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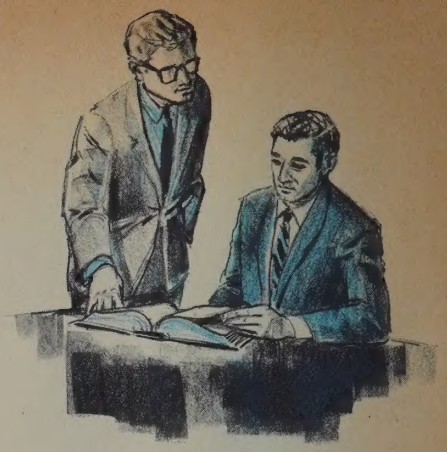

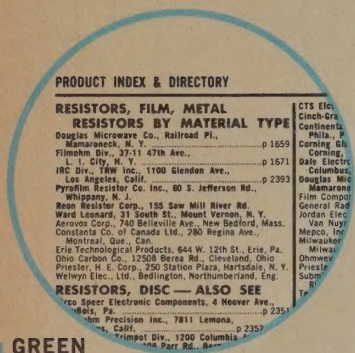

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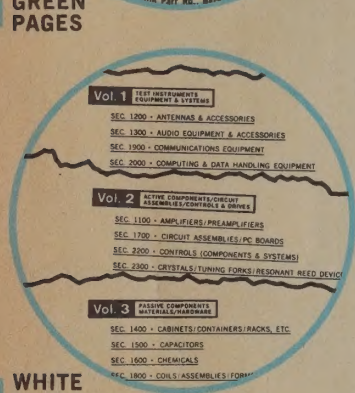

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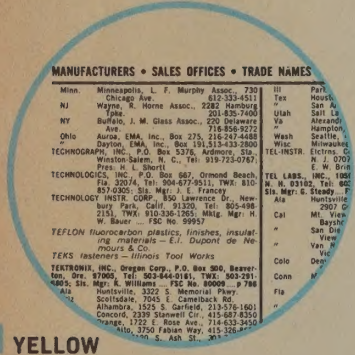

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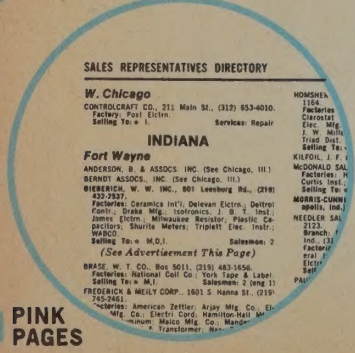

5 PINK PAGES

1 To Find MANUFACTURERS OF A SPECIFIC PRODUCT

GREEN PAGES

Look in the green pages (Product Index and Directory) for the alphabetical listing of products. Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux," etc.

To help you locate the prime product heading, there are hundreds of cross references — (e.g. "Voltmeters — See Meters, Volt").

If you can't locate a specific product, look under the broadest definition: "Connectors, —" "Wire, —" "Indicators, —." If you still can't locate it, you may contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530. Phone: (516) 248-9700.

The **boldface** listings under the product headings indicate the manufacturer has other products cataloged in **eem. Boldface** listings with page numbers refer you to specific and detailed product information in the white pages indicated.

2 To Find MANUFACTURERS' CATALOG INFORMATION

WHITE PAGES

The manufacturers' catalog pages in **eem** (white pages) are grouped in three distinct volumes: **(Vol. 1)** Test Instruments and Equipment and Systems, **(Vol. 2)** Active Components/Circuit Assemblies/Controls and Drives, **(Vol. 3)** Passive Components/Materials/Hardware. The 54 **eem** Product Sections, providing more definite breakdown of product categories, have been assigned individually to the appropriate volumes. Within each of the 54 Product Sections, manufacturers are arranged alphabetically wherever possible. To locate the catalog pages of a specific manufacturer, refer to page 1 or page 501.

Index of Manufacturers' Catalogs .....Pages 1 and 501
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3 To Find MANUFACTURERS' ADDRESSES, PHONES AND SALES OFFICES

YELLOW PAGES

More than 6000 manufacturers of electronic components, materials, instruments, assemblies, systems, and some key services are listed in the yellow pages of Volume 1. These listings include addresses, phone numbers, and sales managers. If the manufacturer has TWX and Federal Supply Code numbers, these are also listed. **Boldface** names indicate that detailed information on the manufacturers' products appears in the **eem** white pages.

4 To Find TRADE NAME SOURCES

YELLOW PAGES

Trade Names, with descriptions of the products and names of their manufacturers, are intermixed alphabetically *(in italics)* in the Manufacturers and Sales Offices Directory described above. Thus, you can easily find the name of the manufacturer if you know only the trade name (brand name or trade mark).

5 To Find SALES REPRESENTATIVES

PINK PAGES

More than 2,000 manufacturers' sales representatives are listed alphabetically and geographically. The geographical listings include addresses, phone numbers, branch offices, lines represented, markets served, facilities and number of salesmen, including those with engineering degrees.

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2500	3	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	1	Environmental Test Equipment
2600	3	Fans, Blowers & Cooling Equipment
2700	2	Filters
2800	3	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
2900	1	Instruments, Measuring & Test
3000	1	Instruments, Graphic Recording
3100	3	Insulators, Insulating Materials & Parts
3130	2	Integrated Circuits & Hybrid Microcircuits
3150	3	Manufacturing, Subcontracting, Custom Fabrication
3200	3	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
3300	1	Medical Electronic Equipment
3400	1	Microwave, Radar Equipment, Components & Accessories
3500	2	Motors, Rotating Components & Accessories
3600	1	Nuclear & Radiation Equipment
3700	2	Photoelectric Equipment & Components
3800	2	Optical Equipment & Accessories PHOTO
4000	1	Power Supplies, Converters, Inverters, Batteries, etc.
4100	1	Production Machinery & Automation Equipment
4200	3	Engineering Aids (Books, Drafting Equipment, Whiteprinters)
4300	1	Recording Equipment (Non-Audio Types)
4500	2	Relays
4600	3	Research, Development, Engineering Services
4700	3	Resistors, Fixed
4750	3	Resistors, Variable (Potentiometers & Rheostats)
4800	2	Semiconductors & Devices, Rectifiers (Non-Tube Types)
4900	2	Servomechanisms & Components
5000	1	Studio Equipment
5100	2	Switches, Circuit Breakers, Fuses, Protective Devices
5200	1	Telemetering Equipment
5300	2	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
5400	3	Tools (Hand & Power); Soldering Supplies
5500	2	Transducers & Associated Equipment
5600	3	Transformers
5700	2	Tubes, Tube Parts, Shields, Inserts, etc.
5800	1	Ultrasonic, Sonic, Subsonic Equipment
5850	1	Vacuum Equipment & Accessories
5900	2	Vibrators, Choppers, etc.
6000	3	Wire, Cable, Harnesses & Accessories

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eem 1970 1971

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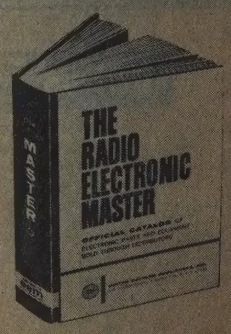

Companion volume
THE RADIO-ELECTRONIC MASTER
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electronic parts distributors
(See page 2969)

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PRODUCT INDEX AND DIRECTORY

The Product Index & Directory contains over 3200 product headings and cross references. Manufacturers of each product are listed alphabetically in two groups under each heading. The first group **(bold face)** are those manufacturers whose catalog pages appear in the white section. Catalog page numbers are shown only when information on the specific product is included in the white section.

Abrasive Belts, Cords, Wheels, etc.

Metex Corp., 970 New Durham Rd., Edison, N.J.
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Armour Ind'l. Prods. Co., 430 N. Michigan Ave., Chicago, Ill.
Avco Bay State Abrasives Div., 12 Union St., Westboro, Mass.
Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
Cratex Rubberized Abrasives, 1600 Rollins Rd., Burlingame, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Felker Mfg. Co., 1900 S. Crenshaw Blvd., Torrance, Calif.
Foredom Elec. Co., Bethel, Conn.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Matthews Ross, Corp., E. Warren St., Fall River, Mass.
Metal Removal Co., 1801 W. Columbia, Chicago, Ill.
Mitchell, E.C., Co., 404 Boston St., Middleton, Mass.
Norton Coated Abrasive & Tape Divs., Dept. 7013, Troy, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Penn Sci. Prods. Co., Inc., 1000 Old York Rd., Abington, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Abrasive Compounds, Grains, Powders, etc.

Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Barton Mines Corp., North Creek, N.Y.
Felker Mfg. Co., 1900 S. Crenshaw Blvd., Torrance, Calif.
Inland Mfg. Co., 1108 Jackson St., Omaha, Neb.
M & T Chemicals Inc., Rahway, N.J.
Norton Co., 1 New Bond St., Worcester, Mass.
Penn Sci. Prods. Co., Inc., 1000 Old York Rd., Abington, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Wells Elctrns., Inc., 1701 S. Main St., So. Bend, Ind.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Absorbers, Microwave

Carborundum Co., Box 367, Niagara Falls, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Ace Shielded Prods., 60 Tomlinson Rd., Huntingdon Valley, Pa.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electronautics, Newton Rd., Littleton, Mass.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
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McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
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Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
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Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Absorbers, Nuclear Radiation

Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Westlake Plastics Co., 133 W. Lenni Rd., Lenni, Pa.

Absorbers, Shock—See Mounts, Shock & Vibration

Accelerators & Accessories, Particle

Allis-Chalmers, Box 512, Milwaukee, Wisc.
Columbia Sci. Inds., Box 6190, Austin, Tex.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Radiation Dynamics, Inc., 1800 Shames Dr., Westbury Industrial Pk., Westbury, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.

Accelerometers

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
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Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
AC Elctrns. Div., 7929 S. Howell Ave., Milwaukee, Wisc.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bell Aerospace Co., 4515 Superior Ave., Cleveland, Ohio
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
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Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Massa Div., 280 Lincoln St., Hingham, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Pickering & Co., Inc., Measurement & Controls Div., 101 Sunnyside Blvd., Plainview, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
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Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.

Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
United Control Corp., Redmond, Wash.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Acoustic Materials—See Materials, Acoustic

Acoustic Noise Generators—See Generators, Acoustic, High Intensity Noise

Acoustic Test Chambers—See Chambers, Acoustical Test, High Intensity Noise

Acrylic Sprays—See Insulating Compounds, Acrylic

Actuators, Servo, Linear

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 1679
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal.
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., S. Montrose, Pa.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
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Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
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MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Rae Motor Corp., Box 518, McHenry, Ill.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Royal Inds., 2040 E. Dyer Rd., Santa Ana, Calif.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skinner Polynoid Div., 95 Edgewood Ave., New Britain, Conn.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Task Corp., Box 3999, Anaheim, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Wright Comps., Inc., Broad & South Sts., Clifton Springs, N.Y.

Actuators, Servo, Rotary

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 1633
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
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Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal.
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa.
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., S. Montrose, Pa.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
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Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Pneu-Hydro Valve Corp., 52 Horse Hill Rd., Cedar Knolls, N.J.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Task Corp., Box 3999, Anaheim, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Adapters—See Connectors; Plugs; Sockets; etc.

Adapters, F-M, Recording

Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Adapters, Panoramic—See Receivers, Panoramic

Adapters, Waveguide

Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
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Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Adhesives (All Types)

Cox & Co., Inc., 215 Park Ave., S., New York, N.Y.
Dow Corning Corp., Midland, Mich. ..... p 2669,2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Abletech, 544 West 182nd St., Gardena, Calif.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Armour Ind'l. Prods. Co., 430 N. Michigan Ave., Chicago, Ill.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Borden Chem., 350 Madison Ave., New York, N.Y.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Carter's Ink Co., 239 First St., Cambridge, Mass.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Daubert Chem. Co., 709 Enterprise Dr., Oak Brook, Ill.
Dennis Chem. Co., 2701 Papin St., St. Louis, Mo.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Fenwal, Inc., Main St., Ashland, Mass.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Hightemp Resins, Inc., 225 Greenwich Ave., Stamford, Conn.
Hysol Div., 211 Franklin St., Olean, N.Y.
Illinois Bronze Powder & Pain Co., 300 E. Main St., Lake Zurich, Ill.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Kenics Corp., One Southside Rd., Danvers, Mass.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Marbon, Box 68, Washington, W. Va.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Nitine, Inc., Rte. 46, Clifton, N.J.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Paisley, Box 987, Edison, N.J.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Rector Engrg. & Plastics Co., 318 Randolph Pl., N.E., Washington, D.C.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rubatex Corp, Bedford, Va.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Smooth-On, Inc., 1000 Valley Rd., Gillette, N.J.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Stametics Co., P.O. Box 9308, N. Hollywood, Calif.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tra-Con, Inc., 55 North St., Medford, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.

Aging Racks—See Racks, Aging

Air Cleaners & Filters (Shielded & Unshielded)

Evans, George Corp., 121-37th St., Moline, Ill. ..... p 2644
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
Metex Corp., 970 New Durham Rd., Edison, N.J. ..... p 2624-2627
Rotron, Inc., Hasbrouck La., Woodstock, N.Y. ..... p 2653
Agnew-Higgins, Inc., P.O. Box 857, Garden Grove, Calif.
Air Control, Inc., 125 Noble St., Norristown, Pa.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Blocksom & Co., P.O. Box 300, Michigan City, Ind.
Cambridge Filter Corp., 7645 Seventh North Rd., Syracuse, N.Y.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Carey Elctrn. Engrg. Co., 1880 Clifton Ave., Springfield, Ohio
Cincinnati Fan & Ventilator Co., 6516 Wiehle, Cincinnati, Ohio
Clean Rooms Constr. Co., Inc., Box 275, Westminster, Cal.
Electro-air, Olivia & Sproul Sts., McKees Rocks, Pa.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Farr Co., 2301 E. Rosecrans, El Segundo, Calif.
Flock Process Corp., P.O. Box 430, Norwalk, Conn.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
Midget Louver Co., 800 Main Ave., Norwalk, Conn.
North American Rockwell Corp., 25000 Miles Rd., Cleveland, Ohio
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pioneer Metals, Inc., Hwy. 127, N., Harrodsburg, Ky.
Research Prods. Corp., 1015 E Washington, Madison, Wisc
Selas Corp. America, Box 200, Dresher, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Torit Corp., 1133 Rankin St., St. Paul, Minn.
Trion, Inc., 1000 Island Ave., McKees Rocks, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.

Air Conditioners (For Equipment)

Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 2643
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Engonics Engrg. Div., 9601 W. Jefferson Blvd., Culver City, Calif.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Kooltronic Fan Co., P.O. Box 504, Princeton, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 3333 W. Warner Ave., Santa Ana, Calif.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Task Corp., Box 3999, Anaheim, Calif.
Typhoon Air Conditioning Co., 505 Carroll St., Brooklyn, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Air Filtering & Ventilating Panels (Shielded & Unshielded)—See Air Cleaners & Filters

Alarms & Alarm Systems

AEL, Inc., Box 552, Lansdale, Pa.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn..... p 2111
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo.
Metrix Instr. Co., Box 36501, Houston, Tex.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Alert Prods. Div., P.O. Box 1851, Costa Mesa, Calif.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beacon Elctrns., Inc., 121 Stanley Ave., Bellmawr, N.J.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Beta Corp., 2639 Manana Dr., Box 20427, Dallas, Tex.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
Burlingame Sci., Box 1754, Burlingame, Cal.
Chatham Controls Corp., 33 River Rd., Chatham, N.J.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Electro-Alarm Safety Devices, 745 N. Pleasant, Fresno, Calif.
Electro Devices, Inc., 11805 Westline Ind'l. Dr., St. Louis, Mo.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Modules Corp., Box 141, Timonium, Md.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Emerson Elec. Co., Box 552, Honeoye Falls, N.Y.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Erdco Engrg. Corp., 136 Official Rd., Addison, Ill.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fenwal, Inc., Main St., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
Fuel Watchman Sls. & Svc., Inc., 2910 Park Ave., Bronx, N.Y.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Hamilton Industries, P.O. Box 504, Winter Haven, Fla.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Heath Co., Benton Harbor, Mich.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Johnson-Williams Prods, 2300 Leghorn St., Mt. View, Calif.
Joliet Control Corp., Box 751, Joliet, Ill.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
Lek-Trol, inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Linear Corp., 347 S. Glasgow Ave., Inglewood, Calif.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Pinkerton Electro-Security Co., 61 Sutton Rd., Webster, Mass.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Puregas Equip. Corp., 1445 Strongs Rd., Copiague, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA, Marne Hwy., Moorestown, N.J.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Rust Corp., 168 Tremont St., Everett, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Scam Instr. Corp., 7401 N. Hamlin Ave., Skokie, Ill.
Schirmer National Alarm Co., 100 Portland Ave., Bergenfield, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Superior Continental Corp., Box 489, Hickory, N.C.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Winpower Mfg Co., 1207 First Ave., E., Newton, Iowa
Worner Elctrn. Devices, Rankin, Ill.
Zeigler Elctrns., Inc., 17810 S. Western Ave., Gardena, Cal.

Alligator Clips—See Clips, Alligator

Alloys, Brazing

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J. ..... p 2837
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal.....p 2684,2685
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cerac, Inc., Box 597, Butler, Wisc.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Handy & Harman, 850 Third Ave., New York, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.
Ventron Corp., Congress St., Beverly, Mass.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Alloys, Metal - Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2603
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cerac, Inc., Box 597, Butler, Wisc.
Cerro Corp., 300 Park Ave., New York, N.Y.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Glidden-Durkee Div., 900 Union Commerce Bldg., Cleveland, Ohio
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.

Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
National Lead Co., 111 Broadway, New York, N.Y.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Ronson Metals Corp., 55 Manufacturers Pl., Newark, N.J.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Sylvania Elec. Prods., Inc., Towanda, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.

Alloys, Metal-To-Glass Sealing—See Seals, Glass-To-Metal

Alloys, Semiconductor—See Metals, Semiconductor

Alphanumeric Readout Tubes—See Tubes, Readout

Alphanumeric Readouts—See Readouts As Modified

Alternators—See Generators, A-C

Altitude Chambers—See Chambers, Altitude

Alumina (Incl. High Purity)—See Insulation Materials, Ceramic

Aluminizers, Vacuum—See Deposition Equip.; Evaporation Equip.

Ammeters—See Meters, Ampere

Amplifiers, A-F (Excluding Hi-Fi)

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Allen Elctrns. Div., Macungie, Pa.
Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1327,1329
Clifton, 5050 State Rd., Drexel Hills, Pa.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032d-1032f
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Daven, Div., Dept. EEM 70, Manchester, N.H.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1046
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773,774
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Singer Co., Finderne Ave., Somerville, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y. ..... p 1941
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Browning Labs., Inc., P.O. Box 310, Laconia, N.H.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Corp., 302 McGuinness Blvd., Brooklyn, N.Y.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Défense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Eckel Inds., Inc., 155 Fawcett St., Cambridge, Mass.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electron Enterprises, Inc., 6645 Stanley Ave., Berwyn, Ill.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fargo Co., 1162 Bryant St., San Francisco, Calif.
Femco Div., Box F, Irwin, Pa.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Johnson Elctrns., Inc., P.O. Box 7, Casselberry, Fla.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loge Elctrns., 2171 W. Washington Blvd., Los Angeles, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Mallory, P.R. & Co. Inc., Integrated Circuit Dept., 3029 E. Washington St., Indianapolis, Ind.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
MB Elctrns., Box 1825, New Haven, Conn.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Midwest Audio Corp., 5707 W. Division, Chicago, Ill.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Pulse Techniques, Inc., 1411 Palisade Ave., W. Englewood, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Radio-Matic America, Inc., 760 Ramsey Ave., Hillside, N.J.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Sparks Communications, Inc., 1107 Lagoon Dr., Dallas, Tex.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tabet Mfg. Co., 1336 Ballentine Blvd., Norfolk, Va.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Touchmaster Labs., 6750 Selma Ave., Hollywood, Calif.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trutone Elctrns., Inc., 14660 Raymer St., Van Nuys, Calif.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wilder Engrg. Prods., 715 Kedzie, Chicago, Ill.

Amplifiers, Antenna

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1328
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Amplifiers, Biophysical

Gould, Inc., 3631 Perkins, Cleveland, Ohio
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.

Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.

Amplifiers, Charge

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ....p 1336,1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Metrix Instr. Co., Box 36501, Houston, Tex. .... p 2122
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
EDC (Electro Dev. Corp.), Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
United Control Corp., Redmond, Wash.

Amplifiers, Compressor

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .... p 1336
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Raytrack Co., 3498 E. Fulton, Columbus, Ohio
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Amplifiers, Control

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Arvee Engrg. Co., Box 3759, Torrance, Calif.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ....p 1981,1982
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
Clifton, 5050 State Rd., Drexel Hills, Pa.... p 1987
CML, Inc., 166 National Rd., Edison, N.J. .... p 2919
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. .... p 1984
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.... p 1330
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. .... p 1335
Intronics, Inc., 57 Chapel St., Newton, Mass. .... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .... p 1336
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. .... p 1396
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. .... p 1345
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Magnetics, Sandy Lake, Pa.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA, Marne Hwy., Moorestown, N.J.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Worner Elctrn. Devices, Rankin, Ill.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Amplifiers, Current

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Amplifiers, D-C

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y. .. p 1631
Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Arvee Engrg. Co., Box 3759, Torrance, Calif. .... p 1322
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. .... p 1983
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Cohu Elctrns., Inc., Box 623, San Diego, Calif. .... p 637
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. .... p 1984
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. .... p 1309
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. .... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. .... p 1331
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Gould, Inc., 3631 Perkins, Cleveland, Ohio .... p 841
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. .... p 1334
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .... p 1336
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. .... p 1396
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio
Singer Co., Finderne Ave., Somerville, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Unico, Inc., 2635 Golf Ave., Racine, Wisc. .... p 600
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Advance Instr. Corp., 1707 F. St., Belmar, N. J.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
B & F Instrs., Inc., Cornwells Hgts., Pa.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.

Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Dorsett Elctrns., Box 36, Tulsa, Okla.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Fairchild Controls, 423 National Ave., Mountain View, Calif.
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RCA, Marne Hwy., Moorestown, N.J.
RDF West, 9371 Kramer Ave., Westminster, Calif.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Rust Corp., 168 Tremont St., Everett, Mass.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Taber, 455 Bryant St., No. Tonawanda, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Amplifiers, Decade

Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 774
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Amplifiers, Deflection

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn. ..... p 567
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Celco, 70 Constantine Dr., Mahwah, N.J.
Cleveland Elctrns., Inc., 2000 Highland Rd., Twinsburg, Ohio
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Amplifiers, Delay Line

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Arvee Engrg. Co., Box 3759, Torrance, Calif.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Modules Corp., Box 141, Timonium, Md.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.

Amplifiers, Differential-Also See Amplifiers, Operational

Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. p 1323
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1887
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ....p 1334,1335
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1608-1613,1616,1617
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1344
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & F Instrs., Inc., Cornwells Hgts., Pa.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Fairchild Controls, 423 National Ave., Mountain View, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
MB Elctrns., Box 1825, New Haven, Conn.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
RDF West, 9371 Kramer Ave., Westminster, Calif.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Tylan Corp., 4203 Spencer St., Torrance, Calif.

Amplifiers, Distributed

AEL, Inc., Box 552, Lansdale, Pa.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1324,1329
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio

Amplifiers, Distribution

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1326,1328
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Honeywell, Box 5227, Denver, Colo.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y..... p 765
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 832
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Components Corp., 106 Main St., Denville, N.J.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Defense Elctrns., Inc., Rockville, Md.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hope Elctrns., Box 773, Clifton, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Amplifiers, Fluidic

Corning Glass Works, Elctm. Prods. Div., Houghton Pk., Corning, N.Y.
Bendix Corp., Sidney, N.Y.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Howie Corp., Noble & Jackson Sts., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.

Amplifiers, I-F

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1325
CML, Inc., 166 National Rd., Edison, N.J.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal..... p 869
Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.. p 1885
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895,904,905
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Koch Inds., 401 S. Dale St., Anaheim, Cal.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Olektron Corp., Box 248, Dudley, Mass.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Amplifiers, Integrating

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ..... p 1335
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1345
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
United Control Corp., Redmond, Wash.

Amplifiers, Isolation

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1329
Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Defense Elctrns., Inc., Rockville, Md.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Amplifiers, Keying

Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1987
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Honeywell, Box 5227, Denver, Colo.
Defense Elctrns., Inc., Rockville, Md.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Amplifiers, Klystron

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.....p 880,881
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.

General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Amplifiers, Limiting

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.

Amplifiers, Line

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Arvee Engrg. Co., Box 3759, Torrance, Calif.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340
Honeywell, Box 5227, Denver, Colo.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Collins Radio Co., Dallas, Tex.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Amplifiers, Linear

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1324,1326,1327
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1046
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y. ..... p 1332
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ....p 1334,1335
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 729
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Singer Co., Finderne Ave., Somerville, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1344-1346
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Amperex Elctrn. Corp., 99 Bald Hill Rd., Cranston, R.I.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
D.A.T.A., Inc., 32 Lincoln Ave., Orange, N.J.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Derivation & Tabulation Assocs., 32 Lincoln Ave., Orange, N.J.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Olektron Corp., Box 248, Dudley, Mass.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Silicon Gen'l., Inc., 7382 Bolsa Ave., Westminster, Cal.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Sparks Communications, Inc., 1107 Lagoon Dr., Dallas, Tex.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Amplifiers, Lock-In

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.

Amplifiers, Logarithmic

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ..... p 1334
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio

Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895,905
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
RDF West, 9371 Kramer Ave., Westminster, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Amplifiers, Magnetic

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Arnold Magnetics Corp., Box K, Culver City, Calif.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374,1375
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Sorensen Oper., Richards Ave., Norwalk, Conn.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Newport Beach, Calif.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Amplifiers, Maser—See Masers

Amplifiers, Master Antenna—See Amplifiers, Distribution

Amplifiers, Microphone—See Amplifiers A-F (Excluding Hi-Fi)

Amplifiers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 355
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1328
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Daico Inds., Inc., Box 5225, Compton, Cal.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 866,869
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870,871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1886
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 880,881
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 910
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Amtron Corp., 337 Newbury St., Boston, Mass.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Amplifiers, Mixing

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Honeywell, Box 5227, Denver, Colo.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Lansdale Microelectronics, Inc., Colmar, Pa.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microcom Corp., Horsham Valley Ind'l. Pk., Horsham, Pa.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
NUS Corp., P.O. Box 248, Paramus, N.J.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pulse Techniques, Inc., 1411 Palisade Ave., W. Englewood, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Amplifiers, Narrow-Band

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa.
CML, Inc., 166 National Rd., Edison, N.J.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
Honeywell, Box 5227, Denver, Colo.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio

Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Amplifiers, Nonlinear

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Singer Co., Finderne Ave., Somerville, N.J.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Collins Radio Co., Dallas, Tex.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Amplifiers, Null

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Honeywell, Box 5227, Denver, Colo.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Singer Co., Finderne Ave., Somerville, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Amplifiers, Operational

Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. p 1323
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y. ..... p 2809
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ....p 1334,1335
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1095
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1338
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Solitron Devices, Inc., 8808 Balboa Ave., San Diego, Cal. p 1938
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. .....p 1608-1613,1617
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1344
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Amperex Elctrn. Corp., 99 Bald Hill Rd., Cranston, R.I.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
Fairchild Controls, 423 National Ave., Mountain View, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Heath Co., Benton Harbor, Mich.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Link Div., Binghamton, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro Networks, 5 Barbara La., Worcester, Mass.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
United Control Corp., Redmond, Wash.
Valid Data Corp., 10760 Burbank Blvd., No. Hollywood, Cal.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Amplifiers, Parametric

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 900
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Amplifiers, Peak-Limiting

Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Amplifiers, Photocell

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Arvee Engrg. Co., Box 3759, Torrance, Calif.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hird Brown America, Box 544, Livingston, N.J.

International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.
Worner Elctrn. Devices, Rankin, Ill.

Amplifiers, Power (Excluding Hi-Fi)

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1324,1327
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
Clifton, 5050 State Rd., Drexel Hills, Pa.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032c-1032f
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Connor-Winfield Corp., Winfield, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1046
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Frequency Control, Inc., Box 671, Austin, Tex.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y. ..... p 1332
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. .....p 1094,1095
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal... p 1343
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895,904
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Singer Co., Finderne Ave., Somerville, N.J.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. ..... p 1291
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Femco Div., Box F, Irwin, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Olektron Corp., Box 248, Dudley, Mass.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Raytrack Co., 3498 E. Fulton, Columbus, Ohio
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Amplifiers, Public Address

Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Aimes Inds., P.O. Box 73, Lockport, Ill.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Browning Labs., Inc., P.O. Box 310, Laconia, N.H.
Chamberlain Mfg. Corp., 5740 N. Tripp Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Encom Prods. Co., Inc., Box 68, Oxford, Pa.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Femco Div., Box F, Irwin, Pa.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loge Elctrns., 2171 W. Washington Blvd., Los Angeles, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Midwest Audio Corp., 5707 W. Division, Chicago, Ill.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Schindlers, 195 Greenfield Ave., Los Angeles, Calif.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Trutone Elctrns., Inc., 14660 Raymer St., Van Nuys, Calif.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Amplifiers, Pulse

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 625 Stewart Dr., Sunnyvale, Calif.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1326,1329
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032f
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y. ..... p 1332
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. .....p 880,881
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.

International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conp. Ave., N.W., Washington, D.C.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA, Marne Hwy., Moorestown, N.J.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Amplifiers, Pulse-Limiting

AEL, Inc., Box 552, Lansdale, Pa.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Honeywell, Box 5227, Denver, Colo.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA, Marne Hwy., Moorestown, N.J.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Amplifiers, Radar—See Amplifiers, Microwave

Amplifiers, Recording—See Amplifiers, A-F (Excluding Hi-Fi)

Amplifiers Resolver—See Amplifiers, Servo

Amplifiers, R-F

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1324,1325,1327,1329
Daico Inds., Inc., Box 5225, Compton, Cal.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Honeywell, Box 5227, Denver, Colo.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y. ..... p 1332
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 729
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 880,881
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Koch Inds., 401 S. Dale St., Anaheim, Cal.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytrack Co., 3498 E. Fulton, Columbus, Ohio
RCA, Marne Hwy., Moorestown, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Rust Corp., 168 Tremont St., Everett, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Wilcox, 1400 Chestnut, Kansas City, Mo.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Amplifiers, Sample & Hold

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586-589
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Amplifiers, Servo

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y. .. p 1631
Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1981-1983
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.

Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1693
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1996
Weston-Transicoil, Worcester, Pa. ..... p 1998
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Advance Instr. Corp., 1707 F. St., Belmar, N. J.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bell Aerospace Co., 4515 Superior Ave., Cleveland, Ohio
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., S. Montrose, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Amplifiers, Single-Sideband

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Amplifiers, Standing Wave

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Amplifiers, Strain Gauge

Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ..... p 1335
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 578
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Standard Controls, Inc., 2401 S. Bayview St., Seattle, Wash. p 2126
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
MB Elctrns., Box 1825, New Haven, Conn.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Vishay Instrs., Inc., 63 Lincoln Hwy., Malvern, Pa.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Amplifiers, Sweep

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 729
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Amplifiers, Synchro

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. .....p 1981,1982
California Instrs. Corp., Behiman Div., 3511 Midway Dr., San Diego, Cal.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Intronics, Inc., 57 Chapel St., Newton, Mass.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595,598
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1996
Weston-Transicoil, Worcester, Pa.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.

Amplifiers, Telemetering

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airpax Elctrns., Inc., Cambridge, Md.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1328

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 880,881
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Brown Engrg Co., Research Pk., Huntsville, Ala.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Defense Elctrns., Inc., Rockville, Md.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
EMR Div., Box 223, Princeton, N.J.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Lansdale Microelectronics, Inc., Colmar, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RCA, Marne Hwy., Moorestown, N.J.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Amplifiers, Thermocouple

Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.

Amplifiers, Thyratron

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Amplifiers, Transducer

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Arvee Engrg. Co., Box 3759, Torrance, Calif.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. ..... p 1366
CML, Inc., 166 National Rd., Edison, N.J.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Crown Int'L, Box 1000, Dept. EEM, Elkhart, Ind.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio
Elctrn. Comps. Div., Trevose, Pa.
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 578
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Geo Space, 5803 Glenmont, Houston, Tex.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lansdale Microelectronics, Inc., Colmar, Pa.
Magnetics, Sandy Lake, Pa.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
MB Elctrns., Box 1825, New Haven, Conn.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
NUS Corp., P.O. Box 248, Paramus, N.J.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Validyne Engrg. Corp., 18819 Napa St., Northridge, Cal.

Amplifiers, Traveling-Wave Tube

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 880,881
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
Collins Radio Co., Dallas, Tex.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Traveling Wave Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Amplifiers, Tunnel Diode

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Amplifiers, Ultrasonic

Arvee Engrg. Co., Box 3759, Torrance, Calif.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032!
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Amplifiers, Vibration Pickup

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
Elctrn. Comps. Div., Trevose, Pa.
Honeywell, Box 5227, Denver, Colo.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
United Control Corp., Redmond, Wash.

Amplifiers, Video

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1327,1328
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Celco, 70 Constantine Dr., Mahwah, N.J.
Collins Radio Co., Dallas, Tex.
Components Corp., 106 Main St., Denville, N.J.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Defense Elctrns., Inc., Rockville, Md.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Silicon Gen'l., Inc., 7382 Bolsa Ave., Westminster, Cal.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Teletronics, Inc., 760 N. Main St., Orange, Calif.
Valid Data Corp., 10760 Burbank Blvd., No. Hollywood, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.

Amplifiers, Voltage Reference

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass..... p 1319
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
Connor-Winfield Corp., Winfield, Ill.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Honeywell, Box 5227, Denver, Colo.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1346
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Amplifiers, VSWR Measuring

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1324
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.

Amplifiers, Wideband

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1319-1321
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1325-1327,1329
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032f
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. p 1323
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1340,1341
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y. ..... p 1332
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ....p 1334,1335
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 729
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ... p 1342
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 773,774
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 904
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. .....p 1608-1613,1616,1617
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. ..... p 1291
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1344
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celco, 70 Constantine Dr., Mahwah, N.J.
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Farinon Electric, 935 Washington St., San Carlos, Calif.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kaiser CATV, Box 9728, Phoenix, Ariz
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Link Div., Binghamton, N.Y.
Locus, Inc, 906 West College Ave., State College, Pa.

Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Massa Div., 280 Lincoln St., Hingham, Mass.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analog Computers—See Computers, Analog

Analog-To-Digital Converters—See Converters, Analog-To-Digital

Analyzers, A-F

A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 643
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 728
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p.892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .... p 771,773,774
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Systron-Donner Microwave, 14844 Oxnard St., Van Nuys, Cal. p 792
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digitech Data Inds., Inc., 22 Grove St., Ridgefield, Conn.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
MB Elctrns., Box 1825, New Haven, Conn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Antenna Pattern

Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St. Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Analyzers, Behavioral, Experimental

Esterline Angus Div., Box 24000, Indianapolis, Ind.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Analyzers, Capacitor—See Testers, Capacitor

Analyzers, Circuit—See Testers, Signal Tracing

Analyzers, Coincidence

Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
3M Co., 3M Center, St. Paul, Minn.

Analyzers, Color—See Colorimeters

Analyzers, Crystal

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Electronic Service Co., 201 Linden Ave., Verona, N.J.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Analyzers, Differential

Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 669
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Honeywell, Box 5227, Denver, Colo.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
T & T Controls Co., Inc., Box 171, Media, Pa.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Analyzers, Dispersion—See Analyzers, A-F

Analyzers, Distortion—See Analyzers, A-F

Analyzers, Frequency—See Analyzers, Spectrum

Analyzers, Frequency Stability—See Meters, Frequency Deviation

Analyzers, Gas

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Aero Vac Corp., Box 448, Troy, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Franklin Gno Corp., 6620 Lakeside Rd., W. Palm Beach, Fla.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
General Monitors, Inc., 3019 Enterprise St., Costa Mesa, Calif.
Gow-Mac Instr. Co., 100 Kings Rd., Madison, N.J.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hays Corp., Michigan City, Ind.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Johnson-Williams Prods, 2300 Leghorn St., Mt. View, Calif.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Royco Instrs., Inc., 141 Jefferson Dr., Menlo Pk., Cal.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Analyzers, Gear Train

Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.

Analyzers, Harmonic

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 643
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .... p 771,773,774
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Link Div., Binghamton, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.

Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Interference

Honeywell, Box 5227, Denver, Colo.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Analyzers, Intermodulation

C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1329
Crown Int'L, Box 1000, Dept. EEM, Elkhart, Ind.
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Measurements, Box 180, Boonton, N.J.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Collins Radio Co., Cedar Rapids, Iowa
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.

Analyzers, Magnetic

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Magnetic Analysis Corp., 535 South 4th Ave., Mt. Vernon, N.Y.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.

Analyzers, Magnetic Tape Dropout

Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 639
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.

Analyzers, Microwave

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Systron-Donner Microwave, 14844 Oxnard St., Van Nuys, Cal. p 792
Collins Radio Co., Dallas, Tex.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Noise

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 639
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 771-773
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Acton Labs., Inc., 531 Main St., Acton, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Bearing Inspection, Inc., 10041 Shoemaker Ave., Santa Fe Springs, Calif.
Collins Radio Co., Dallas, Tex.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Particle-Size

AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Coulter Elctrns., Inc., 590 West 20th St., Hialeah, Fla.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
High Accuracy Prods. Corp., 141 Spring St., Claremont, Cal.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Royco Instrs., Inc., 141 Jefferson Dr., Menlo Pk., Cal.
Thermo Sys., Inc., 2500 Cleveland Ave., N., St. Paul, Minn.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Analyzers, Phase & Voltage

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Polargraphic

Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Brinkmann Instrs., Inc., Cantiague Rd., Westbury, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.

Analyzers, Probability Density

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 771,774
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Celco, 70 Constantine Dr., Mahwah, N.J.
Electron-Machine Corp., Box M, Umatilla, Fla.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Analyzers, Probability Distribution—See Analyzers, Probability Density

Analyzers, Pulse Height

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 774
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Supplies Div., Box 312, Encino, Calif.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Tennelec, Inc., Box D, Oak Ridge, Tenn.

Analyzers, Radar

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Systron-Donner Microwave, 14844 Oxnard St., Van Nuys, Cal. p 792
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.

Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Analyzers, Radiation, Nuclear

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Random Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.

Analyzers, Servo

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
EMR Div., Box 223, Princeton, N.J.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Analyzers, SCR

Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tennelec, Inc., Box D, Oak Ridge, Tenn.

Analyzers, Single-Sideband—See Analyzers, Spectrum

Analyzers, Sonic & Subsonic

A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 728
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .... p 771,773,774
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Sanders Assocs., Inc., Ocean Sys. Div., Daniel Webster Hwy., So. Nashua, N.H.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Signatection, Inc., 225 Crescent St., Waltham, Mass.
Sparton Corp., 2400 E. Ganson St., Jackson, Mich.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.

Analyzers, Spectrum (Including Oscilloscopes With Plug-Ins)

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771,773
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Systron-Donner Microwave, 14844 Oxnard St., Van Nuys, Cal. p 792
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
EMR Div., Box 223, Princeton, N.J.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Signatection, Inc., 225 Crescent St., Waltham, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Vacuum Equip. Div., 160 Chariemont St., Newton, Mass.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
White Instrs., Inc., Box 698, Austin, Tex.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Analyzers, Surface—See Indicators, Surface Roughness

Analyzers, Telemetric Data

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Analyzers, Transfer Function

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
Celco, 70 Constantine Dr., Mahwah, N.J.
EMR Div., Box 223, Princeton, N.J.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Analyzers, Transistor—See Testers, Transistor

Analyzers, Ultrasonic

A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Chesapeake Instr. Corp., Shadyside, Md.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Techsonics, Box 251, El Prado, N.M.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan

Analyzers, Vibration

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Systron-Donner Microwave, 14844 Oxnard St., Van Nuys, Cal. p 792
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Acton Labs., Inc., 531 Main St., Acton, Mass.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.

Balance Technology, Inc., 41 Enterprise Dr., Ann Arbor, Mich.
Bearing Inspection, Inc., 10041 Shoemaker Ave., Santa Fe Springs, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Micro Balancing, Inc., 120 Finn Ct., Farmingdale, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Schenck Trebel Corp, 120 Finn Ct., Farmingdale, N. Y.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Wharton Unitools, 8-10 Lake St., Moosup, Conn.

Analyzers, Video

Colorado Video, Inc., Box 928, Boulder, Colo. ..... p 634
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Collins Radio Co., Dallas, Tex.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Systron-Donner Corp., One Systron Dr., Concord, Cal.

Analyzers, Waveform—See Analyzers, Harmonic

Anechoic Chambers

Ace Shielded Prods., 60 Tomlinson Rd., Huntingdon Valley, Pa.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Eckel Inds., Inc., 155 Fawcett St., Cambridge, Mass.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Topatron, Inc., Box 967, Costa Mesa, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.

Angle-Of-Attack Indicators—See Indicators, Angle-Of-Attack

Annunciators

Allard Instr. Corp., 770 Main St., Westbury, N.Y. ..... p 1494
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Electrospace Corp., 956 Brush Hollow Rd., Westbury
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1516
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. ..... p 568
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2068,2069
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Shelly Assoc., Inc., 111 Eucalyptus Dr., El Segundo, Cal. p 1535
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.... p 1545
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Beta Corp., 2639 Manana Dr., Box 20427, Dallas, Tex.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Electro Devices, Inc., 11805 Westline Ind'l. Dr., St. Louis, Mo.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Honeywell, Inc., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Kirkland H. R. Co., 8 King St., Morristown, N.J.
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Madatron Corp., 110 Rte. 10, Whippany, N.J.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Penn Keystone Corp., Division St., Ansonia, Conn.
Pinkerton Electro-Security Co., 61 Sutton Rd., Webster, Mass.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Scam Instr. Corp., 7401 N. Hamlin Ave., Skokie, Ill.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Truco, Inc., P.O. Box 95, Simsbury, Conn.
Worner Elctrn. Devices, Rankin, Ill.

Anodes, Electroplating

Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Gardner Solder Co., 4820 S. Campbell Ave., Chicago, Ill.
Handy & Harman, 850 Third Ave., New York, N.Y.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
M & T Chemicals Inc., Rahway, N.J.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.

Antenna Coils—See Coils, Antenna Loading

Antenna Couplers—See Couplers Antenna

Antenna Dummy Loads—See Dummy Loads

Antenna Feed Systems

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gabriel Elctrns., Div., Saco, Me.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Antenna Filters—See Filters, Antenna

Antenna Housings-Also See Radomes

AEL, Inc., Box 552, Lansdale, Pa.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
C/P Corp., RFD #3, Newberry, S.C.
Ceram Corp., 5345 Timken Sq., La Mesa, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.

Antenna Lightning Arresters

Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2036
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Cush Craft, 621 Hayward St., Manchester, N.H.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Stainless, Inc., 3rd St., N. Wales, Pa.
Tempo TV Prods. Co., P.O. Box 4156, Sylmar, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.

Antenna Pattern Analyzers—See Analyzers, Antenna Pattern

Antenna Pattern Recorders—See Recorders, Antenna Pattern

Antenna Position Indicators—See Indicators, Antenna Position

Antenna Reflectors

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Gabriel Elctrns., Div., Saco, Me.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microflect Co., 3575 25th S.E., Salem, Ore.
Microwave Sys. Co., Box 15155, Golden, Colo.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Antenna Rotators (Industrial & Military)

AEL, Inc., Box 552, Lansdale, Pa.
Alliance Mfg. Co., Alliance, Ohio ..... p 1632
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Gabriel Elctrns., Div., Saco, Me.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Task Corp., Box 3999, Anaheim, Calif.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Trylon, Inc., Elverson, Pa.
USM Corp., 81 Bay State Rd., Wakefield, Mass.

Antenna Switching Matrices

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Daico Inds., Inc., Box 5225, Compton, Cal.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antenna Towers & Supports

AEL, Inc., Box 552, Lansdale, Pa.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
American Tower Co., P.O. Box 29, Shelby, Ohio
Antenna Products Co., P.O. Box 9588, Austin, Texas
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Copperweld Steel Co., Glassport, Pa.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Dresser Crane Hoist & Tower Div., 875 Michigan Ave., Columbus, Ohio
E-Z Way Prods., Inc., Box 17196, Tampa, Fla.
Easy-Up, Inc., 1006 State St., Racine, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gabriel Elctrns., Div., Saco, Me.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Jontz Mfg. Co., Inc., 1101 E. McKinley Ave., Mishawaka, Ind.
Kline Iron & Steel Co., Inc., P.O. Box 1013, Columbia, S.C.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Microflect Co., 3575 25th S.E., Salem, Ore.
Microwave Sys. Co., Box 15155, Golden, Colo.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RCA Corp., Front & Cooper, Camden, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Stainless, Inc., 3rd St., N. Wales, Pa.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
Tempo TV Prods. Co., P.O. Box 4156, Sylmar, Calif.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Trylon, Inc., Elverson, Pa.
Universal Prods. Engrg., 1230 Racine St., Racine, Wisc.
Up-Right Scaffolds, 1013 Pardee St., Berkeley, Calif.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.

Antennas, Airborne

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bendix Corp., Box 9414, Ft. Lauderdale, Fla.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
C/P Corp., RFD #3, Newberry, S.C.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Copperweld Steel Co., Glassport, Pa.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LP Assocs., Inc., 11830 W. Pico Blvd., Los Angeles, Calif.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stainless, Inc., 3rd St., N. Wales, Pa.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Broadcasting (Commercial)

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Ampex Corp., 401 Broadway, Redwood City, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
E-Z Way Prods., Inc., Box 17196, Tampa, Fla.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RCA Corp., Front & Cooper, Camden, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Video Inds. Co., 45 Brick Oven Rd., Port Chester, N.Y.

Antennas, Conical

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Kay-Townes Antenna Co., Box 593, Rome, Ga.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Trio Mfg. Co., Griggsville, Ill.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Antennas, Direction Finding

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Gold Line Connector, Inc., Mullier Ave., Box 893, Norwalk, Conn.
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Ferrite

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2036
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fair-Rite Prods. Corp., 1 Commercial Row, Walkill, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Antennas, Ground Plane

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Honeywell, Box 5227, Denver, Colo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Avanti R & D Inc., 35 W. Fullerton, Addison, Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
C/P Corp., RFD #3, Newberry, S.C.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Cush Craft, 621 Hayward St., Manchester, N.H.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Kreckman, Herb Co., Cresco, Pa.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
Trylon, Inc., Elverson, Pa.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Helical

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
C/P Corp., RFD #3, Newberry, S.C.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Log-Periodic

AEL, Inc., Box 552, Lansdale, Pa.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Dallas, Tex.
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kay-Townes Antenna Co., Box 593, Rome, Ga.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stainless, Inc., 3rd St., N. Wales, Pa.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Loop

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan ..... p 506
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Microwave

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Waveline, Inc., Box 718, W. Caldwell, N.J.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.

Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stainless, Inc., 3rd St., N. Wales, Pa.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Torngren Co., 236 Pearl St., Somerville, Mass.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Mobile

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Avanti R & D Inc., 35 W. Fullerton, Addison, Ill.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Francis Inds., 11855 Broad St., Pataskala, Ohio
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Master Mobile Mounts, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.

Antennas, Parabolic

AEL, Inc., Box 552, Lansdale, Pa.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Dallas, Tex.
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dresser Crane Hoist & Tower Div., 875 Michigan Ave., Columbus, Ohio
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gabriel Elctrns., Div., Saco, Me.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Torngren Co., 236 Pearl St., Somerville, Mass.
TRG Prods., 400 Border St., E. Boston, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Phased Array

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antennacraft Co., Box 1005, Hwy. 34, W., Burlington, Iowa
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Dallas, Tex.
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Cush Craft, 621 Hayward St., Manchester, N.H.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Kay-Townes Antenna Co., Box 593, Rome, Ga.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sitco Antennas, 10330 N.E. Marx St., Portland, Ore.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Trio Mfg. Co., Griggsville, Ill.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Antennas, Radar

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bedford Div, Daniel Webster Hwy., So. Nashua, N.H.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Gabriel Elctrns., Div., Saco, Me.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Rhombic

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.

Antennas, Rotary Beam

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Avanti R & D Inc., 35 W. Fullerton, Addison, Ill.
Cush Craft, 621 Hayward St., Manchester, N.H.

Finney Co., 34 W. Interstate St., Bedford, Ohio
Gabriel Elctrns., Div., Saco, Me.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Kreckman, Herb Co., Cresco, Pa.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Scatter Propagation

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
Cush Craft, 621 Hayward St., Manchester, N.H.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Gabriel Elctrns., Div., Saco, Me.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.

Antennas, Spiral

AEL, Inc., Box 552, Lansdale, Pa.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Amecom Div., 5115 Calvert Rd., College Park, Md.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Antennas, Telemetry, Tracking

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Cush Craft, 621 Hayward St., Manchester, N.H.
Defense Elctrns., Inc., Rockville, Md.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Antennas, Telescopic

AEL, Inc., Box 552, Lansdale, Pa.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan ..... p 506
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
K-W Engrg. Works, N50 W16328 Pin Oak Ct., Menomonee Falls, Wisc.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Peerless Prods. Inds., 4210 W. Chicago Ave., Chicago, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tempo TV Prods. Co., P.O. Box 4156, Sylmar, Calif.
Tenatronics, Ltd., 3001 Chester Ave., Cleveland, Ohio
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.

Antennas, Troposcatter

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dresser Crane Hoist & Tower Div., 875 Michigan Ave., Columbus, Ohio
Gabriel Elctrns., Div., Saco, Me.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Marconi Div., 1 Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Telrex Comm. Engrg. Labs., Asbury Park, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.

Antennas, Tunable Dipole

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Yokowo Mfg. Co., Ltd., No. 5, 7-chome, Takinogawa, Kita-ku, Tokyo, Japan ..... p 506
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Antenna Products Co., P.O. Box 9588, Austin, Texas
Avanti R & D Inc., 35 W. Fullerton, Addison, Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lattin Radio Labs., 1431 Sweeney, Box 44, Owensboro, Ky.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Peerless Prods. Inds., 4210 W. Chicago Ave., Chicago, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Trylon, Inc., Elverson, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Anti-Static Compounds & Coatings—See Coatings, Anti-Static

Arc Lamp Power Supplies—See Power Supplies, Arc Lamp

Armatures—See Motor & Generator Armatures, Rotors, Stators

Arms, Phono, Trascription—See Phonograph Arms, Transcription

Arresters, Electrical Surge-Also See Suppressors, Arc; Protectors, Surge

ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2036
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Bellaire Elctrns., Inc., 62 White St., Red Bank, N.J.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Arresters, Lightning

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2036
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Bellaire Elctrns., Inc., 62 White St., Red Bank, N.J.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Cush Craft, 621 Hayward St., Manchester, N.H.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Asbestos—See Insulation Materials, Asbestos

Asphalt Insulation—See Insulating Compounds, Asphalt & Pitch

Attenuators, Audio

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Daven, Div., Dept. EEM 70, Manchester, N.H.
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Attenuators, Coaxial

AEL, Inc., Box 552, Lansdale, Pa.
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio ..... p 2775
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
CES Elctrns., 2968 Avenue Z, Brookiyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
EMC Technology Inc. 1300 Arch St., Philadelphia, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Attenuators, Decade

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 872
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Measurements, Box 180, Boonton, N.J.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Attenuators, Fixed

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Daven, Div., Dept. EEM 70, Manchester, N.H.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio ..... p 2775
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bellaire Elctrns., Inc., 62 White St., Red Bank, N.J.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMC Technology Inc. 1300 Arch St., Philadelphia, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Totel Systems, 4695 Main St., Bridgeport, Conn.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Attenuators, I-F

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Olektron Corp., Box 248, Dudley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Attenuators, Impedance Matching

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Daven, Div., Dept. EEM 70, Manchester, N.H.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Measurements, Box 180, Boonton, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799

Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Hope Elctrns., Box 773, Clifton, N.J.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.

Attenuators, Logarithmic

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.

Attenuators, Microwave

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 868
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Measurement Specialties Lab., Inc., 14532 Erwin St., Van Nuys, Cal.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micrometals, 228 N. Sunset, City of Industry, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Attenuators, Programmable

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Computer Labs, 1109 S. Chapman St., Greensboro, N.C.
Daico Inds., Inc., Box 5225, Compton, Cal.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Narda Microwave Corp., Plainview, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Measurement Specialties Lab., Inc., 14532 Erwin St., Van Nuys, Cal.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Wavetek, 3000 Shelby St., Indianapolis, Ind.

Attenuators, R-F

AEL, Inc., Box 552, Lansdale, Pa.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 872
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nytronics, Inc., Industrial Rd., Kutztown, Pa. ..... p 2735
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio ..... p 2775
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rafec Elctrns., Box 566, Temple City, Calif.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Attenuators, Turret

Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Daven, Div., Dept. EEM 70, Manchester, N.H.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Astrolab Inc., 4 Mc Candless St, Linden, N J
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.

Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.

Attenuators, Variable

AEL, Inc., Box 552, Lansdale, Pa.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
CTS of Asheville, Inc., Mills Gap Rd., Skyland, N.C.
Daven, Div., Dept. EEM 70, Manchester, N.H.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 868
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 872
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 730,731
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nytronics, Inc., Industrial Rd., Kutztown, Pa. ..... p 2735
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Measurement Specialties Lab., Inc., 14532 Erwin St., Van Nuys, Cal.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Attitude Indicators—See Indicators, Attitude

Audible Warning Devices—See Alarms & Alarm Systems

Audio Equipment—See Amplifiers; Microphones; Speakers; etc.

Audiometers

Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Farrall Instr. Co., Box 1037, Grand Island, Neb.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.

Autocollimators—See Collimators

Automatic Checkout Equipment—See Test Equipment, Automatic Checkout

Autotransformers—See Transformers, Autotransformer

Averagers, Signal

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hird Brown America, Box 544, Livingston, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Azimuth Indicators—See Indicators, Azimuth

Backlighted Panel Displays—See display Panels

Badges, Radiation Indicating—See Services, Film Badge

Baffles, Acoustic Material—See Materials, Acoustic, Sound Absorbing

Baffles, Speaker—See Enclosures, Speaker

Bails, Stands & Supports (For Equipment, Instruments, etc.)

Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1850
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich

Balancing Equipment, Dynamic

Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Auricord, 35-41 29th St., Long Island City, N.Y.
Balance Technology, Inc., 41 Enterprise Dr., Ann Arbor, Mich.
Bear Mfg. Co., 2830-5th St., Rock Island, Ill.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Exact Weight Scale Co., 1005 W Third Ave, Columbus, Ohio
General Laser Corp., 8 Erie Dr., Natick, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Micro Balancing, Inc., 120 Finn Ct., Farmingdale, N.Y.
Possis Machine Corp., 825 Rhode Island Ave., S., Minneapolis, Minn.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Schenck Trebel Corp, 120 Finn Ct., Farmingdale, N. Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wharton Unitools, 8-10 Lake St., Moosup, Conn.

Ball & Socket Joints—See Joints, Ball & Socket

Ballast Tubes—See Tubes, Ballast

Baluns—See Transformers, Matching

Banding Tools, C-Core

Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.

Bars, Shorting

Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2473,2474,2486-2489
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.

Barretters—See Resistors, Barretter

Bases, Antenna—See Mounts, Antenna

Baths, Controlled Temperature (Air & Liquid)

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Brinkmann Instrs., Inc., Cantiague Rd., Westbury, N.Y.
Brookfield Engrg. Labs., Inc., 240 Cushing St., Stoughton, Mass.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Forma Sci., Inc., Box 649, Marietta, Ohio
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Harris Mfg. Co., Inc., 308 River St., Cambridge, Mass.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
National Appliance Co., Box 23008, Portland, Ore.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
3M Co., 3M Center, St. Paul, Minn.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Baths, Ultrasonic—See Cleaners, Ultrasonic

Batteries, Bi-Polar

RCA, 415 S. 5th St., Harrison, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Carbon Zinc

Marathon Battery Co., Cold Spring, N.Y. ..... p 1158,1159
RCA, 415 S. 5th St., Harrison, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Chemically Heated

Catalyst Resch. Corp., 6101 Falls Rd., Baltimore, Md.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Dry, Flashlight, Transistor, etc.

Marathon Battery Co., Cold Spring, N.Y. ..... p 1158,1159
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
RCA, 415 S. 5th St., Harrison, N.J.
Acme Battery Corp., 700 Canal St., Stamford, Conn.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Bright Star Inds., Inc., 600 Getty Ave., Clifton, N.J.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Mallory Battery Co., S. Broadway, Tarrytown, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Batteries, Lead-Acid

Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.

C & D Batteries, Walton Rd. & Township Line, Plymouth Meeting, Pa.
Electronic Batteries, Inc., 28-34 35th St., Brooklyn, N.Y.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
General Battery Corp., Box 1262, Reading, Pa.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Hobby & Brown Elctrn. Corp., 15 St. Marks Ave., Rockville Centre, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Batteries, Lead-Dioxide

Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Lithium

Catalyst Resch. Corp., 6101 Falls Rd., Baltimore, Md.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Magnesium-Air

Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Manganese Alkaline

Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
RCA, 415 S. 5th St., Harrison, N.J.
Bright Star Inds., Inc., 600 Getty Ave., Clifton, N.J.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Mallory Battery Co., S. Broadway, Tarrytown, N.Y.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Batteries, Mercury

Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
RCA, 415 S. 5th St., Harrison, N.J.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Mallory Battery Co., S. Broadway, Tarrytown, N.Y.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Batteries, Nickel-Alkaline

Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Nickel-Cadmium

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1061
Marathon Battery Co., Cold Spring, N.Y. ..... p 1158
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex..... p 1160
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Bright Star Inds., Inc., 600 Getty Ave., Clifton, N.J.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Gould, Inc., 931 Vandalia St., St. Paul, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Batteries, Nickel-Zinc

Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.

Batteries, Nuclear

Sanders Nuclear Corp, 95 Canal St, Nashua, N H

Batteries, Photoflash

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1061
Marathon Battery Co., Cold Spring, N.Y. .....p 1158,1159
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
RCA, 415 S. 5th St., Harrison, N.J.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Mallory Battery Co., S. Broadway, Tarrytown, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Batteries, Silver-Cadmium

Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.

Batteries, Silver-Zinc

Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
RCA, 415 S. 5th St., Harrison, N.J.
Catalyst Resch. Corp., 6101 Falls Rd., Baltimore, Md.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Epic, Inc., 150 Nassau St., New York, N.Y.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.

Batteries, Solar—See Cells, Photovoltaic

Batteries, Standard Cell

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Marathon Battery Co., Cold Spring, N.Y. .....p 1158,1159
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Mallory Battery Co., S. Broadway, Tarrytown, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Power Applications, Inc., Box 305, Bayside, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Batteries, Storage

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1061
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Marathon Battery Co., Cold Spring, N.Y. .....p 1158,1159
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
C & D Batteries, Walton Rd. & Township Line, Plymouth Meeting, Pa.
Electronic Batteries, Inc., 28-34 35th St., Brooklyn, N.Y.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
General Battery Corp., Box 1262, Reading, Pa.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Power Applications, Inc., Box 305, Bayside, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Batteries, Thermal

Catalyst Resch. Corp., 6101 Falls Rd., Baltimore, Md.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Power Applications, Inc., Box 305, Bayside, N.Y.
Wurlitzer Co, No. Tonawanda, N.Y.

Batteries, Transistor—See Batteries, Dry, Flashlight, Transistor, etc.

Batteries, Water Activated

ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Burgess Battery/Gould Inc., Foot of Exchange St., Freeport, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Crimpco Engrg., 7341 Canoga Ave., Cangoga Park, Calif.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Power Applications, Inc., Box 305, Bayside, N.Y.

Batteries, Zinc-Air

Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Power Applications, Inc., Box 305, Bayside, N.Y.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.

Battery Chargers—See Chargers, Battery

Battery Clips—See Clips, Battery

Battery Eliminators—See Eliminators, Battery

Battery Holders—See Retainers, Battery

Battery Plugs—See Connectors, Battery

Battery Retainers—See Retainers, Battery

Battery Testers—See Testers, Battery Bearings

Bearings

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Abesto Corp., Ackerman St., Bloomfield, N.J.
Barden Corp., 200 Park Ave., Danbury, Conn.
Bearing Inspection, Inc., 10041 Shoemaker Ave., Santa Fe Springs, Calif.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Fafnir Bearing Co., 37 Booth St., New Britain, Conn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Bearing Co., 32 High St., W. Nyack, N.Y.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
Gwilliam Co., 342 Furman St., Brooklyn, N.Y.
Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Keene Corp., Muskegon, Mich.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Marlin-Rockwell, 402 Chandler St., Jamestown, N.Y.
MPB Corp., Precision Park, Keene, N.H.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
New Hampshire Ball Bearings, Inc., Peterborough, N.H.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Poco Graphite, Inc., Box 2121, Decatur, Tex.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Raway Bearing Co., 141 Chrystie St., New York, N.Y.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Roller Bearing Co. America, Sullivan Way, W. Trenton, N.J.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Southwest Prods. Co., 1705 S. Mountain Ave., Monrovia, Calif.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Torrington Co., Box 1008, Torrington, Conn.

Bearings & Assemblies, Jewel

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Moran, T.R. Co., Inc., 137 Eucalyptus Dr., Box 185, El Segundo, Calif.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Swiss Jewel Co., Lafayette Bldg., Philadelphia, Pa.

Bearings, Miniature

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Barden Corp., 200 Park Ave., Danbury, Conn.
Fafnir Bearing Co., 37 Booth St., New Britain, Conn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Bearing Co., 32 High St., W. Nyack, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Marlin-Rockwell, 402 Chandler St., Jamestown, N.Y.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
MPB Corp., Precision Park, Keene, N.H.
New Hampshire Ball Bearings, Inc., Peterborough, N.H.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Raway Bearing Co., 141 Chrystie St., New York, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Southwest Prods. Co., 1705 S. Mountain Ave., Monrovia, Calif.
Torrington Co., Box 1008, Torrington, Conn.

Bearings, Self-Lubricating

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Abesto Corp., Ackerman St., Bloomfield, N.J.
Barden Corp., 200 Park Ave., Danbury, Conn.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Clevite Can., Ltd., St. Thomas, Ont., Canada
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Dixon Corp., Metacom Ave., Bristol, R.I.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Fafnir Bearing Co., 37 Booth St., New Britain, Conn.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.

Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
MPB Corp., Precision Park, Keene, N.H.
New Hampshire Ball Bearings, Inc., Peterborough, N.H.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Raway Bearing Co., 141 Chrystie St., New York, N.Y.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Southwest Prods. Co., 1705 S. Mountain Ave., Monrovia, Calif.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.

Bellows

Belfab, P.O. Box 1881, Daytona Beach, Fla.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Sealol, Inc., Warwick Industrial Park, Providence, R.I.
Servometer Corp., 82 Industrial, E., Clifton, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Technologics Inc, Box 667, Ormond Beach, Fla.
Trish Energetics, Pond Rd., Harvard, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Bells, Buzzers, Gongs, Sirens & Aural Warning Devices

Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1839
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Auth Elec. Co., Inc., 34-20 45th St., Long Island City, N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Transformer Mfrs., inc., 7051 W. Wilson Ave., Chicago, Ill.

Belts, Dial Drive—See Cords & Cable, Dial Drive

Belts, Drive (All Types)

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Altron Elctrns. Co., 1309 Jefferson Ave., Woodlyn, Pa.
American Biltrite Rubber Co., Inc., P.O. Box 1071, Boston, Mass.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Benches, Optical

Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Barry Controls, 700 Pleasant St., Watertown, Mass.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
FJW Inds., Inc., 215 E. Prospect Ave., Mt. Prospect, Ill.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Benches, Consoles, Stools, Tables (Lab & Shop)-Also See Cabinets & Accessories, Metal

Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Ajusto Equip. Co., 513 Conneaut St., Bowling Green, Ohio
Alden Sys. Co., Inc., Box A, Dept. 262, Westboro, Mass.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Bay Prods., Somerset & Gurney Sts., Philadelphia, Pa.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Columbia-Hallowell, Hatfield, Pa.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Easy-Up, Inc., 1006 State St., Racine, Wisc.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Equipto, 225 S. Highland Ave., Aurora, Ill.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Pressteel Co., 9705 E. Garvey Ave., El Monte, Calif.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Stackbin Corp., Box 434, Pawtucket, R.I.
States Co., 19 New Park Ave., Hartford, Conn.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Workplace Sys., Inc., 370 Commercial St., Manchester, N.H.

Bends & Twists, Microwave

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Waveline, Inc., Box 718, W. Caldwell, N.J.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Schutter Microwave, 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Beryllium Fabricating Facilities

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Barden Corp., 200 Park Ave., Danbury, Conn.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Bezels, Shielded & Unshielded

Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal.
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
Metex Corp., 970 New Durham Rd., Edison, N.J. .....p 2622,2623
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1527
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
National Elctrns., Inc., Box 269, Geneva, Ill.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Bi-Metals, Thermostatic

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. ..... p 2682
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Sylvania Elec. Prods, Inc., Div., 1600 Beard Ave., Detroit, Mich.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Binary Scalers—See Scalers, Binary

Binding Posts—See Posts, Binding

Blocks, Terminal

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. ..... p 2385
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amp Inc., Box 3608, Harrisburg, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J. p 2418
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2428,2429
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
ETC, Inc., 990 East 67 St., Cleveland, Ohio ..... p 2442
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2449
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y. ..... p 2461
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2464
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. ..... p 2467
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Vernitron Electrical Compa., 117 Union Ave., Laconia, N.H. p 2551
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Audio Accessories, Inc., Gilsum, N.H.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Capsonic Group, Inc., 1000 Bluff City Blvd., Elgin, Ill.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.

Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eby Sis. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fapritron Inc., 11650 Genesee St., Alden, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Henry & Thomas, Ltd., Yeo St., London E. 3. England
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Marathon Special Prods. Corp., 13300 Van Camp Rd., Bowling Green, Ohio
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
3M Co., 3M Center, St. Paul, Minn.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Blood-Pressure Recorders—See Recorders, Blood Pressure

Blower Cabinets—See Blowers & Fans, & Accessories

Blowers & Fans & Accessories

Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ..... p 1634
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H... p 1645
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 2643
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal.
Equipto Enclosure Systems, 435 Woodlawn Ave., Aurora, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
Globe, 2275 Stanley Ave., Dayton, Ohio ..... p 2645
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Pamotor, Inc., 770 Airport Blvd., Burlingame, Cal. ..... p 2647
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Ripley Co., Inc., 1 Factory St., Middletown, Conn. ..... p 2651
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.....p 2648,2649
Rotron, Inc., Hasbrouck La., Woodstock, N.Y. ..... p 2652-2665
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1693
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. ..... p 2645
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Agnew-Higgins, Inc., P.O. Box 857, Garden Grove, Calif.
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Appalachian Elctrn. Instrs., Inc., 810 W. Monroe Ave., Ronceverte, W. Va.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
Cincinnati Fan & Ventilator Co., 6516 Wiehle, Cincinnati, Ohio
Clean Rooms Constr. Co., Inc., Box 275, Westminster, Cal.
Clements Mfg. Co., 6656 S. Narragansett Ave., Chicago, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
De-Sta-Co Div., 350 Midland Ave., Detroit, Mich.
Dynacool Mfg. Co., Inc., 1 Russell St., Saugerties, N.Y.
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Electronic Cooling Devices, Inc., 15443 Cabrito Rd., Van Nuys, Calif.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Engonics Engrg. Div., 9601 W. Jefferson Blvd., Culver City, Calif.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
ILG Industries, Inc., 2850 N. Pulaski Rd., Chicago, Ill.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Kooltronic Fan Co., P.O. Box 504, Princeton, N.J.
Molon Motors & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.
Morrison Prods., Inc., 16816 S. Waterloo Rd., Cleveland, Ohio
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Standard Elec. Mfg. Co., Haddon Ave., W. Berlin, N.J.
Task Corp., Box 3999, Anaheim, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Torin Corp., 100 Franklin Dr., Torrington, Conn.
Uppco, Inc., 900 S. Des Plaines, Chicago, Ill.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Blueprint Machines

HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Rotolite, Teledyne Co., P.O. Box 7G, Stirling, N.J.

Boards, Graphic, Visual Control

Interswitch, 770 Airport Blvd., Burlingame, Cal. ..... p 2054
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rol-a-chart Div., Somerset, Cal.
Sanders Assocs, Inc., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Boards, Plotting

Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ..... p 2431
Data Technology, Inc., 65 Grove St., Watertown, Mass.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Geo Space, 5803 Glenmont, Houston, Tex.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Pryor Marking Prods., 21 E. Hubbard, Chicago, Ill.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
Universal Drafting Machine Corp., 5200 Richmond Rd., Bedford Hgts., Ohio
Varian, 611 Hansen Way, Palo Alto, Cal.
Visual Inspection Prods., 112 Central Ave., Lynn, Mass.

Boards, Plug-In

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ..... p 2431
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 589
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160,2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elctrn. Labs., Inc., 1085 Commonwealth Ave., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IFE Div, P.O. Box 4265, E Providence, R.I.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Joliet Control Corp., Box 751, Joliet, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Boards, Printed Circuit—See Printed Circuit Boards

Boards, Printed Wiring, Universal

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
AEL, Inc., Box 552, Lansdale, Pa.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Beckman Instrs., Inc., 167 W. Poplar Ave., Porterville, Cal.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EDP Corp., Box 6485, Orlando, Fla.
Electrol Co., Inc., 771 Spring La., York, Pa.
Elctrn. Enterprises, 775 S. Madison Ave., Pasadena, Calif.
Electronic Modules Corp., Box 141, Timonium, Md.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.

Sanders Assocs., Inc., Flexprint Div., Grenier Field, Manchester, N.H.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
3M Co., 3M Center, St. Paul, Minn.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Boards, Programming

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Amp Inc., Box 3608, Harrisburg, Pa. .... p 537
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. .... p 2431
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. .... p 568
Interswitch, 770 Airport Blvd., Burlingame, Cal. .... p 2054
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill.
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. .... p 2467
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. .... p 2535
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. .... p 2553
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Century Strand, Inc., 3 Entin Rd., Clifton, N.J.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
EDP Corp., Box 6485, Orlando, Fla.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mac Panel Co., Box 5027, High Pt., N.C.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wiring Services Co, 17281 Eastman St, Santa Ana, Cal.

Boards, Terminal

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J. p 2418
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
ETC, Inc., 990 East 67 St., Cleveland, Ohio .... p 2442
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2449
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. .... p 2043
Gridcraft, 14520 Lima Rd., R.R. #1, Ft. Wayne, Ind. .... p 1357
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y. .... p 2461
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2464
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. .... p 1851
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. .... p 2537
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2551
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aeronautical Elec. Co., Inc., 5656 Northwest Hwy., Chicago, Ill.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Collectron Corp., 304 East 45th St., New York, N.Y.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Custom Engrg. & Test Co., Inc., 3160-46 Ave., N., St. Petersburg, Fla.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doran Mfg. Co., 1033 Bader St., Cincinnati, Ohio
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Electrical Plastics Corp., 280 Warren St., Box 298, Lyndhurst, N.J.
Electrol Co., Inc., 771 Spring La., York, Pa.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Gyrotronics, Inc., 3500 Sunset Ave., Asbury Park, N.J.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keil Engrg. Prods. Co., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Marathon Special Prods. Corp., 13300 Van Camp Rd., Bowling Green, Ohio
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Red Seal Elec. Co., 3835 W. 150th St., Cleveland, Ohio
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
States Co., 19 New Park Ave., Hartford, Conn.
Sylvania Elec. Prods., Inc., Mt. Laurel Ind'l. Pk., Moorestown, N.J.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Boats & Crucibles

Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Aircraft & Missile Consultants, 2722 Ardmore Ave., Manhattan Beach, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Carler Products Corp., 6200 E. Malloy Rd., E. Syracuse, N.Y.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Poco Graphite, Inc., Box 2121, Decatur, Tex.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Richland Glass Co., Inc., Richland, N.J.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Ultra Carbon Corp., Box 747, Bay City, Mich.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Bobbins, Winding, Coil & Transformer-Also See Coil Forms

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2337
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Dale Elctrns., Inc., Box 180, Yankton, S.D. .... p 2338
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Magnetics, Inc., Box 391, Butler, Pa. .... p 2602
Thermotech Coil Forms & Comps. Div., 1202 S. 5th St., Hopkins, Minn. .... p 2631-2638
Thermotech Inds., Inc., 1202 S. 5th St., Hopkins, Minn. p 2631-2638
Thermotech Plastics, Co., 1202 S. 5th St., Hopkins, Minn. p 2631-2638
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
United Prods. Co., 451 S. Jefferson St., Orange, N.J. .... p 2354
Zaring Inds., Inc., Box 477, Carmel, Ind.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Ceram Corp., 5345 Timken Sq., La Mesa, Calif.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Cosmo Plastics Co., 3239 West 14th St., Cleveland, Ohio
Diamonite Prods. Mfg. Co., Shreve, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Electrical Plastics Corp., 280 Warren St., Box 298, Lyndhurst, N.J.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Form-It Prods., Inc., 1619 W. Walnut St., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gorman Machine Corp., 1645 Superior Ave., Costa Mesa, Cal.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kirchberger, M & Co., Inc., 250 Humphrey St., Englewood, N.J.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pyroferric - N. Y., Inc., Bronx Blvd. at 216th St., Bronx, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Resdel Corp., Box 2171, Rio Grande, N.J.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Smith, Judson A. Co., Boyertown, Pa.
Space Prods., Inc., 6631 Sarnia Ave., Long Beach, Calif.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Superior Steatite & Ceramic Corp., 88 W. Forest Ave., Englewood, N.J.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Wilco Corp., 4030 W. Tenth St., Indianapolis, Ind.

Bolometers, Infrared

Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.

Bolometers, Microwave

Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
MSI Elctrns. Inc., 34-32 57th St., Woodside, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Bolts—See Fasteners

Bonding Jumpers—See Jumpers, Bonding

Books—See Technical Books

Booms, Stands, Holders & Accessories, Microphone

RCA, 415 S. 5th St., Harrison, N.J.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Carpenter Co., 8030 N. Ridgeway, Skokie, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Boots, Switch Handle

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Metex Corp., 970 New Durham Rd., Edison, N.J.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Boxes, Circuit Board—See Boxes, Component (Subassembly Handling)

Boxes, Component/Subassembly Handling (Production)

Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Air Control, Inc., 125 Noble St., Norristown, Pa.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Corrugated Paper Prods., Inc., 300 Babylon Tpke., Roosevelt, N.Y.
Daniels, C.R., Inc., Daniels, Md.
Equipment Co. of America, 1075 Hialeah Dr., Hialeah, Fla.
Kole Enterprises, Inc., P.O. Box 152, Biscayne Annex, Miami, Mass.
Lewis G. B. Co, 426 Montgomery St., Watertown, Wisc
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Panel Controls Corp., 1000 Mt. Elliott Ave., Detroit, Mich.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stackbin Corp., Box 434, Pawtucket, R.I.
Vlchek Plastics Co., Middlefield, Ohio
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio

Boxes, Decade—See Decade Boxes

Boxes, Dry

Air Control, Inc., 125 Noble St., Norristown, Pa.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Ray Prods., Inc., 703 S. Palm Ave., Alhambra, Calif.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.

Boxes, Echo

Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.

Boxes, Glove

Abesto Corp., Ackerman St., Bloomfield, N.J.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Forma Sci., Inc., Box 649, Marietta, Ohio
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Ray Prods., Inc., 703 S. Palm Ave., Alhambra, Calif.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Boxes, Junction & Wall Plate

Trimm, Inc., 400 W. Lake St., Libertyville, Ill.
Wiremold Co., Hartford, Conn. .....p 2556,2557
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Adalet Mfg. Co., 4801 West 150th St., Cleveland, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Bradley Inds., 11040 King St., Franklin Park, Ill.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Danex Corp., 60 Tomlinson Rd, Huntingdon Valley, Pa.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Equipment & Svc. Co., 7118 Envoy Ct., Dallas, Tex.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Metals, Inc., 2200 Fairfax Rd., Box 22107, Greensboro, N.C.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Keystone Mfg. Co., Box 1005, 23328 Sherwood Rd., Warren, Mich.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Stahlin Bros., Inc., 500 Maple St., Belding, Mich.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Union Insulating Co., Box B, Parkersburg, W. Va.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.

Boxes, Metal & Plastic—See Cabinets; Cans; Cases; Containers

Boxes, Plug-In—See Plug-In Module Enclosures

Boxes, Power Outlet—See Boxes, Junction & Wall Plate

Boxes, Shipping (Reusable)—See Transit Cases

Boxes, Tote—See Boxes, Components / Subassembly Handling

Brackets, Antenna—See Mounts, Antenna

Braid, Cable & Wire Shielding

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Beman Mfg., Inc., New Cumberland, Pa.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hudson Wire Co, 62 Water St, Ossining, N.Y.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Montgomery Co, Windsor Locks, Conn
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific-Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Titeflex, Inc., Hendee St., Springfield, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Brakes, Magnetic

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633,1642
Autotronics, Inc., 2700 Davis, Joplin, Mo ..... p 1635
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. .....p 1633,1642
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
General Time Corp., Rte. 8, Torrington, Conn.
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y..... p 1680
Sterling Instr., 76 E. Second St., Mineola, N.Y..... p 1694
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Altair Resch. & Mfg. Co., 1241 E. State St., Ontario, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Bendix Corp., Elmira, N.Y.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Fawick Airflex Div., 9919 Clinton Rd., Cleveland, Ohio
Formsprag Co., 23601 Hoover Rd., Warren, Mich.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Midwest Automatic, Inc., 510 Third St., Des Moines, Iowa
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Simplatrol Prods. Corp., 675 Plantation St., Worcester, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Brakes, Mechanical

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633,1642
Autotronics, Inc., 2700 Davis, Joplin, Mo ..... p 1635
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. .....p 1633,1642
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Midwest Automatic, Inc., 510 Third St., Des Moines, Iowa
Pneu-Hydro Valve Corp., 52 Horse Hill Rd., Cedar Knolls, N.J.

Brazing Flux—See Flux, Brazing & Soldering

Breadboard Kits—See Kits, Breadboarding

Breakdown Testers—See Testers, Insulation Breakdown

Breakers, Circuit—See Circuit Breakers

Bridges, Admittance

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.p 650
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.

General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Bridges, Antenna—See Bridges, R-F

Bridges, Audio

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Bridges, Bolometer

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Measurements, Box 180, Boonton, N.J. ..... p 744
Narda Microwave Corp., Plainview, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.

Bridges, Calorimeter

Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.

Bridges, Capacitance

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673-675
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 750
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Clippard Instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Epic, Inc., 150 Nassau St., New York, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Bridges, Deviation

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 722
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
RDF Corp., 23 Elm Ave., Hudson, N.H.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Teradyne, Inc., 183 Essex St., Boston, Mass.

Bridges, Impedance

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,674
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 747
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Bristol Div, Waterbury, Conn
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Instr. Corp., 33 Southwest Pk., Westwood, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
Olektron Corp., Box 248, Dudley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Bridges, Inductance

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,674
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Bristol Div, Waterbury, Conn
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Gencom Div., 80 Express St., Plainview, N.Y.
General Instr. Corp., 33 Southwest Pk., Westwood, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Malaker Corp., W. Main St., High Bridge, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Bridges, Kelvin

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622-624
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673-675
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Neutronic Corp., Box 625, St. Louis, Mo.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Epic, Inc., 150 Nassau St., New York, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.

Bridges, Limit—See Bridges (Specific Types)

Bridges, Magnetic Susceptibility

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Malaker Corp., W. Main St., High Bridge, N.J.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.

Bridges, Megohm—See Bridges, Resistance

Bridges, Power, R-F

Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Measurements, Box 180, Boonton, N.J. ..... p 744
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Olektron Corp., Box 248, Dudley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Bridges, Programmable—See Bridges (Specific Types)

Bridges, Q

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Bridges, Ratio—See Testers, Ratio Voltage

Bridges, Resistance

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622-625
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,674,677
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 681
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,722
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal. p 768
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Bristol Div, Waterbury, Conn
Clippard Instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.

Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Malaker Corp., W. Main St., High Bridge, N.J.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RDF Corp., 23 Elm Ave., Hudson, N.H.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Shallcross, E. Preston St., Selma, N.C.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Teradyne, Inc., 183 Essex St., Boston, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Bridges, R-F

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622,623
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 747
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Olektron Corp., Box 248, Dudley, Mass.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.

Bridges, Schering

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Epic, Inc., 150 Nassau St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Bridges, Self-Balancing

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bristol Div, Waterbury, Conn
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Teradyne, Inc., 183 Essex St., Boston, Mass.

Bridges, Silicon Cell

Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1909
RCA, 415 S. 5th St., Harrison, N.J.
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal. p 1926-1930
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.....p 1940,1941
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1964
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1964
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex. ..... p 1969-1973
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Power Comps., Inc., Box 421, Scottdale, Pa.
Westinghouse Elec. Corp., Youngwood, Pa.

Bridges, Strain Gauge

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Raytheon Co., 465 Centre St., Quincy, Mass.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Vishay Instrs., Inc., 63 Lincoln Hwy., Malvern, Pa.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Bridges, Synchro & Resolver

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 610,612
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Bridges, Temperature

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. .....p 673,675
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Gow-Mac Instr. Co., 100 Kings Rd., Madison, N.J.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Malaker Corp., W. Main St., High Bridge, N.J.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
T & T Controls Co., Inc., Box 171, Media, Pa.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.

Bridges, Thermistor

Narda Microwave Corp., Plainview, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
T & T Controls Co., Inc., Box 171, Media, Pa.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Bridges, Wenner

Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.

Bridges, Wheatstone

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Neutronic Corp., Box 625, St. Louis, Mo.
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Epic, Inc., 150 Nassau St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
RDF Corp., 23 Elm Ave., Hudson, N.H.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Brushes & Brush Assemblies

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Fabricast, Inc., 9835 Alpaca St., So. El Monte, Cal. ..... p 1646
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Airco Speer Carbon Products, 800 Theresia St., St. Marys, Pa.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Collectron Corp., 304 East 45th St., New York, N.Y.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electro-Miniatures Corp., 600 Huyler St., S. Hackensack, N.J.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Felton, S.A. & Son Co., 315 Wilson St., Manchester, N.H.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Jenkins', M.W. Sons, Inc., P.O. Box 70, Dept. 25, Cedar Grove, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
KDI Electro-Tec Corp., 1600 N. Main St., Blacksburg, Va.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Nuclear Prods. Co., Box 1178, El Monte, Calif.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Ostby & Barton Co., Box 6267, Providence, R.I.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Shanda Labs., Inc., Box 24, Closter, N.J.
Sittler Corp., 18 N. Ada St., Chicago, Ill.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, Ohio
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
Wendon Co., Inc., 17 Irving Ave., Stamford, Conn.

Buffer Memories, Computer-Also See Memory Systems

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Corning Glass Works, 3900 Electronics Dr., Raleigh, N.C.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Display Div., 1275 California Ave., Palo Alto, Calif.

Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Bulbs—See Lamps

Bumpers

Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.... p 2537
Abesto Corp., Ackerman St., Bloomfield, N.J.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Budwig Mfg. Co., P.O. Box 97, Ramona, Calif.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Henrite Prods. Div., Box 1196, Morristown, Tenn.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
3M Co., 3M Center, St. Paul, Minn.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Burnishers, Contact

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Jenkins', M.W. Sons, Inc., P.O. Box 70, Dept. 25, Cedar Grove, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Neuses, P.K., Inc., Box 100, Arlington Hgts., Ill.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Stewart-Hall Chemical Corp., 222 Washington St., Mt. Vernon, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Bus Bars & Systems

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal.... p 2056
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill.
Matrix Science Corp., 435 Maple Ave., Torrance, Cal.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.... p 1398
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
Chase Brass & Copper Co., 20600 Chagrin Blvd., Cleveland, Ohio
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Connectrol Corp., 28 E 22nd St, New York, N Y
Eldre Comps., Inc., 1239 University Ave., Rochester, N.Y.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Rogers Corp., Rogers, Conn.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Bushings, Glass, Plastic, Metal, etc.

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif. .... p 1877
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. .... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Sterling Instr., 76 E. Second St., Mineola, N.Y.... p 1695
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Adalet Mfg. Co., 4801 West 150th St., Cleveland, Ohio
Adjustable Bushing Corp., 11905 Vose St., N Hollywood, Calif.
Allmetal Screw Prods. Co., inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Clevite Can., Ltd., St. Thomas, Ont., Canada
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Deutsch Fastener Corp., P.O. Box 90925, Airport Sta., Los Angeles, Calif.
Dixon Corp., Metacom Ave., Bristol, R.I.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
Gillen, John Co., 2540 South 50th Ave., Cicero, Ill.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Groov-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N.J.
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
K & S Engrg. Co., 6917 W. 58 St., Chicago, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
La Vezzi Machine Works, Inc., 4635 W. Lake St., Chicago, Ill.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Red Seal Elec. Co., 3835 W. 150th St., Cleveland, Ohio
Resdel Corp., Box 2171, Rio Grande, N.J.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Richland Glass Co., Inc., Richland, N.J.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Rogers Corp., Rogers, Conn.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Southwest Prods. Co., 1705 S. Mountain Ave., Monrovia, Calif.
Sparta Mfg. Co., Dover, Ohio
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
Union Insulating Co., Box B, Parkersburg, W. Va.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Western Sky Ind., 21300 Cloud Way, Hayward, Calif.

Bushings, Hermetically Sealed

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Glass Beads Co., Latrobe, Pa.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Buzzers—See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices

Cabinet Coolers, Blowers & Fans—See Blowers & Fans

Cabinet Pressurization Systems—See Pressurization Systems, Equipment Cabinet

Cabinets & Accessories, Metal

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill.... p 2147
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Equipto Enclosure Systems, 435 Woodlawn Ave., Aurora, Ill. p 2149
Falstrom Co., 174 Falstrom Ct., Passaic, N.J.... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass.... p 2151
Honeywell, Inc., 200 Bond St., Wabash, Ind.... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. .... p 2154
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.... p 2630
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. .... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal.... p 2163
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.... p 2162
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Akro-Mils, inc., Box 989, Akron, Ohio
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Ballonoff Metal Prods. Co., 14055 Cedar Rd., Cleveland, Ohio
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bay Prods., Somerset & Gurney Sts., Philadelphia, Pa.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Columbia-Hallowell, Hatfield, Pa.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Cook, T.N., inc., 3520 E. Fulton St., Columbus, Ohio
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Dahlstrom Mfg. Corp., Jamestown, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dolin Metal Prods., Inc., 475 President St., Brooklyn, N.Y.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Equipto, 225 S. Highland Ave., Aurora, Ill.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Metals, Inc., 2200 Fairfax Rd., Box 22107, Greensboro, N. C.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Grant Pulley & Hardware Co., 525 High St., W. Nyack, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gyrotronics, Inc., 3500 Sunset Ave., Asbury Park, N.J.
Hake Prods., Inc., 6152 Wasigo Dr., Cincinnati, Ohio
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Holbrook-Merrill Co., 1150 Kifer Rd., Sunnyvale, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.

Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Janitrol Aero Div., 4200 Surface Rd., Columbus, Ohio
Kees, F.D. Mfg. Co., 700 Park Ave., Beatrice, Neb.
Kentron Corp., 411 S. Ritter Ave., Indianapolis, Ind.
Keystone Mfg. Co., Box 1005, 23328 Sherwood Rd., Warren, Mich.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Lynch, R.H. Mfg. Co., 7831 E. Arroyo Dr., S. San Gabriel, Calif.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Midget Louver Co., 800 Main Ave., Norwalk, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Morrison Prods., Inc., 16816 S. Waterloo Rd., Cleveland, Ohio
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Scientific Int'l. Mktg., Inc., Box 181, Springhouse, Pa.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Superior Switchboard & Devices Div., Box 590, Canton, Ohio
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Cabinets, Metal Shielded

Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2156
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Metalcraft, Inc., Rooseveit Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Scientific Int'l. Mktg., Inc., Box 181, Springhouse, Pa.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Superior Switchboard & Devices Div., Box 590, Canton, Ohio
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.
Welex Elctrns., Box 986, Silver Spring, Md.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Cabinets, Plastic

Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Akro-Mils, Inc., Box 989, Akron, Ohio
Althor Prods., 2260 Benson Ave., Brooklyn, N.Y.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Koch, H. & Sons, Corte Madera, Cal.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Romar Plastics, Inc., 1311 E. Main St., St. Charles, Ill.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Stackbin Corp., Box 434, Pawtucket, R.I.
Stahlin Bros., Inc., 500 Maple St., Belding, Mich.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio

Cabinets, Sliding Drawer

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Accuride Div., 12311 S. Shoemaker Ave., Santa Fe Springs, Calif.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Akro-Mils, Inc., Box 989, Akron, Ohio
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Ballonoff Metal Prods. Co., 14055 Cedar Rd., Cleveland, Ohio
Bay Prods., Somerset & Gurney Sts., Philadelphia, Pa.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Hake Prods., Inc., 6152 Wasigo Dr., Cincinnati, Ohio
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Taylor Millwork & Stair Co., Inc., 1305 W. 132 St., Gardena, Cal.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Workplace Sys., Inc., 370 Commercial St., Manchester, N.H.

Cabinets, Speaker—See Enclosures, Speaker

Cabinets, Wood (Excluding Kits)

A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Cambridge Pattern Works, Inc., 55 First St., Cambridge, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Furniture Craftsmen, 3596 Alpine Rd., N.W., Grand Rapids, Mich.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Heath Co., Benton Harbor, Mich.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Radio-Matic America, Inc., 760 Ramsey Ave., Hillside, N.J.
Taylor Millwork & Stair Co., Inc., 1305 W. 132 St., Gardena, Cal.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio

Cable, Audio

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2949
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal. ..... p 2968
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jersey Specialty Co., Inc., Box 248, Wayne, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
3M Co., 3M Center, St. Paul, Minn.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Cable, Battery Booster

Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2929
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Mueller Elec. Co., 1589H E. 31st St., Cleveland, Ohio..... p 2469
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Carol Cable Co., Box 68, Pawtucket, R.I.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
General Cable Corp., 733 Third Ave., New York, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Cable, Coaxial

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Columbia Elctrn. Cables, 150 Hamlet Ave., Woonsocket, R.I. p 2923
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927

Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2451
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2942
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa. ..... p 2952
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..... p 2954
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y.
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa. ..... p 2966
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carbon Elctrn. Devel. Corp., 20-22 Center St., Lansford, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Dynatronic Cable Engrg. Corp., 136 San Fernando Rd., Los Angeles, Cal.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa
Jersey Specialty Co., Inc., Box 248, Wayne, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Plaxial Div., 70 Jaconnet St., Newton Highlands, Mass.
Prodelin, Inc., Box 131, Hightstown, N.J.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Superior Continental Corp., Box 489, Hickory, N.C.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, Control—See Cable, Multiconductor

Cable, Dial—See Cords & Cable, Dial Drive

Cable, Fault Locators—See Locators, Cable & Line Fault

Cable, Flat, Collated (Flat or Round Conductors)

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2931
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ansley West Corp., 4100 N. Figueroa St., Los Angeles, Cal.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Burndy Corp., Richards Ave., Norwalk, Conn.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Lane Inds., 7254 Atoll Ave. N., North Hollywood, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Montgomery Co, Windsor Locks, Conn
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sanders Assocs., Inc., Flexprint Div., Grenier Field, Manchester, N.H.
Sanders Assocs., Inc., Flexprint Prod. Div., Grenier Field, Manchester, N.H.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, Flat, Etched

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Ansley West Corp., 4100 N. Figueroa St., Los Angeles, Cal.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Lane Inds., 7254 Atoll Ave. N., North Hollywood, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Okonite Co., Box 340, Ramsey, N.J.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Rogers Corp., Rogers, Conn.
Sanders Assocs., Inc., Flexprint Prod. Div., Grenier Field, Manchester, N.H.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
3M Co., 3M Center, St. Paul, Minn.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, Flexible—See Cable, Flat

Cable, Heater

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varflex Corp., 514 W. Court St., Rome, N.Y.
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cerro Corp., 300 Park Ave., New York, N.Y.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Electro-Flex Heat, Inc., Northwood Ind'l. Pk., Bloomfield, Conn.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hudson Wire Co, 62 Water St, Ossining, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Rogers Corp., Rogers, Conn.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Cable, High Voltage

Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Columbia Elctrn. Cables, 150 Hamlet Ave., Woonsocket, R.I. p 2923
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2926
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2932
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2943-2946
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal. ..... p 2968
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Judd Wire Div., S Bedford St., Burlington, Mass.
Okonite Co., Box 340, Ramsey, N.J.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Radix Wire Co., 26260 Lakeland Blvd., Cleveland, Ohio
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Southwire Co., 4 Fertilla St., Carrollton, Ga.

Cable, Irradiated

Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927

Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2451
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2937
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Judd Wire Div., S Bedford St., Burlington, Mass.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.

Cable, Low-Capacitance

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2934
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2941,2942,2945,2946
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
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American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Berkshire Elec. Cable Co., Leeds, Mass.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dynatronic Cable Engrg. Corp., 136 San Fernando Rd., Los Angeles, Cal.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Hughes Aircraft Co, Centineia Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Superior Continental Corp., Box 489, Hickory, N.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.

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Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
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American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Automatic Clerical Sys., Inc., 389 N. Fair Oaks Ave., Pasadena, Calif.
Berkshire Elec. Cable Co., Leeds, Mass.
Bogen Div., P.O. Box 500, Paramus, N.J.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Superior Continental Corp., Box 489, Hickory, N.C.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

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Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
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Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
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Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Columbia Elctrn. Cables, 150 Hamlet Ave., Woonsocket, R.I. p 2923
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Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal. ..... p 2968
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Bergen Wire Rope Co., 1234 Gregg St., Lodi, N.J.
Berkshire Elec. Cable Co., Leeds, Mass.
Bogen Div., P.O. Box 500, Paramus, N.J.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Dynatronic Cable Engrg. Corp., 136 San Fernando Rd., Los Angeles, Cal.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Reliance Div., 20 Mercer St., Dover, N.J.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hughes Aircraft Co, Centineia Ave & Teale St, Culver City, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lane Inds., 7254 Atoll Ave. N., North Hollywood, Calif.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Moore, Samuel & Co., Mantua, Ohio
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Rogers Corp., Rogers, Conn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Superior Continental Corp., Box 489, Hickory, N.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
3M Co., 3M Center, St. Paul, Minn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

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Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
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Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
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Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Berkshire Elec. Cable Co., Leeds, Mass.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Copperweld Steel Co., Glassport, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electn-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Reliance Div., 20 Mercer St., Dover, N.J.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
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Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Moore, Samuel & Co., Mantua, Ohio
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
United States Steel Corp., 525 William Penn Pl., Pittsburgh, Pa.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

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GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
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Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
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Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jersey Specialty Co., Inc., Box 248, Wayne, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
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Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.

Cable, Shielded

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Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
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Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Berkshire Elec. Cable Co., Leeds, Mass.
Bogen Div., P.O. Box 500, Paramus, N.J.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Dynatronic Cable Engrg. Corp., 136 San Fernando Rd., Los Angeles, Cal.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Moore, Samuel & Co., Mantua, Ohio
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Plaxial Div., 70 Jaconnet St., Newton Highlands, Mass.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Superior Continental Corp., Box 489, Hickory, N.C.
Tenna Mfg. Co., Inc., 19201 Cranwood Pkwy., Warrensville Hgts., Ohio
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, Solid Dielectric

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2930
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa. ..... p 2952
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..... p 2954
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa. ..... p 2966
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Superior Continental Corp., Box 489, Hickory, N.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Cable, TFE Insulated

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2926,2927

Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2932,2934
ESCA, Cove Rd., Box 278, Port Salerno, Fla. p 2451
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. p 2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa. p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. p 2941,2946
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. p 2951
Tensolite, W. Main St., Tarrytown, N.Y. p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa. p 2966
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, TV Camera

Belden Corp., P.O. Box 5070-A, Chicago, Ill. p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. p 2913
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. p 2925
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. p 2951
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. p 2953
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Carol Cable Co., Box 68, Pawtucket, R.I.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Denson Elctrns, Corp., P.O. Box 122, Rockville, Conn.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
MTI, 57 Dodge Ave., No. Haven, Conn.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Superior Continental Corp., Box 489, Hickory, N.C.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Cable, Telephone

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y. p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. p 2953
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.

Cable, Transmission Line

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. p 2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. p 2953
Tensolite, W. Main St., Tarrytown, N.Y. p 2956
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa. p 2966
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Copperweld Steel Co., Glassport, Pa.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Superior Continental Corp., Box 489, Hickory, N.C.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable, Triaxial

Cities Svc. Co., Oakland Ave., Chester, N.Y. p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. p 2942
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. p 2951
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Superior Continental Corp., Box 489, Hickory, N.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable Assemblies & Harnesses

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. p 2362
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Amp Inc., 155 Park St., Elizabethtown, Pa. p 2366
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Bendix Corp., Box 239, Franklin, Ind.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Connector Corp., 6025 N. Keystone, Chicago, Ill. p 2435
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. p 2105
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Electrospace Corp., 956 Brush Hollow Rd., Westbury
Guardian California, 5755 Camille Ave., Culver City, Cal.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hughes Aircraft Co., Box H, Newport Beach, Cal. p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. p 2453
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. p 2454
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio p 2530,2531
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. p 2467
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. p 2947,2949
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2484,2505-2508,2513-2518
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa. p 2966
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Wiremold Co., Hartford, Conn.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Ansley West Corp., 4100 N. Figueroa St., Los Angeles, Cal.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Audio Accessories, Inc., Gilsum, N.H.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barker Prods. Co., 344 Central St., Saugus, Mass.

Beckman Instrs., Inc., 167 W. Poplar Ave., Porterville, Cal.
Beman Mfg., Inc., New Cumberland, Pa.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Bergen Wire Rope Co., 1234 Gregg St., Lodi, N.J.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
Carbon Elctrn. Devel. Corp., 20-22 Center St., Lansford, Pa.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Collins Radio Co., Dallas, Tex.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Cord Specialties Co., 9239 Cherry St., Franklin Park, Ill.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Darling, R.E. Co., Inc., Box 666, Gaithersburg, Md.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electro Specialties Corp., 370 Park Ave., Worcester, Mass.
Electrol Co., Inc., 771 Spring La., York, Pa.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Engineering Design & Dev., 12670 Pierce St., Pacoima, Cal.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Lab. Assocs., Norwich, N.Y.
General Reliance Div., 20 Mercer St., Dover, N.J.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Peterborough, N.H.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co. 1901 Malvern St. Fullerton, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Joliet Control Corp., Box 751, Joliet, Ill.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Judd Wire Div., S Bedford St., Burlington, Mass.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Koontz-Wagner Elec. Co., Inc., 516 N. Michigan St., South Bend, Ind.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Lane Inds., 7254 Atoll Ave. N., North Hollywood, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lectrodyne Sys. Corp., 1234 Carpenter St., Philadelphia, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Linemaster Switch Corp., Box 52, Woodstock, Conn.
Link Div., Binghamton, N.Y.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Mac Panel Co., Box 5027, High Pt., N.C.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Mercury Elctrns. Corp., 339 E. Cottage Pl., York, Pa.
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Multicon Div., Box 899, Ft. Wayne, Ind.
Mutron Corp., 646 Summer St, Brockton, Mass.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Network Inds., Inc., Box 397, Bayonne, N.J.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Plaxial Div., 70 Jaconnet St., Newton Highlands, Mass.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Rectico, Inc., 20 Village Park Rd., Cedar Grove, N.J.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Robintech, Inc., Commerce Rd., Vestal, N.Y.
Rogers Corp., Rogers, Conn.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Santa Fe Mfg. Co., 2343 Jerome Ave., Bronx, N.Y.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sittler Corp., 18 N. Ada St., Chicago, Ill.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Superior Continental Corp., Box 489, Hickory, N.C.
Superior Elctrns. Co., 474 Getty Ave., Clifton, N.J.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
TDX Corp., 111 S. Liberty Dr., Stony Pt., N.Y.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Teledyne Mecca, Box 36393, Houston, Tex.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tenna Mfg. Co., Inc., 19201 Cranwood Pkwy., Warrensville Hgts., Ohio
3M Co., 3M Center, St. Paul, Minn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Varied Ind'l. Prods., Inc., 445 Fifth Ave., Paterson, N.J.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable Clamps & Clips—See Clamps & Clips, Cable

Cable-End Sealing Kits—See Kits, Cable-End Sealing

Cable Pressurization Equipment

Adel Div., 10777 Van Owen St., Burbank, Calif.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
General Cable Corp., 733 Third Ave., New York, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Puregas Equip. Corp., 1445 Strongs Rd., Copiague, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.

Cable Retractors

Accuride Div., 12311 S. Shoemaker Ave., Santa Fe Springs, Calif.
Aero-Motive Mfg. Co., P.O. Box 2678, Kalamazoo, Mich.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Grant Pulley & Hardware Co., 525 High St., W. Nyack, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Industrial Elec. Reels, Inc., 1509 Chicago St., Omaha, Neb.
Jonathan Mfg. Co., 1101 S. Acacia Ave., Fullerton, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cable Testers—See Testers, Cable

Cages, Circuit Board—See Racks, Circuit

Calculators, Electrical & Electronic-Also See Computers, Desk Top

Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
C-Thru Ruler Co., 6 Britton Dr., Bloomfield, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Facit-Odhner, Inc., 501 Winson Dr., Secaucus, N.J.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Monroe, 550 Central Ave., Orange, N.J.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.

Calibration Services—See Services, Calibration & Instrument Repair

Calibrators, Accelerometer

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Calibrators, Attenuation

Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Calibrators, Crystal

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Measurements, Box 180, Boonton, N.J. ..... p 744
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Calibrators, Current

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 668
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Calibrators, Frequency

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
CML, Inc., 166 National Rd., Edison, N.J.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Measurements, Box 180, Boonton, N.J. ..... p 744
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.

Collins Radio Co., Dallas, Tex.
EMR Div., Box 223, Princeton, N.J.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Devices Co., Box 8450, Baltimore, Md.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Calibrators, LVDT

North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.

Calibrators, Magnetic Field

RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.

Calibrators, Meter—See Testers, Meter

Calibrators, Microphone

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.

Calibrators, Noise

Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 639
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.

Calibrators, Oscilloscope

Accutronics, Inc., 628 North St., Geneva, Ill.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Tektronix, Inc., Box 500, Beaverton, Ore.

Calibrators, Radar Range

Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Sage Labs. Inc., 14 Huron Dr. Natick, Mass.

Calibrators, Sweep—See Generators, Sweep

Calibrators, Synchro

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Defense Elctrns., Inc., Rockville, Md.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Calibrators, Telemetering—See Telemetering Testers

Calibrators, Time-Base

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Radiation Devices Co., Box 8450, Baltimore, Md.
Tektronix, Inc., Box 500, Beaverton, Ore.

Calibrators, Voltage

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,675
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ....p 668,669
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Measurements, Box 180, Boonton, N.J.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal. p 768
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Horex Elctrns., Inc., 1729 21st St., Santa Monica, Calif.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tektronix, Inc., Box 500, Beaverton, Ore.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Calibrators, VSWR

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.

Calling Sytems—See Intercommunication Systems

Calorimeters, Heat Transfer

Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
RDF Corp., 23 Elm Ave., Hudson, N.H.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Calorimeters, Laser

Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Quantronix Corp., 225 Engineer Rd., Smithtown, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.

Calorimeters, Microwave

Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. p 667,872
Aircom, Inc., Rte. 16B, Union, N.H.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.

Calorimeters, Optical

Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.

Cameras, Data Recording

Abtronics, Inc., Box 712, Livermore, Calif.
AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Bourns/CAI, Inc., 550 W. Northwest Hwy., Barrington, Ill.
Chadwick-Helmuth Co., Inc., 111 E. Railroad Ave., Monrovia, Calif.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Flight Research, Box 1-F, Richmond, Va.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
Photomechanisms Div., Inc., 15 Stepar Pl., Huntington Sta., N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
3M Co., 3M Center, St. Paul, Minn.
Traid Corp., 777 Flower St., Glendale, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Cameras, Image Converter

Abtronics, Inc., Box 712, Livermore, Calif.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
RCA, Marne Hwy., Moorestown, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Cameras, Image Dissection

Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photosystems Corp., 112 Parkway Dr., S., Hauppague, N.Y.

Cameras, Infrared

Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass..... p 1710
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Traid Corp., 777 Flower St., Glendale, Calif.
TRW Instrs., 139 Illinois St., El Segundo, Calif.

Cameras, Microcircuit Processing

Brown Mfg. Co., 2000 Dempster St., Evanston, Ill.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
HLC Mfg. Co., Inc., 700 Davisville Rd., Willow Grove, Pa.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.

Cameras, Oscilloscope

Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bourns/CAI, Inc., 550 W. Northwest Hwy., Barrington, Ill.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Flight Research, Box 1-F, Richmond, Va.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.

Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Traid Corp., 777 Flower St., Glendale, Calif.

Cameras, Rotating Mirror & Drum

Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.

Cameras, TV (Black And White) & Accessories

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Video, inc., Box 928, Boulder, Colo. ..... p 635
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Commercial Elctrns., Inc., 880 Maude Ave., Mountain View, Cal.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Craig Corp., 2302 East 15th St., Los Angeles, Calif.
D-Vel Resch. Labs., Inc., 555 Bedford Rd., Bedford Hills, N.Y.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kalart Co., Inc., Hultenius St., Plainville, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Link Div., Binghamton, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
MTI, 57 Dodge Ave., No. Haven, Conn.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Teletronics, Inc., 760 N. Main St., Orange, Calif.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Cameras, TV (Color) & Accessories

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Commercial Elctrns., Inc., 880 Maude Ave., Mountain View, Cal.
D-Vel Resch. Labs., Inc., 555 Bedford Rd., Bedford Hills, N.Y.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Teletronics, Inc., 760 N. Main St., Orange, Calif.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Cameras, TV, Infrared

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass..... p 1710
Epic, Inc., 150 Nassau St., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
MTI, 57 Dodge Ave., No. Haven, Conn.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.

Cameras, X-Ray

Abtronics, Inc., Box 712, Livermore, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Photomechanisms Div., Inc., 15 Stepar Pl., Huntington Sta., N.Y.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.

Cams

Sterling Instr., 76 E. Second St., Mineola, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Parker-Hartford Corp., P.O. Box 869, Hartford, Conn.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
3M Co., 3M Center, St. Paul, Minn.

Cans & Flat Packs, Integrated Circuit—See Packages, Integrated Circuit

Cans, Capacitor

Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Sexton Can Co., Inc., 31 Cross St., Everett, Mass.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.

Cans, Crystal

GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Cans, Relay

Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1853
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Cans, Semiconductor

GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1619,1620,1625
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Mirro Aluminum Co., Manitowoc, Wisc.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Cans, Transformer

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Kling Metal Spinning & Stamping Corp., 247 Centre St., New York, N.Y.
Mirro Aluminum Co., Manitowoc, Wisc.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
MSL Steel Co., 3912 W. McLean Ave., Chicago, Ill.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Sexton Can Co., Inc., 31 Cross St., Everett, Mass.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Superior Switchboard & Devices Div., Box 590, Canton, Ohio
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.

Capacitance Comparators—See Bridges, Capacitance

Capacitor Leakage Indicators—See Testers, Capacitor

Capacitors, Air Cooled

Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2259
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.

Capacitors, Chip (For Microcircuits)

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
American Tech. Ceramics, Norden La., Huntington Sta., N.Y. p 2164,2165
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180,2181
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180,2181
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180,2181
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Components, Inc., Biddeford, Me.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ..... p 1876
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Electro Mat'ls., 11620 Sorrento Valley Rd., San Diego, Cal. p 2222
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Matsuo Elec. Co., Ltd., 3-5, 3-chome, Sennari-chu, Toyonaka-shi, Osaka, Japan ..... p 2271
Monolithic Dielectrics, Inc., Box 647, Burbank, Cal. ..... p 2273
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
Nytronics, Inc., Orange St., Darlington, S.C.
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
Republic Elctrns. Corp., 176 E. 7th St., Paterson, N.J. ..... p 2276
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal. p 2284-2288
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2315
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. .. p 2317
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 2319-2323
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., Seneca Ave., Olean, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
NCI, 5900 Voss Rd., W. Palm Beach, Fla.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Skottie Elctrns., Archbald, Pa.

Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Vitramon, Inc., Box 544, Bridgeport, Conn.

Capacitors, Fixed, Air

Condenser Prods. Corp., Box 997, Brooksville, Fla.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 2261
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Capacitors, Fixed, Bathtub

Balco Capacitors, 307 Washington St., Orange, N.J.
Condenser Prods. Corp., Box 997, Brooksville, Fla. ..... p 2218
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J. ..... p 2223
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
General Instr. Corp., Walnut St, Tazewell, Va. ..... p 2233
Gudeman Div., 340 W. Huron St., Chicago, Ill.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. p 2170,2173,2174
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Ceramic

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Tech. Ceramics, Norden La., Huntington Sta., N.Y. p 2164,2165
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180-2183
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180-2183
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2180-2183
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ..... p 2216
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electro Mat'ls., 11620 Sorrento Valley Rd., San Diego, Cal. p 2222
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. p 2234-2236
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Monolithic Dielectrics, Inc., Box 647, Burbank, Cal. ..... p 2273
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
Nytronics, Inc., Orange St., Darlington, S.C.
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill.
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
Republic Elctrns. Corp., 176 E. 7th St., Paterson, N.J. ..... p 2276
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal. p 2282-2288,2290-2305
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2313,2315
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. p 2316,2317
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 2319-2323
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Skottie Elctrns., Archbald, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.

Capacitors, Fixed, Ceramic Disc

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J. ..... p 2270
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. ..... p 2741
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal. p 2289-2297
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2315
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Skottie Elctrns., Archbald, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Capacitors, Fixed, Decade

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2179
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla. ..... p 2218
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179
PFC Mfg. Div., Community Dr., Great Neck, N.Y. .....p 2170,2172
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ..... p 2279
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.

Capacitors, Fixed, Electrolytic (All Types)

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2166
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Components, Inc., Biddeford, Me. ..... p 2185-2193
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2230,2231
General Instr. Corp., Walnut St, Tazewell, Va. ..... p 2233
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 2862,2863
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Syncro Capacitor Corp., Meuse-Argonne Rd., Hicksville, Ohio p 2307
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2312
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Barco, Inc., 829 N. Marshall, Milwaukee, Wisc.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Gentronics, Inc., 26 Knollwood Dr., Clinton, Conn.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sprague Elec. of Can., Ltd., 10 Bertal Rd., Toronto, Ont., Can.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
United Elctrn. Mfg. Corp., 542 39th St., Union City, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Capacitors, Fixed, Feedthru

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220
F-Dyne Electronics Co., 449 Howard Ave., Bridgeport, Conn. p 2226
Gudeman Div., 340 W. Huron St., Chicago, Ill.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2259
Monolithic Dielectrics, Inc., Box 647, Burbank, Cal. ..... p 2273
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ..... p 2279
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tansitor Elctrns., Inc., West Rd., Bennington, Vt. ..... p 2310
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. .. p 2317
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 2323
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Dolinko & Wilkens, Inc., 1901-7 Summit Ave., Union City, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.

Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Midwec Corp., Box 417, Scottsbluff, Neb.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
RtroN Corp., Box 743, Skokie, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Film

Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 2169
Amp Inc., Box 3608, Harrisburg, Pa.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2167
Balco Capacitors, 307 Washington St., Orange, N.J. p 2178,2179
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.....p 2224,2225
F-Dyne Electronics Co., 449 Howard Ave., Bridgeport, Conn. p 2226
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2230,2231
General Instr. Corp., Walnut St, Tazewell, Va.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..p 2238,2239,2252
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178,2179
Matsuo Elec. Co., Ltd., 3-5, 3-chome, Sennari-chu, Toyonaka-shi, Osaka, Japan ..... p 2271
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
PFC Mfg. Div., Community Dr., Great Neck, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Sangamo Elec. Co., Box 128, Pickens, S.C.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2308
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2314
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.

Capacitors, Fixed, Gas Filled

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Epic, Inc., 150 Nassau St., New York, N.Y.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Capacitors, Fixed, Glass

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Condenser Prods. Corp., Box 997, Brooksville, Fla..... p 2218
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. .....p 2216,2217
Gudeman Div., 340 W. Huron St., Chicago, Ill.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Owens-Illinois, Inc., C&TP Div., Elctrn. Materials, Box 1035, Toledo, Ohio
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Vitramon, Inc., Box 544, Bridgeport, Conn.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Fixed, High Capacitance-Low Voltage

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
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Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2237-2253
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
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Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Elmag Corp., 54 Clark St., Newark, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
NCI, 5900 Voss Rd., W. Palm Beach, Fla.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Skottie Elctrns., Archbald, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
3M Co., 3M Center, St. Paul, Minn.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Underwood Elec. & Mfg. Co., Inc., 148 South 8 Ave., Maywood, Ill.
United Elctrn. Mfg. Corp., 542 39th St., Union City, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

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Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
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Republic Elctrns. Corp., 176 E. 7th St., Paterson, N.J.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
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Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
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Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Elmag Corp., 54 Clark St., Newark, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Lab. Assocs., Norwich, N.Y.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Skottie Elctrns., Archbald, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Vitramon, Inc., Box 544, Bridgeport, Conn.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

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Balco Capacitors, 307 Washington St., Orange, N.J.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
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Condenser Prods. Corp., Box 997, Brooksville, Fla. ..... p 2218
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220,2221
Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
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General Instr. Corp., Walnut St, Tazewell, Va. .....p 2232,2233
Gudeman Div., 340 W. Huron St., Chicago, Ill. .....p 2254,2255
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2259
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 2267
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J. ..... p 2270
Monolithic Dielectrics, Inc., Box 647, Burbank, Cal.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
PFC Mfg. Div., Community Dr., Great Neck, N.Y. p 2170,2171,2173,2174
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Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2308,2309
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dolinko & Wilkens, Inc., 1901-7 Summit Ave., Union City, N.J.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epic, Inc., 150 Nassau St., New York, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Lab. Assocs., Norwich, N.Y.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Skottie Elctrns., Archbald, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
Wilmad Glass Co., Inc., Buena, N.J.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Laboratory Standard

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Balco Capacitors, 307 Washington St., Orange, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2170
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ..... p 2279
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Skottie Elctrns., Archbald, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Vitramon, Inc., Box 544, Bridgeport, Conn.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Mica

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Amp Inc., Box 3608, Harrisburg, Pa.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
General Instr. Corp., Walnut St, Tazewell, Va.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2174
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Soshin Elec. Co., Ltd., 18-18 1-chome Nakamagome, Ota-ku, Tokyo, Japan ..... p 2281
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. .... p 2306
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Lab. Assocs., Norwich, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Morey Corp., 2659 Wisconsin Ave., Downers Grove, Ill.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Underwood Elec. & Mfg. Co., Inc., 148 South 8 Ave., Maywood, Ill.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Motor Run

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Gudeman Div., 340 W. Huron St., Chicago, Ill.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Motor-Starting

Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2255
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Syncro Capacitor Corp., Meuse-Argonne Rd., Hicksville, Ohio p 2307
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Mylar

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Balco Capacitors, 307 Washington St., Orange, N.J. p 2178,2179
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Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
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Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178,2179
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
PFC Mfg. Div., Community Dr., Great Neck, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ....p 2278,2279
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Sangamo Elec. Co., Box 128, Pickens, S.C.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2308
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.

Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Telefunken Sis. Corp., South St., Garden City, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Mylar, Metallized

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
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Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
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S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ....p 2278,2279
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Sangamo Elec. Co., Box 128, Pickens, S.C.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2308
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Niobium

Capacitors, Fixed, Oil

Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 2169
Condenser Prods. Corp., Box 997, Brooksville, Fla. ..... p 2218
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
Gudeman Div., 340 W. Huron St., Chicago, Ill.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Paper

Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2254-2256
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. .... p 2306
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Paper, Metallized

Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220,2221
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2253
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. .... p 2306
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Photoflash

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2231
General Instr. Corp., Walnut St, Tazewell, Va. ..... p 2233
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Capacitors, Fixed, Polycarbonate

Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2179
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J. ..... p 2224
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General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2230,2231
Gudeman Div., 340 W. Huron St., Chicago, Ill. .....p 2237,2238
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J.
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Polycarbonate, Metallized

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F-Dyne Electronics Co., 449 Howard Ave., Bridgeport, Conn. p 2226,2228,2229
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 2231
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2245-2248
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ....p 2278,2279
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2309
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Seacor, Inc., 598 Broadway, Norwood, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Polystyrene

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2167
Balco Capacitors, 307 Washington St., Orange, N.J. p 2178,2179
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220,2221
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F-Dyne Electronics Co., 449 Howard Ave., Bridgeport, Conn. p 2226
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y. p 2257
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178,2179
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J. ..... p 2270
PFC Mfg. Div., Community Dr., Great Neck, N.Y. p 2170,2171,2173-2175
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ....p 2278,2279
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
International Elctrns. Corp., Melville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Midwec Corp., Box 417, Scottsbluff, Neb.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Telefunken Sls. Corp., South St., Garden City, N.Y.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Capacitors, Fixed, Porcelain, Enamel

American Tech. Ceramics, Norden La., Huntington Sta., N.Y. p 2164
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.

Capacitors, Fixed, Power Factor Correction

Condenser Prods. Corp., Box 997, Brooksville, Fla..... p 2218
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
S & E I Mfg., 18800 Parthenia St., Northridge, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.
York Elctrns., 104 S. 4th St., Brooklyn, N.Y.

Capacitors, Fixed, Pulse-Forming Network

American Tech. Ceramics, Norden La., Huntington Sta., N.Y. p 2164,2165
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 2169
Amp Inc., Box 3608, Harrisburg, Pa.
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla..... p 2218
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ..... p 2217
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J. ..... p 2223
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 2231
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
General Lab. Assocs., Norwich, N.Y.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Paktron Div., 1321 Leslie Ave., Alexandria, Va.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Skottie Elctrns., Archbald, Pa.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
Vitramon, Inc., Box 544, Bridgeport, Conn.

Capacitors, Fixed, Silvered Mica

Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn.p 2219
General Instr. Corp., Walnut St, Tazewell, Va. ..... p 2232
PFC Mfg. Div., Community Dr., Great Neck, N.Y.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Capacitors, Fixed, Tantalum

Components, Inc., Biddeford, Me. ..... p 2185-2193
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 2230
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Matsuo Elec. Co., Ltd., 3-5, 3-chome, Sennari-chu, Toyonaka-shi, Osaka, Japan..... p 2271
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Tansitor Elctrns., Inc., West Rd., Bennington, Vt. ..... p 2310
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Union Carbide Corp., Comps. Dept., Box 5928, Greenville, S.C. p 2312,2315
Barco, Inc., 829 N. Marshall, Milwaukee, Wisc.
Callins Inds., Inc., P.O. Box C, Greenfield, Tenn.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Gentronics, Inc., 26 Knollwood Dr., Clinton, Conn.
Hunter-Stanley Elctrns., Inc., 208 Russell St., Nashville, Tenn.
International Elctrn. Inds., Box "C", Greenfield, Tenn.
Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Ind.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
NCI, 5900 Voss Rd., W. Palm Beach, Fla.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.

Capacitors, Fixed, TFE

Balco Capacitors, 307 Washington St., Orange, N.J. p 2178,2179
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Gudeman Div., 340 W. Huron St., Chicago, Ill. ..... p 2244
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178,2179
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Texas Capacitor Co., Inc., 7830 Westglen Dr., Houston, Tex. p 2309
Capacitor Specialists, Inc., 7711 Convoy Ct., San Diego, Cal.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Elmag Corp., 54 Clark St., Newark, N.J.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.

Capacitors, Fixed, TFE, Metallized

Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2178
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Gudeman Div., 340 W. Huron St., Chicago, Ill.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2178
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Dearborn Elctrns., Inc., P.O. Box 530, Orlando, Fla.
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.

Capacitors, Fixed, Temperature Compensating

American Tech. Ceramics, Norden La., Huntington Sta., N.Y. p 2164,2165
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2167
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2179
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2183

Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal. p 2194
Electro Mat'ls., 11620 Sorrento Valley Rd., San Diego, Cal. p 2222
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.
Gudeman Div., 340 W. Huron St., Chicago, Ill. p 2245-2248,2251-2254
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. .... p 2234
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2274
Nytronics, Inc., Orange St., Darlington, S.C.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. p 2170,2171,2173-2175
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
Republic Elctrns. Corp., 176 E. 7th St., Paterson, N.J. ..... p 2276
S & E I Mfg., 18800 Parthenia St., Northridge, Cal. ....p 2278,2279
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Myrtle Beach, S.C.
Aerovox Corp., Seneca Ave., Olean, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dilectron Div., 2669 S. Myrtle Ave., Monrovia, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Skottie Elctrns., Archbald, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
3M Co., 3M Center, St. Paul, Minn.
TRW Capacitor Div., 112 W. First St., Ogallala, Neb.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Voltronics Corp., West St., Hanover, N.J.

Capacitors, Fixed, Vacuum

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2259
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Dolinko & Wilkens, Inc., 1901-7 Summit Ave., Union City, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Overvoltage Protected

Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.

Capacitors, Variable, Air

Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 2261
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2262-2266
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2272
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Nanasi, 6308 Jackson St., W. New York, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Ametek, Inc., Station Square Two, Paoli, Pa.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Underwood Elec. & Mfg. Co., Inc., 148 South 8 Ave., Maywood, Ill.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Variable, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2168
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2266
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Maida Dev. Co., 214 Academy St., Hampton, Va.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
3M Co., 3M Center, St. Paul, Minn.

Capacitors, Variable, Film

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2168
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 2261
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Film Capacitors, Inc., 100 8th St., Passaic, N.J.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.

Capacitors, Variable, Gas

Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.

Capacitors, Variable, Glass

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2265
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Owens-Illinois, Inc., C&TP Div., Elctrn. Materials, Box 1035, Toledo, Ohio
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Variable, High Temperature

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2258
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2262-2266
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Voltronics Corp., West St., Hanover, N.J.

Capacitors, Variable, HV (Lab Type)-Also See Decade Boxes,Capacitance

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J.
Kilovac Corp., Box 4422, Santa Barbara, Cal.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2176
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.

Capacitors, Variable, Motor Driven

Dale Elctrns., Inc., Box 180, Yankton, S.D.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.

Capacitors, Variable, Mica

Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2176
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.

Capacitors, Variable, Neutralizing

ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2258
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 2261
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2272
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Voltronics Corp., West St., Hanover, N.J.

Capacitors, Variable, Oil

Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.

Capacitors, Variable, Padder

Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2272
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
PFC Mfg. Div., Community Dr., Great Neck, N.Y.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Voltronics Corp., West St., Hanover, N.J.

Capacitors, Variable, Piston—See Capacitors, Variable, Trimmer (All Types)

Capacitors, Variable, Quartz

JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2266
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Variable, Silicone

Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. p 1872,1873,1876
Eastron Corp., 25 Locust St., Haverhill, Mass.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Power Comps., Inc., Box 421, Scottdale, Pa.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio

Capacitors, Variable, TFE

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2168
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.

Capacitors, Variable, Temperature Compensating

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2168
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Voltronics Corp., West St., Hanover, N.J.

Capacitors, Variable, Trimmer (All Types)

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2168
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2184
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Motive Mfg. Co., Inc., S. Park St., Willimantic, Conn. p 2219
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J. ..... p 2223
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2258

Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 2261
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y. ..... p 2260
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, N.J. p 2262-2266
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2268,2269
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2272
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2176
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Underwood Elec. & Mfg. Co., Inc., 148 South 8 Ave., Maywood, Ill.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Variable, Vacuum

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2258
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 2267
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Dolinko & Wilkens, Inc., 1901-7 Summit Ave., Union City, N.J.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Vacap Corp., 1905 Summit Ave., Union City, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Capacitors, Water Cooled

Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 2259
Corson Elec. Mfg. Corp., Watrous St., E. Hampton, Conn.

Caps, Connector

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2402
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2409,2411-2414
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
Nanasi, 6308 Jackson St., W. New York, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N. N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Bendix Corp., Sidney, N.Y.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Teledyne Mecca, Box 36393, Houston, Tex.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable

Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2961
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Caps, Grid & Plate—See Clips & Caps, Grid & Plate

Caps, Lens, Indicator Light

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y. ..... p 1495
Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Clare-Pendar Co., Box 785, Post Falls, Idaho ..... p 2027
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill. .. p 1503
Eldema Div., 18435 Susana Rd., Compton, Cal. ..... p 1506-1509
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal. ..... p 2038
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. p 1518,1519
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Marco-Oak, Box 4011, Anaheim, Cal. ..... p 2065
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. p 1538-1540,1543
Trimm, Inc., 400 W. Lake St., Libertyville, Ill.
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Aeronautical Elec. Co., Inc., 5656 Northwest Hwy., Chicago, Ill.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Penn Keystone Corp., Division St., Ansonia, Conn.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Caps, Wire-Splicing—See Splicers, Wire (Butt & Cap Types)

Carbides

Carborundum Co., Box 367, Niagara Falls, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cerac, Inc., Box 597, Butler, Wisc.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., Box 237, Detroit, Mich.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Carbon

Airco Speer Carbon Products, 800 Theresia St., St. Marys, Pa.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Carter's Ink Co., 239 First St., Cambridge, Mass.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, Ohio
Ultra Carbon Corp., Box 747, Bay City, Mich.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.

Card Holders, Circuit Board—See Racks, Circuit Board

Card Readers—See Punched Card Equipment

Cards, Linear Function (With Discrete Components)

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Lowell Elctrns. Corp., 9100 Terminal Ave., Skokie, Ill.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 589
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Celco, 70 Constantine Dr., Mahwah, N.J.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Doran Mfg. Co., 1033 Bader St., Cincinnati, Ohio
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Komak, Inc., 9th & Ontario Sts., Philadelphia, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
North American Printed Circuit Div., Box 145, Stafford, Conn.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Cards, Linear Function (With IC'S)

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 589
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Cards, Logic (With Discrete Components)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040

Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind.
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 589
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Heath Co., Benton Harbor, Mich.
Honeywell, Inc., Peterborough, N.H.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Midco, Inc., Box 5433, Trenton, N.J.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Weir Elctrns., Ltd., Durban Road, Bognor Regis, Sussex, England
Welex Elctrns., Box 986, Silver Spring, Md.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Cards, Logic (With IC'S)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. .....p 558,559
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 589
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Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Electronic Modules Corp., Box 141, Timonium, Md.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Heath Co., Benton Harbor, Mich.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Midco, Inc., Box 5433, Trenton, N.J.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Weir Elctrns., Ltd., Durban Road, Bognor Regis, Sussex, England
Welex Elctrns., Box 986, Silver Spring, Md.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Carriages, Probe

Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.

Carrier Current Systems—See Comm. Systems, Carrier Current

Carriers—See Holders & Carriers

Cartridges, Microphone

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Astatic Corp., Box 120, Conneaut, Ohio
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Stanford Int'l., Box 266, San Carlos, Calif.

Cartridges, Phono, Ceramic

Astatic Corp., Box 120, Conneaut, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.

Cartridges, Phono, Crystal

Astatic Corp., Box 120, Conneaut, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Cartridges, Phono, Magnetic

CompuCord, Inc., 225 Crescent St., Waltham, Mass.
Audio Dynamics Corp., Pickett District Rd., New Milford, Conn.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Elpa Mktg. Inds., Inc., Thorens & Atlantic Aves., New Hyde Park, N.Y.
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Grado Labs., Inc., 4614 Seventh Ave., Brooklyn, N.Y.
IMF Products, 7616 City Line Ave., Philadelphia, Pa.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
Ortofon Div., Thorens & Atlantic Aves., New Hyde Park, N.Y.
Pickering & Co., Inc., 101 Sunnyside Blvd., Plainview, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanton Magnetics, Inc., Terminal Dr., Plainview, N.Y.

Carts, Instrument & Equipment

Electronic Enclosures, Inc., Box 90978, El Segundo, Cal.
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Columbia-Hallowell, Hatfield, Pa.
Equipment Co. of America, 1075 Hialeah Dr., Hialeah, Fla.
Equipto, 225 S. Highland Ave., Aurora, Ill.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
General TV Network, 901 Livernois Ave., Ferndale, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Labconco Corp., 8811 Prospect, Kansas City, Mo.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Peerless Prods. Inds., 4210 W. Chicago Ave., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Stackbin Corp., Box 434, Pawtucket, R.I.
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Technibilt Corp., 1 W. Alameda Ave., Burbank, Cal.
Technical Svc. Corp., 2618 South 4th St., Louisville, Ky.
Tektronix, Inc., Box 500, Beaverton, Ore.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Cases, Delay Line

Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Resdel Corp., Box 2171, Rio Grande, N.J.
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.

Cases, Equipment, Instrument, Meter (Portable)

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J. ..... p 2146
E-Tronics, 5901 Noble Ave., Van Nuys, Cal. ..... p 1037
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Calabro Unitrack, 8738 W. Chester Pike, Upper Darby, Pa.
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Cambridge Pattern Works, Inc., 55 First St., Cambridge, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Daniels, C.R., Inc., Daniels, Md.
Davies, Harry Molding Co., 4920 W. Bloomingdale Ave., Chicago, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Easco Inds., Inc., 2121 Rte. 110, Farmingdale, N.Y.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Koch, H. & Sons, Corte Madera, Cal.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Skydyne, Inc., River Rd., Port Jervis, N.Y.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.

Stahlin Bros., Inc., 500 Maple St., Belding, Mich.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Whitman Corp., 1725 Powers St., Cincinnati, Ohio

Cases, Equipment, Instrument, Meter (Stationary)

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
E-Tronics, 5901 Noble Ave., Van Nuys, Cal. .....p 1036,1037
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass.
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Techmar Corp., 2232 S. Cotner Ave., Los Angeles, Cal. .. p 2159
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Adalet Mfg. Co., 4801 West 150th St., Cleveland, Ohio
Aimes Inds., P.O. Box 73, Lockport, Ill.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Cambridge Pattern Works, Inc., 55 First St., Cambridge, Mass.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Danex Corp., 60 Tomlinson Rd, Huntingdon Valley, Pa.
Daniels, C.R., Inc., Daniels, Md.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Feiner, P. & Sons, Inc., 522 West 45 St. New York, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mirro Aluminum Co., Manitowoc, Wisc.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Stahlin Bros., Inc., 500 Maple St., Belding, Mich.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Welex Elctrns., Box 986, Silver Spring, Md.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Cases, Relay—See Cans, Relay

Cases, Semiconductor—See Cans, Semiconductor

Cases, Shielded—See Containers, Shielded

Cases, Transit—See Transit Cases

Castings—See Metal Parts, Cast

Cathode-Ray Readout Tubes—See Tubes, Readout

Catv Systems & Equipment

AEL, Inc., Box 552, Lansdale, Pa.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. p 1326,1328
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Ampex Corp., 401 Broadway, Redwood City, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Conrac Div., 600 N. Rimsdale Ave., Covina, Calif.
Copperweld Steel Co., Glassport, Pa.
Craig Corp., 2302 East 15th St., Los Angeles, Calif.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kaiser CATV, Box 9728, Phoenix, Ariz
Kalart Co., Inc., Hultenius St., Plainville, Conn.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Cavities, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
GAF Corp., 140 W. 51 St., New York, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Monsanto-Microwave Prods., 11636 Administration Dr., Westport Ind'l. Pk., St. Louis, Mo.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syncor Prods. Co., inc., 44 Eastern Ave., Malden, Mass.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Cells, Electrolytic Cell—See Timers, Electrolytic Cell

Cells, Fuel—See Fuel Cells

Cells, Kerr

Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.

Cells, Load

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Interface, Inc., Box 1652, Scottsdale, Ariz.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
Micro-Strain, Inc., Spring City, Pa.
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.

Cells, Photoconductive

Clairex Elctrns., 560 S. Third Ave., Mt. Vernon, N.Y. ..... p 1702
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
Hamamatsu Corp., 80 Pine St., New York, N.Y. ..... p 2135
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan ..... p 2135
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1913
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
National Semiconductors, Ltd., 331 Cornelia St., Plattsburgh, N.Y. ..... p 1704
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Vactec, Inc., 2423 Northline Ind'l. Blvd., Maryland Hgts., Mo. p 1707
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
LGM Elctrns., Inc., 4304 La Branch St., Houston, Tex.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Optron, Inc., 1201 Tappon Cir., Carrollton, Tex.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Pioneer Elec. & Resch. Corp., 743 Circle Ave., Forest Park, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Quantrol Elctrns., Inc., 1920 Mills Ave., El Paso, Tex.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.

Cells, Photoemissive-Also See Tubes, Photomultiplier

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Hamamatsu Corp., 80 Pine St., New York, N.Y. ..... p 2135
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan ..... p 2135
RCA, 415 S. 5th St., Harrison, N.J.
Abtronics, Inc., Box 712, Livermore, Calif.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.

Cells, Photovoltaic

Clairex Elctrns., 560 S. Third Ave., Mt. Vernon, N.Y. ..... p 1702
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1912,1913
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.
National Semiconductors, Ltd., 331 Cornelia St., Plattsburgh, N.Y. ..... p 1704
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Vactec, Inc., 2423 Northline Ind'l. Blvd., Maryland Hgts., Mo. p 1707
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
RCA, Marne Hwy., Moorestown, N.J.

Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.

Cells, Solar—See Cells, Photovoltaic

Cements—See Adhesives

Centrifuges-Also See Simulators, Motion

Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Barrett, Leon J. Co., 1450 Grafton Rd., Worcester, Mass.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Trio-Tech, Inc. of Calif., 2435 N. Naomi St., Burbank, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Ceramic Resonators

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 1559
Frequency Control, Inc., Box 671, Austin, Tex.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio..... p 1577
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Gould Labs., 540 E. 105th St., Cleveland, Ohio

Ceramics—See Insulation Parts, Ceramic

Chambers, Acoustical Test, High-Intensity Noise

Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Flame Resch., Inc., Box 10502, Pittsburgh, Pa.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Chambers, Altitude

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Georator Corp., Box 70, Manassas, Va.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Ideal-Aerosmith, Inc., 1505 E. Fox Farm Rd., Cheyenne, Wyo.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Webber Mfg. Co., Inc., Box 217, 8634 Brookville Rd., Indianapolis, Ind.

Chambers, Anechoic—See Anechoic Chambers

Chambers, Explosion

Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.

Chambers, Humidity

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Atmosphere Control Co., Inc., 5315 Chester Ave., Philadelphia, Pa.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Forma Sci., Inc., Box 649, Marietta, Ohio
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
So-Low Environmental Equip. Co., Inc., Cleneay Ind'l. Ctr., 1743 Cleaneay Ave., Cincinnati, Ohio
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.
Webber Mfg. Co., Inc., Box 217, 8634 Brookville Rd., Indianapolis, Ind.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Chambers, Ionization

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Cary Instrs., 2724 S. Peck Rd., Monrovia, Calif.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Ohmart Corp., 4241 Allendorf Dr., Cincinnati, Ohio
Reuter-Stokes, 18530 S. Miles Pkwy., Cleveland, Ohio
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Chambers, Magnetic Environment

Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.

Chambers, Pressure

American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Benthos, Inc., Edgerton Dr., N. Falmouth, Mass.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Reuter-Stokes, 18530 S. Miles Pkwy., Cleveland, Ohio
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.

Chambers, Radiation

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Reuter-Stokes, 18530 S. Miles Pkwy., Cleveland, Ohio
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Chambers, Salt Spray

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.

Chambers, Sand & Dust

American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.

Chambers, Space Simulation—See Solar Simulators

Chambers, Sunshine

American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.
Webber Mfg. Co., Inc., Box 217, 8634 Brookville Rd., Indianapolis, Ind.

Chambers, Temperature

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Atmosphere Control Co., Inc., 5315 Chester Ave., Philadelphia, Pa.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Delta Design, Inc., P.O. Box 1118, 8000 Fletcher Pkwy., La Mesa, Calif.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electronic Control Co., Box S150, Dresher, Pa.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Harris Mfg. Co., Inc., 308 River St., Cambridge, Mass.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio

Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Products for Research, Inc., 78 Holten St., Danvers, Mass.
Research, Inc., Box 24064, Minneapolis, Minn.
Scionics Corp., 8900 Winnetka Ave., Northridge, Cal.
So-Low Environmental Equip. Co., Inc., Cleneay Ind'l. Ctr., 1743 Cleaneay Ave., Cincinnati, Ohio
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.
TIA Elec. Co., Box 777, Princeton, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.
Webber Mfg. Co., Inc., Box 217, 8634 Brookville Rd., Indianapolis, Ind.

Chambers, Vacuum

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Aero Vac Corp., Box 448, Troy, N.Y.
American Resch. Corp., Rte. 6 & New Britain Ave., Farmington, Conn.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Brew Richard D. & Co., Inc., 90 Airport Rd., Concord, N.H.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Delta Engrg., Box 620, Boulder, Colo.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Forma Sci., Inc., Box 649, Marietta, Ohio
Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Middlesex Gen'l. Inds., 58 Washington St., Somerville, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.
Ultek Div., Box 10920, Palo Alto, Calif.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Webber Mfg. Co., Inc., Box 217, 8634 Brookville Rd., Indianapolis, Ind.

Chambers, Vibration

Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Thermotron Corp., 937 Washington Ave., Holland, Mich.

Chargers, Battery

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.p 971
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
CEA, 1221 S. Shamrock, Monrovia, Cal. .....p 972,1002
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
CML, Inc., 166 National Rd., Edison, N.J.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Guardian California, 5755 Camille Ave., Culver City, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill. .. p 1123
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Marathon Battery Co., Cold Spring, N.Y.
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex..... p 1160
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J.
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal.
Static Prods., Inc., 2511 National Dr., Box 2226, Garland, Tex.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ..... p 1282
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio..... p 813
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C & D Batteries, Walton Rd. & Township Line, Plymouth Meeting, Pa.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
General Battery Corp., Box 1262, Reading, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Gould, Inc., 88 Cambridge St., Burlington, Mass.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Heath Co., Benton Harbor, Mich.
Hobart Bros. Co., 600 W. Main St., Troy, Ohio
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Mega Engrg. Co., 2271 Mora Dr., Mountain View, Calif.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Motor Generator Div., EE-61, Troy, Ohio
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Power Applications, Inc., Box 305, Bayside, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Warren Communications, New Town Rd., Littleton, Mass.
Welex Elctrns., Box 986, Silver Spring, Md.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Chargers, Magnet—See Magnetizers

Chassis, Circuit Board Mounting

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2156
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Aimes Inds., P.O. Box 73, Lockport, Ill.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Birtcher Corp., Box D, Monterey Park, Cal.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Circuit Structures Lab., 3200 N. San Fernando Blvd., Burbank, Calif.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Chassis Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Chassis, Metal

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass.
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Techmar Corp., 2232 S. Cotner Ave., Los Angeles, Cal. .. p 2159
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Birtcher Corp., Box D, Monterey Park, Cal.

Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Circuit Structures Lab., 3200 N. San Fernando Blvd., Burbank, Calif.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Gyrotronics, Inc., 3500 Sunset Ave., Asbury Park, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Holbrook-Merrill Co., 1150 Kifer Rd., Sunnyvale, Cal.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kees, F.D. Mfg. Co., 700 Park Ave., Beatrice, Neb.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lynch, R.H. Mfg. Co., 7831 E. Arroyo Dr., S. San Gabriel, Calif.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.
Welex Elctrns., Box 986, Silver Spring, Md.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Chassis Slides—See Slides, Cabinet, Chassis & Drawer

Check-Out Systems, Automatic—See Test Equipment, Automatic Check-Out

Checkers—See Analyzers; Testers

Chemically Milled Parts—See Metal Parts, Chemically Milled

Chemicals, Anti-Static—See Coatings, Anti-Static

Chemicals, Degreasing—See Cleaners & Solvents

Chemicals, Dehumidifying

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Barium & Chems., Inc., P.O. Box 218, Steubenville, Ohio
Dow Chemical Co., Box 1682, Midland, Mich.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Ventron Corp., Congress St., Beverly, Mass.

Chemicals, Electroplating

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Hunt, Philip A. Chemical Corp., Palisades Pk., N.J.....p 2326,2327
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Barco Chem. Prods. Co., 701-703 S. LaSalle, Chicago, Ill.
Barium & Chems., Inc., P.O. Box 218, Steubenville, Ohio
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
Dow Chemical Co., Box 1682, Midland, Mich.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Enthone, Inc., Box 1900, New Haven, Conn.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
M & T Chemicals Inc., Rahway, N.J.
Mac Dermid, Inc., 526 Huntingdon Ave., Waterbury, Conn.
Marbon, Box 68, Washington, W. Va.
Matthey Bishop Inc., Malvern, Pa.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Nitine, Inc., Rte. 46, Clifton, N.J.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Selectrons, Ltd., 116 East 16th St., New York, N.Y.
Technic, Inc., Box 965, Providence, R.I.
3M Co., 3M Center, St. Paul, Minn.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Chemicals, Epoxy Stripping

Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Hardman Inc., Belleville, N.J.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Nitine, Inc., Rte. 46, Clifton, N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.

Chemicals, Etching

Hunt, Philip A. Chemical Corp., Palisades Pk., N.J.....p 2326,2327
Acton Assocs., 100 Thompson St., Pittston, Pa.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Biggs Co., Box 1740, Santa Monica, Cal.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
Dow Chemical Co., Box 1682, Midland, Mich.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Enthone, Inc., Box 1900, New Haven, Conn.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Inland Chem. Corp., 1702 Winter St., Fort Wayne, Ind.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Mac Dermid, Inc., 526 Huntingdon Ave., Waterbury, Conn.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Nitine, Inc., Rte. 46, Clifton, N.J.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Selectrons, Ltd., 116 East 16th St., New York, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Shipley Co., Inc., 2300 Washington St., Newton, Mass.

Chemicals, Fungicidal—See Coatings, Fungicidal

Chemicals, Luminescent

RCA, 415 S. 5th St., Harrison, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Prods., Box 45278, Chicago, Ill.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Cerac, Inc., Box 597, Butler, Wisc.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Stroblite Co., Inc., 29 W. 15th St., New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Chemicals, Metal Stripping

Hunt, Philip A. Chemical Corp., Palisades Pk., N.J.....p 2326,2327
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
Enthone, Inc., Box 1900, New Haven, Conn.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Inland Chem. Corp., 1702 Winter St., Fort Wayne, Ind.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Nitine, Inc., Rte. 46, Clifton, N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.

Chemicals, Photosensitive

Hunt, Philip A. Chemical Corp., Palisades Pk., N.J.....p 2326,2327
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
RCA, 415 S. 5th St., Harrison, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Dow Chemical Co., Box 1682, Midland, Mich.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Etchomatic, Inc., Box 444, Waltham, Mass.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Nitine, Inc., Rte. 46, Clifton, N.J.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Shipley Co., Inc., 2300 Washington St., Newton, Mass.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Chemicals, Semiconductor (Production)

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Hunt, Philip A. Chemical Corp., Palisades Pk., N.J.....p 2326,2327
RCA, 415 S. 5th St., Harrison, N.J.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Potash & Chem. Corp., Kerr-McGee Bldg., Oklahoma City, Okla.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cerac, Inc., Box 597, Butler, Wisc.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Etchomatic, Inc., Box 444, Waltham, Mass.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Nitine, Inc., Rte. 46, Clifton, N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Chemicals, Wire Stripping

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dow Chemical Co., Box 1682, Midland, Mich.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Etchomatic, Inc., Box 444, Waltham, Mass.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Mona Inds., Inc., Paterson, N.J.
Nitine, Inc., Rte. 46, Clifton, N.J.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Chestsets—See Handsets, Chestsets & Operator Sets

Chips, Capacitor—See Capacitors, Chip

Chips, IC—See Circuits, Integrated, Silicon Monolithic, Unpackaged Chips

Chips, Transistor—See Transistors, Chip Unpackaged

Chokes, A-F—See Coils, A-F

Chokes, Air Core, DC

Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
NWL, Inc., Box 455, Trenton, N.J. p 2882
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.

Chokes, Filter

Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bush Transformer, 707 North St., Endicot, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Stancor, 3501 W. Addison St., Chicago, Ill.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.

Chokes, R-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. p 1715
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. p 2335
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Dale Elctrns., Inc., Box 180, Yankton, S.D. p 2339
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. p 2340
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. p 2875
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2343
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. p 2345
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. p 2346
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. p 2351
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. p 2356,2357
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Airco Speer Elctrn. Comps., Grand Plaza, Grand Ave., Box 1692, Nogales, Ariz.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Newport Beach, Calif.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wilco Corp., 4030 W. Tenth St., Indianapolis, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Chokes, Swinging

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. p 2875
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J. p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2888,2889,2895
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 2906
Zaring Inds., Inc., Box 477, Carmel, Ind.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stancor, 3501 W. Addison St., Chicago, Ill.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Chokes, Waveguide

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
CEA, 1221 S. Shamrock, Monrovia, Cal.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
American Radar Comps., Inc., 415 E. Main St., Denville, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Choppers

Airpax Elctrns., Inc., Cambridge, Md.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1708
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1888
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857,2142
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. p 2143
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. p 1346
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Valid Data Corp., 10760 Burbank Blvd., No. Hollywood, Cal.

Choppers, Photo—See Choppers

Chromatographs—See Analyzers, Gas

Chronographs—See Recorders, Timing

Chronometers

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. p 605
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. p 548
Neutronic Corp., Box 625, St. Louis, Mo. p 757
Tracor, Inc., 6500 Tracor La., Austin, Tex. p 801
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Wakmann Watch Co., Inc., 15 West 47th St., New York, N.Y.

Circuit Analyzers—See Testers, Signal Tracing

Circuit Board Boxes—See Boxes, Component (Subassembly Handling)

Circuit Board Holders, Jig Type—See Holders, Circuit Board

Circuit Board Racks—See Racks, Circuit Board

Circuit Boards, Stamped (Without Components)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
AEL, Inc., Box 552, Lansdale, Pa.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. p 1355
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GTI Corp., 310 Chestnut St., Meadville, Pa. p 1356
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y. p 2162
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.

Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
NVF Co. Maryland Ave. & Beech St., Wilmington, Del.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Rogers Corp., Rogers, Conn.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Synthane Taylor Corp., Valley Forge, Pa.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Circuit Breakers

Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J. p 2049
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
E-T-A Prods. Co. America, 6284 N. Cicero Ave., Chicago, Ill.
Electrey, S.A., Apartado 1393, Monterrey, Mexico
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Mechanical Prods., 1824 River St., Box 729, Jackson, Mich.
Mel-Rain Corp., 3100 Roosevelt Ave., Indianapolis, Ind.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wood Elec. Corp., Danvers Ind'l. Pk., Rte. One, Danvers, Mass.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Circuit Linearity Comparators—See Comparators, Circuit Linearity

Circuit Testers—See Testers, Signal Tracing

Circuits, Flexible

Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ansley West Corp., 4100 N. Figueroa St., Los Angeles, Cal.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Bureau Engraving, Inc., 219 N. Second St., Minneapolis, Minn.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Conductorlab, Inc., Main St., Groton, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
Gore, W.L. & Assocs., inc., 555 Paper Mill Rd., Newark, Del.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Philway Prods., inc., 701 Virginia Ave., Ashland, Ohio
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rogers Corp., Rogers, Conn.
Sanders Assocs., Inc., Flexprint Div., Grenier Field, Manchester, N.H.
Sanders Assocs., Inc., Flexprint Prod. Div., Grenier Field, Manchester, N.H.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Synthane Taylor Corp., Valley Forge, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Circuits, Hybrid, Thick Film

AEL, inc., Box 552, Lansdale, Pa. ..... p 858
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 1601
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 1601
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Components, Inc., Biddeford, Me.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 1600
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. ..... p 1600
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 1602
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal. ..... p 2807
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. .... p 1789
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 1603
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal. ..... p 1604
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
Sage Elctrns. Corp., Box 3926, Rochester, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y. ..... p 1941
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1258,1259
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1344-1346
Aerovox Corp., Myrtle Beach, S.C.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Circuit Technology, 160 Smith St., Farmingdale, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fabri-Tek, 1410 S.W. 3rd St., Pompano Beach, Fla.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
HEI, Inc., Jonathan Ind'l. Ctr., Chaska, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co., Hybrid Microelectronic Circuits, 500 Superior Ave., Newport Bch., Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lansdale Microelectronics, Inc., Colmar, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Micropac Inds., Inc., 905 E. Walnut St., Garland, Tex.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Silicon Transistor Corp., East Gate Blvd., Garden City, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Circuits, Hybrid, Thin-Film

AEL, inc., Box 552, Lansdale, Pa. ..... p 858
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal. ..... p 1604
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Collins Radio Co., Newport Beach, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMR Div., Box 223, Princeton, N.J.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co., Hybrid Microelectronic Circuits, 500 Superior Ave., Newport Bch., Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Lansdale Microelectronics, Inc., Colmar, Pa.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Micro Networks, 5 Barbara La., Worcester, Mass.
Micropac Inds., Inc., 905 E. Walnut St., Garland, Tex.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mullard, inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Circuits, Integrated, Metal Oxide Semiconductor (Mos)

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan ..... p 1605
Nippon Elec. New York, inc., Pan Am Bldg., 200 Park Ave., New York, N.Y. ..... p 1605
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, Inc., 8808 Balboa Ave., San Diego, Cal. p 1939
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
American Micro-Sys., Inc., 3800 Homestead Rd., Santa Clara, Cal.
Amperex Elctrn. Corp., 99 Bald Hill Rd., Cranston, R.I.
Collins Radio Co., Newport Beach, Calif.
Electronic Arrays, Inc., 501 Ellis St., Mountain View, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Intel Corp., 365 Middlefield Rd., Mountain View, Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
NORTEC Elctrns. Corp., 3697 Tahoe Way, Santa Clara, Cal.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.

Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Circuits, Integrated, Digital

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan ..... p 1605
Nippon Elec. New York, Inc., Pan Am Bldg., 200 Park Ave., New York, N.Y. ..... p 1605
RCA, 415 S. 5th St., Harrison, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., 730 E. Evelyn Ave., Sunnyvale, Cal. ..... p 1606,1607
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1626,1627
Amperex Elctrn. Corp., 99 Bald Hill Rd., Cranston, R.I.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Circuit Engrg. Corp., 4900 E. Indian School Rd., Phoenix, Ariz.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mallory, P.R. & Co. Inc., Integrated Circuit Dept., 3029 E. Washington St., Indianapolis, Ind.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Circuits, Integrated, Linear

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1885,1886
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal. ..... p 1335
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan ..... p 1605
Nippon Elec. New York, Inc., Pan Am Bldg., 200 Park Ave., New York, N.Y. ..... p 1605
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, Inc., 8808 Balboa Ave., San Diego, Cal. p 1938
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., 730 E. Evelyn Ave., Sunnyvale, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1628
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1608-1617
Amperex Elctrn. Corp., 99 Bald Hill Rd., Cranston, R.I.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Integrated Circuit Engrg. Corp., 4900 E. Indian School Rd., Phoenix, Ariz.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Mallory, P.R. & Co. Inc., Integrated Circuit Dept., 3029 E. Washington St., Indianapolis, Ind.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.

Circuits, Integrated, Silicon Monolithic, Unpackaged Chips

AEL, Inc., Box 552, Lansdale, Pa.
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., 730 E. Evelyn Ave., Sunnyvale, Cal. ..... p 1606,1607
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
NORTEC Elctrns. Corp., 3697 Tahoe Way, Santa Clara, Cal.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Silicon Gen'l., Inc., 7382 Bolsa Ave., Westminster, Cal.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Circuits, Large Scale Integration (LSI)

Elctrn. Comps. Div., Trevose, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
American Micro-Sys., Inc., 3800 Homestead Rd., Santa Clara, Cal.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Collins Radio Co., Newport Beach, Calif.
Electronic Arrays, Inc., 501 Ellis St., Mountain View, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Film Microelectronics, Inc., 17 A St., Burlington, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Intel Corp., 365 Middlefield Rd., Mountain View, Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Macrodata, 20440 Corisco St., Chatsworth, Cal.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
NORTEC Elctrns. Corp., 3697 Tahoe Way, Santa Clara, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Circuits, Logic Computer—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic

Circuits, Medium Scale Integration (MSI)

Elctrn. Comps. Div., Trevose, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stewart-Warner Microcircuits, Div., 730 E. Evelyn Ave., Sunnyvale, Cal. ..... p 1606,1607
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
American Micro-Sys., Inc., 3800 Homestead Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Arrays, Inc., 501 Ellis St., Mountain View, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Micro Networks, 5 Barbara La., Worcester, Mass.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
NORTEC Elctrns. Corp., 3697 Tahoe Way, Santa Clara, Cal.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Circuits, Miniature (Cordwood etc.)

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1258
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 594
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Bureau Engraving, Inc., 219 N. Second St., Minneapolis, Minn.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Conductorlab, Inc., Main St., Groton, Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.

Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fabri-Tek, 1410 S.W. 3rd St., Pompano Beach, Fla.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micropac Inds., Inc., 905 E. Walnut St., Garland, Tex.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Owens-Illinois, Inc., C&TP Div., Elctrn. Materials, Box 1035, Toledo, Ohio
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA, Marne Hwy., Moorestown, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Circuits, Multilayer—See Printed Circuits, Multilayer

Circuits, Printed (With Components)—See Cards, Linear Function

Circuits, Thick-Film—See Circuits, Hybrid, Thick-Film

Circuits, Thin-Film—See Circuits, Hybrid, Thin-Film

Circuits, Woven Wire—See Cloth, Woven Wire

Circulators, Ferrite

Airtron, 200 E. Hanover Ave., Morris Plains, N.J. ..... p 856
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 866-868
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
RCA, 415 S. 5th St., Harrison, N.J.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 911
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Marconi Div., 1 Park Ave., New York, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.

Clamps & Clips, Cable-Also See Wire & Cable Ties

All States Plastic Mfg. Co., Inc., 2937 N. Elston Ave., Chicago, Ill. ..... p 2909
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2402
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2373,2375
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. .....p 2962,2963
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Budwig Mfg. Co., P.O. Box 97, Ramona, Calif.
Burndy Corp., Richards Ave., Norwalk, Conn.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Connectrol Corp., 28 E 22nd St, New York, N Y
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Larson Charles O. Co., P.O. Box "E", Sterling, Ill.
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Preformed Line Prods. Co., 5349 St. Clair Ave., Cleveland, Ohio
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Superior Continental Corp., Box 489, Hickory, N.C.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Titeflex, Inc., Hendee St., Springfield, Mass.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Tyton Corp., 3330 W. Cameron Ave., Milwaukee, Wisc.
Utilities Svc. Co., P.O. Box 627, Allentown, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.

Clamps, Component

Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y. ..... p 1643
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1900
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
Mueller Elec. Co., 1589H E. 31st St., Cleveland, Ohio ..... p 2469
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2964
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Accurate Spring, 8747 W. Palmer St., River Grove, Ill.
Aeroquip Corp., 300 S. East Ave., Jackson, Mich.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Birtcher Corp., Box D, Monterey Park, Cal.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Connectrol Corp., 28 E 22nd St, New York, N Y
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Kestler Elctrns., 4226 Arica Ave., Rosemead, Calif.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Naugler Engrg., Inc., Off Dunham Rd., Beverly, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.

Clamps, Servo

Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Perfect Gear & Instr. Corp., 18141 Napa, Northridge, Calif.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Timber-Top, Inc., 199E N. Main St., Freeport, N.Y.

Clean Room Equipment & Supplies-Also See Work Stations, Clean, Dust-Free

Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Agnew-Higgins, Inc., P.O. Box 857, Garden Grove, Calif.
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Ajusto Equip. Co., 513 Conneaut St., Bowling Green, Ohio
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Angelica Uniform Co., 700 Rosedale Ave., St. Louis, Mo.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Atlas Coverall & Uniform Supply Co., 1441 E. Adams Blvd., Los Angeles, Calif.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
Cambridge Filter Corp., 7645 Seventh North Rd., Syracuse, N.Y.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Clean Rooms Constr. Co., Inc., Box 275, Westminster, Cal.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Farr Co., 2301 E. Rosecrans, El Segundo, Calif.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Industrial Formulations Corp., 160 Terminal Dr, Plainview, N.Y.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Labconco Corp., 8811 Prospect, Kansas City, Mo.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Moore John B. Corp., Outer Main St., Box 65, So. Amboy, N.J.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Standard Glove Co. of N.J., 27 Havnes Ave., Newark, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Texwipe Co., 51 Prospect Pl., Hillsdale, N.J.
3M Co., 3M Center, St. Paul, Minn.
Ultra Sonic Inds., 800 Albany Ave., Lindenhurst, N.Y.
Westinghouse Elec. Corp., 4300 36th St., S.E., Grand Rapids, Mich.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Workplace Sys., Inc., 370 Commercial St., Manchester, N.H.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Clean Rooms—See Rooms, Clean, Dust-Free

Cleaners & Solvents

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Hunt, Philip A. Chemical Corp., Palisades Pk., N.J. ....p 2326,2327
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Acton Assocs., 100 Thompson St., Pittston, Pa.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Atlas Coverall & Uniform Supply Co., 1441 E. Adams Blvd., Los Angeles, Calif.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Barco Chem. Prods. Co., 701-703 S. LaSalle, Chicago, Ill.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Beaver Labs., Inc., 160 Terminal Dr., Plainview, N.Y.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Biggs Co., Box 1740, Santa Monica, Cal.
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brulin & Co., Inc., 2920 Martindale Ave., Indianapolis, Ind.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Carter's Ink Co., 239 First St., Cambridge, Mass.
Cerac, Inc., Box 597, Butler, Wisc.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Cobehn, Inc., 226 Passaic Ave., Fairfield, N.J.

Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
CRC Chemicals, Dresher, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
DuPont Co. (U.K.) Ltd., DuPont House, Fetter La., London, E.C. 4, England
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Dynasonics Corp., Box 672, Pipestone, Minn.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Elctrn. Chemical Corp., 813 Communipaw Ave., Jersey City, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Enthone, Inc., Box 1900, New Haven, Conn.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
Friend's Mfg. Co., Rd. 2, Box 74, Williamstown, N.J.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Industrial Formulations Corp., 160 Terminal Dr, Plainview, N.Y.
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Inland Chem. Corp., 1702 Winter St., Fort Wayne, Ind.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
LPS Resch. Labs., 2050 Cotner, Los Angeles, Cal.
M & T Chemicals Inc., Rahway, N.J.
Mac Dermid, Inc., 526 Huntingdon Ave., Waterbury, Conn.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Moore John B. Corp., Outer Main St., Box 65, So. Amboy, N.J.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nitine, Inc., Rte. 46, Clifton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Philadelphia Quartz Co., 1146 Public Ledger Bldg., Philadelphia, Pa.
Phillips Mfg. Co., 7334 N. Clark St., Chicago, Ill.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Rogers Anti-Static Chems., Inc., 22 W. Madison, Chicago, Ill.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Shanda Labs., Inc., Box 24, Closter, N.J.
Shipley Co., Inc., 2300 Washington St., Newton, Mass.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Stewart-Hall Chemical Corp., 222 Washington St., Mt. Vernon, N.Y.
Superior Flux & Mfg. Co., 1536 St. Clair Ave., Cleveland, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Texwipe Co., 51 Prospect Pl., Hillsdale, N.J.
Ultra Sonic Inds., 800 Albany Ave., Lindenhurst, N.Y.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.

Cleaners, Mechanical, Magnetic Tape

CompuCord, Inc., 225 Crescent St., Waltham, Mass.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Headway Research, Inc., 3713 Forest La., Garland, Tex.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
KYBE Corp., 132 Calvary St., Waltham, Mass.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Phillips Mfg. Co., 7334 N. Clark St., Chicago, Ill.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Ultra Sonic Inds., 800 Albany Ave., Lindenhurst, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Cleaners, Ultrasonic

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich.
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
Ultrasonic Devices, 1057 Summit Ave., Jersey City, N.J. p 1316
Barco Chem. Prods. Co., 701-703 S. LaSalle, Chicago, Ill.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Dynasonics Corp., Box 672, Pipestone, Minn.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Koh-I-Noor, Inc., 100 North St., Bloomsbury, N.J.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Lewis Corp., Rte. 6, Woodbury, Conn.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Marcal Electro-Sonics, P.O. Box 185, Burkank, Calif.
Mettler Elctrns. Corp., 123 N. Fair Oaks Ave., Pasadena, Calif.
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Octagon Process, Inc., 35 Archer St., Edgewater, N.J.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Phillips Mfg. Co., 7334 N. Clark St., Chicago, Ill.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tronic Corp., Box 247-E, Belmont, Calif.
Ultra Sonic Inds., 800 Albany Ave., Lindenhurst, N.Y.
Union Ultra-Sonics Corp., 576 Lawrence St., Lowell, Mass.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Cleaners & Filters, Air—See Air Cleaners & Filters

Cleaning & Filtering Equipment, Liquid

Metex Corp., 970 New Durham Rd., Edison, N.J.
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Industrial Formulations Corp., 160 Terminal Dr, Plainview, N.Y.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.

Clip Insulators—See Insulators, Test & Battery Clip

Clips, Alligator

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Mueller Elec. Co., 1589H E. 31st St., Cleveland, Ohio..... p 2469
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2486,2489,2513
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Carol Cable Co., Box 68, Pawtucket, R.I.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Clips, Battery

Clips, Board, Harness

National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
E-Z-Hook Test Prods., Box 105, Covington, Ky.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Clips, Component

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal..... p 1900
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2964
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
AAVID Engrg., Inc., 30 Cook Ct., Laconia, N.H.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aldrich, C.G. Mfg. Corp., P.O. Box 312, Sugar Grove, Pa.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Birtcher Corp., Box D, Monterey Park, Cal.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Connectrol Corp., 28 E 22nd St, New York, N Y
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
E-Z-Hook Test Prods., Box 105, Covington, Ky.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Kestler Elctrns., 4226 Arica Ave., Rosemead, Calif.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Clips, Fahnestock, Spring Wire

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Clips, Test

A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Mueller Elec. Co., 1589H E. 31st St., Cleveland, Ohio..... p 2469
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2486,2513
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.

Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Contact, Inc., P.O. Box 6, Hudson, N.H.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
E-Z-Hook Test Prods., Box 105, Covington, Ky.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electraid, Inc., Box 53, Cambridge, Mass.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Ostby & Barton Co., Box 6267, Providence, R.I.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Rapid Specialties Co., 327 W. Huron St., Chicago, Ill.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Clips, Transistor & Diode—See Retainers, Transistor & Diode

Clips & Caps, Grid & Plate

Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2372
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Clips & Holders, Fuse-Also See Panels, Fuse

Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo. p 2008,2009
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 1531
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Chase-Shawmut Co., 374 Merrimac St., Newburyport, Mass.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Dante Elec. Mfg. Co., Bantam, Conn.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Marathon Special Prods. Corp., 13300 Van Camp Rd., Bowling Green, Ohio
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Clocks (All Types)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 562
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1452,1455
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal.
Neutronic Corp., Box 625, St. Louis, Mo.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... p 585
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Data Prods., 888 Galindo St., Concord, Cal.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Wakmann Watch Co., Inc., 15 West 47th St., New York, N.Y.

Closed Circuit Tv Systems—See Television Systems, Closed Circuit

Cloth & Fabrics—See Insulation Materials, Fabric

Cloth, Speaker Grille

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Acoustone Corp., 80 Wythe Ave., Brooklyn, N.Y.
Chicopee Mfg. Co., Cornelia, Ga.
Mellotone, Inc., 1220 Broadway, New York, N.Y.
Merlang Mfg. Corp., 122 S. Long Beach, Rockville Centre, N.Y.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Cloth, Woven Wire

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Etchomatic, Inc., Box 444, Waltham, Mass.
Matthey Bishop Inc., Malvern, Pa.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N.J.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Tyler, W.S. Co., 8200 Tyler Blvd., Mentor, Ohio
Unique Wire Weaving Co., Inc., 759 Ramsey Ave., Hillside, N.J.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.
Wright, G.F. Steel & Wire Co., 243 Stafford St., Worcester, Mass.

Clutches, Friction

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633,1642
Autotronics, Inc., 2700 Davis, Joplin, Mo ..... p 1635
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. .....p 1633,1642
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y. ..... p 1643
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y. ..... p 1680
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Dynamic Gear Co., 175 Dixon Ave., Amityville, N.Y.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Fawick Airflex Div., 9919 Clinton Rd., Cleveland, Ohio
Formsprag Co., 23601 Hoover Rd., Warren, Mich.
Insco Corp., Main St., Groton, Mass.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Midwest Automatic, Inc., 510 Third St., Des Moines, Iowa
Perfect Gear & Instr. Corp., 18141 Napa, Northridge, Calif.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Simplatrol Prods. Corp., 675 Plantation St., Worcester, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Clutches, Magnetic

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633,1642
Autotronics, Inc., 2700 Davis, Joplin, Mo ..... p 1635
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. .....p 1633,1642
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y. ..... p 1643
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
General Time Corp., Rte. 8, Torrington, Conn.
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y. ..... p 1680
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1694
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Altair Resch. & Mfg. Co., 1241 E. State St., Ontario, Calif.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bendix Corp., Elmira, N.Y.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Fawick Airflex Div., 9919 Clinton Rd., Cleveland, Ohio
Formsprag Co., 23601 Hoover Rd., Warren, Mich.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Perfect Gear & Instr. Corp., 18141 Napa, Northridge, Calif.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Simplatrol Prods. Corp., 675 Plantation St., Worcester, Mass.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.

Clutches, Positive

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 1633,1642
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. .....p 1633,1642
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y. ..... p 1643
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Fawick Airflex Div., 9919 Clinton Rd., Cleveland, Ohio
Formsprag Co., 23601 Hoover Rd., Warren, Mich.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago, Ill.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Perfect Gear & Instr. Corp., 18141 Napa, Northridge, Calif.
Torrington Co., Box 1008, Torrington, Conn.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Coatings, Anti-Laser Beam

Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.

Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Valpey Corp., 1400 Highland St., Holliston, Mass.

Coatings, Anti-Static

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Barco Chem. Prods. Co., 701-703 S. LaSalle, Chicago, Ill.
Beaver Labs., Inc., 160 Terminal Dr., Plainview, N.Y.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Industrial Formulations Corp., 160 Terminal Dr, Plainview, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Micro-Circuits Co., New Buffalo, Mich.
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Nopco Chem. Div., 60 Park Pl, Newark, N.J.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Rogers Anti-Static Chems., Inc., 22 W. Madison, Chicago, Ill.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Coatings, Conductive

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Cerac, Inc., Box 597, Butler, Wisc.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Enthone, Inc., Box 1900, New Haven, Conn.
Etchomatic, Inc., Box 444, Waltham, Mass.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hardman Inc., Belleville, N.J.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Rogers Corp., Rogers, Conn.
Schweitzer, Peter J. Div., Lee, Mass.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Union Carbide Corp, Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Coatings, Electromagnetic Wave Absorbing-Also See Materials

Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Coatings, Films, Transfers, etc., Etchant-Resisting

Hunt, Philip A. Chemical Corp., Palisades Pk., N.J. ....p 2326,2327
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Naz-Dar Int'l., 1087 N. North Branch St., Chicago, Ill.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.

Coatings, Fluorescent

RCA, 415 S. 5th St., Harrison, N.J.
Black Light Prods., Box 45278, Chicago, Ill.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Illinois Bronze Powder & Pain Co., 300 E. Main St., Lake Zurich, Ill.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Strobiite Co., Inc., 29 W. 15th St., New York, N.Y.

Coatings, Fungicidal

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ..... p 2324,2325
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Coricone Corp., 3605 Long Beach Blvd., Long Beach, Cal.
CRC Chemicals, Dresher, Pa.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Flock Process Corp., P.O. Box 430, Norwalk, Conn.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
M & T Chemicals Inc., Rahway, N.J.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rogers Anti-Static Chems., Inc., 22 W. Madison, Chicago, Ill.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.

Coatings, Compounds, Lubricants, etc., Heat Conductive

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ..... p 2324,2325
Dow Corning Corp., Midland, Mich. ..... p 2668-2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1896
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Cerac, Inc., Box 597, Butler, Wisc.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
CRC Chemicals, Dresher, Pa.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., Waterford, N.Y.
Glidden-Durkee Div., 900 Union Commerce Bldg., Cleveland, Ohio
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hardman Inc., Belleville, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
LPS Resch. Labs., 2050 Cotner, Los Angeles, Cal.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Tickle, Arthur Engrg. Works, Inc., 21 Delevan St., Brooklyn, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Coatings, High-Temperature, Ceramic, Plasma Spray—See Services, Coating

Coatings, Infrared

Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Diode Corp, 90 Eames St., Framingham, Mass.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.

Coatings, Insulating

Carborundum Co., Box 367, Niagara Falls, N.Y.
Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ..... p 2324,2325
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Dow Corning Corp., Midland, Mich. ..... p 2667-2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1896
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Beaver Labs., Inc., 160 Terminal Dr., Plainview, N.Y.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Coricone Corp., 3605 Long Beach Blvd., Long Beach, Cal.
CRC Chemicals, Dresher, Pa.
Dennis Chem. Co., 2701 Papin St., St. Louis, Mo.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., Waterford, N.Y.

Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Hightemp Resins, Inc., 225 Greenwich Ave., Stamford, Conn.
Hysol Div., 211 Franklin St., Olean, N.Y.
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Norton Co., 1 New Bond St., Worcester, Mass.
Paisley, Box 987, Edison, N.J.
Pennsylvania Ind'l. Chem. Corp., 120 State St.,-Clairton, Pa.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rogers Corp., Rogers, Conn.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Unicote Corp., 15121 Charlevoix Ave., Grosse Pointe Pk., Mich.
Union Carbide Corp, Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.

Coatings, Mold Releasing

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
Dow Corning Corp., Midland, Mich. ....p 2667,2669
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Cerac, Inc., Box 597, Butler, Wisc.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
CRC Chemicals, Dresher, Pa.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hardman Inc., Belleville, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Nopco Chem. Div., 60 Park Pl, Newark, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coatings, Optical

Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
FJW Inds., Inc., 215 E. Prospect Ave., Mt. Prospect, Ill.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.

Coatings, Protective

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ....p 2324,2325
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. .... p 2674
Dow Corning Corp., Midland, Mich. .... p 2667-2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. .... p 1896
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. .... p 2328
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Cerac, Inc., Box 597, Butler, Wisc.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Coricone Corp., 3605 Long Beach Blvd., Long Beach, Cal.
CRC Chemicals, Dresher, Pa.
Daubert Chem. Co., 709 Enterprise Dr., Oak Brook, Ill.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
Force Chems. Div., Ind'l. Blvd., Paoli, Pa.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Hysol Div., 211 Franklin St., Olean, N.Y.
Illinois Bronze Powder & Pain Co., 300 E. Main St., Lake Zurich, Ill.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
LPS Resch. Labs., 2050 Cotner, Los Angeles, Cal.
M & T Chemicals Inc., Rahway, N.J.
Markal Co., 250 N. Washtenaw Ave., Chicago, Ill.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nopco Chem. Div., 60 Park Pl, Newark, N.J.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Seal-Peel, Inc., 775 Stephenson Hwy., Royal Oak, Mich.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Sterling, Sewickley, Pa.
Superior Continental Corp., Box 489, Hickory, N.C.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Technic, Inc., Box 965, Providence, R.I.
3M Co., 3M Center, St. Paul, Minn.
Unicote Corp., 15121 Charlevoix Ave., Grosse Pointe Pk., Mich.
Union Carbide Corp, Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Western Coating Co., Box 598, Royal Oak, Mich.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coatings, Radioactive

Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.

Coatings, Transducer Forming

Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.

Coatings, Weatherproofing

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ....p 2324,2325
Datak Corp., 85 Highland Ave., Passaic, N.J. .... p 1499
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. .... p 2674
Dow Corning Corp., Midland, Mich. .... p 2667-2670
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. .... p 2328
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Arnold Labs., Inc., 7103 Laurel Canyon Blvd., N. Hollywood, Calif.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Carboline Co., 328 Hanley Ind'l. Ct., St. Louis, Mo.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
CRC Chemicals, Dresher, Pa.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrotec, Inc., 3726 Cavalier Dr., Garland, Tex.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Force Chems. Div., Ind'l. Blvd., Paoli, Pa.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hardman Inc., Belleville, N.J.
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kano Labs., Inc., 1000 Thompson La., Nashville, Tenn.
Markal Co., 250 N. Washtenaw Ave., Chicago, Ill.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Seal-Peel, Inc., 775 Stephenson Hwy., Royal Oak, Mich.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Unicote Corp., 15121 Charlevoix Ave., Grosse Pointe Pk., Mich.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Western Coating Co., Box 598, Royal Oak, Mich.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.

Code & Tab Markers—See Wire Markers (All Types)

Coded Discs, Optical

Data Technology, Inc., 65 Grove St., Watertown, Mass.
Norden Div., Helen St., Norwalk, Conn.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Litton Inds., 20745 Nordhoff St., Chatsworth, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Ragen Precision Inds., inc., 9 Porete Ave., N. Arlington, N.J.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
United Aircraft Corp., Helen St., Norwalk, Conn.

Coders, A-F

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1430
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coders, Beacon

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coders, R-F

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coders, Transponder

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2575
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va..... p 914
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Coil Assemblies & Forms-Also See Bobbins

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336,2337
Carborundum Co., Box 367, Niagara Falls, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D..... p 2338
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2343
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Thermotech Coil Forms & Comps. Div., 1202 S. 5th St., Hopkins, Minn. ..... p 2631,2632,2634,2635
Thermotech Inds., Inc., 1202 S. 5th St., Hopkins, Minn. p 2631,2632,2634,2635
Thermotech Plastics, Co., 1202 S. 5th St., Hopkins, Minn. p 2631,2632,2634,2635
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Prods. Co., 451 S. Jefferson St., Orange, N.J. ..... p 2354
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Ceram Corp., 5345 Timken Sq., La Mesa, Calif.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Cosmo Plastics Co., 3239 West 14th St., Cleveland, Ohio
Diamonite Prods. Mfg. Co., Shreve, Ohio
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Form-It Prods., Inc., 1619 W. Walnut St., Chicago, Ill.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Howie Corp., Noble & Jackson Sts., Norristown, Pa.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micrometals, 228 N. Sunset, City of Industry, Calif.
National Coil Co., Box 1040, Douglas, Ariz.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Resdel Corp., Box 2171, Rio Grande, N.J.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Smith, Judson A. Co., Boyertown, Pa.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Winatic Corp., 409 Commerce Rd., Vestal, N.Y.

Coil Standards—See Standards, Inductance

Coil Testers—See Testers, Coil

Coil-Winding Equipment—See Machines, Coil-Winding

Coils, A F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2332-2334
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D..... p 2338
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 2342
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2348,2349
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2353
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind..... p 2359
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
EMR Div., Box 223, Princeton, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Antenna Loading

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan..... p 535
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
K-W Engrg. Works, N50 W16328 Pin Oak Ct., Menomonee Falls, Wisc.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Master Mobile Mounts, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Broadcast

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.

General Instr. Corp., 165 Front St., Chicopee, Mass.
National Coil Co., Box 1040, Douglas, Ariz.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Choke—See Chokes (As Modified)

Coils, Color Purity

Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Wilco Corp., 4030 W. Tenth St., Indianapolis, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Crossover, Audio

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Field

H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tur-Bo Jet Prods. Co., Inc., 5025 N. Earle St., Rosemead, Calif.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Focusing

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill..... p 2347
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Celco, 70 Constantine Dr., Mahwah, N.J.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Cleveland Elctrns., Inc., 2000 Highland Rd., Twinsburg, Ohio
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Foil-Wound

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
C.B.C. inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
TDC Div., Box 365, Littleton, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, High-Q, Low-Frequency

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2332-2334
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Dale Elctrns., Inc., Box 180, Yankton, S.D..... p 2338
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 2340
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 2342
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2343
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2348,2350
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. .....p 2352,2353
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ....p 918,2356
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind. ..... p 2359
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
EMR Div., Box 223, Princeton, N.J.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Lenox-Fugle Elctrns., Inc., 100 Sylvania Pl., S. Plainfield, N.J.
Master Mobile Mounts, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
National Coil Co., Box 1040, Douglas, Ariz.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Hybrid & Repeat

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, I-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.

American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2334
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 2340
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2343
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 2351
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Clippard Instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Metallized Glass

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Molded

Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Cosmo Plastics Co., 3239 West 14th St., Cleveland, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.

Coils, Oscillator, Phono Test

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Electro Magnetic Prods., Box 708, Wabash, Ind.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Relay

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. ..... p 1744
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Dano Electric, Main St., Winsted, Conn.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tur-Bo Jet Prods. Co., Inc., 5025 N. Earle St., Rosemead, Calif.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winatic Corp., 409 Commerce Rd., Vestal, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, R-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..p 2332,2334,2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 2340
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 2342
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2343
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1229
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 2348-2351
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ....p 918,2356
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
Airco Speer Elctrn. Comps., Grand Plaza, Grand Ave., Box 1692, Nogales, Ariz.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Clippard Instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lenox-Fugle Elctrns., Inc., 100 Sylvania Pl., S. Plainfield, N.J.
Master Mobile Mounts, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Olektron Corp., Box 248, Dudley, Mass.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.

Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Wilco Corp., 4030 W. Tenth St., Indianapolis, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Saturable Reactor

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal. p 2872
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Tohoku Metal Inds., Ltd., No 13-10; 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
RtroN Corp., Box 743, Skokie, Ill.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TDC Div., Box 365, Littleton, Mass.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Shielded

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 2340
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 2342
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 2350
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Dano Electric, Main St., Winsted, Conn.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Lenox-Fugle Elctrns., Inc., 100 Sylvania Pl., S. Plainfield, N.J.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
TDC Div., Box 365, Littleton, Mass.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Solenoid

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
Airco Speer Elctrn. Comps., Grand Plaza, Grand Ave., Box 1692, Nogales, Ariz.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Koontz-Wagner Elec. Co., Inc., 516 N. Michigan St., South Bend, Ind.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tur-Bo Jet Prods. Co., Inc., 5025 N. Earle St., Rosemead, Calif.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Voltronics, Inc., 7746 W. Addison St., Chicago, Ill.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winatic Corp., 409 Commerce Rd., Vestal, N.Y.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Telephone

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Telephone Pickup (For Recording)—See Pickups, Telephone

Coils, Toroidal

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
Allen Elctrns. Div., Macungie, Pa. ..... p 2329
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2332-2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338

Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 2342
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. .... p 2306
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2348,2349
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. .....p 2352,2353
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind. ..... p 2359
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
EMR Div., Box 223, Princeton, N.J.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Gorman Machine Corp., 1645 Superior Ave., Costa Mesa, Cal.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill..
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
RtroN Corp., Box 743, Skokie, Ill.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Western Transformer Co., Box 370, Tijeras, N. M.
White Instrs., Inc., Box 698, Austin, Tex.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Transducer

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Nytronics, Inc., Orange St., Darlington, S.C.
United Transformer Co., 150 Varick St., New York, N.Y.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Geo Space, 5803 Glenmont, Houston, Tex.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Winatic Corp., 409 Commerce Rd., Vestal, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Transformer

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2339
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal. p 2872
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Nytronics, Inc., Orange St., Darlington, S.C.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Geo Space, 5803 Glenmont, Houston, Tex.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Winatic Corp., 409 Commerce Rd., Vestal, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, TV (All Types)

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2330
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill. ..... p 2347
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Beebe Instrs., Inc., P.O. Box 137, N. White Plains, N.Y.
Bel-Tronics Corp., 344 W. Interstate Rd., Addison, Ill.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Clippard Instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Variable

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Precision Inds., Inc., 270 Quaker Rd., E. Aurora, N.Y. p 2340
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2334
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338

Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y. ..... p 2340
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2880
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan..... p 535
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2344
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sangamo Elec. Co., Box 128, Pickens, S.C. ..... p 2280
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355,2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ....p 918,2356
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Clippard instr., Inc., 7350-90 Colerain Rd., Cincinnati, Ohio
Contemporary Elctrns., 4838 W. 35th St., Minneapolis, Minn.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Coils, Inc., 130 Market St., Kenilworth, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Otis Radio & Elec. Corp., 222 Ave. E., Hawarden, Iowa
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Voltronics, Inc., 7746 W. Addison St., Chicago, Ill.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Vidicon Alignment

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill..... p 2347
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Celco, 70 Constantine Dr., Mahwah, N.J.
Cleveland Elctrns., Inc., 2000 Highland Rd., Twinsburg, Ohio
Electro Magnetic Prods., Box 708, Wabash, Ind.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Voice

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Dano Electric, Main St., Winsted, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Coils, Water—See Water Coils, Tube Cooling

Coincidence Analyzers—See Analyzers, Coincidence

Cold-Cathode Readout—See Tubes, Readout

Cold Traps

Aero Vac Corp., Box 448, Troy, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Delta Engrg., Box 620, Boulder, Colo.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Middlesex Gen'l. Inds., 58 Washington St., Somerville, Mass.
National Coil Co., Box 1040, Douglas, Ariz.
Norton Co., 160 Charlemont St., Newton, Mass.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.

Collars

Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Naugler Engrg., Inc., Off Dunham Rd., Beverly, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.

Collimators, Infrared

Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
National Instr. Labs., Inc., 12300 Park Lawn Dr., Rockville, Md.
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.

Collimators, Optical

American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Electro-Optical Div., 347 King St., Northampton, Mass.
Epol, Inc., 623 Stewart Ave., Garden City, N.Y.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
National Instr. Labs., Inc., 12300 Park Lawn Dr., Rockville, Md.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Colorimeters

Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Coleman Instrs., 42 Madison St., Maywood, Ill.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Lektra Labs., Inc., 129-07 18th Ave., College Point, N.Y.
Magnuson Engrs., Inc., 1010 Timothy Dr., San Jose, Calif.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Color TV Equipment—See Cameras, TV (Color); Monitors, Video; Recorders, Video Tape

Combiners, Diversity, Post Detection

Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Olektron Corp., Box 248, Dudley, Mass.

Combustion Indicators—See Fire Detection & Fighting Equip.

Comm. Systems, Broadcast

AEL, Inc., Box 552, Lansdale, Pa.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 897,899
Ampex Corp., 401 Broadway, Redwood City, Calif.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
Kalart Co., Inc., Hultenius St., Plainville, Conn.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Olektron Corp., Box 248, Dudley, Mass.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Tenatronics, Ltd., 3001 Chester Ave., Cleveland, Ohio
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Comm. Systems, Carrier Current

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Femco Div., Box F, Irwin, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Telecommunications, 2912 Wake Forest Rd., Raleigh, N.C.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Rust Corp., 168 Tremont St., Everett, Mass.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.
Talk-A-Phone Co., 5013 N. Kedzie Ave., Chicago, Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Comm. Systems, Data

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 576
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 897,899

Sangamo Elec. Co., Box 128, Pickens, S.C.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Codex Corp., 150 Coolidge Ave., Watertown, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Communitype Corp., 767 5th Ave. (GM Bldg.), New York, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dasa Corp., 15 Stevens St., Andover, Mass.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digitech Data Inds., Inc., 22 Grove St., Ridgefield, Conn.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Femco Div., Box F, Irwin, Pa.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Marconi Div., 1 Park Ave., New York, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Elec. & Resch. Corp., 743 Circle Ave., Forest Park, Ill.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sanders Assocs., Inc., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., 8700 Main St., Buffalo, N.Y.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Adcom, 808 Memorial Dr., Cambridge, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.
Viatron Computer Sys., Rte. 62, Bedford, Mass.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Comm. Systems, F-M

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 898
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Trutone Elctrns., Inc., 14660 Raymer St., Van Nuys, Calif.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.

Comm. Systems, Facsimile

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Defense Elctrns., Inc., Rockville, Md.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telautograph Corp., 8700 Bellanca Ave., Los Angeles, Cal.
Vidcom Elctrns., Inc., 118 W. 57th St., New York, N.Y.

Comm. Systems, Frequency Shift

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Defense Elctrns., Inc., Rockville, Md.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Elctrns. Corp., 900 Walt Whitman Rd., Huntington Station, N.Y.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Comm. Systems, Induction

Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Parcoe, Inc., 4501 Prospect Ave., Cleveland, Ohio
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.

Comm. Systems, Infrared, Ultraviolet

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Flame Resch., Inc., Box 10502, Pittsburgh, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Comm. Systems, Intercom—See Intercommunication Systems

Comm. Systems, Laser

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Flame Resch., Inc., Box 10502, Pittsburgh, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Comm. Systems, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 896-899
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.

Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
ITT Telecommunications, 2912 Wake Forest Rd., Raleigh, N.C.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Link Div., Binghamton, N.Y.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Sys. Co., Box 15155, Golden, Colo.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telefunken Sis. Corp., South St., Garden City, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Comm. Systems, Multiplex

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bristol Div, Waterbury, Conn
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
ITT Telecommunications, 2912 Wake Forest Rd., Raleigh, N.C.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Comm. Systems, Portable (Industrial)

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
North Elec. Co., 553 S. Market St., Galion, Ohio
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altron Elctrns. Co., 1309 Jefferson Ave., Woodlyn, Pa.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Defense Elctrns., Inc., Rockville, Md.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Holmin, W.A. Corp., 1325 Seventh St., Rockford, Ill.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Radio Specialty Mfg. Co., 2023 Southeast 6th Ave., Portland, Ore.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Comm. Systems, Radiotelephone

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Comm. Systems, Selective Paging

Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Femco Div., Box F, Irwin, Pa.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loge Elctrns., 2171 W. Washington Blvd., Los Angeles, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Parcoe, Inc., 4501 Prospect Ave., Cleveland, Ohio
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Sparks Communications, Inc., 1107 Lagoon Dr., Dallas, Tex.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Comm. Systems, Single-Sideband

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.

KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Comm. Systems, Telemetering

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airpax Elctrns., Inc., Cambridge, Md.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 896-899
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Yeiser Labs, 881 W. 18th St., Costa Mesa, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Defense Elctrns., Inc., Rockville, Md.
Destron Co., 25914 Chalmette La., Rolling Hills Est, Calif.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Femco Div., Box F, Irwin, Pa.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microcom Corp., Horsham Valley Ind'l. Pk., Horsham, Pa.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Comm. Systems, Telephone

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Electrospace Corp., 956 Brush Hollow Rd., Westbury..... p 534
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 899
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Auth Elec. Co., Inc., 34-20 45th St., Long Island City, N.Y.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Corp., 302 McGuinness Blvd., Brooklyn, N.Y.
Dasa Corp., 15 Stevens St., Andover, Mass.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Data Prods. Corp., 6219 De Soto Ave. Woodland Hills, Calif.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Encom Prods. Co., Inc., Box 68, Oxford, Pa.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Femco Div., Box F, Irwin, Pa.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
FRL, Marin Controls Co., 517 Marine View Ave., Belmont, Cal.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
ITT Telecommunications, 2912 Wake Forest Rd., Raleigh, N.C.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., inc., 1105 County Rd., San Carlos, Calif.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Roche, Paul C. Co., Inc., 11 Park Pl., New York, N.Y.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Superior Continental Corp., Box 489, Hickory, N.C.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Comm. Systems, Teletype

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Collins Radio Co., Dallas, Tex.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Defense Elctrns., Inc., Rockville, Md.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Digitech Data Inds., Inc., 22 Grove St., Ridgefield, Conn.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Marconi Div., 1 Park Ave., New York, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Elec. & Resch. Corp., 743 Circle Ave., Forest Park, Ill.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Comm. Systems, Vehicle Mounted

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Ampex Corp., 401 Broadway, Redwood City, Calif.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Defense Elctrns., Inc., Rockville, Md.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Femco Div., Box F, Irwin, Pa.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rateico, Inc., 610 Pontius Ave. N., Seattle, Wash.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.

Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Commutators, Rotary

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass. ..... p 2799
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2803
Fabricast, Inc., 9835 Alpaca St., So. El Monte, Cal. ..... p 1646
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Collectron Corp., 304 East 45th St., New York, N.Y.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
Electro-Miniatures Corp., 600 Huyler St., S. Hackensack, N.J.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
KDI Electro-Tec Corp., 1600 N. Main St., Blacksburg, Va.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Nippert Co., 825 Pittsburgh Dr., Delaware, Ohio
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Toledo Commutator Co., Owosso, Mich.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Commutators, Switching

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass. ..... p 2799
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2803
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Fabricast, Inc., 9835 Alpaca St., So. El Monte, Cal. ..... p 1646
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Markite Corp., 155 Waverly Pl., Dept. 301, New York, N.Y. p 2811
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va. ..... p 1688
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Collectron Corp., 304 East 45th St., New York, N.Y.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
Electro-Miniatures Corp., 600 Huyler St., S. Hackensack, N.J.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
KDI Electro-Tec Corp., 1600 N. Main St., Blacksburg, Va.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Toledo Commutator Co., Owosso, Mich.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Comparators, Attenuation

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Comparators, Capacitance—See Bridges, Capacitance

Comparators, Circuit Linearity

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Comparators, Density—See Densitometers

Comparators, Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 606
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 558,559
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749,750
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electronic Modules Corp., Box 141, Timonium, Md.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Comparators, Frequency

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Frequency Control, Inc., Box 671, Austin, Tex.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762,764,765
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Collins Radio Co., Dallas, Tex.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electronic Service Co., 201 Linden Ave., Verona, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flüke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Comparators, Impedance—See Bridges, Impedance

Comparators, Optical

Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Epol, Inc., 623 Stewart Ave., Garden City, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Ex-Cell-O Corp., Box 386, Detroit, Mich.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Traid Corp., 777 Flower St., Glendale, Calif.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Comparators, Phase

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .... p 1392
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 764
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Collins Radio Co., Dallas, Tex.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Relcom, 2329 Charleston Rd., Mt. View, Calif.

RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Comparators, Q

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.

Comparators, Reluctance

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.

Comparators, Resistance—See Bridges, Inductance

Comparators, Surface—See Indicators, Surface

Comparators, Voltage

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Airpax Elctrns., Inc., Cambridge, Md.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 1319
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1749
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673-675
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intech, Inc., 1220 Coleman Ave., Santa Clara, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. ..... p 786
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adar Assocs., Inc., 65 Bolton St., Cambridge, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Geo Space, 5803 Glenmont, Houston, Tex.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
Midco, Inc., Box 5433, Trenton, N.J.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Silicon Gen'l., Inc., 7382 Bolsa Ave., Westminster, Cal.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Compasses, Electronic Gyro

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.

Compensators, Angular Motion

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.

Compensators, Lead Resistance

Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.

Component Substitutors-See Test Equipment, Component Substituting

Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Compounds, Antistatic—See Coatings, Antistatic

Compounds, Encapsulating, Molding, Potting-Also See Plastic Raw Materials

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y. ..... p 2324,2325
Dow Corning Corp., Midland, Mich. ..... p 2667-2670
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Acme Resin Co., 1401 Circle Ave., Forest Pk., Ill.
Adams & Assoc., Inc., 1062 N. Orange Grove Ave., Hollywood, Cal.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
CRC Chemicals, Dresher, Pa.
Dennis Chem. Co., 2701 Papin St., St. Louis, Mo.
Diamond Shamrock Chemical Co., 300 Union Commerce Bldg., Cleveland, Ohio
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
Durez Plastics Div., 1921 Walck Rd., N. Tonawanda, N.Y.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
Hightemp Resins, Inc., 225 Greenwich Ave., Stamford, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Kano Labs., Inc., 1000 Thompson La., Nashville, Tenn.
Kenics Corp., One Southside Rd., Danvers, Mass.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
Morton Chemical Co., 110 N. Wacker Dr., Chicago, Ill.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Nitine, Inc., Rte. 46, Clifton, N.J.
Pacific Resins & Chems., Inc., 3142 W. Mill Rd. Ct., Milwaukee, Wisc.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Rector Engrg. & Plastics Co., 318 Randolph Pl., N.E., Washington, D.C.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rogers Anti-Static Chems., Inc., 22 W. Madison, Chicago, Ill.
Rogers Corp., Rogers, Conn.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Seal-Peel, Inc., 775 Stephenson Hwy., Royal Oak, Mich.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Smooth-On, Inc., 1000 Valley Rd., Gillette, N.J.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tra-Con, Inc., 55 North St., Medford, Mass.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
U.S. Polymeric, Inc., Canal & Ludlow Sts., Stamford, Conn.
Western Coating Co., Box 598, Royal Oak, Mich.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.
Zurn Inds., 5533 New Perry Hwy., Erie, Pa.

Compounds, Weatherproofing—See Coatings, Weatherproofing

Compressors, Data & Speech

Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Computer Logic Circuits—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic

Computer Memory Testers—See Testers, Computer Memory

Computer Tape Recorders—See Data Recorders

Computer Teaching Devices—See Teaching Machines

Computer Type Indicators—See Lights; Dials; Readouts

Computers, Analog

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Signal Div., Regent St., E. Norwalk, Conn.

Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Bailey Meter Co., Wickliffe, Ohio
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Foxboro Co., Foxboro, Mass.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Link Div., Binghamton, N.Y.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Data Prods., 888 Galindo St., Concord, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Computers, Desk Top (Digital)

Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
EMR Div., Box 223, Princeton, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Monroe, 550 Central Ave., Orange, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Olivetti Corp., One Park Ave., New York, N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Tempo Computers, Inc., 1550 S. State College Blvd., Anaheim, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Computers, Digital (General Purpose)

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal.
Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 590
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
B-D Spear Medical Sys., 335 Bear Hill Rd., Waltham, Mass.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Datacraft Corp., Box 23550, Ft. Lauderdale, Fla.
Digiac Corp., Ames Ct., Plainview, N.Y.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
EMR Computer, 8001 Bloomington Frwy., Minneapolis, Minn.
EMR Div., Box 223, Princeton, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Sys., Inc., 644 Young St., Santa Ana, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Olivetti Corp., One Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Systems Engrg. Labs., Box 9148, Ft. Lauderdale, Fla.
Tempo Computers, Inc., 1550 S. State College Blvd., Anaheim, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Viatron Computer Sys., Rte. 62, Bedford, Mass.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Computers, Digital (Special Purpose)

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... p 585
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 590
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
AC Elctrns. Div., 7929 S. Howell Ave., Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
B-D Spear Medical Sys., 335 Bear Hill Rd., Waltham, Mass.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Bristol Div, Waterbury, Conn
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Collins Radio Co., Cedar Rapids, Iowa
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Datacraft Corp., Box 23550, Ft. Lauderdale, Fla.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Defense Elctrns., Inc., Rockville, Md.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electromec, Inc., 209 N. Tradd St., P.O. Box 1022, Statesville, N.C.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Modules Corp., Box 141, Timonium, Md.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
EMR Computer, 8001 Bloomington Frwy., Minneapolis, Minn.
EMR Div., Box 223, Princeton, N.J.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Evans & Sutherland Computer Corp., 3 Research Rd., Salt Lake City, Utah
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Harworth Mfg. Co., 2881 El Camino Real, Redwood City, Calif.
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
IME Sys., 7800 River Rd., No. Bergen, N.J.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Link Div., Binghamton, N.Y.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Sys., Inc., 644 Young St., Santa Ana, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Tempo Computers, Inc., 1550 S. State College Blvd., Anaheim, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Computers, Hybrid, Analog-Digital

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Bailey Meter Co., Wickliffe, Ohio
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Defense Elctrns., Inc., Rockville, Md.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.

Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Link Div., Binghamton, N.Y.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Computers, Radiac—See Analyzers, Radiation

Computing Equipment, Peripheral—See Converters; Counters; Printers; etc.

Condensers—See Capacitors

Conductive Fabrics, Films & Tapes—See Fabrics, Conductive

Conduit, Electrical

Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill.
Wiremold Co., Hartford, Conn. ..... p 2557
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Cerro Corp., 300 Park Ave., New York, N.Y.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Danex Corp., 60 Tomlinson Rd, Huntingdon Valley, Pa.
General Cable Corp., 733 Third Ave., New York, N.Y.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Ideas, Inc., 118 Grand Ave., Laramie, Wyo.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Taylor Elec., Fisher Rd., Howell, Mich.
Titeflex, Inc., Hendee St., Springfield, Mass.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Cones, Speaker—See Speaker Cones

Connector Adapters

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2396,2402
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2404-2415
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Bendix Corp., Box 239, Franklin, Ind. ..... p 2417
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. ..... p 2430
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y. ....p 2444,2445
Hughes Aircraft Co., Box H, Newport Beach, Cal.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462,2463
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2475-2481,2484,2489,2511,2513,2515-2519
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2534
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Bendix Corp., Sidney, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Deutsch Co., Municipal Airport, Banning, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Prodelin, Inc., Box 131, Hightstown, N.J.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Connector Boxes & Strips, Power Outlet

Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Wiremold Co., Hartford, Conn. ..... p 2556,2557
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Antennacraft Co., Box 1005, Hwy. 34, W., Burlington, Iowa
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Connectors & Terminals, Push-On, Quick Disconnect

Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2426,2427
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. ..... p 2430
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
ETC, Inc., 990 East 67 St., Cleveland, Ohio ..... p 2442
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y. ....p 2444,2445
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2404
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
North Elec. Co., 553 S. Market St., Galion, Ohio ..... p 2072
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Connectrol Corp., 28 E 22nd St, New York, N Y
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Deutsch Co., Municipal Airport, Banning, Calif.
Doran Mfg. Co., 1033 Bader St., Cincinnati, Ohio
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hollingsworth Solderless Terminal Co., P.O. Box 430, Phoenixville, Pa.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Marshall, John Assocs., Inc., Box 6276, Bridgeport, Conn.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Connectors, Anode—See Tube Parts

Connectors, Antenna—See Connectors, R-F, Coaxial

Connectors, Battery

Connector Corp., 6025 N. Keystone, Chicago, Ill. .....p 2434,2435
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Matrix Science Corp., 435 Maple Ave., Torrance, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.

Sittler Corp., 18 N. Ada St., Chicago, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Connectors, Circular, Audio

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2369
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Connector Corp., 6025 N. Keystone, Chicago, Ill. .....p 2434,2435
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455-2457
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Barker Prods. Co., 344 Central St., Saugus, Mass.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Connectors, Circular, Heavy Duty, Power

Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2386,2387,2391,2394,2395
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2373,2380
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2410,2413
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455-2457
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Matrix Science Corp., 435 Maple Ave., Torrance, Cal.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. .. p 2521
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Bendix Corp., Sidney, N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Deutsch Co., Municipal Airport, Banning, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Equipment & Svc. Co., 7118 Envoy Ct., Dallas, Tex.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Lemosa, Inc., 465 California St., San Francisco, Cal.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Teledyne Mecca, Box 36393, Houston, Tex.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Connectors, Circular, Hermetic & Pressurized

Amp Inc., 155 Park St., Elizabethtown, Pa. .....p 2366,2367
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2385,2388-2390,2392,2394,2395,2397,2402
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2373
Bendix Corp., Box 239, Franklin, Ind.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. ..... p 2430
Continental Connector Corp., 34-63 56th St., Woodside, N.Y.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455-2457,2459
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. ..... p 2466
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Bendix Corp., Sidney, N.Y.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
General Lab. Assocs., Norwich, N.Y.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Latronics Corp., Box 469, Latrobe, Pa.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Circular, Minature & Subminiature

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2388-2390,2392-2402
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2369,2372-2374
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2403-2410,2415
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Bendix Corp., Box 239, Franklin, Ind. ..... p 2417
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. ..... p 2430
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Continental Connector Corp., 34-63 56th St., Woodside, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 2441
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
ESCA, Cove Rd., Box 278, Port Salerno, Fla. .....p 2450,2451
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455-2457,2459
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462,2463
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. ..... p 2466
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2534
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Bendix Corp., Sidney, N.Y.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Crimpco Engrg., 7341 Canoga Ave., Cangoga Park, Calif.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Delta Plastics Co., 776 Creek Rd., Bellmawr, N.J.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Lab. Assocs., Norwich, N.Y.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Multicon Div., Box 899, Ft. Wayne, Ind.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Circular, Quick Disconnect

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. ..... p 2363
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2392,2396-2401
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2369,2372-2374
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2403,2407,2415
Bendix Corp., Box 239, Franklin, Ind. ..... p 2417
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. ..... p 2430
Connector Corp., 6025 N. Keystone, Chicago, Ill. .....p 2434,2435
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y. ....p 2444,2445
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2456,2457,2459
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462,2463
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528

Specialty Connector Co., Inc., 3560 Madison Ave., Indianapolis, Ind. ..... p 2536
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Bendix Corp., Sidney, N.Y.
Burndy Corp., Richards Ave., Norwalk, Conn.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lemosa, Inc., 465 California St., San Francisco, Cal.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Multicon Div., Box 899, Ft. Wayne, Ind.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Roylyn, 620 Paula Ave., Glendale, Cal.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teale Machine Co., Inc., Box 936, Rochester, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Mecca, Box 36393, Houston, Tex.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Connectors, Corona Shielded

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bendix Corp., Sidney, N.Y.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Burndy Corp., Richards Ave., Norwalk, Conn.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.

Connectors, Filter

Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bendix Corp., Sidney, N.Y.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Deutsch Co., Municipal Airport, Banning, Calif.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.

Connectors, Flat Cable

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2437
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. ..... p 2466
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. .... p 2546
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2555
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Rogers Corp., Rogers, Conn.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.

Connectors, Fused

Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Astrolab Inc., 4 Mc Candless St, Linden, N J
Burndy Corp., Richards Ave., Norwalk, Conn.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio

Connectors, Integrated Circuit—See Sockets, Integrated Circuit

Connectors, Interlock

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2378
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y. ....p 2444,2445
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543-2546
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Connectors, Microphone

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2369
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462,2463
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Connectors, Missile (Umbilicals, Interstage, Post Boost)

Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Matrix Science Corp., 435 Maple Ave., Torrance, Cal.
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Burndy Corp., Richards Ave., Norwalk, Conn.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Deutsch Co., Municipal Airport, Banning, Calif.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Roylyn, 620 Paula Ave., Glendale, Cal.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Plug-In, Program Board

Amp Inc., Box 3608, Harrisburg, Pa.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ..... p 2431
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Matrix Science Corp., 435 Maple Ave., Torrance, Cal.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
Specialty Connector Co., Inc., 3560 Madison Ave., Indianapolis, Ind. ..... p 2536
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Lemosa, Inc., 465 California St., San Francisco, Cal.
Mac Panel Co., Box 5027, High Pt., N.C.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Connectors, Printed Circuit

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2381-2384
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2420-2424
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436,2437
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dale Elctrns., Inc., 1342 26th Ave., Columbus, Neb. ..p 2440,2441
Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1353
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446,2447
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453

ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. p 2521
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2534
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan p 2532
Specialty Connector Co., Inc., 3560 Madison Ave., Indianapolis, Ind. p 2536
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2545-2547
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Components Corp., 106 Main St., Denville, N.J.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Space Prods., Inc., 6631 Sarnia Ave., Long Beach, Calif.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Connectors, R-F, Coaxial

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. p 2363
Alford Mfg. Co., 120 Cross St., Winchester, Mass. p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. p 859
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2403-2415
Arra Inc., 15 Harold Ct., Bayshore, N.Y. p 853
Bendix Corp., Box 239, Franklin, Ind. p 862,2417
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2422
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn. p 2430
Connector Corp., 6025 N. Keystone, Chicago, Ill. p 2435
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
ESCA, Cove Rd., Box 278, Port Salerno, Fla. p 2450,2451
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y. p 2444,2445
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462,2463
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio p 2529
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2534
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Specialty Connector Co., Inc., 3560 Madison Ave., Indianapolis, Ind. p 2536
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2555
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Budwig Mfg. Co., P.O. Box 97, Ramona, Calif.
Burndy Corp., Richards Ave., Norwalk, Conn.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Deutsch Co., Municipal Airport, Banning, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plaxial Div., 70 Jaconnet St., Newton Highlands, Mass.
Prodelin, Inc., Box 131, Hightstown, N.J.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Superior Continental Corp., Box 489, Hickory, N.C.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Connectors, R-F, Coaxial, Hermaphroditic

Alford Mfg. Co., 120 Cross St., Winchester, Mass. p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.

Connectors, Rectangular, Cable To Chassis

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2375-2380
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2425-2427
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2437
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Hughes Aircraft Co., Box H, Newport Beach, Cal. p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457,2458
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. p 2466,2468
North Elec. Co., 553 S. Market St., Galion, Ohio p 2072
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. p 2521
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio p 2529
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. p 2528
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543,2545
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2555
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Connectors, Rectangular, Environmental

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436
Hughes Aircraft Co., Box H, Newport Beach, Cal. p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. p 2466
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio p 2529
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2555
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Connectors, Rectangular, Hermetic

Amp Inc., 155 Park St., Elizabethtown, Pa. .....p 2366,2367
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2437
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. ..... p 2543
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Latronics Corp., Box 469, Latrobe, Pa.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Connectors, Rectangular, Hermaphroditic

Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. ..... p 2543
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.

Connectors, Rectangular, High Voltage

Amp Inc., 155 Park St., Elizabethtown, Pa. .....p 2366,2367
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. ..p 547
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2421,2425-2427
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Computer Power Sys., Inc., 722 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1015
Continental Connector Corp., 34-63 56th St., Woodside, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2440,2441
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543-2545,2547
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2555
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Rectangular, Miniature & Subminiature

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2372,2375-2377,2379,2381-2384
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2420-2424
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436,2437
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2440,2441
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446,2447
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457-2459
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. p 2466-2468
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J. ..... p 1529
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. .. p 2521
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543-2547
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Micro Science Assocs., 2274 Mora Dr., Mt. View, Cal.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Staffall, Inc., 7 Woodland St., Providence, R.I.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Rectangular, Rack & Panel

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2375-2380
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2422-2425
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436,2437
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2440,2441
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446,2447
Hughes Aircraft Co., Box H, Newport Beach, Cal. ..... p 2453
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 2453
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2455,2457-2459
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Matrix Science Corp., 435 Maple Ave., Torrance, Cal. p 2466,2468
North Elec. Co., 553 S. Market St., Galion, Ohio ..... p 2072
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. .. p 2521
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543-2545
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Connectors, Rectangular, Test

Airborn, Inc., 2618 Manana Dr., Dallas, Tex. ..... p 2368
Amp Inc., Box 3608, Harrisburg, Pa.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y. p 2436
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo. .. p 2521
Techno-Comps. Corp., 7803 Lemona, Van Nuys, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
U.S. Components, Inc., 1320 Zerega Ave., Bronx, N.Y. p 2543,2545,2547
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554,2555
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Stripline

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Bendix Corp., Box 239, Franklin, Ind. ..... p 2417
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2450
American Radar Comps., Inc., 415 E. Main St., Denville, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.

Connectors, Thermocouple

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2394,2402
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Deutsch Co., Municipal Airport, Banning, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Lab. Assocs., Norwich, N.Y.
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Lemosa, Inc., 465 California St., San Francisco, Cal.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.

Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Connectors, Triaxial

Bendix Corp., Box 239, Franklin, Ind. ..... p 2417
Glass Technology Div., 822 Production Pl., Newport Bch., Cal.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.....p 2444,2445
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Burndy Corp., Richards Ave., Norwalk, Conn.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
General Lab. Assocs., Norwich, N.Y.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Connectors, Waterproof

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2385
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2525
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beman Mfg., Inc., New Cumberland, Pa.
Bendix Corp., Sidney, N.Y.
Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.
Burndy Corp., Richards Ave., Norwalk, Conn.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Electro Oceanics, Inc., 2000 S. Santa Fe Ave., Compton, Calif.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif.
Geo Space, 5803 Glenmont, Houston, Tex.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Lemosa, Inc., 465 California St., San Francisco, Cal.
Massa Div., 280 Lincoln St., Hingham, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pyle-National Co., Military Connector Div., 1334 N. Koster, Chicago, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Roylyn, 620 Paula Ave., Glendale, Cal.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Consoles, Cabinet—See Cabinets & Accessories, Metal

Contact Cleaners—See Cleaners & Solvents

Contact Strips, Finger

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2386
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. ..... p 2682
Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J. ..... p 2599
Metex Corp., 970 New Durham Rd., Edison, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elmac, 301 Industrial Way, San Carlos, Calif.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Gibson Elec., Delmont, Pa.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Masterite Inds., Inc., 2841 Lomita Blvd., Torrance, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Micro Science Assocs., 2274 Mora Dr., Mt. View, Cal.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Contactors—See Relays, Power

Contacts, Electrical

Airborn, Inc., 2618 Manana Dr., Dallas, Tex.
Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2391
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2369,2374
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Cinch-Nu Line, 1015 S. Sixth St., Minneapolis, Minn.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. ..... p 2682
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Hughes Aircraft Co., Box H, Newport Beach, Cal.
Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J. ..... p 2599
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal. p 2457
Metex Corp., 970 New Durham Rd., Edison, N.J.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Burndy Corp., Richards Ave., Norwalk, Conn.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Crimpco Engrg., 7341 Canoga Ave., Cangoga Park, Calif.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Deringer Metallurgical Corp., 1250 Town Line Rd., Rte 60, Mundelein, Ill.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Flight Connector Corp., 14128 Lemoli Ave, Hawthorne, Calif.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gibson Elec., Delmont, Pa.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Mallory Metallurgical Co., 3029 E. Washington St., Indianapolis, Ind.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Ostby & Barton Co., Box 6267, Providence, R.I.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Servometer Corp., 82 Industrial, E., Clifton, N.J.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Stanley Ind'l. Comps. Div., Forestville, Conn.
Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, Ohio
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Townsend Co., 530 West St., Braintree, Mass.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Volkert Stampings, Inc., 222-34 96th Ave., Queens Village, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Containers, Shielded (All Types)

Metex Corp., 970 New Durham Rd., Edison, N.J.
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill..... p 2630
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2495-2504
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Danex Corp., 60 Tomlinson Rd, Huntingdon Valley, Pa.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Koch, H. & Sons, Corte Madera, Cal.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio

Containers, Shipping, Metal & Fiberglass (Reusable)-Also See Transit Cases

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J. ..... p 2146
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill..... p 2630
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Corrugated Paper Prods., Inc., 300 Babylon Tpke., Roosevelt, N.Y.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Koch, H. & Sons, Corte Madera, Cal.
Lewis G. B. Co, 426 Montgomery St., Watertown, Wisc
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Royal Inds., 2040 E. Dyer Rd., Santa Ana, Calif.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Containers, Storage

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J. ..... p 2146
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Akro-Mils, Inc., Box 989, Akron, Ohio
Althor Prods., 2260 Benson Ave., Brooklyn, N.Y.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Ballonoff Metal Prods. Co., 14055 Cedar Rd., Cleveland, Ohio
Bradley Inds., 11040 King St., Franklin Park, Ill.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Corrugated Paper Prods., Inc., 300 Babylon Tpke., Roosevelt, N.Y.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Equipment Co. of America, 1075 Hialeah Dr., Hialeah, Fla.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Koch, H. & Sons, Corte Madera, Cal.
Kole Enterprises, Inc., P.O. Box 152, Biscayne Annex, Miami, Mass.
Lewis G. B. Co, 426 Montgomery St., Watertown, Wisc
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.

NVF Co. Maryland Ave. & Beech St., Wilmington, Del.
Plastofilm, Inc., 916 W. Union Ave., Wheaton, Ill.
Republic Steel Corp. Box 6778, Cleveland, Ohio
Robins Data Devices, Inc., 15-58 127th St, Flushing, N.Y.
Royal Inds., 2040 E. Dyer Rd., Santa Ana, Calif.
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Stackbin Corp., Box 434, Pawtucket, R.I.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Vichek Plastics Co., Middlefield, Ohio

Containers, Transit—See Transit Cases

Control Equipment, Classification

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
CML, Inc., 166 National Rd., Edison, N.J.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Century Strand, Inc., 3 Entin Rd., Clifton, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Defense Elctrns., Inc., Rockville, Md.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Safety Controls, Inc., 1411 N. Corn St., Joliet, Ill.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Femco Div., Box F, Irwin, Pa.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Hope Elctrns., Box 773, Clifton, N.J.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Moog, Inc., Proner Airport, East Aurora, N.Y.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Control Panels & Systems, Computer—See Boards, Programming

Controls, Capacitance Operated

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Foxboro Co., Foxboro, Mass.
Hird Brown America, Box 544, Livingston, N.J.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Controls, Carbon—See Potentiometers; Rheostats

Controls, Combustion

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fuel Watchman Sls. & Svc., Inc., 2910 Park Ave., Bronx, N.Y.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hays Corp., Michigan City, Ind.
Hird Brown America, Box 544, Livingston, N.J.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Selas Corp. America, Box 200, Dresher, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Constant Impedance—See Attenuators

Controls, Counting & Sorting

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass... p 1368
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Eagle Signal Div., 736 Federal St., Davenport, Iowa..... p 1372
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Icon Corp., 156 Sixth St., Cambridge, Mass..... p 1386
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal... p 749
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Delavan Mfg Co, 811 Fourth St, West Des Moines, Iowa
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Modules Corp., Box 141, Timonium, Md.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Femco Div., Box F, Irwin, Pa.
Femco Div., Box F, Irwin, Pa.
General Atronics Corp., Sub. Magnavox Co., Industrial Div, 1200 E. Mermaid La., Philadelphia, Pa.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hird Brown America, Box 544, Livingston, N.J.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sensory, Inc., 1 Kennedy Rd., Morris Plains, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Worner Elctrn. Devices, Rankin, Ill.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Controls, Density

Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electron-Machine Corp., Box M, Umatilla, Fla.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Waynesboro, Va.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Princo Instrs., Inc., Industrial Pk., Southampton, Pa.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Dimension

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Beta Corp., 2639 Manana Dr., Box 20427, Dallas, Tex.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.

Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
General Elec. Co., Waynesboro, Va.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Door Opening & Closing (Industrial)

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Chamberlain Mfg. Corp., 5740 N. Tripp Ave., Chicago, Ill.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Femco Div., Box F, Irwin, Pa.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hird Brown America, Box 544, Livingston, N.J.
Honeywell, 11 W. Spring St., Freeport, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Linear Corp., 347 S. Glasgow Ave., Inglewood, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Skinner Polynoid Div., 95 Edgewood Ave., New Britain, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Welex Elctrns., Box 986, Silver Spring, Md.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Environmental Test Equipment

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Chadwick-Helmuth Co., Inc., 111 E. Railroad Ave., Monrovia, Calif.
Delta Design, Inc., P.O. Box 1118, 8000 Fletcher Pkwy., La Mesa, Calif.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electronic Control Co., Box S150, Dresher, Pa.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
MB Elctrns., Box 1825, New Haven, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Research, Inc., Box 24064, Minneapolis, Minn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
T & T Controls Co., Inc., Box 171, Media, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Controls, Film Thickness—See Controls, Material Thickness

Controls, Flame Failure

Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
TIA Elec. Co., Box 777, Princeton, N.J.

Controls, Fluid Conductivity

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Eastern Chem. Corp., 3rd & Greenwich Sts., Reading, Pa.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Waynesboro, Va.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.

Controls, Fluid Flow

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Rotron, Inc., Hasbrouck La., Woodstock, N.Y.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Adel Div., 10777 Van Owen St., Burbank, Calif.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anderson, W.E., Inc., 320E West 80th St., Kansas City, Mo.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Brooks Instr. Div., Hatfield, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Erdco Engrg. Corp., 136 Official Rd., Addison, Ill.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Harwil Co., 903 Colorado Ave., Santa Monica, Calif.
Hays Corp., Michigan City, Ind.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Joliet Control Corp., Box 751, Joliet, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Midco, Inc., Box 5433, Trenton, N.J.
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Power Engrg. & Equip. Co., Inc., 1826 213th St., Torrance, Cal.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Skinner Elec. Valve Div., 95 Edgewood Ave., New Britain, Conn.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Winterburn Mfg. Co., Box 386, Putnam, Conn.

Controls, Frequency

Accutronics, Inc., 628 North St., Geneva, Ill.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airpax Elctrns., Inc., Cambridge, Md.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ..... p 1443
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. ..... p 1821
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 2142

Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Leland Airborne Prods., Box 128, Vandalia, Ohio
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Riverbank Labs., Box 110, Geneva, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Controls, Gas

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Adel Div., 10777 Van Owen St., Burbank, Calif.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Essex International, Box 1007, Mansfield, Ohio
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Elec. Co., Waynesboro, Va.
Hastings-Raydist, Newcomb Ave., Hampton, Va.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Lektra Labs., Inc., 129-07 18th Ave., College Point, N.Y.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Selas Corp. America, Box 200, Dresher, Pa.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.

Controls, Hardware, Shafts & Accessories—See Shafts; Dials;etc.

Controls, Humidity

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.....p 2110,2111
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
J.K. Elctrn. Controls, Inc., Box 1582, Vancouver, Wash.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Logetronics, Inc., 6628 Electronic Dr., Springfield, Va.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Controls, Ignitron Firing

Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Geo Space, 5803 Glenmont, Houston, Tex.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Research, Inc., Box 24064, Minneapolis, Minn.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.

Controls, Illumination

Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Century Strand, Inc., 3 Entin Rd., Clifton, N.J.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Honeywell, 11 W. Spring St., Freeport, Ill.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Level, Dry Material

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Delavan Mfg Co, 811 Fourth St, West Des Moines, Iowa
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Hird Brown America, Box 544, Livingston, N.J.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Level, Liquid

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 2028
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y..... p 2809
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Delavan Mfg Co, 811 Fourth St, West Des Moines, Iowa
Delta Engrg., Box 620, Boulder, Colo.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Dynasonics Corp., Box 672, Pipestone, Minn.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Hays Corp., Michigan City, Ind.
Hird Brown America, Box 544, Livingston, N.J.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Jo-Bell Prods., Inc., 5456 West 111th St., Oak Lawn, Ill.

Johnson Corp., 805 Wood St., Three Rivers, Mich.
Joliet Control Corp., Box 751, Joliet, Ill.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Malaker Corp., W. Main St., High Bridge, N.J.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Engrg. & Equip. Co., Inc., 1826 213th St., Torrance, Cal.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stametics Co., P.O. Box 9308, N. Hollywood, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Machine Tool

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amp Inc., Box 3608, Harrisburg, Pa. ..... p 537
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 2028
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Aldshir Mfg. Co., Inc., 111 Lake Ave., Tuckahoe, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Bendix Corp., 12843 Greenfield, Detroit, Mich.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Bunker-Ramo Corp., 747 Alpha Dr., Cleveland, Ohio
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Gettys Mfg. Co., Inc., 2700 Golf Ave., Racine, Wisc.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Servo Prods. Co., Box B, Altadena, Cal.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Trish Energetics, Pond Rd., Harvard, Mass.
Weldotron Corp., 1532 S. Washington Ave., Piscataway, N.J.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Westinghouse Elec. Corp., Buffalo, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Winterburn Mfg. Co., Box 386, Putnam, Conn.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Controls, Materials Thickness

Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electron-Machine Corp., Box M, Umatilla, Fla.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Ultek Div., Box 10920, Palo Alto, Calif.
Unit Process Assemblies, 53-15 37th Ave., Woodside, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Controls, Meter—See Meter Controllers

Controls, Moisture—See Controls, Humidity

Controls, Motor Speed

Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Autotronics, Inc., 2700 Davis, Joplin, Mo
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
CML, Inc., 166 National Rd., Edison, N.J.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Magnetics, Inc., Box 391, Butler, Pa.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 2116
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ..... p 1690
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691
Singer Co., Finderne Ave., Somerville, N.J.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. p 1230,1698,2898,2900
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ....p 1282,1283
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa.
Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif.
Advance Instr. Corp., 1707 F. St., Belmar, N. J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astro Elctrns., Inc., 1160 E. Ash, Fullerton, Calif.
Autocon Inds., Inc., 995 University, St. Paul, Minn.

Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Belleville Elctrns/ Co., 25 Fifth St., Belleville, Mich.
Beta Corp., 2639 Manana Dr., Box 20427, Dallas, Tex.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Hailaday St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electrol Co., Inc., 771 Spring La.; York, Pa.
Electronic Control Co., Box S150, Dresher, Pa.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Excellon Inds., 23915 Garnier, Torrance, Calif.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hope Elctrns., Box 773, Clifton, N.J.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Joliet Control Corp., Box 751, Joliet, Ill.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Magnetics, Sandy Lake, Pa.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Midco, Inc., Box 5433, Trenton, N.J.
Minarik Electric Co., 226 E. Third St., Los Angeles, Calif.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Research, Inc., Box 24064, Minneapolis, Minn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
T & T Controls Co., Inc., Box 171, Media, Pa.
Task Corp., Box 3999, Anaheim, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Buffalo, N. Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winterburn Mfg. Co., Box 386, Putnam, Conn.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Controls, Oscillator

Accutronics, Inc., 628 North St., Geneva, Ill.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
HB Engrg. Corp.,1101 Ripley St., Silver Spring, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.

Controls, P-H

Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Analytical Meas., Inc., 31 Willow St., Chatham, N.J.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Controls, Photoelectric

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y..... p 1397
Vactec, Inc., 2423 Northline Ind'l. Blvd., Maryland Hgts., Mo. p 1707
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Appalachian Elctrn. Instrs., Inc., 810 W. Monroe Ave., Ronceverte, W. Va.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astronics, Inc., 204 W. Bedford, Euless Rd., Hurst, Tex.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Burlingame Sci., Box 1754, Burlingame, Cal.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Mach. Parts, Inc., 128-11 18th Ave., College Point, N.Y.
EMR Div., Box 223, Princeton, N.J.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Fotomatic Corp., 3141 W. Tenth, Indianapolis, Ind.
General Elec. Co., Waynesboro, Va.
Hird Brown America, Box 544, Livingston, N.J.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lektra Labs., Inc., 129-07 18th Ave., College Point, N.Y.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
LGM Elctrns., Inc., 4304 La Branch St., Houston, Tex.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phlco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photo-Crystals, 605 Prairie St., St. Charles, Ill.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Pioneer Elec. & Resch. Corp., 743 Circle Ave., Forest Park, Ill.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Schoeffel Instr. Corp., 24 Booker St. Westwood, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tabet Mfg. Co., 1336 Ballentine Blvd., Norfolk, Va.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
TIA Elec. Co., Box 777, Princeton, N.J.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Weldotron Corp., 1532 S. Washington Ave., Piscataway, N.J.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Positioning

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Icon Corp., 156 Sixth St., Cambridge, Mass..... p 1386
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Magnetics, Inc., Box 391, Butler, Pa.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691

Singer Co., Finderne Ave., Somerville, N.J.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1996
Weston-Transicoil, Worcester, Pa.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Arvin Sys., Inc., 1482 Stanley Ave., Dayton, Ohio
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., S. Montrose, Pa.
Bendix Corp., 12843 Greenfield, Detroit, Mich.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Bristol Div, Waterbury, Conn
Bunker-Ramo Corp., 747 Alpha Dr., Cleveland, Ohio
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Mach. Parts, Inc., 128-11 18th Ave., College Point, N.Y.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Foxboro Co., Foxboro, Mass.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hays Corp., Michigan City, Ind.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
O'Brien, D. G., Inc., 15 Mercer Rd., Natick, Mass.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Southwest Prods. Co., 1705 S. Mountain Ave., Monrovia, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
TIA Elec. Co., Box 777, Princeton, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Trish Energetics, Pond Rd., Harvard, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Controls, Pressure

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 2028
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Adel Div., 10777 Van Owen St., Burbank, Calif.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bellofram Corp., 103 Blanchard Rd., Burlington, Mass.
Bendix Corp., S. Montrose, Pa.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bristol Div, Waterbury, Conn
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Conrac Corp., 330 Madison Ave., New York, N.Y.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Ellison Draft Gage Co., Inc., Box 96, New Buffalo, Mich.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Gems Co., Inc., The, Spring La., Farmington, Conn.
Granville-Phillips Co., 5675 E. Arapahoe Ave., Boulder, Colo.
Hays Corp., Michigan City, Ind.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Joliet Control Corp., Box 751, Joliet, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
MB Elctrns., Box 1825, New Haven, Conn.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Trish Energetics, Pond Rd., Harvard, Mass.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Programmable

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Airpax Elctrns., Inc., Cambridge, Md.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa. ..... p 537
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. ..... p 605
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Digitron Corp., 2544 W. Main St., Norristown, Pa.
General Time Corp., Rte. 8, Torrington, Conn.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. ..... p 583
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ....p 1230,1698
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Arvin Sys., Inc., 1482 Stanley Ave., Dayton, Ohio
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Bendix Corp., 12843 Greenfield, Detroit, Mich.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
EMR Div., Box 223, Princeton, N.J.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.

Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Controls, Proportioning

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 607
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1425
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. ..... p 1369
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Guardian California, 5755 Camille Ave., Culver City, Cal.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 700
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Magnetics, Inc., Box 391, Butler, Pa.
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 2118
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hays Corp., Michigan City, Ind.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magnetics, Sandy Lake, Pa.
Malaker Corp., W. Main St., High Bridge, N.J.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Research, Inc., Box 24064, Minneapolis, Minn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
T & T Controls Co., Inc., Box 171, Media, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
TIA Elec. Co., Box 777, Princeton, N.J.
United Elec. Controls Co., 85A School St., Watertown, Mass.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Controls, Proximity-Also See Controls, Capacitance Operated

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Licon Div., 8615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Ade Corp., 385 Waverley Ave., Newton, Mass.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Controls, Remote

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 1718
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Midtex/Aemco, 10 State St., Mankato, Minn. ..... p 1829
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y. ..... p 2090
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Abtronics, Inc., Box 712, Livermore, Calif.
Aemco Div., 10 State St., Mankato, Minn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barrett Elctrns. Corp., 630 Dundee Rd., Northbrook, Ill.
Beckman Instrs., Inc.; Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Femco Div., Box F, Irwin, Pa.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Joliet Control Corp., Box 751, Joliet, Ill.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Linear Corp., 347 S. Glasgow Ave., Inglewood, Calif.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Rust Corp., 168 Tremont St., Everett, Mass.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Servwell Prods. Co., 16309 Friend Ave., Cleveland, Ohio
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Winterburn Mfg. Co., Box 386, Putnam, Conn.

Controls, SCR

Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 607
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902-1904
Lowell Elctrns. Corp., 9100 Terminal Ave., Skokie, Ill. ..... p 739
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Magnetics, Inc., Box 391, Butler, Pa.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882

Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bristol Div, Waterbury, Conn
Bunker-Ramo Corp., 747 Alpha Dr., Cleveland, Ohio
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De Soto Elec. Prods., Box 239, De Soto, Mo.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Modules Corp., Box 141, Timonium, Md.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., Waynesboro, Va.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Joliet Control Corp., Box 751, Joliet, Ill.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magnetics, Sandy Lake, Pa.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Midco, Inc., Box 5433, Trenton, N.J.
Minarik Electric Co., 226 E. Third St., Los Angeles, Calif.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Research, Inc., Box 24064, Minneapolis, Minn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
T & T Controls Co., Inc., Box 171, Media, Pa.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Voitex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.

Controls, Servo

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1983
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 653
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990,1991
International Rectifier, 233 Kansas St., El Segundo, Cal.
Lowell Elctrns. Corp., 9100 Terminal Ave., Skokie, Ill. ..... p 739
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Singer Co., Finderne Ave., Somerville, N.J.
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Weston-Transicoil, Worcester, Pa. ..... p 1998
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., S. Montrose, Pa.
Bendix Corp., 12843 Greenfield, Detroit, Mich.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Dallas, Tex.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electrol Co., Inc., 771 Spring La., York, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gettys Mfg. Co., Inc., 2700 Golf Ave., Racine, Wisc.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Keltron Corp., 225 Crescent St., Waltham, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
MB Elctrns., Box 1825, New Haven, Conn.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Moog, Inc., Proner Airport, East Aurora, N.Y.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Sciaky Bros., Inc., 4915 West 67th St., Chicago, Ill.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Control Corp., Redmond, Wash.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.

Controls, Smoke & Combustion—See Controls, Combustion

Controls, Specific Gravity

Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Bailey Meter Co., Wickliffe, Ohio
Bristol Div, Waterbury, Conn
Foxboro Co., Foxboro, Mass.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Milton Roy Co., 5000 Park St., N., St. Petersburg, Fla.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.

Controls, Stepping Motor

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Datastan, Inc., 1111 Paulison Ave., Clifton, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn..... p 1672
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Weston-Transicoil, Worcester, Pa.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.

Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Keltron Corp., 225 Crescent St., Waltham, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
T & T Controls Co., Inc., Box 171, Media, Pa.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Controls, Temperature-Also See Monitors, Temperature

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 607
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1425
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2098
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2098
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2098
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110,2111
Hexacon Elec. Co., 621 W. Clay Ave., Roselle Park, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
International Rectifier, 233 Kansas St., El Segundo, Cal.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 2118
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y. ..... p 1397
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weller, 100 Wellco Rd., Easton, Pa.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1866
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bimet Corp., Box 518, Morris, Ill.
Bristol Div, Waterbury, Conn
Burling Instr. Co., 21 River Rd., Box 298, Chatham, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Chatham Controls Corp., 33 River Rd., Chatham, N.J.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Dales, Franklin Co., 180-85 E. Mill St., Akron, Ohio
David Inds., 2202 S. Wright, Santa Ana, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro-Flex Heat, Inc., Northwood Ind'l. Pk., Bloomfield, Conn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Modules Corp., Box 141, Timonium, Md.
Essex International, Box 1007, Mansfield, Ohio
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Fenwal, Inc., Main St., Ashland, Mass.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Foxboro Co., Foxboro, Mass.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
FRL, Marin Controls Co., 517 Marine View Ave., Belmont, Cal.
Fuel Watchman Sls. & Svc., Inc., 2910 Park Ave., Bronx, N.Y.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Infotronics Corp., 1062 Linda Vista, Mountain View, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Jersey Tech. Consults., 22 Collies Ave., Box 215, Morristown, N.J.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Malaker Corp., W. Main St., High Bridge, N.J.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Princo Instrs., Inc., Industrial Pk., Southampton, Pa.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Research, Inc., Box 24064, Minneapolis, Minn.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
T & T Controls Co., Inc., Box 171, Media, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
Tempil Div., Hamilton Blvd., So. Plainfield, N.J.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Therm-O-Disc, Inc., Box 1538, Mansfield, Ohio
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
United Control Corp., Redmond, Wash.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Controls, Thyratron Grid

Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Firing Circuits Div., Muller Ave, Norwalk, Conn
Hope Elctrns., Box 773, Clifton, N.J.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.

Controls, Timing—See Timers

Controls, Torque-Electronic

Airpax Elctrns., Inc., Cambridge, Md.
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
General Time Corp., Rte. 8, Torrington, Conn.
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y. ..... p 1680
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J.
Electrol Co., Inc., 771 Spring La., York, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.

Lutron Elctrns. Co., Inc., Coopersburg, Pa.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Controls, Vacuum

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bristol Div, Waterbury, Conn
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Foxboro Co., Foxboro, Mass.
Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Arapahoe Ave., Boulder, Colo.
Hastings-Raydist, Newcomb Ave., Hampton, Va.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
United Elec. Controls Co., 85A School St., Watertown, Mass.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.

Controls, Ventilating

Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Foxboro Co., Foxboro, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Paragon Elec. Co., Inc., 1600 12th St., Two Rivers, Wisc.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Controls, Voltage Regulating—See Regulators & Stabilizers,Voltage

Controls, Volume & Tone—See Potentiometers

Controls, Welding

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio
Eagle Signal Div., 736 Federal St., Davenport, Iowa
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Electrol Co., Inc., 771 Spring La., York, Pa.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hamilton Standard, Windsor Locks, Conn.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Precision Arc Co., Inc., 785 Woodend Rd., Stratford, Conn.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Sciaky Bros., Inc., 4915 West 67th St., Chicago, Ill.
Silver, G.H. & Assocs., Inc., P.O. Box 21, Newtonville, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Controls, Wire Wound—See Potentiometers; Rheostats

Convection Cooling Packages, Semiconductor—See Transistor & Diode Heat Dissipators

Converters, A-C To D-C

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930-932,934
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 954,955
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Circuit Power, Inc., 227 Main St., Portland, Conn. ..... p 1008
CML, Inc., 166 National Rd., Edison, N.J.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa. ..... p 1016
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y. p 2853
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1038
Frequency Control, Inc., Box 671, Austin, Tex.
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 722
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1125,1126,1130,1132,1140
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal. ..... p 1186
RCA, 415 S. 5th St., Harrison, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1206
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y. .. p 1262
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal. .... p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1288
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1280
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
B-W Mfrs., Inc., 721 N. Webster St., Kokomo, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Foxboro Co., Foxboro, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Converters, Analog To Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. p 538,2005
Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542,612
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637

Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1987
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. p 549,550
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. .....p 558,559
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 560
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y..... p 554
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Elctrn. Comps. Div., Trevose, Pa.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass. p 566
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa. p 569
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
Neutronic Corp., Box 625, St. Louis, Mo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 591
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586,587
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 594
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Weston-Transicoil, Worcester, Pa.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bristol Div, Waterbury, Conn
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Collectron Corp., 304 East 45th St., New York, N.Y.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Litton Inds., 20745 Nordhoff St., Chatsworth, Cal.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Rohde & Schwarz Sis. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Time Share Peripherals Corp., Box 361, Wilton, Conn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
United Aircraft Corp., Helen St., Norwalk, Conn.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, 611 Hansen Way, Palo Alto, Cal.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Converters, Analog To Pulse

Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Foxboro Co., Foxboro, Mass.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Converters, Binary To Decimal

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542,612
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. .....p 558,559
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn. ..... p 582
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J..... p 1528
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.

B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Burroughs Corp., Box 1226, Plainfield, N.J.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Electronic Modules Corp., Box 141, Timonium, Md.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Card To Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Counter, Vertical To Horizontal Readout

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, CRT Display

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y..... p 1292
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Comm. Display Sys., 2020 Oceanside Blvd., Oceanside, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Time Share Peripherals Corp., Box 361, Wilton, Conn.

Converters, D-C To D-C

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930,944-948
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 956,957
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Circuit Power, Inc., 227 Main St., Portland, Conn. ..... p 1009
CML, Inc., 166 National Rd., Edison, N.J.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal. p 1010,1011
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Flite-Tronics Co., Inc., 3312 Burton Ave., Burbank, Cal..... p 1060
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y. ..... p 1075
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn. p 1231,1246,1247
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1256,1257,1259,1261
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn..... p 1264
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1268
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y. ..... p 1274
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal. .... p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y..... p 1292
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1280
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Components Corp., 106 Main St., Denville, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dorsett Elctrns., Box 36, Tulsa, Okla.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Geo Space, 5803 Glenmont, Houston, Tex.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Mutron Corp., 646 Summer St, Brockton, Mass.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Applications, Inc., Box 305, Bayside, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Warren Communications, New Town Rd., Littleton, Mass.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, D-C To Frequency

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amp Inc., Box 3608, Harrisburg, Pa.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 957
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637

Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Connor-Winfield Corp., Winfield, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 643
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1046
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Control, Inc., Box 671, Austin, Tex.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J..... p 1171
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Rotron, Inc., Hasbrouck La., Woodstock, N.Y. ..... p 2663
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. .....p 1265,1266
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 597
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ..... p 1285
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Buffalo, N. Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, Digital To Analog

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y..... p 538
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass..... p 541
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. .. p 551
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Connor-Winfield Corp., Winfield, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 560
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y..... p 554
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Elctrn. Comps. Div., Trevose, Pa.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Honeywell, Box 5227, Denver, Colo.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass. p 566
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa. p 569
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass. .. p 540
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 591
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 588,589
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Cónn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 594
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Weston-Transicoil, Worcester, Pa.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Components Corp., 106 Main St., Denville, N.J.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Dynamic Meas. Corp., 108 Sumner St., Arlington, Mass.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lear Siegler, inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Networks, 5 Barbara La., Worcester, Mass.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Time Share Peripherals Corp., Box 361, Wilton, Conn.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.
Varian, 611 Hansen Way, Palo Alto, Cal.

Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Digital To Paper Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Digital To Resolver

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 543,610
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 554
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595
Weston-Transicoil, Worcester, Pa. ..... p 1998
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Converters, Digital To Synchro

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 543,544,610
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 554
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Converters, Facsimile

Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.

Converters, Frequency, Logarithmic

Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Olektron Corp., Box 248, Dudley, Mass.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, Frequency Shift Keying

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Welex Elctrns., Box 986, Silver Spring, Md.

Converters, Frequency, Test

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Behiman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
California Instrs. Corp., Behiman Div., 3511 Midway Dr., San Diego, Cal. ..... p 1004
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Frequency Control, Inc., Box 671, Austin, Tex.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.

Converters, Frequency To D-C

Airpax Elctrns., Inc., Cambridge, Md.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. ..... p 539
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behiman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Georator Corp., Box 70, Manassas, Va.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 597
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal. ..... p 1281
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Rafec Elctrns., Box 566, Temple City, Calif.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Converters, Graphic To Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Traid Corp., 777 Flower St., Glendale, Calif.

Converters, High-Frequency

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 971
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 961
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Georator Corp., Box 70, Manassas, Va. ..... p 1068,1069
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Metal Removal Co., 1801 W. Columbia, Chicago, Ill.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Raytrack Co., 3498 E. Fulton, Columbus, Ohio
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Varian/Solid State Div., Akron St., Copiague, N.Y.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, Low-Frequency

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 971
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 961
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 965,967,968
Behman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal. ..... p 970
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. ..... p 1004
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Georator Corp., Box 70, Manassas, Va. ..... p 1068,1069
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 722
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ..... p 1284
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Elctrn. Components Corp., Box 157, Addison, Ill.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.

Converters, Microwave Frequency

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Collins Radio Co., Dallas, Tex.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Converters, Paper Tape To Magnetic Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Paper Tape To Paper Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Phase

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 965,967
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654,1989
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1376
Guardian California, 5755 Camille Ave., Culver City, Cal.
Honeywell, Box 5227, Denver, Colo.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.... p 1392
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Acton Labs., Inc., 531 Main St., Acton, Mass.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.

Converters, Polar To Rectangular Coordinates

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1988,1989

General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1378
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass. p 1333
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 597
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electm. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Converters, Power Frequency, Electronic

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 971
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Avtel Corp., 1130 E. Cypress St., Covina, Cal. p 965,967
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal. p 970
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. p 1004
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. p 1005
CML, Inc., 166 National Rd., Edison, N.J. p1032a
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J. p 1171
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Static Prods., Inc., 2511 National Dr., Box 2226, Garland, Tex. p 1223
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. p 1267
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y. p 1274
Varadyne Power Sys., 14943 Calife St., Van Nuys, Cal. p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Components Corp., 106 Main St., Denville, N.J.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heath Co., Benton Harbor, Mich.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Power Control Corp., Box 11432, Pittsburgh, Pa.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Task Corp., Box 3999, Anaheim, Calif.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, Power Frequency, Rotary

CML, Inc., 166 National Rd., Edison, N.J.
Georator Corp., Box 70, Manassas, Va. p 1068,1069
Macarr, Inc., 166 National Rd., Edison, N.J.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Luminator, Inc., Box 278, Plano, Tex.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Task Corp., Box 3999, Anaheim, Calif.
Techsonics, Box 251, El Prado, N.M.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Converters, Power Frequency, Vibrator

ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
FRL, Marin Controls Co., 517 Marine View Ave., Belmont, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.

Converters, Pressure To D-C—See Transducers, Pressure

Converters, Pressure To Frequency—See Transducers, Pressure

Converters, Pulse To Analog

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. p 1637
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. p 554
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. p 1992
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Icon Corp., 156 Sixth St, Cambridge, Mass.
Intronics, Inc., 57 Chapel St., Newton, Mass. p 1333
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Superior Elec. Co., 1000 Middle St., Bristol, Conn. p 1698
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bristol Div, Waterbury, Conn
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.

Converters, Pulse To Digital

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 612
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1969
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Foxboro Co., Foxboro, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Converters, Resolver To Digital

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. p 545
Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. p 1985
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580,581
Singer Co., 915 Pembroke St., Bridgeport, Conn. p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. p 788
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 596
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Scan

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Raytheon Co., 465 Centre St., Quincy, Mass.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.

Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Converters, Signal To Color

RCA, 415 S. 5th St., Harrison, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Converters, Single Sideband Receiver

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Olektron Corp., Box 248, Dudley, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Converters, Synchro To Digital

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542,544
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Data Technology, Inc., 65 Grove St., Watertown, Mass.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 554
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580,581
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaGienega Blvd., Los Angeles, Cal. .... p 788
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 594,596
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1996
Weston-Transicoil, Worcester, Pa. ..... p 1998
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Ditran Corp., 25 Adams St., Burlinton, Mass.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Converters, Synchro To Linear DC

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 543,544
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1378
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595-597
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Computer Central, Box 5194, Seven Oaks Sta., Detroit, Mich.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Converters, Synchro To Sine-Cosine

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1378
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 579
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595,596
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Converters, Tape To Card

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Converters, Telemetry

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Foxboro Co., Foxboro, Mass.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Converters UHF To VHF

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Finney Co., 34 W. Interstate St., Bedford, Ohio
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA Corp., Front & Cooper, Camden, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Varian/Solid State Div., Akron St., Copiague, N.Y.
Wavetek, 3000 Shelby St., Indianapolis, Ind.

Converters, Vibrator Type—See Converters, Power Frequency, Vibrator

Converters, Voltage To Frequency

Airpax Elctrns., Inc., Cambridge, Md.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 644
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. .....p 558,559
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. ..... p 1459
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J. ..... p 1171
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ..... p 1284
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Metal Removal Co., 1801 W. Columbia, Chicago, Ill.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.

Coolants, Circuit & Component

Dow Corning Corp., Midland, Mich. ..... p 2667
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Dow Chemical Co., Box 1682, Midland, Mich.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Elctrn. Chemical Corp., 813 Communipaw Ave., Jersey City, N.J.
General Elec. Co., Waterford, N.Y.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Rawn Co., Inc., Box 9, Spooner, Wisc.

Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Coolers, Cryogenic

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Air Prods. & Chems., Inc., Box 538, Allentown, Pa.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Malaker Corp., W. Main St., High Bridge, N.J.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.

Cooling Equipment—See Air Conditioners; Blowers & Fans

Cooling/Heating Modules, Thermoelectric

Borg-Warner Thermoelectrics, Wolf & Algonquin Rds., Des Plaines, Ill. ..... p 2096,2097
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Materials Elctrn. Prod. Corp., 990 Spruce St., Trenton, N.J.
3M Co., 3M Center, St. Paul, Minn.

Cooling Packages, Semiconductor—See Transistor & Diode Heat Dissipators

Cooling Sprays—See Coolants, Circuit & Component

Coordinate Measuring Machines—See Machines, Measuring

Copper Clad Laminates —See Laminates, Metal Clad

Cords & Cable, Dial Drive

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Bergen Wire Rope Co., 1234 Gregg St., Lodi, N.J.
Bevin-Wilcox Line Co., 95 Skinner St., E. Hampton, Conn.
Carol Cable Co., Box 68, Pawtucket, R.I.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Matthews Ross, Corp., E. Warren St., Fall River, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Cords & Tapes, Lacing

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2965
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Bevin-Wilcox Line Co., 95 Skinner St., E. Hampton, Conn.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
General Cable Corp., 733 Third Ave., New York, N.Y.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Matthews Ross, Corp., E. Warren St., Fall River, Mass.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Suflex, 33-40 57th St., Woodside, N.Y.

Cords, Line & Set, Extension

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cord Specialties Co., 9239 Cherry St., Franklin Park, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Cord Mfg. Co., Inc., 312 E. Main St., Westfield, Pa.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electric Parts Corp., Box 234, Georgetown, Ky.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Ideas, Inc., 118 Grand Ave., Laramie, Wyo.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Koss Elctrns., Inc., 2227 North 31st St., Milwaukee, Wisc.
Lectrodyne Sys. Corp., 1234 Carpenter St., Philadelphia, Pa.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Linemaster Switch Corp., Box 52, Woodstock, Conn.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Noel Mfg. Co. Inc., 1415 Blondell Ave., Bronx, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Cords, Line (Lamp)—See Cable, Multiconductor

Cords, Line, Resistance

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Electri-Cord Mfg. Co., Inc., 312 E. Main St., Westfield, Pa.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Cords, Patch

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. ..... p 2362
Amp Inc., Box 3608, Harrisburg, Pa.
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2484,2490,2491,2505-2507,2514-2519
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. ..... p 2537
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Audio Accessories, Inc., Gilsum, N.H.
Barker Prods. Co., 344 Central St., Saugus, Mass.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
California Avionics Labs., Inc., Box 701, Palo Alto, Calif.
Carbon Elctrn. Devel. Corp., 20-22 Center St., Lansford, Pa.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Cord Mfg. Co., Inc., 312 E. Main St., Westfield, Pa.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
Mac Panel Co., Box 5027, High Pt., N.C.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
RCA Corp., Front & Cooper, Camden, N.J.
Rectico, Inc., 20 Village Park Rd., Cedar Grove, N.J.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Cords, Power—See Cable, Power

Cords, Retractile

Acopian Corp., P.O. Box 585, Easton, Pa.
Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal... p 2506
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aero-Motive Mfg. Co., P.O. Box 2678, Kalamazoo, Mich.
Barker Prods. Co., 344 Central St., Saugus, Mass.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Cords, Speaker Extension—See Cable, Audio

Cords, Twin Lead—See Cable, Multiconductor

Core Arrays, Memory—See Memory Arrays

Core Planes, Memory—See Memory Planes

Core Stacks, Memory—See Memory Stacks

Core Memory Systems—See Memory Systems, Core

Cores, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Carborundum Co., Box 367, Niagara Falls, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Electronic Memories, 12621 Chadron Blvd., Hawthorne, Cal.

Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kirchberger, M & Co., Inc., 250 Humphrey St., Englewood, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norton Co., 1 New Bond St., Worcester, Mass.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Superior Steatite & Ceramic Corp., 88 W. Forest Ave., Englewood, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
3M Co., 3M Center, St. Paul, Minn.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.
Ultrasonic Mach. Co., 266 West Ave., Long Branch, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Cores, Magnetic, Ferrite, EL & E

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Michigan Magnetics, 203 W. Third St., Vermontville, Mich
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Ampex Corp., 401 Broadway, Redwood City, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.

Cores, Magnetic, Ferrite, Pot/Cup

Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.

Cores, Magnetic, Ferrite, Slug

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2337
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.

Cores, Magnetic, Ferrite, Toroid

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Ampex Corp., 401 Broadway, Redwood City, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Cores, Magnetic, Ferrite, Yoke Section

Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.

Cores, Magnetic, Metal Alloy (Other Than Silicon & Nickel-Iron)

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
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Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.

Cores, Magnetic, Nickel-Iron, EL, EE, F & Ring Laminations

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Dentronics, Inc., 60 Oak St., Hackensack, N.J.

Cores, Magnetic, Nickel-Iron, Toroid

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Dynacor, 1010 Westmore Ave., Rockville, Md.
Infinetics, Inc., 1601 Jessup St., Wilmington, Del.

Cores, Magnetic, Powdered Iron, Pot/Cup

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590,2591
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Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.
Micrometals, 228 N. Sunset, City of Industry, Calif.
Pyroferric - N. Y., Inc., Bronx Blvd. at 216th St., Bronx, N.Y.

Cores, Magnetic, Powdered Iron, Slug

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Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan ..... p 2640
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.
Micrometals, 228 N. Sunset, City of Industry, Calif.
Pyroferric - N. Y., Inc., Bronx Blvd. at 216th St., Bronx, N.Y.

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Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.
Micrometals, 228 N. Sunset, City of Industry, Calif.
Pyroferric - N. Y., Inc., Bronx Blvd. at 216th St., Bronx, N.Y.

Cores, Magnetic, Powdered Permalloy, Toroid

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Infinetics, Inc., 1601 Jessup St., Wilmington, Del.

Cores, Magnetic, Silicon, "C"

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Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
Tempel Steel Co., 5353 N. Elston Ave., Chicago, Ill.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Cores, Magnetic, Silicon EI, EE & F, Laminations

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Dynacor, 1010 Westmore Ave., Rockville, Md.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Corners, Waveguide—See Bends & Twists, Microwave

Corona Testers—See Testers, Corona

Coulometers—See Timers, Electrolytic Cell

Counters, Bi-Directional

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
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Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
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Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
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Digitron Corp., 2544 W. Main St., Norristown, Pa.
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Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
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PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
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Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Burroughs Corp., Box 1226, Plainfield, N.J.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
EDP Corp., Box 6485, Orlando, Fla.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Litton Inds., 20745 Nordhoff St., Chatsworth, Cal.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Midco, Inc., Box 5433, Trenton, N.J.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Coil Winding

Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. p 1371
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.

Counters, Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc.
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Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
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General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
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Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y.
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
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Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... p 585
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal.
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AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burroughs Corp., Box 1226, Plainfield, N.J.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cramer Div., Old Saybrook, Conn.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
EDP Corp., Box 6485, Orlando, Fla.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
EG & G, Inc., 35 Congress St., Salem, Mass.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Heath Co., Benton Harbor, Mich.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Melland Gear & Instr. Co., Inc., 84 Sylvester St., Westbury, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Midco, Inc., Box 5433, Trenton, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
National Elctrns., Inc., Box 269, Geneva, Ill.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Royco Instrs., Inc., 141 Jefferson Dr., Menlo Pk., Cal.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

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Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
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Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1381
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J. ..... p 1383
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
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Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
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Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Burroughs Corp., Box 1226, Plainfield, N.J.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
EDP Corp., Box 6485, Orlando, Fla.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Electro-Magnetic

Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. ..... p 1369
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. p 1370,1371
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1381
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J. ..... p 1383
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Norden Div., Helen St., Norwalk, Conn.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Cramer Div., Old Saybrook, Conn.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT General Controls, 1838 Flower St., Glendale, Cal.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
United Aircraft Corp., Helen St., Norwalk, Conn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Counters, Frequency

AEL, Inc., Box 552, Lansdale, Pa.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 656
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal. ..... p 662
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666

Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,696,699
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 727
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y.
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Neutronic Corp., Box 625, St. Louis, Mo.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Matsushita Comm. Ind'l. Co., Ltd.; 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
New London Instr. Co., Inc., Box 189, New London, Conn.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Gating

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
Neutronic Corp., Box 625, St. Louis, Mo.
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Geiger

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Reuter-Stokes, 18530 S. Miles Pkwy., Cleveland, Ohio
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Wood, N. Counter Lab., Inc., 1525 East 53rd St., Chicago, Ill.

Counters, Mechanical

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. ..... p 1369
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. p 1370,1371
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind. .... p 1393
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Foxboro Co., Foxboro, Mass.
ITT General Controls, 1838 Flower St., Glendale, Cal.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Melland Gear & Instr. Co., Inc., 84 Sylvester St., Westbury, N.Y.
Olympic Instrs., Inc., Vashon, Wash.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Counters, Particle

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Components Corp., 106 Main St., Denville, N.J.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hird Brown America, Box 544, Livingston, N.J.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Royco Instrs., Inc., 141 Jefferson Dr., Menlo Pk., Cal.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Wood, N. Counter Lab., Inc., 1525 East 53rd St., Chicago, Ill.

Counters, Photoelectric

Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
EMR Div., Box 223, Princeton, N.J.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.
Worner Elctrn. Devices, Rankin, Ill.

Counters, Preset

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. ..... p 1369
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Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1381
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Hecon Corp., 31 Park Rd., New Shrewsbury, N.J. ..... p 1383
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Icon Corp., 156 Sixth St., Cambridge, Mass.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
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Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401

Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Burroughs Corp., Box 1226, Plainfield, N.J.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Cramer Div., Old Saybrook, Conn.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hird Brown America, Box 544, Livingston, N.J.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
ITT General Controls, 1838 Flower St., Glendale, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Supplies Div., Box 312, Encino, Calif.
NUS Corp., P.O. Box 248, Paramus, N.J.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Proportional—See Counters, Particle

Counters, Pulse

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. p 1637
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. p 630,631
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Curtis Instrs., Inc., 200 Kisco Ave., Mt. Kisco, N.Y. p 638
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Data Technology, Inc., 65 Grove St., Watertown, Mass. p 1368
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. p 1369
Eagle Signal Div., 736 Federal St., Davenport, Iowa p 1372
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. p 1370
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1381
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. p 1672
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,696,697,699
Icon Corp., 156 Sixth St., Cambridge, Mass.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. p 1388
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y. p 1390
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y.
Neutronic Corp., Box 625, St. Louis, Mo.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. p 1395
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. p 1995
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Veeder-Root, 70 Sargeant St., Hartford, Conn. p 1401
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Components Corp., 106 Main St., Denville, N.J.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
Foxboro Co., Foxboro, Mass.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
ITT General Controls, 1838 Flower St., Glendale, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Radiation—See Counters, Geiger

Counters, Reversible—See Counters, Bi-Directional

Counters, Revolution

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc. p 1369
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. p 1371
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J. p 1383
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. p 1395
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. p 1995
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Veeder-Root, 70 Sargeant St., Hartford, Conn. p 1401
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
ITT General Controls, 1838 Flower St., Glendale, Cal.
JMR Elctrns. Corp., 1424 Blondell Ave., Bronx, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Post Elctrn. Prods., 12 Lothrop St., Beverly, Mass.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Redington Counters, Inc., 130 Addison Rd., Windsor, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Wer Ind'l. Corp., 3036 Alt Blvd., Grand Island, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Counters, Scintillation

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Components Corp., 106 Main St., Denville, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Couplers & Keyers—See Keyers & Couplers

Couplers, Antenna

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. p 854
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. p 861
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. p 2184

Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Antennacraft Co., Box 1005, Hwy. 34, W., Burlington, Iowa
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Color/Craft Antenna Corp., 13434 Raymer St., N. Hollywood, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
View-All Television Prods. Corp., 2510 Electronics Dr., Anniston, Ala.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Couplers, Directional

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2450
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amtron Corp., 337 Newbury St., Boston, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
View-All Television Prods. Corp., 2510 Electronics Dr., Anniston, Ala.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Couplers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 866
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2450
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Narda Microwave Corp., Plainview, N.Y. ..... p 887
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
AAI Corp., P.O. Box 6767, Baltimore, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Couplers, Multi-Set—See Couplers, Antenna

Couplers, Rotary

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.

Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Couplings, Microwave—See Couplers, Microwave

Couplings, Quick-Disconnect, Liquid or Gas

Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Aeroquip Corp., 300 S. East Ave., Jackson, Mich.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Roylyn, 620 Paula Ave., Glendale, Cal.
Scanivalve, Inc., Box 20005, San Diego, Calif.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.

Couplings, Shaft, Rigid & Flexible

FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,2139
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Sterling Instr., 76 E. Second St., Mineola, N.Y..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 2641
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acton Labs., Inc., 531 Main St., Acton, Mass.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Belfab, P.O. Box 1881, Daytona Beach, Fla.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Helical Prods. Co., Inc., P.O. Box 4, Hermosa Beach, Calif.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Naugler Engrg., Inc., Off Dunham Rd., Beverly, Mass.
Nilsen Mfg. Co., 920 Hwy. 27, Haines City, Fla.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Renbrandt, Inc., 6 Parmelee St., Boston, Mass.
Robintech, Inc., Commerce Rd., Vestal, N.Y.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Santa Fe Mfg. Co., 2343 Jerome Ave., Bronx, N.Y.
Sealol, Inc., Warwick Industrial Park, Providence, R.I.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Servometer Corp., 82 Industrial, E., Clifton, N.J.
Stow Mfg. Co., 101 Shear St., Binghamton, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Couplings, Vacuum

Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Granville-Phillips Co., 5675 E. Arapahoe Ave., Boulder, Colo.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Norton Co., 160 Charlemont St., Newton, Mass.
Sargent Welch Sci. Co., 7300 N. Linder Ave., Skokie, Ill.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Covers, Chassis

Falstrom Co., 174 Falstrom Ct., Passaic, N.J.
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GAF Corp., 140 W. 51 St., New York, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Covers, Jack—See Jack Covers

Covers, Protective

GTI Corp., 310 Chestnut St., Meadville, Pa..... p 2595
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Daniels, C.R., Inc., Daniels, Md.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Kees, F.D. Mfg. Co., 700 Park Ave., Beatrice, Neb.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill

Crayons, Coatings, Pellets, etc., Temperature Indicating-Also See Crystals, Liquid, Temperature Indicating

Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Markal Co., 250 N. Washtenaw Ave., Chicago, Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Crimping Machines & Tools—See Tools, Crimping

Crossbars—See Scanners, Crossbar; Switches, Crossbar

Crucibles—See Boats

Cryogenic Equipment—See Dewars; Pumps; etc.

Cryogenic Liquid Converters

Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Norton Co., 160 Charlemont St., Newton, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.

Crystal Analyzers—See Anlayzers, Crystal

Crystal Blanks

Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1420,1421
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y..... p 1424
Croven, Ltd., 500 Beech St., Whitby, Ont., Can..... p 1434
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
M-tron Inds., Inc., Box 630, 100 Douglas St., Yankton, S.D. p 1470
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1460,1461
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1482
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan ..... p 1489
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Crystek Div., 1000 Crystal Dr., Ft. Myers, Fla.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hoffman, P.R. Co. Div., 321 Cherry St., Carlisle, Pa.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
International Crystal Mfg. Co., 10 N. Lee St., Oklahoma City, Okla.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Nebel, R.E. Lab., 31 Whitehall Blvd., Garden City, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.

Crystal Filters—See Filters, Crystal

Crystal Mounts—See Mounts, Crystal

Crystal Oscillators—See Oscillators, Crystal-Controlled

Crystal Ovens—See Ovens, Crystal

Crystals, Barium Titanate

Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Crystals, Filter

Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1420,1421
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y..... p 1424
Croven, Ltd., 500 Beech St., Whitby, Ont., Can..... p 1434
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
M-tron Inds., Inc., Box 630, 100 Douglas St., Yankton, S.D. p 1470
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1460,1461
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Northern Engrg. Labs., Inc., 357 Beloit St., Burlington, Wisc. p 1473
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind..... p 1584
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1482
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
C-W Crystals, Rte. #2, Box 22-B, Marshfield, Mo.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Crystek Div., 1000 Crystal Dr., Ft. Myers, Fla.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Marconi Div., 1 Park Ave., New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Standard Crystal Co., 1105 S. Fremont Ave., Alhambra, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.

Crystals, Frequency Control

Accutronics, Inc., 628 North St., Geneva, Ill.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa.p 1420,1421

Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1424
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Croven, Ltd., 500 Beech St., Whitby, Ont., Can. ..... p 1434
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
M-tron Inds., Inc., Box 630, 100 Douglas St., Yankton, S.D. p 1470
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1460,1461
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1469
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Northern Engrg. Labs., Inc., 357 Beloit St., Burlington, Wisc. p 1473
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
C-W Crystals, Rte. #2, Box 22-B, Marshfield, Mo.
Crystek Div., 1000 Crystal Dr., Ft. Myers, Fla.
Eidson Elctrn. Co., 1902 N. Third, Box 96, Temple, Tex.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
International Crystal Mfg. Co., 10 N. Lee St., Oklahoma City, Okla.
Marconi Div., 1 Park Ave., New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nebel, R.E. Lab., 31 Whitehall Blvd., Garden City, N.Y.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Standard Crystal Co., 1105 S. Fremont Ave., Alhambra, Calif.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.

Crystals, Laser-Maser

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Crystal Technology Inc., 2510 Old Middlefield Way, Mountain View, Calif.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.
Valpey Corp., 1400 Highland St., Holliston, Mass.

Crystals, Liquid, Temperature Indicating-Also See Crayons, Coatings, Pellets, Temperature Indicating

Liquid Crystal Inds., Inc., 460 Brown Ave., Turtle Creek, Pa.
Vari-Light Corp., 9770 Conklin Rd., Cincinnati, Ohio

Crystals, Piezoelectric

Accutronics, Inc., 628 North St., Geneva, Ill.
Croven, Ltd., 500 Beech St., Whitby, Ont., Can. ..... p 1434
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio
M-tron Inds., Inc., Box 630, 100 Douglas St., Yankton, S.D. p 1470
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa..... p 1479
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1482
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
C-W Crystals, Rte. #2, Box 22-B, Marshfield, Mo.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Crystal Resch., Inc., 42 Concord La., Cambridge, Mass.
Crystal Technology Inc., 2510 Old Middlefield Way, Mountain View, Calif.
Crystek Div., 1000 Crystal Dr., Ft. Myers, Fla.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Eidson Elctrn. Co., 1902 N. Third, Box 96, Temple, Tex.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
3M Co., 3M Center, St. Paul, Minn.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.

Crystals, Quartz

Billey Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1420,1421
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1424
Croven, Ltd., 500 Beech St., Whitby, Ont., Can. ..... p 1434
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
M-tron Inds., Inc., Box 630, 100 Douglas St., Yankton, S.D. p 1470
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1460-1462
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1469
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Northern Engrg. Labs., Inc., 357 Beloit St., Burlington, Wisc. p 1473
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa..... p 1479
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1482
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan ..... p 1489
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Crystek Div., 1000 Crystal Dr., Ft. Myers, Fla.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Hoffman, P.R. Co. Div., 321 Cherry St., Carlisle, Pa.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Quaker Elctrns., Box 215, Hunlock Creek, Pa.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Sawyer Resch. Prods., Inc., 35400 Lakeland Blvd., Eastlake, Ohio
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Crystals, Rochelle Salts

Gould Labs., 540 E. 105th St., Cleveland, Ohio
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.

Crystals, Sapphire

Alessi Inds., 418 Main St., El Segundo, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Insaco, Inc., Box 422, Quakertown, Pa.
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.

Crystals, Scintillation Counter

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Crystals, Semiconductor(Ingots & Wafers)

AEL, Inc., Box 552, Lansdale, Pa.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Dow Corning Corp., Midland, Mich.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Narda Microwave Corp., Plainview, N.Y.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Diode Corp, 90 Eames St., Framingham, Mass.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Harmon Lichtenstein & Co., 26 Broadway, New York, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Monsanto Elctrn. Mat'ls., Box 8, St. Peters, Mo.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Ronson Metals Corp., 55 Manufacturers Pl., Newark, N.J.
Semimetals, Inc., 172 Spruce St., Westbury, N.Y.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.

Crystals, Yig

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Cups, Encapsulation

G-L Inds., Inc., 300 Harvard Ave., Westville, N.J.
Atlantic Optical Moulding Co., Ellis St., Dudley, Mass.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Delta Plastics Co., 776 Creek Rd., Bellmawr, N.J.
Electrical Plastics Corp., 280 Warren St., Box 298, Lyndhurst, N.J.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gibson/Egan Co., 34 La Porte St., Arcadia, Calif.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Morris Enterprises, Inc., 16799 Schoenborn St., Sepulveda, Calif.

Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Resdel Corp., Box 2171, Rio Grande, N.J.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Robison Elctrns., Inc., 2134 W. Rosecrans Ave., Gardena, Cal.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.

Current Sensors-Also See Transducers, Volt, etc.

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1361,1362
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1749
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761,2123
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809

Current Sources

California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 649
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 668
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721,722
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1081
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.... p 1392
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y. ..... p 1274,1275
Zaring Inds., Inc., Box 477, Carmel, Ind.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Cutters, Hole, Hand Operated

Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Greenlee Tool Co., 2136-12th St., Rockford, Ill.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Cutters, Wire, Automatic—See Wire Measuring & Cutting Machines

Cutters, Wire, Hand—See Wire Cutters, Hand Operated

Dampers, Servo

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1700
Weston-Transicoil, Worcester, Pa. ..... p 1998
Bendix Corp., S. Montrose, Pa.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Dampers, Structural, Chassis, Panel, etc.—See Mounts, Shock & Vibration

Dashpots

Data Acquisition & Reduction Systems

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Video, Inc., Box 928, Boulder, Colo. ..... p 635
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Data Graphics Corp., 8402 Speedway Dr., San Antonio, Tex. p 556
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 560
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 842
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565,689,877
Honeywell, Box 5227, Denver, Colo. ..... p 691
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa. p 569
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336,1337
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 576
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Norden Div., Helen St., Norwalk, Conn.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586-588
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
B-D Spear Medical Sys., 335 Bear Hill Rd., Waltham, Mass.
B & F Instrs., Inc., Cornwells Hgts., Pa.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bristol Div, Waterbury, Conn
Brown Engrg. Co., Research Pk., Huntsville, Ala.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Communitype Corp., 767 5th Ave. (GM Bldg.), New York, N.Y.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Copar Corp., 5744 West 77th St., Oak Lawn, Ill.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
D.A.T.A., Inc., 32 Lincoln Ave., Orange, N.J.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Defense Elctrns., Inc., Rockville, Md.
Derivation & Tabulation Assocs., 32 Lincoln Ave., Orange, N.J.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Evans Assocs., P.O. Box 5055, Berkeley, Calif.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Link Div., Binghamton, N.Y.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Odetics, Inc., 1845 S. Manchester, Anaheim, Cal.
Petty Geophysical Engrg. Co., 700 Tower Life Bldg., San Antonio, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sagetec Corp., 822 N. Hollywood Way, Burbank, Cal.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Instrs. Resch., Inc., 331 Luckie St., N.W., Atlanta, Ga.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio

Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Adcom, 808 Memorial Dr., Cambridge, Mass.
Tempo Computers, Inc., 1550 S. State College Blvd., Anaheim, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Time Share Peripherals Corp., Box 361, Wilton, Conn.
Traid Corp., 777 Flower St., Glendale, Calif.
United Aircraft Corp., Helen St., Norwalk, Conn.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian, 611 Hansen Way, Palo Alto, Cal.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Data Blockers

Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.

Data Compressors, Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electro-Optical Sys., Pasadena, Calif.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.

Data Display Indicators—See Lights; Dials

Data Display Systems—See Displays

Data Processing Equipment—See Specific Types

Data Recorders, Computer

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Crown Int'L, Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa. ..... p 564
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 842
Houston Instr., 4950 Terminal Ave., Bellaire, Tex. ..... p 848
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal. .... p 1310
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Norden Div., Helen St., Norwalk, Conn.
North Elec. Co., 553 S. Market St., Galion, Ohio
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn. p 1394
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex. p 1311
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astro-Science Corp., 9700 Factorial Way, S. El Monte, Calif.
Auricord, 35-41 29th St., Long Island City, N.Y.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bristol Div, Waterbury, Conn
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Communitype Corp., 767 5th Ave. (GM Bldg.), New York, N.Y.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Dasa Corp., 15 Stevens St., Andover, Mass.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digital Prods., 335 W. Seventh St., San Pedro, Calif.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Geo Space, 5803 Glenmont, Houston, Tex.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kennedy Co., 540 Woodbury Rd., Altadena, Calif.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Peripheral Equip. Corp., 9600 Irondale Ave., Chatsworth, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photomechanisms Div., Inc., 15 Stepar Pl., Huntington Sta., N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
RCA, Marne Hwy., Moorestown, N.J.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sanders Assocs., Inc., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Time Share Peripherals Corp., Box 361, Wilton, Conn.
United Aircraft Corp., Helen St., Norwalk, Conn.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, 611 Hansen Way, Palo Alto, Cal.
Viatron Computer Sys., Rte. 62, Bedford, Mass.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Data Transmission Systems—See Transmission Systems, Data

Decade Boxes, Capacitance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada

Decade Boxes, Delay Line

Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.

Decade Boxes, Inductance

Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Daven, Div., Dept. EEM 70, Manchester, N.H.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
United Transformer Co., 150 Varick St., New York, N.Y.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Decade Boxes, Resistance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676,2808
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 722-724
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Decade Boxes, Transformer

Arnold Magnetics Corp., Box K, Culver City, Calif.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.

Decalcomania-Also See Labels, Pressure Sensitive

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Applebaum Tag & Label Co., 3030 Northern Blvd., Long Island City, N.Y.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Decalcraft, Rte. 309, Hatfield, Pa.
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Hollander Allen, E. 64 Midland Ave., Paramus, N.J.
Meyercord Co., 365 E. North Ave., Carol Steam, Wheaton, Ill.
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
National Decal Corp., S.E. Corner 56th & Chestnut Sts., Philadelphia, Pa.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Stanpat Prods., Inc., 366 Main St., Port Washington, N.Y.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Tekno-Labels Co., 8160 Orion, Van Nuys, Calif.
3M Co., 3M Center, St. Paul, Minn.
Topflight Corp., 160 East 9th Ave., York, Pa.

Decimal Keyboards—See Keyboards, Decimal

Decoders, Audio Tone

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1430
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1848
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Frequency Control, Inc., Box 671, Austin, Tex. p 1444
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Springer Aircraft Radio Co., RR #2, Box 98, Shelleyville, Ind.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.

Decoders, Binary To Decimal—See Converters, Binary To Decimal

Decoders, Digital To Analog—See Converters, Digital To Analog

Decoders, Pulse

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Norden Div., Helen St., Norwalk, Conn.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. p 1313
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. p 914
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Bristol Div, Waterbury, Conn
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Fabri-Tek, 1410 S.W. 3rd St., Pompano Beach, Fla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Decoders, Readout—See Drivers & Decoders For Readouts

Decoders, Telemetry—See Decoders, Audio Tone

Decoders, Video

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Decommutators, Telemetering

Digitron Corp., 2544 W. Main St., Norristown, Pa.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. p 1313
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
RCA, Marne Hwy., Moorestown, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Decontaminants—See Cleaners & Solvents

Deflection Yokes, Coils & Assemblies—See Yokes, Deflection

Degaussers—See Demagnetizers

Degreasing Chemicals—See Cleaners & Solvents

Degreasing Machines—See Machines, Vapor-Degreasing; Cleaners, Ultrasonic

Dehumidifiers (For Equipment)

Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn. p 2642
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. p 2643
Abbeon, Inc., 179-15 Jamaica Ave., Jamaica, N.Y.
Adel Div., 10777 Van Owen St., Burbank, Calif.
Barium & Chems., Inc., P.O. Box 218, Steubenville, Ohio
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
Cargocaire Engrg. Corp., 8-10 Chestnut St., Amesbury, Mass.
Dampp-Chaser Elctrns., Inc., P.O. Box 1610, Hendersonville, N.C.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lectrodryer Div., P.O. Box 4599, Pittsburgh, Pa.
Logetronics, Inc., 6628 Electronic Dr., Springfield, Va.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Puregas Equip. Corp., 1445 Strongs Rd., Coplague, N.Y.
Ross Engrg. Div., Box 751, New Brunswick, N.J.

Dehydrators

Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn. p 2642
Adel Div., 10777 Van Owen St., Burbank, Calif.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Barium & Chems., Inc., P.O. Box 218, Steubenville, Ohio
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lectrodryer Div., P.O. Box 4599, Pittsburgh, Pa.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Prodelin, Inc., Box 131, Hightstown, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.

Delay Line Cases—See Cases, Delay Line

Delay Line Synthesizers

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2559,2561
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2578
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.

Delay Lines, Cable

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2559
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. p 2576
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa. p 2952
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Uniform Tubes, Inc., Collegeville, Pa. p 2966
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. p 2587
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Plaxial Div., 70 Jaconnet St., Newton Highlands, Mass.
Prodelin, Inc., Box 131, Hightstown, N.J.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.

Delay Lines, Distributed, Constant (Fixed)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2562,2563
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J. p 2566,2567,2569,2570
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2575
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2578
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2580
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Nytronics, Inc., Orange St., Darlington, S.C. p 2584
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2585
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. p 2087
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Uniform Tubes, Inc., Collegeville, Pa. p 2966
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. p 2587
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vidcor Co., Inc., 1251 W. El Segundo Blvd., Gardena, Cal. p 2588
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
New London Instr. Co., Inc., Box 189, New London, Conn.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.

Delay Lines, Distributed, Constant (Variable)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2559
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J. p 2568
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2578
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2581

Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ..... p 2585
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C..... p 2087
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Geo Space, 5803 Glenmont, Houston, Tex.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.

Delay Lines, Glass & Quartz

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 2572
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
Corning Glass Works, 3900 Electronics Dr., Raleigh, N.C.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Wilmad Glass Co., Inc., Buena, N.J.

Delay Lines, Liquid

Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.

Delay Lines, Lumped-Constant (Electrically Variable)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2558,2560,2561
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J..... p 2568
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y..... p 1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. ..... p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2578
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2581,2582
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ..... p 2585
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Holex, Inc., 2751 San Juan Rd., Box 148, Hollister, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Delay Lines, Lumped-Constant (Fixed)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2558,2560,2561
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J. p 2566,2567,2569,2570
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y..... p 1427
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. ..... p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2575
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2578
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2582
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2584
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ..... p 2585
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C..... p 2087
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vidcor Co., Inc., 1251 W. El Segundo Blvd., Gardena, Cal.p 2588
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Delay Lines, Lumped-Constant (Mechanically Variable)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2558-2561,2563
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J..... p 2568
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y..... p 1427
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. ..... p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2578
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2581,2582
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ..... p 2585
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C..... p 2087
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Vidcor Co., Inc., 1251 W. El Segundo Blvd., Gardena, Cal.p 2588
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
General Instr. Corp., 165 Front St., Chicopee, Mass.
KDI Navcor, Inc., 15551 Cabrito Rd., Van Nuys, Cal.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.

Delay Lines, Magnetostrictive

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J..... p 2571
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573,2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.

Delay Lines, Miniature & Subminiature-Also See Specific Types Of Delay Lines

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y...p 2558,2563
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md. p 2565
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J... p 2566-2571
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., '61-20 Woodside Ave., Woodside, N.Y..... p 1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. ..... p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573,2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Daven, Div., Dept. EEM 70, Manchester, N.H.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2580,2581
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574
Nytronics, Inc., Orange St., Darlington, S.C. ..... p 2584
Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ..... p 2585
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C..... p 2087
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Uniform Tubes, Inc., Collegeville, Pa.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Vidcor Co., Inc., 1251 W. El Segundo Blvd., Gardena, Cal.p 2588
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Engineered Comps. Co., 2134 W. Rosecrans Ave., Gardena, Cal.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Delay Lines, Solid Blank

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 2572
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Corning Glass Works, 3900 Electronics Dr., Raleigh, N.C.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Valpey Corp., 1400 Highland St., Holliston, Mass.

Delay Lines, Strip

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J..... p 2570
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 2572
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2580
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Wilmad Glass Co., Inc., Buena, N.J.

Delay Lines, Trimmer

Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J..... p 2568
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y. ..... p 2576
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2574
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 2580

Delay Lines, Ultrasonic

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 2572
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y. p 2577
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
Corning Glass Works, 3900 Electronics Dr., Raleigh, N.C.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.

Delay Lines, Waveguide

Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Uniform Tubes, Inc., Collegeville, Pa.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co. 1901 Malvern St, Fullerton, Cal.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.

Delay Lines, Wire

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Hamilton Watch Co., Lancaster, Pa.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Delays, Time (Excluding Delay Lines)

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. ..... p 2559
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1748
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1380
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Gems Co., Inc., The, Spring La., Farmington, Conn.
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sensory, Inc., 1 Kennedy Rd., Morris Plains, N.J.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Trish Energetics, Pond Rd., Harvard, Mass.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Worner Elctrn. Devices, Rankin, Ill.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Demagnetizers

A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio ..... p 619
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Electronic Brazing Co., 140 Glenridge Ave., Montclair, N.J.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Indiana General-Process Equipt., 6001 S. General Ave., Cudahy, Wisc.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Magnetic Analysis Corp., 535 South 4th Ave., Mt. Vernon, N.Y.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Stancor, 3501 W. Addison St., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Demodulators

AEL, Inc., Box 552, Lansdale, Pa.
Airpax Elctrns., Inc., Cambridge, Md.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 640,644
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374-1376
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. ..... p 1459
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 2142
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Gopic Designs Co., 3681 Voltaire St., San Diego, Calif.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Olektron Corp., Box 248, Dudley, Mass.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Validyne Engrg. Corp., 18819 Napa St., Northridge, Cal.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Demodulators, Magnetic

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374-1376
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.

Densitometers, Electronic

Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Fotomatic Corp., 3141 W. Tenth, Indianapolis, Ind.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Sargent Welch Sci. Co., 7300 N. Linder Ave., Skokie, Ill.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.

Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam

Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Middlesex Gen'l. Inds., 58 Washington St., Somerville, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclide Corp., 916 Main St., N. Acton, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.

Desiccators—See Dehumidifiers

Desoldering Tools & Equipment—See Soldering Accessories; Soldering Equip.; Soldering Guns; etc.

Detectors, A-F—See Detectors, Frequency

Detectors, Coaxial

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centineia Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Detectors, Corona—See Testers, Corona

Detectors, Crystal

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Narda Microwave Corp., Plainview, N.Y.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Waveline, Inc., Box 718, W. Caldwell, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fuel Watchman Sls. & Svc., Inc., 2910 Park Ave., Bronx, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Nuclear Supplies Div., Box 312, Encino, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.

Detectors, Electrostatic—See Meters, Volt, Electrostatic

Detectors, F-M—See Detectors, Frequency

Detectors, Fire & Smoke (Electronic)—See Fire Detection & Fighting Equip.

Detectors, Flaw & Defect-Also See Locators, Cable & Line Fault; Locators, Open-Short

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 893
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Gas & Chemicals, Inc., 511 East 72nd St., New York, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Appalachian Elctrn. Instrs., Inc., 810 W. Monroe Ave., Ronceverte, W. Va.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Black Light Prods., Box 45278, Chicago, Ill.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Electron-Machine Corp., Box M, Umatilla, Fla.
Electronic Safety Controls, Inc., 1411 N. Corn St., Joliet, Ill.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Jenkins, M.W. Sons, Inc., P.O. Box 70, Dept. 25, Cedar Grove, N.J.
Krautkramer Ultrasonics, Inc., 1 Research Dr., Stratford, Conn.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Magnetic Analysis Corp., 535 South 4th Ave., Mt. Vernon, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
TAC Tech. Instr. Corp., Scotch Rd., Mercer Airport, Trenton, N.J.

Detectors, Frequency

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Airpax Elctrns., Inc., Cambridge, Md.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 871
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Rafec Elctrns., Box 566, Temple City, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Techsonics, Box 251, El Prado, N.M.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Detectors, Gas Leak

Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Acton Assocs., 100 Thompson St., Pittston, Pa.
Aero Vac Corp., Box 448, Troy, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Gas & Chemicals, Inc., 511 East 72nd St., New York, N.Y.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Erdco Engrg. Corp., 136 Official Rd., Addison, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
General Monitors, Inc., 3019 Enterprise St., Costa Mesa, Calif.
Gow-Mac Instr. Co., 100 Kings Rd., Madison, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Johnson-Williams Prods, 2300 Leghorn St., Mt. View, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Puregas Equip. Corp., 1445 Strongs Rd., Copiague, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Stewart-Hall Chemical Corp., 222 Washington St., Mt. Vernon, N.Y.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Superior Continental Corp., Box 489, Hickory, N.C.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Techsonics, Box 251, El Prado, N.M.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Detectors, Ice, Sleet & Snow

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
United Control Corp., Redmond, Wash.

Detectors, Impedance—See Meters, Impedance

Detectors, Infrared

Borg-Warner Thermoelectrics, Wolf & Algonquin Rds., Des Plaines, Ill. .....p 2096,2097
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
RCA, 415 S. 5th St., Harrison, N.J.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Abtronics, Inc., Box 712, Livermore, Calif.
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electron-Machine Corp., Box M, Umatilla, Fla.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Flame Resch., Inc., Box 10502, Pittsburgh, Pa.
General Elec. Co., Waynesboro, Va.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
HEI, Inc., Jonathan Ind'l. Ctr., Chaska, Minn.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.

Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Judson Resch. & Mfg. Co., Conshohocken, Pa.
Laser Sys. Corp., 313 N. First St., Ann Arbor, Mich.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Reeder Charles M. & Co., Inc., 196 Victor Ave., Detroit, Mich.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.

Detectors, Ion

Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Nuclear Supplies Div., Box 312, Encino, Calif.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.

Detectors, Light Intensity—See Meters, Light, Nonphotographic

Detectors, Magnetic

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1361
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 2120
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Automatic Signal Div., Regent St., E. Norwalk, Conn.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Electro-Alarm Safety Devices, 745 N. Pleasant, Fresno, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Gammatronix, Inc., Dublin, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Detectors, Metal

Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. .....p 1373,2121
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electro-Alarm Safety Devices, 745 N. Pleasant, Fresno, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
Gardiner Elctrns., 4729 North 7th Ave., Phoenix, Ariz.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Harworth Mfg. Co., 2881 El Camino Real, Redwood City, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Indiana General-Process Equipt., 6001 S. General Ave., Cudahy, Wisc.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sensory, Inc., 1 Kennedy Rd., Morris Plains, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Weldotron Corp., 1532 S. Washington Ave., Piscataway, N.J.

Detectors, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 871
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rafec Elctrns., Box 566, Temple City, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Detectors, Null—See Indicators, Null

Detectors, Phase-Sensitive

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1376
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ....p 916,2904
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Berkshire Labs., 107 Tansy Hill Rd., Milford, N.Y.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Oiektron Corp., Box 248, Dudley, Mass.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rafec Elctrns., Box 566, Temple City, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Detectors, Photovoltaic —See Cells, Photovoltaic

Detectors, Radiation—See Counters, Geiger Counters, Scintillation

Detectors,R-F—See Detectors, Frequency

Detectors, Standing Wave

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Oiektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Detectors, Torque—See Indicators, Torque

Detectors, Ultraviolet

American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.

Hird Brown America, Box 544, Livingston, N.J.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Detectors, Vacuum

Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn; Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Ultek Div., Box 10920, Palo Alto, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Detectors,Vibration—See Transducers, Vibration

Detectors, Voltage

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1962
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1749
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1063
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1376
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
RCA, 415 S. 5th St., Harrison, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electro-Alarm Safety Devices, 745 N. Pleasant, Fresno, Calif.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sittler Corp., 18 N. Ada St., Chicago, Ill.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Detectors, Waveguide Arc

Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Dewars

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Corning Glass Works, Lab. Prods. Dept., Corning, N.Y.
Delta Engrg., Box 620, Boulder, Colo.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Sargent Welch Sci. Co., 7300 N. Linder Ave., Skokie, Ill.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Diagonal Cutters —See Wire Cutters, Hand Operated

Dial Locks—See Locks, Dial & Shaft

Dials, Instrument, Metal, Plastic, etc.

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2779,2781
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ..... p 2783
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Datak Corp., 85 Highland Ave., Passaic, N.J.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y. p 1505
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 1531
Rogan Bros., Inc., 8031 N. Monticello Ave., Skokie, Ill. .... p 1532
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1546
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Bristol Div, Waterbury, Conn
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Cryptographics, Inc., 416 Third Ave., New York, N.Y.
Davies, Harry Molding Co., 4920 W. Bloomingdale Ave., Chicago, Ill.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Electro Chemical Engraving Co., 1100 Brook Ave, Bronx, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kurz-Kasch, Inc., 1421 S. Broadway, Dayton, Ohio
Master Engraving, 11 Wallace St., East Paterson, N.J.
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Radial Controls Div. Nicely Corp., 2555 E. 55th Pl., Indianapolis, Ind.
Romar Plastics, Inc., 1311 E. Main St., St. Charles, Ill.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Dials, Telephone-Type

Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
Nanasi, 6308 Jackson St., W. New York, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.

Dials, Turns-Counting

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2779,2781
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ..... p 2783
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. ..... p 2789
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. ..... p 1544
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal. ..... p 2820,2821
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. ..... p 1544
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 2641
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Diaphragms

Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Belloframe Corp., 103 Blanchard Rd., Burlington, Mass.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Sparta Mfg. Co., Dover, Ohio
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Trish Energetics, Pond Rd., Harvard, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Dielectric Constant Indicators—See Indicators, Dielectric Constant

Dielectric Coolants—See Coolants, Circuit & Component

Dielectric Heating Equipment

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Cycle-Dyne, Inc., 134-20 Jamaica Ave., Jamaica, N.Y.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Feco, 5855 Grant Ave., Cleveland, Ohio
La Rose, W.T. & Assocs., Inc., P.O. Box F, Lansingburg Sta., Troy, N.Y.
Mann-Russell Elctrns., Inc., 1401 Thorne Rd., Tacoma, Wash.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Radio Frequency Co., Inc., 50 Park St., Medfield, Mass.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Scientific Elec., inc., 111 Monroe St., Garfield, N.J.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Dielectrics—See Films; Insulation Materials

Dies & Taps

Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bendix Corp., 180 Laurel St., Greenfield, Mass.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dynamic Gear Co., 175 Dixon Ave., Amityville, N.Y.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.

Differential Analyzers—See Analyzers, Differential

Differentials Mechanical—See Gears & Gear Mechanisms

Digital Analyzers—See Analyzers, Differential

Digital Comparators—See Comparators, Digital

Digital Tape Recorders—See Data Recorders, Computer

Digital Voltmeters—See Meters, Volt, Digital

Digitizers, Pencil Follower (Inc. Coordinate & Graphic)

Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Norden Div., Helen St., Norwalk, Conn.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
United Aircraft Corp., Helen St., Norwalk, Conn.
Universal Drafting Machine Corp., 5200 Richmond Rd., Bedford Hgts., Ohio

Dimmers—See Controls Photoelectric

Diode Arrays

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Elctrn. Comps. Div., Trevose, Pa.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1912
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1951
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Diode Testers—See Testers, Diode

Diodes, Avalanche

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ..... p 1874
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal.
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Syntron Div., 264 Lexington, Homer City, Pa..... p 1946-1950
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1957
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1962
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass..... p 1962
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex..... p 1969-1973
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1959,1960
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Comps., Inc., Box 421, Scottdale, Pa.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Semicon Inc., 10 North Ave., Burlington, Mass.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.

Diodes, Backward

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1888
RCA, 415 S. 5th St., Harrison, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Dual

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1888
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Power Comps., Inc., Box 421, Scottdale, Pa.
Semitronics Corp., 265 Canal St., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Diodes, Electroluminescent (Radiating)

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Diodes, Germanium

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1888,1889
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal... p 1909
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1951
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Gunn

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y..... p 2131
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ..... p 1876
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Monsanto-Microwave Prods., 11636 Administration Dr., Westport Ind'l. Pk., St. Louis, Mo.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.

Diodes, High Voltage

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1910
RCA, 415 S. 5th St., Harrison, N.J.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y... p 1919
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal. p 1924,1925,1928
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Syntron Div., 264 Lexington, Homer City, Pa..... p 1946-1950
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1957
Unitrode Corp., 582 Pleasant St., Watertown, Mass. p 1962,1964
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass.....p 1962,1964
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex.....p 1974,1975
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Atlantic Semiconductor, 905 Mattison Ave., Asbury Park, N.J.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Eimac, 301 Industrial Way, San Carlos, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicon Inc., 10 North Ave., Burlington, Mass.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Youngwood, Pa.

Diodes, Hot Carrier

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.

Diodes, Light-Emitting (Led)

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.

Diodes, Limiting

AEL, Inc., Box 552, Lansdale, Pa.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio .. p 1921
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Unitrode Corp., 582 Pleasant St., Watertown, Mass.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.

Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Comps., Inc., Box 421, Scottdale, Pa.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.

Diodes, Matched Pairs

AEL, Inc., Box 552, Lansdale, Pa.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Eastron Corp., 25 Locust St., Haverhill, Mass.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Power Comps., Inc., Box 421, Scottdale, Pa.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semicon Inc., 10 North Ave., Burlington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.

Diodes, Matched Quads

AEL, Inc., Box 552, Lansdale, Pa.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Eastron Corp., 25 Locust St., Haverhill, Mass.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Power Comps., Inc., Box 421, Scottdale, Pa.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semicon Inc., 10 North Ave., Burlington, Mass.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.

Diodes, Microwave Detector

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Microwave Mixer

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Diodes, Noise

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Components, Inc., Biddeford, Me.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ..... p 1872
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.

Diodes, Photoelectric

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Clairex Elctrns., 560 S. Third Ave., Mt. Vernon, N.Y.
Hamamatsu Corp., 80 Pine St., New York, N.Y. ..... p 2135
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan ..... p 2135
RCA, 415 S. 5th St., Harrison, N.J.
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Abtronics, Inc., Box 712, Livermore, Calif.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Optron, Inc., 1201 Tappon Cir., Carrollton, Tex.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Quantum Sensing, Inc., 1650 Locust Ave., Bohemia, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Pin

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 913
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 913
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.

Diodes, Schottky

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Diodes, Selenium—See Rectifiers, Selenium

Diodes, Silicon

AEL, Inc., Box 552, Lansdale, Pa.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Components, Inc., Biddeford, Me. ..... p 1868-1871
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ....p 1875,1876
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind. ..... p 1879
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y. p 1880-1883
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1886,1888,1889
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio .. p 1921
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal.
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y. ..... p 1940
Syntron Div., 264 Lexington, Homer City, Pa.....p 1944,1946-1950
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1951
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. p 1963,1964
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1963,1964
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex. ..... p 1969,1970
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1959,1960
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
American Semiconductor Corp., 4 N. Hickory Ave., Arlington Hgts., Ill.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Atlantic Semiconductor, 905 Mattison Ave., Asbury Park, N.J.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.

Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burroughs Corp., Box 1226, Plainfield, N.J.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eastron Corp., 25 Locust St., Haverhill, Mass.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kemtron Electron Prods., Inc., 14 Prince Pl., Newburyport, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
MSI Elctrns. Inc., 34-32 57th St., Woodside, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Comps., Inc., Box 421, Scottdale, Pa.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semicon Inc., 10 North Ave., Burlington, Mass.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Youngwood, Pa.

Diodes, Step Recovery

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Diodes, Surface Barrier

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Switching

AEL, Inc., Box 552, Lansdale, Pa.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Syntron Div., 264 Lexington, Homer City, Pa. ..... p 1946-1950
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1951
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1966
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1966
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Diodes, Tunnel

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1888
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diodes, Varactor

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. p 1872,1873,1876
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
ITT Electron Tube, Box 100, Easton, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1978,1979
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Eastron Corp., 25 Locust St., Haverhill, Mass.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
MSI Elctrns. Inc., 34-32 57th St., Woodside, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Parametric Inds., Inc., 742 Main St., Winchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Comps., Inc., Box 421, Scottdale, Pa.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.

Diodes, Video Detector—See Diodes, Microwave Detector

Diodes, Zener

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Components, Inc., Biddeford, Me. ..... p 1868-1871
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. .. p 1874-1876
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind. ..... p 1879
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1907,1908
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex. ..... p 1160
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio .. p 1921
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y. ..... p 1940
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1956
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. p 1962,1963,1967,1968
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1962,1963,1967,1968
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
American Semiconductor Corp., 4 N. Hickory Ave., Arlington Hgts., Ill.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Power Comps., Inc., Box 421, Scottdale, Pa.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semicon Inc., 10 North Ave., Burlington, Mass.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Diplexers

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Collins Radio Co., Dallas, Tex.

Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Directional Couplers—See Couplers, Directional

Discriminators

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airpax Elctrns., Inc., Cambridge, Md.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 1419
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1427
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
EMR Div., Box 223, Princeton, N.J.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Supplies Div., Box 312, Encino, Calif.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Disc Packs, Magnetic

Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 560
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Caelus Memories, 967 Mabury Rd., San Jose, Cal.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
3M Co., 3M Center, St. Paul, Minn.

Discs, Computer Memory Also See Memory Systems, Disc

Digital Equip. Corp., 146 Main St., Maynard, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Data, Inc., 19005 Ventura Blvd., Tarzana, Calif.
Bryant Computer Prods., 650 Ladd Rd., Walled Lake, Mich.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Information Data Sys., 8260 E. 8-Mile Rd., Detroit, Mich.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Discs, Optical Encoder—See Coded Discs, Optical

Dispensers For Epoxy, Encapsulating Compounds, etc.

Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Delsen Testing Corp., 719 W. Broadway, Glendale, Calif.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Fenwal, Inc., Main St., Ashland, Mass.
Hardman Inc., Belleville, N.J.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Hysol Div., 211 Franklin St., Olean, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Kenics Corp., One Southside Rd., Danvers, Mass.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Sta-Warm Elec. Co., Inc., 116 N. Chestnut St., Ravenna, Ohio
Stametics Co., P.O. Box 9308, N. Hollywood, Calif.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.

Display Boards—See Boards, Plotting

Display Panels (Back-Lighted & Edge-Lighted)

Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Display Devices, Inc., Box 667, Encinitas, Cal. ..... p 1504
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. ..... p 568
K.C.C. Shokai, Ltd., 4-31, Ouchi-dori, Naka-ku, Kobe, Japanp 570
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn. .. p 1545
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Bomac Elctrns., Inc., 18755 Napa St., Northridge, Cal.
Burtek, Inc., Box 1677, Tulsa, Okla.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Madatron Corp., 110 Rte. 10, Whippany, N.J.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Panob Corp., 49 Beech St., Port Chester, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Price Bros., Inc., 1025 West North Ave, Chicago, Ill
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sanders Assocs, Inc., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Displays, Projection Type (CRT, Electromechanical, Film Light Valve)

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn. ..... p 567
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn. .. p 1545
Adage, Inc., 1079 Commonwealth Ave., Boston, Mass.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Conrac Div., 600 N. Rimsdale Ave., Covina, Calif.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Kaiser Aerospace & Elctrns. Corp., P.O. Box 11275, Sta. "A", Palo Alto, Calif.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Madatron Corp., 110 Rte. 10, Whippany, N.J.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs, Inc., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., Inc., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Mt. Laurel Ind'l. Pk., Moorestown, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Dissipators, Heat—See Heat Sinks

Distortion Analyzers—See Analyzers, A-F

Distortion Indicators—See Analyzers, A-F

Distribution Systems, Frequency

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 576
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Defense Elctrns., Inc., Rockville, Md.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Dividers, Angular

Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Dividers, Frequency

Accutronics, Inc., 628 North St., Geneva, Ill.
AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bramco Controls Div., College & South Sts., Piqua, Ohio
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Connor-Winfield Corp., Winfield, Ill.
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ..... p 1443
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1885
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 1161
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa ..... p 1479
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. ..... p 1485
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
3M Co., 3M Center, St. Paul, Minn.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Dividers, Magnetic

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1375,1378
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.

Dividers, Power (LF, HF, VHF, UHF)

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.

Dividers, Power, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Indit Corp., 79 Albertson Ave., Albertson, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Dividers, Voltage Also See Transformers, Voltage Dividing

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ..... p 2034
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676,2808
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720-722,724
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758,759
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2736
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 806
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Pearson Elctrns., Inc., 4007 Transport St., Palo Alto, Calif.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Shallcross, E. Preston St., Selma, N.C.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Dollies & Instrument Carts—See Carts, Instrument & Equipment

Domes, Optical

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J. ..... p 2681
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohiop 2672
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.

Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Electro-Optical Div., 347 King St., Northampton, Mass.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Doors, Cabinet, Metal—See Cabinets & Accessories, Metal

Dope, Coil—See Insulating Compounds, Coil Dope

Dosimeters

Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Brinkmann Instrs., Inc., Cantiague Rd., Westbury, N.Y.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Penberthy Div., 6701 Maynard S., Seattle, Wash.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Telefunken Sls. Corp., South St., Garden City, N.Y.

Doublers, Frequency—See Multipliers, Frequency

Drafting Machines

Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Mechanical Enterprises, 5249 Duke St., Alexandria, Va. .... p 572
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Universal Drafting Machine Corp., 5200 Richmond Rd., Bedford Hgts., Ohio

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc.

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Bishop Graphics, Inc., 7300 Radford Ave, No. Hollywood, Cal.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
C-Thru Ruler Co., 6 Britton Dr., Bloomfield, Conn.
Centron Engrg., 1518 W. 132nd St., Gardena, Cal.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Etchomatic, Inc., Box 444, Waltham, Mass.
HAPCO, Box 1205, Boulder, Colo.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Stanpat Prods., Inc., 366 Main St., Port Washington, N.Y.
Symbo Co, 7609 Orchard Ave, N., Minneapolis, Minn
Tech-Tac, Inc., 4924 Elsinore, Orange, Calif.

Drafting Templates & Equip.

C-Thru Ruler Co., 6 Britton Dr., Bloomfield, Conn.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
HAPCO, Box 1205, Boulder, Colo.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Koh-I-Noor, Inc., 100 North St., Bloomsbury, N.J.
Stacor Corp., 285 Emmet St., Newark, N.J.
Stanpat Prods., Inc., 366 Main St., Port Washington, N.Y.
Uber Grafic Instrs., Box 4, Palo Alto, Calif.

Drawers, Sliding

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2156
Techmar Corp., 2232 S. Cotner Ave., Los Angeles, Cal. .. p 2159
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio

Drills & Accessories, Hand & Power

Ace Drill Corp., 2600 E. Maumee St., Adrian, Mich.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Bendix Corp., 180 Laurel St., Greenfield, Mass.
Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
Buffalo Forge Co., 490 Broadway, Buffalo, N.Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Dumore Co., 1300 17 St., Racine, Wisc.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
High Speed Hammer Co., Inc., 313 Norton St., Rochester, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Portable Elec. Tools, Div., 1200 E. State St., Geneva, Ill.
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Simonds Saw & Steel, Intervale Rd., Fitchburg, Mass.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Standard Pneumatic Motor Co., Box 745, Whittier, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tilden Tool Mfg. Co., Inc., Deming Ind'l. Area, Box 351, Deming, N.M.
Townsend Co., West Newton, Pa.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Wen Prods., Inc., 5810 Northwest Hwy., Chicago, Ill.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Drivers, Chopper

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1708
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315,2142

Drivers, Nut

Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
Channellock, Inc., S. Main St., Meadville, Pa.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Portable Elec. Tools, Div., 1200 E. State St., Geneva, Ill.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Rosenberg Bros. & Co., 100 Landing Ave., Smithtown, N.Y.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Standard Pneumatic Motor Co., Box 745, Whittier, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Townsend Co., West Newton, Pa.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Drivers, Solenoid—See Solenoid Drivers

Drivers, Speaker

Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Drivers, Switch

AEL, Inc., Box 552, Lansdale, Pa.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Daico Inds., Inc., Box 5225, Compton, Cal.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 868
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 1603
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.

Drivers, Tube

Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Burroughs Corp., Box 1226, Plainfield, N.J.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Drivers & Decoders For Readouts

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1492
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J..... p 568
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa..... p 1525
Norden Div., Helen St., Norwalk, Conn.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J..... p 1528
Shelly Assoc., Inc., 111 Eucalyptus Dr., El Segundo, Cal. p 1535
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burroughs Corp., Box 1226, Plainfield, N.J.
Discon Corp., 1150 N.W. 70th St., Ft. Lauderdale, Fla.
EDP Corp., Box 6485, Orlando, Fla.
Fabri-Tek, 1410 S.W. 3rd St., Pompano Beach, Fla.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Madatron Corp., 110 Rte. 10, Whippany, N.J.
Robins Data Devices, Inc., 15-58 127th St, Flushing, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Drives, Dial

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Dale Elctrns., Inc., Box 180, Yankton, S.D.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 2641
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
General Elec. Co., Waynesboro, Va.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Drivers & Drive Mechanisms

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. p 1364,1365
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Helitronics Corp., 155 Tichenor St., Newark, N.J. ..... p 2597
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 1603
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691
Sterling Instr., 76 E. Second St., Mineola, N.Y..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 2641
Weston-Transicoil, Worcester, Pa.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Insco Corp., Main St., Groton, Mass.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kinetic Instr. Co., 1072 Linwood St., Brooklyn, N.Y.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
La Vezzi Machine Works, Inc., 4635 W. Lake St., Chicago, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio

Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Drums, Computer Memory Also See •Memory Systems, Drum

Digital Equip. Corp., 146 Main St., Maynard, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Bielski Memory Sys., Inc., 122 E. 42 St., New York, N.Y.
Bryant Computer Prods., 850 Ladd Rd., Walled Lake, Mich.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
RCA, Marne Hwy., Moorestown, N.J.

Dry Transfer Letters & Numbers—See Kits, Marking

Dryers, Air, Heatless

Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Cargocaire Engrg. Corp., 8-10 Chestnut St., Amesbury, Mass.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hayes, C.I. Inc., 870 Wellington Ave., Cranston, R.I.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lectrodryer Div., P.O. Box 4599, Pittsburgh, Pa.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Puregas Equip. Corp., 1445 Strongs Rd., Copiague, N.Y.
Ross Engrg. Div., Box 751, New Brunswick, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.

Ducts, Flexible

Wiremold Co., Hartford, Conn. ..... p 2557
Flexaust Co., 277 Park Ave., New York, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
General Cable Corp., 733 Third Ave., New York, N.Y.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Ducts, Wiring

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Wiremold Co., Hartford, Conn. .....p 2556,2557
Danex Corp., 60 Tomlinson Rd, Huntingdon Valley, Pa.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Ideas, Inc., 118 Grand Ave., Laramie, Wyo.
Keystone Mfg. Co., Box 1005, 23328 Sherwood Rd., Warren, Mich.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stahlin Bros., Inc., 500 Maple St., Belding, Mich.
Taylor Elec., Fisher Rd., Howell, Mich.
Tyton Corp., 3330 W. Cameron Ave., Milwaukee, Wisc.
Tyton Corp., 3330 W. Cameron Ave., Milwaukee, Wisc.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.

Dummy Loads

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. p 667,873
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal..... p 735
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Electronautics, Newton Rd., Littleton, Mass.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Ham Kits, Box 175, Cranford, N.J.
Heath Co., Benton Harbor, Mich.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lectrodyne Sys. Corp., 1234 Carpenter St., Philadelphia, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
States Co., 19 New Park Ave., Hartford, Conn.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
TRG Prods., 400 Border St., E. Boston, Mass.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Trylon, Inc., Elverson, Pa.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Duplexer Equipment—See Recievers; Transmitters; etc.

Duplexers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Duplicators, Magnetic Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Cassettes Unlimited, Corp., 200 Claremont Ave., New York, N.Y.
Computerized Elctrn. Education, Inc., 214 Long La., Upper Darby, Pa.
International Radio & Elctms. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Magnetic Video Corp., 23434 Industrial Pk. Ct., Farmington, Mich.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Taben Recordings, 221 Rock Hill Rd., Bala Cynwyd, Pa.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.

Duplicators, Paper Tape

Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.

Dust-Free Chambers—See Rooms, Clean, Dust-Free

Dvm's—See Meters, Volt, Digital

Dynamometers

Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General-Electro Mechanical Corp., 787 Hertel Ave., Buffalo, N.Y. p 1670
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y.
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y. ..... p 1680
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bear Mfg. Co., 2830-5th St., Rock Island, Ill.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Task Corp., Box 3999, Anaheim, Calif.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.

Dynamotors

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Dyna Technology, Inc., Box 3263, Sioux City, Iowa
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Earphones—See Headphones & Headsets

Echo Boxes—See Boxes, Echo

Echo Ranging Equipment, Ultrasonic
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Automation Inds., Inc., Box 950, Boulder, Colo.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Massa Div., 280 Lincoln St., Hingham, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.

Economizers, Carbon Dioxide
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.

Editing Equipment
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 561
Ampex Corp., 401 Broadway, Redwood City, Calif.
Electronic Engrg. Co. Cal., 1601 E. Chestnut Ave., Santa Ana, Cal.
Elpa Mktg. Inds., Inc., Thorens & Atlantic Aves., New Hyde Park, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Elastoners, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Electrical Surge Arresters—See Arresters, Electrical Surge

Electrocardiographs (Ecg)
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Intermed Corp., 2710 Forest La., Dallas, Tex.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.

Electrodes—See Tube Parts

Electrodes, Electroplating—See Electroplating Equipment & Supplies

Electrodes, Spherical
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.

Electroencephalographs (Eeg)
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.

Electromechanical Readouts—See Readouts, Electromagnetic

Electromagnets—See Magnets, Electromagnetic

Electrometers—See Meters, Electrometer

Electromyographs
Honeywell, Box 5227, Denver, Colo.
London Co., 811 Sharon Dr., Westlake, Ohio
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.

Electron Guns—See Tube Parts

Electroplating Equipment & Supplies
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
CML, Inc., 166 National Rd., Edison, N.J.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Enthone, Inc., Box 1900, New Haven, Conn.
Etchomatic, Inc., Box 444, Waltham, Mass.
Fidelity Chem. Prods. Corp., 472 Frelinghuysen Ave., Newark, N.J.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lea-Ronal, Inc., 272 Buffalo Ave., Freeport, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
M & T Chemicals Inc., Rahway, N.J.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Selectrons, Ltd., 116 East 16th St., New York, N.Y.
Servometer Corp., 82 Industrial, E., Clifton, N.J.
Sifco Metachemical, 935 East 63rd St., Cleveland, Ohio
Technic, Inc., Box 965, Providence, R.I.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Electroplating Power Supplies—See Power Supplies, Electroplating Equipment

Electroplating Services—See Services, Plating

Electrostatic Spray Paint Systems—See Spray Systems, Electrostatic Paint

Elements, Heating—See Heating Elements

Elements, Sensing—See Transducers

Eliminators, Battery-Also See Power Supplies
Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006,1007
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. p 1066,1067
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
International Rectifier, 233 Kansas St., El Segundo, Cal.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Marathon Battery Co., Cold Spring, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Sorensen Oper., Richards Ave., Norwalk, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Heath Co., Benton Harbor, Mich.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sun Capacitors, 2554 Lawrence, Chicago, Ill.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Warren Communications, New Town Rd., Littleton, Mass.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Enamel Insulation—See Insulating Compounds, Enamel

Encapsulating Cups—See Cups, Encapsulation

Encapsulating Materials—See Compounds, Encapsulating

Encapsulation Services—See Services, Encapsulation

Enclosures, Component, Plug-In—See Cans

Enclosures, Speaker (Excluding Kits)
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Prods., Inc., 6825 S. Chicago Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Argos Prods. Co., Inc., 600 S. Sycamore St., Genoa, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Cambridge Pattern Works, Inc., 55 First St., Cambridge, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Easco Inds., Inc., 2121 Rte. 110, Farmingdale, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Furniture Craftsmen, 3596 Alpine Rd., N.W., Grand Rapids, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hartley Prods. Corp., Barnert Pl., Hohokus, N.J.
Hawley Prods. Co., 333 North 6th St., St. Charles, Ill.
Heath Co., Benton Harbor, Mich.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Karlson Resch. & Mfg. Div., 388 Penisula Blvd., Hempstead, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Klipsch & Assocs., Inc., Box 280, Hope, Ark.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Oaktron Inds., Inc., Monroe, Wisc.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
Radio-Matic America, Inc., 760 Ramsey Ave., Hillside, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Strom Comms. Corp., 10th & Wallace Sts., Chester, Pa.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Tannoy (America), Ltd., 1756 Ocean Ave., Bohemia, N.Y.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio
Wilder Engrg. Prods., 715 Kedzie, Chicago, Ill.

Encoders, Binary
Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545

Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Norden Div., Helen St., Norwalk, Conn. ..... p 582
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Collectron Corp., 304 East 45th St., New York, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Electronic Modules Corp., Box 141, Timonium, Md.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Flight Research, Box 1-F, Richmond, Va.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Honeywell, 11 W. Spring St., Freeport, Ill.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Litton Inds., 20745 Nordhoff St., Chatsworth, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Springer Aircraft Radio Co., RR #2, Box 98, Shelleyville, Ind.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Encoders, Brush & Magnetic, Disc

International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Norden Div., Helen St., Norwalk, Conn. ..... p 582
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Encoders, Digital

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Norden Div., Helen St., Norwalk, Conn. ..... p 582
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J. ..... p 1528
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
EDP Corp., Box 6485, Orlando, Fla.
Electronic Modules Corp., Box 141, Timonium, Md.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Flight Research, Box 1-F, Richmond, Va.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA, Marne Hwy., Moorestown, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Encoders, Displacement, Linear

Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Norden Div., Helen St., Norwalk, Conn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Encoders, Keyboard

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Norden Div., Helen St., Norwalk, Conn.
Raytheon Co., 465 Centre St., Quincy, Mass.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
United Aircraft Corp., Helen St., Norwalk, Conn.

Encoders, Optical—See Coded Discs, Optical

Encoders, Shaft Position

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 543
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn. ..... p 582
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580
Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Collectron Corp., 304 East 45th St., New York, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flight Research, Box 1-F, Richmond, Va.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Litton Inds., 20745 Nordhoff St., Chatsworth, Cal.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trump-Ross Ind'l. Controls, Inc., 265 Boston Rd., Billerica, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Engine Analyzers—See Analyzers, Engine

Engineering Reference Books—See Technical Books

Engraving & Profiling Equipment

Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Electro Stylus, 31 Cheyenne Blvd., Colorado Springs, Colo.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Metal Removal Co., 1801 W. Columbia, Chicago, Ill.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Preis, H.P. Engraving Mach. Co., 651 U.S. Hwy. 22, Hillside, N.J.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Wilkens, Alwin Fr., Inc., Rte. 22, Pawling, N.Y.

Engraving & Profiling Services—See Services, Engraving

Environmental Chambers—See Chambers

Environmental Rooms—See Rooms, Environmental

Environmental Seals & Feedthrus—See Feedthrus & Seals, Environmental

Environmental Testing Services—See Services, Environmental Testing

Epoxy Resins—See Adhesives; Compounds

Equalizers, Audio

Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TT Elctrns., Inc., Box 180, Culver City, Cal.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Collins Radio Co., Newport Beach, Calif.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Equalizers, Delay

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. ..... p 2559
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426,1427
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.

Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Sangamo Elec. Co., Box 126, Pickens, S.C.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. p 1486
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. p 1593
Acton Labs., Inc., 531 Main St., Acton, Mass.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Collins Radio Co., Newport Beach, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Superior Continental Corp., Box 489, Hickory, N.C.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.

Equalizers, Phase

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 2559
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1427
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Sangamo Elec. Co., Box 126, Pickens, S.C.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. p 1593
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Erasers, Magnetic Tape (Bulk)

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Totel Systems, 4695 Main St., Bridgeport, Conn.

Error Correction Equipment, Teleprinter

Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
Codex Corp., 150 Coolidge Ave., Watertown, Mass.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Welex Elctrns., Box 986, Silver Spring, Md.

Escutcheons

Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
Topflight Corp., 160 East 9th Ave., York, Pa.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Etchants, Printed Circuit—See Printed Circuit Etchants

Evaporation Equipment, Electron Beam

Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Exciters—See Oscillators

Exciters, Vibration—See Vibration Test Systems

Expanders, Data & Speech

RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.

Expanders, Meter—See Multipliers, Meter

Explosive Gas Indicators—See Detectors, Gas Leak

Extensometers, Electro-Optical

American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Optron Corp., 50 Fitch St., New Haven, Conn.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.

Extractors, Circuit Board, Fuse, Lamp, Tube—See Pullers

Eyelets

Circon Corp., Santa Barbara Airport, Goleta, Calif. p 2836
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Atlas Tack Corp., Fairhaven, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
3M Co., 3M Center, St. Paul, Minn.
USM Corp., 510 River Rd., Shelton, Conn.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Fabric, Insulation—See Insulating Materials, Fabric

Fabrics, Acoustic, Sound-Transparent

Acoustone Corp., 80 Wythe Ave., Brooklyn, N.Y.
Merlang Mfg. Corp., 122 S. Long Beach, Rockville Centre, N.Y.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.

Fabrics, Conductive

Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Plymouth Rubber Co., Inc., Canton, Mass.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Unique Wire Weaving Co., Inc., 759 Ramsey Ave., Hillside, N.J.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Faceplates

Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Facsimile Equipment—See Recievers; Transmitters; etc.

Fans—See Blowers & Fans

Fasteners, Metal

Circon Corp., Santa Barbara Airport, Goleta, Calif. p 2836
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Delbert Blinn. Co., Box 2007, Pomona, Calif. p 1877
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Helitronics Corp., 155 Tichenor St., Newark, N.J. p 2597
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2537
Sterling Instr., 76 E. Second St., Mineola, N.Y. p 1695
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Abbott Screw & Mfg. Co., 6525 N. Clark St., Chicago, Ill.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif.
Adjustable Bushing Corp., 11905 Vose St., N Hollywood, Calif.
Allen Mfg. Co., Drawer 570, Hartford, Conn.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Anti-Corrosive Metal Prods. Co., Inc., Box 1894, Albany, N.Y.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Armco/Olympic Fasteners, 7000 Roberts St., Kansas City, Mo.
Arrow Fastener Co., Inc., 271 Mayhill St., Saddle Brook, N.J.
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Atlas Tack Corp., Fairhaven, Mass.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Bland Co., 95 Granby St., Bloomfield, Conn.
Bostitch, Briggs Dr., E. Greenwich, R.I.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
C.E.M. Co., Inc., 24 School St., Danielson, Conn.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Cherry Rivet Div., P.O. Box 2157, Santa Ana, Calif.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Connectrol Corp., 28 E 22nd St, New York, N.Y.
Deutsch Fastener Corp., P.O. Box 90925, Airport Sta., Los Angeles, Calif.
Dimco-Gray Co., 207 East 6th St., Dayton, Ohio
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dynaloc Inc, 511 Second St. Pike, Southampton, Pa.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Elastic Stop Nut Div., 2330 Vauxhall Rd., Union, N.J.
Elco Inds., Inc., 1140 Samuelson Rd., Rockford, Ill.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
Garrett, George K. Co., 8801 Torresdale Ave., Philadelphia, Pa.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
Gillen, John Co., 2540 South 50th Ave., Cicero, Ill.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Groov-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N.J.
Harper, H.M. Co., 8200 Lehigh Ave., Morton Grove, Ill.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Heli-Coil Corp., Shelter Rock La., Danbury, Conn.
H.K. Metalcraft Mfg. Co., 35 Industrial Rd., Lodi, N.J.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.

Hydro Molding Co., Inc., Plattsburgh, N.Y.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jacobson Mfg. Co., Inc., Box 177, Kenilworth, N.J.
Kaynar Mfg. Co., Inc., 800 S. State College Blvd., Fullerton, Calif.
Kelox Industries, 161 Prescott St., E. Boston, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Lamson & Sessions Co., 5000 Tiedeman Rd., Cleveland, Ohio
Larson Charles O. Co., P.O. Box "E", Sterling, Ill.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Luke Line Fasteners, 201 Laurel St., Beverly, N.J.
MacLean-Fogg Lock Nut Co., 1000 Allanson Rd., Mundelein, Ill.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Nelson Stud Welding Co., E. 28th & Toledo Ave., Lorain, Ohio
Nielsen Hardware Corp., 770 Wethersfield Ave., Hartford, Conn.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nylok Co. Div., 611 Industrial Ave., Paramus, N.J.
Pan-L-Fast, 13161 Sherman Way, N. Hollywood, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Republic Steel Corp, Box 6778, Cleveland, Ohio
Rosan, Inc., 2901 W. Coast Hwy., Newport Beach, Calif.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Shakeproof Div., St. Charles Rd., Elgin, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Stake Fastener Co., 9835 Dupree St., S. El Monte, Calif.
Standard Locknut & Lockwasher, Inc., 2725 Tobey Dr., Box 26245, Indianapolis, Ind.
Standard Screw Co., 2701 Washington Blvd., Bellwood, Ill.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Star Expansion Co., Pleasant Hill Rd., Mountainville, N.Y.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Sterling Bolt Co., 5401 W. Roosevelt Rd., Chicago, Ill.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Teale Machine Co., Inc., Box 936, Rochester, N.Y.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Timber-Top, Inc., 199E N. Main St., Freeport, N.Y.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Townsend Co., West Newton, Pa.
Townsend Co., 530 West St., Braintree, Mass.
Tridair Inds., 3000 W. Lomita Blvd., Torrance, Calif.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
USM Corp., 510 River Rd., Shelton, Conn.
Utilities Svc. Co., P.O. Box 627, Allentown, Pa.
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Waterbury Pressed Metal Co., 407 Brookside Rd., Waterbury, Conn.
Western Sky Ind., 21300 Cloud Way, Hayward, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wrought Washer Mfg. Co., 2252 S. Bay St., Milwaukee, Wisc.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Fasteners, Non-Metallic

All States Plastic Mfg. Co., Inc., 2937 N. Elston Ave., Chicago, Ill. ..... p 2909
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Delbert Blinn. Co., Box 2007, Pomona, Calif. ..... p 1877
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2964
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Abbott Screw & Mfg. Co., 6525 N. Clark St., Chicago, Ill.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anti-Corrosive Metal Prods. Co., Inc., Box 1894, Albany, N.Y.
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Bland Co., 95 Granby St., Bloomfield, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Gaskets, Inc., Middletown, Conn.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Hanscom, H.F. Co., Inc., 225 Chapman St., Providence, R.I.
Harper, H.M. Co., 8200 Lehigh Ave., Morton Grove, Ill.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
Luke Line Fasteners, 201 Laurel St., Beverly, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nylogrip Prods. Co., 281 Winter, Waltham, Mass.
Nyltite Corp. America, 3451 S. Clinton Ave., S. Plainfield, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shakeproof Div., St. Charles Rd., Elgin, Ill.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Star Expansion Co., Pleasant Hill Rd., Mountainville, N.Y.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Tridair Inds., 3000 W. Lomita Blvd., Torrance, Calif.
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.

Fault Locators—See Detectors, Flaw & Defect

Feedthrus & Seals, Environmental

Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Latronics Corp., Box 469, Latrobe, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Ultek Div., Box 10920, Palo Alto, Calif.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Resch. Mfg. Co., 3100 Crow Canyon Rd., San Ramon, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Vernay Labs., E. South College St., Yellow Springs, Ohio
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Feedthrus, Terminal—See Terminals, Feedthru

Felt & Felt Parts

Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
Felters Co., 22 West St., Millbury, Mass.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GAF Corp., 140 W. 51 St., New York, N.Y.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Ferrite Parts-Also See Materials Ferrite;Cores, Ferrite

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. ..... p 2741
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fair-Rite Prods. Corp., 1 Commercial Row, Walkill, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Insaco, Inc., Box 422, Quakertown, Pa.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solitron Microwave, 37-11 47th Ave., Long Island City, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Fiber Optic Bundles

Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal.
Allyn, W., Inc., Skaneateles Falls, N.Y.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
EMR Div., Box 223, Princeton, N.J.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Superior Elctrns. Co., 474 Getty Ave., Clifton, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Fiber Optic Inspection Equipment

Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Superior Elctrns. Co., 474 Getty Ave., Clifton, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Fibers—See Insulating Materials, Fiber

Field Plotters, Electric & Magnetic

Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Film Badges—See Services, Film Badge

Film Thickness Indicators—See Indicators, Film Thickness

Films, Capacitor

Dielectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
Elctrn. Concepts, Inc., Box 627, Eatontown, N.J.
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Dixon Corp., Metacom Ave., Bristol, R.I.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Matthey Bishop Inc., Malvern, Pa.
Metallized Prods. Co., Inc., P.O. Box 391, Norwalk, Conn.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Schweitzer, Peter J. Div., Lee, Mass.
3M Co., 3M Center, St. Paul, Minn.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Films, Masking (Incl. Photographic)

Eastman Kodak Co., 343 State St., Rochester, N.Y.
Owens-Illinois, Inc., C&TP Div., Elctrn. Materials, Box 1035, Toledo, Ohio
Ulano Prods. Co. Inc., 210 East 86 St., New York, N.Y.

Films, Resistance

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2693,2695
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2767
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2767
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Filter Synthesizers

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 1552
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. p 1585
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. p 1587
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Teledyne Adcom, 808 Memorial Dr., Cambridge, Mass.

Filters, A-F

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allison Labs., Inc., Box 9849, Austin, Tex. p 1318
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1430
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. p 1551
Aritech Corp., 130 Lincoln St., Brighton, Mass. p 1562
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456,1582
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1426
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2579
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 660
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. p 1570
Gould, Inc., 232 Forbes Rd., Bedford, Ohio p 1576,1577
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. p 1575
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. p 1583
Murata Corp. of America, 2 Westchester Plaza, Elmsford, N.Y. p 1471
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. p 1585
Raytheon Co., 465 Centre St., Quincy, Mass.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. p 1483
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. p 1590,1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. p 2587
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
National Coil Co., Box 1040, Douglas, Ariz.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Techniques, Inc., 1411 Palisade Ave., W. Englewood, N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trion, Inc., 1000 Island Ave., McKees Rocks, Pa.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Active (All Types)

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1561
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. p 1551
Aritech Corp., 130 Lincoln St., Brighton, Mass. p 1562
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. p 1570
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. p 1583
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. p 1584,1585
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. p 1587
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. p 1618
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
KDI Navcor, Inc., 15551 Cabrito Rd., Van Nuys, Cal.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Air—See Air Cleaners & Filters

Filters, Analog—See Filters, Continuously Variable

Filters, Antenna

AEL, Inc., Box 552, Lansdale, Pa.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. p 861
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y.
Honeywell, Box 5227, Denver, Colo.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. p 765
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. p 906
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Band Elimination

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. p 1552,1553
Allison Labs., Inc., Box 9849, Austin, Tex. p 1318
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. p 1561
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. p 1551
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. p 861
Aritech Corp., 130 Lincoln St., Brighton, Mass. p 1562
Automatic Coil, 76 East 2nd St., Mineola, N.Y. p 2335
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1582
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1426,1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. p 1435
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2579
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 660
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. p 876
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. p 1575
Honeywell, Box 5227, Denver, Colo.

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Marconi Instrs., 111 Cedar La., Englewood, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
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Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
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Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
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Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. .....p 1590,1591
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U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l, Pk., Tucson, Ariz.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Lab. Assocs., Norwich, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Band Pass

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
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Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
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Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
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Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
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Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
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Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
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Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
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Tracor, Inc., 6500 Tracor La., Austin, Tex.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. .....p 1590,1591
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Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1618
Zaring Inds., Inc., Box 477, Carmel, Ind.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.

Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Navcor, Inc., 15551 Cabrito Rd., Van Nuys, Cal.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Linear Networks Co., Box 1328, San Pedro, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
White Instrs., Inc., Box 698, Austin, Tex.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Ceramic

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1576,1577
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. p 1594,1595
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.

Filters, Coaxial

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Comb

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Blackhawk Networks Corp., 14 N. Parker Dr., Janesville, Wisc. p 1423
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1418,1419
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1427
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. ..... p 1570
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1577
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1481
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.

TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486,1487
TT Elctrns., Inc., Box 180, Culver City, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Continuously Variable

Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. .. p 1551
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,660
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Filters, Crystals (Incl. Monolithic Devices)

Blackhawk Networks Corp., 14 N. Parker Dr., Janesville, Wisc. p 1423
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1418,1419
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1576,1577
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1463-1465
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1469
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480,1481
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1584,1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486,1487
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
Collins Radio Co., Dallas, Tex.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Marconi Div., 1 Park Ave., New York, N.Y.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Sherold Crystal Prods. Grp., 1510 McGee Trafficway, Kansas City, Mo.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Valpey Corp., 1400 Highland St., Holliston, Mass.

Filters, Electric Wave Section

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1584
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Equalizer

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486,1487
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Techniques, Inc., 1411 Palisade Ave., W. Englewood, N.J.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Filters, Fluid, Nonmetallic

Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Vanton Pump & Equip. Corp., 201 Sweetland Ave., Hillside, N.J.

Filters, Harmonic

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Honeywell, Box 5227, Denver, Colo.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
White Instrs., Inc., Box 698, Austin, Tex.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, High-Pass

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. ..p 1552,1553
Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 1561
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. .. p 1551
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1582
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426,1427
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 660
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1584
Raytheon Co., 465 Centre St., Quincy, Mass.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1590,1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1618
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Linear Networks Co., Box 1328, San Pedro, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, I-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Blackhawk Networks Corp., 14 N. Parker Dr., Janesville, Wisc. p 1423
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois ..... p 1431
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1576,1577
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.

Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C.
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
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Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
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United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Defense Elctrns., Inc., Rockville, Md.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Hope Elctrns., Box 773, Clifton, N.J.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Filters, Industrial, Heavy Duty (Electronic)

Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
NWL, Inc., Box 455, Trenton, N.J.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. .. p 1595
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Barrett, Leon J. Co., 1450 Grafton Rd., Worcester, Mass.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
North American Rockwell Corp., 25000 Miles Rd., Cleveland, Ohio
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
RtroN Corp., Box 743, Skokie, Ill.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Trion, Inc., 1000 Island Ave., McKees Rocks, Pa.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.

Filters, Interference

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
All-Tronics Inc., 45 Bond St., Westbury, N.Y. ..... p 1554-1558
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Filtron Co., Inc., 131-15 Fowler Ave., Flushing, N.Y. ..p 1564,1565
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. ..... p 1566-1569
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal. p 2277
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. p 1594,1595
Acton Labs., Inc., 531 Main St., Acton, Mass.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Blonder-Tongue Labs., inc., One Jake Brown Rd., Old Bridge, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Lab. Assocs., Norwich, N.Y.
Gold Line Connector, Inc., Mullier Ave., Box 893, Norwalk, Conn.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Nytronics, Inc., Third Ave., Alpha, N.J.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RtroN Corp., Box 743, Skokie, Ill.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Schoeffel Instr. Corp., 24 Booker St. Westwood, N.J.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
University Labs., 1250 W. Middlefield Rd., Mountain View, Cal.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Welex Elctrns., Box 986, Silver Spring, Md.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Filters, Interstage & Line—See Filters, Telemetering

Filters, Line

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 1559
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Filtron Co., Inc., 131-15 Fowler Ave., Flushing, N.Y. ..p 1564,1565
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. ..... p 1566-1569
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. .. p 1595
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
AMBAC Inds., Inc.,' 900 Old Country Rd., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
General Lab. Assocs., Norwich, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nytronics, Inc., Third Ave., Alpha, N.J.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RtroN Corp., Box 743, Skokie, Ill.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.

Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Filters, Linear Phase

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.....p 1426,1427
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 660
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1463
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind.
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
General Lab. Assocs., Norwich, N.Y.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
Nytronics, Inc., Third Ave., Alpha, N.J.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Low-Pass

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y...p 1552,1553
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass..... p 1561
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. .. p 1551
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1582
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.....p 1426,1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 660
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. ..... p 1566-1569
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. p 1578,1579
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Intronics, Inc., 57 Chapel St., Newton, Mass.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Nytronics, Inc., Orange St., Darlington, S.C.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.....p 1584,1585
Raytheon Co., 465 Centre St., Quincy, Mass.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal.....p 1590,1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1618
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Capcon, Inc., 61 Stanton St., New York, N.Y.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elmag Corp., 54 Clark St., Newark, N.J.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Navcor, Inc., 15551 Cabrito Rd., Van Nuys, Cal.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Linear Networks Co., Box 1328, San Pedro, Cal.
Linear Networks Co., Box 1328, San Pedro, Cal.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
National Coil Co., Box 1040, Douglas, Ariz.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nytronics, Inc., Third Ave., Alpha, N.J.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.

Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
RtroN Corp., Box 743, Skokie, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
White Instrs., Inc., Box 698, Austin, Tex.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Mechanical

Bramco Controls Div., College & South Sts., Piqua, Ohio p 1582
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Acton Labs., Inc., 531 Main St., Acton, Mass.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Meson Elctrns. Co., inc., 380 Cottage St., Rochester, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.

Filters, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Waveline, Inc., Box 718, W. Caldwell, N.J.
AAI Corp., P.O. Box 6767, Baltimore, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Caledonia Elctrns., Maple St., Caledonia, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Miniature—See Filters (Specific Types)

Filters, Optical

Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kaiser Aerospace & Elctrns. Corp., P.O. Box 11275, Sta. "A", Palo Alto, Calif.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Polacoat, Inc., 9750 Conklin Rd., Blue Ash, Ohio
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Filters, Programmable—See Filters, Variable

Filters, R-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y...p 1552,1553
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio .....p 1576,1577
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. p 1578,1579
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y. p 1571
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1463,1464
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. ..... p 1586
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan

TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1590
United Transformer Co., 150 Varick St., New York, N.Y.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. p 1594,1595
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., Seneca Ave., Olean, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Capcon, Inc., 61 Stanton St., New York, N.Y.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electromec, Inc., 209 N. Tradd St., P.O. Box 1022, Statesville, N.C.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elmag Corp., 54 Clark St., Newark, N.J.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Condenser Corp., 3243 N. California Ave., Chicago, Ill.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Midwec Corp., Box 417, Scottsbluff, Neb.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
North American Rockwell Corp., 25000 Miles Rd., Cleveland, Ohio
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rafec Elctrns., Box 566, Temple City, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
RtroN Corp., Box 743, Skokie, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Reactor

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TDC Div., Box 365, Littleton, Mass.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.

Filters, Screenroom

All-Tronics Inc., 45 Bond St., Westbury, N.Y. ..... p 1558
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Captor Corp., 5040 S. County Rd. (25A), Tipp City, Ohio
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
RtroN Corp., Box 743, Skokie, Ill.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Filters, Single Sideband

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Blackhawk Networks Corp., 14 N. Parker Dr., Janesville, Wisc. p 1423
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 1419
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hertz Filter Corp., 50 Washington Ave., Garden City Pk., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1463
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1480
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andersen W. M. A. & Assocs., 4 Main St. Ext., Tariffville, Conn.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Marconi Div., 1 Park Ave., New York, N.Y.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.

Filters, Synchronous Tracking

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 860
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.

Filters,Telemetering

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426,1427
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1576,1577
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. p 1578,1579
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1463
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
Nytronics, Inc., Orange St., Darlington, S.C.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1590,1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Defense Elctrns., Inc., Rockville, Md.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
EMR Div., Box 223, Princeton, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Networks Co., Box 1328, San Pedro, Cal.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.

Filters, Tone, Telegraph

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1582
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1426,1427
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans. ..... p 1575
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y. p 1596,2355
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Filtech Corp., 10103 W. Pacific, Franklin Park, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Kinetic Tech., Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Nytronics, Inc., Third Ave., Alpha, N.J.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.

Filters, Tunable—See Filters, Continuously Variable

Filters, Tuning Fork

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1430
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Murata Corp. of America, 2 Westchester Plaza, Elmsford, N.Y. p 1471
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. ..... p 1485
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Filters, UHF & VHF

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio ..... p 1576,1577
Honeywell, Box 5227, Denver, Colo.
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal. ..... p 1449
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal. ..... p 1449
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1463,1464
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Piezo Technology, Inc., 2400 Diversified Way, Box 7877, Orlando, Fla. ..... p 1481
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RF Interonics, Inc., 100 Pine Aire Dr., Bay Shore, N.Y. .... p 1586
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. .... p 2306
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1593
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
U.S. Capacitor Corp., 2151 N. Lincoln St., Burbank, Cal. p 1594,1595
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Filters, Variable

AEL, Inc., Box 552, Lansdale, Pa.
Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
A. P. Circuit Corp., 865 West End Ave., New York, N.Y. .. p 1551
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,660
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal. ..... p 1570
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 1581
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y. ..... p 1583
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind. ..... p 1585
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y. ..... p 1587
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind. ..... p 1592
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif. ..... p 1618
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Frequency Devices, Inc., 25 Locust St., Haverhill, Mass.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kinetic Tech.. Inc., 3393 De La Cruz Blvd., Santa Clara, Cal.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
RFL Inds., Inc., Comps. Div., Powerville Rd., Boonton, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sanders Assocs., 95 Canal St., Nashua, N.H.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Spectrum Instrs., Inc., 35 Grand St., New Rochelle, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Filters, Vestigial Sideband

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Multimetrics, Inc., 401 Concord Ave., Bronx, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nytronics, Inc., Orange St., Darlington, S.C.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.

Filters, Waveguide

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 906
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Finders, Range—See Range Finder Systems

Finger Contact Strips—See Contact Strips, Finger

Finishes—See Coatings; Paints; Plating Solutions

Fire Control Systems, Aircraft, Missile, Rocket

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Norden Div., Helen St., Norwalk, Conn.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
AC Elctrns. Div., 7929 S. Howell Ave., Milwaukee, Wisc.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
United Aircraft Corp., Helen St., Norwalk, Conn.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Fire Detection & Fighting Equip.

Eagle Signal Div., 736 Federal St., Davenport, Iowa
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fenwal, Inc., Main St., Ashland, Mass.
Fuel Watchman Sls. & Svc., Inc., 2910 Park Ave., Bronx, N.Y.
Honeywell, Inc., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Schirmer National Alarm Co., 100 Portland Ave., Bergenfield, N.J.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Worner Elctrn. Devices, Rankin, Ill.

Flame Spraying Equipment

Metco, Inc., 1101 Prospect Ave., Westbury, N.Y.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.

Flanges, Waveguide

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Waveline, Inc., Box 718, W. Caldwell, N.J.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
American Radar Comps., Inc., 415 E. Main St., Denville, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Connector Corp. America, 12959 Sherman Way, N. Hollywood, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Formcraft Tool Co., 6453 S. Bell Ave., Chicago, Ill.
Gabriel Elctrns., Div., Saco, Me.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Flash Photolysis Systems & Components

Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Instr. Resch. Co., Box 231, Lincoln, Mass.
Xenon Corp., 39 Commercial St., Medford, Mass.

Flashers

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
E.D.I. Inc., Box 66, Cairo, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Mel-Rain Corp., 3100 Roosevelt Ave., Indianapolis, Ind.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
Xenon Corp., 39 Commercial St., Medford, Mass.

Flashlights & Lanterns

Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.

Flat Packages, Integrated Circuit—See Packages, Integrated Circuit

Flaw Detection Equipment—See Detectors, Flaw & Defect

Fluid Conductivity Indicators—See Indicators, Fluid Conductivity

Fluidic Control Systems & Equip.

Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., Sidney, N.Y.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Howie Corp., Noble & Jackson Sts., Norristown, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Trish Energetics, Pond Rd., Harvard, Mass.

Fluorescent Compounds & Phosphors

RCA, 415 S. 5th St., Harrison, N.J.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Prods., Box 45278, Chicago, Ill.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Carter's Ink Co., 239 First St., Cambridge, Mass.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Stroblite Co., Inc., 29 W. 15th St., New York, N.Y.
Sylvania Elec. Prods., Inc., Towanda, Pa.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Fluorometers

American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Flux, Brazing & Soldering

Edsyn, Inc., 15954 Arminta St., Van Nuys, Cal.....p 2838,2839
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J. ..... p 2837
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. ..... p 2843
Acton Assocs., 100 Thompson St., Pittston, Pa.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Bow Solder Products Co., Inc., 25 Amsterdam St., Newark, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dow Chemical Co., Box 1682, Midland, Mich.
Dunton, M.W. Co., 350 Kinsley Ave., Providence, R.I.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
Farrelloy Co., 1243 North 26 St., Philadelphia, Pa.
Force Chems. Div., Ind'l. Blvd., Paoli, Pa.
Gardiner Solder Co., 4820 S. Campbell Ave., Chicago, Ill.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Handy & Harman, 850 Third Ave., New York, N.Y.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Hobart Bros. Co., 600 W. Main St., Troy, Ohio
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Johnson Mfg. Co., Box 96, Princeton, Iowa
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Kestler Elctrns., 4226 Arica Ave., Rosemead, Calif.
Lake Chemical Co., 250 N. Washtenaw Ave., Chicago, Ill.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
National Lead Co., 111 Broadway, New York, N.Y.
Shanda Labs., Inc., Box 24, Closter, N.J.
Stewart-Hall Chemical Corp., 222 Washington St., Mt. Vernon, N.Y.
Superior Flux & Mfg. Co., 1536 St. Clair Ave., Cleveland, Ohio
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Fluxmeters—See Meters, Flux

Foil, Capacitor Electrode

Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
AMAX Alum/Foil Prods., 6106 S Broadway, St. Louis, Mo.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.

Foil, Magnetic

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2603
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh, Pa.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Hamilton Watch Co., Lancaster, Pa.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Precision Metals Div., Lancaster, Pa.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.

Foil, Magnetic Shielding—See Shields, Magnetic

Forks, Tuning—See Tuning Forks

Forms, Coil—See Coil Forms

Forms, Wire

Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J. .... p 2680
Accurate Spring, 8747 W. Palmer St., River Grove, Ill.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Ce-Ja Springs, Inc., 169 Day St., Newington, Conn.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Dudek & Bock Spring Mfg. Co., 4014 W. Grand Ave., Chicago, Ill.
Eastern Tool & Mfg. Co., 1 Montgomery St., Belleville, N.J.
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
James Elctrn. Tool Co., P.O. Box 1482, Palo Alto, Calif.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Stanley Ind'l. Comps. Div., Forestville, Conn.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Volkert Stampings, Inc., 222-34 96th Ave., Queens Village, N.Y.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
Zims Mfg. Co., 26 Paine Ave., Irvington, N.J.

Frames, Cabinet & Rack

Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Techmar Corp., 2232 S. Cotner Ave., Los Angeles, Cal. .. p 2159
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Abtronics, Inc., Box 712, Livermore, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Frequency Analyzers—See Analyzers, Spectrum

Frequency Calibration Services—See Services, Calibration & Instrument Repair

Frequency Distribution Systems—See Distribution Systems, Frequency

Frequency Extenders—See Dividers, Frequency

Frequency Sources—See Oscillators

Frequency Standards—See Standards, Frequency

Frequency Synthesizers—See Synthesizers, Frequency

Fuel Cells

Allis-Chalmers, Box 512, Milwaukee, Wisc.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Power Applications, Inc., Box 305, Bayside, N.Y.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Furnaces, Brazing

Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Astro Inds., Inc., 606 Olive St., Santa Barbara, Calif.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Hayes, C.I. Inc., 870 Wellington Ave., Cranston, R.I.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Pioneer Metals, Inc., Hwy. 127, N., Harrodsburg, Ky.
Selas Corp. America, Box 200, Dresher, Pa.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Watkins-Johnson Co., 440 Mt. Hermon Rd., Scotts Valley, Cal.

Furnaces, Diffusion

Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Norton Co., 160 Charlemont St., Newton, Mass.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Furnaces, Electric (Laboratory)

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Astro Inds., Inc., 606 Olive St., Santa Barbara, Calif.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Feco, 5855 Grant Ave., Cleveland, Ohio
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
L & L Mfg. Co., 166 Conchester Rd., Twin Oaks, Pa.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Watkins-Johnson Co., 440 Mt. Hermon Rd., Scotts Valley, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Furnaces, Electric (Production)

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Astro Inds., Inc., 606 Olive St., Santa Barbara, Calif.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Feco, 5855 Grant Ave., Cleveland, Ohio
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hayes, C.I. Inc., 870 Wellington Ave., Cranston, R.I.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
L & L Mfg. Co., 166 Conchester Rd., Twin Oaks, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Litton Engrg. Labs., Box 669, Carson City, Nev.
Mech-Tronic Equip. Co., Box 510, Silver Spring, Md.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Research, Inc., Box 24064, Minneapolis, Minn.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Watkins-Johnson Co., 440 Mt. Hermon Rd., Scotts Valley, Cal.

Furnaces, Gas (Production)

Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Feco, 5855 Grant Ave., Cleveland, Ohio
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Selas Corp. America, Box 200, Dresher, Pa.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Furnaces, High-Frequency

Ajax Magnethermic Corp., 1745 Overland Ave., N.E., Warren, Ohio
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Cycle-Dyne, Inc., 134-20 Jamaica Ave., Jamaica, N.Y.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Furnaces, Vacuum

Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Ajax Magnethermic Corp., 1745 Overland Ave., N.E., Warren, Ohio
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Astro Inds., Inc., 606 Olive St., Santa Barbara, Calif.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Brew Richard D. & Co., Inc., 90 Airport Rd., Concord, N.H.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Hayes, C.I. Inc., 870 Wellington Ave., Cranston, R.I.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclide Corp., 916 Main St., N. Acton, Mass.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Watkins-Johnson Co., 440 Mt. Hermon Rd., Scotts Valley, Cal.

Furniture, Electronic Lab.—See Benches, Consoles, Stools, Tables (Lab & Shop)

Fuse Clips—See Clips & Holders, Fuse

Fuse Panels—See Panels, Fuse

Fused Plugs—See Plugs, Fused

Fused Quartz—See Quartz, Fused

Fuses

Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo. p 2008,2009
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal..... p 2037
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Auto Prods. Co., 2735 Olive St., St. Louis, Mo.
Bedford Div, Daniel Webster Hwy., So. Nashua, N.H.
Bellaire Elctrns., Inc., 62 White St., Red Bank, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Chase-Shawmut Co., 374 Merrimac St., Newburyport, Mass.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Economy Fuse Div., 2070 Maple St., Des Plaines, Ill.
Electrey, S.A., Apartado 1393, Monterrey, Mexico
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Micro Devices Corp., P.O. Box 501, Far Hill Sta., Dayton, Ohio
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Trico Fuse Mfg. Co., 2948 North 5th St., Milwaukee, Wisc.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Fuses, Failure Indicating

Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo. p 2008,2009
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Economy Fuse Div., 2070 Maple St., Des Plaines, Ill.
Electrey, S.A., Apartado 1393, Monterrey, Mexico
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Micro Devices Corp., P.O. Box 501, Far Hill Sta., Dayton, Ohio
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Fuses, Thermal

Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Economy Fuse Div., 2070 Maple St., Des Plaines, Ill.
Electrey, S.A., Apartado 1393, Monterrey, Mexico
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Micro Devices Corp., P.O. Box 501, Far Hill Sta., Dayton, Ohio

Fuses, Time Delay

Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo. p 2008,2009
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Chase-Shawmut Co., 374 Merrimac St., Newburyport, Mass.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Economy Fuse Div., 2070 Maple St., Des Plaines, Ill.
Electrey, S.A., Apartado 1393, Monterrey, Mexico
General Elec. Co., 95 Hathaway St., Providence, R.I.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Micro Devices Corp., P.O. Box 501, Far Hill Sta., Dayton, Ohio
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.

Galvanometers—See Meters, Galvanometer

Gamma Ray Tubes—See Tubes, Radiation Detection

Garnet Parts-Also See Materials, Garnet

Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Solitron Microwave, 37-11 47th Ave., Long Island City, N.Y.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Gas Analyzers—See Analyzers, Gas

Gases, Inert

Air Prods. & Chems., Inc., Box 538, Allentown, Pa.
Blackburn, P.W., Inc., 67 Main St., Dobbs Ferry, N.Y.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.

Gaskets—See Seals

Gaskets, Shielding, R-F-Also See Shields, R-F

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J.
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Metex Corp., 970 New Durham Rd., Edison, N.J..... p 2606-2622
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.

Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.

Gates, Computer Circuit (AND, OR, NOR, ETC.)—See Cards, Logic; Circuits, Integrated; Modules, Logic

Gauges, Beta

Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Ohmart Corp., 4241 Allendorf Dr., Cincinnati, Ohio
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Unit Process Assemblies, 53-15 37th Ave., Woodside, N.Y.

Gauges, Connector

Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Measurement Specialties Lab., Inc., 14532 Erwin St., Van Nuys, Cal.

Gauges, Displacement, Linear

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Optron Corp., 50 Fitch St., New Haven, Conn.
P.I. Tape, 7951 North Ave., Lemon Grove, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Starrett, L.S. Co., 1-165 Crescent St., Athol, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Gauges, Fuel

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Ametek, Inc., Station Square Two, Paoli, Pa.
Brooks Instr. Div., Hatfield, Pa.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Gauges, Ionization

Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Middlesex Gen'l. Inds., 58 Washington St., Somerville, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Ohmart Corp., 4241 Allendorf Dr., Cincinnati, Ohio
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Gauges, Lead Bending

Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.

Gauges, Photoelectric

Abtronics, Inc., Box 712, Livermore, Calif.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Link Div., Binghamton, N.Y.
Optron Corp., 50 Fitch St., New Haven, Conn.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Gauges, Pirani

RCA, 415 S. 5th St., Harrison, N.J.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Gauges, Pressure-Also See Transducers, Pressure

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., S. Montrose, Pa.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Crystal Resch., Inc., 42 Concord La., Cambridge, Mass.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Dynisco Div., 20 S. West Pk., Westwood, Mass.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Ellison Draft Gage Co., Inc., Box 96, New Buffalo, Mich.
Foxboro Co., Foxboro, Mass.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
MB Elctrns., Box 1825, New Haven, Conn.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Puregas Equip. Corp., 1445 Strongs Rd., Copiague, N.Y.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Roylyn, 620 Paula Ave., Glendale, Cal.
Scanivalve, Inc., Box 20005, San Diego, Calif.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Superior Continental Corp., Box 489, Hickory, N.C.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
Weksler Instrs. Corp., 80 Mill Rd., Freeport, N.Y.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Gauges, Radiation, Microwave

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.

Gauges, Strain

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Ametek, Inc., Station Square Two, Paoli, Pa.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Foxboro Co., Foxboro, Mass.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Micro-Meas. Div., Box 306, 38905 Chase Rd., Romulus, Mich.
Micro-Strain, Inc., Spring City, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
United Control Corp., Redmond, Wash.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Gauges, Tension

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Ametek, Inc., Station Square Two, Paoli, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
Imtra Corp., 151 Mystic Ave., Medford, Mass.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Neuses, P.K., Inc., Box 100, Arlington Hgts., Ill.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Wharton Unitools, 8-10 Lake St., Moosup, Conn.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Gauges, Thickness (Electronic)—See Indicators, Film Thickness; Indicators, Material Thickness

Gauges, Vacuum

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Abbeon, Inc., 179-15 Jamaica Ave., Jamaica, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Beach-Russ Co., 420 Lexington Ave., New York, N.Y.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bristol Div, Waterbury, Conn
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Ellison Draft Gage Co., Inc., Box 96, New Buffalo, Mich.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Foxboro Co., Foxboro, Mass.

Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hastings-Raydist, Newcomb Ave., Hampton, Va.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Ultek Div., Box 10920, Palo Alto, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
Weksler Instrs. Corp., 80 Mill Rd., Freeport, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Gauges, Wire Measuring—See Wire Measuring Gauges

Gear Measuring Wire

Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio

Gears & Gear Mechanisms (Precision)

Autotronics, Inc., 2700 Davis, Joplin, Mo ..... p 1635
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
Howard Inds., 2420 18th St., Racine, Wisc.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1527
Nanasi, 6308 Jackson St., W. New York, N.J.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind. .... p 1393
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1694
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa. ..... p 1998
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Beaver Gear Works, Inc., 5459 - 11th St., Rockford, Ill.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Dynamic Gear Co., 175 Dixon Ave., Amityville, N.Y.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Electronic Mach. Parts, Inc., 128-11 18th Ave., College Point, N.Y.
Equitable Engrg. Co., 2724 Normandy Rd., Royal Oak, Mich.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Franke Gear Works, Inc., 4401 N. Ravenswood, Chicago, Ill.
GAF Corp., 140 W. 51 St., New York, N.Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago, Ill.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Gibson/Egan Co., 34 La Porte St., Arcadia, Calif.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Insco Corp., Main St., Groton, Mass.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Invincible Gear Co., 14938 Telegraph Rd., Detroit, Mich.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Juall Gear Co., Inc., 1108 Goffle Rd., Hawthorne, N.J.
Kinetic Instr. Co., 1072 Linwood St., Brooklyn, N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
La Vezzi Machine Works, Inc., 4635 W. Lake St., Chicago, Ill.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Link Div., Binghamton, N.Y.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Melland Gear & Instr. Co., Inc., 84 Sylvester St., Westbury, N.Y.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Perfect Gear & Instr. Corp., 18141 Napa, Northridge, Calif.
Perkins Machine & Gear Co., Inc., Circuit Ave., W. Springfield, Mass.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Santa Fe Mfg. Co., 2343 Jerome Ave., Bronx, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Winzeler Mfg. & Tool Co., 7355 W. Wilson Ave., Chicago, Ill.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Geiger Counters—See Counters, Geiger

Geiger-Mueller Tubes—See Tubes, Geiger-Mueller

Generators, A-C

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H... p 1644
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Georator Corp., Box 70, Manassas, Va. .....p 1068,1069
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Singer Co., Finderne Ave., Somerville, N.J.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1700
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Bendix Corp., Hwy. 35, Eatontown, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Columbia Elec. Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Dyna Technology, Inc., Box 3263, Sioux City, Iowa
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
General Lab. Assocs., Norwich, N.Y.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Homelite, Riverdale Ave., Port Chester, N.Y.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Kurz & Root Co., Inc., 1000 N. Meade St., Appleton, Wisc.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Motor Generator Div., EE-61, Troy, Ohio
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.
Task Corp., Box 3999, Anaheim, Calif.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Winpower Mfg Co., 1207 First Ave., E., Newton, Iowa

Generators, A-M

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
CML, Inc., 166 National Rd., Edison, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Measurements, Box 180, Boonton, N.J. ..... p 744
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Wavetek, 9045 Balboa Ave., San Diego, Cal. .. p 815-817,825,834
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
EMR Div., Box 223, Princeton, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Generators, A-M(F-M

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
CML, Inc., 166 National Rd., Edison, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. .....p 776,777
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Wavetek, 9045 Balboa Ave., San Diego, Cal. .....p 825,834
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Defense Elctrns., Inc., Rockville, Md.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, Acoustic, High Intensity Noise

General Radio Co., 300 Baker Ave., W. Concord, Mass.
Sanders Nuclear Corp, 95 Canal St, Nashua, N.H.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Generators, Audio

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Connor-Winfield Corp., Winfield, Ill.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 645
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore..... p 679
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.

Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1453
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Marconi Instrs., 111 Cedar La., Englewood, N.J. .....p 742,743
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892,893
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 815-823,826,827,829,830
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
BECO Solid State Systems, Box 686, Salem, Va.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electromec, Inc., 209 N. Tradd St., P.O. Box 1022, Statesville, N.C.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Generators, Character

Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. .....p 565,689
Honeywell, Box 5227, Denver, Colo.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
EDP Corp., Box 6485, Orlando, Fla.
EMR Div., Box 223, Princeton, N.J.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Link Div., Binghamton, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Varian, 611 Hansen Way, Palo Alto, Cal.

Generators, Color Tv

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 728
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
RCA Corp., Front & Cooper, Camden, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.

Generators, Cross Hatch

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
RCA, 415 S. 5th St., Harrison, N.J.
Heath Co., Benton Harbor, Mich.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.

Generators, D-C

CML, Inc., 166 National Rd., Edison, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J.
Bendix Corp., Hwy. 35, Eatontown, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Kurz & Root Co., Inc., 1000 N. Meade St., Appleton, Wisc.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Winpower Mfg Co., 1207 First Ave., E., Newton, Iowa

Generators, Digital Delay

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Defense Elctrns., Inc., Rockville, Md.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Generators, Emergency Power

CML, Inc., 166 National Rd., Edison, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Aircraft & Missile Consultants, 2722 Ardmore Ave., Manhattan Beach, Calif.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Bendix Corp., Hwy. 35, Eatontown, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Detroit Diesel Engine Div., 13400 W. Outer Dr., Detroit, Mich.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
Homelite, Riverdale Ave., Port Chester, N.Y.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Task Corp., Box 3999, Anaheim, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Universal Motor Div., Box 180, 1552 Harrison St., Oshkosh, Wisc.
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Winpower Mfg Co., 1207 First Ave., E., Newton, Iowa

Generators, F-M

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
CML, Inc., 166 National Rd., Edison, N.J.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 641,644
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 833,834,836
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
EMR Div., Box 223, Princeton, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, F-M & F-M/Stereo

AEL, Inc., Box 552, Lansdale, Pa.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Measurements, Box 180, Boonton, N.J. ..... p 744
RCA, 415 S. 5th St., Harrison, N.J. .....p 776,777
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.

Generators, Frequency, Harmonic

AEL, Inc., Box 552, Lansdale, Pa.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Aircom, Inc., Rte. 16B, Union, N.H.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
GAF Corp., 140 W. 51 St., New York, N.Y.

General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Generators, Frequency-Offset

Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.

Generators, Function

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 629
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. ..... p 679
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990,1991
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1109
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Norden Div., Helen St., Norwalk, Conn.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 815,817-821,826,829,830
Weston-Transicoil, Worcester, Pa. ..... p 1998
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
BECO Solid State Systems, Box 686, Salem, Va.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Celco, 70 Constantine Dr., Mahwah, N.J.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electronic Modules Corp., Box 141, Timonium, Md.
EMR Div., Box 223, Princeton, N.J.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Research, Inc., Box 24064, Minneapolis, Minn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Generators, Hall-Also See Magnetoresistors; Multipliers, Hall; Probes, Hall

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio ..... p 2120
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. p 1894,1895
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.

Generators, Impulse-Also See Generators, Pulse

Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 629
Data Dynamics Div., 240 Humphrey St., Englewood, N.J. .. p 647
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Chesapeake Instr. Corp., Shadyside, Md.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Instr. Resch. Co., Box 231, Lincoln, Mass.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Generators, Infrared—See Lamps, Infrared

Generators, Interference Raster

Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Honeywell, Box 5227, Denver, Colo.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Generators, Keyed Video Signal—See Generators, TV Signal

Generators, Line & Vector

Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803

Generators, Low-Frequency

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1409
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Connor-Winfield Corp., Winfield, Ill.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J. .. p 647
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. ..... p 679
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 726
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
Measurements, Box 180, Boonton, N.J. ..... p 744
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 815-824,826,829,830
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Digiac Corp., Ames Ct., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, Marker

Accutronics, Inc., 628 North St., Geneva, Ill.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Honeywell, Box 5227, Denver, Colo.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726-728
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Generators, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728,729
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
RCA, 415 S. 5th St., Harrison, N.J.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 911
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Collins Radio Co., Dallas, Tex.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
GAF Corp., 140 W. 51 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.

Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Melcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Generators, Neutron

High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.

Generators, Noise, Random (Electrical)

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Elgenco, Inc., 1550 Euclid St., Santa Monica, Cal. ..... p 670,671
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 729
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773,774
Signal Resch., Inc., Box 79, Titusville, N.J. ..... p 783
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Waveline, Inc., Box 718, W. Caldwell, N.J.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Baganoff Assocs., Inc., 6809 W. Florissant, St. Louis, Mo.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
EMR Div., Box 223, Princeton, N.J.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Generators, Phase

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 580
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1700
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 827
Acton Labs., Inc., 531 Main St., Acton, Mass.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Defense Elctrns., Inc., Rockville, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, Plasma

Instr. Resch. Co., Box 231, Lincoln, Mass.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Generators, Portable, Engine Driven

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Dyna Technology, Inc., Box 3263, Sioux City, Iowa
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
Homelite, Riverdale Ave., Port Chester, N.Y.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Kurz & Root Co., Inc., 1000 N. Meade St., Appleton, Wisc.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Superior Continental Corp., Box 489, Hickory, N.C.
Universal Motor Div., Box 180, 1552 Harrison St., Oshkosh, Wisc.
Waukesha Motor Co., W. St. Paul Ave., Waukesha, Wisc.
Winpower Mfg Co., 1207 First Ave., E., Newton, Iowa

Generators, Power, High

Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Elctrn. Enterprises, 775 S. Madison Ave., Pasadena, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Generators, Pulse-Also See Generators, Impulse

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1402,1409
AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 629
Clifton, 5050 State Rd., Drexel Hills, Pa.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 632
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Data Dynamics Div., 240 Humphrey St., Englewood, N.J. .. p 647
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 651
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. ..... p 679
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Icon Corp., 156 Sixth St., Cambridge, Mass.
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,727,729
Kilovolt Corp., 238 High St., Hackensack, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Ledex Div., 126 Webster St., Dayton, Ohio
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Measurements, Box 180, Boonton, N.J. ..... p 744
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Non-Linear Sys., Inc., Box N, Del Mar, Cal.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. p 1292,1293
Weston-Transicoil, Worcester, Pa. ..... p 1998
Abtronics, Inc., Box 712, Livermore, Calif.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Applied Elctrns., 877 Cowan Rd., Burlingame, Cal.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
Berkshire Labs., 107 Tansy Hill Rd., Milford, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Dallas, Tex.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Digiac Corp., Ames Ct., Plainview, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Elctrn. Enterprises, 775 S. Madison Ave., Pasadena, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instr. Resch. Co., Box 231, Lincoln, Mass.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Generators, R-F

Accutronics, Inc., 628 North St., Geneva, Ill.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Honeywell, Box 5227, Denver, Colo.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728,729
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Measurements, Box 180, Boonton, N.J. ..... p 744
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776,777
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Wavetek, 9045 Balboa Ave., San Diego, Cal. .. p 822,827,834-836
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ajax Magnethermic Corp., 1745 Overland Ave., N.E., Warren, Ohio
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Clemens Mfg. Co., 630 S. Berry Rd., St. Louis, Mo.
Collins Radio Co., Dallas, Tex.
Cycle-Dyne, Inc., 134-20 Jamaica Ave., Jamaica, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Feco, 5855 Grant Ave., Cleveland, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Mann-Russell Elctrns., Inc., 1401 Thorne Rd., Tacoma, Wash.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Tektronix, Inc., Box 500, Beaverton, Ore.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Varian, Salem Rd., Beverly, Mass.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Generators, Sawtooth

Accutronics, Inc., 628 North St., Geneva, Ill.
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 629
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore..... p 679
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 726
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 815-820,822-824,826-830
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
Celco, 70 Constantine Dr., Mahwah, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.

Generators, Signal, Standard Type

Accutronics, Inc., 628 North St., Geneva, Ill.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore..... p 679
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Measurements, Box 180, Boonton, N.J. ..... p 744
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 893
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 834
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Clemens Mfg. Co., 630 S. Berry Rd., St. Louis, Mo.
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Mercury Elctrns. Corp., 315 Roslyn Rd., Mineola, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
New London Instr. Co., Inc., Box 189, New London, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Generators, Sine-Wave

Accutronics, Inc., 628 North St., Geneva, Ill.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Connor-Winfield Corp., Winfield, Ill.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 645
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 651
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore..... p 679
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742,743
Measurements, Box 180, Boonton, N.J. ..... p 744
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
Preston Scientific Inc., 305 E. Cerritos Ave., Anaheim, Calif. p 769
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776,777
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal.
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 815-830
Acton Labs., Inc., 531 Main St., Acton, Mass.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Collins Radio Co., Dallas, Tex.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hope Elctrns., Box 773, Clifton, N.J.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Generators, Single-Sideband

EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, Spectrum—See Generators, Sweep

Generators, Square-Wave

Accutronics, Inc., 628 North St., Geneva, Ill.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 629
CML, Inc., 166 National Rd., Edison, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. ..... p 679
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 743
Measurements, Box 180, Boonton, N.J. ..... p 744
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal.
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 815-830
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Comps., Inc., Box 308, 1675 S.E. Allen Ave., Beaverton, Ore.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Generators, Sweep

Accutronics, Inc., 628 North St., Geneva, Ill.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 645
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal. ..... p 718
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726-728
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 746
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Systron-Donner Datapulse Div., 10150 W. Jefferson Blvd., Culver City, Cal. ..... p 790,791
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,822-826,828-830,832-836
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Celco, 70 Constantine Dr., Mahwah, N.J.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Generators, Thermoelectric

Best Elecs. Div., 1211 E. Denny Way, Seattle, Wash. ..... p 2095
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. .... p 2643
Electro-Optical Sys., Pasadena, Calif.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Materials Elctrn. Prod. Corp., 990 Spruce St., Trenton, N.J.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Sanders Nuclear Corp, 95 Canal St, Nashua, N H
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
3M Co., 3M Center, St. Paul, Minn.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Generators, Time Code

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 561,562
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Collins Radio Co., Dallas, Tex.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
EDP Corp., Box 6485, Orlando, Fla.
EMR Div., Box 223, Princeton, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Data Prods., 888 Galindo St., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.

Generators, Time Delay

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 632
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Abtronics, Inc., Box 712, Livermore, Calif.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Collins Radio Co., Dallas, Tex.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Generators, Time Delay & Gate

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. .... p 1293
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
Collins Radio Co., Dallas, Tex.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.

Generators, Timing, Digital

Accutronics, Inc., 628 North St., Geneva, Ill.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
Connor-Winfield Corp., Winfield, Ill.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 562

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 651
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565,689
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 717
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. ..... p 1485
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Collins Radio Co., Dallas, Tex.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Digiac Corp., Ames Ct., Plainview, N.Y.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Generators, Tone

Accutronics, Inc., 628 North St., Geneva, Ill.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Connor-Winfield Corp., Winfield, Ill.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Frequency Control, Inc., Box 671, Austin, Tex.
Honeywell, Box 5227, Denver, Colo.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Wavetek, 9045 Balboa Ave., San Diego, Cal.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Collins Radio Co., Dallas, Tex.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trépac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.

Generators, Tone-Burst

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 645
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 651
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 817,820,823,825,828
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.

Generators, TV Signal

Accutronics, Inc., 628 North St., Geneva, Ill.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Video, Inc., Box 928, Boulder, Colo. ..... p 633,634,636
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728,729
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 832
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.

Generators, TV Synch

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Video, Inc., Box 928, Boulder, Colo. ..... p 633-636
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Craig Corp., 2302 East 15th St., Los Angeles, Calif.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Link Div., Binghamton, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
MTI, 57 Dodge Ave., No. Haven, Conn.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Teletronics, Inc., 760 N. Main St., Orange, Calif.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Generators, UHF(VHF

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 726,728
LogiMetrics, 100 Forest Dr., Greenvale, N.Y. ..... p 736
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742,743
Measurements, Box 180, Boonton, N.J. ..... p 744
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 865
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890,891
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 832-836
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Generators, Ultrasonic

Accutronics, Inc., 628 North St., Geneva, Ill.
CML, Inc., 166 National Rd., Edison, N.J.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sorensen Oper., Richards Ave., Norwalk, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 821
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Dynasonics Corp., Box 672, Pipestone, Minn.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Kurz & Root Co., Inc., 1000 N. Meade St., Appleton, Wisc.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Lewis Corp., Rte. 6, Woodbury, Conn.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Marcal Electro-Sonics, P.O. Box 185, Burbank, Calif.
Phillips Mfg. Co., 7334 N. Clark St., Chicago, Ill.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
TAC Tech. Instr. Corp., Scotch Rd., Mercer Airport, Trenton, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.

Generators, Word

Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Non-Linear Sys., Inc., Box N, Del Mar, Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Digitech Data Inds., Inc., 22 Grove St., Ridgefield, Conn.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Welex Elctrns., Box 986, Silver Spring, Md.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Geophysical Equip.—See Hydrophones; Transducers

Germanium—See Crystals, Semiconductor

Germanium Semiconductors—See Diodes; Transistors

Glass Fibers—See Insulation Materials, Glass Fiber Impregnated

Glass Parts—See Insulation Parts, Glass

Glove Boxes—See Boxes, Glove

Gloves, Protective, Parts Handling

Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Edmont-Wilson, 1300 Walnut, Coshocton, Ohio
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Labconco Corp., 8811 Prospect, Kansas City, Mo.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.

Standard Glove Co. of N.J., 27 Havnes Ave., Newark, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Glues—See Adhesives

Gold-Plating Solutions—See Plating Solutions

Goniometers—See Meters,Goniometer

Governors, Centrifugal

Graph Alloy Products

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.

Graphic Recording Instruments—See Recorders (As Modified)

Graphite Parts

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Airco Speer Carbon Products, 800 Theresia St., St. Marys, Pa.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Grafo Colloids Corp., P.O. Box 195, Sharon, Pa.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Kano Labs., Inc., 1000 Thompson La., Nashville, Tenn.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Poco Graphite, Inc., Box 2121, Decatur, Tex.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Servwell Prods. Co., 16309 Friend Ave., Cleveland, Ohio
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
3M Co., 3M Center, St. Paul, Minn.
Ultra Carbon Corp., Box 747, Bay City, Mich.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.

Greases-Also See Lubricants

Dow Corning Corp., Midland, Mich. ..... p 2670
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Cerac, Inc., Box 597, Butler, Wisc.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
CRC Chemicals, Dresher, Pa.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
MPB Corp., Precision Park, Keene, N.H.
Nye, William F., Inc., P.O. Box G-927, New Bedford, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Grilles, Metal(Plastic

McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Merlang Mfg. Corp., 122 S. Long Beach, Rockville Centre, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Romar Plastics, Inc., 1311 E. Main St., St. Charles, Ill.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Grilles, Speaker

Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Acoustone Corp., 80 Wythe Ave., Brooklyn, N.Y.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Flock Process Corp., P.O. Box 430, Norwalk, Conn.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Merlang Mfg. Corp., 122 S. Long Beach, Rockville Centre, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Taylor Millwork & Stair Co., Inc., 1305 W. 132 St., Gardena, Cal.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.

Grommets

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. .... p 2537
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Budwig Mfg. Co., P.O. Box 97, Ramona, Calif.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Dixon Corp., Metacom Ave., Bristol, R.I.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.
Western Sky Ind., 21300 Cloud Way, Hayward, Calif.

Ground Rods—See Rods & Clamps, Ground

Guides, Circuit Board

Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2502,2503
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2156
Taurus Corp., Academy Hill, Lambertville, N.J.
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex. ..... p 1943
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y. .... p 2162
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Birtcher Corp., Box D, Monterey Park, Cal.
Calabro Unitrack, 8738 W. Chester Pike, Upper Darby, Pa.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Circuit Structures Lab., 3200 N. San Fernando Blvd., Burbank, Calif.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Gibson/Egan Co., 34 La Porte St., Arcadia, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Space Prods., Inc., 6631 Sarnia Ave., Long Beach, Calif.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.

Guns, Electron—See Tube Parts

Guns, Electron Beam (For Vacuum Equip.)

Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclide Corp., 916 Main St., N. Acton, Mass.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Guns, Soldering—See Soldering, Guns

Gyrators, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.

Gyro Compasses—See Compasses, Electronic Gyro

Gyro Testers—See Testers, Gyro

Gyros, Directional

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Gyros, Displacement

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Gyros, Integrating

AC Elctrns. Div., 7929 S. Howell Ave., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Gyros, Rate

Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Condor Pacific Inds. of California, Inc., 8740 Remmet Ave., Canoga Park, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Hall Effect Devices—See Generators, Hall; Magnetoresistors,Hall; Multipliers, Hall; Probes, Hall

Hammers

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Channellock, Inc., S. Main St., Meadville, Pa.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Rosenberg Bros. & Co., 100 Landing Ave., Smithtown, N.Y.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.

Handles For Cabinets, Circuit Boards, Racks, etc.

Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. p 2161,2641
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Collins Radio Co., Newport Beach, Calif.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Davies, Harry Molding Co., 4920 W. Bloomingdale Ave., Chicago, Ill.
Deutsch Fastener Corp., P.O. Box 90925, Airport Sta., Los Angeles, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Goe Engrg. Co., 250 South 9th St., City of Industry, Calif.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Nielsen Hardware Corp., 770 Wethersfield Ave., Hartford, Conn.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.

Handsets, Chestsets & Operator Sets

Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Audiosears Corp., Stamford, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Corp., 302 McGuinness Blvd., Brooklyn, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Roanwell Corp., 180 Varick St., New York, N.Y.
Roche, Paul C. Co., Inc., 11 Park Pl., New York, N.Y.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Telephone Comps., Inc., 9 Norfolk Dr., Northport, N.Y.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Totel Systems, 4695 Main St., Bridgeport, Conn.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Hardness Indicators—See Indicators, Hardness

Hardware, Antenna—See Clamps; Ground Rods; Mounts; etc.

Hardware—See Bolts; Brackets; Clamps; Fasteners; Terminals;etc.

Harmonic Analyzers—See Analyzers, Harmonic

Harnesses, Wire—See Cable Assemblies

Headers, Hermetic—See Seals, Hermetic, Metal To Glass

Headers, Relay & Transformer

Airpax Elctrns., Inc., Cambridge, Md.
Bendix Corp., Box 239, Franklin, Ind. ..... p 2592
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Headers, Transistor & Diode

Bendix Corp., Box 239, Franklin, Ind. ..... p 2592
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan ..... p 2601
Raytheon Co., 465 Centre St., Quincy, Mass.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1620,1625
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hermetic Seal Div., 317 Main St., Box L, Wilmington, Mass.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Headphones & Headsets

Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
AKG, 100 E. 42nd St., New York, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Astatic Corp., Box 120, Conneaut, Ohio
Audiosears Corp., Stamford, N.Y.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Cannon, C.F. Co., Springwater, N.Y.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Corp., 302 McGuinness Blvd., Brooklyn, N.Y.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Elctrn. Labs., Inc., 1085 Commonwealth Ave., Boston, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Heath Co., Benton Harbor, Mich.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Koss Elctrns., Inc., 2227 North 31st St., Milwaukee, Wisc.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pickering & Co., Inc., 101 Sunnyside Blvd., Plainview, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Radioear Corp., 375 Valley Brook Rd., Canonsburg, Pa.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Roanwell Corp., 180 Varick St., New York, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stanford Int'l., Box 266, San Carlos, Calif.
Superex Elctrns. Corp., 151 Ludlow St., Yonkers, N.Y.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Telephone Comps., Inc., 9 Norfolk Dr., Northport, N.Y.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.

Heads, Erase

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 507,508
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510,511
Michigan Magnetics, 203 W. Third St., Vermontville, Mich p 512
Norton Assocs., Inc., 10 Di Tomas Ct., Copiague, N.Y. p 530,531,533
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 517,518,520-526
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Saki Magnetics, 1649-53 12th St., Santa Monica, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Western Magnetics, Inc., 1733 Flower St., Glendale, Cal.

Heads, Indexing, Rotary

Arvin Magnetics, 1531 13th St., Columbus, Ind.
Michigan Magnetics, 203 W. Third St., Vermontville, Mich
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Heads, Magnetic Drum, Memory

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 508
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 509
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510,511
Michigan Magnetics, 203 W. Third St., Vermontville, Mich
Norton Assocs., Inc., 10 Di Tomas Ct., Copiague, N.Y.
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
World Magnetics, Inc., 215 N. Pike St., Charlotte, Mich.

Heads, Recording(Playback, Audio & Stereo)

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 507,508
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 509
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510,511
Michigan Magnetics, 203 W. Third St., Vermontville, Mich p 512
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Norton Assocs., Inc., 10 Di Tomas Ct., Copiague, N.Y. p 530-533
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 517-519,521-526
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.
RCA Corp., Front & Cooper, Camden, N.J.
Saki Magnetics, 1649-53 12th St., Santa Monica, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

3M Co., 3M Center, St. Paul, Minn.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Heads Recording(Playback, Computer

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 507,508
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 509
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510,511
Michigan Magnetics, 203 W. Third St., Vermontville, Mich p 512
Norton Assocs., Inc., 10 Di Tomas Ct., Copiague, N.Y. ..... p 530
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 513-516,524
Sangamo Elec. Co., Box 128, Pickens, S.C.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex. p 1311
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Hamilton Watch Co., Lancaster, Pa.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Saki Magnetics, 1649-53 12th St., Santa Monica, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Western Magnetics, Inc., 1733 Flower St., Glendale, Cal.
World Magnetics, Inc., 215 N. Pike St., Charlotte, Mich.

Heads, Recording Disc

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 508
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510,511
Michigan Magnetics, 203 W. Third St., Vermontville, Mich
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 519
Alpha Data, Inc., 19005 Ventura Blvd., Tarzana, Calif.
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Astatic Corp., Box 120, Conneaut, Ohio
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.

Heads, Video, Recording/Playback

Arvin Magnetics, 1531 13th St., Columbus, Ind. ..... p 507,508
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Michigan Magnetics, 203 W. Third St., Vermontville, Mich p 512
Norton Assocs., Inc., 10 Di Tomas Ct., Copiague, N.Y. ..... p 530
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 519,520
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Lipps, Inc., 1630 Euclid St., Santa Monica, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro Elctrns., Inc., Box 8236, Albuquerque, N.M.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Saki Magnetics, 1649-53 12th St., Santa Monica, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Heat Dissipators—See Transistor & Diode Heat Dissipators; Tube Heat Dissipators

Heat Exchangers & Systems

Borg-Warner Thermoelectrics, Wolf & Algonquin Rds., Des Plaines, Ill. ..... p 2096,2097
E-Tronics, 5901 Noble Ave., Van Nuys, Cal. ..... p 1037
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 2643
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1901
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1914
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cargocaire Engrg. Corp., 8-10 Chestnut St., Amesbury, Mass.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Heatron, Inc., Box 54, York, Pa.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Janitrol Aero Div., 4200 Surface Rd., Columbus, Ohio
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lochart Inds., Inc., 15707 Texaco Ave., Paramount, Cal.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Ross Engrg. Div., Box 751, New Brunswick, N.J.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Standard-Thomson Corp., 152 Grove St., Waltham, Mass.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Waukesha Motor Co., W. St. Paul Ave., Waukesha, Wisc.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Heat Guns, Production

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Clements Mfg. Co., 6656 S. Narragansett Ave., Chicago, Ill.
Commercial Elec. Heating Devices & Mfg., Inc., 1008 E. Garvey Blvd., Monterey Park, Cal.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Sigma Sys. Corp., 3163 Adams Ave., San Diego, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Weldotron Corp., 1532 S. Washington Ave., Piscataway, N.J.

Heat Shrinkable Elastomers—See Caps, Forms & Tapes, Heat Shrinkable

Heat Shrinkable Plastics—See Caps, Forms & Tapes, Heat Shrinkable

Heat Sinks—See Heat Sinks, Soldering

Heat Sinks, Soldering

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal. ..... p 1037
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1901
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Channellock, Inc., S. Main St., Meadville, Pa.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gibson Elec., Delmont, Pa.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Heaters & Accessories, Induction

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ajax Magnethermic Corp., 1745 Overland Ave., N.E., Warren, Ohio
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Cycle-Dyne, Inc., 134-20 Jamaica Ave., Jamaica, N.Y.
Feco, 5855 Grant Ave., Cleveland, Ohio
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Miller, L.C. Co., 717 Monterey Pass Rd., Monterey Park, Calif.
Radio Frequency Co., Inc., 50 Park St., Medfield, Mass.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Heaters, Antenna Radome

Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Safeway Heat Elements, Inc., 440 Middlefield St., Middletown, Conn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Heaters, Electrical (For Components & Equipment)-Also See Ovens

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. ..... p 603
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ampere Elec. Inds., 410 Communipaw Ave., Jersey City, N.J.
Cahnman Hugo N. Assocs., Inc., 125-10 Queens Blvd., Kew Gardens, N.Y.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Capps & Co., Inc., 20 Addison Pl., Valley Stream, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Dampp-Chaser Elctrns., Inc., P.O. Box 1610, Hendersonville, N.C.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Electric Parts Corp., Box 234, Georgetown, Ky.
Electro-Flex Heat, Inc., Northwood Ind'l. Pk., Bloomfield, Conn.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Feco, 5855 Grant Ave., Cleveland, Ohio
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hotwatt, Inc., 128 Maple St., Danvers, Mass.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Michigan Oven Co., 1st Oven Pl., Box 336, Romulus, Mich.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Rama Corp., 39651 Esplanade St., San Jacinto, Calif.
Rogers Corp., Rogers, Conn.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Safeway Heat Elements, Inc., 440 Middlefield St., Middletown, Conn.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Sta-Warm Elec. Co., Inc., 116 N. Chestnut St., Ravenna, Ohio
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Therm-O-Lab Corp., 6940 Farmdale Ave., N. Hollywood, Calif.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Thermolab Corp., 6940 Farmdale Ave., N. Hollywood, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Watlow Elec. Mfg. Co., 12001 Lackland Rd., St. Louis, Mo.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Heaters, Infrared (Production)

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Ampere Elec. Inds., 410 Communipaw Ave., Jersey City, N.J.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cahnman Hugo N. Assocs., Inc., 125-10 Queens Blvd., Kew Gardens, N.Y.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Hotwatt, Inc., 128 Maple St., Danvers, Mass.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Miskella Infra-Red Co., 7301 Grand Ave., Cleveland, Ohio
North American Elec. Lamp Co., 1520 North 13 St., St. Louis, Mo.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Research, Inc., Box 24064, Minneapolis, Minn.
Selas Corp. America, Box 200, Dresher, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Heating Elements

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif.
Carborundum Co., Box 367, Niagara Falls, N.Y.
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ampere Elec. Inds., 410 Communipaw Ave., Jersey City, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electro-Flex Heat, Inc., Northwood Ind'l. Pk., Bloomfield, Conn.
Electrofilm, Inc., 7116 Laurel Canyon Blvd., N. Hollywood, Calif.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Hotwatt, Inc., 128 Maple St., Danvers, Mass.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Miskella Infra-Red Co., 7301 Grand Ave., Cleveland, Ohio
Norton Co., 1 New Bond St., Worcester, Mass.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Pyco, Inc., 604 E. Lineoln Hwy., Penndel, Pa.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Rama Corp., 39651 Esplanade St., San Jacinto, Calif.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Sunbeam Equip. Corp., 212 Mercer St., Meadville, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Therm-O-Lab Corp., 6940 Farmdale Ave., N. Hollywood, Calif.
Thermal Engrg. & Design Co., 44 N. Summit St., Akron, Ohio
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Thermolab Corp., 6940 Farmdale Ave., N. Hollywood, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Waage Elec., Inc., 820 Colfax Ave., Kenilworth, N.J.
Watlow Elec. Mfg. Co., 12001 Lackland Rd., St. Louis, Mo.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Hermetic Sealing—See Machines; Seals; Services, Hermetic Sealing

High-Pressure Equipment

Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Benthos, Inc., Edgerton Dr., N. Falmouth, Mass.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.

Hinges—See Fasteners

Holders & Carriers, Chip (Capacitor, IC, LSI)

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal. ..... p 1597
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Engineering Conslts., Ltd., 1132 Turmont St., Gardena, Calif.

Holders & Carriers, IC, LSI (Packaged)

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal. ..... p 1597
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
GTI Corp., 310 Chestnut St., Meadville, Pa.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind. .. p 2526
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2157
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Engineering Conslts., Ltd., 1132 Turmont St., Gardena, Calif.
Gibson/Egan Co., 34 La Porte St., Arcadia, Calif.
IFE Div, P.O. Box 4265, E Providence, R.I.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.

Holders, Battery—See Retainers, Battery-Also See Connectors, Battery

Holders, Brush—See Brushes & Brush Assemblies

Holders, Chassis (Production Type)

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.

Holders, Circuit Board (Production Type)

Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. ..... p 2155
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Birtcher Corp., Box D, Monterey Park, Cal.
Calabro Unitrack, 8738 W. Chester Pike, Upper Darby, Pa.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Gibson/Egan Co., 34 La Porte St., Arcadia, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Space Prods., Inc., 6631 Sarnia Ave., Long Beach, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tech. Devices Co., 11242 Playa Ct., Culver City, Calif.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Holders, Crystal

AEL, Inc., Box 552, Lansdale, Pa.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1420,1421
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1424
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1482
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Kay Elctrns., Inc., Box 647, Gardner, Kans.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
TRG Prods., 400 Border St., E. Boston, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Holders (Excluding Retainers)—See Holders; Sockets

Holders, Fuse—See Clips & Holders, Fuse; Panels, Fuse

Holders, Lamp—See Sockets, Lamp & Lamp Assemblies

Holders, Tube—See Retainers, Tube

Hole Cutters—See Cutters, Hole

Honeycomb Sheets, Panels, etc.

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Pioneer Metals, Inc., Hwy. 127, N., Harrodsburg, Ky.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
3M Co., 3M Center, St. Paul, Minn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Hoods, CRT Viewing—See Viewing Hoods, Cathode-Ray Tube

Horns, Microwave-Also See Antennas, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Narda Microwave Corp., Plainview, N.Y.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Gabriel Elctrns., Div., Saco, Me.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Horns, Speaker

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Hawley Prods. Co., 333 North 6th St., St. Charles, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Kling Metal Spinning & Stamping Corp., 247 Centre St., New York, N.Y.
Klipsch & Assocs., Inc., Box 280, Hope, Ark.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Housings, Circuit Module—See Plug-In Module Enclosures

Housings, Instrument & Meter—See Cabinets; Cases

Housings, Metal—See Cabinets; Cases

Housings, Metal, Small—See Cans

Housings, Photomultiplier Tube—See Photomultiplier Tube Housings

Housings, Speaker—See Enclosures, Speaker

Humidity Indicators—See Indicators, Humidity (Electronic)

Hybrid Junctions, Microwave

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Narda Microwave Corp., Plainview, N.Y. ..... p 887
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal..... p 909
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..p 2904,2905
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Hydrophones & Accessories

Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Chesapeake Instr. Corp., Shadyside, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Empire Sci. Corp., Ind'l. Instr. Div., 1055 Stewart Ave., Garden City, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Instr. Corp., 33 Southwest Pk., Westwood, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
International Transducer Corp., 640 McCloskey Pl., Goleta, Cal.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
NUS Corp., P.O. Box 248, Paramus, N.J.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.

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Lowell Elctrns. Corp., 9100 Terminal Ave., Skokie, Ill. ..... p 739
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Image Expanders, Oscilloscope—See Oscilloscope Image Expanders

Impedance Comparators—See Bridges, Impedance

Impedance Converters, Microwave

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Aircom, Inc., Rte. 16B, Union, N.H.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Hughes Aircraft Co, Centinela Ave.& Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Olektron Corp., Box 248, Dudley, Mass.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Impregnating Insulating Compounds—See Insulating Compounds

Incremental Magnetic Recorders—See Data Recorders, Computer

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Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Honeywell, 11 W. Spring St., Freeport, Ill.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.

Indicator Lights—See Lights, Dial, Panel, etc.

Indicators, Angle Also See Encoders, Shaft Position

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542,544
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1987
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1988
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
Norden Div., Helen St., Norwalk, Conn. ..... p 582
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 581,758
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Weston-Transicoil, Worcester, Pa.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Bendix Corp., S. Montrose, Pa.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electro-Optical Div., 347 King St., Northampton, Mass.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Penn Keystone Corp., Division St., Ansonia, Conn.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trump-Ross Ind'l. Controls, Inc., 265 Boston Rd., Billerica, Mass.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
United Aircraft Corp., Helen St., Norwalk, Conn.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Indicators, Angle-Of-Attack

Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1987
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bendix Corp., S. Montrose, Pa.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Penn Keystone Corp., Division St., Ansonia, Conn.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Control Corp., Redmond, Wash.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Indicators, Annunciator—See Annunciators

Indicators, Antenna Position

Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 581
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa.
Ametek, Inc., Station Square Two, Paoli, Pa.
Bendix Corp., S. Montrose, Pa.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Epsco, inc., 411 Providence Hwy., Westwood, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Indicators, Attitude

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Bendix Corp., S. Montrose, Pa.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Kaiser Aerospace & Elctrns. Corp., P.O. Box 11275, Sta. "A", Palo Alto, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Indicators, Azimuth

Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... **p 1992**
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... **p 877**
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. **p 574**
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... **p 1995**
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Weston-Transicoil, Worcester, Pa.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Bendix Corp., S. Montrose, Pa.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Indicators, Capacitor Leakage—See Testers, Capacitor

Indicators, Circuit Condition, On(Off, etc. (Electromechanical)

Allard Instr. Corp., 770 Main St., Westbury, N.Y. ..... **p 1494**
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... **p 1598**
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y. ..... **p 1495**
Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo. **p 2008,2009**
Clare-Pendar Co., Box 785, Post Falls, Idaho ..... **p 2026,2027**
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... **p 1987**
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn. ..... **p 1498**
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... **p 1500,1501**
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill. ... **p 1503**
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... **p 672**
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... **p 1672**
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. **p 1524**
Nanasi, 6308 Jackson St., W. New York, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Unimax Switch Corp., Ives Rd., Wallingford, Conn. ..... **p 2093**
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. **p 1549,1550**
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Bendix Corp., S. Montrose, Pa.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Fail-Safe Instrs., Inc., 17 Irving Ave., Stamford, Conn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Penn Keystone Corp., Division St., Ansonia, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Winterburn Mfg. Co., Box 386, Putnam, Conn.

Indicators, Computer Type—See Lights; Dials

Indicators, Data Display—See Lights; Dials

Indicators, Density

Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio **p 2123**
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.

Indicators, Dielectric Constant

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. **p 615**
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. **p 650**
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delsen Testing Corp., 719 W. Broadway, Glendale, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
3M Co., 3M Center, St. Paul, Minn.

Indicators, Distance, Line-Of-Sight

Clifton, 5050 State Rd., Drexel Hills, Pa.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., S. Montrose, Pa.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Collins Radio Co., Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.

Indicators, Distortion—See Analyzers, A-F

Indicators, Elapsed-Time

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bissett-Berman Corp., 3860 Centinela Ave., Los Angeles, Calif. **p 1360**
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. **p 1364**
Curtis Instrs., Inc., 200 Kisco Ave., Mt. Kisco, N.Y. ..... **p 638**
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... **p 562**
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill. **p 1370,1371**
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... **p 683**
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... **p 686**
General Time Corp., Rte. 8, Torrington, Conn. ..... **p 1379**
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... **p 565**
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... **p 1672**
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... **p 1674**
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... **p 1388**
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... **p 2055**
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. **p 1389**
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... **p 755**
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... **p 585**
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... **p 1395**
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... **p 784**
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... **p 789**
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... **p 1401**
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... **p 811**
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Epic, Inc., 150 Nassau St., New York, N.Y.
Hamilton Watch Co., Lancaster, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Motorola Automotive Prods., Inc., 16180 Wyoming Ave., Detroit, Mich.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Indicators, Electromechanical—See Indicators, Circuit Condition, On / Off

Indicators, Film Thickness

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Ade Corp., 385 Waverley Ave., Newton, Mass.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Amthor Testing Instr. Co., Inc., 45-53 Van Sinderen Ave., Brooklyn, N.Y.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Controlmag Labs., 2459 Susquehanna, Roslyn, Pa.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.

Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Empire Sci. Corp., Ind'l. Elctrn. Gage Div., 1055 Stewart Ave., Garden City, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Schoeffel Instr. Corp., 24 Booker St. Westwood, N.J.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
3M Co., 3M Center, St. Paul, Minn.
Ultek Div., Box 10920, Palo Alto, Calif.
Unit Process Assemblies, 53-15 37th Ave., Woodside, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Indicators, Fire—See Fire Detection & Fighting Equipment

Indicators, Fluorescent, Switch Mounting

Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Indicators, Fluid Conductivity

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Bailey Meter Co., Wickliffe, Ohio
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Bristol Div, Waterbury, Conn
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Indicators, Fluid Flow—See Meters, Fluid Flow

Indicators, Frequency—See Meters, Frequency

Indicators, Ground Detector

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Anderson, W.E., Inc., 320E West 80th St., Kansas City, Mo.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Indicators, Hardness

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Epic, Inc., 150 Nassau St., New York, N.Y.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Indicators, Humidity (Electronic)

Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Abbeon, Inc., 179-15 Jamaica Ave., Jamaica, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Indicators, Illumination—See Meters, Light

Indicators, Instrument, Flag, Pointer, Etc.

Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn. ..... p 1498
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Fail-Safe Instrs., Inc., 17 Irving Ave., Stamford, Conn.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brookiyn, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.

Indicators, Level Position

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Conrac Corp., 330 Madison Ave., New York, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.

Indicators, Linear Displacement

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Scientific-Atlanta, Inc.,-Box 13654, Atlanta, Ga.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro-Optical Div., 347 King St., Northampton, Mass.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Link Div., Binghamton, N.Y.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Optron Corp., 50 Fitch St., New Haven, Conn.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Solid Controls, Inc., 6401 Cambrige St., Minneapolis, Minn.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Starrett, L.S. Co., 1-165 Crescent St., Athol, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Indicators, Liquid Level

Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bristol Div, Waterbury, Conn
Cambridge Sci. Inds., Inc., 101 Virginia Ave., Cambridge, Md.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Delta Engrg., Box 620, Boulder, Colo.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Ellison Draft Gage Co., Inc., Box 96, New Buffalo, Mich.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
General Elec. Co., Waynesboro, Va.
Haledy Elctrns. Co., 99 Wall St., New York, N.Y.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hays Corp., Michigan City, Ind.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Joliet Control Corp., Box 751, Joliet, Ill.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.

Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Roylyn, 620 Paula Ave., Glendale, Cal.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Zeigler Elctrns., Inc., 17810 S. Western Ave., Gardena, Cal.

Indicators, Magnetic Field

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.

Indicators, Material Thickness

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Inds., Inc., Box 950, Boulder, Colo.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Electron-Machine Corp., Box M, Umatilla, Fla.
Empire Sci. Corp., Ind'l. Elctrn. Gage Div., 1055 Stewart Ave., Garden City, N.Y.
Hays Corp., Michigan City, Ind.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Krautkramer Ultrasonics, Inc., 1 Research Dr., Stratford, Conn.
Link Div., Binghamton, N.Y.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Optron Corp., 50 Fitch St., New Haven, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Starrett, L.S. Co., 1-165 Crescent St., Athol, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Unit Process Assemblies, 53-15 37th Ave., Woodside, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Indicators, Modulation

Singer Co., 915 Pembroke St., Bridgeport, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Collins Radio Co., Dallas, Tex.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Indicators, Moisture (Electronic)

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delmhorst Instr. Co., 763 Cedar St., Boonton, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus, Ohio
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Mann-Russell Elctrns., Inc., 1401 Thorne Rd., Tacoma, Wash.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Moisture Register Co., 1510 W. Chestnut St., Alhambra, Calif.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Indicators, Motor Load

Diversified Elctrns., Inc., Box 6231, Evansville, Ind
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Indicators, Noise-Figure—See Meters, Noise-Figure

Indicators, Null

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 669
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 682
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Astronics, Inc., 204 W. Bedford, Euless Rd., Hurst, Tex.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bristol Div, Waterbury, Conn
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Collins Radio Co., Dallas, Tex.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y. ...
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Joliet Control Corp., Box 751, Joliet, Ill.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Shallcross, E. Preston St., Selma, N.C.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Indicators, Numeric Readout—See Readouts

Indicators, Oxygen(Ozone

AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
Hays Corp., Michigan City, Ind.
Johnson-Williams Prods, 2300 Leghorn St., Mt. View, Calif.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Indicators, Phase

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind..... p 1749
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Brunswick Instrs., P.O. Box 813, New Brunswick, N.J.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Indicators, Positioning

Clifton, 5050 State Rd., Drexel Hills, Pa.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Ledex Div., 126 Webster St., Dayton, Ohio
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Vernitron Corp., 2440 W. Carson St., Torrance, Cal.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weston-Transicoil, Worcester, Pa.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bendix Corp., S. Montrose, Pa.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spiras Sys., Inc., 332 Second Ave., Waltham, Mass.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Tyco Instr. Div., 16 Hickory Dr., Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Western Indicator Co., 9835 Dupree St., So. El Monte, Cal.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Indicators, Power Level

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 872
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Bristol Div, Waterbury, Conn
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.

Indicators, Pressure—See Gauges, Pressure

Indicators, Proximity

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Collins Radio Co., Dallas, Tex.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Drexelbrook Engrg. Co., 600 Brooke Rd., Glenside, Pa.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sensory, Inc., 1 Kennedy Rd., Morris Plains, N.J.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Indicators, Pulse Rise Time

TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Indicators, Radiation-Also See Counters, Geiger; Counters, Scintillation

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Narda Microwave Corp., Plainview, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Indicators, R-F—See Meters, Frequency

Indicators, Rotary Shaft Position—See Encoders, Shaft Position

Indicators, Servo

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 542,544
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Data Technology, Inc., 65 Grove St., Watertown, Mass. .. p 1368
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990,1991
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J... p 1691
Singer Co., Finderne Ave., Somerville, N.J.
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1996
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa. ..... p 1998
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bendix Corp., S. Montrose, Pa.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bristol Div, Waterbury, Conn
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
United Aircraft Corp., Helen St., Norwalk, Conn.
USM Corp., 81 Bay State Rd., Wakefield, Mass.

Indicators, Shaft Speed—See Tachometers, Electronic

Indicators, Shorted Turn—See Testers, Coil

Indicators, Smoke & Combustion (Electronic)-Also See Fire Detection & Fighting Equipment

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
A.R.P. Inds., Inc., 36 Bay Dr., E., Huntington, N.Y.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Edwards Co. Inc., 90 Connecticut Ave., Norwalk, Conn.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
General Elec. Co., Waynesboro, Va.

Heath Co., Benton Harbor, Mich.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Worner Elctrn. Devices, Rankin, Ill.

Indicators, Sound Level—See Meters, Audio Level

Indicators, Specific Gravity

Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Brooks Instr. Div., Hatfield, Pa.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kay-Ray, Inc., 740 E. Northwest Hwy., Palatine, Ill.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.

Indicators, Strain (For Use With Strain Gauges)

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... **p 766**
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Micro-Strain, Inc., Spring City, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teledyne Mat'ls. Resch., 303 Bear Hill Rd., Waltham, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Vishay Instrs., Inc., 63 Lincoln Hwy., Malvern, Pa.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Indicators, Surface Roughness

Ade Corp., 385 Waverley Ave., Newton, Mass.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Clevite Corp., 4601 Arden Dr., El Monte, Calif.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Epol, Inc., 623 Stewart Ave., Garden City, N.Y.
Heli-Coil Corp., Shelter Rock La., Danbury, Conn.
Industrial Metrology Div., Box 1067, Ann Arbor, Mich.
Marduth Prods., 1387 Ledge Rd., R.D. 1, Hinckley, Ohio
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Indicators, Telemetering—See Analyzers, Temperature

Indicators, Temperature—See Meters, Temperature

Indicators, Time Delay Measurement

Bissett-Berman Corp., 3860 Centinela Ave., Los Angeles, Calif. **p 1360**
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... **p 1672**
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... **p 1674**
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... **p 1395**
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... **p 803**
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Indicators, Torque

Autotronics, Inc., 2700 Davis, Joplin, Mo
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bendix Corp., S. Montrose, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Milbar, 530 Washington St., Chagrin Falls, Ohio
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.

Indicators, Transient Voltage

Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn. ..... **p 1498**
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. **p 655**
Dytro Corp., 63 Tec St., Hicksville, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Indicators, Vacuum-Also See Gauges, Vacuum

Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Abbeon, Inc., 179-15 Jamaica Ave., Jamaica, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beach-Russ Co., 420 Lexington Ave., New York, N.Y.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bristol Div, Waterbury, Conn
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hastings-Raydist, Newcomb Ave., Hampton, Va.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
Weksler Instrs. Corp., 80 Mill Rd., Freeport, N.Y.

Indicators, Viscosity

Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bristol Div, Waterbury, Conn
Brookfield Engrg. Labs., Inc., 240 Cushing St., Stoughton, Mass.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Norcross Corp., 255 Newtonville Ave., Newton, Mass.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.

Indicators, VSWR—See Meters, Standing Wave Ratio

Indicators, Weight—See Scales, Production Weight

Indicators, Wind Direction (Electronic)

Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Indicators, Wind Speed (Electronic)

Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Cambridge Sys., EG&G Inc., 50 Hunt St., Newton, Mass.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hastings-Raydist, Newcomb Ave., Hampton, Va.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thermo Sys., Inc., 2500 Cleveland Ave., N., St. Paul, Minn.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Inductance Comparators—See Bridges, Inductance

Inductance Standards—See Standards, Inductance

Induction Heating Equipment—See Heaters & Accessories, Induction

Induction Potentio Meters—See Resolvers, Synchro

Inductors—See Coils

Infrared Equipment—See Comm. Systems; Detectors; Amps; Spectrometers; Etc.

Inks For Thick Film Microcircuits

Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Etchomatic, Inc., Box 444, Waltham, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Matthey Bishop Inc., Malvern, Pa.
Naz-Dar Int'l., 1087 N. North Branch St., Chicago, Ill.

Inks, Marking

Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Raytheon Co., 465 Centre St., Quincy, Mass.
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Apex Machine Co., 3000 Northeast 12th Terr., Ft. Lauderdale, Fla.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Prods., Box 45278, Chicago, Ill.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Carter's Ink Co., 239 First St., Cambridge, Mass.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Eastern Marking Mach. Corp., 30 Alabama Ave., Island Pk., N.Y.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Etchomatic, Inc., Box 444, Waltham, Mass.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Independent Ink, Inc., 14705 S. Avalon Blvd., Gardena, Calif.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Koh-I-Noor, Inc., 100 North St., Bloomsbury, N.J.
Lake Chemical Co., 250 N. Washtenaw Ave., Chicago, Ill.
M & T Chemicals Inc., Rahway, N.J.
Markal Co., 250 N. Washtenaw Ave., Chicago, Ill.
Markem Corp., 194 Congress St., Keene, N.H.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Organic Prods. Co., Box 428, Irving, Tex.
Phillips Process Co., Inc., 192 Mill St., Rochester, N.Y.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Popper & Sons, Inc., 300 Park Ave. S., New York, N.Y.
Pryor Marking Prods., 21 E. Hubbard, Chicago, Ill.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Star Enterprises-Div., Box 1098, Lowell, Mass.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Insertion Loss Measurement Systems

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Inserts—See Bushings

Inspection Lighting & Equipment—See Fiber Optic Inspection Equipment; Lamps, Magnifying; Comparators, Optical; Ultraviolet Lighting Equipment

Instrument Cases—See Cabinets; Cases, Instrument

Instrument Parts, Precision—See Bearings; Gears; Springs; etc.

Instruments, Elect. Measuring—See Analyzers; Bridges; Comparators; Meters; etc.

Instruments, Graphic Recording—See Recorders, Graphic

Insulating Compounds, Acrylic

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sterling, Sewickley, Pa.

Insulating Compounds, Asphalt & Pitch

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Sterling, Sewickley, Pa.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.

Insulating Compounds, Coil Dope

Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2337
Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
3M Co., 3M Center, St. Paul, Minn.

Insulating Compounds, Enamel

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulating Compounds, Epoxy

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Hardman Inc., Belleville, N.J.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Rector Engrg. & Plastics Co., 318 Randolph Pl., N.E., Washington, D.C.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rogers Corp., Rogers, Conn.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulating Coumpounds, Lacquer

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Dennis Chem. Co., 2701 Papin St., St. Louis, Mo.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio

Insulating Compounds, Silicone

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Dow Corning Corp., Midland, Mich. ..... p 2667-2670
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. ..... p 2328
Abesto Corp., Ackerman St., Bloomfield, N.J.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
General Elec. Co., Waterford, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Midsil Corp, Box 475, 27 Bland St., Emerson, N.J.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.

Insulating Compounds, Varnish

Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2337
Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Dow Corning Corp., Midland, Mich. ..... p 2668-2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
CRC Chemicals, Dresher, Pa.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
Illinois Bronze Powder & Pain Co., 300 E. Main St., Lake Zurich, Ill.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.

Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
Sterling, Sewickley, Pa.
3M Co., 3M Center, St. Paul, Minn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulating Compounds, Wax

Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. .p 2337
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
CRC Chemicals, Dresher, Pa.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
International Wax Refining Co., Inc., 99 E. Hawthorne Ave., Valley Stream, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Zophar Mills, Inc., 112-130 26th St., Brooklyn, N.Y.

Insulation Materials, Adhesive

Dow Corning Corp., Midland, Mich. ..... p 2669,2670
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Armstrong Prods. Co., Inc., Box 657, Warsaw, Ind.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Permacel, U.S. Highway #1, New Brunswick, N.J.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Sterling, Sewickley, Pa.
Techform Labs., Inc., 707 S. Hampton Dr., Venice, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.

Insulation Materials, Asbestos

Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Abesto Corp., Ackerman St., Bloomfield, N.J.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fet-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Insulation Materials, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago, Ill. p 2275
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1624,2677
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Lab. Assocs., Norwich, N.Y.
Kawecki Beryllco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Lougene Elctrns., Inc., 266 West Ave., Long Branch, N.J.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mycalex Div., 125 Clifton Blvd., Clifton, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norton Co., 1 New Bond St., Worcester, Mass.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Superior Steatite & Ceramic Corp., 88 W. Forest Ave., Englewood, N.J.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Insulation Materials, Fabric

Carborundum Co., Box 367, Niagara Falls, N.Y.
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kendall Co., Walpole, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Permacel, U.S. Highway #1, New Brunswick, N.J.
Plymouth Rubber Co., Inc., Canton, Mass.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Suflex, 33-40 57th St., Woodside, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
3M Co., 3M Center, St. Paul, Minn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Materials, Felt—See Felt

Insulation Materials, Fiber

Carborundum Co., Box 367, Niagara Falls, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kendall Co., Walpole, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Rogers Corp., Rogers, Conn.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Materials, Film

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Rogers Corp., Rogers, Conn.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Schweitzer, Peter J. Div., Lee, Mass.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Materials, Foam

Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Ablestik Adhesive Co. Inc., 833 West 182nd St. E., Gardena, Calif.
Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Diamond Shamrock Chemical Co., 300 Union Commerce Bldg., Cleveland, Ohio
Dow Chemical Co., Box 1682, Midland, Mich.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.

Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Resinous Prods. Div., 300 Union Commerce Bldg., Cleveland, Ohio
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Insulation Materials, Glass Bonded Mica

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Acim Paper Co., 1400 Plaza Ave., New Hyde Park, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Molecular Dielectrics, Inc., 101 Clifton Blvd., Clifton, N.J.
Mycalex Div., 125 Clifton Blvd., Clifton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Materials, Glass-Fiber Impregnated

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Natvar Corp., Box 67, Rahway, N.J. p 2675
Varflex Corp., 514 W. Court St., Rome, N.Y. p 2678
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Baer, N.S. Co., 9 Montgomery St., Hillside, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
C/P Corp., RFD #3, Newberry, S.C.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Lougene Elctrns., Inc., 266 West Ave., Long Branch, N.J.
Mica Corp., 4031 Elenda St., Culver City, Calif.
New England Laminates Co., Inc., 481 Canal St., Stamford, Conn.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Permacel, U.S. Highway #1, New Brunswick, N.J.
Plymouth Rubber Co., Inc., Canton, Mass.
Rogers Corp., Rogers, Conn.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Suflex, 33-40 57th St., Woodside, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.
Zurn Inds., 5533 New Perry Hwy., Erie, Pa.

Insulation Materials, Mica (Natural & Synthetic)

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Acim Paper Co., 1400 Plaza Ave., New Hyde Park, N.Y.
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Cleveland Mica Co., 1360 Hird Ave., Lakewood, Ohio
Ford Radio & Mica Corp., 536 63rd St., Brooklyn, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Industrial Mica, 223 S. Van Brunt St., Englewood, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Micacraft Prods., Inc., 49-51 Liberty St., Newark, N.J.
Molecular Dielectrics, Inc., 101 Clifton Blvd., Clifton, N.J.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Mycalex Div., 125 Clifton Blvd., Clifton, N.J.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Insulation Materials, Mylar

Natvar Corp., Box 67, Rahway, N.J. p 2675
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Inmanco, Inc., 3800 West 42nd St., Chicago, Ill.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Materials, Nylon

Natvar Corp., Box 67, Rahway, N.J. p 2675
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Materials, Paper

Natvar Corp., Box 67, Rahway, N.J.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Acme Chemical & Insulation Co., 166 Chapel St., New Haven, Conn.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Brown-Bridge Mills, Inc., E. Water St., Troy, Ohio
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Mosinee Paper Mills Co., Mosinee, Wisc.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Rogers Corp., Rogers, Conn.
Schweitzer, Peter J. Div., Lee, Mass.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Materials, Phenolic

Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Baer, N.S. Co., 9 Montgomery St., Hillside, N.J.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., Coshocton, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.

Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Vernay Labs., E. South College St., Yellow Springs, Ohio
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Materials, Plastic (Misc.)

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Natvar Corp., Box 67, Rahway, N.J.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Baer, N.S. Co., 9 Montgomery St., Hillside, N.J.
Biggs Co., Box 1740, Santa Monica, Cal.
Biwax Corp., 45 E. Bradrock Dr., Des Plaines, Ill.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Dow Chemical Co., Box 1682, Midland, Mich.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Coshocton, Ohio
General Elec. Co., Waterford, N.Y.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Hysol Div., 211 Franklin St., Olean, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Marbon, Box 68, Washington, W. Va.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Nyltite Corp. America, 3451 S. Clinton Ave., S. Plainfield, N.J.
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Resdel Corp., Box 2171, Rio Grande, N.J.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill.
Resinous Prods. Div., 300 Union Commerce Bldg., Cleveland, Ohio
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Schweitzer, Peter J. Div., Lee, Mass.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Suflex, 33-40 57th St., Woodside, N.Y.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Vernay Labs., E. South College St., Yellow Springs, Ohio
Western Coating Co., Box 598, Royal Oak, Mich.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Westlake Plastics Co., 133 W. Lenni Rd., Lenni, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.
Zurn Inds., 5533 New Perry Hwy., Erie, Pa.

Insulation Materials, Polyethylene

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Dow Chemical Co., Box 1682, Midland, Mich.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Suflex, 33-40 57th St., Woodside, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Materials , Polystyrene

Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dow Chemical Co., Box 1682, Midland, Mich.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Richardson Co., 2640 Lake St., Melrose Park, Ill.

Insulation Materials, Powdered Metal Oxide

Carborundum Co., Box 367, Niagara Falls, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Michigan Chemical Corp., 351 E. Ohio St., Chicago, Ill.
Norton Co., 1 New Bond St., Worcester, Mass.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Insulation Materials, Rubber (All Types)

Dow Corning Corp., Midland, Mich. ..... p 2668-2670
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Abesto Corp., Ackerman St., Bloomfield, N.J.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Budd Co., 70 S. Chapel St., Newark, Del.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Darling, R.E. Co., Inc., Box 666, Gaithersburg, Md.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Hysol Div., 211 Franklin St., Olean, N.Y.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Plymouth Rubber Co., Inc., Canton, Mass.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Suflex, 33-40 57th St., Woodside, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Insulation Materials, Steatite—See Insulation Parts, Ceramic

Insulation Materials, TFE

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Dixon Corp., Metacom Ave., Bristol, R.I.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.

Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Rogers Corp., Rogers, Conn.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Materials, Vinyl

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Abesto Corp., Ackerman St., Bloomfield, N.J.
Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Suflex, 33-40 57th St., Woodside, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Parts, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Carborundum Co., Box 367, Niagara Falls, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
GTI Corp., 310 Chestnut St., Meadville, Pa.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex. ..... p 1943
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1624,2677
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Akron Porcelain Co., 2739 Cory Ave., Akron, Ohio
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceram Corp., 5345 Timken Sq., La Mesa, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
Insaco, Inc., Box 422, Quakertown, Pa.
Isolantite Mfg. Corp., 337 Warren Ave., Stirling, N.J.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kirchberger, M & Co., Inc., 250 Humphrey St., Englewood, N.J.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
Mycalex Div., 125 Clifton Blvd., Clifton, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
National Ceramic Co., 500 Southard St., Box 199, Trenton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Palmer Elctrns., Inc., 156 Belmont Ave., Garfield, N.J.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Superior Steatite & Ceramic Corp., 88 W. Forest Ave., Englewood, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
3M Co., 3M Center, St. Paul, Minn.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Insulation Parts, Glass

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
GTI Corp., 310 Chestnut St., Meadville, Pa.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1624
Atlantic Optical Moulding Co., Ellis St., Dudley, Mass.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Garner Glass Co., 177 S. Indian Hill, Claremont, Calif.
Glass Beads Co., Latrobe, Pa.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Latronics Corp., Box 469, Latrobe, Pa.
Richland Glass Co., Inc., Richland, N.J.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
3M Co., 3M Center, St. Paul, Minn.
Ultrasonic Mach. Co., 266 West Ave., Long Branch, N.J.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Insulation Parts, Glass Bonded Mica

Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Molecular Dielectrics, Inc., 101 Clifton Blvd., Clifton, N.J.
Mycalex Div., 125 Clifton Blvd., Clifton, N.J.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.

Insulation Parts, Glass Fiber

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
C/P Corp., RFD #3, Newberry, S.C.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Synthane Taylor Corp., Valley Forge, Pa.

Insulation Parts, Insulating Sleeves— See Tubing

Insulation Parts, Mica (Natural & Synthetic)

Columbia Tech. Corp., 26-60 Brooklyn-Queens Expwy., W., Woodside, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif. ..... p 1877
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Acim Paper Co., 1400 Plaza Ave., New Hyde Park, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
Cleveland Mica Co., 1360 Hird Ave., Lakewood, Ohio
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Industrial Mica, 223 S. Van Brunt St., Englewood, N.J.
Inmanco, Inc., 3800 West 42nd St., Chicago, Ill.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Micacraft Prods., Inc., 49-51 Liberty St., Newark, N.J.
Molecular Dielectrics, Inc., 101 Clifton Blvd., Clifton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
3M Co., 3M Center, St. Paul, Minn.

Insulation Parts, Paper

Abesto Corp., Ackerman St., Bloomfield, N.J.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Gaskets, Inc., Middletown, Conn.
Inmanco, Inc., 3800 West 42nd St., Chicago, Ill.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Mosinee Paper Mills Co., Mosinee, Wisc.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
3M Co., 3M Center, St. Paul, Minn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Insulation Parts, Plastic

Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dielectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex. ..... p 1943
Abesto Corp., Ackerman St., Bloomfield, N.J.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Akron Porcelain Co., 2739 Cory Ave., Akron, Ohio
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Baer, N.S. Co., 9 Montgomery St., Hillside, N.J.
Beaver Labs., Inc., 160 Terminal Dr., Plainview, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.

Conap, Inc., 184 E. Union St., Allegany, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Delta Plastics Co., 776 Creek Rd., Bellmawr, N.J.
Dixon Corp., Metacom Ave., Bristol, R.I.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
General Gaskets, Inc., Middletown, Conn.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Inmanco, Inc., 3800 West 42nd St., Chicago, Ill.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Nylogrip Prods. Co., 281 Winter, Waltham, Mass.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Red Seal Elec. Co., 3835 W. 150th St., Cleveland, Ohio
Resdel Corp., Box 2171, Rio Grande, N.J.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Teledyne Mecca, Box 36393, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.
Zurn Inds., 5533 New Perry Hwy., Erie, Pa.

Insulation Parts, Quartz

General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672

Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Eimac, 301 Industrial Way, San Carlos, Calif.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Garner Glass Co., 177 S. Indian Hill, Claremont, Calif.
Insaco, Inc., Box 422, Quakertown, Pa.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Lougene Elctrns., Inc., 266 West Ave., Long Branch, N.J.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Richland Glass Co., Inc., Richland, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Ultrasonic Mach. Co., 266 West Ave., Long Branch, N.J.
Voltronics Corp., West St., Hanover, N.J.
Wilmad Glass Co., Inc., Buena, N.J.

Insulation Parts, Sapphire

Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alessi Inds., 418 Main St., El Segundo, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Eimac, 301 Industrial Way, San Carlos, Calif.
Insaco, Inc., Box 422, Quakertown, Pa.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.

Insulation Parts, Silicone Rubber

Dow Corning Corp., Midland, Mich. p 2668-2670
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Varflex Corp., 514 W. Court St., Rome, N.Y. p 2678
Abesto Corp., Ackerman St., Bloomfield, N.J.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Budd Co., 70 S. Chapel St., Newark, Del.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Darling, R.E. Co., Inc., Box 666, Gaithersburg, Md.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., Waterford, N.Y.
General Gaskets, Inc., Middletown, Conn.
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Inmanco, Inc., 3800 West 42nd St., Chicago, Ill.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Teledyne Mecca, Box 36393, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Insulation Parts, Steatite—See Insulation Parts, Ceramic

Insulators—See Insulation Parts; Insulators

Insulators, Antenna & Spring Assemblies

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
C/P Corp., RFD #3, Newberry, S.C.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Isolantite Mfg. Corp., 337 Warren Ave., Stirling, N.J.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
National Ceramic Co., 500 Southard St., Box 199, Trenton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Trylon, Inc., Elverson, Pa.

Insulators, Antenna Tower—See Insulators, Antenna

Insulators, Bushing (Metallized)—See Bushings

Insulators, Test & Battery Clip

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Mueller Elec. Co., 1589H E. 31st St., Cleveland, Ohio p 2469
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Carol Cable Co., Box 68, Pawtucket, R.I.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Integrated Circuit Packaging Systems

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal. p 1597
Augat Inc., 33 Perry Ave., Attleboro, Mass. p 1599
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
Gridcraft, 14520 Lima Rd., R.R. #1, Ft. Wayne, Ind. p 1357
GTI Corp., 310 Chestnut St., Meadville, Pa. p 2595
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal.
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind. p 2526,2527
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. p 2157
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. p 1398
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. p 1619
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y. p 2162
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Electronic Modules Corp., Box 141, Timonium, Md.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IFE Div, P.O. Box 4265, E Providence, R.I.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
LTV Electrosystems, Inc., Box 6118, Dallas, Tex.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Integrators, Electro-Mechanical

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 1700
Weston-Transicoil, Worcester, Pa.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio

Integrators, Electronic

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bissett-Berman Corp., 3860 Centinela Ave., Los Angeles, Calif. p 1360

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Curtis Instrs., Inc., 200 Kisco Ave., Mt. Kisco, N.Y. ..... p 638
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 558,559
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1700
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & F Instrs., Inc., Cornwells Hgts., Pa.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Carolina Medical Elctrns., Inc., U.S. 52 Expwy., Box 307, King, N.C.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Geo Space, 5803 Glenmont, Houston, Tex.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
MB Elctrns., Box 1825, New Haven, Conn.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.

Integrators, Mechanical

Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind. .... p 1393
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.

Integrators, Optical

Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.

Intensifiers, Image

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Abtronics, Inc., Box 712, Livermore, Calif.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Bendix Corp., 1975 Green Rd., Ann Arbor, Mich.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Electro-Optical Sys., Pasadena, Calif.
EMR Div., Box 223, Princeton, N.J.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varo, Inc., 2203 Walnut St., Garland, Tex.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Intercommunication Systems (Industrial)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Altec Lansing, 85 Channel Drive, Port Washington, N.Y.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
B-W Mfrs., Inc., 721 N. Webster St., Kokomo, Ind.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Collins Radio Co., Dallas, Tex.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Continental Elctrns. Corp., 302 McGuinness Blvd., Brooklyn, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Emerson Elec. Co., Box 552, Honeoye Falls, N.Y.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Encom Prods. Co., Inc., Box 68, Oxford, Pa.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Farrall Instr. Co., Box 1037, Grand Island, Neb.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
Flush Wall Radio Co., 1721 N. Ft. Harrison Ave., Clearwater, Fla.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lake Mfg. Co., 909 King St., Oakland, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loge Elctrns., 2171 W. Washington Blvd., Los Angeles, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Parcoe, Inc., 4501 Prospect Ave., Cleveland, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Schindlers, 195 Greenfield Ave., Los Angeles, Calif.
Scientific Int'l. Mktg., Inc., Box 181, Springhouse, Pa.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Smith-Meeker Engrg. Co., 157 Chambers St., New York, N.Y.
Spivey, James S., Inc., Box 6298, Washington, D.C.
Talk-A-Phone Co., 5013 N. Kedzie Ave., Chicago, Ill.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Touchmaster Labs., 6750 Selma Ave., Hollywood, Calif.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Worner Elctrn. Devices, Rankin, Ill.

Interferometer Systems

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Electro-Optical Div., 347 King St., Northampton, Mass.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Interlocks—See Connectors, Interlock

Intermodulation Analyzers—See Analyzers, Intermodulation

Interrogator Equipment—See Receivers; Transmitters; etc.

Intervalometers—See Timers

Inverters, D-C To A-C, D-C To D-C

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930,941-943
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 971
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 953
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 957
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 969
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032b
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal. p 1010,1011
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill.
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1041
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Flite-Tronics Co., Inc., 3312 Burton Ave., Burbank, Cal. .... p 1060
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ..... p 1443
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Control, Inc., Box 671, Austin, Tex.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal. p 1070
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y. ..... p 1075
International Rectifier, 233 Kansas St., El Segundo, Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill. .. p 1122
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J. ..... p 1171
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal. ..... p 1186
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.

Rotron, Inc., Hasbrouck La., Woodstock, N.Y. ..... p 2663
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill..... p 1211
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal..... p 1156
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1229
Static Prods., Inc., 2511 National Dr., Box 2226, Garland, Tex. p 1223
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.....p 1231,1234
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1256,1257,1259
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn..... p 1264
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal..... p 1265-1267
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y..... p 1274
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ....p 1282,1285
Varadyne Power Sys., 14943 Calif'a St., Van Nuys, Cal. .... p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1288
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 915
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1280
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. p 1296,1302
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bendix Corp., Hwy. 35, Eatontown, N.J.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Collins Radio Co., Dallas, Tex.
Components Corp., 106 Main St., Denville, N.J.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Lab. Assocs., Norwich, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Gould, Inc., 88 Cambridge St., Burlington, Mass.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Linear Alpha, Inc., 823 Emerson, Evanston, Ill.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Luminator, Inc., Box 278, Plano, Tex.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
ONAN, Div. Studebaker Corp., 1400 73rd Ave., N.E., Minneapolis, Minn.
Pacific Electro Dynamics, Inc., 14220 Sunset Hwy, Bellevue, Wash
Palomar Engrs., Box 455, Escondido, Cal.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Applications, Inc., Box 305, Bayside, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Riverbank Labs., Box 110, Geneva, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Task Corp., Box 3999, Anaheim, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Warren Communications, New Town Rd., Littleton, Mass.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Buffalo, N. Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Ion Traps

Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.

Ionization Chambers—See Chambers, Ionization

Irons, Soldering—See Soldering Irons

Isolators, D-C Signal

CEA, 1221 S. Shamrock, Monrovia, Cal. ..... p 972,994,995
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.

Isolators, Line

California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CEA, 1221 S. Shamrock, Monrovia, Cal. ..... p 972,994,995
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1052
Georator Corp., Box 70, Manassas, Va. ..... p 1069
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.

Isolators, Microwave (All Types)

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 866,867
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 2133
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
RCA, 415 S. 5th St., Harrison, N.J.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 910
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Isotopes, Radioactive—See Sources, Radioactive

Jack Adapters (All Types)

Americon Corp., 87 Rumford Ave., Waltham, Mass.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio .....p 2530,2531
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2473-2478,2480,2485,2489,2510,2515,2518,2519
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Trimm, Inc., 400 W. Lake St., Libertyville, Ill..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barker Prods. Co., 344 Central St., Saugus, Mass.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Jack Covers

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Nanasi, 6308 Jackson St., W. New York, N.J.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Jack Panel Assemblies & Accessories—See Panels, Jack

Jack (All Types)-Also See Connectors

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.....p 2361,2364
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2372
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2406-2414
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio .....p 2530,2531
Nanasi, 6308 Jackson St., W. New York, N.J.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2474-2478,2480,2483,2485,2489,2516,2517
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 1531
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2537,2539
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Audio Accessories, Inc., Gilsum, N.H.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Whitso, Inc, 9330 Byron St., Schiller Park, Ill.

Jacks, Banana

Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2474,2478,2483,2485,2488,2489
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 1531
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
DonMar Prods., Inc., Box 10125, Denver, Colo.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Jewels, Instrument Bearing—See Bearings & Assemblies, Jewel

Jigs And Fixtures, Chassis & Circuit Board

Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
London Co., 811 Sharon Dr., Westlake, Ohio
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
Hedquist Machine & Tool Co., 13110 Diericx Dr., Mountain View, Calif.
Industrial Tools, Inc., 201 Bryant St., Ojai, Calif.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Karisas City, Kans.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.

Joint Compounds, Semiconductor—See Coatings, Heat Conductive

Joints, Ball & Socket

General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Carler Products Corp., 6200 E. Malloy Rd., E. Syracuse, N.Y.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Joints, Rotary, Microwave

E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Waveline, Inc., Box 718, W. Caldwell, N.J.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Schutter Microwave, 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Jumpers, Bonding

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ..... p 2056
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Sittler Corp., 18 N. Ada St., Chicago, Ill.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Jumpers, Circuit Board

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Auget Inc., 33 Perry Ave., Attleboro, Mass.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2490,2508,2509,2513
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cicoil Corp., 9324 Topanga Canyon Blvd., Chatsworth, Cal.
Connectrol Corp., 28 E 22nd St, New York, N Y
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Jumpers, Wire, Terminated—See Cords, Patch

Junction Boxes—See Boxes, Junction & Wall Plate

Junctions, Hybrid, Microwave—See Hybrid Junctions, Microwave

Keyboards, Alpha-Numeric

Clare-Pendar Co., Box 785, Post Falls, Idaho ..... p 2026
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 571
Mechanical Enterprises, 5249 Duke St., Alexandria, Va. .... p 572
Raytheon Co., 465 Centre St., Quincy, Mass.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb. ..... p 2081
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Wild Rover Corp., Herbert Ave., Closter, N.J.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IBM Corp., Dept. EEM, 1271 Ave. of the Americas, New York, NY
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Shepard Div., 131st St. & Jamaica Ave., Richmond Hill, N.Y.

Keyboards, Decimal

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
Clare-Pendar Co., Box 785, Post Falls, Idaho ..... p 2026
Mechanical Enterprises, 5249 Duke St., Alexandria, Va. .... p 572
Raytheon Co., 465 Centre St., Quincy, Mass.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb. ..... p 2081
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
Wild Rover Corp., Herbert Ave., Closter, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.

Keyers & Couplers

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Collins Radio Co., Dallas, Tex.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Palomar Engrs., Box 455, Escondido, Cal.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Keys, Telegraph

Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Telcolab Corp., 405 Lexington Ave., New York, N.Y.
Vibroplex Co., Inc., 833 Broadway, New York, N.Y.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Kits, Antenna (For Engineers)

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.

Kits, Breadboarding (For Engineers)

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Gridcraft, 14520 Lima Rd., R.R. #1, Ft. Wayne, Ind. ..... p 1357
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal.
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Circuit-Stik, Inc., 1518 W. 132nd St., Gardena, Cal.
Circuit Structures Lab., 3200 N. San Fernando Blvd., Burbank, Calif.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Electraid, Inc., Box 53, Cambridge, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Elctrn. Labs., Inc., 1085 Commonwealth Ave., Boston, Mass.
Heath Co., Benton Harbor, Mich.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Semitronics Corp., 265 Canal St., New York, N.Y.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Wittek Prods. Co., 14750 Keswick St., Van Nuys, Calif.

Kits, Cable-End Sealing

Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.

Kits, Computer

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.

Kits, Marking (Dial, Instrument, Equipment, etc.)

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Eastern Marking Mach. Corp., 30 Alabama Ave., Island Pk., N.Y.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Techinques, Inc., 235 Jackson St., Englewood, N.J.

Kits, Potentiometer

Dale Elctrns., Inc., Box 180, Yankton, S.D.
New England Instr. Co., 14 Kendall La., Natick, Mass. ..... p 2814
Keltron Corp., 225 Crescent St., Waltham, Mass.

Kits, Power Supply

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 2862-2871
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.

Kits, Printed Circuit

Augat Inc., 33 Perry Ave., Attleboro, Mass.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Circuit-Stik, Inc., 1518 W. 132nd St., Gardena, Cal.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Micro-Circuits Co., New Buffalo, Mich.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
3M Co., 3M Center, St. Paul, Minn.

Kits, Programming Board

Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ..... p 2431
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.

Kits, Pump

Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.

Kits, Receiver

Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Heath Co., Benton Harbor, Mich.

Kits, Shielding

Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.

Kits, Switch Assembling

Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.....p 2050,2052
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. .... p 2089
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
States Co., 19 New Park Ave., Hartford, Conn.

Kits, Terminal

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Amp Inc., Box 3608, Harrisburg, Pa. ..... p 537
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
ETC, Inc., 990 East 67 St., Cleveland, Ohio ..... p 2442
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Hollingsworth Solderless Terminal Co., P.O. Box 430, Phoenixville, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
3M Co., 3M Center, St. Paul, Minn.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Kits, Test Equipment

RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Digitech Data Inds., Inc., 22 Grove St., Ridgefield, Conn.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
States Co., 19 New Park Ave., Hartford, Conn.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Kits, Training Aid

Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Burtek, Inc., Box 1677, Tulsa, Okla.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Electraid, Inc., Box 53, Cambridge, Mass.
General Elctrn. Labs., Inc., 1085 Commonwealth Ave., Boston, Mass.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Semitronics Corp., 265 Canal St., New York, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Kits, Transistor Mounting—See Pads, Transistor Mounting

Knives & Knife Sets

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Channellock, Inc., S. Main St., Meadville, Pa.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Uber Grafic Instrs., Box 4, Palo Alto, Calif.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Knobs

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1491
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y. p 1505
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 1531
Rogan Bros., Inc., 8031 N. Monticello Ave., Skokie, Ill. .... p 1532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1546
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Aerospace Knob Co., 9835 Dupree St., So. El Monte, Calif.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Christel Co., 20649 Londelius St., Canoga Pk., Cal.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Davies, Harry Molding Co., 4920 W. Bloomingdale Ave., Chicago, Ill.
Delta Plastics Co., 776 Creek Rd., Bellmawr, N.J.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Injection Plastic Corp., 8124-30 N. Ridgeway Ave., Skokie, Ill.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.

Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kentron Corp., 411 S. Ritter Ave., Indianapolis, Ind.
Kurz-Kasch, Inc., 1421 S. Broadway, Dayton, Ohio
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Radial Controls Div. Nicely Corp., 2555 E. 55th Pl., Indianapolis, Ind.
Romar Plastics, Inc., 1311 E. Main St., St. Charles, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Westmoreland Plastics Co., 135 Gertrude St., Latrobe, Pa.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Whitso, Inc, 9330 Byron St., Schiller Park, Ill.

Klystrons, Solid State, Microwave

Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.

Klystrons, Tube—See Tubes, Klystron

Labels, Pressure-Sensitive

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Display Devices, Inc., Box 667, Encinitas, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Applebaum Tag & Label Co., 3030 Northern Blvd., Long Island City, N.Y.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Bell Co., Inc., 106 Morrow Ave., Trussville, Ala.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Bishop Graphics, Inc., 7300 Radford Ave, No. Hollywood, Cal.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Cryptographics, Inc., 416 Third Ave., New York, N.Y.
Decalcraft, Rte. 309, Hatfield, Pa.
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Electro Chemical Engraving Co., 1100 Brook Ave, Bronx, N.Y.
Ever Ready Label Corp., 357 Cortlandt St., Belleville, N.J.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Hollander Allen, E. 64 Midland Ave., Paramus, N.J.
Industrial Commerce Corp., 105-07 Metropolitan Ave., Forest Hills, N.Y.
Labelon Corp., 10 Chapin St., Canandaigua, N.Y.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Master Tape Printers, Inc., 4517 Elston Ave., Chicago, Ill.
Metalcraft, Inc., 149 4th St., S.W., Mason City, Iowa
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
Meyercord Co., 365 E. North Ave., Carol Steam, Wheaton, Ill.
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
National Decal Corp., S.E. Corner 56th & Chestnut Sts., Philadelphia, Pa.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Tekno-Labels Co., 8160 Orion, Van Nuys, Calif.
3M Co., 3M Center, St. Paul, Minn.
Topflight Corp., 160 East 9th Ave., York, Pa.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Labels, Temperature Indicating

Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Camwil, Inc., 835 Keeaumoku, Honolulu, Haw.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Ever Ready Label Corp., 357 Cortlandt St., Belleville, N.J.
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Tempil Div., Hamilton Blvd., So. Plainfield, N.J.
Wahl, William Corp., 1001 Colorado Blvd., Santa Monica, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Laboratories, Mobile & Field

Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Air-Tech. Inds., Inc., 9 Brighton Rd., Clifton, N.J.
Ajusto Equip. Co., 513 Conneaut St., Bowling Green, Ohio
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Duriron Co., Inc., 425 N. Findlay St., Dayton, Ohio
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Lindsay Structure, 1360 Edgar St., Evansville, Ind.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Laboratories, Testing—See Services, Electrical Measurement; Services Environmental Testing

Laboratory Furniture—See Benches, Consoles, Stools, Tables (Lab and Shop)

Lacing, Cable—See Cords & Tapes, Lacing

Lacquer—See Insulating Compounds, Lacquer

Laminar Flow Work Stations—See Work Stations

Laminates, Metal Clad

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Nickeloid Co., Box 333, Peru, Ill.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Cimastra Div., 4760 Marburg Ave., Cincinnati, Ohio
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., Coshocton, Ohio
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Mica Corp., 4031 Elenda St., Culver City, Calif.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
New England Laminates Co., Inc., 481 Canal St., Stamford, Conn.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Laminates, Plastic Impregnated (Unclad)

Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Abesto Corp., Ackerman St., Bloomfield, N.J.
Baer, N.S. Co., 9 Montgomery St., Hillside, N.J.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Cimastra Div., 4760 Marburg Ave., Cincinnati, Ohio
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., Coshocton, Ohio
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Mica Corp., 4031 Elenda St., Culver City, Calif.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
New England Laminates Co., Inc., 481 Canal St., Stamford, Conn.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
UOP Norplex Div., Norplex Dr., LaCrosse, Wisc.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
U.S. Polymeric, Inc., Canal & Ludlow Sts., Stamford, Conn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zurn Inds., 5533 New Perry Hwy., Erie, Pa.

Laminates, Plastic (With Integral Heating Elements)

Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Rogers Corp., Rogers, Conn.
Synthane Taylor Corp., Valley Forge, Pa.

Laminations, Magnetic Recording Head

G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Hamilton Watch Co., Lancaster, Pa.
Micro Science Assocs., 2274 Mora Dr., Mt. View, Cal.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.

Laminations, Transformer & Inductor

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J. ..... p 2594
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2603
Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh, Pa.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Micro Science Assocs., 2274 Mora Dr., Mt. View, Cal.
MSL Steel Co., 3912 W. McLean Ave., Chicago, Ill.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Tempel Steel Co., 5353 N. Elston Ave., Chicago, Ill.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Lamp Adapters

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Display Devices, Inc., Box 667, Encinitas, Cal. ..... p 1504
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. ..p 1542,1543
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
International Prods., Inc., Box 405, Atchison, Kans.

Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Lamp Holders—See Sockets, Lamp & Lamp Assemblies

Lamp Pullers—See Pullers, Lamp

Lamps, Dial & Pilot, Incandescent

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1493
Amp Inc., Box 3608, Harrisburg, Pa.
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Clare-Pendar Co., Box 785, Post Falls, Idaho
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Display Devices, Inc., Box 667, Encinitas, Cal..... p 1504
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Eldema Div., 18435 Susana Rd., Compton, Cal. p 1506,1510,1511
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Hudson Lamp Co., 542 Elm St., Kearny, N.J..... p 1514
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. .. p 1519
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1515
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn..... p 2053
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal.....p 1522,1523
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Marco-Oak, Box 4011, Anaheim, Cal.
Oshino Electric Lamp Works, Ltd, 2-5-2, Minami-Shinagawa, Shinagawa-ku, Tokyo, Japan ..... p 1530
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J..... p 1529
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. p 1539-1543
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn..... p 1533
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1548,1549
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
International Prods., Inc., Box 405, Atchison, Kans.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Kirkland H. R. Co., 8 King St., Morristown, N.J.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
North American Elec. Lamp Co., 1520 North 13 St., St. Louis, Mo.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Precision Lamp Engrs., Inc., 114 Hamilton Dr., Hamilton Ind'l. Pk., Novato, Cal.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sylvania Elec. Prods., Inc., Estes St., Ipswich, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Truco, Inc., P.O. Box 95, Simsbury, Conn.
Vitality Bulbs Ltd., Beetons Way, Bury Saint Edmunds, Suffolk, England
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Lamps, Electroluminescent—See Panels, Electroluminescent

Lamps, Exciter, Photographic

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal.....p 1522,1523
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
General Elec. Co., Photo Lamp Dept., Nela Park, Cleveland, Ohio
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Radiant Lamp Corp., 199 Bank St., Hightstown, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Endicott St., Danvers, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lamps, Flashtube

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Abtronics, Inc., Box 712, Livermore, Calif.
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
General Elec. Co., Photo Lamp Dept., Nela Park, Cleveland, Ohio
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Sylvania Elec. Prods., Inc., 100 Endicott St., Danvers, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lamps, Glow—See Lamps, Neon

Lamps, Infrared

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
North American Elec. Lamp Co., 1520 North 13 St., St. Louis, Mo.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Radiant Lamp Corp., 199 Bank St., Hightstown, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lamps, Luminescent

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal.....p 1522,1523
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Lamps, Magnifying

Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Black Light Prods., Box 45278, Chicago, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Dazor Mfg. Corp., 4455-99 Duncan Ave., St. Louis, Mo.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Glidelite Inds., Inc., 180 Central Ave., Hackensack, N.J.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Swing-O-Lite, Inc., 13 E. Moonachie Rd., Hackensack, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Lamps, Mercury Vapor

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.p 1007
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Epic, Inc., 150 Nassau St., New York, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Nuclear Supplies Div., Box 312, Encino, Calif.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Radiant Lamp Corp., 199 Bank St., Hightstown, N.J.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Lamps, Miniature & Subminiature

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1493
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Eldema Div., 18435 Susana Rd., Compton, Cal. p 1506,1508,1510,1511
General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Hudson Lamp Co., 542 Elm St., Kearny, N.J..... p 1514
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. .. p 1519
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1515
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn..... p 2053
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal.....p 1522,1523
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y.
Oshino Electric Lamp Works, Ltd, 2-5-2, Minami-Shinagawa, Shinagawa-ku, Tokyo, Japan ..... p 1530
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J..... p 1529
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. p 1539-1543
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1548,1549
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Allyn, W., Inc., Skaneateles Falls, N.Y.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Dazor Mfg. Corp., 4455-99 Duncan Ave., St. Louis, Mo.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
International Prods., Inc., Box 405, Atchison, Kans.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Precision Lamp Engrs., Inc., 114 Hamilton Dr., Hamilton Ind'l. Pk., Novato, Cal.
Radiant Lamp Corp., 199 Bank St., Hightstown, N.J.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Swing-O-Lite, Inc., 13 E. Moonachie Rd., Hackensack, N.J.
Sylvania Elec. Prods., Inc., Estes St., Ipswich, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Vitality Bulbs Ltd., Beetons Way, Bury Saint Edmunds, Suffolk, England
Western Indicator Co., 9835 Dupree St., So. El Monte, Cal.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Lamps, Neon

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1493
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Eldema Div., 18435 Susana Rd., Compton, Cal. p 1506,1508,1510,1511

Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. .. p 1518
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal..... p 1523
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y.
Marco-Oak, Box 4011, Anaheim, Cal.
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. .....p 1536,1537
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal..... p 1541
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1548,1549
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
International Prods., inc., Box 405, Atchison, Kans.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Vitality Bulbs Ltd., Beetons Way, Bury Saint Edmunds, Suffolk, England

Lamps, Projection

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Eimac, 301 Industrial Way, San Carlos, Calif.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
General Elec. Co., Photo Lamp Dept., Nela Park, Cleveland, Ohio
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Radiant Lamp Corp., 199 Bank St., Hightstown, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Sylvania Elec. Prods., Inc., 100 Endicott St., Danvers, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Lamps, Solid State

General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Electro-Optical Sys., Pasadena, Calif.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.

Lamps, Stroboscopic

Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 787
Abtronics, Inc., Box 712, Livermore, Calif.
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lamps, Tungsten Halogen

Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Endicott St., Danvers, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Lamps, Ultraviolet

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.p 1007
General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Black Light Prods., Box 45278, Chicago, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
EMR Div., Box 223, Princeton, N.J.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stroblite Co., Inc., 29 W. 15th St., New York, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Xenon Corp., 39 Commercial St., Medford, Mass.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Lamps, Xexon

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Xenon Corp., 39 Commercial St., Medford, Mass.

Laser Energy Monitors—See Monitors, Laser Energy

Laser Q Switches

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Photon Sources, Inc., Box 636, Ann Arbor, Mich.
Quantronix Corp., 225 Engineer Rd., Smithtown, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Lasers, Gas

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Laser Sys. Corp., 313 N. First St., Ann Arbor, Mich.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photon Sources, Inc., Box 636, Ann Arbor, Mich.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
University Labs., 1250 W. Middlefield Rd., Mountain View, Cal.

Lasers, Solid-State

RCA, 415 S. 5th St., Harrison, N.J.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quantronix Corp., 225 Engineer Rd., Smithtown, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
TRW Instrs., 139 Illinois St., El Segundo, Calif.

Lead Assemblies & Receptacles, High Voltage-Also See Connectors; Cable Assemblies

Amp Inc., 155 Park St., Elizabethtown, Pa. .....p 2366,2367
Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GTI Corp., 310 Chestnut St., Meadville, Pa.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal. p 2524,2525
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Beman Mfg., Inc., New Cumberland, Pa.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
General Lab. Assocs., Norwich, N.Y.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hobson Bros., inc., 4940 W. Lawrence Ave., Chicago, Ill.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Lectrodyne Sys. Corp., 1234 Carpenter St., Philadelphia, Pa.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Leads, Test—See Test Leads

Lens Caps, Indicator Light—See Caps, Lens, Indicator Light

Lenses, Inspection—See Magnifying Glasses, Inspection

Lenses, Optical & Camera

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J.
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Cosmicar Optical Co., Ltd., 568, 2-chome, Shimoochiai, Shinjuku-ku, Tokyo, Japan ..... p 1709
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
Honeywell, Box 5227, Denver, Colo.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Bache, Semon & Co., 636 Greenwich St., New York, N.Y.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Bendix Corp., 1975 Green Rd., Ann Arbor, Mich.
Bourns/CAI, Inc., 550 W. Northwest Hwy., Barrington, Ill.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.

Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Electro-Optical Div., 347 King St., Northampton, Mass.
Electro-Optical Sys., Pasadena, Calif.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
FJW Inds., Inc., 215 E. Prospect Ave., Mt. Prospect, Ill.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Gildelite Inds., Inc., 180 Central Ave., Hackensack, N.J.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Heliotek, 12500 Gladstone Ave., Sylmar, Calif.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lancaster Glass Corp., 220-226 W. Main St., Lancaster, Ohio
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Photosystems Corp., 112 Parkway Dr., S., Hauppague, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
S & S Optical Co., inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.
3M Co., 3M Center, St. Paul, Minn.
Traid Corp., 777 Flower St., Glendale, Calif.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Lenses, R-F

Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Valpey Corp., 1400 Highland St., Holliston, Mass.

Lenses, Readout & Display

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1516
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. ..... p 568
Shelly Assoc., Inc., 111 Eucalyptus Dr., El Segundo, Cal. p 1534,1535
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn. ..... p 1533
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.

Light Sources, Isotope Excited—See Sources, Light

Lighting Equipment, Emergency

ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
North Elec. Co., 553 S. Market St., Galion, Ohio
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn. ..... p 1204
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electronic Batteries, Inc., 28-34 35th St., Brooklyn, N.Y.
Hobby & Brown Elctrn. Corp., 15 St. Marks Ave., Rockville Centre, N.Y.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Ray-O-Vac Co., 212 E. Washington Ave., Madison, Wisc.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.

Lighting Equipment, Studio

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Ajmes Inds., P.O. Box 73, Lockport, Ill.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
Century Strand, Inc., 3 Entin Rd., Clifton, N.J.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hico Corp., 76 Coolidge Hill Rd., Watertown, Mass.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Lighting Equipment, Tower

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Electro-Optical Sys., Pasadena, Calif.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Trylon, Inc., Elverson, Pa.

Lightning Arresters—See Arresters, Lightning

Lights, Arc

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. .....p 1712,1713
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Berkey Tech., 25-15 50th St., Woodside, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lights, Dial, Panel, Pilot, & Accessories

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amp Inc., Box 3608, Harrisburg, Pa.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y. ..... p 1495
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Clare-Pendar Co., Box 785, Post Falls, Idaho ..... p 2027
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. .....p 1500,1501
Display Devices, Inc., Box 667, Encinitas, Cal. ..... p 1504
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill. p 1502,1503
Eldema Div., 18435 Susana Rd., Compton, Cal. p 1506,1508-1511
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal. ..... p 2038
Electro Switch Corp., King Ave., Weymouth, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1512
General Elec. Co., Miniature Lamp Dept. MO-1, Nela Park, Cleveland, Ohio ..... p 1513
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. p 1518,1519
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1515
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. ..... p 568
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn. ..... p 2053
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal. ....p 1522,1523
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Marco-Oak, Box 4011, Anaheim, Cal. ..... p 2065
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2068,2069
Shelly Assoc., Inc., 111 Eucalyptus Dr., El Segundo, Cal. p 1535
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1536
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. p 1538-1543
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn. ..... p 1533
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1548,1549
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Aeronautical Elec. Co., Inc., 5656 Northwest Hwy., Chicago, Ill.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electro Devices, Inc., 11805 Westline Ind'l. Dr., St. Louis, Mo.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
International Prods., Inc., Box 405, Atchison, Kans.
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Luminator, Inc., Box 278, Plano, Tex.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Penn Keystone Corp., Division St., Ansonia, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Sylvania Elec. Prods., Inc., Estes St., Ipswich, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Union Carbide Corp., Consumer Prods. Div., 270 Park Ave., New York, N.Y.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Vitality Bulbs Ltd., Beetons Way, Bury Saint Edmunds, Suffolk, England
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Westmoreland Plastics Co., 135 Gertrude St., Latrobe, Pa.

Lights, Edge Lighting, Panel

Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1500
Lamps, Inc., 17000 S. Western Ave., Gardena, Cal. ....p 1522,1523
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Marco-Oak, Box 4011, Anaheim, Cal. ..... p 2065
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. p 1539-1543
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.

Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sun Dial & Panel Corp., Box 326, Caldwell, N.J.
Sylvania Elec. Prods., Inc., Estes St., Ipswich, Mass.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Vitality Bulbs Ltd., Beetons Way, Bury Saint Edmunds, Suffolk, England

Lights, Infrared

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro-Optical Sys., Pasadena, Calif.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Hamilton Industries, P.O. Box 504, Winter Haven, Fla.
Miskella Infra-Red Co., 7301 Grand Ave., Cleveland, Ohio
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Lights, Inspection—See Lamps, Magnifying

Lights, Neon, Test—See Lights, Press-To-Test

Lights, Oil-Tight

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill. ..... p 1497
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. .....p 1500,1501
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.... p 1502
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1512
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pyle-National Co., Connector Div., 1334 N. Kostner Ave., Chicago, Ill.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.

Lights, Placard—See Lights, Dial, Panel, Pilot & Accessories

Lights, Press-To-Test

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn.
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.... p 1503
Electro Switch Corp., King Ave., Weymouth, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1512
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Marco-Oak, Box 4011, Anaheim, Cal. ..... p 2065
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2068,2069
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Lights, Stroboscopic Source

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
CML, Inc., 166 National Rd., Edison, N.J.
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 787
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Abtronics, Inc., Box 712, Livermore, Calif.
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Berkshire Labs., 107 Tansy Hill Rd., Milford, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Chadwick-Helmuth Co., Inc., 111 E. Railroad Ave., Monrovia, Calif.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electronic Brazing Co., 140 Glenridge Ave., Montclair, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Xenon Corp., 39 Commercial St., Medford, Mass.

Lights, Ultraviolet

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Berkey Tech., 25-15 50th St., Woodside, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Eimac, 301 Industrial Way, San Carlos, Calif.
EMR Div., P.O. Box 44, Princeton, N.J.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Etchomatic, Inc., Box 444, Waltham, Mass.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Limit Stops, Mechanical

Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla.
Northfield Precision Instr. Corp., 4400 Austin Blvd., Island Pk., N.Y. ..... p 1683
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1694
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.

Limiters, Current

Airpax Elctrns., Inc., Cambridge, Md.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind..... p 1749
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1102-1104,1106,1108
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1146
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.....p 1274,1275
Burndy Corp., Richards Ave., Norwalk, Conn.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Limiters, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Collins Radio Co., Dallas, Tex.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Physical Elctrn. Labs., 1185 O'Brien Dr., Menlo Park, Calif.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Limiters, Noise

Collins Radio Co., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.

Limiters, Pulse

Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y..... p 1275
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Metcom, inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.

Limiters, Surge

ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Josiyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y..... p 1275
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.

Line Fault Locators—See Locators, Cable & Line Fault

Line Stretchers, Microwave—See Microwave Line Stretchers

Linear Displacement Indicators—See Indicators, Linear Displacement

Liners, Tube Shield—See Shields, Tube

Lines, Slotted—See Lines, Microwave

Links, Antenna

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Collins Radio Co., Dallas, Tex.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Links, Relay

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895-897
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
Collins Radio Co., Dallas, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Liquid Converters, Cryogenic—See Cryogenic Liquid Converters

Liquid Crystals—See Crystals, Liquid, Temperature Indicating

Liquid-Level Indicators—See Indicators, Liquid-Level

Load Cells—See Cells, Load

Loads, Dummy—See Dummy Loads

Loads, Electronic, Variable-Also See Dummy Loads

Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal. p 952
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1109
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal. p 735

Locators, Cable & Line Fault

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Cablemaster Div., 13215 Leadwell St., No. Hollywood, Cal. p 627
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass. p 1710
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 708-710
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. p 786,787
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Electro-Alarm Safety Devices, 745 N. Pleasant, Fresno, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Petty Geophysical Engrg. Co., 700 Tower Life Bldg., San Antonio, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Superior Continental Corp., Box 489, Hickory, N.C.

Locators, Metal—See Detectors, Metal

Locators, Open-Short

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Cablemaster Div., 13215 Leadwell St., No. Hollywood, Cal. p 627
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass. p 1710
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 708-710
Intronics, Inc., 57 Chapel St., Newton, Mass.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. p 786,787
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.

Locators, Pipe & Cable—See Detectors, Metal

Locks, Dial & Shaft

Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. p 1521
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,1527,2139
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Raytheon Co., 465 Centre St., Quincy, Mass. p 1531
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. p 2641
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Logic Circuits—See Cards, Logic Circuits, Integrated Modules, Logic

Loudspeakers—See Speakers

Louvers, Vents, & Windows (For Equipment)—See Cabinets & Accessories, Metal

Lsi Circuits—See Circuits, Large Scale Integration

Lubricants-Also See Greases

Dow Corning Corp., Midland, Mich. p 2669,2670
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex. p 2328
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cerac, Inc., Box 597, Butler, Wisc.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
CRC Chemicals, Dresher, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
DuBois Chems., DuBois Tower, Cincinnati, Ohio
Elctrn. Chemical Corp., 813 Communipaw Ave., Jersey City, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
General Elec. Co., Waterford, N.Y.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Humble Oil & Refining Co., P.O. Box 2180, Houston, Tex.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kano Labs., Inc., 1000 Thompson La., Nashville, Tenn.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
LPS Resch. Labs., 2050 Cotner, Los Angeles, Cal.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Miller, Harry Corp., 4th & Bristol Sts., Philadelphia, Pa.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Nye, William F., Inc., P.O. Box G-927, New Bedford, Mass.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Poxylube, Inc., 541 S. Webster Ave., Indianapolis, Ind.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.

Lugs—See Terminals, Lug

Luminescent Chemicals—See Chemicals, Luminescent

Luminous Paints—See Paints, Luminous

LVDT—See Transducers, Displacement

Machines, Axial Lead Straightening, Automatic

Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1306,1307
Macronetics, Inc., 1003 Weeks St., E. Palo Alto, Cal.

Machines, Balancing—See Balancing Equipment

Machines, Blueprint—See Blueprint Machines

Machines, Chemical Milling

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Chemcut Corp., 500 Science Pk., State College, Pa.
Etchomatic, Inc., Box 444, Waltham, Mass.
Western Technology, Inc., 220 W. Central, Santa Ana, Cal.

Machines, Cleaning-Also See Cleaners, Ultrasonic; Machines, Vapor-Degreasing

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Ultrasonic Devices, 1057 Summit Ave., Jersey City, N.J. p 1316
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Barrett, Leon J. Co., 1450 Grafton Rd., Worcester, Mass.
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Cobehn, Inc., 226 Passaic Ave., Fairfield, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Dynasonics Corp., Box 672, Pipestone, Minn.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Etchomatic, Inc., Box 444, Waltham, Mass.
Industrial Washing Mach. Corp., 32 Main St., Matawan, N.J.
Inland Mfg. Co., 1108 Jackson St., Omaha, Neb.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Lewis Corp., Rte. 6, Woodbury, Conn.
Macronetics, Inc., 1003 Weeks St., E. Palo Alto, Cal.
Marcal Electro-Sonics, P.O. Box 185, Burkank, Calif.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Oakite Prods., Inc., 50 Valley Rd., Berkeley Hgts., N.J.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Technic, Inc., Box 965, Providence, R.I.
Tronic Corp., Box 247-E, Belmont, Calif.
Wells Elctrns., Inc., 1701 S. Main St., So. Bend, Ind.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.

Machines, Coil-Winding

Arnold Magnetics Corp., Box K, Culver City, Calif. p 959
Amacoil Machinery Inc., 111 Plain Ave., New Rochelle, N.Y.
Coil Winding Equip. Co., Inc., Railroad Plaza, Oyster Bay, N.Y.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Eubanks Engrg. Co., Box 563, 225 W. Duarte Rd., Monrovia, Calif.
Gorman Machine Corp., 1645 Superior Ave., Costa Mesa, Cal.
Halm Instr. Co., Inc., Glen Head Rd., Glen Head, N.Y.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Leesona Corp., Mirybrook Rd., Danbury, Conn.
Micafil, Ltd., 1168 EM Grove St., Irvington, N.J.
Possis Machine Corp., 825 Rhode Island Ave., S., Minneapolis, Minn.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Stevens, Geo. Mfg. Co., Inc., 6001 N. Keystone Ave., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Coil-Winding, Toroidal

Arnold Magnetics Corp., Box K, Culver City, Calif. p 959
Coil Winding Equip. Co., Inc., Railroad Plaza, Oyster Bay, N.Y.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Gorman Machine Corp., 1645 Superior Ave., Costa Mesa, Cal.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Leesona Corp., Mirybrook Rd., Danbury, Conn.
Torin Corp., 100 Franklin Dr., Torrington, Conn.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Component Handling & Feeding

Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J. p 2419
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.

Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
C.E.M. Co., Inc., 24 School St., Danielson, Conn.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Connectrol Corp., 28 E 22nd St, New York, N Y
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Federal Mach. Co., Inc., 807 Garfield Ave., Jersey City, N.J.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Halm Instr. Co., Inc., Glen Head Rd., Glen Head, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Midwest Automatic, Inc., 510 Third St., Des Moines, Iowa
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Vimac, Inc., 8853 East Ave., Mentor, Ohio

Machines, Component Inserting

Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
C.E.M. Co., Inc., 24 School St., Danielson, Conn.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Federal Mach. Co., Inc., 807 Garfield Ave., Jersey City, N.J.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Midwest Automatic, Inc., 510 Third St., Des Moines, Iowa
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.

Machines, Component Lead Cleaning

Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.

Machines, Crimping—See Tools, Crimping

Machines, Crystal Manufacturing

Felker Mfg. Co., 1900 S. Crenshaw Blvd., Torrance, Calif.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.

Machines, Cutting

Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Di-Acro, 316 8th Ave., Lake City, Minn.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Felker Mfg. Co., 1900 S. Crenshaw Blvd., Torrance, Calif.
Foredom Elec. Co., Bethel, Conn.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mechanization Assocs., 140 S. Whisman Rd., Mt. View, Calif.
Miller-Stephenson Chem. Co., Inc., Rte. 7, Danbury, Conn.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Machines, Deflashing

Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Laser Sys. Corp., 313 N. First St., Ann Arbor, Mich.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Machines, Degreasing, Vapor—See Machines, Vapor-Degreasing

Machines, Drying

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Barrett, Leon J. Co., 1450 Grafton Rd., Worcester, Mass.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Machines, Electrical Discharge

Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Siltronics, Inc., 140 Pennsylvania Ave., Oakmont, Pa.

Machines, Encapsulating

GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1303
Adams & Assoc., Inc., 1062 N. Orange Grove Ave., Hollywood, Cal.
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Hardman Inc., Belleville, N.J.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Kenics Corp., One Southside Rd., Danvers, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
3M Co., 3M Center, St. Paul, Minn.
Tra-Con, Inc., 55 North St., Medford, Mass.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Machines, Engraving & Profiling—See Engraving & Profiling Equipment

Machines, Etching, Printed Circuits

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
Chemcut Corp., 500 Science Pk., State College, Pa.
Cyclo-Tronics, Inc., 3858 N. Cicero Ave., Chicago, Ill.
Etchomatic, Inc., Box 444, Waltham, Mass.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Western Technology, Inc., 220 W. Central, Santa Ana, Cal.

Machines, Eyelet Installing

Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
Townsend Co., 530 West St., Braintree, Mass.
USM Corp., 510 River Rd., Shelton, Conn.

Machines, Helixing Lathe

Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Halm Instr. Co., Inc., Glen Head Rd., Glen Head, N.Y.

Machines, Hermetic Sealing

GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1303
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Litton Engrg. Labs., Box 669, Carson City, Nev.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
Precision Arc Co., Inc., 785 Woodend Rd., Stratford, Conn.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio

Machines, Hot-Stamping

Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Apex Machine Co., 3000 Northeast 12th Terr., Ft. Lauderdale, Fla.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Kingsley Mach. Co., 850 Cahuenga Blvd. - EEM, Hollywood, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Markem Corp., 194 Congress St., Keene, N.H.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.
Noble & Westbrook, 20 Westbrook St., E. Hartford, Conn.

Machines, Impregnating

Barrett, Leon J. Co., 1450 Grafton Rd., Worcester, Mass.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hardman inc., Belleville, N.J.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Loctite Corp., 705 N. Mountain Rd., Newington, Conn.
Micafil, Ltd., 1168 EM Grove St., Irvington, N.J.
National Vacuum Platers, Inc., 2641 E. Hagert St., Philadelphia, Pa.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Possis Machine Corp., 825 Rhode Island Ave., S., Minneapolis, Minn.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.

Machines, Induction Heating (Electronic)

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio

Machines, Lead Cutting & Forming

Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
D-Vel Resch. Labs., Inc., 555 Bedford Rd., Bedford Hills, N.Y.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Harwil Co., 903 Colorado Ave., Santa Monica, Calif.
James Elctrn. Tool Co., P.O. Box 1482, Palo Alto, Calif.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Macronetics, Inc., 1003 Weeks St., E. Palo Alto, Cal.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Tech. Devices Co., 11242 Playa Ct., Culver City, Calif.
Trish Energetics, Pond Rd., Harvard, Mass.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Machines, Marking & Numbering

Aero Devices, Inc., 494 S. Riverview Dr., Totowa, N.J. .... p 2908
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Apex Machine Co., 3000 Northeast 12th Terr., Ft. Lauderdale, Fla.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
Bostitch, Briggs Dr., E. Greenwich, R.I.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
Eastern Marking Mach. Corp., 30 Alabama Ave., Island Pk., N.Y.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Gillies, Duncan M. Co., Inc., 66 Central St., W. Boylston, Mass.
Halm Instr. Co., Inc., Glen Head Rd., Glen Head, N.Y.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Hollander Allen, E. 64 Midland Ave., Paramus, N.J.
Independent Ink, Inc., 14705 S. Avalon Blvd., Gardena, Calif.
Kingsley Mach. Co., 850 Cahuenga Blvd. - EEM, Hollywood, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Markem Corp., 194 Congress St., Keene, N.H.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.
Noble & Westbrook, 20 Westbrook St., E. Hartford, Conn.
Popper & Sons, Inc., 300 Park Ave. S., New York, N.Y.
Preis, H.P. Engraving Mach. Co., 651 U.S. Hwy. 22, Hillside, N.J.
Pryor Marking Prods., 21 E. Hubbard, Chicago, Ill.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Trish Energetics, Pond Rd., Harvard, Mass.
Wilkens, Alwin Fr., Inc., Rte. 22, Pawling, N.Y.

Machines, Mask Alignment & Exposure

Kasper Instrs., Inc., 983 Shulman Ave., Santa Clara, Cal. p 1305
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Chemcut Corp., 500 Science Pk., State College, Pa.
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hugle Inds., 625 N. Pastoria, Sunnyvale, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.

Machines, Material Handling (Electronic Control)

Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Barrett Elctrns. Corp., 630 Dundee Rd., Northbrook, Ill.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Linear Alpha, Inc., 823 Emerson, Evanston, Ill.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Wells Elctrns., Inc., 1701 S. Main St., So. Bend, Ind.

Machines, Metallizing, Vacuum—See Deposition Equipment, Vacuum

Machines, Measuring

Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Epoi, Inc., 623 Stewart Ave., Garden City, N.Y.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hykon Mfg. Co., 163 E. State St., Box 923, Alliance, Ohio
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Traid Corp., 777 Flower St., Glendale, Calif.
Unitron Instr. Co., 66 Needham St., Newton Highlands, Mass.

Machines, Parts Cleaning—See Machines, Cleaning

Machines, Plastic Molding
Adams & Assoc., Inc., 1062 N. Orange Grove Ave., Hollywood, Cal.
Alden Sys. Co., Inc., Box A, Dept. 262, Westboro, Mass.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Di-Acro, 316 8th Ave., Lake City, Minn.
H-P-M Div., Marion Rd., Mt. Gilead, Ohio
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
K-Tech., Inc., 885 Waverly St., Framingham, Mass.
Morris Enterprises, Inc., 16799 Schoenborn St., Sepulveda, Calif.
Newbury Inds., Inc., 10975 Kinsman Rd., Newbury, Ohio
Orbit, Inc, Box 351, Deming Air Base, Deming, N.M.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Pentronix, Div., 1737 Cicotte St., Lincoln Pk., Mich.
Plastics Mach. Div., Box 1320, New Britain, Conn.
Wabash Metal Prods. Co., Inc., 1569 Morris St., Box 298, Wabash, Ind.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Plating
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
M & T Chemicals Inc., Rahway, N.J.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Selectrons, Ltd., 116 East 16th St., New York, N.Y.
Technic, Inc., Box 965, Providence, R.I.
3M Co., 3M Center, St. Paul, Minn.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Polishing & Buffing
Hoffman, P.R. Co. Div., 321 Cherry St., Carlisle, Pa.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Machines, Printed Circuit Drilling & Punching
A P Inc., 56 Corwin Dr., Painesville, Ohio
Data Technology, Inc., 65 Grove St., Watertown, Mass.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1306
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Dimensional Control Machinery Co., P.O. Box 504, Salem, Ohio
Dumore Co., 1300 17 St., Racine, Wisc.
Etchomatic, Inc., Box 444, Waltham, Mass.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
Servo Prods. Co., Box B, Altadena, Cal.
Trish Energetics, Pond Rd., Harvard, Mass.
Wabash Metal Prods. Co., Inc., 1569 Morris St., Box 298, Wabash, Ind.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland, Ohio

Machines, Punching
Allen, Alva Inds., 1001-15 No. Third St., Clinton, Mo.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Roper Whitney, Inc., 2833 Huffman Blvd., Rockford, Ill.
Trish Energetics, Pond Rd., Harvard, Mass.

Machines, Reel Packaging
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.

Machines, Resistance Also See Resistance Adjusting Equipment For Hybrid Microcircuits
A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Neutronic Corp., Box 625, St. Louis, Mo. p 757
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.

Machines, Riveting
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
Cherry Rivet Div., P.O. Box 2157, Santa Ana, Calif.
Chicago Rivet & Mach. Co., 950 S. 25 Ave., Bellwood, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
High Speed Hammer Co., Inc., 313 Norton St., Rochester, N.Y.
Milford Rivet & Mach. Co., 857 Bridgeport Ave., Milford, Conn.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
Townsend Co., 530 West St., Braintree, Mass.
Trish Energetics, Pond Rd., Harvard, Mass.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines & Accessories, Semiconductor Manufacturing
GTI Corp., 310 Chestnut St., Meadville, Pa. p 1303
Kasper Instrs., Inc., 983 Shulman Ave., Santa Clara, Cal. p 1304,1305
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1306,1307
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Dixie Diamond Tool Co., Inc., 6875 Southwest 81st St., Miami, Fla.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
HLC Mfg. Co., Inc., 700 Davisville Rd., Willow Grove, Pa.
Hoffman, P.R. Co. Div., 321 Cherry St., Carlisle, Pa.
Hugle Inds., 625 N. Pastoria, Sunnyvale, Cal.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Macronetics, Inc., 1003 Weeks St., E. Palo Alto, Cal.
Mechanization Assocs., 140 S. Whisman Rd., Mt. View, Calif.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Norton Co., 1 New Bond St., Worcester, Mass.
Pentronix, Div., 1737 Cicotte St., Lincoln Pk., Mich.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Semimetals, Inc., 172 Spruce St., Westbury, N.Y.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Vimac, Inc., 8853 East Ave., Mentor, Ohio
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Machines, Shock Testing—See Testers, Shock

Machines, Sleeve Cutting
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
Hedquist Machine & Tool Co., 13110 Diericx Dr., Mountain View, Calif.
Kingsley Mach. Co., 850 Cahuenga Blvd. - EEM, Hollywood, Calif.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Machines, Solderability Testing
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. p 2843
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mechanization Assocs., 140 S. Whisman Rd., Mt. View, Calif.

Machines, Soldering—See Soldering Equip.

Machines, Sorting
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624,625
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
Ade Corp., 385 Waverley Ave., Newton, Mass.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Automated Packaging Systems Inc., 8400 Darrow Rd., Twinsburg, Ohio
Automatic Gage Corp., Box 222, W. Roxbury, Mass.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Industrial Div, 1200 E. Mermaid La., Philadelphia, Pa.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Vimac, Inc., 8853 East Ave., Mentor, Ohio

Machines, Spinner, Photo-Resist
Headway Research, Inc., 3713 Forest La., Garland, Tex.
Macronetics, Inc., 1003 Weeks St., E. Palo Alto, Cal.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.

Machines, Swaging
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Torrington Co., Box 1008, Torrington, Conn.
Trish Energetics, Pond Rd., Harvard, Mass.

Machines, Tape Winding
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Cycle Equip. Co., P.O. Box 307, Los Gatos, Calif.
Hedquist Machine & Tool Co., 13110 Diericx Dr., Mountain View, Calif.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
3M Co., 3M Center, St. Paul, Minn.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Tape Winding, Toroidal
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Universal Mfg. Co., Inc., 1168 Grove St., Irvington, N.J.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Machines, Terminal Installing
Amp Inc., Box 3608, Harrisburg, Pa.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2538
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Black & Webster, Inc., 281 Winter St., Waltham, Mass.
Connectrol Corp., 28 E 22nd St, New York, N Y
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Halm Instr. Co., Inc., Glen Head Rd., Glen Head, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Segal, Edward, Inc., 132 Lafayette St., New York, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Machines, Transistor Assembling
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Machines, Ultrasonic Bonding
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Sorensen Oper., Richards Ava., Norwalk, Conn.
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Hugle Inds., 625 N. Pastoria, Sunnyvale, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Marcal Electro-Sonics, P.O. Box 185, Burbank, Calif.
Sonobond Corp., 310 E. Rosedale Ave., West Chester, Pa.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Machines, Vapor-Degreasing-Also See Cleaners, Ultrasonic
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Ultrasonic Devices, 1057 Summit Ave., Jersey City, N.J. p 1316
Acra Elec. Corp., 3801 N. 25th Ave., Schiller Pk., Ill.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Cyclo-Tronics, Inc., 3858 N. Cicero Ave., Chicago, Ill.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Dynasonics Corp., Box 672, Pipestone, Minn.
Headway Research, Inc., 3713 Forest La., Garland, Tex.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Lewis Corp., Rte. 6, Woodbury, Conn.
Phillips Mfg. Co., 7334 N. Clark St., Chicago, Ill.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tronic Corp., Box 247-E, Belmont, Calif.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.

Machines, Vibration Fatigue Testing—See Vibration Test Systems

Machines, Whiteprint—See Whiteprint Machines

Machines, Wire Marking, Hand & Automatic—See Wire Marking Machines

Machines, Wire Measuring & Cutting—See Wire Measuring & Cutting Machines

Machines, Wire Wrapping-Also See Wire Wrapping Tools

Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y. p 1307
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Synergistic Prods., Inc., 150 Stevens Ave., Santa Ana, Cal.

Macroscopic Equip.—See Magnifying Glasses, Inspection

Magnetic Analyzers—See Analyzers, Magnetic

Magnetic Core Testers—See Testers, Magnetic Core

Magnetic Disc Storage Systems

Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Alpha Data, Inc., 19005 Ventura Blvd., Tarzana, Calif.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
Digital Dev. Corp., 5575 Kearny Villa Rd., San Diego, Calif.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Mac Panel Co., Box 5027, High Pt., N.C.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Magnetic Field Indicators—See Indicators, Magnetic Field

Magnetic Foil—See Foil, Magnetic

Magnetic Iron Oxides

Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y. p 2683
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fuji Photo Film Co., Ltd., 26-30 Nishiazabu 2-Chome, Minato-Ku, Tokyo, 106, Japan

Magnetic Recording Tape—See Tapes, Recording, Magnetic

Magnetic Shields & Materials—See Shields, Magnetic

Magnetic Tape Recorders—See Recorders, Magnetic Tape

Magnetizers

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Dura Magnetics, Inc., 5506 Schultz Dr., Sylvania, Ohio
Electronic Brazing Co., 140 Glenridge Ave., Montclair, N.J.
Indiana General-Process Equipt., 6001 S. General Ave., Cudahy, Wisc.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Magnetometers

California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Gammatronix, Inc., Dublin, Ohio
GeoMetrics, 914 Industrial Ave., Palo Alto, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Infinetics, Inc., 1601 Jessup St., Wilmington, Del.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
Schonstedt Instr. Co., 1775 Wiehle Ave., Reston, Va.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.

Magnetoresistors, Hall

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1363
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. p 1894,1895
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.

Magnetron Testers—See Testers, Magnetron

Magnetrons—See Tubes, Magnetron

Magnets, Electromagnetic

Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
IMC Magnetics Corp., 1900 E. 5th St., Tempe, Ariz.
Indiana General-Process Equipt., 6001 S. General Ave., Cudahy, Wisc.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.

Magnets, Focusing—See Magnets, Permanent

Magnets (Lab Type)

ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 716
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Dura Magnetics, Inc., 5506 Schultz Dr., Sylvania, Ohio
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Maryland Magnet Co., 5412 Gist Ave., Baltimore, Md.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.

Magnets, Permanent

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2590
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2596
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
Bunting Magnetics Co., 9245 Cherry St., Franklin Park, Ill.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Dura Magnetics, Inc., 5506 Schultz Dr., Sylvania, Ohio
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
General Magnetic Corp., 10001 Erwin Ave., Detroit, Mich.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Hamilton Watch Co., Lancaster, Pa.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Indiana General-Process Equipt., 6001 S. General Ave., Cudahy, Wisc.
Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.
Magno-Ceram Co., 2614 S. Clinton Ave., S. Plainfield, N.J.
Maryland Magnet Co., 5412 Gist Ave., Baltimore, Md.
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Ogallala Elctrns., Box 59, Ogallala, Neb.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Permanent Magnet Co., Inc., 4437 Bragdon St., Indianapolis, Ind.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Precision Metals Div., Lancaster, Pa.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stackpole Carbon Co., Kane, Pa.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.
3M Co., 3M Center, St. Paul, Minn.
3M Co., 5178 Crookshank Rd., Cincinnati, Ohio
Trico Fuse Mfg. Co., 2948 North 5th St., Milwaukee, Wisc.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.

Magnets, Superconducting

Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
RCA, 415 S. 5th St., Harrison, N.J.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Rol-a-chart Div., Somerset, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.

Magnifying Glasses, Inspection-Also See Lamps, Magnifying

AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Dazor Mfg. Corp., 4455-99 Duncan Ave., St. Louis, Mo.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Glidelite Inds., Inc., 180 Central Ave., Hackensack, N.J.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Moffatt Prods., Inc., 727 Winnetka Ave., N., Minneapolis, Minn.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Marker Strips—See Strips, Marker & Fanning

Markers, Dry Transfer—See Dry Transfer Letters

Markers, Identification—See Labels; Nameplates

Markers, Luminous

Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Electromark Corp., 4445 Industrial Pkwy., Willoughby, Ohio
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
3M Co., 3M Center, St. Paul, Minn.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Markers, R-F—See Generators, Marker

Markers, Terminal—See Kits, Marking, etc.

Markers, Wire, Tab & Sleeve—See Wire Markers

Marking Inks—See Inks, Marking

Masers

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
RCA, Marne Hwy., Moorestown, N.J.

Mask Alignment & Exposure Systems—See Machines, Mask Alignment & Exposure

Masking Films—See Films, Masking

Masks, Aperture, Color TV

Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Sylvania Elec. Prods., Inc., Towanda, Pa.

Masks, Fabrication, Deposition—See Services, Mask Making

Masts, Antenna—See Antenna Towers & Supports

Material Thickness Indicators—See Indicators, Material Thickness

Materials, Acoustic, Sound-Absorbing

Acoustone Corp., 80 Wythe Ave., Brooklyn, N.Y.
Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Barry Controls, 700 Pleasant St., Watertown, Mass.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
GAF Corp., 140 W. 51 St., New York, N.Y.
Hardman Inc., Belleville, N.J.
Hartley Prods. Corp., Barnert Pl., Hohokus, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Materials, Conductive Plastic

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
New England Instr. Co., 14 Kendall La., Natick, Mass. ..... p 2814
Amicon Corp., 25 Hartwell Ave., Lexington, Mass.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Biggs Co., Box 1740, Santa Monica, Cal.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hardman Inc., Belleville, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Materials, Electromagnetic Wave Absorbing - Also See Coatings

Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Blocksom & Co., P.O. Box 300, Michigan City, Ind.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Electronautics, Newton Rd., Littleton, Mass.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Materials, Ferrite - Also See Ferrite Parts

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2602
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y. p 2683
Stackpole Carbon Co., St. Marys, Pa.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Countis Inds., Box 1444, San Luis Obispo, Calif.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fair-Rite Prods. Corp., 1 Commercial Row, Walkill, N.Y.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Insaco, Inc., Box 422, Quakertown, Pa.
Magno-Ceram Co., 2614 S. Clinton Ave., S. Plainfield, N.J.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permag Corp., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Materials, Garnet - Also See Garnet Parts

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y. p 2683
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Barton Mines Corp., North Creek, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Countis Inds., Box 1444, San Luis Obispo, Calif.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Solitron Microwave, 37-11 47th Ave., Long Island City, N.Y.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.

Materials, Graphite

Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.

Materials, Self-Lubricating

Carborundum Co., Box 367, Niagara Falls, N.Y.
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Cerac, Inc., Box 597, Butler, Wisc.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Dixon Corp., Metacom Ave., Bristol, R.I.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GAF Corp., 140 W. 51 St., New York, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Modern Ind'l. Plastics, 3337 N. Dixie Dr., Dayton, Ohio
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Rogers Corp., Rogers, Conn.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.

Matrices, Computer-Also See Boards, Programming

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ..... p 2431
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J. ..... p 568
Interswitch, 770 Airport Blvd., Burlingame, Cal. ..... p 2054
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
EDP Corp., Box 6485, Orlando, Fla.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Mac Panel Co., Box 5027, High Pt., N.C.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Master Antenna TV Systems & Equipment

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.

Measuring Wire, Gear—See Gear Measuring Wire

Mechanical Readouts—See Readouts, Electromechanical

Medical Electronic Research Equipment—See Specific Types

Megaphones, Electrical—See Comm. Systems, Portable

Memory Arrays, Core

Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Ampex Corp., 401 Broadway, Redwood City, Calif.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Electronic Memories, 12621 Chadron Blvd., Hawthorne, Cal.
Fabri-Tek, Inc., 5901 S County Rd. #18, Minneapolis, Minn.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Mnemoteck, 7206 Hibbs La., Edgely-Levittown Ind'l. Pk., Levittown, Pa.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Standard Memories, Inc., 15130 Ventura Blvd., Sherman Oaks, Cal.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.

Memory Arrays, Plated Wire

Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.

Memory Arrays, Thin-Film, Planar

Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Memory Planes, Core

Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Ampex Corp., 401 Broadway, Redwood City, Calif.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Electronic Memories, 12621 Chadron Blvd., Hawthorne, Cal.
Fabri-Tek, Inc., 5901 S County Rd. #18, Minneapolis, Minn.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Mnemoteck, 7206 Hibbs La., Edgely-Levittown Ind'l. Pk., Levittown, Pa.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Standard Memories, Inc., 15130 Ventura Blvd., Sherman Oaks, Cal.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.

Memory Planes, Plated Wire

Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.

Memory Planes, Thin-Film, Planar

Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Memory Stacks, Core

Digital Equip. Corp., 146 Main St., Maynard, Mass.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Electronic Memories, 12621 Chadron Blvd., Hawthorne, Cal.
Fabri-Tek, Inc., 5901 S County Rd. #18, Minneapolis, Minn.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Mnemoteck, 7206 Hibbs La., Edgely-Levittown Ind'l. Pk., Levittown, Pa.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.

Memory Stacks, Plated Wire

Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.

Memory Systems, Delay Line

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J. p 2571
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 2572
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Digital Devices Div., 200 Michael Dr., Syosset, N.Y. p 2586
Corning Glass Works, 3900 Electronics Dr., Raleigh, N.C.
Microsonics, Inc., 60 Winter St., Weymouth, Mass.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.

Memory Systems, Core

Digital Equip. Corp., 146 Main St., Maynard, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan p 2640
Ampex Corp., 401 Broadway, Redwood City, Calif.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Datacraft Corp., Box 23550, Ft. Lauderdale, Fla.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Electronic Memories, 12621 Chadron Blvd., Hawthorne, Cal.
Fabri-Tek, Inc., 5901 S County Rd. #18, Minneapolis, Minn.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Ferroxcube Corp., 5455 S. Valentia Way, Englewood, Colo.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Mnemoteck, 7206 Hibbs La., Edgely-Levittown Ind'l. Pk., Levittown, Pa.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Standard Memories, Inc., 15130 Ventura Blvd., Sherman Oaks, Cal.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Memory Systems, Disc

Digital Equip. Corp., 146 Main St., Maynard, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alpha Data, Inc., 19005 Ventura Blvd., Tarzana, Calif.
Bryant Computer Prods., 850 Ladd Rd., Walled Lake, Mich.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Digital Dev. Corp., 5575 Kearny Villa Rd., San Diego, Calif.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Information Data Sys., 8260 E. 8-Mile Rd., Detroit, Mich.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Singer-General Precision, Inc., 808 Western Ave., Glendale, Cal.

Memory Systems, Drum

Digital Equip. Corp., 146 Main St., Maynard, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Bryant Computer Prods., 850 Ladd Rd., Walled Lake, Mich.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Digital Dev. Corp., 5575 Kearny Villa Rd., San Diego, Calif.
General Instr. Corp., 13040 S. Cerise Ave., Hawthorne, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Madatron Corp., 110 Rte. 10, Whippany, N.J.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.

Memory Systems, Tape

CompuCord, Inc., 225 Crescent St., Waltham, Mass. p 552
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Collins Radio Co., Dallas, Tex.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
RCA, Marne Hwy., Moorestown, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Memory Systems, Thin-Film, Planar

Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Memory Systems, Thin-Film, Plated Wire

Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Ferroxcube Corp., Lock Box 359, Saugerties, N.Y.
Ferroxcube Corp., 5455 S. Valentia Way, Englewood, Colo.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.

Memory Systems, Integrated Circuit

General Instr. Corp., 600 W. John St., Hicksville, N.Y. p 1892
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Micro-Sys., Inc., 3800 Homestead Rd., Santa Clara, Cal.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Electronic Arrays, Inc., 501 Ellis St., Mountain View, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Ferroxcube Corp., 5455 S. Valentia Way, Englewood, Colo.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Intel Corp., 365 Middlefield Rd., Mountain View, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mnemoteck, 7206 Hibbs La., Edgely-Levittown Ind'l. Pk., Levittown, Pa.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Radiation, Inc., Box 37, Melbourne, Fla.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Standard Memories, Inc., 15130 Ventura Blvd., Sherman Oaks, Cal.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Metal Compounds, Foils, Powders, Sheet, Stock

Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y.
Magnetics, Inc., Box 391, Butler, Pa. p 2603
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y. p 2683
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
AMAX Alum/Foil Prods., 6106 S Broadway, St. Louis, Mo.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 21800 Tunqsten Rd., Cleveland, Ohio
Glidden-Durkee Div., 900 Union Commerce Bldg., Cleveland, Ohio
Hamilton Watch Co., Lancaster, Pa.
Handy & Harman, 850 Third Ave., New York, N.Y.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Infinetics, Inc., 1601 Jessup St., Wilmington, Del.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Materials Technology, Inc., P.O. Box 187, Somerset, N.J.
Matthey Bishop Inc., Malvern, Pa.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Metal Oxides

Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y. p 2683
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Chemical Commerce, 123 Sussex Ave., Newark, N.J.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Dow Chemical Co., Box 1682, Midland, Mich.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Glidden-Durkee Div., 900 Union Commerce Bldg., Cleveland, Ohio
Grace, W.R. & Co., 4000 N. Hawthorne St., Chattanooga, Tenn.
Handy & Harman, 850 Third Ave., New York, N.Y.
Harmon Lichtenstein & Co., 26 Broadway, New York, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
M & T Chemicals Inc., Rahway, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Michigan Chemical Corp., 351 E. Ohio St., Chicago, Ill.
Michigan Chem. Corp., 351 East Ohio St., Chicago, Ill.
Norton Co., 1 New Bond St., Worcester, Mass.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.

Metal Parts, Cast

Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cerro Corp., 300 Park Ave., New York, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Hadlock & Temte, Inc., 3332 W. Franklin Blvd., Chicago, Ill.
Hitchiner Mfg. Co., Inc., Box 232, Milford, N.H.
Investment Casting Co., 60 Brown Ave., Springfield, N. J.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Misco Div., 221 W. Webster Ave., Muskegon, Mich.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Rode, Inc., 5 Green St., Woburn, Mass.
Ronson Metals Corp., 55 Manufacturers Pl., Newark, N.J.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Spring City Elec. Mfg. Co., Hall & Main Sts., Spring City, Pa.
Tickle, Arthur Engrg. Works, Inc., 21 Delevan St., Brooklyn, N.Y.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Metal Parts, Chemically Milled

Arnold Engrg. Co., Box G, Marengo, Ill. p 2591
Magnetics, Inc., Box 391, Butler, Pa. p 2603
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Centerline Specialties, Box 656, Boulder, Colo.
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.

Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Golden Technology, Inc., 3017 Santa Rosa Ave., Santa Rosa, Calif.
Hamilton Watch Co., Lancaster, Pa.
Hartzell Elctrns., Inc., 5200 West 74th St., Minneapolis, Minn.
Komak, Inc., 9th & Ontario Sts., Philadelphia, Pa.
Micro Science Assocs., 2274 Mora Dr., Mt. View, Cal.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Precision Metals Div., Lancaster, Pa.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Techinques, Inc., 235 Jackson St., Englewood, N.J.

Metal Parts, Deep Drawn

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Prods., Inc., 6825 S. Chicago Ave., Chicago, Ill.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eastern Tool & Mfg. Co., 1 Montgomery St., Belleville, N.J.
Eimac, 301 Industrial Way, San Carlos, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gibson Elec., Delmont, Pa.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Kling Metal Spinning & Stamping Corp., 247 Centre St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Mirro Aluminum Co., Manitowoc, Wisc.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Romac Elctrns., Inc., 48-01 25th Ave., Long Island City, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Sexton Can Co., Inc., 31 Cross St., Everett, Mass.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Vernitron, P.O. Box 878, Norwalk, Conn.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Volkert Stampings, Inc., 222-34 96th Ave., Queens Village, N.Y.

Metal Parts, Laminated

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eldre Comps., Inc., 1239 University Ave., Rochester, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gibson Elec., Delmont, Pa.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
HPL Jersey Co., 1087 Globe Ave., Mountainside, N.J.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Tempel Steel Co., 5353 N. Elston Ave., Chicago, Ill.

Metal Parts, Machined

Delbert Blinn. Co., Box 2007, Pomona, Calif.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Helitronics Corp., 155 Tichenor St., Newark, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abbott Screw & Mfg. Co., 6525 N. Clark St., Chicago, Ill.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Adjustable Bushing Corp., 11905 Vose St., N Hollywood, Calif.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Aero Vac Corp., Box 448, Troy, N.Y.
Aldrich, C.G. Mfg. Corp., P.O. Box 312, Sugar Grove, Pa.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Diebel Mfg. Co., 6505 Oakton St., Morton Grove, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Mach. Co., Inc., 807 Garfield Ave., Jersey City, N.J.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gyrotronics, Inc., 3500 Sunset Ave., Asbury Park, N.J.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Industrial Tools, Inc., 201 Bryant St., Ojai, Calif.
Inland Mfg. Co., 1108 Jackson St., Omaha, Neb.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
La Vezzi Machine Works, Inc., 4635 W. Lake St., Chicago, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Lochart Inds., Inc., 15707 Texaco Ave., Paramount, Cal.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Ostby & Barton Co., Box 6267, Providence, R.I.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Philips Metalonics, 888 S. Columbus Ave., Mt. Vernon, N.Y.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Red Devil Mfg. Co., Inc., 1416 N. Ogden Ave., Chicago, Ill.
Romac Elctrns., Inc., 48-01 25th Ave., Long Island City, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Tickle, Arthur Engrg. Works, Inc., 21 Delevan St., Brooklyn, N.Y.
Torrington Co., Box 1008, Torrington, Conn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
Youngwood Elctrn. Metals, Inc., 302 N. Fifth St., Youngwood, Pa.

Metal Parts, Powdered

Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Barden Corp., 200 Park Ave., Danbury, Conn.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Clevite Can., Ltd., St. Thomas, Ont., Canada
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dixon Sintaloy, Inc., 535 Hope St., Stamford, Conn.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Ferraloy, Inc., W. Market St., Salem, Ind.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
General Elec. Co., Box 237, Detroit, Mich.
Gibson Elec., Delmont, Pa.
Kwikset Powdered Metal Prods., 516 E. Santa Ana St., Anaheim, Calif.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Moldite Co., Inc., 250 South St., Newark, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Philips Metalonics, 888 S. Columbus Ave., Mt. Vernon, N.Y.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.

Metal Parts, Screw Machine

Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex. ..... p 1943
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Abbott Screw & Mfg. Co., 6525 N. Clark St., Chicago, Ill.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Adjustable Bushing Corp., 11905 Vose St., N Hollywood, Calif.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Cerro Corp., 300 Park Ave., New York, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Continental Swiss Precision Prods., Inc., 71 Romanelli Ave., S. Hackensack, N.J.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Davis & Hemphill, Inc., 2000 Furnace Ave., Elkridge, Md.

Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Inland Mfg. Co., 1108 Jackson St., Omaha, Neb.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
K-W Engrg. Works, N50 W16328 Pin Oak Ct., Menomonee Falls, Wisc.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nutmeg Screw Mach. Prods., Box 1470, Waterbury, Conn.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Ostby & Barton Co., Box 6267, Providence, R.I.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Red Devil Mfg. Co., Inc., 1416 N. Ogden Ave., Chicago, Ill.
Rosan, Inc., 2901 W. Coast Hwy., Newport Beach, Calif.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Standard Screw Co., 2701 Washington Blvd., Bellwood, Ill.
Stanley Ind'l. Comps. Div., Forestville, Conn.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Torrington Co., Box 1008, Torrington, Conn.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Metal Parts, Spun

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kling Metal Spinning & Stamping Corp., 247 Centre St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Romac Elctrns., Inc., 48-01 25th Ave., Long Island City, N.Y.
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.

Metal Parts, Stamped

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J.
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Helitronics Corp., 155 Tichenor St., Newark, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2603
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Admiral Tool & Mfg. Co., 3652 N. Talman, Chicago, Ill.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Aldrich, C.G. Mfg. Corp., P.O. Box 312, Sugar Grove, Pa.
Algo, 50 Schnieffer St., S. Hackensack, N.J.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Alpha Prods., Inc., 6825 S. Chicago Ave., Chicago, Ill.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Barden Corp., 200 Park Ave., Danbury, Conn.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Diebel Mfg. Co., 6505 Oakton St., Morton Grove, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dolin Metal Prods., Inc., 475 President St., Brooklyn, N.Y.
Dudek & Bock Spring Mfg. Co., 4014 W. Grand Ave., Chicago, Ill.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eastern Tool & Mfg. Co., 1 Montgomery St., Belleville, N.J.
Electro Chemical Engraving Co., 1100 Brook Ave, Bronx, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Federal Stampings, 2000 West 94th St., Minneapolis, Minn.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
General Metals, Inc., 2200 Fairfax Rd., Box 22107, Greensboro, N. C.
Gibson Elec., Delmont, Pa.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Gyrotronics, Inc., 3500 Sunset Ave., Asbury Park, N.J.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
H.K. Metalcraft Mfg. Co., 35 Industrial Rd., Lodi, N.J.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
HPL Jersey Co., 1087 Globe Ave., Mountainside, N.J.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Kling Metal Spinning & Stamping Corp., 247 Centre St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metalcraft, Inc., Roosevelt Field, Garden City, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mirro Aluminum Co., Manitowoc, Wisc.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morris, J.I. Co., 372 Elm St., Southbridge, Mass.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Network Inds., Inc., Box 397, Bayonne, N.J.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Peerless Prods. Inds., 4210 W. Chicago Ave., Chicago, Ill.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Romac Elctrns., Inc., 48-01 25th Ave., Long Island City, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
South Shore Metal Prods., Inc., 88-90 Allen Blvd., Farmingdale, N.Y.
Stanley Ind'l. Comps. Div., Forestville, Conn.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.
Torrington Co., Box 1008, Torrington, Conn.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vernitron, P.O. Box 878, Norwalk, Conn.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Volkert Stampings, Inc., 222-34 96th Ave., Queens Village, N.Y.
Wabash Metal Prods. Co., Inc., 1569 Morris St., Box 298, Wabash, Ind.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
Winzeler Mfg. & Tool Co., 7355 W. Wilson Ave., Chicago, Ill.
W.L.S. Stamping Co., 3292 East 80th St., Cleveland, Ohio
Worcester Pressed Steel Co., 101 Barber Ave., Worcester, Mass.
Wrought Washer Mfg. Co., 2252 S. Bay St., Milwaukee, Wisc.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.
Youngwood Elctrn. Metals, Inc., 302 N. Fifth St., Youngwood, Pa.
Zims Mfg. Co., 26 Paine Ave., Irvington, N.J.

Metals, Clad

Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. ..... p 2682
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
Handy & Harman, 850 Third Ave., New York, N.Y.
Materials Technology, Inc., P.O. Box 187, Somerset, N.J.
Montgomery Co, Windsor Locks, Conn
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Synthane Taylor Corp., Valley Forge, Pa.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.

Metals, High Purity

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Magnetics, Inc., Box 391, Butler, Pa. ..... p 2603
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1621-1623
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
AMAX Alum/Foil Prods., 6106 S Broadway, St. Louis, Mo.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cerac, Inc., Box 597, Butler, Wisc.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
Glidden-Durkee Div., 900 Union Commerce Bldg., Cleveland, Ohio
Handy & Harman, 850 Third Ave., New York, N.Y.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Nucleonic Prods. Co., Inc., 6660 Vanel Ave., Canoga Pk, Cal.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Wellington Films & Foils, Inc., 65 Honeck St., Englewood, N.J.

Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Metals, Precious-Also See Powders, Precious Metal

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. ..... p 2682
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1621-1623
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cerac, Inc., Box 597, Butler, Wisc.
Cerro Corp., 300 Park Ave., New York, N.Y.
Chemical Commerce, 123 Sussex Ave., Newark, N.J.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Eastern Smelting & Refining Corp., 37-39 Bubier Terr., Lynn, Mass.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fairmount Chem. Co., Inc., 117 Blanchard St., Newark, N.J.
General Diode Corp, 90 Eames St., Framingham, Mass.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Handy & Harman, 850 Third Ave., New York, N.Y.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Precision Metals Div., Lancaster, Pa.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Technic, Inc., Box 965, Providence, R.I.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
United Refining & Smelting Co., 3700 N. Runge Ave., Franklin Park, Ill.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Metals, Rare

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Potash & Chem. Corp., Kerr-McGee Bldg., Oklahoma City, Okla.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cerac, Inc., Box 597, Butler, Wisc.
Chemical Commerce, 123 Sussex Ave., Newark, N.J.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Harmon Lichtenstein & Co., 26 Broadway, New York, N.Y.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Michigan Chemical Corp., 351 E. Ohio St., Chicago, Ill.
Michigan Chem. Corp., 351 East Ohio St., Chicago, Ill.
Research Chem., Box 14588, 8220 W. Harrison, Phoenix, Ariz.
Ronson Metals Corp., 55 Manufacturers Pl., Newark, N.J.
Technic, Inc., Box 965, Providence, R.I.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.

Metals, Refractory

American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cerac, Inc., Box 597, Butler, Wisc.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Cross, H. Co., 365 Park Ave., Weehawken, N.J.
Crucible Steel Corp., Box 88, Pittsburgh, Pa.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Mallory Metallurgical Co., 3029 E. Washington St., Indianapolis, Ind.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Philips Metalonics, 888 S. Columbus Ave., Mt. Vernon, N.Y.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Precision Metals Div., Lancaster, Pa.
Rembar Co., Inc., 67 Main St., Dobbs Ferry, N.Y.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Sylvania Elec. Prods., Inc., Towanda, Pa.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Ventron Corp., Congress St., Beverly, Mass.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Metals, Semiconductor—See Crystals, Semiconductor

Metal-To-Glass Alloys—See Seals, Glass-To-Metal

Meter Cases—See Cases, Equipment

Meter Controllers—See Relays, Meter

Meter Expanders—See Multipliers, Meter

Meter Shunts—See Shunts, Meter

Meter Testers—See Testers, Meter

Meters, Acceleration

Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bell Aerospace Co., 4515 Superior Ave., Cleveland, Ohio
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
MB Elctrns., Box 1825, New Haven, Conn.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.

Meters, Admittance

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652,653
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Meters, Air Permeability

Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.

Meters, Ampere, A-C

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 657
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 702,703
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... p 752,753,755
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
Sangamo Elec. Co., Box 128, Pickens, S.C.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Bristol Div, Waterbury, Conn
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Van Waters & Rogers, Box 3200, San Francisco, Calif.

Meters, Ampere, D-C

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 657
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,694,702,703
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752-754
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760

Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Meters, Ampere, R-F

Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.

Meters, Ampere, True RMS

Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Ampere-Hour

Curtis Instrs., Inc., 200 Kisco Ave., Mt. Kisco, N.Y. ..... p 638
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
Sangamo Elec. Co., Box 128, Pickens, S.C.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.

Meters, Attenuation

Daven, Div., Dept. EEM 70, Manchester, N.H.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Meters, Audio Level

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... p 755
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Cable Testing—See Testers, Cable

Meters, Capacitance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 622
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,698
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749,750
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Foxboro Co., Foxboro, Mass.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.

Meters, Cavitation Intensity

Meters, Conductance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Meters, Conductivity—See Indicators, Fluid Conductivity

Meters, Counting Rate, Nuclear

Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.

Meters, Decibel Indicating

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 655
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.

Meters, Distortion & Noise

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 639,641,644,646
Daven, Div., Dept. EEM 70, Manchester, N.H.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 772,773
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
EMR Div., Box 223, Princeton, N.J.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Dynamometer—See Dynamometers

Meters, Edge-Wise

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Elapsed Time—See Indicators, Elapsed Time

Meters, Electrometer

Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Cary Instrs., 2724 S. Peck Rd., Monrovia, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.

Meters, Electronic Micrometer—See Micrometers, Electronic

Meters, Events-Per-Unit-Time—See Counters, Mechanical; etc.

Meters, Field Strength

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio ..... p 619
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Heath Co., Benton Harbor, Mich.
Jerroid Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Meters, Fluid Flow

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Brooks Instr. Div., Hatfield, Pa.
Carolina Medical Elctrns., Inc., U.S. 52 Expwy., Box 307, King, N.C.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dynasonics Corp., Box 672, Pipestone, Minn.
Ellison Draft Gage Co., Inc., Box 96, New Buffalo, Mich.
Erdco Engrg. Corp., 136 Official Rd., Addison, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ideas, Inc., 118 Grand Ave., Laramie, Wyo.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
National Instr. Labs., Inc., 12300 Park Lawn Dr., Rockville, Md.
Selas Corp. America, Box 200, Dresher, Pa.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Thermo Sys., Inc., 2500 Cleveland Ave., N., St. Paul, Minn.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Meters, Flutter & Wow

Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 639-642
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Meters, Flux

ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 716
Lowell Elctrns. Corp., 9100 Terminal Ave., Skokie, Ill. ..... p 739
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Empire Sci. Corp., Ind'l. Instr. Div., 1055 Stewart Ave., Garden City, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.

Meters, F-M Deviation

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 639,641,644
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Measurements, Box 180, Boonton, N.J. ..... p 744
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
New London Instr. Co., Inc., Box 189, New London, Conn.
Radio Specialty Mfg. Co., 2023 Southeast 6th Ave., Portland, Ore.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Meters, Frequency

Airpax Elctrns., Inc., Cambridge, Md.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. .....p 630,631
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 656
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal. ..... p 662
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,696,697
Honeywell, Box 5227, Denver, Colo.
International Rectifier, 233 Kansas St., El Segundo, Cal.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Measurements, Box 180, Boonton, N.J. ..... p 744
Narda Microwave Corp., Plainview, N.Y.
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808,809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Waveline, Inc., Box 718, W. Caldwell, N.J.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.

CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
New London Instr. Co., Inc., Box 189, New London, Conn.
Nord Instrs. Co., Inc., 211 E. Calhoun St., Salem, Va.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sell-Tronic Prods. Co., Inc., 138-20 31st Rd., Flushing, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
3M Co., 3M Center, St. Paul, Minn.
TRG Prods., 400 Border St., E. Boston, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Meters, Frequency Deviation

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Measurements, Box 180, Boonton, N.J. ..... p 744
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 764,765
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
New London Instr. Co., Inc., Box 189, New London, Conn
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
3M Co., 3M Center, St. Paul, Minn.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Meters, Frequency Digital

Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku; Tokyo, Japan
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 631
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 656
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal. ..... p 662
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,696
Honeywell, Box 5227, Denver, Colo.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Neutronic Corp., Box 625, St. Louis, Mo.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nord Instrs. Co., Inc., 211 E. Calhoun St., Salem, Va.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
3M Co., 3M Center, St. Paul, Minn.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Meters, Galvanometer

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
New London Instr. Co., Inc., Box 189, New London, Conn.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Meters, Gauss

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio ..... p 619
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 716
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Empire Sci. Corp., Ind'l. Instr. Div., 1055 Stewart Ave., Garden City, N.Y.
Irwin Labs., Inc., 1238 S. Gerhart Ave., Los Angeles, Calif.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Magnetic Analysis Corp., 535 South 4th Ave., Mt. Vernon, N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.

Meters, Gel Time

Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Goniometer

Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.

Meters, Grid Dip

Measurements, Box 180, Boonton, N.J. ..... p 744
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 747
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Heath Co., Benton Harbor, Mich.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Meters, Heat Transfer (Semiconductor)

Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Meters, Illuminated Scale

Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 706
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... p 755
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Impedance

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652,653
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Narda Microwave Corp., Plainview, N.Y.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio

PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Inductance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. p 672
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. p 683
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
London Co., 811 Sharon Dr., Westlake, Ohio p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. p 742
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.

Meters, Infrared

Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.

Meters, Intermodulation

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Marconi Instrs., 111 Cedar La., Englewood, N.J. p 742
Measurements, Box 180, Boonton, N.J. p 744
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.

Meters, Kilovolt

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif p 628
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 686
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 703
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 711
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. p 1809
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kilovolt Corp., 238 High St., Hackensack, N.J.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. p 748
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2512
RCA, 415 S. 5th St., Harrison, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. p 1852
Sangamo Elec. Co., Box 128, Pickens, S.C.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 806
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sun Electric Corp., 6323 Avondale, Chicago, Ill.

Meters, Kilowatt

Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 686
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Sangamo Elec. Co., Box 128, Pickens, S.C.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada

Meters, Laser Energy—See Monitors, Laser Energy

Meters, Light, (Non Photographic)

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. p 1711
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
United Detector Technology, 1732 21st St., Santa Monica, Cal.
Abtronics, Inc., Box 712, Livermore, Calif.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Gencom Div., 80 Express St., Plainview, N.Y.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Photo Resch. Corp., 3000 N. Hollywood Way, Burbank, Calif.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Rockwell Engrg. Co., 2125 E. 45th St., Indianapolis, Ind.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.

Meters, Megohm

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio p 618
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif p 628
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 657
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 673
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. p 680
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,698,703
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 711
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio p 725
London Co., 811 Sharon Dr., Westlake, Ohio p 737
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. p 748
Neutronic Corp., Box 625, St. Louis, Mo.
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. p 767
RCA, 415 S. 5th St., Harrison, N.J. p 776,778
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. p 785
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. p 786
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. p 789
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan p 793
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Meters, Microampere

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio p 606
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
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California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 706,707
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. p 672
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 694,703
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. p 752-755
Neutronic Corp., Box 625, St. Louis, Mo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. p 760
RCA, 415 S. 5th St., Harrison, N.J.
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio p 802
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio p 810
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.

Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Micro-Microampere—See Meters, Nanoampere

Meters, Micro-Nanovolt—See Meters, Nanovolt

Meters, Microhm

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Van Waters & Rogers, Box 3200, San Francisco, Calif.

Meters, Microvolt

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693-695
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Van Waters & Rogers, Box 3200, San Francisco, Calif.

Meters, Microwave

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Milliampere

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 694,703
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752-755
Neutronic Corp., Box 625, St. Louis, Mo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
RCA, 415 S. 5th St., Harrison, N.J.
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bristol Div, Waterbury, Conn
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
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Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Meters, Milliohm

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 698,703
Honeywell, Box 5227, Denver, Colo.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Meters, Millivolt

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
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California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
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Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 695,703
Honeywell, Box 5227, Denver, Colo.
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732

Marconi Instrs., 111 Cedar La., Englewood, N.J.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752-754
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Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Tripiett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Meters, Miniature

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 706,707
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752,753
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Tripiett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Modulation

London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Measurements, Box 180, Boonton, N.J. ..... p 744
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
New London Instr. Co., Inc., Box 189, New London, Conn.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Meters, Moisture (Electronic)—See Indicators, Moisture

Meters, Moving Scale

Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.

Meters, Multitester

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Tripiett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
BECO Solid State Systems, Box 686, Salem, Va.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Epic, Inc., 150 Nassau St., New York, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanwa Corp. America, 2500 Woodbridge Ave., Edison, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Multitester (Digital)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 657
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Electro-Numerics Corp., 2191 Ronald St., Santa Clara, Cal. p 664,665
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,699,702,703
Honeywell, Box 5227, Denver, Colo. ..... p 691
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio

Meters, Multitester (Potentiometric)

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. .....p 673,675
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Neutronic Corp., Box 625, St. Louis, Mo.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.

Meters, Nanampere

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 694
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Neutronic Corp., Box 625, St. Louis, Mo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.

Meters, Nanovolt

Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674,675
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y..... p 748
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.

Meters, Noise-Figure

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Daven, Div., Dept. EEM 70, Manchester, N.H.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 772,773
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Null

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 682
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y..... p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... p 752,753,755
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal. p 768
Scientific Educational Prods., 310 Madison Ave., New York, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Meters, Ohm

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,698,702,703
Honeywell, Box 5227, Denver, Colo. ..... p 691
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Measurements, Box 180, Boonton, N.J.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y..... p 748
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
RCA, 415 S. 5th St., Harrison, N.J. .....p 776,778
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 786
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Anderson, W.E., Inc., 320E West 80th St., Kansas City, Mo.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanwa Corp. America, 2500 Woodbridge Ave., Edison, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Meters, Panel (D'Arsonval Movement)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 606
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 706
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill..... p 686
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752,753
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio .....p 810,811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Bristol Div, Waterbury, Conn
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N/Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Panel (Digital)

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 606
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 616
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 648
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Electro-Numerics Corp., 2191 Ronald St., Santa Clara, Cal. p 664,665
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,699
Honeywell, Box 5227, Denver, Colo.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 769
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. .....p 784,785
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Heath Co., Benton Harbor, Mich.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio

Meters, Peak Power

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 667
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.

Meters, Period

Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 656
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 696,697
Neutronic Corp., Box 625, St. Louis, Mo.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.

Meters, Permeameter

Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
Honeywell, Box 5227, Denver, Colo.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass. p 807
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Thomas & Skinner, Inc., 1100 East 23rd St., Indianapolis, Ind.

Meters, Phase-Angle

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Control Elctrns. Co., Inc., 153 Florida St., Farmingdale, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Honeywell, Box 5227, Denver, Colo.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 771
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 838
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Phase Vector Volt

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658,659
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMR Div., Box 223, Princeton, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Photoelectric, Reflection

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Meters, Picoampere

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
RCA, 415 S. 5th St., Harrison, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Gencom Div., 80 Express St., Plainview, N.Y.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Meters, Pocket

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio

Meters, Power Density

Narda Microwave Corp., Plainview, N.Y. ..... p 887
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.

Meters, Power Factor

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bristol Div, Waterbury, Conn
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Power, R-F

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 667
Measurements, Box 180, Boonton, N.J.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Pyrometer

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio p 606,607
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 616
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Dev. Labs., Inc., 19 Newtown Rd., Plainview, N.Y.
Epic, Inc., 150 Nassau St., New York, N.Y.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Meters, Q

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 682
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
New London Instr. Co., Inc., Box 189, New London, Conn.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Meters, Radiation, Nuclear—See Counters, Geiger; Counters, Scintillation

Meters, Ratio

Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 656
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. .....p 673-675
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.

Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
3M Co., 3M Center, St. Paul, Minn.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Recorders & Comparators, P-H

Esterline Angus Div., Box 24000, Indianapolis, Ind.
London Co., 811 Sharon Dr., Westlake, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Analytical Meas., Inc., 31 Willow St., Chatham, N.J.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Coleman Instrs., 42 Madison St., Maywood, Ill.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Meters, Recording

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 651
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass.
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 842,845
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Houston Instr., 4950 Terminal Ave., Bellaire, Tex.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn. p 1394
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Dixson, Inc., Box 1449, Grand Junction, Colo
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Meters, Reflectometer

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Meters, Refractometer

Electron-Machine Corp., Box M, Umatilla, Fla.

Meters, R-F

Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, RFI

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Honeywell, Box 5227, Denver, Colo.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Singer Co., 915 Pembroke St., Bridgeport, Conn.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Astro Comm, Lab., 9125 Gaither Rd., Gaithersburg, Md.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Meters, Roentgen—See Meters, X-Ray-Intensity

Meters, S-Units

Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. .....p 784,785
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio

Meters, Snap-Around

Esterline Angus Div., Box 24000, Indianapolis, Ind.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. .....p 784,785
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Columbia Elec. Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Meters, Sound Velocity

James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.

Meters, Spectral

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.

Meters, Standing Wave Ratio

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Narda Microwave Corp., Plainview, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gillette Elctrn. Prods. Co., 201 Laurel St., Beverly, N.J.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Tachometer—See Tachometers, Electronic

Meters, Temperature, Dial-Type (Contacting)

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fenwal, Inc., Main St., Ashland, Mass.
Gencom Div., 80 Express St., Plainview, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Marshall Instrs., Inc., 14203 Bessemer St., Van Nuys, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
RDF Corp., 23 Elm Ave., Hudson, N.H.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
United Elec. Controls Co., 85A School St., Watertown, Mass.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Meters, Temperature, Dial-Type (Non-Contacting)—See Pyrometers

Meters, Temperature, Digital (Contacting)

Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.... p 539
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 616
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Neutronic Corp., Box 625, St. Louis, Mo.
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119

Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio

Meters, Tension

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Meters, Thermal Coefficient Of Expansion

Meters, Thermal Transfer

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.

Meters, Thermocouple

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Dev. Labs., Inc., 19 Newtown Rd., Plainview, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Foxboro Co., Foxboro, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Meters, Tilt

Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Meters, Time Delay Rate

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 656
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.

Meters, Time Interval—See Timers, Interval

Meters, Torque—See Indicators, Torque

Meters, Ultraviolet

American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Meters, Vacuum Tube Volt (VTVM)

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 682
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Measurements, Box 180, Boonton, N.J. ..... p 744
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanwa Corp. America, 2500 Woodbridge Ave., Edison, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Meters, Vibration

Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Balance Technology, Inc., 41 Enterprise Dr., Ann Arbor, Mich.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Epic, Inc., 150 Nassau St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Larson Aero Dev., Box 135, Concord, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
MB Elctrns., Box 1825, New Haven, Conn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.

Meters, Viscosity (Electronic)—See Indicators, Viscosity

Meters, Volt

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,675
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,695
Honeywell, Box 5227, Denver, Colo.
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1809
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio.... p 725
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1136,1149
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Modutec, Inc., 18 Marshall St., Norwalk, Conn. .....p 752-755
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal. p 768
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
RCA, 415 S. 5th St., Harrison, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio .....p 810,811
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abphot, 105 W. 27th St., New York, N.Y.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.

AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bristol Div, Waterbury, Conn
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Columbia Elec. Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Meters, Volt, Deviation

Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 669
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 837
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
State Labs, Inc., 215 Park Ave., S., New York, N.Y.

Meters, Volt, Differential—See Meters, Volt

Meters, Volt, Digital (DVM) & Accessories

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 648
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 657
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Electro-Numerics Corp., 2191 Ronald St., Santa Clara, Cal. p 664,665
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 669
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,699,702,703
Honeywell, Box 5227, Denver, Colo. ..... p 691
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. ..... p 760
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn. p 1394
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 769
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co.,-3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bristol Div, Waterbury, Conn
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Nord Instrs. Co., Inc., 211 E. Calhoun St., Salem, Va.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Meas. Prods., 888 Galindo St., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Weir Elctrns., Ltd., Durban Road, Bognor Regis, Sussex, England

Meters, Volt, Electrostatic

Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.

Meters, Volt, Frequency Selective

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 639,643,646
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
EMR Div., Box 223, Princeton, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Video Instr. Corp., 116 Toledo St., Farmingdale, N.Y.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.

Meters, Volt, Log-Conversion

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Wandel & Goltermann/W & G Inst. Inc., 6 Great Meadow La., Hanover, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Meters, Volt, Potentiometric

Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,675
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 669
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Neutronic Corp., Box 625, St. Louis, Mo.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Meters, Volt, R-F

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Honeywell, Box 5227, Denver, Colo.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1809
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
RCA, 415 S. 5th St., Harrison, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada

Meters, Volt, Sampling

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 653,655
Digilin, 6533 San Fernando Rd., Glendale, Cal.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Meters, Volt, True RMS

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 653
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 695
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Marconi Instrs., 111 Cedar La., Englewood, N.J.
RCA, 415 S. 5th St., Harrison, N.J. .....p 776,778
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan ..... p 793
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio..... p 812
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
EMR Div., Box 223, Princeton, N.J.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Meters, Volt-Ammeter

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 707
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. ... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Honeywell, Box 5227, Denver, Colo.
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Columbia Elec. Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Van Waters & Rogers, Box 3200, San Francisco, Calif.

Meters, Volt-Ohm

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693
Honeywell, Box 5227, Denver, Colo.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan ..... p 732
Measurements, Box 180, Boonton, N.J.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
RCA, 415 S. 5th St., Harrison, N.J. .....p 776,778
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Wavetek, 9045 Balboa Ave., San Diego, Cal.
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio..... p 812
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
3M Co., 3M Center, St. Paul, Minn.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Meters, Volt-OHM-Milliampere (VOM)

California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Honeywell, Box 5227, Denver, Colo.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Digilin, 6533 San Fernando Rd., Glendale, Cal.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Gencom Div., 80 Express St., Plainview, N.Y.
Heath Co., Benton Harbor, Mich.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Sanwa Corp. America, 2500 Woodbridge Ave., Edison, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Meters, VU

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 606
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 617
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo. p 706
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electro-Mechanical Instr. Div., 8th & Chestnut St., Box 216, Perkasie, Pa. ..... p 672
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Jewell Electrical Instrs., Inc., Grenier Field, Manchester, N.H. p 719
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Modutec, Inc., 18 Marshall St., Norwalk, Conn. ..... p 752,753,755
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio .... p 802
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 810
A & D Electrical Instrs., 73-07 88th St., Glendale, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Ammon Instrs., Inc., 345 Kelley St., Manchester, N.H.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
International Instrs., 88 Marsh Hill Rd., Orange, Conn.
Marconi Div., 1 Park Ave., New York, N.Y.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Shurite Meters, 428 Chapel St., New Haven, Conn.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Meters, Watt

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 619
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 686
Greibach Instrs., 37-11 47th Ave., Long Island City, N.Y. .. p 690
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Scientific Educational Prods., 310 Madison Ave., New York, N.Y. ..... p 782
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 784
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808,809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Nelson Elctrns. Labs., Inc., 1717 Dallas N. Pkwy., Plano, Tex.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Meters, Watt-Hour

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Sangamo Elec. Co., Box 128, Pickens, S.C.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio

Meters, Watt-Var

Esterline Angus Div., Box 24000, Indianapolis, Ind.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Sangamo Elec. Co., Box 128, Pickens, S.C.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808,809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.

Meters, Wave

Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
London Co., 811 Sharon Dr., Westlake, Ohio
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Narda Microwave Corp., Plainview, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Meters, Waveguide—See Meters, Microwave

Meters, X-Ray Intensity

Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.

Mica Glass Bonded—See Insulation Materials, Glass Bonded Mica

Microcircuit Production Equip.

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Neutronic Corp., Box 625, St. Louis, Mo.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
HLC Mfg. Co., Inc., 700 Davisville Rd., Willow Grove, Pa.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Visual Inspection Prods., 112 Central Ave., Lynn, Mass.
Western Technology, Inc., 220 W. Central, Santa Ana, Cal.

Microcircuits—See Circuits, Integrated; Circuits, Hybrid

Micro Film Retrieval Systems

Dasa Corp., 15 Stevens St., Andover, Mass.
Information Handling Svc., 5500 S. Valentia Way, Englewood, Colo.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Stromberg DatagraphiX, Inc., Box 2449, San Diego, Calif.
Traid Corp., 777 Flower St., Glendale, Calif.

Micrometers, Electronic

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Starrett, L.S. Co., 1-165 Crescent St., Athol, Mass.

Micromosaic Optics

Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.

Microphone Calibrators—See Calibrators, Microphone

Microphones, Aircraft Type

Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Audiosears Corp., Stamford, N.Y.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Mircrophones, Carbon

Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Astatic Corp., Box 120, Conneaut, Ohio
Audiosears Corp., Stamford, N.Y.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Cardioid

RCA, 415 S. 5th St., Harrison, N.J.
AKG, 100 E. 42nd St., New York, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astatic Corp., Box 120, Conneaut, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Holmin, W.A. Corp., 1325 Seventh St., Rockford, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Microphones, Ceramic

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Astatic Corp., Box 120, Conneaut, Ohio
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Chesapeake Instr. Corp., Shadyside, Md.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Condenser

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
AKG, 100 E. 42nd St., New York, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Automatic Clerical Sys., Inc., 389 N. Fair Oaks Ave., Pasadena, Calif.
Capps & Co., Inc., 20 Addison Pl., Valley Stream, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Stanford Int'l., Box 266, San Carlos, Calif.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.

Microphones, Contact

Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Microphones, Crystal

Astatic Corp., Box 120, Conneaut, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Massa Div., 280 Lincoln St., Hingham, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Differential

AKG, 100 E. 42nd St., New York, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Dynamic

RCA, 415 S. 5th St., Harrison, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
AKG, 100 E. 42nd St., New York, N.Y.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astatic Corp., Box 120, Conneaut, Ohio
Audiosears Corp., Stamford, N.Y.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bogen Div., P.O. Box 500, Paramus, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.

Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Holmin, W.A. Corp., 1325 Seventh St., Rockford, Ill.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Microphones, Handsets, Headsets—See Headsets

Microphones, Hearing Aid

Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Knowles Elctrns., Inc., 3102 N. Mannheim Rd., Franklin Park, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.

Microphones, Interferometer

Microphones, Lapel

RCA, 415 S. 5th St., Harrison, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
AKG, 100 E. 42nd St., New York, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Astatic Corp., Box 120, Conneaut, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.

Microphones, Lavalier

RCA, 415 S. 5th St., Harrison, N.J.
Astatic Corp., Box 120, Conneaut, Ohio
Automatic Clerical Sys., Inc., 389 N. Fair Oaks Ave., Pasadena, Calif.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Holmin, W.A. Corp., 1325 Seventh St., Rockford, Ill.
Loge Elctrns., 2171 W. Washington Blvd., Los Angeles, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Microphones, LIP

Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astatic Corp., Box 120, Conneaut, Ohio
Audiosears Corp., Stamford, N.Y.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Roanwell Corp., 180 Varick St., New York, N.Y.

Microphones, Magnetic

RCA, 415 S. 5th St., Harrison, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bogen Div., P.O. Box 500, Paramus, N.J.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Knowles Elctrns., Inc., 3102 N. Mannheim Rd., Franklin Park, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Stanford Int'l., Box 266, San Carlos, Calif.
Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.

Microphones, Noise-Cancelling

RCA, 415 S. 5th St., Harrison, N.J.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
AKG, 100 E. 42nd St., New York, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astatic Corp., Box 120, Conneaut, Ohio
Audiosears Corp., Stamford, N.Y.
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Roanwell Corp., 180 Varick St., New York, N.Y.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Telephone Comps., Inc., 9 Norfolk Dr., Northport, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Pressure

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
RCA, 415 S. 5th St., Harrison, N.J.
AKG, 100 E. 42nd St., New York, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Massa Div., 280 Lincoln St., Hingham, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Ribbon

RCA, 415 S. 5th St., Harrison, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.

Microphones, Sound-Powered

ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.

Microphones, Throat

Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Sonotone Corp., Elmsford, N.Y.

Microphones, Transistorized

RCA, 415 S. 5th St., Harrison, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Automatic Clerical Sys., Inc., 389 N. Fair Oaks Ave., Pasadena, Calif.
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Knowles Elctrns., Inc., 3102 N. Mannheim Rd., Franklin Park, Ill.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Roanwell Corp., 180 Varick St., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Turner Microphone Co., 909 17th St., N.E., Cedar Rapids, Iowa

Microphones, Velocity

Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.

Microphones, Wireless

Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Vega Elctrns. Corp., 2115 De La Cruz Blvd., Santa Clara, Cal.

Microscopes-Also See Stereoscopes

American Optical Corp., Eggert & Sugar Rds., Buffalo, N Y
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Bycoski, Casmir T., Inc., 363 Capitol Ave., Hartford, Conn.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Epoi, Inc., 623 Stewart Ave., Garden City, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Lenox Instr. Co., 122 E. Luray St., Philadelphia, Pa.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Unitron Instr. Co., 66 Needham St., Newton Highlands, Mass.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Microscopes, Electron

Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Ultek Div., Box 10920, Palo Alto, Calif.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Microscopes, Infrared

Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass.... p 1710
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.

Microscopes, Laser

Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Microscopes, Measuring-Also See Machines, Measuring

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Femco Div., Box F, Irwin, Pa.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Lenox Instr. Co., 122 E. Luray St., Philadelphia, Pa.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Titan Tool Supply Co., Inc., 68 Comet, Buffalo, N.Y.
Unitron Instr. Co., 66 Needham St., Newton Highlands, Mass.

Microscopes, Ultraviolet

American Optical Corp., Eggert & Sugar Rds., Buffalo, N Y
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Hacker Instrs., Inc., Box 646, W. Caldwell, N.J.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Microwave Equipment—See Specific Types of Components & Equipment (As Modified By Microwave)

Microwave Line Stretchers

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Deriville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Mirrors, Prism

Bache, Semon & Co., 636 Greenwich St., New York, N.Y.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Electro-Optical Div., 347 King St., Northampton, Mass.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
FJW Inds., Inc., 215 E. Prospect Ave., Mt. Prospect, Ill.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Pacific Universal Prods. Corp., 168 Vista Ave., Pasadena, Calif.
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.
Zoomar, Inc., 55 Sea Cliff Ave., Glen Cove, N.Y.

Mismatches, Microwave, Precision

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.

Mixer-Preamplifiers, Microwave

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895,902,903
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Mixers, Audio

Daven, Div., Dept. EEM 70, Manchester, N.H.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Collins Radio Co., Dallas, Tex.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Dorsett Elctrns., Box 36, Tulsa, Okla.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hardman Inc., Belleville, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Olektron Corp., Box 248, Dudley, Mass.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Mixers, For Epoxies—See Dispensers

Mixers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 878
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 901
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. p 916,917,2904
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.

Mixers, R-F

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Daven, Div., Dept. EEM 70, Manchester, N.H.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 901
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. p 916,917,2904
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Mobile Equipment—See Receivers; Transmitters; etc.

Modems—See Modulator (Demodulators)

Modulation Indicators—See Indicators, Modulation

Modulation Transfer Analyzers—See Analyzers, Transfer Function

Modulator(Demodulators, Data

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan

RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. p 1313
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IBM Corp., Dept. EEM, 1271 Ave. of the Americas, New York, NY
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Midco, Inc., Box 5433, Trenton, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sanders Assocs., 8700 Main St., Buffalo, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Modulator(Demodulators, Laser

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Rixon Elctms., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Savant Engrg. Inc., 825 N. Second St., St. Charles, Mo.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Modulators, A-M

Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1982
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. p 1984
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1375
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. p 882
Measurements, Box 180, Boonton, N.J. p 744
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 747
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gopic Designs Co., 3681 Voltaire St., San Diego, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
KDI Navcor, Inc., 15551 Cabrito Rd., Van Nuys, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Modulators, F-M

Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 639,641,644
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. p 1313
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Clarke - Hess, 43 W. 16th St., New York, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Modulators, Ferrite

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.

Modulators, Light

Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn. p 2564
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal. p 1714
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. p 1713
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Crystal Technology Inc., 2510 Old Middlefield Way, Mountain View, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.

Modulators, Magnetic

Airpax Elctrns., Inc., Cambridge, Md.
American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Amp Inc., 155 Park St., Elizabethtown, Pa.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374,1375
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. p 1894
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.

Modulators, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amp Inc., 155 Park St., Elizabethtown, Pa. p 929
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. p 863
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. p 916
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Rohde & Schwarz Sls. Cp. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Modulators, Phase

E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577,578
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. p 1392
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Chadwick-Helmuth Co., Inc., 111 E. Railroad Ave., Monrovia, Calif.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gopic Designs Co., 3681 Voltaire St., San Diego, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Modulators, Pulse

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Amp Inc., 155 Park St., Elizabethtown, Pa. p 929
Amp Inc., Box 3608, Harrisburg, Pa.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. p 863
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890
RCA, 415 S. 5th St., Harrison, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 2142
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. p 2311
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. p 916
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. p 1292
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.

Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Instr. Resch. Co., Box 231, Lincoln, Mass.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
RCA, Marne Hwy., Moorestown, N.J.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Modulators, R-F

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1375
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 2142
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 916
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Modulators, Telemetering

General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1375
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577,578
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Alessi Inds., 418 Main St., El Segundo, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
EMR Div., Box 223, Princeton, N.J.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.

Modulators, TV

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Olektron Corp., Box 248, Dudley, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.

Modulators, Vibrating Capacitor

Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. ..... p 2143
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Modules, Logic (Encapsulated)-Also See Cards; Circuits; Networks

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Clairex Elctrns., 560 S. Third Ave., Mt. Vernon, N.Y.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 554
Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1377
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Discon Corp., 1150 N.W. 70th St., Ft. Lauderdale, Fla.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electronic Modules Corp., Box 141, Timonium, Md.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Honeywell, Inc., Peterborough, N.H.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Sylvania Elec. Prods., Inc., Mt. Laurel Ind'l. Pk., Moorestown, N.J.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Moisture Indicators—See Indicators, Moisture

Monitors, Frequency

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Airpax Elctrns., Inc., Cambridge, Md.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bramco Controls Div., College & South Sts., Piqua, Ohio
Diversified Elctrns., Inc., Box 6231, Evansville, Ind
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Measurements, Box 180, Boonton, N.J. ..... p 744
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Toyo Comm. Equip. Co., Ltd., Toranonmon Bldg., 15 Shiba-Toranonmon, Minato-ku, Tokyo, Japan
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Eidson Elctrn. Co., 1902 N. Third, Box 96, Temple, Tex.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Leland Airborne Prods., Box 128, Vandalia, Ohio
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA Corp., Front & Cooper, Camden, N.J.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Monitors, Humidity—See Indicators, Humidity

Monitors, Laser Energy

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
United Detector Technology, 1732 21st St., Santa Monica, Cal.
Abtronics, Inc., Box 712, Livermore, Calif.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Photon Sources, Inc., Box 636, Ann Arbor, Mich.
Quantronix Corp., 225 Engineer Rd., Smithtown, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.

Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.

Monitors, Line & Program

Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Collins Radio Co., Dallas, Tex.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.

Monitors, Modulation

London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Marconi Instrs., 111 Cedar La., Englewood, N.J.
Measurements, Box 180, Boonton, N.J. ..... p 744
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lampkin Labs., Inc., Perico Rd., Bradenton, Fla.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.

Monitors, Nuclear Radiation

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Abtronics, Inc., Box 712, Livermore, Calif.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Supplies Div., Box 312, Encino, Calif.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.

Monitors, Phase-Angle

Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 654
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 759
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Monitors, Phase Sequence & Loss

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 609
Diversified Elctrns., Inc., Box 6231, Evansville, Ind....p 1748,1749
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Leland Airborne Prods., Box 128, Vandalia, Ohio

Monitors, Power, A-C & D-C

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1361
Diversified Elctrns., Inc., Box 6231, Evansville, Ind....p 1748,1749
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.

Monitors, Power, A-F

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 652
Collins Radio Co., Dallas, Tex.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Monitors, Power, R-F

Bendix Corp., Box 239, Franklin, Ind.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Astrolab Inc., 4 Mc Candless St, Linden, N J
Collins Radio Co., Dallas, Tex.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rafec Elctrns., Box 566, Temple City, Calif.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Monitors, Pulse Code Modulation

Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.

Monitors, Tape-Recorder

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Auricord, 35-41 29th St., Long Island City, N.Y.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Intermed Corp., 2710 Forest La., Dallas, Tex.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Monitors, Temperature-Also See Controls, Temperature

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass..... p 1710
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.....p 2110,2111
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 1448,2118
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119
Weller, 100 Wellco Rd., Easton, Pa.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beta Corp., 2639 Manana Dr., Box 20427, Dallas, Tex.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Burling Instr. Co., 21 River Rd., Box 298, Chatham, N.J.
Chatham Controls Corp., 33 River Rd., Chatham, N.J.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Dales, Franklin Co., 180-85 E. Mill St., Akron, Ohio
David Inds., 2202 S. Wright, Santa Ana, Cal.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delta Design, Inc., P.O. Box 1118, 8000 Fletcher Pkwy., La Mesa, Calif.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electro-Flex Heat, Inc., Northwood Ind'l. Pk., Bloomfield, Conn.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Modules Corp., Box 141, Timonium, Md.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fenwal, Inc., Main St., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Instruments, Inc., 3434 Midway Dr., San Diego, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Scam Instr. Corp., 7401 N. Hamlin Ave., Skokie, Ill.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Tempil Div., Hamilton Blvd., So. Plainfield, N.J.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Monitors, Video

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn. ..... p 567
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Conrac Div., 600 N. Rimsdale Ave., Covina, Calif.
Craig Corp., 2302 East 15th St., Los Angeles, Calif.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.

Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Comm. Display Sys., 2020 Oceanside Blvd., Oceanside, Calif.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Link Div., Binghamton, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
MTI, 57 Dodge Ave., No. Haven, Conn.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA Corp., Front & Cooper, Camden, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SC Elctrns., Inc., New Brighton, St. Paul, Minn.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Sylvania Elec. Prods., Inc., Mt. Laurel Ind'l. Pk., Moorestown, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.

Monitors, Voltage

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Airpax Elctrns., Inc., Cambridge, Md.
American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1363
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Diversified Elctrns., Inc., Box 6231, Evansville, Ind....p 1748,1749
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1112
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill..... p 1210
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Monitors, Waveform—See Oscilloscopes

Mos Circuits—See Circuits, Integrated, Metal Oxide Silicon

Motion Simulators—See Simulators, Motion

Motor & Generator Armatures, Rotors, Stators

Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ..... p 1634
Fabricast, Inc., 9835 Alpaca St., So. El Monte, Cal....p 1646,1647
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Singer Co., Finderne Ave., Somerville, N.J.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1681
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1681
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1681
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal.
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Dumore Co., 1300 17 St., Racine, Wisc.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
MSL Steel Co., 3912 W. McLean Ave., Chicago, Ill.
Rae Motor Corp., Box 518, McHenry, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Task Corp., Box 3999, Anaheim, Calif.
Tempel Steel Co., 5353 N. Elston Ave., Chicago, Ill.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motor Electric Generator Sets

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
CML, Inc., 166 National Rd., Edison, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Georator Corp., Box 70, Manassas, Va. .....p 1068,1069
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Singer Co., Finderne Ave., Somerville, N.J.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1700
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1700
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1700
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Columbia Elec. Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Detroit Diesel Engine Div., 13400 W. Outer Dr., Detroit, Mich.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Katolight Corp., 1st Ave. at Chestnut, Mankato, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Motor Generator Div., EE-61, Troy, Ohio
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rae Motor Corp., Box 518, McHenry, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Task Corp., Box 3999, Anaheim, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motor Speed Drives—See Controls, Motor Speed

Motor Tachometer Generators—See Tachometers, Electrical (Self-Generating)

Motor-Units, Multiple

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
Singer Co., Finderne Ave., Somerville, N.J.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Linear Alpha, Inc., 823 Emerson, Evanston, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, A-C & D-C

Alliance Mfg. Co., Alliance, Ohio ..... p 1632
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1640
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.. p 1648
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn..... p 1672
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.....p 1685,1686
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ..... p 1690
Servo-Tek Prods. Co., 1066 Goffle Rd., Hawthorne, N.J... p 1691
Singer Co., Finderne Ave., Somerville, N.J..... p 1692
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal..... p 1701
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1701
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y..... p 1701
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.p 1999
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bendix Corp., Hwy. 35, Eatontown, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
Cramer Div., Old Saybrook, Conn.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Dumore Co., 1300 17 St., Racine, Wisc.
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Elden Mfg. Corp., 2712 N. Elston Ave., Chicago, Ill.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Fincor, Inc., 1000 E. Boundary Ave., York, Pa.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Marco Elec. Mfg. Corp., Third & Franklin Sts., Womelsdorf, Pa.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rae Motor Corp., Box 518, McHenry, Ill.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
Task Corp., Box 3999, Anaheim, Calif.
Tenna Mfg. Co., Inc., 19201 Cranwood Pkwy., Warrensville Hgts., Ohio
Universal Elec. Co., 300 E. Main St., Owosso, Mich.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Brushless, D-C

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y. p 1630,1631
Alliance Mfg. Co., Alliance, Ohio ..... p 1632
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Hurst Mfg. Corp., Box 326, Princeton, Ind. ..... p 1675
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685
Vernitron Corp., 2440 W. Carson St., Torrance, Cal.
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Universal Elec. Co., 300 E. Main St., Owosso, Mich.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Clock & Timing

Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Eagle Signal Div., 736 Federal St., Davenport, Iowa
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Hurst Mfg. Corp., Box 326, Princeton, Ind. ..... p 1675
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Bowman Elec. Prods. Corp., 108 N. Jefferson St., Chicago, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
Gleason-Avery Co., Auburn, N.Y.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Motors, Control

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ..... p 1634
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
CML, Inc., 166 National Rd., Edison, N.J.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H. p 1644,1645
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
Globe, 2275 Stanley Ave., Dayton, Ohio ..... p 1652
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. .. p 1685-1687
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ..... p 1690
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J. .. p 1691
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1692
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1697
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. ..... p 1652
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. p 1681,1701,1993
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. p 1681,1701,1993
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 1681,1701,1993
Weston-Transicoil, Worcester, Pa. ..... p 1998
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill. p 1999
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Bendix Corp., S. Montrose, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
General Elec. Co., Waynesboro, Va.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Westinghouse Elec. Corp., Buffalo, N. Y.

Motors, Drag Cup

Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Weston-Transicoil, Worcester, Pa.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Bendix Corp., S. Montrose, Pa.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Motors, Fractional HP (Including 400 CPS)

Alliance Mfg. Co., Alliance, Ohio ..... p 1632
Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ..... p 1634
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H. .. p 1644
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Globe, 2275 Stanley Ave., Dayton, Ohio ..... p 1649-1658
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 1682
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685,1686
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American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Beau Motor Div., 460 Sackett Point Rd., N. Haven, Conn.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Dumore Co., 1300 17 St., Racine, Wisc.
Dyna Technology, Inc., Box 3263, Sioux City, Iowa
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Motors & Specialties, Inc., King & Hamsher Sts., Garrett, Ind.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Gleason-Avery Co., Auburn, N.Y.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
L & R Mfg. Co., 577 Elm St., Kearny, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Marco Elec. Mfg. Corp., Third & Franklin Sts., Womelsdorf, Pa.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Molon Motors & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rae Motor Corp., Box 518, McHenry, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Standard Pneumatic Motor Co., Box 745, Whittier, Calif.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Task Corp., Box 3999, Anaheim, Calif.
Tenna Mfg. Co., Inc., 19201 Cranwood Pkwy., Warrensville Hgts., Ohio
Universal Elec. Co., 300 E. Main St., Owosso, Mich.
Uppco, Inc., 900 S. Des Plaines, Chicago, Ill.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

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American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Beau Motor Div., 460 Sackett Point Rd., N. Haven, Conn.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Cramer Div., Old Saybrook, Conn.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Dumore Co., 1300 17 St., Racine, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Gleason-Avery Co., Auburn, N.Y.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Molon Motors & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.
Motoresearch Mfg. Co., Inc., 1600 Junction Ave., Racine, Wisc.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Rae Motor Corp., Box 518, McHenry, Ill.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Task Corp., Box 3999, Anaheim, Calif.
Uppco, Inc., 900 S. Des Plaines, Chicago, Ill.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

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American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

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Conrac Corp., 330 Madison Ave., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Task Corp., Box 3999, Anaheim, Calif.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

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Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
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Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electric Motors & Specialties, Inc., King & Hamsher Sts., Garrett, Ind.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
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Marco Elec. Mfg. Corp., Third & Franklin Sts., Womelsdorf, Pa.
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Molon Motors & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
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Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
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Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skinner Polynoid Div., 95 Edgewood Ave., New Britain, Conn.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
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Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

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IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
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Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 1682
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
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Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
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Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bowman Elec. Prods. Corp., 108 N. Jefferson St., Chicago, Ill.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Cramer Div., Old Saybrook, Conn.

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Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Gettys Mfg. Co., Inc., 2700 Golf Ave., Racine, Wisc.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rae Motor Corp., Box 518, McHenry, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Servo Prods. Co., Box B, Altadena, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Standard Precision, 4105 W. Pawnee, Wichita, Kans.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Printed Circuit

Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Heller, G K, Corp., Box 14746, Las Vegas, Nev.

Motors, Selsyn—See Motors, Synchronous

Motors, Servo Electric

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H. .. p 1644
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind. .... p 1684
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ..... p 1690
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J. .. p 1691
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1692
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1993
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1993
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1993
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa. ..... p 1998
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill. p 1999
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Bendix Corp., S. Montrose, Pa.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Servo Prods. Co., Box B, Altadena, Cal.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Motors, Squirrel Cage

Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
CML, Inc., 166 National Rd., Edison, N.J.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Howard Inds., 2420 18th St., Racine, Wisc.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Singer Co., Finderne Ave., Somerville, N.J.
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Brevel Prods. Corp., Broad & 16th St., Carlstadt, N.J.
Century Elec. Co., 1806 Pine St., St. Louis, Mo.
Continental Elec. Co., Inc., 325 Ferry St., Newark, N.J.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Singer-General Precision, Inc., 12690 Elmwood Ave., N.W., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
Task Corp., Box 3999, Anaheim, Calif.
Universal Elec. Co., 300 E. Main St., Owosso, Mich.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Stepping

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1636
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J. p 2049
Icon Corp., 156 Sixth St., Cambridge, Mass. ..... p 1386
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 677
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1692
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ....p 1696,1697
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1701
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1701
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1701
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa. ..... p 1998
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Kollsman Motor Corp., Mill St., Dublin, Pa.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Motors, Synchronous

Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ..... p 1634
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ..... p 1638
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H. p 1644,1645
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1648
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Globe, 2275 Stanley Ave., Dayton, Ohio ..... p 1659-1669
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Howard Inds., 2420 18th St., Racine, Wisc. ..... p 1673
Hurst Mfg. Corp., Box 326, Princeton, Ind. ..... p 1675
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 1682
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. .. p 1685-1687
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan ..... p 1689
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ..... p 1690
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1692
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ....p 1696,1697
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. .... p 1659-1669
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1701
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1701
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1701
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa. ..... p 1998
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Beau Motor Div., 460 Sackett Point Rd., N. Haven, Conn.
Bendix Corp., S. Montrose, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Gleason-Avery Co., Auburn, N.Y.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Kato Engrg. Co., 1415 1st Ave., Mankato, Minn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Molon Motors & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Task Corp., Box 3999, Anaheim, Calif.
Universal Elec. Co., 300 E. Main St., Owosso, Mich.
Uppco, Inc., 900 S. Des Plaines, Chicago, Ill.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Synchronous, Polarized—See Motors, Snychronous

Motors, Timing—See Motors, Clock & Timing

Motors, Torque

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y. p 1630,1631
Ashland Elec. Prods., Inc., 32-02 Queens Blvd., Long Island City, N.Y. ... p 1634
Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill. ... p 1638
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ... p 1640
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H. ... p 1645
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. ... p 1648
Globe, 2275 Stanley Ave., Dayton, Ohio ... p 1649
Howard Inds., 2420 18th St., Racine, Wisc. ... p 1673
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. ... p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ... p 1685,1687
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ... p 1690
Singer Co., Finderne Ave., Somerville, N.J.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ... p 1697
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. ... p 1649
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ... p 1681,1701
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. p 1681,1701
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ... p 1681,1701
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Weston-Transicoil, Worcester, Pa. ... p 1998
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Beau Motor Div., 460 Sackett Point Rd., N. Haven, Conn.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Doerr Electric Corp., 1201 S. Doerr Way, Cedarburg, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electro-Craft Corp, 1600 2nd St South, Hopkins, Minn
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Hobbs Mfg. Co., 666 Lincoln St., Worcester, Mass.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Indiana Gen'l. Div., 517 W. Walnut St., Oglesby, Ill.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
O'Brien, D. G., Inc., 15 Mercer Rd., Natick, Mass.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Task Corp., Box 3999, Anaheim, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Motors, Universal, A-C Or D-C Operation

Bodine Elec. Co., 2542 W. Bradley Pl., Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Howard Inds., 2420 18th St., Racine, Wisc. ... p 1673
Sawyer Inds., Inc., 5445 Peck Rd., Arcadia, Cal. ... p 1690
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Dumore Co., 1300 17 St., Racine, Wisc.
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
Dynamic Air Engrg., Inc., 620 E. Dyer Rd., Santa Ana, Calif.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Inds. Co., Taylor & Olive Sts., Elyria, Ohio
Heller, G K, Corp., Box 14746, Las Vegas, Nev.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Marco Elec. Mfg. Corp., Third & Franklin Sts., Womelsdorf, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Rae Motor Corp., Box 518, McHenry, Ill.
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Siemens Corp., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Task Corp., Box 3999, Anaheim, Calif.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Motors, Vacuum

Singer Co., Finderne Ave., Somerville, N.J.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Lamb Elec., 627 Lake St., Kent, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.

Mounts, Antenna (Nonconsumer Applications)

AEL, Inc., Box 552, Lansdale, Pa. ... p 858
Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ... p 877
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
C/P Corp., RFD #3, Newberry, S.C.
Collins Radio Co., Dallas, Tex.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
K-W Engrg. Works, N50 W16328 Pin Oak Ct., Menomonee Falls, Wisc.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Master Mobile Mounts, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla.
Microflect Co., 3575 25th S.E., Salem, Ore.
Microwave Sys. Co., Box 15155, Golden, Colo.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
New-Tronics Corp., 15800 Commerce Pk. Dr., Brookpark, Ohio
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
S & A Elctrns., Inc., 202 W. Florence St., Toledo, Ohio
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sitco Antennas, 10330 N.E. Marx St., Portland, Ore.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Tempo TV Prods. Co., P.O. Box 4156, Sylmar, Calif.
TRG Prods., 400 Border St., E. Boston, Mass.
Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, Calif.
Tryion, Inc., Elverson, Pa.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Mounts, CRT & Accessories

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.

Mounts, Crystal

AEL, Inc., Box 552, Lansdale, Pa.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
GTI Corp., 310 Chestnut St., Meadville, Pa. ... p 2595
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Quaker Elctrns., Box 215, Hunlock Creek, Pa.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Mounts, Integrated Circuit—See Sockets, Integrated Circuit

Mounts, Klystron

Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.

Mounts, Microwave

AEL, Inc., Box 552, Lansdale, Pa. ... p 858
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Gabriel Elctrns., Div., Saco, Me.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microflect Co., 3575 25th S.E., Salem, Ore.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Sys. Co., Box 15155, Golden, Colo.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Mounts, Mobile Antenna—See Mounts, Antenna

Mounts, Motor

Barry Controls, 700 Pleasant St., Watertown, Mass.
Henrite Prods. Div., Box 1196, Morristown, Tenn.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.

Mounts, Shock & Vibration

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Grant Pulley & Hardware Co., 525 High St., W. Nyack, N.Y.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Henrite Prods. Div., Box 1196, Morristown, Tenn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Lord Mfg. Co., 1635 West 12 St., Erie, Pa.
Matthews Ross, Corp., E. Warren St., Fall River, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Robintech, Inc., 3310 Vanowen St., Burbank, Calif.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
3M Co., 3M Center, St. Paul, Minn.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.

Mounts, Tape Head

International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ... p 510
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 519,521,528
Auricord, 35-41 29th St., Long Island City, N.Y.

Mounts, Thermistor

GTI Corp., 310 Chestnut St., Meadville, Pa.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Mounts, Transistor—See Pads, Transistor Mounting

MSI Circuits—See Circuits, Medium Scale Integration

Multiplexers (Excluding Hi-Fi)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. p 538,2005
AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Computer Labs, 1109 S. Chapman St., Greensboro, N.C. .. p 549
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa. p 569
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 591
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Raytheon Computer, 2700 S. Fairview St., Santa Ana, Cal. p 586,587,589
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Texscan Microwave Prods. Corp., 7707 Records St., Indianapolis, Ind.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Codex Corp., 150 Coolidge Ave., Watertown, Mass.
Collins Radio Co., Dallas, Tex.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gralex Inds., Inc., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Link Div., Binghamton, N.Y.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation, Inc., Box 37, Melbourne, Fla.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Tempo Computers, Inc., 1550 S. State College Blvd., Anaheim, Cal.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Multipliers, Analog

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 1319
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374,1375,1377
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass. p 566
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1345
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Multipliers, Crystal

AEL, Inc., Box 552, Lansdale, Pa.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Collins Radio Co., Dallas, Tex.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Multipliers, Diode

AEL, Inc., Box 552, Lansdale, Pa.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex.
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif. ..... p 1345
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Applied Dynamics, Inc., 2275 Platt Rd., Ann Arbor, Mich.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
General Computers, Inc., 5990 W. Pico Blvd., Los Angeles, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods., Inc., 9533 Irondale Ave., Chatsworth, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Salem Rd., Beverly, Mass.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Multipliers, Frequency

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bramco Controls Div., College & South Sts., Piqua, Ohio
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 875
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Meipar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 762
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 890
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 918
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Ajax Magnethermic Corp., 1745 Overland Ave., N.E., Warren, Ohio
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Electronic Service Co., 201 Linden Ave., Verona, N.J.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microcom Corp., Horsham Valley ind'l. Pk., Horsham, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Multipliers, Hall

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 2120
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2124
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.

Multipliers, Magnetic

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1374,1375,1377
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.

Multipliers, Meter

Daven, Div., Dept. EEM 70, Manchester, N.H.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Multipliers, Servo

Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1984
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1377
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
Intronics, Inc., 57 Chapel St., Newton, Mass. ..... p 1333
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 598
Weston-Transicoil, Worcester, Pa.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.

Nameplates

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Bell Co., Inc., 106 Morrow Ave., Trussville, Ala.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif.
Cryptographics, Inc., 416 Third Ave., New York, N.Y.
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Duramark, Inc., 2 Secatoag Ave., Port Washington, N.Y.
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Electro Chemical Engraving Co., 1100 Brook Ave, Bronx, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Ever Ready Label Corp., 357 Cortlandt St., Belleville, N.J.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Hollander Allen, E. 64 Midland Ave., Paramus, N.J.
Industrial Commerce Corp., 105-07 Metropolitan Ave., Forest Hills, N.Y.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Master Tape Printers, Inc., 4517 Elston Ave., Chicago, Ill.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.
Metalcraft, Inc., 149 4th St., S.W., Mason City, Iowa
Metalphoto Corp., 18531 S Miles Rd., Cleveland, Ohio
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
National Decal Corp., S.E. Corner 56th & Chestnut Sts., Philadelphia, Pa.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Pantographic Reproduction Co., 35 Elm Ridge Terr., Newington, Conn.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Romar Plastics, Inc., 1311 E. Main St., St. Charles, Ill.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Star Enterprises-Div., Box 1098, Lowell, Mass.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
3M Co., 3M Center, St. Paul, Minn.
Topflight Corp., 160 East 9th Ave., York, Pa.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Needles—See Styli

Networks, Crossover

Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 1602
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Hartley Prods. Corp., Barnert Pl., Hohokus, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Networks, Directional Antenna Phasing

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Networks, Ladder

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Balco Capacitors, 307 Washington St., Orange, N.J. p 2179,2689
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. .... p 2695
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 1602
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash.
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal..... p 2807
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179,2689
Mepco, Inc., Columbia Rd., Morristown, N.J.
Nytronics, Inc., Industrial Rd., Kutztown, Pa. ..... p 2735
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TT Elctrns., Inc., Box 180, Culver City, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2773
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
General Lab. Assocs., Norwich, N.Y.
HEI, Inc., Jonathan Ind'l. Ctr., Chaska, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Networks, LC

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1427
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2578
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Nytronics, Inc., Orange St., Darlington, S.C.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.....p 1584,1585
Raytheon Co., 465 Centre St., Quincy, Mass.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
General Lab. Assocs., Norwich, N.Y.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
RtroN Corp., Box 743, Skokie, Ill.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Networks, Matching

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Balco Capacitors, 307 Washington St., Orange, N.J. p 2179,2689
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2697
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 1602
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal. ..... p 2807
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179,2689
Mepco, Inc., Columbia Rd., Morristown, N.J.
Nytronics, Inc., Orange St., Darlington, S.C.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2773
Zaring Inds., Inc., Box 477, Carmel, Ind.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Networks, Phase

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Balco Capacitors, 307 Washington St., Orange, N.J. p 2179,2689
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1989
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179,2689
Nytronics, Inc., Orange St., Darlington, S.C.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2175
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMR Div., Box 223, Princeton, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Networks, Pulse

AEL, Inc., Box 552, Lansdale, Pa.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Amp Inc., Box 3608, Harrisburg, Pa.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Columbia Components Corp., 60 Madison Ave., Hempstead, N.Y.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Condenser Prods. Corp., Box 997, Brooksville, Fla. ..... p 2218
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J. ..... p 2223
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J. p 1563
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1580
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Nytronics, Inc., Orange St., Darlington, S.C.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
General Instr. Corp., 165 Front St., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio

Networks, Rejection—See Filters

Networks, RC

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Balco Capacitors, 307 Washington St., Orange, N.J. p 2179,2689
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1427
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind. ..... p 2700
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2700
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. ..... p 2700
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind. ..... p 2700
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2700
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. ..... p 2700
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal. ..... p 2807
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif. p 2220
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J. ..... p 2223
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2179,2689
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Nytronics, Inc., Industrial Rd., Kutztown, Pa ..... p 2735
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2175
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz.
TT Elctrns., Inc., Box 180, Culver City, Cal. ..... p 1591
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Elpac Components, 18651 Von Karman Ave., Irvine, Calif.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
EMR Div., Box 223, Princeton, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
General Lab. Assocs., Norwich, N.Y.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
Midwec Corp., Box 417, Scottsbluff, Neb.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Potter Co., 500 W. Florence Ave, Inglewood, Calif
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
RtroN Corp., Box 743, Skokie, Ill.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Skottie Elctrns., Archbald, Pa.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
White Instrs., Inc., Box 698, Austin, Tex.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Networks, Resistance

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. .... p 2695
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099,2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099,2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099,2697
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind. ..... p 2700
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2700
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. ..... p 2700

Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 1602
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Elctrn. Comps. Div., Trevose, Pa.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Nytronics, Inc., Industrial Rd., Kutztown, Pa. ..... p 2735
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Sage Elctrns. Corp., Box 3926, Rochester, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2773
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Microtek Elctrns., Inc., 138 Alewife Brook Pkwy., Cambridge, Mass.
Miller Electro-Resch. Labs., 14800 W. Grange, New Berlin, Wisc.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shallcross, E. Preston St., Selma, N.C.
Vytell Corp., Box 92, Arlington Hgts., Ill.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Neutron Detection Tubes—See Tubes, Radiation Detection

Noise Analyzers—See Analyzers, Noise

Nuclear Equipment—See Specific Types

Nuclear Radiation Shielding—See Shields, Nuclear Radiation

Null Detectors—See Indicators, Null

Numeric Readouts—See Readouts

Nuts, Metal—See Fasteners, Metal

Nuts, Plastic—See Fasteners, Plastic

O-Rings—See Seals, Oil

Oceanographic Equip. (Electronic)

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Benthos, Inc., Edgerton Dr., N. Falmouth, Mass.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bissett-Berman Corp., 3939 Ruffin Rd., Box 1447, San Diego, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Elctrns. Corp., 900 Walt Whitman Rd., Huntington Station, N.Y.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
NUS Corp., P.O. Box 248, Paramus, N.J.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
Sanders Assocs., Inc., Ocean Sys. Div., Daniel Webster Hwy., So. Nashua, N.H.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Oils—See Lubricants

Open-Short Locators—See Locators, Open-Short

Optical Coded Discs—See Coded Discs, Optical

Optical Comparators—See Comparators, Optical

Optical Image Expanders

Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Electro-Optical Sys., Pasadena, Calif.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Lenox Instr. Co., 122 E. Luray St., Philadelphia, Pa.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Physitech, Inc., 645 Davisville Rd., Willow Grove, Pa.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.

Optics, Fiber—See Fiber Optic Bundles; Fiber Optic Inspection Equip.

Optics, Micromosaic—See Micromosaic Optics

Oscillators, Adjustable—See Oscillators (As Modified)

Oscillators, Audio

Accutronics, Inc., 628 North St., Geneva, Ill. p 1402-1410,1412-1414
Allen Elctrns. Div., Macungie, Pa. ..... p 2329
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. ..... p 1004
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J. p1032c-1032e
Connor-Winfield Corp., Winfield, Ill. ..... p 1432,1433
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois ..... p 1431
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. ..... p 2579
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 644,645
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. p 1046,1050,1051
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho ..... p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. .. p 1439-1442
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1451,1453,1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 727
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1466,1467
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. .... p 1458,1459
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468,1469
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. ..... p 1485
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,822,823,826,829,830
Acton Labs., Inc., 531 Main St., Acton, Mass.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
BECO Solid State Systems, Box 686, Salem, Va.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.

Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Oscillators, Beat Frequency (BFO)

American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Oscillators, Bias

Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 527
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.

Oscillators, Bridge

Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Oscillators, Cavity

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 874,875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 879
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Aircom, Inc., Rte. 16B, Union, N.H.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
GAF Corp., 140 W. 51 St., New York, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Oscillators, Crystal-Controlled

Accutronics, Inc., 628 North St., Geneva, Ill. p 1402-1408,1410-1414
AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. ..... p 1415
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1416,1417
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Connor-Winfield Corp., Winfield, Ill. ..... p 1432,1433
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 644
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho ..... p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill... p 1439-1442
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1450-1453
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1465-1467
Measurements, Box 180, Boonton, N.J.
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y.
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y....p 1458,1459
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468,1469
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Northern Engrg. Labs., Inc., 357 Beloit St., Burlington, Wisc. p 1473
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va... p 1474-1476
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa ..... p 1479
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. ..... p 1484,1485
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. ..... p 1490
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Crystal Network Prods. Corp., 818 Parade St., Erie, Pa.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Electronic Service Co., 201 Linden Ave., Verona, N.J.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Standard Crystal Co., 1105 S. Fremont Ave., Alhambra, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Oscillators, Decade

Accutronics, Inc., 628 North St., Geneva, Ill.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. .....p 1050,1051
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1447
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 1488
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Oscillators, Grid Dip—See Meters, Grid-Dip

Oscillatos, Kystron—See Tubes, Klystron

Oscillators, Magnetron—See Tubes, Magnetron

Oscillators, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 874,875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 1886
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 879
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742

Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 884,885
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 910
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Oscillators, Power

Accutronics, Inc., 628 North St., Geneva, Ill. p 1410
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. p 1004
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. p 1046,1050,1051
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. p 874
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Marconi Instrs., 111 Cedar La., Englewood, N.J. p 742
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. p 745
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Oscillators, Pulse

Accutronics, Inc., 628 North St., Geneva, Ill. p 1402-1408
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. p 1415
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. p 605
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
CML, Inc., 166 National Rd., Edison, N.J. p 1032c
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Connor-Winfield Corp., Winfield, Ill. p 1432,1433
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho p 1438
Frequency Control, Inc., Box 671, Austin, Tex. p 1444
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. p 874,875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1451,1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1447
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. p 1467
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 910
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. p 1490
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Oscillators, Reed

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Frequency Control, Inc., Box 671, Austin, Tex.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.

Oscillators, R-F

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. p 2331
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. p 1415
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1416,1417
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1428
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois p 1431
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. p 1439-1442
Frequency Control, Inc., Box 671, Austin, Tex. p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. p 874,875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1886
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1451-1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 727
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
London Co., 811 Sharon Dr., Westlake, Ohio
Marconi Instrs., 111 Cedar La., Englewood, N.J. p 742
Measurements, Box 180, Boonton, N.J.
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468,1469
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. p 1474-1476
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. p 763
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa p 1479
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. p 1485
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. p 1486
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. p 1488
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla. p 910
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. p 1490
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 822
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aimes Inds., P.O. Box 73, Lockport, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J

Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Polarad Elctm. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Tocco Div., 3800 Harvard Ave., Cleveland, Ohio
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Oscillators, Sinusoidal

Accutronics, Inc., 628 North St., Geneva, Ill. p 1402-1409,1411-1414
Allen Elctrns. Div., Macungie, Pa. p 2329
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Arnold Magnetics Corp., Box K, Culver City, Calif.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. p 1415
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. p 605
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1428
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. p 1004
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J. p 1032c-1032e
Connor-Winfield Corp., Winfield, Ill. p 1432,1433
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois p 1431
Data Delay Devices, 253 Crooks Ave., Clifton, N.J. p 2579
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 645
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. p 1050,1051
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. p 679
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. p 1439-1442
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1452,1453
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Marconi Instrs., 111 Cedar La., Englewood, N.J. p 742
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. p 1467
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. p 1458
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y.
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. p 1474-1476
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. p 1485
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. p 1490
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,823,825,826,828-830
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
BECO Solid State Systems, Box 686, Salem, Va.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Oscillators, Square-Wave

Accutronics, Inc., 628 North St., Geneva, Ill. p 1403-1414
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Arnold Magnetics Corp., Box K, Culver City, Calif.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. p 1415
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. p 605
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1428
CML, Inc., 166 National Rd., Edison, N.J.
Connor-Winfield Corp., Winfield, Ill. p 1432,1433
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois p 1431
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 645
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. p 679
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. p 1439-1442
Frequency Control, Inc., Box 671, Austin, Tex. p 1444
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1450-1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. p 1465
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. p 745
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. p 1476
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. p 1484,1485
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,823,825,826,828-830
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
BECO Solid State Systems, Box 686, Salem, Va.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Digital Data Sys., 18819 Bryant St., Northridge, Cal.
Dorsett Elctrns., Box 36, Tulsa, Okla.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Oscillators, Sweep

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Data Mess. Corp., 855 Commercial St., Palo Alto, Calif. p 645
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. p 727
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 817-820,823,825,826,828-830
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Oscillators, Telemetry

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1411-1414
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. ..... p 1415
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 613
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois ..... p 1431
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ....p 1440,1441
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 874
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1450,1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1447
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 728
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. ..... p 1458
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 835
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Defense Elctrns., Inc., Rockville, Md.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
EMR Div., Box 223, Princeton, N.J.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lansdale Microelectronics, Inc., Colmar, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Oscillators, Temperature Compensated

Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. ..... p 1415
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1416,1417
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois ..... p 1431
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho ..... p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1451,1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 879,1447
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1465,1467
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. ..... p 1475
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. .....p 1484,1485
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. ..... p 1490
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Collins Radio Co., Newport Beach, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Tedford Crystal Labs., Inc., 4914 Gray Rd., Cincinnati, Ohio

Oscillators, Test

Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2573
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 640,643-645
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. .. p 1439-1441
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1447
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
London Co., 811 Sharon Dr., Westlake, Ohio
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1467
Measurements, Box 180, Boonton, N.J.
Meipar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. ..... p 1458
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Preston Scientific Inc., 605 E. Cerritos Ave., Anaheim, Calif.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 818-821,826,828-830
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Dorsett Elctrns., Box 36, Tulsa, Okla.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Oscillators, Tuning-Fork Controlled

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1409
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429,1430
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
CML, Inc., 166 National Rd., Edison, N.J.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. .. p 1439-1441
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Meipar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Spectrum Technology, Inc., Bldg. 240, Santa Barbara Airport, Box 948, Goleta, Cal. .....p 1484,1485
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.

Oscillators, UHF, VHF

Accutronics, Inc., 628 North St., Geneva, Ill. p 1404,1405,1407,1408
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 871
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. .....p 874,875
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 727
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. ..... p 1465-1467
Measurements, Box 180, Boonton, N.J.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan ..... p 1472
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. .. p 1474-1476
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa ..... p 1479
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. ..... p 1490
Wavetek, 9045 Balboa Ave., San Diego, Cal.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Eimac, 301 Industrial Way, San Carlos, Calif.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.

Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wavetek, 3000 Shelby St., Indianapolis, Ind.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Oscillators, Ultra-Low-Frequency

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1402-1411
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032c
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho ..... p 1438
Fork Standards, Inc., 213 Main St., W. Chicago, Ill... p 1439-1441
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1451,1453,1454
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1466,1467
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va... p 1474-1476
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,823,826,829,830
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Collins Radio Co., Dallas, Tex.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Oscillators, Ultrasonic

Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Data Delay Devices, 253 Crooks Ave., Clifton, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass. p 733
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 821
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
TAC Tech. Instr. Corp., Scotch Rd., Mercer Airport, Trenton, N.J.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.

Oscillators, Voltage Controlled

Accutronics, Inc., 628 North St., Geneva, Ill. ..... p 1412-1414
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. ..... p 1415
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 613
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. p 1416,1417
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1428
CML, Inc., 166 National Rd., Edison, N.J.
Connor-Winfield Corp., Winfield, Ill. .....p 1432,1433
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Damon Corp., 115 4th Ave., Needham Hgts., Mass. ..... p 1435
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. p 644,645
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho ..... p 1438
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass. ..... p 874
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 879,1446
Hughes Aircraft Co., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa. .....p 1465,1467
M F Elctrns. Corp., 118 E. 25th St., New York, N.Y. ..... p 1459
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1468
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. ..... p 1475
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa. ..... p 1483
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
TMC Systems (Ariz.), Inc., 930 West 23rd St., Unit 26, Tempe, Ariz. ..... p 1486
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vectron Labs., Inc., 121 Water St., Norwalk, Conn. ..... p 1490
Wavetek, 9045 Balboa Ave., San Diego, Cal. p 816-820,823,826,829,830
Yeiser Labs, 881 W. 18th St., Costa Mesa, Cal.
Addington Labs., Inc., 1043 DiGiulio Ave., Santa Clara, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Dorsett Elctrns., Box 36, Tulsa, Okla.
EMF Systems, Inc., P.O. Box 1009, State College, Pa.
EMR Div., Box 223, Princeton, N.J.
FKS Comms., Inc., 3 Delaware Dr., New Hyde Park, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hope Elctrns., Box 773, Clifton, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Lansdale Microelectronics, Inc., Colmar, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microcom Corp., Horsham Valley Ind'l. Pk., Horsham, Pa.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Oscillographs, Direct Writing

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 844-847
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Honeywell, Box 5227, Denver, Colo. ..... p 691
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I. p 850
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Varian, 611 Hansen Way, Palo Alto, Cal.

Oscillographs, Direct Writing, Multichannel

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 844-846
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo.
Honeywell, Box 5227, Denver, Colo. ..... p 691
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I. p 850
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Oscillographs, Portable

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 844-846
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Honeywell, Box 5227, Denver, Colo.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I. p 850
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.

Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Oscilloscope Amplifier Plug-Ins

Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 705
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 746
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscope Cameras—See Cameras, Oscilloscope

Oscilloscope Image Expanders

Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
EdnaLite Corp., 200 N. Water St., Peekskill, N.Y.

Oscilloscope Oscillator Plug-Ins

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. ..... p 1291

Oscilloscope Preamplifier Plug-Ins

AEL, Inc., Box 552, Lansdale, Pa.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 746
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscope Probes

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 746
Telequipment, Ltd., Box 500, Beaverton, Ore.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.

Oscilloscope Time-Base Generator Plug-Ins

Accutronics, Inc., 628 North St., Geneva, Ill.
Telequipment, Ltd., Box 500, Beaverton, Ore.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscopes, Digital Readout

Infodex, Inc., 7 Cherry Ave., Waterbury, Conn. ..... p 567
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscopes, General Purpose

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692,704,705
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 746
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.

Oscilloscopes, High Frequency

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 704
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
RCA, 415 S. 5th St., Harrison, N.J.
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Oscilloscopes, Low Frequency

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 798
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Coldspring Instr. Corp., 800 W. Jericho Tpke., Huntington, N.Y.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.
Wavetek, 3000 Shelby St., Indianapolis, Ind.

Oscilloscopes, Medical

California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Essential Elctrns. Corp., 3001 Chester Ave., Cleveland, Ohio
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.

Oscilloscopes, Multi-Beam

Telequipment, Ltd., Box 500, Beaverton, Ore.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Heath Co., Benton Harbor, Mich.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Oscilloscopes, Multiple Channel

AEL, Inc., Box 552, Lansdale, Pa.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 704
Honeywell, Box 5227, Denver, Colo.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Telequipment, Ltd., Box 500, Beaverton, Ore.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.

Oscilloscopes, Portable, Battery Operated

AEL, Inc., Box 552, Lansdale, Pa.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Telequipment, Ltd., Box 500, Beaverton, Ore.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Tektronix, Inc., Box 500, Beaverton, Ore.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.

Oscilloscopes, Programmable

Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscopes, Projection

Oscilloscopes, Sampling

Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscopes, Storage

Applied Magnetics Corp., 75 Robin Hill Rd., Goleta, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Tektronix, Inc., Box 500, Beaverton, Ore.

Oscilloscopes, Three-Dimensional

Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.

Oscilloscopes, Wide-Band

AEL, Inc., Box 552, Lansdale, Pa.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692,704,705
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn. ..... p 567
RCA, 415 S. 5th St., Harrison, N.J. ..... p 777
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Telequipment, Ltd., Box 500, Beaverton, Ore. ..... p 796
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Dumont Oscilloscope Labs., Inc., 40 Fairfield Pl., W. Caldwell, N.J.
E-H Resch. Labs., inc., Box 1289, Oakland, Cal.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Elctrn. Instr. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Vu-data Corp., 7595 Convoy Ct., San Diego, Cal.
Waterman Instr. Corp., 400 S. Warminster Rd., Hatboro, Pa.

Ovens, Crystal & Component

Accutronics, Inc., 628 North St., Geneva, Ill.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bliley Electric Co., 2545 W. Grandview Blvd., Erie, Pa. .... p 1422
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1425,1428
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Croven, Ltd., 500 Beech St., Whitby, Ont., Can.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Knights, Inc., 400 Reimann St., Sandwich, Illinois..... p 1431
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1436
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
McCoy Elctrns. Co., Chestnut & Watts St., Mt. Holly Springs, Pa.
Monitor Prods. Co., Inc., 815 Fremont Ave., S., Pasadena, Cal. p 1469
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Northern Engrg. Labs., Inc., 357 Beloit St., Burlington, Wisc. p 1473
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 1448
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va. ....p 1474,1477
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Radaro Elctrns., Inc., 10 E. Park Dr., Albion, Ind.
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Hope Elctrns., Box 773, Clifton, N.J.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Isotemp Research, Inc., 1216 Harris St., Charlottesville, Va.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Safeway Heat Elements, Inc., 440 Middlefield St., Middletown, Conn.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Spedcor Elctrns., Inc., Matawan-Freehold Rd., Morganville, N.J.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
TIA Elec. Co., Box 777, Princeton, N.J.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Ovens, Electric—See Furnaces, Electric

Ovens, Infrared Drying

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Cahnman Hugo N. Assocs., Inc., 125-10 Queens Blvd., Kew Gardens, N.Y.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Etchomatic, Inc., Box 444, Waltham, Mass.
Forma Sci., Inc., Box 649, Marietta, Ohio
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Miskella Infra-Red Co., 7301 Grand Ave., Cleveland, Ohio
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Research, Inc., Box 24064, Minneapolis, Minn.
Ross Engrg. Div., Box 751, New Brunswick, N.J.
Selas Corp. America, Box 200, Dresher, Pa.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Ovens, Laboratory

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Baron-Blakeslee, Inc., 1620 S. Laramie Ave., Chicago, Ill.
BTU Engrg. Corp., 179 Bear Hill Rd., Waltham, Mass.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Delta Design, Inc., P.O. Box 1118, 8000 Fletcher Pkwy., La Mesa, Calif.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Feco, 5855 Grant Ave., Cleveland, Ohio
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Forma Sci., Inc., Box 649, Marietta, Ohio
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
Gruenberg Elec. Co., Inc., 2121 Reach Rd., Williamsport, Pa.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Master Appliance Corp., 1745 Flett Ave., Racine, Wisc.
Michigan Oven Co., 1st Oven Pl., Box 336, Romulus, Mich.
National Appliance Co., Box 23008, Portland, Ore.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
OAL Assocs., Inc., 155 Sullivan La., Westbury, N.Y.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Ross Engrg. Div., Box 751, New Brunswick, N.J.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Ovens, Microwave

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Feco, 5855 Grant Ave., Cleveland, Ohio
La Rose, W.T. & Assocs., Inc., P.O. Box F, Lansingburg Sta., Troy, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Ovens, Particle Reduction

Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.

Ovens, Vacuum

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Fisher Sci. Co., 711 Forbes Ave., Pittsburgh, Pa.
Forma Sci., Inc., Box 649, Marietta, Ohio
Granville-Phillips Co., 5675 E. Arapahoe Ave., Boulder, Colo.
Grieve Corp., 1350 N. Elston Ave., Chicago, Ill.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Hydor Therme Corp., 7155 Airport Hwy., Pennsauken, N.J.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
National Appliance Co., Box 23008, Portland, Ore.
Norton Co., 160 Charlemont St., Newton, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Sunbeam Vacuum Technology Corp., Box 1218, Lowell, Mass.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Ultek Div., Box 10920, Palo Alto, Calif.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Oxide, Aluminum—See Insulating Materials, Powdered Metal Oxide

Oxides, Magnetic—See Magnetic Iron Oxides

Oxygen Indicators—See Indicators, Oxygen / Ozone

Packages, Integrated Circuit

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal. ..... p 1597
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan ..... p 2601
RCA, 415 S. 5th St., Harrison, N.J.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2157
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1620
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Bendix Corp., Sidney, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Honeywell, 11 W. Spring St., Freeport, Ill.
IFE Div, P.O. Box 4265, E Providence, R.I.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Packages, Semiconductor—See Cans, Semiconductor

Packaging, Cushioning

Air-O-Plastik Corp., Asia Pl, Carlstadt, N.J.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Blocksom & Co., P.O. Box 300, Michigan City, Ind.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Daubert Chem. Co., 709 Enterprise Dr., Oak Brook, Ill.
Dow Chemical Co., Box 1682, Midland, Mich.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Sealed Air Corp, 19-01 State Hwy. 208, Fair Lawn, N.J.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.

Pads, L & T—See Attenuators

Pads, Transistor Mounting

Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Delbert Blinn. Co., Box 2007, Pomona, Calif. ..... p 1877
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1896-1900
RCA, 415 S. 5th St., Harrison, N.J.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex. ..... p 1943

Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
AAVID Engrg., Inc., 30 Cook Ct., Laconia, N.H.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Circuit Structures Lab., 3200 N. San Fernando Blvd., Burbank, Calif.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Nippert Co., 825 Pittsburgh Dr., Delaware, Ohio
Robison Elctrns., Inc., 2134 W. Rosecrans Ave., Gardena, Cal.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.

Paging Systems—See Comm. Systems, Selective Paging

Paints, Conductive, Electric—See Coatings, Conductive, Electric

Paints, Fluorescent—See Coatings, Fluorescent

Paints, Luminous

Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Black Light Prods., Box 45278, Chicago, Ill.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Stroblite Co., Inc., 29 W. 15th St., New York, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.

Paints, Metallic

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Illinois Bronze Powder & Pain Co., 300 E. Main St., Lake Zurich, Ill.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Micro-Circuits Co., New Buffalo, Mich.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
3M Co., 3M Center, St. Paul, Minn.

Paints, Radioactive—See Coatings, Radioactive

Paints, Reflective

Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
3M Co., 3M Center, St. Paul, Minn.

Paints, Resistive Also See Inks For Thick-Film Microcircuits

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Etchomatic, Inc., Box 444, Waltham, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Micro-Circuits Co., New Buffalo, Mich.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Randolph Prods. Co., 12th St., Carlstadt, N.J.
Sauereisen Cements Co., 160 Gamma Dr., Pittsburgh, Pa.
Sprayon Prods., Inc., 26300 Fargo Ave., Bedford Hgts., Ohio
3M Co., 3M Center, St. Paul, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.

Panel Equipment—See Dials; Connectors; Jacks; Lights; etc.

Panel Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Panels, Electroluminescent

TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.... p 1545
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Panels, Fuse

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo.... p 2008
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
Marathon Special Prods. Corp., 13300 Van Camp Rd., Bowling Green, Ohio
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.

Panels, Jack

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.....p 2360,2365
Amp Inc., Box 3608, Harrisburg, Pa. ..... p 537
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Connector Corp., 6025 N. Keystone, Chicago, Ill.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Interswitch, 770 Airport Blvd., Burlingame, Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Audio Accessories, Inc., Gilsum, N.H.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
RCA Corp., Front & Cooper, Camden, N.J.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Panels, Metal—See Cabinets & Accessories, Metal

Panels, Meter—See Cases, Equipment, Instrument, Meter

Panels, Patch—See Panels, Jack

Panels, Power Bus

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Panels, Relay Rack

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Interswitch, 770 Airport Blvd., Burlingame, Cal.
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.... p 2162
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Heeger, Inc., 729 Ceres Ave., Los Angeles, Calif.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Miller Dial, 4400 N. Temple City Blvd., El Monte, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Panoramic Adapters—See Receivers, Panoramic

Paper Insulation—See Insulation Materials, Paper

Paper Shredders

Paper, Graphic Recording

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Honeywell, Box 5227, Denver, Colo.
Houston Instr., 4950 Terminal Ave., Bellaire, Tex.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.
AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.

Alfax Paper & Engrg. Co., Inc., Washington St., Box "A", Westboro, Mass.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bristol Div, Waterbury, Conn
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fitchburg Coated Products, P. O. Box 1106, Scranton, Pa.
Foxboro Co., Foxboro, Mass.
Gubelman Chart Div., 100 E. Kinney St., Newark, N.J.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Ludlow Corp., Ware, Mass.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Telautograph Corp., 8700 Bellanca Ave., Los Angeles, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian, 611 Hansen Way, Palo Alto, Cal.

Passive Reflectors—See Antenna Reflectors

Patch Boards—See Boards, Plug-In; Boards, Programming

Patch Cords—See Cords, Patch

Pedestals, Radar

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Falstrom Co., 174 Falstrom Ct., Passaic, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Bendix Aerospace-Elctrns. Co., Teterboro, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Perforators, Paper Tape (Electrically Powered)

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Excellon Inds., 23915 Garnier, Torrance, Calif.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Ohr-Tronics, Box 406, King of Prussia, Pa.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio

Perforators, Paper Tape (Manually Operated)

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 631
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Ohr-Tronics, Box 406, King of Prussia, Pa.
Robins Data Devices, Inc., 15-58 127th St, Flushing, N Y
Telcolab Corp., 405 Lexington Ave., New York, N.Y.

Permeameters—See Meters, Permeameter

Phase & Voltage Analyzers—See Analyzers, Phase & Voltage

Phase Comparators—See Comparators, Phase

Phase Indicators—See Indicators, Phase

Phase-Lock Frequency Stabilizers—See Stabilizers, Frequency

Phase Shifters—See Shifters, Phase

Phones—See Headphones & Headsets

Phonograph Arms, Playback

Astatic Corp., Box 120, Conneaut, Ohio
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.

Phonograph Arms, Transcription

Astatic Corp., Box 120, Conneaut, Ohio
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.

Phonograph Parts & Accessories

Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Phonographs

Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Auricord, 35-41 29th St., Long Island City, N.Y.
Chamberlain Mfg. Corp., 5740 N. Tripp Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electron Enterprises, Inc., 6645 Stanley Ave., Berwyn, Ill.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
MP Audio Corp., Fairfield, Conn.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sylvania Elec. Prods., Inc., 700 Ellicott St, Batavia, N Y
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.

Phosphors—See Fluorescent Compounds

Photo Emulsions, Stencil

Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Naz-Dar Int'l., 1087 N. North Branch St., Chicago, Ill.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Quantrol Elctrns., Inc., 1920 Mills Ave., El Paso, Tex.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.

Photocells & Phototubes—See Cells, Photoconductive, etc.

Photoelectric Equipment—See Alarms; Controls; Counters; etc.

Photoflash Equipment, Electronic

Abtronics, Inc., Box 712, Livermore, Calif.
AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Berkey Tech., 25-15 50th St., Woodside, N.Y.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Dyonics, Inc., 71 Pine St., Woburn, Mass
Eastman Kodak Co., 343 State St., Rochester, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Flight Research, Box 1-F, Richmond, Va.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hico Corp., 76 Coolidge Hill Rd., Watertown, Mass.
Honeywell, Inc., 5501 S. Broadway, Littleton, Colo.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Xenon Corp., 39 Commercial St., Medford, Mass.

Photographic Equip.—See Cameras, etc.

Photometers—See Meters, Light

Photomultiplier Power Supplies—See Power Supplies, Photomultiplier

Photomultiplier Tube Housings

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Components Corp., 106 Main St., Denville, N.J.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Products for Research, Inc., 78 Holten St., Danvers, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Photomultipliers—See Tubes, Photomultiplier

Physiological Equipment—See Specific Types

Pickup Cartidges—See Cartidges, Phono

Pickups, Industrial—See Transducers

Pickups, Magnetic—See Transducers

Pickups, Phonograph—See Phonograph Arms, Playback

Pickups, Proximity—See Transducers, Displacement

Pickups, Telephone (For Recording)

Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Pickups, Torque—See Transducers, Torque

Pickups, Vibration—See Transducers, Vibration; Accelerometers

Piezoelectric Crystals—See Crystals, Piezoelectric

Pilot Lamps—See Lamps, Dial & Pilot

Pin Straighteners, Connector

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.

Pin Straighteners, Tube

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.

Pins, Cotter, Dowel, Taper, etc.—See Pins, Mechanical

Pins, Electrically Conductive

Airborn, Inc., 2618 Manana Dr., Dallas, Tex.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433

Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Pins, Mechanical

Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Allen Mfg. Co., Drawer 570, Hartford, Conn.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Anti-Corrosive Metal Prods. Co., Inc., Box 1894, Albany, N.Y.
Associated Mfg. Co., 2414 Lawrence Ave., Chicago, Ill.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Bland Co., 95 Granby St., Bloomfield, Conn.
C.E.M. Co., Inc., 24 School St., Danielson, Conn.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Deutsch Fastener Corp., P.O. Box 90925, Airport Sta., Los Angeles, Calif.
Elastic Stop Nut Div., 2330 Vauxhall Rd., Union, N.J.
Gillen, John Co., 2540 South 50th Ave., Cicero, Ill.
Groov-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N.J.
Hartwell Corp., 9035 Venice Blvd., Los Angeles, Calif.
Keene Corp., Muskegon, Mich.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Luke Line Fasteners, 201 Laurel St., Beverly, N.J.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Standard Screw Co., 2701 Washington Blvd., Bellwood, Ill.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Torrington Co., Box 1008, Torrington, Conn.
TRG Prods., 400 Border St., E. Boston, Mass.
Tridair Inds., 3000 W. Lomita Blvd., Torrance, Calif.

Pitch—See Insulting Compounds, Asphalt & Pitch

Pitch & Tempo Regulators—See Regulators, Pitch & Tempo

Plastic Films, Rods, Sheets, etc.

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex.
Adam Spence Corp., 3856 Park Ave., Edison, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Avisun Corp., 21 South 12th, Philadelphia, Pa.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
General Elec. Co., 1 Plastic Ave., Pittsfield, Mass.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hercules, Inc., 910 Market St., Wilmington, Dela.
Hysol Div., 211 Franklin St., Olean, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
New England Laminates Co., Inc., 481 Canal St., Stamford, Conn.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rogers Corp., Rogers, Conn.
Schweitzer, Peter J. Div., Lee, Mass.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Plastic Filters; Pumps; Valves—See Filters, Fluid, Nonmetallic; Pumps, Nonmetallic; Valves, Nonmetallic

Plastic Raw Materials, Liquids, Pellets, Powders, Resins

Dow Corning Corp., Midland, Mich. ..... p 2669,2670
Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Acme Resin Co., 1401 Circle Ave., Forest Pk., Ill.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Avisun Corp., 21 South 12th, Philadelphia, Pa.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Belding Chem. Inds., 1430 Broadway, New York, N.Y.
Biggs Co., Box 1740, Santa Monica, Cal.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Borden Chem., 350 Madison Ave., New York, N.Y.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Chemical Prods. Corp., King Philip Rd., E. Providence, R.I.
Cincinnati Dev. & Mfg. Co., 5614 Wooster Pike, Cincinnati, Ohio
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Cosmic Plastics, Inc., 12314 Gladstone St., San Fernando, Calif.
Dennis Chem. Co., 2701 Papin St., St. Louis, Mo.
Diamond Shamrock Chemical Co., 300 Union Commerce Bldg., Cleveland, Ohio
Dolph, John C. Co., New Rd., Monmouth Junction, N.J.
Dow Chemical Co., Box 1682, Midland, Mich.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Durez Plastics Div., 1921 Walck Rd., N. Tonawanda, N.Y.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eastman Chem. Prods., Inc., Kingsport, Tenn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Fiberite Corp., 501 W. 3rd St., Winona, Minn.
FMC Corp., 633 Third Ave., New York, N.Y.
Furane Plastics, Inc., 5121 San Fernando Rd., W., Los Angeles, Calif.
GAF Corp., 140 W. 51 St., New York, N.Y.
General Elec. Co., 1 Plastic Ave., Pittsfield, Mass.
General Elec. Co., Noryl Ave., Selkirk, N.Y.
General Elec. Co., Waterford, N.Y.
Hardman Inc., Belleville, N.J.
Hercules, Inc., 910 Market St., Wilmington, Dela.
Hightemp Resins, Inc., 225 Greenwich Ave., Stamford, Conn.
Hysol Div., 211 Franklin St., Olean, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Marbon, Box 68, Washington, W. Va.
Mereco Prod. Div., 538 Wellington Ave., Cranston, R.I.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Midsil Corp, Box 475, 27 Bland St., Emerson, N J
Mobay Chem. Co., Pkwy. W., Rte. 22 & 30, Pittsburgh, Pa.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
Morton Chemical Co., 110 N. Wacker Dr., Chicago, Ill.
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio
Packaged Resins Co., 130 Wood Rd., Braintree, Mass.
Pennsylvania Ind'l. Chem. Corp., 120 State St., Clairton, Pa.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Rawn Co., Inc., Box 9, Spooner, Wisc.
Rector Engrg. & Plastics Co., 318 Randolph Pl., N.E., Washington, D.C.
Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N.Y.
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Resinous Prods. Div., 300 Union Commerce Bldg., Cleveland, Ohio
Rogers Corp., Rogers, Conn.
Rosenberg Bros. & Co., 100 Landing Ave., Smithtown, N.Y.
Schenectady Chems., Inc., P.O. Box 1046, Schenectady, N.Y.
Smooth-On, Inc., 1000 Valley Rd., Gillette, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tra-Con, Inc., 55 North St., Medford, Mass.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
U.S. Polymeric, Inc., Canal & Ludlow Sts., Stamford, Conn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Plastics, Encapsulating—See Compounds, Encapsulating

Plastics, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Plated Wire Memory Systems—See Memory Systems

Plates, Instructional—See Nameplates

Plates, Name—See Nameplates

Plates, Silk Screen—See Nameplates

Plates, Switch Mounting

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 2002
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Plating Solutions

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
M & T Chemicals Inc., Rahway, N.J.
Mac Dermid, Inc., 526 Huntingdon Ave., Waterbury, Conn.
Matthey Bishop Inc., Malvern, Pa.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Nitine, Inc., Rte. 46, Clifton, N.J.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Shipley Co., Inc., 2300 Washington St., Newton, Mass.
Sifco Metachemical, 935 East 63rd St., Cleveland, Ohio
Technic, Inc., Box 965, Providence, R.I.

Players, Magnetic Tape—See Recorders, Magnetic Tape (Lab Type)

Pliers

Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Channellock, Inc., S. Main St., Meadville, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Milbar, 530 Washington St., Chagrin Falls, Ohio
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Utica Tool Co., Inc., Cameron Rd., Orangeburg, S.C.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City, N.Y.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Plotters, X-Y, & Accessories—See Recorders, X-Y

Plotting Boards—See Boards, Plotting

Plug Adapters

Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2472-2482,2484-2487,2489,2510,2511,2515-2519
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1853
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. ..... p 2537
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540

Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Barker Prods. Co., 344 Central St., Saugus, Mass.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
DonMar Prods., Inc., Box 10125, Denver, Colo.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Noel Mfg. Co. Inc., 1415 Blondell Ave., Bronx, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Sta-Tite Mfg. Co., 3300 Fern Valley Rd., Louisville, Ky.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.

Plug & Jack Sets

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. ..... p 2362
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Connector Corp., 6025 N. Keystone, Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2490,2491,2505-2511,2513-2519
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. ..... p 2537
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Carter Précision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morse, Frank W. Co., 354 Congress St., Boston, Mass.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Parker-Metal Goods Co., 85 Prescott St., Worcester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Telephone Comps., Inc., 9 Norfolk Dr., Northport, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Wald Sound, 11131 Dora St., Sun Valley, Calif.

Plug Caps & Shells

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. ..... p 2424
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2475-2477,2482,2492-2504
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2550
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Sta-Tite Mfg. Co., 3300 Fern Valley Rd., Louisville, Ky.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Plug-in Module Enclosures

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2492-2504
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
3M Co., 3M Center, St. Paul, Minn.

Plugboard Programming Systems—See Boards, Programming

Plugs, Electrical (All Types)

ADC Prods., 4900 W. 78th St., Minneapolis, Minn. ..... p 2363
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Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
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Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2540
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APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Audio Accessories, Inc., Gilsum, N.H.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Barker Prods. Co., 344 Central St., Saugus, Mass.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sta-Tite Mfg. Co., 3300 Fern Valley Rd., Louisville, Ky.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Plugs, Fused

Deutsch Co., Municipal Airport, Banning, Calif.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Pointers, Dial

Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
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Rogan Bros., Inc., 8031 N. Monticello Ave., Skokie, Ill. .... p 1532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Injection Plastic Corp., 8124-30 N. Ridgeway Ave., Skokie, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Smith, Judson A. Co., Boyertown, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Polarimeters

American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Epic, Inc., 150 Nassau St., New York, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Polyester Insulating Film—See Insulation Materials, Film

Porcelain—See Insulation Materials, Ceramic

Porosimeters

American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.

Posts, Binding

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
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Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass

Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
States Co., 19 New Park Ave., Hartford, Conn.
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Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.

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U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Potentiometers, Carbon Ceramic

Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
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CTS of Asheville, Inc., Mills Gap Rd., Skyland, N.C. ..... p 2797
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CTS of Brownsville, Inc., 1100 Roosevelt St., Brownsville, Tex. p 2797
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can. p 2797
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2797
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2797
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Potentiometers, Carbon Film

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2803
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Ceramic-Metal (Cermet)

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
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Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. ..... p 2787,2788
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
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CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2797
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Eagle Signal Div., 736 Federal St., Davenport, Iowa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Stackpole Comps. Co., Box 14466, Raleigh, N.C.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Mallory Controls Co., Box 327, Frankfort, Ind.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Precision Elctrn. Comps. Ltd., 19 Hafis Rd., Toronto, Ont., Can.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Conductive Plastic

Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ..... p 2782,2783
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. .... p 2786-2788
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass. p 2798,2799
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2802,2803
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Fairchild Controls, 225 Park Ave., Hicksville, N.Y. ..... p 2809
Markite Corp., 155 Waverly Pl., Dept. 301, New York, N.Y. p 2811
New England Instr. Co., 14 Kendall La., Natick, Mass. p 2813-2816
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal. ..... p 2820,2821
Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Hot Molded

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2801
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Precision Elctrn. Comps. Ltd., 19 Hafis Rd., Toronto, Ont., Can.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Lab Type

Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
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Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
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LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Brinkmann Instrs., Inc., Cantiague Rd., Westbury, N.Y.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Potentiometers, Metal Film

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2776,2777,2780,2781
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. ..... p 2787,2788
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash. p 2806
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2773
Weston Comps. Div., Archbald, Pa.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Metal, Glazed—See Potentiometers, Ceramic-Metal

Potentiometers, Motorized—See Potentiometers, Servo Mount

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Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2776-2781
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ..... p 2782,2784,2785
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. p 2786-2788,2791-2793
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CTS Corp, 905 N. West Blvd., Elkhart, Ind. ..... p 2797
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2797
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2804,2805
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Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal. ..... p 2807
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IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. ..... p 2822-2829
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Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.

Nytronics, Inc., 183 Commercial St., Watertown, Conn.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.

Potentiometers, Rheostat—See Rheostats

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Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2780,2781
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. .... p 2787-2789
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
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Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2802,2803
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Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
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Weston Comps. Div., Archbald, Pa.
Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Astro Elctrns., Inc., 1160 E. Ash, Fullerton, Calif.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Larson Aero Dev., Box 135, Concord, Calif.
Logan Elctm. Corp., 100 Mill St., Revere, Mass.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Voak Engrg. Co., Inc., 129 A St., Upland, Calif.
Voltronics, Inc., 7746 W. Addison St., Chicago, Ill.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Potentiometers, Trimmer, Carbon Ceramic

Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Potentiometers, Trimmer, Carbon Composition

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. p 2790,2792,2793
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CTS Corp, 905 N. West Blvd., Elkhart, Ind. .... p 2796
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2796
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. .... p 2796
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill.
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Mallory Controls Co., Box 327, Frankfort, Ind.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.

Potentiometers, Trimmer, Carbon Film

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Telefunken Sls. Corp., South St., Garden City, N.Y.

Potentiometers, Trimmer, Ceramic-Metal (Cermet)

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2776,2777
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ....p 2784,2785
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
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CTS Corp, 905 N. West Blvd., Elkhart, Ind. .... p 2796
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2796
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. .... p 2796
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. .... p 2805
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal. ....p 2820,2821
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Weston Comps. Div., Archbald, Pa. ....p 2832,2833
Precision Elctrn. Comps. Ltd., 19 Hafis Rd., Toronto, Ont., Can.

Potentiometers, Trimmer, Conductive Plastic

Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal. ....p 2820,2821
Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Potentiometers, Trimmer, Metal Film

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2776,2777
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y. p 2802,2803
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2804,2805
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash. p 2806
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. .... p 2822,2823,2826,2827
Nytronics, Inc., Industrial Rd., Kutztown, Pa .... p 2735
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
San Fernando Elec. Mfg. Co., 1501 First St., San Fernando, Cal.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal.
Techno-Comps. Corp., 7803 Lemona, Van Nuys, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2822,2823,2826,2827
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Weston Comps. Div., Archbald, Pa.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Potentiometers, Trimmer, Wirewound

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2778,2779
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. .... p 2790-2793
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Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Diplohmatic Div., 1211 E. Denny Way, Seattle, Wash.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.

Potentiometers, Wirewound

Amphenol Controls Div., 120 S. Main St., Janesville, Wisc. p 2778-2781
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif. ....p 2782,2783
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. p 2786-2788,2791-2793
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
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Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. .... p 2801
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. .... p 2701
CTS of Asheville, Inc., Mills Gap Rd., Skyland, N.C. .... p 2797
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CTS of Brownsville, Inc., 1100 Roosevelt St., Brownsville, Tex. p 2797
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can. p 2797
CTS Corp, 905 N. West Blvd., Elkhart, Ind. .... p 2797
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2797
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. .... p 2805
Daven, Div., Dept. EEM 70, Manchester, N.H.
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Fairchild Controls, 225 Park Ave., Hicksville, N.Y. .... p 2809
IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. .... p 2826-2829
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
New England Instr. Co., 14 Kendall La., Natick, Mass. p 2813-2816
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
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Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Astro Elctrns., Inc., 1160 E. Ash, Fullerton, Calif.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Duncan Elctrns., Inc., 2865 Fairview Rd., Costa Mesa, Cal.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Link Div., Binghamton, N.Y.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
Mallory Controls Co., Box 327, Frankfort, Ind.
Mel-Rain Corp., 3100 Roosevelt Ave., Indianapolis, Ind.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Voak Engrg. Co., Inc., 129 A St., Upland, Calif.
Voltronics, Inc., 7746 W. Addison St., Chicago, Ill.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Powders, Precious Metal

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Cerac, Inc., Box 597, Butler, Wisc.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Eastern Smelting & Refining Corp., 37-39 Bubier Terr., Lynn, Mass.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
United Refining & Smelting Co., 3700 N. Runge Ave., Franklin Park, Ill.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Power Outlet Boxes—See Boxes, Power Outlet

Power Supplies, AC Output-60 CPS

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930,941
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 971
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 961
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 964-969
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal. ..... p 970
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Instrs. Corp., Behlman Div., 3511 Midway Dr., San Diego, Cal. ..... p 1004
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a-1032e
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1041
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1046-1050
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ..... p 1443
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Frequency Control, Inc., Box 671, Austin, Tex.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. .... p 1066
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1062,1065
Honeywell, Box 5227, Denver, Colo.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill. .. p 1122
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1154
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Neutronic Corp., Box 625, St. Louis, Mo.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. p 1170,1392
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J. ..... p 1171
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
NWL, Inc., Box 455, Trenton, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal. ..... p 1186
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1220
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Superior Elec. Co., 1000 Middle St., Bristol, Conn. p 1230,2899,2900
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1265-1267
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ....p 1284,1285
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal. .... p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. p 1290,1291
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. p 1301,1302
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Associated Specialties Co., 1751 Main St., Orefield, Pa.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Components Corp., 106 Main St., Denville, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Data Royal Corp., 8014 Armour St., San Diego, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hobby & Brown Elctrn. Corp., 15 St. Marks Ave., Rockville Centre, N.Y.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Magnetics, Sandy Lake, Pa.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Riverbank Labs., Box 110, Geneva, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Task Corp., Box 3999, Anaheim, Calif.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

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K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
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Zaring Inds., Inc., Box 477, Carmel, Ind.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.

Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Components Corp., 106 Main St., Denville, N.J.
Data Royal Corp., 8014 Armour St., San Diego, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electric Machinery Mfg. Co., 800 Central Ave., Minneapolis, Minn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hope Elctrns., Box 773, Clifton, N.J.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
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Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
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Magnetics, Sandy Lake, Pa.
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Motor Generator Div., EE-61, Troy, Ohio
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
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Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
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Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
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Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
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Savant Engrg. Inc., 825 N. Second St., St. Charles, Mo.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
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Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
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Task Corp., Box 3999, Anaheim, Calif.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
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Kilovolt Corp., 238 High St., Hackensack, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
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AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armec Corp., 195 W. Hills Rd., Huntington Sta., N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
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Collins Radio Co., Dallas, Tex.
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Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Invertronics, Box 342, Pine Brook, N.J.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Luminator, Inc., Box 278, Plano, Tex.
Magnetics, Sandy Lake, Pa.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
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Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
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Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
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Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
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Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

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Acopian Corp., P.O. Box 585, Easton, Pa.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
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Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
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NWL, Inc., Box 455, Trenton, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.

Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
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Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
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Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
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Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
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Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
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Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
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Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
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Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
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A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
BECO Solid State Systems, Box 686, Salem, Va.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Chalco Engrg. Corp., 15126 S. Broadway, Gardena, Cal.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Digiac Corp., Ames Ct., Plainview, N.Y.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electro Specialties Corp., 370 Park Ave., Worcester, Mass.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
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Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
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Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
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Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
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Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Palomar Engrs., Box 455, Escondido, Cal.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.

Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
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Precision Apparatus, 1801 W. Belle Plaine, Chicago, Ill.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
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Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
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Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
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Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
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Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
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Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Weir Elctrns., Ltd., Durban Road, Bognor Regis, Sussex, England
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

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Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
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Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.

Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Mictron Div. KMS, Inc., Box 10126, Porter Rd., Sarasota, Fla.
Moran Instr. Corp., 170 E. Orange Grove Ave., Pasadena, Calif.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
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Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro Magnetic Prods., Box 708, Wabash, Ind.
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Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
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Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Moran Instr. Corp., 170 E. Orange Grove Ave., Pasadena, Calif.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Power Control Corp., Box 11432, Pittsburgh, Pa.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
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TRW Instrs., 139 Illinois St., El Segundo, Calif.
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Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

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High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Gauging & Control, 296 Westport Ave., Norwalk, Conn.
Ionic Electrostatic Corp., 111 Monroe St., Garfield, N.J.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.

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Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
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Amp Inc., Box 3608, Harrisburg, Pa.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
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Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
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Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
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Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NJE Corp., 20 Boright Ave., Kenilworth, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
NWL, Inc., Box 455, Trenton, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Singer Co., Finderne Ave., Somerville, N.J.
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Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
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Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
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Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Abtronics, Inc., Box 712, Livermore, Calif.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
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Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
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Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
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Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
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Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
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Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
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Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
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Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
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Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
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Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Heath Co., Benton Harbor, Mich.
Hope Elctrns., Box 773, Clifton, N.J.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Motor Generator Div., EE-61, Troy, Ohio
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Scintillonics, Inc., P.O. Box 701, Ft. Collins, Colo.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Strong Elec. Corp., Box 1003, Toledo, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
TDC Div., Box 365, Littleton, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

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Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. p 930,936-940
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal. p 923
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif. p 955
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Avtel Corp., 1130 E. Cypress St., Covina, Cal. p 969
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
CEA, 1221 S. Shamrock, Monrovia, Cal. p 972,992
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Circuit Power, Inc., 227 Main St., Portland, Conn.
Clifton, 5050 State Rd., Drexel Hills, Pa.
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. p 1039
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1800
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. p 1119
Kilovolt Corp., 238 High St., Hackensack, N.J.
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill. p 1122
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1126,1131
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NJE Corp., 20 Boright Ave., Kenilworth, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J. p 1172-1175
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal. p 1184,1185
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal. p 1157
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn. p 1231,1236-1238,1248-1251
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Viking Modules, Inc., 223 Cresent St., Waltham, Mass.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. p 1299
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Power Supplies, 400 CPS Input Only, D-C Output, Voltage Unregulated

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.

Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Circuit Power, Inc., 227 Main St., Portland, Conn.
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... **p 1987**
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Condenser Prods. Corp., Box 997, Brooksville, Fla.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal. ..... **p 1022**
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NJE Corp., 20 Boright Ave., Kenilworth, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
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Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Viking Modules, Inc., 223 Cresent St., Waltham, Mass.
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Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
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Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
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Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
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B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
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Collins Radio Co., Dallas, Tex.
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Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
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Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
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Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

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Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. **p 960,962**
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... **p 1366**
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Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. **p 1006**
Circuit Power, Inc., 227 Main St., Portland, Conn.
Clifton, 5050 State Rd., Drexel Hills, Pa.
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa. ..... **p 1017,1019**
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal. ..... **p 1020**
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J. .... **p 1042-1044**
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. **p 1056,1057**
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... **p 682**
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. .... **p 1067**
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J. **p 1071**
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. **p 714**
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... **p 1078**
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio. ... **p 725**
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. **p 1081,1089,1091,1098,1099,1101,1104**
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... **p 1120,1121**
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill. .. **p 1122**
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. **p 1151-1153**
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. **p 1163,1165**
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Neutronic Corp., Box 625, St. Louis, Mo.
NJE Corp., 20 Boright Ave., Kenilworth, N.J. ..... **p 1166,1169**
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. ... **p 1170**
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. **p 1189,1190**
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. **p 1189,1190**
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Power/Mate Corp., 514 S. River St., Hackensack, N.J. .... **p 1200**
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
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Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
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Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerospace Avionics, Inc., 1500 Ocean Ave., Bohemia, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Firing Circuits Div., Muller Ave, Norwalk, Conn
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gas Analysis Sys., Inc., P.O. Box 146, Basking Ridge, N.J.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Ideal Elec. & Mfg. Co., E. First & Oak Sts., Mansfield, Ohio
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
LP Assocs., Inc., 11830 W. Pico Blvd., Los Angeles, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Motor Generator Div., EE-61, Troy, Ohio

Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Scintillonics, Inc., P.O. Box 701, Ft. Collins, Colo.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Universal Elctrns. Co., 1720 22nd St., Santa Monica, Calif.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.

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Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
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Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
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Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Macarr, Inc., 166 National Rd., Edison, N.J.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
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Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barden Co., 2217 Purdue Ave., Los Angeles, Cal.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Fairchild Controls, 423 National Ave., Mountain View, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Palomar Engrs., Box 455, Escondido, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Elctrns. Co., 1720 22nd St., Santa Monica, Calif.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

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Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930,944-947
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
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Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
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Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal. p 1010,1011
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Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
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Macarr, Inc., 166 National Rd., Edison, N.J.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
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Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
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Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
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Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
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Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
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Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
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Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
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Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Powercube Corp, 214 Calvary St., Waltham, Mass.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
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Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
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Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Ther Elec. & Mach. Works, 17 S. Jefferson St., Chicago, Ill.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Power Supplies, 28 VDC Input, Up To 10,000 VDC Output, Voltage Regulated

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930,944,945,947
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal. ..... p 952
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 956,957
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 962
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Computer Power Sys., Inc., 722 E. Evelyn Ave., Sunnyvale, Calif.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 1119
Kilovolt Corp., 238 High St., Hackensack, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Sorensen Oper., Richards Ave., Norwalk, Conn.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1227,1229
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1256,1257
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn. ..... p 1264
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. p 1292,1293
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro Magnetic Prods., Box 708, Wabash, Ind.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Power Supplies, 28 VDC Input, Over 10,000 VDC Output, Voltage Regulated

Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal. ..... p 952
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 962
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal. p 1212
Sorensen Oper., Richards Ave., Norwalk, Conn.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1227,1229
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. ..... p 1292
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Introl Corp., 5555 W. 78th St., Minneapolis, Minn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
TDC Div., Box 365, Littleton, Mass.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wesco Elec. Co., Inc., 27 Olive St., Greenfield, Mass.

Power Supplies, 28 VDC Input, D-C Output, Unregulated

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal. ..... p 952
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Circuit Power, Inc., 227 Main St., Portland, Conn.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal. p 1010,1011
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Faratron Corp., 290 Lodi St., Hackensack, N.J.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Macarr, Inc., 166 National Rd., Edison, N.J.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal.
Special Prods., 9001 Fullbright Ave., Chatsworth, Cal.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1227,1229
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. ..... p 1292
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dyna Technology Inc., 2201 East 7th St, Sioux City, Iowa
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hope Elctrns., Box 773, Clifton, N.J.
Horlick, William I. Co., Inc., 266 Summer St., Boston, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Powercube Corp, 214 Calvary St., Waltham, Mass.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scott Electrns. Labs., P.O. Box 8474, Universal City, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Solidstate Controls, Inc., 600 Oakland Park Ave., Columbus, Ohio
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.

Power Supplies, Arc Lamp

Amp Inc., 155 Park St., Elizabethtown, Pa.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006,1007
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a-1032c
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1100
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1120
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
NWL, Inc., Box 455, Trenton, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y..... p 1190
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal.p 1190
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 1287
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
LP Assocs., Inc., 11830 W. Pico Blvd., Los Angeles, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Mutron Corp., 646 Summer St, Brockton, Mass.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Xenon Corp., 39 Commercial St., Medford, Mass.

Power Supplies, Bi-Polar

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
Acopian Corp., P.O. Box 585, Easton, Pa.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
CEA, 1221 S. Shamrock, Monrovia, Cal. ..... p 972
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1012
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. .....p 1081,1094
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J. p 1172-1175
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Power/Mate Corp., 514 S. River St., Hackensack, N.J. p 1192,1194-1196,1198,1199
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn. p 1231,1236,1240,1242,1244,1248,1250,1254
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 1286,1287
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Components Corp., 106 Main St., Denville, N.J.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dial Prods. Co., 19-21 Cottage St., Bayonne, N.J.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
Joliet Control Corp., Box 751, Joliet, Ill.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Systron-Donner Corp., One Systron Dr., Concord, Cal.

Power Supplies, CRT

Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal. ..... p 952
Amp Inc., 155 Park St., Elizabethtown, Pa. .....p 928,929
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 954
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 962
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Computer Power Sys., Inc., 722 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1015
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Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
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Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal.p 1190
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Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1288
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. p 1292,1293
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago, Ill.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Gencom Div., 80 Express St., Plainview, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.

Power Supplies, D-C Input, A-C Output

—See Inverters D-C To A-C, D-C To D-C

Power Supplies, D-C Welding

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.p 1006
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Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 1286
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Motor Generator Div., EE-61, Troy, Ohio
Packer, B. L., Co., Inc., 5-05 Burns Ave., Hicksville, N.Y.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Power Supplies, Electroplating Equipment

Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 962
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
CML, Inc., 166 National Rd., Edison, N.J.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. .... p 1066
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
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Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y..... p 1190
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Power/Mate Corp., 514 S. River St., Hackensack, N.J.
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
M & T Chemicals Inc., Rahway, N.J.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Westinghouse Elec. Corp., Buffalo, N. Y.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Power Supplies, Energy Storage

Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 928
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Avtel Corp., 1130 E. Cypress St., Covina, Cal. .....p 964,969
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1012
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.

Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1100
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1120
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Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
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Sorensen Oper., Richards Ave., Norwalk, Conn.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. ..... p 1228
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Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 1286
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Abtronics, Inc., Box 712, Livermore, Calif.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burmac Elctrns., 80 Montauk Hwy., Lindenhurst, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Power Applications, Inc., Box 305, Bayside, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.

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Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 930
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal. p 922,924,925
Acopian Corp., P.O. Box 585, Easton, Pa. ..... p 950,951
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amp Inc., 155 Park St., Elizabethtown, Pa.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 953
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif. p 954,956,958,959
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 960
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
CEA, 1221 S. Shamrock, Monrovia, Cal. ..... p 972
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
Circuit Power, Inc., 227 Main St., Portland, Conn. ..... p 1009
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 559
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa. ..... p 1019
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1354
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn. p 1026,1030
E-Tronics, 5901 Noble Ave., Van Nuys, Cal. ..... p 1035
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1039,1040
Electrostatics, Inc., 7969 Engineer Rd., San Diego, Cal. .. p 1045
Faratron Corp., 290 Lodi St., Hackensack, N.J. ..... p 1054,1055
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. .... p 1800
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. ..... p 1078
Intronics, Inc., 57 Chapel St., Newton, Mass.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1087,1106
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1137,1138,1140,1148
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1162
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1170
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J. ..... p 1172
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. ..... p 1191
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1191
Power/Mate Corp., 514 S. River St., Hackensack, N.J. .... p 1196
Powertec, 9168 De Soto Ave., Chatsworth, Cal. p 1177,1179,1181
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Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1217
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal. ..... p 1225
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1260
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn. ..... p 1264
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y. .. p 1262
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y. p 1278
Varadyne Power Sys., 14943 Califa St., Van Nuys, Cal. .... p 1281
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Viking Modules, Inc., 223 Cresent St., Waltham, Mass. .... p 1295
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. p 1297,1301
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
BECO Solid State Systems, Box 686, Salem, Va.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Magnetics, Sandy Lake, Pa.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Savant Engrg. Inc., 825 N. Second St., St. Charles, Mo.
Scintillonics, Inc., P.O. Box 701, Ft. Collins, Colo.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Telepacific Elctrns. Co., Inc., 3012 S. Hallady St., Santa Ana, Cal.
Universal Elctrns. Co., 1720 22nd St., Santa Monica, Calif.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Power Supplies, Klystron-Also See Power Supplies By Output Voltage Range

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
Circuit Power, Inc., 227 Main St., Portland, Conn.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1040
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 1119
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Narda Microwave Corp., Plainview, N.Y. ..... p 886
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. ..... p 1190
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1190
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1217
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burmac Elctrns., 80 Montauk Hwy., Lindenhurst, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.
TRG Prods., 400 Border St., E. Boston, Mass.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.

Power Supplies, Lab, Multiple Output

Acopian Corp., P.O. Box 585, Easton, Pa. ..... p 950,951
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 928
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 955
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal. p 960
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal. ..... p 970
CEA, 1221 S. Shamrock, Monrovia, Cal.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
Circuit Power, Inc., 227 Main St., Portland, Conn.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1013
Deltron, Inc., Wissahickon Ave., N. Wales, Pa. ..... p 1019
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal. ..... p 1023
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. .... p 1066
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Magnetics, Sandy Lake, Pa.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Savant Engrg. Inc., 825 N. Second St., St. Charles, Mo.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Telepacific Elctrns. Co., Inc., 3012 S. Hallady St., Santa Ana, Cal.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Universal Elctrns. Co., 1720 22nd St., Santa Monica, Calif.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Yardney Elec. Corp., 40-52 Leonard St., New York, N.Y.

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Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
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Kilovolt Corp., 238 High St., Hackensack, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
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Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. ..... p 1290
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Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Elctrn. Enterprises, 775 S. Madison Ave., Pasadena, Calif.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Grafix, inc., Box 3296, Albuquerque, N.M.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Power Supplies, Operational

Amp Inc., 155 Park St., Elizabethtown, Pa.
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Aritech Corp., 130 Lincoln St., Brighton, Mass.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 954
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
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Nuclear Corp. America, 2 Richwood Pl., Denville, N.J..... p 1172
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Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1189,1190
Power/Mate Corp., 514 S. River St., Hackensack, N.J. p 1192,1198,1199
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Sorensen Oper., Richards Ave., Norwalk, Conn. .....p 1214,2215
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1288
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Viking Modules, Inc., 223 Cresent St., Waltham, Mass. .... p 1295
Abtronics, Inc., Box 712, Livermore, Calif.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
GPS Instr. Co., Inc., 14 Burr St, Framingham, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.

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Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 928
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Arnold Magnetics Corp., Box K, Culver City, Calif.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
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Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1012
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal. p 1070
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TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Thunder Int'l. Corp., 64 Tuttle Rd., Middletown, Conn.
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Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
BECO Solid State Systems, Box 686, Salem, Va.
Bendix Corp., 1975 Green Rd., Ann Arbor, Mich.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Celco, 70 Constantine Dr., Mahwah, N.J.
Chalco Engrg. Corp., 15126 S. Broadway, Gardena, Cal.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
Display Power Sys. Corp., Box 575, Carmel, N.Y.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Gencom Div., 80 Express St., Plainview, N.Y.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Johnston Labs., inc., 3 Industry La, Cockeysville, Md.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Malaker Corp., W. Main St., High Bridge, N.J.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.

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Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1162-1165
Neutronic Corp., Box 625, St. Louis, Mo.
NJE Corp., 20 Boright Ave., Kenilworth, N.J. p 1166,1168,1169
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Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
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Abtronics, Inc., Box 712, Livermore, Calif.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inet-Power, 711 W. Knox St., Gardena, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Telepacific Elctrns. Co., Inc., 3012 S. Hallady St., Santa Ana, Cal.
Universal Elctrns. Co., 1720 22nd St., Santa Monica, Calif.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Weir Elctrns., Ltd., Durban Road, Bognor Regis, Sussex, England

Power Supplies, Programmable, High-Speed

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
Amp Inc., 155 Park St., Elizabethtown, Pa. p 928
Circuit Power, Inc., 227 Main St., Portland, Conn.
Computer Power Sys., Inc., 722 E. Evelyn Ave., Sunnyvale, Calif.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa.
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 649
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1089,1098,1102,1103
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1163
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn. p 1214,2215
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y. p 1263
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y.
Viking Modules, Inc., 223 Cresent St., Waltham, Mass.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.

Power Supplies, R-F

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. p 863
Condenser Prods. Corp., Box 997, Brooksville, Fla.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. p 1119
Kilovolt Corp., 238 High St., Hackensack, N.J. p 1120
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Powertec, 9168 De Soto Ave., Chatsworth, Cal. p 1186
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y. p 1226
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. p 1290
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Scintillonics, Inc., P.O. Box 701, Ft. Collins, Colo.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Walden Elctrns. Corp., 223 Crescent St., Waltham, Mass.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Power Supplies, Readout & Display

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
Acopian Corp., P.O. Box 585, Easton, Pa.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. p 1492
Arnold Magnetics Corp., Box K, Culver City, Calif. p 955,958
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. p 553
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1013
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 1059
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Instrument Displays, Inc., 18 Granite St., Haverhill, Mass. p 1520
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal. p 1078
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio p 725
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
North Elec. Co., 553 S. Market St., Galion, Ohio
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Power/Mate Corp., 514 S. River St., Hackensack, N.J. p 1196
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn. p 1217
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Venus Scientific, Inc., 399 Smith St., Farmingdale, N.Y. p 1292
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. p 1301
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Burroughs Corp., Box 1226, Plainfield, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Celco, 70 Constantine Dr., Mahwah, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Power Supplies, Strain Gauge & Transducer

Acopian Corp., P.O. Box 585, Easton, Pa. p 950,951
Arnold Magnetics Corp., Box K, Culver City, Calif. p 955
Avtel Corp., 1130 E. Cypress St., Covina, Cal. p 969
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. p 1366
CEA, 1221 S. Shamrock, Monrovia, Cal. p 972
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal. p 1010,1011
Deltron, Inc., Wissahickon Ave., N. Wales, Pa. p 1016
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal. p 1070
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
Honeywell, Box 5227, Denver, Colo.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y. p 1075
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1087,1107
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1137
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. p 1191
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1191
Power/Mate Corp., 514 S. River St., Hackensack, N.J. p 1192,1196
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn. p 1205
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal. p 1224
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y. p 1263
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. p 1290
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
B & F Instrs., Inc., Cornwells Hgts., Pa.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynisco Div., 20 S. West Pk., Westwood, Mass.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.

Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
MB Elctrns., Box 1825, New Haven, Conn.
Micro-Strain, Inc., Spring City, Pa.
Modular Power, Inc., 15302 Oak Canyon Rd., Poway, Cal.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Scintillonics, Inc., P.O. Box 701, Ft. Collins, Colo.
Semiconductor Circuits Inc., 163 Merrimac St., Woburn, Mass.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Validyne Engrg. Corp., 18819 Napa St., Northridge, Cal.

Power Supplies, Switch-Over Automatic (Self-Contained Battery)

Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 964,965,969
Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex. ..... p 1160
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
Power Inc., 12809 Eagle Ridge Dr., Burnsville, Minn.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1269
Unitron, 1624 N. First St., Box 1331, Garland, Tex. ..... p 1282
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Allis Louis Co., 6702 Industrial Loop, Greendale, Wisc.
Armour Elctrns. Corp., 51 Jackson St., Worcester, Mass.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Magnetics, Sandy Lake, Pa.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif

Power Supplies, Thermoelectric

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.

Power Supplies, TWT

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 928
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 954
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Crestronics, 744 Rocky Loop, Box "S", Crestline, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1040
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal. p 1070
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y. ..... p 1075
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 1119
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1097
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1120
Macarr, Inc., 166 National Rd., Edison, N.J.
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1162
Narda Microwave Corp., Plainview, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. ..... p 1190
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1190
Power/Mate Corp., 514 S. River St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1217
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 1287
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vector Engrg., Inc., 58 Brown Ave., Springfield, N.J. ..... p 1290
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Berkey Tech., 25-15 50th St., Woodside, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Northeast Scientific Corp., 30 Wetherbee St., Acton, Mass.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Traveling Wave Tube Div., 611 Hansen Way, Palo Alto, Cal.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Power Supplies, Xenon Lamp—See Power Supplies, Arc Lamp

Preamplifiers, Audio

Allison Labs., Inc., Box 9849, Austin, Tex. ..... p 1318
Arvee Engrg. Co., Box 3759, Torrance, Calif. ..... p 1322
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Daven, Div., Dept. EEM 70, Manchester, N.H.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y. ..... p 748
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal. ... p 1343
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Auricord, 35-41 29th St., Long Island City, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mallory, P.R. & Co. Inc., Integrated Circuit Dept., 3029 E. Washington St., Indianapolis, Ind.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Preamplifiers, D-C

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
Arvee Engrg. Co., Box 3759, Torrance, Calif.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Magnetics, Inc., Box 391, Butler, Pa.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Preston Scientific Inc., 805 E. Cerritos Ave., Anaheim, Calif. p 1348
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
B & W Elctrn. Resch. Labs., 10807 Royal Pk., Dallas, Tex.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
EMR Div., Box 223, Princeton, N.J.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Magnetics, Sandy Lake, Pa.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Supplies Div., Box 312, Encino, Calif.
Optical Elctrns., Inc., Box 11140, Tucson, Ariz.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Preamplifiers, I-F

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Arvee Engrg. Co., Box 3759, Torrance, Calif.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 903
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hope Elctrns., Box 773, Clifton, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Preamplifiers, Meter

California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Honeywell, Box 5227, Denver, Colo.

Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Computer Dynamics, Inc., 179 Water St., Torrington, Conn.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.

Preamplifiers, Microphone

Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1336
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Opamp Labs., 172 S. Alta Vista Blvd., Los Angeles, Cal.. p 1343
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Preamplifiers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 901,903
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Semi/Dyne Elctrns. Corp., 44 Bennington Ave., Freeport, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Preamplifiers, Oscilloscope Plug-In—
See Oscilloscope Preamplifier Plug-Ins

Preamplifiers, Receiver

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Arvee Engrg. Co., Box 3759, Torrance, Calif.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1328
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Honeywell, Box 5227, Denver, Colo.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Preamplifiers, R-F

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arvee Engrg. Co., Box 3759, Torrance, Calif.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1328
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Honeywell, Box 5227, Denver, Colo.
Keltec Florida, Drawer 1348, Ft. Walton Bch., Fla. ..... p 880,881
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 901,903
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Arenberg Ultrasonic Lab., Inc., 94 Green St., Jamaica Plain, Mass.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Cushman Elctrns., Inc., 166 San Lazaro Ave., Sunnyvale, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Entron, Inc., 2141 Industrial Pkwy., Silver Spring, Md.
Finney Co., 34 W. Interstate St., Bedford, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hope Elctrns., Box 773, Clifton, N.J.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Locus, Inc, 906 West College Ave., State College, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
MITEQ, Inc., 100 Ricefield La., Hauppauge, N.Y.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rust Corp., 168 Tremont St., Everett, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Preamplifiers, Servo

Behlman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.

Preamplifiers, Telemetry

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
C-COR Elctrns., Inc., 60 Decibel Rd., State College, Pa. .. p 1329
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 903
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Defense Elctrns., Inc., Rockville, Md.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
EMR Div., Box 223, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Preamplifiers, Transducer Signal-Also See Signal Conditioners

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Arvee Engrg. Co., Box 3759, Torrance, Calif.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Elctrn. Comps. Div., Trevose, Pa.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo.

Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Magnetics, Inc., Box 391, Butler, Pa.
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal. .... p 1342
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
United Detector Technology, 1732 21st St., Santa Monica, Cal. p 1706
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
C.G.S. Scientific Corp., Ind'l. Blvd., Southampton, Pa.
Chesapeake Instr. Corp., Shadyside, Md.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynalex, Inc., 885 Front St., Burbank, Cal.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Geo Space, 5803 Glenmont, Houston, Tex.
Glentek, Inc., 1557 7th St., Santa Monica, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Massa Div., 280 Lincoln St., Hingham, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Neff Instr. Corp., 1088 E. Hamilton Rd., Duarte, Calif.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Odetics, Inc., 1845 S. Manchester, Anaheim, Cal.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Tennelec, Inc., Box D, Oak Ridge, Tenn.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.

Preamplifiers, Transistor

Arvee Engrg. Co., Box 3759, Torrance, Calif.
Behiman Engrg. Corp., Box 4518, 427 N. Nopal St., Santa Barbara, Cal.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Elctrn. Comps. Div., Trevose, Pa.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. ..... p 1337
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y. p 1339
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Auricord, 35-41 29th St., Long Island City, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Koch Inds., 401 S. Dale St., Anaheim, Cal.
Locus, Inc, 906 West College Ave., State College, Pa.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Perry Amplifier, 138 Fuller St., Brookline, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A-Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Universal Audio Div., 11922 Valerio St., N. Hollywood, Calif.

Prebonding Etchants—See Chemicals, Etching

Predetection Equipment, Recorders(Playbacks

Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal. .... p 1310
Auricord, 35-41 29th St., Long Island City, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Preforms, Precious Metal -Also See Solder Preforms

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Handy & Harman, 850 Third Ave., New York, N.Y.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Preparation Systems, Paper-Tape

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Ohr-Tronics, Box 406, King of Prussia, Pa.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Prescalers

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Nuclear Supplies Div., Box 312, Encino, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Preselector-Mixers

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Olektron Corp., Box 248, Dudley, Mass.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Preselectors

Aritech Corp., 130 Lincoln St., Brighton, Mass.
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill. p 885
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microphase Corp., 35 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Peninsula Microwave Labs., 855 Maude Ave., Mountain View, Calif.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.

Pressure Sensitive Paint—See Coatings, Transducer Forming

Pressure Vessels—See Chambers, Pressure

Pressure Indicators—See Gauges, Pressure

Pressurization Equipment, Cable—See Cable Pressurization Equipment

Pressurization Systems, Equipment Cabinet

Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Superior Continental Corp., Box 489, Hickory, N.C.
Tem-Pres Research Div., 1401 S. Atherton St., State College, Pa.

Pressurization Units—See Chambers, Pressure

Primers, Bonding & Potting

Biggs Co., Box 1740, Santa Monica, Cal.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fuller-O'Brien Corp., 1342 Willow Rd., Menlo Park, Calif.
General Elec. Co., Waterford, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.

Printed Circuit Boards, Additive Process (Without Components)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. ..... p 1355
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1356
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Agard Elctrns. Corp., 40 Nassau Terminal Rd., New Hyde Park, N.Y.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Beckman Instrs., Inc., 167 W. Poplar Ave., Porterville, Cal.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Conductorlab, Inc., Main St., Groton, Mass.
Defiance Circuit Corp., 12 Shepard St., Lawrence, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Electrol Co., Inc., 771 Spring La., York, Pa.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.

Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
North American Printed Circuit Div., Box 145, Stafford, Conn.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA, Marne Hwy., Moorestown, N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rogers Corp., Rogers, Conn.
Sanders Assocs., Inc., Flexprint Div., Grenier Field, Manchester, N.H.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
3M Co., 3M Center, St. Paul, Minn.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Printed Circuit Boards, Etched Process (Without Components)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
AEL, Inc., Box 552, Lansdale, Pa.
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. ..... p 1355
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1349-1352
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
EIP, Inc., 2353 De La Cruz Blvd., Santa Clara, Cal.
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
Gridcraft, 14520 Lima Rd., R.R. #1, Ft. Wayne, Ind. ..... p 1357
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1356
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y. .... p 2162
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Agard Elctrns. Corp., 40 Nassau Terminal Rd., New Hyde Park, N.Y.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Ampex Corp., 401 Broadway, Redwood City, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Beckman Instrs., Inc., 167 W. Poplar Ave., Porterville, Cal.
BECO Solid State Systems, Box 686, Salem, Va.
Bowers Elctrn. Labs., Inc., 3128 Marion Ave., Evansville, Ind.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Bureau Engraving, Inc., 219 N. Second St., Minneapolis, Minn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Centerline Specialties, Box 656, Boulder, Colo.
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Circuits, Inc., 59 Deming Rd., Berlin, Conn.
Cleveland Metal Specialties Co., 15516 Industrial Pkwy., Cleveland, Ohio
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conductorlab, Inc., Main St., Groton, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Data Corp., 7800 Computer Ave., Minneapolis, Minn.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Custom Engrg. & Test Co., Inc., 3160-46 Ave., N., St. Petersburg, Fla.
Defiance Circuit Corp., 12 Shepard St., Lawrence, Mass.
Digiac Corp., Ames Ct., Plainview, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Eagle-Picher Inds., Inc., "C" & Porter Sts., Joplin, Mo.
Eder Inds., Inc., 4864 S. Tenth St., Milwaukee, Wisc.
E.D.I. Inc., Box 66, Cairo, Ill.
EDP Corp., Box 6485, Orlando, Fla.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Electro Chemical Engraving Co., 1100 Brook Ave, Bronx, N.Y.
Electro-Etch Circuits, Inc., 7112 S. Victoria Ave., Los Angeles, Cal.
Electrol Co., Inc., 771 Spring La., York, Pa.
Elctrn. Enterprises, 775 S. Madison Ave., Pasadena, Calif.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Golden Technology, Inc., 3017 Santa Rosa Ave., Santa Rosa, Calif.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hartzell Elctrns., Inc., 5200 West 74th St., Minneapolis, Minn.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Honeywell, Inc., Peterborough, N.H.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
J-Tron, 10700 "G" W. Katella, Anaheim, Cal.
Joliet Control Corp., Box 751, Joliet, Ill.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Kaiser CATV, Box 9728, Phoenix, Ariz
Keil Engrg. Prods. Co., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Komak, Inc., 9th & Ontario Sts., Philadelphia, Pa.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lek-Tröl, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Micro-Strain, Inc., Spring City, Pa.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Midco, Inc., Box 5433, Trenton, N.J.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
North American Printed Circuit Div., Box 145, Stafford, Conn.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Nutronics Mfg. Co., 1703 Peoria Rd., Springfield, Ill.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philway Prods., Inc., 701 Virginia Ave., Ashland, Ohio
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Robintech, Inc., Commerce Rd., Vestal, N.Y.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sanders Assocs., Inc., Flexprint Prod. Div., Grenier Field, Manchester, N.H.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
Techron Corp., 20 Simmons St., Boston, Mass.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Advanced Circuit Board Dept., Box 5303, M.S. 971, Dallas, Tex.
3M Co., 3M Center, St. Paul, Minn.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Trans/Circuits, Inc., 3509 Carlyn Spring Rd, Falls Church, Va.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-Tronics Lab., Inc., Box 638, Euless, Tex.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Western Technology, Inc., 220 W. Central, Santa Ana, Cal.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Printed Circuit Etchants

Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. ..... p 1355
Hunt, Philip A. Chemical Corp., Palisades Pk., N.J. ....p 2326,2327
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Conversion Chem. Corp., 210 E. Main St., Rockville, Conn.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Lea-Ronal, Inc., 272 Buffalo Ave., Freeport, N.Y.
Mac Dermid, Inc., 526 Huntingdon Ave., Waterbury, Conn.
Nitine, Inc., Rte. 46, Clifton, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Shipley Co., Inc., 2300 Washington St., Newton, Mass.
Techinques, Inc., 235 Jackson St., Englewood, N.J.

Printed Circuit Screens

Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. ..... p 1355
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Kepro Cir. Sys., Inc., 3630 Scarlet Oak Blvd., St. Louis, Mo.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mech-Tronic Equip. Co., Box 510, Silver Spring, Md.
Naz-Dar Int'l., 1087 N. North Branch St., Chicago, Ill.
Podgor, Joseph Co., Inc., 7895 Browning Rd., Airport Cir. Ind'l. Pk., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Techinques, Inc., 235 Jackson St., Englewood, N.J.
Tyler, W.S. Co., 8200 Tyler Blvd., Mentor, Ohio

Printed Circuits (With Components)—
See Cards, Linear Function

Printed Circuits, Multilayer

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal. ..... p 1355
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Agard Elctrns. Corp., 40 Nassau Terminal Rd., New Hyde Park, N.Y.
Allegri-Tech, Inc., 141 River Rd., Nutley, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Bureau Engraving, Inc., 219 N. Second St., Minneapolis, Minn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Chemical & Aerospace Prods., Inc., 231 E. Lomita, Wilmington, Calif.
Circuits, Inc., 59 Deming Rd., Berlin, Conn.
Collins Radio Co., Newport Beach, Calif.
Conductorlab, Inc., Main St., Groton, Mass.
Control Data Corp., 7800 Computer Ave., Minneapolis, Minn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electralab Div./Tyco, Box 548, 1105 Second St., Encinitas, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
General Comps., Inc., Box 10248, St. Petersburg, Fla.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hartzell Elctrns., Inc., 5200 West 74th St., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Lockheed Elctrns. Co., 6201 E. Randolph, Los Angeles, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Midwest Circuits, Inc., 3273 Airway Dr., Santa Rosa, Cal.
North American Printed Circuit Div., Box 145, Stafford, Conn.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philway Prods., Inc., 701 Virginia Ave., Ashland, Ohio
RCA, Marne Hwy., Moorestown, N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rogers Corp., Rogers, Conn.
Safeway Heat Elements, Inc., 440 Middlefield St., Middletown, Conn.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sanders Assocs., Inc., Flexprint Div., Grenier Field, Manchester, N.H.
Sanders Assocs., Inc., Flexprint Prod. Div., Grenier Field, Manchester, N.H.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Superior Circuits, 2821 Ladybird La, Dallas, Tex
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Texas Instruments, Inc., Advanced Circuit Board Dept., Box 5303, M.S. 971, Dallas, Tex.
Trans/Circuits, Inc., 3509 Carlyn Spring Rd, Falls Church, Va.

Welwyn Elec., Ltd., Bedlington, Northumberland, England
Western Technology, Inc., 220 W. Central, Santa Ana, Cal.

Printers, Dial, Meter Scale

A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Detecto Scales, Inc., 540 Park Ave., Brooklyn, N.Y.
Eastern Marking Mach. Corp., 30 Alabama Ave., Island Pk., N.Y.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Podgor, Joseph E. Co., Inc., Box 1714, Phila., Pa.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.

Printers, Digital

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 631
Datatotal, Inc., 31 Park Rd., New Shrewsbury, N.J..... p 557
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa. ..... p 564
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Electro-Numerics Corp., 2191 Ronald St., Santa Clara, Cal. p 664,665
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 842
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 699-701
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Practical Automation, Inc., Trap Falls Rd., Shelton, Conn. p 1394
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Collins Radio Co., Dallas, Tex.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Datamark, Inc., Cantiague Rd., Westbury, N.Y.
Detecto Scales, Inc., 540 Park Ave., Brooklyn, N.Y.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Fabri-Tek Instrs., Inc., 5225 Verona Rd., Madison, Wisc.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
ITT General Controls, 1838 Flower St., Glendale, Cal.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mohawk Data Science Corp., Third & Allendale Rds., King of Prussia, Pa.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Odec Computer Sys., Inc., 871 Waterman Ave., E. Providence, R.I.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Pacific Photometric Instrs., 3024 Ashby Ave., Berkeley, Calif.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
RCA, Marne Hwy., Moorestown, N.J.
Royco Instrs., Inc., 141 Jefferson Dr., Menlo Pk., Cal.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Shepard Div., 131st St. & Jamaica Ave., Richmond Hill, N.Y.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Systron-Donner Concord Instr. Div., Data Prods., 888 Galindo St., Concord, Cal.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Varian, 611 Hansen Way, Palo Alto, Cal.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.

Printers, High Speed—See Printers, Digital

Printers, Keyboard

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Datamark, Inc., Cantiague Rd., Westbury, N.Y.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
National Cash Register Co., Main & K Sts., Dayton, Ohio
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.

Printers, Line—See Printers, Digital

Printers, Microfilm To Paper

Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Traid Corp., 777 Flower St., Glendale, Calif.

Printers, Tape-Listing—See Printers, Digital

Printing, Dry Transfer—See Kits, Marking (Dial Instrument)

Prisms

Bache, Semon & Co., 636 Greenwich St., New York, N.Y.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Electro-Optical Div., 347 King St., Northampton, Mass.
Electro-Optical Sys., Pasadena, Calif.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Industrial Optics Corp., 377 Fifth St., Newark, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Lasermetrics, Inc., 19 Legion Pl., Rochelle Park, N.J.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Photo Tech. Prods., Inc., 623 Stewart Ave., Garden City, N.Y.
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Sawyer Resch. Prods., Inc., 35400 Lakeland Blvd., Eastlake, Ohio
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Probability Distribution Analyzers—See Analyzers, Probability Density

Probes, Crystal

Allison Labs., Inc., Box 9849, Austin, Tex.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Narda Microwave Corp., Plainview, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Alessi Inds., 418 Main St., El Segundo, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Nuclear Supplies Div., Box 312, Encino, Calif.
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Probes, Hall

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y.
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio p 619,2120
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Empire Sci. Corp., Ind'l. Instr. Div., 1055 Stewart Ave., Garden City, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Probes, High-Voltage

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Computer Power Sys., Inc., 722 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1015
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. ..... p 710
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1809
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal... p 2512
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 787
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Probes, Microwave

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Astrolab Inc., 4 Mc Candless St, Linden, N J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Probes, Oscilloscope—See Oscilloscope Probes

Probes, R-F

Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 623
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Honeywell, Box 5227, Denver, Colo.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.

Probes, Temperature-Also See Thermocouples; Transducers

Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 2118
Reico Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Beacon Elctrns., Inc., 121 Stanley Ave., Bellmawr, N.J.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., 5301 Edina Industrial Blvd., Minneapolis, Minn.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
Conklin Instr. Corp., Main St., Pleasant Valley, N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Electronic Dev. Labs., Inc., 19 Newtown Rd., Plainview, N.Y.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fenwal, Inc., Main St., Ashland, Mass.
General Lab. Assocs., Norwich, N.Y.
Gow-Mac Instr. Co., 100 Kings Rd., Madison, N.J.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Malaker Corp., W. Main St., High Bridge, N.J.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Marshall Instrs., Inc., 14203 Bessemer St., Van Nuys, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
RDF Corp., 23 Elm Ave., Hudson, N.H.
Riverbank Labs., Box 110, Geneva, Ill.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
T & T Controls Co., Inc., Box 171, Media, Pa.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
United Elec. Controls Co., 85A School St., Watertown, Mass.
United Sensor & Control Co., 85 School St., Watertown, Mass.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Versitherm, Inc., 51 Toledo St., Farmingdale, N.Y.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
VirTis Co., Inc., Rte. 208, Gardiner, N.Y.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Probes, Test Lead

Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2510,2511
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Desco Mfg. Co., 1530 Flower St., Glendale, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
E-Z-Hook Test Prods., Box 105, Covington, Ky.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Horex Elctrns., Inc., 1729 21st St., Santa Monica, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Ostby & Barton Co., Box 6267, Providence, R.I.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Shallcross, E. Preston St., Selma, N.C.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Probes, Ultrasonic

Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Automation Inds., Inc., Box 950, Boulder, Colo.
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
International Transducer Corp., 640 McCloskey Pl., Goleta, Cal.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Profileometer—See Indicators, Surface Roughness

Profiling—See Engraving

Programmers, Broadcasting

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 562
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.

Programmers, Computer

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 593
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Collins Radio Co., Dallas, Tex.
Computer Methods Corp., 470 Mamaroneck Ave., White Plains, N.Y.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Frankel Engrg. Labs., Inc., 125 South 5th St., Reading, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Petty Geophysical Engrg. Co., 700 Tower Life Bldg., San Antonio, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio

Programmers, Curve Following

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
EMR Div., Box 223, Princeton, N.J.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.

Programmers, Power Supply

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. ..... p 1051
Guardian California, 5755 Camille Ave., Culver City, Cal.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1109-1111
Kilovolt Corp., 238 High St., Hackensack, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Inet-Power, 711 W. Knox St., Gardena, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Oxford Instr. Corp., 100 Cathedral St., Annapolis, Md.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.

Programmers, Punched Card

Amp Inc., Box 3608, Harrisburg, Pa. ..... p 536
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Taurus Corp., Academy Hill, Lambertville, N.J. ..... p 599
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Automatic Timing & Controls, Inc., King of Prussia, Pa.
EMR Div., Box 223, Princeton, N.J.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
IME Sys., 7800 River Rd., No. Bergen, N.J.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Midco, Inc., Box 5433, Trenton, N.J.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Projection Units, TV

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1007
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Century Projector Corp., 729 Seventh Ave., New York, N.Y.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
General TV Network, 901 Livernois Ave., Ferndale, Mich.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Kalart Co., Inc., Hultenius St., Plainville, Conn.
Link Div., Binghamton, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Traid Corp., 777 Flower St., Glendale, Calif.

Protectors, Contact—See Suppressors, Arc

Protectors, Surge-Also See Suppressors, Arc; Arresters, Electrical Surge

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 949
Acopian Corp., P.O. Box 585, Easton, Pa.
Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2036
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal. ..... p 1021
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn. p 1028,1030
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1081,1112
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1129,1131,1134-1136,1146
Power/Mate Corp., 514 S. River St., Hackensack, N.J. .... p 1203
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1259,1261
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
MCG Elctrns., Inc., 279 Skidmore Rd., Deer Park, N.Y.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Buffalo, N. Y.
Wuerth Prods. Corp., 1931 Pembroke Rd., Hollywood, Fla.

Proximity Indicators—See Indicators, Proximity

Public Address Systems

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Applied Electro Mechanics, Inc., 2350 Duke St., Alexandria, Va.
Argos Prods. Co., Inc., 600 S. Sycamore St., Genoa, Ill.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Chamberlain Mfg. Corp., 5740 N. Tripp Ave., Chicago, Ill.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Encom Prods. Co., Inc., Box 68, Oxford, Pa.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Femco Div., Box F, Irwin, Pa.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
Holmin, W.A. Corp., 1325 Seventh St., Rockford, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
Sharpe Audio Div., Amherst Ind'l. Pk., Tonawanda, N.Y.
Smith-Meeker Engrg. Co., 157 Chambers St., New York, N.Y.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Pullers, Circuit Board

Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
UNGAR, 233 E. Manville St. Compton, Calif.

Pullers, Fuse

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Trico Fuse Mfg. Co., 2948 North 5th St., Milwaukee, Wisc.

Pullers, Lamp

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.
Atocon Co., 527 N. Union St., Galion, Ohio
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.

Pullers, Tube

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.

Pulse Analyzers—See Analyzers, Pulse

Pulse-Form Restorers—See Restorers, Pulse-Form

Pulse Networks—See Networks, Pulse

Pulse Rise Time Indicators—See Indicators, Pulse Rise Time

Pumps, Cryogenic

Aero Vac Corp., Box 448, Troy, N.Y.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Norton Co., 160 Charlemont St., Newton, Mass.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Task Corp., Box 3999, Anaheim, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Pumps, Nonmetallic

Air Control, Inc., 125 Noble St., Norristown, Pa.
Elmeco Engrg., 539 Beall Ave., Rockville, Md.
Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Sethco Mfg. Corp., One Bennington Ave., Freeport, N.Y.
Vanton Pump & Equip. Corp., 201 Sweetland Ave., Hillside, N.J.

Pumps, Sealless—See Pumps, Nonmetallic

Pumps, Vacuum

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Air Control, Inc., 125 Noble St., Norristown, Pa.
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Beach-Russ Co., 420 Lexington Ave., New York, N.Y.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Crowell Mfg. Corp., 115 Clifton Pl., Brooklyn, N.Y.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Heatron, Inc., Box 54, York, Pa.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hull Corp., 1140 Davisville Rd., Hatboro, Pa.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lindberg Hevi-Duty, 2450 W. Hubbard St., Chicago, Ill.
Nester/Faust Mfg. Corp., 2401 Ogletown Rd., Newark, Dela.
Norton Co., 160 Charlemont St., Newton, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Red Point Corp., 105 W. Spazier, Burbank, Calif.
Sargent Welch Sci. Co., 7300 N. Linder Ave., Skokie, Ill.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum inds., Inc., 34 Linden St., Somerville, Mass.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Punched Card Equipment

Amp Inc., Box 3608, Harrisburg, Pa. ..... p 536
Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,1384,1385
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1703
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 750
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 593
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
Taurus Corp., Academy Hill, Lambertville, N.J. ..... p 599
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
Collins Radio Co., Dallas, Tex.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
Electrologic, Inc., 4732 Indianapolis Blvd., E. Chicago, Ind.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
National Cash Register Co., Main & K Sts., Dayton, Ohio
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Telcolab Corp., 405 Lexington Ave., New York, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
Uptime Corp., 8455 E. Prentice, Englewood, Colo.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Punches, Chassis

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Di-Acro, 316 8th Ave., Lake City, Minn.
Greenlee Tool Co., 2136-12th St., Rockford, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Wittek Prods. Co., 14750 Keswick St., Van Nuys, Calif.

Pyrometers, Infrared

Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110
Servo Corp. América, 111 New South Rd., Hicksville, N.Y.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Bailey Meter Co., Wickliffe, Ohio
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bristol Div, Waterbury, Conn
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Epic, Inc., 150 Nassau St., New York, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Williamson Corp., 1152 Main St., W. Concord, Mass.

Pyrometers, Optical, Non-Infrared

Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Epic, Inc., 150 Nassau St., New York, N.Y.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.

Pyrometers, Recording

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110,2111
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.

Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Pyrometers, Resistance-Type

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2110,2111
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beacon Elctrns., Inc., 121 Stanley Ave., Bellmawr, N.J.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., 5301 Edina Industrial Blvd., Minneapolis, Minn.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Foxboro Co., Foxboro, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Temtex Co., 5619 Dyer St., Dallas, Tex.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Pyrometers, Thermocouple-Type

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio p 606,607
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 616
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Honeywell, Box 5227, Denver, Colo.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y.
Millivac Instrs., Box 997, Curry Rd., Schenectady, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Burling Instr. Co., 21 River Rd., Box 298, Chatham, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Electronic Dev. Labs., Inc., 19 Newtown Rd., Plainview, N.Y.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fenwal, Inc., Main St., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Temtex Co., 5619 Dyer St., Dallas, Tex.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Quartz, Fused

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J. ..... p 2681
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Carler Products Corp., 6200 E. Malloy Rd., E. Syracuse, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Dynasil Corp. America, Box D, Berlin, N J
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Pan American Trade Dev., 2 Park Ave., New York, N.Y.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.

Quartz, Raw—See Crystals, Quartz

Quick Disconnects—See Connectors, Circular, Quick-Disconnect

RFI Measuring Equipment

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Elgenco, Inc., 1550 Euclid St., Santa Monica, Cal. ..... p 671
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Honeywell, Box 5227, Denver, Colo.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761,2123
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rafec Elctrns., Box 566, Temple City, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Trylon, Inc., Elverson, Pa.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

RFI Shielding—See Shields, R-F

Racks, Aging

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Custom Environments, Inc., 1262 Kettner Blvd., San Diego, Cal.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.

Racks, Cabinet

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal. p 927
ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Equipto Enclosure Systems, 435 Woodlawn Ave., Aurora, Ill. p 2149
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y. p 1279
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y. .... p 2162
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Collins Radio Co., Dallas, Tex.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Holbrook-Merrill Co., 1150 Kifer Rd., Sunnyvale, Cal.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Newcomb Audio Prods. Co., 12881 Bradley Ave., Sylmar, Calif.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Stackbin Corp., Box 434, Pawtucket, R.I.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Watson Mfg. Co., inc., 800 Taylor St., Jamestown, N.Y.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Racks, Desk & Console

Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Equipto Enclosure Systems, 435 Woodlawn Ave., Aurora, Ill. p 2149
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Abtronics, Inc., Box 712, Livermore, Calif.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Lyon Metal Prod., Inc., 47 Railroad Ave., Aurora, Ill.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Riester & Thesmacher Co., 1526 West 25th St., Cleveland, Ohio
Rotary Co., Inc., 1746 Dale Rd., Buffalo, N.Y.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Racks, Circuit Board

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Buckeye Stamping Co., 555 Marion Rd., Columbus, Ohio p 1496
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J. ..... p 559
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1353,1354
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1115
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573

Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
RO Assocs., Inc., 3705 Haven Ave., Menlo Pk., Cal. ..... p 1396
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal. .... p 2156
Techmar Corp., 2232 S. Cotner Ave., Los Angeles, Cal. .. p 2159
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2160
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va. ..... p 2553
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Birtcher Corp., Box D, Monterey Park, Cal.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Calabro Unitrack, 8738 W. Chester Pike, Upper Darby, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Electronic Modules Corp., Box 141, Timonium, Md.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Matrix Engineering Corp., 1502 West 166 St., Gardena, Calif.
Metropolitan Wire Goods Corp., N. Washington St. & George Ave., Wilkes-Barre, Pa.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Spec Plastics, 10717 Chandler Blvd., No. Hollywood, Cal.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.

Racks, Module-Also See Racks, Circuit Board

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal. p 927
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446
Honeywell, Inc., 200 Bond St., Wabash, Ind.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
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Viking Modules, Inc., 223 Cresent St., Waltham, Mass. .... p 1295
Abtronics, Inc., Box 712, Livermore, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Birtcher Corp., Box D, Monterey Park, Cal.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Electronic Modules Corp., Box 141, Timonium, Md.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.

Racks, Relay & Mounting

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal. p 927
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa..... p 1016
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal. p 2148
Equipto Enclosure Systems, 435 Woodlawn Ave., Aurora, Ill. p 2149
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Honeywell, Inc., 200 Bond St., Wabash, Ind. ..... p 2152
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1113-1115
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1136,1145
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y. .... p 2155
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga. ..... p 2158
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y..... p 2162
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bridges Frank Assocs., Inc., 619 Hollywood Ave., Cherry Hill, N.J.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
California Chassis Co., 5445 E. Century Blvd., Lynwood, Calif.
Cook, T.N., Inc., 3520 E. Fulton St., Columbus, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Enclosure Corp., 1701 Industrial Blvd., Pennsauken, N.J.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Feiner, P. & Sons, Inc., 522 West 45 St., New York, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Holbrook-Merrill Co., 1150 Kifer Rd., Sunnyvale, Cal.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Metal Works, Inc., 9th & Jefferson, Hermann, Mo.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Middletown Mfg. Co., 27 Stack St., Middletown, Conn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.

Radar Equipment—See Analyzers; Testers; Simulators; etc.

Radar Systems

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn.
Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Inter-Computer Elctrns., Inc., 1213 Walnut St., Lansdale, Pa.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Norden Div., Helen St., Norwalk, Conn.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bedford Div, Daniel Webster Hwy., So. Nashua, N.H.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Moran Instr. Corp., 170 E. Orange Grove Ave., Pasadena, Calif.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Radar Testers—See Testers, Radar

Radiation Equip., Nuclear—See Dosimeters; Counters, Geiger;Counters, Scintillation; Film Badges

Radioactive Light Sources—See Sources, Light, Radioactive

Radio Comm. Systems—See Comm. Systems (As Modified)

Radiographic Equipment—See X-Ray Inspection Equipment

Radiometers

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass..... p 1710
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
United Detector Technology, 1732 21st St., Santa Monica, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
TE Company, 515 E. Montecito St., Santa Barbara, Cal.
TRG Prods., 400 Border St., E. Boston, Mass.
Williamson Corp., 1152 Main St., W. Concord, Mass.

Radomes

AEL, Inc., Box 552, Lansdale, Pa.
Amersil, Inc., 685 Ramsey Ave., Hillside, N.J.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
Air-Tech. Inds., Inc., 9 Brighton Rd., Clifton, N.J.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
C/P Corp., RFD #3, Newberry, S.C.
Ceram Corp., 5345 Timken Sq., La Mesa, Calif.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Daniels, C.R., Inc., Daniels, Md.
Decibel Prods., Inc., 3184 Quebec St., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
McMillan Radiation Labs, Inc., Brownville Ave., Ipswich, Mass.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Structural Technology, Inc., 1105 O'Brien Dr., Menlo Pk., Cal.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Range Finder Systems

AEL, Inc., Box 552, Lansdale, Pa.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Electro-Optical Sys., Pasadena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.

Litton Sys., Inc., 5500 Canoga Ave., Woodland Hills, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
RCA, Marne Hwy., Moorestown, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Rare Earths—See Metals, Rare

Rate-Of-Turn Tables—See Tables, Rate-of-Turn

Reactors, Charging

Amp Inc., 155 Park St., Elizabethtown, Pa.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
TDC Div., Box 365, Littleton, Mass.

Reactors, Epitaxial—See Machines, Semiconductor Manufacturing

Reactors, Filter

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2859
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Reactors, Loading

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
NWL, Inc., Box 455, Trenton, N.J.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
TDC Div., Box 365, Littleton, Mass.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Reactors, Saturable

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2859
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Magnetics, Sandy Lake, Pa.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Readers, Character

Amp Inc., Box 3608, Harrisburg, Pa. ..... p 537
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 593
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
Farrington, 6707 Elctrns. Dr., Springfield, Va.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.

Readers, Magnetic Tape (Computer Type)

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Genisco Tech. Corp., Data Div., 18435 Susana Rd., Compton, Cal.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.

Readers, Microfinche

Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Information Handling Svc., 5500 S. Valentia Way, Englewood, Colo.
Johnson Research Corp., 2099 New Hwy., Farmingdale, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
National Cash Register Co., Main & K Sts., Dayton, Ohio
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Stromberg DatagraphiX, Inc., Box 2449, San Diego, Calif.
3M Co., 3M Center, St. Paul, Minn.

Readers, Punched Card—See Punched Card Equipment

Readers, Punched Tape

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
Wang Labs., Inc., Dept. 6-AC, 836 North St., Tewksbury, Mass. p 601
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio ..... p 812
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Chalco Engrg. Corp., 15126 S. Broadway, Gardena, Cal.
Coleman Engrg. Co., Inc., 3121 W. Central Ave., Santa Ana, Calif.
Computer Mechanisms, 495 Washington Ave., Carlstadt, N.J.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Electro Fiberoptics Corp., 99 Hartwell St., W. Boylston, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Ohr-Tronics, Box 406, King of Prussia, Pa.
Photologic Co., 3704 E. Walnut Ave., Orange, Calif.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Solar Sys. Div.-Tyco, 4302 Warren Ave., Hillside, Ill.
Tech Serv Inc., 5451 Holland Dr., Beltsville, Md.
Telcolab Corp., 405 Lexington Ave., New York, N.Y.

Readouts & Readout Devices—See Specific Types

Readouts, Edge-Lighted

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1492
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Milman Engrg. Co., Inc., 1669 12th, Santa Monica, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.

Readouts, Electroluminescent

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Readouts, Electro Mechanical

Allard Instr. Corp., 770 Main St., Westbury, N.Y. ..... p 1494
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Clifton, 5050 State Rd., Drexel Hills, Pa..... p 1987
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
ENM Company, Inc., 5306 W. Lawrence Ave., Chicago, Ill.p 1370
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn..... p 1672
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Norden Div., Helen St., Norwalk, Conn.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Cramer Div., Old Saybrook, Conn.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Readouts, Lighted, Segmented

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1492
Allard Instr. Corp., 770 Main St., Westbury, N.Y. ..... p 1494
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio .. p 606
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J..... p 568
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2069
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa..... p 1525
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.....p 1528,1529
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1550
Bomac Elctrns., Inc., 18755 Napa St., Northridge, Cal.
Burroughs Corp., Box 1226, Plainfield, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Discon Corp., 1150 N.W. 70th St., Ft. Lauderdale, Fla.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.

Readouts, Rear-Projection

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1516
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Shelly Assoc., Inc., 111 Eucalyptus Dr., El Segundo, Cal. p 1534
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Burroughs Corp., Box 1226, Plainfield, N.J.
Madatron Corp., 110 Rte. 10, Whippany, N.J.

Readouts, Semiconductor Type Incl. Light-Emitting Diodes & Switches

International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1912
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.

Receivers, A-M (Precision Test)

Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Bogen Div., P.O. Box 500, Paramus, N.J.
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Olektron Corp., Box 248, Dudley, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.

Receivers, Beacon

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Receivers, Carrier Telegraph

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.

Receivers, Command

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Linear Corp., 347 S. Glasgow Ave., Inglewood, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.

Receivers, Communication & Amateur

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Honeywell, Box 5227, Denver, Colo.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Browning Labs., Inc., P.O. Box 310, Laconia, N.H.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.

Receivers, Diplexer

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.

Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Receivers, Diversity Reception

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 899
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.

Receivers, Duplexer

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Receivers, Facsimile

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Telautograph Corp., 8700 Bellanca Ave., Los Angeles, Cal.
Vidcom Elctrns., Inc., 118 W. 57th St., New York, N.Y.

Receivers, Field Intensity, Microwave—See Receivers, Microwave

Receivers, Fixed Frequency

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 897
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Chamberlain Mfg. Corp., 5740 N. Tripp Ave., Chicago, Ill.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Johnson Elctrns., Inc., P.O. Box 7, Casselberry, Fla.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sanders Assocs., Inc., 11101 Sunset Hills Rd., Reston, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Receivers, F-m (Precision Test)

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 899
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Receivers, Frequency Shift

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Honeywell, Box 5227, Denver, Colo.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.

Receivers, Headphone—See Headphones

Receivers, I-F

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Honeywell, Box 5227, Denver, Colo.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 899
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Recievers, Infrared

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Abtronics, Inc., Box 712, Livermore, Calif.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Receivers, Interrogation

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. ..... p 914
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Receivers, Logarithmic

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Receivers, Loran, Lab Test

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.

Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
RCA Corp., Front & Cooper, Camden, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Receivers, Loran, Timing

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.

Receivers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 870
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895,896,899
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Farinon Electric, 935 Washington St., San Carlos, Calif.
Foxboro Co., Foxboro, Mass.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Telefunken Sls. Corp., South St., Garden City, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wilcox, 1400 Chestnut, Kansas City, Mo.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Receivers, Monitoring, Communications

AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Honeywell, Box 5227, Denver, Colo.
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Conrac Div., 600 N. Rimsdale Ave., Covina, Calif.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
SC Elctrns., Inc., New Brighton, St. Paul, Minn.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Receivers, Multiplex

Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Bristol Div, Waterbury, Conn
Browning Labs., Inc., P.O. Box 310, Laconia, N.H.
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electron Enterprises, Inc., 6645 Stanley Ave., Berwyn, Ill.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Heath Co., Benton Harbor, Mich.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Johnson Elctrns., Inc., P.O. Box 7, Casselberry, Fla.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Receivers, Panoramic

AEL, Inc., Box 552, Lansdale, Pa.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 870
Honeywell, Box 5227, Denver, Colo.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.

Receivers, Phase Lock

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Prods. Grp., 100 Express St., Plainview, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.

Receivers, Radar

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 896,897
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio

Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Receivers, Radio Paging—See Comm. Systems, Selective Paging

Receivers, Radiometric—See Radiometers

Receivers, Rebroadcast

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Conrac Div., 600 N. Rimsdale Ave., Covina, Calif.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Scott Instr. Labs., 111 Powdermill Rd., Maynard, Mass.
Standard Elctrns. Corp., Box 677, Freehold, N.J.

Receivers, Search & Countermeasure

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 899
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Amecom Div., 5115 Calvert Rd., College Park, Md.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
KDI Labtron Div., 2233 Hepburn St., Dayton, Ohio
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Olektron Corp., Box 248, Dudley, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Receivers, Single-Sideband

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Prodelin, Inc., Box 131, Hightstown, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Receivers, Telemetry

AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 896,897,899
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bailey Meter Co., Wickliffe, Ohio
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bristol Div, Waterbury, Conn
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Defense Elctrns., Inc., Rockville, Md.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Receivers, Time Code

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 562
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 763
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.

Receivers, Tone

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Honeywell, Box 5227, Denver, Colo.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linear Corp., 347 S. Glasgow Ave., Inglewood, Calif.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Secode Elctrns., 908 Dragon St., Dallas, Texas
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Receivers, Transmissometer

Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Receivers, Tropospheric Scatter

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Marconi Div., 1 Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Receivers, Tv—See Monitors, Video

Receivers, UHF & VHF

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif. ..... p 855
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Honeywell, Box 5227, Denver, Colo.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 896,899
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Astro Comm. Lab., 9125 Gaither Rd., Gaithersburg, Md.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., Box 9414, Ft. Lauderdale, Fla.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.

Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Defense Elctrns., Inc., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Emcee Elctrns., Inc., 177 Old Churchman Rd., New Castle, Del.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Fargo Co., 1162 Bryant St., San Francisco, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SC Elctrns., Inc., New Brighton, St. Paul, Minn.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., 700 Ellicott St, Batavia, N Y
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Trans-Aire Elctrns., Inc., 85 Denton Ave., New Hyde Park, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Receivers, Ultraviolet

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Abtronics, Inc., Box 712, Livermore, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.

Receivers, VLF

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass. ..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Honeywell, Box 5227, Denver, Colo.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
RCA, Marne Hwy., Moorestown, N.J.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Receivers, WWV

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 689
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Karg Labs., Inc., 44 N. Main St., So. Norwalk, Conn.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.

Receptacles—See Connectors; Jacks; Sockets

Receptacles, Antenna Tapping

Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.

Recorders, Antenna Pattern

Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.

Recorders, Blood Pressure

AEL, Inc., Box 552, Lansdale, Pa.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Gould, Inc., 3631 Perkins, Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Intermed Corp., 2710 Forest La., Dallas, Tex.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Code

CompuCord, Inc., 225 Crescent St., Waltham, Mass.
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal. .... p 1310
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Astro-Science Corp., 9700 Factorial Way, S. El Monte, Calif.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.

Recorders, Computer Data—See Data Recorders, Computer

Recorders, Disc

Burroughs Corp., 1649 Wilshire Blvd., Los Angeles, Cal. .. p 547
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Data Disc, Inc., Computer Prods. Div., 1275 California Ave., Palo Alto, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Recorders, Electronic, Rotary Stylus

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.

Recorders, Electrostatic

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, 611 Hansen Way, Palo Alto, Cal.

Recorders, Event

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 845
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Geo Space, 5803 Glenmont, Houston, Tex.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, 611 Hansen Way, Palo Alto, Cal.

Recorders, F-M—See Recorders, Magnetic Tape

Recorders, Facsimile

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Alden Sys. Co., Inc., Box A, Dept. 262, Westboro, Mass.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
3M Co., 3M Center, St. Paul, Minn.

Recorders, Film

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Geo Space, 5803 Glenmont, Houston, Tex.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stanci-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.

Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Traid Corp., 777 Flower St., Glendale, Calif.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Recorders, Film Strip, Magnetic

International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.

Recorders, Flight

Honeywell, Box 5227, Denver, Colo.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal..... p 1310
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Ampex Corp., 401 Broadway, Redwood City, Calif.
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Astro-Science Corp., 9700 Factorial Way, S. El Monte, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Collins Radio Co., Cedar Rapids, Iowa
Conrac Corp., 330 Madison Ave., New York, N.Y.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Genisco Tech. Corp., Data Div., 18435 Susana Rd., Compton, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Intermed Corp., 2710 Forest La., Dallas, Tex.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Odetics, Inc., 1845 S. Manchester, Anaheim, Cal.
Pemco, 942 Commercial St., Palo Alto, Calif.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Recorders, Frequency

Electro/Data, Inc., 1621 Jupiter, Garland, Tex..... p 870
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y... p 734
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 892
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 850
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Recorders, Graphic—See Recorders (As Modified)

Recorders, Humidity (Electronic)

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Foxboro Co., Foxboro, Mass.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Long-Term Tape—See Recorders, Magnetic Tape

Recorders, Magnetic Tape (Lab Type)

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind..... p 1309
Dytro Corp., 63 Tec St., Hicksville, N.Y..... p 661
Honeywell, Box 5227, Denver, Colo. ..... p 691
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Sangamo Elec. Co., Box 128, Pickens, S.C.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex. p 1311
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astro-Science Corp., 9700 Factorial Way, S. El Monte, Calif.
Audiotronics Corp., 7428 Bellaire Ave., Box 151, N. Hollywood, Calif.
Auricord, 35-41 29th St., Long Island City, N.Y.
Avionics Resch. Prods., 6901 W. Imperial Hwy., Los Angeles, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Carolina Medical Elctrns., Inc., U.S. 52 Expwy., Box 307, King, N.C.
Cassettes Unlimited, Corp., 200 Claremont Ave., New York, N.Y.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Defense Elctrns., Inc., Rockville, Md.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Genisco Tech. Corp., Data Div., 18435 Susana Rd., Compton, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Intermed Corp., 2710 Forest La., Dallas, Tex.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Ortofon Div., Thorens & Atlantic Aves., New Hyde Park, N.Y.
Pemco, 942 Commercial St., Palo Alto, Calif.
Peripheral Equip. Corp., 9600 Irondale Ave., Chatsworth, Cal.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Recorders, Moisture (Electronic)

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Foxboro Co., Foxboro, Mass.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Hygrodynamics, Inc., Dept. D-24, 949 Selim Rd., Silver Spring, Md.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Oxygen(Ozone

Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Anderson, W.E., Inc., 320E West 80th St., Kansas City, Mo.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Hays Corp., Michigan City, Ind.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Polar

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
London Co., 811 Sharon Dr., Westlake, Ohio
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Bendix Corp., 3621 S. State Rd., Box 1067, Ann Arbor, Mich.
Geo Space, 5803 Glenmont, Houston, Tex.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.

Recorders, Power-Level

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bristol Div, Waterbury, Conn
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Pressure (Electronic)

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn..... p 2111
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 850
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hays Corp., Michigan City, Ind.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Recorders, Pyrometer—See Pyrometers, Recording

Recorders, Smoke & Combustion (Electronic)

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bristol Div, Waterbury, Conn
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Hays Corp., Michigan City, Ind.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Recorders, Sound Level

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Astro-Science Corp., 9700 Factorial Way, S. El Monte, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Genisco Tech. Corp., Data Div., 18435 Susana Rd., Compton, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.

Recorders, Stereophonic Tape (Nonentertainment)

Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Auricord, 35-41 29th St., Long Island City, N.Y.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Faraday, Inc., 805 S. Maumee St., Tecumseh, Mich.
Fargo Co., 1162 Bryant St., San Francisco, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.

Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
3M Co., 3M Center, St. Paul, Minn.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Recorders, Strain

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Honeywell, Box 5227, Denver, Colo. ..... p 691
Houston Instr., 4950 Terminal Ave., Bellaire, Tex. ..... p 848
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Intermed Corp., 2710 Forest La., Dallas, Tex.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Recorders, Strip-Chart

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Electro/Data, Inc., 1621 Jupiter, Garland, Tex. ..... p 870
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Honeywell, Box 5227, Denver, Colo. ..... p 691
Houston Instr., 4950 Terminal Ave., Bellaire, Tex. ..... p 848
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Yeiser Labs, 881 W. 18th St., Costa Mesa, Cal. ..... p 852
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Biotronics, Inc., 838 Butte St, Redding, Calif
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Bristol Div, Waterbury, Conn
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Conklin Instr. Corp., Main St., Pleasant Valley, N.Y.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairbanks Morse Weighing Sys., 711 E. St. Johnsbury Rd., St. Johnsbury, Vt.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
Infotronics Corp., 1062 Linda Vista, Mountain View, Cal.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Photovolt Corp., 1115 Broadway, New York, N.Y.
Photron Instr. Co., 6516 Detroit Ave., Cleveland, Ohio
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Ross Labs., Inc., 3138 Fairview Ave., E., Seattle, Wash.
Rust Corp., 168 Tremont St., Everett, Mass.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Sloan Technology Corp., 535 E. Montecito St., Santa Barbara, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Recorders, Synchronized Film-Tape

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Faraday, Inc., 805 S. Maumee St., Tecumseh, Mich.
Kalart Co., Inc., Hultenius St., Plainville, Conn.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Stancil-Hoffman Corp., 921 N. Highland Ave., Hollywood, Calif.
Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Traid Corp., 777 Flower St., Glendale, Calif.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.

Recorders, Tape Loop (Lab Type)

International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal. .... p 1310
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amplifier Corp. America, 75 Frost St., Westbury, N.Y.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Auricord, 35-41 29th St., Long Island City, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Geo Space, 5803 Glenmont, Houston, Tex.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
RCA, Marne Hwy., Moorestown, N.J.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Tandberg of America, Inc., 8 Third Ave., Pelham, N.Y.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
3M Co., 3M Center, St. Paul, Minn.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Recorders, Telemetering

Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Honeywell, Box 5227, Denver, Colo.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal. .... p 1310
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex. p 1311
Ampex Corp., 401 Broadway, Redwood City, Calif.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Bristol Div, Waterbury, Conn
EMR Div., Box 223, Princeton, N.J.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Foxboro Co., Foxboro, Mass.
Genisco Tech. Corp., Data Div., 18435 Susana Rd., Compton, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St. Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Leupold & Stevens, Inc., Box 25347, Portland, Ore.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Plainfield, N.J.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Pemco, 942 Commercial St., Palo Alto, Calif.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Vetter, A.R., Co., Box 143, Rebersburg, Pa
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Recorders, Teletype

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.

Recorders, Temperature (Electronic)

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. .....p 2110,2111
Houston Instr., 4950 Terminal Ave., Bellaire, Tex. ..... p 848
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 850
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bristol Div, Waterbury, Conn
Conklin Instr. Corp., Main St., Pleasant Valley, N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.

Recorders, Timing

Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Gould, Inc., 3631 Perkins, Cleveland, Ohio .....p 840,841
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. .. p 734
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Rustrak Instr. Div., Municipal Airport, Manchester, N.H. .... p 849
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Alden Sys. Co., Inc., Box A, Dept. 262, Westboro, Mass.

Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Bristol Div, Waterbury, Conn
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Rapidprint Time Recorders, Inc., Box 580, Middletown, Conn.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Wakmann Watch Co., Inc., 15 West 47th St., New York, N.Y.

Recorders, Torque (Electronic)

Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 840,841
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Miles Reproducer Co., Inc., 599 Broadway, New York, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Recorders, Transient

Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 749
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 850
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
NUS Corp., P.O. Box 248, Paramus, N.J.
Resalab Scientific, 4000 Campbell Ave., Menlo Park, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Recorders, Vacuum—See Recorders, Pressure

Recorders, Vibration

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill..... p 687
Honeywell, Box 5227, Denver, Colo.
Techni-Rite Elctrns., Inc., 25 Manton Ave., Providence, R.I.p 851
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex. p 1311
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Epic, Inc., 150 Nassau St., New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
Intermed Corp., 2710 Forest La., Dallas, Tex.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Leach Corp., 717 N. Coney Ave., Los Angeles, Cal.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Mechanics For Elctrns., Inc., 340 Fordham Rd., Wilmington, Mass.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Recorders, Video Tape

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Craig Corp., 2302 East 15th St., Los Angeles, Calif.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Odetics, Inc., 1845 S. Manchester, Anaheim, Cal.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Sylvania Elec. Prods., Inc., 700 Ellicott St, Batavia, N Y
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Recorders, X-Y

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Esterline Angus Div., Box 24000, Indianapolis, Ind. .....p 843-846
Honeywell, Box 5227, Denver, Colo. ..... p 691
Houston Instr., 4950 Terminal Ave., Bellaire, Tex. ..... p 848
Yeiser Labs, 881 W. 18th St., Costa Mesa, Cal. ..... p 852
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Geo Space, 5803 Glenmont, Houston, Tex.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Larson Aero Dev., Box 135, Concord, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Soltec Corp., 10747 Chandler Blvd., No. Hollywood, Cal.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Traid Corp., 777 Flower St., Glendale, Calif.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.

Recording Paper (For Strip-Chart Recorders, Oscillographs, X-Y)—See Paper, Graphic Recording

Recording Tape, Magnetic—See Tapes, Recording, Magnetic

Records, Frequency Test

Components Corp., 106 Main St., Denville, N.J.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Pacific Transducer Corp., 2301 Federal, Los Angeles, Calif.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Records, Instruction-Code, Language, etc.

Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Auricord, 35-41 29th St., Long Island City, N.Y.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Hayden Book Co., Inc., 116 West 14th St., New York, N.Y.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Rectifier Power Units (Power Supply Type)

Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006
CML, Inc., 166 National Rd., Edison, N.J.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.....p 1020,1021
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y. p 1066,1067
Hewlett-Packard Co., 100 Locust Ave., Berkeley Hgts., N.J.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. ..... p 1081
Kilovolt Corp., 238 High St., Hackensack, N.J.
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J.p 1165
NJE Corp., 20 Boright Ave., Kenilworth, N.J. ..... p 1168
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y..... p 1190
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal.p 1190
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Sorensen Oper., Richards Ave., Norwalk, Conn. .....p 1216,1217
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Technipower, Inc., Benrus Ctr., Ridgefield, Conn.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineering Assocs., 434 Patterson Rd., Dayton, Ohio
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
M & T Chemicals Inc., Rahway, N.J.
Magnetics, Sandy Lake, Pa.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicon Inc., 10 North Ave., Burlington, Mass.
Sifco Metachemical, 935 East 63rd St., Cleveland, Ohio
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Warren Communications, New Town Rd., Littleton, Mass.
Westinghouse Elec. Corp., Buffalo, N. Y.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Rectifiers, Copper Oxide

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.

Rectifiers, Copper Sulfide

Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio

Rectifiers, Electron Tube—See Tubes, Rectifying

Rectifiers, Germanium

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Semitronics Corp., 265 Canal St., New York, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Rectifiers, Germanium Stack

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Rectifiers, Selenium

Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y. p 1880-1883
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1906
Ledex Div., 126 Webster St., Dayton, Ohio
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y... p 1919
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Syntron Div., 264 Lexington, Homer City, Pa..... p 1950
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.

Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Rectico, Inc., 20 Village Park Rd., Cedar Grove, N.J.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Buffalo, N. Y.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.

Rectifiers, Selenium Stack

Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1906
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y... p 1919
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Syntron Div., 264 Lexington, Homer City, Pa..... p 1950
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Westinghouse Elec. Corp., Buffalo, N. Y.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Rectifiers, Silicon

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind. ..... p 1879
Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y. p 1880-1883
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 1890
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1909-1911
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 2862,2863
Ledex Div., 126 Webster St., Dayton, Ohio
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y... p 1919
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal. p 1922-1925,1928-1931
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y..... p 1940
Syntron Div., 264 Lexington, Homer City, Pa.....p 1944,1946-1950
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1957
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. p 1962,1963
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass.....p 1962,1963
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex..... p 1969-1975
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1959-1961
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
American Semiconductor Corp., 4 N. Hickory Ave., Arlington Hgts., Ill.
Atlantic Semiconductor, 905 Mattison Ave., Asbury Park, N.J.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Darrah Elec. Co., Inc., 5914 Merrill Ave., Cleveland, Ohio
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Hull, R.O. & Co., Inc., 3203 W. 71 St., Cleveland, Ohio
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
La Rose, W.T. & Assocs., Inc., P.O. Box F, Lansingburg Sta., Troy, N.Y.
M & T Chemicals Inc., Rahway, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Power Comps., Inc., Box 421, Scottdale, Pa.
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sel-Rex Corp., 75 River Rd., Nutley, N.J.
Semicon Inc., 10 North Ave., Burlington, Mass.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Youngwood, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Rectifiers, Silicon Controlled—See Thyristors

Rectifiers, Silicon Stack

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y. p 1880-1883
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y... p 1919
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Semtech Corp., 652 Mitchell Rd., Newbury Pk., Cal...p 1929,1930
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Syntron Div., 264 Lexington, Homer City, Pa..... p 1950
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1964
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass..... p 1964
Varo, Inc., 1000 N. Shiloh Rd., Garland, Tex.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1959-1961
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Atlantic Semiconductor, 905 Mattison Ave., Asbury Park, N.J.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Power Comps., Inc., Box 421, Scottdale, Pa.
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Recticon Corp., 730 E. Elm St., Conshohocken, Pa.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicon Inc., 10 North Ave., Burlington, Mass.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Westinghouse Elec. Corp., Youngwood, Pa.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Rectifiers, Thyratron—See Tubes, Thyratron

Reducers, Speed-Also See Gear Mechanisms

Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind..... p 1393
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Sterling Instr., 76 E. Second St., Mineola, N.Y..... p 1694
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Holtzer-Cabot Corp., Tri-Borough Ind'l. Pk., No. Attleboro, Mass.
Insco Corp., Main St., Groton, Mass.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Juall Gear Co., Inc., 1108 Goffle Rd., Hawthorne, N.J.
Kinetic Instr. Co., 1072 Linwood St., Brooklyn, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Link Div., Binghamton, N.Y.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sterling Elec. Motors, Inc., 5401 Telegraph Rd., Los Angeles, Calif.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wolfson, P.J. Co. Inc., 150 Broadway, New York, N.Y.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Reduction Systems, Data—See Data Reduction Systems

Reels, Cord & Cable

Electrospace Corp., 956 Brush Hollow Rd., Westbury..... p 534
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Aero-Motive Mfg. Co., P.O. Box 2678, Kalamazoo, Mich.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Hykon Mfg. Co., 163 E. State St., Box 923, Alliance, Ohio
Industrial Elec. Reels, Inc., 1509 Chicago St., Omaha, Neb.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Olympic Instrs., Inc., Vashon, Wash.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.

Reels, Tape—See Tape Recording Accessories

Reference Books—See Technical Books

References, D-C Voltage

Analog Devices, Inc., 221 Fifth St., Cambridge, Mass.
CEA, 1221 S. Shamrock, Monrovia, Cal. ..... p 972
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Components, Inc., Biddeford, Me.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J. ..... p 1874
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn. ..... p 1032
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ..... p 668
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1908
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,723
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1098,1108
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1392
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Emcee Elctrns., Inc., 177 Old Churchman Rd., New Castle, Del.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Power Comps., Inc., Box 421, Scottdale, Pa.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.

Reflectors, Passive—See Antenna Reflectors

Refrigerants, Spray

Refrigerated Cooling Equipment—See Air Conditioners

Regulators, Current

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1361
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1041
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1089,1104
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1146
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetics, Inc., Box 391, Butler, Pa.
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1163
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. ... p 1392
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y. ..... p 1190
Power Designs Pacific, Inc., Miranda Ave., Palo Alto, Cal. p 1190
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1220
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1230
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Todd Prods. Corp., 123 Milbar Blvd., Farmingdale, N.Y.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y. ..... p 1274
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1289
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal. .. p 1301
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delta Elctrn. Control Corp., 1701 Pomona St., Costa Mesa, Cal.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Elasco-Eastern, Inc., 5 Northwood Rd., Bloomfield, Conn.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Joliet Control Corp., Box 751, Joliet, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Magnetics, Sandy Lake, Pa.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Regulators, Frequency

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y. ..... p 1982
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a,1032c
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1041
Fork Standards, Inc., 213 Main St., W. Chicago, Ill. ..... p 1443
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1146
Macarr, Inc., 166 National Rd., Edison, N.J.
Nova Electric Mfg. Co., 263 Hillside Ave., Nutley, N.J.
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1220
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1289
Allis-Chalmers, Box 512, Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Task Corp., Box 3999, Anaheim, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Regulators, Pitch & Tempo

Regulators & References, Silicon-Also See Diodes, Zener

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
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Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
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General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
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Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. .....p 1102,1103
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y. .....p 1940,1941
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Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1628
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y. .....p 1274,1275
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Centralab Semiconductor Div., 4501 Arden Dr., El Monte, Cal.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Eastron Corp., 25 Locust St., Haverhill, Mass.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Power Comps., Inc., Box 421, Scottdale, Pa.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Semicon Inc., 10 North Ave., Burlington, Mass.
Semitronics Corp., 265 Canal St., New York, N.Y.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Regulators & Stabilizers, Voltage Also See Transformers, Voltage Regulating

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 949
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 953
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 955
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 968
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
CML, Inc., 166 National Rd., Edison, N.J. ..... p 1032a,1032c
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn. ..... p 863
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal. ..... p 1021
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J. ..... p 1041
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. .....p 1052,1053
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1062,1063,1065,1885,1888
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Glentronics, Inc., 748 E. Alosta Ave., Box 56, Glendora, Cal.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1081,1090,1091,1097,1101,1112
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1146,2863
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Magnetics, Inc., Box 391, Butler, Pa.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 1161
Mid-Eastern Inds., 660 Jerusalem Rd., Scotch Plains, N.J. p 1163,1165
North Elec. Co., 553 S. Market St., Galion, Ohio
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn. p 1205
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ..... p 1210
Sorensen Oper., Richards Ave., Norwalk, Conn. ..... p 1220
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass.
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1230
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
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TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Trygon Electronics, Inc., 111 Pleasant Ave., Roosevelt, N.Y.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
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Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Astronics, Inc., 204 W. Bedford, Euless Rd., Hurst, Tex.
Atlas Controls & Twinco, 10 Cheney St., Dorchester, Mass.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Data Royal Corp., 8014 Armour St., San Diego, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fining Circuits Div., Muller Ave, Norwalk, Conn
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inet-Power, 711 W. Knox St., Gardena, Calif.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Joliet Control Corp., Box 751, Joliet, Ill.
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Leland Airborne Prods., Box 128, Vandalia, Ohio
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Micro Networks, 5 Barbara La., Worcester, Mass.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Radiation Devices Co., Box 8450, Baltimore, Md.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
T & T Controls Co., Inc., Box 171, Media, Pa.
Task Corp., Box 3999, Anaheim, Calif.

Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 1540 E. Edinger, Santa Ana, Cal.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.

Relay Covers, Cases, Enclosures—See Cans, Relay

Relay Tools—See Tools, Relay Servicing

Relays, Antenna—See Relays, R-F (Including Antenna & Coaxial)

Relays, Audio Operated—See Relays, Frequency Selective

Relays, Coaxial—See Relays, R-F (Including Antenna And Coaxial)

Relays, Contact—See Relays, Power

Relays, Crystal Can—See Relays, Miniature & Subminiature

Relays, Current Sensing

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. p 1749
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1758
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1773
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J. p 2049
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1794,1798
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. p 1804
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1836,1837,1840
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. p 1399
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Inet-Power, 711 W. Knox St., Gardena, Calif.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.

Relays, Differential

Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill. p 1725
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. p 1748,1749
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Guardian California, 5755 Camille Ave., Culver City, Cal.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1106
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1859
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Electrostrictive

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.

Relays, Frequency Selective

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1848
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Frequency Control, Inc., Box 671, Austin, Tex.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1773
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. p 2055
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. p 1820
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. p 1392
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314,1857
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. p 2143
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. p 1399
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Alpha Elctrn. Svcs., 344 N. State College Blvd., Orange, Calif.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Inet-Power, 711 W. Knox St., Gardena, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, General Purpose

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1716,1717
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. p 1718
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1721-1723
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan p 1719
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Babcock Relays, 3501 Harbor Blvd., Costa Mesa, Calif. p 1726-1729
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. p 1730,1731
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. p 1741
Comar Elec., 3349 Addison St., Chicago, Ill. p 1725
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. p 553
Connector Corp., 6025 N. Keystone, Chicago, Ill. p 2435
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Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
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Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1848
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Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. p 1803,1805
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Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1835-1838
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. p 1834
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y. p 1849
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1762,1764,1765
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. p 1864
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1855
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. p 2143
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan p 1862
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1858,1859
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J. p 1863
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. p 1867
Aemco Div., 10 State St., Mankato, Minn.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Branson Corp., Box W, Denville, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Electro-Tec Corp., P.O. Box 667, Ormond Beach, Fla.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pacific Relays, Inc., 13915 Saticoy St., Van Nuys, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.
Warco Mfg. Co., 7607 Page Ave., St. Louis, Mo.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Relays, High-Speed

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1716,1717
Airpax Elctrns., Inc., Cambridge, Md.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1721
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
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Comar Elec., 3349 Addison St., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y. p 1743
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Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. p 1745
Couch S.H. Div., 36 River St., Boston, Mass.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1848
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass. p 1761
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Fifth Dimension, Inc., Box 483, Princeton, N.J. p 1770
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Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
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Self-Organizing Sys., Inc., Box 9918, Dallas, Tex. ..... p 1856
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857,2142
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Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J. p 1863
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1867
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bristol Div, Waterbury, Conn
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Thermosen, Inc., 375 Fairfield Ave., Stamford, Conn.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.
Welex Elctrns., Box 986, Silver Spring, Md.

Relays, High Voltage

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y. p 1743
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I..... p 1848
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1759
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..p 1808,1809
Kilovac Corp., Box 4422, Santa Barbara, Cal.....p 1810,1811
Kilovolt Corp., 238 High St., Hackensack, N.J.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill..... p 1825
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Midtex/Aemco, 10 State St., Mankato, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
RBM Controls Div., 131 Godfrey St., Logansport, Ind..... p 1767
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1867
Aemco Div., 10 State St., Mankato, Minn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Relays, Impulse

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. ..... p 1834
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.

Relays, Indicating Light

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1773
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. ..... p 1803
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1836
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.

Relays, Keying & Break-In

Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. ..... p 1771
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Aemco Div., 10 State St., Mankato, Minn.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Diamond Repeater Co., 55 Main St., Madison, N.J.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
TIA Elec. Co., Box 777, Princeton, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.

Relays, Latching, Magnetic

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Babcock Relays, 3501 Harbor Blvd., Costa Mesa, Calif. .. p 1729
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. .....p 1730,1731
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1737
Comar Elec., 3349 Addison St., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Cunningham Corp., 10 Carriage St., Honeoye Falls, N.Y. p 2030,2031
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc. ..... p 1750
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1846,1847
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ..... p 1760
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1772,1773
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill.
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hamlin Elctrns., Inc., 3879 N. 28th Ave., Phoenix, Ariz. .... p 1778
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1796,1799
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1806
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 1810
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal. ..... p 1813
Ledex Div., 126 Webster St., Dayton, Ohio
Liberty Controls, R.F.D. 5, Joliet, Ill.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. p 1823,1826
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Midtex/Aemco, 10 State St., Mankato, Minn. ..... p 1829
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1831
North Elec. Co., 553 S. Market St., Galion, Ohio
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1839-1841
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y. p 1849
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1864
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1855
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan ..... p 1862
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1858
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Branson Corp., Box W, Denville, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.

Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Touch-Plate Electro-Sys., Inc., 16530 Garfield Ave., Paramount, Calif.
Universal Relay Corp., 42 White St., New York, N.Y.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.

Relays, Latching, Mechanical

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Liberty Controls, R.F.D. 5, Joliet, Ill. p 1816,1818
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 1833
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1763
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.

Relays, Mercury Displacement

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. p 1735
Fifth Dimension, Inc., Box 483, Princeton, N.J. p 1770
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Haledy Elctrns. Co., 99 Wall St., New York, N.Y.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Mercury Contacts, Inc., 1950 Neva Dr., Dayton, Ohio
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Mercury-Wetted Contacts

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1716
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Babcock Relays, 3501 Harbor Blvd., Costa Mesa, Calif. p 1729
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. p 1732-1734
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. p 553
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. p 1745
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1846,1847
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1759
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass. p 1761
Fifth Dimension, Inc., Box 483, Princeton, N.J. p 1770
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. p 1825,1826
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Midtex/Aemco, 10 State St., Mankato, Minn. p 1829
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1830
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1843
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex. p 1856
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Aemco Div., 10 State St., Mankato, Minn.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hays Corp., Michigan City, Ind.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Meter

Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio p 606
Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H. p 616
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 686
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y. p 734
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. p 784
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio p 811
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Miniature & Subminiature

Airpax Elctrns., Inc., Cambridge, Md.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1721-1723
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan p 1719
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Babcock Relays, 3501 Harbor Blvd., Costa Mesa, Calif. p 1726-1729
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. p 1730,1731
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. p 1735,1736,1738,1739
Comar Elec., 3349 Addison St., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y. p 1743
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. p 553
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. p 1744,1745
Couch S.H. Div., 36 River St., Boston, Mass. p 1747
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc. p 1750
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. p 1846,1847
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1758
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. p 1760
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass. p 1761
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Fifth Dimension, Inc., Box 483, Princeton, N.J. p 1770
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. p 1771
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1772,1773
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. p 1787
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo. p 1783
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1790-1799
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. p 1805
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal. p 1812,1815
Liberty Controls, R.F.D. 5, Joliet, Ill. p 1818
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. p 1825,1826
Midtex/Aemco, 10 State St., Mankato, Minn. p 1829
Nanotron, Inc., 8720 Woodley Ave., Sepulveda, Cal. p 1832
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1835,1840-1842
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y. p 1849
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1762,1763
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex. p 1856
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1858,1859
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J. p 1863
Aemco Div., 10 State St., Mankato, Minn.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Branson Corp., Box W, Denville, N.J.
Bristol Div, Waterbury, Conn
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Electro-Tec Corp., P.O. Box 667, Ormond Beach, Fla.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Iso-Switch Corp., 2935 Randolph St., Costa Mesa, Cal.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pacific Relays, Inc., 13915 Saticoy St., Van Nuys, Calif.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermosen, Inc., 375 Fairfield Ave., Stamford, Conn.
Universal Relay Corp., 42 White St., New York, N.Y.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.

Relays, Motor Driven

Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Midtex/Aemco, 10 State St., Mankato, Minn. p 1829
Aemco Div., 10 State St., Mankato, Minn.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Universal Relay Corp., 42 White St., New York, N.Y.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Multi-Pole (8 or More Poles)

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. p 1760
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill.
Ledex Div., 126 Webster St., Dayton, Ohio
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1835
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Thermosen, Inc., 375 Fairfield Ave., Stamford, Conn.
Universal Relay Corp., 42 White St., New York, N.Y.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Overload

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Comar Elec., 3349 Addison St., Chicago, Ill. p 1725
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. p 1748,1749
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1773
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775

Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J. p 2049
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 1810
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1839
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Westinghouse Elec. Corp., Buffalo, N. Y.

Relays, Over-Current & Under-Current

Diversified Elctrns., Inc., Box 6231, Evansville, Ind..... p 1749
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. ..... p 1804
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.

Relays, Over-Frequency & Under-Frequency

Airpax Elctrns., Inc., Cambridge, Md.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. .... p 1848
Frequency Control, Inc., Box 671, Austin, Tex.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Liberty Controls, R.F.D. 5, Joliet, Ill.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. ..... p 1820
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1314,1857
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Motor Generator Div., EE-61, Troy, Ohio
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.

Relays, Over-Voltage & Under-Voltage

Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. ..... p 1731
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. .... p 1366
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind....p 1748,1749
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
International Rectifier, 233 Kansas St., El Segundo, Cal.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1841
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Larson Aero Dev., Box 135, Concord, Calif.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Motor Generator Div., EE-61, Troy, Ohio
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Phase-Sensing

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Diversified Elctrns., Inc., Box 6231, Evansville, Ind..... p 1748
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. ..... p 1820
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.

Relays, Photoelectric

Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y... p 734
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tri-Tronics Co., 619 Enterprise Dr., Oak Brook, Ill.

Relays, Plate Circuit

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Couch S.H. Div., 36 River St., Boston, Mass.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc..... p 1750
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1751
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill..... p 1822
Midtex/Aemco, 10 State St., Mankato, Minn.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1839,1840
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. ..... p 1834
RBM Controls Div., 131 Godfrey St., Logansport, Ind..... p 1764
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1855
Aemco Div., 10 State St., Mankato, Minn.
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
Electro-Tec Corp., P.O. Box 667, Ormond Beach, Fla.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.

Relays, Plunger

Comar Elec., 3349 Addison St., Chicago, Ill.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ..... p 1760
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1765,1767,1768
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
RBM Controls, 3501 W. Addison St., Chicago, Ill.

Relays, Polarized

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1716
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill..... p 1741
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc..... p 1750
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1758
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn..... p 1760
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal..... p 1815
Liberty Controls, R.F.D. 5, Joliet, Ill.

Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill.
Midtex/Aemco, 10 State St., Mankato, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1840,1841
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y. p 1849
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Branson Corp., Box W, Denville, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pacific Relays, Inc., 13915 Saticoy St., Van Nuys, Calif.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Power

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1723
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1735
Comar Elec., 3349 Addison St., Chicago, Ill. ..... p 1725
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc. ..... p 1750
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1751
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ..... p 1760
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1773
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill. p 1777
Hamlin Elctrns., Inc., 3879 N. 28th Ave., Phoenix, Ariz. .... p 1778
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1794,1796
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. p 1806-1809
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kilovac Corp., Box 4422, Santa Barbara, Cal. .....p 1810,1811
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. ..... p 1803
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal... p 1812-1814
Liberty Controls, R.F.D. 5, Joliet, Ill. .....p 1816,1817
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. p 1822,1823,1825
Midtex/Aemco, 10 State St., Mankato, Minn. ..... p 1829
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1837,1838
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. ..... p 1834
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1766-1768
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1864
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1867
Aemco Div., 10 State St., Mankato, Minn.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electro-Tec Corp., P.O. Box 667, Ormond Beach, Fla.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Proximity

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyde Park Elctrns., Inc., Box 44, Dayton View Sta., Dayton, Ohio
Larson Aero Dev., Box 135, Concord, Calif.
Luminator, Inc., Box 278, Plano, Tex.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Westinghouse Elec. Corp., Buffalo, N. Y.

Relays, Pulse & Telegraph

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Liberty Controls, R.F.D. 5, Joliet, Ill. ..... p 1818
Nanotron, Inc., 8720 Woodley Ave., Sepulveda, Cal.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Universal Relay Corp., 42 White St., New York, N.Y.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Relays, R-F (Including Antenna & Coaxial)

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2006,2007
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1752-1755
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. .... p 1799
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..p 1807,1808
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill..... p 1824
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Midtex/Aemco, 10 State St., Mankato, Minn. ..... p 1829
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1858,1859
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Aemco Div., 10 State St., Mankato, Minn.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.

Relays, Reed

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
A.L.A. Inds., Inc., 99 Calvert St., Harrison, N.Y. ..... p 1715
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1737-1739
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y. p 1743
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. p 1744,1745
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Douglas Randall inc., 6 Pawcatuck Ave., Westerly, R.I. p 1846-1848
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1758
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass. p 1761
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1772,1773
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774,1775
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo. p 1779-1786
Liberty Controls, R.F.D. 5, Joliet, Ill.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. p 1825-1827
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Midtex/Aemco, 10 State St., Mankato, Minn.
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1831
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1842
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1864
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex. ..... p 1856
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J. p 1863
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Acrodyne, Ltd., Box 93, Evansville, Wisc.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Thermosen, Inc., 375 Fairfield Ave., Stamford, Conn.
Universal Relay Corp., 42 White St., New York, N.Y.
Western Transformer Co., Box 370, Tijeras, N. M.

Relays, Resistance-Sensitive

Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
General Elec. Co., Waynesboro, Va.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Haledy Elctrns. Co., 99 Wall St., New York, N.Y.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Relays, Reverse-Current

Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1773
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Relays, Rotary

Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Couch S.H. Div., 36 River St., Boston, Mass. ..... p 1747
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal. ..... p 1814
Ledex Div., 126 Webster St., Dayton, Ohio
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. ..... p 1834
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Branson Corp., Box W, Denville, N.J.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Universal Relay Corp., 42 White St., New York, N.Y.
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.

Relays, Sensitive

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1716
Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Babcock Relays, 3501 Harbor Blvd., Costa Mesa, Calif. p 1726-1729
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal. .....p 1730,1731
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. p 1732,1734,1736
Comar Elec., 3349 Addison St., Chicago, Ill. ..... p 1725
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. ..... p 1745
Couch S.H. Div., 36 River St., Boston, Mass.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1749
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. .... p 1848
Elctrn. Applications Co., 2213 Edwards Ave., S. El Monte, Calif. p 1758
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass. p 1761
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. ..... p 1771
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1772
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1774,1775
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hamlin Elctrns., Inc., 3879 N. 28th Ave., Phoenix, Ariz. .... p 1778
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1790-1799
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. ....p 1804,1805
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill.
Liberty Controls, R.F.D. 5, Joliet, Ill.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. .... p 1826
Midtex/Aemco, 10 State St., Mankato, Minn.
Nanotron, Inc., 8720 Woodley Ave., Sepulveda, Cal. ..... p 1832
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1830,1831
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1837,1839,1840,1842,1843
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md. ..... p 1834
RBM Controls Div., 131 Godfrey St., Logansport, Ind. p 1762,1763
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1864
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1855
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex. ..... p 1856
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1858,1859
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J. p 1863
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1867
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Barber-Colman Co., Dept. S, 12116 Rock St., Rockford, Ill.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Larson Aero Dev., Box 135, Concord, Calif.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Pacific Relays, Inc., 13915 Saticoy St., Van Nuys, Calif.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Princo Instrs., Inc., Industrial Pk., Southampton, Pa.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
TIA Elec. Co., Box 777, Princeton, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Sequence

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Ledex Div., 126 Webster St., Dayton, Ohio
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Midtex/Aemco, 10 State St., Mankato, Minn.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. .... p 1839
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Solenoid—See Relays, Plunger

Relays, Solid-State

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Deltron, Inc., Wissahickon Ave., N. Wales, Pa.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1748
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Eldema Div., 18435 Susana Rd., Compton, Cal. .....p 1756,1757
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore. p 1769
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. ..... p 1771
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hamlin Elctrns., Inc., 3879 N. 28th Ave., Phoenix, Ariz. .... p 1778
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal. ..... p 1815
Ledex Div., 126 Webster St., Dayton, Ohio
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. .....p 1820,1821
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. .... p 1828
Midtex/Aemco, 10 State St., Mankato, Minn.
Nanotron, Inc., 8720 Woodley Ave., Sepulveda, Cal. ..... p 1832
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1841,1844
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y. ..... p 1397
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1859
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1867
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Branson Corp., Box W, Denville, N.J.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Electronic Control Sys., Inc., Box 1232, Fairmont, W. Va.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Fumas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
HLS, Inc., 2576 Lafayette St., Santa Clara, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.

Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Lark Elctrns., Inc., 45 Walker St., New York, N.Y.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati, Ohio
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Midco, Inc., Box 5433, Trenton, N.J.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Princo Instrs., Inc., Industrial Pk., Southampton, Pa.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Robicon Corp., Plum Ind'l. Pk., Pittsburgh, Pa
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Welex Elctrns., Box 986, Silver Spring, Md.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Relays, Stepping, Ratchet

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 1641
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio
North Elec. Co., 553 S. Market St., Galion, Ohio
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Imtra Corp., 151 Mystic Ave., Medford, Mass.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Telephone

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1740,1741
Comar Elec., 3349 Addison St., Chicago, Ill.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ..... p 1760
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. ..... p 1771
Guardian California, 5755 Camille Ave., Culver City, Cal.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Kurman Instrs. Corp., 15 Burke La., Syosset, N.Y. ..... p 1805
Liberty Controls, R.F.D. 5, Joliet, Ill. ..... p 1816-1818
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. ..... p 1824
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1840,1841
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
Printact Relay Div., 29-10 Thomson Ave., Long Island City, N.Y.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1854
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Aemco Div., 10 State St., Mankato, Minn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Branson Corp., Box W, Denville, N.J.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Davis Elec. Co., P.O. Box 38, Cape Girardeau, Mo.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Sls., Inc., 604 Danley Dr., Ft. Myers, Fla.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Relays, Inc., 162 West 83rd St., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Universal Relay Corp., 42 White St., New York, N.Y.
Welex Elctrns., Box 986, Silver Spring, Md.

Relays, Temperautre-Compensated

API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla.
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. ..... p 1797
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
La Marche Mfg. Co., 102 Bradrock Dr., Des Plaines, Ill.
Larson Instr. Co., Inc., Greenbush Rd., Orangeburg, N.Y.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y.
Branson Corp., Box W, Denville, N.J.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.

Relays, Thermal

Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind.
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Branson Corp., Box W, Denville, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Dales, Franklin Co., 180-85 E. Mill St., Akron, Ohio
E-T-A Prods. Co. America, 6284 N. Cicero Ave., Chicago, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Princo Instrs., Inc., Industrial Pk., Southampton, Pa.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Westinghouse Elec. Corp., Buffalo, N. Y.

Relays, Time-Delay

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind. p 1717
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan ..... p 1719
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 1746
Bissett-Berman Corp., 3860 Centinela Ave., Los Angeles, Calif.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
California Elctrn. Mfg. Co., P.O. Box 555, Alamo, Calif. ..... p 1366
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1735
Comar Elec., 3349 Addison St., Chicago, Ill. ..... p 1725
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Connor-Winfield Corp., Winfield, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1748
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa. ..... p 1771
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. ..... p 1773
General Time Corp., Rte. 8, Torrington, Conn.
Guardian California, 5755 Camille Ave., Culver City, Cal. p 1382
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. ..... p 1787
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J.
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J. p 2049
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Leach Corp., 5915 Avalon Blvd., Los Angeles, Cal. ..... p 1815
Ledex Div., 126 Webster St., Dayton, Ohio
Liberty Controls, R.F.D. 5, Joliet, Ill. ..... p 1816
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. ..... p 1820,1821
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill. ..... p 1828
Midtex/Aemco, 10 State St., Mankato, Minn. ..... p 1829
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 1833
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1844,1845
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1857
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y. ..... p 1397
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyama, Shinagawa-ku, Tokyo, Japan
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N.J.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Amperite Co., Inc., 600 Palisade Ave., Union City, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Branson Corp., Box W, Denville, N.J.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Cramer Div., Old Saybrook, Conn.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
E-T-A Prods. Co. America, 6284 N. Cicero Ave., Chicago, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Automatic Corp., 235 W. First St., Bayonne, N.J.

General Elec. Co., Waynesboro, Va.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instr. & Control Sys., Inc., 129 W. Laura, Addison, Ill.
Integrated Controls, Inc., 6532 Wellesley Pl., San Diego, Cal.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RBM Controls, 3501 W. Addison St., Chicago, Ill.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Rhodes, M.H., Inc., 99 Thompson Rd., Avon, Conn.
Savant Engrg. Inc., 825 N. Second St., St. Charles, Mo.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Relays, Transmitting—See Relays, Keying & Break-In

Relays, Vacuum Contact

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1754,1755
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. p 1806-1809
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 1810,1811
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Penn Keystone Corp., Division St., Ansonia, Conn.
Phipps Precision Prods., 7641 Densmore, Van Nuys, Cal.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Vibrating Reed

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass..... p 2143
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.
Universal Relay Corp., 42 White St., New York, N.Y.

Relays, Vibration-Sensitive

Metrix Instr. Co., Box 36501, Houston, Tex.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Standard Relay Corp., 40 Dale St, W. Babylon, N.Y.

Relays, Voltage Sensitive

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Comar Elec., 3349 Addison St., Chicago, Ill. ..... p 1725
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Diversified Elctrns., Inc., Box 6231, Evansville, Ind....p 1748,1749
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
International Rectifier, 233 Kansas St., El Segundo, Cal.
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y. ..... p 1820
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1835,1840,1841
Takamisawa Elec. Co., Ltd., 35-4, 1-Chome, Koyame, Shinagawa-ku, Tokyo, Japan
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Teledyne Relays, 3155 W. El Segundo Blvd., Hawthorne, Cal. p 1859
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Barron Controls & Relay Corp., 3 N. Barron Blvd., Box 385, Grayslake, Ill.
General Automatic Corp., 235 W. First St., Bayonne, N.J.
General Elec. Co., Waynesboro, Va.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Hillburn Relay Corp., 125 Schmitt Blvd., Farmingdale, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Welch Relay Co., 11161 W. Pico Blvd., Los Angeles, Cal.

Relays, Wire Contact

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1721
RBM Controls Div., 131 Godfrey St., Logansport, Ind..... p 1763
RBM Controls, 3501 W. Addison St., Chicago, Ill.

Repeaters, Passive, Microwave

Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
International Microwave Corp., 33 River Rd., Cos Cob, Conn.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Sys. Co., Box 15155, Golden, Colo.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Repeaters, Servo

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y..... p 1992
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Bendix Corp., S. Montrose, Pa.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Repeaters, Teletype

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Repeating Equipment, Broadcast

CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Rodelco, 356A Commack Rd., Deer Park, N.Y.

Resins, Encapsulating—See Compounds, Encapsulating

Resins, Synthetic—See Plastic Raw Materials

Resistance Adjusting Equipment For Hybrid Microcircuits-Also See Machines, Resistance Adjusting

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Neutronic Corp., Box 625, St. Louis, Mo. ..... p 757
Alessi Inds., 418 Main St., El Segundo, Calif.
Arvin Sys., Inc., 1482 Stanley Ave., Dayton, Ohio
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
Larson Aero Dev., Box 135, Concord, Calif.

Resistance Comparators—See Bridges, Resistance

Resistance Thermometers—See Networks, Resistance

Resistor Networks—See Networks, Resistance

Resistors, Adjustable-Also See Potentiometers

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2794,2795
Amphenol Controls Div., 120 S. Main St., Janesville, Wisc.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bourns, Inc., 1200 Columbia Ave., Riverside, Cal.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..... p 2710
Daven, Div., Dept. EEM 70, Manchester, N.H.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C...p 2763,2764
IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. .....p 2822,2823
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill.....p 2725,2726
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2723
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2730,2731
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nytronics, Inc., Industrial Rd., Kutztown, Pa..... p 2735
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2736
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y. p 2818
Resistors, Inc., 5226 W. 26th St., Chicago, Ill..... p 2748
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Techno-Comps. Corp., 7803 Lemona, Van Nuys, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2763,2764,2822,2823
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
Weston Comps. Div., Archbald, Pa.
Diplohmatic Div., 1211 E. Denny Way, Seattle, Wash.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Ballast Tube—See Tubes, Ballast

Resistors, Barretter

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc.
Narda Microwave Corp., Plainview, N.Y.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.

Resistors, Beryllia Core—See Resistors, Integral Heat Dissapator

Resistors, Carbon Film

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2687
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2713,2715
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2756
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
Nytronics, Inc., Industrial Rd., Kutztown, Pa p 2735
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. p 2741
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa. p 2746,2747
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan p 2770
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2756
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio p 2775
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Penn Resistor Corp., 526 N. Broad St., Lansdale, Pa.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. p 2666
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Carborundum Co., Box 367, Niagara Falls, N.Y.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind.
Marstan Resistor Div., 307 Washington St., Orange, N.J.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Nytronics, Inc., Industrial Rd., Kutztown, Pa p 2735
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2742
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. .. p 2769
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
3M Co., 3M Center, St. Paul, Minn.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Chip (For Microcircuits)

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind. p 2700
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. p 2700
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. p 2700
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 1602
Electra/Midland Corp., 3347 Ind'l. Ct., San Diego, Cal. p 2037
Elctrn. Comps. Div., Trevose, Pa. p 1977
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. p 2319
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Micro Networks, 5 Barbara La., Worcester, Mass.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Resistors, Composition, Carbon

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2690,2691
Carborundum Co., Box 367, Niagara Falls, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. p 2761
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2736
Stackpole Carbon Co., St. Marys, Pa. p 2749
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2761
Airco Singapore Pte., Ltd., 31 International Rd., Jurong Ind'l. Estate, Singapore 22., Japan
Airco Speer Elctrn. Comps., Foster Brook Rd., Bradford, Pa.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Resistors, Decade

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Daven, Div., Dept. EEM 70, Manchester, N.H. p 2716
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 676,2808
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Kelvin, 5919 Noble Ave., Van Nuys, Cal. p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2736
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. p 2773
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Shallcross, E. Preston St., Selma, N.C.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Resistors, Disc-Also See Resistors By Material Type

Carborundum Co., Box 367, Niagara Falls, N.Y. p 2698,2699
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2767
Nytronics, Inc., Industrial Rd., Kutztown, Pa p 2735
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2767
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Film, Metal

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2692,2695
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2701
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. p 2703
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2704,2712,2715
Electra/Midland Corp., Box 760, Mineral Wells, Tex. p 2717
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2765
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2753-2755
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
M.I.A.L. U.S.A., Inc., 165 Franklin Ave., Nutley, N.J.
Nytronics, Inc., Industrial Rd., Kutztown, Pa p 2735
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Sensor Technology, Inc., 7118 Gerald Ave., Van Nuys, Cal. p 1705
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. p 2306
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan p 2771
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2753-2755,2765
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. p 2772
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio p 2775
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Micro Networks, 5 Barbara La., Worcester, Mass.
Micro-Strain, Inc., Spring City, Pa.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Film, Nonmetallized

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2758,2767
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2758,2767
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Penn Resistor Corp., 526 N. Broad St., Lansdale, Pa.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Resistors, Flexible

Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2727
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Resistors, Flux-Sensitive

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. p 1363
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. p 1894
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.

Resistors, Fuse

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2711
Daven, Div., Dept. EEM 70, Manchester, N.H.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2760
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2726
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2730
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Sage Elctrns. Corp., Box 3926, Rochester, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2760
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.

Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Resistors, Glass

Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ... p 2703
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Resistors, Heat Sink Encased—See Resistors, Integral Heat Dissipator

Resistors, High Frequency

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Carborundum Co., Box 367, Niagara Falls, N.Y.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ... p 2702,2703
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2710,2713
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C...p 2765,2766
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ... p 2722
Mepco, Inc., Columbia Rd., Morristown, N.J.
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ... p 2735
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ... p 2744
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa. p 2746,2747
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. .. p 2769
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. .....p 2765,2766
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio ... p 2775
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, High Megohm

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2690,2691
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2687
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2693-2695
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ... p 2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ... p 2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ... p 2697
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. ... p 2701
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ...p 2702,2703
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2709,2712,2713
Daven, Div., Dept. EEM 70, Manchester, N.H. ... p 2716
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ... p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. .... p 2720
IRC Boone Div. of TRW INC., Box 393, Boone, N.C...p 2765,2766
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2754,2756
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. ... p 2761
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ... p 2722
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Mepco, Inc., Columbia Rd., Morristown, N.J. ... p 2728
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa.
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. ... p 2741
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ... p 2742
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa. p 2746,2747
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Stackpole Carbon Co., St. Marys, Pa. ... p 2749
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2754,2756,2761,2765,2766
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio ... p 2775
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, High Temperature

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2687
Balco Capacitors, 307 Washington St., Orange, N.J. p 2688,2689
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2693,2694
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Carborundum Co., Box 367, Niagara Falls, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. ... p 2701
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ...p 2702,2703
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2704-2709,2711-2713
Daven, Div., Dept. EEM 70, Manchester, N.H. ... p 2716
Electra/Midland Corp., Box 760, Mineral Wells, Tex.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2757,2758,2760,2762,2763
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2753-2756
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. ... p 2761
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ... p 2722
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill.....p 2725,2726
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2688,2689
Mepco, Inc., Columbia Rd., Morristown, N.J. ... p 2728
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2729-2733
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nytronics, Inc., Industrial Rd., Kutztown, Pa ... p 2735
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ... p 2736
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ... p 2743
Sage Elctrns. Corp., Box 3926, Rochester, N.Y....p 2750,2751
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. p 2768,2769
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2753-2758,2760-2763
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio..... p 2775
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Shallcross, E. Preston St., Selma, N.C.
States Co., 19 New Park Ave., Hartford, Conn.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Resistors, High Voltage

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. .... p 2693
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Carborundum Co., Box 367, Niagara Falls, N.Y. ... p 2699
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ...p 2702,2703
CTS Berne, Inc., 406 Parr Rd., Berne, Ind. ... p 2700
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. ... p 2700
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
CTS Micro Elctrns., Inc., Box 1278, Lafayette, Ind. ... p 2700
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2705,2707-2709,2712
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2760,2765,2766
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2754,2756
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. ... p 2761
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ... p 2722
Mepco, Inc., Columbia Rd., Morristown, N.J. ... p 2728
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2732,2733
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. ... p 2741
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ... p 2742
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa. p 2746,2747
Sage Elctrns. Corp., Box 3926, Rochester, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. p 2768,2769
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2754,2756,2760,2761,2765,2766
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio..... p 2775
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Disan Engrg. Corp., 516 E. Cherokee, Nowata, Okla.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Shallcross, E. Preston St., Selma, N.C.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Resistors, Hot Molded

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2690,2691
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ... p 2706
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. ... p 2758
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2756
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. .....p 2756,2758

Resistors, Integral Heat Dissipator

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ...p 2696,2697
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2704,2705,2707,2708
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ... p 2719
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. ... p 2726
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2738,2739
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. ... p 2745
Sage Elctrns. Corp., Box 3926, Rochester, N.Y......p 2750,2751
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. .. p 2768
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Shallcross, E. Preston St., Selma, N.C.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Low Temperature Coefficient

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2690,2691
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2688
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2694,2695
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. ..... p 2702,2703
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2705-2709,2711
Daven, Div., Dept. EEM 70, Manchester, N.H. ..... p 2716
Electra/Midland Corp., Box 760, Mineral Wells, Tex. ..... p 2717
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. .... p 2720
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2755
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 2721
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. ..... p 2724
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2688
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc.
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2736
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. .... p 2742-2745
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistors, Inc., 5226 W. 26th St., Chicago, Ill. ..... p 2748
Sage Elctrns. Corp., Box 3926, Rochester, N.Y. ..... p 2750,2751
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. .. p 2769
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan ..... p 2770,2771
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. ..... p 2755
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2772
Welwyn Int'L, Inc., 811 Sharon Dr., Westlake, Ohio
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Miller Electro-Resch. Labs., 14800 W. Grange, New Berlin, Wisc.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Quantum Devices Corp., 140 Greenwood Ave., Box 68, Midland Pk., N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Shallcross, E. Preston St., Selma, N.C.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Metal Glazed

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. ..p 2757,2759
IRC St. Petersburg Div. of TRW INC., 2801 72nd St., N., St. Petersburg, Fla. ..... p 2822,2823
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2757,2759,2822,2823
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'L, Inc., 811 Sharon Dr., Westlake, Ohio
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.

Resistors, Microwave

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif.
Carborundum Co., Box 367, Niagara Falls, N.Y.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2710,2713
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N.J
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 100 Sylvan Rd., Woburn, Mass.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Varian/Solid State Div., Akron St., Copiague, N.Y.

Resistors, Negative Temperature Coefficient

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2687,2800
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Carborundum Co., Box 367, Niagara Falls, N.Y. ..... p 2100-2103
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2713,2715
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. ..... p 2758
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2754
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Keystone Carbon Co., St. Marys, Pa. ..... p 2112-2117
Marstan Resistor Div., 307 Washington St., Orange, N.J.
Mepco, Inc., Columbia Rd., Morristown, N.J. ..... p 2728
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. .....p 2743,2744
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan ..... p 2770
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. .....p 2754,2758
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2772
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Shallcross, E. Preston St., Selma, N.C.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.

Resistors, Non-Inductive

Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. .... p 2692
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2696
Carborundum Co., Box 367, Niagara Falls, N.Y.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. .....p 2702,2703
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2705,2706,2708-2710
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. ..... p 2719
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. ..p 2760,2763
Kelvin, 5919 Noble Ave., Van Nuys, Cal. ..... p 2722
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill.
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2723
Marstan Resistor Div., 307 Washington St., Orange, N.J.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2730
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2736
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. .....p 2742,2745
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Resistors, Inc., 5226 W. 26th St., Chicago, Ill. ..... p 2748
Sage Elctrns. Corp., Box 3926, Rochester, N.Y. .....p 2750,2751
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. .. p 2769
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. .....p 2760,2763
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. .... p 2772
Welwyn Int'L, Inc., 811 Sharon Dr., Westlake, Ohio ..... p 2775
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Miller Electro-Resch. Labs., 14800 W. Grange, New Berlin, Wisc.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Shallcross, E. Preston St., Selma, N.C.
States Co., 19 New Park Ave., Hartford, Conn.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Resistors, Oil Filled

Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Daven, Div., Dept. EEM 70, Manchester, N.H.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 2721
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Nytronics, Inc., Industrial Rd., Kutztown, Pa
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.

Resistors, Plug-In

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 2721
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Marstan Resistor Div., 307 Washington St., Orange, N.J.
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2473,2480,2487
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
American Comps., Inc., 8th Ave. & Harry St., Conshohocken, Pa.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Positive Temperature Coefficient

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2688
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. .....p 2099,2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. .....p 2099,2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. .....p 2099,2697
Carborundum Co., Box 367, Niagara Falls, N.Y. ..... p 2104
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. ..p 2707,2715
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.

General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2758,2760,2762
IRC Burlington Div. of TRW INC., Box 887, Burlington, Iowa p 2754
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 2721
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2724
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2688
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2743,2744
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2754,2758,2760,2762
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa. p 2772
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Film Microelectronics, Inc., 17 A St., Burlington, Mass
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Shallcross, E. Preston St., Selma, N.C.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa.

Resistors, Power

Balco Capacitors, 307 Washington St., Orange, N.J. p 2689
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2692-2694
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. p .q101525P030
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2099,2697
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2099,2696,2697
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2099,2696,2697
Carborundum Co., Box 367, Niagara Falls, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. p 2702,2703
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2707,2708,2710,2711
Daven, Div., Dept. EEM 70, Manchester, N.H. p 2716
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. p 2719
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2760,2762-2766
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. p 2761
Kelvin, 5919 Noble Ave., Van Nuys, Cal. p 2722
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2725-2727
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2723
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2729-2733
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2736
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2743,2745
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa. p 2746,2747
Resistors, Inc., 5226 W. 26th St., Chicago, Ill. p 2748
Sage Elctrns. Corp., Box 3926, Rochester, N.Y. p 2750,2751
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H. p 2768,2769
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2760-2766
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio p 2774
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio p 2775
Airco Speer Elctrn. Comps., 4 Hoover Ave., Du Bois, Pa.
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Colber Corp., 26 Buffington St., Irvington, N.J.
Diplohmatic Div., 1211 E. Denny Way, Seattle, Wash.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Mallory Controls Co., Box 327, Frankfort, Ind.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Penn Resistor Corp., 526 N. Broad St., Lansdale, Pa.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
Pyrofilm Corp., 60 S. Jefferson Rd., Whippany, N.J.
Shallcross, E. Preston St., Selma, N.C.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Tech-Ohm Elctrns., Inc., 36-11 33rd St., Long Island City, N.Y.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Resistors, Pressure Sensitive

Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.

Resistors, Rectilinear

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc. p 2690,2691
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2687
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2704-2706,2709,2711,2713
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2759
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. p 2761
New England Instr. Co., 14 Kendall La., Natick, Mass.
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2759,2761
Weston Comps. Div., Archbald, Pa.
Astro Elctrns., Inc., 1160 E. Ash, Fullerton, Calif.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Carbone Corp., 400 Myrtle Ave., Boontoh, N.J.
Diplohmatic Div., 1211 E. Denny Way, Seattle, Wash.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Resistors, Rhoestat—See Rheostats

Resistors, Standards—See Standards, Resistance

Resistors, Strip

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2767
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2726
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2729-2731
Nytronics, Inc., Industrial Rd., Kutztown, Pa
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2767
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Resistors, Suppressor

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Carborundum Co., Box 367, Niagara Falls, N.Y.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2701
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Resistors, Surge

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Carborundum Co., Box 367, Niagara Falls, N.Y.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2762,2765
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2732
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2762,2765

Resistors, Tapped

Balco Capacitors, 307 Washington St., Orange, N.J. p 2689
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2098
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2098
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2098
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2710
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y.
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2763
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2725,2726
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2723
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2729-2731
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2736
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2743
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistors, Inc., 5226 W. 26th St., Chicago, Ill. p 2748
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2763
ASC Microelectronics, Shelter Rock La., Danbury, Conn.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Mallory Controls Co., Box 327, Frankfort, Ind.
Rho Engrg. Co., 2234 Colby Ave., Los Angeles, Calif
Shallcross, E. Preston St., Selma, N.C.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Temperature Sensitive—See Thermistors

Resistors, Tin Oxide

Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y. p 2702,2703
Welwyn Int'l., Inc., 811 Sharon Dr., Westlake, Ohio p 2775
Mallory Controls Co., Box 327, Frankfort, Ind.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Resistors, Variable—See Potentiometers

Resistors, Voltage-Sensitive

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Carborundum Co., Box 367, Niagara Falls, N.Y. p 2698,2699
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Daven, Div., Dept. EEM 70, Manchester, N.H.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex. p 1160
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Resistance Prods. Co., 914 S. 13th St., Harrisburg, Pa.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio p 1921
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Colber Corp., 26 Buffington St., Irvington, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.

Resistors, Wirewound

Balco Capacitors, 307 Washington St., Orange, N.J. p 2688,2689
Caddock Elctrns., 3127 Chicago Ave., Riverside, Calif. p 2695
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2696
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2696
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. p 2696
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb. p 2704-2711,2714
Daven, Div., Dept. EEM 70, Manchester, N.H. p 2716
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Tempie City, Cal. p 2038
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 2808
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. p 2718
Gamble, Charles T. Inds., New Jersey Ave. & Fairview St., Riverside, N.J. p 2719
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. p 2720

Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
IRC Boone Div. of TRW INC., Box 393, Boone, N.C. p 2760,2762-2764
IRC Philadelphia Div. of TRW INC., 401 N. Broad St., Philadelphia, Pa. p 2761
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 2721
Kelvin, 5919 Noble Ave., Van Nuys, Cal. p 2722
Lectrohm, Inc., 5562 Northwest Hwy., Chicago, Ill. p 2727
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2723
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2688,2689
Mepco, Inc., Columbia Rd., Morristown, N.J. p 2728
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc. p 2729
Nytronics, Inc., Industrial Rd., Kutztown, Pa p 2735
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2736
Omtronics Mfg., Inc., 2406 Leavenworth St., Omaha, Neb. p 2737-2740
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2743,2744
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Resistors, Inc., 5226 W. 26th St., Chicago, Ill. p 2748
Sage Elctrns. Corp., Box 3926, Rochester, N.Y. p 2750,2751
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass. p 2306
Tel Labs., Inc., 1050-1060 Second St., Manchester, N.H.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal. p 2760-2764
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Astro Elctrns., Inc., 1160 E. Ash, Fullerton, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Bradohm, Inc., 65 South Ave., Box 107, Salamanca, N.Y.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Colber Corp., 26 Buffington St., Irvington, N.J.
Diplohmatic Div., 1211 E. Denny Way, Seattle, Wash.
Euclid Elec. & Mfg. Div., Madison Ind'l, Pk., Madison, Ohio
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Instrument Resistors Co., Inc., 503 Adamston Rd., Brick Town, N.J.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Logan Elctrn. Corp., 100 Mill St., Revere, Mass.
Mallory Controls Co., Box 327, Frankfort, Ind.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Mel-Rain Corp., 3100 Roosevelt Ave., Indianapolis, Ind.
Miller Electro-Resch. Labs., 14800 W. Grange, New Berlin, Wisc.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Penn Resistor Corp., 526 N. Broad St., Lansdale, Pa.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Priester, H.E. Corp., 250 Station Plaza, Hartsdale, N.Y.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Voltronics, Inc., 7746 W. Addison St., Chicago, Ill.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Westinghouse Elec. Corp., Buffalo, N. Y.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Resistors, Wire Woven

Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.
Dale Elctrns., Inc., 1342 28th Ave., Columbus, Neb.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
States Co., 19 New Park Ave., Hartford, Conn.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.

Resists—See Coatings, Films, Transfers, Etchant Resisting

Resolver Testers—See Testers, Synchro / Resolver

Resolvers, Synchro

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. p 1640
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. p 1997
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. p 1997
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 1997
Weston-Transicoil, Worcester, Pa.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Bendix Corp., S. Montrose, Pa.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Resonators—See Filters & Oscillators

Resonators, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Aircom, Inc., Rte. 16B, Union, N.H.
Collins Radio Co., Dallas, Tex.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Restorers, Pulse Form

Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.

Retainers, Battery

Augat Inc., 33 Perry Ave., Attleboro, Mass. p 1599
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Golden I. Corp., 1054 38th St., Brooklyn, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.

Retainers, Relay

American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1724

Retainers, Transistor & Diode

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. p 1896-1901
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. p 2454
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Birtcher Corp., Box D, Monterey Park, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Retainers, Tube

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Birtcher Corp., Box D, Monterey Park, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Kestler Elctrns., 4226 Arica Ave., Rosemead, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.

Reticles—See Scales & Reticles

Retractile Cords—See Cords, Retractile

Rheostats

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. p 626
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2701
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 2808
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1061
LTV Electrosystems, Inc., 1320 Flaxmill Rd., Huntington, Ind. p 2812
Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, Wisc.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. p 2817
Reon Resistor Corp., 155 Saw Mill River Rd., Yonkers, N.Y.
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Techno-Comps. Corp., 7803 Lemona, Van Nuys, Cal.
Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Mel-Rain Corp., 3100 Roosevelt Ave., Indianapolis, Ind.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Westinghouse Elec. Corp., Buffalo, N. Y.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Rings, Brazing

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J. p 2837
Handy & Harman, 850 Third Ave., New York, N.Y.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Rings, Carbon Packing—See Seals, Carbon

Rings, Oil Sealing—See Seals, Oil

Rings, Retaining

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Sterling Instr., 76 E. Second St., Mineola, N.Y. p 1695
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N. Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Rotor Clip Co Inc., 1323 Randall Ave., Bronx, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, Ohio
Templeman, D.R. Co., 8 Park St., Plainville, Conn.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Tridair Inds., 3000 W. Lomita Blvd., Torrance, Calif.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City, N.Y.

Rings, Slip-Brush Assemblies—See Slip Ring Assemblies

Rivets

Circon Corp., Santa Barbara Airport, Goleta, Calif. p 2836
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Abbott Screw & Mfg. Co., 6525 N. Clark St., Chicago, Ill.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Armco/Olympic Fasteners, 7000 Roberts St., Kansas City, Mo.
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Century Fastener Corp., 20 Grand Ave., Brooklyn, N.Y.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Cherry Rivet Div., P.O. Box 2157, Santa Ana, Calif.
Chicago Rivet & Mach. Co., 950 S. 25 Ave., Bellwood, Ill.
Deutsch Fastener Corp., P.O. Box 90925, Airport Sta., Los Angeles, Calif.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Gibson Elec., Delmont, Pa.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Harper, H.M. Co., 8200 Lehigh Ave., Morton Grove, Ill.
Luke Line Fasteners, 201 Laurel St., Beverly, N.J.
Milford Rivet & Mach. Co., 857 Bridgeport Ave., Milford, Conn.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Star Expansion Co., Pleasant Hill Rd., Mountainville, N.Y.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
Teale Machine Co., Inc., Box 936, Rochester, N.Y.
Townsend Co., 530 West St., Braintree, Mass.
USM Corp., 510 River Rd., Shelton, Conn.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.

Rods & Clamps, Ground

Helitronics Corp., 155 Tichenor St., Newark, N.J.
Sterling Instr., 76 E. Second St., Mineola, N.Y. p 1695
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Baumker Mfg. Co., 5144 Enterprise, Toledo, Ohio
Bland Co., 95 Granby St., Bloomfield, Conn.
Copperweld Steel Co., Glassport, Pa.
Crown Metal Products Co., Wyano, Pa.

International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Premax Prods. Div., Highland & College Aves., Niagara Falls, N.Y.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Utilities Svc. Co., P.O. Box 627, Allentown, Pa.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.

Rods & Tubes, Metal—See Tubing, Metal

Rooms, Clean, Dust-Free

Agnew-Higgins, Inc., P.O. Box 857, Garden Grove, Calif.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Clean Rooms Constr. Co., Inc., Box 275, Westminster, Cal.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Merix Chem. Co., 2234 East 75th St., Chicago, Ill.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Westinghouse Elec. Corp., 4300 36th St., S.E., Grand Rapids, Mich.

Rooms, Environmental

Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Atlas Engrg. Corp., 26 Custer St., W. Hartford, Conn.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Develco, Inc., 8 Van Tassel Ct., Norwalk, Conn.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Harris Mfg. Co., Inc., 308 River St., Cambridge, Mass.
Hotpack Corp., 5148 Cottman Ave., Philadelphia, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Dev. & Mfg. Co., 510 E. Washington, Chagrin Falls, Ohio
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
National Appliance Co., Box 23008, Portland, Ore.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Standard Cabinet Co., Inc., 392 Minnisink Rd., Totowa, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Westinghouse Elec. Corp., 4300 36th St., S.E., Grand Rapids, Mich.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Rooms, Screen—See Screen Rooms

Rooms, Shielded—See Screen Rooms

Rotary Joints, Microwave—See Joints, Rotary, Microwave

Rotators—See Antenna Rotators

Rotors, Motor & Generator—See Motor & Generator Armatures, Rotors, Stators

Rubber, Conductive

Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 2593
Metex Corp., 970 New Durham Rd., Edison, N.J. .....p 2616,2620
Abesto Corp., Ackerman St., Bloomfield, N.J.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.

Rubber Guards (For Equipment)—See Bumpers

Rubber, Silicone

Dow Corning Corp., Midland, Mich. ..... p 2667-2670
Abesto Corp., Ackerman St., Bloomfield, N.J.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., Waterford, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Kirkhill Rubber Co., 300 E. Cypress St., Brea, Calif.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minnesota Rubber Co., 3630 Wooddale Ave., Minneapolis, Minn.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Ram Chems. Mfg. Co., Inc., 210 E. Alondra Blvd., Gardena, Calif.
Rehau Plastiks, Inc., 50-22 49th St., Woodside, N.Y.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Tra-Con, Inc., 55 North St., Medford, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Union Carbide Corp., Chemicals & Plastics, 270 Park Ave., New York, N.Y.

Sapphire Parts

Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alessi Inds., 418 Main St., El Segundo, Calif.
Bird, Richard H. & Co., Inc., 1 Spruce St., Waltham, Mass.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Dixie Diamond Tool Co., Inc., 6875 Southwest 81st St., Miami, Fla.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Insaco, Inc., Box 422, Quakertown, Pa.
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Swiss Jewel Co., Lafayette Bldg., Philadelphia, Pa.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.

Saws For Semiconductor Crystals

Felker Mfg. Co., 1900 S. Crenshaw Blvd., Torrance, Calif.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Norton Co., 1 New Bond St., Worcester, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.

Scale Expanders, Meter—See Multipliers, Meter

Scalers, Binary, Decade

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Norden Div., Helen St., Norwalk, Conn.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Tennelec, Inc., Box D, Oak Ridge, Tenn.
3M Co., 3M Center, St. Paul, Minn.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
United Aircraft Corp., Helen St., Norwalk, Conn.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England

Scales & Reticles, Optical

Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.

Scales, Dial

Datak Corp., 85 Highland Ave., Passaic, N.J. ..... p 1499
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bristol Div, Waterbury, Conn
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Detecto Scales, Inc., 540 Park Ave., Brooklyn, N.Y.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Exact Weight Scale Co., 1005 W Third Ave, Columbus, Ohio
Fairbanks Morse Weighing Sys., 711 E. St. Johnsbury Rd., St. Johnsbury, Vt.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Howe Richardson Scale Co., 680 Van Houten Ave., Clifton, N.J.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Metalphoto Corp., 18531 S. Miles Rd., Cleveland, Ohio
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Printfoid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Toledo Scale, 5225 Telegraph Rd., Toledo, Ohio
Torsion Balance Co., 35 Monhegan St., Clifton, N.J.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Scales, Production Weight

PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Yaskawa Elec. America, Inc., 100 Bliss Dr., Oak Brook, Ill.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Detecto Scales, Inc., 540 Park Ave., Brooklyn, N.Y.
Exact Weight Scale Co., 1005 W Third Ave, Columbus, Ohio
Fairbanks Morse Weighing Sys., 711 E. St. Johnsbury Rd., St. Johnsbury, Vt.
Howe Richardson Scale Co., 680 Van Houten Ave., Clifton, N.J.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Toledo Scale, 5225 Telegraph Rd., Toledo, Ohio
Torsion Balance Co., 35 Monhegan St., Clifton, N.J.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.

Scanners, Crossbar

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y..... p 2005
Cunningham Corp., 10 Carriage St., Honeoye Falls, N.Y. p 2030,2031
Honeywell, Box 5227, Denver, Colo.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Takeda Riken Industry Co., Ltd., Tokyo 175, Japan
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Electronic Modules Corp., Box 141, Timonium, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Scanners, Flying Spot

Beta Instr. Corp., 20 Ossipee Rd., Newton Upper Falls, Mass. p 546
Raytheon Co., 465 Centre St., Quincy, Mass.
Electro-Optical Sys., Pasadena, Calif.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Traid Corp., 777 Flower St., Glendale, Calif.

Scanners, Infrared

American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1708
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass..... p 1710
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bendix Corp., 3300 Plymouth Rd., Ann Arbor, Mich.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.

Scanners, Instrument, Input(Output

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y..... p 2005
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1708
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. ..... p 553

Cunningham Corp., 10 Carriage St., Honeoye Falls, N.Y. p 2030,2031
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 677
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Honeywell, Box 5227, Denver, Colo.,
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 749
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y.
Neutronic Corp., Box 625, St. Louis, Mo.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. p 756
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. p 583
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio p 766
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Bristol Div, Waterbury, Conn
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Columbia Sci. Inds., Box 6190, Austin, Tex.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Discon Corp., 1150 N.W. 70th St., Ft. Lauderdale, Fla.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Electronic Modules Corp., Box 141, Timonium, Md.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Howell Instrs., Inc., 3479 W. Vickery Blvd., Ft. Worth, Tex.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
NRA, Inc., 12 Nevada Dr., New Hyde Park, N.Y.
Parker Instr. Corp., 200 Harvard Ave., Stamford, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scanivalve, Inc., Box 20005, San Diego, Calif.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Teradyne, Inc., 183 Essex St., Boston, Mass.
3M Co., 3M Center, St. Paul, Minn.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Vidar Corp., 77 Ortega Ave., Mountain View, Cal.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Scanners, Magnetic Tape—See Readers, Magnetic Tape

Scanners, Radiochromatogram

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. p 2005
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.

Scanners, Solid State

Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Computer Prods., Box 23849, 1400 N.W. 70th St., Ft. Lauderdale, Fla. p 553
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Neutronic Corp., Box 625, St. Louis, Mo.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dynamic Sys. Elctrns. Corp., 1040 W. Alameda Dr., Tempe, Ariz.
Electronic Modules Corp., Box 141, Timonium, Md.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Scintillation Crystals—See Crystals, Scintillation

Scissors

Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Compton, W.H. Shear Co., P.O. Box 1096, North Sta., New Bedford, Mass.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.

Scope Dollies—See Carts, Instrument & Equipment

Scopes—See Oscilloscopes

SCR's—See Thyristors

SCR Firing Controls—See Controls, Scr

Scramblers, Speech

Collins Radio Co., Dallas, Tex.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Screen Room Filters—See Filters, Screen Room

Screen Rooms

Filtron Co., Inc., 131-15 Fowler Ave., Flushing, N.Y. p 1565
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Ace Shielded Prods., 60 Tomlinson Rd., Huntingdon Valley, Pa.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Topatron, Inc., Box 967, Costa Mesa, Calif.

Screwdrivers

Allen Mfg. Co., Drawer 570, Hartford, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Black & Decker Mfg. Co., The, 701 E. Joppa Rd., Towson, Md.
Channellock, Inc., S. Main St., Meadville, Pa.
Desco Mfg. Co., 1530 Flower St., Glendale, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
Foredom Elec. Co., Bethel, Conn.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kedman Co., Box 267, 762 S. Redwood Rd., Salt Lake City, Utah
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Neuses, P.K., Inc., Box 100, Arlington Hgts., Ill.
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Portable Elec. Tools, Div., 1200 E. State St., Geneva, Ill.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Rosenberg Bros. & Co., 100 Landing Ave., Smithtown, N.Y.
Shakeproof Div., St. Charles Rd., Elgin, Ill.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Standard Pneumatic Motor Co., Box 745, Whittier, Calif.
Stanley Tools, New Britain, Conn.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Screws, Lead, Feed & Translatory—See Drives & Drive Mechanisms

Screws—See Fasteners

Scribers, Wafer—See Machines & Accessories, Semiconductor Manufacturing

Sealers—See Coatings

Sealing Kits, Cable End—See Kits, Cable-End Sealing

Sealing Service, Hermetic—See Services, Hermetic Sealing

Seals & Feedthrust, Environmental-See Feedthrust & Seals, Environmental

Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Ultek Div., Box 10920, Palo Alto, Calif.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Seals, Carbon

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Helwig Carbon Prods., Inc., 2550 North 30th St., Milwaukee, Wisc.
Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio
Poco Graphite, Inc., Box 2121, Decatur, Tex.
Pure Carbon Co., Inc., 441 Hall Ave., St. Marys, Pa.
Sealol, Inc., Warwick Industrial Park, Providence, R.I.
St. Marys Carbon Co., 1939 State Rd., St. Marys, Pa.
Stackpole Carbon Co., Stackpole St., St. Marys, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.

Seals, Ceramic To Metal

Airpax Elctrns., Inc., Cambridge, Md. p 2000
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. p 2666
Bendix Corp., Box 239, Franklin, Ind. p 2592
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
GTI Corp., 310 Chestnut St., Meadville, Pa.
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. p 1619,1625
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex.
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
General Elec. Co., Waterford, N.Y.
Glass Beads Co., Latrobe, Pa.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Norton Co., 160 Charlemont St., Newton, Mass.
Power Engrg. & Equip. Co., Inc., 1826 213th St., Torrance, Cal.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
3M Co., 3M Center, St. Paul, Minn.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Vernitron, P.O. Box 878, Norwalk, Conn.

Seals, Glass To Metal

Airpax Elctrns., Inc., Cambridge, Md. ..... p 2000
Bendix Corp., Box 239, Franklin, Ind. ..... p 2592
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
GTI Corp., 310 Chestnut St., Meadville, Pa.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan ..... p 2601
Pfizer Minerals, Dept. 56, 235 E. 42nd St., New York, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1619,1625
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Cerro Corp., 300 Park Ave., New York, N.Y.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dolinko & Wilkens, Inc., 1901-7 Summit Ave., Union City, N.J.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
General Elec. Co., Waterford, N.Y.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hermetic Seal Div., 317 Main St., Box L, Wilmington, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Latronics Corp., Box 469, Latrobe, Pa.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Nester L.G. Co., P.O. Box 666, Millville, N.J.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Norton Co., 160 Charlemont St., Newton, Mass.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Richland Glass Co., Inc., Richland, N.J.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Sperry Elctrn. Tube, Gainesville, Fla.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Superior Elctrns. Co., 474 Getty Ave., Clifton, N.J.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Refining & Smelting Co., 3700 N. Runge Ave., Franklin Park, Ill.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Xenon Corp., 39 Commercial St., Medford, Mass.

Seals, Hermetic-Also See Services, Hermetic Sealing

Bendix Corp., Box 239, Franklin, Ind. ..... p 2592
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1303
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1619,1625
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Hermetic Seal Div., 317 Main St., Box L, Wilmington, Mass.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
KDI Sealtron Corp., Reading at Amity Rd., Cincinnati, Ohio
Latronics Corp., Box 469, Latrobe, Pa.
Mansol Ceramics Co., Inc., 140 Little St., Belleville, N.J.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Seals, Metal To Metal

Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Associate General Labs., Inc., 8934 W. Ogden Ave., Brookfield, Ill.
Belfab, P.O. Box 1881, Daytona Beach, Fla.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Clarkson Labs., Inc., 1450 Ferry Ave., Camden, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., Box 237, Detroit, Mich.
General Elec. Co., Waterford, N.Y.
Gould, Inc., 17000 St. Clair Ave., Cleveland, Ohio
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
H.K. Metalcraft Mfg. Co., 35 Industrial Rd., Lodi, N.J.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Metallo Gasket Co., 16 Bethany St., New Brunswick, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Power Engrg. & Equip. Co., Inc., 1826 213th St., Torrance, Cal.
Sealol, Inc., Warwick Industrial Park, Providence, R.I.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Ultek Div., Box 10920, Palo Alto, Calif.
Vernitron, P.O. Box 878, Norwalk, Conn.

Seals, Microwave—See Gaskets, Shielding, R-F; Seals, Waveguide

Seals, Oil

Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Abesto Corp., Ackerman St., Bloomfield, N.J.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
GAF Corp., 140 W. 51 St., New York, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Penn Fibre & Specialty Co., Inc., 2020 E. Westmoreland St., Philadelphia, Pa.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Sealol, Inc., Warwick Industrial Park, Providence, R.I.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Vibra Seal Corp., 2832 E. Grand Blvd., Detroit, Mich.

Seals, Plastic

Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Hardman Inc., Belleville, N.J.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Seals, Rubber

Abesto Corp., Ackerman St., Bloomfield, N.J.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Bellofram Corp., 103 Blanchard Rd., Burlington, Mass.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Continental Rubber Works, Erie, Pa.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Gaskets, Inc., Middletown, Conn.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hardman Inc., Belleville, N.J.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Kirkhill Rubber Co., 300 E. Cypress St., Brea, Calif.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minnesota Rubber Co., 3630 Wooddale Ave., Minneapolis, Minn.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Vernay Labs., E. South College St., Yellow Springs, Ohio
Vibra Seal Corp., 2832 E. Grand Blvd., Detroit, Mich.

Seals, Rubber To Metal

Adhesive Prods. Corp., 1660 Boone Ave., Bronx, N.Y.
Continental Rubber Works, Erie, Pa.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., Waterford, N.Y.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hardman Inc., Belleville, N.J.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minnesota Rubber Co., 3630 Wooddale Ave., Minneapolis, Minn.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Townsend Co., West Newton, Pa.
Vacuum Resch. Mfg. Co., 3100 Crow Canyon Rd., San Ramon, Calif.
Vernay Labs., E. South College St., Yellow Springs, Ohio

Seals, Silicone Rubber

Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Abesto Corp., Ackerman St., Bloomfield, N.J.
ABSCOA Inds., 1071 W. Arbor Vitae, Inglewood, Calif.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Bellofram Corp., 103 Blanchard Rd., Burlington, Mass.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Continental Rubber Works, Erie, Pa.
Fel-Pro, Inc., 7450 N. McCormick Blvd., Skokie, Ill.
General Elec. Co., Waterford, N.Y.
General Gaskets, Inc., Middletown, Conn.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Houghton, E.F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Industrial Elctrn. Rubber Co., 8589 Darrow Rd., Twinsburg, Ohio
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Kirkhill Rubber Co., 300 E. Cypress St., Brea, Calif.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minnesota Rubber Co., 3630 Wooddale Ave., Minneapolis, Minn.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Multi-Flex Seals, Inc., 1170 Commerce Ave., Bronx, N.Y.
Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Richardson Co., 2640 Lake St., Melrose Park, Ill.

Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Vernay Labs., E. South College St., Yellow Springs, Ohio

Search Unit, Magnetic Tape—See Tape Search Equipment

Selective Calling Devices—See Comm. Systems, Selective Paging

Self-Lubricating Materials—See Materials, Self-Lubricating

Selsyns—See Motors, Synchronous

Semiconductor Cases—See Cans, Semiconductor

Semiconductor Joint Compound

Tech Spray, 2113 W. 3rd, Box 949, Amarillo, Tex.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Semiconductor Material—See Crystals, Semiconductor

Semiconductor Readouts—See Readouts, Semiconductor

Semiconductors—See Diodes; Rectifiers; Transisters

Sensors, Ice, Sleet & Snow—See Detectors, Ice, Sleet & Snow

Sensors, Temperature—See Bolometers, Thermistors, Transducers

Services, Assembly & Fabrication

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
AEL, Inc., Box 552, Lansdale, Pa.
American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
A P Inc., 56 Corwin Dr., Painesville, Ohio
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J. .... p 2680
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Borg-Warner Thermoelectrics, Wolf & Algonquin Rds., Des Plaines, Ill. .....p 2096,2097
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.....p 554,1330
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446
Electronic Enclosures, Inc., Box 90978, El Segundo, Cal.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y..... p 1643
Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Formica Metal Prods. Co., Inc., Corporation Way, Dept. M, Medford, Mass. ..... p 2151
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y.
Gridcraft, 14520 Lima Rd., R.R. #1, Ft. Wayne, Ind. ..... p 1357
GTI Corp., 310 Chestnut St., Meadville, Pa.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Kelvin, 5919 Noble Ave., Van Nuys, Cal.
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio ..... p 2530
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa. p 573
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Oven Industries, Box 229, E. Simpson Rd., Mechanicsburg, Pa. p 1448
Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y.
Ripley Co., Inc., 1 Factory St., Middletown, Conn. ..... p 2651
Rosemount Plug-In, Inc., 1416 Lebanon Rd., Nashville, Tenn.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio ..... p 2529
Samarius, Inc., 300 Seymour Ave., Derby, Conn.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn.
Trio Labs., Inc., 80 DuPont St., Plainview, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Universal Instrs. Corp., 139 E. Frederick St., Binghamton, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1289
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abalon Precision Mfg. Corp., 540 Casanova St., Bronx, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Aero Vac Corp., Box 448, Troy, N.Y.
Aerolux Light Co. Inc., 653 11th Ave., New York, N.Y.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn, N.Y.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Airtronics, Inc., Dulles Int'l. Airport, Washington, D.C.
Algo, 50 Schrieffer St., S. Hackensack, N.J.
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Prods., Inc., 6825 S. Chicago Ave., Chicago, Ill.
Altron Elctrns. Co., 1309 Jefferson Ave., Woodlyn, Pa.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Auricord, 35-41 29th St., Long Island City, N.Y.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Blickman, S., Inc., 201 Gregory Ave., Weehawken, N.J.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Carter Precision Elec. Co., 3401 W. Madison St., Skokie, Ill.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Centerline Specialties, Box 656, Boulder, Colo.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Coast Elctrns., Inc., 1305 Fifth St., Manhattan Beach, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Colorado Instrs., Inc., 1 Park St., Broomfield, Colo.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conductorlab, Inc., Main St., Groton, Mass.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Diebel Mfg. Co., 6505 Oakton St., Morton Grove, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Dynacool Mfg. Co., Inc., 1 Russell St., Saugerties, N.Y.
Dynatronic Cable Engrg. Corp., 136 San Fernando Rd., Los Angeles, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
EDP Corp., Box 6485, Orlando, Fla.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electro Specialties Corp., 370 Park Ave., Worcester, Mass.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electrochemical Inds., Inc., 665 Cambridge St., Worcester, Mass.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Electronic Control Co., Box S150, Dresher, Pa.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Electronics, Inc. Pa., 2440 Maryland Ave., Willow Grove, Pa.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
E.O. Electronics, Inc., Mountain Lakes, N.J.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Federal Mach. Co., Inc., 807 Garfield Ave., Jersey City, N.J.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
GAF Corp., 140 W. 51 St., New York, N.Y.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Reliance Div., 20 Mercer St., Dover, N.J.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Gerrard, A.J. & Co., 400 E. Touhy Ave., Des Plaines, Ill.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Golden, I. Corp., 1054 38th St., Brooklyn, N.Y.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Hartman Electrical Mfg. Co., 173 N. Diamond St., Mansfield, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Holbrook-Merrill Co., 1150 Kifer Rd., Sunnyvale, Cal.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
ITT Mackay Marine, 133 Terminal Ave., Clark, N.J.
Jersey Tech. Conslts., 22 Colles Ave., Box 215, Morristown, N.J.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Joliet Control Corp., Box 751, Joliet, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kaiser CATV, Box 9728, Phoenix, Ariz.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Lane Inds., 7254 Atoll Ave. N., North Hollywood, Calif.
Latronics Corp., Box 469, Latrobe, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Lochart Inds., Inc., 15707 Texaco Ave., Paramount, Cal.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Mercury Elctrns. Corp., 339 E. Cottage Pl., York, Pa.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Microflect Co., 3575 25th S.E., Salem, Ore.

Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Midco, Inc., Box 5433, Trenton, N.J.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Mutron Corp., 646 Summer St, Brockton, Mass.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Ostby & Barton Co., Box 6267, Providence, R.I.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Parks, Henry Francis Lab., Box 25665, Seattle, Wash.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Petty Geophysical Engrg. Co., 700 Tower Life Bldg., San Antonio, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
Rectico, Inc., 20 Village Park Rd., Cedar Grove, N.J.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Riverbank Labs., Box 110, Geneva, Ill.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Santa Fe Mfg. Co., 2343 Jerome Ave., Bronx, N.Y.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Stainless, Inc., 3rd St., N. Wales, Pa.
Stanley Ind'l. Hardware Div., New Britain, Conn.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Tickle, Arthur Engrg. Works, Inc., 21 Delevan St., Brooklyn, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tri-Tronics Lab., Inc., Box 638, Euless, Tex.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Twin City Metalseal, Inc., 825 11th Ave. S.E., Minneapolis, Minn.
Ultra Carbon Corp., Box 747, Bay City, Mich.
Ultrasonic Mach. Co., 266 West Ave., Long Branch, N.J.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Varied Ind'l. Prods., Inc., 445 Fifth Ave., Paterson, N.J.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Waber Elctrns., Inc., 2000 N. Second St., Philadelphia, Pa.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
York Metal Prods., Inc., 34-20 12th St., Long Island City, N.Y.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Services, Calibration & Instrument Repair

AEL, Inc., Box 552, Lansdale, Pa.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Honeywell, Box 5227, Denver, Colo.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Altron Elctrns. Co., 1309 Jefferson Ave., Woodlyn, Pa.
Ametek, Inc., Station Square Two, Paoli, Pa.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Avco Meas. Standards Labs., 201 Lowell St., Wilmington, Mass.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Detroit Testing Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eidson Elctrn. Co., 1902 N. Third, Box 96, Temple, Tex.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electrical Testing Labs., Inc., 2 East End Ave., New York, N.Y.
Electro-Optical Div., 347 King St., Northampton, Mass.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Main Elctrns., Inc., 353 Pattie, Wichita, Kans.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
National Meas. Labs., 2201 Hollywood Way, Burbank, Calif.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photo Resch. Corp., 3000 N. Hollywood Way, Burbank, Calif.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rockwell Engrg. Co., 2125 E. 45th St., Indianapolis, Ind.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
SSCO Standards Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Tektronix, Inc., Box 500, Beaverton, Ore.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tucker Elctrns. Co., 326 Kirby St., Garland, Tex.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Welex Elctrns., Box 986, Silver Spring, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Services, Coating (All-Types)

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Acheson Colloids Co., 1935 Washington Ave., Port Huron, Mich.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Cerac, Inc., Box 597, Butler, Wisc.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Collins Radio Co., Dallas, Tex.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electrochemical Inds., Inc., 665 Cambridge St., Worcester, Mass.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Green Elec. Corp., 29-13 Broadway, Fair Lawn, N.J.
Hardman Inc., Belleville, N.J.
Harper-Leader, Inc., 1046 S. Main St., Waterbury, Conn.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Ment Plating Co., Inc., 212 East 141st St., Bronx, N.Y.
Misco Div., 221 W. Webster Ave., Muskegon, Mich.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norton Co., 1 New Bond St., Worcester, Mass.
Pacific Universal Prods. Corp., 168 Vista Ave., Pasadena, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Sifco Metachemical, 935 East 63rd St., Cleveland, Ohio
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif
Sperex Corp., 2239 Pontius Ave., Los Angeles, Calif.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Tempil Div., Hamilton Blvd., So. Plainfield, N.J.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Twin City Metalseal, Inc., 825 11th Ave. S.E., Minneapolis, Minn.
Ultra Carbon Corp., Box 747, Bay City, Mich.
Unicote Corp., 15121 Charlevoix Ave., Grosse Pointe Pk., Mich.
Union Carbide Corp, Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Valpey Corp., 1400 Highland St., Holliston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Services, Design (Circuits, Components, Equipment, Systems, etc.)

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
FAE Instr. Corp., 16 Norden La., Huntington Sta., N.Y. ..... p 1643
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Frequency Sources, Inc., Kennedy Dr., Box 159, No. Chelmsford, Mass.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Honeywell, Box 5227, Denver, Colo.
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Intronics, Inc., 57 Chapel St., Newton, Mass.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Melcor Elctrns. Corp., 1750 New Hwy., Farmingdale, N.Y.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Sorensen Oper., Richards Ave., Norwalk, Conn.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ..... p 1289
AAI Corp., P.O. Box 6767, Baltimore, Md.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Achrodyne Corp., Rte. 4, Box 321, Yorktown, Va.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Airtronics, Inc., Dulles Int'l. Airport, Washington, D.C.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Belleville Elctrns. Co., 25 Fifth St., Belleville, Mich.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cambridge Memories, Inc., 285 Newtonville Ave., Newtonville, Mass.
Centerline Specialties, Box 656, Boulder, Colo.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Data Sys. Engrg., Inc., 1505 E. 17th St., Santa Ana, Cal.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Datcon Elctrns. Corp., 150 S. Terrace Ave., Mt. Vernon, N.Y.
Design Automation, Inc., 809 Massachusetts Ave., Lexington, Mass.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
FJW Inds., Inc., 215 E. Prospect Ave., Mt. Prospect, Ill.
Fleetwood Labs., Inc., 35 Rockwood Pl., New Rochelle, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Joliet Control Corp., Box 751, Joliet, Ill.

Karlson Resch. & Mfg. Div., 388 Penisula Blvd., Hempstead, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Latronics Corp., Box 469, Latrobe, Pa.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Macrodata, 20440 Corisco St., Chatsworth, Cal.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
McNally Bros. Mach. & Gear Co., Inc., 1145 East 79th St., Minneapolis, Minn.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Microwave Sys. Co., Box 15155, Golden, Colo.
Midco, Inc., Box 5433, Trenton, N.J.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Parks, Henry Francis Lab., Box 25665, Seattle, Wash.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Phoenix Materials Corp., Box 9, Kittanning, Pa.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Scientific Meas., Inc., 9701 N. Kenton, Skokie, Ill.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledyne Adcom, 808 Memorial Dr., Cambridge, Mass.
Texas Instruments, Inc., Advanced Circuit Board Dept., Box 5303, M.S. 971, Dallas, Tex.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.
Vicar Machinery Corp., Village Pk. Rd., Cedar Grove, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Western Engrg. Assocs., 13101 Rose Ave., Los Angeles, Cal.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Services, Electrical Measurement

AEL, Inc., Box 552, Lansdale, Pa.
All-Tronics Inc., 45 Bond St., Westbury, N.Y. ..... p 1558
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Honeywell, Box 5227, Denver, Colo.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal. p 1573
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Avco Meas. Standards Labs., 201 Lowell St., Wilmington, Mass.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Deisen Testing Corp., 719 W. Broadway, Glendale, Calif.
Detroit Testing Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eidson Elctrn. Co., 1902 N. Third, Box 96, Temple, Tex.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Electrical Testing Labs., Inc., 2 East End Ave., New York, N.Y.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
National Meas. Labs., 2201 Hollywood Way, Burbank, Calif.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Parks, Henry Francis Lab., Box 25665, Seattle, Wash.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
Rockwell Engrg. Co., 2125 E. 45th St., Indianapolis, Ind.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Solar Elctrns. Co., 901 N. Highland, Hollywood, Calif.
SSCO Standards Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Topatron, Inc., Box 967, Costa Mesa, Calif.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tucker Elctrns. Co., 326 Kirby St., Garland, Tex.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.
Welex Elctrns., Box 986, Silver Spring, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiss, Janney, Elstner & Assocs., 330 Pfingsten Rd., Northbrook, Ill.

Services, Encapsulation

Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Automatic Coil, 76 East 2nd St., Mineola, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 1303
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
Rectifier Comps. Corp., 124 Albany Ave., Freeport, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Anchor Metal Co., Inc., 966 Meeker Ave., Brooklyn, N.Y.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bacon Inds., Inc., 192 Pleasant St., Watertown, Mass.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Electrical Plastics Corp., 280 Warren St., Box 298, Lyndhurst, N.J.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Endicott Coil Co., Inc., 24 Charlotte St., Binghamton, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
General Reliance Div., 20 Mercer St., Dover, N.J.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hardman Inc., Belleville, N.J.
Hightemp Resins, Inc., 225 Greenwich Ave., Stamford, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Isochem Resins Co., 99 Cook St., Lincoln, R.I.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
K-Tech., Inc., 885 Waverly St., Framingham, Mass.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Mercury Elctrns. Corp., 339 E. Cottage Pl., York, Pa.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
Mutron Corp., 646 Summer St, Brockton, Mass.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Rector Engrg. & Plastics Co., 318 Randolph Pl., N.E., Washington, D.C.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
Santa Fe Mfg. Co., 2343 Jerome Ave., Bronx, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Twin City Metalseal, Inc., 825 11th Ave. S.E., Minneapolis, Minn.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Walkirt Co., 10321 S. La Cienega, Los Angeles, Calif.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Services, Engraving & Profiling

Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bell Co., Inc., 106 Morrow Ave., Trussville, Ala.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Cryptographics, Inc., 416 Third Ave., New York, N.Y.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fisher & Crome, Inc., 2427 N. Mascher St., Philadelphia, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Kaiser CATV, Box 9728, Phoenix, Ariz
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Master Engraving, 11 Wallace St., East Paterson, N.J.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
N/P. Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Nutronics Mfg. Co., 1703 Peoria Rd., Springfield, Ill.
Pantographic Reproduction Co., 35 Elm Ridge Terr., Newington, Conn.
Parker-Hartford Corp., P.O. Box 869, Hartford, Conn.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Visual Inspection Prods., 112 Central Ave., Lynn, Mass.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.

Services, Environmental Testing

AEL, Inc., Box 552, Lansdale, Pa.
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Mepco, Inc., Columbia Rd., Morristown, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
California Testing Labs., Inc., 619 E. Washington Blvd., Los Angeles, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Detroit Testing Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electrical Testing Labs., Inc., 2 East End Ave., New York, N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Epoxylite Corp., 1428 Santa Anita Ave., S. El Monte, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Foxboro Co., Foxboro, Mass.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Elec. Co., 2525 Insulator Dr., Baltimore, Md.
General Testing Labs., Inc., 6840 Industrial Rd., Springfield, Va.
General Testing Labs., 40-50 Commercial Ave., Moonachie, N.J.
Hafstrom Tech. Prods., Inc., 4616 Santa Fe St., San Diego, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Lochart Inds., Inc., 15707 Texaco Ave., Paramount, Cal.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Logic Elctrns., Inc., 25 Biltmore St., Malden, Mass.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Sanders Assocs. Inc., Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Sparton Corp., 2400 E. Ganson St., Jackson, Mich.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
SSCO Standards Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Standard Elctrns. Co., 3012 W. 77th St., Chicago, Ill.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Testing Equip. & Supplies Corp., 6 Huron Dr., Natick, Mass.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Welex Elctrns., Box 986, Silver Spring, Md.
Wiss, Janney, Elstner & Assocs., 330 Pfingsten Rd., Northbrook, Ill.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Services, Film Badge

Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Landauer, R.S., Jr. & Co., Science Rd., Glenwood Science Park, Glenwood, Ill.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.

Services, Glass Blowing & Fabrication

General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
GTI Corp., 310 Chestnut St., Meadville, Pa.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Corning Glass Works, Lab. Prods. Dept., Corning, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Latronics Corp., Box 469, Latrobe, Pa.
Lougene Elctrns., Inc., 266 West Ave., Long Branch, N.J.
Nester L.G. Co., P.O. Box 666, Millville, N.J.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Richland Glass Co., Inc., Richland, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Van Waters & Rogers, Box 3200, San Francisco, Calif.
Xenon Corp., 39 Commercial St., Medford, Mass.

Services, Hermetic Sealing

AEL, Inc., Box 552, Lansdale, Pa.
Bendix Corp., Box 239, Franklin, Ind. ..... p 2592
Electrospace Corp., 956 Brush Hollow Rd., Westbury
Glass Technology Div., 822 Production Pl., Newport Bch., Cal. p 2452
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Accratronics Seals Corp., 2121 Kenmere Ave., Burbank, Calif.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Associate General Labs., Inc., 8934 W. Ogden Ave., Brookfield, Ill.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Connector Inds. America, Inc., 639 N. Wayne Ave., Box 15278, Cincinnati, Ohio
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
Glass Beads Co., Latrobe, Pa.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Hermetic Seal Div., 317 Main St., Box L, Wilmington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Latronics Corp., Box 469, Latrobe, Pa.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
National Vacuum Platers, Inc., 2641 E. Hagert St., Philadelphia, Pa.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Sealtron Corp., 188 Reading Rd., Cincinnati, Ohio
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sperry Elctrn. Tube, Gainesville, Fla.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.

Services, High Vacuum

AEL, Inc., Box 552, Lansdale, Pa.
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Aero Vac Corp., Box 448, Troy, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Applied Vacuum, Inc., 19350 Pruneridge Rd., Box A1, Cupertino, Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Testing Labs., 40-50 Commercial Ave., Moonachie, N.J.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
National Meas. Labs., 2201 Hollywood Way, Burbank, Calif.
National Vacuum Platers, Inc., 2641 E. Hagert St., Philadelphia, Pa.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Twin City Metalseal, Inc., 825 11th Ave. S.E., Minneapolis, Minn.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zenith Optical Lab., 138 Palisade St., Dobbs Ferry, N.Y.

Services, Hydraulic Assembly

United Prods. Co., 451 S. Jefferson St., Orange, N.J.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Auto Control Labs., 5251 W. Imperial Hwy., Los Angeles, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Services, Mask Making

Elctrn. Comps. Div., Trevose, Pa.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Mann, David W. Co., 174 Middlesex Tpke., Burlington, Mass.
M.°C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Tech-Etch, Inc., 10 Ind'l. Pk. Rd., Hingham, Mass.
Visual Inspection Prods., 112 Central Ave., Lynn, Mass.

Services, Metallizing

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
GTI Corp., 310 Chestnut St., Meadville, Pa.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Abesto Corp., Ackerman St., Bloomfield, N.J.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Bron-Shoe Co., 1313 Alum Creek Dr., Columbus, Ohio
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Latronics Corp., Box 469, Latrobe, Pa.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Mitronics, Inc., 132 Floral Ave., Murray Hill, N.J.
National Vacuum Platers, Inc., 2641 E. Hagert St., Philadelphia, Pa.
Norton Co., 160 Charlemont St., Newton, Mass.
Pacific Universal Prods. Corp., 168 Vista Ave., Pasadena, Calif.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Plasmadyne, 3839 S. Main, Santa Ana, Calif.
Sperry Elctrn. Tube, Gainesville, Fla.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Tickle, Arthur Engrg. Works, Inc., 21 Delevan St., Brooklyn, N.Y.
Union Carbide Corp. Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.

Services, Molding

Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2446
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Thermotech Coil Forms & Comps. Div., 1202 S. 5th St., Hopkins, Minn. .....p 2631,2632
Thermotech Inds., Inc., 1202 S. 5th St., Hopkins, Minn. p 2631,2632
Thermotech Plastics, Co., 1202 S. 5th St., Hopkins, Minn. p 2631,2632
AAI Corp., P.O. Box 6767, Baltimore, Md.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Booker & Wallestad, 1324 S. 5th St., Hopkins, Minn.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
Capsonic Group, Inc., 1000 Bluff City Blvd., Elgin, Ill.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Clover Inds. Div., 600 Young St., Dept. 4, Tonawanda, N.Y.
Emeloid Co., Inc., 1239 Central Ave., Hillside, N.J.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Hardman Inc., Belleville, N.J.
Kelm G.R. Mach. Works, Inc., 347 E. Railway Ave., Paterson, N.J.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Minnesota Rubber Co., 3630 Wooddale Ave., Minneapolis, Minn.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Wilcox Prods. Co., 1202 S. Fifth St., Hopkins, Minn.

Services, Plastics Fabrication

AEL, Inc., Box 552, Lansdale, Pa.
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y.
Electronic Hardware Corp., 180-08 Liberty Ave., Jamaica, N.Y.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Reynolds Inds., Inc., Box 850, Dept. M, Marina Del Rey, Cal.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Ace Plastic Co., Inc., 91-54 Van Wyck Expwy., Jamacia, N.Y.
Acme Mfg. & Gasket Co., 738 North 41 St., Philadelphia, Pa.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Atlas Fibre Co., 6970 N. Central Park Ave., Chicago, Ill.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Aubin, A.E. Co., P.O. Box 29, Glastonbury, Conn.
Bell Col., Inc., 106 Morrow Ave., Trussville, Ala.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Best Mfg. Co., 3214 Troost, Kansas City, Mo.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
Boonton Molding Co., Inc., 300 Myrtle Ave., Boonton, N.J.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Celestial Comps., Inc., Box 4216, Covina, Cal.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Comco Plastics, Inc., 98-36 C. Jamaica Ave., Richmond Hill, N.Y.
Conap, Inc., 184 E. Union St., Allegany, N.Y.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Dynaloy, Inc., 7 Great Meadow La., Hanover, N.J.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Emeloid Co., Inc., 1239 Central Ave., Hillside, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Fabritron Inc., 11650 Genesee St., Aiden, N.Y.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Federal Mach. Co., Inc., 807 Garfield Ave., Jersey City, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Fisher & Crome, Inc., 2427 N. Mascher St., Philadelphia, Pa.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Globe Plastics, 1342 S. Signal Dr., Pomona, Cal.
Hermes Plastics, Inc., 20 Cooper Square, New York, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.

Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Miller R.A. Inds., Inc., 1525 Marion, Grand Haven, Mich.
Morrison Inds., Inc., 3714 Ann Ave., Ashtabula, Ohio
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
NY-Glass Plastics, 7314 E. Madison St., Paramount, Calif.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Pantographic Reproduction Co., 35 Elm Ridge Terr., Newington, Conn.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Spruce Pine Mica Co Inc., 108 Greenwood Rd., Spruce Pine, N.C.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Teledyne Mecca, Box 36393, Houston, Tex.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.
U. S. Dielectric, Inc., 16 Fantasia Dr., Worcester, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Vlchek Plastics Co., Middlefield, Ohio
Warren Comps. Corp., P.O. Box 848, Warren, Pa.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.
Westlake Plastics Co., 133 W. Lenni Rd., Lenni, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Winzeler Mfg. & Tool Co., 7355 W. Wilson Ave., Chicago, Ill.

Services, Plating

AEL, Inc., Box 552, Lansdale, Pa.
GTI Corp., 310 Chestnut St., Meadville, Pa.
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
All Star Prods., Inc., P.O. Drawer 487, Defiance, Ohio
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Bron-Shoe Co., 1313 Alum Creek Dr., Columbus, Ohio
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Burton Resch. Labs., 11240 Playa Ct., Culver City, Calif.
Cambridge Plating Co., Inc., 39 Hittinger St., Belmont, Mass.
Centerline Specialties, Box 656, Boulder, Colo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Optical Sys., Pasadena, Calif.
Electrochemical Inds., Inc., 665 Cambridge St., Worcester, Mass.
Etchit, Inc., 643 13th Ave., S. Hopkins, Minn.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Harper-Leader, Inc., 1046 S. Main St., Waterbury, Conn.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Materials Technology, Inc., P.O. Box 187, Somerset, N.J.
Matthey Bishop Inc., Malvern, Pa.
Merit Plating Co., Inc., 212 East 141st St., Bronx, N.Y.
Metaplast Electrochemicals Corp., 915 Westchester Ave., Bronx, N.Y.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sifco Metachemical, 935 East 63rd St., Cleveland, Ohio
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Union Carbide Corp. Coatings Serv., 1500 Polco St., Indianapolis, Ind.
Vernon Plating Works, 33-18 57th St., Woodside, N.Y.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Services, Qualification—See Services, Environmental Testing

Services, Rental, Electronic Instrumentation

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Datacom, Inc., Box 278, Ft. Walton Bch., Fla.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Continental Leasing Co., Inc., 70 Liberty St., Metuchen, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
National Meas. Labs., 2201 Hollywood Way, Burbank, Calif.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Rental Elctrns., Inc., 16600 Oakmont Ave., Gaithersburg, Md.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
3M Co., 3M Center, St. Paul, Minn.
Tucker Elctrns. Co., 326 Kirby St., Garland, Tex.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.
Wiss, Janney, Elstner & Assocs., 330 Pfingsten Rd., Northbrook, Ill.

Services, RFI Measuring—See Services, Electrical Measurement

Services, Silk Screening

Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1354
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme-Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Atmar Engraving Co., Inc., 91-31 121 St., Richmond Hill, N.Y.
Avionics, Ltd., Box 200, Niagara-on-the-Lake, Ont., Can.
Bell Co., Inc., 106 Morrow Ave., Trussville, Ala.
Bodnar Prods. Corp., 30 Grove Ave., New Rochelle, N.Y.
California Microcircuits, Inc., 111 Main St., El Segundo, Cal.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Centerline Specialties, Box 656, Boulder, Colo.
Conductorlab, Inc., Main St., Groton, Mass.
Decalcraft, Rte. 309, Hatfield, Pa.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dura Plastics N.Y., Inc., 49 Richmondville Ave., Westport, Conn.
Edwards, T.J., Inc., 25 Williams St., Jamaica Plain, Boston, Mass.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Eljay Corp., 9062 Old Annapolis Rd., Columbia, Md.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Emeloid Co., Inc., 1239 Central Ave., Hillside, N.J.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
GM Nameplate, Inc., 2040 15th Ave., W., Seattle, Wash.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Mac Panel Co., Box 5027, High Pt., N.C.
Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Photo Chemical Prods. Cal., Inc., 1715 Berkeley, Santa Monica, Calif.
Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
Sillcocks-Miller Co., 350 W. Parker Ave., Maplewood, N.J.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Technical Instrs., Inc., 441 Washington Ave., No. Haven, Conn.
Techron Corp., 20 Simmons St., Boston, Mass.
TeDeTronic, Inc., 2891 Haggarty Rd., Walled Lake, Mich.
Tri-Tronics Lab., Inc., Box 638, Euless, Tex.
Western Coil & Elec. Co., 215 State St., Racine, Wisc.
Wire Cloth Enterprises, Inc., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa.

Services, Tower Erection & Maintenance

Advance Inds., 2301 Bridgeport Dr., Sioux City, Iowa
American Tower Co., P.O. Box 29, Shelby, Ohio
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Camusat Gueguen, 2 Windward Ave., White Plains, N.Y.
E-Z Way Prods., Inc., Box 17196, Tampa, Fla.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kline Iron & Steel Co., Inc., P.O. Box 1013, Columbia, S.C.
Microflect Co., 3575 25th S.E., Salem, Ore.
Microwave Sys. Co., Box 15155, Golden, Colo.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Stainless, Inc., 3rd St., N. Wales, Pa.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Trylon, Inc., Elverson, Pa.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Services, Training Aids

Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Auricord, 35-41 29th St., Long Island City, N.Y.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Collins Radio Co., Dallas, Tex.
Digiac Corp., Ames Ct., Plainview, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electraid, Inc., Box 53, Cambridge, Mass.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Film Assocs., Inc., 4600 S. Dixie Hwy., Dayton, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Lockheed Aircraft Svc. Co., Ontario Intl. Airport, Ontario, Calif.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Norgus Silk Screen Co., Inc., 58 Sylvan Ave., Dept E., Clifton, N.J.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Parks, Henry Francis Lab., Box 25665, Seattle, Wash.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA Service Co., Govt. Svcs. 206-2, Camden, N.J.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Sands, Leo G. & Assocs., Inc., 250 Park Ave., New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.

Services, Vibration Surveys

AEL, Inc., Box 552, Lansdale, Pa.
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Detroit Testing Lab., Inc., 12800 Northend Ave., Detroit, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, N.J.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wiss, Janney, Elstner & Assocs., 330 Pfingsten Rd., Northbrook, Ill.
Wyle Labs., 128 Maryland St., El Segundo, Calif.

Services, Waveform Analysis

AEL, Inc., Box 552, Lansdale, Pa.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Ogden Technology Labs., Inc., 100 Smith St., Farmingdale, N.Y.
Petty Geophysical Engrg. Co., 700 Tower Life Bldg., San Antonio, Tex.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sanders Assocs., Inc., 710 Concord Ave., Cambridge, Mass.
Signatron, Inc., 594 Marrett Rd., Lexington, Mass.
Wiss, Janney, Elstner & Assocs., 330 Pfingsten Rd., Northbrook, Ill.

Services, Wire Cutting & Stripping

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill.
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio .....p 2530,2531
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Auricord, 35-41 29th St., Long Island City, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Cable Sys. & Assembly Co., Inc., 68 Vine St., Everett, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electro Specialties Corp., 370 Park Ave., Worcester, Mass.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Excel Speciality Corp., 6335 N. Broadway, Chicago, Ill.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Hi-Lo Mfg. Corp., 1122 W. Newport, Chicago, Ill.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Joliet Control Corp., Box 751, Joliet, Ill.
Keiser's Inds., Inc., Laurau St., Mt. Holly Springs, Pa.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
M-T Elctrns. Co., 536 Lewelling Blvd., San Leandro, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Mercury Elctrns. Corp., 339 E. Cottage Pl., York, Pa.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.

Mid-West Metal Prods., Inc., 450 E. Donovan Rd., Kansas City, Kans.
Mutron Corp., 646 Summer St, Brockton, Mass.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Paraplegics Mfg. Co., Inc., 304 N. York Rd., Bensenville, Ill.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Tricraft Prods. Corp., 1124 W. Newport, Chicago, Ill.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Varied Ind'l. Prods., Inc., 445 Fifth Ave., Paterson, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wiring Services Co, 17281 Eastman St, Santa Ana, Cal.

Services, Wire Wrapping

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Midco, Inc., Box 5433, Trenton, N.J.
Ostby & Barton Co., Box 6267, Providence, R.I.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Varied Ind'l. Prods., Inc., 445 Fifth Ave., Paterson, N.J.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wiring Services Co, 17281 Eastman St, Santa Ana, Cal.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal

Servo Analyzers—See Analyzers, Servo

Servo Controls—See Controls, Servo

Servo Dampers—See Dampers, Servo

Servo Indicators—See Indicators, Servo

Servo Motors—See Motors, Servo

Servo Multipliers—See Multipliers, Servo

Servo Repeaters—See Repeaters, Servo

Servo Systems

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Autotronics, Inc., 2700 Davis, Joplin, Mo
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1365
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1987
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1988
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990,1991
Norden Div., Helen St., Norwalk, Conn.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Planet Instrs., Inc., 1520 Progress Rd., Ft. Wayne, Ind. ..... p 1684
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1693
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1996
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1996
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1996
Weston-Transicoil, Worcester, Pa. ..... p 1998
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Aviation Elec., Ltd., 200 Laurentien Blvd., Box 2140, Montreal 379, Que., Can.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Bendix Corp., S. Montrose, Pa.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Dallas, Tex.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Control Sys. Resch., Inc., 1811 Main St., Pittsburgh, Pa.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Goldak Co., Inc., 1101-A Air Way, Glendale, Calif.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kinetic Instr. Co., 1072 Linwood St., Brooklyn, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear-Siegler, Inc., 17600 Broadway, Box 6719, Cleveland, Ohio
Link Div., Binghamton, N.Y.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Moog, Inc., Proner Airport, East Aurora, N.Y.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Randtronics, Inc., 465 Convention Way, Redwood City, Cal.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Sequential Information Sys., Inc., 145 Palisade St., Dobbs Ferry, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westamp, Inc., 1542 15th St., Santa Monica, Cal.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.

Servo Testers—See Testers, Servo

Shaft Couplings—See Couplings, Shaft

Shafts & Adapters, Flexible-Also See Couplings, Shaft

Helitronics Corp., 155 Tichenor St., Newark, N.J. ..... p 2597
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 2641
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Stow Mfg. Co., 101 Shear St., Binghamton, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Shafts, Rigid-Also See Couplings, Shaft

Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dynamic Gear Co., Inc., 4571 N.W. 8th Ave., Oakland Pk., Ft. Lauderdale, Fla.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
SECS, Inc., 19-58 38th St., Long Island City, N.Y.
Torrington Co., Box 1008, Torrington, Conn.

Shafts, Threaded

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Helitronics Corp., 155 Tichenor St., Newark, N.J. ..... p 2597
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Abbott Prods., Inc., 14-10 123rd St., College Point, N.Y.
Advance Gear & Machine Corp., 5851 Holmes Ave., Los Angeles, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Star Stainless Screw Co., Box 222, Totowa, N.J.
Torrington Co., Box 1008, Torrington, Conn.

Shake Tables—See Vibration Test Systems

Shells, Encapsulation—See Cups, Encapsulation

Shelters, Outdoor Equipment—See Laboratories, Mobile & Field

Shields, Cathode-Ray Tube

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2604,2605
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh, Pa.
Amuneal Mfg. Corp., 2900 E. Tioga St., Philadelphia, Pa.
Celco, 70 Constantine Dr., Mahwah, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.

Shields, Coil

Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2604
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
United Transformer Co., 150 Varick St., New York, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.

Shields, Corona

Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.

Shields, Electrostatic—See Shields, Tube

Shields, Heat—See Tube Heat Dissipators

Shields, Indicator Light

Metex Corp., 970 New Durham Rd., Edison, N.J.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling, Ill
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.

Shields, Magnetic

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2604,2605
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
United Transformer Co., 150 Varick St., New York, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh, Pa.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Amuneal Mfg. Corp., 2900 E. Tioga St., Philadelphia, Pa.

Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Eldre Comps., Inc., 1239 University Ave., Rochester, N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Magnetic Core Corp., John St., Box 368, Newburgh, N.Y.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Suckle Corp., Suckle & National Hwys., Pennsauken, N.J.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Shields, Nuclear Radiation

Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brooks & Perkins, Inc., 12633 Inkster Rd., Livonia, Mich.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Kennametal Inc., Lloyd Ave., Latrobe, Pa.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Data, Inc., 100 W. Golf Rd., Palatine, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Penberthy Div., 6701 Maynard S., Seattle, Wash.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.

Shields, R-F-Also See Gaskets, Shielding, R-F

Honeywell, Box 5227, Denver, Colo.
Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
McLean Engrg. Labs., 70 Washington Rd., Princeton Junction, N.J. ..... p 2646
Metex Corp., 970 New Durham Rd., Edison, N.J. p 2606-2616,2620-2622
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Allaco Prods., 130 Wood Rd., Braintree, Mass.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
APM Hexseal Corp., 44 Honeck St., Englewood, N.J.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Electro Magnetic Filter Co., 231 S. Whisman Rd., Mountain View, Calif.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Evaporated Coatings, Inc., 798 Welsh Rd., Huntingdon Valley, Pa.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Hoffman Engrg. Co., 9th & Tyler St., Anoka, Minn.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Lindgren, Erik A. & Assoc., Inc., 4515 - 17 N. Ravenswood Ave., Chicago, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Pioneer Metals, Inc., Hwy. 127, N., Harrodsburg, Ky.
Ray Proof Corp., Keeler Ave., Norwalk, Conn.
Robintech, Inc., Commerce Rd., Vestal, N.Y.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Spectrum Control, Inc., 152 E. Main St., Fairview, Pa.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Topatron, Inc., Box 967, Costa Mesa, Calif.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Shields, Switch

Metex Corp., 970 New Durham Rd., Edison, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Shields, Transformer

Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
G-L Inds., Inc., 300 Harvard Ave., Westville, N.J.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2600
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
United Transformer Co., 150 Varick St., New York, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh, Pa.
Amuneal Mfg. Corp., 2900 E. Tioga St., Philadelphia, Pa.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, Calif.
MSL Steel Co., 3912 W. McLean Ave., Chicago, Ill.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.

Shields, Tube

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2372
Arnold Engrg. Co., Box G, Marengo, Ill. ..... p 2591
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
Honeywell, Box 5227, Denver, Colo.
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139,2604
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Amuneal Mfg. Corp., 2900 E. Tioga St., Philadelphia, Pa.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Collins Radio Co., Dallas, Tex.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kinetron Corp., 1416 Roller Rd, Asbury Park, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Waterbury Pressed Metal Co., 407 Brookside Rd., Waterbury, Conn.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Shields, Wire—See Braid, Cable & Wire Shielding

Shifters, Phase, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 868
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Measurement Specialties Lab., Inc., 14532 Erwin St., Van Nuys, Cal.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Prodelin, Inc., Box 131, Hightstown, N.J.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Shifters, Phase, R-F

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Balco Capacitors, 307 Washington St., Orange, N.J. ..... p 2689
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Clifton, 5050 State Rd., Drexel Hills, Pa.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658
Marstan Resistor Div., 307 Washington St., Orange, N.J. p 2689
Narda Microwave Corp., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Acton Labs., Inc., 531 Main St., Acton, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Collins Radio Co., Dallas, Tex.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
ITT Gremar, Inc., 10 Micro Dr., Woburn, Mass.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Nilsen Mfg. Co., 920 Hwy. 27, Haines City, Fla.
Prodelin, Inc., Box 131, Hightstown, N.J.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Shifters, Phase 60/400 CPS

Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Corp., S. Montrose, Pa.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
States Co., 19 New Park Ave., Hartford, Conn.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Shipping Containers—See Containers, Metal & Fiberglass, Shipping (Reusable)

Shock Mounts—See Mounts, Shock

Shock Testers—See Testers, Shock

Shorting Bars—See Bars, Shorting

Shredders, Paper—See Paper Shredders

Shrinkable Plastics & Elastomers—See Caps, Forms & Tapes, Heat Shrinkable

Shunts, Meter

Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Electronic Precision Comps. Corp., 2 Brookdale Pl., Mt. Vernon, N.Y. ..... p 2718
Empro Mfg. Co., Inc., Box 26064, Indianapolis, Ind. ..... p 678
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .... p 687
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 712,713
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ..... p 2056
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio

Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Shutters, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Signal Averagers,—See Averagers, Signal

Signal Conditoners & Equipment

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 542
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ..... p 1330
Ectron Corp., 8070 Engineer Rd., San Diego, Cal. ..... p 1331
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y. ..... p 2809
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gould, Inc., 3631 Perkins, Cleveland, Ohio ..... p 841
Honeywell, Box 5227, Denver, Colo. ..... p 691
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Incor Instrumentation, Inc., 29 Newtown Rd., Plainview, N.Y. p 714
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y. .....p 1336,1337
London Co., 811 Sharon Dr., Westlake, Ohio
Natel Engrg. Co., Inc., 8944 Mason Ave., Canoga Pk., Cal. p 577
Newport Labs., Inc., 630 E. Young St., Santa Ana, Cal.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Princeton Applied Resch. Corp., Box 565, Princeton, N.J. p 770
Rockland Sys. Corp., 131 Erie St., E., Blauvelt, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal. p 1315
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 804
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808,809
Zeltex, Inc., 1000 Chalomar Rd., Concord, Calif.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Astronics, Inc., 204 W. Bedford, Euless Rd., Hurst, Tex.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bay Labs., Inc., 20160 Center Ridge Rd., Cleveland, Ohio
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bristol Div, Waterbury, Conn.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Defense Elctrns., Inc., Rockville, Md.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynalex, Inc., 885 Front St., Burbank, Cal.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
EDP Corp., Box 6485, Orlando, Fla.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Foxboro Co., Foxboro, Mass.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Hamilton Alexander Institute, 235 E. 42nd St., New York, N.Y.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro-Strain, Inc., Spring City, Pa.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Teledyne Taber, 455 Bryant St., No. Tonawanda, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
Varian, 611 Hansen Way, Palo Alto, Cal.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Signal Tracers—See Testers, Signal Tracing

Silica, Fused

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J. ..... p 2681
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Dynasil Corp. America, Box D, Berlin, N.J.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.

Silicon Semiconductors—See Diodes; Transistors

Silicone Insulators & Insulation—See Insulating Compounds, Silicone

Silicone Rubber—See Rubber, Silicone

Silk Screen Processing Services—See Services, Silk Screening

Simulators, Line

Computer Devices Corp., 63 Austin Blvd., Commack, N.Y. p 2574
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y. p 1588
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Burtek, Inc., Box 1677, Tulsa, Okla.
Curtiss-Wright Corp., 35 Market St., E. Paterson, N.J.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.

Simulators, Motion

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Andersen Labs., Inc., 1280 Blue Hills Ave., Bloomfield, Conn.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Icon Corp., 156 Sixth St., Cambridge, Mass.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Weston-Transicoil, Worcester, Pa.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Curtiss-Wright Corp., 35 Market St., E. Paterson, N.J.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.

Simulators, Radar

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 632
Computer Devices Corp., 63 Austin Blvd., Commack, N.Y.
Elgenco, Inc., 1550 Euclid St., Santa Monica, Cal. ..... p 671
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
AAI Corp., P.O. Box 6767, Baltimore, Md.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Curtiss-Wright Corp., 35 Market St., E. Paterson, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Link Div., Binghamton, N.Y.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Sylvapia Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Simulators, Solar—See Solar Simulators

Simulators & Trainers

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Weston-Transicoil, Worcester, Pa.
AAI Corp., P.O. Box 6767, Baltimore, Md.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Analog General Corp., 7 Neil Ct., Oceanside, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Burtek, Inc., Box 1677, Tulsa, Okla.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Curtiss-Wright Corp., 35 Market St., E. Paterson, N.J.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digiac Corp., Ames Ct., Plainview, N.Y.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
EMR Div., Box 223, Princeton, N.J.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Link Div., Binghamton, N.Y.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Nord Instrs. Co., Inc., 211 E. Calhoun St., Salem, Va.
Photomechanisms Div., Inc., 15 Stepar Pl., Huntington Sta., N.Y.
Reflectone, Inc., 2051 W. Main St., Stamford, Conn.
Reflex Controls Corp., 15 Stepar Pl., Huntington Sta., N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Sinks, Heat—See Transister & Diode Heat Dissipators

Sleeves—See Tubing

Slide Rules (Circuitry Computing)

Printloid, Inc., 10-10 44th Ave., Long Island City, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Slides, Cabinet & Chassis

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Cabtron Corp., 1900 W. Kinzie St., Chicago, Ill. ..... p 2147
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 1136
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Premier Metal Prods. Co., 337 Manida St., Bronx, N.Y.
Scanbe Mfg. Corp., 3445 Fletcher Ave., El Monte, Cal.
Stantron, Div., 6914 Beck Ave., Box 9158 V.C., No. Hollywood, Cal. ..... p 2163
Accuride Div., 12311 S. Shoemaker Ave., Santa Fe Springs, Calif.
Acro Prods. Corp., 5000 S. Halsted St., Chicago, Ill.
Amco Engrg. Co., 7333 W. Ainslie St., Chicago, Ill.
Barnes Engrg. Co., 3012 S Halladay St, Santa Ana, Calif.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Donnelly Mfg. Co., P.O. Box 71, Waltham, Mass.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Grant Pulley & Hardware Co., 525 High St., W. Nyack, N.Y.
Gries Reproducer Co., 162 Beechwood Ave., New Rochelle, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Ingersoll Prods., 1016 W. 120th St., Chicago, Ill.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jonathan Mfg. Co., 1101 S. Acacia Ave., Fullerton, Calif.
Par-Metal Prods. Div., 1260 Atlantic Ave., Brooklyn, N.Y.
Watson Mfg. Co., Inc., 800 Taylor St., Jamestown, N.Y.

Sliding Loads, Microwave

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
RF Systems, Inc., 155 King St., Cohasset, Mass.

Slip & Shaker Tables—See Vibration Test Systems

Slip-Rings & Assemblies

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Electronic Specialty Co., 18900 N.E. Sandy Blvd., Portland, Ore.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Fabricast, Inc., 9835 Alpaca St., So. El Monte, Cal. ....p 1646,1647
Graphite Metallizing Corp., 1036 Nepperhan Ave., Yonkers, N.Y. p 1671
Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va..... p 1688
Aero-Motive Mfg. Co., P.O. Box 2678, Kalamazoo, Mich.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Collectron Corp., 304 East 45th St., New York, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Miniatures Corp., 600 Huyler St., S. Hackensack, N.J.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Hansen Mfg. Co., Inc., P.O. Box 23, Princeton, Ind.
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Industrial Elec. Reels, Inc., 1509 Chicago St., Omaha, Neb.
KDI Electro-Tec Corp., 1600 N. Main St., Blacksburg, Va.
Michigan Sci. Corp., 730 Bellevue Ave., Milford, Mich.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Nippert Co., 825 Pittsburgh Dr., Delaware, Ohio
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, Ohio
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Toledo Commutator Co., Owosso, Mich.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Wendon Co., Inc., 17 Irving Ave., Stamford, Conn.

Slotted Lines, Microwave

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.

Smith Chart Impedance Plotters, Automatic

Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Smoke Indicators—See Fire Detection & Fighting Equipment

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Socket Adapters

Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
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Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
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EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal... p 2483
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
IFE Div, P.O. Box 4265, E Providence, R.I.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Morse, Frank W. Co., 354 Congress St., Boston, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.

Sockets, Breadboard

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal..... p 1597
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
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Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, Cal. p 1353
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2482,2520
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
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Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electraid, Inc., Box 53, Cambridge, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
IFE Div, P.O. Box 4265, E Providence, R.I.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Sockets, Capacitor

Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J

Sockets, Crystal

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
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Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa. p 2439
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
DonMar Prods., Inc., Box 10125, Denver, Colo.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Sockets, Diode

Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2371
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
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Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind. .. p 2526
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Sockets, Integrated Circuit

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal..... p 1597
Amp Inc., Box 3608, Harrisburg, Pa.
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa. .... p 2416
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. .... p 2424
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Connector Corp., 6025 N. Keystone, Chicago, Ill.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y.
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Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex..... p 1943
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Ackerman Engravers, Inc., 43-22 36th St., Long Island City, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electraid, Inc., Box 53, Cambridge, Mass.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N J
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
IFE Div, P.O. Box 4265, E Providence, R.I.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
K-Tech., Inc., 885 Waverly St., Framingham, Mass.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.

Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.

Sockets, Lamp & Lamp Assemblies

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2371
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y. ..... p 1495
Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Connector Corp., 6025 N. Keystone, Chicago, Ill.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Display Devices, Inc., Box 667, Encinitas, Cal. ..... p 1504
Drake Mfg. Co., 4626 N. Olcott Ave., Harwood Hgts., Ill. p 1502,1503
Eldema Div., 18435 Susana Rd., Compton, Cal. ..... p 1507
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Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal. ..... p 1714
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. p 1518,1519
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn. ..... p 2053
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y.
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Oshino Electric Lamp Works, Ltd, 2-5-2, Minami-Shinagawa, Shinagawa-ku, Tokyo, Japan
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Sloan Co., 7704 San Fernando Rd., Sun Valley, Cal. ..p 1542,1543
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
Wiremold Co., Hartford, Conn.
Abtronics, Inc., Box 712, Livermore, Calif.
Adronics, Inc., 9 Sand Pk. Rd., Cedar Grove, N.J.
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Aeronautical Elec. Co., Inc., 5656 Northwest Hwy., Chicago, Ill.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Aristo-Craft Distinctive Miniatures, 314 Fifth Ave., New York, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morse, Frank W. Co., 354 Congress St., Boston, Mass.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sylvania Elec. Prods., Inc., Estes St., Ipswich, Mass.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Union Insulating Co., Box 8, Parkersburg, W. Va.
Western Indicator Co., 9835 Dupree St., So. El Monte, Cal.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Socket, Miniature & Subminiature—See Sockets, Diode; IC; Tran

Sockets, Relay

Airborn, Inc., 2618 Manana Dr., Dallas, Tex.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1724
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
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Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Continental Connector Corp., 34-63 56th St., Woodside, N.Y.
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
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Hughes Aircraft Co., Box H, Newport Beach, Cal.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. ... p 2520
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind. p 1836,1837
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1850
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y. p 1853
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Branson Corp., Box W, Denville, N.J.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Photologic Co., 3704 E. Walnut Ave., Orange, Calif.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Viking Inds., Inc., 21001 Nordhoff St., Chatsworth, Calif.
WABCO Aerospace Dept., Swissvale P.O., Pittsburgh, Pa.

Sockets, SCR Section

Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.

Sockets, Test

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Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electraid, Inc., Box 53, Cambridge, Mass.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
IFE Div, P.O. Box 4265, E Providence, R.I.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Photologic Co., 3704 E. Walnut Ave., Orange, Calif.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Sockets, Transistor

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Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J. ..... p 2454
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U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Epoxy Molded Prods. Corp., 119 Coit St., Irvington, N.J.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Sockets, Transmitting & Industrial Tube

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. p 2370-2372
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
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Raytheon Co., 465 Centre St., Quincy, Mass.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.

Sockets, Tube

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
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Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
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Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
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Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 2140
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
Penta Labs., Box 4422, Santa Barbara, Calif. ..... p 2140
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. ... p 2520
Raytheon Co., 465 Centre St., Quincy, Mass.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1850
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Aerovox Corp., 740 Belleville Ave., New Bedford, Mass.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Azimuth Elctrns., Box 1225, 2377 S. El Camino Real, San Clemente, Cal.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burroughs Corp., Box 1226, Plainfield, N.J.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Livingston Elctrn., Box 7, 58 Rte. 10, Hanover, N.J.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
National Elctrns., Inc., Box 269, Geneva, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Sockets, Vibrator

Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2434
EBY, Hugh H. Co., 4701 Germantown Ave., Philadelphia, Pa.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.

Solar Cells—See Cells, Photovoltaic

Solar Simulators

Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Aerospace Controls Corp., 215 West 131st St., Los Angeles, Calif.
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro-Optical Sys., Pasadena, Calif.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Research, Inc., Box 24064, Minneapolis, Minn.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Strong Elec. Corp., Box 1003, Toledo, Ohio
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Solder (All Types)

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. ..... p 2843
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 1622,1623
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
American Smelting & Refining Co., 120 Broadway, New York, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Bow Solder Products Co., Inc., 25 Amsterdam St., Newark, N.J.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Dunton, M.W. Co., 350 Kinsley Ave., Providence, R.I.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Farrelloy Co., 1243 North 26 St., Philadelphia, Pa.
Gardiner Solder Co., 4820 S. Campbell Ave., Chicago, Ill.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Johnson Mfg. Co., Box 96, Princeton, Iowa
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Mico Instr. Co., 80 Trowbridge St., Cambridge, Mass.
National Lead Co., 111 Broadway, New York, N.Y.
New York Solder Co., 684 East 133rd St., Bronx, N.Y.
Rayline, Inc., 80 E. Old Country Rd., Mineola, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.
Stewart-Hall Chemical Corp., 222 Washington St., Mt. Vernon, N.Y.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.

Solder Pots

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2834,2835
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Dee Elec. Co., 2501 N. Wayne Ave., Chicago, Ill.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electric Soldering Iron Co., Inc., P.O. Box 247, Deep River, Conn.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Sta-Warm Elec. Co., Inc., 116 N. Chestnut St., Ravenna, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Trent, Inc., 201 Leverington Ave., Philadelphia, Pa.
UNGAR, 233 E. Manville St, Compton, Calif.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Waage Elec., Inc., 820 Colfax Ave., Kenilworth, N.J.
Wenesco Inc., Box 303 Northtown Sta., Chicago, Ill.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Solder Preforms (Including Rings)-Also See Preforms,Precious Metal

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Metex Corp., 970 New Durham Rd., Edison, N.J.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
AMAX Alum/Foil Prods., 6106 S Broadway, St. Louis, Mo.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Bow Solder Products Co., Inc., 25 Amsterdam St., Newark, N.J.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Division Lead Co., 7742 W. 61st Pl., Summit, Ill.
Gardiner Solder Co., 4820 S. Campbell Ave., Chicago, Ill.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Lead Co., 111 Broadway, New York, N.Y.
Semi Alloys, Inc., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y.

Soldering Accessories

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2834,2835
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Edsyn, Inc., 15954 Arminta St., Van Nuys, Cal. ..... p 2838,2839
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2840
Hexacon Elec. Co., 621 W. Clay Ave., Roselle Park, N.J. p 2841
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. ..... p 2843
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H.
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Weller, 100 Wellco Rd., Easton, Pa. ..... p 2847
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electric Soldering Iron Co., Inc., P.O. Box 247, Deep River, Conn.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Enterprise Development Corp., 5127 E. 65th St., Indianapolis, Ind.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Miller, L.C. Co., 717 Monterey Pass Rd., Monterey Park, Calif.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Photomation, Inc., 280 Polaris Ave., Mountain View, Calif.
Rayline, Inc., 80 E. Old Country Rd., Mineola, N.Y.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Superior Flux & Mfg. Co., 1536 St. Clair Ave., Cleveland, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thermal Ind'l. Prod., Box 405, Atchison, Kans.
Titchener, E.H. & Co., 8 Titchener Pl., Binghamton, N.Y.
UNGAR, 233 E. Manville St, Compton, Calif.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wilder Mfg. Co., Inc., Mechanic St. & Erie R.R., Port Jervis, N.Y.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Soldering Equip., Hot Gas

Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Soldering Equip., Induction Heating

Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan

Soldering Equip., Printed Circuit

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2834,2835
Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. ..... p 2843
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Weller, 100 Wellco Rd., Easton, Pa. ..... p 2847
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Anchor Alloys, Inc., 968 Meeker Ave., Brooklyn, N.Y.
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Dee Elec. Co., 2501 N. Wayne Ave., Chicago, Ill.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Enterprise Development Corp., 5127 E. 65th St., Indianapolis, Ind.
Esson Elctrns., Inc., 1501 W. 166th St., Gardena, Cal.
Etchomatic, Inc., Box 444, Waltham, Mass.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Hollis Engrg., Inc., Charron Ave., Box 742, Nashau, N.H.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Pentronics Corp., 10 Cheney St., Dorchester, Mass.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Selectrons, Ltd., 116 East 16th St., New York, N.Y.
Superior Flux & Mfg. Co., 1536 St. Clair Ave., Cleveland, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
UNGAR, 233 E. Manville St, Compton, Calif.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Wenesco Inc., Box 303 Northtown Sta., Chicago, Ill.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Soldering Equip., Reflow

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Kressilk Prods., Inc., 420 Saw Mill River Rd., Elmsford, N.Y. p 1308
Atlantic Instruments & Electronics, 50 Hunt St., Watertown, Mass.
Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Hollis Engrg., Inc., Charron Ave., Box 742, Nashau, N.H.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Soldering Equip., Resistance

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2835
Americon Corp., 87 Rumford Ave., Waltham, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2840
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Contact, Inc., P.O. Box 6, Hudson, N.H.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Zephyr Mfg. Co., 201 Hindry Ave., Box 759, Inglewood, Calif.

Soldering Equip., Temperature Controlled

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2834,2835
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Circon Corp., Santa Barbara Airport, Goleta, Calif. ..... p 2836
Weller, 100 Wellco Rd., Easton, Pa. ..... p 2847
Browne Engrg. Co., 1727 State St., Santa Barbara, Cal.
Cimron Div., 1152 Morena Blvd., San Diego, Cal.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Dee Elec. Co., 2501 N. Wayne Ave., Chicago, Ill.
Esson Elctrns., Inc., 1501 W. 166th St., Gardena, Cal.
Fostoria-Fannon, Inc., 1200 N. Main St., Fostoria, Ohio
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro-Meas. Div., Box 306, 38905 Chase Rd., Romulus, Mich.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Soldering Equip., Ultrasonic

Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Blackstone Ultrasonics, Inc., 820 Center St., Sheffield, Pa.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Sonobond Corp., 310 E. Rosedale Ave., West Chester, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan

Soldering Flux—See Flux, Brazing & Soldering

Soldering Guns

Edsyn, Inc., 15954 Arminta St., Van Nuys, Cal. ..... p 2838,2839
Wall Mfg. Co., Box 3349, Kinston, N.C. ..... p 2845
Weller, 100 Wellco Rd., Easton, Pa. ..... p 2847
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Wen Prods., Inc., 5810 Northwest Hwy., Chicago, Ill.

Soldering Irons

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2834,2835
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Edsyn, Inc., 15954 Arminta St., Van Nuys, Cal. p 2838,2839
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2840
Hexacon Elec. Co., 621 W. Clay Ave., Roselle Park, N.J. p 2841
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. p 2844
Wall Mfg. Co., Box 3349, Kinston, N.C. p 2845
Weller, 100 Wellco Rd., Easton, Pa. p 2846,2847
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electric Soldering Iron Co., Inc., P.O. Box 247, Deep River, Conn.
Enterprise Development Corp., 5127 E. 65th St., Indianapolis, Ind.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Heath Co., Benton Harbor, Mich.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
UNGAR, 233 E. Manville St, Compton, Calif.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Zeva Elec. Corp., 3 Greatmeadow La., Hanover, N.J.

Solenoid Drivers, Solid-State

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Guardian California, 5755 Camille Ave., Culver City, Cal.
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
EDC Data Comps. Corp., Box 279, Massapequa, N.Y.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Voltex Co., Inc., 115 Marine St., Farmingdale, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Solenoids, Linear

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 1723
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc. p 1750
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill. p 1777
Hart-Advance Relay Div., Crystal Lake, Ill. p 1787
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1789
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Ledex Div., 126 Webster St., Dayton, Ohio p 1678
Liberty Controls, R.F.D. 5, Joliet, Ill. p 1816,1819
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electro-Mechanisms, Inc., 407 W. Chestnut Ave., Monrovia, Calif.
Electroid Co., 95 Progress St., Box 442, Union, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
IMC Magnetics Corp., 1900 E. 5th St., Tempe, Ariz.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Koontz-Wagner Elec. Co., Inc., 516 N. Michigan St., South Bend, Ind.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Meltronics Inc., 3343 Merrick Rd., Wantagh, N.Y.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Naybor, E.V. Labs., Inc., 26 Manorhaven Blvd., Port Washington, N.Y.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Universal Relay Corp., 42 White St., New York, N.Y.
U.S. Elctrns. Corp., 321 Orient Way, Lyndhurst, N.J.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
West Coast Elec. Mfg. Co., 233 W. 116th Pl., Los Angeles, Cal.

Solenoids, Rotary

Allard Instr. Corp., 770 Main St., Westbury, N.Y.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa.
Daco Instr. Co., Inc., Merritt Blvd., Trumbull, Conn.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn. p 1789
Ledex Div., 126 Webster St., Dayton, Ohio p 1679
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2075
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal. p 1801
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
IMC Magnetics Corp., 1900 E. 5th St., Tempe, Ariz.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
Magnuson Engrs., Inc., 1010 Timothy Dr., San Jose, Calif.
Plessey Elctrns. Corp., 170 Finn Ct., Farmingdale, N.Y.
Universal Relay Corp., 42 White St., New York, N.Y.

Solvents—See Cleaners & Solvents

Sonic Analyzers—See Analyzers, Sonic & Subsonic

Sorters—See Machines, Sorting

Sound Level Indicators—See Meters, Audio Level

Sound Recording Equip.—See Microphones; Recorders; etc.

Sources, Light, Isotope Excited

American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Solid State Radiations, Inc., 2261 S. Carmelina Ave., Los Angeles, Calif.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Sources, Light, Radioactive

American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Dyonics, Inc., 71 Pine St., Woburn, Mass.
Fiber Photics, Inc., 2557 Soquel Dr., Santa Cruz, Cal.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
3M Co., 3M Center, St. Paul, Minn.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Sources, Light, Stroboscopic—See Stroboscopes

Sources, Radioactive

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Landsverk Electrometer Co., 641 Sonora Ave., Glendale, Cal.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Nuclear Prods. Co., Box 1178, El Monte, Calif.
Nuclear Supplies Div., Box 312, Encino, Calif.
Picker Ind't., 1020 London Rd., Cleveland, Ohio
Sanders Nuclear Corp, 95 Canal St, Nashua, N H
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
U.S. Radium Corp., 170 E. Hanover Ave, Morristown, N.J.

Spacers

Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif. p 1877
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2138
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y. p 1695
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N. N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Auburn Mfg. Co., Pease Ave. & Stack St., Middletown, Conn.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bell Fasteners Corp., 352 Evelyn St., Paramus, N.J.
C.E.M. Co., Inc., 24 School St., Danielson, Conn.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Crystal Optics Resch., Inc., 3680 S. State St., Ann Arbor, Mich.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
General Gaskets, Inc., Middletown, Conn.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nyltite Corp. America, 3451 S. Clinton Ave., S. Plainfield, N.J.
Perkins Machine & Gear Co., Inc., Circuit Ave., W. Springfield, Mass.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Plastiglide Mfg. Corp., 1757 Stanford St., Santa Monica, Cal.
Resdel Corp., Box 2171, Rio Grande, N.J.
Shur-Lok Corp., 1300 E. Normandy Pl., Santa Ana, Calif.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
3M Co., 3M Center, St. Paul, Minn.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Weckesser Co., Inc., 4444 W. Irving Park Rd., Chicago, Ill.

Spaghetti—See Tubing, Spaghetti

Spark Gap Capacitors—See Capacitors, Overvoltage Protected

Spark Gaps

Bel Fuse, Inc., 203 Van Vorst St., Jersey City, N.J.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. p 2184
Dale Elctrns., Inc., Box 180, Yankton, S.D. p 2036
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
ITT Electron Tube, Box 100, Easton, Pa.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal.
Kilovolt Corp., 238 High St., Hackensack, N.J. p 1120,1121
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif.
Raytheon Co., 465 Centre St., Quincy, Mass.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. p 1852
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. p 1537
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Speaker Cones & Parts

Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Bossert Mfg. Corp., 1030 Oswego St., Utica, N.Y.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Hawley Prods. Co., 333 North 6th St., St. Charles, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Welsh, W.H. Co., Inc., 2241 Indiana Ave., Chicago, Ill.

Speaker Drivers—See Drivers, Speaker

Speaker Enclosures—See Enclosures, Speaker

Speaker Horns—See Horns, Speaker

Speaker Systems (Industrial)

Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Argos Prods. Co., Inc., 600 S. Sycamore St., Genoa, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Audio Dynamics Corp., Pickett District Rd., New Milford, Conn.
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
Bogen Div., P.O. Box 500, Paramus, N.J.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Federated Inds., Box 235, Grayslake, Ill.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
Gai-Tronics Corp., P.O. Box 31, Reading, Pa
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.

Karlson Resch. & Mfg. Div., 388 Penisula Blvd., Hempstead, N.Y.
Klipsch & Assocs., Inc., Box 280, Hope, Ark.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Major Elctrns. Corp., 649 39th St., Brooklyn, N.Y.
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Minneapolis Speaker Co., 3806 Grand Ave., S., Minneapolis, Minn.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Smith-Meeker Engrg. Co., 157 Chambers St., New York, N.Y.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tannoy (America), Ltd., 1756 Ocean Ave., Bohemia, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wharfedale, Div., Westbury, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wilder Engrg. Prods., 715 Kedzie, Chicago, Ill.

Speakers, Ceramic

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Federated Inds., Box 235, Grayslake, Ill.
Minneapolis Speaker Co., 3806 Grand Ave., S., Minneapolis, Minn.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Speakers, Column

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Argos Prods. Co., Inc., 600 S. Sycamore St., Genoa, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Federated Inds., Box 235, Grayslake, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wilder Engrg. Prods., 715 Kedzie, Chicago, Ill.

Speakers, Dynamic, Electro

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 529
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Federated Inds., Box 235, Grayslake, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.

Speakers, Dynamic, P-M

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 529
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Federated Inds., Box 235, Grayslake, Ill.
Hartley Prods. Corp., Barnert Pl., Hohokus, N.J.
Heath Co., Benton Harbor, Mich.
IMF Products, 7616 City Line Ave., Philadelphia, Pa.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Klipsch & Assocs., Inc., Box 280, Hope, Ark.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Minneapolis Speaker Co., 3806 Grand Ave., S., Minneapolis, Minn.
Oaktron Inds., Inc., Monroe, Wisc.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rola Div., 21010 Miles Pkwy., Cleveland, Ohio
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tannoy (America), Ltd., 1756 Ocean Ave., Bohemia, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Wilder Engrg. Prods., 715 Kedzie, Chicago, Ill.

Speakers, Explosion & Flame Proof

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Femco Div., Box F, Irwin, Pa.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Speakers, Horn

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Femco Div., Box F, Irwin, Pa.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Speakers, Paging & Talk Back

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Fanon Elctrns., 100 Hoffman Pl., Hillside, N.J.
Federated Inds., Box 235, Grayslake, Ill.
Femco Div., Box F, Irwin, Pa.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
Fourjay Inds., Box 1465, Northridge Br., Dayton, Ohio
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Karlson Resch. & Mfg. Div., 388 Penisula Blvd., Hempstead, N.Y.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Minneapolis Speaker Co., 3806 Grand Ave., S., Minneapolis, Minn.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Speakers, Pillow

Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Trimm, Inc., 400 W. Lake St., Libertyville, Ill.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Femco Div., Box F, Irwin, Pa.
Fisher-Berkeley Corp., 5800 Christie, Emeryville, Calif.
Parcoe, Inc., 4501 Prospect Ave., Cleveland, Ohio
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.

Speakers, Submergence-Proof

CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Federated Inds., Box 235, Grayslake, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.

Speakers, Weatherproof

CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Adec, Inc., 86 Frelinghuysen Ave., Newark, N.J.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Audio Equip. Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bozak, R.T. Mfg. Co., Box 1166, Darien, Conn.
Cleveland Elctrns., Inc., 1974 E. 61st St., Cleveland, Ohio
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Era Acoustics, 311 E. Park St., Moonachie, N.J.
Era Acoustics Corp., 311 E. Park St., Moonachie, N.J.
Executone, Inc., 29-10 Thomson Ave., Long Island City, N.Y.
Federated Inds., Box 235, Grayslake, Ill.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Klipsch & Assocs., Inc., Box 280, Hope, Ark.
Lansing, James B. Sound, Inc., 3249 Casitas Ave., Los Angeles, Calif.
Magitran Co., 311 E. Park St., Moonachie, N.J.
Micro-Magna Elctrns., 3311 Perkins Ave., Cleveland, Ohio
Minneapolis Speaker Co., 3806 Grand Ave., S., Minneapolis, Minn.
Oaktron Inds., Inc., Monroe, Wisc.
Oxford Speaker Co., 2838 W. 48th Pl., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
RCA Corp., Front & Cooper, Camden, N.J.
Remler Co., 2101 Bryant St., San Francisco, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Tannoy (America), Ltd., 1756 Ocean Ave., Bohemia, N.Y.
University Sound, 9500 W. Reno, Box 26105, Oklahoma City, Okla.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.

Specific Gravity Indicators—See Indicators, Specific Gravity

Spectral Light Sources

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
American Atomics Corp., 425 S. Plumer Ave., Tucson, Ariz.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro-Optical Sys., Pasadena, Calif.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Quartz Radiation Corp., 1275 Bloomfield Ave., Fairfield, N.J.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Schoeffel Instr. Corp., 24 Booker St. Westwood, N.J.
TRW Instrs., 139 Illinois St., El Segundo, Calif.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Spectrographs & Spectrometers

Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Aero Vac Corp., Box 448, Troy, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Electronic Assocs., Inc., 185 Monmouth Pkwy., W. Long Branch, N.J.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Nuclear Diodes, Inc., P.O. Box 135, Prairie View, Ill.
Nuclear Meas. Corp., 2460 N. Arlington Ave., Indianapolis, Ind.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Siemens Corp., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J.
Systems Instrs. Resch., Inc., 334 Luckie St., N.W., Atlanta, Ga.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.

TRW Instrs., 139 Illinois St., El Segundo, Calif.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Aerograph, 2700 Mitchell Dr., Walnut Creek, Calif.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Ventron Instrs. Corp., 144 Middlesex Tpke., Burlington, Mass.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Spectrometers, Infrared

Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Tinsley Labs., Inc., 2448 - 6th St., Berkeley, Calif.

Spectrometers, Mass

Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Analytical Instr. Div., 611 Hansen Way, Palo Alto, Cal.

Spectrophotometers

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Beckman Instrs., Inc., Advanced Technology Opers., 2500 Harbor Blvd., Fullerton, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Cary Instrs., 2724 S. Peck Rd., Monrovia, Calif.
Coleman Instrs., 42 Madison St., Maywood, Ill.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Heath Co., Benton Harbor, Mich.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
McPherson Instr. Corp., 530 Main St., Box 14, Acton, Mass.
National Instr. Labs., Inc., 12300 Park Lawn Dr., Rockville, Md.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Perkin-Elmer Corp., Main Ave., Norwalk, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Photo Resch. Corp., 3000 N. Hollywood Way, Burbank, Calif.
Process & Instrs. Corp., 1943 Broadway, Brooklyn, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectra-Physics, Inc., 1250 W. Middlefield Rd., Mountain View, Calif.
Systems Instrs. Resch., Inc., 331 Luckie St., N.W., Atlanta, Ga.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Spectroradiometers

Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Cary Instrs., 2724 S. Peck Rd., Monrovia, Calif.
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
International Light, Inc., Lord Timothy Dexter Ind'l. Green, Newburyport, Mass.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.

Spectrum Analyzers—See Analyzers, Spectrum

Speech Scramblers—See Scramblers, Speech

Speed Drives, Motor—See Controls, Motor Speed

Spiral Wrap—See Tubing, Spiral Wrap

Splicers, Coaxial Cable

Amp Inc., Box 3608, Harrisburg, Pa.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Connectrol Corp., 28 E 22nd St, New York, N Y
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Superior Continental Corp., Box 489, Hickory, N.C.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.

Splicers, Wire (Butt & Cap Types)

Amp Inc., Box 3608, Harrisburg, Pa.
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J. p 2419
Burndy Corp., Richards Ave., Norwalk, Conn.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Connectrol Corp., 28 E 22nd St, New York, N Y
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Splicing Equipment, Magnetic Tape

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Magnecessories, Box 6960, Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Prestoseal Mfg. Corp., 37-12 108th St., Corona, N.Y.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Reiter, F. Co., 3340 Bonnie Hill Dr., Hollywood, Calif.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Tall Joel, Inc., 158 S. Terrace Ave., Mt. Vernon, N.Y.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
3M Co., 3M Center, St. Paul, Minn.

Splicing Equipment, Paper Tape

Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
O E M Prods., 600 Washington Ave., Carlstadt, N.J.
Prestoseal Mfg. Corp., 37-12 108th St., Corona, N.Y.
Robins Data Devices, Inc., 15-58 127th St, Flushing, N Y

Spoolers, Punched Tape—See Readers, Punched Tape

Spray Systems, Electrostatic Paint

Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Borden Chemical Co., Ford & Washington, Box 390, Norristown, Pa.
Conforming Matrix Corp., Box 37, Sta. "G", Toledo, Ohio
Despatch Oven Co., P.O. Box 1320, Minneapolis, Minn.
Fischer, H.G. & Co., 9451-9491 W. Belmont Ave., Franklin Park, Ill.
Ionic Electrostatic Corp., 111 Monroe St., Garfield, N.J.

Springs (All Types)

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Accurate Spring, 8747 W. Palmer St., River Grove, Ill.
Ace Spring Manufacturing Co., Inc., 150 32nd St., Brooklyn, N.Y.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Ce-Ja Springs, Inc., 169 Day St., Newington, Conn.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Dudek & Bock Spring Mfg. Co., 4014 W. Grand Ave., Chicago, Ill.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Newcomb Spring Corp., 2 Spring St., Southington, Conn.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Pic Design Corp., 477 Atlantic Ave., E. Rockaway, N.Y.
Stanley Ind'l. Comps. Div., Forestville, Conn.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Templeman, D.R. Co., 8 Park St., Plainville, Conn.

Springs, Compression (Helical)

Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J. ..... p 2598
Accurate Spring, 8747 W. Palmer St., River Grove, Ill.
Ace Spring Manufacturing Co., Inc., 150 32nd St., Brooklyn, N.Y.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Helical Prods. Co., Inc., P.O. Box 4, Hermosa Beach, Calif.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Newcomb Spring Corp., 2 Spring St., Southington, Conn.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Stanley Ind'l. Comps. Div., Forestville, Conn.

Springs, Flat

Instrument Specialties Co., Inc., 254 Bergen Blvd., Little Falls, N.J. ..... p 2598
Accurate Spring, 8747 W. Palmer St., River Grove, Ill.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
American Silver Co. Div., 36-07 Prince St., Flushing, N.Y.
Ametek, Inc., Station Square Two, Paoli, Pa.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Chemical Micro Milling Co, Box 770, Camden, N.J.
Connor Spring & Mfg. Co., 1729 Junction Ave., San Jose, Cal.
Helix Spring Corp., 35-10 10th St., Long Island City, N.Y.
H.K. Metalcraft Mfg. Co., 35 Industrial Rd., Lodi, N.J.
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hunter Spring, One Spring Ave., Hatfield, Pa.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Newcomb Spring Corp., 2 Spring St., Southington, Conn.
O'Hara Metal Prods. Co., 540 Brannan St., San Francisco, Calif.
Stanley Ind'l. Comps. Div., Forestville, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tricon Mfg. Co., 2325 Wisconsin Ave., Downer Grove, Ill.

Sputtering Equipment

Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Stabilizers, Frequency

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 963
CML, Inc., 166 National Rd., Edison, N.J. .....p 1032a-1032c
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. .....p 1052,1053
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. .....p 762,764
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass..... p 2143
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Stabilizers, Line Impedance

California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.

Stabilizers, Voltage—See Regulators & Stabilizers, Voltage

Stalos—See Oscillators, Microwave

Stamped Circuit Boards—See Circuit Boards, Stamped

Standards, Atomic Beam

Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Tracor, Inc., 6500 Tracor La., Austin, Tex.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Standards, Capacitance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624,625
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,674,676
Electronic Assocs., Inc., Comps. Div., 185 Monmouth Pkwy., W. Long Branch, N.J.
PFC Mfg. Div., Community Dr., Great Neck, N.Y. ..... p 2172
Southern Elctrns. Corp., 130 W. Cyress Ave., Burbank, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Standards, Current

Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 649
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ....p 668,669
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Standards, Delay Line

Digital Devices Div., 200 Michael Dr., Syosset, N.Y. ..... p 2586
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. p 1574

Standards, Frequency

Accutronics, Inc., 628 North St., Geneva, Ill.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1429
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1359
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bramco Controls Div., College & South Sts., Piqua, Ohio
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Connor-Winfield Corp., Winfield, Ill.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex.
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y. p 1445
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1450,1455
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa. p 1446,1447
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va.
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa.
Micro-Now Instr. Co., Inc., 6104 N. Pulaski Rd., Chicago, Ill. p 883
Ovenaire, Inc., 706 Forrest St., Charlottesville, Va.
Parzen, 48 Urban Ave., Westbury, L.I., N.Y..... p 763
Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Iowa
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Tracor, Inc., 6500 Tracor La., Austin, Tex. ..... p 801
Vectron Labs., Inc., 121 Water St., Norwalk, Conn..... p 1490
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Riverbank Labs., Box 110, Geneva, Ill.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs, Inc., 14 Huron Dr, Natick, Mass.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.

Standards, Inductance

North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Standards, Noise

Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 773,774
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.

Standards, Phase

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 659
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y. ..... p 715
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 803
Acton Labs., Inc., 531 Main St., Acton, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Standards, Q

Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Standards, Resistance

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,674,676
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Nytronics, Inc., Industrial Rd., Kutztown, Pa
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. ..... p 767
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Vishay Resistor Prods., 63 Lincoln Hwy., Malvern, Pa.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Miller Electro-Resch. Labs., 14800 W. Grange, New Berlin, Wisc.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
Shallcross, E. Preston St., Selma, N.C.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Standards, Resistance Transfer

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 676
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 723
Nytronics, Inc., Industrial Rd., Kutztown, Pa
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.

Standards, Synchro & Resolver

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 610,612
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Standards, Temperature

Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Riverbank Labs., Box 110, Geneva, Ill.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Weksler Instrs. Corp., 80 Mill Rd., Freeport, N.Y.

Standards, Time

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Atomichron, Inc., 3 Delaware Dr., New Hyde Park, N.Y. .... p 684
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1455
Metric Engrg., 5235 E. Simpson Rd., Box 290, Mechanicsburg, Pa. ..... p 745
Reeves-Hoffman Div., 400 W. North St., Carlisle, Pa.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Riverbank Labs., Box 110, Geneva, Ill.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Timing Sys., Inc., 22 Sewall St., Marblehead, Mass.

Standards, Voltage

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Connor-Winfield Corp., Winfield, Ill.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn. ..... p 1032
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ....p 668,669
Esterline Angus Div., Box 24000, Indianapolis, Ind. ..... p 847
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,723,724
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal. p 768
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.... p 780
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Standards, Voltage Ratio

Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673,675,676
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,723,724
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Standards, Voltage Reference

Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Cohu Elctrns., Inc., Box 623, San Diego, Calif. ..... p 637
Computer Diode Corp., Pollitt Dr., Fair Lawn, N.J.
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 649
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass. ....p 668,669
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
International Rectifier, 233 Kansas St., El Segundo, Cal.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,723,724
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J. .. p 780
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Delta-Tronics Corp., 1710 E. Princess Dr., Tempe, Ariz.
Electronic Design Labs., Inc., Box 7837, Philadelphia, Pa.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Leeds & Northrup Corp., Sumneytown Pike, No. Wales, Pa.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Monroe Elctrns., Inc., 5 Vernon St., Middleport, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Power Comps., Inc., Box 421, Scottdale, Pa.

Stable Dynamics Corp., 7587 Convoy Ct., San Diego, Calif.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Standing Wave Detectors—See Detectors, Standing Wave

Stands, Waveguide

Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
TRG Prods., 400 Border St., E. Boston, Mass.

Stators, Motor & Generator—See Motor & Generator Armatures,Rotors, Stators

Steatite—See Insulation Parts, Ceramic

Stereoscopes, Magnifying

American Optical Corp., Eggert & Sugar Rds., Buffalo, N Y
Bausch & Lomb, 87970 Bausch St., Rochester, N.Y.
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Epol, Inc., 623 Stewart Ave., Garden City, N.Y.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Titan Tool Supply Co., inc., 68 Comet, Buffalo, N.Y.
Unitron Instr. Co., 66 Needham St., Newton Highlands, Mass.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zeiss, Carl, Inc., 444 5th Ave., New York, N.Y.

Stops, Limit—See Limit Stops, Mechanical

Staighteners, Tube Pin—See Pin Straighteners, Tube

Strain Gauges—See Gauges, Strain

Strain Indicators—See Indicators, Strain

Strain Reliefs, Cable & Wire

Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill. ..... p 2375
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2964
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Stretchers, Microwave—See Microwave Line Stretchers

Strip-Line Components, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
AEL, Inc., Box 552, Lansdale, Pa.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Aertech Inds., 825 Stewart Dr., Sunnyvale, Calif.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J. ..... p 856
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Bendix Corp., Box 239, Franklin, Ind.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
ESCA, Cove Rd., Box 278, Port Salerno, Fla.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Narda Microwave Corp., Plainview, N.Y. ..... p 887
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Megadyne Inds., Inc., 1665 Buffalo Rd., Rochester, N.Y.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Rowe Engravers, 68 Union Ave., Clifton, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, Calif.
Vac-Ohm Elctrns. Co., P.O. Box 444, Haddonfield, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Vitramon Microwave Corp., 276 Lincoln Blvd., Middlesex, N.J.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Strippers & Twisters, Wire—See Wire Strippers

Strippers, Wire—See Wire Strippers

Strippers, Wire, Chemical—See Chemicals, Wire Stripping

Strips, Ground

ACS Inds., Inc., 13726 Saticoy St., Van Nuys, Cal.
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Braun, H., Tool & Instr. Co., 140 Fifth Ave., Hawthorne, N.J.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.

Strips, Marker & Fanning

Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Duramark, Inc., 2 Secatoag Ave., Port Washington, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electrovert, inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
States Co., 19 New Park Ave., Hartford, Conn.

Strips, Terminal

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 1718
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J.
Cinch Elctrns., 1501 Morse Ave., Elk Grove Village, Ill. p 2428,2429
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 2449
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y. ..... p 2461
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2404,2464
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1526,2139
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. ..... p 2537
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H. p 2551
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Advanced Circuitry Div., 4811 W. Kearney St., Springfield, Mo.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
British Radio Elctrns., Ltd., 1742 Wisconsin Ave., N.W., Washington, D.C.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Doran Mfg. Co., 1033 Bader St., Cincinnati, Ohio
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Electrical Plastics Corp., 280 Warren St., Box 298, Lyndhurst, N.J.
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Seastrom Mfg. Co. Inc., 701 Sonora Ave., Glendale, Cal.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
States Co., 19 New Park Ave., Hartford, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tri-Dex Co., 2146 E. Main St., Visalia, Calif.
Tri-Tronics Lab., Inc., Box 638, Euless, Tex.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Stroboscopes—See Lights, Stroboscopic Source

Studio Equipment—See Consoles; Cameras; Lighting Equip.; etc

Styli, Marking & Engraving-Also See Engraving & Profiling Equip.

Electro Stylus, 31 Cheyenne Blvd., Colorado Springs, Colo.

Styli, Recording & Playback

Aldshir Mfg. Co., Inc., 111 Lake Ave., Tuckahoe, N.Y.
American Phono-Ton, Inc., Kiamesha Lake, N.Y.
Astatic Corp., Box 120, Conneaut, Ohio
Audio Dynamics Corp., Pickett District Rd., New Milford, Conn.
Capps & Co., Inc., 20 Addison Pl., Valley Stream, N.Y.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Dixie Diamond Tool Co., Inc., 6875 Southwest 81st St., Miami, Fla.
Duotone Co., inc., Box 1168, S. Miami, Fla.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Pickering & Co., Inc., 101 Sunnyside Blvd., Plainview, N.Y.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stanton Magnetics, Inc., Terminal Dr., Plainview, N.Y.
Walco Elctrns. Co., 1234 State Hwy. #46, Clifton, N.J.

Substrates, Ceramic

AEL, Inc., Box 552, Lansdale, Pa.
American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Carborundum Co., Box 367, Niagara Falls, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Varadyne Packaging & Mat'ls., 2110 Broadway, Santa Monica, Cal. ..... p 2676,2677
Varadyne Semiconductor, 2330 Michigan Ave., Santa Monica, Calif.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro-Science Labs., Inc., 1133 Arch St., Philadelphia, Pa.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Insaco, Inc., Box 422, Quakertown, Pa.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
3M Co., 3M Center, St. Paul, Minn.
Trans-Tech, Inc., 12 Meem Ave., Box 457, Gaithersburg, Md.
Ultrasonic Mach. Co., 266 West Ave., Long Branch, N.J.
Valpey Corp., 1400 Highland St., Holliston, Mass.

Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.

Substrates, Flexible

Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Substrates, Glass

American Tech. Ceramics, Norden La., Huntington Sta., N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Cermetron Corp., 10439 Roselle St., San Diego, Cal.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Garner Glass Co., 177 S. Indian Hill, Claremont, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.

Superconducting Magnets—See Magnets, Superconducting

Supports, Tube—See Retainers, Tube

Suppressors, Arc

Carborundum Co., Box 367, Niagara Falls, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Ledex Div., 126 Webster St., Dayton, Ohio
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
RtroN Corp., Box 743, Skokie, Ill.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.

Suppressors, Harmonic

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.

Suppressors, Noise

Aritech Corp., 130 Lincoln St., Brighton, Mass.
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. .....p 1052,1053
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hopkins Engrg. Co., 12900 Foothill Blvd., San Fernando, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aerovox Corp. Dist. Sls., 740 Belleville Ave., New Bedford, Mass.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Potter Co., 500 W. Florence Ave, Inglewood, Calif.
RtroN Corp., Box 743, Skokie, Ill.
Standard Condenser Corp., 1065 W. Addison St., Chicago, Ill.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
White Electromagnetics, Inc., 656 Lofstrand La., Rockville, Md.

Suppressors, Transient Voltage (Rectifier Type)

California Instrs. Corp., Elin Div., 3511 Midway Dr., San Diego, Cal. ..... p 1005
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. ..... p 2701
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J. p 1884
Elgar Corp., 8159 Engineer Rd., San Diego, Cal. .....p 1052,1053
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1889
International Rectifier, 233 Kansas St., El Segundo, Cal.
Joslyn Elctrn. Sys., 6868 Cortona Dr., Box 817, Goleta, Cal. p 2058,2059
Ledex Div., 126 Webster St., Dayton, Ohio
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo. p 1261
Transtector Systems, 1161 Monterey Pass Rd., Monterey Pk., Cal. ..... p 2092
Bradley Semiconductor Corp., 275 Welton St., New Haven, Conn.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Power Conversion Prods. Inc., Forty Two East St, Crystal Lake, Ill.
Rectifier Engrg. & Supply Co., Inc., 8754 Big Bend Blvd., St. Louis, Mo.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Surface Analyzers—See Indicators, Surface Roughness

Surge Arresters, Electrical—See Arresters, Electrical Surge

Switchboards

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electrospace Corp., 956 Brush Hollow Rd., Westbury ..... p 534
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Macarr, Inc., 166 National Rd., Edison, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Devco Engrg., Inc., Pier La., W. Caldwell, N.J.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
N/P Co., Inc., Box 127, 5620 N. Rosemead Blvd., Temple City, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Private Tele-Comms., Inc., 1300 W. Belmont Ave., Chicago, Ill.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Siemens Corp., Telecommunications Div., 186 Wood Ave., S., Iselin, N.J.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Strom Comms. Corp., 10th & Walnut Sts., Chester, Pa.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Switchers, R-F

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
AEL, Inc., Box 552, Lansdale, Pa.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1755
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Switchers, Video

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
RCA Corp., Front & Cooper, Camden, N.J.
Rust Corp., 168 Tremont St., Everett, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Switches, Acceleration—See Accelerometers

Switches, Air Flow Actuated

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
Rotron, Inc., Hasbrouck La., Woodstock, N.Y. ..... p 2663
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y. ..... p 2090
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dynacool Mfg. Co., Inc., 1 Russell St., Saugerties, N.Y.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Michigan Oven Co., 1st Oven Pl., Box 336, Romulus, Mich.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Switches, Antenna Changeover

AEL, Inc., Box 552, Lansdale, Pa.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1755
Fifth Dimension, Inc., Box 483, Princeton, N.J.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Scherma, F.A. Mfg. Co., Inc., 424 Broome St., New York, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Trylon, Inc., Elverson, Pa.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Switches, Barometric

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
NUS Corp., P.O. Box 248, Paramus, N.J.
Precision Sensors, Inc., P.O. Box 297, Trumbull, Conn.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.

Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Switches, Cam

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ... p 2019,2021
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Connector Corp., 6025 N. Keystone, Chicago, Ill. ... p 2435
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro Switch Corp., King Ave., Weymouth, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ... p 2066,2067
Midtex/Aemco, 10 State St., Mankato, Minn.
Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y. ... p 2073
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ... p 2535
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 11 W. Spring St., Freeport, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Relay Service Co., 1310 N. Pulaski, Chicago, Ill.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Switches, Cam, Adjustable—See Switches, Cam

Switches, Canopy

Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Texas Instruments, Inc., Box 5012, Dallas, Tex.

Switches, Centrifugal

Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1381
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Winterburn Mfg. Co., Box 386, Putnam, Conn.

Switches, Coaxial Cable

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ... p 2005
AEL, Inc., Box 552, Lansdale, Pa. ... p 858
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2006,2007
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ... p 853
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 620
Daico Inds., Inc., Box 5225, Compton, Cal. ... p 865
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1755
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ... p 869
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ... p 2070
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ... p 907
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ... p 909
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ... p 2587
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Gold Line Connector, Inc., Muller Ave., Box 893, Norwalk, Conn.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Winslow Tele-Tronics, Inc., 607 Industrial Way, W., Eatontown, N.J.

Switches, Code

Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ... p 2022
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ... p 2018
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ... p 2034
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ... p 2043
Interswitch, 770 Airport Blvd., Burlingame, Cal. ... p 2054
North Elec. Co., 553 S. Market St., Galion, Ohio ... p 2072
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Honeywell, 11 W. Spring St., Freeport, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.

Switches, Commutator—See Commutators, Switching

Switches, Crossbar

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ... p 2005
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ... p 2022
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho ... p 2026
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ... p 2431
Cunningham Corp., 10 Carriage St., Honeoye Falls, N.Y. p 2030,2031
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ... p 1760
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Honeywell, Box 5227, Denver, Colo.
Interswitch, 770 Airport Blvd., Burlingame, Cal. ... p 2054
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ... p 2070
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio ... p 2072
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Rust Corp., 168 Tremont St., Everett, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Switches, Data-Sampling

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ... p 2005
Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ... p 2018
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y. ... p 2431
Cunningham Corp., 10 Carriage St., Honeoye Falls, N.Y. p 2030,2031
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ... p 2034
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Honeywell, Box 5227, Denver, Colo.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Markite Corp., 155 Waverly Pl., Dept. 301, New York, N.Y. p 2811
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ... p 2070
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ... p 2535
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ... p 1313
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
Space Diversity Sys., Box 167, Totowa, N.J.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.

Switches, Decade

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ... p 2005
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. ... p 1364
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ... p 2022
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ... p 2018
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ... p 2035
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2074
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ... p 2535
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Shallcross, E. Preston St., Selma, N.C.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.

Switches, Electronic—See Controls

Switches, Explosion Proof

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho ... p 2027
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ... p 1674
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ... p 2056
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Stackpole Comps. Co., Box 14466, Raleigh, N.C. ... p 2086
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Unimax Switch Corp., Ives Rd., Wallingford, Conn. ... p 2093
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Wild Rover Corp., Herbert Ave., Closter, N.J. ... p 2094
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Honeywell, 11 W. Spring St., Freeport, Ill.
Linemaster Switch Corp., Box 52, Woodstock, Conn.
Luminator, Inc., Box 278, Plano, Tex.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.
Winterburn Mfg. Co., Box 386, Putnam, Conn.

Switches, Float

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Precision Sensors, Inc., P.O. Box 297, Trumbull, Conn
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.

Switches, Foot-Pedal, Mat, Ribbon, etc.

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y. ..... p 2090
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
Honeywell, 11 W. Spring St., Freeport, Ill.
Lektra Labs., Inc., 129-07 18th Ave., College Point, N.Y.
Line Elec. Co., U.S. Hwy. 287, Parsippany, N.J.
Linemaster Switch Corp., Box 52, Woodstock, Conn.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Micro Switch, 11 W. Spring St., Freeport, Ill.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Rowe L. L. Co., 70 Hichborn St., Boston, Mass.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.

Switches, High Voltage

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. p 2044,2045
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1527
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C..... p 2087
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Honeywell, 11 W. Spring St., Freeport, Ill.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Kentrox Inds., Inc., 14335 N.W. Science Pk. Dr., Portland, Ore.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Shallcross, E. Preston St., Selma, N.C.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Switches, Illuminated

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 2002
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 2004
Amp Inc., Box 3608, Harrisburg, Pa. ..... p 536
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Capitol Machine & Switch Co., 87 Newtown Rd., Danbury, Conn. ..... p 2015
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ..... p 2018
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Clare-Pendar Co., Box 785, Post Falls, Idaho .....p 2026,2027
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ..... p 2035
Eldema Div., 18435 Susana Rd., Compton, Cal. ..... p 1507
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal. ..... p 2038
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.. p 2042
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn. .....p 2050,2051
Interswitch, 770 Airport Blvd., Burlingame, Cal. ..... p 2054
Leecraft Mfg. Co., Inc., 21-16 44th Rd., Long Island City, N.Y. p 1524
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Marco-Oak, Box 4011, Anaheim, Cal. ..... p 2065
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2068,2069
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.....p 2080,2081
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn. ..... p 1533
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn... p 1545
Unimax Switch Corp., Ives Rd., Wallingford, Conn. ..... p 2093
Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Wild Rover Corp., Herbert Ave., Closter, N.J. ..... p 2094
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Farwest Mfg. Div., Inc., Corner S.E. 32nd at 124th S.E., Bellevue, Wash.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
Honeywell, 11 W. Spring St., Freeport, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Luminator, Inc., Box 278, Plano, Tex.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Mossman, Donald P., Inc., P.O. Box 265, Brewster, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Truco, Inc., P.O. Box 95, Simsbury, Conn.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Switches, Inertia—See Accelerometers

Switches, Keyboard

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.p 2002,2003
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 2004
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Clare-Pendar Co., Box 785, Post Falls, Idaho ..... p 2026
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal. ..... p 2038
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Unimax Switch Corp., Ives Rd., Wallingford, Conn.
Wild Rover Corp., Herbert Ave., Closter, N.J. ..... p 2094
Honeywell, 11 W. Spring St., Freeport, Ill.
Luminator, Inc., Box 278, Plano, Tex.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Mossman, Donald P., Inc., P.O. Box 265, Brewster, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.

Switches, Key-Lock

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Chicago Lock Co., 4275 W. Belmont Ave., Chicago, Ill. .... p 2023
Clare-Pendar Co., Box 785, Post Falls, Idaho
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ..... p 2056
Trimm, Inc., 400 W. Lake St., Libertyville, Ill.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
On-Guard Corp. America, 350 Gotham Pkwy., Carlstadt, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Robot Inds., Inc., 7041 Orchard, Dearborn, Mich.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Truco, Inc., P.O. Box 95, Simsbury, Conn.

Switches, Knife

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daven, Div., Dept. EEM 70, Manchester, N.H.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
States Co., 19 New Park Ave., Hartford, Conn.
Superior Switchboard & Devices Div., Box 590, Canton, Ohio
Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, Ky.

Switches, Lever

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
C & K Components, Inc., 103 Morse St., Watertown, Mass. p 2011
Capitol Machine & Switch Co., 87 Newtown Rd., Danbury, Conn. ..... p 2015
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2017
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. .....p 2019,2021
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ..... p 2035
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn.
Electrospace Corp., 956 Brush Hollow Rd., Westbury..... p 534
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn. ..... p 2051
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2066
Nanasi, 6308 Jackson St., W. New York, N.J. ..... p 2071
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2074
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.

Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y. ..... p 2073
Robertshaw Controls Co., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio ..... p 2082
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. .... p 2089
Unimax Switch Corp., Ives Rd., Wallingford, Conn..... p 2093
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Mallory Controls Co., Box 327, Frankfort, Ind.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
Mossman, Donald P., Inc., P.O. Box 265, Brewster, N.Y.
Network Inds., Inc., Box 397, Bayonne, N.J.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Telephone Comps., Inc., 9 Norfolk Dr., Northport, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.

Switches, Limit

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ..... p 2021
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn..... p 1674
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y. ..... p 2073
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1865
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Robertshaw Controls Co., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio ..... p 2083
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Unimax Switch Corp., Ives Rd., Wallingford, Conn.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Chatham Controls Corp., 33 River Rd., Chatham, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Honeywell, 11 W. Spring St., Freeport, Ill.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Luminator, Inc., Box 278, Plano, Tex.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermal Engrg. & Design Co., 44 N. Summit St., Akron, Ohio
United Elec. Controls Co., 85A School St., Watertown, Mass.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.
Westinghouse Elec. Corp., Buffalo, N. Y.

Switches, Liquid Level/Pressure

Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., 3030 Max Roy St., Houston, Tex.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
NUS Corp., P.O. Box 248, Paramus, N.J.
Precision Sensors, Inc., P.O. Box 297, Trumbull, Conn
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Roylyn, 620 Paula Ave., Glendale, Cal.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Simmonds Precision Prods., Inc., Rockingham Rd., Bellows Falls, Vt.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Starretics Co., P.O. Box 9308, N. Hollywood, Calif.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.

Switches, Lock—See Switches, Key-Lock

Switches, Magnetic Reed

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. .... p 2005
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. ..... p 1744
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. .... p 1846
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. p 2044-2046
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1830
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb..... p 2080
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Honeywell, 11 W. Spring St., Freeport, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Whistler Elctrns., Inc., 8613 Yolanda Ave., Northridge, Cal.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Switches, Magnetically Actuated

Airpax Elctrns., Inc., Cambridge, Md.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Chicago Lock Co., 4275 W. Belmont Ave., Chicago, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn.
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Fifth Dimension, Inc., Box 483, Princeton, N.J. ..... p 2041
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. p 2044,2045
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio
Liberty Controls, R.F.D. 5, Joliet, Ill. ..... p 1816
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio
Luminator, Inc., Box 278, Plano, Tex.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., Lamb's Rd., Pitman, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Switches, Matrix—See Switches, Crossbar-Also See Boards, Programming

Switches, Mercury Displacement

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Fifth Dimension, Inc., Box 483, Princeton, N.J. ..... p 2041
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Mechanical Enterprises, 5249 Duke St., Alexandria, Va. .... p 572
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Mercury Contacts, Inc., 1950 Neva Dr., Dayton, Ohio
Micro Switch, 11 W. Spring St., Freeport, Ill.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.

Switches, Mercury Wetted Contacts

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Fifth Dimension, Inc., Box 483, Princeton, N.J. ..... p 2041
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Elec-Trol, Inc., 21018 Soledad Canyon Rd., Saugus, Calif.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.

Switches, Microwave—See Switches, Coaxial Cable; Switches, Waveguide

Switches, Motor-Driven

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. ..... p 1629
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Heinemann Elec. Co., 2636 Brunswick Pike, Trenton, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Midtex/Aemco, 10 State St., Mankato, Minn.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Collectron Corp., 304 East 45th St., New York, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Shallcross, E. Preston St., Selma, N.C.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Switches, Motor-Reversing

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1867
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stevenson Engrg. & Mfg. Co., 3102 Southwest 87th Ave., Box 25070, Portland, Ore.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.

Switches, Oil Immersed

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2042
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.

Switches, Photoelectric—See Cells Photoconducter

Switches, Power

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2017
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. ..... p 2025
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ..... p 2057
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. .....p 2066,2067
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2074
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Mack Elec. Devices, Inc., 32 Glenside Ave., Wyncote, Pa.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Radio Switch, State Hwy. 79, Marlboro, N.J.
Shallcross, E. Preston St., Selma, N.C.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Switches, Pressure

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Automatic Controls Div, 6201 Oakton St., Morton Grove, Ill. p 2028
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y. ..... p 2809
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind.
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y. ..... p 2090
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Bendix Corp., S. Montrose, Pa.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Prods., Inc., Box 72, Hanover, N. J.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Dietz, Henry G. Co., Inc., 14-26 28th Ave., Long Island City, N.Y.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Gems Co., Inc., The, Spring La., Farmington, Conn.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
IMC Magnetics Corp., 1900 E. 5th St., Tempe, Ariz.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 241 S. Abbe Rd., Elyria, Ohio
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Meletron Corp., 940 N. Orange Dr., Los Angeles, Calif.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
NUS Corp., P.O. Box 248, Paramus, N.J.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Precision Sensors, Inc., P.O. Box 297, Trumbull, Conn.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
U.S. Switch Corp, 351 Boston Post Rd., Milford, Conn.
Wallace & Tiernan Div., 25 Main St., Belleville, N.J.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Switches, Program

Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ..... p 2022
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ..... p 2018
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 677
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Interswitch, 770 Airport Blvd., Burlingame, Cal. ..... p 2054
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y. p 1994
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Essex Int'l., Inc., 800 E. Garfield Ave., Decatur, Ill.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Paragon Elec. Co., Inc., 1600 12th St., Two Rivers, Wisc.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Switches, Proximity

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927

Daven, Div., Dept. EEM 70, Manchester, N.H.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Fifth Dimension, Inc., Box 483, Princeton, N.J. ..... p 2041
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. p 2044,2045
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Robertshaw Controls Co., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio ..... p 2083
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Wild Rover Corp., Herbert Ave., Closter, N.J.
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Automation Devices, Inc., Box A.D., Automation Pk., Fairview, Pa.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Delavan Mfg Co, 811 Fourth St, West Des Moines, Iowa
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Electronic Control Corp., 15341 Dale, Detroit, Mich.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hudson Corp., Box 867, Manchester, N.H.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
Jo-Bell Prods., Inc., 5456 West 111th St., Oak Lawn, Ill.
Luminator, Inc., Box 278, Plano, Tex.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Photobell Co., Inc., 12M East 22nd St., New York, N.Y.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Recora Co., Inc., Box 68, Powis Rd., St. Charles, Ill.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Westinghouse Elec. Corp., Buffalo, N. Y.

Switches, Pushbutton (All Types)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.p 2002,2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Zettler, Inc., 697 Randolph Ave., Costa Mesa, Calif. p 2004
Bloc-Lite Div., 102-48 43rd Ave., Corona, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
C & K Components, Inc., 103 Morse St., Watertown, Mass. p 2012,2013
Capitol Machine & Switch Co., 87 Newtown Rd., Danbury, Conn. ..... p 2015
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. ..... p 2017
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. .....p 2019,2020
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ..... p 2018
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Clare-Pendar Co., Box 785, Post Falls, Idaho .....p 2026,2027
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Connector Corp., 6025 N. Keystone, Chicago, Ill. ..... p 2435
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y. ..... p 1501
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ..... p 2035
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Eldema Div., 18435 Susana Rd., Compton, Cal. ..... p 1507
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal. ..... p 2038
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn. ..... p 1760
Electronic Mess., 2 Crescent Pl., Oceanport, N.J.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2042
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn. ..... p 2050-2053
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. ..... p 2056
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. .....p 2066,2067
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2068,2069
Nanasi, 6308 Jackson St., W. New York, N.J. ..... p 2071
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2074
Raytheon Co., 465 Centre St., Quincy, Mass.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1865
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.....p 2080,2081
Robertshaw Controls Co., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio .....p 2082,2083
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan ..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn. ..... p 1533
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. .... p 2088
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan
Trimm, Inc., 400 W. Lake St., Libertyville, Ill. ..... p 2541
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Vemaline Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1547
Wild Rover Corp., Herbert Ave., Closter, N.J. ..... p 2094
Adalet Mfg. Co., 4801 West 150th St., Cleveland, Ohio
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Control Prods., Inc., Box 72, Hanover, N. J.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Euclid Elec. & Mfg. Div., Madison Ind'l. Pk., Madison, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Control Co., 1196 Soldiers Field Rd, Boston, Mass.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
ITT Telecommunications, Fulton Dr., Corinth, Miss.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Korry Mfg. Co., 223-8th Ave. N., Seattle, Wash.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Mallory Controls Co., Box 327, Frankfort, Ind.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Methode Elctrns., Inc., 7447 W. Wilson Ave., Chicago, Ill.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Mossman, Donald P., Inc., P.O. Box 265, Brewster, N.Y.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Teledyne Radar Relay, 1631 10th St., Santa Monica, Cal.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Touch-Plate Electro-Sys., Inc., 16530 Garfield Ave., Paramount, Calif.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Truco, Inc., P.O. Box 95, Simsbury, Conn.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.
Universal Relay Corp., 42 White St., New York, N.Y.
Vitramon, Inc., Box 544, Bridgeport, Conn.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.

Switches, R-F

Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2006,2007
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1752-1755
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ..... p 882
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 1527
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 907
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. ..... p 2087
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal. p 2542
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mini-Circuits Lab., 2913 Quentin Rd., Brooklyn, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Olektron Corp., Box 248, Dudley, Mass.
Radio Switch, State Hwy. 79, Marlboro, N.J.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.

Switches, Reed

Adams & Westlake Co., 1025 N. Michigan St., Elkhart, Ind.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Clare-Pendar Co., Box 785, Post Falls, Idaho
Coto-Coil Co., Inc., 57 Pavilion Ave., Providence, R.I. ..... p 1744
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Douglas Randall Inc., 6 Pawcatuck Ave., Westerly, R.I. ..... p 1848
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. p 2044,2045
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc. ..... p 2047
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo. .... p 2048
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind. p 1830
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RBM Controls Div., 131 Godfrey St., Logansport, Ind.
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.....p 2080,2081
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Compac Engrg., Inc., 845 Commercial St., San Jose, Cal.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
RBM Controls, 3501 W. Addison St., Chicago, Ill.

Switches, Rocker

Airpax Elctrns., Inc., Cambridge, Md.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 2001
C & K Components, Inc., 103 Morse St., Watertown, Mass. p 2011
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016

Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2025
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Sorenson Lighted Controls, Inc., 530 Oakwood Ave., W. Hartford, Conn.
Stackpole Comps. Co., Box 14466, Raleigh, N.C. p 2085
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Luminator, Inc., Box 278, Plano, Tex.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.

Switches, Rotary

Airflyte Elctrns. Co., Box 207, Bayonne, N.J. p 1629
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. p 2002
Amp Inc., Box 3608, Harrisburg, Pa. p 536
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. p 1364
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Carter Mfg. Corp., 23 Washington St., Hudson, Mass. p 2799
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. p 2017
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. p 2022
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. p 2018
Chicago Lock Co., 4275 W. Belmont Ave., Chicago, Ill. p 2023
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Connector Corp., 6025 N. Keystone, Chicago, Ill. p 2435
Couch S.H. Div., 36 River St., Boston, Mass. p 1747
CTS Berne, Inc., 406 Parr Rd., Berne, Ind.
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Corp, 905 N. West Blvd., Elkhart, Ind. p 2014
CTS Elctrns., Inc., 1010 Sycamore Ave., S. Pasadena, Calif. p 2014
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daven, Div., Dept. EEM 70, Manchester, N.H. p 2032,2033
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. p 2035
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electro-Mech. Comps., Inc., 5639 N. Rosemead Blvd., Temple City, Cal.
Electro Switch Corp., King Ave., Weymouth, Mass. p 2039
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. p 2043
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. p 1674
Industrial Devices, Inc., 982 River Rd., Edgewater, N.J.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. p 2055
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal. p 2056,2057
Ledex Div., 126 Webster St., Dayton, Ohio p 2060
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill.
Markite Corp., 155 Waverly Pl., Dept. 301, New York, N.Y. p 2811
Nanasi, 6308 Jackson St., W. New York, N.J. p 2071
New England Instr. Co., 14 Kendall La., Natick, Mass.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2074
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
Poly-Scientific Div., 1111 N. Main St., Blacksburg, Va.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J. p 2077-2079
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Shallco, Inc., Hwy. 301, S., Holt Lake, Smithfield, N.C. p 2087
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan p 2532
Spectrol Elctrns. Corp., 17070 E. Gale Ave., City of Industry, Cal. p 2820,2821
Stackpole Comps. Co., Box 14466, Raleigh, N.C. p 2086
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. p 2088
TEC Magnetics, 12117 Slauson Ave., Santa Fe Springs, Cal.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Unimax Switch Corp., Ives Rd., Wallingford, Conn.
Veeder-Root, 70 Sargeant St., Hartford, Conn.
Wilmington Controls Div., 111 S. Nelson Rd., Wilmington, Ohio p 2061-2064
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal.
Ace Elctrn. Assocs., Inc., 99 Dover St., Somerville, Mass.
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
ASM Corp., 525 Truck La., Box 860, Smithfield, N.C.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bendix Corp., Sidney, N.Y.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Collectron Corp., 304 East 45th St., New York, N.Y.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Electro-Miniatures Corp., 600 Huyler St., S. Hackensack, N.J.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Eugene Engrg. Co., Inc., 50 Church St., Rockland, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
General Scientific, 137 Walsh Ave., Newburgh, N.Y.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
KDI Electro-Tec Corp., 1600 N. Main St., Blacksburg, Va.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
LEM Instr. Corp., 20 Sarah Dr., Farmingdale, N.Y.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Mallory Controls Co., Box 327, Frankfort, Ind.
Meletron Corp., 940 N. Orange Dr., Los Angeles, Calif.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Miniature Elctrn. Comps. Corp., 600 South St., Holbrook, Mass.
Mossman, Donald P., Inc., P.O. Box 265, Brewster, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Northern Precision Labs., Inc., 202 Fairfield Rd., Fairfield, N.J.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Radio Switch, State Hwy. 79, Marlboro, N.J.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Tabet Mfg. Co., 1336 Ballentine Blvd., Norfolk, Va.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
TRG Prods., 400 Border St., E. Boston, Mass.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Switches, Rotary Chopper

Airflyte Elctrns. Co., Box 207, Bayonne, N.J.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Collectron Corp., 304 East 45th St., New York, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.

Switches, Slide

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. p 2001
Amp Inc., Box 3608, Harrisburg, Pa. p 536
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc. p 2017
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2025
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
International Electro Exchange Corp., 6851 Oxford St., Minneapolis, Minn.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan p 535
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2075
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. p 1865
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. p 2528
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan p 2532
Stackpole Comps. Co., Box 14466, Raleigh, N.C. p 2084
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. p 2089
Wilmington Controls Div., 111 S. Nelson Rd., Wilmington, Ohio
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Seacor, Inc., 598 Broadway, Norwood, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
Underwriters Safety Device Co., 4332 N. Kedzie Ave., Chicago, Ill.

Switches, Snap-Action (All Types)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. p 2003
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. p 2020
Chicago Lock Co., 4275 W. Belmont Ave., Chicago, Ill.
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill. p 2024
Clare-Pendar Co., Box 785, Post Falls, Idaho p 2026,2027
Connector Corp., 6025 N. Keystone, Chicago, Ill. p 2435
Continental-Wirt Elctrns. Corp., 26 W. Queen La., Philadelphia, Pa. p 2025
CTS of Canada, Ltd., 80 Thomas St., Streetsville, Ont., Can.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
CTS Corp, 905 N. West Blvd., Elkhart, Ind.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Digilog Elctrns. Corp., 13253 G Northrup Way, Bellevue, Wash.
Electro Switch Corp., King Ave., Weymouth, Mass. p 2039
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. p 2043
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. p 1674
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. p 2055
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. p 2066,2067
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2069
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan p 535
Potter & Brumfield, 1200 E. Broadway, Princeton, Ind.
Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y. p 2073
Price Elec. Co., E. Church & 2nd Sts., Frederick, Md.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. p 1865
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.

Robertshaw Controls Co., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio ..... p 2082,2083
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Stackpole Comps. Co., Box 14466, Raleigh, N.C. ..... p 2085
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Unimax Switch Corp., Ives Rd., Wallingford, Conn. ..... p 2093
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Clarostat Mfg. Co., Inc., Washington St., Dover, N.H.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Control Prods., Inc., Box 72, Hanover, N. J.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electrical Controls, 170 E. 131 St., Cleveland, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Equip. & Mfg. Co. Inc., 3303 Fern Valley Rd., Louisville, Ky.
General Reed Co., 19 Walnut Ave., Box 858, Clark, N.J.
Hi-Tek Corp., 2220 S. Anne St., Santa Ana, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Luminator, Inc., Box 278, Plano, Tex.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sealectric Switch & Relay Co., 6025 N. Keystone, Chicago, Ill.
Shallcross, E. Preston St., Selma, N.C.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stacoswitch, Inc., 1139 Baker St., Costa Mesa, Cal.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Therm-O-Disc, Inc., Box 1538, Mansfield, Ohio
TIA Elec. Co., Box 777, Princeton, N.J.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
Truco, Inc., P.O. Box 95, Simsbury, Conn.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.
United Control Corp., Redmond, Wash.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Universal Relay Corp., 42 White St., New York, N.Y.
U.S. Switch Corp. 351 Boston Post Rd., Milford, Conn.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.

Switches, Solid State

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airpax Elctrns., Inc., Cambridge, Md.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Analog Devices, Inc., 221 Fifth St., Cambridge, Mass. ..... p 541
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 968
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Control Data Corp., 2300 Berkshire La., N., Minneapolis, Minn. p 1367
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 868
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 1373
Elctrn. Instr. & Specialty Corp., 71 Cross St., Winchester, Mass.
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Grigsby-Barton, Inc., 107 N. Hickory Ave., Arlington Hgts., Ill. p 1775
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Hybrid Sys. Corp., 95 Terrace Hall Ave., Burlington, Mass.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Nanotron, Inc., 8720 Woodley Ave., Sepulveda, Cal. ..... p 1832
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pastoriza Div., 385 Elliot St., Newton Upper Falls, Mass.
Precision Standards Corp., 1701 Reynolds, Santa Ana, Cal.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. ..... p 1851
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Static Prods., Inc., 2511 National Dr., Box 2226, Garland, Tex.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal. ..... p 909
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1867
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Arbor Sys., Inc., Box 1325, Ann Arbor, Mich.
Assembly Elctrns. Ltd., Box 461, 807 Kent St., Niagara Falls, Can.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Burr-Brown Resch. Corp., Int'l. Airport Ind'l. Pk., Tucson, Ariz.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Collins Radio Co., Dallas, Tex.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Crydom Controls Div. Int'l. Rectifier, 3115 W. Warner, Santa Ana, Cal.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Denison, R.B., Inc., 103 Broadway, Bedford, Ohio
Design Prods. Corp., 1925 W. Maple Rd., Troy, Mich.
Dickson Elctrns. Corp., Box 1390, Scottsdale, Ariz
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Electronic Modules Corp., Box 141, Timonium, Md.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
G-L Microwave Corp., 825 Black Oak Ridge Rd., Wayne, N.J.
Gems Co., Inc., The, Spring La., Farmington, Conn.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, 11 W. Spring St., Freeport, Ill.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lancer Elctrns. Corp., 1416 W. Main St., Norristown, Pa.
Langevin, 1801 E. Carnegie Ave., Santa Ana, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Maytronics, Inc., P.O. Box 460, Colorado Springs, Colo.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
MEM Controls, Inc., 1450 East 289th St., Wickliffe, Ohio
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Monsanto-Elctrn. Special Prods., 10131 Bubb Rd., Cupertino, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Norbatrol Elctrns. Corp., Norbatrol Ave. at Carson St., Murrysville, Pa.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Olektron Corp., Box 248, Dudley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Power Control Corp., Box 11432, Pittsburgh, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Reed Switch Dev. Co., Inc., 34 Lincoln Ave., Greenwich, Conn.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Rochester Instr. Sys., Inc., 275 N. Union St., Rochester, N.Y.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
TIA Elec. Co., Box 777, Princeton, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., Youngwood, Pa.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Switches, Step Type

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ..... p 2018
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill. ..... p 1742
Daven, Div., Dept. EEM 70, Manchester, N.H.
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio ..... p 2072
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill. p 2075
Precision Switch Corp., 181 Westchester Ave., Port Chester, N.Y.
RCL Elctrns., Inc., 700 S. 21st St., Irvington, N.J.
Schrack Elec. Sls. Corp., 1140 Broadway, New York, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Imtra Corp., 151 Mystic Ave., Medford, Mass.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Shallcross, E. Preston St., Selma, N.C.
Subminiature Instrs. Corp., 3236 Kansas Ave., Riverside, Calif.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Universal Relay Corp., 42 White St., New York, N.Y.

Switches, Thermally Actuated

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I. p 2107
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
International Rectifier, 233 Kansas St., El Segundo, Cal.
Standard Controls, Inc., 2401 S. Bayview St., Seattle, Wash. p 2126
Aladdin Controls, 703 Murfreesboro Rd., Nashville, Tenn.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Bimet Corp., Box 518, Morris, Ill.
Burling Instr. Co., 21 River Rd., Box 298, Chatham, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Chatham Controls Corp., 33 River Rd., Chatham, N.J.
Control Prods., Inc., Box 72, Hanover, N. J.
Dales, Franklin Co., 180-85 E. Mill St., Akron, Ohio
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Fasco Inds., Inc., Augusta at N. Union Sts., Rochester, N.Y.
Fenwal, Inc., Main St., Ashland, Mass.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, Ill.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Networks Elctrn. Corp., 9750 De Soto, Chatsworth, Calif.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Prince Instrs., Inc., Industrial Pk., Southampton, Pa.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Thermal Engrg. & Design Co., 44 N. Summit St., Akron, Ohio
Therm-O-Disc, Inc., Box 1538, Mansfield, Ohio
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
United Control Corp., Redmond, Wash.

United Elec. Controls Co., 85A School St., Watertown, Mass.
U.S. Switch Corp, 351 Boston Post Rd., Milford, Conn.
Valverde Labs., 60 Main St., Oakfield, N.Y.
Vulcan Elec. ITT, 88 Holten St., Danvers, Mass.
Wavetronics Inds., Inc., 211 Warren St., West Pittston, Pa.

Switches, Thumbwheel

Airpax Elctrns., Inc., Cambridge, Md.
Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
Cherry Electrical Prods. Corp., 1650 Old Deerfield Rd., Highland Pk., Ill. ..... p 2022
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill. ..... p 2018
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Daven, Div., Dept. EEM 70, Manchester, N.H.
Digitran Co., 855 S. Arroyo Pkwy., Pasadena, Cal. ....p 2034,2035
Elctrn. Engrg. Co. Cal., 1441 E. Chestnut Ave., Santa Ana, Cal. p 2040
Electrospace Corp., 956 Brush Hollow Rd., Westbury..... p 534
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 2042
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Interswitch, 770 Airport Blvd., Burlingame, Cal..... p 2054
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J.
Nanasi, 6308 Jackson St., W. New York, N.J.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Standard Grigsby Co., 920 Rathbone Ave., Aurora, Ill. .... p 2089
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Bendix Corp., Sidney, N.Y.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.

Switches, Time Delay

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill..... p 1828
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Ewing Prods., Inc., 1014 W. Burbank Blvd., Burbank, Calif.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Norwalk Thermostat Co., 100 N. West St., Norwalk, Ohio
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Switches, Timing—See Timers

Switches, Toggle

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 2001
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
C & K Components, Inc., 103 Morse St., Watertown, Mass. p 2010-2013
Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc. p 2029
Daven, Div., Dept. EEM 70, Manchester, N.H.
Elctrn. Controls, Inc., 141 Danbury Rd., Wilton, Conn..... p 1760
Electrospace Corp., 956 Brush Hollow Rd., Westbury..... p 534
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
J-B-T Instrs., Inc., Box 1818, New Haven, Conn. ..... p 2055
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J.
Kulka Elec. Corp., Dept. E., Box 149, Mt. Vernon, N.Y..... p 2461
Licon Div., 6615 W. Irving Pk. Rd., Chicago, Ill. ..... p 2067
Master Specialties Co., 1640 Monrovia, Costa Mesa, Cal. p 2069
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan..... p 535
Nanasi, 6308 Jackson St., W. New York, N.J.
Remvac Comps., Inc., 37-55 61st St., Woodside, N.Y. ..... p 1865
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Unimax Switch Corp., Ives Rd., Wallingford, Conn.
Arcolectric Switch Co., Box 348, N. Hollywood, Calif.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
Control Prods., Inc., Box 72, Hanover, N. J.
Controls Co. of America, 1420 Delmar Dr., Folcroft, Pa.
Culver Stearns Mfg. Co., 354 Franklin St., Worcester, Mass.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Honeywell, 11 W. Spring St., Freeport, Ill.
Indak Mfg. Corp., 1915 Techny Rd., Northbrook, Ill.
Jay-El Prods., Inc., 1859 W. 169th St., Box 25, Gardena, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Micro Switch, 11 W. Spring St., Freeport, Ill.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Milli-Switch Corp., Box 67, Gladwyne, Pa.
Network Inds., Inc., Box 397, Bayonne, N.J.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Painton, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N.Y.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Pollak, Joseph Corp., 195 Freeport St., Boston, Mass.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Superior Switch Co., 1001 W. Broad St., Richmond, Va.
Switchcraft, Inc., 5555 N. Elston Ave., Chicago, Ill.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Texas Instruments, Inc., 34 Forest St., Attleboro, Mass.
Torsion Balance Co., 35 Monhegan St., Clifton, N.J.
Tower Mfg. Corp., 158 Pine St., Providence, R.I.
UID Elctrns. Corp., 4105 Pembroke Rd., Hollywood, Fla.

Switches, Touch Actuated

Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Nanasi, 6308 Jackson St., W. New York, N.J.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Wild Rover Corp., Herbert Ave., Closter, N.J..... p 2094
Aeroelectric Switch Co., Box 348, No. Hollywood, Cal.
Burgess Switch Co., Ltd., 777 Warden Ave., Scarborough, Ont., Can.
Rodale Mfg. Co., Inc., Emmaus, Pa.

Switches, Transfer

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
Avtel Corp., 1130 E. Cypress St., Covina, Cal. ..... p 968
Chicago Switch, Inc., 2035 W. Wabansia Ave., Chicago, Ill.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Dow-Key, 2260 Industrial La., Box 348, Broomfield, Colo. p 1755
Electro Switch Corp., King Ave., Weymouth, Mass. ..... p 2039
Fifth Dimension, Inc., Box 483, Princeton, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Ledex Div., 126 Webster St., Dayton, Ohio ..... p 2060
Matrix Sys. Corp., 9201 Gazette St., Chatsworth, Cal. ..... p 2070
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., N.J. p 2091
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Wilmington Controls Div., 111 S. Nelson Rd., Wilmington, Ohio
American Solenoid Co., Inc., 245 E. Inman Ave., Rahway, N.J.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Cyberex Inc., 4399 Industrial Pkwy., Willoughby, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Luminator, Inc., Box 278, Plano, Tex.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Switches, Trigger

Carling Electric, Inc., 505 New Park Ave., W. Hartford, Conn. p 2016
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, Ill.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Conectrix, Inc., 201 N. Gables, Wheaton, Ill.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
General Elec. Co., 95 Hathaway St., Providence, R.I.
Luminator, Inc., Box 278, Plano, Tex.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
McGill Mfg. Co., Inc., 909 N. Lafayette St., Valparaiso, Ind.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Pacific Switch Controls, Inc., 14048 Burbank Blvd., Van Nuys, Calif.
Relay & Control Corp., 23-16 40th Ave., Long Island City, N.Y.
Specialties Mfg. Co., 8821 Fenkell, Detroit, Mich.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.

Switches, Ultrasonic

Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Abtronics, Inc., Box 712, Livermore, Calif.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Delavan Mfg Co, 811 Fourth St., West Des Moines, Iowa
Linden Labs., Inc., P.O. Box 920, State College, Pa.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.

Switches, Vacuum

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc.
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1808
Kilovac Corp., Box 4422, Santa Barbara, Cal.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Tapeswitch Corp. America, 320 Broad Hollow Rd., Farmingdale, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal. p 1860,1861
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Fredericks Co., Philmont & Anne Sts., Huntingdon Valley, Pa.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
H-B Instr. Co., American & Bristol Sts., Philadelphia, Pa.
Meletron Corp., 940 N. Orange Dr., Los Angeles, Calif.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Norton Co., 160 Charlemont St., Newton, Mass.
NUS Corp., P.O. Box 248, Paramus, N.J.
Precision Sensors, Inc., P.O. Box 297, Trumbull, Conn.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
United Elec. Controls Co., 85A School St., Watertown, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Switches, Waveguide

AEL, Inc., Box 552, Lansdale, Pa. ..... p 858
Airtron, 200 E. Hanover Ave., Morris Plains, N.J..... p 856
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2006,2007
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 869
Fifth Dimension, Inc., Box 483, Princeton, N.J.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y. ..... p 907
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal..... p 909
Waveline, Inc., Box 718, W. Caldwell, N.J. ..... p 919
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Ferrotec, Inc., Chapelbridge Pk., 80 Bridge St., Newton, Mass.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
I-Tel, Inc., 10504 Wheatley St., Kensington, Md.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sedco Sys., Inc., 130 Schmitt Blvd., Farmingdale, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Switchlights—See Switches, Illuminated

Synchro Error Testers—See Testers, Synchro Error

Synchro / Resolver Testers—See Testers, Synchro / Resolver

Synchro Resolvers—See Resolvers, Synchro

Synchro Transmitters, Solid-State

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 612
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y. ..... p 1985
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J. p 1378
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1991
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y. p 595
Ametek, Inc., Station Square Two, Paoli, Pa.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dynalex, Inc., 885 Front St., Burbank, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Ten Bosch, M., Inc., Vermilyea St., Pleasantville, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Synchronizers, Klystron & BWO

Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Microwave/Sys., Inc., 1 Adler Dr., E. Syracuse, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.

Synchros

Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y. .. p 1676
IMC Magnetics Corp., Rte. 16B, Rochester, N.H. ..... p 1676
IMC Magnetics Corp., 6058 Walker Ave., Maywood, Cal. p 1676
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1997
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1997
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1997
Weston-Transicoil, Worcester, Pa.
American Elctrns., Inc., 1600 E. Valencia Dr., Fullerton, Calif.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
Bendix Corp., S. Montrose, Pa.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Henschel Corp., 14 Cedar St., Amesbury, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England

Synchroscopes

Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.

Synthesizers, Delay Line—See Delay Line Synthesizers

Synthesizers, Filter—See Filter Synthesizers

Synthesizers, Frequency

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Damon Corp., 115 4th Ave., Needham Hgts., Mass.
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J. ..... p 876
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J. ..... p 728
Lorch-Adret Corp., 105 Cedar La., Englewood, N.J. ..... p 738
Micro-Power, Inc., 25-14 Broadway, Long Island City, N.Y. p 912
Nihon Dempa Kogyo Co., Ltd., 1-21 Nishihara, Shibuya-ku, Tokyo, Japan
Parzen, 48 Urban Ave., Westbury, L.I., N.Y. ..... p 765
RF Communications Inc., Elctrn. Instr. Oper., 1680 University Ave., Rochester, N.Y. ..... p 775
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Technology, 3412 Hillview Ave., Stanford Ind'l. Pk., Palo Alto, Calif.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Dana Labs., Inc., 2401 Campus Dr., Irvine, Calif.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Itek Corp., 10 Maguire Rd., Lexington, Mass.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Omni-Spectra, Inc., 253 S. Hinton, Scottsdale, Ariz.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.

Synthesizers, Waveform

Arvin Frequency Devices, 2505 N. Salisbury St., W. Lafayette, Ind. ..... p 1415
EMR Instrs., E. County Line Rd., Hatboro, Pa. ..... p 663
Exact Elctrns., Inc., 455 S.E. 2nd Ave., Hillsboro, Ore. ..... p 679
Wavetek, 9045 Balboa Ave., San Diego, Cal. ..... p 830,831
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
EMR Div., Box 223, Princeton, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Elctrns. Corp., 900 Walt Whitman Rd., Huntington Station, N.Y.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Systron-Donner Corp., One Systron Dr., Concord, Cal.

Systems, Temperature Control—See Controls, Temperature

Tables, Laboratory—See Benches, Consoles, Stools, Tables (Lab and Shop)

Tables, Rate Of Turn

Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
BFC-Bernard Franklin Co., Inc., 4045 Torresdale Ave., Philadelphia, Pa.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.

Tables, X-Y Axis—See Simulators, Motion

Tachometers, Electrical (Non-Generating)

Airpax Elctrns., Inc., Cambridge, Md.
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Norden Div., Helen St., Norwalk, Conn.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Unico, Inc., 2635 Golf Ave., Racine, Wisc. ..... p 600
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 808,809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Bendix Corp., S. Montrose, Pa.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
Epic, Inc., 150 Nassau St., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ideal Precision Meter Co., Inc., 214-218 Franklin St., Brooklyn, N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tachtronic Instrs., Inc., 1500 N. Front St., New Ulm, Minn.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
United Aircraft Corp., Helen St., Norwalk, Conn.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Tachometers, Electrical (Self-Generating)

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y. p 1630,1631
Airpax Elctrns., Inc., Cambridge, Md.
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Cedar Div., 5806 W. 36th St., Minneapolis, Minn. ..... p 1639
Clifton, 5050 State Rd., Drexel Hills, Pa. ..... p 1640
Eastern Air Devices, Inc., 385 Central Ave., Dover, N.H.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
IMC Magnetics Corp., 570 Main St., Westbury, L.I., N.Y.
Rotating Comps., 1560 Fifth Ave., Bay Shore, N.Y. ..... p 1685
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J. .. p 1691
Singer Co., Finderne Ave., Somerville, N.J. ..... p 1693
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Vernitron Corp., 2440 W. Carson St., Torrance, Cal. ..... p 1681
Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal. ..... p 1681
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y. ..... p 1681
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Western Gear Corp., Dept. E, 75 W. Green St., Pasadena, Cal. p 1699
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Weston-Transicoil, Worcester, Pa. ..... p 1998
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Bristol Div, Waterbury, Conn
Carter Motor Co., 2707 W. George St., Chicago, Ill.
Dixson, Inc., Box 1449, Grand Junction, Colo.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Electric Tachometer Corp., 68th & Upland Sts., Philadelphia, Pa.
Electro-Craft Corp. 1600 2nd St South, Hopkins, Minn
Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
Epic, Inc., 150 Nassau St., New York, N.Y.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Harowe Servo Controls, Inc., 48 Westtown Rd., W. Chester, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Inland Motor Corp. of Va., 501 First St., Radford, Va.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
MPC Prods. Corp., 4200 W. Victoria Ave., Chicago, Ill.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio
Skurka Engrg. Co., 4002 N. Mission Rd., Los Angeles, Calif.
Standard Elec. Time Corp., 89 Logan St., Springfield, Mass.
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Varo, Inc., 402 E. Gutierrez St., Box 1500, Santa Barbara, Cal.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Zero-Max Co., 2845 Harriet Ave., S., Minneapolis, Minn.

Tachometers, Electronic, Indicating

Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., 11655 Chillicothe Rd., Chesterland, Ohio
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Esterline Angus Div., Box 24000, Indianapolis, Ind.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 1392
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J. .. p 1691
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Vernitron Corp., 300 Marcus Blvd., Deer Pk., N.Y.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Anocut Engrg. Co., 2375 Estes Ave., Elk Grove Village, Ill.
Baldwin Elctrns., Inc., 1101 McAlmont St., Box 3838, Little Rock, Ark.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., Sidney, N.Y.
Bendix Corp., S. Montrose, Pa.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bristol Div, Waterbury, Conn
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Delavan Mfg Co, 811 Fourth St, West Des Moines, Iowa
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.

Dixson, Inc., Box 1449, Grand Junction, Colo.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hill, E. Vernon, Inc., Box 14248, San Francisco, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Metron Instrs., Inc., 1051 S. Platte River Dr., Denver, Colo.
Midco, Inc., Box 5433, Trenton, N.J.
Motorola Automotive Prods., Inc., 16180 Wyoming Ave., Detroit, Mich.
Pioneer Elec. & Resch. Corp., 743 Circle Ave., Forest Park, Ill.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
PMF Elctrns., Inc., 124 E. Third St., Dayton, Ohio
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Reliance Elec. Co., 24701 Euclid Ave., Cleveland, Ohio
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Strandberg Engrg. Labs., Inc., 1001 S. Elm St., Greensboro, N.C.
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.

Tachometers, Stroboscopic

Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. ..... p 787
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.

Tape Decks—See Tape Transports

Tape Duplicators—See Duplicators, Magnetic Tape; Perforators, Paper Tape

Tape Editing Equipment—See Editing Equipment, Magnetic Tape

Tape Erasers, Magnetic—See Erasers, Magnetic Tape (Bulk)

Tape Perforators—See Perforators, Paper Tape

Tape-Programmed Testers—See Test Equip., Automatic Checkout; Testers, Integrated Circuit

Tape Recording Accessories

Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif.
Data Meas. Corp., 855 Commercial St., Palo Alto, Calif. .... p 639
Honeywell, Box 5227, Denver, Colo.
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Ampex Corp., 401 Broadway, Redwood City, Calif.
Audio Devices, Inc., 100 Research Dr., Glenbrook, Conn.
Auricord, 35-41 29th St., Long Island City, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Electronic Engrs., Inc., 1639 W. Evergreen Ave., Chicago, Ill.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Heat Technology Lab. Inc., 4308 Governor Dr., Huntsville, Ala.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
Laminated Shim Co., Inc., 48 Union St., Glenbrook, Conn.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Neumade Prods. Corp., 720 White Plains Rd., Scarsdale, N.Y.
Porter, H.K. Co., inc., Porter Bldg., Pittsburgh, Pa.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
3M Co., 3M Center, St. Paul, Minn.
United Resch. Lab., Corp., 681 Fifth Ave., New York, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Tape Recorders—See Recorders, Magnetic Tape; Data Recorders

Tape Search Equipment

Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. .....p 560,562
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. .....p 565,689
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Ampex Corp., 401 Broadway, Redwood City, Calif.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Auricord, 35-41 29th St., Long Island City, N.Y.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Collins Radio Co., Dallas, Tex.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Fluidics Production & Sls., Inc., 3100 Eldredge St., Salt Lake City, Utah
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
Kyros Corp., Box 406, Madison, Wisc.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Tape Transports, Computer

CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Crown Int'l., Box 1000, Dept. EEM, Elkhart, Ind. ..... p 1309
Datascan, Inc., 1111 Paulison Ave., Clifton, N.J.
Digital Equip. Corp., 146 Main St., Maynard, Mass. ..... p 563
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Auricord, 35-41 29th St., Long Island City, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Borg-Warner Controls, 3300 S. Halladay St., Santa Ana, Calif.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Cook Electric Co., 6401 W. Oakton, Morton Grove, Ill.
Cycle Equip. Co., P.O. Box 307, Los Gatos, Calif.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Defense Elctrns., Inc., Rockville, Md.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
EMR Div., Box 223, Princeton, N.J.
Fen-Tone Corp., 106 5th Ave., New York, N.Y.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
International Radio & Elctrns. Corp., 1718 W. Mishawaka Rd., Elkhart, Ind.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Precision Instr. Co., 3170 Porter Dr., Palo Alto, Calif.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
RCA, Marne Hwy., Moorestown, N.J.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
V-M Corp., 305 Territorial Rd., Benton Harbor, Mich.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Xerox Data Sys., 701 S. Aviation Blvd., El Segundo, Cal.

Tapes, Electrical Insulation

Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Natvar Corp., Box 67, Rahway, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2965
American Biltrite Rubber Co., Inc., P.O. Box 1071, Boston, Mass.
Arlin Mfg. Co., Inc., 239 Industrial Ave., E., Box 222, Lowell, Mass.
Armour Ind'l. Prods. Co., 430 N. Michigan Ave., Chicago, Ill.
Borden Chem., 350 Madison Ave., New York, N.Y.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
Devon Tape Corp., 649 S. Commercial Ave., Carlstadt, N.J.
Dixon Corp., Metacom Ave., Bristol, R.I.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
General Elec. Co., 95 Hathaway St., Providence, R.I.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Lundy Elctrns. & Sys., Inc., Robert La., Glen Head, N.Y.
Mystik Tape, Borden Inc. 1700 Winnetka Ave., Northfield, Ill.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Okonite Co., Box 340, Ramsey, N.J.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Schjeldahl, G.T. Co., Box 170, Northfield, Minn.
Schweitzer, Peter J. Div., Lee, Mass.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Technical Tape Corp., 1 Le Fevre La, New Rochelle, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Tapes, Films & Foils, Pressure Sensitive

Aero Devices, Inc., 494 S. Riverview Dr., Totowa, N.J. .... p 2908
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Applebaum Tag & Label Co., 3030 Northern Blvd., Long Island City, N.Y.
Armour Ind'l. Prods. Co., 430 N. Michigan Ave., Chicago, Ill.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Bishop Graphics, Inc., 7300 Radford Ave, No. Hollywood, Cal.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Canrad Precision Inds., Inc., 629 Fifth Ave., Pelham, N.Y.
Centron Engrg., 1518 W. 132nd St., Gardena, Cal.
Chartpak Rotex, 2620 S Susan St, Santa Ana, Calif
Chase & Sons, Inc., 19 Highland Ave., Randolph, Mass.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Devon Tape Corp., 649 S. Commercial Ave., Carlstadt, N.J.
Fitchburg Coated Products, P. O. Box 1106, Scranton, Pa.
Labelon Corp., 10 Chapin St., Canandaigua, N.Y.
Master Tape Printers, Inc., 4517 Elston Ave., Chicago, Ill.
Mystik Tape, Borden Inc, 1700 Winnetka Ave., Northfield, Ill.
National Laminating Mfg. Co., 369 S. Robertson Blvd., Beverly Hills, Cal.
Norton Coated Abrasive & Tape Divs., Dept. 7013, Troy, N.Y.
Plymouth Rubber Co., Inc., Canton, Mass.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Press-On Prods., 39 Factory Rd., Addison, Ill.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
3M Co., 3M Center, St. Paul, Minn.
Topflight Corp., 160 East 9th Ave., York, Pa.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tapes, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Tapes, Paper, Plastic, etc. (For Punching)

Arvey Corp., 3500 N. Kimball Ave., Chicago, Ill.
Bemis Co., Inc., 800 Northstar Ctr., Box 121, Minneapolis, Minn.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Corkpak Co., Inc., 70 Argyle Ave., New Rochelle, N.Y.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
Norton Coated Abrasive & Tape Divs., Dept. 7013, Troy, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.

Tapes, Recording, Magnetic (All Types)

CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Infodex, Inc., 7 Cherry Ave., Waterbury, Conn.
RCA, 415 S. 5th St., Harrison, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Sangamo Elec. Co., Box 128, Pickens, S.C.
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
AGFA-Gevaert, Inc., 275 North St., Teterboro, N.J.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Audio Devices, Inc., 100 Research Dr., Glenbrook, Conn.
Audio Instr. Co., Inc., 311 Mountain Rd., Union City, N.J.
Auricord, 35-41 29th St., Long Island City, N.Y.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Cassettes Unlimited, Corp., 200 Claremont Ave., New York, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Design Elements, Inc., 1356 Norton Ave., Columbus, Ohio
Duotone Co., Inc., Box 1168, S. Miami, Fla.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah

Game Inds., Inc., 80 Commercial St., Freeport, N.Y.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Indofex, Inc., 7 Cherry Ave., Waterbury, Conn.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
Irish Magnetic Recording Tape, 458 Broadway, New York, N.Y.
Kennedy Co., 540 Woodbury Rd., Altadena, Calif.
Leach Corp., 1499 Huntington Dr., So. Pasadena, Cal.
Mac Panel Co., Box 5027, High Pt., N.C.
Memorex Corp., 1180 Shulman Ave., Santa Clara, Calif.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Recoton Corp., 46-23 Crane St., Long Island City, N.Y.
Superscope, Inc., 8150 Vineland Ave., Sun Valley, Calif.
Tape-Athon Corp., 502 S. Isis Ave., Inglewood, Calif.
Telephone Dynamics Corp., 1333 Newbridge Rd., N. Bellmore, N.Y.
3M Co., 3M Center, St. Paul, Minn.
U.S. Magnetic Tape Co., Box 128, Huntley, Ill.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.

Tape To Film Transfer Equip.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
RCA Corp., Front & Cooper, Camden, N.J.
Traid Corp., 777 Flower St., Glendale, Calif.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Taps—See Dies & Taps

Teaching Machines

Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Non-Linear Sys., Inc., Box N, Del Mar, Cal.
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avid Corp., 10 Tripps La., E. Providence, R.I.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Burtek, Inc., Box 1677, Tulsa, Okla.
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Computerized Elctrn. Education, Inc., 214 Long La., Upper Darby, Pa.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Link Div., Binghamton, N.Y.
Mast Dev. Co., 2212 East 12th St., Davenport, Iowa
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
M. C. I., Inc., 11949 Vose St., No. Hollywood, Cal.
Merchant, Robert C. Co., Box 246, Carmel Valley, Calif.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
R-Columbia Prods., Inc., 2008 St. John's Ave., Highland Park, Ill.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Viewlex, Inc., Veteran's Memorial Hwy. & Broadway, Holbrook, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Webster Elec. Co., Inc., 1900 Clark St., Racine, Wisc.

Technical Books

International Rectifier, 233 Kansas St., El Segundo, Cal.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
RCA, 415 S. 5th St., Harrison, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Radio Relay League, Inc., 225 Main St., Newington, Conn.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
D.A.T.A., Inc., 32 Lincoln Ave., Orange, N.J.
Derivation & Tabulation Assocs., 32 Lincoln Ave., Orange, N.J.
Editors & Engrs., Box 68003, New Augusta, Ind.
Hayden Book Co., Inc., 116 West 14th St., New York, N.Y.
Johnson Research Corp., 2099 New Hwy., Farmingdale, N.Y.
Lockheed Elctrns. Co., Rte. #22, Watchung, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sams, Howard W. & Co., Inc., 4300 W. 62 St., Indianapolis, Ind.
Sands, Leo G. & Assocs., Inc., 250 Park Ave., New York, N.Y.
Supreme Publications, 1760 Balsam Rd., Highland Park, Ill.

Tees, Coaxial

Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. p 2412-2414
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Anaren Microwave, Inc., 478 E. Brighton Ave., Syracuse, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Tees, Waveguide

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Miles Reproducer Co., Inc., 598 Broadway, New York, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Telegraph Keys—See Keys, Telegraph

Telemetering Indicators—See Analyzers, Telemetric Data

Telemetering Systems, Electronic—See Comm. Systems, Telemetering

Telemetering Testers & Calibrators

Airpax Elctrns., Inc., Cambridge, Md.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex. .... p 605
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 658
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass.
Frequency Control, Inc., Box 671, Austin, Tex.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Monitor Sys., Inc., 401 Commerce Dr., Ft. Washington, Pa.
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y.
Norden Div., Helen St., Norwalk, Conn.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 891
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Meas. Instrs., Inc., 109 Dover St., Somerville, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bristol Div, Waterbury, Conn.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Defense Elctrns., Inc., Rockville, Md.
Destron Co., 25914 Chalmette La., Rolling Hills Est, Calif.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Ericsson Centrum, Inc., 16 East 40th St., New York, N.Y.
General Devices, Inc., P.O. Box 253, Princeton, N.J.
Gulf Aerospace Corp., 5440 Alder, Houston, Texas
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microcom Corp., Horsham Valley Ind'l. Pk., Horsham, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Stellarmetrics, Aydin Co., 416 E. Cota St., Santa Barbara, Cal.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Video Resch. Corp., 761 N. Washington St., Rockville, Md.

Telemetric Data Analyzers—See Analyzers, Telemetric Data

Telemetry Preamplifiers—See Preamplifiers, Telemetry

Telephone Handsets—See Handsets

Telephone Systems—See Comm. Systems, Telephone

Telephones, Sound Powered—See Comm. Systems, Telephone

Teleprinter Error Correction Equipment—See Error Correction Equipment

Teleprinters

CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Century Elctrns. & Instrs., Inc., Box C, Admiral Sta., Tulsa, Okla.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Datamark, Inc., Cantiague Rd., Westbury, N.Y.
General Elec. Co., Waynesboro, Va.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
National Cash Register Co., Main & K Sts., Dayton, Ohio
Notifier Co., 3700 No. 56th St., Lincoln, Neb.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Shepard Div., 131st St. & Jamaica Ave., Richmond Hill, N.Y.
Telcolab Corp., 405 Lexington Ave., New York, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.

Teletypewriter Testers—See Testers, Teletypewriter

Teletypewriters & Equipment

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Boehme, H.O., Inc., 200 Shames Dr., Westbury, N.Y.
Bolt Beranek & Newman, Inc., 1762 McGaw Ave., Santa Ana, Calif.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.

Television Equipment—See Antennas; Cameras; Coils; Monitors; Recorders, Video

Television Systems, Closed-Circuit

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Colorado Video, Inc., Box 928, Boulder, Colo. ..... p 635
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Spencer-Kennedy Labs., Inc., 2 Lowell Ave., Winchester, Mass. p 1589
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Altron Elctrns. Co., 1309 Jefferson Ave., Woodlyn, Pa.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Bionic Instrs., Inc., 221 Rock Hill Rd., Bala Cynwyd, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bludworth Marine Div., 10 Adams St., Linden, N.J.

Brown Engrg. Co., Research Pk., Huntsville, Ala.
Centurion Prods. Div., 7607 Page Ave., St. Louis, Mo.
Collins Radio Co., Dallas, Tex.
Commercial Elctrns., Inc., 880 Maude Ave., Mountain View, Cal.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
Connecticut Con. Inds., Inc., 34 Cambridge St., Meriden, Conn.
Dalmo Victor, 1515 Industrial Way, Belmont, Calif.
Data Disc., Inc., Display Div., 1275 California Ave., Palo Alto, Calif.
Data Disc, Inc., Video Div., 1275 California Ave., Palo Alto, Calif.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dynair Elctrns., Inc., 6360 Federal Blvd., San Diego, Calif.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Electronic Homes Co., 200 Claremont Ave., New York, N.Y.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
General TV Network, 901 Livernois Ave., Ferndale, Mich.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Integrated Elctrns. Corp., 900 Walt Whitman Rd., Huntington Station, N.Y.
Inter-Market, Inc., 312 Waukegan Rd., Glenview, Ill.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lear Siegler, Inc., 714 N. Brookhurst St., Anaheim, Cal.
Link Div., Binghamton, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Massey Dickinson Co., Inc., 9 Elm St., Saxonville, Mass.
Matsushita Comm. Ind'l. Co., Ltd., 880 Tsunashima, Kohoku-ku, Yokohama, Japan
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
MTI, 57 Dodge Ave., No. Haven, Conn.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Nelson-Hershfield Elctrns., 1848 W. Campbell Ave., Phoenix, Ariz.
Odetics, Inc., 1845 S. Manchester, Anaheim, Cal.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marrte Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Rust Corp., 168 Tremont St., Everett, Mass.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Sylvania Elec. Prods., Inc., Comm. Elctrns. Div., 100 First Ave., Waltham, Mass.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Teletronics, Inc., 760 N. Main St., Orange, Calif.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Unimetrics, Inc., 23 W. Mall, Plainview, N.Y.
Vidcom Elctrns., Inc., 118 W. 57th St., New York, N.Y.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.
Wald Sound, 11131 Dora St., Sun Valley, Calif.
Westinghouse Elec. Corp., 7800 Susquehanna St., Pittsburgh, Pa.
Winegard Co., 3000 Kirkwood St., Burlington, Iowa

Temperature Controls—See Controls, Temperature

Temperature Indicators—See Meters, Temperature

Temperature Sensors—See Transducers, Temperature

Templates, Drafting—See Drafting Equipment

Tempo Regulators—See Regulators, Pitch & Tempo

Tensile Testers—See Testers, Material

Terminal Blocks—See Blocks, Terminal

Terminal Boards—See Boards, Terminal

Terminal Boards, Prepunched

A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Interswitch, 770 Airport Blvd., Burlingame, Cal.
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan..... p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Continental Rubber Works, Erie, Pa.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electri-Wire Assemblies Co., Inc., 700 W. Virginia St., Milwaukee, Wisc.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Terminal Equipment, Digital

CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Data Mess. Corp., 855 Commercial St., Palo Alto, Calif.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Digitron Corp., 2544 W. Main St., Norristown, Pa.
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Interstate Elctrns. Corp., 707 E. Vermont Ave., Box 3117, Dept. 7000, Anaheim, Cal.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 576
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pacific Radionics, Inc., 581 Division St., Campbell, Cal. .... p 583
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Clary Corp., 320 W. Clary Ave., San Gabriel, Calif.
Codex Corp., 150 Coolidge Ave., Watertown, Mass.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Computer Prods. Int'l., Inc., 3444 De La Cruz Blvd., Santa Clara, Calif.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Datamark, Inc., Cantiague Rd., Westbury, N.Y.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Design Elements, Inc., 1356 Norton Ave., Columbus, Ohio
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Elec. Co., 4000 N.W. 39th Expwy., Oklahoma City, Okla.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Gleason-Avery Co., Auburn, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Information Displays, Inc., 333 N. Bedford Rd., Mt. Kisco, N.Y.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Interlind Elctrns., Inc., 3800 Oakcliff Rd., Doraville, Ga.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Litton Inds., 1 Exec. Pk., Englewood, Colo.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Olivetti Corp., One Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Potter Instr. Co., Inc., E. Bethpage Rd., Plainview, N.Y.
Prentice Elctrns. Corp., 795 San Antonio Rd., Palo Alto, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Sagetec Corp., 822 N. Hollywood Way, Burbank, Cal.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Mt. Laurel Ind'l. Pk., Moorestown, N.J.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, 611 Hansen Way, Palo Alto, Cal.
Viatron Computer Sys., Rte. 62, Bedford, Mass.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Terminal Strips—See Strips, Terminal

Terminals, Feedthru

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I..... p 2443
GTI Corp., 310 Chestnut St., Meadville, Pa..... p 2595
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Koto Elec. Co., Ltd., 671 Nishibori, Urawa-shi, Saitama-ken, Japan
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2539
Sterling Instr., 76 E. Second St., Mineola, N.Y.
Taurus Corp., Academy Hill, Lambertville, N.J.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cary Instrs., 2724 S. Peck Rd., Monrovia, Calif.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Connectrol Corp., 28 E 22nd St, New York, N Y
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dixon Corp., Metacom Ave., Bristol, R.I.
Eimac, 301 Industrial Way, San Carlos, Calif.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Electrical Inds., 691 Central Ave., Murray Hill, N.J.
Electronic Seals Co., Inc., 13766 Saticoy St., Van Nuys, Calif.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Glass Beads Co., Latrobe, Pa.
Glasseal Prods. Co., Inc., Box 530, 725 Commerce Rd., Linden, N.J.
Gleason-Avery Co., Auburn, N.Y.
Goe Engrg. Co., 250 South 9th St., City of Industry, Calif.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Heyman Mfg. Co., E. Michigan Ave., Kenilworth, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Isotronics, Inc., 12 Coffin Ave., New Bedford, Mass.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Rostone Corp., 2451 S. Concord Rd., Lafayette, Ind.
Silicone Seals, Inc., 3694 Milwaukee Ave., Chicago, Ill.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stettner-Trush Inc., 67 Albany St., Cazenovia, N.Y.
Teale Machine Co., Inc., Box 936, Rochester, N.Y.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tinnerman Prods., Inc., Box 6688, Dept. 16, Cleveland, Ohio
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Whitso, Inc, 9330 Byron St., Schiller Park, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Ferrule, Cable-End

Amp Inc., Box 3608, Harrisburg, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Connectrol Corp., 28 E 22nd St, New York, N Y
Elmac, 301 Industrial Way, San Carlos, Calif.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.

Terminals, Hermetic—See Terminals (As Modified)

Terminals, Lug

Amp Inc., Box 3608, Harrisburg, Pa.
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
ETC, Inc., 990 East 67 St., Cleveland, Ohio p 2442
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. p 1521
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan p 535
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2483
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2533
Showa Musen Kogyo Co., Ltd., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan p 2532
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2537,2539
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
Taurus Corp., Academy Hill, Lambertville, N.J.
Thermotech Coil Forms & Comps. Div., 1202 S. 5th St., Hopkins, Minn. p 2638
Thermotech Inds., Inc., 1202 S. 5th St., Hopkins, Minn. p 2638
Thermotech Plastics, Co., 1202 S. 5th St., Hopkins, Minn. p 2638
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carol Cable Co., Box 68, Pawtucket, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Connectrol Corp., 28 E 22nd St, New York, N Y
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Dante Elec. Mfg. Co., Bantam, Conn.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
Gemp Terminals, Inc., 20 Woodworth Ave., Yonkers, N.Y.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Great Eastern Metal Prod. Co., 22 Woodworth Ave., Yonkers, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Hollingsworth Solderless Terminal Co., P.O. Box 430, Phoenixville, Pa.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, N.Y.
Jan Engrg., 2018 Pico Blvd., Santa Monica, Calif.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Network Inds., Inc., Box 397, Bayonne, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Shakeproof Div., St. Charles Rd., Elgin, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Stimpson Co., Inc., 70 Franklin Ave., Brooklyn, N.Y.
Teale Machine Co., Inc., Box 936, Rochester, N.Y.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Miniature & Subminiature

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Amp Inc., Box 3608, Harrisburg, Pa.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
ETC, Inc., 990 East 67 St., Cleveland, Ohio p 2442
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. p 2043
GTI Corp., 310 Chestnut St., Meadville, Pa. p 2595
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. p 1521
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Robinson-Nugent, Inc., 800 E. 8th St., New Albany, Ind. p 2527
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2537,2539
Taurus Corp., Academy Hill, Lambertville, N.J.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Connectrol Corp., 28 E 22nd St, New York, N Y
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Goe Engrg. Co., 250 South 9th St., City of Industry, Calif.
Heli-Coil Corp., Shelter Rock La., Danbury, Conn.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Holmberg, Inc., 20 Melville Park Rd., Melville, N.Y.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
IFE Div, P.O. Box 4265, E Providence, R.I.
Jan Engrg., 2018 Pico Blvd., Santa Monica, Calif.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sjoberg, C. & Son, inc., 415 Station St., Cranston, R.I.
Staffall, Inc., 7 Woodland St., Providence, R.I.
Teledyne Penn-Union Elec., Box 723, Edinboro, Pa.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Printed Circuit Board

Amp Inc., Box 3608, Harrisburg, Pa.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Curtis Dev. & Mfg. Co., 3278 N. 33rd St., Milwaukee, Wisc. p 2438
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
RDI, 21W183 Hill Ave., Glen Ellyn, Ill. p 1851
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2533
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Vero Elctrns., Inc., 176 Central Ave., Farmingdale, N.Y.
Virginia Panel Corp., Box 1106, 114 New Hope Rd., Waynesboro, Va.
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Circuits, Inc., 95 Mt. Read Blvd., Rochester, N.Y.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Goe Engrg. Co., 250 South 9th St., City of Industry, Calif.
HMW Enterprises, Inc., 15 Walnut St., Steelton, Pa.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Push-On—See Connectors & Terminals, Push-On, Quick Disconnect

Terminals, Solderless

Amp Inc., Box 3608, Harrisburg, Pa.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. p 2443
ETC, Inc., 990 East 67 St., Cleveland, Ohio p 2442
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2464
Malco Mfg. Co., Inc., 5150 W. Roosevelt Rd., Chicago, Ill. p 2465
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
RDI, 21W183 Hill Ave., Glen Ellyn, Ill.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2539
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn. p 2554
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Burndy Corp., Richards Ave., Norwalk, Conn.
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Carol Cable Co., Box 68, Pawtucket, R.I.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Cole-Hersee Co., 20 Old Colony Ave., S. Boston, Mass.
Connectrol Corp., 28 E 22nd St, New York, N Y
Dante Elec. Mfg. Co., Bantam, Conn.
Doran Mfg. Co., 1033 Bader St., Cincinnati, Ohio
Electraid, Inc., Box 53, Cambridge, Mass.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.

H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hollingsworth Solderless Terminal Co., P.O. Box 430, Phoenixville, Pa.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Marshall, John Assocs., Inc., Box 6276, Bridgeport, Conn.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Network Inds., Inc., Box 397, Bayonne, N.J.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Shakeproof Div., St. Charles Rd., Elgin, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Twin Lock Inc., 13115 Washington Blvd., Los Angeles, Cal.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Whitso, Inc, 9330 Byron St., Schiller Park, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Standoff

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Delbert Blinn. Co., Box 2007, Pomona, Calif.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
Grayhill, Inc., 569 Hillgrove Ave., LaGrange, Ill. ..... p 2043
GTI Corp., 310 Chestnut St., Meadville, Pa. ..... p 2595
Jackson Brothers (London), Ltd., 258 Broadway, New York, N.Y. ..... p 1521
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. ..... p 2539
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
Taurus Corp., Academy Hill, Lambertville, N.J.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal. p 2549
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Allmetal Screw Prods. Co., Inc., 821 Stewart Ave., Garden City, N.Y.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Armel Elctrns., Inc., 1601 - 75th St., N. Bergen, N.J.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Dixon Corp., Metacom Ave., Bristol, R.I.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Elecpac Inc., 15 E. Main St., Cary, Ill.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Fabri-Tek, Inc., Science Industry Ctr., Minneapolis, Minn.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Goe Engrg. Co., 250 South 9th St., City of Industry, Calif.
Grayhill Moldtronics, Inc., 707 Rogers St., Downers Grove, Ill.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Latronics Corp., Box 469, Latrobe, Pa.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Permonite Mfg. Co., 910 W. Jackson Blvd., Chicago, Ill.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Staffail, Inc., 7 Woodland St., Providence, R.I.
Teledyne Positive Connector, 6488 River Rd., Ansonia, Conn.
3M Co., 3M Center, St. Paul, Minn.
Tri-Point Inds., Inc., One Teflon Way, Commack, N.Y.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Veritron West, Inc., 20245 Sunburst St., Chatsworth, Calif.
Whitso, Inc, 9330 Byron St., Schiller Park, Ill.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Threaded

Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I. ..... p 2443
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich. p 2464
Millen, James Mfg. Co., Inc., 150 Exchange St., Malden, Mass. p 2139
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y.
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Sterling Instr., 76 E. Second St., Mineola, N.Y. ..... p 1695
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cinch Mfg. Co., 1501 Morse Ave., Elk Grove Village, Ill.
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Empire Prods., Inc., 9201 Blue Ash Rd., Cincinnati, Ohio
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Staffail, Inc., 7 Woodland St., Providence, R.I.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Terminals, Turret

Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Augat Inc., 33 Perry Ave., Attleboro, Mass.
Concord Elctrns. Corp., 37 Great Jones St., New York, N.Y. p 2432,2433
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn. p 2460
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2470
Positronic Inds., Inc., 1906 S. Stewart, Springfield, Mo.
Precision Metal Prods. Co., 41 Elm St., Stoneham, Mass. p 2523
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2533
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y. p 2537,2539
United Prods. Co., 451 S. Jefferson St., Orange, N.J.
U.S. Terminals, Inc., 7502 Camargo Rd., Cincinnati, Ohio p 2548
Abacus Elctrns. Corp., 10 Hudson Terr., Dobbs Ferry, N.Y.
Abadak Inds., Inc., 200 Allen Blvd., Farmingdale, N.Y.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Aracon Elctrns., 1437 Second Ave., New York, N.Y.
Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Federal Screw Prods., Inc., 3917 N. Kedzie Ave., Chicago, Ill.
General Mfg. Co., 724 Ruberta Ave., Glendale, Calif.
Henry & Thomas, Ltd., Yeo St., London E. 3, England
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Staffail, Inc., 7 Woodland St., Providence, R.I.

Terminations, Antenna-Also See Dummy Loads

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 873
Magnum Elec. Corp., Drawer 247, 1000 Streetman, Erie, Mich.
Narda Microwave Corp., Plainview, N.Y. ..... p 886
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Collins Radio Co., Dallas, Tex.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Javex Elctrns., 9509 Oak Glen Rd., Cherry Valley, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA, Marne Hwy., Moorestown, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Trylon, Inc., Elverson, Pa.

Terminations, High Voltage

Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. p 667,873
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Narda Microwave Corp., Plainview, N.Y.
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal. .... p 1852
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
General Elec. Co., 1 Campbell Rd., Schenectady, N.Y.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Jones, Norman, Inc., Box 1, S. Merrimack, N.H.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Plymouth Rubber Co., Inc., Canton, Mass.

Terminations, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Alford Mfg. Co., 120 Cross St., Winchester, Mass. ..... p 857
Americon Corp., 87 Rumford Ave., Waltham, Mass. ..... p 859
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Applied Microwave Lab., Inc., Andover St., Andover, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Arra Inc., 15 Harold Ct., Bayshore, N.Y. ..... p 853
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 866,867
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 873
ESCA, Cove Rd., Box 278, Port Salerno, Fla. ..... p 2450
Narda Microwave Corp., Plainview, N.Y. ..... p 886
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. .... p 920
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Bell P/A Prods. Corp., 1200 N. Fifth St., Box 8177, Columbus, Ohio
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Collins Radio Co., Dallas, Tex.
Core-Tronics, Inc., 241 N. Day St., Orange, N.J.
Custom Materials, Inc., Alpha Ind'l. Pk., Chelmsford, Mass.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
EMC Technology Inc, 1300 Arch St., Philadelphia, Pa.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
Fairchild Electro-Metrics Corp., 100 Church St., Amsterdam, N.Y.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
H & S Wire Cutting Svc., Inc., 42 East 12th St., New York, N.Y.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Insulating Shapes, Inc., 1381 Seabury Ave., Bronx, N.Y.
ITT Telecommunications, 2912 Wake Forest Rd., Raleigh, N.C.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
MI-KRO Connector Div., 40-09 21st St., Long Island City, N.Y.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.

Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Microwave Magnetics Inc., 183 Newburyport Tpke., Danvers, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Radiation Devices Co., Box 8450, Baltimore, Md.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Stoddart Electro Sys., 2045 W. Rosecrans Ave., Gardena, Cal.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Wheeler Labs., Inc., Box 561, Smithtown, N.Y.

Terminations, VHF, Video, Pulse

Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio p 621
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 873
Narda Microwave Corp., Plainview, N.Y. ..... p 886
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. p 799
Trompeter Elctrns., Inc., 8936 Comanche Ave., Chatsworth, Cal.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Barth Elctrns., Inc., 7777 Wall St., Cleveland, Ohio
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Collins Radio Co., Dallas, Tex.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Engelmann Microwave Co., Skyline Dr., Montville, N.J.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lundey Assocs., Inc., 694 Main St., Waltham, Mass.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radiation Devices Co., Box 8450, Baltimore, Md.
RCA, Marne Hwy., Moorestown, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.

Test Equipment, Color Tv

Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, N.J..... p 729
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 742
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y. p 893
RCA, 415 S. 5th St., Harrison, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Heath Co., Benton Harbor, Mich.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
Joliet Control Corp., Box 751, Joliet, Ill.
Kollmorgen-Color Sys. Div., 67 Mechanic St., Attleboro, Mass.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Mercury Elctrns. Corp., 315 Roslyn Rd., Mineola, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Photo Resch. Corp., 3000 N. Hollywood Way, Burbank, Calif.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Tektronix, Inc., Box 500, Beaverton, Ore.
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Telonic Inds., Inc., 21282 Laguna Canyon Rd., Laguna Bch., Cal.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Test Equipment, Component Substituting

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Daico Inds., Inc., Box 5225, Compton, Cal. ..... p 865
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Maurer, J.A., Inc., 25-26 50th St., Woodside, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Test Equipment, Environmental—See Specific Type Of Equipment

Test Equipment, Mechanical Impedance

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn.
Universal Ad-Yu Elctrns., Inc., 249-259 Terhune Ave., Passaic, N.J. ..... p 2587
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
MB Elctrns., Box 1825, New Haven, Conn.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Wentworth Labs, Inc., Rte. 7, Broadfield, Conn.

Test Lead Probes—See Probes, Test Lead

Test Leads & Adapters

A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 677
Elctrn. Molding Corp., 44 Church St., Pawtucket, R.I.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Lab-Tronics Div., 6225 Benore Rd., Toledo, Ohio .....p 2530,2531
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
Pomona Elctrns. Co., Inc., 1500 E. 9th St., Pomona, Cal. p 2479,2481,2482,2508-2511,2513,2514,2517-2519
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y..... p 2537
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Accurate Elctrns. Corp., Box 935J, Elyria, Ohio
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
Amatom Elctrn. Hardware Co., 81 Rockdale Ave., New Rochelle, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
AUL Instrs., Inc., 139-30 34th Rd., Flushng, N.Y.
Bruno-New York Inds. Corp., 636 Eleventh Ave., New York, N.Y.
California Avionics Labs., Inc., Box 701, Palo Alto, Calif.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cooke Engrg. Co., 900 Slaters La., Alexandria, Va.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Desco Mfg. Co., 1530 Flower St., Glendale, Calif.
DonMar Prods., Inc., Box 10125, Denver, Colo.
E-Z-Hook Test Prods., Box 105, Covington, Ky.
Empire Elctrns., 60 Spruce St., Paterson, N.J.
Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Lynn Elctrns. Corp., Box 3003, Philadelphia, Pa.
Network Inds., Inc., Box 397, Bayonne, N.J.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Seven Assocs., Inc., 568 San Xavier Ave., Sunnyvale, Calif.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
States Co., 19 New Park Ave., Hartford, Conn.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Textool Prods., Inc., 1410 Pioneer Dr., Irving, Tex.
Vytell Corp., Box 92, Arlington Hgts., Ill.

Test Sets—See Testers

Test Sets, Multipurpose

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
AEL, Inc., Box 552, Lansdale, Pa.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 610,611
California Instrs. Corp., Calico Div., 3511 Midway Dr., San Diego, Calif ..... p 628
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650,652
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. .....p 675,677
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692,693,699
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-710
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y. ..... p 740
Nelson Ross Elctrns., 5 Delaware Dr., Lake Success, N.Y.
Power Designs, Inc., 1700 Shames Dr., Westbury, N.Y.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794,795
Texscan Corp., 2446 N. Shadeland Ave., Indianapolis, Ind.
Wavetek, 9045 Balboa Ave., San Diego, Cal. .....p 821,837
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
De Soto Elec. Prods., Box 239, De Soto, Mo.
EDP Corp., Box 6485, Orlando, Fla.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Test Equip. Corp., Box 20215, Dallas, Tex.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Testers, Accelerometer—See Calibrators, Accelerometer

Testers, Battery

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Christie Electric Corp., 3404 A W. 67th St., Los Angeles, Cal. p 1006,1007
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Component Resch. Co., Inc., 1717 19th St., Santa Monica, Cal.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Macarr, Inc., 166 National Rd., Edison, N.J. ..... p 1155
Marathon Battery Co., Cold Spring, N.Y.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio..... p 813
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Exide Power Sys. Div., P.O. Box 5723, Philadelphia, Pa.
Gulton Inds., Inc., 13041 Cerise Ave., Hawthorne, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Moran Prods. Co., 2878 Detroit Ave., Cleveland, Ohio
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
N.Y. Testing Labs., Inc., 81 Urban Ave., Westbury, N.Y.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Q.V.S., Inc., 20 North 15th St., East Orange, N.J.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sun Electric Corp., 6323 Avondale, Chicago, Ill.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Unex Labs., Inc., 321 Newbury St., Hathorne, Mass.
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.

Testers Burn-In/Aging

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal..... p 1078
Jettron Prods., Inc., 58 Rte. 10, Box 7, Hanover, N.J.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y. ..... p 740
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Opad Elec. Co., Inc., 43-12 Walker St., New York, N.Y.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.

Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Test Equip. Corp., Box 20215, Dallas, Tex.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Testers, Cable

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Cablemaster Div., 13215 Leadwell St., No. Hollywood, Cal. p 627
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-710
Intronics, Inc., 57 Chapel St., Newton, Mass.
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 786
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 806,1287
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
Ametek, Inc., Station Square Two, Paoli, Pa.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Audio Accessories, Inc., Gilsum, N.H.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Brooks Resch. & Mfg., Inc., 5612 Brighton Terr., Kansas City, Mo.
Central Engrg. Co., 2930 Anthony La., Minneapolis, Minn.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Digital Gen'l. Corp., 11000 Cedar Ave., Cleveland, Ohio
Dit-MCO International, 5612 Brighton Terr., Kansas City, Mo.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Glenair, Inc., 1211 Air Way, Glendale, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Network Inds., Inc., Box 397, Bayonne, N.J.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
Sanders Assocs., 8700 Main St., Buffalo, N.Y.
Shallcross, E. Preston St., Selma, N.C.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sterling Mfg. Co., 2880 Detroit Ave., Cleveland, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tektronix, Inc., Box 500, Beaverton, Ore.
V. J. Elctrns., 622 W. Harvard Pl., Ont., Can.

Testers, Capacitor

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 675
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 680
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. p 750,751
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 786
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Mercury Elctrns. Corp., 315 Roslyn Rd., Mineola, N.Y.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Teradyne, Inc., 183 Essex St., Boston, Mass.
Test Equip. Corp., Box 20215, Dallas, Tex.

Testers, Circuit—See Testers, Signal Tracing

Testers, Coil

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 650
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 683
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Intronics, Inc., 57 Chapel St., Newton, Mass.
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 786
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Collins Radio Co., Dallas, Tex.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Kartron Inc., P.O. Box 1338, Huntington Beach, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Testers, Component Linearity

London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Miracle-Hill Elctrns., 320 Martin Ave., Santa Clara, Cal.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.

Testers, Computer Memory

Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
Heidelex Corp., Stuart Rd., Chelmsford, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
Macrodata, 20440 Corisco St., Chatsworth, Cal.
Research Engrg. Div., 12 Manheim Rd., Box 128, Essex Fells, N.J.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.

Testers, Corona

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-710
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Delcon Div., 333 Logue Ave., Mt. View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Neptune Elctrns. Co., 30 West 15th St., New York, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Techsonics, Box 251, El Prado, N.M.

Testers, Crystal—See Analyzers, Crystal

Testers, Diode

AEL, Inc., Box 552, Lansdale, Pa.
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y. ..... p 740
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1170
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 772,773
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Alessi Inds., 418 Main St., El Segundo, Calif.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Datalogic Sys., Inc., 20 Merrimac Sq., Merrimac, Mass.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Heath Co., Benton Harbor, Mich.
IC Metrics, 607 Industrial Way W., Eatontown, N.J.
Instr. Resch. Co., Box 231, Lincoln, Mass.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
J-Omega Co., 2271 Mora Dr., Mountain View, Calif.
Larson Aero Dev., Box 135, Concord, Calif.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Quaker Elctrns., Box 215, Hunlock Creek, Pa.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Test Equip. Corp., Box 20215, Dallas, Tex.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Testers, Electric Power—See Monitors, Power, A-C & D-C

Testers, Encoder

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Frequency Control, Inc., Box 671, Austin, Tex.
Norden Div., Helen St., Norwalk, Conn.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
United Aircraft Corp., Helen St., Norwalk, Conn.

Testers, Flutter—See Meters, Wow & Flutter

Testers, Ground Resistance—See Meters, OHM

Testers, Gyro

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Advanced Energy Conversion, 1918 Menalto Ave., Menlo Park, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Goerz Optical Co., Inc., 301 Alpha Dr., Pittsburgh, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Ideal-Aerosmith, Inc., 1505 E. Fox Farm Rd., Cheyenne, Wyo.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
NH Research, Inc., 1510 S. Lyon St., Santa Ana, Calif.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Sanwa Corp. America, 2500 Woodbridge Ave., Edison, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.

Testers, Hi-Pot—See Testers, Insulation Breakdown

Testers, Insulation Breakdown

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608,609
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 614,615
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill.
Cablemaster Div., 13215 Leadwell St., No. Hollywood, Cal. p 627
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. .....p 680,682
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-711
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Janco Corp., 3111 Winona Ave., Box 3038, Glenoaks Sta., Burbank, Cal.
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737

Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Opad Elec. Co., inc., 43-12 Walker St., New York, N.Y.
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. ..... p 767
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.....p 786,787
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Sticht, Herman H. Co., Inc., 27 Park Pl., New York, N.Y. .... p 789
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 806,1287
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Astronics, Inc., 204 W. Bedford, Euless Rd., Hurst, Tex.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Brooks Resch. & Mfg., Inc., 5612 Brighton Terr., Kansas City, Mo.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dit-MCO International, 5612 Brighton Terr., Kansas City, Mo.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Electronic Brazing Co., 140 Glenridge Ave., Montclair, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Instrument Labs. Corp., 315 W. Walton Pl., Chicago, Ill.
Instr. Resch. Co., Box 231, Lincoln, Mass.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Multi-Amp Corp., 61 Myrtle St., Cranford, N.J.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Ostby & Barton Co., Box 6267, Providence, R.I.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Rohde & Schwarz Sis. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Testers, Integrated Circuit (Automatic)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 561
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 772,773
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 795
Testex, Inc., 162 San Lazaro Ave., Sunnyvale, Cal..... p 797
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
AAI Corp., P.O. Box 6767, Baltimore, Md.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Bulova Watch Co., Inc., Green Acres Rd., W., Valley Stream, N.Y.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
Digital Gen'l. Corp., 11000 Cedar Ave., Cleveland, Ohio
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Micro Test Corp., 9000 Wennetka Ave., Northridge, Cal.
Miracle-Hill Elctrns., 320 Martin Ave., Santa Clara, Cal.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Signetics Corp., 811 E. Arques Ave., Sunnyvale, Calif.
Signetics Meas/Data, 341 Moffett Blvd., Mountain View, Cal.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Test Equip. Corp., Box 20215, Dallas, Tex.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Testers, Integrated Circuit (Manual)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 795
Testex, Inc., 162 San Lazaro Ave., Sunnyvale, Cal..... p 797
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Alessi Inds., 418 Main St., El Segundo, Calif.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IC Metrics, 607 Industrial Way W., Eatontown, N.J.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
Measurement Technology Corp., 7124 Owensmouth Ave., Canoga Park, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Miracle-Hill Elctrns., 320 Martin Ave., Santa Clara, Cal.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Ostby & Barton Co., Box 6267, Providence, R.I.
Pulse Monitors, Inc., 351 New Albany Rd., Moorestown, N.J.
Pylon Co., Inc., 51 Newcomb St., Attleboro, Mass.
REDCOR Corp., 21200 Victory Blvd., Woodland Hills, Cal.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Tektronix, Inc., Box 500, Beaverton, Ore.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Testers, Leakage

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Cablemaster Div., 13215 Leadwell St., No. Hollywood, Cal. p 627
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. .....p 680,682
GAR Enterprises, 2031 N. Lincoln Ave., Pasadena, Cal. .... p 685
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-711
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. ..... p 767
Ross Engrg. Corp., 11915 Shadybrook, Saratoga, Cal.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill. ..... p 785
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.....p 786,787
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Aerotronic Assocs., Inc., Box 367, Contoocook, N.H.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Brooks Resch. & Mfg., Inc., 5612 Brighton Terr., Kansas City, Mo.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dit-MCO International, 5612 Brighton Terr., Kansas City, Mo.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Erdco Engrg. Corp., 136 Official Rd., Addison, Ill.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Test Equip. Corp., Box 20215, Dallas, Tex.
3M Co., 3M Center, St. Paul, Minn.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Testers, Life, Component

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Associated Testing Labs., Inc., 200 Rte. 46, Wayne, N.J. .. p 602
Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Kilovolt Corp., 238 High St., Hackensack, N.J.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
FRL, Inc., 1890 Embarcadero Ave., Palo Alto, Calif.
FRL, Marin Controls Co., 517 Marine View Ave., Belmont, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Test Equip. Corp., Box 20215, Dallas, Tex.
Vestal Modern Design Corp., Vestal Pkwy., E., Vestal, N.Y.

Testers, Logarithmic Amplifier

Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 905

Testers, Logic Card

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
A P Inc., 56 Corwin Dr., Painesville, Ohio ..... p 1598
Aritech Corp., 130 Lincoln St., Brighton, Mass. ..... p 1562
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 561
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 795
AAI Corp., P.O. Box 6767, Baltimore, Md.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
CGS Units, Inc., 73 Saginaw Dr., Rochester, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Digital Gen'l. Corp., 11000 Cedar Ave., Cleveland, Ohio
EDP Corp., Box 6485, Orlando, Fla.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Lockheed Aircraft Service Co., Ontario Int'l. Airport, Ontario, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Pulse Monitors, Inc., 351 New Albany Rd., Moorestown, N.J.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Testers, LSI (Automatic)

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 561
International Contronics, Inc., 1030 W. Evelyn Ave., Sunnyvale, Cal.....p 717,1078
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
AAI Corp., P.O. Box 6767, Baltimore, Md.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Digital Gen'l. Corp., 11000 Cedar Ave., Cleveland, Ohio
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
Macrodata, 20440 Corisco St., Chatsworth, Cal.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Texas Instruments, Inc., Box 66027, Houston, Tex.

Testers, Magnetic Core

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Computer Test Corp., 3 Computer Dr., Cherry Hill, N.J.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Horex Elctrns., Inc., 1729 21st St., Santa Monica, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Shallcross, E. Preston St., Selma, N.C.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Testers, Magnetron

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Mictron Div. KMS, Inc., Box 10126, Porter Rd., Sarasota, Fla.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.

Testers, Material

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Magnetics Sys. & Instrs. Div., Rockdale St., Worcester, Mass.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
American Instr. Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Ametek, Inc., Station Square Two, Paoli, Pa.
Amthor Testing Instr. Co., Inc., 45-53 Van Sinderen Ave., Brooklyn, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Ann Arbor Div., P.O. Box 1025, Ann Arbor, Mich.
Arvin Sys., Inc., 1771 Springfield St., Dayton, Ohio
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Electromatic Equip. Co., 562 Albermarle Rd., Cedarhurst, N.Y.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Microwave Instrs. Co., 3111 Second Ave., Corona del Mar, Calif.
Pacific Scientific Co., Aircraft Prods. Div., 6280 Chalet Dr., City of Commerce, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.

Testers, Memory—See Testers, Computer Memory

Testers, Meter

Advanced High Voltage Co., Inc., 8635 Yolanda Ave., Northridge, Cal.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore.
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Holt Instr. Labs., Inc., Box 230, Oconto, Wisc.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
States Co., 19 New Park Ave., Hartford, Conn.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Testers, Microphone—See Calibrators, Microphone

Testers, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. p 872
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y. p 889
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Waveline, Inc., Box 718, W. Caldwell, N.J. p 919
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. p 920
AAI Corp., P.O. Box 6767, Baltimore, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Carco Elctrns., 1180 O'Brien Dr., Menlo Park, Calif.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Dallas, Tex.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Geospace Elctrns. Div., Daniel Webster Hwy., So. Nashua, N.H.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hyletronics Corp., Newtown Rd., Littleton, Mass.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Testers, Motor

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2125
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla. p 786
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Delta Products, Inc., P.O. Box 1147, Grand Junction, Colo.
Kintron Co., 29 S. Pasadena Ave., Pasadena, Cal.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Testers, Multipurpose—See Test Sets, Multipurpose

Testers, Potentiometer

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 609
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 673
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Advance Instr. Corp., 1707 F. St., Belmar, N. J.
Ametek, Inc., Station Square Two, Paoli, Pa.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bristol Div, Waterbury, Conn
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Nytronics, Inc., 183 Commercial St., Watertown, Conn.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.

Testers, Power Supply

Arnold Magnetics Corp., Box K, Culver City, Calif.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1013
Electronic Dev. Corp., 11 Hamlin St., Boston, Mass.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 708-710
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y. p 1109
Spar Elctrns., Inc., 7585 Convoy Ct., San Diego, Cal.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y. p 806,1287
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Pacific Meas., Inc., 940 Industrial Ave., Palo Alto, Calif.
Packer, B. L., Co., Inc., 5-05 Burns Ave., Hicksville, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Rodale Mfg. Co., Inc., Emmaus, Pa.

Testers, Pulse Jitter

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.

Testers, Radar

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Bird Elctrn. Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. p 920
AAI Corp., P.O. Box 6767, Baltimore, Md.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bedford Div, Daniel Webster Hwy., So. Nashua, N.H.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Nichols Prods. Co., 325 W. Main St., Moorestown, N.J.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sperry Microwave Elctrns. Div., Box 4648, Clearwater, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.

Testers, Ratio Voltage

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. p 626
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. p 673
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y. p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 721,722
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Singer Co., 915 Pembroke St., Bridgeport, Conn. p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. p 788
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md. p 920
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Weston Instrs., Inc., 17 Hartwell Ave., Lexington, Mass.

Testers, Relay

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Couch S.H. Div., 36 River St., Boston, Mass.
Hathaway Comps., 5250 E. Evans Ave., Denver, Colo.
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
New Prod. Engrg., Inc., First & Webster Sts., Wabash, Ind.
Non-Linear Sys., Inc., Box N, Del Mar, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Brooks Resch. & Mfg., Inc., 5612 Brighton Terr., Kansas City, Mo.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Electro-Standards Labs., Inc., 3560 N.W. 34th St., Miami, Fla.
Fleetwood Labs., Inc., 35 Rockwood Pl., New Rochelle, N.Y.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kemper Engrg. Co., 9337 Shoshone Ave., Northridge, Cal.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Multi-Amp Corp., 61 Myrtle St., Cranford, N.J.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Ostby & Barton Co., Box 6267, Providence, R.I.
Photologic Co., 3704 E. Walnut Ave., Orange, Calif.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Sittler Corp., 18 N. Ada St., Chicago, Ill.
Solatron Enterprises, 421 E. Beach Ave., Inglewood, Calif.
States Co., 19 New Park Ave., Hartford, Conn.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Testers, Resistivity

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 609
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. p 1637
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. p 626
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 708-710
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio

North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. ..... p 767
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Semimetals, Inc., 172 Spruce St., Westbury, N.Y.
Shallcross, E. Preston St., Selma, N.C.

Testers, Resistor

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Boonton Elctrns. Corp., Rte. 287 at Smith Rd., Parsippany, N.J. p 624,625
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 674,677
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 680
General Resistance; 500 Nuber Ave., Mt. Vernon, N.Y. ..... p 688
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio
Industrial Test Equip. Co., Inc., 20 Beechwood Ave., Port Washington, N.Y.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 1170
Penn Airborne Prods. Co., Industrial Hwy., Southampton Ind'l. Pk., Southampton, Pa. ..... p 767
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. ..... p 773
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla..... p 786
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Brunswick Instrs., P.O. Box 813, New Brunswick, N.J.
California Instrs. Corp., 3511 Midway Dr., San Diego, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
D.M. Research Corp., 13703 Madison Ave., Cleveland, Ohio
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Luft Instrs., Inc., Old Winter St., Lincoln, Mass.
Mercury Elctrns. Corp., 315 Roslyn Rd., Mineola, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Shallcross, E. Preston St., Selma, N.C.
Teradyne, Inc., 183 Essex St., Boston, Mass.

Testers, Servo

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 610
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
EMR Instrs., E. County Line Rd., Hatboro, Pa.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y. p 1990
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Advance Instr. Corp., 1707 F. St., Belmar, N. J.
Aetna Elctrns. Corp., 19 Readington Rd., North Branch, N.J.
Ametek, Inc., Station Square Two, Paoli, Pa.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Bendix Corp., S. Montrose, Pa.
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Collins Radio Co., Dallas, Tex.
EMR Div., Box 223, Princeton, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kollsman Motor Corp., Mill St., Dublin, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Orbit Instr. Corp., 131 Eileen Way, Syosset, N.Y.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Testers, Shock

Blue M Engrg. Co., 138th & Chatham St., Blue Island, Ill. .. p 603
Multitech Microelectronics, 583 Monterey Pass Rd., Monterey Pk., Cal.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Avco Elctrns., 10700 E Independence St, Tulsa, Okla.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Cincinnati Sub-Zero Products, Inc., 2612 Gilbert Ave., Cincinnati, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
IMPACT-O-GRAPH Div., 1762 E. 18th St., Cleveland, Ohio
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Kartron Inc., P.O. Box 1338, Huntington Beach, Calif.
L.A.B. Corp., 981 Onondaga St., Skaneateles, N.Y.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Mechanization Assocs., 140 S. Whisman Rd., Mt. View, Calif.
Monterey Resch. Lab., Inc., P.O. Box 72, Monterey, Calif.

Testers, Short-Turn—See Testers, Coil

Testers, Signal Tracing

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Barnes & Reinecke, Inc., 351 E. Ohio St., Chicago, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bliss Elctrn. Corp., P.O. Box 366, Sussex, N.J.
Bright Star Inds., Inc., 600 Getty Ave., Clifton, N.J.
Brooks Resch. & Mfg., Inc., 5612 Brighton Terr., Kansas City, Mo.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Desco Mfg. Co., 1530 Flower St., Glendale, Calif.
Dit-MCO International, 5612 Brighton Terr., Kansas City, Mo.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co., Box 92904, Los Angeles, Cal.
Hunter Tools, 9851 Albertis Ave., Santa Fe Springs, Calif.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Industrial Inventions, Inc., RD2 463, US 1, Monmouth Jct., N.J.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Ostby & Barton Co., Box 6267, Providence, R.I.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Teledyne Philbrick/Nexus Resch., 17 Allied Dr., Dedham, Mass.
Ultra Audio Prods., Box 921, Beverly Hills, Calif.
Versa-Tronics, 3016 Deer Pass Rd., Marengo, Ill.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Testers, Solderability—See Machines, Solderability Testing

Testers, Spark

Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.....p 708-710
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.

Testers, Synchro Error

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 610,611
Clifton, 5050 State Rd., Drexel Hills, Pa.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 758
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Bendix Corp., S. Montrose, Pa.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Farrand Controls, Inc., 99 Wall St., Valhalla, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Testers, Synchro/Resolver

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. p 610,611
Clifton, 5050 State Rd., Drexel Hills, Pa.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y. p 581
Singer Co., 915 Pembroke St., Bridgeport, Conn. ..... p 788
Singer Co., Instr. Div., 3176 Porter Dr., Stanford Ind'l. Pk., Palo Alto, Calif. ..... p 788
Singer Co., 3211 S. LaCienega Blvd., Los Angeles, Cal. .... p 788
Carbonara, Victor E. Inc., 90 Harbor Rd., Port Washington, N.Y.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Testers, Tape-Programmed—See Test Equipment, Automatic CheckOut; Testers, Integrated Circuit

Testers, Telemetering—See Telemetering Testers & Calibrators

Testers, Teletypewriter

Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Teledata, Inc., 98-05 217th St., Queens Village, N.Y.

Testers, Tensile—See Testers, Material

Testers, Torque

Autotronics, Inc., 2700 Davis, Joplin, Mo
Magtrol, Inc., 70 Gardenville Pkwy., W., Buffalo, N.Y.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Ametek, Inc., Station Square Two, Paoli, Pa.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kahn & Co., Inc., P.O. Box 516, Hartford, Conn.
Matrix Corp., 520 North 11th Ave., Beech Grove, Ind.
McFadden Elctrns. Co., 8953 S. Atlantic Blvd., South Gate, Calif.
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
Waters Mfg., Inc., 533 Boston Post Rd., Wayland, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.

Testers, Tracking & Erosion Resistance (Insulation)

Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
London Co., 811 Sharon Dr., Westlake, Ohio ..... p 737
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.

Testers, Transistor

AEL, Inc., Box 552, Lansdale, Pa.
Barnes Corp., 24 N. Lansdowne Ave., Lansdowne, Pa.
Dynarad, Inc., 1416 Providence Hwy., Norwood, Mass.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
Mastech, Inc., Box 178, E. Molloy Rd., Syracuse, N.Y.
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal.... p 751
Quan-Tech, 43 S. Jefferson Rd., Whippany, N.J. .....p 772,773
RCA, 415 S. 5th St., Harrison, N.J. ..... p 778
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
Teivac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Abbey Elctrns. Div., 200 Shames Dr, Westbury, N.Y.
Alessi Inds., 418 Main St., El Segundo, Calif.
Automated Meas. Corp., P.O. Box 1289, Oakland, Calif.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bulova Watch Co., Inc., Green Acres Rd., W., Valley Stream, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Custom Sci. Instrs., Inc., Box A, Whippany, N.J.
Daymarc Corp., Bear Hill Rd., Waltham, Mass.
Desco Mfg. Co., 1530 Flower St., Glendale, Calif.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Fairchild Sys. Technology, 974 E. Arques Ave., Sunnyvale, Cal.
Gencom Div., 80 Express St., Plainview, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Heath Co., Benton Harbor, Mich.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
IC Metrics, 607 Industrial Way W., Eatontown, N.J.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Leader Instr. Corp., 37-27 27th St., Long Island City, N.Y.
Lecroy Resch. Sys. Corp., 126 N. Rte. 303, West Nyack, N.Y.
Leland Airborne Prods., Box 128, Vandalia, Ohio
Loranger Mfg. Corp., Box 948, Warren, Pa.
Lorin Inds., Inc., Precision Rd., Danbury, Conn.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Mechanization Assocs., 140 S. Whisman Rd., Mt. View, Calif.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.

Miracle-Hill Elctrns., 320 Martin Ave., Santa Clara, Cal.
Optimized Devices Inc., 220 Marble Ave., Pleasantville, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Semitronics Corp., 265 Canal St., New York, N.Y.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Test Equip. Corp., Box 20215, Dallas, Tex.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Testers, Transmission & Delay

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Daven, Div., Dept. EEM 70, Manchester, N.H.
Marconi Instrs., 111 Cedar La., Englewood, N.J. ..... p 741
Western Reserve Elctrns., Inc., 12430 Euclid Ave., Cleveland, Ohio
Acton Labs., Inc., 531 Main St., Acton, Mass.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Railway Comm., 9351 E. 59th St., Raytown, Mo.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Waveforms Div., 11922 Valerio St., No. Hollywood, Cal.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Testers, Tube

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Henry Prods. Co., Inc., 500 Bayview, Inwood, N.Y.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 692
RCA, 415 S. 5th St., Harrison, N.J.
Triplett Elec. Instr. Co., 280 Harmon Rd., Bluffton, Ohio
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill.
Electro Specialties Corp., 370 Park Ave., Worcester, Mass.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
Heath Co., Benton Harbor, Mich.
Jackson Elec. Instr. Co., 35 Windson Ave., Mineola, N.Y.
Jetronic Inds., Inc., Main & Cotton St., Philadelphia, Pa.
Joliet Control Corp., Box 751, Joliet, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lattin Radio Labs., 1431 Sweeney, Box 44, Owensboro, Ky.
Loranger Mfg. Corp., Box 948, Warren, Pa.
Mercury Elctrns. Corp., 315 Roslyn Rd., Mineola, N.Y.
RIL Elctrns., Inc., Street Rd. at 2nd St. Pike, Southampton, Pa.
Sanders Assoc., 1 Fairchild Ave., Plainview, N.Y.
Seco Elctrns. Corp., 1001 2nd St., S., Hopkins, Minn.
Sencore, Inc., 426 S. Westgate Dr., Addison, Ill.
Stark Elctrn. Instrs., Ltd., 180 Station St., Ajax, Ont., Canada
Viz Mfg. Co., 335 E. Price St., Philadelphia, Pa.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Wiltron Co., 930 E. Meadow Dr., Palo Alto, Calif.

Testers, Universal

Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 724
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 795
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Ametek, Inc., Station Square Two, Paoli, Pa.
Anchor Specialty Mfg. Co., Inc., 300 Hollister Rd., Teterboro, N.J.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Chatillon John & Sons, 83-30 Kew Gardens Rd., Kew Gardens, N.Y.
Dataprobe, Inc., 290 Huyler St., So. Hackensack, N.J.
De Soto Elec. Prods., Box 239, De Soto, Mo.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Electronic Meas. Corp., 625 Broadway, New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Welex Elctrns., Box 986, Silver Spring, Md.

Testers, Vibration—See Vibration Test Systems

Testers, Voltage Breakdown

Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill. p 608
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J. p 615
Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa. ..... p 626
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y. p 708,709,711
ITT Jennings, 970 McLaughlin Ave., San Jose, Cal. ..... p 1809
Kikusui Elctrns. Corp., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Kilovolt Corp., 238 High St., Hackensack, N.J. ..... p 1121
Micro Instr. Co., 12901 Crenshaw Blvd., Hawthorne, Cal. .. p 751
Self-Organizing Sys., Inc., Box 9918, Dallas, Tex.
Slaughter Co., Moore & Hailey Sts., Ardmore, Okla.....p 786,787
Telesciences, Inc., 351 New Albany Rd., Moorestown, N.J. p 794
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Avtron Mfg., Inc., 10409 Meech Ave., Cleveland, Ohio
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Cole Instr., 2034 Placentia Ave., Costa Mesa, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Electrical Instr. Svc., Inc., 25 Dock St., Mt. Vernon, N.Y.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Instr. Resch. Co., Box 231, Lincoln, Mass.
IPT Corp., 185 Evelyn Ave., Mountain View, Cal.
Lehighton Elctrns., Inc., Box 281, Lehighton, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Randam Elctrns., Inc., 3091 Shadycrest Dr., Cincinnati, Ohio
Spedcor Elctrns., Inc., 70-31 84th St., Glendale, N.Y.
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Tektronix, Inc., Box 500, Beaverton, Ore.
Teradyne, Inc., 183 Essex St., Boston, Mass.
Velonex Div., 560 Robert Ave., Santa Clara, Calif.

Testing, Environmental—See Services, Environmental Testing

Thermistors

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2800
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal.....p 2098,2099
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal.....p 2098,2099
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal.....p 2098,2099
Carborundum Co., Box 367, Niagara Falls, N.Y. ..... p 2100-2104
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Fenwal Elctrns., Inc., 63 Fountain St., Framingham, Mass. p 2108
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J. .... p 2109
Interelectronics Corp., Interelectronics Pk., 505 U.S. Rte. 303, Congers, N.Y.
Keystone Carbon Co., St. Marys, Pa. ..... p 2112-2117
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Carbone Corp., 400 Myrtle Ave., Boonton, N.J.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N.Y.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Gow-Mac Instr. Co., 100 Kings Rd., Madison, N.J.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Palmer Elctrns., Inc., 156 Belmont Ave., Garfield, N.J.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Victory Engrg. Corp., 128 Victory Rd., Springfield, N.J.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Thermo Compression Bonding Equipment

Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.

Thermocouple Reference Junctions

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Resistance, 500 Nuber Ave., Mt. Vernon, N.Y.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Gencom Div., 80 Express St., Plainview, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Kaye, Joseph & Co., Inc., 737 Concord Ave., Cambridge, Mass.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Research, Inc., Box 24064, Minneapolis, Minn.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Thermocouples, Elements & Accessories

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Best Elecs. Div., 1211 E. Denny Way, Seattle, Wash. ..... p 2095
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J..... p 873
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
ITT Cannon Electric, 3208 Humboldt St., Los Angeles, Cal.
J-B-T Instrs., Inc., Box 1818, New Haven, Conn.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Astro Inds., Inc., 606 Olive St., Santa Barbara, Calif.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
Beckman Instrs., Inc., Analytical Instrs. Sls. & Svc. Div. (AISSD), 2500 Harbor Blvd., Fullerton, Cal.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Bristol Div, Waterbury, Conn.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
Consolidated Ohmic Devices, Inc., 115 Old Country Rd., Carle Pl., N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Electronic Brazing Co., 140 Glenridge Ave., Montclair, N.J.
Electronic Dev. Labs., Inc., 19 Newtown Rd., Plainview, N.Y.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Foxboro Co., Foxboro, Mass.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Instrulab, Inc., 1205 Lamar St., Dayton, Ohio
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Nanmac Corp., 9 Mayhew Rd., Framingham, Mass.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N.J.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Reeder Charles M. & Co., Inc., 196 Victor Ave., Detroit, Mich.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Temtex Co., 5619 Dyer St., Dallas, Tex.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.

Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
United Elec. Controls Co., 85A School St., Watertown, Mass.
United Sensor & Control Co., 85 School St., Watertown, Mass.
Vacuum Prods., Inc., 25 Dock St., Mt. Vernon, N.Y.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Thermocouples, Vacuum-Also See Thermocouples, Elements & Accessories

Best Elecs. Div., 1211 E. Denny Way, Seattle, Wash. ..... p 2095
Singer Co., 915 Pembroke St., Bridgeport, Conn.
American Thermo Elec. Co., 7269 Santa Monica Blvd., Los Angeles, Calif.
Barker Elec. Sls. Co., 339 Broad Ave., Ridgefield, N.J.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pyrometer Instr. Co., Inc., 234 Industrial Pkwy., Northvale, N J
RDF West, 9371 Kramer Ave., Westminster, Calif.
Reeder Charles M. & Co., Inc., 196 Victor Ave., Detroit, Mich.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Temtex Co., 5619 Dyer St., Dallas, Tex.
Ultek Div., Box 10920, Palo Alto, Calif.
United Elec. Controls Co., 85A School St., Watertown, Mass.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Prods., Inc., 25 Dock St., Mt. Vernon, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Thermocouple Devices & Materials—See Cooling/Heating Modules, Thermoelectric

Thermoelectric Generators—See Generators, Thermoelectric

Thermometers, Resistance

Beede Electrical Instr. Co., Inc., S. Main St., Penacook, N.H.
Cal-R, Inc., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099
Cal-R, Inc., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099
Cal-R, Inc., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal. ..... p 2099
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 673
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn.
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J. ..... p 781
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla.
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Bacharach Instr. Co., 625 Alpha Dr., Pittsburgh, Pa.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beacon Elctrns., Inc., 121 Stanley Ave., Bellmawr, N.J.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., 5301 Edina Industrial Blvd., Minneapolis, Minn.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
Cryotronics, Inc., W. Main St., High Bridge, N.J.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fenwal, Inc., Main St., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Hallikainen Instrs., 750 National Ct., Richmond, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Malaker Corp., W. Main St., High Bridge, N.J.
Marshall Instrs., Inc., 14203 Bessemer St., Van Nuys, Calif.
Melabs, 3300 Hillview Ave., Stanford Industrial Pk., Palo Alto, Cal.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Midwest Audio Corp., 5707 W. Division, Chicago, Ill.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sostman H. E., & Co., 347 E. Lincoln Ave., P.O. Box 60, Cranford, N.J.
T & T Controls Co., Inc., Box 171, Media, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Temtex Co., 5619 Dyer St., Dallas, Tex.
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
United Sys. Corp., 918 Woodley Rd., Dayton, Ohio
Versitherm, Inc., 51 Toledo St., Farmingdale, N.Y.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Thermopiles

Biddle, James G. Co., Township Line & Jolly Rds., Plymouth Meeting, Pa.
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 873
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bristol Div, Waterbury, Conn
Cintra Physics Int'l. Co., 440 Logue Ave., Mt. View, Calif.
Eppley Lab., Inc., Box 419, Main P.O., Newport, R.I.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
RDF Corp., 23 Elm Ave., Hudson, N.H.
Reeder Charles M. & Co., Inc., 196 Victor Ave., Detroit, Mich.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.

Thermostats-Also See Switches, Thermally Actuated; Controls, Temperature

Electronic Research Co., 10000 W. 75th St., Overland Pk., Kans. p 1437
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I. p 2107
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776

Thin-Film Memory Systems, Planar—See Memory Systems

Thyratrons—See Tubes, Thyratron

Thyristors (Includes Silicon Controlled Rectifiers)

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1885,1890,1891
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902-1905
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Semikron Int'l., Inc., Box 323, Scarsdale, N.Y. ..... p 1920
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Syntron Div., 264 Lexington, Homer City, Pa. ....p 1944,1945,1950
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1954,1955
Unitrode Corp., 582 Pleasant St., Watertown, Mass. p 1965-1967
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1965-1967
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
M & T Chemicals Inc., Rahway, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Elctrns., Inc., Box 269, Geneva, Ill.
PIRGO Elctrns., 130 Central Ave., Farmingdale, N.Y.
Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind
Semicon Inc., 10 North Ave., Burlington, Mass
Semitronics Corp., 265 Canal St., New York, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Youngwood, Pa.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Ties, Wire & Cable—See Wire & Cable Ties

Timer Switches—See Switches, Time Delay

Timers, Coin Operated

Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.

Timers, Counting

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa. .... p 548
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Data Dynamics Div., 240 Humphrey St., Englewood, N.J.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal.
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,697
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... p 585
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal. .. p 1398
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davis Elctrns. Corp., 4711 East 5th St., Austin, Tex.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Fedtro, Inc., Fed. Elctrns. Bldg., Rockville Centre, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
MKC Elctrns. Corp., 454 E. Donovan Rd., Kansas City, Kans.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.

Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Tyco Instr. Div., 16 Hickory Dr, Waltham, Mass.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Timers, Cycle

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Cutler-Hammer, Inc., 4201 North 27th St., Milwaukee, Wisc.
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc. ..... p 1750
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Time Corp., Rte. 8, Torrington, Conn. ..... p 1379
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn. ..... p 1672
Haydon Switch & Instr., Inc., 1500 Meriden Rd., Waterbury, Conn. ..... p 1674
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind. p 1391
Midtex/Aemco, 10 State St., Mankato, Minn.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Sangamo Elec. Co., Box 128, Pickens, S.C.
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y. ..... p 2535
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif. p 800
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan ..... p 1400
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal. ..... p 1866
Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Cramer Div., Old Saybrook, Conn.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati, Ohio
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Minarik Electric Co., 226 E. Third St., Los Angeles, Calif.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Rhodes, M.H., Inc., 99 Thompson Rd., Avon, Conn.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Timers, Electrolytic Cell

Bissett-Berman Corp., 3860 Centinela Ave., Los Angeles, Calif. p 1360
Curtis Instrs., Inc., 200 Kisco Ave., Mt. Kisco, N.Y. ..... p 638
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc. p 1380
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.

Timers, Impulse

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y. ..... p 1552
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind. .. p 1364
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 693,697
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa. ..... p 585
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan
Sealectro Corp., 225 Hoyt St., Mamaroneck, N.Y.
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Aemco Div., 10 State St., Mankato, Minn.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Cramer Div., Old Saybrook, Conn.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati, Ohio
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Timers, Interval

Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif. .... p 539
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Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. p 1358,1359
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Chrono-log Corp., 2583 W. Chester Pike, Broomall, Pa.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Corning Glass Works, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y.
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Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif. p 656
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Ferwalt, W.H., Inc., Webb Rd., Lapwai, Idaho
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Sangamo Elec. Co., Box 128, Pickens, S.C.
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan
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Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
Burke & James, Inc., 333 W. Lake St., Chicago, Ill.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cramer Div., Old Saybrook, Conn.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dimco-Gray Co., 207 East 6th St., Dayton, Ohio
Dri-Clave Corp., 54 Kinkel St., Westbury, N.Y.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Elron Inc., 9701 N. Kenton Ave., Skokie, Ill.
Engler Instr. Corp., 250 Culver Ave., Jersey City, N.J.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Itron Corp., 11675 Sorrento Valley Rd., San Diego, Cal.
Lear Siegler, Inc., 4141 Eastern Ave., S.E., Grand Rapids, Mich.
Lehigh Valley Elctrn., Inc., Box 125, Fogelsville, Pa.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.

Lektra Labs., Inc., 129-07 18th Ave., College Point, N.Y.
Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati, Ohio
Lisk, G.W. Co., Inc., 5019 South St., Clifton Springs, N.Y.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Nano Fast, Inc., 416 W. Erie, Chicago, Ill.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Northeast Elctrns. Corp., Box 649, Concord, N.H.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Paragon Elec. Co., Inc., 1600 12th St., Two Rivers, Wisc.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Rhodes, M.H., Inc., 99 Thompson Rd., Avon, Conn.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Sigma Instrs., Inc., 170 Pearl St., Braintree, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., 1810 Grant Ave., Philadelphia, Pa.
Symbolic Displays, Inc., 1188 N. Batavia St., Orange, Calif.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Technic, Inc., Box 965, Providence, R.I.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
USM Corp., 81 Bay State Rd., Wakefield, Mass.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

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Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 562
Deltrol Controls, 2745 S. 19th St., Milwaukee, Wisc.
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Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
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Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y.
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Midtex/Aemco, 10 State St., Mankato, Minn.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Precision Mechanisms Corp., 44 Brooklyn Ave., Westbury, N.Y.
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Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cramer Div., Old Saybrook, Conn.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hird Brown America, Box 544, Livingston, N.J.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
International Register Co., 4700 W. Montrose Ave., Chicago, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Minarik Electric Co., 226 E. Third St., Los Angeles, Calif.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Noble Elctrns., Inc., 5025 Seventh St., Carpinteria, Calif.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

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A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
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Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
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Aemco Div., 10 State St., Mankato, Minn.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Cramer Div., Old Saybrook, Conn.
Di/An Controls, Inc., 944 Dorchester Ave., Boston, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Globe-Union Inc., 5757 N. Green Bay Ave., Milwaukee, Wisc.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lab-Line Instrs., Inc., Lab-Line Plaza, Melrose Park, Ill.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati, Ohio
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
McKee-Pedersen Instrs., P.O. Box 322, Danville, Calif.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Paragon Elec. Co., Inc., 1600 12th St., Two Rivers, Wisc.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Precision Sci. Co., 3737 W. Cortland St., Chicago, Ill.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Techmetric Co., 2449 Harding Ave., Redwood City, Calif.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

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Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
C & K Components, Inc., 103 Morse St., Watertown, Mass.
Chicago Dynamic Inds., Inc., 1725 W. Diversey Blvd., Chicago, Ill.
Clare, C.P. & Co., 3101 Pratt Blvd., Chicago, Ill.
Co-Ord Switch Div., 102-48 43rd Ave., Corona, N.Y.
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Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
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Abrams Instr. Corp., 606 E. Shiawassee St., Box 149, Lansing, Mich.
Acton Labs., Inc., 531 Main St., Acton, Mass.
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., 3629 N. Vermilion, Danville, Ill.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bristol Div., Waterbury, Conn.
Bulova Watch Co., Inc., Bulova Pk., Flushing, N.Y.
California Electro-Scientific Corp., 2203 S. Grand Ave., Santa Ana, Calif.
Clare-Electroseal Corp., 946 North Ave., Des Plaines, Ill.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Condor Ind'l. Corp., 649 Childs St., Wheaton, Ill.
Controlomag Labs., 2459 Susquehanna, Roslyn, Pa.
Controlotron Corp., 35 Central Ave., Farmingdale, N.Y.
Cramer Div., Old Saybrook, Conn.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago, Ill.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Durant Mfg. Co., 625 N. Cass St., Box 748, Milwaukee, Wisc.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Gammatronix, Inc., Dublin, Ohio
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heitz, Karl, Inc., 979 Third Ave., New York, N.Y.
Hird Brown America, Box 544, Livingston, N.J.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Montgomery Mfg. Co., Inc., 206 S. Main St., Owensville, Ind.
National Time & Signal Corp., 21803 Wyoming Ave., Oak Pk., Mich.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Paragon Elec. Co., Inc., 1600 12th St., Two Rivers, Wisc.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Raymond Engrg., Inc., 217 Smith St., Middletown, Conn.
Reach Elctrns., Inc., Box 308, Lexington, Neb.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Rhodes, M.H., Inc., 99 Thompson Rd., Avon, Conn.
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Tenor Co., Inc., 17020 W. Rogers Dr., New Berlin, Wisc.
Transystems Elctrn. Co., 2200 Central Rd., Fort Lee, N.J.

Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Zenith Controls Inc., 830 West 40th St., Chicago, Ill.

Timers, Solid State

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y.
Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wisc.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y.
Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J. p 1720
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Bulova Watch Co., Elctrns. Div., Servo Prods., 61-20 Woodside Ave., Woodside, N.Y.
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Eagle Signal Div., 736 Federal St., Davenport, Iowa ..... p 1372
Electronic Meas., 2 Crescent Pl., Oceanport, N.J.
Gibbs Mfg. & Resch. Corp., 450 N. Main St., Janesville, Wisc.
Guardian California, 5755 Camille Ave., Culver City, Cal.
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Logitek, Inc., 42 Central Dr., Farmingdale, N.Y.
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, Ill..... p 1828
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind. p 1391
Midtex/Aemco, 10 State St., Mankato, Minn.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Servo Dev. Corp., 2 Willis Ct., Hicksville, N.Y. ..... p 1995
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y..... p 1397
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y. ..... p 1399
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal... p 1398
Time Sys. Corp., 265 Whisman Rd., Mountain View, Calif.
Tokyo Elec. Co., Ltd., 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan ..... p 1400
Zenrad Controls Co., 1575 A.P.S., Santa Barbara, Cal..... p 1866
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Autronics Corp., 180 N. Vinedo Ave., Pasadena, Calif.
Bayside Timers, Inc., 43-69 162 St., Flushing, N.Y.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Control Logic, Inc., 3 Strathmore Rd., Natick, Mass.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
EDP Corp., Box 6485, Orlando, Fla.
Farmer Elec. Prods. Co., Inc., Tech Circle, Natick, Mass.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Elec. Co., Waynesboro, Va.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Giannini-Voltex, 12140 E. Rivera Rd., Whittier, Calif.
Gulton Inds., Inc., 15000 Central, E., Albuquerque, N.M.
Industrial Solid State Controls, Inc., Box 934, York, Pa.
Instrument Comps. Co., Inc., 15105 Broadway, Maple Hgts., Ohio
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Midco, Inc., Box 5433, Trenton, N.J.
Monroe Timer Co., 625 Sound View Ave., Bronx, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Plessey Airborne Corp., 1414 Chestnut Ave., Hillside, N.J.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Starnetics Co., P.O. Box 9308, N. Hollywood, Calif.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Taft Electrosystems, Inc., Box 43, Metuchen, N. J.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.
Time-O-Matic, Inc., P.O. Box 850, Danville, Ill.
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, N.Y.
Venner Elctrns., Ltd., Kingston By-Pass, New Malden, Surrey, England
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Timers, Thermal

Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
G-V Controls, Inc., 101 Okner Pkwy., Livingston, N.J. ..... p 1776
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J. p 1788
Sankyo Seiki Mfg. Co., Ltd., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan
Tempo/UTI, 9135 Independence Ave., Chatsworth, Cal... p 1398
E-T-A Prods. Co. America, 6284 N. Cicero Ave., Chicago, Ill.
Ebert Elctrns. Corp., 130 Jericho Tpke., Floral Park, N.Y.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Relay Specialties, Inc., 3 Godwin Ave., Fair Lawn, N.J.
Scaico Div., 211 Warren St., W. Pittston, Pa.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa

Timers, Welding (Electronic)

Artisan Elctrns. Corp., 5 Eastmans Rd., Parsippany, N.J.
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
Tempo Instr., 1478 Old Country Rd., Plainview, N.Y.
Aemco Div., 10 State St., Mankato, Minn.
Agastat Div., 1027 Newark Ave., Elizabeth, N.J.
Air-O-Tronics Prods., Inc., Box "K", Morrisville, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Digital Instrs., Inc., 13735 Victory Blvd., Van Nuys, Cal.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Precision Arc Co., Inc., 785 Woodend Rd., Stratford, Conn.
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Raymond Controls Corp., 217 Smith St., Middletown, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Vocaline Co. America, Inc., Coulter St., Old Saybrook, Conn.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.

Timing Switches—See Timers

Tinsel—See Wire, Tinsel

Tonometers

Biotronics, Inc., 838 Butte St. Redding, Calif

Tool Kits & Sets

Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill. p 2391,2393
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn. .... p 2403
Circon Corp., Santa Barbara Airport, Goleta, Calif..... p 2836
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Nanasi, 6308 Jackson St., W. New York, N.J.
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H.
Ace Drill Corp., 2600 E. Maumee St., Adrian, Mich.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bearing Inspection, Inc., 10041 Shoemaker Ave., Santa Fe Springs, Calif.
By-Buk Co., 4326 W. Pico Blvd., Los Angeles, Calif.
Channellock, Inc., S. Main St., Meadville, Pa.
Cole-Parmer Instr. Co., 7425 N. Oak Park Ave., Chicago, Ill.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Milbar, 530 Washington St., Chagrin Falls, Ohio
Moody Machine Prods. Co., Inc., Box 2248, Providence, R.I.
Multi-Amp Corp., 61 Myrtle St., Cranford, N.J.
Neuses, P.K., Inc., Box 100, Arlington Hgts., Ill.
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Rosenberg Bros. & Co., 100 Landing Ave., Smithtown, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Uber Grafic Instrs., Box 4, Palo Alto, Calif.
UNGAR, 233 E. Manville St, Compton, Calif.
Upson Tools, Inc., P.O. Box 4750, Rochester, N.Y.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Wharton Unitools, 8-10 Lake St., Moosup, Conn.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Tools, Alignment & Tuning

GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
Injectorall Elctrns. Corp., 4 North Rd., Great Neck, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Moran Instr. Corp., 170 E. Orange Grove Ave., Pasadena, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Tools, Crimping

Amp Inc., Box 3608, Harrisburg, Pa.
Amphenol Connector Div., 2801 S. 25th Ave., Broadview, Ill.p 2391,2393
Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Buchanan Elec. Prods. Corp., 1065 Floral Ave., Union, N.J.
Circon Corp., Santa Barbara Airport, Goleta, Calif.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa. p 2447
ETC, Inc., 990 East 67 St., Cleveland, Ohio ..... p 2442
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. p 2462
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Winchester Elctrns. Div., Main & Hillside Aves., Oakville, Conn.
Amphenol Cadre Div., 20 Valley St., Endicott, N.Y.
Beman Mfg., Inc., New Cumberland, Pa.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Burndy Corp., Richards Ave., Norwalk, Conn.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Connectrol Corp., 28 E 22nd St, New York, N Y
Crimpco Engrg., 7341 Canoga Ave., Cangoga Park, Calif.
Electric Terminal Corp., 25 Bellows St., Warwick, R.I.
Ewing Prods., Inc., 1014 W. Burbank Blvd., Burbank, Calif.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hollingsworth Solderless Terminal Co., P.O. Box 430, Phoenixville, Pa.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Superior Continental Corp., Box 489, Hickory, N.C.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Triple-A Specialty Co., 5750 West 51st St., Chicago, Ill.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.
Zierick Mfg. Corp., Radio Circle, Mt. Kisco, N.Y.

Tools, Hand Or Mechanical—See Cutters; Screwdrivers; Wrenches; etc.

Tools, Heat Sealing

Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Berg Elctrns., Inc., York Expwy., New Cumberland, Pa.
Harwil Co., 903 Colorado Ave., Santa Monica, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Tools, Microelectronic Handling

Circon Corp., Santa Barbara Airport, Goleta, Calif..... p 2836
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Orbit Inds., Box 1444, San Luis Obispo, Calif.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
UNGAR, 233 E. Manville St, Compton, Calif.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Wendon Co., Inc., 17 Irving Ave., Stamford, Conn.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Tools, Parts-Handling, Vacuum Operated

Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill.
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
Foredom Elec. Co., Bethel, Conn.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
Hydro Molding Co., Inc., Plattsburgh, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan

Tools, Relay Servicing

Circon Corp., Santa Barbara Airport, Goleta, Calif..... p 2836
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.

Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
Neuses, P.K., Inc., Box 100, Arlington Hgts., Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.

Tools, Resistance Soldering—See Soldering Equip., Resistance

Tools, Soldering—See Specific Types

Tools, Swaging

Circon Corp., Santa Barbara Airport, Goleta, Calif.
Elco Corp., Maryland Rd. & Computer Ave., Willow Grove, Pa.
Helitronics Corp., 155 Tichenor St., Newark, N.J.
Vector Elctrn. Co., Inc., 12460 Gladstone Ave., Sylmar, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Connectrol Corp., 28 E 22nd St, New York, N Y
D-Cemco, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Eyelet Tool Co., Inc., 76 Rogers St., Cambridge, Mass.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keystone Elctrns. Corp., 49 Bleeker St., New York, N.Y.
Litton Inds., 13536 Saticoy St., Van Nuys, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.

Toroids—See Coils, Toroidal

Torque Indicators—See Indicators, Torque

Torque Meters—See Indicators, Torque

Torque Testers—See Testers, Torque

Torquers, Gyro—See Motors, Gyro

Totalizers, Digital

Anadex Instrs., Inc., 7833 Haskell Ave., Van Nuys, Calif..... p 539
Atec, Inc., 1125 Lumpkin St., Box 19426, Houston, Tex. .. p 1358
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
CMC (Computer Measurements Co.), 12970 Bradley Ave., San Fernando, Cal. ..... p 630,631
Digital Equip. Corp., 146 Main St., Maynard, Mass.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.p 656
Dytro Corp., 63 Tec St., Hicksville, N.Y. ..... p 661
Eagle Signal Div., 736 Federal St., Davenport, Iowa
Eldorado Electrodata Corp., 601 Chalomar Rd., Concord, Cal. p 666
Electro-Numerics Corp., 2191 Ronald St., Santa Clara, Cal. p 664,665
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 565
Haydon, A. W. Co., 232 N. Elm St., Waterbury, Conn.
Hecon Corp., 31 Park Rd., New Shrewsbury, N.J. ..... p 1383
Hickok Electrical Instr. Co., 10514 Dupont Ave., Cleveland, Ohio p 697
Intercontinental Elctrns. Corp., 319 E. Chestnut St., E. Rochester, N.Y. ..... p 1388
Kessler-Ellis Prods. Co., 120 First Ave., Atlantic Highlands, N.J. p 1389
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Mesa Co., Inc., 216-220 Mill St., Bristol, Pa.
Neutronic Corp., Box 625, St. Louis, Mo.
Norden Div., Helen St., Norwalk, Conn.
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal. .. p 584
Pennwood Numechron Co., 7249 Frankstown Ave., Pittsburgh, Pa.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
PPM, Inc., 7016 Euclid Ave., Cleveland, Ohio ..... p 766
Precision Timer Co., Inc., Westbrook Ind'l. Commons, Westbrook, Conn. ..... p 1395
Takeda Riken Industry Co., Ltd., Tokyo 176, Japan
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Veeder-Root, 70 Sargeant St., Hartford, Conn. ..... p 1401
Acoustronics, Inc., 156 Olive St., Huntington, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Binary Elctrns. of Cal., 1429 N. State College Blvd., Anaheim, Calif.
Bio-Medical Elctrns., Inc., 653 Lofstrand La., Rockville, Md.
Bristol Div, Waterbury, Conn
Burroughs Corp., Box 1226, Plainfield, N.J.
Collins Radio Co., Dallas, Tex.
Datum, Inc., 170 E. Liberty Ave., Anaheim, Calif.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electron-Machine Corp., Box M, Umatilla, Fla.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Instrumentation Tech. Corp., 18811 Napa St., Northridge, Calif.
Jersey Tech. Consits., 22 Colles Ave., Box 215, Morristown, N.J.
Keltron Corp., 225 Crescent St., Waltham, Mass.
Kingmann-White, Inc., 653 S. Melrose St., Placentia, Calif.
Newell Inds., 795 Kifer Rd., Sunnyvale, Cal.
Presin Co., Inc., Trap Falls Rd., Shelton, Conn.
RCA, Marne Hwy., Moorestown, N.J.
Struthers-Dunn, Inc., 1114 State St., Bettendorf, Iowa
Tasker Inds., 18842 Teller Ave., Newport Beach, Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
3M Co., 3M Center, St. Paul, Minn.
United Aircraft Corp., Helen St., Norwalk, Conn.
Zehntel, Inc., 1450 - 6th St., Berkeley, Calif.

Tote Boxes—See Boxes, Component / Subassembly Handling

Tower Erection & Maintenance Services—See Services, Tower Erection & Maintenance

Towers, Antenna—See Antenna Towers

Tracers, Curve, Tube & Transistor

AEL, Inc., Box 552, Lansdale, Pa.
California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif.
Spectra Sonics, 770 Wall Ave., Ogden, Utah
Tektronix, Inc., Box 500, Beaverton, Ore.

Tracers, Signal—See Testers, Signal Tracing

Tracers, Voltage Curve

Tracking Systems

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
Control Technology Co., Inc., 41-16 29th St., Long Island City, N.Y.
Geo Space Sys., Inc., 6301 49th St., N., Box 13575, St. Petersburg, Fla. ..... p 877
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 574
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Servo Corp. America, 111 New South Rd., Hicksville, N.Y.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Electrac, Inc., 1614 Orangethrope Way, Anaheim, Calif.
EMR Div., P.O. Box 44, Princeton, N.J.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Optron Corp., 50 Fitch St., New Haven, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Photo-Sonics, Inc., 820 S. Mariposa St., Burbank, Calif.
Radiation Sys., Inc., 1755 Old Meadow Rd., McLean, Va.
Rantec Div., 24003 Ventura Blvd., Calabasas, Calif.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Trailers, Instrumentation—See Laboratories, Mobile & Field

Transceivers, Airborne

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Bendix Corp., Box 9414, Ft. Lauderdale, Fla.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Granger Assocs., Dorne & Margolin, Inc., 2950 Veterans Memorial Hwy., Bohemia, N.Y.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
ISC/Telephonics Div, 770 Park Ave., Huntington, N.Y.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Republic Elctrn. Inds., Inc., 575 Broad Hollow Rd., Melville, N.Y.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transceivers, Facsimile

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA, Marne Hwy., Moorestown, N.J.

Transceivers, Infrared

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Loral Elctrn. Sys., 825 Bronx River Ave., Bronx, N.Y.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Transceivers, Single-Sideband

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Avco Corp., 2630 Glendale Milford Rd., Cincinnati, Ohio
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Sunair Elctrn., Inc., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.

Transcription Arms—See Phonograph Arms, Transcription

Transducers, Acceleration—See Accelerometers

Transducers, Displacement

Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Hamlin, Inc., 670 Lake St., Lake Mills, Wisc.
Honeywell, Box 5227, Denver, Colo.
Norden Div., Helen St., Norwalk, Conn.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
Ade Corp., 385 Waverley Ave., Newton, Mass.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.

Applied Control Co., 1275 Bloomfield Ave., Fairfield, N.J.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., S. Montrose, Pa.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Davidson Elctrn. Dev. Co., 2211 Peninsular Dr., Erie, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Foxboro Co., Foxboro, Mass.
Gould Labs., 540 E. 105th St., Cleveland, Ohio
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Humphrey, Inc., 2805 Canon St., San Diego, Calif.
IKL, Inc., 4360 Campus Dr., Newport Beach, Calif.
Jordan Controls, 5607 W. Douglas Ave., Milwaukee, Wisc.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Larson Aero Dev., Box 135, Concord, Calif.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Litton Inds., 226 E. Third St., Mt. Vernon, N.Y.
Magnedyne Inc., 5580 El Camino Real, Carlsbad, Calif.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Massa Div., 280 Lincoln St., Hingham, Mass.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
O'Brien, D. G., Inc., 15 Mercer Rd., Natick, Mass.
Optron Corp., 50 Fitch St., New Haven, Conn.
Pickering & Co., Inc., Measurement & Controls Div., 101 Sunnyside Blvd., Plainview, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Research, Inc., Box 24064, Minneapolis, Minn.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
Sostman H. E., & Co., 347 E. Lincoln Ave., P.O. Box 60, Cranford, N.J.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Systems Resch. Labs., Inc., 7001 Indian Ripple Rd., Dayton, Ohio
Task Corp., Box 3999, Anaheim, Calif.
Teledyne Gurley, 514 Fulton St., Troy, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
United Aircraft Corp., Helen St., Norwalk, Conn.
Varo Inertial Prods., Inc., 55 Merritt Blvd., Trumbull, Conn.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Transducers, Flow

Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Honeywell, Box 5227, Denver, Colo.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Avien, Inc., 58-15 Northern Blvd., Woodside, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bristol Div, Waterbury, Conn
Carolina Medical Elctrns., Inc., U.S. 52 Expwy., Box 307, King, N.C.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Hays Corp., Michigan City, Ind.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Micro-Strain, Inc., Spring City, Pa.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Transducers, Force

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Honeywell, Box 5227, Denver, Colo.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bristol Div, Waterbury, Conn
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynisco Div., 20 S. West Pk., Westwood, Mass.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Foxboro Co., Foxboro, Mass.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Interface, Inc., Box 1652, Scottsdale, Ariz.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Larson Aero Dev., Box 135, Concord, Calif.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
MB Elctrns., Box 1825, New Haven, Conn.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Task Corp., Box 3999, Anaheim, Calif.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Transducers, Impedance

Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.

Transducers, Incremental Digital Position, Rotary

Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Norden Div., Helen St., Norwalk, Conn.
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal.
Unico, Inc., 2635 Golf Ave., Racine, Wisc.
Ade Corp., 385 Waverley Ave., Newton, Mass.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Computer Conversions Corp., 6 Dunton Ct., East Northport, N.Y.
Disc Instrs., Inc., 2701 S. Halladay St., Santa Ana, Cal.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dynamics Resch. Corp., 38 Montvale Ave., Stoneham, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Singer-General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trump-Ross Ind'l. Controls, Inc., 265 Boston Rd., Billerica, Mass.
United Aircraft Corp., Helen St., Norwalk, Conn.

Transducers, Magnetic Pickup

Airpax Elctrns., Inc., Cambridge, Md.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Electro Prods. Labs., Inc., Power Supply Div., 6125-P Howard St., Chicago, Ill. ..... p 2121
International Electro-Magnetics, Inc., Eric Dr. & Cornell Ave., Palatine, Ill. ..... p 510
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1387
Norden Div., Helen St., Norwalk, Conn.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 2123
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y. ..... p 2528
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Airpax Elctrns., 1836 Floradale St., So. El Monte, Cal.
Allis, Louis Co., 427 E. Stewart St., Milwaukee, Wisc.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Dynalco Corp., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla.
Dynapar Corp., 1675 Delany Rd., Gurnee, Ill.
Electro Prods. Labs., Inc., Transducer Div., 6125-KP Howard St., Chicago, Ill.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Flow Technology, Inc., 401 S. Hayden Rd., Tempe, Ariz.
Gammatronix, Inc., Dublin, Ohio
General Instr. Corp., 33 Southwest Pk., Westwood, Mass.
Grado Labs., Inc., 4614 Seventh Ave., Brooklyn, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Pickering & Co., Inc., Measurement & Controls Div., 101 Sunnyside Blvd., Plainview, N.Y.
Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, Ill.
Sensor Corp., 97 Indian Field Rd., Greenwich, Conn.
Sensory, Inc., 1 Kennedy Rd., Morris Plains, N.J.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
United Aircraft Corp., Helen St., Norwalk, Conn.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Transducers, Power—See Transducers, Volt, Watt, Currents, etc.

Transducers, Pressure

Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md.
Computer Instrs. Corp., 92 Madison Ave., Hempstead, N.Y.
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y. ..... p 2809
Honeywell, Box 5227, Denver, Colo.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Non-Linear Sys., Inc., Box N, Del Mar, Cal. ..... p 756
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Standard Controls, Inc., 2401 S. Bayview St., Seattle, Wash. p 2126
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
Ametek, Inc., Station Square Two, Paoli, Pa.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Ametek U. S. Gauge, 746 A Clymer Ave., Sellersville, Pa.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., S. Montrose, Pa.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bofors Inds., Inc., 342 Madison Ave., New York, N.Y.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bristol Div, Waterbury, Conn
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.

Celtic Inds., Inc., 14743 Oxnard St., Van Nuys, Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Crystal Resch., Inc., 42 Concord La., Cambridge, Mass.
Datametrics Div., 127 Coolidge Hill Rd., Watertown, Mass.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Dynisco Div., 20 S. West Pk., Westwood, Mass.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Hays Corp., Michigan City, Ind.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hudson Corp., Box 867, Manchester, N.H.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Lion Precision Div., 60 Bridge St., Newton, Mass.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Massa Div., 280 Lincoln St., Hingham, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Medistor Instr. Co., 4503 8th Ave., N.W., Seattle, Wash.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
MKS Instrs., Inc., 45 Middlesex Tpke., Burlington, Mass.
Moore Inds., Inc., 8158 Orion Ave., Van Nuys, Cal.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Scanivalve, Inc., Box 20005, San Diego, Calif.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Sostman H. E., & Co., 347 E. Lincoln Ave., P.O. Box 60, Cranford, N.J.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Teledyne Sys. Co., 200 N. Aviation Blvd., El Segundo, Calif.
Teledyne Taber, 455 Bryant St., No. Tonawanda, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
3M Co., 3M Center, St. Paul, Minn.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
United Control Corp., Redmond, Wash.
Vactric Control Equip., Ltd., Garth Rd., Morden, Surrey, England
Validyne Engrg. Corp., 18819 Napa St., Northridge, Cal.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Viatran Corp., 1720 Military Rd., Buffalo, N.Y.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wintriss Controls, 20 Vandam St., New York, N.Y.

Transducers, Sonar

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Aiden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Benmar Div., 3000 W. Warner Ave., Santa Ana, Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Empire Sci. Corp., Ind'l. Instr. Div., 1055 Stewart Ave., Garden City, N.Y.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
International Transducer Corp., 640 McCloskey Pl., Goleta, Cal.
Massa Div., 280 Lincoln St., Hingham, Mass.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
Sanders Assocs., Inc., Ocean Sys. Div., Daniel Webster Hwy., So. Nashua, N.H.
Sparton Corp., 2400 E. Ganson St., Jackson, Mich.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Transducers, Sound Velocity

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Automatic Clerical Sys., Inc., 389 N. Fair Oaks Ave., Pasadena, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Brys Instr. Corp., 7026 Sixth Ave., Brooklyn, N.Y.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Chesapeake Instr. Corp., Shadyside, Md.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Geo Space, 5803 Glenmont, Houston, Tex.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Massa Div., 280 Lincoln St., Hingham, Mass.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.

Transducers, Strain Gauge

Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Honeywell, Box 5227, Denver, Colo. ..... p 691
Automation Inds., Inc., Box 950, Boulder, Colo.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dillon, W.C. & Co., Inc., 14620-EP Keswick St., Van Nuys 340, Calif.
Doric Sci. Corp., 7969 Engineer Rd., San Diego, Calif.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Dynisco Div., 20 S. West Pk., Westwood, Mass.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Fairchild Controls, 423 National Ave., Mountain View, Calif.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Houston Scientific Inds., Inc., 3925 Dacoma Rd., Sec. E, Houston, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Interface, Inc., Box 1652, Scottsdale, Ariz.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
MB Elctrns., Box 1825, New Haven, Conn.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
Sigma Sys. Corp., 1703 Oak Lawn Ave., Dallas, Texas
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Teledyne Taber, 455 Bryant St., No. Tonawanda, N.Y.
Thwing-Albert Instr. Co., 10960 Dutton Rd., Philadelphia, Pa.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Transducers, Inc., 11971 E. Rivera Rd., Santa Fe Springs, Calif.
Transidyne-General Corp., 462 S. Wagner Rd., Ann Arbor, Mich.
Viatran Corp., 1720 Military Rd., Buffalo, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.

Transducers, Temperature

Airpax Elctrns., Inc., Cambridge, Md.
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Cox & Co., Inc., 215 Park Ave., S., New York, N.Y. ..... p 2106
Dynasciences Corp., 9601 Canoga Ave., Chatsworth, Calif.
Elmwood Sensors, Inc., 1653 Elmwood Ave., Cranston, R.I.
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Harrel, Inc., 16 Fitch St., E. Norwalk, Conn. ..... p 2111
Hoagland Instr. Co., 65 Chestnut St., Box 830, Red Bank, N.J.
Keystone Carbon Co., St. Marys, Pa. .....p 2116,2117
Relco Prods., Inc., 5594 E. Jefferson Ave., Denver, Colo. p 779
RFL Inds., Inc., Thermocontrol Div., Boonton, N.J.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Weed Instr. Co., Inc., Box 549, 109 W. 11th St., Elgin, Tex. p 2119
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J.
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Airpax Elctrns., 1836 Floradale St., So. El Monte, Cal.
Alpha-Monarch Corp., 10030 Monroe, Dallas, Tex.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
Amprobe Instr., 630 Merrick Rd., Lynbrook, N.Y.
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Artronix, Inc., 716 Hanley Ind'l. Ct., St. Louis, Mo.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Beacon Elctrns., Inc., 121 Stanley Ave., Bellmawr, N.J.
Beckman Instrs., Inc., Process Instrs. Div., 2500 Harbor Blvd., Fullerton, Calif.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., 5301 Edina Industrial Blvd., Minneapolis, Minn.
Clark Elctrns. Lab., 1570 E. Edinger Ave., Ste. K, Santa Ana, Cal.
Climet Instrs., 1240 Birchwood Dr., Sunnyvale, Cal.
Conax Corp., 2900 Walden Ave., Buffalo, N.Y.
David Inds., 2202 S. Wright, Santa Ana, Cal.
Dentronics, Inc., 60 Oak St., Hackensack, N.J.
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Edison, Thomas A. Inds., 36 Lakeside Ave., W. Orange, N.J.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
Genisco Tech. Corp., Instr. Div., 18435 Susana Rd., Compton, Cal.
Hays Corp., Michigan City, Ind.
Heat Technology Lab, Inc., 4308 Governor Dr., Huntsville, Ala.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
High Temperature Instr. Corp., 5 Union Hill Rd., W. Conshohocken, Pa.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hy-Cal Engrg., 12105 Los Nietos Rd., Santa Fe Springs, Calif.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Ircon Inc., 207 Lawrencewood Ctr., Niles, Ill.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kulite Semiconductor Prod., Inc., 1030 Hoyt Ave., Ridgefield, N.J.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Micro-Strain, Inc., Spring City, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Mikron Instr. Co., Box 211, Ridgewood, N.J.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pennsylvania Elctrns. Technology, Inc., 1397 Frey Rd., Pittsburgh, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Ramsay Engrg. Co., 707 N. Anaheim Blvd., Anaheim, Calif.
RDF Corp., 23 Elm Ave., Hudson, N.H.
RDF West, 9371 Kramer Ave., Westminster, Calif.
Riverbank Labs., Box 110, Geneva, Ill.
Rosemount Engrg. Co., Box 35129, Minneapolis, Minn.
Sensotec Div., 1400 Holly Ave., Columbus, Ohio
Sostman H. E., & Co., 347 E. Lincoln Ave., P.O. Box 60, Cranford, N.J.
Sparton Corp., 2400 E. Ganson St., Jackson, Mich.
Sparton Southwest, Inc., 9621 Coors Rd., N.W., Albuquerque, N.M.
T & T Controls Co., Inc., Box 171, Media, Pa.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Technology/Versatronics, Inc., 506 S. High St., Yellow Springs, Ohio
Thermal Sys., Inc., 13920 S. Broadway, Los Angeles, Calif.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
3M Co., 3M Center, St. Paul, Minn.
TIA Elec. Co., Box 777, Princeton, N.J.
Trans-Sonics, Inc., P.O. Box 326, Lexington, Mass.
Tylan Corp., 4203 Spencer St., Torrance, Calif.
United Control Corp., Redmond, Wash.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Versitherm, Inc., 51 Toledo St., Farmingdale, N.Y.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Transducers, Thermoelectric—See Transducers, Temperature

Transducers, Torque

Ade Corp., 385 Waverley Ave., Newton, Mass.
Ametek/Instrs. & Controls, 860 Pennsylvania Blvd., Feasterville, Pa.
B & F Instrs., Inc., Cornwells Hgts., Pa.
Bendix Corp., S. Montrose, Pa.
Bergen Labs., Inc., 60 Spruce St., Paterson, N.J.
BLH Elctrns., Inc., 42 Fourth Ave., Waltham, Mass.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.

Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
Falcon Div., 164 Ballardvale St., Wilmington, Mass.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Interface, Inc., Box 1652, Scottsdale, Ariz.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Larson Aero Dev., Box 135, Concord, Calif.
Lebow Assocs., Inc., 1728 Maplelawn Rd., Troy, Mich.
Measurement Sys., Inc., 523 West Ave., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Strainsert Co., 24 Summit Grove Ave., Bryn Mawr, Pa.
Tensitron, Inc., P.O. Box 185, Dept. EEM, Harvard, Mass.
Transducer Controls Corp., 737 N. Dodsworth, Covina, Calif.
Tyco Bytrex Div., Inc., 223 Crescent St., Waltham, Mass.
Vibrac Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass.
West Coast Resch. Corp., Box 25061, Los Angeles, Calif.
Wood, C.N. Mfg. Co., Rte. 332 E., Newtown, Pa.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Transducers, Ultrasonic

Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Gould, Inc., 232 Forbes Rd., Bedford, Ohio
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Automation Inds., Inc., Shelter Rock Rd., Danbury, Conn.
Automation Inds., Inc., Box 950, Boulder, Colo.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bourns Euphonics, 681 Old Willetts Path, Smithtown, N.Y.
California Avionics Labs., Inc., Box 701, Palo Alto, Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Commander Labs., Inc., 1177 W. Washington Ave., Escondido, Calif.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Erie Technological Prods., Inc., 644 West 12 St., Erie, Pa.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
International Transducer Corp., 640 McCloskey Pl., Goleta, Cal.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Lewis Corp., Rte. 6, Woodbury, Conn.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Marcal Electro-Sonics, P.O. Box 185, Burkank, Calif.
Massa Div., 280 Lincoln St., Hingham, Mass.
National Sonics Corp., 43 Milbar Blvd., Farmingdale, N.Y.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Union Ultra-Sonics Corp., 576 Lawrence St., Lowell, Mass.
Valpey-Fisher Corp., 1015 First St., Holliston, Mass.
Wheelabrator Corp., 1478 S. Byrkit St., Mishawaka, Ind.

Transducers, Vibration

B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Dytronics Co., Inc., 4800 Evanswood Dr., Columbus, Ohio p 604
Honeywell, Box 5227, Denver, Colo.
Metrix Instr. Co., Box 36501, Houston, Tex. ..... p 2122
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
Amstro Corp., 114 Clinton Rd., Fairfield, N.J.
Aperco Co., 1383 Luddington Rd., East Meadow, N.Y.
Barry Instr. Corp., Box 252, Los Alamitos, Cal.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Decker Corp., 101 Monument Rd., Bala-Cynwyd, Pa.
Dyna Magnetic Devices, Inc., 200 Frank Rd., Hicksville, N.Y.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Dynamic Precision Controls Corp., 449 E. Main St., Hagerstown, Ind.
E.B.L. Co, 78 Tolland St., R., East Hartford, Conn.
Electro-Sonic Control, 1625 N. Main, Manteca, Calif.
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gulton Inds., Inc., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
H H Controls Co., Inc., 16 Frost St., Arlington, Mass.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
Kaman Nuclear, Div., 1700 Garden of the Gods Rd., Colorado Springs, Colo.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Larson Aero Dev., Box 135, Concord, Calif.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Marathon Instrs. Div., 9626 E. Beverly Rd., Pico Rivera, Calif.
Mark Prods., Inc., 3935 Fairhill Dr., Houston, Tex.
Massa Div., 280 Lincoln St., Hingham, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Optron Corp., 50 Fitch St., New Haven, Conn.
PCB Piezotronics, Inc., 3311 Walden Ave., Depew, N.Y.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Statham Instrs., Inc., 2230 Statham Blvd., Oxnard, Cal.
Wintriss Controls, 20 Vandam St., New York, N.Y.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Transducers Volt, Watt, Current, Var, Power Factor, Frequency

American Aerospace Controls, Inc., 131 Verdi St., Farmingdale, N.Y. ..... p 1361-1363
Bell, F.W., Inc., 4949 Freeway Dr., E., Columbus, Ohio..... p 2120
Fairchild Controls, 225 Park Ave., Hicksville, N.Y.
Flight Sys., Inc., Box 25, Mechanicsburg, Pa.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
International Rectifier, 233 Kansas St., El Segundo, Cal.
ISC Magnetics Div., 770 Park Ave., Huntington, N.Y. ..... p 1894
Narda Microwave Corp., Plainview, N.Y.
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio p 761,2123
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Rustrak Instr. Div., Municipal Airport, Manchester, N.H.
Scientific Columbus, Inc., 1035C W. Third Ave., Columbus, Ohio p 2124
Voltron Products, Inc., 403 S. Raymond Ave., Pasadena, Cal. p 809
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Westinghouse Elec. Corp., Plane & Orange Sts., Newark, N.J. p 814
A & M Instrument, Inc., Community Dr., Great Neck, N.Y.
Acromag, Inc., 30765 Wixom Rd., Wixom, Mich.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bristol Div, Waterbury, Conn.
Evans Assocs., P.O. Box 5055, Berkeley, Calif.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hudson Corp., Box 867, Manchester, N.H.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Phaostron Instr. & Elctrn. Co., 151 Pasadena Ave., So. Pasadena, Cal.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
Telecraft Elctrns. Co., Inc., 125 Schmitt Blvd., Farmingdale, N.Y.

Transformers, Audio

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877,2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd.; 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Autotransformer

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.

Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2890,2891
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ..... p 2897
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Eastern Specialty Co., 3619 N. Eight St., Philadelphia, Pa.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Invertronics, Box 342, Pine Brook, N.J.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Model Rectifier Corp., 2500 Woodbridge Ave., Edison, N.J.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
SRC Div., 2222 Michelson Dr., Newport Bch., Cal.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Buffalo, N. Y.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Bias

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2850
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Nortronics Co., Inc., 8101 10th Ave., N., Minneapolis, Minn. p 527
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Torwico Elctrns., Inc. Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Bridging

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. .... p 2890
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, Chopper

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. ..... p 2143
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.

Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, Constant Voltage

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ... p 2852
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ... p 2856,2857
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. ... p 2864
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa. ... p 2876
North Elec. Co., 553 S. Market St., Galion, Ohio
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. ... p 2892,2893
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ... p 2885
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ... p 1289
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utah Elctrns., 1124 E. Franklin St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, Control

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ... p 2852
DDC, Dept. 21, 100 Tec St., Hicksville, N.Y. ... p 554
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. ... p 2860,2861
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio ... p 2341
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ... p 2874
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. ... p 2877,2878
North Elec. Co., 553 S. Market St., Galion, Ohio
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. ... p 2887,2892,2893
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ... p 2897
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind. ... p 2907
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caig Labs., Inc., 155 Sullivan La., Westbury, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Furnas Elec. Co., 1197 McKee St., Batavia, Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hyperion Inds. Corp., 134 Coolidge Ave., Watertown, Mass.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Westinghouse Elec. Corp., Box 231, Greenville, Pa.

Transformers, Converter, D-C To D-C

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ... p 2335
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D. ... p 2338
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio ... p 2341
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ... p 2873
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. ... p 2878
North Elec. Co., 553 S. Market St., Galion, Ohio
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex. ... p 1289
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind. ... p 2907
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Beebe Instrs., Inc., P.O. Box 137, N. White Plains, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Halmar Elctrns., Inc., 1544 W. Mound St., Columbus, Ohio
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.

Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Current—See Transformers, Instrument

Transformers, Current Limiting

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2859
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1062
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetics, Inc., Box 391, Butler, Pa.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa. p 2876
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. .... p 2886
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ..... p 2885
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Ratelco, Inc., 610 Pontius Ave. N., Seattle, Wash.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Decade

Arnold Magnetics Corp., Box K, Culver City, Calif.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Transformer Co., 150 Varick St., New York, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Transformers, Differential

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Aimes Inds., P.O. Box 73, Lockport, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns, Inc., 6135 Magnolia, Riverside, Calif.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Kavlico Elctrns., Inc., 20869 Plummer St., Chatsworth, Calif.
Minnetech Labs., Inc., 8115 10th Ave., N., Minneapolis, Minn.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Pickering & Co., Inc., Measurement & Controls Div., 101 Sunnyside Blvd., Plainview, N.Y.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Robinson-Halpern Co., 5 Union Hill Rd., W. Conshohocken, Pa.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Transformers, Discriminator

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Donut—See Transformers, Toroidal

Transformers, Driver

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2859
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal. p 2872
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio

Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Filament

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2850
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif...p 2856,2857
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 1062
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877,2878
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill...... p 2885
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A.C. Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, 400 CPS

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif......p 2848,2849
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal...... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y...... p 2873
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal...... p 1271
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2901
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.

Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, Flyback

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2330
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, HUM Reducing

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Grand Transformers, Inc., Beechtree & Manon Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.

Transformers, HV

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Beckman Instrs., Inc., 89 Commerce Rd., Cedar Grove, N.J.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Elctrn. Resch. Assocs., Inc., 67 Sand Park Rd., Cedar Grove, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Kilovolt Corp., 238 High St., Hackensack, N.J.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Beebe Instrs., Inc., P.O. Box 137, N. White Plains, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Fischer, H.G. & Co., 9451-9491 W. Belmont Ave., Franklin Park, Ill.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Peschel Instrs., Inc., Cape Coral Ind'l. Pk., Box 847, Cape Coral, Fla.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, I-F

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ..... p 2331
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 2883
Nytronics, Inc., Orange St., Darlington, S.C.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ..... p 2346
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Cambridge Thermionic Corp. 445 Concord Ave. Cambridge, Mass
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Teikoku Tsushin Kogyo Co., 335, Nishi-Nakamachi, Aza Kariyado, Kawasaki-Shi, Kanagawa Pref., Japan
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transformers, Input

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y. p 2853
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877,2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NWL, Inc., Box 455, Trenton, N.J.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1270-1272
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.

Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Olektron Corp., Box 248, Dudley, Mass.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Instrument

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Associated Research, Inc., 3773 W. Belmont Ave., Chicago, Ill.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 612
Colorado Hickok Corp., 2897 North Ave., Grand Junction, Colo.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Esterline Angus Div., Box 24000, Indianapolis, Ind.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..p 2856,2857
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hoyt Elec. Instr. Works, Inc., 556 Trapelo Rd., Belmont, Mass. p 713
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877,2878
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Princeton Applied Resch. Corp., Box 565, Princeton, N.J.
Sangamo Elec. Co., Box 128, Pickens, S.C.
Simpson Elec. Co., 5200 W. Kinzie St., Chicago, Ill.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. ..... p 2143
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ....p 2898,2899
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wacline, Inc., 35 S. Saint Clair St., Dayton, Ohio ..... p 811
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Annis, R.B. Co., 1101 N. Delaware St., Indianapolis, Ind.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Components Corp., Box 157, Addison, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Pearson Elctrns., Inc., 4007 Transport St., Palo Alto, Calif.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, Interstage

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Instr. Corp., 65 Gouverneur St., Newark, N.J.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Isolation

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2850
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 612
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.

Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878,2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
NWL, Inc., Box 455, Trenton, N.J.
RCA, 415 S. 5th St., Harrison, N.J. ..... p 776
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2891,2894
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill..... p 2885
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ..... p 2897
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1270-1272
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..p 2904,2905
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Argonaut Assocs., Inc., P.O. Box K, Beaverton, Ore.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electronic Safety Controls, Inc., 1411 N. Corn St., Joliet, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Hughey & Phillips, Inc., 3050 N. California St., Burbank, Calif.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Box 231, Greenville, Pa.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Line

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2860,2861
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2886,2887,2889,2891
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1270
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electronic Safety Controls, Inc., 1411 N. Corn St., Joliet, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oaktron Inds., Inc., Monroe, Wisc.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Linear

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Clifton, 5050 State Rd., Drexel Hills, Pa.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.

Transformers, Magnetic Amplifier—See Transformers, Saturable

Transformers, Matched, Precision

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RF Amplifier Co., 88 Brook Ave., Deer Pk., N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, Matching

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Alford Mfg. Co., 120 Cross St., Winchester, Mass.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y. ..... p 861
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Electro Impulse, Inc., 116 Chestnut St., Red Bank, N.J. ..... p 873
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858,2859
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Krohn-Hite Corp., 580 Massachusetts Ave., Cambridge, Mass.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Antennacraft Co., Box 1005, Hwy. 34, W., Burlington, Iowa
Astrolab Inc., 4 Mc Candless St, Linden, N J
Atlas Sound Div., 10 Pomeroy Rd., Parsippany, N.J.
Ava Elctrns., 416 Long La., Upper Darby, Pa.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicott, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Delta Elctrns., Inc., 4206 Wheeler Ave., Alexandria, Va.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
Elcom Sys., Inc., 151-24 W. Industry Ct., Deer Pk., N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Voice, Inc., 600 Cecil St., Buchanan, Mich.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hy-Gain Elctrns. Corp., R.R. 3, Lincoln, Nebr.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Koss Elctrns., Inc., 2227 North 31st St., Milwaukee, Wisc.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Quam-Nichols Co., Marquette Rd. at Prairie Ave., Chicago, Ill.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RMS Electronics, Inc., 50 Antin Pl., Bronx, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sitco Antennas, 10330 N.E. Marx St., Portland, Ore.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Trylon, Inc., Elverson, Pa.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
View-All Television Prods. Corp., 2510 Electronics Dr., Anniston, Ala.

Transformers, Matrix

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.

Transformers, Mercury Vapor

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Invertronics, Box 342, Pine Brook, N.J.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Transformers, Metered

Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2884
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 2900
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.

Transformers, Microphone

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
United Transformer Co., 150 Varick St., New York, N.Y.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Geloso Elctrns., Inc., 251 Park Ave., S., New York, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Bogen Div., P.O. Box 500, Paramus, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.

Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Stancor, 3501 W. Addison St., Chicago, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, Microwave

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Transco Prods., Inc., 4241 Glencoe Ave., Venice, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..p 2904,2905
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Aircom, Inc., Rte. 16B, Union, N.H.
Astrolab Inc., 4 Mc Candless St, Linden, N J
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Transformers, Miniature, Subminiature & Microminiature

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2848-2851
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 612
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..p 2856,2857
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877-2879
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2894,2895
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. ..... p 2143
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. ..... p 2902
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2901
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..p 2904,2905
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Dano Electric, Main St., Winsted, Conn.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Components Corp., Box 157, Addison, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Pico Elctrns., Inc., 316 W. First St., Mt. Vernon, N.Y.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
Stancor, 3501 W. Addison St., Chicago, Ill.
Stanford Int'l., Box 266, San Carlos, Calif.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Western Transformer Co., Box 370, Tijeras, N. M.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Mixing

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, Modulation

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.

Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co., Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.

Transformers, Output

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y. p 2853
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2859
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2860,2861
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y. p 2863
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877-2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa. p 2876
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. .... p 2895
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ..... p 2897
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Components Specialties, Inc., 39 St. Marys Pl., Freeport, N.Y.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jensen Mfg. Div., 5655 West 73rd St., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Round Hill Assoc. Inc., 325 Hudson St., New York, N.Y.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Phase Conversion

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
Aritech Corp., 130 Lincoln St., Brighton, Mass.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dynamic Instr. Corp., 115 E. Bethpage Rd., Plainview, N.Y. p 2853
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Merrimac Resch. & Dev., Inc., 41 Fairfield Pl., West Caldwell, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.

Transformers, Photoflash Power

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1713
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Plate

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ..... p 2885
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio

TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Knopp, Inc., 1307 66th St., Oakland, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Power

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2850,2851
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Austron, Inc., 10214 N. Interregional Hwy., Austin, Tex.
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Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
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H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
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Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
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Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2886-2891,2894
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
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TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2901
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Universal Voltronics Corp., 27 Radio Cir. Dr., Mt. Kisco, N.Y.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2905
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind. ..... p 2907
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
A C Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St. Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Invertronics, Box 342, Pine Brook, N.J.
James Elctrns., Inc., 4050 N. Rockwell St., Chicago, Ill.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Box 231, Greenville, Pa.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Printed Circuit Mounting

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
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Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877-2879
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ..... p 2345
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2894,2895
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo. .....p 2902,2903
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2901
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.

Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Components Corp., Box 157, Addison, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stancor, 3501 W. Addison St., Chicago, Ill.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transformers, Pulse

AEL, Inc., Box 552, Lansdale, Pa.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 929
Amp Inc., Box 3608, Harrisburg, Pa.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
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Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858,2859
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Gulton Inds., Inc., Microceramics Div., Metuchen, N.J.
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif.
Powertec, 9168 De Soto Ave., Chatsworth, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass..... p 2306
TDK Elctrns. Corp., 23-73 48th St., Long Island City, N.Y. p 2639
Tobe Deutschmann Labs., 550 Turnpike St., Box 74, Canton, Mass. ..... p 2311
Tohoku Metal Inds., Ltd., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Vidcor Co., Inc., 1251 W. El Segundo Blvd., Gardena, Cal. p 2588
Zaring Inds., Inc., Box 477, Carmel, Ind.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Berkshire Labs., 107 Tansy Hill Rd., Milford, N.Y.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Burmac Elctrns., 80 Montauk Hwy., Lindenhurst, N.Y.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
Contemporary Elctrns., 4838 W. 35th St., Minneapolis, Minn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E-H Resch. Labs., Inc., Box 1289, Oakland, Cal.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hudson Corp., Box 867, Manchester, N.H.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
LAD Electro-Sys., Inc., 7 Commercial St., Hicksville, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Modelectric Prods. Corp., 9 Cindy La (Wayside), Asbury Park, N.J.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Obrisco Electronics, Inc., 110 Valley Rd., Wilmington, Del.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Pearson Elctrns., Inc., 4007 Transport St., Palo Alto, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transformers, Rectifier

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, N.J.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
NWL, Inc., Box 455, Trenton, N.J. ..... p 2882
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. .... p 2890
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
A C Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
B.H. Inds., 5794 Venice Blvd., Los Angeles, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
"EDC (Electro Dev. Corp.)", Box 100, 16700 13th Ave., W., Lynnwood, Wash.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.

Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Rapid Elec. Co., 1300 Herschell St., Bronx, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Reference

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ... p 2852
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ... p 2858
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2887,2891,2894
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Inet-Power, 711 W. Knox St., Gardena, Calif.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.

Transformers, R-F

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y. ... p 2331
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ... p 2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N.Y. p 2336
Dale Elctrns., Inc., Box 180, Yankton, S.D. ... p 2338
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J. ... p 882
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ... p 2873
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal. ... p 2345
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
Nytronics, Inc., Orange St., Darlington, S.C.
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y. ... p 2346
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Astrolab Inc., 4 Mc Candless St, Linden, N.J.
Avionics, Inc., 1915 Bendix Dr., South Bend, Ind.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Edwin Inds. Corp., 11933 Tech Rd, Silver Spring, Md.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Fugle-Miller Labs., 130 Market St., Kenilworth, N.J.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Morey Corp, 2659 Wisconsin Ave., Downers Grove, Ill.
Mutron Corp., 646 Summer St, Brockton, Mass.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Optimax, Inc., 258 N. Main St., Ambler, Pa.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raybond Elctrns., Inc., 930 Washington St., Norwood, Mass.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Relcom, 2329 Charleston Rd., Mt. View, Calif.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Smallwood, S.G., Ltd., 391-397 King St., E., Kitchener, Ont., Canada
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Syscon Int'l., Inc., 205 Sycamore St., So. Bend, Ind.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Warsaw Coil Co. Inc., Box 389, Warsaw, Ind.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Rotary

Clifton, 5050 State Rd., Drexel Hills, Pa.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Electric Indicator Co., Inc., 195 Danbury Rd., Wilton, Conn.
Himmelstein, S. & Co., 2500 Estes Ave., Elk Grove Village, Ill.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.

Transformers, Saturable

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ... p 2858,2859
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal. p 2872
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Macarr, Inc., 166 National Rd., Edison, N.J.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
North Elec. Co., 553 S. Market St., Galion, Ohio
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio
Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Transmagnetics, Inc., 134-25 Northern Blvd., Flushing, N.Y.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Servo

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
Clifton, 5050 State Rd., Drexel Hills, Pa.

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2857
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Gap Instr. Corp., 110 Marcus Blvd., Hauppauge, N.Y. ..... p 1992
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2879
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Bendix Corp., S. Montrose, Pa.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Collins Radio Co., Dallas, Tex.
Edison, T.A., Instr. Div., Box 8364, Ft. Lauderdale, Fla.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.

Transformers, Step-Down, Step-Up

Abbott Transistor Labs., Inc., 5200 W. Jefferson Blvd., Los Angeles, Calif. ..... p 2848-2851
ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Astro-Metrix Corp., 125 W. Providencia Ave., Burbank, Cal.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Elcor Prods. Welex Elctrns., 2431 Linden La., Silver Spring, Md. p 1024
Electro Cube, Inc., 1710 S. Del Mar Ave., San Gabriel, Calif.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2857
Ferrotran Elctrn. Co., Inc., 693 Broadway, New York, N.Y. p 2855
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Gates Elctrn Co., Inc., 256 Van Nest Ave., Bronx, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Hipotronics, Inc., Rte. 22, Drawer A, Brewster, N.Y.
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal. p 2872
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877-2879
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y... p 2883
NWL, Inc., Box 455, Trenton, N.J.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J.
RFL Inds., Inc., Instr. Div., Powerville Rd., Boonton, N.J.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2886-2889,2891,2892,2894,2895
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ..... p 2885
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ..... p 2897
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1270,1271
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J. ..... p 2901
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..... p 2904
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Wanlass Elec. Co., 1815 S. Ritchey St., Santa Ana, Cal.
Zaring Inds., Inc., Box 477, Carmel, Ind. ..... p 2907
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
A C Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Continental X-Ray Corp., 1536 Clybourn Ave., Chicago, Ill.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dano Electric, Main St., Winsted, Conn.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Magnetic Prods., Box 708, Wabash, Ind.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Components Corp., Box 157, Addison, Ill.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.
Energy Comps., Inc., 834 S. Broadway, New Lisbon, Wisc.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Elec. Co., 95 Hathaway St., Providence, R.I.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
Jerome Elec. Corp., 391 Lakeside Ave., Orange, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lee Elec., Inc., 309-51st St., W. New York, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Magnetics, Sandy Lake, Pa.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
Miller, Sanford Corp., 89 Throop Ave., Brooklyn, N.Y.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Sierra Elec., 15100 S. Figueroa St., Box 85, Gardena, Calif.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Touch-Plate Electro-Sys., Inc., 16530 Garfield Ave., Paramount, Calif.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Virginia Elctrns, Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Box 231, Greenville, Pa.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Toroidal

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Amp Inc., Box 3608, Harrisburg, Pa.
Arnold Magnetics Corp., Box K, Culver City, Calif. ..... p 959
Artronic Instr. Co., 11232 Triangle La., Silver Spring, Md.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y. ..... p 612
Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y. p 2336
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Diversified Elctrns., Inc., Box 6231, Evansville, Ind. ..... p 1749
Dressen-Barnes Elctrns. Corp., 250 N. Vinedo Ave., Pasadena, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Glentronics, Inc., 748 E. Alosta Ave., Box 66, Glendora, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Hisonic, Inc., 249 N. Troost, Olathe, Kans.
Ind'l. Control Co., Central Ave. at Pinelawn, Farmingdale, N.Y.
JFD Elctrns. Corp/Sub. Riker-Maxson Corp., 1484 62nd St., Brooklyn, N.Y.
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2878
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
Seg Elctrns. Corp., 120-30 Jamaica Ave., Richmond Hill, N.Y.
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Superior Elec. Co., 1000 Middle St., Bristol, Conn.
TEC/Tecnetics, Inc., Box 910, Boulder Ind'l. Pk., Boulder, Colo.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Electronics Co., 2928 Nebraska Ave., Santa Monica, Cal.
Ace Coil & Elctrns. Corp., 916 Lincoln Hwy., Metuchen, N.J.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
Ballastran Corp., 600 E. Votaw St., Portland, Ind.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bunday Elctrns. Corp., 44 Fadem Rd., Springfield, N.J.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Coil Co., Inc., 110 W. Morgan St., Martinsville, Ind.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Component Tech. Corp., 17 Brooklyn Ave., Westbury, N.Y.
Components Corp., 2857 N. Halsted St., Chicago, Ill.
De Coursey Engrg. Lab., 11828 W. Jefferson Blvd., Culver City, Cal.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electro Windings & Comps., Inc., 725 Federal Ave., Kenilworth, N.J.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
EMP Elctrns., Inc., Box 2346, Phoenix, Ariz.

Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grafix, Inc., Box 3296, Albuquerque, N.M.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Harder, Donald C. Co., Inc., 2580 "K" St., San Diego, Calif.
Inductor Engrg., Inc., 117 Schley Ave., Lewes, Del.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
McCarron Elec. Co., 721 Monterey Pass Rd., Monterey Park, Calif.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Novatronics, Inc., Box 878, Pompano Beach, Fla.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Osborne Transformer Corp., 3834 Mitchell Ave., Detroit, Mich.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Profile Elctrns., Inc., Box 314, Concord, N.H.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Mich.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
RMS Engineering, Inc., 486 14th St., N.W., Atlanta, Ga.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Skyway Magnetics, 637 Isis Ave., Inglewood, Calif.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Stanford Applied Engrg., 340 Martin Ave., Santa Clara, Cal.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Torelco Inc., 51 Smith St., Box 108, Irvington, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Vectrol, Inc., 1010 Westmore Ave., Rockville, Md.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.
Western Transformer Co., Box 370, Tijeras, N. M.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Transformers, Transistor

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Computer Comps., Inc., 88-06 Van Wyck Expwy., Jamaica, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal. ..... p 2852
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
K.G.S. Elctrns., Inc., 2029 N. Lincoln Ave., Pasadena, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y. p 2877
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal. .. p 2881
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. .... p 2895
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Custom Coil Co., Box 2624, Zanesville, Ohio
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Mid-West Coil & Transformer Co., 1642 N. Halstead St., Chicago, Ill.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Power Elctrns. Co., 5701 Savoy La., Houston, Tex.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Sage Elctrns. Corp., Micromagnetics Prods., Box 3926, Rochester, N.Y.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.

Transformers, Ultrasonic

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Automation Inds., Inc., 1901 Bldg., 20th Floor, Century City, Los Angeles, Calif.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Beebe Instrs., Inc., P.O. Box 137, N. White Plains, N.Y.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
JB Elctrn. Transformers, Inc., 2300 W. Armitage Ave., Chicago, Ill.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Precision Elctrns., Inc., 1 Di Tomas Ct., Amityville, N.Y.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Redman Elctrns. Corp., P.O. Box 72, Enfield, Conn.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Spectran Elctrns., P.O. Box 878, Pompano Beach, Fla.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Variable

Allen Avionics, Inc., 255 East 2nd St., Mineola, N.Y.
American Trans-Coil Corp., 124-06 101st Ave, Richmond Hill, N.Y.
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Dale Elctrns., Inc., Box 180, Yankton, S.D.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Delevan Div., 270 Quaker Rd., E. Aurora, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 2860,2861
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Miller, J.W. Co., 19070 Reyes Ave., Compton, Cal.
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2884
Spellman High Voltage Elctrns. Corp., 1930 Adee Ave., Bronx, N.Y.
Staco, Inc., 2240 E. 3rd St., Dayton, Ohio ..... p 2897
Superior Elec. Co., 1000 Middle St., Bristol, Conn. .. p 2898-2900
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bush Transformer, 707 North St., Endicot, N.Y.
Carson Mfg. Co., Inc., 2426 E. 55th St., Indianapolis, Ind.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Collins, G.L. Corp., 5875 Obispo Ave., Long Beach, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
Electro Assemblies, Inc., 4338 W. Montrose Ave., Chicago, Ill.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
General Coil Prods. Corp., 156 Hinsdale St., Brooklyn, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
Model Rectifier Corp., MRC Elctrns. Div., 2500 Woodbridge Ave., Edison, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Ragen Precision Inds., Inc., 9 Porete Ave., N. Arlington, N.J.
Renco Elctrns., Inc., 240-1 Old Country Rd., Hicksville, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Virginia Elctrns. Co., Inc., 2908 Telestar Ct., Falls Church, Va.

Transformers, Vibrator

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
United Transformer Co., 150 Varick St., New York, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bush Transformer, 707 North St., Endicot, N.Y.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Electrical Windings, Inc., 2015 N. Kolmar Ave., Chicago, Ill.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Grand Transformers, Inc., Beechtree & Marion Sts., Box 188, Grand Haven, Mich.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Rae Co. Inc., 3725 East 13th St., Indianapolis, Ind.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Universal Transistor Prods., 380 Oak St., Copiague, N.Y.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Voltage-Dividing

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
Astrosystems, Inc., 6 Nevada Dr., Lake Success, N.Y.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Electro Scientific Inds., Inc., 13900 N.W. Science Pk. Dr., Portland, Ore. ..... p 2808

Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal.
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y.
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
North Atlantic Inds., Inc., 200 Terminal Dr., Plainview, N.Y.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y.
NWL, Inc., Box 455, Trenton, N.J.
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y.
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Unitron, 1624 N. First St., Box 1331, Garland, Tex.
Varo Inc., 1600 Dallas N. Pkwy., Plano, Tex.
Zaring Inds., Inc., Box 477, Carmel, Ind.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Automatic Control Elctrns. Co., Box 20264, San Antonio, Tex.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Bush Transformer, 707 North St., Endicot, N.Y.
Cal-Power Corp., 140 Kansas St., El Segundo, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dormeyer Inds., 3418 Milwaukee Ave., Chicago, Ill.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gladding-Keystone Corp., 179 River St, Oneonta, N.Y.
Guildline Instrs., Inc., 1997 Palmer Ave., Larchmont, N.Y.
Hallmark Standards, Inc., 257 Washington St., Mt. Vernon, N.Y.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Idalee Elctrns. Corp., 891 Fulton St., Valley Stream, N.Y.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
Optimation, Inc., 9421 Telfair Ave., Sun Valley, Calif.
Perkin-Elmer Corp., 131 Danbury Rd., Wilton, Conn.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Welco Inds. Inc., 9027 Shell Ave., Cincinnati, Ohio
Wintron Co., Inc., 9759 Rush St., S. El Monte, Calif.

Transformers, Voltage-Regulating-Also See Regulators & Stabilizers, Voltage

ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2857
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1062,2860,2861
Kepco, Inc., 131-38 Sanford Ave., Flushing, N.Y.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Merrimack Magnetics, 361 Aiken St., Lowell, Mass. ..... p 1802
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa. p 2876
North Elec. Co., 553 S. Market St., Galion, Ohio
Ohmite Mfg. Co., 3635 W. Howard St., Skokie, Ill. ..... p 2884
Signal Transformer Co., Inc., 1 Junius St., Bklyn., N.Y. p 2892,2893
Sola Elec. Div., 1717 Busse Rd., Elk Grove Village, Ill. ..... p 2885
Topaz Inc., 3855 Ruffin Rd., San Diego, Cal. ..... p 1273
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y.
Zaring Inds., Inc., Box 477, Carmel, Ind.
A C Transformer Corp., 89 Madison St., Newark, N.J.
Acme Elec. Corp., 28 Water St., Cuba, N.Y.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Altec Lansing, 1515 S. Manchester Ave., Anaheim, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Barwood Elctrns., Inc., 120 S. Maryland, Glendale, Cal.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Cycle Transformer Corp., 177 Main St., West Orange, N.J.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Electronic Devices, Inc., Box 78, N. Ridgeville, Ohio
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Era Electric Corp., 67 Sand Park Rd., Cedar Grove, N.J.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio
Geo Space, 5803 Glenmont, Houston, Tex.
Goslin Elec. & Mfg. Co., 2921 W. Olive St., Burbank, Calif.
Green Rectifier Corp., 1-10 30th St., Fair Lawn, N.J.
Invertronics, Box 342, Pine Brook, N.J.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Mag-Con Engrg. Co., 85 Richardson St., S.E., St. Paul, Minn.
Merit Coil & Transformer Corp., 2040 Sherman St., Hollywood, Fla.
National Coil Co., Box 1040, Douglas, Ariz.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Permavolt Transformers, Inc., 1901 S. Lafayette St., S. Bend, Ind.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Queensboro Transformer & Machinery Corp., 115-25 15th Ave., College Point, N.Y.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
SNC Mfg. Co., Inc., P.O. Box 470, Oshkosh, Wisc.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
TDC Div., Box 365, Littleton, Mass.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
Utrad Corp., 305 N. Briant St., Huntington, Ind.
Wanlass Elec. Co., 2165 S. Grand Ave., Santa Ana, Cal.
Westinghouse Elec. Corp., Box 231, Greenville, Pa.

Transformers, Welding

Consolidated Transformer Unlimited, 1039 E. Valley Blvd., San Gabriel, Cal.
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y. p 1014
Dynage, Inc., 1331 Blue Hills Ave., Bloomfield, Conn.
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y.
Genisco Technology Corp., Comps/Genistron Div., 18435 Susana Rd., Compton, Cal.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Neshaminy Transformer Co., Edison-Furlong Rd., Furlong, Pa.
North Elec. Co., 553 S. Market St., Galion, Ohio
Sorensen Oper., Richards Ave., Norwalk, Conn.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
United Transformer Co., 150 Varick St., New York, N.Y.
Basler Elec. Co., Box 269, Rte. 143, Highland, Ill.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Chu Assocs., Inc., P.O. Box 387, Whitcomb Ave., Littleton, Mass.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Diversified Power Co., Inc., 15226 Grevillea Ave., Lawndale, Calif.
Edko Elctrns., Inc., 397 Bedford Ave., Brooklyn, N.Y.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Epco Prods., Inc., P.O. Box 298, Wallkill, N.Y.
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forest Elec. Co., 1001 N. 25th Ave., Melrose Pk., Ill.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Hobart Bros. Co., 600 W. Main St., Troy, Ohio
Hughes Aircraft Co. Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
Kolton Elec. Mfg. Co., 123 New Jersey R.R. Ave., Newark, N.J.
Light Elec. Corp., 214 Lackawanna Ave., Newark, N.J.
Lincoln Elec. Co., 22801 St. Clair Ave., Cleveland, Ohio
Maxwell Labs., Inc., 9244 Balboa Ave., San Diego, Calif.
Nytronics, Inc., Third Ave., Alpha, N.J.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Phoenix Transformer Co., 1818 E. Madison, Phoenix, Ariz.
Precision Elctrns. Corp., 427 Plain St., Marshfield, Mass.
Prototype Transformer Corp., 545 N. Arlington Ave., E. Orange, N.J.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sciaky Bros., Inc., 4915 West 67th St., Chicago, Ill.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Test Equip. Corp., Box 20215, Dallas, Tex.
Transformer Mfrs., Inc., 7051 W. Wilson Ave., Chicago, Ill.
Transformer Tech., Inc., 4447 W. Armitage Ave., Chicago, Ill.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.

Transformers, Wide Band

ACDC Elctrns., Inc., Oceanside Ind'l. Ctr., Oceanside, Cal.
ADC Prods., 4900 W. 78th St., Minneapolis, Minn.
AEL, Inc., Box 552, Lansdale, Pa.
Bulova Watch Co., Inc., Elctrns. Div., Frequency Control Prods., 61-20 Woodside Ave., Woodside, N.Y.
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J.
Ferrodyne Corp., 4240 Glencoe Ave., Venice, Calif. ..... p 2856
Freed Transformer Co., Inc., 1795 Weirfield St. (Ridgewood), Bklyn., N.Y. ..... p 2858
Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J.
Lambda Elctrns. Corp., 515 Broad Hollow Rd., Melville, N.Y.
Lorch Elctrns. Corp., 105 Cedar La., Englewood, N.J.
Magnetic Circuit Elements, Inc., 2455A Garden Rd., Del Monte Research Pk., Monterey, Cal. ..... p 2874
Magnetico, Inc., 6 Richter Ct., E. Northport, N.Y. ..... p 2873
Microtran Co., Inc., 145 E. Mineola Ave., Valley Stream, N.Y.
Ness Pacific, Inc., 470 San Antonio Rd., Palo Alto, Cal.
North Hills Elctrns., Inc., Alexander Pl., Glen Cove, N.Y. .. p 2883
Torotel, Inc., 13402 S. 71 Hwy., Grandview, Mo.
Torwico Elctrns., Inc., Rte. 70, Lakewood, N.J.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
United Transformer Co., 150 Varick St., New York, N.Y. .. p 2906
Vanguard Elctrns., 930 W. Hyde Pk. Blvd., Inglewood, Cal. p 2358
Vari-L Co., Inc., 3883 Monaco Pkwy., Denver, Colo. ..p 2904,2905
Zaring Inds., Inc., Box 477, Carmel, Ind.
Aladdin Elctrns., 701 Murfreesboro Rd., Nashville, Tenn.
American Magnetics Corp., P.O. Box 8, Carterville, Ill.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Bourns Pacific Magnetics Corp., Box 1398, Romoland, Calif.
Bullock Magnetics Corp., 2805 Metropolitan Pl., Pomona, Calif.
Caledonia Elctrns., Maple St., Caledonia, N.Y.
C.B.C. Inds., Inc., 2601 N. Howard St., Philadelphia, Pa.
Central Transformer Co., 850 W. Jackson Blvd., Chicago, Ill.
Coil Co. of Amer., Inc., 221 Washington St., Northvale, N.J.
Comdel, Inc., Beverly Airport, Beverly, Mass.
Dietz Design, Inc., 100 Electronics Pkwy., Belton, Mo.
Dynographic Elctrns. Corp., 57 Bloomingdale Rd., Hicksville, N.Y.
El-Rad Mfg. Co., 4300 N. California, Chicago, Ill.
Electro-Winders Co., Inc., 854 W. Front St., Covina, Calif.
Elctrn. Coils, Inc., Box 1665, 33 Lyman St., Springfield, Mass.
Elctrn. Transformer Corp., 460 Totowa Ave., Paterson, N.J.
Elnetic Elctrns., Inc., 2100 Zeno Pl., Venice, Cal.
Florida Transformer Co., Box 518, DeLeon Springs, Fla.
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
Geo Space, 5803 Glenmont, Houston, Tex.
Hammond Mfg. Co., Ltd., 394 Edinburgh Rd., N., Guelph, Ont., Can.
Johnson Elec. Coil Co., 9361 Larch Ave., Box 559, Elmhurst, Ill.
National Coil Co., Box 1040, Douglas, Ariz.
Oeco Corp., 712 S.E. Hawthorne Blvd., Portland, Ore.
Olektron Corp., Box 248, Dudley, Mass.
PCA Elctrns., Inc., 16799 Schoenborn St., Sepulveda, Calif.
Peerless Elec. Prods., 1515 S. Manchester Ave., Anaheim, Cal.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Polyphase Instr. Co., 126 E. Fourth St., Bridgeport, Pa.
Pulse Engrg., Inc., Box 12235, San Diego, Cal.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Radio Resch. Co., 189 Mt. Pleasant Ave., Rockaway, N.J.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sartron, Inc., 114 N. Main St., Newberg, Ore.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Tele Coil Co., Inc., 2733 Saunders St., Camden, N.J.
Transformer Design, Inc. Milwaukee, 7377 North 76 St., Milwaukee, Wisc.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.
Whitewater Elctrns., Inc., 136 W. Main St., Whitewater, Wisc.

Transistor & Diode Heat Dissipators

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn.
Augat Inc., 33 Perry Ave., Attleboro, Mass. ..... p 1599
Beckman Instrs., Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, Calif.
Cinch-Graphik Div., 200 S. Turnbull Canyon Rd., City of Industry, Cal.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Delbert Blinn. Co., Box 2007, Pomona, Calif. ..... p 1877
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
E-Tronics, 5901 Noble Ave., Van Nuys, Cal.
Inland Elctrn. Prods. Corp., 403 S. Raymond St., Pasadena, Cal. p 1893
International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal. ..... p 1896-1901
International Rectifier, 233 Kansas St., El Segundo, Cal. p 1902,1914
Mauratron, Inc., 13333 N. Central Expwy., Dallas, Tex. ..... p 1160
Risk, George, Inds., Inc., 802 S. Elm, Kimball, Neb.

Thermalloy Co., 8719 Diplomacy Row, Dallas, Tex..... p 1943
Vematine Prods. Co., 455 W. Main St., Wyckoff, N.J. ..... p 1980
AAVID Engrg., Inc., 30 Cook Ct., Laconia, N.H.
Accel Ind'l. Heat Sink Corp., 5338 Alhambra Ave., Los Angeles, Cal.
Alpha Comps. Corp., 4087 Glencoe Ave., Venice, Calif.
Argent Inds., Inc., 8514 N. Main St., Dayton, Ohio
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Astrodyne, Inc., 355 Middlesex Ave., Wilmington, Mass.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Birtcher Corp., Box D, Monterey Park, Cal.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Cinch-Monadnock, 18300 E. Valley Blvd., Box 1222, City of Industry, Cal.
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Eastern Inds. Div., 100 Skiff St., Hamden, Conn.
Eltee, Inc., 21 Fairfield Pl., W. Caldwell, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Fischer Special Mfg. Co., 446 Morgan St., Cincinnati, Ohio
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
Gibson Elec., Delmont, Pa.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Horex Elctrns., Inc., 1729 21st St., Santa Monica, Calif.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Industrial Mica, 223 S. Van Brunt St., Englewood, N.J.
Lochart Inds., Inc., 15707 Texaco Ave., Paramount, Cal.
Modular Devices, Inc., 1265 West 135th St, Gardena, Calif.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Space Prods., Inc., 6631 Sarnia Ave., Long Beach, Calif.
Stauffer-Wacker Silicone Corp., 299 Park Ave., New York, N.Y.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Tekna Prods. Co., 82 St. Paul St., Rochester, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Waterbury Pressed Metal Co., 407 Brookside Rd., Waterbury, Conn.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Transistor Mounting Pads—See Pads, Transistor Mounting

Transistor Testers—See Testers, Transistor

Transistors, Chip, Unpackaged

Elctrn. Comps. Div., Trevose, Pa..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1887
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Communications Transistor Corp., 301 Ind'l. Way, San Carlos, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Physics Corp., Box 626, Eatontown, N.J.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.

Transistors, Dual

Elctrn. Comps. Div., Trevose, Pa..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1887
General Instr. Corp., 600 W. John St., Hicksville, N.Y.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Solitron Devices, Inc., 8808 Balboa Ave., San Diego, Cal. p 1938,1939
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Carter Semiconductor, Inc., 374 Bayview Ave., Amityville, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Power Physics Corp., Box 626, Eatontown, N.J.
Qualidyne Corp., 3699 Tahoe Way, Santa Clara, Cal.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semitronics Corp., 265 Canal St., New York, N.Y.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.

Transistors, Field-Effect

General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, Inc., 8808 Balboa Ave., San Diego, Cal. p 1934-1937
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932
American Micro-Sys., Inc., 3800 Homestead Rd., Santa Clara, Cal.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.

Transistors, Germanium, Photo

General Instr. Corp., 600 W. John St., Hicksville, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
HEI, Inc., Jonathan Ind'l. Ctr., Chaska, Minn.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Optron, Inc., 1201 Tappon Cir., Carrollton, Tex.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.

Transistors, Germanium, Power

Delco Radio Div., 700 E. Firmin St., Kokomo, Ind..... p 1878
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932,1933
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
KSC Semiconductor Corp., KSC Way, Katrina Rd., Chelmsford, Mass.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transistors, Germanium, R-F

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Lansdale Transistor & Elctrns., Inc., Advance La. & Rte. 309, Colmar, Pa. ..... p 1918
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.

Transistors, Germanium, Switching

Delco Radio Div., 700 E. Firmin St., Kokomo, Ind..... p 1878
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1887
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Lansdale Transistor & Elctrns., Inc., Advance La. & Rte. 309, Colmar, Pa. ..... p 1918
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1933
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.

Transistors, Pressure Sensitive

Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
Stow Labs., Inc., Kane Ind'l. Pk., Hudson, Mass.

Transistors, Silicon, Photo

Clairex Elctrns., 560 S. Third Ave., Mt. Vernon, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1887,1888
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Toyo Elctrns. Ind. Corp., 21, Sain Misosaki-cho, Ukyo-ku, Kyoto, 615, Japan
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1965
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass..... p 1965
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Sensors, Inc., P.O. Box 231, Athens, Tex.
HEI, Inc., Jonathan Ind'l. Ctr., Chaska, Minn.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Quantum Sensing, Inc., 1650 Locust Ave., Bohemia, N.Y.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.

Transistors, Silicon, Power

Delco Radio Div., 700 E. Firmin St., Kokomo, Ind..... p 1878
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.... p 1887

Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Lansdale Transistor & Elctrns., Inc., Advance La. & Rte. 309, Colmar, Pa. ..... p 1918
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Sensitron Semiconductor, 221 W. Industry Ct., Deer Pk., N.Y. p 1942
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1933
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass. p 1952,1953
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1966
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1966
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Cordover, Carl & Co., 104 Liberty Ave., Mineola, N.Y.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Semiconductor Corp., 230 W. 5th St., Tempe, Ariz.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
PIRGO Elctrns., 130 Central Ave., Farmingdale, N.Y.
Power Physics Corp., Box 626, Eatontown, N.J.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Silicon Transistor Corp., East Gate Blvd., Garden City, N.Y.
Solid Power Corp., 440 Eastern Pkwy., Farmingdale, N.Y.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.
Westinghouse Elec. Corp., Youngwood, Pa.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transistors, Silicon, R-F

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1886
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Lansdale Transistor & Elctrns., Inc., Advance La. & Rte. 309, Colmar, Pa. ..... p 1918
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill. ..... p 2741
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932,1933
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Carter Semiconductor, Inc., 374 Bayview Ave., Amityville, N.Y.
Communications Transistor Corp., 301 Ind'l. Way, San Carlos, Cal.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Power Physics Corp., Box 626, Eatontown, N.J.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.

Transistors, Silicon, Switching

Delco Radio Div., 700 E. Firmin St., Kokomo, Ind. ..... p 1878
Elctrn. Comps. Div., Trevose, Pa. ..... p 1977
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 1886
General Instr. Corp., 600 W. John St., Hicksville, N.Y. ..... p 1892
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Lansdale Transistor & Elctrns., Inc., Advance La. & Rte. 309, Colmar, Pa. ..... p 1918
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Piher Int'l. Corp., 711 Devon Ave., Park Ridge, Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Solitron Devices, 256 Oak Tree Rd., Tappan, N.Y.
Solitron Devices, Inc., 1177 Blue Heron Blvd., Riviera Bch., Fla. p 1932,1933
Sprague Elec. Co., 481 Marshall St., No. Adams, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1966
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1966
AMC Semiconductor Corp., 106 East 18th St., New York, N.Y.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Avantek, Inc., 2981 Copper Rd., Santa Clara, Cal.
Burns & Towne, Inc., 18-36 Granite St., Haverhill, Mass.
Carter Semiconductor, Inc., 374 Bayview Ave., Amityville, N.Y.
Continental Device, 12515 Chadron Ave., Hawthorne, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Crystalonics Div., 147 Sherman St., Cambridge, Mass.
Electronic Transistors Corp., 153-13 Northern Blvd., Flushing, N.Y.
Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, Calif.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
Industro Transistor Corp., 35-10 36th Ave., Long Island City, N.Y.
International Diode Corp., 90 Forrest St., Jersey City, N.J.
Intersil, Inc., 10900 N. Tantau, Cupertino, Calif.
Isofilm Int'l., 20131 Bahama St., Chatsworth, Cal.
ITT Semiconductors, 3301 Electronics Way, W. Palm Beach, Fla.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
KMC Semiconductor Corp., Parker Rd., RD 2, Long Valley, N.J.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif.
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
PIRGO Elctrns., 130 Central Ave., Farmingdale, N.Y.
Power Physics Corp., Box 626, Eatontown, N.J.
Raytheon Co., 350 Ellis St., Mt. View, Calif.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Semicoa, 940 S. Ajax Ave., City of Industry, Calif.
Semitronics Corp., 265 Canal St., New York, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Silicon Transistor Corp., East Gate Blvd., Garden City, N.Y.
Siliconix, Inc., 1140 W. Evelyn Ave., Sunnyvale, Calif.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Uni-Tran Semiconductor Corp., 1 Charles St., W. Orange, N.J.
Westinghouse Elec. Corp., Youngwood, Pa.
Workman Elctrn. Prods., Inc., Box 3828, Sarasota, Fla.

Transistors, Unijunction

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. p 1886,1888
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Unitrode Corp., 582 Pleasant St., Watertown, Mass. ..... p 1966
Unitrode Corp., Microwave Div., 580 Pleasant St., Watertown, Mass. ..... p 1966
Motorola Semiconductor Prods., Inc., Box 20912, Phoenix, Arizona
Nucleonic Prods. Co., Inc., 6660 Variel Ave., Canoga Pk, Cal.
Solid State Devices, Inc., 12741 Los Nietos Rd., Santa Fe Springs, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Texas Instruments, Inc., Box 5012, Dallas, Tex.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Transit Cases-Also See Containers, Shipping

American Aluminum Co., 230 Sheffield St., Dept. EEM, Mountainside, N.J. ..... p 2146
M M Elctrn. Enclosures, Inc., 111 Bloomingdale Rd., Hicksville, N.Y. ..... p 2153
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Applied Design Co., Inc., 2461 Sheridan Dr., Tonawanda, N.Y.
Bal, William Corp., 947 Newark Ave., Elizabeth, N.J.
Bud Radio, Inc., 4605 E. 355th St., Willoughby, Ohio
Craig Sys. Corp., 360 Merrimack St., Lawrence, Mass.
Elzee Metal Prods. Co., Inc., 775 39th St., Brooklyn, N.Y.
Environmental Container Sys., P.O. Box 337, Union City, Calif.
Golding Mfg. Co., 90 Porete Ave., N. Arlington, N.J.
Goldsman, Inc., 1328-34 North 4th St., Philadelphia, Pa.
Koch, H. & Sons, Corte Madera, Cal.
Muckle Mfg. Co., 334 Medford, Owatonna, Minn.
REF Dynamics, 393 Jericho Tpke., Mineola, N.Y.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Skydyne, Inc., River Rd., Port Jervis, N.Y.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
TA Mfg. Corp., 4607 Alger St., Los Angeles, Calif.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Warwick Prods. Co., 7909 Rockside Rd., Independence, Ohio

Transitions—See Couplings

Translators, Data

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Datatron, Inc., 1562 Reynolds St., Santa Ana, Cal. ..... p 560
Dialight Corp., 60 Stewart Ave., Brooklyn, N.Y.
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575,576
Parabam, Inc., 3017 E. Las Hermanas St., Compton, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
Superior Elec. Co., 1000 Middle St., Bristol, Conn. ..... p 1698
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Climatronics Corp., 1324 Motor Pkwy., Hauppauge, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Equip. Corp., 32 Kearney Rd., Needham Hgts., Mass.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Eon Instr., Inc., 15547 Cabrito Rd., Van Nuys, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Maivern St, Fullerton, Cal.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Navcor, Inc., Valley Forge Ind. Pk., Norristown, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N.Y.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.

Translators, TV—See Transmitters, UHF; Transmitters, VHF

Transmission Line, Wire & Cable—See Cable, Transmission Line

Transmission Systems, Data

A. D. Data Sys., Inc., 830 Linden Ave., Rochester, N.Y. ..... p 538
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Bendix Corp. Environmental Science Div., 1400 Taylor Ave., Baltimore, Md. ..... p 545
Dynamics Instr. Co., 583 Monterey Pass Rd., Monterey Pk., Cal. p 1341
Hi-G, Inc., Spring St. & Rte. 75, Windsor Locks, Conn.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y. .. p 1390
Metric Sys. Corp., 736 N. Beal St., Ft. Walton Beach, Fla. p 575,576
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
North Elec. Co., 553 S. Market St., Galion, Ohio
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa. ..... p 1313
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Applied Peripheral Sys., Inc., 7120 Harwin, Houston, Tex.
Astrodata, Inc., 240 E. Palais Rd., Anaheim, Cal.
Austin Elctrns., 450 W. First Ave., Roselle, N.J.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automatic Electric Co., 400 N. Wolf Rd., Northlake, Ill.
Bristol Div. Waterbury, Conn
Brown Engrg. Co., Research Pk., Huntsville, Ala.
Cardion Elctrns., Long Island Expwy., Woodbury, N.Y.
Codex Corp., 150 Coolidge Ave., Watertown, Mass.
Collins Radio Co., Newport Beach, Calif.
Communitype Corp., 767 5th Ave. (GM Bldg.), New York, N.Y.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dasa Corp., 15 Stevens St., Andover, Mass.
Data Access Sys., Inc., 503 Rte. 10, Mt. 19, Dover, N.J.
Data Prods. Corp., 6219 De Soto Ave, Woodland Hills, Calif.
Demex, Inc., 2130 Jefferson, Kansas City, Mo.
Diamond Repeater Co., 55 Main St., Madison, N.J.
Digi-Data Corp., 4315 Baltimore Ave., Bladensburg, Md.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Elpac Data Systems, 18651 Von Karman Ave., Irvine, Calif.
EMR Div., Box 223, Princeton, N.J.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Essex Engrg. Co., Inc., Box 28, Essex, Conn.
Fairchild Space & Defense Sys., 300 Robbins La., Syosset, N.Y.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
General Atronics Corp., Sub. Magnavox Co., Military Elctrns. Div., 1200 E. Mermaid La., Philadelphia, Pa.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.

Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Meteorology Research, Inc., 464 W. Woodbury Rd., Altadena, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Midco, Inc., Box 5433, Trenton, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Motorola, Inc., 3102 North 56th St., Phoenix, Ariz.
Motorola Instr. & Control, Inc., Box 5409, Phoenix, Ariz.
Multitech Data Prods., 583 Monterey Pass Rd., Monterey Park, Calif.
Nationwide Elctrn. Sys., Inc., 7N662 Rte. 53, Itasca, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Radiation, Inc., Box 37, Melbourne, Fla.
Radio Comm. Co., Inc., 1020 E. Land Pl., Milwaukee, Wisc.
RCA, Marne Hwy., Moorestown, N.J.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rixon Elctrns., Inc., 2120 Industrial Pkwy., Silver Spring, Md.
Sagetec Corp., 822 N. Hollywood Way, Burbank, Cal.
Sanders Assocs, Inc., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H.
Sanders Assocs., Inc., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Sperry Rand Corp., P.O. Box 8100, Philadelphia, Pa.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Texas Instruments, Inc., Box 66027, Houston, Tex.
Theta Instr. Corp., 24 Dwight Pl., Fairfield, N.J.
Trepac Corp. America, 30 W. Hamilton Ave., Englewood, N.J.
Viatron Computer Sys., Rte. 62, Bedford, Mass.
Western Telematic, Inc., 5507 Peck Rd., Arcadia, Cal.

Transmitters, Broadcast, A-M, F-M & TV

AEL, Inc., Box 552, Lansdale, Pa.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Ampex Corp., 401 Broadway, Redwood City, Calif.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.

Transmitters, Digital Data—See Transmission Systems, Data

Transmitters, Diplexer

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Elctrn. Resources Div., 4561 Colorado Blvd., Los Angeles, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.
Standard Elctrns. Corp., Box 677, Freehold, N.J.

Transmitters, Direction Finding

AEL, Inc., Box 552, Lansdale, Pa.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Marconi Div., 1 Park Ave., New York, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Transmitters, Duplexer

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Iso-Switch Corp., 2955 Randolph St., Costa Mesa, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA, Marne Hwy., Moorestown, N.J.
Sinclair Radio Labs., Inc., 675 Ensminger Rd., Tonawanda, N.Y.
Sinclair Radio Labs., Ltd., 4975 Regent St., No. Burnaby, British Columbia, Can.

Transmitters, Facsimile

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Alden Elctrn. & Impulse Recording Equip. Co., Inc., Washington St., Westboro, Mass.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Concord Elctrns. Corp., 1935 Armacost Ave., Los Angeles, Cal.
International Comm. Corp., 7620 N.W. 36th Ave., Miami, Fla.
International Scanatron Sys. Corp., 1623 Straight Path, Wyandanch, N.Y.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
RCA, Bldg. CHIC-225, Cherry Hill, Camden, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Telautograph Corp., 8700 Bellanca Ave., Los Angeles, Cal.
Vidcom Elctrns., Inc., 118 W. 57th St., New York, N.Y.

Transmitters, Fixed Frequency

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 897
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Bogen Div., P.O. Box 500, Paramus, N.J.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
Bristol Div, Waterbury, Conn
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Ventron Elctrns. Corp., Box 529, Bradford, Pa.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transmitters, Fixed Station Comm.

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Bogen Div., P.O. Box 500, Paramus, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transmitters, Infrared

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Collins Radio Co., Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.

Transmitters, Interrogation

AEL, Inc., Box 552, Lansdale, Pa.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Transmitters, Microwave

AEL, Inc., Box 552, Lansdale, Pa.
Applied Microwave Lab., Inc., Andover St., Andover, Mass. p 860
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, Pa.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y. p 895-898
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Aircom, Inc., Rte. 16B, Union, N.H.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.

Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Collins Radio Co., Dallas, Tex.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
E.F.E. Labs., Inc., Horsham Valley Ind'l. Ctr., Horsham, Pa.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Elctrn. Resch. Enterprises, 2700 Bay Rd., Redwood City, Calif.
Jerrold Elctrns. Corp., 401 Walnut St., Philadelphia, Pa.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Maxson Elctrns. Div., Sunrise Hwy., Great River, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro-Link Sys/Varian Assoc., 1365 Akron St., Copiague, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Sanders Assocs., Inc., Ledge St., Nashua, N.H.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Transmitters, Multiplex

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Bristol Div, Waterbury, Conn
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
EMR Div., Box 223, Princeton, N.J.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Tele-Signal Corp., 250 Crossways Pk. Dr., Woodbury, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.

Transmitters, Pulse Code Modulation

Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
EMR Div., Box 223, Princeton, N.J.
Femco Div., Box F, Irwin, Pa.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Transmitters, Pulse Phase Modulation

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dorsett Elctrns., Box 36, Tulsa, Okla.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA, Marne Hwy., Moorestown, N.J.
Robertshaw Controls Co., Santa Ana Frwy at Euclid Ave., Anaheim, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Transmitters, Pulse Time Modulation

Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, N.Y... p 1390
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va..... p 914
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Bristol Div, Waterbury, Conn
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
RCA, Marne Hwy., Moorestown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Transmitters, Radar—See Radar Systems

Transmitters, Radio Range

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
RCA, Marne Hwy., Moorestown, N.J.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transmitters, Railroad

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
HB Engrg. Corp., 1101 Ripley St., Silver Spring, Md.
McElroy Elctrns. Corp., Fredonian St., Shirley, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.

Transmitters, Single-Sideband

AEL, Inc., Box 552, Lansdale, Pa.
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Delco Radio Div., 700 E. Firmin St., Kokomo, Ind.
Johnson E. F. Co., 1923 Tenth Ave., S.W., Waseca, Minn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Brelonix, Inc., 106 North 36th St., Seattle, Wash
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Delta Elctrns., Ltd., 70 Ronson Dr., Rexdale, Ont., Can.
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
Drake, R.L., Co., 540 Richards St., Miamisburg, Ohio
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kahn Resch. Labs., Inc., 81 S. Bergen Pl., Freeport, N.Y.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Linear Sys., Inc., 220 Airport Blvd., Watsonville, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Prodelin, Inc., Box 131, Hightstown, N.J.
Racal Comm., Inc., 8440 Second Ave., Silver Spring, Md.
Raytheon Co., 1415 Boston-Providence Tpke., Norwood, Mass.
RCA Corp., Front & Cooper, Camden, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Telectro Sys. Corp., 96-18 43rd Ave., Corona, N.Y.
Weitermann Elctrns., 4549 North 38th St., Milwaukee, Wisc.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transmitters, Telemetry

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Avtel Corp., 1130 E. Cypress St., Covina, Cal.
Bramco Controls Div., College & South Sts., Piqua, Ohio p 1456
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RFL Inds., Inc., Comms. Div., Powerville Rd., Boonton, N.J. p 1312
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va..... p 914
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Autocon Inds., Inc., 995 University, St. Paul, Minn.
Automation Dynamics, 35 Industrial Pkwy., Northvale, N.J.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Biocom, Inc., 9522 W. Jefferson Blvd., Culver City, Cal.
Bristol Div, Waterbury, Conn
Collins Radio Co., Dallas, Tex.
Concord Control, Inc., 1282 Soldiers Field Rd., Boston, Mass.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Defense Elctrns., Inc., Rockville, Md.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Dynasciences Corp., 1020 S. Arroya Pkwy., Pasadena, Cal.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
EMR Div., Box 223, Princeton, N.J.
Femco Div., Box F, Irwin, Pa.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Gosh Instrs., Inc., 1252 Berlin Tpke., Wethersfield, Conn.
Hathaway Pacific Corp., 4055 Fabian Way, Palo Alto, Calif.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Mennen-Greatbatch Elctrns., Inc., 10123 Main St., Clarence, N.Y.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Microcom Corp., Horsham Valley Ind'l. Pk., Horsham, Pa.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Moore Assocs. Div., 815 American St., San Carlos, Calif.
Northern Radio Co., Inc., 143 West 22nd St, New York, N.Y.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Quindar Elctrns., Inc., 60 Fadem Rd., Springfield, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Schneider Instr. Co., 8115 Camargo Rd., Madeira, Cincinnati, Ohio
SCI Sys., Inc., 8620 S. Memorial Pkwy., Huntsville, Ala.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Stoelting Co., 424 N. Homan Ave., Chicago, Ill.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Transmitters, Tropospheric Scatter

Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
Amtron Corp., 337 Newbury St., Boston, Mass.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Marconi Div., 1 Park Ave., New York, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.

Transmitters, UHF

AEL, Inc., Box 552, Lansdale, Pa.
AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Trak Microwave Corp., 4726 Eisenhower Blvd., Tampa, Fla.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va..... p 914
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Alto Scientific Co., Inc., 4083 Transport St., Palo Alto, Calif.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amtron Corp., 337 Newbury St., Boston, Mass.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.

BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Electronic Comm., Inc., 1501 72nd St., N., St. Petersburg, Fla.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
EMR Div., Box 223, Princeton, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Radio Engrg. Labs., 29-01 Borden Ave., Long Island City, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Somerset Radiation Lab., Inc., 2060 North 14th St., Arlington, Va.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Wilcox, 1400 Chestnut, Kansas City, Mo.
Zeta Labs., Inc., 616 National Ave., Mountain View, Calif.

Transmitters, ULF

Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Transmitters, VHF

AEL, Inc., Box 552, Lansdale, Pa.
AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
Applied Research, Inc., 76 S. Bayles Ave., Port Washington, N.Y.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Instrs. Ind., Inc., 151 Toledo St., Farmingdale, N.Y.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Sierra Sys., Inc., 2255 Old Middlefield Way, Mountain View, Cal.
Sonex, Inc., 20 E. Herman St., Philadelphia, Pa..... p 1313
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
ACR Elctrns. Div., 112 Voice Rd., Carle Place, N.Y.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
Ampex Corp., 401 Broadway, Redwood City, Calif.
Amtron Corp., 337 Newbury St., Boston, Mass.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif.
Barker & Williamson, Beaver Dam & Canal Rds., Bristol, Pa.
Benco Television Assoc., 27 Taber Rd., Rexdale, Ont., Canada
BF Elctrns., 415 S. Nardo, Solana Beach, Calif.
Bogen Div., P.O. Box 500, Paramus, N.J.
Cardion Communications, Long Island Expwy., Woodbury, N.Y.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Communications Co., Inc., Box 520, Coral Gables, Fla.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Conic Corp., 9020 Balboa Ave., San Diego, Calif.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Electronics Missiles & Comms., Inc., P.O. Box 116, White Haven, Pa.
Emcee Elctrns., Inc., 177 Old Churchman Rd., New Castle, Del.
EMR Div., Box 223, Princeton, N.J.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Fargo Co., 1162 Bryant St., San Francisco, Calif.
Farinon Electric, 935 Washington St., San Carlos, Calif.
General Elec. Co., Mountain View Rd., Lynchburg, Va.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Radiotelephone Co., 3501 W. Burbank Blvd., Burbank, Cal.
Hammarlund Mfg. Co., 73-88 Hammarlund Dr., Mars Hill, N.C.
Heath Co., Benton Harbor, Mich.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Marconi Div., 1 Park Ave., New York, N.Y.
Melpar, 7700 Arlington Blvd., Falls Church, Va.
Micro State Elctrns., 152 Floral Ave., Murray Hill, N.J.
Micro-Tel Corp., 1406 Shoemaker Rd., Baltimore, Md.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Mobil Elctrns., Inc., Box 1132, Anderson, Ind.
Motorola Comms. & Elctrns., Inc., 1301 E. Algonquin Rd., Schaumburg, Ill.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Oklahoma Aerotronics, Inc., 632 Pennsylvania Ave., Hartshorne, Okla.
Olektron Corp., Box 248, Dudley, Mass.
Port-O-Vox Enterprises, Corp., 130 West 57th St., New York, N.Y.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA Corp., Front & Cooper, Camden, N.J.
RCA, Marne Hwy., Moorestown, N.J.
Regency Elctrns., Inc., 7900 Pendleton Pike, Indianapolis, Ind.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Robertson Instr. Co., 1760 W. First St., Azusa, Calif.
Rodelco, 356A Commack Rd., Deer Park, N.Y.
Rohde & Schwarz Sls. Co. (U.S.A.), Inc., 111 Lexington Ave., Passaic, N.J.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Standard Winding Co., 44-62 Johnes St., Newsburgh, N.Y.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
TRF, Inc., 5265 Port Royal Rd., Springfield, Va.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Visual Elctrns. Corp., 356 W. 40th St., New York, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Transmitters, VLF

AEL, Inc., Box 552, Lansdale, Pa.
Aerospace Resch. Inc., 130 Lincoln St., Boston, Mass..... p 854
Anritsu Electric Co., Ltd., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan
CML, Inc., 166 National Rd., Edison, N.J.
Cober Elctrns., Inc., 7 Gleason Ave., Stamford, Conn..... p 863
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Bertan Assocs., Inc., 15 Newtown Rd., Plainview, N.Y.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Bogue Elec. Mfg. Co., 52 Iowa St., Paterson, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Continental Elctrns. Mfg. Co., P.O. Box 17040, Dallas, Tex.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Energy Systems, 3180 Hanover St., Stanford Ind'l. Pk., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
Micromega, 12575 Beatrice St., Los Angeles, Cal.
Multitone Elctrns., Inc., 111 Broadway, New York, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Standard Elctrns. Corp., Box 677, Freehold, N.J.
Summit Engrg. Corp., Box 938, Bozeman, Mont.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Transponders

ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
RCA, 415 S. 5th St., Harrison, N.J.
Vega Precision Labs., Inc., 239 Maple Ave., Vienna, Va. .... p 914
Admiral Sys. Corp., 2060 N. Kolman Ave., Chicago, Ill.
Aerocom, 3090 S.W. 37th Ave., Miami, Fla.
Aeronautical Comm. Equip. Inc., 3090 S.W. 37th Ave., Miami, Fla.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
A.R.F. Products, Inc., Gardner Rd., Raton, N.M.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Beukers Labs., Inc., 1324 Motor Pkwy., Hauppauge, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Conductron Corp., 2600 North 3rd St., St. Charles, Mo.
Control Sci. Corp., 4810 Beauregard St., Alexandria, Va.
Cubic Corp., 9233 Balboa Ave., San Diego, Cal.
Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Dorsett Elctrns., Box 36, Tulsa, Okla.
Electronic Svcs., Inc., 1258 Fitzgerald Ave., San Francisco, Calif.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N.Y.
International Transducer Corp., 640 McCloskey Pl., Goleta, Cal.
ITT Avionics Div, 390 Washington Ave., Nutley, N.J.
King Radio Corp., Inc., 400 North Rogers Rd., Olathe, Kans.
Massa Div., 280 Lincoln St., Hingham, Mass.
Motorola, Inc., Box 1417, Scottsdale, Ariz.
Narco Avionics, Commerce Dr., Ft. Washington, Pa.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Prodelin, Inc., Box 131, Hightstown, N.J.
Raven Elctrns., Inc., 101 W. Alameda Ave., Burbank, Cal.
RCA, Marne Hwy., Moorestown, N.J.
Resdel Engrg. Corp., 300 E. Live Oak Ave., Arcadia, Cal.
Rodale Elctrns., Inc., 603 Chestnut St., Garden City, N.Y.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.
Southern Avionics Co., 5055 Belmont, Beaumont, Tex.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
United Telecontrol Elctrns., Inc., 3500 Sunset Ave., Asbury Park, N.J.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wilcox, 1400 Chestnut, Kansas City, Mo.

Traps, Ion—See Ion Traps

Traps, Wave—See Filters, Wave Trap

Triacs—See Thyristors

Trigger, SCR—See Controls, SCR

Trimmer Potentiometers—See Potentiometers, Trimmer

Tripods (For Instruments)

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Buhl Optical Co., 1009 Beech Ave., Pittsburgh, Pa.
Gordon Alan Enterprises, Inc., 5362 Cahuenga Blvd., N. Hollywood, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Keuffel & Esser Co., 20 Whippany Rd., Morristown, N.J.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.

Tube Heat Dissipators

International Elctrn. Resch. Corp., 135 W. Magnolia Blvd., Burbank, Cal.
Atlee Corp., 2 Lowell Ave., Winchester, Mass.
Birtcher Corp., Box D, Monterey Park, Cal.
Hobson Bros., Inc., 4940 W. Lawrence Ave., Chicago, Ill.
Nuclear Sys., Inc., 406 S. Yale St., Box 98, Garland, Tex.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.
Waterbury Pressed Metal Co., 407 Brookside Rd., Waterbury, Conn.

Tube Parts

Amphenol Ind'l. Div., 1830 S. 54th Ave., Chicago, Ill.
Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
National Tel-Tronics Corp., 55 Northern Blvd., Great Neck, N.Y. p 2471
RCA, 415 S. 5th St., Harrison, N.J.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Auto-Swage Products, Inc., 726 River Rd., Shelton, Conn.
Buckbee-Mears Co., 245 E. 6th St., St. Paul, Minn.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Coleman Instrs., 42 Madison St., Maywood, Ill.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Eby Sls. Co., 148-05 Archer Ave., Jamaica, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Johnson & Hoffman Mfg. Co., 40 Voice Rd., Carle Place, N.Y.
Kirchberger, M & Co., Inc., 250 Humphrey St., Englewood, N.J.
Lancaster Glass Corp., 220-226 W. Main St., Lancaster, Ohio
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Micacraft Prods., Inc., 49-51 Liberty St., Newark, N.J.
National Elctrns., Inc., Box 269, Geneva, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Philips Metalonics, 888 S. Columbus Ave., Mt. Vernon, N.Y.
R. I. Metpro, Inc., 139 Jefferson Blvd., Warwick, R.I.
Richland Glass Co., Inc., Richland, N.J.
S & S Optical Co., Inc., 7812 Stellhorn Rd., Ft. Wayne, Ind.
Semicon Assoc., Inc., Box 832, Lexington, Ky.
Staver Co., Inc., 41 N. Saxon Ave., Bay Shore, N.Y.
Superior Elctrns. Co., 474 Getty Ave., Clifton, N.J.

Superior Tube Co., Box 191, Norristown, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Tube Pullers—See Pullers, Tube

Tube Testers—See Testers, Tube

Tubes, Backward Wave

ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Alltronics of Cal., Inc., 841 Warrington Ave., Redwood City, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Klystronics, Inc., Mid Monmouth Ind'l. Pk., Box 534, Eatontown, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Tubes, Ballast

Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Amperite Co., Inc., 600 Palisade Ave., Union City, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Jefferson Elec. Co., 840 S. 25th Ave., Bellwood, Ill.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Soderberg Mfg. Co., Inc., 628 S. Palm Ave., Alhambra, Cal.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.

Tubes, Cathode-Ray, Data-Storage

Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Honeywell, Inc., 60 Walnut St., Wellesley Hills, Mass.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Union Elec. Corp., Bloomington, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Westinghouse Elec. Int'l. Co., 200 Park Ave., New York, N.Y.

Tubes, Cathode-Ray, Instrument Use

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Electronic Ideas, Inc., Reading Sta., Wyncote, Pa.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
General Atronics Corp., Sub. Magnavox Co., Electronic Tube Div., 1200 E. Mermaid La., Philadelphia, Pa.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
National Union Elec. Corp., Bloomington, Ill.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, Multiple Gun

Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
General Atronics Corp., Sub. Magnavox Co., Electronic Tube Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, Projection

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
General Atronics Corp., Sub. Magnavox Co., Electronic Tube Div., 1200 E. Mermaid La., Philadelphia, Pa.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
International Elctrns. Corp., Melville, N.Y.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, Scan Conversion

Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, Shaped-Beam

Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
General Atronics Corp., Sub. Magnavox Co., Electronic Tube Div., 1200 E. Mermaid La., Philadelphia, Pa.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Storage Tubes, 2020 Oceanside Blvd., Oceanside, Calif.
International Elctrns. Corp., Melville, N.Y.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, Studio or Theatre

Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
International Elctrns. Corp., Melville, N.Y.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Cathode-Ray, TV Picture & Color

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill.
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
International Elctrns. Corp., Melville, N.Y.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Ceramic (Electron)

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Mictron Div. KMS, Inc., Box 10126, Porter Rd., Sarasota, Fla.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Counting

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Raytheon Co., 465 Centre St., Quincy, Mass.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burroughs Corp., Box 1226, Plainfield, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Tubes, Diode, Temperature Limited

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thermosen, Inc., 375 Fairfield Ave., Stamford, Conn.

Tubes, Electron Multiplier

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EMR Div., Box 223, Princeton, N.J.
EMR Div., P.O. Box 44, Princeton, N.J.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Johnston Labs., Inc., 3 Industry La, Cockeysville, Md.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Tubes, Flash

Illumination Inds., Inc., 610 Vaqueros, Sunnyvale, Cal..... p 1714
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Pek, Inc., 825 E. Evelyn Ave., Sunnyvale, Calif. ..... p 1712
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Xenon Corp., 39 Commercial St., Medford, Mass.

Tubes, Forward Wave

International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Alltronics of Cal., Inc., 841 Warrington Ave., Redwood City, Calif.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.

Tubes, Gamma Ray

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Wood, N. Counter Lab., Inc., 1525 East 53rd St., Chicago, Ill.

Tubes, Gas

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Burroughs Corp., Box 1226, Plainfield, N.J.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electrons Co., 127 Sussex Ave., Newark, N.J.
General Lab. Assocs., Norwich, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Union Elec. Corp., Bloomington, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Tubes, Geiger-Mueller

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nuclear Corp. America, 2 Richwood Pl., Denville, N.J.
Raytheon Co., 465 Centre St., Quincy, Mass.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eberline Instr. Corp., Box 2108 - Airport Rd., Santa Fe, N.M.
Gencom Div., 80 Express St., Plainview, N.Y.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Kahl Scientific Instr. Corp., P.O. Box 1166, El Cajon, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear-Chicago, 2000 Nuclear Dr., Des Plaines, Ill.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Resch. Corp., Street Rd. & Second St. Pike, Southampton, Pa.
Nuclear Supplies Div., Box 312, Encino, Calif.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Wood, N. Counter Lab., Inc., 1525 East 53rd St., Chicago, Ill.

Tubes, Glow Or Discharge—See Tubes, Gas

Tubes, Hollow Cathode, Spectroscopic

Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Ignitron

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
National Elctrns., Inc., Box 269, Geneva, Ill.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Image Converter

Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Abtronics, Inc., Box 712, Livermore, Calif.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Bendix Corp., 1975 Green Rd., Ann Arbor, Mich.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Electro-Optical Sys., Pasadena, Calif.
EMR Div., Box 223, Princeton, N.J.
EMR Div., P.O. Box 44, Princeton, N.J.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Rauland, 2407 W. North Ave., Melrose Pk., Ill.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Varo, Inc., 2203 Walnut St., Garland, Tex.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Indicator

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass..... p 1492
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan ..... p 1605
Nippon Elec. New York, Inc., Pan Am Bldg., 200 Park Ave., New York, N.Y. ..... p 1605
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
TEC, Inc., 5700 S. Washington Ave., Eden Prairie, Minn... p 1545
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1550
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Burroughs Corp., Box 1226, Plainfield, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Mura Corp., 357 Great Neck Rd., Great Neck, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.

Tubes, Industrial Power

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electrons Co., 127 Sussex Ave., Newark, N.J.
General Elctrns., Inc., 42 Spring St., Newark, N.J.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Elctrns., Inc., Box 269, Geneva, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.

Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
United Elctrns. Co., 42 Spring St., Newark, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Infrared

General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Abtronics, Inc., Box 712, Livermore, Calif.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EMR Div., P.O. Box 44, Princeton, N.J.
Epic, Inc., 150 Nassau St., New York, N.Y.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Merco Prods. Co., Inc., 1298 Bethel Dr., Eugene, Ore.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varo, Inc., 2203 Walnut St., Garland, Tex.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Ionization

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Electron Technology, Inc., 626 Schuyler Ave., Kearny, N.J.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, 3011 Malibu Canyon Rd., Malibu, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
International Elctrns. Corp., Melville, N.Y.
Norton Co., 160 Charlemont St., Newton, Mass.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Klystron

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y..... p 2131
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Polarad Elctrn. Instrs., 5 Delaware Dr., Lake Success, N.Y.
RCA, 415 S. 5th St., Harrison, N.J.
Beam Tube Corp., 11 Beach St., Milford, Mass.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Klystronics, Inc., Mid Monmouth Ind'l. Pk., Box 534, Eatontown, N.J.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.

Tubes, Laser

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Coleman Instrs., 42 Madison St., Maywood, Ill.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electro Optics Assocs., 974 Commercial Ave., Palo Alto, Calif.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
Jodon Engrg. Assocs., 145 Enterprise Dr., Ann Arbor, Mich.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Optics Technology, Inc., 901 California Ave., Palo Alto, Calif.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
University Labs., 1250 W. Middlefield Rd., Mountain View, Cal.

Tubes, Magnetron

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y..... p 2131
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Bowmar/Tie, Inc., 850 Lawrence Dr., Newbury Park, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Edmund Scientific Co., 555 Edscorp Bldg., Barrington, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Kriss Elctrns., Inc., 169 Lake St., Upper Saddle River, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mictron Div. KMS, Inc., Box 10126, Porter Rd., Sarasota, Fla.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.

Tubes, Microwave

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Bowmar Instr. Corp., 8000 Bluffton Rd., Ft. Wayne, Ind.
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Alltronics of Cal., Inc., 841 Warrington Ave., Redwood City, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Klystronics, Inc., Mid Monmouth Ind'l. Pk., Box 534, Eatontown, N.J.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Traveling Wave Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Tubes, Noise Source

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J. ..... p 1537
Waveline, Inc., Box 718, W. Caldwell, N.J.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Burroughs Corp., Box 1226, Plainfield, N.J.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian, Eastern Tube Div., 800 Rahway Ave., Union, N.J.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.

Tubes, Pencil

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J.
RCA, 415 S. 5th St., Harrison, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.

Tubes, Photomultiplier

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Gamma Scientific, Inc., Dept. 301, 3777 Ruffin Rd., San Diego, Cal. ..... p 1711
Hamamatsu Corp., 80 Pine St., New York, N.Y. ..... p 2134
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan ..... p 2134
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Abtronics, Inc., Box 712, Livermore, Calif.
Bendix Corp., 1975 Green Rd., Ann Arbor, Mich.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EMR Div., Box 223, Princeton, N.J.
EMR Div., P.O. Box 44, Princeton, N.J.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Schoeffel Instr. Corp., 24 Booker St, Westwood, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.

Tubes, Pirani—See Gauges, Pirani

Tubes, Printer

International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
International Elctrns. Corp., Melville, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Rank Precision Inds., Inc., 260 N. Rte. 303, Box 463, West Nyack, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.

Tubes, Radiation Detection

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Raytheon Co., 465 Centre St., Quincy, Mass.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Abtronics, Inc., Box 712, Livermore, Calif.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Nuclear Supplies Div., Box 312, Encino, Calif.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Wood, N. Counter Lab., Inc., 1525 East 53rd St., Chicago, Ill.

Tubes, Readout-(CRT, Cold-Cathode, Vacuum Fluorescent, Etc.)

Alco Elctrn. Prods., Inc., Box 1348, Lawrence, Mass. ..... p 1492
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, Cal. p 1517
Inter-Tech. Grp., Inc., Box 23, Irvington-on-Hudson, N.Y. p 2137
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan ..... p 1605
Nippon Elec. New York, Inc., Pan Am Bldg., 200 Park Ave., New York, N.Y. ..... p 1605
Pinlites, Inc., 1275 Bloomfield Ave., Fairfield, N.J. ..... p 1528
Raytheon Co., 465 Centre St., Quincy, Mass. ..... p 2141
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn. .. p 1545
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J. p 1550
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Burroughs Corp., Box 1226, Plainfield, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Integrated Circuit Elctrns., Inc., 237 Riverview Ave., Waltham, Mass.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Union Elec. Corp., Bloomington, Ill.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Thomas Elctrns., Inc., 100 Riverview Dr., Wayne, N.J.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Receiving

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Sampson Elctrns. Prods. Div., 2244 S. Western Ave., Chicago, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Tubes, Rectifying, Gas-Filled

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Schauer Mfg. Corp., 4516 Alpine Ave., Cincinnati, Ohio
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Electrons Co., 127 Sussex Ave., Newark, N.J.
General Elctrns., Inc., 42 Spring St., Newark, N.J.
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Elctrns., Inc., Box 269, Geneva, Ill.
National Union Elec. Corp., Bloomington, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
United Elctrns. Co., 42 Spring St., Newark, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Rectifying, Vacuum

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Eureka X-Ray Tube Corp., 3250 N. Kilpatrick Ave., Chicago, Ill.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
General Elctrns., Inc., 42 Spring St., Newark, N.J.
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Klystronics, Inc., Mid Monmouth Ind'l. Pk., Box 534, Eatontown, N.J.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
United Elctrns. Co., 42 Spring St., Newark, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Scintillation

International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EMR Div., P.O. Box 44, Princeton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
International Elctrns. Corp., Melville, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.

Tubes, Strobe—See Lights, Stroboscopic

Tubes, Switching

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Burroughs Corp., Box 1226, Plainfield, N.J.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Weltronic Co., 19500 W. Eight Mile Rd., Southfield, Mich.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Tv Camera Pickup

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
Hamamatsu Corp., 80 Pine St., New York, N.Y.
Hamamatsu TV Co., Ltd., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.
Gencom Div., 80 Express St., Plainview, N.Y.
General Electrodynamics Corp., 4430 Forest La., Garland, Tex.
International Elctrns. Corp., Melville, N.Y.
Multi Media Engrg., Inc., 2385 Lewis Ave., Rockville, Md.
RCA Corp., Front & Cooper, Camden, N.J.
Shibaden Corp. America, 58-25 Brooklyn-Queens Expwy., Woodside, N.Y.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Sylvania Elec. Prods., Inc., Seneca Falls, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Thyratron

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y. ..... p 2131
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EG & G, Inc., 170 Brookline Ave., Boston, Mass.
EG & G, Inc., Elctrn. Prods. Div., 160 Brookline Ave, Boston, Mass.
Electrons Co., 127 Sussex Ave., Newark, N.J.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Elctrns., Inc., Box 269, Geneva, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Transmit-Receive (TR)

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Elctrns. Corp., Melville, N.Y.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Unity Elctrns., 107 Trumbull St., Elizabeth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Tubes, Transmitting

Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J. .... p 2132
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill. .. p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Kilovac Corp., Box 4422, Santa Barbara, Cal. ..... p 2140
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Penta Labs., Box 4422, Santa Barbara, Calif. ..... p 2140
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Apollo Corp., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
DuMont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Fairchild Du Mont Electron Tubes, 750 Bloomfield Ave., Clifton, N.J.
General Elctrns., Inc., 42 Spring St., Newark, N.J.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
International Elctrns. Corp., Melville, N.Y.
JSH Elctrns. Co., 8549 Higuera St., Culver City, Calif.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., 215 Park Ave., S., New York, N.Y.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
United Elctrns. Co., 42 Spring St., Newark, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.

Varian Assocs., Traveling Wave Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, Traveling Wave Amp.

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
ITT Electron Tube, Box 100, Easton, Pa. ..... p 2136
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
RCA, 415 S. 5th St., Harrison, N.J.
Alltronics of Cal., Inc., 841 Warrington Ave., Redwood City, Calif.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, Calif.
International Elctrns. Corp., Melville, N.Y.
Litton Inds., 960 Industrial Rd., San Carlos, Calif.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Elctrns., 3165 Porter Dr., Palo Alto, Calif.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
Thomson Elec. Co., Inc., 50 Rockefeller Plaza, New York, N.Y.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Traveling Wave Tube Div., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Tube Div., 611 Hansen Way, Palo Alto, Cal.
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Tubes, Ultraviolet

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J.
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Abtronics, Inc., Box 712, Livermore, Calif.
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Amperex Elctrn. Corp., Box 278, Slatersville, R.I.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Cetron Elctrn. Corp., 715 Hamilton St., Geneva, Ill.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
EMR Div., Box 223, Princeton, N.J.
EMR Div., P.O. Box 44, Princeton, N.J.
Gencom Div., 80 Express St., Plainview, N.Y.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Ikor, Inc., N.W. Ind'l. Pk., Burlington, Mass.
International Elctrns. Corp., Melville, N.Y.
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, Ill.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.
Xenon Corp., 39 Commercial St., Medford, Mass.

Tubes, Vidicon—See Tubes, TV Camera Pickup

Tubes, Voltage Reference Or Regulating

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y. p 2128-2130
Calvert Elctrns., Inc., 220 E. 23rd St., New York, N.Y.
General Elec. Co., Oakbrook Exec. Plaza, Oakbrook, Ill... p 2133
International Elctrns. Corp., 316 S. Service Rd., Melville, N.Y.
Raytheon Co., 465 Centre St., Quincy, Mass.
RCA, 415 S. 5th St., Harrison, N.J.
Signalite, Inc., 1933 Heck Ave., Neptune, N.J.
Victoreen Instr. Div., 10101 Woodland Ave., Cleveland, Ohio
Wagner Elec. Corp., 630 W. Mt. Pleasant Ave., Livingston, N.J.
Amperex Elctrn. Corp., Providence Pike, Slatersville, R.I.
Corvair Elctrns., Inc., 150 Fifth Ave., New York, N.Y.
Dutrex Inds., Inc., 150 Fifth Ave., New York, N.Y.
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., 3650 Hayden Ave., Culver City, Calif.
International Elctrns. Corp., Melville, N.Y.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National Union Elec. Corp., Bloomington, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Telefunken Sls. Corp., South St., Garden City, N.Y.
Thor Elctrns. Corp., 741 Livingston St., Elizabeth, N.J.
Westinghouse Elec. Corp., Box 284, Elmira, N.Y.

Tubes, X-Ray

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.p 2128-2130
Syracuse Elctrns. Corp., Box 566, Syracuse, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Abtronics, Inc., Box 712, Livermore, Calif.
Eureka X-Ray Tube Corp., 3250 N. Kilpatrick Ave., Chicago, Ill.
Machlett Labs., Inc., 1063 Hope St., Stamford, Conn.
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
Picker Ind'l., 1020 London Rd., Cleveland, Ohio
Warnecke Electron Tubes, Inc., 175 W. Oakton St., Des Plaines, Ill.

Tubing, Aluminum

Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa.
Uniform Tubes, Inc., Collegeville, Pa.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Metal Climax, Inc., 1270 Ave. of the Americas, New York, N.Y.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
K & S Engrg. Co., 6917 W. 58 St., Chicago, Ill.
La Pointe Inds., Inc., 155 W. Main St., Rockville, Conn.
Smith, Judson A. Co., Boyertown, Pa.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Tubing, Asbestos

Abesto Corp., Ackerman St., Bloomfield, N.J.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Paramount Inds., Inc., 1430 Progress Rd., Ft. Wayne, Ind.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Brass

Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa.
Uniform Tubes, Inc., Collegeville, Pa.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Chase Brass & Copper Co., 20600 Chagrin Blvd., Cleveland, Ohio
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
Helenor Metals Corp., 60 Marbledale Rd., Tuckahoe, N.Y.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
K & S Engrg. Co., 6917 W. 58 St., Chicago, Ill.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Smith, Judson A. Co., Boyertown, Pa.

Tubing, Ceramic

American Lava Corp., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn. ..... p 2666
Carborundum Co., Box 367, Niagara Falls, N.Y.
Centralab, Elctrns. Div., 5757 N. Green Bay Ave., Milwaukee, Wisc.
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Consolidated Ceramics & Metalizing Corp., P.O. Box 352, Flemington, N.J.
Coors Porcelain Co., 600 Ninth St., Golden, Colo.
Diamonite Prods. Mfg. Co., Shreve, Ohio
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Duramic Prods., Inc., 430 Commercial Ave., Palisades Park, N.J.
Electrical Refractories Co., 50 Clark St., E. Palestine, Ohio
Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Frenchtown/Cfi, Inc., 8th & Harrison Sts., Frenchtown, N.J.
Kirchberger, M & Co., Inc., 250 Humphrey St., Englewood, N.J.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National Ceramic Co., 500 Southard St., Box 199, Trenton, N.J.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Paul, F.H. & Stein Bros., Inc., 235 5th Ave., New York, N.Y.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Rosenthal China Corp., 411 E. 76th St., New York, N.Y.
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.
Steward, D.M. Mfg. Co., East 36th St., Box 510, Chattanooga, Tenn.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
3M Co., 3M Center, St. Paul, Minn.
Union Carbide Corp., Carbon Prods. Div., 270 Park Ave., New York, N.Y.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Zircoa, Chemetals Div., Box 39217, Solon, Ohio

Tubing, Copper

Precision Tube Co., Inc., Church Rd. & Wissahickon Ave., No. Wales, Pa.
Uniform Tubes, Inc., Collegeville, Pa.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Chase Brass & Copper Co., 20600 Chagrin Blvd., Cleveland, Ohio
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
K & S Engrg. Co., 6917 W. 58 St., Chicago, Ill.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Okonite Co., Box 340, Ramsey, N.J.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Smith, Judson A. Co., Boyertown, Pa.

Tubing, Fabric-Also See Tubing, Spaghetti

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Suflex, 33-40 57th St., Woodside, N.Y.

Tubing, Fluorocarbon, Flexible

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Smith, Herman H., Inc., 812 Snediker Ave., Bklyn., N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex.
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Adam Spence Corp., 3856 Park Ave., Edison, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Fused Quartz

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J. ..... p 2681
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Garner Glass Co., 177 S. Indian Hill, Claremont, Calif.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Quartzite Processing, Inc., 6 Holyoke St., Malden, Mass.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Thermal American Fused Quartz Co., Rte. 202 & Change Bridge Rd., Montville, N.J.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Tubing, Glass Fiber Insulation

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa. p 2673,2939
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
C/P Corp., RFD #3, Newberry, S.C.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Johns-Manville Sls. Corp., 22 East 40th St., New York, N.Y.
Laminated Fabricators, 1145 San Mateo Ave., San Bruno, Calif.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Suflex, 33-40 57th St., Woodside, N.Y.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Glass, Precision

General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
GTI Corp., 310 Chestnut St., Meadville, Pa.
Celluplastics, Inc., Brockway, Pa.
Corning Glass Works, Lab. Prods. Dept., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Fischer & Porter Co., 115 Warminster Rd., Warminster, Pa.
Garner Glass Co., 177 S. Indian Hill, Claremont, Calif.
Jenaer Glaswerk Schott & Gen. Inc., 200 Park Ave., New York, N.Y.
Owens-Illinois, Inc., Consumer & Tech. Prods. Div., Box 1035, Toledo, Ohio
Richland Glass Co., Inc., Richland, N.J.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Wilmad Glass Co., Inc., Buena, N.J.

Tubing, Heat Shrinkable-Also See Caps, Forms & Tapes, Heat Shrinkable

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Dow Corning Corp., Midland, Mich.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2961
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemelec Prods., Inc., 8 Fellowship Rd., Cherry Hill, N.J.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
E.I. Du Pont De Nemours & Co., Inc., 1007 Market St., Wilmington, Del.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Rehau Plastiks, Inc., 50-22 49th St., Woodside, N.Y.
Republic Steel Corp, Box 6778, Cleveland, Ohio
Resin Formulators Co., 9601 Jefferson Blvd., Culver City, Cal.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
3M Co., 3M Center, St. Paul, Minn.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Magnesium

Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Dow Chemical Co., Box 1682, Midland, Mich.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Tubing, Metal—See Tubing, Brass; Tubing, Copper, etc.

Tubing, Metal Hose, Flexible

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Flexaust Co., 277 Park Ave., New York, N.Y.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Russell Inds., Inc., 96 Station Plaza, Lynbrook, N.Y.
Titeflex, Inc., Hendee St., Springfield, Mass.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.

Tubing, Mica

Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Asheville-Schoonmaker Mica Co., Inc., 900 Jefferson Ave., Newport News, Va.
Cleveland Mica Co., 1360 Hird Ave., Lakewood, Ohio
Mica Fabricating Co., 53 Central Ave., Rochelle Park, N.J.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
3M Co., 3M Center, St. Paul, Minn.

Tubing, Molybdenum

Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Rembar Co., Inc., 67 Main St., Dobbs Ferry, N.Y.
Superior Tube Co., Box 191, Norristown, Pa.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
3M Co., 3M Center, St. Paul, Minn.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.

Tubing, Monel

Uniform Tubes, Inc., Collegeville, Pa.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Janney Cylinder Co, 7401 State Rd., Philadelphia, Pa.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Superior Tube Co., Box 191, Norristown, Pa.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Tubing, Nylon-Also See Tubing, Spaghetti

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Abesto Corp., Ackerman St., Bloomfield, N.J.
Adam Spence Corp., 3856 Park Ave., Edison, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Hudson Wire Co, 62 Water St, Ossining, N Y
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Moore, Samuel & Co., Mantua, Ohio
New England Tape Co., 30 Tower St., Hudson, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Nyltite Corp. America, 3451 S. Clinton Ave., S. Plainfield, N.J.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.

Tubing, Phenolic

Abesto Corp., Ackerman St., Bloomfield, N.J.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Edal Inds., Inc., 4 Short Beach Rd., E. Haven, Conn.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
General Elec. Co., Coshocton, Ohio
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
NVF Co, Maryland Ave. & Beech St., Wilmington, Del.
Panelyte Ind'l./Chem. Div., 780 N. Clinton Ave., Trenton, N.J.
Paramount Inds., Inc., 1430 Progress Rd., Ft. Wayne, Ind.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Red Seal Elec. Co., 3835 W. 150th St., Cleveland, Ohio
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Richardson Co., 2640 Lake St., Melrose Park, Ill.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N.Y.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Synthane Taylor Corp., Valley Forge, Pa.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Westinghouse Elec. Corp., 1585 Lebanon School Rd., West Mifflin, Pa.

Tubing, Plastic-Also See Tubing, Spaghetti

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa. p 2673,2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal.
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. .....p 2959,2960
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Ace Plastic Co., Inc., 91-54 Van Wyck Expwy., Jamacia, N.Y.
Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, N.J.
Adam Spence Corp., 3856 Park Ave., Edison, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Blum, Julius & Co., Inc., Box 292, Carlstadt, N.J.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Celanese Plastics Co., 550 Broad St., Newark, N.J.
Celluplastics, Inc., Brockway, Pa.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemetron Corp., 11 Penn St., El Segundo, Cal.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Engineered Plastics, Inc., 213 Chase St., Gibsonville, N.C.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Moore, Samuel & Co., Mantua, Ohio
New England Tape Co., 30 Tower St., Hudson, Mass.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Okonite Co., Box 340, Ramsey, N.J.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Rehau Plastiks, Inc., 50-22 49th St., Woodside, N.Y.
Resdel Corp., Box 2171, Rio Grande, N.J.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Suflex, 33-40 57th St., Woodside, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Synthane Taylor Corp., Valley Forge, Pa.
Taylor Elec., Fisher Rd., Howell, Mich.
3M Co., 3M Center, St. Paul, Minn.
Titeflex, Inc., Hendee St., Springfield, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Platinum

Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Uniform Tubes, Inc., Collegeville, Pa.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Tubing, Porcelain

Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Du-Co Ceramics Co., 900 Main St. Extension, Saxonburg, Pa.
Ferro Corp., Louthan Plant, Box 20, E. Liverpool, Ohio
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Porcelain Prods. Co., 225 N. Patterson St., Carey, Ohio
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.
3M Co., 3M Center, St. Paul, Minn.

Tubing, Rubber, Natural & Synthetic

Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Abesto Corp., Ackerman St., Bloomfield, N.J.
Anchor Plastics Co Inc., 36-36 36th St., Long Island City, N. Y.
Atlantic India Rubber Co., 571 W. Polk St., Chicago, Ill.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Chemetron Corp., 11 Penn St., El Segundo, Cal.

Continental Rubber Works, Erie, Pa.
Darling, R.E. Co., Inc., Box 666, Gaithersburg, Md.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Goodrich, B.F. Ind'l. Prods. Co., 500 S. Main St., Akron, Ohio
Groendyk Mfg. Co., Inc., Box 278, Buchanan, Va.
Hecht Rubber Corp., 482-484 Riverside Ave., Jacksonville, Fla.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Kirkhill Rubber Co., 300 E. Cypress St., Brea, Calif.
Minisink Rubber Co., Inc., 2 Orange County, Unionville, N.Y.
Minor Rubber Co., Inc., 69 Ackerman St., Bloomfield, N.J.
Pelmor Labs., Inc., 401 Lafayette St., Newtown, Pa.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Stalwart Rubber Co., 377 Northfield Rd., Bedford, Ohio
Stevens Prods., Inc., 128 N. Park St., E. Orange, N.J.
Titeflex, Inc., Hendee St., Springfield, Mass.
Uniroyal, Inc., 1230 Ave. of Americas, New York, N.Y.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Tubing, Shrinkable—See Tubing, Heat Shrinkable

Tubing, Spaghetti

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa. p 2673,2939
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. .....p 2959,2960
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Adam Spence Corp., 3856 Park Ave., Edison, N.J.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Star Porcelain Co., 71 Muirhead Ave., Box 1267, Trenton, N.J.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Suflex, 33-40 57th St., Woodside, N.Y.
Superior Continental Corp., Box 489, Hickory, N.C.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Titeflex, Inc., Hendee St., Springfield, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Tubing, Spiral Wrap

Amp Inc., Box 3608, Harrisburg, Pa.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2673
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill.
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. ..... p 2958
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Budd Co., 2450 Hunting Park Ave., Philadelphia, Pa.
Budd Co., 70 S. Chapel St., Newark, Del.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Fabritron Inc., 11650 Genesee St., Alden, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Higbie Mfg. Co., Wagner Rd., Rochester, Mich.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Niemand Bros. Inc., 45-10 94th St., Elmhurst, N.Y.
Paramount Inds., Inc., 1430 Progress Rd., Ft. Wayne, Ind.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Precision Paper Tube Co., 1033 S. Noel Ave., Wheeling, Ill.
Resinite Corp. Div., 1047 S Noel Ave, Wheeling , Ill
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Stone Ind'l. Corp., 900 Franklin St., N.E., Washington, D.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Tubing, Tantalum

Uniform Tubes, Inc., Collegeville, Pa.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Electrotools, Inc., 1422 Roosevelt Rd., Broadview, Ill.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Superior Tube Co., Box 191, Norristown, Pa.
Thermo Electron Corp., 85 First Ave., Waltham, Mass.
Var-Lac-Oid Chemical Co., 866 S. Front St., Elizabeth, N.J.

Tubing, TFE-Also See Tubing, Spaghetti

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Dilectrix Corp., 69 Allen Blvd., Farmingdale, N.Y. ..... p 2674
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa. p 2673,2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. .....p 2958,2959
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J. p 2679
Abesto Corp., Ackerman St., Bloomfield, N.J.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Brandywine Fibre Prods. Co., 1501 Popular St., Wilmington, Del.
Burlington Opers. Div., S. Bedford St., Burlington, Mass.
Cadilac Plastics & Chems., Box 810, Detroit, Mich.
Central Plastics Dists. Co., 527 S. Wells St., Chicago, Ill.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Crane Packing Co., 6400 Oakton St., Morton Grove, Ill.
Dixon Corp., Metacom Ave., Bristol, R.I.
Electrical Insulation Co., Inc., 1245 Marconi Blvd., Copiague, N.Y.
Fluoro Plastics, Inc., G & Venango Sts., Philadelphia, Pa.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Sci. Equip. Co., Limekiln Pike & Williams Ave., Philadelphia, Pa.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Insulating Fabricators, Inc., 150 Union Ave., E. Rutherford, N.J.
Jodee Plastics, Inc., 9903 Foster Ave., Brooklyn, N.Y.
Long, T.J., Inc., 215 Stonehinge La., Carle Pl., N.Y.
Norrich Plastics Corp., 206 Babylon Tpke., Roosevelt, N.Y.
Plastic Assocs., Inc., 60 Inip Dr., Inwood, N.Y.
Polymer Corp., 2120 Fairmont Ave., Reading, Pa.
Port Plastics, Inc., 8037 E. Slauson Ave., Montebello, Cal.
Raybestos-Manhattan, Inc., 205 Middle St., Bridgeport, Conn.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
Shamban, W.S. & Co., 11543 W. Olympic Blvd., Los Angeles, Calif.
Sparta Mfg. Co., Dover, Ohio
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
3M Co., 3M Center, St. Paul, Minn.
Titeflex, Inc., Hendee St., Springfield, Mass.
Tri-Tech. Fla., Inc., 5151 Park St., N., St. Petersburg, Fla.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tubing, Varnished Cambric Insulation-Also See Tubing, Spaghetti

Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
B & C Insulation Prods., Inc., 490 Lincoln Hwy., Box 122, Iselin, N.J.
Bentley-Harris Mfg. Co., 1050 Colwell La., Conshohocken, Pa.
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Suflex, 33-40 57th St., Woodside, N.Y.
3M Co., 3M Center, St. Paul, Minn.

Tubing, Waveguide

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Uniform Tubes, Inc., Collegeville, Pa.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
American Radar Comps., Inc., 415 E. Main St., Denville, N.J.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Formcraft Tool Co., 6453 S. Bell Ave., Chicago, Ill.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Superior Tube Co., Box 191, Norristown, Pa.

Tubing, Zipper

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Metex Corp., 970 New Durham Rd., Edison, N.J. .....p 2628,2629
Brand Dielectrics, Inc., Route 203, N. Windham, Conn.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Tuners, Microwave

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif.
Frequency Engrg. Labs., Box 527, Farmingdale, N.J.
Microwave Cavity Labs., 10 N. Beach Ave., La Grange, Ill.
Narda Microwave Corp., Plainview, N.Y.
Natvar Corp., Box 67, Rahway, N.J. ..... p 2675
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich.p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
RHG Elctrns. Lab., Inc., 94 Milbar Blvd., Farmingdale, N.Y.
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Weinschel Engrg. Co., Inc., Box 577, Gaithersburg, Md.
Aircom, Inc., Rte. 16B, Union, N.H.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Coax Devices Inc., Box 234-EEM, Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Communication Elctrns., 6006 Executive Blvd., Rockville, Md.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Elpac RF/Microwave, 18651 Von Karman Ave., Irvine, Calif.
General Instr. Corp., Andrews Rd., Hicksville, N.Y.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
OKI Elctrns. America, Inc., 500 S.E. 24th St., Ft. Lauderdale, Fla.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Polarad Elctrn. Instrs., 34-02 Queens Blvd., Long Island City, N.Y.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
RCA, Marne Hwy., Moorestown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Teledyne Microwave, 815 Stewart Dr., Sunnyvale, Cal.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian/Solid State Div., Akron St., Copiague, N.Y.
Watkins Johnson Co., 3333 Hillview, Palo Alto, Cal.

Tuners, TV & FM

Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind.
Mitsumi Elec. Co., Ltd., 1056 Koadachi, Komaecho, Kitatamagun, Tokyo, Japan ..... p 535
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Allied Elctrns. Corp., 100 N. Western Ave., Chicago, Ill.
Bogen Div., P.O. Box 500, Paramus, N.J.
Calbest Elctrns., 4801 Exposition Blvd., Los Angeles, Calif.
Davis J.W. & Co., P.O. Box 35313, Dallas, Texas
Dynaco, Inc., 3060 Jefferson St., Philadelphia, Pa.
Ercona Corp., 2121 Bellmore Ave., Bellmore, N.Y.
Gavin Instrs., Inc., P.O. Box 413, Somerville, N.J.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Heath Co., Benton Harbor, Mich.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Riemer David Co., Inc., Box 112, N. Miami Beach, Fla.
Sherwood Elctrn. Labs., Inc., 4300 N. California Ave., Chicago, Ill.
Sparks Communications, Inc., 1107 Lagoon Dr., Dallas, Tex.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Trutone Elctrns., Inc., 14660 Raymer St., Van Nuys, Calif.
Waller Corp., Ridgefield Box 340, Crystal Lake, Ill.

Tuning Forks
Accutronics, Inc., 628 North St., Geneva, Ill.
American Time Prods., 61-20 Woodside Ave., Woodside, N.Y. p 1430
Bramco Controls Div., College & South Sts., Piqua, Ohio
Fork Standards, Inc., 213 Main St., W. Chicago, Ill.
Frequency Control, Inc., Box 671, Austin, Tex. ..... p 1444
Melpar, Special Prods. Dept., 6631 Iron Pl., Springfield, Va. p 1457
Murata Corp. of America, 2 Westchester Plaza, Elmsford, N.Y. p 1471
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Meson Elctrns. Co., Inc., 380 Cottage St., Rochester, N.Y.
Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J.
Philamon, Inc., 90 Hopper St., Westbury, N.Y.
Riverbank Labs., Box 110, Geneva, Ill.

Turntables, Recording & Transcription
Alcor, Inc., 215 S. Tioga St., Ithaca, N.Y.
Bogen Div., P.O. Box 500, Paramus, N.J.
CCA Elctrns. Corp., 716 Jersey Ave., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Elpa Mktg. Inds., Inc., Thorens & Atlantic Aves., New Hyde Park, N.Y.
Empire Scientific Corp., 1055 Stewart Ave., Garden City, N.Y.
Garrard, Westbury, N.Y.
Gotham Audio Corp., 2 West 46th St., New York, N.Y.
Gray Resch. & Dev. Co., 150 Park Ave., E. Hartford, Conn.
Ortofon Div., Thorens & Atlantic Aves., New Hyde Park, N.Y.
RCA Corp., Front & Cooper, Camden, N.J.
Visual Educom Co., U.S. 12 E., Michigan City, Ind.

Tweezers, Hand & Vacuum
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Vernitron Electrical Comps., 117 Union Ave., Laconia, N.H.
Air-Vac Engrg. Co., Inc., 100 Gulf St., Milford, Conn.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Compton, W.H. Shear Co., P.O. Box 1096, North Sta., New Bedford, Mass.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
Federal Tool Engrg. Co., Inc., 1384 Pompton Ave., Cedar Grove, N.J.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Keller, Hugo P., Inc., 41 East 42nd St., New York, N.Y.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Micro Tech. Mfg., Inc., 703 Plantation St., Worcester, Mass.
Orbit Inds., Box 1444, San Luis Obispo, Calif.
Scientific Inds., Inc., 150 Herricks Rd., Mineola, N.Y.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
X-Acto Precision Tools, Inc., 48-41 Van Dam St., Long Island City, N.Y.

Twisters, Wire—See Wire Twisters

Twists, Waveguide—See Bends & Twists, Microwave

Typewriters, Input-Output (All Types)
CompuCord, Inc., 225 Crescent St., Waltham, Mass. ..... p 552
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
TEC, Inc., 6700 S. Washington Ave., Eden Prairie, Minn.
Communitype Corp., 767 5th Ave. (GM Bldg.), New York, N.Y.
Digitronics Corp., 1 Albertson Ave., Albertson, N.Y.
Electronic Engrg. Co. Cal., 1601 E. Chestnut Ave., Santa Ana, Cal.
Epsco, Inc., 411 Providence Hwy., Westwood, Mass.
Friden Div., 2350 Washington Ave., San Leandro, Calif.
IBM Corp., Dept. EEM, 1271 Ave. of the Americas, New York, NY
KDI Navcor, Inc., Rittenhouse Rd. & Van Buren Ave., Valley Forge Ind'l. Pk., Norristown, Pa.
Northern Sci., Inc., 2551 W. Beltline, Middleton, Wisc.
Scope, Inc., 1860 Michael Faraday Dr., Reston, Va.

Ultrasonic Bonding Machines—See Machines, Ultrasonic Bonding

Ultrasonic Cleaners—See Cleaners, Ultrasonic

Ultrasonic Equip.—See Amplifiers; Analyzers; Controls, Indicators; Soldering Equip., etc.

Ultrasonic Guns
Ultrasonic Devices, 1057 Summit Ave., Jersey City, N.J. p 1316
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif.
Du Kane Corp., 103 11th Ave., St. Charles, Ill.
Marcal Electro-Sonics, P.O. Box 185, Burkank, Calif.

Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet
American Ultraviolet Co., 123 Commerce St., Chatham, N.J.
Atlantic Ultraviolet Corp., 24-10 40th Ave., Long Island City, N.Y.
Black Light Corp. of America, 5114 Walnut Grove Ave., San Gabriel, Calif.
Black Light Eastern, 29 New York Ave., Westbury, N.Y.
Black Light Prods., Box 45278, Chicago, Ill.
Dolan-Jenner Inds., Inc., 10 Ingalls Ct., Melrose, Mass.
Engelhard Hanovia, Inc., 100 Chestnut St., Newark, N.J.
Etchomatic, Inc., Box 444, Waltham, Mass.
Gaertner Scientific Corp., 1261A Wrightwood Ave., Chicago, Ill.
Gates, George W. & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Square, N.Y.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Olympus Corp. America, Two Nevada Dr., New Hyde Park, N.Y.
Oriel Optics Corp., 1 Market St., Stamford, Conn.
Schoeffel Instr. Corp., 24 Booker St. Westwood, N.J.
Shannon Luminous Materials Co., 7356 Santa Monica Blvd., Hollywood, Calif.
Stroblite Co., Inc., 29 W. 15th St., New York, N.Y.
Sylvania Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass.
Ultra-Violet Prods., Inc., 5114 Walnut Grove Ave., San Gabriel, Cal.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.
Will Scientific, Inc., 39 Russell St., Rochester, N.Y.

Ultraviolet Spectrophotometers—See Spectrophotometers

Underwater Communication, Detection, Navigation, etc. Equipment
AEL, Inc., Box 552, Lansdale, Pa.
AEL, Inc., Box 552, Lansdale, Pa.
CML, Inc., 166 National Rd., Edison, N.J.
Dranetz Engrg. Labs., Inc., 1233 North Ave., Plainfield, N.J. p 1988
Electronic Enterprises, Inc., 65 7th Ave., Newark, N.J.
Info-Lite Corp., 2337 Lemoine Ave., Ft. Lee, N.J.
Ithaco, Inc., 735 W. Clinton St., Ithaca, N.Y.
Kinelogic Corp., 873 S. Fair Oaks Ave., Pasadena, Cal.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
AMBAC Inds., Inc., 900 Old Country Rd., Garden City, N.Y.
American Mach. & Foundry Co., 1025 N. Royal St., Alexandria, Va.
Apelco Co., 213 E. Grand Ave., S. San Francisco, Calif.
Arvin Industries, Inc., 13th St. & Big Four Railroad, Columbus, Ind.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bludworth Marine Div., 10 Adams St., Linden, N.J.
Bunker-Ramo Corp., 8433 Fallbrook Ave., Canoga Pk., Calif.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Edo Western Corp., 2645 S. 2nd W., Salt Lake City, Utah
Egan Lab., 107-56 113 St., Richmond Hill, N.Y.
Electro-Mechanics Co., P.O. Box 1546, Austin, Tex.
Electro-Optical Sys., Pasadena, Calif.
Elctrn. Navigation Inds., Inc., 1337 E. Main St., Rochester, N.Y.
E.M.I. Elctrns. Canada, Ltd., Box 1005, Dartmouth, N.S., Canada
General Instr. Corp., 33 Southwest Pk., Westwood, Mass.
Goodyear Aerospace Corp., 1210 Massillon Rd., Akron, Ohio
Honeywell, Inc., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Integrated Elctrns. Corp., 900 Walt Whitman Rd., Huntington Station, N.Y.
Int'l. Computer Prods., Inc., Box 34484, Dallas, Tex.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
Lear Siegler, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Lek-Trol, Inc., Rte. 2, Box 453-B, Grapevine, Tex.
Linden Labs., Inc., P.O. Box 920, State College, Pa.
Massa Div., 280 Lincoln St., Hingham, Mass.
Nold, Walter, Co., 24 Birch Rd., Natick, Mass.
Pickard & Burns Elctrns., 103 Fourth Ave., Waltham, Mass.
Prodelin, Inc., Box 131, Hightstown, N.J.
Raytheon Co., Gov't. Mktg., 141 Spring St., Lexington, Mass.
RCA, Marne Hwy., Moorestown, N.J.
RF Communications, Inc., 1680 University Ave., Rochester, N.Y.
Ross Labs., Inc., 3138 Fairview Ave., E., Seattle, Wash.
Sanders Assocs., Inc., Ocean Sys. Div., Daniel Webster Hwy., So. Nashua, N.H.
Scientific Resch. Instrs. Co., 700 Turner Rd., Richmond, Va.
Sparton Corp., 2400 E. Ganson St., Jackson, Mich.
Sperry Marine Sys. Div., Rte. 29 N. & Hydraulic Rd., Charlottesville, Va.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Straza Inds., 790 Greenfield Dr., El Cajon, Calif.
Sylvania Elec. Prods., Inc., 140 First Ave., Waltham, Mass.
Technical Mat'l. Corp., Box 142, 700 Fenimore Road, Mamaroneck, N.Y.
Teledyne Isotopes, 50 Van Buren Ave., Westwood, N.J.
Telex Comm. Div., 9600 Aldrich Ave., S., Minneapolis, Minn.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Victor Comptometer Corp., 3900 N. Rockwell St., Chicago, Ill.
Westinghouse Elec. Corp., P.O. Box 2278, Pittsburgh, Pa.

Urea Formaldehyde—See Plastic Raw Materials

Vacuum Equip., Deposition—See Depositiion Equip., Vacuum

Vacuum Fluorescent Readout Tubes—See Tubes, Readout

Vacuum Indicators—See Indicators, Vacuum

Vacuum Parts-Handling Tools—See Tools, Parts-Handling, Vacuum Operated

Vacuum-Tube Voltmeters—See Meters, Vacuum-Tube Volt

Valves, Cryogenic
Andonian Assocs., Inc., 26 Thayer Rd., Waltham, Mass.
Atkomatic Valve Co., Inc., Box 11258, Indianapolis, Ind.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Circle Seal Corp., Circle Seal Ctr., Box 3666, Anaheim, Cal.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Delta Engrg., Box 620, Boulder, Colo.
Essex Cryogenics Inds., Inc., 8213 Gravois, St. Louis, Mo.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Pesco Prods., 24700 N. Miles Rd., Bedford, Ohio
Pneu-Hydro Valve Corp., 52 Horse Hill Rd., Cedar Knolls, N.J.
Royal Inds., 2040 E. Dyer Rd., Santa Ana, Calif.
Task Corp., Box 3999, Anaheim, Calif.
United Elec. Controls Co., 85A School St., Watertown, Mass.
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wright Comps., Inc., Broad & South Sts., Clifton Springs, N.Y.

Valves, Epitaxial Reactor
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.

Valves, Servo
Automation Dev. Co., 9905 W. Jefferson Blvd., Culver City, Calif. ..... p 1637
Adel Div., 10777 Van Owen St., Burbank, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Glar-Ban Corp., 496 Kennedy Rd., Buffalo, N.Y.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Knapton Assocs., Inc., 125 Northeastern Blvd., Nashua, N.H.
Moog, Inc., Proner Airport, East Aurora, N.Y.
O'Brien, D. G., Inc., 15 Mercer Rd., Natick, Mass.
Sanders Assocs., Inc., Instr. Div., Grenier Field, Manchester, N.H.
Servotronics, Inc., 3901 Union Rd., Buffalo, N.Y.
Standard-Thomson Corp., 152 Grove St., Waltham, Mass.

Valves, Solenoid
Adel Div., 10777 Van Owen St., Burbank, Calif.
Aerodyne Controls Corp., 90 Gazza Blvd., Farmingdale, N.Y.
Aeronautical Div, 400 Enterprise St, Bryan, Ohio
Atkomatic Valve Co., Inc., Box 11258, Indianapolis, Ind.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bendix Corp., 11600 Sherman Way, N. Hollywood, Calif.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Caltron Prods. Co., 3518 W. Pico Blvd., Los Angeles, Calif.
Circle Seal Corp., Circle Seal Ctr., Box 3666, Anaheim, Cal.
Clark Control Div., 1146 E. 152nd St., Cleveland, Ohio
Dynamco, Inc., 10052 Monroe Dr., Dallas, Tex.
Fluorocarbon Co., 1754 S. Clementine, Box 3339, Anaheim, Cal.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Hartman Sys. Co., Inc., 360 Wolf Hill Rd., Huntington Sta., N.Y.
Honeywell, Inc., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Honeywell, Inc., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn.
Hydro-Aire Div., 3000 Winona Ave., Burbank, Calif.
IMC Magnetics Corp., 1900 E. 5th St., Tempe, Ariz.
Johnson Corp., 805 Wood St., Three Rivers, Mich.
Koontz-Wagner Elec. Co., Inc., 516 N. Michigan St., South Bend, Ind.
Laketown Mfg. Corp., Box 27A RFD 1, Waconia, Minn.
Magnetec Corp., 7751 Densmore Ave., Van Nuys, Calif.
Marotta Sci. Controls, Inc., Boonton Ave., Boonton, N.J.
National Water Lift Co., 2220 Palmer Ave., Kalamazoo, Mich.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pneu-Hydro Valve Corp., 52 Horse Hill Rd., Cedar Knolls, N.J.
Robintech, Inc., 3310 Vanowen St., Burbank, Calif.
Scanivalve, Inc., Box 20005, San Diego, Calif.
Skinner Elec. Valve Div., 95 Edgewood Ave., New Britain, Conn.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
U.O.P. Instrs. Div., Box 2001, Greenwich, Conn.
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Victor Controls, 2336 Auburn Ave., Sacramento, Calif.
Weston Hydraulics, Div., 7500 Tyrone Ave., Van Nuys, Calif.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wright Comps., Inc., Broad & South Sts., Clifton Springs, N.Y.

Valves, Vacuum

Electro/Data, Inc., 1621 Jupiter, Garland, Tex.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Allis-Chalmers, Box 512, Milwaukee, Wisc.
Aremco Prods., Inc., Box 145, No. Hollywood, N.Y.
Automatic Switch Co., 50-56 Hanover Rd., Florham Park, N.J.
Bemco, Inc., 9908 San Fernando Rd., Pacoima, Cal.
Bendix Corp., 211 Seward Ave., Utica, N.Y.
Bendix Corp., 2734 Hickory Grove Rd., Davenport, Iowa
Bendix Corp., 1775 Mt. Read Blvd., Rochester, N.Y.
Central Scientific Co., 2600 S. Kostner Ave., Chicago, Ill.
Circle Seal Corp., Circle Seal Ctr., Box 3666, Anaheim, Cal.
Davis & Wilder, Inc., 1115 E. Arques Ave., Sunnyvale, Cal.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Edwards High Vacuum (Can.), Ltd., 430 S. Service Rd., W., Oakville, Ont., Canada
Edwards High Vacuum, Inc., 3279 Grand Island Blvd., Grand Island, N.Y.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Fox Valve Dev. Co., Inc., 2 Great Meadow La., Hanover, N.J.
Gardner Cryogenics Corp., 2136 City Line Rd., Bethlehem, Pa.
General Elec. Co., 25 Federal St., Bldg. 4MX, W. Lynn, Mass.
Granville-Phillips Co., 5675 E. Araphahoe Ave., Boulder, Colo.
High Vacuum Equip. Corp., 2 Churchill Rd., Hingham, Mass.
High Voltage Engrg. Corp., S. Bedford St., Burlington, Mass.
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Kinney Vacuum Co., 3529 Washington St., Boston, Mass.
Laketown Mfg. Corp., Box 27A RFD 1, Waconia, Minn.
Lunkenheimer Co., P.O. Box 14360, Cincinnati, Ohio
Norton Co., 160 Charlemont St., Newton, Mass.
Pennwalt Corp., 3 Penn Center, Philadelphia, Pa.
Pneu-Hydro Valve Corp., 52 Horse Hill Rd., Cedar Knolls, N.J.
Skinner Elec. Valve Div., 95 Edgewood Ave., New Britain, Conn.
T-M Vacuum Prods., Warrington & Rowland, Riverton, N.J.
Taylor Instr. Process Control Div., 95 Ames St., Rochester, N.Y.
Ultek Div., Box 10920, Palo Alto, Calif.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vactronic Lab. Equip., Inc., 65 Brightside Ave., E. Northport, N.Y.
Vacuum Equip. Div., 160 Charlemont St., Newton, Mass.
Vacuum Inds., Inc., 34 Linden St., Somerville, Mass.
Vacuum Resch. Mfg. Co., 3100 Crow Canyon Rd., San Ramon, Calif.
Valcor Engrg. Corp., 365 Carnegie Ave., Kenilworth, N.J.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Vacuum Div., 611 Hansen Way, Palo Alto, Cal.
Veeco Instrs., Inc., Terminal Dr., Plainview, N.Y.
Whittaker Corp., 9229 Sunset Blvd., Los Angeles, Calif.
Wright Comps., Inc., Broad & South Sts., Clifton Springs, N.Y.

Vapor Degreasers—See Machines, Vapor-Degreasing

Varactors—See Diodes, Varactor

Varistors—See Resistors, Voltage Sensitive

Varnish—See Insulating Compounds, Varnish

Vehicle Guidance Systems (Industrial)—See Machines, Material Handling (Electronic Control)

Verification Systems, Tape

Datacom, Inc., Box 278, Ft. Walton Bch., Fla. ..... p 555
Remex Elctrns., 5250 W. El Segundo Blvd., Hawthorne, Cal. p 592
Adar Assocs., Inc., 85 Bolton St., Cambridge, Mass.
Boston Digital Corp., 21 Main St., Ashland, Mass.
Defense Elctrns., Inc., Rockville, Md.
Gerber Sci. Instr. Co., Box 305, Hartford, Conn.
Infotec, Inc., 70 Newtown Rd., Plainview, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Milgo Electrn. Corp., 7620 N.W. 36th Ave, Miami, Fla.
Sanders Assocs., Inc., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H.

VHF Equipment—See Generators; Receivers; etc.

Vibration Analyzers—See Analyzers, Vibration

Vibration Measurement Instruments—See Meters, Vibration

Vibration Mounts—See Mounts, Shock & Vibration

Vibration Test Systems-Also See Services, Environmental Test

Aeroflex Labs., Inc., South Service Rd., Plainview, N.Y.
B & K Instrs., Inc., 5113 W. 164th St., Cleveland, Ohio ..... p 618
Elgenco, Inc., 1550 Euclid St., Santa Monica, Cal. ..... p 671
Singer Co., 915 Pembroke St., Bridgeport, Conn.
Teledyne Geotech, Dept. 14, 3401 Shiloh Rd., Garland, Tex.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Unholtz-Dickie Corp., 3000 Whitney Ave., Hamden, Conn. p 805
AGAC-Derritron, Inc., 1332 N. Henry St., Alexandria, Va.
All American Tool & Mfg. Co., Inc., 8027 Lawndale, Skokie, Ill.
Ametek, Inc., Station Square Two, Paoli, Pa.
Bafco, Inc., 717 Mearns Rd., Warminster, Pa.
Barry Controls, 700 Pleasant St., Watertown, Mass.
Bell & Howell Co., 360 Sierra Madre Villa, Pasadena, Calif.
Chadwick-Helmuth Co., Inc., 111 E. Railroad Ave., Monrovia, Calif.
Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, Pa.
Data-Control Systems, Inc., Commerce Dr., Danbury, Conn.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Endevco, 801 S. Arroyo Pkwy., Pasadena, Calif.
Environmental Engrg. Div., 225 West 2nd St., Bethlehem, Pa.
Epic, Inc., 150 Nassau St., New York, N.Y.
Federal Sci. Corp., 615 West 131 St., New York, N.Y.
General Oceanology, Inc., 27 Moulton St., Cambridge, Mass.
General Radio Co., 300 Baker Ave., W. Concord, Mass.
Gulton Inds., Inc., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal.
Gulton Inds., Inc., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Indikon Co., Inc., 76 Coolidge Hill Rd., Watertown, Mass.
IRD Mechanalysis, Inc., 6150 Huntley Rd., Columbus, Ohio
KDI Electronetics Corp., 1363 S. Patrick Dr., Satellite Bch., Fla.
Kistler Instr. Corp., 8967 Sheridan Dr., Clarence, N.Y.
Kollsman Instr. Corp., 575 Underhill Blvd., Syosset, N.Y.
L.A.B. Corp., 981 Onondaga St., Skaneateles, N.Y.
Ling Elctrns., 1515 S. Manchester Ave., Anaheim, Calif.
Massa Div., 280 Lincoln St., Hingham, Mass.
MB Elctrns., Box 1825, New Haven, Conn.
Ogden Technology Labs., Inc., 1536 E. Valencia Dr., Fullerton, Cal.
Optron Corp., 50 Fitch St., New Haven, Conn.
Philips Elctrn. Instrs., 750 S. Fulton Ave., Mt. Vernon, N.Y.
Rawco Instrs., Inc., P.O. Box 1286, Ft. Worth, Tex.
Signal Analysis Inds. Corp., 595 Old Willets Path, Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, Box 671, San Diego, Calif.
Sprengnether, W.F. Instr. Co., Inc., 4567 Swan St., St. Louis, Mo.
Tektronix, Inc., Box 500, Beaverton, Ore.
Wyle Labs., 128 Maryland St., El Segundo, Calif.
Zonic Technical Labs., 8927 Rossash Rd., Cincinnati, Ohio

Vibrating Capacitors

Stevens-Arnold, Inc., 7 Elkins St., So. Boston, Mass. ..... p 2143
Tel-Instr. Elctrns. Corp., 728 Garden St., Carlstadt, N.J.

Vibrators (Frequency Converting)

ATR Elctrns., Inc., 300 E. 4th St., St. Paul, Minn. ..... p 921
Mallory Timers Co., 3029 E. Washington St., Indianapolis, Ind.
Oak Mfg. Co., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill.
Beckman Instrs., Inc., 2200 Wright Ave., Richmond, Calif.
Channel Inds., Inc., 839 Ward Dr., Box 3680, Santa Barbara, Calif.
Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland, Ohio
Cornell-Dubilier Elctrns., 150 Ave. L, Newark, N.J.
Terado Corp., 1068 Raymond Ave., St. Paul, Minn.
Vokar Prods., Inc., 2801 S. State St., Ann Arbor, Mich.

Video Analyzers—See Analyzers, Video

Vidicon Tubes—See Tubes, TV Camera Pickup

Viewing Hoods, Cathode Ray Tube

Dero Resch. & Dev. Corp., Broadway & Park Ave., Huntington, N.Y.
Flexco Div., 6855 Suva St., Bell Gardens, Calif.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Jan Hardware Mfg. Co., Inc., 47-27 36th St., Long Island City, N.Y.
Tektronix, Inc., Box 500, Beaverton, Ore.

Vinyl Compounds—See Plastic Raw Materials

Viscosity Indicators—See Indicators, Viscosity

Visual Control Boards, Charts & Graphs—See Boards, Graphic,Visual Control

VLF Equipment—See Receivers; Transmitters; etc.

Voltage Comparators—See Comparators, Voltage

Voltage Regulators—See Regulators & Stabilizers, Voltage

Voltage SourceS

Cohu Elctrns., Inc., Box 623, San Diego, Calif.
Digital Apparatus Corp., 300 Marcus Blvd., Deer Pk., N.Y. p 649
Julie Research Lab., Inc., 211 W. 61st St., New York, N.Y. p 720,722
Keithley Instrs., Inc., 28775 Aurora Rd., Cleveland, Ohio
Fluke, John Mfg. Co., Inc., Box 7428, Seattle, Wash.

Voltmeters—See Meters, Volt

Washers—See Fasteners

Water Coils, Tube Cooling

Enviromental Control Sys., 43-22 Queens St., Long Island City, N.Y.
Lapp Insulator Div., Interpace Corp., 350 Sumner St., LeRoy, N.Y.
Wakefield Engrg., Inc., Teal & Audubon Rds., Wakefield, Mass.

Wave Soldering Equipment—See Soldering Equip, Printed Circuit

Waveform Analyzers—See Analyzers, Waveform

Waveguide-Coax Adapters

Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Americon Corp., 67 Rumford Ave., Waltham, Mass. ..... p 859
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Bendix Corp., Box 239, Franklin, Ind. ..... p 862
E & M Laboratories, 5388 Sterling Center Dr., Westlake Village, Cal. ..... p 867
Kings Elctrns. Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
OMNI Spectra, Inc., 24600 Hallwood Ct., Farmington, Mich. p 888
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
R L C Elctrns., Inc., 83 Radio Cir., Mt. Kisco, N.Y.
Scientific-Atlanta, Inc., Box 13654, Atlanta, Ga.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
CES Elctrns., 2968 Avenue Z, Brooklyn, N.Y.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
General Microwave Corp., 155 Marine St., Farmingdale, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Kevlin Mfg. Co., 26 Conn St, Woburn, Mass.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Meca Elctrns., Inc., 459 E. Main St., Denville, N.J.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Filter Co., Inc., 135 W. Manlius St., East Syracuse, N.Y.
Microwave Labs. America, Box 13, Bay Sta., Brooklyn, N.Y.
N-H Microwave, Inc., Box 887, Red Bank, N.J.
Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, Md.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Phelps Dodge Comm. Co., 60 Dodge Ave., Box 187, North Haven, Conn.
PRD Elctrns., Inc., 1200 Prospect Ave., Westbury, N.Y.
Prodelin, Inc., Box 131, Hightstown, N.J.
Reeve Elctrns., Inc., 601-EEM-West Lake St., Chicago, Ill.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Sage Labs. Inc., 14 Huron Dr, Natick, Mass.
Schutter Microwave, 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Tru-Connector Corp., 245 Lynnfield St., Peabody, Mass.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Waveguides, Flexible

Airtron, 200 E. Hanover Ave., Morris Plains, N.J. ..... p 856
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Gabriel Elctrns., Div., Saco, Me.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes Aircraft Co, 1901 Malvern St, Fullerton, Cal.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Prodelin, Inc., Box 131, Hightstown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Schutter Microwave, 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y.
Servometer Corp., 82 Industrial, E., Clifton, N.J.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Waveguides, Rigid

Airtron, 200 E. Hanover Ave., Morris Plains, N.J. ..... p 856
Amphenol RF Div., 33 E. Franklin St., Danburry, Conn.
Arra Inc., 15 Harold Ct., Bayshore, N.Y.
Narda Microwave Corp., Plainview, N.Y.

Nippon Electric Co., Ltd., 33-7, 5-chome, Minato-ku, Tokyo, Japan
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y. p 894
Uniform Tubes, Inc., Collegeville, Pa.
Waveline, Inc., Box 718, W. Caldwell, N.J.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alpha Inds., Inc., 381 Elliot St., Newton Upper Falls, Mass.
Andrew Corp., 10500 W. 153 St., Orland Pk., Ill.
Astrolab Inc., 4 Mc Candless St, Linden, N J
Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 158, Lindenhurst, N.Y.
Chemalloy Elctrns. Corp., 7947 John Towers Ave., Gillespie Airport, Santee, Cal.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Connolly & Co., Inc., 914 N. Rengstorff Ave., Mt. View, Calif.
Diamond Antenna & Microwave Corp., 35 River St., Winchester, Mass.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Electronic Specialty Co., 401 Watertown Rd., Thomaston, Conn.
Gabriel Elctrns., Div., Saco, Me.
GAF Corp., 140 W. 51 St., New York, N.Y.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Hughes-Treitler Mfg. Corp., 300 Endo Blvd., Garden City, N.Y.
Industrial Microwave Corp., 520 Martin Pl., Scotch Plains, N.J.
Laminair, Inc., 13226 Figueroa, Los Angeles, Calif.
Lenkurt Elec. Co., Inc., 1105 County Rd., San Carlos, Calif.
Lieco, Inc., 80 E Montauk Hwy., Lindenhurst, N.Y.
MCS Corp., 1307 S. Myrtle Ave., Monrovia, Calif.
Microlab/FXR, 10 Microlab Rd., Livingston, N.J.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Omega Labs., Inc., Haverhill St., Rowley, Mass.
Pem Mach. Tool Co., Inc., 39A Myrtle St., Cranford, N.J.
Prodelin, Inc., Box 131, Hightstown, N.J.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Schutter Microwave, 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y.
Struthers Elctrns. Corp., Railroad Pl., Mamaroneck, N.Y.
Surface Conduction, Inc., 1501 Broadway, New York, N.Y.
Systron-Donner Corp., One Systron Dr., Concord, Cal.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Tech. Appliance Corp., One Taco St., Sherburne, N.Y.
Thomson-CSF Electron Tubes, Inc., 50 Rockefeller Plaza, New York, N.Y.
TRG Prods., 400 Border St., E. Boston, Mass.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.
Victor Microwave, Inc., 38 W. Water St., Wakefield, Mass.

Wave Traps—See Filters, Antenna; Filters, Microwave; etc.

Wax—See Insulating Compounds, Wax

Weatherstrip, Electronic

Metex Corp., 970 New Durham Rd., Edison, N.J. .....p 2606,2607
Chomerics, Inc., 77 Dragon Ct., Woburn, Mass.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Welding Equip. & Access.-Also See Controls, Welding; Timers,Welding

Falstrom Co., 174 Falstrom Ct., Passaic, N.J. ..... p 2150
Sorensen Oper., Richards Ave., Norwalk, Conn.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Aerometrics, 3300 Crow Canyon Rd., San Ramon, Calif.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Arizona Elctrns., Inc., Drawer AE, Benson, Ariz.
Becker Bros. Carbon Co., 3450 S. Laramie Ave., Cicero, Ill.
Carol Cable Co., Box 68, Pawtucket, R.I.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Electro Powerpacs Corp., 253 Norfolk St., Cambridge, Mass.
Eutectic Corp., 40-40 172nd St., Flushing, N.Y.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Forney Inds., Inc., 1800 La Porte Ave, Fort Collins, Colo.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hamilton Standard, Windsor Locks, Conn.
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
Hobart Bros. Co., 600 W. Main St., Troy, Ohio
Hughes Aircraft Co., Vacuum Tube Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Kahle Engrg. Co., 3344 Hudson Ave., Union City, N.J.
Lenco, Inc., 319 W. Main, Jackson, Mo.
Maryland Lava Co., Inc., P.O. Box 527, Dept. EEM, Bel Air, Md.
Microflame, Inc., 7800 Computer Ave., Minneapolis, Minn.
Miller Elec. Mfg. Co., 718 S. Bounds, Box 1087, Appleton, Wisc.
National-Standard Co., Niles, Mich.
Nelson Stud Welding Co., E. 28th & Toledo Ave., Lorain, Ohio
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Precision Arc Co., Inc., 785 Woodend Rd., Stratford, Conn.
Price & Rutzebeck, P.O. Box 30, Hayward, Calif.
Protronic Inds., Inc., 2415 S Manchester Ave, Anaheim, Calif
Robotron Corp., 21300 West 8 Mile Rd., Detroit, Mich.
Sciaky Bros., Inc., 4915 West 67th St., Chicago, Ill.
Scientific Elec., Inc., 111 Monroe St., Garfield, N.J.
Silver, G.H. & Assocs., Inc., P.O. Box 21, Newtonville, Mass.
Square D Co., 205 S. Northwest Hwy., Park Ridge, Ill.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Tempil Div., Hamilton Blvd., So. Plainfield, N.J.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Thermatron, Div., 44-16 23rd St., Long Island City, N.Y.
Thomson Gen'l. Corp., 161 Pleasant St., Lynn, Mass.
Trindl Prods., Ltd., 1807 S. Clark St., Chicago, Ill.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Walters, W.A., Inc., 7713 S. Western Ave., Chicago, Ill.
Westberg Mfg. Co., 3400 Westach Way, Sonoma, Cal.
Westinghouse Elec. Corp., Box 300, Sykesville, Md.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Welding Equip., Semiconductor Devices

GTI Corp., 310 Chestnut St., Meadville, Pa.
Hughes Aircraft Co., Newport Beach Div., 500 Superior Ave., Newport Beach, Cal.
Sorensen Oper., Richards Ave., Norwalk, Conn.
Accra-Point Arrays Corp. (A-PAC), 20729 Dearborn St., Chatsworth, Cal.
Arvin Sys., Inc., 1482 Stanley Ave., Dayton, Ohio
Associate General Labs., Inc., 8934 W. Ogden Ave., Brookfield, Ill.
Communications Tech. Corp., 2237 Colby Ave., Los Angeles, Cal.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Freudenberg, B., Inc., 50 Rockefeller Plaza, New York, N.Y.
Hadron Inc., 800 Shames Dr., Westbury, N.Y.
Hamilton Standard, Windsor Locks, Conn.
Hughes Aircraft Co., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif.
Kokusai Electric Co., Ltd., 9, Nishikubo-Sakuragawa-cho, Minato-ku, Tokyo 105, Japan
Korad Dept., Mat'ls. Sys. Div., 2520 Colorado Ave., Santa Monica, Calif.
Kulicke & Soffa Inds., Inc., 135 Commerce Dr., Fort Washington, Pa.
Sonobond Corp., 310 E. Rosedale Ave., West Chester, Pa.
Tekform Prods. Co., 2780 Coronado St., Anaheim, Cal.
Tempress Inds., Inc., 980 University Ave., Los Gatos, Calif.
Thomson Gen'l. Corp., 161 Pleasant St., Lynn, Mass.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.

Welding & Refining Equip., Electron Beam

Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
Torr Labs., Inc., 2228 Cotner Ave., Los Angeles, Cal.
Cooke Vacuum Prods., Inc., 13 Merritt St., S. Norwalk, Conn.
Denton Vacuum, Inc., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J.
Hamilton Standard, Windsor Locks, Conn.
Norton Co., 160 Charlemont St., Newton, Mass.
Sciaky Bros., Inc., 4915 West 67th St., Chicago, Ill.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Westinghouse Elec. Corp., Box 868, Pittsburgh, Pa.

Whip Antennas—See Antennas, Mobile

Whiteprint Machines

HJS Engrg. Co., P.O. Box 96, Park Ridge, Ill.
Rotolite, Teledyne Co., P.O. Box 7G, Stirling, N.J.

Windings, Transformer

Automatic Coil, 76 East 2nd St., Mineola, N.Y. ..... p 2335
Dale Elctrns., Inc., Box 180, Yankton, S.D. ..... p 2338
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, N.Y.
H & H Toroidal Winding Co., 26215 Tungsten Rd., Euclid, Ohio p 2341
Solid State Elctrns. Corp., 15321 Rayen St., Sepulveda, Cal.
Stanwyck Winding, 137 Walsh Ave., Newburgh, N.Y.
A.P.W. Co., Inc., 72 W. Main St., Rockaway, N.J.
Bicron Elctrns. Co., Box 807, Barlow St., Canaan, Conn.
Device Seals, Inc., 11684 Tuxford St., Sun Valley, Calif.
Electro-Pacific, Inc., 5782 Thornwood Dr., Goleta, Calif.
Electrocom Inds., 1105 N. Ironwood Dr., So. Bend, Indiana
Forbes & Wagner, Inc., 345 Central Ave., Silver Creek, N.Y.
Keiser's Inds., Inc., Laumau St., Mt. Holly Springs, Pa.
National Coil Co., Box 1040, Douglas, Ariz.
New York Coil Co., 40-48 Second Ave., Phoenixville, Pa.
Piconics Inc., Cummings Rd., Tyngsboro, Mass.
Ramm Rectifier Co., Inc., 340 Coster St., Bronx, N.Y.
Raytheon Co., Microwave & Power Tube Div., 141 Spring St., Lexington, Mass.
Rho Engrg. Co., 2234 Colby Ave, Los Angeles, Calif
SKG Assocs., Inc., 206 Eustis St., Boston, Mass.
Topper Mfg. Co., Inc., 889 Northern Blvd., Great Neck, N.Y.
Trindl Prods., Ltd., 1807 S. Clark St., Chicago, Ill.
Tur-Bo Jet Prods. Co., Inc., 5025 N. Earle St., Rosemead, Calif.
Universal Toroid Coil Winding, Inc., 1190 Grove St., Irvington, N.J.

Windows, Infrared

Amersil, Inc., 685 Ramsey Ave., Hillside, N.J. ..... p 2681
General Elec. Co., 24400 Highland Rd., Richmond Hgts., Ohio p 2672
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, Ohio
Servo Corp. America, 111 New South Rd., Hicksville, N.Y. p 908
Advanced Kinetics, Inc., 1231 Victoria St., Costa Mesa, Calif.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Barnes Engrg. Co., 30 Commerce Rd., Stamford, Conn.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Ceramics Int'l., 39 Siding Pl., Manhwah, N.J.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Eastman Kodak Co., 343 State St., Rochester, N.Y.
Eimac, 301 Industrial Way, San Carlos, Calif.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
General Laser Corp., 8 Erie Dr., Natick, Mass.
Harshaw Chem. Co., 1945 E. 97th St., Cleveland, Ohio
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Infrared Inds., Inc., Box 989, Santa Barbara, Cal.
Insaco, Inc., Box 422, Quakertown, Pa.
Isomet Corp., 433 Commercial Ave., Palisades Park, N.J.
Jones, A.D. Optical Works, Inc., 64 Cambridge St., Burlington, Mass.
Kopp Glass, Inc., Box 8255, Swissvale, Pittsburgh, Pa.
Liberty Mirror Div., 851 Third Ave., Brackenridge, Pa.
Moser Jewel Co., 544 Fayette St., Perth Amboy, N.J.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Republic Lens Co., Inc., 31 East 169th St., Bronx, N.Y.
Santa Barbara Resch. Ctr., 75 Coromar Dr, Goleta, Calif.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Syncor Prods. Co., Inc., 44 Eastern Ave., Malden, Mass.
Texas Instruments, Inc., Box 6015 M/S 561, Dallas, Tex.
Union Carbide Corp, Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif.

Windows, Shieled

Metex Corp., 970 New Durham Rd., Edison, N.J.
Franklin Fibre-Lamitex Corp., 901-905 East 13th St., Wilmington, Del.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Optics for Ind., Inc., 1929 N. Buffum St., Milwaukee, Wisc.
Penberthy Div., 6701 Maynard S., Seattle, Wash.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.

Windows, Waveguide

AEL, Inc., Box 552, Lansdale, Pa.
Airtron, 200 E. Hanover Ave., Morris Plains, N.J.
Premier Microwave Corp., 35 New Broad St., Port Chester, N.Y.
Ainslie Corp., 531 Pond St., S. Braintree, Mass.
Aircom, Inc., Rte. 16B, Union, N.H.
Airtec, Inc., 264 Columbus Ave., P.O. Box 158, Roselle, N.J.
Alberox Corp., New Bedford Ind'l. Pk., New Bedford, Mass.
Ceramaseal, Inc., Box 25, New Lebanon Center, N.Y.
Christian Precision Mfg. Co., Inc., 12th & Federal Sts., Camden, N.J.
Dell Optics Co., Inc., 9226 Kennedy Blvd., N. Bergen, N.J.
Filmohm Div., 37-11 47th Ave., Long Island City, N.Y.
Frenchtown/Cfi, inc., 8th & Harrison Sts., Frenchtown, N.J.
Guide Inds., Inc., 11855 Wicks St., Sun Valley, Calif.
Herley Inds., Inc., 175 Eileen Way, Syosset, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Latronics Corp., Box 469, Latrobe, Pa.
Metcom, Inc., 76 Lafayette St., Salem, Mass.
Microwave Assocs., Inc., Northwest Ind. Pk., Burlington, Mass.
Microwave Sys. Co., Box 15155, Golden, Colo.
O & S Research, Inc., 1912 Bannard St., Riverton, N.J.
Pacific Universal Prods. Corp., 168 Vista Ave., Pasadena, Calif.
RF Systems, Inc., 155 King St., Cohasset, Mass.
Richland Glass Co., Inc., Richland, N.J.
Rogers Corp., Rogers, Conn.
Severna Div., 45 Glenwood Pl., East Orange, N.J.
3M Co., 3M Center, St. Paul, Minn.
Varian Assocs., 611 Hansen Way, Palo Alto, Cal.
Varian Assocs., Radiation Div., 611 Hansen Way, Palo Alto, Cal.
Varian Ind'l. Microwave Oper., 611 Hansen Way, Palo Alto, Cal.

Wire, Antenna (All Types)

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Plastoid Corp., 42-61 24th St., Long Island City, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Copperweld Steel Co., Oswego, N.Y.
Copperweld Steel Co., Glassport, Pa.
Finney Co., 34 W. Interstate St., Bedford, Ohio
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.

Wire, Asbestos Insulated

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Radix Wire Co., 26260 Lakeland Blvd., Cleveland, Ohio
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
United States Steel Corp., 525 William Penn Pl., Pittsburgh, Pa.

Wire, Bare, Aluminum

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
ARC Prods. Div., 840 N. Michigan Ave., Chicago, Ill.
Asco Wire & Cable Co., P.O. Box 2127, Noble Sta., Bridgeport, Conn.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Copperweld Steel Co., Oswego, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Orban Kurt Co., Inc., Orban Way, Wayne, N.J.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Beryllium Copper

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y.p 2921
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Copperweld Steel Co., Oswego, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Hamilton Watch Co., Lancaster, Pa.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Precision Metals Div., Lancaster, Pa.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Wire, Bare, Composite Metals

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Hudson Wire Co, 62 Water St, Ossining, N Y
Kester Solder Co, 4201 Wrightwood Ave., Chicago, Ill.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.

Wire, Bare, Copper

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y.
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dabum Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Asco Wire & Cable Co., P.O. Box 2127, Noble Sta., Bridgeport, Conn.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cerro Corp., 300 Park Ave., New York, N.Y.
Chase Brass & Copper Co., 20600 Chagrin Blvd., Cleveland, Ohio
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Copperweld Steel Co., Oswego, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
General Cable Corp., 733 Third Ave., New York, N.Y.
Helenor Metals Corp., 60 Marbledale Rd., Tuckahoe, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Precision Metals Div., Lancaster, Pa.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Revere Copper & Brass, Inc., 605 Third Ave., New York, N.Y.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Spargo Wire Co., Box 229, Rome, N.Y.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Viking Wire Co., Inc., Shelter Rock Rd., Danbury, Conn.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.

Wire, Bare, Copper-Clad

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Dabum Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Asco Wire & Cable Co., P.O. Box 2127, Noble Sta., Bridgeport, Conn.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Carol Cable Co., Box 68, Pawtucket, R.I.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Copperweld Steel Co., Oswego, N.Y.
Copperweld Steel Co., Glassport, Pa.
Crown Metal Products Co., Wyano, Pa.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.

Wire, Bare, Fine, Specialties

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Dabum Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cerro Corp., 300 Park Ave., New York, N.Y.
Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Copperweld Steel Co., Oswego, N.Y.
Copperweld Steel Co., Glassport, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Gavitt Wire & Cable Div., Brookfield, Mass.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Micro Contacts Inc., 62 Alpha Plaza, Hicksville, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
Mullard, Inc., 100 Finn Ct., Farmingdale, N.Y.
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.

Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Viking Wire Co., Inc., Shelter Rock Rd., Danbury, Conn.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Gold & Gold-Plated

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. p 2924
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Handy & Harman, 850 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Nickel-Chrome

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Hamilton Watch Co., Lancaster, Pa.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Howmet Corp., Roy St., Dover, N.J.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Precision Metals Div., Lancaster, Pa.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Republic Steel Corp, Box 6778, Cleveland, Ohio
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Phosphor Bronze

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Anaconda American Brass Co., 414 Meadow St., Waterbury, Conn.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Chase Brass & Copper Co., 20600 Chagrin Blvd., Cleveland, Ohio
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Copperweld Steel Co., Oswego, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Helenor Metals Corp., 60 Marbledale Rd., Tuckahoe, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Unibraze Corp, 455 Knollwood Rd, White Plains, N.Y.

Wire, Bare, Platinum

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. p 2924
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Engelhard Minerals & Chemicals Corp., H. A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J. p 2682
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Hamilton Watch Co., Lancaster, Pa.
Handy & Harman, 850 Third Ave., New York, N.Y.
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Ney, J.M. Co., Maplewood Ave., Bloomfield, Conn.
Nuclear Equip. Chem. Corp., 165 Marine St., Farmingdale, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Western Gold & Platinum Co., 525 Harbor Blvd., Belmont, Cal.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Wire, Bare, Silver-Plated

Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. p 2924
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alpha Metals, Inc., 56 Water St., Jersey City, N.J.
Brainin, C.S. Corp., 320 Washington St., Mt. Vernon, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Copperweld Steel Co., Oswego, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Goldsmith Div., 900 West 18th St., Chicago, Ill.
Hudson Wire Co, 62 Water St, Ossining, N Y
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.

Wire, Bare, Stainless-Steel

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. p 2967
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Berkley & Co., Spirit Lake, Iowa
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Chase Metal Service Div., 20600 Chagrin Blvd., Cleveland, Ohio
Copperweld Steel Co., Oswego, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hamilton Watch Co., Lancaster, Pa.
Harper, H.M. Co., 8200 Lehigh Ave., Morton Grove, Ill.
Hudson Wire Co, 62 Water St, Ossining, N Y
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Precision Metals Div., Lancaster, Pa.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Republic Steel Corp, Box 6778, Cleveland, Ohio
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Steel (Excluding Guy Wire)

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. p 2925
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Reliance Div., 25 Charles Ave., S.E., Massillon, Ohio
Republic Steel Corp, Box 6778, Cleveland, Ohio
Ryerson, J.T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
United States Steel Corp., 525 William Penn Pl., Pittsburgh, Pa.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.

Wire, Bare, Titanium

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Hamilton Watch Co., Lancaster, Pa.
Howmet Corp., Roy St., Dover, N.J.
Kawecki Berylco Inds., Inc., 220 E. 42nd St., New York, N.Y.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National-Standard Co., Niles, Mich.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
ULVAC Corp., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
York, Otto H. Co., Inc., 6 Central Ave., W. Orange, N.J.
York Wire Co., Box 982, Clifton, N.J.

Wire, Bare, Tungsten

Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
City Chemical Corp., 132 West 22nd St., New York, N.Y.
Cross, H. Co., 365 Park Ave., Weehawken, N.J.
Electronic Space Prods., Inc., 954 S. Robertson Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Hamilton Watch Co., Lancaster, Pa.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Materials Resch. Corp., Route 303, Orangeburg, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Rembar Co., Inc., 67 Main St., Dobbs Ferry, N.Y.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Sylvania Elec. Prods., Inc., Towanda, Pa.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Wire, Braid (Excluding Shielding)

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Metex Corp., 970 New Durham Rd., Edison, N.J.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cerro Corp., 300 Park Ave., New York, N.Y.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Copperweld Steel Co., Oswego, N.Y.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Gavitt Wire & Cable Div., Brookfield, Mass.
Hudson Wire Co, 62 Water St, Ossining, N Y
Icore Electro-Plastics, Inc., 3015 Copper Rd., Santa Clara, Cal.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Montgomery Co, Windsor Locks, Conn
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
Transvac Elctrns., 270 Newtown Rd., Plainview, N.Y.
Tri-State Elctrns. Corp., Broadway & Jefferson Sts., Camden, N.J.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire, Braid (Shielding)—See Braid, Cable & Wire Shielding

Wire, Bridge

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Alloys Unlimited, Inc., 16661 Ventura Blvd., Encino, Calif.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.

Wire, Ceramic Insulated

Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Conax Corp., 2300 Walden Ave., Buffalo, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National Beryllia Corp., Greenwood Ave, Haskell, N.J.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.

Wire, Enamel Insulated—See Wire, Hookup, Pushback (All Types)

Wire, Fine, Bare Or Insulated—See Wire, Bare, Fine, Specialties

Wire, Fuse

Bussmann Mfg. Div., Univ. at Jefferson, St. Louis, Mo.
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Hudson Wire Co, 62 Water St, Ossining, N Y
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National-Standard Co., Niles, Mich.
United American Metals Div., 970 Meeker Ave., Brooklyn, N.Y.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.

Wire, Gear Measuring—See Gear Measuring Wire

Wire, Glass Insulated

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dalburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..... p 2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Varflex Corp., 514 W. Court St., Rome, N.Y. ..... p 2678
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Carol Cable Co., Box 68, Pawtucket, R.I.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Radix Wire Co., 26260 Lakeland Blvd., Cleveland, Ohio
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.

Wire, Guy

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Dalburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Tensolite, W. Main St., Tarrytown, N.Y.
Armco Steel Corp., 703 Curtis St., Middletown, Ohio
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Copperweld Steel Co., Oswego, N.Y.
Copperweld Steel Co., Glassport, Pa.
Crown Metal Products Co., Wyano, Pa.
General Cable Corp., 733 Third Ave., New York, N.Y.
IE Mfg. Co., 3039 W. Carroll Ave., Chicago, Ill.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Lance Antenna Corp., 13001 Bradley Ave., Sylmar, Calif.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National-Standard Co., Niles, Mich.
Parker Metal Goods Co., 85 Prescott St., Worcester, Mass.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Southwire Co., 4 Fertilla St., Carrollton, Ga.
Wright, G.F. Steel & Wire Co., 243 Stafford St., Worcester, Mass.

Wire, Heater—See Cable, Heater

Wire, High Temperature

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Dalburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2929,2930,2932
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. p 2936,2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Cabot Corp., 1020 W. Park Ave., Kokomo, Ind.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Howmet Corp., Roy St., Dover, N.J.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
National-Standard Co., Niles, Mich.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.

Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Radix Wire Co., 26260 Lakeland Blvd., Cleveland, Ohio
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Richards Arklay S. Co., Inc., 1 Winchester St., Newton Highlands, Mass.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
Viking Wire Co., Inc., Shelter Rock Rd., Danbury, Conn.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.

Wire, High Voltage

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Amp Inc., 155 Park St., Elizabethtown, Pa. ..... p 2366
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Columbia Elctrn. Cables, 150 Hamlet Ave., Woonsocket, R.I. p 2923
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2930-2933
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. p 2936,2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Rowe Inds., 1700 Airport Hwy., Toledo, Ohio
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Copperweld Steel Co., Glassport, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Okonite Co., Box 340, Ramsey, N.J.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Radix Wire Co., 26260 Lakeland Blvd., Cleveland, Ohio
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.

Wire, Hookup-Pushback (All Types)

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Columbia Elctrn. Cables, 150 Hamlet Ave., Woonsocket, R.I. p 2923
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2929-2931,2933,2935
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. p 2936,2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2940-2942
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal. ..... p 2968
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza, S., Long Island City, N.Y.
Electric Parts Corp., Box 234, Georgetown, Ky.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Judd Wire Div., S Bedford St., Burlington, Mass.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Philco-Ford Corp., 815 Conn. Ave., N.W., Washington, D.C.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Sag Harbor Inds., Inc., Bayview St., Sag Harbor, N.Y.
Superior Insulated Wire Corp., Box 188, Stony Point, N.Y.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.

Wire, Irradiated

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2936
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Judd Wire Div., S Bedford St., Burlington, Mass.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.

Wire, Lead-In & Ground

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2942
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Copperweld Steel Co., Oswego, N.Y.
Copperweld Steel Co., Glassport, Pa.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 21800 Tunqsten Rd., Cleveland, Ohio
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jersey Specialty Co., Inc., Box 248, Wayne, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lance Inds., P.O. Box 4156, Sylmar, Calif.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pacific Electricord Co., 747 W. Redondo Beach Blvd., Gardena, Calif.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Rohn Mfg. Co., 6718 W. Plank Rd., Peoria, Ill.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Superior Continental Corp., Box 489, Hickory, N.C.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.

Wire, Litz

Belden Corp., P.O. Box 5070-A, Chicago, Ill.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Asco Wire & Cable Co., P.O. Box 2127, Noble Sta., Bridgeport, Conn.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Montgomery Co, Windsor Locks, Conn
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Slepian, Arthur & Co., Box 2127, Noble Sta., Bridgeport, Conn.

Wire, Magnet

Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Caddel-Burns Mfg. Co., Inc., 40 E. 2nd St., Mineola, N. Y.
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Aluminum Co. America, 1628 Alcoa Bldg., Pittsburgh, Pa.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Asco Wire & Cable Co., P.O. Box 2127, Noble Sta., Bridgeport, Conn.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Essex Int'l., Inc., 1601 Wall St., Fort Wayne, Ind.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Montgomery Co, Windsor Locks, Conn
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
New Haven Wire & Cable, Inc., Box 266, New Haven, Ind.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
REA Magnet Wire Co., Inc., 3600 E. Pontiac St., Ft. Wayne, Ind.
Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.
Siemens Corp., Comps. Div., 186 Wood Ave., S., Iselin, N.J.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Viking Wire Co., Inc., Shelter Rock Rd., Danbury, Conn.

Wire, Plastic Insulated—See Wire, Hookup-Pushback

Wire, Potentiometer Winding

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Hudson Wire Co, 62 Water St, Ossining, N Y
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.

Wire, Radiation-Resistant

Cities Svc. Co., Oakland Ave., Chester, N.Y.
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y.p 2921
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2929

ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2936
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hudson Wire Co, 62 Water St, Ossining, N Y
Judd Wire Div., S Bedford St., Burlington, Mass.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Wire, Recording

ITT Surprenant Div., 172 Sterling St., Clinton, Mass.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Magnaflux Corp., 7328 W. Lawrence Ave., Chicago, Ill.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.

Wire, Refractory Metal

Cleveland Refractory Metals Div., 28850 Aurora Rd., Solon, Ohio
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
Var-Lac-Oid Chemical Co., 666 S. Front St., Elizabeth, N.J.

Wire, Resistance & Filament

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Electric Parts Corp., Box 234, Georgetown, Ky.
General Elec. Co., 21800 Tunqsten Rd., Cleveland, Ohio
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.

Wire, Resistance Thermometer

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hudson Wire Co, 62 Water St, Ossining, N Y
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Matthey Bishop Inc., Malvern, Pa.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Porter, H.K. Co., Inc., Porter Bldg., Pittsburgh, Pa.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.

Wire, Resistor Winding

Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Hudson Wire Co, 62 Water St, Ossining, N Y
Materials for Elctrns., Inc., 149-32 132nd St., Jamaica, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Precision Resistor Co., 109 U.S. Hwy. 22, Hillside, N.J.
York Wire Co., Box 982, Clifton, N.J.

Wire, Ribbon

Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Brookfield Wire Co., Inc., Box 248, Brookfield, Mass.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Colonial Alloys Co., Ridge Ave. & Crawford, Bldg. 11, Philadelphia, Pa.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Cross, H. Co., 365 Park Ave., Weehawken, N.J.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Flexible Circuits, Inc., Paul Valley Ind'l. Pk., Warrington, Pa.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Hudson Wire Co, 62 Water St, Ossining, N Y
Improved Laminated Metal Co., 775 Eddy St., Providence, R.I.
Indium Corp. America, 1676 Lincoln Ave., Box 269, Utica, N.Y.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N.J.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Steel Heddle Mfg. Co., 2100 W. Allegheny Ave., Philadelphia, Pa.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire, Semiconductor Lead

Art Wire & Stamping Co., 28 Boyden Pl., Newark, N.J.
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Copperweld Steel Co., Oswego, N.Y.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 21800 Tunqsten Rd., Cleveland, Ohio
Haydu Prods., Inc., 1150 Ali Baba Ave., Opa Locka, Fla.
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Kentucky Elctrns., Inc., P.O. Box 511, Owensboro, Ky.
Leico Inds., Inc., 250 W. 57th St., New York, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
National-Standard Co., Niles, Mich.
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Sylvania Elec. Prods., Inc., 12 Second Ave., Warren, Pa.
Vernitron, P.O. Box 878, Norwalk, Conn.

Wire, Shielded

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2930,2932
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2941
Plastoid Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Times Wire & Cable Co., 358 Hall Ave., Wallingford, Conn. p 2957
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Whitmor Wire & Cable Corp., 13161 Sherman Way, Unit B, No. Hollywood, Cal. ..... p 2968
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Cable Elec. Prods., Inc., 234 Daboll St., Providence, R.I.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Dielectric Materials Co., 1811 W. Bryn Mawr Ave., Chicago, Ill.
Essex Int'l., Inc., 2601 S. Adams, Marion, Ind.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
General Elec. Co., 1285 Boston Ave, Bridgeport, Conn
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
Hatfield Wire & Cable Div., 360 Hurst St., Linden, N.J.
Hudson Wire Co, 62 Water St, Ossining, N Y
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Jefferson Cable Corp., 181 Greenwood St., Worcester, Mass.
Judd Wire Div., S Bedford St., Burlington, Mass.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Microdot Inc., 220 Pasadena Ave., S. Pasadena, Calif.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Mohawk Wire & Cable Corp., Box 707, Leominster, Mass.
Montgomery Co, Windsor Locks, Conn
Nesor Alloy Corp., 666 Passaic Ave., W. Caldwell, N.J.
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Okonite Co., Box 340, Ramsey, N.J.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Permaluster, Inc., 1844 N. Keystone St., Burbank, Calif.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.
Rockland Insulated Wire & Cable Co., Inc., 87 Broadway, Haverstraw, N.Y.
Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Superior Continental Corp., Box 489, Hickory, N.C.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Wiegand, Edwin L. Co., 7705 Thomas Blvd., Pittsburgh, Pa.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire, Strain Gauge

Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y.
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2936
Tensolite, W. Main St., Tarrytown, N.Y.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Cooper, Joseph B. & Sons, Inc., 180 Varick St., New York, N.Y.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Judd Wire Div., S Bedford St., Burlington, Mass.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.

Wire, TFE Insulated

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cimco Wire & Cable Co., 250 W. Crescent Ave., Allendale, N.J. p 2920
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill. p 2932,2933
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2937
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.p 2939
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2941
Plastold Corp., 42-61 24th St., Long Island City, N.Y. ..... p 2951
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..... p 2954
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Anaconda Wire and Cable Co., 605 Third Ave., New York, N.Y.
Cerro Corp., 300 Park Ave., New York, N.Y.
Cerro Wire & Cable Co., 285 Nicoll St., New Haven, Conn.
Chemplast, Inc., 031-150 Dey Rd., Wayne, N.J.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Gore, W.L. & Assocs., Inc., 555 Paper Mill Rd., Newark, Del.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Philadelphia Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Spectra-Strip Corp., P.O. Box 415, Garden Grove, Calif.
Surf Chemical Inc., 105 Maple Ave., Hackettstown, N.J.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Wirecraft Prods., Inc., Rte. 9, W. Brookfield, Mass.

Wire, Test Lead

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill. p 2922
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
ITT Surprenant Div., 172 Sterling St., Clinton, Mass. ..... p 2937
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, Cal. ..... p 2940
Rye Inds., Inc., 125 Spencer Pl., Mamaroneck, N.Y.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y. ..p 2954,2955
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Berkshire Elec. Cable Co., Leeds, Mass.
Brand-Rex Div., P.O. Box 498, Willimantic, Conn.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carol Cable Co. W., 2665 E. Del Amo Blvd., Compton, Cal.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Judd Wire Div., S Bedford St., Burlington, Mass.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Manhattan Elec. Cable Corp., 170 Imlay St., Brooklyn, N.Y.
Pace Wire & Cable Corp., 3590 Oceanside Rd., Oceanside, N.Y.
Prestolite Wire & Cable Div., Box 649, Port Huron, Mich.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Rhode Island Insulated Wire Co., 50 Burnham Ave., Cranston, R.I.

Wire, Thermocouple

Amperex Elctrn. Corp., 230 Duffy Ave., Hicksville, N.Y.
Cities Svc. Co., Oakland Ave., Chester, N.Y. ..... p 2913
Cohn, Sigmund Corp., 121 S. Columbus Ave., Mt. Vernon, N.Y. p 2921
Coleman Cable & Wire Co., 1900 N. Fifth Ave., River Grove, Ill.
Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Mamaroneck, N.Y. ..... p 2924
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Control Prods. Corp., 4431 W. Division St., Chicago, Ill. .. p 2105
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Dearborn Wire & Cable Co., 3333 W. Ohio St., Chicago, Ill.
Engelhard Minerals & Chem. Corp., 231 New Jersey Railroad Ave., Silver Prods. Dept., Newark, N.J.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal. ..... p 2953
Tensolite, W. Main St., Tarrytown, N.Y. ..... p 2956
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal.
Alnor Instr. Co., 420 N. LaSalle St., Chicago, Ill.
American Standard, 9000 Kings St., Franklin Pk., Ill.
Ametek Hitemp Wires, 1200 Shames Dr., Westbury, N.Y.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Berkley & Co., Spirit Lake, Iowa
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
Bristol Div, Waterbury, Conn
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
CF & I Steel Corp., P.O. Box 1920, Denver, Colo.
Continental Wire & Cable, Gulton Rd., W. York Ind'l. Pk., Box 1863, York, Pa.
Driver, Wilbur B. Co., 1875 McCarter Hwy., Newark, N.J.
Electric Thermometers, Inc., 10 Glover Ave., Norwalk, Conn.
Engelhard Minerals & Chem. Corp., 113 Astor St., Newark, N.J.
Essex International, Inc., 445 Park Ave., Sycamore, Ill.
Exotic Materials, Inc., 2968 Randolph Ave., Costa Mesa, Cal.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
Harco Labs., Inc., 186 Cedar St., Branford, Conn.
Honeywell, 1100 Virginia Dr., Ft. Washington, Pa.
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
International Wire Prods. Corp., 500 W. Main St., Wyckoff, N.J.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Lewis Engrg. Co., 550 Spring St., Naugatuck, Conn.
Mackay, A.D., Inc., 198 Broadway, New York, N.Y.
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Marlin Mfg. Corp., 12404 Triskett Rd., Cleveland, Ohio
Matthey Bishop Inc., Malvern, Pa.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Molecu-Wire Corp., P.O. Box 495, Farmingdale, N.J.
Moore, Samuel & Co., Mantua, Ohio
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.
Pall Trinity Micro Corp., Rte. 281, Cortland, N.Y.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Revere Elctrn. Div., 845 N. Colony Rd., Wallingford, Conn.
Singer Co., 312-314 E. Live Oak Ave., Arcadia, Cal.
Temtex Co., 5619 Dyer St., Dallas, Tex.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Thermo Elec. Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thermology, Inc., 2558 W. Middlefield Rd., Mountain View, Calif.
Thermotronic Devices, Inc., Forest & Hector Sts., Conshohocken, Pa.
West Instr. Div., 3860 N. River Rd., Schiller Pk., Ill.
Wilkinson Co., 31011 Agoura Rd., Westlake Village, Cal.

Wire, Tinsel

Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill.
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
Tensolite, W. Main St., Tarrytown, N.Y.
Transitron Elctrn. Corp., 168 Albion St., Wakefield, Mass.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Carol Cable Co., Box 68, Pawtucket, R.I.
Columbia Wire Prods. Co., 4045 N. Rockwell St., Chicago, Ill.
Garrett Elctrns. & Cable Co., 24 Central Dr., Farmingdale, N.Y.
Gavitt Wire & Cable Div., Brookfield, Mass.
General Cable Corp., 733 Third Ave., New York, N.Y.
Hudson Wire Co, 62 Water St, Ossining, N Y
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Metal Ceram, Inc., 17 N. West St., Mt. Vernon, N.Y.
Miller Elec. Co., P.O. Box 231, Woonsocket, R.I.
Montgomery Co, Windsor Locks, Conn
Plastic Wire & Cable Corp., E. Main St., Jewett City, Conn.

Wire, Tungsten

Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Atomergic Chemetals Co., 584 Mineola Ave., Carle Place, N.Y.
Bram Metallurgical-Chem. Co., 245 W. Chelten Ave., Philadelphia, Pa.
California Fine Wire Co., 338 S. Fourth St., P.O. Box 446, Grover City, Calif.
Electronic Space Prods., Inc., 854 S. Robertson Blvd., Los Angeles, Cal.
Fansteel Inc., One Tantalum Pl., N Chicago, Ill.
General Elec. Co., 21800 Tungsten Rd., Cleveland, Ohio
Magnet Wire, Inc., 25 Walker St., New York, N.Y.
Omega Engrg., Inc., Box 4047, Stamford, Conn.
Philips Elmet Corp., Lisbon Rd., Box 1041, Lewiston, Me.
Pyco, Inc., 604 E. Lincoln Hwy., Penndel, Pa.
Rembar Co., Inc., 67 Main St., Dobbs Ferry, N.Y.
Sylvania Elec. Prods., Inc., Towanda, Pa.
Unique Wire Weaving Co., Inc., 759 Ramsey Ave., Hillside, N.J.
United Mineral & Chem. Corp., 129 Hudson St., New York, N.Y.
Vacuum/Atmospheres Co., 4652 Rosecrans Ave., Hawthorne, Cal.
Westinghouse Elec. Corp., Parts Sls. Dept., 1 Westinghouse Plaza, Bloomfield, N. J.

Wire & Cable Ties

All States Plastic Mfg. Co., Inc., 2937 N. Elston Ave., Chicago, Ill.
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill. p 2448
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Transcon Mfg. Co., 2655 Perth St., Dallas, Tex. .....p 2962,2963
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Zeus Ind'l. Prods., Inc., Foot of Thompson St., Raritan, N.J.
Bergen Wire Rope Co., 1234 Gregg St., Lodi, N.J.
Copperweld Steel Co., Glassport, Pa.
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.
General Cable Corp., 733 Third Ave., New York, N.Y.
Gudebrod Bros. Silk Co., Inc., 225 W 34th St., New York, N.Y.
Hanscom, H.F. Co., Inc., 225 Chapman St., Providence, R.I.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Ico/Rally, 1015 Corp. Way, Palo Alto, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcorn St., Ajax, Ont., Can.
Kent Corp., 169 N. Lake St., Mundelein, Ill.
Leviton Mfg. Co., Inc., 236 Greenpoint Ave., Brooklyn, N.Y.
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, Ill.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Tyton Corp., 3330 W. Cameron Ave., Milwaukee, Wisc.
Tyton Corp., 3330 W. Cameron Ave., Milwaukee, Wisc.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire Cutters, Automatic

ETC, Inc., 990 East 67 St., Cleveland, Ohio
Automatic Die Cutting Mach. Co., 149 Church St., New York, N.Y.
Caton Inds., Inc., 648 W. First Ave., Roselle, N.J.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Eubanks Engrg. Co., Box 563, 225 W. Duarte Rd., Monrovia, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Wire Cutters, Hand Operated

ETC, Inc., 990 East 67 St., Cleveland, Ohio
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Bailey Co., 5919 Massachusetts Ave., Washington, D.C.
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Carol Cable Co., Box 68, Pawtucket, R.I.
Channellock, Inc., S. Main St., Meadville, Pa.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Compton, W.H. Shear Co., P.O. Box 1096, North Sta., New Bedford, Mass.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Erikson Specialized Tool Co., Box 424, Pico-Rivera, Cal.
E.T.M. Corp., 144 W. Chestnut Ave., Monrovia, Calif.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Henes Mfg. Co., 4301 E. Madison St., Phoenix, Ariz.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Hunter Tools, 9851 Albertis Ave., Santa Fe Springs, Calif.
Ideal-Hellermann Can., Ltd., 331 Frankcorn St., Ajax, Ont., Can.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
James Elctrn. Tool Co., P.O. Box 1482, Palo Alto, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
Larsen Importing Co., 140 Nassau St., New York, N.Y.
Milbar, 530 Washington St., Chagrin Falls, Ohio
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Porter, H.K., Inc., 74 Foley St., Somerville, Mass.
Snap-On Tools Corp., 8120 28th Ave., Kenosha, Wisc.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Utica Tool Co., Inc., Cameron Rd., Orangeburg, S.C.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Vigor Tool Co., 53 W. 23 St., New York, N.Y.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Williams J.H. & Co., 400 Vulcan St., Buffalo, N.Y.
Xcelite, Inc., Thorne & Bank Sts., Orchard Park, N.Y.

Wire Forms—See Forms, Wire

Wire Markers (All Types)-Also See Strips, Marker & Fanning

Aero Devices, Inc., 494 S. Riverview Dr., Totowa, N.J. .... p 2908
Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J.
Markel, L. Frank & Sons, Inc., School La., Norristown, Pa.
Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Cryptographics, Inc., 416 Third Ave., New York, N.Y.
Duramark, Inc., 2 Secatoag Ave., Port Washington, N.Y.
E.C.P. Corp., 4726 Superior Ave., Cleveland, Ohio
Electrovert, Inc., 86 Hartford Ave., Mt. Vernon, N.Y.

Excel Specialty Corp., 6335 N. Broadway, Chicago, Ill.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
National Band & Tag Co., 721 York St., Newport, Ky.
Plymouth Rubber Co., Inc., Canton, Mass.
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire-Marking Machines, Automatic

Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Artos Engrg. Co., 15600 W. Lincoln Ave., New Berlin, Wisc.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Geartronics Corp., 112 Chelmsford Rd., N. Billerica, Mass.
Gillies, Duncan M. Co., Inc., 66 Central St., W. Boylston, Mass.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Kingsley Mach. Co., 850 Cahuenga Blvd. - EEM, Hollywood, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.
Wharton Unitools, 8-10 Lake St., Moosup, Conn.

Wire-Marking Machines, Hand Operated

Aero Devices, Inc., 494 S. Riverview Dr., Totowa, N.J. .... p 2908
Ackerman Gould Co., Inc., 10 Neil Ct., Box 188, Oceanside, N.Y.
Acromark Co., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J.
Brady, W.H. Co., 710 W. Glendale Ave., Milwaukee, Wisc.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
Gillies, Duncan M. Co., Inc., 66 Central St., W. Boylston, Mass.
Kingsley Mach. Co., 850 Cahuenga Blvd. - EEM, Hollywood, Calif.
Matthews, Jas & Co., 6619 Penn Ave., Pittsburgh, Pa.

Wire Measuring & Cutting Machines

Durant Digital Instrs., 600 N. Cass St., Box 748, Milwaukee, Wisc.
Conrac Corp., 330 Madison Ave., New York, N.Y.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Foster & Allen, Inc., P.O. Box 466, Chatham, N.J.
Hykon Mfg. Co., 163 E. State St., Box 923, Alliance, Ohio
Laser Technology, Inc., 10624 Ventura Blvd., N. Hollywood, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Olympic Instrs., Inc., Vashon, Wash.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Wire-Measuring Gauges

Multicore Sls. Corp., Dept. RY-39, Westbury, N.Y. ..... p 2843
Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Bendix Corp., 721 Springfield St., Box 1127, Dayton, Ohio
Dice, J.W. Co., 16 Highwood Ave., Englewood, N.J.
Dynamic Data Corp., 1183 Chesapeake Ave., Columbus, Ohio
Electron-Machine Corp., Box M, Umatilla, Fla.
Formulabs Ind'l. Inks, Inc., 529 W. Fourth Ave., Box 1056, Escondido, Calif.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Lion Precision Div., 60 Bridge St., Newton, Mass.

Wire Shielding

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. .. p 2911
Belden Corp., P.O. Box 5070-A, Chicago, Ill. ..... p 2912
Consolidated Wire & Assoc. Corps., 1635 S. Clinton St., Chicago, Ill. ..... p 2925
Daburn Elctrns. & Cable Corp., 2360 Hoffman St., Bronx, N.Y. p 2927
Metex Corp., 970 New Durham Rd., Edison, N.J. p 2622,2628,2629
Perfection Mica Co., 740 Thomas Dr., Bensenville, Ill. ..... p 2630
Saxton Prods., Inc., 215 N. Rte. 303, Congers, N.Y.
Standard Wire & Cable Co., 3440 Overland Ave., Los Angeles, Cal.
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, Cal. ..... p 2967
Aircraft & Elctrn. Specialties, Inc., 12675 West U.S. Hwy. 36, Box 126, Plainfield, Ind.
American Elec. Cable Co., 181 Appleton St., Holyoke, Mass.
Calcon Mfg. Corp., 100 Oakland Ave., Washington, Pa.
Co-Operative Inds., Inc., 100 Oakdale Rd., Chester, N.J.
Consolidated Prods. Corp., 17360 S. Gramercy Pl., Gardena, Calif.
Copperweld Steel Co., Glassport, Pa.
Estes Engrg. Co., 543 West 184th St., Gardena, Calif.
International Wire & Cable Co., 1300 W. Fletcher St., Chicago, Ill.
Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.
Montgomery Co, Windsor Locks, Conn
New England Elec. Wire Corp., 367 Main St., Lisbon, N.H.
Technical Wire Prods., Inc., 129 Dermody St., Cranford, N.J.
Templet Ind., Inc., 201 E. Bethpage Rd., Plainview, N.Y.
Thermax Wire Corp., 32-02 Linden Place, Flushing, N.Y.
Westinghouse Elec. Corp., R.D. #2, Box 45, Blairsville, Pa.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wire Strippers, Automatic

Addison Div., 1101 Bristol Rd., Mountainside, N.J.
Artos Engrg. Co., 15600 W. Lincoln Ave., New Berlin, Wisc.
Carpenter Mfg. Co., Inc., Fairgrounds Dr., Manlius, N.Y.
Clinton Instr. Co., Boston Post Rd., Clinton, Conn.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Eubanks Engrg. Co., Box 563, 225 W. Duarte Rd., Monrovia, Calif.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
High Speed Hammer Co., Inc., 313 Norton St., Rochester, N.Y.
Hughes Aircraft Co, Centinela Ave & Teale St, Culver City, Cal.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Industrial Winding Mach. Corp., Box 45, River Edge, N.J.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Manger Elec. Co., Inc., W. Henry St., Stamford, Conn.
Taylor-Winfield Corp., 1052 Mahoning Ave., N.W., Warren, Ohio
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tech. Devices Co., 11242 Playa Ct., Culver City, Calif.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Wire Strippers, Hand Operated

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich.
ETC, Inc., 990 East 67 St., Cleveland, Ohio
GC Electronics, Dept. ID-7, 400 S. Wyman St., Rockford, Ill.
Telvac Instr. Co., 18531-E Ventura Blvd., Tarzana, Cal. .... p 2844
Blonder-Tongue Labs., Inc., One Jake Brown Rd., Old Bridge, N.J.
Carol Cable Co., Box 68, Pawtucket, R.I.
Carpenter Mfg. Co., Inc., Fairgrounds Dr., Manlius, N.Y.
Channellock, Inc., S. Main St., Meadville, Pa.
Clauss Cutlery Co., P.O. Box 667, Fremont, Ohio
Contact, Inc., P.O. Box 6, Hudson, N.H.
Engineering & Elctrn. Devices, Inc., 1024 N. McCadden Pl., Los Angeles, Calif.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Ewald Instrs. Corp., Rte. 7R, Kent, Conn.
Gagne Assocs., Inc., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
General Hardware Mfg. Co., Inc., 80 White St., New York, N.Y.
Hammel, Riglander & Co., Inc., 435 Hudson St., Village Sta., New York, N.Y.
Helenor Metals Corp., 60 Marbledale Rd., Tuckahoe, N.Y.
Holub Inds., Inc., 413 DeKalb Ave., Sycamore, Ill.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
James Elctrn. Tool Co., P.O. Box 1482, Palo Alto, Calif.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Klein, Mathias & Sons, Inc., 7200 McCormick Rd., Chicago, Ill.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Owatonna Tool Co., 395 Eisenhower Dr., Owatonna, Minn.
Philmore Mfg. Co., Inc., 130-01 Jamaica Ave., Richmond Hill, N.Y.
Proto Tool Co, 2209 Santa Fe Ave., Los Angeles, Calif.
Stevens, Geo. Mfg. Co., Inc., 6001 N. Keystone Ave., Chicago, Ill.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, Cal.
Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.
Vaco Prods. Co., 510 N. Dearborn St., Chicago, Ill.
Waldom Elctrns., Inc., 4633 W. 53rd St., Chicago, Ill.
Western Elctrn. Prods. Co., 107 Los Molinos, San Clemente, Cal.
Whitaker Cable Corp., 1301 Burlington St., N. Kansas City, Mo.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Wire Strippers, Thermal

American Elec. Heater Co., 6110 Cass Ave., Detroit, Mich. p 2835
Contact, Inc., P.O. Box 6, Hudson, N.H.
Eraser Co., Inc., Oliva Dr., Box 1342, Syracuse, N.Y.
Hunter Tools, 9851 Alburtis Ave., Santa Fe Springs, Calif.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Ideal Industries, Inc., 4450 Becker Pl., Sycamore, Ill.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
MacDonald & Co., 213 S. Brand Blvd., Glendale, Calif.
Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, Cal.
REPAC Grp. Republic Corp., 950 N. Supulveda Blvd., El Segundo, Cal.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Unitek Corp., 1820 S. Myrtle Ave., Monrovia, Calif.
Wybar Elctrns., Inc., Oliva Dr., Box 109, Syracuse, N.Y.

Wire Stripping Chemicals—See Chemicals, Wire Stripping

Wire Wrapping Services—See Services, Wire Wrapping

Wire Wrapping Tools & Accessories-Also See Machines, Wire Wrapping

Panduit Corp., 17301 S. Ridgeland Ave., Tinley Pk., Ill. .... p 2950
Bussco Engrg., Inc., 122 Penn St., El Segundo, Cal.
Cambridge Thermionic Corp, 445 Concord Ave, Cambridge, Mass
Cognitronics Corp., 333 Bedford Rd., Mt. Kisco, N.Y.
Gardner-Denver Co., Gardner Expwy., Quincy, Ill.
Ideal-Hellermann Can., Ltd., 331 Frankcom St., Ajax, Ont., Can.
Jonard Inds. Corp., 3047 Tibbett Ave., Bronx, N.Y.
Micro Metrics, Inc., 165 Pennsylvania Ave., Paterson, N.J.
Ostby & Barton Co., Box 6267, Providence, R.I.
Ross, Milton Co., 511 Second St. Pike, Southampton, Pa.
Sjoberg, C. & Son, Inc., 415 Station St., Cranston, R.I.
Standard Pneumatic Motor Co., Box 745, Whittier, Calif.
Synergistic Prods., Inc., 150 Stevens Ave., Santa Ana, Cal.
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Torrington Co., Box 1008, Torrington, Conn.
Utica Tool Co., Inc., Cameron Rd., Orangeburg, S.C.
Zippertubing Co., 13000 S. Broadway, Los Angeles, Calif.

Wiring Panels & Boards, Computer—See Boards, Programming

Work Positioners, Circuit Board & Chassis—See Holders & Jigs

Work Stations, Clean, Dust Free

Kasper Instrs., Inc., 983 Shulman Ave., Santa Clara, Cal. p 1305
Metal Cabinet & Fixture Co., Inc., 1751 Raymond Ave., Anaheim, Cal. ..... p 2154
Agnew-Higgins, Inc., P.O. Box 857, Garden Grove, Calif.
Air Control, Inc., 125 Noble St., Norristown, Pa.
Ajusto Equip. Co., 513 Conneaut St., Bowling Green, Ohio
American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.
Baker Co., Inc., 106 Granite St., Biddeford, Me.
Clean Rooms Constr. Co., Inc., Box 275, Westminster, Cal.
Controlled Environment Equip. Corp., 160 Pleasant St., Brockton, Mass.
Edcraft Inds., Inc., 620 Commerce Rd., Linden, N.J.
Farr Co., 2301 E. Rosecrans, El Segundo, Calif.
Flotron Inds., Inc., 2104 W. Rosecrans Ave., Gardena, Cal.
Interlab, Inc., 109 Wheeler Ave., Pleasantville, N.Y.
Janel, Inc., 226 Main Ave., Box 2, Stirling, N.J.
Matthews Resch., Inc., 4306 Wheeler Ave., Alexandria, Va.
Pressteel Co., 9705 E. Garvey Ave., El Monte, Calif.
Ray Prods., Inc., 703 S. Palm Ave., Alhambra, Calif.
Sara Scientific Co., P.O. Box 321, San Francisco, Calif.
Sturdilite Sci. Furniture Sys., 100 Acorn St., Plainwell, Mich
Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa.
Tenney Engrg., Inc., 1090 Springfield Rd., Union, N.J.
Torit Corp., 1133 Rankin St., St. Paul, Minn.
Westinghouse Elec. Corp., 4300 36th St., S.E., Grand Rapids, Mich.

X-Ray Intensity Meters—See Meters, X-Ray Intensity

X-Y Axis Tables—See Simulators, Motion

Xenon Lamp Power Supplies—See Power Supplies, ARC Lamp

Yokes, Deflection, Oscilloscope

Stackpole Carbon Co., St. Marys, Pa.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill. ..... p 2347
Celco, 70 Constantine Dr., Mahwah, N.J.
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Yokes, Deflection, Radar PPI

Stackpole Carbon Co., St. Marys, Pa.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill. ..... p 2347
Celco, 70 Constantine Dr., Mahwah, N.J.
Dittmore-Freimuth Corp., 2517 E. Norwich St., Milwaukee, Wisc.
Y.T. & T. Corp., P.O. Box 306, Roslyn Hgts., N.Y.

Yokes, Deflection, Cathode-Ray Tube

Amperex Elctrn. Corp., 35 Hoffman Ave., Hauppauge, N.Y. p 2330
Stackpole Carbon Co., St. Marys, Pa.
Syntronic Instrs., Inc., 100 Industrial Rd., Addison, Ill. ..... p 2347
TRW INC., 1100 Glendon Ave., Los Angeles, Cal.
Advance Ross Elctrns. Corp., 135 S. La Salle St., Chicago, Ill.
American Elctrn. Controls Co., 2459 Susquehanna Rd., Roslyn, Pa.
Celco, 70 Constantine Dr., Mahwah, N.J.
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, N.J.
Denson Elctrns. Corp., P.O. Box 122, Rockville, Conn.
Ferranti Elec., Inc., E Bethpage Rd., Plainview, N.Y.
General Instrument of Canada, Ltd., 151 Weber St. S., Waterloo, Ont., Can.
General Instr. Corp., 165 Front St., Chicopee, Mass.
Molex Prods. Co., 5224 Katrine Ave., Downers Grove, Ill.
Rola Div., 21010 Miles Pkwy., Cleveland, Ohio
Shigoto Inds., Inc., 350 Fifth Ave., New York, N.Y.
Stancor, 3501 W. Addison St., Chicago, Ill.
Sylvania Elec. Prods., Inc., Elctrn. Comps. Div., 100 First Ave., Waltham, Mass.
Triad Distributor Div., 305 N. Briant St., Huntington, Ind.
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3000	Instruments, Graphic Recording
3300	Medical Electronic Equipment
3400	Microwave, Radar Equipment, Components & Accessories
3600	Nuclear & Radiation Equipment
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4100	Production Machinery & Automation Equipment
4300	Recording Equipment (Non-Audio Types)
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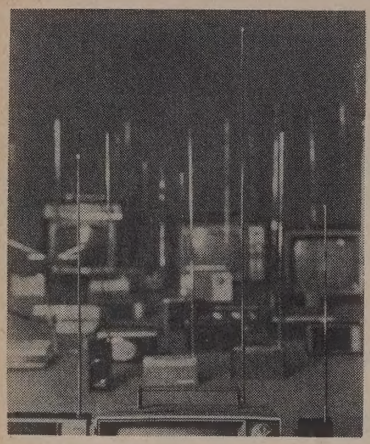

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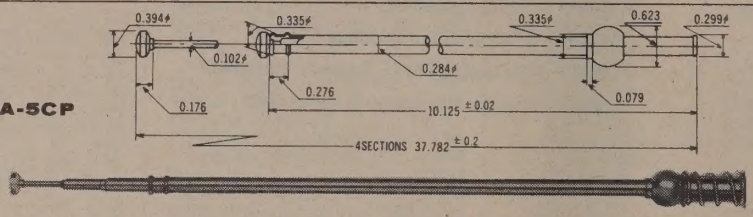
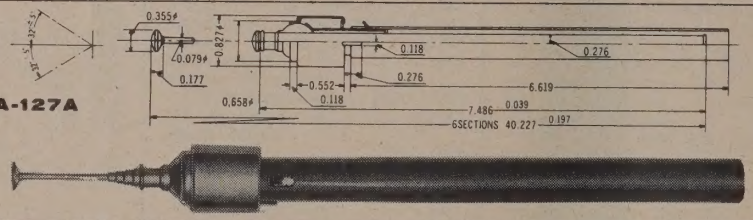
Model BA-5CP



Any collapsed length available, provided the extended length of antenna is limited by the collapsed length, diameter of outer tubing, and number of sections.

Model SA-127A



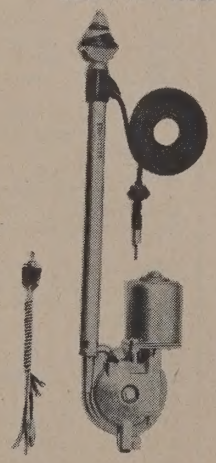
Material:
Antenna elements and tips are made of brass (65～35 alloy) if otherwise not stated.

Finish:
All the visible parts are chrome plated, if otherwise not stated.

CAR RADIO ANTENNA

Automatic Type

Model YA-1000A



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Model VW-402

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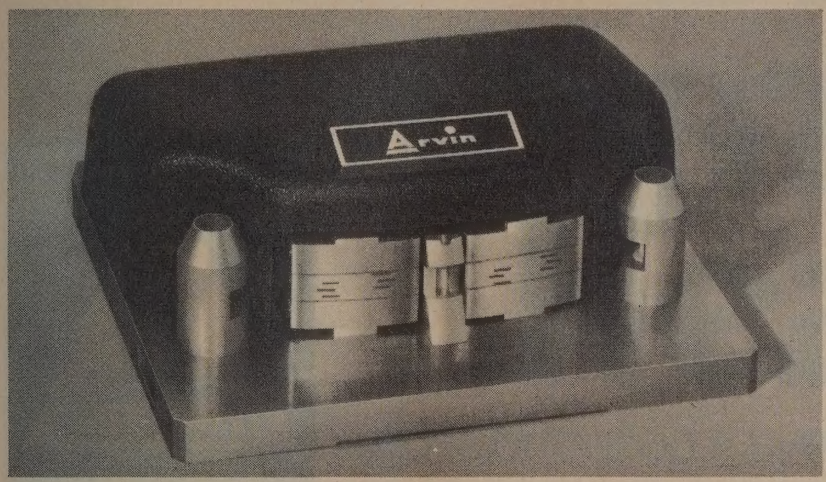

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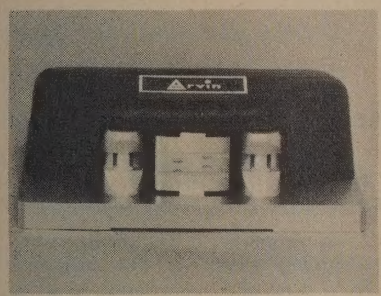
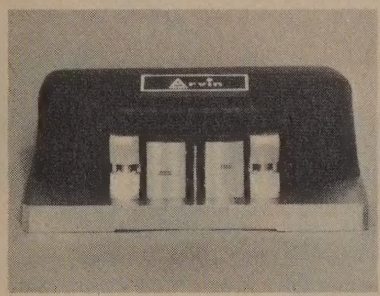
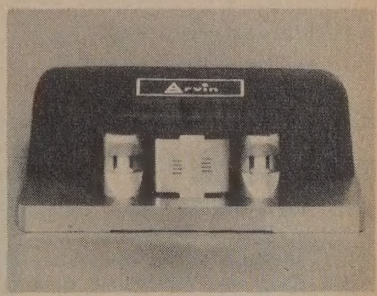


4 TRACK
Inductance 1.0mH



CASSETTE
Inductance .900mH



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Inductance .900mH

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All accessories removable and replaceable from the top.

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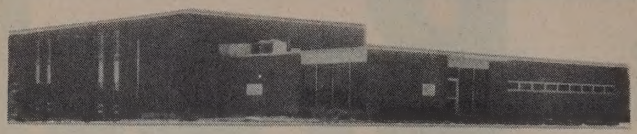

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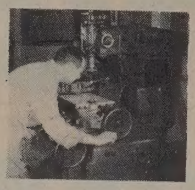
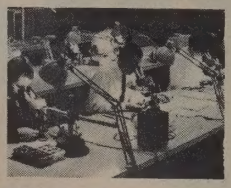
Electrical testing under laboratory conditions, NBS traceable.

FACILITIES CAPABILITIES QUALITY



Jig borer oriented machine shop represents the ultimate in precise machining.

Completely equipped machine shop for mass production of machined parts.



Proficient line personnel perform the delicate assembly operations.

Ultra precise mechanical checkout. NBS traceable accuracy.

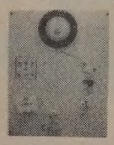
SPECIAL SYSTEMS

Complete facilities for both engineering and fabrication makes IEM an ideal partner in your special short run requirements. Below are a few items developed with both customer and company sponsored programs.

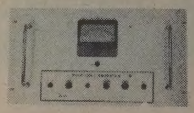
"Run-in" and Test Line for General Purpose Instrumentation decks

Check-out Line for IEM® "Run-in" Machine

Miniature Personal Recorder Measures 7/8" x 3½" x 5"



Two Station Semi-Automatic High Speed Cartridge or Cassette Tape Loader



Bias Amplifier Mega Cycle Range Rated 50 Watts

FLUX RESPONSIVE SYSTEMS

The flux sensitive system represents an efficient method of sensing static magnetic information, making data output independent of tape speed.
The system is flexible, simple, and economical, the accuracy being mainly a function of the drive element. All circuitry is solid state utilizing plug in board, thus reducing maintenance and trouble shooting to within the scope of the average user.

— USES —

- FEEDBACK SYSTEM FOR POSITION CONTROL
- LOAD ACTUATION TO INITIATE AN OPERATION
- METERED OUTPUT FOR QUANTITATIVE MEASUREMENT
- LOGIC SYSTEM FOR NUMERICAL CONTROL
- TRIGGER CIRCUIT FOR COUNTING
- LINEAR RESOLVER
- ANGULAR RESOLVER
- ANALOG ULTRA LOW FREQUENCY PLAYBACK

Angular Resolver

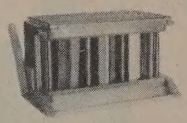
Flux-Sensitive Linear Resolver for Machine Control and Measuring Applications

Analog Ultra Low Frequency Playback System Response to DC

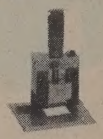
Flux Sensitive Programmable Machine Control System

RECORDING ASSEMBLIES

Professional recording assemblies represent the state of the art for precision magnetic components. They encompass most of the standard and special recording formats and electronics. They can be incorporated for upgrading most existing professional equipment. They are also available as OEM equipment for systems manufacturers. All parts are precision ground for accuracy and permanent alignment. • Guide surfaces are of tungsten carbide for maximum life and accuracy. • IEM unique MEGA-BIAS design permits head change in seconds with positive azimuth and zenith lock-in.



Complete 16 Track 2 In. System Incorporating Tape Lift Off, Flutter Rollers and Magnetic Shielding, for Up-Dating Studio Recorders.



Micrometer Calibration Head

Turret Head Mount

Cam Actuated Head System for Ultra Precise Recording of Master Tape

Quick Change Mount with Integrated Bias Current Control Panel

REFURBISHING RECONDITIONING SERVICES

Complete service for refurbishing, including cleaning, relapping, replacement of guides and inspection. Standard audio types — all formats. Duplicator types — slave and master assemblies. Video tape recorder audio heads. Complete conversion service for various tape formats.

iem®

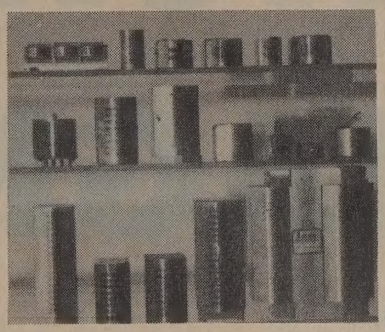
INTERNATIONAL ELECTRO-MAGNETICS, INC.

ERIC DRIVE AND CORNELL AVENUE, PALATINE, ILL., 60067, AC #312-358-4622

PRECISION MAGNETIC HEADS SPECIAL SYSTEMS

iem®

Type Designation	Application	No. of Tracks	Track Width	Track Spacing	Inductance @ 1KC	Bias	Output	Tape Speed IPS
R4N5	Record	4	.080	.130	10 mh	3.5 ma @ 100KC	—	15
P4N5	Playback	4	.080	.130	700 mh		1KC 5.5 mv 20KC 12 mv	15
E8N1	Erase	8	.080	.130	1.5 mh	30 ma @ 100KC	—	15
R8N1	Record	8	.070	.130	15 mh	3.5 ma @ 100KC	—	15
P8N1	Playback	8	.070	.130	1.2 henry		1KC 5 mv	15
E12L1	Erase	12	.050	.085	100 uh	200 ma @ 60KC	—	15
R12M1	Record	12	.040	.085	3.5 mh	7 ma @ 120KC	—	15
P12H1	Playback	12	.040	.085	800 mh	—	1KC 3 mv 15KC 8 mv	15
R7/14L1	Record	7/7	.050	.070/.140	1.4 mh	3.8 ma @ 375KC	—	60
P7/14L1	Playback	7/7	.044	.070/.140	20 mh		1KC 0.6 mv 100KC 2 mv	30
R16L1	Record	16	.025	.0625	3.6 mh	4.2 ma @ 150KC	—	15
P16L1	Playback	16	.025	.0625	3.8 mh		1KC 0.2 mv	15
E16L1	Erase	16	.030	.0625	0.7 mh	25 ma @ 150KC	—	15
R16L20	Record	16	.070	.127	3.5/15 mh	6.0/2 ma @ 150KC	—	15
P16L20	Playback	16	.070	.127	3.8/900 mh		0.4/6.0 mv 1KC	15
E16L20	Erase	16	.080	.127	0.6/1.2 mh	75/50 ma @ 150KC	—	15
E24L20	Erase	24	.050	.084	0.6 mh	75 ma @ 150KC	—	15



AUDIO

ANALOG IRIG

VIDEO

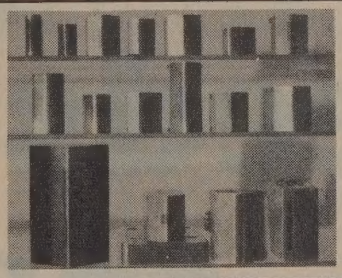
Application	No. of Tracks	Track Width	Gap Shim	Inductance at 1 KC	Saturation Current	Playback	Tape Speed IPS
Video	1	.050	100 u in.	67 uh	8 ma		120
Record	1	.025	100 u in.	100 uh	5 ma		60
Video	1	.050	36 u in.	1.9 mh		1mc .15mv	120
Playback	1	.025	20 u in.	4 5 mh		1mc .06mv	60

FLUX SENSITIVE

Application	No. of Tracks	Track Width	Track Spacing	Carrier Freq.	Carrier Current	Output Level
Flux Sensitive	1	.250	—	100 KC	80 ma	10 mv
	2	.050	.140	228 KC	40 ma	3 mv
	4	.077	.250	100 KC	80 ma	5 mv
	7	.040	.070	228 KC	40 ma	3 mv

VIDEO FLUX

Application	No. of Tracks	Track Width	Track Spacing	Inductance 1 KC	Bit Density BPI	Read Output MV p/P	Saturation Current NRTZ	Tape Speed IPS
Hi Density Read	20	.020	.049	3 mh	900	10 mv		150
Hi Density Write	20	.027	.049	150 uh	900		100 ma	150
Med. Density Read	7	.030	.070	12 mh	556	40 mv		120
Med. Density Write	7	.048	.070	150 uh	556		50 ma	120
Hi Density Read/Write	30	.012	.042	80 mh	800	4.5 mv	3.0 ma	7½
Hi Density Read/Write	4	.025	.062	50 mh	5000	4.0 mv	1.8 ma	7½
Read	9	.040	.055	12 mh	1000	40 mv		120
Write	9	.042	.055	300 uh	1000		100 ma	120



DIGITAL COMPUTER

Application	Tape Width	Type No.	Track Width	Track Spacing
Full Track	.250	R1H2	.260	—
2 Track Stereo	.250	R2H2	.100	.160
4 Track Stereo	.250	R2/4H2	.043	.136
8 Track Stereo	.250	R2/8H2	.022	.127
2 Track Mono	.150	R1/2H15	.059	.091
4 Track Stereo	.150	R2/4H15	.024	.035

Electrical Specifications

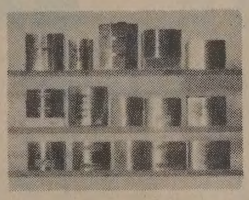
Inductance: 3 MH nominal

Bias Freq.: Standard up to 1.5 MC
Special 2 MC

Bias Current: 6-8 MA RMS

Signal Current: 0.6 MA RMS

Note: All formats can be designed to meet customer's special requirements.



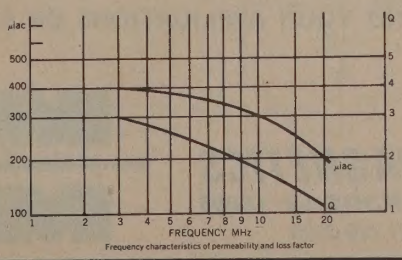
HI-SPEED DUPLICATION

iem manufactures head structures utilizing axis oriented manganese-zinc single crystal ferrite as well as the sintered ferrite types. The advantages of the single crystal are

- **Linearity of gap equivalent to metallic core structure. No grain pull out.**
- **Lower core loss at high frequency.**
- **Excellent wear characteristics for long life.**

Saturation magnetic flux density B_{10}(G)	4,700
Coercive force Hc(Oe)	0.1
Curie temperature Tc(°C)	265
Electrical resistivity $\rho(\Omega \cdot cm)$	≥ 0.1
Density d(g/cm³)	5.07
Vicker's hardness Hv	700

Fundamental Characteristics



Frequency characteristics of permeability and loss factor

FERRITE

INTERNATIONAL ELECTRO-MAGNETICS, INC.
ERIC DRIVE AND CORNELL AVENUE, PALATINE, ILL., 60067, AC #312-358-4622

iem®

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is ready to meet your needs for magnetic heads

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M M

A DIVISION OF VSI CORPORATION

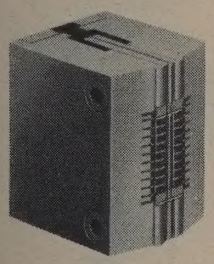
NORTRONICS DIGITAL HEADS

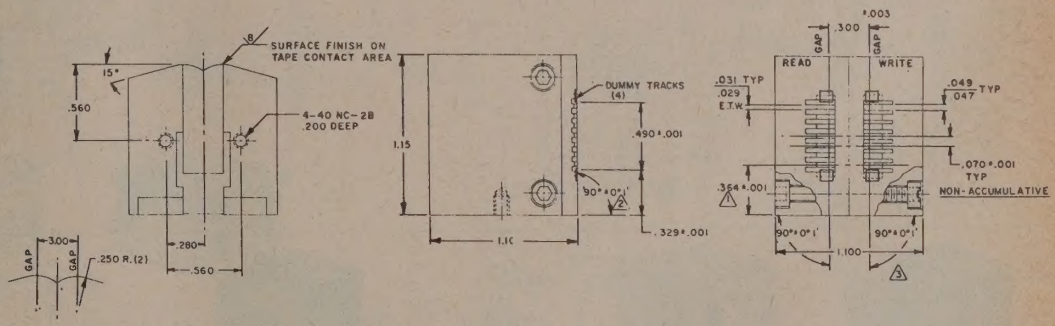
Datum Series

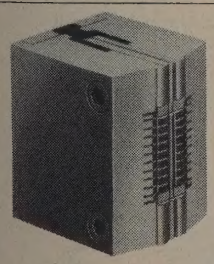
- IBM-Compatible
- Write and read on ½" computer tape
- Medium and high density formats
- Densities up to 3200 fci, speeds to 150 ips

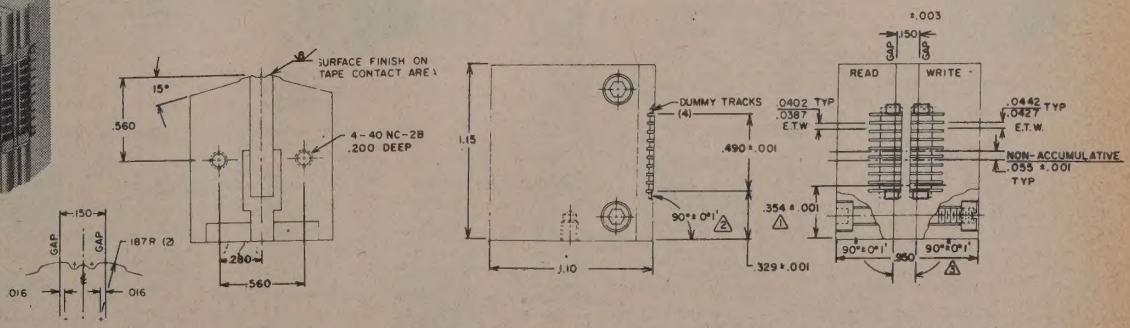
DUAL GAP HEADS—READ AFTER WRITE

	7 TRACK HEADS	9 TRACK HEADS	
	MEDIUM DENSITY	HIGH DENSITY	MEDIUM DENSITY
MODEL	D72D08	D92C04	D92C05
Density	800 BPI (NRZI)	3200 fci (PE)	800 BPI (NRZI)
Gap Length	Write 500 u in. Read 250 u in.	Write 100 u in. Read 100 u in.	Write 250 u in. Read 200 u in.
I_s Saturation Current Write current required for 95% of maximum 800 BPI output	17 ma 0-Peak ½ winding	60-80 ma 0-Peak ½ winding	17 ma 0-Peak ½ winding
I_w Operating Current	25 ma 0-Peak at 3200 fci ½ winding 12 u s rise time 10-90%	70 ma 0-Peak at 3200 fci ½ winding 0.3 u s rise time 10-90%	25 ma 0-Peak at 800 BPI ½ winding 2 u s rise time 10-90%
Read Output at 800 BPI into 10K + 100 pf	20 mv P-P at 112.5 ips	21 mv P-P at 112.5 ips	36 mv P-P at 112.5 ips 9.5 mv P-P at 30 ips
Resolution (Ratio of output signals after 5 passes of prerecorded tape)	$\frac{800\ BPI}{200\ BPI}$ = 85% min. with I_w 25 ma	$\frac{3200\ fci}{200\ BPI}$ = 36% min. with I_w 70 ma	$\frac{800\ BPI}{200\ BPI}$ = 85% min. with I_w 25 ma
Self Erasure—Read only output after 10 passes as a % of read while write at 800 BPI	90% min.	90% min.	90% min.
Electrical Skew at 800 BPI at 112.5 ips Read Standard Tape Write only	 1.33 u s max. 1.33 u s max.	 1.33 u s max. 1.33 u s max.	 1.33 u s max. 1.33 u s max.
Crossfeed (Write to Read) Feedthrough to any read track relative to 800 BPI output of that track. With tape stopped, shield in place, normal write current I_w, normal load, worst case write phasing.	3%	3%	3%
Adjacent Channel Crosstalk Crosstalk signal of erased track compared to written output of that track at 800 BPI with other tracks written worst case.	2% max.	2% max.	2% max.
Inductance at 1 khz—Write ½ coil Read	.37 mh max. 3.5 mh nom.	.24 mh max. 1 mh nom.	.37 mh max. 3.5 mh nom.
D. C. Resistance— Write Read	8 ohms/leg max. 35 ohms max.	2 ohms/leg max. 15 ohms max.	8 ohms/leg max. 35 ohms max.
Gap Depth	.012" minimum	.012" minimum	.012" minimum
Tape Wrap	10° each side of head assembly	10° each side of head assembly	10° each side of head assembly
Tape Contact Surface	No voids or epoxy exceeding .0015" in vertical section.	No voids or epoxy exceeding .0015" in vertical section.	No voids or epoxy exceeding .0015" in vertical section.
D. C. Erase	Available for erasure in-contact or non-contact with oxide surface.	Available for erasure in-contact or non-contact with oxide surface.	Available for erasure in-contact or non-contact with oxide surface.









NORTRONICS COMPANY, INC.
8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

NORTRONICS DIGITAL HEADS

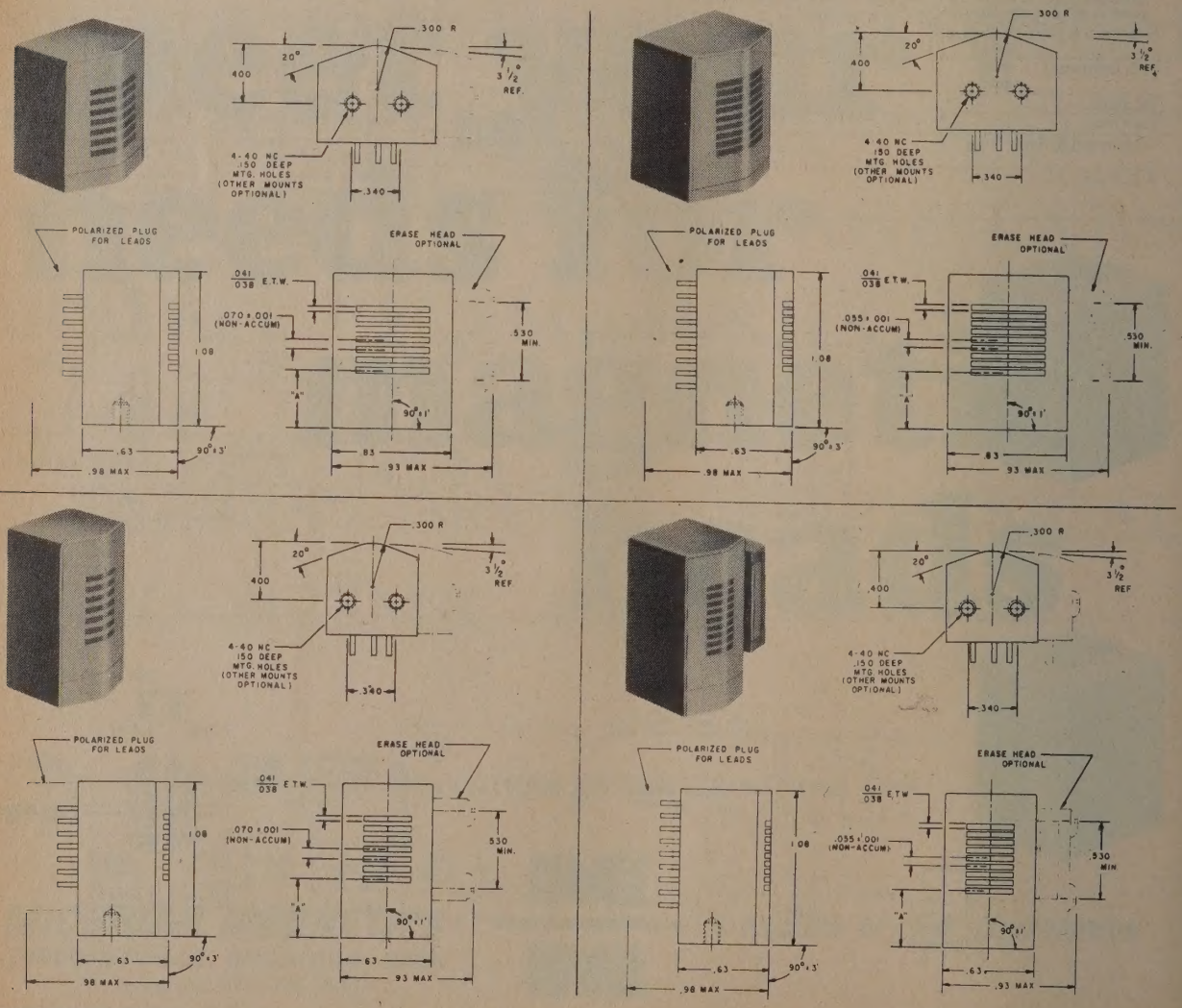
Datum Series

- IBM-Compatible
- Write and read on ½" computer tape
- Medium and high density formats
- Densities up to 3200 fci, speeds to 150 ips

SINGLE GAP HEADS / READ, WRITE, READ/WRITE

	7 TRACK HEADS			9 TRACK HEADS			
MODEL	D71A03	D71A07	D71B02	D91A03	D91A07	D91B02	D91B06
Density	800 BPI	800 BPI	200 BPI	800 BPI	800 BPI	200 BPI	3200 fci
Is Saturation Write Current 0-Peak ½ Coil Current required for 90% of maximum 800 BPI output	11 ma	11 ma	4.5 ma	11 ma	11 ma	4.5 ma	5.3 ma
Iw Operating Current	16.5 ma	16 ma	6.7 ma	16.5 ma	16 ma	6.7 ma	5.8 ma
Read Output in mv P-P at indicated density	5.8 my @ 15 ips	6.6 mv @ 15 ips 25 mv @ 60 ips 48 mv @ 120 ips	2 mv @ 1⅞ ips	5.8 my @ 15 ips	6.6 mv @ 15 ips 25 mv @ 60 ips 48 mv @ 120 ips	2 mv @ 1⅞ ips	5 mv @ 7½ ips
Resolution 800 BPI output / 200 BPI output	85% min.	85% min.	85% min.	85% min.	85% min.	85% min.	85% min.
Self Erasure—Output after 10 passes related to Read while Write Output @ 800 BPI	90% min.	90% min.	90% min.	90% min.	90% min.	90% min.	90% min.
Crosstalk with adjacent channels written worst case	23 db.	37 db.	21 db.	22 db.	36 db.	20 db.	20 db.
Inductance @ 1 khz—½ coil whole coil	.83 mh 3.2 mh	1.7 mh 6.7 mh	6.4 mh 26 mh	.9 mh 3.5 mh	1.8 mh 7.3 mh	7 mh 28 mh	14 mh 55 mh
D. C. Resistance—½ coil	14 ohms	30 ohms	60 ohms	14 ohms	30 ohms	60 ohms	75 ohms
Gap Depth—inches	.012 min.	.012 min.	.012 min.	.012 min.	.012 min.	.012 min.	.012 min.
D. C. Erase	Available for erase in-contact or non-contact with oxide surface.						

Note: Crosstalk of 30 db minimum is available on all models.



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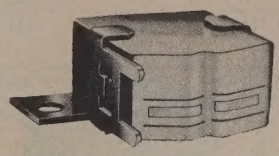
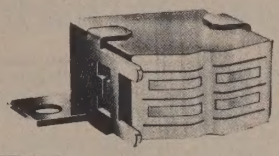
NORTRONICS MINI-DIGITAL HEADS

- Nortronics offers unique capability for designing and producing to special size and format requirements.
- Constant development of new mini-digital approaches and concepts. Consult Nortronics Marketing Engineering Department.
- NRZ Digital Read/Write Data at 3.75 ips, 400 BPI, based on tests using 3M 272 tape.

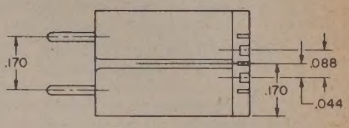
dual gap—read after write

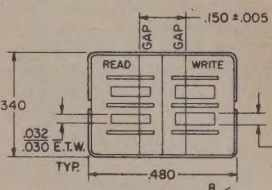
1 and 2 channels—cassette (.150") format

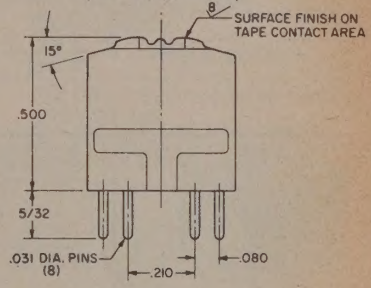


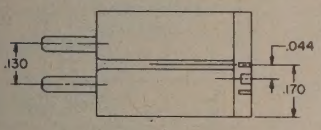


MODEL	HIGH DENSITY	MEDIUM DENSITY
2 Channels 1 Channel	WR2R10K WR1R10K	WR2R21N WR1R21N
Density	3200 fci	800 BPI
Gap Length	Write 100 u in. Read 100 u in.	Write 200 u in. Read 200 u in.
I_s Saturation Current Write current required for 95% of maximum 800 BPI output	12 ma O-Peak	3.5 ma O-Peak
I_w Operating Current at rated density	12 ma O-Peak	5 ma O-Peak
Read Output at 3¾ ips into 10K + 100pf	2.0 mv Pk-Pk 3200 fci	4.5 mv Pk-Pk 800 BPI
Self Erasure—Read only output after 10 passes as a % of read while write at 800 BPI	90% min.	90% min.
Crossfeed (Write to Read) Feedthrough to any read track relative to output of that track. With tape stopped, normal write current I_w, normal load.	18 db	18 db
Adjacent Channel Crosstalk Crosstalk signal of erased track compared to written output of that track at normal density.	45 db min.	45 db min.
Inductance at 1 khz—Write coil Read D. C. Resistance— Write Read	250 uhy 17 mhy 2 ohms 60 ohms	3 mhy 20 mhy 12 ohms 70 ohms
Gap Depth	.012 min.	.012 min.



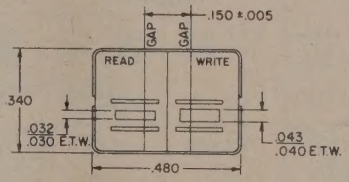


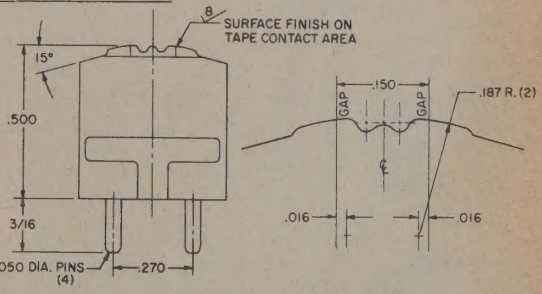


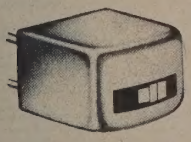


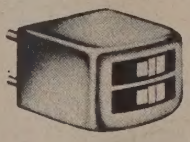
2 after part number indicates cylindrical radius.

3 after part number indicates dual hyperbolic face.



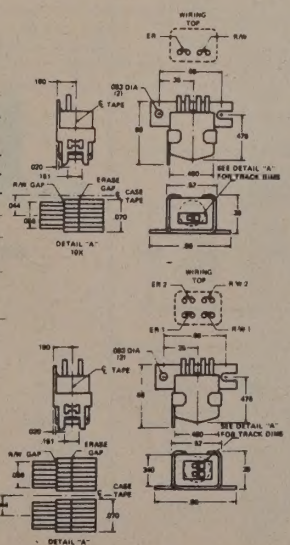


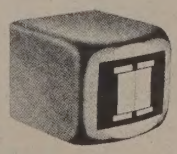


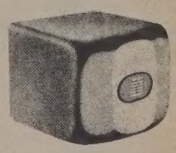


tunnel write

	PRE-ERASE ENTIRE TRACK			PRE-ERASE TRACK EDGES ONLY
SINGLE TRACK MODEL NO.	ZW1R38N		ZW1R48N	
DUAL TRACK MODEL NO.	ZW2RK38N	ZW2R36F	ZW2RK48N	ZW2RL48N
Tape Width (inches)	.150	.150	.150	.150
No. of Tracks on Tape:	2	2	2	2
Track Width Read/Write (inches)	.056	.056	.056	.056
Channel Spacing, Dual Channel Heads Center-to-Center	.088	.088	.088	.088
Gap Spacer	0.2 Mil	0.05 Mil	0.2 Mil	0.2 Mil
R/W Inductance, 1KHZ	10 Mhy	200 Mhy	10 Mhy	10 Mhy
R/W Resistance, Ohms	48	290	48	48
R/W Gap	200 U-in	50 U-in	200 U-in	200 U-in
Erase Inductance	2.5 Mhy	2.5 Mhy	15 Mhy	10 Mhy
Erase D.C. Resistance	40 Ohms	40 Ohms	150 Ohms	150 Ohms
60 KHZ Erase Voltage 60 KHZ Erase Current D.C. Erase Current	40 RMS 50 MA 70 MA	20 RMS 30 MA 70 MA	80 RMS 18 MA 25 MA	— — 20 MA
Write Current P-P	7 MA	1 3A MA	7 MA	7 MA
Read Output P-P 200 BPI	3.6 MV	9.0 MV	3.6 MV	3.6 MV
Maximum Read Packing Density	800 BPI	1600 BPI	800 BPI	800BPI







card reader

MODEL NUMBER	RIF8S	BIHC4R	BIHC1R
Tape Width (Inches) Number of Tracks on Tape Number of Channels in Head	— — 1	— — 1	— — 1
Track Width (Inches) Channel Spacing Center to Center (Inches) Gap Spacer	0.25-0.10 — 1.0 Mil	.080 — 0.5 Mil	.080 — 0.5 Mil
Inductance, 1 KHZ Resistance, D.C. (Ohms)	6 Mhy 10	50 Mhy 66	700 Mhy
Saturation Current—ma. to Produce 90% Peak Output @ 200 BPI (Measured Zero to Peak, Alternate Polarity)	5	1.5	0.4
Write Current—ma. 150% Saturation Current @ 200 BPI	7.5	3.0	0.6
Read Output—mv. P-P (Open Circuit) NRZI @ 200 BPI 3.75 ips. 15 ips.	11.5 40	12 48	48 160
Read Output—mv. P-P 800 BPI Ref. 200 BPI.	85% min	85% min	85% min

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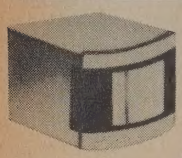
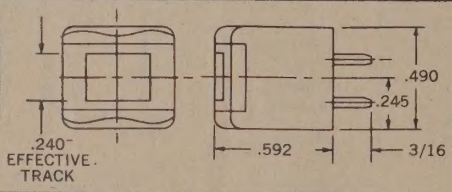
Phone: (612) 545-0401

NORTRONICS MINI-DIGITAL HEADS

read, write, and read/write

- For calculators, input/output systems, terminal systems, and peripheral equipment
- Wide range of ¼" and cassette formats
- Any Nortronics audio head can be used for mini-digital application. Consult the Marketing Engineering Department for digital specifications
- Specifications and read/write data based on tests using 3M 870 tape

MODEL NUMBER	PR-B1F8R	P-B2H8R	P-B2H8K	P-B2Q8R	P-BQQN8R	P-BQL8R	W2R8N	W4J8N
Tape Width (Inches)	.250	.250	.250	.250	.250	.250	.150	.150
Number of Tracks on Tape	1	2	2	4	4	8	2	4
Number of Channels in Head	1	2	2	2	4	4	2	4
Track Width (Inches)	.250	.080	.080	.042	.037	.020	.056	.021
Channel Spacing Center to Center (Inches)	—	.160	.160	.136	.071	.0635	.088	.035
Gap Spacer	0.5 Mil	0.5 Mil	0.1 Mil	0.5 Mil	0.5 Mil	0.5 Mil	0.2 Mil	0.2 Mil
Inductance, 1 KHZ	10 Mhy	10 Mhy	20 Mhy	10 Mhy	85 Mhy	10 Mhy	10 Mhy	10 Mhy
Resistance, D.C. (Ohms)	10	28	25	32	280	70	39	68
Saturation Current—ma. to Produce 90% Peak Output @ 200 BPI (Measured Zero to Peak, Alternate Polarity)	4.8 ma.	2.7	2.1	2.1	0.9	2.6	2.7	2.8
Write Current—ma. 150% Saturation Current @ 200 BPI	7.2	4.0	3.2	3.1	1.4	3.9	4.0	4.2
Read Output—mv. P-P (Open Circuit) NRZI @ 200 BPI 3.75 ips.	11.2	6.5	6.3	4.6	11.8	2.3	4.2	2
15 ips.	40	24	21	17	44	8.5	15	7.4
Read Output—mv. P-P 800 BPI Ref. 200 BPI.	85% min	85% min	85% min	85% min	85% min	85% min	85% min	85% min

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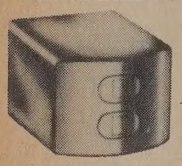
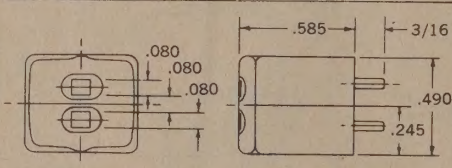

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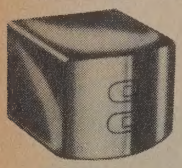
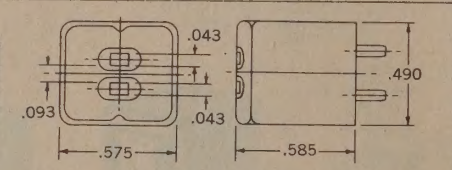

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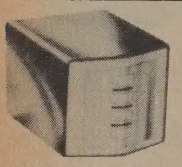
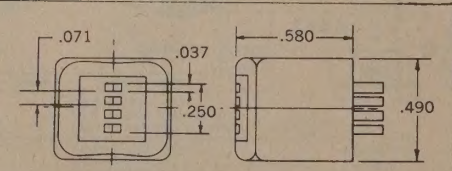

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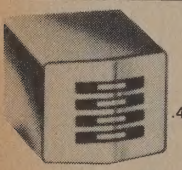
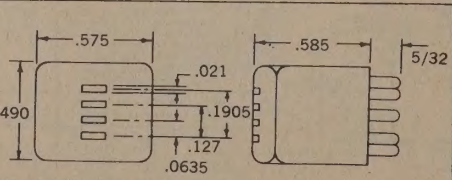

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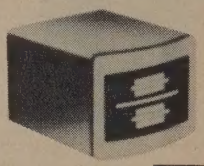
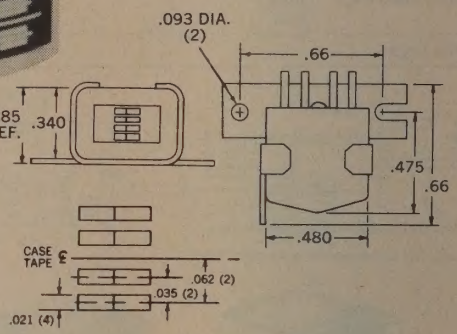
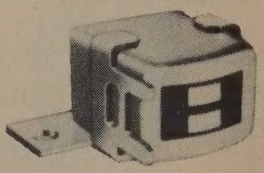
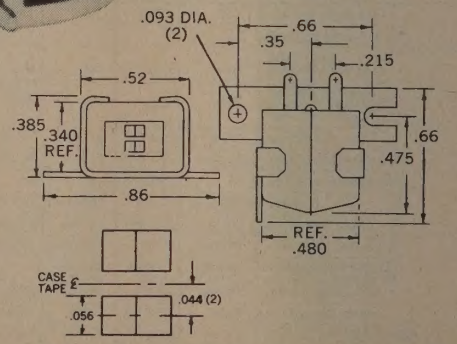



W4J

W2R

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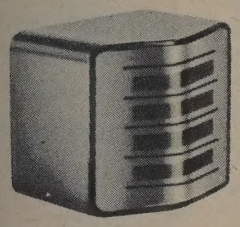
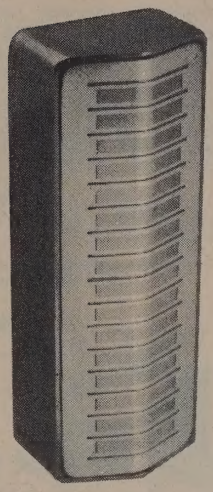
Nortronics

STUDIO SERIES HEADS
for ½", 1" and 2" tape



STR-4B

STR-8B



STR-16B

DESIGNED ESPECIALLY...

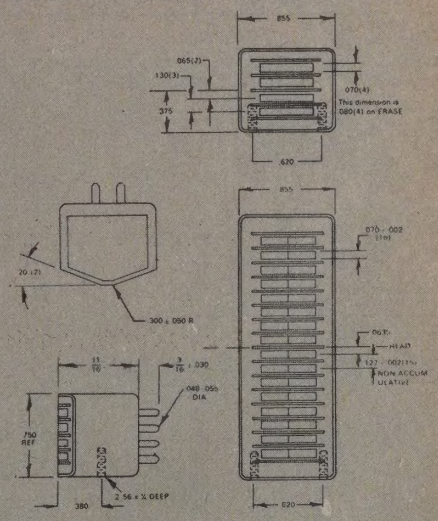
for professional audio or mastering recorders using one half, one, or two inch tape. Uncompromised quality dictates only the finest in design, materials and technology. Custom built to your electrical specifications and mechanical mounting requirements, the Studio Series is available in standard SMPTE track formats; 3 or 4 channels on one half inch tape, 8 or 12 channels on one inch tape, or 16 channels on two inch tape. Record and Playback heads feature ultra thin HY MU 800 laminated precision-lapped cores for minimum eddy current loss, deposited silicon monoxide gaps for maximum frequency definition and hyperbolic face contour for uniform intimate tape contact. Compatible companion erase heads are available with selective (independent) channels or full width. Ferrite core structures reduce ultra high frequency bias losses while providing erasure to virgin tape level.

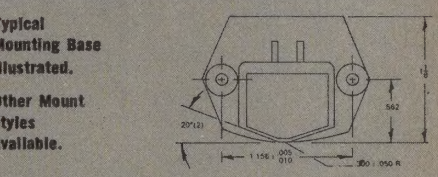
SPECIFICATIONS

	BASIC MODEL NUMBER			
TAPE WIDTH	ERASE	RECORD	PLAYBACK	
ONE HALF INCH TAPE	STE- 3B6 STE- 4B6	STR- 3B7 STR- 4B7	STP- 3B3 STP- 4B3	STP- 3B8 STP- 4B8
ONE INCH TAPE	STE- 8B6 STE-12B6	STR- 8B7 STR-12B7	STP- 8B3 STP-12B3	STP- 8B8 STP-12B8
TWO INCH TAPE	STE-16B6	STR-16B7	STP-16B3	STP-16B8
Inductance, 1 KHZ	215 UHY	4.0 MHY	300 MHY	650 MHY
Resistance, D.C. (OHMS)	1.3	8.3	245	530
Track Width (Inches	.080	.070	.070	.070
Track Spacing (Inches)	.130	.130	.130	.130
Gap Width (Microinches)	—	500	100	200
AVERAGE RECORD/PLAYBACK CHARACTERISTICS, USING 3M 201 TAPE, BIASED FOR PEAK 1 KHZ OUTPUT AT A LEVEL OF 12 DB BELOW TAPE SATURATION @ 1 KHZ				
Erase Voltage @ 100 KHZ	11 Volts	—	—	—
Erase Current @ 100 KHZ	100 MA	—	—	—
Bias Voltage @ 180 KHZ @ 15 IPS	—	17 Volts	—	—
Bias Voltage @ 180 KHZ @ 7.5 IPS	—	16 Volts	—	—
Bias Current @ 180 KHZ @ 15 IPS	—	8.0 MA	—	—
Bias Current @ 180 KHZ @ 7.5 IPS	—	7.5 MA	—	—
Audio Record Current @ 15 IPS	—	.40 MA	—	—
Audio Record Current @ 7.5 IPS	—	.38 MA	—	—
1 KHZ OUTPUT (15 IPS)	—	—	2.1 MV	3.2 MV
1 KHZ OUTPUT (7.5 IPS)	—	—	1.9 MV	3.0 MV
10 KHZ/1 KHZ Output (15 IPS)	—	—	+11 DB	+10 DB
10 KHZ/1 KHZ Output (7.5 IPS)	—	—	+5 DB	+3 DB
15 KHZ/10 KHZ Output (15 IPS)	—	—	+1 DB	−1.5 DB
15 KHZ/10 KHZ Output (7.5 IPS)	—	—	−1 DB	−4 DB

Specifications subject to change without notice.

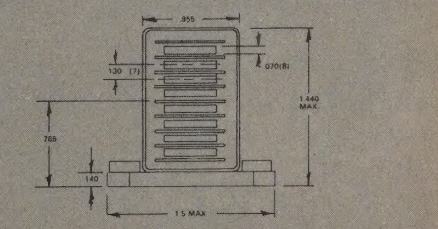
PHYSICAL CHARACTERISTICS





Typical Mounting Base Illustrated.

Other Mount Styles Available.



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Nortronics

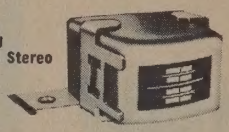
TAPE HEADS
Cassette Type

Nortronics features a complete line of heads for the cassette system, including a new bi-directional design that permits automatic changing, since the cassette need not be flipped over to play the second half of the tape.*

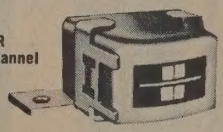
The Nortronics bi-directional design puts all three functions on one head, permitting two capstans to be used, thus providing for automatic reversing. Nortronics also produces conventional compatible cassette heads.

Typical operating speed for commercial applications is 1.875 ips.

Designed to provide usable frequency response from 50-12,000 Hz at 1.875 ips. with an excellent signal-to-noise ratio.



MODEL W4J
MODEL ZW4J
4 Track, 4 Channel Stereo



MODEL W2R
2 Track Dual Channel

MODEL W2ER
2 Channel Erase Head

TRACK CONFIGURATIONS

The track configurations of the cassett system have been defined on an inte national basis. The following configu ations are available:

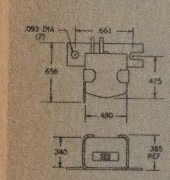
Model WIR
2 Track Monaural Record/Playback
Model ZWIR
2 Track Monaural Erase/Record/Playback
Model W2R
2 Track, Dual Channel Record/Playback
Model W2J
4 Track, 2 Channel Stereo Record/Playback
Model ZW2J
4 Track, 2 Channel Stereo Erase/Record/Playback
Model W4J
4 Track 4 Channel Stereo Record/Playback
Model ZW4J
4 Track, 4 Channel Stereo Erase/Record/Playback
Model W2ER
2 Channel Erase Head

ELECTRICAL SPECIFICATIONS

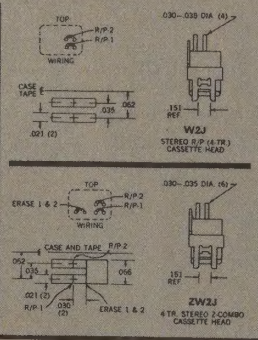
	MODEL NUMBER / FUNCTION		W1R6F W2R6F	ZW1R36K ZW2R36K	W4J8N W2J8N	W1R8N W2R8N	ZW4J34F ZW2J34F	W4J4F W2J4F	W2ER
			R/P	E/R/P	R	R	E/R/P	P	E
R/P	Track Width (Inches)		.056	.056	.021	.056	.021	.021	.070
	Inductance (MHY) @ 100 MV-1 KHz		2C0	100	10	20	50	80	—
	Resistance, DC (OHMS)		270	2C0	60	50	140	150	—
	Interchannel Crosstalk @ 1 KHz Rejection (DB)						1-2/3-4	30 DB	—
	Gap (Micro Inches)		50	50	50	50	2-3	50 DB	—
			50	100	200	200	50	50	—
ERASE	Induction (MHY) @ 100 MV, 1 KHz		—	1.5	—	—	2	—	2
	Resistance DC (OHMS)		—	30	—	—	38	—	12
	Erasure From Sat. 400 Hz (DB)		—	50	—	—	50	—	60
		Average constant-current unequalized R/P characteristics using 3M 272 tape. Biased for peak 1 KHz output at level 10-12 DB below tape saturation. Tape speed, 1.875 inches per second							
	Bias Voltage @ 60 KHz (Volts Rms)		20	25*	3.5	7.0	30*	—	13
	Bias Current @ 60 KHz (Ma Rms)		33	70*	1.6	1.5	60*	—	17
	Record Current (MA)		.028	.070	.130	1.40	.070	—	—
	1 KHz Playback Output (MV)		.4	.4	—	—	.15	.17	—
	5 KHz Output Vs. 1 KHz Output (DB)		−1	−8	—	—	—	—	—
	10 KHz Output Vs. 1 KHz Output (DB)		—	—	—	—	−14	−14	—

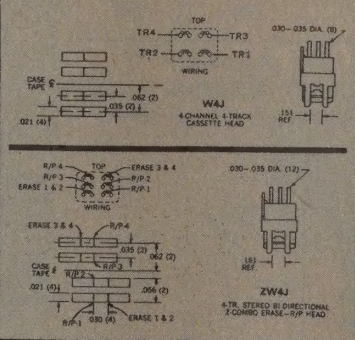
* R/P section normally receives sufficient bias thru magnetic leakage from the erase section, 50 pf across R/P coil during record.

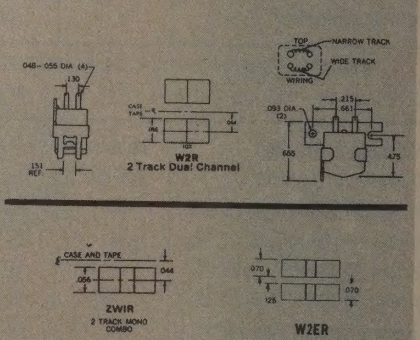
PHYSICAL CHARACTERISTICS



The mounting bracket/tape guide (illustrated) is supplied pre-aligned. The tape guide for .150 is positioned for proper track height when gap is azimuth aligned. (Specify "A" following basic model number).







TYPICAL APPLICATIONS

ENTERTAINMENT

For monaural applications; one or two recorded tracks, .059 inches wide separated by a guard band of .030 inches on the standard .150 inch tape. For compatible stereophonic recording; four recorded tracks, each .023 inches wide, are grouped in identical adjacent pairs with .012 guard bands — permits playing monaural and stereo tapes on the same equipment without loss of program material. Despite close spacing, crosstalk rejection of stereo models is in excess of 36 db.

LANGUAGE LABORATORY-DUPLICATORS

Model W2R provides two 56-mil tracks for language lab applications with master on one channel and student record/playback on other. Also used for cue and audio information in pre-programmed slide projectors, for duplicating mono cartridges, and for recording audio and synchronization tracks with portable motion picture cameras.

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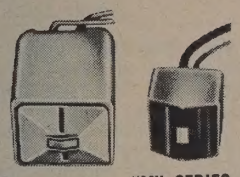
Nortronics

TAPE HEADS
miniature types

SIZES



"L" SERIES (5/16"W x 5/16"H x 3/8"D) "M" SERIES (1/4"W x 1/4"H x 1/4"D)

"M" SERIES — Features small size — 1/4 inch cubed. R/P track widths are .045 or .070 with compatible erase track widths of .055 or .090 inch. Face contour is either flush (as illustrated) or relieved. Standard relief for 16 mm stripe is .050 inch notch across top of face from case to core. To specify a relieved face add the number "3" to part number shown below. Available as no mount or base, side or rear mount (No. 2-56 stud).

"L" SERIES — Incorporates laminated cores, deposited quartz gaps and either a flush face for use with tape or a relieved face (as illustrated) for use in drum, disc or film stripe applications. The flush face contour is hyperbolic, while the pole-tip projection is .010 to 020 inch on relieved heads. To specify a relieved face add the number "5" to part number shown below. Available as no mount or base or rear mount (No. 2-56 stud). Special track widths or specifications on custom order basis. Six-inch leads std.

TYPICAL APPLICATIONS — Magnetic drums and discs, magnetic stripes on motion picture film and miniature tape recorders. When used with magnetic drums, discs and film stripes, it is recommended that a projecting track version be selected.

TYPICAL SPECIFICATIONS

TYPICAL MINIATURE RECORD/PLAY HEADS

MODEL NUMBER	L42R8L	L24R2K	L24R8L	L12R8K	M70R4L
TYPE OF HEAD	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback
Inductance, 1 KC Impedance, 1 KC Resistance, D.C.	80 MHY 500 Ω 128 Ω	200 MHY 1.2 K 400 Ω	40 MHY 250 Ω 125 Ω	30 MHY 200 Ω 125 Ω	20 MHY 130 Ω 80 Ω
Gap Spacer Track Width	0.16 MIL .042 INCH	0.10 MIL .024 INCH	0.16 MIL .024 INCH	0.10 MIL .012 INCH	0.16 MIL .070 INCH
Average 7.5 IPS constant current Record/Playback characteristics using 3M190 tape at 1 KC and recorded 12 DB below tape saturation at 1 KC.					
Peak Bias, 60 KC Record Current 1 KC Output 10 KC/1 KC Ratio	.070 MA 60 UA 1.0 MV 0 DB	0.33 MA 30 UA 1.0 MV +2 DB	0.65 MA 50 UA 0.45 MV 0 DB	0.75 MA 60 UA 0.25 MV 0 DB	2.0 MA 100 UA 0.6 MV −8 DB

MINIATURE ERASE HEADS

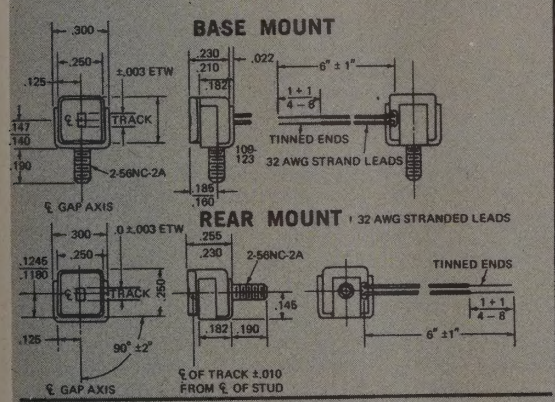
NORTRONICS MODEL NUMBER	L42E6U	M90E3U
Track Width Inductance, 1 KC	.042 INCH 5 MHY	.090 INCH 16 MHY
Resistance, D.C. †Erase Current Oper.	38 Ω 28-42 MA	315 Ω 12 MA
Impedance, 60 KC Voltage, 60 KC RMS	1.2 K 32-48 VOLTS	4 K 50 VOLTS

† For 56 DB Erasure of Saturated Tape.

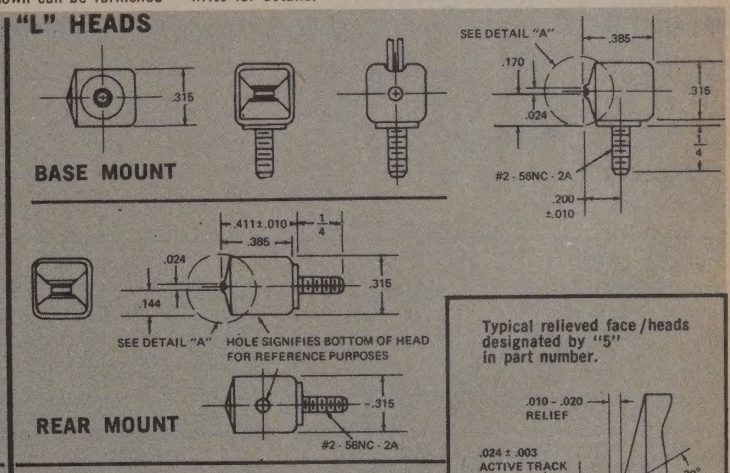
Specifications subject to change without notice.

STANDARD MOUNTS
Variations of the mountings shown can be furnished — write for details.

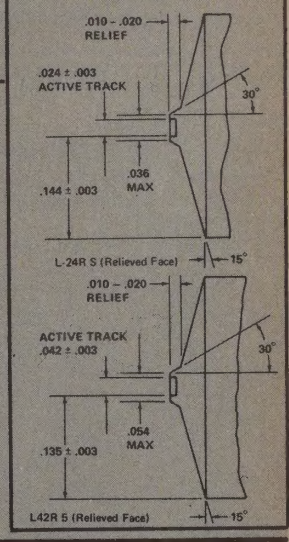
"M" HEADS



"L" HEADS

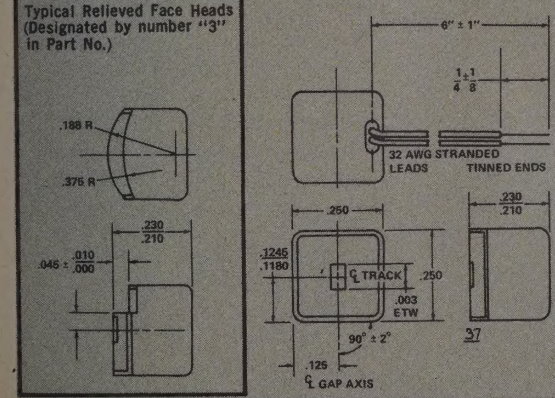


Typical relieved face/heads designated by "5" in part number.



PHYSICAL CHARACTERISTICS

Typical Relieved Face Heads (Designated by number "3" in Part No.)



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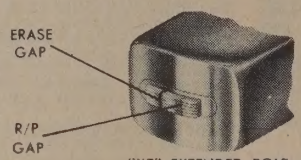
Nortronics

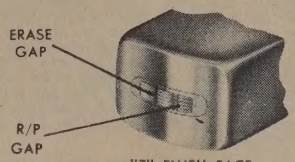
TAPE HEADS

Narrow track/Video recorder/Extended pole piece

Extended tip or flush face — Mu Metal or Alfenol Cores Standard track widths: .0135 inches, .020 inches,



"XZ" EXTENDED POLE



"Z" FLUSH FACE

***Z Combo — Type Z** — Combination erase and R/P head places all three functions within a single head. Ideal for dictation machines, card readers and film stripe applications. "Close-coupled" gap provides internal bias coupling that simplifies required circuitry and permits accurate editing.

Type XZ offers additional advantage of extended pole tip (.010-.020 inches) for gap to oxide contact on hard or non-compliant surfaces.

***R/P Heads — Type X** — Extended pole tip R/P heads feature high sensitivity mu-metal cores.

Type XA — Extended pole tip R/P heads feature long wearing alfenol cores.

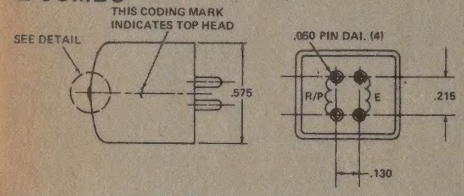
SPECIFICATIONS

BASIC MODEL NO.	X-ZRINC	X-ZRILC	CILC RILC	ZRILC	XACILC
Track Width (Inches)	.0135	.020	.020	.020	.020
Electrical Code	75 K	96 K	7 K	47 K	13 K
Head Function	Erase—R/P	Erase—R/P	R/P	Erase—R/P	R/P
R/P Inductance	500 MHY	220 MHY	400 MHY	450 MHY	170 MHY
R/P Gap Spacer	0.1 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.1 MIL
Erase Inductance	0.3 MHY	8 MHY	—	14 MHY	—
Erase Current (Bias)	65 MA	15 MA	—	12 MA	—
Erase Voltage (Bias)	2.5 V	28 V	—	32 V	—
Record Current	35 UA	30 UA	—	22 UA	—
1 KHZ Output	0.8 MV	0.5 MV	0.8 MV	0.7 MV	0.4 MV
10 KHZ/1 KHZ Ratio	–12 DB	–12 DB	–12 DB	–15 DB	–12 DB

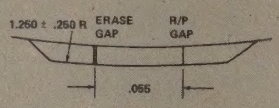
Typical 3.75 IPS constant current R/P characteristic using 3M190 tape.
Peak biased at 60 KHZ at 1 KC and recorded 12 DB below tape saturation.

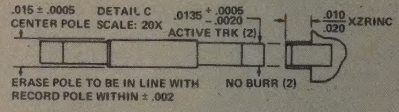
PHYSICAL CHARACTERISTICS

Z-COMBO

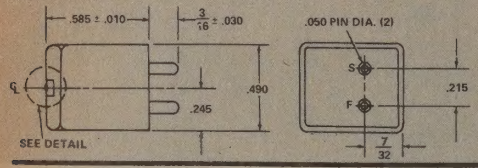


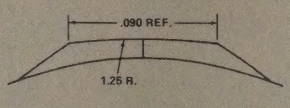
TYPICAL POLE PIECE DETAIL

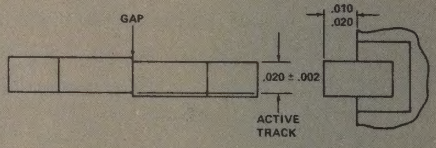




R/P







SPECIAL Z COMBO HEADS

Features include

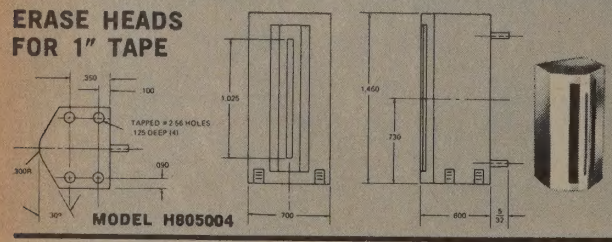
- Special wide cases give full-width tape support
- In-line gaps permit precise timing accuracy
- Z combo close-spaced erase gap controls editing and alignment
- Provides maximum center tape area for video information

AUDIO & SYNC FOR VIDEO RECORDERS

Custom built to your specifications, this series of special Z combo & R/P heads is designed specifically for video recorders. Two or three channels of sound and/or sync information can be recorded along the edges of one-half or one-inch tape.

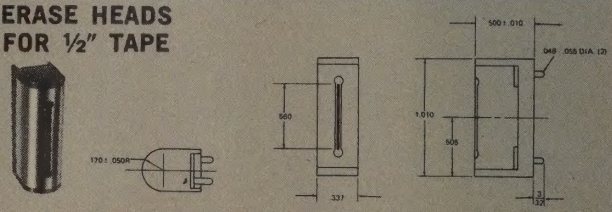
Check with Nortronics for your special-purpose head requirements.

ERASE HEADS FOR 1" TAPE



MODEL H805004

ERASE HEADS FOR ½" TAPE



MODEL H805037

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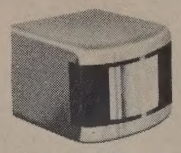
Nortronics

TAPE HEADS

full-track heads for ¼" tape

TRACK SYSTEM	FULL TRACK			
BASIC MODEL NUMBER	PR-B1F			
ELECTRICAL CODE	4R	11R	7K	12N
HEAD FUNCTION	Record Only	Record Only	Playback	Playback
TYPE OF CIRCUIT	Tubes/ Transistors	Tubes/ Transistors	Tubes/ Transistors	Tubes/ Transistors
Inductance, 1 KHz	55 MHY	4.0 MHY	400 MHY	650 MHY
Impedance, 1 KHz	330 Ω	27 Ω	2.5 K	4 K
Max. Bias Frequency	250 KHz	500 KHz	—	—
Resistance, D.C.	125 Ω	3.35 Ω	220 Ω	275 Ω
Gap Spacer	0.5 MIL	0.5 MIL	0.1 MIL	0.2 MIL
Average 7.5 IPS Constant Current Record/Playback Characteristics Using 3M 201 Tape, Peak Biased at 1 KHz and Recorded 12 DB Below Tape Saturation.				
Peak Bias Current, 60 KHz	.95 MA	9.0 MA	—	—
Bias Voltage RMS, 60 KHz	43 V	25 V	—	—
Record Record Current	.15 MA	.540 MA	—	—
1 KHz Output	—	—	3.5 MV	5.0 MV
10 KHz/1 KHz Ratio	—	—	+3 DB	+3 DB

Specifications subject to change without notice.



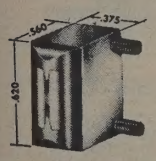
PR-B1F

PR SERIES

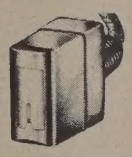
- Sets a new standard for high performance magnetic heads.
- Unexcelled response from 20HZ to 20KHZ.

Professional series full track — PR-B1F, designed especially for long wave length response with extra wide pick-up poles, smooth response characteristics are obtained to below 20HZ. Fine precision lapped laminated core stacks and deposited gaps extend short wavelength response. Extra deep deposited quartz gap.

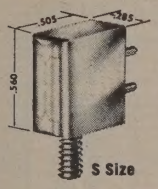
Companion PR-B1EF ERASE also available.



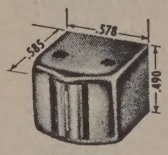
L Size (Side Mount—S23)



S Size (Rear Mount—R-12S)



S Size (Base Mount—B3)



B Style (No Mount—N)

ALL NORTRONICS erase heads have efficient double-gap construction plus metal faces and cases for superior tape contact surface and heat transfer. MEF and B1EF types have same metal core construction and will erase over 60 DB. at operating frequencies up to 100 KHZ. Case sizes shown at left are "L"—large for side mount, "S"—small for base and rear mount, and "B"—standard r/p size.
PR-B1EF "PRO" series erase heads have super-efficient hybrid ferrite/laminated core structures which give erase depth in excess of 70 DB. and operate at frequencies up to 200 KHZ. Available in B-style only, with standard mounting options.

Erase heads are shown with various mounts, but all are available in your choice of **base, side, rear** or **no mount.**

TRACK SYSTEM	FULL TRACK			
BASIC MODEL NUMBER	MEF-B1EF		PR-B1EF	
ELECTRICAL CODE	1	4	14	4
Inductance, 1 KHz	40 MHY	4.0 MHY	.200 MHY	1.2 MHY
Resistance, D.C.	88 Ω	20 Ω	1.8 Ω	3.8 Ω
†Erase Current Oper.	13 MA	40 MA	120 MA	95 MA
Impedance, 60 KHz	12 K	1 K	80 Ω	42 Ω
Voltage, 60 KC RMS	120 V	40 V	9.3 V	40 V

Specifications subject to change without notice. †For 56 DB erasure of Saturated Tape.

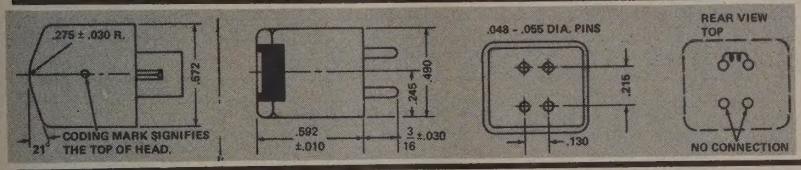
To determine erase model number, select a basic model number, add the erase electrical code, add a dash (—) and add mounting designator (below). Following are typical examples:

MEF1-S23U, Full-track mono erase head, No. 1 erase electrical code, "L case," **side mount,** track **up** (studs are to **left**).

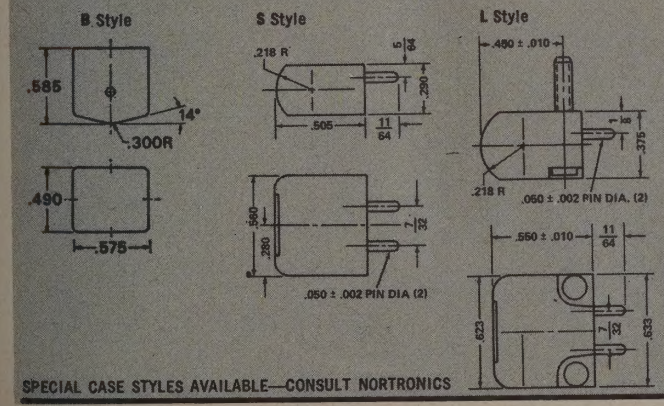
Erase Mounting Designator follows model number in this fashion:

"MEF1-N9", no mount (S Size)
"-N", no mount (L Size)
"-B3", standard base mount (Supplied S Size only). For mono heads, add a U for up or D for down after the B3 to denote track up or track down.
"-S23", standard side mount (Supplied L Size only). For mono heads, add a U for up or a D for down after S23 to denote track up or track down.
"-R-12S", standard rear mount and 12 inch shielded leads (Supplied S Size only).
"-R-4U", standard rear mount and 4 inch unshielded leads (Supplied S Size only).

For "B" style erase heads, mounts are the same as for R/P heads.



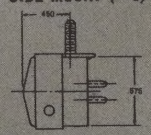
CASE OUTLINE STYLES



SPECIAL CASE STYLES AVAILABLE—CONSULT NORTRONICS

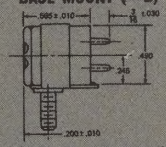
MOUNT

SIDE MOUNT (—S)



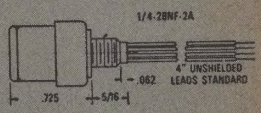
L or R Combo erase on left or right side
U or D Mono track up or down

BASE MOUNT (—B)

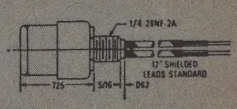


L or R Combo erase on left or right side
U or D Mono track up or down

REAR MOUNT (—R—4U)



REAR MOUNT (—R—12S)



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Nortronics

TAPE HEADS

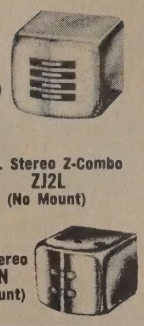
8-track heads for ¼" tape

MODEL ZJ2L Z-Combo

The type **ZJ2L** offers combination erase and record/playback functions in one head for 8-track stereo applications. Its patented unique "Z-Combo" construction places the erase and R/P gaps only .030 apart in the same pole structure, resulting in extremely accurate height alignment and tracking. Recording and erasing for the 8-track stereo system thereby become fully practicable. Standard B-size case fits most mountings.

Advantages of Z-Combo Close-Coupled Gaps

- Intimate tape contact with single or no pressure pad
- Insures overlap alignment of erase when R/P section is azimuth aligned
- Prevents adjacent channel erasure in close spaced track configurations when R/P section is azimuth aligned



8-Track 4-Channel P-BQL-N (No Mount)

8-Tr. Stereo Z-Combo ZJ2L (No Mount)

8-Tr. Stereo B2L-N (No Mount)

MODEL P-BQL

SUITABLE FOR HIGH SPEED DUPLICATORS, LOW SPEED LOGGING APPLICATIONS, AND GENERAL PURPOSE RECORDING AND PLAYBACK.

The NORTRONICS Premium Quality P-BQL four-channel magnetic tape head utilizes the most advanced design and manufacturing techniques. Fine-laminated cores and precision-deposited gaps give extended frequency response capability. Ideal as high speed slave heads for duplication of 8-track stereo at speeds up to 8X or 16X, with bias frequencies up to 750 KHz.

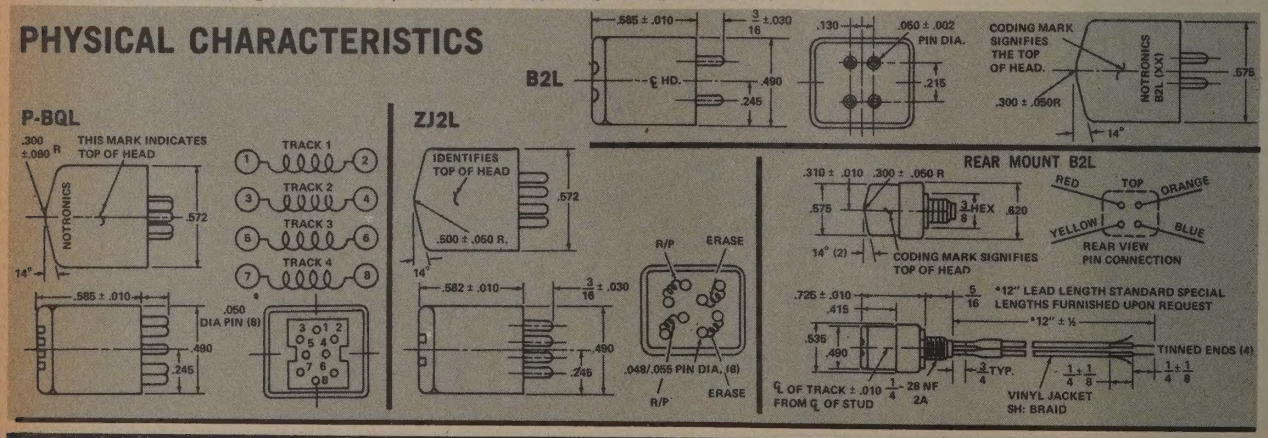
MODEL B2L-N

Standard playback — only or record/playback head for automobile or home type Stereo — 8 tape cartridge players. Premium version of above head is available with extra-fine laminated cores for improved high frequency response to 15 KHz at 3.75 ips tape speed. Also available Alfenol Premium record-only head for heavy-duty high speed duplicating applications. Give five times normal life.

BASIC MODEL NUMBER	8-TRACK (.021 INCH WIDTH) P-BQL 2 HEADS INTERLACE FOR 8 TRACKS ON ¼" TAPE				8-TRACK STEREO Z-J2L	8-TRACK (.020 INCH TRACK WIDTH) STEREO B2L			8 TRACK STEREO Special Duplicating
ELECTRICAL CODE	8R	4R	4K	6K	47 K	8R	4R	7K	AP-B2L14R
HEAD FUNCTION	Duplicating Record	Record Only	Record/ Playback	Record/ Playback	Erase/ Record/ Playback	Duplicating Record	Record Only	Record/ Playback	Record Only
TYPE OF CIRCUIT	Tubes/ Transistors	Tubes/ Transistors	Transistors	Tubes/ Transistors	R/P Section Data	Tubes/ Transistors	Tubes/ Transistors	Tubes/ Transistors	Alfenol/ Duplicating
Inductance, 1 KC	10 MHY	50 MHY	100 MHY	200 MHY	400 MHY	10 MHY	50 MHY	400 MHY	2 MHY
Impedance, 1 KC	65 Ω	300 Ω	650 Ω	1.5 K	2.5 K	75 Ω	400 Ω	2.5 K	—
Maximum Bias Frequency	500 KC	200 KC	100 KC	100 KC	100 KC	750 KC	250 KC	100 KC	—
Resistance, D.C. Mono					—	20 Ω	100 Ω	520 Ω	10 Ω
Resistance, D.C. Stereo	60 Ω	250 Ω	250 Ω	500 Ω	680 Ω	42 Ω	220 Ω	700 Ω	—
Gap Spacer	0.5 MIL	0.5 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.5 MIL	0.5 MIL	0.1 MIL	500 U-IN
Track Spacing	.0635 INCH	.0635 INCH	.0635 INCH	0.635 INCH	.127 INCH	.127 INCH	.127 INCH	.127 INCH	—
1 KC Crosstalk Rej.	50 DB	50 DB	50 DB	50 DB	50 DB	50 DB	50 DB	50 DB	—
For "WP" AND PREMIUM — Average 7.5 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC	1.8 MA	0.7 MA	0.55 MA	0.35 MA	*15 MA	1.1 MA	0.5 MA	0.15 MA	40 MA @ 30 IPS
Bias Voltage RMS, 60 KC	5 VOLTS	15 VOLTS	15 VOLTS	22 VOLTS	*45 VOLTS	2.6 VOLTS	8 VOLTS	21 VOLTS	30 VOLTS @ 500 KHz
Record Current	140 UA	55 UA	45 UA	35 UA	30 UA	88 UA	40 UA	19 UA	0.3 MA
1 KC Output	—	—	0.6 MV	0.8 MV	0.9 MV	—	—	1.0 MV	—
10 KC/1 KC Ratio	—	—	0 DB	0 DB	−3 DB	—	—	0 DB	—
For "WP" AND PREMIUM — Average 3.75 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC	1.5 MA	0.6 MA	0.50 MA	0.30 MA	*10 MA	1.0 MA	0.4 MA	0.12 MA	6 MA
Bias Voltage RMS, 60 KC	4.5 VOLTS	10 VOLTS	13 VOLTS	20 VOLTS	*40 VOLTS	2.3 VOLTS	7 VOLTS	18 VOLTS	3 VOLTS
Record Current	120 UA	45 UA	40 UA	32 UA	20 UA	86 UA	35 UA	35 UA	0.3 MA
1 KC Output	—	—	0.5 MV	0.6 MV	0.8 MV	—	—	0.8 MV	—
10 KC/1 KC Ratio	—	—	−12 DB	−12 DB	−12 DB	—	—	−9 DB	—
For STANDARD HEADS — Average 7.5 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC					Z-J2L			.55 MA	
Bias Voltage RMS, 60 KC	Not Available				ERASE SECTION DATA	Not Available		32 VOLTS	
Record Current	in				Inductance @ 60 KC 12 MHY	in		30 UA	
1 KC Output	Standard Series				Erasure @ 60 KC 50 DB	Standard Series		0.9 MV	
10 KC/1 KC Ratio								−4 DB	

* Provides internal bias coupling from erase to R/P section. Bias data above is fed to erase section.

PHYSICAL CHARACTERISTICS



NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
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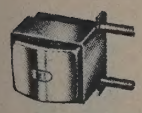
Nortronics

TAPE HEADS

3 and 4-track heads for ¼" tape



4-Tr. Mono
B1QC-S
(Side Mount)

4-Tr. Stereo
WP-B2Q
(No Mount)

4-Tr. Stereo Combo
A2Q-BL
(Base Mount)

4-Tr. Mono Combo
A1QC-N
(No Mount)

The B2Q, C2Q, G2Q heads shown represent a broad new series of 4-track stereo and monophonic record/playback heads. Each type of head is available in either a PREMIUM or STANDARD version. The PREMIUM series is a fully professional line of tape heads giving unsurpassed performance for broadcast and studio applications. Long life and extended high frequency response at slower tape speeds, are among the benefits of the features listed: • Fine laminated, precision-lapped, low loss core structures • Deposited quartz gaps, as fine as 50 micro-inches • Hyperbolic face contour • Highly polished all-metal faces • Compatible mechanically and electrically with older model Nortronics heads • Superbly shielded against external magnetic fields. The STANDARD versions are recommended for less critical applications where cost is a primary factor. They offer improved high frequency performance over that of conventional solid-core heads, plus the added features of hyperbolic all-metal face and precision deposited quartz gaps.

4-Tr. Stereo
B2Q-N
(No Mount)

3-Track
3-Channel
P-B3Q-R
(Rear Mount)

The P-A2Q, A2Q, P-A1QC and A1QC 4-track series of NORTRONICS Combination Magnetic Tape Heads contain record/playback and erase sections in one miniature case. Internal construction is based on the low-loss, laminated core design. PREMIUM Series P-A2Q and P-A1QC heads offer fully professional fine-laminated core construction where the ultimate in high frequency performance is required. STANDARD A2Q and A1QC series heads are recommended for less critical applications where cost is a primary factor. STANDARD type heads have laminated cores, providing a superior high frequency response over that of conventional solid-core heads. Deposited quartz gaps as fine as 50 micro-inches. Precision-polished metal faces for freedom from oxide buildup. Hyperbolic face contours, available on PREMIUM models, for optimum tape-to-gap contact without need for pressure pads.

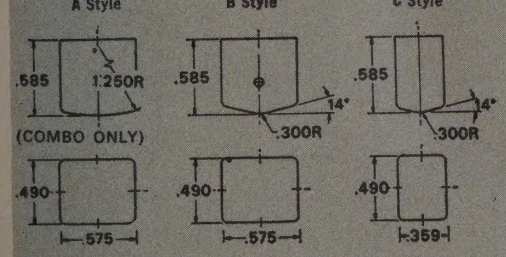
P-B3Q SERIES

Premium series three channel R/P heads designed especially to meet N.A.B. (USA) track configuration for stereo cartridge machines, two channels for stereo program plus control channel. Precision gap co-linearity eliminates phase cancellation distortion of stereo signal, all metal face insures maximum shielding. B case to fit all mounting accessories.

TRACK SYSTEM BASIC MODEL NUMBER	4-TRACK (.043 INCH TRACK WIDTH) MONO — B1QY, B1QC, A1QC STEREO — B2Q, C2Q, G2Q, A2Q (For Premium Series Add "P" Prefix to Above Numbers)								3-TRACK (.043 INCH WIDTH) P-B3Q 3 CHANNELS FOR ¼" TAPE		
ELECTRICAL CODE	8R	4R	8K	4K	6K	7K	7F	2K	4R	6K	7K
HEAD FUNCTION	Duplicating Record	Record Only	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback	Playback Only	Record/ Playback	Record Only	Record/ Playback	Record/ Playback
TYPE OF CIRCUIT	Tubes/ Transistors	Tubes Transistors	Transistors	Transistors	Transistors	Tubes/ Transistors	Tubes/ Transistors	Tubes	Tubes/ Transistors	Transistors	Tubes/ Transistors
Inductance, 1 KC	10 MHY	50 MHY	20 MHY	100 MHY	200 MHY	400 MHY	500 MHY	800 MHY	50 MHY	200 MHY	340 MHY
Impedance, 1 KC	70 Ω	400 Ω	150 Ω	650 Ω	1.3 K	2.5 K	3.3 K	5 K	400 Ω	1.3 K	2.0 K
Maximum Bias Frequency	500 KC	250 KC	250 KC	140 KC	120 KC	100 KC	100 KC	80 KC	250 KC	120 KC	100 KC
*Resistance, D.C.	22 Ω	90 Ω	22 Ω	90 Ω	110 Ω	210 Ω	210 Ω	520 Ω	260 Ω	450 Ω	800 Ω
**Resistance, D.C.	32 Ω	90 Ω	32 Ω	90 Ω	200 Ω	390 Ω	390 Ω	700 Ω			
Gap Spacer	0.5 MIL	0.5 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.05 MIL	0.1 MIL	0.5 MIL	0.1 MIL	0.1 MIL
**Track Spacing	.136 INCH	.136 INCH	.136 INCH	.136 MIL	.136 MIL	.136 MIL	.136 INCH	.136 INCH	.100 INCH	.100 INCH	.100 INCH
1 KC Crosstalk Rej.	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB
For "WP" AND PREMIUM — Average 7.5 IPS Constant Current Record / Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.											
Peak Bias Current, 60 KC	1.3 MA	0.65 MA	1.6 MA	0.70 MA	0.40 MA	0.25 MA	0.25 MA	0.16 MA	.065 MA	0.40 MA	0.25 MA
Bias Voltage RMS, 60 KC	3 V	7.5 V	6 V	18 V	25 V	35 V	50 V	45 V	1.5 V	20 V	35 V
Record Current	140 UA	60 UA	150 UA	70 UA	50 UA	35 UA	30 UA	25 UA	60 UA	50 UA	35 UA
1 KC Output	—	—	0.5 MV	0.9 MV	1.3 MV	1.8 MV	1.8 MV	2.6 MV	—	1.3 MV	1.8 MV
10 KC/1 KC Ratio	—	—	0 DB	0 DB	+1 DB	+1 DB	+2 DB	+1 DB	—	+1 DB	+1 DB
For "WP" AND PREMIUM — Average 3.75 IPS Constant Current Record / Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.											
Peak Bias Current, 60 KC	1.2 MA	0.50 MA	1.25 MA	0.50 MA	0.32 MA	0.20 MA	0.20 MA	0.12 MA	0.50 MA	0.32 MA	0.20 MA
Bias Voltage RMS, 60 KC	2.5 V	7.0 V	5 V	13 V	20 V	25 V	35 V	35 V	7.0 V	15 V	25 V
Record Output	130 UA	50 UA	130 UA	50 UA	44 UA	30 UA	25 UA	22 UA	.50 UA	44 UA	30 UA
1 KC Output	—	—	0.4 MV	0.7 MV	1.0 MV	1.4 MV	1.4 MV	2.1 MV	—	1.0 MV	1.4 MV
10 KC/1 KC Ratio	—	—	−10 DB	−10 DB	−9 DB	−9 DB	−7 DB	−9 DB	—	−9 DB	−9 DB
For STANDARD HEADS — Average 7.5 IPS Constant Current Record / Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.											
Peak Bias Current, 60 KC	Not Available in Standard Series			1.1 MA	0.70 MA	0.42 MA	Not Available in Standard Series	0.30 MA	Not Available in Standard Series		
Bias Voltage RMS, 60 KC				20 V	25 V	35 V		45 V			
Record Current				70 UA	50 UA	35 UA		25 UA			
1 KC Output				0.8 MV	1.2 MV	1.6 MV		2.4 MV			
10 KC/1 KC Ratio				−4 DB	−3 DB	−3 DB		−3 DB			

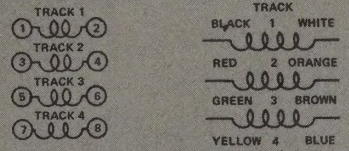
* Mono ** Stereo

CASE OUTLINE STYLES

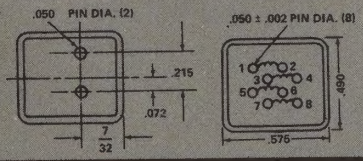


SPECIAL CASE STYLES AVAILABLE—CONSULT NORTRONICS

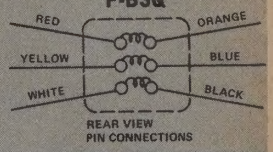
PBQQ & BQQN



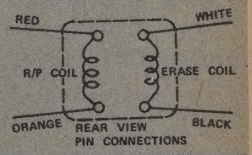
MONO R/P



P-B3Q



MONO COMBO



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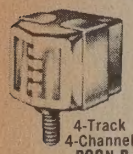
Nortronics

TAPE HEADS

4-track heads for ¼" tape



4-Track
4-Channel
BQQN-B
(Base Mount)

P-BQQ-N
(No Mount)

Nortronics Model P-BQQ is an instrument quality, 4-channel in-line record/reproduce magnetic tape head for ¼-inch tape. Its fine laminated-core construction is designed for professional applications with the ultimate in high frequency performance. Deposited quartz gaps as fine as 50 micro-inches result in exceptionally clean "smear-free" gap edges. The all-metal face greatly reduces oxide loading problems and the hyperbolic contour promotes intimate tape-to-gap contact allowing reduced tape tension and elimination of pressure pads.

Typical Applications — Instrumentation recording including carrier modulated types such as AM, FM or Pulse, as well as straight digital and analog recording. Tracks of the P-BQQ head are compatible with the 4-track stereo system making it ideal for audio duplication, background music and 4-channel in-line stereo.

Two versions are available, offering a choice between the minimum interchannel crosstalk and lower price. The P-BQQ style has the superior interchannel crosstalk rejection of 55 db. For some applications, such as pulse recording, the 18 db crosstalk rejection of the more economical BQQN model may be acceptable.

SERIES / BASIC MODEL NUMBER	PREMIUM 4-TRACK (.037 INCH WIDTH) P-BQQ 4 CHANNELS FOR ¼" TAPE			
ELECTRICAL CODE	23R	4R	4K	7K
HEAD FUNCTION	Duplicating Record	Record Only	Record/ Playback	Record/ Playback
TYPE OF CIRCUIT	Tubes/ Transistors	Tubes/ Transistors	Transistors	Tubes/ Transistors
Inductance, 1 KC	12 MHY	50 MHY	100 MHY	400 MHY
Impedance, 1 KC	75 Ω	320 Ω	600 Ω	2.2 K
Maximum Bias Frequency	500 KC	150 KC	100 KC	80 KC
Resistance, D.C.	55 Ω	220 Ω	220 Ω	690 Ω
Gap Spacer	0.5 MIL	0.5 MIL	0.1 MIL	0.1 MIL
Track Spacing	.071 INCH	.071 INCH	.071 INCH	.071 INCH
1 KC Crosstalk Rej.	55 DB	55 DB	55 DB	55 DB

For **PREMIUM** — Average **7.5 IPS** Constant Current Record/ Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.

Peak Bias Current, 60 KC	2.0 MA	0.60 MA	0.70 MA	0.30 MA
Bias Voltage RMS, 60 KC	4 V	7 V	15 V	30 V
Record Current	110 UA	60 UA	60 UA	34 UA
1 KC Output	—	—	0.7 MV	1.4 MV
10 KC/1 KC Ratio	—	—	0 DB	0 DB

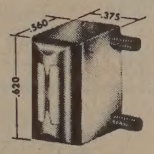
For **PREMIUM** — Average **3.75 IPS** Constant Current Record/ Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.

Peak Bias Current, 60 KC	1.6 MA	0.50 MA	0.50 MA	0.22 MA
Bias Voltage RMS, 60 KC	3 V	6 V	10 V	25 V
Record Current	90 UA	50 UA	50 UA	30 UA
1 KC Output	—	—	0.5 MV	1.1 MV
10 KC/1 KC Ratio	—	—	−10 DB	−9 DB

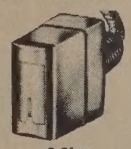
ERASE HEADS

All Nortronics erase heads have efficient double-gap construction plus metal faces and cases for superior heat transfer. They will operate effectively at erase frequencies up thru 100 kc. and also on d.c. **Two low-cost standard case sizes, "L" and "S,"** in the various mounting styles as illustrated to the right and indicated below. All erase models are also available in the B-case style to match the r/p heads; example, B2EQ4-N which is identical electrically to the SEQ4.

Erase heads are shown with various mounts, but all are available in your choice of **base, side, rear** or **no mount.**

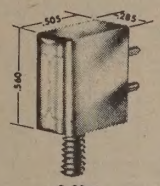


L Size
SEQ
(Side Mount—S23)



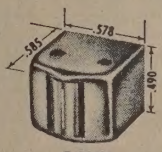
S Size

(Rear Mount—R-12S)



S Size

(Base Mount—B3)



B Style

(No Mount—N)

To determine erase model number, select a basic model number, add the erase electrical code, add a dash (—) and add mounting designator (below). Following is a typical example:

SEQ4-R-12S, 4-track (quarter track) stereo erase head, No. 4 erase electrical code, "S" case, rear mount, 12 inch shielded leads.

Erase Mounting Designator follows model number in this fashion:

"SEQ4-N9", no mount (S Size)

"-N", no mount (L Size)

"-B3", standard base mount (Supplied S Size only). For mono heads, add a U for up or D for down after the B3 to denote track up or track down.

"-S23", standard side mount (Supplied L Size only). For mono heads, add a U for up or a D for down after S23 to denote track up or track down.

"-R-12S", standard rear mount and 12 inch shielded leads (Supplied S Size only).

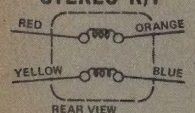
"-R-4U", standard rear mount and 4 inch unshielded leads (Supplied S Size only).

For "B" style erase heads, mounts are the same as for R/P heads.

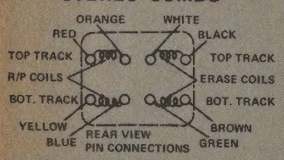
ERASE HEADS			
TRACK SYSTEM	4-TRACK		
NORTRONICS BASIC MODEL NO.	MONO — MEQ STEREO — SEQ; B2EQ		
ELECTRICAL CODE	1	2	4
Inductance, 1 KC	80 MHY	0.13 MHY	10 MHY
Resistance, D.C.	240 Ω	1.8 Ω	38 Ω
†Erase Cur. Oper.	5 MA	120 MA	13 MA
Impedance, 60 KC	30 K	40 Ω	3 K
Volt., 60 KC RMS	120 V	5 V	40 V

† For 56 DB erasure of Saturated Tape.

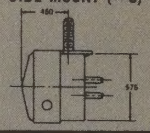
STEREO R/P



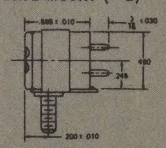
STEREO COMBO



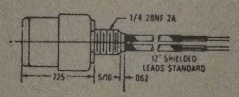
SIDE MOUNT (—S)



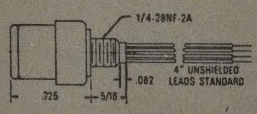
BASE MOUNT (—B)



REAR MOUNT (—R—12S)

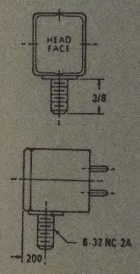


REAR MOUNT (—R—4U)



(Base Mount—B3)

G or C Style Heads Only

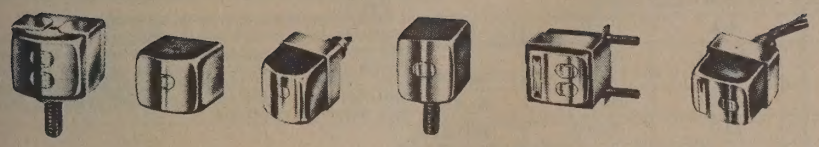


NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

Nortronics

TAPE HEADS

2-track heads for ¼" tape



2-Tr. Stereo B2H-B (Base Mount) | 2-Tr. Mono B1HY-N (No Mount) | 2-Tr. Mono G1H-R (Rear Mount) | 2-Tr. Mono G1HY-B3 (Base Mount) | 2-Tr. Stereo Combo A2H-SR (Side Mount) | 2-Tr. Mono Combo A1HC-R (Rear Mount)

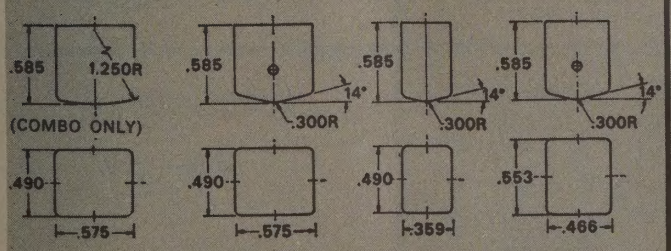
For reel-to-reel and cartridge applications. Hyperbolic all-metal faces for maximum shielding, optimum tape-to-gap contact. Precision deposited quartz gaps, as fine as 50 micro-inches.
PREMIUM version offers extra long life, extended frequency response, especially at slower tape speeds.

BASIC MODEL NUMBER	2-TRACK (.080 INCH TRACK WIDTH) MONO — B1HY, G1H, G1HY, A1HC STEREO — B2H, A2H (See opposite page for PR-B2H series)								2 Track STEREO Z-J2H
ELECTRICAL CODE	8R	4R	8K	4K	6K	7K	7F	2K	46K
HEAD FUNCTION	Duplicating Record	Record Only	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback	Record/ Playback	ERASE
TYPE OF CIRCUIT	Tubes/ Transistors	Tubes/ Transistors	Transistors	Transistors	Transistors	Tubes/ Transistors	Tubes/ Transistors	Tubes	R/P Section Data
Inductance, 1 KC	10 MHY	50 MHY	20 MHY	100 MHY	200 MHY	400 MHY	450 MHY	800 MHY	200 MHY
Impedance, 1 KC	72 Ω	320 Ω	150 Ω	650 Ω	1.3 K	2.5 K	3.3 K	5 K	1.3 K
Maximum Bias Frequency	500 KC	200 KC	250 KC	150 KC	100 KC	100 KC	80 KC	60 KC	100 KC
Resistance, D.C. Mono	14 Ω	70 Ω	14 Ω	70 Ω	110 Ω	165 Ω	165 Ω	400 Ω	—
Resistance, D.C. Stereo	27 Ω	130 Ω	27 Ω	130 Ω	245 Ω	410 Ω	410 Ω	720 Ω	260 Ω
Gap Spacer	0.5 MIL	0.5 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.1 MIL	0.05 MIL	0.1 MIL	0.1 MIL
Track Spacing Stereo	.160 INCH	.160 INCH	.160 INCH	.160 INCH	.160 INCH	.160 INCH	.160 INCH	.160 INCH	.160 INCH
1 KC Crosstalk Rej.	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	55 DB	50 DB
For "WP" AND PREMIUM — Average 7.5 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC	1.7 MA	0.70 MA	2.0 MA	0.80 MA	0.40 MA	0.33 MA	0.46 MA	0.25 MA	*30 MA
Bias Voltage RMS, 60 KC	3.3 V	9 V	7.5 V	20 V	30 V	40 V	55 V	55 V	*40 V
Record Current	200 UA	75 UA	220 UA	80 UA	60 UA	40 UA	46 UA	30 UA	UA
1 KC Output	—	—	0.7 MV	1.2 MV	1.8 MV	2.4 MV	2.2 MV	3.6 MV	MV
10 KC/1 KC Ratio	—	—	0 DB	0 DB	+1 DB	+1 DB	+2 DB	+1 DB	−3 DB
For "WP" AND PREMIUM — Average 3.75 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC	1.5 MA	0.60 MA	1.8 MA	0.70 MA	0.30 MA	0.22 MA	0.37 MA	0.20 MA	*80 MA
Bias Voltage RMS, 60 KC	2.8 V	8 V	6.5 V	15 V	25 V	30 V	45 V	40 V	*25 V 22
Record Current	180 UA	60 UA	200 UA	66 UA	45 UA	30 UA	37 UA	22 UA	40 UA
1 KC Output	—	—	0.6 MV	0.9 MV	1.2 MV	1.8 MV	1.5 MV	2.5 MV	1.2 MV
10 KC/1 KC Ratio	—	—	−10 DB	−10 DB	−9 DB	−9 DB	−7 DB	−9 DB	−12 DB
For Standard Heads — Average 7.5 IPS Constant Current Record/Playback Characteristics Using 3M190 Tape (3M111 Within 5%) Peak Biased at 1 KC and Recorded 12 DB Below Tape Saturation.									
Peak Bias Current, 60 KC	—	—	—	1.1 MA	0.80 MA	0.6 MA	—	0.4 MA	ERASE SECTION DATA
Bias Voltage RMS, 60 KC	—	—	—	20 V	30 V	45 V	—	65 V	INDUCTANCE @ 1 KC
Record Current	—	—	—	80 UA	60 UA	40 UA	—	30 UA	0.9 MHY
1 KC Output	—	—	—	1.1 MV	1.7 MV	2.2 MV	—	3.4 MV	ERASURE
10 KC/1 KC Ratio	—	—	—	−4 DB	−3 DB	−3 DB	—	−3 DB	50 DB

* Provides internal bias coupling from erase to R/P section. Bias data above is fed to erase section.

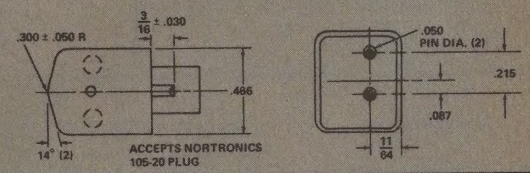
Specifications Subject to Change Without Notice.

CASE OUTLINE STYLES

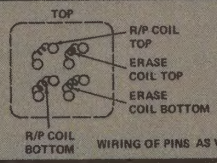


SPECIAL CASE STYLES AVAILABLE—CONSULT NORTRONICS

NO MOUNT (—N) MONO R/P G CASE



ZJ2H



WIRING OF PINS AS VIEWED FROM REAR OF HEAD

NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

Nortronics

TAPE HEADS

2-track heads for ¼" tape

PR SERIES

- Sets a new standard for high performance magnetic heads.
- Unexcelled response from 20 HZ to 20KHZ.

Professional series R/P heads. Designed especially for long wave length response with extra wide pickup poles, smooth response characteristics are obtained to below 20HZ. Fine precision lapped laminated core stacks and deposited gaps extend short wavelength response. Extra deep deposited quartz gap.

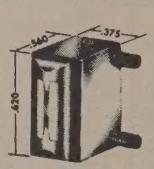
BASIC MODEL NUMBER	PROFESSIONAL PR-B2H 2 TRACK (.080 INCH TRACK WIDTH)				
ELECTRICAL CODE	8R	4R	11R	7K	12L
HEAD FUNCTION	Record Only	Record Only	Record Only	Record/ Playback	Playback
Inductance, 1 KHz	10 MHY	50 MHY	4.5 MHY	400 MHY	700 MHY
Impedance, 1 KHz	68 Ω	320 Ω	33 Ω	2500 Ω	4400 Ω
Resistance, D.C.	24 Ω	130 Ω	15 Ω	410 Ω	570 Ω
Gap Spacer	.5 MIL	.5 MIL	.5 MIL	.1 MIL	.160 MIL
Track Spacing	.160	.160	.160	.160	.160
1 KHz Crosstalk Rej.	55 DB	55 DB	55 DB	55 DB	55 DB
For **PROFESSIONAL HEADS** — Average **7.5 IPS** Constant Current Record/Playback Characteristics Using 3M 201 Tape, Peak Biased at 1 KHz and Recorded 12 DB Below Tape Saturation.					
Peak Bias Current, 60 KHz	3.3 MA	0.7 MA	5.8 MA	.33 MA	—
Bias Voltage RMS, 60 KHz	14 V	9 V	18 V	40 V	—
Record Current	.190 MA	.075 MA	.360 MA	.040 MA	—
1 KHz Output	—	—	—	2.4 MV	2.9 MV
10 KHz/1 KHz Ratio	—	—	—	+1 DB	+3 DB

ALL NORTRONICS erase heads have efficient double-gap construction plus metal faces and cases for superior tape contact surface and heat transfer. MEH, SEH and BZEH types have same metal core construction and will erase over 60 DB. at operating frequencies up to 100 KHZ. Case sizes shown at left are "L"—large for side mount, "S"—small for base and rear mount, and "B"—standard r/p size.

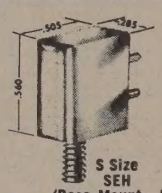
PR-B2EH "PRO" series erase heads have super-efficient hybrid ferrite/laminated core structures which give erase depth in excess of 70 DB. and operate at frequencies up to 200 KHZ. Available in B-style only, with standard mounting options.

Erase heads are shown with various mounts, but all are available in your choice of **base, side, rear or no mount.**

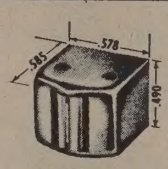
S Size MEH (Rear Mount—R—12S)



L Size (Side Mount—S23)



S Size SEH (Base Mount—B3)



B Style (No Mount—N)

To determine erase model number, select a basic model number, add the erase electrical code, add a dash (—) and add mounting designator (below). Following are typical examples:

MEH1-S23U, 2-track (half track) mono erase head, No. 1 erase electrical code, "L case," **side mount, track up** (studs are to **left**).

Erase Mounting Designator follows model number in this fashion:

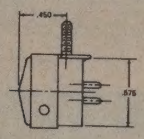
For "B" style erase heads, mounts are the same as for R/P heads.

"SEH2-N9", no mount (S Size)
"-N", no mount (L Size)
"-B3", standard base mount (Supplied S Size only). For mono heads, add a U for up or D for down after the B3 to denote track up or track down.
"-S23", standard side mount (Supplied L Size only). For mono heads, add a U for up or a D for down after S23 to denote track up or track down.
"-R-12S", standard rear mount and 12 inch shielded leads (Supplied S Size only).
"-R-4U", standard rear mount and 4 inch unshielded leads (Supplied S Size only).

ERASE HEADS — TRACK SYSTEM — 2-TRACK					
NORTRONICS BASIC MODEL NO.	MONO — MEH STEREO — SEH; B2EH			STEREO — PRB2EH	
ELECTRICAL CODE	1	2	4	14	4
Inductance, 1 KC	50 MHY	0.20 MHY	8 MHY	.225 MHY	5.5 MHY
Resistance, D.C.	160 Ω	1.8 Ω	30 Ω	3.6 Ω	30 Ω
†Erase Cur. Oper.	6 MA	120 MA	20 MA	70 MA	17 MA
Impedance, 60 KC	20 K	50 Ω	2 K	85 Ω	2 K
Volt., 60 KC RMS	120 V	6 V	40 V	6 V	34 V

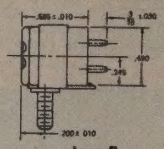
† For 56 DB Erase of Saturated Tape.

SIDE MOUNT (—S)



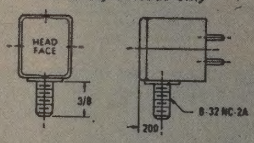
L or R
Combo erase on left or right side
U or D
Mono track up or down

BASE MOUNT (—B)



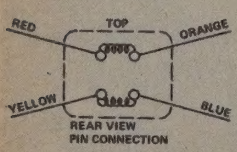
L or R
Combo erase on left or right side
U or D
Mono track up or down

BASE MOUNT (—B3)
G or C Style Heads Only

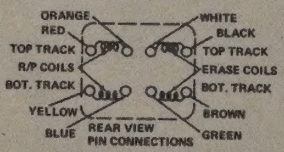


U or D
Mono track up or down

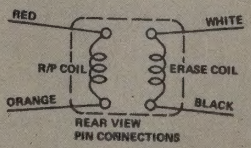
Stereo R/P



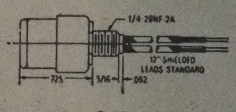
Stereo Combo R/P Erase



Mono Combo



REAR MOUNT (—R—12S)



S Size
W/12" Leads
(—R—4U) W/4" Leads (unshielded)

NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

BIAS OSCILLATOR TRANSFORMERS

NORTRONICS

TO DRIVE RECORD AND ERASE HEADS

- Heavy-duty Ferrite E-core construction assures minimum external magnetic field.
- High efficiency, high Q, clean waveform, and good voltage regulation.
- Wide frequency and voltage range.
- Output voltage at secondary of transformer may be varied by adjustment of the D.C. power supply voltage to the oscillator.
- Power handling up to 3 watts.

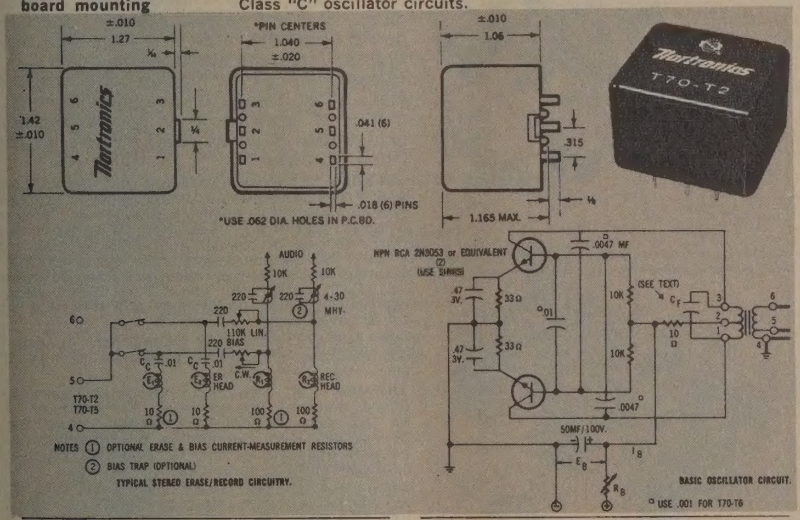
Model Number	Circuit Type and Mount	Application	Typical Operating Frequency (KHz)	Secondary Voltage (RMS)	Compatible Nortronics Heads
T70-T2	Transistor, PC Board	General Purpose	50-120	40, 80, 120	No. 4 & No. 1 Erase
T60-T2	Transistor, Can & Lug	General Purpose	60-110	40, 80, 120	No. 4 & No. 1 Erase
T70-T6	Transistor, PC Board	Duplicating	230-500	70	Drives 10 No. 8R Record
T60-T6	Transistor, Can & Lug	Duplicating	230-500	70	Drives 10 No. 8R Record
T70-T5	Transistor, PC Board	Professional	150-200	—	PR Series Erase
T60-E	Vacuum Tube, Can & Lug	General Purpose	40-70	7 & 120	No. 2 & No. 1 Erase
T60-F	Vacuum Tube, Can & Lug	General Purpose	60-100	60 & 150	No. 4 & No. 1 Erase

Table and circuit list the various methods of operation for the T70-T2 oscillator circuit, to obtain power for Nortronics #4 erase heads, at three different frequencies.

T-70 SERIES

for printed circuit board mounting

- Pin terminals provide for plug-in and soldering
- May be used with standard transistor push-pull or single-ended Class "C" oscillator circuits.
- Nylon case measures 1¼" x 1½" x 1⅛"



T70-T2 ERASE OPERATION

Frequency ER. V. RMS	EB D.C. Volts	SEC. Taps	CC MF.
60 KHZ.	20 V.	4 - 5*	.01
40 V.A.C.	15 V.	4 - 5	.002
	10 V.	5 - 6	.01
80 KHZ.	25 V.	4 - 5*	.01
50 V.A.C.	20 V.	4 - 5	.002
	13 V.	5 - 6	.01
100 KHZ.	30 V.	4 - 5*	.0047
60 V.A.C.	25 V.	4 - 5	.002
	18 V.	5 - 6	.0047

* Preferred

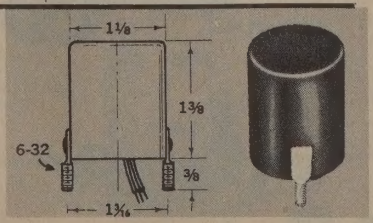
PARAMETER TABLE

	T70-T2	T70-T5	T70-T6
Pri. Induct. (1-3)	130 UHY.	60 UHY.	18 UHY.
Pri. D.C. Res. (1-3) Ohms	0.35	0.2	0.06
Sec. D.C. Res. (4-6) Ohms	15	0.3	0.22
Turns Ratio (1-3):(4-5)	1:15	1:0.5	—
Turns Ratio (1-3):(5-6)	1:3	1:1	—
Turns Ratio (1-3):(4-6)	1:45	1:15	1:1.67
*Out Volts (4-5)	40 V.	12 V.	—
*Out Volts (5-6)	80 V.	24 V.	—
*Out Volts (4-6)	120 V.	36 V.	50 V.
Tun. Cap. CF (60 KHZ.)	.047	—	—
Tun. Cap. CF (100 KHZ.)	.015	.038	—
Tun. Cap. CF (150 KHZ.)	—	.016	—
Tun. Cap. CF (250 KHZ.)	—	.0047	.033
Tun. Cap. CF (500 KHZ.)	—	—	.0075

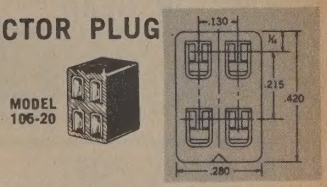
*No Load RMS Oscillator Voltages with 20 Volt D.C. Supply Output Voltage is Directly Proportional to D.C. Supply Voltage at Transformer Center Tap.

T-60 SERIES for chassis mounting

- Color coded leads, anodized aluminum case (1⅛" diameter, 1⅜" high)
- Two 6-32 x ⅜" spade lugs
- Units for transistor and vacuum tube applications

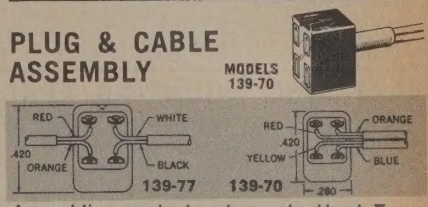


CONNECTOR PLUG



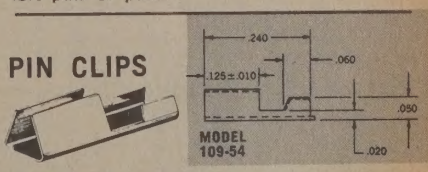
4-Pin Black Phenolic Plugs permit instant connection to all 4 pins of Stereo Heads and 2 pins of Mono Heads. **105-20** plug is for all Nortronics heads except BQQ, P-B3Q and P-BQL.

PLUG & CABLE ASSEMBLY



Assemblies ready to plug onto Head Terminal Pins. Consist of proper plug and two shielded cables (nominal length 18" each). **139-70** is used with all Nortronics stereo heads, with cable pairs connected to the upper pair of pins and lower pair of pins. **139-77** is used with Nortronics mono-combo and certain cassette heads, with cable pairs connected to the right pair of pins and left pair of pins.

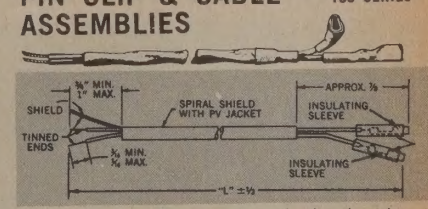
PIN CLIPS



The **109-54** is a gold plated beryllium copper push-on clip formed to fit the terminal pins of all Nortronics heads. Lead wires may be soldered easily to the small end of the clip, leaving the larger end open to push on to the terminal pins. Pin clips permit ready attachment or removal of leads to terminals of heads, and also eliminate damage to head caused by soldering leads directly to pins.

PIN CLIP & CABLE ASSEMBLIES

139 SERIES



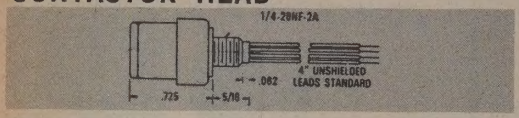
Provided to make neat and simple electrical connections to the terminal pins of Nortronics heads. Two conductor (No. 26) shielded wire insulated with vinyl jacket, with 109-54 pin clips. Available in 2 lengths, 4 color combinations:

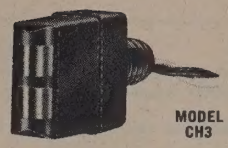
	9 inch	24-inch
Red-Orange	139-55	139-78
Yellow-Blue	139-56	139-79
White-Black	139-57	139-80
Green-Brown	139-58	139-81

NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

ACCESSORIES

CONTACTOR HEAD

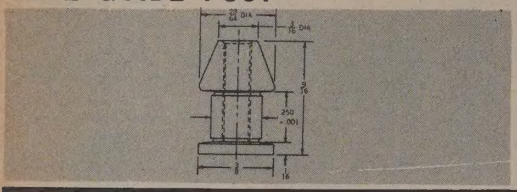




MODEL CH3

Use with metal-foil cueing to operate relay. Has two isolated contactor shoes. Model CH3-R-4U has rear mount and 4" leads. Model CH3-N9 is no-mount small-case size. CH3-B3 is base mount.

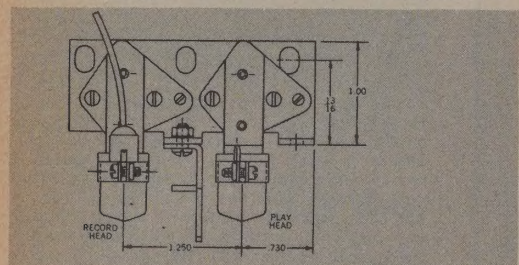
TAPE GUIDE POST

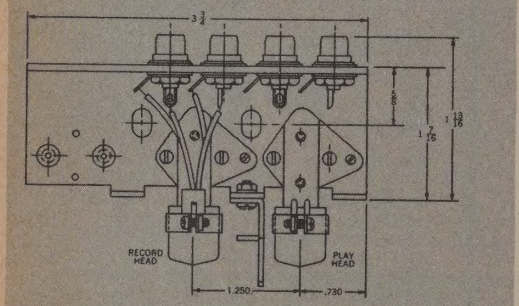


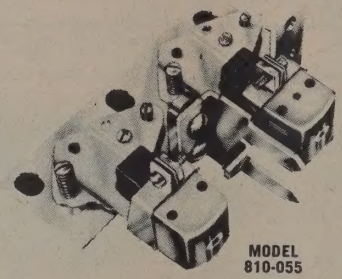
MODEL 173-13

A universal precision-made guide post for ¼" tape — may readily be mounted to control the path of tape travel. Chrome plated brass insures long life and friction-free operation. Height is readily adjustable by loosening the locking set screw and rotating the threaded post.

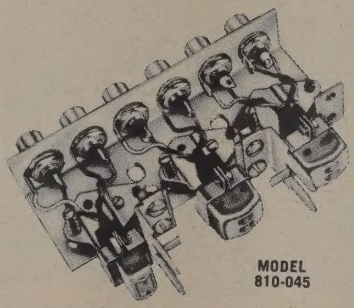
CARTRIDGE MOUNTING BRACKETS







MODEL 810-055



MODEL 810-045

Unique head mounting assembly for endless loop cartridge tape handlers (Fidelipac and Viking types). Eliminates awkward mounting and adjustment problems of rear-mount style heads. Offers "Micrometer" adjustments of head height, azimuth, and face perpendicularity. Lock screw on each head bracket "freezes" adjustments.

Heads fastened to bracket with quick-release screw clamp. Replacement time is a matter of seconds when heads are connected with plug and cable assemblies provided with kits.

#810-045 "B" Cartridge-Mount Kit. Up to three heads may be mounted on this assembly, using two no-mount R/P heads of the "A" or "B" size. A small case erase head may be added in the third position on the channel base by means of a #810-044 head bracket. Kit supplied unassembled, includes base channel, four jacks, two #810-042 brackets for the R/P or Combo heads, one #173-16 tape guide fork, and two plug and cable assemblies.

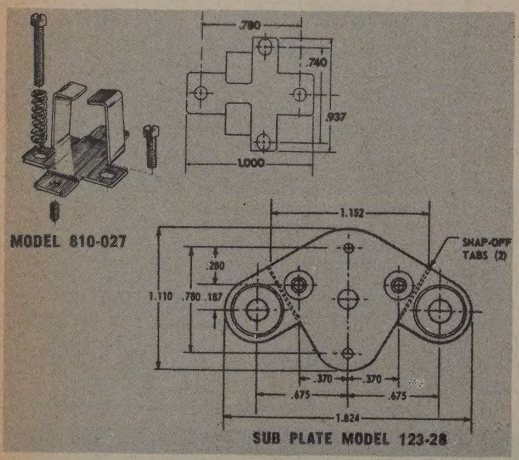
#810-046 "G" Cartridge-Mount Kit. As above, but with two #810-043 brackets for "G" or "T" size mono R/P heads.

#810-055 "B" Two Head Cartridge-Mount Kit. Accommodating two no-mount R/P heads of "A" or "B" size. Vertical back rail and jacks have been eliminated. Connection to the heads may be made by use of the 18" shielded plug and cable assemblies (provided).

#810-056 "G" Two Head Cartridge-Mount Kit. As above, but with #810-043 brackets "G" or "T" size mono R/P heads.

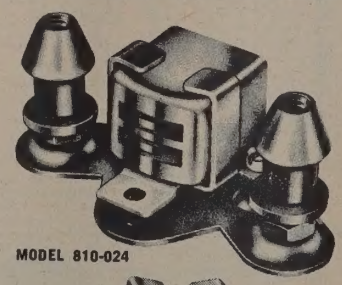
#173-17 Brake-Release Guide — for larger Viking metal cartridges.

UNIVERSAL MOUNTING BRACKETS

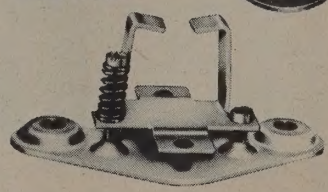


MODEL 810-027

SUB PLATE MODEL 123-28



MODEL 810-024



Designed for simplified mounting plus ease in adjustments.

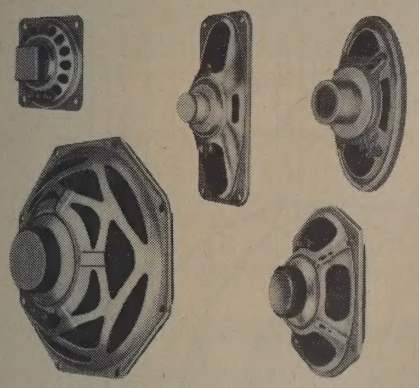
These universal head mounting brackets provide for convenient adjustment of head azimuth height and tilt. Heads are easily snapped in and out of brackets, which are accurately positioned by means of "Micrometer" adjustment screws. Brackets are made of cadmium-plated steel and are supplied with mounting screws and spring—and can be combined with other Nortronics accessories to make various mounting assemblies.

#810-024 Head Nest. Includes bracket, guide posts and mounting plate for "A" and "B" Heads.
#810-027 Bracket. For "A", "B",, and "E" style no-mount heads.
#810-028 Bracket. For "G" size heads.
#810-041 Bracket. For small-case no-mount erase heads.

NORTRONICS COMPANY, INC. 8101 Tenth Avenue North, Minneapolis, Minnesota 55427
Phone: (612) 545-0401

Amperex INDUSTRIAL AND HIGH FIDELITY Speakers

STANDARD SPEAKER SERIES



Amperex standard speakers offer a wide diversity in characteristics, size, and price for all kinds of radio and television sets, phonographs, tape recorders, sound columns, etc.

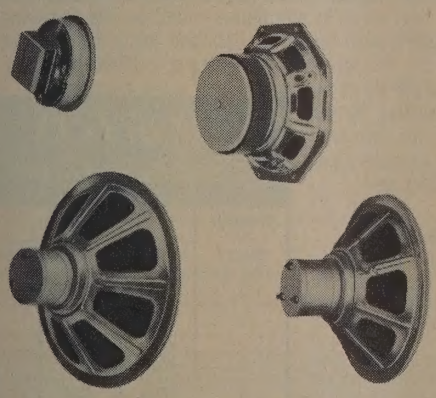
Most standard speakers have a flat magnet system of powerful Ferroxdure ceramic. For television sets and other applications where the leakage field should be kept as small as possible, there are Amperex loudspeakers with a Ticonal magnet in a pot system. Due to the use of Ticonal 750 these pot systems are very small.

NOTE: ALL STANDARD SPEAKERS AVAILABLE IN 4, 8, 15, AND 25 OHM IMPEDANCES.

*Ticonal Magnet in pot system
**Dual-Cone °Inverted Magnet

Size (inches)	Model No.	Magnet Weight (oz.)	Power Handling (watts)	Voice Coil Diameter (inches)	Total Depth (inches)	Resonant Frequency (Hertz)
ROUND GROUP						
2½	AD2070/Z	.70	1	9/16	4/5	360
3	AD3370/Y	.70	2	9/16	1 1/8	250
4	AD4470/Y	.70	2	9/16	1 1/6	200
4	AD4080/X	4.0	6	3/4	1 3/5	165
4	AD4080/Z	4.0	6	3/4	1 3/5	185
4	AD4090/X	1.0*	4	3/4	1 1/2	175
5	AD5080/Z	4.0	8	3/4	2	155
5	AD5080/X	4.0	12	3/4	2	140
5**	AD5080/M	4.0	8	3/4	2	130
6½	AD7080/X	4.0	12	3/4	2 1/2	110
6½**	AD7080/M	4.0	8	3/4	2 1/2	95
6½°	AD7091/M	1.5*	6	3/4	1 4/5	95
8	AD8080/X	4.0	12	3/4	2 3/4	95
8**	AD8080/M	4.0	12	3/4	2 3/4	75
OVAL GROUP						
3 x 5	AD3590/X	1.0*	4	9/16	1 3/5	200
3 x 8	AD3880/X	4.0	4	3/4	2	120
3 x 8	AD3890/X	1.0*	4	3/4	2 1/8	120
4 x 6	AD4680/Z	4.0	6	3/4	1 4/5	155
4 x 6	AD4680/X	4.0	12	3/4	1 4/5	140
4 x 6**	AD4680/M	4.0	8	3/4	1 4/5	125
4 x 6	AD4690/X	1.0*	12	3/4	2	140
4 x 6**	AD4690/M	1.0*	8	3/4	2	135
5 x 7	AD5780/X	4.0	6	3/4	2 1/4	115
5 x 7**	AD5780/M	4.0	8	3/4	2 1/4	100
5 x 7	AD5790/X	1.5*	12	3/4	2 1/2	115
6 x 9	AD6980/X	4.0	12	3/4	2 3/4	85
6 x 9	AD6980/M	4.0	12	3/4	2 3/4	72

HIGH QUALITY SPEAKER SERIES



The high-quality speakers have been specially designed for use in Hi-Fi equipment, where a high power-handling capacity, a very wide frequency-range and a negligible distortion level are required. Examples of application: acoustic boxes, brass-reflex boxes, juke boxes, Hi-Fi enclosures with or without cross-over network and stereo columns.

*Ticonal Magnet

Size (inches)	Model No.	Magnet Weight (oz.)	Power Handling (watts)	Voice Coil Diameter (inches)	Total Depth (inches)	Resonant Frequency (Hertz)
TWEETERS						
1" Dome (mylar)	AD0160/T	10.0	20*	1	1	1000
2¼"	AD2070/T	.70	10	9/16	1 1/8	800
*Cross-over frequency 1500 Hz. Power handling capacity is 40 watts if cross-over frequency is 4000Hz.						
WOOFERS						
(All woofers have rigid paper cone with highly flexible butyl-rubber suspension.)						
5	AD5060/W	10.0	10	1	2 1/4	50
6½	AD7065/W	14.4	20	1	2 3/5	28
8	AD8065/W	14.4	20	1	3 2/5	28
10	AD1055/W	32*	40	1 1/2	6	24
12	AD1256/W	20*	40	2	6 3/4	15
FULL RANGE						
5	AD5060/M	10	8	1	2 1/4	85
6½	AD7060/W	10	10	1	2 3/5	55
8	AD8050/M	14*	15	1 1/2	5	60
8½	AD9710/M	10*	15	1 1/2	4 3/4	50
10	AD1050/M	14*	15	1 1/2	5 1/2	50
12	AD1260/M	10	15	1	4 3/4	50
12	AD1250/M	14*	30	1 1/2	5 1/4	50
12	AD1255/M	20*	30	1 1/2	6 3/4	50
12	AD1255/HP	20*	50	2	6 3/4	60

AMPEREX ELECTRONIC CORPORATION
Component Division: 35 Hoffman Ave., Hauppauge, N.Y.
Telephone: 516-234-7000 TWX 510-227-8552

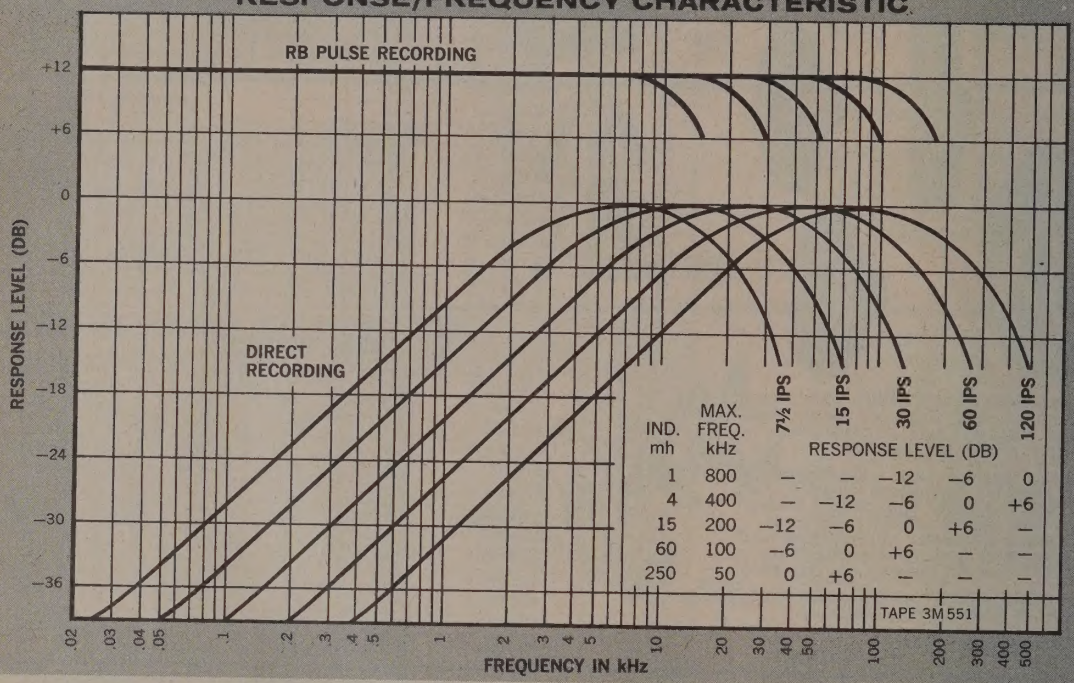
Amperex®
TOMORROW'S THINKING IN TODAY'S PRODUCTS
A NORTH AMERICAN PHILIPS COMPANY

NORTON® MAGNETIC HEADS

MULTITRACK

SERIES 2000/7500 — ERASE RECORD PLAY

RESPONSE/FREQUENCY CHARACTERISTIC



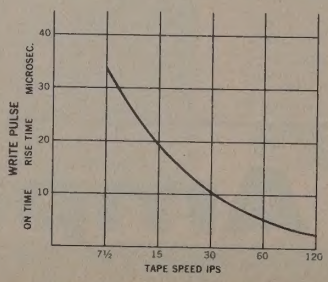
The Response/Frequency characteristics above, illustrate the exceptional performance of the Series 2000 thru 7500 Norton Magnetic Heads in direct and digital recording. The upper curves relate to the readback pulse amplitude for RB (return to bias) writing with the digital models and the lower curves relate to the unequalized playback amplitude of the analog models for constant current direct recording, both as a function of frequency (or rep rate). The five standard impedances available, together with the five tape speeds illustrated, total 25 different curves in each group, too many to clearly represent on a single chart. Pairs of inductance and tape speed are selected, which result in a set of curves peaking at the same level and having upper frequency limits proportional to tape speed. Therefore, the 1 mh inductance record/play response is at 120 ips; the 4 mh at 60 ips, and so on to the 250 mh response at 7½ ips. The other inductances are related to each as set forth in the included table. Each curve is at the same mv level as the others and so enables a quick comparison of level, frequency response, and required tape speed to achieve a desired performance goal. To read the curves, first refer to any Series found on the following pages, and note the Typical Operation data and the 0 DB playback reference level in mv rms for direct recording or +12 DB reference level in mv p-p for RB pulse recording. Then referring to the curves, calculate the response obtainable at the inductance and tape speed contemplated.

DIGITAL RECORDING

Selecting the 5500 Series from the following pages for analysis, the 60 mh track for RB pulse recording has a +12 DB reference level of 10 mv p-p at 15 ips. The readback pulse at 15 ips is 10 mv p-p and constant up to a 15 kHz rep rate, equivalent to a 1000 ppi recording density, with a 20 μsec, 3 ma p-p write pulse (rise time 20 μsec). At a faster rep rate of 30 kHz (2000 ppi) at 15 ips and a 10 μsec, 3 ma p-p pulse (rise time 10 μsec) the readback pulse is 5 mv p-p (10 mv less 6 DB) with all pulses present, and 10 mv p-p for an isolated pulse.

Writing and reading at 7½ ips the readback pulse amplitude of the 60 mh track is 5 mv p-p (10 mv less 6 DB) and flat to 7.5 kHz, with a 30 μsec 3 ma p-p pulse (rise time 30 μsec).

Full output is obtained up to a recording density of 1000 ppi with equal pulse on time and rise time at the values shown in the graph below. Operation up to 2000 ppi at reduced read amplitude requires halving these times. Increasing the times will reduce the recording density and readback level, and is not recommended. A better solution is to choose a lower inductance to preserve the recording density capability.



DIRECT RECORDING

Selecting the 2000 Series from the following pages for analysis, the 15 mh track for direct (bias) recording has a stated playback 0 DB reference level of 1.8 mv rms which at 30 ips is at 30 kHz. At 1 kHz the playback level drops to 0.15 mv rms (21 db below 1.8 mv). Operated at 7½ ips its 1 kHz and 30 kHz levels are both 0.15 mv rms (1.8 mv less 12 db less 9 DB). Increasing the inductance to 250 mh would increase the 1 and 30 kHz play level to 0.6 mv rms (1.8 mv less 9 DB) at 7½ ips. It can be seen that the short wavelength response to over 4000 cpi together with a maximum contour effect deviation of ±2 DB from the 6 DB/octave slope permits a useful bandwidth of over 10 octaves at any tape speed, and with the range of inductances available, permits the highest play level consistent with the frequency range of the system.

NORTON® SERIES SELECTOR

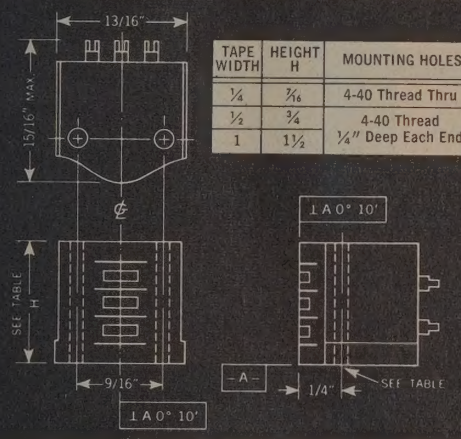
NUMBER OF TRACKS	TAPE WIDTH		
	¼ INCH	½ INCH	1 INCH
2	2000		
3	3500		
4	4500 5000	2000	
5	5500	3500	
6	6500		
7	7500	4500	
8		5000	2000
9		5200	
10		5500	3500
12		6500	
14		7500	4500
16			5000
18			5200
20			5500
24			6500
28			7500

NORTON®
MAGNETIC HEADS
MULTITRACK
ERASE RECORD PLAY

STANDARD FEATURES SERIES 2000/7500

Standard features include extremely low crosstalk ratings and +75°C temperature operation without derating, plus a mechanical accuracy permitting hard mount or adjustable mount installation. Rugged solid metal construction, shock and vibration resistant, provides a hard, stable, low friction, long wear surface for the tape. The cores, shields and all metallic members are mechanically and electrically bonded together for effective electrostatic shielding and grounding of static charges. Precision finishing of the recording face to micro-inch tolerance insures intimate contact of the tape with every channel for uniformly excellent response independent of track location.

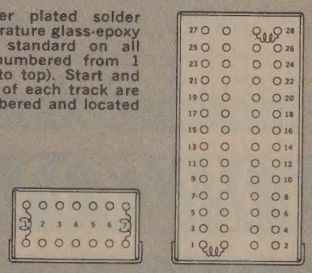
OUTLINE & MOUNTING DIMENSIONS



TAPE WIDTH	HEIGHT H	MOUNTING HOLES
¼	7/16	4-40 Thread Thru
½	¾	4-40 Thread ¼" Deep Each End
1	1½	

TERMINAL BOARD CONNECTION DIAGRAM

TERMINATION: Silver plated solder lugs on a high temperature glass-epoxy terminal board are standard on all series. Tracks are numbered from 1 through 28 (bottom to top). Start and finish terminal pairs of each track are correspondingly numbered and located as illustrated.



2 TO 7 TRACKS — 8 TO 28 TRACKS

SELECTIVE ERASE HEADS

Multitrack selective erase heads to match the formats of the NORTON Series 2000/7500 units are available. All heads offer erase track widths at least 10 mils wider than the record tracks to insure full erasure. Outline and mounting dimensions are the same, and a standard 1 mh inductance is stock with other impedances available on request.

Erase heads for the Series 2000 and 3500 heads are a single unit with the same number of tracks and track spacing as the record head. Erase heads for the Series 4500 thru 7500 units consists of a pair of heads, each with double track spacing. Odd number tracks are on one unit, and even number tracks on the other.

Catalog numbers for the erase heads have the same Series number as the record head except for the suffix which changes to 1E as in the following example: Catalog #3510-1E is a 1mh erase head for use with the 10 track 1" tape head in the Series 3500.

ORDERING INFORMATION

To specify the complete catalog number for ordering purposes designate the Series number of the head you require, the inductance in mh and the function ie. Record (AR) only, Record/Play (ARP), or Play (AP) only for audio and analog applications: or Record (DR) only, Record/Play (DRP), or Play (DP) only for digital applications, as in the following example: Catalog #4507—15 DP which is the Series 4500, 7 tracks, 15mh Digital Play Head for ½" tape.

NORTON ASSOCIATES, INC.

10 Di Tomas Court, Copiague, New York • (516) 598-1600

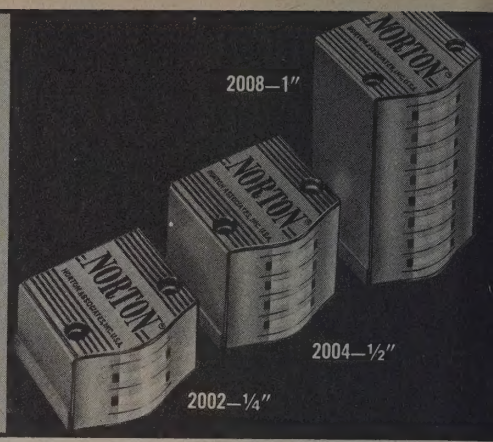
SERIES 2000

CROSSTALK—60 DB

TRACK WIDTH—2002—.080, 2004, 2008—.070 TRACK SPACING—2002—.160 ctoc, 2004, 2008—.130 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	60	10	1.5	1.8	40	18
4	40	5	.8		20	
15	20	2.5	.4		10	
60	10	1.3	.2		5	
250	5	.7	.1		2.5	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
2	¼"	2002	1, 4, 15, 60 or 250	A or D	R, R/P or P
4	½"	2004			
8	1"	2008			



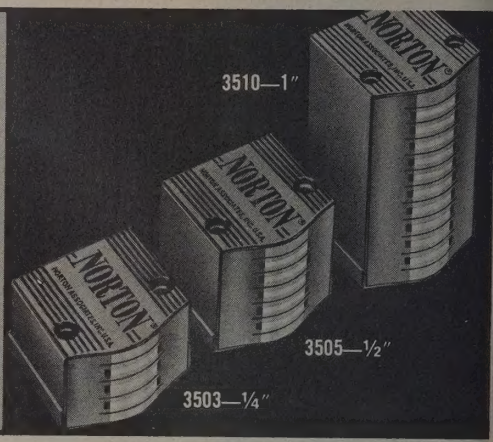
SERIES 3500

CROSSTALK—60 DB

TRACK WIDTH—.040 TRACK SPACING—.100 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	50	8	1	1.2	32	12
4	40	4	.5		16	
15	20	2	.25		8	
60	10	1	.12		4	
250	5	.5	.06		2	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
3	¼"	3503	1, 4, 15, 60 or 250	A or D	R, R/P or P
5	½"	3505			
10	1"	3510			



NORTON® MAGNETIC HEADS

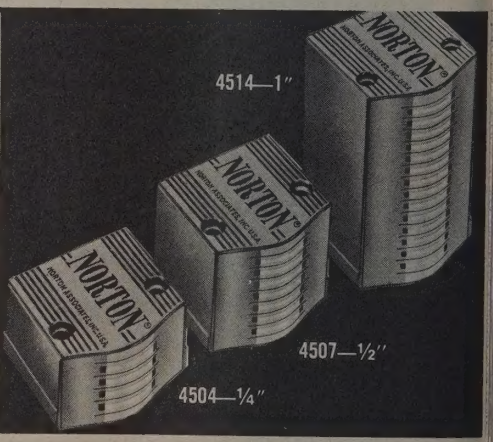
SERIES 4500

CROSSTALK—50 DB

TRACK WIDTH—.032 TRACK SPACING—.070 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	40	6	.8	1.0	24	10
4	20	3	.4		12	
15	10	1.5	.2		6	
60	5	.8	.1		3	
250	5	.4	.05		1.5	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
4	¼"	4504	1, 4, 15, 60 or 250	A or D	R, R/P or P
7	½"	4507			
14	1"	4514			



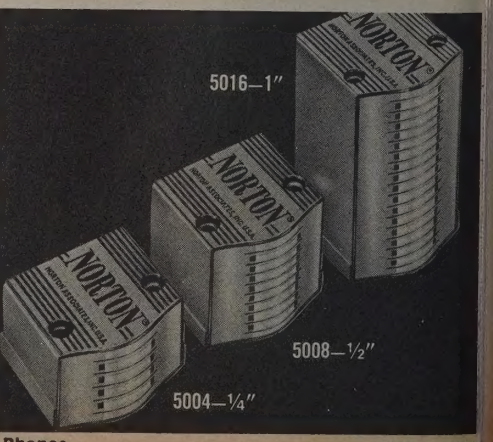
SERIES 5000

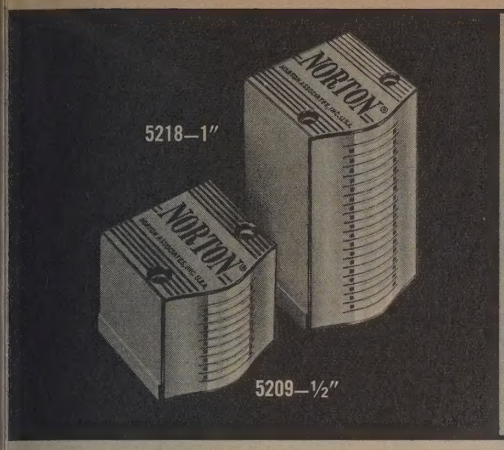
CROSSTALK—50 DB

TRACK WIDTH—.024 TRACK SPACING—5004—.0635 ctoc, 5008, 5016—.064 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	40	6	.8	1.0	24	10
4	20	3	.4		12	
15	10	1.5	.2		6	
60	5	.8	.1		3	
250	5	.4	.05		1.5	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
4	¼"	5004	1, 4, 15, 60 or 250	A or D	R, R/P or P
8	½"	5008			
16	1"	5016			





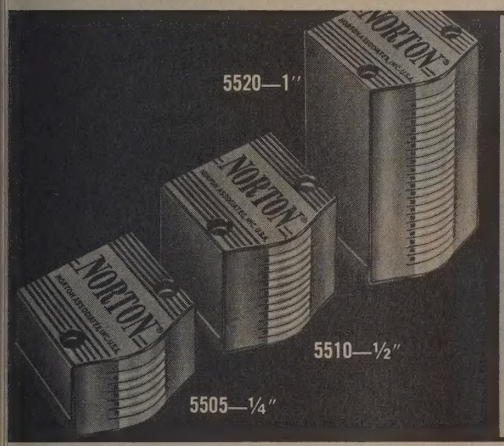
SERIES 5200

CROSSTALK—40 DB

TRACK WIDTH—.024 TRACK SPACING—.055 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	40	6	.8	1.0	24	10
4	20	3	.4		12	
15	10	1.5	.2		6	
60	5	.8	.1		3	
250	5	.4	.05		1.5	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
9	½"	5209	1, 4, 15, 60 or 250	A or D	R, R/P or P
18	1"	5218			



SERIES 5500

CROSSTALK—40 DB

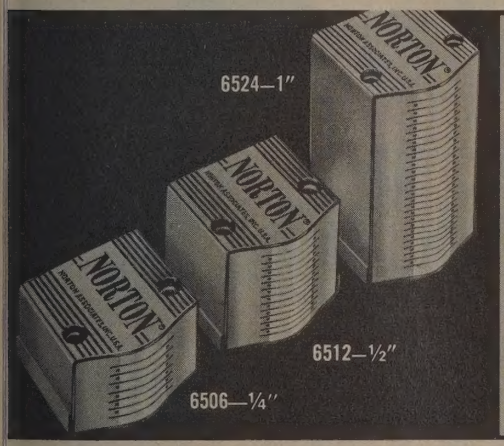
TRACK WIDTH—.024 TRACK SPACING—.050 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	40	6	.8	1.0	24	10
4	20	3	.4		12	
15	10	1.5	.2		6	
60	5	.8	.1		3	
250	5	.4	.05		1.5	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
5	¼"	5505	1, 4, 15, 60 or 250	A or D	R, R/P or P
10	½"	5510			
20	1"	5520			

MULTITRACK
ERASE RECORD PLAY

NORTON **ASSOCIATES, INC.**
10 Di Tomas Court, Copiague, New York 11726 • (516) 598-1600



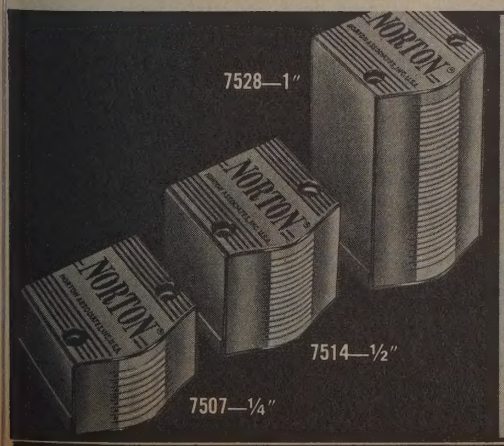
SERIES 6500

CROSSTALK—40 DB

TRACK WIDTH—.018 TRACK SPACING—6506—.045 ctoc
6512, 6524—.042 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	40	5	.6	0.9	20	9
4	30	2.5	.3		10	
15	10	1.3	.15		5	
60	5	.7	.08		2.5	
250	5	.4	.04		1.3	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
6	¼"	6506	1, 4, 15, 60 or 250	A or D	R, R/P or P
12	½"	6512			
24	1"	6524			



SERIES 7500

CROSSTALK—40 DB

TRACK WIDTH—.012 TRACK SPACING—7507 —.038 ctoc
7514, 7528 —.036 ctoc

INDUCTANCE mh	MAXIMUM RATING AT 75°C ma rms	TYPICAL OPERATION				
		BIAS RECORDING			RB PULSE RECORDING	
		Bias Current ma rms	Record Current ma rms	Playback 0 DB mv rms	Write Pulse ma p-p	Read Pulse +12DB mv p-p
1	30	4	.6	0.7	16	7
4	15	2	.3		8	
15	10	1	.15		4	
60	5	.5	.08		2	
250	5	.3	.04		1	

NUMBER OF TRACKS	TAPE WIDTH	CATALOG NUMBER			
		SERIES	INDUCTANCE	ANALOG OR DIGITAL	FUNCTION
7	¼"	7507	1, 4, 15, 60 or 250	A or D	R, R/P or P
14	½"	7514			
28	1"	7528			

TELEPHONE EQUIPMENT

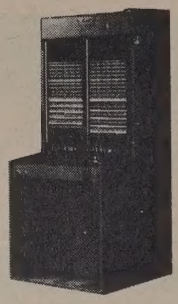
FOR MILITARY and COMMERCIAL APPLICATIONS

SWITCHBOARDS • CENTRAL OFFICE EQUIPMENT • HANDSETS • COMPONENTS • EARPHONE & MICROPHONE ELEMENTS • ACCESSORIES

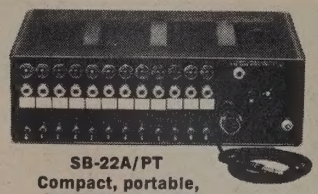
TELEPHONE SWITCHBOARDS, CENTRAL OFFICE EQUIPMENT AND HANDSETS

We are prime producers of manual and dial military switchboards, central office equipment and versatile handsets for many applications. Telephone facilities from 12 to 1,000 lines can be provided, for up to 160 manual or dial trunks, with our various equipments. Adaptations of standard equipment can be made to specifications.

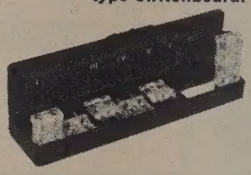
SB-86/P
Portable, local battery, field type manual switchboard.



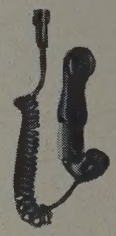
Complete, transportable manual telephone central office.



SB-22A/PT
Compact, portable, local battery field type switchboard.



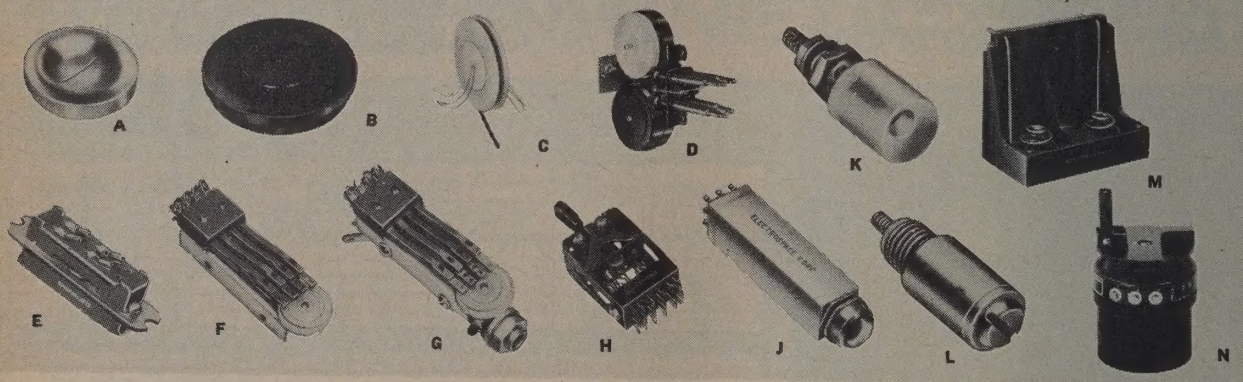
SB-993
Manual telephone switchboard for stacking conference calls.



H-33F/PT
Waterproof handset supplied with U-161/U connector.

TYPICAL TELEPHONE COMPONENTS

Widest Choice Available of Components, Elements and Accessories To Meet All Requirements.



(A) B3001P-1 MICROPHONE ELEMENT. Carbon capsule. Impedance: 40 ohms nominal. Frequency Response: 300-4000 Hz. Temperature Range: −40°F. to +150°F. Adaptable to standard WECO handsets. Made to MIL-M-11095A.

(B) C3001P-10 EARPHONE ELEMENT. Magnetic type. Impedance: 300 ohms nominal. Frequency Response: 300-4000 Hz. Temperature Range: −40°F. to +150°F. Reliable mechanical and acoustical stability. Adaptable to standard WECO handsets. Made to MIL-H-11134D.

(C) D3014-362 REEL & CABLE ASSEMBLY, RETRACTABLE. Accepts various cord types and sizes. Extends cord up to 4 ft. Provides neat, convenient cord storage. Readily applicable for use in telecommunication systems, test equipment, and others.

(D) D3014-318 TELEPHONE SWITCHBOARD MODULE. Shows typical application of Reel & Cable Assembly (—362) for field or stationary switchboards.

(E) B3001-18 BAR SWITCH. Double pole. 1 amp. 30V D.C. contact rating. Instantaneous actuation with nominal pressure at any point on bar. Operating life tested in excess of 500,000 cycles.

(F) C3014-105 THUMBWHEEL SWITCH. Flat, horizontal construction saves valuable panel space. One-finger operation. Permits multi-position, multi-circuit control. Heavy duty contacts mounted on leaf springs.

(G) D3014-76 THUMBWHEEL SWITCH & JACK ASSEMBLY. Shows typical application of switch (—105) with switchboard plug-in jack.

(H) D3014-320 LEVER SWITCH. Exceptionally rugged construction provides greatest operation dependability. Positive detent action. Return spring design reduces contact bounce and chatter. Three-position, multi-circuit contacts available.

(J) C3014-77 SIGNAL INDICATING RELAY. Requires only ¾" dia. panel space. Gives positive indication of relay operation. Combines signal-relay operation in one package. Operable from either of two individual coils.

(K) D3014-38 HOLE-IN-HEAD BINDING POST. Saves space. Provides easy, convenient, positive connection. Wire inserted at front of post instead of side. "PUSH-INSERT-RELEASE" — wire positively locked in place.

(L) B3014-39 CIRCUIT PROTECTOR. Reusable protective device for communication systems. Shorts the circuit to be protected against high voltage surges. Factory adjustable to break-down voltage required.

(M) B3014-54 BATTERY BLOCK. Provides convenient storage and method for connecting two "D" size cells into circuit.

(N) G-42A/PT HAND RINGING GENERATOR. Used for ringing field telephones. Centrifugally operated switch operates at a crank speed of about 140 rpm. The generator delivers 100 volts at 20 cycles at a crank speed of 200 rpm.

DETAILED SPECS AND MODIFICATIONS AVAILABLE. WRITE OR CALL FOR LITERATURE.

ELECTRONICS FOR LAND, SEA AND SPACE

electrospace corporation

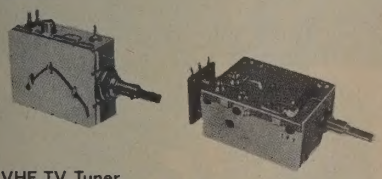
956 BRUSH HOLLOW ROAD, WESTBURY, L. I., N. Y. 11590 • 516 - 997-7000

TELECOMMUNICATIONS EQUIPMENT • MEGPOTS • TOGGLE SWITCHES • RADIAC DOSIMETRY • NIGHT VISION & ILLUMINATION • ELECTRICAL SWITCHGEAR & CONTROLS • TELEPHONE ANSWERING SYSTEMS

MITSUMI COMPONENTS

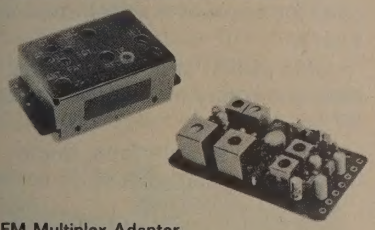
We have a wide range of standard products for electronic components effectivity, and most of them meet or exceed your specs. They are available off the shelf. Shown here is only a representative sampling of our products. When you need, reliable and dependable components, Ask For Mitsumi. We will provide anything you wants.

UHF TV Tuner
All-transistor construction provides extremely low power consumption and spurious radiation well below both European FTZ and United States FCC standards, something which is extremely difficult, if not impossible, to attain with vacuum tube systems. Frequency drift is held to a minimum through the use of temperature compensation and an adjustment-free variable capacitor. Wide range of types available, from standard models to high performance color TV models.



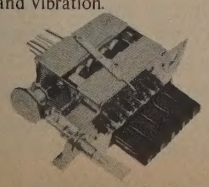
VHF TV Tuner
Revolutionary new VHF tuner with switch plus built-in IF amplifier and AGC (automatic gain control). These tuners feature easy adjustment extremely small local oscillator drift, superb S/N ratio, and unmatched electrical and mechanical reliability. Wide range of types from standard models to high performance color TV models to choose from.

FM Tuner
Mitsumi FM tuners employ all silicon transistors and feature compact size, lightweight, and excellent temperature and humidity characteristics. Amplification and S/N ratio are, of course, excellent. Moreover, use of a special RF circuit and high Q IFT provide unparalleled selectivity. Metal case and specially designed circuit reduces spurious radiation to an absolute minimum.

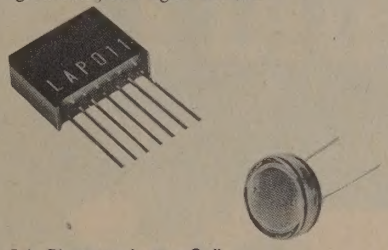


FM Multiplex Adapter
Noise, as well as erroneous operation due to noise, have been completely eliminated by the use of a special bias circuit.
Separation greater than 25dB between 300Hz ~ 4kHz and greater than 20dB at 10kHz. Temperature characteristics and S/N ratio are also excellent.

Car Tuner
Easy to operate pushbutton system. Silicon transistors and printed wiring, as well as Mitsumi developed high Q IFT and other high reliability components provide superb electrical, temperature, and mechanical characteristics. Simple, semipermanent mechanism. No drift even when subjected to shock and vibration.

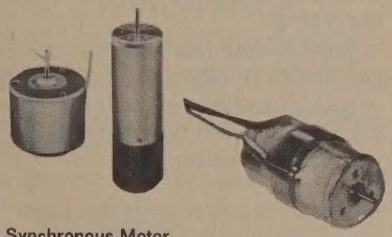


Hybrid IC
Consisting of a high reliability transistor switch and stable elements sintered onto an alumina substrate, these hybrid IC are perfect for use in linear circuits, DC constant voltage circuits, and digital circuits.



Cds Photoconductive Cell
Sintered film type Cds features small variations in light sensitivity and extremely small light resistance.
Spectral wavelength corresponding to application. Television camera, automation equipment types are available.
Moreover, photoconductive cell-lamp composite element, light source-light receiver composite types are also available.

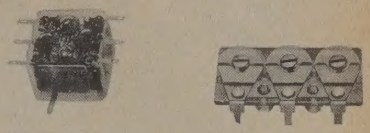
Micromotor
Original magnetic circuit, bearings, rectifier, and mechanism not only eliminate starting troubles but also assure stable operation, long life, and superb temperature and humidity resistance.
Ideal for cassette recorders, car stereo, and other acoustical products as well as 8mm cameras, all types of servos, automation equipment, and other applications.



Synchronous Motor
Extremely small induction type multi-pole synchronous motor incorporating magnets in the rotor.
Mitsumi synchronous motors boast extremely fast response and powerful rotating torque dispite their small size. Rated voltage 100V, speed 1, 15, 1000 rpm.

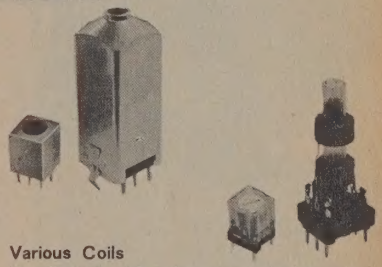
PRODUCTION ITEMS
Thick Film ICs, UHF & VHF TV Tuners, Front-end FM Tuners, Push-button Tuners, IF Transformers, Various Coils, Polyethylene Variable Capacitors, Magnetic Heads, Micromotors, Synchronous Motors, CdS Photoconductive Cells, Trimmer Capacitors, Semi-fixed Resistors, Switches, Terminals, Fuse Holders, Small Mechanical Components.

Polyvaricon
Polyvaricon is an extremely small variable capacitor developed through our unrelenting research and consists of a variable capacitor with a highly inductive polyethylene film inserted between the stator and rotor.
The polyvaricon features high resistance to howling and superb Q. AM use, FM use, AM. FM use, and a wide variety of other types are available.



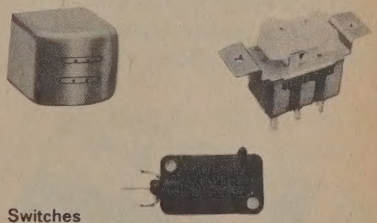
Trimmer Capacitor
BC, SW, FM radio receiver, high quality radio, communications equipment, and measuring instrument types are available. The use of a polycarbonate and steatite base provides unexcelled Q. Linear capacitance change facilitates use. Superb heat resistance and no changes due to aging.

IF Transformer
Low-cost, high reliability coils produced by automatic production techniques employing a fully automatic winder developed through Mitsumi's unmatched technology. AM use, FM use, TV use, and other general use IFT are available.



Various Coils
Excellent Q, wide inductance variation range, and excellent temperature characteristics. Radio antenna, OSC, IF detector pack, television, and a variety of other types, all boasting compact size and light weight, are available.

Magnetic Head
Twenty standard 8-track and 4-track types are available for stereo, cassette, monaural, and other applications. Uniform, stable quality is assured through the use of new materials and Mitsumi's unique precision machining techniques.

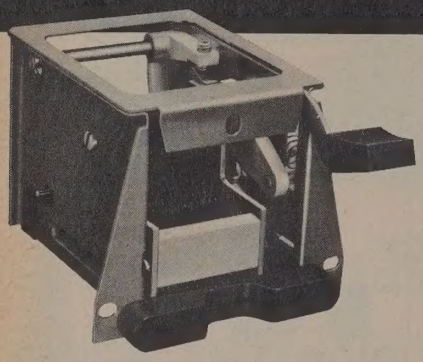


Switches
Permanent, low contact resistance, super insulation resistance switches produced under rational quality control conditions.
See-saw switches, toggle switches, slide switches, wire switches, snap switches, snaction switches, and a host of other types are available.

MITSUMI

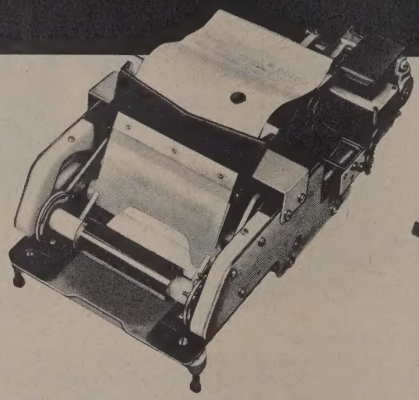
MITSUMI ELECTRIC CO., LTD.
Main office 1056 Koadachi, Komae-machi, Kitatama-gun, Tokyo, Japan. Tel: 489-5333
Europe office Marienstrasse 12, Düsseldorf, W.Germany. Tel: 352701
MITSUMI ELECTRONICS CORPORATION
11 Broadway, New York 4, N.Y. 10004, U.S.A.
Tel: (212) 425-3085
MITSUMI COMPANY, LTD.
302, Cheong Hing Building, 72, Nathan Road, Kowloon, Hong Kong
Tel: 666925

AMP gives you the and Data Entry



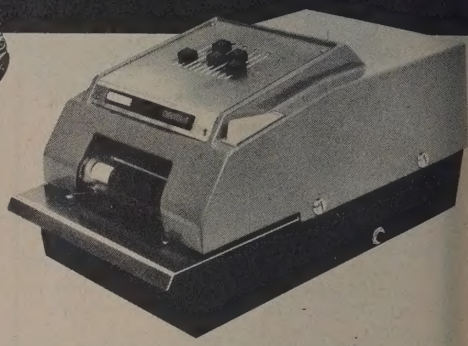
CARD READER (GI/161/261)

- low cost matrix badge card reader
- small size makes it especially adaptable to applications with limited space
- reads 10 columns of a 15-column card, 15 columns of a 20-column card or 17 columns of a 22-column card
- available cross matrix for numeric data, matrix alpha-numeric, or telephone dial code



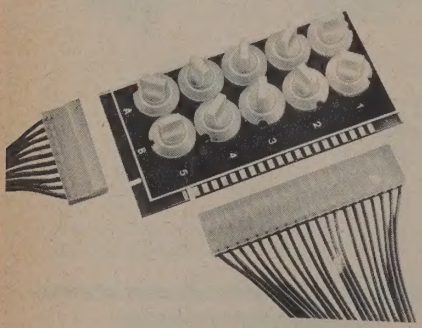
READER/IMPRINTER

- reads punched holes and imprints embossed data from credit cards
- imprints on command after data is read or completes cycle without imprinting
- imprint area has maximum position flexibility
- accommodates many form sizes such as manifold tab card sets as well as large sales slips



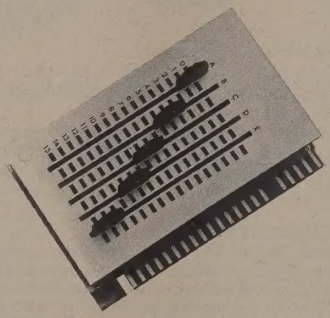
CREDIT VALIDATION TERMINAL

- used to selectively imprint a document based on computer decision
- uses punched and embossed card for account number input and imprint
- slide switch used for variable data and rotary matrix switch used for fixed data
- available for interface, touch-tone, teletype, or USASCI II codes



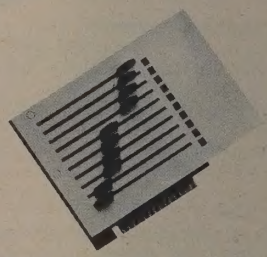
MATRIX ROTARY SWITCH

- direct visual display
- positive detent action
- wide selection of sizes
- economy achieved by integral interwiring



MATRIX SLIDE SWITCH (Without visual display.)

- standard sizes—5-slide by 10-positions, also 5 x 16, 10 x 10 and 10 x 16
- positive detent positioning
- completely solderless wiring interface
- available decimal and hexadecimal codes



MATRIX SLIDE SWITCH (With visual display.)

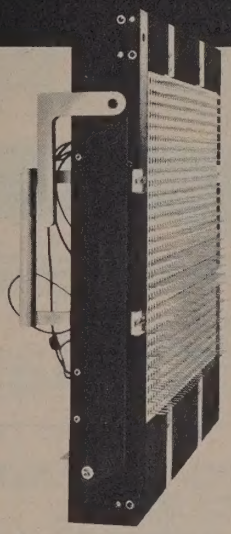
- standard sizes—5-slide by 10-positions, also 5 x 16, 10 x 10 and 10 x 16. Special sizes available on request
- positive detent positioning
- small, compact—takes up minimal space
- ⅛″ high characters

most in Programming Devices

. . . Everything you need for computer input, process control, machine control, test programming, production control, status indication and access control.

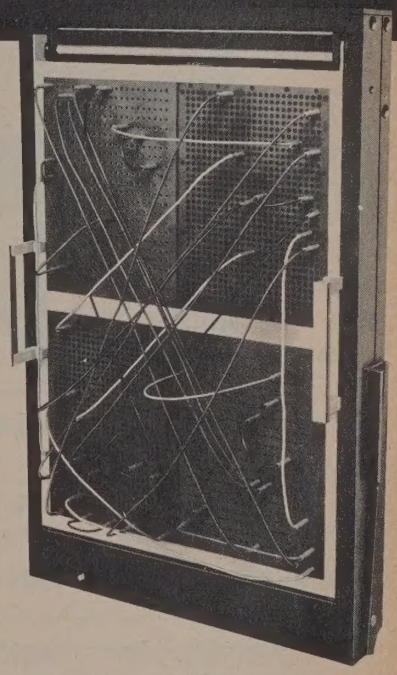
DATA ACCUMULATION TERMINAL

- used to transmit information contained in cards—variable data such as quantity and fixed data
- communicates to incremental magnetic tape, paper tape or communications controller
- available with modems for bit-serial teletype compatible or character serial touch tone
- simplified DC level systems and multiplexers optional



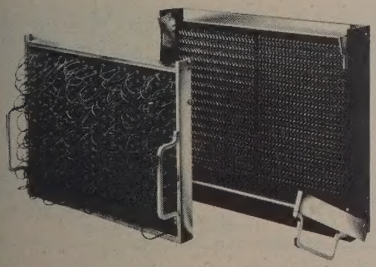
LOW CAPACITANCE SHIELDED PATCHCORD PROGRAMMING SYSTEMS

- three standard sizes—960, 1920 and 3840
- spacing .375″ centers
- designed for applications with signals in the KC and low MC frequency range



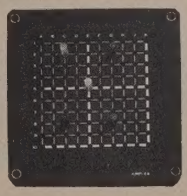
COAXIAL PATCHCORD PROGRAMMING SYSTEMS

- .375 x .270 spacing
- three standard sizes—506, 1012 and 2024
- low crosstalk—60db to 100 MHz
- individual coaxial contacts



STANDARD PATCHCORD PROGRAMMING SYSTEMS

- choice of sizes—240, 480, 816, 1224, 1632, 1768, 3264 and 4896 holes
- versatile rear bay wiring
- post patch capability
- double wiping action for reliability
- variety of patchcords and accessories



PINBOARDS

- available in many standard sizes. Special designs on request
- low cost color coded shorting pins
- machine applied terminations
- silk screened or engraved to customer requirements
- diode pins available

For further information write
Industrial Division, AMP Incorporated, Harrisburg, Pa. 17105.

AMP
INCORPORATED

ANALOG DIGITAL DATA SYSTEMS, INC.

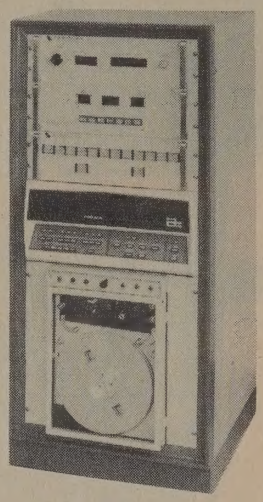
830 LINDEN AVENUE • ROCHESTER, N. Y. 14625 • PHONE 716 - 381-2370

DATA ACQUISITION SYSTEMS

DATALOGGING SYSTEMS FROM STOCK UNITS. ASSEMBLED TO CUSTOM REQUIREMENTS

The Dataloggers accept multiple analog signals, from physical transducers, such as thermocouples, strain gauges, and similar devices. These are scanned by a multiplexer and programmer, individually conditioned to the appropriate voltage level; digitized, converted to computer compatible format and recorded.

SIGNAL
↓
SCANNER
↓
A/D CONVERTER
↓
AMPLIFIER (OPTIONAL)
↓
SERIALIZER
↓
RECORDER
↓
TAPE



SERIES M

This datalogger is available with either 10, 100 or 1000 channel multiplexer capability, digitizing and recording in computer compatible magnetic tape. The tape format can be either straight binary or binary coded decimal, 7 or 9 tracks and 200, 556 or 800 b.p.i. The system speed can be from manual push button to 1000 characters/second asychronous or up to 5000 characters/second in the slew mode.

SERIES P

This datalogger is available as the above, but the output is recorded in computer compatible paper tape, such as ASC11. The system speed is 20 characters/second as standard and up to 120 characters/second as options.

SERIES T

This datalogger is available as the above, but with teletype output. The teletype gives both punched paper tape output in the ASC11 code and also a line printer. The teletype includes a keyboard for manual input data and can be used for computer input. Speed is controlled by the teletype at 10 characters/second.

SERIES K

This datalogger is available as above, but with output onto magnetic tape cassettes. The format is compatible with teletype and the cassettes can be read out onto teletype machine or over a datalink to a shared time computer.

SERIES C

This datalogger is available as above, but controlled from a small computer, which can perform on line computation and read out onto all forms of output devices, such as magnetic tape, paper tape, and teletype. Memory is 4096 words and can be expanded as required.

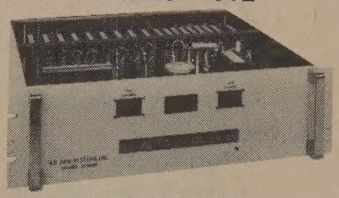
OPTIONS

Many options and additions are available from stock units to expand the capability of the systems. Other options are available from the more than 1000 different logic modules used in our special designs.

DATALOGGER COMPONENTS

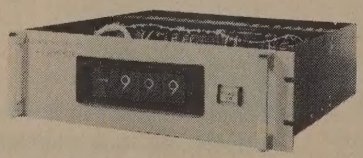
The full range of components used to build up the datalogger systems are available as individual products. Each designed for ease of interface with individual powers supplies, pin board programming and DTL or TTL compatible logic levels.

MULTIPLEXERS - SERIES - 012



Both reed relay scanners and FET multiplexers from 10 channels to 1000 channels are available as standard. Using a unique modular design, the multiplexers can be built up from a wide range of modules to give 1, 2, 3 or 4 wire switching. Features include low thermal switching, high common mode rejection, switched guard, flying capacitor filtering, and programming.

A/D CONVERTERS - SERIES - 013

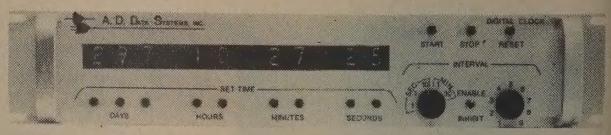


These converters have been designed as system components and are available as either binary or decimal units. Conversion speed is 10 Kc compatible with either reed relay or solid state multiplexing.

Standard units available include:

Model 013-012 — 3 decimal digits plus sign.
Model 013-121 — 4 Decimal digits plus sign.
Model 013-123 — 5 Decimal digits plus sign.
Model 013-112 — 11 Bit binary plus sign.
Model 013-111 — 12 Bit binary.

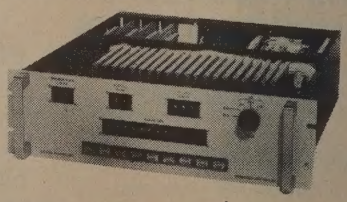
DIGITAL CLOCKS - SERIES - 015



This clock has been designed not only as a visual display of time, but also to be easily integrated into the data handling systems. All inputs and outputs are buffered TTL or DTL compatible logic levels.

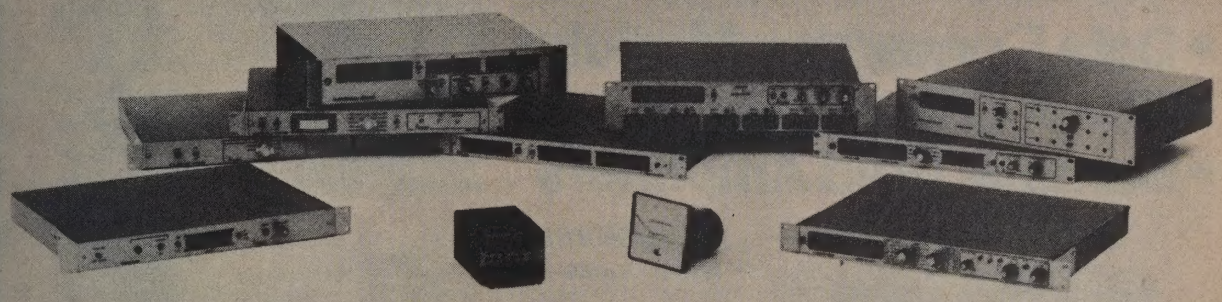
Model 015-016 — Days, Hours, Minutes and Seconds
Model 015-017 — Hours, Minutes and Seconds

UNIVERSAL CONTROLLER COUPLERS



These units have been designed to control the overall system and also to serialize parallel data into computer compatible format. The Coupler has plug-in modules to drive output devices such as punched card, paper tape, magnetic tape, teletype and computers. It is also pin board programmable for control functions and computer format, and front panel controls for word length, record length, recycle point and cycle time.

ANADEX DIGITAL/ANALOG BUILDING BLOCKS



The next time you have a digital/analog application, call Anadex. Anadex Instruments not only puts together the finest digital/analog instruments at prices that make sense, but also has the capability of putting them together in a system. For immediate reply to your digital/analog system application, call (213) 873-6620.

ANALOG

DC to Frequency Converters	
DF-100	DC to Frequency Converter
DF-110R	DC to Frequency Converter
DF-115R	DC to Frequency Converter
Frequency to Frequency Converter	
FF-100	Frequency to Frequency Converter
Frequency to DC Converters	
PI-100	Pulse Rate Integrator
PI-200	Frequency to DC Converter
PI-300	Pulse Rate Integrator
PI-408	Frequency to DC Converter
PI-408R	Frequency to DC Converter Rack Mounted
PI-600	Industrial Frequency to DC Converter

SPECIAL

DT-600R	Digital Temperature Indicator
FD-250	Frequency Detecting Switch
PD-600R	Preset Detector
CF-600N	Nuclear Instrument Module Packaging of Scalers, Timers, and Intercouplers. (NIM)
IC-600R	Intercoupler
DP-600R	Digital Printer

DIGITAL

Counters	
CF-600R	Counter-Timer
CF-601R	Variable Time Base Counter
CF-602R	Multichannel Variable Time Base Counter
CF-603R	Frequency Counter
CF-604R	Preset Scaler Timer
CF-611R	Frequency Divider/ Period & Delay Generator
CF-630R	Time Interval Counter
CF-635R	Universal Counter Timer
CB-600R	Bi-Directional Counter
Totalizer	
DC-600R	Totalizer

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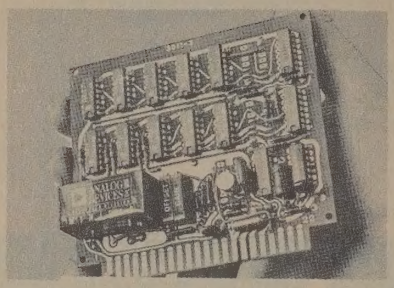
ANALOG DEVICES INC
PASTORIZA DIVISION

• Data Conversion Modules
• D/A, A/D Converters
• Sample/Hold Amplifiers

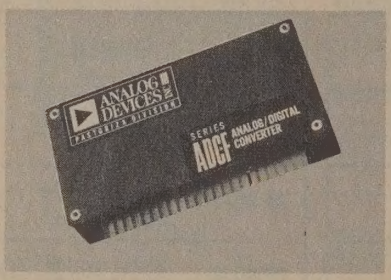
The Pastoriza Division of Analog Devices offers a wide variety of data conversion modules. These include analog-to-digital converters, digital-to-analog converters, sample-and-hold amplifiers, analog switches, etc. Comprehensive catalogs, evaluation samples and information on newly developed products are available upon request from Analog/Pastoriza or your local Analog Devices sales office.

A/D CONVERTERS



ADC-U SERIES The ADC-U Converter is a low cost model especially designed for OEM applications. This unit features open card design built around the MINIDAC. All components are accessible for repair or replacement. ADC-U is pin-compatible with the ADC-T series.

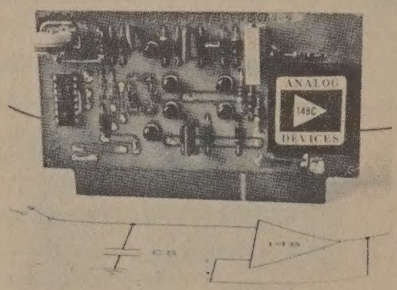
Resolution:	Up to 12 bits
Input Range:	0 to +10V, ±5V, ±10V
Speed of Conversion:	12 bits in 10μsec, 10 bits in 6μsec, 8 bits in 4μsec
Price:	$775. (12 bits)



ADC-F SERIES The ADC-F is a very fast successive-approximation converter requiring only one microsecond for the total conversion with 10 bits resolution. It is pin-compatible with the ADC-U and ADC-T Series for upgrading existing designs.

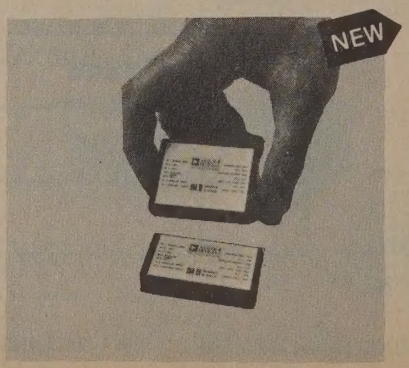
Input Range:	0 to +10V, ±5V, ±10V
Total Conversion Time:	100 nanoseconds per bit ±10%
Resolution:	Up to 10 bits
Output:	10 parallel bits TTL compatible
Price:	$1990. (10 bits)

SAMPLE/HOLD AMPLIFIERS



SHA I, SHA II Sample and Hold Units are used to strobe (sample) changing input voltages at an exact time and to hold the value at the output for an indefinite period. The SHA Models I and II are used as high-speed, resolution A/D Converter input signal conditioners. The SHA I is designed for the standard ADC-T and ADC-U Converters. The SHA II is especially designed for the ADC-F high speed Converter and features a 10-nanosecond-aperture strobe time.

	SHA I	SHA II
Input Range:	±5V, ±10V	±5V
Slew Rate:	50V/μsec	50V/μsec
Aperture Time	< 100nsec	10nsec
Leakage Rate:	1mV/msec	125mV/msec
Price:	$225	$350.



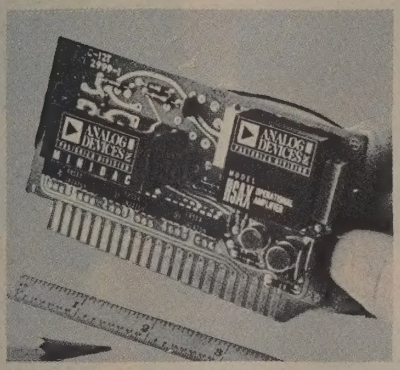
SHA III, SHA IV The models SHA III and SHA IV are modular, low priced sample and hold amplifier modules specifically designed for general purpose applications requiring extremely good hold characteristics over relatively long periods of time. Data distribution systems to drive meters, recorders, etc. from D/A converters are typical applications. SHA IV is optimized for low switching transients.

Gain:	+1, ±0.01%
Linearity:	±0.005%
Input Impedance	
Sample Mode:	100MΩ
Hold Mode:	20KΩ
Decay Rate:	10mV/sec
Price(SHA III, SHA IV):	$95/120

D/A CONVERTERS

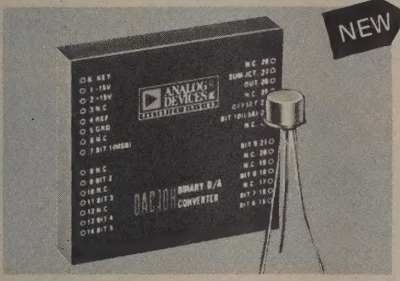
MINIDAC MDA-L is a unique miniature potted module for printed circuit card mounting. It contains a 12-bit switch system, resistor networks, and a reference supply which provides up to 12-bit digital-to-current conversion. The output current can be used directly into a resistor for up to 2 volts output or may be fed to the summing point of an operational amplifier

Settling Time:	200 nanoseconds to 0.05%
Resolution:	Up to 12 bits binary or BCD
Output Range:	0 to 2mA
Input Signals:	Compatible with DTL or TTL inputs
Price:	$195. (12 bits)



DAC-T SERIES The DAC-T Series is essentially a MINIDAC mounted on a printed circuit card, with a digital buffer register and protected output amplifier, to provide a complete digital-to-voltage converter. It provides a variety of output voltage ranges, including bipolar operation. The many options permit the customer to purchase a converter, essentially off-the-shelf, to meet his exact requirements at minimum cost.

Resolution:	Up to 12 bits binary or BCD
Settling Time:	Medium or high speed options: 20μsec to < 0.1% or 2μsec to < .01%
Output Voltage Range:	0 to +5V, 0 to +10V, ±5V or ±10V
Input Signals:	DTL or TTL compatible
Price:	$355. (12 bits)

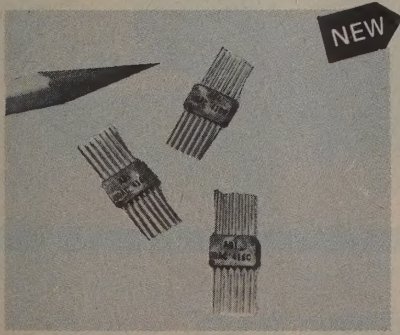


DAC 10-H This completely self contained 10 bit D/A converter costs just $55 in 100 quantities and includes DTL/TTL compatible input switches, resistor ladder network, precision reference and output amplifier with tracking gain resistors.

Resolution:	10 bits binary
Accuracy:	±½LSB (0.05%)
Settling Time:	20μs to .05%
Linearity:	±½LSB
Price:	$75.

DAC-15R The new DAC-15R is a fast 15 bit high resolution digital-to-analog converter for high accuracy applications. Completely self contained on a single printed circuit card, the DAC-15R includes input storage register, precision reference supply, solid state switching network and output amplifier.

Settling Time:	1μsec (Fast version)
Resolution:	15 bits binary
Linearity:	±0.0015% (±½LSB)
Overshoot:	< 1 LSB (Stable version)
Temp. Coeff:	±7ppm/°C
Price:	On request



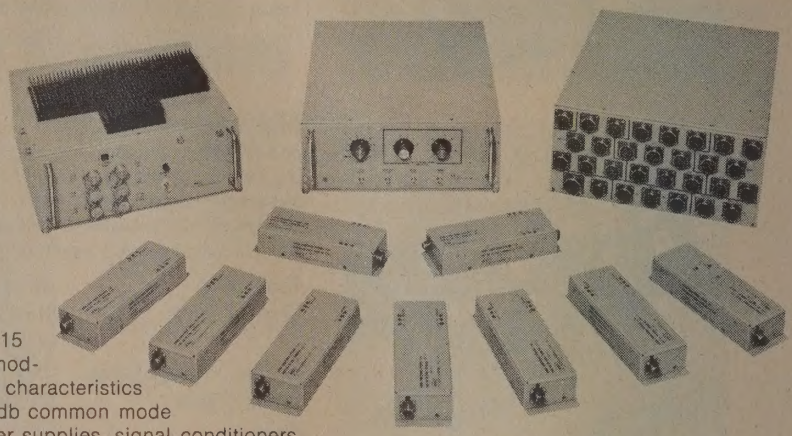
MICRODAC The MICRODAC Model AD550 monolithic quad current switch consists of four logic-operated switches and their associated circuitry, all on a single monolithic chip. When connected with precision resistors and reference circuitry, it can be used to form D/A and A/D Converters having 12-bit accuracy, with unipolar or bipolar binary resolutions of 4, 8, and 12 bits, or BCD resolutions of 1, 2, 3, or 4 digits.

Accuracy:	12 bit over −55°C to +125°C
Logic:	TTL, DTL, RTL Compatible
Package:	Hermetic flatpack or dual in-line
Settling Time:	1 μsec
Price:	On request

ANALOG DEVICES, INC. · 221 Fifth Street · Cambridge, Massachusetts 02142 · (617) 492-6000

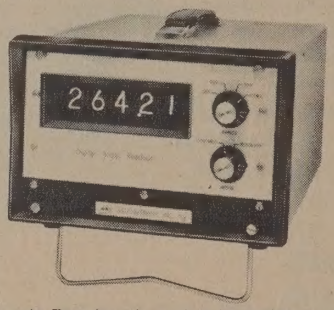
Analog to Digital Converters

Multiplexed Analog to Digital PCM System



Astrosystems solid state Multiplexed PCM System is a 50 channel data acquisition system which converts synchro and linear AC inputs to a serial PCM output for data recording and/or telemetering. The basic unit provides a resolution and accuracy of 15 binary bits (.003%). Signal conditioning modules are provided for all inputs, with typical characteristics of 13 megohms input impedance and 80 db common mode rejection. The basic system includes power supplies, signal conditioners, multiplexer, converter and PCM code conversion. Write for Data File No. 109.

Digital Angle Readout

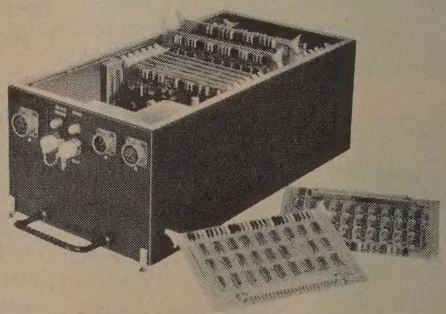


Astrosystems Digital Angle Readout is a simple, reliable and accurate device for converting synchro and resolver input angles to a direct in-line decimal display and electrical digital format. Guaranteed accuracy is 0.01° *peak* error from all causes. The standard model accepts either synchro or resolver inputs at 11.8, 26 or 90 volts line-to-line. Both the visual and electrical outputs continuously track the synchro input. Write for Data File No. 110.

Synchro to Digital Converters

Astrosystems high accuracy Synchro to Digital Converters convert angle inputs from synchros to an equivalent binary or BCD output. Resolutions from 12 to 18 binary bits are available. Accuracy is ±1 bit total peak error including digitizing errors. Converter operation is ratiometric using toroidal transformers which make the units insensitive to transformation ratio and phase shift variations as well as harmonic distortion and noise. Write for Data File No. 101.

Multiplexed Synchro to Digital Converter



Multiplexed Synchro to Digital Converters feature a high accuracy ultra-reliable method of converting multiple synchro and resolver inputs to parallel or serial digital outputs. The converters are completely solid state and have a basic accuracy of 16 binary bits (20 seconds of arc). The units are insensitive to wide variations in input voltage and frequency. Write for Data File No. 109.

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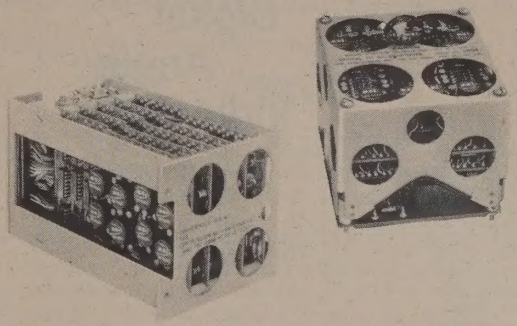
Advanced Instrumentation

astrosystems, inc.

6 Nevada Drive / Lake Success, New York 11040 / 516/328-1600 / TWX 510/223-0411
West Coast: 4341 Commonwealth Avenue, Fullerton, California 92633 714/523-0820

Digital to Analog Converters

Airborne Digital to Analog Converters



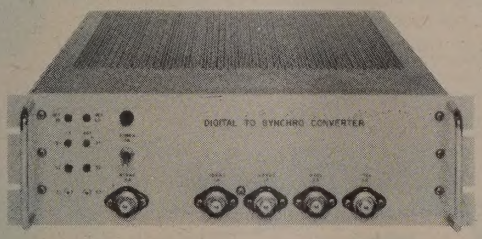
Airborne solid state Digital to Analog Converters feature high reliability, high density packaging and low power consumption. Units are available to provide synchro, resolver or AC output signals to a resolution and accuracy of 16 binary bits. A full range of standard card and circuit designs are available to enable quick delivery of special units. Converters meet the requirements of MIL-E-5400 for airborne equipment. Write for Data File No. 103.

Shaft Angle Encoder

This unique solid state Shaft Angle Encoder is a completely self contained system for transforming shaft rotations into a direct decimal visual display and a digital output capable of feeding computers, printers and various types of off-line equipment. A magnetic transducer is used for long life and high reliability. Angle measurement is absolute, not incremental, to high resolution and accuracy. Write for Data File No. 114.

Multichannel Digital to Analog Converter

Multichannel solid state Digital to Analog Converters provide AC and/or DC voltage output signals proportionate to a digital input. Units feature 15 bits resolution and accuracy. The DC as well as the AC outputs are floating and completely isolated from each other as well as from the digital inputs. Standard interfaces are available to match most computer and peripheral equipment interfaces.
Write for Data File No. 102.



Digital to Synchro Converters

Digital to Synchro Converters accept and register digital angles in binary or BCD code and convert these inputs to an equivalent synchro or resolver output. Standard models are available to operate as synchro transmitters (CX) or synchro control transformers (CT). Accuracy and resolution to 18 bits is obtained through the use of tapped high precision toroidal transformers to derive the required output voltages. Write for Data File No. 102.

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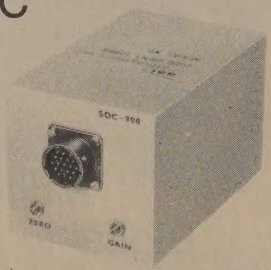
Special Purpose Converters

Digital Angle Indicator

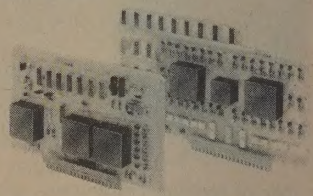
A solid state all electronic device for measuring and displaying angle inputs from remote synchro or resolver inputs. Large inch-high characters on NIXIE® tube readout provide higher visibility and readability than servo drum dials. Accepts synchro or resolver inputs at 11.8, 26 or 90 volts line-to-line. Four decade BCD digital output is available for driving off-line equipment without adding decoder. Write for Data File No. 115.

Synchro to DC Converter



A miniature solid-state light weight unit that transforms a 3-wire synchro or 4-wire resolver input to a linear DC output proportional to the equivalent input angle. Output is completely smooth over the entire 360° angular range and is without transients, even at cardinal points. Suitable for applications in servo system testing, general computer use, or any other area where precise angle indication is required. Write for Data File No. 121.

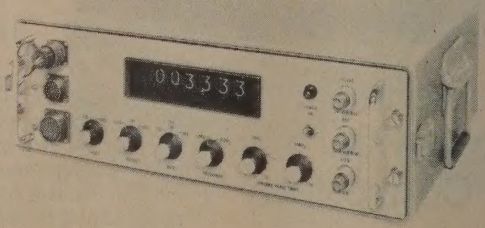
Commercial Units



These miniaturized, light weight, high accuracy solid state converters on cards, both Synchro-to-Digital and Digital-to-Synchro, are contained on standard 5 x 8 inch printed circuit cards. Considerably smaller, less expensive and lighter in weight than equivalent conventional units, they fit into standard mounting racks and can be incorporated into existing systems without special interfaces. Ideally suited for incorporation into large process control and computer command systems. Write for Data File Nos. 125 and 126.

Multispeed Converters

Ruggedized, portable, all solid state units that convert multispeed or single speed synchro or resolver inputs into six-digit decimal visual displays and BCD (8-4-2-1) electrical outputs. Accept 1x, 36x or 1x and 36x inputs. Accuracy and resolution to 001°. Voltage inputs 11.8 volt, 26 volt or 90 volt line to line. All synchro conversions performed on ratiometric basis using high precision tapped toroidal transformers as the basic measuring element. Write for Data File No. 201.



asi

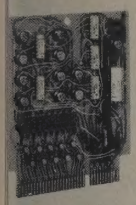
Advanced Instrumentation

astrosystems, inc.

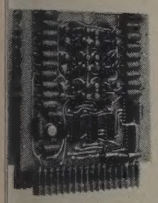
6 Nevada Drive / Lake Success, New York 11040 / 516/328-1600 / TWX 510/223-0411
West Coast: 4341 Commonwealth Avenue, Fullerton, California 92633 714/523-0820

Towson Laboratories®, Analog/Digital/Analog Converters, Systems, and Components

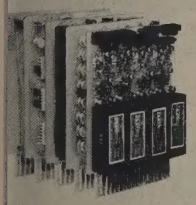
AD4100/5100



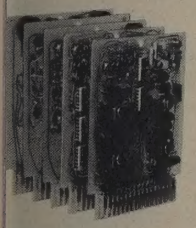
MX4100/5100



DA1000/2000



SD1200/2200



DS1100/2100

Modular Plug-in Components, Commercial or Mil Specs

FUNCTION	MODEL	INPUT	SAMPLING-ENCODING RATE (MAX.)	RESOLUTION/ ACCURACY	GENERAL
A/D - Binary (BCD Optional)	AD4100 (Airborne) AD5100 (Ground)	Single (or multiplexed) unipolar or bipolar voltage, 0 to 5V. Includes sample and hold.	1,000 (10,000 optional)	8 - 13 bits/ ± .025%	Binary, offset binary or sign and magnitude. Absolute or ratio encoding. External or internal reference.
Multiplexer-Analog	MX4100 (Airborne) MX5100 (Ground)	High or low level, single ended or differential. Includes guard circuits. >10 megohms (FET) inputs. AC or DC signals.	>10,000	± .025%	Binary address random sampling, any number of channels. High common mode rejection, low cross talk. Low level inputs require SC4100/ 5100 Amplifier with A/D Converter.
D/A - Bipolar (Binary)	DA1000 (Airborne) DA2000 (Ground)	External AC or DC reference of ±5V peak to operational amplifier. (Internal DC reference available.)	25,000	12 bits	Output equals input X binary multiplier (to ±5V) from operational amplifier (±5 ma. max.).
S/D - Shaft Angle (Sampling)	SD1200 (Airborne) SD2200 (Ground)	Multiple synchros or resolvers, single or dual speed, any number of inputs.	800	13 bits/ ± 6 min.	Binary, BCD, or combined dual-speed codes.
S/D - Sin/Cos (Sampling)	SD1300 (Airborne) SD2300 (Ground)	Multiple synchros or resolvers, single or dual speed, any number of inputs.	400	13 bits/ ± 6 min.	Binary, encodes ratio of Sin/ Ref and Cos/Ref.
S/D - Shaft Angle (Tracking)	SD1400 (Airborne) SD2400 (Ground)	Single channel, synchro or resolver, to 1000°/ sec or higher.	Continuous	13 bits/ ± 6 min.	Binary, BCD, or combined dual-speed codes.
D/S - Sin/Cos	See DS1100 and DS2100	Binary Sin/Cos codes, plus AC reference.	25,000	12 bits	Same options as DS1100/ 2100.
D/S - Shaft Angle Transmitter (CX)	DS1100 (Airborne) DS2100 (Ground)	Binary angle code plus AC reference (50-400 Hx). Single or dual speed types.	25,000	12 bits/ 0.1°	Output 11.8/90V rms, isolated three wire, current limited to 400/50 ma. rms, short/open circuit proof.
D/S - Control Transformer (CT)	See DS1100 and DS2100	Binary angle code and single speed synchro signals.	25,000	12 bits/ 0.1°	Output single AC signal to drive servo amplifier.
D/S - Control Differential (CDX)	See DS1100 and DS2100	Binary angle code and single speed synchro signals.	25,000	12 bits/ 0.1°	Output 11.8/90V rms, isolated three wire, current limited to 400/50 ma. rms, short/open circuit proof.
Linear Sweep Resolver	See DS1100 and DS2100	Linear sweep voltage, 0 to +5V, up to 1 kHz rep rate, into operational amplifier.		12 bits/ 0.1°	X-Y output signals for cathode ray tube deflection amplifier inputs.

THE BENDIX CORPORATION
ENVIRONMENTAL SCIENCE DIVISION
Department 81
1400 Taylor Avenue
Baltimore, Maryland 21204
Telephone (301)-825-5200
TWX 301-828-7074

In Canada:
AVIATION ELECTRIC LIMITED
200 Laurentien Blvd.
P.O. Box 2140 St. Laurent
Montreal, Quebec 379
Phone: (514) 744-2811

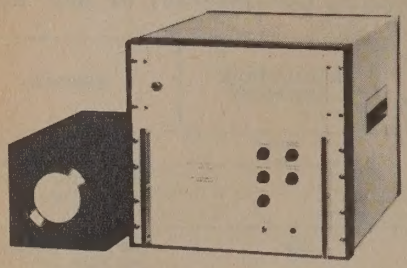
Export Sales and Service:
THE BENDIX CORPORATION
BENDIX INTERNATIONAL
605 Third Avenue
New York, N. Y. 10016

Bendix

BETA

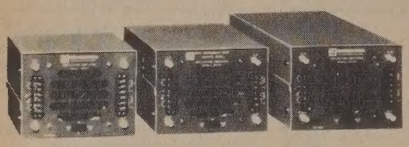
PRECISION CRT DISPLAYS and DISPLAY SYSTEM MODULES

PRECISION X-Y CRT DISPLAYS FOR FILM RECORDING AND FILM READING



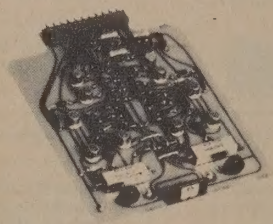
	PD900	PD1100	PD1200	PD1400
Resolvable Elements/Diameter	1700	2100	3400	4200
CRT Diameter	5 inches	5 inches	5 inches	7 inches
Maximum Spot Size	0.0025	0.002	0.00125	0.0015
Small Signal Bandwidth	1 MHz	1 MHz	1 MHz	1 MHz
Settling Time	10 μsec	12 μsec	20 μsec	50 μsec

±35 VOLT DEFLECTION AMPLIFIERS



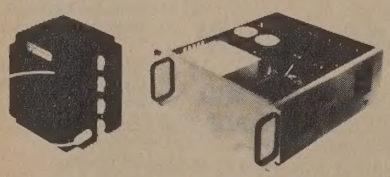
The models DA223, DA224 and DA225 are dc-coupled, all-silicon, solid-state modular packages capable of supplying up to ±2.0, ±4.0 and ±6.0 amperes of deflection current respectively to each axis of a directly-coupled deflection yoke. A unique method of damping optimizes the amplifier for the particular yoke being used by means of an adjustable potentiometer. The amplifiers also feature extremely fast settling time and high bandwidth. The user has the choice of operating the amplifiers Class A for achieving nonlinearities of ±0.02% maximum or Class AB for minimum power consumption.

MODULAR CRT BUILDING BLOCK COMPONENTS



Individual, compatible plug-in circuits such as: DF2050 Dynamic Focus Generator; DF347 Electromagnetic Dynamic Focus Amplifier; DF2496 Electrostatic Dynamic Focus Amplifier; LC2656/2676 Precision Linearity Correction Circuit; VA2076 Video Amplifier (10 MHz); VA2075 Gamma-Corrected Video Amplifier (10 MHz); VA2769 Video Amplifier (10 MHz, 60 volt output); VA2077 Video Amplifier (30 MHz); SG1190 X-Y Sawtooth Generator; PP529 Phosphor Protection Circuit; DA341 Deflection Amplifier (±200 ma); DA1340 (±.75 amperes); EDA800 Electrostatic Deflection Amplifier (350 volts plate-to-plate positive or negative); EDA1504 Electrostatic Deflection Amplifier (500 volts plate-to-plate positive or negative); FR1882 Static Focus Regulator; BA1714 Blank/Unblank Amplifier. All Beta circuitry features silicon semiconductors and temperature stable metal-film resistors throughout.

HIGH & LOW VOLTAGE CRT POWER SUPPLIES



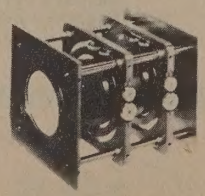
SERIES HV provides regulated high voltage outputs for CRT electrodes — anode, focus grid, G2 and filament.

Model No.	Anode Output Range
HV8	1-8 kv
HV15	5-15 kv
HV25	15-25 kv

SERIES PAK provides regulated low voltage outputs for Beta modules — ±35 volts, ± 20 volts, G1 and filament.

Model No.	±35 volt (deflection) Output
PAK16	16 amperes

PRECISION TUBE AND COIL MOUNTS



Flexible combinations of standard assemblies for the precision mounting and alignment of CRT's, yokes and coils: CRTM Basic CRT Mount includes removable bezel, rods and neck end clamps; DSTM Dual Gun Recording Storage Tube Mount, includes rods and neck clamps both ends; MCM Micropositioner Coil Mount allows 6 independent motions and positive lock; FYM Fixed Yoke Mount for application where micropositioning is not required; FYMS Fixed Yoke Mount for servo-type mounted yokes; CCM Centering and/or Alignment Coil Mount; MS983 Magnetic Shield Enclosure.

BETA INSTRUMENT CORPORATION
20 Ossipee Road, Newton Upper Falls, Massachusetts 02164 Telephone: (617) 969-6510.

Burroughs Computer System Components

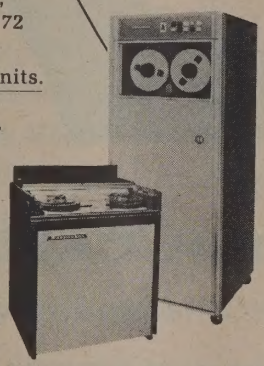
Magnetic Tape Transports

Free-standing Units.

Several models are offered to meet various tape speed requirements. Bi-directional units operate up to 120 inches per second. All models feature gentle tape handling, end-of-tape sensing, fast start/stop, remote and local control, easy threading and dust-free operation. Packing densities up to 800 bits per inch; transfer rates up to 72 KC per second.

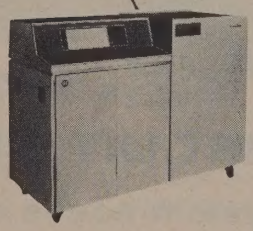
4-station "cluster" Units.

Unique Burroughs design permits four tape drives to share common electronics and cabinetry. Compact, economical, easy to use. Uses 7 or 9 channel tapes, or both. Packing densities up to 1600 bits per inch; transfer rates up to 36KC per second.



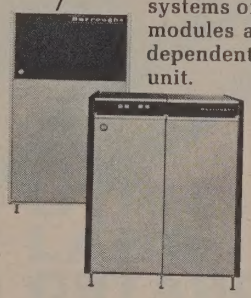
Line Printer

High speed drum printer offers 64 alphanumeric and special characters, prints 132 characters per line. Features a 132-character print buffer, plus immediate access print cycle. Handles multipart forms 5 to 20 inches wide. Available in 700 and 1040 line per minute models.



On-Line Disk File

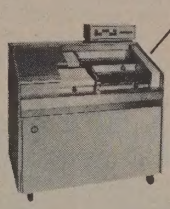
Full electronic switching via individual, fixed read/write heads provides very high speed access to every disk address regardless of total capacity. Fast, flexible, and fully proven. Individual modules available in 16-, 80- and 160-megabit capacities, with transfer rates up to 9 megabits per second. Expanded systems of up to 100 modules are possible dependent upon control unit.

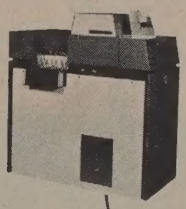


Punched Card Reader

This reliable, high speed Burroughs reader handles short cards as well as standard 80-column cards. Features photoelectric reading and positive strobing of each card column. Unit shown reads 1400 cards per minute. 475 and 800 cpm models also available.

New Low-Cost Card Reader! Operates at 300 cpm flow mode, and 200 cpm demand mode. Same reliable photoelectric reading principle as higher speed units. Reads standard 80-column cards with strobe output for each card column.





Card Punch

300 card per minute punch features magnetic core buffer, solid-state echo check punching verification, low maintenance. Unit may be loaded or unloaded while operating; can idle indefinitely without card damage. 3 program-selected stackers.

Manual Tape Punch

A precision unit for adding information to an already prepared tape. Fast, easy, and accurate. No need to reinsert the tape in the main perforator. Accommodates standard Teletype and Commercial Control Flexowriter tapes. Corrects up to an 8-hole code. Tape slips in easily, and is held in perfect registration.

Decimal Keyboard

A modestly priced, versatile input device adaptable to a wide variety of data processing and communications systems.

A compact 13-key unit with a featherlight touch for high speed indexing.

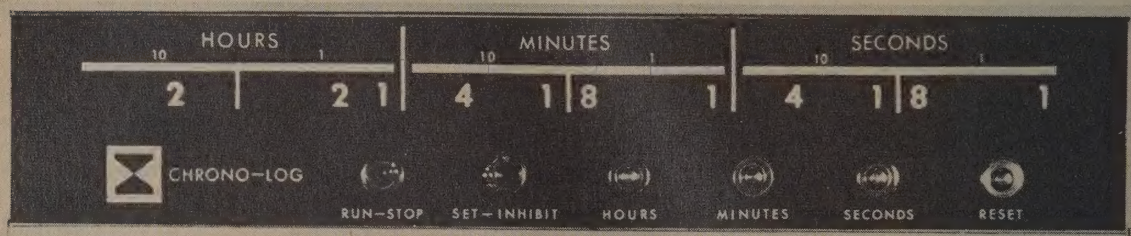
Burroughs

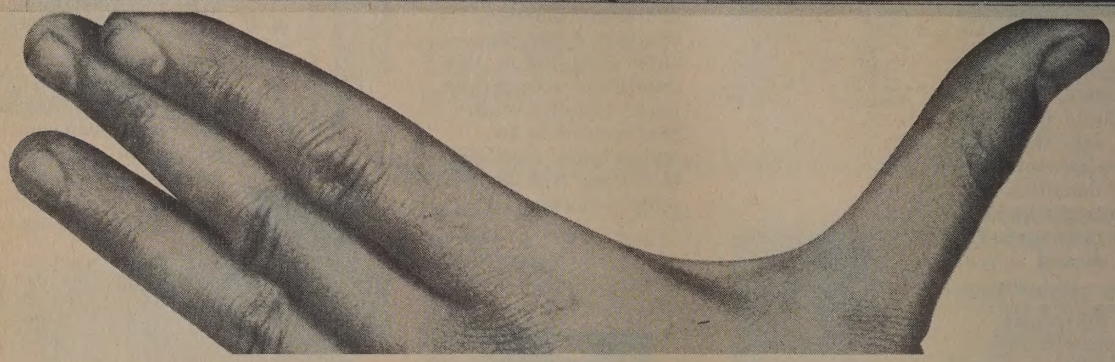
OEM Sales, 1649 Wilshire Blvd., Los Angeles 90017
Call (213) 483-4520, TWX: 910-321-2494

Whatever your requirements for

TIME CODE EQUIPMENT...

Look to Chrono-log





Series 30,000

INTEGRATED CIRCUIT CLOCK/CALENDARS

Meet specific system needs at off-the-shelf prices

Applications
Wherever a digital output of real or elapsed time is required such as data logging, data transmission, data processing, time display, telemetry and digital printout systems.

Versatility, at low cost
Over 7,000 standard configurations available to meet specific system requirements at off-the-shelf prices which are less than the prices of electromechanical clocks. Use of common interface wiring and logic levels save you the costs of making engineering and documentation changes from one application to the next. Options include:

- BCD or NIXIE-type front panel displays
- Outputs of hours, minutes and seconds or other time ranges
- Day-of-the-year or month-and-day calendars
- Parallel and/or serial outputs
- Commercial or military temperature ranges
- A variety of internal or external time bases
- Various power supply inputs

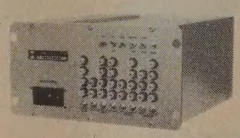
System compatibility
Use of TTL monolithic units, DTL and TTL circuits provide the optimum characteristics for clock applications, permitting simple interface with the most popular integrated circuit families. Chrono-log clock circuits are extremely reliable and provide excellent noise immunity.

Small size
Measures only 1¾ in. high, 9½ in. wide (half rack), and 8¾ in. deep.

For complete details request Bulletin 30,000.

OTHER CHRONO-LOG TIME CODE EQUIPMENT:

Time Code Generators—for recording, telemetry, range timing and other real time systems using IRIG, NASA, Vela or other time code formats. Both parallel outputs and serial modulated carrier outputs are provided for analog magnetic tape recording systems. Ask for Bulletin 4,000.



Low Power Time Code Generators—for field and airborne systems. Operate up to 60 hours from internal standby batteries. Internal oscillator has stability of 2 parts in 10^9 per day. Ask for Bulletin 26,000.

Time Code Readers—accept serial time code input in forward or reverse direction, fast or slow speed. Available for a variety of time codes or in universal multi-code models. Displays time reading and produces parallel and serial outputs of time for data processors, graphic recorders and other data devices. Ask for Bulletin 5,000.

Automatic Tape Search Control—controls tape drive to search for data at high speed and play back selected portions of recording. Provides front panel selection of start and stop times. Eliminates manual searching and playback. Ask for Bulletin 6,000.

Whatever your requirements for time code equipment, look to Chrono-log to fulfill them. For more information, contact your local Chrono-log field engineer or write us directly.

CHRONO-LOG CORPORATION

2583 West Chester Pike, Broomall, Pa. 19008. (215) 356-6771

OVER 6 MILLION analog connections a second;

The Computer Labs Model MUX-810 Multiplexer will connect eight analog inputs to a single output at a rate of 6.6 million connections every second. Channels can be connected sequentially, with any number in the sequence; random access; or manually, with a front panel push button. **Equivalent "ON" resistance is 0.2 ohm, making the Model MUX-810 an ideal choice for switching 100-ohm lines.**

INPUT CHANNELS: 8 Can be switched sequentially (any number); random access; or manually, with push button	LOGIC LEVELS: "1" = +2.5 V to +4.5 V "0" = 0.0 V to +0.5 V All loads 50 ohms or greater
INPUT VOLTAGE RANGE: 2.2 V P-P max. (−1.1 V to +1.1 V)	LOGIC INPUT IMPEDANCE: 100 ohms
DC ACCURACY: ±2 mV (Max. difference input to output)	CHANNEL INPUT IMPEDANCE: 1000 ohms in parallel with 20 pF
LINEARITY: 0.05%	CHANNEL BANDWIDTH (−3 dB): 15 MHz min.
DC OUTPUT IMPEDANCE: 0.1 ohm	CHANNEL CROSSTALK (@ 5 MHz): −60 dB
SETTLING TIME: ±10 mV of final value = 150 ns ± 5 mV of final value = 400 ns	POWER: 120 V ±5%; 300 mA PRICE: $2,400

COMPUTER CL LABS

for tomorrow's technology today

1109 South Chapman St. / Greensboro, N. C. 27403
(919) 292-6427/TWX 510 922-7954

Analog Multiplexers / Analog-to-Digital Converters / Digital-to-Analog Converters / Operational Amplifiers

followed by...

(See Next Page)

...converters that go from

Analog to Digital

Computer Labs HS Series A/D Converters include sample-and-hold, internal test circuits, and power supplies. **No external test equipment required.** Machines operate at any random or periodic word rate up to maximum shown in table. Digital output is TTL compatible. Unipolar or bipolar input; 50, 75, or 93 ohms impedance; and regular binary or 2's Complement outputs are no-cost options.

Computer Labs Model No.	Bits	Max. Word Conv. Rate	Aperture	Weight of LSB	Delay: ENCODE CMND to DATA READY Pulses	Price
HS-425	4	25 MHz	1.0 ns	128 mv	50 ns	$5,800
HS-520	5	20 MHz	0.8 ns	64 mv	70 ns	$6,400
HS-615	6	15 MHz	0.6 ns	32 mv	90 ns	$7,490
HS-710	7	10 MHz	0.4 ns	16 mv	120 ns	$7,950
HS-810	8	10 MHz	0.4 ns	8 mv	135 ns	$8,750
HS-905	9	5 MHz	0.2 ns	4 mv	180 ns	$9,660
HS-406	4	6 MHz	3.0 ns	128 mv	50 us	$3,200
HS-505	5	5 MHz	2.5 ns	64 mv	70 ns	$3,250
HS-604	6	4 MHz	2.0 ns	32 mv	90 ns	$3,300
HS-703	7	3 MHz	1.5 ns	16 mv	120 ns	$3,350
HS-802	8	2 MHz	1.0 ns	8 mv	135 ns	$3,400
HS-901	9	1 MHz	0.5 ns	4 mv	180 ns	$5,450

See our **Analog Multiplexer**—preceding page.

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Analog Multiplexers / Analog-to-Digital Converters / Digital-to-Analog Converters / Operational Amplifiers

...and back again.

Computer Labs HS-2000 Series D/A Converters convert parallel binary words into analog voltages accurate to within ±2 mv. **No strobe signal required.** Output settles to within 0.1% of input in less than 90 nanoseconds. External bias and reference signals can be applied from dc to 25 MHz, making units useful also as programmable attenuators, function generators, or modulators.

SPECIFICATIONS ON ALL MODELS	RESOLUTION @ INPUT WORD RATE	MODEL NO.	PRICE
INPUT CODE: Parallel binary Binary "0" = 0.0 to +0.5 V Binary "1" = +2.2 to +4.0 V DIGITAL INPUT IMPEDANCE: 93 ohms ANALOG OUTPUT: 2.1 V max. (into 100 ohms) OUTPUT IMPEDANCE: Less than 1 ohm OUTPUT SLEWING RATE: 200 V/us OUTPUT RANGE RESOLUTION: Internal = ±1 mv External = Resolution of external source BIAS INPUT IMPEDANCE: 500 ohms REFERENCE INPUT IMPEDANCE: 93 ohms REFERENCE VOLTAGE RANGE: 0 to −2.1 V POWER REQUIREMENTS: ±15 V; ±600 mA	4 Bits @ 25 MHz	HS-2425	$1,480
	5 Bits @ 20 MHz	HS-2520	$1,530
	6 Bits @ 15 MHz	HS-2615	$1,580
	7 Bits @ 10 MHz	HS-2710	$1,630
	8 Bits @ 10 MHz	HS-2810	$1,690
	9 Bits @ 10 MHz	HS-2910	$1,760

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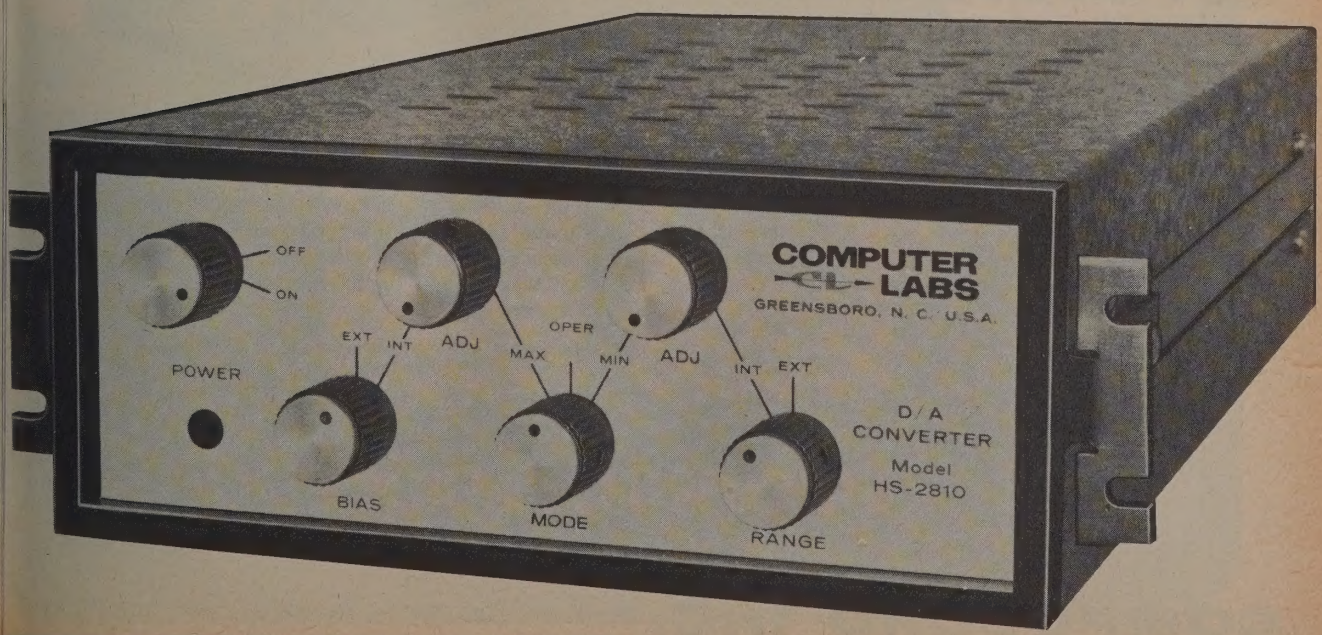
Analog Multiplexers / Analog-to-Digital Converters / Digital-to-Analog Converters / Operational Amplifiers

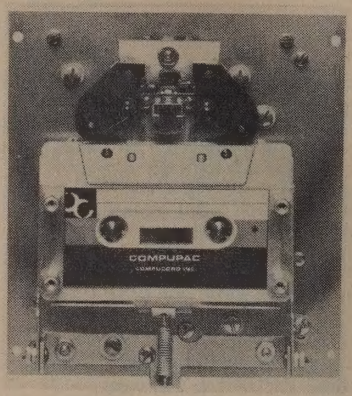


COMPUCORD computer system cassettes

Compudette 1100

The "true industrial" cassette loaded digital tape transport dieally suited for OEM applications. The Model 1100 is the most versatile recorder of its kind and it is priced well below any comparable equipment.

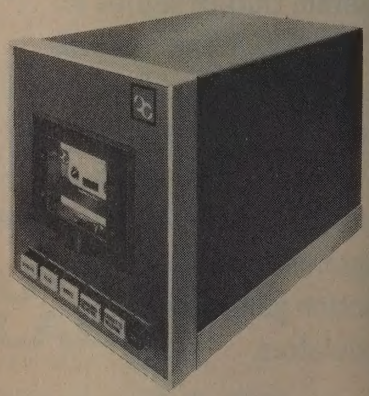
Read/Write Speed:	5 ips bidirectional incremental/continuous
Speed Accuracy:	±2%
Packing Density:	500 bpi or 1000 bpi
Start/Stop Time:	20 milliseconds
Rewind Speed:	80 ips
Transfer Rate:	5,000 bps (5KHZ)



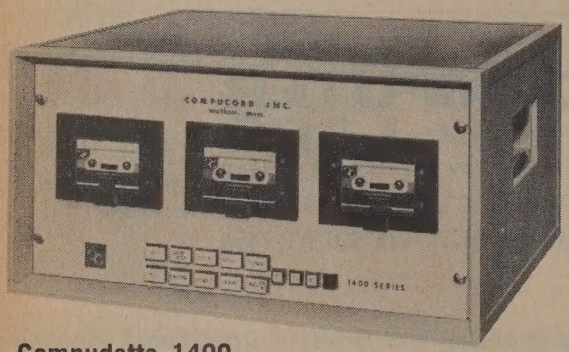
Compudette 1200

Built around the Model 1100, this unit provides a complete electro-mechanical tape system that accepts parallel word input up to 32 ibts in length. The only true incremental/continuous recorder available.

Data Input/Output:	Parallel lines 5 to 32
Data Advance:	Pulsed input for incremental or held @ 1 for continuous
Inter-record Mark:	Input of 1 generates inter-record mark
End-of-file Mark I/O:	Input of 1 generates inter-OEF mark
Load Point Search:	Input of 1 causes tape search for BOT mark
BOT/EOT Sensing:	1 output
Error Correction:	DataRite corrects single bit errors on character by character basis
Logic Levels:	DTL or TTL compatible



COMPUCORD INC.



Compudette 1400

The Model 1400 provides three transports in a 19-inch panel. They are such that one can be inputting data while one or both of the other transports are outputting data or performing any of the other functions.

Data Input/Output:	Parallel lines 5 to 32
Data Advance:	Pulsed input for incremental or held @ 1 for continuous
Inter-record Mark:	Input of 1 generates inter-record mark
End-of-file Mark I/O:	Input of 1 generates inter-OEM mark
Load Point Search:	Input of 1 causes tape search for BOT mark
BOT/EOT Sensing:	1 output
Error Correction:	DataRite corrects single bit errors on character by character basis
Logic Levels:	DTL or TTL compatible

Data Sense 5000

A multi-purpose data terminal capable of operating as a complete independent processor. The DS 5000 allows the user keyboard insertion on digital magnetic tape, visual display, and digital magnetic tape recording at low system cost.

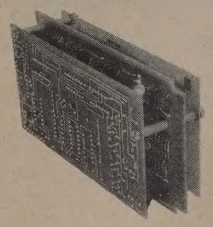
Character Set:	26 Alpha, 10 Numeric, 8 Punctuation, 18 Symbols, displayed on video screen
Video Display Size:	16 square inches
Memory System:	MOS Recirculating tape storage (DataRite circuit)
Code Internal:	ASCII
Tape Control:	Forward/Reverse (read, write, search) EOF, Inter-record code
Record Length:	Variable 0-400 characters

COMPUCORD INC. 225 Crescent Street, Waltham, Massachusetts 02145 617/891-0080

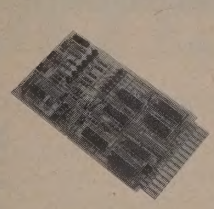
MODERN VALUE-ENGINEERED PRODUCTS

DISPLAY MODULES

The DM500 and DM600 Series are self-contained, plug-in decimal display units. The DM500 Series use Amperex gas discharge type indicator tubes and the DM600 Series use the **RCA NUMITRON** 7-segment indicator tubes. Both series are available with decade counter, decoder/driver and quad latch storage register. All models plug into a standard 15-position (0.156" spacing) connector. The indicator tubes provide numerical readout from 0 to 9 including decimal point. **AN ATTRACTIVE BEZEL AND MOUNTING CHASIS IS AVAILABLE.** Single quantity prices start as low as **$25.90.**



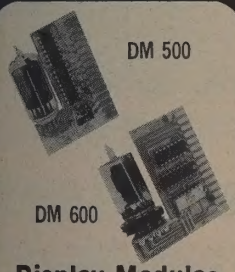
A/D Converter



D/A Converter

DC POWER SUPPLIES

The PM400, 500, 600 and 700 Series Regulated DC Power Supplies offer a total of 73 models with output voltages ranging from 3.6 to 180 VDC. The PM400, 500 and 600 Series have power outputs of less than 2 watts. The PM700 Series offer 5, 15 and 180 VDC supplies with up to 18.9 watts power. The PM800 Series Unregulated DC Power Supplies offer six models with output voltages from 5 to 45 VDC and output currents up to 440mA. Single quantity prices for the PM400, 500 and 600 Series start at **$25.95.** The PM700 Series start at **$31.95** and the PM800 Series start at **$16.80.**



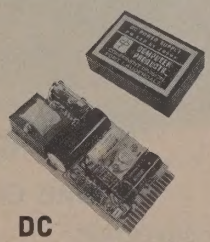
Display Modules

A-TO-D CONVERTERS

The AD300 Series offers 14 standard models providing binary or BCD output code with 8, 10 or 12 bit binary resolution or 12-bit BCD resolution. Bipolar inputs of +4V to −4V or +10V to −10V are standard input configurations. 10KC conversion rates are standard, 20KC available. Accuracy is ±0.025%, ±½ LSB. The AD 300 Series are mounted on three plug-in P.C. boards measuring 2.75" x 5.25" x 1.0". Single quantity price for 12-bit binary 10KC, only **$189.00.**

D-TO-A CONVERTERS

The DA035 Series provides 8, 10 or 12-bit binary or 12-bit BCD resolution, with or without input data storage, on a P.C. card measuring 2.75" x 5.25". Inputs are TTL and DTL compatible. There are 40 models with six full-scale analog output ranges up to ±10 volts and ±10mA available. F.S. settling time is less than 50μ sec. Conversion rates up to 200 KHz. Accuracy on 12-bit models is ±0.05%, ±½ LSB. Single quantity prices start as low as **$69.00.**



DC Power Supplies

CompuREED™ RELAYS AND SCANNERS

The CR300 Series Relays are the newest development in low-level analog switching. The series includes 12 models available in one, two or three pole, form "A", switching configurations with dry or mercury-wetted reed switches operating at rates up to 200 samples/second. The CM600 Series CompuREED™ Scanner uses the CR300 reeds to provide economical low-speed, high-accuracy sampling of analog signals in the ranges of ±5 millivolts to ±1 volt full scale with programmable gain control. The reed switches provide extremely low (<0.1 microvolt for 5% coil duty cycle, and <1.0 microvolt for 100% coil duty cycle) thermal offset. CR300 Series prices are typically **$14.00.** A typical price for the CR600 Scanner is **$24.00 channel.**

LOW-LEVEL MULTIPLEXERS

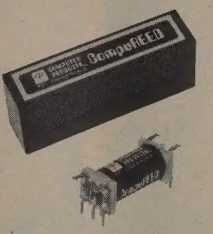
The **significantly different** LM700 Series Low-Level Multiplexers feature **transformer isolation** of each channel allowing independent operation. Also featured is high common mode voltage capability of 120V RMS. The LM700 Series has an input range of ±5mV to ±1 Volt and an accuracy of ±.05% RTO, ±5 microvolts RTI, ±½ LSB. Up to 10 KHz channeling rates may be achieved. Common mode rejection—120DB @ 60 Hz with 1K ohm unbalance in the input lines. Gain settings are programmable. Popular models are LM723 (64-channel), LM738 (128-channel). Both include ADC and appropriate power supplies. Typical price is **$95.00 per channel.**

Digital Panel Meter

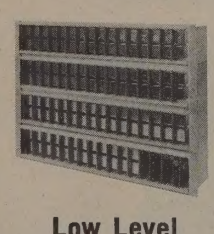
CompuLogIC™

CompuLogIC™

The CL800 Series comprises a complete family of plug-in logic circuit modules using monolithic DTL integrated circuits. The series consists of positive logic, NAND based circuits with each circuit card containing two hermetically sealed, 14-pin, dual in-line, ceramic packages. Each circuit module measures only 1.25" x 2.5" and mates with standard 30-pin, 15-position, card-edge connectors with 0.156" spacing. The basic series consists of 18 separate circuit module types containing both high and low-speed models. A typical price for CompuLogIC™ is **$10.00.**



CompuREED™



Low Level Multiplexer

DIGITAL PANEL METERS

The DP400 Series measures DC voltage accurately (.05% ±½ count for 2000 and 4000 count models. .02% ±1 count for 10,000 count models) with up to 10,000 count resolution. It offers 11 voltage ranges (200mV, 400mV, 1V, 2V, 4V, 10V, 20V, 40V, 100V, 200V and 400V). Temp. coefficient is .005%/°F(2000 and 4000) and .003%/°F (10,000). Single quantity prices start as low as **$198.00. Guaranteed shipment within 15 to 30 days.**

Call or Write for Specifications, Prices and Delivery on our Entire Line.

COMPUTER PRODUCTS™
FORT LAUDERDALE

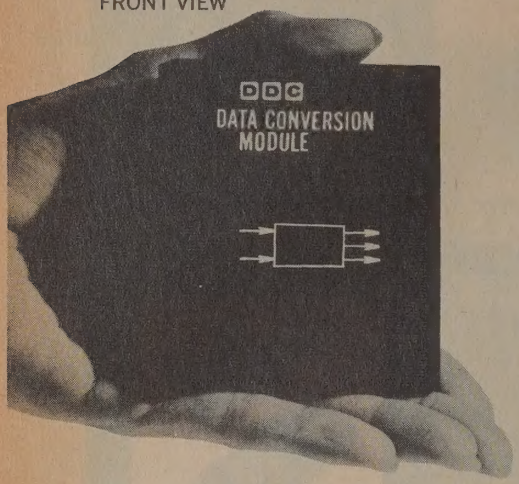
Post Office Box 23849
Ft. Lauderdale, Fla. 33307
Telephone: (305) 933-5561

DATA DEVICES from DDC

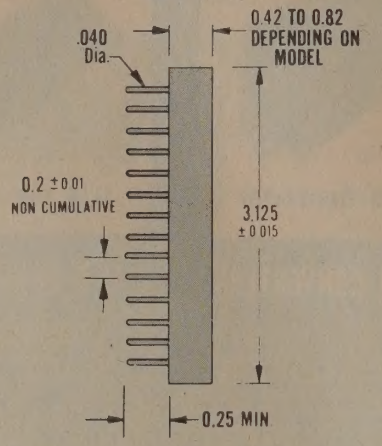
DATA CONVERSION MODULES

THIS IS OUR STANDARD MODULE:

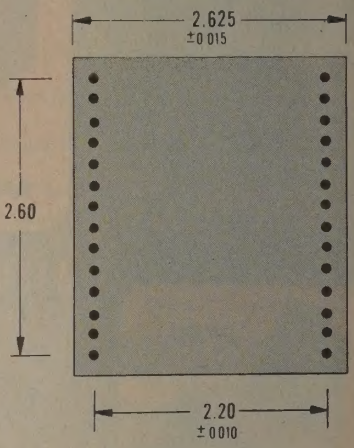
FRONT VIEW



SIDE VIEW



BOTTOM VIEW



SOME OF THE CONVERTERS WE PACKAGE IN IT ARE:

8-13 BIT D/A CONVERTERS
—including 50ns settling, 100 mA output, multiplying AC, and economy versions.

14 BIT SYNCHRO-TO-DIGITAL CONVERTERS
—with ±4 minute ±0.9 LSB accuracy and isolation of reference and input.

14 BIT SOLID STATE CT's
—with ±4 minute accuracy and isolation of input and output.

8-11 BIT A/D CONVERTERS
—including ultra-fast, fast, and economy versions.

14 BIT DIGITAL-TO-SYNCHRO CONVERTERS
—with ±4 minute accuracy and isolation of reference and output.

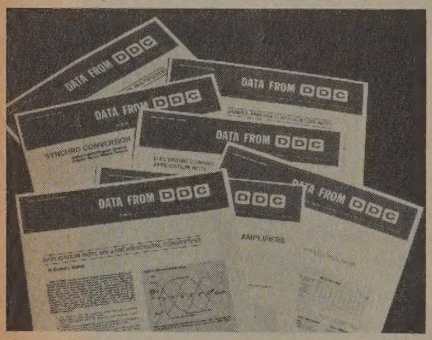
14 BIT DIGITAL-TO-RESOLVER CONVERTERS
—with ±4 minute accuracy, and isolation of reference and output.

14 BIT SOLID STATE CDX's
—with ±4.5 minute accuracy and isolation of input.

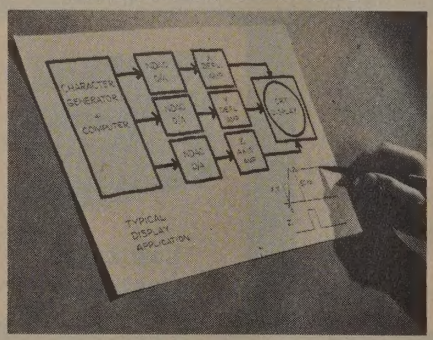
ALL ARE AVAILABLE IN THREE OPERATING TEMPERATURE RANGES: —55 TO +85°C, —25 TO +70°C, AND 0 TO +50°C. HERMETICALLY SEALED VERSIONS ARE AVAILABLE. WE ALSO SUPPLY MULTIPLEXERS, SAMPLE & HOLD MODULES, AND SPECIAL PURPOSE CONVERTERS. PLEASE SEE SECTION 1100 FOR A LISTING OF OUR SIGNAL CONDITIONING MODULES, INCLUDING WIDEBAND DATA AMPLIFIERS.

DDC IS DIRECTED TO CUSTOMER SATISFACTION; WE OFFER YOU:

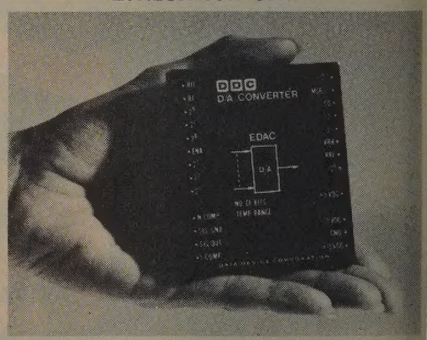
APPLICATIONS INFORMATION



APPLICATIONS ASSISTANCE



EVALUATION UNITS



CONTACT US, OR YOUR LOCAL DDC ENGINEERING SALES REPRESENTATIVE, FOR DETAILED SPECIFICATIONS, APPLICATIONS ASSISTANCE, AND EVALUATION UNITS.

DDC Dept. 21, 100 Tec Street, Hicksville, N.Y. 11801 • TWX 510-221-1874 • PHONE 516-433-5330

A DIVISION OF SOLID STATE SCIENTIFIC DEVICES CORP.

DC INC.

datacom,inc.

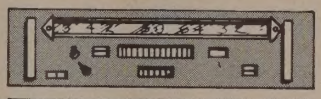
P. O. BOX 278 • FT. WALTON BEACH, FLORIDA 32548 • AC 904 242-3113

Datacom specializes in the production of computerized data acquisition equipment, multiplexing and digitizing equipment (for both high and low level sources), timing equipment, computer peripherals, and computer aided process control equipment for industry. Datacom maintains a staff of experienced engineers to advise customers on special requirements.

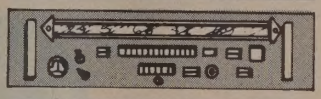
LOGIC CARDS Datacom offers a full line of logic modules and accessories for those who wish to build their own customized digital equipment. Contact our plant for more detailed information, including pertinent specifications, on Datacom's line of DTL, TTL, and MSI integrated circuit digital logic cards. Card files, chassis and power supplies as well as other accessories are available from Datacom.

TIMING EQUIPMENT

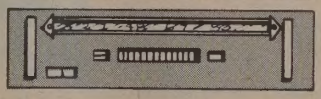
TIME CODE GENERATOR



TIME CODE REGENERATOR

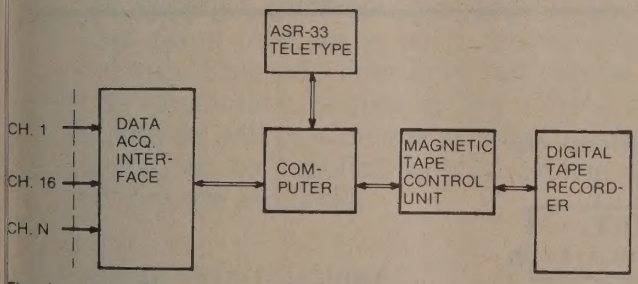


DIGITAL CLOCKS



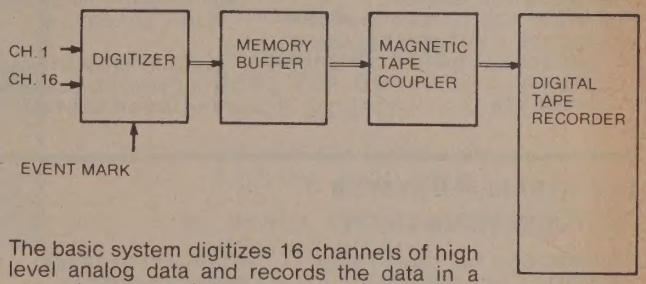
DATA SYSTEMS

COMPUTER CONTROLLED DATA ACQUISITION SYSTEM



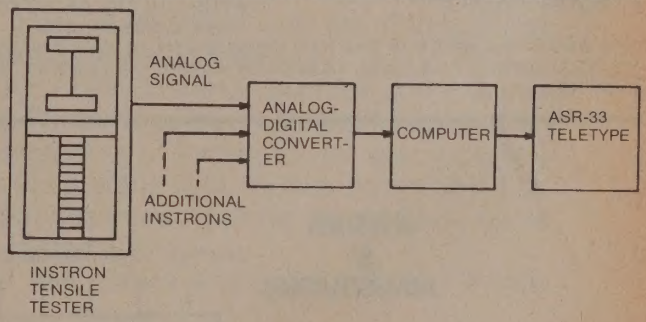
The basic system acquires 16 channels of high level analog data for processing by the computer. Processed data may be printed by the ASR-33 Teleprinter or recorded on magnetic tape.

DATA LOGGER

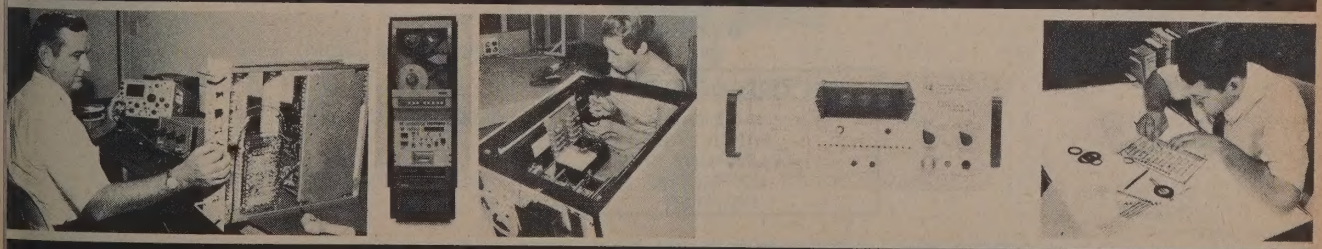


The basic system digitizes 16 channels of high level analog data and records the data in a computer compatible magnetic tape format.

FIBER TESTER



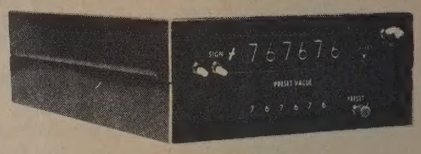
The basic system acquires elongation and load data from an instron tensile tester. When the fiber under test breaks, the system lists the test results on the ASR-33 Teleprinter. Examples of the type of test data obtainable are: decrimping load, decrimping elongation, decrimping area, yield load, yield area, breaking load, breaking elongation, estimated tenacity, initial modulus, secondary modulus, standard deviations, and others.



DATACOM INC. • P. O. BOX 278 • FT. WALTON BEACH, FLORIDA 32548 • AC 904 242-3113

DATA GRAPHICS CORPORATION

8402 SPEEDWAY DRIVE
SAN ANTONIO, TEXAS 78230
(512) 342-9486



DIGITAL READOUT SYSTEMS

FEATURES
ANY CONFIGURATION
- CONTROLS AND DISPLAY IN THE SAME CABINET AS ELECTRONICS
- REMOTE CONTROLS
- REMOTE DISPLAY
- REMOTE CONTROLS AND DISPLAY
- RACK MOUNTED
- NEMA ENCLOSURES
- INTERFACE TO ANY ENCODER:
  DGC-250-A ROTARY ENCODER
  DGC-25000-A ROTARY ENCODER
  LINEAR
  ABSOLUTE

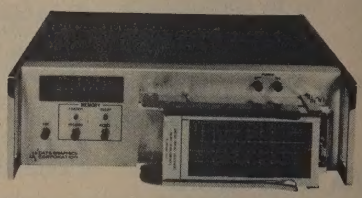
WIDEST RANGE OF OPTIONS
- ANY NUMBER OF AXES
- ANY NUMBER OF DIGITS PER AXIS
- SIGN (+ OR –)
- OFFSET CONTROLS
- PRESET COINCIDENCE
- BCD OUTPUT (8-4-2-1 CODE)
- POWER FAILURE LATCH
- RESOLUTION SWITCHES
- TWO POSITION DECIMAL POINT SELECTOR

PLUG-IN COMPATABILITY TO DGC ELECTRONIC SCALER AND DATA TRANSFER SYSTEM.

DATA TRANSFER SYSTEM FEATURES VERSATILITY

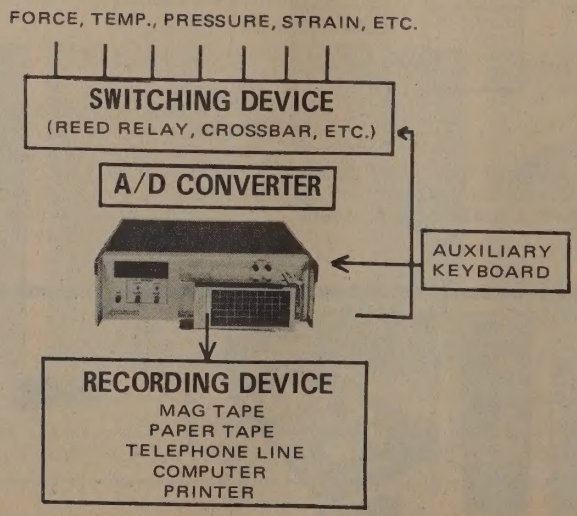
ACCEPTS DIGITAL DATA FROM:
- DIGITAL VOLTMETERS
- A TO D CONVERTERS
- TIME CODE GENERATORS
- COUNTERS
- DIGITAL CLOCKS
- ANY OTHER DIGITAL OUTPUT DEVICE

INTERFACES DIRECTLY TO:
- KEYPUNCHES
- TYPEWRITERS
- TAPE RECORDERS
- PRINTERS
- PAPER TAPE PUNCHES
- ON LINE WITH A COMPUTER
- THE MULTIPLEXING OF MORE THAN ONE SYSTEM



THE DATA TRANSFER IS THE KEY COMPONENT IN ANY DATA ACQUISITION SYSTEM. WE WILL SUPPLY THE DATA TRANSFER ALONE OR THE ENTIRE DATA ACQUISITION SYSTEM.

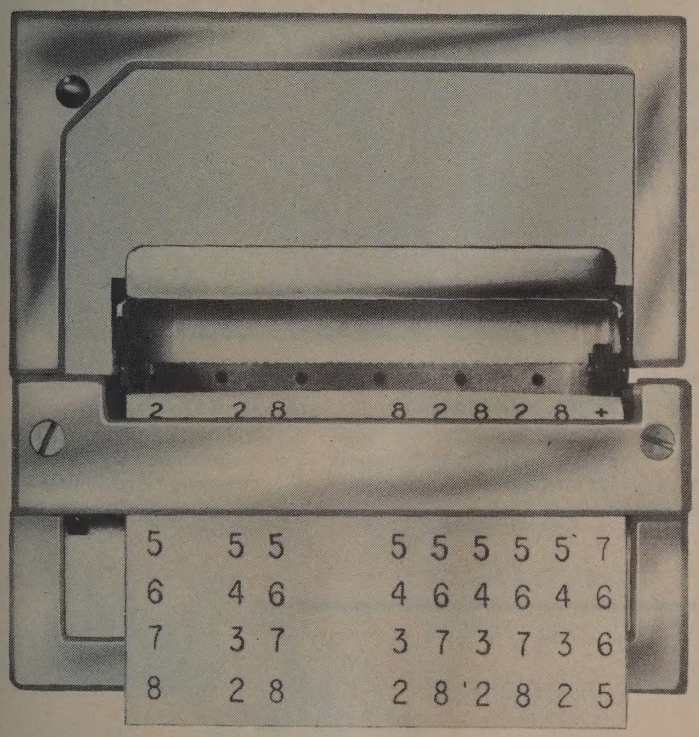
SENSORS & TRANSDUCERS



DGC WILL SUPPLY THE DATA TRANSFER ALONE OR THE ENTIRE DATA ACQUISITION SYSTEM.

DATATOTAL INC.

DIGITAL PRINTERS



- DECIMAL, TWELVE LINE, OR B. C. D. INPUT
- FOUR TO TWELVE ACTIVE COLUMNS. (MORE ON REQUEST).
- ASYNCHRONOUS OPERATION; SIX LINES PER SECOND AVERAGE SPEED. SYNCHRONOUS OPERATION FOUR LINES PER SECOND.
- SPECIAL CODE CHARACTERS AVAILABLE.
- COMPACT IN SIZE, DESK TOP OR PANEL MOUNT.
- TICKET OR CARD PRINTER AVAILABLE.
- UNIQUE INKING SYSTEM WITH NO RIBBON GIVES A CLEAR SMUDGE-FREE PRINT.

Datatotal offers a complete range of medium performance Digital Printers with models suitable for O.E.M. or user applications. The basic mechanical and electronic design is modular giving great flexibility in input mixes and ease of service.
All Datatotal Printers are normally furnished for 110V 60 Hertz operation and the units are supplied complete and ready to go. The Printer employs individual interchangeable count modules in each column allowing spacing of format to suit specific applications. Time and date print out can be supplied along with various code identification characters. Should at any time a special character, that we do not have, be required we will provide one at a low one time charge.
Units can be supplied with or without drive electronics and various Ticket Printer options are available.

BRIEF SPECIFICATIONS

MODEL NUMBER	NUMBER OF COLUMNS STANDARD UNIT	PRINT SPEED LINES PER SECOND	DIMENSIONS 12 COLUMN UNIT WIDTH	HEIGHT	DEPTH	ENTRY CODE
1141C	4-12 (More on Request)	6 Per Second Average	4⅝"	4½"	15"	Decimal or Twelve Line
1141CD	4-12 (More on Request)	6 Per Second Average	4⅝"	4½"	15"	B.C.D. (1248)
1141B	4-12 (More on Request)	4 Per Second	4⅝"	4½"	15"	Decimal or Twelve Line
1141BD	4-12 (More on Request)	4 Per Second	4⅝"	4½"	15"	B.C.D. (1248)

31 PARK ROAD, NEW SHREWSBURY, NEW JERSEY P.O. BOX 275, EATONTOWN, NEW JERSEY 07724
(201) 542-7870

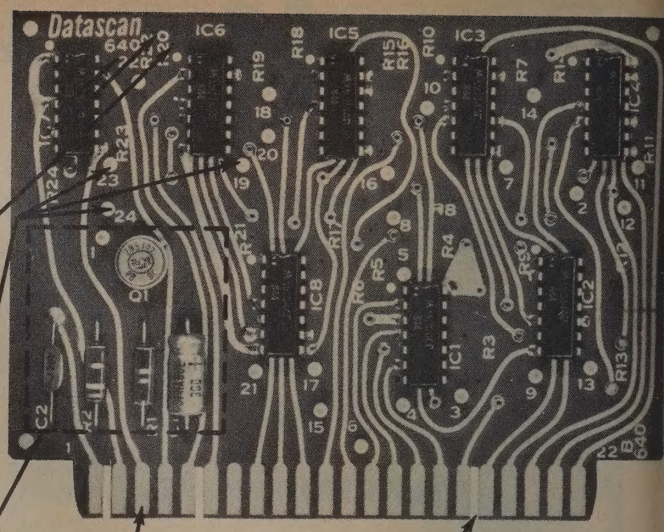
The Integrated Circuit Logic Card with *More Value* Built In

Datascan now offers you the most complete line of *function* IC cards — DTL 200 series, TTL 600 series and HTL (High Noise Immunity) 400 series, power supplies, hardware and accessories. All three card lines are pin for pin interchangeable.

Pull-Up Resistors
Provision for mounting resistors right on card — reduces number of interconnections, cards and cost.

Test Points
Optimum number with no added capacitance or sacrifice in function capacity.

Dynamic Decoupling™
Exclusive with Datascan — eliminates high and low frequency noise for extremely reliable system operation. The decoupling circuit is right on the card.

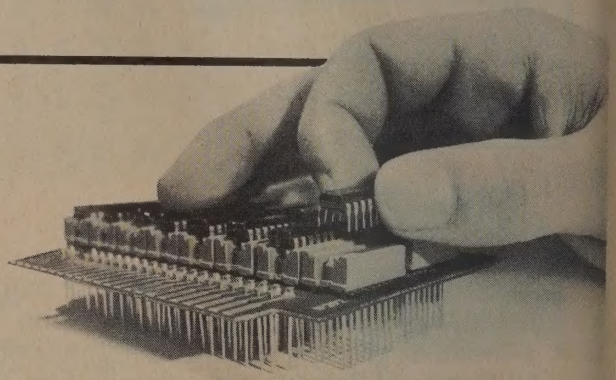


Edge Connections
44 pins for economy, availability, reliability—compatible for any type of termination.

Card Keying
Unique 3 slot interpin keying — prevents accidental interchanging or reversing—saves all 44 pins for active connections.

A New Concept in Logic Card Systems

- Economic Savings
- Less Noise Problems
- Less Software
- Plug-in Conveniences
- Over 100 Function Logic Cards Available
- Exclusive Dynamic Decoupling™



The new WRAP-X cards contain wire wrap sockets for 14 pin IC'c and/or 16 pin MSI chips. They are mechanically compatible with over 100 Datascan "function" logic cards — i.e., decimal converters, comparators, shift registers, etc.

You select which complex function cards you need and then do the simple logic yourself. Or, supply a block diagram or schematic and we will complete the system using computer-aided design and wire-wrap techniques. You save time, money and trouble.

One reason you save is that WRAP-X works with existing standard function cards; complex function cards which cannot be economically duplicated with the back-plane approach. The back-plane approach requires complex interconnections, extensive run list and many hours of engineering time.

Datascan's exclusive Dynamic Decoupling circuit is on every function logic card and WRAP-X board to assure low noise operation and system reliability.

Write for complete information and WRAP-X layout kit.

Wrap-X Module Price List

292A Wrap-X Module with sixteen 14 pin sockets	$47.00	OEM quantities of Wrap-X Modules with both 14 and 16 pin sockets are available on request. Consult factory for OEM discount schedule.
292B Wrap-X Module with sixteen 16 pin sockets	$49.00	

Datascan

DATASCAN, INC.
1111 Paulison Avenue, Clifton, N. J. 07013
Telephone 201-478-2800

Datascan IC Function and General Logic Cards

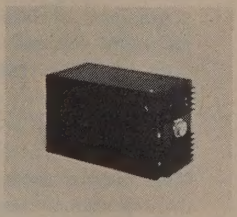
DESCRIPTION	LOGIC MODULE #
2 Input NAND Gate	201 401 601
3 Input NAND Gate	202 402 602
4 Input NAND Gate	203 403 603
4 Input Power NAND Gate	203A
4 Input NAND, expandable	204 404
4 Input Power NAND, expandable	204A
Diode Expander	205 405* 605*
Inverter	206 406 606
Inverter, Power	207
Inverter, Line Driver	208 408 608
4 Input Line Driver	209 409 609
4 Input Line Driver, expandable	210 410
Universal Flip-Flop	211 411 611
Toggle Flip-Flop	212 412 612
R-S Flip-Flop	213 413 613
One Shot Adjustable	214
One Shot. Fixed	214A
Input Level Converter	215 415 615
Output Level Converter (Neg.)	216 416 616
Astable Multivibrator & Gate	217 417 617
Power AND Gate	218 418 618
Schmitt Trigger	219 419 619
Reed Relay Board	220 420 620
BCD Storage FF w. 7 Segment Decoding	221
BCD Storage FF w. Decimal Decoding	222
Level Converter, Neg.	223
Decimal to BCD Relay Board	224
Storage Flip-Flops	225 425 625
Gated Storage Flip-Flops	226
One Shot, Adjustable	427
One Shot, Fixed	427A
Count Down Counter, BCD	228 428 628
Count Down Counter, Binary	229 429 629
Decade Counter	230 430 630
4 Bit Counter	231 431 631
8 Bit Shift Register	232 432 632
Decade Counter w. Decimal Conv.	233 633

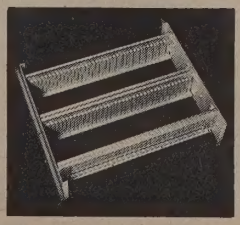
DESCRIPTION	LOGIC MODULE #
6 Bit Shift Register	234 434 634
Decade Ctr. w. 7 Seg. Conv.	235 635
4 Bit Binary Reversible Ctr.	236 436 636
4 Bit BCD Reversible Ctr.	237 437 637
Synchronous Counter, 4 Bit Binary	238 438 638
Synchronous Counter, BCD	239 439 639
Exclusive Or/Adder	240 440 640
BCD to Decimal Converter	241 441 641
BCD to Decimal Conv. w. Lamp Drivers	242 442 642
BCD to Decimal Conv. w. Nixie 1 Driver	242A 442A 642A
BCD to 7 Seg. Conv. & Lamp Drivers	243 443 643
Binary to Decimal Converter	244 444 644
Power Binary to Decimal Conv.	244A 444A 644A
8 Bit Parity Generator	245 445 645
Binary/Octal Converter	246 446 646

DESCRIPTION	LOGIC MODULE #
4 Bit Comparator, Parallel	247 447 647
12 Bit Shift Register	248
Operational Amplifier Board	256 456* 656*
Crystal Oscillator	260 460 660 660B
Crystal Oscillator	260A 460A 660A
6 Decade Counter/Divider	261
Synchronous Clock Board	262 462 662
DC to Frequency Converter	263 463* 663*
±15 V Power Converter @ 0.1A	264 664*
D/A Converter, 3 BCD Decades	265 665*
D/A Converter, 12 Bit Binary	265 665A*
Pulse Coupled Flip-Flops	266
D/A Converter, 6 Bit Binary	267 667*
A/D Converter Control Board	268 668*
One-Shot Adjustable	669
One-Shot Fixed	669A
Discrete Inverter	271 471* 671*
Time Delay	285 485 685
Transfer Gate	289 489 689

NEW MODULES NOW AVAILABLE

DESCRIPTION	LOGIC MODULE NO.
2 Input OR Gate	273
2 Input NOR Gate	274
2 Input AND Gate	275
2 Input Exclusive OR Gate	276
8 Input NAND, Expandable	278
10 Input NAND Gate	279
2 Input Power Gate	290
Power Transfer Gate	691





ACCESSORIES

POWER SUPPLIES

Solid state units, with current limiting and over-voltage protection. Available for use with or without dynamic decoupling in the logic system.

CARD DRAWERS

Datascan offers standard card drawers with 1 rack (40 slots), 2 racks (80 slots) or 3 racks (120 slots). All drawers are furnished with a finished 5¼" front panel, handles and holes for mounting chassis slides. Drawers can be furnished, at the customer's option, with solder, wire-wrap, termi-point or taper pin connectors; chassis slides; 4-layer power buss and rear connector panel.

DATASCAN, INC. 1111 Paulison Avenue, Clifton, N. J. 07013
Telephone 201-478-2800

datatron...expanding man's capability with data.

From its inception. Datatron has purposely sought to attain a national position of leadership in the fast growing commercial and government markets for low-cost, high-performance electronic equipment and systems. Through continual development of new approaches to problem solving in instrument design, the company has carved out four distinct areas of achievement.

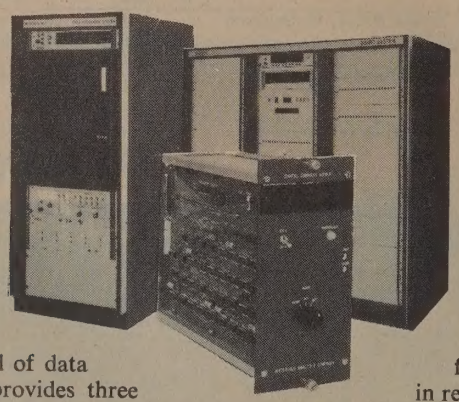
data handling systems — Datatron has a proven capability and background of successful experience in matching the design and manufacture of data handling equipment to problems encountered in widely varying fields of operation. These areas range from jet engine testing through data communication in the petrochemical field.

timing instrumentation — Engineering innovations, including reduction in equipment size and cost, coupled with increased capability and reliability quickly established Datatron's reputation in the forefront of timing technology.

video tape editing — By applying previously gained knowledge to the television industry, Datatron produces equipment providing fast and accurate control for both editing and real time control of quadraplex and helical video recorders.

microelectronic testing — The company has spearheaded a new dimension of total service capability in the electronic testing of integrated circuits, components, arrays, and modules. Utilizing either the Microelectronic Testing Laboratories or the company's unique series of computer controlled test equipment, Datatron can solve any manufacturer's testing requirement no matter how small or complex.

DATATRON data handling systems



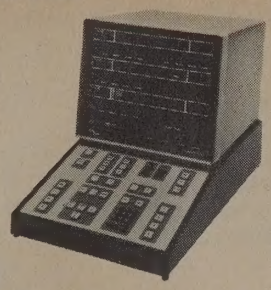
data acquisition systems — In the field of data acquisition and reduction, Datatron provides three alternate approaches to system implementation: (1) High performance, low cost systems (very small to medium size) for solving specific problems encountered in research or production areas. (2) Design and construction of systems for OEM applications. (3) An extensive line of linkage equipment for interconnecting subsystems.

data handling systems — Datatron can solve special data handling requirements in one of two ways. Small system requirements can normally be implemented using standard building blocks so that the system in effect becomes a standard product. Medium size systems, though often requiring more in the way of special engineering, can also be easily implemented using standard available building blocks. Such items include acquisition of meteorological data, monitoring of cardiograph information, logging of geophysical data, acquisition of data from radar pedestals, and monitoring of jet engine test cells. Other types of systems include magnetic tape to paper tape conversion and verification systems.

OEM systems — Datatron has extensive experience in providing OEM systems as accessories to analytical instruments. This requires the capability to produce reliable, low-cost equipment, and to respond quickly to customer requirements. Examples include the acceptance of analog and digital outputs from analytical instruments, their conversion to a predetermined format, and subsequent recording on such output devices as teletypewriters. High performance systems have been provided in environments ranging from oil well drilling rigs to electron current beam spectroscopy. Other OEM contracts have covered special counters and interface equipment to link graphic display devices to a computer via telephone dataset.

linkage equipment — Where a complete system is in existence but specialized equipment for the interconnection of subsystems is required, Datatron's capability for building a wide range of linkage equipment can be of great value. Typical linkage systems would connect a digital computer to a digital tape deck, XY plotter, timing system, or existing data system. Other linkage systems can connect digital tape transports to telephone datasets, punched paper tape, printer, XY plotter, etc.

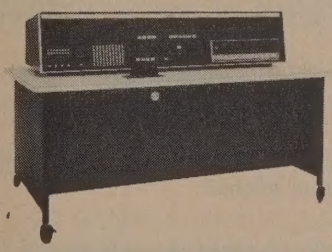
DATATRON video editing equipment



By applying timing techniques long used in the instrumentation field, Datatron offers a new approach to the real time control and editing of both high band quadraplex and helical video tape recorders. The Vidicue 5000 series of video editing equipment consists of Model 5100 Time Code Generator and the Model 5200 Control Unit. The Model 5100 is used during the video recording process, laying down on the cue track a time code identifying the tape to the video frame. During the editing or real time control process the Model 5200 Control Unit is used to control and precisely synchronize up to three video tape recorders. The operator can control his video tape recorder in one of four ways:

1. *Cue/Preview* — The automatic cue of a single video tape recorder to a preset point and the preview of a desired section of the tape.
2. *Add-On Edit* — The sequential assembly of material on the record tape from the playback tape.
3. *Insert Edit* — The user can insert new material in a prerecorded tape.
4. *AB Roll* — The most complicated of the edit modes involves precise control and synchronization of three machines. In this mode, data from two playback machines is made available for an effects edit on the record machine.

DATATRON microelectronic testing



microelectronic testing — Datatron offers a comprehensive program for the preconditioning, testing, and evaluating of integrated circuits, arrays, modules, and printed circuit cards.

1. For customers whose testing requirements do not justify the purchase or lease of a system for in-house preconditioning and testing, a complete testing service is available through Datatron's Microelectronic Testing Laboratories division.
2. Where quantity use of integrated circuits, arrays, or printed circuit cards makes an in-house tester practical, Datatron offers its Model 4400 Digital Module Tester.

The Model 4400 Digital Module Tester automatically tests (both DC and functionally) small, medium, and large scale integrated circuits and printed circuit cards having up to 100 active pin connections. Principle features of the Model 4400 are:

1. *Speed* — The unit tests devices at rates of up to 50,000 tests per pin per second.
2. *Total Test Capability* — At each pin, voltage may be forced and the resultant current monitored, or current forced and the resultant voltage monitored.
3. *Programming Flexibility* — Each pin can be independently set for both voltage and current values.
4. *Operational Flexibility* — This system includes a general purpose 16-bit computer providing flexibility both in the generation of programs and data logging.
5. *Low Cost* — The system is priced competitively with testers offering considerably less in performance.

Both Go/No Go and parametric tests can be performed by the Model 4400. When an error occurs during Go/No Go tests, the pin in error is indicated along with the point in the test program at which the error occurred, and the pass through the test if operating in a multiple pass mode. An integral analog-to-digital converter and multiplexer permit the operator either manually or under computer control to read current or voltage at any pin or bias supply within the system.

Data logging of test results can be obtained either on the teletype included with the system or optional punched tape or magnetic tape units. Data logging can be performed in one of three modes:

1. Record pin in error, point in program at which error occurred and pass (if multiple pass).
2. Same as 1. above, plus the recording of voltage and current at the pin in error.
3. The recoding of voltage and current at selected pins for every nth device.

The Model 4400 is programmed using a conversational routine between the computer and the operator. In this routine the computer asks questions and the operator responds. Since only a limited response is permitted to all questions, it is extremely difficult for the operator to misprogram a device. The tester's strictly English language format offers another major benefit. After, only a short period of familiarization, operators can prepare complete programs within one hour.

microelectronic testing laboratories — The Microelectronic Testing Laboratories (MTL) division of Datatron completes the cycle of total service capability. As an independent laboratory, MTL provides a new service to the commercial equipment manufacturer. This service is a unique concept of high volume, low-cost preconditioning and screening of microcircuits.

For the first time, the commercial equipment manufacturer has a service to parallel that available to the military and aerospace equipment manufacturers. By abstracting from and implementing the most usable portions of the military and aerospace high reliability programs, MTL is able to provide orders of magnitude improvement in commercial system reliability at an extremely low cost.

The services offered by MTL include device burn-in (aging), thermal shock, and computer controlled DC, functional testing. Experience proves that such preconditioning more than pays for itself in reduced manufacturing costs, plus vastly improving the reliability of the end product.

MTL performs an additional service for each customer by identifying each electronic component according to its specific failure mode, and by supplying a summary report showing a complete recap of the entire lot subjected to testing.

DATATRON timing instrumentation

Whenever analog data is recorded on instrumentation tape recorders, the need exists for timing equipment. By laying a serial time code down on one track of the tape recorder during data acquisition and then during data reduction playing it back, timing instrumentation provides both indexing and correlation of recorded data. Datatron offers a complete line of timing equipment to solve your problems.

In addition, Datatron also possesses extensive capability in the production of timing systems. These include complete range timing systems, countdown systems, sequencer control systems, and computer integrated timing systems.

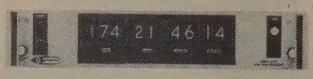
Model 3000 Time Code Translator/Generator

When coupled with the Datatron Model 3400 Tape Search Unit, the Model 3000 Time Code Translator/Generator provides a complete, highly flexible timing system for those facilities where both data acquisition and reduction are performed.

As a generator, the unit accumulates time from an internal frequency standard. Synchronization controls permit close correlation, if desired, to an external time standard. The Model 3000 generates up to five serial time codes simultaneously while also outputting pulse rates for system synchronization and parallel data for time tagging of information.

As a translator, the unit will accept many different time codes such as the IRIG and NASA families, the XR3 code, or the Vela uniform code simply by changing a printed circuit card. High or low speed, forward or reverse translation is provided and outputs include serial time codes, parallel data, and pulse rates. Such items as input carrier filters, and digital error bypass logic usually found only on much more expensive units are included as standard features in the Model 3000.

Model 3100 Time Code Generator

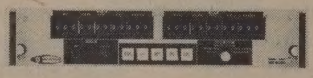


Where timing is required for data acquisition at a site remote from the data reduction station, the Model 3100 Time Code Generator is an ideal solution. This generator accumulates time from an internal crystal oscillator, includes synchronization logic, and outputs up to five serial time codes along with pulse rate and parallel outputs.

Model 3200 Time Code Translator

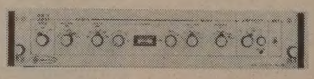
The Model 3200 Time Code Translator permits high or low speed, forward or reverse translation of a time code from magnetic tape or can be utilized as a terminal device to accept a time code over RF link. The unit provides serial time code ouputs for the redubbing of magnetic tape or "quick look" on strip chart recorders, parallel outputs for entry into digital data systems or time tagging of recorded digital data, and pulse rates for system synchronization.

Model 3400 Tape Search Unit



The Model 3400 Tape Search Unit Complements the Model 3000 Time Code Translator/Generator and Model 3200 Time Code Translator. When used in conjunction with a translator, this unit provides automatic search for a data interval as programmed by front panel rotary thumbwheel switches or by a digital computer.

Model 3600 DC Code/Failsafe Unit

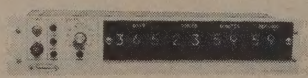


The Model 3600 DC Code/Failsafe Unit adds capability and flexibility to either the Model 3200 Time Code Translator or the translator portion of the Model 3000 Time Code Translator/Generator. Utilization of the Model 3600 with either of these units provides the capability of accepting DC level shift time code inputs and also eliminates output discontinuities due to dropout of either a modulated carrier input or a DC level shift input. The Model 3600 has a wide dynamic range commensurate with the dynamic ranges of both translators.

Model 3700 Remote Display Unit

The Model 3700 Remote Display Unit accepts up to 15 digits of parallel BCD inputs, converts these to a decimal form and drives the front panel Nixie display. The inputs to the Model 3700 are compatible with the parallel BCD time outputs of the Model 3000, Model 3100, Model 3200, and Model 3350 timing units. Other logic level inputs are also available.

Model 3350 Digital Clock



The Model 3350 Digital Clock accumulates time-of-day and day-of-year utilizing either an internal crystal oscillator or the 60-cycle power line as a frequency source. Digital outputs are available for time tagging data when the clock is used in data system applications. Accumulated time is displayed on the front panel. The unit is entirely solid state, but is priced competitively with electro-mechanical or mechanical units.

Datatron's creative engineering approach is supplemented by a completely new manufacturing facility with an experienced staff capable of making on time deliveries and providing total after-sales service.

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free

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☐ 284 page Control Handbook (1970 edition) describing industrial control circuits, interface modules, applications, the teaching "Logic Lab", the INDAC-8 industrial data acquisition system, and the PDP-14 programmable control computer.

☐ 438 page Logic Handbook (1970 edition) including description of all Digital's logic modules, hardware, power supplies, interfacing to the PDP-11 computer, and complete 1970 module price list.

Send for your free copies.

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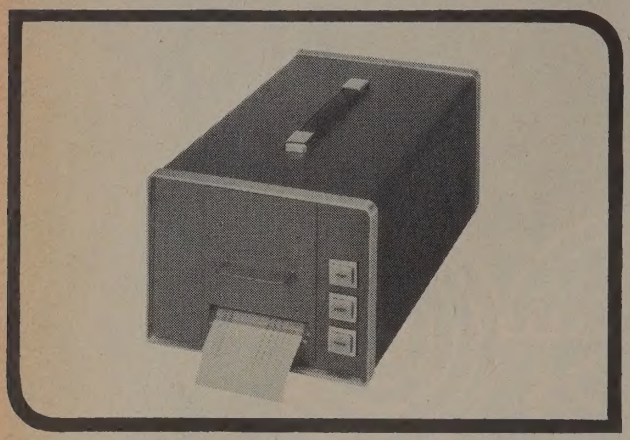
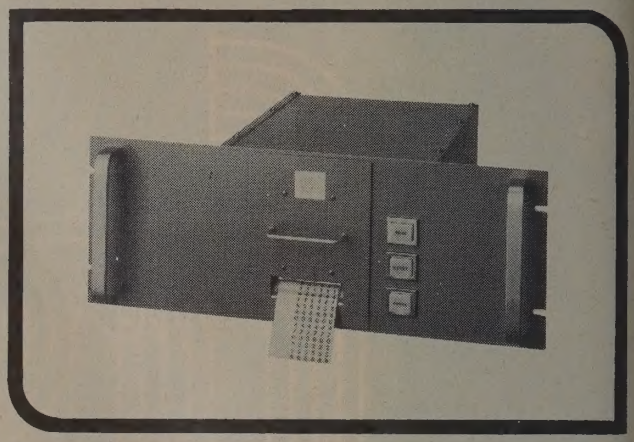




MODELS 2014 & 2020

DIGITAL PRINTERS

• 4 to 20 columns • 60 lines per minute • BCD parallel entry 8421, 4221, or 2421 • Modular construction • All solid state circuitry • Available options include: clock printout, log indexing, floating point, memory, 180 lines per minute

Digitron Printers are specifically designed for the facility requiring a low-cost digital printer for recording from all types of digital instruments and systems. They are complete units with power supply and all electronics, ready for recording.

SPECIFICATIONS

MODEL 2014 AND MODEL 2020 DIGITAL PRINTERS

1. PRINT RATE
1 line per second.

2. NUMBER OF COLUMNS
Basic Model 2014 ..... 4 to 14 columns
Basic Model 2020 ..... 10 to 20 columns

3. FORMAT
Horizontal spacing: 0.285″ ±.002″.
Vertical spacing: 4.25 lines per inch.
Character size: 0.160 x 0.100 W.

4. PRINTABLE CHARACTERS PER COLUMN (FONTS AVAILABLE)
Choice of fonts in any column is as shown in the following table. Note: A fixed colon or decimal point can be supplied to print between any column.

5. PAPER
Length approximately 250′. Model 2014 uses 4″ width. Model 2020 uses 6″ width.

6. MOUNTING
Rack mounting, standard: 7″ H x 19″ W x 15″ D, or — Table mounting, portable case with handle: 7¼″ H x 10″ W x 16¼″ D.

7. POWER
115 Volts ±10 Volts, 50 to 400 Hz fused at ½ A.

8. CONSTRUCTION
Modular, all silicon semiconductors and integrated circuits.

9. FRONT PANEL CONTROLS
Power-on switch and indicator light.
Print switch, reset switch, hours advance and minutes advance.

10. DATA INPUT (LOGIC LEVELS)
A. Standard: "1" = +2.4 to +30 VDC; 100K ohms input impedance.
"0" = +0.4 ±0.4V; 1.5 ma (std. DTL Load).
B. Alternate: "1" = −3V to −30 VDC; 100K ohms impedance.
"0" = −0.4 ±0.4V; 100K ohms impedance.

11. PRINT COMMAND
A. Contact closure to gnd. (normally closed, continues to print when open).
B. −3 to −30 VDC, continues to print until signal is removed. (See 10B).
C. +3 to +30 VDC, continues to print until signal is removed. (See 10A).

12. CONTROL SIGNAL
Busy during print cycle: 1 second.
A. +3.5 VDC gate during print cycle. Normal reference ground.
B. Vcc (−30 to +30V) during print cycle. Normal reference ground. User must supply Vcc.

13. OPTIONS
F ... Floating Point.
H ... High Speed — 180 lines per minute.
M ... Memory.
P ... Table Model — Portable case.
T ... Digital Clock — prints AM or PM, hours 1 through 12 and minutes 0 through 59. Memory prevents loss of time during print cycle. Time set switches on front panel.
U ... Print Identification Index — Pulsed counter shows numerical sequence of recording from 1 to 99. May be reset by front-panel switch, contact closure to ground, or signal of (−3 to −30V, see Item 10) or (+3 to +30V, see Item 10).
V ... Decimal Point or Colon.
X ... Special Fonts.

AVAILABLE CHARACTER FONTS PER COLUMN

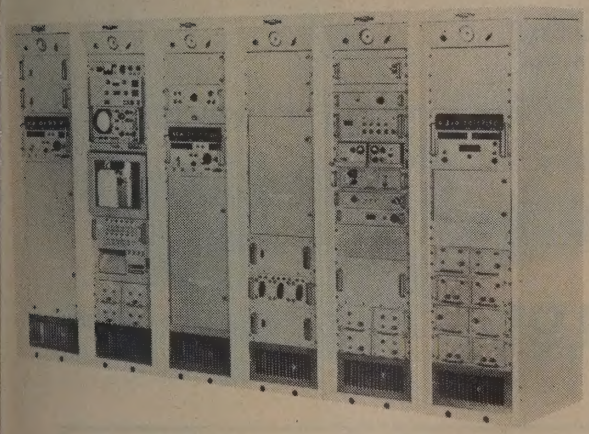
Font	Characters In Font											
A	0	1	2	3	4	5	6	7	8	9	.	
E	A	B	C	D	E	F	G	H	I	K	L	M
F	N	O	P	R	S	T	U	V	W	X	Y	Z
*G	0	1	2	3	4	5	0	1	2	3	4	5
H	0	1	2	3	4	5	6	7	8	9	10	11
L	•	−	+	A	∞	V	M	Ω	K	X	÷	
*M	12	1	2	3	4	5	6	7	8	9	10	11
*N	AM	PM	AM	PM	PM	PM	AM	PM	AM	PM	AM	PM
X	Special fonts are available											

*These 12-position fonts are used for time recordings from an internal clock. See options, Item 13 of these specifications.

GEO SPACE SYSTEMS, INC.

DIGITAL SYSTEMS AND TIMING EQUIPMENT

COMPLETE TIMING SYSTEMS



APOLLO TIMING SYSTEM

The most sophisticated central timing systems built by Geo Space Systems, Inc. were installed onboard the National Aeronautics and Space Administration's new Apollo instrumentation ships. The system generates time codes and a variety of standard and nonstandard reference frequencies and distributes them to range instrumentation equipment located throughout the ships. It provides time signals that are synchronized within one ten thousandth of a second with the Naval Observatory.

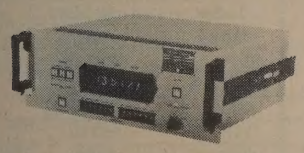
Outputs, derived from precise rubidium and crystal frequency standards by redundant master time-of-year clocks and time signal generators, include standard NASA and IRIG time codes, serial binary time-of-year and time-of-day, serial binary-coded-group time-of-year and paralleled BCD time-of-day. Elapsed time clocks are incorporated for complete pre, or post event timing, and feature manual or automatic initiation. All frequencies and time codes are channelled through a system patch panel for programmable distribution. A time scaler produces time and event markers for use with event recorders and plotting boards.

The system's time comparison equipment includes a WWV receiver, a VLF receiver, chart recorders and an oscilloscope featuring a plug-in unit to make it readily available for use in synchronizing, timing procedures and troubleshooting. VLF doppler effect is corrected by a ships motion compensator.

The utmost in operational dependability has been incorporated into this system, exemplified by: The crystal frequency standard, phase-locked to the rubidium frequency standard to within ±0.2 degrees, is automatically switched in place of the rubidium standard if the rubidium standard output drops to half amplitude or if there is a dropout of a whole cycle. A monitoring circuit accomplishes similar switching between master time-of-year clocks. Synchronous, non-transient switching between time signal generator outputs is provided by the transfer switch unit.

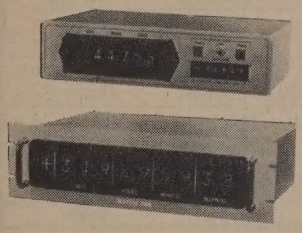
Redundancy also exists in the system master power supplies. An internal battery pack is also automatically selected in the event of main power failure. System battery chargers keep the stand-by pack ready at all times.

DIGITAL EQUIPMENTS AND SYSTEMS



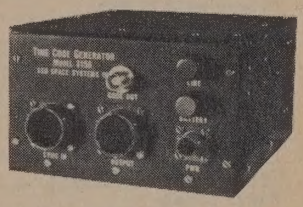
TIME CODE GENERATORS

This line of advance-design equipments begins with the GTG-1000, developed to meet the most stringent time correlated instrumentation requirements; and extends to the GTG-3000, designed for applications requiring a reliable, low-cost time signal source of ±1 second accuracy.



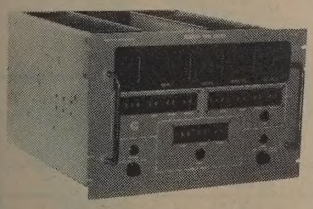
REMOTE DISPLAYS

Digital display indicators are available individually, or as companions to GSS time code generators. Simple time-of-year, time-of-day, and elapsed time indicators are featured, as well as models which incorporate selected time of event output. They are available in individual cabinets finished to customer specifications, or as rack mounted units.



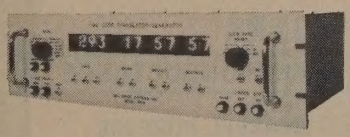
AIRBORNE TIME CODE GENERATOR

Model 8156, qualified for airborne use, is 5.6 x 6.6 x 3.5 inches and weighs only 3.2 pounds. It generates modified IRIG B time code with frequency stability of 1 x 10^{-6} and drift rate parts of 10^{8} per week provided by an internal temperature-compensated crystal oscillator. Time is preset by a 20-bit parallel BCD time-of-day input and an external switch or relay closure. An internal nickel-cadmium battery provides backup power during input power dropouts.



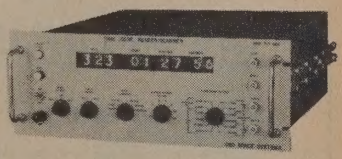
ELAPSED TIME CLOCKS & COUNT-DOWN GENERATORS

Capable of countdown and countup, with controls for hold count and count adjust, these units can be started automatically at a preset time-of-year, by an external start pulse, or manually by a front panel pushbutton. Preset time-of-year and preset initial elapsed time value (plus or minus) are set in by convenient front panel thumbwheel switches.



RANGE TIME CODE TRANSLATOR/GENERATOR

This RTC T/G is capable of functioning either as a subcentral timing system or an independent timing generator. Using dual-in-line integrated logic, the Model 8174 generates all the necessary timing signals and pulse rates for use in radar systems and computers. This includes NASA BCD and serial codes as well as binary time-of-year in tenths of seconds. Solid state components and technology are used throughout.



TIME CODE READER SCANNER

The GSS Time Code Reader/Scanner, Model 8108, provides reliable phase-coherent serial and parallel outputs when reading noisy time code signals with non-coherent carriers. An acquisition/lock feature assures coherent time outputs for up to 32 frames of signal dropout once sync is initially acquired. The standard unit handles the NASA 36-bit time code at the standard 1 kHz rate and four non-coherent carrier rates. Other codes and rates are optionally available.

Followng the introduction of silicon integrated circuit micrologic modules, Geo Space Systems, Inc. redesigned its line of standard building block module cards and incorporated them into a new family of timing system equipments. The company meets the needs of government and industry from a simple clock to a dual or triple-redundant, highly sophisticated digital system.

In the data display field, a team of engineering specialists is available to analyze customer needs and custom tailor our standard system configurations to their specific needs.

GEO SPACE SYSTEMS, INC.
6301 49TH STREET NORTH, P. O. BOX 13575
ST. PETERSBURG, FLORIDA 33733
Phone: 813 - 525-1161

SOLID STATE FUNCTION MODULES

READY TO USE

ALL UNITS

- Fully Encapsulated
- Suitable for P.C. Mounting
- Operate from ±15V
- Short Circuit Protected

A/D CONVERTER

SPECIFICATIONS (25°C unless noted)

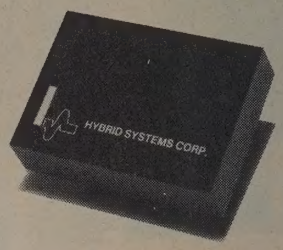
MODEL	501
Bits	10
Input Range	0 to +10V
Conversion Time	30 μSec
Code	Binary
Accuracy vs. Temp.	75PPM/°C
Price (1-9)	$195

10 BITS

30 μSec CONVERSION

$195

A/D CONVERTER



MODEL 501

D/A CONVERTERS

SPECIFICATIONS (25°C unless noted)	10-BIT			11-BIT	12-BIT	
	FAST ECONOMY	GENERAL PURPOSE	EXTRA FAST	GENERAL PURPOSE	MULTIPLYING AC or DC	
MODEL	320	325	340	350	301	302
Resolution (# of Bits)	10(.1%)	10.(1%)	10(.1%)	11(0.05%)	12(.1%)	12(0.025%)
Logic Code	Binary	Binary	Binary	Binary	BCD	Binary
Full Scale Output	15 ma	10 V	10 ma	10 ma	±10 V	±10 V
Settling Time (0.05%)	750 nSec	20μSec	200 nSec	750 nSec	10 μSec	10 μSec
Reference Range - Min/Max.	+10V/+15V	Built-In	Built-In	Built-In	±10V	±10V
Accuracy vs. Temp. (ppm/°C)	50	50	25	25	25	25
Offset Drift vs. Temp.	———	20 μV/°C	———	———	20 μV/°C	20 μV/°C
Power Supply Rejection	N/A	.05%/%	.005%/%	.005%/%	.005%/%	.05%/%
Power Supply	+10V/+15V	±15V	±15V	±15V	±15V	±15V
Price (1-9) −25°C to +70°C	$69	$99	$149	$165	$350	$350

D/A CONVERTER

10 BITS

750 nSec SETTLING

$69

MODEL 320

MULTIPLIER/DIVIDER

1%

NO TRIMMING

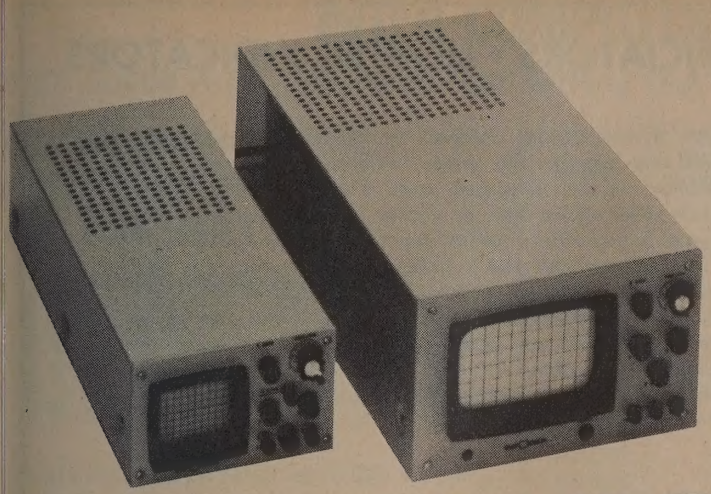
$39

MODEL 107C

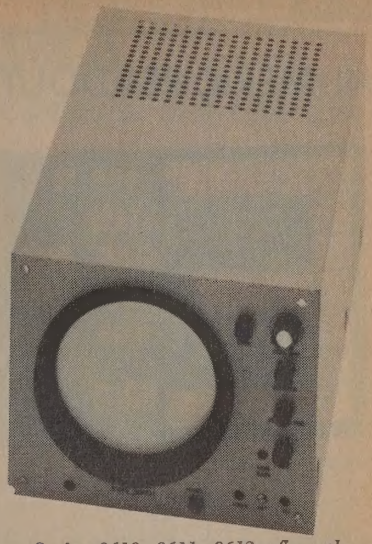
ANALOG MULTIPLIER/DIVIDERS

SPECIFICATIONS (25°C unless noted)	TRANSCONDUCTANCE		PULSE MODULATION		
	GENERAL PURPOSE		ANALOG DIVIDER	MULTIPLIER/DIVIDERS	
MODEL	107C	107	106A	108	101
Accuracy — Mult. (Quadrants)	1%(4)	1%(4)	———	.1%(2)	.2%(4)
Accuracy — Divide (Quadrants)	1%(2)	1%(2)	.1%(2)	———	.2%(2)
Signal Range	±10V	±10V	±10V	±10V	±10V
Denominator Dynamic Range	20:1	40:1	200:1	———	200:1
Input Impedance	10K	10K	10K	10K	10K
Linearity	0.75%	0.75%	.05%	.05%	.05%
Null	0.75%	X-axis adjustable to .1%	.05%	.05%	.05%
Bandwidth	400KHz	400KHz	100Hz	100Hz	100Hz
Slewing Rate	6V/μSec	6V/μSec	1V/μSec	1V/μSec	1V/μSec
Offset vs. Temp.	2mV/°C	2mV/°C	50μV/°C	50μV/°C	50μV/°C
Gain vs. Temp.	.03%/°C	.03%/°C	.005%/°C	.005%/°C	.005%/°C
Price (1-9)	$39	$55	$120	$120	$195

HYBRID SYSTEMS CORP. 97 Terrace Hall Ave., Burlington, Mass. 01803 • Tel: 617-272-1524 TWX: 710-332-7584



'eries 8602 (3") and 8622 (5") have vertical bandwidth to 2½MHz (4HMz ptional), TTL compatible Z axis control, and 12-step multirange sweep that lso provides DC-1MHz horizontal channel for X-Y operation. Fixed sweep nodels also available (Series 8601 and 8621).



Series 8610, 8611, 8612 offers the same capabilities as the 8600, 8601, 8602, with 5" circular CRT.

CRT DISPLAY

Basically, Infodex offers three series of scopes — 3" rec-angular, 5" rectangular, and 5" round. Each series em-braces 22 standard models, ranging from X-Y indicators with AC coupled Z axis for gray scale modulation, through a choice of 18 triggered sweep ranges, to three models with 12-step multi-range sweep. All sweep models have TTL compatible Z axis controls. 66 models in toto, whose gen-eral specifications include:

Vertical bandwidth — 2½ MHz
Horizontal bandwidth — 1 MHz
Sensitivity — 100μV/div
Sweep rates — 1μs/div to 500 ms/div

Plus many options.

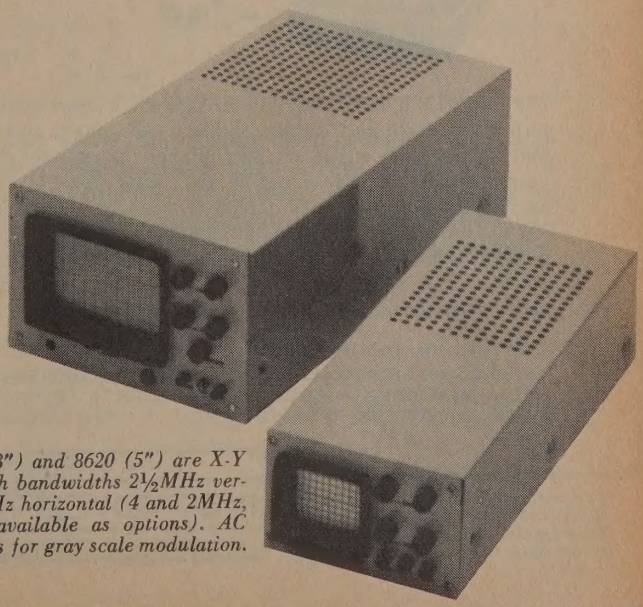
However — many customers need something a little differ-ent. Infodex circuit design and packaging gives outstand-ing manufacturing flexibility so that we can provide specials with reasonable lead times and price tags.

Therefore — if you need special capabilities and/or con-figurations, in prototype or production quantities — give us a call!

Note: Deflection amplifiers also available as individual components.

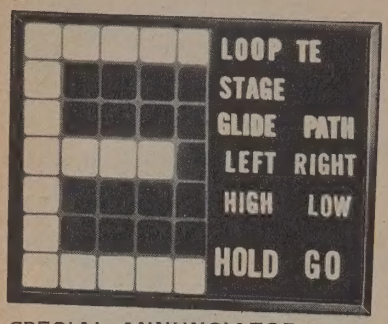
INFODEX
INCORPORATED
7 Cherry Avenue, Waterbury, Conn. 06702 • 203-757-9291

Some special assem-blies, delivered ready for user installation in custom applications.



Series 8600 (3") and 8620 (5") are X-Y indicators with bandwidths 2½MHz ver-tical and 1MHz horizontal (4 and 2MHz, respectively, available as options). AC coupled Z axis for gray scale modulation.

NUMERIC READOUTS • ANNUNCIATORS • LIGHTED INDICATORS

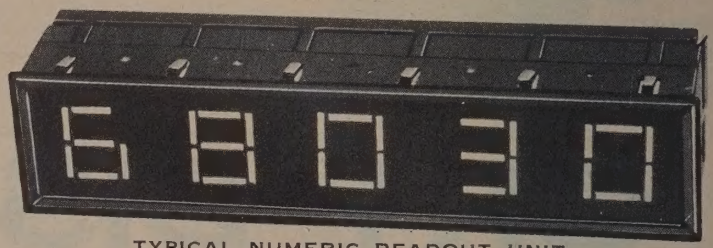


SPECIAL ANNUNCIATOR UNIT

NOW, a new modular approach to Lighted Information Displays that provides the design flexibility and attractive appearance usually associated with expensive custom units. INFO–LITE allows you to choose the Size, Shape, Color, Legend and Intensity combination that will meet your requirements • All INFO–LITE units are made from four basic light modules which have lighted area sizes of 3/8 x 3/8, 3/8 x 3/4, 3/8 x 1-1/8 and 3/8 x 1-1/2 • Colored filters, special legends and masks are added as required • Light sources are standard, flange based T 1-3/4 lamps • INFO–LITE assemblies are easily panel mounted and may be removed from the front for rapid servicing.

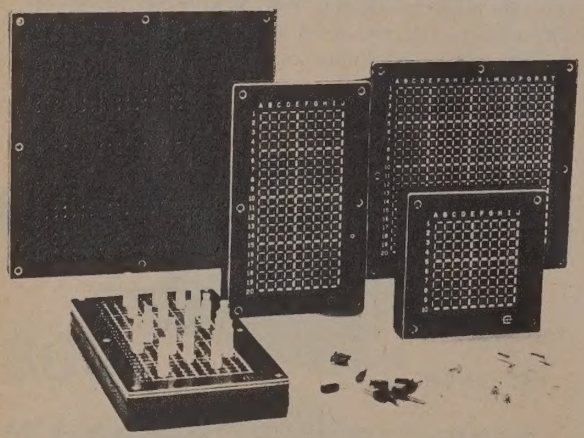
SEVEN SEGMENT NUMERIC READOUT

INFO–LITE seven bar numerics are available with .7", 1", 2" and 3" characters. They are supplied complete and ready to mount with the number of digits that you require. Decimal points, colons, + or – indicators, unit indicators, and a wide variety of other readouts may be integrated into the assembly. Mating decoder-drivers compatible with TTL logic can be supplied with the units.



TYPICAL NUMERIC READOUT UNIT

FEATURES: MODULAR CONSTRUCTION • MANY COMBINATIONS AVAILABLE FOR SPECIAL DISPLAYS ATTRACTIVE CUSTOM BUILT APPEARANCE • STANDARD LAMPS USED • SERVICED FROM FRONT SIMPLE, CLIP MOUNTING • LOW COST



MATRIX PROGRAM BOARDS

FEATURES:
- RELIABLE CLOSED ENTRY CONTACTS
- RUGGED PROGRAMMING PINS THAT WILL NOT BEND
- RAPID & CONVENIENT PROGRAMMING/SWITCHING
- COMPONENTS INSERTION INTO NETWORK WITHOUT SOLDERING
- ATTRACTIVE AND COMPACT/PACKAGE
- LOW CAPACITANCE FOR HIGH FREQUENCY APPLICATIONS

INFO–LITE Matrix Program Boards are a convenient and economical way to switch and program multiple terminal inputs and outputs without the panel clutter of older patching arrangements • The two-level matrix board is made of two planes of contact busses on .250" centers • Busses on one deck are perpendicular to the busses in the other deck so that switching crosspoints are obtained • Connecting an input buss to an output buss is done by simply inserting a programming pin at the desired crosspoint • Two types of program pins are available: Shorting Pins, and Diode Pins which are used for inserting a component (diode, resistor, lamp, etc.) into the contact matrix • Standard units are available in 10 x 10, 10 x 15, 10 x 20, 10 x 25, 10 x 50, 15 x 20, 15 x 25, 20 x 20 and 25 x 25 arrangements • Special matrices with up to 100 x 100 crosspoints and six levels of contacts are available.

TYPICAL APPLICATIONS: NUMERIC CONTROLLED EQUIPMENT • CIRCUIT/COMPONENT TEST PROGRAMMERS LOGIC MEMORIES • CODE GENERATORS • PROGRAMABLE DIODE MATRICES • FUNCTION GENERATORS COMMUNICATIONS DISTRIBUTORS • THERMO-COUPLE SELECTORS • SEQUENCE PROGRAMMERS.

Patent Pending

For more information on how INFO-LITE can meet your requirements, call your area representative or contact:

"LINKS BETWEEN MAN AND MACHINE"

INFO-LITE CORPORATION

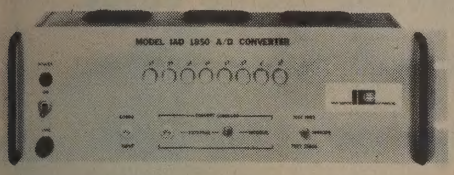
A SUBSIDIARY OF SYSTEMS & COMPONENTS, INC.

2337 LEMOINE AVENUE
FORT LEE, N. J. 07024
PHONE: (201) 947-6646

INTER-COMPUTER ELECTRONICS

High Speed A-D Converters/Fast Settling D-A Converters/Computer Interface Systems

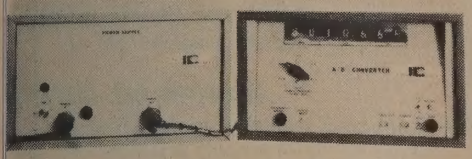
OUTSTANDING FEATURES OF A-D CONVERTER



- Data conversion rates up to 320 megabits.
- Aperture time on the order of tenths of nanoseconds.
- Word sizes ranging from 4 to 10 bits.

MODEL	MAXIMUM WORD CONVERSION SPEED	RESOLUTION	APERTURE TIME	% OF FULL SCALE ACCURACY (± ½ LSB) @ 25 C
SERIES A				
IAD-1104	80 MHz	4 bits	0.2 nsec	± 3%
IAD-2104	60 MHz	4 bits	0.2 nsec	± 3%
IAD-3105	30 MHz	5 bits	0.6 nsec	± 1.6%
IAD-5105	20 MHz	5 bits	0.7 nsec	± 1.6%
IAD-1206	12 MHz	6 bits	1.0 nsec	± 1%
SERIES B				
IAD-1208	10 MHz	7 bits	0.2 nsec	± 0.2%
IAD-0280*	5 MHz	8 bits	0.6 nsec	± 0.2%
IAD-2208	6 MHz	8 bits	0.5 nsec	± 0.2%
IAD-3210	3 MHz	10 bits	0.3 nsec	± 0.05%
IAD-1850*	1 MHz	8 bits	1 nsec	± 0.2%
IAD-1309	1 MHz	9 bits	0.8 nsec	± 0.1%

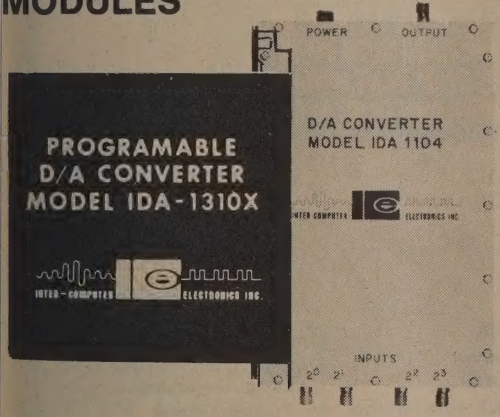
VARIABLE SAMPLE RATE SERIES



MODEL	RANGE OF CONVERSION SPEED	APERTURE TIME	RESOLUTION	FULL SCALE ACCURACY (± ½ LSB)
IAD 1104V	2 MHz to 80 MHz	0.4 nsec	4 bits	± 3%
IAD 3104V	500 KHz to 30 MHz	1.0 nsec	4 to 8 bits	± 3%
IAD 1206V	160 KHz to 10 MHz	0.5 nsec	6 to 8 bits	± 1%
IAD 3108V	100 KHz to 3 MHz	0.7 nsec	8 to 10 bits	± 0.1%

The Variable sample rate series offers models with sampling rates from 156 KHz to 80 MHz. All conversion systems are complete, providing sample and hold circuitry in both internal and external triggering modes, and includes power supplies and display. Designed to enable the systems designer to empirically identify an optimum sampling frequency for a particular sensor input.

D-A CONVERTER MODULES



FAST SETTLING D/A MODULES						
MODEL	IDA 1104	IDA 2104	IDA 3106	IDA 5108	IDA 1210	IDA 1310
Number of Bits	4	4	6	8	10	10
Settling Time (to stated accuracy)	10ns	20ns	30ns	50ns	120ns	1000ns
Accuracy (± 0.5 LSB)	± 3%	± 3%	± 1%	± 0.2%	± 0.05%	± 0.05%
Power Requirements	± 15V @ 250ma	—	—	—	—	—

The same technology that provides the basis for the A-D converters is used in the design of a full line of digital-analog converters. These units are characterized by ultra-fast settling times. Each of the D/A's have the capability of varying the reference voltage.

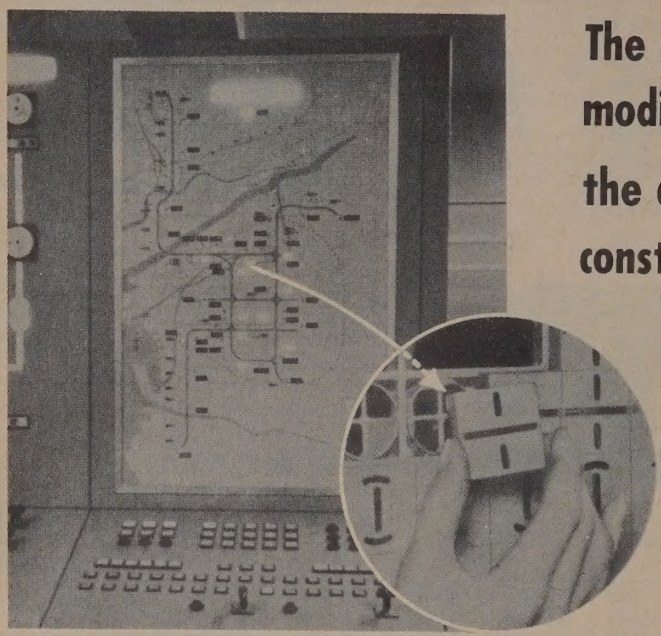
Inter-Computer Electronics manufactures a complete line of ultra high speed A-D converters, D-A converters, compatible multi-channel multiplexers, and computer interface equipment. For complete information call ICE at (215) 855-0922.

INTER-COMPUTER ELECTRONICS INC.

1213 Walnut Street, Lansdale, Pennsylvania 19446

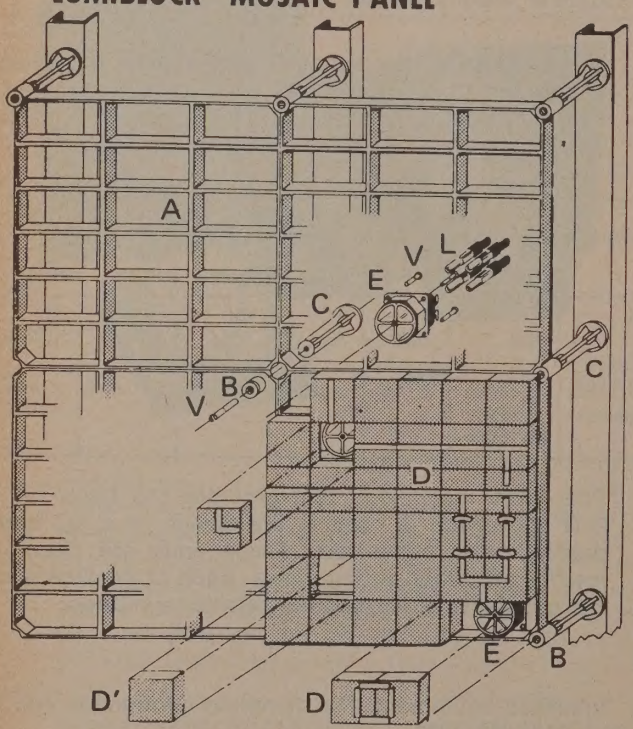
MULTIFARIOUS ILLUMINATOR SYSTEM

KCC MOSAIC PANEL



The panel design can be easily modified in accordance with the development of the plant construction.

LUMIBLOCK MOSAIC PANEL



* The 'LUMIBLOCK' is precisely standardized and manufactured on a mass-production basis thereby allowing easy assembling.
* The flow sheet offers a wide variety of illuminations even in complicated processes. Meters and switches can be easily installed.
* Exchange and addition of the illuminating units need only a simple tool.

A. Aluminum grid
B. Clamping washer
C. Pillar (colonette)
D. Covering block with symbol
D'. Neutral covering block
E. Light diffusing box
L. Lamp (switchboard type)
V. Fixation screw

K.C.C. SHOKAI LTD.

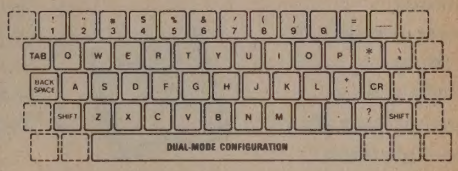
K. C. C.

Head Office: 4-31, Ouchi, Nada-ku, Kobe, Japan Phone: (078)87-0271/3
Branch: Tokyo, Nagoya, Nagasaki, Ohkubo.
New York: Nichimen Co., Inc., 22 ND Floor, 60 Broad Street, New York, N-Y. 10004 Phone DIGBY 4-3456.
Houston: Japan Cotton Co., Room 1510 Meirose Bldg., Walker at San Jacinto, Houston 2, Texas Phone CA 5-6863/3431

LICON
DIVISION ILLINOIS TOOL WORKS INC.
615 WEST IRVING PARK ROAD • CHICAGO, ILLINOIS 60634
hone (312) 282-4040 • TWX: 910-221-0275

SERIES 550 Electronic Keyboard

COMPLETELY SOLID STATE



Model 550 ASCII Keyboard Arrays

SERIES 550 FEATURING:

- Magnetic Core Switching
- ASCII, EBCDIC, BCD or Special Encoding
- Simple Construction
- Unlimited Configurations— Design your own Keyboard layout
- Compatibility with 5 volt IC Logic
- Negative or Positive Logic Output
- Minimum Power Consumption (3.5 watts)
- Keys Bottom on Housing — Not P.C. Card

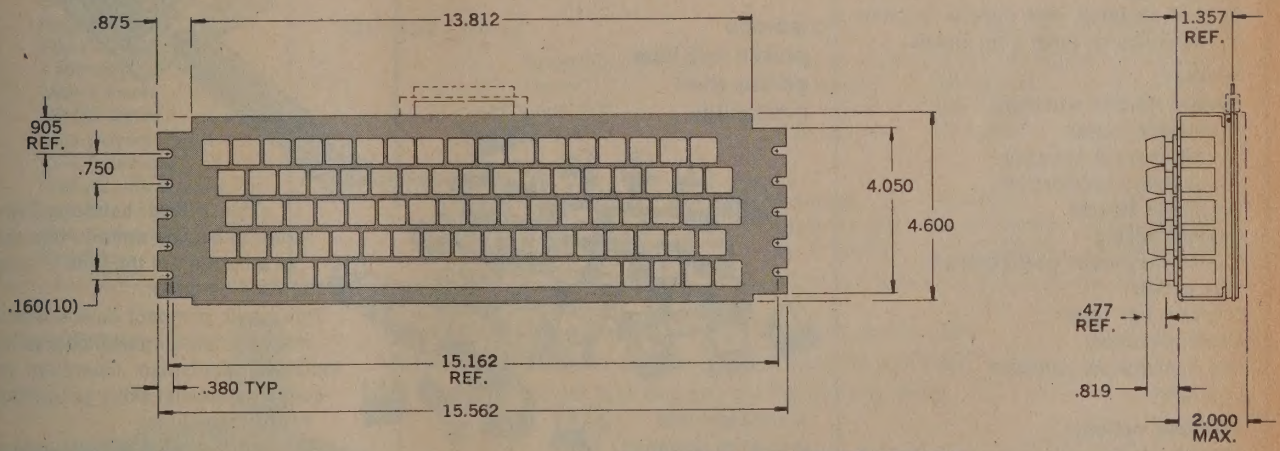
SERIES 550 ELIMINATES:

- Mechanical Linkage
- Delicate Chips
- Contact Bounce

SERIES 550 OPTIONS:

Strobe Output • Odd or Even Parity • Multi-Key Interlock • Two Key Rollover • Shift • Repeat Function • Shift Lock • Cabinet • Control Function Keys.

SERIES 550 Specifications



INPUT POWER

+5 VDC, ±5% regulation
700 milliamps maximum

OUTPUT LEVELS

Logic "0": +2.4 VDC nominal @ 1.5 ma drive

Logic "1": +0.4 VDC maximum @ 16 ma minimum sinking current

WEIGHT

Without cabinet: 3.7 lbs. (approx.)
With cabinet: 11.5 lbs. (approx.)

Patents Pending

AMBIENT TEMPERATURE

Operating: 0°C to +75°C
Non-operating: −55°C to +85°C

MODES OF OPERATION*

Mono-mode: no shift
Dual-mode: unshifted, shifted
Tri-mode: unshifted, shifted, control

CONNECTOR INTERFACE

Edge card accepts standard Cinch Jones connector or equivalent.

KEYSET CONFIGURATION

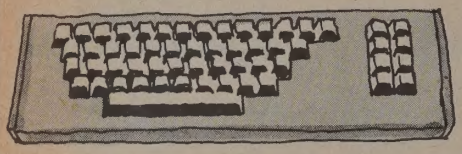
Keys mounted on ¾ inch centers with standard 3/8 - 3/16 - 3/8 inch typewriter offset between rows.

mechanical enterprises

Quality Engineering

innovations for 1970

unique mercutronic coding keyboard . . . design your own configuration



Mechanical Enterprises, Inc. can supply custom keyboard configurations immediately. Keyboards have no printed circuit boards or soldered connections. The plastic key module contains all encoding diodes and mercury switching element to provide reliable no-bounce output. Positive contact is ensured by use of non-oxidizing components under constant spring tension. A five-channel aluminum extrusion of any desired length holds the individual switch modules and the continuous flat, 11-wire cable that carries the signals.

Key modules are simply snapped into the channels and permanent contact is established.

Special features and options expand its versatility to meet your needs.

features:

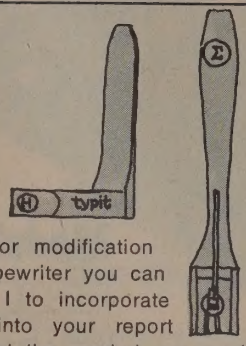
Simple reliable circuitry
No-bounce output
No mechanical linkages
No soldered connections
No circuit boards
Custom coding
Custom keyboard configuration
Low profile
Stepped key rows
Quiet operation
Not temperature sensitive
Low cost

available options:

Shift and Shift-Lock—Allows upper and lower case operation, similar to mechanical typewriters.
Strobe Signal—Signals input device to read keyboard output.
Strobe Signal Inhibit—Prevents strobe signal if more than one key is depressed.

Write for our keyboard brochure. Let us quote on your keyboard requirements.

type any symbol instantly with Typit

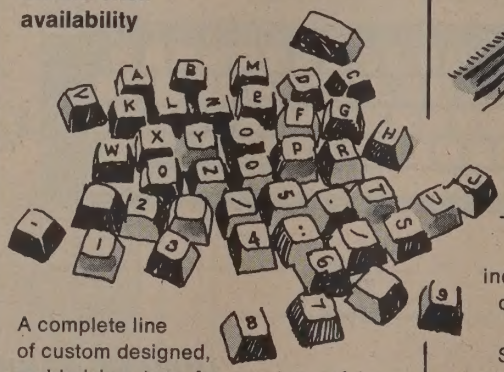


With a minor modification to your typewriter you can use Typit I to incorporate symbols into your report copy. Select the symbol you need (over 1,000 symbols available) and insert it in the typewriter. Strike any key and you've got it perfectly . . . quickly. Print quality is equal to that of your typewriter. Symbols can be custom designed to suit your requirements.

Note: Typit II is also available for IBM Selectric Typewriters with the same features and range of symbols as Typit I.

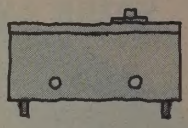
Send for catalogues of adapters and symbols available.

molded plastic key tops off-the-shelf availability



A complete line of custom designed, molded key tops for any type of keyboard. Keytops with integrally molded contrasting inscriptions are available from stock—standard alphanumeric as well as many special inscriptions. Plain keytops that can be custom engraved to meet customers' special requirements are also available. Write for descriptive literature and prices.

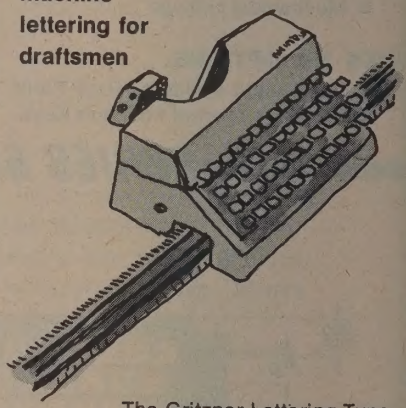
mercutron switch . . . fast response no bounce



Provides electrical properties of a mercury switch in a subminiature configuration. Unique design relies on mercury movement in a flexible sealed tube for fast response with no bounce.

Switching Capacity ..... 60 ma @ 24 VDC
Contact Rise Time ..... $<1 \times 10^{-9}$ seconds
AC Contact Noise ..... 10 Microvolts
Bounce Time ..... Zero
Operating Temperature Limits ..... -30°C to 60°C

machine lettering for draftsmen



The Gritzner Lettering Typewriter gives you uniform lettering in a fraction of the time it takes to do it by hand.

This small, compact device makes machine lettering available to the individual draftsman. Operation requires no special skills or training.

Features include:

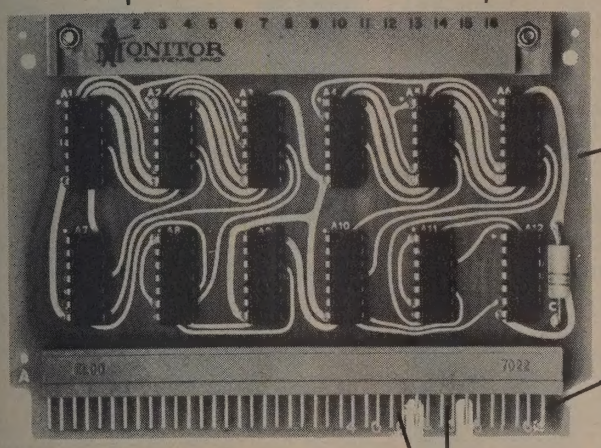
Standard keyboard with 26 letters, 10 numerals, and 20 miscellaneous punctuation marks and symbols. (Special symbols and keyboards available.) Easy adjustment is provided to obtain required impression. Inking is accomplished without messy, hard-to-replace ribbon. Indexing rail provides exact letter positioning. Priced at $300. Write for more detailed information.

For further information on the 1970 Innovations from Mechanical Enterprises call or write us at 5249 Duke St., Alexandria, Va. 22304 (703) 751-3030

MONILOGIC*

INTEGRATED-CIRCUIT LOGIC CARDS

MONILOGIC is a complete line of high-performance functional circuit cards, power supplies, and associated packaging hardware, designed for system integration with a minimum number of cards.
Reflecting MONITOR's extensive experience in data systems, MONILOGIC provides:



easy-access top-mounted test points for .080" scope probe tips

1/16" glass-epoxy board with 2-oz. copper on both sides

Size: 3.3" high x 4.65" wide

40 pin Elco Varicon connector

card keyed according to power supply voltage

A full complement of digital logic, analog, and interface card types.

Compatible TTL, DTL, and **HIGH-LEVEL** integrated circuits in dual in-line form, supplemented by discrete components where necessary.

High quality construction featuring test points and Elco Varicon connectors.

System orientation in the functional design of approximately 100 different standard card types.

Special order cards of over 200 different types for a variety of special applications.

Custom-designed cards for greatest economy in specific high-use requirements.

Hardware for card mounting in efficient assemblies, along with power supplies.

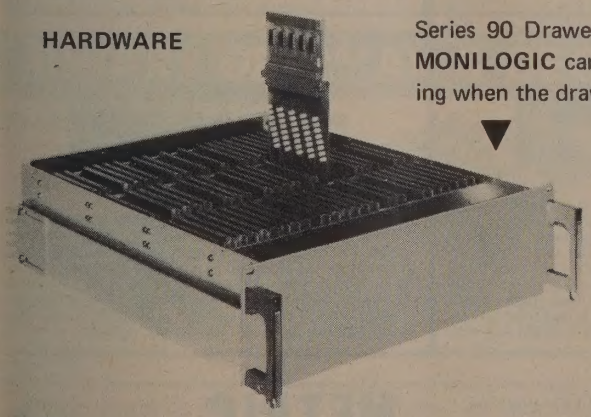
CARD TYPES

- Counters
- Registers
- Flip-Flops
- Expanders
- Matrix Gates
- NAND Gates
- Line Drivers
- Line Receivers
- Relay/Lamp Drivers
- A/D Converters
- D/A Converters
- Amplifiers

DTL – TTL – HIGH-LEVEL LOGIC

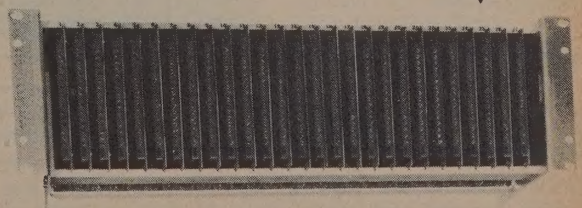
		DTL	TTL	HIGH-LEVEL
VOLTAGE LEVELS				
	Power Supply (V_{CC})	+4.5v to +5.5v	+4.75v to +5.25v	15v ± 1 volt
	Logic "1"	V_{CC} typical	2.6v typical	V_{CC} typical
	Logic "0"	0.3v typical	0.3v typical	1.0v typical
	Threshold	1.2v typical	1.3 typical	7v typical
PERFORMANCE:				
	Fan-out (to DTL or TTL)	8 typical	10 typical	10 typical
	Device Rate	Up to 8 MHz	Up to 20 MHz	Up to 2 MHz
	System Clock Rate	Up to 5 MHz	Up to 10 MHz	Up to .5 MHz

HARDWARE



Series 90 Drawer Assemblies, accommodate up to 128 **MONILOGIC** cards in a manner which permits top loading when the drawer is withdrawn on its latching slides.

Series 90 **MONIFILE** Assemblies are aluminum frame card files, designed to mount in a standard 19" EIA rack and occupies 5¼" of front panel space.



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CUSTOM DIGITAL SYSTEMS FROM STANDARD SUBASSEMBLIES

TIMING EQUIPMENT

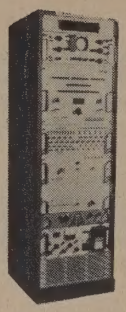
AMR TIMING SYSTEM

Model 8379

Timing System Model 8379 provides Atlantic Missile Range Time Codes B1, B2, C1, D1, and D5. The system features automatic or manual WWV synchronization, a WWV receiver, a synchronization oscilloscope, a waveform monitoring oscilloscope, a test point selector switch, and a versatile output patch panel. Models designed for ground station, airborne, or shipborne operation are available.

IRIG TIMING SYSTEM

Model 8020



Timing System Model 8020 generates IRIG Codes A, B, C, and D. The system contains receivers for automatic or manual synchronization to WWV, VLF or LORAN "C". Other features are: a Decimal Time Display in Hours, Minutes, and Seconds, an oscillator stability of 1 part in 10^{10} per day, an oscilloscope for waveform monitoring and fine synchronization, and an output panel for patching time codes and pulse rates to any one of 10AC and 12DC line driver amplifiers.

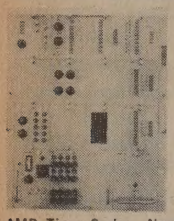
CENTRAL TIMING SYSTEM

Model 8259

Model 8259 Central Timing System contains a Model 8259-1 Time Code Generator, an oscilloscope, a WWV receiver, a VLF receiver, and a precision frequency standard. The Model 8259 Central Timing System provides an IRIG "B" output with built-in provisions for synchronization to WWV. Stability of the internal frequency standard is 5×10^{-9} per day. A VLF receiver is included for calibrating the frequency standard.

AMR TIME CODE GENERATOR

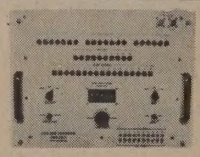
Model 8379-1



Time Code Generator Model 8379-1 is designed for mobile operation and is suitable for either airborne or shipborne use. Relay and neon output amplifiers are provided. The unit generates AMR Time Codes, Numbers B1, B2, C1, D1, and D5. Solid-state modularized construction permits expanding to additional codes by adding appropriate code generator modules.

IRIG TIME CODE GENERATOR

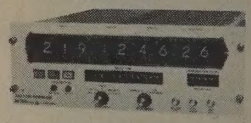
Model 8020-1



Model 8020-1 Time Code Generator simultaneously generates IRIG Codes A, B, C, and D synchronized to within 1 microsecond. Additional features include: Solid-state printed circuit card construction, taper-pin wiring, propagation delay correction to better than 1 microsecond, digital time retard and advance, parallel binary coded decimal Time-of-Day, and parallel straight binary Time-of-Day in millisecond increments. Other output formats and pulse rates are available on special order.

TIME CODE GENERATOR

Model 8259-1



Model 8259-1 Time Code Generator provides both serial and parallel IRIG "B" outputs. The unit features a decimal display of days, hours, minutes, and seconds, semi-automatic WWV tick synchronization, propagation delay correction, 1×10^{-8} per day oscillator stability, and an optional two hour battery for continuous operation during power failures.

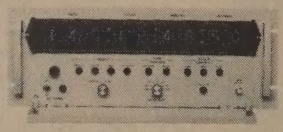
TIME CODE GENERATOR

Model 8134

Model 8134 Time Code Generator is available in options capable of simultaneously generating up to five serial IRIG modulated time codes. Digital advance/retard allows manual fine synchronization. A front serviced projection display provides a decimal indicator of days, hours, minutes, and seconds. The unit contains an unusual self-check feature for operating 1000 times faster than normal. A lamp test feature is also provided.

TIME CODE GENERATOR

Model 8258



Model 8258 Time Code Generator provides four separate, isolated serial IRIG "B" outputs having individually adjustable levels. Parallel BCD outputs representing days, hours, minutes, seconds, and milliseconds, are also provided. The unit features a panel mounted days, hours, minutes, and seconds display plus digital advance/retard for fine synchronization.

CAMERA TIMING UNITS

Models 8021 & 8024

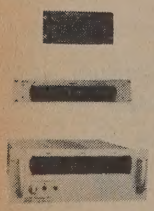
ASKANIA 8021

BOWEN 8024

The Askania and Bowen Camera Demodulators extract remote camera control and timing signals from the IRIG Time Code "B" signal. The units provide relay closures initiating shutter operation and high level neon outputs for film track timing. Three cameras may be started or stopped, remotely and independently, using three camera demodulators with channel selector switches set for three different IRIG "B" control function bit channels.

TIMING TERMINAL UNIT

Model 8205



Timing Terminal Unit, Model 8205, accepts serial IRIG "B" and produces a decimal display of hours, minutes, and seconds. The unit is capable of driving as many as six remote time displays. Optional remote time displays are available in standard and miniature sizes.

TRANSLATOR GENERATOR

Model 8165

Model 8165 Time Code Translator accepts either IRIG "A" or "B" as an input and produces IRIG "A", "B", "C", "D", and "E" outputs. A typical application of the Model 8165 is the distribution of IRIG "A" by radio link to a number of remote sites each having an 8165 translator. A precision internal oscillator provides continuous output time codes even during loss of input signal. Re-synchronization occurs automatically when the input signal returns.

TAPE SEARCH

Model 8193

The Model 8193 is capable of reading either IRIG "A" or "B" serial time codes. It may be used either for Tape Search or as a general purpose display for serial IRIG "A" or "B". A contact closure is provided when the accumulated time matches the value preset by the operator on panel mounted decade thumb-wheel switches. The unit is capable of driving as many as six remote displays.

Metric Systems Corporation produces an assortment of digital equipment ranging in scope from simple logic modules to complex digital instrumentation systems. Digital Systems designed and fabricated by Metric Systems are now in operation on both the Atlantic and Pacific Missile Ranges and most other Aerospace Instrumentation installations. Metric Systems invites your inquiries for solutions to problems involving special applications.

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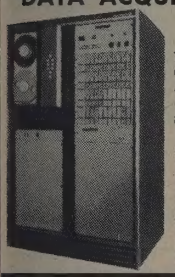
CUSTOM DIGITAL SYSTEMS FROM STANDARD SUBASSEMBLIES

DATA ACQUISITION SYSTEMS

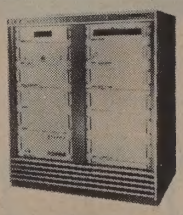
DATA ACQUISITION SYSTEM



Model 8126

Model 8126 Data Acquisition System accepts analog data, digitizes this data, and records the digital data on ½ inch magnetic tape in an IBM compatible format. Front panel controls provide selection of tape speeds and tape packing density. An internal clock is provided for time tagging each frame of data. The maximum sampling rate of the Model 8126 Data Acquisition System is 45,000 samples per second.

SUB-MULTIPLEXING SYSTEM



Model 8144

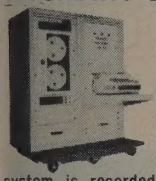
Model 8144 Sub-Multiplexing System scans 320 low-level input channels at a maximum rate of 200 steps per second. An internal IRIG "B" time code reader is provided for displaying the digitized input voltage of any selected input channel. The multiplexer is designed for low-level input signals in the range of 5 millivolts full scale and features a temperature drift of only 2 microvolts over a 25°C operating range.

DATA ACQUISITION PERIPHERAL

Model 8226

Model 8226 is a computer controlled data acquisition system. The computer performs data analysis, converts to engineering units, and prints out operator instructions. Data is analyzed in real time and recorded for future analysis. The system processes 40 analog channels to .01% accuracy.

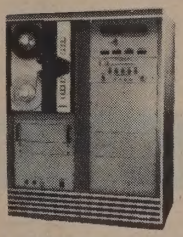
AUTOMATIC DIGITAL DATA LOGGER MODEL 8054



The Automatic Digital Data Logger, Model 8054, performs storage, conversion, parity generation, and logging of binary coded decimal (BCD) data generated by the AN/GJQ-9(V)2 Checkout Sequence Programming Set. The input data to this system is recorded on magnetic tape in an IBM compatible format.

The record length is variable and in the case of manual data, is controlled by manual operation of an "end of record" switch. Record length is limited only by the computer or the interface equipment.

MAGNETIC TAPE DIGITAL RECORDING SYSTEM

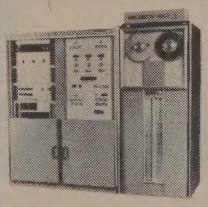


Model 8266

Model 8266 is basically a digital data formatter and recorder. The unit receives digital data words from several external devices at various data rates. The digital data is stored in a magnetic core memory and recorded on magnetic tape in IBM computer compatible format. The system contains a precision Time-of-Day clock for time tagging recorded data.

DATA ACQUISITION SYSTEM

Model 8176

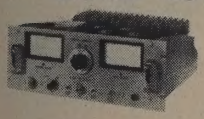


System Components Include:
- Irig Time Code Generator
- Tape Search System
- Sample and Hold Amplifiers
- Analog Multiplexer
- Analog/Digital Converter
- Magnetic Core Memory
- Magnetic Tape Recorder

System Capabilities Include:
- Accept analog input signals
- Accept digital input words
- High speed A/D conversion
- Prepare tape in IBM format
- Time tag all input data
- Patch panel selects operating modes

TEST EQUIPMENT

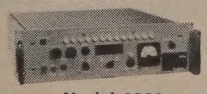
DIGITAL MOVING TARGET SIMULATOR



Model 8007M

Simulator Model 8007M is designed for use with "multiple time around" tracking radars. Late model radars, such as the AN/FPS-16 (V) radiate a number of transmitter pulses before the first distant echo is received. To simulate a distant target, the simulator must be capable of receiving several input pulses before producing the first delayed echo pulse. Conventional simulators are not capable of responding to an input pulse before the delay interval is completed. In Metric's Model 8007M Simulator, as many as eighteen (18) pulses may be propagating through the delay section simultaneously.

RADAR MOVING TARGET SIMULATOR/ CALIBRATOR



Model 8220

Series 8220 Radar Target Simulator has been designed for use either as a moving target video simulator or as a precise fixed range calibrator. The simulator is completely digital in operation, controlled by an internal precision VHF frequency standard. Range is preset by decimal thumbwheel switches. The instantaneous range value is available as a parallel binary output word and as an optional numerical display. Overall accuracy is ±3 feet in the internal PRF operating mode. The unit provides precise delay settings corresponding to radar ranges of 100 to 1,000,000 feet. Velocity may be varied from 0 to ±10,000 feet/second. The unit is designed to meet military specifications and has been designated SG903/APM-336V for government procurement purposes.

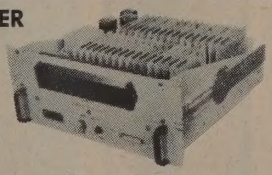
PROGRAMMABLE WAVEFORM GENERATOR Model 8272

Model 8272 Programmable Waveform Generator output consists of sixteen individually controlled voltage segments which may be individually adjusted to produce any desired pattern. Stepping rate for the segments may be varied from 10 steps per second to one million steps per second or controlled by a pushbutton. The pattern may be reflected to produce a symmetrical 32-segment waveform.

BINARY/DECIMAL & DECIMAL/BINARY CONVERTERS

BINARY/DECIMAL CONVERTER

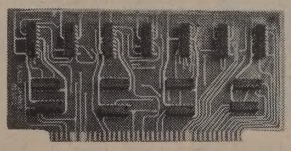
Model 8025



Model 8025 Binary-to-Decimal Converter is a high speed device for conversion of straight binary words up to 19-bits to their decimal equivalent and displaying the result. A typical application of the Model 8025 would be as a degrees, minutes, and seconds display for a straight binary shaft angle encoder. Any specified multiplication constant can be permanently wired into the converter making it possible to display the input binary word in any convenient unit such as hours, minutes, seconds, miles per hour, radians, degrees, minutes, seconds, etc.

DECIMAL-TO-BINARY CONVERTER CARD

Model Z-253



Model Z253 accepts three binary coded decimal digits on 12 lines and delivers a straight binary word on ten output lines. Decimal-to-Binary conversion is accomplished by a parallel logic matrix providing continuous output information. No external gating or control circuitry is required. The card operates from a single 5 volt power source and uses standard 0 and 5 volt integrated circuit logic levels.

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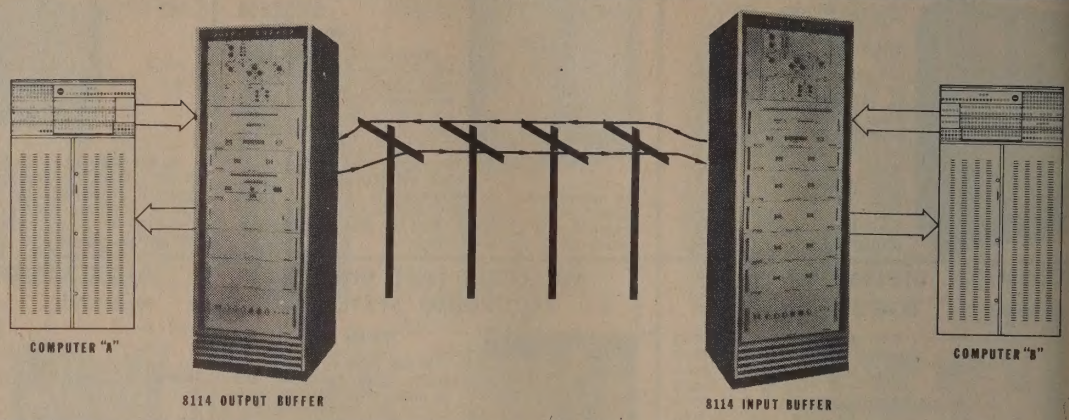
DIGITAL DATA COMMUNICATIONS EQUIPMENT

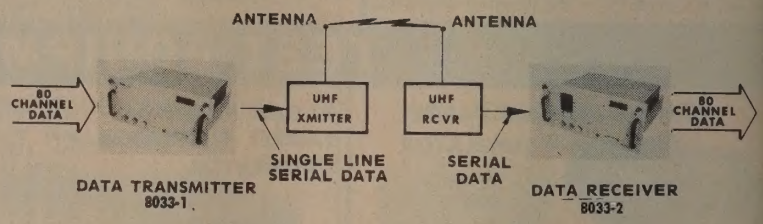
COMPUTER TO COMPUTER

The Model 8114 Data Transmitter (Output Buffer) and the Model 8114 Data Receiver (Input Buffer) form a complete two-way data transmission link between two digital computers. Data is transmitted at a rate of 2400 bits/second on Class 4B telephone lines. A single Model 8114 Transmitter/Receiver provides 4 separate channels each having a capability of transmitting 2400 bits per second. Two separate error detecting codes are employed to verify the quality of the data transfer.



POINT TO POINT

Model 8033 Data Distribution System transmits up to 80 channels of digital data from a centrally located transmitting station to any number of remotely located receiving stations. A complete Data Distribution System consists of a single 8033-1 Transmitter Unit located at the central transmitting station and an 8033-2 Receiving Unit located at each receiving station. The Transmitting Unit accepts up to 80 separate parallel input data lines and converts to a single serial output line suitable for transmission by a radio link. The Receiving Unit accepts the single line serial information and reconstructs the original 80 channel input data. Each of the 80 data channels may be operated at bit rates as high as 1000 bits per second producing a serial bit rate as high as 80,000 bits per second.



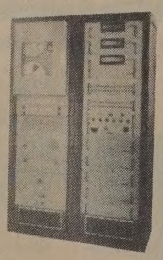
REMOTE LOCATION TO COMPUTER

HIGH DENSITY DATA TRANSMITTER

MODEL 8062

Model 8062 High Density Data Transmitter will accept serial Azimuth, Elevation and Range data words from a radar set. Timing pulses and a parallel time word are obtained from a time code generator.

The transmitter will accept 17 serial bits of Azimuth and Elevation data, a 20-bit Range word and two 36-bit auxiliary words which may be manually set in through the use of front panel switches.

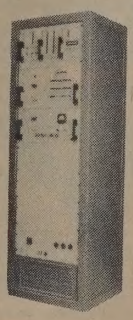


LOW DENSITY DATA TRANSMITTER

MODEL 8031

Model 8031 (CASY II) receives digital Radar Acquisition Data from a 7094 computer in the form of three 13-bit data words, 6 auxiliary bits and one sub-synch. The words are parallel dumped into a 45-bit input buffer register, transferred to a shift register and shifted out serially at 480-bits/10 frames per second rate.

The output bits modulate a 1920 CPS carrier to drive a standard 600 ohm telephone line. An internal test generator is provided which is capable of simulating computer commands.



MULTIPLE RADAR DATA TRANSMITTER

MODEL 8023

Model 8023

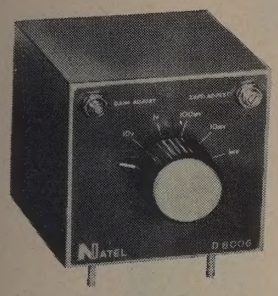
Real Time Data System, Model 8023, is the entire digital data link between 4 AN/FPS-16 radars and a Univac 1218 computer. Interrogate and Shift commands generated by the system are transmitted to the 4 radars. Incoming digital radar coordinate words are tagged with 9-bit identification and 23-bit time information, converted to Univac format, stored, and fed into the computer upon command.

Metric Systems Corporation produces an assortment of digital equipment ranging in scope from simple logic modules to complex digital instrumentation systems. Digital Systems designed and fabricated by Metric Systems are now in operation on both the Atlantic and Pacific Missile Ranges and most other Aerospace Instrumentation installations. Metric Systems invites your inquiries for solutions to problems involving special applications.

METRIC
Systems Corporation
736 N. BEAL STREET
FORT WALTON BEACH, FLORIDA
Tel: (904) 242-2111

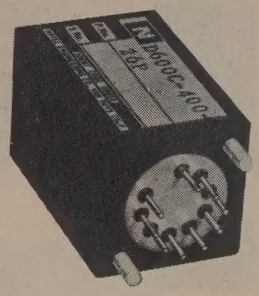
NATEL

PHASE SENSITIVE DEMODULATORS & AMPLIFIER DEMODULATORS



Natel's miniature solid state AC to DC Converters (amp-demods or carrier-demods) convert low level phase sensitive suppressed carrier AC input signals to a linearly proportional high level bi-polar DC voltage or current. The amp-demod provides a high input impedance and low output impedance with greater than 50 megohms isolation between input, output, and reference.

Amp-demods are designed for airborne and ground instrumentation and control applications—to operate subcarrier oscillators, meters, galvanometers, recorders, valves and servos.



SINGLE & MULTI-RANGE AMPLIFIER DEMODULATORS & DEMODULATORS

DEMODULATORS	D500	D600	—
AMP DEMODS	D6006	D7006	D8006
Linearity	±.5% E_o or ±5 MV	±.1% E_o or ±2 MV	±.05% E_o or ±1 MV
E_{out}	C*, F, G, J, K		
Z_{out}	1KΩ to ±5VDC E_o, 2KΩ ±10VDC E_o (3KΩ Demod Only)		
Freq. Response	20% of carrier	10% of carrier	5% of carrier
Ripple P-P	.5% or 3 MV	.1% or 1 MV	.05% or. 5MV
Null Offset	Adj. to zero ±1 MV		
Threshold	.01% of FS		

SINGLE RANGE MODEL					MULTI-RANGE	
MODEL	-73	-74	-79	-80	-72	-82
E_{in} VRMS	0-.025 to 0-.100	0-.100 to 0-1.00	0-1.00 to 0-10.0	0-5.0 to 0-25.0	.001 to 10.0	
					4 Ranges	8 Ranges
Input Adj.	Continuously adj. external POT. Full range. For internal adj. add "A" to part number.					
Dimensions (inches)	1.53x1.53 x3.03	1.03x1.03x1.53, Connector P 1.34x .79x1.72, Connector V			2.53x2.53x2.53	
Connector	(P) — Min. Plug-in,(S) — Solder Hook, (V) — DE9P Connector					

FEATURES:

- Isolation 50 megohms between input, output, and reference.
- Short circuit polarity protection
- Input over-voltage protection — 100 E_1 115 vrms max
- Quadrature rejection 60 db
- CMR: 60 db min DC to ref frequency — 30 v p-p max CMR signal

GENERAL SPECIFICATIONS:

- Frequency: 400 — 1000 Hz std
- Input Impedance: 500K (above 350 cps)
- Output Voltage: (F) ±2.5, (G) 0 — 5.0, (J) ±5 vdc, (K) ±10 vdc, (C)* $E_o = E_{in}$ (Demod Only)
- Ref. Amplitude: 5, 6.3, 10, 26, 115 vrms, @ 50 mw, Fixed (specify) w/ref amp 1 mw (Amp Demod Only)
- DC Power: 25-31 v, or ±15 @ 10-25 ma (depending on model) (Amp/Demod Only)
- Null Stability: 20 uv/°C referred to output
- Gain Stability: ±0.0025%/°C of full scale
- Range to Range Calibration: .1% F.S.

OPTIONS:

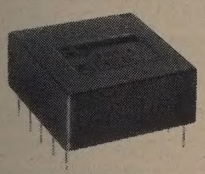
- Non Phase Sensitive Models available with comparable Input Levels.

ENVIRONMENTAL SPECS:

Vibration, 20g, 50-2000 cps; Shock, 100g, 11ms; Temp., −55° to +71°C; Weight, 2-4 oz; Mil Specs, MIL-E-5272C

* 10Ω available as option.

DEMOD MODEL	D500 D600	D501 D601	D502 D602	D503 D603	D504 D604	D505 D605	D506 D606	D507 D607	D508 D608	D509 D609
E_{in} VRMS	0-1	0-2	0-2.5	0-5	0-7.5	0-10	0-15	0-20	0-25	0-50
Dimensions	(*for units operating above 350 cps) 1.03 x 1.03 x 1.53 using type "P" and "S" connector; 1.25 dia. x 1.5 using type "T" connector; 1.34 x .79 x 1.72 using DE-9P connector (add "V" to model no.)									



PRINTED CIRCUIT MODULE

HAS ACTIVE FILTER OUTPUT

Flatpack Model 6106 amplifier demodulator incorporates a standard two-pole active filter output with up to a six-pole Butterworth filter optionally available.

The unit provides outputs up of ±10 vdc or an alternate output of ±10 ma into a 200-ohm load. The input-to-output transformation ratio is 50 (for example, 200 mv rms input = 10 vdc output). Linearity is better than ±0.25% of reading or ±2.5 mv d-c. Null offset with internal adjustment is specified as 1 mv or 0.5% of full scale. Designed specifically for printed-circuit board installation. Contact factory for complete Data Sheet.

HOW TO ORDER	Basic Model No.	Input	Output	Ref. Freq.	Ref. Voltage	Adjustments Gain	Adjustments Null	Connector
DEMOD	D505		C	400	26		N*	P
AMP/DEMOD	D6006	71	F	400	26	A	N*	C

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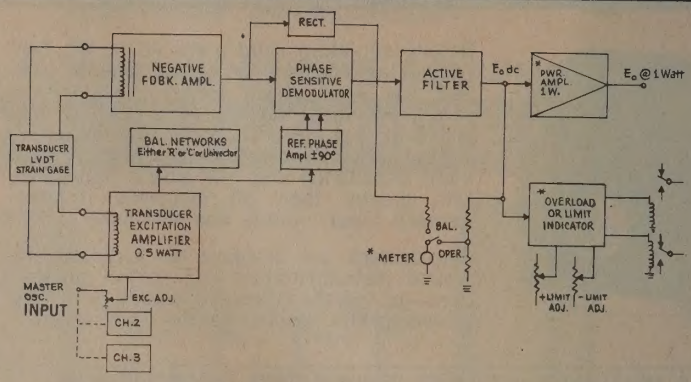
NATEL

TRANSDUCER - AMPLIFIER SYSTEMS or INDICATORS



Transducer Amplifiers are available as multiple channels (6-8) per system, single channel indicators or airborne modules. Designed for static/dynamic measurements and/or control, the amplifiers condition low level AC signal inputs from LVDT, RVDT and strain gages and interface with strip chart recorders, galvanometers, servo controls, VCO's and data processing equipment.

Extremely versatile, the amplifiers operate with a wide variety of transducers without requiring special tailoring or auxiliary modules. Greater freedom in transducer selection eliminates interface problems. Incorporating a unique concept for balancing, "UNIVECTOR" 360 degree phase shift can be achieved which enables operation with cable lengths exceeding one mile.

The accuracy, sensitivity, dynamic response, and stability offered generally exceed the geometry of the physical measurement such as dimensional stability mechanical hysteresis, and thermal expansion.

STANDARD PERFORMANCE CHARACTERISTICS ARE:

Input:	0.5 mv — 1.0 vrms (100 micro inch F.S. typical)
Gain Ranges:	12 positions, binary or 1, 2, 5 decade
Accuracy:	±0.1, ±0.25, ±0.5% of reading
Frequency Response:	−3db @ 10%, 20%, 40% of carrier, 40 K Hz max.
Overshoot:	10% max.
Ripple:	0.1% or 0.5% F.S. (p-p)
Threshold:	.01% F.S. (.01 micro inches, 10 micro strain/inch)
Carrier Frequency (Isolation Exc. Amplifier/Channel)	
Amplitude:	5 or 10 vrms C.T.
Frequency:	2 - 100 Kc
Power:	0.5 watt
Reference Phase Adj.:	±90° std., 1° resolution
Balance Controls:	"R" and "C" balance of UNIVECTOR balance
± Shunt Calibration	
Meter*:	6" single channel indicator, ½% accuracy 2" multi channel system, 2% accuracy calibrated % full or engr. units
Limit/Overload Detector*:	Limits adjustable
Expanded Range*	
Power Output*:	1 watt, 10 v @ 100 ma
Power Required*:	115 vrms, 60-440 Hz, 24-32 vdc or 11-15 vdc

* Optional

APPLICATIONS:

- Weighing - Mixing
- Stress/Strain
- Displacement
- Pressure
- Force - Thrust
- Servo Controls
- Torque
- Flow - Velocity
- Vibration Analysis
- Biomedical

Consult factory referencing System Series #2085

PHASE SENSITIVE MODULATORS

Natel's miniature solid state sinewave modulators convert DC input signals to linearly proportional AC output signals. Phasing of the output signal is determined by the polarity of the input signal.

Input, output, reference and DC supply signals are completely isolated from each other. Typical applications include:

- Algebraic summing of multiple input signals
- Summing the output signals with other AC signals in closed loop control systems
- Drive servo motor directly using high power modulator

FEATURES:

- Null — .1% of full output
- Phase shift — 2° max. between reference and output
- Input overvoltage — 150 vdc max.
- Modulation intelligence — 20% of carrier
- Gain stability — .005%/°C (−55°C to +71°C)
- Isolation — Input, Output, Reference and DC supply isolated from each other by 50 megohms
- Distortion — 2% max.

MODEL NO.	D6003-10	D6003-12	D6003-14	D6003-16	D6003-18	D6003-20
Input Signal (vdc)	0 to ±10	0 to ±25	0 to ±100	0 to ±10	0 to ±25	0 to ±100
Input Impedance (ohms)	100 K (above 350 cps)					
Output Signal (vrms)	(A) 3.5	(B) 10	(C) 30	(A) 3.5	(B) 10	(C) 30
Output Impedance (ohms)	(A) or (B) 1000 ohms (C) 2000 ohms			10 ohms max.		
Output Power (watts)	N/A	N/A	N/A	5	5	5
Output Waveshape	Sine					
Output Distortion	2%					
Input/Output Linearity	0.5					
Null	.1% of full scale output p-p					
Gain Adjust	±10% internal potentiometer					
Threshold	0.1% of full scale output					
Dimensions (above 350 cps)	1.03" x 2.03" x 3.03"			1.75" x 2.03" x 3.03"		
Connector	(P) 9 pin plug-in — (S) 9 pin solder hook — (V) 9 pin connector (DE-9P)					
HOW TO SPECIFY MODEL NO.	BASIC MODEL NO. D6003-10	OUTPUT A	REF. FREQ. (CPS) 400	REF. VOLTAGE (VRMS) 26		CONNECTOR P

Vibration: 20g, 50-2000 cps; Shock: 100g, 11ms; Temp.: −55°C to +71°C; Weight: 2-4 oz.; MIL-E-5272C.

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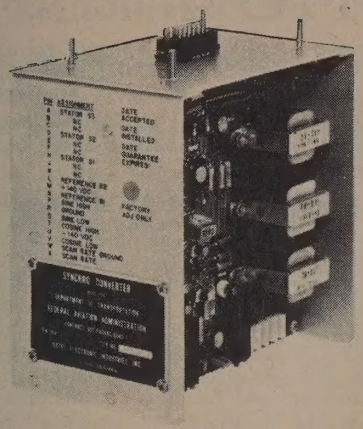
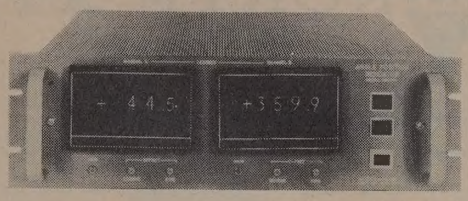
NATEL

SYNCHRO CONVERTERS
SOLID STATE





ANALOG - DIGITAL or BOTH. Natel has a synchro converter fitting the requirement!

All models incorporate the nonvariant features required when using synchros or resolvers as transducers.

Model 431 is used in radar display systems by converting input signals to DC sine and DC cosine voltages, compatible with deflection coil circuitry of radar PPI's. The non-variant characteristics compensate for varying line voltage conditions typical in radar systems. Solid-state techniques prevent the hunting and spoking problems of electro-mechanical converters. Units are available as encapsulated plug-ins or open-frame printed circuit boards.

The Model 406 provides one linear (±6 min) DC voltage directly proportional to the angle input. Its reliability and accuracy have found applications in all environments from sub-surface to space! Incorporating one or several available options as needed, provides an extremely versatile sub-system. The 4060 and 4061 add digital capability to the conversion techniques of the 406. These synchro to digital converters are compatible with existing digital systems, and readily adaptable to special requirements. Outputs of all units can be factory scaled to reflect any required engineering unit.

MODEL NO.	431	406	4060	4061
Input Signal	3 Wire Synchro S1-S2-S3, 11.8 VRMS (1) or 90VRMS (3), Line To Line			
Input Impedance	100 KΩ Minimum			
Synchro Exc.	26VRMS or 115VRMS: 60, 400, 1000 Hz			
Output	DC — Sine DC — Cosine A = ±5VDC/Quad B = ±10VDC/Quad	Linear DC Voltage 0 to 360° A = 0 to ±5VDC B = 0 to ±10VDC	0 - 360° Parallel Binary: STD TTL Logic Levels	4 Digit Display 000.0 to 359.9° Linear DC & BCD on Rear Panel
Accuracy	0.1% of F.S.	±6 Min	12 Bit	12 Bit ±6 Min
Power Required	±15VDC ±10% @ 50ma	±15VDC ±5% @ 250ma		115VRMS 60-400Hz
Size and Construction	1.5" x 2" x 4" 400Hz 2" x 3.5" x 3.5" 60Hz Encapsulated can or 6" x 6" x 1" PCB	4" x 5" x 6" Extruded Can	PC Board	6.6" x 8.3" x 17"

ENVIRONMENTAL SPECIFICATIONS:

Temperature ..... −55° to +71°C
Vibration ..... −5G's 55-2000Hz
Shock ..... −10G's 11 MSES
} Encapsulated Containers Only

Short CKT Protection

Polarity Protection

Voltage and Frequency Variations of ±10% affect the Output less than ±3 Minutes

Most Models available with following options: Synchro/Resolver Input (SR), Internal Power Supply (28VDC (U) or 115VRMS 60 (P)-400 Hz (L), Variable Zero (Z), Expanded Scale (Y), Multiplexed Inputs (M), Wide Frequency Operation, Bi-Polar Outputs (D).

All units use Amphenol MRE21P or Equal, with Mate Supplied.

HOW TO SPECIFY MODEL NO.	Basic Model	Input	Output	Reference Frequency	Reference Amplitude	Options (as required)		
	4061	3	B	60	115	Z	Y	D

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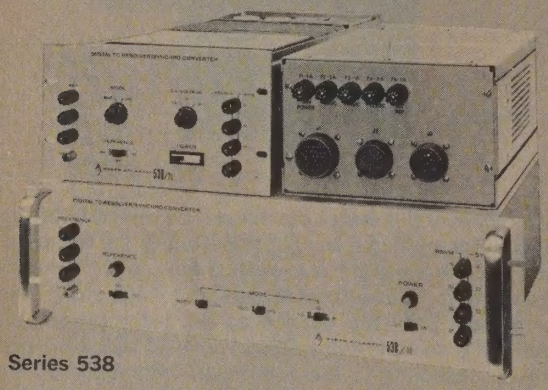
PRECISION DIGITAL-TO-RESOLVER SYNCHRO AND RESOLVER/SYNCHRO

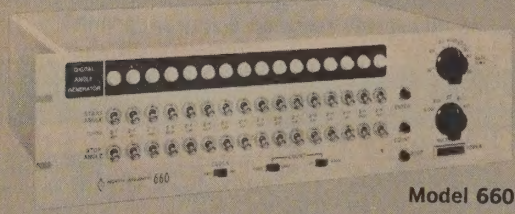
NORTH ATLANTIC *industries, inc.*

Digital To Resolver/Synchro Converters

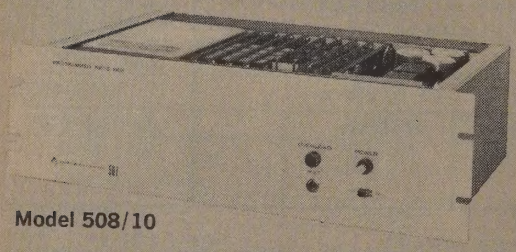
These units provide a complete high-speed interface from digital to analog systems, enabling precise simulation of resolver/synchro data. All converters feature semi-conductors, integrated circuits, and precision trigonometric transformers. Basic models use 400 Hz as the signal data frequency, with optional operation at other frequencies from 50 Hz to 10 KHz. A variety of system-oriented options are available in each model, and multi-speed or multi-channel systems can be provided.



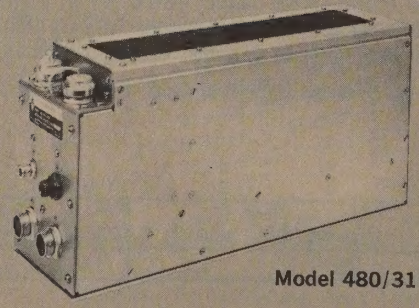
Series 538



Model 660



Model 508/10



Model 480/31

Series 538—Digital-To-Resolver/Synchro Converters

The Series 538 D/R-S Converters offer 9- to 17-bit single speed resolution with digital input as binary angle. The input register is strobed and the digital data is then held until the next strobe. The internal logic selects the appropriate trigonometric transformer taps, thus simulating actual 4-wire resolver or 3-wire synchro data at the selected line-line voltage. Built-in protection circuits are provided for power-line voltage and frequency transients, overload and short-circuit. The Model 538/30 "shoebox" unit provides 9- to 13-bit resolution with 6-minute accuracy and the Models 538/10 (full-rack) and 538/20 (half-rack) converters provide 14- to 17-bit resolution with better than 1-minute accuracy. Options include 50 Hz to 10 KHz signal data frequencies, special input logic and multi-speed outputs. Series 536 D/R Converters and Series 537 D/S Converters are also available as single-mode units.

Model 660—Digital Angle Generator

The Model 660 Digital Angle Generator provides digital angle input data and data strobe signals to the Series 538 D/R-S Converters. Useful in semi-automatic test system applications, static data angles and angular data rates from 1 arc-minute/second to 2000°/second can be generated from an internal or an external clock. Typical optional features include 2-speed digital data output and start/stop angle.

Model 537/31—MIL-T-21200 D/S Converter

Designed and qualified to MIL-T-21200, the Model 537/31 Digital-To-Synchro Converter accepts binary inputs, provides solid-state-switched, precision trigonometric transformer conversion to 90 V and 11.8 V line-line synchro signals to an accuracy better than 50 arc-seconds with built-in short-circuit protection. Computer-related functions include "acknowledge" pulse, "busy" pulse, and 1 MHz clocked input serial data. Design MTBF of 13,000 hours.

Digital-To-AC-Converters

Model 508/10—Digital-To-AC Converter

In automatic test systems, this solid-state-switched, a-c ratiometric converter can be directly programmed from a punched card reader, a paper tape reader, or a digital computer. Featuring BCD digital data input with 10-microsecond data acceptance, the Model 508/10 400 Hz D/AC Converter has a ratio of zero to unity with 5-decade (BCD) resolution and is accurate to .005% (50 ppm). Also available is the Model 508/11, which accepts a pulse train input and provides an a-c ramp output. Higher accuracies, different resolution, and inversion mode are available as specific options.

A/D-D/A Converters

Model 480/31—A/D-D/A Converter

Designed and qualified to MIL-T-21200, the Model 480/31 A/D-D/A Converter is a state-of-art device incorporating 16 multiplexed A/D conversion channels and 11 D/A channels. The A/D Converter has bipolar ranges up to 32 vdc with measurement accuracy to 0.02% full scale. The D/A Converter provides non-inverted and inverted ratio conversion with 25 vdc output and a maximum conversion time of 600 msec, with accuracy to 0.01%. Computer-related functions include channel selection and read command. Featured are a self-test mode and module fault isolation. Design MTBF of 14,000 hours.

TO-DIGITAL COMPUTER-INTERFACE, AND ATE EQUIPMENT.

Resolver/Synchro To Digital Converters

These converters provide a complete high-speed interface from analog to digital systems through continuous conversion of analog resolver and synchro data into digital data at angular velocities up to 20,000°/sec. High-speed continuous tracking is achieved through use of a unique electronic servo technique which provides velocity constants to 200,000 sec^{-1} and eliminates any data staleness errors. These 400 Hz converters feature semiconductors, integrated circuits, and precision trigonometric transformers. A wide selection of application-oriented options including operation at other frequencies from 50 Hz to 10 KHz are available in specific models. Multi-speed and multi-channel systems are also available.

Model 545—Automatic Angle Position Indicator

This instrument is offered with .01° resolution and accuracy or with .001° resolution and 10-second accuracy for all line-to-line voltages from 11.8 to 90 V at 400 Hz. The digital angle is both displayed and available in BCD format at the rear connectors. Remote or front-panel selection of resolver or synchro input, line-line voltage range and operating mode. Operating modes selected as Track (the instrument continuously follows the input data), Update (the instrument tracks for 200 msec, then holds until receipt of another command), and Auto-Update (repetitive track/hold sequences) with a Variable Display Time of .5 to 3 seconds. Optional remote readout, analog d-c null output, data freeze command, signal frequencies 50 Hz to 4.8 KHz, multiplexed and multi-speed units.

Model 546/31—Synchro-To-Digital Converter

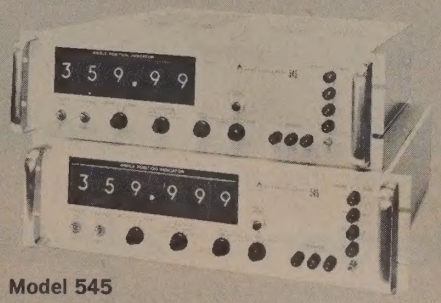
Designed and qualified to MIL-T-21200, this model converts 11.8 V line-line 400 Hz synchro signals to 16-bit binary angle data on 10-multiplexed channels. The accuracy is .01° with tracking speed to 20,000°/second and velocity constant of 200,000 sec^{-1} with input channels programmed by logic level address signals. System-related functions include self-test at 60° increments, and module fault isolation. Computer-related functions include "read command," 1 MHz clocked output serial data, "data ready" and "acknowledge" signals. Design MTBF of 10,000 hours.

Building Block 54

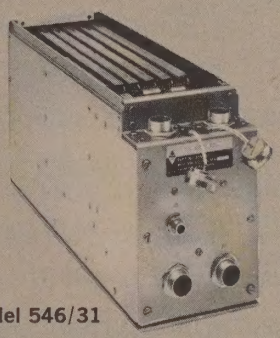
A special version of the Model 545 designed as a part of the GPATS (General Purpose Automatic Test System) system. It operates from 50 Hz to 5 KHz, includes module fault isolation, and provides digital output without display.

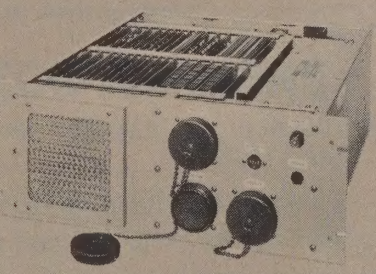
Angle Position Indicators

High-speed performance 400 Hz servos for field test and production test measurement of synchro and resolver transmitters. The half-rack API-8025 provides accuracy of 6 arc minutes, repeatability of 30 arc seconds, and slew speed of 25°/second with a digital readout display. Optional retransmit components, dual-mode, and two-speed operation. Also available for operational use, 2" and 3" diameter units.



Model 545


Model 546/31


Building Block 54

API-8025

NORTH ATLANTIC
industries, inc.
TERMINAL DRIVE, PLAINVIEW, NEW YORK 11803 • 516—681-8600

See More Complete Catalog Information in directron™

V-Scan Binary Encoder

Norden Encoders: there's no better way to convert shaft angles to numbers.

Norden offers the broadest line: magnetic, optical and contacting. Plus reliability, verified by 100% testing. Plus competitive pricing. And fast delivery.

For more information and detailed specs, write Norden, Att: Components Dept., Helen Street, Norwalk, Conn. 06856. Phone (203) 838-4471. TWX: 710-468-0788.

Norden DIVISION OF UNITED AIRCRAFT CORPORATION UA®

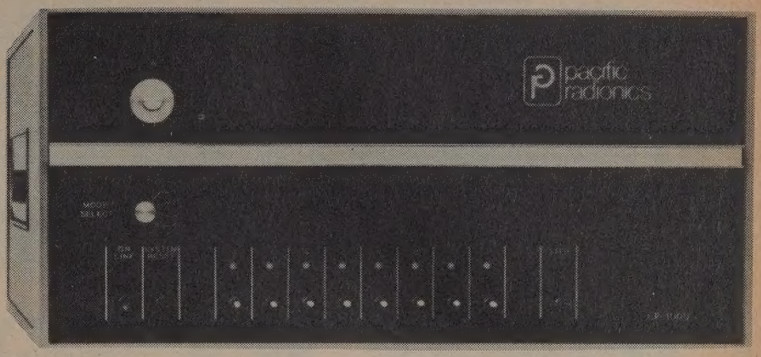
	Total Count	Revolutions for Full Count	Diameter"	Model Number
NEW! Rugged Industrial Grade Optical Incremental Encoders				
All available with quadrature and internal squaring circuit options	4,000	1	3.500	OADC-35/4000/INC
	3,000	1	3.500	OADC-35/3000/INC
	2,500	1	3.500	OADC-35/2500/INC
	2,000	1	3.500	OADC-35/2000/INC
	1,200	1	3.500	OADC-35/1200/INC
	1,000	1	3.500	OADC-35/1000/INC
	600	1	3.500	OADC-35/600/INC
	400	1	3.500	OADC-35/400/INC
	200	1	3.500	OADC-35/200/INC
Optical Incremental Encoders				
All available with index marker, quadrature outputs and internal squaring circuit options. Other counts on special order.	500	1	2.250	OADC-23/500/INC
	512	1	2.250	OADC-23/512/INC
	1,000	1	2.250	OADC-23/1000/INC
	1,024	1	2.250	OADC-23/1024/INC
	2,000	1	2.250	OADC-23/2000/INC
	2,048	1	2.250	OADC-23/2048/INC
IC-Compatible Encoders. For direct interface with TTL & DTL circuits				
Binary	128	1	1.750	ADC-ST7-BNRY-E/L
	8,192	64	1.750	ADC-13-BNRY-E/L
	524,288	4,096	1.750	ADC-19-BNRY-E/L
Binary-Decimal Code	100	1	2.250	ADC-ST2-BCD/L
	1,000	10	2.250	ADC-3-BCD/L
	10,000	100	2.250	ADC-4-BCD/L
	100,000	1,000	2.250	ADC-5-BCD/L
	1,000,000	10,000	2.250	ADC-6-BCD/L
	360	1	2.250	ADC-3-36BCD-E-360L
	3,600	10	2.250	ADC-4-36BCD-E-360L
	36,000	100	2.250	ADC-5-36BCD-E-360L
	360	1	3.250	ADC-ST3-36-BCD/L
	3,600	36	2.250	ADC-4-36-BCD/L
	36,000	360	2.250	ADC-5-36-BCD/L
	360,000	3,600	2.250	ADC-6-36-BCD/L
External Logic V-Scan Binary Encoders				
	128 or 256	1	1.750	ADC-7/8-BNRY-XB
	8,192 or 16,384	64	1.750	ADC-13/14-BNRY-XB
	524,288 or 1,048,576	4,096	1.750	ADC-19/20-BNRY-XB
Single Turn Gray Code Encoders				
Available with various levels of RFI suppression	256	1	1.066	ADC/11/8/GRAY
	256	1	1.750	ADC-ST8-GRAY
	512	1	2.250	ADC-ST9-GRAY
	1,024	1	3.062	ADC-ST10-GRAY
Multiturn Gray Code Encoders				
Available with various levels of RFI suppression	1,024	4	1.062	ADC-11/10GRAY256
	1,024	16	1.062	ADC-11/10GRAY 64
Low-Cost Magnetic Noncontacting Encoders				
Incremental	128	1	1.750	MADC-18/128/INC
Binary	128(V scan)	1	1.750	MADC-18/7/BV
Binary	8,192(V scan)	64	1.750	MADC-18/13/BV
Binary	524,288(V scan)	4,096	1.750	MADC-18/19/BV

All magnetic encoders are normally furnished with sleeved leads. Terminal header or Cannon connector options are available for all units. Non-standard counts within the capabilities of the encoder are available on special order.

PACIFIC RADIONICS

FEATURES LP1000

- COMPUTER CONTROL OF TEST INSTRUMENTS
- AUTOMATIC DATA ACQUISITION
- PRINTED DATA
- ANALYTICAL & COMPUTATIONAL ABILITY



PLUS

- Unlimited adaptability through hardware input-output options: BCD, binary or analog—10 or 15 bit conversion.
- Multiple channel in or out by time multiplex.
- High speed sample and hold data acquisition.
- Utilizes the memory and computational power of the time-shared computer.
- Eliminates the need to buy and program a computer.
- Completely compatible with most network analyzers.
- One step data acquisition and computation— no time wasted loading separate taped programs . . . no dead time.
- Interaction with any existing program easily accomplished by "building block" subroutine programs which are provided.
- A complete built-in test routine, involving 100 test readings and 1000 computations, accomplished in less than one minute.
- Extra data channels can be used to monitor crystal outputs or any other desired parameter.
- All equipment compatible with dedicated computer by minor alterations, if required.
- The LP 1000 will never be obsolete . . . . if you can justify your own computer, you make the LP 1000 a part of your total system.

OPTIONS

ANALOG TO DIGITAL CONVERTER

Input: 0 to + 5V or -2.5 to +2.5V or 0 to +10V or -5 to +5V

Input Impedance: 1.0 megohm

Resolution: 10 bits ± ½ LSB

DIGITAL TO ANALOG CONVERTER

Output: 0 to +5V or -2.5 to +2.5V or 0 to +10V or -5 to + 5V

Output Current: 25 ma (max)

Resolution: 10 bits ± ½ LSB

16 CHANNEL ANALOG MULTIPLEXER

Commutating Rate: 200 K Hz

Channel Identification: Binary, 4 bits

Digital or Analog Input

SPECIFICATIONS

Computer Interface: Standard E.I.A. levels, ASCII code

Primary Output: 16 bits binary

Parallel Input: up to 40 bits binary information

Auxiliary Output: 4 bits of binary data are available for relay closures (one of 16) for commanding the environment

Power Requirement: 115 Vac ± 10%, 50-500 Hz

Size: 19-¾ in. W x 18 in. Dp x 9-½ in. H

pacific radionics

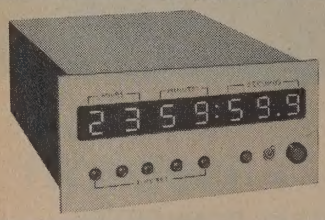
581 DIVISION STREET
CAMPBELL, CALIFORNIA 95008
(408) 379-3280

PARABAM

DIGITAL CLOCKS

SOLID STATE—ELECTROMECHANICAL

For computers, data logging, missile launch count-down display and control. Multi-channel digital time programming for control of automatic processing and radio/TV broadcasts. Variety of logic outputs compatible with most data readout devices. Single or multiple remote glow-tube or projection-type time displays.



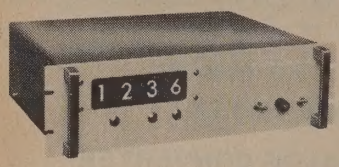
SOLID STATE CLOCKS

For countdown and/or elapsed time, time-of-day. Combined calendars provide day-of-year or month-day. Various time bases, time data output formats and displays available.

features:

- Integrated circuits used for basic logic.
- Front panel display Seven Bar Nixie or projection type.
- Logic output compatible with standard recording devices.
- Options: Battery operation, variety of time bases, variety of time ranges, multiple display.

Write for Tech. Bulletin No. 470-33



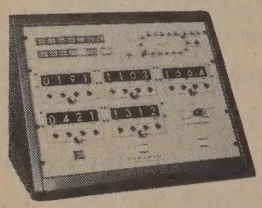
ELECTROMECHANICAL DIGITAL CLOCKS

Time resolution down to one second. Single or multiple isolated contact closure outputs in 10-line decimal, teletype code, and/or any BCD format. Wide choice of number and type of time displays.

features:

- Time Synchronized to line frequency or external pulse input.
- Countdown/elapsed time or real time.
- Outputs interface readily with digital systems.
- Special time-controlled pulse closures available.

Write for Tech. Bulletin No. 1066-27



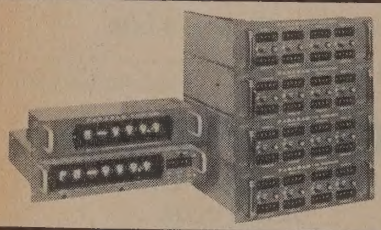
AUTOMATIC RACE TRACK TIMING SYSTEMS

Automatically measures and displays the precise quarter mile times and finish time for all types of races and for all race distances. Designed for operation by non-technical personnel.

features:

- All solid state electronics.
- For track, turf, and harness races.
- Output drives two tote board display units.
- Automatically programs photocells for selected race distances.

WRITE FOR DESCRIPTIVE LITERATURE



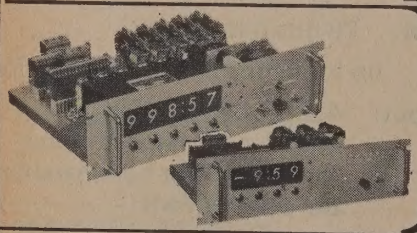
DIGITAL TIME PROGRAMMERS

Standard units accept time data inputs from solid state or electromechanical digital clocks and provide any number of precisely timed signal outputs as pre-selected by the wiring of one or more program plugs.

features:

- Programmed time interval accuracy well within the clock resolution.
- Display of output channel numbers and status available.
- Complete program changed in seconds by replacing program plugs.

Write for Tech Bulletin No. 566-24



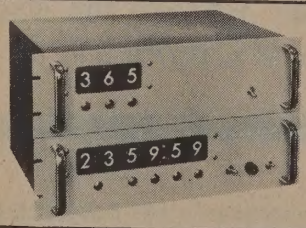
COUNT/DOWN, COUNT/UP DIGITAL CLOCKS

Used in missile launch, testing, radio-television — anywhere time is counted down, then afterward elapsed time is observed.

features:

- Available with digital logic output or for programming and recording.
- Plus minus count in most time ranges and resolutions.
- Projection type or Nixie displays.
- Standard system operates up to 40 displays.

Write for Tech. Bulletin No. 162-16A



DIGITAL CALENDARS

Provide nonambiguous contact closures in parallel form corresponding to date in Month-Days (months from 01 to 12, days from 01 to 31) or Day-of-the-Year (from 001 to 365). Used in data logging, process control or other date of time oriented systems.

features:

- May be ordered in Month-Day or Day-of-Year Models.
- Outputs in decimal or various codes of binary coded decimal.
- Projection type or Nixie displays.
- Switch for leap year correction.

Write for Tech. Bulletin No. 1066-29

PARABAM, INC.

Special Design Charges eliminated through hundreds of off-the-shelf designs.

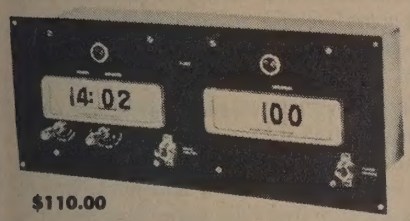
3017 E. Las Hermanas St., Compton, California 90221 • (213) 537-1771

TYMETER®

"Time At A Glance"

Featuring:
- **FRONT PANEL MOUNT**
- **DESK OR BENCH USE**
- **DIGITS RESETTABLE INDIVIDUALLY**
  CSA and UL approved motor & cord

- **DIGITAL READ-OUT CLOCKS**
- **ELAPSED TIME COMPUTERS**
- **INTERVAL, COUNT DOWN AND IMPULSE TIMERS**

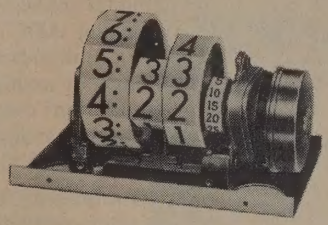


$110.00

DIGITAL CLOCK SECOND BY SECOND

Time registered on 5 polygonal drums. One Hour drum, one 10-minute drum, one minute drum, two seconds drums. 4½"h, 12"w, 3¼"d. Wt. 6 lbs. Anodized metal dustproof case.

#110-12H ..... 12 Hour
#110-24H ..... 24 Hour



12 HOUR — TYMETER® "Time At A Glance" 9:37 — 24 HOUR

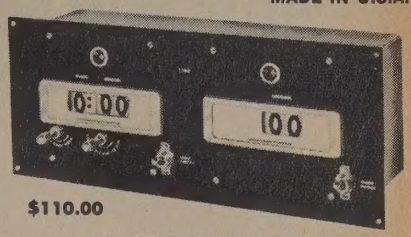
DIGITAL CLOCK MOVEMENT

DIGITS RESETTABLE INDIVIDUALLY

Available in 50, 60 cy., all voltages, AC. UL approved motor and cord. 3" high, 5½" wide, 3½" deep. Wt. 2 lbs. One Year Guarantee.

#130-12H — 12 Hour $16.50
#131-24H — 24 Hour $16.50

MADE IN U.S.A.



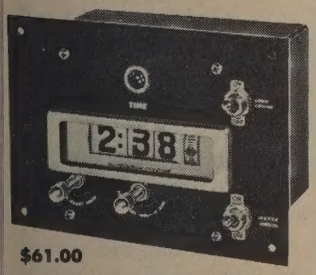
$110.00

ELAPSED TIME DIGITAL COMPUTER

6 DIGIT READ OUT

Automatically calculates and registers elapsed time in hours, 10 minutes, minutes and seconds. Second by second. 4½' h, 12" w, 3½" d. Wt. 6 lbs. Stop and Hold Control. Count down or Count up.

#115 — *Available In:* 30 Minute, 60 Minute, 12 Hour, 24 Hour



$61.00

DIGITAL CLOCK

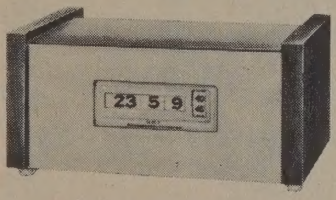
12 and 24 hour 6 digit read out . . . minutes, 10 minutes and hours. Rotating visual 1 RPM calibrated seconds drum. 4½"h, 6"w, 3¼"d. Wt. 3½ lbs. Anodized metal dustproof case.

#160-12H ..... 12 Hour
#161-24H ..... 24 Hour

24-HOUR DIGITAL READ OUT CLOCK

Calculates time automatically. Stainless steel case with walnut wood ends. 3⅞"h, 7¾"w, 3¾"d. Wt. 3 lbs. 110V 60 Cy. AC.

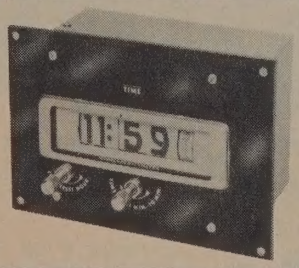
#920-24 Hour $28.50
#920-12 Hour $27.00

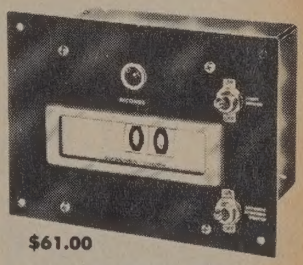


DIGITAL CLOCK

12 and 24 hour read out . . . minutes, 10 minutes and hours. Rotating 1 RPM seconds wheel in visual 5 second increments. Completely enclosed anodized metal dust-proof case. 3½"h, 5½"w, 3¼"d. Wt. 3½ lbs.

#140-12H — 12 Hour.... $39.50
#141-24H — 24 Hour.... $39.50





$61.00

ELAPSED TIME DIGITAL COMPUTER

Second by second 2 digit read out . . . 00-59. Automatically calculates and registers elapsed time in seconds. 4"h, 6"w, 3¼"d. Wt. 3½ lbs. Anodized metal dustproof case. Stop and Hold Control. Count down or count up.

#10-60S ..... 60 Seconds

ELAPSED TIME COUNTER

Digits resettable individually. Stop and Hold Control. Time Control switch, Anodized metal dustproof case. 3½" h, 5½" w, 3¼" d. Wt. 3½ lbs.

RANGES:
- Hours ..... 99,999 hours
- Hours, and tenths of hours ..... 9,999.9 hours
- Minutes ..... 99,999 minutes
- Minutes, and tenths of minutes ..... 9,999.9 minutes

#120 ..... $41.00

#96—LARGE FIGURE COUNTER.... $92.50

Digits ¾" high, 19/32" wide. Digits resettable. Stop and Hold Control. 10½" w, 3½" h, 4½" d. Wt. 5½ lbs.

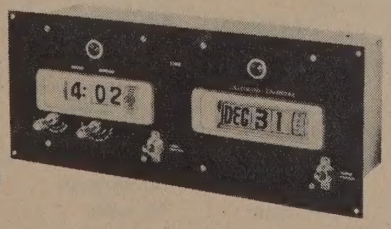
RANGES:
- Seconds ..... 99,999 seconds
- Tenths of minutes ..... 9,999.9 minutes
- Minutes ..... 99,999 minutes
- Tenths of Hours 9,999.9
- Hours ..... 99,999 hours

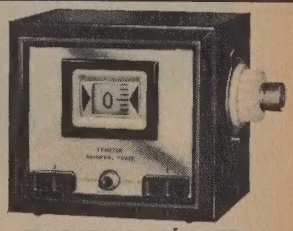
CALCHRON CALENDAR and *TYMETER DIGITAL CLOCK

Digits resettable individually. Anodized metal dustproof case, 4½" h, 12" w, 3½" d, Wt. 6 lbs.

* #125-12H — 12 Hour
* #125-24H — 24 Hour

#125 ..... $127.50





DIGITAL TIMER for All-Purpose Laboratory & Industrial TEST TIMING

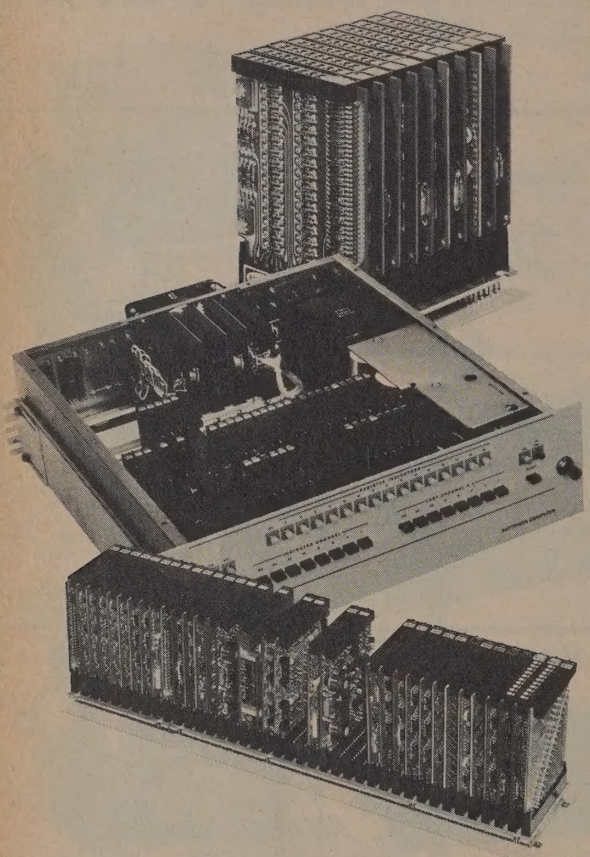
Adjustable reset stop to enable rapid repeat timing. Closes load circuit during OR after a preset interval. Buzzer sounds at end of interval. 120V 60 cy. AC. Ranges available: 57 seconds by seconds, 57 minutes by minutes, 11.5 hours by ¼ hours, 23 hours by ½ hours, 57 hours by hours. 5"h, 5½"w, 3½"d. Wt. 3½ lbs.

#90 ..... $27.50

ALL TYMETERS AVAILABLE IN ALL VOLTAGES & CYCLES. CATALOG OF COMPLETE LINE ON REQUEST.

PENNWOOD NUMECHRON CO. - TYMETER ELECTRONICS
7249 FRANKSTOWN AVENUE • PITTSBURGH, PA. 15208 • DIAL 412 - 371-4200

RAYTHEON Analog-to-Digital Conversion Equipment



Raytheon Computer builds an extensive line of analog-to-digital conversion equipment, including basic ADC's, multiplexing ADC's, simultaneous sample-and-hold equipment, and multiplexing equipment. This equipment is available in single or multiple channels and in a variety of physical configurations *completely wired, tested, and documented.* Resolution is available in 10-bit, 12-bit, and 15-bit binary, and in 3-digit BCD.

Multiplexing ADC Raytheon Computer multiplexing ADC's (Miniverters™) feature a MOS-FET multiplexer, a sample-and-hold amplifier, and an A/D converter in a single chassis. A variety of options in packaging, speed and performance is available. The units are supplied fully wired and tested in connector block assemblies or case-mounted.

The 15-bit unit, referred to as the Multiverter III®, features 100KHz throughput and low power consumption. The high-performance ADC has an accuracy of 0.01%. It's all contained in less than 200 cubic inches. The unit is available in a connector block or case-mounted with front panel controls and indicators.

Basic ADC For convenience and versatility, Raytheon Computer offers basic A/D converters supplied fully wired and tested in connector blocks or case-mounted. The low-cost converters feature high packing density and are extremely flexible when used as building blocks in conversion systems.

Simultaneous Sample-and-Hold This equipment is available with up to 8 channels of medium or high performance sample-and-hold amplifiers in a single connector block. Standard input range is ±10 volts full scale.

Multiplexing Up to 48 channels of multiplexing and control is available in a fully wired and tested single connector block. This unit is ideally suited for expansion of your conversion equipment.

Model Designations

MULTIPLEXING ADC
Connector Blocks (Miniverter™)

MADC XX - 04 - XX

Resolution
10-bit
12-bit (35KHz)
12A (50KHz)
12F (100KHz)
13-(3BCD)
15-bit

Channels
08- chan.
16- chan.
(For additional channels, consult factory)

Case-Mounted (Miniverter™ Instrument)

MADC XX - 06 - XXX - XX - XX - XX

Resolution
10-bit
12-bit (35KHz)
12A (50KHz)
12F (100KHz)
15-bit

Channels
008- chan.
128- chan.

Front Panel Option
00-without
01-with

Sign & Magnitude Code Option
00-without
01-with

Computer Coupler
00-without
01-with

Model Designations

SIMULTANEOUS SAMPLE-AND-HOLD

MSHA XX - 04 - XX

Sample-and-Hold Amplifier
01- MSH1 Amplifier
02- MSH2 High Performance Amplifier

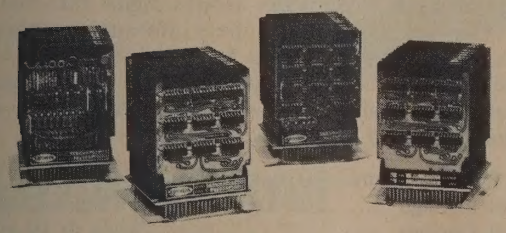
Channels
01- chan.
08- chan.
(4 chan max for 02 configuration)

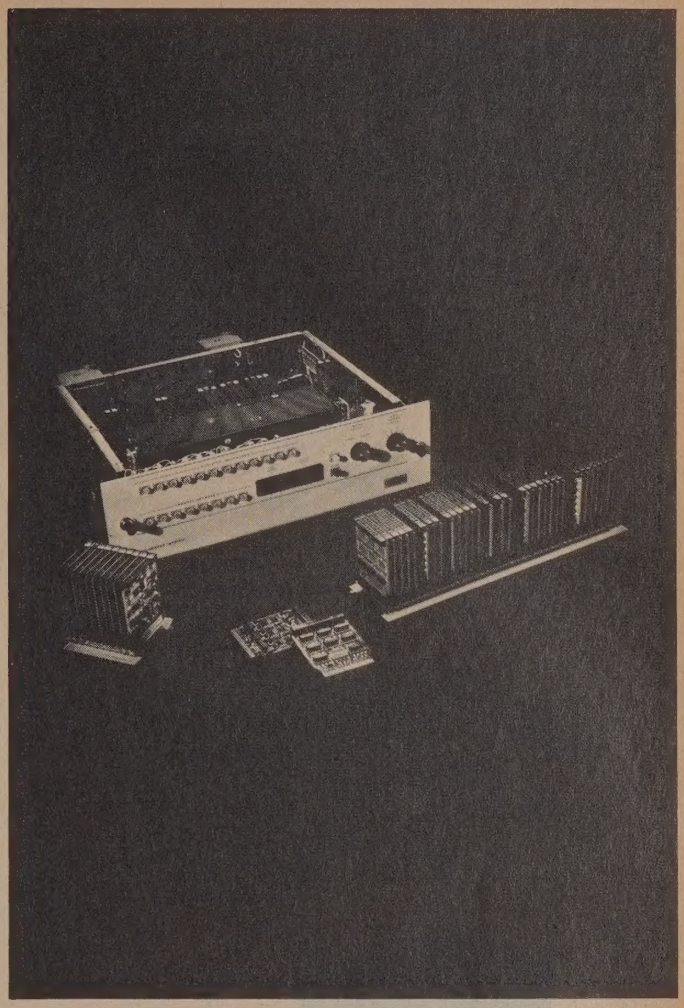
MULTIPLEXER

MMPX XX - 04 - XX

Sample-and-Hold
01- with MSH2
02- without (Extender for Miniverter™)

Channels
08- chan.
48- chan.





Specifications	MADC 10 10-Bit Binary	MADC 12 12-Bit Binary	MADC 13 3-Digit BCD	MADC 15 15-Bit Binary
SYSTEM PERFORMANCE				
Resolution	9 Bit + Sign	11 Bit + Sign	3 BCD + Sign	14 Bit + Sign
Max. Throughput Rate	**50 KHz**	**35 KHz (50 KHz*) (100 KHz**)**	**50 KHz**	**100 KHz**
Conversion Time	9.8 μs	18.5 μs	12.5 μs	(Consult Factory)
Min. Sample Time	8 μs	8 μs	8 μs	
Overall Accuracy	0.065% ± 1 LSB	0.065% ± 1 LSB	0.065% ± 1 LSB	0.025% ± ½ LSB
Temp. Range	0°-50°C	0°-50°C	0°-50°C	15°-50°C
Temp. Coefficient	0.8mv/°C	0.8mv/°C	0.8mv/°C	0.3mv/°C
ANALOG INPUTS				
Voltage Range	±10vfs	±10vfs	±10vfs	±10vfs
Max. Source Impedance	1 Kohm	1 Kohm	1 Kohm	1 Kohm
Input Impedance	50 Mohm	50 Mohm	50 Mohm	100 Mohm
Aperture Time	100 ns	100 ns	100 ns	50 ns
LOGIC LEVELS				
Logical "1"	+2.5 to +5.0v	+2.5 to +5.0v	+2.5 to +5.0v	+2.5 to +5.0v
Logical "0"	0 to 0.5v	0 to 0.5v	0 to 0.5v	0 to 0.5v

*MADC 12A
**MADC 12F

RAYTHEON COMPUTER • 2700 SO. FAIRVIEW ST., SANTA ANA, CALIFORNIA, 92704, (714) 546-7160 TWX 910-595-1570

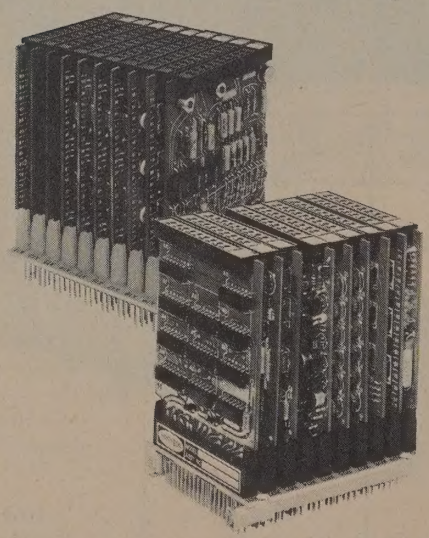
RAYTHEON

RAYTHEON Digital-to-Analog Conversion Equipment

Digital-to-Analog Converters. Digital-to-analog conversion equipment is available from Raytheon Computer in a wide range of configurations and types. Resolution of 10 and 12-bits binary is provided. (Consult the factory for availability of 14 and 15-bit resolution.) Capacities range from single channel DAC's contained on 2 printed circuit cards to up to 48 channels rack mounted with front panel controls and indicators. The units are all high speed, low cost DAC's with high packing density.

The rack mounted configurations (standard 19-inch Retma) are fully assembled, *wired and tested,* and contain the necessary drive and storage electronics. They also offer several options such as front panel controls, computer interface and power supplies. Up to four channels of D/A conversion can be provided fully wired and tested in a connector block assembly. These units include input storage register, output operational amplifiers, reference supplies and data and address drivers.

Analog Data Distributor. Raytheon Computer offers a low-cost Analog Data Distributor consisting of a 12-bit DAC, a high current driving amplifier, up to 64 analog output sample-and-hold amplifiers and all the necessary power supplies and controls. The system accepts digital information from a computer, along with address information, converts the data into equivalent analog form and distributes it to the selected output holding amplifier. The overall system is comprised of an analog data distributor master drawer and additional distributor slave drawers.



Typical DAC Performance Characteristics

Output Voltage	±10 volts full scale
Output Current	5 ma at 10 volts
Output Impedance	0.1 ohm at dc
Accuracy at 25°C	
10 bit	±10 mv
12 bit	±5 mv
Settling Time	
10 bit	25 μs to rated accuracy
12 bit	10 μs to rated accuracy

Analog Data Distributor Performance Characteristics

Channel Capacity	
Master Drawer	64 channels
Slave Drawer	96 channels (2 slaves max)
Resolution	12 bits including sign
Analog Output	±10 volts at 5 ma
Refresh Rate	40 KHz max
Droop Rate at 25°C	0.1% full scale in 100 ms 0.05% typical
System Accuracy	0.05% full scale ±½ LSB
Linearity	0.03% full scale ±½ LSB

DAC Model Designations

MDAC XX - XX - XX - XX - XX

Resolution
10-bit
12-bit

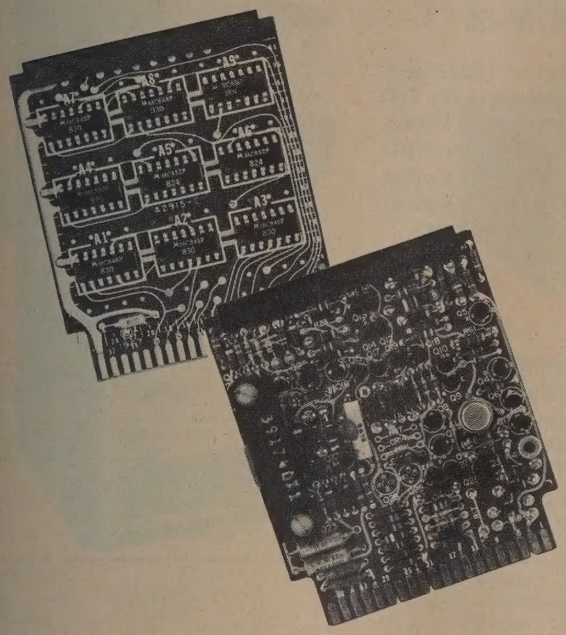
Configuration
04- Connector Blocks
06- MC80 Case (Retma Rack Mounting)

Channels
01- chan.
16- chan.
(4 chan max for 04 conf.)
(16 chan max for 06 conf.)

Front Panel Option (06 only)
00- without
01- with

Computer Coupler (06 only)
00- without
01- with
(Consult factory for specifications)

Analog Cards



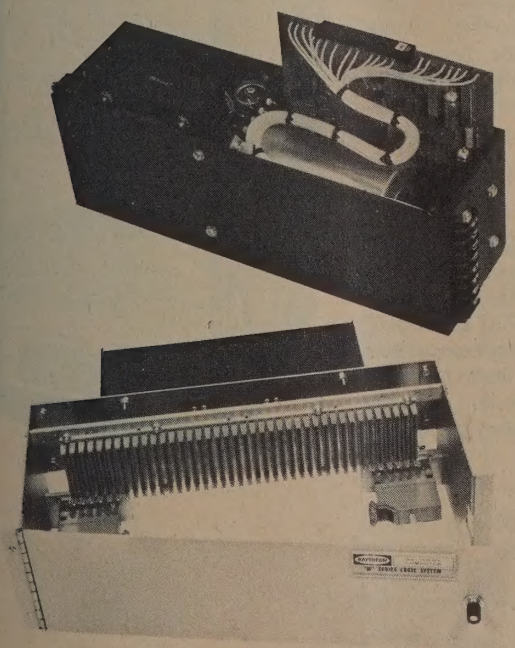
Accessory analog cards are offered by Raytheon Computer to assist you in designing your system. M-Series integrated circuit analog cards are high-performance functional circuit cards designed for system integration. These cards allow the system designer to expand basic A/D and D/A conversion equipment at a very reasonable cost.

The following analog cards are offered:

MAM1 — 8-channel multiplexer
MSH1 — Sample-and-hold amplifiers
MSH2 — High-performance sample-and-hold amplifiers (0.01%)
MDA2 — 10-bit D/A converter. Output = ±10V full scale at 5 ma
MDA6 — 12-bit D/A converter
MDS2 — 10-bit data storage
MDS8 — 12-bit data storage

The M-Series analog cards have many outstanding design features. The cards are compact, measuring only three by 3.65 inches. The one-sixteenth inch thick glass epoxy card is made of flame retardant FR4 material per MIL-P-13949. Convenient features are designed into the cards, such as: eight signal and one ground test points, plainly marked components and connectors, color-coded functions, and polarized key slots to prevent incorrect insertion. Power supply decoupling is provided on each card. Connections are provided through a 40-pin etched connector.

Hardware and Accessories



A complete line of hardware and accessories is offered by Raytheon Computer for conveniently implementing your system. The hardware features rugged construction and is mechanically compatible to simplify and reduce assembly and checkout time.

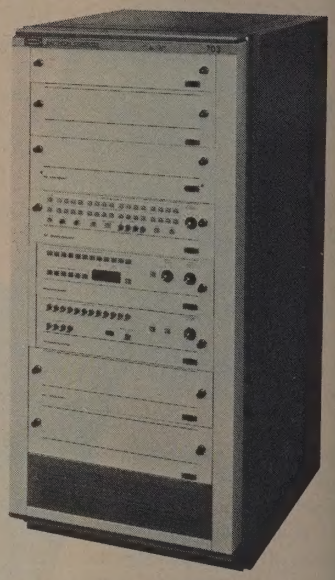
A wide choice of connector blocks, case configurations, and accessory items are offered. The line includes power supplies and indicator assemblies and assorted extender cards, cable cards, and card extractors. Raytheon Computer also offers automatic wire wrapping and a selection of design aids for documenting your system.

Here are just a few examples of the items which are offered:

- Standard 19-inch Retma rigid and hinged frames for compact organization of your digital equipment accommodating from 40 to 200 cards plus power.
- Modular power supplies for indicator lamp assemblies and logic power.
- Laminated bus bars for power and ground bussing.
- Sub-miniature connector blocks for mounting logic cards; fully compatible with automatic wire wrap.
- Wire wrapping guns and accessories.

RAYTHEON COMPUTER • 2700 SO. FAIRVIEW ST., SANTA ANA, CALIFORNIA, 92704, (714) 546-7160 TWX 910-595-1570 **RAYTHEON**

Raytheon Computer 700 Series 16-Bit General Purpose Computers

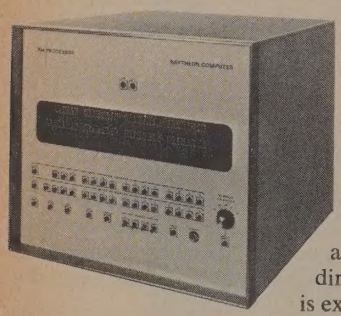


The Raytheon Computer 700 Series provides you with a complete range of 16-bit, general-purpose computers for on-line, real-time applications. All the processors in the 700 Series are identical except for cycle times. So you can choose from a range of 900ns, 1.5μs or 1.75μs cycle times. Then if your requirements change, you can change the CPU without any software penalties. Programs written for one machine will run on any other machine with no changes. Because of this compatibility, whichever 700 Series computer you select, you have a library of over 400 programs and subroutines to choose from.

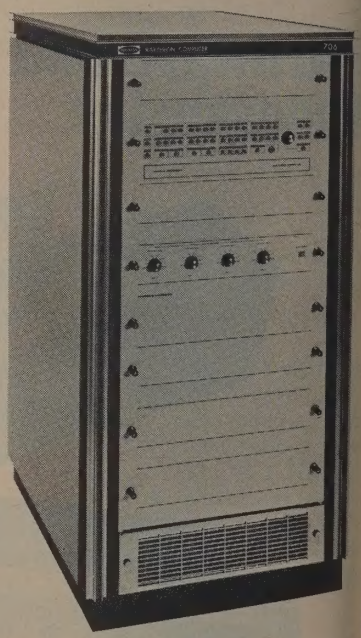
Raytheon 703

The Raytheon 703 Computer is designed for real-time, multi-programming applications where its interrupt system and real-time instructions can be exploited. Hardware-software architecture allows easy expansion from a 4K word processor with ASR 33/35 terminal to a 32K word system with disc and other major peripherals. The 703 has a 1.75μs cycle time and 74 powerful instructions. The basic configuration includes a 4K memory with ASR 33 terminal and a software package with ASA real-time FORTRAN IV, a real-time monitor, an integrated executive system and the SENSOR hardware diagnostic program.

Raytheon 704



The new Raytheon 704 Computer provides large computer capability and compatibility at a reasonable price. The 704 is instantly useable with more than 400 proven programs and subroutines available off-the-shelf. The basic 704 includes 74 instructions, word and byte manipulation, 1.5μs full cycle time, a real-time automatic priority interrupt system, direct I/O to the CPU and four addressable hardware registers. The 704 becomes even more powerful by adding a real-time clock, hardware multiply/divide, high-speed direct memory access and other available options. The 704 is expandable from 4K to 16K words of memory. A very useable software package is included with the basic hardware.



Raytheon 706

The Raytheon 706 Computer is a 16-bit systems computer developed for multi-programming applications. The 706 features a 900ns cycle time word memory, expandable from 4K to 32K in 4K increments. Special features include memory protect, hardware bootstrap and parity check. The 706 is systems oriented with both byte and word addressing and manipulation, direct memory access, direct input/output to the central processor and a 16-level priority interrupt scheme. The standard software package includes real-time ASA FORTRAN IV, real-time monitor, X-Ray EXEC operating system, and the SENSOR hardware diagnostic program. The 706 has four addressable registers with one hardware index register. A total of 74 instructions are available.

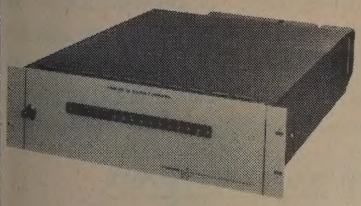
RAYTHEON COMPUTER • 2700 SO. FAIRVIEW ST., SANTA ANA, CALIFORNIA, 92704, (714) 546-7160 TWX 910-595-1570 **RAYTHEON**

PRESTON

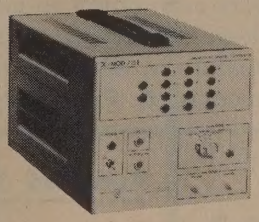
SCIENTIFIC INCORPORATED
805 East Cerritos Ave., Anaheim, Calif. 92805
Tel. (714) 776-6400

ANALOG TO DIGITAL CONVERTERS

8500 VHS



X-MOD 715



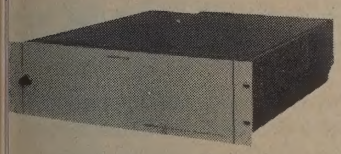
- Conversion Times as Short as 2 Microsec for Sign Plus 14 Bits
- Accuracies up to 0.01%
- Front Panel Display of Data
- Selectable Output Codes
- Operating Temperatures to 50°C

SPECIFICATIONS

MODEL	RESOLUTION	ACCURACY	CONVER TIME	INPUT Z	DISPLAY	OPTIONS	SIZE**	PRICE
711	11-bit binary & sign	±0.05% ±½LSB	150 usec	500 ohm/v	Neon	S & H High Z Buffer	D	$625.
715	3-digit BCD & sign	±0.1% ±½LSB	160 usec	1000 ohms per volt			D	$625.
8500VHS	6-14 bit binary & sign	±0.01% ±½ LSB	5 usec	10 megohms	Incan-descent Lamp	S & H Mux	A	***$5760.
8500MS			12 usec				A	***$3725.
8500K	6-14 bit binary or BCD & sign		100 usec	625 ohm/v		S & H High Z Buffer	A	***$2045.
8500HS	3- or 4-digit BCD & sign		8 usec	10 megohms		S & H Numeric	A	***$5665.
GMAD1	6-14 bits binary & sign		2 usec	10 megohms		S & H Diff. ADC Input Buff. Amp. DAC, Mux	A	***$9000.

** (A) 5.25H, 19.00W, 22.50L. (D) Double 6.70H, 6.90W, 12.22L.
*** Price subject to resolution and options.

MULTIPLEXERS



- Accuracies of 0.01%
- Switching in Less Than 1.5 Microseconds
- Component Cards Front Loaded Plug-In
- Solid-State . . . All Silicon Semiconductors
- Up to 96 Single-Ended Channels Per Card Module

SPECIFICATIONS

Model	Type	Chan.	Switch Time	FS Input	Lin.	Cross-talk	Input Z	Drift	Temp.	Channel Selection	Size**	Price
1700	Solid State	16	5 usec	±10 volts	0.01% FS	±0.01% FS	50 megohms	±1 mv 0° to 50°C	0° to +50°C	Random, with or without address storage.	A	$1695.
1700S2			1.5 usec				5 megohms				A	$1890.

SAMPLE-AND-HOLD SPECIFICATIONS

Model	Description	Type	Gain	Lin.	Set Time	Aperture	Noise	Droop	Temp.	Output Z	Size**	Price
8500SH	Sample & Hold Amplifier	Single-ended	Unity	±0.01% of full scale	4 usec max.	50 nsec	0.5 mv p-to-p	±1 mv/ 1 msec	0° to 50°C	Less than 1 ohm	E	$715.
6MSH-10*					0.5 usec max.	10 nsec					G	

** (A) 5.25H, 19.00W, 22.50L (E) Mounted on standard 8500VHS circuit board. (G) Mounted on standard GM circuit board. * Compatible with GMAD1 — ADC only.

PRESTON SCIENTIFIC also manufactures Instrumentation Amplifiers and Oscillators. See EEM Section 1100 Page 1348 . . . Digital Voltmeters, Panel Meters and Multimeters. See EEM Section 2900 Page 769. For the location of your nearest PRESTON representative refer to the Yellow Section.

REMEX Photocell Punched Tape Readers and Spoolers

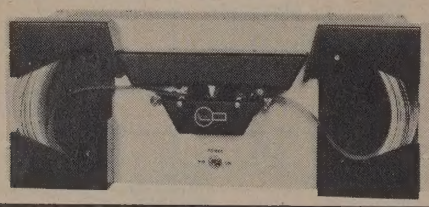
"The Standard of the Industry"

Complete range of speeds to 1000 character/second ■ Automatic adjustment for 5, 7 or 8 level punched tapes ■ omplete with integrated circuit amplifiers and control circuits ■ Unidirectional or bidirectional ■ Rugged, precision mechanical construction ■ Regulated power supply ■ No contacts to wear out or cause errors due to bounce ■ Ultra soft take-up feature in all spoolers ■ No extra charge for rack mount units ■ Self-adjusting brakes on all reader models ■ Fiber-optics ■ 15,000 hour quartz light source

Standard Readers

REMEX tape readers are available with operating speeds to 1000 characters per second. Some of the operating features are:

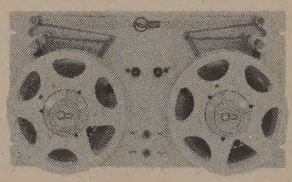
- Fused Quartz Iodine light source.
- Fibre optic light conduction system.
- TTL/DTL integrated interface logic.
- Automatic tape transparency compensation.
- Pluggable options and rugged construction.



Standard Spoolers

REMEX tape spoolers are high performance bidirectional units ideally suited to the corresponding REMEX photocell readers as well as general use with other peripheral products. Some of the operating features are:

- State of the art servo system.
- Provision for 8" and 10½" diameter reels.
- Broken tape sensing.
- Remote low level rewind.

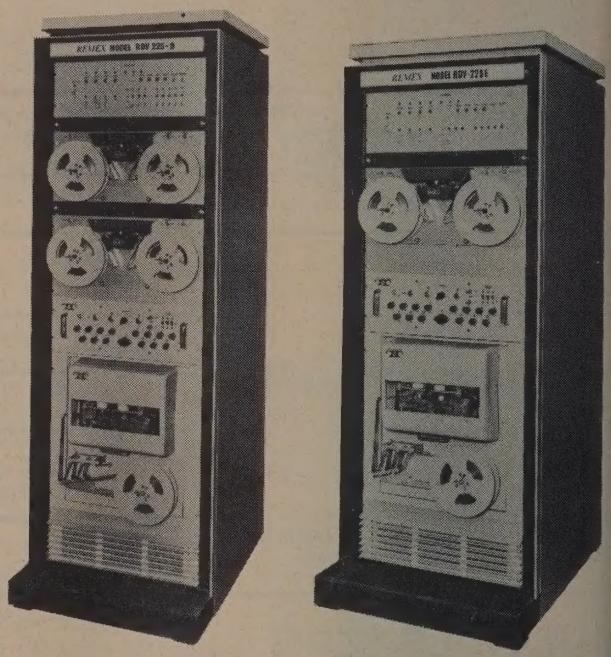


Combination Reader/Spoolers

REMEX tape reader/spoolers which operate at speeds to 500 character/second are available with the following additional features.

- Reel sizes from 4⅝" to 10½".
- Compact size relative to the functions performed.
- Minimum required system interface.

Punched Tape Duplicator-Verifiers



REMEX RDV-225 tape systems provide a family of nine tape duplicators, verifiers and duplicator verifiers with the following features:

- High speed duplication at 175 or 225 character/second.
- High speed verification at 175 or 500 character/second.
- Read after punch verification at the punching station.
- Automatic tape allignment to a selectable code.
- Odd or even parity error check.
- Skip block and/or delete codes.
- Auxiliary input for keyboard or equivalent.
- Manual inputs for switch selectable data.
- Reel types — 7½", 8" and 10½".
- Computer interface compatible.

Typical applications include tape processing for users of numerical controls, special purpose computer, test equipment and related industries.

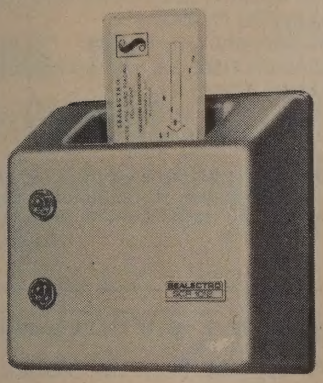
REMEX Electronics

A DIVISION OF EX-CELL-O CORPORATION XLO

5250 West El Segundo Boulevard
Hawthorne, California 90250
Telephone (213) 772-5321
TWX (910) 325-6219

SEALECTRO

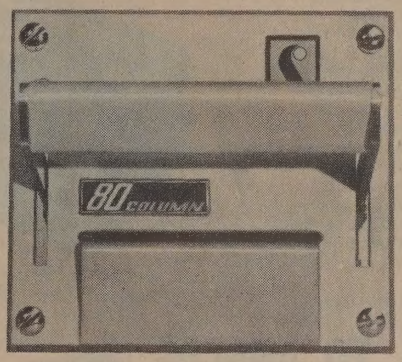
SEALECTROCARD™ CARD, BADGE AND TAB READERS



10x10-10x12 BADGE READERS

Completely automatic Badge Readers that accept standard IBM and Friden Type Badge cards in 10x10 or 10x12 formats. Ideal for personnel identification, production control and process control operations.

Go/no-go lights immediately indicate if the card is inserted correctly. No contacts actuate until the card is properly inserted. Remote solenoid-operated contacts sense hole patterns and read. Reaa function is automatically held until feedback from system releases contacts and card is automatically ejected. Flexible output wiring allows bussed or discrete contact interface connections.



12x80 CARD READER

The Sealectrocard card reader is designed to be completely compatible with all standard 12 x 80 TAB type punched-cards. This unit combines features which provide maximum reliability, convenience and economy in programming. The 12 x 80 Sealectrocard is ideally suited as peripheral equipment for a wide range of computers or as a programming device. Programs consisting of up to 960 bits of information can be read instantly from conventional punched-card formats. Features include:

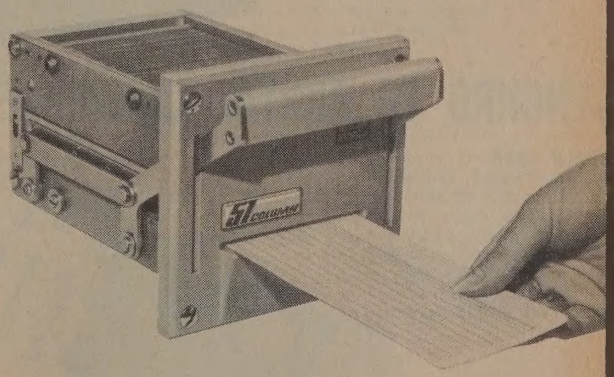
- Remote contacts with double contact wiping surfaces.
- Positive mechanical lockout if a card is mis-orientated.
- Wide choice of terminations.
- Simple, fast operation even by unskilled personnel.

12x51 TAB READER

Accepts and reads standard 80 column TAB card, but limits read area to 51 columns, providing 612 bits of information. Ideal for data acquisition in production control and other terminal operations of data processing systems not requiring full 960 point readout.

Completely foolproof. Correct orientation and positioning of card electrically interlocks operating handle eliminating faulty readouts. Card is inserted in insertion slot, handle pulled down to read position, and unit is in operation.

Utilizes same electrical contact assembly as 12 x 80 Reader. Can be bussed vertically or horizontally. It may be used with completely discrete circuitry for each of the 612 points.

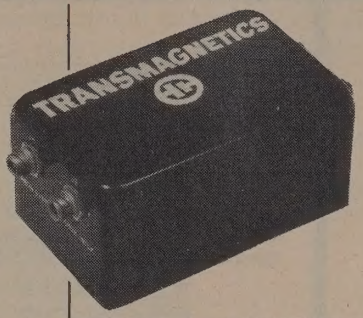


PROGRAMMING DEVICES DIVISION
SEALECTRO®
CORPORATION
MAMARONECK, N. Y. 10543
PHONE: 914 698-5600 TWX: 710-566-1110
Sealectro Ltd. Portsmouth, Hants, England
Sealectro S.A. Villiers-le-Bel, Paris, France

D-A and A-D Converters

MULTIPLEXED SYNCHRO TO DIGITAL

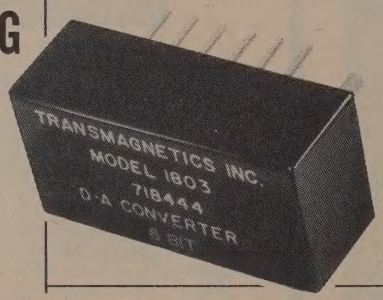
SERIES 1601
All solid state converters convert up to 8 mixed synchros or resolvers to binary digital output. A three line address selects the input to be converted. Upon receipt of a start conversion pulse, conversion of the addressed input begins. The output appears in a storage register and is retained until the next conversion command. Over 300 conversions per second may be made.



SYNCHRO/RESOLVER INPUTS: 400 Hz, 11.8V or 90 VRMS line-to-line.
AC REFERENCE: 26V or 115V RMS
DIGITAL OUTPUT: 12 bit binary MSB 180°
DATA LEVELS: TTL-DTL
STATIC ACCURACY: six minutes
CONVERSION TIME: 3.6 milliseconds max.
OPERATING TEMP.: 0 to 70°C
PACKAGE: 10 x 6 x 5" metal case plus connectors. Converter is mounted on plug-in P.C. boards
OPTIONS: Up to 64 channels input, 60 Hz Synchro or Resolvers, one millisecond conversion time, 19" rack mounting, −55 to +85°C operation

DIGITAL TO ANALOG CONVERTERS

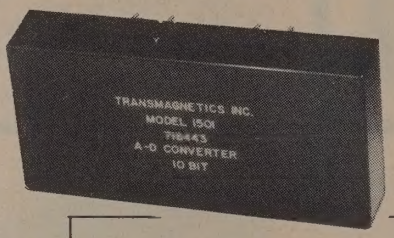
SERIES 1800
Converts up to 13 bit digital input to DC output. These miniature low cost converters contain their own reference.



DIGITAL INPUT: 8, 10, 12, or 13 Parallel, DTL-TTL compatible.
OUTPUT VOLTAGE: 0 to +10V, Output impedance: 1 Ohm max.
LINEARITY: ½ LSB
SETTLING TIME: 10 μs max (to 1 LSB)
OPERATING TEMPERATURE: 0 to 70°C or −55 to +85°C.
TEMP. COEFFICIENT: ± 20 ppm of FS/°C.
DC POWER: ± 15V ± 3% at 30 MA
PACKAGE: Metal case 1.53 x 2.03 x 0.75"H plus P.C. terminals and studs on base.
OPTIONS: 300 nanoseconds settling time, bipolar DC or AC output

ANALOG TO DIGITAL CONVERTERS

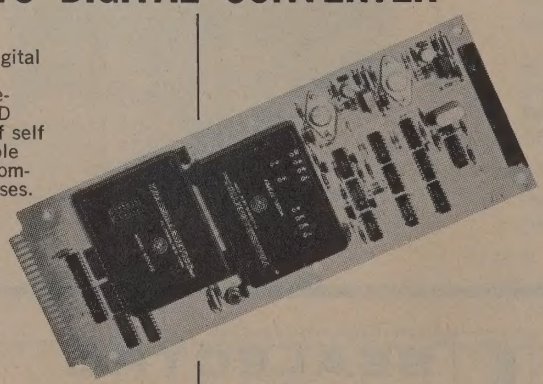
SERIES 1500
Are miniaturized analog to digital converters which, on command convert a D.C. input, to 8 or 10 bit digital output



DC INPUT: 0 to +10V into 10K ohms min.
DIGITAL OUTPUT: 8 or 10 bits parallel, DTL-TTL compatible.
CONVERSION TIME: 25 microseconds max.
RELATIVE ACCURACY: ½ LSB
TEMP. COEFFICIENT: ± 20 ppm of FS/°C.
OPERATING TEMPERATURE: 0 to 70°C or −55 to +85°C
DC POWER: ± 15V ± 1% at 70 MA each and 5.2V ± 0.3V at 300 MA max.
PACKAGE: 0.75" H. x 2.03 x 4.03 metal case with P.C. terminals and 4 mounting studs.

SYNCHRO TO DIGITAL CONVERTER

SERIES 1623
Synchro/Resolver to Digital Converters convert all standard synchros or resolvers to binary or BCD output. Three modes of self or slave operation enable easy interfacing with computers and data processes.



INPUT: Synchro or Resolver or both, 60 or 400 Hz, 11.8 or 90V line-to-line, 26 or 115V RMS line.
DIGITAL OUTPUT: 12 bit parallel binary register, DTL-TTL compatible, MSB 180°, or 4 decade BCD.
CONTROL MODES: (a) Internal Convert and update; (b) External Command Convert and Update; (c) External Command Convert, Internal Update
CONVERSION TIME: 2.4 ms Max. In internal mode, conversion time adjustable down to one conversion in 3 seconds.
CONTROL OUTPUT: Data ready pulse of 100 ns nominal width appears when conversion is complete
STATIC ACCURACY: ± 1 LSB
OPERATING TEMPERATURE: 0 to 70°C
DC POWER: ± 15V ± 2V at 50 MA max and + 5V ± 10% at 350 MA max.
PACKAGE: Furnished on 4½ x 12 P.C. plug-in board

TRANSMAGNETICS INC.

134-25 Northern Boulevard • Flushing, New York 11354 Phone: 212-539-2750

Solid State Synchro Drivers

Transmagnetics solid state synchro drivers will drive torque receivers, control transformers and differentials. Torque receivers, in particular, are difficult loads, drawing large surges on turn-on or with step changes. Years of design effort have resulted in the Transmagnetics line of drivers with protection against short circuit and synchro load malfunction but with the required surge current drive capability for synchro operation without "hang-up"

SINE-COSINE TO SYNCHRO OUTPUT

76 SERIES
ccepts DC Sine and Co-
ine inputs and generates
hree-wire synchro output

STANDARD MODELS AVAILABLE:

Model No.	Nom. V Line to Line	Ref VRMS	HZ Frequency	Plug-In P.C. Card	Synchro Load Capability TR=torque receivers CT=control transformer CDX=control differential
650-31	11.8	26±5%	400±5%	4½x8	to 3 size 11 TR's
A676-10	11.8	26±5%	400±5%	4½x8	to 3 size 11TR's, CT's, CDX
A676-10HP	11.8	26±5%	400±5%	4½x12	to 2 size 15TR's, CT's, CDX
A676-90	90	115±5%	400±5%	4½x8	1 size 11TR, CT's & CDX
A676-90HP	90	115±5%	400±5%	4½x12	size 23TR, CT's & CDX
A676-60	90	115±5%	60±5%	4½x8	CT's & CDX
A676-60HP	90	115±5%	60±5%	4½x12	Size 23TR, CT's & CDX's

OTHER SPECIFICATIONS:

INPUTS: Two DC inputs from—10 to +10V into 100K ohms min. representing sine and cosine of the angle.

ACCURACY: 10 minutes of arc

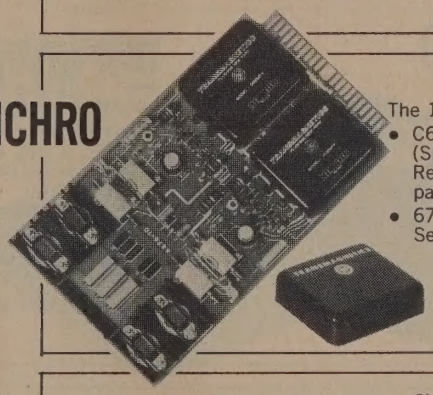
DC POWER: Three wire + and —25V for 11.8V L.L outputs. Three wire + and —150V for 90V L.L outputs.

DC CURRENT: The DC current drawn is approximately ½ the AC current drawn by the load. TR's are extremely heavy loads. Consult Transmagnetics application engineering for specific requirements.

TO ORDER: Add "C" to model number for 0-70°C operation. Add "M" for —55 to +85°C operation.

LINEAR DC TO SYNCHRO OUTPUT

612 SERIES
ccepts a linear DC input
roportional to angle and
enerates a three-wire
ynchro output.



The 1612 Series consists of:

- C670 sin-cos generator. (Specifications will be found in Computing Resolver Section of Transmagnetics EEM pages.
- 676 Synchro Driver. Select model from listing above.

SYNCHRO BUFFER AMPLIFIER

620 SERIES
e synchro buffer ampli-
ers to drive up to three
ze 11 11.8V L.L torque
ceivers.

SYNCHRO INPUT: 90V or 11.8V L.L 400 Hz into 100K ohm min. impedance. Input is transformer isolated.

SYNCHRO OUTPUT: 3 wire synchro 11.8V nominal L.L. 52 output is common to DC supply common.

ACCURACY: 6 minutes of arc.

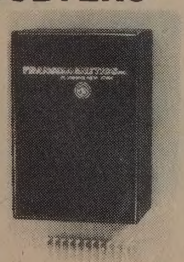
DC POWER: Plus and minus 25V ± 5%. Torque receivers draw heavy surges. Consult Transmagnetics application engineering for current requirements on supply.

OPERATING TEMPERATURE: 0 to 70°C or —55 to +85°C

PACKAGE: 1.78"H X 3.19 X 3.44

DIGITAL TO SYNCHRO/RESOLVERS CONVERTERS

670 SERIES
onverts 13 bit binary
igital input to 3 wire
ynchro or 4 wire resolver
utput.



DIGITAL INPUT: 13 parallel lines, DTL-TTL compatible, MSB is 180°.

SYNCHRO/RESOLVER OUTPUT: 3 wire synchro or 4 wire resolver output, isolated. 11.8V L.L for loads of 100 ohms min or 90V L.L at 6000 ohms min, 400 Hz.

REFERENCE INPUT: 26V or 115V RMS ± 10%, 400 Hz ± 5%.

ACCURACY: ± 4 minutes

DC POWER:
+ 15V ± 5% at 120 MA no load
— 15V ± 5% at 120 MA no load
+ 5V ± 5% at 150 MA

CONVERSION TIME: 50 microseconds max.

PACKAGE: P.C. card 4.5X6X1.5" above board.

TRANSMAGNETICS INC.

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Solid State Synchro/Resolver Converters

Transmagnetics' unique compact solid state series converts all standard synchro or resolver formats to sine-cosine DC, linear DC with angle or digital angle outputs, replacing cumbersome mechanical servos and interfacing with digital computers and data processors.

SYNCHRO/RESOLVER TO SINE-COSINE DC

SERIES 655
are miniature modules which generate sine and cosine DC outputs proportional to the synchro or resolver input angle

SYNCHRO OR RESOLVER INPUT: 60 or 400 Hz, 90V or 11.8 VRMS line to line, 26 or 115 VRMS line
OUTPUTS: 10 sine and 10 cosine θ nominal. Outputs vary proportional to line. Also see 655-NVR series below.
ACCURACY: ± 5 minutes of arc.
DC POWER: Required for A655 models (buffered output) only, ± 15 VDC ± 3% at 20 MA
OPERATING TEMPERATURE: 0 to 70°C or —55 to +85°C
PACKAGES: for 400 Hz 11.8V L.L. — 0.58"H x 2.03 x 2.28
for 400 Hz 90V L.L. — 0.78"H x 2.53 x 3.22
for 60 Hz 90V L.L. — 1.28"H x 2.53 x 3.22

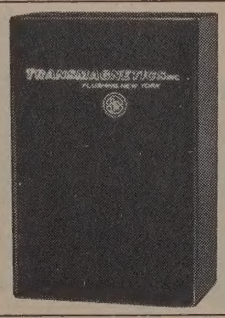
NON-VARIANT SYNCHRO TO SINE-COSINE DC

SERIES 655-NVR
modules maintain the sine-cosine outputs constant when the line and frequency vary and are independent of synchro non-linear characteristics. Synchro transformation ratios vary with line amplitude and frequency. In the 655 NVR series, these variations are computed and corrected for.

SYNCHRO OR RESOLVER INPUT: 60 or 400 Hz, 90V or 11.8V L.L. 26V or 115V RMS line
OUTPUTS: 10 sine and 10 cosine
CONFORMITY: Each output within ± ½% FS includes ± 10% line and ± 5% frequency variation, measured with actual synchro input.
ANGULAR ACCURACY: ± 15 minutes of arc.
DC POWER: ± 15V ± 1% at 50 MA
OPERATING TEMPERATURE: 0 to 70°C or —55 to +85°C
PACKAGE: 1.78"H. x 3.19 x 3.44

SYNCHRO TO LINEAR DC

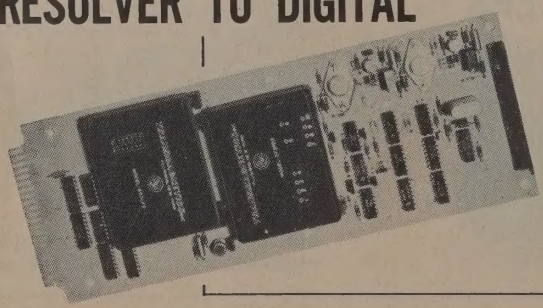
SERIES 678
convert synchro or resolver inputs to a linear DC output proportional to the angle. The output rejects changes in line amplitude and frequency.



SYNCHRO OR RESOLVER INPUT: 60 or 400 Hz, 90 or 11.8V L.L. 26 or 115 VRMS line.
OUTPUT: —10 to +10V DC linear with angles from —180 to +180°.
ACCURACY: 6 or 15 minutes of arc. Effect of ± 10% amplitude and ± 5% frequency less than 3 minutes of arc.
DC POWER: +15V ± 3% at 125 MA max, —15V ± 3% at 60 MA max
OPERATING TEMPERATURE: 0 to 70°C or —55 to +85°C
PACKAGE: 1.80"H x 3.06 x 4.56

SYNCHRO/RESOLVER TO DIGITAL

SERIES 1623



See Transmagnetics page on D/A and A/D converters for characteristics of Series 1623 converters.

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Solid State Computing Resolvers

Coordinate rotation, polar to rectangular or rectangular to polar conversion, sine-cosine generation and similar trigonometric computing functions which in the past have been implemented with mechanical resolver servo-systems, are now performed with Transmagnetics compact modules.

LINEAR DC TO SINE-COSINE OUT

C670 SERIES
accepts a DC input proportional to angle and provides two DC outputs proportional to sine and cosine of the angle.

INPUT: —10 to +10VDC representing angles from +180 to —180° into 75K ohms min input impedance.
OUTPUTS: K sine A and K cosine A where K = 10 ± 1%, outputs impedance less than 1 ohm, short circuit protected, 2000 ohms min. res. load.
ACCURACY: ± 15 minutes of arc as defined by ratio of outputs.
DYNAMIC RESPONSE: For a — 90 to + 90° step input, 25 milliseconds to reach rated accuracy.
DC POWER: + 15V ± 3% at 50 MA
— 15V ± 3% at 50 MA
+ 5V ± 5% at 200 MA
OPERATING TEMPERATURE:
0 to 70°C or — 55 to + 85°C
PACKAGE: 1.78"H X 3.19 X 3.44

COORDINATE ROTATOR

689 SERIES
accepts rectangular input (X and Y) and rotates the input through an angle proportional to a linear DC input

INPUT A: X = R cos A and Y = R sin A, each — 10 to + 10 VDC where R may vary from 20 mv to 10V, into 100K ohms nom.
INPUT B: — 10 to + 10VDC linear with angles from 0 to 360° into 100K ohms nominal.
OUTPUTS: R sin (A + B) and R cos (A + B)
ACCURACY: Angle ± 15 minutes at R = 10.
R: ± 0.15% FS
DYNAMIC RESPONSE: 450 conversions per second min.
DC POWER: + 15V ± 1% at 60 MA max
— 15V ± 1% at 60 MA max
5V ± 10% at 85 MA max
OPERATING TEMPERATURE:
0 to 70°C or — 55 to + 85°C
PACKAGE: 1.78"H X 3.19 X 3.44

POLAR TO RECTANGULAR CONVERTER

1618 SERIES
converts input in polar form R, A to rectangular R Sin A and R Cos A

INPUTS: R: 20 MV to 10V into 100K ohms nom.
A: — 10 to + 10V into 100K ohms nom., linear with angles from 0 to 360°.
OUTPUTS: R Sin A and R Cos A into 2K ohms min. res. load
ACCURACY: Angle: ± 15 minutes at R = 10
R: ± 0.15% FS
DYNAMIC RESPONSE: 450 conversions per second min.
DC POWER: + 15V ± 1% at 60 MA max
— 15V ± 1% at 60 MA max
5V ± 10% at 85 MA max
OPERATING TEMPERATURE:
0 to 70°C or — 55 to 85°C
PACKAGE: 1.78"H X 3.19 X 3.44

RECTANGULAR TO POLAR CONVERTER

695 SERIES
converts input in rectangular form X, Y to polar R, A

INPUTS: R Cos A and R Sin A into 100K ohms min. impedance. R may vary from 50MV to 10V.
OUTPUTS: R and A from less than 10 ohms to 2K ohms min. load.
ACCURACY: Angle: ± 15 minutes at R = 10
R: ± 0.1% FS
DYNAMIC RESPONSE: 450 conversions per second min.
DC POWER: + 15V ± 1% at 75MA max.
— 15V ± 1% at 75MA max.
+ 5V ± 5% at 50MA max.
OPERATING TEMPERATURE:
0 to 70°C or — 55 to + 85°C
PACKAGE: 1.78"H X 3.19 X 3.44

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Solid State Computing Modules

COMPUTING SINE WAVE MODULATORS

FOR DC TO AC
Proportional phase-reversing conversion. Models 152 and 191 are fully isolated

These modulators offer high performance, small size and off the shelf delivery in radar, fire control, auto-pilots and similar applications where high accuracy is required. The output of these models remains constant for a 10% change in line. For "multiplying" modulators see Model 365 below. Models listed have 26V 400 Hz reference. 115V and 60 Hz units are available.

Model	DCV in	AC out VRMS	Lin % FS	Oper. Temp.	Phase °	Size
1102	−10 to +10	0 to 6	0.1	−55 to +85°C	±1	.58"H X 2.03X2.28
152	−7 to +7	0 to 1	0.1	−55 to +85°C	±3	1.87"H X 1.13X1.25
191	−5 to +5	0 to 5	0.1	−55 to +85°C	±5	1.87"H X 1.13X1.25

COMPUTING DEMODULATORS

FOR AC TO DC
Proportional phase-sensitive bipolar output. All models are fully isolated.

SPECIFICATIONS
Demodulators are required in similar systems to modulators. They are also used to condition AC signals from strain gauges, pressure and similar transducers to DC for telemetry and data processing. 697 Models contain two demodulators in a very small size and may be used for resolver demodulation. All models shown are for 400 Hz operation. 60 Hz also available.

Model	AC Sig. In VRMS	DCV Out	ACV Ref	Lin % FS	Oper. Temp.	Size
840	0 to 5	0±4.3	26	0.1	−55 to +85°C	1.63"H X 1 X 1
854	0 to 20	0±10	26	0.1	−55 to +85°C	1.63"H X 1 X 1
697MP4	0 to 11.8	0±10	26	0.1	−55 to +85°C	0.58"H X 2.03X2.28
697-115MP2	0 to 90	0±10	115	0.1	−55 to +85°C	0.78"H X 2.53X3.22

ANALOG MULTIPLIERS—COMPUTING GRADE

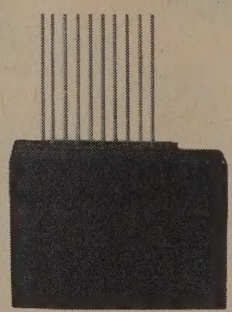
NARROW BANDWIDTH*
These pulse modulator multipliers are accurate, stable and repeatable. They represent the best buy in servo and trigonometric computing requiring only limited bandwidth.

QUARTER-SQUARE**
Quarter-square multipliers with diode-shaping networks are the most repeatable and stable wide-band multipliers.

Model	350RP2*	350MP4*	380MP4**	380CP5**
3 DB BW	100 Hz	100 Hz		
Size	.78 x 2.53 x 3.22	.58 x 2.03 x 2.28	.58 x 2.03 x 2.28	.78 x 3.19 x 3.44
Operating Temperature	−25 to +85°C	−55 to +85°C	−55 to +85°C	0 to 70°C
Input Impedance	100K, 50K	100K, 50K	10K ohms min.	10K ohms min.
Output V	±10	±10	±10	±10
Output MA	2	2	2	2
Accuracy % F.S. Range	0.25	0.25	0.25	0.25
Supply DC	±15V	±15V	±15V	±15V
Full Output KHz			20	20

MULTIPLYING MODULATOR—VARIABLE GAIN AMPLIFIER

MODEL 365
A miniature solid-state multiplying modulator without hysteresis produces an AC gain proportional to a DC input.



This device finds applications in flight control systems in varying loop gain or as a sine-wave modulator.

DC INPUT: 0 to ±10V into 50 ohms min.
AC INPUT: 0 to 7V RMS into 50K ohms min.
AC OUTPUT: Proportional to product of inputs. Output is 2V RMS when inputs are at maximum above.
PHASE: Constant to ±1° over 380 to 420 Hz.
3 DB BANDWIDTH: 200 Hz to 100 KHz
AC LINEARITY: 1% FS
DC LINEARITY: 1% FS
NULL: 10 MV RMS, 200 Hz to 10 KHz
DC POWER: ±15V
SIZE: .4H x 1.27 x 1.77
OPERATING TEMPERATURE: 0 to 70°C (available for −55 to +85°C)

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TAURUS

World Leaders in Card Readers

FEATURING HIGH RELIABILITY

A Complete Line of Punched Card Readers for Static and Serial Programming

APPLICATIONS

MILITARY USES: Ground checkout equipment, programming, testing, component testing, simulators, etc.

COMMERCIAL USES: Batching of concrete, food, chemicals, etc.; automatic crane operation, automated manufacturing processes, data processing, process control, etc.

STANDARD SPECIFICATIONS

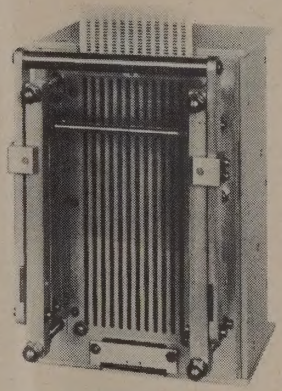
Cards—IBM, Rem. Rand or others.

No. of Switches—10 to 960—(Form A, B or C).

Electrical—Dry Circuit to 3 AMPS.

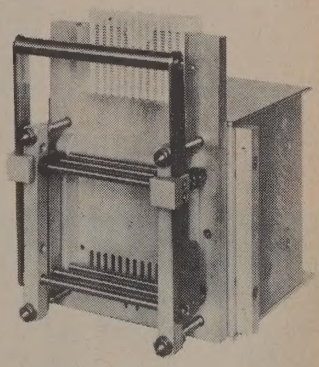
M-3
FULL IBM CARD STATIC READER

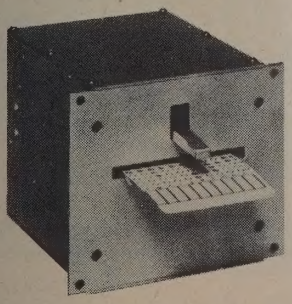
Reads up to 80 columns, or 960 switches, (complete IBM card). Most compact switching array available. Reads indirectly for maximum reliability. After insertion, punched hole has a closed switch, no hole an open switch. Switch reliability 100,000 cycles. Mechanical reliability 500,000 cycles.



JM-3
STATIC READER FOR ONE HALF OF AN IBM CARD

Reads up to 40 columns, or 480 switches, of an IBM card. After insertion, punched hole has a closed switch, no hole an open switch. Switch reliability 100,000 cycles. Mechanical reliability 500,000 cycles.



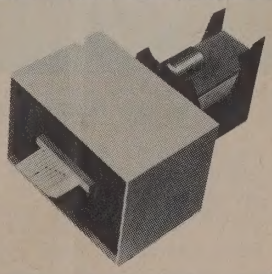


S SERIES
S-60, S-120, S-180

For simple functions. Practical. Economical. Reads an entire card or part of one. Choice of 60, 120, or 180 replaceable switches. Each switch can be removed or replaced separately. Cards can be hand punched.

MODEL 600
SERIAL READER

Relatively Slow But Inexpensive.
Feed and Read . . . Less than $1,000.



Reads standard 80-column, 12-row cards, serially, column by column, 10 columns per second or less. Alpha-numeric or other symbols accepted. For on line computer, remote transmission, interfaced with other machines, numerical control, card duplication or correction. Sizes 6¼″ High x 9¾″ Wide x 6½″ Deep. Automatic card feed available for sequential feeding of up to 200 cards.

Also Teflon Terminals and Printed Circuit Board Guides

CUSTOM BUILT UNITS ARE OUR SPECIALTY. We will fill your requirements in spacing, switch action, number of switches and any other special needs, and will determine the most economical size and type for your operations. **Send for 1970 Catalog.**

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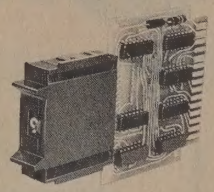
DIGITAL SYSTEM COMPONENTS

UNICO, INC.



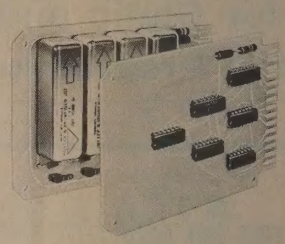
thumbwheel switches

A wide variety of thumbwheel switch units with functionally related electronic components mounted as an integral part of the switch assembly reduces and simplifies interconnecting wiring to a fraction of that used with conventional methods. These combinations also simplify system test and troubleshooting. The thumbwheel switch functions include:

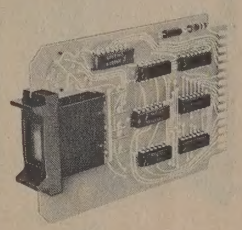
- coincidence detection
- magnitude comparison
- BCD, binary and decimal setting
- multi-station multiplexing
- frequency division
- frequency addition/subtraction
- frequency multiplication

A complete line of functional and logic modules that include both digital and analog types are designed for convenient interface with pulse generators, encoders, switch closures, dc drives and other control equipment. All modules are compatible with the readout and thumbwheel units to ease system design and application. Functional and logic modules include:

- input/output convertors
- analog switches
- relays and relay drivers
- DC amplifiers
- cyclic-to-binary convertors
- frequency and D-to-A convertors
- variable time delays
- gates, flip-flops and counters



functional and logic modules



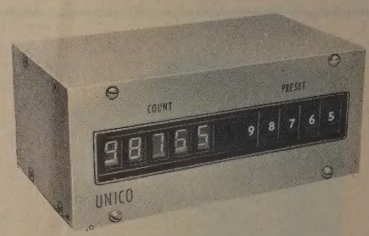
readout units

Readout units with a variety of digital functions mounted as an integral part of the module simplify digital system design and implementation. Most units are available with optional storage and/or buffer amplifiers. Both the seven segment and ± readouts operate at logic levels and view easily at a distance of 20 feet. Readout module functions include:

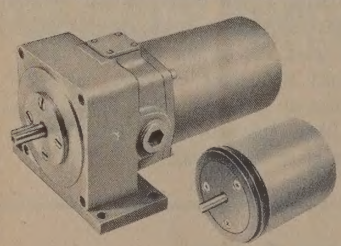
- BCD decoders
- binary (0-15) decoders
- 9's complement decoders
- XS3 decoders
- XS14 decoders
- binary up or down counters
- decimal up or down counters
- BCD bidirectional counters

Complete hardware and compatible hardware modules make new system design and fabrication easy and fast. All units mount on identical centers of the same mounting racks. Application information, design assistance, standard functional units and special systems designed and built with standard parts, are available when required. Hardware parts and modules include:

- spacer and end modules
- cable and component cards
- mounting racks
- face plates and covers
- pushbutton cards
- IC mounting modules
- extender cards
- indicator modules



hardware and functional systems



rotary transducers

Rotary transducers available in both ruggidized and conventional enclosures are compatible with, and complementary to the line of digital system components. Heavy-duty units can be flange or foot mounted and are designed to withstand high shaft load and hostile environments. Integral amplifiers are included on most units for pulse wave shaping and line driving. Rotary transducers include:

- bidirectional pulse generators (10-5000 pulses/revolution)
- tachometers
- absolute encoders (360-10,000 parts/turn)
- potentiometers

manufacturers of digital system components, digital servos, dc drive systems, and scr amplifiers

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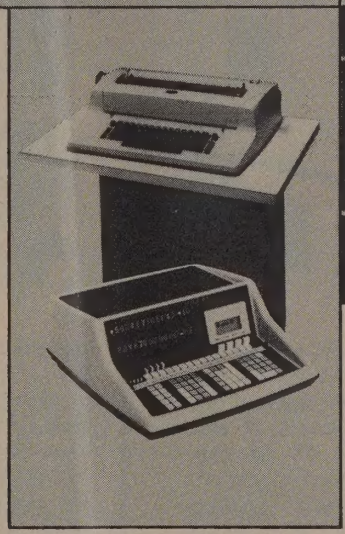
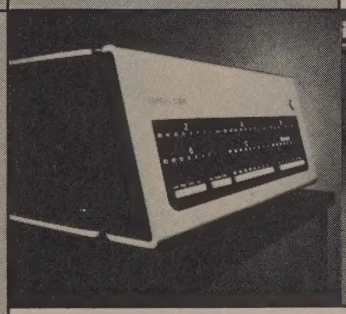
Wang time machines give you greater design freedom

300 Series – (right) for Low-Cost Flexibility in Design Calculations. Choose the model that best meets your design requirements: Model 320 with instantaneous $\sqrt{x}$, x^2, $\log_e x$ and e^x plus two storage registers; Model 360 with six storage registers; Model 362 with up to 26 storage registers; or six more keyboards providing trig functions by single keystrokes. Peripherals include the CP-1 and CP-2 Card Programmers and the 301 Column Printer. Four keyboards can operate simultaneously from a briefcase-size electronic package for optimum cost advantage.

WANG 3300 BASIC – (below) The First Low Cost Time-Sharing Mini-Computer with BASIC. The WANG 3300 BASIC is the first in-house, time-sharing system designed to give large system time-sharing performance at only ¼ the cost of subscription services or other in-house time-sharing systems. The 3300 BASIC is an integrated hardware/software system utilizing typewriter terminals, with compact magnetic tape cassettes, or standard teletypes. Software features BASIC the most popular, proven conversational time-sharing language – with a flexible calculator mode.

370 Series – (above) for your More Complex Design Problems. Our 370 Model provides increased storage with random access from the keyboard or under program control with up to 480 steps. This system will branch, loop, perform subroutines, make decisions and manipulate arrays. Peripherals include a 301 Column Printer and 379-5/7a numeric Output Writer.





Model 700 – (left) the Ultimate Programmable Calculator. The 700 is a fully self-contained IC calculator which programs and executes up to 960 program steps in core, stored on tape cassettes. It has 120 data registers, for manipulating numbers throughout the dynamic range, dual Nixie®-type displays, special keys for trig functions, commands for loops, branches and subroutines, plus basic arithmetic and log keys. Execution speeds range from 300 μ sec for + and – to 250 m sec for trig functions. Model 701 Output Writer and other peripherals add increased design flexibility.

Comprehensive library programs are available for all Models.

WANG

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CONSULT YELLOW PAGES FOR YOUR NEAREST WANG SALES/SERVICE OFFICE.

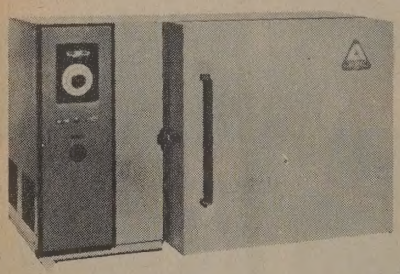
Environmental Test Chambers

MOST COMPLETE, MOST RELIABLE LINE IN THE INDUSTRY! DELIVERED FROM STOCK AT PRODUCTION-LINE PRICES!

Associated Testing Laboratories, Inc., one of the country's largest independent environmental testing facilities serving the aerospace and electronics industry, offers through its Manufacturing Division a complete line of environmental test chambers for research, production, reliability testing and quality control.

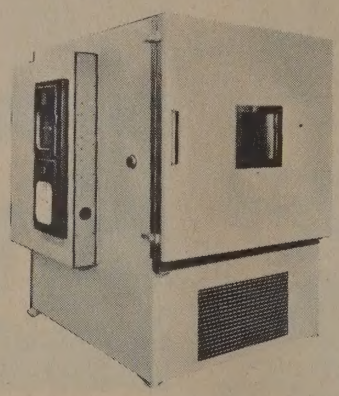
Originally designed for use in Associated's own testing laboratories, these chambers have been time-tested and use-proven in industry after industry, as well as in thousands of hours of on-the-line operations at our own laboratories, performing tests to the most rigorous government specifications. Associated's environmental chambers are a standard line of equipment, manufactured in production quantities and delivered from stock. Detailed specifications, technical data and price information are available directly from our plant or from your regional Associated representative.

LOW-HIGH TEMPERATURE CHAMBERS



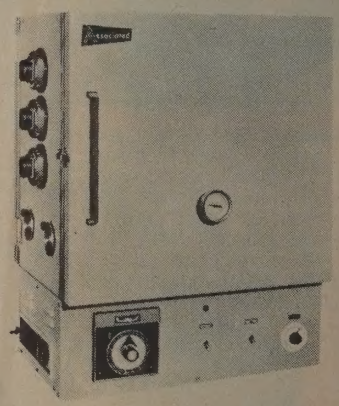
A complete line of chambers for military and commercial testing offering a choice of mechanical refrigeration or CO_2 cooling • Rack, bench and stacking types • Sizes from 0.5 to 27 cubic feet • Low Temperatures to −120°F, high temperatures to +500°F • Solid state controllers, choice of ±½°F or ±¼°F control stability • Adjustable high temperature fail-safe • Wide range of options • Prices for CO_2 chambers start at $335., prices for mechanically refrigerated chambers start at $875. • **Delivery From Stock.**

TEMPERATURE-HUMIDITY CHAMBERS



Performance features normally found only in custom-built chambers, built in production quantities and at production prices • Sizes 4, 8, and 27 cubic feet • Choice of single stage or cascade refrigeration • Optional CO_2 capability • Temperature ranges from −100°F to +350°F • Humidity ranges from 10% to 98% • Forced air circulation • 2-Pen 2-Cam programming recording controllers • Adjustable high temperature fail-safe • Integral demineralizer • **Delivery From Stock.**

BURN-IN TEST CHAMBERS



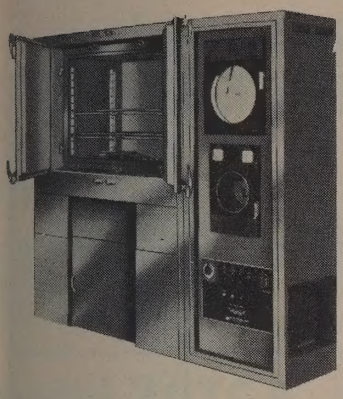
Designed specifically for life and burn-in testing of semi-conductors, integrated circuits, and axial lead devices • Test temperatures from ambient to +300°F, with choice of ±½°F or ±¼°F temperature control stability • Rise time ambient to upper limit in 30 minutes • Printed circuit board trays offer maximum burn-in capacity on axial lead devices of up to 3,300 units per chamber • Low temperature CO_2 capability optional • Prices for standard printed circuit boards and chambers available upon request.

• *Write or call for free catalog of Environmental Test Chambers and Test Equipment.*

ASSOCIATED TESTING LABORATORIES INC.

200 Route 46, Wayne, New Jersey 07470 • Phone (201) 256-2800 • TWX (710) 988-5712
West Coast Office: 1304 Seventh Street, Santa Monica, Calif. 90401 • (213) 451-8521

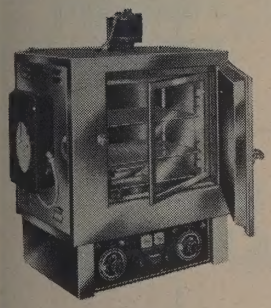
BLUE M TEMPERATURE CONTROLLED EQUIPMENT FOR ELECTRONICS RESEARCH AND PRODUCTION



FULL-RANGE TEMPERATURE/HUMIDITY CHAMBERS

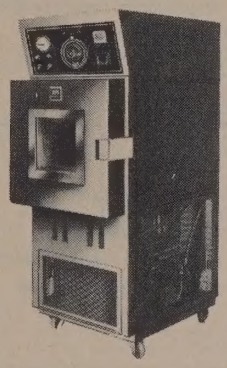
Maximum capability cabinets to perform all current MIL humidity tests. Dual wet and dry bulb POWER-O-MATIC 60® Saturable Reactor Control Systems assure absolute stability and reliability. High speed stabilization and the finest control tolerances available insure accurate reproduction of today's test requirements plus the capability of meeting future requirements when existing standards are tightened. These mechanical convection, horizontal air-flow units feature programming and separate monitoring recorder. Temperature range: −18°C. to +93°C. (±½°C.). Meets MIL-202D, Method 160-C, Step 7A; automatically performs −10°C. dip without changing cams. Maintains R. H. ±½%. Chamber sizes: 5.8, 11, 27, and 64 cu. ft.

Similar units for single steady state tests available. Also new, compact top loading cabinets with similar operating characteristics.



NEW AIR-COOLED TEMPERATURE/HUMIDITY CABINETS

HUMIDAIRE Combination Temperature/Humidity Cabinets with independent wet and dry bulb POWER-O-MATIC 60 Saturable Reactor Control Systems provide extreme accuracy from +12°C. above ambient to +93°C. (±½°C.). Use air for cooling, not costly conditioned water. Saves 30,000—100,000 gallons a year. The most reliable and economical chamber ever developed for long-term high temperature/humidity testing. Ideal for such steady state tests as MIL-202D, Method 103B—continuous operation for 56 days. Four sizes. 1.47, 3.24, 5.5 and 10 cu. ft.

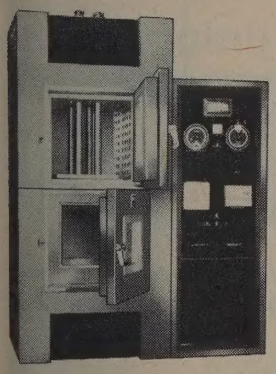


NEW VERSA-RANGE® REFRIGERATED TEST CHAMBERS

Incomparable control accuracy, reliability and dependability—plus a choice of two versatile ranges: −100°F. to +400°F. and −40°F. to +200°F. Five chamber sizes—3 to 64 cu. ft.—for each range. POWER-O-MATIC 60 control carefully matched with heating system and exclusive quality non-cycling mechanical refrigeration system for maximum efficiency and economy. Rapid pull-down. Also chest type cold chambers with ranges to −40°F. and −120°F.

THESE ARE ONLY EXAMPLES OF OUR COMPLETE TEMPERATURE/HUMIDITY AND REFRIGERATION CONTROL CAPABILITY

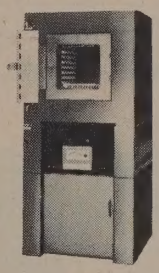
BLUE M THERMAL SHOCK TEST CHAMBERS DESIGNED FOR MIL-STD-202D AND 883



Ask about our complete line of thermal cycling chambers, LN_2 chambers, and new Versa-Whirl baths for MIL-STD-883, Method 1011, Conditions A to F.

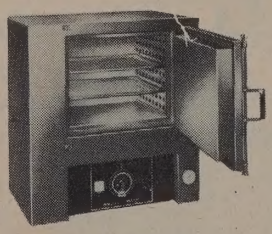
DUAL THERMAL SHOCK TEST CABINETS

2.3 cu. ft. work chamber moves vertically from lower cold chamber to upper heat chamber as required by spec. Cold chamber uses LN_2 to reduce incoming load to −55°C or −65°C. Has solid-state instrumentation. Heat chamber, with range of +204°C (+400°F), regulated by POWER-O-MATIC 60 Control for reliable, straight-line performance. Also available: 3-stage Thermal Cycling Test Cabinets to meet MIL-STD-202D, Method 102A, Preferred Conditions C & D. Test accomplished in one unit instead of two as is customary. Operation of both models is fully automatic—with reliability and accuracy to meet spec. easily.



BLUE M FURNACES

A wide variety of research and production models to suit the strictest needs. Box type muffle furnaces, Globar units — in bench and floor models — new tube furnace. Most have solid-state instrumentation for extremely accurate temperature control and unmatched reliability. Temperatures to +3000°F. Quality materials and workmanship throughout.



BLUE M OVENS

All types. Mechanical and gravity . . . batch, aging, vacuum, life-test, hazard-safe, gas forming, annealing. Simple lab models to units for Mil Specs. Sizes to 96 cu. ft. . . . temperatures to +1200°F. Most have patented POWER-O-MATIC 60 Control, others feature patented POWER-O-MATIC 70(TM) Solid-State Proportioning Control. All accessories, including programming, available.

FOR FULL DETAILS ON THESE PRODUCTS AND FOR INFORMATION ON OUR COMPLETE CONTROLLED TEMPERATURE CAPABILITY, WRITE:

BLUE M

BLUE M ENGINEERING COMPANY, A Division of Blue M Electric Company
Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406

DYTRONICS

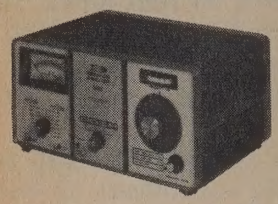
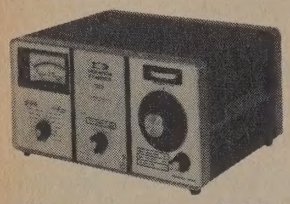
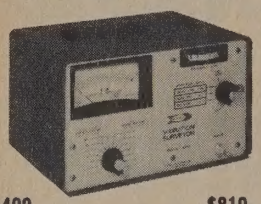
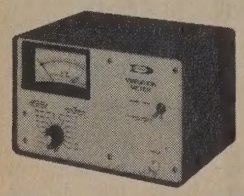
VIBRATION ANALYSIS DYNAMIC BALANCER

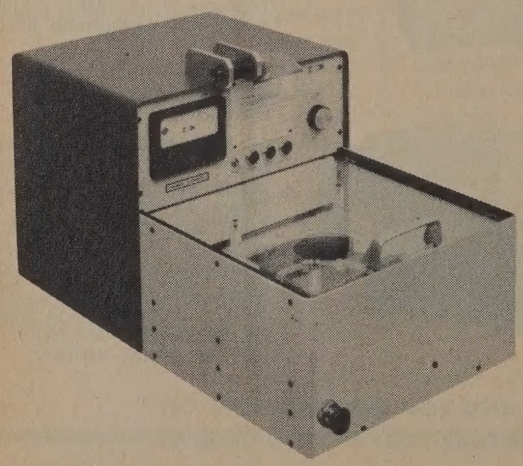
Vibration is a major problem for industry! It affects quality, safety and maintenance costs for metal working manufacturers, power and process industries, construction and mining industries, aircraft and missile industries and transportation. Stop vibration trouble before it starts. Use Dytronic's vibration instrumentation to:

- **Detect Vibration**
- **Correct Vibration**
- **Analyze Vibration**
- **Monitor Vibration**

Solve vibration porblems with Dytronics vibration analysis instrumentation.

DYTRONICS COMPANY, INC.
4800 EVANSWOOD DRIVE, COLUMBUS, OHIO 43229

Model Number	Description	Application	Frequency Range	Sensitivity
 4000 $3,630	Vibration Analyzer Amplitude Meter Frequency Meter Vibration Filter Stroboscopic Light AC or Rechargeable Batteries	(1) In place detecting, Analysis and Correction of Vibration in Rotating devices	50 cpm to 500,000 cpm	1 micro inch and .0001 G
 4200 $2,010	Vibration Examiner Amplitude & Frequency Meters Tunable Filter AC or Battery operation	(1) Detecting and analyzing vibrations	50 cpm to 500,000 cpm	1 micro inch and .0001 G
 4400 $810	Vibration Surveyor Amplitude & Frequency Meter AC or Battery operation	(1) Survey machinery conditions (2) Avoid costly breakdown	50 cpm to 500,000 cpm	1 micro inch and .0001 G
 4600 $720	Vibration Meter with Accelerometer Pickup AC or Battery operation	(1) Vibration Amplitude Measurement (2) Displacement or Acceleration (3) Monitoring (4) QC Checks	50 cpm to 500,000 cpm	1 micro inch and .0001 G



4501 $7,880

BALANCE ROTATING ASSEMBLIES DYNAMICALLY

- **WITHOUT DISASSEMBLY**
- **USING SEMI-SKILLED OPERATORS**
- **AT PRODUCTION RATES**
- **WITH SINGLE RUN CORRECTION**

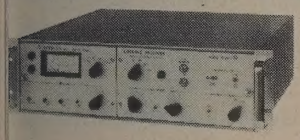
The Model 4501 Dynamic Balancer corrects vibration in fans, blowers, motors, hand tools, appliances, without taking the assembly apart. Life of operation is increased up to three times by balancing the complete assembly. An exclusive memory system remembers the exact amount of material the operator must remove or add. Never before has such an advanced technique been offered the balancing industry.

See Additional Products Section 290

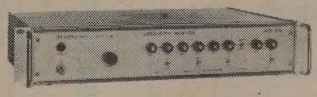
AUSTRON

time / frequency instruments / data logging instruments / Sulzer crystal oscillators / TCXO crystal oscillators

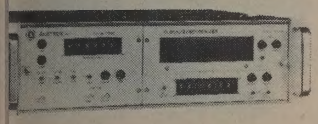
model 2000C



model 2082

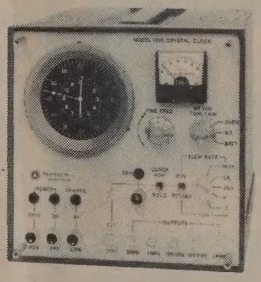


model 2070A



model 2060A

model 1200-1210



AUSTRON, Inc., offers a complete line of instruments for time/frequency calibration and control. Designed to maximize utilization of Loran-C, VLF, and Omega transmission, AUSTRON instruments find applications in time synchronization, timekeeping, frequency calibration, propagation studies, and ionospheric event monitors.

The Model 2000C receives and automatically phase tracks all Loran-C chains. Direct cycle identification via front panel meter and signal wave form printout. Ground or skywave tracking for micro-second timing and frequency monitoring. All-electronic servo. Loop or whip antenna system available.

The Model 2070A provides in-line, digital time-of-day display. Synchronized by Loran-C or other electrical reference. Includes Loran-C repetition period generator. Internal Crystal Frequency Standard of 2×10^{-10}/day is optional.

The Model 2082 Loran-C TRF Receiver is optimized for visual or photographic monitoring and analysis of Loran-C signals. Unit includes two adjustable notch filters. Additional filters optional.

The Model 2062A Group Repetition Period and Time of Coincidence Generator adapts skywave monitors and visual receivers for timing by odd-rate Loran-C stations. The unit also provides visual and electrical indication of TOC seconds.

The Model 2040 Loran-C Signal Simulator generates Master or Slave test signals at any repetition period for Loran-C receivers. Phase shifter for signal time adjustment. Doppler simulator and Loran-D format optional.

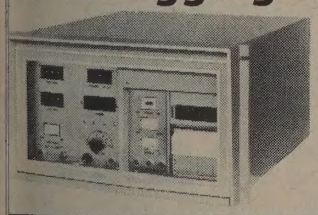
The Model 2010A Oscillator Control Unit permits phase-locking a crystal frequency standard to a higher stability reference such as an atomic standard or Loran-C receiver output. The unit uses a third order servo system for automatic correction of systematic oscillator aging in the event of primary reference failure.

The Model 1200 or 1210 Crystal Clock is available in portable or rack mount pack. Unit weighs twenty pounds and includes double proportional oven controlled crystal reference with stability of $\pm 1 \times 10^{-10}$/day or better. Also included is automatic synchronization to external reference with 0.4 microseconds or manual synchronization to 0.2 microseconds. Sine wave outputs of 5 MHz, 1 MHz, and 100 kHz and pulse outputs from 100 pps to 1 pps. Standby battery capability of twenty hours minimum.

Data sheets for these instruments and others are available. Also write for the following application notes:

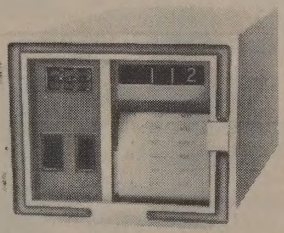
1. A Loran-C Skywave Timing Experiment
2. A Frequency Control Experiment
3. Loran-C for Time and Frequency

data logging instruments



model 2210

The Model DL-2210 Digilogger scans up to 1000 voltage on thermocouple inputs and prints out directly in Engineering units on roll paper. Unit equipped with hi-low alarms and time print-out.



model DL-1200

The Model DL-1200 is an inexpensive logging device which scans up to 50 voltage on thermocouple inputs and prints out on roll paper directly in Engineering units. Ten voltage inputs may be logged for less than $1500.

Sulzer crystal oscillators

model 1150
2½ x 3¼ x 5″

model 1120
2¼ x 2⅛ x 4″

1150 — 2×10^{-10}/day long term stability, 2×10^{-11}/°C average for −55°C to +60°C, 5 MHz, 4.5 watts maximum 2.5 watts average power input, 2½ x 3¼ x 5″. **1120** — Long term stability to 1×10^{-9}/24 hours, −20°C to +55°C, 5×10^{-9} retrace after one hour, 1 MHz output (special frequencies available), 4 watts maximum 2 watts average power input, 2.14 x 2.27 x 4″, 9 ounces. Electrical and mechanical replacement for older Sulzer Model 1 KLM series.

TCXO-50 Temperature-Compensated Crystal Oscillator
2 x 2 x 1″

Temperature-compensated Crystal Oscillators

ACO-57
Frequency Range — 100 KHz to 50 MHz
Accuracy — $\pm 1 \times 10^{-6}$
Frequency vs. Temperature — 5×10^{-6}
Temperature Range — −5°C to +55°C
Input — 5 v dc ±1%
Output — 1-4 v pk-pk into 10 K ohms

TCXO-50
Frequency Range — 1 MHz to 10 MHz
Frequency Tolerance — $\pm 1 \times 10^{-6}$
Temperature Range — 5°C to +55°C
Frequency vs. Temperature — $\pm 1 \times 10^{-6}$
Input — 24 v dc ±10%
Output — 1-4 v pk-pk into 10 K ohms
Stabilization — <3 seconds

AUSTRON INC. • 10214 NORTH INTERREGIONAL HIGHWAY, AUSTON, TEXAS 78753 • TELEPHONE (512) 836-3523

api INDICATING & CONTROLLIN

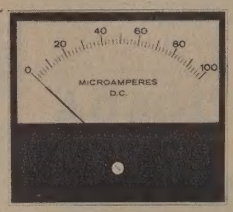
Panel meters

API panel meters have standard 1% tracking and frictionless taut band movement in the most popular DC ranges—20 to 100 μa and 5 to 25 mv. Taut band (not 1% tracking) is standard in ranges between 3 and 10 μa. Most taut band DC meters can be calibrated for 0.5% tracking, 1% accuracy, or 0.5% accuracy. Pivot-jewel movement is standard above 100 μa.

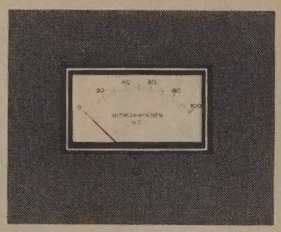
New Series 7000 panel meters

API Series 7000 is an all-new line with forward styling and panel mounting versatility never before available in one meter design. Mounting options are front mount, bezel mount and lens mount. "Stick-on" color plates are offered for front-mounted meters. Other features: field-changeable scales, rugged phenolic cases and fronts, glass windows.

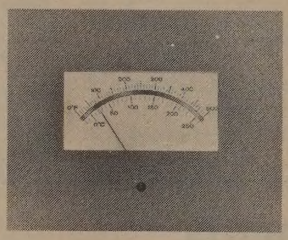
Sizes: Model 7035 (3½"), Model 7045 (4½"), and Model 7055 (5½"). ***Request Bulletin 67.***



Front Mount.



Bezel mount.



Lens mount.

Other API panel meters

Additional panel meter types include black phenolic in both front mounting and recessed mounting styles, edge-reading models, ruggedized-sealed meters, and VU meters for recording and broadcasting applications. Sizes range from 2¼" to 10" in width.

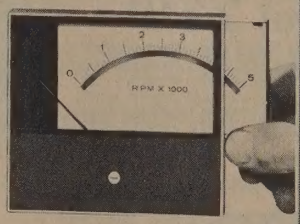
New electronic panel meters, featuring 1% accuracy and 1-second response, are also available. Specify product when requesting literature.

Indicating pyrometers

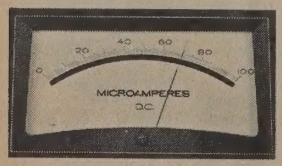
Pyrometers are thermocouple-actuated, all taut band, and both bimetal and thermistor compensated for ambient temperature changes. Standard mirrored scales read both °F and °C. They are stocked in popular ranges, with the same case styles as panel meters. Standard accuracy is 2%, with 1% available. Portable pyrometers also stocked. ***Request Bulletin 68.***

Meter-relays

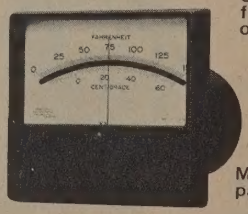
Meter-relay types include the Ultimeter (potentiometric set point), contactless (optical), contacting (locking-coil), and contacting (magnetic), all of which are used with API circuit modules or other control circuitry. Adjustable single or double set points. Specify product when requesting literature.



Series 7000 scales are field-changeable without pointer damage.



Model 561 panel meter.



Model 503-E electronic panel meter.

Digital products

API digital panel instrun combine award-winning d with fine features. Digital meters may be teamed with m ing comparators for large up display plus precise limit co

Model 4304 digital panel r

Model 4304 has large 7-ba mented digits with easy-to-rea play to ±1999 with 1000-me input impedance. Standard fea include auto-polarity, 0.1% racy, BCD output, 100% over-r front or rear panel mounting. Ra are 0-199.9 mv to 0-1000 volt ***quest Bulletin DP-2.***

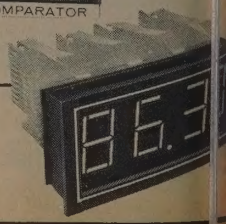
Model 4310 digital compa

This 4-digit comparator has input 1-2-4-8, algebraic compa logic output, 2 amp relay co polarity switch, and visual lan dicators. Logic circuitry is separ Choice of fixed limit or adjus thumbwheel limit. Remote pro ming models available. ***Re Bulletin DP-3.***

7-bar segmented displays

Digital display modules ma used for low cost counters and outs. Each module provides cou storage and decoder-driver, output, serial or parallel input, lamp, decimal point. Mou hardware available for multi-de displays. ***Request Bulletin DP***

Mode 431 digita comp arator

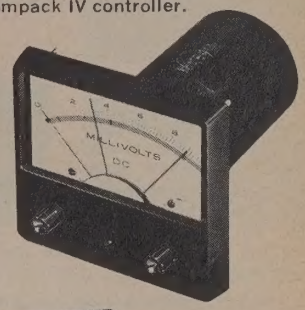


Digital display modules.

INSTRUMENTS

▶ Controllers

API solid-state controllers provide many different levels of sophistication for controlling temperature and other process variables. Most temperature control models are thermocouple actuated, with no recalibration necessary up to 100 ohms thermocouple resistance. Quick delivery in standard ranges.

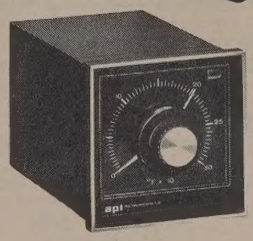


Compack IV controller.

Compack controllers

Compack IV On-Off controllers are dimensionally and electrically interchangeable with most controllers incorporating optical meter-relays, but they provide such improvements as 1% accuracy, faster response and solid-state reliability. Other features: switching independent of meter, chopper amplifier input impedance, adjustable single or double set points, self-contained power supply. Available as a thermocouple-actuated temperature controller. ***Request Bulletin 66.***

Pyrometer models of Compacks I and II, built around optical meter-relays, offer On-Off, Time Proportioning or SCR driver control action.


Model 232 temperature controller.

Model 232 temperature controller

This low cost controller is designed for industrial and commercial ovens, laboratory environmental chambers, plastics and packaging machines. Built in the USA to DIN dimensions, it provides either relay or SCR type output for On-Off or Time Proportioning control. Standard ranges in stock (minimum span 0 to 300°F). May also be used as a limit device. ***Request Bulletin T-232-A.***

Model 226—digital set point

Two-mode temperature controllers

These instruments cover a broad range of applications in plastics, packaging, textiles, hydrocarbons, and many types of furnaces and ovens. Outputs include voltage or current, Time Proportioning zero crossing, Time Proportioning relay, phase-fired pulse.

Models 225 and 226 offer field-changeable plug-in cards for ranges, outputs and optional alarm. Other features are adjustable proportional band, adjustable automatic reset, deviation meter. Model 225 has analog set point; Model 226 is digital. ***Request Bulletin T-225/226-A.***

Model 227—analog set point

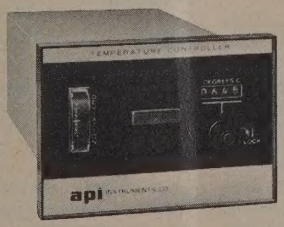
Model 227 is the smallest, lowest priced instrument among two-mode controllers with indicating meters and integral control elements. No adjustments except temperature setting. Analog set point. ***Request Bulletin T-227-A.***

Model 228 incorporates a large indicating meter, 4-digit set point, and offers choice of plug-in output cards. ***Request Bulletin T-228-A.***

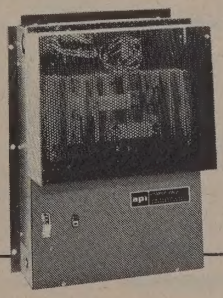
Model 235 has a 4-digit set point, deviation meter, adjustable proportional band, adjustable reset, choice of output cards. ***Request Bulletin T-235-A.***

Solid-state power packs, for use with API process controllers, are available in 30, 50, 70 and 100 amperes. ***Request Bulletins T-4010-A and T-4011-A.***

Model 228



Model 235


Model 4011 power pack

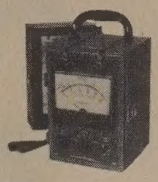
api INSTRUMENTS CO. Chesterland, Ohio 44026 | (216) 729-1611

INSULATION TESTING INSTRUMENTS

ASSOCIATED RESEARCH, INC.

Insulation Resistance Testers

Ranges from 100 to 10 million megohms at test potentials to 10 KV.



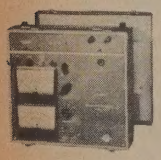
The MEG-CHEK® megohmmeter provides a wide selection of battery and line-powered instruments for accurate insulation resistance measurements of circuits, components, cables, motors, etc. They are direct reading and push button operated requiring no cranking or leveling.

Select from 17 models ranging from pocket-size to portable 10 KV with variable voltage. Some models combine megohm with ohm and AC-DC volt scales in one instrument. Five popular models are:

Model	DC Test Voltage	Max. Megohms	Features	Price
2000	500	100	Pocket-size	$ 95
2201	500	200	Includes 2K ohm and six AC-DC volt scales	165
2211	1000	2000	200 K ohm range	255
2850	500/50	10 Million	Constant test voltage through 6 decades	345
2955	0-2,500	50,000	Adjustable test voltage	890

Request MEG-CHEK Megohmmeter Bulletins by model number.

Portable DC HYPOTS® to 200 KV



Output of the several portable DC HYPOTS is continuously variable from 0 to maximum with the voltage metered directly in the output. Leakage current measurements are on four range meters reading down to as low as 0.05 microamps. Features: 2% metering accuracies, electronic circuit protection, by-pass and metered return terminals, grounded steel cases, silicon rectifiers, plug-in high voltage leads, etc.

Model	Output Voltage	Output Current	Price
5205	0-5 KV	2.0	$ 550
5212	0-10 KV	2.0	675
5220	0-15 KV	2.0	735
5271	0-50 KV	2.5	2250
5321	0-100 KV	5.0	3115

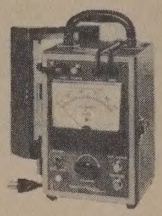
Request Portable DC HYPOT Bulletins

Testing Manual Available

This 60 page collection of Bulletins covers specs, prices and applications of insulation resistance testers, AC HYPOT Juniors, portable and mobile DC test sets, corona and materials test equipment, kilovoltmeters, precision ohmmeter, current transformers, phase sequence indicators.

Request Manual 2900 on company letterhead

A-C HYPOT Jrs... to 10 KV, limited current



Portable a-c dielectric strength testers providing outputs continuously variable from 0-1500 V up to 10,000 V a-c. Use of neon breakdown and leakage current indicators in conjunction with collapsing field-type high voltage transformers assures rapid and safe production testing.

The leakage current indicator is adjustable from 0.3 to 3 ma. A 4½" kilovoltmeter provides high accuracy. Short-circuit current cannot exceed 18 ma.

Three popular models are:

Model	Output Voltage	Price
411	0-2,500	$175
404	0-4,000	190
422	0-10,000	260

HYPOT Jr. Automatic "Squawker" Models

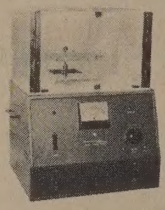
Available with output voltages from 0-1500 volts to 0-6000 volts a-c. Similar to the standard HYPOT Jr. models but include an audible signal unit and external control terminals.

DC and Combined AC/DC HYPOT Jrs.

offer same features as described above, plus test potentials to 5 KV.

Request AC & DC HYPOT Jr. Bulletins.

Insulating Materials Testers



A full range of testers for solid and liquid insulating materials to 100 KV and higher is available. Due to the rapid progress of insulating materials and testing techniques, new equipment is added whenever required to meet ASTM, MIL and Federal test specifications.

Model 4501 Materials Testing HYPOT 0-35 KV at 2 KVA

This popular model meets dielectric strength testing requirements of Specification D-149, ASTM Standards on Electrical Insulation Materials. Output continuously variable from 0-35 KV a-c at 2 KVA (intermittent rating). Magnetic breaker trips when specimen breaks down. Output termination in jacks at center of the lucite cabinet top accepts the interchangeable ARI materials testing fixtures. Optional features: interlocked clear lucite test cage and selection of ARI plug-in materials testing fixtures, automatic rate of rise, dual sensitivity circuit breaker, etc.

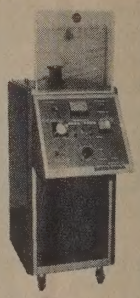
Request Insulation Materials Tester Bulletin

High Voltage Test Equipment to 500 KV AC and 1,000 KV DC

A full range of instruments for extra high voltage dielectric strength testing. AC or DC potentials at capacities of up to 150 KVA or more. Control and measurement features include: automatic rate of voltage rise, memory circuit to record breakdown voltage, output current metering, separate low voltage control and high voltage test cabinets and many others.

ARI has over 30 years experience in the design and manufacture of heavy duty very high voltage test equipment. All instruments are ruggedly constructed and fully tested in our own high voltage laboratory.

Corona Testing Equipment



New instruments detect, display and measure corona caused by voids, surface or other conditions in the insulation sample or the equipment under test.

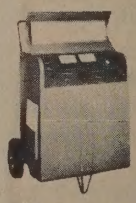
Instruments include: specially constructed corona-free HYPOT test set, a pickup network to extract the true corona signal and the corona detection display module. Detector also incorporates a calibrator to make quantitative corona measurements down to 0.1 picocoulombs.

These modules are available as individual units or as a complete integrated instrument. Standard models with test potentials of 10 to 100 KV AC include these two popular models:

Model	Output KV	KVA Capacity	Cabinet Style	Price
4074	10	0.25	Bench	$2250
4309	35	1.0	Console	3950

Request Bulletin 4-1.9.

Mobile HYPOTS . . . to 150 KV DC



Heavy-duty mobile test sets for determining insulation leakage and dielectric strength of cables, bushings, switch-gear, transformers, motors and generators.

Outputs continuously variable from 0 to 45 KV and on up to 150 KV, with ratings of 2.5, 5, 10 ma. at full voltage.

Features include: 4½" kilovoltmeter connected directly across the high voltage output; three-range 4½" microammeter electronically protected against overload; zero return interlock; connector for remote safety interlock; fast-acting magnetic circuit breaker in output to protect high voltage circuits and external load; thermal overload breaker to protect input circuits; long-life silicon high voltage rectifiers; metered return and bypass return terminals for measurement of load (leakage) or bypass (guard) currents.

Request Mobile DC HYPOT Bulletin 5-1.16.

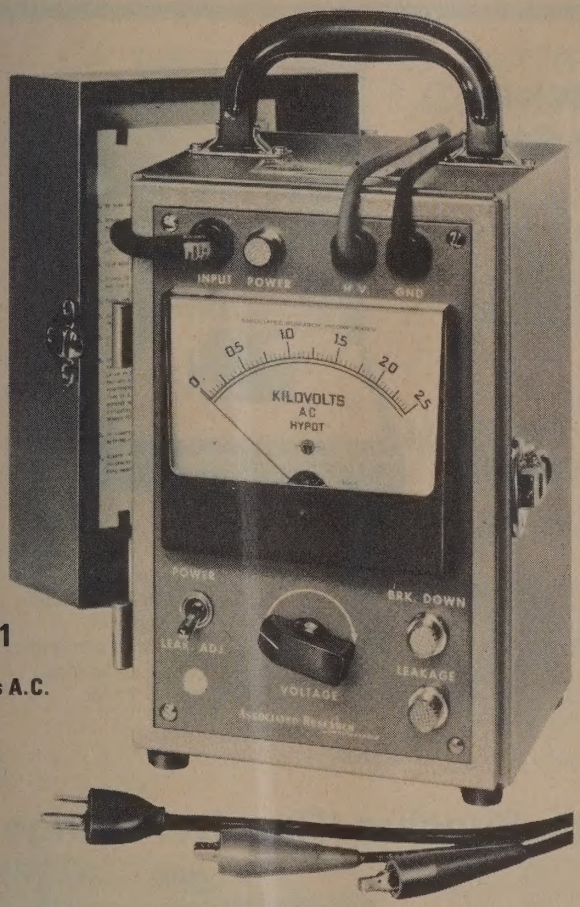
0025

ASSOCIATED RESEARCH, INC.
3773 W. BELMONT AVE., CHICAGO, ILL. 60618 • (312) 267-4040

INSULATION TESTING INSTRUMENTS

ASSOCIATED RESEARCH, INC.

HYPOT® Junior BREAKDOWN TESTERS



Model 411
(illustrated)
0-2500 volts A.C. output

only $175

make faster, safer AC dielectric strength tests of electronic parts and components, small tools, appliances, motors, transformers, etc.

Simple to operate. Make breakdown, leakage and short tests to UL, CSA, ASTM, NEMA, IEEE, MIL and EASA standards. 115 vac, 50/60 cycle input. Continuously adjustable output. Included are: complete metering, controls, safety features, case with removable cover, test leads, line cord, instructions.

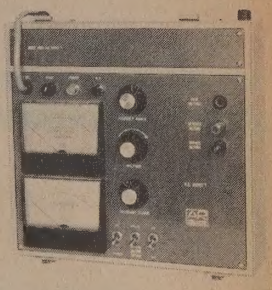
Visual Indicator Models . . . have neon "breakdown" light for breakdown, corona or arcing indication . . . and separate neon "leakage" light for leakage indication adjustable 0.3-3.0 Ma. 5 Models from 0-1500 to 0-10,000 volts output, priced from . . . . . **$165 to $260.**

Automatic "Squawker" models provide audible and visual test indications. 4 models from 0-1500 to 0-6000 volts output, priced from . . . . . **$265 to $290.**

Request Bulletin 4-1.3.

HYPOT® Juniors

with leakage current metering



Two new models incorporate three range micro-ammeters and guard circuits. Both feature:

- low AC leakage current measurement
- external guard circuit to eliminate stray leakage current
- accuracy of ± 3% F.S. on voltage and current ranges

Model No.	Output Voltage	Leakage Current Ranges	Price
4006	0-0.75/1.5 KV	0-50/500/5000 microamps	$415.00
4030	0-2/4 KV	0-50/500/5000 microamps	$495.00

Request Bulletin 4-1.10.

MEGOHMMETER Model 2850

measures insulation resistance to 10 million megohms

only $345

Advanced features:

- **constant test voltage over full range**
- **no overload damage**
- **positive line-voltage control**
- **maximum guarding flexibility**
- **latest tube-miniaturization techniques**

Versatile, accurate, reliable. Dual test voltage . . . 500 vdc and 50 vdc. 24" total scale length . . . 1 to 10,000,000 megohms in 6 decades. 115 vac, 50/60 cycle input. Measures resistance on printed circuits, transistor and miniaturized circuit components, cables, motors, etc. Measures leakage resistance of capacitors. Measures grounded and ungrounded sections of three-terminal resistors.

Also available: Model 2851 with 100 vdc and 500 vdc dual test ranges . . . . . only **$355.**

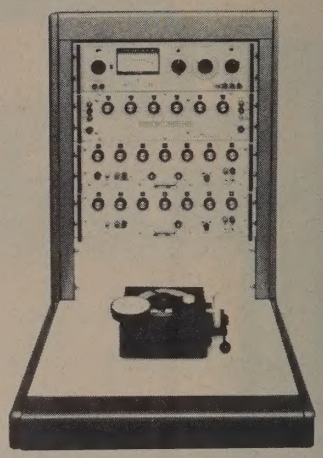
Request Bulletin 2-1.4.

0026

ASSOCIATED RESEARCH, INC.
3773 W. BELMONT AVE., CHICAGO, ILL. 60618 • (312) 267-4040

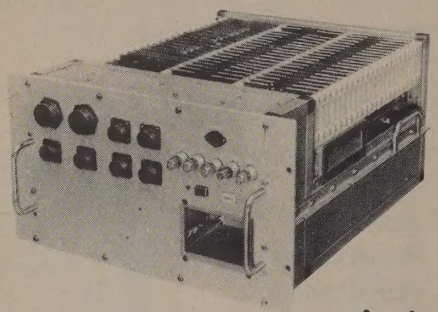
Automatic Test Instrumentation

Synchro/Resolver Test Stands



Astrosystems designs and produces standard and custom synchro and resolver testers. These devices measure synchro/resolver parameters such as accuracy, phase shift and transformation ratio. Indexing tables are also supplied as part of complete synchro/resolver and servo test systems. Options include error printout and computer control. Write for Data File No. 107.

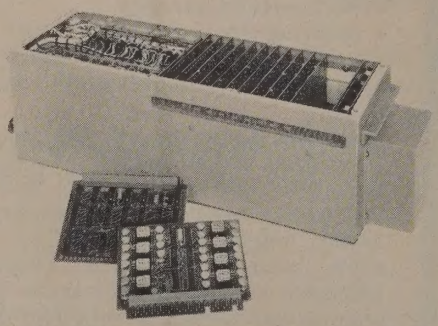
Automatic Test Building Blocks



Building blocks are available for use in general purpose and special purpose automatic test systems. Devices include stimuli equipment such as synchro simulators, programmable AC voltage generators, programmable power supplies and automatic servo inputs. Measurement devices include voltage measuring blocks, response monitors and phase indicators. Write for Data File No. 107.

Automatic Synchro/Resolver Bridge

The Automatic Synchro Resolver Bridge reads out synchro or resolver inputs on a direct in-line decimal display to an accuracy of 0.01°, completely automatically. This solid state readout eliminates the necessity for complex manual setting of synchro bridges and error detectors. BCD or binary electrical digital outputs are provided. Write for Data File No. 110.



Automatic Synchro/Resolver Converters

Automatic Synchro/Resolver Converters provide for programmed synchro/resolver outputs and measurement of synchro/resolver inputs in the same unit. These solid state devices are available with resolutions and accuracies to 16 binary bits (20 seconds of arc). Standards units cover the frequency range from 200Hz to 10K Hz without deterioration in accuracy. Write for Data File No. 107.

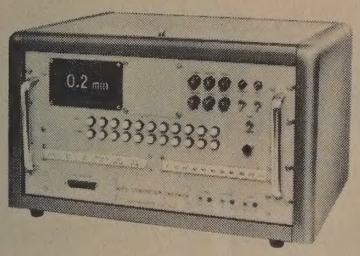
asi

Advanced Instrumentation

astrosystems, inc.

6 Nevada Drive / Lake Success, New York 11040 / 516/328-1600 / TWX 510/223-0411
West Coast: 4341 Commonwealth Avenue, Fullerton, California 92633 714/523-0820

Automatic Test Instrumentation

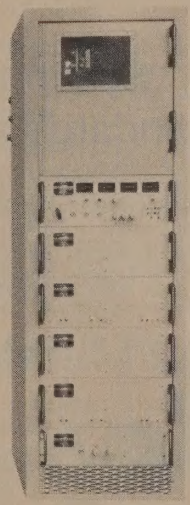


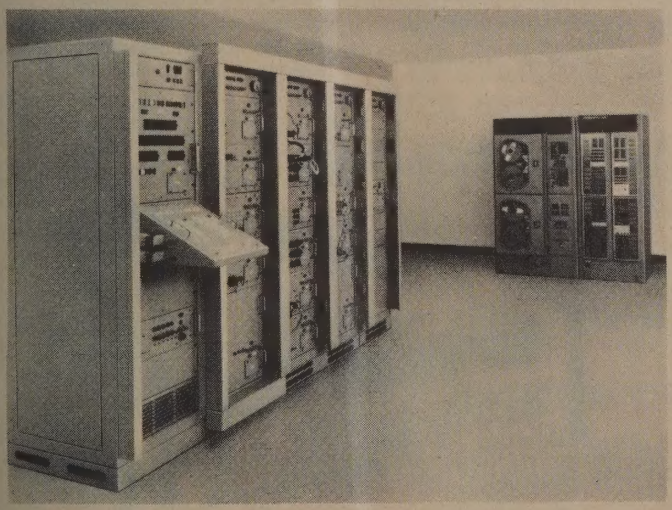
Automatic Converter Tester

Automatic Converter Testers are completely self contained devices for laboratory or production testing of all types of synchro, resolver and voltage digital conversion equipment. The units feature push button selection of tests such as accuracy, phase shift and transformation ratio, with an in-line decimal display of error in actual measurement parameters. Write for Data File No. 107.

Automatic Test Systems

Astrosystems designs and manufactures complete general purpose and special purpose automatic test systems. These units are constructed from standard building blocks and provide programming, stimuli, measurement and recording functions. Programming and data readout can be tape or computer controlled. Simple programming allows tests to be accomplished by relatively unskilled personnel. Data File No. 107.





Computer Controlled Circuit Test Systems

Astrosystems designs and produces automatic circuit test systems controlled by general purpose computers. These systems can be operated, controlled and programmed by test engineers and technicians unfamiliar with computers and computer terminology. A unique interactive communication system is employed which uses only English language and is completely unit-under-test oriented. The economical way to automate production testing, the systems perform go/no-go as well as diagnostic tests. Send for Data File #123.

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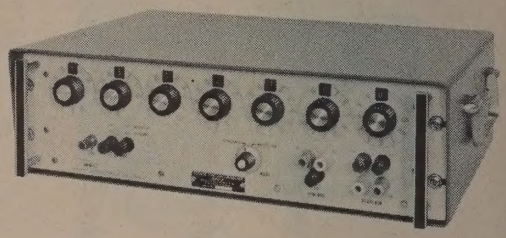
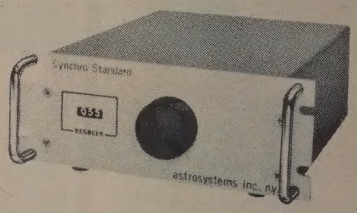
Advanced Test Instrumentation

Decade Synchro/Resolver Standards and Bridges



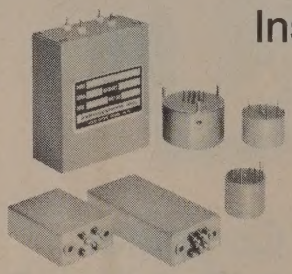
These devices are completely passive instruments for testing and simulating synchro/resolver systems to absolute accuracies of 2 seconds of arc. Units are available with 1° to .0001° resolution and feature direct angular readout. The units employ a unique toroidal ratio transformer technique to generate synchro and resolver voltages or discern synchro angle errors. Uses cover a wide range of applications for both laboratory and in-the-field use. Write for Data File No. 105.

Synchro and Resolver Standards and Bridges



Synchro and Resolver Standards and Bridges test and simulate synchros, resolvers and servo systems quickly and economically. All units are accurate to 2 arc seconds, traceable to the National Bureau of Standards. Units are available with 5°, 10° and 15° resolution to cover a wide range of applications for both laboratory and system use. Write for Data File No. 105.

Instrumentation Transformers



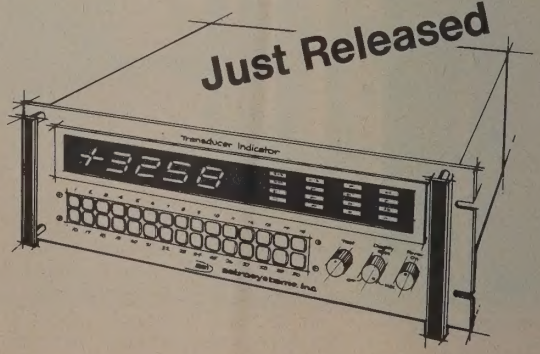
Astrosystems high precision toroidal transformers are produced to accuracies of better than 0.5 parts per million. Available are matched high precision isolation transformers, bridging transformers, high precision voltage scaling transformers and Scott "T" transformers. Write for Data File No. 117.

Transducer Indicators

Astrosystems Transducer Indicators are random access converters capable of direct readout from thermocouples, strain gages, flow meters or other transducers, the outputs of which are in the form of voltages or frequencies.

The multi-channel units can be both manually and computer controlled in a time-shared mode, providing concurrent visual readouts and BCD formats of the different channels. For non-linear inputs, Digital Linearization format for over 100 sequences can be provided.

Resolution and accuracy ±0.1% of full scale. Measurement time is 75 millisecond. Write for Data File No. 122.



Advanced Instrumentation

asi astrosystems, inc.

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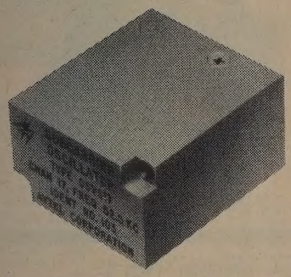
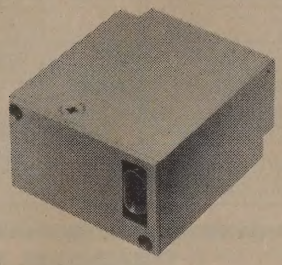
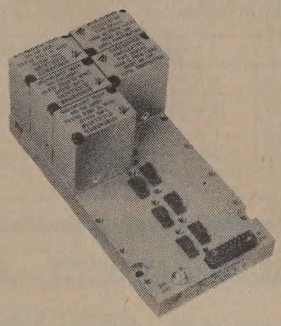
West Coast: 4341 Commonwealth Avenue, Fullerton, California 92633 714/523-0820

AVTEL FULLY QUALIFIED SUBCARRIER OSCILLATORS

AVTEL







AVTEL SERIES 150 AND 160 SUBCARRIER OSCILLATORS OFFER THESE OUTSTANDING ADVANTAGES

FULLY MIL-QUALIFIED. Series 150 and 160 oscillators have been fully qualified to all applicable military specifications.

INCREASED OPERATING TEMPERATURE. Series 150 operates at temperatures from −55°C to +125°C. Series 160 operates from −20°C to +85°C.

HIGHER OUTPUT LEVEL. Avtel's oscillators can produce 3 volts rms into 3000 ohms, permitting low-impedance mixing networks, eliminating the need for a mixing amplifier, improving system signal-to-noise ratio, and reducing system size, weight, and power consumption.

WIDE STORAGE TEMPERATURE RANGE. Avtel's oscillators can be stored indefinitely at temperatures of −75°C to +150°C.

SMALL SIZE. The unit has a total volume of only 1.6 cubic inches and weighs 1.5 ounces.

PIN PROTECTION. The connector is recessed into the bottom of the case to protect pins from damage during handling.

EXTREME ACCURACY. Maximum zero drift is less than ±1% of design bandwidth over the entire operating temperature range. Deviation sensitivity remains constant within 0.5% of design bandwidth over the temperature range.

MAXIMUM RELIABILITY. Avtel's subcarrier oscillators are designed so that each component operates well within its maximum stress ratings. No adjustable components are used, and shift problems resulting from severe environmental conditions are eliminated.

HIGH STABILITY. Frequency and sensitivity remain constant to 0.1% of the design bandwidth voltage. Frequency deviation is less than 0.25% of design bandwidth when subjected to shock and acceleration of 200 g's and vibration of 5 to 5000 cps.

LOW INPUT POWER. The Series 160 requires an input of 15 ma, at 28 vdc. The Series 150, 11 ma at 28 vdc.

NOTE: Avtel specializes in solid state power conversion equipment. See Section 4000.

SPECIFICATIONS

AVAILABLE BANDS

For Channels 1 through 18 and Channels A through E.

INPUT

SIGNAL: Any 5-volt segment between −5 and +5 volts.

IMPEDANCE: 500K ohms ±5% resistive, Channels 1 through 18; 250K ohms ±5% resistive, Channels A through E.

INPUT INTELLIGENCE FREQUENCY RESPONSE: 0 db at a deviation ratio of 5.0. Modulation frequencies higher than recommended by IRIG may be used for a deviation ratio of 2.0 at an attenuation of 3 db.

SOURCE IMPEDANCE VARIATION: Oscillator frequency change is less than ±1% of the design bandwidth with a variation in source impedance over the range from short to open circuit at any temperature between −55°C and +125°C. For 150's −20°C and +85°C for 160's.

INPUT OVERLOAD CAPABILITY: The oscillator will withstand signal inputs of ±50 volts without damage.

THERMAL SHOCK EFFECT: Rapid changes in environmental temperature will not cause a permanent change in characteristics. A change of 10°C per minute will cause less than 3% peak error. An instantaneous shock of 180°C in either direction between −55°C and +125°C for Series 150 of 105°C between −20°C and +85°C for Series 160 will cause less than 10% peak error. In either case, the oscillator will recover to well within specification tolerances in not more than 10 minutes following the thermal shock.

OUTPUT

LEVEL: −3 volts rms ±0.1 volt into a 3000 ohm resistive load.

AMPLITUDE MODULATION: The maximum change in output level is ±0.5 db over the band.

BANDWIDTH: The design bandwidth is 98% of the total bandwidth specified in MIL-T-26985.

SENSE: With an increase in input voltage, there is a linear increase in frequency.

LINEARITY: Better than ±0.1% of the design bandwidth from best straight line.

ZERO INPUT DRIFT: ±1% maximum of the design bandwidth between −55°C and +125°C reference frequency for Series 150 and between −20°C and +85°C for Series 160.

SENSITIVITY SHIFT: ±1% at either end of the band over the temperature range.

HARMONIC DISTORTION: 1% THD maximum.

POWER REQUIREMENTS

28V dc ±10%, 11 ma nominal, 150; 15 ma nominal, 160.

STABILITY: Frequency and sensitivity will remain constant to ±0.1% with a variation in the supply voltage of ±10%.

SOURCE POWER OVER-VOLTAGE PROTECTION: Meets and exceeds all requirements of MIL-E-7894A for power transients when installed in the Avtel Series 150 Subcarrier Chassis.

ENVIRONMENTAL

THERMAL SHOCK: Exceeds the requirements of MIL-E-5272C.

OPERATING TEMPERATURE RANGE: −55°C to +125°C for Series 150, −20°C to +85°C for Series 160.

STORAGE TEMPERATURE RANGE: −75°C to +150°C.

SHOCK: Frequency deviation is less than ±0.25% of design bandwidth when tested to 200 g's shock in accordance with MIL-E-5272C.

ACCELERATION: Frequency deviation is less than 0.25% of design bandwidth when tested to 200 g's acceleration in accordance with MIL-E-5272C, Procedure II.

HUMIDITY: The unit is hermetically sealed and meets all requirements of MIL-E-5272C, Procedure I.

VIBRATION: Frequency deviation (momentary or fixed) is less than 0.25% of design bandwidth when vibrated from 5 cps to 2000 cps in accordance with MIL-E-5272C, Procedure I.

ALTITUDE: Meets all requirements of MIL-E-5272C when tested at zero to 10 atmospheres.

INSTALLATION DATA

HEIGHT: 1.510 maximum.

WIDTH: 1.335 maximum.

DEPTH: 0.810 maximum.

TOTAL VOLUME: 1.6 cubic inches nominal.

WEIGHT: 1.5 ounces nominal.

MOUNTING: Attaches to subcarrier chassis with two 4-40 machine screws.

CASE: Cast aluminum.

CONNECTORS: Cannon MDI-9S recessed into bottom of case.

ASSOCIATED EQUIPMENT

SERIES 150 SUBCARRIER CHASSIS: Standard 4, 6, 8, 10, 12, 14, 16, and 18-channel Subcarrier Chassis are available. The chassis will accommodate 4 to 18 oscillators in 2-unit steps. A 12-channel chassis with 12 oscillators attached displaces less than 28 cubic inches.

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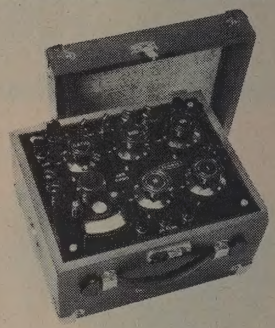
Beckman®

ELECTRICAL TEST EQUIPMENT & POWER SUPPLIES

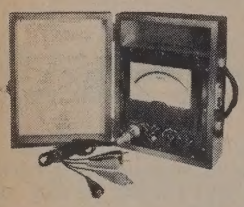
WHEATSTONE BRIDGE — Model RN Series

Universally use for the measurement of all types of resistance devices and circuits where high accuracy is required. Models available for performing Murray and Varley Loop tests.



Model	Total Resistance of Decade	Ration Dial Settings	Circuits
RN-1	9 × (1 + 10 + 100 + 1000)	.001, .01, .1, 1.0, 10, 100, 1000	—
RN-2	9 × (1 + 10 + 100 + 1000)	.001, .01, .1, 1.0, 10, 100, 1000, M10, M100, M1000	Murray & Varley
RN-3	10 × (1 + 10 +100) + 9 × (1000)	1/1000, 1/100, 1/10, 1.9, ¼, 1/1, 10/1, 100/1, 1000/1, M10, M100, M1000	Murray & Varley

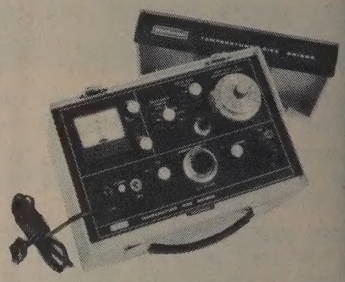
LOW RESISTANCE OHMMETER — Model LRO-1



For measuring resistance of sensitive relay contacts, fuses, bus-bars and connections, rail joints, pipe or conduit, switch contacts, transformer windings, motor windings, bonding, grounding and similar applications. Current through the unknown resistance never exceeds 110 ma. Extreme accuracy. Self-contained, including 1½ V flashlight battery. Ranges: 0.1 ohm, 1 ohm and 10 ohms. 100 meter scale divisions. One scale division on 0.1 ohm range is 0.001 ohm. Accuracy ±½% based on full scale values.

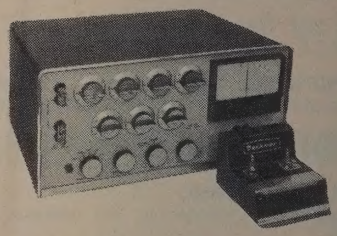
TEMPERATURE RISE BRIDGE — Model TRB-1

Used in measuring temperature rise in applications where the change-in-resistance method is used (transformers, chokes, motors, generators, solenoids). Covers transformer temperature rise to beyond Class B rating. In-line digital readout indicates temperature rise directly in degrees C. Winding resistance read at anytime without disturbing initial ambient bridge balance. Doubles as standard resistance bridge. Operates on 120/240 volts, 50/60 Hz, single phase.



RESISTANCE DEVIATION BRIDGE — Model DB-1

FEATURES direct reading of percentage of deviation from internal resistance standard. Accurate to 0.1%. Low bridge voltage (1 volt nominal across test piece). Deviation scales of 20, 5, 2, and 1%. **Model DB-1** can be operated as a balanced or unbalanced Wheatstone Bridge for rapid resistance comparisons. It can be used to indicate percentage deviation from an internal standard; comparison of resistors to sample resistor; matching pairs of resistors; and for general resistance measurements by the null method. Provisions are made for external standards, when required, and for using built-in decade steps as a resistance standard for other measurement. Provides the incoming Inspection Departments and Engineering Laboratories with a rapid, accurate method of sorting resistors into percentage classifications.



PORTABLE HIGH VOLTAGE DC POWER SUPPLIES

These general purpose supplies are particularly suited for laboratory or production line use to provide a convenient source of high voltage, low current dc power. Widely used for such applications as powering photomultiplier tubes, image intensifiers, condenser chargng, and routine insulation breakdown testing.

Voltage readings are indicated by a 6" precision mirror scale kilovoltmeter of 1% accuracy. Polarity is reversible from the front panel (patent applied for). An ac input protection fuse is included as well as a built-in limiting ballast lamp restricting maximum current output levels. These levels may be adjusted by changing ballast. A single control allows continuous adjustment of output voltage from zero to maximum rated voltage.

The output is unregulated (regulation is 20% for 10 to 100% loading). Current rating is 5 milliamperes. The ripple is 5% (rms) at full voltage and current load.

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT	DIMENSIONS H x W x D	NET WGT. (Pounds)	INPUT POWER REQUIREMENTS
6000-1MA-MS	0-1000	5 MA	11" x 9" x 13"	17	115 V, 60 Hz, 100 watts
6000-5MA-MS	0-2500	5 MA	11" x 9" x 13"	17	115 V, 60 Hz, 100 watts
6005-5MA-MS	0-5KV	5 MA	11" x 9" x 13"	17	115 V, 60 Hz, 100 watts
6010-5MA-MS	0-10 KV	5 MA	11" x 9" x 13"	23	115 V, 60 Hz, 100 watts
6015-5MA-MS	0-15 KV	5 MA	11" x 9" x 13"	23	115 V, 60 Hz, 150 watts
6025-5MA-MS	0-25 KV	5 MA	11" x 9" x 13"	34	115 V, 60 Hz, 150 watts

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Additional Beckman Instrumentation in Section 2900

Beckman®

INSULATION TEST EQUIPMENT

WIDE RANGE MEGOHMMETERS Model L Series

Including Digital Readout. Designed for laboratory and high speed testing of motor and transformer winding insulation, cable insulation, high value resistors, capacitor insulation, and for the measurement of surface and volume leakage of insulating materials. Meets requirements for testing insulation resistance in accordance with ASTM D-257, and Federal Spec. LP-406B, Method 4041.

*Continuously variable, built-in voltmeter for accurate setting.
**Continuously variable, selectable by switch.
†Features digital readout, automatic or manual range selection.

Model	Test Voltage	Resistance Range Low	Resistance Range High	Power Cons.
L-4B	200 or 500 fixed	1 meg. 2.5 meg.	100,000 meg. 250,000 meg.	50 w.
L-6C	100 to 600*	1 meg.	100,000 meg.	80 w.
L-7	100 to 600*	1 meg.	5×10^{13} ohms	75 w.
L-8	10 to 1000**	10^5	10^{16}	35 w.
L-9†	10 to 1000*	10^6	10^{14}	145 w.

AC BREAKDOWN TESTERS Model PA Series

Type PA variable high voltage AC breakdown testers are designed to meet the requirements of ASTM specification D-149, and Federal specification LP-406, Method 4031, as well as all general purpose breakdown testing. Provided with motor-driven control of output voltage with any desired rise of secondary voltage. Available with wide variety of testing jigs.

PA-5-152	15,000 V. rms. 2KVA
PA-5-155	15,000 V. rms. 5KVA
PA-5-252	25,000 V. rms. 2KVA
PA-5-255	25,000 V. rms. 5KVA
PA-5-502	50,000 V. rms. 2KVA
PA-5-505	50,000 V. rms. 5KVA
PA-50-1005	100,000 V. rms. 5KVA

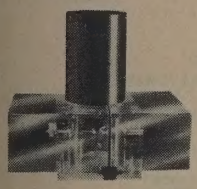
For even greater versatility, dual range units using multiple winding transformers are available on order. These provide two meters and a total of six scales. Typical dual-range models as follows:

PA-5-252/052	25 kv or 5 kv rms. 2KVA
PA-5-502/102	50 kv or 10 kv rms. 2KVA
PA-50-5010/1510/510	50 kv or 15 kv or 5 kv rms. 10KVA

PORTABLE OIL FILTER — MODEL P-8

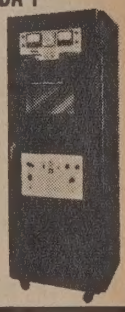
Provides three methods for determining dielectric strength and breakdown voltage of insulating liquids. All HV components housed within cabinet. Interlock system protects personnel. Meets requirements of ASTM specifications D-149 and D-877. Maximum test voltage: 50,000 volts. Accuracy: ±10% of voltmeter reading. Operates on 120 volts, 50/60 Hz, single phase.

JE ELECTRODE



Oil test electrode permits dielectric breakdown acceptance and evaluation tests on liquid dielectrics using the ASTM-1816 (VDE) method. Features adjustable, spherically-capped electrodes capable of testing with 0.080" spacing. The cell body is constructed from a solid block of lucite, eliminating mechanical or bonded fabrication and assuring virtual leak-proof operation. A motor driven stirrer provides constant mixing. When used in connection with Beckman's Model P-8 Portable Oil Tester, the new electrode provides a compact, portable, reliable 50KV oil test set capable of laboratory, production and in-field testing.

DIELECTRIC BREAKDOWN TESTER Model PDA-1



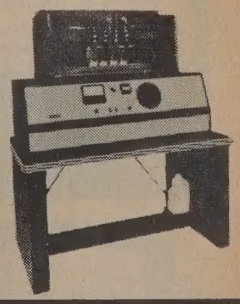
Designed to provide simple, safe, accurate means of determining dielectric strength and breakdown voltage in the laboratory or factory (conforms to requirements of ASTM specifications D-149 and Federal specification L-P-406 method 4031).

Push button selection — four different leakage current meter ranges (six operating modes) — enclosed test cubicle, fail-safe circuitry, interlocked doors and oil immersed gravity-drop shorting switch allows safe use by unskilled personnel.

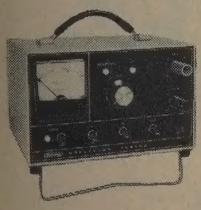
- Continuously adjustable (automatic or manual) test output voltage control uses full 100% rotation to allow fine control for critical testing (choice of AC or DC).
- Provides for transient suppression and introduction of non-linear resistance into transformer.
- Maximum versatility of test jig set-up using plug-in jigs or high voltage cable to external "hi-pot" testing circuits.
- Self contained unit — portable yet provides easy access to all parts for maintenance.

TRACKING and EROSION RESISTANCE TEST -- TERT-1

Evaluates relative track and erosion resistance of various materials using Liquid Contamination Inclined Plane method described in ASTM and IEEE specifications. Test represents service exposure evaluation of wide range of insulated material subject to AC surface current. Test conditions simulate water film on insulation surface in which ionizable and other contaminants may dissolve. Contaminant rate easily controlled to simulate different service stresses and outside conditions. Tests conducted on 2" x 5" specimen; actual test covers 1" x 2" track area. Test criteria is either "time to track a fixed distance at a fixed voltage," or "voltage to initiate tracking" — depending on specific service requirement evaluation.



VOLTAGE BREAKDOWN TESTER — Model P-2B

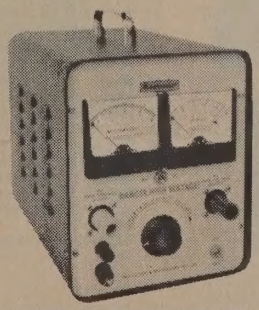


Furnishes adjustable ac or dc test voltage for determining capability or in flashtesting capacitors and insulating materials. Completely solid-state, no relays or circuit breakers. Continuously adjustable, metered output. Breakdown indication provided.

SPECIFICATIONS

Model	Voltage Range* ac (rms)	Voltage Range* dc	Input Power Required
P-2B	0-3000	0-4000	120/240 V, 50/60 Hz

* Metering Accuracy ±5% Full-scale.

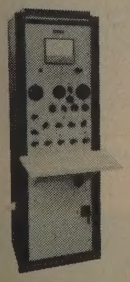


INSULATION TEST SETS

Used in testing insulation where AC voltages are desired. Dual instruments are also available which provide choice of AC or DC output. Includes kilovoltmeter, current meter and automatic overload limiter circuits. Metering accuracies are ±3%. The basic model number covers AC types. Add the prefix AC/DC to the basic model number for the dual output type.

Model	Type	Voltages	Current Meter
3000	AC or AC/DC	0 to 3,000	10 MA
1000	AC or AC/DC	0 to 10,000	10 MA
2500-DC	DC only	0 to 25,000	100 μA
4000-DC	DC only	0 to 40,000	50 μA

HIGH VOLTAGE SCHERING BRIDGE — Model PS-1GP



Used to measure dissipation and capacitance of electric insulating material while subjected to high-voltage stress. From these two measured values and the dimensions of the sample and test electrodes, dielectric constant, loss factor, and other values may be calculated.

Exceptionally wide capacitance range from 0.0000025 to 1.0 mfd. Built-in shunts for testing large capacitances without additional equipment. Materials can be tested at operating value. Easy-to-operate, all controls located on front panel. High accuracy, plus or minus 0.2% capacitance accuracy and 2.0% or better tangent accuracy.

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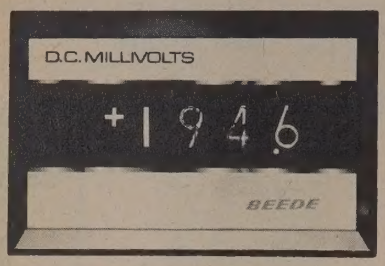
Additional Beckman Products in Power Supply Section 4000

BEEDE . . . Value by Design

DIGITAL PANEL METERS



The Beede Digital Panel Meter is a precision measuring instrument that displays an analog input signal as a digital readout. It is a single, complete unit (including power supply), requiring only signal and power connections for immediate use. It is designed to meet the needs of the manufacturer who plans to install the DPM as a component in the equipment he produces.

Beede's DPM is packaged in a rugged, dust-sealed, die-cast aluminum case with a completely enclosed wiring compartment. The case size is compatible with most known panel cutouts. The unit is equipped with screw terminals to permit connection by production personnel, the calibration adjustments are hidden from curious operators, and the meter is easily and securely installed or removed from the front of the panel to which it mounts.

The front panel appearance may be stylishly and conveniently customized to complement the appearance of your panel. The bezel color, and the company logo and scale identification printed on the decorative mask mounted behind the glass front will be tailored to provide your own proprietary appearance.

The standard models have been deliberately designed to fit into existing instrument circuits designed for pointer type panel meters, *without requiring modifications* to the existing circuit, simplifying the job of the design engineer changing over from pointer type panel meters to digital panel meters. Engineers will also appreciate the flexibility of being able to design a piece of equipment with one circuit, and the option of providing either a pointer type, or digital panel meter readout to their customers.

Beede supplies panel meters designed to customer specifications. Each unit shipped has been produced for a specific customer order, and the electrical range, readout and appearance have been engineered to meet the customer's requirements. A standard BCD (Binary Coded Decimal) Output option is available, and for special volume requirements, a wide choice of electrical and mechanical design options is also available.

SPECIFICATIONS:

Accuracy ±0.1% of reading ± one digit. This accuracy will be maintained over a temperature range of 20°F for 60 days without adjustment. Temperature coefficient: 0.004%/°F.

Temperature Range 14°F to 140°F operating. −20°F to 185° storage.

Input — Differential input isolated to ±300 VDC or AC (Peak). ±3.5 VDC or AC (Peak) when BCD utilized.

Optional Input Arrangements — Current Source for Resistance Measurement. Ratiometric Input.

Speed — 2 conversions/second (Standard). Other speeds available.

Resolution and Display — Three digits plus "1" over-range. Unit accurate to full 100% over-range. Automatic polarity indication. Three least significant digits extinguish for reading above 100% over-range. NIXIE™ display; ½ inch nominal character height. Three decimal point positions selected by grounding connector pins. Hold and/or blanking capability furnished as standard.

BCD Output Option — Three BCD 8-4-2-1 digits plus "1" over-range digit totaling 13 lines. Logic Levels: Standard TTL/DTL practice. End of Conversion, polarity signals and Trigger Input available.

Power Requirements — 105 to 125VAC, 57 to 63Hz, 3.5 watts nominal. Contact Beede for other input voltages and frequencies.

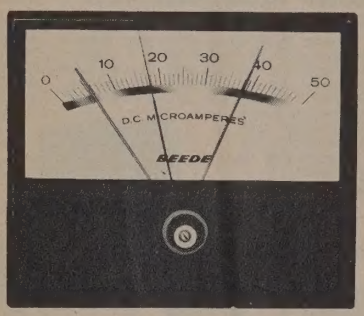
Termination — Standard unit without BCD Output option has nine, No. 6 screw terminals, and movable connector to select decimal point position. Units with BCD Output option have two, solder type, 30 pin edge connectors. Terminal Board cover supplied, providing a completely enclosed wiring compartment.

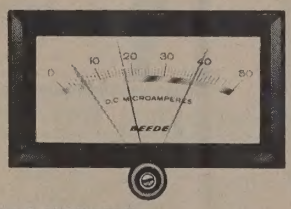
Mechanical Specifications — Die-cast aluminum, dust-sealed case. Die-cast aluminum front bezel with glass window and aluminum decorative mask. Amber polarizing filter. Captive front pulls out and swings to side for access to zero and span adjustments, and panel clamping arrangement. Front may be completely removed. Steel terminal board cover, screw fastened. Space available in case for customer specified accessory components.

Also available as options: Plastic window; Red or neutral polarizing filter; Sealed case for JIC type applications; Shorter depth behind panel dimension.

Mounting — Panel mounting is standard. Installable and removable from the front of the panel with leads connected. Rugged clamping arrangement designed for panels up to ⅜ inch thick. Mounting arrangement for heavier panels, conduit mount and yoke mount with stand available as options.

NON-CONTACTING CONTROL METER RELAYS





The Beede Control Meter Relay is an instrument that combines a permanent magnet-moving coil meter with an adjustable photoelectric sensor, switching circuit and output switch. As the indicated variable being monitored passes the adjustable set point, an output relay is either energized or de-energized. Units are available with either one or two adjustable set points.
Beede has greatly simplified the design of the conventional non-contacting meter relay, significantly reducing the number of parts incorporated in the unit, resulting in price savings of up to 50% without a loss of quality features.

FEATURES

- **Optical, non-contacting control-continuous indication**
- **Wide variety of options available for easy, inexpensive customizing**
- **Inherently Fail Safe**
- **AC or DC power input**
- **Directive Drive Set Pointers**
- **Bulb Life in excess of 10 yrs.**
- **Meter movement and dial custom designed to your specifications if required**
- **Meter permanently free of static influence**
- **Attractive modern "Centurion" style case**
- **Large easy-to-read dial**

SPECIAL PYROMETER FEATURES

- **Models available from 0-300° F**
- **Electrical ambient temperature compensation**
- **Thermocouple break protection**
- **Internal potentiometer to compensate for external lead resistance**
- **Deadband externally adjustable**

SPECIFICATIONS

Accuracy ±2% or ±1%
ON-OFF operation or latching with manual reset
Output: 10 amp (resistive load) DPDT relay for each set point. Solid State Output available
Standard Deadband is 0.5%
Power Requirements 105 to 130 Volts AC.
Other AC and DC power inputs available
Ambient Temperature 40° F to 165° F is standard

MOVEMENTS

MAG-BAND TAUT BAND
0-10 μA DC minimum range
MAG-B PIVOT AND JEWEL
0-50 μA DC minimum range
Size: 3" and 4"

MODELS AVAILABLE

		3 INCH		4 INCH	
	Mounting	Single Set Point	Double Set Point	Single Set Point	Double Set Point
Complete Package	Front of Panel Behind Panel	MR-13-05 MR-13-06**	MR-23-05 MR-23-06**	MR-14-05 MR-14-06	MR-24-05 MR-24-06
Optical Element* Only	Front of Panel Behind Panel	MR-13-05-01 MR-13-06-01**	MR-23-05-01 MR-23-06-01**	MR-14-05-01 MR-14-06-01	MR-24-05-01 MR-24-06-01
Separate Control Package	Front of Panel Behind Panel	MR-13-05-02 MR-13-06-02**	MR-23-05-02 MR-23-06-02**	MR-14-05-02 MR-14-06-02	MR-24-05-02 MR-24-06-02

*Control meter without power supply, switching circuit and load relays.

**Contact factory for availability of 3" Behind Panel Models.

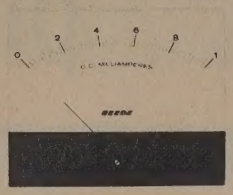
BUY VALUE BUY BEEDE

BEEDE ELECTRICAL INSTRUMENT CO., INC. Penacook, New Hampshire 03301

BEEDE . . . Value by Design

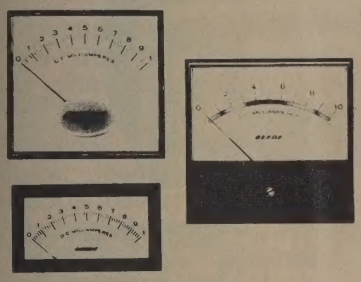
PANEL METERS

CENTURION LINE — A fine line of meters of modern clean design constructed of durable molded phenolic permitting rugged handling. Front of panel mounting models available in 4″ and 3″ cases, behind-the-panel model available in 4″ case only. Illuminated models available in 4″ size.



UNIVERSAL LINE — Large 6″ and 8″ clear plastic cases with flat fronts suitable for front of panel mounting or flush mounting behind panel. Back lighting possible with these models; available clear or painted at the bottom. Beede high torque movements are especially suited for these larger cases.

TRADITIONAL LINE — The Traditional meter look is available in various rectangular and round phenolic cases.



DESIGNER LINE — Featuring a clear picture frame design, this line offers a wide selection of sizes. 2″, 3″, 4″ and 6″ in both front and behind-the-panel mounting. The front-of-panel models are available with a painted front or clear front featuring the floating oval escutcheon name plate. Illumination is available in behind panel mounting models.

PANORAMA LINE — This "Wider Than Higher" look design is popular for applications requiring curved lines and soft corners to match instruments having similar features. Available in 3″, 4″ and 7″ cases.

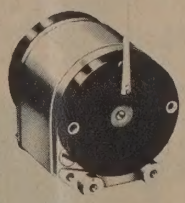
CLEAR FRONT LINE — The Clear Front Styling is designed for general purpose meter applications. Available in 1″, 2″, 3″ and 4″ cases.

EDGEWISE — Designed for applications requiring minimum panel space. Available as a single unit or as a stacked double unit in one case.

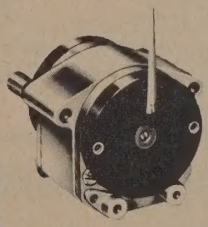
250° LINE — Beede's famous 250° movement is available in a switchboard style presentation in brass, chrome or black lacquer case with glass front.

METER MOVEMENTS

250-A

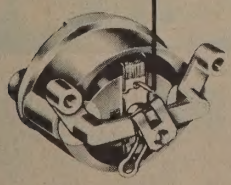


250-S

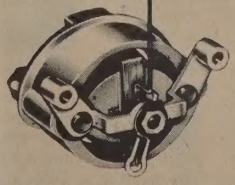


250-SR

MAG-B Taut-Band Movement



MAG-B Pivot and Jewel Movement



Illustrated here are a few of Beede's high torque meter movements. A broad line of standard Beede meter movements is available in a complete range of sensitivities and electrical characteristics including ½% accuracy taut band movements with individually calibrated scales. These meter movements are used in the panel meter case models described above, or are installed in special customer cases, or are supplied separately for customer installation.

METER MOVEMENTS
MAG-BAND TAUT BAND . . . Self-shielded, high-torque, excellent balance and no drift. Maximum sensitivities: 0-5 μA DC; 0-5 MV DC ± 1% OR ±2% accuracy.
MAG-B . . . Rugged, high-torque, self-shielded pivot and jewel movement. Maximum sensitivities: 0-50 uA DC; 0-20 MV DC ± 1% or ± 2% accuracy.
250°MOVEMENT — A fine tracking, sturdy, self-shielded 250° movement.

CUSTOM METER DESIGN

Beede specializes in custom designed meters to meet exacting customer requirements.

Beede has application experience and an in-depth knowledge of the technology of most meter-using industries.

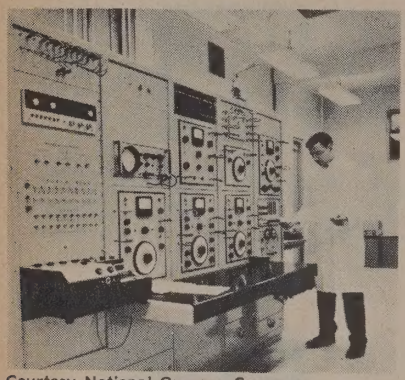
BEEDE

BUY VALUE BUY BEEDE

ELECTRICAL INSTRUMENT CO., INC. Penacook, New Hampshire 03301

product data

Systems and instrumentation for AC voltage measurements, analysis, and recording – from 2 Hz to 200,000 Hz.



Courtesy National Gypsum Company

B & K INSTRUMENTS:

- Accelerometers
- Acoustical Absorption Measuring Apparatus
- Artificial Ears and Voices
- Audiometer Calibrators
- Beat Frequency Oscillators
- Cathode Followers
- Complex Modulus Measurement Systems
- RLC Comparison Bridges
- Distortion Analysis Systems
- Electromagnetic Transducers
- Environmental Test Equipment
- Frequency Response Tracers
- Hearing Aid Test Systems
- High Speed 1/3 and 1/1 Octave Band Analysis Systems
- Instrumentation Tape Recorders
- Low-Frequency RF Voltmeters
- Measurement Amplifiers
- Megohmmeters
- Microphone and Accelerometer Calibration Systems
- Narrow Band Frequency Analysis Systems
- Noise Exposure Meters
- Octave Band Frequency Analysis Systems
- Phonograph Cartridge Test Systems
- Probability Density Analysis Systems
- Production Noise and Vibration Testors
- Random Noise Generators
- RMS Graphic Level Recorders
- RMS Polar Plotting Systems
- RMS Voltmeters
- Sound Level Meters
- Spectral Density Analysis Systems
- Statistical Distribution Analysis Systems
- Strain Measurement Systems
- Stroboscopes
- Vibration Exciter Control Generators
- Vibration Plotting Systems

B & K Instruments, Inc. specializes in the application and marketing of Bruel & Kjaer instruments and complete systems for measurement, analysis, control, and recording of AC voltages from 2 Hz to 200,000 Hz. To provide customers with immediate access to men familiar with their problems and with application experience in their area, the B & K staff is divided into specific market groups:

EDUCATIONAL — Teaching dynamic measurements; sound, vibration, strain, and shock.

HUMAN ACOUSTICS — Speech and hearing, hearing aids, psycho-acoustics, neuro-physiological research, heart sound.

AEROSPACE ENVIRONMENT — Data acquision, data processing, vibration environmental testing, instrument and transducer calibration, and bio-acoustics testing.

PRODUCT NOISE AND VIBRATION — Product noise and vibration analysis, control, or reduction; materials testing, architectural acoustics, traffic, airport noise, and similar fields.

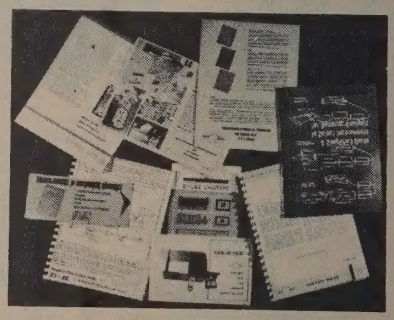
COMMUNICATIONS — Recording, reproduction, broadcasting, and dictating equipment; telephone equipment, hydrophones, and related equipment.

GENERAL INSTRUMENTS — Measurement of voltages, resistance, impedance, phase angles, and other values.

Within each market group is a pool of practical experience and know-how, available through the B & K field representatives, or by direct contact to Cleveland.

Individual Bruel & Kjaer instruments are unique and unmatched for accurate, professional measurements. A separate staff is maintained in Cleveland to assist customers in integrating instruments into reliable systems — or to design and manufacture custom systems to solve specific measurement, control, or analysis problems.

B & K instruments and systems are available for sale, lease, or rental. Factory-trained field representatives are located in most major cities.



Each B & K instrument is described in an individual Specification Sheet. The entire line is presented in condensed form in an annual Condensed Catalog. A quarterly journal, the B & K Technical Review, reports new developments in the field and from Bruel & Kjaer research. For the B & K instrument user, a Service Note program keeps him up-to-date on new servicing and calibration techniques, accessories, and ideas for assuring effective use of his instruments. An Application Note series discusses new solutions to difficult or unusual problems. All publications are available free, on request.

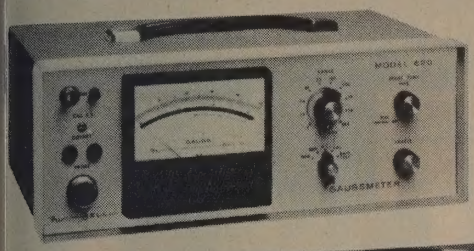
B&K INSTRUMENTS, INC.
Bruel & Kjaer Precision Instruments
5113 West 164th Street • Cleveland, Ohio 44142
Telephone: (216) 267-4800 • TWX: (810) 421-8266

BELL INC.

INSTRUMENTS

GOLD SEAL GUARANTEE
All ceramic-encapsulated transverse probes guaranteed one year against breakage

GAUSSMETERS



MODEL 620

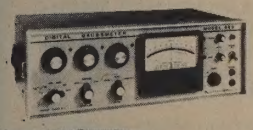
MODEL 640

- *0.5% Accuracy to 10 kG* • *1.0% Accuracy to 30 kG*
- *0.3% Built-in Calibration Accuracy*
- *1000 X Scale Expansion (with automatic zero center readout)*
- *Temperature Compensated Probes*
- *100 kG Probe Capability*
- *1 Volt and 5 Volt FS Calibrated Output*
- *AC and DC Magnetic fields*

Bell Gaussmeters, in a wide range of standard, in-stock models are suited for use in a broad spectrum of both industrial and laboratory applications. Industrial applications include: magnet processing, charging, stabilizing, testing, sorting, classifying magnets; evaluation of magnetic structures, tachometers, pm motors, TV focusing yokes, tape heads and all types of magnetic materials.

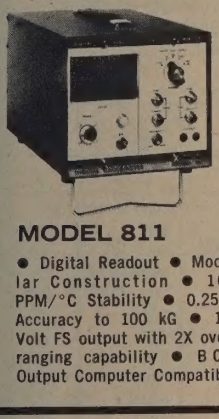
In Laboratory: mass spectrometer field monitoring; electron beam focusing magnets; field monitoring and control of large electromagnets; and magnetic ink paper and tape, evaluation and test.

Special Modifications:
If your specific application for a magnetic field sensing instrument cannot be met with a standard BELL Gaussmeter our engineers will be glad to study your needs and recommend an instrument with necessary modifications.



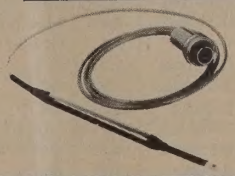
MODEL 660
• Digital and Analog Readout • 2 Parts in 10^5 Resolution FS

MODEL 610
• Low Cost • General Purpose • 1.5% FS Accuracy to 10 kG



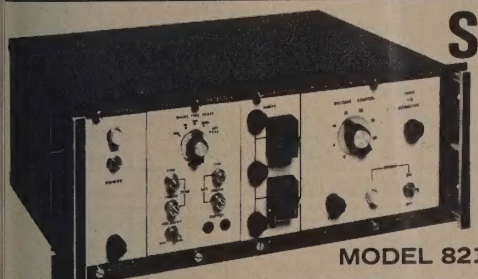
MODEL 811
• Digital Readout • Modular Construction • 100 PPM/°C Stability • 0.25% Accuracy to 100 kG • 1.0 Volt FS output with 2X overranging capability • B C D Output Computer Compatible

Suitable Probes for all purposes*



Bell probes are available in a wide range of types: transverse types in thicknesses from 0.006 and widths from 0.040; axial types in outside diameters from 0.062; for industrial use in ruggedized design, encapsulated in brass or aluminum; in hand held models and for fixture mounting.

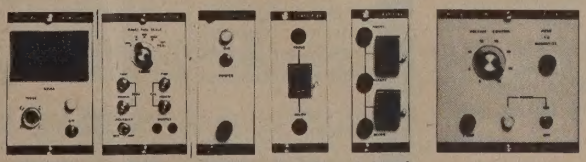
Self-contained Modular Components



MODEL 821

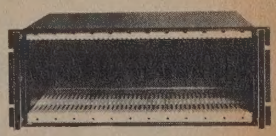
BELL'S new modular instrument design makes it now possible to improve many process control functions with the noncontacting detection capabilities of magnetics. Application flexibility is added to recognized high field measuring performance. By varying the combination of modules instruments can be tailored — and at a later date expanded — for such applications as: Magnetic Field Measurement; Electromagnet Field Control; Permanent Magnet Inspection and Classification; Automatic Magnet Processing; Noncontact Position Sensing; Material Thickness Monitoring; Material Hardness Testing; Weld and Sheet Edge Tracking; and many others.

Hardness Tester
A system composed of BELL Modules for making a nondestructive test by the residual flux technique. Composed of a field detector, magnetizer, classifier and power supply modules mounted in a rack bin.



Digital Readout | Field Detector | Power Supply | 2 Level Classifier | 3 Level Classifier | Magnetizer

Bench Cabinet with Power Supply



Rack Bin

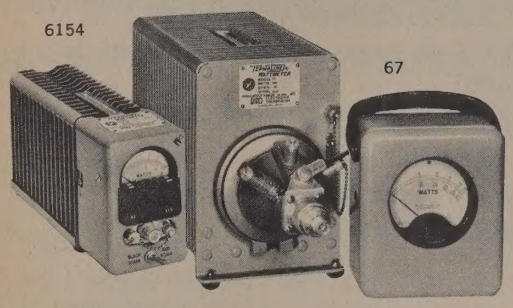
*Probes: A wide variety of standard and special probes is available.
Write for a complete catalog or assistance with your application.

Specifications subject to change without notice.

Leaders in Hall Effect Components, Instruments and Systems

BELL INC.
4949 Freeway Drive East Columbus, Ohio 43229
614-888-7501 TWX: 810-337-2851

TERMALINE® RF ABSORPTION WATTMETERS



TERMALINE® RF ABSORPTION WATTMETERS

Are direct reading instruments for absorbing and measuring RF power in 50-ohm coaxial line systems through the frequencies of 2 to 1000 MHz. The load section of the TERMALINE Wattmeter serves as a dummy load. The indicating meter is calibrated to read RF power directly in watts with ±5% of full scale accuracy. TERMALINE Wattmeters are available from milliwatts to kilowatts.

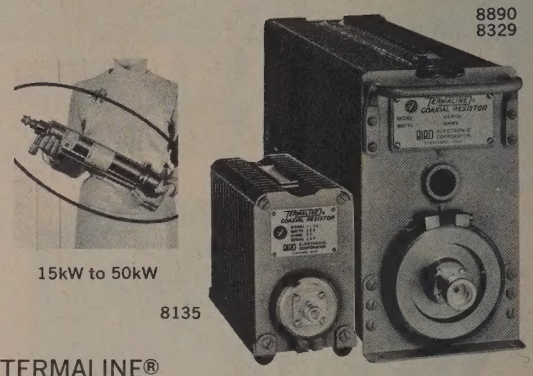
Maximum Power	Calibrated Frequency Range	Power Scales Available	Connector	Model	U.S. Price
AIR-COOLED					
2W	30-500MHz	25, 50, 100, 250, 500, 1000 milliwatts, 2 watts	BNC/F	6254	$115
60W	30-500MHz*	Dual range: 0-15/0-60W	N/F	611	175
80W	30-500MHz*	Dual range: 0-20/0-80W	N/F	612	175
80W	30-500MHz*	Choice of two compatible scales (eg.: 1-5W, 5-25W, 2-20W)	N/F	61	220
150W	25-1000MHz**	Four range: 0-5/0-15/0-50/0-150W	N/F	6154	265
500W	30-500MHz*	Triple range: 0-25/0-100/0-500W	QC(1)	67	350
1000W	2-30MHz	0-1000W	QC(1)	694	365
1200W	30-500MHz	Triple range: 0-120/0-600/0-1200W	QC(1)	6835	485
WATER-COOLED					
2500W	30-500MHz*	Triple range: 0-100/0-500/0-2500W	QC(1)	67C	$390

*Special calibration 500-1000 MHz available at time of order.
**25-500 MHz ±5%, 500-1000 MHz ±10% Accuracy.

COAXIAL RF FILTERS

Custom engineered or field-proven designs. High rejection attenuation filters available with Low-pass cut-off from 16 to 2700 MHz (about fifty designs at 400 MHz), Hi-pass cut-off frequencies from 30 to 1000 MHz, Band-pass as narrow as 5% of center frequency. Sizes from ½ cubic inches, with subminiature connectors, to 3⅛" line.

TERMALINE® RF COAXIAL LOAD RESISTORS TENULINE® POWER ATTENUATORS



TERMALINE® RF COAXIAL LOAD RESISTORS

For accurate, non-radiating termination of 50-ohm RF coaxial transmission lines are designed for use in permanent installations, development testing and trouble shooting of transmitters, intermediate components, power tubes, and accessories.

TENULINE® POWER ATTENUATORS

In addition to terminating a 50-ohm system, deliver an output signal 30 dB below the input, for RFI measurements, for extending the range of low-power wattmeters, for isolation of system components, etc.

Max. Power	Freq. Range	Max. VSWR	Connector Input	Model	U.S. Price
AIR-COOLED					
2W	0-4GHz	1.1	N/M or F	8011 or 10	$ 20
5W	0-4GHz	1.2	N/M or F	80	25
5W	0-4GHz	1.2	M or F: C, BNC, TNC	80	30
10W	0-4GHz	1.2	N/M or F	8053 or 52	30
20W	0-3.5GHz	1.3	N/F	80A	30
25W	0-3.5GHz	1.25	QC(3)	8080	40
50W	0-4GHz	1.2	QC(1)	8130	49
80W	0-4GHz	1.2	N/F	81B	65
100W	0-2.5GHz	1.2	QC(3)	8160	125
150W	0-4GHz	1.2	QC(1)	8135	75
225W	0-2.5GHz	1.2	QC(3)	8161	157
500W	0-2.5GHz	1.25	QC(1)	8201	165
600W	0-3GHz	1.25	QC(1)	8401	175
1000W	0-2GHz	1.25	QC(2)	8251	365
1000W	0-2.5GHz	1.25	QC(2)	8833**	365
2500W	0-2GHz	1.25	QC(2)	8890**	425
2500W	0-2GHz	1.25	3⅛" EIA Flanged	8891**	450
2500W	0-2GHz	1.25	1⅝" EIA Flanged	8892**	435
WATER-COOLED					
1000W	0-3.5GHz	1.25	M or F: N,C	8710/11	$200
2500W	0-2.5GHz	1.25	QC(2)	8230	180
5kW	0-2GHz	1.2	1⅝" EIA Flanged	8720	325
10kW	0-1.4GHz	1.15	3⅛" & 1⅝" EIA Fl.	8732/6	Inquire
15kW	0-500MHz	1.1	3⅛" (Adapters to 1⅝" and 6⅛" available)	See note below	on request
25kW	0-500MHz				
50kW	0-500MHz				

Six models of 15, 25, and 50kW Load Resistors are available with 50-ohm EIA or 51.5-ohm Unflanged Input Connectors. Write for details.

30 dB ATTENUATORS (AIR COOLED)					
50W	0-500MHz	1.1	QC(1) in. (1) out	8321	$125
200W	0-500MHz	1.1	QC(1) in. (1) out	8322	225
500W	0-500MHz	1.1	QC(1) in. (1) out	8325	400
1000W	0-500MHz	1.1	QC(2) in. (1) out	8327**	475
2000W	0-500MHz	1.1	QC(2) in. (1) out	8329**	600

**Overtemperature Thermoswitch available.

BIRD RF POWER QUALITY INSTRUMENTS 50-OHM COAXIAL

to measure, terminate, attenuate and filter

Thruline Model	Connectors	Plug-in Elements Frequency (MHz)	Plug-in Elements Power Ranges (watts)	U.S. Price
43	QC(1)			$95
Order one or more elements with your Thruline Wattmeter to suit your frequency and power ranges.		2-30	50, 100, 250, 500, 1000, 2500, 5000	$30 each
		25-60, 50-125 100-250, 200-500, 400-1000	5, 10, 25, 50,100, 250, 500, 1000	
		60-80, 80-95, 95-125 110-160, 150-250, 200-300, 275-450, 425-850, 800-950	1 watt	$50 each
Cowhide Carrying Case model CC-1 $17.50		60-80, 80-95, 95-150, 150-250, 200-300, 250-450, 400-850, 800-950	2.5 watts	
		950-1260, 1100-1800, 1700-2200, 2200-2300	1, 2.5, 5, 10, 25	$75 each
4311	QC(1)			$575
	For Peak and CW Power use Elements listed above, or select from Peak Power Elements below.			
		25-60, 50-125, 100-250, 200-500, 400-1000	2.5kW, 5kW, 10kW	$75 each
		950-1260	50, 100, 250, 500, 1000, 2.5kW, 5kW	

Mini-Monitor™ Thruline Model	Connectors	Freq. Range	Power Scales	U.S. Price
4111	UHF, N, BNC	25-175MHz	150/15W	$105 each
4112	N, UHF, BNC	2-30MHz	200/20W	
4113	N, UHF, BNC	2-30MHz	1000/100W	
4114	N, UHF, BNC	450-470MHz	50/5W	

Carrying Case Model CC-2 $6.50

Thruline Model	Connectors	Plug-in Elements Frequency (MHz)	Plug-in Elements Power Ranges (kilowatts)	U.S. Price
4712	1⅝" EIA Flanged			$206
		2-30	1, 2.5, 5, 10, 25	$ 50 each
		25-60, 50-125	.25, .50, 1, 2.5, 5, 10	
		.1-.25, .2-.5, .4-1 GHz	.25, .50, 1, 2.5, 5	
460	3⅛" EIA Flanged			$235
		2-30	5, 10, 25, 50, 100	$ 50 each
		25-60, 50-125, 100-250, 200-500, 400-1000	1, 2.5, 5, 10, 25	
4902	6⅛" EIA Flanged			$600
		2-30	25, 50, 100, 250	$ 50 each
		25-60, 50-125 100-250, 200-500, 400-1000	2.5, 5, 10, 25, 50	

THRULINE®
RF DIRECTIONAL WATTMETERS

Insertion instruments for measuring and monitoring incident and reflected power in coaxial transmission lines with ± 5% of full scale accuracy. Insertion VSWR is less than 1.05. Net power under any load condition is the difference between incident and reflected power readings, which also yield load VSWR from a nomograph.

4311 THRULINE Peak **and** CW Wattmeter **also** measures power of **pulsed RF** systems such as air navigational aids, telemetry, radar, etc. from 0.4 microsecond pulse width (± 8% accuracy).

Models 4111-12-13-14 are new palm-sized CW Wattmeters with one forward and one reflected power scale for servicing transmitters in the 2-30 MHz, 25-175 MHz or the 450-470 MHz frequency range.

Line Sections with single or double element sockets for all THRULINE Wattmeters, as well as ⅞" diameter instruments available.

QC-TYPE CONNECTORS (Quick Change) Adaptable to particular TERMALINE, THRULINE, and TENULINE units, these connectors may be quickly changed in the field. Connector types available are: Female or male BNC, TNC, N, C, SC, HN, LC, UHF, LT, ⅞" and 1⅝" EIA Flanged.

Normally supplied: (1) Female N, (2) Female LC, (3) Male N.

Prices are subject to change without notice. F.O.B. Cleveland, Ohio.

OTHER BIRD INSTRUMENTS THRULINE® RF DIRECTIONAL POWER SENSORS • TERMALINE® CALORIMETERS • BIRD WATTCHER® RF POWER MONITOR/ALARM • SENTRILINE® FILTER-COUPLERS • COAXWITCH® COAXIAL SELECTOR SWITCHES.

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BIRD ELECTRONIC CORPORATION
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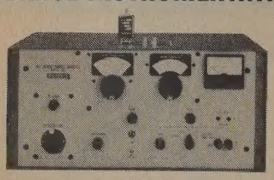
BOONTON ELECTRONICS CORPORATION

Boonton Electronics Corporation, engaged exclusively in developing and producing precision electronic laboratory instrumentation and high speed automated production testing equipment, is represented world-wide by skilled independent sales engineering representatives, who are thoroughly qualified to offer guidance and consultation on your electronic instrumentation problems. Check the yellow pages of this directory under Boonton Electronics for our representative in your area.

IMPEDANCE INSTRUMENTATION



Model 33A/1

RF Admittance Bridge

Measures 2-terminal shunt capacitance and conductance at high frequencies. Specified capacitance resolution obtains with 10 times lower test level than earlier Model 33A with accuracy improved to ±0.3%. Inductance, resistance, dissipation factor, and Q may readily be determined. Internal and external dc bias. Major applications in diode, transistor, and IC measurements.

Capacitance Measurement: 0 to 150 pF from 1 MHz to 50 MHz; to 30 pF at 100 MHz; accuracy, ±0.3%; 10-150 pF; resolution, 0.02 pF

Conductance Measurement: 0 to 25,000 μmhos; accuracy, ±2%; resolution, 0.5 μmho

Test Signal: 7 internally supplied crystal controlled frequencies of 1, 5, 10, 20, 30, 50, and 100 MHz; level continuously adjustable from 0.1 V down to as low as 1 mV

DC Bias: Internal, continuously adjustable from —6 to +100 V; external, to ±250 V

Price: $2950.00

Model 33B/1

Ultra High Conductance Resolution RF Admittance Bridge

Conductance range, 0 to 5000 μmhos with resolution of 0.1 μmho. Otherwise similar to Model 33A/1

Price: $3500.00

Model 33C/1

Ultra High Capacitance Resolution RF Admittance Bridge

Capacitance range, 0 to 15 pF with resolution of 0.002 pF; basic accuracy, ± 1%. Otherwise similar to Model 33A/1

Price: $3150.00

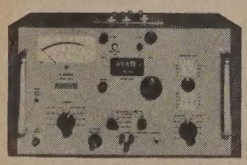
Model 33D/1

Ultra High Capacitance and Conductance Resolution RF Admittance Bridge

Capacitance range 0 to 15 pF with resolution of 0.002 pF. Conductance range 0 to 5000 μmhos with resolution of 0.1 μmho. Basic accuracy, ± 1%. Otherwise similar to Model 33A/1. **Price:** $3700.00

Capacitance Range Extensions

Accessories available for measuring higher values of capacitance at frequencies up to 30 MHz for Model 33A/1 and to 20 MHz for Model 33B/1



Model 35A

Q Bridge—100 kHz to 50 MHz

Dramatically new, non-resonant 3-terminal bridge. Provides direct reading measurements of capacitance up to large values and Q over a wide range with continuously adjustable test frequency. Low test signal levels. No external work coils. Internal or external dc bias.

Capacitance Measurement: 20 to 1,000 pF (100 kHz to 50 MHz); 2 to 10,000 pF (100 kHz to 10 MHz); indirectly 0.005 to 20 pF; basic accuracy, 0.5%

Q Measurement: 5 to 10,000; basic accuracy, 5% for Q's up to 100, (10 + Q/500)% for Q's 100 to 10,000

Test Signal: Frequency continuously adjustable from 100 kHz to 50 MHz; levels <50 mV; continuously adjustable

Dual External DC Bias: HI to GND and/or LO to GND; differential ±200V

Internal DC Bias: HI to LO; 0 to 150V

Price: On request

Delivery: Consult factory

Model 71A

Capacitance/Inductance Meter—1 MHz

Quick, convenient, direct reading, 3-terminal measurements of capacitance or 2-terminal measurements of inductance. Internally supplied 1 MHz test signal. Operates with low test signal level, permitting semi-conductor tests. Linear meter scales. Provision for dc bias. Linear dc output proportional to capacitance or inductance reading for display on dvm, x-y plotter, for data logging, or, with suitable voltage comparator, for go/no go testing.

Capacitance Measurement: 0 to 1000 pF in 7 ranges; accuracy, ±1%; resolution, 0.01 pF

Inductance Measurement: 0 to 1000 μH in 7 ranges; accuracy, ±1%; resolution, 0.01 μH

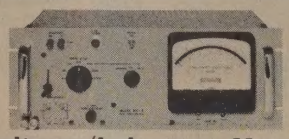
Test Signal: Frequency 1 MHz; level, 15 mV rms for capacitance measurements, < 1 mV for inductance measurements

Q Range: Specified accuracies apply for test specimens having Q's of 3 or more; lower with readjustment

DC Bias: Externally supplied up to ±200 V

DC Analog Output: 0 to 100 mV or 300 mV fs depending on range numerics; also > 1 V fs for loads > 10 MΩ; linearity, 0.1% of reading; response time, 10 ms

Price: $975.00; rack-mounting version with built-in standard, Model 71AR, $1050.00



Model 71CR

Capacitance/Inductance Meter—100 kHz

Quick, convenient, direct reading, 3-terminal measurements of capacitance or 2-terminal measurements of inductance. Internally supplied 100 kHz test signal. Operates with low test signal level, permitting semi-conductor tests. Linear meter scales. Provision for dc bias. Linear dc output proportional to capacitance or inductance reading for display on dvm, x-y plotter, for data logging, or with suitable voltage comparator, for go/no go testing.

Capacitance Measurement: 0 to .01 μF in 7 ranges; accuracy, ± 1%; resolution, 0.1 pF

Inductance Measurement: 0 to 10 mH in 7 ranges; accuracy, ± 1%; resolution, 0.1 μH

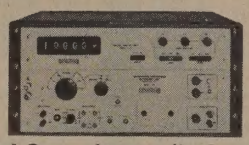
Test Signal: Frequency, 100 kHz; level, 15 mV for capacitance measurements, <1 mV for inductance measurements

Q Range: Specified accuracies apply for test specimens having Q's of 3 or more; lower with readjustment

DC Bias: Externally supplied up to ±200V

DC Analog Output: 0 to 100 mV or 300 mV fs depending on range numerics; also >1 V fs for loads > 10 MΩ; linearity, 0.1% of reading; response time, 20 ms

Price: rack-mounting with built-in standard, Model 71CR, $1125.00



Model 700C

Digital Capacitance/Inductance Meter—1 MHz

Continuous digital readout of 3-terminal capacitance or 2-terminal inductance at 1 MHz. Provisions for remote capacitance measurements and dc bias of capacitance specimen. Internal capacitance standard for both high Q and low Q (Q=3) calibration check. BCD output 8, 4 2, 1 coded sequence.

Capacitance Measurement: 0 to 1000 pF in 3 ranges; lowest range, 10 pF, fs: 4 digit resolution and over-range (5th digit); basic accuracy, ±0.3%

Inductance Measurement: 0 to 100 μH in 3 ranges; lowest range, 1 μH, fs; 4 digit resolution and over-range (5th digit); basic accuracy, ±1%

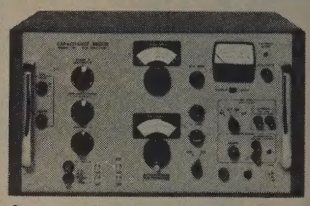
Test Signal: 1 MHz, crystal controlled; level, 15 mV for capacitance, <1 mV for inductance

Q Range: Specified accuracy applies for Q's down to 3; lower with readjustment

DC Bias: Monitored internal and external; ± 140V internal ± 200V external

Response Time: 200 ms

Price: $2,500.00



Model 74D

Capacitance Bridge—100 kHz

Precision measurements of capacitance and conductance over very broad ranges at 100 kHz. Excellent stability with negligible warm-up drift. Test signal level adjustable to low values for semiconductor testing. 3-terminal arrangement permits use of remote test jig without errors owing to cable capacitance to ground. 2-terminal operation also provided. "Linear" mode for limit operation permits go/no go testing. Provision for differential or comparison measurements. Balancing simple and convenient, with no false or sliding nulls. All zeroing controls vernier driven. Internally supplied or external dc bias.

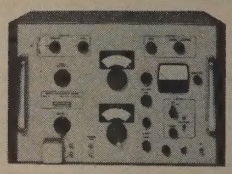
Capacitance Measurement: 0 to 110,000 pF; accuracy, ±0.1%; resolution, 0.0002pF

Conductance Measurement: 0 to 1000 μmhos; accuracy, ±5%; resolution, 0.001 μmho

Test Signal: Internally supplied, 100 kHz; level continuously adjustable from 1 mV to 4 V

DC Bias: Internal, —6 V to +100 V; External, up to ±400 V

Price: $2250.00



Model 75C

Capacitance Bridge—5 kHz to 500 kHz

Versatile 3-terminal bridge with adjustable test frequency. Permits determination of effects of frequency upon test. Includes built-in dc bias supply. Convenient operation; eliminating false and sliding nulls. Completely self-contained including bridge circuit, tunable oscillator and detector.

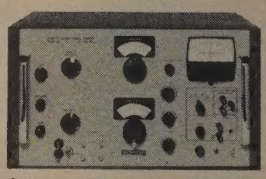
Capacitance Measurement: 0 to 1000 pF; accuracy, ±0.25%; resolution, 0.0002 pF

Conductance Measurement: 0 to 1000 μmhos; accuracy, ±5%; resolution, 0.001 μmho

Test Signal: Internally supplied; continuously adjustable in frequency from 5 kHz to 500 kHz; level adjustable from 1 mV to 3 V

DC Bias: Internal only; continuously adjustable from —5 V to +110 V

Price: $2600.00



Model 75D

Capacitance Bridge—1 MHz

This bridge provides 3-terminal measurements of capacitance and conductance allowing remote connection without errors due to stray capacitance to ground. Makes 2-terminal measurements using Ground Plane Adapter Model 75-6A. Inductance is read by conversion from equivalent capacitance measurement. The detector is needle sharp yet shows balance direction from the most extreme off-range setting and an additional differential detector mode allows capacitance or inductance sorting of components. Internal and external dc bias.

Capacitance Measurement: 0 to 1000 pF; accuracy, ±0.25%; resolution, 0.00005 pF with phase sensitive detector; 0.0005 pF with amplitude sensitive detector

Conductance Measurement: 0 to 1000 μmhos; accuracy, ±5%; resolution, 0.01 μmho

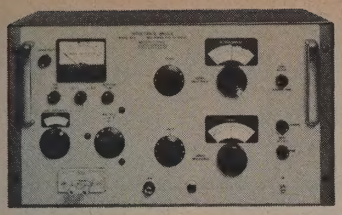
Inductance Measurement: 25 μH to 25 mH; basic accuracy, ± 0.25%

Test Signal: 1 MHz, crystal controlled; level adjustable from 1 mV to 300 mV

Dual External DC Bias: HI to GND and/or LO to GND; differential ±400 V, max.

Internal DC Bias: HI to LO; —6 V to +150 V

Price: $1950.00



Models 63H 63L and 63M

Inductance Bridges

Direct reading measurements of inductance and series resistance. Convenient operation, eliminating false balance and sliding nulls. Exceptional stability. Completely self-contained, with bridge circuit, oscillator, detector, and null indicator in single, compact bench cabinet. Particularly useful for quality assurance or production tests, as well as for laboratory studies.

Model 63H

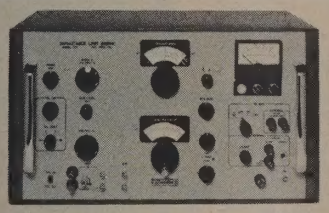
Inductance Measurement: 0 to 110 mH; accuracy, ±0.25%; resolution, 0.0002 μH
Series Resistance Measurement: 0 to 11,000 Ω; accuracy, ±3%; resolution, 0.0002 Ω
Test Signal: Internal oscillator-detector continuously adjustable from 5 kHz to 500 kHz; max. open-circuit level, 3 V **Price: $2750.00**

Model 63L

Inductance Measurement: 0 to 11 H; accuracy, ±0.25%; resolution, 0.02 μH
Series Resistance Measurement: 0 to 110,000 Ω; accuracy, ±3%; resolution, 0.005 Ω
Test Signal: Internal oscillator-detector continuously adjustable from 400 Hz to 40 kHz max. open-circuit level 5.5 V **Price: $3000.00**

Model 63M

Inductance Measurement: 0 to 1.1 H; accuracy, ±0.25%; resolution, 0.002 μH
Series Resistance Measurement: 0 to 110,000 Ω; accuracy, ±3%; resolution, 0.002 Ω
Test Signal: Internal oscillator-detector continuously adjustable from 1 kHz to 100 kHz; max. open-circuit level 5.5 V **Price: $2750.00**



Model 77B

Capacitance Limit Bridge—1 MHz

Automatic, high-speed, dual or single limit tests, or conventional manual measurements of capacitance or inductance. In automatic mode, test is insensitive to specimen loss. "High," "Low," or "Go" test decisions indicated by front panel lamps as well as by continuity closures for actuation of material handling equipment. Internally supplied crystal controlled 1 MHz test signal. Operates with low test level. Built-in dc bias supply; provision for external bias. 3-terminal arrangement permits remote measurements.
Capacitance Measurement: Automatic Mode, 0 to 1000 pF with 0.001 pF resolution; Manual, 0 to 1000 pF with 0.0001 pF resolution; basic accuracy, ±0.25%
Inductance Measurement: Manual or Automatic, 25 μH to 25 mH; basic accuracy, ±0.25%
Conductance Measurement: (Manual only) 0 to 1000 μmhos; basic accuracy, ±5%; resolution, 0.01 μmho
Tolerance Limits: Programmable at front panel controls from ±0.0005 pF to ±200 pF; basic accuracy, ±1% of limit setting
Test Time: Approx. 50 ms
Test Signal: Internally supplied; 1 MHz, crystal controlled; level adjustable from 250 mV to 15 mV for Automatic Mode, to 1 mV for Manual
Decision Output: Green, red, and amber panel lamps indicating "Go," "High," and "Low," respectively; continuity contacts available at rear panel in conformance with test decisions
DC Bias: Internal, continuously adjustable from —6 V to +150 V; external, to ±400 V
Price: $2650.00

Model 77B-S1

Capacitance Limit Bridge—100 kHz

Essentially similar to Model 77B. Has basic capacitance/inductance accuracy of ±0.1%. Operates with internally supplied 100 kHz crystal controlled test signal. Capacitance range, automatic or manual, is 0.001 pF to 1000 pF. Inductance range, 2.5 mH to 250 mH. Otherwise specifications are as shown for Model 77B.
Price: $2650.00

RF POWER INSTRUMENTATION

Model 41A

RF Microwattmeter

Exceptionally stable microwave power meter providing reliable measurements over a 71dB range with one power detector. Use of full wave diode detector overcomes limitations of stability, sensitivity, and overload of thermal types. No zero balancing except for fractional microwatt measurements. Can be calibrated from low frequency rf source. Stable dc output proportional to $\sqrt{P}$.
F.S. Power Range: 0.01 μW (—50dBm) to 10mW (+10dBm)
Power Sensitivity: 0.001 μW (—60dBm)
Basic Accuracy: ±0.5 dB
Drift: Less than 0.001 μW/hr
Overload Limit: Input of 300 mW (+25dBm) will not damage power detector.
Input Connector: Type N, Precision
Price: 41A, $600.00; rack-mounting Model 41AR, $625.00

Power Detectors

	Model 41-4A	Model 41-4B
Frequency Range:	0.2 MHz to 7 GHz	0.2 MHz to 12.4 GHz
VSWR:	≤1.3 to 3 GHz ≤1.5 to 7 GHz	≤1.3 to 3 GHz ≤1.5 to 11 GHz ≤1.75 to 12.4 GHz
Price:	$160.00	$250.00

RF VOLTAGE INSTRUMENTATION

Sensitive RF Voltmeters

Model 91 DA

This series of RF Voltmeters provides reliable, reproducible voltage measurements from the low radio frequencies to the gigahertz region over a wide range of amplitude . The versatility of these instruments plus their accuracy and convenience of operation have established them as standards of performance for the industry. The primary differences among the Models 91DA, 91H, 91C, 91K and 91L are indicated in the specification table below. All five models are characterized by low noise, excellent stability, high input impedance and low input capacitance.

Model 91 H

	Model 91DA	Model 91H	Model 91C	Model 91K	Model 91L
Full Scale Voltage Range:*	1 mV to 3 V	1 mV to 3 V	3 mV to 3 V	10 mV to 30 V	1 mV to 1 V
dB Range:	81 dB**	81 dB**	71 dB**	81 dBm	71 dBm
Voltage Sensitivity:	300 μV	100 μV	1 mV	1 mV	100 μV
Basic Accuracy:	2%	3%	5%	3%	3%
Frequency Range:	20 kHz to 1.2 GHz			0.5 MHz to 600 MHz	*with 91-23A:* 0.2 MHz to 2.5 GHz *with 91-12E:* 20 kHz to 1.2 GHz
Input Resistance: (f<10 MHz)	100 kΩ (at low level) to 1 MΩ (at high level)			>4 MΩ	same as 91H
VSWR:	≤1.2 at frequencies below 1.2 GHz			≤1.2 at 600 MHz	*with 91-23A:* ≤1.2 below 2.5 GHz *with 91-12E:* ≤1.2 below 1.2 GHz
Waveform Response:	True rms below 30 mV (3 V with Model 91-7C 100:1 Voltage Divider) gradually becoming peak-to-peak (calibrated in rms) at 3 V.			Same as 91H except all voltages are 10 times greater	Same as 91H
Price:	$750.00† $900.00††	$675.00† $825.00††	$575.00† $725.00††	$705.00†	$1000.00†

*to 300 V with Model 91-7C 100:1 Voltage Divider (91L, 100V max.)
**dBm scale available; order Model nos. with suffix S4
All instruments except 91C have DC Analog; Input capacitance of all probes is approx. 2.5 pF
†Includes 91-12E RF Probe, 91-13B RF Probe Tip and 91-8B 50 ohm Adapter (also 91-23A with 91L)
†† With complete Accessory Kit. Includes 91-6C Unterminated BNC Adapter, 91-7C 100:1 Voltage Divider, 91-14A Tee Adapter, 91-15A 50 ohm Termination, all in 91-18A Accessory Storage Box with space for probe, 91-13B Probe Tip, and 91-8B 50 ohm Adapter provided as standard equipment with each instrument.

*** IMPORTANT NOTICE ***

We will offer in mid-1970, in addition to the above RF Voltmeters, a new solid state RF Voltmeter.
It will have essentially the same specifications as the above but will be in a new case configuration. In addition, features and options to be made available will include auto-ranging, programmability, digital readout, etc.
Please contact the factory for further information on this new product.

DC VOLTAGE INSTRUMENTATION

Model 95A

Sensitive DC Microvolt/Picoammeter

Unusually broad range of dc voltage and current measurements covered in 42 ranges. Front panel range and function switching uniquely simple and convenient. Zero-center meter. Fast response. Exceptionally stable amplifier output at front panel. Amplifier output gain and reference level adjustable without interaction with meter. Either floating or grounded operation for voltage; floating for current.

Voltage Range: 10 μV to 1000 V end scale; Accuracy, ±3%; sensitivity, 1 μV
Current Range: 1 pA to 1 A e.s. ; Accuracy, ±4%; sensitivity, 0.1 pA
Voltmeter Input Resistance: 10 MΩ, all ranges
Amplifier Output: ±1 V es across 1000 Ω
Amplifier Gain: 100,000 max.
Price: $625.00 (rack mounted Model 95AR, $650.00)

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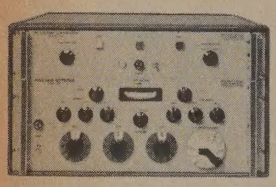
BOONTON ELECTRONICS CORPORATION | AUTOMATION PRODUCTS DIVISION

PRECISION INSTRUMENTATION FOR HIGH-SPEED GO/NO-GO AND COMPLEX LIMIT TESTING

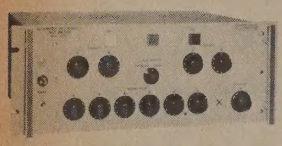
A wide selection of modular units for manufacturing test, process control, incoming inspection, sorting, batching and data logging.



Model 122D Automatic Resistance Limit Bridge

High-precision, 4-wire resistance measuring system which performs dual-limit go/no-go resistance tests at very high rates of speed for either production testing or manual operation. Nominal values programmable from 0.1 Ω to 100 M Ω. Plus and minus tolerances individually adjustable from 0 to ±29.9%. Excitation voltage adjustable from 0 to 100 V, dc. Test results indicated visually by front panel lamps and by continuity contacts. Negligible drift; no need for recalibration; unattended operation possible over extended periods. Test time, 50 milliseconds, minimum; cycle time adjustable from 2 to 20 tests/second.

Alternative versions available: Model 122D-S1 with nominal value programmable from 0.01 Ω to 10 M Ω, and tolerance limits programmable from 0% to ±9.99% in 0.01% steps. Model 122D-S2 with nominal value programmable from 0.01 Ω to 100 M Ω, and tolerance limits programmable from 0% to ±9.99% in 0.01% steps. Accuracy of all units ±0.05% from 10 Ω to 10 M Ω; ±0.15% above 10 M Ω and decreasing below 10 Ω to ±0.5% at 1.0 Ω.

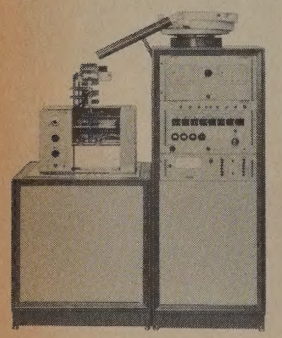


Model 122CD Automatic Resistance Limit Bridge

An integral, highly compact, low-cost rack-mounting automatic 4-wire resistance limit bridge which provides an economical approach to high-speed go/no-go testing. Nominal values selectable from 0.1 Ω to 10 M Ω. Tolerance limits individually programmable from 0 to ±11%. System accuracy, ±0.05% from 10 Ω to 1 M Ω; ±0.1% from 1 M Ω to 10 M Ω, and decreasing below 10 Ω to typically ±0.75% at 1.0 Ω. Excitation continuous dc 50 milliwatt max. dissipation in test resistor. Test speed 50 milliseconds per 2 limit classification. Test decisions indicated by front panel lamps and by mercury-wetted relay contacts. Negligible drift; unattended operation possible over extended periods. Operates in manual and triggered modes. Decisions stored until completion of next test. Size: 7" x 19" panel; 6¾" x 17" x 16" chassis. Primary power, 105-125 V, 50/60 Hz, 75 W.

Model 124C Resistance Sorting Bridge

An automatic, 8-limit, 4-wire resistance bridge for high speed sorting of resistors into categories or "zones". Provision for up to 10 category sorting. Decision outputs for Go_1 through Go_8 plus "High" and "Lo" are indicated by front panel lamps as well as being issued by continuity contacts. System accuracy ±0.05%. Nominal values programmable from 0.1 Ω to 10 M Ω with 5-digit resolution. Sorting limits individually adjustable from 0 to ±11.1% in 0.01% steps. Test speed, 25 ms per test (single limit); 150 ms per final classification, max. Excitation voltage across test resistor continuously adjustable from 0 to 100 V, dc and is monitored at front-panel meter. "Normalized" position of excitation control assures specified system accuracy and limits power dissipation in test resistor to 50 mW max. Operates in manual and triggered modes. Decisions stored until completion of next test. Size: 17" h x 19½" w x 23" d, overall with cabinet. Primary power, 105-125 V, 50/60 Hz, 300 W.



Typical system for 11 category classification of capacitors

Test Systems For Axial Leaded Components

The typical equipment combination illustrated shows a highspeed, axial leaded capacitor sorting system for 11-category classification of components into eight Accept Zones, Capacitance High and Low, plus DF Reject at a 1 KHz test frequency. Parts are sorted and binned at a rate of 6,000 to 8,000 pieces per hour.

Bulk components are introduced into an integral vibratory bowl, which presents a continuous flow of parts to the hopper of the Model 850B Component Feeder. A small reservoir of parts is maintained in tracks and then transported to the test head. The electrical tests are performed, and the tested components are collected in the proper bin, ready for stock or further processing.

Programming of the test equipment consists of merely setting a nominal capacitance value and per cent tolerance limits as boundaries for the desired Capacitance Accept Zones and the DF limit.

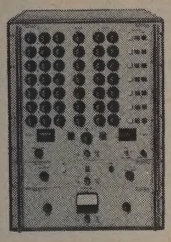
These test systems are designed for high-volume production applications, and a virtually unattended operation is practical. Typically, a half hour reserve of parts may be maintained in the bowl, thus accommodating multiple-station testing by a single operator. All test results are displayed visually in the form of colored lamps and are transmitted to the handling equipment in the form of contact closures.

The mechanical portion of these systems has been designed to make changeovers to accommodate various parts sizes as simple as possible. Track and transport wheel spacing adjustments and hopper exchange is accomplished in only a few minutes. The vibratory bowl accommodates most sizes with only minor baffle adjustments to reject components with badly bent leads.

The axial lead test systems are modular in construction and many combinations of modules are available to suit particular requirements. Systems are available for classification of resistors, capacitors, inductors and other axial leaded components such as diodes and varactors.

The handling system is compatible with the Models 122D, 122CD, 124C, 171K-C-M and 174K-C-M.

High-Speed Test Instruments & Systems


125A

Model 125A Resistance Scanning Bridge

Primarily intended for final inspection of microcircuit resistor networks. Automatically tests up to 7 resistances on a substrate or other type of multi-resistor assembly in predetermined sequence, providing individual HI/LO/GO decisions plus an "Accept" or "Reject" decision for the total circuit at conclusion of test cycle. Number of resistances per scan selectable from 1 to 7; additional multiples of 7 can be added by slave units. Nominal resistance values are individually selectable from 0.1Ω to 10 MΩ with 3 digit resolution. Tolerances for each resistance are individually selectable from 0 to ±11.0% with 2 digit resolution. Basic system accuracy, ±0.05%. Results of individual resistance tests and final "Accept" or "Reject" decisions are indicated by panel lamps. Individual and final test results are also available as contact closures for actuation of associated materials handling equipment or for data logging. Running totals of "Accept" and "Reject" decisions are kept by front panel electro-mechanical counters. Test time is 50 mS per resistance; 350 mS per 7 resistor scan. Excitation voltage across resistor adjustable at front panel. "Normalized" position of this control guarantees specified accuracy and automatically adjusts voltage to limit power dissipation in test resistor to 50 mW. Programming can be converted from front panel selectors to static card reader by means of add-on Model 52-7A.

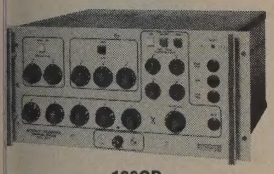
Models 126CD/126A/126B/126CD-S5 Resistance Trimming Bridges

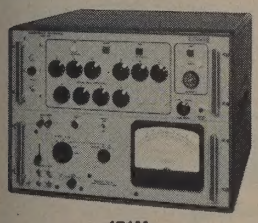
The Model 126CD is an integral rack mounting, 4 wire Resistance Limit Bridge primarily intended for controlling the trimming of thick film resistors. Upon receipt of a start test signal, the bridge first compares the untrimmed resistor to the "Minimum Start" value, and if this test is acceptable, the trimming command is issued. When the resistor reaches the "Stop" value, the trim command is removed, and after an adjustable delay to make certain that the adjustment process has stopped, a final, double limit inspection is performed with a measurement accuracy of ±0.05%. Each model 126CD is an integral measuring system with its own control logic, isolated power supply and input-output connectors, making the unit suitable for combination with other units for simultaneous trimming of multiple resistor networks. Final values are programmable to 10M ohms, and final value tolerance limits are independently adjustable from 0 to ±11.1%. The power dissipation in a resistor being trimmed is limited to a maximum of 25 mW.

The Model 126A is a programmable version of the Model 126CD and may be used to sequentially trim any number of resistors with complete flexibility. Programming of minimum start value, stop value, final value and tolerance limits is done by means of external B-C-D contact closures.

The Model 126B is a special purpose resistance trimming bridge which is intended for the simultaneous processing of resistors in closed loop configurations such as bridge circuits and delta networks. This bridge provides precisely regulated excitation levels of 0.5 to 1.0VDC.

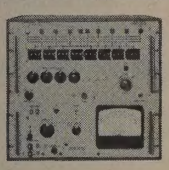
The Model 126CD-S5 is a modified model 126CD which incorporates means for use of external standard arm resistors. With this feature, a simple form of programming may be attained, "match" trimming may be accomplished and greater accuracy may be reached for very low values of resistors. An accessory programming device (Model 126-1A) is available for use with this bridge, which provides means for use of 10 plug-in external standards.


126CD


171M

Models 171K, 171C & 171M Capacitance-Inductance Test Systems

The Models 171K, 171C and 171M are a family of high-speed automatic test systems providing test frequencies of 1KHz, 100KHz and 1MHz. The systems consists of a universal, main frame, control unit plus one or more measurement modules. At 1KHz, go, high, low tests for capacitance plus an accept-reject test for dissipation factor are performed and at the 100KHz and 1MHz frequencies, HI/LO/GO inductance tests as well as the basic capacitance tests may be made. Test time is 50mS for the combined "C" and "D" decisions, which are presented in the forms of panel lamps and mercury-wetted relay contacts. Six full scales provide measurement ranges of 100pF to 10μF at 1KHz, 10pF to 10,000pF at 100KHz and 1pF to 1000pF at 1MHz. At 1KHz, dissipation factor may be checked over a range of 0.001 to 0.1 and at 100KHz and 1MHz, inductance may be tested over the respective ranges of 1μH to 10,000μH and 0.1μH to 1000μH. Several fixed excitation levels are available at 1KHz, and at 100KHz and 1MHz the excitation level is 15mV for C and less than 1mV for L. Interface accessory units are available to provide 0 to 10VDC analog outputs with sample and hold features for use with external DVMs, printers and recorders. A 3-terminal measurement permits remote tests without serious errors due to cable capacitance. Panel size is 12¼" x 19" for the Model 171K and 14" x 19" for the Models 171C or 171M.


174M

Models 174K, 174C, 174M Capacitance-Inductance Sorting Systems

The Models 174K, 174C and 174M are multi-category sorting versions of the Models 171K, 171C, 171M. In lieu of a simple High, Low, Go classification for capacitance or inductance, these systems, by virtue of a different control unit, provide (8) go categories plus high and low. The Measurement Modules for these systems are identical to their Model 171 counterparts. Maximum classification time is 125mS and all decision outputs are provided in panel lamps as well as mercury-wetted relay contacts. Panel size is 15¾" x 19" for the Model 174K and 17½" x 19" for either the Model 174C or 174M.

Model 178A Varactor Test Systems

The Model 178A is a modular and expandable test system primarily intended for rapid limit testing of varactor diodes. The system provides test functions for capacitance value, capacitance ratio, breakdown voltage (V_R), reverse current (I_R) and quality factor (Q). It is ideally suited to manufacturing test applications, incoming inspection and quality assurance.

The complete system consists of four (4) rack mounting units whose nomenclature and function are as follows:

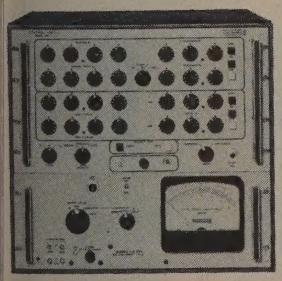
Nomenclature	Function
Model 71AR-S5 Capacitance Meter	1 MHz Capacitance Measurements
Model 59A Control Unit	Capacitance and capacitance ratio tests
Model 150A V_R/I_R Tester	Voltage breakdown and reverse current tests
Model 135A Auto Q Tester	Q limit tests

Each unit of the system is designed as an add-on module to enhance flexibility, and subsystems such as the combination of the Models 71AR-S5 and 59A for capacitance value and ratio are available to meet specific long range test requirements or to act as "starter" equipment for an eventual complete test facility.

Precision, programmable internal DC bias sources with 4-digit setting resolution are provided for both capacitance value and ratio tests which are performed at low level 1 MHz excitation.

Programming of capacitance value, bias voltages and numerical ratio limits is performed by simple-to-set front panel knobs on the Model 59A Control Unit. A range selection for the value test is made by a panel switch; however, in the ratio test, the Model 71AR-S5 will auto-range to complete the two-test function after merely programming High and Low limits.

At the inception of a test cycle an automatic polarity test is also made to orient properly the diode under test. In addition to this function, indications of shorted or open diodes are provided.


178A

Write for complete technical data

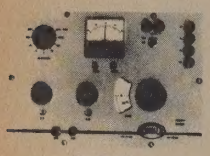
BOONTON ELECTRONICS CORPORATION | **AUTOMATION PRODUCTS DIVISION**

1279 ROUTE 46, PARSIPPANY, N.J. 07054
TEL. 201-335-9550 □ TWX 710-986-8241

The products listed above are indicative of Boonton Electronics capability in the area of Automation Products. However, they should not be considered as totally inclusive of our line. Many variations of these units are available and we are always interested in knowing of new requirements for automatic test instrumentation. For complete technical details on these and other instruments and systems please contact our Sales Engineering Representatives in your area (see yellow pages of this directory) or the factory.

Biddle Instruments Preserve Accuracy For Years

PORTABLE POTENTIOMETERS **Bulletin 72-6 EEM**



72-3110

72-310

Cat. No.	Ranges	Limit of Error	Price
72-310	0-11.1 0-111 mV	0.05% + 5μV	$325.00
72-312	0-0.182 0-1.82	0.05% + 5μV	325.00
72-314	−11 to +111 mV	0.05% + 5μV	340.00
72-316	Any single Range −300° to +3000°	0.2% of span	275.00
72-318	Any two ranges	0.2% of span	365.00
72-3110	−11.1 to +111.1 mV	±0.03% + 2μV without RJC ±0.03% + 4μV with RJC	575.00
72-3112	--0.0111 to +0.1611 V	±0.03% + 2μV	
	−0.111 to +1.611V	±0.03% + 20μV	650.00

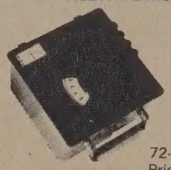
PORTABLE WHEATSTONE BRIDGES

72-430 Price: $250.00

72-432 Price: $295.00

Range: 0.1Ω to 11.1MΩ
Limit of error: ± (0.1% of reading + 0.01Ω)
Detector Sensitivity: 8μv/div. (1.6 mm)
Detector Resolution: ± 0.01% (10Ω to 1MΩ)
Bridge Resolution: ± 0.01%
Model 72-432 also has ratios of M1, M10, M100, M1000 for Murray Loop tests.

PORTABLE KELVIN BRIDGE



72-436
Price: $300.00

Range: 0.0001Ω to 110Ω
Limit of Error: 0.3% to 1%

RESISTANCE TEMPERATURE BRIDGE

72-490 Price: $700.00
Range: 0 to 1111.1Ω
Limit of Error:
± (0.03% of reading + 0.0025Ω)

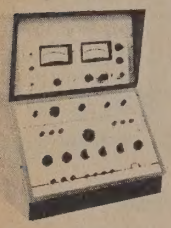
STRAIN GAUGE BRIDGE

72-4010 Price: $395.00

Range: Resistance 0 to 111.1Ω
Ratio .5 to 1.111
Rheostat 0 to 211.1Ω
Limit of Error: Resistance and Rheostat ± 0.01Ω
Ratio ± 0.01%

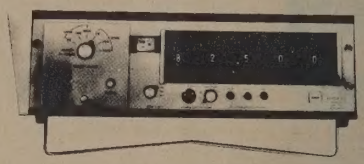
For information on above instruments request Bulletin 72-7 EEM

LABORATORY AND CALIBRATION INSTRUMENTS



71-131

A complete line of voltage, current, and resistance measuring instruments. Available as individual modules for complete measuring systems. Ranges: Voltage—mV to 1,500 volts; Current—0.075 to 15 amperes; Resistance—0.0001 to 1 × 11^9 ohms. Accuracies from 2 ppm, depending on range and parameter selected. Request Series 71 Bulletins.



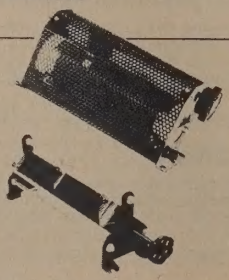
603

MENTOR RESISTANCE TRIM/TESTERS

Designed for controlling resistance trimming equipment used in adjusting thin and thick film resistors. These instruments are adaptable to all type systems including abrasive, laser and ultrasonic. Featured are extremely rapid measurement response time, multispeed control, and measurement of resistance and voltage ratio in addition to absolute resistance. Bulletin 73-9 EEM.

BIDDLE RHEOSTATS

Lubri-tact and carbon pile rheostats. Seventy-six standardized ratings available in 8″, 10″, 16″ and 20″ sizes. A variety of special non-inductive, double and graded types and Compression Carbon Rheostats also available. Write for Bulletin 41-EEM.



FRAHM® RESONANT REED FREQUENCY METERS
Bulletin 32-EEM

2½″, with metal case.

3½″, GE style case

3½″, Plastic case.

RESISTANCE STANDARDS
Resistance values 1 ohm to 1 megohm.
Accuracy: 0.001% Certified directly to N.B.S.
Bulletin 71-5.

SOLID STATE NULL DETECTOR
A 4μV per division zero center meter driven by a solid state high gain differential amplifier, powered by two mercury batteries.
Bulletin 72-8 EEM.

COMPRESSED GAS CAPACITORS
For use as reference standards of capacitance and as precision ac voltage dividers.
Bulletin 85 EEM.

CORONA MEASURING EQUIPMENT
A fully programmable Corona Test set keyed to digital print out.
Bulletin 66 EEM.

50/100/150 kv
DIELECTRIC TEST SETS
Safe, rugged equipment for supplying and measuring both ac and dc voltages from 5kv to 150kv.
Bulletin 22 EEM.

Inquiries Answered Promptly.

JAMES G. BIDDLE CO.
Meeting the Test for 75 Years—1895-1970
PLYMOUTH MEETING, PENNSYLVANIA 19462

CABLEMASTER

A compact, versatile unit for rapid and efficient testing of electrical cable assemblies, harnesses, connectors, and bulk cable

■ Ease of Operation

Simplified operating procedures permit the Model 400-C to be operated by non-technical personnel. Controls are conveniently located and are arranged to provide efficient operation. Test results are displayed on a digital readout to reduce errors. When a fault is located in a cable being tested, the test sequence automatically stops and an alarm is sounded to alert the operator. Testing can be continued at the operator's discretion.

■ Mobile Carrier for Increased Versatility

The Model 400-C is designed to provide maximum convenience and versatility for in-plant or field applications. It is equipped with a mobile carrier to permit easy movement to any location. The Unit can also be removed from the carrier if desired.

■ Permanent Test Record (Optional)

The 400-C is available with an optional printer to provide a complete and permanent record of each test. The type of test, circuit tested, and test results are recorded on a continuous paper tape. Failures are printed in red for easy identification. With the printer in operation the Cablemaster will not stop when a fault is located, but will record the fault and proceed with the test.

■ Insulation Resistance Range From 1 to 5000 Megohms

The Model 400-C automatically checks each conductor against all others to determine insulation resistance under any impressed voltage between 20 and 1000 vdc. Use of plug-in resistance standards and environmental sealing of critical components eliminates acceptance level drift caused by humidity or temperature changes within normal operating conditions. Rapid change from one acceptance level to another is easily accomplished.

■ Continuity Resistance Range from 0.5 to 59 Ohms — 0.5 to 3 Amperes

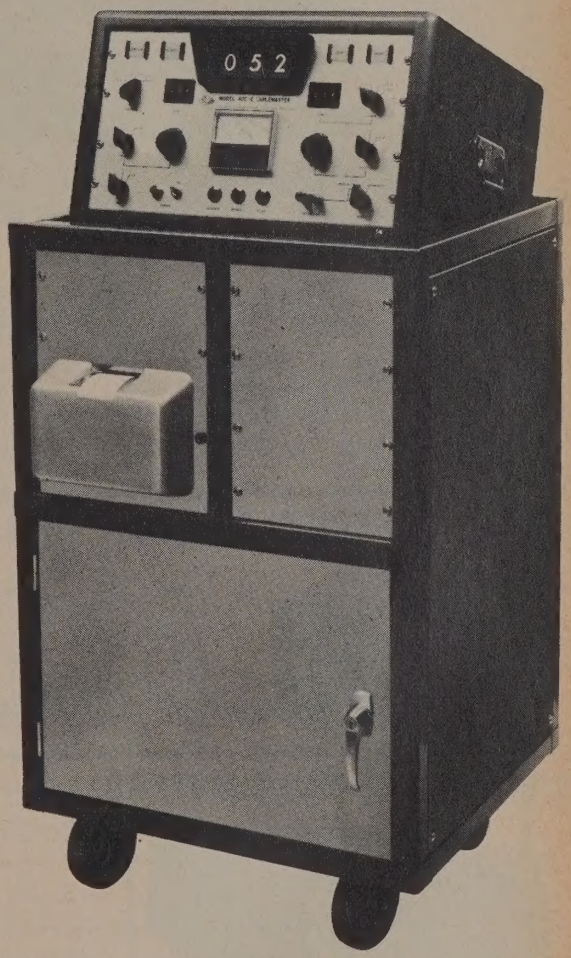
Termination-to-termination continuity on a maximum of 200 simple or complex circuits is quickly accomplished in one test setup. Resistance test level is selected with convenient digital switches.

■ Simplified Testing Capability for Multiple Conductors

A unique programming circuit permits testing of multiple and simple circuits mixed in any sequence. No special programming is required and setup time is greatly reduced.

■ Dielectric Strength (Hipot) Range From 0 to 3000 Volts AC or DC

The Model 400-C automatically checks each conductor against all others for shorts and leakage. Any test voltage up to 3000 vac or vdc can be selected by the operator. The voltage range is continuously variable and is monitored on the precision meter provided on the front panel. Hipot dwell time can be set for any period up to three minutes.



Model 400-C shown with optional console

SPECIFICATIONS

Test Capacity:

Insulation Resistance: 400 circuits

Hipot: 400 circuits

Continuity: 200 circuits

Test Ranges:

Insulation Resistance: 1 to 5000 megohms

Hipot: 0 to 3000 volts ac or dc

Continuity: Resistance 0.5 to 59 ohms; Current 0.5 to 3 amperes

Dwell Time: 0.5 to 180 seconds

Max. Test Rate: 120 tests per minute

Input Power: 110 to 125 volts ac, 50 - 60 cps

Weight: 130 pounds

Dimensions (cabinet): 21 x 13½ x 18½ inches

Information on special models and multipliers available on request.

Other models include new portable units and the Model 400-S, a new concept in shipboard cable checkout.

cablemaster®

a division of Accurate Electronics Corporation

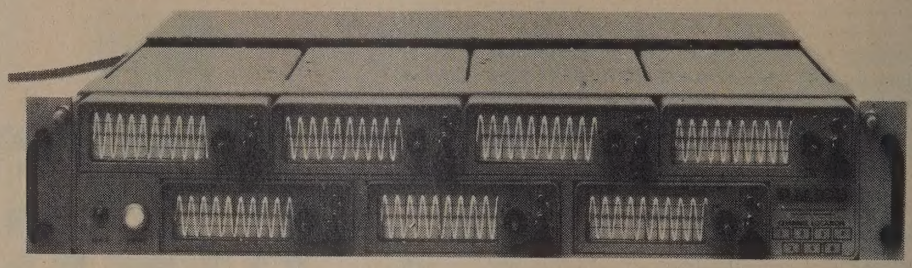
13215 LEADWELL ST., NORTH HOLLYWOOD, CALIFORNIA • 91605 • PHONE (213) 875-0500

CALICO DIVISION

CALIFORNIA INSTRUMENTS CORPORATION

a subsidiary of AIKEN INDUSTRIES, INC.
3511 Midway Drive / San Diego, California 92110 / (714) 224-3241

MULTI-CHANNEL OSCILLOSCOPES



From one to seven independent oscilloscopes in a 19" rack for analog tape recorders or any multi-channel monitoring application. Only 3½" high, this system features high-intensity 1 x 3" rectangular CRT's for large viewing area. Accuracy and linearity equal to laboratory 'scopes.

FEATURES

- WIDEBAND — DC to 5 mHz within 1 dB
- WIDE SWEEP RANGE — 0.2 Hz to 1 mHz
- FRONT-PANEL AC-DC SWITCH for observing expanded portion of AC signal with DC present
- SENSITIVITY — 100 mv/in to 10 V/in
- FULLY AUTOMATIC TRIGGERING over entire bandwidth — no controls required.

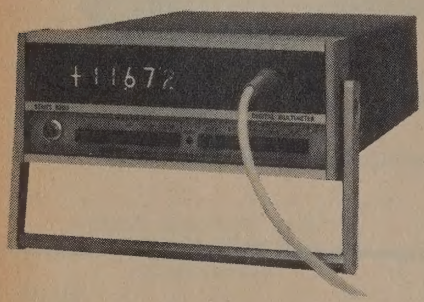
MODELS

- **7000** ..... Standard Dual Selectable Channel version
- **7001** ..... External Synch input
- **7002** ..... Phase Comparison: Identical V & H Amplifiers
- **7003** ..... Master/Slave Common Sweep
- **7004** ..... Medical Model: Slow Sweep

8361/8461 SERIES DIGITAL PANEL METER

Model 8361 provides a five-digit display including 20% over-range. It is only 2½" H x 3⅝" W x 5" D. Features are: BCD 1-2-4-8 output code; 5 readings per second; programmable decimal; read and hold; non-blinking NIXIE® display; active filter option; 10 megohm input impedance; 100 dB of CMR; and automatic polarity. Companion Model 8461 features a four-digit display, including 20% overrange. For OEM applications, cost savings can be realized by omitting metal case and bezel, overrange indication and/or polarity indication.

8300 SERIES MULTIMETERS



SEVEN FUNCTIONS

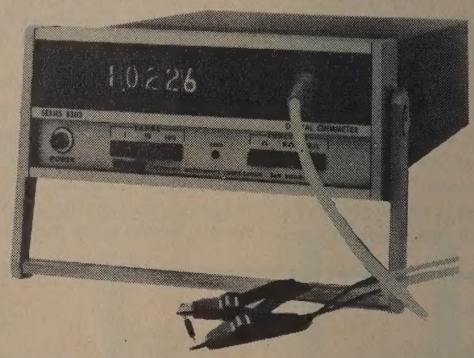
- Frequency counter
- DC & AC volts
- DC & AC current
- Ohms
- Ratio

FEATURES

- 0.1% Accuracy
- .01% Resolution
- Guarded input high CMR
- Push button range and function
- Plug-in options

Feature compact size, four full digits plus overrange into the fifth digit, read-out storage, printout, automatic polarity indication, 10 microvolt sensitivity, and damage-proof ohmmeter. The plug-in options allow expansion from a single range DC voltmeter to a complete multimeter, including printout.

8303 DIGITAL OHMMETER



- FIVE-DIGIT NIXIE DISPLAY INCLUDING OVERRANGE
- PUSHBUTTON RANGE SELECTION
- RESOLUTION .01% or 100 MICRO-OHMS
- ACCURACY .02% OF READING PLUS .01% OF RANGE
- FOUR WIRE KELVIN CLIP INPUT CABLE
- IC PLUG-IN CARD CONSTRUCTION
- 100 MICRO-OHM TO 100 MEGOHMS
- TRILLION-TO-ONE DYNAMIC RANGE

Completely protected against inadvertent inputs up to 200 VDC or peak AC, input circuits are automatically protected and, upon removal of the input voltage, will recover instantaneously.

FOR AC POWER SOURCES, REFER TO SECTION 4000, Page 1004

ADVANCED PULSE GENERATORS

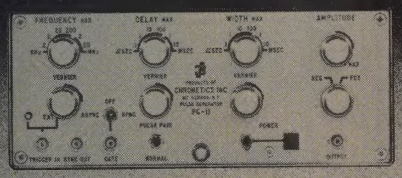
Chronetics' 3-I Pulse Generators represent the most versatile and wide-range instruments in the pulse generator field. Eleven standard models, all solid state, meet most user requirements.

Repetition rates from 0.1 Hz to 100 MHz, output amplitudes from 0 to ±100 volts or ±2A, rise/fall-times of less than 2 ns, wide dynamic ranges, high duty cycles, bipolar outputs, etc. are all available on standard instruments.

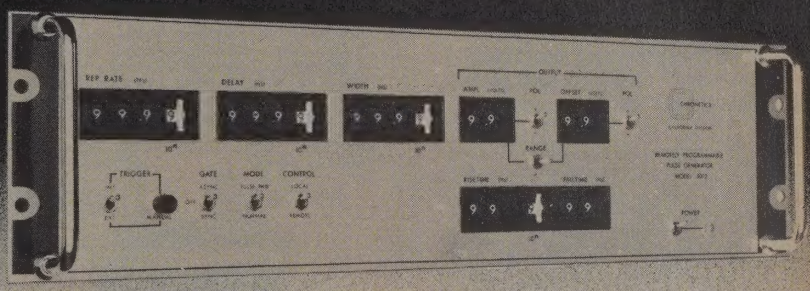
3-I Pulse Generators are exceptionally flexible. Most provide single or double pulses of either polarity, single-shot, pulse bursts. Bipolar outputs and current/voltage modes are available. Usually prf, amplitude, risetime and falltime, width, delay and DC-offset are independently and continuously variable.

Price/performance engineering makes 3-I Pulse Generators best buys in the pulser field. Prices begin as low as $375 for the compact, rugged and high-performing PG-11. Sales/Service is on a world-wide basis with more than 45 field offices to respond promptly to any need.

Compare 3-I performance.



PG-11 $375.



MODEL 1012 FULLY PROGRAMMABLE $4000!

SUMMARY DATA

MODEL	CLOCK PRF	AMPLITUDE[2]	Z OUT	RISE/FALL TIME	WIDTH	DELAY	DUTY CYCLE (MAX)	DC OFFSET
PG-2	1 Hz-10 MHz 20 MHz Max.[1]	10 mV-10V + or −	50 ohms	<10 ns-20 ms[4]	< 35 ns-200 ms	0-200 ms	100%	±5V
PG-11	<10 Hz-> 20 MHz 30 MHz Max.[1]	0-15V + or −	50 ohms	5 ns	25 ns-10 ms	20 ns-10 ms	85%	
PG-13A	1 Hz-25 MHz	100 mV-100V + or −	50 ohms or 1K, min.	<10 ns-50 ms[4]	10 ns-500 ms[5]	15 ns-500 ms	10% @ 2A 50% @ 1A 100% @ < 0.5A	±5V ±100 mA
PG-14	1 Hz-50 MHz	100 mV-20V + or −	50 ohms or 10K, min.	2 ns-50 ms[4]	<5 ns-500 ms	10 ns-500 ms	100%	±5V ±100 mA
PG-32	0.1 Hz-10 MHz 20 MHz Max.[1]	20 mV-20V[3] + and − 2 Channels	50 ohms or 500 ohms	5 ns-1 sec[4]	< 30 ns-1 sec[5]	50 ns-1 sec	100%	To 10V To 400 mA
PG-32N	0.1 Hz-10 MHz 20 MHz Max.[1]	−20mV—35V dual Neg. 2 Channels	50 ohms or 500 ohms	5 ns-1 sec[4]	< 30 ns-1 sec[5]	50 ns-1 sec	100%	To 10V To 400 mA
PG-32P	0.1 Hz-10 MHz 20 MHz Max.[1]	20 mV-28V dual Pos. 2 Channels	50 ohms or 500 ohms	5 ns-1 sec[4]	< 30 ns-1 sec[5]	50 ns-1 sec	100%	To 10V To 400 mA
1012	10 Hz-9.99 MHz 20 MHz Max.[1]	0-9.9V[2] + or −	50 ohms	5 ns-9.9 ms	40 ns-9.9 ms	0-9.99 ms	85%	±9.9V

Notes:
1 Effective PRF in double pulse mode
2 Max. Range into 50-ohm loads
3 Separate or combined (bipolar) channels; same polarity on Special Order
4 Variable linearly — 100:1 dynamic range. Separate control of Rise and Fall Times
5 Independent control Pulse 1/Pulse 2 (double pulse mode)

CHRONETICS

U.S.A.: 500 Nuber Avenue, Mt. Vernon, New York (914) 699-4400 TWX 710 560 0014
Europe: 39 Rue Rothschild, Geneva, Switzerland (022) 31 81 80 TELEX 22266

See YELLOW SECTION for Local Offices, Phones

CMC COUNTERS

ALL-SILICON SOLID-STATE SERIES 600

The 600 Series features reliable, all-silicon, solid-state instruments that offer direct frequency measurement to 20 MHz, with prescaling to 225 MHz, with heterodyning to 3.3 GHz, plus the measurement of period, multiple period, average, frequency ratio, time interval, and totalizing, with both preset functions and portability available — all at a minimum cost.

CMC's 600 series are the first counters built with all silicon semiconductors for higher reliability, superior temperature stability. Maximum frequency ranges of 2.5,15, 20 and 225 MHz. Simplified design techniques and advanced "Mother Board" circuitry reduce components by 10 per cent over competitive models. Temperature operation —20 to +65°C standard, —30 to +75°C available. All silicon memory (display storage), a standard feature, is not subject to slow response and upper temperature limitations of photoconductor memory circuits.

MODEL 608 $850

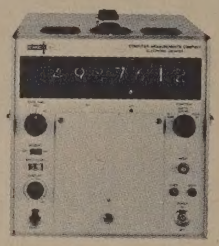
Measures frequency and period, determines frequency ratio and totalizes. Frequency, period and frequency ratio measurement ranges: 2 Hz to 15 MHz. Period average and multiple ratio: 1, 10 and 100. In-line long-life biquinary display. Five decades are standard, a sixth is optional.

MODEL 609 $1275

Measures frequency, period, multiple period average, frequency ratio, time interval, and totalizes. Frequency measurement range: 0 to 5 MHz. Period: 0 to 1 MHz. Multiple period average measurement from 0 to 20 MHz, from 10^0 to 10^7 periods in decade steps. 1 MHz crystal time base; stability ±2 parts in 10^7 per month. Six decade in-line biquinary display, automatically positioned decimal point.

MODEL 614 $1300

Preset Multi-function Counter extends applications to normalizing and multiplication by any preselected constant. Gate time presets to any interval from 10 μsec to 100 seconds. Gate time presets by remote selection. Direct displays as mph, rpm, ms, per N periods, etc. 614 also measures frequency and period and totalizes. Frequency range: 2 Hz to 2.5 MHz. Period and frequency ratio ranges: 2 Hz to 500 kHz. Preset count circuitry operates dependably at frequencies through 300 kHz–up to three times as fast as other variable gate time counters. 100 kHz crystal time base; stability ± 2 parts in 10^6 per week. Standard five decade in-line biquinary display (sixth optional) with automatically positioned decimal point.



MODEL 616 $1975

Model 616 provides low-cost direct frequency measurement from 10 Hz to 225 MHz by means of a unique prescaler built into the instrument. It can be rack-mounted. All-silicon semiconductor circuitry assures dependable operation over wide temperature ranges. 1 MHz crystal time base; stability ± 2 parts in 10^7 per month. Seven decade in-line display is standard — eighth decade optional. Standard automatic decimal and display storage.

MODEL 631 $775

Model 631, turret-type, positive switching 100 MHz to 1.3 GHz Heterodyne Converter.

MODEL 633 $300

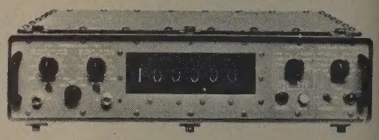
Model 633, 1 μsec resolution Time Interval Plug-in with range from 1 μsec to 10 sec.

MODEL 635 $825

Model 635, continuous tuning, 200 MHz to 3.3 GHz Heterodyne Converter.

SOLID-STATE MILITARY COUNTERS

5-MHz COUNTER



MODEL 687 $1875

Model 687 is a 5 MHz fully militarized counter that measures frequency, period, multiple period average, frequency ratio, time interval and totalizes. Meets MIL-E-16400 including temperature, humidity and vibration specs.

100-MHz COUNTER

MODEL 880 $3750

Model 880 is the first solid-state counter fully militarized to meet Mil Specs. It measures frequency, period, multiple period average, frequency ratio, frequency ratio average, time interval with internal and external clock, and totalizes; scales input frequency in decade steps; provides standard frequency outputs. If you want the safety of a counter providing full Mil Specs reliability at a price surprisingly close to a commercial counter, then check these specs: 0 to 100 MHz frequency range; oscillator stability of 1 part in 10^9; meets or exceeds MIL-E-16400, including applicable temperature, humidity, vibration, shock, and RFI specs; built-in time interval measurement. Eight decade in-line display. Militarized plug-ins available (see below).

PLUG-INS FOR MILITARIZED 880

MODEL 884

MODEL 884 $695

Heterodyne Converter, turret-type, positive-switching, 100 MHz to 555 MHz, acceptance tested to MIL-E-16400, MIL-S-901, MIL-I-16910.

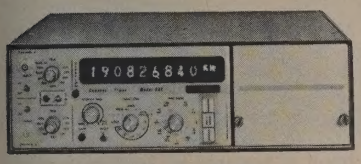
MODEL 887 $400

Video Amplifier increases gain of Model 880 thirty times.

CMC COUNTERS

IC SERIES 900

The 200-MHz Model 901 Universal Counter-Timer and the 15-MHz Model 905 Frequency Meter were the first instruments to be introduced in CMC's completely new series of integrated-circuit counters. Now four new compact instruments in the 905 Family have been added to this expanding IC series: the Model 915 TIM, the Model 925 Totalizer, the Model 912 Preset Counter, and the Model 913 Dual Preset Counter.



MODEL 901 $2475

UNIVERSAL COUNTER-TIMER

The Model 901 is a state-of-the-art instrument. It is the industry's first, true, 200-MHz, universal counter-timer capable of achieving its range without prescaling, heterodyning, or using plug-ins...while also offering as part of its main-frame capability the measurement of frequency, period, multiple period average, time interval, ratio, multiple ratio averaging, totalizing, scaling, and the measurement of time interval from an external standard...plus a heterodyning capability for gigahertz operation.

Gate times are 1 μsec to 100 seconds in decade steps. A special feature of the display control is a fast reset to 10 μsec to accommodate those requiring maximum data gathering abilities. Input sensitivity of the 901 is 10mV for both A and B amplifiers.

The readout has nine decades with automatically positioned decimal point, large readout tube with units symbols, and an overflow lamp. Printer output in the form of BCD in the 1-2-4-8 code is a standard feature. Remote programming of the entire front panel controls, except trigger levels and attenuators, is an optional feature. Time Interval mode offers resolution to 10 nanoseconds. Gate output, useful in determination of the amplifier trigger points in the Time Interval mode, is a standard feature of the 901.

FREQUENCY EXTENDER PLUG-INS

MODEL 931

MODEL 931 $825
Turret type, positive switching 100 MHz to 1.3 GHz Heterodyne Converter. Sensitivity is 50 mV across its entire range.

MODEL 935 $675
Continuous tuning 100 MHz to 3.3 GHz Heterodyne Converter. Sensitivity is 50 mV across its entire range.

MODEL 933 $225.00
Video Amplifier increases gain of Model 901 thirty times.

SERIES 900 COMPACT INSTRUMENTS

MODEL 905
15-MHz FREQUENCY METER
$395

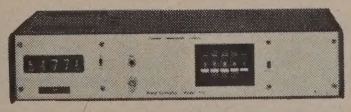
The Model 905 Frequency Meter is a low-cost 15-MHz counter that is priced considerably lower than comparable competitive instruments. Although low-cost, it provides quality performance and is contained in a high-quality package that features a tip-up stand for easy visibility in bench work. It can also be rack mounted. Measuring only 4" x 5" x 8½", the 905 provides direct frequency measurement from DC to 15 MHz. It features a 1-MHz crystal oscillator time base with a stability of ±2 parts in 10^6 per month, and a five-decade in-line display is standard with display storage and automatically positioned decimal point. Wt. 3½ lb.

MODEL 915
TIME INTERVAL METER
$555

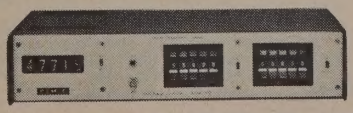
A low-cost instrument that features a 1-MHz temperature-compensated crystal oscillator . . . triggers on positive or negative going pulses . . . can be operated in either a 1 μs or 1 ms mode, with a range from 0 to 99,999. Starts on the A-input and stops on the B-input, and permits reset even during the measurement operation. Same dimensions as and fully compatible with CMC's Model 905 Frequency Meter.

MODEL 925
ELECTRONIC TOTALIZER
$340

Frequency range, from dc to 1-MHz, or dc to 100 Hz (internally switch selectable) with totalizing count from 0 to 99,999. Trigger level is automatic, and a pushbutton switch on the front panel resets the count to "0". Same dimensions as the 905 and fully compatible with the other compact instruments in this line.



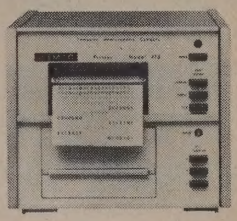
MODEL 912 PRESET COUNTER $630



MODEL 913 DUAL PRESET COUNTER $725

Both models operate in either a "Limit Mode" or "Recycle Mode" with a frequency range (selectable by internal switch) of either 0 to 100 Hz or 0 to 10 KHz. In the "Limit Mode" "output" is held at the preset number until reset manually, while continuing to count: and in the "Recycle Mode" the counters hold the "pulse relay output" at the preset number, then reset to "0" and automatically resume counting. The Model 913 is equipped with a second bank of 5 preset switches, a second control switch so that there is independent control for each switch bank. Both units completely compatible with the other CMC compact instruments, but come in 16.8" widths for standard rack mounting.

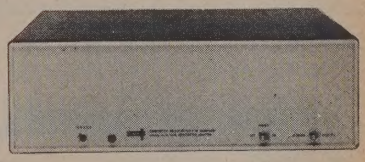
NEW LOW-COST DIGITAL PRINTER



MODEL 415 $1295 TO $2000

LOW-COST, DATA LOGGING PRINTER FEATURES IC DESIGN AND SUPERB MECHANISM

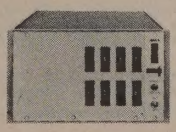
The new Model 415 Digital Printer employs IC design and utilizes IC sockets for accurate reliable performance and easy maintenance. Its mechanical printing mechanism is good for more than 5,000,000 cycles without an adjustment, is replaceable in the field, and provides the legibility of an electric typewriter. From 7 to 21 columns of line capacity are offered, and red/black printing with color selection by numerical field is provided . . . also floating decimal point, zero suppression, "print command" control over 3-input channels, and a remote control option. Speed is 3 lines-per-second, and printing stock is paper tape or fan-fold. The 415 measures 8½"w X 7½"h X 17½"d.



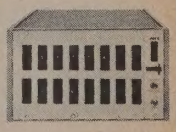
MODEL 403 $1375

SOLID-STATE TAPE PERFORATOR ADAPTER

Model 403 couples counters with 1-2-4-8 BCD output to the Tally Series 420 Paper Tape Perforator. Compatible with all CMC solid-state counters having standard digital printer output plug, and modifiable to accept other manufacturer's equipment. Accessory output allows simultaneous operation of digital printer in parallel with Tally 420. Up to 6 decades provided (8 optional). Accepts 60 characters per second. Punch command —4V to —12V pulse, 50 μsec wide (min.), into 10,000 ohms.



MODEL 404 $950



$1485

SOLID-STATE GO, NO-GO COMPARATOR

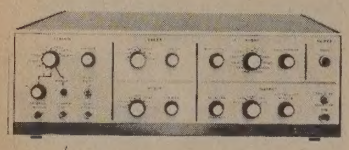
Model 404 compares a binary coded decimal number, obtained from printer output receptacle of a counter with two selected preset numbers in the comparator for go, no-go operation. Provides visual display in "HI", "LO", and "IN" limit lights as well as contact closure outputs for control purposes. Half-rack size permits dual mounting. Weighs only 17 lbs. and uses just 45 watts power. Four decade preset standard, 8 optional. Remote presetting of limits optional

CMC

PULSE GENERATORS, TIME DELAY GENERATORS, AND TARGET SIMULATORS

PULSE GENERATORS

CMC's famous line of pulse generators includes both portable and laboratory instruments offering repetition rates from 20 Hz to 50 MHz... rise-and-fall rates as fast as 5 nsec at 10-volt amplitude... and a uniform high level of accuracy and performance.



MODEL 220 $1225

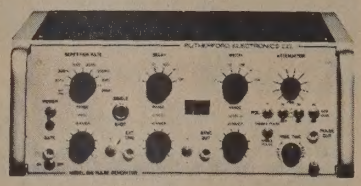
NEW 50 MHz PULSE GENERATOR
This new all silicon, solid-state pulse generator adds 50 MHz capability to the famous Rutherford instrument line. Other specs include: 50 MHz repetition rate; delay from less than 10 nanosec to 10 millisec; width from 10 nanosec to 10 millisec; baseline offset variable from −5 volts to +5 volts; ±10 volt amplitude polarity switched; rise and fall time from 5 nanosec to 1 millisec.

MODEL B-7B $875
MODEL B-7D $875
MODEL B-7F $950

BASIC PULSE GENERATOR
B-7B is a general purpose instrument with repetition rate to 2 MHz and 50V into 50 ohms. Variable rise/fall time control.

B-7D has all specifications of B-7B and simultaneous positive and negative output pulses; separate and independent rise/fall time controls.

B-7F has all B-7B features plus: 2 Hz repetition rate; separate rise/fall time controls; and double pulse output.



MODEL B-14 $475
MODEL B-15 $525
MODEL B-16 $850

PORTABLE PULSE GENERATORS
Model B-14 is a low cost, portable unit with repetition rate of 20 Hz to 2 MHz. Delay is 0 to 10 msec. Amplitude is 15V into 1k, 8V into 50 ohms. Pulse width of 60 nsec to 10 msec. Rise/fall time is less than 10 nsec fixed.

B-15 has same rise/fall time, delay, and pulse width. Also offers a repetition rate of 5 Hz to 5 MHz.

B-16 offers repetition rate of 20 Hz to 20 MHz. Variable rise/fall times of less than 5 nsec to greater than 200 nsec. Pulse width 15 nsec to 10 msec. Amplitude 10V. Single or pulse pair operation.

Rack mount available for B-14, -15, -16.

TIME DELAY GENERATORS

MODEL A-10 $2215
MODEL A-11 $1070
MODEL A-12 $3120

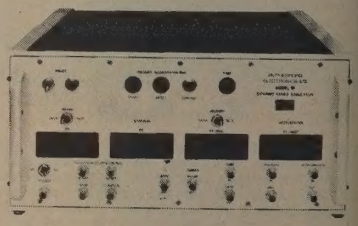
SOLID-STATE DELAY GENERATORS
A-10 has time delays 0 to 1 sec in 100 nsec increments. Accuracy 0.001% of delay. Jitter less than 1 nsec. Amplitude 10V. Rise time 15 nsec.

A-11 has same features as A-10 with exception of amplitude, 6V and rise time 10 nsec.

A-12 was designed for fail-safe operation in explosives testing or other tests where premature triggering might destroy information. Amplitude, 70V; rise time, 100 nsec.

DYNAMIC TARGET SIMULATOR

The Model 301 is a truly unique off-the-shelf instrument that aids in the design, evaluation, checking, and calibration of tracking systems. It does this by producing artificial targets which can be easily and accurately set to various ranges and which can be dynamically moved at various velocities and/or accelerations. It features all solid-state digital logic... low jitter, high accuracy, high stability... 1-foot target resolution... and is available for portability or rack mounting.



MODEL 301 $6330

DYNAMIC TARGET SIMULATOR
Model 301 is a moving target simulator. It is applicable to tracking radars, weapons control systems, or sonar for calibration, production checkout, or operator training.

The standard Model 301 has a target Range from 0 to 1,000,000 feet in one foot increments with 0.1% of setting accuracy. It has a target Velocity from 0.0 to 100,000.0 feet/second in 0.1 foot/second increments with 0.005% of setting accuracy. Target Acceleration can be set from 0.00 to 10,000.00 feet/second/second in 0.01 foot/second/second increments with 0.005% of setting accuracy.

Special versions of the Digital Target Simulator are available with increased accuracies. 301's have also been built with remote-programming capabilities and ruggedized to meet MIL specifications.

Your local CMC representative will demonstrate these products on your premises at your convenience. Call him or call CMC direct.

All prices f.o.b. factory

COMPUTER MEASUREMENTS

CMC

A DIVISION OF NEWELL INDUSTRIES

12970 Bradley Avenue
San Fernando, California 91342
Phone (213) 367-2161
TWX 910-496-1487

This list of specifications is not an offer. Since we cannot control our source(s) of component(s) supply, we cannot guarantee availability of these specifications at published pric

short form catalog

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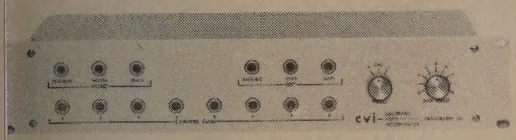
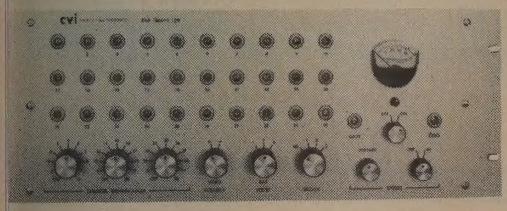


Bar Graph 101

A device accepting 8 negative going signal inputs and converting these into a vertical "Bar" pattern as seen on the screen of a standard TV monitor. Requires external sync. Rack mount, 3½" high, solid state.

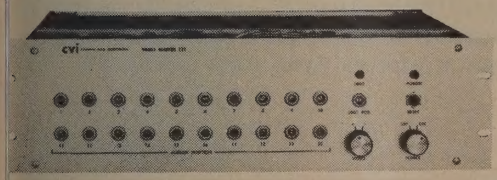
$1250.



Bar Graph 120

Accepts 30 negative going input signals and produces a horizontal bar display with better than 1% accuracy. Has individual channel markers, zero suppression, decade expansion, and other features. Requires external sync. Rack mount, 7" high, solid state.

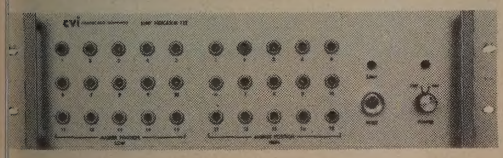
$4200.



Video Marker 121

A unit generating 20 individually moveable vertical lines as seen on the screen of a TV monitor. May be used for the display of linear or non-linear scales, or as an electronic "grease pencil." An additional marker sets a limit position, tripping an alarm when video falls within a restricted area. Requires external sync. Rack mount, 5¼" high, solid state.

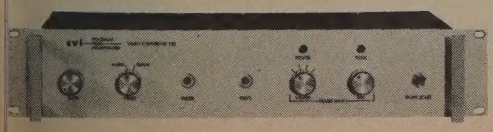
$2800.



Limit Indicator 122

A device producing 15 separate "high" and 15 separate "low" vertical markers with automatic alarm when video falls outside of predetermined limits. Requires external sync. Rack mount, 5¼" high, solid state.

$3500.



Video Converter 201

A unit which accepts a standard "real time" television input signal and uses high speed sampling to produce a "slow-scan TV" output signal for computer data reduction or other forms of video processing. Conversion accuracy is excellent, with negligible grey scale distortion. Also contains simple "Two Level" quantizing circuits giving 1 bit binary output signal. Rack mount, 3½" high, solid state.

$1950.

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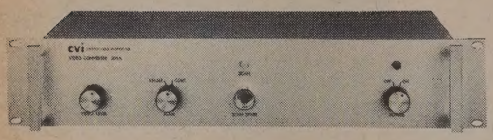
Video Converter 201-A



Communications version of the model 201. Incorporates sync stripper, frame burst generator, and continuous scan circuitry, but does not have quantizer. Rack mount, 3½" high, solid state.

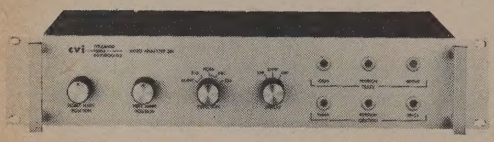
$1950.

Video Converter 220-A

Companion unit to the 201-A. Utilizes a magnetic disc memory together with high speed pulse circuits to convert "slow-scan" video or properly formated computer data to standard 525 line TV rates. Has automatic erase and indefinite image storage capabilities. Options include color reproduction and selective record/erase. Rack mount, 7" high, solid state circuitry.

$5000.

Video Analyser 301



An instrument displaying "vertically line-selected" TV waveforms directly on the screen of a normal TV monitor. 1/1 waveform/picture ratio simplifies identification of individual picture elements. Display also includes an electronic reference grating and H and V markers. Requires external sync. Rack mount, 3½" high, solid state.

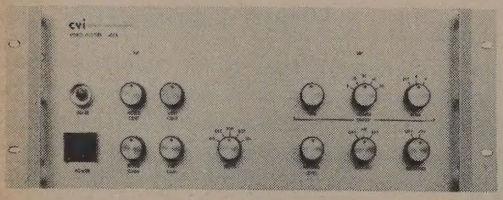
$875.

Video Analyser 321

Laboratory version of the 301. Incorporates additional circuitry to allow chart recording of "line selected video waveforms, X-Y coordinate indication, noise analysis, computer data input, and other features. Requires external sync. Rack mount, 3½" high, solid state.

$2500.

Video Plotter 401-A



An instrument which converts low frequency data to video format with indefinite signal storage via a wide band magnetic disc memory. Features include internal time base, electronic reference grating, multimode recording, grey scale reproduction, and selective erase. Generates own sync. Rack mount, 7" high, solid state circuitry.

$4000.

cvi VIDEO INSTRUMENTS FOR DATA ACQUISITION — PROCESSING — DISPLAY — TRANSMISSION

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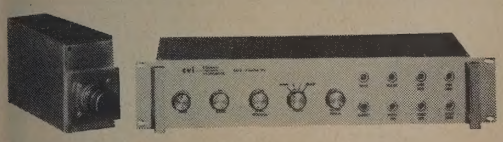
Video Memory 404-A

A wide band magnetic disc recorder accepting properly formatted computer output signals for conversion to standard 525 line TV rates. Incorporates four separate read/write/erase channels for generation of multiple displays or synthetic color. Also produces H and V timing pulses for synchronization of auxiliary equipment. Rack mount, 8¾" high, solid state circuitry.

$6000.

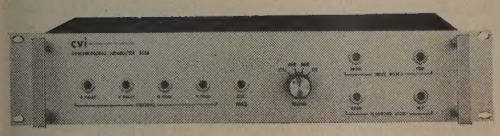
Data Camera 501



A Vidicon camera intended for laboratory use. Features both "real time" and "slow-scan" video outputs for computer data reduction. Requires external sync. Control chassis is rack mount, 3½" high, solid state.

$3500.

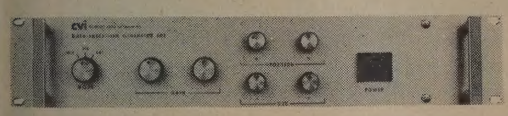
Sync Generator 601-B



A unit intended for laboratory use when either standard or non-standard TV scan rates are required. Uses micrologic binary counters with adjustable feedback paths. Drive and blanking pulses are variable width, but sync is not EIA format. Incorporates dot/bar generator for test purposes. Rack mount, 3½" high, solid state.

$1025.

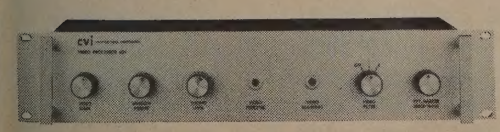
Data Insertion Generator 603-A



Combines the functions of a 2 channel video mixer, special effects generator, and video pointer. Moveable oblong is positionable to any point in TV raster and is variable in size over a wide range. Oblong acts as the internal "key" in special effects mode, and also generates a white "box" outline or solid square for marking purposes. Requires external sync. Rack mount, 3½" high, solid state.

$1500.

Video Processor 604

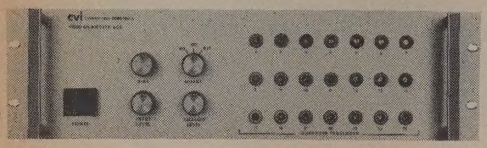


An instrument which modifies the grey scale of a video input signal by selecting and amplifying a variable width "slice." Also incorporates variable brightness control, sync adding, and marker adding functions. Requires external sync. Rack mount, 3½" high, solid state.

$950.

cvi COLORADO VIDEO INCORPORATED • P.O. BOX 928 • BOULDER, COLORADO 80302 • PHONE (303) 444-3972

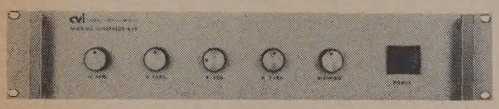
Video Quantizer 606



A device which allows the processing of a video input signal into 16 separate amplitude levels. Operates with tape, camera, or disc inputs and allows radical grey scale alterations or the generation of complex synthetic color signals. Rack mount, 5¼" high, solid state.

$3500.

Shading Generator 608



Generates H and V sawtooth and parabolic waveforms of variable amplitude and polarity to provide compensation of brightness errors in video input signals. May also be used to drive external dynamic correction circuitry. Requires external sync. Rack mount, 3½" high, solid state.

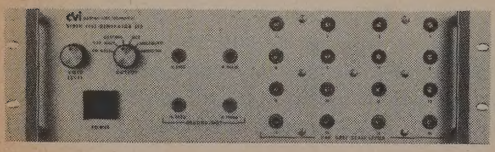
$950.

Video Pointer 610-C

A voltage positionable marking device producing a set of cross-hairs, solid oblong, "box" outline, or a combination of these. Rack mount, 3½" high, solid state. Requires external sync.

$1950.

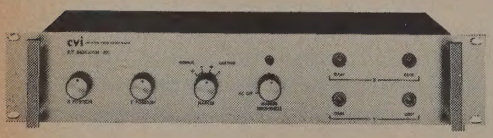
Video Test Generator 615



Produces various test signals including: 16 step linear grey scale, 16 step variable grey scale, grating, dot, multiburst, and window patterns. Requires external sync. Rack mount, 5¼" high, solid state.

$1500.

X-Y Indicator 621

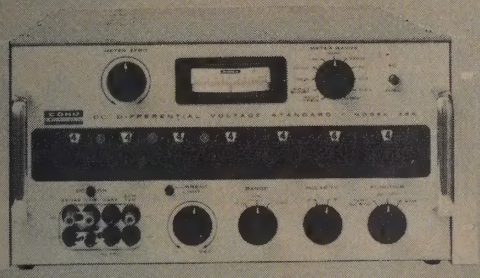


An instrument intended to reduce spatial data coordinates in a TV image to two variable X and Y voltage outputs. Either a dot or cross-hair marker is manually positioned to any location in the TV raster. Accuracy is better than 1%, and an internal grating generator allows convenient camera setup. Rack mount, 3½" high, solid state.

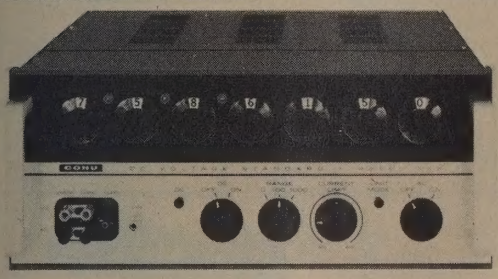
$1500.

COHU

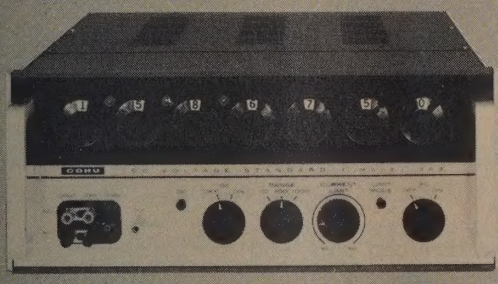
dc voltage standards



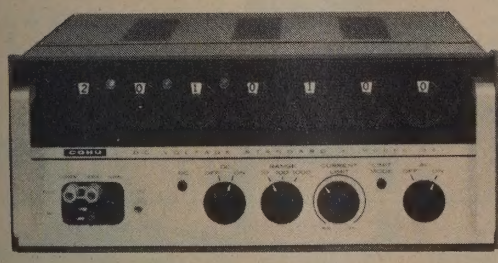
MODEL 365 - DIFFERENTIAL DC VOLTAGE STANDARD - A multifunctional instrument which can be used as: a null indicating, potentiometric, dc voltage measuring instrument (differential voltmeter); a direct reading transistorized dc voltmeter (TVM); or a precision dc voltage source (dc voltage standard). The differential voltmeter and dc voltage standard modes provide 0.001% accuracy and voltages from zero to over 1100 volts with seven-place precision.



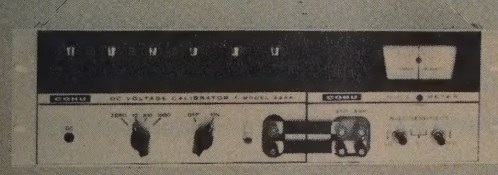
MODEL 355 - 10 PPM DC VOLTAGE STANDARD - Provides accuracy to within 0.001% (including all stability variations) for 90 days. Three decade ranges supply voltages from zero to over 1100 volts with seven-place precision and an output current to 50 milliamperes at any voltage setting. Complete isolation and excellent guard shielding permit full output voltage with either positive or negative terminal grounded.



MODEL 353 - 20 PPM DC VOLTAGE STANDARD - Provides accuracy to within 0.002% (including all stability variations) for 6 months. Three decade ranges supply voltages from zero to over 1200 volts with seven-place precision and an output current to 50 milliamperes at any voltage setting. Noise and hum is less than 15 μV rms on the 10V range. Features include: overcurrent protection, overvoltage protection and all solid state active circuitry.



MODEL 351 - 30 PPM DC VOLTAGE STANDARD - A completely solid-state dc voltage standard that can be operated continuously for 12 months to an accuracy within 0.003% (including all stability variations). Output voltage, 0 to ± 1111.1110V dc, with a resolution as small as 1 μV. Output current to 50 mA at any voltage setting. A rackmounting kit is included for easy and fast conversion from a bench model to a rackmount model. FSN4931-913-3062



MODEL 324AN - DIFFERENTIAL VOLTAGE CALIBRATOR - Combining a passive null indicator with the Model 324A DC Voltage Calibrator creates a system capable of measuring unknown voltages by differential comparisons. Accuracy is to within 0.01%, 100 ppm, over a voltage range of 0 to ±1111.110V dc. Output current to 25mA at any voltage setting, as a dc calibrator. As a null indicator, meter sensitivity at null point is 300 μV/mm.

COHU
ELECTRONICS, INC
SAN DIEGO DIVISION
BOX 623, SAN DIEGO, CALIFORNIA 92112
PHONE 714-277-6700 • TWX 910-335-1244

COHU also manufactures programable dc standards, wideband and differential dc amplifiers, and precision multimeters. Complete catalog of equipment specifications and application notes furnished upon request.

Curtis

ELAPSED TIME INDICATORS

...Smallest size, lowest cost, AC or DC, any voltage

How they work — The patented Curtis Ampere Hour Meter is basically a mercury microcoulometer fabricated from precision bore, glass capillary tubing filled with two columns of mercury separated by a small electrolyte gap. Application of pure or pulsed DC signals to electrodes inserted in the mercury causes mercury at the anode to be electrochemically transferred across the gap to the cathode at a time rate proportional to the current. The gap moves along the tube length as a function of the current-time integral. A constant-current supply provides a precision timing device.

TYPICAL APPLICATIONS

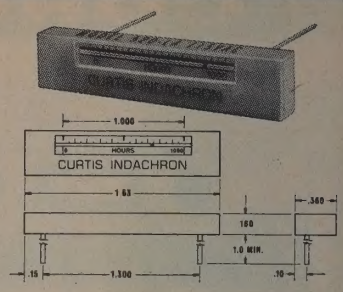
Warranty — Low-cost meters for warranty of equipment based on both actual usage, and calendar period.

Reliability Engineering — Provides mean-time-to-failure or sub-system replacement time without costly, unreliable logging.

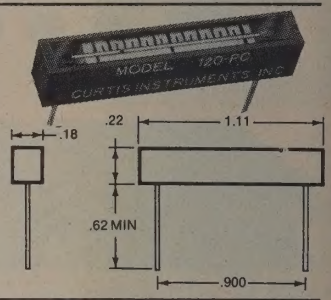
Test Equipment Utilization & Calibration — Provides calibration on actual hours of use with savings up to 50% compared to calendar-basis programs. Substantial savings in capital investments can be realized with accurate utilization data on test instruments, tools and equipment.

Curtis Instruments, Inc.
200 Kisco Avenue, Mount Kisco, N.Y. 10549
(914) 666-2971 • TWX 710-571-2163

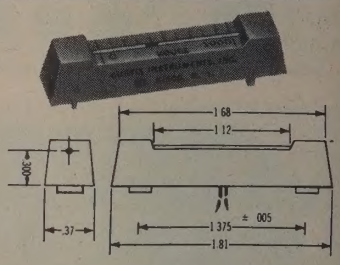
L Series Curtis Indachron®
Used on OEM equipment as a very low-cost means of validating warranties and for P.M. scheduling. Under $2.00 each in production quantities. AC and DC Models. Various time scales and electrical ratings. Can be mounted on printed circuit cards or direct to chassis with adhesive strips.



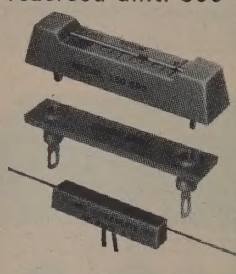
120-PC Series
Radial leads for installation directly on printed circuit cards for "mean-time-to-failure" or preventative maintenance scheduling. Can be instrumented from available DC voltages for any time scale by use of series resistor. Full scale of .65 inches = 4.16 milliamp-hours.

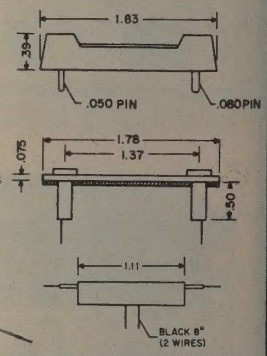


150-S Series
Operates directly from DC voltage with calibrating series resistor: full scale of 1 inch in 10 divisions = 10.4 milliamp-hours. Stud mounting, plug-in or printed card configurations. Fully reversible, no threshold.

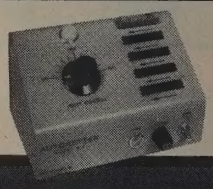


550-CP Series
Permits instant replacement of the indicator with rezeroed unit. 500 and 1000 hour scales, 115 VAC standard. Any scale, any voltage can be provided. Model with integral zener regulating circuit also available.



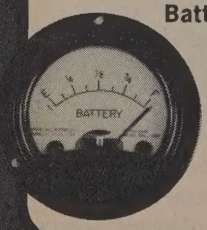


Curtis Autosetter
For automatic resetting of 150-S and 550-CP series indicators.



Military Units
Provides lowest power, lowest weight, smallest size and lowest cost for ground and airborne applications. Meets MIL 1-81219.

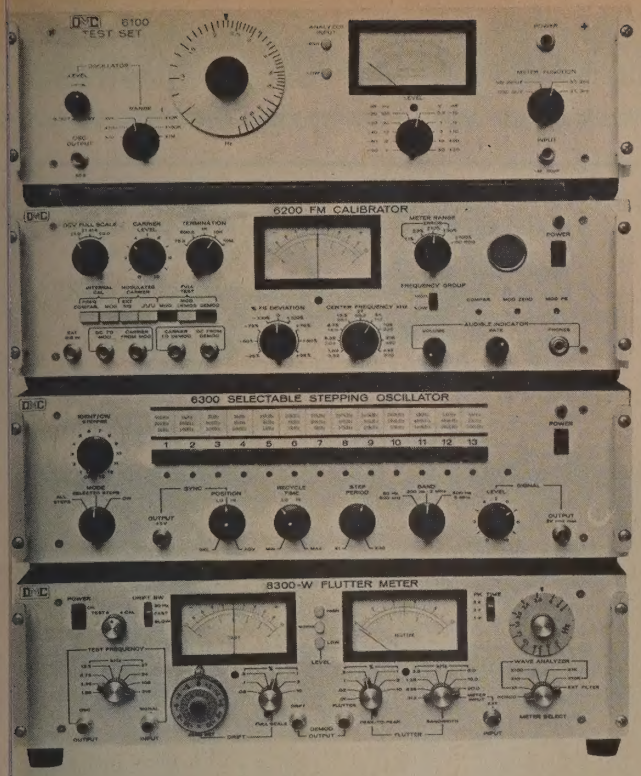
CURTIS INFINITE MEMORY INTEGRATORS



Battery "Fuel" Gauges
Meter displays % of discharge (amp-hrs. remaining in rechargeable battery systems). Typical of applications for Curtis 921 Millivolt Integrator.

Millivolt Hour Integrator Model 921
Printed circuit module using capacitive readout techniques with the Curtis microcoulometer. 0-100 MV input signal provides a 0-100 microampere output analog of the integral. Infinite memory storage, high and low limit detectors, high accuracy, and small size are other significant features. 12 to 36 VDC. 4½" x 4½" overall.

Bipolar Integrator Model 992
A portable instrument integrates positive and negative signals to 100 MV. Readout on 4½" taut band meter. Permanently stores recorded integral until reset. Accuracy: ±2%; Typical linearity: ½%. 115 VAC/60 Hz.



SYSTEM CAPABILITY

DMC has designed several instruments which, when coupled together, form a highly proficient system for alignment and calibration of instrumentation magnetic tape recorders. Because these instruments are of a special design, not general purpose, they drastically reduce the recorder's check-out time by simplifying normal test procedures without sacrificing reliability or accuracy of measurements. The Models 6100, 6200, 6300, and 8300-W have the capability to test all major recorder operating parameters for both direct and FM recording models, as well as to assess completely the transport's flutter characteristics in accordance with the IRIG document's recommendations. This complete, solid-state system minimizes panel space requirements, and meets economic considerations. DMC can also provide a pushbutton switch panel to facilitate testing procedures for magnetic tape recorder / reproducer systems. Other system modifications can be accommodated for performing special tests or using semi-automatic testing procedures. If you wish to reduce recorder alignment or checkout time for production or field use, let DMC analyze your requirements and suggest an economical system that can justify its use through labor-saving techniques. DMC is the only manufacturer of instruments with these unique capabilities, and we have the technical depth necessary to competently evaluate your needs.

RECISION
ECTRONIC
NSTRUMENTATION

CONDENSED CATALOG

ecause of possible design improvements or equipment odifications, all specifications in this catalog re subject to change without notice.

DMC

ATA MEASUREMENTS CORPORATION

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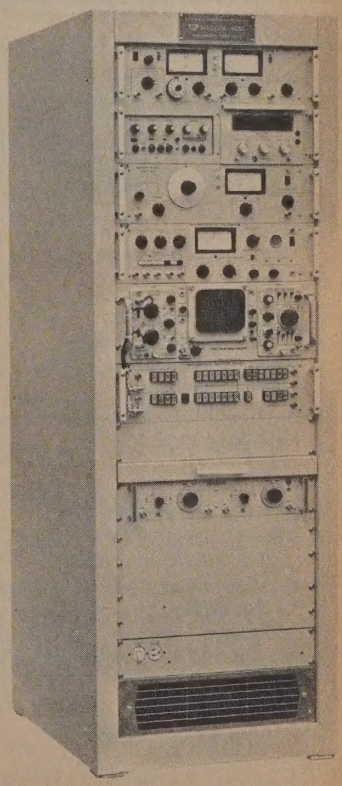

A typical example of DMC's capability to produce a complete alignment and calibration system in accordance with a government agency's requirements.

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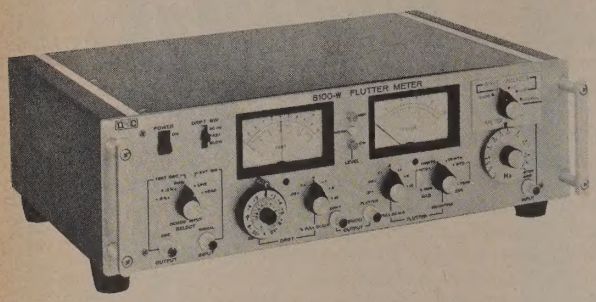

MODEL 8100-W FLUTTER METER

FEATURES

Full Scale Flutter Ranges: 0.01% to 10%
Full Scale Drift Ranges: ±0.03% to ±10%
Demodulator Output Accuracy: ±2% on all ranges
Frequency Range: DC to 200 Hz
Input Sensitivity: 5mV to 5V
Separate metering for flutter and drift
RMS and Peak measurements, weighted or unweighted
Advanced solid state construction
Automatic input level indication
Simultaneous indication of drift and flutter

APPLICATIONS

Tape transports
Phonograph turntables
Motion picture equipment
Industrial rotational apparatus

SPECIFICATIONS

TEST SIGNAL INPUT

Frequency: 3kHz ±10%

Input level ranges: 5mV to 200mV (HEAD sensitivity) and 100mV to 5V (LINE sensitivity)—AGC fully effective at 0.5mV input

Input Impedance: >300 kilohms, unbalanced, at 3kHz

Maximum acceptable frequency deviation: ±10%. (Range over which zero set may be adjusted to center drift meter)

SIGNAL FAILURE CLAMP

Restores meters to zero when signal is below range of proper operation.

High Level Indicator: actuated by input signals exceeding allowable level.

DRIFT MEASUREMENTS

Frequency Range: DC to .7Hz ±20% (fast); DC to .2Hz ±20% (slow) at —3dB

Indication Mode: + or —% frequency deviation with "0" center meter

Test Ranges: ±.03, .1, .3, 1, 3, and 10% full scale

Meter Accuracy: ±5% full scale at DC

FLUTTER MEASUREMENTS

Frequency ranges:
.2 to 200Hz weighted to DIN Standard (± peak indication)
.5 to 200Hz weighted to NAB Standard (rms indication)
.3 to 200Hz at —3dB DIN unweighted (±peak indication)
.5 to 200Hz at —3dB NAB unweighted (rms indication)

Test Ranges: .01, .03, .1, .3, 1, 3, and 10% full scale

Meter Accuracy: ±5% full scale at 40Hz unweighted, +½dB, —1dB from 1.5Hz to 150Hz
±5% full scale at 4Hz weighted

INTERNAL TEST OSCILLATOR

Test Frequencies: f_o = 3kHz ±.1%
+.3% = f_o +9 ±.2Hz
—.3% = f_o —9 ±.2Hz

Output Voltage: 1.23Vrms ±10%

Source Impedance: <100 ohms, unbalanced

DEMODULATOR OUTPUTS FOR ANALYSIS
DRIFT DEMODULATOR OUTPUT

Frequency Range: DC to 30Hz ±20% —3dB, falling at 18dB/octave above 60Hz. —3dB at .7Hz ±20% in slow and fast positions

Output Voltage: + or —.1V for full scale meter indication

Source Impedance: 1 kilohm unbalanced

Accuracy: ±2% full scale at DC; +0, <−1dB from DC to 10Hz

FLUTTER DEMODULATOR OUTPUT

Frequency Range: .3Hz ±20% to 210Hz ±5% at —3dB, falling >6dB/octave below .3Hz and >20dB/octave above 220Hz

Output Voltage: .1V rms or ±.1V peak for full scale meter indication

Source Impedance: 1 kilohm unbalanced

Accuracy: ±2% full scale at 40Hz; <.2dB −.8db from 1.5Hz to 150Hz

EQUIVALENT INTERNAL INSTRUMENT NOISE

<0.001% (with pure 3kHz sinewave input)

METER AMPLIFIER INPUT

Input Level: ±.1V peak or .1V rms for full scale meter indication

Input Impedance: 30 kilohm unbalanced

WAVE ANALYZER

Frequency Range: .5 to 600Hz continuously tunable in 3 decade bands

Accuracy of frequency calibration: ±5%

Frequency Response: Max. response ±1dB over entire tuning range

Bandwidth: 3dB down at ±5% of selected frequency, >20dB down at ½ and 2 times selected frequency

Indication: % rms or ± % peak on unwt. flutter indicator

GENERAL

Power: 115 or 230V, ±10%; 50/60Hz; 25 watts
Front Panel dimensions: 5.25" x 19" wide
Cabinet dimensions: 6.25" x 19" x 13" overall
Ambient temperature range: 0-60°C
Bench or Rack mount
Net Weight: 18 lbs.
Shipping Weight: 23 lbs.

Specifications subject to change without notice.

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MODEL 8155 AUDIO FLUTTER METER

The Model 8155 Flutter Meter is a solid-state instrument designed primarily for use in radio and television stations and in critical high-fidelity applications, where professional quality and accuracy are mandatory, yet economy is an important consideration. The standard unit is designed for precise flutter measurement to NAB standards, and Option 01 provides measurement to DIN standards. A precision 3kHz test frequency is provided in the Model 8155, which may be used for recording and reproducing in the absence of a standard tape; Option 02 provides a 1kHz reference carrier for use with low-frequency recorders. The Model 8155 has a self-checking calibration feature and will maintain calibration with measurement consistency between an unlimited number of units. The instrument operates from reproduce electronics. It also has easily understood front panel controls, an asset for production line or field service operations.

The compact size and construction of the Model 8155 makes it an ideal service tool when portability becomes an important consideration in equipment use.

APPLICATIONS

Audio and video tape transports
Field service operations
Phonograph turntables
Motion picture equipment
Dictating equipment

SPECIFICATIONS

TEST SIGNAL INPUT
Frequency: 3kHz
Input Level Range: 100mV to 5V
Input Impedance: >300 kilohms, unbalanced, at 3kHz

SIGNAL FAILURE CLAMP
Restores meter to zero when signal is below range of proper operation.
Normal Level Indicator: Actuated by input signals to indicate proper range of operation.

FLUTTER MEASUREMENTS
Frequency Ranges:
0.5 to 200Hz weighted to NAB Standard (rms indication).
0.5 to 200Hz at —3dB NAB unweighted (rms indication).
Test Ranges: 0.03%, 0.1%, 0.3%, 1%, 3% and 10% full scale.
Meter Accuracy: ±5% full scale at 40Hz unweighted, +½dB, —1dB from 1.5Hz to 150Hz ;±5% full scale at 4Hz weighted with 3.00kHz test input signal.
Meter Damping: Either true VU meter characteristics for making standard NAB measurements; or slow, highly damped meter characteristics to increase ease of reading.

INTERNAL TEST OSCILLATOR
Test Frequency: f_o = 3kHz ±0.25%.
Output Voltage: 1.23V rms ±10% into 600 ohms; 2.46V rms open circuit.
Source Impedance: 600 ohms, unbalanced.

8155 SPECIFICATIONS CONTINUED

FLUTTER DEMODULATOR OUTPUT
Frequency Range: 0.3Hz ±20% to 210Hz ±5% at —3dB, falling >6dB/octave below 0.3Hz and >20dB/octave above 220Hz.
Output Voltage: 0.1V rms for full-scale meter indication.
Source Impedance: 1 kilohm unbalanced.
Accuracy: ±3% true value at 40Hz; <+0.2dB, —0.8dB from 1.5Hz to 150Hz.

EQUIVALENT INTERNAL INSTRUMENT NOISE
<0.001% (with pure 3kHz sinewave input)

FLUTTER TEST
Self-check feature causes meter to indicate 1% rms flutter in unweighted mode.

GENERAL
Connectors, BNC type.
Power: 115V, ±10%; 50/60Hz; 25 watts.
Power Cable: Three-wire, grounded.
Mounting: Bench mount only.
Cabinet Dimensions: 8.25" x 10" x 5" overall.
Ambient Temperature Range: +10°C to +50°C.
Net Weight: 10 lbs. Shipping Weight: 13 lbs.

OPTIONS
OPTION -01: DIN Standard Weighting
OPTION -02: 1kHz Carrier Frequency
OPTION -03: Input Power: 115/230V, 50/60 Hz
Specifications subject to change without notice.

MODEL 9100 FM MODULATOR

The Model 9100 FM MODULATOR provides exceptionally low noise, linear modulation over a wide bandwidth.

Although originally developed by DMC as a means of testing its wideband flutter meters, the Model 9100 FM modulator has a much wider application wherever a precision FM modulator is needed.

SPECIFICATIONS

CENTER FREQUENCIES:
216, 108, 54, 27, 13.5, 6.75, 3.375 and 1.688 kHz.
200, 100, 50, 25, 12.5, 6.25, 3.125 and 1.562 kHz.

DEVIATION: ±40% maximum with <.5% static linearity
±10% with <.2% static linearity

BANDWIDTH: Not restricted; less than .05 dB down to 20 kHz.

CENTER FREQUENCY DRIFT: <±.1% 20°C to 40°C after 10 minute warmup

FM NOISE WITH ZERO MODULATION: <5 ppm rms

OUTPUT: Adjustable to 2V rms square wave from behind 600 ohms, single ended

MODULATION VOLTAGE: 4V for 10% deviation

INPUT IMPEDANCE: 1 kilohm ±2%, single ended

PRECISION ATTENUATOR: provides 10%, 3%, 1%, 0.3%, 0.1%, .03% and .01% deviation ±1% with 4V external modulation input.

GENERAL
Power: 115 or 230V, ±10%; 50/60 Hz; 25 watts
Front Panel Dimensions: 5.25" x 19" wide
Bench or Rack mount
Specification subject to change without notice

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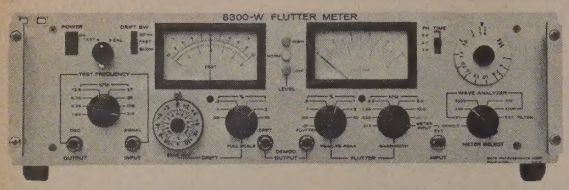


MODEL 8300-W IRIG FLUTTER METER

The DMC Model 8300-W instrumentation flutter meter is the only instrument available which provides National Bureau of Standards traceable calibration for measurement of flutter and drift to IRIG recommended standards. This solid-state instrument is specifically designed to make precision flutter measurements using a direct meter readout. The accurate meter reading eliminates **subjective interpretation** of complex oscilloscope traces. This simple, direct flutter meter reading allows less skilled operators, as well as experts, to thoroughly investigate and locate flutter causes, with equal proficiency. The Model 8300-W measures flutter using eight reference carriers and in seven standard bandwidths. An associated wave analyzer provides a simple and convenient method of precise analysis, within specified flutter bandwidths, facilitating determination of flutter causes. A strobe light modification is available for assistance in locating defective rotating mechanical components.

APPLICATIONS

The Model 8300-W provides consistent accuracy over exceptional bandwidths in the measurement of both flutter and drift. The instrument was specifically designed to make simple, direct measurements of:

—flutter in tape transports
—low speed variations in tape transports
—speed disturbances in precision rotation apparatus
—accurate low index wideband FM demodulation
—pulse jitter in low pulse rate PCM transmission systems
—applications requiring a low deviation, low noise demodulator
—determining mechanical rotational rates for elements of a mechanical device

SPECIFICATIONS

TEST SIGNAL INPUT
Frequencies: 1.69kHz, 3.38kHz, 6.75kHz, 13.5kHz, 27kHz, 54kHz, 108kHz and 216kHz
The above test frequencies can be shifted by 8% upon request to accommodate prerecorded timing frequencies of 200kHz, 100kHz, etc.
Input Level: 10mV to 2V rms
Input Impedance: 100 kilohms shunted by approximately 50pF unbalanced
Maximum Acceptance Frequency Deviation: ±10% (range over which ZERO SET may be adjusted to center drift meter)

SIGNAL LEVEL MONITOR
Restores meters to no-signal indication when signal is above or below proper range of operation. Lamp indicates signal level.
Drift output available from front panel BNC.

DRIFT MEASUREMENTS (METER)
Frequency Range: DC to 0.7Hz ±20% FAST; DC to 0.2Hz ±20% SLOW
Indication Mode: + or — % frequency deviation with "0" center meter
Test Ranges: ±.03, 0.1, 0.3, 1, 3, and 10% full scale
Meter Accuracy: ±5% full scale at DC

FLUTTER MEASUREMENTS (METER)
Frequency Ranges:
0.5Hz to 313Hz with 1.69kHz or higher test frequency
0.5Hz to 625Hz with 3.38kHz or higher test frequency

SPECIFICATIONS CONTINUED
0.5Hz to 1.25kHz with 6.75kHz or higher test frequency
0.5Hz to 2.50kHz with 13.5kHz or higher test frequency
0.5Hz to 5.00kHz with 27.0kHz or higher test frequency
0.5Hz to 10.0kHz with 54.0kHz or higher test frequency
0.5Hz to 20.0kHz with 108kHz or higher test frequency
External filter can be used.
Indication Modes:
Peak-to-peak to 1σ limit (random peaks occurring less than 32% of the time excluded). Two times rms value for white noise.
Peak-to-peak to 2σ limit (random peaks occurring less than 5% of time excluded). IRIG Standard measurement.
Peak-to-peak to 3σ limit (random peaks occurring less than 0.3% of the time excluded). Practical peak-to-peak measurement.
Test Ranges: .01, .03, 0.1, 0.3, 1, 3, and 10% full scale
Meter Accuracy: ±5% full scale at 100Hz
Flutter demodulator output available from front panel BNC.

INTERNAL TEST OSCILLATOR
Test Frequencies: 1.69kHz, 3.38kHz, 6.75kHz, 13.5kHz, 27kHz, 54kHz, 108kHz, and 216kHz ±.01%
(Other frequencies available on special order)
Output Voltage: 1V rms ±1dB
Source Impedance: 50 ohms, unbalanced

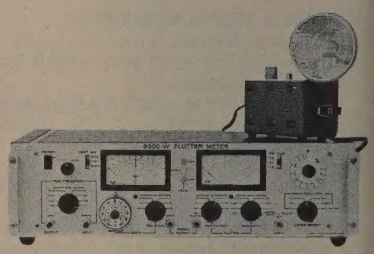
DEMODULATOR OUTPUTS FOR ANALYSIS

EQUIVALENT INTERNAL INSTRUMENT NOISE
Less than 0.005% peak-to-peak (50ppm in the 2σ indication mode at 108 or 216kHz, with the internal test oscillator used as the signal input).

WAVE ANALYZER
Frequency Range: 0.5Hz to 20kHz continuously tunable in 5 decade bands
Accuracy of Frequency Calibration: ±10% from 0.5Hz to 50Hz; ±5% from 50Hz to 20kHz
Frequency Response: ±1.5dB over entire tuning range
Bandwidth: 3dB down at + and —5% of selected frequency; greater than 20dB down at 0.5 and 2 times selected frequency
Indication: % peak-to-peak on Flutter Indicator
Wave Analyzer can be used with external meter input

GENERAL
Power: 115 or 230V, ±10%; 50/60Hz; 25 watts
Front Panel Dimensions: 5.25" x 19" wide
Cabinet Dimensions: 6" x 19" x 13" overall
Ambient Operating Temperature Range 0 to 55°C
Instruction Manuals: Two with each instrument
Power Cable: Eight-foot, three-pin cord with ground
Extender Card: One with each instrument for servicing
Bench or Rack Mount
Net Weight: 20 lbs; Shipping Weight: 26 lbs.
Specifications subject to change without notice.

FLUTTER METER STROBE-LIGHT OPTION



To further simplify and reduce the problem of locating deceptive troubles in mechanical parts, DMC can provide (Option 01) a triggered circuit which is driven by the Model 8300-W wave analyzer's tuned frequency. The triggered circuit output is a positive 5.0 volt (minimum) peak pulse which is sufficient for driving most strobe-lights. By marking suspicious rotating mechanical parts, the strobe-light makes those parts rotating at the analyzer's tuned frequency appear stationary by its synchronizing action with the strobe-light. This procedure saves maintenance time and eliminates trial and error troubleshooting practices. (Strobe light not provided.)

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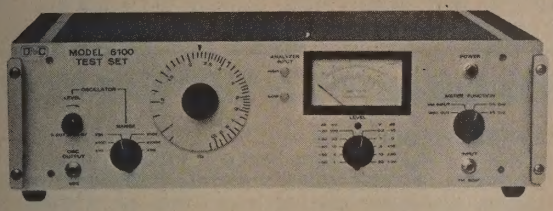


MODEL 6100 TEST SET

FEATURES

- **Fast and Easy to Operate: Five controls simplify function selection without complicated cable interconnections.**
- **Automatic Wave Analysis: Analyzer tuning tracks selected harmonic of oscillator frequency.**
- **Normalized Readout: Internal AGC eliminates tedious reference checks and adjustments for distortion measurements.**
- **Instruments may be used separately as general purpose oscillator, ac voltmeter, or harmonic analyzer.**

APPLICATIONS

I. Tape Recorder Adjustment and Testing

A. Bias Setting: Signal generator and ac voltmeter permit quick bias setting at all recommended frequencies for low, medium, and high bands at speeds from 15/16 ips to 120 ips.

B. Record Level Adjustment: Tedious procedures required with general purpose analyzers are replaced by (a) selecting the recommended frequency, and (b) adjusting input level until analyzer indicates 1% third harmonic.

C. Complete frequency response measurements may be made from 10Hz to 10MHz with self-contained signal generator and voltmeter. Meter can be switched from recorder input to recorder output.

II. General System Testing

A. Rapid frequency response measurements.

B. Easy second and third harmonic distortion measurements.

C. Signal-to-noise measurements facilitated by zero output position of oscillator level control.

SPECIFICATIONS

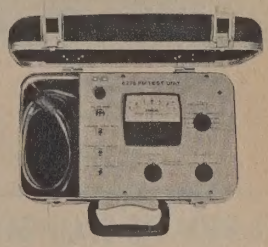
OSCILLATOR
Frequency: 10Hz to 10MHz in 6 decade ranges
Output: 4V rms behind 50 ohms. Adjustable to 40dB below full output
Total Harmonic Distortion: Less than 0.2% from 100Hz to 500kHz; less than 2% from 10Hz to 5MHz; less than 4% at 10MHz

VOLTMETER
Input Impedance: 1 megohm shunted by less than 50pF
Input Range: 1mV to 30V rms in ten 10dB steps
Accuracy: ±3% of full scale at 1kHz
Frequency Response: +0.5dB, —1dB from 10Hz to 10MHz on 3mV to 3V ranges. +0.5dB, —1dB from 10Hz to 6MHz on 1mV, 10V, and 30V ranges
Amplifier Output: 1V rms for full-scale meter reading.
Scale Calibration: 50 divisions, 0-1 scale; 32 divisions, 0-3.2 scale; +2dB to —15dB
Meter Characteristics: Average responding, calibrated in rms for sinewaves.

WAVE ANALYZER
Frequency Ranges: Measures second and third harmonic distortion of signals with fundamental components from 100Hz to 1MHz
Range: 3% full scale
Accuracy: ±1dB

6100 SPECIFICATIONS CONTINUED
AGC Range of Input: 20dB with high and low-level warning lamps

GENERAL
Power: 115V or 230V, ±10%; 48-64Hz. Approximately 40W required.
Ambient Operating Range: 0°C to 50°C
Front Panel Dimensions: 5.25" x 19" wide
Cabinet Dimensions: 6.25" x 19" x 13" overall
Mounting: Bench mount, convertible or rack mount
Net Weight: 17 lbs. Shipping Weight: 25 lbs.
Specifications subject to change without notice.



MODEL 6275 TEST UNIT

The DMC Model 6275 FM Test Unit is a solid-state instrument that meets the instrumentation magnetic tape recording needs for a portable, professionally built FM calibrator.

Independent three-point calibration of modulators and demodulators can be performed as well as overall FM channel calibration. This is a distinct advantage. Most inexpensive FM calibrators align the demodulator first and then use the demodulator as a reference for modulator calibration.

SPECIFICATIONS

DC TO MOD:
Nominal +1.414V to 0V to —1.414V, ±0.3%. May be changed by customer to any voltage up to +5V to 0V to —5V. Maximum output current: 50mA.

CARRIER FROM MOD:
Impedance: 10 kilohms, shunted by less than 50pF; limits of 30mV to 5V peak-to-peak. ±3% full-scale comparator.

CARRIER TO DEMOD:
0.845kHz to 432kHz, ±0.02%. 1.5V peak-to-peak behind 50-ohm squarewave.

DC FROM DEMOD:
Impedance: greater than 10 kilohms. ±3% full-scale indication. Null accuracy ±0.2%. Can be self-checked against internal dc supply.

TESTS:
FM Record Electronics: DC IN vs FREQUENCY OUT
FM Demodulator: FREQUENCY IN vs DC OUT
Overall System: DC IN vs DC OUT
Self-Check

GENERAL:
Power Requirements: 105 to 130V, 48 to 440Hz; also 210 to 260V ac; approx. 10 watts.
Power Cable: Three-wire, grounded
Temperature Range: 0°C to 55°C
Dimensions: 12" long x 10" high x 5" wide
Weight: Approx. 11 lbs.

OPTION -01: Wideband Group II, 900kHz test frequencies
OPTION -02: Adjustable 0 to ±5V dc input, front panel lockable precision attenuator
OPTION -03: 845Hz carrier frequency added
OPTION -04: Carrier level equalization (6dB per octave)
OPTION -05: High input impedance (greater than 1 megohm)

Specifications subject to change without notice.

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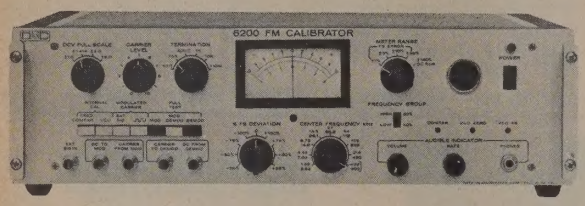

MODEL 6200 FM CALIBRATOR

FEATURES AND APPLICATIONS

The Model 6200 can be used for rapidly testing and aligning instrumentation tape recorder FM record and reproduce channels, or for calibrating other FM modulators and demodulators that operate at the standard IRIG tape recorder frequencies up to 900kHz.

I. RECORD MODE

A precise dc voltage is fed to the tape recorder record modulation, and the resulting output frequency is compared to the internal standard frequency. The error is shown directly in percentage on the zero-center meter, whose maximum sensitivity is ±1% full scale.

II. REPRODUCE MODE

A standard frequency is fed to the recorder's reproduce demodulator. The resulting dc voltage, across the standard termination, is compared to the internal standard dc voltage. The error is similarly shown directly in percentage.

III. RECORD-REPRODUCE MODE

This combination can be checked by feeding precise dc into the recorder's modulator and comparing the dc output from the recorder's demodulator. The error is again shown directly in percentage.

IV. INTERNAL SQUARE WAVE MODULATION*

The modulator output that is fed into the reproduce channel is alternated between plus and minus full-scale deviation, at a 100Hz rate.

EXTERNAL MODULATION*

Full-scale dc voltage input causes full-scale deviation.

*Option 01—See "Specifications"

SPECIFICATIONS

CENTER FREQUENCIES

432kHz, 216kHz, 108kHz, 54kHz, 27kHz, 13.5kHz, 6.75kHz, 3.375kHz, and 1.6875kHz with ±40% full-scale deviation; and 900kHz, 450kHz, 225kHz, 112.5kHz, 56.25kHz, 28.125kHz, 14.062kHz, 7.031kHz, and 3.516kHz with ±30% full-scale deviation.

CRYSTAL OSCILLATOR

The center frequency and all static deviation frequencies are derived from a crystal oscillator with a ±0.01% accuracy from 0°C to +55°C. A counter chain counts down to the desired frequency. Static deviation frequencies are ±100%, ±75%, ±50%, and ±25% of full-scale deviation.

CARRIER OUTPUT (TO DEMODULATOR)

Square wave adjustable up to 6 volts peak-to-peak, open circuit. Output impedance selected by internal jumper, 75 or 50 ohms. Less than 5% dissymmetry above 600kHz, less than 3% between 600 and 250kHz, and less than 1% below 250kHz.

FULL-SCALE DC VOLTAGE (TO MODULATOR)

Front panel selected; ±1.0V, ±1.414V, ±2.0V, ±5.0V. Accuracy ±0.1% of peak-to-peak output.

DC OUTPUT (TO MODULATOR)

Output impedance less than 10 milliohms. Will drive 50 ohms at ±2.0V. The deviation control selects the appropriate output voltage for each static deviation.

TERMINATION (FROM DEMODULATOR)

Front panel selected; 50 ohms, 75 ohms, 600 ohms, 1000 ohms, 10K, or 10 megohms.

VOLTAGE AND FREQUENCY COMPARISON

The zero-center meter indicates the difference between the measured frequency or voltage and the desired one. Full-scale sensitivities of ±1%, ±3%, ±10%, and ±30% of full deviation are provided. In addition, the dc voltage from the reproduce channel can be displayed on a ±100% scale.

AUDIBLE NULL INDICATOR

A small loudspeaker is provided, which will give an audible indication of either voltage or frequency error. The click rate is an analog of the meter deflection. The volume may be regulated or turned off. A front panel earphone jack is also provided.

OPTION 01 (INCLUDES INTERNAL MODULATOR FOR DYNAMIC TESTING OF DEMODULATORS)

Modulator: The modulator provides signals for dynamic signal testing. The modulating signal is either an internal square wave or an external voltage. The modulator may be checked or zero beat by switching to MOD CHECK mode.

Internal Wave Modulation: Approximately ± full-scale deviation at 100Hz.

External Modulation: Separate input, 10K resistance. Sensitivity as selected by DC V FULL SCALE control.

GENERAL

Mounting: Bench, convertible to rack mount
Ambient Temperature: 0 to 55°C
Power Requirements: 115V ±10%, 48-64Hz. Approximately 30W required.
Front Panel Dimensions: 5.25" x 19" wide
Cabinet Dimensions: 6.25" x 19" x 13" overall
Net Weight: 22 lbs.
Shipping Weight: 26 lbs.

Specifications subject to change without notice.

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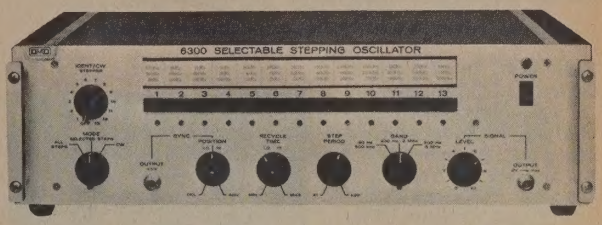
MODEL 6300 SELECTABLE STEPPING OSCILLATOR



The DMC Model 6300 Selectable Stepping Oscillator is a unique, solid-state instrument that generates from one to 13 selectable frequency bursts sequentially in each of three ranges from 50Hz to 5MHz. It is the first instrument to provide quick assessment of amplitude-vs.-frequency characteristics in any communications network or system. Frequency stepping—as opposed to sweeping—is accomplished by switching the oscillator to successive frequencies selected for a given time period so that a constant frequency sinewave output is obtained for each selected frequency burst. The Model 6300 produces a serial train of discrete frequencies free of spikes or irregularities. The unit offers transient-free stepping or CW operation, with constant output level vs. frequency. Frequencies are tunable for setting adjacent frequencies close together or even overlapping them. The Model 6300 combines the operational advantages of manually tunable and sweep oscillators to provide the user with a virtually simultaneous frequency response display over a wide frequency range. This makes the unit highly versatile and economical; therefore, it can be used in research and development, production, and calibration. The instrument saves time and effort and eliminates the need for highly skilled personnel in single and wideband automatic frequency testing.

APPLICATIONS

The Model 6300 is designed for use in single and wideband frequency testing that requires a simultaneous display of a wide range of frequency and corresponding response for quick testing, alignment, and measurement, especially where adjustments interact on devices under test. Typical uses:

- magnetic tape recorder equalization and response alignment
- testing or alignment of filters
- telephone or telemetry multiplex systems testing
- measurement of amplifier frequency response
- testing of video amplifier characteristics
- tone burst generation
- alignment of IF in receivers
- loudspeaker testing
- equalization of computer transmission lines
- production line testing

SPECIAL APPLICATIONS

Frequently, special requirements are imposed on standard hardware to meet the demands of unusual operating characteristics affiliated with special applications. The following are modifications to the standard Model 6300 for use in these special applications:

1. A one-shot or cycling through all SELECTED STEPS can be accommodated through pushbutton control (Option 02)
2. Special internal filters for fixed weighting or frequency response characteristics can be easily accommodated.
3. Remote step selection (1 through 13) is available for requirements where the Model 6300 is not in close proximity.
4. Step identification pulses can be made available for each of the steps (1 through 13) as required where frequency response evaluation must be accomplished on a remote basis.

SPECIFICATIONS

FREQUENCY

Ranges: Low: 50Hz through 500kHz
Mid: 200Hz through 2MHz
High: 500Hz through 5MHz

Steps: 1 through 13, selectable
Sequence Ratio: 1, 2, 5, 10 nominal
Adjustment Range: ±3.2 to 1 (one decade), within above ranges, by use of front-panel adjustable multiturn pots.
(Bottom step, up only; top step, down only.)
Period: Approximately 1 ms min. or a time duration to include 5 cycles of the selected step frequency, whichever time is greater.
Period Multiplier: 1 ms to 20 ms minimum

Mode: (1) All steps
(2) Selected Steps
(3) CW (single frequency)

Identification: Attenuates any selected step output level by approximately 20 dB

Time Separation: continuous stepping; no transients

DISPLAY TIME AND SYNC

Operation Cycle Time:
Low Band: 200 ms nominal for 13 steps to 1 ms minimum for 1 step
Mid Band: 56 ms nominal for 13 steps to 1 ms minimum for 1 step
High Band: 25 ms nominal for 13 steps to 1 ms minimum for 1 step

Recycle (Hold-Off) Time:
Internal: Approximately 1 ms to greater than 0.6 sec, adjustable
External: Rear panel BNC connector provided. —5V peak pulse required to start operation cycle.

Sync Time Position: Adjustable to trigger external scope at any time during operation cycle.

Sync Output: +5V peak behind 600 ohms

OUTPUT

Level: 2V rms, open circuit, behind 50 ohms

Attenuation: 0 to 40dB

Frequency Response: Within ±0.50dB at 1 V rms output into 50-ohm load

Load: 50 ohms

GENERAL

Mounting: Bench, convertible to rack mount

Ambient Temperature: 0 to 55°C

Power Requirements: 115-230V ±10%, 48-400Hz. Approximately 40 VA required

Front Panel Dimensions: 5.25" x 19" wide

Cabinet Dimensions: 6.25" x 19" x 13" overall

Power Cable: Eight-foot, three-pin cord with ground.

Instruction Manuals: Two with each instrument

Net Weight: 22 lbs.

Shipping Weight: 26 lbs.

Specifications subject to change without notice.

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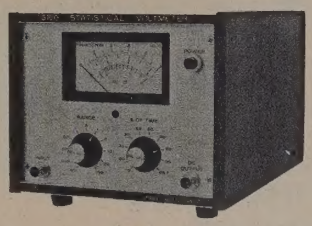
MODEL 3100 STATISTICAL VOLTMETER



The DMC Model 3100 Statistical Voltmeter is a solid-state voltmeter that can analyze random or noise-like waveforms on a statistical basis. It ignores the peak input signal excursions. The unit tracks a changing input signal and conveniently reads the peak-to-peak signal voltage directly for the preset percentage of time or statistical limit. It replaces the "eyeball" subjective scope measurement with direct, accurate measurement. Statistical measurement methods are recognized by many engineering and research departments as a more efficient and precise technique of evaluating data having noise-like or complex waveforms. This is because signal characteristics can be ignored or accepted at the operator's option. This capability cannot be provided by any other commercially available instrument.

APPLICATIONS

Typical applications are:

—measuring power supply PARD (ripple and noise)

—vibration and acoustical noise generated by various type engines, turbulent air motion or environmental conditions.

—medical evaluation of EEG, EKG and other physiological waveforms.

—obtaining separate measurements of repetitious spikes and average noise, such as in slip rings, bearings, and static interferences from atmosphere disturbances.

—measuring seismic or biological waveforms.

—analyzing communication system noise problems in the presence of transients.

SPECIFICATIONS

VOLTAGE RANGE
1mV to 100V full-scale in eleven 10dB steps. Peak input must not exceed ±250V.

% OF TIME ACCURACY (measured at 1kHz)

99.7,% 99%	95%, 90%	80%, 68%, 50% 33%	20%, 10%
±.2%	±1%	±2%	±3%

AMPLITUDE ACCURACY
±3% of full scale at 1kHz.

METER FREQUENCY RESPONSE
For sine waves at % OF TIME settings;
Above 80%: ±1dB from 5Hz to 100kHz, 3dB at less than 2Hz.
33% through 68%: ±1dB from 2Hz to 100kHz, 3dB at less than 1Hz.

METER SLEWING RATE
(Response time to square waves or voltage step):
Up-Scale:

99.7% of Time	160 times full scale per second (6.25 millisec)
95% of Time	10 times full scale per second (100 millisec)
68% of Time	1 times full scale per second (1 sec)
Down-Scale:	0.5 times full scale per second (2 sec)

For sinewaves, the tracking ratio is reduced approximately 50%.

DC OUTPUT
0-1V dc with respect to chassis ground, proportional to meter deflection.
Output impedance is 1K; BNC connector.

AC OUTPUT
Same waveform as input signal, with gain of 1,000 on 1mV range and unity gain on 1V range. BNC connector.

GENERAL
Power: 115 or 230V; 50/60Hz; 10 watts
Overall Dimensions: 7 25/32" x 6 3/32" H x 11 5/8" D.
Ambient Temperature Range: 10°C to 40°C.
Degrade specifications 2 x for 0°C to 55°C operation
Mounting: Bench mount, half rack size; rack adaptor, DMC 14:61:0001
Net Weight: 8 lbs.
Shipping Weight: 12 lbs.

SALES REPRESENTATIVES

DATA MARKETING ASSOCIATES, INC.
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Houston, Texas 77018
Telephone: (713) 686-9627

10050 Monroe Street
Dallas, Texas 75229
Telephone: (214) 358-4643

RUSH DRAKE ASSOCIATES, INC.
6133 Maynard Avenue South
Seattle, Washington 98108
Telephone: (206) 763-2755

LOREN F. GREEN & ASSOCIATES
5218 West Diversey Avenue
Chicago, Illinois 60639
Telephone: (312) 286-6824

6225 University Avenue Northeast
Minneapolis, Minnesota 55421
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Indianapolis, Indiana 46220
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HILLEARY ASSOCIATES
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SCIENTIFIC DEVICES — NORTHEAST
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Wakefield, Massachusetts 01880
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WARD/DAVIS ASSOCIATES
770 South Arroyo Parkway
Pasadena, California 91105
Telephone: (213) 684-2840

3941 East Bayshore Road
Palo Alto, California 94303
Telephone: (415) 968-7116

3442 Hancock Street
San Diego, California 92110
Telephone: (714) 297-4619

FOREIGN REPRESENTATIVES

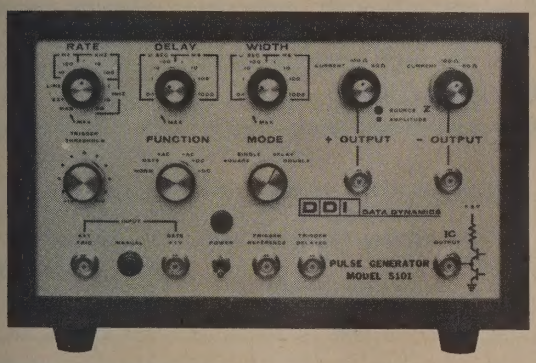
ROCKE INTERNATIONAL CORPORATION
Post Office Box 745
Melville, New York 11746
Telephone: (516) 694-7800

KANEMATSU-GOSHO (USA) INC.
606 South Hill Street
Los Angeles, California 90014
Telephone: (213) 620-1640

PULSE GENERATORS

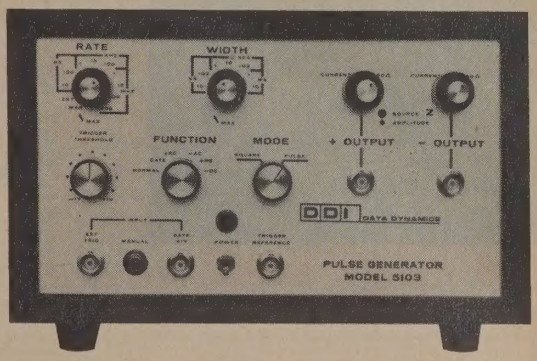
MODEL 5101 $525.00

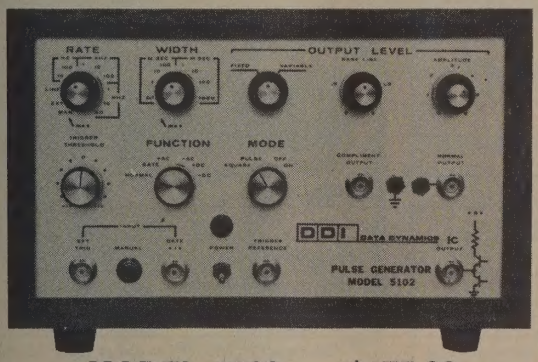
50 MHz general purpose Pulse Generator with separate current sinking IC output. Selectable source termination of 50 Ω, 100 Ω, and current output. Lowest price 50 MHz Pulse Generator made today.



MODEL 5103 $600.00

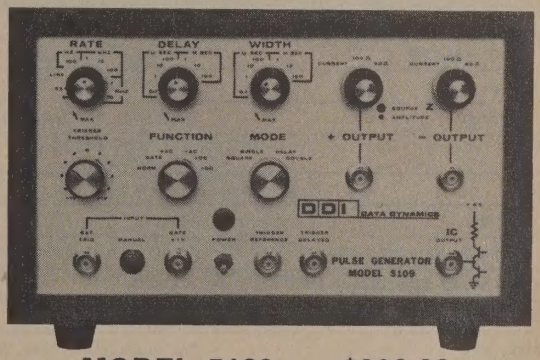
Economical 200 MHz Pulse Generator with output of 5 volts into 50Ω and a rise time of less than 2 ns.





MODEL 5102 $475.00

50 MHz Pulse Generator designed with a unique current sinking output specifically intended for use with TTL, RTL or DTL Integrated Circuits. Variable baseline offset and pulse amplitude can be remotely programmed.



MODEL 5109 $390.00

Low cost 10 MHz Pulse Generator with high priced features: Pulse Width and Delay times adjustable from 10 ns to 100 ms; IC output; Square Wave output; Current, 100 Ω, 50 Ω outputs.

MODEL	PULSE REP. RATE	PULSE WIDTH	PULSE DELAY	OUTPUT IMPEDANCE	PULSE AMPLITUDE	RISE & FALL TIME	ADDITIONAL* FEATURES
5101	1 Hz to 50 MHz	10 ns to 1 sec.	10 ns to 1 sec.	50 ohms, 100 ohms, current	0 to +10 V and 0 to −10 V	< 4 ns	1 2 3 5 6
5102	1 Hz to 50 MHz	10 ns to 1 sec.	——	low impedance: "1" = line driving "0" = current sinking	0 to +6 V normal & complement	< 5 ns	2 3 4
5103	10 Hz to 200 MHz	< 4 ns to 10 ms	——	current	+0.1 V to +5 V −0.1 V to −5 V	< 2 ns	2 6
5109	10 Hz to 10 MHz	10 ns to 100 ms	10 ns to 100 ms	50 ohms, 100 ohms, current	0 to +10 V 0 to −10 V	< 4 ns	1 2 3 5 6

***FEATURES** **1.** Double pulse. **2.** Square wave output **3.** IC outout **4.** Base line offset **5.** Delayed trigger output **6.** Separate positive & negative outputs.

All pulse generators have the following common specifications: Manual, single pulse (pushbutton) operation. Gated operation. External triggering with trigger threshold adjustable between −1 volt and +1 volt. Trigger input is AC or DC coupled with choice of triggering on either the + or − slope of the input trigger signal. Reference trigger output.

Call or write DATA DYNAMICS, or your nearest sales representative for detailed literature. A demonstration and/or loan can be arranged at your convenience.

DDI DATA DYNAMICS

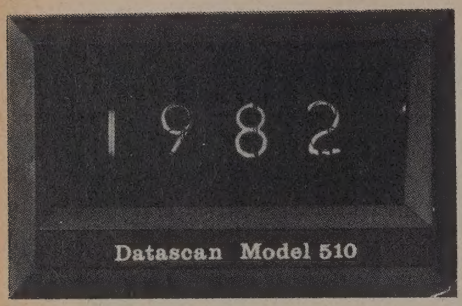
240 HUMPHREY ST., ENGLEWOOD, N.J. 07631 • (201) 567-5300

New Digital Panel Meters

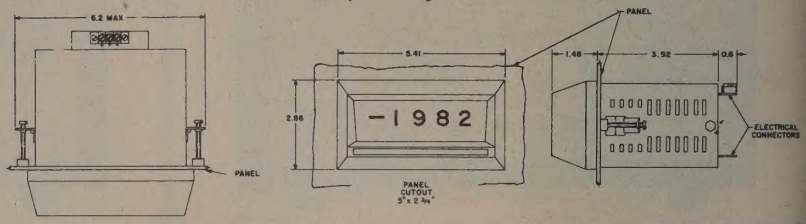
• Low Price • High Performance • New Styling

This new line of DPM's offers features found only in the more expensive models. New integrated circuit techniques are used to give you outstanding performance and reliability while reducing costs.

Write for information of Datascan's full line of Digital Panel Meters — and DVM's for OEM.



Model 510 — unipolar
Model 525 — unipolar with underrange zeroing capability — ±10% accuracy with negative inputs, .1% with positive inputs
Model 520 — auto-polarity
Model 720 — auto-polarity



	500 Series	700 Series
No. of Digits	3½	4½
Full Scale Reading	999	9999
Overrange	100% (1999)	100% (19999)
Out of Range	Overrange "1" tube flashes	Indicator lights "out range"
Accuracy	±0.1% reading ±1 digit***	±0.02% reading ±1 digit
Stability	±0.01%/°C	±0.003%/°C
Encode Rate	10/sec.	2/sec.
Normal Mode Rejection (NMR)	20 db @ 60 HZ then 20 db/decade	20 db @ 60 HZ then 20 db/decade
Common Mode Rejection Ratio**	———	60 db min.
Setting Time	11 msec. max.	150 msec. max.
Display Type	0.6" high NIXIE type, continuous & non-blinking	0.6" high NIXIE type, continuous & non-blinking
BCD Outputs*	"1":+4V@ .2ma max. "0":OV@4 ma max.	"1":+4V@ .2ma max. "0":OV@4 ma max.
Overload Protection	100 times full scale (1kV max.)	100 times full scale (1kV max.)
Polarity Indication	minus sign lights	minus sign lights
Input Power	115V, 50-60Hz, 5W, (210-250V add E to P/N)	115V, 50-60Hz, 7W, (210-250V add E to P/N)

* Standard on 500 Series, optional on 700 Series ** Not available on 500 Series, optional on 700 Series.
*** Accuracy for negative inputs for Model 525 is ±10%, positive inputs ±.1%.

SPECIALS

a. Special ranges are available — consult Datascan.
b. Case colors, other than black are available in special quantities — call Datascan.
c. Custom Digital Voltmeters tailored electrically and mechanically to your needs for OEM applications (over 100) are available.
d. All units are available without bezel and/or power supply at reduced prices — consult Datascan.
e. Other encode rates are available as an option — consult Datascan.
f. Models V2 and V3 input impedance is 100 KΩ/v

MODEL DESIGNATIONS

500 SERIES — 3 digit		500 SERIES — 3 digit		700 SERIES — 4 digit	
Range	Model Suffix No.	Range	Model Suffix No.	Range	Model Suffix No.
100 mV	V1	1 ma	A4	100 V	V4
1 V	V2	10 ma	A5	10 μa	A2
10 V	V3	100 ma	A6	100 μa	A3
100 V	V4	1A	A7	1 ma	A4
1000V	V5	**700 SERIES — 4 digit**		10 ma	A5
10 μa	A2	1 V	V2	100 ma	A6
100 μa	A3	10 V	V3		

	Model	10-24		Model	10-24		Model	10-24
3 DIGIT	510 Uni-Polar (all standard ranges)	$175	3 DIGIT	510-XX*-A (A/D Converter & readout)	$137	4 DIGIT	720 Autopolarity (all standard ranges)	$340
	525-Uni-Polar w/underrange capability (all standard ranges)	180		525-XX*-A (A/D Converter & readout)	142			
	520 Autopolarity (all standard ranges)	199		520-XX*-A (A/D Converter & readout)	161			

*Insert range codes

Datascan

DATASCAN, INC.
1111 Paulison Avenue, Clifton, N. J. 07013
Telephone 201-478-2800

Programmable
DC Voltage & DC Current Sources

Employing TTL Logic, these precision sources meet all critical requirements for stable Voltage and Current Sources.

BCD programming and BCD output options permit logic-level programmable voltage or current selection and readout.

Easily programmable, these accurate sources are the ideal references for calibration laboratories, component test and OEM applications.

Features

- Remote Programming Capability
- .003% Accuracy
- 100 ms Response Time
- 1 ppm Resolution on Each Range
- 5 minute Warm Up
- Nixie® Readout
- Programming/Output Isolation
- Highly Stable Reference
- Portable or Rack Mounted
- BCD Output

Digital Programmable Voltage Source
model M106

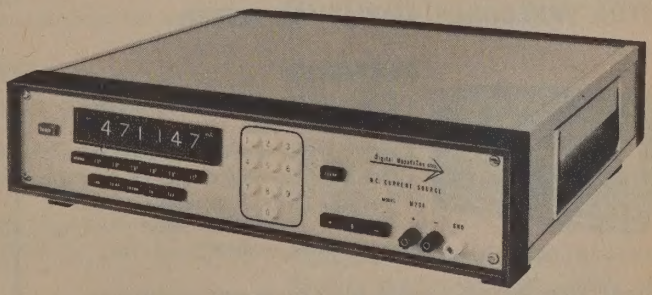
The Model M106 is a digitally programmable (BCD), all solid state, stable DC voltage source. This programmable unit covers 0 to 1000 VDC in four ranges; 1, 10, 100 and 1000 volts, each with a full six digit readout. Manual mode voltage and polarity changes can be obtained by selection on the front panel keyboard. The calibration accuracy is .003% of indication on all ranges.

0-1000VDC /4 Ranges / $1745.00

Digital Programmable Current Source
model M206

The Model M206 is a unique solid state DC Current Source. Digitally programmable, this precision source covers 0 to 10 amperes in five ranges; 1, 10, and 100 milliamperes, 1 ampere, and 10 amperes each with a six digit Nixie readout. Current output and polarity changes are obtained by manual selection on the front panel keyboard. Accuracy is .003% to .01% of reading depending on range.

0-10 Amps / 5 Ranges / $2985.00



For more detailed information about our products, contact your local Representative listed in the EEM Directory.

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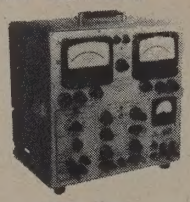
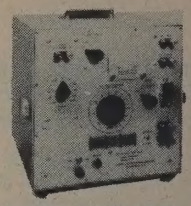
SERIES 100
COMPLEX IMPEDANCE, ADMITTANCE AND TRANSFER FUNCTION METERS

MODEL 100B


MODEL 100C

PLUG-IN 100-PA-1013

PLUG-IN 100-PA-1009

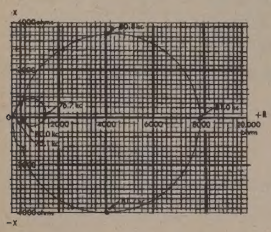

ADAPTER 100-PA-1011B

FEATURES:

- Direct Reading of Impedance, Admittance and Transfer Function
- Wide range of input levels
- Differential measurements for high accuracy
- Wide frequency range
- DC outputs for continuous plotting
- Plug-in versatility

APPLICATIONS:

- Electrical Components Testing
  Rapid testing of resistors, inductors, capacitors, crystals and transformers
  Non-linear analysis
- Materials Research
  Dielectric and magnetic properties
- Electro-acoustical Transducers
  Resonance frequencies and mechanical Q
  Coupling coefficient
- Active and Passive Networks
  Impedance and transfer function
- Mechanical and Acoustical Systems
- Impedance studies in Physiology


Complex Impedance plane plot of piezo-electric ceramic disk. (Plotted on X-Y recorder in 20 seconds.)

Series 100 Complex Impedance, Admittance and Transfer Function Instruments is comprised of a family of highly accurate main frames and plug-ins for the direct measurement of vector components of impedance, admittance, transfer function, power, vector magnitude and phase angle. Elimination of bridge balance enables measurements to be made rapidly and simply.

Main Frames: Three basic main frames are offered, each capable of analyzing a sinusoidal a-c voltage, producing readings and d-c outputs proportional to in-phase and quadrature components as well as magnitude and phase. Primarily designed for CW applications, the Series 100 can be used for limited gated-CW measurements where long duty cycles are present.

Model 100B Main Frame — measures in-phase and quadrature components, of Z, Y and transfer function.

Model 100B - Mod 4 Main Frame — is similar to the 100B but includes internal emitter-follower of higher power capability.

Model 100C Main Frame measures in-phase and quadrature components, as well as magnitude and angle of Z, Y and transfer function.

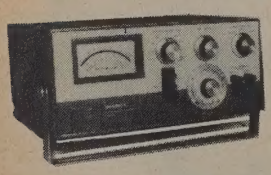
Plug-In and Adapters: Eight separate units control or measure the alternating current or voltage applied to the unknown, scale the signals and apply them to the main frame for direct reading of the selected function.

PLUG-INS AND ADAPTERS

Model 100-PA-	Measures	Freq. Range	Linear Ranges, Full Scale 1, 2.5, 5, etc. sequence	Voltage Across or Current Through Unknown (RMS)
1001A	Z & Y	100 Hz to 200 Khz	10Ω to 50 KΩ 10μ℧ to 50 Kμ℧	0-45 mv in Z mode; 3 v in Y mode
1004	Z	100 Hz to 200 Khz	1Ω to 5KΩ	0-45 mv
1008	Y or △Y	100 Hz to 100 Khz	100μ℧ to 500m℧	3 v
1009	Y or △Y	100 Hz to 10 Khz	0.025μ℧ to 10K μ℧	3 v
1010A	Z	100 Hz to 75 Khz	1Ω to 10KΩ	31.6A, 3.16KV max
1011B	Y or △Y*	100 Hz to 75 Khz	10 to 10^6μ℧ or pfd	31.6A, 6KV max
1012A	Y	100 Khz to 300 Khz	25μ℧, 2.5m℧, 250m℧	3 v
1013	V_0/V_1	100 Hz to 200 Khz	Gains of 0.01 to 10K	Input: 0.3 to 300 mv Output: 3 mv to 30 v

For further details on Series 100 write for bulletin 100
* Also used for dielectric measurements — measures capacitance and dissipation factor

SERIES 320
VECTOR IMPEDANCE AMPLITUDE METER



FEATURES:

- Direct reading of amplitude of impedance or transfer function
- Wide frequency range of 5 Hz to 500 Khz
- Wide impedance range of 1 to 10^7 ohms
- Impedance angle measurements (when Series 301 Phasemeter is used)
- Self contained oscillator

Series 320 Vector Amplitude Impedance Meters provide rapid, accurate direct measurements of impedance or transfer function. At premarked frequencies, inductance and capacitance are read from panel meter and a db scale facilitates Q measurements. Coupled with Series 301 phase meter, direct reading of impedance angle can be made easily.

SPECIFICATIONS

Frequency Range: 5 Hz to 500 Khz
Impedance Range: 1Ω to 10 MΩ, in 7 ranges
Inductance Range: 1 μh to 100,000 h, in 11 ranges
Capacitance Range: 0.1 pf to 10,000 mfd, in 11 ranges
Amplitude Accuracy: 20 Hz to 100 Khz, better than 5% of reading; for frequency extremes, better than 7% at 5 Hz and 10% at 500 Khz.
Phase Accuracy: 20 Hz to 100 Khz, better than 2½°. Low frequency: 5 Hz, better than 4°. High frequency: 500 Khz, better than 5° at 10 to 10^6 ohms; for other values of Z, better than 10°.
Oscillator: 5 Hz to 500 Khz, 5 ranges, 3 v rms approx., ±3% frequency accuracy.
Signal across unknown: Below 1K Ω, < 35 mv rms. Above 1K Ω, approx. 3 v rms.
AC Outputs: Two, for connection to Series 301 Phase meter.
AC Power Input: 115 v, 50-400 Hz; other voltages available.
Size: Portable (320, 320A) 7" x 16½" x 11½". For 19" rack mount specify 320R or 320AR.
Weight: 18 pounds; shipping, 27 pounds.

APPLICATIONS:

- Rapid production and incoming inspection of resistors, capacitors and inductors
- Filter and network design and testing
- Amplifier impedance measurements
- General purpose signal generator

OPTIONAL FEATURES
(Specify Model 320A or 320AR)

(1) DC output 0 to +1 v proportional to |Z| below 1K ohms, proportional to 1/|Z| above 1K ohms.
(2) DC output 0 to +1 v proportional to freq. dial position.
(3) AC output for use by counter for accurate freq. measurement.
(4) External oscillator input for use with special signal sources.

See Section 4900 for our pages on Synchro Converters.

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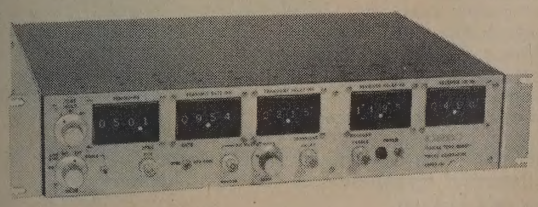
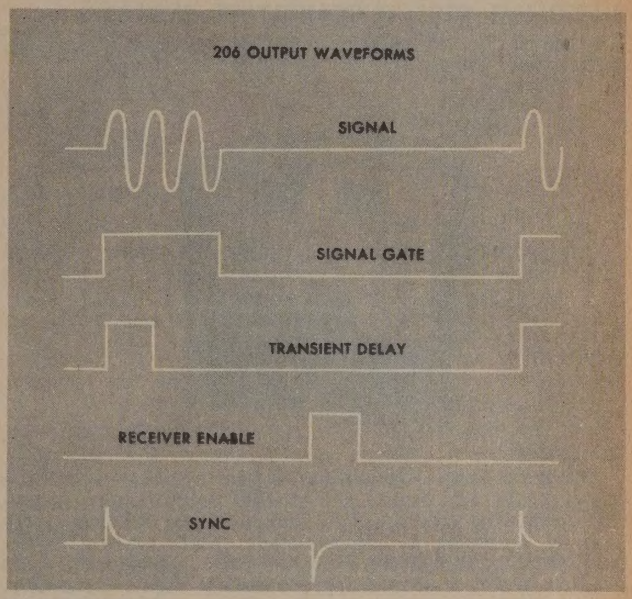
SERIES 206
DIGITAL GATING/TIMING GENERATOR



Series 206 GATING/TIMING GENERATORS gate the output of an a-c signal generator and provides a single signal burst or repetitive signal bursts, with turn-on and turn-off times coincident with zero crossings of the input signal to minimize switching transients.

Internal or external triggering initiates an accurate sequence of pulses for: (1) turning on the signal at its first positive going zero crossing; (2) turning off the signal at the first positive going zero crossing following a precise time interval; (3) delayed triggering of oscilloscopes or other devices; (4) gating detectors or receivers after a precise time interval; (5) delayed triggering of Dranetz Series 215 AC Sampling Voltmeters or Series 202 CW/Pulse Vector Component Computer systems.



APPLICATIONS:

- Automatic a-c testing of components and circuits.
- Testing of data communications systems, modems, multiplexers and switching circuits.
- Calibration of underwater transducers under tone burst conditions.
- Measurement of propagation and reflections in acoustical fields.

FEATURES:

- Wide frequency range of 50 Hz to 3 Mhz.
- Provides zero-crossing turn-on and turn-off of a-c signals, single or repetitive gating.
- Provides three additional independently selectable timing pulses for controlling gated detectors and receivers.
- Digitally-controlled timing from front panel controls.
- Remote programming option.

SPECIFICATIONS

MODES OF OPERATION:

CW

Gated: (for CW, FM or Phase-shifted signals).
Single shot or repetitive gating of AC signals.
Repetitive gating using internal timing oscillator (with or without sync. to 60 Hz power line).

SIGNAL CHANNEL:

Frequency range: 50 Hz to 3 Mhz.
Input: Level — Sinusoidal signal, 1 v rms ±10%.
Impedance—10 kΩ shunted by 100 pf.
Output: Level — Adjustable from 0.1 to 1 v rms into 75Ω load over full frequency range; adjustable from 0.5 to 5 v rms into 10kΩ up to 2 MHz.
Distortion — Less than ½% from 50 Hz to 0.5 Mhz; < 1% to 3 Mhz.
Input to output isolation: > 60 db to 0.5 Mhz; noise typically 60 db down.
Types of gating: Zero crossing turn on and zero crossing turn off; less than 1.5° or 25 nsec coincidence error. Non-synchronous turn-on and turn-off.

EXTERNAL TRIGGER:

Pulse or square wave input, ±5 v into 3 kΩ load, transformer input, rise time 50 μsec max, duration 50 μsec. min.

GROUNDING:

Separate chassis, circuit and power line grounds.

CONNECTIONS:

Connections on rear; monitor outputs on front.

CONTROLLED TIMING:

Repetition Period: 100 μsec to 99.99 sec.
Signal On-Time: 10 μsec to 9.999 sec.
Transient Delay Pulse: 10 μsec to 9.999 sec.
Receiver Delay: 10 μsec to 9.999 sec.
Receiver On-Time: 10 μsec to 9.999 sec.

OUTPUT CONTROL PULSES:

Sync. Output: +5 pulse at signal turn-on followed by −5 v pulse at delayed receiver turn-on.
Signal gate output (for use with commercial E-I Normalizers): +10 v rectangular wave, having leading edge coincident with signal turn-on and lagging edge coincident with signal turn-off.
Signal transient delay output: +10 v rectangular wave having lagging edge coincident with setting of Transient Delay Control.
Receiver enable output: +10 v rectangular wave having leading edge corresponding to Receiver Delay Control, and pulse width corresponding to Receiver On-Time Control.

INPUT POWER:

105 - 125 v 50 - 60 Hz, 40 watts.
SIZE: 3½" high x 17" wide x 15½" deep (with hardward for mounting in standard 19" relay rack).
WEIGHT: 20 pounds; shipping, 20 pounds.

PROGRAMMABLE UNIT MODEL 206A

Parallel BCD rear panel inputs for each timing control. Remote operation on zero position of manual controls. Switch closure to ground or application of 0 to +0.8 v dc is binary one; open circuit or application of +2 to +5 v dc is binary zero. For switch closure, Model 206A produces 3.2 ma dc max. For manual setting of controls, rear connectors produce BCD outputs corresponding to control positions.

See Section 4900 for our pages on Synchro Converters.

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SERIES 202

SAMPLING VECTOR COMPUTING SYSTEMS

For pulsed or CW measurements of Complex Impedance, Admittance, Phase, Transfer Function and Power

FEATURES:

- Computing time less than 1 cycle after sample
- Computes real and imaginary components, phase and magnitude
- Measures CW, gated CW or rapidly varying AC signals
- Selectable sampling times — 0.5 to 500 ms
- Single burst measurements — sample and hold outputs
- Analog and Digital readouts
- Plug-in concept for broad versatility
- Internal delay to eliminate transients
- Differential measurements for high accuracy

APPLICATIONS:

- Automatic high speed testing of components
- Measurement of electro-acoustic transducers under low and high power
- Use as phase-lock detector for low level signal bursts
- Analysis of acoustical fields
- Measurement of real and imaginary input power

The 202 Vector Computing System provides real time computation of vector components, phase and magnitude, requiring only a single sample of the AC test signal and AC reference for measurement. Direct reading digital and analog displays are produced, with provision for connection to X-Y or strip chart recorders or digital computers.

Consisting of a Model 202 or 202A Main Frame, a selectable plug-in and a readout unit, this system can be used for direct computation of impedance, admittance and transfer function under a wide range of voltages, currents and frequencies.

Its rapid computing speed is designed for simultaneous graphic recording of all four outputs, and is particularly useful for frequency plotting or complex immittance plane recording. Yet its sample and hold outputs are excellent for single burst measurements. Measuring on external command, this system is well suited for automatic high speed testing of components as well as complete network analysis.

VECTOR COMPUTER MAIN FRAMES 202 and 202A

Heart of a 202 system is the Vector Computer Model 202 or 202A. The Model 202 accepts two normalized AC signals from the plug-in, producing DC voltages proportional to real and imaginary components. In addition, the Model 202A also produces simultaneously DC voltages proportional to magnitude and phase. Utilizing a unique sampling and integrating technique, effects of noise and harmonics are considerably reduced as compared to systems which utilize peak reading techniques for magnitude and zero axis crossings for phase.

PLUG-INS:

Plug-ins 202-PA-2505 and 202-PA-2506 are for general purpose use, and complement each other to cover a frequency range of 100 Hz to 10 Mhz. Each consists of a plug-in section and a probe unit, with 10 ft of cable. Model 202-PA-2505 measures up to 5,000 v rms, and is completely programmable by computer. Model 202-PA-2506 covers the complete 150 Khz to 10 Mhz band without frequency band switching.

Both units are capable of the unique Dranetz differential admittance measurement as well as impedance and transfer function. Both plug-ins also provide auto-ranging of the DVM's on the Model D12 readout.

READOUTS:

Two panel readouts are available. Model D10 provides two 5″ analog meters, mounted with accessory circuits, on a 5¼″-high panel for 19″ rack mounting. Model D12 (shown in photo) consists of two direct reading digital meters, with BCD outputs mounted on a 3½″-high panel for 19″ rack mounting.

MAIN FRAME SPECIFICATIONS

Repetition Rates:

A. On CW, automatic recycling at approx. 10 samples/sec.

B. On gated AC, externally triggered, from 100 samples/sec to 1 sample per 200 seconds.

C. Single pulse operation.

Sampling Times: selectable from 0.5 to 500 ms; 4 - 8 cycles min.

Hold Times: up to 3 minutes.

Inputs:

A. Signal power: see E-I limits, plug-in chart, below.

B. Command (not required for CW). 5 v pulse or gate into 3KΩ, related to turn on of signal source.

DC Outputs (all simultaneous):

A. (202 and 202A): 0 to ±5 v fs, proportional to real and imaginary components.

B. (202A only): 0 to ±1.80 v proportional to 0 to ±180°. 0 to 1 v fs proportional to magnitude.

Monitor & Command Outputs:

Signal or pulse outputs for AC signal monitoring and sampling time presentation, Z axis scope intensification, scope synch, pen lift, out-of-limit disabling, and blanking.

Front End Plug-Ins:

Accommodates all Dranetz Series 202-PA-plug-ins directly and all Dranetz 100-PA-plug-ins by use of adapters 202-PAR-2501 and 100,713.

Readout Compatibility:

Compatible with analog DC meters (e.g. Dranetz Model D10), Digital meters (e.g. Dranetz D12), oscilloscopes, X-Y recorders and A-D converters.

Input Power: 105 - 125 v, 60 Hz, 120 watts max.

Mechanical:

A. Size: 8¾″ high x 17″ wide x 18″ deep (will fit into 24″D hatch). Carrying handles and slides for 19″ rack mounting.

B. Weight: 56 pounds; shipping 95 pounds.

PLUG-IN SPECIFICATIONS

Model	Measuring Function	Freq. Range	Z - Y Ranges	E-I Limits	Nominal Accuracy *	Operation	Probe Size
202-PA-2505	Impedance, Differential Admittance and Transfer Function	50 hz to 300 Khz	Z: 1 to 10^5 Ω Y: 10 to 10^6 μ℧	1 - 5000 v rms 10 ma - 30 A rms	±2° phase ±2% fs Amplitude	Manual and Programmable	3½″x12″x12″
202-PA-2506		150 Khz to 10 Mhz	Z: 2.5 to 10^4Ω Y: 10 to 25 K μ℧	1 - 100 v rms 1 ma - 1 A rms	±2° phase ±2% fs Amplitude	Manual	3″x4″x6″

* Higher accuracy in differential mode

See Section 4900 for our pages on Synchro Converters.

DRANETZ

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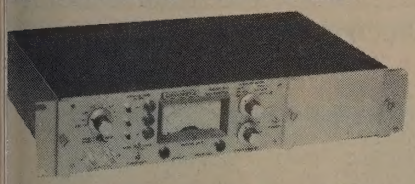
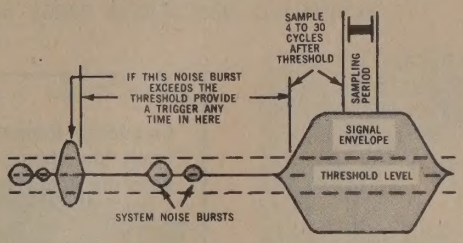
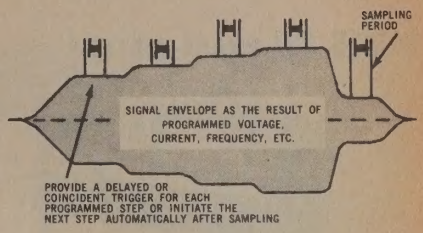
PLAINFIELD, NEW JERSEY 07062 • TEL. (201) 755-7080

SERIES 215
AC SAMPLING VOLTMETER







Measures average value of signals in sampling periods as short as 100 μsec.

FEATURES:

- Selectable sampling periods
- Internally delayed or externally triggered sampling for measurement of any selected portion of signal waveforms
- Excellent noise discrimination during signal measurement
- Can be triggered externally or by internal sensing of signal
- Sample and hold d-c output for DVM or a-to-d conversion and automatic print out
- Frequency range of 100 Hz to 1 Mhz
- Sampling rates to 2,000 per second
- For use to 5,000 vrms, 50 Amps rms with available probes

APPLICATIONS:

High speed component testing; analysis of time varying or transient effects; measurement of direct or reflected acoustical signals; and measurement and control of signal burst levels applied to radiators or receivers (when used with Dranetz Series 501 Servo Control Unit).

Series 215 is a true averaging AC voltmeter for rapid sampling and analysis of complex A-C signals in the form of single transients, repetitive voltages or multiplexed signals. Its unique integrating design makes possible averaged measurements within a time as short as one cycle and provides discrimination against background noise and spikes.

SPECIFICATIONS

Frequency Range: 100 Hz to 1 Mhz
Input Impedance: 1M ohm, shunted by 50 pf
Input Signal Levels: 6 voltage ranges, 0.1 to 5 vrms, fs
For extended ranges use one of the following probes:
Tektronic Models: P6006 (1-50 vrms), P6007 (10-500 vrms), P6013 (100-5,000 vrms);
Dranetz Models: TR2004 (1-50 A rms), TR-2005 (0.1-5A rms), Threshold adjustable 4-20% fs.
Input Circuit Configurations: single ended, floating ground; differential.
Repetition Rates:
CW: 10 samples/sec with internal generator
Gated AC: 1 sample/2.5 sec to 1,000 samples/sec, without internal delay; with internal delay, 20 msec minimum off-time required between pulses.

Triggered Input: square wave, pulse or step, ±5 v peak.

Single Shot: Output changes to 99% of change from previous reading. Shift less than 1% FS/minute.

Sampling Periods: 0.1, 1 and 10 msec. Requires min of 1 full cycle.

Delay Control to Mask Transients: External or Internal. Controlled on internal, 4 to 30 Hz delay, selectable, below 0.5 Mhz; 6 to 60 μsec delay above 0.5 Mhz.

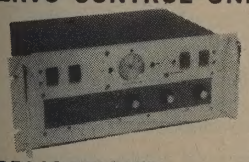
Accuracy: ±2% at reading, ±½% fs, single ended input.

Monitor and Control Outputs: Synchronizing pulse (+10 v, 39kΩ) for external equipment; Monitor output: 2 v p-p with 0.5 v pedestal indicating sampling time.

Output Indication: Panel meter calibrated in rms. DC output 0-5 v fs, drives > 10K ohm load.

Indicating lamps: For overload, correct sampling and sampling period.
Input Power: 115 v, 50-60 Hz, 18 watts.
Size: 12" x 3½" x 15½" deep, equipped for 19" rack mounting.
Weight: 16 lbs; shipping, 25 lbs.

SERIES 501A
SERVO CONTROL UNIT



FEATURES:

- Precision control of signal level
- Broad frequency range of 100 Hz to 1 MHz
- Wide dynamic range of 60 db
- Ground isolation of signals

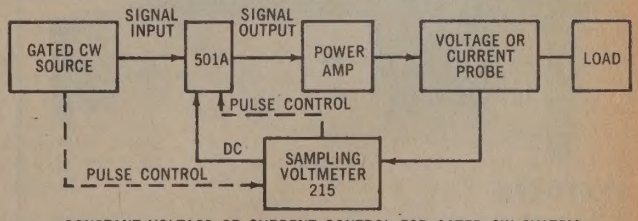
APPLICATIONS:

- For CW and gated CW control
- Measurement of complex impedance and admittance under high power
- Constant level control for acoustical calibrations
- Vibration amplitude control for mechanical impedance measurements
- Parameter control in programmed industrial process systems.

Series 501A Servo Control Unit maintains the level of a signal at a precise value, regardless of fluctuations in source level or load. By proper scaling of signals the unit will control voltage, power, acceleration, velocity, displacement, pressure or other physical functions. The 501A's servo system senses the voltage at a sampling point, compares it with an internal reference voltage and controls the position of a precision potentiometer, to adjust the voltage to a predetermined level.

SPECIFICATIONS:

Modes of Operation:
(1) CW (2) CW or Gated CW when used with Dranetz Model 215
Frequency Range:
(1) CW: 100 Hz to 100 kHz (2) CW or Gated CW with Dranetz Model 215: 100 Hz to 1 MHz



CONSTANT VOLTAGE OR CURRENT CONTROL FOR GATED CW SYSTEM

Signal Input: Voltage level, 3 v rms max. Input impedance, 2 kΩ, approx. Leads: 2 wire, single-ended, both isolated from ground.

Signal Output: Level: From 0 to 60 db below input level. Input impedance of equipment following (e.g., power amplifier) should be 10kΩ or higher. Input leads to amplifier: 2 wire, single-ended.

Feedback Control Voltage or Current: CW (w/out Model 215), between 0.5 and 5 v rms into 50,000 ohms. CW or Gated CW (w/Model 215): Same current and voltage range as 215 with or without probes. (See above).

Control Characteristics: Dynamic range: 60 db. Level control — Maintains feedback control voltage within ±2% up to 500 Khz for change in input signal or power amplifier load of ±30 db. Response time — Approx. 0.5 sec.

Oversignal Protection: Automatic signal cutoff for over-level signals.

Power Required: 115/230 v, 60-400 hz, 0.6 amps rms.

Size: 7" high x 16½" wide x 11½" deep equipped for mounting 19" rack. **Weight:** 25 lbs.; shipping, 40 lbs.

See Section 4900 for our pages on Synchro Converters.

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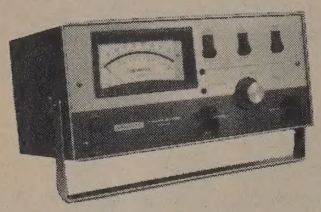
SERIES 301 PHASE METERS



FEATURES:

- 70 db input level range
- 1° accuracy, 0.1° resolution
- 5 Hz to 0.5 Mhz frequency range
- 0° to 360° phase range
- 0 to 3.6 vdc analog output

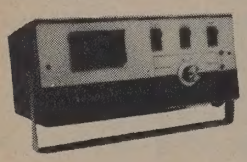
Series 301 Phase Meters are low cost, direct-reading instruments for measurement of the phase difference between two sinusoidal signals.

Phase angle is indicated by a large taut band meter with mirror scales of 0 to 36, 0 to 90, 0 to 180, and 0 to 360 degrees. The 70 db input range of the 301 is achieved without range switching. Operating controls include an input reversal switch and an "Add 180°" switch which allows the operator to avoid the 0°/360° discontinuity. Model 301A also produces a DC voltage output proportional to angle.

SPECIFICATIONS

Frequency Range: 5 Hz to 500 Khz
Input Impedance: 100 KΩ
Absolute Accuracy (independent input levels):
±1°, 45 Hz to 40 Khz, inputs > 200 mv
±1.5°, 7 Hz to 100 Khz, inputs > 200 mv
±2°, 5 to 7 Hz and 100 to 200 Khz
1° additional for each additional 100 Khz
Minimum Input Levels:
1 v rms, 5 Hz to 30 Hz
300 mv rms to 50 mv rms, 30 Hz to 200 Hz
50 mv rms, 200 Hz to 50 KHz
50 mv rms to 500 mv rms, 50 Khz to 500 Khz
Maximum Input Levels:
160 v rms
Panel Meter:
6" taut band movement
0.5% fs linearity (add to accuracy)
Rectangular Wave Output: 1.5 v p-p, 5 nsec rise time
DC Output (Model 301A or 301AR only):
0 to +3.6 vdc for 0 to 360°
Z out less than 50Ω
AC Power Input: 115/230 v 50 to 400 Hz, 0.4 Amps rms
Case:
7" x 16½" x 11½". For 19" rack mount specify option R.
Weight: 18 lbs.; shipping, 27 lbs.

SERIES 302 PHASE METERS



Series 302 Phase meters have all of the features of Series 301A instruments with the addition of an easy to read Digital Display. Display ranges are 0 to 180° and 0 to 360°, with resolution up to 0.1°. Readout accuracy is ±0.2°. Analog output is standard on all 302 series instruments. In addition, BCD outputs are available. Except for the above differences, 302 specifications are identical to those of the 301 Series.

SERIES 305 PHASE METERS

FEATURES:

- No operating controls
- Excellent stability — no adjustments
- 0.1° accuracy independent of input voltage
- Versatile plug-in concept
- Rejects harmonics, distortion and noise
- Digital readout and outputs

Series 305 Phase meters represent a totally new concept in the measurement of phase angle. A precision phase angle measurement requires only connection of the signals and reading the 4 digit display. The 305 senses signal frequency and adjusts its output time constant for maximum speed commensurate with low ripple. Its unique design locks out high frequency noise. This instrument is also insensitive to waveform distortions which can cause errors of as much as 0.6° per % distortion in other instruments.

Three main frames provide a selection of outputs suited to the individual need. Two plug-ins available are: the Model 305-PA-3001, which achieves exceptional accuracy over a broad dynamic range by "auto ranging" in each channel; and the 305-PA-3002, with high accuracy over limited dynamic ranges. Other plug-ins can also be furnished.

SPECIFICATIONS — SERIES 305 MAIN FRAMES

MODEL 305 PHASE TO DC CONVERTER

Analog Output: −1.800 to +3.600 vdc. 10 mv/degree sensitivity. Time constant variable from 10 to 700 ms by signal freq.
Output stability: ±0.1° per month
Operating Modes: Zero to +360° and 0 to ±180°. Automatic switching at <−160°, >+160°, <+20°, and >+340°
Self-Check: −180°, Zero, +180°, and +360°
Error Rejection: False triggers due to high frequency noise are locked out for signal to noise ratios better than 10:1. Errors and fluctuations due to waveform disymmetry or low frequency noise reduced by at least 10:1
Input Power: 115 v - 50-400 Hz - ½ Amp.
Size: 3½" rack/portable package; 16" depth.
Weight: 20 lb.; shipping 30 lb.

MODEL 305A PHASE METER

Same as Model 305 with the addition of 3½ digit readout: 0 ±180.0° indication with −180° offset for coverage of +180° to +360°. ±0.2° accuracy (add to basic accuracy).

MODEL 305B PHASE METER

Same as Model 305 with the addition of full 4 digit readout: −180.0° to +360.0° indication. ±0.15° accuracy (add to basic accuracy). 1248 BCD Outputs. Read and hold on command.

305 SERIES PLUG-IN SPECIFICATIONS (WHEN IN MAIN FRAME)

Model	Freq. Range	Input Levels[1] (independent)	Accuracy[2] (w/independent level)
305-PA-3001	5 Hz to 500 Khz[3]	10 mv to 50 v rms direct; can be extended to 40 Kv rms with Tektronix probes.	±0.1°, 50 mv to 50 v rms from 50 Hz to 50 Khz
305-PA-3002	5 Hz to 500 Khz[3]	10 mv to 500 mv rms direct; can be extended to 500 v rms with Tektronix probes.	±0.1°, 50 mv to 500 mv rms from 50 Hz to 50 Khz

(1) Other levels available on special order.
(2) For sinusoidal signals; can be used with square wave inputs over limited frequency range. Contact plant for further information.
(3) Frequency limited by plug-in. Higher frequency plug-ins also available (up to 10 MHz).

See Section 4900 for our pages on Synchro Converters.

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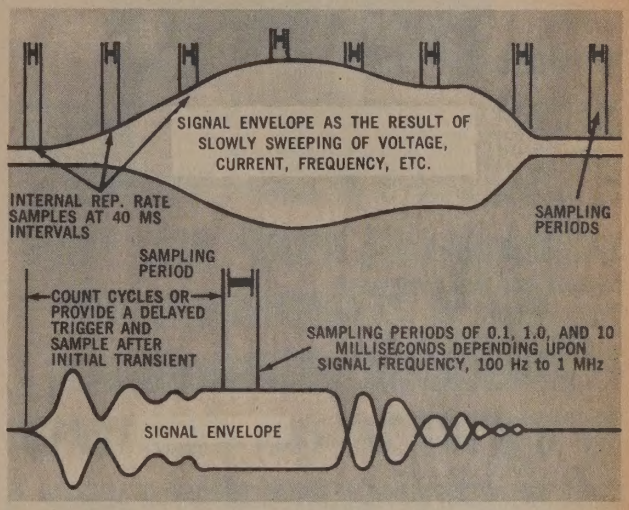
SERIES 220
LOG SAMPLING VOLTMETER

Direct digital readout of CW, Gated AC, or rapidly varying AC signals



FEATURES:

- Frequency range - 100 Hz to 1 Mhz
- Sample and hold output - analog and digital outputs
- Single or repetitive measurement to 1000 samples per second
- Sampling times down to 100 μsec
- Output independent of sampling time or duty cycle
- 84 db dynamic range - 300 μv to 5 v (to 5 kv with voltage probes)
- Logarithmic digital display and BCD outputs
- Complete programmability for either remotely controlled or computer controlled test systems

APPLICATIONS:

- High speed component testing
- Analysis of time-varying or transient effects
- Measurement of direct or reflected acoustical signals
- Measurement of signal burst levels applied to radiators or receivers.

The Model 220 Sampling Voltmeter is a gated, average responding voltmeter for measuring amplitude of AC signals during a short sampling time. Measurement can be made of rapidly varying CW signals, gated AC signals (tone bursts), or single shot AC signals. Measurements are made at any predetermined time in a selected period which can be as short as 1 cycle of the signal.

Sample and hold output circuitry, combined with internal logarithmic conversion, provide several simultaneous outputs: a digital panel meter reading directly in DBV (ref: 0 DBV = 1 v rms), a linear DC output, two logarithmic DC outputs, and a logarithmic digital output (BCD code) corresponding to the digital panel meter reading. Provision is made for insertion of an external DC signal which allows both the digital display and BCD output to correspond to other logarithmic parameters without effecting instrument calibration.

This instrument combines internal low and high pass filtering, a unique average responding detector, and logarithmic conversion to offer an exceptionally wide dynamic range, high sensitivity, wide frequency range, short sampling time and low susceptibility to noise and signal distortion compared to peak responding AC instruments.

SPECIFICATIONS

Signal Frequency Range: 100 Hz to 1 Mhz

Accuracy: ±0.3 db to 200 Khz, ±0.5 db 200 Khz to 1 Mhz

Resolution: Analog output - infinite Digital readout and output: 0.1 db

Dynamic Input Range: −70 to +14 dbv (ref. 0 dbv = 1.0 v rms) (0.3 mv to 5 v rms)

Input Circuit Configuration: Single ended, front and rear panel input jacks (BNC)

Signal Input Impedance: 1 megohm

Output Indication: (1) Digital panel meter: −70 to +14 dbv, ±199.9 db max. indication with external DC scaling input (2) DC analog outputs, Zo = 600Ω, drives 10kΩ min. load resistance:

A. Log, 0.05 v/db, +0.0 to +4.2 v out

B. Log, 1mv/db −70.0 mv to +14.0 mv (0 v dc out ref 1 vrms in)

C. Linear, +0.5 to +5 v dc

(3) BCD outputs, 12 lines (8-4-2-1 BCD)

Repetition Rate: Internal trigger generator approx. 10 samples/second. External trigger: 1 to 4 ms required between samples for analog DC outputs depending upon sample time; 10 msec min repetition rate for digital display and BCD outputs.

Sampling Period: Periods approx. 0.1, 0.3, 1, 3 and 10 msec. Requires min of 1 full cycle.

Filters: 0.1, 1 and 10 Khz high pass; 0.01, 0.1 and 1 Mhz low pass.

Sample and Hold Facility: Output transfers from level to level without discharge. DC outputs drift less than 0.2 db per minute after last sample. Digital output can be programmed for infinite hold.

Trigger Input (to initiate sampling): Square wave, pulse, or step, ±5 v peak, rise time < 50 μsec (10-90%) transformer input, ungrounded, input impedance approx. 5k ohms.

Delay Control to Mask Signal Transients: Below 0.5 Mhz, selectable cycle count 4 to 300 cycles; above 0.5 Mhz, selectable time delay of 8 to 600 μsec.

Monitor and Control Outputs: (1) Synchronizing pulses for external equipment. (2) AC monitor outputs: Filtered and unfiltered signal level approx. 2V pk-pk; filtered output has 0.5 volt pedestal indicating sampling time. (3) Fault indicating signals available at rear panel.

Visual Indicators: For overloads, correct sampling, sampling period, low and high pass filter selection, incorrect sampling and loss of signal input.

Compatibility: Compatible with Dranetz Gating/Timing Generator 206, and other pulse generators.

Programmability (rear connectors): Compatible with DTL and TTL; also operable by remote contact closures. Filter selection, sample period, timing and other functions are programmable.

AC Input Power: 115v, 50-60 Hz, 35 watts

Size: 3½" high x 17" deep x 17" wide equipped for 19" rack mounting.

Weight: 25 lbs.; Shipping, 35 lbs.

See Section 4900 for our pages on Synchro Converters.

ACT 1

Accurate Counter Timer Model 461

INTRODUCTION

Dynasciences Accurate Counter Timer (ACT 1) incorporates integrated circuitry to provide a small, lightweight, multi-purpose counter/timer with 10 millivolt sensitivity to measure frequency, period, multiple period, frequency ratio, multiple frequency ratio, time intervals and to totalize. Standard configuration provides a counting rate from DC to 20 MHz, and displays measured units on a seven-digit display with storage. The display includes an in-line decimal point and units annunciator. BCD output and remote programming are standard. A precision crystal oscillator controls the time base permitting time measurements with 0.1 microsecond resolution.

Versatility in circuit design permits optional eight-digit display, in-field modification extending the frequency measuring capability to 125 MHz, and both high and ultra-high stability oscillators.

SPECIFICATIONS

FREQUENCY MEASUREMENT
Range: D.C. to 35 MHz
Input: A Channel
Function: Frequency of A signal
Gate Times: 0.1 usec to 100 sec in decade steps
Readout: MHz, KHz or Hz with automatic decimal point
Accuracy: Plus or minus 1 count plus or minus time base error

PERIOD MEASUREMENT
Range: 0.1 usec to 10^9 sec (10^{10} with option No. CO1)
Input: A Channel
Function: Period of A signal
Frequency Counted: 0.01 Hz to 10 MHz in decade steps
Readout: usec, msec, sec, Ksec, with automatic decimal point
Accuracy: Plus or minus 1 count plus or minus time base error plus or minus trigger error

MULTIPLE PERIOD MEASUREMENT
Range: 0.1 usec to 10^9 sec (10^{10} with option No. CO1)
Input: A Channel
Function: Period of A signal x 10^m
Frequency Counted: 10 MHz
Multiplier: m = 0 to 9 decade steps
Readout: usec's
Accuracy: Plus or minus 1 count plus or minus time base error plus or minus $\frac{\text{trigger error}}{m}$

RATIO AND MULTIPLE RATIO MEASUREMENT
Range: D.C. to 20 MHz, both inputs
Input: A and B Channels
Function: B/A x 10^m
Multiplier: m = 0 to 9 decade steps
Readout: 7 digits (8 digits optional)
Accuracy: Plus or minus 1 count of B plus or minus $\frac{\text{trigger error of A}}{m}$

TIME INTERVAL MEASUREMENT
Range: 0.1 usec to 10^9 sec (10^{10} with option No. CO1)
Input: A and B Channels
Function: Time A to B
Frequency Counted: 0.01 Hz to 10 MHz in decade steps
Readout: usec, msec, sec, Ksec with automatic decimal point
Accuracy: Plus or minus 1 count, plus or minus trigger error A, plus or minus trigger error B, plus or minus time base error

SCALE MEASUREMENT
Range: 1 to 10^{16} (10^{17} with option No. CO1)
Input: A Channel
Function: Total pulses into A x m
Multiplier: m = 0 to 9 in decade steps
Pulse Pair Resolution: 50 ns. for 25 ns. min. width pulses
Readout: 7 digits (8 digits optional)
Accuracy: Absolute

A CHANNEL AND B CHANNEL
Input Impedance: 1 Megohm shunted by 30 pf max
Attenuator: x1, x10, and x100
Trigger Level Range: ±1 volt times attenuator setting (±0.1 volt in 10 MV setting)
Slope Selection: Positive slope or negative slope
Input Coupling: AC or DC
Overvoltage Protection: To 600 volts combined AC plus DC

A CHANNEL
Frequency Range: D.C. to 35 MHz
Input Sensitivity: 100 mv rms, D.C. to 35 MHz
10 mv rms, 10 Hz to 15 MHz

B CHANNEL
Frequency Range: D.C. to 20 MHz
Input Sensitivity: 100 mv rms, D.C. to 20 MHz
10 mv rms, 10 Hz to 15 MHz

EXTERNAL CLOCK INPUT
Frequency Range: 10 Hz to 15 MHz
Input Sensitivity: 1.0 volt rms
Input Impedance: 1000 ohms
Input Coupling: AC
Maximum Input: ±10 volts peak

CLOCK OUTPUT (10 MHz OUTPUT)
Frequency: 10 MHz
Output: 0.5 V rms into 1000 ohms

TRIGGER ERROR A AND B CHANNEL
Trigger error is less than 0.3% of one period for sinusoids having 40 db or more signal to noise ratio

BCD OUTPUT
Function: Provides electronic representation of display register along with positive going print command and hold-off control. (negative print command available).
Output Code: 8421 BCD
Output Levels: 7400 TTL Compatible positive true, positive level

REMOTE PROGRAMMING
Parameters: Remote selection of counter functions and counter time bases
Selection: Single line for each parameter. One line per time base
Input Levels: Switch to ground or saturated NPN transistor capable of accepting 10 mA when on

MECHANICAL SPECIFICATIONS
☐ **Height:** 3.5 inches ☐ **Width:** 17.0 inches
☐ **Length:** 16.25 inches ☐ **Weight:** 16.0 lbs.

POWER REQUIREMENTS
☐ **Voltage:** 115 or 230 VAC
☐ **Frequency:** 50-60 or 400 Hz ☐ **Input Power:** 45 watts

OPTIONS AVAILABLE

CO1 EXTENDED DISPLAY REGISTER
Function: Adds eighth display position

CO2 ULTRA-HIGH STABILITY OSCILLATOR
Time Base Frequency: 10 MHz
Crystal Frequency: 1 MHz
Aging Rate: ±1 x 10^{-9} per day
Temperature Stability: ±5 x 10^{-9} from 0°C to 50°C
Input Power (115 V or 230 V) must be specified at time of order
Crystal and Oscillator are enclosed in oven and oven remains operating when power switch on counter is off. Oven power is supplied from a D.C. voltage regulator.

CO3 125 MHz PRE-SCALER
Function: Increases maximum counting rate to 125 MHz
Frequency Range: 10 Hz to 125 MHz
Input Sensitivity: 100 mv rms
Input Impedance: 1 Megohm shunted by 30 pf max.
Input Range for Proper counting: 100 mv to 100 Volts rms—
10 Hz to 10 MHz
10 MHz to 125 MHz
100 mv to 10 Volts rms—
Input Coupling: AC
Overvoltage Protection: To 600 Volts combined D.C. plus A.C.

CO4 HIGH STABILITY OSCILLATOR
Time Base Frequency: 10 MHz
Crystal Frequency: 5 MHz
Aging Rate: ±1 x 10^{-8} per day
Temperature Stability: ±1 x 10^{-7} from 0°C to 50°C

CO5 RACK ADAPTER MOUNTING INCLUDING SPECIAL SIDE PANEL COVERS

EXTERNAL FREQUENCY STANDARD INPUT
Frequency Accepted: 1 MHz
Input Sensitivity: 1.0 volt rms
Input Impedance: 1000 ohms
Maximum Input: 2 volts rms

TIME BASE
Time Base Frequency: 10 MHz
Crystal Frequency: 5 MHz
Aging Rate: ±3 x 10^{-7} per day
Temperature Stability: ±4 x 10^{-6} from 0°C to 50°C

TIME BASE OUTPUT
Frequency: 0.01 Hz to 10 MHz in decade steps
Amplitude: 3.5 volts p-p, nominal (TTL Compatible)
Output Impedance: 200 ohms, nominal

PRICE

Standard Configurations: $1295.
Option CO1, Eighth Digit: $100.
Option CO2, Ultra-high Stability Oscillator: $475.
Option CO3, 125 MHz Pre-scaler: $425.
Option CO4, High Stability Oscillator: $185.

DYNASCIENCES CORPORATION INSTRUMENT SYSTEMS DIVISION
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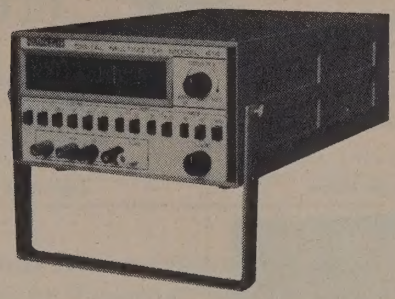
DM 414 MAXI RANGER



DM 414 Specifications — Standard Multimeter and Options

Ranges and Accuracy: DC volts: .05% (.02% optional) R* + .01% F.S. in 10, 100 and 1000 mV ranges.—.05% (.01% optional) R* + .01% F.S. for 10, 100 and 1000 V ranges. 100% overrange.

DC current: .05% R + .01% F.S. in 10, 100, 1000 μamp and 10, 100 and 1000 mA ranges. 100% overrange.

Resistance: .05% R + .01% F.S. in 10, 100, 1000 ohm and 10K, 100K and 1000 Kohm ranges. .5% R + .05% F.S. in 10 Megohm range. 100% overrange.

Optional AC volts 50 Hz to 10K Hz: — 1% F.S. in 100 and 1000 mV, 10, 100 and 1000 V ranges. 100% overrange.

Optional AC current 50 Hz to 10 KHz: 1% F.S. in 10, 100 and 1000 μamp and 10, 100 and 1000 milliamp ranges. 100% overrange.

Stability: Accuracy will remain as specified for not less than 90 days from calibration over the temperature range of 15°C to 35°C.

Reading Time: 10 readings per second at full scale.

Common Mode Rejection: >100 dB at 60 Hz and its multiples, with 1KΩ source imbalance.

Normal Mode Rejection: >30 dB at 60 Hz (integration).

Automatic Range Change Time: Less than 1 sec.

Input Current: 10^{-9}A (All DC voltage ranges).

Specifications subject to change without notice. * R = Reading

FIRST LOW PRICED DVM TO MEET THE REQUIREMENTS OF THE DESIGN ENGINEER, PRODUCTION DEPARTMENT, AND THE CAL LAB, IN A SINGLE LOW-PRICED INSTRUMENT

FROM $795

TANDARD FEATURES

C Volts: 1 μV/digit to 1000 V (6 ranges)
esistance: 4 wire Kelvin measurements, 1 Milliohm to 10 Megohms. F.S. (7 ranges)
C Current: 1 na/digit to 1 amp (6 ranges)
00% overrange

PTIONS

C Volts: 10 μV/digit to 1000 V (5 ranges)
C Current: 1 na/digit to 1 amp (6 ranges)
splay Storage — Autoranging — BCD Outputs (1248 T²L Compatible) — Rack Mounting

SPECIAL FEATURES

Extensive MSI for reliability, compact size, and low weight
High Common Mode and Normal Mode Rejection (see specifications above)
Rugged Cyclolac® Cabinet: Strong, lightweight. Scratches and mars don't show
Overload Protection: 1100 VDC or peak AC on DCV ranges, 300 VDC or peak AC on all other ranges
Automatic Polarity: On DC, mV and Current functions
Combination Handle/Tilt Bar: Standard equipment. Adjusts to any convenient viewing angle

XPENSIVE DVM FEATURE & CAPABILITY AT VERY LOW COST

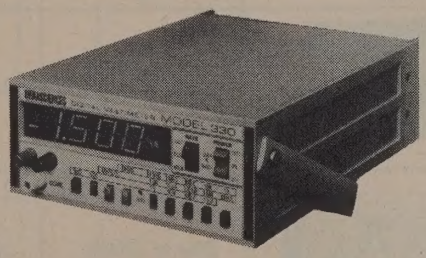
DM 330 BASIC SPECIFICATIONS

Display: 3 full digits, reads 1500 at full scale. Polarity, range, and units. With AC option — AC volts.

Ranges: DC Volts: ±1 mv/digit to ±1000V full scale. DC input resistance, 10 meg Ω constant. DC current: ±1 na/digit to ±10 ma full scale, (Higher ranges optional).

AC volts (optional): 50 Hz to 10 KHz with 10 megohm input resistance shunted by 110 pF.

Resistance: 1Ω/digit to megohms, full scale.



EATURES

ull Multimeter Capability: DC volts, AC volts, DC current, KΩ measurements, all built in

igh Accuracy: ±.1% ±1 digit on DC volts, KΩ and current functions. ±1% ±1 digit on AC volts

100 dB Common Mode Rejection

Unique Current Measurement Circuit: Provides sensitivity of 1 na/digit

High Speed Readings: Up to 10 readings/sec.

Portable: 7½ lbs. ½ rack size (8½" wide x 3½" high x 12" long)

Overrange Capability: 3 full digits plus overrange digit (50%)

DM 330 (with AC volts): $399

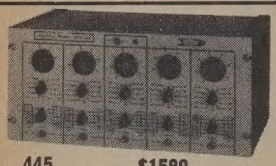
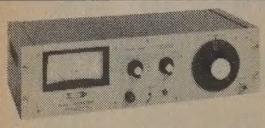
DD 330 (without AC): $369

DYNASCIENCES CORPORATION

INSTRUMENT SYSTEMS DIVISION
9601 CANOGA AVE. • CHATSWORTH, CAL. 91311 • (213) 341-0800 • TWX 910-494-1951 • TELEX 67-3382

DYTRONICS

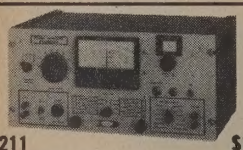
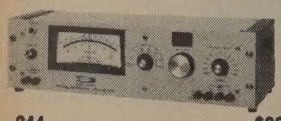
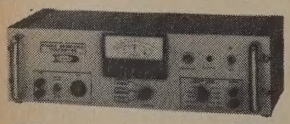
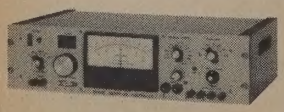
PHASE SHIFTERS RATIO TRANSFORMERS FILTER/AMPLIFIER/VOLTMETER TELEMETRY CALIBRATOR

Model Number	Applications & Features	Frequency Range	Accuracy	Measure Phase	Shift Phase	0° to 360° Coverage Without Ambiguity?
 445 $1580	(1) Uses include steering of Sonar beam. (2) Consists of five separate phase shifters in single package. (3) Constant gain.	100hz to 50khz	±5%	No	Yes	Yes
 717S $1060	(1) Tunable narrow band filter. (2) Amplifier. (3) Voltmeter (4) Spectrum Analyzer.	20hz to 20khz	±2%			
RT501 $555	(1) High Frequency Decade Voltage Divider	4khz to 500khz	1ppm below 100hz—10ppm above 100khz			
614 $3,950	(1) Telemetry Subcarrier Calibrator (2) Calibrator	Channels 1-21 and A-H	±.1%			

DYTRONICS

PHASE SENSITIVE VOLTMETERS

- QUADRATURE VOLTAGE
- IN-PHASE VOLTAGE
- FUNDAMENTAL VOLTAGE
- TOTAL VOLTAGE
- PHASE ANGLE

Model Number	Frequency Range As Standard VTVM	Frequency Range As A PSVM	Frequency Range Where Signal is Filtered	Full Scale Sensitivity	Null Sensitivity	Internal Phase Shifter?
 211 $1,990	100hz to 100khz	310hz to 10khz	310hz to 10khz	1 mv	3 μv	Yes
 244 $800*	10hz to 200khz	50hz to 15khz	any single frequency	300 μv	2 μv	Yes
 242 $710	20hz to 60khz	20hz to 20khz	None	1 mv	2 μv	No
 250 $1,380	10hz to 100khz	30hz to 20khz	1, 2, 3, or 4 frequencies	300 μv	2 μv	Yes

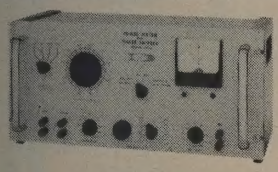
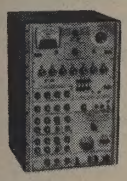
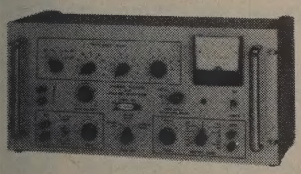
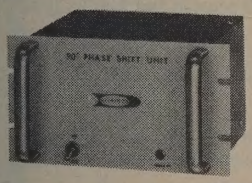
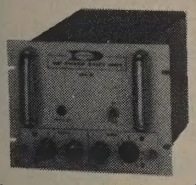
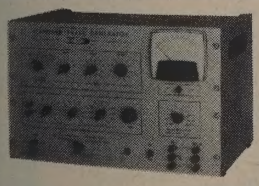
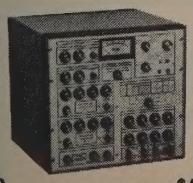
*Subject to change

See Additional Products Section 2550

DYTRONICS

PHASE ANGLE MEASUREMENT AND STANDARDS

Instrumentation for the measurement and generation of phase angle. This advanced measurement technique is recognized as the finest throughout the world. For complete information contact Dytronics Company Inc., 4800 Evanswood Drive, Columbus, Ohio 43224.

Model Number	Frequency Range	Accuracy	Measure Phase?	Shift Phase?	0° to 360° Coverage Without Ambiguity?	Applications & Features
 301A $910	10hz - 30khz	±2°	Yes	Yes	Yes	(1) General laboratory & testing use. (2) Phase indicated on continuous 360° dial.
 311/RT-1/717s $7,800	30hz - 10khz	±0.015	Yes	Yes	Yes	(1) Primary Phase Angle Standard for metrological applications. (2) Self-calibrating. (3) Resolution of 12 microdegrees. (4) Up to 125 volt input signal level.
 341 $1,180	400hz or other specified single frequency	±0.1°	Yes	Yes	Yes	(1) For applications requiring high accuracy at a single frequency. (2) Dials read degrees in decimal form. (3) Not influenced by harmonics.
 400K $480	375hz-425hz	±0.05°	No	Yes	No	(1) Produces precision 90° phase shift. (2) For applications requiring precise quadrature voltage.
 401 $790	Any single frequency from 50hz to 50khz	±0.01°	No	Yes	No	(1) Produces very precise 90° phase shift. (2) Frequency is changed by plug-ins. (3) 115 volts output.
 410 $1830	0.1hz-120khz	±0.15°	No	Yes	Yes	(1) General laboratory Phase Angle Standard. (2) High accuracy over broad frequency range.
 312 $4,300	4khz - 500khz	±0.03°	Yes	Yes	Yes	(1) Primary Phase Angle Standard for metrological applications. (2) Self-calibrating. (3) Resolution better than 12 milli-degrees. (4) Up to 15 volt rms input signal level.

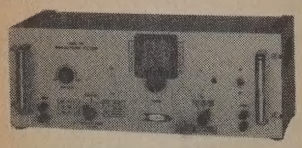
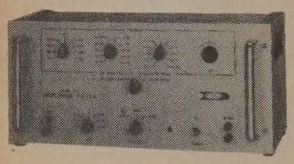
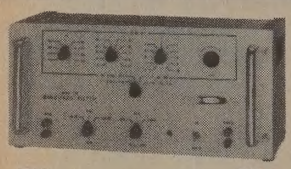
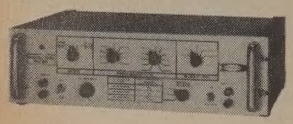
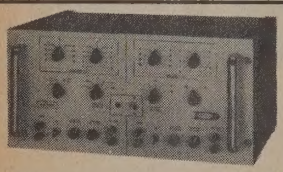
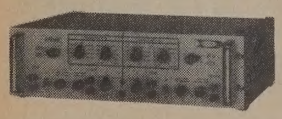
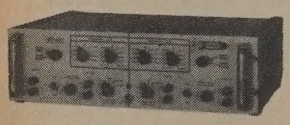
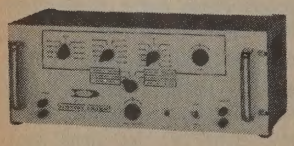
See Additional Products Section 2550

DYTRONICS

TUNABLE FILTERS

• Spectrum Analysis • Sound and Vibration Analysis • Digital-Data Filtering • Sonar Development and Studies • Separation of Communications Carriers • Null Sensing • Medical Research • Servo Operation • Geophysical Investigations.

Dytronics Company, Inc.
4800 Evanswood Drive, Columbus, Ohio 43229

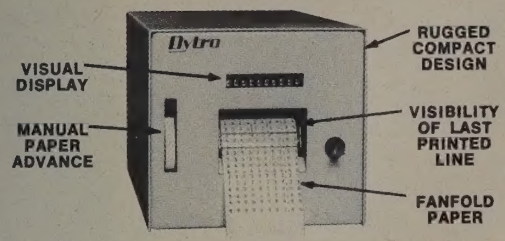
Model Number	Tuning Range	Description	Special Features
 718 $1,080	3khz - 400khz	Narrow-band tunable filter	(1) Continuously tunable filter. (2) High skirt selectivity.
 719 $850	0.1kz - 1khz	Ultra low frequency band-pass filter	(1) Narrow band-pass. (2) Ultra low-frequency operation. (3) Continuously tunable.
 720 $810	1hz - 10khz	Low-frequency band-pass filter	(1) Narrow band-pass. (2) Variable gain and bandwidth.
 721 $1,110	1hz - 100khz	Digital-data filter	(1) Adjustable delay distortion. (2) Adjustable cutoff rate. (3) D-C coupled and low D-C drift.
 722 $1,490	1hz - 100khz	Multiple characteristic filter	(1) Low-pass, high-pass, band-pass, or band reject characteristics. (2) High attenuation rate. (3) D-C coupled.
 723 $1,490	1hz - 100khz	Multiple characteristic filter	(1) Low-pass, high-pass, band-pass, or band reject characteristics. (2) Small size. (3) D-C coupled.
 724 $1,310	1hz - 100khz	Multiple characteristic filter	(1) Low-pass, high-pass, band-pass, or band reject characteristics. (3) D-C coupled.
 730 $810	0.1hz - 10khz	Notch filter	(1) Narrow band-reject. (2) Ultra low-frequency operation.

See Additional Products Section 2550

address-o-print™ Dytro logmatic® pdvm®

Lister Printer

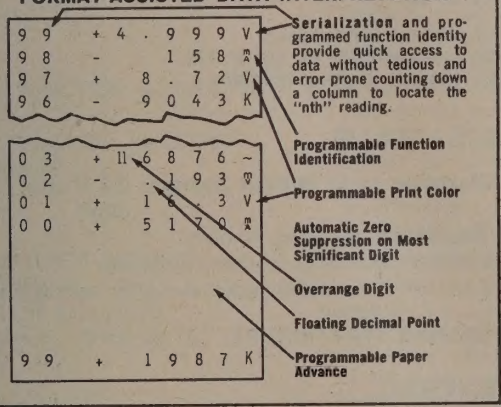
SERIES 1000



- Digital Lister Printer—DVM Compatible
- Unique Echo-Check Feature for Reliable Printed Data
- Designed for OEM Use
- Direct Interface, No User Added Circuitry Needed
- Includes Power Supplies
- 10 Column Capability—2, 10 or 12 Elements per Column
- Parallel BCD Entry—Parallel Decimal, Excess 3, Excess 3, Gray and Serial Codes Available
- Counting Capability
- Floating Decimal Points
- Programmable Print Color and Paper Advance
- Auto Zero Suppression
- Overrange Digit
- Clock Option, Clock Printout on Each Print Line, Example: 11:59+937 V.
- Decimal Readout, one of ten Contact Closure for Each Decade
- Programmable Function Identification (+, —, V. MA, MV, etc.)
- Serialization (Log Identifying Digits)
- Easy Paper Loading
- Reliable Data • Extended Life • Shortened Cycle Time

(Address-O-Print Averages 1/2 Cycle per Printout vs. Full Cycle for Incrementing Type Printers)

FORMAT-ASSISTED DATA INTERPRETATION



Printing Digital Voltmeter

SERIES 8040

- **CONVERTS** 0-1100 Volts DC in 3 ranges into 4 digits (plus overrange) and autopolarity. AC and Resistance options
- **IDENTIFIES** Two additional digits indicate which of 100 readings has been made.
- **DISPLAYS** all eight data elements: logging numbers, polarity, reading, and range (decimal point).
- **PRINTS** the complete display, in single or multiple copies, on command or automatically.

- Available in OEM Versions
- 2, 3 and 4 digits
- Card/Ticket PDVM's
- Up to 5 Digit Ratio Capability
- Hi/Lo Limit Checking
- Self Check Mode
- Manual/Auto Print
- Scanner/Multiplexer Available
- Clock for Auto/Read and Printout
- BCD and 10 Line Codes Available as Outputs
- Rack Mounting Versions Available
- Reset/Preset of Log Digits
- Inkless Printing
- Paper Tape Punch (ASCII) Ability
- Complete Data Logging Systems Using the 8040 PDVM Available, Tailored to Specific Customer Needs

PDVM APPLICATION AREAS:

- Automatic Potentiometer Checker
- Pollution Monitoring Data Loggers
- Medical—Clinical Lab Equipment
- Process-Control Monitoring
- Ships Data Logger

OEM DIGITAL CASSETTE TAPE SYSTEMS

AVAILABLE FEATURES & APPLICATIONS

- Minicomputer Interfaced Keyboard to Cassette
- Multiplexed A/D Entry
- Cassette To: 7 or 9 Track Tape, TTY, Punched Card, Paper Tape
- Write Only, Read Only, Read/Write, Read After Write
- Parity Detection
- Error Correction Codes
- Tape Sensing—BOT, EOT, and EOT Warning
- Inter-Record Gap—0.1" Inches Min.
- Automatic Self Test Features
- Synchronous or Asynchronous Operating Modes
- Data Rate: 3.75 KC Typical
- Data Capacity: 4 Million Bits
- Fast Forward/Fast Reverse Capability
- Address Capability
- Correction Capability
- Stack Loader/Reader
- Unequal Read/Write Speeds

PORTABLE CASSETTE DATA LOGGER

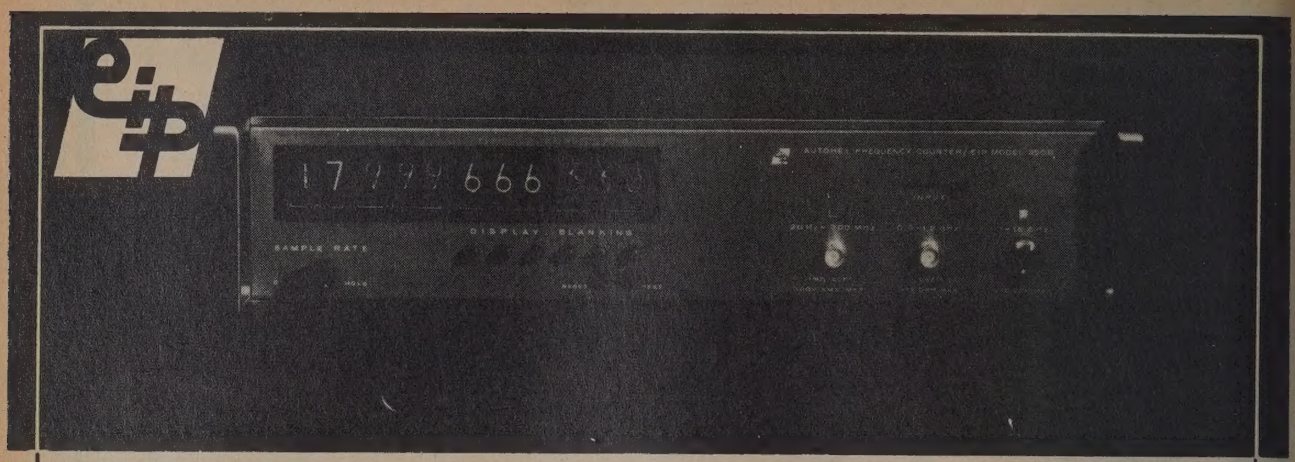
- Battery Operated
- Self-Contained A/D Converter

Dytro also manufactures other analog card/ticket printers, cassette tape checkers, hybrid & digital acquisition, recording, formatting and printing equipment.

DYTRO CORPORATION, 63 TEC STREET
HICKSVILLE, NEW YORK 11801 ▪ (516) 822-2130

Dytro

DYTRO / originators of the PRINTING DIGITAL VOLTMETER



20 Hz to 18 GHz Autohet™ Frequency Counter

Now for the first time, automatic frequency measurements can be made from 20 Hz to 18 GHz with no sacrifice in performance. To provide this broadband coverage EIP has developed an Autohet Frequency Counter that uses two digitally programmed YIG-tuned converters to translate any CW input signal into the range of a direct reading 200 MHz counter. The basic technique is similar to that of the widely used manually tuned hetrodyne converters; therefore it measures frequency, even of signals with considerable FM, in the shortest possible time (30 to 1000 times faster than any other available automatic counters).

FEATURES

- **Completely automatic operation.**
- **Continuous frequency coverage.**
  20 Hz to 12.4 GHz — Model 350A
  20 Hz to 18.0 GHz — Model 351A
- **11-digit direct readout.**
- **No susceptibility to signal FM.**
- **Pushbutton display blanking.**

SPECIFICATIONS

FREQUENCY COUNTER

RANGE: 20 Hz to 210 Hz.
SIGNAL INPUT:
Minimum Sensitivity: 100 mV rms.
Maximum Input: 100 V.
ACCURACY: ± 1 count ± time base stability.
GATE TIME: Fixed at 0.1 second (rear panel FREQ x 10 switch extends gate time to 1.0 second).
DISPLAY: 11 digits sectionalized to read GHz, MHz, KHz, and Hz (least significant digit is a permanent zero).
TIME BASE:
Crystal Frequency: 1 MHz.
Aging Rate: $<$ 7 parts in 10^9 per 24 hours after 30 days continuous operation.

AUTOHET CONVERTER

RANGES: 210 MHz to 1.2 GHz and 1.2 GHz to 12.4 GHz (350A) or 1.2 GHz to 18.0 GHz (351A).
SIGNAL INPUT:
Minimum Sensitivity: 100 mV rms (−7 dBm) for frequencies between 210 MHz and 12.4 GHz. 160 mV rms (−3 dBm) for frequencies between 12.4 GHz and 18.0 GHz (351A only).
Maximum Input: 1 V rms (+13 dBm) for inputs to 210 MHz to 1.2 GHz range. 0.7 V rms (+10 dBm) for inputs to 1.0 GHz to 12.4 GHz or 18.0 GHz range.
Maximum Input Without Damage: 2.2 V rms (+20 dBm).
Impedance: 50 ohms nominal.
ACCURACY: Maintains counter accuracy.
OPERATION: Completely automatic after setting Range switch.
OPERATING TEMPERATURE: 10° to 55°C.

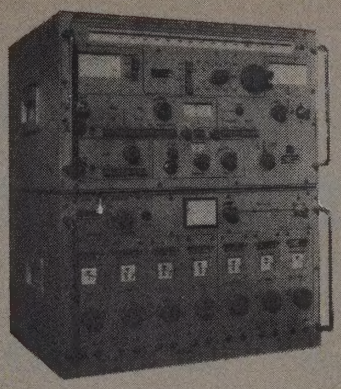
GENERAL

REMOTE RESET: Contact closure to ground at rear panel BNC connector resets display to zero and initiates single read cycle.
POWER: 115V or 230V ± 10%, 50 to 60 Hz, 70 watts.
WEIGHT:
Net: 26.5 lb. (12.1 kg).
Shipping: 31.0 lb. (14,2 kg).
DIMENSIONS: 3½" High, 16¾" Wide, 15¼" Deep.
PRICE: Model 350A — $4,450.00.
Model 351A — $5,450.00.
OPTION 03: High Stability Time Base.
Crystal Frequency: 1 MHz.
Aging Rate: 1 part in 10^9 per 24 hours after 48 hours operation.
Price: Option 03, add $550.00.
OPTION 04: Digital Output.
BCD Code: 8421 "I" state positive.
Price: Option 04, add $100.00.

Send for information on EIP's complete line of: Counters/Frequency Meters/Spectrum Analyzers/Tunable Filters

EIP INC.
2353 De La Cruz Boulevard, Santa Clara, California 95050 • (408) 244-7975/6
Specifications and prices subject to change without notice.

Model 1640 series Arbitrary Function Generators provide an easily programmable source of repeatable abitrary functions programmed by tape or direct output from a storage device. Non repetitive cyclic or block cyclic functions can be obtained with DC offset using ramp or optional haversine



Model FSM530 series Synthesizer Signal Generators operate from 300 Hz to 470 MHz with stability of 3.10^{9}/day. Spectral purity offers non harmonic spurious greater than 80 dB down, phase noise less than 0.06°. Full modulation facilities included for AM, FM, Pulse and Phase.

FUNCTION GENERATORS AND DYNAMIC ANALYSIS INSTRUMENTATION

DESCRIPTION	FEATURES
FREQUENCY RESPONSE ANALYZER MODEL 1410	Suitable for testing DC and AC control systems in the 0.001 Hz to 10 kHz range; sine or square output. Fully digital unit measures amplitude and phase to within ±1% and ±½° respectively. Has 40 dB harmonic and noise rejection. Options include, programming, analog outputs, log readout.
PROGRAMMER MODEL 1450	Paper tape programmer with photo electric reader provides full programming for Model 1410 Frequency Response Analyzer.
ARBITRARY FUNCTION GENERATOR MODEL 1641	Provides output of any cyclic or non recurrent function consisting of linear ramp segments or optional haversines. Controlled by built in photoelectric reader; ramp times 99 seconds/ramp to 1 millisec/ramp with 0.1% accuracy. Output level 0 to ±10 volts in 2000 step increments.
ARBITRARY FUNCTION GENERATOR MODEL 1642	As for Model 1641 but without photoelectric reader. Accepts input from external program store devices such as computer, magnetic tape, etc.
TRANSFER FUNCTION ANALYZER MODEL JM1600A	Readout in cartesian, polar and log polar co-ordinates of amplitude and phase in range 0.00001 Hz to 480 Hz. Fully isolated and floating inputs, accuracy 0.1% amplitude 10 minutes of arc phase. 140 dB DC and 66 dB AC common mode rejection. Fully programmable. May be locked to external source using Mechanical Reference Synchronizer JX1606.
HIGH FREQUENCY EXTENSION UNIT MODEL JX1639	Extends operation of JM1600 series Transfer Function Analyzer up to 160 kHz.
TIME DOMAIN ANALYZER MODEL JM1680	Basically a programmable DC coupled True RMS DVM extending to 10 kHz the analyzer measures Mean Value, Mean Modulus or True RMS of a deterministic or random input signal. Unit offers exponential or True Time Averaging modes with ranges from 99.9 mV to 300 V and accuracy of ±1% of reading. Function as correlator in conjunction with Model 1861 Random Generator.
PSEUDO RANDOM GENERATOR MODEL 1861	Provides binary and multilevel sequencies with lengths from 31 bits to 1047k bits and clock rates from 10^{-3} Hz to 1 MHz. Also delayed output sequence with delay either manually or automatically incremented. When used with JM1860 becomes Impulse Response Test Set.

FREQUENCY SYNTHESIZER SIGNAL GENERATORS

H.F. TWOTONE SIGNAL GENERATOR MODEL SSB 30 SERIES	Tuneable SSB Signal Generator has stability 1×10^{-9}/day. Upper or lower sideband switch selected. Sideband separation variable 300 Hz to 10 kHz over carrier range 300 Hz to 32 MHz. Carrier suppression independently variable — 40 dB. Versions offer smallest vernier increment from 0.1 Hz to 100 Hz.
VHF SYNTHESIZER SIGNAL GENERATOR MODEL FSM 530 SERIES	Range 300 Hz to 470 MHz with stability 1×10^{-9}/day. Modulation facilities include AM, FM, Pulse and Phase mod. spurious output $>$ 80 dB down phase noise $<$ 0.06° can be battery operated.
SYNTHESIZER FREQUENCY METER MODEL FSX3000 SERIES	Unit provides usual synthesizer outputs up to 100 MHz plus comb generator minimum 10 mV up to 3 GHz (useable up to 5 GHz) built in zero beat detector with chart drive output for stability histograms. Stability better than 1×10^{-9} per day.

EMR INSTRUMENTS

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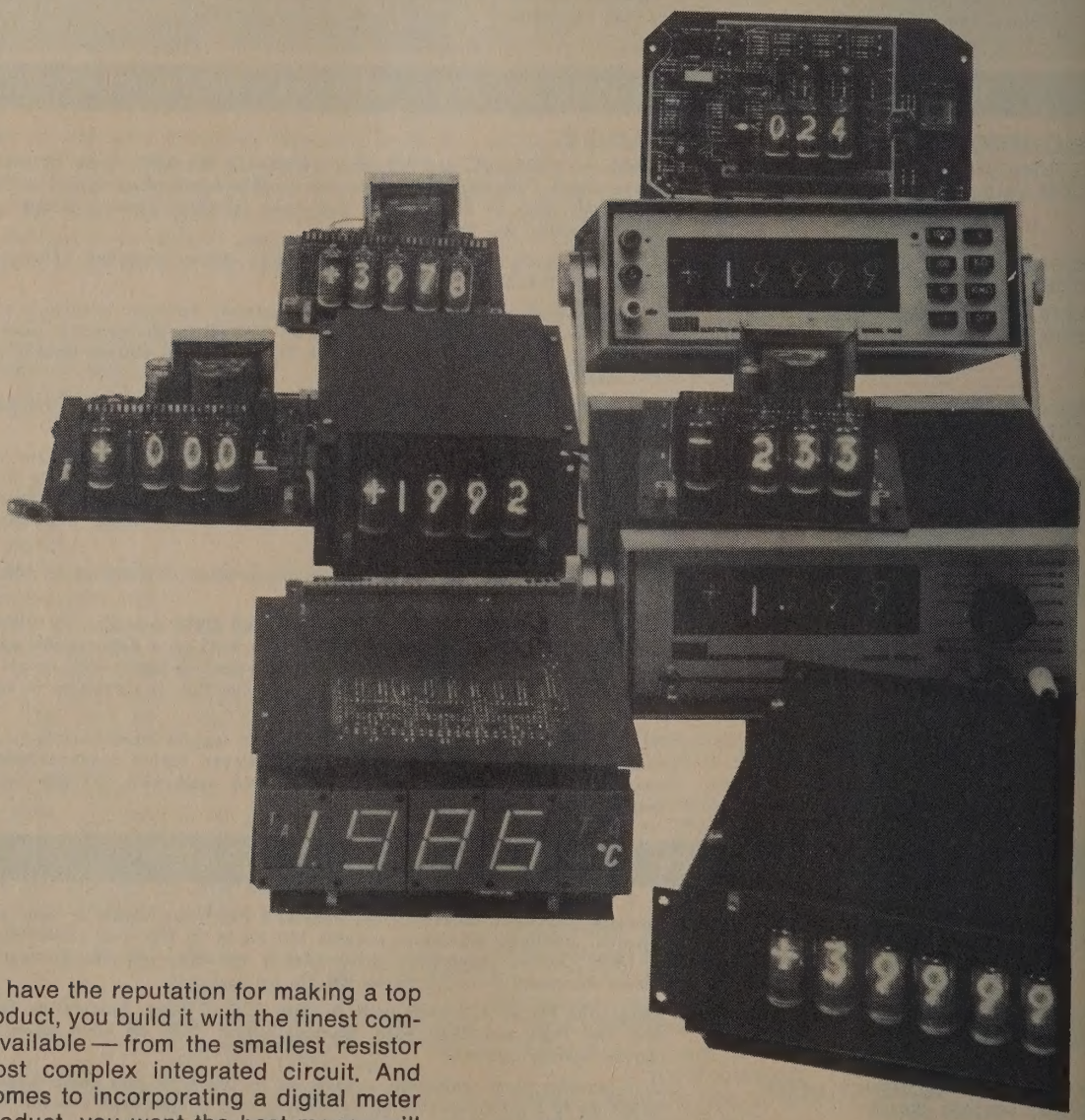
We have eleven ways to improve your product.

Plus a lot of extras.



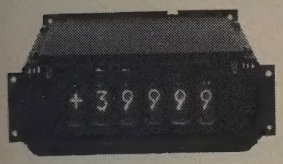
When you have the reputation for making a top quality product, you build it with the finest components available — from the smallest resistor to the most complex integrated circuit. And when it comes to incorporating a digital meter in your product, you want the best money will buy.

Electro-Numerics has a complete line of high quality digital panel meters and multimeters designed specifically for OEM applications. We have eleven meters to choose from, with a list of options second to none. And if we don't have a meter to fit your need, we'll design one. And deliver a prototype within 60 days. What more could you ask for?

Our Two-Year Warranty.

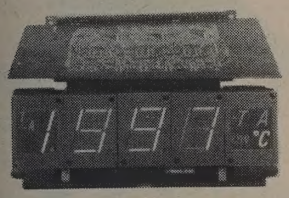
Get the complete story. Write for our data sheets today. Or better yet, call your local Electro-Numerics representative for a demonstration. You'll find him listed in the back of this book.

DIGITAL PANELMETERS



FULL SCALE DISPLAY	STANDARD CAPABILITY	OPTIONAL CAPABILITY	MODEL	BASE PRICE*
+39999	Designed for OEM Applications Extremely Flexible Design Highest Accuracy Available Matched Dual FET Amplifiers for Temperature Stability Selected Temperature Compensated Zener Diode Reference	Digital Subtraction Digital Peak Retention Buffered BCD Outputs Ten (10) Line Outputs 1μV and 10μV Preamplifiers Ratio Remote Display	3412	$595.00
+19999			3410	$550.00
9999			3400	$495.00
+1999			3310	$395.00

+3999	Designed for OEM Applications Plug-in PC Construction Wide Mounting Surfaces for Easy Installation		3302	$275.00
199	FET Input Non-blinking Display	Battery Operation Digital Limits	3301	$175.00
+1999	Programmable Decimal Points Highest Accuracy Available Low Operating Temperature	Buffered BCD Outputs Wide-range Zero Offset 1μV and 10μV Preamplifiers Ohms Measurement	3300	$199.00



*The same features as the **Model 3300** plus:*

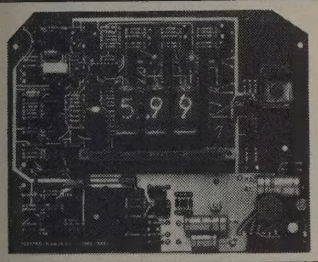
Bright, Clear Seven-segment Display

One-inch-high Characters

Four Windows for Parameter Identification

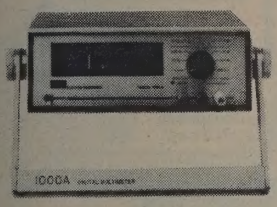
Differential Input
Remote Readout
Auto-polarity
Overload Indication

3350 — $295.00

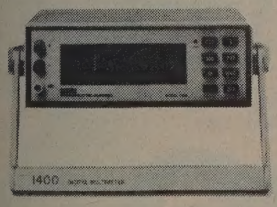


CUSTOM DESIGNS TO YOUR EXACT SPECIFICATIONS — Competitive

DIGITAL MULTIMETERS



RANGES		FEATURES	MODEL	BASE PRICE*
DCV	199.9mV to 1000V f.s.	Portable Self-contained Battery (optional)	1000A	$295.00
Ohms	199.9Ω to 19.99MΩ f.s.	Attractive, Strong Vinyl-covered Aluminum Case		
Accuracy	±1% reading ±.05% f.s.	Adjustable Tiltstand/Carrying Handle		
DCV	399.9mV to 1000V f.s.	Overload Indication	1200	$495.00
ACV	199.9mV to 750V f.s.	Overload Protected		
DCI	.1999 to 1999mA f.s.	Buffered BCD Outputs (optional)		
ACI	.1999 to 1999mA f.s.	Two-Year Warranty		
Ohms	399.9Ω to 39.99mΩ f.s.			
Accuracy	±.05% reading ±.025% f.s.			



DC	1999.9V to 1000.0V f.s.	Attractive, Strong Vinyl-covered Aluminum Case	1400	$595.00
Ohms	1999.9Ω to 19.999MΩ f.s.	Buffered BCD Outputs (optional)		
Accuracy	±.01% reading ±.005% f.s.	Adjustable Tiltstand/Carrying Handle		
		Two-Year Warranty		

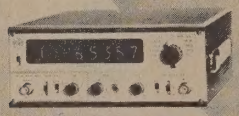
*Substantial OEM discounts available.

ELECTRO-NUMERICS CORPORATION / 2961 Corvin Drive, Santa Clara, Calif. 95051 (408) 738-1840

Digital, Microwave, Nanosecond, Voltage and Timing Instrumentation . . .

1 ns TIM $5500
1 ns TIG $4500

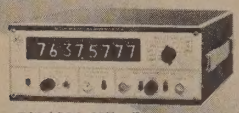
18/12.4 GHz Frequency $5450/$4450



10 ns TIM $1750

15 MHz Frequency
$395/4 digit $325

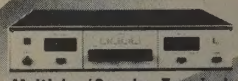
3 GHz Frequency $2250



500/200 MHz Frequency
$1650/$1050

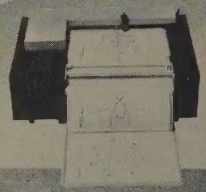
15 MHz UCT $975

Data Terminals

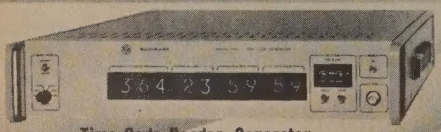


Multiplex/Coupler Terminals
Priced from $1350

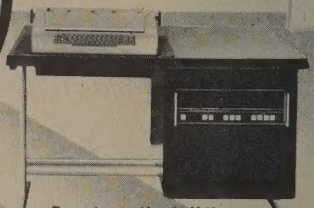
15 MHz Preset $1050



Digital Plotter Terminals
Priced from $5850



Time Code Reader, Generator
$1575, $1950

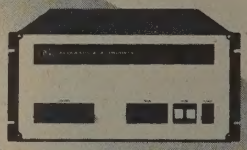


Remote on-line/off-line
Data Collection Terminals

.01% DVM $675
.1% DVM $350

Computer Aided Graphics
Priced from $3550

Scientific Digital Computer Systems



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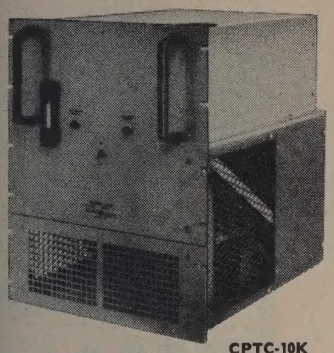
DUMMY LOADS

Electro IMPULSE, INC.

CPTC SERIES



CPTC-10K

5,000 to 100,000 watts average power

Frequency range to 10 GHz

Completely self-contained, requiring only a power line connection

Nominal input impedance is 50 ohms — other available.

hese units are fully self-contained, corporating an oil-filled termination, oil to air heat exchanger and circu-ting system.

ressure, flow and temperature inter-cks insure complete protection for oth transmitter and termination.**

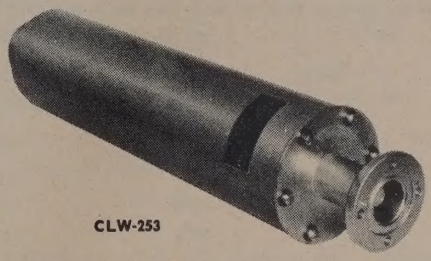
lthough 50 ohms is the standard input npedance for this series, impedances f 72, 300 or 600 ohms can be sup-lied. Please specify all requirements hen ordering.

* On most units.

Model	*Frequency Range MHz	Suggested Connector Choice Available	Total Average Power Watts	VSWR Maximum
PTC-5K	DC-1000	1⅝	5,000	1.15
PTC-10K	DC-1000	3⅛	10,000	1.15
PTC-20K	DC-1000	3⅛	20,000	1.15
PTC-30K	DC-1000	3⅛	30,000	1.15
PTC-50K	DC-1000	6⅛	50,000	1.15
PTC-100K	DC-1000	6⅛	100,000	1.15

Ranges to 10 GHz can be supplied.

CLW SERIES WATER COOLED



CLW-253

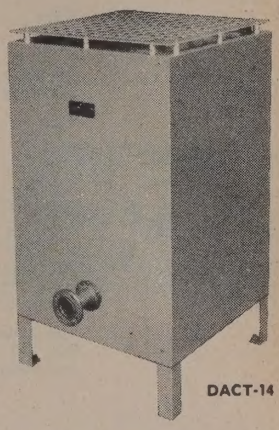
- **ECONOMICAL** — Use only tap water to absorb heat dissipated by resistive elements
- **COMPACT** — Smaller and lighter than Oil-Filled Terminations with corresponding power ratings
- **HIGH OVERLOAD CAPACITY** — Resistive element is practically indestructible
- Cooling Units can be supplied for closed system operation
- Available in three frequency ranges to 1 GHz*
- Nominal impedance is 50 ohms. Other impedances available
- Specify connector type desired when ordering
- Use with Tap Water Calorimeter

Model	Max. Power Watts	Frequency Range	VSWR**
CLW-14	10,000	DC-1GHz	1.25
CLW-253	25,000	DC-1GHz	1.25
CLW-54	50,000	DC-1GHz	1.25
CLW-15	100,000	DC-1GHz	1.25
CLW-25	200,000	DC-1GHz	1.25

* DC-32MHz, DC-110MHz, DC-1GHz.
** Values for DC-1GHz range. Lower for other ranges.

DACT SERIES CONVECTION COOLED

UNIQUE 25-MONTH WARRANTY!



DACT-14

ABSOLUTELY NO MAINTENANCE!

NO POWER REQUIREMENT!

Power Ratings Available:
3,000, 5,000, 10,000, 15,000 20,000 watts.

VSWR:
1.1:1.

Frequency Range:
Standard to 30 MHz — Models available to 55 MHz.

Impedance:
50 ohms standard. 72, 300, 600 ohms available.

Maximum Ambient Temperature:
52°C. No minimum!

Mounting Orientation:
Non-critical.

UNITS MAY BE PULSED

WRITE FOR CATALOG #684
FOR OTHER ELECTRO IMPULSE PRODUCTS

- CALORIMETERS
- COOLING UNITS
- ATTENUATORS
- THERMOELECTRIC PROBE
- POWER METERS
- WAVEGUIDE LOADS
- COMPLETE LINE OF TERMINATIONS

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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SEE OUR OTHER PRODUCTS ON PAGES 872, 873, 2643.

ELECTRONIC DEVELOPMENT CORPORATION

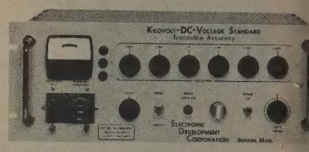
precision engineered AC/DC voltage and current calibrators

(also standards, sources and references)

DC Voltage Standards

All solid state. Short circuit and overload proof. Fully automatic recovery and zero balance. 30 second warm-up. Stability better than .001% of setting per day.

MODEL	VS-11	VS-111	VS-1000
E_{out}	±11.1110 v	±111.110 v	±1111.110
I_{out}	50 mA	50 mA	10 mA
Absolute Accuracy	±0.005%	±0.005%	±0.007%
Z_{out}	.02Ω	0.1Ω	0.1Ω
Weight	8 lbs.	9 lbs.	20 lbs.
Prices	$670	$870	$1250



Options: *Rack Mountable* — $25 additional (add "R" to model number). *Null Meter* — differential measurements with built in null detector. ∞ Z at null — $25 additional (add "N" to model number).

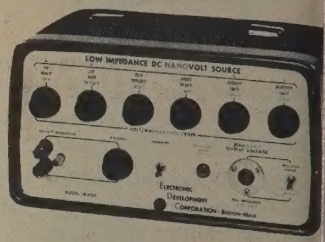
Electronic Galvanometer — differential measurements with built in, protected meter. Input impedance: ∞ at null, 1 MΩ off null, sensitivity 25 μV—$200 additional (add "G" to model number).

Applications: Calibrators, standards, references, sources and power supplies. EDC DC Voltage Standards are used in calibration laboratories, design and engineering laboratories, field service and production line Q.C.

DC Voltage Standards (special purpose)

EDC introduces a new **Low-Impedance DC Millivolt Standard (Model MV-105)** and a new **DC Nanovolt Standard (Model MV-106).** All solid state. Short circuit and overload proof. Fully automatic recovery and zero balance. 30 second warm-up. Stability better than .001% of setting per day.

MODEL		MV-100	MV-105 (NEW)	MV-106 (NEW)
E_{out} Ranges	(1)	±11.1110 v	±11.1110 v	±11.11110 v
	(2)	±111.110 mV	±111.110 mV	±111.1110 mV
	(3)	—	—	±11.11110 mV
Resolution	(1)	100 μV	100 μV	10 μV
	(2)	1 μV	1 μV	100 nV
	(3)	—	—	10 nV
I_{out} Volt Range		50 mA	50 mA	50 mA
Z_{out}	(1)	.02Ω	.02Ω	.02Ω
	(2)	20Ω	1.0Ω	10Ω
	(3)	—	—	10Ω
Accuracy (limit of error)	(1)	±.005%	±.005%	±.005%
	(2)	±.01%	±.01%	±.01%
	(3)	—	—	±.01%
Weight		8 lbs.	8 lbs.	8½ lbs.
Prices		$770	$775	$950



Options: For *rack mountable models, null meters,* and *electronic galvanometers* see "options" listed above.

Applications: Thermocouple and transducer calibration, simulation and measurements. Recorder calibration and linearity. Transducers: bridge excitation. Amplifiers: checking gain and linearity.

Digitally Programmable DC Voltage Standards

True digital programming from BCD logic signals. Serial by digit or parallel entry. Sign and each decade independently selected. The output is isolated from both the chassis and the control circuit. Short circuit and overload protected, fully automatic recovery.

MODEL	MV-100P (NEW)	VS-11P	VS-111P
E_{out}	166.65 mV	±11.110 v	±111.10 v
Accuracy	±0.015%	±0.01%	±0.01%
I_{out}	N/A	50 mA	100 mA
Z_{out}	20Ω	.03Ω	0.1Ω
Prices	$1160	$1020	$1195

Digital programming: Input programming readers such as punch paper tape, punch card, incremental magnetic tape, pin board, programmer drum, stepping switches or key board.

Memory features: Preserves the register contents without maintaining digital inputs. Programmer can then be used for other functions.

Options: Detailed specifications on these and other models on request.

Multi-purpose Voltmeter and Calibrator

VM,
VM,
nd
ource

EDC has been building exclusively solid state instrumentation for 12 years. The **Model 2900** is our latest achievement.

This instrument is a highly versatile transistorized voltmeter, differential voltmeter (infinite impedance null detector) and DC voltage calibrator at a very low cost.

NEW

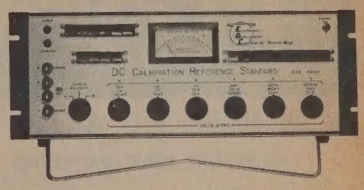
MODEL EDC 2900

INPUT SPECIFICATIONS

TVM Mode:	
E_{in}	10 μV to 1200 Vdc in 8 ranges
Z_{in}	20 MΩ
Resolution	1 ppm
ΔVM Mode:	
E_{in}	10 μV to 1200 Vdc
Z_{in}	∞ at null, 20 MΩ off null
Sensitivity	10 μV

OUTPUT SPECIFICATIONS

Accuracy	±0.002%
Output	10 nV to ±111.1110 Vdc in 4 ranges
Resolution	1 ppm
Stability	.0005% day
Current	100 mA
Z_{out}	30 milliohms
Weight	10 lbs.
Price	$1190



Recorder output terminals available at rear panel

DC Current Standards

Short circuit and open-circuit proof. 30 second warm-up. Automatic zero.

NEW

MODEL	CR-10	CR-100	CR-102
OUTPUT			
I mode	±11.1110 mA	±111.110 mA	±111.110 mA
E mode	±11.1110 Vdc	—	±11.1110 Vdc
COMPLIANCE			
I mode	50 V	100 V	125 V
E mode	50 mA	N/A	100 mA
Accuracy	±0.01%	±0.01%	±0.01%
Prices	$900	$975	$1100

Options: *Null detector* built in and protected for differential voltage measurements. ∞ Z at null. $25 additional (add "N" to model number).

Rack Mountable — $25 additional (add "R" to model number).

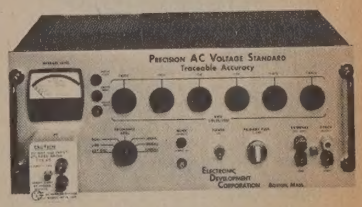
Applications: Transducer, relay characteristics, precision checking of zener diodes, calibration of gyro torquers, relays, controllers and recorders.

AC Voltage (RMS) Standards

Completely solid state. Short circuit protection. 60 second warm-up. Automatic zero. Low output impedance. Fully self-contained and portable.

NEW

MODEL	AC-1000	AC-200	AC-100
E_{out}	100 μV to 1111.110 V in 2 ranges	100 μV to 211.110 V in 2 ranges	1 mV to 111.110 V
Resolution	10 μV & 1 mV	10 μV & 1 mV	1 mV
E Accuracy	0.05%	0.05%	0.05%
Burden	50 VA or 2 Amps	25 VA or 1 Amp	100 mA
Frequency Range	45 Hz to 5 kHz	30 Hz to 20 kHz	10 Hz to 50 kHz
	Unlimited number of frequencies attained by use of external oscillator via front panel terminals		
5 Internal Frequencies	50, 60, 400 Hz, 1 kHz + Optional f	50, 60, 400 Hz, 1 kHz + Optional f	line only
Z_{out}	.001Ω to 1Ω	.001Ω to .2Ω	.001Ω to .1Ω
Distortion	0.1%	0.1%	0.1%
Weight	50 lbs.	45 lbs.	30 lbs.
Prices	$2690	$2490	$2190



Applications: Calibration of VOM, DVM, VTVM; design and evaluation of amplifiers, converters, filters, rectifiers, filter regulators, demodulators, transformers, and inductors; power source for servo applications.

All EDC instruments are traceable to the U.S. National Bureau of Standards. Certification supplied with each instrument / All instruments are available under GSA Contract / Export prices slightly higher / Line (Mains) power: 115 Vac, 60 or 400 Hz; or 220 Vac, 50 Hz / Instruments available for no-charge evaluation. Contact your local sales representative or the main plant.

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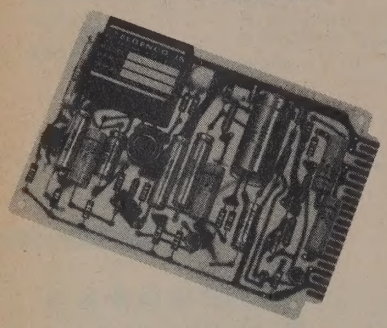
ELGENCO NOISE GENERATORS

SOLID STATE NOISE GENERATORS



FIXED RANGE NOISE GENERATOR CARDS

AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform.
OUTPUT LEVEL: (open circuit) 3 volts rms.
AMPLITUDE CONTROL: Continuously variable.
SIZE: 4½" x 6½" x 1".
POWER: —30 volts dc.

SERIES 3602A, 3603A, and 3606A

OUTPUT IMPEDANCE: 600 ohms ±10%.
MAX. LOAD: 300 ohms.

Some of the many frequency ranges available are listed below. Write for further information.

MODEL 3602A
-12124 20 Hz to 20 kHz ±1db $174
-11124 10 Hz to 20 kHz ±1db $209
-12154 20 Hz to 50 kHz ±1db $194
-11154 10 Hz to 50 kHz ±1db $229

MODEL 3603A
-12115 20 Hz to 100 kHz ±1db $214
-11115 10 Hz to 100 kHz ±1db $249
-12125 20 Hz to 200 kHz ±1db $229
-11125 10 Hz to 200 kHz ±1db $264
-12155 20 Hz to 500 kHz ±1db $249
-11155 10 Hz to 500 kHz ±1db $284

MODEL 3602A
-22154 20 Hz to 50 kHz ±2db $174
-21154 10 Hz to 50 kHz ±2db $209
-22115 20 Hz to 100 kHz ±2db $179
-21115 10 Hz to 100 kHz ±2db $214
-22125 20 Hz to 200 kHz ±2db $199
-21125 10 Hz to 200 kHz ±2db $234
-22155 20 Hz to 500 kHz ±2db $214
-21155 10 Hz to 500 kHz ±2db $249
-32155 20 Hz to 500 kHz ±3db $174
-31155 10 Hz to 500 kHz ±3db $209

MODEL 3606A
-52124 20 Hz to 20 kHz ±½db $299
-51124 10 Hz to 20 kHz ±½db $334
-52154 20 Hz to 50 kHz ±½db $319
-51154 10 Hz to 50 kHz ±½db $354
-52115 20 Hz to 100 kHz ±½db $339
-51115 10 Hz to 100 kHz ±½db $374
-52125 20 Hz to 200 kHz ±½db $354
-51125 10 Hz to 200 kHz ±½db $389
-52155 20 Hz to 500 kHz ±½db $374
-51155 10 Hz to 500 kHz ±½db $409

SERIES 3607A

OUTPUT IMPEDANCE: 200 ohms ±10%
MAX. LOAD: 700 ohms.

Some of the many frequency ranges available are listed below. Write for further information.

MODEL 3607A
-15316 5 kHz to 1 mHz ±1db $345
-35316 5 kHz to 1 mHz ±3db $195
-25356 5 kHz to 5 mHz ±2db $570
-35356 5 kHz to 5 mHz ±3db $460

SOLID STATE NOISE GENERATORS

Model 602A-200 5 Hz to 5 mMz, 3 Ranges . . . $395

FREQ. RANGES: 5 Hz to 20 kHz, 5 Hz to 500 kHz, 5 Hz to 5 mHz.
OUTPUT SPECTRUM: 20 Hz to 20 kHz — ±1 db, 20 Hz to 500 kHz — ±2.5 db, 500 kHz, to 5 mHz — ±5 db.
OUTPUT LEVEL: (open circuit), 20 kHz range — 3 volts, 500 kHz range — 2.5 volts, 5 mHz range — 2 volts.
OUTPUT IMPEDANCE: 200 ohms ±10%.
MAXIMUM LOAD: (on direct output) 700 ohms.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit.
Accuracy: ±3% to 100 kHz, ±10% to 5 mHz.
Output Impedance: 200 ohms ±1%.
SPECTRAL DENSITY: Approximate spectral density (mv/√Hz) for 1 volt rms output. 20 kHz band — 5, 500 kHz band — 1.2, 5 mHz band — 0.4.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform all ranges.
OUTPUT METER: 0-5 volts rms.

Model 602A-1390 5 Hz to 5 mHz, 3 Ranges . . $330

FREQ. RANGES: 5 Hz to 20 kHz, 5 Hz to 500 kHz, 5 Hz to 5 mHz.
OUTPUT SPECTRUM: 20 Hz to 20 kHz — ±1 db, 20 Hz to 500 kHz — ±3 db, 500 kHz, to 5 mHz — ±8 db.
OUTPUT LEVEL: (open circuit), 20 kHz range — 3 volts, 500 kHz range — 2 volts, 5 mHz range — 1 volt.
OUTPUT IMPEDANCE: 900 ohms ± 10%.
MAXIMUM LOAD: (on direct output) no limit.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit.
Accuracy: ±3% to 100 kHz, ±10% to 5 mHz.
Output Impedance: 200 ohms ±5%.
SPECTRAL DENSITY: Approximate spectral density (mv/√Hz) for 1 volt rms output. 20 kHz band — 5, 500 kHz band — 1.2, 5 mHz band — 0.6.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform all ranges.
OUTPUT METER: 0-5 volts rms.

Model 603A 5 Hz to 5 mHz, 3 Ranges $545

FREQ. RANGES: 5 Hz to 20 kHz, 5 Hz to 500 kHz, 5 Hz to 5 mHz.
OUTPUT SPECTRUM: 10 Hz to 500 kHz — ±1 db, 500 kHz to 5 mHz — ±3 db.
OUTPUT LEVEL: (open circuit) 3 volts rms all ranges.
OUTPUT IMPEDANCE: 200 ohms ± 10%.
MAX. LOAD: (on direct output) 700 ohms.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit.
Accuracy: ±3% to 500 kHz, ±5% to 5 mHz.
Output Impedance: 200 ohms ± 1%.
SPECTRAL DENSITY: Approximate spectral density (mv/√Hz) for 1 volt rms output. 20 kHz band—5, 500 kHz band—1.2, 5 mHz band — 0.4.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform all ranges.
OUTPUT METER: 0-5 volts rms.

MODEL 3609A Power Supply Card $67

(supplies power for up to 2 noise generator cards)
SIZE: 4½" x 6½".
INPUT: 115/230 volts ±10/20 volts, 50 to 1000 Hz.

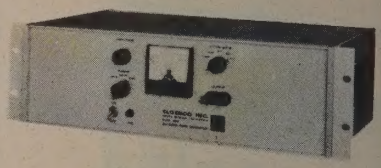
SOLID STATE NOISE GENERATORS

Model 610A 5 Hz to 5 mHz, 8 Ranges $1,275

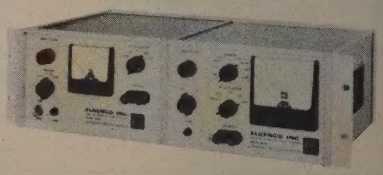
FREQ. RANGES: 5 Hz to 2 kHz, 5 Hz to 5 kHz, 5 Hz to 20 kHz, 5 Hz to 50 kHz, 5 Hz to 200 kHz, 5 Hz to 500 kHz, 5 Hz to 2 mHz, and 5 Hz to 5 mHz.
OUTPUT SPECTRUM: Uniform ± 0.5 db from 10 Hz to 500 kHz and ± 2.0 db from 500 kHz to 5 mHz.
OUTPUT LEVEL: 0 to 1 volt rms, adjustable by front panet amplitude control. A dynamic range of 5 to 1 peak to rms value is provided.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, X.0001. Accuracy ± 0.1 db to 500 kHz; ± 0.25 db to 5 mHz.
SPECTRAL DENSITY: Approx. for 1 volt rms output.

Band	mv/√Hz	Band	mv/√Hz
2 kHz	17.5	200 kHz	1.75
5 kHz	11.0	500 kHz	1.10
20 kHz	5.5	2 mHz	0.55
50 kHz	3.5	5 mHz	0.30

AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical Gaussian all ranges.
OUTPUT METER: 0 to 1 volt rms. Accuracy ±2% of full scale to 2 mHz; ±5% to 5 mHz.
MAXIMUM LOAD: 500 ohms on direct output.
OUTPUT IMPEDANCE: 50 ohms direct output.
POWER REQUIREMENTS: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.



Model 602A with full rack width mounting option.



Models 602A and **610A** combined by dual unit adapter kit.

OPTIONS & ACCESSORIES FOR MODELS 602A, 603A, 610A, & SERIES 624A

Rechargeable battery option . . . . . add $135
Full rack width cabinet and rack mounting hardware option add $35
Adapter kit, dual unit and rack mounting hardware $7
Adapter kit, single unit rack mounting (includes blank panel to make dual unit) $56
Rechargeable battery kit $145

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ELGENCO NOISE GENERATORS

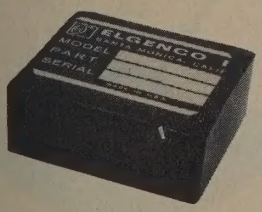
SOLID STATE NOISE GENERATORS

Series 624A Fixed Range Noise Generators

OUTPUT LEVEL: (open circuit) 3 volts rms.
OUTPUT IMPEDANCE: 200 ohms ±10%.
MAX. LOAD: 700 ohms.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit.
Output Impedance: 200 ohms ±1%.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform.
OUTPUT METER: 0-5 volts rms.
POWER: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.
DIMENSIONS: 5¼" high x 8¾" wide x 11" deep.
Some of the many frequency ranges available are listed below. Write for further information.

MODEL 624A

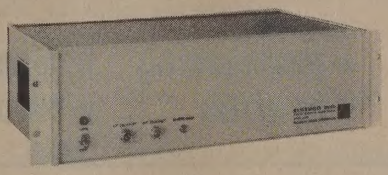
·12124 20 Hz to 20 kHz ±1db	$305
·11124 10 Hz to 20 kHz ±1db	$340
·12154 20 Hz to 50 kHz ±1db	$325
·11154 10 Hz to 50 kHz ±1db	$360
·12115 20 Hz to 100 kHz ±1db	$345
·11115 10 Hz to 100 kHz ±1db	$380
·12125 20 Hz to 200 kHz ±1db	$395
·11125 10 Hz to 200 kHz ±1db	$430
·12155 20 Hz to 500 kHz ±1db	$415
·11155 10 Hz to 500 kHz ±1db	$450
·22154 20 Hz to 50 kHz ±2db	$305
·21154 10 Hz to 50 kHz ±2db	$340
·22115 20 Hz to 100 kHz ±2db	$310
·21115 10 Hz to 100 kHz ±2db	$345
·22125 20 Hz to 200 kHz ±2db	$330
·21125 10 Hz to 200 kHz ±2db	$365
·22155 20 Hz to 500 kHz ±2db	$345
·21155 10 Hz to 500 kHz ±2db	$380
·32155 20 Hz to 500 kHz ±3db	$305
·31155 10 Hz to 500 kHz ±3db	$340
·52124 20 Hz to 20 kHz ±½db	$430
·51124 10 Hz to 20 kHz ±½db	$465
·52154 20 Hz to 50 kHz ±½db	$450
·51154 10 Hz to 50 kHz ±½db	$485
·52115 20 Hz to 100 kHz ±½db	$470
·51115 10 Hz to 100 kHz ±½db	$505
·52125 20 Hz to 200 kHz ±½db	$520
·51125 10 Hz to 200 kHz ±½db	$555
·52155 20 Hz to 500 kHz ±½db	$540
·51155 10 Hz to 500 kHz ±½db	$575



ENCAPSULATED NOISE SOURCE MODULES

Series 1602A, 1603A, and 1606A ..... **$95 to $340**
Various frequency ranges and output flatness available. Size: 1¾" x 1½" x ¾". Write for details.

SOLID STATE NOISE GENERATORS



MODEL 632A Dual Output DC to 400 Hz and 5 Hz to 40 kHz **$2,595**

LOW FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1.0%.
OUTPUT SPECTRUM: Uniform ±0.1 db from DC to 350 Hz.
MAXIMUM OUTPUT: 1.0 volts rms. A dynamic range of 5 to 1 peak to rms value is provided.
MAXIMUM SPECTRAL DENSITY: Approx. 1.5 x 10^{-3} volts²/Hz.
OUTPUT MEAN: Less than 5 mv.
OUTPUT IMPEDANCE: Approximately 1,000 ohms.

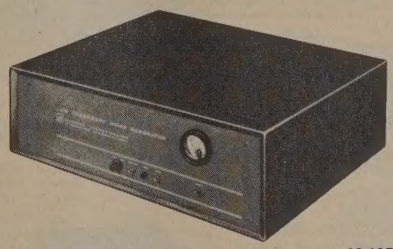
HIGH FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±2%.
OUTPUT SPECTRUM: Uniform ±0.5 db from 10 to 35,000 Hz.
MAXIMUM OUTPUT: 1.0 volts rms. A dynamic range of 5 to 1 peak to rms values is provided.
MAXIMUM SPECTRAL DENSITY: Approx. 2 x 10^{-5} volts²/Hz.
OUTPUT MEAN: Less than 1 mv.
OUTPUT IMPEDANCE: Approximately 100 ohms.

NOISE REGULATOR: rms output level continuously stabilized against a reference voltage.
OVERLOAD INDICATOR: Panel overload indicator lights when input noise level to regulator is out of regulation range.
POWER: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.
DIMENSIONS: 5¾" high x 17" wide x 11" deep. 19" wide with rack mounting flanges mounted (supplied).

Model 631A 5 Hz to 40 kHz **$1,645**

VACUUM TUBE NOISE GENERATORS



Model 301A DC to 40 Hz **$2,195**

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1%.
OUTPUT SPECTRUM: Uniform ±0.1 db from 0 to 35 Hz.
MAX. OUTPUT: 12 volts rms into a 1 megohm input resistance. Dynamic range of 5 to 1 peak-to-rms is provided.
MAX. SPECTRAL DENSITY: Approx. 2.5 volts²/Hz.
D.C. UNBALANCE: Less than 50 mv.
NOISE REGULATOR: rms output level continuously stabilitzed against a reference voltage.
OVERLOAD INDICATOR: Panel overload indicator lights when input noise level to regulator is out of regulation range.
POWER: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.
MOUNTING: Standard relay rack panel 7" high x 19" wide. Can be supplied in deluxe cabinet as shown for $75 extra.

Model 321A DC to 120 Hz **$2,295**

OUTPUT SPECTRUM: Uniform ±0.1 db from 0 to 105 Hz.
MAX. SPECTRAL DENSITY: Approx. 1.0 volts²/Hz.

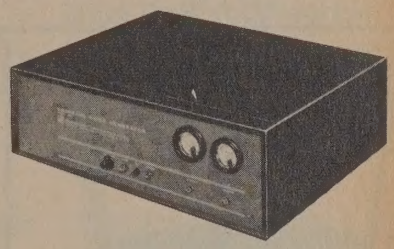
OTHER SPECIFICATIONS SAME AS MODEL 301A

VACUUM TUBE NOISE GENERATORS

Model 331A 5 Hz to 20 kHz **$1,395**

OUTPUT SPECTRUM: Uniform to plus or minus 0.5 db from 10 to 20,000 Hz.
OUTPUT LEVEL: 0 to 5 volts rms, adjustable by self contained attenuator. A dynamic range of 7 to 1 peak to rms value is provided.
SPECTRAL DENSITY: Approx. 1 mv/$\sqrt{\text{Hz}}$ for 5 volt rms output.
AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1%.
NOISE REGULATOR: rms output level continuously stabilized against a zener reference voltage.
OVERLOAD INDICATOR: Panel overload indicator lights when input noise level to regulator is out of regulation range.
OUTPUT METER: 0 to 5 volts rms.
MAX. LOAD: 10,000 ohms.
POWER REQUIREMENTS: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.
MOUNTING: Standard relay rack panel 7" high x 19" wide and is 15" deep. Can be supplied in deluxe cabinet as shown for $75 extra.

MODEL 331A-23	5 Hz to 2 kHz	$1495
MODEL 331A-53	5 Hz to 5 kHz	$1495
MODEL 331A-54	5 Hz to 50 kHz	$1495
MODEL 331A-25	5 Hz to 200 kHz	$1595
MODEL 331A-55	5 Hz to 500 kHz	$1745



Model 311A Dual output DC to 40 Hz and 5 Hz to 20 kHz **$2,595**

LOW FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1%.
OUTPUT SPECTRUM: Uniform ±0.1 db from 0 to 35 Hz.
MAX. OUTPUT: 12 volts rms into a 1 megohm input resistance. Dynamic range of 5 to 1 peak-to-rms is provided.
MAX. SPECTRAL DENSITY: Approx. 2.5 volts²/Hz.
D.C. UNBALANCE: Less than 50 mv.

HIGH FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±2%.
OUTPUT SPECTRUM: Uniform ±0.5 db from 10 to 20,000 Hz.
MAX. OUTPUT: 15 volts rms.
MAX. SPECTRAL DENSITY: 7.5 x 10^{-3} volts²/Hz.

NOISE REGULATOR: rms output level continuously stabilized against a reference voltage.
OVERLOAD INDICATOR: Panel overload indicator lights when input noise level to regulator is out of regulation range.
POWER: 115 v. ±10 v, 50/60 Hertz ac.
MOUNTING: Standard relay rack panel 7" high x 19" wide. Deluxe cabinet as shown not available.

Model 312A Dual output DC to 120 Hz and 5 Hz to 20 kHz **$2,695**

LOW FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION: Gaussian ±1%.
OUTPUT SPECTRUM: Uniform ±0.1 db from 0 to 105 Hz.
MAX. OUTPUT: 12 volts rms into a 1 megohm input resistance. Dynamic range of 5 to 1 peak-to-rms is provided.
MAX. SPECTRAL DENSITY: Approx. 1.0 volts²/Hz.
D.C. UNBALANCE: Less than 50 mv.

HIGH FREQUENCY OUTPUT

OTHER SPECIFICATIONS SAME AS MODEL 311A

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EMICO is the dependable VOLUME source for 100% American-made AC and DC meters, supplying both standard and custom types, for a wide range of applications in the electronics, automotive, appliances and test equipment fields...

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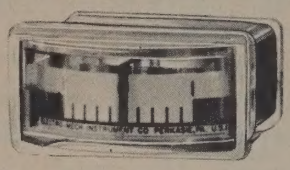
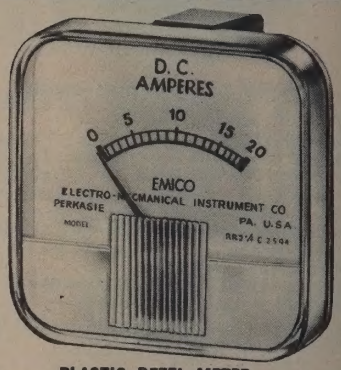
- MILLIVOLT METERS
- MICROAMMETERS
- VU METERS
- VOLTAGE TESTERS
- AMMETERS
- MILLIAMMETERS
- DB METERS
- CIRCUIT INDICATORS
- INDUCTION METERS

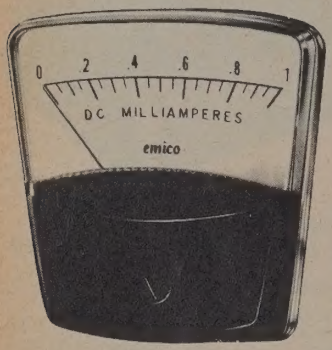
EDGE READING METER
Model 13
1 13/16" x 3/4"



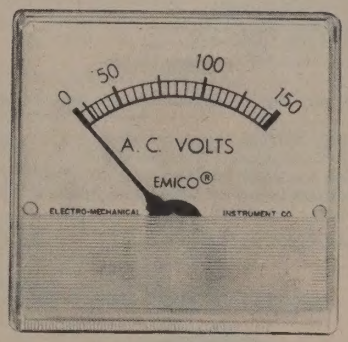
EDGE READING METER
Model 12 1 1/4" x 9/16"



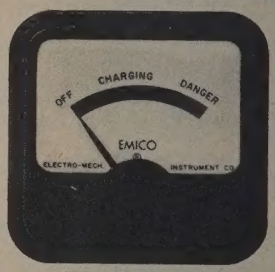
PLASTIC BEZEL METER
Model 42 2 5/16" square



STARLINE METER
Model 32
approx. 3" square



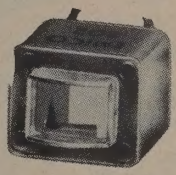
PLASTIC BEZEL METER
Model 52 approx. 2 3/4" square



METAL BEZEL METER
Model 72 2 1/4" square

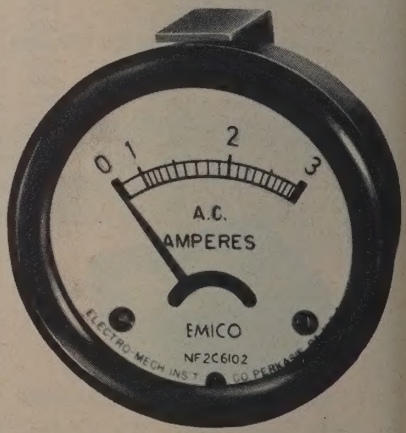
MICRO-MINIATURE CIRCUIT INDICATORS

For monitoring on-off conditions, malfunctions, or battery charge conditions, select either Model 802P (pointer-type) or 802F (flag-type) indicator. Rugged, dependable extremely low-cost. Available with either wire leads or plug-in jacks for easy installation. For technical details, request Bulletin R12-A.



Model 802F approx. 1/2" square

Model 802P approx. 1/2" square



METAL BEZEL METER
Model 73
2 1/4" diameter

EMICO designs and engineers meters to your exact requirements, including any custom dial face, with special scale, trademark, name or colors. Send details or drawings for prompt quotation.

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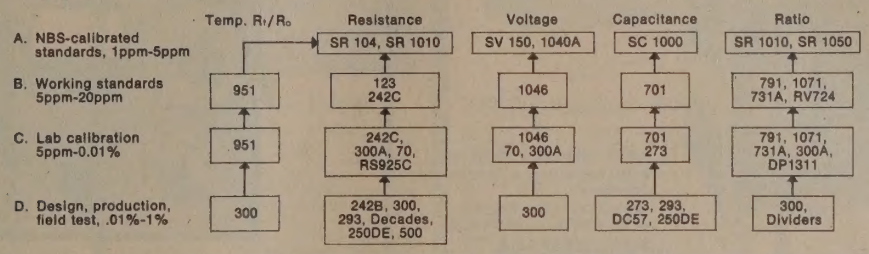
e|s|i® precision test and calibration instruments

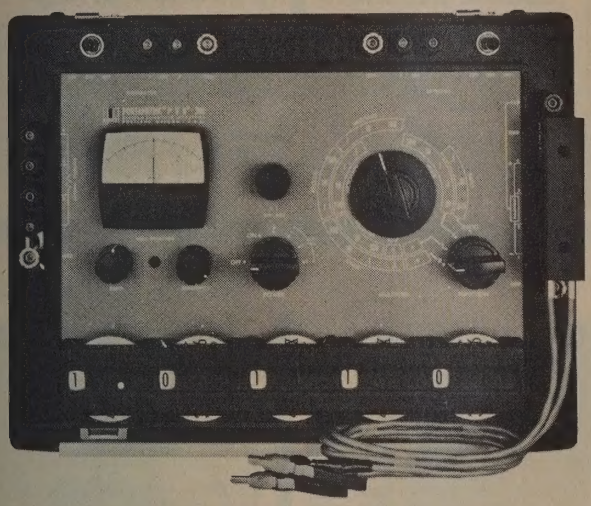
ESI produces a comprehensive line of instruments, standards and system components for the precise measurement of resistance, voltage, capacitance, inductance and ac/dc ratio. The full spectrum of critical application is covered: standards and laboratory calibration, design work, production and field test.

All calibrations on ESI instruments are traceable to the National Bureau of Standards through ESI transportable reference standards. These standards are test reported by NBS and maintained by ESI. They form the base from which our professional grade instruments derive their warranted accuracy.

For more complete information than given here, please request our comprehensive metrology catalog.

ESI traceability—application chart (Numbers in boxes are models of ESI instruments)





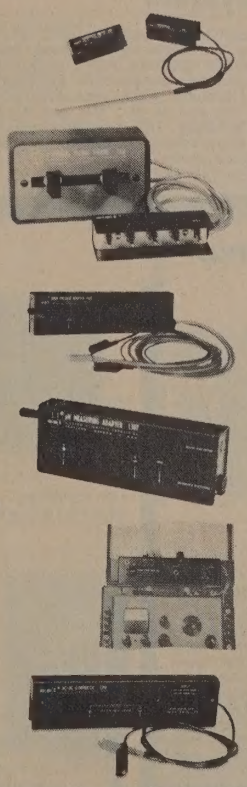
300A PVB® Potentiometric Voltmeter Bridge

The Model 300A Potentiometric Voltmeter Bridge provides a complete five-dial dc measurement facility in one convenient battery-operated instrument with 0.01% accuracy, 2 μV sensitivity. (A Model 300 is offered at 0.02% accuracy at less cost.)

The PVB® combines the functions of a five-range potentiometric voltmeter, three-range precision voltage source, eight-range ammeter, ten-range guarded Kelvin double bridge, four-terminal 0.01% resistance comparison bridge, ratiometer and high-sensitivity electronic null detector. Two-, three- or four-terminal resistance measurements can be made.

A modulator-type null detector with an integral high-gain solid-state amplifier provides better than 2 microvolts dc sensitivity with an input impedance of approximately one megohm. Exceptional rejection of ac pickup by the detector, coupled with complete guarding and shielding, makes possible accurate measurements in noisy electrical environments under conditions of high humidity. Long battery life provides complete flexibility of measurement by isolating the instrument from annoying ground loops and power line transients. Measurements can be made in either grounded or ungrounded systems.

300A PVB accessories



1302A & 1303A platinum resistance thermometer and adapter. A precision thermometer specifically designed for use with the 300A PVB plus a new, four-terminal adapter. Readings are given directly as the ratio between zero-point resistance and the resistance at the temperature to be measured, thereby eliminating several steps in computation of the temperature.

1304 four-terminal sorting fixture. A flexible sorting fixture which can be used with almost any size component and can make a four-terminal connection with nearly any lead configuration.

1305 high-voltage adapter. This adapter allows the 300A PVB® to measure positive and negative voltages as high as 5000 volts. It consists of a precision calibrated voltage divider that attenuates the input voltage by a factor of exactly 1000.

1307 pH measuring adapter. This adapter enables the 300 PVB® to measure positive or negative pH readings by connecting pH electrodes to the 300A PVB®.

1310 precision voltage source. This source provides a 50-nanovolt to 5-volt calibration signal, with sufficient power to drive the instrument under test, allowing a complete field calibration system for recorders, meters and other low-input-impedance devices.

1399A ac-dc converter. This converter is used with the 300A PVB to permit measurement of ac voltages at dc potentials of ±600 volts to case or line ground.

Multi-Purpose Instruments

MODEL	DESCRIPTION	RANGE	NOMINAL ACCURACY	PRICE
300A	Measuring E, I, R and ratio (battery)	0-511 V, 0-5.11 A, 0-511 MΩ	0.01%	$1075.
300	(same)	(same)	0.02%	995
250DE	Measures R, C, L battery operated (line operation and rack mount opt.)	0-12 MΩ 0-1200 μF 0-1200 H	0.1% 0.2% 0.2%	550.
293	Universal bridge for R, G, C, L AC/DC gen.-det. (Bridge alone—$600)	0-1.2 MΩ 0-1200 mmho 0-1200 μF 0-1200 H	0.05% 0.05% 0.1% 0.1%	1300.

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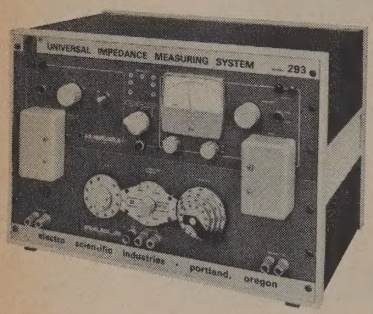
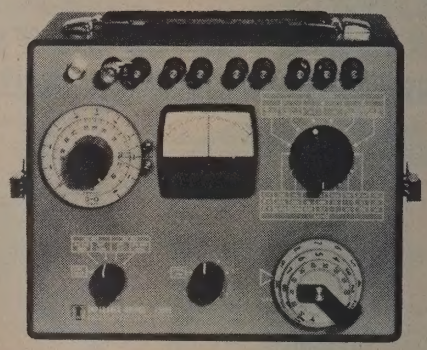
Multi-Purpose Instruments (Cont.)



- 0.05% resistance accuracy
- 0.1% capacitance, inductance accuracy
- simplified in-line readout of D or Q, measured value
- self-contained ac/dc generator-detector
- front panel terminals

293 universal impedance measuring system

Precision measurements can be made of resistance, conductance, inductance and capacitance. Modern circuit design, close manufacturing tolerance, and the highest quality materials permit a conservative accuracy rating of 0.05% for R and C, 0.1% for inductance and capacitance. Comparative five-figure measurements can be made using the 120,005 divisions of dial resolution provided by the unique ESI DEKADIAL®. Provides dc, and ac at 1 kHz and front-panel provisions to plug in separate frequency modules. This precision system is designed for maximum versatility. Terminals are provided so that ranges may be extended and special circuit connections can be made.



250DE portable impedance bridge

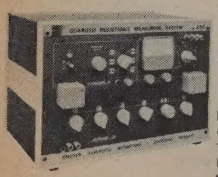
A completely self-contained, portable instrument for precision measurements o resistance, capacitance and inductance. It can also be used to measure diss pation factor and storage factor for capacitors and inductors. Its accurac is conservatively rated at 0.1% for R, 0.2% for C and L. Even greater precisio is possible for comparative measurements because of the 12,005 divisions o dial resolution.

This instrument is extremely versatile for ac measurements involving d bias. Other applications include non-destructive life prediction testing, pro duction limits testing and temperature measurement using copper resistanc elements.

Resistance Measurements

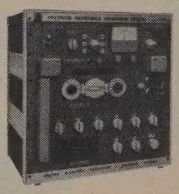
500 Resistance Deviation Bridge

High volume resistor sorter and tester with 0.01% accuracy or better; ranges from 1 ohm to over 100 megohms. When operated semi-automatically with the KELVIN-KLAMP® and foot switch provided, measurements can be made at the rate of one per second with 50 ppm accuracy.



231C Guarded Wheatstone System

Direct-reading accuracy of 0.01%. Range 10 milliohms to 12 gigohms with high resolution. Completely guarded internally; Model 801 Generator-Detector provides variable generator output 0 to 600 V, detector ranges of 1000 volts to 3 microvolts. Lower range, less expensive 232A System also available.

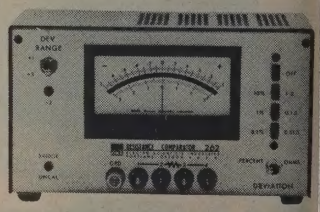


242C Resistance Measuring System

Most versatile system at 10 ppm direct readout accuracy. Four-terminal comparisons to 1 ppm, with 0.1 ppm resolution. Matched generator — detector with complete guarding and shielding provides easy operation over wide range (10 microhms—120 megohms). Data logging available, as is less accurate, less expensive Model 242B.

123 Resistance Comparison System

For absolute ratio comparison of resistance standards to 0.2 ppm direct reading. Wide range to 10 megohms. Wenner balance ensures traceability, stability. Includes Model 900 Nanovolt Galvanometer.



262 Resistance Comparator

A low cost, compact trimming bridg which is ideal for fast resistor-winding cu off determination. High ac rejection filte out production environment noise; accu racy of 0.01%; range of 1 milliohm to 10 megohm; six deviation ranges from 30% to 0.1% and guarded 4-terminal connec tions.

MODEL	DESCRIPTION	FULL SCALE RANGES	NOMINAL ACCURACY	PRICE
500	Auto Kelvin bridge and sorting fixture	1111 Ω to 11 MΩ (1 mΩ steps)	0.01%	$2900.
262	Resistance comparator	1 mΩ to 100 MΩ	0.01%	490.
242B	Kelvin bridge, gen.-det. and decade standard	0.1 mΩ-120 MΩ (1 μΩ resolution)	50 ppm	4000.
242C	(same)	(same)	10 ppm	5600.
240	Kelvin comparison bridge, 5 ratio ranges	1 ppm resolution	10-30 ppm	1100.
240C	(same, except trimmable)	0.1 ppm resolution	2 ppm	1650.
231C	Wheatstone bridge, guarded gen.-det.	1.2 Ω 12 GΩ	0.01%	2375.
232A	Wheatstone bridge, gen.-det.	1.2 Ω 12 GΩ	0.01%	1575.
123	Double ratio set, nanovolt detector	1:1, 10:1 ratios	0.2 ppm	7975.
122	Direct-reading double ratio set	1:1, 10:1 ratios	0.2 ppm	4900.

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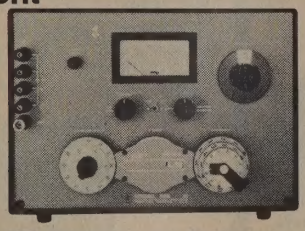
Capacitance Measurement

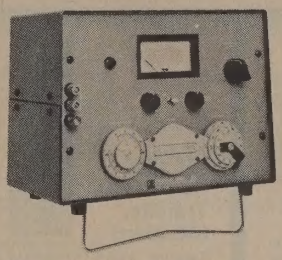
701 Capacitance Measuring System

Two and three-terminal capacitors measured from 0 to 1.2 microfarads with 0.01% accuracy. Resolution of 1 ppm and continuous tuning from 20 cycles to 20 kHz.



273 Capacitance Bridge

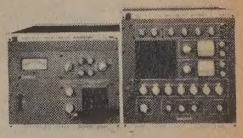
Provides capacitance measurements over 9 ranges, from zero to 120 pF through zero to 12,000 μF, with accuracy to ±0.1% over the most widely used ranges. It uses a highly accurate and sensitive bridge-detector circuit, with four-terminal Kelvin connections to eliminate errors caused by lead resistance. Completely shielded throughout plus easy-to-read nullmeter and easy-to-operate controls.



272 Capacitance Bridge

Offers lower D and C ranges (0 to 0.0105 at 1 kHz and 0 to 120 pF) plus greater D resolution (0.0001 at 1 kHz) than its sister, the Model 273. In addition, it has better D accuracy (0.0005) while maintaining the same C accuracy of 0.1%. Highest of the instrument's seven C ranges is 0 to 120 microfarads. All types of capacitors, including electrolytic or tantulum varieties, may be checked.

Voltage Measurement



1046 DC Voltage Measurement System

Nanovolt to kilovolt with one system; 5 ppm accuracy above one volt, 0.5% at 1 microvolt; nanovolt sensitivity and resolution; standard cell comparison to 0.005 ppm. Includes both Models 1045A1 and 945.

MODEL	DESCRIPTION	FULL SCALE RANGES	NOMINAL ACCURACY	PRICE
1046	Precision DC voltage system, 7 dial	1 nV-1111 V (1 nV steps)	5 ppm	$8500.
1045A1	Potentiometric DC voltmeter, two internal detectors	11 V-1111 V (1 μV steps)	5 ppm	4850.
945	Nanovolt potentiometer with galvanometer	1 nV-1 V (1 nV resolution)	ext. ref. source	3650.
1040A	Guarded absolute voltbox	1:1, 1:10, 1:100 ratios	1-4 ppm	1150.
701	Capacitance measuring system, gen.-det.	12 pF-1200 nF (0.0001 pF resolution)	0.01%	2500.
273	Capacitance bridge, 4-terminal, gen-det.	120 pF-12,000 μF (0.01 pF resolution)	0.1%	950.
272	Capacitance bridge, improved dissipation resolution	120 pF-120 μF (0.01 pF resolution; 0.0001 dissipation resolution)	0.1%	950.

Ratio Measurement

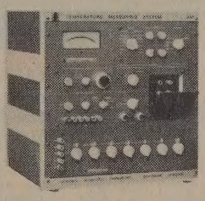
791/1071AC Ratio Calibration System

Calibrate AC ratio transformers and resistive decade voltage dividers; compare standard capacitors and inductors; provide 0.5 ppm linearity, traceable to NBS. 791 also determines residual reactances.

731A DC Ratio and Voltage Calibration System

7-decade lab standard voltage divider, plus guarded absolute ratio voltbox with built-in, self-calibration.

Temp. R_t/R_o Measurement



951 Temperature Measuring System

10 ppm measurement of thermometer/ice point resistance ratio. Features direct readout of R_t/R_o or resistance; 2 nanovolt sensitivity. Combines Mueller bridge and potentiometric methods of temperature measurement.

MODEL	DESCRIPTION	RANGE	NOMINAL ACCURACY	PRICE
†*731A	DC ratio and voltage calibration (less power supply)	7-dial K-V divider (0.1 ppm/step)	1-10 ppm	$2795.
791	AC ratio measuring system, gen.-det.	7-dial transformer (0.1 ppm/step)	0.5-5 ppm	2850.
†*1071	AC ratio measuring system, gen.-det.	7-dial transformer (0.1 ppm/step)	0.5-5 ppm	2015.
951	Temp. meas., R_t/R_o	0-1111 Ω	10 ppm	6150.
*Special order	†Certified report of calibration supplied			

Generators-Detectors

801 DC Generator-Detector

Features solid state construction with complete guarding and shielding; 3-microvolt full-scale sensitivity; power-limited output to 1 watt; 600 volts maximum.

861A AC Generator-Detector

Gang-tuned 20 hertz to 20 kilohertz, variable; 1-microvolt sensitivity, very low noise; variable generator output power-limited.

900R Nanovolt Galvanometer

Precision nullmeter for low-level signal measurement. Wide range: 10 nanovolts to 3 millivolts. No critical adjustments: Operates from any source resistance. Two nanovolt sensitivity with 2% accuracy end scale, all ranges.

MODEL	DESCRIPTION	GEN. OUTPUT	DETECTOR SENS.	INPUT R.	PRICE
801	DC generator-detector 3 μV-1000 V end scale	0-600 V	0.1 μV	100 k-100 MΩ	$1300.
803A	DC generator-detector	0-200 V	5 μV	500 kΩ	500.
830	DC generator, guarded and isolated	0-200 V	——	——	575.
861A	AC generator-detector, variable freq.	0-200 V, 20 Hz-20 kHz	0.25 μV	1 MΩ	850.
865	AC/DC generator-detector	0-6 V	5 μV	10 MΩ	575.
900R	Nanovolt galvanometer, 10 nV-3 mV end scale	——	2 nV	1000 Ω	2350.

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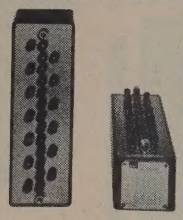
esi® standards, calibration and system components

Standards

SR 104 Transportable Resistance Standard

Calibration to 1 ppm is available on this 10-kilohm standard. Unique features include stability of 1 ppm/yr and a temperature coefficient of less than 0.2 ppm/°C.



SR 1010 Resistance Transfer Standard

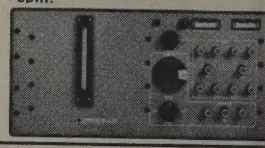
Twelve aged premium resistors, shielded, provide transfer measurements from a standard resistor to one of different value; accurate to 1 ppm.

SC 1000 Standard Capacitor

3-terminal, one nanofarad capacitor for calibrating bridges, capacitors. Stability of 20 ppm/yr guaranteed.

SV 150 Standard Voltage Cell

First voltage standard easily tra ported. Four cells sealed in co trolled environment with integ batteries for maintaining pow during shipment. Sealed batteri rarely need servicing and cann spill.



MODEL	DESCRIPTION	VALUE	NOMINAL ACCURACY	PRICE
†SR 104	10k transportable resistance standard	10 kΩ	5 ppm (1 ppm/yr stability)	$ 600.
SR 1	Standard resistor	.01 Ω	500 ppm	55.
		0.1 Ω	300 ppm	45.
		1, 10, 100 Ω; 1, 10, 100 kΩ	50 ppm	40.
		1 MΩ	100 ppm	70.
SR 1010	Resistance transfer standard (12 steps)	10 MΩ	100 ppm	150.
		1, 100 Ω	50 ppm	350.
		1, 10, 100 kΩ (per step)	50 ppm	350.
SR 1010/LTC	Low temperature coefficient model	10 Ω/step	50 ppm	475.
SR 1010/MTA	Resistance transfer standard, trimmable	10 kΩ/step	1 ppm	850.
SR 1050	High resistance transfer standard (11 steps)	100 kΩ/step	50 ppm	600.
		1 MΩ/step	50 ppm	700.
		10 MΩ/step	50 ppm	975.
†SC 1000	Standard Capacitor	1 nF	20 ppm	325.
SV 150	Standard cell bank	4 standard cells	——	1650.

†Certified report of calibration supplied

Working Standards

Many of the decade and divider standards offered in the ESI catalog can be special ordered in a programable version. Most accuracies and ranges can be obtained with either binary or BCD coding. Contact repeatability and reliability are outstanding, due to the use of latching mercury-wetted relays throughout.

RV 726 DEKAVIDER® Decade Voltage Divider

Self-calibration, 7-decade Kelvin-Varley circuit provides 0.1 linearity, 0.1 ppm resolution and outstanding performance at low settings. Temp. coefficient of ± 1 ppm/°C. RV 722 is a 7-decade, 1 ppm non-trimmable unit.

DT 72A DEKATRAN® Decade Transformer Standard

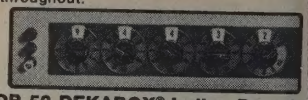
Laboratory voltage divider having 0.1-ppm resolution with 7-dial in-line readout. Over-windings provide additional 0.1 taps. Calibration certificate supplied.

DC 57 DEKAPACITOR® Capacitance Decade

Low-loss, 1% accuracy standard. Four decades and interpolating, variable air capacitor for continuous resolution. Range to 1.111120 microfarads.

RS 925C Resistance Standard

Four-terminal, provides 10 significant figures and accuracy of 0.0005%. Value: 1.2 megohm in 10 milliohm steps. First four decades trimmable. RS 624 is 6-decade, less accurate version.



DB 52 DEKABOX® In-line Decade

Resistors used for precision dc and audi frequency. Low temperature, power coeff cients; minimal leakage. Six-dial DB 6 also available.

DB 877 DEKABOX® Decade Resist

Compact design employs two coaxial dials (ES patent) for 8 full decades to 12 megohms at 0.02% accuracy long term.

MODEL	DESCRIPTION	VALUE	LINEARITY	PRICE
†RV 622A	Resistive divider (Kelvin-Varley), 6 decades	10 kΩ	5 ppm	$ 500.
		100 kΩ	5 ppm	570.
†RV 722	Standard divider (Kelvin-Varley), 7 decades	100 kΩ	1 ppm	995.
†RV 724	Standard divider—7 decades, over ranging	11 kΩ	1 ppm	1400.
RV 726	Adjustable divider (Kelvin-Varley), 7 decades	100 kΩ/110 kΩ	0.1 ppm	1495.
†DT 72A	Ratio transformer—7 decade standard	1.1111110	0.5 ppm	670.

MODEL	DESCRIPTION	PER STEP	TOTAL RESISTANCE	NOMINAL ACCURACY	PRICE
*DB 655	6-Decade resistor—tilting bench model	0.1, 1 Ω	120 kΩ, 1.2 MΩ*	0.02%	$ 235.
DB 877	8-Decade resistor—tilting bench model	10 Ω	12 MΩ*	0.02%	275.
DB 52	Decade resistor—5 decades in-line	0.1 Ω	12 MΩ	0.02%	310.
		0.01, 0.1 Ω	1.1111, 11.111 kΩ	0.02%	165.
		1 Ω	111.11 kΩ	0.02%	175.
		10 Ω	1.1111 MΩ	0.02%	195.
DB 62	Decade resistor—6 decades in-line	100 Ω	11.111 MΩ	0.02%	270.
		0.01 Ω	11.1111 kΩ	0.02%	185.
		0.1 Ω	111.111 kΩ	0.02%	195.
		1.0 Ω	1.11111 MΩ	0.02%	215.
		10 Ω	11.1111 MΩ	0.02%	300.
*RS 624	6-Decade resistance standard, 2-terminal, rack panel	1.0 Ω	1.2 MΩ	0.01%	815.
RS 925A	9-Decade resistance standard, 4-terminal	100 μΩ	1.2 MΩ	0.005%	1450.
RS 925C	9-Decade standard, trimmable, highest accuracy	100 μΩ	1.2 MΩ	0.0005%	2500.
DC 57	4-Decade capacitor—plus air variable		1.11 μF	1.0%	250.

*Special order †Certified report of calibration supplied

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e|s|i® automated measuring systems

peed up resistor making, testing, sorting, trimming . . . at the accuracy you want

measure/command bridge systems . . . to 36,000 measurements per hour up to 1% accuracy for applications ranging m rapid sorting and checking, to environntal testing and even control of resistive work manufacturing. Automatic connec- verification, normal mode AC rejection, rmal emf cancellation. Wide deviation ge with full scale accuracy. Complete nputer control available.

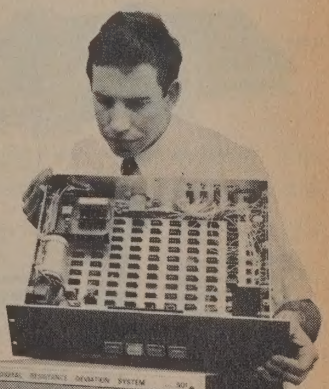
continuous tracking bridge systems . . . sistor trimming process (such as Q- tched laser beam) can be controlled by h speed bridge which responds to a 0.1% nge in value within 100 microseconds. que active arm Kelvin bridge permits adjing individual element within a network. tles in 1 millisecond after connection to nown. Resistor sorting can be cut to 30 iseconds. 100% full scale linear devia-. Programable model available.

c. limits comparators . . . Two manually-set limits control modules. One permits 6-band sorting, the other provides three successive negative limits and one symmetrical set point for controlling a continuous-tracking measure. Programable unit available.

d. control scanners . . . Two different models can scan up to 100 channels with metrological integrity. Mercury-wetted latching relays ensure contact repeatability of better than 0.5 milliohms and switching speed of 2 milliseconds. Through resistance constant.

e. data couplers . . . Four models provide interface between most data recorders and digital instruments. Accept 4 independent signal sources and a mixture of standard or open collector BCD or decimal switch inputs. 80-character interrogation. Flexible patchblock formatting.

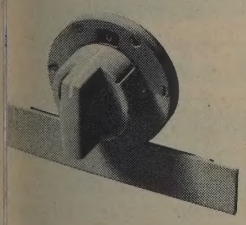
And more: Special winding cutoff bridges, ladder network checking systems, mechanical handlers, programable standards, programable dividers. If you have a volume resistance measuring problem, will you give some metrologists who think digital a crack at it?



e.

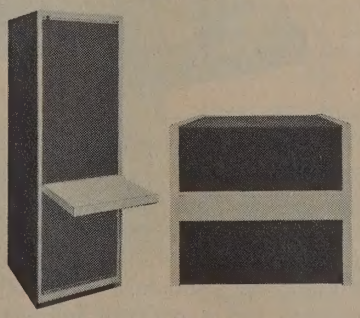
c. d. a. b.

ata Logging



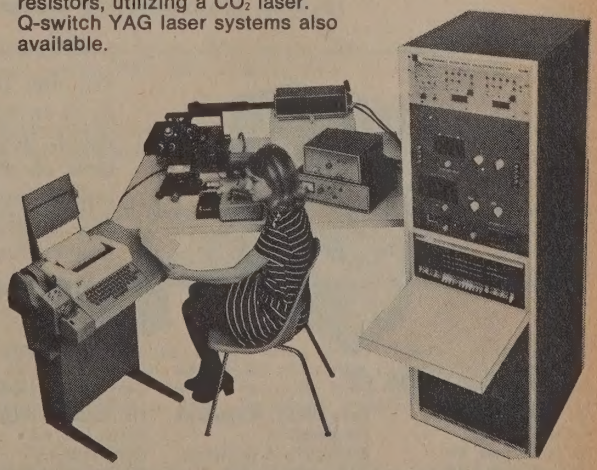
a Dial™ Conversion Units. mits most manual, precision asuring instruments to be ily and inexpensively data ged automatically. Essenti- they are decimal-to-BCD oders; they replace decimal tches on the front panel of ESI instrument (and others well). Output from a DATA L is fed from terminals unneath the dial on the panel nt directly to a data coupler.

Cabinets and Racks



Sturdy frame and skin-type construction of ESI enclosed cabinets and racks utilize extruded aluminum bezels with welded corners. Cabinets have recessed hand-holds in the side frame members for carrying convenience and racks feature standard mounting holes and hinged rear doors. Sizes and prices on request from factory.

Fully automatic laser trimming system for thick or thin film resistors, utilizing a CO_2 laser. Q-switch YAG laser systems also available.



For Individual Decades and Components, see ESI page in Precision Resistor Section #4750.

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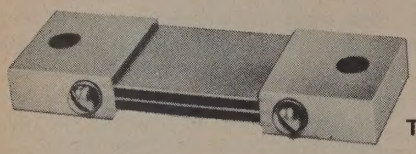
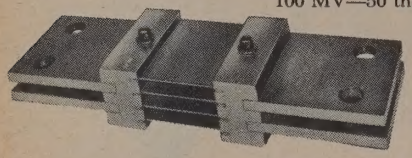
World's Largest Selection of D.C. AMMETER SHUNTS

ACCURACY ¼%



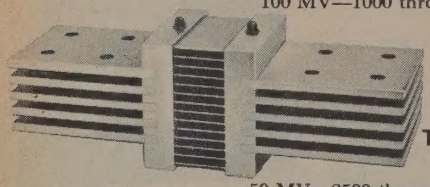
TYPE A

50 MV—15 through 600 amperes
100 MV—50 through 600 amperes



TYPE C

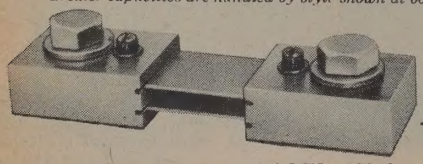
50 MV—1000 through 2000 amperes
100 MV—1000 through 2000 amperes



TYPE F

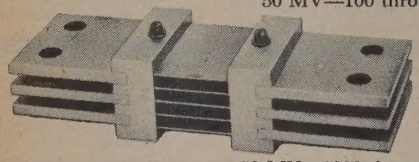
50 MV—2500 through 30000 amperes
100 MV—2500 through 10000 amperes

Style shown here has rated capacities of 10,000 amps and under. Greater capacities are handled by style shown at bottom of page.



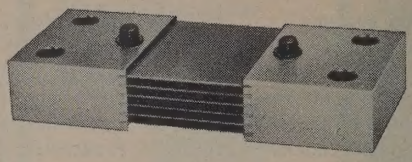
TYPE TRW-50

50 MV—100 through 600 amperes



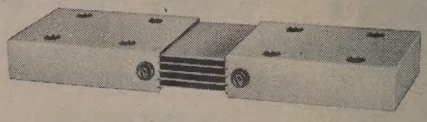
TYPE WT

50 MV—1000 through 10000 amperes
100 MV— 600 through 6000 amperes



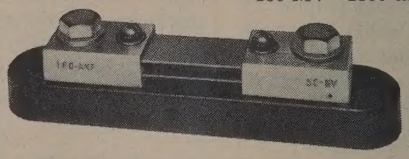
TYPE B

50 MV—300 through 1200 amperes
100 MV—300 through 1200 amperes



TYPE E

50 MV—1500 through 2000 amperes
100 MV—1500 through 2000 amperes

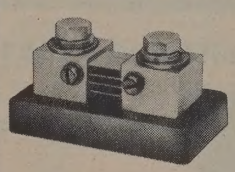


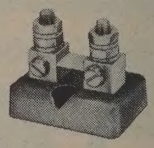
TYPE HA

50 MV—1 through 500 amperes
100 MV—1 through 500 amperes

TYPE W

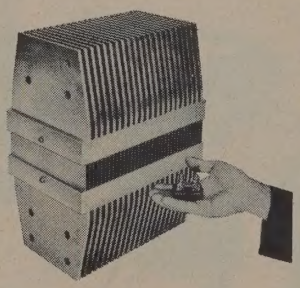
50 MV—500 through 1000 amperes
100 MV—120 through 500 amperes





LIGHTWEIGHT TYPES

50 MV—5 through 1200 amperes



Large capacity Type F shown with Lightweight Type

We offer the widest selection of standard model shunts available anywhere. Both switchboard and portable types. In addition, we produce custom made shunts to your specifications. Our standard models, illustrated on this page have current ratings up to 30,000 amperes. Many of these can be shipped immediately. Custom made shunts, of course, take a little time to produce. But whether you order a standard or special model, we promise fast service, fine craftsmanship and a personal interest in your complete satisfaction.

EMPRO MANUFACTURING CO., INC

GENERAL SALES OFFICE AND PLANT
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Phone: 212/726-4551

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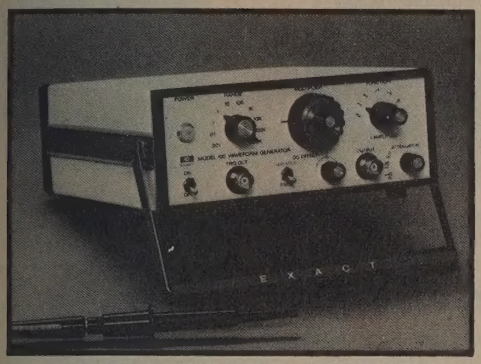
4250 West 130th St.
Phone: 216/251-4609

Pa. 19115: Philadelphia
Sunshine Scientific Inst., Inc.
1810 Grant Ave.
Phone: 215/ORchard 3-5600

Can., Ontario: AJAX
Stark Electronic Inst., Ltd.
540 Finley Ave.
Phone: 416/942-2120

WAVEFORM GENERATORS

Function Generators Oscillators (Variable Frequency) Pulse Generators Signal Generators Complex Waveform Synthesizers



MINIATURE WAVEFORM GENERATORS

A Combination Waveform, Oscillator and Pulse Generator

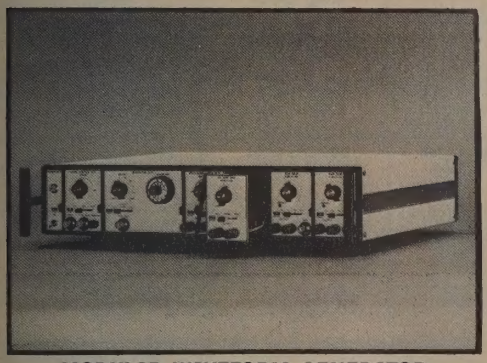
100 series waveform generators are:

MODEL 100 WAVEFORM GENERATOR
.001Hz to 5MHz; Sine ∿, Square-⊓, Pulse ⊓⊓ ⊓⊓, Triangle ∿ and Ramp ⊿⊾. Variable 0 to 15V P-P into 50 onms, 30V P-P Open Circuit, with variable ±5V D.C. offset. $445

MODEL 120 WAVEFORM GENERATOR
Sine, Square & Triangle 0.1Hz to 3 MHz $295

MODEL 123 VCF GENERATOR
Voltage controlled frequency 1000:1 range $345

MODEL 126 VCF/SWEEP GENERATOR
Internal ramp provides 1000:1 sweep capability $495



MODULAR WAVEFORM GENERATOR

The 5000 modular system offers the capabilities of building a wide variety of waveform, oscillator, pulse or signal generators from basic independent modular units. 3½" Thin

Some modules for this system are:

GENERATORS

G5210 ⊓⊔ ∿	0.0001Hz to 2MHz (triangle for sine shaping limited to 1MHz)	$225
G5212 (ramp)	1000 sec to 1μsec built-in gating, triggering.	$210
G5214 (ramp)	100 sec to 10 μ sec designed to drive G5211 or M5310	$210

MODULATOR

M5310	Adds VCF to G5210	$95

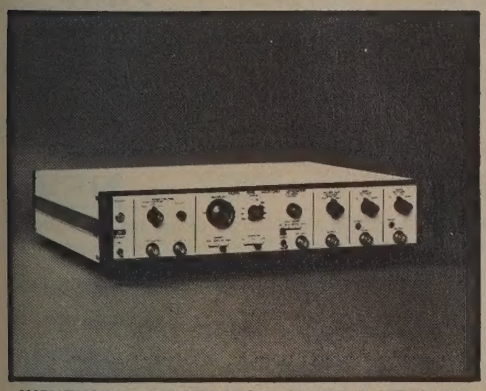
MODE CONTROLS

C5110	Gate and Trig to generator—variable start-stop point. Adds haversine and havertriangle	$75

AMPLIFIERS

A5410	Square output only. Features fast rise and fall times. 28V P-P into 600 ohms.	$75
A5420	Built-in sine shaper. External input provided. 26V P-P into 600 ohms.	$125
P5001	Cabinet/power unit ±18V regulated, ±30 unregulated, ±8V unregulated	$290

The P5001 cabinet/power supply can hold and supply power to seven module widths, the generators being two module widths each and all other modules one width each.



WAVEFORM GENERATOR (SLIM LINE 3.5")

Designed to give a great amount of flexibility in a fixed package at a low cost

500 series waveform generators are:

MODEL 502 WAVEFORM GENERATOR .001 Hz to 1MHz; Sine ∿, Square ⊓⊔⊓⊔, Pulse-⊓⊔⊓⊔, Triangle ∿ and Ramp ⊿⊾ Sine, Triangle and Ramp 10V P-P into 600 ohms. Square 14V P-P. $385

MODEL 500B WAVEFORM GENERATOR .0001Hz to 1MHz, square and triangle to 2MHz; Sine∿, Square -⊓⊔⊓⊔, Pulse-⊓⊔⊓⊔, Triangle ∿ and Ramp ⊿⊾. Three independent output amplifiers and attenuators, 25V P-P into 600 ohms with variable D.C. offset. Will drive 50 ohms at reduced amplitude. $495

MODEL 503B VCF GENERATOR All Model 500B features plus precision control of frequency with an external voltage (VCF). 50:1 sweeping ratio. VCF input signal conditioning. $545

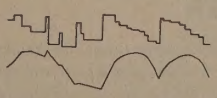
MODEL 504B TRIGGERED GENERATOR All Model 500B features plus manual or external gating and triggering (single shot). Variable start-stop point adds haversine waveform. $565

MODEL 505B TRIGGERED, VCF All Model 500B features plus gating, triggering and voltage controlled frequency (reference Models 503B and 504B). $645

NEW 201 COMPLEX WAVEFORM SYNTHESIZER SOLID STATE 5½" HIGH PACKAGE

DIGITAL

ANALOG



Produces forty individual and incremental voltage levels, twenty, if both amplitude level and the pulse width are variable. Both digital and analog (variable slope) outputs. Increment programming enables each individual increment to be set to a pre-determined D.C. level by monitoring with VOM or DVM. Increments variable from 100 msec to 2 μsec.

Prices and specifications subject to change.

EXACT ELECTRONICS INC.
455 S.E. 2nd Avenue, Hillsboro, Oregon 97123 • TEL: (503) 648-6661

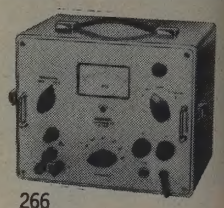
FREED TRANSFORMER CO., INC.

1620-A-B-C-D

1020-C

667

2030-A-B-C


266

MEGOHMMETERS

Freed can supply a complete range of insulation resistance measuring equipment with fixed and variable d.c. test voltages from 5 to 5000 volts. Insulation and leakage measurements can be made on transformers, motors, cables, electronic assemblies and components, dielectric materials, electrical appliances and tools, capacitors and resistors.

Type	Resistance Range	Test Voltage	Accuracy	Power Requirements	Size and Weight	Pr
1620	0.1 to 4,000,000 megohms 1 to 2,000,000 megohms @ 500 volts	Variable 50 to 1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	360
1620-A	0.01 to 4,000,000 megohms 0.1 to 200,000 megohms @ 50 volts 1 to 2,000,000 megohms @ 500 volts	Variable 5-100 volts d.c. 100-1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	375
1620-B	1 to 2,000,000 megohms 10 to 2,000,000 megohms @ 2500 volts	Variable 250-2500 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	395
1620-C	All features same as Type 1620 with additional circuitry for capacitor measurements	Variable 50 to 1000 volts d.c.	±5% at full scale	105-125 volts 50-60 cycles	15" x 9" x 7½" 24 lbs. *	385
1620-D	0.01 to 40,000,000 megohms 0.1 to 2,000,000 megohms @ 50 volts 1 to 20,000,000 megohms @ 500 volts	Variable 5-100 volts d.c. 100-1000 volts d.c.	±5% at full scale except highest range ±10%	105-125 volts 50-60 cycles	15" x 9" x 7½" 25 lbs. *	415
1020-C	0.1 to 2,000,000 megohms 0.1 to 200,000 megohms @ 50 or 100 volts d.c. 1 to 2,000,000 megohms @ 500 volts d.c.	Fixed 50, 100, 500 volts Regulated	±3% all ranges except highest range ±5%	105-125 volts 50-60 cycles	9½" x 10½" x 8" 18 lbs. *	280
1020-D	0.1 to 2,000,000 megohms 0.1 to 200,000 megohms @ 100 or 200 volts d.c. 1 to 2,000,000 megohms @ 500 volts d.c.	Fixed 100, 200, 500 volts Regulated	±3% all ranges except highest range ±5%	105-125 volts 50-60 cycles	9½" x 10½" x 8" 18 lbs. *	290
* 266	0.6 megohm to 500 teraohm @ 500 v. 0.6 megohm to 100 teraohm @ 100 v.	Fixed 100-500 v.d.c. Regulated	± 5% at full scale	105-125 Volts 50-60 Hz	11½" x 9" x 9" 18 lbs.	425
* 668	0 to 20,000 megohms @ 1000 v 0 to 50,000 megohms @ 2500 v 0 to 100,000 megohms @ 5000 v	Fixed 1000-2500 5000 v.d.c.	±2.5% of scale length	battery operated transistor supply built in charger	16" x 12½" x 6½" 23 lbs.	850.
2030-A	10 to 2,000,000 megohms	Fixed 500 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	205
2030-B	1 to 20,000,000 megohms	Fixed 500 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	250
2030-C	1 to 2,000,000 megohms	Fixed 50 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	225
2030-D	1 to 2,000,000 megohms	Fixed 100 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	225
2030-E	1 to 2,000,000 megohms	Fixed 200 volts d.c.	±5% full scale	battery operated transistor supply	6" x 8" x 4" 8 lbs.	225
* 667	0 to 10,000 megohm	Fixed 100-250-500 1000 v.d.c.	± 2.5% of scale length	battery operated transistor supply	8½" x 4½" x 5" 4½ lbs.	175

Rack type available — 1620 series 19" x 10½" x 9½"
1020 series 19" x 7" x 9½"

* Norma Instruments, Freed exclusive U.S. agent.

MEGOHMMETER - NO. 1650 NEW

The Type 1650 Megohmmeter is a versatile ultra high resistance measuring instrument providing variable test voltages from 10 to 1000 v.d.c. Ground and guard terminals are provided for measurement of grounded and ungrounded two or three terminal components. Provision for pre-charging and discharging capacitors is incorporated in the instrument.

Specifications: Test Voltage: 10-1000 v.d.c. – Resistance Range: 50 KΩ to 200 TΩ – Operating Voltage: 105-125 volts, 50-60 Hz – Size and Weight: 11" x 10" x 8"; approx. 12 lbs. – Price: $465.00.

MEGOHMMETER - NO. 2030-G NEW

The new Type 2030-G Megohmmeter is a portable re-chargeable battery operated high insulation resistance measuring instrument. Battery operation provides stable isolated resistance measurement capability not affected by leakage path through the power lines. Five commonly used test voltages are available from 50 to 500 volts.

Specifications: Test Voltages: 50, 100, 200, 250, 500 v.d.c., ±5% – Resistance Range: 50 KΩ to 100 teraohms in eight ranges: 50 v., 50KΩ to 10 TΩ, 100 v., 100 KΩ to 20 TΩ, 200 v., 200 KΩ to 40 TΩ, 250 v., 250 KΩ to 50 TΩ, 500 v., 500 KΩ to 100 TΩ – Resistance Accuracy: ±5% at full scale to 1 teraohm, ±10% above – Operating Voltage: Re-chargeable batteries – Size and Weight: 11" x 10" x 8", approx. 10 lbs. – Price: $345.00.

NON-DESTRUCTIVE MEGOHMMETER NEW

The Type 1625 Non-Destructive Megohmmeter provides three modes of insulation resistance testing: a manual voltage control meghommeter; an automatic linear ramp voltage; and an adjustable leakage current for non-destructive dielectric testing of components. The non-destructive feature will operate in the automatic ramp mode or by manual voltage control. Test voltage is removed from the unknown in milli-seconds when leakage current exceeds the preset value. A voltmeter indicates the test voltage at disconnect and will hold the reading until reset.

Specifications: Test Voltage: Manual or Ramp controlled, 50-1000 v.d.c. – Resistance Range: 0.1 to 4,000,000 megohms, 1 to 2,000,000 megohms at 500v. – Resistance Accuracy: ±5% at full scale – Leakage Current: 15 microamps to 3 milliamps – Operating Voltage: 105-125 volts, 50-60 Hz – Size and Weight: 15" x 9" x 7½", 26 lbs. – Price: $495.00.

Prices quoted are subject to change without notice

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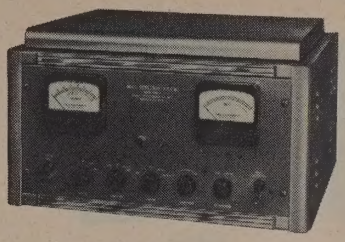
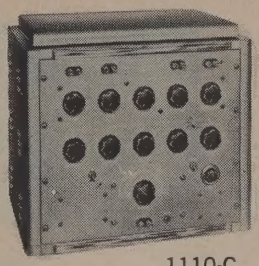
FREED TRANSFORMER CO., INC.

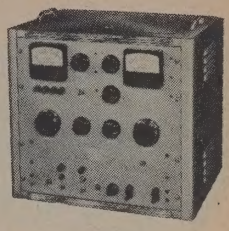
1010-A



1210-A



1110-C



1870

INCREMENTAL INDUCTANCE BRIDGES

Direct in-line readings of inductance and conductance of iron core component at audio frequencies with or without superimposed direct current. The bridge uses the Owens circuit with provisions for measuring the series or parallel inductance and conductance of the unknown inductor; five precision resistance and capacitance decades are provided to indicate these values. "Q" or storage factor can be measured as the product of the inductive reactance and the conductance.

Type	Inductance Range	Conductance Range	Frequency Range	D.C. Current	Accuracy	Dimensions and Weight	Price
1110-C	1111.1 h to 1 mh 5 decades 1.1 h to 1 μh 2 decades	0.015 μmho—100 mho "Q" = 600 max @ 100 cycles	20 cycles to 10KC	up to 2 amperes	±0.5% to 5 KC ±2% to 10 KC	21¾" x 17½" x 15¼" 50 lbs.	545.00
1115	111.1 h to 100 μh 5 decades 0.11 h to 0.1 μh 2 decades	0.15 μmho—1000 mho "Q" = 600 max @ 100 cycles	20 cycles to 10 KC	up to 15 amperes	±1% to 5 KC ±3% to 10 KC	21¾" x 28" x 15¼" 80 lbs.	825.00
1185	111.1 h to 100 μh 5 decades 0.11 h to 0.1 μh 2 decades	0.15 μmho—1000 mho "Q" = 600 max @ 100 cycles	20 cycles to 10 KC	up to 30 amperes	±1% to 5 KC ±3% to 10 KC	21¾" x 33¼" x 15¼" 100 lbs.	1250.00

IMPEDANCE & ADMITTANCE BRIDGE

An audio frequency bridge for measuring the complex impedances of inductors, transformers, filter networks and capacitors.

Type	Frequency Range	Impedance and Admittance	Accuracy	Maximum Applied Voltage	Dimensions and Weight	Price
1120	20 to 20,000 cycles	XL, XC and R up to 1000 ohms, BL, BC and G up to 1000 microhms	R: ±1% G: ±2% X: ±1% up to 5 KC B: ±1% up to 5 KC	125 Volts	10½" x 12" x 12" 25 lbs.	455.00

UNIVERSAL BRIDGE

The Freed Type 1150-A Universal Bridge offers the laboratory a combination of eight bridges in one instrument. This bridge will measure the reactive and resistive component of impedances, capacitance, resistance and phase angle. In the Hay and/or Owen bridge configuration the incremental permeability of an inductance can be measured.

Type	Inductance Range	Capacitance Range	Resistance Range	"D" Hay Bridge	Price
1150-A	5 μh 1110 h	5 pf-10 mf	0.05 Ω-1 MΩ	0.001-10 Q = 0.1-1000	825.00
	"Q" Maxwell 0.01-50	"Q" Series Owen 0.01-600 @ 100 cycles	"Q" Parallel Owen 80 @ 100 cycles	"Q" Parallel Resistor-Condensor Bridge 0.01-11.1	
	Accuracy Inductance ±0.5% up to 1 KC. ±2% to 10 KC. Capacitance ±1% @ 1 KC. "D"-"Q" ±5% @ 1 KC. Resistance (ac.) ±1% @ 1 KC.			Dimensions and Weight 21¾" x 24½" x 17" 65 lbs.	

INDUCTANCE COMPARISON BRIDGE

A complete production unit for comparing transformer and inductor impedances under dynamic conditions against a standard resistor. The instrument has a self-contained metered 500 Ma. d.c. supply, metered 135 volt a.c. source and a direct reading percentage deviation indicator, provision for connecting external test frequencies up to 10 Kc. is provided.

Type	Inductance Range	Deviation Range	Test Frequency	D.C. Current Range	Dimensions and Weight	Price
1870	25 mh - 100 h	±20%, accuracy 1% ±30%, accuracy 5%	60-10,000 cycles	0.5 ma., 0-25 ma., 0-100 ma., 0-500 ma.	22" x 19½" x 15" 150 lbs.	550.00

COMPARISON & LIMIT BRIDGE

A rapid and convenient method for laboratory or production testing of resistors, capacitors and inductors. Components may be sorted for tolerances up to ±20% or selected in matched pairs.

Type	Inductance Range	Capacitance Range	Resistance Range	Test Frequency	Accuracy	Dimensions and Weight	Price
1010-A	10 μh-100 h	10 Pf-100 mf.	1 Ω-20 MΩ	50 or 60 cycles 1 KC-10 KC	±0.1% on 5% range	10½" x 12" x 12" 17 lbs.	350.00

Prices quoted are subject to change without notice

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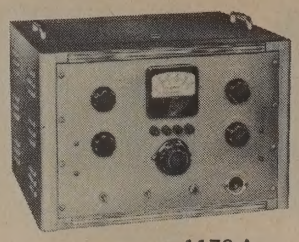
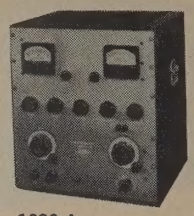
FREED TRANSFORMER CO., INC.

1140-B



1170-A



1030-A

1210-A

NULL DETECTORS

Sensitive null detectors for bridge measurements, with self contained selective filters to limit the amplifier characteristics at various bridge measuring frequencies.

Type	Sensitivity	Frequency Range	Filter	Power Requirements	Dimensions and Weight	Price
1140-B	10μ volts @ 1 KC for 15% meter deflection filter in	20 to 20,000 cycles	Fixed 60, 400, 1000 cycles Adjustable ±5% of center Other frequencies available	105-125 volts 50-60 cycles	Cabinet 12" x 8½" x 10"—18 lbs. Rack—19" x 6" x 10"	250.00
2076	1μ volts @ 1 KC for 15% meter deflection filter in	20 to 20,000 cycles	Fixed 60, 400, 1000 cycles Adjustable ±5% of center Other frequencies available	Transistorized Battery operated	Cabinet—8" x 6" x 8" Rack—19" x 5¼" x 8"	295.00

NULL DETECTOR — VACUUM TUBE VOLTMETER

Designed primarily for a.c. bridge measurements, a dual purpose instrument for indicating bridge balance and the a.c. excitation across the unknown.

Type	Null Sensitivity	Frequency Range	Filter	Power Requirements	Dimensions and Weight	Price
1210-B	10 M volts @ 1 KC for 15% meter deflection	20-20,000 cycles	Fixed 60, 400, 1000 cycles provision for other frequencies	105-125 volts 50-60 cycles	*21" x 12" x 13" 37 lbs.	350.00
	Voltage Range	Input Impedance	Frequency Range	Accuracy	Rack	
	0.1 to 150 volts ac. 0.15-1.5-15-150 volts full scale	500 KΩ in parallel with 25 PF.	20 to 20,000 cycles ±1db	2% of full scale	19" x 8¾" x 9½"	

D.C. SUPPLY

A constant voltage transformer regulated current source designed for use with the Freed Incremental Inductance Bridges. Solid state bridge rectification, L-C filters and low internal impedance provides good current regulation with a minimum of circuit complexity.

Type	Current Ranges	Voltage Ranges	Regulation	Power Requirement	Dimensions and Weight	Price
1170-A	4 ranges, 0-5, 25, 100 and 1000 milliamperes	Maximum no load voltage 1000 Ma, 270V, 100 Ma, 270V, 25 Ma, 85 V, 5 Ma, 48 V	±1% for line variation 105-125 V	105-125 volts 60 cycles	19" x 10½" x 13½" 66 lbs.	350.00

LOW FREQUENCY "Q" INDICATORS

Direct indication of "Q" at low frequencies, inductance, distributed capacity, impedance and dielectric loss can also be measured. Instrument may be used to study the magnetic properties of iron core material for stability as a function of applied voltage and losses as a function of the frequency.

Type	Test Frequency	Q Range	Accuracy	Test Voltage	Power Requirements	Dimensions and Weight	Price
1030-A	20 cycles to 200 K.C.	1-1000	±5% 20 cycles to 50 KC— to 200 KC at reduced accuracy	Voltage to series circuit, 0.01 to 10 volts voltage across coil variable to 100 volts	105-125 volts 50-60 cycles	21" x 23" x 15" 120 lbs.	1250.00

NEW

NON-DESTRUCTIVE AC/DC INSULATION TESTERS

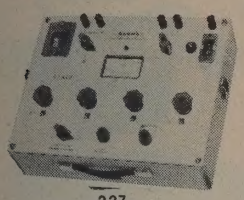
The Freed Type 3001 Non-destructive Insulation Tester features adjustable leakage current which may be preset for non-destructive dielectric testing of materials and components. Voltage is removed from the test sample when preset current is exceeded. A memory voltmeter will indicate voltage when preset current is removed from test sample and hold reading until reset. Manually variable test voltage and adjustable ramp of 2-4-6-8 seconds.

Specifications: Test Voltage: Model 3001 — 0-5000 v. A.C. RMS/D.C.; Preset Leakage Current: 20 microamps to 5 milliamps; Operating Voltage: 105-125 volts, 50-60 Hz; Size and Weight: 21" x 15" x 10", 58 lbs.; Price: Type 3001 — $395.00.

Prices quoted are subject to change without notice

FREED TRANSFORMER COMPANY, INC. 1795 WEIRFIELD ST. (Ridgewood) Brooklyn, N.Y. 11227

FREED TRANSFORMER CO., INC.



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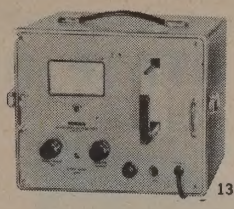

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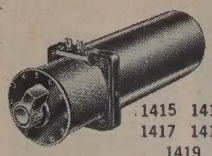


1415 1416
1417 1418
1419

RAC—1.5/3

DISTORTION METER

The type 1970 Distortion Meter is a wide range low input impedance instrument, designed with passive circuitry resulting in high stability, low residual distortion and hum levels.

Type	Frequency Range	Input Impedance	Input Voltage	Sensitivity	Dimensions and Weight	Price
1970	20 cycles to 1 megacycle	75-150 300-600	1 to 200 volts	Distortion level of 0.02% for 1 volt input	19" x 10½" x 12" 30 lbs.	525.00

A.C. LINE REGULATOR

A distortion free 60/400 Hz electromechanical a.c. line regulator. Features a tubeless fast response phase reversible magnetic amplifier preceded by a transistor comparison amplifier with zener reference.

Type	Nominal Input Voltage-Frequency	Output Voltage	KVA Rating and Regulation Range	Regulation Accuracy	Response Speed Volts/sec.	Dimensions and Weight	Price
R.A.C. 1.5/3	115 Volts 60 or 400 Hz	Adjustable 110-120 volts	3 KVA for ± 10% regulation 1.5 KVA for ± 20% regulation	± 0.25% for ± 10% regulation range ± 0.5% for ± 20%	10@ ± 10% 20@ ± 20%	19" x 7" x 13" 45 lbs.	450.00

DECADE CAPACITORS

The Freed series of Decade Capacitors cover a wide range of values and can be supplied as individual decades from 0.0001 PF. per step to 1 mf. per step or in various combinations of assembled decade boxes. All capacitors are non-inductively wound and heat treated for stability.

Type	Total Capacity	Dielectric	Dissipation Factor	Accuracy	Dimensions and Weight		Price
1415	10 μf in steps of 1 μf	Mylar	<0.005	±1%	3" x 3" x 7"	2 lbs.	40.00
1416	1 μf in steps of 0.1 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	55.00
1417	0.1 μf in steps of 0.01 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	40.00
1418	0.01 μf in steps of 0.001 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	40.00
1419	0.001 μf in steps of 0.0001 μf	Polystyrene	<0.0002	±1%	3" x 3" x 7"	2 lbs.	45.00
1250	1.110 μf in steps of 0.001 μf	Polystyrene	<0.0002	±1%	13¾" x 6" x 4½"	8 lbs.	180.00
1351	11.111 μf in steps of 0.0001 μf plus 100 pf variable air capacitor	Mylar Polystyrene Air	<0.005	±1%	19" x 10¾" x 8"	25 lbs.	305.00
1352	1.111 μf in steps of 0.0001 μf	Polystyrene	<0.0002	±1%	19" x 5¼" x 10"	13 lbs.	220.00
1353	11.111 μf in steps of 0.0001 μf	Mylar Polystyrene	<0.005	±1%	19" x 5¼" x 10"	14 lbs.	275.00

Maximum operating voltage, 500 VDC or peak. Capacitors can be supplied to better than ±1%, write for complete information.
In addtion to listed equipment, Freed manufactures a complete series of decade inductors, AC and DC regulated power supplies, comparison and limit bridges.
Write for complete catalog.

DECADE INDUCTORS

Each unit is an assembly of four toroids wound on a stabilized Molybdenum permaloy dust core. The coils have a nominal inductance of 1-2-3-4 and are connected in series and switched to vary the inductance from 0-10.

Type	Frequency Range, Cycles	Maximum*	Inductance per Step	Total Inductance	Accuracy	Dimensions and Weight		Price
1220	500-20,000	230 @ 4 KC	0.001 h	0.01 h	±2%	3" x 3" x 9"	4½ lbs.	$100.00
1230	500-20,000	280 @ 3 KC	0.01 h	0.1 h	±1%	3" x 3" x 9"	4½ lbs.	95.00
1240	500-20,000	260 @ 3 KC	0.1 h	1. h	±0.5%	3" x 3" x 9"	4½ lbs.	100.00
1270	500-20,000	190 @ 2 KC	1. h	10 h	±0.25%	3" x 3" x 9"	4½ lbs.	110.00
1341	100-2,000	100 @ 1 KC	10 h	100 h	±0.25%	3" x 3" x 9"	4½ lbs.	120.00
1280	500-20,000	280 @ 3 KC	0.001 h	1.11 h	See note	13¾" x 6⅛" x 5½"	16 lbs.	325.00
1290	500-20,000	280 @ 3 KC	0.001 h	11.11 h	See note	15" x 7" x 5½"	20 lbs.	425.00
1310	500-20,000	280 @ 3 KC	0.01 h	11.1 h	See note	13¾" x 6⅛" x 5½"	16 lbs.	325.00
1164†	30-2,000	60 @ 300	0.1 h	111 h	±1%	15" x 7" x 5½"	28 lbs.	285.00

† Type 1164 inductors are wound on special nickel alloy laminated cores.

Inductance per step:	1 mh	10 mh	100 mh	1 h	10h
Nominal Accuracy:	±2%	±1%	±0.5%	±0.25%	±0.25%

*Maximum Q depending on inductance value and a.c. voltage across coil.

PHASE SEQUENCE INDICATOR

The model 206 phase sequence indicator is a rugged instant reading instrument for determining the proper connections of motors, meters and relays operating in a 3 phase system. The unit is supplied with permanently connected coded leads and operates over a voltage range of 80 to 400/500 volts, 16 to 400 Hz. Weight: 8 oz.; Dimensions: 2½" dia. x 1" thick. Comes complete with leather carrying case. Price: $36.50

ELAPSED TIME METER

Model 1900 is a rugged synchronous drive elapsed time indicator which indicates hours to 9999.9. Operates on 117 volts, 60 Hz; power consumption 1 watt. Mounts in a 1" x 2" opening Price: $14.50.

SHORTED TURNS INDICATOR

*type 134 shorted turns indicator is a high sensitivity instrument which will detect the presence of one or more shorted turns in a coil using up to #44 wire. Eddy current losses are minimized by the use of a very low frequency built in test oscillator. The instrument will test most types of audio, power, IF chokes, relays and other coreless coils. Power requirement: 115 Volt, 60 Hz; Wt.: 13.5 lbs.; Dimension: 11" x 9" x 10"; Price: $395.00.

TRANSFORMER RATIO METER

The *type 227 will measure transformer ratio of 1 to 1011 in three decade ranges with an accuracy of 0.1%. The instrument can also be operated as a ratio comparison tester with a deviation range of ±1%. Power requirements: 115 volts, 60 Hz; Size 17" x 13" x 6"; Wt.: 25 lbs.; Price: $925.00.

*Norma Instruments, Freed Exclusive U.S. Agent.

FREQUENCY PRODUCTS

INSTRUMENTS

High Stability Frequency Standards

Digital Phase Comparators

High Performance Distribution Amplifiers

High Stability Portable Clocks

High Precision Low Frequency Variable Oscillators

OSCILLATORS

High Stability Crystal Oscillators
Oven Proportionally Controlled

Sub-Miniature Crystal Oscillators
No Ovens Utilized

High Stability Crystal Oscillators
Low Power Oven

High Precision Crystal Oscillators
Frequency Voltage Controlled

Temperature Compensated Oscillators

High Stability Proportional Ovens

Linear Discriminators

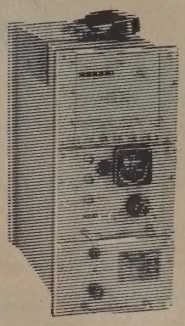
SEND FOR COMPLETE CATALOG C

FREQUENCY ELECTRONICS, INC.

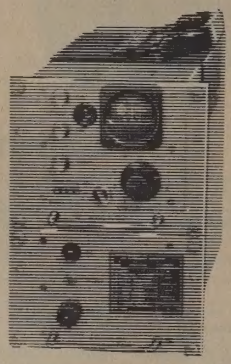
Where Time/Frequency is a unique dimension

3 Delaware Drive,
New Hyde Park, N. Y. 11040
(516) 328-0100

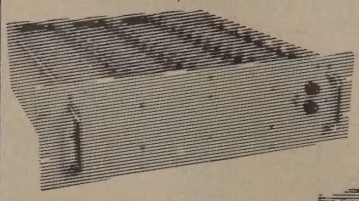
INSTRUMENTATION



PORTABLE DIGITAL CLOCKS



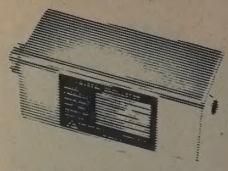
HIGH STABILITY FREQUENCY STANDARDS



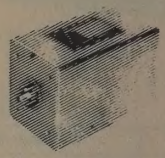
DISTRIBUTION AMPLIFIERS

DIGITAL PHASE COMPARATORS

COMPONENTS



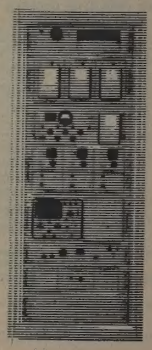
CRYSTAL OSCILLATORS



LINEAR DISCRIMINATORS

PROPORTIONAL OVENS

SYSTEMS



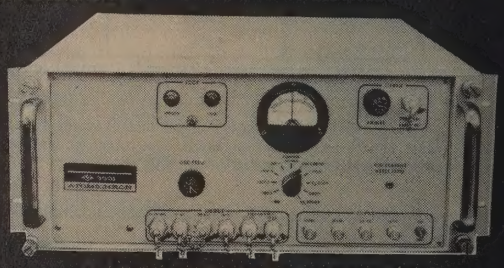
FREQUENCY-TIME STANDARD

and now... Precision Frequency Standards *by* Atomichron® MODEL 3501

CESIUM BEAM PRIMARY TIME AND FREQUENCY STANDARD

Atomic and UTC Time Scales

Model 3501 Atomichron is a compact, solid-state, self-contained, cesium-beam primary time and frequency standard, designed for scientific, industrial and military applications. The 3501 provides output frequencies accurate to ± 1 parts in 10^{11} for the life of the cesium beam resonator, with a 1,000-second stability of ± 3 parts in 10^{12}, rms. The fundamental primary-loop frequency is 14.59+ MHz. Standard output frequencies (10 MHz, 100 kHz, 1 PPS and 14.591479 MHz) and standard time-scale selection (Atomic Time A.1 or Universal Time UTC) are provided by an internal frequency synthesizer (secondary loop) with a 10 MHz reference oscillator. No accessories are required to convert the unit from one time scale to another.



MILITARY NOMENCLATURE AN/USQ-43

ATOMICHRON, INC. *A subsidiary of Frequency Electronics, Inc.*

3 Delaware Drive, New Hyde Park, New York 11040 • (516) 328-0360

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gar enterprises

2031 North Lincoln Avenue • Pasadena, California 91103 • Tel. (213) 798-0785

800 Hz SOLID STATE AURAL WARNING DEVICE

FUNCTION: This tone oscillator is designed for installation in aircraft of the turbo-jet class and up. Triggers audible warning alert signal when preset flying conditions are attained.

Unit works in conjunction with existing altimeter system to seek and hold pre-determined altitude.

VERSATILITY: By controlling 28 VDC input, functions other than altitude may be monitored audibly in flight.

SPEAKERS: The plane's built-in speaker system is employed, but, if required, self-contained speaker system supplied at extra cost.

INPUT: 28 VDC.

OUTPUT: 4 or 8 ohms at 10 W. maximum.

SIZE: 2¼ inch cube

WEIGHT: 8 oz.

ENVIRONMENTALS: Operates from −65°F. to +185°F. at altitudes up to 65,000 ft.

PERFORMANCE: Meets FAA requirements of FAR 91.51.

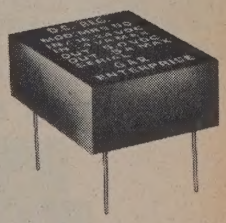
VOLTAGE REGULATOR — MODEL MRS

Designed for installation in computers, control, automation GSE, and other digital logic systems.

The Model MRS Series Voltage Regulator: 1) dissipates only 20% of the power consumed by conventional regulators; 2) distributes power to digital systems in the form of higher voltage and lower current; 3) delivers high current only at the point of installation; 4) reduces system noise by reducing buss bar currents.

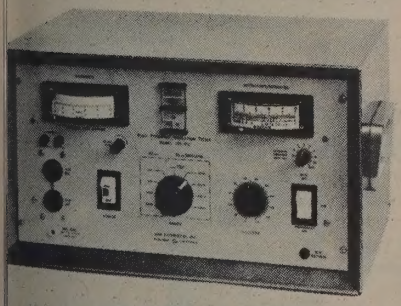
SPECIFICATIONS

1. Input voltage range: 16-24 VDC
2. Output voltage:
   Model MRS 45 — 4.5 VDC
   Model MRS 50 — 5.0 VDC
   Model MRS 55 — 5.5 VDC
3. Load current: 0-500 ma
4. Efficiency: 65% @ Full Load
5. Line regulation: ±0.5% Max.
6. Load regulation:
   No load to full load: ±0.5% Max.
7. Output ripple: 40 m v P-P Max.
8. Temperature stability: 2.0 m v/°C
9. Operating temperature: 0-65°c
10. Overload and short circuit protection: Protected against dead short and above 150% overload
11. Recovery time:
    (a) No load to full load: 0.75m sec
    (b) Full load to no load: 4.5 m sec
12. Size: 1 3/16 x 1¼ x ½ inches high
    Leads: ⅝ inches long



Wide variety of other models of Voltage Regulators available. Contact us for further information.

HIGH POTENTIAL INSULATION TESTER MODEL HPT-100



MEASURES OR TESTS

☐ DC Insulation ☐ AC Insulation ☐ DC Leakage Current ☐ AC Leakage Current ☐ Megohm ☐ Corona **ON INDUSTRIAL AND MILITARY** ☐ Transformers ☐ Capacitors ☐ Cables ☐ Motors ☐ Insulation Materials ☐ Appliances ☐ High Voltage Rectifiers **FOR** ☐ Quality Control ☐ Production Testings ☐ Research and Development ☐ Maintenance ☐ Repair

Oil Filled H.V. Transformer, HVT1, used in the High Potential Insulation Tester GAR Model HPT-100.

SPECIFICATIONS

INPUT VOLTAGE 115 vac, 60 hz

POWER CONSUMPTION 70 watts

OUTPUT VOLTAGE DC: 0-10 kv continuously variable AC: 0-5 kv continuously variable

LEAKAGE CURRENT DC: 5 ranges zero to 5ua/10ua/50ua/100ua/500ua AC: 4 ranges zero to 100ua/500ua/1ma/5ma

MEGOHM INSULATION RESISTANCE AT 500 VDC 5 ranges: 1-50/5-250/10-500/50-2500/100-5000 megohm

ACCURACY DC: ±3% current and voltage AC: ±4% current and voltage for up to 1ma range AC: ±5% voltage for 5ma range MEGOHM: ±5%

LEAKAGE CURRENT TRIP-SET-POINT DC: 1ua-500 ua continuously adjustable AC: .02ma-5ma continuously adjustable

NON-DESTRUCTIVE HIGH POTENTIAL TEST APPLICATION Continuously adjustable leakage current trip-set-point from 1ua to 5ma may be used for non-destructive high potential tests

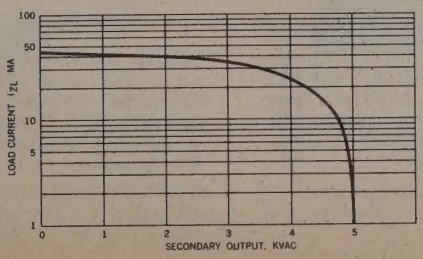
CORONA Scope output per MIL-T-27B and per ASTM D1868-61T Audible output via speaker for corona detection

ZERO START FOR H.V. OUTPUT Minimizes erroneous electrical test condition. Eliminates hysteresis from previous on-off usage

FINISH Cabinet: Hammertone. Panel: Semi-gloss light green. Other colors available on special orders

WEIGHT 35 pounds

PORTABILITY Handles provided for ease of carrying



FEATURES

DC OR AC DIELECTRIC STRENGTH TESTS
- ☐ Edgewise meter calibrated to read 0-10 kvdc or 0-5 kvac
- ☐ 0-1000 vdc expanded scale provded by using leakage current meter
- ☐ KV meter re-calibration

DC OR AC LEAKAGE CURRENT MEASUREMENTS
- ☐ I.C. operational amplifier used for linear, damage-free measurement of leakage current.
- ☐ DC and AC leakage current range switch
- ☐ Microamp meter re-calibration

INSULATION RESISTANCE MEASUREMENTS
- ☐ 5 ranges up to 5000 megohms at 500 vdc
- ☐ Up to 100,000 megohms at 10 kvdc

CORONA LEVEL VOLTAGE TESTS
- ☐ Scope output for visual peak-to-peak corona level indication
- ☐ Speaker output with volume control for audio corona detection

SAFETY PROVISIONS
- ☐ Continuously adjustable leakage current trip-set-point from 1 ua to 5 ma may be used for NON-DESTRUCTIVE high potential tests
- ☐ Flux-gate H.V. transformer (model HVT-1) automatically decreases the output voltage when overloaded or short circuited.
- ☐ Zero start interlock to minimize erroneous application of test condition
- ☐ Positive selection of DC or AC function by relay logic to have only DC or AC output, but not both
- ☐ Leakage current trip set, flux-gate transformer and zero start interlock doubles as safety feature to the operator

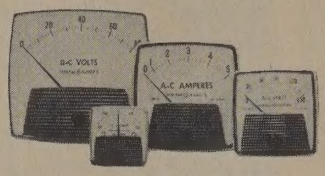
SIMPLICITY
- ☐ Easy-to-operate, illuminated instructional display

CONVENIENCE
- ☐ High voltage on/off/momentary switch for abrupt voltage application on the sample under test

Easy to use, illuminated functional operation.

PANEL, SWITCHBOARD, AND RECORDING INSTRUMENTS

BIG LOOK™ PANEL METERS

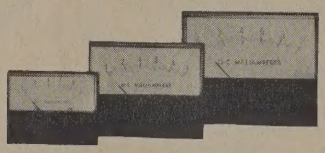


features: 1½-, 2½-, 3½-, and 4½-inch sizes . . . a-c, d-c, and rectifier types . . . iron-vane mechanism in a-c models . . . pivot and jewel, or taut band mechanism for 2½-, 3½-, and 4½-inch d-c models . . . expanded scales available . . . completely sealed cases on 2½- and 3½-inch models . . . available in all standard scale ranges.

specifications: accuracy ±2% (3% on rectifier types) . . . meets ASA Spec C39.1 . . . displays a-c and d-c volts, amperes, milliamperes, percent motor load, and other parameters equivalent to d-c microamperes, milliamperes, etc. Self-contained frequency meters available in 3½- and 4½-inch sizes.

Write for Bulletin GEC-1076

HORIZON LINE® PANEL METERS

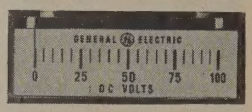


features: 2½-, 3½-, and 4½-inch sizes . . . a-c, d-c, and rectifier types . . . iron-vane mechanism in a-c models . . . pivot and jewel, or taut-band mechanism for d-c models . . . expanded scale available for all models . . . all meters have snap-on snap-off covers.

specifications: accuracy ±2% (3% on rectifier types) . . . meets ASA Spec C39.1 . . . displays a-c and d-c volts, amperes, percent motor load, and other parameters equivalent to d-c microamperes, milliampers, etc.

Write for Bulletin GEC-1076

TYPE 185 EDGEWISE PANEL METERS

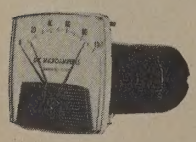


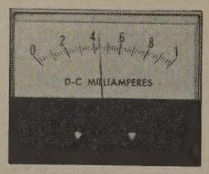
features: 2¼-inches wide by 1-inch high by 3-inches deep . . . horizontal or vertical scale . . . d-c meters have moving-coil D'Arsonval mechanism . . . rectifier-type D'Arsonval mechanism in a-c meters . . . shielded, dust-tight, one-piece molded cycolac window . . . flush case sides permit mounting of two, three or more units.

specifications: accuracy d-c meters 2% of full scale (3% on a-c meters) . . . meets ASA Spec C39.1 . . . displays a-c and d-c volts, amperes, microamperes and milliamperes.

Write for Bulletin GEC-1076

TYPE 195 AND 196 METER RELAYS





features: 2½-, 3½-, and 4½-inch sizes in BIG LOOK Type 195 styling and 3½- and 4½-inch sizes in HORIZON LINE Type 196 . . . d-c type with pivot and jewel mechanism . . . single and double set-points . . . contactless control . . . "piggyback" mounting of relay and meter on 3½- and 4½-inch sizes.

specifications: accuracy ±2% . . . ON/OFF contact standard . . . DPDT relay rated at 5 amps, 120 volts a-c . . . displays a-c parameters.

Write for Bulletin GEA-8014

TYPE 236 ELAPSED-TIME METERS

Commercial case, with reset knob

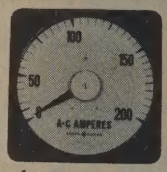
In conduit-mounted case

features: distinctive appearance and excellent readability designe to match BIG LOOK ammeters and voltmeters . . . wide selectic of mounting styles including 2½ and 3½-inch sizes for pan mounting and 2½-inch size mounted in conduit case or portab stand . . . sealed models, both 2½- and 3½-inch sizes.

Write for Bulletin GEC-107

SWITCHBOARD A-C TYPES AB-16; D-C TYPES DB-16 (semiflush)

Type AB-16



features: non-parallax scale plates . . . magnetic damping . . rugged, taut-band construction . . . self-contained resistors t simplify wiring of transformer-rated instruments . . . magnet shielding . . . rugged, dust-tight, moisture-resistant cases.

specifications: accuracy ±1% of full scale . . . scale length 14.2 i (AB-16, DB-16).

Write for Bulletin GEC-15(

SWITCHBOARD A-C TYPE AB-30, D-C TYPE DB-30 (semiflush)

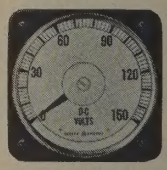
features: non-parallax scale plate . . . easy-to-read, large, blac numerals and pointer plus convex, shadow-proof cover . . . ma netic shielding . . . rugged drawn-steel case and molded luci cover resist shock, dust, and moisture.
Predetermined scales for 5A and 150V transformer-rated instr ments.

specifications: accuracy ±1% of full scale . . . scale length 5.1 i . . . size 4¼ x 4¼ in.

Write for Bulletin GEC-15(

SWITCHBOARD A-C TYPE AB-40 D-C TYPE DB-40 (semiflush)

Type DB-40 voltmeter



features: High sensitivity . . . ratings as low as 50 microamper . . . taut-band suspension on a-c and d-c ammeters and voltmete eliminates mechanism friction and jewel roll . . . permits high sensitivities . . . insures greater resistance to shock and vibratic . . . weather-tight construction . . . non-parallax scale plate.

specifications: accuracy ±1% of full scale . . . scale length 7.1 i . . . size 4¼ x 4¼ in.

Write for Bulletin GEC-15(

SWITCHBOARD TYPE 180 EDGEWISE INSTRUMENTS (semiflush)

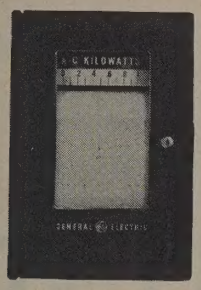
features: space-saving, slimline design . . . cluster mounting . . . flush case-sides for easy stacking . . . vertical or horizontal models . . . non-parallax scale plate . . . magnetic shielding . . . durable, one-piece molded lucite case . . . gasketed to resist moisture, dust and fungus . . . large 4½ in. scales.

specifications: accuracy a-c 1.5% horizontal . . . 2.0% vertical, d-c 1.5% vertical or horizontal . . . scale length approx. 4.5 in. . . . size (flange) 1¾ in. wide x 6 in. long.

Write for Bulletin GEC-1507

PANEL, SWITCHBOARD, AND RECORDING INSTRUMENTS

DIRECT-OPERATED RECORDERS, TYPE CH

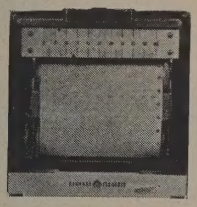


eatures: ink-type marking mechanism with throw-away inkwell r . . . Telechron motor-driven tapper-type inkless mechanism . . . 10 ft. record roll . . . multispeed synchronous motor or optional pring-clock drives . . . high readability . . . fast response: inking ¼ second, inkless 2 seconds . . . heavy-duty cases . . . rugged, pring-mounted jewel bearings . . . this recorder available in ortable case or for panel mounting.

pecifications: accuracy 1% . . . record roll size 6 in. overall width, ½ in. calibrated width 110 ft. long . . . AC voltmeter, wattmeter nd varmeter; ammeter, power factor, frequency, and speed . . . C instruments: permanent magnet, moving-coil mechanism.

Write for Bulletin GEA-8619

4" SOLID-STATE SERVO-OPERATED RECORDERS TYPES 520, 521



Type 520 recorder, single pen

atures: measure, indicate and record any variable represented y a d-c millivolt signal . . . null-balance, servo-operated . . . solid ate amplifiers . . . wide range of chart speeds (½ in/hr. to 1440 /hr . . . up to 8 control and alarm switches . . . control or transitting slidewire . . . companion to GE-MAC controller Type 524 . . printed wire boards . . . highly sensitive . . . compact, flexible rocess instrumentation, reliable . . . easy to maintain.

pecifications: accuracy ±½% of full scale . . . response time: ne or 5 seconds nominal full scale response as specified . . . ptional quick change dual response of 1 and 5 seconds nominal . . input signal: spans of 1 mv to 1 volt d-c . . . amplifier: plug-in pe, transistorized amplifier 4 x 10^5 gain . . . chart size 4⅜ in., alibrated width 4 in., length 65 ft. . . . chart speeds: ½ in./hr. to 440 in./hr. . . . maximum sensitivity 1 millivolt d-c full scale . . . efillable plastic inkwell . . . writing capacity up to 3 months . . . ype 520 single pen. Type 521 two-pen.

Write for HBK-8115

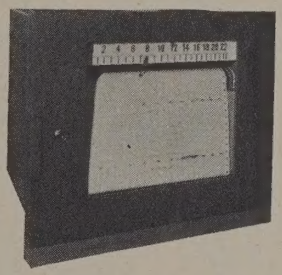
DIRECT-OPERATED RECORDERS, TYPE CF

features: tapper-type inkless recording mechanism . . . sturdy case . . . dependable Telechron motor drives . . . this recorder available in portable case or panel mounting for practically all AC and DC values.

specifications: accuracy ±2% . . . record roll 4 in. wide, 3½ in. calibrated width, 65 ft. long . . . AC motor driven chart drive . . . 3 in. per hour standard chart speed . . . other chart speeds available.

Write for Bulletin GEA-8619

12" SERVO-OPERATED RECORDERS TYPES HF, HR, HL, HT, HG

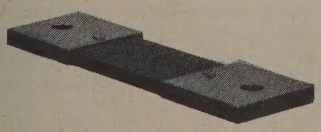


features: same basic amplifier for AC and DC measuring circuits . . . interchangeable universal slidewire . . . 3000-turn measurement slidewire provides high degree of resolution and sensitivity . . . simple conversion from potentiometric to bridge-measuring circuits . . . individual switch set-point adjustments . . . continuous standardization . . . unit mounted components, isolated by function . . . all measurement and recording elements including amplifier are mounted on swing-out panel for convenience . . . printed circuits speed trouble-shooting work . . . range resistors are mounted on replaceable card . . . no soldering required . . . high accuracy measurement plus sufficient torque to operate a variety of control devices.

specifications: accuracy ¼% of full scale . . . response time: strip chart ink types 1, 2, 4, 10, 24 sec. full scale, printed types 1.2, 2.4, 5, 12, 30, 60, 144 sec/point print speed . . . round chart 4, 10, 24 seconds, full-scale . . . input signal: direct input 1.0 millivolt to 1.0 volt d-c. (higher inputs available using voltage-divider circuits) . . . amplifier: plug-in unit, transistorized, printed wiring . . . power gains $5x10^{13}$ . . . strip chart size 12 in. wide (10¾ in. calibrated width) 130 ft. long . . . round chart 12 in. diameter (4 9/16 in. calibrated radius) . . . synchronous motor chart drives . . . chart speeds: ½ to 60 motor rpm, ½ in. to 360 in. per hour strip-chart speed . . . round chart speeds standard 24 hours . . . ink-type marking mechanism . . . maximum sensitivity one millivolt d-c full scale . . . meets ASA specifications C39.4.

Write for HBK-8117

TYPE 140 SHUNTS



atures: lighter and smaller than earlier designs, easy to handle nd install . . . full length manganin strips provide greater sturcural strength . . . silver-plated terminals on larger ratings provide ow-resistance contact . . . "chimney" design for maximum self-oling.

specifications: accuracy ¼% (calibrated) of rated millivolts . . . ratings minimum 10A, 50MV, 100MV, maximum 10KA, 50MV, 100MV (for 5A, 50MV use 10A, 100MV) . . . standard 6-ft. leads for back-of-panel wiring feature machined terminals and FLAMENOL® insulation, suitable for operating temperatures up to 75C and when base included line-to-ground voltages up to 600 volts maximum.

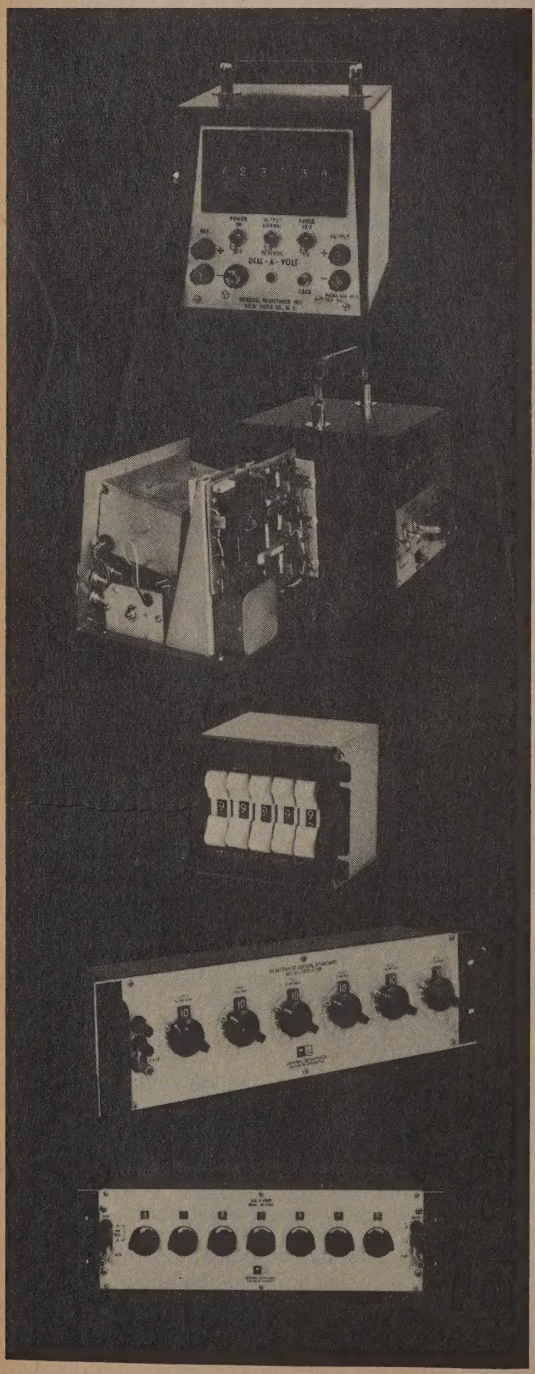
Write for Bulletin GEC-1076

or complete information contact nearest GE Sales Office listed on inside front over, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

General Resistance
DIVISION OF CHRONETICS

DC INSTRUMENTATION



HI-ACCURACY, STABILITY, PERFORMANC

General Resistance's DC instrumentation line makes GR **first sour** for high-accuracy, stability and performance in DC Voltage, Curre and Resistance Equipment. Nearly everything for DC Voltage, Currer Resistance and Ratio Calibration is available from GR. Your te instrumentation can be no better than its calibration standard a GR's instruments are among the best of those. The examples here a a small part of the total GR line. Write for your complete catalo

DIAL-A-VOLT Dialable Voltage Reference
±1 μV to ±10 V. Accuracy up to 0.0015% • Stability: 0.001 • Resolution: 1 PPM • to 7 Decades • In-Line Readout • From $39

DIAL-A-SOURCE Dialable E/I (Zero Impedance) DC Calibratic Source
±0.1 μV to ±10V @ up to 25 mA • Stability ±10 PPM • Acc racy to ±0.0015% • to 7 Decades • In-Line Readout • 5 Mode • From $875.

DIAL-A-VIDER Dialable Volt/Ratio Divider
Linearity to ±3 PPM • Resolution to 1 PPM • Phase Angle 10 KC <0.1° • to 7 Decades • In-Line Readout • 5 Mode Bench/OEM • From $119.

RESISTANCE DECADE STANDARD 0.0025%
Accuracy ±0.0025% • Cal. Accuracy ±5 PPM • Reactance le than 0.1° phase angle @ 10 KC • From $495.

DECADE RESISTANCE UNITS
DIAL-AN-OHM DIAL-A-STAT
RESIST-O-STAT
Universal / Dialable / Precision Resistance Decades
GR offers one of the widest lines of accurate resistance decac available. All use GR precision wirewound resistors and combi excellent accuracy with simplicity of operation at low pric Dial-An-Ohm units are as low as $17/decade, Dial-A-Stat un from $83, Resist-O-Stat units from $95. In bench or OEM c figurations.

VOLTAGE DIVIDERS
Primary / Secondary Standard Voltage Dividers
Complete line of Primary Standard and Secondary Stand Voltage Dividers using Kelvin-Varley (isohmic) circuits and precision wirewound resistors. ±0.5 PPM (DV4107) or ±1 P (DV5008) Accuracy. Stability ±0.5 PPM/yr (DV4107) or ±1 PP yr. Prices start as low as $339 (DV5008, 8 dials) for a 1 P Divider.

Prices f.o.b. Mt. Vernon, New York, domes

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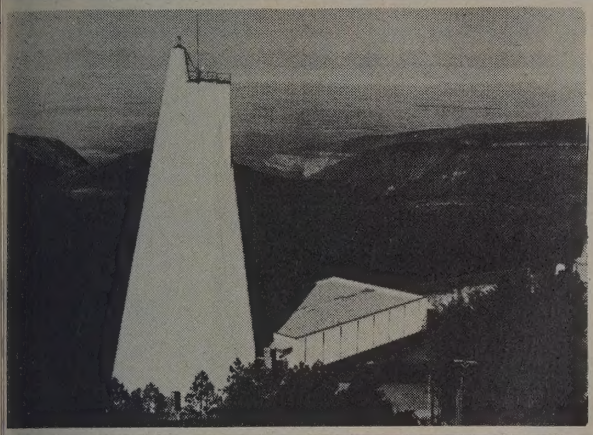
GENERAL RESISTA
DIVISION OF CHRONI

GEO SPACE SYSTEMS, INC.

PRECISION INSTRUMENT SYSTEMS AND EQUIPMENTS

COMPLETE INSTRUMENT CONTROL SYSTEMS



MOVABLE TURRET ASSEMBLY & CONTROL SYSTEM SACRAMENTO PEAK OBSERVATORY

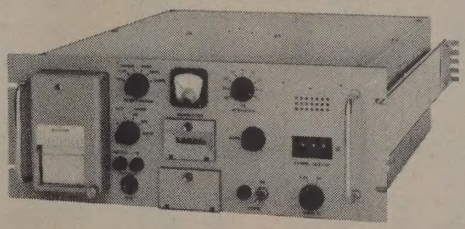
The Air Force Cambridge Research Laboratories' Sacramento Peak Vacuum Telescope is a vivid demonstration of the Company's depth of diversified talent and systems capability.

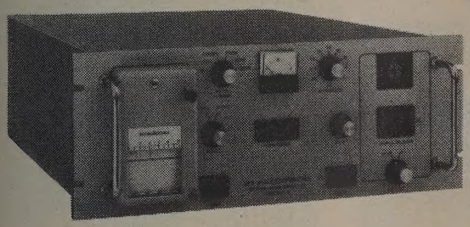
This telescope, with associated instrumentation and electronics, is located at Sunspot, New Mexico, 9200 feet above sea level. It stands 136 feet above ground level and extends 221 feet into the heart of the mountain.

The instrumentation and electronics furnished by Geo Space Systems, Inc., will serve as the operating controls of the telescope. It is designed to auto-track or track on a programmed basis, the sun, other stars or planets and will enable scientists to learn more about the physical composition and activity of these bodies. The instruments can provide continuous automatic compensation for the rotation of these bodies with respect to their celestial coordinates during all tracking phases. One hoped-for result of these studies will be the ability to forecast accurately solar flares. This ability will be of great importance to world-wide communications and to space programs.

The GSS role in this program involved design, production and installation of an optimum switched, non-linear servo control system to drive the 10,000 ft/lb torque motor which rotates the 230 ton evacuated optical tube forming the lower part of the telescope; and the servo control systems operating the upper turret section and its precision components, including solar-optical error detectors yielding auto-track accuracy within 30 arc sec. GSS is also building and installing the large spectrograph and the Echelle spectrograph.

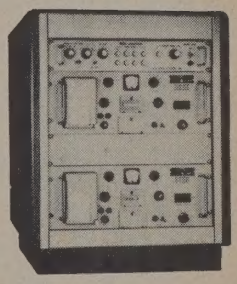
TIME/FREQUENCY CONTROL EQUIPMENT





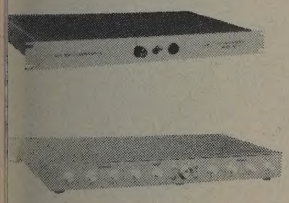
GSS VLF RECEIVERS

The GSS VLF receivers are designed for precision phase monitoring of VLF stations or rating of local standards. They are also capable of monitoring the new Omega stations when used with a suitable commutator. Characteristics are standard inputs of 100 kHz or 1 MHz, tuning range of 10 to 30 kHz in 50 Hz increments, mechanical or electronic servo, .006 Hz servo bandwidth, 10 nanovolt sensitivity and a built-in chart recorder for read-out. Units are line operated with optional DC standby input available.



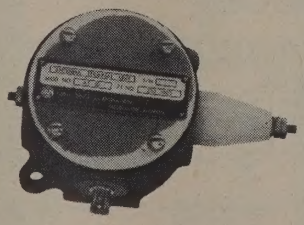
OMEGA SYSTEM

The Omega Navigation System provides navigation for ships and aircraft with excellent accuracy. Results are obtained with readouts of "lane crossings" and an analog position voltage. Suitable outputs are also provided for interfacing with a computer for more sophisticated readout and data analysis.



VLF ANTENNA MULTICOUPLER

This multicoupler can reduce such roblems as desensitization, phase hift, cross-coupling interference, and oherent ground circuit interference. put impedance is 50Ω, with 8 indeendent 50Ω outputs featuring 50 db olation, and a gain of 3 db.



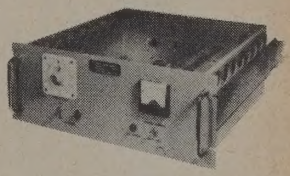
VLF LONG-WIRE AND WHIP ANTENNAE

The AT-10 long wire antenna and matching network provide excellent VLF reception, and allows use of a 50Ω coaxial transmission line.

The WA-10 whip antenna excels in areas of heavy horizontally polarized man-made noise.

COHERENT SIGNAL GENERATOR

This instrument furnishes a stable and controllable input signal for complete, rapid testing of performance characteristics of VLF receivers, including sensitivity, stability, accuracy, time constant and lag, deadband, noise rejection, adjacent channel rejection, intermodulation distortion, image response, and desensitization. The reference and the GSC-12 outputs are simultaneously monitored by the receiver under test, yielding data that is an absolute measure of the receiver's response.



BATTERY POWER SUPPLY

The GSS standby battery power supplies have been designed to furnish emergency DC power to critical equipment when primary AC power fails. Stable output voltage is obtained from nickel-cadmium batteries for long periods. Integral circuits provide fast and trickle charge. In the fast charge mode, batteries are restored to full charge in less than 8 hours. Full voltage life is dependent upon Amp/Hour rating of batteries supplied and the load current. Indication of approximate charge status is provided by a front panel meter and indicator lights.

As a leading manufacturer of standard frequency correlation and time signal nchronization equipment, Geo Space Systems, Inc. has successfully met the owing needs for time synchronization between geographically separated ations.

With its equipment serving the U. S. Army, Navy, NASA and FAA, and by meeting their stringent requirements, Geo Space is continually expanding its efforts develop new approaches and instrumentation in this field.

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ST. PETERSBURG, FLORIDA 33733
Phone: 813 - 525-1161

Solitron DEVICES, INC.

Greibach true RMS passive analog meters

Greibach RMS Meters combine the proven Bifilar Suspension system with a new, proprietary solid state transducer called transquare. These precision meters achieve measurements with an accuracy of 0.5% full scale.

Exceptional stability with repeatability of better than 0.1% is obtained since no amplifiers, power supplies or other active components are used in the simple meter design. Input is completely isolated as there is no coupling of meter circuits through power transformers of components. In addition, Greibach RMS Meters are capable of withstanding 100X overcurrent. This overload capacity applies to the most sensitive current ranges.

Greibach Meters also have low insertion loss resulting in minimal disturbance to the circuits under test. Greibach meters offer large, easy-reading scales for best visual accuracy. Scales are at least 6″ long and individually enscribed in a calibration-marking process. One unique feature of the Greibach meters is their leight-bar readout that completely eliminates normal reading difficulty due to parallax.

Cases are formica and aluminum for both ruggedness and eye appeal. Several styles are offered including Portable, Panel-Mounted and Edgewise Panel-Mounted.

OUR ACCURACY IS TRACEABLE TO THE BUREAU OF STANDARDS.

DC AMMETERS
- NANOammeters—¼% and ½% accuracy, from 50 nanoamperes, 15 ranges to ½ A.
- MICROammeters—¼% and ½% accuracy, from 1 microamp, 22 ranges to 10 A.
- MILLIammeters & AMMETERS—¼% and ½% accuracy, complete coverage to 100 amps full scale.

DC VOLTMETERS
- VOLTmeters—from 1 millivolt to 1000 volts full scale, 1 K to 30 K ohms per volt.
- VOLT-AMMETERS—¼% and ½% accuracy, up to 23 ranges in each instrument.
- VOLT-POTENTIOMETERS—20,000 ohms/volt as voltmeter, infinite impedance in balanced system.

AC-DC AMMETERS
- MICROammeters—from 25 microamperes full scale, 0.5% accuracy.
- MILLIammeters & AMMETERS—complete coverage from 1 milliamp to 30 amperes with 0.5% accuracy.

AC-DC VOLTMETERS
- VOLTmeters—from 30 millivolts to 1000 volts with ½% accuracy.
- HIGH FREQUENCY AMMETERS—from 1 milliampere to 1000 amps full scale with frequency coverage from 30 Hz to 10 KHz. ½% accuracies.

WATTMETERS
- MILLIwattmeter—from 10 milliwatts to 10 watts full scale, 1% accuracy and 0.1% repeatability.
- W-A-V wattmeter—a true multimeter for volts, amps and watts from 30 Hz to 10 KHz, ½% accuracy and 1 to 10 watts at 25 v, 10 to 100 watts at 250 v. Additional ranges with external current transformers.

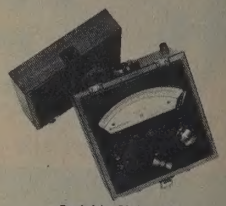
GALVANOMETERS

Model No.	Sensitivity	Coil Resistance (ohms)	CRDX (ohms)	Period
601	1 nanoamp/mm	3360	225,000	2 sec
602	2 nanoamp/mm	690	56,000	2 sec
605	5 nanoamp/mm	125	9,000	2 sec
610	10 nanoamp/mm	45	2,200	2 sec

Portable Style 560 (or Style 561 Battery-operated lamp)

Panel-Mounted Style 540

Edgewise Panel-Mounted Style 700


Portable Style 500 (or Style 510 Battery-operated lamp)

Portable Style 700P

Galvanometer 600

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GREIBACH INSTRUMENTS
DIVISION OF SOLITRON DEVICES, INC.
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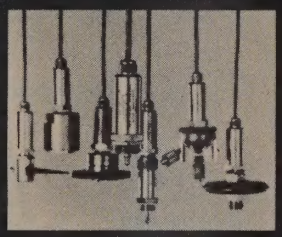
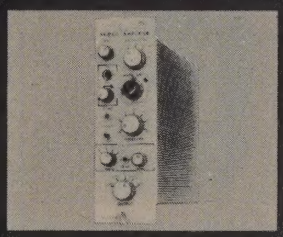
From Honeywell: Nine ways to make data do what you want it to

Whether your problem is transducing data, conditioning a signal . . . readout or recording, Honeywell has the experience, the instruments, the complete data acquisition systems you need for a better solution.

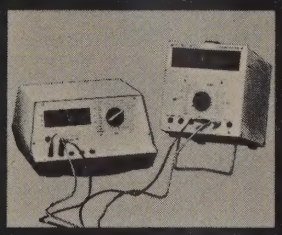
Statham Transducers
Need someone to assume single source responsibility for your measurement problems? Honeywell has the Statham family of general purpose strain gage transducers . . . a line so complete, we can help you measure virtually any parameter.

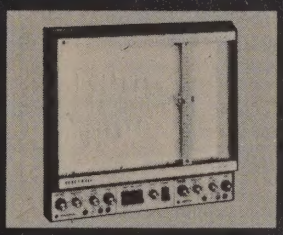




Signal Conditioning
Our complete line of signal conditioning devices, includes everything from strain gage control units to attenuators and amplifiers; gives you interface between transducer and measuring, monitoring or recording instruments.

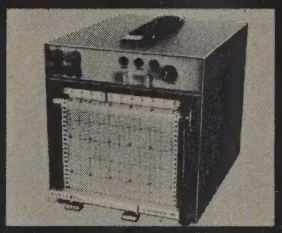
Digital Multimeter
A low-cost, versatile meter providing direct readout of transducer output as well as measurement of AC/DC voltage and current, plus resistance, in general purpose trouble-shooting applications.

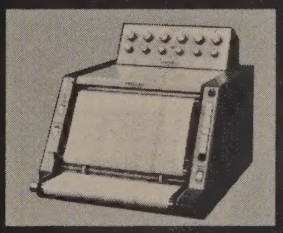




X-Y Graphic Recorders
Make direct recordings of transducer outputs with respect to time or other independent variables.

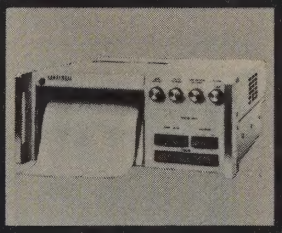
Strip Chart Recorders
For highly accurate measurement and recording of long-term transducer outputs – 1 or 2 channel.





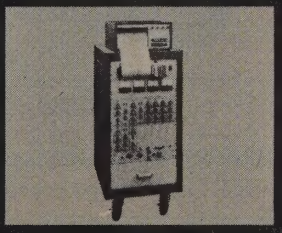
Ink Writing Oscillographic Recorders
Record up to eight channels simultaneously for simplified correlation.

Light Beam Oscillographic Recorders
Multiple channel recording of signals requiring higher frequency response.



Magnetic Tape Recorders
A permanent record available for repeated analysis, remote display and/or control functions.

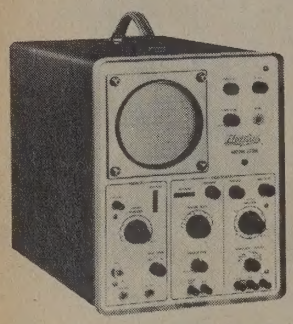
And complete systems
If your need is for a complete data acquisition system . . . incorporating single or multiple data channels . . . Honeywell can supply this as well, completely installed and ready to go on-line.



For additional information about these products, contact: Honeywell, Test Instruments Division, P. O. Box 5227, Denver, Colorado 80217.

Honeywell

SERVICE TEST EQUIPMENT



5", Wide-band Industrial and General Purpose Oscilloscope

MODEL 770A

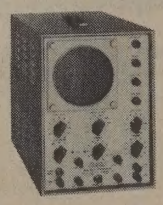
Calibrated 4 MC DC vertical amplifier with 8-step and vernier attenuator, covers 0.01v/div. to 50v/div. 80nsec rise time. Built-in square wave calibrator. Eighteen direct reading, calibrated sweep rates from 0.5 sec/div. to 1 μsec/div. Choice of free-running, driven or automatic sweep modes. 5X sweep magnifier. Flat-faced, post-accelerated CRT. Illuminated, calibrated graticule. 11" w., 13¾" h., 17½" d. Shipping weight 57 lbs.

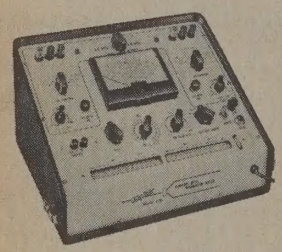
$475.00

Wide-Band Service Technician's Oscilloscope—5" AC—5 cps to 4.5 MC within 3db.

MODEL 677

40 mv/in. sensitivity. Pre-set horizontal and vertical sweep positions. Has sharp, bright trace with astigmatic correction. Facilitates detailed observation of TV sinc wave forms, including 3.58 MC color burst. 9½" w., 14" h., 18½" d. Shipping weight, 36 lbs. **$269.50**



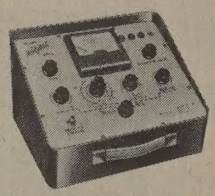


Dynamic Beta Transistor Tester.

MODEL 870

Measures AC and DC Beta. Variable collector voltage and current permits tests according to manufacturer's specifications, Tests switching transistors. Measures large signal DC Beta on power transistors—small signal AC Beta on low and medium power transistors. Collector Test current variable up to 2 amperes, permitting Beta measurement on power transistors rated 5 amperes or more. Icbo Ranges: 100μa, 1 ma, 10 ma. Beta Ranges: 0-100, 0-300. Replaceable roll chart. 14⁹⁄₁₆" w., 7⅞" h., 11¾" d. Shipping weight, 22 lbs.

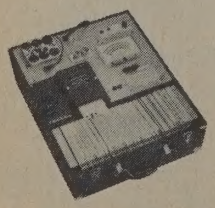
$425.00



Dynamic Beta IN-CIRCUIT Transistor Tester.

MODEL 890A

Utilizes unique test circuit to measure AC Beta in OR OUT of circuit with 5% accuracy. Measures these in-circuit parameters: AC Beta, Ic, Rin (transistor input resistance), Z ohms (base-emitter circuit impedance). Measures AC Beta, Ic, Rin and Icbo out of circuit. Portable, completely self-contained, fully transistorized. 10¾" w., 6½" h., 9" d. Shipping weight, 8 lbs. Shipped less batteries. **$235.00**

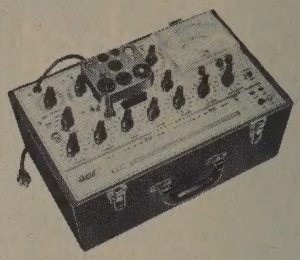


Industrial and Laboratory Cardmatic® Automatic Tube Tester

MODEL 123R

Card programmed complete "Fringe" tests, saturation and cut-off tests, in addition to basic Gm measurement. 5% accuracy. Supplied with 575 selected cards. May be ordered less cards. 16½"w., 9¼"h., 19½"d. Shipping weight, 57 pounds.

$795.00



Technician's High Speed Deluxe Portable Tube, Transistor and Diode Tester

MODEL 6000A

Tests latest tubes including Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin "headers". Sensitive, neon lamp type instantaneous interelement leakage and shorts test. Gm to 15,000 μmhos in three ranges. Also tests transistors and diodes. 16¾" w., 7½" h., 11¾" d. Shipping weight, 21 lbs.

$297.50

Industrial and Communications Portable Tube Tester

MODEL 752A

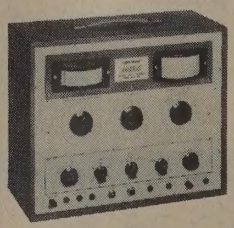
Designed for use in maintaining communications equipment and industrial electronic apparatus. New voltage regulator test circuit tests VR tubes to handbook specifications, including firing point, regulating voltage and current range. Tests all the latest tubes including Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin "headers". Push button test feature for dual-section tubes speeds selection of tubes for balanced or matched characteristics, Gm to 30,000 μmhos in five ranges. Interelement leakage read directly on the meter (sensitivity to 10 megohms). Illuminated meter and roll chart. 18⅜" w.., 7½" h., 16¾" d. Shipping weight, 27 lbs, **$475.00**

Industrial and Laboratory Portable Tube Tester

MODEL 539C

Tests all the latest tubes, including Compactrons, Novars, 5-and 7-pin Nuvistors, 10-pin "headers", VR tubes, low power thyratrons, "4-digit" types. VR test evaluates voltage regulator tubes under actual operating conditions. Panel terminals provide access to grid, plate, cathode and heater circuits, permitting direct measurement of voltages and current for "non-standard" or "tailored" tests. Metered line voltage, metered grid voltage. Dual leakage readings: directly on meter or by neon short indicator (sensitivity to 50 megohms). 16¾" w., 7½" h., 18⅜" d. Shipping weight, 35 lbs.

$625.00



Crystal-controlled, High Output AM-FM Sweep and Marker Generator

MODEL 288AX

A complete alignment instrument with built-in decibel meter, crystal-controlled reference frequency. 8 bands from 35KC to 160MC FM, 110 KC to 110 MC AM. New 35-125KC ultrasonic band. Provides for internal or external amplitude or frequency modulation of RF output. Complete with 100 KC/1000 KC crystals, cable assembly and meter leads. 16" w., 13" h., 7" d. Shipping weight, 33 lbs.

$415.00

PRICE INFORMATION

Prices F.O.B. Greenwood, Mississippi
Terms: 30 days net
Specifications and prices subject to change without notice

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue • Cleveland, Ohio 44108 • Phone 216-541-8060

DIGITAL MEASURING SYSTEM

WHAT IS A HICKOK DIGITAL MEASURING SYSTEM?

The HICKOK Digital Measuring System is an all solid-state, three and one-half digit precision measurement system that offers unlimited expansion capability through plug-in additions resulting in a specialized instrument for each type of measurement.

The variety of plug-ins available negates the need of several instruments to measure voltage, frequency, resistance, capacitance, etc., because the Main Frame will accept any one of the DP series plug-ins for measurement of these parameters at a cost considerably less than individual voltmeters, counters, etc.

The system is further expanded by two pieces of peripheral equipment. The Model 4900 Printer is used with one or two Model 3202Ps to provide a permanent record of measurements. The Model 1050 Set Point Controller can be used in a variety of ways with any of the plug-ins to provide a signal for a closed feedback loop control system, or, for example, to indicate a go-no go condition on parameter measurement.

The illustration at the bottom of this page shows the latest plug-in modules that are available for use in the system. Detailed descriptions and specifications are given in the following pages.

PLUG-INS AVAILABLE

DC MICROVOLTMETER — **Model DP110**
Range: 0.001 mv (1 microvolt) to 1,300 volts
Resolution: 0.01% of reading (using 1000% overrange capability)
Accuracy: ± 0.05% of reading ± 1 digit

DC VOLTMETER — **Model DP100**
Range: 00.1 mv to 1,500 volts
Accuracy: ± 0.1% of reading ± 1 digit

AC VOLTMETER — **Model DP130**
Range: 0.01 mv to 1,000 volts
Frequency range: 22 Hz to 1.0 MHz
Accuracy: ± 0.1% of reading ± 1 digit

DC CURRENT ADAPTER — **Model D310**
Range: 000.1 nanoamps to 13 amperes
Accuracy: ± 0.15% of reading ± 1 digit

100 MHz COUNTER — **Model DP160**
Range: 00.1 Hz to 100 MHz
Accuracy: ± 0.00005% of reading ± 1 digit
Sensitivity: 20.0 mv
Resolution: up to 7 digits

1 MHz COUNTER — **Model DP150A**
Frequency Measurements: 00.1 Hz to 1 MHz
Period Measurements: 00.1 ms to 999. sec
Accuracy: ±0.0005% of reading ± 1 digit
Resolution: up to 7 digits

EVENT COUNTER — **Model DP140**
Counting rate: up to 1,000,000 counts/second

TIME INTERVAL METER — **Model DP210**
Range: 0.01 ms to 1,999 seconds
Accuracy: ± 0.0005% of reading ± 1 digit

RESISTANCE METER — **Model DP170**
Range: 0.001 ohm to 1,000 megohms
Accuracy: ± 0.1% of reading ± 1 digit

CAPACITANCE METER — **Model DP200**
Range: 0001. picofarad to 10 millifarads
Accuracy: ± 0.1% of reading ± 1 digit

NOTE
All plug-ins may be used with the following Main Frames. DMS3200, DMS3200A, DMS3200P, Model 3202, Model 3202P.

AC & DC VOLTAGE AND DC CURRENT

DC MICROVOLTMETER

DC VOLTMETER

AC VOLTMETER

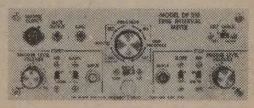
DC CURRENT ADAPTER

FREQUENCY AND TIME

100 MHz COUNTER

1 MHz COUNTER

EVENT COUNTER


TIME INTERVAL METER

RESISTANCE AND CAPACITANCE

RESISTANCE METER

CAPACITANCE METER

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue • Cleveland, Ohio 44108 • Phone 216-541-8060

AC AND DC VOLTAGE AND DC CURRENT

DC MICROVOLTMETER

- TRULY INTEGRATING SYSTEM
- 1 MICROVOLT SENSITIVITY
- FLOATING INPUT
- 4 DIGIT RESOLUTION
- SCALE EXPANSION
- 0.05% ACCURACY

GENERAL DESCRIPTION

The Model DP110 DC MICROVOLTMETER plug-in is a true integrating voltmeter which measures DC voltages from 1 microvolt to 1300 volts with a basic accuracy of ±0.05% of reading ±1 digit. The SCALE EXPANSION feature provides four digit (0.01%) resolution on any range.

The input circuitry is fully floating, with more than 10,000 megohms isolation between input ground and chassis or power line ground. The 3000 volt breakdown voltage makes it possible to use the instrument safely for above ground measurements.

The DP110 and all of the other voltage plug-ins maintain a constant 10 megohm input impedance to assure a constant and minimum range-to-range loading on the circuit under test.

Full four digit resolution is obtained by depressing the EXPANDED push button to enable the DP110 to automatically overrange one decade and display the fourth most significant digit.

SPECIFICATIONS

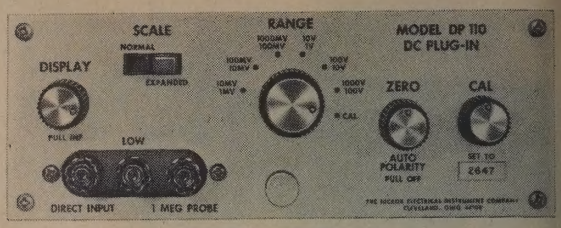
RANGES

Normal	Expanded
0.00 to 13.00 millivolts	0.000 to 13.000 millivolts
00.0 to 130.0 millivolts	00.00 to 130.00 millivolts
000. to 1300. millivolts	000.0 to 1300.0 millivolts
0.00 to 13.00 volts	0.000 to 13.000 volts
00.0 to 130.0 volts	00.00 to 130.00 volts
000. to 1300. volts	000.0 to 1300.0 volts

ACCURACY
±0.05% of reading ±1 digit (+20° to 30°C) (line frequency of 50 or 60 Hz ±0.01%) on 1 mv EXPANDED range ±0.1% reading ±2 digits

OVERRANGE
1300%

INPUT IMPEDANCE
10 megohms



MODEL DP110

INPUTS
Direct or 1 megohm probe

NOMAL MODE REJECTION
40 db at 40 Hz
60 db at 60 Hz
70 db at 120 Hz

COMMON MODE REJECTION
60 db

OVERLOAD
±1000 volts on lowest two ranges
±1500 volts on all other ranges

CHASSIS TO INPUT ISOLATION
Greater than 10^{10} ohms

READING TIME
NORMAL = 100 ms
EXPANDED = 500 ms

RESPONSE TIME
In response to a full scale step input, 99.9% of final reading within 1.5 seconds.

POLARITY REVERSAL
Automatic

DISPLAY TIME
Variable from 0.5 second/reading to 2.5 second/reading plu indefinite

WEIGHT
4¾ pounds

PRICE
$475.00

DC CURRENT ADAPTER

- 1 NANOAMP TO 13 AMP RANGE
- FLOATING INPUT
- AUTO POLARITY
- 4 DIGIT RESOLUTION
- 1,300% OVERRANGE
- LOW INSERTION LOSS
- 0.15% ACCURACY

GENERAL DESCRIPTION

The model D310 CURRENT ADAPTER is used with the Model DP110 DC VOLTMETER and 3202 MAIN FRAME for measurement of DC current from 0.1 nanoampere to 13.0 amperes with an accuracy of ±0.15% of reading ± 1 digit and resolution up to 4 full digits.

The D310 consists of a combination of precision current shunts selectable through the front-panel push-button switch. Voltage across the shunts is measured by a DP110 MICROVOLTMETER plug-in in the 3202 MAIN FRAME and readout is directly in units of current. Range selection need only be made on the D310. The high sensitivity of the DP110 makes it possible for the shunt resistance to be very low in value, minimizing the insertion loss in circuits being measured.

Because the D310 is used in conjunction with the DP110, the features of the DP110 such as SCALE EXPANSION and AUTO-POLARITY are applicable to the D310.

The Current Adapter offers a completely floating input, with greater than 10,000 megohms isolation between input ground and chassis or power line ground. The 3,000 volt breakdown feature of the DP110 is applicable to the D310.

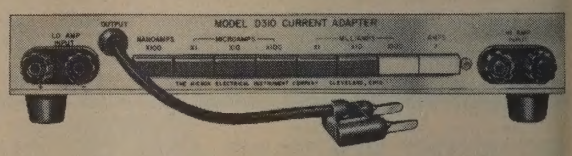
SPECIFICATIONS

RANGE*	NORMAL	EXPANDED
x 100 nanoamps	000. to 1300. nanoamps	000.0 to 13000. nanoamps
x 1 microamps	0.00 to 13.00 microamps	0.000 to 13.000 microamps
x 10 microamps	00.0 to 130.0 microamps	00.00 to 130.00 microamps
x 100 microamps	000. to 1300. microamps	000.0 to 1300.0 microamps
x 1 milliamp	0.00 to 13.00 milliamps	0.000 to 13.000 milliamps
x 10 milliamps	00.0 to 130.0 milliamps	00.00 to 130.00 milliamps
x 100 milliamps	000. to 1300. milliamps	000.0 to 1300.0 milliamps
x 1 ampere	0.00 to 13.00 amperes	0.000 to 13.000 amperes

* sensitivity down to 0.1 nanoamp

ACCURACY (+20°C to +30°C)
±0.15% of reading ±1 digit (on EXPANDED ±0.2% of reading ±2 digits)

OVERRANGE
1,300%



MODEL D310

INSERTION LOSS

Range	Shunt Resistance
x 100 nanoamps	10,000 ohms
x 1 microamp	1,000 ohms
x 10 microamps	100 ohms
x 100 microamps	10 ohms
x 1 milliamp	1.01 ohm
x 10 milliamps	.11 ohm
x 100 milliamps	.015 ohm
x 1 ampere	.015 ohm

CHASSIS TO INPUT ISOLATION
Greater than 10^{10} ohms

BREAKDOWN VOLTAGE
3000 volts

READING TIME
NORMAL 100 ms
EXPANDED 500 ms

RESPONSE TIME
In response to a full scale step input, 99.9% of final reading with 1.5 seconds

POLARITY REVERSAL
Automatic

DISPLAY TIME
Variable from 0.5 seconds/reading to 2.5 seconds/reading, pl infinity

DIMENSIONS
1¾"H x 9⅝"W x 11½"D

WEIGHT
3 pounds

PRICE
$100.00

.C VOLTMETER

1 MHz FREQUENCY RESPONSE
10 MICROVOLTS TO 1,000 VOLTS
OVERLOAD PROTECTION
INTEGRATING DIGITAL VOLTMETER
0.1% ACCURACY

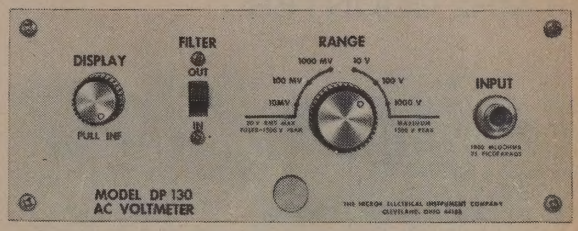
ENERAL DESCRIPTION

ıe Model DP130 AC VOLTMETER plug-in measures AC ›ltages from 10 microvolts to 1,000 volts in six ranges with ıe 3202 Main Frame. The basic accuracy of ±0.1% of read-g ±1 digit on all ranges includes effects of ambient mperature change from 15°C to 35°C, line voltage varia-ons, and line frequencies from 47 Hz to 400 Hz. The 1,000 egohm 20 picofarad input impedance minimizes circuit ading even for high frequency measurements.

ıis instrument is designed to provide RMS readings when easuring sine wave signals. Accurate indications of the MS value of square and triangular waveform inputs may be ›tained by using correction factors specified in the instruc-›n manual. The DP130 is designed to assure the stipulated :curacies so that certification may be obtained from NBS ›rtified calibration laboratories.

PECIFICATIONS

ANGE
0.00 to 14.00 mv
00.0 to 140.0 mv
000. to 1400. mv
0.00 to 14.00 v
00.0 to 140.0 v
000. to 1000. v



MODEL DP130

ACCURACY (+ 15°C to + 35°C)

Frequency	Accuracy
22 Hz - 100 kHz	± 0.1% reading ± 1 digit
100 kHz - 200 kHz	± 0.2% reading ± 1 digit
200 kHz - 300 kHz	± 0.2% of FS ± 1 digit
300 kHz - 500 kHz	± 0.3% of FS ± 1 digit
500 kHz - 700 kHz	± 1.0% of FS ± 1 digit
700 kHz - 1MHz	± 2.0% of reading ± 0.6% FS

OVERRANGE
40%
INPUT IMPEDANCE
1000 megohm shunted by 20 picofarads (25 picofarads on lowest three ranges)
READING TIME
200 milliseconds
RESPONSE TIME
In response to a step input of full scale, 99.9% of final reading within 1 second with filter out (with filter in, time is 7 seconds)
FILTER
Filter must be switched in for making measurements below 100 Hz.

DISPLAY TIME
Variable from 0.8 second/reading to 4 seconds/reading plus infinity.
OVERLOAD
1,500 volts peak
WEIGHT
3¼ pounds
PRICE
$395.00

)C VOLTMETER

LOW COST • **80 db AC REJECTION**
60% OVERRANGE • **0.1% ACCURACY**

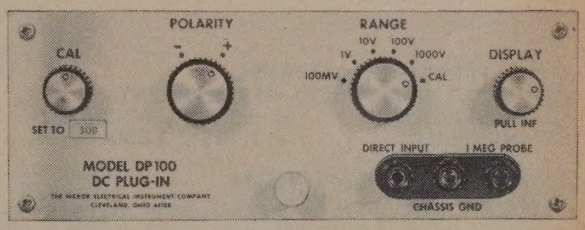
ENERAL DESCRIPTION

ıe Model DP100 DC VOLTMETER plug-in measures DC ›ltages from 0.1 millivolt to 1500 volts in 5 ranges with ıe 3202 Main Frame. The accuracy of ±0.1% of reading 1 digit on all ranges makes maximum use of the Main ame three and one-half digit display. The constant 10 egohm input impedance from range to range assures a ›nsistent and minimum loading on the circuit under test. ıe 80 db AC power line rejection characteristic maintains aximum accuracy of voltage measurements during in-rcuit testing.

ıe photochopper stabilized voltage-to-frequency converter ›gether with a precision gate provides true integration with gh noise rejection. Long term accuracy is assured by feed-ack design and temperature compensated zener diode ference voltage.

PECIFICATIONS

ANGES
00.0 to 160.0 millivolts
.000 to 1.600 volts
0.00 to 16.00 volts
00.0 to 160.0 volts
000. to 1500. volts
CCURACY
± 0.1% of reading ± 1 digit (15°C to 35°C)



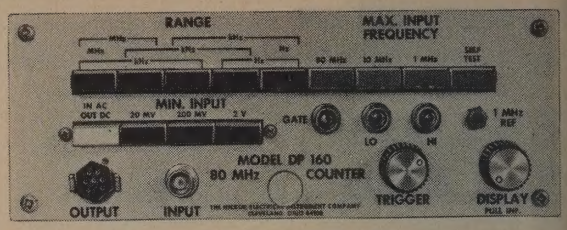
MODEL DP100

OVERRANGE
60%
INPUT IMPEDANCE
10 megohm constant
COMMON MODE REJECTION
40 db
NORMAL MODE REJECTION
80 db at line frequency
READING TIME
100 milliseconds/reading
RESPONSE TIME
In response to a step of full scale — ± 99.9% of final reading within 4 seconds
POLARITY REVERSAL
front panel switch
DISPLAY TIME
Variable from 0.5 second/reading to 5 seconds/reading plus infinity
INPUTS
Direct or 1 meg probe
OVERLOAD
1500 volt protection on all ranges except 1000 volt protection on lowest range
WEIGHT
3¼ pounds
PRICE
$150.00

FREQUENCY AND TIME

100 MHz COUNTER

- 100 MHz COUNTER
- 20 MV SENSITIVITY
- OVERLOAD PROTECTED
- 0.0005% ACCURACY
- 7 DIGIT RESOLUTION
- FCC APPROVAL APPLIED FOR



MODEL DP160

GENERAL DESCRIPTION

The DP160 100 MHz COUNTER provides digital display of signal frequencies from 0.1 Hz to 100 MHz when used with the 3202 or 3202P Main Frame. The instrument is direct-counting and utilizes no heterodyning to achieve its 100 MHz measurement capability. Through utilization of the overrange capability, the normal three and one-half digit display of the 3202 Main Frame can provide up to 7-digit resolution with an accuracy of ±1 digit, making it usable for frequency measurement of communications frequencies in addition to normal counter applications. A front-panel push-button selector switch permits readout of any 3-digit sector of a 7-digit input signal being measured, thus achieving the resolution specified. Alternatively, a slave output permits its use with a second Main Frame and DP140 Slave Plug-in combination to provide a full 6-digit simultaneous display, if desired.

Emphasis has been placed on the high sensitivity of the DP160 since signals being measured at these higher frequencies are normally at low levels. Further, to minimize any possibility of overloading the instrument's input, a front-panel input signal attenuator is provided. Either AC or DC coupling is available through a selector switch. A 10:1 attenuation accessory probe is available for minimizing circuit loading.

A precision crystal controlled time base with exceptionally low aging rate is used in the DP160 to achieve the accuracies specified, and recalibrated is simplified by a front-panel 1 MHz output which may be beat against NBS standard WWV. Built-in self test provisions are provided and front panel indicator lamps simplify the Trigger level adjustment.

SPECIFICATIONS

RANGES

1 MHz Pos.	10 MHz Pos.	80 MHz Pos.*
00.0 - 199.9 Hz	000. - 1999. Hz	0.00 - 19.99 kHz
000. - 1999. Hz	0.00 - 19.99 kHz	00.0 - 199.9 kHz
0.00 - 19.99 kHz	00.0 - 199.9 kHz	000. - 1999. kHz
00.0 - 199.9 kHz	000. - 1999. kHz	0.00 - 19.99 MHz
000. - 1999. kHz	0.00 - 19.99 MHz	00.0 - 100.0 MHz

* 80 MHz with DMS 3200 Main Frame, 100 MHz with all other Main Frames

ACCURACY (15°C to 40°C)
±0.0005% ± 1 digit
±0.00005% of reading ± 1 digit (0.5 ppm) Short term accuracy
Drift less than 3.5 parts in 10^8 (100,000,000) per week.

INPUT IMPEDANCE
1 megohm shunted by 25 pf

INPUT SENSITIVITY
20 mv RMS

OVERLOAD
Accurate readings obtainable at voltages up to 200 v RMS using internal attenuator. AC RMS input plus DC level must not exceed 600 v.

SIGNAL COUPLING
AC or DC

OUTPUT
Slave output for driving a second main frame for simultaneous 6 digit display

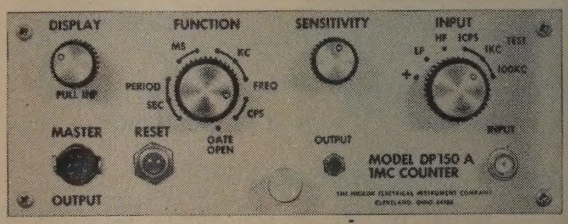
DISPLAY TIME
Adjustable by front panel control plus infinity

WEIGHT
3½ pounds

PRICE
$395.00

1 MHz COUNTER

- 1 MHz FREQUENCY RESPONSE
- FREQUENCY AND PERIOD MEASUREMENTS
- 10 MV SENSITIVITY
- ±0.005% ACCURACY
- EXPANDIBILITY
- 7 DIGIT RESOLUTION



MODEL DP150A

GENERAL DESCRIPTION

The DP150A 1 MHz COUNTER provides digital display of both frequency and period of sinewaves, squarewaves, pulses, or other complex waveforms.

Frequencies of 0.1 Hz up to 1.0 MHz and periods of 0.1 millisecond to 999 seconds may be measured. A 10:1 attenuation accessory probe is available for minimizing circuit loading.

Through utilization of the overrange capability of the plug-in, the normal three and one-half digit display of the 3202 Main Frame can provide up to 7-digit resolution, and with an accuracy of ±0.005% of reading ±1 digit. A front-panel switch selection permits readout of any 3-digit sector of a 7-digit input signal being measured. The plug-in also includes provision for event totalizing and a manual reset, permitting its use in production counting applications.

Built-in internal checks at 1 Hz, 1 kHz, and 100 kHz are provided. An output from the Trigger is provided on the front panel as a utility pulse output for oscilloscope trigger, time mark generator, etc. A slave output also permits use with a second Main Frame/DP140 Slave Plug-in combination to provide full 6-digit simultaneous display.

SPECIFICATIONS

RANGES
Frequency measurements from 0.1 Hz to 1.0 MHz.

00.0 to 199.9 Hz	(example of 6-digit resolution to measure frequency of 875,450 Hz read 875. on kHz range, then 450. on Hz range)
000. to 1999. Hz	
0.00 to 19.99 kHz	
00.0 to 199.9 kHz	
000. to 1000. kHz	

Period measurements from 0.1 millisecond to 1999 seconds.

00.0 to 199.9 ms	(example of 6-digit resolution to measure period of 475.324 ms read 475. on seconds range, then 324. on ms range.)
000. to 1999. ms	
0.00 to 19.99 sec	
00.0 to 199.9 sec	
000. to 1999. sec	

ACCURACY
±0.005% ± 1 digit, 15°C to 35°C ambient (50 ppm)
± 0.0005% ± 1 digit, short term accuracy at constant ambient temperature after calibration against NBS standard

GATE TIMES
1 millisecond to 10 seconds in five decades

INPUT IMPEDANCE
1 megohm shunted by 24 picofarads

INPUT SENSITIVITY
10.0 mv RMS

OVERLOAD
200v RMS

NOISE REJECTION
Selectable input for low frequency noise rejection to permit frequency measurements of high frequency signals which contain low frequency noise.

DISPLAY TIME
0.1 sec/reading to 10 sec/reading plus infinity.

WEIGHT
3½ pounds

PRICE
$255.00

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue • Cleveland, Ohio 44108 • Phone 216-541-8060

'IME INTERVAL METER

10μSEC to 1999 SECOND TIME INTERVAL OR PERIOD MEASUREMENT
SEPARATE LEVEL AND SLOPE ADJUSTMENTS
20 MILLIVOLT SENSITIVITY
USE WITH DP140 FOR 6-DIGIT DISPLAY
0.005% ACCURACY
7 DIGIT RESOLUTION

ENERAL DESCRIPTION

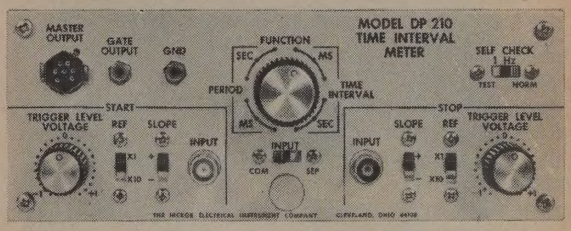
ıe Model DP210 TIME INTERVAL METER provides a digital splay of time interval or period measurements from 10 icroseconds to 1999 seconds with an accuracy of ±0.0005% reading ±1 digit in the 3202 Main Frame.

ɔmpletely separate START and STOP inputs are provided, ıch with independent adjustments of trigger level, attenuaɔn, and slope. Thus, start and stop commands from the ɜvice being measured may be from different sources and ɜir isolation is maintained. A front panel selector switch ɜrmits the choice of either TIME INTERVAL measurement "one-shot" or repetitive phenomena or PERIOD measureent of repetitive signals. Either is displayed with resolution ɔ to eight digits in the case of a 1999 second measurement. ıis is achieved by readout of three digit sectors to obtain ı accumulative eight digit reading.

vo inputs may be internally connected through a front panel vitch without change in input impedance for measurements ıen both start and stop information is from a common signal ɔurce. A built in "self-check" tests for proper operation of ternal count circuitry. A "gate output," when used with an ɔilloscope, permits the operator to adjust trigger points sually.

ıe 20 millivolt sensitivity and 1 megohm input impedance ı all ranges permit use of the plug-in with signal sources hich may have low output levels and critical loading charɔteristics. Front panel trigger level controls allow accurate ɜlection of trigger point on any input wave shape, and selectɔle slope permits triggering on either positive or negative-goɔg wave fronts. Both STOP and START inputs are DC coupled.

slave output on the plug-in permits its use with a second ain Frame/DP140 Slave Plug-in combination to provide full x-digit display.



MODEL DP210

SPECIFICATIONS

RANGES
Six ranges for Time Internal measurements, six ranges for Period measurements.
0.00 to 19.99 milliseconds
00.0 to 199.9 milliseconds
000. to 1999. milliseconds
0.00 to 19.99 seconds
00.0 to 199.9 seconds
000. to 1999. seconds

ACCURACY
± 0.005% of reading, ± 1 digit (50 ppm)
± 0.0005% of reading, ± 1 digit, short term accuracy at constant ambient temperature after calibration against NBS standard

RESOLUTION
10 microseconds

INPUT IMPEDANCE
1 megohm shunted by 20 picofarads

INPUT SENSITIVITY
20 millivolts RMS

TRIGGER LEVEL ADJUSTMENT
± 10 volts

MAXIMUM INPUT VOLTAGE
500 volts peak

OPERATING TEMPERATURE RANGE
+ 10°C to + 35°C

START STOP CHANNEL ISOLATION
40 db minimum with sensitivity set at maximum on undriven channel

WEIGHT
3 pounds

PRICE
$295.00

:VENT COUNTER

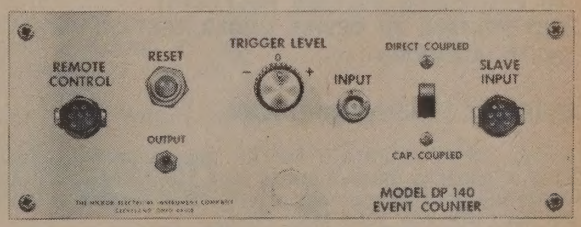
EXPANDS DISPLAY OF OTHER DMS COUNTERS
INFINITE OVERRANGE CAPABILITY
100 MV INPUT SENSITIVITY
OVERLOAD PROTECTED
0 TO 1,000,000 COUNTS/SECOND

ıENERAL DESCRIPTION

ıe type DP140 EVENT COUNTER plug-in is designed for use ith any Digital Measuring System Main Frame to provide ıe user with the following capabilities:

. Used singly, in a Main Frame, it permits counting of incoming pulses, with the totalized number appearing on the Main Frame three and one-half digit readout. Additional combinations of DP140 Plug-ins and Main Frames may be added which, when operated in cascade, can provide an accumulated readout of six, nine, twelve, etc., digits.

. Operating as a Slave Plug-in, the DP140 in a Main Frame may be driven from the output of a Main Frame DP150A or DP160 Frequency Counter, or DP210 Time Interval Meter combination to provide full six-digit display of frequency, period, or time interval.



MODEL DP140

SPECIFICATIONS

COUNTING RATE
0 to 1,000,000 counts/sec

INPUT SENSITIVITY
100 mv

OPERATING TEMPERATURE RANGE
10°C to 45°C

INPUT IMPEDANCE
1 megohm shunted by 10 pf

OVERLOAD PROTECTION
400 volts

INPUT
Direct or Capacity-coupled

UTILITY OUTPUT
.4v P-P

WEIGHT
2¾ pounds

PRICE
$100

RESISTANCE AND CAPACITANCE

RESISTANCE METER

- 0.001 OHM TO 1,000 MEGOHM RANGE
- AUTOMATIC BRIDGE BALANCE
- LEAKAGE CURRENTS ELIMINATED ON HIGH RESISTANCE MEASUREMENTS
- LEAD RESISTANCE ELIMINATED ON OHMS MEASUREMENT
- EXTREMELY LOW POWER TO DEVICE UNDER TEST
- 0.1% ACCURACY

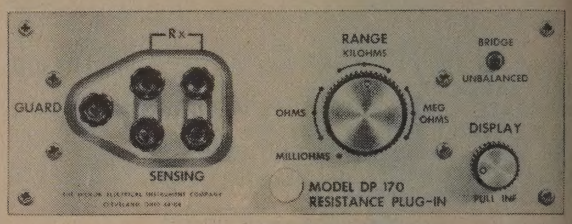
GENERAL DESCRIPTION

The DP170 OHMMETER plug-in provides display of resistance measurements from 1 milliohm to 1,000 megohms with an accuracy of ±0.1% of reading ±1 digit with the 3202 Main Frame. The measurement system is that of a true four terminal Wheatstone bridge. The front panel null-out indicator shows the operator when automatic bridge balance is complete and a reading may be taken. Null time is nominally one second.

Four terminal measurement technique is used in the DP170 so that lead resistance will not cause inaccuracies on extremely low resistance measurements. This feature is very useful when measuring resistance of motor windings, coil windings, etc.

A "Guard" voltage is provided for high resistance measurement so that external leakage paths and spurious leakages in components are automatically eliminated.

The low power output of the DP170 makes it very useful for safe measurements on semiconductor devices.



MODEL DP170

SPECIFICATIONS

RANGES AND ACCURACIES

Range	Accuracy*
000. to 1999. milliohms	± 0.2% of reading ± 2 digits
0.00 to 19.99 ohms	± 0.1% of reading ± 1 digit
00.0 to 199.9 ohms	± 0.1% of reading ± 1 digit
000. to 1999. ohms	± 0.1% of reading ± 1 digit
0.00 to 19.99 kilo-ohms	± 0.1% of reading ± 1 digit
00.0 to 199.9 kilo-ohms	± 0.1% of reading ± 1 digit
000. to 1999. kilo-ohms	± 0.1% of reading ± 1 digit
0.00 to 19.99 megohms	± 0.1% of reading ± 1 digit
00.0 to 100.0 megohms	± 0.2% of reading ± 1 digit
000. to 1000. megohms	± 0.5% of reading ± 1 digit

* 20°C to 30°C, ambient after warmup, line frequency 50/60 H ± 0.05%. An additional 0.1% of reading is allowed for ambien temperature range of 10°C to 20°C and from 30°C to 40°C

OPERATING TEMPERATURE RANGE
10°C to 50°C

OVERRANGE
100%

RESPONSE TIME (Open circuit to full scale) for balance condition
First 8 ranges — 1 second
100.0 Meg Range — 4 seconds
1000 Megohm Range — 30 seconds

OUTPUT VOLTAGE AND POWER
0.01V to 1.0V; 1.0 microwatt to 1.0 milliwatt

DISPLAY
Variable from 0.5 sec/reading to 6 seconds/reading plus infinity

WEIGHT
3¼ pounds

PRICE
$305.00

CAPACITANCE METER

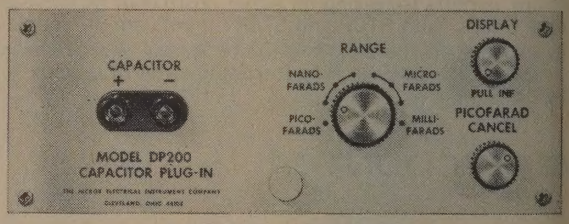
- 1.0 PICOFARAD TO 10,000 MICROFARADS RANGE
- NO POLARIZING VOLTAGE NECESSARY
- LOW VOLTAGE TO DEVICE UNDER TEST
- ±0.1% ACCURACY

GENERAL DESCRIPTION

The type DP200 CAPACITY METER plug-in provides digital display of capacity measurements from 1 picofarad to 10,000 microfarads, with an accuracy of ±0.1% of reading ±1 digit when used with the 3202 Main Frame.

Capacity measurement is by means of a bridge comparing the stored charge of the unknown capacitor with that of a precise internal standard capacitor. The test signal is a low DC potential so no external polarizing voltage is necessary for electrolytics. The measurement is relatively unaffected by the Q of the component being tested, resulting in highly accurate capacity measurements. A provision has been made for balancing out test lead capacity for low capacitance measurement accuracy.

Measurements with the DP200 are extremely simple, requiring no manual balancing or nulling operations to make a capacitance measurement. Test leads need only be clipped to the capacitor under test and a direct three and one-half digit reading gives the capacity value directly. Low test voltages and currents are used to protect components and operator.



MODEL DP200

SPECIFICATIONS

RANGE AND ACCURACY

Range	Accuracy*
000. to 1400. picofarads	± 0.1% of reading ± 1 digit
0.00 to 14.00 nanofarads	± 0.1% of reading ± 1 digit
00.0 to 140.0 nanofarads	± 0.1% of reading ± 1 digit
000. to 1400. nanofarads	± 0.1% of reading ± 1 digit
0.00 to 14.00 microfarads	± 0.1% of reading ± 1 digit
00.0 to 140.0 microfarads	± 0.1% of reading ± 1 digit
000. to 1000. microfarads	± 0.1% of reading ± 1 digit
0.00 to 10.00 millifarads	± 0.9% of reading ± 1 digit

* 15°C to 35°C; add 0.2% over temperature range 10°C to 15° and 35°C to 40°C

OVERRANGE
Lower six ranges 40%
Top 2 ranges 2%

RESPONSE TIME
1 pf to 140.0 nf range — 1 second
1400 nf to 1000 μf range — 2 seconds
1000 mf range — 10 seconds

OUTPUT VOLTAGE
Millifarad range — + 1v
All other ranges — + 2v

DISPLAY TIME
Variable from 0.5 second/reading to 6 seconds/reading plus infinity

WEIGHT
3½ pounds

PRICE
$305.00

MAIN FRAMES

- 3½ DIGIT READOUT
- ACCEPTS ALL DP SERIES PLUG-INS
- OVERRANGE INDICATOR
- PRINTER OUTPUT (MODEL 3202P)

MODEL 3202P

GENERAL DESCRIPTION

The Model 3202 and 3202P MAIN FRAMES contain the digital display system, power supplies, and accepts all plug-ins of the DP series. A 3½ digit, all electronic display makes maximum use of the high accuracy capability of the analog-to-digital converters in the System. Because of the high overrange capability of some plug-units used with these Main Frames, the 3½ digit display can provide an equivalent of a 4, 5, 6, or 7 digit display, providing resolution up to 1 part in 10^7.

Integrated circuits along with discrete transistors constitute the all-solid-state circuitry, providing high reliability and long life. The display counter circuit has a response of 5 MHz, assuring fast, reliable count and readout of input pulse trains from the plug-ins. A self-contained power supply provides all operating voltages for the Main Frame circuitry as well as plug-in units. All critical voltages are zener regulated.

The two Main Frame models are similar mechanically and electrically. The Model 3202P, however, offers the following additional features:

1. Non-blinking display through use of buffer-storage circuitry. A rear panel switch is provided to select either buffered or unbuffered display mode.
2. Printer output. 10-line decimal data is provided on a rear-panel connector along with decimal location, polarity, wrong polarity indication, overrange indication, and print command data. Out-puts are fully buffered and can be used to operate external device such as the HICKOK Model 4900 Digital Printer or the Model 1050 Set Point Controller.

MODEL 3202 MAIN FRAME IN RACK MOUNT ADAPTER

SPECIFICATIONS

DISPLAY
3½ Digit Readout
3 digit Nixie Readout
1 digit Neon Readout (for overrange numeral 1)
Polarity Indicator
Overrange Indicator
Wrong Polarity Indicator

POWER SUPPLY
Supplies all operating voltages for Main Frame and Plug-in
Zener Reference Regulated
Short Circuit Protection

BUFFER STORAGE IN MODEL 3202P

PRINTER OUTPUT (MODEL 3202P)
10 line decimal, 3 columns numerical data plus 1 column accessory data; decimal points, wrong polarity, overrange, polarity

OUTPUT LEVELS
"0" State Level + 0.2 volts
"1" State Level + 1.5 volts
Maximum available current 300μa per output line

CONTER
5 MHz Response

POWER REQUIREMENTS
115/230V, 47 to 400 Hz
[illegible] Watts, (typical with plug-in)
Both sides of power line fused

WEIGHT
[illegible] pounds

DIMENSIONS
[illegible]⅛"W x 6⅞"H x 12⅞"D (including handles and feet)

PRICE
Model 3202 — $385.00
Model 3202P — $475.00

C80 & C81 CARRYING CASE/ STORAGE RACK

MODEL C80 & C81

- EXPANDABLE — BASIC UNIT EXPANDS TO ACCOMMODATE 4, 6, OR 8 PLUG-INS
- PORTABLE AND LIGHT WEIGHT
- PROTECTS PLUG-INS FROM LOSS OR DAMAGE

GENERAL DESCRIPTION

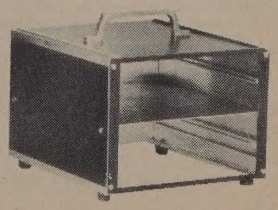
The Model C80 carrying case/storage rack is used to house any two of the DP series plug-in units for the Digital Measuring System. The Model C81 is an add-on unit which is used to expand the C80 to accommodate 4, 6 or 8 plug-ins.

SPECIFICATIONS

DIMENSIONS
C80 — 10½" x 6½" x 9¾"
C81 — 10¾" x 6½" x 9¾"

WEIGHT
C80 — 5½ pounds
C81 — 4¾ pounds

PRICE
C80 — $45.00
C81 — $35.00



THE HICKOK ELECTRICAL INSTRUMENT COMPANY • CLEVELAND, OHIO 44108

PERIPHERAL EQUIPMENT

DIGITAL PRINTER

- COMPANION INSTRUMENT TO MODEL 3202P MAIN FRAME
- FIELD EXPANDIBILITY
- 10 SECOND TO 120 MINUTE TIMER
- EASE OF OPERATION
- DUAL CHANNEL OPTION
- FULL FOUR DIGIT PRINTOUT OF THE THREE AND ONE-HALF DIGIT MAIN FRAME READING

GENERAL DESCRIPTION

The Model 4900 DIGITAL PRINTER is a companion unit to the HICKOK Model 3202P Digital Measuring System and provides a print out of up to ten columns of digital information from one or two independent sources. The 4900 may also be used with any device which provides ten-line decimal or BCD coded data outputs. Voltage, frequency, time period, resistance, capacitance, or event counts are examples of the type of data which may be recorded in printed form.

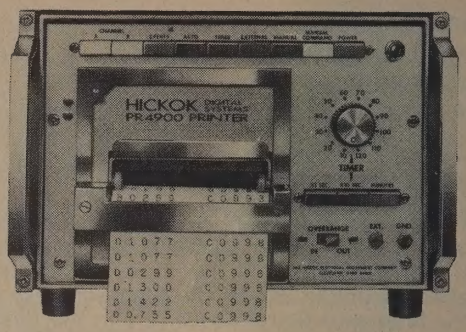
The printer has integrated circuit electronics, permitting it to operate directly from standard low-voltage, low-level logic outputs. Both circuit boards and print wheel mechanisms are in modular plug-in form, thus providing the user with a wide variety of column, channel, and input code options. Options may be changed in the field if desired.

Operation of the unit is simple and a number of function selections are available to the operator. Inputs may be taken from two independent sources simultaneously or singly as preselected by a front-panel push-button switch. The print command is also selected by the operator, permitting him to choose print command as follows: External, Manual, Automatic, or at calibrated time intervals switched from the front panel in 36 steps from 10 seconds to 120 minutes. Maximum print rate is one line/second from an external print command signal.

Basic ten-line decimal logic is standard for the printer input. However, by adding the appropriate decoding board, BCD 1248 or 1224 codes may be used to drive the unit. Print is either by pressure-sensitive paper or by inked impression on standard 3½" adding machine paper. A replaceable ink cartridge provides 250,000 lines of printing. The printing mechanism slides out from the front of the unit to permit changing of paper rolls and ink cartridges with ease.

SPECIFICATIONS

PRINT OUT
Either three digit or full four digit print-out of the Model 3202P three and one-half digit display through print-out of all 10 numerals of the fourth overrange digit.
First digit of the 4 or 5 column print-out is the code print wheel digit which indicates polarity, decimal location and wrong polarity (overrange code controlled by front panel switch)
Single or dual channel, 4 or 5 column print-out options available. (one code column)



MODEL 4900

ACCURACY
Identical to input device used
PRINTING RATE
One line per second
DATA INPUT REQUIREMENTS
Parallel entry, 10 line decimal, positive logic, "0" state must be less than +0.4v and greater than −4.0v. "1" must be greater than +1.0v but less than 4.0v.
PRINT COMMAND
Activated on positive going portion of +2.0v or −4.0v pulse. Minimum rise time (positive going portion) 10.0v/microsecond.
OPERATING MODES
"Auto" prints each time source takes a reading
"Timer" prints on a preset time interval basic from 10 seconds to 2 hours
"External" prints upon application of an external print command signal.
TRANSFER TIME
17 milliseconds
PAPER REQUIRED
Roll 3⅞" width x 3½" diameter (standard adding machine paper) or pressure sensitive paper (no ink required.)
POWER REQUIREMENTS
115 VAC or 230 VAC ±10% 50 to 60 Hz
7 watts idle
35 watts at one line per second printing
SIZE
9⅝"W x 6⅞"H x 14⅜"D
WEIGHT
21 pounds

DIGITAL SET POINT CONTROLLER

- UPPER AND LOWER THREE FULL DIGIT SET LIMITS
- COMPANION INSTRUMENT TO MODEL 3202P MAIN FRAME and MODEL 4900 PRINTER
- FRONT PANEL INDICATOR LIGHTS
- CONTACT CLOSURE AT UPPER AND LOWER LIMITS AND ACCEPT

GENERAL DESCRIPTION

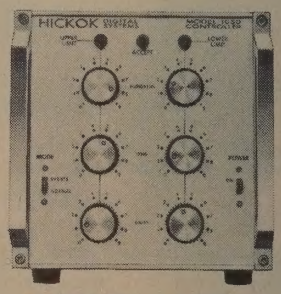
The Model 1050 DIGITAL SET-POINT CONTROLLER, when used with the Hickok Digital Measuring System, provides a feed-back control signal to adjust the operation of a peripheral function at pre-determined measurement values, as selected by the operator. Set-points may be set to 1 part in 1,000 and are absolute, assuring start or stop functions at specific values with zero-set-point error. Although the controller was designed primarily as a companion unit to the Model 3202P system, it can be used with any device which provides ten-line decimal data outputs at the proper logic levels and appropriate read commands.

When used with the DMS Main Frame and the appropriate DP series plug-in, digital measurements of voltage, frequency, period, resistance, capacity, events (and with appropriate transducers, pressure, flow, temperature, strain, etc.) can be used to activate external mechanical feeds, drives, print-outs, reject hoppers, feed motors, fuel adjustments, blowers, tabulation recorders, etc. Provision has been made for selection of three full digits of both upper and lower set-points so that external control will be activated when a reading exceeds an upper-set-point number or drops below a lower set-point number, thus establishing an "Accept" range.

Two controllers may be used in tandem, along with two main frames and a DP140 Slave Plug-in to extend the normal three-digit control to six digits. Further, a HICKOK Model 4900 Digital Printer may be added to the system to provide a printed record of all measurements or selective measurements within or outside of the "accept" range. Internal relay switches permit use of the Model 1050 for control of other equipment.

SPECIFICATIONS

DATA INPUT
Parallel entry, 10 line decimal, positive logic. "0" state must be



MODEL 1050

from 0 to +0.4v. "1" state must be greater than +0.9v but less than 4.0v. Nominal source requirement 1v at 200 microamps.
FREQUENCY RESPONSE
1 MHz when operated as 3-digit controller
100 KHz when two units used as a 6-digit controller
READOUT
Indicates if measurements are within or outside of "accept" band
OPERATED MODES
NORMAL — used for all functions except events
EVENTS — used when scaling is to be controlled
RELAY CONTACT RATING
1.5 amperes/115v
POWER REQUIREMENTS
115 vac/220 vac, 47 to 400 Hz, 2 watts
WEIGHT
6½ pounds
DIMENSIONS
6½"W x 6⅞"H x 7¾"D
PRICE
$295.00

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue • Cleveland, Ohio 44108 • Phone 216-541-8060

ACCESSORIES

ACCESSORIES FOR DIGITAL MEASURING SYSTEM

DESCRIPTION	PART NUMBER	PRICE	DMS MODEL NUMBER 3202	3202P	DP100	DP110	DP130	DP140	DP150A	DP160	DP170	DP200	DP210	D310
' INTERCONNECTING CABLE, DMS/PRINTER	P300-3	$35.00		X										
ONNECTOR for data output	16525-229	$ 8.50		X										
ACK MOUNT ADAPTER KIT	100-132	$15.00	X	X										
SOLATION PROBE KIT, 1 MEGOHM (10 megohm input impedance when used with DP100 r DP110 Plug-In)	100-149	$38.00			X	X								
OW CAPACITY PROBE KIT, 10 megohm/10 pf, 0:1 attenuation ratio. Adjustable compensation to match instrument input of 1 megohm/20 50 pf.	100-148	$38.00						X	X	X			X	
TRAIGHT THROUGH PROBE with BNC connector	100-152	$30.00			X	X	X		X	X			X	
EST LEADS (pair) 48" long, Banana Plug/Alligator Clips	12450-419	$ 3.00			X	X					X	X		X
EST LEAD, 36" long coax, BNC connector/Alligator Clips	12450-416	$10.00					X	X	X	X			X	
EST CLIP ADAPTER for testing all pigtail type ad components, Banana Plug/Metal Clips	1050-174	$ 7.00									X	X		
EST CLIPS (pair) same as 1050-174 except parate plugs rather than molded single plug.	16525-217	$ 3.00									X	X		

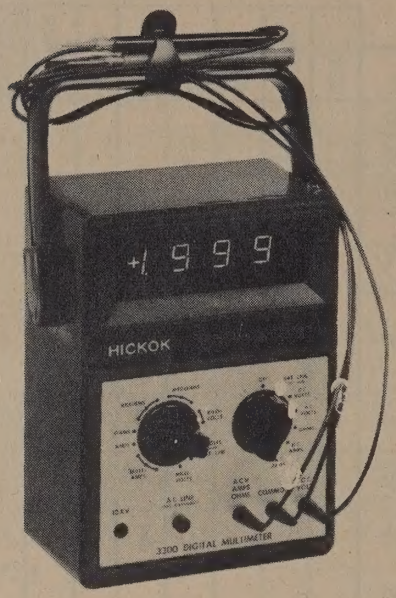
MODELS AND ACCESSORIES FOR DIGITAL PRINTER

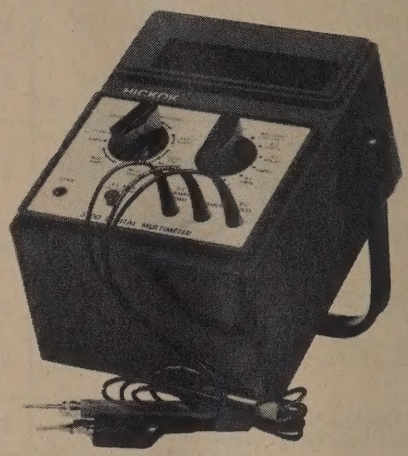
MODEL NO.	DESCRIPTION	PRICE
400-04	Single Channel Input, 4 Column Printer	$ 760.00
400-05	Single Channel Input, 5 Column Printer	870.00
400-44	Dual Channel Input, 4 Column Printer	1,040.00
400-55	Dual Channel Input, 5 Column Printer	1,290.00
P00	Fourth Digit Plug-in Assembly	130.00
P04	Second Channel Plug-in Assembly, 4 Column	300.00
P05	Second Channel Plug-in Assembly, 5 Column	440.00
P20	BCD 1248 Decode Board Plug-in	140.00
P30	BCD 1224 Decode Board Plug-in	150.00
P00-3	Interconnecting Cable, 4900/3202P	35.00
P01	Ink Cartridge	10.50
P02	Print Out Paper (Ink Imprint) Roll	1.00
P03	Print Out Paper (Pressure Sensitive) Roll	9.50
16525-229	Cable Connector for 4900 Data Input	8.50
3025-804	Cable for 4900 Data Input	1.00/ft.
100-143	Rack Mounting Adapter Kit	29.00

ACCESSORIES FOR DIGITAL SET POINT CONTROLLER

MODEL NO.	DESCRIPTION	PRICE
P-300-3	3' interconnecting cable to connect 1050 Controller with Digital Measuring System Main Frame	$35.00
P-301-1	1' interconnecting cable to connect two 1050 Controllers	10.00
P-302-3	3' interconnecting cable to connect 1050 Controller, DMS Main Frame, and 4900 Digital Printer	75.00
16525-229	Cable Connector only for 1050 Controller	8.50
3025-804	Interconnecting cable ribbon cable only, no connectors, 25 conductor	1.00/ft.
100-137	Rack Mount Adapter Kit. Accepts 1050 Controller and DMS Main Frame in standard 19"W x 17"H rack mount Panel	25.00

DIGITAL MULTIMETER





MODEL 3300

- 27 MEASUREMENT RANGES
- INTERNAL BATTERY PACK AND AC LINE OPERATION
- DESIGNED FOR RUGGED PORTABILITY
- BRIGHT READOUT WITH OUT-OF-RANGE INDICATION
- AUTOMATIC POLARITY
- AUTOMATIC ZEROING
- HIGH INPUT Z

GENERAL DESCRIPTION

The Model 3300 DIGITAL MULTIMETER is designed for portability with 27 ranges covering AC and DC voltage, AC and DC current, and resistance. The Multimeter may be operated either from the internal rechargeable battery pack, or 115/230 volt AC line.

The internal NiCad battery pack has an overnight recharge cycle of 16 hours that provides approximately 24 hours of operation. For example, the batteries can operate the Model 3300 for one hour a day for 24 days, or alternatively, eight hours a day for three days. This allows operation in field locations for extended periods of time. In addition, the batteries permit measurement with complete isolation from power line interference (infinite common mode rejection).

The Multimeter may be operated from the AC power line while the battery pack is being recharged. For battery only use, the permanently attached recharge power line cord can be conveniently stored in a rear panel receptacle.

Operator convenience and safety has been stressed in the design of the Model 3300. A color-coded front panel is provided for ease in selection of the 27 ranges. The test probes are permanently attached to the front panel and are fitted with a captive strap which conveniently stores the probes on the combination carrying handle and tilt bail. The case is completely isolated from the input terminals and contains no metal parts for operator protection on high voltage measurements. Furthermore, a high input impedance minimizes erroneous readings from loading of the circuit under test. The bright fluorescent readout includes automatic polarity indicator, decimal point and out of range indication.

A high impact resistant ABS plastic case, shock mount readout, and wide temperature operating range makes this a rugged instrument for field applications, as well as for laboratory and production line use.

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue · Cleveland, Ohio 44108 · Phone 216-541-8060

MODEL 3300 SPECIFICATIONS

UNCTIONS

AC and DC volts
AC and DC current
Resistance

NGES

C AND DC VOLTS

Range	Reading	Resolution
.00 mv	000.0 to 199.9 mv	100 microvolts
1 v	0.000 to 1.999 v	1 millivolt
10 v	00.00 to 19.99 v	10 millivolts
.00 v	000.0 to 199.9 v	100 millivolts
1 kv	0.000 to 1.500 kv	1 volt
10 kv probe	0 to 15.00 kv	10 volts

: AND DC CURRENT

Range	Reading	Resolution
1 ma	0.000 to 1.999 ma	1 microampere
10 ma	00.00 to 19.99 ma	10 microamperes
100 ma	000.0 to 199.9 ma	100 microamperes
1 a	0.000 to 1.999 a	1 milliamp

IMS

Range	Reading	Resolution	Current
00 Ω	000.0 to 110.0 Ω	0.1 Ω	250 μa
1 kΩ	0.000 to 1.100 kΩ	1.0 Ω	25 μa
10 kΩ	00.00 to 11.00 kΩ	10 Ω	2.5 μa
00 kΩ	000.0 to 110.0 kΩ	100 Ω	.25 μa
1 mΩ	0.000 to 1.999 mΩ	1 kΩ	250 μa
10 mΩ	00.00 to 19.99 mΩ	10 kΩ	25 μa
00 mΩ	000.0 to 199.9 mΩ	100 kΩ	2.5 μa

ERLOAD PROTECTION

AC VOLTS	OHMS
250 v on 100 mv range	100 v on 100 ohm range
000 v on all other ranges	250 v on all other ranges
DC VOLTS	**CURRENT**
.000 v on 100 mv range	10 times full scale on all ranges
.500 v on all other ranges	

ERATING TEMPERATURE RANGE

0 to 50°C

CURACY

Function	Range	Accuracy @ 20°C to 30°C	Temperature Coefficient 0 — 19°C; 31 — 50°C
C volts	10 mv to 1500 v	0.1% of reading ±1 digit	150 ppm/C°
	10 kv probe	5.0% of full scale	150 ppm/C°
C volts	100 μv to 1000 v		
	22 Hz to 50 Hz	1.5% of full scale	200 ppm/C°
	50 Hz to 50 kHz	0.5% of full scale	200 ppm/C°
	50 kHz to 100 kHz	1.0% of full scale	200 ppm/C°
C amps	all	0.2% of reading ±1 digit	200 ppm/C°
C amps	all		
	22 Hz to 50 Hz	1.0% of full scale	200 ppm/C°
	50 Hz to 50 kHz	0.5% of full scale	200 ppm/C°
	50 kHz to 100 kHz	1.5% of full scale	200 ppm/C°
Ohms	all	0.3% of full scale	200 ppm/C°

*1 Only

INPUT ISOLATION FROM GROUND

Infinite when operated on batteries
1500 volts peak when line operated (batteries charging)

INPUT IMPEDANCE AT PROBE TIP

DC 11 megohm/5 pf, includes 1 megohm isolation resistor
AC 10 megohm/200 pf

COMMON MODE REJECTION

Infinite
40 db on recharge

NORMAL MODE REJECTION

50 db at 40 Hz
60 db at 60 Hz
70 db at 120 Hz

DISPLAY

7 segment numerical indicators
Maximum display of 1999
Automatically positioned decimal point
Automatic polarity indicator
Out-of-range indication
Display rate: once per second

PROBES

Permanently attached

AC volts, amps, ohms	straight through with prod tip
common	insulated alligator clip
DC volts	1 megohm isolation resistor in prod

OPERATING POWER REQUIREMENT

Internal rechargeable battery, or 115/230 ±20% vac, 50/400 Hz. 5 watt line operation (battery charging).

DIMENSIONS

8"H x 5⅞"W x 4"D

WEIGHT

6 pounds

PRICE $395.00

includes internal battery pack and probes

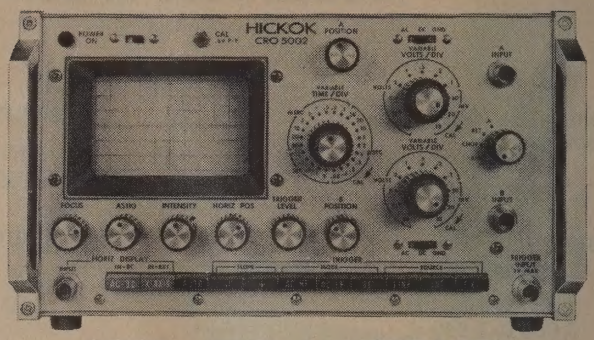
ACCESSORIES

Insulated alligator clip, threaded to fit on prod tip.
Red (p/n 3300-120) $2.00
Black (p/n 3300-103) $2.00

10KV Probe, prod tip and alligator clip included
(p/n 16970-101) $75.00

25 MHz OSCILLOSCOPES

- DC TO 25 MHz BANDWIDTH (3 db point)
- SIMPLIFIED STABLE TRIGGERING TO 50 MHz
- 24 CALIBRATED SWEEP RANGES
- VERTICAL DELAY LINE
- ALL SOLID STATE FOR HIGH STABILITY



MODEL 5002 ILLUSTRATED

DUAL CHANNEL OSCILLOSCOPE

MODEL 5002

SPECIFICATIONS

VERTICAL DEFLECTION SYSTEM

DISPLAY MODES
Channel A only
Alternate
Channel A and B signal displayed alternatively
A — B
Channel B signal is subtracted from Channel A signal
Channel B only

CHANNEL SEPARATION (A — B Mode)
1% of deflection or ⅓ minor scale division, whichever is greater

COMMON MODE REJECTION
10:1

RANGES

10 millivolts/division	1.0 volts/division
20 millivolts/division	2.0 volts/division
50 millivolts/division	5.0 volts/division
0.1 volt/division	10.0 volts/division
0.2 volt/division	20.0 volts/division
0.5 volt/division	

ACCURACY
± 3%

POSITIONING
±9 division (any portion of an 18 division signal symmetrical about center screen may be positioned to center of display area.

INPUT
1 megohm ± 1.0% shunted by 27 pf ± 1.0 pf
500 volts DC plus peak AC

BANDWIDTH
DC to 25 MHz (3 db point)
A — B mode 22 MHz

RISETIME
14 nanosec, 10% — 90% points

WAVEFORM ABERRATIONS
Less than 3% of applied signal or ½ minor scale division, whichever is greater

OVERLOAD PROTECTION

10 mv/div range	300 volts DC plus peak AC
All other ranges	500 volts DC plus peak AC

HORIZONTAL DEFLECTION SYSTEM

RANGES

0.05 microseconds/division	0.5 milliseconds/division
0.1 microseconds/division	1.0 milliseconds/division
0.2 microseconds/division	2.0 milliseconds/division
0.5 microseconds/division	5.0 milliseconds/division
1.0 microseconds/division	10.0 milliseconds/division
2.0 microseconds/division	20.0 milliseconds/division
5.0 microseconds/division	50.0 milliseconds/division
10.0 microseconds/division	0.1 seconds/division
20.0 microseconds/division	0.2 seconds/division
50.0 microseconds/division	0.5 seconds/division
0.1 milliseconds/division	1.0 seconds/division
0.2 milliseconds/division	2.0 seconds/division

ACCURACY
± 3.0%

SWEEP SPEED
Continuously variable between ranges

EXTERNAL INPUT IMPEDANCE
1 megohm ± 5.0% shunted by approximately 30 pf

EXTERNAL BANDWIDTH
DC to 5 MHz (3 db point)

EXTERNAL SENSITIVITY
200 millivolts/division ± 5%

TRIGGERING

MODES
AC - HF High pass filter, signal component below 3KH rejected
AC - LF Low pass filter, signal component above 10KH rejected
DC
Automatic

SOURCES
Line
Internal
External

SENSITIVITY
Internal and Line
1 minor scale division deflection (deflection for trig gering increases at higher frequencies to 1 majc division at 50 MHz)
External
200 mv P-P signal (input impedance is 1 megoh ± 5.0% shunted by approximately 10 pf)

SLOPE
Positive or Negative

CALIBRATOR OUTPUT
0.6v P-P square wave
200 nanosecond rise time

CRT
4" diameter
P 31 phosphor standard, other phosphor available
3.8 kv accelerating voltage
6 x 10 division display area

POWER REQUIREMENTS
105 to 125 volts AC, 50-60 Hz
55 watts
(220 volt model available)

DIMENSIONS
11¼"W x 6⅞"H x 19"D

WEIGHT
27 pounds

PRICE
$995.00

HICKOK INSTRUMENTATION GROUP
10514 Dupont Avenue • Cleveland, Ohio 44108 • Phone 216-541-806

GENERAL DESCRIPTION

The Model 5000 (Single Trace) and 5002 (Dual Trace) are precise laboratory oscilloscopes designed to exceed the basic specifications of higher priced oscilloscopes. The all solid state design offers stability, long term reliability, cool operation, minimum maintenance, light weight, and low power consumption.

The vertical bandwidth specification of DC to 25 MHz (3 db point) satisfies most high frequency oscilloscope requirements in laboratory, quality control, inspection, and production activities. The roll-off characteristic is essentially Gaussion to assure clean step response and makes the instrument usable to over 50 MHz. The built-in vertical delay line provides nearly 50 nanoseconds of display prior to the trigger point on the input waveform.

Vertical sensitivity of 10 millivolts per division and 11 calibrated sensitivity steps (12 in the Model 5000) accommodate a broad range of input signal levels. The input impedance is 1 megohm shunted by 30 picofarads and the input circuitry is overload protected. A 10:1 accessory probe is available to reduce capacitive loading, and a straight through probe for operator convenience.

The overdrive characteristics of the vertical output section facilitates critical viewing or measurement of the waveform in detail. The vertical amplitude display of any waveform may be increased five times the CRT display area with essentially zero distortion. Any portion of a 30 division waveform may be positioned to the center of the display area.

The multi-turn horizontal position control allows display of any 10 division segment of the 40 division sweep. Thus, a signal may be viewed in detail up to 40 divisions after the trigger point. Sweep linearity is maintained throughout the 40 division sweep.

The horizontal amplifier bandwidth of DC to over 5MHz (3 db point) permits wide bandwidth waveform displays such as X-Y presentations. The input impedance is 1 megohm shunted by 30 picofarads.

An ultra stable triggering circuit provides solid waveform displays up to 50 MHz. Either the positive or negative slope of the input waveform may be selected to start the sweep. From the internal source, the sweep will trigger on waveforms as small as 0.2 division deflection. All triggering functions are selected by front panel push buttons which are clearly labeled for operator convenience.

SINGLE CHANNEL OSCILLOSCOPE

MODEL 5000 SPECIFICATIONS

VERTICAL DEFLECTION SYSTEM
RANGES

10 millivolts/division	1.0 volts/division
20 millivolts/division	2.0 volts/division
50 millivolts/division	5.0 volts/division
0.1 volt/division	10.0 volts/division
0.2 volt/division	20.0 volts/division
0.5 volt/division	50.0 volts/division

ACCURACY
±3.0%

POSITIONING
±15 Divisions (any portion of a 30 major division signal may be positioned to center of display area)

INPUT
1 megohm ± 1.0% shunted by 30 pf ± 1.0 pf
600 volts DC plus peak AC

BANDWIDTH
DC to 25 MHz (3 db point)

RISETIME
14 nanoseconds — 10% to 90% point

WAVEFORM ABERRATIONS
Less than 3% of applied signal or 1/10 division, whichever is greater

OVERLOAD PROTECTION

10 millivolts/division range	— 300 volts DC plus peak AC
All other ranges	— 600 volts DC plus peak AC

HORIZONTAL DEFLECTION SYSTEM & TRIGGERING
SAME AS MODEL 5002

CALIBRATOR OUTPUT
0.6v P-P square wave
200 nanosecond risetime

CRT
4" diameter
P 31 phosphor standard, other phosphor available
3.8 kv accelerated voltage
6 x 10 division display area

POWER REQUIREMENTS
105 to 125 volts AC, 50-60 Hz
32 watts
(220 volt model available)

DIMENSIONS
11¼"W x 6⅞"H x 19"D

WEIGHT
24 pounds

PRICE
$725.00

ACCESSORIES FOR BOTH MODELS

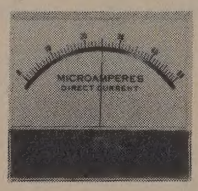
MODEL NO.	DESCRIPTION	PRICE
100-148	Low Capacity Probe Kit, 10 megohm/10 pf, 10:1 attenuation ratio. Adjustable compensation to match instrument input of 1 megohm/20 to 50 pf.	$ 38.00
100-152	Straight Through Probe with BNC connector.	$ 30.00
100-138	Rack Mount Adapter Kit, accepts Model 5000 or 5002 in standard 19" wide, 7" high rack mount panel.	$ 29.00
5000 LP or 5002 LP	Same description as Model 5000 or 5002 except with P7 phosphor.	Add $85.00 to basic unit price
5000E or 5002E	Same description as Model 5000 or 5002 except 220 volt AC Model.	$ 750.00 $1,030.00

COLORADO HICKOK

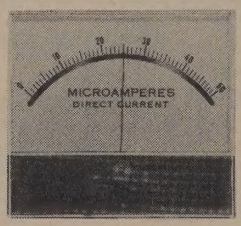
HIGH QUALITY electrical indicating instruments

3½", 4½", 5½", AC or DC
CLEAR VISION
100° PANEL METERS

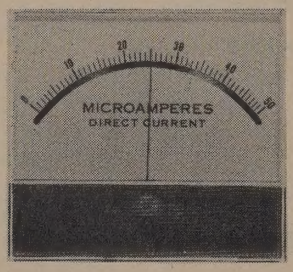
These popular PANEL METERS feature excellent viewing and readability and offer HICKOK dependability and performance. All DC Meters have self-shielding movements, and are available in either PIVOT-JEWEL or TAUT-BAND versions.



3½" — Series 1230



4½" — Series 1240



5½" — Series 1250

SPECIFICATIONS

CASE .....Clear plastic molded case sealed against dirt and dust.

MOVEMENT .....Self-shielding Pivot-Jewel or Taut-Band for D.C. Iron Vane for A.C.

ACCURACY .....1½% standard — higher accuracies available.

SIZES .....3½", 4½", 5½".

ACCESSORIES ....Rear mount Bezels, external solid state devices for some applications.

MOUNTING DIMENSIONS ....4 stud mounting, meets standard requirements.

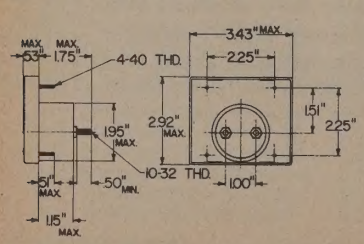
SCALE .....Black lettering on white. Mirror scales on 1% Meters.

RANGES .....All practical ranges available.

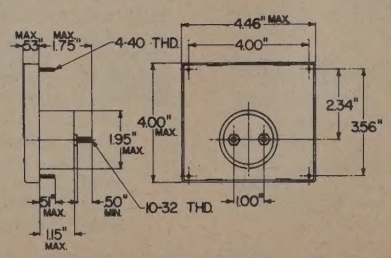
MODEL DESIGNATION

Size	D.C. UA, MA, MV Volts, Amps	A.C. Rect. Type UA, MA, MV Volts, Amps	A.C. Iron Vane MA Volts, Amps	Watts VARS Freq. etc.
3½"	1235	1234	1233	1232
4½"	1245	1244	1243	1242
5½"	1255	1254	1253	1252

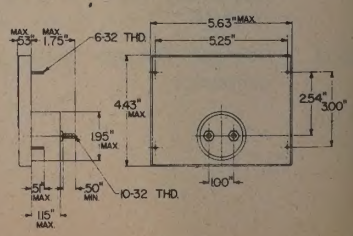
Taut-band movements available on all Models except AC IRON VANE Models 1233, 1243 & 1253. To designate add T to Model No.



3½"

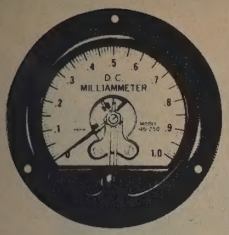


4½"



5½"

3½" ROUND-250 DEGREE METER



46-250

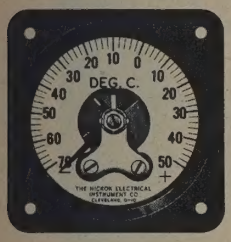
All DC meters can be supplied with accuracy either 1% or 2% of full scale deflection. The AC meters, which use copper-oxide rectifier-type movements, have accuracy within 5% of full scale deflection under all conditions. These instruments are as accurate as panel mounting instruments having equal size and have the advantage of two and one-half times longer scale. They are damped in accordance with American Standards Association Specifications, and their response time is also in accordance with these specifications. Allows readings to be taken quickly and more accurately.

3½" SQUARE 250 DEGREE METER SAME AS THE ROUND 250 DEGREE METER

46

All DC meters can be supplied with accuracy either 1% or 2% of full scale deflection. The AC meters, which use copper-oxide rectifier-type movements, have accuracy within 5% of full scale deflection under all conditions. These instruments are as accurate as panel mounting instruments having equal size and have the advantage of two and one-half times longer scale. They are damped in accordance with American Standards Association Specifications, and their response time is also in accordance with these specifications. Allows readings to be taken quickly and more accurately.

2½" 250 DEGREE AIRCRAFT METER



56-250

This instrument is mounted in a regulation aircraft case per Army-Navy specification, including the shielding and dimensional requirements. Has scale approximately 4-3/8" long. Quick readability makes them desirable as flight instruments. Aircraft-type dial is available. Mechanism specially designed for aircraft service and will meet vibration-resistant requirements, etc.

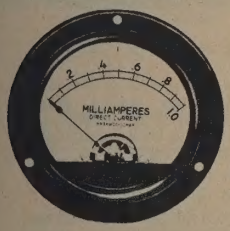
4⅝" RECTANGULAR PANEL METER

68

Model 68 DC, Model 69 AC, Accuracy 1½%.

Developed specifically to meet requirements for a 4⅝" instrument that permits maximum length of scale, new efficiency small movement, and choice of two mounting stud locations to permit maximum versatility in semi-flush panel mount applications. Also available as an illuminated type with a new illumination technique that permits bulb replacement from front panel without necessitating removal of instrument from panel.

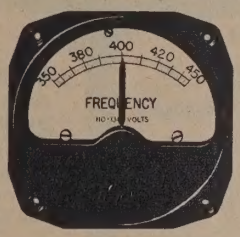
3½" ROUND RUGGEDIZED METER



46 HSR

The high Hickok standard of quality is now available in a ruggedized DC or rectifier type AC meter. This instrument provides the practical answer to requirements for shock proof meters with dependable accuracy. This highly efficient shock mount design permits pointer and scale divisions to be easily read when meter is under vibration. Rear panel is built with new screw-type terminals to eliminate solder connections. Also available in 2-1/2" and 4-1/2".

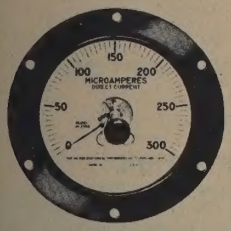
DIRECT READING FREQUENCY METER, AIRCRAFT TYPE



59

These Hickok improved self-contained frequency meters can be mounted in aircraft type cases of the large AN size. These are the smallest size frequency meters. This type of case is often convenient where space is a limiting factor. Suitable for aircraft use. Movement is shockproof. Case is dust and waterproof in accordance with Army-Navy aircraft instrument specifications. Radium or fluorescent dials and pointers available.

4½" 250 DEGREE RUGGEDIZED METER



48-250R

DC Model: 48-250R
AC Model: 49-250R (Rectifier type)
Accuracy: 2% as standard and available to 1%.
For flush mounting.

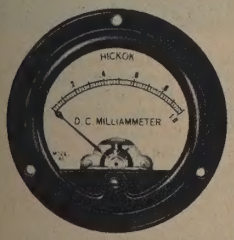
These long scale 250 degree arc angle instruments are now available as shock proof ruggedized and sealed. Permits a scale length approx. 2½ times as long as conventional instruments in the same size case. Use of these meters offers possibility of considerable saving to panel space. Available in 3½" and 4½" sizes.

2½" MINIATURE SQUARE PANEL MOUNTING

S 56

Flush mounting, phenolic case, wide flange only; and metal cases, wide and narrow flanges. Accurate within 1-1/2%. These miniature panel mounting instruments are of the standardized 2-1/2" size, but have extra long scale lengths by reason of the wide angle of deflection and longer scale radius. Five types of cases are available. Lance type pointers regularly supplied, however, small spade pointers can be furnished.

3½" ROUND FLUSH MOUNTINGS



46

Accurate within 1-1/2%. Large opening symmetrically designed admits a maximum of light to the dial. Thick flange eliminates danger of breakage and improves appearance. Metal dials with white background are supplied in all standard ranges. Special dial designs are supplied on quantity orders, at no extra charge. Include internal illumination.

Hickok is one of the foremost pioneers and manufacturers of electrical indicating instruments. Here shown are a few of the more popular types furnished. However, any practical range and type can be supplied. Your inquiry is invited. Kindly list details of your requirements. Prices are available on request.

3½" SQUARE FLUSH MOUNTINGS

S 46

Accurate within 1-1/2%. Large opening, symmetrically designed, admit maximum light to the dial. Thick flange eliminates danger of breakage and improves appearance. Require less panel space than round flush instruments. Metal dials with white background are supplied in all standard ranges. Special dial designs supplied on quantity orders at no extra charge, including internal illumination by means of bulb inserted in a socket through the instrument base.

Subsidiary of
The HICKOK
lectrical Instrument Company
Cleveland, Ohio

COLORADO HICKOK CORP.

2897 North Avenue • P.O. Box 2168 • Grand Junction, Colorado 81501

PHONE 243-2124 AREA CODE 303

HIPOTRONICS INC.

AC INSULATION TESTERS

Hipotronics AC Insulation Testers are conservatively engineered to insure quality and dependability. The most advanced techniques and years of high voltage experience go into every unit, from the smallest AC Hipots to heavy units rated up to 500 kv, in excess of 3000KVA. Using Hipotronics' own transformers, corona free performance to full rating is guaranteed.

All units are designed for maximum operator and equipment protection. The surge devices preclude injury to any component from repeated short circuits at full output and the many safety devices insure operator protection.

FEATURES

- **Continuously adjustable output control from zero to maximum.**
- **Continuously adjustable electronic thyratron operated overload — prevents excessive burning of cable or insulation when failure occurs.**
- **Back-up magnetic overload circuit breaker.**
- **Triple range output connected KV meter, 4½" square, 2% accuracy.**
- **Single range current meter in grounded HV return.**
- **Circuit breaker input.**
- **HV on and off pushbuttons.**
- **Zero start interlock — compels operator to always raise voltage from zero.**
- **External interlock provision.**
- **Main, HV on and failure pilot lights.**
- **Surge and transient protection on all meters, transformers etc.**
- **Corona-free to full output.**
- **Meets ASTM, IPCEA, MIL, UL etc. specifications.**
- **Less than 5% waveform distortion on all models.**

OPTIONAL EXTRAS

Corona Detection Equipment: Any AC or AC/DC units may be supplied with Hipotronics' own advanced corona detector as part of an integrated system. See catalog sheet for features and prices of Hipotronics Corona System.

Motorized output control, single speed

Motorized output control with 10 to 1 range of adjustment

Burn Feature — bypasses overload and inserts line reactor in series with HV transformer's primary.

Multi-pi secondary — increases secondary current capability x4 at ¼ output, x2 at ½ output, thus increasing test capacity. Price depends on unit.

DA OUTPUT CHANNEL for 1.3 or 2.6 times AC rating with current capability of 10 ma.

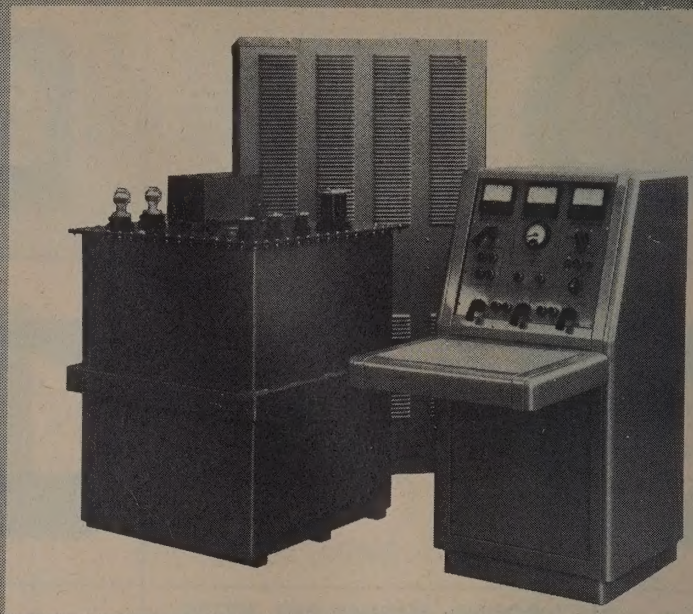
HV on Dwell timer — allows operator to preset maximum HV on time

Memory KV — maintains KV meter reading at breakdown value on motorized units

Floor model cabinet with clear plastic 2 foot door

Caster mounted HV section

Test Jigs — Any ASTM jig — ¼" dia., 2" dia., oil cup, ¼" x4, etc.



SPECIFICATIONS

Hipotronics will provide more complete details including prices, sizes, weights, input voltage, and delivery time on a particular unit. While size and configuration of units depends on KV and KVA rating as well as optional extras that might be required, the following is an approximation.

Up to 25 KV Units generally air-insulated and in one cabinet.

Over 25 KV High voltage section hermetically sealed in oil.

100 KVA and up Consists of slope front desk type control console, voltage regulator section, and an oil tank containing the HV transformer, meter multiplier and power separation filter for corona testing if desired.

Over 200 KVA Normally as other units above 100 KVA, with a fourth section containing the main circuit breaker and contactor.

SERIES RESONANT

Hipotronics Inc., recommends the use of Series Resonant Dielectric test sets for very high KVA capacitive load testing. Write for details.

MODEL NUMBER AND ORDERING INFORMATION

Hipotronics uses this system. AC Insulation testers are preceded by the number "7". The next number or numbers is the KV rating, the number after the hyphen is the KVA rating, i.e.

715-5 is a 15 KV @ 5 KVA AC unit
7150-500 is a 150 KV @ 500 KVA AC unit

When DC outputs are available they are indicated with numbers following the AC designation, i.e.

715-1/20 is a 15 KV @ 1 KVA AC tester with 20 KV DC available.

Corona testers are indicated by the letters CT following the number designation, i.e. **750-2CT**

When requesting further information or quotation, please include complete details of your requirements and any special restrictions that might be applicable. If you are not sure which units best suit your needs, describe the tests to be performed, including capacitance of the load (i.e. rating and length of cable), test standards used IPCEA, NEMA, etc.

CUSTOM DESIGN

Hipotronics can provide start-to-finish fabrication of AC Dielectric Test Sets to exact specifications. Any reasonable KV-KVA combination throughout design ranges can be provided; i.e., 45 KV @ 225 KVA.

SEND FOR CATALOG

HIPOTRONICS INC.

High-Potential Electronics
Brewster, New York 10509, (914) BR 9-8091

HIPOTRONICS INC.

DC INSULATION TESTERS

Hipotronics DC Insulation Testers are specifically designed for insulation testing with sufficient current capacity to charge high capacitive loads.

All units are designed for maximum equipment and operator protection. The surge devices preclude injury to any component from repeated short circuits at full output, and the many safety features insure operator protection.

An instantaneous overload relay turns the HV off and the internal shorting relay discharges the sample under test immediately after failure.

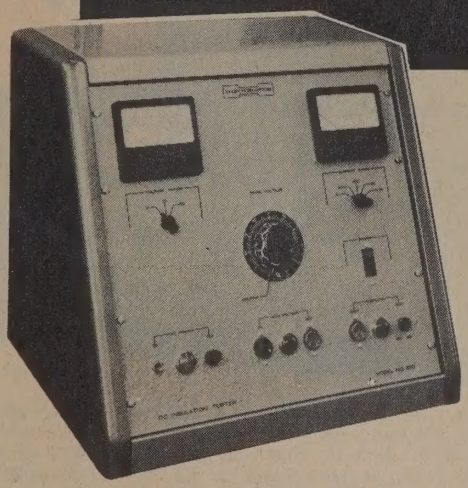
All units are ruggedly constructed for plant or field use and are designed for long life trouble free operation. Every unit is shorted many times at full output before shipping to insure the effective operation of all surge devices.

SAFETY FEATURES

- Output shorting relay with discharge resistor, gravity operated.
- Instantaneous adjustable overload relay in grounded return.
- Instantaneous overload circuit breaker in primary of HV transformer.
- Zero start interlock – compels operator to always raise voltage from zero.
- External interlock provision for test cage door or "dead man" switch.
- Surge limiting resistor in HV output.
- Shielded output cable or bushing.
- Three wire grounding type cord and plug on 115 volt units.
- 115 volt control circuitry in 220 volt models.

CONVENIENCE FEATURES

- Solid state rectifiers
- Triple range output connected KV meter with recalibration facilities
- Triple range current meter in grounded return
- HV on and off push buttons with HV on pilot light
- Continuously adjustable output control
- Hermetic sealed oil filled HV section on all models 30 KV and up
- 4½" square Weston meters with 2% accuracies



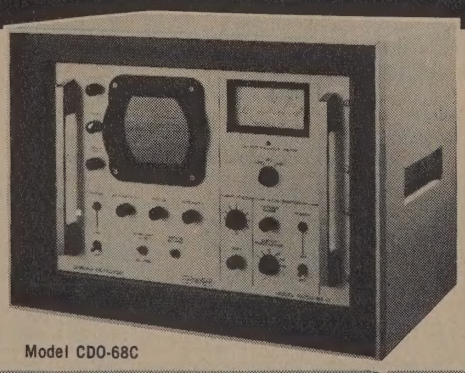
Model 250

Input	Voltage	Current	Model	Insulation	Size* Control	Size* HV Section	KV Meter	Current Meter	Price
115 Volt 60 Hz	0-5 KV	10 ma.	25	AIR	17"x9"x11"H	None	0-1/2.5/5	0-100 ua/1ma/10ma.	$330
	0-10 KV	10 ma.	210	AIR	17"x9"x11"H	None	0-2.5/5/10	0-100 ua/1ma/10ma.	385
	0-20 KV	10 ma.	220	AIR	17"x9"x11"H	None	0-5/10/25	0-100 ua/1ma/10ma.	495
	0-30 KV	10 ma.	230	AIR	22"x18"x18"H Sloped Front Deluxe Type	None	0-6/12/30	0-100 ua/1ma/10ma.	550
	0-50 KV	10 ma.	250	OIL		None	0-10/25/50	0-100 ua/1ma/10ma.	825
	0-60 KV	10 ma.	260	OIL		None	0-12/30/60	0-100 ua/1ma/10ma.	880
	0-75 KV	10 ma.	275	OIL		17"dia.x20"H	0-15/37.5/75	0-100 ua/1ma/10ma.	1045
	0-100 KV	10 ma.	2100	OIL		17"dia.x20"H	0-25/50/100	0-100 ua/1ma/10ma.	1540
	0-120 KV	10 ma.	2120	OIL		19"dia.x30"H	0-30/60/120	0-100 ua/1ma/10ma.	1870
	0-150 KV	10 ma.	2150	OIL		19"dia.x30"H	0-37.5/75/150	0-100 ua/1ma/10ma.	2310
220 Volt 60 Hz	0-200 KV	10 ma.	2200	OIL		30"Wx30"Dx35"H	0-40/80/200	0-100 ua/1ma/10ma.	3850
	0-250 KV	10 ma.	2250	OIL		36"Wx34"Dx38"H	0-50/100/250	0-100 ua/1ma/10ma.	5500
	0-300 KV	10 ma.	2300	OIL		40"Wx36"Dx40"H	0-60/120/300	0-100 ua/1ma/10ma.	7920
	0-400 KV	10 ma.	2400	OIL		48"Wx38"Dx44"H	0-80/200/400	0-100 ua/1ma/10ma.	10,450
	0-500 KV	10 ma.	2500	CHECK FACTORY FOR INFORMATION					
	0-600 KV	10 ma.	2600						
	0-750 KV	10 ma.	2750						
	0-1000 KV	10 ma.	21000						

Standard output voltage is negative polarity. Positive or reversible polarity available.

CORONA DETECTORS

All Hipotronics AC, DC, or AC/DC Insulation test sets are corona free to full rating and can be supplied with Hipotronics advanced Corona Detector Oscilloscope to provide a complete and integrated corona test system. These systems meet or exceed testing requirements as specified by ASTM, IPCEA, MIL-C-17D and MIL-T-27. Request a complete quotation to fill your requirements.



Model CDO-68C

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HIPOTRONICS INC.

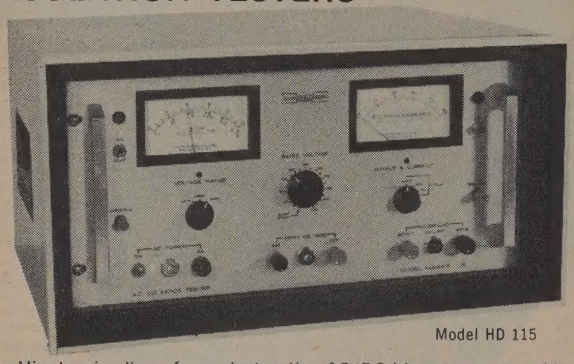
High-Potential Electronics

HIPOTRONICS, INC. / BREWSTER, N. Y. 10509 / (914) 279-8091

HIPOTRONICS INC.

NON-DESTRUCTIVE HIPOT & INSULATION TESTERS

100 Series
NON-DESTRUCTIVE HIPOT AND INSULATION TESTERS



Model HD 115

The Hipotronics line of non-destructive AC/DC hipot test sets utilize a thyratron-operated overload circuit for unprecedented reliability and speed of operation. Reaction time is remarkably low, sensitivity is variable over a range of 1 to 110% of rated output current. With circuit sensitivity set at maximum, corona discharge or leakage currents of sufficient magnitude will trip the HV before insulation failure occurs.

Each unit is packaged on a rack mounted panel installed in a new, attractive desk-top cabinet. The unit may be removed from the cabinet and mounted to a standard equipment 19" rack in minutes. Controls have been human engineered to provide ease of operation, safety, readability, and an attractive, professional appearance.

Two versions are available: a standard unit with minimal control features, and a deluxe unit with all the most desired controls for laboratory precision testing programs.

FEATURES IN STANDARD MODEL:

• AC input on and off switches • Input fuse and pilot light • Output control continuously adjustable from zero to maximum • Single range, output connected KV meter, 2% full scale accuracy, 3½" arc • Single range current meter in grounded HV return. 2% full scale accuracy, 3½" arc, 0-5 ma AC/DC • Meters are recessed for protection • KV meter recalibration facility • Continuously adjustable, overload circuit from 50 ua to 5 ma • Failure indicator and reset button • Front panel, re-entrant output jacks with shielded HV output lead and ground lead • AC/DC meter switch with reminder lights over output jacks • External interlock provision • Surge limiting resistor in DC output • Deluxe, 21"W x 19"D x 10"H cabinet (slightly larger for 25 KV unit)

ADDITIONAL FEATURES IN DELUXE (HD) MODELS:

• Zero start interlock with HV on and off buttons—compels operator to start test at zero volts • Triple range KV meter • Triple range DC current meter, 0-50/500/5000 ua DC • High Voltage On pilot light

OPTIONAL EXTRAS (ALL UNITS):

- HV test probe $10
- Gravity operated output shorting solenoid with discharge resistor $35
- Audible failure signal $15

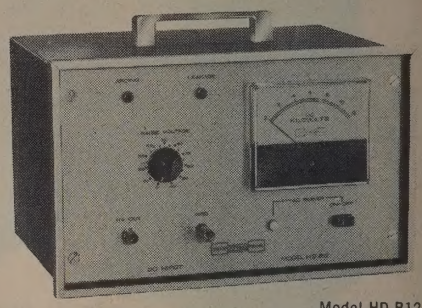
SPECIFICATIONS:

Input	115 VAC, 60 Hz, 5 amps max.
Size & Weight	21"W x 19"D x 10"H; appx. 60 lbs.
Output Current	5 ma. AC or DC at full rated voltage
Meters	2% full scale accuracy, 3½" arc

Model	Output Voltage	KV Meter Ranges	Price
H 103	0-2.5 KV AC/0-3 KV DC	0-3 KV AC/DC	$270
HD 103	0-2.5 KV AC/0-3 KV DC	0-.6/1.2/3 KV AC/DC	340
H 106	0-5 KV AC/0-6 KV DC	0-6 KV AC/DC	290
HD 106	0-5 KV AC/0-6 KV DC	0-1.2/3/6 KV AC/DC	360
H 115	0-12 KV AC/0-15 KV DC	0-15 KV AC/DC	370
HD 115	0-12 KV AC/0-15 KV DC	0-3.75/7.5/15 KV AC/DC	440
H 125	0-10 KV AC/0-25 KV DC	0-25 KV AC/DC	465
HD 125	0-10 KV AC/0-25 KV DC	0-5/10/25 KV AC/DC	535

Consult factory for quotation on special requirements.
Prices and specifications subject to change without notice.

AC and DC PRODUCTION HIPOT TESTERS
A and B Series



Model HD B12

Designed for use by unskilled or semi-skilled personnel in mass testing of electrical components, transformers and appliances. Simple to operate, reliable for go no/go testing. Indicators provide information on component leakage and internal arcing. Continuously variable output voltage and output connected KV meter provide optimum test accuracy at lowest cost.

FEATURES:

• Detachable test leads enter front panel • Continuously adjustable output from zero to maximum • Output connected KV meter for maximum accuracy • "Arcing" detector employs corona pickup network for best sensitivity • "Leakage" detector sensitivity continuously adjustable from 500 ua to 5 ma • Three-wire grounding cord and plug • Shielded output lead thru re-entrant jack • AC input switch, fuse, and pilot light • Each model has a corresponding deluxe model with an audible failure alarm circuit incorporated in its design.

OPTIONAL:

HV probe $10

SPECIFICATIONS:

Size & Weight	7"H x 12"W x 8"D; appx. 20 lbs.
Input	115 VAC, 60 Hz, 3 amps max.
Short Circuit Current	
AC Units	18 ma.
DC Units	5 ma.
KV Meter	3% full scale accuracy, 3" arc

AC Models	Output	Price
H A3	3 KV AC	$145
HD A3	3 KV AC	170
H A5	5 KV AC	160
HD A5	5 KV AC	185
H A10	10 KV AC	190
HD A10	10 KV DC	215
DC Models	**Output**	**Price**
H B4	4 KV DC	150
HD B4	4 KV DC	175
H B6	6 KV DC	170
HD B6	6 KV DC	195
H B12	12 KV DC	210
HD B12	12 KV DC	235

HIPOTRONICS INC.

High-Potential Electronics

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HIPOTRONICS INC.

HIPOT TESTERS & MEGOHMMETERS

300 Series
AC/DC HIPOT TESTERS AND MEGOHMMETERS

Model H 306B

The 300 series of Hipot Testers and Megohmmeters are voltage test sets which perform three different functions. They may be used for AC dielectric/insulation tests, DC dielectric/insulation tests, and insulation/resistance tests. The "A" units perform IR tests to 1000 megohms and the "B" units to 100,000 megohms at 500 volts. Megohms at any other voltage may be determined from the volt and current meter readings.

New design package is human engineered for easy operation, flexibility, and safety, and is available in two series:

A SERIES: Four current ranges
Two resistance ranges
Reads currents as low as 1 ua
Measures megohms to 1,000

B SERIES: Current amplifier permits reading as low as 0.01 ua
as high as 100,000 megohms
Six current ranges
Four resistance ranges

FEATURES:

- Overload circuit has continuously adjustable sensitivity from 50 ua to 5 ma. Maximum sensitivity allows non-destructive testing of insulation and dielectrics.
- Reset button and failure indicator.
- Unit is mounted in an attractive, dust-proof, bench-top cabinet. May be removed from cabinet and mounted on a standard equipment rack.
- Dual range output connected KV meter, with set point for megging clearly marked.
- Range and function switches.
- Front panel test lead connections, with AC and DC output reminder lights.
- Input on and off switches, pilot light, and fuse.
- Recalibration facilities.

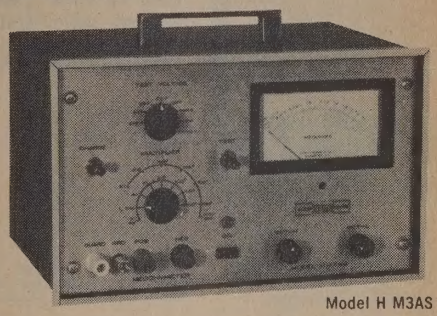
SPECIFICATIONS:

Input	115 VAC, 60 Hz, 1 amp max.
Size & Weight	21"W x 19"D x 10"H; appx. 50 lbs.
Meters	2% full scale accuracy, 3½" arc
Current meter ranges:	
A Series	0-50/500/5000 ua DC; 5 ma AC/ 1-100 megohms, x1, x10
B Series	0-.5/5/50/500/5000 ua DC; 5 ma. AC/ 1-100 megohms, x1, x10, x100, x1000

Model	Output Voltage (KV) AC	Output Voltage (KV) DC	Output Current	Megohm Ranges	Price
H 301A	1.0	1.5	5 ma.	2	$415
H 301B	1.0	1.5	5 ma.	4	550
H 303A	2.5	3.0	5 ma.	2	435
H 303B	2.5	3.0	5 ma.	4	570
H 306A	5	6	5 ma.	2	465
H 306B	5	6	5 ma.	4	605

Consult factory for quotation on special requirements.
Prices and specifications subject to change without notice.

MEGOHMMETERS



Model H M3AS

Hipotronics megohmmeters are precision instruments for use in production or laboratory testing of cables, capacitors, printed circuits, transformers, electronic assemblies, etc.

- The output voltages are both regulated with a ferro-resonant line and a solid state electronic regulator. Even with large capacitive loads on the 20 million range, there is no bounce.
- The indicating device is a high quality Weston with better than 2% accuracies on all ranges below 1 million and 3% on 10 million. The VTVM circuit driving the meter on the higher range models has no zero shift on any range.
- The short circuit protection is such that the output may be continuously shorted without injury to any component.
- Self contained calibrating resistors in the seven range models permit the operator to periodically verify the calibration.
- A three terminal output network (positive, negative and guard) permits grounded or ungrounded tests to be made.
- Dual color scale on multiple output voltage models improves readability.
- The units also contain a resistor and switch position for discharging both the internal and load capacitance.
- Available in 6 models, all with 115 Volt, 60 Hz input and AC input switch, fuse and pilot light.
- Two models have mandatory 2-hand operation.

Model	Output Voltage	Range	Price
H M1	500	1-100 megohms (X1, X10)	$170
H M3A/3AS (H M3AS has mandatory two-hand operation)	50	1-100 megohms ($X.1/1/10/10^2/10^3/10^4$)	$315/$340
	100	2-200 megohms ($X.1/1/10/10^2/10^3/10^4$)	
	500	1-100 megohms ($X1/10/10^2/10^3/10^4/10^5$)	
	1000	2-200 megohms ($X1/10/10^2/10^3/10^4$)	
H M6B/6BS (H M6BS has mandatory two-hand operation)	50	1-100 megohms ($X.1/1/10/10^2/10^3/10^4$)	$255/$280
	250	5-500 megohms ($X.1/1/10/10^2/10^3/10^4/10^5$)	
	500	1-100 megohms ($X1/10/10^2/10^3/10^4/10^5$)	
M6C	250	1-100 megohms ($X.1/1/10/10^2/10^3/10^4$)	$250

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HIPOTRONICS INC.

High-Potential Electronics

HIPOTRONICS, INC. / BREWSTER, N. Y. 10509 / (914) 279-8091

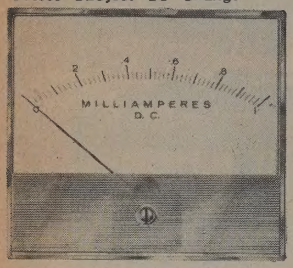
Hoyt SINCE 1904

Prices Subject To Change

HOYT ELECTRICAL INSTRUMENTS

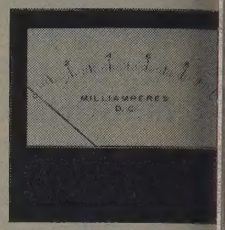
BURTON-ROGERS CO./Sales Div., 556 Trapelo Rd., Belmont, Mass. 02179 (617) 489-1520

For Original Equipment and Replacement Applications



MODEL Nos. 2025, 2035, 2045, 2060, 2080 DC/2026, 2036, 2046, 2061, 2081 AC—Clear Plastic Styrene Cases, Available with Bezel for mounting behind panel (2)
Mirror dial available.

Moving Coil Meters built on d'Arsonval principle using jewel bearings, polished steel pivots. 2% accuracy. Alnico magnets. Permanently correct balance assured by HOYT cross-arm balance. High torque to weight ratio. Quick response and good damping. Knife-edge or lance pointers. 100° movements standard on most models. Special cases available. Inquiries invited on special types.



MODEL 680 D.C., 681 A.C.
Dull bakelite finish →

PRICE LIST: PANEL MOUNTING

Range	Size:	1½"	2½"	3½"	4½"	6"	8"	6¾"—8½" ROUND PANEL METERS	3" x 4" PORTABLE METERS	5" x
			#2025	#2035 #1037	#2045, #680 #1045, #683					
			#1025	# 17L	# 574, #685					
			#17/3	# 653	# 641, #673					
	Approx.	# 668	# 635	# 582	# 645, #570	#2060		#583* #602*	#578* #51	
	Resist.	#2015	# 649	# 597	# 600, #607	#1060	#2080			

*Prices on request.

D.C. MILLIAMMETERS

0/1	*60*	$16.45	$15.50	$16.45	$18.25	$21.75	$35.60

Above prices also apply to 0/3, 0/5, 0/10, 0/15 MA Standard ranges.

0/25	*1.7*	16.95	15.95	16.95	18.60	22.45	36.25

Above prices also apply to 0/25, 0/30, 0/50, 0/100, 0/150, 0/200, 0/300, 0/500 MA Standard ranges.

D.C. MICROAMMETERS

0/20	*3000*	—	27.65	28.75	30.35	—	—
0/50	*2000*	24.25	23.50	24.25	25.95	—	—
0/100	*2000*	21.20	20.40	21.20	22.95	26.55	40.20
0/200	*1000*	18.40	17.45	18.40	20.10	23.70	37.40
0/500	*200*	17.45	16.60	17.45	19.10	22.70	36.45

Zero center microammeters available for most models in 25/0/25,50/0/50, 100/0/100, 500/0/500 UA. Prices on request.

D.C. MILLIVOLTMETERS

0/50	*3*	16.95	15.95	16.95	18.60	22.45	36.25

D.C. AMMETERS

0/1	*0.005*	17.00	16.15	17.00	18.75	22.80	36.60
0/5	*0.004*	17.00	16.15	17.00	18.75	22.80	36.60

Above prices for 0/5 amp. range also apply to standard ranges of 0/10, 0/15, 0/25, 0/30*, 0/50* amps on all models (self-contained shunts). No. 668 uses external shunt over 5 amps. See Shunt Table below.

D.C. VOLTMETERS

0/1	*1000Ω/V.*	17.60	16.85	17.60	19.20	22.80	36.60

Above prices also apply to standard ranges of 0/3, 0/5, 0/10, 0/15, 0/25, 0/30*, 0/50*, 0/100, 0/150*, 0/300* volts on all models.

0/500	*2000Ω/V.*	—	17.60	18.50	20.25	23.85	37.60

Above prices also apply to standard ranges at 0/600, 0/750 volts on all models except #668.

NOTE:

If "in-between" ranges are quired, add $3.70 to price next higher range listed. "zero-center" ranges are quired, add $5.80 to price that range. For in-betwe ranges on moving-coil t Voltmeter 150 volts and add $5.80 to next higher ran

Please specify type of c on order from chart abo

All prices are net — subj to change or withdrawal w out notice.

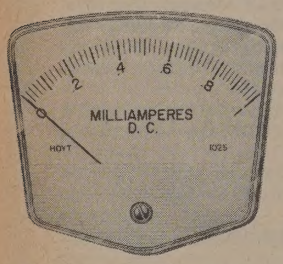
(1) Models marked a available in surface mount metal case. Unless specifi all meters are calibrated non-magnetic panels. If st panels are used, give thickn of steel and size of panel h (No extra charge).

(2) Bezels for behind pa mounting of models 20 2025, 2035, 2045 add /B model no., $2.25 extra.

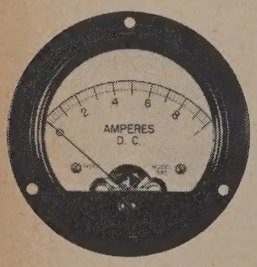
* These ranges carried IN STO . . . Models #582, 597, and only (For non-magnetic pane

MODEL No. 2015 DC/2016R AC

MODEL No. 685 D.C. Pancake Edgewise Meter.



MODEL Nos. 1025, 1037, 1045, 1060 DC/1026, 1038, 1046, 1061 A.C./Clear Plastic Styrene Case



MODEL Nos. 582 & 17/3, D.C.(1)
MODEL Nos. 584 and 552, A.C.

METER SIZE		MODEL DC	MODEL AC	CASE TYPE PANEL MTG.	SCALE LENGTH DC	FLANGE	BODY DIAM. AC - DC	BODY DEPTH AC - DC
1½"		668	669/R	Styrene Sq.	1.800"	1.740"	1.500"	1.000"
1½"	(2)	2015	2016/R	Styrene Sq.	1.800"	1.740"	1.500"	1.000"
2½"		17/3	552	Bakelite Rd.	2.015"	2.690"	2.200"	1.375"
2½"		1025	1026	Styrene	2.500"	2.87" x 2.59"	2.160"	1.120"
2½"	(2)	2025	2026	Styrene	2.500"	2.81" x 2.37"	2.160"	1.120"
2½"		635	636	Bakelite Sq.	2.015"	2.375"	2.200"	1.400"
2½"		649	650	Styrene Sq.	2.480"	2.625" x 2.375"	2.200"	1.125"
2½"		685	686/R	Metal Edgewise	2.000"	3" x 1.25"	2.375"	.900"
3½"	(1)	17/L	560	Metal Rd. Flush	2.480"	3.219"	2.500"	1.500"
3½"		582	584	Bakelite Rd.	2.720"	3.500"	2.750"	1.375"
3½"		1037	1038	Styrene	3.812"	3.500"	2.750"	1.125"
3½"	(2)	2035	2036	Styrene	3.435"	3.50" x 2.97"	2.750"	1.100"
3½"		597	598	Bakelite Sq.	2.720"	3.000"	2.750"	1.375"
3½"		653	654	Styrene Sq.	3.435"	3.375" x 3.125"	2.750"	1.125"
3¾"	(1)	570	580	Metal Rd. Flush	2.850"	3.750"	3.000"	1.688"
3¾"		607	610	Bakelite Sq.	2.850"	3.625" x 3.313"	2.250"	1.063"
4¼"		641	642	Styrene	4.250"	4.500" x 3.844"	2.750"	1.125"
4½"	(1)	574	617	Metal Rd. Flush	3.875"	4.500"	3.750"	1.594"
4½"		600	601	Bakelite Sq.	4.034"	4.500" x 4.000"	2.750"	1.063"
4½"		645	646	Styrene Sq.	4.470"	4.625" x 4.188"	2.750"	1.125"
4½"		647	648	Bakelite Sq.	4.470"	4.500" x 4.188"	2.750"	1.125"
4½"		680	681	Bakelite Sq.	4.470"	4.652" x 4.188"	2.750"	1.125"
4½"		683	684	Bakelite Sq.	4.470"	4.500" x 4.188"	2.750"	1.125"
4½"		1045	1046	Styrene	4.500"	4.81"	2.750"	1.125"
4½"	(2)	2045	2046	Styrene	4.500"	4.50" x 4.03"	2.750"	1.090"
6"		1060	1061	Styrene	5.375"	6.000" x 4.500"	2.750"	1.100"
6"		2060	2061	Styrene	5.375"	5.72" x 4.49"	2.750"	1.100"
8"		2080	2081/R	Styrene	9.125"	7.75" x 6.56"	3.500"	1.100"

STANDARD SWITCHBOARD SHUNTS AND AMMETER RANGES

On High Current Ammeters, add 0/50 millivoltmeter price to external shunt price below. Shunts include 3 ft. leads. Standard Ammeter and Shunt Ranges on types 17/3, 582 and 647 only; others listed are special ranges at slight extra cost.

0/25 —$12.65	0/30 —$12.65	0/50 —$11.65	0/75 —$11.65	0/100—$11.65	0/150 —$12.65
0/200—$12.65	0/300—$13.55	0/500—$19.75	0/600—$23.30	0/800—$30.95	0/1000—$38.05

Hoyt SINCE 1904

HOYT ELECTRICAL INSTRUMENT WORKS, INC.
BURTON-ROGERS COMPANY SALES DIVISION

HOYT ELECTRICAL INSTRUMENTS

BURTON-ROGERS CO./Sales Div., 556 Trapelo Rd., Belmont, Mass. 02179 (617) 489-1520

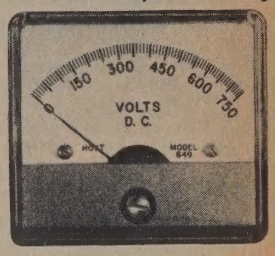
Precision Quality and Craftsmanship Since 1904

Hoyt SINCE 1904

Prices Subject To Change

.C Meters for 60 cycle Voltage and Current Measurements are repulsion type with air amping. Same case styles and sizes match HOYT D.C. meters; see DC-AC Specifications hart on opposite page. 2% accuracy. Choice of pointer available; special shields supplied at dditional cost.

U METERS, with "A" scale, available in #649, #653, #645, and #683 case styles. Prices on request.
OTE: A. C. Meters calibrated at any special frequency. Prices on request.



MODEL No. 649, 653, 645 DC/ 650, 654, 646 AC Clear Plastic Styrene Cases

PRICE LIST:

Size:	2½"	3½"	4½"	6"	8"	PORTABLE 3" x 4"	PORTABLE 5" x 4"
	#2026	#2036 # 560	#684/R, # 684	Quantity Prices On Request		#562*	#517*
	#1026	#1038	#580 # 642			*Prices on request	
	# 552	# 654	#610 # 646			NOTE: Bezels for behind panel mounting of models 2026 - 2036 - 2046 — add /B to model no. $2.05 extra.	
	# 636	# 584	#617 #1046	#1061			
Approx. Resist.	# 650	# 598	#601 #2046	#2061	#2081/R		

A.C. MILLIAMMETERS

Range	Approx. Resist.	#640	#693 #740 #793†	#795		
/10	2700	$15.95	$16.95	$18.60	$22.45	— —

Prices for ranges: 0/30, 0/50, 0/100, 0/150, 0/200, 0/300, 0/500 MA for all models — same as 0/10 MA. range above

A.C. AMMETERS

Range	Approx. Resist.	#640	#693 #740 #793†	#795		
/1	0.271	16.15	17.00	18.75	22.80	

Above prices also apply to all models of standard single ammeter ranges—0/3, 0/5*, 0/10, 0/15, 0/25, 0/30*, 0/50* amps. A.C. Ammeters are self-contained to 50 amps.

For High Current Ranges—See Transformer Section below.

A.C. VOLTMETERS (Repulsion Type)

Range	Approx. Resist.	#640	#693 #740 #793†	#795		
/25	1476	16.85	17.60	19.20	22.80	

Above prices also apply to all models in standard ranges of 0/30, 0/50, 0/100 volts.

/150*	25,000	17.65	18.40	20.05	23.55	
/300*	50,000	17.65	18.40	20.05	24.95	
/500	83,300	—	25.75	27.40	31.05	
/600*	99,960	—	25.75	27.40	31.05	

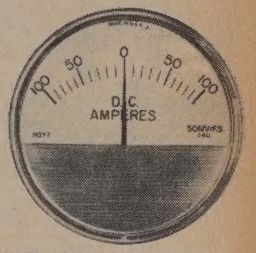
5% RECTIFIER TYPE VOLTMETERS

Available in the following ranges: 0/5, 0/10, 0/15, 0/25, 0/30, 0/50, 0/100, 0/150, 0/300 volts.

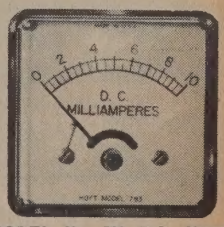
Above ranges apply to models #584-R, #598-R, #654-R at $22.70 ea.

Above ranges apply to models #642-R, #646-R, #684/R at $25.20 ea.

* These ranges carried IN STOCK on Models #584, #598 and #684 only (calibrated for non-magnetic panels).
NOTE: If "in-between" ranges are required, add $3.70 to next higher price as shown above (add $5.50, if above 150 volts). Standard calibration is for non-magnetic panels. Steel panel calibration at no extra charge if order specifies thickness of steel and size of panel hole. Please specify type of meter case.
DIAL COSTS: Standard range dials only — $1.30 each; special hand drawn single range dials. Prices on Request; other custom dials on special order.



MODEL No. 740 D.C. Indicator 2¼".



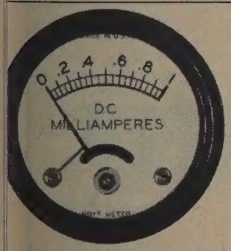
MODEL No. 793 D.C. Shown. No. 793-M type masked front. Also 2½" No. 693 Metal Case.

HIGH CURRENT DONUT TYPE TRANSFORMERS (In Stock)

For prices on HIGH CURRENT AC AMMETERS, add price of ammeter model above to transformer price below, plus an additional $4.50 except on model #552, #584 and #684. Transformers have 2 ft. leads and 2 VA burden. Other ranges available on request.

)/5	$15.25	100/5	$15.25	200/5	$15.25	500/5	$24.35
5/5	15.25	150/5	15.25	300/5	15.25	600/5	24.35

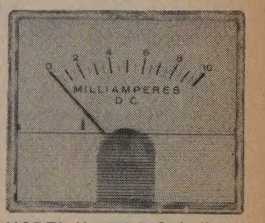
MOVING MAGNET INDICATORS



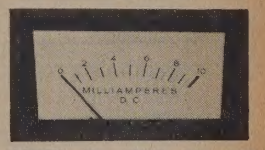
MODEL No. 640, D.C. 2¼" Metal Case

Feature long scales, accuracy within 5%. Attractive appearance with sturdy movement; round or square cases at low cost. Standard finish on metal cases is black. Chrome Plate is available at slight additional cost. Many types of mounting arrangements available.

MODEL DC	CASE TYPE PANEL MTG.	SCALE LENGTH DC	FLANGE	BODY DIA. DC	BODY DEPTH DC
640	Nar. Metal Rd.	1.400"	2.281"	2.000"	1.078"
640	Metal Surface	1.400"	2.375"	2.000"	—
693	Metal Sq.	1.400"	2.625"	2.000"	0.563"
793†	Plastic Sq.	1.715"	2.375"	2.000"	0.500"
740	Plastic Rd.	1.715"	2.375"	2.000"	0.520"
795	Plastic Sq.	1.715"	2.375"x2.81	2.000"	0.520"



MODEL No. 795 D.C. Indicator.



MODEL No. 795/B Die cast metal bezel for behind panel mounting. Dull black finished.

D.C. MILLIAMMETERS

Range	Approx. Resist.	#640	#693 #740 #793†	#795
/1	1000	$6.70	$7.30	$7.30
/3	700	5.00	5.65	6.00
/5	480	4.60	5.20	5.70
/10	180	4.35	4.90	5.35
/15	130	3.65	4.30	4.90

Prices for 0/25, 0/30, 0/50, 0/100, 0/150, 0/200, 0/300, 0/500 MA. ranges: $3.60 $4.25 $4.70

† or 793-M Masked Front - Specify

D.C. AMMETERS

Range	Approx. Resist.	#640	#693 #740 #793†	#795
0/1	.1	$3.60	$4.25	$4.70

Above prices also apply to 1/0/1, 3/0/3, 0/5, 5/0/5, 0/10, 10/0/10, 0/15 amp. ranges.

20/0/20	.0015	4.55	5.10	5.45

Above prices also apply to 0/25, 0/30, 30/0/30 amp. ranges.

0/50	.0011	4.90	5.35	4.70
50/0/50	.001	4.90	5.35	4.70
0/75	.001	5.65	6.45	6.75
0/100	.001	6.55	7.20	7.60

D.C. VOLTMETERS

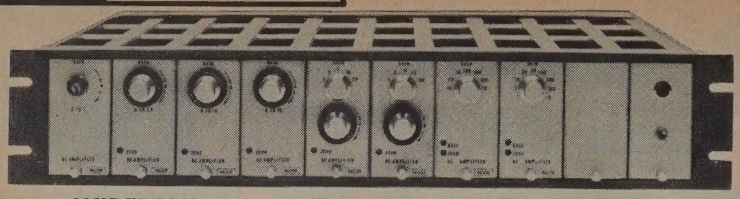
Range	Approx. Resist.	#640	#693 #740 #793†	#795
0/1	37	$3.60	$4.25	$4.70

Above prices also apply to 0/3, 0/5. 0/10, 0/15 volt ranges.

0/25	1375	4.25	4.25	5.30
0/30	1650	4.25	4.25	5.30
0/50	2200	4.55	5.10	5.45
0/100	20,000	4.55	5.10	5.45
0/150	30,000	4.60	5.20	5.70
0/300	60,000	6.25	6.75	7.25

HOYT ELECTRICAL INSTRUMENT WORKS, INC.
BURTON-ROGERS COMPANY SALES DIVISION

Hoyt SINCE 1904



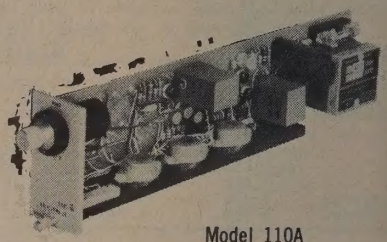
INCOR

WIDEBAND DC INSTRUMENTATION AMPLIFIERS

INCOR's Instrumentation Amplifiers are solid state devices containing their own regulated power supplies. Designed specifically to fulfill DC instrumentation requirements, each has the ability to drive all types of galvanometers, A to D converters, multiplexers, tape recorders and extremely long data lines.
Amplifiers provide low output impedance and frequency response from DC to 100 KHz. Up to ten amplifiers may be mounted in the INCOR Series 103 Rack Adapters, or supplied with individual cases for single channel bench operation.

SINGLE-ENDED FLOATING

Model	Output Volts	Available Output Current, MA	Gain	Input Z	Source Resistance for Specs.	Max. Usable Source Resist.	Linearity	Front Panel Gain Vernier	Front Panel Zero Control	Price
102	±3	100	0 to 1	50 K	∞	∞	.2%	Yes	No	$ 95
112	±3.6	100	0 to 2.5	50 K	∞	∞	.1%	Yes	Yes	140
110A	±10	100	0 to 10	50 K	10 K	∞	.05%	Yes	Yes	150
116	±10	100	0 to 20	100 K	10 K	∞	.05%	Yes	Yes	190
114	±10	100	1, 3, 10, 30, 100	10 meg.	2 K	20 K	.05%	Yes	Yes	250
116A	±10	100	1, 2, 5, 10, 20	10 meg.	2 K	50 K	.05%	Yes	Yes	230
300	±10	100	1, 3, 10, 30, 100	1 meg.	±10 & ±50 Volt/Vernier Zero Suppression					295

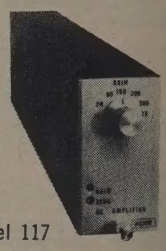


Model 110A

WIDEBAND DIFFERENTIAL

Model	Output Volts	Maximum Current	Gain with Vernier	Input Z	Source Z for Specs.	Maximum Usable Source Z	Linearity	Common Mode Voltages	Current Limit Provisions	Price
501	±10	100 MA	10, 30, 100 300, 1,000	50 meg.	1 K	10 K	.05%	±500 V	Yes	$450
117	±10	100 MA	10, 20, 50, 100, 200, 500, 1K	50 meg.	50 K	100 K	.01%	±10 V	Yes	350
115	±10	100 MA	0 to 200	50 meg.	10 K	50 K	.01%	±10 V	Yes	200
130	Attenuator for Galvonometers 1 to 10 K, Fixed and Variable Polarity and Off Switch, Adjustable Z.									90

Model 130



Model 117

STRAIN GAGE/TRANSDUCER POWER SUPPLIES

INCOR power supplies are designed specifically for low level DC instrumentation applications. They feature a high degree of guarded isolation from the power lines (0.1 picofarads) and ground (10,000 megohms minimum). Other features are high resolution 10 turn voltage control potentiometers, .01% time stability and .005% / °F temperature coefficient.
Up to 10 channels can be accommodated in the Model 103 rack, Fig. A.

Model	Voltage Range	MA Current Range	Noise to gnd., µv.	Line Reg. 95-135V	Ripple	Remote Sensing Current	Remarks	Price
215	0-15	0-200	5	.05%	1 MV	50 µa.	General purpose	$ 95
215A	0-15	0-200	1	.005%	50 µv.	1 µa.	.01%, low remote sensing current	130
230	0-30	0-100	1	.01%	100 µv.	1 µa.	.01%, low remote sensing current	130
224	0-24	5-100	1	.01%	100 nanoamps		Current regulated	130

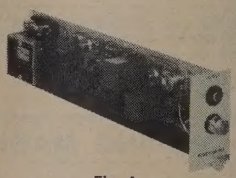


Fig. A

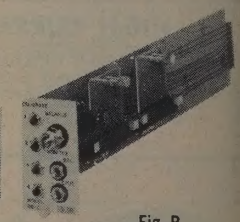


Fig. B

The Model RB-2 signal conditioning unit shown in Fig. B. There are two internal cards for bridge completion resistors and calibrating resistors. Spare resistor cards are available for $2.00 each and may be prepared for different transducers. Signal conditioning units may be combined with any power supply by combining their model numbers and prices.

Model	Balance and Calibration Units			Price
RB-2	10 turn Balance control	4 point shunt calibration	Excitation & balance monitor jacks	$65
RB-3	Same	4 point shunt calibration	Polarity switch Relay for remote or automatic calibration	80

Model 103B

RACK ADAPTERS AND CASES

The INCOR series adapters provide interchangeable mountings. The amplifier units plug in from the front with complete access to operating controls and test points. The rack adapter provides for AC power distribution and signal input (XLR-3-14) and output connectors (MS3102A) for operation in a recording system. Blank filler panels are provided for all unused positions. Rack size is 19″ x 3½″ x 18″ deep. Case 3″ x 1.7″ x 13″.

Model	Amplifier Capacity	Connectors Input	Connectors Output	Price
103	1-10	Amphenol 143-010-01		$ 90
103B	1-10	10 Rear	1-Rear 28-21S	125
103E	1-5	91-PC3F	80-PC2F	135
2006	1	Amphenol 143-010-01		9
2104	1	MS-3102A-14S-6S		18

Case 2104

Case 2006

INCOR

INCOR INSTRUMENTATION, INC.
29 NEWTOWN ROAD • PLAINVIEW, N. Y. • 516-293-8717

INCOR reserves the right to modify specifications and prices

PHAZOR

The operation of the Phazors is unique in that the input and reference signals are applied to an electronic multiplier which derives the instantaneous product of their amplitudes. The multiplier output is then applied to a DC meter which produces a deflection proportional to the time average of this product.

Expressing this function mathematically we have: Meter Deflection = $\frac{k}{T}\int_0^T V_S \cdot V_R \, dt$

PHASE METERS

High Accuracy and Resolution • Measures 0°-360° Without Ambiguity • Rejects All Noise and Harmonics (without filters) • Wide Input Voltage and Frequency Range • Self Calibration Assures Accuracy

MODEL 200A

$505.00

APPLICATIONS: Measures phase shift in transformers, amplifiers, etc. • Readings not affected by noise and harmonics • Measures in-phase or quadrature voltage components • .01 degree can be measured employing special techniques.

SPECIFICATIONS

ACCURACY: ±2 degrees
FREQUENCY: 20 Hz to 20 KHz

MODEL 210AB

$840.00

This instrument retains the essential feature of other Phazor models in that accurate measurements can be made even though signals may be complicated by noise and harmonics. The quadrant is read directly on a projection readout. The angle within the quadrant is displayed on the meter.

SPECIFICATIONS

ACCURACY: ±2 degrees
FREQUENCY RANGE: 15 Hz—30 KHz
SENSITIVITY: 5 millivolts

VECTOR VOLTMETERS

Precise Measurement of:
IN-PHASE VOLTAGE • QUADRATURE VOLTAGE
TRUE RMS VOLTAGE • PHASE ANGLE
NULL VOLTAGE

MODEL 300PB

$1,200.00

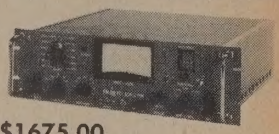
- Portable — All Solid State
- Direct Reading Phase and Quadrant Indicator
- Battery Operated — Eliminates Power Line Ground Loops

SPECIFICATIONS

INPUT VOLTAGE: 1 MV—300 V
INPUT IMPEDANCE: 1 megohm
VOLTAGE ACCURACY: 2% full scale
PHASE ACCURACY: ±1 degree
FREQUENCY RANGE: 60 Hz—10 KHz
NULL SENSITIVITY: 10 microvolts
HARM. REJECTION: 40 db down without filters
WEIGHT: 9 lbs., approx., with batteries

AC Power Pack Available — $150.00

MODEL 300B



$1675.00

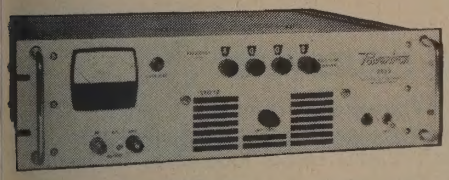
- Direct Reading Phase Angle
- Wide Frequency Range
- Rejection of Noise and Harmonics without Filters

SPECIFICATIONS

INPUT VOLTAGE: 1MV to 300 V
INPUT IMPEDANCE: 10 megohm
VOLTAGE ACCURACY: 2% Full Scale
PHASE ACCURACY: ±1 degree
FREQUENCY RANGE: 15 Hz to 30 KHz
REF. VOLTAGE: 5V to 220V
NULL SENSITIVITY: 10 Microvolts
HARM. REJECTION: 40 DB without filters
RACK PANEL SIZE: 19"Wx5¼"H

Powertron ELECTRONIC GENERATORS

Series 250S (Solid State)



$595.00
(Less Plug-In Osc.)

The Series 250S (illustrated above) and the Series 1000S Solid State supplies are designed to be used in modular form so that they may readily be stacked for 1Ø, 2Ø or 3Ø output power.

Fixed frequency and variable frequency plug-in oscillators are available for single phase, or poly-phase operation. The variable frequency oscillators are digitally set to three significant figures. They feature excellent stability and continuous resolution and are readily adaptable to remote programming.

A complete line of 1Ø, 2Ø & 3Ø models with power output ratings from 3 VA to 9 KVA and frequency accuracies to .0001%

These AC Power Supplies provide stable, low distortion AC power at frequencies within the audio frequency spectrum. The highly reliable and versatile power sources find wide application in calibration and test stations, motor drives, gyro wheel supplies, laboratory use, military component testing, and operating foreign equipment.

SPECIFICATIONS
(Series 250S Illustrated)

OUTPUT CIRCUIT: 1Ø, Isolated
OUTPUT POWER: 250 VA
POWER FACTOR: Unity ±0.7 (at full power)
OUTPUT VOLTAGE: Selectable — 0-130V RMS or 0-190V, 0-75V, 0-67V, 0-38V, 0-30V, and 0-17V
FREQUENCY RANGE: 45 Hz — 10 KHz full power; 20 Hz — 20 KHz derated
DISTORTION: 0.1% mid-band
REGULATION: 0.5%, 0—full load; 0.1%, for ±5% line
RESPONSE: 50 microseconds
HUM LEVEL: 80 db down
SHORT CIRCUIT PROTECTION: Output may be shorted indefinitely
THERMAL PROTECTION: Output transistors protected by thermal cutout
EXTERNAL AMPLIFIER INPUT: Available on rear
EXT. SYNC. INPUT: Available on rear
CONVENIENCE OUTLETS: Two switch-controlled outlets on rear
INPUT POWER: 115V or 230V, 50-60Hz (400 Hz avail.)

WRITE FOR COMPLETE POWERTRON CATALOGS

IMPEDANCE COMPARATORS

PRECISE, RELIABLE AND RAPID COMPARISON OF COMPONENTS

The circuit consists of a bridge, two arms of which are precision resistors matched to .01%. The two remaining arms are the standard and the component under test. Any voltage resulting from bridge unbalance is amplified and fed to a phase discriminator. The percentage deviation is read directly in both sign and magnitude on a meter.

FEATURES: High Accuracy & Stability • Fast Response • Linear Meter Scales • Self Calibrated

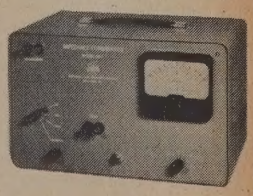
MODEL 60

$265.00

SPECIFICATIONS

FREQUENCY: 60 Hz
FULL SCALE RANGES: ±1%, 5%, 10%, 20%
IMPEDANCE LIMITS:
Resistance 5 ohms to 5 megohms
Capacitance 500 mmfd. to 500 mfd.
Inductance 15 milihy to 10,000 hy

MODEL 1010



$395.00

SPECIFICATIONS

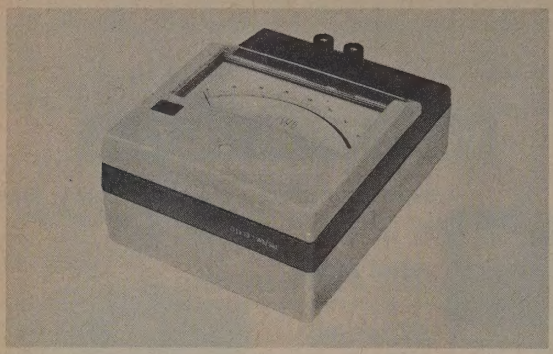
FREQUENCY: Either 1 KHz or 10 KHz
FULL SCALE RANGES: ±5%, 10%, 20%
IMPEDANCE LIMITS:
Resistance 5 ohms to 5 megohms
Capacitance 50 mmfd. to 10 mfd.
Inductance 100 microhy to 100 hy

OTHER MODELS AVAILABLE } **MODEL 1000—1000 Hz—±1%, 5%, 10%—$395.00**
MODEL 1025—1KHz, 25 KHz—±5%, 10%, 20%—$455.00

WRITE FOR CATALOGS

Manufacturers of: PHASE SHIFTERS, FREQUENCY STANDARDS, NULL DETECTORS, AUTOMATIC HI-POT TESTERS AND OTHER ELECTRONIC TEST EQUIPMENT

ITECO **INDUSTRIAL TEST EQUIPMENT CO.** 20 Beechwood Ave., Port Washington, N. Y. 11050
Phone: (516) PO 7-5253

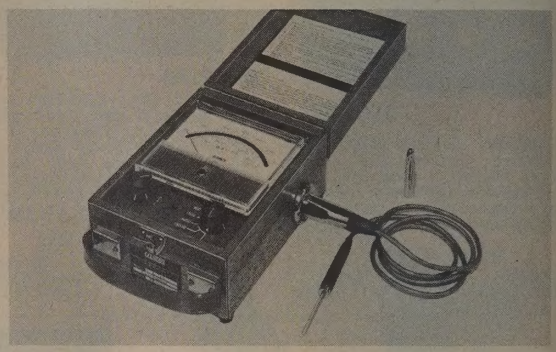


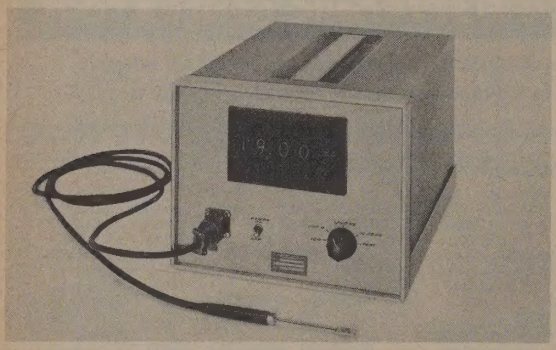
MODEL 621 F NORMA FLUXMETER

Joining the widely used model 251F is the new, small and rugged model 621F fluxmeter. This accurate instrument, with a simple scale of 10^{-4} Webers (10,000 Maxwells)/Scale Division is expressly intended for the educational field. The economical price and liberal education discount makes its purchase for student use possible even with the limited budgets that exist in many science departments.

MODEL A GAUSSMETER

With prices starting at $185.00 (including probe) and a ten year history of performance and durability, the Model A Hall Effect Gaussmeter is the answer to many engineering, production and inspection requirements. The instrument includes a built-in magnet standard and can be supplied with axial probes to a diameter of 0.125 inches and transverse probes to a thickness of 0.006 inches.





MODEL D GAUSSMETER

The model D Gaussmeter provides a digital (3½ digit) display for exceptional readability and high resolution. As a highly stable laboratory instrument the model D Gaussmeter is available with a wide selection of probes including special units for operation at 4.2°K or 200°C.

MODEL 251F NORMA FLUXMETER

The model 251F is a highly sensitive, versatile fluxmeter for laboratory and production use. The instrument provides ten ranges covering 5×10^{-6} to 5×10^{-3} Webers (500 to 500,000 Maxwells)/Scale Division. Search coils, carrying/storage cases, etc. are also available.

ISC ✱ MAGNETICS

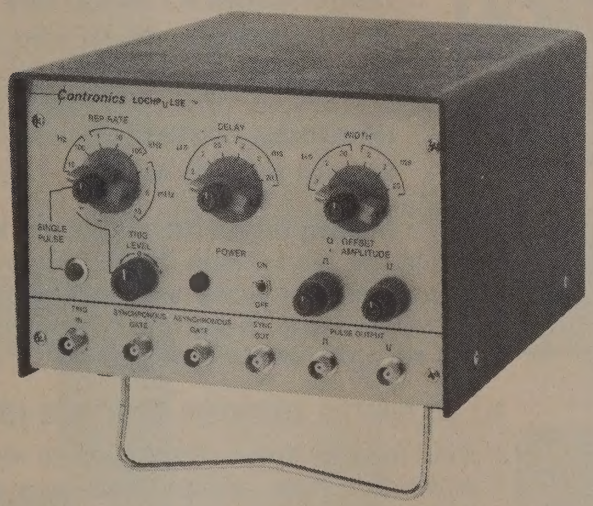
Division of INSTRUMENT SYSTEMS CORPORATION

770 Park Avenue, Huntington, N. Y. 11743

Telephone: (516) 423-6200 / TWX: 510-226-6983 / Cable Address: INSSYSTHTGN

CONTRONICS PULSE GENERATORS FEATURE SIMULTANEOUS COMPLEMENTARY OUPUTS, 100% DUTY CYCLE

IDEAL FOR DRIVING MOST POPULAR TYPES OF LOGIC



MODEL CPG 300

PORTABLE UNITS DESIGNED FOR USE WITH ICs

GENERAL SPECIFICATIONS

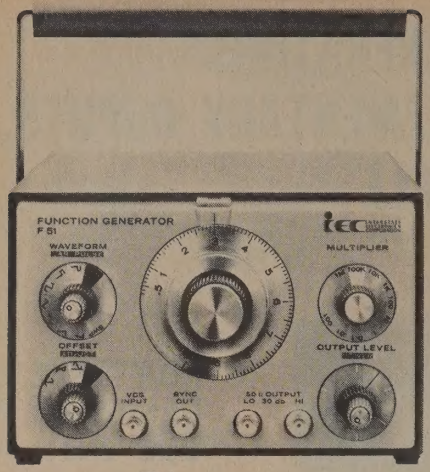
Model	Repetition Rate	Pulse Delay	Pulse Output	Rise & Fall Time	Pulse Width	Price	Special Features
200-1	8 ranges continuously variable from 1 Hz to 10 MHz.	Continuously variable with respect to sync output from 50 ns to 20 ms in 6 ranges.	+4 V into 50Ω load (fixed).	Typ, 6 ns into 50Ω load; 10 ns max	Continuously variable from 50 ns to 20 ms in 6 ranges. 100% duty cycle.	$315	Direct driving for RTL, DTL, TTL. DC-coupled, simultaneous complementary outputs.
200-2	8 ranges continuously variable from 1 Hz to 10 MHz.	Continuously variable with respect to sync output from 50 ns to 20 ms in 6 ranges.	+3.5 V into 50Ω load (amplitude control).	Typ, 6 ns into 50Ω load; 10 ns max	Continuously variable from 50 ns to 20 ms in 6 ranges. 100% duty cycle.	$335	Direct driving for RTL, DTL, TTL. DC-coupled, simultaneous complementary outputs.
200-3	8 ranges continuously variable from 1 Hz to 10 MHz.	Continuously variable with respect to sync output from 50 ns to 20 ms in 6 ranges.	+5 V into 50Ω load (amplitude control).	Typ, 6 ns into 50Ω load; 10 ns max.	Continuously variable from 50 ns to 20 ms in 6 ranges. 100% duty cycle.	$335	Direct driving for RTL, DTL, TTL. DC-coupled, simultaneous complementary outputs.
300	Continuously variable from 1 Hz to 10 MHz in 8 ranges overlapping with vernier control.	Continuously variable with respect to sync output from 85 ns to 25 ms in 6 ranges.	+10 V into 50Ω load (amplitude control).	6 ns, typical, into 50Ω load.	Continuously variable from 40 ns to 22.5 ms in 6 ranges. 100% duty cycle.	$395	Direct driving for RTL, DTL, TTL. DC-coupled, simultaneous complementary outputs. Independently variable amplitude, offset.
1100	Continuously variable from 1 Hz to 50 MHz.	Continuously variable with respect to sync output from 12 ns to 20 ms.	+20 V into 50Ω load (amplitude control).	Variable from 5 ns to 500 μs.	Continuously variable from 12 ns to 20 ms in 6 ranges. 80% duty cycle.	$1195	Max. repetition rate is 50 MHz. DC-coupled, simultaneous complementary outputs.

CUSTOM ENGINEERING ASSISTANCE ■ Contronics maintains a continuing program of technical assistance for customers requiring special-purpose pulse generators and power supplies. One result of this program has been a new line of custom testers for MOS, LSI and MSI circuits. Complete details are available upon request.

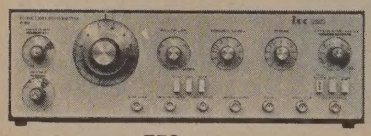
INTERNATIONAL CONTRONICS INC.
1030 West Evelyn Avenue, Sunnyvale, California 94086 • Phone (408) 736-7620

SERIES 50 TEN MHz FUNCTION GENERATORS

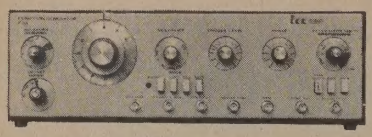
NEW FROM INTERSTATE!



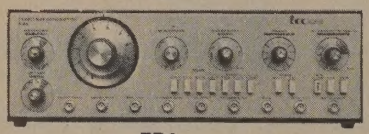
F51



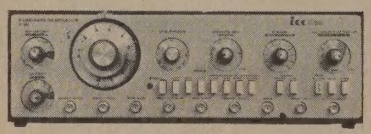
F52



F53



F54



F55

From Interstate Electronics Corporation, a new series of highly reliable function generators providing a broad variety of functions as a universal signal source. Starting with the versatile, low cost F51 select the exact model for your needs.

F51 PORTABLE FUNCTION GENERATOR
Basic unit of the IEC Series 50

Frequency Range: 0.0005 Hz to 10 MHz. **Waveforms:** Sine, square, triangle, plus and minus ramp, plus and minus fixed width pulse, plus and minus variable width pulse waveforms and sync. **Output** adjustable up to 15v peak to peak into a 50 ohm load. Adjustable as well as fixed offset and VCG capability.

ALL IEC FUNCTION GENERATORS OFFER THESE FEATURES:

1. Broad Frequency Range — 0.0005 Hz to 10 MHz
2. Variable Width Pulse — provides variable pulse width in addition to the standard assortment of function generator outputs: sine, square, triangle, ramp, and fixed duty cycle pulse.
3. VCG — analog voltage control operating frequency
4. PWM — analog voltage control of pulse duty cycle
5. Sync signal output
6. Low Operating Costs . . . designed-in maintainability and reliability.
7. Voltage Offset — fixed offsets to provide all-positive or all-negative waveforms as well as continuously variable offset.
8. Sync Input — allows the function generator to be synchronized with another signal source.

CHECK THIS TABLE FOR SPECIFIC FEATURES OF EACH MODEL

MODELS	F51	F52	F53	F54	F55
Variable Offset — independent of output signal level	X	X	X	X	X
Calibrated Attenuator — with 70 db range		X	X	X	X
Triggered Output — one complete output cycle for each trigger input		X	X	X	X
Gated Output — continuous output when gate input signal is present. Variable gate threshold voltage. Gate accepts either polarity		X	X	X	X
Phase Lock — generator will lock and track any signal frequency within the selected 100:1 frequency range			X		X
Sweep — width variable to 100:1 repetition rate variable from 0.01 to 100,000 sweeps per sec.				X	X
Burst — uses internal sweep generator ramp to gate out a selectable number of Output Cycles				X	X

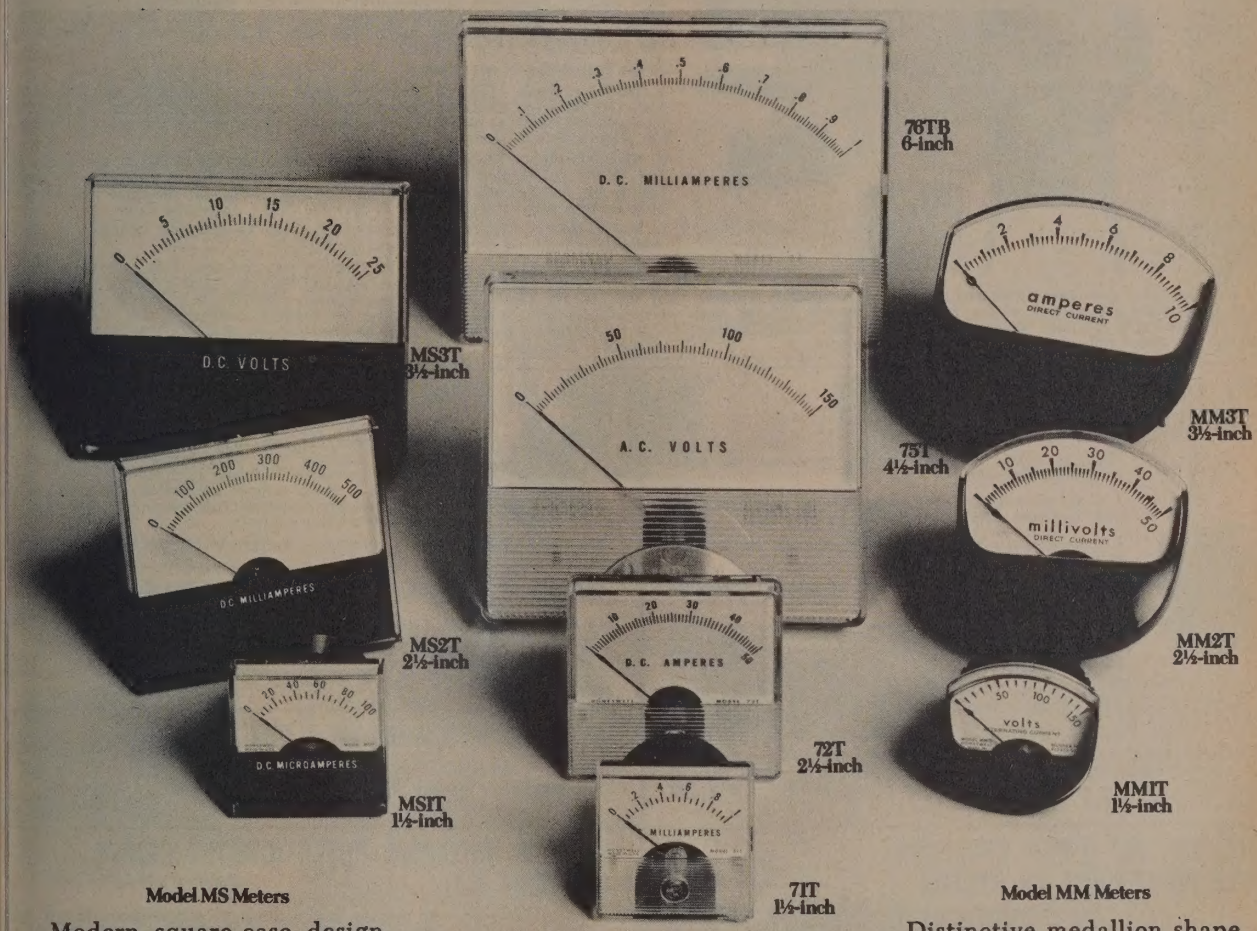
SERIES 50 FUNCTION GENERATORS OFFER THESE SPECIAL CAPABILITIES COMPARE!

Wider frequency range
Both variable and fixed width pulse waveforms. Simplified sweep width control for easier operation. Designed-in maintainability Model F55 offers both phase lock and sweep capability.

For complete technical information or demonstration call your IEC Field Engineer listed in the EEM Yellow Section or contact John Norburg at Dept. 7000E, Box 3117, Anaheim, Calif. 92803. Telephone (714) 772-2811. TWX 714-776-0280.

INTERSTATE ELECTRONICS CORPORATION
A Subsidiary of A-T-O Inc.
DEPT. 7000E
707 EAST VERMONT AVENUE, ANAHEIM, CALIFORNIA 92803

Jewell
Panel Instruments



Model MS Meters

Modern square-case design. Dials are uncluttered, easy to read, precisely marked. The sides of the cover are crystal-clear Plexiglas, like the front of the cover; this lets extra light in. In 20 standard colors.

Series 70 Meters

Simple, handsome design. Plexiglas cover. A serrated panel covers only the unusable parts of the dial. 2½-inch and 4½-inch models can be used with a metal bezel for mounting from behind the panel.

Model MM Meters

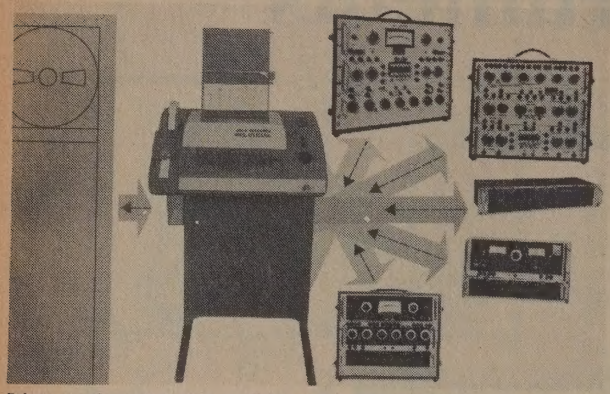
Distinctive medallion shape. Plexiglas cover and extra-long scale for maximum readability. Special wedge-shaped divisional markings and lance-type pointer. Choice of colors.

Write for our new catalog . . . or get in touch with our nearest sales representative, distributor or mod-center.

Jewell ELECTRICAL INSTRUMENTS, INC.
Grenier Field, Manchester, N. H. 03105
Phone: 603/669-6400

JULIE NEW DEVELOPMENTS—1970

ATS-106/20 AUTOMATED PRECISION MEASURING and DATA LOGGING SYSTEM



Prices are dependent upon application and begin at approximately $10,000 Refer to the current and voltage source section for Models AVS-106 and ACS-106 relay-operated precision sources. Also refer to the voltage divider section for the Model RVD series of relay operated dividers.

A significant advance has been made in universal interfacing of programmable inst mentation with the development of the new Julie ATS-106/20, which provides the mea for keeping up with today's increasingly sophisticated electrical test work load in t accuracy range of from 10% to 0.001% or better. This new system may be used with Julie programmable instruments and, in fact, any equipment using 10-line decimal BCD program format, and provides an immediate interface with any computer or oth data handling equipment equipped with a "Teletype" input/output channel. The Mo ATS-106/20 includes a modified Teletype keyboard, automatic paper tape punch a reader and specially designed digital logic cards to interface with the instrumentati and an external computer system.

It has four modes of operation:

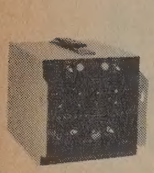
1. Automatic Mode — The program tape made while operating in the Manual-Rec mode (see below) is placed on the reader. The system then goes through the programm measurement sequence and punches a new tape and prints out the new data along w the original data to show deviation.

2. Manual-Record — The user makes measurements manually in the conventional mann The results are printed by the Teletype and a paper tape is automatically punch storing the measurement data and the instrument settings. This tape will serve as program tape when the equipment is operated in the Automatic Mode.

3. Manual-Mode — The individual instruments may be operated manually, in the c ventional manner, via their front panel controls.

4. Computer Mode — The ATS-106/20 Teletype may be linked with a computer via dir wire or through a standard telephone coupling terminal. In this case, all data collect by the new JRL system will be simultaneously printed out at the keyboard and au matically transmitted to the computer for analysis. Conversely, the computer may used as a program source to direct the measurement sequence and control the vario instrument programs.

MODEL SCO-107 PORTABLE ABSOLUTE VOLTAGE STANDARD



The best voltage reference possible must meet two basic critical requirements —

1. Time performance; the three saturated cells used must have minimum output voltage change with time.

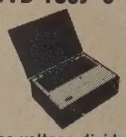
2. The enclosure must maintain its nominal temperature with time.

Our Model SCO-107 provides both of these requirements as shown in the table.

	Oven	Cells
Time Performance	1 PPM/Year guaranteed	.005°C/year guaranteed
Temperature Performance	64 PPM/°C	.001°C/day guaranteed

Other features include a.) Proportionally controlled oven. b.) Small size and light weight — it fits under the seat of an airplane. c.) Has rechargeable internal batteries that allow it to be transported while on heating power. d.) It is NBS certifiable. e.) **Price: $1390.**

DVD-108J 8 DIAL PRECISION DOUBLE K-V DIVIDER



Provides the means for comparison accuracies betwe two voltages, currents, resistances, etc., of up to .01 pp It also features — 1) Ultra stable Julie resistors t allow a guarantee of 1 ppm accuracy for 5 years and ppm for 1 year, without adjustment. 2) A trim feat with .01 ppm resolution that eliminates long term fr tional PPM ratio errors.

See voltage divider table in Ratiometric Systems section for details. **Price: $35**

MODEL VS-127S ULTRA STABLE VOLTAGE SOURCE

Features: • Stability: 1 ppm/1000 hours • Output voltage: ±12 volts • Out current: 35 ma • Accuracy: ±.5 ppm (after calibration) • Resolution: 0.1 p • System includes divider (1 ppm for 5 years) and null detector (11 uv sen tivity) so that it can be used as a precision 0 to ±12 volt potentiome **Price: $4550**

DV-1000B PRECISION VOLT BOX

10 ppm Accuracy for up to 1000 volts.

Also features: • Voltage taps at 1000/300/100/30/10/3/1 volts
• Small size, only 8" h x 10½" w x 7" d. **Low Price: $6**

MODEL DVP-108J 8 DIAL PRECISION DOUBLE POTENTIOMETER SYSTEM

The most accurate potentiometer available —voltage comparisons are, in effect, simultaneous and yet accomplished on a single set of divider resistors.

Range	Dialable Resolution	System Accuracy
0 to ±12 v	100 nv	0.5 PPM of reading +0.05 uv
0 to ±1.2 v	10 nv	0.5 PPM of reading +0.05 uv
0 to ±.12 v	1 nv	0.75 PPM of reading +0.01 uv
0 to ±.012 v	.1 nv*	1 PPM of reading +0.005 uv
0 to ±.0012 v	.01 nv*	2 PPM of reading +0.001 uv

Price: $6550 (includes ND-106/7 Null Detector)

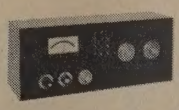
GTX-332 AND GTX-335 VOLT-A-VIDER

A compact dialable precision voltage source at an economical price

Features: • 0.0025% or 0.005% accuracy, as ordered • ±0.001% stability
• 1 volt & 10 volt output with 6-dial resolution
• 25 ma maximum output current • Remote sensing

Prices: GTX-332 (.0025%) **$895** **GTX-335** (.005%) **$795**

UPB-100 UNIVERSAL POTENTIOMETER/BRIDGE (STUDENT KIT)



A durable and economical potentiometer/bridge syst designed for use in the college classroom as well as industry.

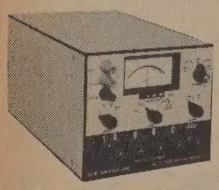
The basic unit consists of five items:

1. Precision Attenuator/Universal Galvanometer
2. Precision Resistance Standards (5 values) Ratio Netwo (1000:100:10:1)
3. K/N Ratio Standards (12 Resistors)
4. Potentiometer Linear Circuit Adaptor
5. Resistance Bridge Linear Circuit Adaptor

The basic system is used to measure voltage, resistance, current, and ratio a is priced at $732. A 10% educational discount is available, where applicab to produce a net price of **$658.80.**

For added convenience, optional accessories are available. These include Lead Kit (**$22**), a specially written instruction book for theory, experiments, a answers (**$15**), a Student Manual (**$1**), a Binary Series Resistor Set (16 Bin Bits) (**$55**) and a Binary Coded Decimal Resistor Set (5 decade) (**$66.**).

TDV-1000 SERIES DIFFERENTIAL VOLTMETERS



Provide rapid voltage measurements with lab-standard accuracies.

DC accuracies up to ±0.0025% and AC accuracies up to ±0.05% are standard. The Julie design includes a solid state chopper (in the detector/amplifier circuits) that never needs replacement, modular circuit construction that allows critical circuits to be unplugged for rapid emergency replacement (ie: plug-in encapsulated zener reference voltage. Julie Model ZVR-512, plug-in converter etc., etc.), and high quality Julie resistor components that reduce periodic readjustments by 80 percent compared with competitors models. Resistance to extreme environmental conditions includes operation from 4°C to 40°C, from 0 to 10,000 feet altitude at from 0 to 90% R.H.

All models that operate on battery power (rechargeable) also operate on 115v/230v. 50 to 440 Hz line power. **Dimensions:** 7" L x 8½" W x 14¾" D.

Model	DC%	AC%	Line	Bat.	Input Impedance Inf. to ±11v and 10 Meg above 11v DC (AC see below)	Price
TDV-1000/0	.0025	—	Yes	No	DC only	$105
TDV-1000B	.0025	—	Yes	Yes	DC only	$115
TDV-1000A	.0025	.05	Yes	No	1 Meg, 40 Pf.	$148
TDV-1000	.0025	.05	Yes	Yes	1 Meg, 40 Pf.	$158
TDV-1000/1	.005	—	Yes	No	DC only	$ 88
TDV-1000/1B	.005	—	Yes	Yes	DC only	$ 98
TDV-1000/1A	.005	.1	Yes	No	1 Meg, 40 Pf.	$128
TDV-1000/1AB	.005	.1	Yes	Yes	1 Meg, 40 Pf.	$138
TDV-1000/2	.02	—	Yes	No	DC only	$ 68
TDV-1000/2B	.02	—	Yes	Yes	DC only	$ 78
TDV-1000/2A	.02	.2	Yes	No	1 Meg, 40 Pf.	$ 98
TDV-1000/2AB	.02	.2	Yes	Yes	1 Meg, 40 Pf.	$108

JULIE RATIOMETRIC® SYSTEMS

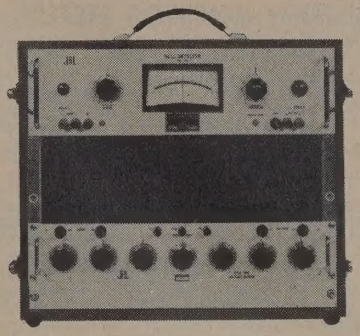
odern Julie systems make older conventional approaches obsolete. They are arkedly superior both electrically and mechanically.

frequency measurements, very accurate reference crystals are used to set ecific frequency points and then plugin units are used to both interpolate tween and extrapolate from these values so that frequencies of all values can produced and measured accurately. The only additional significant errors oduced are those from the interpolating and extrapolating devices. Similarly, the Julie approach, use is made of very accurate resistance and voltage ref- ences. A voltage divider is used with associated circuitry, switches and a null tector, to interpolate and extrapolate the values of these references. Total easurement errors are reduced, very simply, to those produced by the voltage vider (usually 1 ppm f.s. at worst), switching and hook-up (usually 1 or 2 ppm) d reference voltage or resistance (1 ppm for voltage and 1 ppm to typically) ppm for resistance).

e key to the RatiometricTM approach is the stable Kelvin-Varley voltage vider. (See the table that follows.) Although the Kelvin-Varley divider was vented over 100 years ago, it was not used in high precision applications cause of accuracy limitations. With the radical improvement in the accuracy the Kelvin-Varley divider by Loebe Julie, founder of Julie Research Labora- ries, Inc., the previously unrealized advantages of this divider were harnessed. ckground information is available for the asking from the Julie Research home fice in New York City.

cluded in the sections of this catalog that follow are the various measuring stems and sources that incorporate the Julie Kelvin-Varley divider. In general, e required null detector will be the Julie Model ND-106. Where more sensi- vity is required, the ND-107 preamplifier is also specified.

e section immediately following describes the null detectors and dividers that e compatible with the Julie systems. These units may be considered as basic ilding blocks onto which plugin adaptors are added for specific measurement rameters of voltage, current, resistance and ratio. For example, a particular stem could consist of an ND-106 null detector and a VDR-307 divider, mounted



Multivider cabinet with null detector and voltage divider

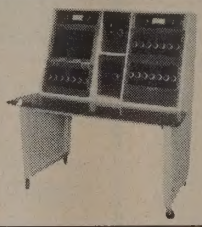
in a carrying case (as shown) and then either a potentiometer plugin (such as Model PVP-1000C) or a resistance bridge plugin (such as PRB-205C) could be mounted in the space provided. The size of the space provided is standard and the plugin modules can be interchanged in a matter of minutes. A laboratory can be supplied with one basic null detector/divider unit and several plugins, to save the repeated cost of the null detector and divider.

Other arrangements are available. Some typical systems are shown in the illustrations.

NGINEERING DATA AND ASSISTANCE

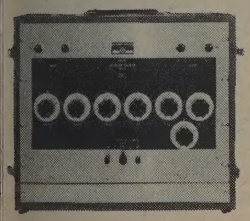
Ratiometric systems may be assembled for special purposes from the basic Multi-Vider units and the many specific plug-ins. Special plug-ins can be designed for special applications. Automatic systems and data logging are our specialties.

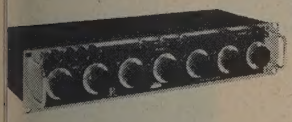
The exclusive JRL instrumentation console shown here contains, on the right, a complete RATIOMETRIC DC standards laboratory, and, on the left, a complete wide-range DC current source, assembled from basic RATIOMETRIC instrument modules.



The complete JRL portable standards laboratory — the most popular form of RATIOMETRIC facility — is shown here mounted on a portable cart, which also carries a primary standard emf reference in oven, SCO-106.

ULIE VOLTAGE DIVIDERS





Model	Accuracy (PPM)	Linearity/ Resolution (PPM)	Stability/ year (PPM)	Total Resistance (K ohms)	Max. Voltage (v)	Dim. (inches) W	H	D	Special Features	Price
DVD-108J	1 (5 yr)	.01	.2	100/110/120	1000	19	14	5	*	$3500.
SVD-108	1 (5 yr)	.01	.2	100	1000	19	17½	8	**	$3300.
SVD-107/8	1 (5 yr)	.01	.2	100	1000	19	21	8	**	$5110.
VDR-106/7	1 (5 yr)	.1	.2	100	300	19	14	8	1 PPM for 5 years	$1875.
VDR-127	1 (5 yr)	.1	.2	100/110/120	300	19	14	8	overranging	$2300.
VDR-307	1	.1	1	100	700	19	3½	6	only 3¼" high	$ 950.
VDR-307H	1	.1	1	100/110/120	700	19	3½	6	overranging	$1150.
VDR-327J	1	.1	1	100/110/120	700	19	3½	6	overranging	$1150.
VDR-327P	1	.1	1	100	700	19	3½	6	data logging output	$1250.
RVD-106-IC	1	1	1	100	700	19	3½	7¾	Relay operated	$1790.
RVD-126-1C	1	1	1	100/110/120	700	19	3½	7¾	Relay operated and overranging	$1980.
RVD-107-IC	1	1	1	100	700	19	3½	7¾	Relay operated 7 dial	$2290.
VDR-106A	2	1	1	10	120	19	14	14	***	$3550.

VD-108J DOUBLE KELVIN-VARLEY DIVIDER has trim feature with .01 PPM resolution which can be used to eliminate long term fractional PPM errors.

**SVD-108 and SVD-107/8 are both ovenized. SVD-107/8 includes Lead Compensator. Both include ovenized Resistance/Ratio Standards (RCO-105/7)

***VDR-106A can be used from 0 to 20 KHz within accuracy.

ULIE NULL DETECTORS

Model	Ranges	Max. Sens.	Max. Resol.	Input Imped.	Stability	Output	Dimension/ Input Power	Price
ND-106 and ND-106/7	±3 uv to ±30 mv in 9 ranges f.s.	0.1 uv	0.1 uv	100K	1 uv/wk. max.	±1.5 v f.s.	19½"w x 5¼"h x 7¾"d 115 v, 50-60 Hz.	ND-106/7: $905. ND-106: $880.
ND-107 (used with ND-106/7)	±10 nv ±100 nv ±1000 nv	0.3 nv	1 nv	10 ohms 1 K 50K	3 nv/hr. after 1 hr. warmup	to ND-106/7	9½"w x 3½"h x 5"d Internal Ni-Cad batteries	$650.
ND-507A	±3 na ±30 na ±300 na	0.2 na	.2 na	180 ohms	10 na/hr. after 60 sec. warmup	None	3¼"h x 3½"w x 6"d 150 hr — Mercury cell	$225.

JULIE RESEARCH LABORATORIES, INC.

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JULIE

PRECISION RESISTANCE AND VOLTAGE MEASURING SYSTEMS AND PRECISION VOLTAGE AND CURRENT SOURCES

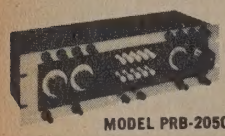
PRECISION RESISTANCE MEASURING SYSTEMS

Through the use of the RESISTANCE PLUG-INS, the multivider system is made into various precision resistance measuring systems.

When the PRB-205C bridge and range extenders PRB-205L and PRB-205H are used with the basic multivider detector and divider, the system is identified as the PRB-205S, and is capable of measuring resistance values from 0 to 10^{12} ohms. Zero offset circuitry establishes the true zero point and eliminates all test lead and fixture effects. Direct reading deviation dials permit measurement of deviation from 0 to ±1200 PPM in 0.1 PPM steps, with an accuracy of 0.1% of observed deviation or 0.2 PPM, whichever is larger. Resistance measurement accuracies obtained are tabulated below. All required resistance standards with NBS traceability are included. Model PRB-205C Plug-in includes Model MRS-106 Reference Resistorset, and the PRB-205L includes Model MRS-105 Reference Resistor set. See specifications in the resistance reference section.

When the Model DRRS-108 plug-in is used, the Multivider system is made into a Direct Reading Ratio Set, capable of measuring the Thomas pattern 1 ohm resistor with an accuracy and precision of .1 PPM. It also permits making 1:1, 1:9 and 1:10 comparisons of 2 and 4 terminal standard resistors.

See also the Model UPB-100 Potentiometer/Bridge in the NEW PRODUCTS SECTION.



MODEL PRB-205C

MODEL PRB-205H

MODEL PRB-205L

Range	*Accuracy	*Accuracy With Self-Calibration
Model PRB-205C, Price $2120.00		
0-1000 ohm	±.0001% of setting ±.0001% f.s.	±.0001% of setting ±.00001% f.s.
0-10 Kilohms	±.0001% of setting ±.0001% f.s.	±.0001% of setting ±.00001% f.s.
0-100 Kilohms	±.0001% of setting ±.0001% f.s.	±.0001% of setting ±.00001% f.s.
0-1 Megohm	±.0002% of setting ±.0001% f.s.	±.0002% of setting ±.00001% f.s.
0-10 Megohms	±.0003% of setting ±.0001% f.s.	±.0003% of setting ±.00001% f.s.
Model PRB-205L, Price $990.00		
0-0.1 ohms	±.0003% of setting ±.0001% f.s.	±.0003% of setting ±.00001% f.s.
0-1 ohm	±.0002% of setting ±.0001% f.s.	±.0002% of setting ±.00001% f.s.
0-10 ohms	±.0002% of setting ±.0001% f.s.	±.0002% of setting ±.00001% f.s.
0-100 ohms	±.0001% of setting ±.0001% f.s.	±.0001% of setting ±.00001% f.s.
Model PRB-205H, Price $990.00		
100 Megohms	±.004% ±.0001% f.s.	
1,000 Megohms	±.009% ±.0001% f.s.	
10,000 Megohms	±.019% ±.0001% f.s.	
100,000 Megohms	±.04% ±.0001% f.s.	

*Absolute accuracy of measurement is equal to the absolute accuracy of the resistance standard used plus the accuracy of the bridge as shown above.

DIRECT READING RATIO SET PLUG-IN DRRS-108

- Low impedance permits use with nanovolt null detector
- Simple automatic calibration with self-contained 1:1 STD.
- Use with .001 ohm to 10 meg resistors

Price (DRRS-108) only **$1480.00**

PRECISION VOLTAGE MEASURING SYSTEMS

Through the use of POTENTIOMETER PLUG-INS, the Multivider system is mad into various precision voltage measuring systems.

When Plug-ins such as the PVP-110C potentiometer or PVP-1000C potentiometer voltbox or PCVP-1000C potentiometer/current shunt, or PVP-1001J universa potentiometers are used with the basic multivider detector and divider, th systems are identified as PVP-110S potentiometer, PVP-1000S potentiometer voltbox, PCVP-1000S potentiometer/current shunt and PVP-1001JS, respectively potentiometers using larger dividers such as the VDR-106/7 and DPV-108J ar described separately. The voltage plug-ins have integrally mounted mercur cells for excitation current. The systems described herein are all complete except that an external voltage reference (such as Julie Model SCO-106 o SCO-107) are required. Other voltage plug-ins not pictured are:

PVP-110C potentiometer plug-in, same as PVP-1000C, except with only a singl range of 0-1 VDC. PRICE: **$1275.00**

PVCP-1000C potentiometer/current shunt plug-in is the same as the PVP-110 except that it includes compatible shunts for measuring current from 0-1 amperes. PRICE: **$1725.00**

ALSO SEE THE WIDE LINE OF JULIE DIFFERENTIAL VOLTMETERS LISTED IN TH NEW PRODUCTS SECTION for measurement of voltage to ±0.0025% accurac and the Models NVS-1103A and NVS-503A potentiometer/source system f ±.04% accuracy in the Voltage Sources Section, and the Model UPB-10 Potentiometer/Bridge in the New Products Section.

See New Products Section for .01 PPM potentiometer Model DPV-108J.

MODEL PVP-1000S (Model PVP-1000C Plug-in Potentiometer/voltbox) PRICE: $3850.00 (AS SHOWN)

Range	Accuracy
0 to 1 vdc	0.0004% ±1 digit 0.0002% ±1 digit*
3 vdc	0.0009% ±1 digit
10 vdc	0.0009% ±1 digit
30 vdc	0.0014% ±1 digit
100 vdc	0.0014% ±1 digit
300 vdc	0.0014% ±1 digit
1000 vdc	0.0014% ±1 digit
0.1 to 1.1 vdc (std. cell comparator)	±1 microvolt

* With self-calibration

NANOVOLT POTENTIOMETER

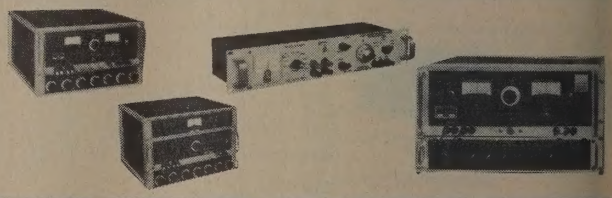
MODEL PVP-1001J PLUG-IN PRICE: $2175.00

Range	Accuracy Direct Reading	Accuracy With Correction
0 - 12 volts	.0005% ±1 μvolt	.0001% ±.1 μvolt
0 - 1.2 volts (standard cell comparison)	.0003% ±1 μvolt	.0001% ±.1 μvolt
0 - ±.12 volts	.0005% ±.1 μvolt	.0002% ±.02 μvolt
0 - ±.012 volts	.0008% ±.01 μvolt	.0003% ±.3 nanovolts
0 - ±.0012 volts	.0013% ±.001 μvolt	.0004% ±.1 nanovolts

NOTE: Complete PVP-1001JS System includes the PVP-1001J Plug-in, VDR-327J Ov ranging Divider, ND-106/7 Null Detector, and ND-107 Preamplifier: PRICE $4880.

DC VOLTAGE AND CURRENT SOURCES

Julie precision voltage and current sources are the most accurate and most stable available. Many standard models are available as tabulated below. The Julie Engineering team is always pleased to design special configurations when special applications demand custom units. In general, highest quality precision sources are comprised of a stable voltage reference (such as ZVR-512), a 100K Kelvin-Varley divider (such as VDR-307H) for output control, and an ultra stable, low noise operational amplifier (such as OA-600 Series). All three basic modules are available from Julie and can be assembled as required.



Model	Output and Output Resolution	Accuracy of Output	Stability Brief Specs.	Pr
DVS-106 Precision Voltage Source	0 to ±12, 120, 1200v at 0-35 ma. 7 digits	2 PPM of setting +0.5 PPM of range after calibration	7 PPM	$37
DCS-105 Precision Current Source	0 to ±1.2, 12, 120 ma and 0 to ±1.2, 12 amps with ±10v compliance. 7 digits	1.2, 12, 120 ma: 10 PPM 1.2, 12 amps: 25 PPM after calibration	1.2, 12, 120 ma: 15 PPM/wk. 1.2, 12 amps: 25 PPM/wk.	$37
ACS-106 Precision Relay Operated Current Source	0 to ±1.2, 12, 120 ma and 0 to ±1.2, 12 amps with 10v compliance. 6 digits	1.2, 12, 120 ma: 10 PPM 1.2, 12 amps: 25 PPM after calibration	1.2, 12, 120 ma: 15 PPM/wk. 1.2, 12 amps: 25 PPM/wk.	$46
DCS-106 Precision High Current Source	0 to ±12 ma, 120 ma, and 1.2 amps at 10v. 0 to ±12 amps at 3v. 0 to ±120 amps at 1v. 7 digits	12, 120 ma: 10 PPM 1.2, 12 amps: 25 PPM 120 amps: 50 PPM after calibration	12, 120 ma: 15 PPM/wk. 1.2, 12 amps: 25 PPM/wk. 120 amps: 50 PPM/wk.	$45
AVS-106 Precision Relay-Operated Voltage Source	0 to ±12, 120, 1200v at 0-35 ma. 6 digits	2 PPM of setting +0.5 PPM of range after calibration	7 PPM	$46
PVC-504S Voltage/Current Source and Potentiometer	1 and 4v. 1, 4, 10, 40 ma. 6 digits	Voltage: 15 PPM or 10 uv (larger) Current: 30 PPM or 15 PPM plus .01 va		$84
PVC-106S Current/Voltage Source	190 ua to 100. 1 ma in six ranges. Up to 15 vdc output. 7 digits		19 ua to 1 ma: 2 PPM/wk. 1 ma to 10 ma: 1 PPM/wk. 10 to 100.1 ma: 2 PPM/wk.	$92
DRU-207 Precision Voltage Source	0 to ±3 vdc. 7 digits		.2 uv/20 hours	$69
DCS-104 High Compliance Current Source	0 to ±40 ma at 0 to 150v. 7 digits		15 PPM/mo.	$3
DCS-505 Low Current Source	1 ua to 10 ma		1 PPM/.5 hr.	$1
DVS-104 Low Voltage Source	0-2v in 1 uv steps. 0-.2 in .1 uv steps	2 v Rg: 15 PPM ± 1 uv .2 v Rg: 15 PPM ±.1 uv		$3
GTX-332	0-1v with 1 uv Resolution. 0-10v with 10 uv Resolution at 0-25 ma	25 PPM +5 uv of setting	10 PPM	$
GTX-335		50 PPM +5 uv of setting		$
NVS-503A	5, 50, 500 uv and 5, 50, 500 mv	±.04% of reading or ±.004% of range or ±.1 uv, whichever is greater	30 days Accuracy	$
NVS-1103A	10, 100 uv and 1, 10, 100 mv and 1v	Same as NVS-503A	Same as NVS-503A	$
VS-127S	0 to ±12 v at 35 ma. 7 digits	0.5 PPM	1 PPM/1000 hrs.	$

JULIE VOLTAGE AND RESISTANCE REFERENCES (STANDARDS)

VOLTAGE REFERENCES

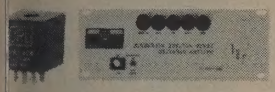
SATURATED STANDARD CELL OVENS

SCO-106 Primary standard voltage reference provides the highest accuracy and stability obtainable. This is derived from 3 saturated standard cells in a temperature stabilized enclosure which affords two orders of magnitude better accuracy than unsaturated cells customarily used for laboratory work. The SCO-106 is transportable under oven heat, thus eliminating the need for lengthy restabilization.

		Temperature	Time
SCO-106	Cells	64 ppm/yr.	.01°C/day max.
	Oven	1 ppm/yr. max.	.05°C/yr. max.
SCO-107		See New Products section	

PRICE: $1390.00

SOLID STATE REFERENCES — ZENERS



lie ovenized zener voltage ref-ences are second in stability and curacy only to ovenized saturated lls.

e zener reference is superior pri-rily in that it is not damaged en shorted, is less affected by mperature variations and is much ss expensive. Unlike cells, the ner can be adjusted to deliver wer to a specific load such as a ltage divider. This feature is ex-emely valuable to instrumentation stems manufacturers. Non-oven-d versions with extremely low mperature coefficients, and bat-ry-powered types are also available.

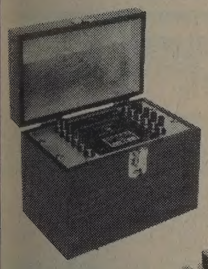
Model	Ovenized (Yes or No)	Output Voltage (Volts dc)	Input Power	Output Stability Max. PPM Change per day	per 30 days	per 6 mo.	Room Temp. Effect	Line Regulation 10% Input Change	Size	Price
ZRO-106	YES	+1.018 +1.0 −5.0	105-125 v 60 Hz	1	10	25	5 PPM total from 0°C to 50°C	1 PPM	6″w x 6″h x 4″d	$500.00
ZRO-106A (Half-rack version of ZRO-106)	YES	+1.018 +1.0 −5.0	105-125 v 60 Hz	1	10	25	5 PPM total from 0°C to 50°C	1 PPM	9½″w x 3½″h x 5″d Half rack	$500.00
ZVR-106 A/B	NO	+1.018 +1.0 −5.0	110 v 60 Hz and internal recharge-able battery	1	10	25	0.3 PPM/°C from 20°C to 30°C	1 PPM	9½″w x 3½″h x 5″d Half rack	$475.00
ZVR-106B	NO	+1.018 +1.0 −5.0	110 v 60 Hz and internal recharge-able battery	1	10	25	0.3 PPM/°C from 20°C to 30°C	1 PPM	6″w x 6″h x 4″d	$475.00
ZVR-506 ZVR-512 ZVR-518	NO NO NO	6.3 12.6 18.9	22 vdc 24 vdc 35 vdc	1	10	25	0.2 PPM/°C from 20°C to 30°C	1 PPM	.84″w x .84″l x .75″h	$135.00 $165.00 $195.00

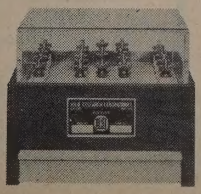
RESISTANCE REFERENCES

Julie evanohm resistors are acknowledged to be the most stable precision types available anywhere. For the ultimate in convenience and reliability these resistors are made available in a variety of packages and configurations. The most pampered are the NB-1's mounted in the PRO series ovenized enclosures. These resistors exhibit an observed drift (as low as 1 ppm in several years) which is much less than any other resistors available.

Other models are designed for maximum convenience in size and portability. Others are used when it is also important to be able to transfer values to different decade levels.

Refer also to the resistor chart in the resistor section. Individual data sheets are available for all Julie standard resistors.

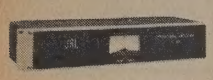




Model	Absolute Resistance Values (ohms) and max. initial deviation from absolute in PPM	Stability Per Year (PPM)	Room Temp. Effect (PPM)	Size	Price
PRO-106 Ovenized Standard Resistor Bank	10 ±5 PPM, 100 ±5 PPM	5	.1 PPM from 0°C to 28°C		$1390.
	1K, 10K, 100K ±1 PPM	1			
	1 Meg ±5 PPM	5			
PRO-106L Ovenized Low Range Resistor Bank	.001, .01, .1 ±10 PPM	10			$1890.
	1 ±5 PPM, 10 ±5 PPM	5			
MRS-106 Oil-filled Multiple Resistance Standard	100 ±30 PPM	30	2.5 PPM/°C from 20°C to 30°C		$180.
	1K, 10K, 100K ±10 PPM	10			
	1 Meg ±30 PPM	30			
MRS-105 Oiled-filled Multiple Low Range Resistance Standards	.1 ±10 PPM	10	2.5 PPM/°C from 20°C to 30°C		$280.
	1, 10 ±5 PPM	5			
	100 ±30 PPM	30			
DMR Series Decade Resistance Standards Sets, Oiled-filled. 10 Nominally Equal Resistors/Unit	DMR-102: 10 ±50 PPM	50	±5 PPM/°C absolute 2 PPM/°C relative	5″w x 4¼″l x 2⅞″h	$395.
	DMR-103: 100 ±30 PPM	30			$240.
	DMR-104: 1K ±15 PPM	15			$180.
	DMR-105: 10K ±15 PPM	15			$270.
	DMR-105a: 10K ±10 PPM	10			$270.
	DMR-106: 100K ±15 PPM	15			$395.
	DMR-107: 1 Meg ±15 PPM	15			$395.
RCO-105/7 Ovenized Primary Resistance/ Conductance/Ratio Transfer Standard. 10 Nominally Equal Resistors/Unit	RCO-105/7A: 1 ±100 PPM	100	±.05 PPM/°C from 15°C to 25°C	10⅛″l x 12¼″w x 7⅜″d	$1910.
	RCO-105/7B: 10 ±50 PPM	50			$1680.
	RCO-105/7C: 100 ±30 PPM	30			$1680.
	RCO-105/7D: 1K ±15 PPM	15			$1680.
	RCO-105/7E: 10K ±15 PPM	15			$1680.
	RCO-105/7F: 100K ±15 PPM	15			$1680.
	RCO-105/7G: 1 Meg ±15 PPM	15			$1680.
	RCO-105/7H: 10 Meg ±30 PPM	30			$1210.
NB-104S Portable Reference Non-ovenized	10K ±5 PPM at 25°C	1	±.2 PPM/°C at 25°C	10½″w x 8″h x 7″d	$585.
DTR Series Decade Transfer Resistors, Oiled-filled, 11 Nominally Equal Value Resistor/Set	DTR-101: 1 ±100 PPM	100	±5 PPM/°C absolute ±2 PPM/°C relative	9½″l x 2½″w x 2″h Terminals extend 1⅜″	$250. per set
	DTR-102: 10 ±50 PPM	50			
	DTR-103: 100 ±30 PPM	30			
	DTR-104: 1K ±15 PPM	15			
	DTR-105: 10K ±15 PPM	15			
	DTR-106: 100K ±15 PPM	15			
RCS-105/7 Primary Resistance/ Conductance/ Ratio Transfer Standard. 10 Nominally Equal Resistors/Unit	RCS-105/7A: 1 ±100 PPM	100	±5 PPM/°C absolute ±2.5 PPM/°C relative	10⅛″l x 12¼″w x 7⅜″d	$1480.
	RCS-105/7B: 10 ±50 PPM	50			$1250.
	RCS-105/7C: 100 ±30 PPM	30			$1250.
	RCS-105/7D: 1K ±15 PPM	15			$1250.
	RCS-105/7E: 10K ±15 PPM	15			$1250.
	RCS-105/7F: 100K ±15 PPM	15			$1250.
	RCS-105/7G: 1 Meg ±15 PPM	15			$1250.
	RCS-105/7H: 10 Meg ±30 PPM	30			$1680.
BMR Binary Resistance Sets	BMR-104S: 29,996 ohms max.	15	±5 PPM/°C	5″w x	$495.
	BMR-105: 131,074 ohms max.	15	±5 PPM/°C	4¼″l x	$180.
	BMR-105A: 131,074 ohms max.	10	±5 PPM/°C	2⅞″h	$270.
BDR Binary Decimal Sets	BDR-105: 100,000 ohms max.	15	±5 PPM/°C	5″w x 4¼″l	$250.
	BDR-105A: 100,000 ohms max.	10	±5 PPM/°C	x 2⅞″h	$300.

JULIE OPAMPS, SYNCHRO/RESOLVER BRIDGES, AC STANDARDS, DECADE RESISTOR BOXES, HIGH VOLTAGE DIVIDERS, VOLT BOXES, AND CURRENT SHUNTS

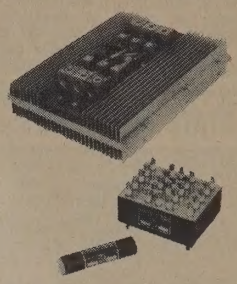
OPAMPS



Julie self-powered OA series operational amplifiers are uniquely drift free and ultra-low in noise content. Specially designed for high precision DC applications, these amplifiers feature input stability of 100 nanovolts and typical gains from 10^6 (120db) to 10^8 (160db).
Julie precision resistors, references, dividers and amplifiers can easily be assembled into high precision generators and sources in a wide range of output configurations.

Output Power Capability	Price
OA-601, ±10 ma, zero to 1000 ohms load	$ 800.
OA-602, ±40 ma, zero to 750 ohms load	$ 860.
OA-603, ±10 amps, zero to 1 ohm load	$1880.
OA-604, ±1,200 volts, 35 ma capability	$1980.
OA-605, ±150 volts, 50 ma capability	$1450.

PRECISION CURRENT SHUNTS

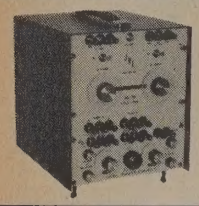


High quality shunts are high quality 4-termin resistors especially designed to operate relatively higher current levels without suffe ing appreciable resistance change. In order maintain a constant resistance, these resisto are mounted in oil or in air-finned heat sinks that the internal temperature rise is kept to minimum. Internal heating is negligible at cu rents up to that specified as rated.

Most high ranges (50 Amps for example) are t finned heat-sink type. Most lower ranges a available in both single and multiple-range unit Accuracies of up to .0025% are availabl although most applications only require acc racies in the order of .05% or .01%. Typic stabilities are .01%/year and temperatu coefficients are 5 PPM/°C or better.

Further details are available in data she CS-106, available upon request.

AC/DC THERMAL VOLTAGE TRANSFER STANDARD



The JRL Model TRS-105 Thermal Transfer Standard is designed to provide rapid and simple referencing of any AC voltage up to 1,024 vrms to known DC voltages with a basic accuracy of .001% without the use of calibration curves or correction tables and with excellent thermal stability and DC reversal error. Voltage Ranges: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024 vrms with each range useful from .5 to 1 times its maximum.

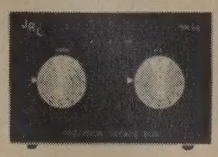
Price: $1500

Frequency	To 64 V	128 to 512 V	1,024 V
5 Hz through 10 KHz	.001%	.002%	.003%
10 KHz through 20 KHz	.002%	.003%	.005%
20 KHz through 50 KHz	.003%	.004%	.01%
50 KHz through 100 KHz	.02%	.1%	.2%
100 KHz through 1 MHz	.1% up to 10 V.		

Thermocouple Reversal Error: Zero ±2 PPM adjustable from front panel.
Input Impedance: 100 ohms/volt.

PRECISION DECADE RESISTOR BOXES

MODEL DR-100 SERIES. Accuracy: 0.02% of setting ± 1 milliohm



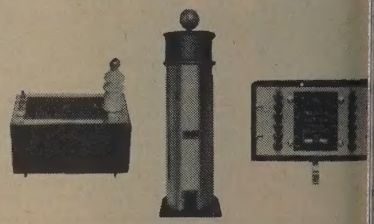
This is a modern two concentric-dial version the familiar inline 6-dial decade boxes found most Engineering, Q.C. and Production area Resistance at zero setting is 15 milliohms a repeatability at any setting is typically 1 mil ohm. Inquire about accuracies of .01%, .005 and .0025%.

Model	DR-114	DR-115	DR-116	DR-117
Total Resistance	11.1K	111K	1.11 meg.	11.1 meg.
Price	$210.	$210.	$210.	$260.

HIGH VOLTAGE MEASUREMENTS

The Julie High Voltage Dividers and Volt Boxes on the table below are used to "drop" high voltages to a level that traditional precision potentiometers and high impedance electronic voltmeters can safely measure (such as the Julie models PVP-1000S, PVP-1001JS, the DVD-108J and the TDV-1000).

Each unit contains the highest quality Julie primary standard resistors with the exception of the HV Series, where film resistors are used for highest possible input impedance, except where otherwise noted. Those HV models followed by a /w utilize the wirewound Julie resistors. All instruments listed are NBS-certifiable, self-calibrating and self-guarding.



Model	No.	Input Ranges Lowest	Highest	Input Imped. Ω/V	Output Taps	Acc. (%)	1Yr.Stab. (%)	Price
DV-1500/25	25	.15 V	1500 v	1000	1/1.5 v	.001	.001	$3650.
DV-1500	11	1 v	1500 v	1000	1/1.5 v	.001	.001	$1280.
DV-1000	7	1 v	1000 v	1000	1/1.5 v	.001	.001	$ 990.
DV-750/20	20	.15 V	750 v	1000	1/1.5 v	.001	.001	$3100.
DV-750	10	1 v	750 v	1000	1.5 v	.001	.001	$ 750.
DV-500		1 v	500 v	1000	1.5 v	.001	.001	$ 660.
DV-400	6	1 v	400 v	1000	1.5 v	.001	.001	$ 660.
DV-300	9	1 v	300 v	1000	1.5 v	.001	.001	$ 550.
DV-1000B	7	1 v	1000 v	1000	1 v	.001	.001	$ 600.
HV-100/W	1	100 Kv	100 Kv	1000	1 v	.05	.0015	$2280.
HV-100	1	100 Kv	100 Kv	4000	1 v	.05	.1	$1730.
HV-85	1	85 Kv	85 Kv	4000	1 v	.05	.1	$1550.
HV-80/W	1	80 Kv	80 Kv	1000	1 v	.01	.0015	$2450.
HV-50	1	50 Kv	50 Kv	4000	1 v	.05	.1	$1330.
KV-50/.01	1	50 Kv	50 Kv	1000	1/10 v	.01	.0015	$1280.
KV-50/.1	1	50 Kv	50 Kv	1000	1/10 v	.1	.0015	$1180.
KV-25/.01	1	25 Kv	25 Kv	1000	1/10 v	.01	.0015	$ 750.
KV-25/.1	1	25 Kv	25 Kv	1000	1/10 v	.1	.0015	$ 650.
KV-10/.01	1	10 Kv	10 Kv	1000	1/10 v	.01	.0015	$ 450.
KV-10/.1	1	10 Kv	10 Kv	1000	1/10 v	.1	.0015	$ 350.
KV-10R	1	10 Kv	10 Kv	1000	1/10 v	.01	.0015	$ 385.
KV-5R	1	5 Kv	5 Kv	1000	1/10 v	.01	.0015	$ 345.

SYNCHRO RESOLVER BRIDGES 0.002%

These instruments permit checking synchro transmitters, receivers, differential transformers or 4-wire induction resolvers for electrical error every 5° of angular rotation to very high accuracy.

Accuracy: ±0.002% (4 seconds of arc)
Frequency: 800 cps standard
2 KHz and 10 KHz on request
Harmonic distortion: zero

Model	Price
MSB-5 PSB-5	$514
MRB-5 PRB-5	$614

JULIE RESEARCH LABORATORIES, INC.

211 WEST 61st STREET, NEW YORK, NEW YORK 10023 • (212) 245-2727

KEITHLEY INSTRUMENTS

DC VOLTMETERS/NULL DETECTORS

ODEL	FEATURES	FULL-SCALE RANGES	ACCURACY	INPUT R or IR DROP	STABILITY (drift)	U.S.A. PRICE
	MICROVOLTMETERS/NANOVOLTMETERS					
48	Line/battery, most sensitive	10 nV-100 mV	2%	10^3-$10^6\Omega$	10 nV/24 h	$1465
47	Line/battery, optimized as null detector	30 nV-100 mV	2%	10^4-$10^7\Omega$	25 nV/24 h	$1465
49	Line, high sensitivity, medium price	100 nV-100 mV	2%	10^4-$10^7\Omega$	10 nV/h	$ 975
50B	Line/battery, 60 Hz rejection, current ranges	300 nV-1 V	2%	10^6-$10^8\Omega$	100 nV/24 h	$ 895
53	Line, high input resistance, current ranges	5μV-1000 V	1%-3%	2×10^7-$2\times10^8\Omega$	2μV/24 h	$ 625
▶55	Battery, low cost, portable	1μV-1000 V	2%	10^6-$10^8\Omega$	0.5μV/24 h	$ 345
▷60	Digital, measures V, I, R	1 mV-1 kV	0.1%	10^6-$10^7\Omega$	1μV/24 h	$ 545
▶00	Picovoltmeter, cryogenic input	30 pV-3 μV	2%-3%	$10^{-5}\Omega$	30 pV/3 h	$5100
	ELECTROMETERS					
40	Line or battery, 45 ranges, highest impedance, most stable, measures V, I, Q	30μV-30 V	1%	$10^{16}\Omega$	20μV/24 h	$1995
▶10C	Line, 81 ranges, measures V, I, R, Q	1 mV-100 V	1%	$10^{14}\Omega$	1 mV/24 h	$ 615
02	Battery, 75 ranges, measures V, I, R, Q	1 mV-10 V	1%	$10^{14}\Omega$	1 mV/24 h	$ 695
▶04	Line, widest bandwidth, differential input	1 mV-1 V	2%	$10^{14}\Omega$	4 mV/week	$ 940
▶00B	Battery, low cost, 67 ranges, measures V, I, R, Q	10 mV-10 V	2%	$10^{14}\Omega$	2 mV/24 h	$ 445
▷15	Digital electrometer, measures V, I, R, Q	100 mV-100 V	0.2%	$10^{14}\Omega$	1 mV/24 h	$1195

DC AMMETERS/CURRENT AMPLIFIERS

ODEL	FEATURES	FULL-SCALE RANGES	ACCURACY	INPUT R or IR DROP	STABILITY (drift)	U.S.A. PRICE
	PICOAMMETERS					
▶10A	Economical, high sensitivity	3×10^{-13}-10^{-7}A	2%-4%	1 mV	0.5%/week	$ 525
12	Logarithmic, low drift	3×10^{-13}-10^{-3}A	0.2 dec	5 mV	0.05 dec/24 h	$ 595
16	High speed	10^{-13}-3×10^{-5}A	2%-3%	1 mV	1%/8 h	$ 725
17	High speed, zero suppression	10^{-13}-3×10^{-5}A	2%-3%	1 mV	1%/8 h	$ 925
19	Automatic ranging, programmable	10^{-13}-10^{-2}A	2%-3.5%	1 mV	1%/24 h	$2450
13A	Logarithmic, high currents	10^{-12}-10^{-4}A	0.2 dec	5 mV	0.17 dec/24 h	$ 625
▶14A	Solid state, high stability	10^{-10}-10^{-2}A	2%-4%	1 mV	0.5%/week	$ 345
▶14S	Solid state, zero suppression	10^{-10}-10^{-2}A	2%-4%	1 mV	0.5%/week	$ 445
▶40	Digital	10^{-10}-10^{-2}A	0.2%-0.5%	1 mV	0.5%/week	$ 995
▶45	Digital, automatic ranging	10^{-9}-10^{-2}A	0.2%-0.5%	1 mV	0.5%/week	$1495
▷8000	High-speed current amplifier, programmable, 2-ms rise time, ±10V output	10^{-10}-10^{-5}A	2%	1 mV	0.5%/week	$ 595

CALIBRATION DEVICES AND REGULATED SOURCES

MODEL	TYPE	VOLTAGE OUTPUT	CURRENT OUTPUT	ACCURACY	STABILITY (drift)	LOAD REGULATION	RIPPLE & NOISE	U.S.A. PRICE
				VOLTAGE SOURCES				
▶45	High voltage supply	0-2100 volts	10 mA	1%	0.01% ±2 mV/8 h	0.002% ±2 mV	1 mV rms	$425
46	High voltage supply	0-3100 volts	10 mA	1%	0.01% ±2 mV/8 h	0.002% ±2 mV	1 mV rms	$475
40A	High voltage supply	0-1200 volts	10 mA	1%	0.02% ±2 mV/8 h	0.005% ±2 mV	1 mV rms	$360
41	Regulated supply	0-1000 volts	20 mA	0.05%	0.005%/h	0.005%	1 mV rms	$930
▶60	Nanovolt source	10^{-9}-1 volt	$<10^{-3}$A	0.25%-0.75%	—	—	—	$565
				CURRENT SOURCES				
▶25	Constant current	0-100 volts	10^{-7}-10^{-1}A	0.5%	0.005%/h	0.005%	0.01%	$595
61	Picoampere source	0-10 volts	10^{-14}-10^{-4}A	0.25%-1.6%	—	—	—	$595

RESISTANCE MEASURING DEVICES

ODEL	FEATURES	FULL-SCALE RANGES	ACCURACY	U.S.A. PRICE
▷15A	Megohm bridge, highest accuracy	$10^5\Omega$-$10^{15}\Omega$	0.05%-1%	$2295
00	Portable megohmmeter, logarithmic scales	$10^7\Omega$-$10^{13}\Omega$	20%	$ 185
01	Portable megohmmeter, logarithmic scales	$10^4\Omega$-$10^{10}\Omega$	20%	$ 185
02A	Portable milliohmmeter, linear scales	$10^{-3}\Omega$-$10^3\Omega$	3%-5%	$ 525
03	Line milliohmmeter, linear scales	$10^{-3}\Omega$-$10^3\Omega$	1%	$ 735
▷20	Resistance bridge; dissipates $<10^{-10}$ W	$10^2\Omega$-$10^6\Omega$	0.1%-10%	$ 995

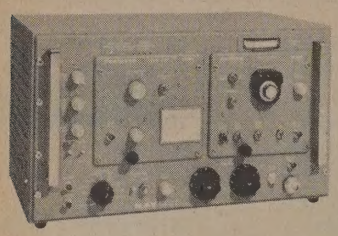
ELECTROMETER OPERATIONAL AMPLIFIERS

ODEL	FEATURES	CURRENT OFFSET	CURRENT TEMP. STABILITY	VOLTAGE TEMP. STABILITY	GAIN BAND-WIDTH	INPUT RESIST-ANCE	RMS VOLTAGE NOISE	U.S.A. PRICE
00	Highest input resistance, uses unregulated power supply	5×10^{-14}A	10^{-15}A/°C	500μV/°C	150 kHz	$10^{14}\Omega$	5 μV	$200
01	Differential input, solid state, uses unregulated power supply	10^{-14}A	doubles/5°C	150μV/°C	500 kHz	$10^{12}\Omega$	100 μV	$185
02	Low cost, small size, uses regulated power supply	10^{-14}A	doubles/5°C	150μV/°C	150 kHz	$10^{12}\Omega$	100 μV	$125
▶0200	Low power, light weight	10^{-14}A	doubles/5°C	150μV/°C	100 kHz	$10^{12}\Omega$	100 μV	$250

▶ Denotes a product which is new. ▷ Denotes a product available early in 1970.

SEND FOR TECHNICAL LITERATURE: 28775 AURORA ROAD, CLEVELAND, OHIO 44139, TELEPHONE: (216) 248-0400

KAY Sweep and Marker Generators



1500C
20 Hz-4 GHz

1500C: The model 1500C is a high performance solid-state sweep and marker system which accepts a variety of sweep and marker plug-ins to cover the frequency spectrum from 20 Hz to 4 GHz. The basic rack unit contains a variable sawtooth sweep generator, a fast-acting AGC, birdie and pulse marker controls, and RF output circuits including precision attenuators and built-in detector.

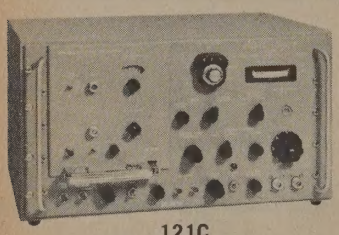
860H: The model 860H includes all of the features of the model 1500C with the exception of the frequency marking facility. It is intended for use where the frequency marking is obtained from an external source or counter.

SWEEP PLUG-INS for the 1500C an 860H systems feature: A group o highly stable, low residual audio ban modules; extremely flat wide band videc VHF and UHF plug-ins; and a new serie of low cost, high output, solid-stat microwave devices which extend th range of these systems to 4 GHz.

MARKER PLUG-INS for the 1500C in clude PCM7631, PCM7632, PCM763 and PCM932 pulse marker plug-ins PCM861 birdie marker plug-in and th new PCM7670 variable marker plug-in– all described on the following page.

Frequency Range	Model	Sweep Width	RF Output	FEATURES
20 Hz—200 KHz	PC-141A	0*—20 KHz	1.0V RMS Into 50 ohms	Ultra-stable, Narrow band plug-ins. Crystal-controlled beat-frequency oscillators provide 1.0 V rms output with excellent waveshape. Extremely low residual FM: <0.2 Hz. Drift: <3 Hz/min. Log or linear sweeps.
35 Hz—600 KHz	PC-142A	0*—40 KHz		
100 Hz—2 MHz	PC-130F	0*—2 MHz		Ultra-stable, narrow sweep plug-ins; wide sweeps to 2 MHz. Residual FM: <4GHz. Drift: <30 Hz/min. Log or linear sweeps.
1 KHz—20 MHz	PC-152B	0*—20 MHz		Wide video sweep plug-in; sweeps from 20 MHz down to less than 1 KHz. Log or Lin sweeps. Spurious beats down more than 30 DB. Residual FM: <75Hz.
50 KHz—115 MHz	PC-154A	0*—100 MHz		Solid-state wide sweep plug-in; very flat output: ±.25 DB; harmonic and spurious distortions >30 DB down. Residual FM: <50Hz. Log and Linear sweeps.
1—175 MHz	PC-857A	0*—30%		Ultra stable, narrow band plug-in, very low residual FM.
2—220 MHz	PC-860F	0*—30%		Solid-state, fundamental frequency sweeps to 220 MHz; Twelve band direct reading dial; high output with excellent waveshape. Extremely low residual FM.
220—470 MHz	PC-867A	20 KHz—70 MHz	0.5V rms into 50Ω	Solid-state, VHF-UHF, fundamental frequency sweeps. Excellent waveshape.
Following Models Available for 1500-C, 860-H and 121-C Rack Systems				
100 MHz—1 GHz (Any octave)	PC-123A P-123A	0.2%—octave	0.5V rms into 50Ω	Solid-state octave sweeps to customer specifications. Excellent linearity over full octaves. Stable outputs.
.75—1.5 GHz	PC-120A P-120A	Nom. 0—Full octave	10 MW levelled 13 MW unlevelled	Completely solid-state octave-wide sweep plug-ins; high-level outputs. Quality not luxury prices; spurious distortion: >60 DB down, Harmonic distortion: >20 DB down.
1—2 GHz	PC-125A P-125A	Nom. 0—Full octave		
1.2—2.4 GHz	PC-126A P-126A	Nom. 0—Full octave	50 MW levelled 70 MW unlevelled	
1.5—3 GHz	PC-128A P-128A	Nom. 0—Full octave	15 MW levelled 18 MW unlevelled	
2—4 GHz	PC-127A P-127A	Nom. 0—Full octave	10 MW levelled 13 MW unlevelled	

* Residual



121C
500 KHz-4 GHz

121C: This solid-state instrument is an electronically swept wide sweep and marker generator which accepts a choice of UHF and microwave sweep plug-ins to provide extended frequency ranges and sweep widths. With its plug-ins, the 121C covers a range of 500 KHz—4 GHz, offers a new series of solid-state microwave sweeps featuring high output at low cost, and accepts a variety of narrow and wide-sweep plug-ins for speci applications such as UHF TV.

The basic 121C system includes va able sweep rates, external modulatio CW and manual operation, built-in atte uator and detector plus a fine digit frequency control for smooth center fr quency settings and remarkable adjus ment during narrow operation.

Frequency Range	Model	Sweep Width	RF Output	FEATURES
500 KHz—1050 MHz	P-121A	5 KHz—350 MHz	0.5V rms	Electronic, wide-sweep, stable narrow sweeps.
900—1300 MHz	P-122	200 KHz—400 MHz	0.5V rms	Electronic, wide-sweep, stable narrow sweeps.
1.3—1.7 GHz	P-124A	500 KHz—400 MHz	0.5V rms	Electronic, solid-state, wide sweep.
.75—4 GHz	Microwave Plug-in Models P120 thru P128 see table above			

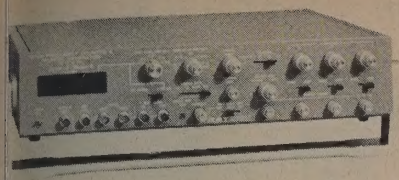
KAY ELEMETRICS CORP
FORMERLY KAY ELECTRIC

Maple Avenue
Pine Brook, N. J. 07058
(201) 227-2000
TWX: 710-734-4347

Midwest Office
U.S. Route 31 North
South Bend, Ind. 46637
(219) 272-2848

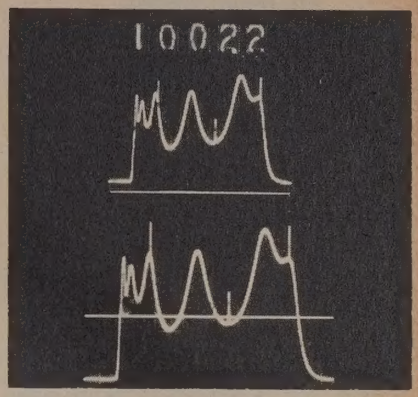
West Coast Office
P.O. Box 206
Goleta, Calif. 9301
(805) 967-9316

Marker Generators KAY



NEW MODEL 8323A FREQUENCY MARKER COUNTER PROVIDES VARIABLE PULSE MARKERS TO 7 SIGNIFICANT DIGITS

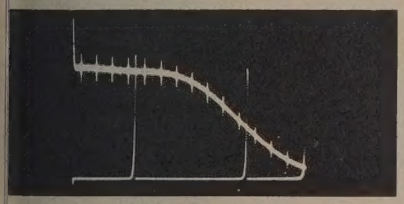
8323A: This all new ultra-state-of-the-art instrument teaches your "Old Dog" sweeper a "New Trick" — How to count! The 8323A works with any old dog or new VCO sweep to provide both a counter (DC-115MHz) and three independent, continuously variable pulse markers that can be read out individually to counter accuracy. Designed to facilitate precision passband marking and sweep and point setting, each frequency marker can be read out as desired with the flick of a switch. Marker height, width, and direction (horizontal for sharp slopes) are controlled on the front panel. A variable, horizontal line provides easy reference for amplitude calibration. Works with Kay sweeps or others.



■ Variable Marker Plug-Ins

PCM7631, PCM7632, PCM7633, PCM932 (1500C system), PM7650 (154C, 159D systems): These plug-ins are precision pulse marking systems which accept multiple, crystal-controlled, markers at customer specified frequencies. Each marker or marker group is controlled by a simple front panel switch. The individual pulse marker is sharp enough to remain narrow and well defined even on extremely narrow sweeps.

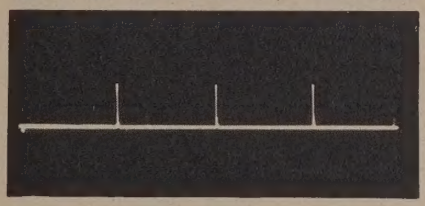
Model	Freq. Range	No. of Markers
PCM7632	1KHz—1MHz	6 + External Variable
PCM7631	10KHz—2MHz	6 + External Variable
PCM7633	1KHz—110MHz	12 + External Variable
PCM932	2MHz—220MHz	31 + External Variable
PM7650	1MHz—110MHz	8 + External Variable



■ Pulse Marker Plug-Ins

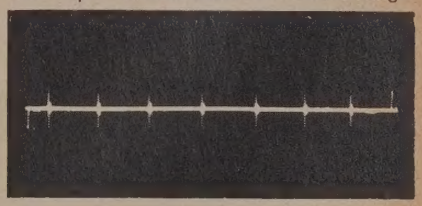
PM100, PM300: These new plug-ins provide two, accurate, variable pulse markers for use with 154C and 159D sweep generators. Both models also include individually controlled 1 and 10MHz crystal marker arrays. The variable pulse markers thus may be used as calibrated end point markers and passband markers. Individual amplitude controls adust marker size up from the base line for accurate gain marking.

PM7670: The model PM7670 is a new fundamental frequency marker module which develops a direct-reading variable birdie marker for use with the Kay model 154C, 159D and 1500C sweep systems. It covers its 300KHz—300MHz spectrum in 8 individual calibrated bands. In addition to the variable marker, 1 and 10MHz harmonic markers and a CW output are provided. An optional 4.5MHz crystal sideband marker may also be specified. For the model 1500C system, specify PCM7670.



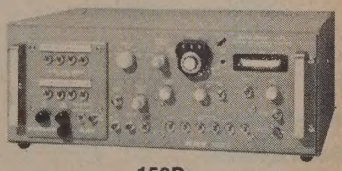
■ Birdie Marker Plug-Ins

PCM861, PM7660: Designed for use with the 1500C and 154C and 159D respectively these plug-ins offer either individually switched single frequency and/or harmonic birdie-pip markers as specified. The PCM861 produces up to six markers in the 200KHz—1GHz region. The PM-7660 allows up to eight indicators in the 500KHz—300MHz range. All markers are held to .005% crystal accuracy. Variable level controls are included and an external CW signal can be injected to develop a variable birdie within the range.



154C - 159D: These up-to-the-minute versions of Kay's 154 and 159 are completely solid-state, electronically swept, wide-sweep and marker generators which cover their ranges in a single wide sweep. The additional features of continuously variable sweep width and multiturn digital frequency dial provide exceptional fine touch settings over the video, IF and VHF range. The use of a broad output amplifier in these beat frequency units permits light coupling of the mixed oscillators, thus providing high RF levels with superior waveshape; distortion and spurious are minimal.

Performance characteristics include line lock, CW, manual, wide variable sweep rates, and external modulation input. Frequency range may be swept from HI to LO or from LO to HI as required. Automatic leveling may be controlled either externally or internally. A built-in detector and precision sweep attenuator are standard features. Both models are available in 50 or 75Ω impedance. In addition, a full compliment of pulse, birdie, and variable marker plug-ins are available for use with these instruments. These modules are described above.



159D

Freq. Range	Model No.	Sweep Width	RF Output	Flatness	Markers	Features
50 KHz-110 MHz	154C	5 KHz-100 MHz	1.0 V., 50Ω metered	±0.25 db	PM7650 pulse markers PM7660 birdie markers PM7670 variable birdie markers PM100 dual variable pulse markers	Solid-state, wide sweep: plug-in marker system. Sweeps full 110MHz to low end 50KHz. Pulse and harmonic markers. Sweep rates .01—1000Hz.
300 KHz-300 MHz	159D	20 KHz-300 MHz	1.0V., 50Ω metered		PM7650, PM7670 PM7660, as above PM300 dual variable pulse markers See descriptions above.	Similar to 154C solid-state sweep and marker system. Very flat, very low harmonics and spurious. Now with full 1 volt RMS output.

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KAY Sweep Synthesizers

101A

101A: The model 101A is a sweep synthesizer which provides not only the solid-state 100 MHz wide sweep capability of Kay's proven 154C (see above) but also superb, low residual, narrow sweep features essential for steep-skirted, narrow band filter applications and for the design and production of pin-point frequency discriminating circuits. In addition it provides a new order of swept and cw stability, of narrow-band frequency marking, of calibrated (0.01%) cw output frequencies, and of digital/analog programmability through the use of newly developed IC synthesizer circuitry. The price at around $3000 for a unit that includes a "locked" range of 100 KHz to 100 MHz is a fraction of the cost of the usual synthesizers.

PLUG-IN RF MODULES	K10237			K10324	K10325-6	K10327-8
MODULE	**FREE RUNNING**	**STABILIZED**	**STABILIZED**	**STABILIZED**	**STABILIZED**	**STABILIZED**
FREQUENCY RANGES VARIABLE:	.05-110MHz	1-10MHz	10-100MHz	0.1-1.0MHz	1.0-5.0MHz 5.0-10.0MHz	10-30MHz 30-70MHz
RESIDUAL FM LINE RELATED: RANDOM:	500Hz pk 100Hz pk	200Hz pk 100Hz pk	300Hz pk 100Hz pk	5Hz pk 5Hz pk	5Hz pk 5Hz pk	20Hz pk 20Hz pk
SWEEP WIDTH RANGES VARIABLE:	0-100MHz	In 2 Ranges; —— 0 to 1% of Center Frequency; 0 to 4% of Center Frequency				
AM SPURIOUS HARMONIC: NON-HARMONIC:	below —— 30 db below —— 30 db			below —— 40 db below —— 50 db		
SWEEP LINEARITY 100 MHz SWEEP: (WIDE) 0-4% SWEEP: (MEDIUM) 0-1% SWEEP (NARROW)	±5% (of sweep width)	±.5% (of sweep width) ±100Hz				
STABILIZED OUTPUT FREQUENCIES: **FREQUENCY SETTABILITY** FIXED STEPS: VERNIER:	10KHz 20Hz	100KHz 200Hz		1KHz 2Hz	10KHz 20Hz	100KHz 200Hz
STABILIZED OUTPUT FREQUENCIES: **FREQUENCY CALIBRATION** FIXED STEPS: FIXED plus vernier:	±.002% Accuracy (% of indicated frequency) ±.01% Accuracy (% of indicated frequency)					
STABILIZED OUTPUT FREQUENCIES: **FREQUENCY DRIFT** ONE MINUTE ONE HOUR 10 VOLT LINE VAR. PER °CENTIGRADE	± 5ppm on 0-1% Sweep Range; ±20ppm on 0-4%. ±20ppm on 0-1% Sweep Range; ±80ppm on 0-4%. ±10ppm on 0-1% Sweep Range; ±20ppm on 0-4%. ±30ppm on 0-1% Sweep Range; ±120ppm on 0-4%. (AFTER 10 MINUTE WARMUP)					

KAY PRODUCTION SWEEPS FOR RADIO, TV, ETC.

1484 BP

- **Push-Button Sweep and Marker Selection.**
- **Application Oriented, Sweep and Marker Units.**

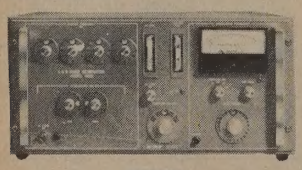
1483B: The new 1483B is a solid-state sweep and marker generator used to design, test, and align UHF-TV receivers, it develops a full 0.5 volt rms output into load over the entire channel 14 to 83 frequency range. A front panel control permits switching of the sweep width from a wide 520 MHz (entire UHF-TV band) to continuously variable widths from 60 down to 5 MHz.

- **Easy to Use, Lower Cost Excellent for Production.**

1484BP: New, compact units for production type applications feature push-button band switching of both sweeper and marker outputs. Markers are pulse or birdie pip, sweeps are ALC'd flat and linear, standard models at FM IF, FM RF, VHF TV frequencies. Frequencies to 1GHz to order. Excellent narrow sweep units feature level controls free from frequency pulling. Wide sweeps to an octave at all frequencies and wider as many (e.g. 40 — 230MHz single sweep TV), low cost, repeatable, stable.

Model No.	Frequency Range	Markers	Features
1483B	440-960MHz	Up to 8 single frequency or 7 harmonic birdie	UHF channels 14-83
1484BP	10.7MHz	Band selected pulse markers or single freq and harmonic birdies	Push-button sweep and marker selection for fast production line testing
1484BP	88-108MHz		
1484BP 1484BP	40-230MHz Selectable to 1GHz	Single frequency or harmonic birdies	Customer specified bands

KAY TELEMETRY L & S BAND GENERATOR



1522A

- **Programmable Carrier Frequency, IRIG Channel and RF Attenuation.**

A new FM signal Generator for the telemetry L and S bands uses phase-lock techniques to provide superior stability and accuracy; and digital control of RF frequency, set up for remote operation or BCD programmability. Remote operation (or programmability) is also provided for RF output and IRIG channel selection.

The new generator, model 1522, is a solid state unit with peak FM deviations of up to ±3 MHz modulated on a self-contained, calibrated deviation meter. Internal modulation for each of the 21 standard IRIG subcarrier frequencies is provided. Calibrated RF output is adjustable from 0 dbm to —120 dbm.

Settability: 100 KHz, digital control

Accuracy: ±.002%, calibrated after one half hour warm-up.

Stability: Drift plus incidental FM less than ±2 KHz pk for 1 minute, less than ±5.0 KHz pk for 10 minutes, less than ±15 KHz for one hour.

(Residual FM: <1.5 KHz on L Band <2.0 KHz on S Band)

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KAY AUTOMATIC NOISE FIGURE METER

792A

- TUNED IF INPUT AMPLIFIER (NO SPURIOUS READINGS
- BROAD 10-1000 MHz SOURCE (NO CHANGING SOURCE IN MID-BAND)
- OPTIMIZED IN PRICE AND PERFORMANCE FOR 10-1000 MHz RANGE
- NOISE MEASUREMENTS TO 26.5 GHz
- 75Ω MEASUREMENTS FOR CATV COVERAGE

The 792A is a sensitive, solid-state, noise figure meter. Primarily focused on the frequency range below 1000 MHz, this instrument provides better accuracy and greater flexibility at considerably less cost than conventional noise generators. The 7921A hot wire noise source is a unique broad band generator and operates over the full 10-1000 MHz range.

Provision is made for later addition of noise sources covering the range to 26.5 GHz. In this way, an expanded applications requirement can be met without the full expense or added space demands of an additional unit.

Additional noise sources provide variable impedance and balanced VHF outputs from temperature-limited diodes, waveguide output from argon gas tubes Either 6 db or 15.2 db excess noise outputs can be selected for increased accuracy at low or high noise figures, respectively.

This wide coverage eliminates the inconvenience (and the inaccuracies) of changing noise generator source in mid-band, as is usually required.

INPUT FREQUENCY: 10-120 MHz Continuous Coverage

BANDWIDTH: Approx. 4% of Center Frequency

INPUT SENSITIVITY: 0 to 75 dbm (noise source on). Approx. 35 db gain required between lowest noise source & input.

INPUT IMPEDANCE: 50 ohms nominal

INPUT ATTENUATOR: Steps of 20, 10, 5, 3, 2, and 1 db.

KAY RANDOM NOISE GENERATORS

10, 403, 780: These models are calibrated random noise sources providing output over a wide frequency and power range. They employ noise diodes with tungsten filaments as temperature-limited noise generators. The plate voltage of the noise diode is regulated and the diode plate current, (proportional to noise power output), is variable by a front panel control. A calibrated meter provides direct reading in noise figure. The ability to vary the noise output in an accurately known way, greatly simplifies the measurement process since it permits precise matching of circuit noise rather than a more complicated referencing back to some fixed output.

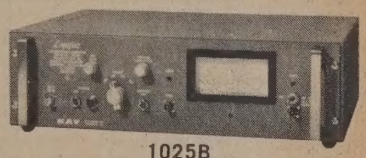
Model	Frequency	Features
240	5-220MHz	0-23.8DB Noise Figure
403	3-500MHz	0-19DB Noise Figure
780	1-3GHz	0-20DB Noise Figure

AMPLIFIERS KAY

1022A, 1022A PF, 1023A, 1024A, 1026A: These amplifiers include new wide-band models with excellent gain-bandwidth characteristics, (40 db - 150 MHz, 30 db 300 MHz), and a high output 8 MHz unit delivering 15 volts rms into 50 ohms. Each of these amplifiers has unusually flat response over its full frequency range. Each is designed for accurate input and output impedances of 50 ohms, but can operate an accessory probe to provide amplification from high-impedance outputs without loading down the test signals.

For high impedance application, the 965A broad-band probe is designed for operation with these 50 ohm input amplifiers.

1025B: The 1025B gives overall response, and at the same time gives detailed, easily seen measurements of points on the curves as far down as 80 db. The unit permits highly accurate viewing of the skirts and sharp slopes of bandpass filters, single side-band filters, traps, etc. A control gives expansion of the top critical points simultaneously with the log display. 80 db log range, also available as undetected RF signal.

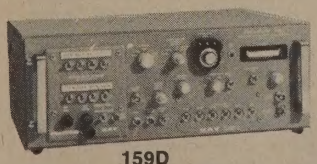


1025B

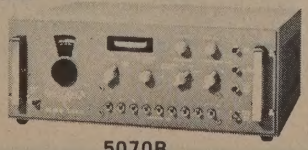
Model No.	Frequency Range	Output Voltage	Gain	Response	Features
1022A	50KHz—8MHz	15VRMS	34DB	±.25DB	High, Flat Output
1022APF	10KHz—110MHz	5VRMS	30DB	±.5DB	Wideband, High Output for distribution systems
1023A	1KHz—150MHz	.5VRMS	40DB	±.5DB to 100MHz ±1DB to 150MHz	40DB Gain, Compact Built-in Attenuator
1024A	200Hz—300MHz	.5VRMS	30DB	±.5DB: 1KHz—300MHz ±3DB: 200Hz—300MHz	Wideband Low Noise 75Ω for CATV
1026A	100KHz—300MHz	3VRMS	20DB	±.5DB	Wideband, High Flat Output

CATV TEST INSTRUMENTS

Kay offers a complete line of CATV test instruments. We have often supplied the model 159D sweeper with PM7670 vari-marker plug-in, 1024A amplifier, 792A automatic noise figure meter, attenuators, and 255B coaxial electronic switch at 75Ω for CATV testing.



159D



5070B

PULSED RF GENERATOR

The 5070-B is a solid-state instrument whose pulsed output features sharp rise and decay and flat tops. The unit will serve as a CW generator, as well as a video pulse generator. It provides a stable CW signal from 10 MHz to 120MHz, continuously variable, in five overlapping bands. Carrier off level — 85DB.

OTHER MODELS AVAILABLE
The Model 5071-A offers a wider frequency range of 10-250 MHz. The Model 5072-A expands the standard 5070-B to provide carrier-off levels of up to 95 db.

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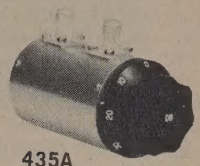
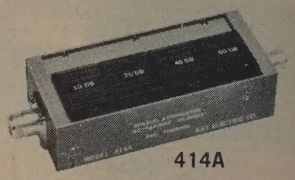
KAY

PRECISION ATTENUATORS



435A

431C



414A

MODEL		431-C	432-D	1/432-D	439-A	460-A	437-A	1/439A	433-A	434-A
ATTENUATION RANGE		0-41 DB In 1 DB steps	0-101 DB In 1 DB steps	0-22.1 DB In 0.1 DB steps	0-101 DB In 1 DB steps	0-132 DB In 1 DB steps	0-102.5 DB In 0.5 DB steps	0-22.1 DB In 0.1 DB steps	0-119 DB in 1 DB steps	0-99 DB In 1 DB steps
FREQUENCY		DC-1 GHz	DC-1 GHz	DC-1 GHz	DC-1 GHz	DC-1 GHz	DC-1 GHz	DC-1 GHz	DC-500 MHz	DC-1 GHz
CONTROLS		In-line toggle switches	In-line toggle switches	In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Miniature In-line toggle switches	Rotary-Digital	Rotary-Digital
TYPICAL OVERALL ACCURACY (± DB) OR % OF INDICATED DB	DC-250 MHz	0.5	0.6	0-.5 DB steps: ±.5 DB/step 1-10 DB steps: ±.2 DB/step	0.5	0.5	0.5	0-.5 DB steps: ±.05 DB/step 1-10 DB steps: ±.3 DB/step	0.6	0.6
	250-500 MHz	0.9	1.2		1.0	1.0	1.0		1.2	1.0
	500-1000 MHz	1.2	2.0		1.5	1.5	1.5			1.5
	1-2 GHz									
	2-4 GHz									
	4-6 GHz									
	6-12.4 GHz									
MAXIMUM VSWR	DC-250 MHz	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1
	250-500 MHz	1.4:1	1.4:1	1.5:1	1.2:1	1.2:1	1.2:1	1.2:1	1.4:1	1.2:1
	500-1000 MHz	1.4:1	1.4:1	1.5:1	1.4:1	1.4:1	1.4:1	1.4:1		1.4:1
	1-2 GHz									
	2-4 GHz									
	4-6 GHz									
	6-12.4 GHz									
INSERTION LOSS TYPICAL (db)	DC-250 MHz	.1	.1	.1	.1	.1	.25	.1	1	.1
	250-500 MHz	.2	.3	.3	.2	.2	.35	.2	2	.25
	500-1000 MHz	.5	.6	.6	.5	.5	.7	.5		.5
	1-2 GHz									
	2-4 GHz									
	4-6 GHz									
	6-12.4 GHz									
POWER (watts)		1	1	1	1	1	1	1	½	1
DIMENSIONS (inches)		2 x 7 x 2	2 x 9¾ x 2		1¼ x 6¼ x ⅞				5 x 2¼	2¼ x 2 x 5¾

Kay in-line and rotary attenuators are designed to provide a means of inserting an accurate and fixed amount of loss in circuits operating in the DC-12.4 GHz range. Attenuation is controlled by field-proven high-frequency toggle switches. Solid silver contacts set in Teflon for low loss and superior match are employed throughout. The precision resistors used are 1% tolerance, carbon film resistors. The maximum total error is very low and incidental insertion loss is negligible. These units have met rigid environmental tests and are traceable to N.B.S.

The individually-switched steps are isolated in broad-tuned, shielded compartments, providing high accuracy and a flat frequency response over the specified range. All models are symmetrical, (bi-directional), attenuators. Most models are available in either 50, 75, or 90 ohms.

To afford maximum utility, Kay in-line attenuators are available for your special built-in applications. These attenuators are ideally suited for inclusion in a wide variety of equipment, such as test equipment, IF amplifiers, receivers, etc. In general, the electrical specifications are the same as for the in-line model. They differ, however, in mechanical configuration.

PROGRAMMABLE

A new series of programmable attenuators has been introduced to provide precise increments of fixed attenuation which may be switched from a remote position or be controlled by programmed opens and shorts on a 9 wire control system.

These models feature programmed values of attenuation in the DC-12.4 GHz region. Utilizing Kay's proven in-line models, these devices incorporate a new light-weight, low-cost control package that includes a low-level SCR network

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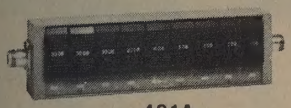
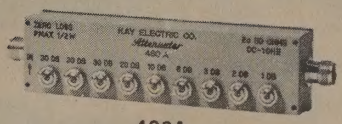
DC — 12.4GHz

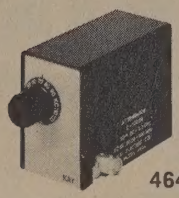
KAY



461A



460A



464A

464-A	467-A	435-A	436-A	1/435-A	400-A	461-A	424-A	414-A	495-A	411-A
120 DB In DB steps	0-12 DB In 1 DB steps	0-10 DB In 1 DB steps	0-70 DB In 10 DB steps	0-1 DB In 0.1 DB steps	0-70 DB In 10 DB steps	0-132 DB In 1 DB steps	0-90 DB In 10 DB steps	0-130 DB In 1 DB steps	Single Step switched coax pads	Single Step switched coax pads
C-1.3 GHz	DC-1.5 GHz	DC-2 GHz	DC-2 GHz	DC-1 GHz	DC-2 GHz	DC-4 GHz	DC-6 GHz	DC-12.4 GHz	DC-4 GHz	DC-12.4 GHz
otary-Step	Rotary-Step	Rotary-Step	Rotary-Step	Rotary-Step	Miniature Rotary-Step	Slide Switches	Slide Switches	Slide Switches	Slide Switches	Slide switches
1% ± .1	.2	0.1	1% ± .1	.025	± 1%	1% ± .1	1% ± .2	1 DB or 5% whichever is greater	1% ± .1	1 DB or 5% whichever is greater
% ± .2	.2	0.1	1% ± .1	.025	± 1%	1% ± .1	1% ± .2		1% ± .1	
2% ± .2	0.3	0.3	1% ± 0.2	.025	± 2%	1% ± 0.3	1% ± .2		1% ± .2	
	0.5 to 1.5 GHz				± 4%	2% ± .3	1.5% ± .2		2% ± .2	
						2% ± .3	2% ± .2			
							2% ± .5			
1.2:1	1.2:1	1.1:1	1.1:1	1.1:1	1.1:1	1.05:1	1.05:1	1.1:1	1.05:1	1.1:1
1.2:1	1.2:1	1.2:1	1.2:1	1.2:1	1.1:1	1.05:1	1.05:1	1.1:1	1.05:1	1.1:1
1.4:1	1.25:1	1.3:1	1.3:1	1.4:1	1.15:1	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1
					1.25.1	1.25:1	1.2:1	1.2:1	1.2:1	1.2:1
						1.5:1	1.3:1	1.3:1	1.5:1	1.3:1
							1.5:1	1.5:1		1.5:1
								1.5:1		1.5:1
.1	.15	.1	.1	.1	.1	.1	.1	.1	.1	.1
.15	.25	.1	.1	.1	.1	.1	.1	.1	.1	.1
.3	.5	.2	.2	.2	.2	.2	.2	.2	.1	.1
					.5	.3	.2	.3	.1	.1
						.5	.3	.5	.2	.2
							.5	.6	.3	.3
								1.0		.5
1	1	1	1	½	¼	1	1	2	1	2
1¾ x 3 7/16 x 2 11/16		2 dia. x 2⅛	2 dia. x 2⅞	2 dia. x 2⅛	1¼ dia.x2 3/16	8⅜x2⅜x1⅝	2⅜x4¼x1⅝	2⅜x5⅛x1⅝	2⅜ x 1½ x 1⅝	

TTENUATORS

cilitating use in large test systems here a low current drain is essential. A rotary control arrangement is avail- ble for remote sequential control of tenuator levels.

30B — DC - 1300 MHz
0-135 db in 1 db steps

61A — DC - 4 GHz
0-132 db in 1 db steps

24A — DC - 6 GHz
0-90 db in 10 db steps

COAXIAL ATTENUATORS

A new group of switched, coaxial attenuators is now available to span the DC - 12.4 GHz range. Developed from Kay's precision VHF - UHF attenuators, these devices eliminate the cumbersome technique of inserting and reinserting individual pads or the need to go thru a time-consuming rotary step-cycle.

Individual attenuation steps are controlled by finger operated, spring-loaded slide switches. These models consist of a complete coaxial system. Each segment is constructed with air dielectrics, and fine silver contacts insuring precision surfaces. Individual steps are isolated in broad-tuned, shielded compartments.

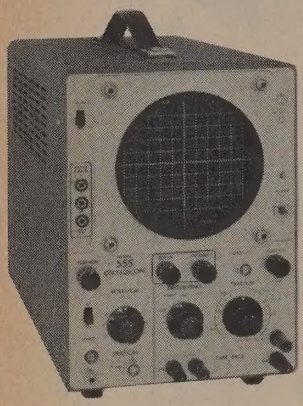
A variety of models is available to provide customer specified attenuation and frequency ranges covering the 0 - 132 db — DC-12.4 GHz range. Standard models are listed on the attenuator chart; many attenuators in this series are available in single coaxial pads, two or three step versions or special versions to suit customer specifications.

Maple Avenue
Pine Brook, N. J. 07058
(201) 227-2000
TWX: 710-734-4347

Midwest Office
U.S. Route 31 North
South Bend, Ind. 46637
(219) 272-2848

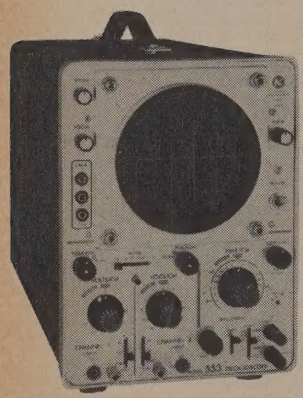
West Coast Office
P.O. Box 206
Goleta, Calif. 93017
(805) 967-9316

kikusui ELECTRONIC MEASURING INSTRUMENTS



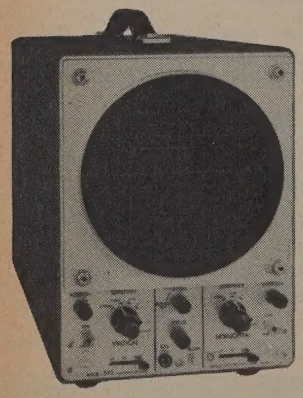
MODEL 555 OSCILLOSCOPE

Vertical Amplifier
Sensitivity ..... 0.02V/cm~10V/cm in 9 Steps
Calibration Accuracy
..... ± 3% (at correct mains voltage)
Bandwidth (−3dB approx) ..... DC to 7MHz
Rise Time 50nS
Input Impedance 1MΩ, 33pF
Time Base
Sweep Range ..... 1μS/cm to 1S/cm in 19 Steps
Accuracy ..... ± 5% (at correct mains voltage)
Expanded Sweep ..... 5 times ± 5% accuracy (at correct mains voltage)
External Sweep
Deflection Sensitivity ... 1Vp-p/cm. 200mVp-p/cm using 5 times magnifier. 200mV to 10V/cm adjustable continously in conjunction with AMPLITUDE control.
Frequency Response (−3dB) ..... 2Hz to 200kHz
Synchronization
Synchronous System ... Self-excited trigger sweep
Synchronous Signal ..... Internal, external, mains frequency
Calibration
Output Wave-form ... 1kHz square wave (approx)
Dimentions ..... 205W × 295H × 450Dmm
Net Weight ..... Approx. 11Kg



MODEL 553 OSCILLOSCOPE (DUAL TRACE)

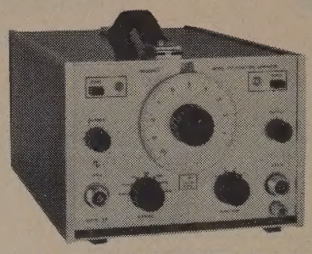
Vertical Axis
Calibrated Deflection Factor
..... 10mV/cm~20V/cm, accuracy ± 3%, 1-2-5 Sequence, 11 position
Bandwidth ... For DC connection, DC ~7MHz, within −3dB
For AC connection, 2Hz~7MHz, within −3dB
Input Impedance ..... 1MΩ paralleld by 38pF
Rise time ..... Approx. 50nS
Time-Base
Sweep time ..... 1μ S/cm~1S/cm in 19 calibrated steps. 1-2-5 Sequence
Time Base Sweep Accuracy ..... ± 5%
Sweep Magnifier ..... × 5, accuracy ± 5%
Synchronization
Synchronizing System ... Trigger sweep and self-oscillating sweep
Horizontal Axis
Sensitivity ... Approx. 1Vp-p/cm; approx. 0.2Vp-p /cm in case sweep magnifier is actuated
Bandwidth ..... 2Hz~200kHz, within −3dB
Input Impedance ..... Approx. 1MΩ paralleled by less than 40pF
Calibrator
Output Waveform ..... Squarewave of 1kHz
Dimensions ..... 206W × 295H × 460Dmm
Net Weight ..... Approx. 11kg



MODEL 573 ALIGNMENT SCOPE

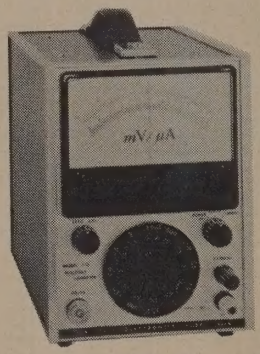
This type is an X-Y oscilloscope to be used in combination with a sweep generator for direct-viewing the frequency response of measuring instruments.

Vertical Axis
Sensitivity ..... More than 1mVp-p/cm
Voltage Dividing Accuracy ..... Within ± 0.5dB
Frequency Response ..... AC Less than −3dB at 2Hz to 200kHz
DC Less than −3dB at 0 to 200kHz
Input Impedance ..... Approx. 1MΩ, 50 ± 2pF parallel capacitance,
Input Terminal ..... BNC-type receptacle
Horizontal Axis
Sensitivity ..... More than 10mVp-p/cm
Frequency Response ..... AC Less than −3dB at 2Hz to 200kHz
DC Less than −3dB at 0 to 200kHz
Intensity Modulation
System ..... Z-axis intensity modulation
Sensitivity ... Sufficient modulation obtained with 1Vp-p signal
Frequency Response ..... Less than −3dB at 400kHz



MODEL 455 FUNCTION GENERATOR

Ultra-low frequency oscillator which divides sine wave, triangular wave, ramp wave and square wave from 0.005Hz~100KHz into 7 ranges based on the decimal system and generates them. Transistors have been adopted for all the circuits of Model 455, resulting in compact design and light weight. The frequency characteristics of the oscillation output voltage is essentially flat for the reason of its principle. Almost no transient is caused when waveform and range are changed over. It starts oscillating immediately with newly given waveform. By means of the start switch located on the operation panel, sine wave, triangular wave and ramp wave can be oscillated from minus (−) electric potential and square wave, from plus (+) electric potential respectively optionally. For this reason, this is a very convenient unit when measurement is made in ultra-low frequency. This unit can be used for measurement on low pass characteristics of feedback amplifiers, test of servomechanism of automatic controllers and serve as function generator for analog computer as well as signal source for oscillation driver. This unit can be applied to various kinds of measurements and tests in a very wide range.
MODEL 455L
Oscillation frequency ..... 0.0005Hz~10kHz



MODEL 115 HIGH SENSITIVE DC VOLT AMMETER

High sensitive DC voltammeter designed for measuring small DC voltage and current and for using as a DC amplifier. This instrument consists of the stable amplifier of extremely less drift employing a DC-AC converter, and the measuring terminal is floated. Also, zero center type is adopted, so that simple and quick measurement is ensured without requiring attention to the polarity. The input resistance of each measuring voltage range is 11MΩ constant and the full scale is 1.5mV~500V. The current range is 0.15μA~50mA. They are divided into 12 ranges respectively in 1.5-5-15 step. As DC amplifier, this instrument enables to take out from the output terminal provided at the back side of the panel 1.5V output voltage to the input value of the full scale at each of the above voltage and current ranges.

MODEL 156A DIGITAL VOLTOHMMETER

DC voltage within a range from ± 0.000 to 1000 volts and resistance within a range from 0.000Ω to 30.00MΩ at high accuracy by the use of a pulse width conversion system of integration type. It has the following features:

- The dynamic range is wide, and measurement can be counted up to "3000" in four decimal digits without switching the range. When a voltage higher than "3000" preset is applied to the input, a lamp lights to indicate it.
- Compact and lightweight, the Model 156A requires a minimum bench space. Operating procedure is very simple.
- The measuring speed is as high as 10 samplings /sec. Polarity switching is automatic. Because of the memory circuit, indication has little flicker. The measuring accuracy is as high as ±(0.1%+1 digit) of the indicated value. The input resistance is 10 megohms for all measuring ranges. The input terminals are floated from the case.
- The circuitry does not involve any electromagnetic mechanical parts, but employs silicon transistors and integrated circuits to a great extent for high-reliability performance.

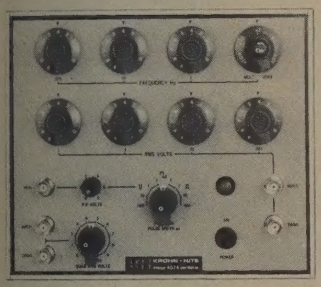
kikusui
KIKUSUI ELECTRONICS CORP.
3-1175, SHINMARUKO-HIGASHI, KAWASAKI-CITY, KANAGAWA-PREF., JAPAN.
TELEPHONE: (044) 41-0111
CABLE ADDRESS: "KIKUSUIDE" KAWASAKI

MAIN PRODUCTS:
● ELECTRONIC VOLTMETER ● DIGITAL VOLTMETER ● FUNCTION GENERATOR ● OSCILLOSCOPE ● CURVE TRACER ● PUNCTURE TESTER ● POWER SUPPLY

FROM KROHN-HITE

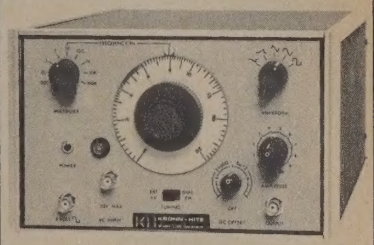
THE WAVEMAKERS:

RC OSCILLATORS AND FUNCTION GENERATORS



Model 4024 Standard Oscillator
0.001 Hz to 100 kHz

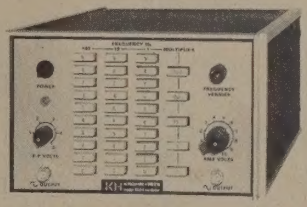
Model 4200 Test Oscillator 10 Hz to 10 MHz



NEW SERIES 5000 FUNCTION GENERATORS

- 0.002 Hz – 5 MHz
- ~ ∧ ∿ ∿ ∿
- 30 v p to p output
- 50 ohm impedance
- 1000:1 ext. volt. control
- 0.5% distortion
- Aux. < 15 ns squarewave
- Frequency accuracy 5% of setting
- Calibrated attenuator
- D-C offset

Model 4000 Standard Oscillator 0.1 Hz to 100 kHz



Model 4100A Push-Button Oscillator
0.01 Hz to 1 MHz

Frequency Range	Osc. Model*	Freq. Acc. %	Power (mw)	Impedance (ohms)	VRMS (Open Circuit)	Quad. Output	Add'l. Wave-Forms	Freq. Resp. (db)	Dist. %	Approx. Ship. Wt. lbs/kgs	Price
0.001 Hz to 100 kHz	4024	0.5	125	200/600	10	Yes	∿ ⎍	0.01	0.01	24/11	$1200
0.001 Hz to 100 kHz	4025	0.1	125	200/600	10	Yes	∿ ⎍	0.01	0.01	24/11	$1950
0.01 Hz to 1 MHz	4100A	0.5	500	50	10		∿	0.05	0.02	21/10	$ 550
0.1 Hz to 100 kHz	4000	0.5	125	200/600	10	Yes	∿	0.01	0.01	18/9	$ 850
0.1 Hz to 100 kHz	4001	0.1	125	200/600	10	Yes	∿	0.01	0.01	18/9	$1450
10 Hz to 10 MHz	4200	2	500	50	10		~(FIXED)	0.025	0.1	21/10	$ 350

*Add suffix "R" for rack mounting.

PROGRAMMABLE OSCILLATORS

Frequency Range	Osc. Model	Freq. Acc. %	Max. Volts	Output Impedance	Dist.	Square Wave	Prog. Amp.	Approx. Ship. Wt. lbs/kgs	Price
0.1 Hz to 100 kHz	4030R	0.5	10 RMS	200/600	0.01%	optional	optional	27/13	$1495
0.1 Hz to 100 kHz	4031R	0.1	10 RMS	200/600	0.01%	optional	optional	27/13	$2145
0.1 Hz to 1 MHz	4131R	0.1	10 RMS	50	0.02%	yes	no	30/15	$1375
0.1 Hz to 1 MHz	4141R	0.1	10 RMS	50	0.02%	yes	yes	30/15	$1585
1 Hz to 1 MHz	4130R	0.5	10 RMS	50	0.02%	yes	no	27/13	$1075
1 Hz to 1 MHz	4140R	0.5	10 RMS	50	0.02%	yes	yes	27/13	$1285

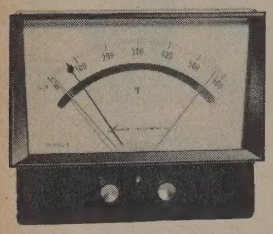
For complete details, write: The Wavemakers:
Krohn-Hite Corporation, 580 Massachusetts Avenue,
Cambridge, Mass. 02139 U.S.A.
Tel: (617) 491-3211 TWX: 710-320-6583

KROHN-HITE CORPORATION

OSCILLATORS / FILTERS / AC POWER SOURCES / AMPLIFIERS

Larson CONTACTLESS METER CONTROLLERS

Where there is INDICATION, there is a need for CONTROL



4½"

Wide View

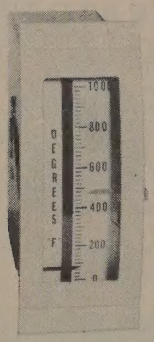
3½"

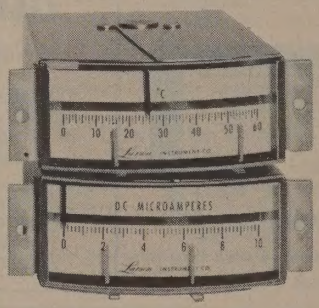
2½"

Features:

- Overall depth, ONLY 3.95"
- No moving wires — no failures
- Continuous indication beyond set point
- Fail-safe circuit
- Repeatability ¼%
- Relay contacts 10 Amps 115V
- Amplifier for 115V AC or 24V DC input

Space Saver





2½" and 3½"

This is exactly what the Larson Controller offers you. Our instruments are designed to indicate and control any electrical variable from:

5 μa up to 1000 μa, dc
1 ma to 1000 ma, dc or ac
5 mv to 1000 mv
1 amp to 1000 amps dc or ac
1 volt to 1000 volts dc or ac

The variety in models and ranges continues... AC Volts Rectifier, RF Amps, Watt meters, Expanded Scale and Temperature Controllers from 100°C to 3000°F plus the newest design which features a Temperature sensitivity of 60°C f.s. with Thermistor or Thermocouple output amplifier.

For your design, we have a selection of styling and sizes. The Wide Vue, available in 2.5", 3.5" and 4.5"; single or dual limits. Shadow box optional.

The Space Saver, in 2.5" and 3.5", for vertical or horizontal mounting; single or dual limits.

The method of operation is an optical system, consisting of a miniature light source with a life expectancy of 100,000 hours. Each set pointer is equipped with a photo-electric sensing device. The indicating pointer has a segment which actuates the sensing elements precisely at the control point. They will remain actuated anywhere beyond the set point.

Control is established by means of a transistorized electronic circuit. The transistor amplifier and load relay are continuously energized up to the control point. In the event of power or light failure, the fail-safe circuit will de-energize the relays.

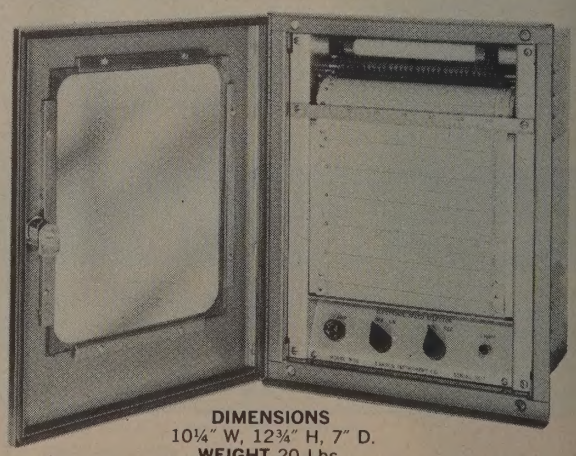
In the Larson Meter Relays, we designed for you, **our** Customer, modern styling, incorporating components obtaining top reliability...to give **your** Customer the best in Quality.

Inkless Event Recorder

The Larson Model ROS instrument will continuously record the time, sequence and duration of as many as 30 different events on one chart. The record is made on electro-sensitive paper, by a stylus which marks only when current flows through the paper. The recording is instantaneous, accurate and permanent.

RESPONSE and **RESOLUTION.** The recorder can remain on stand-by for an unlimited length of time, yet be ready to respond within 1 Millisecond when a signal is applied. The instrument will record up to 60 pulses per second for each stylus. Response time of the styli is 1 Millisecond.

CHART SPEEDS. Are available for ½" per hour to 10" per second. Standard speeds are ½", 1", 2", 3", 4", 6", 8" and 10" per hour, minute or second.

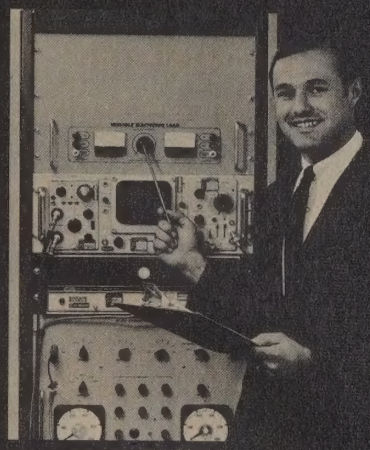


DIMENSIONS
10¼" W, 12¾" H, 7" D.
WEIGHT 20 Lbs.

Larson INSTRUMENT COMPANY, INC.
GREENBUSH RD. • ORANGEBURG, N.Y. 10962 • 914 EL 9-3800

A new concept in
laboratory load simulation.

VARIABLE ELECTRONIC LOAD



- ☐ Instant dial-a-load control.
- ☐ Precision control to ± 10 milliamperes.
- ☐ Static and dynamic load simulation up to 100 watts.
- ☐ Front panel voltage and current readout.
- ☐ Lightweight, compact and portable.
- ☐ Available in rack or bench configuration.
- ☐ Programmable dynamic load.
- ☐ Rapid set up. No decade switching.
- ☐ No Calculations. One front panel control.

IMMEDIATE DELIVERY from stock

ELECTRICAL SPECIFICATIONS:
Power rating—100 watt maximum
Voltage rating—50 volts maximum
Current rating—20 ampere maximum

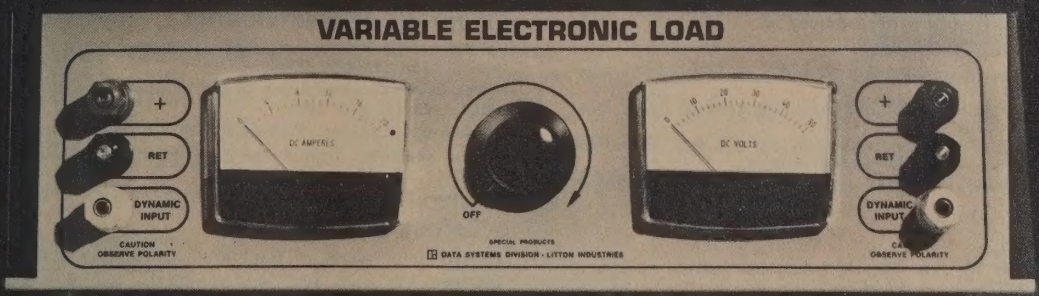
STATIC LOAD (VARIABLE):
DC current load adjusted by the front panel control 0-20 amperes.

DYNAMIC INPUT:
AC current load may be superimposed on DC current load at a ratio of one ampere peak-to-peak load current per one volt peak-to-peak of dynamic input. Modulated with sine wave, sawtooth, square wave or any non-symmetrical wave form, DC to 10 KHz.

POWER REQUIRED:
Four type "C" batteries (provided with unit).

BATTERY CONSERVATION:
VARIABLE ELECTRONIC LOAD unit automatically turns off when equipment under test is disconnected.

MECHANICAL SPECIFICATIONS:
Bench—4.5"H x 15"W x 10"D.
Rack—5.25"H x 19"W x 10.5"D.
Weight—12 pounds.



MODEL 541900 VARIABLE ELECTRONIC LOAD

For additional information, contact direct to:

Marketing Manager
SPECIAL PRODUCTS
DATA SYSTEMS DIVISION
LITTON INDUSTRIES
9001 Fullbright Ave.
Chatsworth, California 91311
Phone: (213) 781-8211
TWX: (910) 495-1708

International Sales Representatives

Litton Precision Products International, Inc.
95 High St.
Slough, Buckinghamshire, England
Phone: Slough 28267

R. F. Russell Associates
R. R. No. 1, Kennedy Rd.
Unionville, Ontario, Canada
Phone: (416) 297-1616

U.S. Sales Representatives

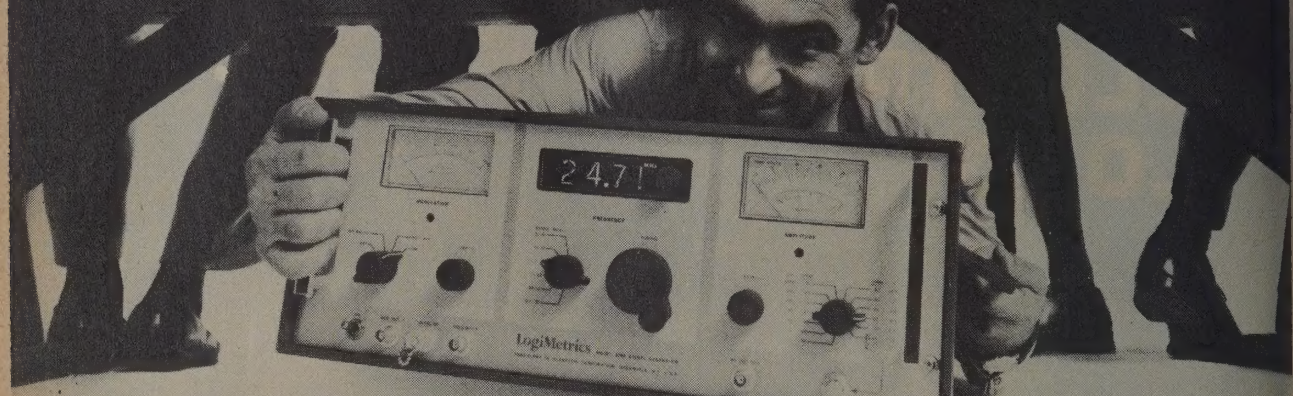
David Sonkin Assoc., Inc.
Ten Fiske Place
Mount Vernon, N.Y. 10550
Phone: (914) 668-9809

Reynolds & Assoc., Inc.
822 E. Strawbridge Ave.
Melbourne, Fla. 32901
Phone: (305) 727-3205

Forsberg Sales
646 Summer St.
Brockton, Mass. 02402
Phone: (617) 522-6300

Litton Data Systems
320 Broad St.
Red Bank, N.J. 07701
Phone: (201) 741-7490

LogiMetrics audaciously introduces the world's most accurate RF signal generator with continuously viewable (non-ambiguous) display.



- **Unprecedented stability and resolution**
- **No separate counter or accessory equipment required**
- **A true combination of improved performance and reduction in cost!**

FOR GENERAL LAB USE

MODEL 920A

100 kHz to 80 MHz, ddc to ±0.006% (60 PPM) accuracy and resolution, with compatible stability. 3 Volts RMS into 50 ohms.

SPECIFICATIONS — MODEL 920A

FREQUENCY CHARACTERISTICS:

Accuracy: The total uncertainty in frequency determination is ±0.006% of full scale, (i.e. ±60 PPM of a 4-digit scale) on all ranges.

Stability: Drift is less than 20 PPM per 10 minute period.

External Frequency Shift: DC coupled frequency control, for phase locking or fine tuning.

Display: Four decimal digit visual display plus overrange.

AMPLITUDE MODULATION CHARACTERISTICS

Internal: 400 Hz and 1000 Hz (±5%). Continuously variable 0 to 95%.

External: DC to 20 kHz depending upon carrier frequency.

External Mod Input: 3 Volts RMS into 600 ohms.

Modulation linearity: Less than 1% distortion for 30% modulation and less than 3% distortion for 70% modulation.

RF OUTPUT CHARACTERISTICS

Voltage Level: Continuously adjustable from 0.1 uV to 3.0 Volts RMS into 50 ohm resistive load.

Power Level: Corresponding to CW or peak of modulated signal level range; −127 to +23 dBm.

Impedance: 50 ohms, SWR less than 1.05 on 0.3 volt attenuator range and below, less than 1.2 on higher ranges.

Output Levelling: Output Level variation with frequency change is less than ±½ dB.

Accuracy: Better than ±1.0 dB.

SPURIOUS SIGNALS

RF Harmonic Output: At least 30 dB below the carrier at output levels of 1 volt or below.

Spurious AM: Hum and noise sidebands are at least 70 dB below carrier down to thermal noise threshold of 50 ohm system.

Residual FM: Typically less than ±1 PPM.

Incidental FM With 30% AM: Less than ±1 PPM.

RFI and Leakage: Permits receiver sensitivity measurements to 0.1 uV.

PHYSICAL CHARACTERISTICS

Cabinet: 7¾″ H x 19¾″ W x 18″ D.

PRICE: $1,975.00.

FOR PRODUCTION TEST USE

MODEL 910A

100 kHz to 32 MHz, ddc to ±0.006% (60 PPM) accuracy and resolution, with compatible stability. Lowest-priced ddc design.

SPECIFICATIONS — MODEL 910A

FREQUENCY CHARACTERISTICS:

Display: Four decimal digit visual display plus overrange.

Accuracy: The total uncertainty in frequency determination is ±0.006% of full scale, (i.e. ±60 PPM of a 4-digit scale) on all ranges.

Stability: Drift is less than 20 PPM per 10 minute period.

AMPLITUDE MODULATION CHARACTERISTICS

Internal: 400 Hz and 1000 Hz (±5%). Continuously variable 0 to 95%.

Modulation Linearity: Less than 1% distortion for 30% modulation and less than 3% distortion for 70% modulation.

RF OUTPUT CHARACTERISTICS

Voltage Level: Continuously adjustable from 0.1 mV to 1.0 Volts RMS into 50 ohm resistive load.

Power Level: Corresponding to CW or peak of modulated signal level range; −65 to +13 dBm.

Impedance: 50 ohms, SWR less than 1.2 on all ranges.

Output Levelling: Output Level variation with frequency change is less than ±1 dB.

Accuracy: Output accuracy better than ±1.5 dB at any frequency.

SPURIOUS SIGNALS

RF Harmonic Output: At least 30 db below the carrier.

Spurious AM: Hum and noise sidebands are at least 70 db below carrier down to thermal noise threshold of 50 ohm system.

Residual FM: Typically less than ±1 PPM.

Incidental FM With 30% AM: Less than ±1 PPM.

RFI and Leakage: Permits receiver sensitivity measurements to 0.1 uV.

PHYSICAL CHARACTERISTICS

Cabinet: 7¾″ H x 19¾″ W x 18″ D.

PRICE: $1,475.00.

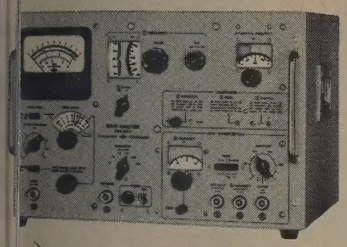
CUSTOM DESIGN OF SIGNAL GENERATORS THAT COUNT: 1. MILITARIZED 2. FM/AM 3. SPECIAL PURPOSE

we're audacious because we're right

LogiMetrics INC.
A Subsidiary of Slant/Fin Corp
100 Forest Drive, Greenvale, New York 11548
Phone: (516) 484-2222

TEST EQUIPMENT by RADIOMETER COPENHAGEN

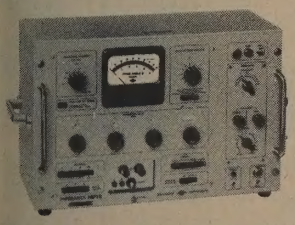
Audio Frequency



WVE ANALYZER, FRA3 — Frequency Cov-erge: 10 Hz to 60 kHz. Six Band widths: ±1, 6, 12, 25, 50 and 100 Hz. Sensitivity 30μV to 300V f.s. Distortion, noise and hum: in the order of —100 db. Recorder output. Internal BFO and Superposition Amplifier for Intermodulation Measurements.

DISTORTION METER, BKF6 — Ranges from 0.1 to 100% f.s. Sensitivity 100 mV to 3V f.s. True r.m.s. detection. High pass and low pass filters. Push button operation, low internal distortion, hum and noise.

WIDE RANGE SINE-SQUARE WAVE GENERATOR, RCO11 — 10 Hz to 1MHz in 5 ranges. Metered Outputs: Sine wave; 50Ω and 600Ω (0.1 mV to 1 Vrms-monitored) and direct at approx. 10Ω (0 to 5V) Square wave; 50Ω and 600Ω (0.1 mV to 1 peak to peak-monitored) 50 ns rise time.

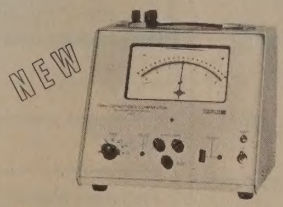


VECTOR IMPEDANCE METER, GB11 — Accurate measurements of magnitude and phase angle of capacitive or inductive impedances from 1 ohm to 1.1 megohm. Frequency range 25 Hz to 1 MHz. Option for d-c polarization. Phase angle from 0 to ±90°.

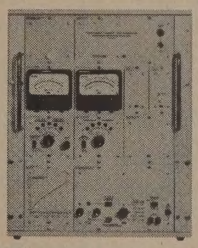
Component

R-L-C METER, MM2 — Wide range, direct reading measurements of Resistance: 0.1Ω to 1MΩ, Inductance: 3 μH to 100 H., Capacitance: 3 pF to 5000 μF, five test frequencies from 160 Hz to 1.6 MHz., DC bias input to ±60V. Recorder output. Low voltage test signals from 160 Hz to 1.6 MHz.

R-L-C COMPONENT COMPARATOR, TRB11 — Manual or automatic comparison of magnitude and phase angle at 1 KHz. 10Ω to 10MΩ, 1 mH to 10 H., 200 pF to 20 μF. Magnitude Deviation: ±1.5 to 100% f.s. Phase angle deviation: ±.015 to 0.6 radian f.s. Shown with component jig KPH1 and Limit Sensor LMS1.

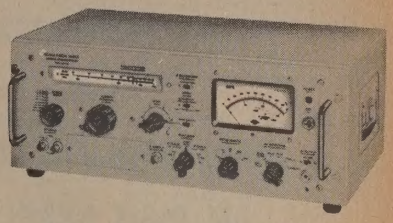


CAPACITANCE COMPARATOR, CMB12 — For manual or automatic check of capacitance directly or against a standard. 7 ranges from ±1 to ±1000 pF f.s. Test frequency 1 MHz. Ext. bias to ±60V.

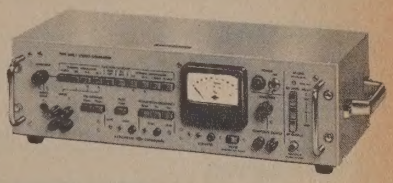


COMPONENT LINEARITY TEST EQUIPMENT, CLT1 — Fast, nondestructive RELIABILITY TEST METHOD for detecting latent defects in resistors, capacitors and other components. May be used on laboratory basis or on-line for automatic check of up to 10 components per second. High sensitivity — Interference free. Impedance range: 0.01Ω to 100MΩ, 10kHz Test Signal.

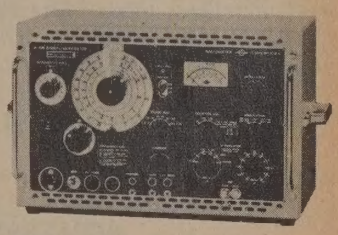
Radio Frequency



AM/FM MODULATION METER, AFM2 — Frequency range: 5MHz to 1002MHz. AM: 3% to 100% f.s. FM: ±3kHz to ±300kHz. High sensitivity: 3mV to 10V input at 50Ω. Mod. Freq. Response: 10kHz to 200kHz. Automatic level control. L/R separation better than 46 d.b. Distortion less than 0.2%.



STEREO GENERATOR AND MODULATOR, SMG1 — Both Composite and RF Outputs (100MHz). Exceptionally stable stereo signal in accordance with FCC standards. SCA modulation with FM sub-carriers. Multiple Modulation Frequencies.



FM/AM SIGNAL GENERATOR, MS27 — Wide Range: 0.3 to 240MHz in 5 ranges. 0.5% accuracy with crystal calibration. Int. or ext. mod: to ±75kHz FM and 80% AM. Low distortion: ±50kHz incremental frequency for narrow band applications.

GALVONOMETER, MULTIMETER, GMV30 — High sensitivity measurements, Current: 30 pA to 300 μ A.f.s. Voltage: 1mV to 300 V.f.s. Resistance: 1 kΩ to 300 MΩ f.s. Battery operated; differential inputs.

Specifications subject to change without notice. Detailed literature and demonstrations available on request.

THE LONDON COMPANY 811 Sharon Drive • Cleveland, Ohio 44145 Telephone (216) 871-8900

London

In Canada: Bach-Simpson Ltd., Ontario

Lorch-adret

PROGRAMMABLE SYNTHESIZERS DC VOLTAGE STANDARDS

PROGRAMMABLE DC VOLTAGE STANDARD

Model 102

with

HIGH ABSOLUTE ACCURACY

SIX DIGIT RESOLUTION

HIGH SPEED PROGRAMMING

SWITCHES OPERATE AT 5K OHMS
No Switch Cleaning Required

Output Voltage

10 volt range: 10 microvolts to 9.99999 volts in 10 microvolt steps
100 volt range: 100 microvolts to 99.9999 volts in 100 microvolt steps

Output Current
0 to 50 ma for any setting on 10 or 100 volt range

Absolute Accuracy
10 volt range: ±(0.003% of setting +100 microvolts)
100 volt range: ±(0.005% of setting +1 millivolt)
From 20° to 30°C and for a ±10% line voltage variation

Stability 7 days
10 volt range: ±(0.001% of setting +30 microvolts)
100 volt range: ±(0.0013% of setting +300 microvolts)

Noise
10 volt range: less than 25 microvolts rms
100 volt range: less than 250 microvolts rms

ACCESSORIES

Remote Digital Readout
Operates with main unit in local or remote program mode.

Remote Programmer
Voltages or Frequencies may be preset on eight rows of manual switches. Any preset program may be selected by a front panel push button or a single contact closure. Remote programmers may be cascaded.

Programmable Attenuator
0 to 99 db in 1 db steps; DC to 60 MHz; may be controlled by front panel decade switch, remote BCD program or remote programmer accessory.

Harmonic Generator
Generates a comb of frequencies to 100 MHz precisely derived from the synthesizer.

100:1 Precision Divider
Provides a 0.1 volt range on Model 102 DC standard.

IRIG Programmers for Telemetry and FM Tape Systems
These devices generate BCD signals which program Model 201 Synthesizer to frequencies covering all telemetry channels (both constant bandwidth and proportional bandwidth). Other programmers set FM tape system center frequencies and 20 frequencies across the band in accord with IRIG standards.

60MHz, 2MHz, 100KHz and 1KHz

PROGRAMMABLE SYNTHESIZERS

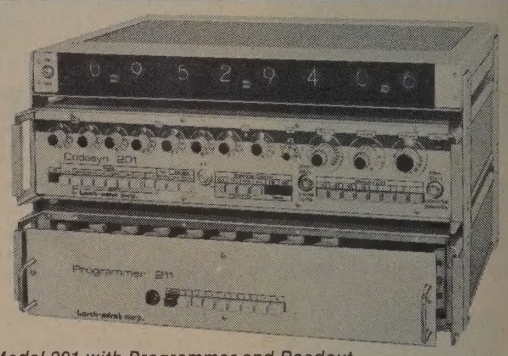
with

SIGNAL GENERATOR VERSATILITY

PROGRAMMABLE PHASE

SWEEP CAPABILITY

MANY USEFUL ACCESSORIES



Model 201 with Programmer and Readout.

SPECIFICATIONS

Model	301 100 KHz	201 2 MHz	202 60 MHz
Frequency Stability	3×10^{-5}/ week	1×10^{-7}/ day (2×10^{-9}/ day optional)	
Digital Decades	4	8	8
Resolution (with vernier)	0.1 Hz	0.001 Hz	0.001 Hz
Modulation AM	none	0 – 100%	0 – 90%
Deviation FM	100 KHz (external only)	2 MHz	10 MHz
Sweep Range	100 KHz	2 MHz	12 MHz
Output Level	+21 dbm	+13 dbm	+13 dbm
Attenuator	continuous	0 – 100 db	0 – 60 db
Spurious Output (nonharmonic)	– 60 db	– 70 db	– 80 db
Signal to Phase Noise	60 db	70 db	*
Rack Panel Height	3½″ (½ rack)	3½″	5¼″
Price	$2150.00	$3800.00	$6300.00

* Noise level below carrier at 1 Hz bandwidth, beginning 100 Hz from center frequency: > 100 db.

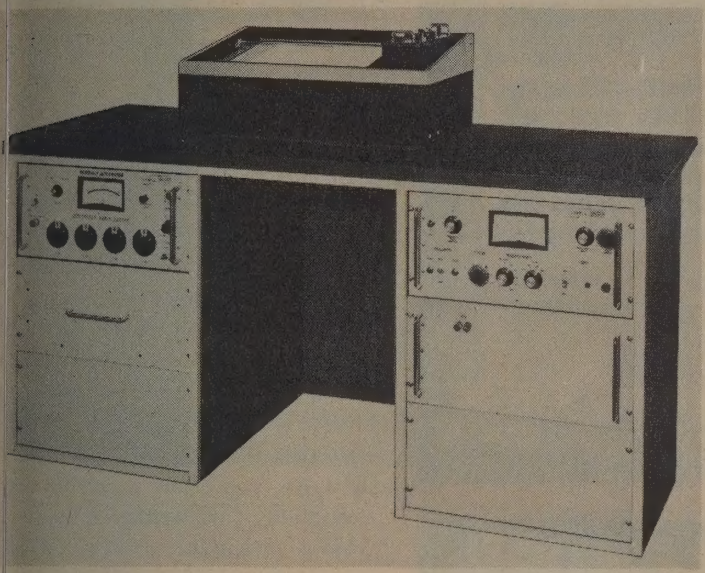
Model 303 features DIGITALLY PROGRAMMABLE PHASE in 1° steps (0.1° accuracy). Frequency range 0 to 1 KHz.

Lorch-adret corp.

105 Cedar Lane, Englewood, N. J. 07631 • 201-569-8282 • TWX: 710-991-9718

MODEL V ALL-ELECTRONIC D.C. HYSTERESIGRAPH

by Lowell Electronics Corporation



The Model V Electronic DC Hysteresigraph replaces several laboratory pieces of equipment used in the point by point method of generating hysteresis curves. Traditionally the H axis is obtained by employing batteries, ammeter, rheostat, ballistic galvanometer and a reversing switch.

The operator is faced with the compound problem of monitoring power supply drift and balancing a ballistic galvanometer while reading flux and current.

The Model V DC Hysteresigraph does all this automatically by plotting a continuous B-H curve.

Operator time is decreased to approximately 20 seconds per curve and an infinite number of points plotted. No important data is overlooked or missed. Both major and minor loops may be programmed at will.

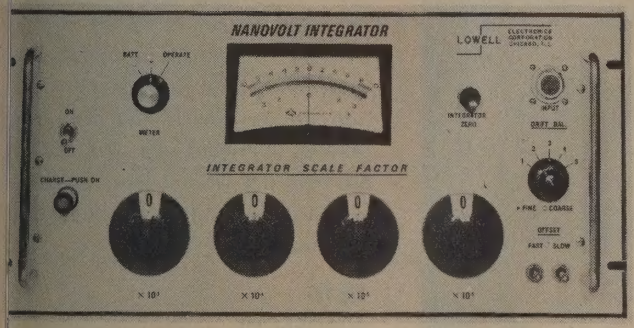
Driving samples to zero flux is insured by automatic recycle control so that initial permeability curves may be plotted.

The Hysteresigraph automatically does the following:

- Draws the positive half of the loop.
- Reverses the field when the preselected value of magnetization is reached.
- Draws the negative half of the loop and reverses direction of the field again when the desired value is reached.
- Initiates another reversal of field and completes the positive half of the loop.
- Lifts the pen from the recorder and turns off the current source.

Other programs are possible by manipulating front panel controls.

E AXIS CONTROLS



tegrating Fluxmeter—search coil employed in a Miller Integrator Circuit

curacy—0.05% or better

ability—3% of display at ±100 Maxwell turns for one minute or better allows practical measurements as low as 10 Maxwell turns

nsitivity—Scaled by operator. Displays of 10 Maxwell Turns per inch readily obtainable

he Nanovolt integrator is also sold as a separate unit

put Impedance—essentially infinite

utput —5 to +5 volts at 5 ma

EMANENCE TEST SET

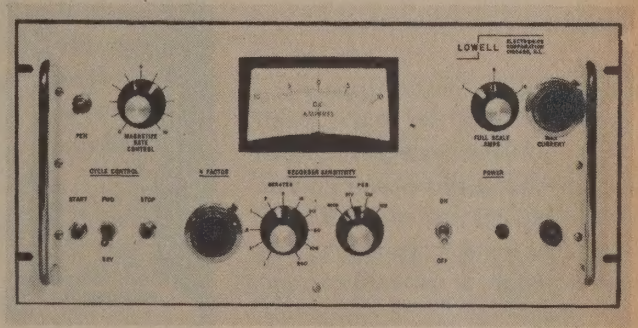
perator positions piece part in solenoid, presses button, activating rogrammed power supply, and withdraws piecepart at end of program signal and reads remanence flux on digital display.

agnetizing force up to 1000 Oersteds with flux sensitivities to 5 Maxwells.

pecial as well as stock fixtures available.

pecial magnetic system designed to your requirements.

H AXIS CONTROLS



Power Supply—Programmed −10 to +10 Amps, current regulated, 1 KW max, short circuit proof.

CONTROLS

Max current—Adjusts power supply output from 2 ma to 10 amps

Full scale amps—Meter scale selector

Magnetize rate control—Adjustable from 0 to 1 amp per second

Recorder Sensitivity—K factor control sets recorder to display 0 to 10^5 oersteds per division. Continuously variable with .1% calibrated multipliers

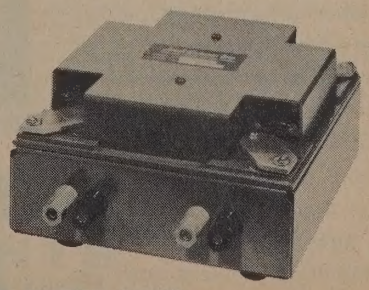
Forward-Reverse—Permits initial magnetization in positive or negative mode changes sweep direction without changing polarity

Size—Instrument is 30″ high x 60″ wide x 30″ deep in a steel frame desk. A handy storage drawer is supplied. The top is walnut grain formica

Recorder x-y type 11″ x 17″ display

MAGNETICS TEST FIXTURES

Typical one shown below—ask for information.



MODIFIED EPSTEIN FRAME

Sample size—2 cm wide x 13 cm long x .03 cm
K-Factor—5.024

LOWELL ELECTRONICS CORP.
9100 TERMINAL AVENUE
SKOKIE, ILLINOIS 60076
312/965-6500

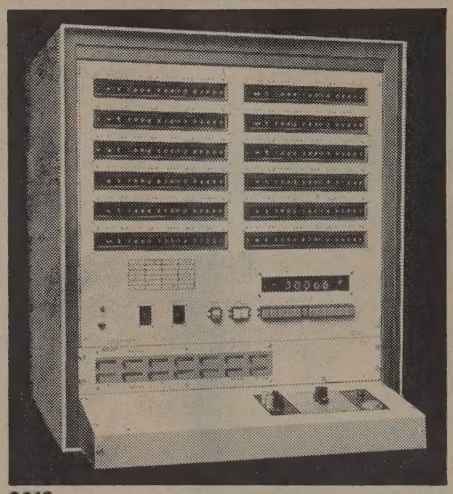
MASTECH DIRECT READING TRANSISTOR / DIODE TEST SETS

FEATURES

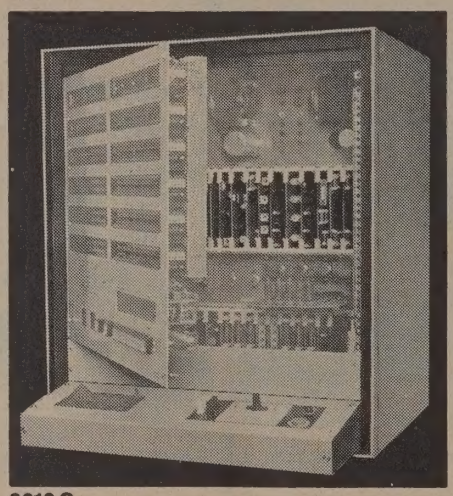
- **High Speed testing**
- **Quickly programmed**
- **Direct digital readings**
- **Gated power supplies**
- **Test results memory**
- **Twelve test positions**
- **Wide operating range**
- **Swing-out front panel for easy accessibility**
- **Removable PC card assemblies**
- **Provision for custom modification**
- **Sloping desk-type extension for operating facility**
- **Any combination or sequence of tests**

Description The Mastech transistor/diode test sets are high speed sequential limit testers which perform all of the common transistor and diode tests such as breakdown or reverse voltage, sustaining voltage, leakage or reverse current, saturation voltage, forward voltage, DC beta and small signal AC beta. All DC tests are made as pulse tests at low duty cycles whenever the operating current is programmed over ten milliamperes. All tests can be made in any desired combination or sequence. The standard models are programmed by means of thumbwheel digit switches.

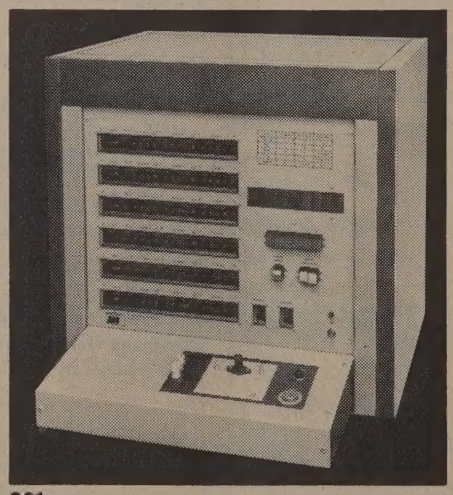
The differences between the various standard models are the number of test positions, the direct readout mode of operation, the voltage and current range and the type selection programming. In addition special sets are available. These include sets designed for testing SCR's, UJT and FET transistors and other discrete semiconductor devices. Test sets can also be supplied with other types of programming devices such as card readers and core memory storage.



2610



2610 C



201

Models Available The two basic test sets are the Model 2610 and the Model 2900 each of which are twelve test position limit testers with a maximum voltage and current range of 300 volts and one ampere. The Model 2610 has the direct readout mode of operation whereas the Model 2900 does not. The voltage and current range can be extended on these two basic models to 600 volts and 10 amperes ("B" postscript) or 1000 volts and 20 amperes ("D" postscript). Each set can also be supplied with a type selection programming capability ("C" postscript) which is useful whenever a lot of devices are to be segregated into appropriate classifications according to the tests passed or failed. Test sets with six test positions (Model 2611 and 2911) and a single test position (Model 2901) are also available as standard sets. These standard sets are priced from $8,500 to $17,000 depending on the model selected.

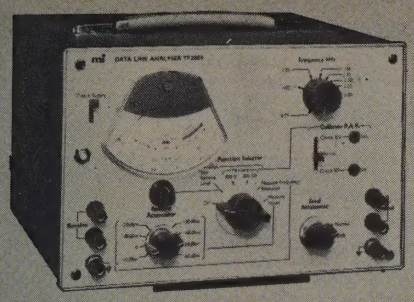
NEW!
MODEL 201

Model 201 has been designed for low to moderate volume users of semiconductor devices for incoming test and inspection. This set is an economy version of the Model 2611 featuring the direct readout mode of operation, six test positions and a 250 volt, 1 ampere operating range. Model 201 performs all of the transistor and diode DC tests in any desired combination and sequence. Small signal AC beta is an optional test (Model 201A). Digit switch programming is used in the standard set but a card reader programmer can also be supplied. Model 201 is priced at $7,200.

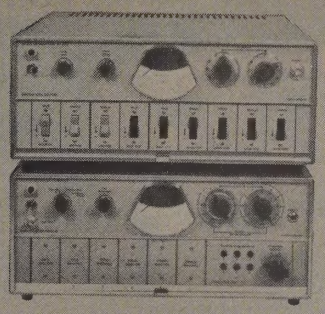
MASTECH INC.

PICKARD BLDG.
E. MOLLOY RD.
P. O. BOX 178
SYRACUSE, N. Y.
315 (455-6662)

Write or phone for additional information



MODEL 2809 DATA LINE ANALYZER — A self contained test set for assessment of overall distortion produced by communication links, it is useful for testing the suitability of voice band transmission systems and microwave links — for data transmission. Three types of measurement can be made, peak-to-average rating (PAR), frequency response and system noise level (a special circuit is incorporated to correct for the effects of phase intercept distortion.)



MODEL 2090B NOISE LOADING TEST SET — This new unit measures Noise Power Ratio directly in db and picowatts. A standardizing noise generator is built into the receiver to facilitate out of — band measurements. Band limiting and slot filters for all CCIR/CCITT and D.C.A. recommendations. Special frequencies to order.

INTERMODULATION AND BASEBAND TEST GEAR

ESCRIPTION	FREQUENCY	FEATURES
OISE LOADING TEST SET RANSISTORIZED 625-670-0146) N/GSM 161) odel 2090A	12KHz to 12.388MHz (i.e. up to 2700 channels)	Solid state unit has built-in standardizing noise source in receiver for gain setting, out-of-band testing, etc. Includes noise generator, receiver and a choice of many different filters. NPR measurements can be made up to 75 db.
OISE LOADING EST SET odel 2090B	12KHz to 12.360MHz	Designed to meet latest CCIR and CCITT requirements (Recommendation 399-1 Oslo 1966). Operation similar to model 2090A.
WELVE CHANNEL OISE GENERATOR 625-948-4724) odel TM7816	300Hz to 3400Hz	Generates twelve non-related channels of Gaussian noise from twelve separate solid state sources. Output: each channel 1mW in 600Ω balanced, 300Hz to 3400Hz. Attenuation to −32 dbm in 2 db steps. Spurious noise in OFF channel (all other channels ON) is less than 10 dba (−75 dbm FIA weighted).
ATA LINE NALYZER odel 2809		Used for testing data transmission lines and links; measures peak-to-average rating (PAR) frequency response and system noise level. Has correction for phase-intercept distortion.
WO-TONE SIGNAL OURCE odel 2005	20Hz to 20KHz	Two continuously variable solid state oscillators 0.1% harmonic distortion, intermodulation −80 db, hum −80 db, monitored 111 db attenuator with balanced and unbalanced outputs. Recommended for SMPTE and CCIF two-tone testing.
ELECTIVE VOLTMETER odel 2330 625-168-0955)	20Hz to 50KHz	3 db bandwidth 6Hz; rejection ratio 65 db at 40Hz off tune. Sensitivity 30μv to 300 volts full scale. BFO output tracked in frequency and flat to 0.1 db. Includes RF detector for AM demodulation.
OLID STATE ISTORTION FACTOR ETER odel 2331	20Hz to 20KHz Fundamental 20Hz to 100KHz Max. Bandwidth	All transistorized unit measures distortion factor 0.05% to 100% in seven ranges from 0.1% to 100% f.s.d. Noise measurement to 100% in similar ranges. Switch bandwidth 100KHz or 20KHz with filters to give HF cut above 20KHz, LF cut below 400Hz and CCIF weighting characteristics. Voltage measurement 20Hz to 100KHz in ten ranges between 1mv and 30v f.s.d.

RECEIVERS FM/AM/CW/SSB

DDYSTONE odel 850/4	10KHz to 600KHz	11 tube superheterodyne with top performance throughout VLF and LF bands. Three selectivities, 100Hz to 6KHz; 75 db image rejection. Has facility for eight xtal controlled spot frequencies.
DDYSTONE odel 958	10KHz to 30MHz	High stability AM/SSB receiver with FET front end. Drift cancelling loop above 1.6MHz gives stability better than 20Hz. Blocking and adjacent signal interference exceptionally low; front end protected against high voltage at antenna input.
DDYSTONE odel 990R	27MHz to 240MHz	All solid state four range single conversion receiver for AM/FM. Two bandwidths of 30KHz and 125KHz. Local oscillator may be xtal locked to any of 8 internal customer selected crystals.
DDYSTONE odel 990S	230MHz to 870MHz	Transistorized two range single conversion receiver for AM/FM. Bandwidth variable 6MHz an 1MHz. FM discriminator deviation to 250KHz.
NORAMIC SPLAY UNIT odel 961	50KHz to 60MHz	3 models (/A — 50KHz to 800KHz; /B — 500KHz to 36.5MHz; /C — 36MHz to 60MHz) can be used separately or in conjunction with Eddystone Receivers. Sensitivity: /A 10μv/cm; /B and /C 20μv/cm. Calibration markers and pen recorder output; log/lin display, variable sweep speed or manual.

mi MARCONI INSTRUMENTS
DIVISION OF ENGLISH ELECTRIC CORPORATION

111 CEDAR LANE ☐ ENGLEWOOD, NEW JERSEY 07631
TELEPHONE: (201) 567-0607

SWEEP GENERATORS & OSCILLATORS

DESCRIPTION	FREQUENCY	FEATURES
VIDEO AND UHF SWEEPER Model 2361		Main sweep unit has internal rep. rate 0.01Hz to 100Hz with linear, semi log, CW, single shot and manual modes. TV field lock, blanking and phase shift controls and alternate trace separation.
VIDEO PLUG-IN Model 9692	25KHz to 30MHz	Sweep width variable 0 to 30MHz, detected system flatness +0.05 db harmonic and spurious 40 db down. 1MHz and 5MHz markers.
UHF PLUG-IN Model TM9693	1MHz to 300MHz	Sweep width variable 0 to 300MHz, flatness ±0.25 db, harmonic and spurious 40 db down, 1, 10 and 100MHz markers.
AF OSCILLATOR Model 2102M	3Hz to 30KHz	A solid state oscillator capable of delivering up to 10 volts into 600 ohms (20 volts open circuit). Has complete freedom from "amplitude bounce" when rapid frequency changes are made. Drift 0.02% per 15 minutes. Distortion 1%.
WIDE RANGE OSCILLATOR Model 2103	10Hz to 1MHz	Sine wave or square wave output 0 to 2.5 volts RMS continuously variable with 4 step attenuator. Sine wave distortion less than 0.5% 50Hz to 10KHz.
MICROWAVE OSCILLATOR Model 6058	7.0 to 12.5GHz	Direct digital readout of frequency, accuracy ±1% resettability ±0.1%. Output power 5mw. Internal square wave mod, external PIN diode.
GUNN DIODE OSCILLATOR Model 6061	8.0 to 10.5 GHz	Micrometer head tuning, 5mv output other types for system use available on request.

FM DEVIATION METERS

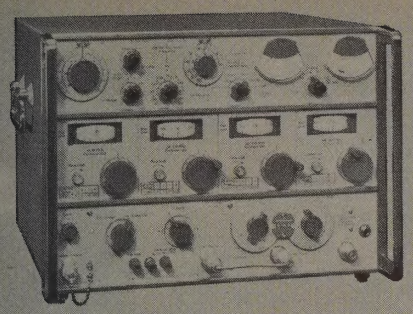
FM DEVIATION METER (6625-060-3320) Model 791D	4MHz to 1024MHz	Deviation ranges, ±5, ±25, ±75 and ±125KHz full scale. Accuracy 3%. Crystal standardized. Local oscillator can be xtal controlled for measuring deviations down to 10Hz.
FM DEVIATION/ AM MODULATION METER Model 2300	4MHz to 1000MHz to 2500MHz using ext. oscillator	Wide range, mod. freq. up to 200KHz; deviation ranges ±5, ±15, ±50, ±150, ±500KHz. Local oscillator can be xtal locked, external oscillator can be used. De-emphasis 50μsec. 75μsec. switch selected. FM accuracy ±3% for deviation up to ±500KHz f_m 30Hz to 150KHz. AM modulation two ranges 30% and 100% mod. freqs. 30Hz to 50KHz (carrier 4 to 350MHz).
WIDE BAND FM DEVIATION METER Model 2300/6	20MHz to 1000MHz to 2500MHz using ext. oscillator	Deviation Ranges: ±10, ±30, ±100, ±300, ±1000KHz. Accuracy better than 5%, crystal standardized, f_m 30Hz to 150KHz.

BRIDGES AND Q METERS

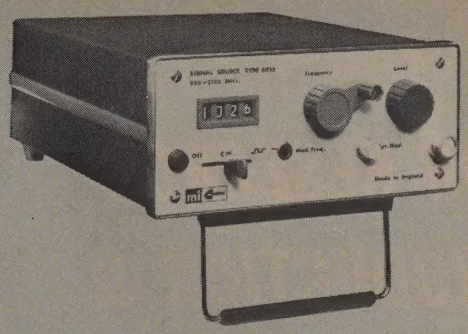
UNIVERSAL BRIDGE Model 1313A	1KHz and 10KHz 20Hz to 20KHz External	0.1μh to 110h, 0.1pf to 100μf, 0.003Ω to 110MΩ. Accuracy 0.1%. Built-in osc. and det. Direct reading; simplest possible operation. Uses adapter TM6113 for biasing inductors to 200ma.
PORTABLE UNIVERSAL BRIDGE Model 2700	1KHz internal 20Hz to 20KHz External	0.2μh to 110h, 0.5pf to 1100μf, 0.01Ω to 11MΩ. Accuracy 1%. Transistorized, simple. Measures incremental L, electrolytics & non-linear resistance using external bias supplies.
Q METER Model 1245A	1KHz to 300MHz	Q ranges 5 to 1000, △Q 25-0-25. Accuracy 5% to 100MHz, 20% to 300MHz. Calibrated capacitor 7.5 to 500pf, △C ranges ±1 and ±5pf. Extremely stable and easy to operate. Uses separate oscillators—see below. Dielectric and Series Loss Test Jigs available. Also HF & LF inductors.
POWER OSCILLATOR Model 1246	40KHz to 50MHz	For driving 1245A Q Meter, or 4v across 50Ω for general lab use.
POWER OSCILLATOR Model 1247	20MHz to 300MHz	For driving 1245A Q Meter, or 4v across 50Ω for general lab use.

TELEVISION TEST EQUIPMENT

SINE² PULSE AND BAR GENERATOR Model 2905/5		Sine² pulse and bar generator for 525 line systems includes monochrome pulse and bar T/2, T and 2T. Also 10T and 20T with color burst, color sine² pulse and bar and sub-carrier added to staircase or sawtooth. External sub-carrier may be used.
SINE² PULSE AND BAR GENERATOR Model 2905/9		For accurate K factor measurement provides T, 2T, 5T, 10T, and 20T sine² pulse 25μsec bar, adjustable luminance/chrominance amplitude and delay, color burst pedestal, asynchronous square wave, 0.05 volt 52μsec set up. Includes inverted sine² pulse for checking quadrature distortion.
LUMINANCE/CHROMINANCE GAIN & DELAY TEST SET Model TF2904/1		Measures gain and delay inequality with gain discrimination 0.5 db, delay discrimination 2 nanoseconds, visible display of misalignment with scope.
TV SIDEBAND ANALYZER Model TF2360	100KHz to 20MHz 30MHz to 90MHz 170MHz to 230MHz 470MHz to 960MHz	Provides a symmetrical or asymmetrical swept video signal for testing video amplifiers or transmitters using 625, 525 or 405 line systems, positive or negative modulation.
BLANKING AND SYNC MIXER Model TF2908		Reshapes blanking and sync pulses and mixes with video waveform (sine² pulse and bar, sweep, sawtooth, etc.). Permits sweep measurement with clamps or dc restoring circuits in normal operation. Output flat 0.2 db to 10MHz, 0.3 db to 20MHz.
GRAY SCALE GENERATOR Model 2909/1		For linearity measurements on color and monochrome systems. 5, 7 or 10 stai step or sawtooth with line sync. selectable every first, fourth or fifth line. Colo sub carrier can be added to steps. Features automatic switching between blaci and white levels. Contains line frequency xtal or may be triggered from externa VIT unit.



MODEL 2006 SOLID STATE PRECISION SIG. GEN. — All solid state unit in which each frequency range is covered by separate fundamental RF oscillator unit. Generators will accept any 4 of 5 available units. Features very low microphony 12KHz deviation under ½ G acceleration. Low noise pure spectrum typically 12Hz telephone weighted, 40Hz flat over entire range.



MODEL 6055 SOLID STATE SIG. SOURCE — All solid state microwave signal source operates on fundamentals 850MHz to 2150MHz with digital frequency readout. Unwanted harmonics are −25 db; spurious unrelated components −35 db. Resettability 0.1%; square wave AM. FM to special order.

FM/AM SIGNAL GENERATORS

SCRIPTION	FREQUENCY	FEATURES
M SIG. GEN. (525-900-1016) odel 144H/4	10KHz to 72 MHz	0.2μv to 2v ±0.5 db, 50Ω. Also max. direct output 2.75v, xtal check, 400KHz and 2MHz. Stability 0.002%/10 min. internal AM to 80% at 400Hz and 1KHz. Also external AM.
M/AM SIG. GEN. odel 2002AS	10KHz to 72 MHz	0.1μv to 1v ±1 db, fully solid state, AM variable to 100%, FM deviation ±1KHz to ±50KHz max. dependent upon range. Incremental frequency controls with discrimination of 0.025% of carrier frequency and direct readout in KHz. Xtal calibrator 1MHz, 100KHz, 10KHz. Drift less than 30 ppm/15 minutes after warm-up. External frequency shift permits phase mod. or phase locking. For specifications of TF2116 Synchronizer, see below.
EQ. CONTROL UNIT odel 2166		For use with Signal Generator 2002AS. Unit locks up the frequency to a crystal, internal or external, or another signal generator. Variable offset up to ±50KHz enables units to simulate SSB signal.
M/AM SIG. GEN. (525-913-7223) odel 995B/Series	200 KHz to 220 MHz	0.1μv to 100mv. Calibrated, △F. Step attenuator, Crystal standardized; extremely stable. Deviation ±600KHz on top bands. Has simultaneous FM & AM. Special high sensitivity external FM mod. position with frequency/phase response suitable for stereo modulation. Also available for narrow band working FM spurious less than 25Hz. Model 995B/5.
OBILE RADIO EST SET odel 2905	Low and High Band	Test set comprises an FM/AM Signal Generator covering low and high bands, FM/AM modulation meter with demodulated output, RF power meter terminated and through line with forward and reflected power, 1KHz audio oscillator and AF voltmeter.
M SIG. GEN. (625-929-4277) odel 1066B/1	10MHz to 470 MHz	0.1μv to 100mv. 50Ω, FM at 1KHz and 5KHz internal, deviation to ±100KHz, △F to ±100KHz, both meter monitored. Stability .0025% 10 min. Rack mounted available.
M SIG. GEN. (625-937-2801) odel 1066B/6	10MHz to 470 MHz	0.1μv to 100mv into 50Ω. FM modulation at 1KHz and 5KHz internal or 30Hz to 100KHz external. Deviations to 100KHz, 10MHz to 50 MHz, ±400KHz, 50MHz to 270MHz and ±300KHz. 270MHz to 470MHz. Modulation distortion 5% over telemetering band 215MHz to 265MHz, AM or FM less than 5% at max. deviation. Crystal calibrator gives check points at 1MHz and 10MHz.
OW NOISE M SIGNAL GENERATOR odel 2012	400MHz to 520MHz	Highly stable low noise unit for testing UHF narrow band mobile receivers. Rejection ratios exceeding 90 db at 20KHz from mid band can be measured. Output level 0.01μv to 100mv into 50 ohm. FM deviation variable to ±30KHz f_m 300Hz to 3KHz.
OLID STATE RECISION FM IGNAL GENERATOR odel 2006	4MHz to 1000MHz	Solid state precision FM unit accepts any 4 of 5 oscillators with bands 4 to 10MHz; 10 to 90MHz; 88 to 220MHz, 215 to 500MHz and 440 to 1000MHz. Stability 15ppm +1.5KHz per 15 minutes. Xtal calibrator, 10MHz, 1MHz, 100KHz. Output 0.1μv to 100mv into 50Ω. FM ±100KHz to ±300KHz max. dependent on frequency. Mod. frequencies 20Hz to 125KHz from internal tunable oscillator or external source.
OLID STATE SIG. OURCE odel 6055	850MHz to 2150MHz	Digital readout continuously tunable solid state microwave source. Scale accuracy 1%, residual FM 1ppm, harmonics 25 db down, output 30mW into 50Ω max. AM (square wave) 900Hz to 1.1KHz. FM model to special order.

mi MARCONI INSTRUMENTS
DIVISION OF ENGLISH ELECTRIC CORPORATION
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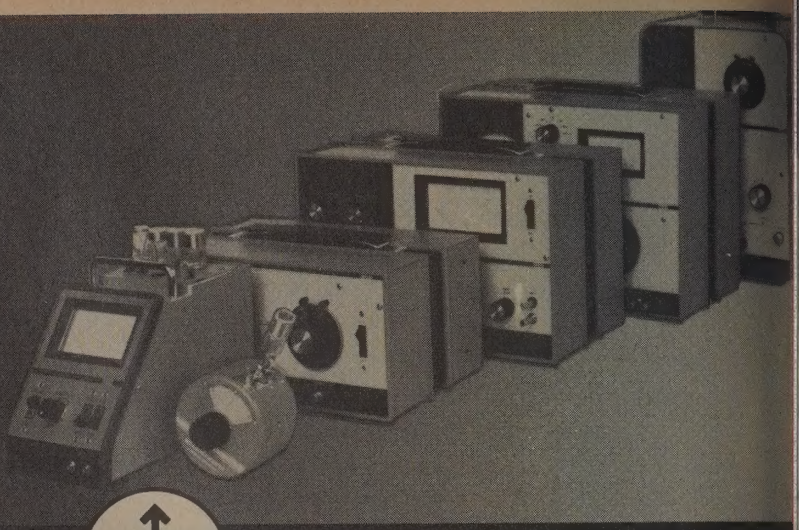
INSTRUMENTS FOR RESEARCH PRODUCTION & SERVICE



Laboratory *Standards*

Standard Signal Generators, Standard Frequency Meters, Megacycle (Grid-dip) Meters, Standard Frequency Synthesizers, Square Wave and Pulse Generators, Vacuum Tube Voltmeters, Standard Bolometer Bridges, Crystal Calibrators, Standard Deviation Meters, Amplitude Modulators, Intermodulation Meters, I-F Converters

SIGNAL GENERATORS

MODEL		FREQUENCY RANGE
65B	AM	75 kHz to 30 MHz
80	AM	2 MHz to 400 MHz
80-R	AM	5 MHz to 475 MHz
82	AM	20 Hz to 50 MHz
95	FM	50 MHz to 400 MHz
180	AM	2 MHz to 400 MHz
180 R	AM	5 MHz to 475 MHz
188	FM	86 MHz to 108 MHz
189	FM	86 MHz to 108 MHz, 10.7 MHz
800	FM	Mobile Bands
801	FM	Mobile Bands
802	FM	Mobile Bands
840	FM	400 MHz to 1000 MHz

CALIBRATORS

MODEL	FREQUENCY RANGE
111	250 kHz to 1000 MHz
111 B	100 kHz to 1000 MHz
950	54 MHz to 250 MHz

SQUARE WAVE AND PULSE GENERATORS

MODEL	FREQUENCY RANGE
71	Square Wave 6 Hz to 100 kHz
72	Square Wave 5 Hz to 5 MHz
179	Pulse 60 Hz to 100 kHz

INTERMODULATION METER

MODEL	I. M. FREQUENCIES
940	60 and 120 Hz (low) 3, 7 and 12 kHz (high)

MEGACYCLE "GRID DIP" METERS

MODEL	FREQUENCY RANGE
159 Std.	Oscillator only (2.2 MHz to 420 MHz)
159 LF	Oscillator only (100 kHz to 4.5 MHz)
159 UHF	Oscillator only (420 MHz to 940 MHz)
159 P.S.	Power supply only
159 COMB.	Above oscillators, with one power supply

VACUUM TUBE VOLTMETERS

MODEL	FREQUENCY RANGE
67	Peak-to-peak (5 Hz to 100 kHz)
162 & 162 R	20 Hz to 300 MHz

BOLOMETER BRIDGE

MODEL	FREQUENCY RANGE
202-C	2 MHz to 1000 MHz

FREQUENCY METERS

MODEL	FREQUENCY RANGE
700	25 MHz to 50 MHz
760	Mobile Bands

DEVIATION METER

MODEL	FREQUENCY RANGE
140 A	25 MHz to 1000 MHz (0-20 kHz Dev.)
141	2 MHz to 500 MHz (0-20 kHz Dev.)

FOR FURTHER INFORMATION ON THESE AND OTHER INSTRUMENTS SEND FOR CATALOG.

MEASUREMENTS

THOMAS A. EDISON INDUSTRIES • McGRAW-EDISON CO.

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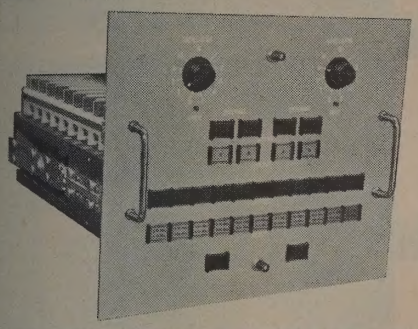
SIGNAL GENERATION SYSTEMS

• Hi-Stability • Logic Control Switching • Custom Applications



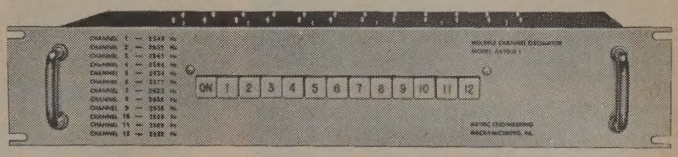
WIDE BAND TRANSMITTER EXCITER

- 2-30 MHz output frequency with inputs of 2 to 10 MHz
- Two internal 10 channel oscillators
- Logic Controlled switching and tuning
- ±.0005% Stability
- Harmonic distortion less than 1%
- Up to 1 watt output

Operates on 115 VAC or 230 VAC, 50 to 400 Hz

URE SINE WAVE GENERATOR

- 12 Discrete frequencies in a 1KHz to 20KHz range
- Push Button Selectable
- Harmonic distortion less than .1%
- 1 VRMS into 600 ohm load balanced or unbalanced
- Individual level adjust and master level adjust



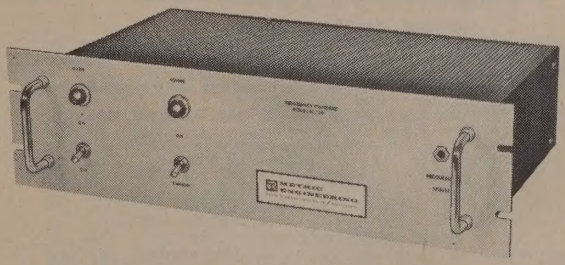
HI-FREQUENCY: HI-POWER

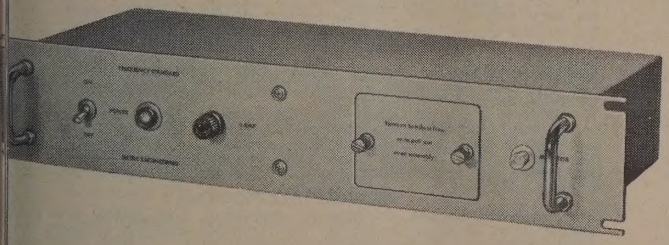
- 1 to 500 MHz frequency range
- Minimum of 5 watts into 50 ohms
- Turn-counting pot for output level adjust
- Less than 12 lbs. weight
- Stability to $\pm 1 \times 10^{-8}$

Operates on 117 VAC, 50 to 400 Hz

0 Hz, 60 Hz, or 400 Hz TIME STANDARD

- $\pm 1 \times 10^{-7}$ frequency stability
- 120 VRMS output voltage
- ±.5% output regulation
- 25 Watt output power
- Square wave or sine wave available
- Operates from 120 VAC, 50 to 400 Hz or 28 VDC





30 to 35 MHz TRANSMITTER EXCITER

- 1 VRMS output into 50 ohm load
- $\pm 5 \times 10^{-8}$ stability
- Sine wave
- Harmonic distortion less than 5%
- Remote keying capability

FCC approved in the 32 to 33 MHz range

DESIGN AND MANUFACTURE OF CUSTOM SYSTEMS IN SIGNAL GENERATION AND SWITCHING CONTROL ARE OUR SPECIALTY. LET *METRIC ENGINEERING* SOLVE YOUR PROBLEMS.

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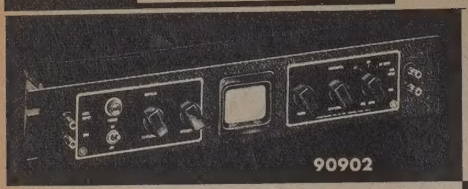
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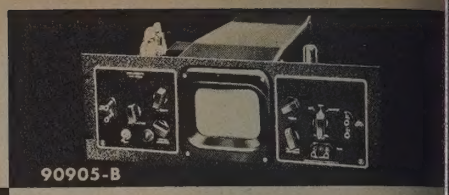
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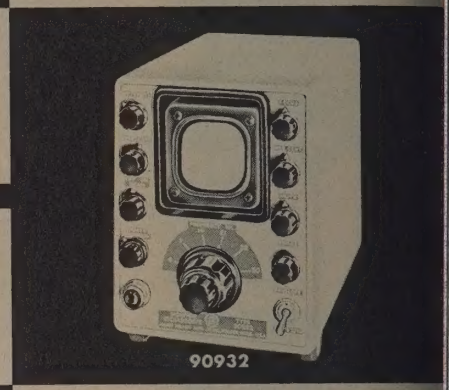
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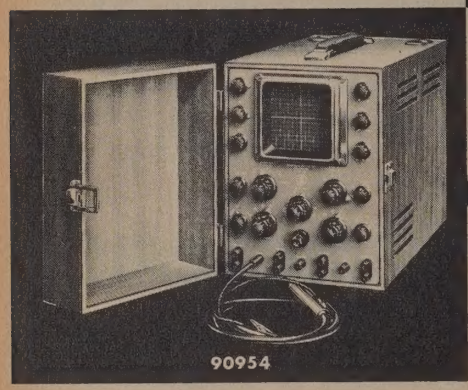
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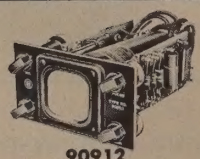
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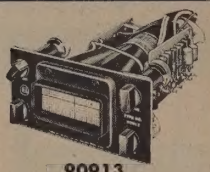
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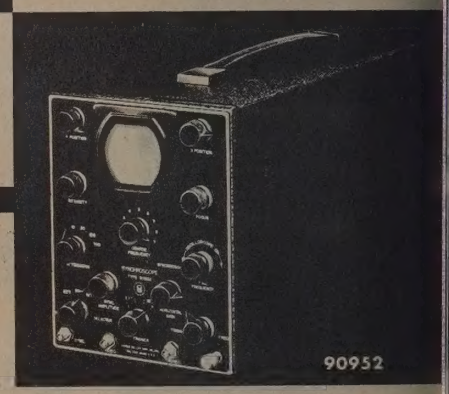

90952

"Designed for Application"® OSCILLOSCOPES AND ACCESSORIES

MODULE OSCILLOSCOPES

Miniature, packaged panel mounting cathode ray module oscilloscope indicators for monitoring. Designed to be built into equipment. Require minimum panel space. Use separate module power supply.

No. 90901 uses 1CP1 fixed focus cathode ray tube. Smallest and most economical of the module oscilloscopes. Panel 2⅜″ square.

No. 90911 uses type 1EP1 flat face 1¼″ cathode ray tube. Balanced deflection. Blanking input. Sharp focus. Panel 2⅜″ square.

No. 90912 uses type 2BP1 two inch cathode ray tube. 3″ x 5″ panel.

No. 90912-R uses type 3UP1 2⅛″ x 1-9/16″ cathode ray tube.

No. 90913 uses type 3XP1 3″ x 1½″ rectangular cathode ray tube.

No. 90914 uses type 4KP1 3½″ square cathode ray tube.

No. 90943 uses type 3KP1 Three inch C-R-T. Contains power supply.

No. 90945 uses type 5BP1 Five inch C-R-T. Contains power supply.

BASIC OSCILLOSCOPES

Rack mounted inexpensive basic oscilloscopes including cathode ray tube circuit, power supply; intensity, focus, and centering controls, magnetic shielding, safety features, switches, etc..

No. 90902 uses type 2BP1 two inch cathode ray tube. 3½″ x 19″ panel.

No. 90902-M designed to meet military specification MIL-T-945.

No. 90903 uses type 3KP1 three inch cathode ray tube. 5¼″ x 19″ panel. Power requirement — 105-125 volts 60 cycles — 19 watts.

No. 90903-R uses type 3XP1 3″ x 1½″ rectangular cathode ray tube.

No. 90905 uses type 5UP1 five inch cathode ray tube. 7″ x 19″ panel.

No. 90905-B uses type 5ADP1 five inch flat face precision tolerance cathode ray tube. Balanced deflection. Blanking input. 35 W at 117 V.

No. 90905-D for balanced direct coupled deflection. Uses 5ADP1.

No. 90905-R uses type 5BXP1 4⅝″ x 2⅝″ rectangular C-R tube.

COMPACT COMPLETE OSCILLOSCOPES

Extremely compact oscilloscopes complete with amplifiers, linear low frequency sweep, and power supplies. Balanced deflection for minimum distortion. High accelerating potential for good resolution.

No. 90923 uses type 3XP1 3″ x 1½″ rectangular cathode ray tube. 3½″ x 19″ panel. 0.4 V. p to p per cm. defl. d.c. to 275 kc.

No. 90923-C uses 3RP1. 5¼″ x 10½″ panel. 50 mv p to p per cm.

No. 90925 uses type 5BXP1 4⅝″ x 2⅝″ rectangular C-R tube. 3½″ x 19″ panel. 0.16 V. p to p per cm. defl. DC to 550 kc.

No. 90925-A Vertical amplifier is 50 mv. p to p per cm. to 2.5 mc.

No. 90925-B Low frequency linear sweep 3 seconds per sweep to 22 kc.

PORTABLE FIELD OSCILLOSCOPES

Especially suitable for use in factory, laboratory, and the field for desig installation, maintenance, and service. Well shielded against magnetic fiel Excellent linearity. Sharp focus. Compact.

No. 90915 uses 5AQP1. Frequency response either amplifier DC to 200 Completely insulated front panel and case. Double shielded.

No. 90952 Synchroscope or Oscilloscope. 7½″ x 5⅝″ x 13″

No. 90954 uses 4KP1 3½″ square CRT. 7½″ x 9½″ x 13½″ insulated ca 23 pounds. Response DC to 1.2 mc. 0.1V. per cm.

MONITOR OSCILLOSCOPE

No. 90932 Amateur Band Monitor Oscilloscope is a complete oscilloscope monitoring the modulated r-f output of a transmitter. Built-in link-coup tuned circuits cover all amateur bands 3.5 to 54 mc. All circuits and cessories are built in. The monitor will display the r-f envelope and/or trapezoidal monitoring pattern.

AMPLIFIER/SWEEP UNITS

Amplifier/Sweep Units are accessories which may be used with any ba or module oscilloscope. They contain a vertical amplifier, a horizon amplifier, a sweep generator and power supplies.

No. 90921 Inexpensive rack mounted unit. 5¼″ x 19″ panel.

No. 90921-A DC to 1 mc. Vert. amp. Balanced deflection. 0.3V./cm.

POWER SUPPLIES

Compact high voltage and low voltage power supplies for oscilloscopes 1⅞″ x 2⅛″ x 4⅝″. Input 117 volts 50/60 cycles. Supply accelerating centering potential for oscilloscopes.

No. 90202 is a plug-in supply for high voltage and heater power for of the MILLEN Module Oscilloscopes. Output 750 volts dc at 3 ma.

No. 90202-M designed to meet military specification MIL-E-16400.

No. 90203 supplies B+ and heater to three amplifiers and a sweep.

No. 90203-A has external filter capacitors for military applications.

MODULE ACCESSORIES

The MILLEN Module Oscilloscope Amplifiers and Sweep are comp plug-in units designed to provide the required deflection voltages for MILLEN series of Module and Basic Oscilloscopes.

No. 90924 A-C coupled unit. Use as pre-amplifier or deflection amp.

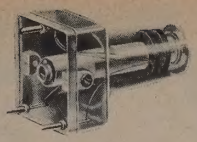
No. 90926 Plug-in linear sawtooth sweep generator. Controls on top.

No. 90927 Several versions of direct coupled deflection amplifier.

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY

150 EXCHANGE ST., MALDEN, MASSACHUSETTS, U. S. A.



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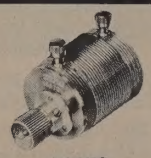

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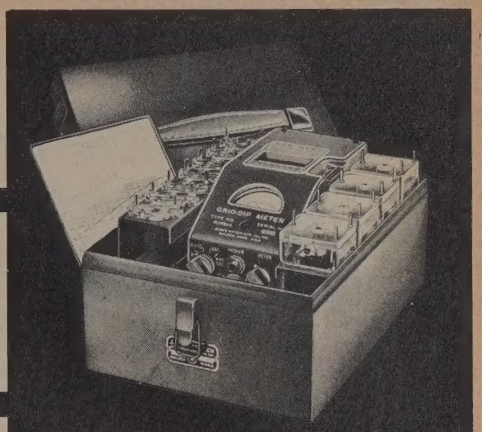

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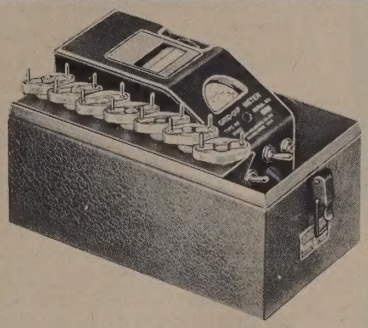

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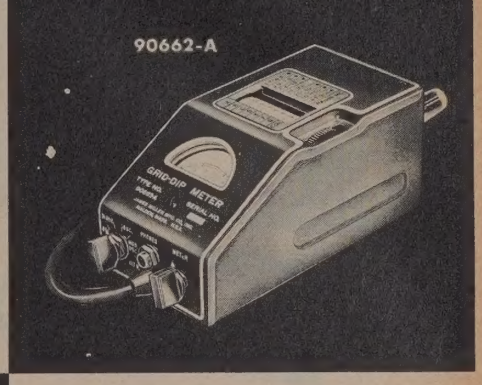

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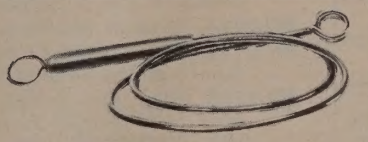

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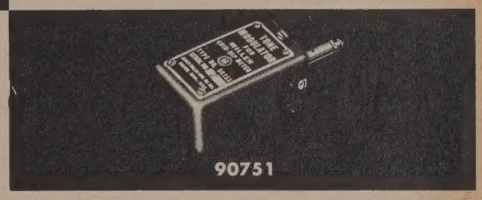

90751

GRID DIP METERS

No. 90651-A GRID DIP METER

The No. 90651-A Grid Dip Meter has a transistor d.c. amplifier to increase sensitivity. It provides full scale meter reading at all frequenies from 1.7 to 300 mc. It has a modern, taut band meter to eliminate any possibility of meter ever becoming "sticky". These additions are made while still maintaining all of the features which have made the MILLEN No. 90651 Grid Dip Meter so thoroughly reliable it has become the standard of the industry. It uses the same stable oscillator without spurious dips, it has a transformer-type power supply, it has seven coils protected by forming molded covers, etc.

No. 90651 STANDARD GRID DIP METER

The No. 90651 Grid Dip Meter is complete with a convenient polypropylene carrying case which keeps the coil/probes with the Grid Dip Meter and protects both. Frequency coverage is 1.7 to 300 mc. with the seven coil/probes finished. Additional coils for extending the calibration to 160 kc. are available. See below.

No. 90662-A LABORATORY AND INDUSTRIAL GRID DIP METER

The No. 90662-A Industrial and Laboratory Grid Dip Meter is hand calibrated from 225 kc. to 300 mc. Calibration accuracy is +0.5%. Additional features are a d.c. amplifier for excellent sensitivity at all frequencies, modulation, easily read dial, three wire grounding-type power cord and stable carrying case.

No. 90662 INDUSTRIAL GRID DIP METER

The No. 90662 Grid Dip Meter covers the frequency range of 225kc. to 300mc. and is hand calibrated with calibration accuracy of +0.5%. It is supplied with a carrying case, three wire grounding-type power cord and a plug-in modulator. The d.c. amplifier and internal modulator are not supplied.

No. 90661 INDUSTRIAL GRID DIP METER

The No. 90661 Grid Dip Meter covers the frequency range of 1.7 to 300 mc. and is hand calibrated with calibration accuracy of +0.5%. It is supplied with a carrying case and three wire grounding-type power cord. DC amplifier, modulator and L-F coils are not supplied.

ACCESSORIES

No. 90672 ANTENNA BRIDGE

The No. 90672 Antenna Bridge is an r-f bridge which uses a Grid Dip Meter as a source of signal. It is a sensitive bridge for measuring impedance in the range of 5 to 500 ohms for unbalanced impedances.

No. 90751 TONE MODULATOR

The No. 90751 Tone Modulator plugs into the 'phone jack of a Grid Dip Meter to provide 800 cycle modulation.

No. 46721 PROBE — Used where it is difficult to couple directly.
No. 46701 COIL KIT — Coil form and cover for Grid Dip Meter. No coil.
No. 46702 LOW FREQUENCY COIL/PROBE — 925 to 2000 kc.
No. 46703 LOW FREQUENCY COIL/PROBE — 500 to 1050 kc.
No. 46704 LOW FREQUENCY COIL/PROBE — 325 to 600 kc.
No. 46705 LOW FREQUENCY COIL/PROBE — 220 to 350 kc.
No. 46706 LOW FREQUENCY COIL/PROBE — 160 to 225 kc.
No. 46672-10 BALUN — Reactances tuned out for 10 meters and C.B.
No. 46672-15 BALUN — Reactances tuned out for 15 meter amateur band.
No. 46672-20 BALUN — Reactances tuned out for 20 meter amateur band.
No. 46672-40 BALUN — Reactances tuned out for 40 meter amateur band.
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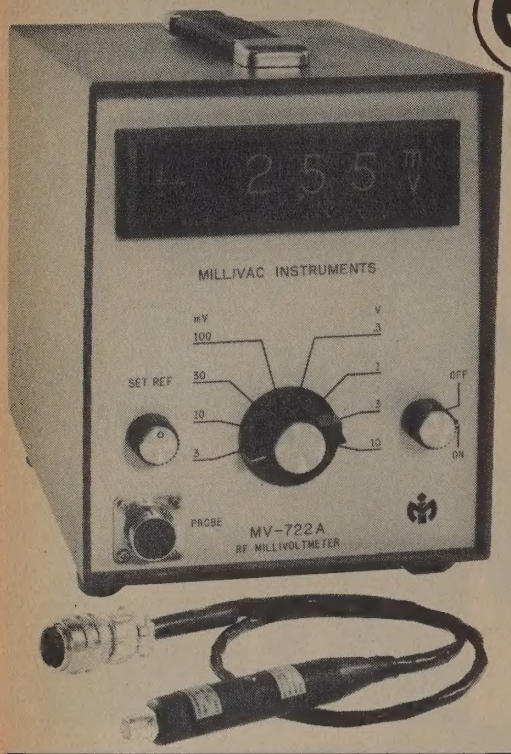


MV-722A, R.F. Millivoltmeter with Digital readout. 3mV to 10V F.S. to 300V with 100/1 divider. 10KHz-100MHz ±3%, 100MHz-400MHz ±5%, 400MHz-1.2GHz 10%. 115/230V. 50-450Hz....$1150

MV-928A, Same as MV-722A except 1mV to 3V, 300V with divider. Analog readout, Battery or 115/230V. 50-450Hz 775

MV-828A, Same as MV-928A without battery operation 675

MV28B, Same as MV828A, except vacuum tube model 625

MV-38B, Same as MV28B except 3mV-3V F.S. 525

MV-952A, Ultra Sensitive Solid State Micro-Volt-Ammeter. Measures 10uV to 1KV DC F.S. with 1% basic accy. Current 10pA to 10mA with 2% basic accy. 1 to 100 meg input, Shunts, 1 meg to 1 ohm. Battery operated and/or 115/230, 50/450Hz 695

MV-852A, Same as MV-952A, except without battery operation 625

MV-07C, Measures same as above, but tube model and operates on 115/230, 50/60Hz only 575

MV-27E, 250uV to 1KV, F.S. DC, 14 ranges, imp. 10-100 megs, 1% accy. 425

MV-127B-L, 100uV to 1KV, F.S. DC, 15 ranges, inp. imp. 1-100 megs, 1% basic accy. 475

MV-11E, 100pA to 10A, F.S. DC, 23 ranges, shunts 10 meg. .001 ohms, 1% basic accy. 425

MV-111B-L, 100pA to 250mA, F.S. DC, 20 ranges, shunt 1 meg .004 ohm, 1% basic accy. 475

MV-77B, 1mV-1KV, 1uA-1A, F.S. 1 ohm-5K meg. Input imp. 10-100 megs, 1, 2, 2% basic accy. 475

MV-964A, Solid-State Multimeter, 100uV to 1KV, DC F.S. Current 100nA to 1A F.S. Ohms 1 to 100 megs center scale. Input imp. 10-100 megs. Shunts, 10K to .01 ohms. Basic accy. volts 1% current 2%, ohms 5 & 10%. Battery operated and/or 115/230, 50-450Hz 525

MV-864A, Same as MV-964A, except without battery operation 445

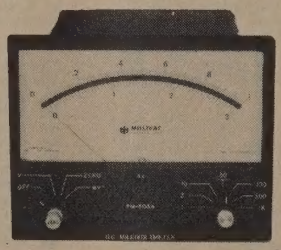
MV-279C, Direct reading Linear Scale ohmmeter, 1 ohm-10 megs F.S. 15 ranges Rx drop 10mV. 1% accy. 550

MV-276B, Wheatstone Bridge, 1 milliohm to 1000 megs, .05%, basic accy. Lead resistance cancellations and calibrated 1% unbal. Max. dissipation 1mW 1050

MV-45A, 10uV to 1KV, F.S. AC, 17 ranges inp. imp. 10K to 3.3 meg, AC amp output 40db, 3% basic accy. 425

VS-68B, Hi-Impedance Hushed Transistor Amplifier, 10K, 100K and 50 meg input. Transistorized 575

VS-64A, Same as above except 10K and 100K input only 425



PANEL MOUNTED ELECTRONIC VOLTMETERS

PM-504A, DC Voltmeter measures 100uV to 1KV, F.S. in 15 ranges. 100uV, 3%, All others 2% F.S. accuracy. Operates on 115/230V. 50/60 Hz, 10 megs input $375

PM-503A, Same as above except 12 ranges, 1mV F.S. to 1KV F.S. $350

PM-502A, Same as above except 11 ranges, 10mV, F.S. to 1KV F.S. 325

PM-522A, Solid-State RF Millivoltmeter. Freq. Resp. 10KHz to 1.2GHz; Basic accy. ±3%, Measures 3mV to 10V F.S. in 8 ranges to 300V with 100/1 Divider. 10KHz to 100MHz, ±3% accy. 100MHz to 400MHz ±5% accy. 400MHz to 1.2GHz ±10% accy. 115/230V. 60 Hz 500

PM-301A, VTVM, 10mV F.S. to 1KV F.S. in 11 ranges, 3% accuracy, 10 meg input, 115/230V 60Hz 280

PM-311A-1, AC Voltmeter, 10mV F.S. to 300V F.S. in 10 ranges. Accuracy 1% 50Hz to 100KHz, 3% from 20Hz to 250Hz. Input 5 megs shunted by 25pF, −40 to 50db, 115/230V 50-400Hz 250

PM-311A, Same as above, except 3, 4 and 5% accuracy 200

PM-300-1, DC Multi-Range Voltmeter. 1V to 1KV F.S. in 7 ranges. 1% accuracy. 115/230V 50-400Hz. Input 10 meg 155

PM-300, Same as above except 3% accuracy 120

(Also available, 4½" square single range AC or DC. Panel Mounted Meters.)

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SPIKE READING MEMORY VOLTMETERS... VOLTAGE MEMORY PAKS AND A-D CONVERTERS

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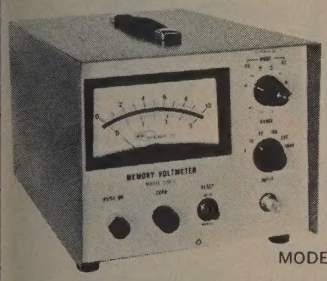
icro Instrument Co. offers a complete line of ecision memory voltmeters and systems for dustrial, commercial and aerospace mea- rement of peak pulse amplitude and one ot pulses. Features include: positive and gative readout of amplitude to 30 kV; digital meter readout; strip-chart or printer opera- n; analog or digital outputs; continuous line onitoring with systems to 100 channels. For tails on the complete line, contact your local presentative or Micro Instrument Co. directly.



MODEL 5201C

MODEL 5203

DIGITAL READOUT MEMORY VOLTMETER — DUAL SHIELDING CABINET — MODEL 5203

The Model 5203 is a new 4-digit Memory Voltmeter, featuring digital readout of dc to 50 nanosecond single pulses with amplitudes to ±1000 volts in four ranges; it also has overrange capabilities, as well as an optional probe for measurements to 10 kV. It is a broad-band, dc to 50 MHz, all solid-state instrument that will measure any ac or dc coupled parameter that can be defined in terms of peak voltage; it holds the peak amplitude of one-shot or transient pulses, as well as repetitive pulses, until an input voltage of greater amplitude occurs, causing an increase in the reading, or until operator or automatic reset. Automatic reset permits using the digital Memory Voltmeter as a conventional RF digital voltmeter. Accuracy of wide band peak value will be displayed to 1% of full scale, with narrow band measurement ¼% of reading ±2 bits.
The Model 5203 is housed in a dual shielded cabinet to prevent radiated transient pick-up, ground loops or common mode errors; this also permits off-ground measurements to 1000v while maintaining the cabinet at ground potential for operator safety. The instrument's case is a 7 inch high half-rack cabinet for portable use or for rack mounting. Available features include: provision for remote programming of mode, range and reset; analog output; BCD output; sample-and-hold capability.

SPECIFICATIONS

Input: Single-ended. Ground isolated.
Voltage Range: 0.999, 9.99, 99.9 and 999V full scale. To 10 kV with optional H.V. probe.
Input Impedance: 1V range, 10K ohms; 10V range, 100K ohms; 100V range 1Mohms; 1000V range, 10Mohms. All ranges shunted by 100pF max.
Pulse Width Range: DC to 50 nanoseconds (wide band) DC to 400 microseconds (narrow)
Accuracy: 1% wide band; ¼%, ±2-bits narrow.
Readout: 4-digits in-line.
Price: $1,550.00

METER READOUT MEMORY VOLTMETER — DUAL SHIELDED CABINET — MODEL 5201C

The Model 5201C Memory Voltmeter is an all solid-state broad-band, dc to 20 MHz instrument, with amplitude memory. With ac and dc ranges from 0 to 1000 volts, the instrument will measure and store the maximum peak voltage applied. The voltage range may be extended to 30 kv; pulses as short as 50 nanoseconds duration will be recorded. Voltages of greater amplitude than the stored voltage will increase the reading, displaying the maximum voltage detected. In addition, a front panel switch permits automatic reset of the internal memory allowing operation as a standard peak-reading voltmeter that will follow the peak value of a varying waveform. The peak amplitude is displayed on a 5" taut-band, mirror-backed 1% panel meter. The instrument is housed in a dual shielded cabinet to prevent radiated transient pick-up. This construction also permits off ground measurement while maintaining the cabinet surface at ground potential for operator safety. The common side of the input is isolated from ground thus preventing ground loops in systems checkout work, or incorrect connection for power line monitoring applications. Portable cabinet standard, single or dual rack mount units available. Optional gate circuit available for sample and hold operation. Variable response control to reduce band width in 5 steps for added versatility.

SPECIFICATIONS

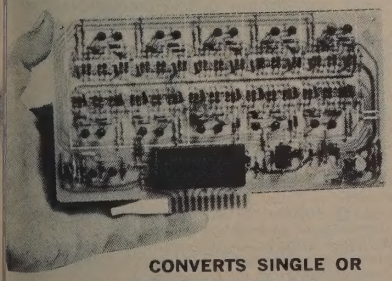
Voltage Range: 0-3, 10, 30, 100, 300, 1000 v. Can be operated up to 1000 v above ground.
Input Impedance: 100k to 10 megohms (depending on range).
Pulse Width Range: DC to 50 nanoseconds.
Accuracy: ±3% of full scale.
Operating Modes: +, −, ± (dc or ac coupled).
Price: Model 5201C ..... $ 795.00

Single Rack Mount: Model 5201C-1 .. $ 845.00
Dual Rack Mount: Model 5201C-2 ... $1690.00
Gate Ckt. Option: ..... $ 100.00
Hi Voltage Probes: (3, 10, 30kv) each $ 100.00

PEAK VOLTAGE MEMORY PAKS AND A-D CONVERTERS

oltage Memory Paks are available in two asic versions: Pulse Stretchers with tempo- ary memory for recording of short duration ulses with low frequency devices and Volt- ge Memories that provide permanent stor- ge of the measurement values.

The Pulse Stretcher Paks and Voltage Mem- ry Paks may either be used separately or to- gether to form a system for measuring a wide variety of single, repetitive or complex wave- forms and permanently retain the maximum peak value.



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SERIES 5221

VOLTAGE MEMORY PAKS PERMANENT MEMORY

- **Pulse To Digital Conversion**
- **Analog To Digital Conversion**
- **Conversion Times To 100 Microseconds**
- **Accuracies To +0.1% Of Reading**

The Voltage Memory configurations convert the peak analog or pulse voltage input of single or repetitive pulses into a digital or D.C. output for readout by meter, digital display or other appropriate monitoring device. This output level will be held permanently until a higher peak input is applied or until the memory is reset by external contact closure or application of a reset pulse.

DIGITAL OR ANALOG OUTPUT

Digital output is available in binary, BCD or as a DC voltage proportional to the input amplitude. An average of the peak output may be provided by applying the reset signal periodically, thus allowing the memory to function as a conventional peak reading voltmeter.

CONTINUOUS UNATTENDED MONITORING

Random transients or periodic pulse peaks may be monitored without continuous observation because the binary register will retain the pulse peak permanently... even if the input signal is removed.

Price: $150.00 up.

SERIES 5222

PULSE STRETCHER PAKS BUFFER MEMORY

- **Pulse To Analog Conversion**
- **Analog To Analog Conversion**
- **Acquisition Time to 50 Nanoseconds**
- **Accuracies To ±1.0%**

Pulse Stretchers convert short duration peak voltage pulses into longer pulses. These temporary dc voltages provide excellent accuracy for pulses in the nanosecond region. They also provide a suitable input for low frequency monitors, such as strip chart recorders, and DVM's which would otherwise be unable to monitor pulses in the nanosecond range.

POSITIVE OR NEGATIVE MEASUREMENTS

Pulse Stretchers are available for either positive or negative signal operation. They may be used together to provide simultaneous positive and negative pulse stretching.

TRUE PEAK READING AND HIGH INPUT CHARGING RATES

The Pulse Stretcher charging current is "snapped off" upon reaching the peak voltage. This produces greater accuracy than conventional voltage averaging devices which never achieve full charge and which have a rapid capacitor discharge through associated circuitry.

Price: $150.00 up.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

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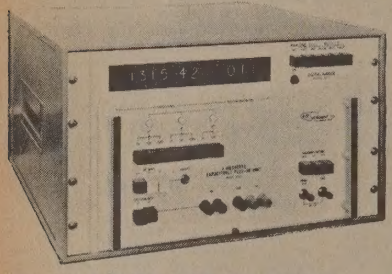
MULTIPLE PLUG-IN DIGITAL BRIDGE TEST SYSTEM

MIC SUPERBOX . . . The new concept in component test systems consisting of a basic Data-Deck and optional plug-in test modules for optimum test capabilities at minimum instrument cost

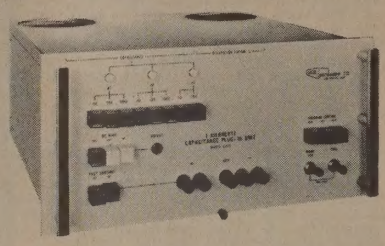


MULTIPLE PLUG-IN DIGITAL BRIDGE "DATA DECK"— MODEL 6100

Similar in concept to plug-in oscilloscopes, the Model 6100 brings the same kind of versatility to digital component testing. The system features two basic sections: (1) the 6100 Data-Deck; and (2) any one of many MIC plug-in modules. Buy the basic Data-Deck with basic controls, readouts, circuits and power supply just once . . . add inexpensive plug-in modules for specific tests as required. Typical test modules are detailed at right. The model 6100 features true self-balancing bridge techniques with laboratory accuracies.

MODEL 6100 SPECIFICATIONS

Readouts: Two sets of readout tubes: in groups of six digits and three digits.
Controls: Pushbutton control of all operating functions.
Outputs: Electrical BCD outputs for both 6 digit and 3 digit displays;Test/Display signal; Print command signal for remote printer.
Inputs: Display "Hold" line . . . allows hold of BCD data by electrical signal;External Trigger input.
Dimensions: 10-1/2" high by 19" wide by 20" deep.
Price: $2,495.00

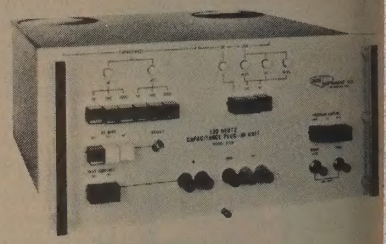


1 KHz CAPACITANCE PLUG-IN UNIT MODEL 6205

Used in conjunction with the MIC Model 6100 digital Data-Deck, the Model 6205 plug-in module provides a complete test instrument for simultaneous display of both capacitance and dissipation factor at one kilohertz.

SPECIFICATIONS

Test Frequency: 1000 Hz, ±5%
Capacitance Ranges: From 1pF to 150 μF in 8 ranges, with complete automatic ranging.
Capacitance Accuracy: (Cs Measurement) 0.1%
DF Range: 0.00 to 9.89%
DF Accuracy: ±1% of reading, ±1 Digit.
Test Signal Amplitude: 1 volt rms, max.
DC Bias: Internal: 0 to 5VDC, front panel adj., External: 0 to 300 VDC
Test Time: 200 msec, nominal.
Price: $1,495.00



120 Hz CAPACITANCE PLUG-IN UNIT MODEL 6208

Model 6208 120 Hz Bridge plug-in and a Model 6100 Digital Data-Deck make a complete test system for simultaneous display of both capacitance and loss at 120 Hz. The loss factor can be optionally displayed as DF or ESR by the push of a panel button.

SPECIFICATIONS

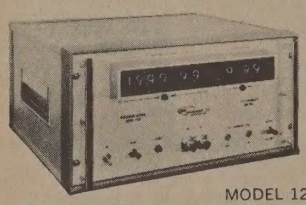
Test Frequency: 120 Hz, ±2%
Capacitance Ranges: From 500pF to 1500 μF in six ranges.
Capacitance Accuracy: ±0.1% of reading, ±1 Digit.
DF Range: 0.00 to 9.89%, 00.0 to 98.9%
ESR Ranges: 6 Ranges from 989. milliohms to 989. kilohms.
Accuracy: DF and ESR: ±1% of reading, %1 digit.
Test Signal Amplitude: 1 volt rms, max.
DC Bias: Internal: 0 to 5VDC, External: 0 to 300VDC
Test Time: 1 second, nominal.
Price: $1,495.00

Contact the factory for complete data on these and other plug-in modules.

Several plug-in modules available include: Resistance; Capacitance to 1.2 Farad; Capacitance & ESR at 100KHz; Capacitance & Df at 1MHz

CAPACITANCE TEST INSTRUMENTS AND SYSTEMS

A complete line of capacitance test instruments are available from Micro Instrument Co. Included in the line are: 120 Hz, 1000 Hz and 120/1000 Hz; C and DF limit bridges and digital readout capacitance testers featuring true series capacitance measurements; high speed digital comparators; interface units for card punch and related BCD functions; digital capacitance ratiometer; capacitance-winder, auto-controller and systems for intermittency testing or for complete data logging. Contact your local representative or the factory for complete details.



MODEL 1212

MODEL 1206

1 MHz C & DF DIGITAL CAPACITANCE TESTER — MODEL 1212

The Model 1212 is the first instrument that simultaneously displays dissipation factor in digital form on a 1 MHz instrument along with the capacitance measurement. This all solid-state capacitance tester uses a true automatic bridge circuit for high accuracy measurements in ½ second. BCD output information is supplied for interfacing with printers, card punches, computers, etc. The conveniently located two and three-terminal (guarded) connections permit front panel component testing, while eliminating stray capacitance errors. A variety of test jigs and adapters are available to extend the rapid testing versatility of the unit.

SPECIFICATIONS

Capacitance Range: 0 to 1999.99 pF full scale.
Capacitance Accuracy: ±½% of reading ±3 digits.
Capacitance Readout: 6 in-line readout tubes.
D.F. Range: 0 to 9.99%
D. F. Accuracy: ±1% of reading ±3 digits.
Readout: 3-digit in-line readout tubes.
Single Level: 500 mV rms.
Test Time: 500 msec.
Display Time: Variable from 50 to 500 msec.
Stray Capacitance: 100 pF null control.
Trigger Operation: Input trigger pulse permits single readings to be displayed indefinitely; a repeat trigger pulse resets instrument to zero and displays next readings.
Outputs: 1-2-4-8 BCD (0 = 0V, 1 = +3.5v min. into 50K ohms)
Terminals: Guarded input test fixture provided with instrument for axial lead components.
Price: (rack mount) $4,775.00

1 MHz HIGH SPEED DIGITAL CAPACITANCE TESTER — MODEL 1206

The Model 1206 is a new direct reading 1 MHz capacitance tester featuring high reliability integrated circuitry for fast test time of 50 milliseconds. The instrument also features a 50% over-range which minimizes switching at often used test values, permitting faster testing. The instrument provides direct digital readout of measurements from 0.01 pF to 1500 pF. The tester may be equipped with a wide range of comparators for high speed sorting. The instrument also provides low impedance, short circuit-proof output signals which will directly drive digital printers and can be interfaced to card punches, electric typewriters, etc. Automatic zero control circuit produces extreme stability and drift free operation.

SPECIFICATIONS

Ranges: 00.01 pF to 1500 pF.
Over-Range: Fifth digit 50% over-range.
Accuracy: ±¼% of reading ±1 digit.
Readout: 5-digit, in-line, readout, with blanking.
Signal Level: 0-100 pF range: 35mV rms max.
Test Time: 100 msec nominal.
Display Time: 25 msec adjustable from ¼ to 1 sec.
Maximum Frequency Variation: 1% (at full scale).
Low Q Tolerance: No accuracy loss for 10K ohms shunt resistance or greater.
DC Bias Supply: 0-100 vdc in two ranges.
Stray Capacitance: Front panel controls permit neutralization of up to 100 pF.
Off-Scale Indicator: Front panel light.
Off-Zero Indicator: Front panel light.
Outputs: 1-2-4-8 BCD (0 = 0v, 1 = +5v min). Source impedance 600 ohms maximum.
Terminals: Guarded input test fixture supplied.
Price: $3,000.00

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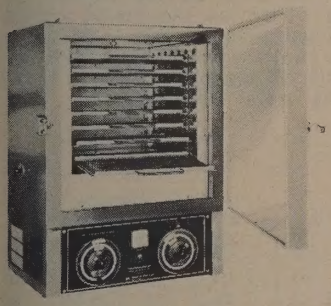
LIFE TEST SYSTEMS

LIFE TEST SYSTEMS

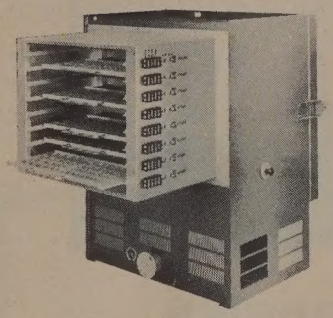
Micro Instrument Company offers, to the industry, the most versatile and reliable component power aging systems available. These systems have proven themselves through hundreds of thousands of hours of operation in customer facilities. Systems are available for testing resistors, capacitors, diodes, transistors, power transistors, rectifiers, and integrated circuits (both flat pack and TO-5 types). The power aging techniques employed include Reverse Bias Soak, Forward Bias Power Dissipation, Dynamic (AC Power Simulation) Operation for Diodes, DC and Dynamic Tests for Integrated Circuits, Resistor Power Dissipation, and Capacitor Voltage Soak. Systems are available for either ambient or elevated temperature testing.

STANDARD MODELS —

The Models 1024 and 1025 are modular systems ideally suited for testing small components such as resistors, capacitors, signal diodes, and transistors. In these systems, the components to be tested mount on printed



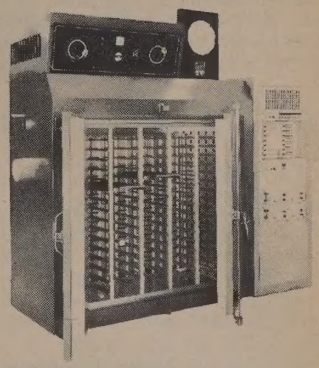
circuit cards with proprietary spring clips, or with printed circuit type transistor sockets. The systems have a capacity of eight cards, each mounting up to 200 axial lead or 100 3-lead components. Tests may be performed under reverse or forward bias conditions. The Model 1024 system connects each test device in series with a load resistor, which is installed on a connector assembly (resistor module) mounted on the outer wall of the test chamber. This system is used primarily for reverse



bias testing where parameter measurement at elevated temperature is not required. The Model 1025 system is similar to the Model 1024, but uses plug-in load cards for mounting the load resistors. The load card may be removed and a scanner head inserted for parameter measurement while the components are at elevated temperatures. The Models 1024 and 1025 provide exceptional versatility. Load resistor modules are readily changed, allowing easy conversion; for example, from a forward soak to a reverse bias test for diodes. Transistors may be operated with emitter and/or collector load resistors under power conditions or in a reverse bias circuit. Component mounting cards of many different circuit configurations are available for these systems. Variations of the basic systems are available with internal bias supplies.

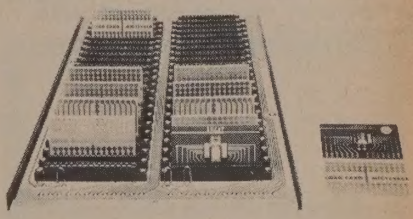
INTEGRATED CIRCUIT SYSTEM —

The Model 8500 Integrated Circuit Power Aging System consists of two interconnected assemblies: the temperature test chamber, and the power supply, pulse generator, and failure indicator console. The components to be tested are inserted in mother boards. The mother boards plug into rack connectors in the temperature chamber which distribute the various bias and signal drives. The mother board also contains monitor lines, and a signal mixing circuit to provide failure indication.



The Model 8500 is available in three basic sizes:

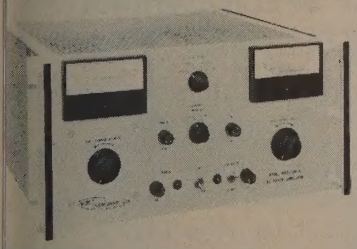
The -1 holds 32 mother boards
The -2 holds 48 mother boards
The -3 holds 80 mother boards



GENERAL INFORMATION —

Standard power aging systems operate in the temperature range of +40 to +150°C with overall accuracy including control, gradient, and drift of ±3°C. Special systems with temperature ranges to 325°C are available. Micro Instrument Company offers a wide variety of printed circuit cards and trays for holding components for various systems. Micro Instrument Company will be pleased to discuss any lift test requirement, suggesting possible test methods and system concepts.

SWITCHING TYPE LIFE TEST POWER SUPPLIES AND LIFE TEST SYSTEMS



SWITCHING-TYPE POWER SUPPLY — MODELS 9100-100, 9100-300

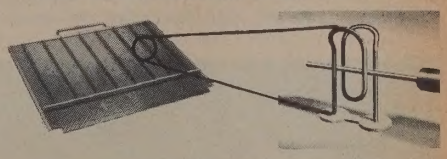
The Model 9100 Switching-Type Power Supply is used in life testing and power aging of semiconductor rectifiers. The output waveform consists of a half-sine wave adjustable from 0 to 15 volts peak (for forward conduction through the test rectifiers), and a half-sine wave adjustable from 0 to 1000 volts peak, depending on the model, (for reverse voltage stress on the test rectifiers). Both forward current and reverse voltage are independently adjustable. Forced-air cooled SCR's are used as switching elements; the SCR's are automatically turned off for over-load or over-temperature conditions.

SPECIFICATIONS

Average Rectified Forward Current (Io): 0 to 300 A (Model 9100-300). 0 to 100 A (Model 9100-100). Outputs in two equal channels.
Forward Voltage: 0 to 15 volts peak.
Forward Form Factor: 170° typical into rectifier & resistive load at max. forward volts.
Forward Current Metering: 0 to 150 A to (Model 9100-300. 0 to 50 A to (Model 9100-100).
Forward Current Interlock: Remote contact.
Forward Current Indication: Front panel light:
SCR Protection:
Peak Inverse Voltage: 0-200 volts (-2); 0-400 volts (-4); 0-600 volts (-6); 0-1000 volts (-10).
Peak Inverse Current: 350mA peak continuous.
Reverse Voltage Metering: 0-100, 300, 1000.
Transient Protection & SCR Protection
Input and Output: Terminal strips on rear.
Input Power: 208 or 230 volts, 60 Hz, single phase, 4500 VA (Model 9100-300), 120 volts, 60 Hz, single phase, 1800 VA (Model 9100-100).
Size: 17½" H (9100-300), 8¾" H (9100-100).
Weight: 275 lbs. (9100-300). 150 lbs. (9100-100).

Prices: In 1 to 4 quantities, complete including SCR's. Model 9100-300-2 (200v), $1703.00; -4 (400v) $1774.00; -6 (600v) $1884.00; -10 (1000v), $2168.00. Model 9100-100-2 (200v), $1276.00; -4 (400v) $1332.00; -6 (600v), $1395.00; -10 (1000v) $1620.00.

COMPONENT LIFE-TEST CARDS



These high-reliability epoxy-glass, printed circuit cards offer efficient power aging and testing to +150°C with low cost per position. The component mounting cards are available in a wide variety of configurations and sizes with mounting sockets or M.I.C. proprietary mounting clips. Automatic eyeletting and soldering insure uniformity of workmanship and high quality at low cost.

CARD TYPES — Many types of component cards are available, broadly categorized by connector pins (44 pin, 56 pin and 210 pin), by component type (two-lead and three-lead or combination), and by circuit (sensing, non-sensing, etc.).

SPECIAL CARDS — A wide variety of special designs are available, or can be made to customer requirements. Cost is comparable to standard designs except for an average one-time engineering charge of $150.00 to $250.00.

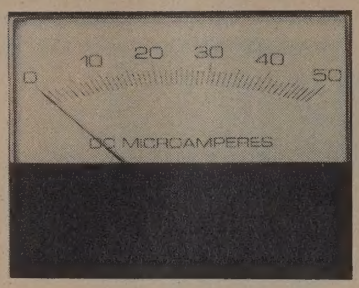
PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

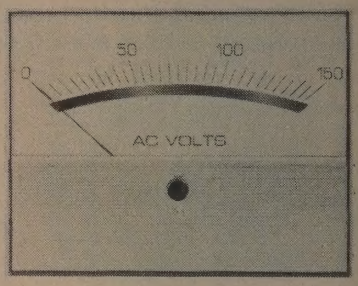
MICRO INSTRUMENT COMPANY / 12901 CRENSHAW BOULEVARD / HAWTHORNE, CALIFORNIA 90250 / PHONE: (213) 679-8237 or 772-1275

MODUTEC
TAUT BAND PANEL METERS

The Modutec family of precision, self-shielded, permanent-magnet / moving coil panel meters combines state-of-art movements with advanced, functional styling.

Each of the five Modutec series is available in a full range of five sizes.





FEATURES AND SPECIFICATIONS

Movement — High torque, frictionless taut-band suspension assures long life and dependable high accuracy.

Scale — 100° long, linear, low-profile scales provide easy, accurate reading.

Accuracy: ±2% for DC meters; ±3% for AC meters (60 Hz sine wave).

Tracking: ±1.5% for DC meters; ±2% for AC meters.

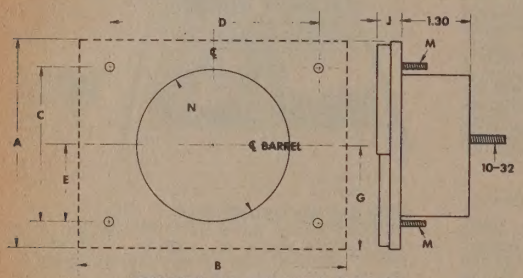
Modutec meters meet or exceed the performance requirements of USA Standard C-39-1.

S SERIES
SURFACE MOUNT BLACK COVER

The handsome aspect ratio and clean cut detailing of these meters will add distinction to any instrument or control panel. Available in five sizes and a wide variety of ranges, this series provides new latitude for the equipment designer.

C SERIES
SURFACE MOUNT CLEAR COVER

This series features a case front of clear acrylic, polished on the outside and closely ribbed on the inside surface. The visual effect of this is to greatly reduce contrast between the meter and the adjacent panel, resulting in a very pleasing overall appearance.

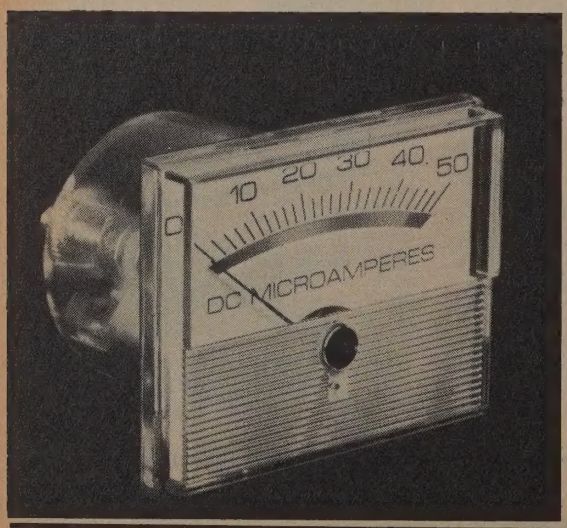


DIMENSIONS, AND PANEL CUTOUT FOR BARREL

METER SIZE	A	B	C	D	E	G	J	M	N
1½"	1.75	2.24	1.31	1.31	.66	.83	.34	4-40	1.55
2½"	2.27	2.99	1.88	1.88	.94	1.13	.37	4-40	2.22
3½"	2.87	3.70	2.25	2.25	1.12	1.44	.41	4-40	2.82
4½"	3.96	5.10	3.56	4.00	1.54	1.74	.48	6-32	2.82
5½"	4.48	5.85	3.00	5.25	.85	1.59	.55	6-32	2.82

Ruggedized meters for difficult environments

This series is available in all surface mount, bezel mount, and Windo-mount styles and sizes, and in all types except as noted at right. Hermetically sealed Lexan cases and covers easily withstand treatment that would break or damage ordinary meters. Specially shockproofed movements.



BLUE•DOT™ SERIES

ENVIRONMENTAL SPECIFICATIONS

BLUE•DOT meters meet or exceed the following:

General: MIL-T-21200-H; MILT-T-945-A; USA STND C-39.1.

Shock: 100g per lightweight machine of MIL-STD-202C, method 20

Vibration: MIL-T-21200-H, Class II & III, para 3.2.19.4.
MIL-T-945-B, para 4.4.5 (5-55Hz, 0.06" max ampl.).

Humidity: MIL-STD-202C, Method 103B, test cond. B.

Sand, dust, explosion proof: MIL-T-21200-H.

Flammability: UL Bulletin 94, Group II, UL rating +110°C.

Chemical resistance, cases & covers: See GE Lexan Btn. CDC-392-

PRICES

The following should be added to the basic prices of "S", "C", "BA", or "W" series:

Meter Type	1½"	2½"	3½"	4½"	5½
DC Microammeters*	6.60	6.05	6.60	7.70	8.8
DC Milliammeters	4.95	4.40	4.95	5.50	6.6
DC Ammeters	5.50	4.95	5.50	6.60	7.7
DC Milli- & Voltmeters	4.95	4.40	4.95	5.50	6.6
AC Milli- & Ammeters	6.05	5.50	6.05	7.15	8.2
AC Voltmeters	6.05	5.50	6.05	7.15	8.2
VU & NULL Meters	6.60	6.05	6.60	7.70	

Note: Types not listed above are not available in BLUE•DOT series

*Not available in 20μA or 50μA rating, zero left or zero center.

BEZEL MOUNT METERS

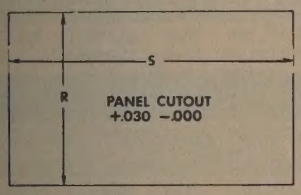
BA SERIES

Cut metal bezels are available for behind-panel mounting of S series or C series meters in all sizes. The cleanly designed bezel features minimum depth and cross-sectional area consistent with function, and is supplied in solid black finish or with brushed metal inline, as shown below.

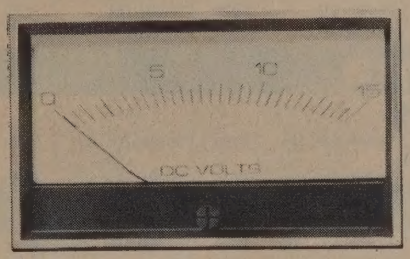
When you order a bezel mount meter you are, in effect, ordering a complete package, comprising meter, bezel, hardware, template, and mounting instructions. To order, substitute "B" for the letter in the model designation, and add suffix "B1", "B2", "B3", or "B4". For example, 3B-DVV-025-B2 specifies a 3½" DC voltmeter, range 0-25 VDC, bezel mount with brushed metal inline over a clear cover meter.

Prices: Prices of bezel mount packages are obtained by adding to the basic meter prices (on the following page) as follows:

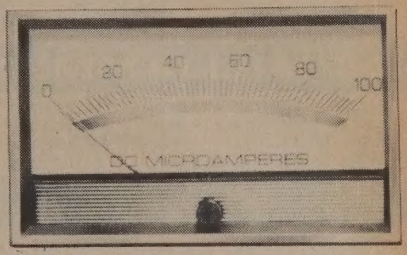
1½" — $2.20 4½" — $2.35
2½" — $2.20 5½" — $2.50
3½" — $2.20



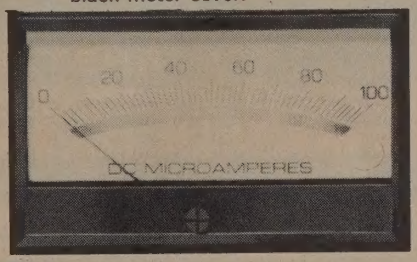
METER SIZE	R	S
1½"	1.37	2.25
2½"	1.59	3.00
3½"	2.16	3.72
4½"	2.75	4.81
5½"	3.14	5.86



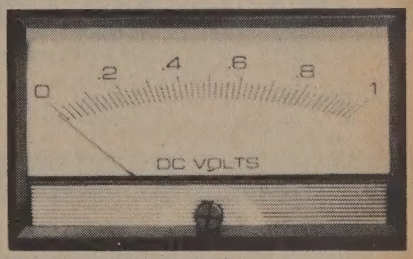
BA1 brushed metal inline bezel, black meter cover.



BA2 brushed metal inline bezel clear meter cover.



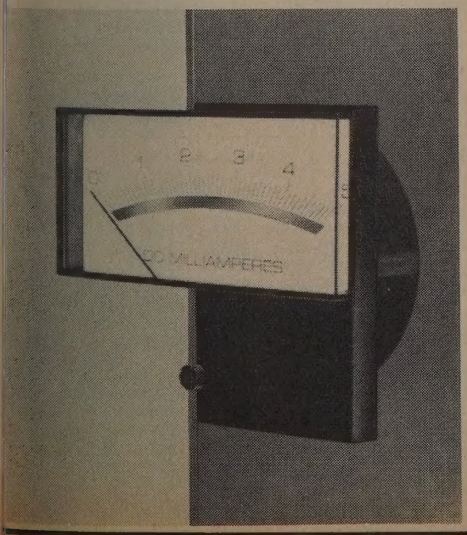
BA3 solid black bezel, black meter cover.



BA4 solid black bezel, clear meter cover.

WINDO-MOUNT® METERS

W SERIES TAUT BAND



If you want your panel to be the last word in sophisticated styling, specify Windo-Mount® meters! You see only the meter dial, through what appears to be a flush window in the instrument panel. Available in all standard Modutec sizes — concessions need be made to neither function nor appearance.

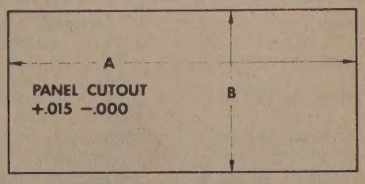
For illumination, see "Options" on next page. Mounting to panel can be done in several ways; for information request applications bulletin AB6-1 from your Modutec rep or from factory. Price: Same as "S" series, except see "Edge Options", below.

Edge Options

1. Clear. Concealed outside edge of dial cover is polished acrylic. This is the standard meter, and will be supplied unless specified otherwise.

2. White. Concealed outside edge of dial cover is painted opaque white.
To order: Add numeral "2" to the letter "W" in the catalog number, e.g., 4W2-AVU-190-AB, and add $0.75 to the list price.

3. Black. Concealed outside edge of dial cover is painted black.
To order: Add numeral "3" to the letter "W" in the catalog number, e.g., 4W3-AVU-190-AB, and add $0.75 to the list price.



METER SIZE	A	B
1½"	2.145	.930
2½"	2.895	1.265
3½"	3.593	1.590
4½"	5.005	2.330
5½"	5.775	2.588

Range	1½" Catalog No.	Price	2½" Catalog No.	Price	3½" Catalog No.	Price	4½" Catalog No.	Price	5½" Catalog No.	Price
DC MICROAMMETERS										
ZERO LEFT										
0-20	1S-DUA-020	18.90	2S-DUA-020	18.10	3S-DUA-020	18.90	4S-DUA-020	20.25	5S-DUA-020	24.55
0-50	1S-DUA-050	13.90	2S-DUA-050	13.20	3S-DUA-050	13.90	4S-DUA-050	14.80	5S-DUA-050	18.00
0-100	1S-DUA-100	13.10	2S-DUA-100	12.55	3S-DUA-100	13.10	4S-DUA-100	14.00	5S-DUA-100	16.95
0-200	1S-DUA-200	12.40	2S-DUA-200	12.05	3S-DUA-200	12.40	4S-DUA-200	13.20	5S-DUA-200	15.95
0-500	1S-DUA-500	11.75	2S-DUA-500	11.20	3S-DUA-500	11.75	4S-DUA-500	12.40	5S-DUA-500	15.10
ZERO CENTER										
10-0-10	1S-DUA-10U10	19.50	2S-DUA-10U10	18.70	3S-DUA-10U10	19.50	4S-DUA-10U10	20.85	5S-DUA-10U10	25.15
25-0-25	1S-DUA-25U25	14.40	2S-DUA-25U25	13.75	3S-DUA-25U25	14.40	4S-DUA-25U25	15.35	5S-DUA-25U25	18.55
50-0-50	1S-DUA-50U50	13.75	2S-DUA-50U50	13.05	3S-DUA-50U50	13.75	4S-DUA-50U50	14.65	5S-DUA-50U50	17.60
100-0-100	1S-DUA-1H1	13.00	2S-DUA-1H1	12.30	3S-DUA-1H1	13.00	4S-DUA-1H1	13.80	5S-DUA-1H1	16.65
500-0-500	1S-DUA-5H5	11.90	2S-DUA-5H5	11.35	3S-DUA-5H5	11.90	4S-DUA-5H5	12.75	5S-DUA-5H5	15.30
DC MILLIAMMETERS										
ZERO LEFT										
0-1, 3, 5, 10	1S-DMA-001, etc.	11.50	2S-DMA-001, etc.	10.95	3S-DMA-001, etc.	11.50	4S-DMA-001, etc.	12.25	5S-DMA-001, etc.	15.80
0-15, 20, 25, 30, 50, 100, 150, 200, 300, 500, 750	1S-DMA-015, etc.	12.80	2S-DMA-015, etc.	12.15	3S-DMA-015, etc.	12.80	4S-DMA-015, etc.	13.60	5S-DMA-015, etc.	16.40
ZERO CENTER										
1-0-1, 5-0-5	1S-DMA-1U1, -5U5	11.85	2S-DMA-1U1, -5U5	11.25	3S-DMA-1U1, -5U5	11.85	4S-DMA-1U1, 5U5	12.60	5S-DMA-1U1, -5U5	15.1
10-0-10, 25, 50, 100, 500	1S-DMA-10U10, etc.	13.15	2S-DMA-10U10, etc.	12.50	3S-DMA-10U10, etc.	13.15	4S-DMA-10U10, etc.	13.90	5S-DMA-10U10, etc.	16.7
DC AMMETERS										
ZERO LEFT (0-100 through 0-1000 amps require external shunts)										
0-1, 1.5, 2, 3, 5, 10	1S-DAA-001, etc.	12.80	2S-DAA-001, etc.	12.15	3S-DMA-001, etc.	12.80	4S-DAA-001, etc.	13.60	5S-DAA-001, etc.	16.4
0-15, 20, 25	1S-DAA-015, etc.	12.20	2S-DAA-015, etc.	12.15	3S-DMA-015, etc.	12.80	4S-DAA-015, etc.	13.60	5S-DAA-015, etc.	16.4
0-30, 50	1S-DAA-030, etc.	12.20	2S-DAA-030, etc.	12.60	3S-DMA-030, etc.	13.20	4S-DAA-030, etc.	14.10	5S-DAA-030, etc.	17.0
0-100, 150, 200, 300, 500, 750, 1000	1S-DAA-100, etc.	12.20	2S-DAA-100, etc.	11.65	3S-DMA-100, etc.	12.20	4S-DAA-100, etc.	13.05	5S-DAA-100, etc.	15.7
ZERO CENTER										
1-0-1, 3, 5	1S-DAA-1U1, etc.	13.15	2S-DAA-1U1, etc.	12.60	3S-DAA-1U1, etc.	13.15	4S-DAA-1U1, etc.	13.90	5S-DAA-1U1, etc.	16.7
10-0-10	1S-DAA-10U10	12.55	2S-DAA-10U10	12.50	3S-DAA-10U10	13.15	4S-DAA-10U10	13.90	5S-DAA-10U10	16.7
15-0-15, 25	1S-DAA-15U15, etc.	12.55	2S-DAA-15U15, etc.	12.90	3S-DAA-15U15, etc.	13.55	4S-DAA-15U15, etc.	14.40	5S-DAA-15U15, etc.	17.3
DC MILLIVOLTMETERS										
ZERO LEFT										
0-50, 100	1S-DMV-050, etc.	12.20	2S-DMV-050, etc.	11.65	3S-DMV-050, etc.	12.20	4S-DMV-050, etc.	13.05	5S-DMV-050, etc.	15.7
ZERO CENTER										
50-0-50	1S-DMV-50U50	12.55	2S-DMV-50U50	12.00	3S-DMV-50U50	12.55	4S-DMV-50U50	13.40	5S-DMV-50U50	16.1
DC VOLTMETERS										
ZERO LEFT										
0-1, 1.5, 2, 3, 5, 10, 15, 20, 25, 50, 100, 150, 200, 250, 300	1S-DVV-001, etc.	12.20	2S-DVV-001, etc.	11.65	3S-DVV-001, etc.	12.20	4S-DVV-001, etc.	13.05	5S-DVV-001, etc.	15.7
0-500, 750	1S-DVV-500, etc.	13.00	2S-DVV-500, etc.	12.25	3S-DVV-500, etc.	13.00	4S-DVV-500, etc.	13.75	5S-DVV-500, etc.	16.5
0-1000	1S-DVV-1000	18.50	2S-DVV-1000	17.75	3S-DVV-1000	18.50	4S-DVV-1000	19.25	5S-DVV-1000	22.0
ZERO CENTER										
5-0-5, 10, 15, 25, 50, 100, 150	1S-DVV-5U5, etc.	12.55	2S-DVV-5U5, etc.	12.00	3S-DVV-5U5, etc.	12.55	4S-DVV-5U5, etc.	13.40	5S-DVV-5U5, etc.	16.1
300-0-300, 500	1S-DVV-3H3, etc.	13.00	2S-DVV-3H3, etc.	12.25	3S-DVV-3H3, etc.	13.00	4S-DVV-3H3, etc.	13.75	5S-DVV-3H3, etc.	16.5
EXPANDED SCALE — DC VOLTS (Other input ranges available on special order)										
Nominal Range	**Accuracy**									
5	± 5%	±0.25%	2S-DVX-005-05	44.00	3S-DVX-005-05	46.20	4S-DVX-005-05	48.40	5S-DVX-005-05	50.6
12, 15, 28, 48, 120, 150, 300	± 5%	±0.25%	2S-DVX-012-05, etc.	44.00	3S-DVX-012-05, etc.	46.20	4S-DVX-012-05, etc.	48.40	5S-DVX-012-05, etc.	50.6
5	±10%	±0.5%	2S-DVX-005-10	44.00	3S-DVX-005-10	46.20	4S-DVX-005-10	48.40	5S-DVX-005-10	50.6
12, 15, 28, 48, 120, 150, 300	±10%	±0.5%	2S-DVX-012-10, etc.	44.00	3S-DVX-012-10, etc.	46.20	4S-DVX-012-10, etc.	48.40	5S-DVX-012-10, etc.	50.6
5	±20%	±1.0%	2S-DVX-005-20	44.00	3S-DVX-005-20	46.20	4S-DVX-005-20	48.40	5S-DVX-005-20	50.6
12, 15, 28, 48, 120, 150, 300	±20%	±1.0%	2S-DVX-012-20, etc.	44.00	3S-DVX-012-20, etc.	46.20	4S-DVX-012-20, etc.	48.40	5S-DVX-012-20, etc.	50.6
EXPANDED SCALE — PERCENT DEVIATION										
12	± 5%	±0.25%	2S-DPX-012-05	44.00	3S-DPX-012-05	46.20	4S-DPX-012-05	48.40	5S-DPX-012-05	50.6
28, 120	± 5%	±0.25%	2S-DPX-028-05, etc.	44.00	3S-DPX-028-05, etc.	46.20	4S-DPX-028-05, etc.	48.40	5S-DPX-028-05, etc.	50.6
12	±10%	±0.5%	2S-DPX-012-10	44.00	3S-DPX-012-10	46.20	4S-DPX-012-10	48.40	5S-DPX-012-10	50.6
28, 120	±10%	±0.5%	2S-DPX-028-10, etc.	44.00	3S-DPX-028-10, etc.	46.20	4S-DPX-028-10, etc.	48.40	5S-DPX-028-10, etc.	50.6
12	±20%	±1.0%	2S-DPX-012-20	44.00	3S-DPX-012-20	46.20	4S-DPX-012-20	48.40	5S-DPX-012-20	50.6
28, 120	±20%	±1.0%	2S-DPX-028-20, etc.	44.00	3S-DPX-028-20, etc.	46.20	4S-DPX-028-20, etc.	48.40	5S-DPX-028-20, etc.	50.6

Listings above are for S series. To designate C series, substitute "C" for "S" in catalog number. Prices are identical.

	1½"		2½"		3½"		4½"		5½"	
Range	Catalog No.	Price	Catalog No.	Price	Catalog No.	Price	Catalog No.	Price	Catalog No.	Price
AC MILLIAMMETERS — Rectifier Type										
0-25, 50, 100, 200, 500	1S-AMA-025, etc.	17.25	2S-AMA-025, etc.	16.15	3S-AMA-025, etc.	17.25	4S-AMA-025, etc.	19.20	5S-AMA-025, etc.	21.95
AC AMMETERS — Rectifier Type										
0-1, 1.5, 2, 3, 5, 10, 15	1S-AAA-001, etc.	17.25	2S-AAA-001, etc.	16.15	3S-AAA-001, etc.	17.25	4S-AAA-001, etc.	19.20	5S-AAA-001, etc.	21.95
0-20, 25, 30, 50	1S-AAA-020, etc.	18.05	2S-AAA-020, etc.	16.95	3S-AAA-020, etc.	18.05	4S-AAA-020, etc.	19.95	5S-AAA-020, etc.	22.70
0-100, 150, 200, 500	1S-AAA-100, etc.	17.25	2S-AAA-100, etc.	16.15	3S-AAA-100, etc.	17.25	4S-AAA-100, etc.	19.20	5S-AAA-100, etc.	21.95
(0-100 through 0-500 volts require external current transformers)										
AC VOLTMETERS										
ZERO LEFT										
0-3, 5, 10, 15, 25, 50, 100, 150, 300	1S-AVV-003, etc.	16.05	2S-AVV-003, etc.	15.30	3S-AVV-003, etc.	16.05	4S-AVV-003, etc.	17.05	5S-AVV-003, etc.	20.75
0-500	1S-AVV-500	17.00	2S-AVV-500	15.95	3S-AVV-500	17.00	4S-AVV-500	18.00	5S-AVV-500	21.60
EXPANDED SCALE (1½" models, other ranges available on special order)										
Range	Accuracy									
105-125	±0.5%		2S-AVX-115-10	46.20	3S-AVX-115-10	48.40	4S-AVX-115-10	50.60	5S-AVX-115-10	52.80
210-250	±0.5%		2S-AVX-230-10	46.20	3S-AVX-230-10	48.40	4S-AVX-230-10	50.60	5S-AVX-230-10	52.80
95-135	±1.0%		2S-AVX-115-20	46.20	3S-AVX-115-20	48.40	4S-AVX-115-20	50.60	5S-AVX-115-20	52.80
190-270	±1.0%		2S-AVX-230-20	46.20	3S-AVX-230-20	48.40	4S-AVX-230-20	50.60	5S-AVX-230-20	52.80
NULL METERS										
Range / End Scale Current										
NULL 50μA ±20%	1S-NUL-050	20.05	2S-NUL-050	19.25	3S-NUL-050	20.05				
NULL 100μA ±20%	1S-NUL-100	17.50	2S-NUL-100	17.00	3S-NUL-100	17.50				
NULL 500μA ±20%	1S-NUL-500	14.55	2S-NUL-500	14.15	3S-NUL-500	14.55				
ELAPSED TIME METERS										
Time Range / Input			(Other ranges and inputs available)							
0-99999.9 hrs. 115VAC (60Hz)			2S-ETM-115/60H	18.50						
0-99999.9 min. 115VAC (60Hz)			2S-ETM-115/60M	18.50						
VU METERS — Per USA Standard C-16.5 1954										
Type A scale (record) or Type B scale (broadcast)	1S-AVU-000-	17.50	2S-AVU-000-	16.85	3S-AVU-000-	17.50	4S-AVU-000-	18.15		
VU TYPE DC MICROAMMETERS										
Scales as above	1S-DVU-000-	12.90	2S-DVU-000-	12.60	3S-DVU-000-	12.90	4S-DVU-000-	13.75		

DISCOUNT SCHEDULE:
0-9 meters NET;
10-24 meters 15%;
25-49 meters 25%;
50-99 meters 35%,
applicable to total number of meters ordered.

MODIFICATIONS

Certain modifications of catalog meters, the specifications of which are normally detailed by the customer, can be accomplished quickly at Modutec factory modification centers, at costs proportionate to work required. Typical modifications:

Custom Dials or Scales — These can be produced from artwork supplied by Modutec or by customer.

Custom Colors — Meter covers can be finished with paint supplied by the customer.

Suppressed Zero — Up to 60% of the normal range may be suppressed.

Zero Right — Meters with zero-right movements and custom scale can be supplied.

Single-Point Calibration — Can be furnished to an accuracy of 1%.

Special Marking — Case or cover can be hot stamped with customer's name, trade-mark, etc.

SPECIALS

If your application demands special requirements beyond the listed options and modifications, communicate with us. Some of the areas of capability are:

- Damping factor variation
- Response time variation
- Special cases, covers
- High sensitivity movements
- VU meters
- Multiple range meters
- Externally adjustable (dead set) pointer

OPTIONS

The optional features listed below can be promptly incorporated in any standard meter. To order, add the appropriate suffix to the catalog number of the meter, and add the indicated charge to the list price before applying the quantity discount (see above).

Improved Accuracy

Calibration	Add'l Charge	Suffix
±1% tracking, ±1% accuracy	$4.50	A1
±0.5% tracking, ±2% accuracy	8.25	A2
±0.5% tracking, ±1% accuracy	11.00	A3

Colors — 9 standard colors, C suffix, add'l. charge $1.00

Blank Dial — D suffix, add'l. charge $0.50

Lexan Case & Cover — H suffix, add'l. charge $2.25

Illumination Kit — K suffix. For bezel mount & Windo-mount meters. 1½" to 3½", $3.00; 4½" & 5½", $3.25

Mirror Scale — M suffix, add'l. charge $1.00

Single-Point Calibration — P suffix, add'l. charge $2.25

Improved Terminal Resistance—R suffix, add'l. charge $1.00

Sealed Case — S suffix, add'l. charge $2.75

Temperature Compensation — T suffix, add'l. charge $4.00

Rear Zero Adjust — Z suffix, add'l. charge $2.25

Hand Lettered Custom Dials — Add'l. charge $7.50 minimum

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INCORPORATED
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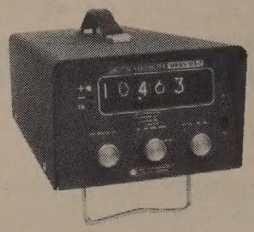
NON-LINEAR SYSTEMS, INC.

THE MOST RELIED UPON NAME IN THE INSTRUMENTATION INDUSTRY. MAKERS OF HIGH-QUALITY, VALUE-PRICED PRODUCTS IN THE FOLLOWING AREAS:

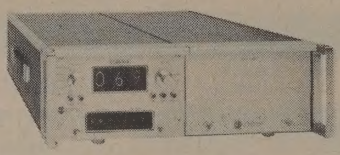
MX-2
4-Digit Multimeter
$1645



- **Digital Volt and Multimeters**

3, 4, or 5 digit models
Measure DC, AC, Ohms, Ratio, and Current
Digital Panel Meters, Computing Ratiometers,
MIL-Spec Units

2300 Scanner
5 to 1000 Channels



- **Data Acquisition System Modules**

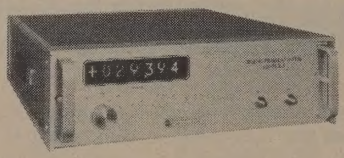
Scanners, Digital Clocks, Digital Comparators,
Printers, Signal Conditioners, Serializers,
and Buffers

S-5
Ideally suited
for process control
and data aquisition
in all fields.

- **Digital Data Acquisition and Control Systems**
  Computer or Hardware Control

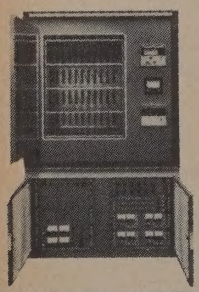
Low, Medium, or High Speed Analog Systems,
Magnetic and Paper Tape,
Printer (high and low speed), Card Punch,
X-Y Plotter or CRT Terminal Output Recordin
Software capability

X-5
Will read
in any
standard
engineering
unit, and is
non-position sensitive.



- **Pressure Measurement and Control**

Digital Pressure Meters
Transducers
Pressure Control Systems



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Modular concept
and complete inventory
of boards
affords easy expansion.

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Word Generators and Word Generator Systems

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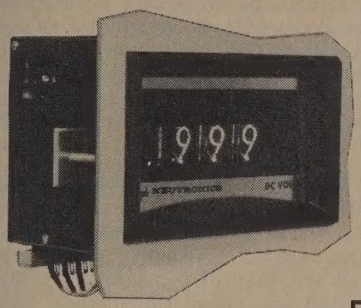


MODEL 100 SERIES DIGITAL PANEL METERS

FEATURES

- COMPACT: Physically interchangeable with most conventional 4.5″ Bezel Mount Panel Meters (3.5″ High x 4.5″ Wide x 2.75″ Deep).
- VERSATILE: Capable of measuring AC or DC Volts, Current (with DC Zero Suppression), or Ohms.
- TTL BCD DIGITAL OUTPUTS, REMOTE ENCODE & ISOLATED ANALOG AND DIGITAL GROUNDS STANDARD: Ideally suited for Data Logging System requirements.
- AC OR DC OPERATION: Permits either stationary or mobile use.
- HIGH ACCURACY: ±0.1% of Reading ±0.1% of Full Scale.
- HIGH INPUT IMPEDANCE: Greater than 1,000 Megohms on 0.2 Volt Range.
- 100 MICROVOLT RESOLUTION
- AUTOMATIC POLARITY AND OVERRANGE INDICATION
- NON-BLINKING WIDE ANGLE DISPLAY
- OVERLOAD PROTECTION

DESCRIPTION

The Neutronic Model 100 Series Digital Panel Meters were designed primarily as a high performance, low cost, 3½ digit instrument. They are direct replacements for most conventional 4.5″ bezel mount panel meters, thereby permitting instrument and system manufacturers to use interchangeably that meter which best suits their specific requirements.

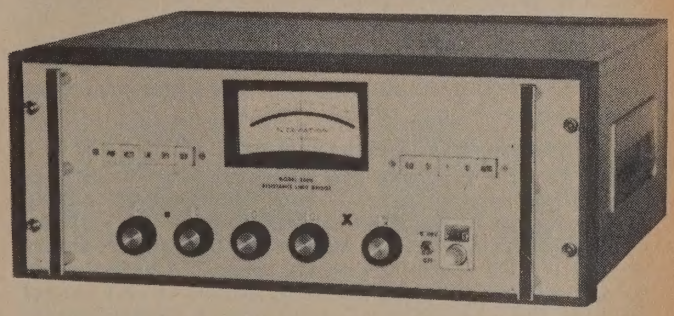
MODEL 2000 RESISTANCE LIMIT BRIDGE

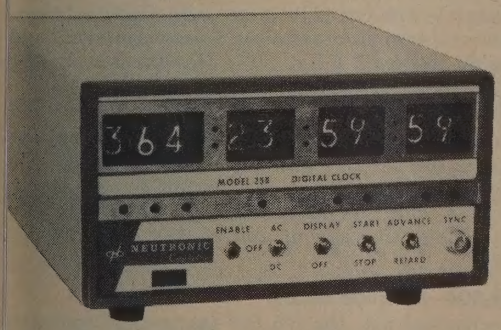
FEATURES

- TO 1.2 GIGOHM RANGE
- ±0.005% ACCURACY AVAILABLE
- PPM SENSITIVITY ON ALL RANGES
- INEAR, DIRECT READING PERCENT DEVIATION
- UTOMATIC DEVIATION METER RANGING
- O DEVIATION METER ZERO OR CALIBRATION ADJUSTMENTS
- OW OVERLOAD RECOVERY TIME
- EST VOLTAGE PER MIL-R-93
- OMPLETELY FLOATING, GUARDED AND SHIELDED
- LL SILICON SOLID STATE CIRCUITRY

ESCRIPTION

T Neutronic Model 2000 Resistance Limit Bridge is a human engi- nred, completely self-contained instrument, designed for use in the nufacture of resistors whenever control of a trimming process is uired. The instrument incorporates a unique "Active Guarded Bridge" wch permits features heretofore unobtainable in Resistance Limit Bges. Namely, perfectly linear direct reading percent deviation, with- o any requirement for meter zeroing or calibration prior to use on a range.





MODEL 250 DIGITAL CLOCK

FEATURES

- HIGH STABILITY: Aging rate 5 parts in 10^8/day typical.
- LOW POWER CONSUMPTION: 6 watts typical with the display off.
- COMPACT, LIGHTWEIGHT, INSTRUMENT PACKAGING.
- AC OR DC OPERATION: Permits either stationary or mobile use.
- SYNCHRONIZABLE ELECTRONICALLY TO WWV.
- CONTROL INTERLOCK: Eliminates accidental control misadjustments.
- CONTACT CLOSURES: Each second, minute, hour and day.
- ALL SOLID STATE CONSTRUCTION utilizing monolithic integrated circuits.
- ADVANCE-RETARD: Allows precision real time synchronization.

DESCRIPTION

The model 250 is an extremely accurate and reliable instrument primarily for precision measurement and/or recording of real or elapsed time in fixed or mobile applications. It displays seconds, minutes, hours and days (optional) with an in-line digital display utilizing cold cathode numerical indicator tubes. Pushbuttons are provided to preset instrument to desired start time. It can be started manually — or electronically by synchronizing from the 600 Hz audio tone transmitted by radio station WWV. The instrument also provides an optional serial Time Code Output for recording on magnetic tape, visual BCD outputs for use with data systems or digital recorders, and precision decade rate outputs for synchronization of external equipment.

NEUTRONIC *Corporation*

EW CONCEPTS IN ELECTRONICS

ADDITIONAL DETAILS ON THESE AND OTHER NEUTRONIC PRODUCTS ON REQUEST

ADDITIONAL PRODUCTS: Resistance Deviation Bridges • Automatic Resistance Bridges • Digital Voltmeters • Time Code Generators • Totalizing Counters • Preset Counters • AC & DC Power Supplies • Solid State Relays

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NORTH ATLANTIC *industries, inc.*

AC PHASE SENSITIVE

Resolver/Synchro Simulators & Bridges

Most instruments offer a dual mode capability, permitting a single model to work with both resolvers and synchros. All units feature input/output isolation, and also direct in-line readout of angle, i.e., 359.999°, thus eliminating operator confusion, reading error and fatigue. All dual-mode units are also available as single-mode resolver or synchro units.

Series 530—Resolver/Synchro Simulators

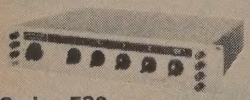
These simulators provide the ideal outputs for driving resolvers and synchros at 11.8, 26, 90 and 115 V line-line voltages. These line-line voltages are all available with either 26 V or 15 V 400 Hz excitation, and feature isolated input and output. Accuracy is 2 arc-seconds. Standard resolutions are .0001°, .001°, 1° and 5°, with standard units 3½" full-rack. Optional half-rack mounting for 1° and 5° resolution models.

Model 530/20, 540/20 Broadband Resolver/ Synchro Simulator & Bridge

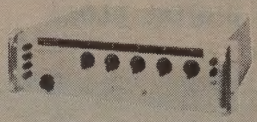
These broadband instruments operate over the frequency range from 50 Hz to 10 KHz, and provide accuracy to 10 arc-seconds. Their flat frequency vs. accuracy characteristic makes either unit an ideal choice for test facilities requiring maximum utility from all instruments. Both the Simulator and the Bridge provide selectable resolver-and-synchro-modes for all standard line-line voltages in a 5¼" high full-rack unit. Angle is displayed as a non-ambiguous in-line readout from 0° to 360°.

Model 532—Miniature Synchro Simulator

Model 532 is a miniature synchro simulator offering precision performance in a small panel-mounted unit suitable for production test, ground support and similar systems. Direct simulation of 11.8 V 400 Hz line-line synchro transmitters (CX) is provided, with dial reading in 30° segments plus 5° increments selectable by sealed thumb-wheel switches and accurate to 30 arc-seconds. A similarly packaged Resolver Simulator, Model 531, is also available. Units can be supplied with several options, including 90 V line-line output.

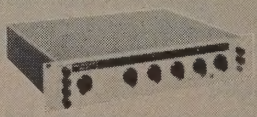


Series 530



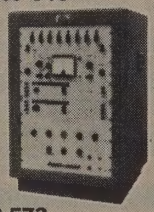
Model 530/20, 540/20

Model 532



Series 540

Model 541/10



RTS-573

API-8025

RB-503, RB-504

Series 540—Resolver/Synchro Bridge

These bridges permit direct measurement of resolver an synchro transmitters. They feature a constant null gradien output voltage, isolated input and output, input impedanc over 500K, and 400 Hz accuracy of 2 arc seconds. Standar resolutions are .0001°, 1°, and 5°, and are provided in a 3½ full-rack panel unit. Optional half-rack mounting for 1 and 5° resolution models.

Model 541/10—Miniature Resolver Bridge

This Miniature Resolver Bridge is designed for panel-moun applications in production and field test equipment. It meas ures the angular position of 400 Hz resolver transmitter with an accuracy of 5 arc-seconds. Manual balance is b coarse and fine sealed thumbwheel switches, with readou in 45° segments plus 5° steps. A Miniature Synchro Bridg Model 542/10, is available in an identical package.

RTS-573

An integrated 400 Hz Resolver/Synchro Test Console fo complete resolver and synchro testing. Tests include Phas Shift, TR, Angular Accuracy, Electrical Zero, Phasin Total and Fundamental Nulls, Input Current.

Angle Position Indicators

High-speed performance 400 Hz servos for field test an production test measurement of synchro and resolver tran mitters. The half-rack API-8025 provides accuracy of 6 a minutes, repeatability of 30 arc seconds, and slew speed 25°/second with a digital readout display. Optional retran mit components, dual-mode, and two-speed operation. Al available for operational use, 2" and 3" diameter units.

Model 545—Automatic Angle Position Indicator

This instrument is offered with .01° resolution and accura or with .001° resolution and 10-second accuracy for all lin to-line voltages from 11.8 to 90 V at 400 Hz. The digit angle is both displayed and available in BCD format at t rear connectors. Remote or front-panel selection of resolv or synchro input, line-line voltage range and operating mo Operating modes selected as Track (the instrument contin ously follows the input data), Update (the instrument trac for 200 msec, then holds until receipt of another command and Auto-Update (repetitive track/hold sequences) with Variable Display Time of .5 to 3 seconds. Optional remo readout, analog d-c null output, data freeze command, sign frequencies 50 Hz to 4.8 KHz, multiplexed and multi-spe

AC Ratio Boxes

These precision inductive voltage dividers provide ide characteristics for use in ratiometric measurements. Th feature high input impedance, low output impedance, a accuracy over a wide frequency band. All units have dire in-line non-ambiguous readout and occupy a minimum panel space.

RB-503, RB-504—AC Ratio Boxes

For production test use, the RB-503 features 10 ppm acc racy from 50 Hz to 5 KHz, Zin 300K, Zo 3.5Ω, 0.35f vo input rating and a ratio range from 0 to 1.111110. RB-5 features 1 ppm accuracy from 300 Hz to 2 KHz, Zin 200 Zo 8.5Ω, 0.7f volts input rating, and a ratio range fr −0.111110 to +1.111110.

RB-503T, RB-504T—Inverting AC Ratio Boxes

Both models feature isolated input with full inversion ca ability. Ratio range is ±1.111110 with 0.35f volts input r ing. The accuracy is 10 ppm and 3 ppm respectively for ea model over the entire ratio range. Higher accuracy and inp voltage rating is included through a built-in direct-inp mode.

STRUMENTS, RATIO BOXES, AND ANGLE POSITION INDICATORS.

del 503/10—AC Ratio Box

broadband unit has a ratio range 0 to 1, operates from 50 Hz to 10 KHz with 10 ppm accuracy from 50 Hz to 3 KHz, and 100 ppm from 3 KHz to 10 KHz. This 3½" high rack unit is environmentally qualified for temperature, humidity, altitude, shock, and vibration.

521—Miniature Ratio Box

field use, this instrument features drip- and splash-proof construction while providing 10 ppm accuracy. Zin 25K, Zo 3.5Ω, 0.35f volts input rating.

ase Angle Voltmeters

se multifunctional instruments combine phase-sensitive es with the functions of a conventional a-c voltmeter rating over the range of 10 Hz to 100 KHz. They provide ct-reading voltage measurement of the total, fundamen- in-phase and quadrature components of an a-c signal to full-scale, as well as phase angle to 1°. They feature brated voltage ranges of 300 μV (or 1 mV) to 300 V full-scale, built-in or plug-in harmonic-rejection filters, in quadrature overload capability, and operate with a e range of reference voltages.

del 214A, 214B, 214C—Four-Frequency se Angle Voltmeter

production test use, these solid-state instruments pro- phase sensitive operation at 1, 2, 3, or 4 frequencies 30 to 20 KHz. Features include ±5% bandwidth without ustment, adjustable meter scaling for go/no-go applica- s, and 300 μV to 300 V full-scale ranges. Rapid field nge of frequency modules accomplished with simple one- trol recalibration procedure. Available as Model 214A isolation), 214B (reference isolation), and 214C (signal reference isolation). Optional rear connectors, 10 μV -scale range.

del 240, Model 245—Phase Angle Voltmeters

field support use, these transistorized Phase Angle Volt- ers are designed for operation at a specified frequency m 30 Hz to 20 KHz. Similar performance to the Series with operation at a fixed reference level. Optional d-c tmeter function.

-202—Phase Angle Voltmeter

e original Phase Angle Voltmeter designed for production t use, provides phase-sensitive operation at a single-spe- ed frequency 30 Hz to 10 KHz. Optional signal and/or rence isolation. Also available in 2- or 3-frequency del VM-204.

del 301A—Broadband Phase Angle Voltmeter

r production test and laboratory use, this broadband trument is designed for continuous phase sensitive opera- n from 10 Hz to 100 KHz with a phase angle accuracy of 5° from 30 Hz to 30 KHz. Harmonic rejection filters are ilable and simply plugged in behind the swinging meter el.

del 215C—Militarized Phase Angle Voltmeter

ovides over-all functions of and similar performance to e Model 214C Phase Angle Voltmeter in a configuration alified to MIL-T-21200, and designed for operation from to 75°C. Construction includes drip-proof front panel, oted toggle switches, panel meter per MIL-M-10304B, aled controls and RFI gaskets.

Model 212A, 212B, 212C—Transistorized Phase Angle Voltmeter

This solid-state instrument, successor to the famous VM-202, provides phase-sensitive measurement at a single pre-specified frequency from 30 Hz to 10 KHz with full-scale measurement from 300 μV to 300 V. Three basic models are available: Model 212A (no isolation), Model 212B (reference isolation), and Model 212C (signal and reference isolation).

Phase Sensitive Converters

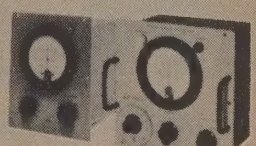
PSC-419—Phase Sensitive AC/DC Converter

For automatic test systems, this programmable instrument converts 400 Hz signal components to high-level d-c with 0.1% linearity and 0.003% scale factor change from −40° to +75°C. Input sensitivity 10 mV full-scale for 10 vdc full-scale output with 100 msec response time. Output impedance 0.2Ω. Accessory panel available to provide rack mounting and manual input controls. Optional operation at other frequencies to 10 KHz.

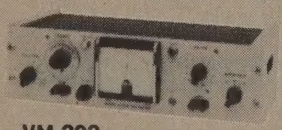
Phase Sensitive Converter—Model 431

Designed as a building block for the GPATS (General Purpose Automatic Test System), this special purpose Phase Sensitive Converter measures total, fundamental, in-phase and quadrature voltages, and reads angles directly. It operates in multiple frequency bands from 60 Hz to 15 KHz.

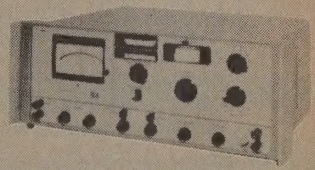
Model 214A, 214B, 214C



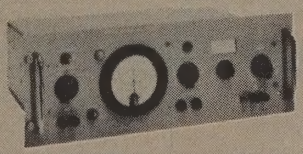
Model 240, Model 245



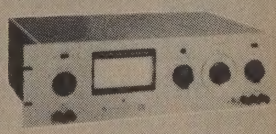
VM-202



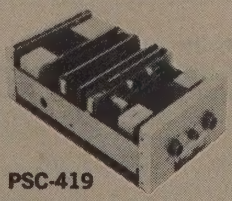
Model 301A



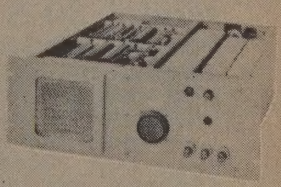
Model 215C



Model 212A, 212B, 212C



PSC-419



Model 431

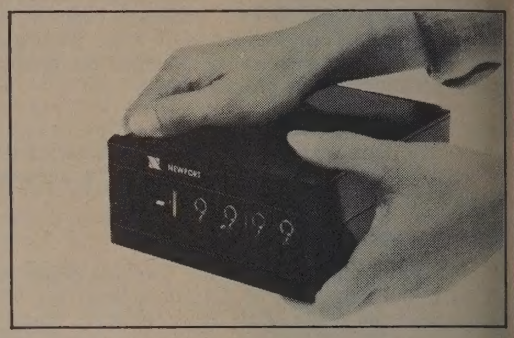
NORTH ATLANTIC
industries, inc.
RMINAL DRIVE, PLAINVIEW, NEW YORK 11803 • 516—681-8600

NEWPORT LABORATORIES, INC. ■ 630 East Young Street, Santa Ana, California 92705 ■ (714) 540-4914

DIGITAL PANEL METERS

series 2000

- 30 readings per second
- Automatic polarity
- Driven guard-shield, box-within-box construction
- High accuracy, ±.01%R±.01%FS
- Isolated inputs to BCD outputs, up to 500 volts common-mode
- 1000 MΩZ_{in}
- Overranging to 20,000 counts
- ± and overload indicators
- Operates 0° to 60°C
- Non-glare polaroid screen



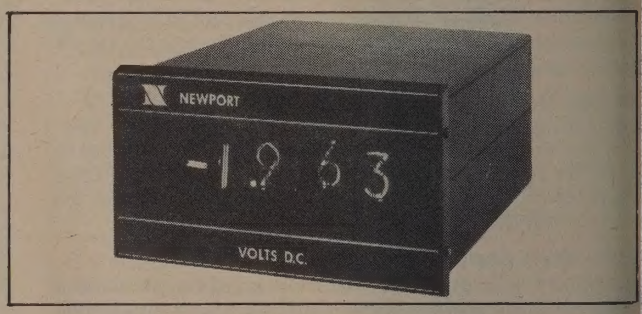
series 2000 specifications

	DC VOLTAGE METERS				AC VOLTAGE METERS			RATIO METERS
Model	2000-1	2000-2	2000-3	2000-4	2200-2	2200-3	2200-4	Any meter can be ordered for use with an external reference.
Full Scale	±199.99mv	±1.9999v	±19.999v	±199.99v	1.9999v	19.999v	199.99v	
Maximum Error 8 hrs. at 25°C	.01%R+.02%FS	.01%R+.01%FS	.01%R+.01%FS	.01%R+.01%FS	.1% reading ±.05%FS 50 Hz to 500 Hz			10v same as DC
Maximum Error 15-35°C, 30 days	.02%R±.03%FS	.02%R±.02%FS	.02%R±.02%FS	.02%R±.02%FS				1v same as DC +.01%

	DC CURRENT METERS					AC CURRENT METERS			
Model	2100-1	2100-2	2100-3	2100-4	2100-5	2300-1	2300-2	2300-3	2300-4
Full Scale	±19.999μa	±199.99μa	±1.9999ma	±19.999ma	±199.99ma	199.99μa	1.999ma	19.999ma	199.99ma
Maximum Error 8 hrs. at 25°C		.02% reading ±.02%FS				1% reading ±.05%FS			
Maximum Error 15-35°C, 30 days		.05% reading ±.03%FS				.10% reading ±.05% FS 50 Hz to 500 Hz			

series 200

- Optional panel mountings
- AC, DC, voltage, current ratio
- Non-blinking display
- Overrange indication
- 0.1%R error, 1999 FS
- Electrical shield, solid aluminum enclosure
- Isolation of input from digital ground
- 60 readings per second maximum
- Voltages from 20 mv FS to 200 v FS
- Currents from 2 μamps FS to 200 ma FS
- BCD output, bipolar options



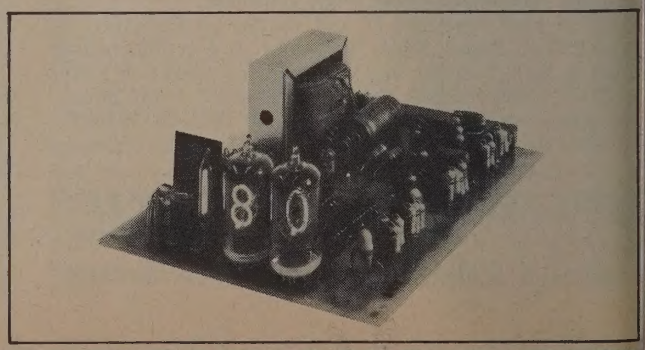
	DC VOLTAGE METERS									AC VOLTAGE METERS				RATIO METERS
Model	20-1	20-2	20-3	20-4	200-1	200-2	200-3	200-4	200-5	220-1	220-2	220-3	220-4	Any 1999-count meter may be employed to take ratio, using +10v DC ±20% as a reference.
Full Scale	199mv	1.99v	19.9v	199v	19.99mv	199.9mv	1.999v	19.99v	199.9v	199.9mv	1.999v	19.99v	199.9v	
Maximum Error 15 to 35°C	1mv±0.5%R±0.5%FS				0.1%R±0.1%R±0.1%R± 0.15%FS 0.1%FS 0.05%FS			0.15%R±0.1%FS		100μv±0.2%R±0.15%FS 48Hz to 500Hz				Add 0.1%R to the basic meter specification

	DC CURRENT METERS											AC CURRENT METERS					
Model	21-1	21-2	21-3	21-4	21-5	210-1	210-2	210-3	210-4	210-5	210-6	230-1	230-2	230-3	230-4	230-5	230-6
Full Scale	19.9μa	199μa	1.99ma	19.9ma	199ma	1.999μa	19.99μa	199.9μa	1.999ma	19.99ma	199.9ma	1.999μa	19.99μa	199.9μa	1.999ma	19.99ma	199.9ma
Maximum Error 15 to 35°C	100na ±0.5%R±0.5%FS					2na±0.15%R±0.1%FS						2na±0.25%R±0.2%FS 48Hz to 500Hz					

Definitions: "R" means reading; "FS" means full scale.

model 20-S

- Small size — 4.50" x 5.75"
- High input impedance — 1000 megohms minimum
- Fast reading rate — up to 60 per second
- Wide operating temperature — 0°C to 50°C
- Zero stability — With Temp. ±1 digit 0-50°C
  Constant Temp. ±1 digit in 90 days
- Low price — under $100 at 100 level

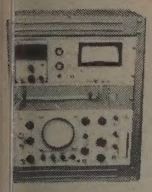


The Model 20-S panel meter is a small, rugged, low-cost, non-blinking readout particularly suited for OEM users. It is stable and accurate over a wide-range of operating requirements.

Prior to shipment, all units are subjected to accelerated aging at elevated temperature to minimize or prevent failure in the field.

OEM users are invited to inquire concerning variations and special characteristics suited to your individual requirements.

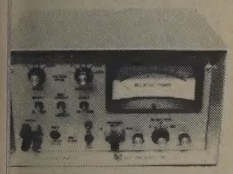
Precision Devices and Equipment for Current and Power Measurement



WIDEBAND POWER MONITORING EQUIPMENT

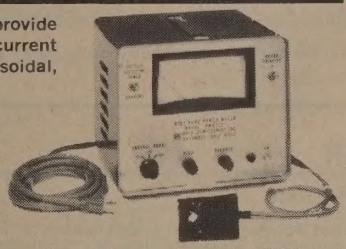
4000 Series Power Monitoring Equipment is designed to measure average or peak power at frequencies from d.c. to Megahertz. Flat frequency response makes these units ideal for power measurements involving transients or non-sinusoidal waveforms as encountered in resistance welding, electrical discharge machines, rotating machines, inverters and other industrial applications. Meter displays of peak or average power is provided. Oscilloscope display of voltage, current or instantaneous power with 100 nanosecond risetime permits detailed analysis of system operation and efficiency determination.

WIDEBAND PULSE WATTMETER



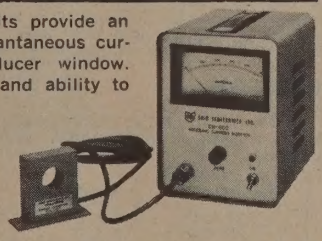
5000 Series Wideband Wattmeters provide the unique capability of measuring pulse power involved in turn-on, conduction, and turn-off of switching transistors, silicon-controlled rectifiers and other solid state devices. The typical 30 nanosecond risetime and flat d.c. to Megahertz frequency response provides accurate measurements in circuits where 1 microsecond or less switching time is involved. Monitor output is available for oscilloscope display of instantaneous power, current or voltage.

WIDEBAND POWER MONITORS



600 Series Power Monitors provide economical units for power or current measurements where d.c., sinusoidal, non-sinusoidal or pulse power is delivered to a load. Currents as high as 1000 Amperes are handled with negligible circuit interaction due to use of isolated current transducers. Meter display of peak or average power is provided, as well as +1 to −1 volt output for oscilloscope monitoring of instaneous waveform.

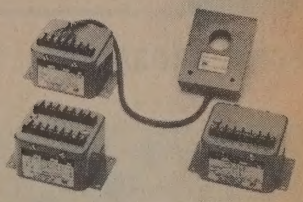
WIDEBAND d.c. to Megahertz CURRENT MEASURING EQUIPMENT



1 Series current measuring units provide an output signal proportional to instantaneous current flowing through the transducer window. The d.c. to Megahertz response and ability to faithfully reproduce 1 microsecond transients provide an ideal way to monitor critical circuits without electrical connection and with minimum interaction caused by measurement. The panel meter provides display of direct current while the +1 to −1 volt output can be used for monitoring or control purposes with current flow in either direction.

MODEL	PEAK CURRENT AMPERES	METER RANGE AMPERES	OUTPUT-VOLTS
CM-30	30	0 - 30	0 - 1
CM-100	100	0 - 100	0 - 1
CM-200	200	0 - 200	0 - 1
CM-600	600	0 - 500	0 - 1
CM-1000	1000	0 - 1000	0 - 1

HALLTRON POWER COMPUTERS OR WATT TRANSDUCERS

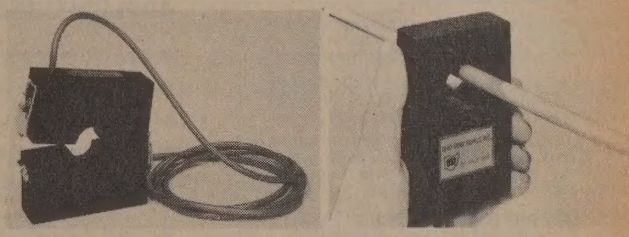


The Halltron Power Computer provides a d.c. output signal proportional to the true power consumed by the load. Single and three phase units have fast response needed for sinusoidal or chopped waveforms and have an output which is electrically isolated from supply lines.

MODEL	APPLICATION	(Volts) VOLTAGE	(Ampere) CURRENT	(Millivolts) OUTPUT
PC-51	1ϕ 2 Wire	120	5	50 @ .5KW
PC-52	1ϕ 2 Wire	240	5	50 @ 1KW
PC-101	1ϕ 2 Wire	120	10	50 @ 1KW
PC-102	1ϕ 2 Wire	240	10	50 @ 2KW

Special units, for higher currents or higher voltages than listed in stock models, can be supplied for control applications.

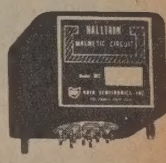
HALLTRON d.c. to Kilohertz CURRENT TRANSDUCERS



These Halltron Current Transducers provide flat d.c. to 5 Kilohertz response and require no electrical connection to the circuit being monitored. The circuit isolation makes many measuring and control applications simple, especially where conductors are at high voltage with respect to measuring or control circuits.

Models with better than 1% linearity and temperature effects less than 1% are stock items in current ranges to 2000 Amperes. Special units for higher currents or split-core configuration can be supplied for specific requirements. Auxiliary amplifier-power supply units are available to provide 10 volt output when desired instead of 50 millivolt output of transducer alone.

HALLTRON TRUE PRODUCT MULTIPLIER



O.S.I.'s Halltron, true-product multipliers provide an electrical output which is the product of two input currents which may be ± d.c. or time-dependent. High linearity and low-noise properties insure optimum performance in critical circuit applications. All units are supplied in hermetically sealed packages with, in most cases, dual magnetic inputs so that series or parallel operation can be obtained to satisfy various input requirements.

MODEL	INPUT 1	INPUT 2	OUTPUT MILLIVOLTS
MC-101	25/50 ma.	250 ma.	250
MC-103	250/500 ma.	250 ma.	250
MC-105	1.25/2.5 A.	250 ma.	250
MC-107	7.0 A.	250 ma.	250

AMPERE-HOUR MONITORING EQUIPMENT

The A-H Series units provide bidirectional registration of charge and discharge in d.c. applications, thereby accurately indicating electrical energy consumed. 1% accuracy is mtaintained to current levels of 10,000 Amperes.

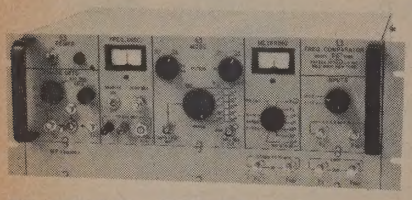
OHIO SEMITRONICS, INC.
1205 CHESAPEAKE AVENUE • COLUMBUS, OHIO 43212 • PHONE: 614-486-9561
PIONEER IN SOLID STATE ENERGY CONVERSION MATERIALS, DEVICES and SYSTEMS

PARZEN

A DIVISION OF SKINNER INDUSTRIES INC.

48 URBAN AVE., WESTBURY, L.I., NEW YORK 11590
TELEPHONE: (516) ED 4-3900

MODELS 103A, 104A, 105A and 106A



PRINCIPAL FEATURES

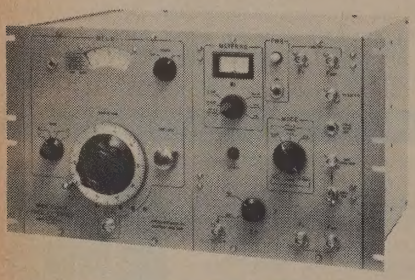
- Resolutions Greater Than 1 Part in 10^{12} Peak to Peak in One Second
- Direct Digital Readings of Frequency Difference of ±1 Part in 10^{12} for 1 Second Observation Time Using a Frequency Counter (Model 106A)
- Six Selectable Decade Stages of Error Multiplication of 10, 100, 1,000, 10,000, 100,000, and 1,000,000 (Model 106A)
- Built-in Frequency Discriminator Gives Analog Frequency Difference Indications on Front Panel Meter and External Chart Recorder
- Built-in Phase Detectors with Resolution Greater Than 0.3 Degree Peak to Peak at Equivalent Frequency of 1GHz
- Allows Quick Accurate Measurement of Both Short and Long Term Performance of Frequency Sources, Active and Passive Networks, etc.
- Can Be Used with Peripheral Equipment to Make An Extremely High Resolution, Low Noise, Very Wide Dynamic Range Spectrum Analyzer

The Parzen Frequency Comparators are advanced instruments based on well established error multiplication techniques and of proven design and performance. The basic units accept 1.0, 2.5, and 5.0 MHz signals in any combination. Other frequencies can be handled by adding the model MF Multiple Input Frequency option or using them in combination with the model 109 Wide Range Frequency Extender. By effectively multiplying the frequency difference between the two input signals, the Comparators provide an error expanded signal which can be fed directly to a counter for digital presentation and which is detected internally by a built in frequency discriminator and two built in phase detectors. The frequency discriminator provides a linear analog signal, proportional to the frequency difference between the signals, which is displayed on a calibrated front panel meter and which is also provided on the front panel for feeding to a strip chart recorder. The phase detectors of the compararto provide detailed information on the total frequency, phase, time and noise characteristics of the device being tested. The phase detector outputs can also be used for tracing specific sources of noise etc such as ac pickup, power supply hum, EMI, and low level oscillations. Finally they have a bandwidth of 3 KC allowing observation times as short as 0.3 ms.

APPLICATIONS Applications include

- Short-term and long-term stability measurements of frequency sources.
- Rapid alignment of frequency sources for maximum accuracy and stability.
- Rapid detailed analysis of total frequency, phase, time, and noise performance.
- Acquisition of useful information on noisy frequency sources.
- Stability and noise measurements of active and passive networks such as amplifiers frequency multipliers, dividers, mixers, and synthesizers.
- Rapid diagnosis and adjustment to improve performance of sources and networks.
- Extremely high resolution, low noise, very wide dynamic range spectrum analysis.

MODEL 109 WIDE RANGE FREQUENCY EXTENDER



MODEL 109 WIDE RANGE FREQUENCY EXTENDER

Used with Model 103A, 104A, 105A or 106A for 1 to 108 MHz inputs.

PRINCIPAL FEATURES

- Frequency comparison or calibration methods of operation.
- Accepts any frequency from 1 MHz to 108 MHz in comparison mode of operation and 0.6 to 220 MHz in calibration mode of operation.
- Resolution better than 1 part in 10^{11} peak-to-peak in 1 second.
- Allows short term phase stability of networks to be measured at any frequency from 1 to 108 MHz.
- Can be used with peripheral equipment to make an extremely high resolution, low noise, very wide dynamic range, wide tuning range, Spectrum Analyzer.
- Auxiliary unit for Parzen Frequency Comparators.

GENERAL DESCRIPTION

The Parzen Model 109 Wide Range Frequency Extender is a state-of-the-art instrument that expands the frequency coverage of Parzen Frequency Comparators. Now for the first time high-resolution comparison, short term phase and gain stability of networks, and frequency calibration measurements can be made at all frequencies between 1 and 108 MHz or 0.6 and 220 MHz depending on mode of operation used.

The Model 109 Extender can be used with any existing or newly purchased Parzen Research Model 103A, 104A, 105A, 106A, or Frequency Comparator. However, it is likely to be the most useful with the Model 104A for the majority of applications.

The Model 109 produces 1 MHz input signals for the Comparator. It utilizes a variable frequency local ocsillator (LO), which may be either the internal LO or any external unit of greater stability or purity. Complete phase-locking facilities and both aural and visual lock indications are provided, as well as flexible controls for the various methods of operation.

FREQUENCY COMPARISON

For frequency comparison measurements, either the internal LO or an external signal generator can be used. Both input signals must be nominally the same frequency. The LO is locked to the input in the following relationships:

Input Frequency	Intermediate Frequency (IF)	Band	LO Setting
Between 1 and 7 MHz	100 kHz	C & D	100 kHz lower than input frequency
Between 7 and 53 MHz	1 MHz	A & B	1 MHz lower than input frequency
Between 53 and 108 MHz	1 MHz	2XA	½ MHz lower than input frequency divided by 2

The LO lock beat output is provided for use in phase locking an external signal generator. Once lock is achieved either internally or externally, the frequency comparison measurement can be made immediately with the connected Comparator in the usual way. The frequency difference, Δf, is related to that indicated by the Comparator, as follows:

$$\frac{\Delta f}{F_{REF}} = [\text{Comparator indication expressed in parts in}]\frac{F_{IF}}{F_{REF}}$$

Thus, some error multiplication is effected by the Extender, and extending the resolution of the Comparator or allowing it to be used in its lower ranges. The practical resolution of this method is better than 1 part in 10^{11} peak-to-peak in 1 second.

FREQUENCY CALIBRATION

An external frequency synthesizer is required for frequency calibration of a test signal connected to F_{REF}. It is connected to the external LO input, with the output set for the same IF as above. There is no input to the Fx channel of the Extender. The F_{REF} output of the Extender is fed to the Fx input of the Comparator, and an external accurate 1, 2.5, or 5 MHz signal (such as from the frequency synthesizer) is fed to the F_{REF} input of the Comparator. The test signal can then be precisely calibrated to an accuracy determined by that of the frequency synthesizer, the accuracy of the signal fed to the F_{REF} input of the Comparator, and the capabilities of the Comparator.

PARZEN
A DIVISION OF
SKINNER INDUSTRIES INC.
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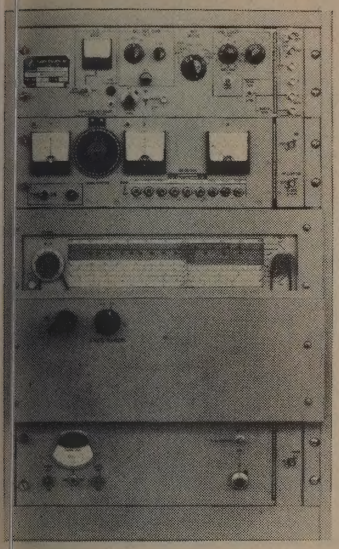
TELEPHONE: (516) ED 4-3900

ODEL 302 UNIVERSAL PRECISE CRYSTAL MEASURING SYSTEM



RINCIPAL FEATURES:

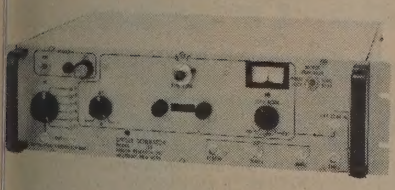
- State of the art instrument.
- Up to 1 part in 10^8 frequency ac-cracy.
- Up to 1 part in 10^9 frequency repro-cibility.
- Covers frequency range 500 kHz to 6 MHz.

GENERAL DESCRIPTION

The Parzen Model 302 Universal Precise Crystal Measuring System is a highly advanced, state-of-the-art instrument which, when used in conjunction with immitance bridges such as the Hewlett-Packard 803-A, General Radio 1606-A, 1606-B and 1602-B, and Wayne-Kerr B801 and B901, allows the precise measurement of the properties (i.e., impedance as a function of frequency) of quartz crystals of similar devices over the frequency range 500 kHz to 216 MHz. The system is of the single-frequency "servobridge" type and is based on the procedures described by E. Hafner in USAELRDL Technical Report E-1220.

The system is one in which the crystal unit or other device under test is used as a passive element in an impedance bridge. The system consists of a Master Oscillator, a superheterodyne receiver (i.e., coherent detector) whose local oscillator is phase locked to both the master oscillator and an internal frequency standard. In addition, it has provisions for additionally phase locking the master oscillator to the phase output of the receiver and hence to the bridge output, or operating the master oscillator in unlocked or swept modes. The wide dynamic range and high sensitivity of the instrument allows measurements to be made at powers of less than one fento watt. Bridges are not supplied with the instrument. All required operational controls and connectors are clearly marked and located on the front panel.

ODEL 154 and 155—OFFSET GENERATORS



RINCIPAL FEATURES:

- Automatic Conversion of One Time cale to Another, Such As A.1 to UT.2, ithout Affecting the Original Standard.
- Enables Comparison of Two 1 MHz ignals Offset Beyond a Frequency Com-arator's Frequency Range.
- Generates Precision Offsets from 0-050 Parts in 10^{-11} to 0-1050 Parts in 10^{-6} in Steps of 50 Parts.
- Short Term (1 Second) Stability of 1 'art in 10^{-10}.
- Provides 1 MHz and 100 KHz Outputs 'lus or Minus the Selected Offset.

GENERAL DESCRIPTION

State of the art instruments. The Parzen Models 154 and 155 Offset Generators are especially useful for time standard conversions. These precision instruments enable a laboratory to have access to all time scale standards without interruption of their basic time scale. These instruments provide an excellent method of calibration and measurement of narrow band filters, discriminators, sources, and investigation of phase-locked frequency control systems.

The Parzen Models 154 and 155 Offset Generators are completely Solid State and differ only in the offset selection Range. The 155 has an additional range of 10^{-11}. The Parzen Offset Generators automatically produce a stable output frequency that is offset by a precise amount from an input reference frequency. The amount of the offset can be fixed anywhere in the range from 0 to 1050 parts in 10^N, where N is selected. F_{OFFSET} **can be higher or lower than the input reference** frequency, F_{REF}.

The offset signal frequency is generated by a self-excited oscillator which is usually phase-locked to a stable frequency. This oscillator continuously covers the range from 0 to 10,500 Hz, which is equivalent to 0 to 1050 parts in 10^N. Three modes of operation are possible. The oscillator can be phase-locked to the internal source, it can be phase-locked to an externally supplied signal, or it can be used unlocked with moderate stability and accuracy.

The internal locking signal is derived by dividing down the input reference frequency. This provides 22 precise offsets, which can be dialed in, between 0 and 1050 parts in 10^N in 50-part steps.

An external locking signal is necessary only when an exact offset other than a multiple of 50 parts is required. The externally supplied frequency, in Hz, is equivalent to $10\triangle f$, and the amount of the offset is $10^N\triangle f$. Therefore, an external precision source of 1,300 Hz will produce an offset of exactly 130 parts in 10^N. The Generators will also lock on to harmonics of the externally supplied frequency.

PARZEN

A DIVISION OF SKINNER INDUSTRIES INC.

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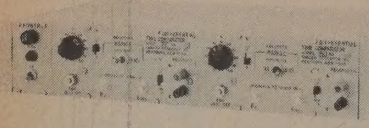
MODEL 113 — DIFFERENTIAL TIME COMPARATOR



(DUAL CHANNEL CONFIGURATION)

PRINCIPAL FEATURES:

- Low-cost high resolution instrument for long-term monitoring of Time and Frequency Difference.
- Unique differential feature enables precise measurements over a continually expandable range.
- Internal Stability Better than 1 part in 10^{13}.
- Recorder ranges down to ±5 nanoseconds full scale; self-calibration.
- 21 frequencies from 100 kHz to 10 MHz accepted in both inputs.
- Two Differential Time Comparators fit in one 3½ inch high cabinet.

FUNCTIONAL DESCRIPTION

The Parzen Model 113 Differential Time Comparator is an advanced solid-state instrument for indicating and recording long-term time and frequency difference between two (2) sources with maximum resolution better than 0.1 nanosecond. This permits determining frequency differences as small as 1 part in 10^{13} in about 15 minutes, and 1 part in 10^{10} in about a second. The Model 113 automatically accepts any of 21 frequencies from 100 kHz to 10 MHz in both channels, thus accommodating 231 possible combinations of input frequencies.

TECHNICAL SPECIFICATIONS

The Model 113 permits calibration of the output ranges, and eliminates the need for adjusting the phase of either source before the start of measurements. The total readings of the instrument at any instant, t_s, is equal to the sum of $t_1 + t_2 + t_3$ in nanoseconds, where t_1 and t_2 are the positions of the differential switches and t_3 is the reading on the external zero-centered chart recorder or voltmeter. When the range selector switch is in the X10 position, all nanosecond values are multiplied by 10.

The measurement procedure is as follows: First, the t_3 output is set to zero on the external recorder through the use of the differential switches t_1 and t_2 and the time zero set control. The initial reading of these switches has no meaning, but it must be noted. Second, the long-term change in the input phase is observed on the recorder. The accumulated time difference between the two input frequencies, $\triangle t$, is equal to the total reading, $t_s = (t_1 + t_2 + t_3)$, minus the initial reading. Third, when the recorder indicates near the end or off scale, the t_1 and t_2 switches are used to bring the reading back into the normal positive range; the locked zero set control is not touched. The new t_1 and t_2 positions must be noted. This last step can be repeated indefinitely.

The time difference, $\triangle t$, occurring between instant **a** and instant **b** can readily be determined as follows:

$$\triangle t = t_{sb} - t_{sa}, \text{ or}$$
$$\triangle t = (t_1 + t_2 + t_3)_b - (t_1 + t_2 + t_3)_a, \text{ in nanoseconds}$$

When the positions of the t_1 and t_2 switches have not been changed, then this calculation simply reduces to subtracting the meter reading at the end from the meter reading at the beginning of the observation period.

The frequency deviation, $\frac{\triangle f}{f}$, between the two sources for the time elapsed between **a** and **b** can be calculated as follows:

$$\frac{\triangle f}{f} = \frac{\triangle t \times 10^{9}}{T}$$

where T is the observation time in seconds and $\triangle t$ is the time difference in nanoseconds as calculated above between instant **a** and instant **b**.

MODEL 112 — TIME DIFFERENCE MONITOR

PRINCIPAL FEATURES:

- Digital readout of time difference between two frequency sources.
- Convenient observation time indication.
- High-resolution measurement technique.
- Skilled labor savings as a result of simple presentation of data.
- Unique "state-of-the-art" instrument.
- Accessory for Parzen Frequency Comparator.

GENERAL DESCRIPTION

The Model 112 Time Difference Monitor is an accessory equipment for use with Parzen Model 103A, 104A, 105A or 106A Frequency Comparators. These proven instruments offer an efficient technique for making long-term and extremely long-term measurements with high resolution. The Model 112 provides bi-directional digital readings of the total accumulated time differences between two precisely generated frequencies during timed monitoring periods.

The Monitor consists of a digital time difference indicator, a digital observation time indicator, associated controls, and completely solid-state circuitry. During the monitoring operation, the time difference indicator moves forward one digit for each unit of time gained, and reverses one digit for each unit of time lost, by the unknown frequency in comparison to the reference frequency. The unit of time difference is selected on the Frequency Comparator as 0.1 (with Models 104A, 105A or 106A), 1, 10, or 100 nanoseconds. This indicator can also be manually stepped in either direction. The observation time indicator counts tenths of minutes. Manual controls permit starting, stopping, and restarting the monitoring operation, and provisions are made for remote control of these functions or for synchronizing them with other events.

The E_x and E_y phase detector outputs of the Frequency Comparator are accepted directly by the Model 112, and the same signals are made available for an external oscilloscope, X-Y recorder, and/or dual-channel T-Y recorder. Time pulse outputs are provided for operating an external events counter, printer, or other equipment.

MODEL 091 — FREQUENCY COMPARATOR

PRINCIPAL FEATURES:

- Low Cost Precision Error Frequency Multiplication.
- Resolution of Frequency Difference Better Than ±1 Part in 10^9 for 1 Second Observation Time.
- 231 Input Frequency Combinations between 100 KHz to 10 MHz.
- Four Multiplication Ranges, 10^6, 10^7, 10^8 and 10^9.
- Input Frequency Tolerance ±¼%.
- Dual Channel, Interchangeable Inputs.
- Stability Better Than 1 Part in 10^{10} in 1 Second Observation Time.

GENERAL DESCRIPTION

The Parzen Model 091 Frequency Comparator is a high-quality frequency stability measuring instrument of proven design and performance. Circuitry and techniques are employed to provide high resolution, low noise, relatively wide bandwidth, and automatic acceptance of 2 frequencies in both inputs. The system is self-checking. Completely solid state, it utilizes silicon semi-conductors exclusively and embodies plug-in modular construction in a sturdy dual-purpose cabinet.

This simplified instrument is designed for quick, foolproof, and unambiguous measurements in standards rooms, on production lines and at field stations, as well as in development laboratories. Practical applications include aligning the time bases of frequency counters and time code generators with primary standards, measuring the frequencies of crystal oscillators at high resolution, checking the stability of frequency sources, and collecting data on the long-term drift in input signals.

The Frequency Comparator accepts 21 commonly used frequencies between 100 kHz and 10 MHz in both inputs; thus, it can compare 231 pairs of frequencies. The input frequencies handled are 100, 111.1, 125, 142.9, 166.7, 200, 250, 333.3, and 500 KHz, and 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, and 10 MHz, all ± ¼%. Each of these frequencies is automatically converted to the proper internal frequencies for further signal processing. No auxiliary equipment, switching, adjustments, or connection changes are required for different frequencies. The two input channels can be used interchangeably.

The outputs of the Frequency Comparator are fast rise time pulses which are ideally suited for digital events counters. The error-expanded frequency of 1 MHz ± M$\triangle$f is provided for display by a frequency counter. The maximum resolution of these direct readings in ±1 part in 10^{11} for a 100 second count, ±1 part in 10^{10} for 10 seconds, ±1 part in 10^9 for 1 second, etc. A separate audio frequency output of M$\triangle$f is furnished for higher resolution indications on a period counter. Maximum resolution of these readings is better than ±1 part in 10^{10} for 1 second and for 1 period.

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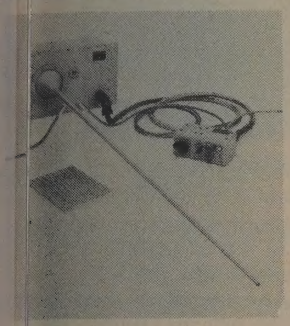
MODEL AN/SRA-43 ANTENNA GROUP



PRINCIPAL FEATURES:

- Tunes frequency range 2 to 8 MHz in three bands.
- Meets the stringent requirements of MIL-E-16400 and MIL-S-901.
- Allows one vertical structure to serve as an antenna for many receivers.
- Can be operated in close proximity to high power transmitters without damage to the receiver.
- Built-in noise source to allow tuning of coupler to exact frequency when no signal is present.

GENERAL DESCRIPTION

Parzen's Antenna Group AN/SRA-43 is a shipboard antenna and remotely-controlled preselector covering the 2 to 8 mc frequency range. The Antenna Group is designed to be used with any communications receiver operating in this frequency range.

Parzen's Antenna Group rejects undesired signals outside its passband, presents an extremely small parasitic aperture to other antennas in the area, protects the connected receiver against damage from strong local signals over the operating range (including the frequency to which its passband is tuned), provides additional image rejection for the receiver, and reduces spurious radiation from the receiver.

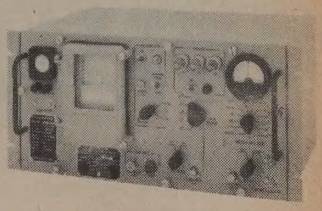
Each Antenna Group consists of the following three units:

a. Antenna AS-1857/SRA-43.
b. Radio Frequency Tuner TN-438/SRA-43.
c. Antenna Control C-6828/SRA-43.

The Antenna is a short whip, which is tuned by the R. F. Tuner. The Tuner is remotely controlled by the Antenna Control unit. The Antenna and the R. F. Tuner are supplied as a combined watertight equipment designed for installation in a housed and heated space near the connected receiver. The Antenna Group does not include the receiver, the interconnecting cables, nor any brackets or other supporting structure that may be needed to mount the combined Antenna and R. F. Tuner equipment.

The complete antenna system consists of a grounded vertical structure on which the tuned whip is horizontally mounted. The grounded vertical structure is actually the antenna, and each tuned whip is the means of coupling between the antenna and one receiver. Each complete antenna system is tunable over the entire 2 to 8 mc frequency range. Antenna system performance is a function of the height of the vertical structure and of the actual mounting location.

MODEL AN/URM-115A FREQUENCY DEVIATION METER



PRINCIPAL FEATURES:

- Militarized version of the Model 104A Comparator.
- Four selectible decade stages of error multiplication to 10,000.
- Built-in strip chart recorder in conjunction with frequency discriminator gives analog frequency difference indications.
- Built-in oscilloscope in conjunction with sine and cosine phase detectors gives polar phase display with resolution to 0.3 degrees peak to peak at equivalent frequency of 1 GHZ.
- Meets full shipboard environmental specifications.

GENERAL DESCRIPTION

Parzen's Frequency Deviation Meter AN/URM-115A is a self-contained test equipment for measuring, monitoring, and recording the difference between two precisely-generated input frequencies with a resolution better than 2 parts per (pp) 10^{11} for a 1-second observation time. Noise is also displayed. This high-precision instrument has been developed to evaluate the performance of atomic and quartz crystal frequency standards, precise oscillators, and other frequency sources, as well as stable frequency multipliers, dividers, amplifiers, and related four-terminal networks.

MODEL 120 SERIES FREQUENCY DISTRIBUTION AMPLIFIERS AND SYSTEMS

- **Low noise — less than 1 part in 10^{12} degradation.**
- **Up to 40 isolated outputs.**
- **High isolation.**
- **10, 5, 1, and .1 MHz frequency outputs.**

HIGH RESOLUTION IN FREQUENCY AND TIME

Frequency Comparison Instruments The competence of the Company for developing highly reliable, state-of-the-art frequency control equipment has been demonstrated by the Parzen line of proprietary frequency comparators. Design and construction techniques used in these instruments have resulted in extremely stable, noise-free circuits which have relatively wide bandwidth. With these instruments, instantaneous frequency, phase, and noise characteristics can be displayed and analyzed, and the relative power spectrum of two similar sources can be obtained. Frequency comparators have been built to accept input frequencies from 100 kHz to 108 MHz, and to provide effective error multiplication factors of 1 to 1,000,000 (referred to 1 MHz) in decade steps.

Industry and the Government have accepted Parzen frequency comparators as the outstanding instruments available in this field. These units are now being used to measure the short-term and the long-term stability of atomic and crystal frequency standards throughout the world.

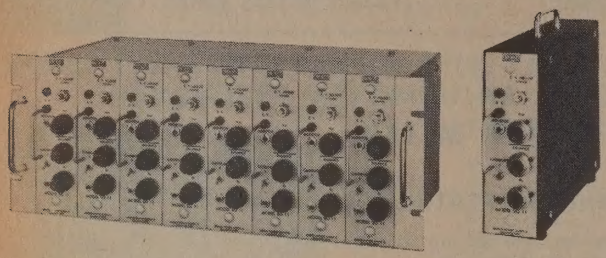
The development of high-resolution frequency comparators has not only produced needed instruments but has also created a convenient technique for evaluating circuitry under development. The high performance of other frequency control equipment built by Parzen is due in part to the use of the frequency comparators in investigating the noise properties of the multipliers, dividers, mixers, and amplifiers employed. Such four-terminal networks often deteriorate the actual stability of the frequency sources to a marked degree. A Parzen frequency comparator makes it possible to study the phase and frequency characteristics of these networks and to adjust them for minimum noise, independent of the basic oscillator or atomic standard.

Frequency Generation and Synthesis Equipments In this field, the Company has developed high-performance equipments for specific applications. As an example, a frequency synthesizer was built to accept the output of a cesium gas cell and to generate a 5.000,000 MHz signal with good short-term stability. A number of frequency control modules, which exhibit circuit stability greater than 1 picosecond per second, have also been furnished individually or as systems. Standard and custom-designed multipliers, dividers, mixers, and amplifiers of this type have been delivered to a number of users.

Several multiple-channel signal generators have also been delivered. Two such equipments consist of a group of closely spaced crystal oscillators feeding a common output. These sources have tight specifications on spillover from one channel to an adjacent channel. One equipment also includes digital control and monitoring of the oscillators and of the combined oscillator output signal.

Frequency offset generators and time scale converters of several different types have been developed by Parzen. These self-contained systems generate stable output frequencies which are offset by selectable precise fractional amounts from frequency standard inputs. Completely electronic, they have superior short-term stability and low noise characteristics.

SIGNAL CONDITIONERS



The SG-11 series of Transducer Bridge Signal Conditioning Units are self-contained plug-in instruments designed to be used with various strain-gage transducers. Each consists of a highly regulated, adjustable power supply and the balance, calibration and monitoring circuitry to be used with four, six and eight wire shielded systems. The power supply circuit exhibits very high temperature and time stability and provides line and load regulation of 0.01%; excitation voltage is continuously adjustable from 0 to 16 volts at 0 to 150 mA. The all-silicon transistor circuitry features a self-restoring current limit circuit. These units can be wired for constant-current operation.

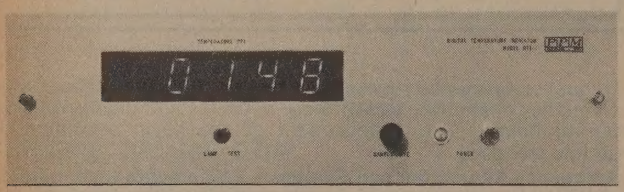
Extreme care has been taken to provide very high isolation to line — less than 0.03 pF coupling capacitance from power line to D.C. output — so that the instrument's performance approximates that of battery operation.

The BALANCE, CALIBRATION, and E. V. COARSE and FINE adjust controls are on the panel for easy adjustment and are all ten-turn potentiometers of very high resolution. A single shunt is used for calibration.

Two types of enclosures are available: a relay-rack mounting enclosure that permits the mounting of eight units side-by-side in a 19-inch rack and a portable enclosure, accepting a single plug-in unit. A plug-in power supply, only, is also available.

MODEL SG-11 PLUG-IN UNIT (eight shown in rack) **$187.50** each
MODEL SG-11-R RELAY-RACK MOUNTING ENCLOSURE (as shown) with solder terminals only **$90.00** each
MODEL SG-11-RC RELAY-RACK MOUNTING ENCLOSURE with MS connectors (mating connectors included) **$250.00** each
MODEL SG-11-P PORTABLE ENCLOSURE (as shown) **$39.50** each

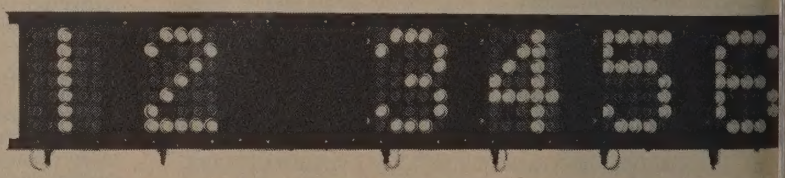
Write for Bulletin SG and Application Notes.
Models for conditioning other transducers are also available.



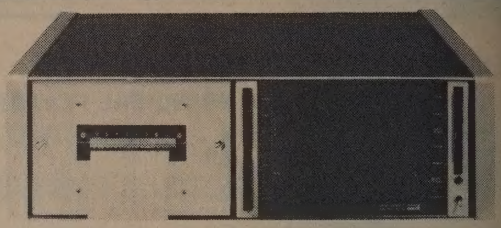
The Digital Temperature Indicator, Model DTI-1 series, accepts signals from various thermocouples, amplifies and linearizes these signals, and displays temperature in digital form. BCD outputs are available for external printers or comparators. Bulletin DTI.

ALPHA-NUMERIC DISPLAYS

We design and build a wide variety of data displays for commercial and industrial use. Digits up to 20 in. high — readable 500 feet away — with solid state control circuitry. Ask for quotation to meet your display requirements.



DATA LOGGERS



The Model DL-2 Data Logger is a complete data acquisition system a compact, portable package. It will scan up to 100 differential signa digitize them, and print out their values to four places, also printi range, polarity and channel number. All data is displayed in the fo of ⅛ inch high characters on the printer wheels.

Data Logger with 10 Channels $1995.
Data Logger with 100 Channels $2445.

PPM offers custom systems and Systems Components for data acqui tion and process control. PPM Data Acquisition Systems will acce as many as 1000 individual signals; these signals are scanned, di tized, and recorded in printed form or on punched or magnetic ta Alarm outputs are available for signals falling outside of pres limits. For systems applications we offer several Systems Co ponents, such as:

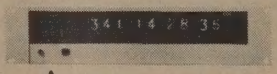
COUPLERS to drive various output devices such as card paper tape punches, magnetic tape recorders, P (or other) printers, and electric typewriters.

PRINTERS to accept most data codes are available up to columns wide (see Data Logger above). Bulletin D

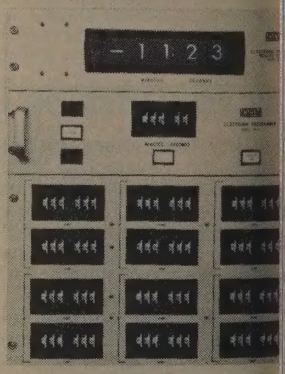
COMPARATORS to provide GO - NO GO comparison between digi data and preset limits or between two sets of digi data.

SCANNERS reed relay and low level, are available with a wi choice of options. These include programming p boards, analog channel output, and others. Bulle SN.

Price (100 channel 2-pole reed-relay scanner)..$995.



↑ **DIGITAL CLOCK**
Modular construction affords flexibility in meeting your special requiremens. Options, include crystal oscillator time base, additional digits, and time interval output. Bulletin DC.
Price (6 Digit DC-4).....**$650.00**



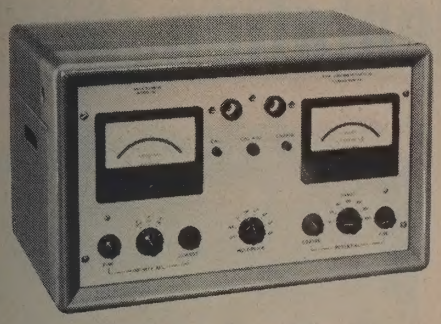
ELECTRONIC PROGRAMMER →
The Model EP-1 provides relay contact operation at programmed start and stop times. Bulletin EP.

All priced equipment available from stock.

PPM
CLEVELAND • OHIO

CALL US COLLECT WITH YOUR SPECIAL REQUIREMENTS
7016 EUCLID AVENUE • CLEVELAND, OHIO 44103
Telephone: (216) 361-4720

ultra high resistance standards



Meet the "MEGATROMETER"... for Measuring Resistance to 75,000 Million Megohms

The "Megatrometer" is a self-contained test device capable of measuring resistances from 14,000 ohms to 7.5 x 10^{16} ohms. The test potential is continuously variable with ranges of 0-1,000 VDC or 0-1,500 VDC. It is accurate enough (±3% upper half scale) for general laboratory and engineering development, yet simple and rugged enough for use in production testing.

The unique circuitry of the "Megatrometer" employs an extremely small grid current which permits the determination of ultra-high resistance measurements. It is completely portable, no external AC supply is required as the unit uses mercury "D" cells and BC batteries. Battery life under normal usage is approximately six months. The "Megatrometer" is safe under all operating conditions, and can not be damaged by short circuits or severe mechanical shock.

Accuracy: ±3% upper ½ scale. (Higher accuracies obtainable by using front panel calibration adjustment and plug-in resistor standards.)

Calibration: Built-in 10 Megohm 0.2% calibration standard. Push button on front panel permits fast, easy calibration.

Meters: Precision, fan-type with mirror scale.

Power Supply: 8 mercury "D" cells. (The internal transistorized power supply impedance at 1,000 volts is sufficiently high to preclude the possibility of shock so common to low impedance-type power supplies.)

Guard Circuit: A guard ring network intercepts all leakage current flowing across the electrode insulators and by-passes it around the electrometer circuit.

Dimensions: 21½" W x 13⅛" H x 15⅛" D in cabinet. Rack panel can be removed and mounted in a standard 19" relay rack.

Weight: Net approx. 40 lbs., shipping approx. 45 lbs.

Prices: Model No. 710 — $ 960. FOB Southampton, Pa.
Model No. 710H — $1,500. " "
Model No. 710V — $2,100. " "

Options: Volume Resistivity Jig — Plug-in design for rapid comparative measurements of resins, thin tapes, etc. up to 7.5 x 10^{17} ohms/cm³. Tests can be made in ten seconds. Dimensions: 5" x 2" x 2¼" . . . $85. **Extension Cables**—Dual, 6-ft., Teflon-insulated cables terminating in Faraday boxes at each end . . . $98.

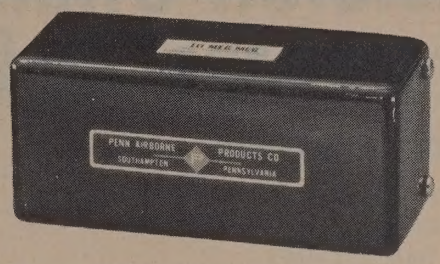
SPECIFICATIONS:

Resistance & Test Potential Ranges

Model No.	Resistance Range	Test Potential
710	14,000Ω to 5 x 10^{15}	0-1,000 Volts, DC
710H	140,000Ω to 5 x 10^{16}	0-1,000 Volts, DC
710V	140,000Ω to 7.5 x 10^{16}	0-1,500 Volts, DC

Measurement Range for Various Test Potentials:

VOLTAGE	RANGE IN OHMS		
	710	710 H	710 V
3	14K – 5 x 10^{12}	140K – 5 x 10^{13}	140K – 5 x 10^{13}
10	50K – 5 x 10^{13}	500K – 5 x 10^{14}	500K – 5 x 10^{14}
25	4 x 10^{5} – 1.2 x 10^{14}	4 x 10^{7} – 1.2 x 10^{15}	4 x 10^{7} – 1.2 x 10^{15}
50	5 x 10^{6} – 2.5 x 10^{14}	5 x 10^{7} – 2.5 x 10^{15}	5 x 10^{7} – 2.5 x 10^{15}
100	1 x 10^{7} – 5 x 10^{14}	1 x 10^{8} – 5 x 10^{15}	1 x 10^{8} – 5 x 10^{15}
250-1000	2 x 10^{7} – 5 x 10^{15}	2 x 10^{8} – 5 x 10^{16}	2 x 10^{8} – 5 x 10^{16}
1500	–	–	2 x 10^{8} – 7.5 x 10^{16}



RESISTOR STANDARDS Certified to 0.2%

Each Resistor Standard is the culmination of months of meticulous processing, ageing cycles, measured, labeled, stored, shelf aged and measured again. This process is repeated until stability in terms of long term drift is less than 0.2% during the first year.

Resistors are mounted in a specially designed Faraday Box which plugs into the terminals of the "Megatrometer," Standard Resistance Bridge or with special mounting for use with compatible instruments. Teflon insulation is used exclusively and surface leakages are virtually eliminated through a special silicone treatment.

Three basic types of Certified Resistance Standards in the ultra-high resistance range of 10 Megohms to 10,000,000 Megohms are available:

1). **Reference Series** — with resistance values selected to within 10% of listed values, measured to within 0.1%, and certified to within 1%.

2). **Precision Series** — with resistance values selected to within 10% of listed values, measured to within 0.02%, and certified to within 0.2%.

3). **Exact Series** — with resistance values selected to within 1% of listed values, measured to within 0.02%, and certified to within 0.2%.

Temperature Coefficient: 10 Megohm units approx. 15PPM/°F; high Megohms approx. 0.2%/°F. The Precision and Exact Series supplied with temp./resistance curves.

Stability: The greatest portion of long term drift occurs during the first year after delivery — less than 0.2% for high Megohm units. Recalibration and recertification is recommended. Use Penn Airborne complete calibration facilities for prompt service.

Leakage: Teflon insulation employed and a guard terminal is used which connects to the guard ring electrode of a Megatrometer or Bridge.

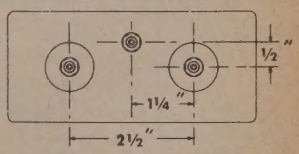
Certification: Reference Series resistors are certified to within 1%. The resistor's temperature coefficient is supplied on the certificate. Precision and Exact Series units are certified to within 0.2%, and a certificate plus a temp./resistance curve are furnished with each unit.

Dimensions: 5" W x 2¼" H x 2" D, with banana plugs extending 1" beyond the 2" dimension.

Standard Mounting:

Special Mounting: Consult Factory.

Weight: Shipping approx. ¾ pound per unit.



SPECIFICATIONS:

Resistance Values Available & Prices:

RESISTANCE IN MEGOHMS*	UNIT PRICE		
	REFERENCE	PRECISION	EXACT
10	$ —	$ 72.00	$115.00
100	34.00	98.00	126.00
1,000	36.50	110.00	139.00
10,000	42.50	117.00	148.00
100,000	49.00	165.00	198.00
1,000,000	58.00	—	—
10,000,000	72.00	—	—

Voltage Coefficient: Approx. 0.001%/volt. The precise coefficient is given for each resistor of the Precision and Exact Series.

PENN AIRBORNE PRODUCTS COMPANY

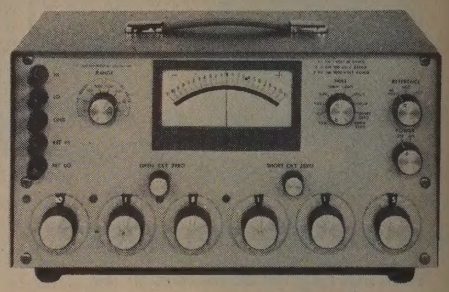
INDUSTRIAL HIGHWAY • SOUTHAMPTON, PA. 18966 • PHONE: (215) 355-3400

FORMERLY MANUFACTURED BY MID-EASTERN ELECTRONICS, INC.

PRECISION STANDARDS: State-of-the-art Instrumentation

Differential Voltmeters

Offer extreme accuracy and stability over a wide measurement range.
Model SS 1002 (AC-DC)
Accuracy 0.001% of reading, 0 to 1100 VDC; AC accuracy 0.05% of reading
Null sensitivity . . . guarded ultra sensitive 10μV full scale
Resolution 7 digits of readout resolution
5 instruments in one: Differential Voltmeter, Decade Voltage Divider, Ratiometer, Electronic Null Detector, Precision Calibrated Reference Source. **Price $1650.**



SS 1002 (one of 10 models)

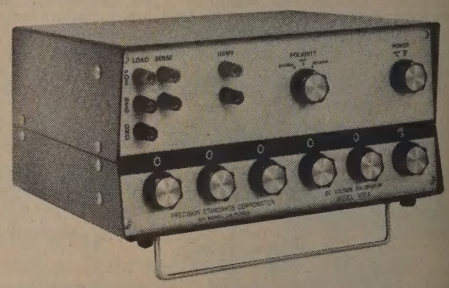
Wheatstone Bridges

Unique line of "3 in one" units combines an all transistorized chopper, stabilized readout amplifier and adjustable bridge voltage supply. Compact, light weight, ultra sensitive and accurate. Model WB 200B can also be used as a resistance comparator.
Accuracy 0.005% of reading
Range 0 to 110 megohms in 7 ranges
Sensitivity to Null Detector 10μV
Resolution 6 digits **Price $950.**

WB 200B (one of 3 models)

Precision DC Voltage Calibrators

Ideally suited as a calibration source to check the operation and calibration of Digital and Differential Voltmeters. Extreme accuracy and stability achieved through the use of an ultra sensitive zener reference supply, precision highly stable silicon oil filled wire wound resistors and a high gain wide band ultra stable amplifier. Model 472A lightweight portable, solid state unit.
Accuracy 0.0025% of setting . . better than 0.05μV resolution . . adjustable in 2 ranges 0 to 11VDC and 0 to 110 MV output at 0-20 MA output current. Short circuit proof. Excellent for testing operational amplifiers and A to D converters. **Price $950.**

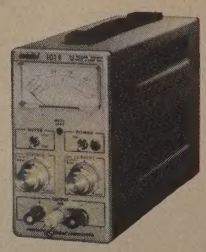


472A (one of 4 models)

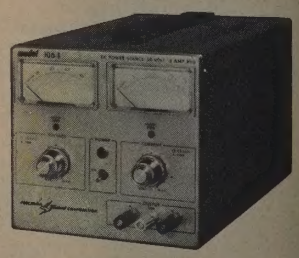
PSC 100 Series DC Laboratory Power Sources

(Solid State Silicon)

High quality line which provides useful features not found in many competitive supplies in this price range. All units feature automatic crossover from voltage-to-current and current-to-voltage regulation with complete protection for overloads and short circuits. Low noise and drift. Front panel meter indicates voltage and current. Concentric fine and course controls for voltage and current . . remote voltage sense. All silicon construction. **Price $169.00** for Single Module 101, **$269.00** for Double Module 106.



Model 101 (one of 5 models)



Double Module 106 (one of 10 models)

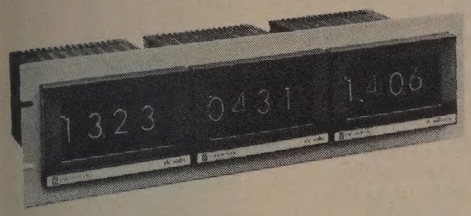
PRECISION Standards CORPORATION 1701 Reynolds (Irvine Industrial Complex), Santa Ana, Calif. 92705 • (714) 546-0431

PRESTON

SCIENTIFIC INCORPORATED
805 East Cerritos Ave., Anaheim, Calif. 92805
Tel. (714) 776-6400

DIGITAL PANEL METERS

X-MOD/DPM



- Automatic Polarity
- Digital Output Option
- Self Contained Power Supply
- 100% Overrange

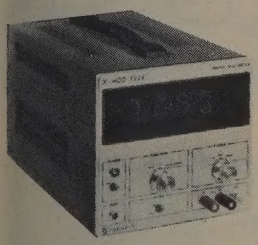
SPECIFICATIONS

Type	Resolution	Accuracy	Reading/Sec	Input Z	Options	Function	Temp.	Size**	Price
Integrating	3 digits & sign 100% overrange	DC voltage ±0.1% ±1 digit	10 (100 option)	10 megohms	outputs BCD	DC V current	+10°C to +50°C	F	$225.

** (F) 3.62H, 5.81W, 6.25L

DIGITAL MULTIMETERS

X-MOD 722

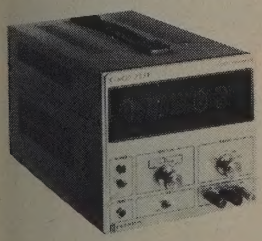


- Automatic Polarity Indication
- 10 Megohm Input Resistance
- Digital Output Option
- Exceptionally Low Cost

SPECIFICATIONS

X-Mod	Type	Resolution	Accuracy	Read. per sec.	Input Z	Options	Range	Function	Temp.	Size **	Price
722	Dual Slope Integration	3-digit & sign 100% overrange	±0.1% ±1 digit	10 (100 option)	10 megohms	BCD outputs & AC-DC converter	1, 10, 100 & 1000v FS	DC volts & ohms	10° to −50°C	D	$295.

X-MOD 723



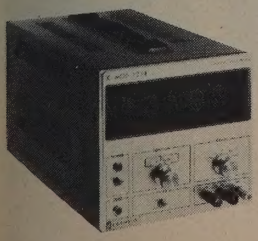
SPECIFICATIONS

X-Mod	Type	Resolution	Accuracy	Read. per sec.	Input Z	Options	Range	Function	Temp.	Size **	Price
723	Dual Slope Integration	4-digit & sign 100% overrange	±0.01% ±1 digit	10 (50 option)	10 megohms	BCD outputs & AC-DC converter	100 mv, 1, 10, 100, 1000v FS	DC volts & ohms	10° to −50°C	D	$645.

** (D double 6.70H, 6.90W, 12.22L

DIGITAL VOLTMETER

X-MOD 723A



- 0.01% Accuracy
- 100 Microvolt Resolution
- 10 Millisecond Conversion Time
- Automatic Polarity Indication

SPECIFICATIONS

X-Mod	Type	Resolution	Accuracy	Read. per sec.	Input Z	Options	Range	Function	Temp.	Size **	Price
723A	Dual Slope Integration	4-digit & sign 100% overrange	±0.01% ±1 digit	10 (50 option)	10 megohms	BCD outputs	1, 10, 100, 1000v FS	DC volts	10° to −50°C	D	$485

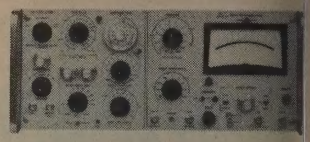
**(D double 6.70H, 6.90W, 12.22L

PRESTON SCIENTIFIC also manufactures Instrumentation Amplifiers and Oscillators. See EEM Section 1100 Page 1348 . . . Analog-to-Digital Converters and Multiplexers. See EEM Section 2000 Page 591. For the location of your nearest PRESTON representative refer to the Yellow Section.

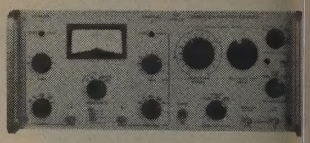
PRECISION INSTRUMENTS FOR ENGINEERING • DEVELOPMENT • RESEARCH

Lock-In Amplifiers: P.A.R. manufactures a full line of Lock-In Amplifiers which measure changes in amplitude or phase of coherent signals buried in noise. Input signal to the system is modulated at some reference frequency and phase-sensitive detection techniques are used to correlate the detected signal against the reference signal. Instruments are available with a minimum equivalent noise bandwidth as small as .00125 Hz. The maximum frequency range of PAR™ Lock-In Amplifiers extends from 1.5 Hz to 150 kHz. Maximum sensitivity is as high as one nanovolt full scale. Accessories include low-noise preamplifiers, light choppers, photomultiplier housings and power supplies. Prices range from $995 to $2,700.

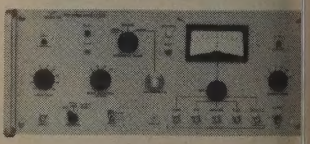
Signal Averagers: Two types of signal averagers are available from P.A.R. Boxcar Integrators extract pulses as small as 10 nanoseconds in duration from noise. Complete waveforms may be observed by automatic scanning of single time gate across repetitive signal. Waveform Eductors™ utilize fast analog techniques to provide a 100 channel signal averaging capability. Digital interface accessories are available to permit operation on signals of low repetition rates, and to provide interconnection with digital read-out and data processing equipment. Prices range from $2,150 to $4,350.



Correlation Function Computers: Perform autocorrelation to separate unknown signals from noise and crosscorrelation to determine degree of conformity between two signals. A combination of analog and digital techniques are utilized to simultaneously compute 100 points of the correlation function and provide real-time analysis. Delay ranges (or computation periods) extend from 50 microseconds to 207.5 seconds. Frequency range is from dc to 1 MHz. Prices range from $6,950 to $8,950.

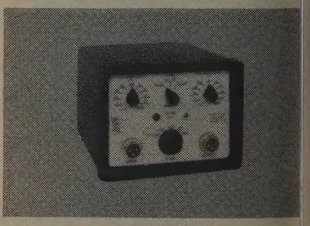


Fourier Analyzer: Extends the usefulness of Correlation Function Computers by transforming the correlation function from the time domain into the frequency domain to provide power density spectrum. The autocorrelation function is transformed into power density amplitude versus frequency and the crosscorrelation is resolved into the amplitude of cross spectral density plus phase angle as a function of frequency. Price is $3,250.

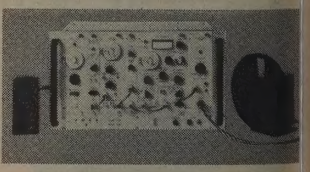


Tuned Amplifier/Oscillator: Combination Wave Analyzer, Distortion Analyzer, Low-Distortion Oscillator and Low-Noise Preamplifier. Frequency range is 1 Hz to 110 kHz with Q adjustable from 1 to 100 over the complete frequency range. Gain is continuously variable to 80 dB. Price is $1,495.

Preamplifiers: Extremely low-noise amplification for use ahead of other signal processing instruments or as general purpose instruments. The frequency range covered is from 1 Hz to 1 MHz with gains ranging to 10^4. Various input impedances are available. Models available provide transformer coupled input, high impedance inputs for photomultipliers, built-in adjustable high pass and low pass filters, and differential input capabilities. They are available in many configurations; battery-powered or line-operated; freestanding or modular. Prices range from $300 to $795.



RIM: Research Instrument Modules offer ease of assembly of signal processing instruments for general engineering applications. More than 20 modules are available: Lock-In Amplifier, Selective Amplifier, Preamplifiers, Variable Frequency Light Chopper, High Voltage Photomultiplier Power Supply, Four-Quadrant Analog Multiplier, Operational Amplifier, Power Amplifier, DC Photometer. All modules are designed in accord with specifications developed by the AEC for Nuclear Instrumentation Modules; thus the flexibility of a standardized modular instrument system previously available only to nuclear researchers has been extended to engineers and scientists in other fields of activity. Prices range from $390 to $1,195.

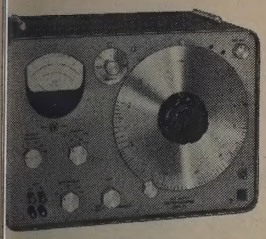


PAR **PRINCETON APPLIED RESEARCH CORPORATION**

For more information write Princeton Applied Research Corporation, Box 565, Princeton, N.J. 08540, or call (609) 924-6

Quan-Tech
Division of KMS INDUSTRIES, INC.

• WAVE AND SPECTRUM ANALYZERS



Model 303
WAVE AND SPECTRUM ANALYZER

quency range: 30 Hz to 100 KHz, semi-log frequency l. **Bandpasses:** 10, 30, 100 and 1000 Hz at —3 db (100 and 0 Hz bandwidths flat topped). **Sensitivity:** 100 μV to 300 FS. **Price:** $1700.

Model 2156
WAVE AND SPECTRUM ANALYZER

nilar to Model 303 except: **Frequency range:** 10 Hz to 30 z. **Bandpasses:** 3, 10, 30, 300 Hz. **Price:** $2375.

Model 2223
WAVE AND SPECTRUM ANALYZER

milar to Model 303 except: **Frequency range:** 10 Hz to) KHz. **Bandpasses:** 10, 100, 750, 1000 Hz. **Price:** $3525.

PE 1110-1 SWEEP DRIVE ACCESSORY MODELS 303, 2156 AND 2223

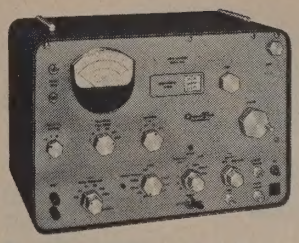
sily attached. Drives main tuning dial at 1.6 or 0.25 RPM. l stops included. **Price:** $75.00.

Model 304-TD
LOW FREQUENCY TRACKING WAVE AND SPECTRUM ANALYZER

equency range: 1 Hz to 5 KHz. **Frequency readout:** 5 place ctronic digital display. **Bandpasses:** Flat-topped, 1, 10, d 100 Hz at —3 db. **Skirt selectivity:** 24 db per ½ band-dth. **Sensitivity:** 30 μV to 300 V, FS. **Tuning:** Electronic, six lectable modes: manual, manual plus AFC, automatic eep, tracking, search and track, external. **Outputs:** BFO, stored signal, sample of automatic sweep, analogs of ter reading and frequency setting, phase outputs for ase plot. Built-in master-slave capability for multi-annel analyzer systems. **Price:** $3575.

Model 304-T
me as Model 304-TD except with 5000 division linear quency dial in place of electronic display. **Price:** $3025.

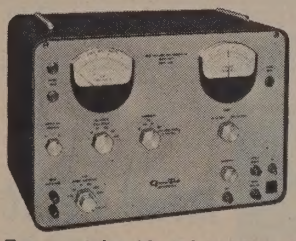
Model 304
me as Model 304-T except without AFC, tracking, or ster-slave capabilities. **Price:** $2700.



Model 305
TRACKING WAVE AND SPECTRUM ANALYZER

Similar to Model 304-TD except: **Frequency range:** 10 Hz to 50 KHz, 5000 division linear frequency dial. **Bandpasses:** 10, 100, and 1000 Hz. **Price:** $2800.

Model 305-D
Same as Model 305 except 5 place electronic digital frequency readout instead of frequency dial. **Price:** $3350.



Model 1304
SLAVE ANALYZER AND PHASEMETER

For use with Model 304-T or 304-TD in multi-channel phase locked analyzer systems. The Model 1304 has a built-in phasemeter but no tuning controls. Mechanical impedance and transfer function analysis is simplified. Bandwidths and sensitivity are the same as for the Model 304-TD. **Price:** $2050.

Model 1305
Similar to Model 1304, but for use with Model 305 or 305-D. **Price:** $2050.

Model 3304
CROSS SPECTRAL DENSITY ANALYZER

For use with the Models 304T and 1304 for computing cross spectral density. Values of Cxy, Qxy, and Gxy are presented on front panel meters. **Price:** $1800.

Model 3305
Similar to Model 3304, but for use with Models 305 and 1305. **Price:** $1800.

Model 350
HIGH FREQUENCY WAVE ANALYZER

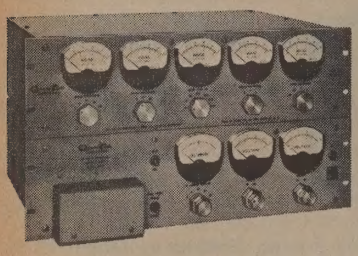
Frequency range: 10 KHz to 10 MHz. **Frequency readout:** 5 place electronic digital display. **Bandpasses:** 4 KHz and 40 KHz at —3 db. **Sensitivity:** 10 μV to 10V, continuously variable precision capacitive attenuator with input overload indicator. **Outputs:** BFO, rectified signal envelope, and meter analog. **Price:** $2495.

All prices shown are F.O.B. Whippany, N. J. Prices and specifications subject to change without notice.

SOUTH JEFFERSON ROAD, WHIPPANY, NEW JERSEY 07981 • PHONE (201) 887-5508 • TWX 710-986-8251

Quan-Tech
Division of KMS INDUSTRIES, INC.

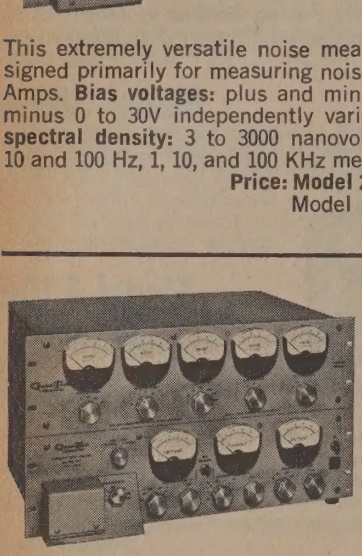
- TRANSISTOR & DIODE NOISE ANALYZERS
- INTEGRATED CIRCUIT NOISE ANALYZER
- R.F. NOISE ANALYZERS



Model 2283 -2281

INTEGRATED CIRCUIT NOISE ANALYZER

This extremely versatile noise measuring system was designed primarily for measuring noise in linear IC's and Op Amps. **Bias voltages:** plus and minus 12V fixed, plus and minus 0 to 30V independently variable at 100 ma. **Noise spectral density:** 3 to 3000 nanovolts. **Filter frequencies:** 10 and 100 Hz, 1, 10, and 100 KHz measured simultaneously.
Price: Model 2283 Control Unit $1600.
Model 2181 Filter Unit $2500.



Model 2173C -2181

TRANSISTOR NOISE ANALYZER

The most versatile unit available. Measures noise current and voltage at 10 and 100 Hz, 1, 10, and 100 KHz simultaneously. **Noise spectral density range:** 3 to 3000 nanovolts FS. **Base resistance range:** 0, 500, 1K, 10K, 100K, and 1M ohms plus external position. **Collector voltage range:** 0.3 to 60 volts. **Collector current range:** 0.3 μa to 30 ma. Also measures FET's. **Price:** $4995.

Model 310

TRANSISTOR NOISE ANALYZER

Measures noise current and voltage at 100 Hz, 1 KHz and 10 KHz as well as I_{cbo}, I_{ebo} and beta. **Noise spectral density range:** 0.01 to 3 μV, FS.1 to 300 pa, FS. **Collector Current range:** 0.05 to 30 ma. **Collector voltage range:** 0.1 to 30 V. **Base resistance range:** 0, 500, 1K, 10K, plus external position. **Price:** $2725.

Model 311

Similar to above, except that collector current range is from 5 to 1000 μa for noise measurement in low-collector-current devices. Measures Gm instead of beta. Also measures FET's.
Price: $2725

Model 51

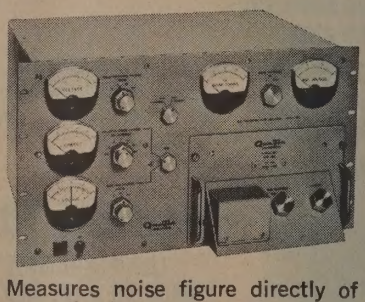
TRANSISTOR NOISE TEST

Measures broadband noise figure directly in db. **Noise ba width:** 15.7 KHz (—3 db at 10 Hz and 10 KHz). **Noise fig range:** 0 to 62 db. **Collector voltage range;** ± 3 to 30 vo **Collector current range:** 10 μa to 1 ma. **Base resista range:** 50, 500, 1K, 10K ohms plus external position. A measures FET's. **Price:** $1

Model 3

DIODE NOISE ANALY

Measures noise in back-biased semi-conductor diodes 10 Hz and 1 KHz simultaneously. **Noise spectral den range:** 0.03 μV to 1 mV. **Test Voltage:** 0 to 500 V, continuo variable. **Test Current:** 0 to 100 ma continuously varia Internally supplied ramp automatically sweeps test curr and/or voltage within maximum ratings. A wide variet outputs for data logging, external monitoring, actuat external equipment, etc. **Price:** $3



Model 3

R.F. TRANSIS NOISE ANALY

Measures noise figure directly of transistors and FE at radio frequencies. Plug-in heads available for frequencies between 1 MHz and 60 MHz. **Noise figure ran** 0 to 40 db. **Base resistance range:** 50, 100, 200, 500, 1K, 5K ohms. **Collector voltage range:** ± 1 to 30 volts. **Collec current range:** 30 μa to 30 ma.
Price: $2

Model 13

MODEL 1340 TRANSISTOR TEST HE FOR USE WITH MODEL

1340 — 1 MHz — 10.7 MHz **Price:** $1
1340 — 2 MHz — 45 MHz — 60 MHz **Price** $1

Model 13

LINEAR I.C. TEST H

Measures noise in integrated circuits at 10.7 MHz.
Price: $1

All prices shown are F.O.B. Whippany, N. J. Prices and specifications subject to change without notice.

43 SOUTH JEFFERSON ROAD, WHIPPANY, NEW JERSEY 07981 • PHONE (201) 887-5508 • TWX 710-986-

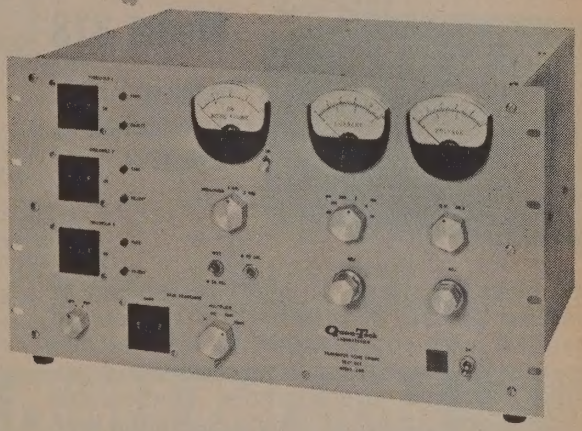
Quan-Tech
Division of KMS INDUSTRIES, INC.

- TRANSISTOR NOISE TEST SYSTEMS
- RESISTOR NOISE TEST SETS
- SPECIAL INSTRUMENTS & SYSTEMS

lodel 2310

ITOMATIC TRANSISTOR NOISE TEST SYSTEM

easures 1KHz, 10KHz, or broadband (—3db at) Hz and 10KHz) Noise Figure in 200 milliseconds. ront panel reject level settings and GO-NO-GO dicators. PASS and REJECT information at rear onnector. **Collector voltage:** ± 5 to 30 volts. **ollector current:** 5μA to 10mA. **Noise Figure:** 0 to)db. **Base resistance:** 50 ohms to 99K ohms.



oming in 1970

entative Specifications)

UTOMATIC RESISTOR NOISE TEST SYSTEM

utomatically measures resistance to 0.1%, com- utes and applies rated power, and measures oise Voltage or Noise Index in 1 second test ycle. Sequentially measures up to 20 different esistors on thick or thin film chips. Digital panel splays and BCD outputs of readings. **Range:**) ohms to 1 megohm.

EMI-AUTOMATIC TRANSISTOR NOISE ANALYZER

leasures Noise Voltage or Noise Figure at up to x spot frequencies, 10Hz to 1MHz sequentially. ast test cycle. Front panel programming and igital displays of readings, plus BCD outputs. May e fully automated.

UTO-RANGING INSTRUMENTATION AMPLIFIER

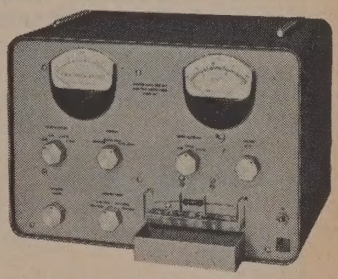
imilar to Model 2220 but with gain ranging auto- natically from 78 to 0 db. Front panel electronic igital display of gain setting plus rear BCD output.

UTO-RANGING LOG OUTPUT WAVE ANALYZERS

imilar to Model 304-305 series but with gain auto- natically ranging over 50 db. Log or linear output eading. Overall dynamic range 120 db. Front panel ndication of gain setting plus rear BCD output.

UTOMATIC LINEAR IC TEST SYSTEM

imilar to Model 2310 but for high-speed noise esting of linear IC's.



Model 315

RESISTOR NOISE TEST SET

Measures noise in resistors in conformance with specifications recommended by NBS and Method 308 of MIL STD 202B. **Test-resistor range:** 10Ω to 22 meg Ω. **Measurement range:** 0.6 μV in a decade to 1000 μV in a decade. **Outputs:** Sample of noise voltage; analogs of meter readings. External cable supplied for remote location of test jig.

Price: $2375.

Model 2136 RESISTOR NOISE TEST SET

Similar to above, but measures resistors down to 10 Ω. **Price:** $2550.

Special Instruments and Systems

Quan-Tech manufactures a great many "specials", ranging from one unit only to production quantities on an OEM basis. We can supply not only automatic measuring systems, but the automatic component handling equipment to go with them. We will assume system responsibility and are prepared to interface our systems with computers and other data programming, handling, and storage equipment. Your inquiry will receive a prompt reply.

All prices shown are F.O.B. Whippany, N. J. Prices and specifications subject to change without notice.

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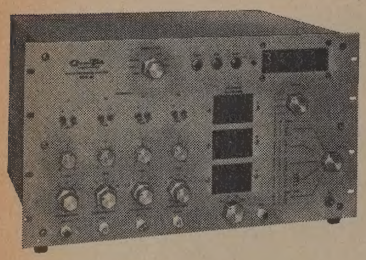
Quan-Tech
Division of KMS INDUSTRIES, INC.

- SOLID STATE AMPLIFIERS
- AMPLITUDE DISTRIBUTION ANALYZER
- RANDOM NOISE GENERATOR



Model 318

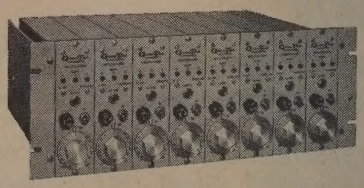
IMPULSE DISTRIBUTION ANALYZER

Determines amplitude & width of random or repetitive pulses, and stores the number of times that pulses occur within pre-selected amplitude or width ranges. 4 input channels, 4 amplitude threshold level controls, 3 adjustable time gates and 4 memory banks. Sampling time is selectable. **Frequency Response:** Dc to 15 MHz. **Amplitude Threshold sensitivity:** −10dBm to −60dBm, adjustable each channel, positive and negative inputs. **Input Impedance:** 75Ω, 135Ω, 600Ω switch selected. **Signal width Analysis:** 100 nanosecs to 99.9 millisecs in 4 decade ranges. Adjustable width thresholds $0\text{-}t_1$; $0\text{-}t_2$; $0\text{-}t_3$; $0\text{-}\infty$. **Sampling times:** 1 sec; 1 min; 1 hr; manual timing, Ext. program. **Data Readout:** 4 digit visual; BCD printer output. **Price:** $4,500.

Model 206

SELECTABLE GAIN AC AMPLIFIER

Bandwidth: 1 Hz to 100 KHz (within 0.5 db); — 3 db at 500 K **Typical noise spectral density:** 5 x 10—9 V and 3 x 10—12 A 1 KHz. **Gain:** 10, 100, & 1000, selectable at front panel; **Pow** 105-125 V AC or optional self-contained battery pack (automa cally recharging). **Price:** $200. Batteries $35.



Model 222

INSTRUMENTATIO AMPLIFIER

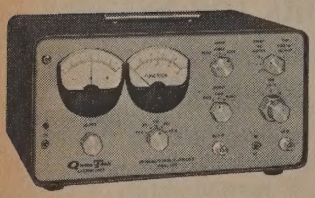
Modular amplifiers mount 8 units in a 7" rack panel. **Voltage ga** 0 to 80 db in 5 db steps. **Controlled frequency characteristi** (selected by plug-in cards) voltage gain flat 10 Hz to 100 K or 10 Hz to 20 KHz, rising 3 db/octave 10 Hz to 100 KHz 6 db/octave 10 Hz to 20 KHz. **Price:** $590

*DIGITAL OUTPUTS AVAILABLE

Model 317

AMPLITUDE DISTRIBUTION ANALYZER

Determines amplitude-probability distribution of random signals. **Amplifier response:** 3 db down at approx. 12 Hz and 1 MHz; **Switching rate:** 5 MHz. **Amplitude ranges:** 100%, 10%, 1% FS; Normal or "inverted" operation; provision for external sweep of level. **Price:** $495.



Model 317B

PROBABILITY DENSITY ANALYZER

Measures manually or plots automatically amplitude probability density or cumulative probability functions of random, complex, and repetitive signals. **Frequency Range:** DC or 10 Hz to 1.75 MHz. **Sweep:** −3 sigma to +3 sigma, automatic or manual. Gated clock pulse for low probability density. **Price:** $990.

Model 42

RANDOM NOISE GENERATOR

Stable "white" noise output having true gaussian amplitude d tribution. **Frequency range:** DC to 100 KHz; **Output spectral d sity:** 0.01 to 1000 μV, continuously variable, calibrated; **DC offs** less than 10 mV at max. output. **Price:** $700

Model 42

RANDOM NOISE GENERATOR

Similar to Model 420 but covering higher frequencies. **Frequen Range:** 10 KHz to 12.5 MHz flat ±0.5 db. **Output Spectral Densit** .02 to 300 μV, continuously variable, calibrated, into 75 ohm (1.34V RMS maximum for full bandwidth) **Price:** $1100.

All prices shown are F.O.B. Whippany, N. J. Prices and specifications subject to change without notice.

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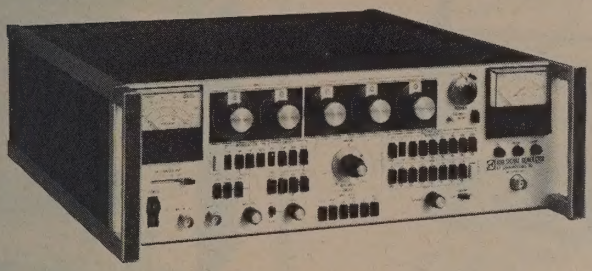
RF COMMUNICATIONS, INC.

ELECTRONIC INSTRUMENTATION OPERATION

80 MHz SYNTHESIZED GENERATOR/SWEEPER



MODEL RF-808

$2980

- 50 KHz to 80 MHz
- Stability 5 PP 10^9/Day
- 0.1 μV to 10V into 50 ohms
- AM, FM, or Pulse Modulation
- Manual and Automatic Sweep
- Fully Programmable
- Low Spurious and Harmonics
- All Solid State

The RF-808 Signal Generator is a synthesizer and sweeper in addition to a standard signal generator covering .05 to 80 mhz in 1 khz steps with a vernier settable to 1 hz. The unit features remote programmability, digital frequency setting, high signal power output, FM, AM, pulse, automatic sweep, and manual sweep.

The RF-808 has digital synthesizer performance, yet retains the manual and vernier tuning and low spurious output of conventional signal generators. Applications include automated test systems where frequency, amplitude, and modulation must be computer controlled; general purpose lab use where high stability, digital or analog tuning, sweep, and modulation versatility are needed; receiver and communication system testing from ultrasonic up into VHF ranges. The unit is intended for bench use, but a standard rack panel adapter is available using only 5¼ inches of rack space.

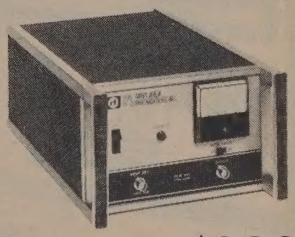
80 MHz WIDEBAND RF POWER AMPLIFIER

The RF-805 is a solid state amplifier, broadband from .05 to 80 mhz, producing ten watts with −30 db harmonic and intermodulation distortion, lower distortion at lower output levels. Gain is 47 db minimum, constant within 1 db. Full output is developed with less than 0.1 volt at the 50 ohm input. Accurate output metering and overload protection is provided.

The RF-805 will raise the power of most manual and swept tuned signal generators extending their versatility. Receiver testing, wattmeter calibration, antenna testing, RFI testing, attenuator measurements, and filter and component testing will be aided with this equipment. Optional rack mounting uses 5¼" rack height.

MODEL RF-805

- 10 Watts Output into 50Ω
- 0.1 Volts In—22.5 Volts Out
- .05 MHz to 80 MHz Broadband
- Flat 47 db Gain
- Solid State
- Low Distortion

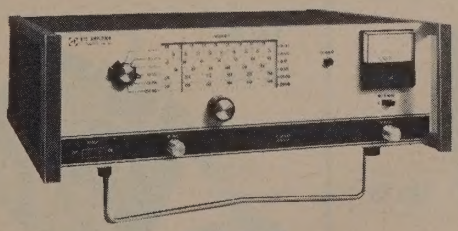


$980

10-500 MHz TUNABLE RF POWER AMPLIFIER

Tunable in six bandswitched ranges from 10 to 500 MHz, the RF-815 provides up to 8 watts of RF power into a 50 ohm load. With about 40 db of gain, the 3 db RF bandwidth is 1.0 MHz at the low end of the frequency range, increasing to 5 MHz wide at 500 MHz. Accurate output metering and overload protection is provided.

Applications include amplification of signal generator outputs up to 20 volts, selective amplification of RF signals as provided by a receiver preselector, exciter driver stage for transmitters, RFI testing, attenuator measurements, harmonic amplification, and many others. All solid state except for the one tube output stage. Simple mechanical design provides for easy maintenance. Light weight of 25 pounds makes the unit portable for bench use. Optional rack mounting uses 5¼" rack height.



$1150

MODEL RF-815

- Up to 8 Watts into 50 Ohms
- > 35 DB Gain
- Bandwith 1-5 MHz
- Low Distortion
- Small and Lightweight

OTHER EQUIPMENT

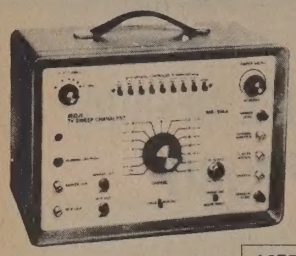
Other models available include amplifiers, both wideband and tunable, low level to 100 watts, audio to 500 MHz; frequency synthesizers, signal generators, and programmable signal sources to 500 MHz. Modifications to your specifications can be furnished. Contact our local sales representative or the factory. Our other divisions are leaders in commercial and military two-way radio equipment. For information about our Single Sideband, VHF-FM, Marine, Mobile, or Military lines, contact the factory.

For complete information contact Sales Manager, Electronic Instrumentation Operation.

RF COMMUNICATIONS, INC.
1680 UNIVERSITY AVENUE—ROCHESTER, NEW YORK 14610
PHONE: 716-244-5830, TWX: 510-253-7469

RCA Test Equipment

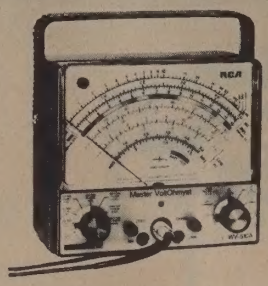
FOR: SERVICE
SCHOOLS
INDUSTRY
LABORATORIES



$375.00

WR-514A TV Sweep Chanalyst

- Fundamental sweep output on all VHF TV channels; sweep width adjustable to 12 MHz
- Video and IF sweep output; sweep width adjustable to 20 MHz
- 7 crystal-controlled IF markers
- Solid-state marker-adder provides distortion-free sweep/marker displays



$128.00

WV-510A Master VoltOhmyst

- All solid-state, battery/AC operated
- 7 overlapping ranges for AC, resistance, and DC current; 8 ranges for DC voltage
- 21-megohm resistance on all DC ranges
- ± 3% accuracy of full-scale reading for all voltage and current functions

$30.00

Kit $22.00

WG-412A RC Circuit Box

- Resistor values from 15 ohms to 10 megohms
- Capacitor values from 100 pF to .22 μF
- Test leads with alligator clips

$256.50

WR-99A Crystal-Calibrated Marker Generator

- Tunable output from 19 MHz to 260 MHz
- For aligning and trouble-shooting TV and FM receivers
- Built-in crystal calibrator

$63.00

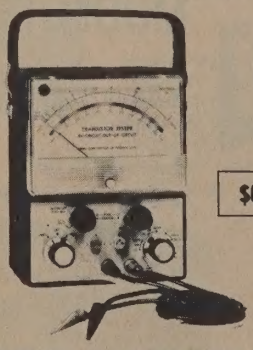
WV-77E VoltOhmyst

- Measures dc and ac rms voltage up to 1500 volts, ac p-p voltage of complex waveforms to 4200 volts, and resistance from 0.2 ohms to 1000 megohms
- 11 megohm imput resistance

$88.00

WV-500B Transistorized Voltohmyst

- All solid-state, battery operated and portable
- Eliminates warm-up time and zero-shift
- Measures AC/DC voltage and resistance



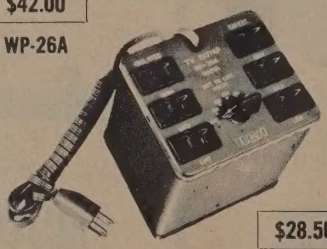
$66.75

WT-501A In-Circuit/Out-of-Circuit Transistor Tester

- Battery operated and portable
- Tests both low and high power transistors
- Collector current adjustable from 20μA to 1 A

$42.00

WP-26A



$28.50

WP-25A

TV Isotap Isolation and Autotransformer

- Checks high-low-medium line-voltage operation
- WP-25A...275VA; WP-26A...400VA
- Minimizes shock hazards... prevents damage to test equipment

$87.00

$48.00

WP-700A & WP-702A (dual unit) Power Supplies

- 0 to 20 volts at 200 MA
- Negative feedback regulator circuit
- All silicon transistors and diodes

RCA | Electronic Components | Harrison, N. J. 07

RCA Test Equipment

FOR: SERVICE
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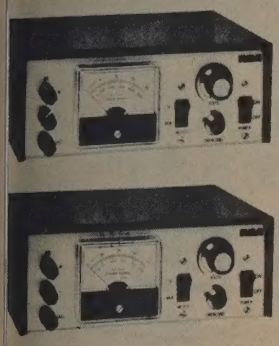
LABORATORIES

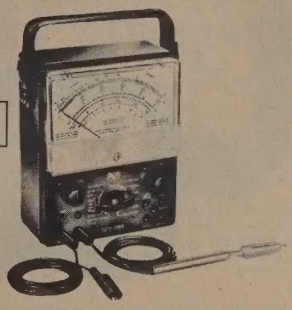


$58.50

$58.50

WP-703A & WP-704A Power Supplies

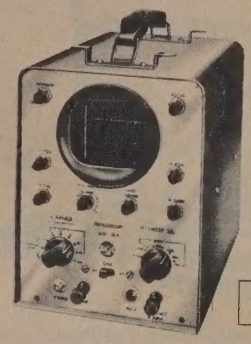
- 0 to 20 volts at 500 MA for WP-703A; 0 to 40 volts at 250 MA for WP-704A
- Negative feedback regulator circuit
- All silicon transistors and diodes
- Electronic short-circuit protection



$55.50

WV-38A Volt-Ohm-Milliammeter

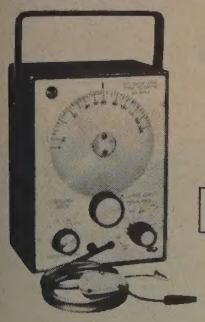
- Measures ohms, DC volts, AC volts, direct current, audio signals in db units
- Precision ±1% resistors insure high accuracy
- Meter movement protected against burn-out



$180.00

WO-33A Super Portable Oscilloscope

- Flat response to 5.5 Mc
- Frequency compensated 3-to-1 vertical attenuators
- Automatic switching from wide-band to narrow-band on range switch



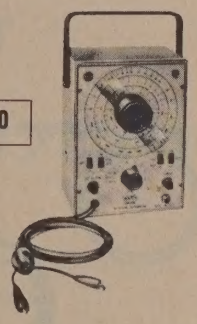
$95.00

WA-504A Transistorized Sine/Square Wave Audio Signal Generator

- Frequency range — 20 Hz to 200,000 Hz
- Stable signal — amplitude variation only ±1.5 db
- Distortion only 0.25% from 30 Hz to 15 kHz

RCA Test Equipment and Accessories Catalog 1Q1218B

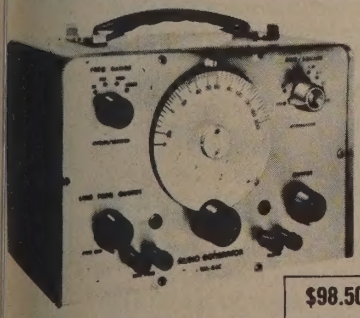
Available from your local RCA Test Equipment Distributor



$72.00

WR-50B RF Signal Generator

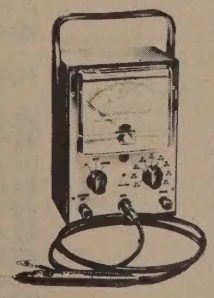
- Frequency range — 85 kHz to 40 MHz (6 overlapping ranges)
- Internal 400 Hz audio oscillator
- Sweep output at 455 kHz
- Includes crystal oscillator for use with external crystals



$98.50

WA-44C Sine/Square Wave Audio Signal Generator

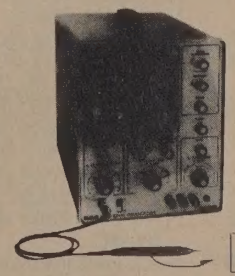
- Wide frequency range — 20 Hz to 200,000 Hz
- Distortion only 0.25% from 30 Hz to 15 kHz
- Stable signal — amplitude variation only ± 1.5 db



$90.00

WV-76A High Sensitivity AC VTVM

- Measures 0.0002 volt to 100 volts (9 overlapping AC volt ranges)
- Measures −40 to +40 db levels on separate decibel scale
- Probe permits measurements to 500 volts or +56 db



$298.50

WO-505A 5″ Solid-State Oscilloscope

- Flat-face 5″ CRT with illuminated graph screen
- DC vertical amplifier; DC/AC input
- High sensitivity (.05 V range)
- Useable response to 8 MHz
- Regulated power supply for maximum stability

RCA | Electronic Components | Harrison, N. J. 07029

RCA Test Equipment

FOR: SERVICE
SCHOOLS
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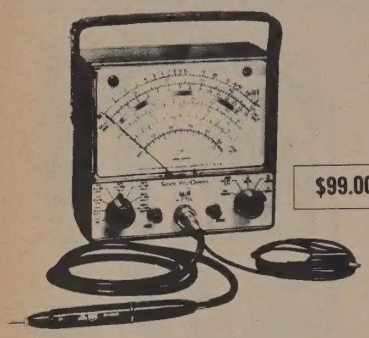
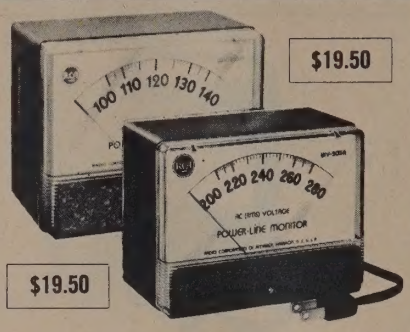
LABORATORIES



$99.00

WV-98C Senior VoltOhmyst

- Measures dc and ac rms voltage up to 1500 volts, ac p-p voltage of complex waveforms to 4200 volts, and resistance from 0.2 ohms to 1000 megohms
- Large mirror scale meter & dc/ac ohms switch-probe with shielded cable

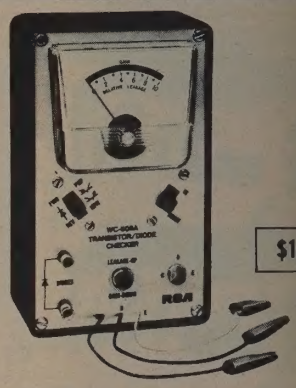


$19.50

$19.50

WV-120A and WV-503A Power Line Monitors

- Continuous, accurate indication of ac line voltage
- Expanded 2-color scale (WV-120A . . . 100-140V; WV-503A . . . 200-240V)
- Wide frequency range from 25 to 400 Hz

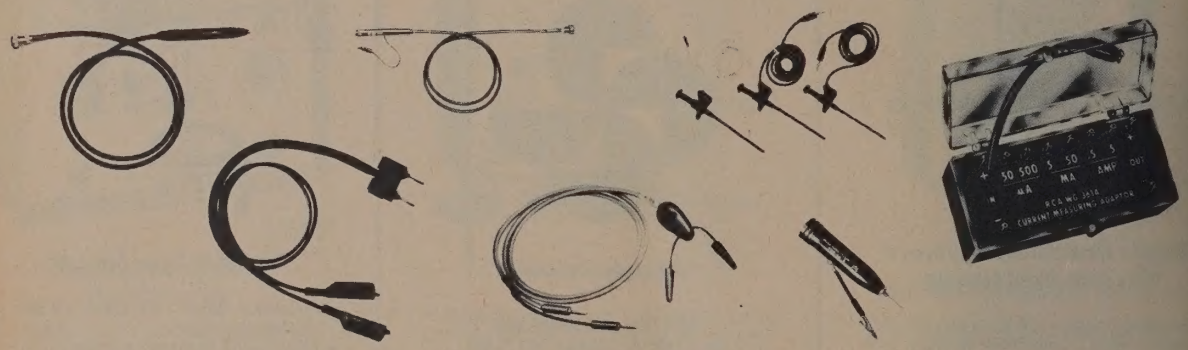


$18.00

WC-506A Transistor/Diode Checker

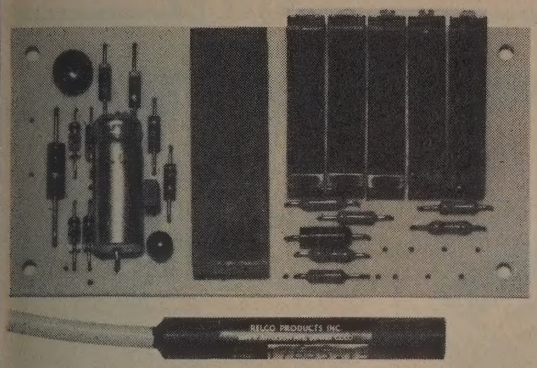
- Checks relative gain and leakage levels of out-of-circuit transistors
- Checks relative front to back current ratio of diodes

Test Equipment Accessories



WG-206	1090-Megohm Resistor for H.V. Probe	$ 3.75
WG-210	900-Megohm Resistor for H.V. Probe	3.75
WG-211	495-Megohm Resistor for H.V. Probe	3.75
WG-270A	Carrying Case for WV-38A	5.25
WG-271A	Adapter for using WG-300B Cable and Probe on WO-33A	2.50
WG-277A	Test Leads for WV77E	4.50
WG-289	High Voltage Probe (less resistor) with microphone type connector	13.50
WG-297	High Voltage Probe (less resistor) with banana plugs	13.50
WG-299E	DC/AC-Ohms Probe and Cable for WV-98C	9.75
WG-300B	Direct/low-Capacitance Probe	12.00
WG-301A	Crystal-Diode Probe for WV-98C	8.25
WG-302A	RF/IF-VF Signal-Tracing Probe	9.00
WG-349A	Direct-Low Cap. Probe for WO-33A	6.75
WG-350A	Demodulator Probe for WO-33A	5.25
WG-351A	RF Probe for WV-77E	5.25
WG-354A	Capacitance-Type Voltage Divider Probe for WG-300B	11.00
WG-361A	Current Measuring Adaptor	$ 5.25
WG-400A	Direct/Low Capacitance Probe and Cable for WO-505A	10.50
WG-401A	AC/DC Ohms Probe and Cable for the WV-510A	9.00
WG-410B	AC/DC Ohms Probe and .150″ Diameter Cable	9.00
WG-411A	Slip on High Voltage Probe	13.50
WG-412A	RC Box	30.00
WG-412A-K	Circuit Box Kit	22.00
WG-413A	Test Leads with Dual Banana Plugs	3.75
WG-414A	3 Clip Probes	13.50
WG-426A	RF Output Cable for the WR-514A	11.25
WG-427A	Direct Cable for the WR-514A	6.00
WG-428A	Connector Adapter for the WR-514A	3.75
WG-429A	VF/IF 75 Ohm Terminated Adapter for WR-514A	4.50
WG-430A	Direct Cable Adapter for WR-514A	4.50
WG-436A	2079-Megohm Resistor for High Voltage Probes	3.75

THERMOMETER SYSTEM



MODEL 1062/1063

FEATURES

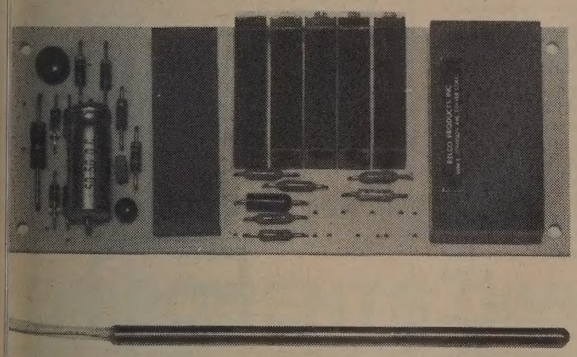
- Range: —75 to +140°C or —100 to +280°F
- Designed for direct digital readouts
- Sensitivity of 10mv/degree
- Probe linearity of .1%
- 100 millivolt strip-chart recorder signal
- Military grade components for maximum probe reliability

STEM 1062/1063 consists of a Model 1062 power supply and signal conditioning unit together with one Model 1063 temperature sensing probe. This system is de-ned to be used with digital voltmeters to measure temperatures between —75 and +140 °C. The readings are presented directly in engineering units without resort tables or linearizing functions. Provision is made for the simultaneous recording of the probe output on a strip chart recorder. Provision is also made for substitut- an analog readout device for a digital voltmeter readout.

DEL 1062 POWER & SIGNAL CONDITIONING UNIT is made up of a regulated power supply and a signal conditioner section. The power supply is a highly regulated nperature stable source of +15 VDC which can supply up to 50 Model 1063 probes. The input is 24 to 30 volts rms 50 to 400 Hz.

e signal conditioner is made up of output and biasing circuits required by a single Model 1063 probe. These circuits are shown in the schematic diagram and are sily duplicated if more than one probe is to be operated from the power section. Model 1062 is also available as a plug in card.

DEL 1063 TEMPERATURE SENSOR is an ultralinear current generator (.1%) which supplies an output current proportional to temperature as is shown in the graph. e basic sensitivity is 5 microamperes per degree Celsius so that signals of 10 millivolts per degree Celsius or 10mv/°F are obtained with the recommended output cuit component values. Applications of this probe in digital and analog thermometers are shown in the schematic diagram.



MODEL 1070/1071

FEATURES

- Range: —75 to +600°C or —100 to +800°F
- Designed for direct digital readout
- Sensitivity of 10 mv/degree
- Linearity of .1%
- 100 millivolt strip-chart recorder signal
- High temperature platinum probe for maximum reliability
- Dynamic linearization of the probe signal

STEM 1070/1071 consists of a model 1070 power supply and signal conditioning unit together with one of the Model 1071 platinum temperature sensing probes. s system is designed to be used with digital voltmeters to measure temperatures between —75 and +600°C or —100 and +800°F. Dynamic linearization of the be signal provides readings directly in engineering units without resort to tables. Provision is made for the simultaneous recording of the measured temperature a strip-chart recorder. Model 1070 is also available as a plug-in card.

DEL 1070 POWER AND SIGNAL CONDITIONING UNIT is made up of a regulated power supply and a signal conditioning section. The power supply is a highly regu-ed temperature stable source of +15 vdc. The input is 24 to 30 volts rms 50 to 400 Hz.

e signal conditioner is made up of a Model 1077 Amplifier with the necessary output and biasing circuits. The input signal to pins A, B and C of the amplifier is from 100 ohm platinum element using the three-wire lead resistance canceling connection. A second 100 ohm platinum element connected to pins D and E provides the namic linearizing signal. The amplifier output voltage at pin 9 is proportional to probe temperature and is shown in the above graph. Units with a 0 to 5 volt signal and sensitivities of up to 50 mv/°C are also available.

DEL 1071 TEMPERATURE SENSOR is a general purpose dual platinum unit consisting of two separate 100 ohm windings packaged in a stainless steel housing. e sensor length has to be chosen so that the maximum temperature of the lead end of the probe is not exceeded (i.e. 250°C). Available lengths range from the 4 ches shown to 18 inches in ½ inch increments.

ASK FOR FREE CATALOG covering the above systems and our line of precision temperature transducers having output signals of 0 to +5 vdc and sensitivities of up to 200 mv/°F. Catalog describes transducer models designed for measuring temperatures of surfaces, gases and liquids which have been developed for industrial, aerospace, oceanographic and laboratory applications.

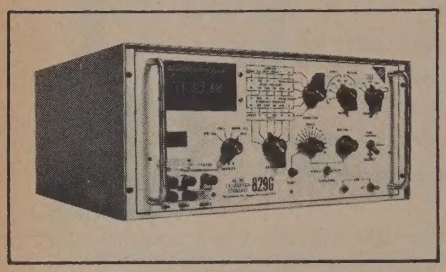
RELCO PRODUCTS, INC.

5594 EAST JEFFERSON • DENVER, COLORADO 80237 • PHONE (303) 756-1143

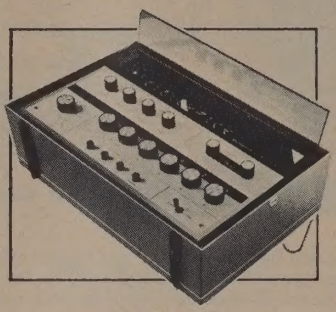
INSTRUMENTATION DIVISION

Since 1922

AC/DC Voltage, Current and Power Standards



Model 829G
Digital Standard



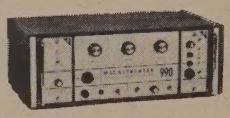
Model 1000

Model 829G	Measure & Deliver
Full-scale ranges	AC/DC Volts 0.1V—1000V AC/DC Current 100μA—10A Ohms 0.1-10 meg.
Accuracies of reading	±0.05% DC ±0.08% AC ±0.06% Ohms
AC Frequencies	50, 60 400, 1000 Hz
Price	$3,100.

Model 1000 Potentiometer with accuracy of ±3 ppm to 2.3 V. Plant or field use. Self calibration and easy to read digital presentation.
Price: **$2100.**

Magnet Chargers and Treaters

Model 2470-350
Variable output voltage with energies up to 440 watt-seconds for saturating up to 4 lbs. of Alnico V using wire-wound fixture. Bench or rack mounting available. Accessory Booster available for doubling output. **$1,145.**



Model 990
Magnetreater®
Completely solid state demagnetizer for stabilization of permanent magnets. Power continuously variable from less than 1VA to in excess of 80,000VA. Resolution, 0.1%. Can be programmed for automatic or semi-automatic operation.
$ 750.

Model 1500
Produces 225 watt-seconds for large Alnico meter magnets plus cobalt platinum and barium ferrite materials. Wire-wound fixtures plug into front panel through safety interlocks. **$1,290.**

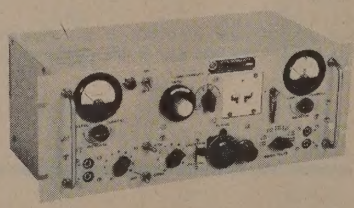
Model 942
Saturate Alnico magnets to 34 lbs. and high coercive force barium ferrite compounds of any shape or number of poles. Outputs to 3,600 watt-seconds. Safety interlocked.
$2,140. to $2,740.

Model 3260
First all solid state impulse charger variable output to 54 watt-seconds. Capable of magnetizing a wide range of materials and configurations. **$775.**

Model 107A
Saturates most medium size and instrument magnets, including core types, using variety of fixtures. Two output ranges: Maximum 18 watt-seconds. Booster unit also available.
$ 750.

Crystal Impedance Meters

Model	Frequency Range	Impedance Range	Price
459A	800KHz-15 MHz	0-9,900 ohms	$1175.
531	10-140 MHz	10-150 ohms	890.
541C	2.5-1100 kHz	200 ohms-0.5 megohms	1175.
1207	75-200 MHz	10-125 ohms	1350.



Reference standards for measuring resonance and anti-resonance of quartz crystals in determination of capacitance, inductance and performance index. Meet U.S. MIL-C-3098E/Amd. 1 and U.K. Defense DEF-5271 A.

Gaussmeters

Model 3265

Model 505, a low cost unit ranging from gauss to 50 kilogauss in 7 full-scale rang Measures permanent magnet, DC and fields to 20 kHz. Built in probe calibration a zero center mode for determining polari Accuracy: ±3% Price: **$210.00**

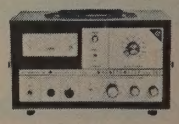
Model 750, a wide range device for flux d sity measurements from .02 gauss to kilogauss in 24 full-scale ranges. Measur permanent magnetic fields, DC and AC fr 20 Hz to 400 Hz. Easy to read 7" meter. Li or battery operation for field use. Accura ±1%① Price: **$ 720.00**

Model 3265, three-in-one gaussmeter capa of measuring absolute flux densities fr .02 gauss to 50 kilogauss (DC and AC to 4 Hz). In the expanded scale mode, measu ment to a resolution of 1 ppm and a differe tial mode for simultaneous measurement two separate fields or field gradients. Ac racy: ±1%① Price: **$ 1050.00**
①Plus accuracy of reference.
Gaussmeters are solid state, Hall effect struments that yield laboratory accura traceable to NBS.

Probes — Are InAs elements for temperatu stability. Choice of flat, axial or tangential various sizes to fit most gaps. Flat rang from .006" thick x .135" wide x .625" lo **$95.00 to $470.00**

Reference Magnets — Traceable to NBS w 50 gauss to 20K gauss fields and gaps fr .040" to .343" are standards for probe calib tion. **$45.00 to $500.00.** AC reference magn (1000 gauss peak-to-peak) also available **$105.00**

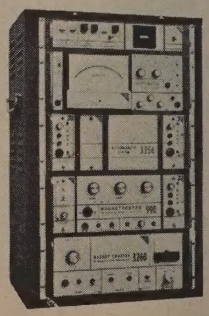
Magnetometer



Model 101

Solid state low level magnetic flux densi measurements from 1 gamma to 100,0 gamma (1 oersted). Temperature compe sation is provided to enable virtual drift-fr operation.
Price: **$630.** — Standard Probe: **$11**

Automagnetic® Systems



A combination RFL standard m netizing, measuri and demagnetizi equipment perm interconnection semi-automatic completely automa systems, design for individual quirements. Proce ing includes TV BAR and C shap magnets, DC mete Torque motors, celerometers a other designs e bodying perman magnets.

RFL Industries, Inc.
Instrumentation Division • Boonton, New Jersey 07005 • U.S.A.
Tel. (201) 334-3100 / TWX: 710-987-8352 / CABLE: RADAIRCO, N. J.

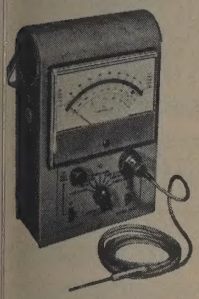
See page 781 Thermocontrol Division Temperature Measurement Cont
See page 1312 Communication Division Data Transmission Equipment

THERMOCONTROL DIVISION

Since 1922

Temperature Measurement and Control Equipment

Direct-Reading



Wide Range: -100°C to +500°C

Accuracy: ±0.75°C

Response: 0.5 min.

Probes: Platinum

A wide range thermometer for precise temperature measurements of liquids, gases and atmosphere.
Price: **$450.00**

ectronic Thermometer
Model 212

Lowest Cost

Voltage/Power Ratings: Single Phase 50/60 Hz
115V. line—15A., 1.5 kW max load
208V. line—15A., 3 kW max load
230V. line—15A., 3 kW max load

Accuracy: To ±0.05°C of set point

Range: From 100°C to 650°C

A miniature, solid-state device for delivering precise power to control temperature light or any other desired load within its range.
Price: **$37.80**

Proportional Controller
Model 70

F offers a wide ction of control- e for most any ication. A signifi- ca and major new ancement in the d is the new del 70 Propor- l Controller. This iature, low cost provides true portional control is competitive on-off or fixed erature types.

Proportional Temperature Controllers

Model	Range	Accuracy*	Load	Probe Resistance	Features	Price
40	−100°C to 500°C	±0.1°C	0-2V DC out	8000 to 300 ohms	Servo equipped valve use	$151.00
70	−100°C to 650°C	±0.05°C	To 3 kW	8000 to 100 ohms	OEM installation-miniature-non-indicating	37.80
72	−100°C to 650°C	±0.5°C	To 1.5 kW	8000 to 100 ohms	Zero voltage firing eliminates radio frequency interference	39.20
80	−100°C to 650°C	±0.1°C	To 100 kW	8000 to 300 ohms	Compact fast response non-indicating	155.00
90	−100°C to 650°C	±0.1°C	To 100 kW	8000 to 300 ohms	Low cost precision indicating	250.00

*of set point for 10% load

Prices less probes and are for 115V 1.5 kW 1ø

SCR's replace bulkier auto-transformers and saturable core reactors with a resultant line of light, compact and reliable controllers.

COMPONENTS DIVISION

tom Service/Engineering Consultation

RFL Components Division offers a custom service with ally unlimited coil winding capabilities. High quality are wound to meet special design requirements or to plete any inductive circuit application.

e goal of our Components Division is to provide a per- lized service with quick delivery and competitive prices. engineers are always available for consultation either at or your plant to help with any individual problem relating il design and manufacture.

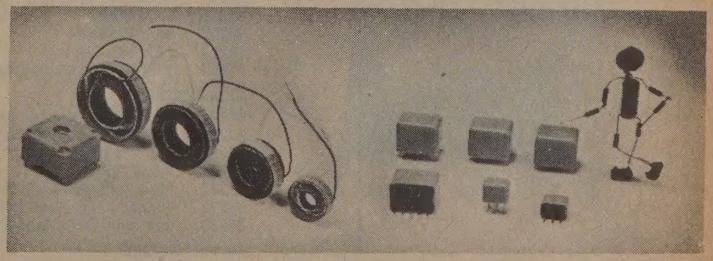
Applications

In addition to the wide range of coil combinations available, a large variety of mechanical and mounting configurations may be specified. These components are adaptable to chassis or circuit board applications. They are used for filters, magnetic amplifiers, blocking oscillators and low signal, high frequency devices.

ven Reliability and Quality

has designed more than 7,000 different coil combinations late in support of our long established product line. Mean- e-between-failure figures and field experience in industry, tary and aerospace over the years have attested to the ability and built-in quality of every RFL manufactured ponent.

ll inductors are precision wound under strict quality trol supervision using the finest materials available. cal sizes range from under ¼" to over 2" outside diameter. uctances range from 0.06mH to 10.4H over wide frequency ges.



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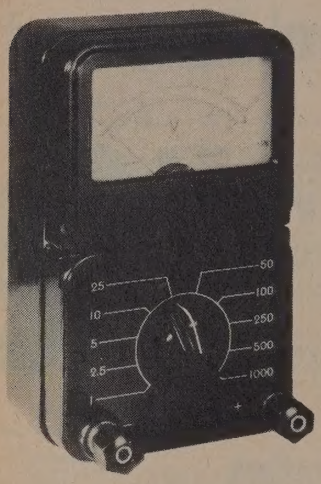
See page 1312 **Communication Division** Data Transmission Equipment

See Page 780 **Instrumentation Division** Metrology, Magnetics

SEP/CONWAY PRECISION INSTRUMENTS

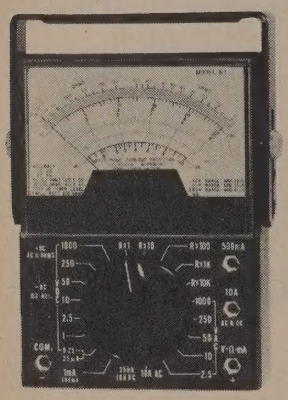
SERIES 36000 MULTI-RANGE LAB METERS



Designed for general production, lab and bench testing use. 5000 Ohms per volt sensitivity. Accuracy 2% FSD. Electronic protection against overloads of up to 100,000% (1000 times). Double spring-loaded sapphire jewel pivots. Mirror scales. Knife-edge pointers. Rugged five-way binding posts. Arc length 2¾". Size 6" x 3⅝" x 2⅛".

MODEL — PRICE	RANGES
36007 DC Voltmeter $37.50	0-1/2.5/5/10/25/50/100/250/500/1000 V DC
36011 DC Millivoltmeter $37.50	0-10/50/100/500/1000 mV DC
36005 DC Ammeter $37.50	0-1/2.5/5/10/25 A DC
36012 DC Milliamp/Ammeter $37.50	0-10mA/50mA/100mA/1A/5A/10A DC
36004 DC Milliammeter $37.50	0-1/10/25/50/100/250/500/1000 mA DC
36003 DC Microammeter $37.50	0-50/100/250/500/1000 μA DC
36013 DC Microammeter $37.50	0-10/25/50 μA DC
36002 AC Voltmeter $37.50	0-5/10/25/50/100/250/500/1000 V AC
36006 AC Voltmeter $37.50	0-150/300/600 V AC
36001 AC Ammeter $37.50	0-1/2.5/5/10/25 A AC
36000 AC Milliammeter $37.50	0-5/25/100/250/1000 mA AC
36009 Galvanometer $37.50	50-0-50 μA, 500-0-500 μA, 5-0-5 mA
36008 Ohmmeter $39.50	0-500/5K/50K/500K/5M/50M Ohms
36010 Ohmmeter $39.50	0-5/25 Ohms

MODEL 30061 VOLT-OHM-MILLIAMMETER



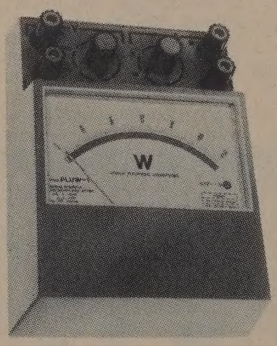
FEATURES

- **50,000 Ohms Per Volt Sensitivity.**
- **Electronic Movement Protection Against Overloads Of Up To 100,000%.**
- **Input Circuits Fuse Protected.**
- **2% Accuracy.**
- **AC & DC Current Ranges.**
- **Double Spring Loaded Sapphire Jewel Pivots.**
- **Polarity Reversing Switch.**
- **Mirror Scale.**
- **Knife Edge Pointer.**

SPECIFICATIONS

Sensitivity:	50,000 Ohms Per Volt DC 10,000 Ohms Per Volt AC
DC Millivolts:	0-250
DC Volts:	0-1/2.5/10/50/250/100(
AC Volts:	0-2.5/5/10/50/250/100(
DC Microamperes:	0-25
DC Milliamperes:	0-1/25/500
DC Amperes:	0-10
AC Amperes:	0-10
Ohms:	0-20K/200K/2M/200M (100 Center)
Decibels:	−20 to +50 (0 DB = 1 mW, 600 Ohms)
Accuracy:	DC 2%, AC 3% FSD
Size:	5 13/16" x 4⅛" x 1⅞"
Includes:	Leather Case, Tilting Handle, Leads, Batterie
Price:	$61.00

PRECISION 0.5% VOLTMETERS, AMMETERS & WATTMETERS



These 0.5% precision instruments feature double spring-loaded industrial sapphi pivots, mirror scales and knife-edge tantalum pointers. DC meters are moving co instruments with 5000 Ohms per volt sensitivity. AC meters are moving iron wi 0.5% accuracy from 15-100 Hertz. Wattmeters are electrodynamometer AC/D movements with four voltage and two current ranges each.

0.5% Voltmeters and Ammeters are $115.00. 0.5% AC/DC Wattmeters are $195.0

DC VOLTMETERS

62240	60 mV
62251	3/30/300 V
62252	30/300/600 V
62253	120/240/600 V
62262	1/3/10/30/100/300/600 V

DC AMMETERS

62221	50/100/500 Microamperes
62222	50/100/1000 Microamperes
62223	0.2/1/5 Amperes
62224	0.5/2/10 Amperes
62231	60μA/240μA/600μA/2.4mA/60mA
62232	600μA/2.4mA/6mA/24mA/120mA/600mA
62233	6mA/24mA/60mA/240mA/1.2A/6A

AC VOLTMETERS

62161	65/130 V
62162	130/260 V

AC VOLTMETERS (Continued)

62163	250/500 V
62171	130/260/650 V

AC AMMETERS

62121	1/5 A
62123	10/50 A
12124	20/100 A
62131	0.2/1/5 A
62132	1/5/20 A
62133	5/20/100 A

AC/DC WATTMETERS

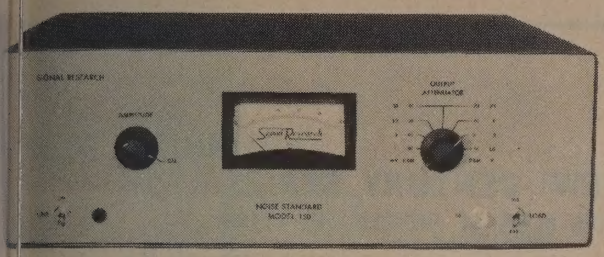
32615	60/120/240/360 V	0.5/1 Amp
32616	60/120/240/360 V	1/2 Amp
32617	60/120/240/360 V	2.5/5 Amp
32618	60/120/240/360 V	5/10 Amp
32619	60/120/240/360 V	10/20 Amp

Prices are suggested User Net. All prices and specifications subject to change without notice.

SEP INSTRUMENTS

310 MADISON AVENUE • NEW YORK, N.Y. 10017 • 212-867-9480

NOISE GENERATORS



Model 150 is an all solid-state noise generator of high precision suitable for the most exacting random signal work and also for general laboratory use, calibrating spectrum analyzers and probability density analyzers, etc. Both the output spectral density and the amplitude probability density are stable and controlled. The output is calibrated in terms of spectral density to ±0.3% and the output may be read with a high degree of accuracy in terms of power or voltage spectral density by simple numerical constants. The output is indicated in volts RMS and dBm in 50 ohms.

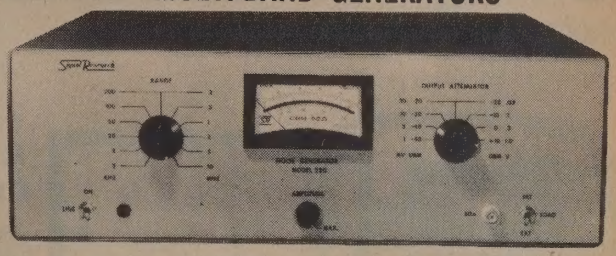
Spectral Density	5 mV/ Hz ±0.025 dB absolute calibration ±0.3%
Frequency Range	DC to 40 KHz DC constant less than 5 mV
Output Impedance	50 ohms ±0.2%
Output Level	1 volt RMS across a 50 ohm load
Attenuator	60 dB in 10 dB steps, ±0.05 dB overall
Variable Amplitude	a variable amplitude control is provided
Metering	mirror-backed taut-band movement
Conformity to Gaussian Amp Prob Density	±2% of point to 2.5 sigma +2% −30% of point to 4 sigma
Price	Model 150 —$1850.00 Model 150R—$1850.00 (rack mount)

NOISE MODULES

A wide range of encapsulated noise modules is available, with frequency ranges to 1 MHz and spectral flatness to 0.2dB. The modules are designed for PC board mounting, and their low profile (1.5 in. wide x 3.25 in. long x 0.625 in. high) permit close mounting of PC cards in card trays. These modules are ideal for OEM equipment, systems, special noise setups and experiments, etc.

Because of the wide range of characteristics available, it is impossible to give exhaustive listings. Write your requirements for a prompt quote.

MULTI-BAND GENERATORS



Model 220 is a general-purpose wide-range noise generator. Eleven noise bands are provided, with upper band edges from 2 KHz to 10 MHz. A 60 dB attenuator in convenient 10 dB steps and a variable amplitude control permit convenient, accurate output level settings. A mirror-backed taut-band movement meters the output. The meter and attenuator are scaled in volts RMS and dBm in 50 ohms. Output impedance is 50 ohms, and an output of at least one volt RMS across a 50 ohm load is available on all bands.

Frequency Ranges	Lower Band Edges, all Bands are 5 Hz Upper Band Edges are 2, 5, 20, 50, 100, 200, 500 KHz, 1, 2, 5, 10 MHz
Spectral Density	Flat ±0.3 dB, all bands
Amp Prob Density	Symmetrical Gaussian, all bands
Price	Model 220 —$980.00 Model 220R—$980.00 (rack mount)

Model 210 is identical in all respects to the Model 220, except that it has ten noise bands, the band from 5 Hz to 10 MHz being omitted.

Price	Model 210 —$935.00 Model 210R—$935.00 (rack mount)

SINGLE-BAND GENERATORS

Model 240 will provide noise signals with a symmetrical Gaussian amplitude probability density and a spectrum flat ±0.5 dB from 20 Hz to 20 MHz. An output level of 1 volt RMS across a load resistance of 50 ohms is available through an output impedance of 50 ohms. A variable level control and 60 dB attenuator in 10 dB steps permit precise, repeatable level settings, and the output is metered by a taut-band mirror-backed meter scaled in volts RMS and dBm.

Output Spectrum	20 Hz to 20 MHz ±0.5 dB
Output Level	1 volt RMS across a 50 ohm load
Case	6¼H x 11W x 10D
Price	$680.00

Model 250 will provide noise signals with a symmetrical Gaussian amplitude probability density and a spectrum flat ±0.5 dB from 10 KHz to 12.5 MHz. An output level of −30 dBm across a load resistance of 75 ohms is available through an output impedance of 75 ohms. A variable level control and 60 dB attenuator in 10 dB steps permit precise, repeatable level settings, and the output is metered by a taut-band meter.

Output Spectrum	10 KHz to 20 MHz ±0.5 dB
Output Level	−30 dBm/ KHz
Case	6¼H x 11W x 10D
Price	$680.00

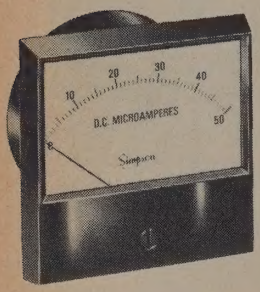
Signal Research INC.
BOX 79 • TITUSVILLE, NEW JERSEY 08560
TELEPHONE: (609) 737-1917

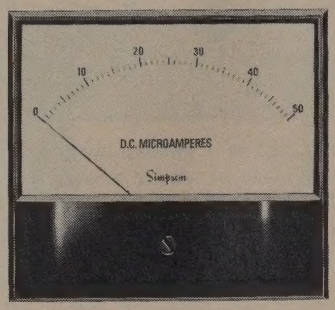
Simpson®

INSTRUMENTS THAT STAY ACCURATE

PANEL INSTRUMENTS

OVER 1500 STOCK RANGES, SIZES, AND TYPES

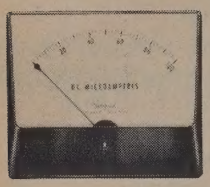




■ NEW! CENTURY SERIES

A MODERN BLEND OF PHENOLIC AND GLASS

Simpson's new panel instrument design concept. Rugged glass and phenolic construction **plus** a modern clean-cut design. Directly replaces older panel instrument designs. A complete line to meet all electrical needs — AC and DC Ammeters, Wattmeters and Elapsed Time Meters. Available in four sizes: 1½", 2½", 3½" and 4½". Features Simpson's self-shielding movements with spring-loaded pivot and jewel or shock-proof Taut Band suspensions. Available from stock in a wide selection of ranges. Write for bulletin 3000A or see listings in RADIO-ELECTRONIC MASTER.

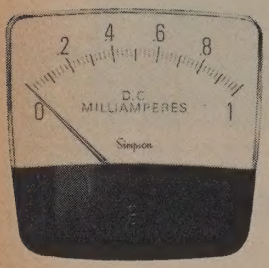


■ WIDE-VUE

Simpson's most popular panel instrument designs. Clear acrylic viewing areas will not yellow or develop hairline cracks. Available from stock in 1½", 2½", 3½", 4½" and 8" sizes and the widest selection of ranges. Behind panel bezel mount also available for 3½" and 4½" sizes.

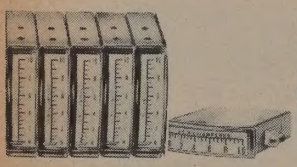
■ DESIGNER SERIES

3½" and 4½" sizes, made for today's compact equipment designs — without sacrificing readability. 4½" model uses less than 3" of panel height, yet has a clear, readable scale over 3½" long. Clean, crisp glass windows.



■ BOLD-VUE

Now you can have Simpson quality in this bold looking 3-hole mount design. Large numerals and wide tapered pointer make reading easy. Simpson movements are built for stay-accurate dependability. Bold-Vue is available in 2½" and 3½" sizes.



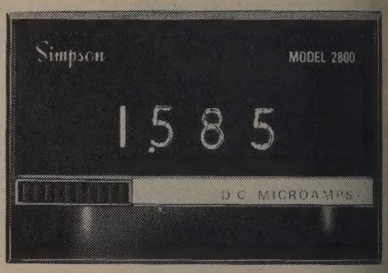
■ EDGEWISE

1½" and 2½" sizes. Stackable design permits extremely compact panel displays. Optimum scale display, extending nearly the full height and width, allows the use of large, easy-to-read numerals. Core magnet movements are self-shielding.

CALL SIMPSON FOR ALL YOUR PANEL INSTRUMENT NEEDS . . .

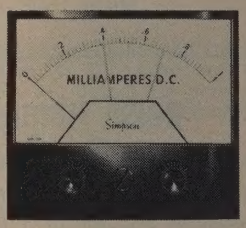
- **Elapsed Time**
- **Radio Frequency**
- **Pyrometers**
- **Behind Panel Mounts**
- **Decibel/VU**
- **Electro-Mechanical Counters**

Write today for bulletin 3000A.



■ DIGITAL

Adds so much to your new equipment design . . . easier readouts, better accuracy, and the most modern look. Simpson's model 2800 is a reliable instrument which features easy one-hole panel mounting. Three full-time digits plus 100% overrange. ±0.1% accuracy Write for bulletin 3000A.



■ CONTROLLERS

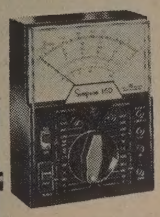
Maximum reliability design for control, alarm, or limit applications. Photoconductor sensing eliminates all interference with the indicating meter. High gain transistor amplifier provides accurate switching and a "dead band" of just 0.25% maximum. Rugged Seal construction withstands rigorous environmental conditions. Write today for bulletin 3000A.

SIMPSON ELECTRIC COMPANY • 5200 W. KINZIE STREET • CHICAGO, ILLINOIS 60644 • (312) 379-112

TEST EQUIPMENT
ONTROLLERS • CHART RECORDERS

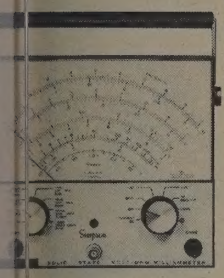
Simpson®
INSTRUMENTS THAT STAY ACCURATE

TEST EQUIPMENT



160 Handi-VOM

Full-size VOM features in a palm-size package! 20,000Ω/V DC, 5000Ω/V AC. Overload and shock protected Taut Band movement. Built for today's VOM needs, including solid-state circuit testing, the 160 has 0.25 VDC and DC uA ranges. $55.00.

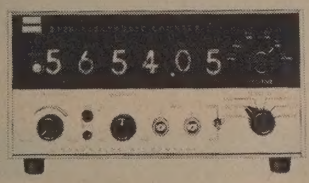


313 Solid-State VOM

VTVM features plus VOM convenience. Battery operated, with 11 MEGΩ DC, 10 MegΩ AC input impedance. Operates for over 300 hours on easily obtained inexpensive batteries. Large 7″ scale for maximum resolution. FET input withstands high votlages. Taut Band movement only is overload protected. $125.00.

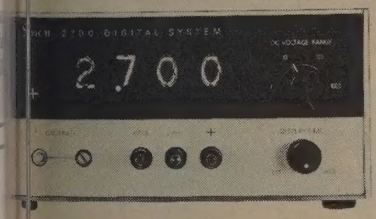
229 AC Current Leakage Tester

Designed to test 120 VAC appliances and electrical equipment in accordance with proposed U.S. Standards Committee specification C101.1. Approximates normal perception curve to within ±1.0 dB. Measures currents as low as 5 microamperes. Detects shorts and near shorts. $90.00.



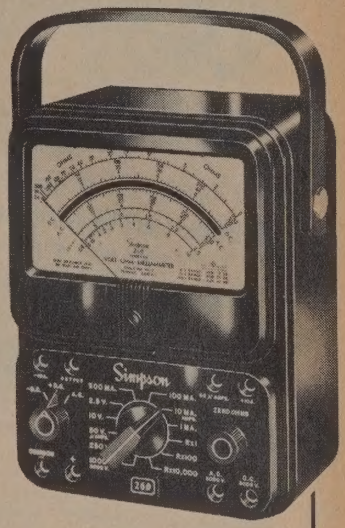
2726 Frequency Counter

32 MHz counter has six full-time digits plus overrange. Measures average frequency, frequency ratios, time periods, time intervals, and totalizes. Also provides multiple measurement of period and ratio. Accuracy 0.001, $600.00. Five-digit model also available, $550.00.



2700 Digital System

Plug-in function modules for DC and AC voltage and current, plus resistance. Features four full-time digits, automatic polarity indication, and ±0.05% accuracy. Supplied complete with DC voltage range module. $615.00.



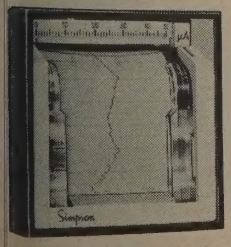
WORLD FAMOUS
260® VOMs

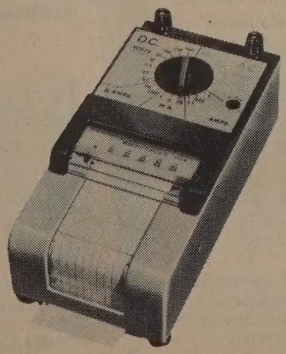
Now has Simpson's new Taut Band movement. Self-shielding and shockproof for outstanding accuracy and repeatability. Varistor protects the movement from even 200,000% overloads. A replaceable 1-ampere fuse guards the input circuits, 260-5, $65.00.

The 260® family includes VOMs with special features, such as push-button overload protection, mirror scales, and increased accuracy. Write today for bulletin 3000A or see listings in RADIO-ELECTRONIC MASTER.

CHART RECORDERS

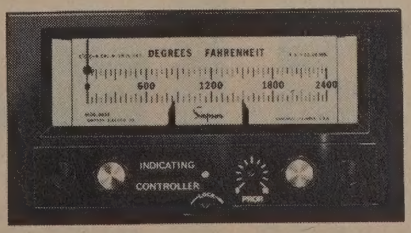
Model 2750 panel mounts in just 3¾″ x 3¾″ of panel space. Records for over a month — unattended. Model 604 has 22 ranges, switch selectable, for low power-range. Simpson also has fast response potentiometric and XY recorders. Write for complete information, or call your local Simpson representative.

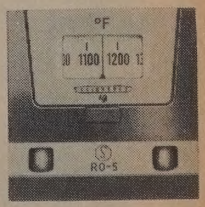




■ TEMPERATURE CONTROLLERS

Simpson can meet your control needs with "off the shelf" delivery of stock ranges — or experienced sales engineers can custom design controllers for your application. Simpson model 5632 RO-7 is 3¾″ square and extends behind the panel only 2¾″. Controller supplied wtih cold-end compensation, thermocouple break protection and proportioning. Price $90.00. Write for complete information, or call your local Simpson representative.





SIMPSON ELECTRIC COMPANY • 5200 W. KINZIE STREET • CHICAGO, ILLINOIS 60644 • (312) 379-1121

Precision Linear Ohmmeter

. . . . for accurate resistance testing

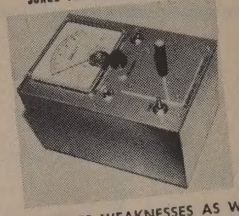
SERIES **203**

0.1 to 5000 Ohms Range

LINEAR RESISTANCE SCALES . . . CONTINUOUSLY SELF-CHECKING . . . GO/NO-GO LIMIT STYLE WITH BUZZER REJECTION SIGNAL.

High Energy Coil Tester

SURGE TESTS COILS FOR . . SHORTS . . GROUNDS . . OPENS



SERIES **640**

High Level Tester

DETECTS WEAKNESSES AS WELL AS DEFECTS . . . USE WITH CORE OR SOLENOID TYPE COILS . . . REQUIRES NO OPERATOR SKILL.

Coil & Winding Testers

WRITE FOR DATA SHEETS ON THE UNITS SHOWN ALL ARE STANDARD PRODUCTION ITEMS, AVAILABLE FOR EARLY DELIVERY . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

SLAUGHTER CO.
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

Adjustable Limit Megohmmeter

. . . . . with buzzer signal on rejections

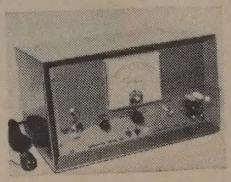
SERIES **205**

1 to 2000 Megohms

DRIFT FREE . . . NO WARM-UP . . . RUGGED TAUT BAND MOVEMENT . . . ADJUSTABLE REJECTION LIMIT WITH BUZZER SIGNAL.

Universal Comparator

tests coils and windings for impedance
. . . . . shorts
. . . . . opens
. . . . . turns



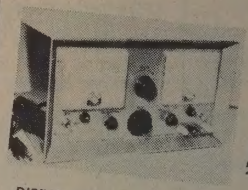
SERIES **635**

0.1 Percent Sensitivity

COMPARES COILS AND WINDINGS WITH STANDARD ON HIGH PRODUCTION GO/NO-GO BASIS . . . EXCELLENT AS A TURNS COUNT CHECKER . . .

Adjustable HI Voltage Surge Tester

tests coils and windings for shorts
. . . grounds
. . . . . opens



SERIES **648**

Ratings to 5000 Volts

DIRECT READING PULSE-SURGE TESTER . . . REQUIRES NO ACTIVE MASTER . . . PRECISE ENERGY CONTROL . . . GO/NO-GO OPERATION FOR UNSKILLED PERSONNEL . . .

Automatic Test Equipment

WRITE FOR DETAILS ON THE EQUIPMENT SHOWN THESE ARE FULLY ENGINEERED, PROVEN, STANDARD DESIGNS AVAILABLE ON A REASONABLE DELIVERY SCHEDULE . . . LET US QUOTE ON YOUR REQUIREMENTS . . .

SLAUGHTER CO.
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

Automatic Test Sequence Controller

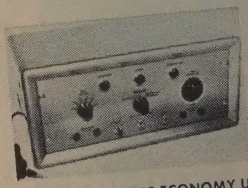
SERIES **910**

Brain Package

FULLY AUTOMATIC CONTROLLER WITH START — ACCEPT — REJECT — DELAY — SKIP — STOP — RESET FUNCTIONS . . . SELF-TIMING . . . PROGRAMMABLE.

Universal Cable & Harness Tester

for continuity . . . breakdowns



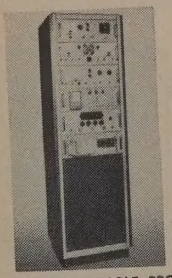
SERIES **701**

17 Circuit Capacity

SEMI-AUTOMATIC ECONOMY UNIT FOR GENERAL PURPOSE TESTING . . . REQUIRES NO OPERATOR SKILL . . . ELIMINATES COSTLY RE-WIRING.

Automatic Cable & Harness Tester

for continuity . . . breakdowns
. . . megohms



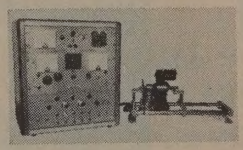
SERIES **707**

Expandable to 10,000 Circuits

INTERCHANGEABLE PROGRAM BOARDS FOR RAPID SET-UP CHANGES . . . MODULAR CONSTRUCTION . . . TESTING RATES TO 200 CIRCUITS/MINUTE . . . ALL LIMITS ADJUSTABLE.

Automatic Wound Armature Tester

for insulation weakness...opens
...grounds...shorted turns



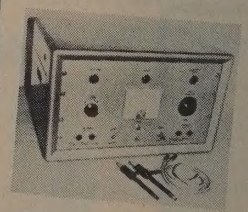
SERIES **920**

360 Parts Per Hour

CHECKS WOUND ARMATURES ON GO/NO-GO BASIS AT HIGH PRODUCTION RATES . . . HIGHLY EFFECTIVE PULSE-SURGE TEST SPOTS WEAKNESSES AS WELL AS DEFECTS.

Automatic Cable & Harness Tester

for continuity . . . breakdowns



SERIES **706**

Expandable to 50 Circuits

FULLY AUTOMATIC PROGRAMMABLE UNIT FOR HIGH PRODUCTION ON SIMPLE ASSEMBLIES . . . GO/NO-GO OPERATION . . . ADJUSTABLE LIMITS.

Insulation Testers

WRITE FOR DATA SHEETS ON THE INSTRUMENTS SHOWN . . . ALL ARE STANDARD PRODUCTION MODELS, AVAILABLE FOR IMMEDIATE DELIVERY FROM STOCK . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

SLAUGHTER CO.
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

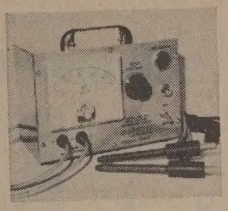
High-voltage Insulation Tester
with buzzer signal on breakdowns
. . . grounds
. . . . shorts

MODEL **101**

Watch what you are doing . . . not the tester

SIX TEST VOLTAGES . . 500 to 2500 V.A.C. PRICED SO YOU CAN AFFORD TO SPOT A FEW ALONG YOUR ASSEMBLY LINES.

Adjustable High-voltage Tester
with buzzer signal on breakdowns
. . . grounds
. . . . shorts

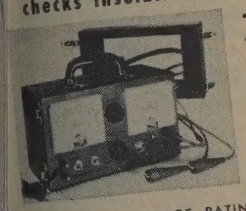


MODEL **106**

Voltmeter shows actual Test Voltage

CONTINUOUSLY VARIABLE TEST VOLTAGE RATINGS TO 10,000 VOLTS AC & DC . . RECOMMENDED FOR BREAKDOWN TESTING AT FINAL ASSEMBLY AND INSPECTION

High-voltage Leakage Tester
checks insulation for . . . leakage
. . . grounds
. . . . . arcing



MODEL **122**

16 lb. Portable for lab and field work

VARIABLE VOLTAGE RATINGS TO 5 KV AC & DC. DUAL RANGE LEAKAGE METER 0/100/1000 μa. . . . CAPACITY COMPENSATION. . . MEASURES INSULATION RESISTANCE, CAPACITY, POWER FACTOR.

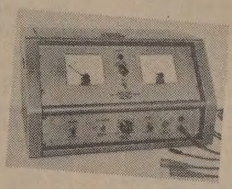
High-voltage Leakage Tester
audibly signals excess leakage
. . . grounds
. . . . . arcing

MODEL **103**

Measures Leakage . . . not capacity current

TEST VOLTAGE CONTINUOUSLY VARIABLE ADJUSTABLE LEAKAGE LIMIT. . CAPACITY COMPENSATION ON AC TESTS. . . RATINGS TO 10,000 VOLTS AC & DC. . . . LIMITED ENERGY. . NON-DESTRUCTIVE. . . FOR LAB AND PRODUCTION LINE SERVICE. . . . . .

Automatic H-V Insulation Tester
for precision checking . . . breakdowns
. . . leakage
. . . grounds



MODEL **103-MP**

Automatic Test Cycle

FULLY AUTOMATIC TEST CYCLE. . . CONTROLLED RATE-OF-RISE. . . ADJUSTABLE TEST VOLTAGE, DWELL TIME, & LEAKAGE LIMIT. . . CAPACITY COMPENSATION ON AC TEST. . . FOR PRECISION TEST OF CRITICAL PARTS & ASSEMBLIES. . .

Stroboscopes

WRITE FOR DATA SHEETS ON THE INSTRUMENTS SHOWN . . . ALL ARE STANDARD PRODUCTION MODELS, AVAILABLE FOR IMMEDIATE DELIVERY FROM STOCK . . . LET US QUOTE ON YOUR REQUIREMENTS FOR MODIFIED UNITS OR SPECIAL TEST EQUIPMENT.

SLAUGHTER CO.
MOORE & HAILEY STREETS
ARDMORE, OKLAHOMA
TELEPHONE: 405-223-4773 TWX: 405-223-6832

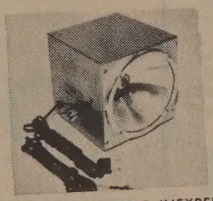
Inspection Stroboscope
. . . with extra high intensity daylight lamp

MODEL **167**

0/600 Flashes per Minute

SUPER INTENSITY TRIGGERED FLASH UNIT . . . PUSH—TO—SEE SWITCH. . . . FOR INSPECTION ON-THE-GO UNDER HIGH AMBIENT LIGHT CONDITIONS.

Inspection Stroboscope
. . . . . with high intensity daylight lamp

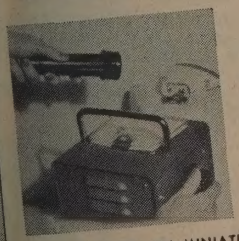


MODEL **161**

0/2,000 Flashes per Minute

LIGHT WEIGHT INEXPENSIVE TRIGGERED FLASH UNIT. . . . . PUSH-TO-SEE SWITCH. . . . INTENSE WHITE LIGHT FOR INSPECTION ON —THE —GO

MIDGET STROBOSCOPE FLASH HEAD



MODEL **166**

0/10,000 Flashes per Minute

FOR WORK ON MINIATURIZED EQUIPMENT . . . . FOR PRINTING TRADES. . . . FOR BIO—MEDICAL WORK. . ADAPTS TO ANY SLAUGHTER STROBOSCOPE. . .

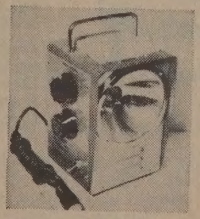
Universal Stroboscope
. . . with high intensity daylight lamp

MODEL **163**

50/16,000 Flashes per Minute

UNIVERSAL UNIT FOR MOTION STUDY & INSPECTION ON-THE-GO. . . INSTANT STARTING . . . HIGH INTENSITY WHITE LIGHT . . . . TRIGGER EXTERNALLY OR OPERATE FROM INTERNAL OSCILLATOR

Metered Precision Stroboscope
. . . . . with high intensity daylight lamp



MODEL **165**

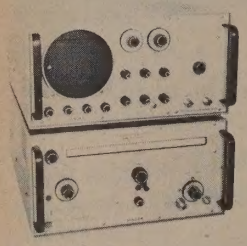
50/16,000 Flashes per Minute

PRECISION STROBOSCOPE TACHOMETER INSTANT STARTING. . . HIGH INTENSITY WHITE LIGHT. . . OPERATES FROM EXTERNAL CONTACTS OR INTERNAL OSCILLATOR. . EASILY SYNCHRONIZED. . OUTPUT JACKS TO COUPLE SCOPE, ETC. . . .

The Broad Spectrum of Singer Instrumentation

Four Instrumentation Centers designing and manufacturing Test Instrumentation to satisfy the most demanding requirements

Singer/Bridgeport



Model SPA-3000
3 GHz Dispersion
Spectrum Analyzer

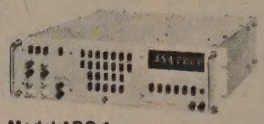
Model SG-1000
Signal Generator
61 kHz to 1024 MHz

Spectrum Analyzers . . . Total Coverage from Audio to Microwave. Featuring: 3 GHz Dispersion Analyzers ■ Telemetry Spectrum Analysis ■ SSB Analyzers ■ Automatic Analyzers for sensing Communication Carrier Overloads . . . Much more.

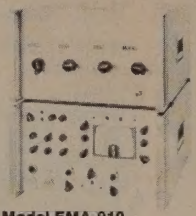
Low Frequency Noise & Field Intensity Meters from 14 kHz to 1 GHz . . . The Model NF-105A and its complete range of calibrated pick-up devices has set the industry standard for over a decade . . . other units make measurements as low as 20 Hz! . . . Meets all the requirements of the new TR1-Service Specs.

New Signal Generator . . . has a 5-place, fool-proof Nixie Frequency Readout, and covers range from 61 kHz to 1024 MHz in one small 5¼ inch high package. AM/FM/Pulse/Video Modulation pose no problem for the Model SG-1000. Other features like an automatically leveled output from +20 to —146 dBm and a counter for checking on external modulating rep-rates surely makes the SG-1000 the most versatile generator available.

Singer/Gertsch—EMC



Model ADC-1
Synchro/Resolver-
to-Digital Converter



Model EMA-910
Field Intensity Meter
1GHz to 26.5 GHz

Model FM-10
Heterodyne Frequency Meter
100 kHz to 500 MHz

The Model ADC-1 typifies the multitude of Synchro and Resolver Test Instrumentation available from Gertsch . . . This Synchro/Resolver to Digital converter features 250 millisecond nulling and readout time ■ 0.0005 degree resolution ■ 0.001 degree accuracy.

See our line of Phase Angle Voltmeters, featuring Broad Frequency Coverage, Unique Phase Lock System and more.

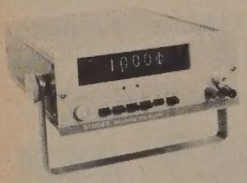
The Model EMA-910 Microwave Noise and Field Intensity Meter is the finest system available for all your MIL-STD-461 Series needs or as a state-of-the-art surveillance receiver. No other unit can boast Nixie readout of frequency and signal strength or "call-up" of any of 10 preselected frequencies.

Gertsch RatioTran AC Voltage Dividers are known the world over . . . All ranges and styles.

The FM-10 is the newest member in a family of 2-way mobile Communications Test Systems. Perform all your calibration and repair functions with this Frequency Meter/Synthesized Signal Generator with coverage from 100 kHz to 500 MHz.

Singer/Ballantine

Model 323
Broadband
True RMS Voltmeter



Model 3600
Digital Voltmeter

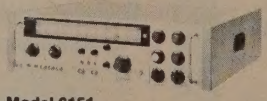
If you are making Broadband AC Voltage Measurements to 10 MHz you must be using a Ballantine . . . There are the famous Models 323 and 303, Broadband "True Rms" and Average Responding Units respectively.

New Model 3600 0.01% Accuracy DC Digital Voltmeter can be combined with Model 3571 AC Converter Module to form the most comprehensive voltage measuring system available . . . 10 MHz Frequency Coverage ■ Four digit Nixie Readout ■ Measurements from 10 mV to 300 VAC full scale . . . and there are BCD outputs for computer interfacing and programmability of all controls.

Find out why the Ballantine is a respected leader in the field of Voltage Standards and Calibrators . . . See the new 421B Voltage Calibrator in action.

Singer/Alfred Electronics

Model 8000/7051
Sweep Network
Analyzer System



Model 6151
Solid State
Sweep Oscillator

Sweepers are the by-line of Alfred Electronics. A full range of units from 10 MHz to 40 GHz . . . Purchase oscillator plug-ins to cover your frequency of interest now . . . expand your coverage at any time in the future.

Alfred Sweep Network Analyzer Systems are the economical way of combining all the functions of an SWR meter, slotted line, power meter, ratiometer, lin log converter, precision attenuator and oscilloscope into one convenient package. All measurements are made with computer accuracy over a 60 dB dynamic range with either direct dB or dBm readout.

Also remember Alfred's complete line of Microwave Amplifiers ■ Variable Attenuators ■ Sampler-Attenuators ■ PIN Modulators ■ Sawtooth Generators ■ Crystal Detectors

SINGER
INSTRUMENTATION

The Singer Company, Instrumentation Division, Bridgeport Operation / 915 Pembroke Street, Bridgeport, Connecticut / (203) 366-3201
The Singer Company, Instrumentation Division, Ballantine Operation / P.O. Box 97, Boonton, New Jersey 07005 / (201) 334-1432
The Singer Company, Instrumentation Division, Gertsch Operation / 3211 S. LaCienega Blvd., Los Angeles, Calif. 90016 / (213) 870-2761
The Singer Company, Instrumentation Division, EMC Operation / 3211 S. LaCienega Blvd., Los Angeles, Calif. 90016 / (213) 837-4405
The Singer Company, Instrumentation Division, Alfred Electronics Operation / 3176 Porter Drive, Palo Alto, Calif. 94304 / (415) 326-6496

STICHT INSTRUMENTS

TACHOMETERS

FOR EVERY NEED . . . EVERY SPEED

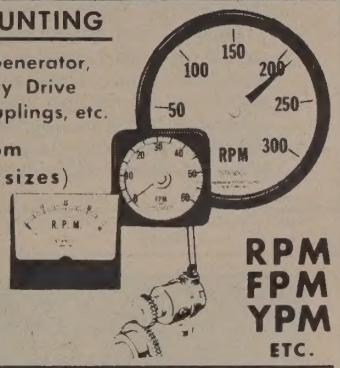
ELECTRICAL TACHOMETERS

OR PERMANENT MOUNTING

Furnished complete with Generator, Indicator and all necessary Drive Equipment such as gears, couplings, etc.

Indicator sizes from 3" to 18" (extra large sizes)

- Heavy duty design.
- Smooth, instant response to changes of speed.
- No Pointer Fluctuation.



RPM FPM YPM ETC.

Bulletins 720, 723

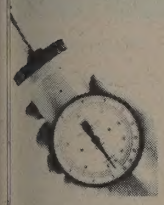
CENTRIFUGAL STATIONARY TACHOMETERS

For permanent mounting on machines and engines. Model "J", with 3", 4", 5½", 8" or 10" dial diameter. Flexible cable driven. Many standard ranges reading RPM, FPM, YPM, and other operations.

Bulletins 793, 794, 795, 796, 798

PORTABLE TACHOMETERS

CENTRIFUGAL HAND TACHOMETERS



With one, two, three, five or six ranges in one tachometer. All speeds up to 100,000 RPM with overspeed protection.

Type "UO"	Cat. No. 303	30-12,000 RPM	5 ranges
Type "UO"	Cat. No. 322	60-24,000 RPM	5 ranges
Type "UY"	Cat. No. 630	25-30,000 RPM	3 ranges
Type "UY"	Cat. No. 640	30-40,000 RPM	3 ranges
Type "UH"	Cat. No. 666	30-100,000 RPM	6 ranges

Bulletins 750, 751, 756, 765, 790

CHRONOMETRIC HAND TACHOMETERS

With built-in chronometric movement, timing period 3 or 6 seconds.

JAQUET

Guaranteed accuracy ½%.
Cat. 2302 0-2000 RPM
Cat. 2301 0-20,000 RPM
Cat. 2304 0-200 RPM

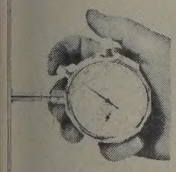
Bulletin 735

HASLER

Guaranteed accuracy ¼%
Cat. 4402 0-2000 RPM
Cat. 4401 0-20,000 RPM

Bulletin 745

VIBRATING REED TACHOMETERS



PORTABLE AND STATIONARY TYPES

Measure speed by touch.

Many different ranges from 600-30,000 RPM.

Bulletin 770

HIGH INTENSITY STROBOSCOPE

MODEL 510 AL

With Brilliant Daylight Flasher Unit for maximum readability.

Range 60-15,000 RPM

"Industry's Seeing Eye"

Bulletin 781

VIBRATING REED FREQUENCY METERS

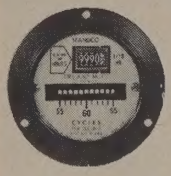
In 2½" and 3½" sealed or unsealed cases, meeting all MIL Specs. Rugged, dependable, accuracy ±0.5%, reeds aged. Standard voltage ranges: 100-150, 200-250, 400-450 volts.

Bulletin 806

REPRESENTATIVE RANGES

Cat. No.	Range CPS	No. of Reeds	Intervals Between Reeds
359	58-62	5	1
360	57-63	7	1
361	56-64	9	1
357	57.5-62.5	11	0.5
358	55-65	21	0.5
369	48-52 & 58-62	10	1
390	47-53 & 57-63	14	1
374	380-420	5	10
364	380-420	9	5
375	380-420	17	2.5
367	380-420	21	2
370	395-405	11	1

"STANDCO" COMBINATION FREQUENCY AND RUNNING TIME METERS



Bulletin 811

In 3½" flush mounting, round bakelite cases.

Cat. No.	Freq. Range	No. of Reeds	Time Range
TF-362	55-65 CPS	11 Reeds	9999.9 hrs.
TF-356	58-62 CPS	9 Reeds	9999.9 hrs.
TF-360	57-63 CPS	7 Reeds	9999.9 hrs.
TF-359	58-62 CPS	5 Reeds	9999.9 hrs.

"STANDCO" RUNNING TIME METERS

Bulletin 810

In 2½" and 3½" round, flush mounting, sealed or unsealed cases

3½"		2½"	
Type T-1	9999.9 hrs.	Type T-25	9999.9 hrs.
Type T-3	99,999 hrs.	Type T-30	99,999 hrs.
Type T-4	99,999 min.	Type T-35	99,999 min.
115V, 220V, 440V, 60 or 50 cycles		115V, 220V, 440V, 60 or 50 cycles	

"MEGOHMER" INSULATION TESTERS

DC GENERATOR (HAND CRANK) TYPES

"DWARF" MEGOHMER — 500 volts, D.C. Bulletin 421

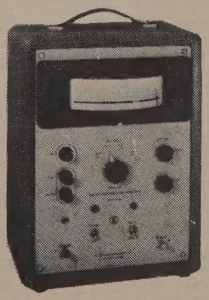
Cat. No.	Cat. No.
703 - 0-100 Megohms	705 - 0-100 Megohms
0-10,000 Ohms	0-500 Ohms

STANDARD MEGOHMER MARK II

Multi-Range — Multi-Test Potential

Cat. No.	Test Potential	Insulation Range
718	1000 volts	0-200 megohms
	500 volts	0-100 megohms
	250 volts	0-50 megohms
	100 volts	0-20 megohms
		Continuity Range
		0-100 ohms

Cat. No.	Test Potential	Insulation Range
719	1000 volts	0-2000 megohms
	500 volts	0-1000 megohms
	250 volts	0-500 megohms
		Discharge
		Continuity Range
Bulletin 435		0-20,000 ohms



HIGH RESISTANCE MEGOHMMETER

MODEL 29-U

20,000,000 MEGOHMS

Direct Reading: Unusual stability, fast in operation, high accuracy.

11 Ranges: From 300,000 ohms to 20 million megohms.

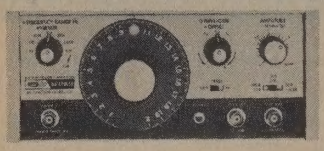
Power Supply: 115 volts AC, 60 cycles.

Test Potentials: 100 volts DC and 500 volts DC. Also: 0.5 volts to 1000 volts by external supply.

Bulletin 1029U

HERMAN H. STICHT CO., INC. 27 PARK PLACE, NEW YORK, N.Y. 10007

DATAPULSE Waveform Function Generators



Datapulse 401 Function Generator.

The Model 401 provides small size, wide frequency range and clean waveforms at a low price. The 1% of setting dial and .25% total harmonic sine distortion make it the best buy in general purpose oscillators, or waveform sources.

Datapulse 410 Sweep/Function Generator.

Dual 40 volt output amplifiers and a multiplicity of operating modes make the Model 410 Sweep/Function Generator the most versatile waveform source available. The built in sweep generator and four quadrant multiplier (for amplitude modulation and programming) further expand the Model 410's capability.

SPECIFICATIONS	401	410
WAVEFORMS:	Sine, Squarewave and Triangle	Sine, Squarewave, Triangle, Pulse, Sine Squared and Sawtooth
FREQUENCY:		
Range	0.02Hz to 2MHz in 7 ranges	0.0002 Hz to 2 MHz in 9 ranges
Accuracy	<±1% of reading, 2 Hz to 200 kHz	<±1% of reading, 2 Hz to 200 kHz
	<±2% of reading, 0.2 Hz to 2 MHz	<±2% of reading, 0.002 Hz to 2 MHz
Vernier	Approximately 1% of full scale (2 minor dial divisions)	Approximately 1% of full scale (2 minor dial divisions)
Time Symmetry	>99.5% to 200 kHz	>99.5%, 2 Hz to 200 kHz
	>98% to 2 MHz	>99%, 0.002 Hz to 2 Hz
		>98%, 200 kHz to 2 MHz
Stability	<±0.05% for 1 hour	<±0.05% for 1 hour
	<±0.5% for 1 month	<±0.5% for 1 month
OUTPUT:		
Amplitude	>20 volts, peak to peak, max., open circuit	>40 volts, peak to peak, max., open circuit
Power	>500 mW, max., into 50 ohms (Square wave)	>2 W, max., into 50 ohms (Square wave)
Amplitude Range	80 dB (1 mV, p-p to 10 V, p-p into 50 ohms)	80 dB (2 mV, p-p to 20 V, p-p into 50 ohms)
Impedance	50 or 600 ohms, front panel selectable	50 or 600 ohms, front panel selectable
Sine Distortion	<0.25%, 2 Hz to 20 kHz	<0.25%, 2 Hz to 20 kHz
	<0.5%, 0.2 Hz to 200 kHz	<0.5%, 0.002 Hz to 200 kHz
	<3%, 200 kHz to 2 MHz	<3%, 200 kHz to 2 MHz
Squarewave Rise/Fall Time	<40 nsec	<50 nsec
Squarewave Abberations	<±5%	<±5%
Sine Frequency Response	<±1% to 200 kHz	<±1% to 200 kHz
	<±3% to 2 MHz	<±3% to 2 MHz
DC Offset	±10 volts, open circuit	±20 volts, open circuit
	±5 volts, terminated	±10 volts, terminated
	(Combination of output amplitude and offset not to exceed ±10 volts open circuit or ±5 volts terminated.)	(Combination of output amplitude and offset not to exceed ±20 volts open circuit or ±10 volts terminated.)
Stability	<±0.1% for 1 hour	<±0.1% for 1 hour
MODULATION:		
Frequency	DC coupled, approximately 25 mV for 1 minor dial division (4.5 volts for 0.2 to 2 deviation)	DC coupled, approximately 25 mV for 1 minor dial division (4.5 volts for 0.2 to 2 deviation)
Range	>1,000:1	>1,000:1
Amplitude	Not Applicable	DC coupled, 5 volt input for 40 volt p-p, max., at either output amplifier, waveform selectable
MODES OF OPERATION:	Not Applicable	Normal, Triggered, Gated, Sweep and Tone Burst
SWEEP GENERATOR:	Not Applicable	
Duration		10 μsec to 100 sec in 6 ranges
Width		0 to 100% of main generator frequency dial in 3 ranges
Sweep Ratio		1,000:1
Output		5 volts, p-p, fixed amplitude with 50 ohm output impedance
Modes of Operation		Normal — free running sawtooth Triggered — One cycle of output for each positive transition of trigger input Internal Trigger/Gate — Sweep is connected to main generator trigger input
PRICE: (fob, Culver City, Calif.)	Model 401 ..... $395.00 Model 401 (Socket) $445.00	Model 410 ..... $ 995.00 Model 410 (Socket) ..... $$1,070.00

Notes:

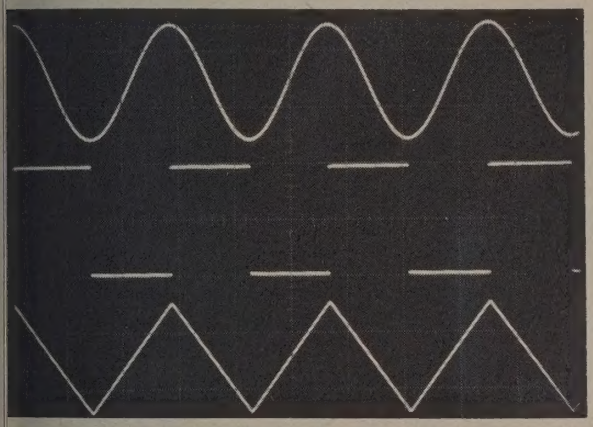
1. In models designated (Socket), all integrated circuits are mounted in IC sockets for ease of maintenance. In all others integrated circuits are soldered to the circuit boards.
2. Unless otherwise noted, all specifications apply from 0.2 to 2 on the frequency dial.

SYSTRON DONNER CORPORATION

DATAPULSE DIVISION
10150 W. Jefferson Blvd., Culver City, California 90230.
Phone 213-836-6100 or TWX 910-340-6766.

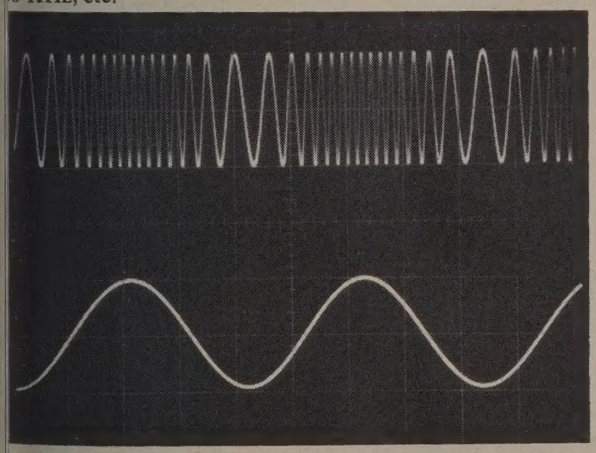
ATAPULSE Waveform Function Generators

Datapulse Function Generators are general purpose aveform sources which provide basic sine, square and riangle waves for use in every application where fre-uency coherence and waveform clarity are of utmost nportance. They find wide acceptance as signal sources or the design and testing of logic modules and counters, perational and audio amplifiers, filters, spectrum analyz-rs, digital voltmeters, comparators, A/D converters, chart ecorders and a wide range of similar devices. They also rove to be invaluable for frequency response measure-ents, oscilloscope calibration, music and voice simula-on, computer and computer peripheral design and many ther related applications. Precise calibration and stability f operation combined with high quality construction make atapulse function generators the ultimate instrument for e design and testing of nearly every type of electronic ircuit.



ine, Square and Triangle Waveforms.

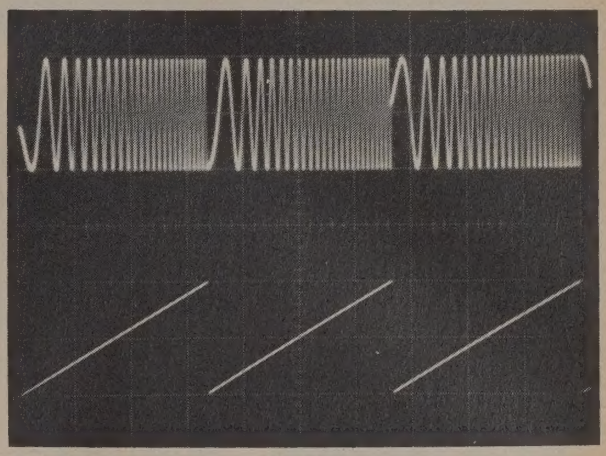
The Datapulse Model 401 Function Generator is an conomical source of sine, square and triangle waveforms n the frequency range of 0.02 Hz to 2 MHz. Further, it as DC coupled, broadband frequency modulation capa-ilities. A five volt ramp applied to the FM input pro-uces a frequency sweep ratio of 1000:1, i.e. 20 Hz to 0 KHz, etc.



10 kHz Sinewave, Frequency Modulated by a 1 kHz Sinewave.

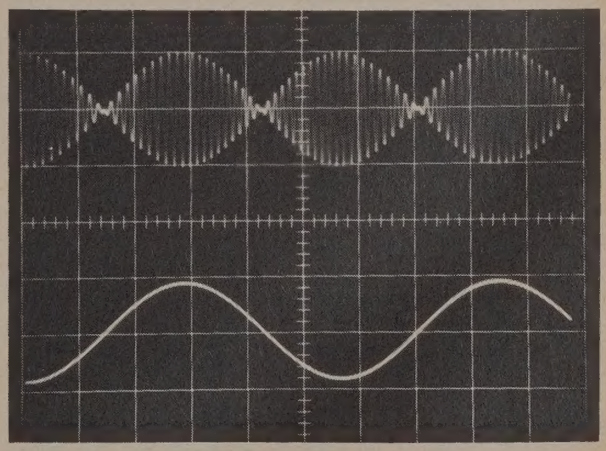
Output amplitude of the Model 401 is 20 volts, peak-to-peak, with a full 80 db range of amplitude variation. The outputs are available from a selectable source impedance of either 50 or 600 ohms. Rise time of the squarewave output is less than 40 nanoseconds. Also available, for reference purposes, is a calibrated 1 volt, peak-to-peak squarewave.

The Datapulse Model 410 Sweep/Function Generator represents the epitome of waveform generation versatility. Incorporating advanced solid state, integrated circuit technology, the Model 410 offers capabilities previously unavailable in any waveform generating instrument. The waveform photograph below illustrates the swept sine wave capability of the Model 410.



Swept Sinewave.

The Model 410 features all of the salient characteristics of the Model 401 with an extended frequency range of from 0.0002 Hz to 2 MHz. Additionally it features wide sweep range, externally triggered operation of both main generator and sweep, a fully integrated internal sweep ratio of 1000:1, amplitude modulation with true four quadrant multiplication, two 40 volt, peak-to-peak, output amplifiers with independent waveform selection, DC offset adjustment and wide range amplitude control allowing a balanced output of 80 volts, peak-to-peak.



Supressed Carrier Amplitude Modulation.

Datapulse Function Generators produce extremely accurate, clean waveforms at exceptionally economical prices. Further, they feature the use of highest quality electrical and mechanical components throughout. Their mechanical design offers wide open, easy to service construction. The circuit boards are of the highest quality with all plated through holes for through board connections. All of these features, plus a design which requires a minimum number of field settable calibration adjustments, make Datapulse Function Generators the best waveform source value on the market today.

SYSTRON DONNER CORPORATION

DATAPULSE DIVISION
10150 W. Jefferson Blvd., Culver City, California 90230.
Phone 213-836-6100 or TWX 910-340-6766.

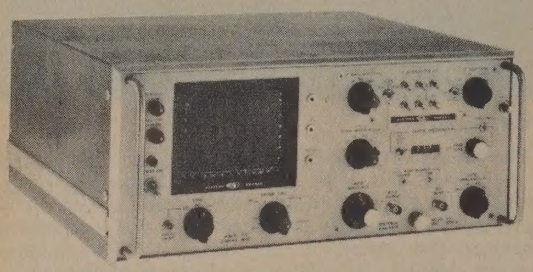
CALIBRATED SPECTRUM ANALYZERS

SYSTRON-DONNER SPECTRUM ANALYZERS

The Systron-Donner Spectrum Analyzer line consists of a series of instruments offering calibrated spectrum analysis over a frequency range from 10 Hz to 40 GHz. These instruments are especially designed to cover applications in the fields of audio, vibration, intermediate and high frequencies, RFI/EMI, broadcast and single-sideband, and through the microwave region.

One of the important features of these instruments is the portable nature of their design which permits them to be internally battery operated for extended periods of time (>8 hrs.). Instruments of this type generally find extensive use in the field, for RFI, ECM, antenna pattern measurements and similar applications; battery operation and light weight of the Systron-Donner instruments make them ideal for such on-site system testing.

All units in the line offer reliable solid state design, high sensitivity, wide dynamic range, and fully calibrated display.



MODEL 710/800 (10Hz–50kHz)
Lin/Log Scan & Tracking Oscillator Output

Model 710/800, 801 Plug-In Series Calibrated Spectrum Analyzers

This series presently consists of the Model 710 Display Unit, designed to accept Systron-Donner Plug-in Spectrum Analyzer modules, and two plug-ins (Models 800 & 801) which allow measurements in the frequency domain from 10 Hz to 50 kHz.

The 710/800, 801 Spectrum Analyzers permit absolute measurements over a 140 dB dynamic range, any 60 dB of which is presented on the built-in 7 x 10 cm high contrast CRT. Wave analysis, distortion studies, and spectral display are enhanced by a full 50 kHz scan and a narrow 10 Hz resolution. High sensitivity (calibrated to 30 nV/cm) plus selectable input impedances of 50 ohms, 600 ohms, 10k ohm and 1 megohm simplify measurements of EMI and other low level signals. Scan width is adjustable from 10 Hz/cm to 50 kHz on a linear display. X-Y outputs, pen lift, sync and sweep inputs and many other features are standard on these fully calibrated, truly portable instruments.

The Model 710/801 Spectrum Analyzer has all the features of the Model 710/800 plus logarithmic scan and a tracking oscillator output.

Model 710/800A RFI/EMI Spectrum Analyzer

The Model 710/800A utilizes the Model 710 Display Unit with Plug-in Model 800A, designed to permit calibrated RFI/EMI measurements in accordance with MIL-STD-826A. This instrument has a 20kHz bandwidth setting making it useful for audio sound level measurements and other applications.

Model 710/805 Video Spectrum Analyzer

Model 710/805 utilizes the Model 710 Display Unit with Plug-in Model 805, designed for calibrated spectrum analysis measurement from 200 Hz to 1.6 MHz. In addition to the features of the Model 710 Display Unit, this broadband instrument includes the following specifications: linear frequency sweep; selectable scanwidths to 1.6 MHz maximum; I.F. bandwidths of 100 Hz, 300 Hz, 1 kHz and 3 kHz; 30 nanovolt sensitivity.

Model 710/805 is useful for broadcast transmitter checkout, telemetry, video signal monitoring, analysis of tape and playback systems, and general broadband signal analysis in the range of 200 Hz to 1.6 MHz.

Model 720 HF/SSB Spectrum Analyzer

Model 720 is a calibrated Spectrum Analyzer system covering a frequency range of 10 Hz to 56 MHz. This instrument consists of the Model 806 Frequency Extender combined with one of the following basic instruments: 710/800; 710/801; 710/800A, or 710/805. The Model 806 Frequency Extender is a separate R.F. Converter deriving its power from the Model 710 Display Unit. Tuning is manual with the frequency read directly from a slide-rule dial and the scanwidth determined by the model of the plug-in used with the Model 710 Display Unit.

The Model 806 has an extremely stable oscillator and high sensitivity (<60 nanovolts), making this system valuable for monitoring and analysis of H.F. communication systems, especially single-sideband applications.

Model 751 Microwave Spectrum Analyzer

The Model 751 covers the frequency range of 10 MHz to 6500 MHz. This unit combines complete portability for field use with the precision measurement capabilities of larger laboratory spectrum analyzers.

Sensitivity as low as −110 dBm, 500 MHz scan width, 60 dB "on screen" dynamic range, and 1% frequency accuracy are featured. Low power dissipation (20 W) and light weight make the Model 751 ideal for field use for such applications as spectrum surveillance, antenna pattern measurement, RFI, and field strength measurements, and CATV monitoring.

MODEL 761
(10MH –40GHz)
1 kHz Resolution

Model 761 Broadband Spectrum Analyzer

Model 761 is a broadband calibrated spectrum analyzer covering a frequency range of 10 MHz to 40 GHz. This instrument uses the Model 855 Frequency Extender in combination with the Model 751 Microwave Spectrum Analyzer. Model 855 is a separate R.F. Converter deriving its power from the Model 751. Tuning is manual with frequency read directly from a slide-rule dial and the scanwidth determined by the setting of the 751 unit, to a maximum of 500 MHz.

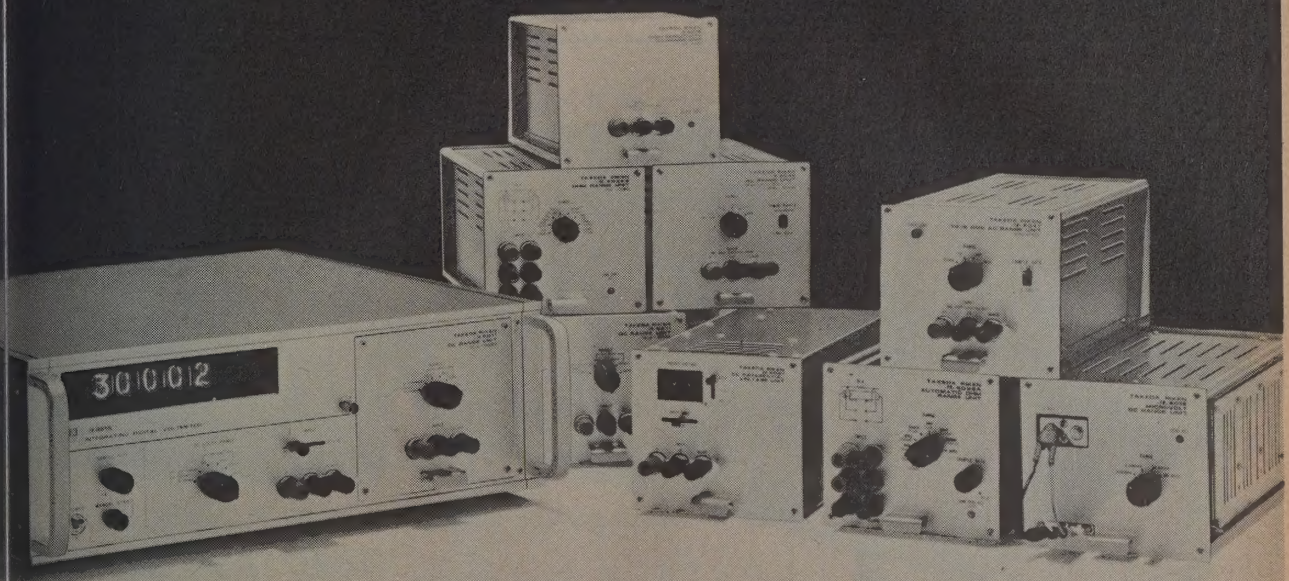
With its wide scanwidth and broad frequency coverage coupled with the ease of operation and portability of the basic Model 751, the Model 761 combination is a very useful instrument for monitoring and analysis of HF and microwave sources in communication, radar, telemetry, and guidance applications.

SYSTRON DONNER CORPORATION

MICROWAVE DIVISION
14844 OXNARD ST., VAN NUYS, CALIFORNIA 91409
213-786-1760, 873-1100 TWX: 910-495-1786

Takeda Riken

Capability: 8 Different Measurements!



-TR-6515 Integrating Digital Voltmeter

-TR-6515 Integrating Digital Voltmeter has a basic measurement range from 300mV full scale in 5 ranges. It features AUTOMATIC RANGE SELECTION, a system in which the optimum range in respect to input voltage is selected automatically.
A guaranteed absolute accuracy of 0.01% of rdg. 1 digit is attained over a period of 3 months.

Plug-ins for **-TR-6515**
-TR-6018 Micro Volt DC Range Unit
-TR-6018 resolves signals as weak as 10 nanoV for five-digit display.

Range: 300 μV, 3mV, 30mV, 300mV f.s. in 4 ranges
Max. Resolution: 10nanoV on 300 μV range
Max. Sensitivity: 0.03 μV.
Accuracy: 0.02% 2 digits (300 μV range)

-TR-6061 DC Differential Unit
-TR-6061 is designed to measure deviations from preset voltage with high accuracy and high resolution.

Range: 300mV to 102V Max. Resolution: 1ppm.
Input Impedance: 100 MΩ (0 to 102V input, deviation ±3V), 10 M
Accuracy: 0.009% of rdg. (25°C ± 5°C, Humidity 70%)
Total Effective Noise Rejection: 160 dB.

-TR-6047 TRUE RMS AC Range Unit
-TR-6047 is capabile of measuring true rms AC voltage: sine, triangular, rectangular, pulse, and other sophisticated waveforms

Range: ±500mV, ±5V, ±500Vrms f.s. in 4 ranges
Max. Sensitivity: 100 μVrms (500mV range)
Input Impedance: 1MΩ less than 27 pF.
Accuracy: 0.12% of rdg. 0.04% of f.s.
(Frequency: 45Hz to 5kHz, 25°C ±5°C, Humidity 70%)
Frequency: 30Hz to 20 kHz

-TR-6026A Automatic Range Unit

Range: 30, 300Ω 3, 30, 300kΩ , 3, 30, 200MΩ (8 ranges)
Range Selection: Automatic or Manual
Measurement Method: 4 terminals.
Accuracy: 0.025% of rdg. 0.008% of f.s. (30Ω range)

Takeda Riken Industry Co., Ltd.

1-32-1, Asahi-cho, Nerima-ku, Tokyo 176, Japan
Tel: Tokyo 930-4111 Cables: TRITRONICS TOKYO

Agents:
Litton Precision Products International Inc. Germany, France, Holland, Belgium, Luxemburg, England, Switzerland.

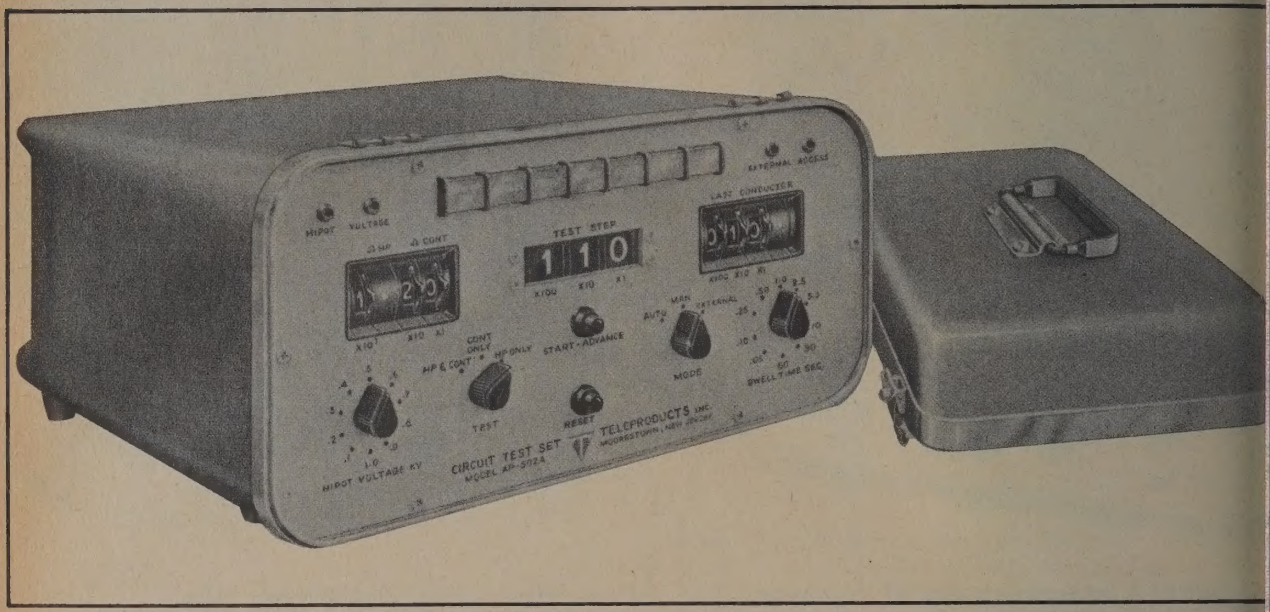
Ing. S & Dr. Guido Belotti Ltd. ..... Italy
K. Juul Hansen ..... Denmark
E. Nores ..... Finland
Carl-Eric Larsson ..... Sweden

Universal Counter, Digital Voltmeter, Digital Integrator, Electrometer, Frequency Counter, Frequency Synthesizer, Frequency Standard, Data Acquisition System, Operational Amplifier.

AUTOMATIC CIRCUIT TEST SET

model AP-502

A FULLY AUTOMATIC PORTABLE TEST SET FOR RAPID AND ECONOMICAL CHECKOUT OF CABLES, CONNECTORS, AND HARNESSES.



SPECIFICATIONS

TEST SPEED
1200 Tests per minute

TEST CAPACITY
Continuity . . . . . 110 circuits
HiPot/Insulation Resistance . . . . . 220 points

TEST RANGES
Continuity . . . . . Resistance Limit adjustable from 1 to 99 ohms in 1 ohm steps.
Insulation Resistance . . Adjustable in steps: 1;10;20;30; 40; 50; 60; 70; 80; 90 megohms.
HiPot . . . . . Voltage adjustable from 100V to 1000V DC in steps of 100 V.

DWELL TIME
Adjustable in steps . . . . 50 ms; 100 ms; 250 ms; 500 ms; 1 sec; 2.5 sec; 5 sec; 10 sec; 30 sec; 1 min.

INPUT POWER
110 to 125V, 50–60 cps (or optional internal battery.)

BATTERY (OPTIONAL)
A rechargeable 4 ampere hour nickel cadmium battery lbs) provides sufficient capacity for 3 hours of continuc testing at 70°F.

TRANSIT CASE
The AP-502 is housed in a rugged, weather-proof, Kyc +100 carrying case with handle and removable top.

PHYSICAL DETAILS
Width . . . . 18 inches Height . . . . 9½ incl
Depth . . . . 16 inches Weight . . . . 40 pour

INPUT CONNECTORS
2 Elco 8016 series, 120 pin. (mating connectors with sol type terminals supplied)

ACCURACY
Continuity Resistance . . . . . ± 0.5 ohms or ± 1 whichever is great
Insulation Resistance . . . . . ± 1(
HiPot Voltage . . . . . – 1(

TELESCIENCES INC.
351 NEW ALBANY RD. MOORESTOWN, NEW JERSEY 08057 TEL. 609-235-6227

OMNITESTER™ model 1000

AN AUTOMATIC TESTER FOR PRODUCTION CHECKOUT AND MAINTENANCE OF ELECTRONIC EQUIPMENT.

STANDARD FEATURES

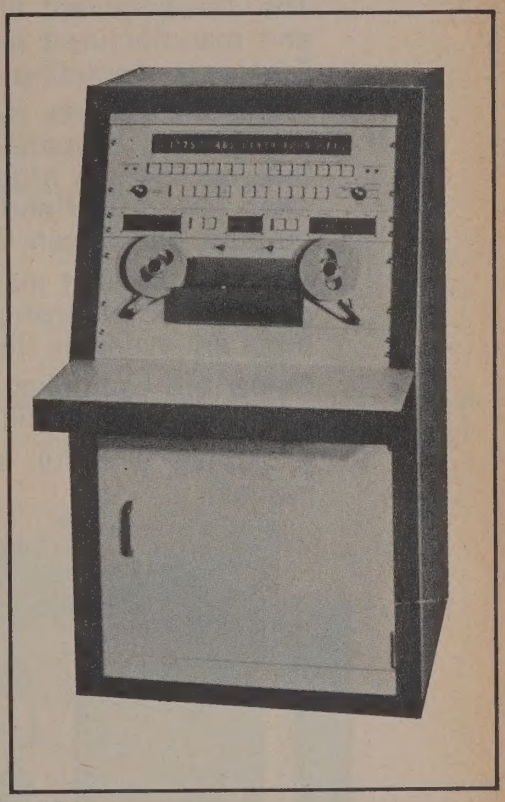
SELF PROGRAMMING
Automatically generates own test tape from known good sample
REJECT CRITERIA
Programmable to reject high, low, or with double limits
NBS 943 or ASCII Codes
NARRATIVE PRINTOUT
Provides English Language Printout of operator instructions for trouble shooting and repair
ERROR SEARCH
Automatically locates wiring errors
TAPE SEARCH
Provides ready access to any specific test
LONG OR SHORT PRINTOUT
At operator's option entire test including test parameters can be printed out (long) or just addresses and test results (short)
AUTOMATIC TAPE REWIND
DIAGNOSTIC TEST TAPE
Permits precise fault location in case of OmniTester failure
CALIBRATION TEST KIT
For verifying and calibrating measurement circuits
TEST SPEED
Greater than 1500 tests per minute
SMALL SIZE
Basic console 51"H x 28¾"W x 26½"D. This unit includes control and display capability for up to 100,000 access points and switching modules for 2000 points
Human engineered for simplicity of programming, operation, and maintenance

OPTIONAL FEATURES

Automatic dynamic testing by application of externally applied stimuli and verification of results
Computer Interface Capability
Four-wire Continuity Resistance Testing
Multiplex mode for simultaneous loading and testing using same test tape
Diode shunt path masking for in-circuit measurement of resistors

SPECIFICATIONS

CONTINUITY RESISTANCE TESTS
(Voltage at 5.2v and 28v)
Two-Wire Operation
Resistance Ranges:
1 ohm to 999 ohms in 1 ohm steps
10 ohms to 9.99K ohms in 10 ohm steps
100 to 99.9K ohms in 100 ohm steps
1K ohms to 999K ohms in 1K ohm steps
10K ohms to 9.99 megohms in 10K ohm steps
Accuracy: ±½ ohm or ±5%
Test Current:
Programmable through test terminals at 10ma; 20ma; 50 ma; 100ma; 500ma; 1a; 1.5a; 2a.
Four-Wire Operation
Resistance Ranges:
.010 ohm to 0.999 ohm in .001 ohm steps
.010 to 9.99 ohm in .01 ohm steps
0.1 ohms to 99.9 ohm in .01 ohm steps
Accuracy: ±3 milliohms or ±5%
Test Current:
Programmable through test terminals at 1A; 1.5A; 2A
INSULATION RESISTANCE TEST
Resistance Ranges:
10K ohm to 9.99 megohms in 10K ohm steps
100K ohm to 99.9 megohms in 100K ohm steps
1 megohm to 999 megohm steps
Accuracy: Up to 100 megohms, ± 1K ohm or ±5% above 100 megohms, ±10%
Test Voltage:
Programmable at 28v; 100v DC to 500v DC



DIODE TEST
Voltage:
1.8v DC; 5.2v DC; 14v DC; 28v DC
Short Circuit Current:
1ma; 2ma; 20ma
DIELECTRIC STRENGTH (HIPOT TESTS)
Voltage:
DC, 28v, 100 to 500v in 100v steps
AC, 100v to 500v RMS
Breakdown Current:
Test limit manually variable from 0.1ma to 2.5ma ±10%.
Protective circuit limits current after breakdown to 10ma
AUTOMATIC VOLTAGE READING (go/no go)
Range:
0.1v to 9.99v DC or AC in .01v steps
0.1v to 99.9v DC or AC in 0.1v steps
1.0v to 500v DC or AC in 1v steps
Accuracy: ± 5%
AUTOMATIC CURRENT READING (go/no go)
Range:
1 ma to 1 A
Accuracy: ± 5%
DWELL TIME
Range:
0.1 sec to 1 sec on 0.1 sec steps
1 sec to 10 sec in 1 sec steps
10 sec to 90 sec in 10 sec steps
Accuracy: ± 20 millisec or ± 10%
DOUBLE LIMIT DETECTION
Values:
± 2%; ± 5%; ± 10%; ± 20%; ± 30%
IMPEDANCE TEST
Range:
10 ohms to 9.99K ohms in 10 ohm steps
Accuracy: ± 10%
Current: Limited to 10ma
Voltage: Limited to 2v
Frequency: Choice of 160 Hz or 1600 Hz or other value may be specified. More than one frequency available as option.

TELESCIENCES INC.
351 NEW ALBANY RD. MOORESTOWN, NEW JERSEY 08057 TEL. 609-235-6227

Telequipment Oscilloscopes

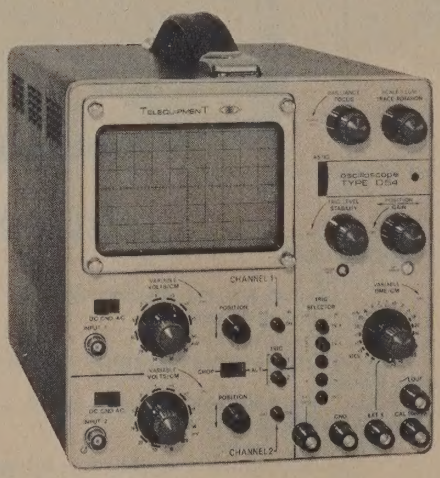
The Telequipment line of low-cost oscilloscopes is designed and manufactured in England, sold and serviced through the Tektronix marketing organization.

These instruments meet the requirements for waveform measurements in education, service, and industry. The performance features include triggered sweep, 1-2-5 sequence step attenuators for vertical and horizontal deflection controls, calibration outputs, and 5-inch CRT's.

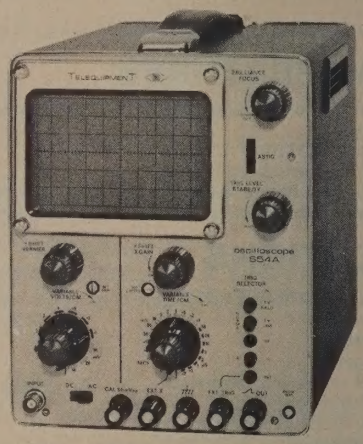
All Telequipment instruments are warranted against defective parts or workmanship for one year. Service and replacement parts are available through 57 Tektronix field offices.

Below are examples of the Telequipment products, which also include plug-in oscilloscopes and bandwidth to 25 MHz.

A catalog with full specifications and prices is available on request.



DUAL TRACE
TYPE D54—$550



SINGLE TRACE
TYPE S54A—$435

- 10 mV/cm DEFLECTION FACTOR and 10 MHz BANDWIDTH permit viewing of low level high frequency signals with good vertical resolution.
- FET INPUTS minimize vertical trace drift.
- TRIGGERED SWEEP, including TV field or line, so that signals remain stationary with changes in sweep speed.
- 22 CALIBRATED SWEEP SPEEDS from 0.2 μs/cm to 2 s/cm permit analysis of a wide range of frequencies.
- 4-kV CRT HIGH VOLTAGE which means that the trace is bright.
- VOLTAGE CALIBRATOR for verification of the vertical gain.
- SOLID STATE DESIGN for reliability.

For information, contact your Tektronix field office or write: Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97005.

TELEQUIPMENT ®

A SUBSIDIARY OF TEKTRONIX, INC.

Test digital IC's

In Circuit

estex 410 IC Analyzer is the in-circuit analyzer. Without moving the high impedance probe, the 0 isolates and identifies the problem to a specific pin. It detects **level errors, logic errors, low Vcc level** and displays **signal presence** at each pin. Relatively unskilled personnel can use Testex 410 with effectiveness.

Testex 410 IC Analyzer

Device Test Capability

The 410 tests RTL, DTL and/or TTL digital tegrated circuits of the dual-in-line or flat-pack type. Each device is tested against a plug-in program board. No other operator decisions are required. The entire test procedure is quick, mple and easily taught to non-technical personnel. Boards for commonly used devices are available, and a universal blank is supplied which can be programmed for all analyzer functions.

& Out of Circuit

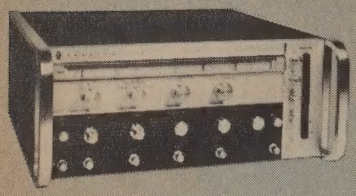
Testex 420 Circuit Board Exerciser enables the Testex 410 to analyze devices on circuit boards that are not 'in-circuit'. It generates a grey code square wave to exercise the board. It is available in a minimum of 12 stages (outputs) and can be supplied in 16, 20 or 24 stages.

Testex 420 Circuit Board Exerciser

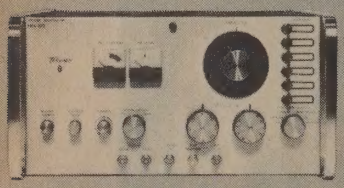
TESTEX
INCORPORATED
162 San Lazaro Avenue
Sunnyvale, California 94086
(408) 732-0461

Texscan SWEEP SIGNAL GENERATORS

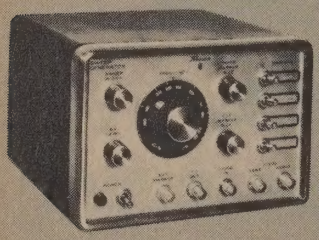
VS SERIES



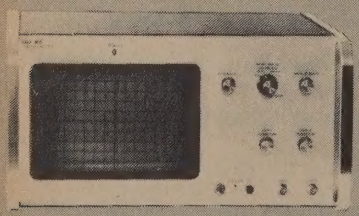
RS SERIES



HS SERIES



LS SERIES



DU SERIES

Texscan manufactures solid state sweep/signal generators which cover the frequency rang of 500 Hz to 2300 MHz. Texscan's product line consists of five different types c instruments, each type being a complete line of instruments. Depending on the customer application, he may require all the versatility that the RS series provides or he may b able to perform the required test with the lower VS series generator.

The VS instruments are designed so that warm up drift is negligible and componer life is almost unlimited. Each unit has extended sweep rate capability including lin variable, manual and external.

The HS series are high power, wide tuning range units which provide more than 4 watts c leveled output over the frequency range of 20 MHz to 1000 MHz and offer a choice c four modes of operation: swept RF, modulated swept RF, CW and modulated CW

MODEL NO.	FREQUENCY RANGE	SWEEP WIDTH	SWEEP RATE RANGE	LINEARTY	RF OUTPUT	PRICE
VS-20	500 Hz to 25 MHz	500 Hz-25 MHz	.1 Hz to 60 Hz	1%	1v	$1095
VS-30	100 KHz to 100 MHz	100 KHz-100 MHz	5 Hz to 60 Hz	1%	1v	$ 895
VS-40	1 MHz to 300 MHz	200 KHz-300 MHz	5 Hz to 60 Hz	1%	.5v	$ 925
VS-50	2 MHz to 500 MHz	500 KHz-500 MHz	5 Hz to 60 Hz	1%	1v	$1250
VS-70	290 MHz to 1200 MHz	to 40%	5 Hz to 60 Hz	5%	.5v	$1095
VS-80	1 MHz to 1200 MHz	50 KHz to 40%	5 Hz to 60 Hz	5%	.5v	$1550
VS-90	5 MHz to 2350 MHz	10 KHz-800 MHz	.1 Hz to 60 Hz	2%	.75v	$2495
RS-50	3 MHz to 500 MHz	500 KHz to 500 MHz	.01 Hz to 100 Hz	1%	1v	$2500
RS-70	500 MHz to 1000 MHz	50 KHz to 500 MHz	.01 Hz to 100 Hz	1%	.5v	$2500
RS-120	1000 MHz to 2000 MHz	100 KHz to 1000 MHz	.01 Hz to 100 Hz	1%	.5v	$2500
HS-70	20 MHz to 100 MHz	15%	50/60 Hz	2%	4w	$2500
HS-75	100 MHz to 250 MHz	15%	50/60 Hz	2%	4w	$2500
HS-80	200 MHz to 425 MHz	15%	50/60 Hz	2%	4w	$2500
HS-85	400 MHz to 1000 MHz	15%	50/60 Hz	2%	4w	$2500
HS-86	500 MHz to 1000 MHz	15%	50/60 Hz	2%	8w	$3200
LS-76	460 MHz to 920 MHz	.1 MHz to 45 MHz	50/60 Hz	10%	.5v	$ 575
LS-40	1 MHz to 250 MHz	.5 to 250 MHz	50/60 Hz	3%	.75v	$ 655
LS-45	250 MHz to 500 MHz	.5 to 250 MHz	50/60 Hz	3%	.5v	$ 575
LS-70	500 MHz to 1000 MHz	.5 to 500 MHz	50/60 Hz	3%	.5v	$ 575
TP-10.7	10.4 MHz to 11 MHz	600 KHz	50/60 Hz	3%	1v	$ 475

Solid State Oscilloscopes

Model	Screen Size	Vertical Amp Band with/ Sensitivity	No. of Y inputs	Price
DU-88M	5" x 7"	DC-15KHZ/1MV/DIV-1V/DIV	1	$ 695.0
DU-89M	5" x 7"	DC-15KHZ/5MV/DIV-5V/DIV	1	$ 695.0

Reflection Coefficient Bridges

	RCB-3	RCB-3/75	RCB-4
FERQUENCY RANGE	0.5 MHz to 1 GHz	0.5 MHz to 1 GHz	0.5 MHz to 2.5 GHz
IMPEDANCE	50 ohms	75 ohms	50 ohms
PRICE	$75.00	$150.00	$150.00

Detectors

	CD-50	CD-51	CD-75
FREQUENCY RANGE:	100 kHz to 1000 MHz	5 MHz to 4000 MHz	100 kHz to 1000 MH
INPUT IMPEDANCE:	50 ohms	50 ohms	75 ohms
PRICE:	$30.00	$75.00	$30.00

Texscan

Texscan Corporation
2446 North Shadeland Avenue
Indianapolis, Indiana 46219
Phone: 317-357-8781
TWX: 810-341-3184
Cable Address: TEXSCAN

Texscan RF TEST EQUIPMENT

Texscan Corporation Component Division manufactures a broad line of coaxial components. These components include devices for both O.E.M. and laboratory use. index below contains Texscan's standard components and will be useful for mining availability of a particular component.

modifications of Texscan's standard products have been produced for special cations and inquiries for specials are cordially invited.

ary Attenuators

del	Attenuation Range	Steps	Frequency Range	Impedance	Control	Size	Price
53	0 to 1db	0.1db	DC to 500 MHz	50 ohm	Manual	1⅞" x 2¼"	$ 85.00
73	0 to 1db	0.1db	DC to 500 MHz	75 ohm	Manual	1⅞" x 2¼"	$ 85.00
53	0 to 1db	0.1db	DC to 1000 MHz	50 ohm	Manual	1¾" x 1¾"	$135.00
50	0 to 10db	1db	DC to 2000 MHz	50 ohm	Manual	1⅞" x 2¼"	$ 85.00
70	0 to 10db		DC to 1000 MHz	75 ohm	Manual	1⅞" x 2¼"	$ 85.00
-50	0 to 10db	1db	DC to 3000 MHz	50 ohm	Manual	1¾" x 1¾"	$125.00
60	0 to 10db	1db	DC to 4000 MHz	50 ohm	Manual Manual Dual	2¾" x 2¼"	$275.00
534	0 to 11db	0.1db	DC to 500 MHz	50 ohm	Concentric Manual Dual	1⅞" x 3¾"	$165.00
734	0 to 11db	0.1db	DC to 500 MHz	75 ohm	Concentric Manual	1⅞" x 3¾"	$165.00
0	0 to 11db	0.1db	DC to 500 MHz	50 ohm	Bench Mount	2" x 4" x 6"	$235.00
-61	0 to 50db	10db	DC to 4000 MHz	50 ohm	Manual Manual Dual	1⅞" x 3"	$275.00
-54	0 to 50db	1db	DC to 1500 MHz	50 ohm	Concentric Manual Dual	1⅞" x 3¾"	$165.00
-74	0 to 50db	1db	DC to 1000 MHz	75 ohm	Concentric	1⅞" x 3¾"	$165.00
-51	0 to 60db	10db	DC to 3000 MHz	50 ohm	Manual	1¾" x 2¾"	$125.00
-51	0 to 70db	10db	DC to 2000 MHz	50 ohm	Manual	1⅞" x 2¼"	$ 85.00
-71	0 to 70db	10db	DC to 1000 MHz	75 ohm	Manual Manual	1⅞" x 2¼"	$ 85.00
70	0 to 80db	1db	DC to 1500 DC	50 ohm	Bench Mount	2" x 4" x 6"	$225.00
100	0 to 100db	10db	DC to 1000 MHz	50 ohm	Manual Manual Dual	1⅞" x 3"	$130.00
104	0 to 110db	1db	DC to 1000 MHz	50 ohm	Concentric Manual	1⅞" x 4¾"	$230.00
50	0 to 110db	1db	DC to 1000 MHz	50 ohm	Bench Mount	2" x 4" x 6"	$275.00
-53	0 to 1db	0.1db	DC to 500 MHz	50 ohm	Manual	1½" x 2"	$ 65.00
-50	0 to 10db	1db	DC to 500 MHz	50 ohm	Manual	1½" x 2"	$ 60.00
-51	0 to 70db	10db	DC to 500 MHz	50 ohm	Manual Manual Dual	1½" x 2"	$ 67.50
-54	0 to 80db	1db	DC to 500 MHz	50 ohm	Concentric	1½" x 3"	$120.00

tch Attenuators

	SA-50	SA-58	SA-60	SA-70	SA-78
TTENUATION	0 to 102 db, 1 db steps	0 to 82.5 db, 0.5 db steps	0 to 42 db, 1 db steps	0 to 102 db, 1 db steps	0 to 82.5 db, 0.5 db steps
TTENUATION STEPS	1, 2, 3, 6, 10, 20, 20, 20, 20	0.5, 1, 2, 3, 6, 10, 20, 20, 20	1, 2, 3, 6, 10, 20	1, 2, 3, 6, 10, 20, 20, 20, 20	0.5, 1, 2, 3, 6, 10, 20, 20, 20
MPEDANCE	50 ohms			75 ohms	
EQUENCY RANGE	DC to 1000 MHz				
RICE	$85.00	$85.00	$65.00	$85.00 With Type F Conn. $95.00	$85.00 With Type F Conn. $95.00

rminations and DC Blocks

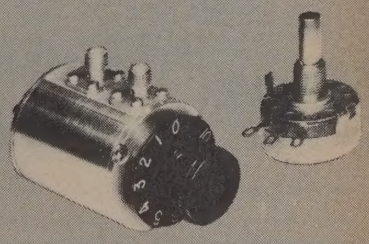
	TF-50	TF-75	DC-50
PEDANCE:	50 ohms	75 ohms	50 ohms
REQUENCY RANGE:	DC to 1000 MHz	DC to 1000 MHz	10 MHz to 1000 MHz
AXIMUM VSWR:	1.15:1 @ 1000 MHz	1.15:1 @ 1000 MHz	1.5:1 @ 1000 MHz (properly terminated)
RICE:	$10.00	$10.00	$10.00

ed Pads

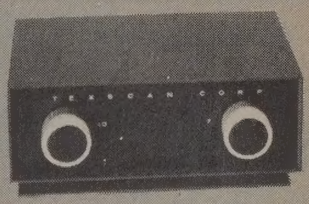
	FP-50	FP-75
TTENUATION:	1 to 20 db, any 1 db step	1 to 10 db any 1 db step 15 db and 20 db
MPEDANCE:	50 ohms	75 ohms
REQUENCY RANGE:	DC to 2000 MHz	DC to 1200 MHz
ALIBRATION ACCURACY:	±0.1 db	±0.2 db
ONNECTORS:	BNC, TNC, or Type N	BNC, TNC, 70 ohm Type N and Type F
RICE:	BNC, TNC—$12.50 Type N—$16.00	BNC, TNC, Type F—$12.50 70 ohm Type N—$18.00

VOLTAGE TUNED OSCILLATORS

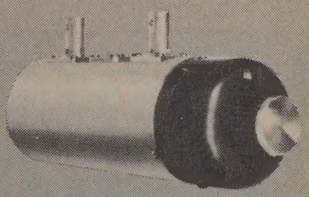
Model No.	VTS-25	VTS-50	VTS-100
Freq. Range	250-500 MHz	500-1000 MHz	1-2 GHz
Power Output into 50 ohm	600 mW	400 Mw	200 Mw
Signal to harmonic ratio	15db Min.	15db Min.	15db Min.
Tuning Voltage	+0.5 to +28 VDC	+0.5 to +28 VDC	+0.5 to +40 VDC
Physical Size	1" x 1" x 2½"	1" x 1" x 2½"	1" x 1" x 2½"
Price	$195.00	$195.00	$275.00



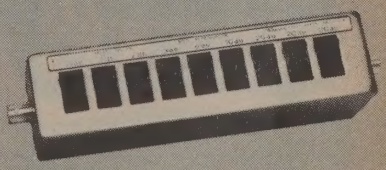
MA SERIES



500 SERIES



RA SERIES



RCB SERIES

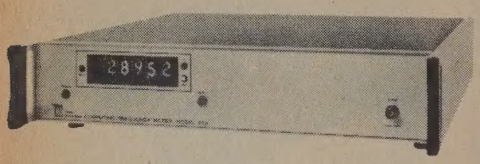
CD SERIES

DIGITAL INSTRUMENTS & SYSTEMS

TIME SYSTEMS

265 WHISMAN ROAD
MT. VIEW, CALIF. 94040
PHONE, (415) 961-9321

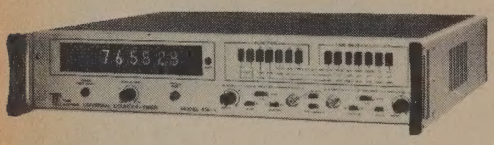
AUTOMATIC COMPUTING COUNTERS



A computing counter permits accurate measurement of low frequencies. The counter makes a period measurement, then using a proprietary computer circuit takes the reciprocal and displays the answer — (frequency).

Model	Description	Price
270	1.0 Hz to 1.0 MHz, 100 MV SENSITIVITY, 5 DIGIT	$ 750
272	1.0 Mz to 10 MHz, 100 MV SENSITIVITY, 5 DIGIT	1500
273	0.1 Hz to 20 MHz, 100 MV SENSITIVITY, RPM MEASUREMENT, 5 DIGIT	1800
210	0.1 Hz to 20 MHz, 10 MV SENSITIVITY, 7 DIGIT, AUTO FILTERING	1995
211	0.1 Hz to 20 MHz, 10 MV SENSITIVITY, 8 DIGIT, AUTO FILTERING	2100

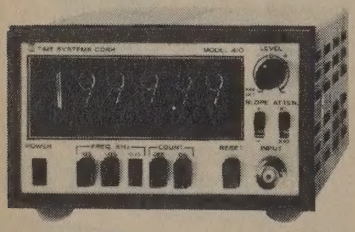
UNIVERSAL COUNTER-TIMERS



The Universal Counter-Timer is a versatile instrument with capabilities to measure frequency, time interval, period, multiple period average, ratio, multiple ratio average, total count and also provide scaled outputs.

Model	Description	Price
400-1	0-2 MHz, 100 MV SENSITIVITY, 6 DIGIT RUGGED CONSTRUCTION TO MEET NAVY BUORD 1803308F	$ 850
300	0-20 MHz, 10 MV SENSITIVITY, WITH BCD & REMOTE PROGRAMING OPTIONS, 7 DIGIT	1100

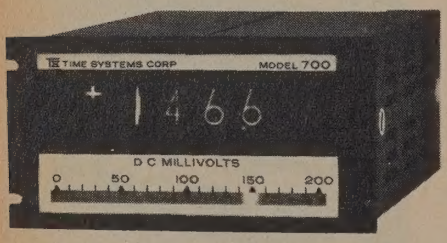
LOW COST COUNTERS



The term low cost applies to any counter that is less than $200 per digit.

Model	Description	Price
410-1	2 Hz to 200 KHz, 4 DIGIT, 60 HZ POWER LINE TIME BASE	$335
410-2	2 Hz to 2 MHz, 5 DIGITS, 60 Hz POWER LINE TIME BASE	360
410-3	2 Hz to 200 KHz, 4 DIGIT, CRYSTAL OSCILLATOR	370
410-4	2 Hz to 2 MHz, 5 DIGIT, CRYSTAL OSCILLATOR	395

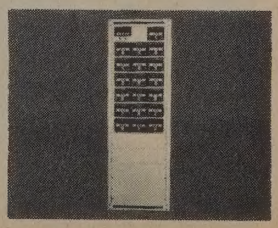
DIGITAL PANEL METERS



This line of digital panel meters come with the TSC exclusive **LITE NEEDLE** that provides the quick look capability of a deflection type meter as well as digital readout and complete isolation of analog circuits from the digital output (up to 500 volts isolation on all terminals).

Model	Description	Price
700	3½ DIGIT, 100 μV RESOLUTION, **LITE NEEDLE**	$245
701	3½ DIGIT, 100 μV RESOLUTION	225
710	3½ DIGIT, 100 μV RESOLUTION, **LITE NEEDLE** BCD OUTPUT	295
711	3½ DIGIT, 100 μV RESOLUTION, BCD OUTPUT	279
703	3½ DIGIT, MULTIRANGE, DC VOLTAGE	279
704	3½ DIGIT, MULTIRANGE, DC CURRENT	295

DIGITAL SYSTEMS

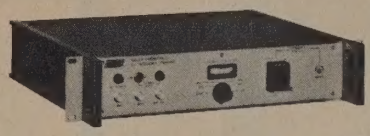


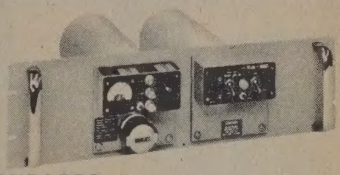
Series 4000: the series 4000 digital systems are custom systems designed from standard TSC building blocks for a specific customer application. The system shown here is an on line speed monitoring system that monitors velocity (up to 2000 meters/min.) and RPM (to 200 RPM). This particular system consists of a **Master Counter Control** that provides gate and test signals to a number of **Slave Preset Counters.** When either a high or low count is recorded, a master alarm is sounded. Other systems are designed for a variety of applications in process and digital control.

These are specialized TRACOR instruments designed for your specific needs.

FREQUENCY STANDARDS

RUBIDIUM FREQUENCY STANDARD
Long Term Stability 5×10^{-11} (Std. Dev./Yr.)
Drift Rate 2×10^{-11}/month





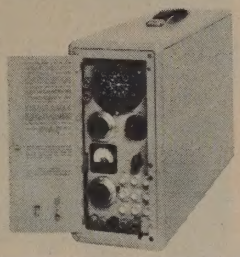
CRYSTAL STANDARDS

Long Term Stability $< 5 \times 10^{-10}$/24 hours
5, 1, 0.1 MHz

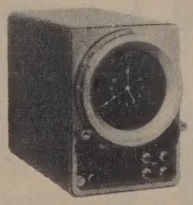
Long Term Stability $< 5 \times 10^{-11}$/24 hours
5, 1, 0.1 MHz

CLOCKS

PORTABLE RUBIDIUM ATOMIC CLOCKS
1 μsec. per day
38 Pounds
14 Hrs.
Self-contained Batteries

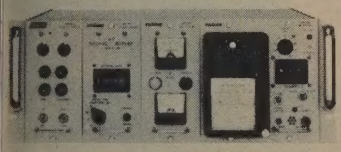


CRYSTAL CLOCKS
2×10^{-6} Secs/Day
38 Pounds
15 Hrs.
Self-contained Batteries

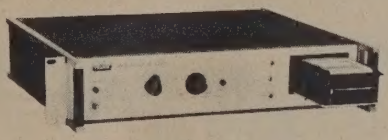


PORTABLE CHRONOMETERS
1×10^{-3} Sec/Day
8 Pounds
80 Hrs.
Self- contained Batteries

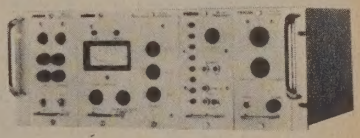
V.F RECEIVERS



VLF TRACKING RECEIVER/COMPARATORS
5.0 - 99.95 kHz continuous tuning

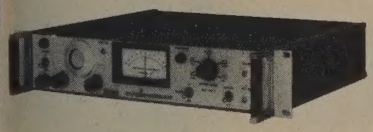


TWO FREQUENCY VLF RECEIVER
20 & 60 kHz for rating house standard



TIMING RECEIVER
3 frequency reception
1 μs accuracy

TIME AND FREQUENCY INSTRUMENTS

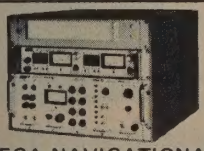


FREQUENCY DIFFERENCE METER
Instantaneous Determination of Fractional Freq. Diff. to 1×10^{-11}

LINEAR PHASE/TIME COMPARATOR
1 nanosecond time resolution
0.01 cycle phase resolution

FREQUENCY DISTRIBUTION SYSTEM
Provides up to 16 outputs
Front panel adjustment

NAVIGATION SYSTEMS



VLF/OMEGA NAVIGATIONAL SYSTEMS
4 Channel
Receives all Omega Frequencies
Digital Lane Counter

LANE COUNT/PHASE CORRECTOR
displays Omega lane count in digital format; simplifies application of correction information

SPECTRAL INSTRUMENTS

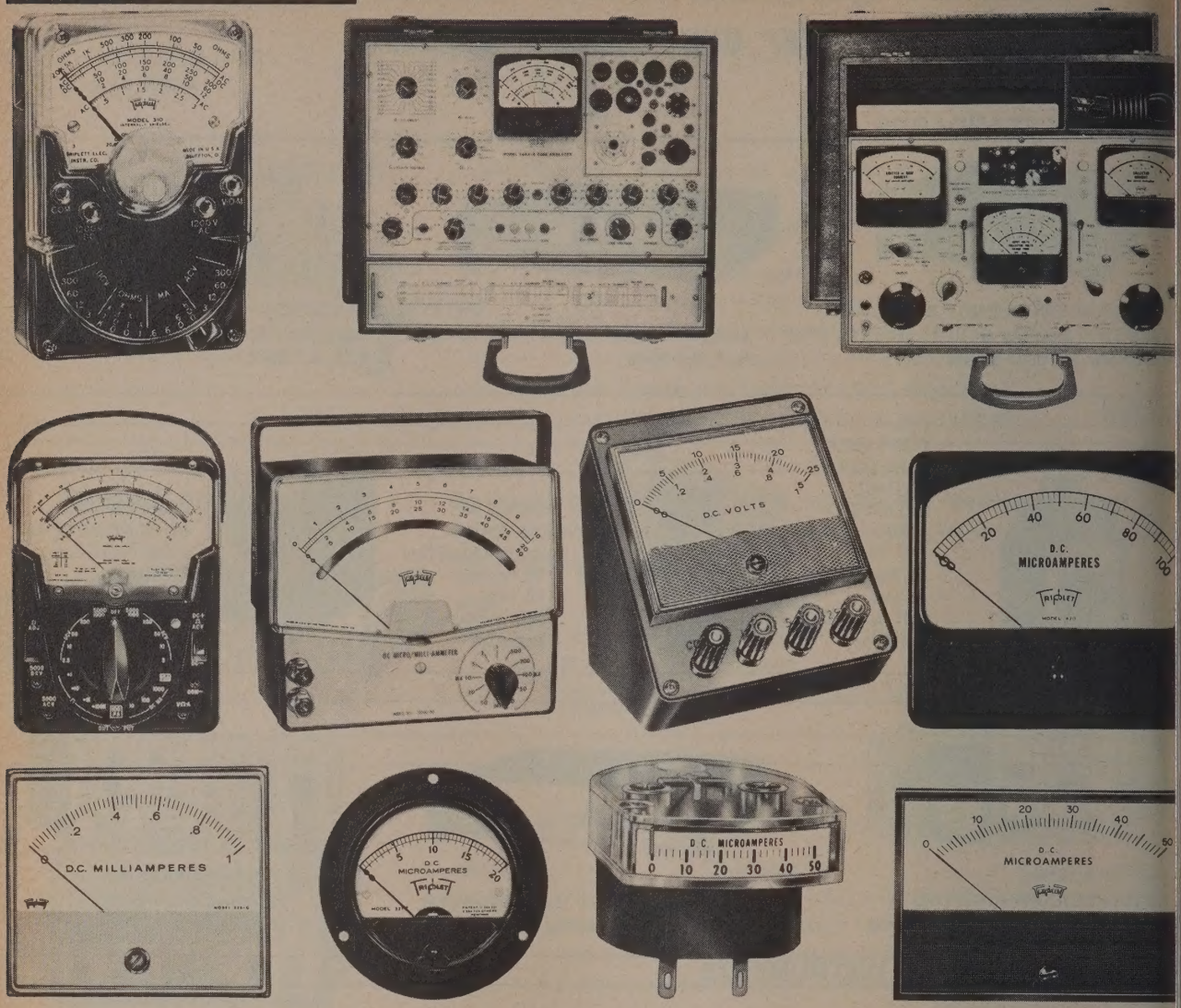
SPECTRUM GENERATOR/SHAPER
Programmable random noise from 0.1Hz to 100kHz
1-, 1/2-, 1/3-, 1/6- octave bandwidths

Industrial Instruments

TRACOR®

A-107F

6500 TRACOR LANE, AUSTIN, TEXAS 78721 (512) 926-2800



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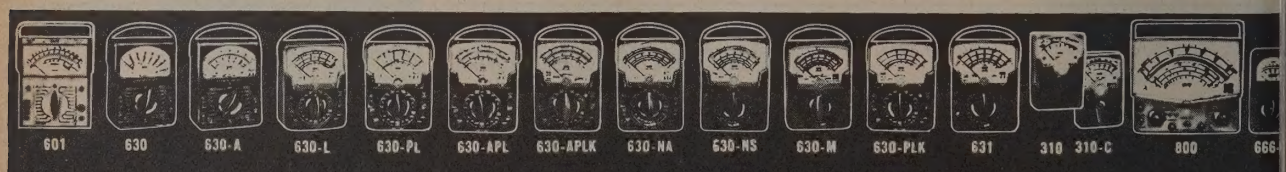


THE WORLD'S MOST COMPLETE LINE OF V-O-M's • AVAILABLE FROM YOUR TRIPLETT DISTRIBUTOR'S STOCK

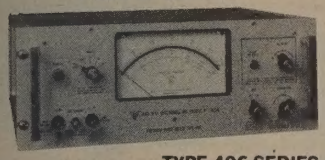
World Famous IN Phase Time MEASUREMENT

UNIVERSAL AD-YU ELECTRONICS, INC.

249-259 TERHUNE AVENUE • PASSAIC, NEW JERSEY
CABLE: UAD PASSAIC • PHONE (201) 472-5622

PRECISION PHASE METERS

Direct Reading In Degrees 1 CPS To 500 KC

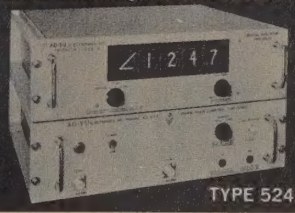


TYPE 406 SERIES

No amplitude adjustment from 0.05 to 90v, no frequency adjustment. Accuracy: ±0.25° relative, ±1° or ±2% absolute. Phase Range: 0-12°, 0-36°, 0-90°, 0-180° up to 360° in 8 ranges. Input impedance: 3 megohms shunted by 20 uuf. Analog output for external recorder available.

DIGITAL PHASE METER

±0.05° Accuracy, 20 CPS to 500 Kc.



TYPE 524A4

Phase angle in degrees directly represented in 4 or 5 digits. No amplitude adjustment from 0.3v to 70v. No frequency adjustment up to 500 kc. Accuracy: ±0.05° relative, ±1° absolute. Analog Output: zero for 0°, increases to +3.6v for 360°, 1 mv change for every 0.1°.

WIDEBAND PHASE VECTOR VOLTMETER

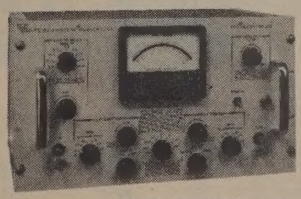
40 CPS To 20 KC Continuous Coverage.

TYPE 248A

Direct reading of total, fundamental, in-phase, quadrature components and phase angle in degrees on panel meter. Accuracy: ±0.25° or ±1% for phase, ±2% for vector voltage. Nulling Sensitivity: Less than 2 microvolts. Quadrature Rejection: over 60 db below 5 kc, 40 db up to 20 kc. Input Impedance: 1 megohm shunted with 20 uuf.

VECTORLYZERS

±0.02° or ±2% Accuracy, 0.005° Readability.



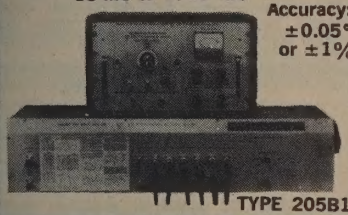
TYPE 202-202A-203

Especially suitable for measuring small phase angle near 0°, 180°, 90° and 270°. Continuously variable filter for isolation of harmonics and noise. Full Scale Sensitivity: 1°, 2°, 4°, 10° up to 360°. Freq. Range: 25 cps to 100 kc for Type 202 and 202A, 50 cps to 20 kc for Type 203.

H-F PHASE PICOSECOND DETECTOR

15 MC to 1700 MC

Accuracy: ±0.05° or ±1%

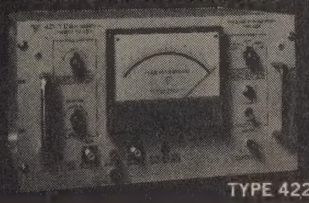


TYPE 205B1-4-5

Useable for continuous sine wave, pulsed or amplitude modulated sine wave. Calibration traceable to National Bureau of Standards. Sensitivity: 50mv with panel meter, 10mv with external receiver. Input Impedance: 50 ohms nominal. Readability: 10ps per division on main scale. 1ps on vernier scale.

VIDEO AND RF PHASE METER

50 CPS To 10 MEGACYCLES

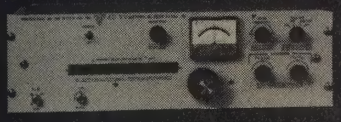


TYPE 422A

Direct reading in degrees. Accuracy: ¼° relative or 2% absolute. Analog output available for plotting phase characteristic curve. No amplitude adjustment from 0.3v to 20v, no frequency adjustment from 50 cps to 10 mc. Input Impedance: 1 megohm shunted by 30 uuf.

MICROWAVE PHASE METERS

1 GC to 8.2 GC ±0.1° Accuracy.

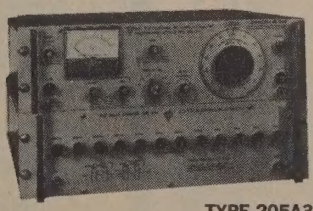


TYPE 206A

Suitable for continuous sine wave or pulsed signal. Infinite resolution. Plot phase response curve on recorder, no adjustment required for variation of signal amplitude up to ten times. Frequency Range: 1 to 8.2 gc. Accuracy: ±0.1° or ±1%. Input Voltage: 50 mv minimum. Readability better than 0.05 pico-second.

VIDEO PHASE DETECTORS

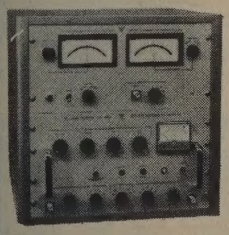
100 KC To 15 MC



TYPE 205A3-4

Especially suitable for measuring small phase angle. Excellent for phase and delay measurement of filters, amplifiers, etc. at video frequency. Accuracy: ±0.05°. Readability: ¼ ns distortion. Minimum Input Signal: 10 mv rms. Input Impedance: 1 megohm shunted with 12 uuf.

TRANSFER FUNCTION ANALYZER



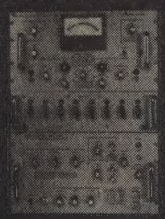
TYPE 308

Reads In-Phase And Quadrature Components Simultaneously.

Input Impedance: 1 megohm shunted with 20 uuf. Accuracy: ±2% of full scale. Frequency Range: 0.1 cps to 10 kc. Voltage Range: 0.03v to 100v in six ranges. Center zero gives direct identification of lead or lag. Analog output available for plotting Nyquist diagram.

WIDE-BAND PHASE STANDARD

0.015° Accuracy, 50 CPS To 10 KC.



TYPE 209

Primary wideband standard, self-calibration, self-checking by means of fundamental bridge balancing, without the use of an external standard. Useful for measuring unknown networks, unknown signals, or checking phase meters. Traceable to NBS standards. Phase shift from 0° to 360° with 7 digit resolution.

INSTANTANEOUS PHASE DETECTOR

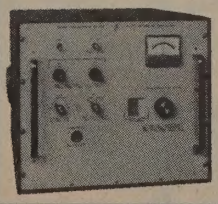
For Pulsed Signals Or CW Signals

TYPE 251

Measures instantaneous phase difference (from cycle to cycle) of pulsed or cw signals. Measures differential phase between steps of a video staircase signal. Measures phase angle between two pulse modulated sine waves or between a pulse modulated sine wave and a cw signal. Infinite resolution, 0.05° phase difference can be detected. Readability: ¼ ns. Operating Frequency: 200 kc to 15 mc. Minimum Input Signal: 50 millivolts.

MICROWAVE PHASE AND TIME DETECTOR

8.2 GC to 18 GC, ±1° or ±1% Accuracy.



TYPE 206B3-4

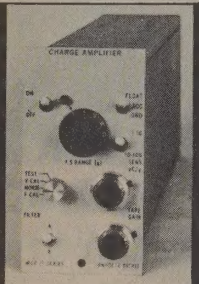
Accuracy unaffected by amplitude fluctuation. Measures pulse modulated or cw signals. Both input signals enter separate channels and are accurately terminated. Resolution: infinite. Minimum Input Signal: 50 millivolts for pulsed signals; 30 millivolts for cw signals. Frequency Response: 206B3—8.2 gc to 12.4 gc; 206B4—12.4 gc to 18 gc. Input Waveguide Size: 206B3—X-Band waveguide O.D. 1"x½" includes UG-39 / U Flange; 206B4—KU-Band 0.702 x0.391 includes UG-419 / U Flange.

UNHOLTZ-

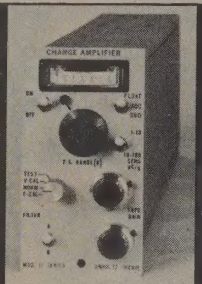
Signal conditioning amplifiers for shock and vibration monitoring

This popular series of signal conditioning amplifiers features individual double shielded power supplies, a totally-enclosed-vinyl-clad case, portability of separate units, ultra low noise levels, frequency response to 100 kHz, and switchable low pass filters with an 18 dB/octave attenuation rate. They can be operated in the integral charge mode with direct connection to the piezoelectric transducer, or switched to the remote preamp mode for operation with either the two-wire charge type remote preamp or the two-wire voltage type remote preamp. Full scale ranges of .1 g to 10 Kg with accelerometer sensitivities from 1 pC/g to 100 pC/g are standard. Also offered is Option III full scale ranging to provide an extra gain of 10 for very low level measurements. Panel height is only 5¼ inches when standard edgewise meters are selected.

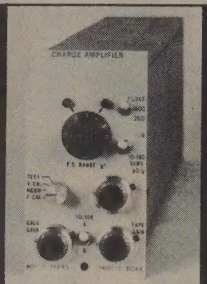
D11V SERIES



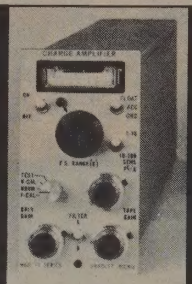
Model D11V
Tape output only
$525.00



Model D11MV
Tape and meter
$575.00



Model D11GV
Tape and galvo
$590.00



Model D11MGV
Tape, galvo, meter
$640.00

Basic D11V series permits operation with grounded transducers while eliminating usual ground loop problems. Differential circuitry provides rejection of common-mode signals by a factor of 1000. The two-wire remote preamps shown below can be used with any of the D11V series instruments.

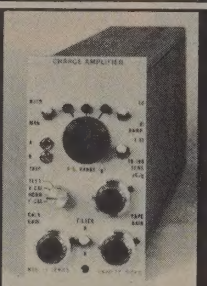
OPTIONAL FEATURES

L	Log dc output with 60 dB dynamic range (requires meter feature)	$175.00
S	Normalized 10 mV/g servo output for full scale ranges up to 300 g	$50.00
O	1 kHz fixed amplitude, sine wave, internal calibration oscillator	$50.00
—8	Large meter with 2½ inch scale length and 8¾ inch panel height	$20.00
—2	Extended low frequency response flat within ±5% down to 0.5 Hz	$25.00

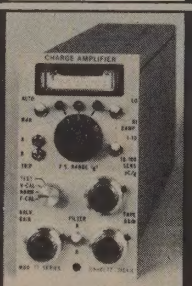
AUTORANGER SERIES

Model 811M
Range restorer
$1200.00

Model 11MAV
Tape and meter
$745.00



Model 11GAV
Tape and galvo
$760.00



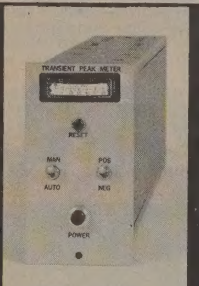
Model 11MGAV
Tape, galvo, meter
$810.00

AUTORANGER series selects best of 3 adjacent full scale ranges. Pilot light and dc code signals indicate range selected. Range sequences of 1, 3, 10 . . ., or 10 dB steps, or 1, 10, 100, 1K are offered. Companion RANGE-RESTORER converts tape recorded data to original dynamic range. The two-wire remote preamps shown below can be used with any of the AUTORANGER instruments.

OPTIONAL FEATURES

S	Normalized 10 mV/g servo output for full scale ranges up to 1 Kg	$50.00
O	1 kHz fixed amplitude, sine wave, internal calibration oscillator	$50.00
F	Linear DC output for amplifiers supplied with meter feature	$25.00
—8	Large meter with 2½ inch scale length and 8¾ inch panel height	$20.00

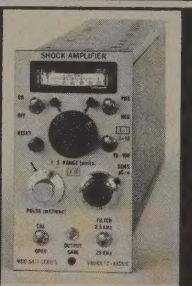
SHOCK SERIES



Model 11TPM
Transient peak meter
$350.00

Model SA11TPM
Shock amplifier with tape and transient meter
$875.00

Model SA11G
Shock amplifier with adjustable galvo output
$615.00



Model SA11MG
Shock amplifier with galvo, and standard meter
$665.00

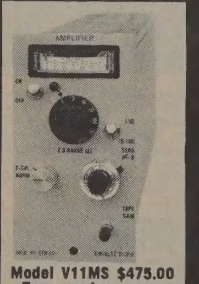
Shock amplifiers have selectable low and high frequency time constants for pulse durations from 100 microsec to 100 millisec. Reset feature and direct coupling provide rapid stabilization. Series shown at left can be intermixed with other series 11 instruments. Series described below are housed in a single portable carrying case that can be rack mounted as one, two or three units.

PORTABLE SHOCK INSTRUMENTS

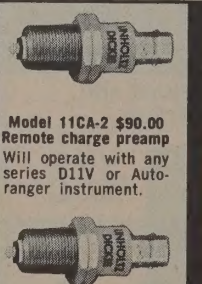
Model SA11GO-3	Portable shock amplifier with galvo and internal oscillator
Model 11TPM-3	Portable transient peak meter for pulse measurements
Model 11RA-3	Rack adapter for 1 to 3 of the portable units above.

OPTIONAL FEATURES

1 kHz Osc. $50.00 10 mV/g Servo $50.00

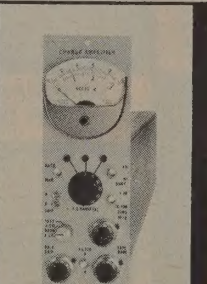


Model V11MS $475.00
Tape, meter, servo
Economy model operates exclusively with two-wire remote charge or voltage preamp shown at right.
Galvo option $65.00
OSC option $50.00

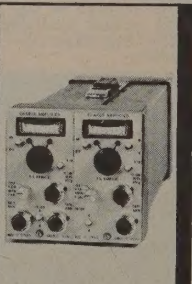


Model 11CA-2 $90.00
Remote charge preamp
Will operate with any series D11V or Autoranger instrument.

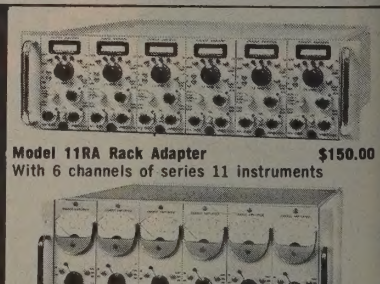
Model 11PA-2 $50.00
Remote voltage preamp
Will operate with any series D11V or Autoranger instrument.



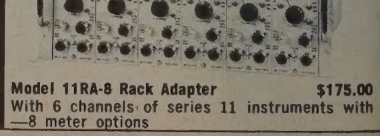
Series 11 instrument with —8 meter option.



Model 11P-2 $70.00
Dual channel Portable adapter
With 2 channels of series 11 instruments



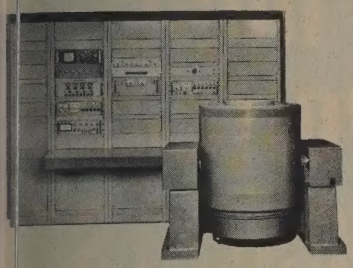
Model 11RA Rack Adapter $150.00
With 6 channels of series 11 instruments



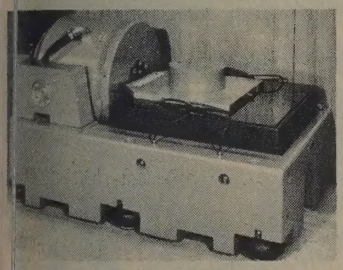
Model 11RA-8 Rack Adapter $175.00
With 6 channels of series 11 instruments with —8 meter options

DICKIE CORP.

Complete vibration test systems



000 lb system with solid state amplifier



Shaker and slip table on seismic base

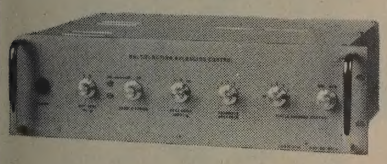
SYSTEM	SYSTEM	SHAKER TABLE					SYSTEM COOLING		
								SHAKER	
Model Number	Force Sine lbs.-pk	Stroke inches pk-pk	Bolt Circle Max. Dia.	Suspension Stiffness lbs/in.	Weight lbs.	Frequency Range - Hz	Amplifier	Moving Element	Field
TA 100-4	150	4	—	Nil	3	dc-1000	Air	Air	Air
TA 250-6	1000	6	—	Nil	11	dc-1000	Air	Air	Air
TA 50-20	200	1	3.5	80	2	dc-3000	Air	Air	Air
72-7	200	1	4.5	225	4	5-10000	Air	Air	Air
TA 250-100	350	1	4.5	225	4	dc-6000	Air	Air	Water
76-7	350	1	4.5	225	4	5-10000	Air	Air	Water
340-7	350	0.5	2.25	50	2.5	5-10000	Air	Air	Water
279	450	1	4.5	225	5.3	5-5000	Air	Air	Water
TA 161	1000	1	5.75	250	14	dc-2000	Air	Air	Air
262-8	1200	1	8	400	20	5-3000	Air	Air	Air
464-8	1700	1	8	400	20	5-3000	Air	Air	Air
8160-8-20	2000	1	8	400	20	5-3000	Air	Air	Air
8160-20	2000	1	5.75	250	14	5-2000	Air	Air	Air
454	1750	1.25	8	600	20	5-3000	Air	Air	Air
484H	2000	1.25	8	600	20	5-3000	Air	Air	Air
8208 AAA	2600	1.25	8	600	27	5-5000	Air	Air	Air
8208 AMA	3000	1.25	8	600	20	5-3000	Air	Air	Air
8208 PH	3000	1.25	5.75	300	14	5-2000	Air	Air	Air
8208 CMV	3800	1.25	8	600	26	5-2000	Air	Air	Water
691M-50	5000	1.25	12	1200	34	5-3000	Air	Air	Air
1596M-60	6000	1.25	12	1200	34	5-3000	Air	Air	Water
TA 1696M-60	6000	1.25	12	1200	36	dc-3000	Water	Air	Water
TA 1600M-80	8000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 3200M-100	10000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 13500-120	12000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 16400-150	15000	1.25	16	3000	75	5-3000	Water	Air	Wtaer

Systems with TA in model number include all silicon, direct coupled, solid state power amplifiers.

MULTIPLE SHAKER SYSTEMS FOR LARGE LOADS, HIGH FORCE RATINGS, OR SPECIAL APPLICATIONS ARE AVAILABLE

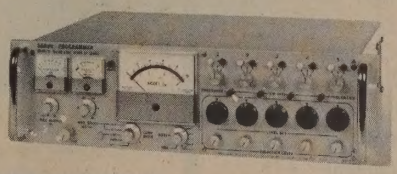
Accessory instruments

Shaker system controls and protective functions



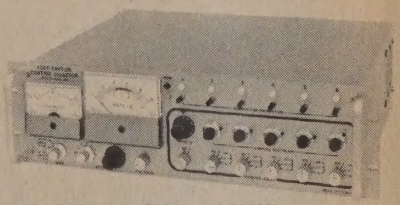
MULTIFUNCTION AVERAGING CONTROL
Model MAC-6C

Features: Phase insensitive averaging for at least 6 inputs ■ Allows averaged shaker system control for sine and random tests ■ Sine tests: absolute average of output yields average of input magnitudes ■ Random tests: spectral density of output yields average of input spectral densities ■ Freedom from detector time constant problems ■ DC output for recording ■ Units may be coupled for more than 6 inputs.



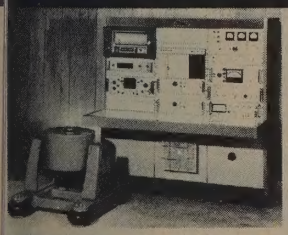
SERVO PROGRAMMERS
Models SP5 and SP2

Features: Combines functions of amplitude servo and vibration programmer in one instrument ■ Programmer contains up to five program segments with servo controlled acceleration, velocity or displacement selectable for each segment (SP5) ■ Simplified closed-loop presetting of vibration levels before actual test is performed ■ Optional safety shutdown at pre-set level of acceleration ■ Solid state, plug-in, printed circuit construction ■ Log dc output for X-Y recording of test



ACCELERATION CONTROL SELECTOR
Model ACS-6
Solid State Switching

Features: Automatically switches to highest (or lowest) accelerometer for amplitude servo control ■ Up to 6 input acceleration signals ■ Switching speed continuously variable with frequency ■ Weighted switching from .01 to 10 times nominal acceleration ■ Wide dynamic range ■ Pilot light indicates controlling channel.



Calibration systems for accelerometers

AUTOMATIC CALIBRATION SYSTEMS

Unholtz-Dickie automatic calibration systems, based on Model 106A shaker automatically plot accelerometer calibration curves of charge or voltage sensitivity vs. frequency to any level up to 100 g and 10 kHz. Original data is permanently plotted — eliminating operator error in readout and transcription. Continuous curve detects all variations, expansion or compression of vertical scale for optimum accuracy and readability of curves. One per cent accuracy of unknown accelerometer relative to reference.

ABSOLUTE CALIBRATION OPTICAL SYSTEM

Model DO-5000. New optical instrument gives digital readout of absolute displacement.

Piezoelectric accelerometers

Micro-miniature
0.8 grams

General purpose
high sensitivity

For accurate vibration measurements this D21 series of shear mode types insure freedom from case sensitivity and lowest cross axis sensitivity. A range of sizes covers most applications, down to a 0.65 gram subminiature model. This series uses Lead Ziconate-Titanate crystals. Also available are Bismouth composition crystals for high temperatures.

Complete information is available on all products. Write to Unholtz-Dickie.

manufacturers of shaker systems, advanced instrumentation, and accelerometers

UNHOLTZ-DICKIE CORPORATION

3000 WHITNEY AVE. / HAMDEN, CONN. 06518 / (203) 288-3358

PORTABLE high voltage testers

PORTABLE HIGH VOLTAGE POWER SUPPLIES
UVC standard portable power supplies, series "BAP" as shown (Photo A), offer the desirability of light weight, compact packaging and the flexibility of complete control instrumentation for field hi-pot testing. Availability is up to 32 KVDC and 40 milliamperes continuous duty on most models. Each supply is furnished with single range kilovolt meter and milliammeter; high voltage on and off pushbutton function with indicator lights; primary protective fuses and a fixed overload circuit.

At voltage ratings in excess of 32 KVDC, two packages are furnished, each offering the advantage of easy portability. These supplies are available at ratings up to 60 KVDC and utilize air insulation.

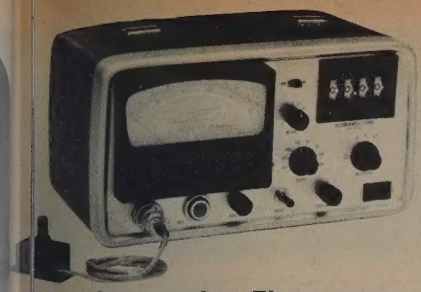
For non-destructive breakdown testing such as is required for coaxial cables, strain gauge equipment, capacitors and semi-conductors, UVC has introduced a line of multi-range, crow bar protected, suitcase style packaged portable power supplies (Photo B) at voltage ratings up to 45 KV. Each supply provides four modes of operation, selectable by means of a front panel control and the high voltage rises in each mode as an approximate ramp function up to its preset crest. Leakage current is also selected by means of a front panel control and should a preset value of current be exceeded, a crow bar circuit will be activated with response time in the order of less than 5 microseconds after initiation of breakdown. The kilovolt meter will hold the voltage reading at the point of breakdown indefinitely until the equipment is manually reset.

KILOVOLT METERS - HIGH VOLTAGE DIVIDERS
For precise high voltage measurement, UVC offers a complete line of 1% and 3% accuracy kilovolt meters (Photo C); 0.1% high voltage dividers as well as specially designed frequency compensated dividers (Photo D). Availability is up to 1000 KVDC.

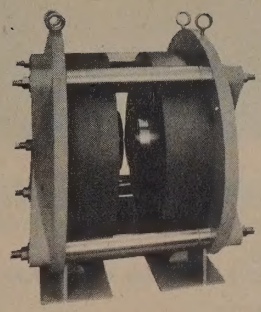
STOCK AND CUSTOM TERMINATION HARDWARE
UVC offers specially designed termination hardware to minimize the effects of corona discharge. Standard shapes include cap nuts, toroids, spheres and cylinders (Photo E). These hardware items are used in all UVC high voltage and extra high voltage power supplies to reduce spacing requirements, and offer a more reliable high voltage design. Mounting tap sizes, materials and shape are not restricted to the standard configurations shown. We welcome the opportunity to discuss your special termination requirements.

Write or phone for Catalog UVC-670 containing complete specifications for the extensive line of UVC high voltage power supplies.

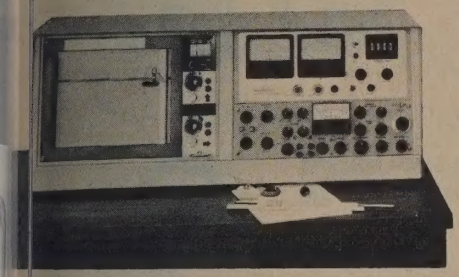
UNIVERSAL VOLTRONICS
27 Radio Circle Drive, Mt. Kisco, N.Y. 10549 · 914-241-1300



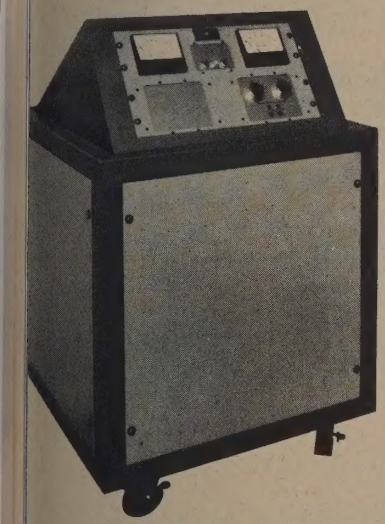
Walker Integrating Fluxmeter and Hall Gaussmeter
Accurately measure magnetic flux, fields...record hysteresis loops.



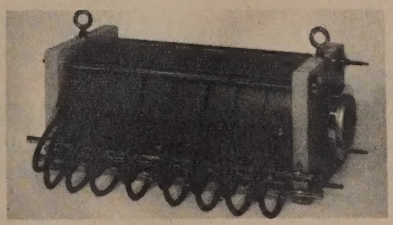
Walker Precision Laboratory Magnets
Five models: 4", 7", 10" diameters . . . offer stepped variable gap by precision ground spacer blocks.



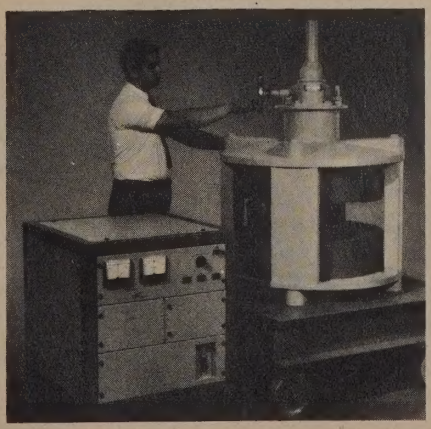
Walker Hysteresisgraphs
Automatically plot curves of hard and soft magnetic materials.



Walker Regulated Power Supplies
5, 11 and 15 kilowatt current regulated models . . . all silicon solid state circuitry. Bi-Polar models also available.



Walker Custom Coils
Engineered coil systems: Helmholtz, plasma and laser coils...air core and iron core solenoids.



Walker Special Magnet Systems
Special magnetic systems, designed and built by O. S. Walker.

One basic supplier of precision magnetic laboratory equipment

A pioneer in the field of magnetics, O. S. Walker produces several lines of highly accurate magnetic laboratory equipment. Measurement and test instruments . . . regulated power supplies . . . electromagnets . . . superconductor magnets . . . custom coils . . . special magnetic systems.

And if your particular problem cannot be solved by our standard products, a special unit may be the answer. Walker's total capabilities range from application analysis to the design and manufacture of complete special-purpose magnetic systems.

Write for our new catalog today!

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ROCKDALE STREET, WORCESTER, MASS. 01606
TELEPHONE 617-853-3232. TELEX 92-0489

WALKER MAGNETIC GROUP

MAGNETIC SYSTEMS & INSTRUMENTS DIVISION
(MSI Division)

INDUSTRIAL MAGNETICS DIVISION/BUX-SHRADER MAGNETIC PRODUCTS/WALKER HAGOU N.V. HOLLAND

VOLTRON PRODUCTS, INC.

SIGNAL CONDITIONING INSTRUMENTATION

FULL-SCALE TAUT-BAND PANEL METERS (90°, 200° and 240° arcs)

Incorporating VOLTAUT® taut-band suspension for frictionless, shock-proof operation.

AC AND DC VOLTMETERS AND AMMETERS

AC and DC Current Ranges:	10 μA F.S. to 5 mA F.S. self-contained; over 5 mA with external components.
AC and DC Voltage Ranges:	to 300V F.S. self-contained.
Accuracy:	±1% F.S. basic.
Cases:	90° and 240° movements available.

WRITE FOR BULLETIN 4030.

EXPANDED-SCALE AND SPECIAL-PURPOSE PANEL METERS

With the precision and wide deflection capabilities inherent in the exclusive VOLTAUT® taut-band suspension system.

EXPANDED-SCALE VOLTMETERS AC AND DC AND EXPANDED SCALE FREQUENCY METERS

WRITE FOR BULLETIN 4040 (DC) AND 4050 (AC) AND 4100 (FREQUENCY METER)

TRANSISTORIZED VOLTMETERS AC, DC, AND PHASE-SENSITIVE **WRITE FOR BULLETIN 7000.**

AC AMMETERS LINEAR AND LOGARITHMIC **WRITE FOR BULLETIN 4070.**

POWER-FACTOR METERS **WRITE FOR BULLETIN 4130**

WATT-VAR METERS **WRITE FOR BULLETIN 4120.**

LOAD METERS **WRITE FOR BULLETIN 4140.**

AIRCRAFT INDICATING INSTRUMENTS

Featuring the exclusive VOLTAUT® taut-band movement for accurate, frictionless operation — 10 to 20 times the sensitivity of equivalent jeweled movements. The extremely rugged construction of these instruments makes them useable in any position; they are not affected by heavy overloads, shock or vibration. Available for single or dual scales with any combination of color bands.

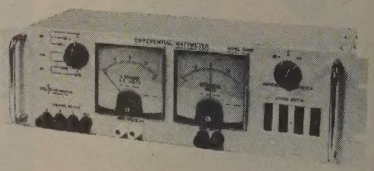
Available in MS-33639 or ATI 1", 1½", 2" and 3", single and dual configurations. Illuminated and non-illuminated.

FUNCTIONS AVAILABLE

DC VOLTS	AC LOAD
DC AMPS	AC VARS
DC LOAD	AC WATTS
AC VOLTS	FREQUENCY
AC AMPS	TEMPERATURE
DIFFERENTIAL TEMPERATURE	
EXHAUST GAS TEMPERATURE	
ENGINE TACHOMETER	

WRITE FOR BULLETIN 4180A.

LABORATORY INSTRUMENTS



DIFFERENTIAL WATTMETER

Full Scale Range:	0-30 watts (available up to 100 watts and above with external transformers).
Differential Watt Range:	10, 100, and 1000 milliwatts.
Full Scale Accuracy:	±1% of reading, ±20 mW.
Differential Accuracy:	±0.04, 4.0 and 40mW.
Frequency Range:	200-3000 Hz at stated accuracy.

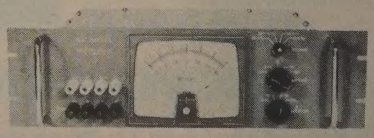
Input voltage can be any single voltage (single phase, 2-phase, 3-phase, 3- or 4-wire) from 10 to 120 V rms as specified by customer.

WRITE FOR BULLETIN 3021.

LOW-POWER LABORATORY WATTMETER

Models for single or polyphase low-power measurements where wattmeter burden must be extremely small.

Frequency Range:	50-2000 cps.
Accuracy:	±1% of full scale.
Current-circuit voltage-drop:	negligible.
Power Drain:	<than 0.2% of indicated power at unity PF.
Meter:	accurate to 10% PF without reconnection.
Full Scale Ranges:	(26 VAC) 0 to 1.2/3/12/30 watts F.S. (115 VAC) 0 to 1.2/3/12/30/120 watts F.S.



WRITE FOR BULLETIN 3020.

403 S. RAYMOND AVENUE ■ PASADENA, CALIFORNIA 91101 ■ TELEPHONE: (213) 681-2751 ■ TWX: 910-588-3288

VOLTRON PRODUCTS, INC.

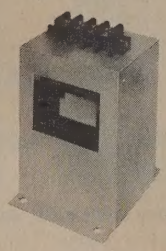
SIGNAL CONDITIONING INSTRUMENTATION

SIGNAL CONDITIONING TRANSDUCERS

AC VOLTAGE TRANSDUCERS

Accuracy: 0.5%.
Frequency Range: 50-3000 Hz, −25° to 70°C.
Response Time: .25 second to 99%.
Hipot: 1200 VAC.
Adjustable: ±5%.

WRITE FOR BULLETIN 5010.



AC CURRENT TRANSDUCERS

Accuracy: 0.5%.
Frequency Range: 50-3000 Hz.
Temperature Coefficient: <.01%/°C.
Input Current: 0-1, 2.5, 5 and 10 A.

WRITE FOR BULLETIN 5020.

WATT TRANSDUCERS

Accuracy: 0.5% with ±25% line voltage and .1 to 0.5 PF.
Frequency Range: 50-3000 Hz.
Response Time: .25 second to 99%.
Input Elements: one (500W), two (1000W) and three (1500W).
Adjustable: 60 to 120%.

WRITE FOR BULLETIN 5030.

PF TRANSDUCERS

Accuracy: 0.1 PF at nominal voltage and 60% current.
PF Ranges: 0-1-0, 0.3-1-0.3, 0.5-1-0.5, and 0.7-1-0.7.
Nominal Frequency: 50-3000 Hz.
Input Voltage: 120V ±20%.
Input Current: 0-5 A.
Phases: Single and 3-phase.

WRITE FOR BULLETIN 5040.

FREQUENCY TRANSDUCERS

Accuracy: 0.5%
Input Frequency: 55-65, 58-62, 350-450 and 380-420 Hz.
Voltage: 100-130V.
Overload: 1.5 X rated input, continuous; 2 X rated input, one second.
Hipot: 1200 VAC.

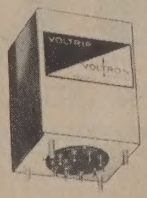
WRITE FOR BULLETIN 5050.

VOLTRIP GO/NO-GO LIMIT-DETECTOR

A precise, stable voltage-sensing device that signals, by means of a contact closure, when the voltage, current or other parameter being monitored reaches a pre-determined value. Also available to sense frequency and watts.

Completely solid state except for relay.
External resistors extend functions to current and resistance.
Dual limit models available.
MIL versions available for −55° to 71°C operation.
Voltage Range: 5 to 500V rms, 50 to 2000 Hz.
Auxiliary Power Required: 3 watts at 115V, ±10%, 60-1200 Hz.
Response Time: 50 ms.

WRITE FOR BULLETIN 6033.



4½" SWITCHBOARD INSTRUMENTS

Featuring Voltron's unique taut-band, axial air gap transducer approach for a wide range of functions:

DC AMMETERS AND VOLTMETERS
AC AMMETERS AND VOLTMETERS
WATTMETERS AND VARMETERS
FREQUENCY METERS
SYNCHROSCOPES
TACHOMETERS

Accuracies: ±1% of F.S. (±.01 for PF; ±2% for Frequency and Tachometers).
Frequency Range: 50-500 Hz.
Full Scale Deflection Angle: 250° (360° for synchroscopes).
Full Scale Length: approx. 7.25".
Weight: approx. 0.9 to 3.7 lb.

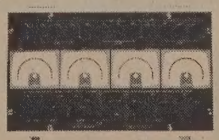
WRITE FOR BULLETIN SB68.

POWER ANALYZER

Requires no recalibration.

A versatile, portable test set offering high accuracy and low power consumption for general purpose use. Ideal for 50, 60 and 400 Hz measurements without recalibration or correction factors. Featuring large, easy to read 4½" — 200° rectangular meters with frictionless taut-band suspension systems for accuracy and protection against shock and vibration.

Accuracy: ±1%.
Phases: Single, 2-phase/3-wire or 3-phase/4-wire.
Size: 12" x 20" x 7".
Weight: 40 lb.



CHECKOUT RANGES:

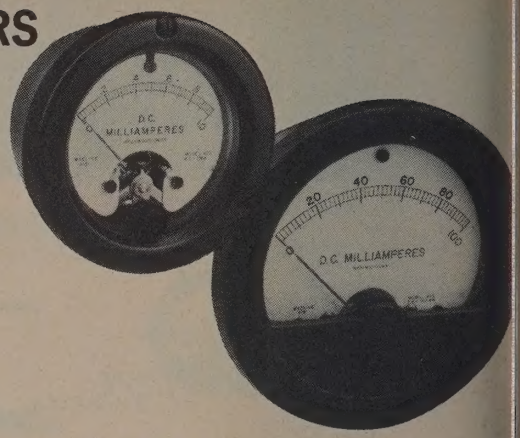
Current: 0 to 125/250/500 A.
Voltage: 0 to 125/250/500 VAC.
Frequency: 45-55, 55-65, 375-425 Hz.
Watt/Var: 0 to 1/2/4/5/10/20/40/80/160 kW/kvar.

WRITE FOR BULLETIN PA69

403 S. RAYMOND AVENUE ■ PASADENA, CALIFORNIA 91101 ■ TELEPHONE: (213) 681-2751 ■ TWX: 910-588-3288

SEALED/RUGGEDIZED MILITARY & COMMERCIAL METERS

Many of the meters and accessory products described in these pages have been designed to conform to the requirements of the applicable military meter specifications or the unusual requirements of the environments in which they are to be used. This also provides significant benefits to those with industrial applications which commercial-grade meters do not fully satisfy.



GENERAL SPECIFICATION:

MOVEMENTS
D'Arsonval; U magnet, core magnet; moving iron vane, high strength ALNICO magnets standard.

ACCURACY
Standards as shown to the right, special accuracy ±1% or better available.

CASE/FINISH
5/8" and 1" aluminum with anodized finish. 7/8, 1½, 2½, 3½, 4½ steel cadmium-plated, iridite-treated.

MOUNTING
Standard hardware and mounting dimensions to appropriate military specifications.

SEALING
Watertight gasket sealing standard, epoxy or solder sealing available on some models.

TERMINALS
1/4-28 brass stud and solder lug construction.

SCALE/FINISH
Aluminum with black markings on white enameled background.

POINTER
Knife edge standard, lance or sword pointers available.

SHIELDING
Magnetically shielded construction for use on magnetic or non-magnetic panel.

WINDOW
High strength glass. Plastic or RFI shielded furnished on special applications.

RESISTANCE
Standard tolerances ±10%, special to ±1%.

PIVOTS & JEWELS
Springbacked jewels, osmium pivots standard.

SPECIAL METER DESIGNS

For special applications, WacLine offers a wide selection of custom design meters. Special features include:

Custom scale markings & logos • Mirrored scale • Self-contained multi-range designs • Expanded scale AC & DC Voltmeters • RFI shielding • Edge lighting • Dual meter configurations • Special terminal resistances • Special movement designs • Non linear movements • Suppressed zero ranges • High resistance Voltmeters • Vu & Db Meters.

Consult factory for Technical assistance on your custom design requirements.

SELECTION CHART FOR STANDARD SEALED METERS

SIZE	BEZEL SHAPE	AVAILABLE MODELS	TYPE OF MECHANISM	STANDARD ACCURACY	STANDARD DEFLECTION
5/8"	SQUARE	KOB	D.C. CORE MAGNET	±5%	82°
7/8"	SQUARE	F33	D.C. CORE MAGNET	±5%	100°
1"	ROUND	CIB	D.C. CORE MAGNET	±3%	90°
1½"	ROUND	CCD	D.C. U MAGNET	±3%	90°
	ROUND	CCX	A.C. RECT.	±3%	90°
	SQUARE	BCD	D.C. MAGNET	±3%	90°
	SQUARE	BCX	A.C. RECT.	±3%	90°
2½"	ROUND	ADD	D.C. U MAGNET	±2%	90°
	ROUND	ADX	A.C. RECT.	±3%	90°
	ROUND	ADA	A.C. IRON VANE	±2%	90°
	ROUND	ADL	D.C. CORE MAGNET	±2%	250°
2⅜"	SQUARE	DLD	D.C. U MAGNET	±2%	90°
	SQUARE	DLX	A.C. RECT.	±3%	90°
	SQUARE	DLA	A.C. IRON VANE	±2%	90°
3½"	ROUND	AED	D.C. U MAGNET	±2%	90°
	ROUND	AEX	A.C. RECT.	±3%	90°
	ROUND	AEA	A.C. IRON VANE	±2%	90°
	ROUND	AEL	D.C. CORE MAGNET	±2%	250°
3⅛"	SQUARE	DND	D.C. U MAGNET	±2%	90°
	SQUARE	DNX	A.C. RECT.	±3%	90°
	SQUARE	DNA	A.C. IRON VANE	±2%	90°
4½"	ROUND	AFD	D.C. U MAGNET	±2%	90°
	ROUND	AFX	A.C. RECT.	±3%	90°
	ROUND	AFL	D.C. CORE MAGNET	±2%	250°
	ROUND	AFA	A.C. IRON VANE	±2%	90°

The most widely used meters are described in the chart above to assist in the selection of the correct meter for each application.

Sizes and mounting dimensions meet requirements of MIL-M 10304 and MIL-M-17275 where applicable.

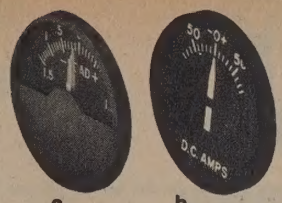
The availability of both round and square configurations in the most popular sizes offers greater flexibility in selecting a meter compatible with your styling requirements.

Write or call today for additional information on anyone of the models described.

WACLINE a division of Simmonds Precision
35 South St.Clair St., Dayton, Ohio 45402 □ 513-224-9921 □ TWX 810-459-1741

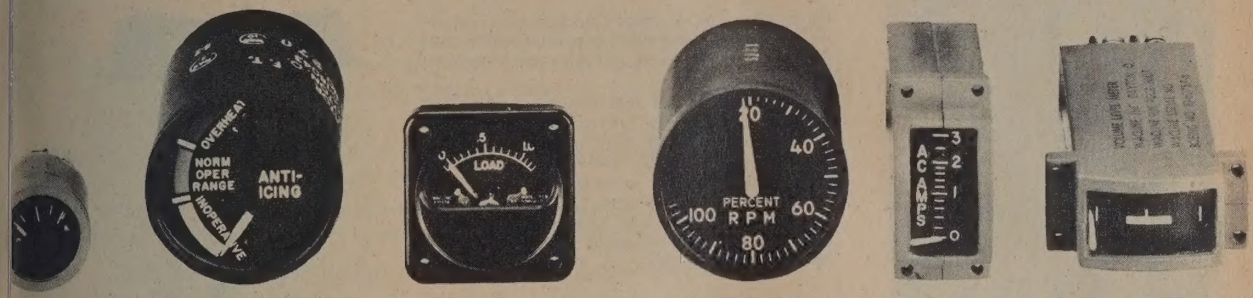
THE PANORAMIC LINE

ast, accurate readings through reduction of parallax is but ne outstanding feature of Panoramic meters. Variety of possible pplications is almost limitless.



a. b.

a. Ordinary meter face shows erroneous reading due to parallax.
b. Panoramic design improvement reduces parallax for true reading.

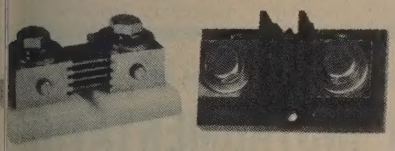


till more idea of the completeness of WacLine models is rovided in this lineup. From the left, a 1" round position indicator, a 2" round meter with 110° scale, a 1½" round, a 2" round with 250° scale, and at right, two lighted edgewise meters.

PECIAL DESIGN METERS & ACCESSORIES

HUNTS

ightweight military shunts to meet MIL-S51 for direct current values to 1200 mperes. Special commercial and aircraft designs also available.

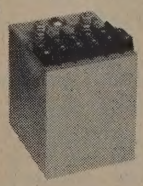


URRENT TRANSFORMERS

nly two of a wide variety of current ransformers produced by WacLine are shown. Single phase and three-phase odels are offered. These transformers xtend useful ranges for AC measurement of current and power.

ONVERTERS & RANSDUCERS

- Hall-generator Watt Converters
- Meter relays
- Frequency converters
- Power Factor & Phase Angle
- Control Relay circuits

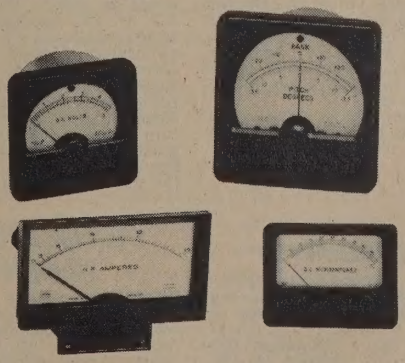


EXTENSION—CASE METERS

A full line of self-contained electronic meters includes: • Expanded scale AC Voltmeters (True RMS and Average sensing) • Expanded scale DC Voltmeters • Expanded scale frequency meters • • Elapsed Time Indicators • Power Factor & Phase Angle meters • Watt/Var meters

COMMERCIAL PANEL METERS

All of the sealed and ruggedized meters produced by WacLine for military applications have commercial application. The same quality and reliability which is built into our military meters is offered in a variety of commercial styled meters as shown below.



TACHOMETER GENERATORS

Pancake-style self-generating Tachometer Generators in a variety of sizes, 1" to 6". Output signals of up to 500 volts/1000 RPM. Linear output when used with high impedance loads. Custom designs available.

FLIGHT INSTRUMENTS

WacLine has produced for a number of years a complete line of aircraft cockpit meters for both commercial jet airliners and general aviation aircraft. Past accomplishments in such techniques as integral lighting and self-contained electronic circuitry to measure a wide variety of signals has recently been further advanced by introduction of the new Panoramic low parallax instrument.

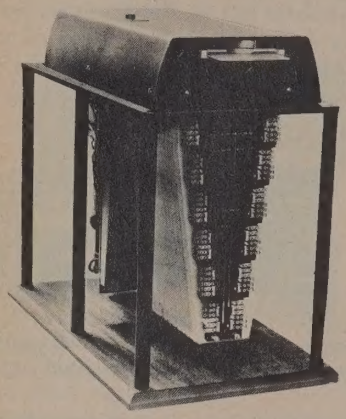
FOR MORE DETAILED INFORMATION ON SPECIAL DESIGN METERS AND ACCESSORY PRODUCTS, CONSULT THE FACTORY.

WACLINE a division of Simmonds Precision

35 South St.Clair St., Dayton, Ohio 45402 □ 513-224-9921 □ TWX 810-459-1741

W R E

CARD OPERATED *Programmers*

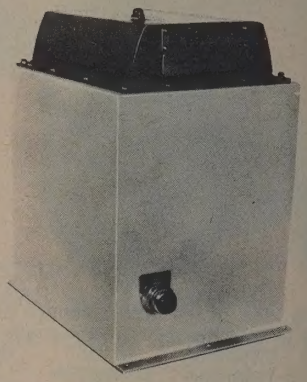


These advanced concept card actuated reader-programmers have high current carrying capabilities and provide complex switching on each data bit.

Built around a new mechanical switching arrangement that features single pole, double throw switches with silver, self-wiping contacts and excellent dry circuit characteristics.

Proper design with attention to insulation, mechanical strength and positive actuation assure long service life. Card reader instantly interprets and activates all desired contacts simultaneously.

provide complex switching on each data bit



READER/ACTIVATOR CAPACITY: Model 240P: 240 bits/240 isolated SPDT switches. Model 960P: 960 bits/960 isolated SPDT switches. Model 96: 96 bits/96 isolated SPDT switches.

DATA MEDIUM: Standard 12 x 80 EAM CARD (IBM format). Model 240: Utilizes total card data capacity by reading four, 12 x 20 bit zones (two zones each end of card). Model 950: Reads total 960 bit card simultaneously.

SWITCH CONTACT CONFIGURATION: Standard: Form A — SPST normally open. Form B — SPST normally closed. Form C — SPDT non-shorting. Form D — STDT shorting. Each of the standard configurations available on any bit within the programmer. Special switching per customer specifications.

SWITCH CONTACTS: Silver alloy, double-action, self-cleaning. Contact-to-contact resistance 0.003 to 0.015 ohms. Excellent dry circuit characteristics.

SWITCH CONTACT ELECTRICAL RATING: (Resistance load). Break 2 amperes at 28 Vdc; break 1 ampere at 110 Vac; and continuously carry 5 amperes.

PROGRAMMER ACTUATION: Model 240P and Model 960P are available motor driven only.

MOUNTING: Bench (horizontal) or rack (vertical) 10″ W, 15″ H, 13″ D.

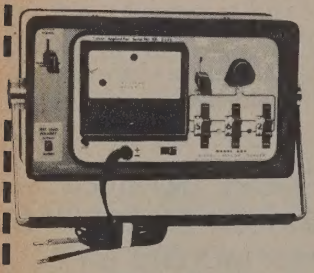
NEMA ENCLOSURE: 14″ D, 7¾″ W, 13″ H.

SPECIALS: to customer specifications.

W R E

DIGITAL SCALER INSTRUMENTATION

- ★ 3 significant figure in-line digital presentation
- ★ Within 1% of indicated value on all measurements
- ★ Passive solid state circuitry for long term stability
- ★ Automatic, fail-safe resettable protection system
- ★ Rugged, militarized, self-contained portables



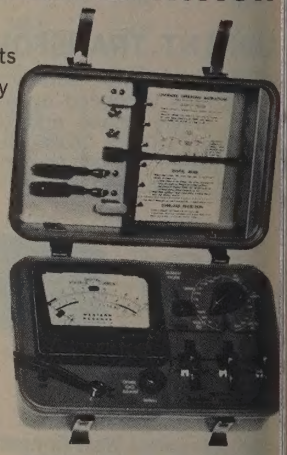
MODEL 320, IN BENCH CASE

DIGITAL TRUE RMS

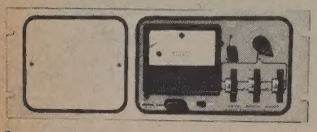
Model 320 . . . Precise digital readout of the RMS value of complex waveforms containing both AC and DC components and with crest factors as great as 10 to 1. Accurate to within 1% of indicated value from 100 mv to 1000V. Freq. Resp.: 20 Hz to 100 kHz.
(Shown in bench case) Supplied in fiberglass lab case 10″ x 6½″ x 3¼″, 4½ lbs. net.

DIGITAL MULTIMETER

Model 300 . . . 3 figure digital. All readings within 1% of indicated. AC or DC voltage: 100 mv to 1000V; response 10 Hz to 100 kHz calibrated in RMS value of sine wave. DC current: 10 μA to 10 A. Resistance 1Ω to 1 MΩ (wheatstone bridge with direct digital readout). Resettable overload protection system. Supplied in waterproof, fiberglass case 10″ x 7¼″ x 4¾″, 6¾ lbs. net. Model 300M (Militarized) for use in extreme environments.



MODEL 300, IN FIELD CASE



MODEL 310, IN RACK MOUNT

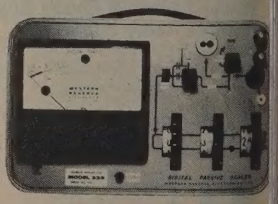
DIGITAL DC VOLTMETER

Model 310 . . . Readability, repeatability and within 1% of accuracy of actual readout — at a price of conventional analogs.
3 significant figure indication 100 mv to 1000V DC. (Shown in 19″ rack panel) supplied in fiberglass lab case, 3¾ lbs.
Model 311 available same except overload protection non-resettable.

Adapters available for DC & AC current and transistor testing.

TRANSMISSION LEVEL (dbm) *METER*

Model 332 . . . For measuring and setting transmission level. Direct reading in dbm for 600 and 900 ohm sources. (0 dbm = 1 milliwatt) 3 digit readout of —20.0 to +20.0 dbm, within ±0.1 db. Range to —35 dbm analog. Freq. response: 10 Hz to 100 kHz. RMS responding. Fail safe resettable overload protection. Fiberglass lab case shown, 10″ x 6½″ x 3¼″.



MODEL 332, IN LAB CASE

WESTERN RESERVE ELECTRONICS, INC
12430 Euclid Avenue • Cleveland, Ohio 44106 • (216) 791-511

See YELLOW SECTION for Local Offices, Phones

Nickel-Cadmium and Silver-Zinc Battery Charger/Analyzer Systems

W R E

MODEL 1575 *Nickel-Cadmium System*

This battery charger-analyzer concept is thoroughly design tested as a system to provide maximum efficiency in programmed maintenance of nickel-cadmium batteries.

Required sequence of events is unitized in a functional package to increase work flow efficiency with minimum equipment. Since all units can function simultaneously, single system has capacity for 3 batteries at a time; i.e., one discharging, one charging, and one under evaluation.

Exhaustive tests have proven this system to assure a full charge — safely! . . . and provide cell restandardization in the process.

Deep discharge of each cell assures total emptying of battery safely — with all cells to "zero". This standardizing effect assures a zero-base for each cell.

150% ampere-hour charge at precise prescribed rate assures "total-fill" of the battery.

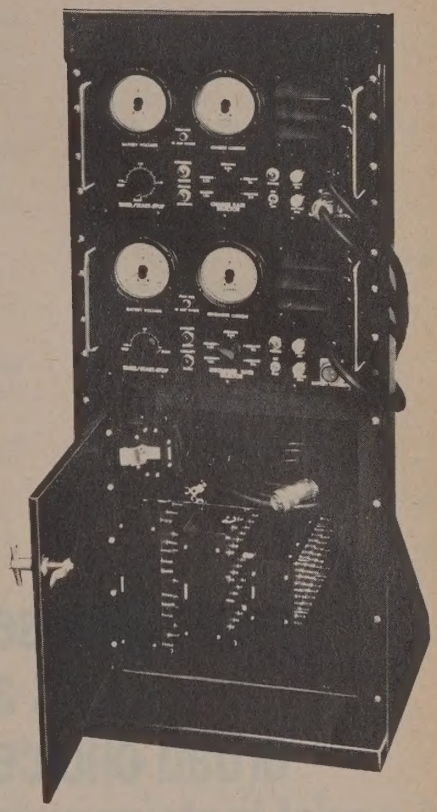
Evaluation cycle "pulls" 100% of battery rated capacity in 2 hours. Analyzer automatically cuts off at either of 2 points . . . at preset voltage point, or at 2 hours . . . and "holds" the result.

ANALYZER, MODEL 1000 — Discharge Rate: 5 preselectable discharge current ranges: 1.8, 2.5, 5.5, 11, 17 amperes. Discharge Time: 0-2 hours, ±5%. Cut-off Voltage: Internally adjustable, 17-20 volts. Indicators: "Capacity Accept", "Capacity Reject", "Power On". Meters: 250°, 4½", ruggedized. Voltmeter: 0-40 volts. Ammeter: 2-range; 0-10, 0-20 amperes. Circuit: Solid state power switching. Physical: 19" W., 10½" H., 11" D., 33 lbs. Rugged, portable, rack mountable, drip-proof construction. Cooling is forced air.

CHARGER, MODEL 1500 — Charge Current: 5 preselectable ranges: 1.8, 2.5, 5.5, 11, 17 amperes, ±3%. Charge Time: 0-3 hours ±5%. Meters: 250°, 4½", ruggedized. Voltmeter: 0-40 volts. Ammeter: 2-range; 0-10, 0-20 amperes, Overload Protection: Charge terminates if output voltage rises above 33V on all ranges (except 2.5A range — 34.5V). Indicators: "Power On", "Charge Complete", "Abnormal Charge". Circuit: Solid state. Physical: 19" W., 10½" H., 11" D., 72 lbs. Rugged, portable, rack mountable, drip-proof. Cooling is forced air.

Popular discharge fixtures for fixed resistive load to each cell at the C/2 rate, and MA and MS type battery cables are available from stock. Other fixtures are available on special order.

Specifications subject to change without notice.



Overall system, rack and cabinet, is approximately 22" W., 4' H., 12" D., 192 lbs. and is of strong steel construction with drip-proof finish. Discharge fixtures and cables fit neatly into the compartmentized storage cabinet.

MODEL 1525 *Silver-Zinc Battery Charger*

Also charges Nickel-Cadmium, Silver-Cadmium, and Lead-Acid Types

The Model 1525 is a portable, 3-channel battery charger that meets the most stringent requirements for charging Silver-Zinc batteries (such as BB-451/U types).

The unit is designed with modular plug-in circuits and features a precision, solid state electronic control that permits front-panel programming of cut-off voltages in one-tenth volt steps, from 0.0 to 36.0 volts. This programming extends the capabilities so that the equipment may be used for charging Silver-Cadmium, Nickel-Cadmium or Lead-Acid battery types.

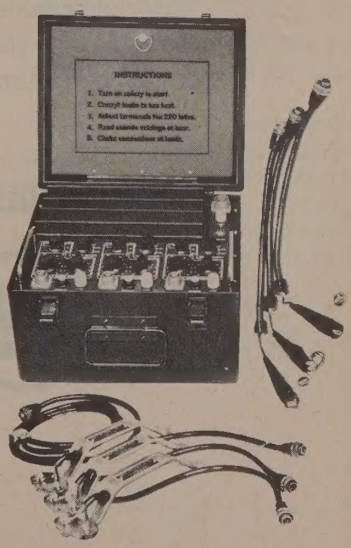
Each of the 3 channels may be used independently at currents of 1.0 or 2.25 amperes, or connected in parallel to provide up to nine different currents (up to 6.75 amperes).

Fail-safe charging indication is provided via internal sensing circuitry which assures that the programmed charging current is flowing when the charging lamp is lighted. The system automatically prevents damage to batteries or charger due to operator error.

Single cell charge capability permits charge equalizing of a battery. The 1525 is thoroughly militarized . . . including R.F.I. suppression.

Accessories furnished include 3 special charging handles for BB-451/U Silver-Zincs, and universal charging cables for other batteries. Cables, line cord and instruction manual are neatly stored in the case lid. Self-contained, water tight portable case; 13⅝" W., 11" H., 11½" D., 38 pounds net.

Specifications subject to change without notice.



WESTERN RESERVE ELECTRONICS, Inc.

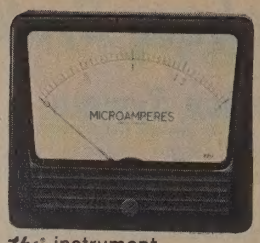
12430 Euclid Avenue • Cleveland, Ohio 44106 (216) 791-5112

Westinghouse offers a broad choice of panel instruments

Available through your local Westinghouse distributor. For a full listing of ratings and prices, ask for the descriptive bulletins and price lists shown for each instrument.

J-43012

You can be sure... if it's **Westinghouse**

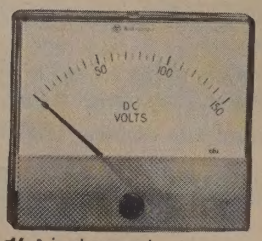


tbz® instrument

Foundation Line

Premium instruments for quality test or i strumentation equipment. Always custo built to meet a specific need. Sizes, 4½ ar 5½ inches. Taut-band suspension. D-c: microamps to 20 amps, voltmeters to 6 volts, self-contained. Accuracy and trackir to ½%. A-c rectifier: 5 microamps to milliamps, voltmeters 200,000 ohms per vo Transducer combinations listed at botto of page.

Descriptive Bulletin 43-370 Price List 43-3



tbz® instrument

20/20 Custom Line, Surface Mounted

Taut-band suspension instruments priced be generally competitive with quality pivo and-jewel instruments. Accuracy, 2%. Size 2½, 3½, 4½ and 5½ inches. Most rating carried in stock. D-c: 50 microamps to 5 amps, 20 millivolts to 800 volts. A-c rectifie 80 microamps to 20 milliamps, 3 to 800 volt A-c moving iron: 5 milliamps to 50 amps, 1. to 600 volts. Transducer combinations ar listed at bottom of page.

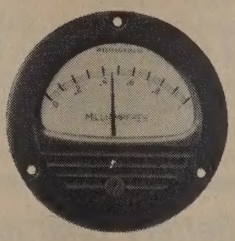
Descriptive Bulletin 43-320 Price List 43-30

tbz® instrument

Rear-of-panel Mounting

Foundation or 20/20 instruments are avai able with rear-of-panel mounting kits, wit or without illumination.

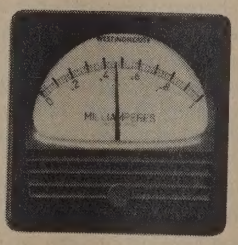
Descriptive Bulletins 43-320 and 43-370 Price List 43-30



Conventional Round

USA standard dimensions. Conventiona pivot-and-jewel mechanisms. Sizes, 3½ an 4½ inches. D-c: 20 microamps to 50 amps 50 millivolts to 800 volts. A-c rectifier: 10 amps to 10 milliamps, 0.5 to 600 volts. A-c moving iron: 5 milliamps to 50 amps, 1.5 t 800 volts. Radio frequency: 10 milliamps t 20 amps a.c. Transducer combinations are listed at bottom of page.

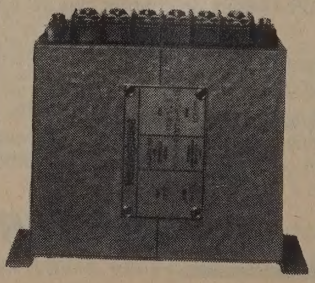
Descriptive Bulletin 43-350 Price List 43-30



Conventional Rectangular

USA standard dimensions. Conventional pivot-and-jewel mechanisms. Sizes, 3½ and 4½ inches. D-c: 20 microamps to 50 amps, 50 millivolts to 800 volts. A-c rectifier: 100 amps to 10 milliamps, 0.5 to 600 volts. A-c moving iron: 5 milliamps to 50 amps, 1.5 to 800 volts. Radio frequency: 10 milliamps to 20 amps a.c. Transducer combinations are listed at bottom of page.

Descriptive Bulletin 43-350 Price List 43-300



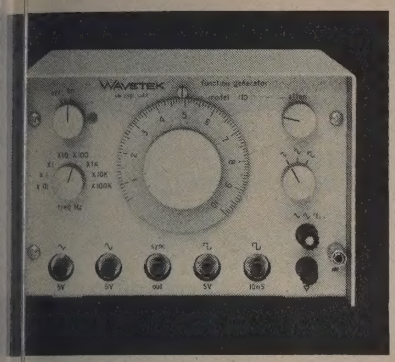
Panel Instrument Transducers

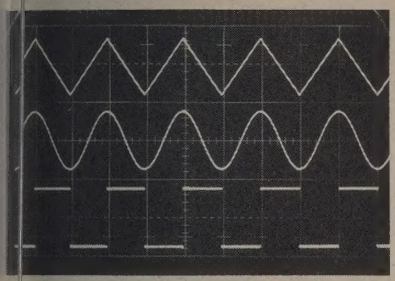
Combine with any panel instruments to read watts, vars, frequency, power factor, rms voltage, rms current, expanded voltage, speed or temperature. Standard frequencies, 60 and 400 Hz. Accuracy, 1%. Outputs compatible with characteristics of panel instruments.

Descriptive Bulletin 43-861 Price List 43-860

Model 110 Function Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Wavetek Model 110 Function Generator is a calibrated, high-purity source of sine, square and triangle waveforms. It is an all transistorized unit featuring complete plug-in printed circuit board construction, utilizing silicon semiconductors throughout. The Model 110 provides six simultaneous outputs over a dynamic frequency range of 0.005 Hz to 1 MHz. All outputs may be shorted simultaneously and the generator will continue to oscillate internally with less than 0.5% change in frequency. Its rugged construction, compact size and precision operating characteristics make the Model 110 a portable laboratory of test signals in one economical package.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧ and sync pulse.

Dynamic Frequency

0.005 Hz to 1 MHz (3.3 min. to 1 μsec).

Ranges

.01 = 0.005 Hz to 0.1 Hz
.1 = 0.05 Hz to 1 Hz
1.0 = 0.5 Hz to 10 Hz
10 = 5 Hz to 100 Hz
100 = 50 Hz to 1 kHz
1K = 500 Hz to 10 kHz
10K = 5 kHz to 100 kHz
100K = 50 kHz to 1 MHz

Six Simultaneous Outputs

∿, ⊓ or ∧ selectable with variable amplitude. Specs apply from 10% to 100% of max. amplitude setting.

50-Ω output impedance (600-Ω output impedance available by removing one jumper wire, with corresponding decrease in output amplitude).
30 V p-p max into 600-Ω load.
10 V p-p max into 50-Ω load.
Short circuit output current ±100 mA.
Model 110B: 5 V p-p into open circuit, 600-Ω output impedance.

2. ⊓ 1 V p-p.
3. ⊓ 5 V p-p.
4. ∿ 5 V p-p.
5. ∧ 5 V p-p.
6. Sync pulse: At least −10 V into open circuit; less than 5 μsec duration.

Note: Outputs 2 through 5 are 500-Ω output impedance. Output voltage stated is into open circuit.

HORIZONTAL PRECISION

Dial Accuracy

±1% of full scale to 100 kHz.
±2% of full scale 100 kHz to 1 MHz.

Note: Dial is a high-quality composition pot, allowing true continuously variable frequency control.

Frequency Stability

Short term: Drift less than ±0.05% of setting for 10 min.
Long term: Drift less than ±0.25% of setting for 24 hr.
No critical components requiring internal oven.

Jitter

±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response

Amplitude change with frequency less than 0.1 db 0.005 Hz to 100 kHz and 0.5 db 100 kHz to 1 MHz.

Peak-to-Peak Voltage Accuracy

±1% for outputs 3, 4 and 5.
±1% for output 1 at 30 V out.
±10% for output 2.

Amplitude Stability

Short term: ±0.05% of max p-p values for 10 min.
Long term: ±0.25% of max p-p values for 24 hr.

Symmetry

All waveforms are symmetrical about ground within ±1% of max p-p amplitude (zero adjust rear-panel control provided for output 1).

DC Offset Stability

Short term: ±0.05% of max p-p amplitude for 10 min.
Long term: ±0.25% of max p-p amplitude for 24 hr.

PURITY

Sine Wave Distortion

Less than:
0.5% 0.005 Hz to 10 kHz.
1.0% 10 kHz to 100 kHz.
2.0% 100 kHz to 600 kHz.
3.0% 600 kHz to 1 MHz.

Triangle Linearity

Greater than:
99% 0.005 Hz to 100 KHz.
95% 100 kHz to 1 MHz.

Square Wave Rise and Fall Time

Less than 10 nsec, output 2.
Less than 15 nsec, output 3.
Less than 100 nsec, output 1.

Total Aberrations

Less than 5% (overshoot, preshoot, etc.) when properly terminated.

Tilt

Less than 0.5%.

Time Symmetry (All Waveforms)

99.5% 0.005 Hz to 100 kHz.
99% 100 kHz to 1 MHz.

ENVIRONMENTAL

Temperature

All specifications listed, except stability, are for 25°C ±5°C.
For operation from 0°C to 55°C, derate all specifications by a factor of 2.

MECHANICAL

Dimensions

Model 110: 7¾ in. w, 5¼ in. h, 7½ in. d.
Model 110B: 7¾ in. w, 5¼ in. h, 11½ in. d.

Weight

7 lb net, 10 lb shipping.

Color

Clear anodized aluminum.

Controls

On-off power switch, frequency range switch, frequency dial, function selector switch, amplitude attenuator. Rear dc zero adjustment, 110; charge rate adjustment, 110B. All-silicon semiconductors, modular plug-in construction.

Power

Model 110: 105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 10 watts.
Model 110B: dc rechargeable ni-cad batteries provided with built-in charger. Fifteen hours of operation on batteries for every 16 hours of charge; simultaneous operation and charge. 105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 15 W.

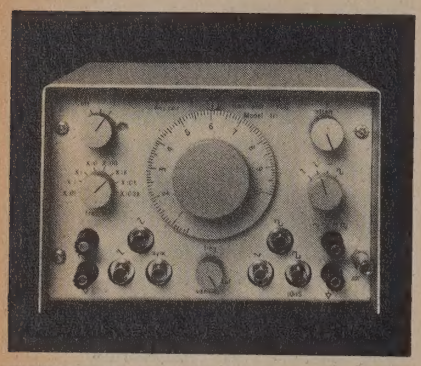
ORDER INFORMATION

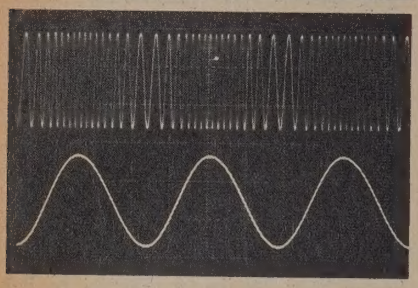
Prices (F.O.B. San Diego)

Model 110, $445 Model 110B, $545

Model 111 VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2





The Model 111 VCG is a precision source of sine, square, triangle and ramp waveforms. It offers control of frequency by external voltage—either dc programming or wideband ac frequency modulation. The instantaneous frequency of these waveforms is determined by the combination of the dial setting and the externally applied voltage. The VCG input is in parallel with the frequency dial. Set the dial at mid-frequency and increase the frequency with positive voltage or decrease it with negative voltage. Set the dial at the lowest point and increase frequency with positive voltage. Set the dial at the highest point and decrease frequency with negative voltage. Actually, the Model 111 VCG is a portable oscillator, square-wave generator, FM modulator, frequency shift keyer and sweep generator—all in one economical package.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, ramp ⟋, and sync pulse.

Dynamic Frequency

0.0015 Hz to 1 MHz (10 min to 1 μsec). In 8 ranges X.3 range multiplier.

Seven Simultaneous Outputs

1. ∿, ⊓, ∧ or ⟋ selectable with variable amplitude. Specs apply from 10% to 100% of max amplitude setting.
   50-Ω output impedance. (600-Ω output impedance available by removing one jumper wire, with corresponding decrease in output amplitude.)
   30 V p-p max (15 V⟋) into 600-Ω load. 10 V p-p max (5 V⟋) into 50-Ω load. Short circuit output current ±100 mA.
   Model 111B: 5 V p-p into open circuit, 600-Ω output impedance.
2. ⊓ 1 V p-p.
3. ⊓ 5 V p-p.
4. ∿ 5 V p-p.
5. ∧ 5 V p-p.
6. ⟍ 0 V to −2.5 V ramp; 50% duty cycle.
7. Sync pulse: At least −10 V into open circuit; less than 5 μsec duration.

Note: Outputs 2 thru 6 are 50-Ω output impedance. Output voltage stated is into open circuit.

VCG — Voltage-Controlled Generator

Over 20:1 frequency ratio (selectable in ranges of 3:1, allowing excellent range overlap). 4.75 V input for 20:1 frequency ratio (0.5 V per major dial division ±1%). Input impedance 10 kΩ.

HORIZONTAL PRECISION

Dial Accuracy

±1% of full scale to 100 kHz.
±2% of full scale 100 kHz to 1 MHz.

Electronic Frequency Vernier

One turn for one minor dial division.

Typical VCG Linearity

±0.1% frequency vs input voltage (frequency error 0.1% of total deviation—best straight-line method). 0.0015 Hz to 100 kHz generated frequency. From 10% to 100% of max dial frequency.

VCG Bandwidth

100 kHz.

Frequency Stability

Short term: Drift less than ±0.05% of setting for 10 min.
Long term: Drift less than ±0.25% of setting for 24 hr.

Jitter

±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response

Amplitude change with frequency less than 0.1 db 0.0015 Hz to 100 kHz and 0.5 db 100 kHz to 1 MHz.

Peak-to-Peak Voltage Accuracy

±1% for outputs 3 through 6.
±1% for output 1 at 30 V out.
±10% for output 2.

Amplitude Stability

Short term: ±0.05% of max p-p values for 10 min.
Long term: ±0.25% of max p-p values for 24 hr.

Symmetry

All waveforms, except ramp, are symmetrical about ground within ±1% of max p-p amplitude (zero adjust rear-panel control provided for output 1).

DC Offset Stability

Short term: ±0.05% of max p-p am tude for 10 min.
Long term: ±0.25% of max p-p am tude for 24 hr.

PURITY

Sine Wave Distortion

Less than:
0.5% 0.0015 Hz to 10 kHz.
1.0% 10 kHz to 100 kHz.
2.0% 100 kHz to 600 kHz.
3.0% 600 kHz to 1 MHz.

Triangle and Ramp Linearity

Greater than:
99% 0.0015 Hz to 100 kHz.
95% 100 kHz to 1 MHz.

Ramp Fall Time

Less than 250 nsec.

Square Wave Rise and Fall Time

Less than 10 nsec, output 2.
Less than 15 nsec, output 3.
Less than 100 nsec, output 1.

Total Aberrations

Less than 5% (overshoot, presho etc.) when properly terminated.

Tilt

Less than 0.5%.

Time Symmetry (All Waveforms)

99.5% 0.0015 Hz to 100 kHz.
99% 100 kHz to 1 MHz.

ENVIRONMENTAL

Temperature

All specifications listed, except stat ity, are for 25°C ±5°C.

MECHANICAL

Dimensions

Model 111: 7¾ in. w, 5¼ in. h, 7½ in. d.
Model 111B: 7¾ in. w, 5¼ in. h, 11½ in. d.

Weight

7 lb, 10 lb shipping.

Controls

Off-X.3-X1 power/dial multiplier switc frequency range switch, frequency di frequency vernier, function select switch, amplitude attenuator. Rear zero adjustment, 111; charge rate a justment, 111B.

Power

Model 111: 105 V to 125 V or 200 V 250 V, 50 Hz to 400 Hz. Less th 10 W.
Model 111B: dc rechargeable ni-ca batteries provided with built-in charge Ten hours of operation on batteries f every 16 hours of charge; simultaneou operation and charge. 105 V to 125 V 200 V to 250 V, 50 Hz to 400 Hz. Les than 15 W.

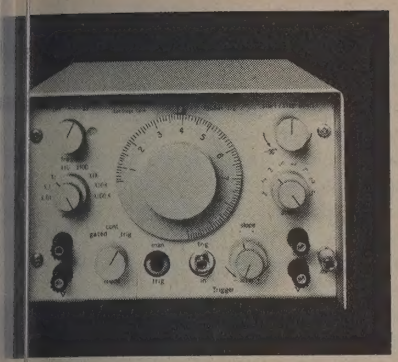
ORDER INFORMATION

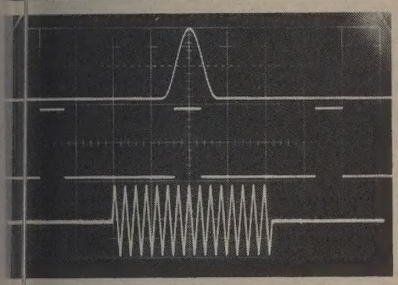
Prices (F.O.B. San Diego)

Model 111, $545 Model 111B, $64

Model 112 Triggered VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Model 112 Triggered VCG offers precision control of frequency by external voltage—either dc programming or wideband ac frequency modulation. It also triggers from a manual front-panel control or from an external pulse or gate. One cycle is generated on command. If a gate signal is applied, the generator will operate until the gate is removed. The trigger start-stop point is adjustable over 360°. Trigger level and polarity may be selected from front-panel control. The Model 112 generates sine, square, triangle and ramp waves simultaneously in fixed-phase relationships. The frequency of these waveforms is determined by the combination of the dial setting and the externally applied voltage. The VCG input is in parallel with the frequency dial. The Model 112 Triggered VCG is a portable oscillator, square-wave generator, FM modulator, frequency shift keyer, sweep generator, and tone-burst generator. The Model 112 is a versatile, general-purpose instruments for laboratory and field use.

VERSATILITY

Waveforms
Sine ∿, square ⊓, triangle ∧, ramp ⟋, and sync pulse.

Dynamic Frequency
0.0015 Hz to 1 MHz (10 min to 1 μsec). With 8 ranges X.3 range multiplier.

Nine Simultaneous Outputs
∿, ∩, ⊓, ⊔, ∧, ⋀, ⟋ or ⟍ selectable with variable amplitude.
30 V p-p max (15 V⟋) into 600-Ω load.
10 V p-p max (5 V⟋) into 50-Ω load. Short circuit output current ±100 mA.
Model 112B: 5 V p-p into open circuit, 600-Ω output impedance.

2. ⊓ 1 V p-p.
3. ⊓ 5 V p-p.
4. ∩ 5 V p-p.
5. ∧ 5 V p-p.
6. ⟍ 0 V to −2.5 V ramp; 50% duty cycle.
7. ∩, ⊔, ⋀, or ⟋ selectable. 5 V p-p differential output 180° out-of-phase with outputs 2 through 6.
8. ∿ 2.5 V p-p offset +1.25 V.
9. Sync pulse: At least −10 V into open circuit; less than 5 μsec duration.

Note: Outputs 2 thru 7 are 50-Ω output impedance. Output voltage stated is into open circuit.

Trigger
Input impedance is 10 kΩ.
Trigger mode: Manual or external voltage of ±0.5 V will generate one cycle.
Gated mode: Discrete number of cycles may be generated by application of ±0.5 V gate.
Up to 100 V may be applied without damage to input circuitry.
Trigger level and slope are adjustable by front-panel controls. (These controls are similar to trigger adjustments of an oscilloscope.)
The start-stop point of the generated waveform is adjustable through 360°. Haversine is available by adjusting trigger start control to the −90° position and using offset sine wave output 8.

VCG—Voltage-Controlled Generator
Over 20:1 frequency ratio (selectable in ranges of 3:1, allowing excellent range overlap). 4.75 V input for 20:1 frequency ratio (0.5 V per major dial division ±1%). Input impedance 10 kΩ.

Stability*
Short term: ±0.05% for 10 min.
Long term: ±0.25% for 24 hr.
*Percentages apply to amplitude, frequency and dc offset.

HORIZONTAL PRECISION

Dial Accuracy
±1% of full scale to 100 kHz.
±2% of full scale to 1 MHz.

Electronic Frequency Vernier
One turn for one minor dial division.

Typical VCG Linearity
±0.1% frequency vs input voltage (frequency error 0.1% of total deviation—best straight-line method). 0.0015 Hz to 100 kHz generated frequency. From 10% to 100% of max dial frequency.

VCG Bandwidth
100 kHz.

Jitter
±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response
Amplitude change with frequency less than 0.1 db 0.0015 Hz to 100 kHz and 0.5 db 100 kHz to 1 MHz.

Peak-to-Peak Voltage Accuracy
±1% for outputs 3 through 7.
±1% for output 1 at 30 V out.
±10% for output 2.

Symmetry
All waveforms, except offset sine and ramp, are symmetrical about ground within ±1% of max p-p amplitude (zero adjust rear-panel control provided for output 1).

PURITY

Sine Wave Distortion
Less than:
0.5% 0.0015 Hz to 10 kHz.
1.0% 10 kHz to 100 kHz.
2.0% 100 kHz to 600 kHz.
3.0% 600 kHz to 1 MHz.

Triangle and Ramp Linearity
Greater than:
99% 0.0015 Hz to 100 kHz.
95% 100 kHz to 1 MHz.

Ramp Fall Time
Less than 250 nsec.

Square Wave Rise and Fall Time
Less than 10 nsec, output 2.
Less than 15 nsec, output 3.
Less than 100 nsec, output 1.

Total Aberrations
Less than 5% (overshoot, preshoot, etc.) when properly terminated.

Tilt
Less than 0.5%.

Time Symmetry (All Waveforms)
99.5% 0.0015 Hz to 100 kHz.
99% 100 kHz to 1 MHz.

ENVIRONMENTAL

Temperature
All specifications listed, except stability, are for 25°C ±5°C.

MECHANICAL

Dimensions
7¾ in. w, 5¼ in. h, 11½ in. d.

Weight
10 lb, 15 lb shipping.

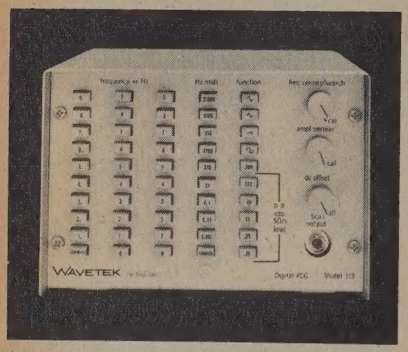
Power
Model 112: 105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 10 W. Ni-cad battery unit available.

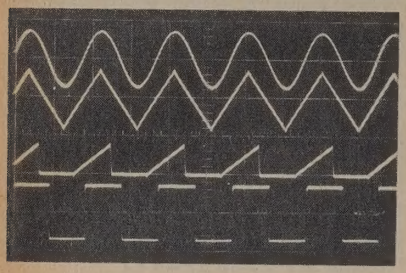
ORDER INFORMATION

Prices (F.O.B. San Diego)
Model 112, $695 Model 112B, $795

Model 113 Digital VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Model 113 Digital VCG is a precision source of sine, square, triangle and ramp waveforms. It offers pushbutton control of frequency, function and amplitude, plus voltage control of frequency by external input — either dc programming or wideband ac frequency modulation.

The amplitude is controlled by a precision 50-Ω attenuator that offers 10 db steps from 0.1 volt to 10 volts peak-to-peak. Both frequency and amplitude also may be controlled by vernier controls that allow overlap between the digitally selected values. Resolutions of the frequency vernier allows 4-digit control. Frequency pushbuttons may be switched over to a 1-turn control for frequency search.

A special pushbutton position is provided to give 30 volt peak-to-peak output with a vernier control. All waveforms are available by selection on the front panel output. Fixed amplitude outputs of each waveform also are available on the rear panel.

The Model 113 Digital VCG is a portable source of stimuli for laboratory or field use allowing ease of selection, accuracy and repeatability.

VERSATILITY

Waveforms
Sine ∿, square ⊓, triangle ∧, and ramp ⟋.

Dynamic Frequency
0.001 Hz to 1 MHz (15 min. to 1 μsec.)

Ranges
X.001 = 0.001 Hz to 0.01 Hz
X0.1 = 0.1 Hz to 1 Hz
X1.0 = 1 Hz to 10 Hz
X10 = 10 Hz to 100 Hz
X100 = 100 Hz to 1 kHz
X1K = 1 kHz to 10 kHz
X10K = 10 kHz to 100 kHz
X100K = 100 kHz to 1 MHz

Five Simultaneous Outputs
1. ∿, ⊓, ∧, or ⟋, 30 V p-p max into 600-Ω load (15 V⟋). precision attenuator providing 0.1, 0.3, 1, 3 and 10 V p-p into 50-Ω load with continuous vernier. Short circuit output current ±100 mA.
2. ⊓ 5 V p-p.
3. ∿ 5 V p-p.
4. ∧ 5 V p-p.
5. ⟍ 0 V to −2.5 V ramp; 50% duty cycle.

Note: Outputs 2 through 5 are 500-Ω output impedance. Output voltage stated is into open circuit.

VCG—Voltage-Controlled Generator
0.5 V input for frequency change of first significant digit (±1%). Up to 100:1 frequency ratio. Input impedance 10 kΩ.

HORIZONTAL PRECISION

Frequency Accuracy
1% of selected frequency, 0.001 Hz to 100 kHz.
2% of selected frequency, 100 kHz to 1 MHz.

Typical VCG Linearity
±0.1% frequency vs. input voltage (frequency error 0.1% of total deviation—best straight-line method) 0.001 Hz to 100 kHz generated frequency.

VCG Bandwidth
100 kHz.

Frequency Stability
Short term: Drift less than ±0.05% of setting for 10 min.
Long term: Drift less than ±0.25% of setting for 24 hrs.
No critical components requiring internal oven.

Jitter
±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response
Amplitude change with frequency less than 0.1 db, 0.001 Hz to 100 kHz and 0.5 db, 100 kHz to 1 MHz.

Peak-to-Peak Voltage Accuracy
±1% of selected output. 0.1 V to 10 V p-p into precision 50-Ω load.
±1% for outputs 2 through 5.

Amplitude Stability
Short term: ±0.05% of max p-p values for 10 min.
Long term: ±0.25% of max p-p values for 24 hrs.

Symmetry
All waveforms, except ramp, are symmetrical about ground within ±1% of max p-p amplitude (zero adjust rear panel control provided for output 1).

DC Offset Control
Front panel vernier may be switched in for up to ±5 V dc offset on output 1; dc offset plus ac signal limited to ±15 V peak.

DC Offset Stability
Short term: ±0.05% of max p-p amplitude for 10 min.
Long term: ±0.25% of max p-p amplitude for 24 hrs.

PURITY

Sine Wave Distortion
Less than:
0.5% 0.001 Hz to 10 kHz.
1.0% 10 kHz to 100 kHz.
2.0% 100 kHz to 600 kHz.
3.0% 600 kHz to 1 MHz.

Triangle and Ramp Linearity
Greater than:
99% 0.001 Hz to 100 kHz.
95% 100 kHz to 1 MHz.

Ramp Fall Time
Less than 250 nsec.

Square Wave Rise and Fall Time
Less than 10 nsec, output 2.
Less than 100 nsec, output 1.

Total Aberrations
Less than 5% (overshoot, preshoot, etc.) when properly terminated.

Tilt
Less than 0.5%.

Time Symmetry (All Waveforms)
99.5% 0.001 Hz to 100 kHz.
99% 100 kHz to 1 MHz.

ENVIRONMENTAL

Temperature
All specifications listed, except stability, are for 25°C ±5°C. For operation from 0°C to 55°C, derate all specifications by a factor of 2.

MECHANICAL

Dimensions
7¾ in. w, 5¼ in. h, 11½ in. d.

Weight
7 lb, 10 lb shipping.

Color
Clear anodized aluminum.

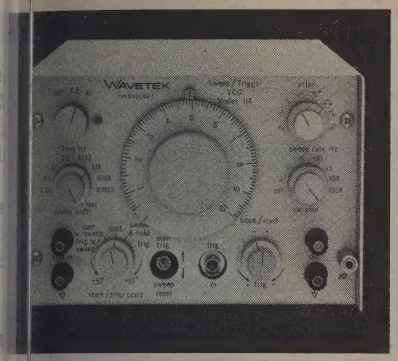
Power
105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 10 W

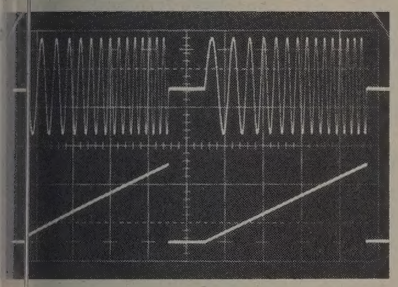
ORDER INFORMATION

Price (F.O.B. San Diego)
Model 113, $795

Model 114 Sweep–Trigger VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Model 114 is two independent generators in a single compact unit. The first generator is a precision source of sine, square and triangle waveforms. The second is a ramp generator for sweeping the frequency of the first. Both generators may be operated continuously or triggered with independent frequency control. In the triggered mode, the start-stop point may be continuously varied through 360°. Also, sine² pulses are available from the offset sine output in the triggered mode. A unique feature of the Model 114 is the sweep-and-hold mode which allows static setting of both start and stop frequency. In addition to internal sweep control, terminals are provided for external voltage control of frequency (VCG) — either dc programming or wideband ac frequency modulation. The Model 114 Sweep-Trigger VCG is a portable oscillator, square-wave generator, FM modulator, frequency shift keyer, sweep generator and tone-burst generator. The Model 114 is a versatile, general-purpose instrument for both laboratory and field use.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, offset sine ∿₀, and sync pulse.

Dynamic Frequency

0.0015 Hz to 1 MHz (10 min to 1 μsec).

Nine Simultaneous Outputs

∿, ∩, ⊓, ⊔, ∧, ∩̸, ∿₀, or ∩°̸ selectable with variable amplitude. Specs apply from 10% to 100% of max amplitude setting.

50-Ω output impedance.

30 V p-p max (15 V ∿₀) into 600-Ω load. 10 V p-p max (5 V ∿₀) into 50-Ω load. Short circuit output current ±100 mA.

Model 114B: 5 V p-p into open circuit, 600-Ω output impedance.

2. ⊓ 1 V p-p.
3. ⊓ 5 V p-p.
4. ∿ 5 V p-p.
5. ∧ 5 V p-p.
6. ∩°̸ 2.5 V p-p offset −1.25 V.
7. ∿, ⊓, ∧, or ∿₀ selectable. 5 V p-p differential output 180° out-of-phase with outputs 2 through 6.
8. Sweep monitor (output of sweep generator), 2.5 V nominal.
9. Sync pulse: At least −10 V into open circuit; less than 5 μsec duration.

Note: Outputs 2 thru 7 are 50-Ω output impedance. Output voltage stated is into open circuit.

OPERATIONAL MODES

Continuous Mode—Operates as a standard VCG. Frequency determined by dial/range settings parallel with VCG input.

Trigger Mode—One complete cycle is generated by activating the manual trigger or applying a pulse or gate to the trigger input.

Sweep and Hold Mode—Generator runs at the selected frequency until triggered by the manual trigger or external pulse. When thus activated, the unit sweeps to a new frequency determined by the sweep-width control and holds this frequency until manually reset.

Continuous with Sweep Mode—Main generator continuously swept from frequency selected by main dial to upper frequency selected by width control.

Trigger with Sweep Mode—No output is generated until manual trigger is activated or trigger input is applied. The unit starts at the frequency selected by the dial and range settings and sweeps to a frequency controlled by the sweep-width control. The generator stops oscillating at this point and will not restart until triggered again. Tone-burst operation may be obtained in this mode by setting the sweep-width control to zero; the number of cycles generated for each trigger applied is determined by sweep-rate controls.

Trigger Controls

Input impedance is 10 kΩ. Input voltage is ±0.5 V to ±100 V. Trigger level and slope are adjustable by front-panel controls. Start-stop point of the waveform is adjustable through 360°.

Sweep Controls

Sweep width is adjustable from 0 to 100:1.

VCG — Voltage-Controlled Generator

Over 20:1 frequency ratio (selectable in ranges of 3:1, allowing excellent range overlap). 4.75 V input for 20:1 frequency ratio (0.5 V per major dial division ±1%). Input impedance to kΩ.

STABILITY*

Short term: ±0.05% for 10 min.
Long term: ±0.25% for 24 hr.

*Percentages apply to amplitude, frequency and dc offset.

HORIZONTAL PRECISION

Dial Accuracy

±1% of full scale to 100 kHz.
±2% of full scale 100 kHz to 1 MHz.

Typical VCG Linearity

±0.1% frequency vs input voltage (frequency error 0.1% of total deviation—best straight-line method). 0.0015 Hz to 100 kHz generated frequency. From 10% to 100% of max dial frequency.

VCG Bandwidth—100 kHz.

Jitter

±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response

Amplitude change with frequency less than 0.1 db 0.0015 Hz to 100 kHz and 0.5 db 100 kHz to 1MHz.

PURITY

Sine Wave Distortion

Less than:
0.5% 0.0015 Hz to 10 kHz.
1.0% 10 kHz to 100 kHz.
2.0% 100 kHz to 600 kHz.
3.0% 600 kHz to 1 MHz.

Triangle Linearity

Greater than:
99% 0.0015 Hz to 100 kHz.
95% 100 kHz to 1 MHz.

Square Wave Rise and Fall Time

Less than 10 nsec, output 2.
Less than 15 nsec, output 3.
Less than 100 nsec, output 1.

Total Aberrations

Less than 5% (overshoot, preshoot, etc.) when properly terminated.

MECHANICAL

Dimensions

7¾ in. w, 5¼ in. h, 11½ in. d.

Weight

10 lb, 15 lb shipping.

Power

Model 114: 105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 10 W. Ni-cad battery unit available.

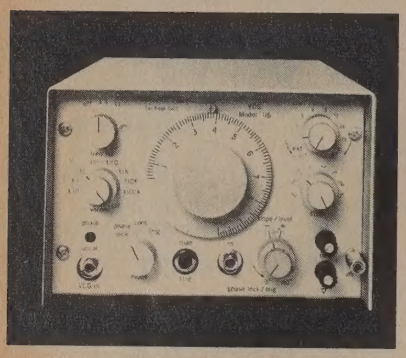
ORDER INFORMATION

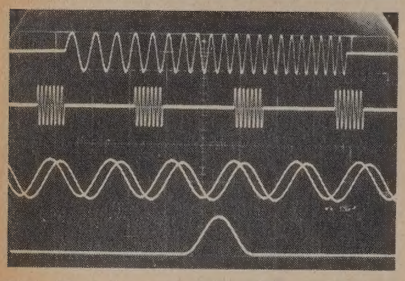
Prices (F.O.B. San Diego)

Model 114, $795 Model 114B, $895

Models 115 & 116 Trigger—Phase Lock VCGs

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-22
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-20





The Models 115 and 116 generators produce sine, square, triangle and ramp waveforms with trigger and phase-lock capabilities. In addition, the 116 provides tone burst operation giving discrete bursts of signal from 2 to 256 cycles in binary increments. The VCG feature offers precision control of frequency by external voltage, either dc programming or wide band ac frequency modulation. Trigger capability allows triggered or gated operation from an external pulse or gate and single cycle operation (or tone burst, Model 116) by manual push button. Phase-lock operation converts the generator to a slave unit where the frequency is locked to an external frequency input, such as a crystal or master system clock; the relative phase of the two sources is controllable over 360°. The combination of features in these compact portable instruments makes either one virtually indispensable for field or laboratory tests and design operations.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, ramp ⟋, and sync pulse.

Dynamic Frequency

0.0015 Hz to 1 MHz (10 min to 1 μsec).

Nine Simultaneous Outputs

1. ∿, ∩, ⊓, ⊓, ∧, ∩, ⟋ or ⟍ selectable with variable amplitudes. Specs apply from 10% to 100% of max amplitude setting. 50-Ω output impedance. 30 V p-p max (15 V⟋) into 600-Ω load. 10 V p-p max (5 V⟋) into 50-Ω load.

Models 115B and 116B: 5 V p-p into open circuit, 600-Ω output impedance.

2. ⊓ 1 V p-p.
3. ⊓ 5 V p-p.
4. ∿ 5 V p-p.
5. ∧ 5 V p-p.
6. ⟍ 0 V to −2.5 V ramp; 50% duty cycle.
7. ∿, ⊓, ∧, or ⟋ selectable. 5 V p-p differential output 180° out-of-phase with outputs 2 through 6.
8. ∿₀ 2.5 V p-p offset +1.25 V.
9. Sync pulse: At least −10 V into open circuit; less than 5 μsec duration.

Note: Outputs 2 thru 7 are 50-Ω output impedance. Output voltage stated is into open circuit.

VCG—Voltage-Controlled Generator

Over 20:1 frequency ratio (selectable in ranges of 3:1, allowing excellent range overlap). 4.75 V input for 20:1 frequency ratio (0.5 V per major dial division ±1%). Input impedance 10 kΩ.

Trigger

Input impedance is 10 kΩ.

Trigger mode: Manual or external voltage of ±0.5 V will generate one cycle.

Gated mode: Discrete number of cycles may be generated by application of +0.5 V gate.

Up to 100 V may be applied without damage to input circuitry.

Trigger level and slope are adjustable by front-panel controls.

The start-stop point of the generated waveform is adjustable through 360°. Haversine is available by adjusting trigger start control to the −90° position and using the offset sine-wave output 8.

Phase Lock

Frequency range is 10 Hz to 1 MHz.

Input impedance is 10 kΩ.

Input amplitude requirements are minimum 800 mV p-p to lock and 5 V p-p sine wave for specified accuracy.

An input of 100 V will not damage circuitry. Unit will frequency lock to any input within 10 to 1 of dial frequency and will be phase locked to the fundamental of the dial frequency within specified accuracy. Phase accuracy is ±10° from 10 Hz to 10 kHz.

Indicator "phase uncalibrated" light illuminates when selected phase relationship is exceeded. Unit will maintain frequency lock even when light is on.

Tone Burst (Model 116 only)

Tone burst may be generated automatically on command in the trigger mode. Selectable from a front-panel control, the unit will generate 1, 2, 4, 8, 16, 32, 64, 128 and 256 discrete cycles. The unit may be gated from an external voltage and a discrete number of cycles may be generated by selection of the proper gate length (see Trigger).

STABILITY*

Short term: ±0.05% for 10 min.

Long term: ±0.25% for 24 hr.

*Percentages apply to amplitude, frequency a dc offset.

HORIZONTAL PRECISION

Dial Accuracy

±1% of full scale to 100 kHz.

±2% of full scale 100 kHz to 1 MH

Typical VCG Linearity

±0.1% frequency vs input voltage (fr quency error 0.1% of total deviation- best straight-line method). 0.0015 H to 100 kHz generated frequency. Fro 10% to 100% of max dial frequency.

VCG Bandwidth

100 kHz.

Jitter

±0.025% cycle-to-cycle stability.

VERTICAL PRECISION

Frequency Response

Amplitude change with frequency les than 0.1 db 0.0015 Hz to 100 kHz an 0.5 db 100 kHz to 1 MHz.

PURITY

Sine Wave Distortion

Less than:

0.5% 0.0015 Hz to 10 kHz.

1.0% 10 kHz to 100 kHz.

2.0% 100 kHz to 600 kHz.

3.0% 600 kHz to 1 MHz.

Induced distortion due to phase lock operatio 1% 10 Hz to 100 kHz and 2% 100 kHz to 1 MH

Triangle and Ramp Linearity

Greater than:

99% 0.0015 Hz to 100 kHz.

95% 100 kHz to 1 MHz.

Ramp Fall Time

Less than 250 nsec.

Square Wave Rise and Fall Time

Less than 10 nsec, output 2.

Less than 15 nsec, output 3.

Less than 100 nsec, output 1.

Total Aberrations

Less than 5% (overshoot, preshoot, etc when properly terminated.

ENVIRONMENTAL

Temperature

All specifications listed, except stabil ity, are for 25°C ±5°C.

For operation from 0°C to 55°C, derat all specifications by a factor of 2.

MECHANICAL

Dimensions

7¾ in. w, 5¼ in. h, 11½ in. d.

Weight

10 lb, 15 lb shipping.

Power

Models 115/116: 105 V to 125 V o 200 V to 250 V, 50 Hz to 400 Hz. Les than 10 W. Ni-cad unit available.

ORDER INFORMATION

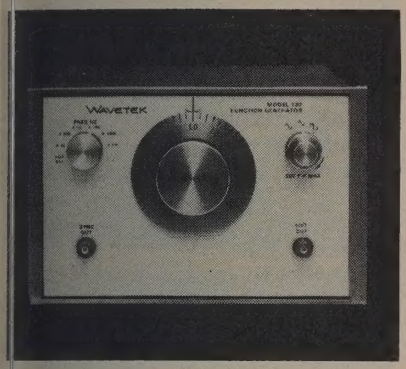
Prices (F.O.B. San Diego)

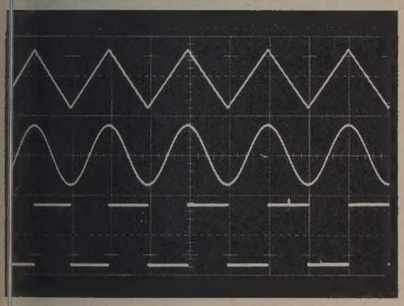
Model 115, $745 Model 116, $84

Model 115B, $845 Model 116B, $94

Model 130 Oscillator/Function Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Wavetek Model 130 is the first general-purpose laboratory test instrument that offers true function generator versatility for the low price of an oscillator. This attractive, all-solid-state unit is a high-purity source of sine, square, and triangle waveforms which can be generated over a frequency range of 0.2 Hz to 2 MHz. The outputs are selectable and variable from a 50-ohm source with an auxiliary sync output for scope and system timing. The instrument is ideal for ultrasonic, audio, and video applications — from troubleshooting to robotic IC design. Rugged construction, compact size, and precision operating characteristics make the Model 130 a portable laboratory of test signals in the economical package.

VERSATILITY

Waveforms
Sine ∿, square ⊓, and triangle ∧.

Dynamic Frequency Range
0.2 Hz to 2 MHz.

Ranges

X10	0.2 Hz to 20 Hz
X100	2Hz to 200Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Output
Sine ∿, square ⊓, and triangle ∧, selectable; amplitude variable over 40 dB; 50Ω output impedance (600Ω available); 20 V p-p into open circuit and 10 V p-p into 50Ω load from 50Ω source impedance.

Sync Output
Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

DC Offset
±5 V offset (±2.5 V offset into 50 Ω load) controlled from rear panel; peak amplitude limited by the dynamic range range of the amplifier output.

Stability
Short term ±0.05% for 10 minutes.
Long term ±0.25% for 24 hours.
Percentages apply to amplitude, frequency, and dc offset.

HORIZONTAL PRECISION

Dial Accuracy
±2% of full scale, 1 Hz to 2 MHz.

Time Symmetry
±1% through X100K range.

VERTICAL PRECISION

Sine Wave Frequency Response
Amplitude change with frequency less than:
0.1 dB from 0.2 Hz to 200 kHz
0.5 dB from 0.2 Hz to 2 MHz

PURITY

Sine Wave Distortion
Less than:
0.5% on X10, X100, X1K, X10K ranges
1.0% on X100K range
2.0% on X1M Hz range

Square Wave Rise and Fall Time
Less than 100 nsec.

ENVIRONMENTAL

Temperature
All specifications listed, except stability, are for 25°C ±5°C. For operation from 0°C to 55°C, derate all specifications by factor of 2.

MECHANICAL

Dimensions
8½ in. w., 5¼ in. h., 11½ in. d.

Weight
7 lb. net, 10 lb. shipping.

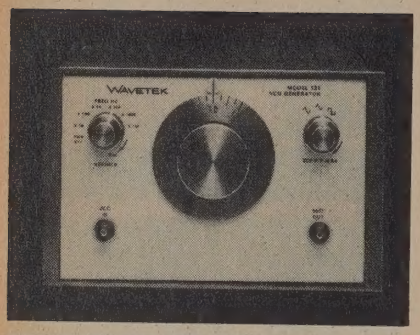
Power
105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 15 watts.

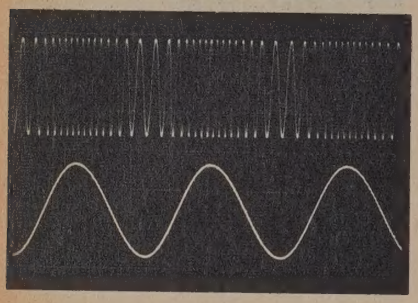
NOTE: All specifications apply for frequencies obtained when dial is between 0.1 and 2 and at 10 V p-p into a 50Ω load. Prices and specifications subject to change.

ORDER INFORMATION
Price (FOB San Diego)
Model 130 — $295

Model 131 Oscillator/VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-22
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-20





The Model 131 Voltage Controlled Generator (VCG) is a precision source of sine, square, and triangle waves that may be externally voltage controlled. The frequency may be modulated or dc-programmed; the instantaneous resultant frequency is the sum of the dial setting and the externally applied voltage. A positive voltage increases frequency and a negative voltage decreases frequency. The output waveforms (from 0.2 Hz to 2 MHz) are selectable and variable from a 50Ω source and an auxiliary sync output is available for scope or system timing. The Model 131 can be swept over a 1000:1 ratio and is designed so that the audio range of 20 Hz to 20 kHz may be covered in a single sweep without changing ranges. Rugged construction, compact size, and precision operating characteristics make the Model 131 a portable laboratory of test signals. Actually it is an oscillator, square wave generator, FM modulator, frequency-shift keyer, and sweep generator, all in one economical package.

VERSATILITY

Waveforms

Sine ∿, square ⊓, and triangle ∧.

Dynamic Frequency Range

0.2 Hz to 2 MHz.

Ranges

X10	0.2 Hz to 20 Hz
X100	2 Hz to 200 Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Output

Sine ∿, square ⊓, and triangle ∧, selectable; amplitude variable over 40 dB; 50Ω output impedance (600Ω available); 20 V p-p into open circuit and 10 V p-p into 50Ω load from 50Ω source impedance.

Sync Output

Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

DC Offset

±5 V offset (±2.5 V offset into 50Ω load) controlled from rear panel; peak amplitude limited by the dynamic range of the amplifier output.

VCG — Voltage Controlled Generator

Frequency of generator may be dc-programmed or ac-modulated by external 0 to 5 V signal. Voltage control circuitry is capable of 1000:1 deviation. The VCG amplifier has a 100 kHz bandwidth and a slew rate of 0.1 V/μsec. The instantaneous frequency is the result of the sum of the dial setting and the externally applied voltage.

NOTE: It is possible to stop the generator from oscillating by applying a negative voltage when the dial is already set at minimum frequency.

Stability

Short term	±0.05% for 10 minutes
Long term	±0.25% for 24 hours

Percentages apply to amplitude, frequency and dc offset.

HORIZONTAL PRECISION

Dial Accuracy

±2% of full scale, 1 Hz to 2 MHz.

Frequency Vernier

One turn equals 1% of full scale.

Time Symmetry

±1% through X100K range.

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency less than:

0.1 dB from 0.2 Hz to 200 kHz
0.5 dB from 0.2 Hz to 2 MHz

PURITY

Sine Wave Distortion

Less than:

0.5% on X10, X100, X1K, X10K ranges
1.0% on X100K range
2.0% on X1M Hz range

Square Wave Rise and Fall Time

Less than 100 nsec.

ENVIRONMENTAL

Temperature

All specifications listed, except stabil are for 25°C ±5°C. For operation fr 0°C to 55°C, derate all specificati by factor of 2.

MECHANICAL

Dimensions

8½ in. w., 5¼ in. h., 11½ in. d.

Weight

7 lb. net, 10 lb. shipping.

Power

105 V to 125 V or 200 V to 250 V, Hz to 400 Hz. Less than 15 watts.

NOTE: All specifications apply for frequenc obtained when dial is between 0.1 and 2 at 10 V p-p into a 50Ω load. Prices and sp ifications subject to change.

ORDER INFORMATION

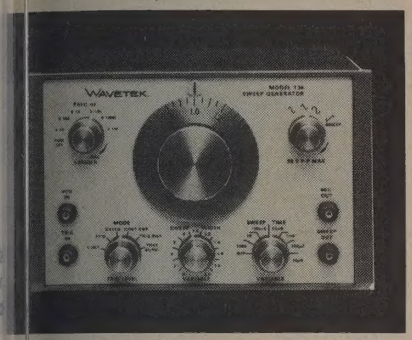
Price (FOB San Diego)

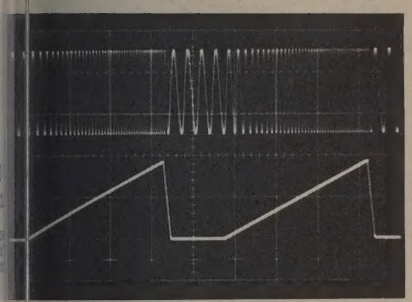
Model 131 — $395

See YELLOW SECTION for Local Offices, Phones

Model 134 Sweep/Trigger VCG

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





The Model 134 Sweep Generator is actually two independent generators in one compact unit. The first generator is a precision voltage controlled generator with sine, square and triangle waveform outputs. The second generator is a triggered ramp and sawtooth generator which supplies the voltage for sweeping the frequency of the first. Both generators may be operated independently in the continuous or triggered mode with independent frequency control.

In addition to internal sweep, terminals are provided for external voltage control of frequency (VCG) — either dc-programmed or wideband ac modulation. The instantaneous resultant frequency is the sum of the dial setting and the externally applied voltages; positive voltage increases frequency and negative voltage decreases frequency. The Model 134 can be used in continuous, triggered, gated, continuous with sweep, triggered with sweep, or tone burst modes. The output waveforms, from 0.2 Hz to 2 MHz, are selectable and variable from a 50Ω source. The sweep output (0 to +5 volts) is proportional to the frequency of the main generator when in the sweep mode. The instrument may be swept over a 1000:1 ratio and is so designed that the entire audio band from 20 Hz to 20 kHz may be covered without range change.

While the Model 134 is designated a Sweep/Trigger VCG, it also is a portable oscillator, square wave generator, FM modulator, frequency shift keyer, and sweep and tone-burst generator.

VERSATILITY

Waveforms
Sine ∿, square ⊓, triangle ∧, and sweep ⟋.

Dynamic Frequency Range
0.2 Hz to 2 MHz.

Ranges

X10	0.2 Hz to 20 Hz
X100	2 Hz to 200 Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Output
Sine ∿, square ⊓, triangle ∧, and sweep ⟋, selectable; amplitude variable over 40 dB; 50Ω output impedance (600Ω available); 20 V p-p into open circuit and 10 V p-p into 50Ω load from 50Ω source impedance.

Sync Output
Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

DC Offset
±5 V offset (±2.5 V offset into 50Ω load) controlled from rear panel; peak amplitude limited by the dynamic range of the amplifier output.

VCG — Voltage Controlled Generator
Frequency of generator may be dc-programmed or ac-modulated by external 0 to 5 V signal. Voltage control circuitry is capable of 1000:1 deviation. The VCG amplifier has a 100 kHz bandwidth and a slew rate of 0.1 V/μsec. The instantaneous frequency is the result of the sum of the dial setting and the externally applied voltage.

NOTE: It is possible to stop the generator from oscillating by appliyng a negative voltage when the dial is already set at minimum frequency.

Stability

Short term	±0.05% for 10 minutes.
Long term	±0.25% for 24 hours.

Percentages apply to amplitude, frequency and dc offset.

OPERATIONAL MODES

Continuous*
Operates as a standard VCG. Frequency determined by dial/vernier/range settings in parallel with VCG input.

Trigger**
One complete cycle is generated by applying a pulse to the trigger input.

Gated**
Same as trigger except that cycles continue for the duration of input gate.

Continuous Sweep
The main generator is frequency modulated by the sweep generator. When swept, the main generator frequency rises from the frequency set by the dial and range settings to a frequency selected by the sweep-width controls. Sweep rate is set by panel controls.

Trigger Sweep
Same as continuous sweep mode except one complete sweep cycle is generated for each input trigger pulse. Main generator continues to oscillate between sweep cycles.

Tone-Burst
Main generator is gated by the sweep output (internally connected). The tone-burst rate, frequency, and length can be independently controlled.

Trigger Input
1 V peak into 10 kΩ impedance dc coupled to 200 kHz, proportionally greater at higher frequencies.

Sweep Time
10 μsec to 100 sec.

Sweep Width
Up to 1000:1 with calibrated control.

HORIZONTAL PRECISION

Dial Accuracy
±2% of full scale 1 Hz to 2 MHz.

Frequency Vernier
On turn equals 1% of full scale.

Time Symmetry
±1% through X100K range.

VERTICAL PRECISION

Sine Wave Frequency Response
Amplitude change with frequency less than:
0.1 dB from 0.2 Hz to 200 kHz.
0.5 db from 0.2 Hz to 2 MHz.

PURITY

Sine Wave Distortion
Less than:
0.5% on X10, X100, X1K, X10K ranges
1.0% on X100K range
2.0% on 1M Hz range

Square Wave Rise and Fall Time
Less than 100 nsec.

ENVIRONMENTAL

Temperature
All specifications listed, except stability are for 25°C ±5°C. For operation from 0°C to 55°C, derate all specifications by factor of 2.

MECHANICAL

Dimensions
8½ in. w., 5¼ in. h., 11½ in. d.

Weight
8 lb. net, 11 lb. shipping.

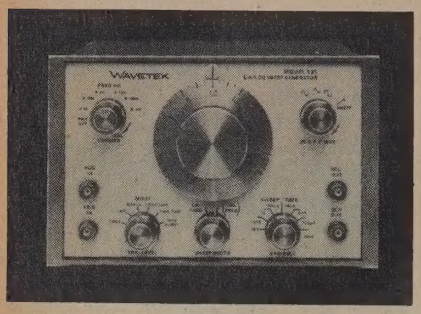
Power
105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 20 watts.

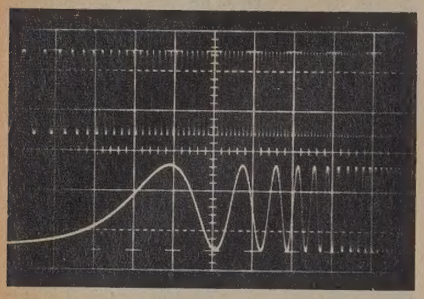
NOTE: All specifications apply for frequencies obtained when dial is between 0.1 and 2 and at 10 V p-p into a 50Ω load. Prices and specifications subject to change.
*Both generators free run.
**Sweep generator free runs, main generator is triggered or gated.

ORDER INFORMATION
Price (FOB San Diego)
Model 134 — $495

Model 135 Lin/Log Sweep Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-220
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-200





The Model 135 LIN/LOG Sweep Generator produces sine, square, and triangle waveforms which may automatically be swept in frequency up to a 1000:1 ratio. The Model 135 is actually two independent generators in one compact unit. The first generator is a precision voltage controlled generator with sine, square, and triangle waveform outputs. The second generator is a triggered ramp and sawtooth generator which applies the voltage for sweeping the frequency of the first in either a linear or logarithmic mode. Both generators may be operated independently in the continuous or triggered mode with independent frequency control.

In addition to internal sweep, terminals are provided for external voltage control of frequency (VCG) — either dc-programmed or wideband ac modulation. The instrument may be swept over a 1000:1 ratio and is so designed that the entire audio band from 20 Hz to 20 kHz may be covered without range change.

The frequency sweep may be selected as either a linear function for use in narrow band linear sweep applications, or logarithmic function, normally used in wideband (1000:1) sweep testing.

This versatile instrument also features a voltage output (GCV) that is proportional to the instantaneous frequency of the generator. This output can be used as the calibrated horizontal drive for an oscilloscope or an X-Y recorder.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, and sweep ⟋.

Dynamic Frequency Range

0.2 Hz to 2 MHz.

Ranges

X10	0.2 Hz to 20 Hz
X100	2 Hz to 200 Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Output

Sine ∿, square ⊓, triangle ∧, and sweep ⟋, selectable; amplitude variable over 40 dB; 50Ω output impedance (600Ω available); 20 V p-p into open circuit and 10 V p-p into 50Ω load from 50Ω source impedance.

GCV Output

Zero to 5 V (maximum limits) proportional to the frequency of the main generator. Output impedance 600Ω.

Sync Output

Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

DC Offset

±5 V offset (±2.5 V offset into 50Ω load) controlled from rear panel; peak amplitude limited by the dynamic range of the amplifier output.

VCG — Voltage Controlled Generator

Frequency of generator may be dc-programmed or ac-modulated by external 0 to 5 V signal. Voltage control circuitry is capable of 1000:1 deviation. The VCG amplifier has a 100 kHz bandwidth and a slew rate of 0.1 V/μsec. The instantaneous frequency is the result of the sum of the dial setting and the externally applied voltage.

NOTE: It is possible to stop the generator from oscillating by applying a negative voltage when the dial is already set at minimum frequency.

Stability

Short term	±0.05% for 10 minutes
Long term	±0.25% for 24 hours

Percentages apply to amplitude, frequency, and dc offset.

OPERATIONAL MODES

Continuous*

Operates as a standard VCG. Frequency determined by dial/vernier/range settings in parallel with VCG input.

Trigger**

One complete cycle is generated by applying a pulse to the trigger input.

Gated**

Same as trigger except that cycles continue for the duration of input gate.

Continuous Sweep

The main generator is frequency modulated by the sweep generator. When swept, the main generator frequency rises from the frequency set by the dial and range settings to a frequency selected by the sweep-width control. Sweep rate and sweep function (LIN or LOG) are selected by front panel controls.

Trigger Sweep

Same as continuous sweep mode exce one complete sweep cycle is generat for each input trigger pulse. Main ge erator continues to oscillate betwe sweep cycles.

Tone-Burst

Main generator is gated by the swe output (internally connected). The ton burst rate, frequency, and length can b independently controlled.

Trigger Input

1 V peak into 10 kΩ impedance c coupled to 200 kHz proportional greater at higher frequencies.

Sweep Time

10 μsec to 100 sec.

Sweep Width

Up to 1000:1 with front panel control.

HORIZONTAL PRECISION

Dial Accuracy

±2% of full scale 1 Hz to 2 MHz.

Frequency Vernier

One turn equals 1% of full scale.

Time Symmetry

±1% through X100K range.

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency les than:

0.1 dB from 0.2 Hz to 200 kHz.
0.5 dB from 0.2 Hz to 2 MHz.

PURITY

Sine Wave Distortion

Less than:

0.5% of X10, X100, X1K, X10K range
1.0% on X100K range.
2.0% on X1M Hz range.

Square Wave Rise and Fall Time

Less than 100 nsec.

ENVIRONMENTAL

Temperature

All specifications listed, except stabilit are for 25°C ±5°C. For operation fror 0° to 55°C, derate all specifications b factor of 2.

MECHANICAL

Dimensions

8½ in. w., 5¼ in. h., 11½ in. d.

Weight

8 lb. net, 11 lb. shipping.

Power

105 V to 125 V or 200 V to 250 V, 5 Hz to 400 Hz. Less than 20 watts.

NOTE: All specifications apply for frequencie obtained when dial is between 0.1 and 2 an at 10 V p-p into a 50Ω load. Prices and spec ifications subject to change.

* Both generators free run.
** Sweep generator free runs, generator i triggered or gated.

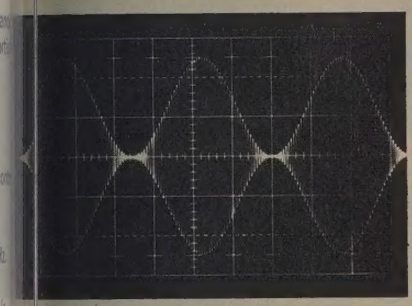
ORDER INFORMATION

Price (FOB San Diego)

Model 135 — $695

Model 136 VCG/VCA Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



The Model 136 VCG/VCA Generator is a precision source of sine, square, and triangle waveforms that may be externally voltage controlled in amplitude (VCA) and in frequency (VCG). The amplitude level can be continuously controlled from dc step programming through 100% amplitude modulation to suppressed carrier AM. The frequency can be continuously controlled either by dc programming or by wideband modulation up to a 1000:1 ratio.

The Model 136 is actually as oscillator, square wave generator, triangle wave generator, and an AM-FM generator in one rugged compact package. The versatility and precision operating characteristics of the instrument make it a portable laboratory of test signals that can be used as a CW signal generator, tone-burst generator, frequency shift keyer, sweep generator, and a dc programmable generator.

VERSATILITY

Waveforms

Sine ∿, square ⊓, and triangle ∧.

Dynamic Frequency Range

0.2 Hz to 2 MHz.

NOTE: The fixed unmodulated) sine waveform can be used to self-modulate the generator and extend the frequency range to 4 MHz.

Ranges

X10	0.2 Hz to 20 Hz
X100	2 Hz to 200 Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Outputs

Sine ∿, square ⊓, and triangle ∧ selectable with 60 dB step attenuator in 10 dB steps, and overlapping vernier control, 50Ω output impedance; 20 V p-p into open circuit and 10 V p-p into 50Ω load.

Fixed Sine Output

2.5 V p-p (fixed) into an open circuit. This output is unaffected by any amplitude modulation signal.

Sync Output

Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

VCA — Voltage Control of Amplitude

DC Offset

±5 V offset (±2.5 V offset into 50Ω load) controlled from rear panel; peak amplitude limited by the dynamic range of the amplifier output.

Amplitude of the generator may be dc-programmed or ac-modulated by a 0 to 5 volt signal. The voltage control circuitry is bipolar and operates linearily over a 40 dB range. The VCA bandwidth is 4 MHz. The output amplitude at any time is determined by the output attenuator, the step attenuator, and any externally applied voltage.

VCG — Voltage Controlled Generator

Frequency of generator may be dc-programmed or ac-modulated by external 0 to 5 V signal. Voltage control circuitry is capable of 1000:1 deviation. The VCG amplifier has a 100 kHz bandwidth and a slew rate of 0.1 V/μsec. The instantaneous frequency is the result of the sum of the dial setting and the externally applied voltage.

NOTE: It is possible to stop the generator from oscillating by applying a negative voltage when the dial is already set at minimum frequency.

Stability

Short term ±0.05% for 10 minutes
Long term ±0.25% for 24 hours.
Percentages apply to amplitude, frequency, and dc offset.

HORIZONTAL PRECISION

Dial Accuracy

±2% of full scale, 1 Hz to 2 MHz.

Frequency Vernier

One turn equals 1% of full scale.

Time Symmetry

±1% through X100K range.

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency less than:
0.1 dB from 0.2 Hz to 200 kHz.
0.5 dB from 0.2 Hz to 2 MHz.

PURITY

Sine Wave Distortion

Less than:
0.5% on X10, X100, X1K, X10K ranges.
1.0% on 100K range.
2.0% on X1M Hz range.

Square Wave Rise and Fall Time

Less than 100 nsec.

ENVIRONMENTAL

Temperature

All specifications listed, except stability, are for 25°C ±5 C. The generator will operate from 0°C to 55°C.

MECHANICAL

Dimensions

8½ in. w., 5¼ in. h., 11½ in. d.

Weight

8 lb. net, 12 lb. shipping.

Power

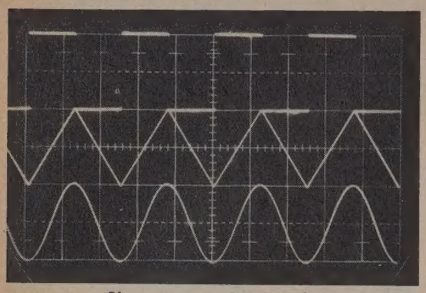
105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 15 watts.

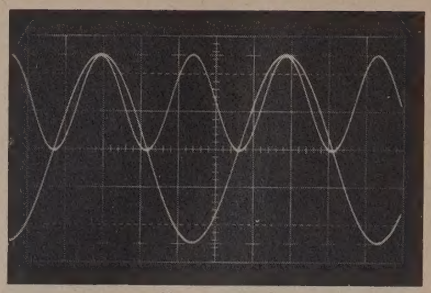
NOTE: All specifications apply for frequencies obtained when dial is between 0.1 and 2 and at 10 V p-p into a 50Ω load. Prices and specifications subject to change.

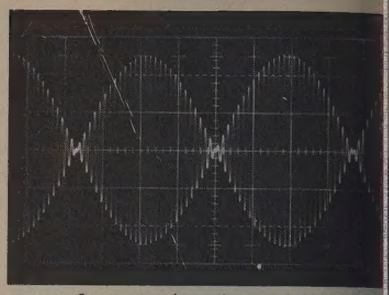
ORDER INFORMATION

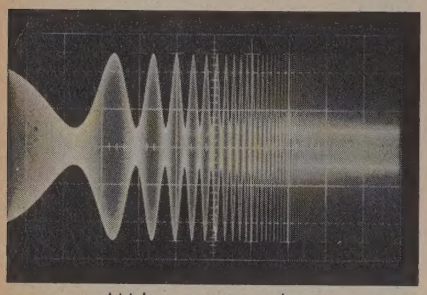
Price (FOB San Diego)

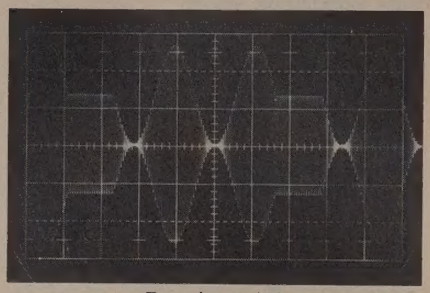
Model 136 — $595

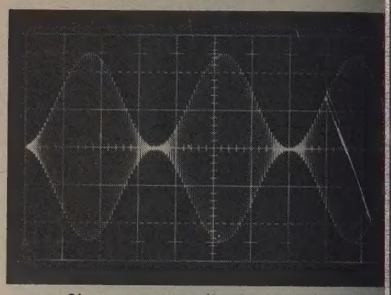

Sine, square & triangle

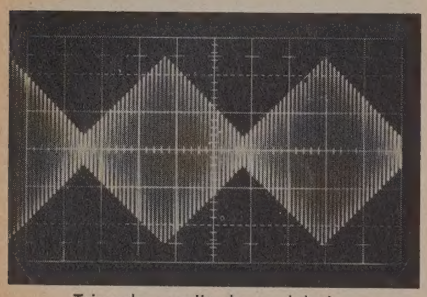

Sine squared

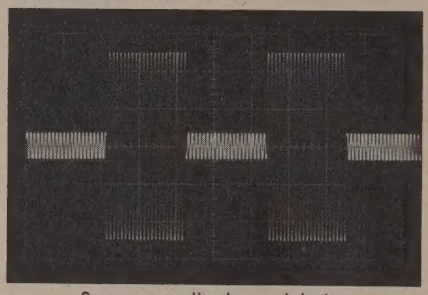

Suppressed carrier modulation

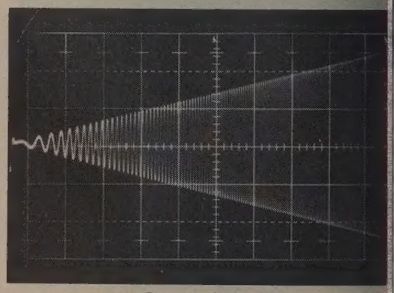

AM log swept envelope

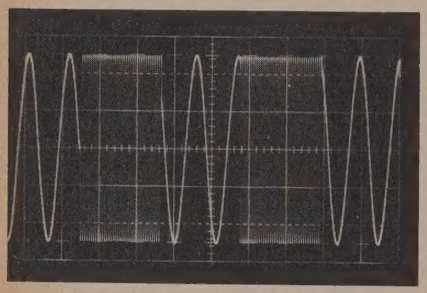

Tone burst AM

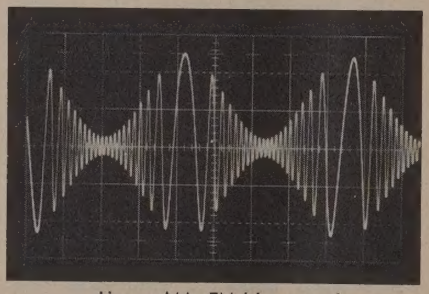

Sine wave amplitude modulation

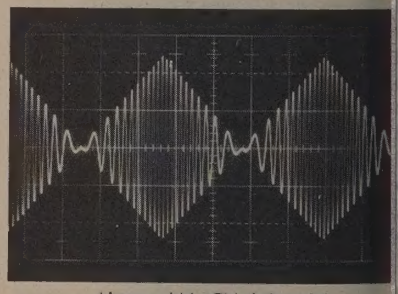

Triangle amplitude modulation

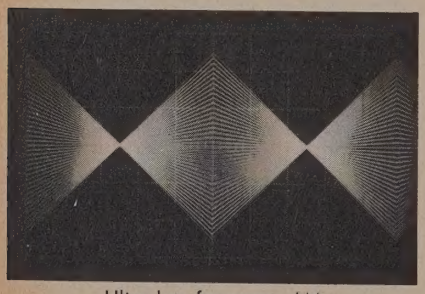

Square amplitude modulation

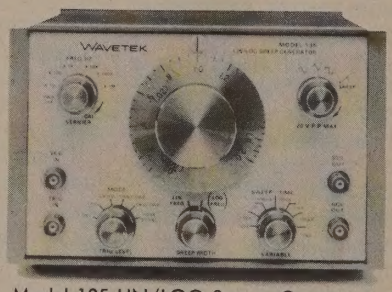

Swept AM - FM


Frequency shift keying


Linear AM - FM (sine wave)


Linear AM - FM (triangle)


Ultra low frequency AM



Model 135 LIN/LOG Sweep Generator

Model 136 VCG/VCA Generator

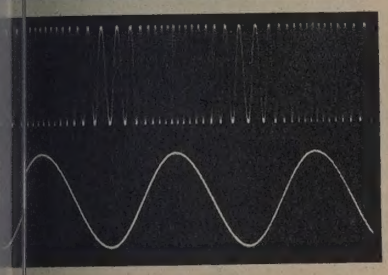
How do these waveforms grab you, generator fans?

WAVETEK

9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-220
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-200

Model 142 HF VCG Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



The Model 142 HF VCG Generator is a precision signal source . . . providing full capability for present needs and reserve capability for future needs. This instrument features a broad frequency range (extending from 0.0005 Hz to 10 MHz) coupled with unprecedented waveform versatility.

In addition to the sine, square, and triangle waveforms usually offered, the Model 142 provides a variable duty cycle and dc offset on all output waveforms. The duty cycle of the output can be continuously adjusted from a low of 5% through the usual 50%, to a high of 95%. This means that pulse outputs can be generated with on-off ratios of 1:19, 19:1, or anywhere between. A sawtooth waveform with a rise-fall ratio of 1:19, 19:1, or anywhere between, also is possible.

Greater versatility in output amplitude is also offered by the Model 142. In addition to the higher power output of a full 15 volts p-p into 50 ohms, the 60 dB step attenuator allows clean signal levels as low as 15 millivolts peak to peak.

An external sweep signal (either dc programming or ac modulation) can be applied to the Model 142 to sweep the output frequency over a 1000:1 ratio.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, positive pulse ⎍, negative pulse ⎏. Continuously variable time symmetry (duty cycle) of all waveforms from 19:1 to 1:1 to 1:19, resulting in pulses with variable duty cycle and ramp sawtooth waveforms with variable rise and fall times. Also separate sync output.

Operating Frequency Range

0.0005 Hz to 10 MHz.

Frequency Ranges

X.001	0.0005 Hz to .01 Hz
X.01	0.005 Hz to .1 Hz
X.1	0.05 Hz to 1 Hz
X1	0.1 Hz to 10 Hz
X10	1 Hz to 100 Hz
X100	10 Hz to 1 kHz
X1K	100 Hz to 10 kHz
X10K	1 kHz to 100 kHz
X100K	10 kHz to 1 MHz
X1M	100 kHz to 10 MHz

Multiply dial by 0.1 for non-symmetrical waveforms.

Main Output

Sine, square, triangle, positive pulse, and negative pulse selectable. Maximum output 30 V p-p (0 to 15 V P) into open circuit with calibrated 15 V p-p (0 to 7.5 V P) into 50 ohm load. Precision output attenuator calibrated in 10 dB steps to −60 dB, with a 20 dB vernier giving over-all attenuation of 80 dB. Output impedance is 50 ohms. Short circuit current is ±150 ma.

Sync Output

Amplitude greater than 4 V p-p open circuit; 2 V p-p into 50 ohms. Rise and fall times less than 20 nsec. Waveform square for symmetrical functions, rectangular for pulse and ramp. Positive and negative going pulses coincident with the transitions of the square wave output.

DC Offset

±10 Vdc open circuit (±5 Vdc into 50-ohm load). Peak output is limited to ±15 V open circuit (±7.5 V into 50-ohm load). DC offset and waveform are attenuated proportionately by the 60 dB attenuator.

STABILITY

Short term	±0.05% for 10 min.
Long term	±0.25% for 24 hrs.

Percentages apply to amplitude, frequency, and dc offset.

HORIZONTAL PRECISION

Frequency accuracy for time symmetrical waveforms 0.005 Hz to 1 MHz ±(1% of setting +1% of full scale); 1 MHz to 10 MHz ±(2% of setting +2% of full scale).

Vernier

Electronic frequency vernier is provided for precision frequency adjustment (approximately 1% of range).

VOLTAGE-CONTROLLED GENERATOR — VCG

VCG Control Range

Up to 1000:1 frequency change with external voltage input. Upper frequency is limited to maximum of selected range. Required external signal for full voltage control is 5 V with input impedance of 5 kΩ.

VCG Input Frequency

VCG Bandwidth— 100 kHz

VCG Slew Rate — 2% of range per μsec.

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency less than:

0.1 dB to 100 kHz.
0.2 dB to 1 MHz.
2.0 dB to 10 MHz.

Step Attenuator Accuracy

±0.25 dB/10 dB.

Amplitude Symmetry

All waveforms are symmetrical about ground within ±1% of maximum p-p amplitude, with dc offset in off position.

PURITY

Sine Wave Distortion

Less than:

1.0 Hz to 100 kHz — 0.5%
0.005 Hz to 1 MHz — 1.0%.
1 MHz to 10 MHz — all hormonics at least 30 dB down.

Triangle Linearity

Greater than 99% 0.01 to 100 kHz.

Square Wave Rise and Fall Time

Less than 20 nsec; limited to 500 V/μs (terminated into 50-ohm load).

Total Aberrations

Less than 5%.

ENVIRONMENTAL

Temperature

All specifications listed, except for stability, are for 25°C ±5°C. For operation from 0°C to 55°C, derate all specifications by a factor of 2.

MECHANICAL

Dimensions

8½ in. w., 5¼ in. h., 11½ in. d.

Weight

8 lb. net, 12 lb. shipping.

POWER

105 V to 125 V or 200 V to 250 V; 50 to 400 Hz. Less than 30 watts.

CONTROLS

Power on/off switch, range switch, frequency vernier, function selector, calibrated step attenuator, and vernier attenuator, dc-offset switch and vernier, symmetry offset switch and vernier.

ORDER INFORMATION

Price (FOB San Diego)

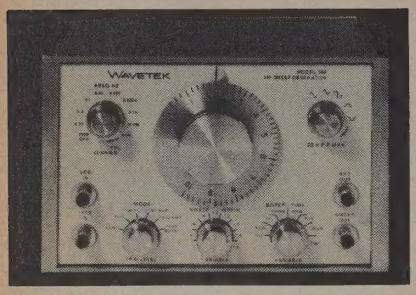
Model 142 — $595

Terms: ½% 10 days; net 30.

NOTE: Specifications apply from 1 to 10 on the frequency dial only.

Model 144 HF Sweep Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-220
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-200



The Model 144 HF Sweep Generator is actually two independent generators in one package. The first generator is a precision voltage-controlled generator operating over the 0.0005 Hz to 10 MHz range. The second generator is a triggered ramp or sawtooth generator which supplies the voltage to sweep the sine, square, and triangle outputs of the main generator. Both generators can be operated independently in the continuous or triggered modes, with independent frequency control.

Though the Model 144 is designated an HF Sweep Generator, it is also a portable oscillator, square wave generator, FM modulator, frequency shift keyer, and sweep and tone-burst generator — with variable duty cycles.

VERSATILITY

Waveforms

Sine ∿, square ⊓, triangle ∧, positive pulse ⎍, negative pulse ⎎. Continuously variable time symmetry (duty cycle) of all waveforms from 19:1 to 1:1 to 1:19, resulting with pulses in variable duty cycle and ramp or saw tooth waveforms with variable rise and fall times. Also separate sync output.

Operating Frequency Range

0.0005 Hz to 10 MHz.

NOTE: Multiply indicated frequency by 0.1 for non-symmetrical waveforms.

Main Output

Sine, square, triangle, positive pulse, and negative pulse selectable. Maximum output 30 V p-p (0 to 15 V p) into open circuit with calibrated 15 V p-p (0 to 7.5 V p) into 50 ohm load. Precision output attenuator is calibrated in 10 dB steps to −60 dB, with a 20 dB vernier giving overall attenuation of 80 dB. Output impedance is 50 ohms. Short circuit current is ±150 milliamps.

Sync Output

Amplitude greater than 4 V p-p open circuit; 2 V p-p into 50 ohms. Rise and fall times less than 20 nanoseconds.

DC Offset

±10 Vdc open circuit (±5 Vdc into 50-ohm load). Peak output is limited to ±15 V open circuit (±7.5 V into 50-ohm load). DC offset and waveform are attenuated proportionately by the 60 dB attenuator.

STABILITY

Short term ±0.05% for 10 minutes.
Long term ±0.25% for 24 hours.
Percentages apply to amplitude, frequency, and dc offset.

OPERATIONAL MODES

Continuous*

Operating as a standard voltage-controlled generator (VCG), the output frequency, appearing at the 50Ω OUT connector, is determined by the front panel control settings in conjunction with the signal applied to the VCG IN connector. The output of the internal ramp generator appears at the SWP/GCV OUT connector in this operational mode.

Trigger**

Same as the CONTINUOUS mode except that only one complete cycle of the output appears at the 50Ω OUT connector for each trigger pulse applied to the TRIG IN connector.

Gated**

Same as the TRIGGER mode except that output oscillations continue for the duration of the gating signal applied to the TRIG IN connector.

Tone Burst — Tone burst operation can be accomplished in the GATED mode by connecting the ramp voltage at the SWP/GCV OUT connector to the TRIG IN connector. The tone burst rate, frequency, and duration can be independently controlled in this configuration.

Continuous Sweep*

In this mode, the main generator is frequency modulated (swept) by the internal ramp generator. The output frequency appearing at the 50Ω OUT connector is swept from a low frequency determined by the front panel frequency control settings to a high frequency determined by the SWEEP WIDTH control setting. The sweep rate is determined by the front panel SWEEP TIME and VARIABLE controls. A generator-controlled voltage (GCV) proportional to the instantaneous frequency appears at the SWP/GCV OUT connector.

Triggered Sweep

Same as the CONTINUOUS SWEEP mode except that the output appearing at the 50Ω OUT connector is swept only once for each trigger pulse applied to the TRIG IN connector.

Sweep and Hold

Same as the TRIGGERED SWEEP mode except that the main generator continues to oscillate at the high frequency determined by the SWEEP WIDTH control during the time between triggered sweeps.

Trigger Input

1 V peak into 10 kΩ impedance dc coupled to 200 kHz, proportionally greater at higher frequencies.

Sweep Time/Width

10 μsec to 100 sec.; Up to 1000:1.

HORIZONTAL PRECISION

Frequency accuracy, for time symm trical waveforms, 0.005 Hz to 1 MH ±(1% of setting +1% of full scale 1 MHz to 10 MHz ±(2% of setting +2 of full scale).

VOLTAGE-CONTROLLED GENERATOR — VCG

VCG Control Range

Up to 1000:1 frequency change wi external voltage input. Upper frequen is limited to maximum of selected rang Required external signal for full volta control is 5 V; input impedance 5 k

VCG Input Frequency

VCG Bandwidth — 100 kHz.
VCG Slew Rate — 2% of range per μs.

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency le than: 0.1 dB to 100 wHz, 0.2 dB to MHz, 2.0 dB to 10 MHz

Step Attenuator Accuracy

±0.25 dB/10 dB

Amplitude Symmetry

All waveforms are symmetrical abo ground within ±1% of maximum pea to-peak amplitude, with DC offset in position.

PURITY

Sine Wave Distortion

Less than:

1.0 Hz to 10 kHz	0.5
0.005 Hz to 1 MHz	1.0
1 MHz to 10 MHz	all harmonics least 30 dB dov

Triangle Linearity

Greater than 99% 0.01 to 100 kHz

Square Wave Rise and Fall Time

Less than 20 nanoseconds; limited 50 V/μs (terminated into 50-ohm loa

Total Aberations — Less than 5%.

MECHANICAL

Dimensions

8½ in. w., 5¼ in. h., 11½ in. d.

Weight

10 pounds net, 14 pounds shipping.

POWER

105 V to 125 V or 200 V to 250 V; to 400 Hz. Less than 30 watts.

Controls

Power on/off switch, range swit frequency vernier, function selecti switch, calibrated step attenuator, a vernier attenuator. Rear panel dc-off switch and vernier, symmetry off switch and vernier.

ORDER INFORMATION

Price (FOB San Diego)

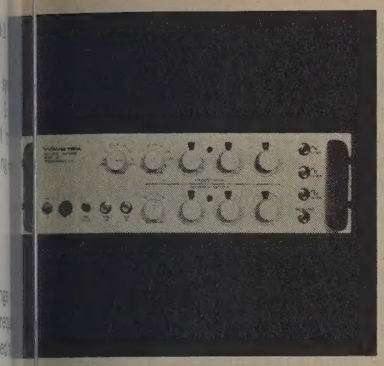
Model 144, $845.

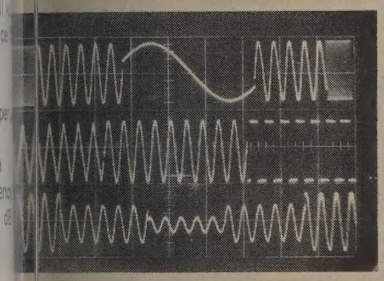
Terms: ½% 10 days; net 30.

NOTE: Specifications apply from 1 to 10 the frequency dial only.
*Both generators free run.
**Sweep generator free runs, main genera is triggered or gated.

Models 150 & 155 Programmable VCGs

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007





he Series 150 Programmable Voltage-Controlled Generators are precision sources of sine, square and triangle waveforms that are designed for automatic system application. The Model 155 has local and remote digital control (Model 150 remote only) of frequency, function and amplitude. Additionally, both generators may be controlled by analog voltage in the following manner: the frequency may be programmed or modulated by an ac or dc signal. Generator output may be initiated by means of a trigger which will initiate one complete cycle, and/or gate input which will provide a signal for of an integral number of cycles for the duration of the applied gate. In the Model 155, programming is accomplished using front-panel switches. The frequency range consists of 8 decade ranges with 3 decimal digits of resolution covering the dynamic range 0.01 Hz to 1 MHz. The signal amplitude consists of 3 decade ranges with decimal digits of resolution covering the dynamic range of 0.01 volt to 10 volt peak-to-peak. Output range scaling is accomplished using an attenuator with 50-Ω output impedance on all ranges. All specifications require that the output be terminated by a 50-Ω load. The functions and modes are selected by a multiple deck switch. All these controls may be activated remotely by contact closures through a 50-pin connector on the rear panel of all models. The 3-pin digit control of frequency and amplitude is 8421 BCD coded with only 12 lines required for each. The ranges and functions are controlled by 1 line per function. Standard interface options are available so that any logic input may be converted in the instrument to provide proper information control. The Series 150 Programmable VCGs may be driven by computers, punched cards, or tape and servo switch devices. They are useful in automatic test systems, automatic control tools, production test stands, and as precision laboratory test generators.

VERSATILITY

Waveforms

Sine ∿, square ⊓, and triangle ∧.

Dynamic Frequency

0.01 Hz to 1 MHz in 8 ranges.

Four Simultaneous Outputs

1. ∿, ⊓, ∧, selectable and digitally variable from 0.01 V to 10 V p-p into a 50-Ω load in 3 ranges with 3-digit resolution.
2. ∿ 1 V p-p into 50-Ω load.
3. ∧ 1 V p-p into 50-Ω load.
4. ⊓ 0.5 V p-p into 50-Ω load.

Note: All outputs may be shorted without damage to instrument. This specification includes frequency stability.

VCG Analog Voltage Control

Over 20:1 frequency ratio. Analog frequency control and/or modulation. Input impedance is 10 kΩ.

Trigger

Manual or external voltage input control generator in trigger mode. A pulse will generate 1 cycle and a gate will allow a burst of cycles, the number determined by the length of the gate.

Input impedance 10 kΩ.

Input trigger voltage ±5 V to ±100 V.

HORIZONTAL PRECISION

Program Frequency Accuracy

±1% +1 digit with following exceptions: X.01 range is ±2% +1 digit; X100K range is ±5% +1 digit.

Typical VCG Linearity

±0.2% of frequency vs. input voltage, (frequency error 0.2% of total deviation best straight-line method).

0 V to 5 V gives 10:1 frequency deviation. Absolute frequency accuracy same as programmed frequency.

VCG Bandwidth

100 kHz.

VERTICAL PRECISION

Amplitude change with frequency less than 0.1 db to 100 kHz and 0.5 db to 1 MHz.

Peak-to-Peak Voltage Accuracy

Output 1 ±1% +1 digit of the programmed voltage 0.01 Hz to 100 Hz and ±5% +1 digit of the programmed voltage 100 kHz to 1 MHz when properly loaded with 50-Ω. Outputs 2 through 4 ±1% of stated output when properly loaded with 50-Ω. This specification includes amplitude stability.

Symmetry

All waveforms are symmetrical about ground within ±1% of max. p-p amplitude.

DC Offset Stability

Short term: 0.05%; long term: 0.25%.

PURITY

Sine Wave Distortion

Less than:

1% 0.01 Hz to 99.9 kHz.

3% 100 kHz to 1 MHz.

Triangle Linearity

Greater than:

99% 0.01 Hz to 99 kHz.

95% 100 kHz to 1MHz.

Square Wave Rise and Fall Time

Less than 150 nsec. output 1.

Less than 10 nsec. output 4.

PROGRAMMING

Basic units are programmable by remote contact closure. Frequency, function and amplitude may all be programmed. Frequency and amplitude have 3 digits resolution programmed by 8421 BCD code. Range and function selection direct-line contact. The Model 150 is remote programming only. The Model 155 is local and remote control. Local switches override remote programming.

INTERFACE OPTIONS

Option 2—Logic Level.

8421 code "1" = ±5 V to ±20 V dc, 15 mA/line max "0" = 0 V to ±0.5 V, $600.

Option 3—Logic Level.

8421 code "1" = 0 V to ±0.5 V.

"0" = ±5 to ±20 V dc, 15 mA/line max, $600.

Option 3S

Same as above with "0" = +3.5 V dc, 15 mA/line max., $700

Note: Consult factory for other options available.

ENVIRONMENTAL

Specifications apply at 25°C ±5°C. For operation 0°C to 50°C, derate by factor of 2.

MECHANICAL

Dimensions

19 in. w, 5¼ in. h, 16¼ in. d.

Weight

10 lb, 15 lb shipping.

Power

105 V to 125 V or 200 V to 250 V; 50 Hz to 400 Hz. Less than 15 W.

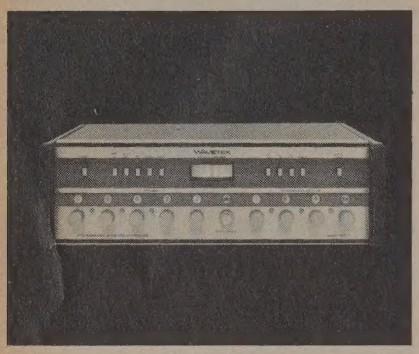
ORDER INFORMATION

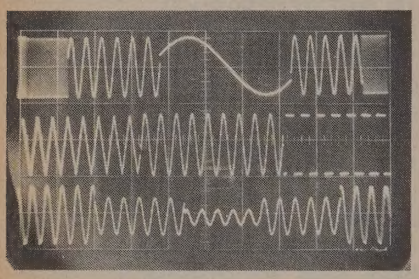
Prices (F.O.B. San Diego)

Model 150, $995 Model 155, $1,195

Model 157 Programmable Waveform Synthesizer

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-





The Model 157 Programmable Waveform Synthesizer is a precision source of sine, square and triangle waveforms generated over a frequency range of 100 μHz to 1 MHz. This unique multi-function generator features:

1. 0.01% frequency accuracy.
2. 100 μHz (2.77 hr/cycle) to 1 MHz (1 μsec) frequency range.
3. Sine, square, triangle waveforms.
4. 1,000:1 VCG.
5. Triggered/gated operation.
6. Selectable amplitude to 10 volts peak-to-peak.
7. All parameters programmable.

The frequency, function and amplitude of the generator can be controlled locally with front-panel switching or remotely by BCD/binary programming. Frequency accuracy is 0.01% of programmed frequency with 5-digit resolution on each of 10 ranges. The output voltage level can be programmed from 1 millivolt to 10 volts, peak-to-peak, in four ranges with 0.2% accuracy and 3-digit resolution.

The frequency of the Model 157 can be modulated about an accurately set center frequency by application of an ac voltage input. With a sawtooth input, the frequency can be swept over a 1,000:1 ratio.

A trigger capability is included to allow a single cycle of any waveform, or a burst of cycles, when gated from an external source. In addition, a frequency-search control is provided on the front panel that provides continuous sweep over the selected range with one turn of the control.

The combination of extremely broad signal range, frequency accuracy, and programmability make this instrument ideally suited for the demanding requirements of automatic system testing. It may be programmed by computers, paper tape, magnetic tape, IBM cards, servo switches, or remote-control stations. The instrument will respond to a program change in 1 milliseconds. Typical applications for the Model 157 are:

Automatically swept tone-burst signal source for programmed sonar transducer checkout.

Precise source of discrete frequency changes for audiometric research.

Muscle and tissue stimulus for biomedical research.

Low-frequency triangle waveform for metal testing to determine elongation and modulus of elasticity of samples.

Precision source for the determination of soil compressibility in geophysical studies.

Extremely low-frequency signals for earthquake-simulation studies.

The automatic-programming concept of the Model 157 propels the voltage-controlled oscillator (VCO) into the Computer Age at a time when more and more manufacturers are converting to automatic data processing (ADP) to produce, test and calibrate electronic products. In the easily foreseeable future, the demand for programmable instruments will exceed that now known for conventional manually controlled instruments.

The binary-coded-decimal (BCD) format that commands the Model 157 is used universally and is one of the simplest codes to program. Because all controllers do not use the same logic levels, Wavetek has designed the Model 157 to be optionally available in all of the following commonly-used logic configurations:

Option A: Inverse logic with positive voltage (logical one = 0 volts, logical zero = +2 volts to +10 volts).

Option B: Inverse logic with negative voltage (logical one = 0 volts, logical zero = −2 volts to −10 volts).

Option C: True logic with negative voltage (logical one = −2 volts to −10 volts, logical zero = 0 volts).

Option D: True logic with positive voltage (logical one = +2 volts to +10 volts, logical zero = 0 volts).

When no logic configuration is specified on the sales order, the Option A configuration will be shipped as the standard instrument. When Option B, C D is ordered, the specified logic c figuration will be supplied at no a tional cost.

Besides digital programming of quency, amplitude and function, VCO sweep and the gated tone-b can be automatically programmed f digital or analog sources.

VERSATILITY

Waveforms

Sine ∿, square ⊓, and triangle

Dynamic Frequency

100 μHz to 1 MHz in 10 ranges (hrs to 1 μsec).

Outputs

∿ , ⊓ , ∧ , selectable and digi variable from 0.001 V to 10 V p-p in 50-Ω load in 4 ranges with 3- resolution (0.002 to 20 V p-p open cuit).

Note: Output may be shorted without dama instrument.

VCG—Voltage-Controlled Generator

Over 1000:1 frequency ratio with signal. Input impedance is 10 kΩ

OPERATIONAL MODES

Trigger Mode

Generator may be triggered to pro single cycles on command or gate produce any discrete number of c by applying a + gate signal to tri input for the length of the de burst.

Input Impedance is 10 kΩ.

Plus gate required is +5 V to +5

Auto Cal Mode

Generator has an automatic co loop to maintain the output frequ for high accuracy and stability.

Manual Cal Mode

Generator is manually calibrated u the control loop but is then autor cally returned to the open-loop dition so that it may be swept or gered.

Search Mode

Generator frequency control within selected range is transferred from digital controls to a single turn ar control for convenient manual swee of the entire range.

Sync In

Within the upper 4 ranges, the in ment may be frequency synchron to an external signal of approxim 1 V p-p that is within 1% of the running frequency. The induced distortion will be less than 1%.

Sync Out

A fixed amplitude square wav brought out at 1 k impedance for ing scopes or other equipment.

Model 157 Programmable Waveform Synthesizer

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007

HORIZONTAL PRECISION

Auto Cal Mode

Frequency accuracy from programmed input or front-panel selector switches is ±0.01% of programmed frequency, ±1 digit.

Closed-loop stability is within ±0.005% of programmed frequency at constant temperature for a 24-hour period.

Settling time of control loop—Loop will settle to within the accuracy specification of its final value in less than 3 sec max (1 msec for small-step changes).

Manual Cal Mode

Instrument can be calibrated to within an accuracy of 0.02% of programmed frequency and triggered or frequency modulated about this accurate center frequency. Open-loop stability is within 0.05% of setting for eight-hour period at constant temperature.

VCO Bandwidth

1 MHz.

Slew rate—100% of range per μsec.

VCO Linearity

Frequency vs input voltage—best straight-line method.

±1% 100 MHz - 10 kHz.

±% 10 kHz - 100 kHz.

±% 100 kHz - 1 MHz.

VERTICAL PRECISION

Amplitude change with frequency is less than 0.1 db to 100 kHz and 0.5 db to MHz.

Peak-to-Peak Voltage Accuracy

% of Program

1 to 10 V range ±(0.1% +5 mV).

0.1 V to 1 V range ±(1% +1 mV).

10 mV to 100 mV range ±(1% +0.1 mV).

1 V to 10 mV range ±(1% ±0.1 mV).

Amplitude Symmetry

All waveforms are symmetrical about ground ±1% of full range.

Trigger start-stop point will be 0 V ±5% of output amplitude program.

PURITY

Sine Wave Distortion

Less than:

0.5% 100 μHz to 10 kHz.

1% 10 kHz to 100 kHz.

3% 100 kHz to 1 MHz.

Triangle Linearity

Greater than:

.99, 1 Hz to 100 kHz.

.95, 100 kHz to 1 MHz.

Square Wave Rise and Fall Time

Less than 100 nsec.

ISOLATION

Output signal can be raised above ground up to 250 V. Caution must be taken as all exposed BNC connectors are at raised potential.

ENVIRONMENTAL

Temperature

Specifications apply at 25°C ±5°C.

Operating temperature range 0°C to 50°C.

REMOTE CONTROL SPECIFICATIONS

Configuration A (Standard)

True or Logic **"1" = 0 V ±1 V.**

Note: 0 V sinks approximately 1.5 mA.

False or Logic **"0" = +2 V to +10 V.**

Note: Open circuit voltage is approximately +2 V.

Configuration B

True or Logic **"1" = 0 V ±1 V.**

Note: 0 V sinks approximately 1.5 mA.

False or Logic **"0" = −2 V to −10 V.**

Note: Open circuit voltage is approximately −2 V.

Configuration C

True or Logic **"1" = −2 V to −10 V.**

Note: −2 V sinks approximately 1.5 mA.

False or Logic **"0" = 0 V to −1 V.**

Note: Open circuit voltage approximately +0.7 V.

Configuration D

True or Logic **"1" = +2 V to +10 V.**

Note: +2 V sinks approximately 1.5 mA.

False or Logic **"0" = 0 V to +1 V.**

Note: Open circuit voltage approximately −0.7 V.

Program Transition Time

1 msec.

MECHANICAL

Weight

22 lb, shipping 27 lb.

Power

105 Vac or 125 Vac or 210 Vac to 250 Vac, 50 Hz to 400 Hz.

50W of power required.

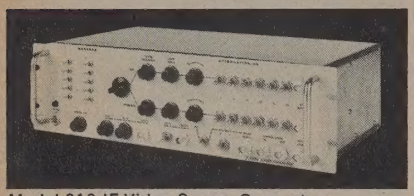
ORDER INFORMATION

Price: (F.O.B. San Diego)

Model 157, $2995

Sweep Generators for TV Industry

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2



Model 310 IF-Video Sweep Generator

860 Series Combination VHF-UHF Sweep Generators

200 Series Video Sweep Generator

These instruments provide a wideband, flat, sweep signal of from 0.1 MHz to 10 MHz. The instrument will also sweep portions as narrow as 1 MHz throughout the entire frequency range. The instrument is designed specifically for testing video stages and chroma applifiers in monochrome or color TV receivers. They also find applications in closed-circuit TV and other video transmission systems. Up to 10 crystal-controlled pulse-type markers are available at discrete customer frequencies and the markers are extremely flexible, providing plus or minus 35-volt pulses for oscilloscope Z-axis modulations. Also, they may be used to shut off the sweep oscillator allowing a useable presentation on wideband oscilloscopes. The markers may also be connected to the oscilloscope horizontal or vertical axis for pulse indications.

Frequency Range
0.1 to 10 MHz.
Sweep Width
1 MHz to 10 MHz.
Output Amplitude
1 V rms (75 Ω).
Output Amplitude Variation
±0.5 db over max sweep width.
Sweep Rate
Line frequency.
Attenuation
99 db, in 3-db steps.

300 Series IF Sweep Generator

These instruments provide fixed-frequency, fundamental outputs for alignment and evaluation of intermediate frequency amplifiers. Models are available between 20 and 80 MHz, fitting the requirements of U. S. or foreign television receivers. They are also ideal for military or industrial applications in this frequency range. Bandpass measurements or other points of interest on a demodulated IF envelope are easily identified with the accurate, sharp, crystal-controlled pulse-type markers provided. These markers, like the 200 series, may be used internally or externally. Several optional features are available with the 300 Series, providing extremely accurate, expanded views of the rejection traps for either IF, video or automatic color phase control. For further details, contact factory representative.

Frequency Range
20-80 MHz (U.S. or foreign standards).
Sweep Width
5 MHz to 15 MHz.
Output Amplitude
1 V rms (75 Ω).
Output Amplitude Variation
±0.25 db.
Sweep Rate
Line frequency.
Attenuation
99 db, in 3-db steps.

400 Series VHF Sweep Generator

This series provides any 13 television channels to either U. S. or foreign standards. All switching is from dc contacts, eliminating the maintenance problems in obsolete instruments which are switching oscillator-lumped constants. Markers are provided at the video and sound carriers of the standard selected and optional features allow the addition of extra markers, local oscillator tracking features or a total of 7 markers on an independent IF function position. Units are available for 5¼ inch x 19 inch rack mounting or in a portable 6 inch x 7 inch x 10 inch cabinet. Other optional features are available as standard items providing complete self-contained test stations for tuner manufacturers. Please contact the factory for specific details.

Frequency Range
Any 13 channels to U. S. or foreign standards.
Sweep Width
5 MHz to octave bands.
Output Amplitude
0.75 V rms (75 Ω).
Output Amplitude Variation
±0.25 db over any channel.
Attenuation
±0.5 db over max frequency range.
99 db, in 3-db steps.

500 Series UHF Sweep Generator

These instruments provide frequency coverage of from 435 to 930 MHz and are designed primarily for the evaluation and alignment of UHF TV tuners and receivers. Instruments are available with video and sound pulse-type markers on all 69 UHF channels with counterparts to European or o standards. Sweep width is continuo adjustable from 5 MHz to 60 MHz a once preset, maintains a constant ba width throughout the entire tuning ra

Frequency Range
435 to 930 MHz.
Sweep Width
5 MHz to 60 MHz.
Output Amplitude
0.5 V rms (50 Ω).
Output Amplitude Variation
±0.25 db over any 50 MHz portion
±0.5 db over max range.
Sweep Rate
Line frequency.
Attenuation
45 db, in 5-db steps.

Combination Sweep Generato

Since the 200, 300, 400 and 500 Se instruments just described are al modular plug-in, solid-state const tion, they easily lend themselves t combination of multiple functi Combination instruments available described as follows:

Model 310 IF-Video Sweep Generator

This instrument provides the funct of both 200 and 300 Series, u a common 5¼ inch x 19 inch x 10 i package. An additional savings of u $500 under the cost of sepa units, is attained by using com markers for both the video and IF f tions. The Model 310 is ideal for engineering laboratory, quality co or repair facilities in production receiver manufacturing facilities, o the large-volume TV repair shops.

860 Series Combination VHF-UHF Sweep Generators

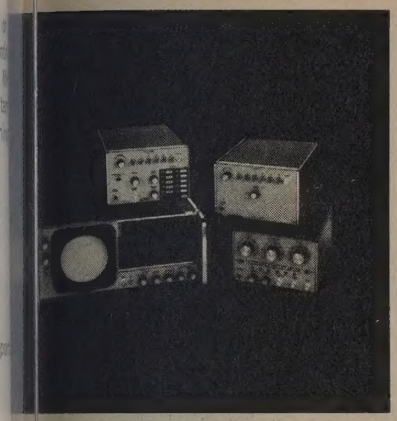
These instruments are a combinatio the 400 and 500 Series VHF or U Sweep Generators. They provide same frequency coverage, optional tures and specifications and are signed for the engineering labora quality control test station and re facility. Due to space limitations, all tional features cannot be included the factory or area representa should be consulted regarding user's specific requirements.

Distribution Amplifiers

A single Series 300 Sweep Gener may be used with up to 20 Series Distribution Amplifiers. Amplifica isolation, automatic leveling and ad able amplitude of 0.1 to 1.5 V rms provided at each test station wit flatness of ±0.25 db. More stat may be accommodated by using amplifier to drive 20 additional stati

Programmable Sweep Generators

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



1000 Series Automatic Programmable Sweep Generators

A new series of sweep generators, unique in both operation and packaging have been introduced by Wavetek-Indiana. These units provide all-modular construction, including power supply and cabinet. By removing the power supply and cabinet, the basic sweep-generator functions may be mounted in the Wavetek SA series laboratory type, 5-inch electrostatic X-Y display oscilloscope. This provides a completely integrated package with a minimum of space, interconnecting cables, etc.

All of the 1000 Series Sweep Generators utilize pin diode attenuator and leveling systems. This provides a method of leveling the sweep oscillator, or buffer amplifier, output without controlling B+; this results in little or no clipping of the RF envelope. Instead, leveling is controlled by bias on pin diode attenuator. Since the pin diode exhibits a wide attenuation range over the frequency with which they are used (and because they are in a closed-loop control system), the various 1000 Series instruments provide a continuously variable or dc programming output leveling adjustment of from 0 to 20 or 30 db.

The 1000 Series instruments also are completely voltage-tuned and voltage-swept, again allowing dc control from internal potentiometers or external analog programming. A unique feature available with the 1401, 1501, 1601 and 1001 programmer, provides automatic operation of both tuning and attenuation and, depending upon the test device and programming interface, the sweep oscillator bandwidth. This allows the instrument to be connected to the test device, adjusting itself automatically at the frequency to which the device is tuned. Attenuation is automatically programmed to maintain a constant, preset voltage from the test device and/or programming bandwidth to start or stop at the 3-db points. Analog voltages of all three parameters are readily available. These analog voltages may be compared with the desired parameters, providing error signals to automatically retune or adjust the set unit.

Many more applications and unique concepts are covered by the 1001 Series and various application notes are available from Wavetek-Indiana or the area representative. These instruments also find applications in communication checkout systems for the RF devices in telemetering, missile- or gun-control systems. The various instruments available are described in the following paragraphs.

1312 Series Sweep Generator

This series provides extremely narrow or medium coverage of IF amplifiers and components in the frequency range from 5 to 250 MHz. Units are available for most specific bands of interest and the marker systems are designed for the specific band covered. The pulse-type marker output may be used to internally shut off the sweep signal or the extremely accurate ±35 V marker pulses may be added to the oscilloscope for Z-axis modulation. The marker width is always 1/100 of the display allowing easy-to-read indications on very sharp slopes. Instruments are available covering the 4 to 5, 10 to 12, 11 to 13, 20 to 22 or 70 MHz IF bands. Special instruments for other bands of interest are available with no increase in price. Please contact the factory or the area representative for specific details.

1401 VHF Sweep Generator

This instrument provides frequency coverage of from 5 to 300 MHz and is designed for use in VHF television applications where the complete automatic circuits are useful for the evaluation, alignment or repair of VHF TV tuners or receivers. Optional features are available providing an interface with detent or continuously tuned test systems, and also provide easy-to-read indications of oscillator conversion or gain. Without the automatic circuits, the 1401 is ideal for CATV or MATV applications and, again, special optional features are available.

1501 UHF Sweep Generator

This instrument is similar to the 1401, except that it covers the UHF broadcast band from 450 to 950 MHz. It may be used manually, automatically, with complete dc remote programming, or in the complete operation mode. Markers are available and frequency ranges preset for use to U. S. or all European television standards.

1601 Automatic FM Sweep Generator

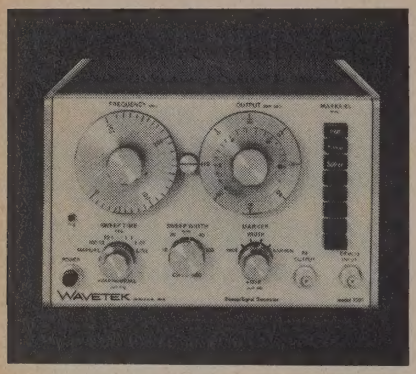
This instrument is similar to the 1401 and 1501 counterparts except that it covers the commercial FM broadcast band (88 to 108 MHz). It also provides complete manual, programming or automatic operation. Optional features are available for complete evaluation and alignment of the tuner, IF amplifier and ratio detector of a receiver, with all signals injected at the antenna terminals.

SA Series 5 Inch X-Y Display Oscilloscope

The SA basic scope frame will accept any of the 1000 Series instruments mentioned previously, providing power requirements, as well as internal connections of the three oscilloscope axes of horizontal, vertical and "Z". The instrument is all-solid-state (except CRT) and has a high-quality, electrostatic focus, 5AQP1 cathode ray tube. Vertical sensitivity is from 10 mV to 100 V/cm and is flat for frequency inputs of from dc to 500 kHz. A switch is provided on the front panel allowing the vertical amplifier to be internally connected to the built-in sweep generator or externally used for other applications.

Model 1001 Sweep/Signal Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2



The Model 1001 Sweep/Signal Generator is a wideband, general-purpose sweeper covering the frequency range of 0.5 MHz to 300 MHz. Sweep frequency, sweep width, and attenuation all may be voltage-controlled, allowing the instrument to be used in programmed systems or as an automatic tester in closed-loop applications. In addition, the oscillator is so stable that it may be used as a CW signal source. A calibrated attenuator is provided to facilitate this application offering a +13 dBm to −77 dBm output level, including a 20 dB electronic vernier.

A marker system allows up to 8 plug-in modules at specified crystal-controlled frequencies; harmonic (comb-type) markers also are available. All markers are individually adjustable and may be turned on and off by front-panel pushbuttons. Additionally, amplitude, tilt and width all are controllable for optimum visibility.

The Model 1001 is unique in that the cabinet and power supply may be removed and the instrument internally mounted in the Wavetek SA Series, five-inch, transistorized X-Y oscilloscope. Mounting in this manner results in a complete sweep test system in a 7¼ x 19-inch package. Internal connections are made for X, Y or Z axes of the scope for automatic control of test signal, sweep and marker presentation. Only two external connectors need be used — the RF output to the test device and the demodulated output of the test device back into the sweep generator.

The Model 1001 actually is many instruments in one. For example, it is a quality sweep generator with specifications, applications and price that are virtually unequalled in the industry. The instrument also is usable as a signal generator providing signal generator specifications such as calibrated output system, AM or FM modulations, excellent dial accuracy, frequency resolution of tuning, etc. Finally, it is a completely programmable signal source in either of the aforementioned modes of operation and also can function as an automatic Q meter, an automatic readout, or error signal device.

GENERATOR SPECIFICATIONS

Frequency Range
Continuously adjustable from 0.5 MHz to 300 MHz.

Frequency Dial Calibration
10 MHz intervals at better than 1% of full scale accuracy.

Vernier Dial
Expands main frequency dial over ±3 MHz range.

Frequency Programming
−15 V to +15 V input signal results in 0.5 MHz to 300 MHz tuning range at approximately 10 MHz/V.

Frequency Readout
+15 V to −15 V analog output voltage indicates center sweep frequency or fixed frequency, essentially linear.

External FM
±15 V results in full deviation of ±150 MHz, max. modulation rate 100 Hz. (With reduced drive, i.e., 100 kHz bandwidth modulation rate, up to 50 kHz may be used).

Sweep Width
Continuously adjustable from 0.2 MHz to 300 MHz with logarithmic taper providing resolution for narrowband sweep.

Output Amplitude
+13 dBm, 1 V rms (−77 dBm min.) 50Ω output.

Output Attenuation
90 dB; 70 dB in 10 dB steps, with 3% accuracy and continuously veriable 20 dB with 1 dB calibration and 0.5 dB accuracy.

Output Programming
0 V to −18 V signal controls full 20 dB range; 30% AM modulation to 1 kHz.

Output Readout
0 V to −18 V analog voltage indicates attenuation, essentially linear.

Output Flatness
±0.25 dB* over full 0.5 MHz to 300 MHz frequency range; ±0.05 dB with external monitoring for programmed control of 20 dB electronic attenuator.
*As read on Wavetek D151 detector.

Spurious Signals
Harmonically related, typically 30 dB below signal frequency; non-harmonically related, typically 50 dB below signal frequency.

Residual FM
Less than 5 kHz.

Drift
Short term is less than 50 kHz/5 min.

Display Linearity
Frequency change to oscilloscope horizontal is within 2%.

Sweep Modes
Repetitive sweep; internally trigge single sweep, externally triggered si sweep, manual sweep, line-freque lock.

Sweep Rate
Continuously adjustable from 50 swe /sec. to 1 sweep/100 sec. in four o lapping ranges.

Blanking
Blanking of RF output in sweep m and removed in CW mode.

Horizontal Output
16 V p-p signal synchronized with sw oscillator.

MARKER SPECIFICATIONS

Type
Birdy-bypass markers with provisions up to eight plug-in modules. Mar may be 1-300 MHz discrete freque (Option A-1) or 1-10 MHz and 2 MHz harmonic frequency (A-2).

Marker Accuracy
0.005%.

Marker Amplitude
Adjustable from 1 mV to 12 V p-p dividually or collectively.

Marker Width
Adjustable in four incremental st from approximately 15 kHz to 400 k

Marker Tilt
From vertical to approximately

Tilt Amplitude
Approximately 10% of display wi

External Marker Input
BNC connects external CW signal conversion into birdy marker; input l at least 0.1 V rms into 50Ω.

Recorder Processing
Internal switching removes negative tion of birdy markers for use with recorders.

MECHANICAL

Dimensions
8¼ w. x 5¼ h. x 13 in. d.

Weight
15 lb. net, 18 lb. shipping.

Power Requirements
115/230 V, 50/60 Hz, approximately watts.

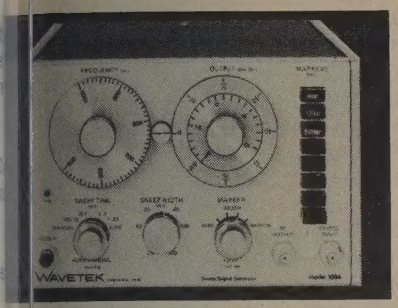
ORDER INFORMATION

Price (FOB Indianapolis)
Model 1001 — $995

Marker Options
A-1: Single frequencies, crystal-c trolled markers from 1 to 300 k (specify frequencies).
A-2: Harmonic type (comb) crystal-c trolled birdy markers, available at quencies of 1 to 10 or 25 to 50 MHz.
A-4: A 1 kHz square-wave generator is available as a plug-?in module 100% amplitude modulation of the output in low-level applications.

Model 1004 Sweep/Signal Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



The Model 1004 Sweep/Signal Generator is a wideband, general-purpose sweeper covering the frequency range of 500 MHz to 1000 MHz. Sweep frequency, sweep width, and attenuation all may be voltage-controlled, allowing the instrument to be used in programmed systems or as an automatic tester in closed-loop applications. In addition, the oscillator is so stable that it may be used as a CW signal source. A calibrated attenuator is provided to facilitate this application offering a +10 dBm to −80 dBm output level, including 20 dB electronic vernier.

A marker system allows up to eight plug-in modules at specified crystal-controlled frequencies; harmonic (comb-type) markers also are available. All markers are individually adjustable and may be turned on and off by front-panel push buttons. Additionally, amplitude, tilt and width all are controllable for optimum visibility.

The Model 1004 is unique in that the cabinet and power supply may be removed and the instrument internally mounted in the Wavetek SA Series, five-inch, transistorized X-Y oscilloscope. Mounting in this manner results in a complete sweep test system in a 7¼ x 13 inch package. Internal connections are made for X, Y, or Z axes of the scope for automatic control of test signal, sweep, and marker presentation. Only two external connectors need be used—the RF output to the test device and the demodulated output of the test device back into the sweep generator.

The Model 1004 actually is many instruments in one. For example, it is a quality sweep generator with specifications, applications, and price that are virtually unequalled in the industry. The instrument also is usable as a signal generator providing signal generator specifications such as calibrated output system, AM or FM modulations, excellent dial accuracy, frequency resolution tuning, etc. Finally, it is a complete programmable signal source in either of the aforementioned modes of operation and also can function as an automatic Q meter, an automatic readout, or error signal device.

GENERATOR SPECIFICATIONS

Frequency Range
Continuously adjustable from 500 MHz to 1000 MHz.

Frequency Dial Calibration
20 MHz intervals at better than 1% of full scale accuracy.

Vernier Dial
Expands main frequency dial over ±5 MHz range.

Frequency Programming
−15 V to +15 V input signal results in 500 to 1000 MHz tuning range.

Frequency Readout
+15 V to −15 V analog output voltage indicates center sweep frequency or fixed frequency, essentially linear.

External FM
±15 V results in full deviation of ±250 MHz, maximum modulation rate 100 Hz. (With reduced drive (i.e., 100 kHz bandwidth modulation rate) up to 50 kHz may be used).

Sweep Width
Continuously adjustable from 0.5 MHz to 500 MHz with logarithmic taper providing resolution for narrowband sweep.

Output Amplitude
+10 dBm, .7 V rms (−80 dBm minimum), 50Ω output.

Output Attenuation
90 dB; 70 dB in 10 dB steps, with 3% accuracy and continuously variable 20 dB with 1 dB calibration and 0.5 dB accuracy.

Output Programming
0 V to −18 V signal controls full 20 dB range; 30% AM modulation to 1 kHz.

Output Readout
0 V to −18 V analog voltage indicates attenuation, essentially linear.

Output Flatness
±0.5 dB* over full 500 MHz to 1000 MHz frequency range; ±0.05 dB with external monitoring for programmed control of 20 dB electronic attenuator.
*As read on Wavetek D151 detector.

Spurious Signals
Harmonically related, typically 30 dB below signal frequency; nonharmonically related, typically 50 dB below signal frequency.

Residual FM
Less than 20 kHz.

Drift
Short term is less than 100 kHz/5 min.

Display Linearity
Frequency change to oscilloscope horizontal is within 3%.

Sweep Modes
Repetitive sweep; internally triggered single sweep, externally triggered single sweep, manual sweep, line-frequency lock.

Sweep Rate
Continuously adjustable from 50 sweep/sec. to 1 sweep/100 sec. in four overlapping ranges.

Blanking
Blanking of RF output in sweep mode and removed in CW mode.

Horizontal Output
16 V p-p signal synchronized with sweep oscillator.

MARKER SPECIFICATIONS

Type
Birdy-bypass markers with provisions for up to eight plug-in modules. Markers may be 500 to 1000 MHz discrete frequency (Option A-1) or 1-10 MHz and 25-50 MHz harmonic frequency (A-2).

Marker Accuracy
0.005%.

Marker Amplitude
Adjustable from 1 mV to 12 V p-p individually or collectively.

Marker Width
Adjustable in four incremental steps from approximately 15 kHz to 400 kHz.

Marker Tilt
From vertical to approximately 90°.

Tilt Amplitude
Approximately 10% of display width.

External Marker Input
BNC connects external CW signal for conversion into birdy marker; input level at least 0.1 V rms into 50Ω.

Recorder Processing
Internal switching removes negative portion of birdy markers for use with X-Y recorders.

MECHANICAL

Dimensions
8¼ in. w., 5¼ in. h., 13 in. d.

Weight
15 lb. net, 18 lb. shipping.

Power Requirements
115/230 V, 50/60 Hz, approximately 20 watts.

ORDER INFORMATION

Price (FOB Indianapolis)
Model 1004 — $995

Marker Options
A-1: Single frequency, crystal-controlled markers from 500 to 1000 MHz (specify frequencies). $45
A-2: Harmonic type (comb) crystal-controlled birdy markers, available at frequencies of 1 to 10 or 25 to 50 MHz. $55
A-4; A 1 kHz square-wave generator also is available as a plug-in module for 100% amplitude modulation of the RF output in low-level applications. $50

Model 2001 Sweep/Signal Generator

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-22
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-20

The Model 2001 Sweep/Signal Generator offers an exceptionally wide frequency range (.5 to 1500 MHz) and programming versatility in a ruggedized, bench-top instrument. Despite its laboratory-type specifications, the Model 2001 is very much at home in a production setup, being used as an automatic tester in a closed-loop system. For a complete sweep/test system in a 7¼ inch by 19 inch rack-mounting package, the cabinet and power supply may be removed, and the 2001 may be installed in the Wavetek SA Series, five-inch, transistorized X-Y oscilloscope.

Each of its three frequency ranges can be swept in its entirety, up or down in frequency, at any rate between 50 sweeps a second and 1 sweep every 100 seconds. Manual, triggered, or recurring sweeps are provided; sweep frequency, sweep width, and output attenuation each may be controlled by external voltages.

Up to eight crystal-controlled marker modules (single frequency or harmonic birdy markers) may be plugged into the 2001; each has its own on/off switch, width control, and amplitude control. A unique circuit design permits the markers to be tilted 90° for easy viewing when they are displayed with steep transition signals. When X-Y plotter operation is desired, the user need only flip a front panel switch to provide rectified markers.

One marker position can be occupied by a 1 kHz square wave modulator module, providing 100% amplitudemodulation of the RF output for low-level recovery use. In this configuration, a push button on the front panel turns the 1 kHz modulator on and off.

Frequency Range
0.5 to 1400 MHz in 3 bands. 0.5 to 500 MHz, 500 to 1000 MHz and 900 to 1400 MHz — 50 MHz overlap between bands.

Frequency Functions
Start-stop — tuning dials with slide rule readout of start and stop frequencies. May sweep up or down in this mode.
△f — in this mode, start dial indicates center frequency, stop dial indicates sweep width.
CW — oscillator blanking is removed for a 100% duty cycle.

Frequency Dial Calibration
10 MHz intervals at accuracy better than 3% or 10 MHz whichever is smaller.

Frequency Programming
−15V to +15V input signal results in full range tuning of band selected at approximately 16 MHz/volt.

Frequency Readout
+15V to −15V analog output voltage indicates center sweep frequency or CW frequency of band selected, essentially linear.

External FM
±15V results in full deviation ±250 MHz, maximum modulation rate of 100 Hz (with reduced drive, i.e., 100 kHz bandwidth, modulation rates up to 50 kHz may be used.)

Sweep Width
200 kHz to full band in either start/stop or △f modes.

Output Amplitude
+10 dBm, 0.7 VRMS (−80 dBm maximum) 50Ω output impedance.

Output Attenuation
90dB; 70dB in 10dB steps and continuously variable 20dB with 1dB calibrations.

Output Programming
0V to −18V signal controls full 20dB range, 30% AM modulation to 1 kHz.

Output Readout
0 to −18 volt analog voltage indicates attenuation essentially linear.

Output Flatness

Band 1	0.5 to 500 MHz	±0.5dB.
Band 2	500 to 900 MHz	±0.25dB.
Band 3	900 to 1400 MHz	±0.25dB.

All bands with up to ±.05dB flatness using external samplers for programmed control of 20dB attenuator.

Spurious Signals
Harmonically related.

Band 1	0.5 to 500 MHz	−20dB.
Band 2 & 3	500 to 1500 MHz	−30dB.

Non-harmonically related band 1 −20dB bands 2 & 3 not applicable.

Residual FM
Less than 10 kHz.

Drift
Short term less than 100 kHz per 5 min. at 25°C.

Display Linearity
Frequency change to oscilloscope. Horizontal is within 2%.

Sweep Modes
Recurring sweep, Internally triggered.
Single sweep, Externally triggered.
Single sweep, Manual sweep, Line frequency lock.

Sweep Rate
Continuously adjustable from 50 sweeps/second to 1 sweep/100 seconds in 4 overlapping ranges.

Blanking
Blanking of RF output in sweep mode for zero reference line, removed in CW mode.

Horizontal Output
16V p-p signal synchronized sweep oscillator.

MARKER SPECIFICATIONS

Type
Up to eight plug-in birdy bypass ma ers may be at discrete frequencies (c tion A-1) of 0.1, 1.0, 5.0, 10.0, 25 50.0 or 100 MHz harmonic interva (option A-2). Note the 0.1 MHz harmon will not operate above 500 MHz.

Marker Accuracy
.005%.

Marker Amplitude
Adjustable from 100μV to over 1 V individually or collectively.

Marker Width
Adjustable in four incremental ste from approximately 15 kHz to 400 k

Marker Tilt
From vertical to approximately 90°.

Tilt Amplitude
Approximately 10% of display wid when at 90°.

External Marker Input
BNC connector connects external signal for conversion to birdy mark marker is processed with amplitu width and tilt as with A-1 and A-2 tions. Input level must be at le 100mv into 50Ω.

Recorder Processing
Front panel switch removes negat portion of birdy markers for use w X-Y recorders.

Frequency-Counter Output
A rear panel BNC connector provides sample of the RF output frequency frequency counter monitoring. Useal in CW or manual sweep mode only. O put level 50mv into 50Ω.

Mechanical

Dimensions
8¼ in. w., 5¼ in. h., 13 in. d

Weight
15 lb. net, 18 lb. shipping.

Power Requirements
115/230V, 50/60 Hz approximately watts. (100/200 volts on special ord

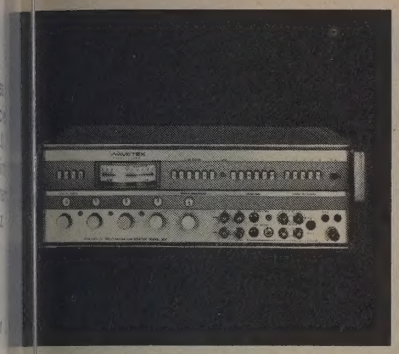
ORDER INFORMATION

Prices: (FOB Indianapolis)
Model 2001, $1695.

Marker Options
A-1: Single frequency, crystal-controll markers from 1 to 1500 MHz (spec frequency). $
A-2: Harmonic type marker at 0.1 M (usable to 500 MHz). $
A-3: Harmonic type markers at 1, 5, 25, 50 or 100 MHz. $
A-4: 7 kHz square wave generator also available as a plug-in module 100% amplitude modulation of the output for low level recovery appli tions (the use of this module redu the maximum number of markers seven). $

Model 220 Dialamatic Measurement System

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



The Wavetek Model 220 presents an entirely new concept in multiple-purpose meters. The versatility that is often found in low- to medium-accuracy multimeters is combined with the accuracy that is usually only found in special-purpose calibrators. The addition of the exclusive Wavetek Transfermatic Switch mechanism and the Model 220 nonsaturating null amplifier result in an instrument that has unequalled versatility, accuracy and ease of operation.

The Model 220 has the following features:

Measures dc voltages to 1,200 V.
Measures dc ratio.
Measures ac voltages to 1,200 V.
Measures frequency to 12 MHz.
Measures ohms to 12 ohms.
Measures ohms ratio.
Supplies calibrated dc voltage to 120 V.

The basic 0.005% accuracy of this instrument is such that it can be used as a general-purpose laboratory tool in research and development, and also as an indispensable aid in the maintenance and calibration of instruments that are less accurate.

The Model 220 is a precision potentiometric/null balance measuring device. The readout is a six-digit precision Kelvin Varley bridge interconnected by Wavetek's Transfermatic Switch. Output terminals are provided for permanent recording of off-null deflections.

Digital Readout
Six-digit potentiometric control with associated dial indicators: 4 switches, and 1 potentiometer in the least-significant decade having 2-digit resolution.

Analog Readout
Edge-reading, taut-band null indicator with selectable full-scale indication from ±0.01% of range to 100% of range.

Meter Sensitivity
±01 0.1, 1, 10 and 100% of range. The full-scale sensitivity of the null meter depends on the meter sensitivity and the range selected for the parameter being measured. When measuring dc volts, the dc range switch determines the meter sensitivity. For all other measurements, the plug-in range switch determines the sensitivity.

Full-Scale Meter Sensitivity in Volts and kHz.

Meter Sensitivity Setting In % of Range	Range Setting, Volts—kHz/kΩ 1	10	100	1,000
100	1	10	100	1,000
10	0.1	1	10	100
1	0.01	0.1	1	10
0.1	0.001	0.01	0.1	1
0.01	0.0001	0.001	0.01	0.1

Resolution (Null Meter)
1 ppm of range (½ minor division on mirror scale).

Resolution (Transfermatic Switch)
0.5 ppm of range (½ minor division on dial).

Voltage Reference Stability
±0.0005% per hr.
±0.0025% per yr.

Recorder Output
±300 mV output corresponding to full-scale meter deflection. Output impedance—10 kΩ.

Environmental
All specifications apply for 25°C ±5°C; for operation from 0°C to 50°C, derate by factor of 3.

Dimensions
17 in. w, 5¼ in. h, 16 in. d.

Weight
Approximately 15 lb net, 20 lb shipping.

Power Requirements
105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz. Less than 50 watts.

DC/DC RATIO SPECIFICATIONS

Input
0 to 1,200 V dc in 4 ranges: 1 V, 10 V, 100 V, and 1,000 V, each range having 20% over-range capability.

Polarity
Front-panel pushbutton selected, plus or minus.

DC Accuracy
±0.005% of reading +0.001% of range (or 15 μV); 0 to 100 V ±0.01% of reading ±0.001% of range, 100 V to 1,200 V.

DC Input Impedance
Infinite at null on 1 V, 10 V, and 100 V ranges; greater than 10 megohms on 1,000 V range.

DC RATIO LINEARITY
0.001% of full scale (+10 V nominal input into 25 kΩ).

DC CALIBRATOR SPECIFICATIONS

Accuracy
0.005% of value ±0.001% of range from 0.00000 to 119.9999 V.

Output Current
1 mA.

Overload
A current trip relay is provided to open the calibrator if the output current is exceeded.

AC SPECIFICATIONS

Frequency Range
5 Hz to 100 kHz.

Input Voltage
1 mV to 1,000 Vac rms in 4 ranges.

Input Impedance
1 MΩ and 40 pF.

AC ACCURACY
±0.1% of reading ±0.005% of range, 50 Hz to 5 kHz, 1 mV to 120 V.
±0.5%, 5 Hz to 20 kHz, 1 mV to 120 V (10 Hz to 20 kHz on 1,000 V range).

HERTZMETER SPECIFICATIONS

Frequency Range
10 Hz to 12 MHz in 5 ranges.

Accuracy
±0.001% of reading +0.001% of range.

Typical Response to Step Input
±0.01% of range in 3 sec, ±0.001% of range in 8 sec.

Input Trigger Characteristics
250 mV (rms) sensitivity, ac-coupled input into zero crossing detector; max input 250 V rms.

Input Impedance
1 MΩ and 40 pF to 5 V input, 100 kΩ and 100 pF to 250 V.

Self-Calibration Feature
Frequency calibration and linearity can be checked for all ranges by means of 1 MHz and 500 kHz test signals on front panel.

OHMS/OHMS RATIO SPECIFICATIONS

Ohms Range
0 to 12 MΩ in 5 ranges.

Accuracy
±0.005% of reading +0.001% of range, 1 kΩ to 112 kΩ.
±0.01% of reading +0.002% of range, 1 kΩ and 1 MΩ ranges.

Test Current

Range	Test Current	Max Voltage Across Range
0 to 1,200-Ω	1 mA	1.2 V
1 kΩ to 12 kΩ	1 mA	12 V
10 kΩ to 120 kΩ	100 μV	12 V
100 kΩ to 1,200 kΩ	10 μV	12 V
1 MΩ to 12 MΩ	1 μV	12 V

Ohms Ratio Accuracy
±0.02%.

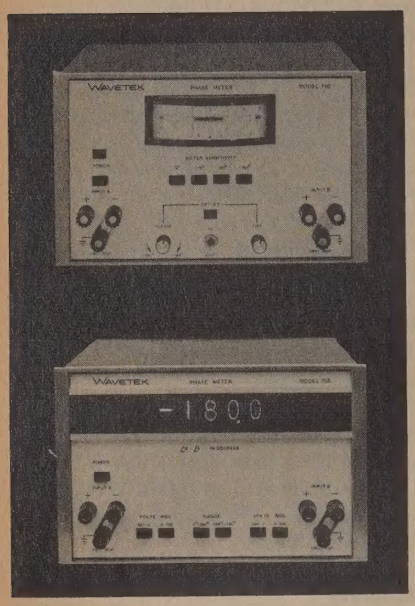
ORDER INFORMATION

Price: (F.O.B. San Diego)
Model 220, $2,395.

Note: Price and specifications subject to change.

Model 740 and 750 Phase Meters

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-22
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-20



The Wavetek Model 740 and 750 Phase Meters accurately measure the phase angle between any two ac signals (with an amplitude ratio as great as 10,000 to 1) within the 10 Hz to 2 MHz range. Excellent sensitivity, broad dynamic range, wide bandwidth, and high precision are offered by these compact easy to use instruments. High impedance differential inputs are used; and a dc output (−10mV/DEG) is provided for use in recording phase angle measurements or as a control signal for phase lock loops or servo systems.

The digital Model 750 provides four digit resolution (0.1°) and the widest dynamic amplitude range available. The automatic operation of this instrument eliminates the need for amplitude matching, frequency tuning, and output filtering, resulting in true hands-off operation.

The Model 740 substitutes a taut band meter readout and 360-degree phase offset capability to allow measurements at the highest possible resolution and adjustment for input signal phase shifts. Both instruments incorporate a unique closed loop design which eliminates most errors due to signal distortion and ensures stable, long-term phase measurements over varying temperature conditions.

ACCURACY

Absolute Measurement Accuracy
±0.1° calibration accuracy, reference 20 Hz to 20 kHz square wave input with equal amplitude on both channels between 100 mV and 5 V p-p.

Frequency Effects on Accuracy
With a sine wave input of 100% of amplitude range, accuracy is equal to calibration accuracy ±.2° from 20 Hz to 20 kHz. Zero offset from 10 Hz to 100 kHz is less than 0.1° or 0.1° per 10 kHz. Relative phase accuracy 100 kHz to 2 MHz better than 2°.

Amplitude Effects on Accuracy
Less than 1° error per 20 dB input-level change, 10 Hz to 500 kHz with equal level signals.

NOTE: Minimum sensitivity below 20 Hz and above 50 kHz is 1% of amplitude range.

Waveforms Effects on Accuracy
Errors due to even harmonic sine distortion are essentially eliminated by unique input detection circuitry.

Resolution
0.1°.

Drift
Less than 0.3° per 100 hours after one-half hour warmup.

Response Time
For full scale phase angle change on input, less than 4 seconds for specified accuracy.

NOTE: Rated accuracy applies throughout phase range except for 2° from either range extreme.

INPUT SIGNAL

Model 740 Amplitude Range
50 mV to 50 V rms.

NOTE: Any 1000:1 amplitude range between 1 mV and 300 V available as an option.

Model 750 Amplitude Range
1 mV to 300 V rms, selectable in two overlapping ranges, 1 mV to 2 V and 300 mV to 300 V rms.

Frequency Range
10 Hz to 2 MHz.

Differential Measurement
True differential input. Input impedance is 2 MΩ shunted by 20 pF. When used single ended the input impedance is 1Ω M and 30 pF.

Maximum DC Voltage
Model 740 — 400 V. .
Model 750 — 200 V. (2 V range), 500 V (300 V range).

Common Mode Rejection
10 Hz to 100 kHz >50 dB.
100 kHz to 2 MHz >40 dB.

READOUT/CONTROLS

Model 740

Display
Meter readout with four selectable scales, ±6°, ±18°, ±60°, ±180°.

Recorder Output
0 to −3.600 Vdc (−10 mV/degree) directly proportional to phase reading, output impedance 1 kΩ.

Phase Offset Control
Phase offset control continuously variable from 0 to ±180° with coarse and fine adjustments.

Model 750

Display
Four digit Nixie readout +000.0° +360.0° or −180.0° to +180.0° sele able, with automatic lead-lag (+ or indication.

Recorder Output
0 to −3.600 Vdc (−10 mV/degree, 0 360 range) or −1.800 to +1.800 V (−180 to +180 range) directly prop tional to phase reading, output im dance 1 kΩ.

BCD Output (Optional)
8421 coded output available. Nomi logic levels, logic 1 = 1.6 V ±.4 V, lo 0 = 0.2 V ±.2 V from 10 k source i pedance.

GENERAL FEATURES

Phase Calibrate Switch
This rear panel switch allows the u to check range maximum and minim calibration points. Rear panel access provided for calibrate adjustments.

MECHANICAL

Weight
9 lb. net, 12 lb. shipping.

Dimensions
8½ in. w., 5¼ in. h., 11 in. d.

Power Requirements
100 V to 130 V or 200 V to 250 V, to 400 Hz, less than 25 watts.

Environmental
Specifications apply 25°C ±5°C, a one-half hour warmup.

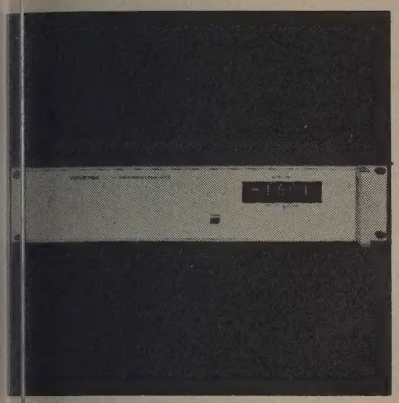
ORDER INFORMATION

Prices (FOB San Diego)
Model 740 — $895
Model 750 — $1495
BCD Output Option (Model 750 on $1

Prices and specifications subject to chang

Model 755 Programmable Phase Meter

WAVETEK
9045 Balboa Ave., San Diego, Calif. 92123; Tel. 279-2200
P.O. Box 651, San Diego, Calif. 92112; TWX 910-335-2007



The Wavetek Model 755 is a completely automatic programmable digital phase meter designed for automatic phase measurement in systems applications. The instrument features the excellent sensitivity and broad dynamic range characteristics of all Wavetek phase meters, and adds the automatic and programming features required for automatic systems applications.

The wide dynamic range of the Model 755 allows measurements to be made over a 1000:1 range of input signal. Phase range is selected automatically to permit measurement of any phase angle without manual adjustment. The instrument may be programmed to update a phase angle reading upon receipt of a read command from an external source. Upon receipt of this command, the instrument will measure the phase angle and generate a print output command when the measurement is complete.

All automatic controls may be operated manually from rear panel controls for added convenience during system checkout.

The automatic operation of the Model 755 Phase Meter makes it ideally suited for computer-controlled test systems. The optional closed-loop phase lock feature allows the instrument to be used with a Model 157 Programmable Waveform Synthesizer. This combination will phase-lock and generate precision programmable phase shift from an external reference frequency. Phase shift is controllable from 0° to 360°.

ACCURACY

Absolute Measurement Accuracy
±0.1° calibration accuracy, reference 40 Hz to 20 kHz square wave input between 100 mV and 5 V peak-to-peak.

Frequency Effects on Accuracy
With a sine wave input of 100% of amplitude range, accuracy is equal to calibration accuracy ±.2° from 40 Hz to 20 kHz. Zero offset from 40 Hz to 100 kHz is less than 0.1° or 0.1° per 10 kHz. Relative phase accuracy 100 kHz to 2 MHz better than 2°.

Amplitude Effects on Accuracy
Less than 1.5° for 60 dB change on both channels.

NOTE: Minimum sensitivity above 50 kHz is 500 mV.

Waveforms Effects on Accuracy
Errors due to even harmonic sine distortion are essentially eliminated by unique input detection circuitry.

Resolution
0.1°.

Drift
Less than 0.3° per 100 hours after one-half hour warmup.

INPUT SIGNAL

Amplitude Range
50 mV to 50 V rms.

Frequency Range
40 Hz to 2 MHz.

Differential Measurement
True differential input. Input impedance is 2 MΩ shunted by 20 pF. When used single-ended the input impedance is 1 MΩ and 30 pF.

Maximum DC Voltage
400 V.

Common Mode Rejection
10 Hz to 100 kHz >50 dB.
100 kHz to 2 MHz >40 dB.

READOUT/CONTROLS

Display
Four digit Nixie readout −180.0° to +360.0° with automatic lead-lag (+ or −) indication. Proper phase range is automatically selected. Rear panel switch allows manual selection of −180° +180° or 0° +360° range.

Recorder Output
−10 mV per degree dc voltage output directly proportional to phase reading, output impedance 1 kΩ.

GENERAL FEATURES

Phase Calibrate Switch
This rear panel switch allows the user to check range maximum and minimum calibration points. Rear panel access is provided for calibrate adjustments.

MECHANICAL

Weight
14 lb. net, 18 lb. shipping.

Dimensions
19-in. rackmount panel, 3½ in. h., 16½ in. d.

Power Requirements
100 V to 130 V or 200 V to 250 V, 50 to 400 Hz, less than 25 watts.

Environmental
Specifications apply 25°C ±5°C, after one-half hour warmup.

ORDER INFORMATION

Price (FOB San Diego)
Model 755 — $1995

Prices and specifications are subject to change.

INTERFACE DATA

Program Connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	4	8	1	2	4	8	1	2	4	8	1	2	±	Read Command In	Recorder Output	Ground	Print Command Out	Range Program	Range Minimum Calibrate	Range Maximum Calibrate
Tenths				Units				Tens				Hundreds									

Notes:

BCD Output
8421 TTL Logic
Logic 1 = +2.4 V minimum
Logic 0 = +0.4 V maximum

Computer Read Command Input
Accepts positive pulse 2-10 V, 100 ns minimum width. Manual read command available with rear panel switch.

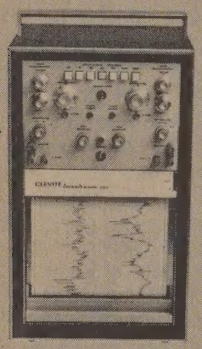
Print Command Output
Pulse 0 (±.3V) to 2.0 (±.4) volts when reading is available. Minimum width 50 μseconds.

Read Time
500 ms maximum

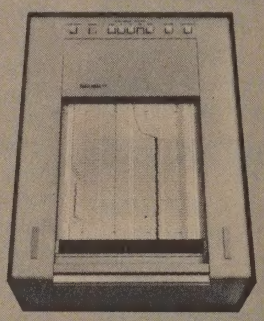
BRUSH RECORDERS: A MATTER OF RECORD

Here . . . from a single source . . . is a complete selection of versatile, high-performance direct writing recorders. There's a choice of 2, 4, 6 and 8 analog channels (plus event markers).

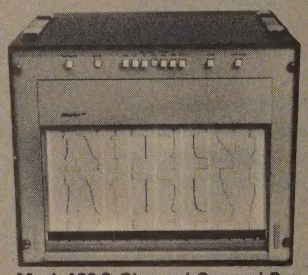
Their unique precision servo penmotors provide 99½% linearity and a true rectilinear trace. The famous Brush patented pressurized-ink writing system is standard on all but the Datapoint recorder. Pressurized ink-writing puts ink *into* the paper not onto it. There's no smudge, no smear, no puddling. All electronics are solid-state. They are compatible with the wide variety of Brush signal conditioners. Most models are available in both portable and rack mounted versions. Look to Brush for the optimum answer in direct writing recorders. Their performance is a matter of record.



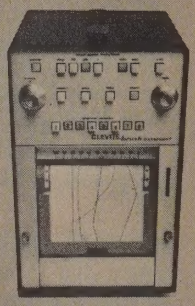
Mark 280 2-Channel High Performance Recorder—Facts come in twice as loud and clear on this high performance recorder. Double width 80mm channels assure highest resolution, quick and easy read-out. Built-in preamps provide a measurement range from 0.5mV/Div. to 500V full scale. The finest 2-channel portable you can buy.



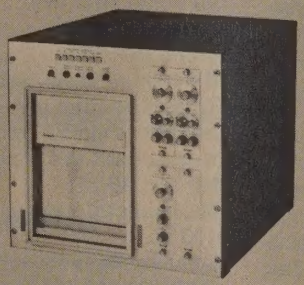
Brush 440 4-Channel General Purpose Recorder—Designed for maximum versatility at low cost per channel. It's rugged and performs with exceptional reliability in laboratory or field applications. Four 40mm channels and 2 event markers.



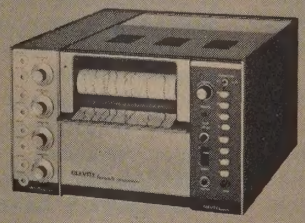
Mark 480 8-Channel General Purpose Recorder—One of our newest. This system is ideally suited for a wide range of applications. It is the lowest-cost-per-channel recorder of its kind available today.



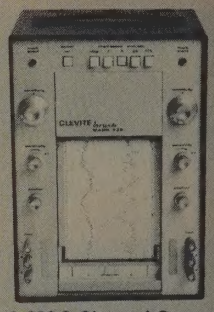
Datapoint 8 Channel Multipoint Recorder—Ideal for monitoring such variables as temperature, flow, pressure, etc. It utilizes felt tip capillary writing. Sampling rates can be selected anywhere between 2 seconds per point to 20 points per second. One or two channels can be intensified. Or it can write continuously as a single channel recorder.



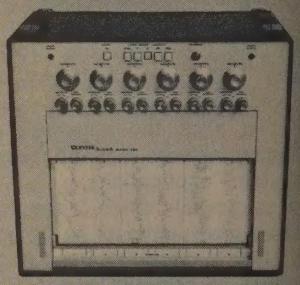
Mark 240 4-Channel High Performance Recorder—This 4-channel recorder is designed for applications where maximum resolution and precision are required. Modular design permits use of interchangeable preamps. Rack, cabinet or cart mounted, it also offers a push-button choice of 12 chart speeds.



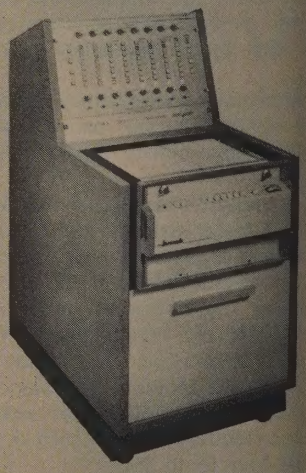
Mark 2300 Lightbeam Oscillograph—This dual tungsten filament optical oscillograph provides fail-safe reliability, economy of operation, operator safety and unlimited application possibilities. It has 1 to 16 channels, d-c to 5 kHz with matched companion amplifiers and plug-in galvos.



Mark 220 2-Channel General Purpose Recorder—A versatile, rugged, accurate recorder that's easy to operate, easy to buy. Small as a breadbox, weighs just 25 lbs. Built-in preamps provide a measurement range from 1 mV per division to 500V full scale.



Mark 260 6-Channel General Purpose Recorder—This rugged 6-channel recorder will handle the great majority of recording tasks with high precision and maximum operator convenience. Built-in preamps provide a measurement range from 1 mV per division to 500V full scale.



Mark 200 8-Channel High Performance Recorder—The world's standard for high performance direct writing recorders. The Mark 200 can be tailored to your specific requirements through a broad range of modular sub-systems. There's a choice of horizontal or vertical oscillographs and a wide range of penmotor and channel-width combinations.

BRUSH RECORDERS AND OSCILLOGRAPHS—CONDENSED SPECIFICATIONS

	Datapoint	Mark 220	Mark 280	Brush 440	Mark 240	Mark 260	Brush 480	Mark 200	Mark 2300
No. Analog Channels	8	2	2	4	4*	6	8	8*	1 to 16
No. Event Channels	1 (accessory)	2 (standard)	2 (standard)	2 (standard)	2 (standard)	4 (standard)	2 (standard)	2 (standard)	
Channel span	4.5" (114mm)	40mm	80mm	40mm	40mm*	40mm	40mm	40mm*	6" (152mm)
Frequency Response†	See Description	40Hz	35 Hz	40 Hz	55 Hz	40 Hz	40 Hz	55 Hz	Up to 1k Hz
Non-Linearity†	<0.5%	<0.5%	<0.5%	<0.5%	<0.5%	<0.5%	<0.5%	<0.5%	<2%
Sensitivity†	±2.5V	1mV/div. to 500V/full scale	0.5mV/div. to 500V/full scale	±2.5V	±2.5V	1mV/div. to 500V/full scale	±2.5V	±2.5V	Depends on galvos selected
Input Circuit	Single ended, floating	Differential balanced to ground	Floating and shielded	Single ended, floating	Single ended, common ground	Differential, balanced to ground	Single ended, floating	Single ended, common ground	Varies with galvos
Input Impedance	50k ohm	10M ohm	1M ohm	50k ohm	50k ohm	10M ohm	50k ohm	50k ohm	Varies w/galvos
Chart Speeds	0.02, 0.05, 0.1, 0.2, 0.5, 1 in./min. & in./sec.	1, 5, 25, 125 mm/sec.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200mm/sec.	1, 5, 25, 125 mm/sec. & mm/min.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200mm/sec.	1, 5, 25, 125 mm/sec. & mm/min.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200mm/sec.	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200mm/sec.	0.002, 0.004, 0.01, 0.02, 0.05, 0.1, 0.2, 0.25, 0.4, 0.5, 1, 2, 5, 10, 25, 50in/sec.
Dimensions in (in.) Portable case (cm) (Nominal)	9w x 14h x 12d 23w x 36h x 31d	9w x 14h x 8d 23w x 35h x 21d	11w x 18h x 12d 27w x 47h x 29d	14w x 8h x 18d 34w x 20h x 46d	22w x 21h x 21d 56w x 53h x 52d	18w x 16h x 10d 44w x 41h x 26d	19w x 17h x 15d 49w x 42h x 37d	Rack Mounting Only	11w x 9h x 20d 28w x 23h x 51d
Weight (Lbs.) (Kg.)	45 20	25 11	76 35	45 20	170 77	65 30	95 43	275 125	45 20

*Optional 80mm analog channels, 80mm 8 channel "Multimarker" or combinations are available.

†Full scale.

BRUSH SIGNAL CONDITIONERS

	Model No.	Measurement Range	Attenuator Steps
DC Preamplifiers			
High Gain	13-4215-02 13-4215-12 with calibrated zero suppression	100μV/div. to 500V Full Scale	100, 200, 500μV/div., 1, 2, 5, 10, 20, 50, 100mV/div., OFF, plus x 100 mult. (± 1.0%)
Very High Gain	13-4215-62 13-4215-72 with calibrated zero suppression	1μV/div. to 50V Full Scale	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000μV/div., OFF, plus x 100 Mult. (±1%)
Carrier	13-4212-02	Strain of 1μ in/in/div. to 5 in/in Full Scale with 4 active gages	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 μ in/in/div., OFF CAL, x 100 Mult. (internal) (±1%)
Log-Linear	13-4214-00	a-c:10mV to 100V rms Full Scale d-c:1V to 100V Full Scale	a-c:10, 31.6, 100 316mV Full Scale; 1, 3.16, 10, 31.6 100V Full Scale plus -50dB/F.S. (±2%) d-c:1, 3.16, 10, 31.6, 100V F.S. (±2%)
High Voltage	13-4215-82	0.5mV/div. to 1000V Full Scale	0.5, 1, 2, 5, 10, 20, 50, 100, 200mV/div. plus volts/div. Mult. (±1.0%)
Multichannel Medium Gain	13-4185-05 (Pushbutton)	50mV/div. to 250V Full Scale	0.05, 0.1, 0.2, 0.5, 1, 2, 5V/div., OFF (±1%)
Portable Amplifiers			
DC Bridge	13-4312-00	For transducers of 2mV/V to 10mV/V sensitivity	5, 10, 20, 50, 100% load, OFF, CAL (±1%)
Thermo-couple	13-4312-10	2mV Full Scale to 70mV Full Scale	2-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, mV full scale
Biomedical Couplers			
Universal a-c/d-c	11-4307-00	a-c:20μV/div. to 25mV F.S. d-c:1mV/div. to 25V F.S.	a-c:20, 50, 100, 200, 500μV/div. (±1%), OFF d-c:1, 2, 5, 10, 20, 50, 100, 200, 500 mV/div. (±1%)
ECG	11-4307-01	20μV/div. to 25V F.S.	20, 50, 100, 200 500μV/div. (±1%)
EEG and High Gain a-c	11-4307-02	1μV/div. to 50mV F.S.	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000μV/div., OFF, (±2%)
Bio-Tach Computer	11-4307-03	1bpm/div. to 500 bpm F.S.	1, 2, 5, 10bpm (±2%) CAL, OFF ECG
Transducer	11-4307-04	2μV/div. to 50 mV/F.S. output of transducer	.2, .5, 1, 2, 5, 10, 20, 50, 100, units/div.
Integrator	11-4307-05	Direct:1mV/div. to 5V Full Scale Integrate: 1mV-sec/div. to 5 volt-sec F.S.	1, 2, 5, 10, 20, 50, 100mV-sec/div.

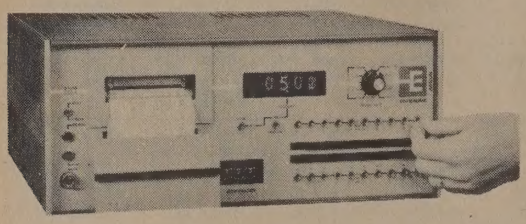
Complete information and technical data on request.
Write Brush Instruments Division, Gould Inc.,
3631 Perkins Avenue, Cleveland, Ohio 44114

GOULD BRUSH

ESTERLINE

ESTERLINE ANGUS

Digital Data Acquisition System



Typical Data Frame

Channel Number — Data — Data Identification

```
CH10    1.173  MV
CH09     *     MV
CH08     *     MV
CH07   02.32   MV
CH06    1.320  MV
CH05   000.8   MV
CH04  -00.88   MV
CH03   -1.006  MV
CH02   -0.988  MV
CH01   -1.033  MV
CH00   -0.977  MV
312    01:29   HR
```

*Indicates overrange

Data Frame Identification — Time — Hour

Outstanding data print out, a real time clock, nixie tube display and variable frame scan rate are a few exceptional features of the compact 5 to 20 channel Esterline Angus Model D-2020 Digital Data Acquisition System.

The D-2020 has a self-contained digital printer. It prints ch nel number, data, time and data frame identification entered by a manual control. Its decimal point is floati thus, it can be assigned to any of the four digits. Frame s rates can vary from two channels per second to one fra per hour to permit a wide range of data sampling.

The system has low level signal conditioning of one milliv full scale with 200 percent over-range. Programmable g of individual channels—1, 10 and 100 millivolts—can selected by front panel switches. Each channel can be signed a different gain which allows various levels of scale input from different types of transducers.

Noise rejection is accomplished by using an integrating ty digital voltmeter and guard-shield techniques. Errors due common mode pickup are made negligible by guarding. T guard circuit completely isolates the measuring circuit fr the chassis, breaking the common mode loop. The gua connection is carried through the input scanner to the sig source.

This compact digital data system has an optional internal cuit which allows interface with incremental magnetic ta or punched paper tape recorders. Data is available in AS coded format which means data can be analyzed readily computer reduction.

Specifications

Number of Channels	Maximum of 20, minimum of 5
Operational Modes	A. Automatic scan of any length frame determined by front panel push button. (Frame scan rate variable from continuous to one scan per hour.) B. Single scan of any frame length, manually triggered. C. Single or continuous scan of any one channel. D. External trigger for single channel or single frame scan.
Data Frame Scan Rate	Variable from continuous to one frame per hour. External frame trigger available as standard.
Data Frame Length	Variable by push button "end-of-frame" selector switches on front panel.
Channel Scan Rate	Two channels per second.
Data Frame Identification Number	Three digits controlled by front panel manual entry switches.
Clock	Internal, digital, real time, solid-state clock. Twenty-four hour time code for hours and minutes.
Input Configuration	Floating, differential 3-wire input (high, low and guard). Complete channel isolation (all three leads switched).
Input Ranges	Choice of three: 1, 10 and 100 MV individually selectable by front-panel switches. Readable over-range on all ranges is 200%
Resolution	1 μv (on 1MV range).
Input Impedance	100 megohms all ranges.
Source Impedance	Maximum 10 K ohms.
Noise, Referred to Input	5 μv peak-to-peak.
Common Mode Voltage	200 VDC
Common Mode Rejection	120 db (1,000,000:1) at DC 100 db (100,000:1) at 60Hz AC Maximum AC voltage — 120 V rms
System Accuracy	$\pm$ 0.1% of full scale or 5 μv, whichever is greater, $\pm$ one digit.
Size and Weight	17⅛" wide, 7" high, 16½" deep. 25 pounds
Power Requirements	120 or 240 V $\pm$10%, 50 and 60Hz
Output Options	A. Internal interface and formatter to drive paper tape perforator. Data coded per ASCII (1968). B. Internal interface for seven track 556-BPI incremental magnetic tape recorder.
Price	$3,540.00 for basic 5-channel system. This basic system is wired to accept 20 channels of data. Additional 15 channels by plug-in cards available at $250.00 per 5-channel card.

Servo Recorders

Single 150 mm Channel

Chart—170 mm wide, 65′ long, 150 mm (approximately 6″) calibrated width, straight coordinates.

Writing—Ink.

Servo Motor—AC rotary, only two pulleys.

Battery or AC operation—12 continuous hours per charge with rechargeable batteries, 24 continuous hours with alkaline batteries, indefinitely on AC.

Amplifier—Solid state.

Minimum Source Impedance—Up to 10,000 ohms.

Step Response—½, 1 second full 150 mm span.

Spans—2, 5, 10, 20, 100 and 200 MV. 0.5, 1, 2, 5, 10, 20 or 50 V. Switch selectable.

Accuracy—±0.5% of span.

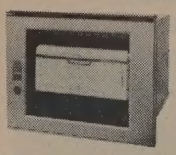
Chart Speeds—Switch selectable. 20, 60 and 180 mm per minute and hour with two times multiplier.

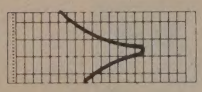
Case—T171B portable.

Options—Carrying case.

Prices—From $800.

Single 10″ Channel





Chart—11″ wide, 120′ long, 10″ calibrated width, straight coordinates.

Writing—Ink.

Servo Motor—AC rotary. Infinite resolution sealed conductive plastic feedback element.

Amplifier—Solid state plug-in.

Maximum Source Impedance—Up to 10,000 ohms. Off balance input impedance 50,000 ohms minimum.

Step Response—½, 1, 4 or 20 seconds full 10″ span.

Inputs—DC MV as low as 1 MV, DC volts, thermocouples, DC bridge for resistance thermometers.

Accuracy—±0.25% of span or ±3.5 microvolts, whichever is greater.

Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

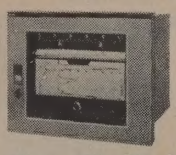
Chart Speeds—½″ per hour to 8″ per second or 12½ mm per hour to 200 mm per second.

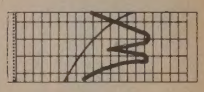
Case—Series "E"—Flush, wall or bench mounting.

Options—Retransmitting potentiometer, up to 6 alarms, variable span and zero.

Prices—From $1,050.

Two 10″ Overlapping Channels





Chart—11″ wide, 120′ long, 10″ calibrated width, straight coordinates.

Writing—Ink.

Servo Motors—AC rotary, one pen located 1/10″ behind the other. Two records overlap full 10″ calibrated width. Infinite resolution sealed conductive plastic feedback element.

Amplifiers—Solid state plug-in.

Maximum Source Impedance—Up to 10,000 ohms. Off balance input impedance 50,000 ohms minimum.

Step Response—½, 1, 4 or 20 seconds full 10″ span.

Inputs—DC MV as low as 1 MV, DC volts, thermocouples, DC bridge.

Accuracy—±0.25% of span or ±3.5 microvolts, whichever is greater.

Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

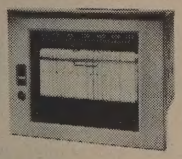
Chart Speeds—½″ per hour to 8″ per second or 12½ mm per hour to 200 mm per second.

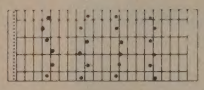
Case—Series "E"—Flush, wall or bench mounting.

Options—Retransmitting potentiometer, variable span and zero.

Prices—From $1,750.

Multipoint





Chart—11″ wide, 120′ long, 10″ calibrated width, straight coordinates.

Printing—Single or multicolor dots with point numbers.

Input Points—2, 3, 4, 6, 8, 10, 12, 16, 18, 20 or 24 with print rate from 1½ second to 10 minutes per point.

Amplifier—Solid state plug-in. Infinite resolution sealed conductive plastic feedback element.

Maximum Source Impedance—Up to 10,000 ohms. Off balance input impedance 50,000 ohms minimum.

Inputs—DC MV as low as 1 MV, DC volts, thermocouples, DC bridge.

Accuracy—±0.25% of span or ±3.5 microvolts, whichever is greater.

Chart Drives—Series "E"—10 or 5 speed automatic; 10 or 5 speed manual.

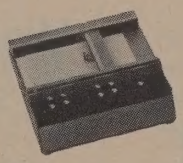
Chart Speeds—½″ per hour to 8″ per min. or 12½ mm per hr. to 200 mm per min.

Case—Series "E"—Flush, wall or bench mounting.

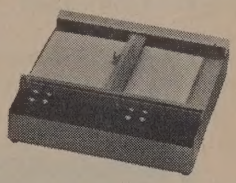
Options—Electrical programmed printing of points, dual range, print-on alarm, variable span and zero, up to 6 common or selective alarms.

Prices—From $1,520.

X-Y Recorders



Model X-Y 8511 with 8.5″ x 11″ chart priced from $1,450



Model X-Y 1117 with 11″ x 17″ chart priced from $1,550

Writing—Ink.

Repeatability—±0.1%.

Slewing Rate—35 inches per second.

Paper Positioning—Illuminated graticule.

Amplifiers—Interchangeable, plug-in.

OPTIONAL PLUG-INS

Maximum Sensitivity—0.1 MV per inch.

Zero Offsetting—Up to ±5 V DC.

Time Base Sweep—Variable, up to 10 inches per second.

Note: Esterline Angus X-Y Recorders are for sale in North and South America only.

ESTERLINE ANGUS
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ESTERLINE

ESTERLINE ANGUS

Direct Writing Recorders

Single 4½" Channel Curvilinear

Chart—6" wide, 103' long, 4½" calibrated width, curved coordinates.

Writing—Ink.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements—Electrodynamometer or Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts, watts, vars, KVA, frequency, Pf, pressure, vacuum, speed, position.

Chart Drives—Series "A"—Synchronous motor, spring, motor-wound spring, Selsyn.

Chart Speeds—¾" per hour to 3" per second or 12½ mm per hour to 100 mm per second.

Cases—Series "A"—Portable, flush, wall, front switchboard, twin.

Prices—From $475.

Two 2" Channels Curvilinear

Chart—6" wide, 103' long, each channel 2" calibrated width, curved coordinates.

Writing—Ink.

Synchronized Records—Two complete recording systems side-by-side.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements—Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts. Through use of appropriate transducers will also record watts, volts, Pf, amperes, vars, frequency, phase angle.

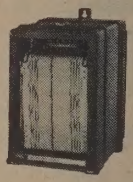
Chart Drives—Series "A"—Synchronous motor, spring, motor-wound spring, Selsyn.

Chart Speeds—¾" per hour to 3" per second or 12½ mm per hour to 100 mm per second.

Cases—Series "A"—Portable, flush, wall, front switchboard, twin.

Prices—From $730.

Analog Event



Chart—6" wide, 103' long, 2¾" calibrate width and curved coordinates in analo channel, 8 event channels.

Writing—Ink.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements—Electrodynamomete or Permanent-Magnet Moving-Coil in an log channel. 6, 7 or 8 event elements.

Records in Analog Channel—Microampere milliamperes, amperes, millivolts, volt watts, vars, KVA, pressure, vacuum, spee position. Through use of appropriate tran ducers will also record Pf, frequency an phase angle.

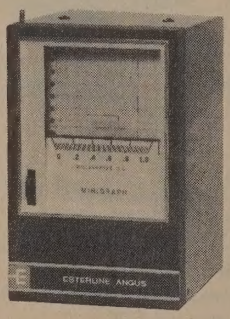
Chart Drives—Series "A"—Synchronou motor, spring, motor-wound spring, Selsy

Chart Speeds—¾" per hour to 3" per se ond or 12½ mm per hour to 100 mm pe second.

Cases—Series "A"—Portable, flush, wal front switchboard, twin.

Prices—From $625.

Minigraph Recorder



When you order the Esterline Angus Minigraph, you get a miniature recorder of unsurpassed durability and versatility whether you use it in laboratory, industry, aerospace or education.

You'll like the price ($99.50), the size (3⅝" wide, 5⅝" high, 4⅜" deep) and the weight (3½ pounds). And there's a lot more to like about the Minigraph.

Inkless Recording

Take inkless recording, for example. The Esterline Angus Minigraph employs a special stylus. It is firmly positioned against pressure sensitive paper by an impact plate.

You can choose from 14 chart speeds ranging from ⅛ inch to 60 inches per hour. To change speeds, you simply install a new gear train.

All Esterline Angus charts are the same active width (2⅛") with space for an event marker to record in the right margin.

Taut Band Measuring Element

Diamonds might be a girl's best friend. But there are no diamonds or other jewels to wear in the Minigraph. In their place is a taut band movement which is much more resistant to shock and vibration than pivot or spring movements. The movement is friction-free because there are no parts to wear. This prolongs the life of the movement indefinitely.

Accuracy is an exceptional ±2%, and full scale response is one second. Maximum sensitivity is 10 microamperes full scale.

Designed for OEMs

The compact size and low cost of the Minigraph makes it easy to add recording ability to other equipment.

Original Equipment Manufacturers will like the ease with which the Esterline Angus nameplate snaps out for private labeling. The nameplate also conceals the readily accessible zero adjust.

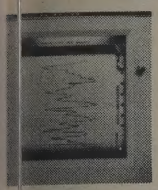
The Esterline Angus Minigraph has four basic movements—zero to 10 microamperes, zero to 50 microamperes, zero to 100 microamperes and zero to one milliampere. The six DC voltage ranges range from one to 500 volts.

Hook-On to Something Good

Outstanding options for the Minigraph are two Hook-On Current Transformers for AC current measurements. A convenient range change dial provides six AC ranges from 250 to five amperes.

Direct Writing Recorders

Single 4½" Channel Recti Graph®



Chart—6" wide, 103' long, 4½" calibrated width, straight coordinates.

Writing—Ink or inkless.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements — Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts. Through use of appropriate transducers will also record watts, volts, Pf, amperes, vars, frequency, phase angle.

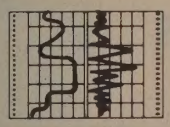
Chart Drives — Series "A" — Synchronous motor, spring, motor-wound spring, Selsyn. Series "S"—Synchronous motor from single speed to 14 speed automatic drives.

Chart Speeds—¾" per hour to 3" per second or 12½ mm per hour to 100 mm per second in Series "A." ¾" per hour to 6" per second or 12½ mm per hour to 200 mm per second in Series "S."

Cases—Series "A"—Portable, flush, wall, front switchboard, twin. Series "S"—Portable or flush with 8" by 8" front.

Prices—From $580.

Two 2³⁄₁₆" Channels Recti Graph®



Chart—6" wide, 103' long, each channel 2³⁄₁₆" calibrated width, straight coordinates.

Writing—Ink or inkless.

Synchronized Records—Two complete recording systems side-by-side.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements — Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts. Through use of appropriate transducers will also record watts, vars, Pf, amperes, frequency, phase angle.

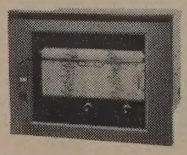
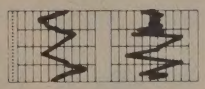
Chart Drives — Series "S" — Synchronous motor from single speed drives to automatic drives with 14 immediately dialable speeds.

Chart Speeds—¾" per hour to 6" per second or 12½ mm per hour to 200 mm per second.

Cases—Series "S"—Portable or flush. Flush is 8" by 8" front.

Prices—From $910.

Two 4½" Channels Recti Graph®

Chart—11" wide, 120' long, each channel 4½" calibrated width, straight coordinates.

Writing—Ink or inkless.

Synchronized Records—Two complete recording systems side-by-side.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements — Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts. Through use of appropriate transducers will also record watts, vars, Pf, amperes, volts, frequency, phase angle.

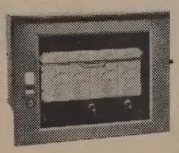
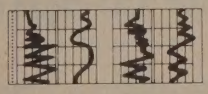
Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

Chart Speeds—½" per hour to 8" per second or 12½ mm per hour to 200 mm per second.

Case—Series "E"—Flush, wall or bench mounting.

Prices—From $1,170.

Four 2³⁄₁₆" Channels Recti Graph®

Chart—11" wide, 120' long, each channel 2³⁄₁₆" calibrated width, straight coordinates.

Writing—Ink or inkless.

Synchronized Records—Four complete recording systems side-by-side.

Response—To ½ second.

Accuracy—To 1%.

Measuring Elements — Permanent-Magnet Moving-Coil.

Records—Microamperes, milliamperes, amperes, millivolts, volts. Through use of appropriate transducers will also record watts, vars, Pf, amperes, volts, frequency, phase angle.

Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

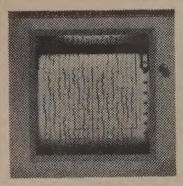
Chart Speeds—½" per hour to 8" per second or 12½ mm per hour to 200 mm per second.

Case—Series "E"—Flush, wall or bench mounting.

Prices—From $1,800.

Event Recorders

20 Channels Event



Chart—6" wide, ink is 103' long, inkless is 81' long, 20 off-position lines ¼" apart for writing elements.

Writing—Ink or inkless.

Writing Elements—5, 10, 15, 20 ink. 10 or 20 inkless.

Response—Presence or absence of an event of 15 millisecond duration causes writing element to deflect.

Measuring Elements—Deflection caused by electromagnets rated for any one AC or DC voltage from 2 to 250.

Chart Drives — Series "A" — Synchronous motor, spring, motor-wound spring, Selsyn. Series "S"—Synchronous motor from single speed to 14 speed automatic drives.

Chart Speeds—¾" per hour to 3" per second or 12½ mm per hour to 100 mm per second in Series "A" or ¾" per hour to 6" per second or 12½ mm per hour to 200 mm per second in Series "S."

Cases—Series "A"—Portable, flush, wall, front switchboard, twin. Series "S"—Portable or flush with 8" by 8" front.

Prices—From $455.

Galvanometer Recorders With 1 MV Sensitivity

Pen Response—½ second full span.

Input Impedance—Potentiometric.

Source Impedance—Up to 10K.

Available Millivolt Ranges—0-1 MV to 0-100 MV.

Multi-Range—0-1/5/10/50/100/500 MV. 0-1/5/10/50/100 V DC.

Operating Temperature Range—+20° F to +120° F.

Power Supply—120 V ±10%—50, 60 Hz.

Zero Stability—Three-position switch provides for source impedance compensation.

Source Impedance	Switch Position	Maximum Zero Offset
less than 10 K	1	0.5 μV/°C
1 K to 3 K	2	0.75 μV/°C
3 K to 5 K	3	0.75 μV/°C

Writing System — Capillary and constant head ink or alternate inkless.

Special Op-Amp Options—Consult factory. Available are low input impedance microamp input, temperature compensation, electrical zero, fixed suppression.

Prices—From $625.00.

ESTERLINE ANGUS
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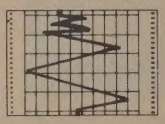
Speed Servo® Recorders

Single 4½" Channel Speed Servo®



Chart—6", wide, 103' long, 4½" calibrated width, straight coordinates.

Writing—Ink.

Servo Motor—Linear motion DC. Only the pen moves.

Amplifier—Sold state, except for one high impedance input tube.

Maximum Source Impedance— Up to 100,000 ohms. Off balance input impedance 500,000 ohms minimum.

Step Response—⅛ sec. full 4½" span.

Ranges—0-1 MV DC or higher.

Accuracy—±0.5% of span.

Chart Drives—Series "S"—Synchronous motor from single speed drives to automatic drives with 14 immediately dialable speeds.

Chart Speeds—¾" per hour to 6" per second or 12½ mm per hour to 200 mm per second.

Cases—Series "S"—Portable or flush. Flush has 8" by 8" front.

Options—Adjustable Zero Adjustable Span (AZAS), retransmitting potentiometer, ratio recording circuit.

Prices—From $1,045.

Two 4½" Channels Speed Servo®

Chart—11" wide, 120' long, each channel 4½" calibrated width, straight coordinates.

Writing—Ink.

Synchronized Records—Two complete recording systems side-by-side.

Servo Motors—Linear motion DC. Only the pens move.

Amplifiers—Modular solid state except for one high impedance input tube.

Maximum Source Impedance—Up to 100,000 ohms. Off balance input impedance 500,000 ohms minimum.

Step Response—⅛ sec. full 4½" span.

Ranges—0-1 MV DC or higher.

Accuracy—±0.5% of span.

Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

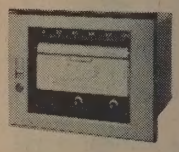
Chart Speeds—½" per hour to 8" per second or 12½ mm per hour to 200 mm per second.

Case—Series "E"—Flush, wall or bench mounting.

Options—Adjustable Zero Adjustable Span (AZAS), retransmitting potentiometer, solid state alarms.

Prices—From $2,480.

Single 10" Channel Speed Servo®



Chart—11" wide, 120' long, 10" calibrated width, straight coordinates.

Writing—Ink with inertial ink pump.

Servo Motor—Linear motion DC. Only the pen moves.

Amplifier—Solid state.

Maximum Source Impedance—Up to 100,000 ohms. Off balance input impedance 500,000 ohms minimum.

Step Response—2/10 second full 10" span.

Ranges—0-1 MV DC or higher.

Accuracy—±0.4% of span.

Chart Drives—Series "E"—15, 10 or 5 speed automatic; 10 or 5 speed manual.

Chart Speeds—½" per hour to 8" per second or 12½ mm per hour to 200 mm per second.

Case—Series "E"—Flush, wall or bench mounting.

Options—Adjustable Zero Adjustable Span (AZAS), retransmitting potentiometer, solid state alarms.

Prices—From $1,440.

Oscillo Graph Recorders

Portable Single 30 mm Channel

Chart—200' long with 1 channel 40 mm wide. Full scale excursion is 30 mm.

Writing—Direct-Carbon-Transfer.

Frequency Response—DC to 125 Hz (down 3 db from full scale).

Rise Time—3.2 milliseconds, 10-90% of full scale.

Sensitivity—5 millivolts to 5 volts per mm.

Inputs—Single-ended or balanced to ground with 2.5 megohms input impedance either side to ground. Built-in amplifier.

Case—Series "O".

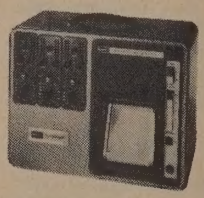
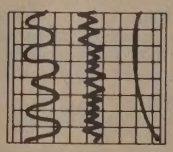
Chart Drive—Push button controlled.

Chart Speeds—From 1 to 100 mm per second.

Event Markers—One optional.

Prices—From $700.

Portable 2 or 3 (30 mm) Channel

Chart—200' long with 3 channels. Each channel 30 mm wide.

Writing—Direct-Carbon-Transfer.

Frequency Response—DC to 125 Hz (down 3 db from full scale).

Rise Time—3.2 milliseconds, 10-90% of full scale.

Sensitivity—5 millivolts to 5 volts per mm.

Inputs—Single-ended or balanced to ground. Separate plug-in amplifiers for each channel.

Case—Series "O".

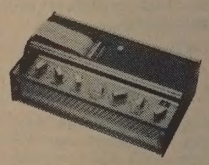
Chart Drive—Push button controlled.

Chart Speeds—From 1 to 100 mm per second.

Event Markers—One standard. One optional.

Prices—From $1,770.

Portable Single 40 mm Channel



Chart—80' long with one channel 40 mm wide.

Writing—Rectilinear, heat writing.

Frequency Response—DC to 75 Hz (down 3 db at 10 mm p to p). DC to 50 Hz (down 3 db at 40 mm p to p).

Sensitivity—15 switch selected values of 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20 MV per mm and times 100 of above sensitivities.

Input—Floating (maximum 250 V DC). Input impedance 10,000 ohms on 0.05 MV/mm. Sensitivity increasing to a maximum of 4 megohms on 2 V/mm sensitivity.

Chart Speeds—1, 2, 5, 10, 25 and 50 mm per second. Selectable through transmission.

Case—0-501 portable.

Event Markers—One standard for manual actuation.

Options—Carrying case.

Prices—From $725.

Other Products

Modular Oscillo Graph

ction A—S-21129 Pen Motor, Without Am-
plifier—Pen motor sensitivity is 100 ma/
c ±10%

Resonance—48 Hz (without stylus).

Price—$215.

ction B—S-21129 Pen Motor, With Am-
plifier—Sensitivity is 15 mv/cm maxi-
m, 100 mv/cm minimum.

Frequency Response—Down 1 DB maxi-
mum at 50 Hz at 25 mm peak-to-peak.

Power Requirement—120 V ±10%, 50 or
60 Hz.

Price—$340.

SPECIFICATIONS COMMON TO OPTIONS A AND B

earity—±2% of full scale.

iting—Rectilinear, with heated stylus.

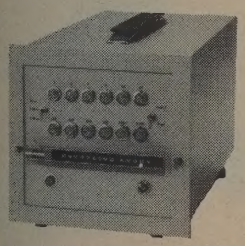
art Paper Width—60 mm.

art Grid Width—50 mm.

art Length—25 meters.

art Speeds—25 and 50 mm per second,
ctrically switched.

Auto-Attenuator



plication—For use with any high imped-
ce recorder to provide maximum reso-
tion records of widely varying voltage
gnals such as those found in gas chroma-
graphy or mass spectrometry.

e all solid state Auto-Attenuator pro-
les signal attenuation rates as fast as
milliseconds per step through a dy-
mic 12 step range from 1 to 2,048 times
e recorder's basic calibration. The re-
rder triggers the attenuator through a
n position signal or high-low alarms.

put Span—1MV minimum, 100V maxi-
um.

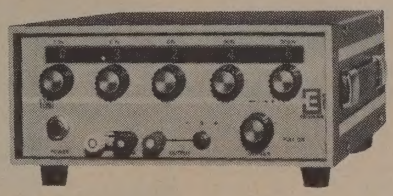
gnal Input Impedance—20,000 ohms.

wer Input—10VA, 120V ± 10V, 50 or
Hz.

ption—On-chart record of attenuation
ep changes.

ices—From $550.

DC Voltage Standard



Output

Voltage Range—0 to ±11.1110 V DC in five decades; ±1 MV DC vernier.

Attenuator—Built-in, 100:1, 100 ohms source impedance.

Current Capability—0 to 50 MA, short circuit proof.

Accuracy—0.005% of reading ±50 μV at 23°C. ±0.0002% per degree C.

Noise—0.001% of reading +50 μV.

Recommended Recalibration Interval—6 months.

Output Impedance

DC—10 millohms.
Dynamic—L ≲ 10 μH; R=2 ohms.

Common Mode—±500 V maximum.

Operating Temperature—0° to +60°C.

Power Requirements—117 or 243 V AC, 47 to 420 Hz, 10 watts maximum, R. F. filter included.

Dimensions—3½" high, 8½" wide, 12" deep. 19" rack mounting adapter available.

Price—$625.

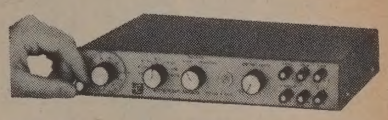
Charts and Ink

The best instrument is only as good, as reliable and as accurate as the chart on which essential information is recorded. Because only perfection in every aspect of chart production is good enough, Esterline Angus engineers have designed and constructed presses and auxiliary equipment which produce charts to exacting specifications. This equipment holds all charts printed in the plant to precise tolerances.

Most chart orders can be filled within seven working days. A liberal quantity discount policy is in effect. In fact, if you use more than 500 charts a year, write for a special annual pricing agreement.

Years of exacting research have led Esterline Angus to the production of an ink which is ideal for use in recorders. It's specially filtered and packaged in polyethylene bottles which are ultrasonically cleaned. It does not evaporate quickly in the ink reservoir, yet it dries quickly on the chart to prevent smearing. It has sufficient body to produce a clear record, yet it flows freely and will not clog the pen. Esterline Angus ink is available in red, green or black.

Function Generator



Output Waveforms—Sine∼, square ⊓⊔ or triangle ∧∨ wave forms switch selected. Any one of these variable voltage level wave forms is available simultaneously with a sine wave of fixed 10 V peak-to-peak level.

Frequency Range—.01 Hz to 100 KHz in 7 decade ranges.

Sine Wave Distortion—
<1% .01 Hz—20 KHz
<5% 20 KHz—100 KHz

Square Wave Response—
<1 microsecond rise and fall time on all ranges.

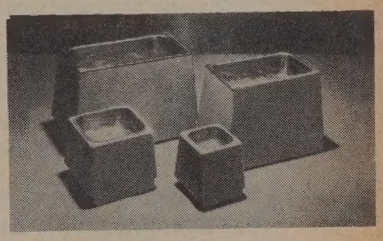
Triangle Linearity Error—
<1% .01 Hz—20 KHz
<5% 20 KHz—100 KHz

Power—
120 V ±10%, 50 or 60 Hz, 20 VA maximum.
220 V ±10%, 50 Hz available.

Dimensions—12" wide, 2 3/16" high and 8⅞" deep (add ⅝" to depth for protrusion of front terminals).

Price—$310.

Ultrasonic Cleaners



Select one of four models to meet your tank size and cleaning power requirements.

Model EA 32 (upper left)
Tank size—11" x 6" x 6" d
Cleaning power—150W
Price—$225, 120V 50/60Hz
$255, 240V 50/60Hz

Model EA 220 (upper left)
Tank size—5" x 9" x 4" d
Cleaning power—100W
Price—$100, 120V 50/60Hz
$120, 240V 50/60Hz

Model EA 12 (lower left)
Tank size—5" x 5" x 3" d
Cleaning power—50W
Price—$60, 120V 50/60Hz
$70, 240 50/60Hz

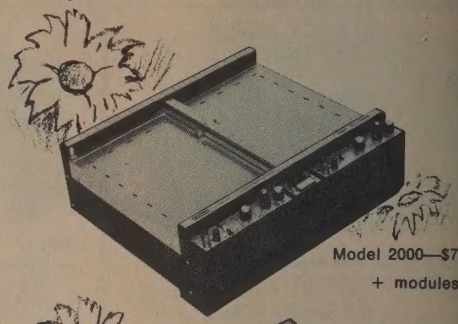
Model EA 2 (lower right)
Tank size—3½" x 3½" x 2⅝" d
Cleaning power—25W
Price—$50, 120V 50/60Hz
$60, 240V 50/60Hz

ESTERLINE ANGUS
DIVISION OF ESTERLINE CORPORATION
BOX 24000 · INDIANAPOLIS, INDIANA 46224
ESTERLINE TELEPHONE 317/244-7611

Flat Bed or Moving Paper, Omnigraphic™ X-Y Plotters Continue to Offer More Features, Less Cost

Feature for feature, model for model— a superior X-Y with unmatched flexibility:

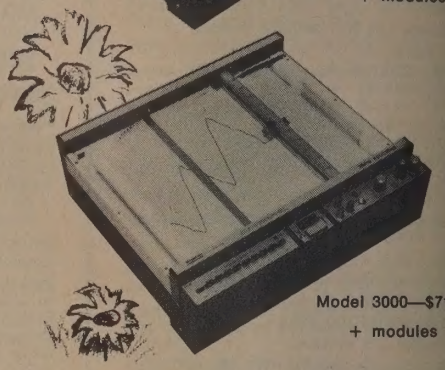
- ☐ Both 8½″ x 11″ and 11″ x 17″ charts
- ☐ A choice of 12 interchangeable modules from $25. to $420.
- ☐ English/Metric scaling switch
- ☐ Vacuum paper hold down
- ☐ 20 in/sec. speed
- ☐ ± .2% overall accuracy
- ☐ Electric pen lift
- ☐ Disposable non-drying pens



Model 2000—$795. + modules

Strip Chart recording with multi speeds and wide range of input functions:

- ☐ Paper size: 10″ (25cm) x 100′
- ☐ Nine pushbutton selectable speeds from .05 to 20 in./min.
- ☐ Nine interchangeable Y axis modules
- ☐ Positive paper feed or roll take-up
- ☐ Rack, panel or bench mounting
- ☐ Electric pen lift
- ☐ Event marker
- ☐ All solid state electronics



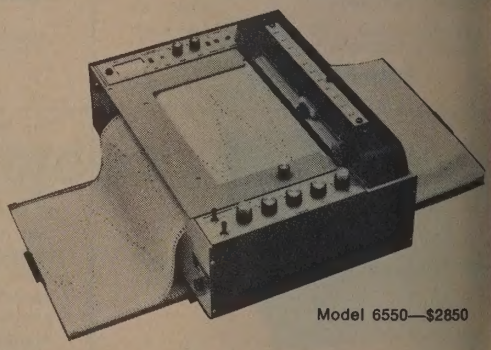
Model 3000—$710. + modules

High speed point plotting for the Nuclear Lab:

Here is the popular OMNIGRAPHIC™ point plotter designed for use with pulse height analyzers, digital oscilloscopes, DVM's, counters or scanners. Simply plug in the 6550 and you get:

- ☐ A plotting speed of 1200 points/minute
- ☐ Four Step resolution from 0.025″ to 0.10″
- ☐ High accuracy of ± 0.2% with ± 0.1% repeatability
- ☐ Manually selectable 6 character printer head
- ☐ Z-fold chart paper tears to file size
- ☐ Bi-directional paper movement
- ☐ Plugs into the following Pulse Height Analyzers with only a cable change:

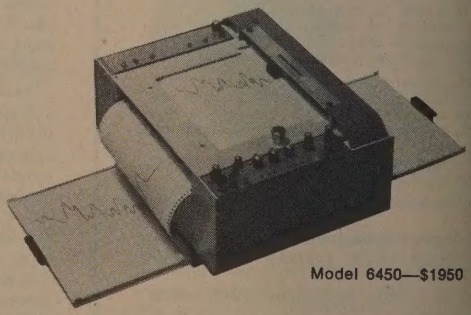
Fabri-Tec	**Intertechnique**	**Laben**	**Northern Scientific**	
Nuclear Data	**Packard**	**RCL-RIDL**	**TMC**	**Victoreen**



Model 6550—$2850

X-Y Plotting is now more convenient with the Omnigraphic™ 6450 because it has all the advantages of conventional X-Y's, yet offers:

- ☐ Z-fold paper eliminates hand loading of individual charts
- ☐ Automatic index or reversal of chart on command—local or remote.
- ☐ Slewing speed 20 in/sec. on Y (pen) axis and 15 in/sec. on X (paper) axis.
- ☐ 18 calibrated DC voltage ranges (continuously variable between ranges).
- ☐ Input impedence 1 megohm, all ranges fixed and variable
- ☐ Accuracy ± 0.2% of full scale, repeatability ± 0.1%
- ☐ 11″ x 17″ recording surface
- ☐ Pen control local or remote
- ☐ Front panel switch for automatic English/Metric scaling
- ☐ Ask about 2 pen model 6452



Model 6450—$1950

Send for catalog on the complete line of graphic recorders

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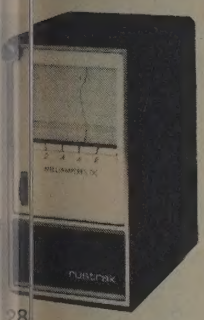
rustrak miniature chart recorders

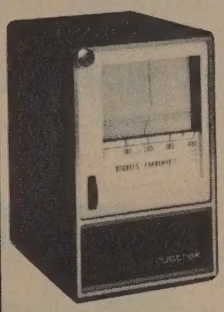
Dependable miniature instruments for permanently recording power, temperature, pressure, strain, events or virtually any parameter that can be converted into an electrical signal. • Inkless, dry writing, rectilinear recording with wide range of sensitivities, writing and chart speeds. • Operate as chart tearoff or reroll. Quick, easy chart review and rewind. Sliding access window. • Most units about 5⅝"H, 3⅝"W, 4⅛"D. Weight about 3½ lbs. • Rugged die-cast aluminum case in epoxy suede-like charcoal gray finish. • Accuracy ±2% of full scale. Response time 0.8 sec. to 1.0 sec. Usable chart widths: single channel — 2-5/16", dual channel — 1" each.



Single Channel DC Recorder.

Basic recorder in the Rustrak line. Ranges from 0-10 microamperes to 0-5 amperes DC; 0-10 millivolts to 0-500VDC. Multipliers and shunts available. Chart speeds 1/32" to 480" per hour. Many available options, features and accessories. AC models also available.

from **$99.50**

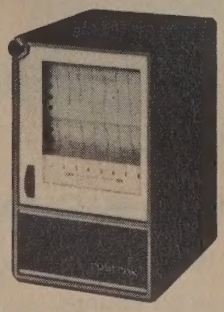


Temperature Recorders.

Wide variety of temperature recorders using thermocouples, thermistors or nickel wire sensors. Ranges from −100°F. to +2400°F. and custom spans as narrow as 25°F. Also available in °C. and in single or dual channels.

from **$148.00**

2122



Event Recorders, Models 292-4 & 292-8.

Four or eight channels. Records worktime, productivity of machines and personnel; provides data for time study, cost analysis, security control. Chart speeds to 50 inches per minute with definition of up to 16 events per second.

from **$103.00**

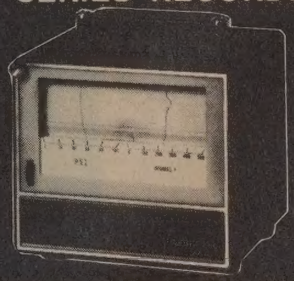
292-8

Dual Channel DC Recorder.

Same as basic Model 288 except dual channel with two galvanometers. Available in combinations of current and voltage or different ranges each channel. Useable chart width, 1" per channel. AC models also available.

from **$143.50**

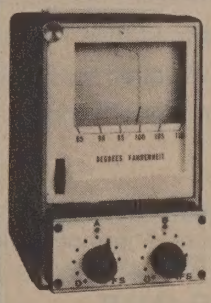
New Dual Width '300' SERIES RECORDERS



double the data at your fingertips. Combine in one housing two Standard Series '200' recorders on a common time basis, using a single chart.

Model shown: 3162/3144 Gas or Liquid Pressure & Temperature Recorder **$370.00**

Rustrak can develop many types of recorders to suit special requirements.

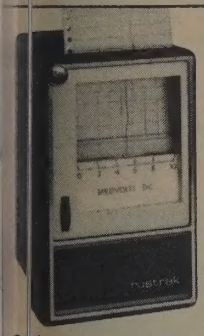


Recording-Controller Feature.

ON-OFF solid state controller feature available as option on most Rustrak recorders. Controls up to 5 amps resistive load at 30 VDC or 115 VAC. Set points continuously adjustable over entire chart range. Option price added to cost of companion recorder. Not available separately.

2133/F204AB

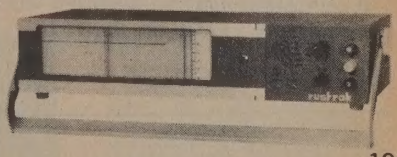
from **$95.00**



One Microampere DC Recorder.

Solid state with full-scale sensitivity of 1 microampere, range of 0 to 10 millivolts DC and input impedance of 10,000 ohms. For use as temperature bridge and strain gauge readout or as a recorder accessory for laboratory and process instruments.

$180.00

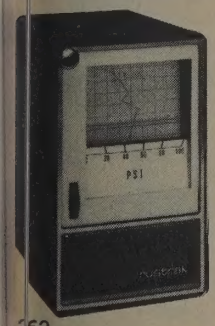


191

Multipurpose Recorder.

Two recording channels, one analog, one event. Twenty-one ranges up to 1000 millivolts, microamperes or milliamperes on analog channel. Displays 7½ inches of chart. On-off event marker has 10 millisecond response time. Carrying handle doubles as tilting support.

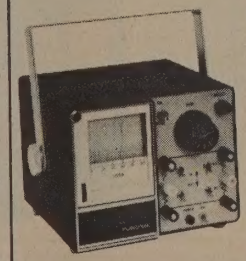
$425.00



Pressure Recorder.

Single channel pressure recording of most liquids and gases using a C-type Bourdon tube. Standard ranges 0-15, 0-30, 0-50, 0-100, 0-200, 0-300 and 0-500 psi. Many special offset ranges available.

from **$110.00**

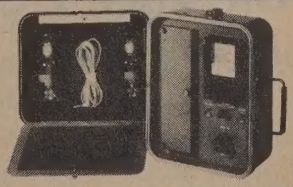


Strain Gage Recorder.

Records resistance change of gages used for measuring strain, stress, displacement, load, torque, or any transducer using strain gauge sensing elements for static display. Maximum sensitivity: 500 micro-inches/inch, Self-contained instrument with regulated supply.

from **$385.00**

2195



192

Dissolved Oxygen/Temperature Recorder.

Simultaneously records dissolved oxygen and temperature. Temp. range, 0 to 40°C. Operates unattended for about four weeks from two inexpensive batteries. Chart speed regulation, ±0.5%. For surveys in water pollution control programs.

$585.00

the miniature recorder people

Send for catalog.

Prices subject to change

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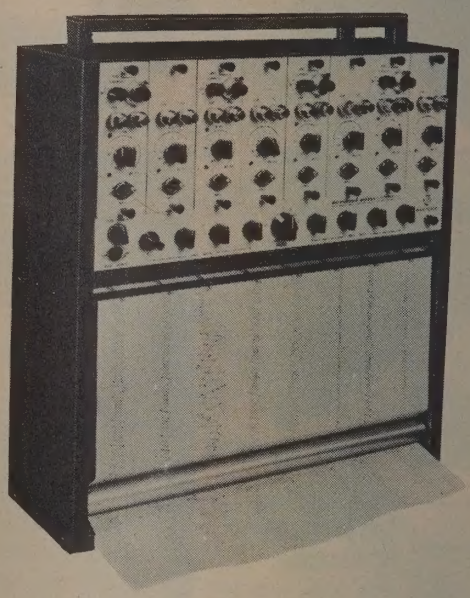
techni-rite RECORDERS

High speed, direct writing recorders and monitoring and controlling systems for industrial, military, aerospace and medical applications.

LOW COST LINEUP OF HIGH SPEED ANALOG RECORDERS

PORTABLE 8-CHANNEL

- Only 17½" Wide x 19" High x 6" Deep
- Weighs Just 65 Pounds
- Inkless Rectilinear Presentation
- 4 to 5 Millisecond Rise Time
- Rugged Construction for Lab or Field
- Other Plug-In Signal Conditioners:
  1 mv/div
  50 uv/div
  Stress, Strain, Transducer
  Temperature, Thermocouple

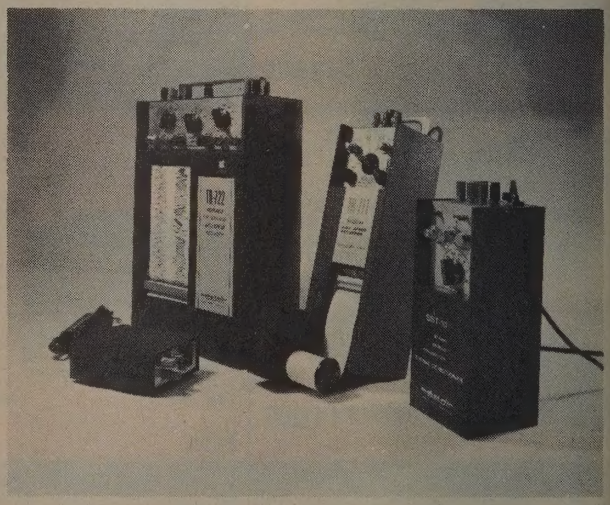


ONLY $3,995

A complete system with 10 mv/div Signal Conditioners

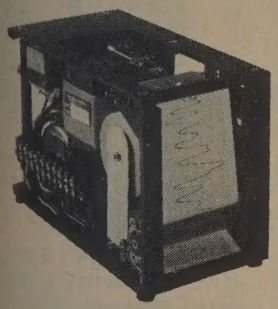
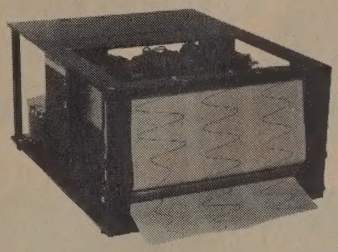
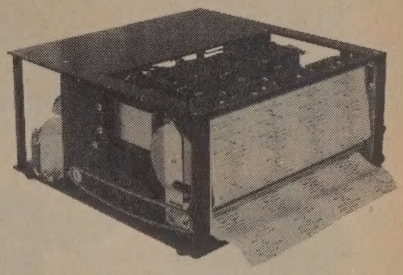
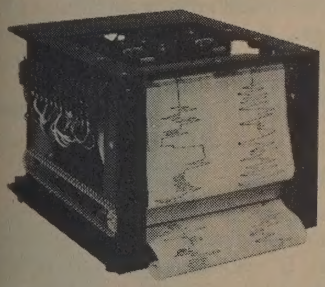
PORTABLE 1-CHANNEL
ONLY $495

PORTABLE 2-CHANNEL
ONLY $1,195



- DC to 125 Hz Frequency Response
- Inkless, True Rectilinear Coordinates
- Electric Chart Speed Selection
- Compact and Portable
- Rugged Construction for Lab or Field
- Complete Range of Accessories and Special Purpose Preamplifiers

O.E.M. RECORDER BUILDING BLOCKS
Pen Motors, Amplifier and Chart Drives

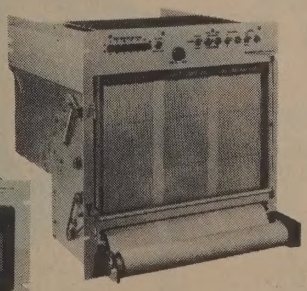
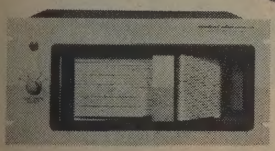





1-2-3-4 and 8-CHANNEL

- Amplifier Inside Pen Motor
- Stylus Limiters Inside Pen Motor
- Choice of Chart Drive
- Inkless Rectilinear Recording
- Extreme Compactness — only 5½" high
- Simple Chart Loading
- Meets AHA Specifications

20-40-60 CHANNEL EVENT RECORDERS

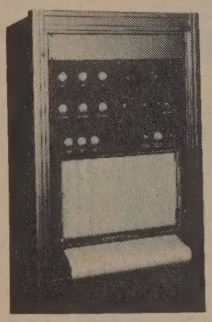
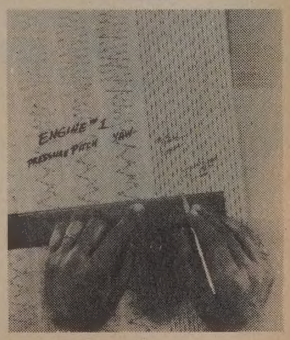
for monitoring "ON-OFF," "GO-NO-GO" data continuously on a common time base

- 3 Millisecond Response (There are none faster!)
- Continuous, Deflection Type, Inkless Writing
- Accepts Switch Closure Signals or External Voltages
- Variable Chart Speed Selection
- Portable or Panel Mounted

Exclusive ANA-VENT 2-IN-1 RECORDERS

combine Analog and Event data on a single chart

- Simplifies Data Interpretation
- Minimizes Analysis Error
- Saves Time, Space and Money

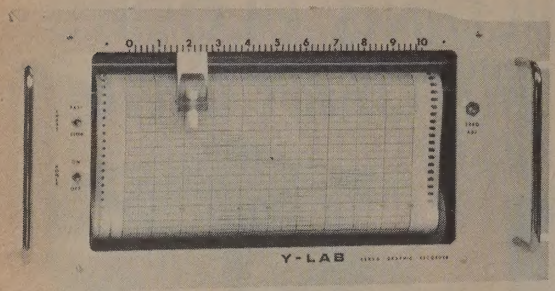
Eight basic models available — combinations ranging from 8 channels of analog data with 10 channels of event data to 1 channel of analog with 64 channels of event.

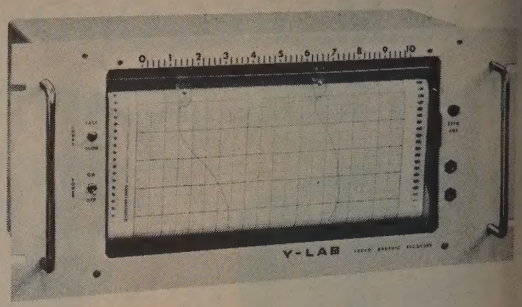
WRITE, PHONE OR TELEX FOR CATALOG AND ON-THE-SPOT DEMONSTRATION!

Gulton
techni-rite ELECTRONICS, INCORPORATED
A Subsidiary of Gulton Industries

EAST GREENWICH, RHODE ISLAND, U.S.A. 02818 • TEL. (401) 272-2000 • TELEX 927-725

SERVO GRAPHIC RECORDERS





MODEL 28

Basic recorder for standard rack mounting. 10" calibrated width, 100' chart roll and simple, dependable re-roll techniques provide reliable low cost industrial recording. 10 mv to 100 volt full scale spans are available. Wide selection of 2, 3 or 4 chart speeds.
19"W - 10½"H - 8½"D from $305.00

- 1/2% ACCURACY
- SPANS TO 5 MV FULL SCALE
- PEN SPEED 10"/SECOND
- NEW DISPOSABLE FIBER PEN
- MODULAR – SOLID STATE

ALL Y-LAB RECORDERS EMPLOY A TRUE POTENTIOMETRIC NULL BALANCE SYSTEM AND WILL OPERATE FROM A SIGNAL SOURCE RESISTANCE UP TO 20KOHMS. ALL ELECTRONICS ARE CONTAINED ON ONE EASILY REPLACEABLE PC BOARD. THE GREAT ACCURACY, VERSATILITY AND RUGGED SIMPLICITY OF THESE INSTRUMENTS, COUPLED WITH THEIR REMARKABLY LOW PRICE, MAKE THEM TECHNICALLY PRACTICAL IN ALL RECORDING APPLICATIONS.

MODEL 29

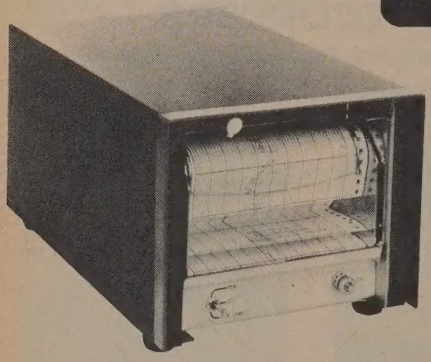
Essentially a Model 28 with 2 overlap ping pens. Two completely independ ent and isolated channels of data ca be recorded with a minimum of tim offset. A remote capillary ink syster with felt nibs gives a fine line recorc ing at maximum pen speed.
19"W - 10½"H - 8½"D from $545.0

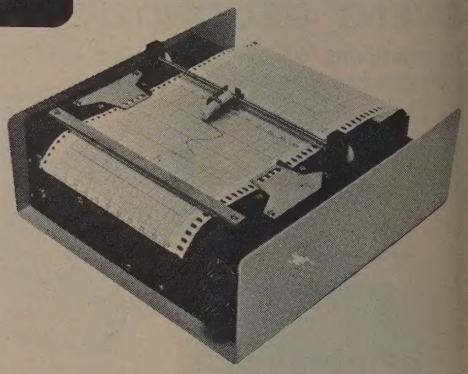
MODEL 31

Ideal price, size and performance for OEM and systems applications. Uses 4" calibrated fanfold paper for "quick reference". 5 mv to 100 volt full scale spans are available. Wide selection of single or dual chart speeds.
6"W - 5"H - 9"D from $195.00

MODEL 32

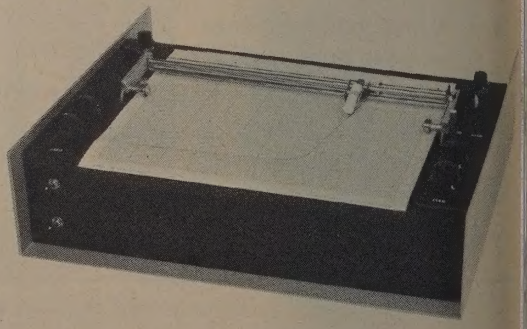
Precision compact laboratory recorde with a wide range of options – very lo cost. 5" calibrated chart on an 85' ro with handy tear-off bar. 5 mv to 10 volt full scale spans are available. Wid selection of single or dual chart speeds
10¼"W - 4"H - 11"D from $275.0





MODEL 40

A new and truly unique X-Y Plotter for laboratory and production testing. It is small, ruggedly simple and very easy to operate. Both X and Y axes use the same proven interchangeable modular servo amplifiers used in our strip chart recorders. Standard 8½" x 11" graph paper can be used and pen/paper speed is 10"/second without overshoot. Spans from 1 mv/inch to 10 v/inch are available. Electric pen lift is one of many options.
15"W - 9"D - 4"H from $395.00



Y-LAB

YEISER LABORATORIES / 881 WEST EIGHTEENTH STREET / COSTA MESA, CA 92627 / (714) 548-9344

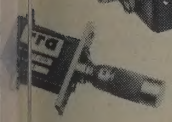
See YELLOW SECTION for Local Offices, Phones

ARRA INC.
ANTENNA & RADOME RESEARCH ASSOCIATES

COAXIAL • WAVEGUIDE • SOLID STATE

MICROWAVE

COMPONENTS • ASSEMBLIES • SUB-SYSTEMS



MINIATURE ATTENUATORS 2 OUNCES RANGE FROM 2- GHz

BROADBAND

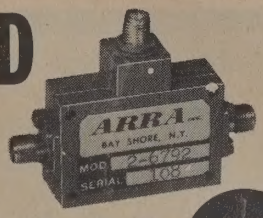
DIODE MINI-PIN TYPE

SWITCHES

Model 2-6792

500-12400 MHz 5 WATTS

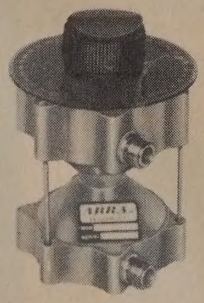
40 db Min. Isolation • 1 db INSERTION LOSS (1.0-9.0 GHz)



1½" x 1" x ½"

$230

VARIABLE ATTENUATOR WITH INTEGRATED MOTOR



120 db ATTENUATION RANGE

DIRECT READING VARIABLE ATTENUATOR

MINIATURE VARIABLE ATTENUATORS

5 WATTS 3KW PEAK

2 OUNCES

1¾" x 1" x ½"

FROM $170.00 TO $225.00

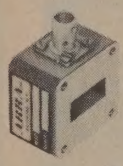
Freq. Range (GHz)	Atten. Range (db)	Maximum VSWR	Max. Ins. Loss (db)	Model No.
2.0-4.0	10	1.8	0.5	4804-10
2.5-4.0	10	1.5	0.5	4804-10X
4.0-8.0	10	1.5	0.5	5804-10
4.0-8.0	20	1.5	0.5	5804-20
6.0-11.0	10	1.5	0.5	5-6804-10
6.0-11.0	20	1.5	0.5	5-6804-20
6.0-11.0	30	1.5	1.0	5-6804-30
8.0-12.4	10	1.5**	1.0	6804-10
8.0-12.4	20	1.5**	1.0	6804-20
8.0-12.4	30	1.5**	1.0	6804-30

** 1.7 VSWR ABOVE 11.0 GHz.

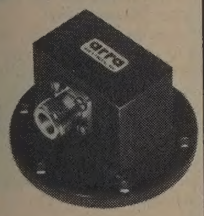
100 WATTS AVERAGE POWER

NON TRANSLATING SHAFT CONTROL

FIXED ATTENUATORS



WAVEGUIDE TO COAXIAL ADAPTERS



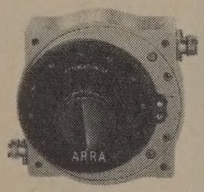
DIRECT READING

VARIABLE ATTENUATORS

100 db RANGE

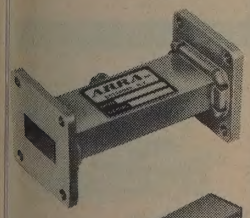
15 Watts Av. INPUT POWER

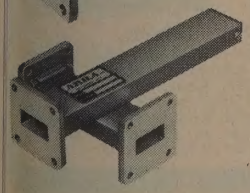
Freq. Rge.	Min. Dynamic Atten. Rge. (db)	Attenuation vs. Freq. (±db)	Model No.
0.5-1.0	60	1.0	2952-60
0.5-1.0	100	1.5	2952-100
0.9-1.3	60	1.0	2-3952-60
0.9-1.3	100	1.5	2-3952-100
1.0-2.0	60	1.0	3952-60X
1.0-2.0	100	1.5	3952-100X
1.4-2.4	80	1.25	3-4952-80
2.0-4.0	60	1.0	4952-60X
2.0-4.0	80	1.25	4952-80X



DIRECT READING DIAL 6 db Maximum INSERTION LOSS

COAXIAL & WAVEGUIDE DIODE SWITCHES





WAVEGUIDE COUPLERS & ATTENUATORS

VARIABLE ATTENUATORS

VAMP TYPE

500-11000MHz • 10 Watts Average Pwr.

Freq. Rge. (GHz)	Atten. Rge. (db)	Atten. vs. Freq.	Form Factor	Model No.
0.5-1.0	10		0-19	2614-10
1.0-2.0	30		9-19	3614-30
2.0-4.0	50		0-51	4674-50
2.0-4.0	20	±1.5	0-51	4674-20F
4.0-7.0	50		0-39	5684-50
4.0-8.0	20	±1.0	0-39	5684-20F
5.4-11.0	20	±1.5	0-39-2	5-6684-20F
7.0-11.0	50		0-39-2	6684-50
7.0-11.0	20	±1.0	0-39-2	6684-20F

Form 0-39 & 0-39-2: 3" Dia
Form 0-19 & 0-51: 5" Dia.

COAXIAL & WAVEGUIDE TERMINATIONS

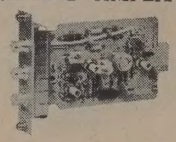
WRITE FOR CATALOG

15 HAROLD COURT • BAY SHORE, N. Y. 11706 PHONE 516-231-8400 • TWX 510-227-6231

AEROSPACE RESEARCH INC.

RADIO DEVICES, RF RANDOM NOISE GENERATORS, PRECISION FREQUENCY AND TIMING INSTRUMENTATION *for laboratory, production lines and field operations.*

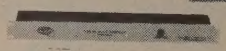
PHASE AND AMPLITUDE STABLE AMPLIFIERS



ARI specializes in amplifier systems for use with high insertion loss elements, such as delay lines. Driver amplifier shown, Type A, provides 34 db gain at 60 Mc/s. BW is 30 Mc/s, output 1 watt phase stability within 2°, amplitude within 0.25 db. Post amplifier, Type B, provides 54 db gain with 250 MW output to follow lossy element.

These amplifiers can be packaged in standard multiple chassis as shown above. Unit holds 30 ARI modules, plus power supply and fans, where required. Other rack-units hold 2, 4, or 15 units.

SOLID STATE ANTENNA MULTICOUPLERS



VLF-UHF combining optimum noise figure, dynamic range, intermodulation distortion and VSWR. Units shown are AMC-110 (3-300 Kc/s) and AMC-136 (130-140 Mc/s). Other units at HF and UHF. Prices start at $310.

RECEIVERS — ULF-UHF

ARI designs and manufactures receivers for standard and special purposes. Included are our VLF rocket and satellite units, LF beacon, HF radar, VHF radar, UHF balloon, Dopplometers, and many others. Write for free receiver catalog . . . or send us your specifications.

RADIO ASTRONOMY

ARI is eminent in the field of radio astronomy equipment at metric and longer wavelengths. Our radiometers are in constant use in almost every part of the world. In addition to the items shown, we manufacture a Polarimeter of the Cohen configuration in the HF-VHF range, various receivers for measuring cosmic noise intensities on the ground and in space, and special antenna systems. ARI Random Noise Generators are standard equipment at many observatories for radiometer system calibration. Send for free Radio Astronomy brochure.

EDSON RADIOMETER

The ER-110 can be used ith any HF-VHF receiver to form a precision 0.1 db long-term stability radiometric instrument. It makes use of a closed-loop Ryle-Vonberg configuration to continuously calibrate to a thermionic servo diode.

ARI-100C RIOMETER MARK II

A highly sensitive, ultra-stable instrument for measuring intensities of electro-magnetic fields. The RIOMETER is used principally for recording changes in ionospheric absorption of extra-terrestrial radio noise. Features 0.1 db long-term stability.

PHASE SWITCH

The ARI-140 Phase Switching Receiver is a complete phase sensitive interferometer (less antennas) in a single package. Based on the Ryle configuration, the unit enables precise measurement of the interferometer pattern. The ARI-140 is equipped with plug-in r.f. heads to cover a range from 3-250 Mc/s.

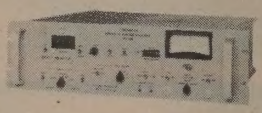
RF RANDOM NOISE GENERATORS

STABILITY, ZERO- WARM-UP TIME, FREQUENCY COVERAGE 100 c/c TO 2000 mc/s. ARI Random Noise Generators provide the unique feature of servo-control of the output level to insure stability with variations in line voltage and ambient temperature. The units are specifically suitable for continuous production-line testing and for calibration of sensitive receivers and radiometers. Other advantages gained from the servo-control system are excellent long-term stabilities (0.05 db), and millisecond warm-up. A remote programming capability is standard equipment providing the ultimate in resettability. Another unique feature of ARI noise sources is meter calibration in both db noise figure and degrees Kelvin.

The Model NS-L is the only commercially available device that provides RF random noise at laboratory accuracies in the VLF ranges. It uses lightweight rechargeable batteries to completely rid the output signal of power-line contamination.

Model	Frequency	
NS-L	100c/s-500 Mc/s	$845.°
NS-B	1-500 Mc/s	450.
NS-H	1-2000 Mc/s	825.

PRECISION FREQUENCY AND TIMING

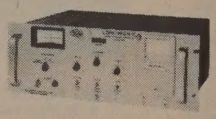


LORCHRON*

Loran-C Timing Receiver. Latest techniques, incorporating integrated-circuit micrologic. All-electronic servo system, lightweight and portable. TIMING SYNCHRONIZATION TO ONE MICROSECOND within Loran-C area.

DIGICHRON*

Numerical readout of hours, minutes and seconds. Thumb-wheel digital switch to set output pulse delay from 0 to 999,999 microseconds. Useful with any clock standard for display, and removal of propagation delay.



LORCHRON-C

For frequency comparison and synchronization. NO DIURNAL SHIFT, as experienced at VLF, within Loran-C area. Measurement can be made to 1×10^{-9} in two minutes, and 1×10^{-12} in a day.

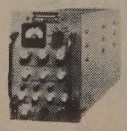
* TM

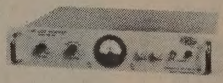
LORAN-C

Thirty Loran-C stations are currently in operation with locations in Europe, Africa, the North Atlantic, Continental U.S., Alaska, Hawaii, and in the vicinity of Japan. Operation is on an assigned frequency of 100 Kc/s is controlled to atomic standards. Times of transmission of some of the chains are being steered by the Naval Observatory to provide synchronization to the Observatory Master Clock.

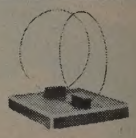
The instruments shown can be used to derive time reference and frequency synchronization for Loran-C signals. In addition, ARI manufactures Loran-C r.f. amplifier units, repetition rate generators, simulators, and antenna systems. Send for our free brochures on Loran-C Timing and Instrumentation.

RF TIME DISTRIBUTION





Range timing by transmission of RF signals modulated by standard IRIG codes is a simple technique for covering a large area at minimum cost. ARI manufactures complete systems to suit any requirement, and can provide field services for installation, operation, and maintenance. Transmitters are available for AM and FM service using either single, or multiplexed time codes. Receivers such as the airborne TCR-136 or the ground based TCR-141 as shown are available in both AM and FM configurations to suit your particular timing needs. Send for free brochure.



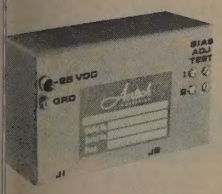
LOOP ANTENNAS

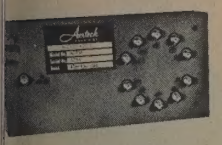
Crossed-loop (shown), single loops and loop-whip cardiod arrays, ULF-HF. General purpose L1-L single loop available from stock is balanced, electrostatically shielded and has an effective height of 1 cm at 20 Kc/s. $140.

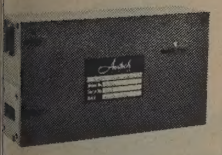
WRITE FOR ARI PRODUCT AND PRICE CATALOG

AEROSPACE RESEARCH INC. *130 Lincoln Street, Boston, Massachusetts 02135 617-254-7200*

Check Aertech BEFORE you Buy!







...the industry's leader in proven high reliability

SCHOTTKY-BARRIER & TUNNEL DIODE DETECTORS

Features:
- Low VSWR
- Flat Response
- Extreme Reliability
- Extra Wide Video Bands
- Very Low I/f Noise Corner
- High Sensitivity
- Optimized Units for maximum performance
- Wide Dynamic Range over Octave and W/G Bands
- Custom Units designed to your specifications

53 Models Available — **Delivery: Stock to 30 days ARO**

...the industry's most comprehensive selection

ORTHOSTAR DOUBLY BALANCED SCHOTTKY MIXERS

Features:
- Subminiature Size
- Octave RF Bandwidths
- Broad IF Bandwidths
- Improved Intermodulation Performance
- High Isolation

Typical Specifications:
- 1"x1"x1" maximum size (excluding connectors)
- Frequency from 500 MHz to 12 GHz available
- IF Frequency up to 4 GHz available
- Average intercept point greater than +25 dBm
- 20 dB minimum isolation

20 Models Available plus Biased units for low LO power applications — **Delivery: Stock to 30 Days**

...pioneering more knowledgeable designs

TUNNEL DIODE AMPLIFIERS

Features:
- Wide Bandwidths
- Low Noise Figures
- Low Level Limiters
- High Gain
- Space Qualified Performance

Typical Specifications:
- 2 - 18 GHz Octave Band Units Available
- Noise Figure of 3.5 dB at 1400 MHz
- Outputs available from 10 to 20 dBm
- Up to 50 dB Gain
- High-Rel units Available

Standard and Custom Models Available — **Delivery: 60 to 90 Days ARO**

...a complete line of Compact, Lightweight

SOLID STATE TRANSISTOR AMPLIFIERS

Features:
- Available in Octave and Multi-octave Bandwidths
- Excellent Temperature Characteristics
- High Reliability Microstrip Circuitry
- Low VSWR
- Low Noise Figure

Typical Specifications:
- Frequency Range from 10 MHz to 4 GHz
- −54°C to +71°C Operating Range
- MTBF greater than 100,000 Hours
- Less than 1.5:1 input and output
- Noise Figure of 1.5 dB at 200 MHz

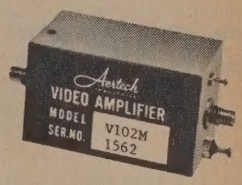
50 Models Available — **Delivery: Stock to 60 Days ARO**

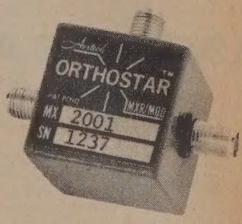
...try Aertech's Building Block approach to

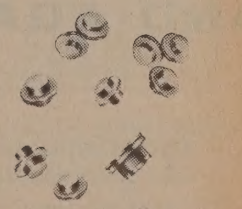
SUBSYSTEMS

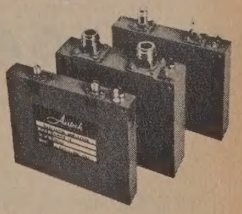
Aertech's capability extends to the manufacture of complete RF Subsystems for operation from VHF through Ku-Band. These include Preamplifier/Multicoupler RF distribution products for use in wide dynamic range reconnaissance systems. An extensive line of standard and custom design telemetry down converters and receivers operating in both L-Band and S-Band are also available. Although standard catalog devices are available for optimum savings, custom and High-Rel configurations can be designed to meet specific customer requirements.

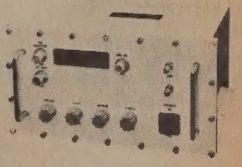
Aertech's FULL Capability includes...
- Telemetry Products
- Multicouplers
- Down Converters
- Receivers
- Power Dividers
- Log Video Amplifiers
- T.D.A. Limiters
- Vector Detectors
- Sources
- Detector Video Amplifiers
- Mixer/Preamplifiers
- Tunnel & Back Diodes
- 3 dB Hybrid Couplers
- Microwave Semiconductors

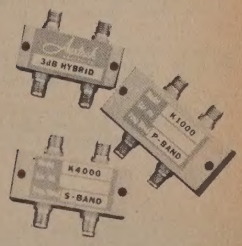












For detailed specifications and applications, consult your area Aertech Representative or contact us direct.

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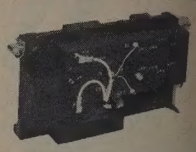
AIRTRON

DOES IT AGAIN . . .

STRIP LINE

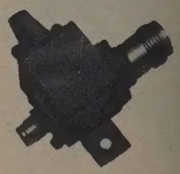
Integrated RF Assembly combines 12 components into a single package 8⅛″ x 4¾″ x 2¾″



AND AGAIN . . .

SUBMINIATURE FERRITE

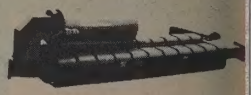
Circulator occupies less than ½ cu. in., covers 4.2 - 4.4 GHz.



AND AGAIN . . .

HIGH POWER FERRITE

4-Port Circulator, *tested* at 20 megawatts peak power, 20 Kw avg. power.



AND AGAIN . . .

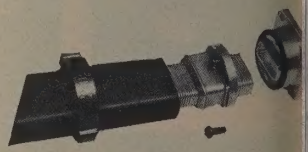
SOLID STATE DIODE SWITCH

L Band. High Power. Field Replaceable Diodes

AND AGAIN . . .

WAVEGUIDE

innovation, *AIRFLEX*®, allows field assembly of flexible waveguide.



And will keep on presenting you with microwave component and assemb innovations. These illustrations represent only a few proven examples Airtron's creative thinking, research and state-of-the-art know-how plus fu scale production facilities. And . . . they're all available now.

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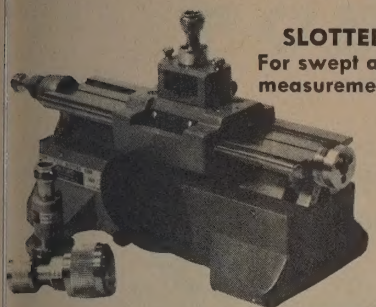
RF INSTRUMENTS and COMPONENTS



SLOTTED LINES

For swept and point-by-point measurements

TYPE 3028

Residual SWR
< 1.02 to 10 GHz
< 1.03 to 18 GHz
With MIL-C-39012 Type N Laboratory Standard Connectors

with interchangeable precision reducers and tunable detector probes

he type 3028 7mm Slotted Line has the following dditional features:

- Rated frequency range: 1.2 to 18 GHz
- Rated error in detected signal ±1.005
- Available with a wide variety of interchangeable precision reducers for measurements in many transmission line sizes and connector types without an intermediate adapter which tends to increase the residual SWR of the measuring system. For example, reducers to Type OSM jack or plug result in a system residual SWR of under 1.06 to 18 GHz.

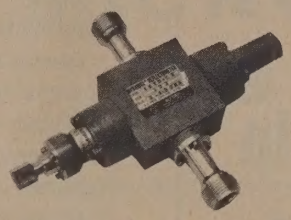
Partial Listing of Output Connectors Available for Alford Slotted Lines

Type N, TNC, BNC, MICON 1001 and 1002, Sealectro 50-0 series, TPS, OSM TM , GM , GR874B , C, SC, HN, 3⅛ EIA, 1⅝ EIA, ⅞ EIA, LT, LC, GR900 Precifix A , Amphenol APC-7 Other connectors available on request.

Summary of ALFORD Slotted Lines

Frequency Range (MHz)	Line Size	Type
2000-36,000	3.5mm	3501-04
1200-18,000	7mm	3028-05
600-12,400	.4 inch	2288A-1
300-8500	14mm	2382-2
150-8500	14mm	2382-4
100-4500	1 inch	2181A-6
75-3000	1.5 inch	1026C-8
37.5-3000	1.5 inch	1026C-16

HYBRIDGE® REFLECTOMETERS



A precision, broadband RF bridge with an integral reference termination. Available with fixed measuring connectors or interchangeable precision reducers; either way ALFORD Hybridges offer low residual SWR (directivity) with ALL connector types.

FREQUENCY RANGE (GHZ)	ALFORD CA-45 PLUG RESIDUAL SWR OR DIRECTIVITY	TYPE	AMPHENOL APC-7 RESIDUAL SWR OR DIRECTIVITY	TYPE	R&S PRECIFIX A RESIDUAL SWR OR DIRECTIVITY	TYPE
0.2- 1.1	1.03 (36DB)	4803	1.03 (36DB)	4668-57	1.03 (36DB)	4668-54
1.0- 3.2	1.03 (36DB)	4804	1.03 (36DB)	4669-57	1.03 (36DB)	4669-54
2.0- 4.2	1.03 (36DB)	4805	1.03 (36DB)	4670-57	1.03 (36DB)	4670-54
2.6- 5.2	1.03 (36DB)	8367	1.03 (36DB)	8367-57	1.03 (36DB)	8367-54
3.7- 8.0	1.04 (34DB)	4806	1.045 (33DB)	4671-57	1.045 (33DB)	4671-54
5.0-10.0	1.04 (34DB)	4807	1.045 (33DB)	4672-57	1.045 (33DB)	4672-54
5.0-12.4	1.045 (33DB)	4809	1.05 (32DB)	4809-57	1.05 (32DB)	4809-54
7.0-12.4	1.04 (34DB) *	4808	1.045 (33DB) *	4673-57	1.045 (33DB) *	4673-54
12.4-18	1.06 (30.5DB)	4810	1.07 (29.5DB)	4820-57	1.07 (29.5DB)	4820-54

FREQUENCY RANGE (GHZ)	TYPE OSM RESIDUAL SWR OR DIRECTIVITY	TYPE NUMBER JACK	TYPE NUMBER PLUG	TYPE N RESIDUAL SWR OR DIRECTIVITY	TYPE NUMBER JACK	TYPE NUMBER PLUG
0.2- 1-1	1.05 (32DB)	4668-35	4668-36	1.03 (36DB)	4668-01	4668-02
1.0- 3.2	1.05 (32DB)	4669-35	4669-36	1.03 (36DB)	4669-01	4669-02
2.0- 4.2	1.05 (32DB)	4670-35	4670-36	1.03 (36DB)	4670-01	4670-02
2.6- 5.2	1.05 (32DB)	8367-35	8367-36	1.03 (36DB)	8367-01	8367-02
3.7- 8.0	1.065 (30DB)	4671-35	4671-36	1.055 (31.5DB)	4671-01	4670-02
5.0-10.0	1.07 (29.5DB)	4672-35	4672-36	1.06 (31DB)	4672-01	4672-02
5.0-12.4	1.075 (28.5DB)	4809-35	4809-36	1.065 (30DB)	4809-01	4809-02
7.0-12.4	1.07 (29.5DB)	4673-35	4673-36	1.06 (31DB)	4673-01	4673-02
12.4-18	1.10 (26.5DB)*	4820-35	4820-36	1.085 (27.5DB)*	4820-01	4820-02

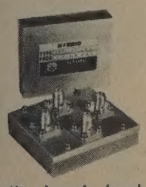
Tentative Specifications

INSTRUMENTS AND COMPONENTS FOR THE 3.5mm STANDARD LINE SIZE

A wide selection of components are available with the precision sexless ALFORD 3.5AC connector for use up to 36 GHz in both coax and stripline. These are ideal for experimental work, especially at the higher frequencies when a great deal of accuracy and repeatability is required.

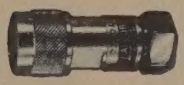
- 3510 Sliding Termination
- 3511 Fixed Termination
- Launchers to Stripline
- 3528 Connectors with SWR under 1.085 per pair to 26.5 Ghz
- EasyMatch® Tuners to 26.5 GHz

HYBRIDS



- Inherently broad band with rated isolations over 40dB, substantially independent of frequency.
- Available ranges from 20 MHz to 10,500 MHz.
- High peak power, high CW power and pressurized models available.
- Models available to environmental specifications of MIL-STD-810A.

PRECISION RF TERMINATIONS AND CALIBRATED MISMATCHES



- Fixed and sliding terminations from DC to 36 GHz
- Wide variety of rigid and flexible coaxial transmission line sizes from 6⅛" EIA to subminiature
- Also available in specially compensated bands

STRIPLINE COMPONENTS

- Broadband directional couplers, power dividers, combiners, and launchers.
- Miniature, lightweight, and low priced.
- Available in most connector types.

AUTOMATIC PLOTTERS

for measurement of Phase shift, Attenuation (or Gain) and RF Impedance

- Automatically measure and plot phase shift, insertion loss or gain, and rf impedance as continuous functions of frequency.
- For impedance, accurately measure SWR's as low as 1.01 when observed on 1.2 expanded Smith chart.
- Continuous frequency coverage from 0.025 to 7500 MHz with interchangeable sets of rf components.

OTHER ALFORD PRODUCTS

- Detector-Mixers
- Variable Attenuators
- Matching Tees
- Power Dividers
- Temperature-compensated Resonant Cavities
- Multiplexers
- Diplexers
- Directional FM Broadcast Antennas
- Vestigial Sideband Filters
- VOR Antennas
- Coaxial Switches
- Tracking Antenna Feed Assemblies
- Dipoles
- Automatic SWR Meters
- Adjustable Matching Networks
- TV Broadcast Antennas (directional and omni-directional)
- Line Stretchers
- Impedance Standards

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The most complete line of Broadband Frequency Independent Circularly and Linearly Polarized Antennas from 20 MHz to 12.4 GHz. Stock and Custom.

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COMPONENTS FOR THE MICROWAVE SYSTEM

Constructing a microwave system requires access to a wide range of components that will perform effectively and efficiently through grueling environments throughout the frequency spectrum. Americon Corporation offers a complete assortment of coaxial components to meet the most demanding requirements. Connectors, terminations, microstrip transitions, adapters (coaxial and waveguide), coaxial attenuators, quadrature hybrids, directional couplers, mixers, and crystal detectors all combine to allow the system designer complete access to a wide variety of components of the highest integrity. For further information write for a complete catalog to Americon Corporation, 87 Rumford Avenue, Waltham, Massachusetts 02154 or phone (617) 891-5230

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CORPORATION

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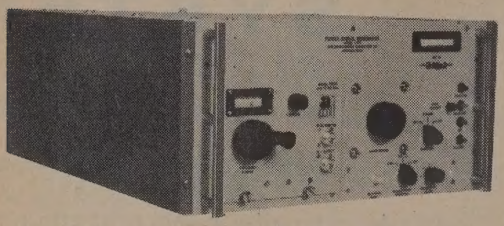
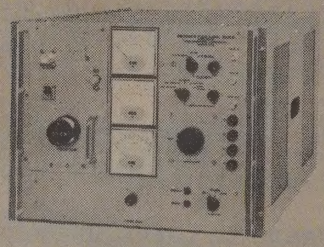
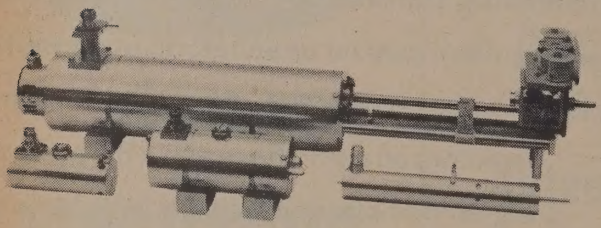
Custom and Standard
HIGH POWER SIGNAL SOURCES AND OSCILLATORS
HIGH PERFORMANCE SIGNAL PROCESSING DEVICES



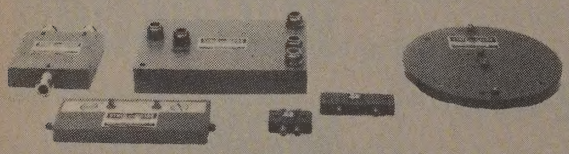
● **CW Signal Sources** • Power to 150W • 150-6100 MHz plug-in heads • 30dB power adjust • Internal 1KHz Sq - wave ulation • External modulation to full power at 50% duty • frequency & power stability • Low residual AM & FM



● **Pulse Signal Sources** • Peak power to 40KW • 150-6100 with plug-in heads • Variable pulse width 0.4-50μs • Variable rate 10-25000 pps to max duty cycle of .0033 • Internal & exte pulse generator & sync

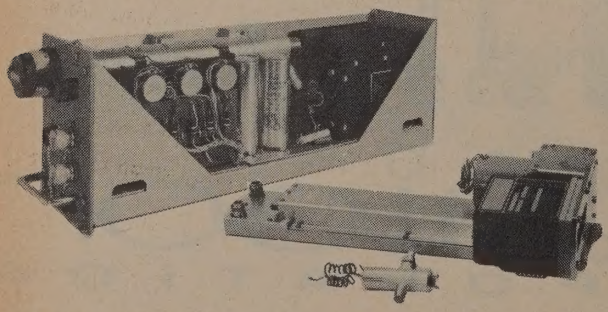


● **Triode Cavity Oscillators** • Plate, cathode, grid pulsed CW • Broadband or fixed tuned • 150-6100 MHz • Power to 40 peak/150W CW • Highly stable • Suitable for lab use or sev Military/Aerospace environments



● **Stripline Signal Processing Devices** • Octave bandwidths • VHF thru X-band • High Isolation • High power handling • Low Insertion loss • Low VSWR • Excellant Amplitude & phase balance • Solid dielectric/epoxy encapsuled • Impervious to severest military/aerospace environments • Products include:

- 90° Hybrids
- Power dividers
- Multiplexers
- Phase shifters
- 180° Hybrids
- Monopulse comparators
- Diode switches
- Mixer/detectors



● **Custom Products** • We'll develop, design, & fabricate • sample quantities or high volume • To your spec requirements Military & Industrial • Products & systems generally using te niques described above Experience includes:

- Airborne pulse & CW transmitters
- Radar simulators
- Linear Accelerator drivers
- Special power oscillators
- Integrated stripline networks
- Remotely controlled phase shifters

APPLIED MICROWAVE LABORATORY INC.

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Advances in RF from Applied Research

Filters · Converters · Multi-Couplers · Signal Sources
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BROADBAND FREQUENCY MULTIPLIERS
5-18,000 MHz

SIGNAL SOURCES / SYNTHESIZERS
VACUUM TUBES / SOLID STATE
VARACTOR / SNAP-ACTION DIODES / TRANSISTOR

A complete line of frequency multipliers operating up to 18,000 MHz has been developed and is presented by APPLIED RESEARCH. These units utilize solid state devices, vacuum tube devices or combinations of both.
Using the frequency multiplier as the basic tool, lines of Signal Sources, Frequency Synthesizers and Multiplier Chains are now available.

Some general characteristics are:

Frequency Range:	5 - 18000 MHz
Bandwidths:	up to 27%
Power Output:	up to 10 watts
Efficiency:	as high as 50%

FILTERS (5-12,000 MHz)

MULTIPLEX
BANDPASS / BAND REJECT
LOW POWER / HIGH POWER

By applying advanced network design techniques, Filters have been developed operating in the frequency range up to 12,000 MHz with electrical performance approximating theoretical expectations. In addition to Bandpass, Band Reject and Multiplex Filters, advanced network designs are available for antenna couplers, Diplexers, Interdigital Filters and many other types.

Some general characteristics are:

Frequency Range:	5 - 12,000 MHz
Bandwidths:	up to several octaves
Insertion Loss:	as low as 0.25 dB
Power:	up to 3.5 kW(cw)
Band Reject Notches:	as narrow as ¼% fo
Band Reject Attenuation:	as great as 75 dB

SOLID STATE
LOW NOISE AMPLIFIERS
POWER AMPLIFIERS

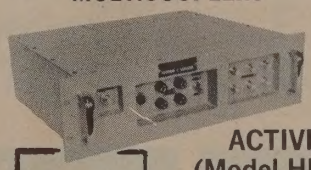
- Broad Bandwidth
- Wide Dynamic Range
- Phase & Gain Matching
- Low Noise Performance

APPLIED RESEARCH presents an integrated line of RF amplifiers in both solid state and vacuum tubes for operation in the frequency spectrum up to 4200 MHz. Their truly exceptional performance features many advanced characteristics. Units are also available in weatherproof cases for antenna mounting or other outdoor applications.

Some general characteristics are:

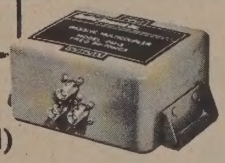
Frequency Range:	up to 4200 MHz
Bandwidths:	up to multiple octaves
Gains:	up to 120 dB
Phase Matching:	to within 1° over an octave
Noise Figures:	as low as 1.5 dB
Power Output:	up to 20 watts

MULTICOUPLERS



ACTIVE
(Model HFM)

3-4000
MHz



HYBRID
(Model PM)

Model HFM and PM Multicouplers provide the ultimate in performance and sensitivity in signal distribution.
Model HFM Active Multicouplers, by combining filter networks and active elements, feature multiple outputs, broad bandwidths (if desired), low noise and high dynamic range.
Model PM Hybrid Multicouplers offer compact size, minimal insertion loss, broad bandwidths (if desired) and low cost.

FIXED PAD ATTENUATORS & TERMINATONS

DC—3GHz

FOR TYPES BNC, TNC
C, N & OSM CONNECTORS

APPLIED RESEARCH presents an integrated line of fixed pad attenuators, terminations and impedance-matching transformers. These products provide means for rapid and accurate division of voltages over the frequency range of DC to 3GHz, and for the matching of different impedances with minimum loss over a broad frequency band. The unit cost is within the practical price range of the large and small equipment user, as well as the research and experimental user.

Some general characteristics are:

Frequency Range:	DC—3GHz
VSWR:	1.25:1
Attenuation Accuracy:	±0.5 dB
Impedances (nominal):	50, 75, 90 ohms
Attenuation values:	1, 2, 3, 4, 6, 10, 12, 15 20 dB (standard)

APPLIED RESEARCH INC.

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CIRCULATORS & ISOLATORS

Model No.	Frequency Range (gc)	Type	RF Connectors
C3R21	4.4 - 5.0	3 Port	BRM
C4R96	8.2 - 10.0	4 Port	BRM
C3N28	2.75 - 4.0	3 Port	N
C4N94	4.4 - 5.0	4 Port	N
C5N03	5.4 - 5.9	5 Port	N
C2W35	4.4 - 5.0	Isolator	UG149A

DIRECTIONAL COUPLERS & HYBRIDS

Model No.	Frequency Range (mc.)	Coupling Attenuation (db)	RF Connectors
323R31	1 - 2 (gc)	3	BRM
323R62	4 - 8 (gc)	6	BRM
308N2	500 - 1000	20	Type N
313N3	300 - 2000	30	Type N
362A7	30 - 1000	70	1⅝" Flange
382A6	120 - 1000	60	3⅛" Flange

DC OUTPUT DIRECTIONAL COUPLERS

Model No.	Frequency Range (mc.)	Power Range (watts)	RF Connectors
596N2	1700 - 2400	0 - 4	Type N
263N5	2 - 30	0 - 60	Type N
576N6	28 - 1000	0 - 400	Type N
536.63	2 - 30	0 - 1200	Type LC
402A8	28 - 1000	0 - 4000	1⅝" Flange
442A9	28 - 1000	0 - 12000	3⅛" Flange

WAVEGUIDE DIRECTIONAL COUPLERS

Model No.	Frequency Range (gc)	Coupling Attenuation (db)	Overall Length—Inches
WL3A	1.12 - 1.70	30	4¾
WN3B	1.70 - 2.60	30	1⅞
WR4B	2.20 - 3.30	40	1⅞
WS4A	2.60 - 3.95	40	3⅝
WC5A	3.95 - 5.85	50	3⅝
WX6A	8.20 - 12.40	60	1⅞

DUMMY LOADS & TERMINATIONS

Model No.	Frequency Range (mc.)	RF Power Dissipation (watts)	RF Connectors
680R	0 - 10 (gc)	200 (mw)	BRM
601N	0 - 3000	5	N
634N	0 - 3000	150	N
674N	0 - 3000	400	N, 70 ohms
636N	0 - 3000	600	N
638A	0 - 2000	6000	3⅛" Flange

RF FILTERS & WAVEMETERS

Model No.	Frequency Range (gc)	Type	RF Connectors
FCTS504	3.4 - 3.6	Tunable BP	BRM
FCRS201	3.5	Band Reject	BRM
FCLB15B	980	Low Pass	1⅝" Flange
FCTA201	400 - 450	Tunable	TNC
FCTL213	1200 - 1400	Tunable	N
FIWE271	5.3 - 6.3	Wavemeter	C-MB

RF COAXIAL SWITCHES

Model No.	Frequency Range (mc.)	Type	RF Connectors
S21N373	0 - 3000	SPDT	N
S21R563	0 - 5000	SPDT	BRM
S21R383	0 - 5000	SPDT	BRM
S23R383	0 - 3000	DPDT	BRM
S54N473	0 - 3000	Transfer	N
S11N253	0 - 3000	Latching	N

RF WATTMETERS

Model No.	Frequency Range (mc.)	Power Range (watts)	RF Connectors
621N	1 - 100	0 - 120 (mw)	N
651N	25 - 1000	0 - 25, 100, 500	N
612A	44 - 1000	0 - 6000	3⅛" Flange
711N	8 - 1000	0 - 30, 75, 300	N
712N	25 - 1000	0 - 2.5, 5, 10	N
706N	28 - 1000	0 - 400	N

INTEGRATED DEVICES

Device	Model No.	Specifications
Triplexer	FCPC332	3 Channel, 4.7 to 4.9 gc; loss 1.5 db; VSWR 1.
Coupler-Filter-Switch	CFSA391	200-400 mc., 1 vdc output, low pass SPDT
Dual Preselector	FCBS363	2 Channel, 3.4 to 3.7 gc; loss 1.5 db; VSWR 1.
Frequency Multiplier	FMSE10	Input Freq. 2.74-3.35 gc, dblr., bdwth. 20%
Circulator-Coupler	C4CN036	4.4-5.0 gc, 4 pt. Cir.
Switch-Coupler	SC2NI83	4.2 gc, Transfer Swt., pwr. & VSWR Monitor

MINIATURE COMPONENTS

Model No.	Frequency Range (gc)	Type	RF Connectors
MDC101	1 - 4	D.C. Block	BRM
MMT104	4 - 8	Monitor Tee	BRM
AFR03	0 - 5	Attenuator	BRM
AMN92	4.4 - 5.0	Variable Atten.	N
PMR03	5.4 - 6.5	Phase Shifter	BRM
PEN32	5.4 - 5.9	Phase Shifter	N

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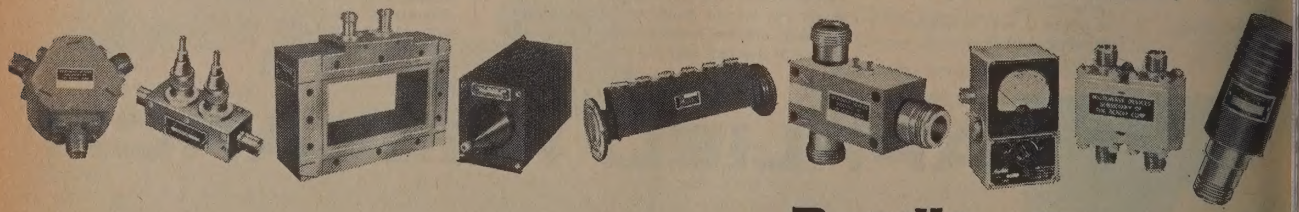


Bendix Electronics

HIGH POWER

Pulse Modulators
Pulse Generators
D.C. Supplies
Transmitters

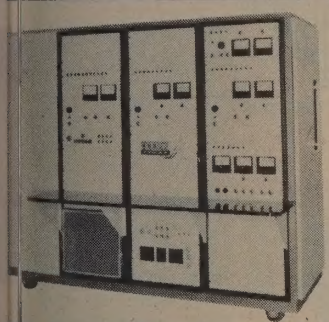
Cober Electronics, Inc., manufactures a very broad line of High-Power Products. These are assembled to customers' specifications from packaged modules and standard Cober designs, making it as easy and as economical to buy custom equipment as it is to buy standard units. The categories below illustrate the range within which these products fall.

Model 698-L2 Power Amplifier used in FM tropospheric systems provides 1 KW in the 610-985 MHz band.

ansmitters and Power Amplifiers

oposcatter & Satellite Communications & Test

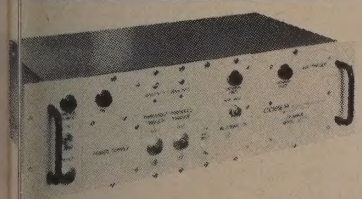
er transmitters are supplied at powers from several hundred watts up to egawatts in the UHF and Microwave frequency areas. They form the t of troposcatter and earth-satellite transmitting systems or designed as test sets for antenna-pattern studies, R.F.I. susceptibility surements, and microwave component testing.



Model 1421 Power Supply drives exotic Crossed Field Amplifier microwave tubes. It contains five supplies in floating arrangement, is highly regulated, and has two modulators for pulsed modes.

C. Power Supplies 5 KV to over a Million Volts

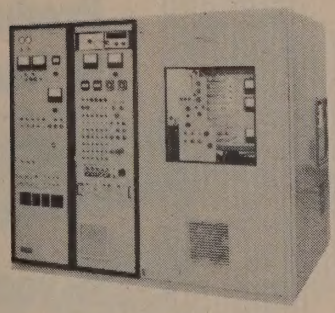
strial and Mil-spec DC supplies offer high regulation up to .001%. tiple output units, with various supplies floating at high voltage are ecialty. Unregulated brute force units that furnish large amounts of er at minimum cost are also available.



Model ST-77 Electronic Crowbar acts within 5 microseconds of an arc or fault to protect valuable microwave tubes and loads.

gh Power Components

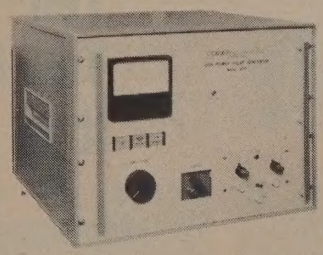
cialized high power components and modules are available for tomers building or modifying their own systems. These include: lectronic Crowbars • Electronic Regulators (up to .001% ulation) • Pulse Current Viewing Transformers • High Voltage charge Solenoids.



Model 1445 85 KV Grid Modulator powers T.W.T.'s. Pulse width is variable from 1 to 10 microseconds and rep rate adjustable to over 20KC.

Pulse Modulators 5 KW to 100 Megawatts

Cober's high-power modulators drive a wide range of microwave and power tubes, as well as such devices as laser and plasma tubes. Units are available from a few kilowatts to over 100 megawatts with pulse widths as narrow as 25 nanoseconds to long pulses of thousands of microseconds. State-of-the-art rise times and high rep rates are our specialty. Full mil-spec, solid-state modulators are supplied for systems use, and soft-tube and hard-tube units are supplied for laboratory and industrial applications.



Model 605P 24 KW Pulse Generator, available from stock $3,990.

Pulse Generators 24 KW

Cober's line of pulse generators is characterized by their pulse fidelity and flexibility. The Model 605P shown is a 24 Kw Pulse Generator with a rise time of 20 nanoseconds and pulse widths variable from 50 nanoseconds to more than a millisecond at repetition rates from a single shot to 1 MHz. It is used for driving LSA devices, Gunn diodes, microwave tubes, Pockel cells, and general laboratory applications. Other pulse generators in Cober's line provide pulse widths to D.C. or offer unique characteristics, such as built-in bias supplies to allow convenient use as a grid pulser.

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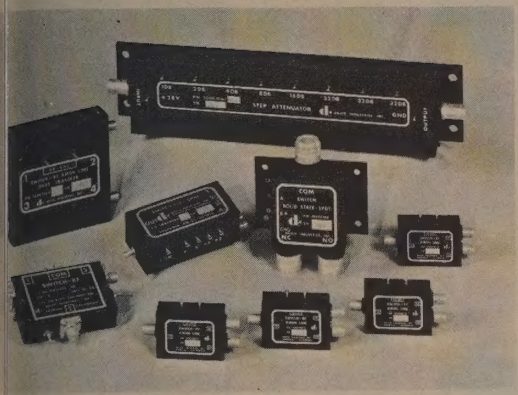

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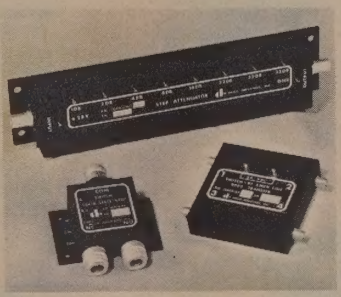
SPST TO SP 36 T with hermetically sealed switching elements or solid state techniques. Logic decoders and driver. High power. Low insertion loss. High speed. Remotely controlled step attenuators to 127 db.



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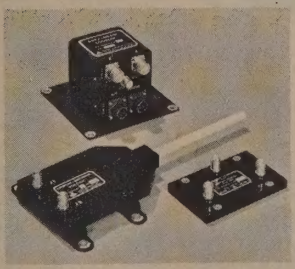

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Special depot level test equipment developed to provide rapid evaluation of complex networks. Includes pulse generators, D.C. continuity, gain and attenuation indicators.

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MICROWAVE FERRITE COMPONENTS

BROADBAND COAXIAL ISOLATORS

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions-Inches L W H	Model Number
0.5- 1.0	10	1.5	1.25	9 3/16 x1 7/8 x2 13/16	U10P
†1.0- 2.0	15	1.0	1.15	7 7/16 x2 1/8 dia.	L20PS
1.0- 4.0	10	1.0	1.25	7 7/16 x1 1/2 dia.	LS10P
†2.0- 4.0	20	1.0	1.20	6 7/8 x2 1/8 dia.	S11PS
3.8-11.7	10	1.0	1.30	6 5/8 x1 1/2 dia.	SCX10P
†4.0- 8.0	15	1.0	1.20	6 5/8 x2 1/8 dia.	C20PS
4.0-11.0	10	1.0	1.25	7 5/8 x2 dia.	CX10P
†7.0-11.0	15	1.0	1.25	5 3/32 x1 3/4 dia.	CX20PS
†8.0-12.0	10	1.0	1.25	4 1/8 x1 3/4 dia.	X20PS

LIGHTWEIGHT COAXIAL ISOLATORS

3/4" DIA. MAX.

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions-Inches L W H	Model Number
0.6- 1.0	10	1.3	1.25	9 3/8 x1 7/16 dia.	U10N
1.0- 2.0	15	1.0	1.20	10 x 3/4 dia.	L19N
1.0- 2.0	15	1.0	1.20	9 3/4 x 3/4 dia.	L19NR
2.0- 4.0	12	1.0	1.20	6 3/4 x 3/4 dia.	S10N
2.0- 4.0	15	1.0	1.25	7 3/4 x 3/4 dia.	S21N
2.0- 4.0	15	1.0	1.25	7 3/4 x 3/4 dia.	S21NR
2.1- 4.2	15	1.0	1.25	7 7/16 x 3/4 dia.	S22NR
3.7- 7.4	10	1.0	1.25	5 11/32 x 3/4 dia.	SC16N
4.0- 7.0	12	1.0	1.25	5 27/64 x 3/4 dia.	C17N
4.0- 7.0	12	1.0	1.25	5 45/64 x 3/4 dia.	C17NR
4.0- 8.0	10	1.0	1.20	5 27/64 x 3/4 dia.	C19N
4.0- 8.0	10	1.0	1.25	5 27/64 x 3/4 dia.	C21NR
7.0-11.0	10	0.9	1.25	3 13/16 x 3/4 dia.	CX15N
7.0-11.0	10	0.9	1.25	3 x 5/8 dia.	CX15NR

Magnetically shielded units. Connectors: Series N, type N; Series NR, type OSM.

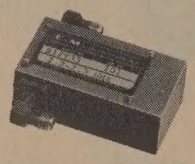
OCTAVE BANDWIDTH

OCTAVE TERMINATED CIRCULATORS

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions-Inches L W H	Model Number
0.5- 1.0	15	0.75	1.45	5 rad. x 1 1/2	U30YI
1.0- 2.0	18	0.35	1.28	3 7/8 x3 7/8 x1	L30T30
2.0- 4.0	18	0.35	1.28	2 x2 x 7/8	S30T30
4.0- 8.0	18	0.4	1.28	1 13/32 x1 13/32 x 3/4	C30T30
8.0-12.0	18	0.5	1.28	13/16 x1 x 11/16	X30T30
12.0-18.0	18	0.6	1.28	3/4 x 15/16 x1	Ku30T30

Connectors: Type OSM female.

TELEMETRY ISOLATORS



VHF BAND (216 - 260 MHz)

Frequency MHz	Bandwidth	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Body Dimensions Inches L W H	Termination Watts Max.	Model Number
216-260	1%	20	0.5	1.25	1 3/8 x2 1/2 x 7/8	30	V2T17
230	12MHz	18	1.0	1.30	2 x1 5/8 x1	5	V2T20
230-260	2MHz	18	0.7	1.30	1 13/64 x 27/32 x1 17/64	5	V2T25
247.8	1%	20	0.7	1.25	1 1/4 x2 19/64 x1	30	V2T12

L BAND (1430 - 1540 MHz) (1750 - 1850 MHz)

1.46	60MHz	20	0.4	1.25	1 7/64 x 2 7/64 x 3/4	20	L13T13
1.545	20MHz	20	0.4	1.25	1 7/64 x 2 7/64 x 3/4	10	L12T15
1.6 - 1.9	40MHz	20	0.4	1.25	1 7/64 x 2 7/64 x 3/4	10	L12T14
1.75-1.85	Full	23	0.3	1.20	1 3/4 x 1 3/4 x 7/8	5	L12T23
1.75	20MHz	20	0.4	1.25	1 7/64 x 2 7/64 x 3/4	20	L12T17

S BAND (2200 - 2300 MHz)

2.1 - 2.4	18		0.5	1.25	1 13/16 x2 3/4 x 25/32	25	S12T20
2.2 - 2.3	20		0.3	1.25	1 7/64 x2 7/64 x 3/4	25	S12T11
2.2 - 2.3	20		0.3	1.25	1 7/64 x1 1/8 x 5/8	5	S12T15
2.2 - 2.3	20		0.25	1.25	1 1/4 x1 3/64 x 3/4	5	S12T46

BROADBAND WAVEGUIDE ISOLATORS

*Bilaterally Matched

COVER FLANGES STANDARD

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Length Inches	Model Number
2.6 - 3.95	15	1.0	1.15	14	S102LI
2.6 - 3.95	20	1.0	1.15	14	S103LI
2.6 - 3.95	30	1.7	1.15	16	S104LI
3.3 - 4.9	25	1.0	1.15	8 1/4	CS110LI
3.95- 5.85	25	0.8	1.10	7	C878LI
3.95- 5.85	25	0.8	1.15	7	C879LI
3.95- 5.85	25	1.0	1.15	8 1/4	C102LI
3.95- 5.85	30	1.0	1.10*	7	C876LI
3.95- 5.85	30	1.0	1.15*	7	C877LI
3.95- 5.85	30	1.2	1.15	8 1/4	C110LI
3.95- 5.85	30	1.2	1.15*	8 1/4	C110LIA
3.95- 5.85	40	1.0	1.15*	8 1/4	C111LI
5.85- 8.2	30	1.0	1.10*	5	Xb951LI
5.85- 8.2	30	1.0	1.15	6 1/8	Xb103LI
5.85- 8.2	30	1.0	1.15*	5	Xb952LI
5.85- 8.2	40	1.2	1.15*	7 5/8	Xb910LI
7.05-10.0	30	1.0	1.10*	5	XL920LI
7.05-10.0	30	1.0	1.12*	5	XL921LI
7.05-10.0	30	1.0	1.15	6 1/8	XL103LI
7.05-10.0	30	1.0	1.15*	6 1/8	XL103LI
7.05-10.0	35	1.0	1.15*	7 1/8	XL910LI
7.05-10.0	40	1.2	1.15*	7 1/8	XL911LI
8.2 -12.4	30	1.0	1.10	5	X110LI
8.2 -12.4	30	1.0	1.10*	4 1/2	X956LI
8.2 -12.4	30	1.0	1.10*	5	X110LIA
8.2 -12.4	30	1.0	1.15	5	X111LI
8.2 -12.4	30	1.0	1.15*	4 1/2	X957LI
8.2 -12.4	40	1.0	1.10	5 23/32	X910LI
8.2 -12.4	40	1.2	1.15	5 23/32	X911LI
10.0 -15.0	25	1.0	1.15	5	M110LI
10.0 -15.0	30	1.0	1.15*	5	M111LI
12.4 -18.0	24	1.0	1.15*	5	Ku103LI
12.4 -18.0	25	0.8	1.10*	4	Ku916LI
12.4 -18.0	30	1.0	1.10*	4	Ku915LI
12.4 -18.0	30	1.0	1.15*	5	Ku110LI
12.4 -18.0	35	1.0	1.15*	6	Ku910LI
12.4 -18.0	40	1.2	1.15*	6	Ku911LI
13.0 -17.0	40	1.0	1.15	5	Ku130LI
18.0 -26.5	25	1.0	1.15	4 1/2	K110LI
18.0 -26.5	30	1.5	1.15	4 1/2	K111LI

STANDARD WAVEGUIDE ISOLATORS

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Length Inches	Model Number
3.5 - 4.0	25	0.6	1.10	5 1/2	CS180LI
4.0 - 4.5	30	0.6	1.10	5 1/2	CS230LI
4.7 - 5.1	30	1.5	1.15	5	C101MI
5.4 - 5.9	50	1.0	1.10	4 1/2	Xb121LI
5.925- 6.425	50	1.0	1.10	4 1/2	Xb121LI
6.425- 6.875	50	1.0	1.10	4 1/2	Xb121LI
6.875- 7.125	50	1.0	1.10	4 1/2	Xb121LI
7.125- 7.65	50	1.0	1.10	4 1/2	Xb121LI
7.125- 7.75	60	1.0	1.10	4 1/2	XL500LI
8.2 -10.0	25	1.0	1.10	3 1/2	X345LI
8.5 - 9.6	35	1.0	1.10	2 1/2	X106LI
9.2 - 9.6	35	0.8	1.10	2 1/2	X320LI
10.7 -11.7	40	0.7	1.20	2	M6LI
13.0 -17.0	40	1.0	1.15	5	Ku130LI
16.0 -18.0	20	1.0	1.10	2 1/2	Ku107LI
23.0 -25.0	22	0.6	1.10	2 1/2	K106LI

FULL BANDWIDTH TERMINATED CIRCULATORS

LOW-LOSS

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dim. - Inches Diam. H	Model Number
3.95- 5.85	17	0.5	1.30	4 1/2 x 3 7/8	C102LYI
5.85- 8.2	17	0.5	1.30	3 1/2 x 3 1/8	Xb111LY
7.05-10.0	17	0.5	1.30	3 x 2	XL106LY
7.0 -11.0	17	0.5	1.30	3 x 2	Xa102LY
8.2 -12.4	20	0.3	1.20	2 1/2 x 2	X112LYI
12.4 -18.0	17	0.5	1.30	2 1/8 x 1 45/64	Ku134LY
18.0 -26.5	17	0.5	1.30	2 x 1 1/2	K134LYI

Power (maximum): 10 Kw peak; 10 watts average.
Terminale: 1 W maximum standard.

MINIATURE WAVEGUIDE ISOLATORS

XLM Series	7.05 –10.0 GH
XM Series	8.2 –12.4 GH
WM Series	13.3 –14.4 GH
KM Series	12.4 –18.0 GH
KMA Series	18.0 –26.5 GH
RM Series	26.5 –40.0 GH
Length	1/2 inc
Bandwidth	200 Mc. (averag
Isolation	20.0 db (averag
Ins. Loss	0.4 db (averag
VSWR	1.15 (averag

WRITE FOR COMPLETE CATALOG

SPECIFICATIONS SUBJECT TO CHANGE

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MICROWAVE FERRITE COMPONENTS

COAXIAL CIRCULATORS

3-PORT

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Body Dimensions Inches L W H	Wgt. Ounces Nom.	Model Number
.100-.110	15	0.9	1.35	10 dia.x1½	135	V16Y10
.110-.122	15	0.8	1.35	9 dia.x1½	120	V17Y10
.122-.135	15	0.8	1.35	9 dia.x1½	120	V18Y10
.135-.155	15	0.7	1.35	9 dia.x1½	120	V21Y10
.155-.190	15	0.7	1.35	9 dia.x1½	120	V22Y10
.190-.240	15	0.6	1.35	7½ dia.x1½	104	V24Y10
.225-.300	17	0.5	1.30	7 dia.x1½	96	V25Y10
.25- .35	17	0.6	1.30	7 x6½x1½	104	V25T
.35- .50	17	0.6	1.30	4¾x4¾x1⅝	56	U35T
.50- .70	17	0.5	1.30	3¾x3¾x1⅝	38	U36T
.70-1.00	17	0.5	1.30	3 x3 x1¾	28	U22T
1.50-1.80	20	0.4	1.25	3¼x3¼x1⅛	20	L22T
1.70-2.40	20	0.3	1.20	3 x3 x1⅛	18	LS10T
2.00-3.00	18	0.3	1.25	2¾x2¾x1⅛	16	S31T
2.50-3.50	18	0.3	1.25	2¼x2¼x1⅛	9	S35T
3.00-4.00	20	0.3	1.25	2¼x2¼x1⅛	9	S32T
3.60-4.40	20	0.3	1.25	1¾x1¾x1	7	SC10T
4.00-5.00	20	0.4	1.20	1½x1½x1	6	C31T
5.00-6.20	20	0.4	1.20	1½x1½x ⅞	6	C32T
5.4- 5.9	20	0.3	1.25	⅝x 11/16x ½	1¾	C10T
7.0-10.5	15	0.6	1.35	⅞x1 x 13/16	3	CX23T
8.0-10.0	18	0.5	1.30	11/16x 13/16x ⅝	1¾	X27T
10.0-12.0	18	0.5	1.30	⅝x ¾x ⅝	1¾	X28T

3-PORT OCTAVE MINIATURE

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions-Inches L W H	Model Number
0.5- 1.0	15	0.75	1.45	5 rad.x 1½	U30Y
1.0- 2.0	18	0.35	1.28	3⅞x3⅞x1	L30T40
2.0- 4.0	18	0.35	1.28	3 x2 x ⅞	S30T40
4.0- 8.0	18	0.4	1.28	1 13/32x1 13/32x ¾	C30T40
8.0-12.0	18	0.5	1.28	15/16x1 x 1¼	X30T40
12.0-18.0	18	0.6	1.28	¾ x 13/16x1	Ku30T40

Connectors: Model U30Y: type N female; all other models: type OSM female.

3-PORT SUB-MINIATURE

10 BANDWIDTH

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions-Inches L W H	Model Number
1.6- 1.9	20	0.4	1.25	1⅝x1⅝x 11/16	L12T
1.9- 2.2	20	0.3	1.25	1½x1½x ⅝	S12T
2.2- 2.5	20	0.3	1.25	1¼x1¼x ⅝	S15T
2.5- 3.3	20	0.3	1.25	1 x1 x ⅝	S13T
3.3- 4.0	20	0.3	1.25	13/16x 13/16x ½	S14T
4.0- 5.4	20	0.3	1.25	⅝x ⅝x ½	C12T
5.4- 7.0	20	0.3	1.25	½x ⅝x ½	C14T
7.0- 7.0	20	0.3	1.25	½x ⅝x ½	X12T
12.0-18.0	20	0.3	1.25	½x ½x ½	Ku12T

Specify center frequency when ordering.
Connectors: OSM female.

4-PORT

Frequency GHz	Isolation db Min. 1-4, 3-2	Isolation db Min. 4-3, 2-1	Insertion Loss db Max. 1-2, 3-4	Insertion Loss db Max. 2-3, 4-1	VSWR Max.	Body Dimensions Inches L W H	Model Number
1.7-2.4	40	18	0.3	0.6	1.25	6 x3½x1⅛	LS10D
2.0-4.0	35	14	0.4	0.7	1.25	4 x3 x1⅛	S30D10
2.2-2.4	40	20	0.3	0.6	1.25	4 x2¼x1⅛	S33D11
2.4-2.7	40	25	0.3	0.6	1.25	4½x2¾x1¼	S27D13
2.7-3.3	40	20	0.3	0.6	1.25	4¼x2½x1⅛	S28D14
4.4-5.0	40	20	0.3	0.5	1.20	2¾x1¼x ⅞	C31D15
5.4-5.9	40	20	0.3	0.6	1.25	2½x1½x ⅞	C35D14
8.5-9.5	40	20	0.4	0.8	1.20	2½x1½x ⅞	X24D10

Connectors: N female.

5-PORT

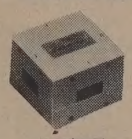
Frequency GHz	Isolation db Min. 2-1	Isolation db Min. 3-2	Insertion Loss db Max. 1-2	Insertion Loss db Max. 2-3	VSWR Max.	Body Dimensions Inches L W H	Model Number
1.7-2.4	40	40	0.6	0.6	1.25	7¾x3¾x1⅛	LS10J
2.2-2.3	40	40	0.5	0.6	1.15	6½x3 x1⅛	S27J11
2.7-3.3	40	40	0.6	0.6	1.25	5 x3 x1⅛	S35J11
3.1-3.5	40	40	0.4	0.5	1.20	5 x2½x1	S23J13
5.4-5.9	40	40	0.5	0.6	1.20	4 x1¾x ⅞	C35J10
7.2-7.8	40	40	0.6	0.6	1.25	3½x1¾x ⅞	C35J12
8.5-9.5	40	40	0.6	0.6	1.25	3 x1½x ⅞	X21J14

coave*

Frequency GHz	Isolation db Min. 3-2	Isolation db Min. 3-1	Isolation db Min. 2-1	Insertion Loss db Max. 1-2	Insertion Loss db Max. 2-3	VSWR Max. 1	VSWR Max. 2	VSWR Max. 3	Model Number
3.7- 4.2	42	40	40	0.4	0.5	1.20	1.15	1.25	SC10J13
5.9- 6.45	40	40	40	0.4	0.6	1.15	1.15	1.25	C38J10
6.6- 7.1	40	40	40	0.4	0.5	1.15	1.15	1.20	C33J15
7.2- 7.8	40	40	40	0.4	0.6	1.15	1.15	1.20	C33J16
7.6- 8.5	40	20	20	0.5	0.6	1.20	1.15	1.20	CX21D11
8.7- 9.3	40	40	40	0.5	0.6	1.15	1.15	1.25	X21J11
9.9-10.2	40	40	40	0.5	0.6	1.15	1.15	1.20	X21J13
10.4-11.0	40	40	40	0.5	0.6	1.15	1.15	1.20	X22J14
10.9-11.6	40	40	40	0.5	0.6	1.15	1.15	1.20	X22J16
12.8-13.3	40	20	20	0.4	0.8	1.25	1.20	1.25	Ku20D11

* Pronounced 'co-wave.

WAVEGUIDE T CIRCULATORS



3-PORT

Frequency GHz	Isolation db Min.	Ins. Loss db Max.	VSWR Max.	Body Dimensions Inches L W H	Model Number
2.8- 3.2	20	0.3	1.20	6½x6½x5½	S101LT
3.2- 3.6	20	0.3	1.20	6½x6½x5½	S102LT
3.6- 4.0	20	0.3	1.20	6½x6½x5½	S103LT
4.0- 5.2	20	0.2	1.20	4⅜x4 x3⅝	C103LT
5.2- 6.7	20	0.2	1.20	3⅛x3¾x3⅛	Xb103LT
5.9- 7.2	20	0.2	1.20	3⅛x3¾x3⅛	Xb104LT
7.0- 8.5	20	0.2	1.20	2½x2⅝x1⅞	XL102LT
7.7- 8.9	20	0.2	1.20	2½x2⅝x1⅞	XL103LT
8.2-10.2	20	0.2	1.20	2 x2 1/32x1¾	X110LT
8.5- 9.6	20	0.2	1.20	2 x1⅞x1⅝	X104LT
10.2-12.4	20	0.2	1.20	2 x1⅞x1⅝	X111LT
10.5-11.7	20	0.2	1.20	1⅞x1⅞x1½	M101LT
11.7-13.2	20	0.2	1.20	1⅞x1⅞x1½	M102LT
12.4-15.4	20	0.3	1.20	1¾x1¾x1 5/16	Ku107LT
14.0-17.0	20	0.3	1.20	1¾x1¾x1 5/16	Ku108LT
16.0-18.0	20	0.3	1.20	1¾x1¾x1 5/16	Ku105LT
22.0-24.0	20	0.5	1.20	1⅞ dia.x 3/32	K102LY
31.0-33.0	20	0.5	1.20	1 7/16 dia.x 3/32	R102LY

4-PORT

SPECIFICATIONS

V S W R (maximum):	1.20
Insertion Loss (maximum):	0.2 db (single section) 0.4 db (double section)
Isolation (minimum):	20.0 db (single section) 35.0 db (double section)
Peak Power (maximum):	10 kw
Average Power (maximum):	10 w
Weight	Approximately twice that of 3-port unit.
Dimensions:	On request
Model Number:	Add letter "D" to Model Number in table.

FULL BANDWIDTH 3-PORT

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dim.-Inches Diam. H	Model Number
3.95- 5.85	17	0.5	1.30	4½ x 3⅞	C102LY
5.85- 8.2	17	0.5	1.30	3½ x 3⅛	Xb111LY
7.05-10.0	17	0.5	1.30	3 x 2	XL106LY
7.0 -11.0	17	0.5	1.30	3 x 2	Xa102LY
8.2 -12.4	20	0.3	1.20	2½ x 2	X112LY
12.4 -18.0	17	0.5	1.30	2⅛ x 1 5/64	Ku134LY
18.0 -26.5	17	0.5	1.30	2 x 1½	K134LY

Power (maximum): 10 Kw peak; 10 watts average.

3-PORT H-PLANE HIGH POWER

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Power Cw. Max.	Dimensions Inches L W H	Model Number
4.4- 5.0	20	0.3	1.20	2 KW	4⅜x4x3⅝	C104HT
8.2-10.2	20	0.3	1.20	1 KW	2x2 1/32x1¾	X110HT

3-PORT E-PLANE HIGH POWER

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Power Kw Peak	Power W. Ave.	Dim.-Inches L W H	Model Number
8.8 - 9.20	20	0.4	1.20	100	100	2 x1¾x1¾	X128TE
9.6 -10.1	20	0.4	1.20	40	50	2½x2½x2½	X101TE
15.95-16.35	20	0.4	1.20	40	50	2 x2 x1½	Ku112TE

DIFFERENTIAL PHASE SHIFT CIRCULATORS

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Kw Peak	W. Ave.	Waveguide Type	Weight Length Inches	Weight Lbs. Nom	Model Number
5.9- 6.4	25	0.5	1.20	20	20	RG-50/U	14	16	C102LD
8.5- 9.6	20	0.4	1.25	250	250	RG-51/U	11⅛	7	XL102HD
9.0- 9.5	25	0.3	1.15	250	250	RG-51/U	11⅛	7	XL101HD
8.5- 9.6	25	0.4	1.25	200	200	RG-52/U	7½	5½	X101HD
13.2-14.0	25	0.5	1.25	20	20	RG-91/U	7½	4	Ku101LD
16.0-17.0	25	0.5	1.25	20	20	RG-91/U	7½	4	Ku103LD

PLUG-IN WAVEGUIDE

Frequency GHz	Bandwidth	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Body Dimensions Inches A B C	Waveguide Type	Model Number
3.7 - 4.2	Full	20	0.3	1.20	2 1/16 x 1 x2 5/16	WR-229	SC10T12
3.95- 5.85	10%	20	0.3	1.20	1 11/16x 1 x2⅛	WR-187	C37T10
5.85- 8.2	10%	20	0.3	1.20	1 11/32x 1 x1 9/16	WR-137	C39T10
7.05-10.0	10%	20	0.4	1.20	1 x 1 x1 13/64	WR-112	X21T19
8.2 -12.4	10%	20	0.4	1.20	⅞ x2 7/32x1⅛	WR-90	X21T12

PLUG-IN STRIPLINE

Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Body Dimensions Inches Dia. Hgt. †	Model Number
1.10- 1.25	20	0.5	1.25	2½ x3 5/64x⅛	L23YP10
1.36- 1.40	20	0.4	1.20	2½ x3 5/64x¼	L23YP
1.53- 1.66	20	0.4	1.20	2½ x3 5/64x⅛	L25YP10
1.70- 1.85	18	0.5	1.25	2¼ x2½x⅛	L25YP
2.20- 2.50	20	0.4	1.20	2½ x3 5/64x⅛	S33YP
3.05- 3.15	25	0.3	1.20	1¾ x3 5/64x⅛	S34YP10
3.07- 3.30	20	0.4	1.25	1¾ x3 5/64x⅛	S34YP
5.40- 5.90	20	0.3	1.20	1 13/32x3 5/64x⅛	C35YP
*10.0 -12.0	20	0.4	1.20	1¼ x3 5/64x⅛	X22YP

* Any 10% bandwidth. † Ground plane spacing.

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SPECIFICATIONS SUBJECT TO CHANGE

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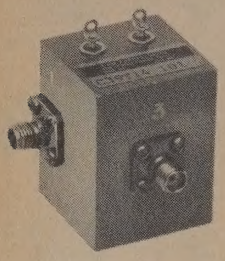
ELECTRICALLY CONTROLLED COMPONENTS

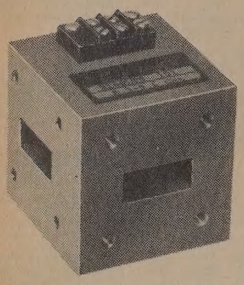


HIGH SPEED SWITCHABLE FERRITE COAXIAL CIRCULATORS

ISOLATION: 20db minimum — INSERTION LOSS: 0.3db maximum — VSWR: 1.25 maximu

Frequency - GHz	*Switch Speed Microseconds Max.	Body Dimensions - Inches A	B	C	Weight - Ounces Nominal	Model Number
3.7 - 4.2	50	1¾	1⅝	1¾	8	SC10T14
4.2 - 5.0	35	1½	1⅜	1¾	7	C31T14
5.0 - 6.0	35	1⅜	1¼	1¾	6	C32T14
6.0 - 7.2	35	1¼	1⅛	1⅝	5	C38T14
7.2 - 8.5	35	1¼	1⅛	1⅝	5	C39T14
8.0 - 10.0	35	1¼	1⅛	1⅝	5	X21T20
10.0 - 12.0	35	1¼	1⅛	1⅝	5	X22T20

* 10% to 90% points of RF power. Connectors: OSM fema

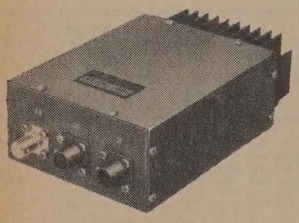


HIGH SPEED SWITCHABLE FERRITE WAVEGUIDE CIRCULATORS

ISOLATION: 20db minimum — INSERTION LOSS: 0.5db maximum — VSWR: 1.25 maximu

Frequency - GHz	*Switch Speed Microseconds Max.	Body Dimensions - Inches A	B	C	†Flange Type	Weight - Ounces Nominal	Model Number
8.5 - 9.6	50	2	2¼	2	UG- 39/U	15	X160LTS
8.5 - 9.6	5	2	2¼	2	UG- 39/U	15	X170LTS
9.2 - 9.5	10	2	2¼	2	UG- 39/U	15	X161LTS
14.0 - 15.0	5	1 27/32	2 13/64	1 19/32	UG-419/U	12	Ku148LTS
16.0 - 17.0	5	1 27/32	2 13/64	1 19/32	UG-419/U	12	Ku149LTS
21.0 - 22.0	5	1¼	2⅛	2	UG-595/U	7	K115LTS
34.5 - 35.5	5	1⅜	2⅛	2	UG-599/U	4	R123LTS

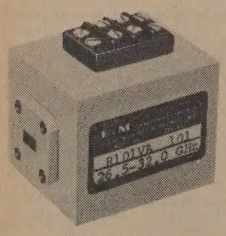
* 10% to 90% points of RF power. † Cover with tapped hole



SOLID STATE SWITCH DRIVERS

Model Number	Input Current Amperes Nominal	*Body Dimensions - Inches A	B	C	D	Use with Circulator Model Number
EDS2110	0.5	3	4	1	½	SC10T14
EDS2131	0.4	3	4	1	½	C31T14
EDS2132	0.3	3	4	1	½	C32T14
EDS2138	0.3	3	4	1	½	C38T14
EDS2139	0.3	3	4	1	½	C30T14
EDS2121	0.3	3	4	1	½	X21T20
EDS2122	0.3	3	4	1	½	X22T10
EDS1160	0.3	3	4	1	½	X160LTS
EDS1170	2.0	3	4	1	½	X170LTS
EDS1161	0.3	3	4	1	½	X161LTS
EDS1148	2.0	4	5	2 1/32	1 5/16	Ku148LTS
EDS1149	2.0	4	5	2 1/32	1 5/16	Ku149LTS
EDS1115	2.0	4	5	2 1/32	1 5/16	K115LTS
EDS1123	2.0	4	5	2 1/32	1 5/16	R123LTS

* "D" dimension: ½" end cover; 1 5/16" transistor heat dissipating fins.
Input Voltage: +9.0 V. DC. Other input voltages available on special order.
NOTE: Input power is a function of switching speed and RF bandwidth. Variations of all models available on special order.



FERRITE WAVEGUIDE VARIABLE ATTENUATORS

Frequency - GHz	Attenuation db Min.	Insertion Loss db Max.	VSWR Max.	Coil Resistance ohms	DC Coil Current ma Max.	Length Inches	Weight Ounces Nominal	Flange Type	Model Number
4.4 - 5.1	12	1.0	1.35	30	200	6½	40	UG-149A/U	C104VA
5.4 - 5.9	18	1.0	1.35	25	250	5½	28	UG-344/U	Xb101VA
7.05 - 10.0	30	1.0	1.25	30	200	6	24	*UG- 51/U	XL102VA
8.2 - 12.4	30	1.0	1.30	50	200	5	18	*UG- 39/U	X101VA
12.4 - 18.0	20	1.0	1.35	30	200	3¼	12	*UG-419/U	Ku102VA
22.0 - 25.0	25	1.0	1.30	15	100	3½	4	*UG-595/U	K101VA
26.5 - 32.0	25	1.0	1.30	600	100	2	3	*UG-599/U	R101VA

* Standard cover flanges with tapped holes.

FERRITE WAVEGUIDE VARIABLE PHASE SHIFTERS

Frequency - GHz	Phase Shift Min.	Insertion Loss db Max.	VSWR Max.	DC Coil Current ma Max.	Length Inches	Weight Ounces Nominal	Flange Type	Model Number
†5.4 - 5.9	180°	1.0	1.3	150	7	16	N female	C102LPC
6.4 - 6.9	180°	1.0	1.3	200	6	32	UG-344/U	Xb101LP
8.0 - 9.0	360°	1.0	1.25	300	6	32	*UG- 51/U	XL101LP
8.5 - 10.2	330°	1.0	1.3	500	7¾	28	*UG- 39/U	X121LP
16.4 - 16.6	360°	1.0	1.3	200	6	12	*UG-419/U	Ku111LP
22.0 - 23.0	360°	1.0	1.3	250	3½	4	*UG-595/U	K101LP

† Coaxial * Standard cover flanges with tapped holes

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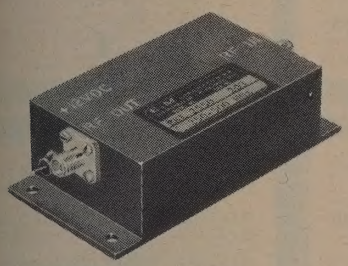
SOLID STATE AMPLIFIERS

HGH LEVEL BROADBAND AMPLIFIERS

Frequency MHz	Noise Figure db Max.	Gain db Min.	Gain Flatness ±db	(1) Power Output dbm. Min.	VSWR Max. Input	VSWR Max. Output	Model Number
(3) 300	8	20	0.75	+23	2.5	3.0	EBA1002
(2) 400	8	20	0.5	+20	2.5	2.0	EBA1001
(2) 400	8	20	1.0	+27	2.5	3.0	EBA1003
100	8	25	1.0	+27	2.5	2.5	ESK5010
100	6	25	1.0	+20	2.0	2.5	ESH5010
1 200	8	25	1.0	+27	2.0	3.0	ESK1020
1 200	6	25	1.0	+20	2.0	2.5	ESH1020
1 300	8	25	1.0	+27	2.0	3.0	ESK1530
1 300	6	25	1.0	+20	2.0	2.5	ESH1530
2 400	8	23	1.0	+27	2.0	3.0	ESK2040
2 400	6	25	1.0	+20	2.5	2.5	ESH2040
2 500	8	23	1.0	+27	2.5	3.0	ESK2550
2 500	7	23	1.0	+20	2.0	2.5	ESH2550
5 1000	8	23	1.0	+10	2.0	2.5	ESM50001

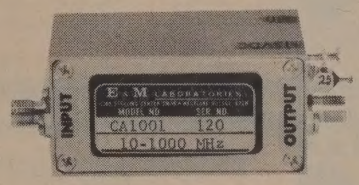
NOTES:
1) At db gain compression
2) 5-0 MHz: 3 db bandwidth (nom). Low frequency response to 10 kHz optional
3) 2nd and higher order intermodulation products: — db min. from two +10 dbm output signals
Impedance level: 50 ohms
Connectors: OSM female. Other types available on order
All series have silicon transistors



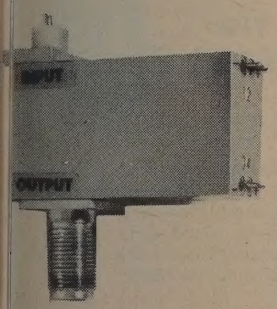
MINIATURE STYLE LOW NOISE BROADBAND AMPLIFIERS

Frequency MHZ	Noise Figure db Max.	Noise Figure db Typ.	Gain db Min.	Gain Flatness ±db	(1) Power Output dbm Min.	VSWR Max. Input	VSWR Max. Output	(2) Input Current ma. Nom. @ +15 VDC	Model Number
10-300	2.5	2.0	26	0.5	+3	2.0	2.0	20	CA1003
10-500	3.2	3.0	25	0.5	+3	2.5	2.0	25	CA1005
10-1000	4.5	4.0	27	1.0	+5	2.5	2.5	40	CA1001
50-100	2.0	1.8	27	0.5	+3	2.0	2.0	20	CA5010
100-200	2.5	2.0	27	0.5	+3	2.0	2.0	20	CA1020
150-300	2.5	2.0	26	0.5	+3	2.0	2.0	20	CA1530
200-400	2.5	2.3	25	0.5	+5	2.0	2.0	20	CA2040
250-500	2.5	2.3	25	0.5	+5	2.0	2.0	20	CA2550
300-600	2.7	2.5	25	0.5	+5	2.0	2.0	20	CA3060
500-1000	3.0	2.7	29	0.75	+10	2.0	2.0	40	CA5001

NOTES: (1) At 1 db gain compression
(2) RFI Filter input
3. Impedance level: 50 ohms
4. Connectors: OSM female
5. Silicon transistors all models
6. Weight: 1¾ ounces nom.



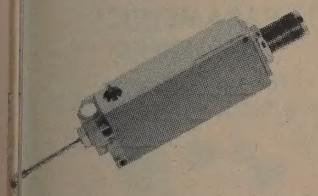
CUSTOM INTEGRATED ASSEMBLIES



ISOLATOR-DUAL DIRECTIONAL COUPLERS-DUAL POWER MONITORS

Frequency Range ..... S-Band
Isolation ..... 20 db Min.
Insertion Loss ..... 0.3 db Max.
VSWR ..... 1.25 Max.
Power Monitor Diode Output ..... 1.0 VDC (Both ends of diode above ground)
Connectors:
- **Input** ..... Special plug-in
- **Output** ..... TNC female (hermetically sealed)
- **Monitor Outputs** ..... Solder terminals

Termination ..... 25 watts Max.
Body Size ..... 1 7/64 x 2 7/64 x ¾
(Magnetically Shielded)



ISOLATOR-BAND PASS FILTER-TUNABLE IMPEDANCE MATCHING SECTION

Frequency Range ..... C-Band
Isolation ..... 20 db Min.
Insertion Loss ..... 0.9 db Max. (isolator and filter)
VSWR ..... 1.25 Max.
Filter ..... 3-section comb line
Termination ..... 5 watts Max.
Connector ..... TNC female (hermetically sealed)
Body Size ..... 2⅝ x 1 7/64 x 9/16

WRITE FOR COMPLETE CATALOG

SPECIFICATIONS SUBJECT TO CHANGE

E&M LABORATORIES
A STERLING ELECTRONICS COMPANY
5388 STERLING CENTER DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91360 • (213) 889-1470 TWX 910-494-1953

ELECTRO/DATA INC.

- Microwave Test Equipment
- Swept Microwave Receiver

YIG TUNED SPECTRUM ANALYZER PLUG-INS

Five models cover the entire frequency spectrum from 100 Mc to 40 Gc with greater than decade band tuning ranges. With these units, an ordinary oscilloscope is converted into a pre-selected wide band, microwave receiver which gives a panoramic display of signals on the oscilloscope The entire frequency spectrum or any segment of it, may be displayed in a single sweep.

SPECIFICATIONS

MODEL PN 1010 / PN 1010A — 100-1000 MC

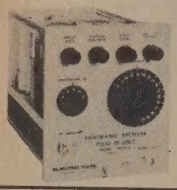
MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (–dbm)	Price
PN 1010	.1-1.0	.1-1.0	3-6	40-60	$2,495
PN 1010A	.1-1.0	:1-1.0	3-6	60-80	$2,895

Ask for Bulletin: PN1000

MODEL PN 1011 — 1000-12,400 MC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (–dbm)	Price
PN 1011	1.0-12.4	.4-11	4-10	45-48	$1,995

Ask for Bulletin: PN1000



MODEL PN 1012 — 500-5000 MC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (–dbm)	Price
PN 1012	.5-5.0	.4-4.5	4-7	42-56	$2,195

Ask for Bulletin: PN1000

MODEL PN 1013 — 1.8-25 GC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (–dbm)	Price
PN 1013	1.8-25	1.5-23.5	5	40-55	$2,795

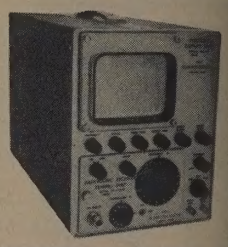
Ask for Bulletin: PN 1013

MODEL PN 1014 — 10-40 GC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (–dbm)	Price
PN 1014	10-40	2-30	25	30-45	$2,995

Ask for Bulletin: PN 1014

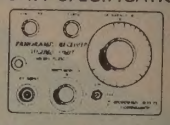
The above units for these Tektronix oscilloscopes: 531A, 532, 533A, 536, 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 549, 551, 555, 556, 581A, 585A
Other units available for 561, 564 series — Contact Marketing Department



SPECTRUM DISPLAY UNIT DU-501

This portable, battery operated display unit provides panoramic viewing from 100 Mc to 40 Gc when used with the five plug-ins listed below. Price $2675.

PLUG-IN SPECIFICATIONS



TU-VL501 .10 Gc to 1.0 Gc
Price . . . . . $2,600.

TU-LX501 1.0 Gc to 12.4 Gc
Price . . . . . $2,000.

TU-VC501 .5 Gc to 5.0 Gc
Price . . . . . $2,200.

TU-LK501 1.8 Gc to 25 Gc
Price . . . . . $3,000.

TU-XK501 10 Gc to 40 Gc
Price . . . . . $3,000.

Bulletin: DU-501

YIG FILTERS

5 models cover from 100 Mc to 40 Gc with greater than decade electronic tuning ranges. Solid state, rugged compact construction.
Bulletin: YIG Filters

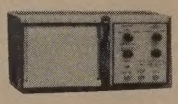
PANORAMIC RECEIVER R-10

Self contained YIG tuned receiver accurately tunes any selected decade band from 100 Mc to 40 Gc. Price: $3,750. Bulletin: R-10

HAND HELD SURVEY UNIT

This compact receiver utilizes a YIG tuned RF preselector and sensitive crystal video circuit to cover 1-12.4 Gc. Price $2,900. Bulletin: RLX-100

GRAPHIC RECORDER



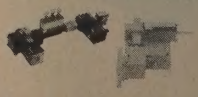
The RC-10, electric writing recorder, provides a permanent falling raster display for RFI and spectrum signal analysis. Price $3875.

MARKER GENERATOR

MK-1
Covers 1-12.5 Gc. 100/500 Mc spacing. Self contained power supply. Price: $1,295.
Bulletin: MK-1

PARAMETRIC AMPLIFIERS

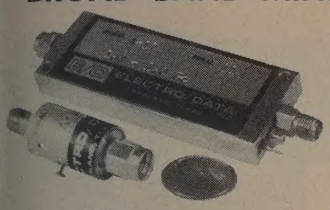
for operation in L,S,C,X,Ku Bands



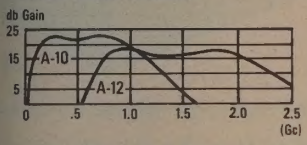
E/D's broad design experience in both cryogenically cooled and room temperature low noise amplifier systems ranges from L to Ku band.
Contact Marketing Department

YIG Devices • Advanced Systems Components • Parametric Amplifiers • RF Subsystems

BROAD BAND MINIATURE AMPLIFIERS



- **Low Noise**
- **Solid State, Miniature Size**
- **New Low Prices**



Typical Gain and Noise Figure vs Frequency

Other Models available having a variety of gain, bandwidth and noise figures.

Send for Bulletin A10/A12

SPECIFICATIONS

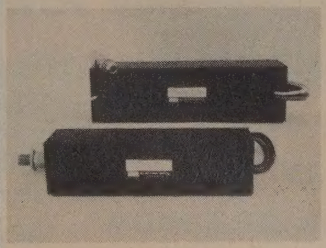
A-10

Frequency Response:
(10 db Gain) 20 to 1000 Mc
(18 db Gain) 50 to 850 Mc
Noise Figure: 5.0 db (Max)
Gain Compression (1 db): −10 dbm Output
Connectors 50 OHMS, 3 MM
Bias Requirements: −18V, ±1V, 20Ma
Size: 1½" Long x ½" Diameter
Weight: ¾ oz.
Price: $375.

A-12

Frequency Response:
(15 db Gain) 1000 to 2000 Mc
(10 db Gain) 700 to 2200 Mc
Noise Figure: 8 db (Max)
6 db (Typical)
Gain Compression (1 db): −6 dbm Output
Connectors: 50 OHMS, 3MM
Bias Requirements: −12V, ±1V, 20Ma
Size: ⅜" Thick x 1" Wide x 2⅝" Long
Weight: 5 oz.
Price: $750.

SOLID STATE 50 — 100 MW BWO REPLACEMENTS FOR L & S BANDS



These reliable high powered transistor oscillators are designed for direct mechanical and electrical replacement in existing BWO circuits (sweepers, spectrum analyzers).

SPECIFICATIONS

MODEL	Frequency	Power Output (Min)	Helix Voltage (Max)	Size	Price
ED-214A	1-2 Gc	100 MW	1600	3x3x11	$1,200.
ED-215A	2-4 Gc	50 MW	2000	2½x2½x9	$1,350.

Send for Bulletin ED-214A

TUNNEL DIODE DETECTORS

- **Highest sensitivity**
- **Broadband, flat response**
- **Field replaceable diodes**
- **Low price includes diodes with mount**

SPECIFICATIONS

Type N Input	Freq. Gc.	Tss −dbm	Price
D10	1-12.4	50	$ 75.00
D11	1-2	54	60.00
D12	2-4	54	60.00
D13	4-8	52	60.00
D14	8-12.4	50	60.00
D15	.01-12.4	45	75.00

3 MM Input	Freq. Gc.	Tss −dbm	Price
D30	1-12.4	50	$ 85.00
D31	1-2	54	70.00
D32	2-4	54	70.00
D33	4-8	52	70.00
D34	8-12.4	50	70.00

BNC/TNC Input	Freq.	Tss −dbm	Price
D40	100KC-2.5Gc	48	$ 25.00
D41	100KC-4Gc	45	40.00

Ask for Series D Bulletin

LOG PERIODIC ANTENNAS

Broad Band Coverage 1-12.5 Gc. Compact, Rugged, Lightweight Portable.

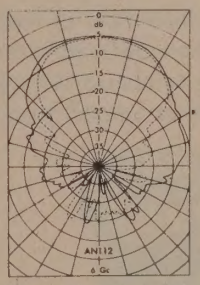
Measured antenna patterns show only a single main lobe with a 15 db front to back ratio over the entire 1 to 12.5 Gc band.

AN112 6¼" x 6½" x 8"

SPECIFICATIONS

- Broad bandwidth — 1 to 12.5 Gc
- High Gain — 11 db (50° beamwidth)
- Linear Polarization 20 db

- High front to back ratio in both horizontal and vertical planes — 15 db.
- Low VSWR — 2: 1 nominal with 50 ohm input.
- Connectors: Type "N" or miniature
- Price, $175 each Bulletin: AN112



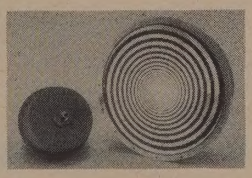
Measured typical radiation pattern
Solid, vertical
Dashed, horizontal

AN112F 1¾" x 6½" x 8"

SPECIFICATIONS

- Broad bandwidth — 1 to 12.5 Gc
- High Gain — 8 db (90° bandwidth)
- Linear polarization 15 db
- Price, $175 each
- Bulletin: AN112F

CAVITY BACKED SPIRAL ANTENNAS



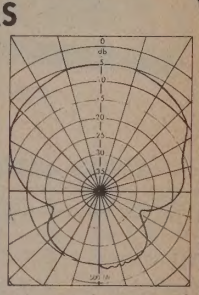
These compact, lightweight antennas are ideal for portable survey applications in the 30 Mc—2 Gc frequency range.

Write for Bulletin AN012-L

- **Broadband Coverage UHF Thru L-Band**
- **Circular Polarization • Lightweight**

SPECIFICATIONS

	MODEL AN012	MODEL AN013
Frequency	50 Mc — 2 Gc	30 Mc — 1.5 Gc
Beamwidth	70 to 110°	80 to 120°
VSWR	2:1	2:1
Connector	N Female	N Female
Size	7½" Dia. x 3¾" H.	13½" Dia. x 5" H.
Weight	1 Lb.	4 Lbs.
Price	$420.00	$600.00



Measured pattern of the AN012-L Circular polarization.

Write for detailed product information

1621 Jupiter
Garland, Texas 75040
214-341-2100

ELECTRO/DATA INC.

Electro IMPULSE, INC.

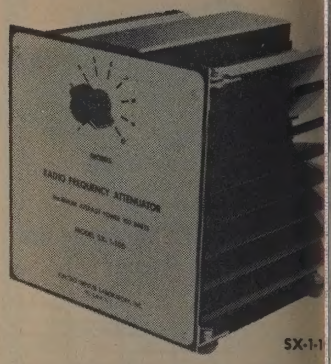
116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404 • TWX No. 710-722-5767

HIGH POWER RF ATTENUATOR

- Power Capacities to 5000 watts
- Variable in 1 db steps
- VSWR less than 1.25
- Input and output impedance: 50 ohms (DC to 100 MHz)

These attenuators are arranged in a T-pad configuration, switched in one db steps. Use either connector as input, with no loss of accuracy.

Usable to 500 MHz with slightly different characteristics.



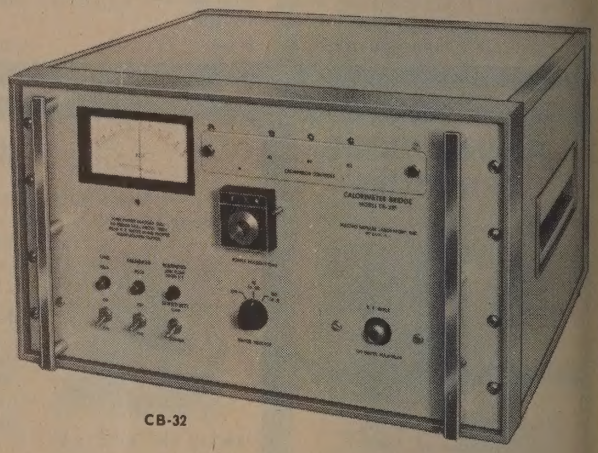
SX-1-1

AUTOMATIC DIRECT READING CALORIMETERS

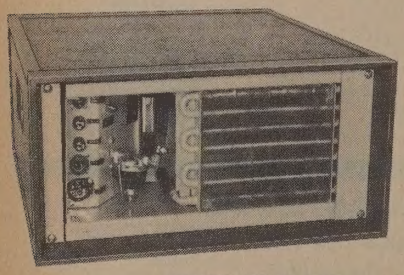
1% ACCURACY

TRACEABLE TO NATIONAL BUREAU OF STANDARDS!

One percent accuracy is independent of frequency and waveshape, but does not include load error. A VSWR vs. frequency chart can be furnished with your choice of any standard waveguide or coaxial load. (No extra cost on 1% models).



CB-32



ADR-100, REAR VIEW

AUTOMATED PRECISION

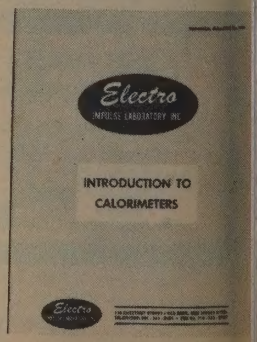
Instead of time consuming manipulation of Controls Flow Adjustments, Reading of Thermometers, Flow Meters, Graphs and other error producing devices

Model	Max. Power	Load*
CB-32	100 watts**	CHOOSE ANY STANDARD LOAD DC-40GHz
ADR-10	10 watts	
ADR-100	100 watts	
ADR-1000	1000 watts	
ADR-5000	5000 watts	
ADR-10000	10000 watts	

*Price includes choice of Standard Load and Connector.
**Manual 1% version.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

WRITE FOR FREE APPLICATION BULLETIN #685: "INTRODUCTION TO CALORIMETERS"

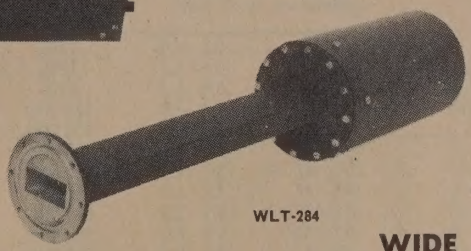


Electro IMPULSE, INC.
116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404 • TWX No. 710-722-5767

WAVEGUIDE WATER LOADS

WL-112

WLT-137



WLT-284

MODELS TO 40 GHz

WIDE VARIETY OF CONNECTORS

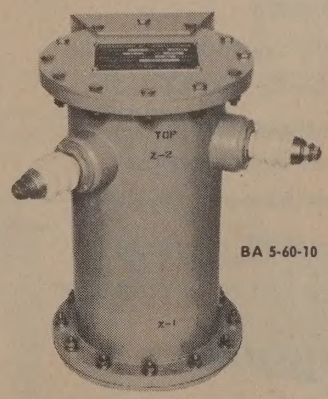
- Calibration resistor precisely located in coolant flow path permits calibration of Load using only a source of DC or 60 Hz power
- Quick-connect couplings on coolant connections guarantee safe, sure and convenient operation
- Specify frequency range desired when ordering
- Compact, portable
- Use with our Calorimeter Bridges or Calorimetric Power Meters
- Extremely low RF radiation
- Low VSWR guarantees most accurate termination and power transfer

Model	Frequency Range GHz	VSWR Max.	Power Rating Watts	Weight	Connector
WL-650	1.12 - 1.70	1.2	40 KW	6	UG-417/U
WL-430	1.70 - 2.60	1.2	30 KW	5	UG-435/U
WL-284	2.60 - 3.95	1.2	25 KW	5	UG-53/U
WL-187	3.95 - 5.85	1.2	10 KW	5	UG-149/U
WL-137	5.85 - 8.20	1.2	5 KW	4	UG-344/U
WL-112	7.05 - 10.0	1.2	3 KW	3	UG-51/U
WL-90	8.20 - 12.4	1.2	2 KW	2	UG-39/U
WL-62	12.40 - 18.00	1.2	1 KW	2	UG-419/U
WL-42	18.00 - 26.5	1.2		2	
WL-28	26.6 - 40.0	1.2		2	

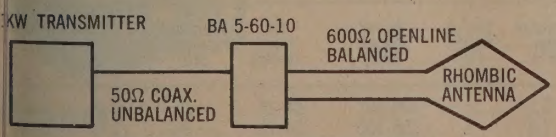
- Optional equipment includes Closely Coupled Thermopiles, Output Meters reading directly in watts and Flow Meters
- Loads can be furnished with power ratings up to maximum feasible waveguide applications

BALUNS

- High efficiency Baluns permit use of 600 ohm twin line between Transmitter and Antenna
- Insertion VSWR 1.2
- Impedances are 50, 75, 200 and 600 ohms
- Insertion loss less than 0.15 db
- Maximum load (antenna) VSWR 3:1
- Ambient temperature range (typical) −40°C to +50°C
- Frequencies to 34 MHz



BA 5-60-10



TYPICAL BALUN APPLICATION

SPECIFICATIONS — HIGH POWER MODELS

Model	Input Output Z	Peak Power	Average Power
BA 5-60-10	50/600	40KW	10KW
BA 5-7.5-10	50/75	40KW	10KW
BA 5-60-25	50/600	100KW	25KW
BA 5-7.5-25	50/75	100KW	25KW
BA 5-20-100	50/200	Inquire	100KW

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

SEE OUR OTHER PRODUCTS ON PAGES 667, 2643

Frequency Sources Inc.

KENNEDY DRIVE P.O. BOX 159
NORTH CHELMSFORD, MASS. 01863
TEL (617) 251-4921 • TWX 710-343-6506

We manufacture the most adaptable line of microwave frequency sources avail anywhere. Our standard models are manufactured to meet your individual req ments. How is this possible? Because of their unusually flexible circuit designs modularized mechanical construction, our production models are designed to be tomized. This results in virtually "off-the-shelf" availability of "specials" with red delivery time and lower costs to you.

If you don't see exactly what you want listed on these pages, select the model ha the nearest frequency range, power output, method of tuning or degree of freq stability to meet your requirement. Then contact our Application Engineering De ment. Chances are, one of our standard models can be scheduled through produc to meet your exact requirements in a matter of days.

VOLTAGE TUNED — High Power

- Bandwidths up to 15%
- Extremely fast tuning rates
- Voltage/frequency curve approximately linear
- Power output to 2.0 watts
- Spurious outputs —40 dB on most models

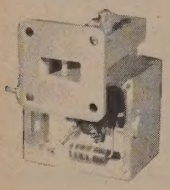
FS-2

L Band

Model	Frequency Range (GHz)	Voltage Tuned Bandwidth	Power Output (mW)	Harmonic Suppression (dB)	Dimensio (Inches) L W
FS-2M	0.2– 0.6	12%	1000	—25	2½ x 1⅛ x
FS-2	0.6– 1.2	12%	1000	—25	2½ x 1⅛ x
FS-2H	0.6– 1.2	10%	2000	—25	2½ x 1⅛ x
FS-14A	2.3– 2.9	325 MHz	250	—40	3 15/16 x 1⅝ x
FS-14B	2.8– 3.3	400 MHz	200	—40	3 15/16 x 1⅝ x
FS-14C	3.1– 3.6	450 MHz	200	—40	3 15/16 x 1⅝ x
FS-14D	3.5– 4.3	500 MHz	200	—40	3½ x 1⅛ x
FS-14E	4.2– 4.9	500 MHz	175	—40	3½ x 1⅛ x
FS-14F	4.9– 5.6	600 MHz	125	—35	3½ x 1⅛ x
FS-14G	5.4– 6.0	600 MHz	100	—35	3½ x 1⅛ x
FS-24	8.0–10.0	500 MHz	40	—35	4⅝ x 1⅛ x
FS-24M	10.0–10.4	400 MHz	25	—35	4⅝ x 1⅛ x
FS-35	12.4–18.0	800–1000 MHz	25	—35	5 x 1⅛ x

VOLTAGE TUNED — Low Power

- Up to octave tuning ranges
- Rapid tuning rates
- Rugged compact package
- Low DC power drain



FS-48

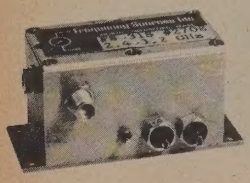
Ku-Band

Model	Frequency Range (GHz)	Voltage Tuned Bandwidth	Power Output (mW)	Harmonic Suppression (dB)	Dimensions (Inches) L W
FS-6	0.3– 1.8	15%	20	—25	2½ x ⅞ x
FS-6H	0.3– 1.8	10%	100	—25	2½ x ⅞ x
FS-36	0.2– 1.5	Octave	10	—15	2½ x ⅞ x
FS-36H	0.2– 1.2	Octave	150	—15	2½ x ⅞ x
FS-47	1.0– 2.0	Octave	100	—15	2½ x ⅞ x
	2.0– 4.0	Octave	15	—15	2½ x ⅞ x
FS-25	1.8– 2.5	200 MHz	10	—30	2½ x ⅞ x
FS-50	1.2– 2.8	10% Fund.	40	—30	1¾ x 1½ x
FS-23	2.5– 5.0	15%	15–10*	—35	3 x 1½ x
FS-18	4.8–11.0	500 MHz	25–3*	—35	3 7/16 x ⅞ x
FS-18W	8.5–11.0	1100 MHz	1	—35	3 7/16 x ⅞ x
FS-48	15.0–18.0	1000 MHz	5	—35	2½ x 2½ x

* High end of band.

CAVITY STABILIZED

- Mechanically tuned, wide bandwidth
- ±0.05% stability —30°C to +71°C
- Low FM noise content
- AFC and oven stabilized options
- Fundamental frequencies to 4 GHz



FS-31S

S Band

Model	Frequency Range (GHz)	Tuning Range (MHz)	Power Output (mW)	Harmonic Suppression (dB)	Dimensi (Inche L W
FS-26	1.2– 1.5	300	10	—40	3 x 1 x
FS-28	1.5– 2.3	800	10	—35	2½ x 1 x
FS-31	2.0– 3.0	1000	10	—35	2 x 1 x
FS-31S	2.4– 3.2	800	10	—35	2 x 1 x
FS-31A	3.0– 4.0	1000	10	—35	2 x 1 x
FS-27H	3.2– 6.0	500	20	—30	3 x 1 x
FS-37A	4.0– 4.5	500	10	—50	2½ x 1 x
	4.5– 4.9	400	10	—50	2½ x 1 x
	4.9– 5.4	500	10	—50	2½ x 1 x
	5.4– 5.9	500	10	—50	2½ x 1 x
FS-37B	5.9– 6.5	600	10	—50	2½ x 1 x
	6.4– 6.9	500	10	—50	2½ x 1 x
FS-37C	6.8– 7.3	500	10	—40	2½ x 1 x
	7.0– 7.5	500	10	—40	2½ x 1 x
FS-37D	7.5– 8.0	500	5	—40	2½ x 1 x
	8.0– 8.6	600	5	—40	2½ x 1 x
	8.6– 9.2	600	5	—40	2½ x 1 x
FS-37E	9.2– 9.8	600	5	—40	2½ x 1 x
	9.8–10.4	600	5	—40	2½ x 1 x

MECHANICALLY TUNED — High Power

- Operating temperatures —55°C to +71°C
- Frequency stability ±0.5%
- AFC available on most models
- Rugged, compact package

FS-14R

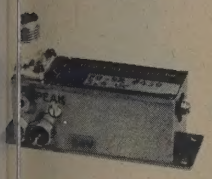
S & C Band

Model	Frequency Range (GHz)	Tuning Range (%)	Power Output (mW)	DC Input (Volts)	Harmonic Suppression (dB)	Dimension (Inches) L W
FS-7	0.1– 1.7	15	200–50*	24–28	—25	2½ x ⅞ x
FS-7R	0.1– 1.8	1	250–100*	24–28	—25	2½ x ⅞ x
FS-148	0.2– 0.5	20	2000	40	—25	2½ x 1⅛ x
FS-2R	0.6– 1.4	1	1000	40	—25	2½ x 1⅛ x
FS-165	1.6– 1.8	1	250	12	—25	1½ x ¾ x
FS-14R	2.4– 3.5	1	500	40	—40	3 15/16 x 1⅝ x
FS-14L	3.5– 6.0	1	400–150*	40	—40	3½ x 1⅛ x
FS-24R	7.0–10.5	1	100	40	—40	4⅝ x 1⅛ x
FS-35R	12.4–18.0	1	40	40	—35	5½ x 1⅞ x

*High end of band.

E HANICALLY TUNED — Low Power

- mple power for L.O. applications
- 0.1% stability over 0°C to +60°C
- xcellent pulse capabilities
- w DC power drain
- pecial designs —55°C to +95°C



FS-9R

C Band

RSTAL CONTROLLED

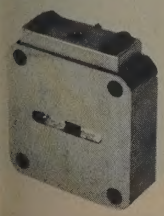
- ltrastable frequency control
- igh harmonic suppression
- mpact, rugged design
- vailable 0.06 GHz to 18.0 GHz

FS-34

C & X Band

VLANCHE DIODE SOURCES

- undamental frequencies to 18 GHz
- -40°C to +70°C temperature range
- igh efficiency
- p to 100 mW available



FS-202

X Band

RSTAL STABILIZED — Phase Lock

- igh output power
- 0.003% stability 0°C to +60°C
- w DC power consumption
- w harmonic responses
- vailable from 0.6-18.0 GHz

FS-24PL

TIPLIERS

- put frequencies from 50 MHz
- utput frequencies to Ku-band
- oth passive and active available
- ustom designed
- ugged, compact packages

Model	Frequency Range (GHz)	Tuning Range	Power Output (mW)	DC Input (Volts)	Harmonic Suppression (dB)	Dimensions (Inches) L W H
FS-8	0.5– 1.8	1%	100	20–28	—25	2½ x ⅞ x 1
FS-5	0.5– 1.8	15%	25	20–28	—25	2½ x ⅞ x 1
FS-19	0.8– 1.2	20%	10	20–28	—25	1⅜ x ¾ x 13/16
FS-19A	1.2– 1.8	20%	10	20–28	—25	1⅜ x ¾ x 13/16
FS-4R	2.0– 4.0	1%	15–7*	20–28	—25	3½ x ⅞ x 1
FS-3R	2.0– 4.0	1%	60–30*	20–28	—25	3½ x ⅞ x 1
FS-1R	4.0– 6.5	50 MHz	7–4*	20–28	—25	2½ x ⅞ x 1
FS-9R	2.0– 6.0	50 MHz	20	20–28	—25	2½ x ⅞ x 1
FS-17R	7.0–10.0	50 MHz	10	20–28	—35	3 7/16 x ⅞ x 1

*High end of band.

Model	Frequency Range (GHz)	Power(3) Output (mW)	Frequency Stability (0-60°C)	Harmonic Suppression (dB)	DC Input (Volts)	Dimensions (Inches) L W H
FS-21A	0.06– 0.25	20–10	±0.003%	—35	15(4)	3½ x 1⅜ x 1⅛
FS-21B	0.25– 0.45	10–5	±0.003%	—35	15(4)	3½ x 1⅜ x 1⅛
FS-38	0.06– 0.45	20–5	±1.0PPM	—35	15(2)(4)	5 1/16 x 2 21/32 x 2 25/32
FS-21CLP	0.45– 1.50	20–5	±0.003%	—60	15(4)	5 x 2½ x 1 19/64
FS-21CMP	0.45– 2.00	175–10	±0.003%	—60	28(4)	5 x 2½ x 1 19/64
FS-21CHP	0.45– 2.00	1000–50	±0.003%	—60	28(4)	5 x 2½ x 1 19/64
FS-39	0.45– 2.00	70–1	±1.0PPM	—60	28(2)(4)	6 59/64 x 3 55/64 x 2½
FS-30A	2.00– 2.50	15–10	±0.003%	—60	+15	4 39/64 x 1⅞ x 1 9/16
FS-30	2.50– 5.00	10–5	±0.003%	—60	+15	4 39/64 x 1½ x 1 9/16
FS-30HP	2.50– 5.00	60–25	±0.003%	—60	+28	4 39/64 x 1½ x 1 9/16
FS-34	5.00–10.00	5–2	±0.003%	—30(1)	+28	4 39/64 x 1½ x 1 9/16
FS-34HP	5.00–10.00	15–5	±0.003%	—30(1)	+28	4 39/64 x 1½ x 1 9/16
FS-29A	2.50– 5.00	25–8	±1.0PPM	—60	+28(2)	6 3/16 x 2 31/32 x 2¾
FS-29B	5.00–10.00	5–2	±1.0PPM	—30(1)	+28(2)	6 3/16 x 2 31/32 x 2¾
FS-49	12.40–18.00	5–0.5	±0.003%	—40	+28	5⅛ x 2 5/16 x 2

Notes:
(1) ½ f_o and 2 f_o suppressed greater than 30 dB. All other spurious signals greater than 60 dB.
(2) Additional +28 volt supply required for oven.
(3) Minimum power output. Lower figure applies to highest frequency.
(4) Isolated supply terminals.

Model	Frequency Range (GHz)	Tuning Range (MHz)	Power Output (mW)	Harmonic Suppression (dB)	Output Connector W/G	Output Connector Coax	Dimensions (Inches) L W H
FS-40	5.0–12.4	100	10	—40		X	2 x ¾ x 15/16
FS-40W	8.2–12.4	100	10	—40	X		1 9/16 x 1⅝ x 1¾
FS-202	8.2–12.4	Fixed	100	—40	X		⅝ x 1⅝ x 1⅞
FS-40K	12.4–18.0	Fixed	10	—40	X		⅝ x 1 5/16 x 1 9/16
FS-42	5.0–12.4	10%	10	—35		X	2 x ¾ x 1⅜
FS-43	8.2–12.4	150 Elec.	10	—35		X	2¾ x ¾ x 15/16

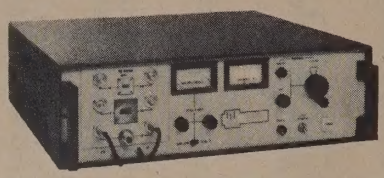
Notes:
Most models available optimized for pulse operation.
Models FS-40, 40W, 42 and 43 have built-in current control as standard.

Model	Frequency Range (GHz)	Power Output (mW)	DC(1) Input (Volts)	Harmonic Suppression (dB) Min.	Dimensions (Inches) L W H
FS-2-PL	0.6– 1.4	1000	50	—25	5⅜ x 4⅛ x 1 9/16
FS-14R-PL	2.4– 3.5	500	50	—40	5⅜ x 4⅛ x 1 9/16
FS-14L-PL	3.5– 6.0	200	50	—40	5⅜ x 4⅛ x 1 9/16
FS-24-PL	7.0–10.5	100	50	—40	5⅜ x 4⅛ x 1 9/16
FS-35-PL	12.4–18.0	40	50	—40	6 x 5⅜ x 1 5/16

Notes:
(1) 400 mA max. Terminals isolated from case.

Model	Output Frequency (GHz)	Output Power (mW)	Passive Or Active	Input Power (mW)	Multiplication	Dimensions (Inches) L W H
FS-156	1.2	300	P	2500	8	4⅜ x 2 5/16 x 1⅜
FS-195	1.25	100	P	1000	4	2½ x 2½ x 1⅛
FS-155	1.3	0.5	P	200	45	4⅜ x 2 5/16 x 1⅜
FS-178	1.2–1.4	200	A	20	2	5 x 2¾ x 1½
FS-174	3.9–4.1	30	P	1000	10	4 x 3 x 1½
FS-143	4.6–5.2	5	P	30	3	3½ x 1⅛ x 1 5/16
FS-209	5.0	10	P	100	6	3½ x 1⅛ x 1 5/16
FS-206	7.3–8.2	3	P	150	5	3 7/16 x ⅞ x 1
FS-201	10.5	2	P	30	6	3 7/16 x ⅞ x 1

130A series SYNCHRONIZERS



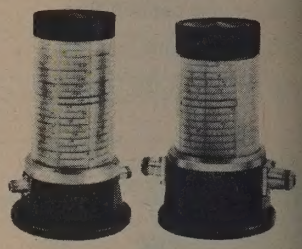
FEL 1-40GHz CONTINUOUSLY TUNABLE SYNCHRONIZER

to phase-lock klystrons, backward-wave oscillators, solid state and triode oscillators to a crystal reference

- ultra frequency stability . . . 1 part in 10^8/second, or 1 part in 10^7/day
- continuously tunable from 1GHz to 40GHz . . . also available in shorter ranges with add-on range capabilities
- single control operation
- solid-state and completely self-contained; cabinet or rack mount
- low power consumption
- deliverable from current production

For use with an oscillator source in the research lab, on the production line, or rack mounted for tactical environments . . . to provide an extremely stable signal for microwave frequency standards, doppler systems, MTI techniques, radio astronomy receivers and parametric amplifier pumps.

WDA series DIRECT-READING WAVEMETERS



FEL WDA 940, WDA 3712 DIRECT-READING PRECISION FREQUENCY METERS

just 2 absorption type meters—instead of the usual 4 to 5—cover the full frequency range from 960MHz to 12400MHz

- WDA 940, 960-4200MHz
- WDA 3712, 3700-12400MHz
- direct readout in MHz
- special alloys and precision-ground invar threads assure smooth operation, minimum wear
- reduced cost
- superior temperature stability

For measuring cw, am, fm or pm microwave signals. Ideal for frequency measurement of microwave transmitters, microwave receivers, local oscillators and signal generators.

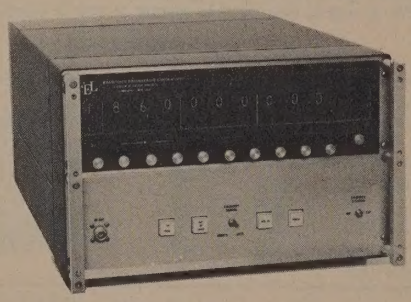
ANTENNA CAPABILITIES

In addition to its design, development and manufacturing capabilities, the experience and technical know-how of the FEL Antenna Group is available as a consulting service for your specific antenna design problems. The services provided include:

- Optimum selections of Antennas for System Applications.
- Computation of Antenna Radiation patterns where standard solutions are not available.
- Determination of the effects of obstacles on known free space antenna patterns.
- Experimental and theoretical evaluation of antenna performance.

HARVARD FREQUENCY ENGINEERING LABORATORIES

PRECISION MICROWAVE INSTRUMENTS AND COMPONENTS



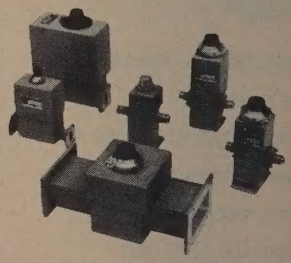
FEL 700B 1.2-2.4GHz COHERENT MICROWAVE SYNTHESIZER

generates ultra-stable, spectrally-pure RF energy

- ultra frequency stability . . . 2 parts in 10^9/day
- simplified tuning
- frequency selection in increments of 1Hz with digitally calibrated front dials or electronic programming
- solid-state, self-contained, compact
- rear-panel jacks supply reference outputs at 100kHz, 1, 5 and 100MHz
- optional remote programming with 10 line bcd code
- 10mw output across entire range

Applications include laboratory use as a microwave frequency standard, telemetry, local oscillators for coherent radar and MTI systems, automatic and manual testing of frequency sensitive devices.

CUSTOM ENGINEERED PRODUCTS



Extensive engineering and manufacturing capabilities make Frequency Engineering Laboratories an ideal supplier of custom engineered microwave components, instruments, sub-systems or complete fixed station or tactical systems. Your inquiries are invited, for:

- airborne interdigital filters
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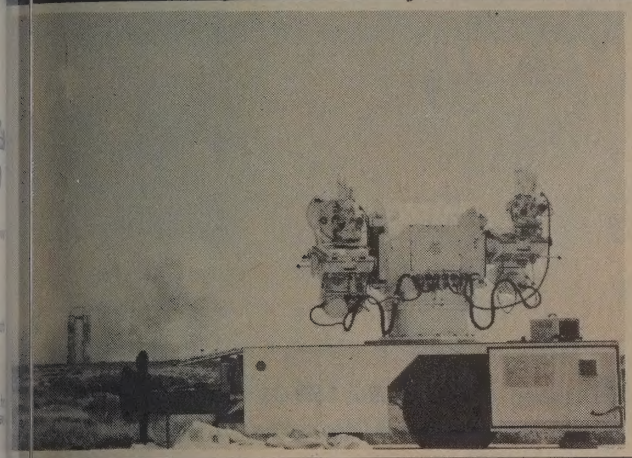
EO SPACE SYSTEMS, INC.

NGE INSTRUMENTATION EQUIPMENT — PRECISION PEDESTALS

COMPLETE TRACKING SYSTEMS



MOBILE OPTICAL TRACKING SYSTEM

The Mobile Optical Tracking System is a precision, high load capacity, servo controlled position pedestal, mobilized for usage in rugged terrain. It can be controlled locally from the pedestal, or from its mobile control van—or a permanent site—located up to 12 miles from the pedestal.

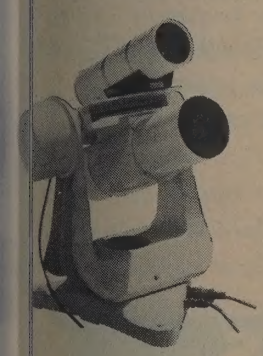
The pedestal is controlled by infrared or TV edge track auto-track systems, or by manual joystick control. The control system features auto-override to allow momentary selection of manual mode, and a coast function allowing the pedestal to continue at the established rate for a minimum of 10 seconds should the target be lost.

Versatility is the key to the control system design. Operational switches allow the operator to select a variety of tracking modes, change system bandwidth, or introduce special functions for ease of tracking and improved accuracy.

The system requires only two hours site installation and collimation time. Two men are necessary for calibration and set-up, but normal system operation is a one-man job. Position accuracy is 2 arc seconds (static) and 0.003 mr/mr/sec (dynamic). Its angular displacement is 345° azimuth, —10° to 90° elevation. Stable tracking rates in the speed range of 5 arc sec/sec to 70 deg/sec may be obtained. Camera platforms are capable of accepting cameras weighing 500 pounds with a maximum load capacity of 1480 pounds symmetrical and balanced. Balancing of the load requires no counterweights, utilizing crank controlled weight displacement for balancing.

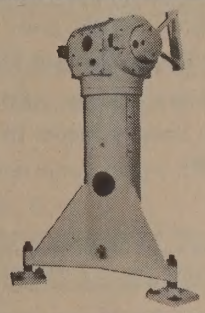
The flexible capabilities of MOTS allows many system variations, making it easily adaptable to the user's specific requirements.

PEDESTALS AND TRACKING EQUIPMENT



RVO CONTROLLED INSTRUMENT POSITIONER

s positioner is a rugged, lightweit unit capable of remote control, autrack, and pre-programming. Handli a symmetrical load of up to 75 lbs it utilizes dc servo control in a clod loop system.



PRECISION SERVO CONTROLLED PEDESTAL

This instrument positioning system features continuous azimuth travel with ±100° elevation, is capable of mounting symmetrical loads up to 200 pounds, and has a positioning accuracy (static) of ±.1°. Along with the solid state servo controller, the complete system can be pre-programmed, operated in a pre-position select or autotrack mode.

AZIMUTH/ELEVATION POSITIONER

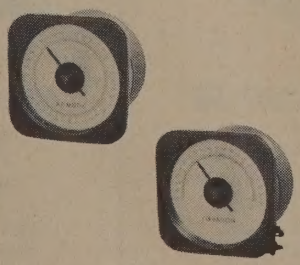
The GSS Model 8175 Azimuth/Elevation Positioner is a lightweight, precision positioning unit capable of remote, manual or autotrack control. The versatile mounting arrangement permits balanced loads of up to 75 pounds with a rated velocity of 30 degrees/second and an acceleration of 30 degrees/second and an acceleration of 30°/sec². Elevation travel is —10 degrees to 190 degrees. Azimuth travel is limited by cable wrap up, or approximately ±180 degrees. Drive power is supplied by a dual-channel, complimentary transistor servo-amplifier.

XY PEDESTAL POSITIONER

The XY Pedestal positioning system is a high rigidity antenna positioner capable of maximum sky coverage including target fly-over. A unique X-shaft cam reduces "key hole" around support pillows to a minimum. Instrument loads of up to 1200 pounds can be positioned to .1° static accuracy. The tracking unit rate is 10° per second with a dynamic error of .3° maximum. The maximum acceleration is 35° per sec².

SUN SENSOR AND CONTROL

e SS-101 furnishes switch contact clores when an intense light source pa s through the field of view. The un is fully compatible with any electri ly driven sun shutter equipment an its light sensitivity threshold is ad table.



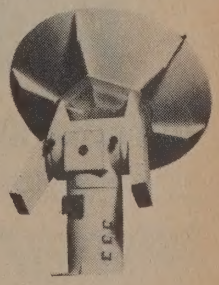
SERVO/SYNCHRO DRIVEN REMOTE AZIMUTH AND ELEVATION INDICATORS

These indicators display remote angular or linear position, or any other calibrated quantity that can be represented by shaft rotation or linear displacement.

A wide variety of dial calibrations, colors, mounting arrangements and synchro ratios can be provided.

AUTO-TRACK INTEGRATION EQUIPMENTS

These solid state units will couple an angle-error sensing device to an elevation-over-azimuth positioning pedestal to achieve a completely automatic tracking system. They also allow addition of a remote manual control (joystick) to the system, provide a provision for automatic switchover to null detector tracking, and allow retention of existing means of pedestal control.



AUTOMATIC TELEMETRY TRACKING SYSTEMS

These systems have been designed using the GSS precision servo controlled pedestal. A variety of antennae from conical scanning telemetry types to helix and cross dipole arrays can be mounted on and positioned by the servo driven pedestal. Antenna polarization can be selectable from remote control. Automatic tracking rates to 30 deg/sec are obtainable.

esign excellence and trouble-free performance are recognized attributes of th Geo Space Systems' servo positioned pedestal equipment that has been deloped and manufactured for a number of critical national test range apptions.

staff of professional design engineers and consultants and an experienced fi engineering team are maintained to offer a full range of expert services to prpective users.

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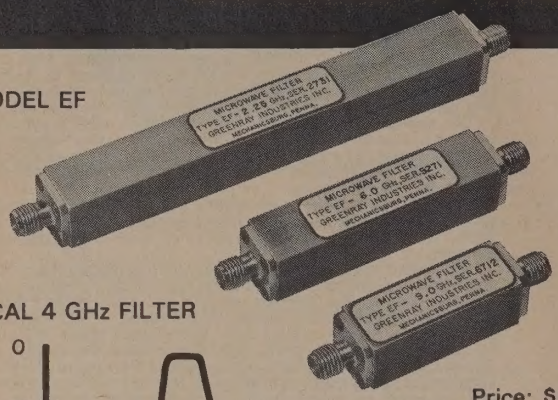
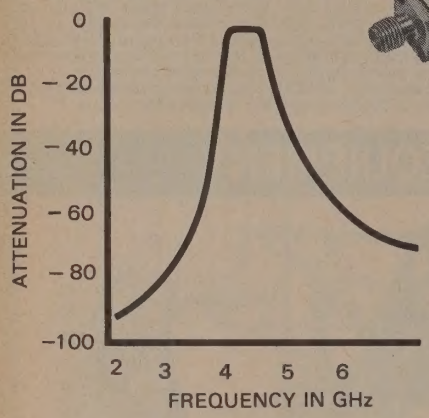
MICROSTRIP 5 POLE
BAND PASS FILTERS

MODEL EF



Standard Center Frequencies	Size: (approximately, less connectors)
2.0 GHz	1/2" x 1/2" x 3 7/8"
3.0 GHz	1/2" x 1/2" x 2 7/8"
4.0 GHz	1/2" x 1/2" x 2 1/16"
5.0 GHz	1/2" x 1/2" x 1 7/8"
6.0 GHz	1/2" x 1/2" x 1 5/8"
7.0 GHz	1/2" x 1/2" x 9/16"
8.0 GHz	1/2" x 1/2" x 1 7/16"
9.0 GHz	1/2" x 1/2" x 1 3/8"

TYPICAL 4 GHz FILTER



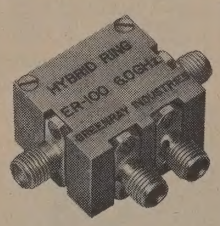
Price: $148.00 each / 100 pieces, $88.00 each
Special center frequencies (2 to 9 GHz range), not listed, $195.00 each

- Typical bandwidth (3 dB points) 10%
- Insertion loss (pass band) 2 to 4 dB, (3 dB nominal)
- Typical attenuation: 40 dB down at center frequency ± 17 %.
- Mounting: Filter may be clamped in place or mounted using two 4-40 threaded inserts supplied on the under side.

When Ordering: Specify Model EF filter and center frequency desired.

NOTE: Attenuation out of the pass band will generally be below 60 dB except for the 2nd harmonic frequency of the pass band. The design characteristics of a microstrip filter using 1/2 λ resonators, in such that the resonators will respond to 2 times the output frequency. This allows 2nd harmonic frequency responses to pass with as high as -12 dBm below the input. We, therefor, recommend this filter in applications where heavy 2nd harmonic attenuation is not required.

MICROWAVE ACCESSORIES



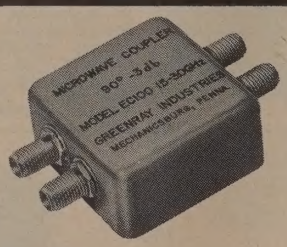
MICROSTRIP HYBRID RING

MODEL ER-100

Specify frequency desired between 1 GHz and 9.6 GHz

- 3 dB power split
- ± 90° relative phase
- 10% bandwidth
- 50 ohms
- OSM style connectors

Price: $145.00



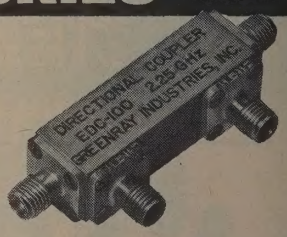
MICROSTRIP COUPLER

MODEL EC-100

- 3 dB, 90° Octave band
- Coupling is 3 ± .5 dB
- Isolation 20dB typical
- VSWR, less than 1.4

Specify frequencies
F1 1.5 GHz to 3.0 GHz
F2 .75 GHz to 1.5 GHz
F3 1.0 GHz to 2.0 GHz

Price: $125.00 each



Stripline coaxial
DIRECTIONAL COUPLERS

MODEL EDC-100

Specify frequency range
F1 .5 to 1.0 GHz
F2 1.0 to 2.0 GHz
F3 2.0 to 4.0 GHz
F4 4.0 to 8.0 GHz

- 10 dB coupling value
- 20 dB minimum directivity
- VSWR less than 1.30
- ±.7 dB coupling flatness
- OSM style connectors

Price: $155.00 each

Greenray Industries, Inc.

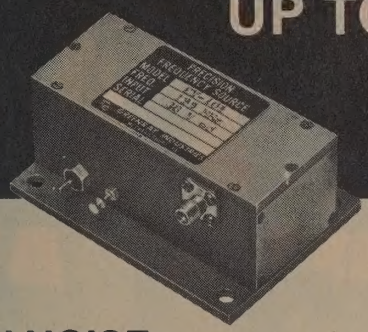
840 West Church Road, Mechanicsburg, Pa. Phone — (Area Code 717) 766-0223

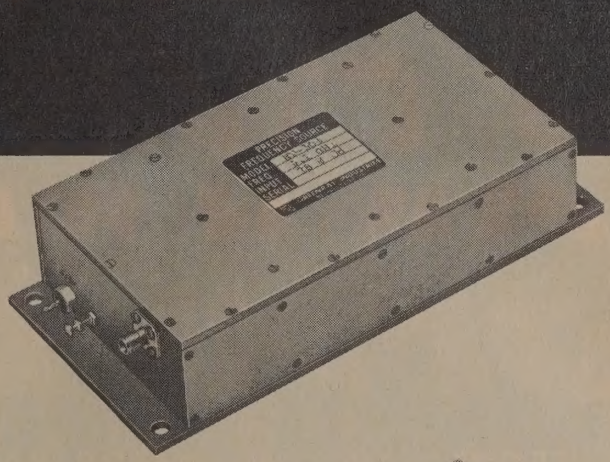
MICROWAVE FREQUENCY SOURCES

CRYSTAL CONTROLLED (±.00075%)

UP TO 10 GHz

5 milliwatts
or
00 milliwatts

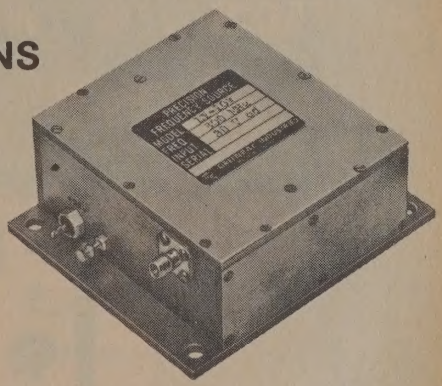




VERY LOW NOISE:

- Achieved by using straight multiplication.
- Only one step recovery diode is used (on units with output frequency above 1 GHz.)
- Noise producing phase locking is not used.

MICROWAVE OSCILLATOR SPECIFICATIONS



- Fixed frequency output: Manufactured to your exact requirements.
- Stability: ± .00075% over temperature range.
- Temperature range: 0 to 50°C.
- Power Output: 100 mW minimum, or, 5 mW as specified.
- Spurious levels (non-harmonically related): 60 dB down.
- Harmonics and sub-harmonics: 26 dB down minimum.
- Input: 28V dc regulated, ± 1 V.
- FM jitter: Less than ± 2 x 10^{-9}/10 milliseconds.
- Output connectors: OSM style.
- All units have mechanical frequency adjustment for aging.

MODEL	FREQUENCY RANGE	OUTPUT	SIZE (L. W. H.)	PRICE
EY-101	1 MHz to 125 MHz	100 mW	1 1/2" x 3 3/8" x 1 1/2"	$ 675.00
EY-102	125. 01 MHz to 500 MHz	100 mW	3" x 3 3/8" x 1 1/2"	990.00
EY-103	500. 01 MHz to 1 GHz	100 mW	4 1/2" x 3 3/8" x 1 1/2"	1200.00
EY-104	1.0 + GHz to 2.5 GHz	100 mW	4 1/2" x 3 3/8" x 1 1/2"	1800.00
EY-105	2.5 + GHz to 4 GHz	100 mW	4 1/2" x 3 3/8" x 1 1/2"	2200.00
EY-106	4.0 + GHz to 5 GHz	100 mW	4 1/2" x 3 3/8" x 1 1/2"	2745.00
EY-107	5.0 + GHz to 7.2 GHz	100 mW	6 3/4" x 3 3/8" x 1 1/2"	3200.00
EY-108	7.2 + GHz to 8.6 GHz	100 mW	6 3/4" x 3 3/8" x 1 1/2"	3850.00
EY-109	8.6 + GHz to 10.0 GHz	100 mW	6 3/4" x 3 3/8" x 1 1/2"	4100.00
EY-115	1 MHz to 125 MHz	5 mW	1 1/2" x 3 3/8" x 1 1/2"	345.00
EY-116	125.01 MHz to 500 MHz	5 mW	1 1/2" x 3 3/8" x 1 1/2"	445.00
EY-117	500.01 MHz to 1 GHz	5 mW	3" x 3 3/8" x 1 1/2"	645.00
EY-118	1.0 + GHz to 2.5 GHz	5 mW	3" x 3 3/8" x 1 1/2"	745.00
EY-119	2.5 + GHz to 4 GHz	5 mW	3" x 3 3/8" x 1 1/2"	890.00
EY-120	4.0 + GHz to 5 GHz	5 mW	3" x 3 3/8" x 1 1/2"	945.00
EY-121	5.0 + GHz to 7.2 GHz	5 mW	5 1/4" x 3 3/8" x 1 1/2"	1090.00
EY-122	7.2 + GHz to 8.6 GHz	5 mW	5 1/4" x 3 3/8" x 1 1/2"	1245.00
EY-123	8.6 + GHz to 10.0 GHz	5 mW	5 1/4" x 3 3/8" x 1 1/2"	1390.00

OPTIONS AVAILABLE:

1. Voltage controlled
   ±. 1% frequency deviation, 5% linearity, $300.00 additional.
2. Temperature compensated
   ±. 0001% frequency stability (no oven), $300.00 additional
3. Frequency standard
   ± 2 x 10^{-8} frequency stability (with oven), $550.00 additional.
4. Multiple channel
   2 to 20 channels over 10% bandwidth. CALL US !!!

WE DESIGN TO ANY SPECS WITHIN THE "STATE-OF-THE -ART". CALL US.

SEND FOR OUR COMPLETE MICROWAVE CATALOG.

Greenray Industries, Inc.

840 West Church Road, Mechanicsburg, Pa. Phone — (Area Code 717) 766-0223

TWT AMPLIFIERS

3 FOR THE SPACE OF 1

KELTEC'S NEW TWT AMPS SAVE SPACE AND WEIGHT

- Designed for portable, rack or bench-mount operation
- Plug-in solid state, modular construction
- Frequency coverage 1.0 to 18.0 GH_Z in standard frequency bands
- Power output of 1, 2, 10 or 20 watt CW
- 100 and 200 watt units available in 19" rack
- As an option, the Keltec R-600 series can be provided with logic circuitry to facilitate remote operation

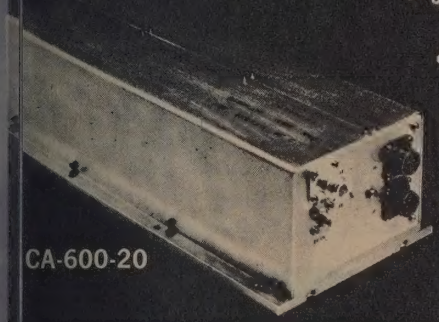
KELTEC FLORIDA

A DIVISION OF AIKEN INDUSTRIES, INC.
P. O. DRAWER 1348, FORT WALTON BEACH, FLORIDA 32548
(904) 651-1210 • TWX 510-730-7775

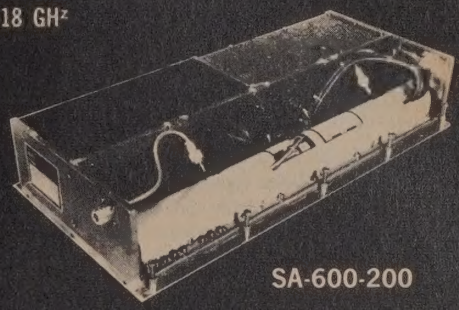
TWT AIRBORNE AMPLIFIERS

FEATURES:

- Complete Frequency Coverage from 1-18 GHz
- All Solid State design
- Power levels available from 1-200 watts
- Protect circuitry includes helix overcurrent, high voltage time delay and thermal overload
- Elapsed time meter



CA-600-20



SA-600-200

MODEL 600 SERIES TWT AMPLIFIERS (HIGH DENSITY PACKAGES)

Frequency Range	1 Watt	10 Watts	20 Watts	100 Watts	*200 Watts
L-Band 1-2GHz	LA 600-1	LA 600-10	LA 600-20	LA 600-100	LA 600-200
S-Band 2-4GHz	SA 600-1	SA 600-10	SA 600-20	SA 600-100	SA 600-200
C-Band 4-8GHz	CA 600-1	CA 600-10	CA 600-20	CA 600-100	CA 600-200
CX Band 5.11GHz	CXA 600-1	CXA 600-10	CXA 600-20	CXA 600-100	CXA 600-200
X-Band 8-12.4GHz	XA 600-1	XA 600-10	XA 600-20	XA 600-100	XA 600-200
K Band 12-18GHz		UA 600-10		UA 600-50 *Restricted Band	

SPECIFICATIONS

RF Power Output	1 Watt	10 Watts	20 Watts	100 Watts	200 Watts
Saturated Gain Input	†35 db minimum	†35 db minimum	†35 db minimum	†30 db minimum	†30 db minimum
Input	28 VDC ±10% 400 cps Available on request	28 VDC ±10% 400 cps Available on request	28 VDC ±10% 400 cps Available on request	28 VDC ±10% 400 cps 3 phase Available on request	400 cps 3 phase
Size	12" x 5" x 4" Typical	14" x 5" x 4" Typical	14" x 5" x 4" Typical	8" x 5" x 14" Typical	10" x 7" x 21" Typical
Environment	Mil-E-5400	Mil-E-5400	Mil-E-5400	Mil-E-5400	MIL-E-5400
Cooling	Conduction, Max. Heatsink Temp 85°C	Conduction, Max. Heatsink Temp 85°C	Conduction, Max. Heatsink Temp 85°C	Conduction, Max. Heatsink Temp 85°C	Conduction, Max. Heatsink Temp 85°C

NOTE: Specifications subject to change without notice. †Higher gain tubes available on request.

ELTEC FLORIDA

A DIVISION OF AIKEN INDUSTRIES, INC.
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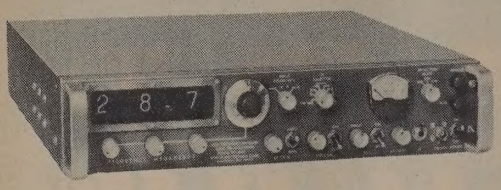
LORCH COMMUNICATION EQUIPMENT AND ACCESSORIES • RF COMPONENTS

WIDE DYNAMIC RANGE RECEIVER
Model HR-240 - 2 to 32 MHz



A sensitive, wide dynamic range receiver with locally or remotely contro all-electronic tuning. All front panel knobs and switches, including frequ tuning may be controlled locally or by remote program.

Frequency Range .....2 to 32
Tuning Time .....5.0 millisec
Dynamic Range .....over 10
Spurious Response Rejection (including Image and IF) .....over 10
Sensitivity (3 KHz Bandwidth) .....−133
Gain Variation vs. Frequency (2 to 32 MHz) .....±1
Reception Modes .....AM, USB, LSB, and
Size .....17″ W x 21″ D x 5¼

DOUBLE BALANCED FET MIXER
Model FC-351

A double balanced FET mixer with extremely low intermodulation distortion, high power handling capability and excellent isolation between all ports.

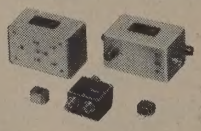
Frequency Range, all ports .....0.2 to 100 MHz
Conversion Loss and Noise Figure .....9 db max.
Two Tone Intermodulation Ratio (3rd and 5th Order)
Two RF tones, each 0 dbm .....80 db
Compression Level (2 db compression) .....+30 dbm
Dynamic Range .....155 db
Isolation .....To 50 db
DC Power Required .....None

WIDE BAND DOUBLE BALANCED MIXERS

Low intermodulation and spurious products

Frequency Range .....From 10 KHz to 12.4 GHz
Conversion Loss .....As low as 5 db
Isolation .....To 85 db
Two Tone Intermodulation Ratio, Third Order
Two tones, −30 dbm .....To 130 db
Dynamic Range .....To 145 db
Temperature Range .....−65°C to +125°C
Hermetically Sealed
Standard Pin Packages, TO-5 Can, Connector Versions, Custom Packaging, High power versions of mixers and product detectors available on special order.

WIDE BAND ELECTRONIC SWITCHES



RF Frequency Range .....1 to 200 MHz
Switching Frequency Range .....DC to 50 MHz
RF Input Level for 2 db Compression .....To +23 dbm
Insertion Loss, ON Condition .....To 1 db
Insertion Loss, OFF Condition .....To 70 db
Temperature Range .....−65°C to +125°C
Hermetically Sealed
Standard Pin Packages, Connector Versions, Custom Packaging

WIDE BAND HYBRID JUNCTIONS and POWER SPLITTERS
2, 3, 4, 5, 6, 8 and MULTIWAY

Frequency Ranges .....From 10 KHz to 400
VSWR 1.2
Isolation .....To 3
Phase Balance .....
Amplitude Balance 0.1
Temperature Range .....−65°C to +12
Input Power .....To 50 w
Hermetically Sealed
TO-5 Can, Standard Pin Packages, Connector Versions, Custom Packa

MICROWAVE FILTERS

Low Pass Filters.....From 100 KHz to 12.0 GHz (Low power and power).
Band Pass Filters.....From 10% to octave bandwidth. Frequencies 100 KHz to 8.0 GHz.
Preselectors .....Tuning range 15% (nominal). 3 db bandwidth: 0.5% to 1.2%. Fixed tuned, individually tu or gang tuned. From 800 MHz to 6.0 GHz.
Diplexers .....From 0.5% to 1.2% (3 db bandwidth), fixed tu Frequencies from 100 KHz to 6.0 GHz.

WIDE BAND RF AMPLIFIERS, SERIES AM-320

Frequency Range .....0.1 to 500
Noise Figure .....To
Power Output for 3 db Compression .....To +30
Third Order Intercept .....To +45
Temperature Range .....−20 to +

Normally available as connector versions, these high perform amplifiers may be ordered as hermetically sealed pin packages.

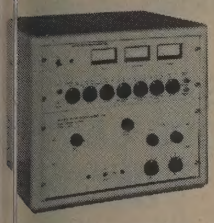
FET LINEAR ATTENUATORS, FREQUENCY MULTIPLIERS, RF TRANSFORMERS, DIRECTIONAL COUPLERS

LORCH ELECTRONICS CORP.
105 Cedar Lane, Englewood, N. J. 07631 • 201-569-8282 • TWX: 710-991-9718

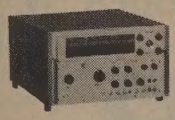
MICROWAVE from MICRO-NOW

MICROWAVE INSTRUMENTATION FOR SCIENCE AND INDUSTRY

ILLIMETER WAVE SWEEPER
.5-40; 40-60; 60-90 GHz



MODEL 702C (FULL RANGE SWEEP) WITH MODEL 724 HEAD



lectronic sweeping of the ll oscillator tube tuning nge (as wide as 30 GHz) i featured in the Model 2 Millimeter-wave sweep stem. Also available thout sweep or with narw band (up to 3 GHz) eep only. Prices (witht sweep, less oscillator ad) start at $3400.

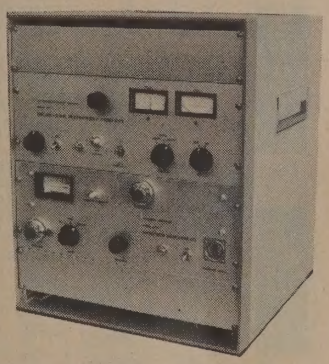
abilizing and leveling ailable.

TYPICAL PERFORMANCE

Model	Range	Power out	Price (head only)
722	26-42 GHz	60 mW	$4295
723	39-62 GHz	20 mW	5075
724	55-94 GHz	5 mW	5625

Other Sweepers: Standard and custom built instruments and systems, 1 GHz and up.

YSTEMS



stom designed microave instrumentation sysms are a specialty of icro-Now Instrument ompany. Programmed ultiple sources such as e one illustrated here e representative of icro-Now's capabilities the microwave specialty ea.

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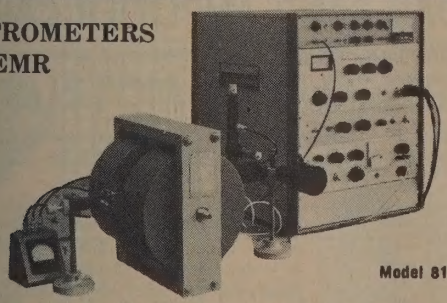
PECTROMETERS
SR, EMR



Model 810

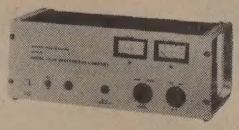
icrowave spectrometers for electron-spin resonance and ectromagnetic resonance studies. Both standard and ecial-purpose models are available.

Model 801A (L Band): $4,850
Model 810 (X Band): $1,900

icro-Now has developed and delivered a number of ecial-purpose microwave spectrometers for such applitions as dielectric constant analysis. Consult us regardg your specific requirements.

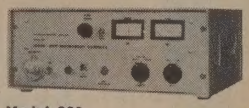
STABILIZERS

Model 202



Phase-Locked: Model 202 general purpose stabilizer for locking klystron oscillator to stable reference signal or second klystron. Also available with additional AM detector (Model 202B) or for use with BWO tubes (Model 202C).
Price: from $875

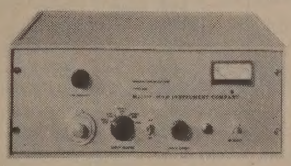
Stabilizer-Reference: Combination of phase-lock stabilizer (model 202, above) and tunable crystal-controlled source (Model 101C, below) to provide Model 203 single-unit stabilizer usable to over 25 GHz (to over 40 GHz with accessory Model 301).
Price: $1500



Model 203

Cavity-Referenced: Two stabilizers combined as Model 204 superhet system to permit phase-locking klystron oscillator to reference cavity. Uses Model 202 (above) plus Model 205 and waveguide components (not provided).
Price (Model 205 only): $650

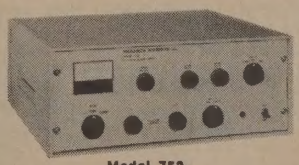
REFERENCE MULTIPLIERS



Model 101C

Precision oven stabilized 5 MHz crystal oscillator with harmonic amplifier, for use as stable microwave reference signal to to over 25 GHz. Available fixed frequency (Model 101B), manually tunable (Model 101C), or sweep motor tuned (Model 101D).
Price: from $525

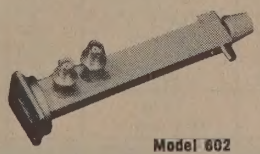
POWER SUPPLIES



Model 753

Micro-Now manufactures a variety of special power supplies specifically designed to power microwave oscillator tubes. Included are supplies for klystrons, backward-wave oscillators, and voltage-tunable magnetrons.

MIXERS



Model 602

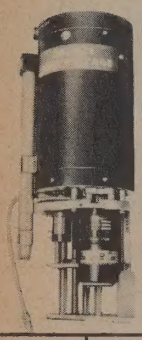
Harmonic generating mixers for use with stabilizers and other microwave systems. Frequency ranges from 1-40 GHz.
Prices: from $200

Micro-Now Instrument Co. Inc.

6104 North Pulaski Road Chicago Illinois, 60646 312-478-1151

MICROWAVE MART

CAVITIES • RF POWER AMPLIFIER SYSTEMS/SUB-SYSTEMS
TEST EQUIPMENT • SOLID STATE COMPONENTS • ACCESSORIES

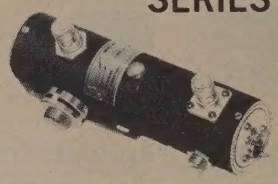


HIGH POWER, RF TETRODE PULSE, CW CAVITIES

Up to 250 KW Output (Pulse Service)

- Tunable from 40-1350 MHz
- Input VSWR, 2:1 or better.
- Gang tuning available.
- Input and output coupling matched over entire range on most units.
- No neutralizing.
- Servo tuned models available.*
- Temperature stable.
- Optimum cooling.
- MIL Spec design.

MODEL	FREQ. RANGE MHz	OPERATION	POWER OUTPUT	SERVICE
11023	40-200	Class B	1.0 KW	CW Amp.
11022	230	Class C	15 KW Peak	Pulse Amp.
11024	40-200	Class B	0.1 KW	CW Amp.
11050	150	Class C	30 KW	Pulse Osc.
11051	150	Class C	125 KW	Pulse Amp.
11014	200-400	Class B lin.	1.0 KW	CW Amp.
11006	225-400	Class B lin.	.12 KW	CW Amp.
11009*	225-400	Class C	1.2 KW Peak	Pulse Amp.
11010*	225-400	Class B lin.	.12 KW	CW Amp.
11018	280-315	Class B	1.0 KW	CW Amp.
11029	360-480	Class B	.15 KW	CW Amp.
11030	360-480	Class B	1.5 KW	CW Amp.
11056	375	Class B	0.1 KW	CW Amp.
11057	375	Class B	1.4 KW	CW Amp.
11001	400-450	Class B lin.	2.5 KW	CW Amp.
11031	400-800	Class C	15 KW	Pulse Amp.
11019	400-800	Class B lin.	1.0 KW	CW Amp.
11004	410-460	Class C	14 KW	Pulse Amp.
11005	410-460	Class C	2.5 KW	Pulse Osc.
11205	420	Class C	35 KW	Pulse Osc.
11046	800-1000	Class B	1.0 KW	CW Amp.
11011	1250-1350	Class C	10 KW Peak	Pulse Amp.



SERIES "N" STANDARD TRIODE CAVITIE

Minimum Range: 10%

Amplifiers and oscillators, desig for narrow band operation.

STANDARD OPERATING CONDITIO

	Application	Series No.	High Frequency Limit MHz	P in mw	GAIN DB 1 GHz	2 GHz	3 GHz	
CW AMPLIFIERS	Lo Noise	1000	3400	1	17	16	11	
	Med. Power	2000		100	13	11	8	
	Med. Power	2002	2240	2000	13	8		
					POWER OUT WATTS 1 GHz	2 GHz	3 GHz	4
CW OSCILLATORS	Lo-Power	6000 / 7000*	5250		0.4	0.3	1	
	Med. Power	6002 / 7001*	4500		1.4	0.8	0.7	0
	Med. Power	6003 / 7003*	2520		28	18		
				DUTY CYCLE	All Pulse Widths: 1.0 use			
PULSED OSCILLATORS	Lo-Power	8000 / 9000*	5250	.001	18	12	8	
	Hi-Power	8002 / 9002*	4500	.001	1950	1850	1800	17
	Hi-Power	8003* / 9003*	2520	.003	1700	1500		

*Re-entrant

"MINI-CAV" OSCILLATOR, AMPLIFIER, TRIPLER CAVITIES

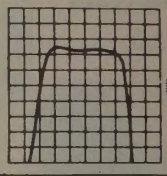
Meet rigid demands for reliability, small size and light weight in airborne and similar equipment.

MODEL	FREQ. GHz	POWER OUTPUT	SIZE DIA.	SIZE LENGTH	WEIGHT (APPROX.)
9010*	.988-1.012	3.5 KW min.	1½"	4½"	1 lb.
9012*	2.84-3.18	10 W peak min.	1"	6 3/16"	12 oz.
9013*	4.82-5.22	5.0W peak	1"	6 3/16"	14 oz.
9017*	.960-1.06	2.5 KW peak min.	1½"	5 1/16"	2 lbs.
9019*	2.84-3.00	10 W peak	1"	6 3/16"	12 oz.
9022B*	5.40	15 W	⅝"	2 3/32"	3 oz.
9023*	9.0	3.0 W min.	11/16"	2 3/16"	4 oz.
8207†	.940-.980	6KW peak	1½"	5 9/16"	20 oz.
9009A†	4.30	1.0 KW min.	1⅜"	3 9/16"	12 oz.
9018†	4.30	.25 KW peak	1"	2 9/32"	5 oz.
7009**	1.23-1.37	1.0 W min.	1½"	10½"	1½ lbs.
9015**	4.30	2.0 MW	⅝"	2⅝"	3 oz.
1004††	1.80-2.00	25 MW min.	1¼"	3"	12 oz.
1005††	1.075-1.10	1.0W	1 9/32"	2"	12 oz.
5015***	2.12-2.35 output .7083-.7833 input	150 MW min.	1½"	7"	2 lbs.

*Grid Pulsed Oscillators †Plate Pulsed Oscillators **CW Oscillators ††CW Amplifiers ***CW Tripler

BROAD BAND AMPLIFIER CAVITIE

Give maximum utilization of the gain-bandwidth product, VHF through S-Band. Bandwidths more than double those of ordinary cavities. Flat-top response for easy cascading, with minimum reduction in overall system bandwidth. Eliminate mechanical tuning in many uses. Excellent phase stability, linearity. Compact.

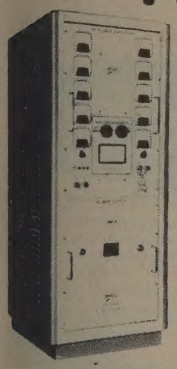


Model	Freq. MHz	Gain db	Bandwidth-db pts	Power Out
3029*	216	10	4.0 MHz @ 3.0 db	300 watts
3031*	216	10	4.0 MHz @ 3.0 db	3.0 kilowat
3021*	420	10	20 MHz @ 3.0 db	5.0 kilowat
3022*	420	23	20 MHz @ 3.0 db	200 watts
2041†	425	9.0, nom.	47 MHz @ 3.0 db	60 watts
3012*	425	8.0	50 MHz @ 1.0 db	2.5 kilowat
3014*	425	26	50 MHz @ 1.0 db	400 watts
11026*	425	6.0	50 MHz @ 1.0 db	10 kilowat
11033*	430.5	7.0	33 MHz @ 1.0 db	8.0 kilowat
3045*	470	19	100 MHz @ 3.0 db	20 watts
3017*	476	12	8.0 MHz @ 3.0 db	15 watts
3023*	476	12	8.0 MHz @ 3.0 db	250 watts
3044B*	512	20	75 MHz @ 1.0 d	2.5 kilowa
3042*	1025-1150	7.0	120 MHz @ 3.0 db	1.5 kilowa
3046*	1545	23	20 MHz @ 3.0 db	100 watts
3047*	1545	13	20 MHz @ 3.0 db	2.0 kilowa
3015†	1800	10	30 MHz @ 1.0 db	22 watts
3028†	2000	10	30 MHz @ 3.0 db	20 watts
1009†	2101.8	16	12 MHz @ 3.0 db	400 milliw
3020†	2101.8	11, min.	15 MHz @ 3.0 db	15 watts
3006B†	2106	7.0	10 MHz @ 3.0 db	10 watts
3040†	2250	9.0, min.	4.0 MHz @ 3.0 db	22 watts
1010†	2282.5	10	15 MHz @ 3.0 db	50 milliwa
3005*	2846-2866	9.0	26 MHz @ 3.0 db	500 watts

*Pulse Operation †CW Operation

HIGH POWER, RF ADD-ON AMPLIFIER SYSTEMS

- ***40-18,000 MHz Coverage***
- ***100 WATTS to 2.5 KW***
- ***CW or Pulse Operation***



An exclusive MCL advancement which affords quick, economical modernization of older installations. Replaces multi-unit lashups with neat, standard 19" rack-mounted, high power amplifier systems. Complete with power supply, cooling source, sequential circuitry, fusing and protective interlock.

CW TETRODE AMPLIFIER SYSTEMS

Model	Freq. Range MHz	Power Output	Gain db.	Bandwidth at 3.0 db.
1070-11043	40-200	1.0 KW	13	1.0 MHz
1070-11044	200-400	1.0 KW	13	5.0 MHz
1070-11045	400-800	1.0 KW	13	6.0 MHz
1070-11046	800-1000	1.0 KW	12	4.0 MHz
10017	400-450	2.5 KW	13	6.0 MHz
1158-10359	10-50	200 W	13	2.5 MHz
1158-10363	50-200	200 W	13	2.5 MHz
1158-10364	200-500	200 W	13	2.5 MHz
1158-10376*	400-800	200 W	12	2.5 MHz
1158-10365	500-1000	200 W	12	2.5 MHz

IN EVELOPMENT

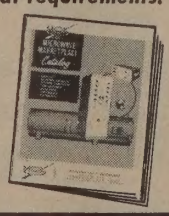
KLYSTRON AMPLIFIER SYSTEMS

High Gain, High Efficiency
Or Broad Band Tuning Modes

Model	Tube Type	Freq. MHz	Power Output	Max. Gain Tuned Gain db.	Max. Gain Tuned BW MHz	Max. B.W. Tuned Gain db.	Max. B.W. Tuned BW MHz
1002	4K3SJ	1700-2400	1.0 KW	47-45	4.0-6.0	—	—
1002	4K3SL	1700-2400	1.0 KW	41-38	9.0-12	38.3	13-14
1002	4K3SK	2400-2700	1.0 KW	43-42	10-15	—	—
1002	4K3SN	2850-3050	1.0 KW	45	7.0	—	—
1002	VA888	4400-5000	1.0 KW	51	6.0-8.0	41	13-19
1002	VA834B	4400-5000	1.0 KW	51	5.5-7.5	41	11-17
1002	VA834D	5500-5850	1.0 KW	51	5.5-7.5	41	11-17
1002	VA861	5900-6400	1.0 KW	58	7.0-8.0	48	11
1002	VA866	7100-8500	1.0 KW	59	12	50	20
1002	VA930	15000-18000	0.5 KW	50	12	40	20

MCL CUSTOM CAPABILITIES

y of the components or systems advertised on these ges can be modified for your individual requirements.

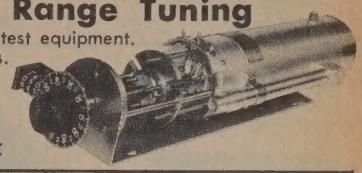


We for complete catalog covering more th 500 standard and custom engineered product varieties including solid state components and accessories such as preselectors, diplexers, low, high and bandpass filters, switches, mixers, power dividers, power samplers, detectors, attenuators and loads.

SERIES "E" RF TRIODE OSCILLATORS, AMPLIFIERS

150-4000 MHz Coverage
With Extended Range Tuning

Use as system components or test equipment. Modified to your requirements.



PULSED OSCILLATORS

Available from stock

Model Number	Frequency MHz	Min Power Output KW	Model Number	Frequency MHz	Min. Power Output KW
8038	150-300	1.5	8019	600-1200	1.0
8021	200-400	1.5	8028	1000-1500	1.0
8026	250-500	1.5	8029	1450-2000	1.0
8018	300-600	1.5	8027	2000-3000	1.0
8022	400-800	1.5	8030	3000-4000	1.0
8024	500-1000	1.5			

CW OSCILLATORS

Model Number	Frequency MHz	Power Output	Model Number	Frequency MHz	Power Output
6020	200-550	80 W	7015	550-1000	100 Mw
6021	550-1215	50 W	7016	1000-2500	100 Mw
6022	1215-2500	25 W	7017	2500-3500	100 Mw

CW AMPLIFIERS	Model Number	Frequency MHz	Power Output
	2026	200-550	80 W
	2027	550-1215	50 W
	2028	1215-2500	40 W

MODEL 10330, SERIES "E" PULSE MODULATED SIGNAL GENERATORS

Powerful, versatile test instruments built around Series "E" triode oscillators. Available as complete, rack-mounted signal source with built-in power supply and integral pulse modulator (same as Series 10299B below). Frequency range covered by interchangeable, plug-in tuning heads listed below.

Plug-In Head No.	Freq. MHz	Power Output, KW	Plug-In Head No.	Freq. MHz	Power Output, KW
8046	150-300	1.5	8052	600-1200	1.0
8047	200-400	1.5	8053	1000-1500	1.0
8048	250-500	1.5	8054	1450-2000	1.0
8049	300-600	1.5	8055	2000-3000	1.0
8050	400-800	1.5	8056	3000-4000	1.0
8051	500-1000	1.5			

SERIES 10299B HIGH POWER PULSE MODULATOR

Designed as companion modulators to Series "E" pulsed oscillators.

- **Available in three standard, adjustable output voltage ranges:** 0-1.5 KV@ 6.0amperes, peak; 0-3.0 KV @ 3.0 amperes, peak; and 0-6.0 KV @ 1.5 amperes, peak. Peak voltage readout accurate to 2.0% of full scale, from 100 pulses per second up. (Other voltages and currents at average power levels to 100 watts, available on special order.)
- **Pulse characteristics:** repetition rate: 100 Hz to 10 kHz. Width, variable, 0.5 to 10 microseconds. Rise and fall time: as low as 200 nanoseconds into resistive load.
- **Duty cycle:** .001 to .01 with 2.0% readout accuracy. Overload cut-off, adjustable over same range.

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DIVISION OF KMS INDUSTRIES, INC.
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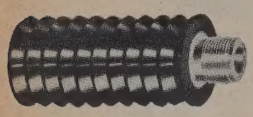
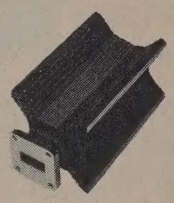
TERMINATIONS





COAXIAL — DC TO 12.4 GHz

Frequency	Power Avg.	Power Peak	VSWR (max)	Model	Price
2-12.4 GHz	500W	5KW	1.3-1.4	368	$500
.7-12.4 GHz	175W	10KW	1.1-1.2	369	$250
DC-10 GHz	5W	2KW	1.05-1.2	370	$35
2-12.5 GHz	10W	10KW	1.05	371	$70
DC-12.4 GHz	20W	2KW	1.05-1.5	374	$75
DC-12.4 GHz	10W	2KW	1.05-1.3	375	$65
DC-12.4 GHz	50W	40KW	1.05-1.3	376	$95
2-12.4 GHz	10W	10KW	1.05	372*	$125
1-5 GHz	25W		1.10-1.15	373*	$250

*Sliding Termination Prices include Type N connectors — other connectors are available.

WAVEGUIDE — 1.12 TO 40 GHz

LOW POWER						
FREQ. BAND	FREQ. RANGE GHz	Power Avg.	Power Peak	VSWR	Model	Price
C	3.95- 5.85	5W	2KW	1.015	303C	$75
XN	5.85- 8.20	2W	1KW	1.015	302C	$70
XB	7.05-10.00	2W	1KW	1.015	301C	$60
X	8.20-12.40	1W	1KW	1.015	300C	$50
KU	12.40-18.00	1W	1KW	1.015	299C	$50
K	18.00-26.50	.5W	.2KW	1.015	298C	$70
V	26.50-40.00	.5W	.2KW	1.020	V297C	$70

HIGH POWER						
FREQ. BAND	FREQ. RANGE GHz	Power Avg.	Power Peak	VSWR	Model	Price
S	2.60- 3.95	3.5KW	3.2MW	1.12	324B	$220
C	3.95- 5.85	2.0KW	1.0MW	1.1	323B	$175
XB	7.05-10.00	600W	460KW	1.1	321B	$110
X	8.20-12.40	500W	290KW	1.1	320B	$85
KU	12.40-18.00	250W	160KW	1.15	319B	$110
K	18.00-26.50	150W	80KW	1.1	318B	$125

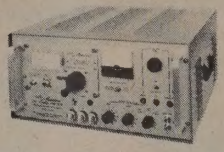
PRECISION COAX 7MM SLIDING TERMINATIONS

Model	5372
Frequency (GHz)	2.0 to 17.0
VSWR (max.)	VSWR element: 1.05, 2.0 to 3.7 GHz; 1.02, 3.7 to 17.0 GHz. Add VSWR of APC-7 pair to slide at frequency of operation: 1.003 + 0.002 (fGHz)
Power (watts, average)	10
Price	$250.

PRECISION COAX 14MM SLIDING TERMINATIONS

Model	6372
Frequency (GHz)	1.0 to 8.5
VSWR (max.)	VSWR element: 1.03, 1.0 to 2.0 GHz; 1.02, 2.0 to 8.5 GHz. Add VSWR of GR-900 pair to slide at frequency of operation: 1.001 + 0.001 (fGHz)
Power (watts, average)	20
Price	$250.

PULSED SIGNAL SOURCES and KLYSTRON POWER SUPPLIES

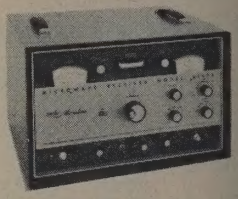


Model 18500B— High Power Pulse Signal Sources from 200 to 9500 MHz with 5 KW output with 11 interchangeable RF heads. Get continuously variable peak power, repetition rates and pulse widths. External pulse capability. $3660.–$6360.

Model 62A1A — Universal Klystron Power Su features automatic switching of meter scale the beam voltage is advanced for continuo variable beam from 200 to 4000 volts. Pre regulation of 0.01%. Maximum ripple of 3 $1995.

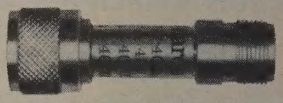
ATTENUATION CALIBRATION

VSWR Amplifier Model 441F is qualified to meet MIL-I-38702. Sensitivity — 0.1 μV for full scale deflection. Recorder output for full scale deflection — 1ma into 1500 ohms. Digital indication in 2 db steps, up to 70 db. Temperature compensated from 0° to +55°C for accuracy. $450.



Model 61A1B — Attenuation Calibrator is c ble of highly accurate measurements over frequency range of 10 MHz to 40 GHz. Featu 100 db single-step attenuation measureme built-in noise generator; power and attenua measurements to below —117 DBM; preci and resolution better than 0.05 db. $2825

ATTENUATORS



FIXED ATTENUATORS

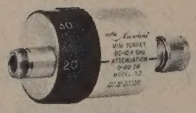
	ATTENUATORS					MEDIUM, HIGH POWER		
Model	777C	757C	773	771	774	768	766	76
Freq. Range	DC to 12.4 GHz	DC to 12.4 GHz	DC to 6 GHz	DC to 3 GHz	DC to 10 GHz	DC to 11 GHz	DC to 4 GHz	DC 5 G
Attenuation	3, 6, 10, 20, 30, 40, 50, 60 db values				3, 6, 10, 20 db values	3, 6, 10 20, 30	3, 6, 10 20, 30	3, 2
Impedance	50 ohms							
VSWR (imax)	1.15-1.30	1.20-1.30	1.20-1.25	1.20	1.30	1.10-1.35	1.10-1.35	1.20
Power Rating	2W avg., 300W peak					20W Average 1 KW peak		50W 2 KW
Temp. Stability	.0001 db/db/°C					.001 db/db/°C		
Price (for type N) 3-20 db 30-60 db	$85. $100.	$45. $60.	$30. $40.	$20. $30.	$35.	$125. $150.	$75 $95	$2

Peak power rating based on measurements made at a duty cycle .001

NEW — micro-pad™

Model	4772	4778	4779
Freq. Range (GHz)	DC-6	DC-12.4	DC-18
Attenuation (db)	3, 6, 10, 20	3,6,10,20	3,6,10,20
Impedance (Ohms)	50	50	50
VSWR. (max.)	DC-4 GHz: 1.25; 4 - 6 GHz: 1.40	DC-4 GHz: 1.15; 4-12.4 GHz: 1.30	DC-4 GHz: 1.15; 4-12.4 GHz: 1.3; 12.4-18 GHz: 1
Power: Average (W) / Peak (KW)	2 / 0.3	2 / 0.2	2 / 0.2
Price	$35	$60	$75

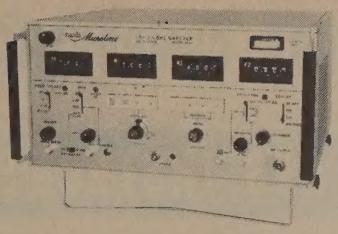
STEP ATTENUATORS



- Positive detent — absolute repeatability — better than 0.05 db.
- Zero position insertion loss — less than 0.5
- Precision spring RF contact assembly — low

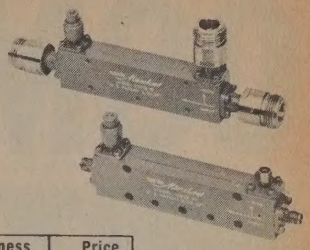
Model	710, 710P	711, 711P	712	713
Frequency	DC to 12.4 GHz	DC to 12.4 GHz	DC to 12.4 GHz	DC to 12.4
Attenuation	0 to 60 db in 10-db steps	0 to 10 db in 1-db steps	0 to 69 db in 1-db steps	0 to 60 db in 10-db ste
VSWR (max.)	1.35	1.35	1.6	1.35
Price	$450.	$625.	$1250	$450.

BROADBAND GENERATION



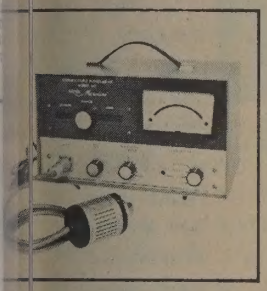
New **Solid State Sweeper** will sweep any segment of 1.0 to 12.4 GHz by pushing a couple of buttons. No plug-ins, no BWO's, no ticking. Direct dialing of frequency eliminates operator error and interpolation.
Model 9500 (1.0 - 12.4 GHz) $9,800.
Model 9510 (2.0 - 12.4 GHz) $8,600.

NEW BROADBAND DIRECTIONAL COUPLERS



Model	Frequency (GHz)	Flatness (db)	Price
3202B	1.0 to 12.4	±0.4	$500.
4202B	1.0 to 12.4	±0.4	$475.

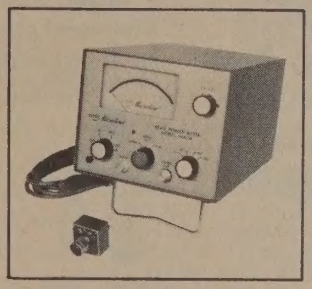
POWER METERS



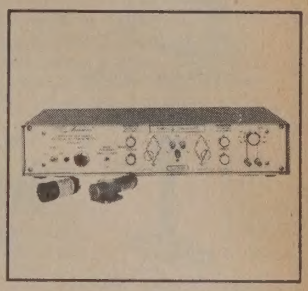
Model 443 — $550. plus mounts
Thermocouple Power Meter For Average & Peak Power Measurements
- Wide dynamic range: 0.3 μw to 100mw full scale (—35 dbm to +20dbm)
- High accuracy: 1% full scale, ±2.3 total RF error

Model 474A— $375.
Integrated Thermocouple Coaxial Power Monitor for systems application.

Models	Power Range	Price
474A	10 μW - 1.0 mW	$375.
475A	100 μW - 10.0 mW	$325.
476A	1.0 mW - 100.0 mW	$375.



Model 66A3A — $890. plus mounts
Peak Power Meter For Continuous, Instant Readings of Peak Power
- Direct readout: 3 to 300 mW independent of pulse width, shape and PRF
- Accuracy: within 8% total rms error — RFI shielded

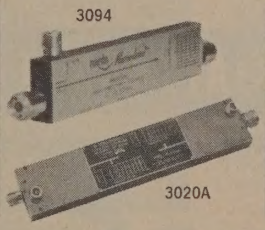


Model 445 — $975.
Precision RF Power Bridge For Standard Use For Precise Calibration
- Very high accuracy: 0.15% for bridge, 0.15% total RF error
- Automatic temperature compensation — range of 10μW to 10 mW from 10 MHz to 12.4 GHz.

HIGH DIRECTIVITY REFLECTOMETER COUPLERS with Improved Performance

3072

Reflectometer Coupler Set Model 3070 Series (10db coupling)				High Directivity Model 3090 Series (10db coupling)	
Freq. (GHz)	Tracking (db)	Directivity (db)	Model	Directivity (db)	Model
0.95-2.2	0.3	45	3072	45	3092
1.7 -4.2	0.3	42	3073	42	3093
3.7 -8.3	0.3	37	3074	37	3094
7.0 -12.4	0.3	35	3075	35	3095
Price $975				Price $400 - $450	

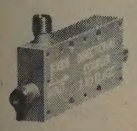


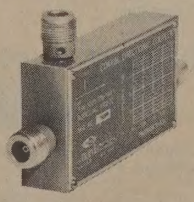
3094

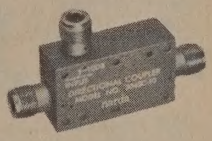
3020A

Dual Directional Model 3020 Series (20db coupling)			
Freq. (GHz)	Tracking (db)	Directivity (db)	Model
0.05-1	±0.3	35	3020A
1.0-4.0	±0.3	27-30	3022
4.0-8.0	±0.3	25	3024
Price $275			

PRECISION COUPLERS AND HYBRIDS with Improved Performance







Freq. (GHz)	MINIATURE COUPLERS 4000 Series: NEW NPM MINIATURE Flatness (db)	Directivity (db)	Model	Price	HYBRID JUNCTIONS: TYPE N Flatness (db)	VSWR	Model	Price	NPM MINIATURE Flatness (db)	VSWR	Model	Price	HIGH DIRECTIVITY 3000 Series Flatness (db)	Directivity (db)	Model	Price	MAXIMAL FLATNESS EXTENDED FREQUENCY Freq. (GHz)	Flatness (db)	Directivity (db)	Model	Price
30-60	±1	25	4000B	$200.													.150-.40 (MHz)	±.5	25	3059-20	$125.
60-125	±1	25	4001B	$200.					±.5	1.25	4028B	$250.					.010-.200	±.5	20	3060-20	$110.
125-250	±1	25	4002B	$125.					±.5	1.25	4029B	$250.					.125-.250	±.2	20	3039-20	$200.
250-500	±1	25	4010B	$125.	±.5 ±.4	1.1 1.1	3029 3030	$250. $250.	±.5	1.25	4030B	$125.	±1	30	3000	$150.	.240-.500	±.2	20	3040**	$250.
500-1000	±1	25	4011B	$125.	±.25	1.2	3031	$225.	±.5	1.25	4031B	$125.	±1	30	3001	$150.	.50-1.0	±.2	20	3041	$200.
1000-2000	±1	27	4012C*	$125.	±.25	1.2	3032	$225.	±.5	1.10	4032C	$125.	±1	30	3002**	$150.	.92-2.2	±.2	20	3042B	$200.
2000-3000	±1	22	4013C*	$125.	±.25	1.25	3033	$225.	±.5	1.20	4033C	$125.	±1	25-27	3003**	$150.	1.7-4.2	±.2	20	3043B	$200.
3000-4000	±1	20	4014C*	$125.	±.5	1.3	3034	$250.	±.5	1.20	4034C	$125.	±1.2	17-20	3004**†	$200.	3.7-8.3	±.2	17	3044B	$200.
4000-8000	±.5	20	4015C*	$135.	±.5	1.35	3035	$250.	±.5	1.30	4035C	$135.	†(4.0 to 10. GHz)				7.0-12.4	±.2	15	30450**	$250.
8.4-12.0	±.5	15	4016*	$200					±.7	1.50	4036	$250.									
Coupling values: 10, 20, 30 db					Coupling value: 3 db				Coupling value: 3 db				Coupling values: 10, 20, 30 db				Coupling values: 10, 20, 30 db				

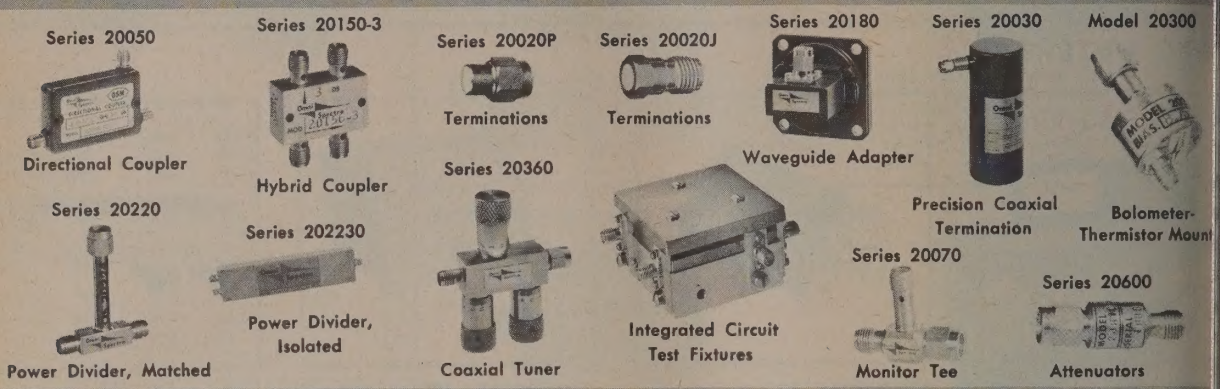
*Available 6 db value

**Available in 10, 20, 30 db — priced accordingly.

Vol. 1 TEST INSTRUMENTS EQUIPMENT & SYSTEMS

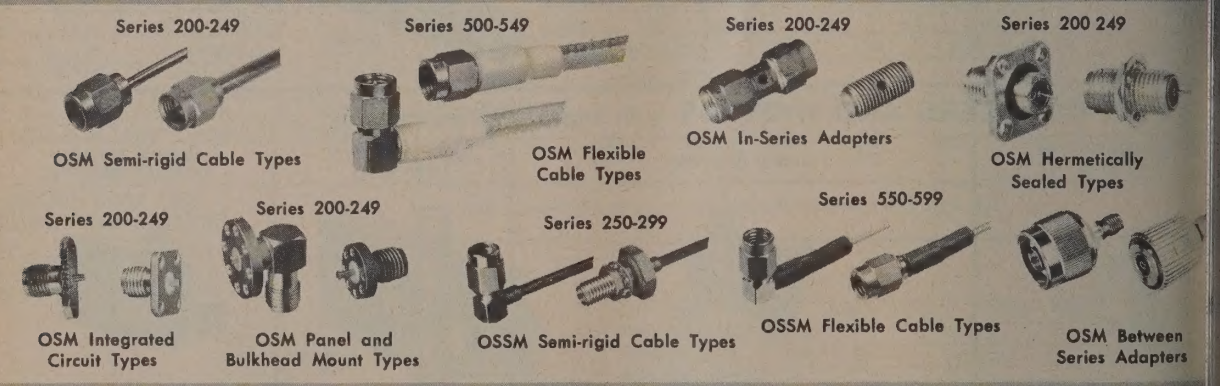
OSM® MINIATURE COAXIAL MICROWAVE CONNECTORS, COMPONENTS & INSTRUMENT

COMPONENTS AND INSTRUMENTS



ADAPTERS, WAVEGUIDE
ATTENUATORS, FIXED
BOLOMETER-THERMISTOR MOUNTS
COAXIAL TEES
COUPLERS, DIRECTIONAL
COUPLERS, HYBRID
D. C. BLOCKS
DETECTORS, BACK DIODE
DETECTORS, CRYSTAL
DETECTORS, SCHOTTKY BARRIER
INTEGRATED CIRCUIT MOUNTS
INTEGRATED CIRCUIT TEST FIXTURES
LINE STRETCHERS
MONITOR TEES
POWER DIVIDERS, FOUR-WAY
POWER DIVIDERS, TWO-WAY
SLOTTED LINE, COAXIAL
TERMINATIONS, BROADBAND
TERMINATIONS, PRECISION
TERMINATIONS, SLIDING
TUNERS, COAXIAL

COAXIAL CONNECTORS AND ADAPTERS



OSM SEMI-RIGID CABLE TYPES
OSM FLEXIBLE CABLE TYPES
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TYPE N AND TNC SEMI-RIGID CABLE TYPES

Send for NEW 82 page OSM Catalog of Components, Connectors, Adapters and Assemblies. Included are complete specifications, detailed outline drawings and applications and performance data.

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See YELLOW SECTION for Local Offices, Phones

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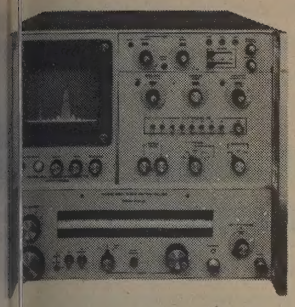
MICROWAVE SPECTRUM ANALYZERS 10 MHz-90 GHz



The Model SA 2650 Microwave Spectrum Analyzer employs new design concepts which provide increased performance and reliability. This Broadband Spectrum Analyzer utilizes both RF and IF sweep techniques to provide narrowband stability and resolution with wide image free frequency spans. A solid state swept first local oscillator is employed for wide dispersions up Hz. For frequency spans of 3 MHz or less, a stabilized cavity first wh very low residual FM provides repeatable displays for stable high on measurements. The unique design enables the user to obtain s free displays through X-Band without the use of costly pre- rs or filters. Frequency tuning, dispersion, IF Bandwidth, sweep and CRT scales are all directly calibrated. RF and IF frequency s self check the frequency and dispersion calibrations for more e measurements. The CRT Log presentation is calibrated over a 7 db dynamic range. Other convenience features: automatic opti- and adjustable resolution, simplified foolproof signal identi- .

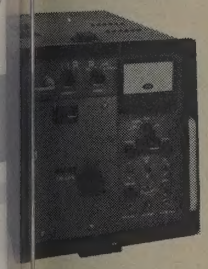
SA-2650 SALIENT SPECIFICATIONS

Frequency Range: 10 MHz to 90 GHz in 12 Bands.
Sensitivity: −100 dbm to −40 dbm depending upon frequency band (S+N=2N @ 10 KHz BS).
Dispersion: 0 to 2 GHz calibrated and adjustable.
Resolution: 1 KHz to 1 MHz calibrated steps, completely adjustable from 1 KHz to 100 KHz with Automatic Optimized Resolution provided.
Sweep Speed: 0.003 to 1 Sec/div., calibrated and variable.
Vertical Display: 70 DB Log, Linear, Power.
Frequency Markers: RF Markers: Accuracy ±0.01%, every 100 MHz self-checks frequency scale calibration. IF Markers: Center Frequency and internal marker modulation every 100 KHz or 1 MHz, plus external modulation.
Multiple Responses: No in-band multiple responses at 0-2 GHz frequency spans from 0.01 to 12.4 GHz.
Mixer Selection: Internal mixer covers range from 10 MHz to 12.4 GHz. External Mixers may be used on any band. Selected by front panel switch. Optional waveguide mixer and transition accessories available from 8.2 to 90 GHz:

X9060 Mixer 8.2-12.4 GHz	$ 75.00
K9070 Mixer 12.4-40 GHz	$160.00
K9071 Transition 12.4-18 GHz	$ 65.00
K9072 Transition 18-26 GHz	$ 65.00
K9073 Transition 26-40 GHz	$ 65.00
Q9081 Mixer 40-90 GHz	
Q9081 Transition	$625.00

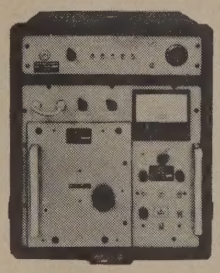
CRT Display: Calibrated 8 x 10 cm, scale illumination, Camera Mount.
Dimensions: 14" H x 16¾" W x 23" D.
SA-2650 Price: $8500.00

MICROWAVE RECEIVERS & FIELD INTENSITY METERS 0.95-21.0 GHz



The Model TR Microwave Receiver is a triple conversion superheterodyne receiver. Six plug in tuning units cover the frequency range from 0.95 to 21 GHz and include preselectors for rejection of unwanted responses. The receiver functions equally well as an AM-FM receiver, a field intensity meter, a pulse, pulsetime or pulse position demodulator or as a sensitive microwave power meter. Operates on 115/230 Volt 50-60 Hz or 12 Volt battery.

DESCRIPTION	FREQUENCY (GHz)	PRICE
Basic Unit and Power Supply		$4,120.00
Tuning Unit (Plug-In)	0.95— 2.04	$2,940.00
Tuning Unit (Plug-In)	1.9 — 4.34	$2,940.00
Tuning Unit (Plug-In)	4.2 — 7.74	$2,940.00
Tuning Unit (Plug-In)	7.3 —11.26	$2,940.00
Tuning Unit (Plug-In)	9.85—15.35	$3,480.00
Tuning Unit (Plug-In)	14.75—21.0	$3,580.00
Tuning Unit (Plug-In)	2.0 —75.0	$2,940.00



The Model CFI Field Intensity Meter combines a microwave receiver, impulse calibrator and calibrated antenna system for RI/I measurements per MIL-I-11748B, MIL-E-6051C, MIL-STD-449A and category A of MIL-I-618-1D and MIL-I-26600. Provides accurate measurements of absolute power level of conducted or radiated microwave energy. Six plug in tuning units cover frequency range from 1 to 21 GHz. Choice of battery or 115/230V line power operation.

MODEL	DESCRIPTION	FREQUENCY (GHz)	PRICE
T-CB	Basic Unit & Calibrator		$6,000.00
CFI-L	Tuning Unit (Plug-In)	1.0 — 2.04	$2,940.00
CFI-S	Tuning Unit (Plug-In)	1.9 — 4.34	$2,940.00
CFI-M	Tuning Unit (Plug-In)	4.2 — 7.74	$2,940.00
CFI-X	Tuning Unit (Plug-In)	7.3 —10.0	$2,940.00
CFI-KS	Tuning Unit (Plug-In)	9.85—15.35	$4,330.00
CFI-KU	Tuning Unit (Plug-In)	15.0 —21.0	$4,740.00

CALIBRATED MICROWAVE ANTENNAS 0.95-21.0 GHz

- HIGHLY DIRECTIONAL
- LINEARLY POLARIZED
- HIGH FRONT/BACK RATIOS
- MAXIMUM VSWR 3:1
- LIGHTWEIGHT
- PORTABLE
- RUGGED CONSTRUCTION

MODEL	DESCRIPTION	FREQUENCY RANGE (GHz)	PRICE
CA-L	Horn Antenna	1.0 — 2.34	$200.00
CA-S	Horn Antenna	2.14— 4.34	200.00
CA-M	Horn Antenna	4.1 — 7.74	190.00
CA-X	Horn Antenna	7.36—10.0	200.00
CA-KS	Horn Antenna	9.85—15.35	260.00
CA-KU	Horn Antenna	14.15—21.0	305.00
CA-R2	Antenna Reflector	4.19—21.0	180.00
CA-B	Omnidirectional Conical	1.0 —10.0	150.00
CA-KSO	Omnidirectional Conical	9.8 —15.35	295.00
CA-KUO	Omnidirectional Conical	14.75—21.0	305.00
CA-T	Antenna Tripod		200.00
CA-LPR	Log Periodic Antenna	1.0 —11.0	775.00

larad electronic instruments

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polarad

MICROWAVE SIGNAL GENERATORS & SOURCES 0.95-21 GHz

Polarad's 12 Microwave Signal Generating Instruments Provi High Performance Without Costly Duplication

The 12 instruments comprising the Polarad broadband line of modular signal-generating equipment offer practical combinations for producing every type of signal required in modern microwave development and testing between 0.95 and 21 GHz. They feature:

FLEXIBILITY — Use Polarad broadband instrument modules individually or in combination to obtain the desired signal characteristics. Select only the functions required by each application — add functions only when needed — avoid costly duplication. Patented reversible handles permit rack mounting or easy handling and stacking on the bench. A stacking lock fits the instruments together.

COMPACTNESS — All modules are of one standard size; measure only 5¼ inches high, 16¾ inches wide (19 inches with reversed handles for rack mounting) and 17 inches deep.

HIGH FREQUENCY ACCURACY — Frequency indication is accurate to ±0.5%.

DIGITAL FREQUENCY READOUT — Frequency setting is displayed on an easy-to-read digital indicator; turned by the UNIDIAL® one-knob tuning control.

HIGH POWER OUTPUT — Signal sources provide up to 50 mw; signal generators up to 15 mw. Doublers range from 0 to −100 dbm calibrated.

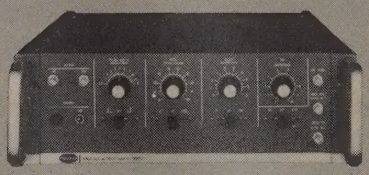
HIGH ATTENUATOR ACCURACY — Fully calibrated attenuator to −127 dbm over full frequency range.

STABILITY — Frequency and power-stability are representative of the highest state of the art.

FULL MODULATION CAPABILITY — Polarad's modular line offers maximum versatility for all test applications through a wide range of internal and external pulse, square wave and FM modulation.

PHASE LOCK — A frequency stabilizer module permits locking of frequency to crystal stability. Phase lock capability is built into all Polarad modular signal instruments.

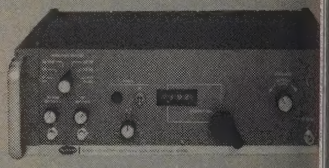
LOW PRICE — You save by paying for high quality and flexibility, without duplication of functions.



Modulator Model 1001
Full FM, squarewave
and pulse modulation

Signal Source Model 1206
1.95 to 4.2 GHz

Signal Generator Model 1105
0.95 to 2.4 GHz

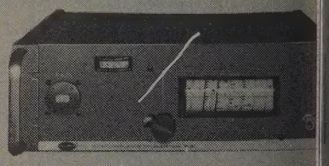


Signal Source Model 1207
3.8 to 8.2 GHz

Signal Generator Model 1106
1.95 to 4.6 GHz

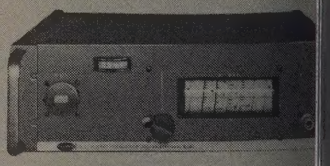
Signal Source Model 1208
6.95 to 11.0 GHz

Signal Generator Model 1107
3.8 to 8.2 GHz



Frequency Doubler Model 1509
10.0 to 15.5 GHz

Signal Generator Model 1108
6.95 to 11.0 GHz



Frequency Doubler Model 1511
15.0 to 21.0 GHz

Signal Source Model 1205
0.95 to 2.4 GHz

Frequency Stabilizer Model 38
1.0 to 12.4 GHz

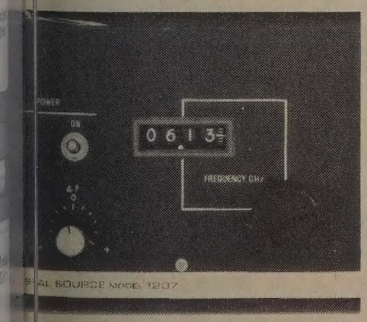
Use Polarad modular instruments individually or in combination to obtain any required microwave signal

Polarad Modular Signal Instruments Condensed Specifications

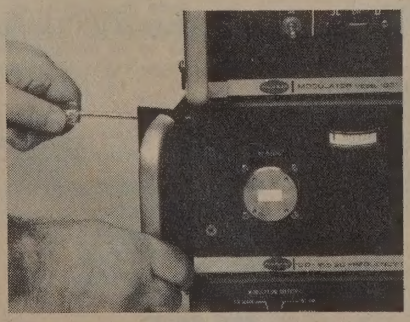
All models supplied with rack mounting capability and 115/230 V, 50-60 Hz operation at no extra cost.
For 50 to 400 Hz power line operation add F suffix to model number and $175.00 to price of unit.

MODEL	MODULE	DESCRIPTION	FREQUENCY	PRICE*	CHARACTERISTICS
100		Modulator		$ 745.00	Supplies squarewave, pulse and sawtooth FM modulation for signal generators and sources.
1105		Signal Generator, L Band	0.95— 2.4GHz	2090.00	0 to —130 dbm calibrated power output.
1106		Signal Generator, S Band	1.95— 4.6GHz	2090.00	+3 to —127 dbm calibrated, 15 mw 1.95 to 4.6 GHz, 30 mw 2.3 to 4.2 GHz.
1107		Signal Generator, C Band	3.8 — 8.2GHz	2090.00	+3 dbm to —127 dbm calibrated power output, 5 mw min. power output. 10 mw power output over entire frequency range optionally available. Add H suffix to model number and $100.00.
1108		Signal Generator, X Band	6.95—11.0GHz	2090.00	
1205		Signal Source, L Band	0.95— 2.4GHz	1590.00	50 mw minimum power output.
1206		Signal Source, S Band	1.95— 4.2GHz	1590.00	
1207		Signal Source, C Band	3.8 — 8.2GHz	1840.00	18 mw average power output.
1208		Signal Source, X Band	6.95—11.0GHz	1840.00	
1509		Frequency Doubler	10.0 —15.5GHz	1685.00	0 to —100 dbm calibrated power output. Doubles input frequency from signal source.
1510		Frequency Doubler	15.0 —21.0GHz	1685.00	
1105	1001	Signal Generator, L Band with Full Modulation Capabilities	0.95— 2.4GHz	2330.00	0 to —130 dbm calibrated power output.
1106	1001	Signal Generator, S Band with Full Modulation Capabilities	1.95— 4.6GHz	2330.00	+3 to —127 dbm calibrated, 15 mw 1.95 to 4.6 GHz, 30 mw 2.3 to 4.2 GHz.
1107	1001	Signal Generator, C Band with Full Modulation Capabilities	3.8 — 8.2GHz	2330.00	+3 to —127 dbm calibrated power output, 5 mw min. power output. 10 mw power output over entire frequency range optionally available. Add H suffix to model number and $100.00.
1108	1001	Signal Generator, X Band with Full Modulation Capabilities	6.95—11.0GHz	2330.00	
1509	1207	Signal Generator, Ks Band	10.0 —15.5GHz	3525.00	—3 to —100 dbm calibrated power output. 0 dbm (1 mw) calibrated power output optionally available. Add H suffix to model number and $100.00.
1510	1208	Signal Generator, Ku Band	15.0 —21.0GHz	3525.00	
1509	1207 1001	Signal Generator, Ks Band with Full Modulation Capabilities	10.0 —15.5GHz	3765.00	—3 to —100 dbm calibrated power output. Internal or external pulse, CW, FM or square wave modulation. 0 dbm (1 mw) calibrated power output optionally available. Add H suffix to model number and $100.00.
1510	1208 1001	Signal Generator, Ku Band with Full Modulation Capabilities	15.0 —21.0GHz	3765.00	
1301		Frequency Stabilizer	1—12.4GHz	Contact Factory	Continuous phase lock with crystal stability, proportional oven controlled. Can be used separately to lock any voltage tuneable device from 1 to 12.4GHz.

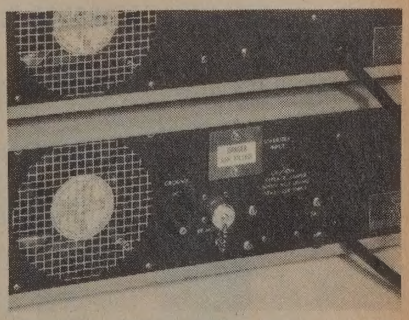
Polarad signal instruments also offer...



knob UNIDIAL tuning control provides frequency indication in easy-to-read digital form. Knob simultaneously tracks the oscillator and display to provide frequency accuracy of ±0.5%.



Simply remove and reverse the handles on Polarad Modular instruments to convert them to rack mounting. For bench use the units can be easily stacked one above the other.



Programmable motor drive can be accommodated on any Polarad Generator or Source by means of a rear tuning shaft extension.

Polarad electronic instruments

A DIVISION OF
POLARAD ELECTRONICS CORP.
5 DELAWARE DRIVE
LAKE SUCCESS, NEW YORK 11040
516-328-1100 • TWX 510 223 0414

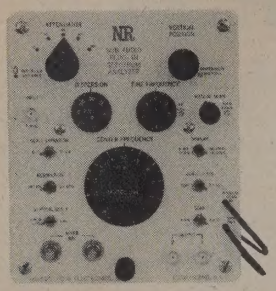
nelson ·ross

PLUG-IN SPECTRUM ANALYZERS 0.5 Hz to 6.5 GHz

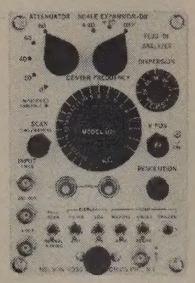
NR provides an unequalled array of plug-in spectrum analyzers for virtually every application from sub-audio through microwave frequency ranges. Each instrument is carefully designed and fully tested to provide optimum performance and versatility, at minimum cost.

NR plug-in spectrum analyzers are available for use with the Tektronix® "letter" and 560 series, and the Hewlett-Packard 140A/141A series oscilloscopes. The NR plug-ins convert these widely used scopes into easily used, calibrated spectrum analyzers. Their exceptional specifications, ease of use, self-checking, and high calibration accuracies are normally associated with spectrum analyzers costing several times as much.

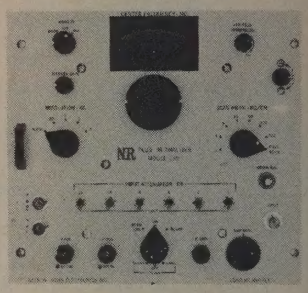
Nelson-Ross instruments are well-known for quality and reliability. Each carries a full one-year warranty. Thousands of NR instruments are in successful use throughout the world.



PSA-016



PSA-021



PSA-235

LOW FREQUENCY SERIES

All the analyzers in this series have calibrated center frequency and dispersion (frequency scan width) dials; full band dispersion; high sensitivity and stability; low distortion; 1 megohm input impedance; calibrated input attenuator and scale expander; low noise and incidental FM levels; video (noise smoothing) filter; recorder outputs; and a wide range of scan rates (manual and single scan also provided on some models).

Typically, these analyzers are employed in the measurement of frequency, bandwidth, spectral distribution, frequency response, energy distribution, power levels, intermodulation and harmonic distortion of both simple and complex signals.

Also refer to the extremely versatile 1 kHz-25 MHz spectrum analyzers, in the high frequency series.

	SUB AUDIO 0.5 Hz to 2 kHz	AUDIO 10 Hz to 20 kHz	SONIC 35 Hz to 100 kHz	ULTRASONIC 150 Hz to 500 kHz	VIDEO 1 kHz to 2 MHz
CENTER FREQUENCY	0.5 Hz to 2 kHz	10 Hz to 20 kHz	35 Hz to 100 kHz	150 Hz to 500 kHz	1 kHz to 2 MHz
DISPERSION (Scan Width)	10 Hz to 600 Hz; & 2 kHz	100 Hz to 6 kHz; & 20 kHz	500 Hz to 30 kHz; & 100 kHz	2.5 kHz to 150 kHz; & 500 kHz	10 kHz to 600 kH & 2 MHz
RESOLUTION	0.5 Hz and 50 Hz	10 Hz to 100 Hz	35 Hz to 250 Hz	150 Hz to 2 kHz	1 kHz to 8 kHz
SENSITIVITY	2 mv/cm deflection	85 uv/cm deflection	85 uv/cm deflection	85 uv/cm deflection	85 uv/cm deflection
VERTICAL DISPLAYS	Linear & 40 db log	Linear & 40 db log	Linear & 40 db log	Linear & 40 db log	Linear & 40 db log
DISTORTION	> 40 db down	> 60 db down	> 60 db down	> 60 db down	> 55 db down
PLUG-INS FOR TEKTRONIX LETTER SERIES	PSA-016 $950	PSA-011 $650	PSA-012 $650	PSA-013 $650	PSA-014 $850
TEKTRONIX 560 SERIES	PSA-026 $1100	PSA-021 $800	PSA-022 $800	PSA-023 $800	PSA-024 $1000
HEWLETT-PACKARD 140A/141A SERIES	PSA-036 $1100	PSA-031 $800	PSA-032 $800	PSA-033 $800	PSA-034 $1000
COMPLETE NR SPECTRUM ANALYZER	Model 36 $2400	Model 31 $2100	Model 32 $2100	Model 33 $2100	Model 34 $2300
COMPLETE NR STORAGE SPECTRUM ANALYZER	Model 36S $3400	Model 31S $3100	Model 32S $3100	Model 33S $3100	Model 34S $3300

ACCESSORIES FOR LOW FREQUENCY SERIES

SYNCHRO-SWEEP GENERATORS

FREQUENCY RESPONSE PLOTTERS

10 Hz — 500 kHz

NR synchro sweep generators, companion instruments to the low f quency series spectrum analyzers, are signal sources tracked to t same frequency as the analyzer. The SSG is used in filter and amplif design to plot frequency response, insertion loss, etc., in vibration ana sis as an excitation source and in other similar applications. Dynar range is virtually unlimited.

	SSG-101	SSG-102	SSG-103
COMPANION ANALYZER:	PSA-011, PSA-021, PSA-031	PSA-012, PSA-022, PSA-032	PSA-013, P 023, PSA-0
OUTPUT FREQUENCY:	10 Hz to 20 kHz	35 Hz to 100 kHz	150 Hz to 500
OUTPUT VOLTAGE:	10 volts peak to peak (open circuit);		
OUTPUT IMPEDANCE:	600 ohms;		
OUTPUT ATTENUATOR:	63 db in 1 db steps;		
AMPLITUDE FLATNESS:	±1 db or less;		
SCAN RATES:	as provided by analyzer;		
INPUT POWER:	115V, 50/60 Hz;		
PRICE:	$450.		

MODEL SA-120 SIGNAL ALTERNATOR Triggered Relay —enables t input signals to be compared on NR Low Frequency analyzers. PRICE: $100.

nelson·ross electronics

A DIVISION OF POLARAD ELECTRONICS CORP. 5 DELAWARE DRIVE LAKE SUCCESS, NEW YORK, 11040 516-328-1100 TWX 510-223-0

eson CSS COMPLETE SPECTRUM ANALYZERS 0.5 Hz to 6.5 GHz

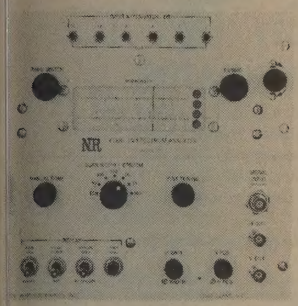
le NR spectrum analyzers consist of calibrated NR display main nd plug-in spectrum analyzers. They provide unequalled versa- se-of-use, and reliability. Use of the value-engineered NR plug- ly reduces the cost of complete NR analyzers.

ch frequency range from sub-audio through microwave, there is te NR Spectrum Analyzer with a calibrated high persistence CRT a variable persistence, storage CRT display. All carry the NR warranty.

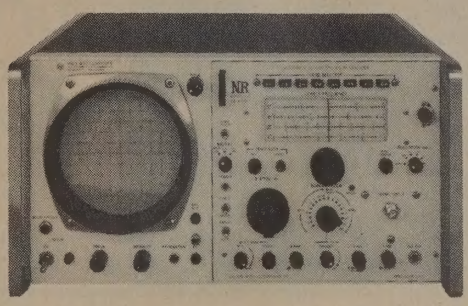
Two NR Main Frames are available. Each is suitable for rack mount or bench top use.

Model MF-3; with 5" CRT, *P7 high persistence phosphor with amber filter, calibrated spectrum analysis graticule, adjustable scale illumination, and camera mount bezel. Dimensions: 9"H x 16¾"W x 18⅜"D. (Rack Mount 8¾"H x 19"W x 16¾"D behind panel.) Power: 115/230V, 50-60 Hz. *P31 phosphor CRT furnished with Models 531 and 532

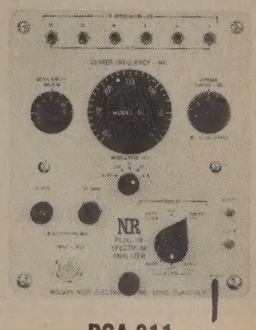
Model MF-3S Storage Main Frame; similar to Model MF-3, with variable persistence display. Displays can be retained until erased.



PSA-231



MODEL 531 SPECTRUM ANALYZER



PSA-311

	VIDEO 1 kHz to 25 MHz	NARROW-BAND, RF/SSB 600 kHz to 108 MHz	BROADBAND RF/UHF 1 MHz to 300 MHz	MICROWAVE 10 MHz to 4.5 GHz	MICROWAVE 10 MHz to 6.5 GHz
UCY E:	1 kHz to 25 MHz	600 kHz to 36 MHz; 108 MHz w/harmonics	1 MHz to 300 MHz	10 MHz to 4.5 GHz	10 MHz to 6.5 GHz
ERON th):	5 kHz to 5 MHz; 25 MHz	100 Hz to 100 kHz	100 kHz to 100 MHz; 300 MHz	0 to 1 GHz Internal Phase Lock	0 to 1 GHz Internal Phase Lock
LON:	Automatic; 200 Hz to 20 kHz	Automatic; 10 Hz to 2 kHz	Automatic; 5 kHz to 100 kHz	Automatic; 1 kHz to 200 kHz	Automatic; 1 kHz to 200 kHz
TY:	—90 dbm	—100 dbm	—90 dbm	—90 dbm to 1.5 GHz	—92 dbm to 1.5 GHz
A:	Linear, sq. law & 60 db log	Linear & 60 db log	Linear, sq. law & 60 db log	Linear, sq. law & 60 db log	Linear, sq. law & 60 db log
RANGE:	60 db	60 db	60 db	60 db	60 db
ON:	>50 db down	>60 db down	>46 db down		
FOR X ERIES	PSA-205 $1400	PSA-201 $1600	PSA-311 $1300	PSA-511 $1900	PSA-512 $2200
X ES	PSA-225 $1500	PSA-221 $2060	PSA-321 $1400		
PACKARD SERIES	PSA-235 $1500	PSA-231 $1700	PSA-331 $1400	PSA-531 $2000	PSA-532 $2300
E NR W t	Model 235 $2800	Model 231 $3000	Model 331 $2700	Model 531 $3300	Model 532 $3600
E NR SPECTRUM t	Model 235S $3800	Model 231S $4000	Model 331S $3700	Model 531S $4300	Model 532S $4600

HIGH FREQUENCY SERIES

The NR high-frequency spectrum analyzers provide unequalled capability for rapid broadband scanning, as well as highly resolved, narrow-band analysis; at lowest cost.

The narrow-band analyzers are well suited for signal analysis of SSB, AM, FM, and data communications. They have such essential features as 60 db dynamic range for distortion measurements, 60 db log amplitude scale, simplified operation and automatically optimized resolution. Some models include self-checking crystal controlled frequency markers.

The all solid-state wideband analyzers provide dispersions up to 1 GHz stable narrow scans, usable 60 db display range, high and uniform sensitivity, and automatically optimized resolution. In some models, highly stable phase locked narrow band scans are provided.

Typically, these analyzers are employed for pulsed and CW signal analysis, telemetry and multiplexed carrier monitoring, frequency response studies, spectrum signature and surveillance; harmonic and spurious analysis.

ACCESSORIES FOR HIGH FREQUENCY SERIES

TWO-TONE GENERATORS 100 Hz — 10 kHz

	TTG	TTG/F
CY RANGE:	100 Hz to 10 kHz Adjustable in 1% steps	100 Hz to 10 kHz Preset at factory
CY ACCURACY:	±2%	±1%

CY STABILITY: ±0.1%/hr after initial warmup;
LEVEL: each tone set at 0 dbm (600 ohms), on panel meter;
ATTENUATOR: 63 db range in 1 db steps; ±0.1 db/db;
OWER: 115/230V; 50-60 Hz.

	$900	$600

NR audio two-tone signal generators are distortion-free one and two-tone modulation sources for transmitter testing, frequency response and distortion measurements. Outputs are precisely adjustable and stable. Unwanted outputs are >60 db down from each tone level.

PROBES

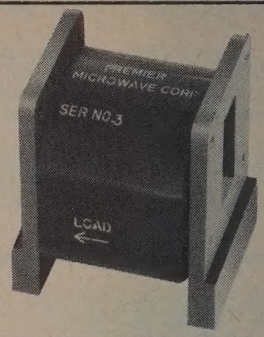
For high input impedance for high frequency NR Spectrum Analyzers up to 36 MHz.

	P1	P2	P3 (passive)
INPUT IMPEDANCE:	1 megohm	2 megohms	0.1 megohm
INPUT CAPACITANCE:	10-15 mmf	15 mmf	7 mmf
PRICE (INCLUDING ACCESSORIES):	$105	$105	$105

Electro-mechanical & Microwave Products
FROM

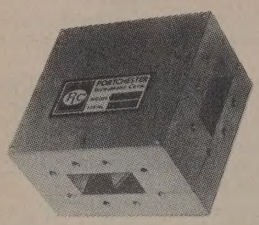
PREMIER MICROWAVE CORPORATION

Combining the manufacturing and design capabilities with extensive knowledge of microwave circuitry, waveguide systems, computer-peripheral equipment, and electro-mechanical, sub-assemblies, has become the specialty of Premier Microwave Corp. Whether we manufacture custom parts to the customers' exact drawings or our own engineering department works to overall specifications, our unique capacity assures fastest possible delivery of finished pieces. In addition, our fast growing line of standard products now includes microwave circulators, isolators, (Gombos) filters, wave meters, and similar fully-developed microwave products for which tooling already exists.



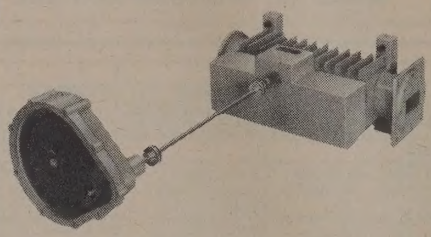
X-BAND ISOLATOR

Includes permanent magnet and offers excellent transmission with high powers to 250 Kw peak, 250 w cw, at 20 db isolation. VSWR is less than 1.20:1. 4½″ long. Many standard and custom units available.



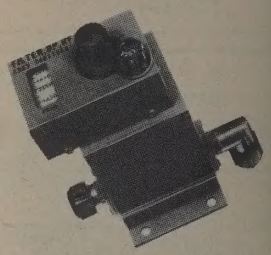
FERRITE WAVEGUIDE CIRCULATOR

Unique non-reciprocal electrical properties of ferrite materials used in the circulator permit one antenna to be used for both transmission and reception. Premier offers an extensive line of circulators for microwave applications.



TUNABLE FILTER
(GOMBOS)

Direct-reading waveguide unit with fins and mounting brackets. Note long shaft, spiral dial design and large indicator card.



DIRECT TAPE READOUT FILTER
(GOMBOS)

Less than 1 db insertion loss, 4400 to 5000 MHz tuning range with 2MHz calibration accuracy. Other units available from 1 to 12 GHz.

COMPUTER COIL
(PORTCHESTER)

Magnetic reluctance devices such as solenoids require the small, flat packaging design used here for close, space-starved installations. Portchester Instrument Corp. of California has designed and built their own unique counter-rotating coil winder enabling high production rates plus excellent quality in a small size.

INTERPOSER
(PORTCHESTER)

Typical of the tightly-wound and quality encapsulated electro-mechanical components used in computer peripheral equipment.

For engineering excellence in electronic products:

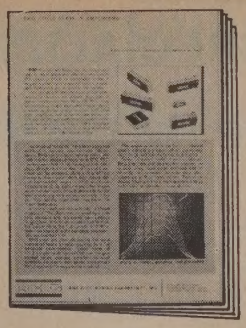
PMC **Premier Microwave Corporation**

33 NEW BROAD ST. • PORT CHESTER, N.Y. 10573 • (914) 939-8900

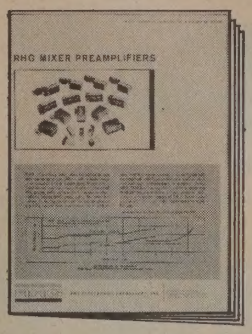
PORTCHESTER INSTRUMENT CORP. OF CALIFORNIA is a wholly owned subsidiary of PREMIER MICROWAVE CORP.

RHG

microwave transmitters, receivers and components

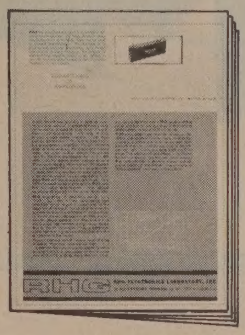


BULLETIN IFA-103 A
SOLID STATE
IF AMPLIFIERS

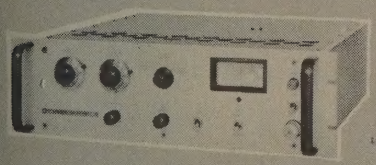


BULLETIN MP-102 A
MIXER
PREAMPLIFIERS

NEW!
MIC Microwave Products
SEE FOLLOWING PAGES

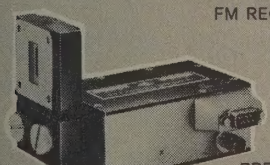


BULLETIN LA-101 A
LOGARITHMIC
IF AMPLIFIERS

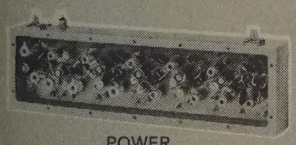


FM RECEIVER

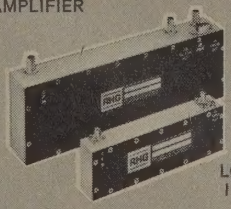
PORTABLE
FM-TV
RELAY LINK



MIXER
PREAMPLIFIER

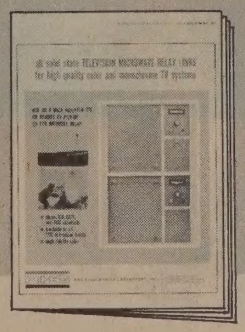


POWER
AMPLIFIER



LOGARITHMIC
IF AMPLIFIER

CATALOG 70A
MICROWAVE
TRANSMITTERS,
RECEIVERS &
COMPONENTS



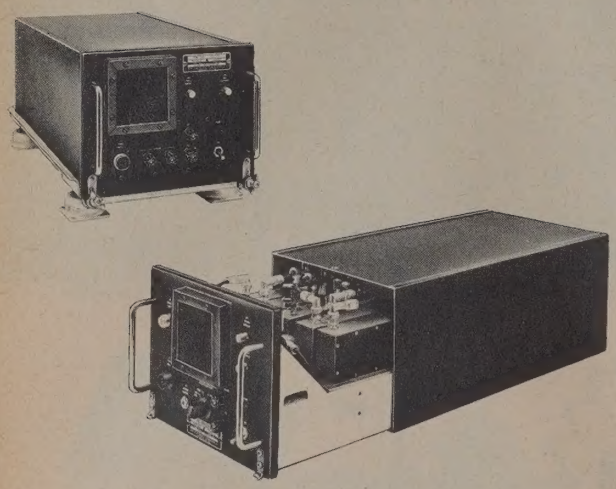
CATALOG 70C
TELEVISION
MICROWAVE
RELAY LINKS

RHG ELECTRONICS LABORATORY • INC
94 MILBAR BOULEVARD ■ FARMINGDALE ■ LONG ISLAND ■ NEW YORK 11735 (516) 694-3100

SEE DETAILED LISTING OF RHG PRODUCTS ON FOLLOWING TEN PAGES

RHG SPECIALIZED MICROWAVE RELAY LINKS

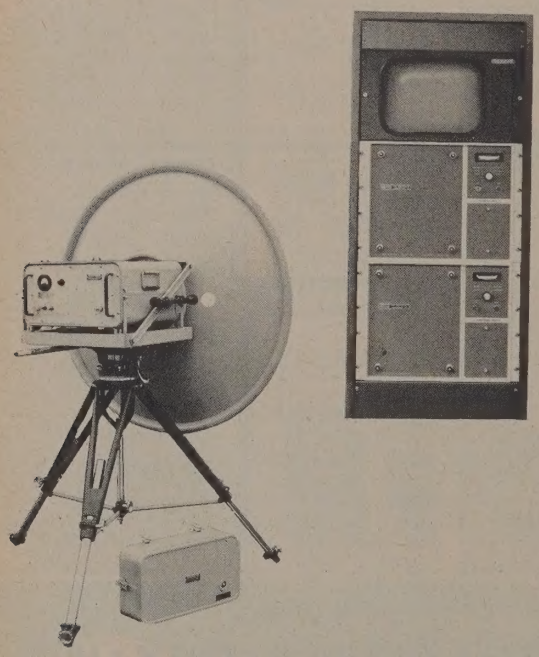
▪ *FOR HIGH SPEED VIDEO DATA* ▪ *FOR REAL TIME SURVEILLANCE*



AIR TO AIR
(L, S, C, X Bands)

- **Very Wideband**
- **Meets MIL-E-5400**
- **RFI Protected**
- **200 nautical mile range**

Used by the Air Force for transmission and reception of 945 line TV signals, this equipment provides the rugged reliability required in airborne environments. Packaged in standard ATR configuration, this system provides operation on 3 RF channels, switch selectable on receiver and transmitter.



GROUND STATIONS
(2 thru 13 GHz)

- **Portable or Fixed installations**
- **Rugged—weatherproof**
- **Built-in subcarriers**
- **Meets EIA, CCIR and FCC STDS**

In use by many military and industrial customers. These units offer flexibility and economy. Built-in audio or narrowband telemetry subcarriers are multiplexed with a wideband video channel. The rugged weatherproof portable gear can be readily assembled and/or disassembled by one man in the field. The rack equipment offers full accessibility via readily removable front panels.

RHG manufactures highly sophisticated Microwave Relay Links for military applications and has a listing of "standard" models in its catalog. Additionally, "specials" designed and built to customer specifications account for a major part of the work done in this area.

RHG can draw on an extensive library of designs and use previously developed building blocks to meet your specific requirements. Many RHG links have been delivered to the U.S. Army, Navy and Air For are presently operational on aircraft, missiles, and ships.

A few of these "special" and "standard" models are illustrated plete details are listed in Catalog 70B. Call or write for te information or catalog.

SPECIALIZED MICROWAVE RELAY LINKS

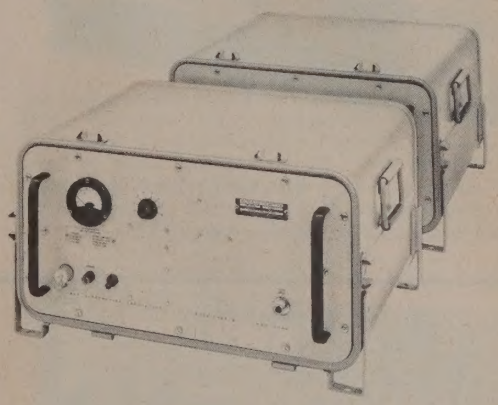
RHG

▪ *FOR RADAR REMOTES* ▪ *FOR HIGH RESOLUTION TV*

POINT TO POINT
(C Band)

- **High Shock Environment**
- **Low Intermodulation**
- **High Signal to Noise**
- **Diplexed Operation**

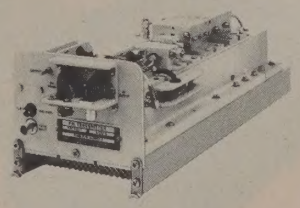
In use by the AEC for telemetry of sensor data. These links must withstand high shock environment and provide ultra reliable performance. Multi-mode operation provides super fast transient response with carrier offset in one mode, and conventional TV transmission as a switch selectable alternate.

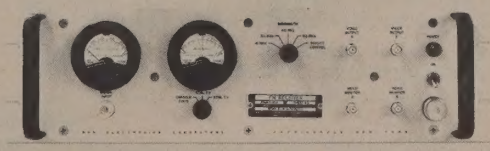


AIR TO GROUND
(9 GHz)

- **1000 Line Resolution**
- **Missile Grade Transmitter**
- **AFC Frequency Control**
- **Switchable Receiver Bandwidths**

In use by the Air Force as a multipurpose link suitable for transmission of wide band signals with video basebands up to 20 MHz. Transmitter designed and tested for high shock and vibration airborne environment. Receiver bandwidths are switch-selectable for optimization of signal to noise.





RHG

RHG ELECTRONICS LABORATORY, INC.

94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

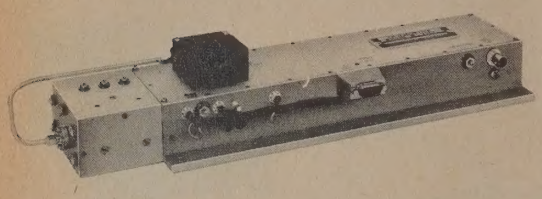
RHG

MICROWAVE FM TRANSMITTERS

- *WIDEBAND PERFORMANCE*
- *ALL SOLID STATE*
- *HANDLE VIDEO, TELEMETRY AND MULTIPLEX*
- *LOW DISTORTION*
- *L, S, C AND X BAND*
- *POWER OUTPUTS TO 100 WATTS*

MINI-LINK SERIES

• <75 cubic inches • 5 lbs.



The "MLT" miniature series is designed for those applications requiring a compact module, which incorporates only the essential elements and features without sacrifice of performance.

"MLT" WIDEBAND MODELS

Model No.	(in band of) Frequency GHz	Baseband	Output Power (watts)
MLT1.7	1.71 to 1.85	10 Hz to 6.0 MHz ±0.5 db <1% tilt on 50 Hz square wave	4.0
MLT2.2	2.2 to 2.3		2.0
MLT3.7	3.7 to 4.2		1.0
MLT4.4	4.4 to 5.0		0.75
MLT5.9	5.9 to 6.5		0.50
MLT7.1	7.1 to 8.4		0.30

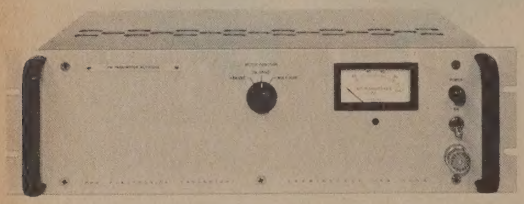
"MLTW" VERY WIDEBAND MODELS

MLTW1.7	1.71 to 1.85	10 Hz to 12 MHz ±1.0 db <1% tilt on 50 Hz square wave	4.0
MLTW2.2	2.2 to 2.3		2.0
MLTW3.7	3.7 to 4.2		1.0
MLTW4.4	4.4 to 5.0		0.75
MLTW5.9	5.9 to 6.5		0.50
MLTW7.1	7.1 to 8.4		0.30

NOTES:

1. Power: +24 VDC @ 1.5 A (typical)
2. Size: 17" x 4½" x 2¼" (nominal)
3. Weight: 5 lbs. (approx.)

19" RACK MOUNTED



The "FMT" series is designed for standard 19" rack mounting. This unit is completely self contained, all solid state, and fully RFI protected.

"FMT" WIDEBAND MODELS

Model No.	In Band of (GHz	Baseband	Output Power (watts)
FMT1.7	1.71 to 1.85	±0.5 db 10 Hz to 6 MHz <1% tilt on 50 Hz square wave	4.0
FMT2.2	2.2 to 2.3		2.0
FMT3.7	3.7 to 4.2		1.0
FMT4.4	4.4 to 5.0		0.75
FMT5.9	5.9 to 6.5		0.5
FMT7.1	7.1 to 8.4		0.5
FMT1.7HP	1.71 to 1.85		20
FMT2.2HP	2.2 to 2.3		20
FMT3.7HP	3.7 to 4.2		20
FMT4.4HP	4.4 to 5.0		20
FMT5.9HP	5.9 to 6.5		20
FMT7.1HP	7.1 to 8.4		20

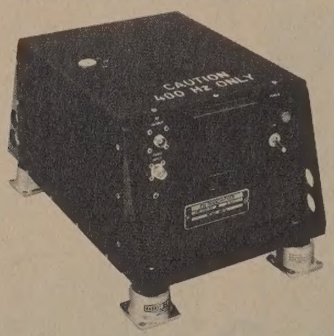
"FMTW" VERY WIDEBAND MODELS

FMTW1.7	1.71 to 1.85	±1.0 db 10 Hz to 12 MHz <1% tilt on 50 Hz square wave	4.0
FMTW2.2	2.2 to 2.3		2.0
FMTW3.7	3.7 to 4.2		1.0
FMTW4.0	4.4 to 5.0		0.75
FMTW5.9	5.9 to 6.5		0.5
FMTW7.1	7.1 to 8.4		0.5
FMTW1.7HP	1.71 to 1.85		20
FMTW2.2HP	2.2 to 2.3		20
FMTW3.7HP	3.7 to 4.2		20
FMTW4.4HP	4.4 to 5.0		20
FMTW5.9HP	5.9 to 6.5		20
FMTW7.1HP	7.1 to 8.4		20

NOTES:

1. All models listed above are available in "ATR" configuration. Add suffix "ATR" to model number shown. Packaging is B1D1 size to mate with shock mount tray M591405-B1D1 (not supplied). These units require 115 V 400 Hz power. Other power options available.
2. Std. units require 115 V 60 Hz.

"ATR" STYLE—AIRBORNE



The "FMT-ATR" series is designed for airborne applications, and offers electrical performance identical to the regular "FMT" series.

ADDITIONAL INFORMATION

1. Deviation: Wideband models ±4 MHz; Very wideband models ±8 MHz
2. Video levels: Rated deviation produced by 0.7 to 1.4 V p-p (adjustable)
3. Output load: All models designed for 50Ω load. "FMT" and "FMTW" models incorporate terminated 3 port circulator, protecting against open, shorted, and poor VSWR loads
4. Stability: ±0.5% from −20 to +55°C. (all models.) Up to ±.003% with AFC option
5. RFI: All models incorporate RFI protection
6. Fidelity: Typical linearity <5% over full deviation; <2% over 50% deviation. Complete fidelity data related to intended usage available on request

AVAILABLE OPTIONS

1. Deviations: Up to ±24 MHz
2. Video: Up to 24 MHz
3. Power: Up to 100 watts
4. Frequency: 0.5 to 13 GHz
5. Selectable Frequency: Models with step or continuous tuning available
6. Pre-emphasis: Standard or special networks are available
7. Subcarriers: Standards at 6.5, 7.5 and 8.5 Specials up to 20 MHz
8. AFC: Stabilities to ±.002% available
9. Multiplex: Complete multiplex facilities for TV, Telemetry, Telephony are available

SEE "SYSTEM PERFORMANCE CONSIDERATIONS" ON OPPOSITE PAGE WHEN ORDERI TRANSMITTER-RECEIVER COMBINATIONS

MICROWAVE FM RECEIVERS

RHG

VIDEBAND FM-TV ▪ VIDEO DATA LINKS ▪ MULTICHANNEL TELEPHONY ▪ BANDWIDTH TO 50 MHz ▪ LOW DIFFERENTIAL PHASE AND GAIN ▪ FIXED OR TUNEABLE

WIDEBAND MODELS

• 30 MHz IF BW • 6 MHz Baseband

Model No.	Tuning	In Band of (GHz)	RF Preselector	AFC
FMR1.7	Fixed	1.71 to 1.85	STD.	OPT.
FMR2.2	Fixed	2.2 to 2.3	STD.	OPT.
FMR3.7	Fixed	3.7 to 4.2	STD.	OPT.
FMR4.4	Fixed	4.4 to 5.0	STD.	OPT.
FMR5.9	Fixed	5.9 to 6.5	STD.	OPT.
FMR7.1	Fixed	7.1 to 8.4	STD.	OPT.
FMR1.7-1.8	Tuneable	1.71 to 1.85	OPT.	STD.
FMR2.2-2.3	Tuneable	2.2 to 2.3	STD.	STD.
FMR3.7-4.2	Tuneable	3.7 to 4.2	OPT.	STD.
FMR4.4-5.0	Tuneable	4.4 to 5.0	OPT.	STD.
FMR5.9-6.5	Tuneable	5.92 to 6.43	OPT.	STD.

VERY WIDEBAND MODELS

• 50 MHz IF BW • 12 MHz Baseband

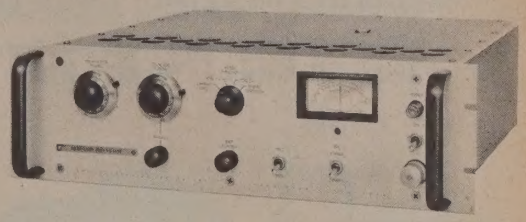
Model No.	Tuning	In Band of (GHz)	RF Preselector	AFC
FMRW1.7	Fixed	1.71 to 1.85	STD.	OPT.
FMRW2.2	Fixed	2.2 to 2.3	STD.	OPT.
FMRW3.7	Fixed	3.7 to 4.2	STD.	OPT.
FMRW4.4	Fixed	4.4 to 5.0	STD.	OPT.
FMRW5.9	Fixed	5.9 to 6.5	STD.	OPT.
FMRW7.1	Fixed	7.1 to 8.4	STD.	OPT.
FMRW1.7-1.8	Tuneable	1.71 to 1.85	OPT.	STD.
FMRW2.2-2.3	Tuneable	2.2 to 2.3	STD.	STD.
FMFW3.7-4.2	Tuneable	3.7 to 4.2	OPT.	STD.
FMRW4.4-5.0	Tuneable	4.4 to 5.0	OPT.	STD.
FMRW5.9-6.5	Tuneable	5.92 to 6.43	OPT.	STD.

DDITIONAL SPECIFICATIONS:

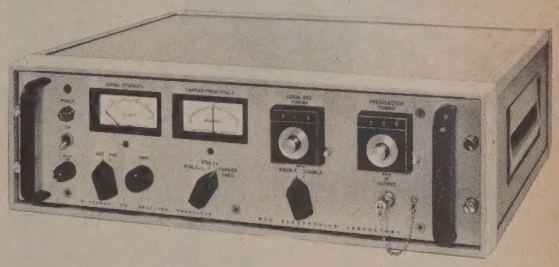
. Noise Figure: 9 db (typ.) all units plus preselector loss, if applicable.
. RF Isolator: Standard on all units.
. AGC: 45 db (min.)
. Video Baseband: ±0.5 db over 10 Hz to 6 MHz (12 MHz, ±1.0 db) on wideband models with <1% tilt on a 50 Hz square wave.
. Video Output: 2 supplied at 75Ω impedance level. (1.4 V-P-P).

TANDARD MODIFICATIONS

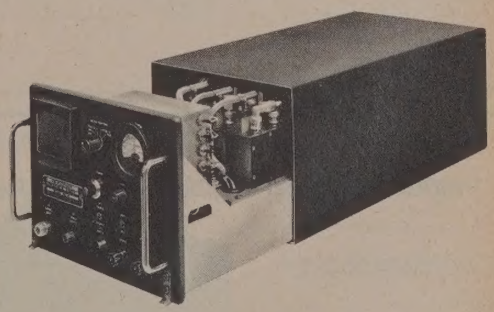
. De-emphasis: Standard CCIR plug-in networks are available.
. Power Input: Units designed for 12, 24 or 28 VDC are available.
. Diversity Operation: Manual and automatic diversity operation can be supplied with post detection combining.
. Subcarrier Demodulators: Available to meet customer needs.



The photos on this page show three packaging options available for the FMR series. They are available in L, S, C or X-band and have low thermal and intermodulation noise characteristics. They are wideband, phase equalized and can provide distortion-less baseband signals of up to 12 MHz.



Receivers intended for mounting in standard 19″ relay racks require 5¼″ of panel height. The unit illustrated above is shown in a bench type instrument case, which is an optional extra.



RHG's complete line of FM receivers are also available for airborne applications. They are packaged in B1D1 size standard "ATR" cases with built-in cooling. They utilize shock mount tray MS91405-B1D1 (not supplied).

SYSTEM PERFORMANCE CONSIDERATIONS

Wn individual transmitters or receivers are ordered, RHG utilizes a suitable lbratory standard mating test receiver or transmitter to perform final test on tl unit.

When a transmitter-receiver combination is ordered, RHG will perform applicle system tests on the units, as well as individual tests. These tests are cdducted with the transmitter and receiver connected by suitable attenuators tprovide a received signal level of −40 dbm nominal.

ypical fidelity characteristics are as follows:

TTESTS: (Std. 525 line pre and de-emphasis utilized)

Ung std. test signals per EIA RS-170

D. gain: ±0.25 db
D. phase: ±0.5°
Veo Signal to noise: 58 db p-p/rms (EIA weighting)
Veo Signal to hum: 50 db

NPR TESTS: (Using Marconi noise loading test set TF2091 & TF2092)
At baseband loading of 4 MHz. providing p-p deviation of 8 MHz, typical NPR is −40 db at the midband slot.

HARMONIC DISTORTION:
Single tone harmonic distortion, measured over this system baseband, at rated deviation is typically <2%.

INTERMODULATION (Two tone):
Utilizing two signals, each producing one-half the rated deviation, and producing in band 2nd and 3rd order products, these products are typically greater than 40 db down.

SPECIAL TESTS:
Any special testing requested to document some particular or unusual aspect of performance can be performed on a complete system, or an individual receiver or transmitter. RHG engineering personnel are available to discuss these requirements when applicable.

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NEW YORK 11735 (516) 694-3100

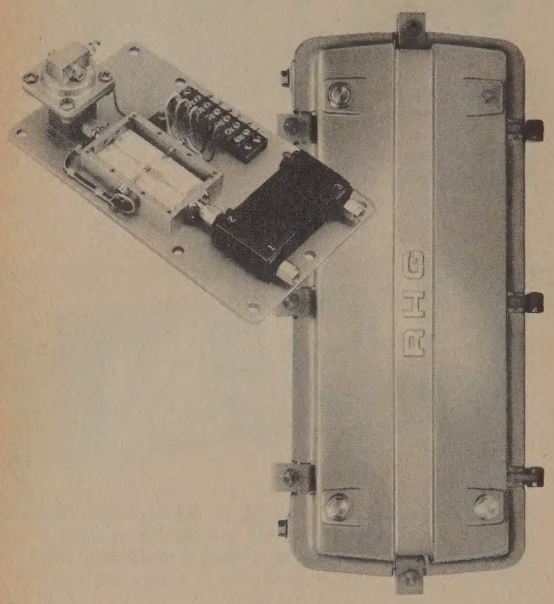
RHG

MIC MICROWAVE PRODUCTS

NEW FROM RHG

UNCOOLED PARAMETRIC* AMPLIFIERS

- Low Cost
- Unique Double Balanced* Design
- Single & Multistage
- "Gunn" Oscillator



The amplifier is an all solid state design fabricated on an alumina substrate. The circuit employs four varactor diodes in a double balanced ring resulting in wide bandwidth and minimum phase nonlinearity and IM distortion.

A cavity stabilized "Gunn" diode oscillator with a PIN diode leveling loop is used as a pump source. This results in improved gain stability and the lowest FM & AM noise. To provide additional gain stabilization, all critical components are mounted on a temperature stabilized base plate.

For outdoor operation, the entire assembly is housed in a rugged weatherproof housing. Rack mounted models for controlled environments provide similar electrical performance at some reduction in cost.

Model No.	In Band of (Freq. GHz)	Instant. Bandwidth (MHz)	Stages	Gain (db)	Noise Figure (db)
PAR1.5/1	1.4 to 1.6	200	1	17	1.6
PAR2.0/1	1.9 to 2.3	200	1	20	1.8
PAR2.0/2	1.9 to 2.3	350	2	20	1.8
PAR3.7/1	3.7 to 4.2	80	1	17	2.4
PAR3.7/2	3.7 to 4.2	500	2	17	2.2
PAR4.4/1	4.4 to 5.0	90	1	17	2.5
PAR4.4/2	4.4 to 5.0	450	2	20	2.5
PAR7.0/1	7.0 to 8.0	275	1	17	3.5
PAR7.0/2	7.0 to 8.0	475	2	20	3.5

NOTES:

1. Input/Output Impedance: 50Ω at VSWR $\gtrsim$1.5
2. Output Capability: $\geqq$−10 dbm at 1 db compression
3. All models operate from 115V 47-400 Hz.

OPTIONS:

1. Packaging: For 19" rack mount, add suffix "RM"
   For outdoor mounting, add suffix "OM"
   (Weatherproof −20 to +55°C operation)

*patent pending

PARAMETRIC AMPLIFIERS—General Information

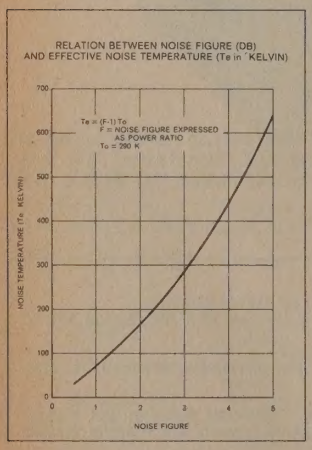
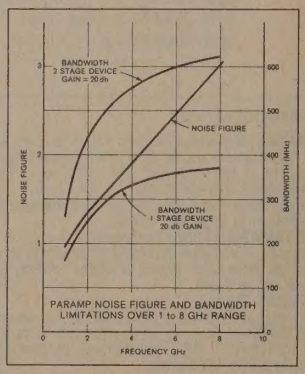


FIG. 1

FIG. 2



Advantages of Double Balanced Design: The RHG design does not use bandpass or bandstop filters to isolate the key frequencies of interest (i.e., pump, signal, and idler). Because of this, the phase and amplitude characteristics of the amplifier are determined solely by the varactor diodes and not by the critical placement of filter poles or zeros. Separation of the pump, signal, and idler frequencies in the RHG paramps is obtained by the use of a ring connection of four diodes in a double balanced configuration. This is a unique design feature and a patent application has been filed.

Low IM Distortion: The use of four varactor diodes, instead of one, results in a 6 db improvement in the 1 db saturation point—with a corresponding significant reduction in IM products.

Improved Stability: The majority of standard RHG paramps contain two relatively low gain ($\simeq$10 db) stages in cascade. This results in the best signal phase and amplitude stability with respect to changes in pump power or frequency.

Noise Figure: Figure No. 1 is a graph of noise figure versus effective noise temperature. In general, the noise figure of a parametric amplifier is not related to bandwidth and cannot be improved merely by narrowing the passband. However, it can be lowered by either pumping at a higher frequency or by employing cooling with both these alternatives adding to the cost.

The products listed above tell a small part of the story about RHG's growing capability in microwave integrated circuitry (MIC). Drawing on its diversified experience in the receiver field, RHG will custom engineer a "front end" subassembly to your specifications. For example, preselector, isolator, and mixer-preamplifier may be packaged on a single substrate. Contact RHG's nearest Sales office or call direct for assistance.

MIC MICROWAVE PRODUCTS

RHG

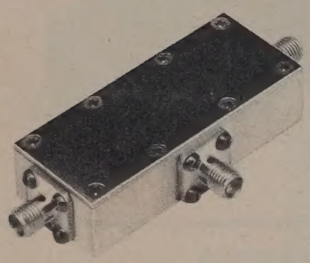
NEW FROM RHG

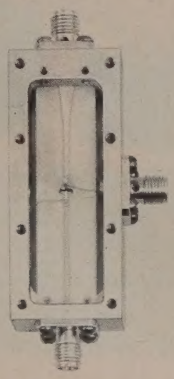
DOUBLE-BALANCED MIXERS*

• Multi-Octave Bandwidths • 0.5 to 12 GHz
• Low IM • Alumina Substrate

LTI-OCTAVE MIXERS

y wide band coverage in a single mixer has been achieved ough the use of a unique double balanced microwave con- uration.* Excellent noise performance is maintained over sev- l octaves along with low intermodulation distortion and high lation.





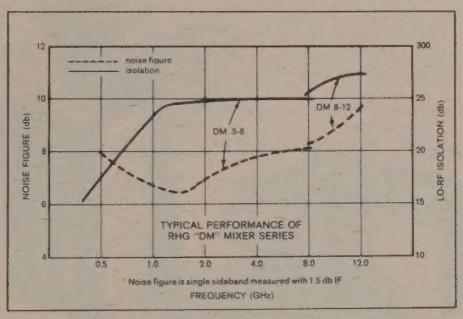
TAVE MODELS

odel No.	Freq. (GHz)	LO-RF Isolation (db)	N.F. (1) (db)	Price
M .5-1	0.5 to 1.2	>18	8.0	$295
M 1-2	0.8 to 2.2	>25	7.2	295
M 2-4	1.8 to 4.2	>25	7.5	295
M 4-8	3.7 to 8.2	>25	8.2	325
M 8-12	7.8 to 12.2	>25	10.0	345

LTI-OCTAVE MODELS

M .5-8	0.5 to 8.0	>18	8.5	375
M 1-4	1.0 to 4.0	>25	7.5	325
M 1-8	1.0 to 8.0	>20	8.5	345
M 1-12	1.0 to 12.0	>20	10.0	425
M .5-12	0.5 to 12.0	>18	10.0	450

TES:
Based on 1.5 db IF noise figure.
RF & LO VSWR: 2.0:1.
.0 injection: +5 to +10 dbm.
Connectors: OSM all ports (for feed thru terminal at IF output—add Suffix "PT"—no charge).



atent pending

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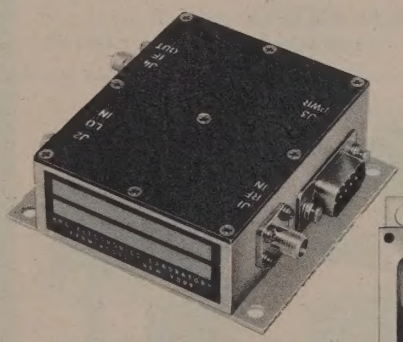
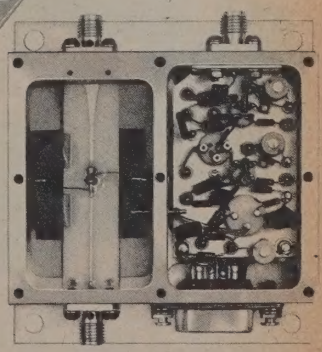
andard preamplifiers are available with any of the mixers listed ove. To order specify mixer model number and add appropriate ffix for preamp desired.

DOUBLE BALANCED MIXERS* with PREAMPS





ANDARD MODELS

Preamp Suffix	Cent. Freq. (MHz)	Bandwidth (MHz Min.)	RF-IF Gain (db Min.)	N.F. Increment (db)	Cost Increment
9KK	10	2	25	0.5	$350
9C	30	10	25	0.5	300
9A	60	10	25	0.5	300
9B	60	20	25	0.5	300
9JJ	70	30	20	0.5	325
9BB	120	40	20	1.0	350
9EE	160	60	20	1.0	375
9GG	10 to 150		20	1.5	395

YBRID IC MODEL

10HH	10 to 200MHz	20 db	1.5	450

TES:
Output Capability: ≥0 dbm at 1 db compression.
Power Requirements: 12V at 30 ma (typical).
IF Connector: OSM
Overall Size: 2¼ x 2¾ x 1 (plus connectors).
Noise Figure: For mixer-preamp combination, add noise figure increment to value shown for mixer.
Price: For mixer-preamp price, add increment for preamp to cost shown for mixer.

RHG

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FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

RHG

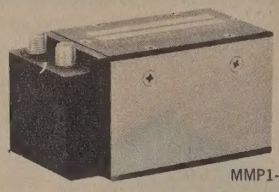
MIXER PREAMPLIFIERS

■ 0.1 to 40 GHz ■ NOISE FIGURES TO 6DB ■ RFI PROTECTION

MINIATURE COAXIAL SERIES

• 1.5 cubic inches • 2.5 ounces

MMPI-2/6A



MMP1-2/5B

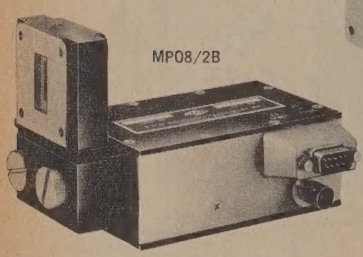
The MMP1-2/6A ultraminiature model occupies 1.5 cubic inches, weighs only 2½ ounces and requires less than 1/20 watt of power. Its companion, the MMP1-2/5A standard miniature model, is packaged in 4.5 cubic inches and weighs 6 ounces.

RF Band & Price	Std. Min. Model No.	Ultramin. Model No.	IF Freq/BW	N.F. (db)
L BAND	MMP1-2/5A	MMP1-2/6A	60-10	7.2
1.0-2.0 GHz	MMP1-2/5B	MMP1-2/6B	60-20	7.2
MMP/5 Series $595	MMP1-2/5C	MMP1-2/6C	30-10	7.2
MMP/6 Series $665	MMP1-2/5D	MMP1-2/6D	70-10	7.2
S BAND	MMP2-4/5A	MMP2-4/6A	60-10	7.7
2.0-4.0 GHz	MMP2-4/5B	MMP2-4/6B	60-20	7.7
MMP/5 Series $595	MMP2-4/5C	MMP2-4/6C	30-10	7.7
MMP/6 Series $665	MMP2-4/5D	MMP2-4/6D	70-10	7.7
C BAND	MMP4-8/5A	MMP4-8/6A	60-10	8.5
4.0-8.0 GHz	MMP4-8/5B	MMP4-8/6B	60-20	8.5
MMP/5 Series $625	MMP4-8/5C	MMP4-8/6C	30-10	8.5
MMP/6 Series $695	MMP4-8/5D	MMP4-8/6D	70-10	8.5

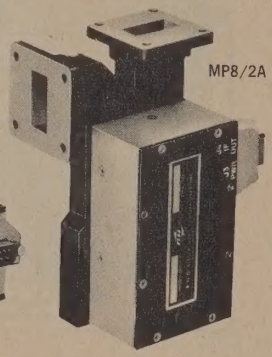
NOTES:
1. Gain: 25 db min.
2. LO Injection: +3 dbm (typ)
3. LO-RF Isolation: 6 db (typ)
4. Input VSWR: 1.5/1 (typ)
5. Supply voltage: +12 VDC

WAVEGUIDE SERIES

• Hybrid and Crossed-Field • Premium Diodes



MPO8/2B



MP8/2A

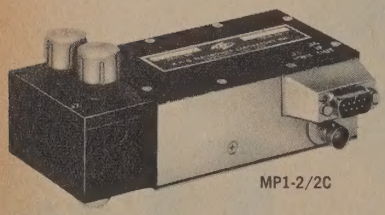
The waveguide series of mixer-preamps consist of a low-noise all-silicon preamplifier, integrated with either a short-slot hybrid mixer or a crossed-field mixer. Frequency coverage from X through K-band is provided.

RF Band & Price	Hybrid Model No.	Crossed Field Model No.	IF Freq/BW	N.F. (db)
X BAND	MP7/2A		60-10	MP Series
7.5-8.5GHz	MP7/2B		60-20	7.2 db
MP Series $625	MP7/2C		30-10	MPO Series
	MP7/2D		70-10	8.0
X BAND	MP8/2A	MPO8/2A	60-10	MP Series
8.5-9.6 GHz	MP8/2B	MPO8/2B	60-20	7.3
MP Series $540	MP8/2C	MPO8/2C	30-10	MPO Series
MPO Series $540	MP8/2D	MPO8/2D	70-10	8.0
X BAND	MP9/2A	MPO9/2A	60-10	MP Series
9.5-10.2 GHz	MP9/2B	MPO9/2B	60-20	8.0
MP Series $645	MP9/2C	MPO9/2C	30-10	MPO Series
MPO Series $595	MP9/2D	MPO9/2D	70-10	8.7
K BAND		MPO10/2A	60-10	9.5 db
8.0-12.0 GHz		MPO10/2B	60-20	9.5 db
Price $895		MPO10/2C	30-10	9.5 db
		MPO10/2D	70-10	9.5 db
K BAND		MPO15/2A	60-10	9.8 db
12.0-18.0 GHz		MPO15/2B	60-20	9.8 db
Price $895		MPO15/2C	30-10	9.8 db
		MPO15/2D	70-10	9.8 db

NOTES:
1. Gain: 25 db Min.
2. LO Injection: 0 to +3 dbm
3. LO-RF Isolation: 12 db (Hybrid) 20 db (crossed field)
4. Input VSWR: 1.25/1 (Hybrid) 3/1 (crossed field)
5. Supply Voltage: +12 VDC

COAXIAL SERIES

• 32 Models • Low Noise Figure



MP1-2/2C

MPX1-2/2D

This series consists of dual crystal balanced hybrid mixers, electrically and mechanically integrated with low-noise all-silicon preamplifiers. The preamplifier portion of the units is available in two sizes as shown in the photos.

RF Band & Price	Std. Size Model No.	Min. Size Model No.	IF Freq/BW	N.F. (db)
UHF BAND	MP5-1/2A	MPX5-1/2A	60-10	8.8 db
0.5-1.0 GHz	MP5-1/2B	MPX5-1/2B	60-20	8.8 db
MP Series $525	MP5-1/2C	MPX5-1/2C	30-10	8.8 db
MPX Series $575	MP5-1/2D	MPX5-1/2D	70-10	8.8 db
L BAND	MP1-2/2A	MPX1-2/2A	60-10	7.5 db
1.0-2.0 GHz	MP1-2/2B	MPX1-2/2B	60-20	7.5 db
MP Series $495	MP1-2/2C	MPX1-2/2C	30-10	7.5 db
MPX Series $545	MP1-2/2D	MPX1-2/2D	70-10	7.5 db
S BAND	MP2-4/2A	MPX2-4/2A	60-10	7.8 db
2.0-4.0 GHz	MP2-4/2B	MPX2-4/2B	60-20	7.8 db
MP Series $495	MP2-4/2C	MPX2-4/2C	30-10	7.8 db
MPX Series $545	MP2-4/2D	MPX2-4/2D	70-10	7.8 db
C BAND	MP4-8/2A	MPX4-8/2A	60-10	8.0 db
4.0-8.0 GHz	MP4-8/2B	MPX4-8/2B	60-20	8.0 db
MP Series $545	MP4-8/2C	MPX4-8/2C	30-10	8.0 db
MPX Series $595	MP4-8/2D	MPX4-8/2D	70-10	8.0 db

NOTES:
1. Gain: 25 db Min.
2. LO Injection: 0 to +3 dbm
3. LO-RF Isolation: 6 db (typ.)
4. Input VSWR: 1.5/1 (typ.)
5. Supply Voltage: +12VDC (MP Series) +6VDC (MPX Series)

MODIFICATIONS

1. RFI Protection: Standard on MPX and MMP series, $50 additional on all other units.
2. High Power Preamps: Providing +20 dbm output capability are available most models.

LOWER NOISE UNITS

Noise figures shown are single sideband, and represent typical performance for production units. Lower noise units, especially for spot RF frequencies can be supplied on special order. The use of "super-premium" diodes and/or transistors will generally result in improved noise figure. An AIL-type 70 Hot-Cold noi standard assures accuracy. Noise figures under 6.0 db have been achieved special designs.

SEND FOR CATALOG MP102A—OR CONTACT FACTORY FOR "SPECIALS" WHICH MA ALREADY BE IN OUR DESIGN FILE.

MIXER PREAMPLIFIERS

RHG

■ *IF BANDWIDTHS TO 240 MHz* ■ *PHASE MATCHING TO 5°* ■ *HOT CARRIER DIODES*

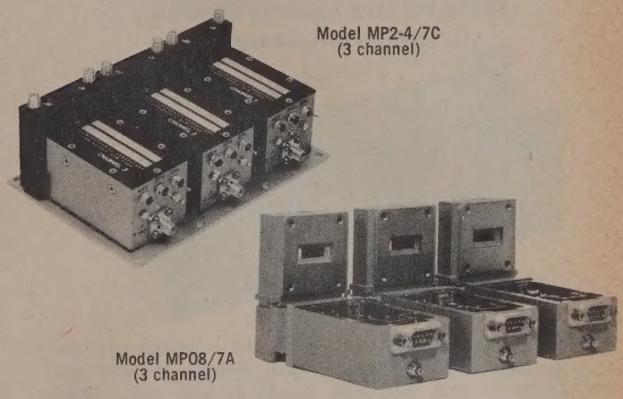
COAXIAL SERIES

RF Band & Price	Model No.*	IF Freq/BW	N.F. (db)
L BAND	MMP1-2/7A	60/10	8.2
1.0-2.0 GHz	MMP1-2/7B	60/20	8.2
Price $725	MMP1-2/7C	30/10	8.2
per channel	MMP1-2/7D	70/10	8.2
S BAND	MMP2-4/7A	60/10	8.7
2.0-4.0 GHz	MMP2-4/7B	60/20	8.7
Price $725	MMP2-4/7C	30/10	8.7
per channel	MMP2-4/7D	70/10	8.7
C BAND	MMP4-8/7A	60/10	9.5
4.0-8.0 GHz	MMP4-8/7B	60/20	9.5
Price $775	MMP4-8/7C	30/10	9.5
per channel	MMP4-8/7D	70/10	9.5
WAVEGUIDE SERIES			
X BAND	MP08/7A	60/10	9.0
8.5-9.6 GHz	MP08/7B	60/20	9.0
Price $775	MP08/7C	30/10	9.0
per channel	MP08/7D	70/10	9.0
K BAND	MP010/7A	60/10	10.5
8.0-12.0 GHz	MP010/7B	60/20	10.5
Price $1095	MP010/7C	30/10	10.5
per channel	MP010/7D	70/10	10.5

NOTES:
1. Gain: 20 db min (all models)
2. Gain and phase trim std.
3. AGC: 20 db (min)
4. Phase matching ±5°
5. Gain matching ±1.0 db
6. Matching held over AGC of 20 db and temp of −30 to +71°C
7. LO injection: 0 to +3 dbm
8. Power: +12 VDC @ 40 ma (typ)
9. Xtal current monitoring provided.

GAIN AND PHASE MATCHED MODELS

• 5° and 1 db matching • Coax and waveguide



Model MP2-4/7C (3 channel)

Model MP08/7A (3 channel)

This series offers the user a wide range of standard models for monopulse, phased array, and other applications where precise matching over temperature and AGC range is needed. Specifications apply to two and three channel devices. To order, specify model no. and number of channels.

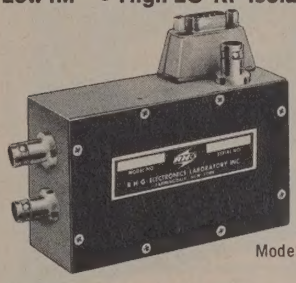
DOUBLE BALANCED AMPLIFIERS

RF Band & Price	Model No.	IF Freq/BW	N. F. db Typical
0.1 to 1.0 GHz Price $595	DMP/8A	60/10	100- 200 <8.5
	DMP/8B	60/20	200- 500 <9.0
	DMP/8C	30/10	500- 800 <10.0
	DMP/8D	70/10	800-1000 <11.0

NOTES:
1. LO injection: +5 dbm
2. RF-LO isolation: 30 db min
3. RF-IF gain: 20 db min
4. Output: <0.5 compression @ +10 dbm
5. Connectors: BNC
6. Size: 4x2⅜x1⅜ plus connectors

DOUBLE BALANCED MIXER PREAMPS

• Low IM • High LO-RF Isolation



Model DMP/8B

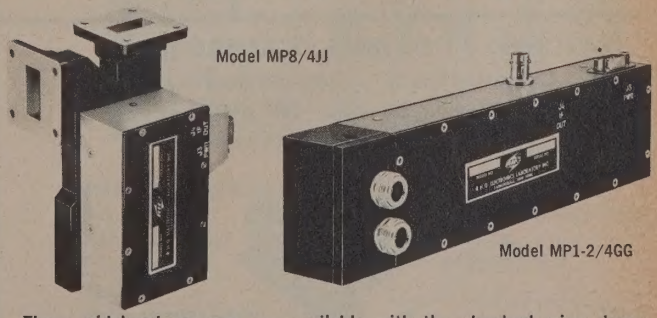
This series offers the user wideband high performance and are ideal as the second converter in double conversion systems.

Preamp Type	Cent. Freq. (MHz)	Band Width (MHz min.)	RF-IF Gain (db min.)	[1]Additional N.F. (db)	[1]Additional Cost
4KK	10	2	25	0	$ 50
4LL	20	6	25	0	50
4AA	60	40	25	0.5	100
4JJ	70	30	25	0.5	75
4BB	120	40	25	1.2	150
4MM	130	60	20	1.5	175
4CC	150	100	20	2.0	250
4DD	160	40	25	1.5	150
4EE	160	60	20	2.0	200
4FF	238	50	20	2.0	225
4GG		10 to 150	30	5.0	295
4HH		10 to 250	20	6.0	345
4NN	200	100	20	2.5	295
4PP	300	20	20	2.0	250
4QQ	370	20	20	2.0	275
4RR	450	30	20	3.0	350

NOTES:
1. These increments must be added to the values shown in the table on the opposite page for mixer style delivered.
2. A complete line of standard matching post amplifier units is available. Refer to "EBT," "EVT" and "EST" series.

WIDEBAND AND SPECIAL PREAMPS

• IF Bandwidths to 240 MHz • IF Center Freq. to 450 MHz



Model MP8/4JJ

Model MP1-2/4GG

These wideband preamps are available with the standard mixer types shown on the opposite page. To order, replace suffix 2A, 2B, 2C, or 2D with the suffix shown in "TYPE" column. Virtually any other IF combination is available on request.

RHG

RHG ELECTRONICS LABORATORY, INC.

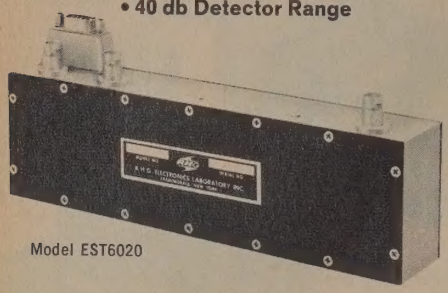
94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

RHG LINEAR IF AMPLIFIERS

■ *WIDE RANGE OF MODELS* ■ *GAIN AND PHASE MATCHED* ■ *MIL GRADE*

"SUPER" IF AMPLIFIER

• All Silicon • Closed Loop AGC
• Phase and Gain Matching Available
• 40 db Detector Range



Model EST6020

The "EST" Series is designed for use in military receiving systems requiring the utmost in performance and reliability. The units are built to comply with MIL-E-5400 and MIL-E-16400 and operate from −54°C to +71°C providing MTBF's in excess of 25,000 hours. Units may be obtained in gain and phase matched sets.

"EST" SERIES

Model	Center Freq. (MHz)	Band-width (MHz)	Rise-time (μsec)	Gain to IF (db)	Gain to Video (db)	Noise Figure (db)	Price
EST3002	30	2	0.50	80	90	2.5	$525
EST3004	30	4	0.25	80	90	2.5	525
EST3010	30	10	0.10	80	90	2.5	525
EST6004	60	4	0.25	80	90	2.5	525
EST6010	60	10	0.10	80	90	2.5	525
EST6020	60	20	0.05	80	90	2.5	545

NOTES:

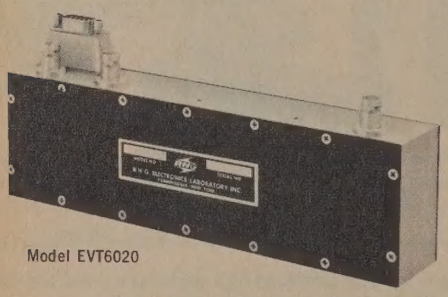
1. IF output capability >+13 dbm (1 V at 50Ω for <1 db compression
2. IF input and output: designed for 50Ω system. Input VSWR1.5:1 Nom.
3. Video output: emitter follower, direct coupled. Capability 5V into 93Ω
4. AGC: Closed loop provision built in with AGC delay to establish desired output level. Compression ratio 60 db in to 3 db out. AGC may be disabled and MGC will provide 60 db of manual control.
5. RFI protection consists of special filtered power connector assembly and RFI gasketing standard on all models
6. Power requirements: +12V at 160 ma (nom.), −12V at 160 ma (nom.)

STANDARD MODIFICATIONS

1. Units can be gain matched to ±2 db and phase matched to ±10° over 50 db AGC range. Add suffix "MAT" $200 additional per unit.
2. Wide Range Linear Detector—A new exclusive RHG detector circuit offering a linear detected output (±0.5 db over 30 db) is available. Add suffix "LD." $200 additional.

SOLID STATE

• All Silicon • IF and Video Outputs
• MIL Grade • Risetimes to 25 Nanoseconds



Model EVT6020

The "EVT" Series are all solid state, high gain amplifiers. They feature a high power IF output plus a low impedance detected output. They are capable of pulsed and CW amplification. Power required is +12 VDC at 100 ma.

"EVT" SERIES

Model	Center Freq. (MHz)	Band-width (MHz)	Rise-time (μsec)	Gain to IF (db)	Gain to Video (db)	Price
EVT1002	10	2	0.50	80	90	$395
EVT2004	20	4	0.25	80	90	395
EVT3002	30	2	0.50	80	90	325
EVT3004	30	4	0.25	80	90	325
EVT3010	30	10	0.10	80	90	325
EVT4510	45	10	0.10	80	90	395
EVT6010	60	10	0.10	80	90	325
EVT6020	60	20	0.05	80	85	345
EVT7010	70	10	0.10	75	85	345
EVT7030	70	30	0.03	60	70	495
EVT12020	120	20	0.05	65	75	525
EVT16040	160	40	0.025	60	70	795

NOTES:

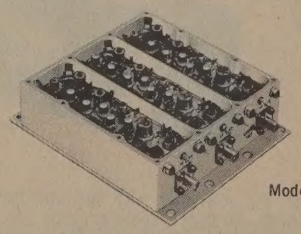
1. IF Output: +10 dbm (min.)
2. Video Output: +5 V into 93Ω
3. Gain control range of 50 db is obtained with 0 to −5 VDC (typical)
4. Low noise input with VSWR <2:1. Standard on all models from 30 to 70 MHz. (NF ≃ 4 db).

STANDARD MODIFICATIONS

1. Low Noise Mixer Input (for reversed mixer xtals): 2 connectors plus crystal monitors. Add suffix "M" $75.00 additional
2. RFI Protection: Includes power line filtering and RF gasketing. Add suffix "RFI" $50 additional

MATCHED 3 CHANNEL IF AMPLIFIERS

• Phase matched to 5° • Gain matched to 1 db
• Ultraminiature size • MIL grade



Model ETM3010

The "ETM" series provides three matched IF amplifier channels suitable for use in monopulse and similar applications. Its small size and low power drain make it ideal for airborne applications.

"ETM" SERIES

Model	Center Freq. (MHz)	Band-width (MHz)	Gain (db)	Rise-time (μsec)	Price
ETM3004	30	4	80	0.25	$2250
ETM3010	30	10	70	0.10	2250
ETM6010	60	10	70	0.10	2250
ETM6020	60	20	65	0.05	2350

NOTES:

1. AGC range: 50 db (min)
2. Tracking: Channels A and B will be within 5° and 1 db of Channel C over 50 db AGC range, and temperature of −30 to +70°C.
3. Input Impedance: 50Ω at VSWR <1.5:1
4. Output Impedance: Designed for 50Ω load
5. Output Capability: 0.5 VRMS (+6 dbm) at <1 db compression
6. Noise Figure: <10 db—low noise versions to 2.5 db available. Specify suffix "LN"—$100 additional.
7. Power: +12 V at 150 ma (typical)
8. Size: Approx. 7 cubic inches per channel

SEND FOR LINEAR IF BULLETIN IF103A OR LOG BULLETIN LA101A—OR CONTACT FACTOR FOR "SPECIALS" WHICH MAY ALREADY BE IN OUR DESIGN FILE.

LOGARITHMIC IF AMPLIFIERS

RHG

▪ TRUE LOG COMPRESSION ▪ FREQ. COVERAGE TO 200 MHz ▪ MIL AND MISSILE GRADE ▪ RISETIMES TO 10 NSEC. ▪ DYNAMIC RANGES TO 90 DB

", "LST" and "LLT" SERIES

("T" Series Supersedes Equivalent "LT" Models)

ndard odel	Miniature Model	Center Freq. (MHz)	BAND WIDTH (MHz)	RISE-TIME (μsec)	INPUT RANGE (db)	LT LST	LLT PRICE
1003	LLT1003	10	3	0.3	80	$695	$775
2005	LLT2005	20	5	0.2	80	695	755
3002	LLT3002	30	2	0.5	80	575	675
3004	LLT3004	30	4	0.25	80	575	675
3010	LLT3010	30	10	0.10	80	575	675
4510	LLT4510	45	10	0.10	80	695	775
6010	LLT6010	60	10	0.10	80	575	675
6020	LLT6020	60	20	0.05	80	625	695
7010	LLT7010	70	10	0.10	80	625	695
12040	.....	120	40	0.02	60	995	—
16020	.....	160	20	0.06	60	1250	—
16040	.....	160	40	0.03	60	1375	—
00100	.....	200	100	0.01	60	3500	—

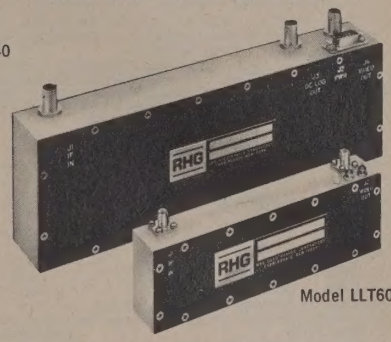
NOTES:
1. Input dynamic range (referenced to) dbm high end.
2. Video output 0.25 to 2.5V (typ) into 93Ω "LST" and "LLT" units direct coupled.
3. Linearity—±1 db over 60 db; ± db over 80 db.
4. Limited IF output tap—std on "LLT" and "LST".
5. Size: LLT—6 x 1¾ x 1 LST—8⅞ x 2⅜ x 1½ LT—9 11/16 x 3 x 1½.

OPTIONS:
1. RFI protection—includes power line filtering and RFI gasketed covers. (Not applicable to "LLT" series). Add suffix "RFI" $50 additional.

SOLID STATE

- Risetimes to 10 nanoseconds
- Center frequencies to 200 MHz
- Miniature and Standard Models

LT12040



Model LLT6010

These series offer the user high fidelity "logging" of wide dynamic signal ranges thru the use of successive detection and video summing.

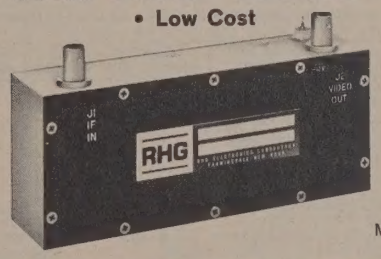
" SERIES

Model	Center Freq. (MHz)	Band-width (MHz)	Rise-time (μsec.)	Input Dynamic Range Volts	db	Price
L3002	30	2	0.5	250 μv to .25 v	60	$325
L3004	30	4	0.25	250 μv to .25 v	60	325
L3010	30	10	0.15	250 μv to .25 v	60	325
L6002	60	2	0.5	250 μv to .25 v	60	325
L6010	60	10	0.15	250 μv to .25 v	60	325

NOTES:
1. Input Impedance: 50Ω, VSWR 1.5 (typical)
2. Video output voltage: 0.2 to 2.0 volts into a 1KΩ load (typical)
3. Log accuracy: ±1 db over the dynamic range
4. Power required: —12 VDC @ 60 ma

SOLID STATE – ECONOMY

- Low Cost



Model LL6010

The "LL" series offers true log amplification in an economical package design. Features not required in all applications have been eliminated providing a low-cost high-quality design.

"SL" SERIES...The RHG Model TSL log test sets facilitate the specialized alignment and testing of log IF amplifiers.

Linearity: A dynamic test method permits adjustment of linearity while viewing a "plot" of signal input power versus output voltage on an ordinary oscilloscope (not supplied). Non-linearities can be measured to within ±¼ db. Front panel attenuator provides calibration.

Slope: A calibrated control provides settings from 10 to 100mv per db in 10 steps. A vernier provides non-calibrated continuous adjustments between steps.

Dynamic Range: Direct measurement is provided with a display showing the entire curve from "lift off" to saturation. A built-in source provides levels from +10 dbm to—90 dbm. A meter and screwdriver adjust provides calibration.

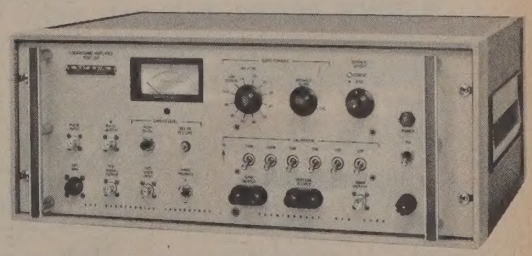
Pulse Response: An RF source capable of complete "turn off" and fast risetime (several RF cycles) is provided. This tunnel diode oscillator can be gated on and off by any standard pulse generator providing 10 volts or more. (Pulse generator not supplied.)

Matching*: An optional attachment permits two log amplifiers to be observed simultaneously, thus facilitating the matching of the units.

Modulation Check*: An optional attachment provides a modulated (constant percentage) RF signal which is swept, in amplitude, over the dynamic range. Variations in the demodulated output can be measured, providing a sensitive indication of the change of log slope over the dynamic range.

LOG AMPLIFIER TEST SET

- Rapid Dynamic Testing of Log Amplifiers



Additional Specifications

IF Frequency	30 or 60 MHz (10 to 100 MHz available on order)
Test Signal Range	+10 to —90 dbm
Power Available	±12 V at 250 ma for unit under test
Metering	Carrier level

Prices: Model TSL-30 (30 MHz) $3995
Model TSL-60 (60 MHz) $3995
Model TSL-XX (any freq. between 10 & 70 MHz) $4295

*Matching and modulation check options not included in price.

RHG

RHG ELECTRONICS LABORATORY, INC.

94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

MINIATURE COAXIAL COMPONENTS

COAXIAL FILTERS

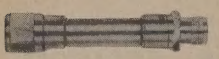
MINIATURE LOW PASS FILTERS

R L C Electronics' miniature low pass filters are available with cut-off frequencies ranging from 100 MHz to 5 GHz. These filters combine minimum insertion loss and low VSWR in the Pass Band, together with sharp skirt selectivity and high rejection in the Stop Band. This is accomplished by the utilization of multi-section, modern network design. Miniaturization of these units is accomplished by utilizing advanced coaxial techniques and optimum selection of materials. Both lumped constant and distributive techniques are utilized in the fabrication of these filters.

Model No.	Pass Band (MHz)	3 db Point (Typical) (MHz)	30 db Point (Typical) (MHz)	60 db (Min) Stop Band (MHz)
F-10-100	DC-100	125	150	180-500
F-10-200	DC-200	250	300	360-1000
F-10-300	DC-300	375	450	540-1500
F-10-400	DC-400	500	600	720-2000
F-10-500	DC-500	625	750	900-2500
F-10-600	DC-600	750	900	1080-3000
F-10-800	DC-800	1000	1200	1440-4000
F-10-1000	DC-1000	1250	1500	1800-5000
F-10-1500	DC-1500	1875	2250	2700-7500
F-10-2000	DC-2000	2500	3000	3600-10,000
F-10-3000	DC-3000	3750	4500	5400-15,000
F-10-4000	DC-4000	5000	6000	7200-20,000
F-10-5000	DC-5000	6250	7500	9000-25,000

Pass Band VSWR: 1.5
Pass Band Insertion Loss: 0.5 db max.
Power Rating: 25 watts average
Impedance: 50 ohms
Connectors: Type N, BNC, TNC, RSM *Male and female
Price: $60.00

MINIATURE HIGH PASS FILTERS



R L C Electronics' miniature high pass filters are available with cut-off frequencies from 100 MHz to 1000 MHz. These filters have no spurious response below the cut-off frequency. High dielectric materials and unique construction assure reliable operation for this miniature line of coaxial filters. Low VSWR and low insertion loss in the pass band are inherent in the design of these filters.

Model No.	Pass Band (MHz)	3 db Point (Typical) (MHz)	30 db Point (Typical) (MHz)	60 db (Min) Stop Band (MHz)
F-20-100	100-170	90	70	DC-50
F-20-200	200-340	180	140	DC-100
F-20-300	300-510	270	210	DC-150
F-20-400	400-680	360	280	DC-200
F-20-500	500-850	450	350	DC-250
F-20-600	600-1020	540	420	DC-300
F-20-800	800-1360	720	600	DC-400
F-20-1000	1000-1700	900	700	DC-500

Pass Band VSWR: 1.5
Pass Band Insertion Loss: 0.5 db max.
Power Rating: 25 watts average
Impedance: 50 ohms
Connectors: Type N, BNC, TNC, RSM *Male and Female
Price: $75.00

* To designate connector type, add suffix N, B(BNC), T(TNC), or R(RSM) to model number. (Example: F-20-100-R).

PRECISION LOW PASS FILTERS

R L C Electronics' precision low pass filters are available with cut-off frequencies ranging from 600 MHz to 12.4 GHz. These filters combine extremely sharp skirt selectivity and high rejection in the stop band, together with minimum pass band insertion loss, low VSWR and reasonable size. Extremely low pass band, VSWR and insertion loss are maintained by proper impedance matching of these filters. Sharp skirt selectivity is obtained by the utilization of multi-section modern network design. These filters incorporate extremely rugged features allowing them to be utilized in severe environments.

Model No.	Pass Band (MHz)	3 db Point (Typical) (MHz)	30 db Point (Typical) (MHz)	60 db (Min) Stop Band (MHz)
F-30-600	DC-600	630	720	810-3000
F-30-800	DC-800	840	960	1080-4000
F-30-1000	DC-1000	1050	1200	1350-5000
F-30-1500	DC-1500	1575	1800	2025-7500
F-30-2000	DC-2000	2100	2400	2700-10,000
F-30-3000	DC-3000	3150	3600	4050-15,000
F-30-4000	DC-4000	4200	4800	5400-20,000
F-30-5000	DC-5000	5250	6000	6750-25,000
F-30-6000	DC-6000	6300	7200	8100-30,000
F-30-7000	DC-7000	7350	8400	9450-35,000
F-30-8000	DC-8000	8400	9600	10,800-40,000
F-30-10.0	DC-10000	10500	12000	13,500-50,000
F-30-12.4	DC-12400	13000	14900	16,740-62,000

Pass Band VSWR: 1.35
Pass Band Insertion Loss: 0.5 db max.
Power Rating: 100 watts average
Impedance: 50 ohms
Connectors: Type N, BNC, TNC RSM *Male and Female
Price: $40.00

PRECISION HIGH PASS FILTERS

R L C Electronics' precision high pass filters are designed for operation over the frequency range of 1000 MHz to 10,000 MHz. Sharp rejection below the cut-off frequency and no spurious responses are assured in the use of these filters. Low insertion loss and low VSWR in the pass band are accomplished by the utilization of impedance matching and transforming end sections and combining them with precise coaxial fabrication. Rugged, lightweight construction makes the units suitable for extreme environmental conditions.

Model No.	Pass Band (MHz)	3 db Point (Typical) (MHz)	30 db Point (Typical) (MHz)	60 db (Min) Stop Band (MHz)
F-40-1000	1000-2000	900	700	DC-500
F-40-1500	1500-3000	1350	1050	DC-750
F-40-2000	2000-4000	1800	1400	DC-1000
F-40-3000	3000-6000	2700	2100	DC-1500
F-40-4000	4000-8000	3600	2800	DC-2000
F-40-5000	5000-10,000	4500	3500	DC-2500
F-40-6000	6000-12,000	5400	4200	DC-3000
F-40-8000	8000-16,000	7200	5600	DC-4000
F-40-10.0	10,000-18,000	9000	7000	DC-5000

Pass Band VSWR: 1.8 nominal
Pass Band Insertion Loss: .8 db max.
Power Rating: 100 watts average
Impedance: 50 ohms
Connectors: Type N, BNC, TNC RSM *Male and Female
Price: $75.00

MINIATURE TUBULAR BAND PASS FILTERS — BPF-500 series

R L C Electronics' miniature tubular band pass filters are designed for operation over the frequency range of 60 MHz to 4000 MHz. These fixed tuned filters are constructed utilizing 3 to 6 sections with 3 db bandwidths of 2, 5, 10 and 20% of center frequency. These filters utilize direct coupled sections and have a maximally flat (Butterworth) response. Outside of the pass band no spurious responses exist from DC to 12.4 GHz.

***VSWR:** 1.5 **Impedance:** 50 ohms
Connectors: Type N, BNC, TNC, RSM
Price: 3 Sections $ 75.00
4 Sections 90.00
5 Sections 110.00
6 Sections 130.00
Power Rating: 25 watts

MEDIUM POWER TUBULAR BAND PASS FILTERS — BPF-750 series

R L C Electronics' medium power tubular band pass filters are available with center frequencies from 60 MHz to 4000 MHz. These fixed tuned filters are fabricated utilizing either 3, 4, 5 or 6 sections with a variation of 3 db bandwidths from 2 to 20% of center frequency. There are no spurious responses of these filters from DC to 12.4 GHz. These filters utilize direct coupled sections for optimum response.

Price: 3 Sections $ 90.00
4 Sections 110.00
5 Sections 130.00
6 Sections 150.00
Power Rating: 50 watts

MINI-LOSS TUBULAR BAND PASS FILTERS — BPF-1250 series

R L C Electronics' mini-loss tubular band pass filters are capable of handling 200 watts of average power. These units utilize lo-loss components, which insure optimum selectivity and minimum loss in the pass band. They are constructed using 3 to 5 sections with 3 db bandwidths of 2 to 20%.

Price: 3 Sections $110.00
4 Sections 130.00
5 Sections 150.00
Power Rating: 200 watts

Model No.	3 db Bandwidths Center Freq. Range	2% (A) No. Sec.	2% (A) 40 db Bandwidth	2% (A) Pass Band Ins. Loss (in db)	5% (B) No. Sec.	5% (B) 40 db Bandwidth	5% (B) Pass Band Ins. Loss (in db)	10% (C) No. Sec.	10% (C) 40 db Bandwidth	10% (C) Pass Band Ins. Loss (in db)	20% (D) No. Sec.	20% (D) 40 db Bandwidth	20% (D) Pass Band Ins. Loss (in db)
BPF-500-( )-( )-( )-( ) †	60 to 4000 MHz	3	11%	3½	3	24%	3	3	48%	2	—	—	—
		4	7%	4	4	17%	3	4	34%	2½	4	66%	1½
		5	6%	4½	5	14%	3½	5	28%	2½	5	55%	1½
		6	5%	5	6	12%	4	6	24%	2½	6	50%	1½
BPF-750-( )-( )-( )-( ) †	60 to 4000 MHz	3	11%	2½	3	24%	2½	3	48%	1½	—	—	—
		4	7%	3	4	17%	2½	4	34%	1½	4	66%	1
		5	6%	3½	5	14%	2½	5	28%	1½	5	55%	1
		6	5%	3½	6	12%	2½	6	24%	1½	6	50%	1
BPF-1250-( )-( )-( )-( ) †	60 to 4000 MHz	3	11%	2	3	24%	1½	3	48%	1	—	—	—
		4	7%	2	4	17%	1½	4	34%	1	4	66%	½
		5	6%	2½	5	14%	1½	5	28%	1	5	55%	½

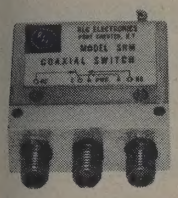
† **NOTE:** When ordering a filter, you must specify center frequency, 3 db bandwidth (A, B, C, D), number of sections (3, 4, 5, 6), and connectors (N, B(BNC), T(TNC) or R(RSM.
Example: BPF-500-60-C-5-T, i.e. — 60 MHz center frequency, 10% 3 db bandwidth, 5 sections with Type TNC connectors.

Special filters requiring closer tolerances, different frequency ranges, special connectors, higher power rating, etc. can be provided. Specifications subject to change without notice.

MINIATURE COAXIAL COMPONENTS

COAXIAL SWITCHES

EMOTE "MITI-MIN" OAXIAL SWITCHES

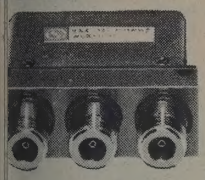


RLC Electronics' Remote "MITI-MIN" Coaxial Switch is of a single pole, two position type. The switch provides extremely high reliability, long life and excellent electrical performance characteristics over the frequency range of DC — 12.4 GHz. The characteristics of the switch feature extremely low insertion loss and extremely low VSWR over the entire frequency range and in addition, very high isolation over the same frequency range. The "MITI-MIN" package utilizes high density packaging techniques, hence the over-all volume of the switch is less than .75 cubic inch. Fail-safe operation is provided.

Model No.	Switch Type	Freq. Range	Insertion Loss	VSWR	Isolation	Power Rating RF	Impedance	Connectors—RF	Operating Voltage	Connectors—Power	Life	Switching Time	Weight	Price
SR-2 Min.	Single pole, two position	DC — 12.4 GHz	0.4 db max.	1.5 max.	60 db min.	50 watts, average	50 ohms	RSM Female	28 V dc at 200 ma nom.	Feed through solder lugs	1,000,000 cycles min.	20 milliseconds max.	2 oz.	$125 each

Add $25.00 for indicator

EMOTE OAXIAL WITCHES

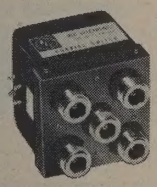


R L C Electronics' remote coaxial switches employ advance techniques to provide maximum performance, reliability and long life. These switches are of the single pole, two position type. Features of these switches include low VSWR and low insertion loss from DC to 12.4 GHz, as well as extremely high isolation over this extended frequency range. These switches are suitable for either laboratory or production use. The size, weight and reliability enhance its inclusion as an integral part of a complex system. An indicator circuit is available, if needed. Fail-safe operation is provided. **SR-2 Price $100.00.**

Add $25.00 for Indicator. Add $15.00 for AC operation.

Model No.	Switch Type	Freq. Range (GHz)	Insertion Loss	VSWR	Isolation	Power Rating, RF	Impedance	Connectors, RF	Operating Voltage	Connectors, Power	Life	Switching Time
SR-2 *-**	Single pole, two position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max	60 db min	50 watts average	50 ohms	Type N, TNC, BNC, RSM *Female	115 Vac at 90 ma nom** 28 Vdc at 300 ma nom**	Feed through solder lugs	1,000,000 cycles min	15 milliseconds max

EMOTE MULTI-POSITION OAXIAL WITCHES

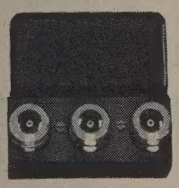


R L C Electronics' remote multi-position coaxial switches are precision assemblies, employing advanced RF techniques to provide maximum performance, reliability and long life. Features of these switches, include low VSWR and low insertion loss from DC to 12.4 GHz, as well as extremely high isolation over this extended frequency range. These switches are suitable for either laboratory or production use. The size, weight and reliability enhance their inclusion as an integral part of a complex system. An indicator circuit is available, if needed. Fail-safe operation is provided.

Model No.	Switch Type	Freq. Range GHz	Insertion Loss	VSWR	Isolation
SR-3-*-**	3 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max	60 db min
SR-4-*-**	4 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max	60 db min
SR-6-*-**	6 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max	60 db min

	SR-3	SR-4	SR-6
Price	$200.00	$240.00	$280.00
Add for Indicator	$30.00	$40.00	$60.00
Add for AC operation	$21.00	$28.00	$42.00

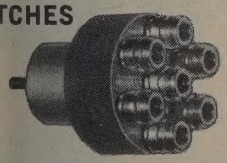
EMOTE MINIATURE OAXIAL WITCHES



R L C Electronics' remote miniature coaxial switches provide a small, compact switch with excellent microwave characteristics. These switches are of the single pole, two position type. Features of this switch include extremely low VSWR and insertion loss over the frequency range of DC to 3.3 GHz. Fail-safe operation is provided. This series of switches operates on DC only.
Price: CS-221 $30.00

Model No.	Switch Type	Freq. Range GHz	Insertion Loss	VSWR	Isolation
CS-221-*	Single pole, two position Break before make.	0 - 1 1 - 3.3	0.1 db 0.3 db	1.1 1.5	50 db 30 db

MANUAL COAXIAL WITCHES



R L C Electronics' manual coaxial switches employ precision mechanical assembly, together with advanced microwave techniques, to afford a highly reliable small, efficient coaxial switch. Standard switches are available in single-pole, two position; single-pole three position; single-pole four position; and single-pole six position. Features of the switch include low VSWR and low insertion loss from DC to 12.4 GHz and high isolation extended over this frequency range.

Price: SM-2- $100.00 SM-3- $150.00
SM-4- $160.00 SM-6- $170.00

Model No.	Switch Type	Freq. Range GHz	Insertion Loss	VSWR	Isolation
SM-2-*	2 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max.	60 db min
SM-3-*	3 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max.	40 db min
SM-4-*	4 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max.	40 db min
SM-6-*	6 position	0 - 7 7 - 12.4	0.3 db max 0.6 db max	1.25 max 1.6 max.	40 db min

ORDER TO ORDER
Specify model number of switch. Add suffix N, B(BNC), T(TNC), or R(RSM) for connector. Add suffix to designate operating voltage and suffix to add indicator circuit, if required. Thus SR-2-N-A-I is an SR-2 switch with an N connector, operating voltage of 115 Vac and equipped with an indicator circuit.

Special switches requiring closer tolerances, different frequency ranges, special connectors, higher power rating, etc. can be provided. Specifications subject to change without notice.

SPECIFICATIONS (ALL SWITCHES)

Impedance:	50 ohms
Life:	1,000,000 cycles, min.
Switching Time:	15 milliseconds, max.**
Power Rating:	50 watts average (except for CS 221, which is rated at 100 watts, average)
Connectors, RF:	Female N, TNC, BNC or RSM**
Operating Voltage:	115 Vac (specify suffix A)* 28 Vdc (specify suffix D)*
Indicator Circuit:	To specify, add I to model number.*
Connectors, Power:	Feed through solder lugs*

***APPLICABLE TO REMOTE SWITCHES ONLY** ****Except SR-2 MIN**

RLC ELECTRONICS INC.
83 Radio Circle, Mt. Kisco, N. Y. 10549
phone: 914/241-1334

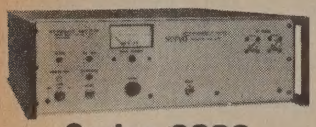
PRECISION MICROWAVE COMPONENTS

servo 4-BAND MICROWAVE SWEPT SIGNAL GENERATO

Model 404

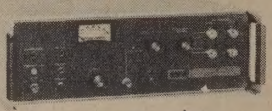
- Covers from 1.0 to 12.4 GHz in one continuous, automatic sweep
- Self-contained, built-in programmer, no plug-ins require
- Versatile, automatic/manual band selection
- Solid state, integrated circuit design
- Human-engineered with push-button controls for ease and speed of operation
- Compact package, only 10½" high

servo MICROWAVE TWT AMPLIFIERS



Series 2000

- 1.0 to 18.0 GHz frequency range
- Gain at least 30 dB
- 10 or 20-watt power output
- TWT thermal sensor
- Helix overload and current meter

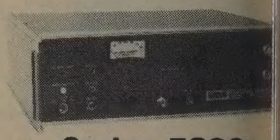


Series 3000

- Ultra-broad frequency range of 1.0 to 12.4 GHz in a single instrument
- 1-watt power output
- Pulse modulation capability
- Complete TWT protection

Series 4000

- 1.0 to 11.0 GHz frequency range
- 10-watt power output
- Pulse modulation capability
- Front panel gain and helix controls
- Excellent gain and phase stability



Series 5000

- NEW—All solid state power supply
- 1.0 to 12.4 GHz frequency range
- 1-watt power output

servo "SERVOMATIC"® SYSTEM ANALYZERS

Model 1999

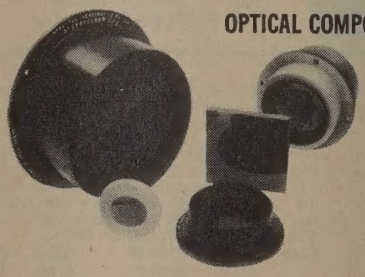
For design, analysis and production testing of complex servo-mechanisms and control systems

- Function Generator
- Internal Modulator
- Phase Shifter
- Precision Attenuator

All Combined In One Compact Instrument

servo INFRARED & ELECTRO-OPTICAL

OPTICAL COMPONENTS & SYSTEMS

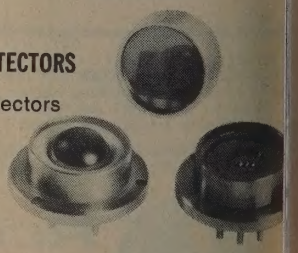


- Lenses
- Refractive Optical Systems
- Catadioptric Optical Systems
- IR Transmitting Materials

THERMISTOR BOLOMETER IR DETECTORS

- Immersed & Unimmersed Detectors
- Infrared Telescope Assemblies

For detection, measurement, analysis and control of IR radiation



servo

servo corporation of america

111 New South Road, Hicksville, N.Y. 11802 • 516-938-9700 • TWX 510-221-1872

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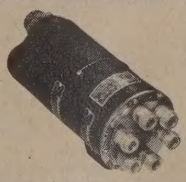
Transco Products, Inc. • 4241 Glencoe Ave. • Venice, Calif. 90291 • (213) 391-7291 • Telex 65-2448 • TWX 910-343-6469

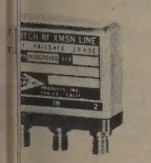
TYPE-Y was designed to meet the requirement for a small, lightweight, coaxial switch having good R.F. performance over a broad bandwidth (0-11 GHz) with million cycle reliability. Two independent solenoids allow make-before-break or break-before-make operation; both may be on or off simultaneously. Approx. size 4" X 2½" X 1".

TYPE-A coaxial switch weighs only 12 oz. - extremely light for a multi-position switch. It has a broad bandwidth, 0-11 GHz. Four independent solenoids allow complete control over make/break contact operation. All positions can contact simultaneously. Fail-safe is easily provided by solenoid selection. Approx. size: 3" X 3" X 4" high.

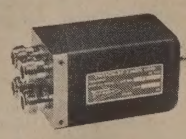
TYPE-D is a SPDT, 0-12.4 GHz, coaxial switch available with 3 actuators - LATCHING, FAIL-SAFE, and PULSE. In the TYPE-DS, solid state circuitry replaces all auxiliary contacts and provides a high input impedance for pulse operation; fail-safe but only .84 watts for holding. Connectors: N, TNC, OSM. Approx. size: 1" X 2¾" X 2" high.



TYPE-E and TYPE-EM are rugged, service proven switches which have been continually improved ...frequency to 12 GHz with over 60 db isolation and life to 100,000 operations. TYPE-E is motor actuated. TYPE-EM is manual. Switches qualified to MIL specifications with SA nomenclatures. Approx. size: dia. 3", length E - 7" and M - 3".

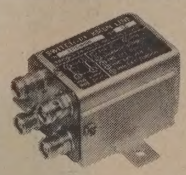


TYPE-DT is a SPDT, 0-12.4 GHz, coaxial switch for small connector types. It offers the following choices: (1) TNC or SMA connectors, (2) latching or fail-safe, (3) 28 VDC or 115 VAC, and (4) with or without indicator circuits. 1,000,000 operation reliability. All this flexibility in about 2 cubic inches, 5 oz. Approx. size: 5/8" X 1¾" X 1¾" high.



TYPE-H is a coaxial transfer switch with excellent R.F. performance thru 12.4 GHz. Options: TYPE-N or other connector types, LATCHING ...with PM latch or FAIL-SAFE...rotary solenolid, 28 VDC or 115 VAC, with or without indicator circuits. Features: high isolation, 60 db, and high vibration spec., 20 g's. Approx. size: 1¾" X 1¾" X 2½" to 3¼".

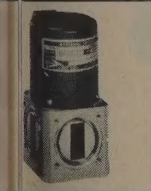
TYPE-DO is a micro size coaxial switch with excellent R.F. performance from D.C. to 18 GHz. It is the result of Transco's fast reaction to meet the need of the ECM industry for extended frequency in less than 1 cubic inch with state-of-the-art R.F. performance and reliability of one million actuations Approx. size: ½" X 1¼" X 1" high.



TYPE-HT is a very small, lightweight, 0-12.4 GHz, coaxial transfer switch for connector types TNC or smaller. Available LATCHING or FAIL-SAFE, It has the same features and options as the TYPE-H. The latching is a 2 coil rotary design with PM latch. The fail-safe is a one coil rotary solenoid design. Stringent environmental specifications. Approx. size: 1¼" X 1½" X 2".

TYPE-MO is a six-position, up to 18 GHz coaxial switch designed for Type-SMA connectors. Each position has an individual solenoid. Switch is completely sealed, meets extreme environmental specifications, and is available with either a power connector or solder terminals. Life 1,000,000 operations minimum. Approx. size: 1½" dia. x 1½" + connectors.

TYPE-GV variable waveguide switch; fast, reliable switching...without blanking the transmitter. May be used as 3-port 2 position (SPDT) or as a power divider. (Five position power divider shown). See TYPE-GH for waveguide sizes available. Features: low VSWR and Insertion Loss with high reliability. Size related to frequency.



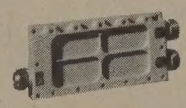
TYPE-GH are lightweight, 90° E-Plane switches available in WR-62, WR-90, WR-102, and WR-112. They are remote control, spring return, solenoid operated. Designed for use in a pressurized system, they feature: anti-bounce rotor braking device for more consistent switching action, printed circuitry, and switch position indicator. Size related to frequency.

TYPE-T11 is a blade antenna, UHF and L-BAND, aerodynamically shaped and qualified for high performance Mach 2-3 aircraft. The radiation pattern is omnidirectional for both UHF and L-BAND. Pattern shaping elements control patterns and improve horizon coverage. Filters and test probes are incorporated. Approx. size: 3½" X 7½" base, 8" high.

P/N 9C15300 is typical of broad-band, spiral antennas designed by Transco to meet customer requirements. It is a small, 2½" dia., light weight, 4 ounces, circular polarized antenna for receiving applications. Frequency is 2 to 12.5 GHz; VSWR is 2.0 max. Beamwidth is 60° to 95°. Beam squint is 5° max. Approx. size: 2½" dia. x 1½".

P/N 11C22900 shown is a 2200 to 2300 MHz monopole antenna for Mach 3 operation. The uniquely designed all metal blade is self supporting with no dielectric in the airstream above the mounting surface. Antenna also available in bands 1625 — 1675 MHz Collision Avoidance or 2750 — 2960 MHz Telemetry. Blade height: 1¼" approx.

P/N 90D10600 triplexer is a three channel multiplexer used to couple three transmitters to a common antenna. It provides at least 15 dB isolation between channels separated by 25 MHz in the telemetry band 2200 to 2300 MHz. Insertion loss is low, 1 dB max. VSWR is 1.5:1 max. within ± 1.0 MHz of each channel tuned center frequency. Approx. size: 5" dia. x 1¾".



TEEBRID is a 3-port hybrid with internal termination for in-phase power dividing or power combining, octave and multi-octave bandwidths. Unequal or equal power division (or combining) is independent of termination mismatch. All three ports are impedance matched. High R.F. power...stringent environmental specifications. Approx. size: 2" X 3½" X ¾".

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MICROWAVE ENERGY SOURCES

ISOLATOR 2620-1101

SPECIFICATIONS

ELECTRICAL
Frequency: 1.110 to 1.320 GHz.
Isolation: 20 db.
Insertion Loss: 1.2 db.
VSWR (Input and Output): 1.20 maximum.

ENVIRONMENTAL
Temperature: —40°C to +85°C.

PHYSICAL
Dimensions: 0.625" dia. x 6.25" long.
Weight: 4.0 oz.

ISOLATOR 2620-1102

SPECIFICATIONS

ELECTRICAL
Frequency: 1.365 GHz to 1.690 GHz.
Isolation: 20 db minimum.
Insertion Loss: 1.0 db maximum.
VSWR (Input and Output): 1.20 maximum.

ENVIRONMENTAL
Temperature: —40°C to +85°C.

PHYSICAL
Dimensions: 0.688" dia. x 5.25" long.
Weight: 4.7 oz.

RESONATRON 2970-1000

SPECIFICATIONS

ELECTRICAL
Frequency: Manual tuning range, 5.2-6.0 GHz.
Service: CW.
Power Output: <10 mW from 5.4-5.9 GHz, <5 mW from 5.2-6.0 GHz.
Power Input: 175 VDC @ 13 mA nominal, 14 mA maximum; 6.5 V @ 250 mA nominal, 270 mA maximum.
Frequency Stability: Temperature, 30 kHz/°C from —54°C to + 95°C; Ep 200 kHz/V; Efil 5 MHz/volt.

ENVIRONMENTAL
Shock: 100 g, 7 ms, 3 axis, <±1.0 MHz FM.
Vibration: 15 g peak, 20-2000 Hz, 3 axis, ±1.0 MHz FM.
Altitude Limit: 100,000 feet.

PHYSICAL
Dimensions: ⅞" dia. x 2" long (less projections).
Weight: 3 oz.
Output Connector: TNC female.
Output Coupler: Capacitive, adjustable.
TYPICAL USE: Local oscillator, parametric amplifier pump, harmonic generator driver.

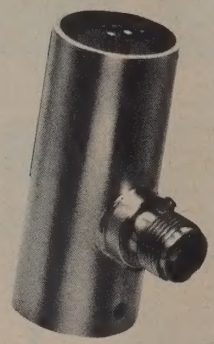
RESONATRON 9196-1009

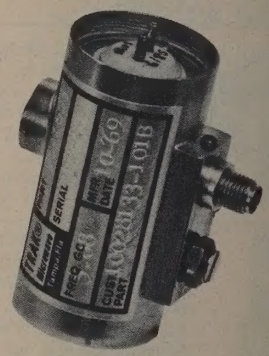
SPECIFICATIONS

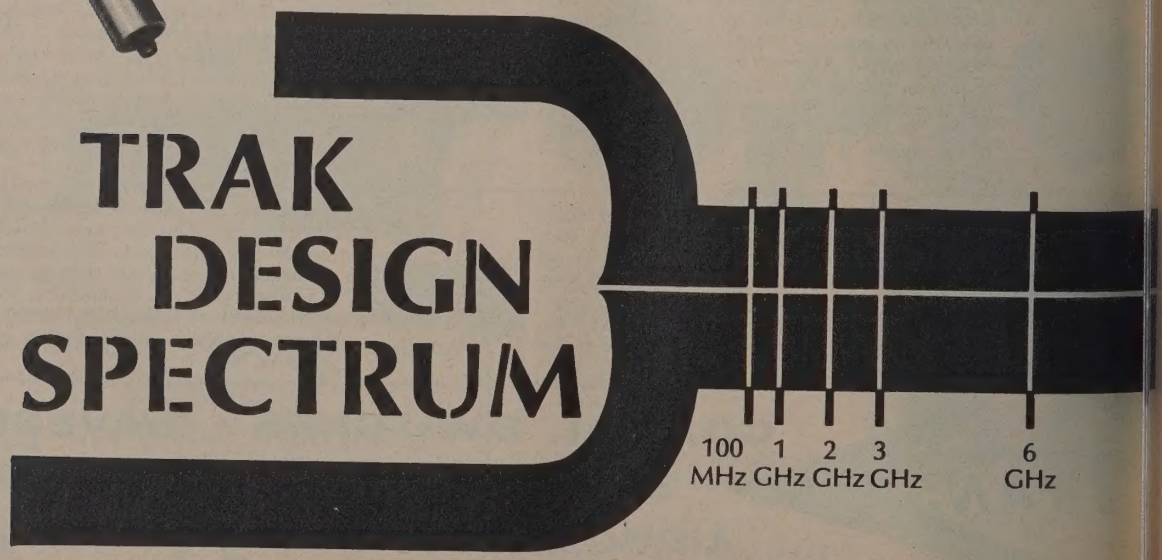
ELECTRICAL
Frequency: 5.4-5.9 GHz.
Service: Plate pulse.
Power Output: 500 watts peak minimum.
Power Input: 3 kV @ 2.5 amps; 6.3 V @ 550 mA nominal.
Frequency Stability: 30 kHz/°C from —40°C to ±95°C; Ep 6 kHz/V nominal; Efil 22 MHz/V nominal.
Pulse Width: 0.5-1.0 µs typical.
Rise Time: 50 ns nominal.
Fall Time: 50 ns nominal.
Fixed Delay: 50 ns nominal.
Jitter: <10 ns.
Duty Cycle: 0.001 maximum.

ENVIRONMENTAL
Shock: 100 g, 5 ms, 3 axis.
Vibration: 10-55 Hz, 0.1" D.A.; 55-2000 Hz, 20 g peak.
Acceleration: 100 g longitudinal 25 g any axis.

PHYSICAL
Dimensions: ⅞" dia. x 1 63/64" long (less projections).
Weight: 3 oz.
Output Connector: TNC female.
Output Coupling: Inductive, adjustable.
TYPICAL USE: Beacon, altimeter, transponder transmitter oscillator.







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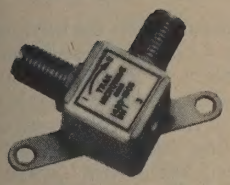
CIRCULATOR 1420-1903

SPECIFICATIONS

ELECTRICAL
Frequency: 8.88 GHz to 9.68 GHz.
Isolation: 20 db minimum.
Isolation Loss: 0.3 db maximum.
VSWR (Ports 1 and 2): 1.25 maximum.
Power Rating: 0.5 watts peak.

ENVIRONMENTAL
Temperature: —40°C to +100°C operating. —54°C to +125°C storage.

PHYSICAL
Dimensions: 0.50" x 0.60" x 0.56" (less projections).
Weight: 0.7 oz. maximum.



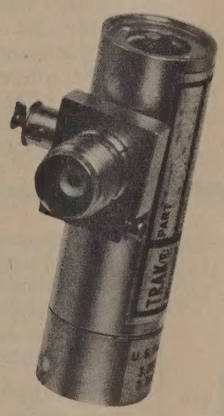
RESONATRON 9170-1018

SPECIFICATIONS

ELECTRICAL
Frequency: Manual tuning range, 8.5-9.6 GHz.
Service: Plate pulse.
Power Output: 25 watts minimum from 8.5-9.4 GHz; 10 watts minimum from 9.4-9.6 GHz.
Power Input: Modulator 1200 V @ 0.6 amps peak nominal; 6.3 V @ 0.3 amps nominal.
Frequency Stability: Temperature, ±6 MHz from —45°C to+95°C.
Pulse Width: 0.5 µs.
Rise Time: 25 ns.
Duty Cycle: 0.005.
Jitter: 10 ns.

ENVIRONMENTAL
Shock: 100 g, 7 ms, 3 axis.
Vibration: 15 g peak, 20-2000 Hz <±1 MHz FM.
Altitude Limit: None.

PHYSICAL
Dimensions: 11/16" dia. x 2 3/16" long (less projections).
Weight: 3 oz.
Output Connector: TNC female.
Output Coupling: Inductive, adjustable.
TYPICAL USE: Beacon transmitter oscillator, high altitude sounding rockets.



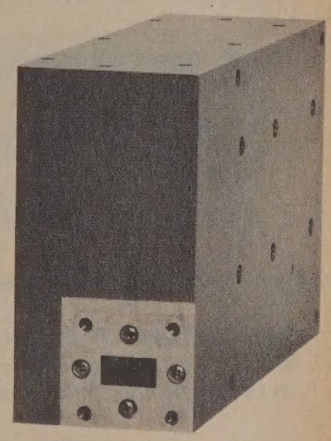
RESONATRON 6056-9200

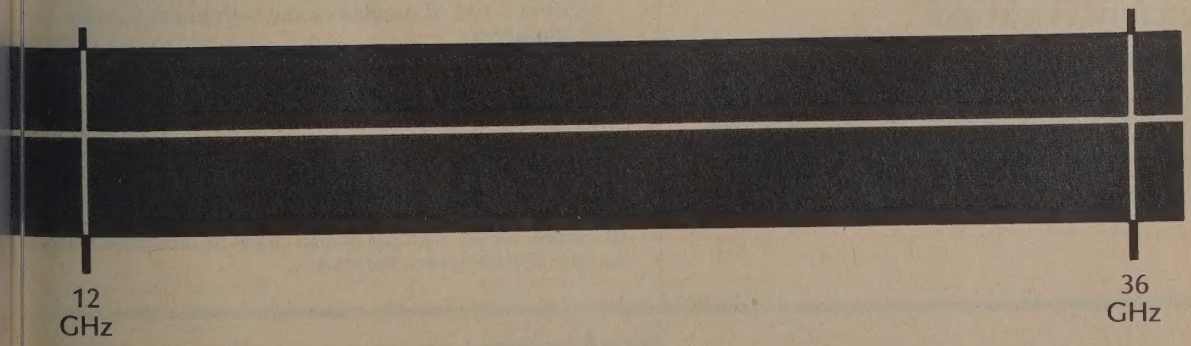
SPECIFICATIONS

ELECTRICAL
Frequency: 16.0 to 17.0 GHz.
Tuning: Electronic.
Input Voltage: —30 VDC.
Power Output: 5 mW to 15 mW.
Tuning Sensitivity: 250 MHz/volt.
Frequency Stability: 50 ppm/°C.
Spurious Response: 40 dbm nominal.

ENVIRONMENTAL
Temperature: —55°C to +85°C.

PHYSICAL
Dimensions: 5" x 1½" x 2¾" (less projections).
Output Connector: Waveguide.
TYPICAL USE: Local oscillator for frequency agility radar, signal generator, spectrum analyzer.





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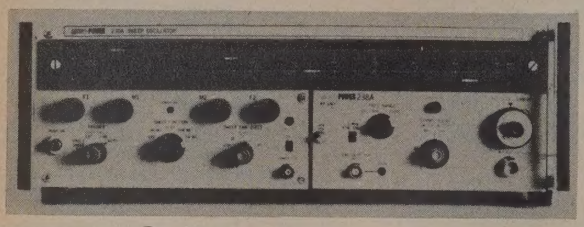
Microwave Instruments and Power Supplies

SOLID STATE MICROWAVE SWEEP OSCILLATOR Model 230A — 10 MHz to 18 GHz



- Single RF unit covers 10 MHz to 2 GHz, with leveled calibrated power.
- Very low residual FM and spurious signals.
- Internal, external and power meter leveling.
- Frequency accuracy of 0.25 to 0.5%.
- Multi-band sweeping.

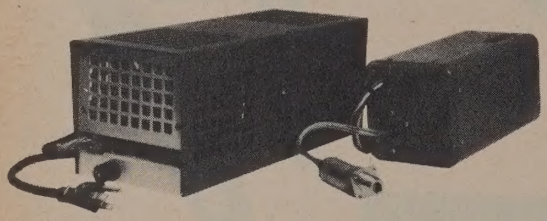
Our new 230A weighs less than 22 pounds, yet has the same high resolution tuning and uncrowded control panel as the 221 sweeper. Has higher output power and less frequency pulling than other solid state sweepers; is compatible with all network analyzer systems; has 0 to 100% calibrated symmetrical sweep width control, and analog programmability for both frequency and power.

MICROWAVE SWEEP OSCILLATOR Model 221 – 200 MHz to 110 GHz

- 2 ppm peak residual FM
- Extreme stability with line voltage change
- 0 to 100% calibrated Δ f control
- Solid state or BWO plug-ins from 0.2 to 40 GHz

This easy-to-operate sweep oscillator offers the advantages of solid state devices in the 1 to 4 GHz frequency ranges, while also accepting a wide choice of BWO plug-ins for frequencies up to 40 GHz. Most bands are available with either internal or external, grid or diode leveling. All oscillators offer power meter leveling for exceptionally flat response. FM rate is DC to over 5 MHz. Mm – wave version available to cover 40 to 110 GHz ranges.

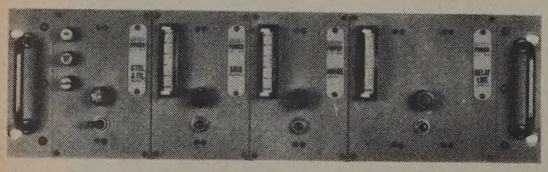
PROGRAMMABLE MICROWAVE SOURCE – Model 101 – 1.0 to 40 GHz in octave or waveguide ranges



- Voltage and/or resistance controlled source of microwave frequencies
- Programming speed 1 msec. for full band
- Linearity ±0.5% for full band
- For use in ground checkout equipment, production test stands, etc.

Use of the Model 101 eliminates the need for the systems engineer to select the proper BWO and then design and build the necessary power supplies and linearizing networks. Instead, it is only necessary to specify the required rf output. The input can be swept by any function, stepped or set at a fixed value. It can also be programmed through a digital to analog converter.

POWER SUPPLIES FOR MICROWAVE TUBES



- Modular power supplies for greater flexibility
- High regulation and stability (0.002% for line, 0.005% for load, 0.001 to 0.0001% ripple) for low incidental FM of oscillators and high phase stability of amplifiers
- All modules are 3½ in. or 5¼ in. rack-mounting units

Micro-Power power supply modules are available in a wide variety of outputs for powering BWO's, voltage tunable magnetrons, medium and high voltage klystrons, and TWT amplifiers. Choice of standard module combinations increases selectivity in matching supply characteristics to specific tube types and project requirements. Electrode supply voltages can be swept or otherwise varied at up to 20,000 volts/sec/mA.

For complete information on these products call your local Micro-Power field engineering office or contact

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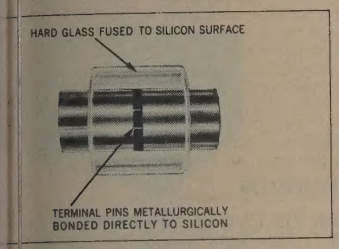
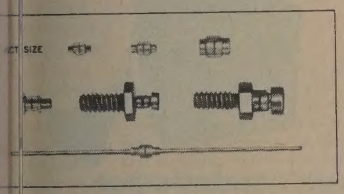
GH POWER **PIN MICROWAVE** SWITCHING DIODES



ique Unitrode package for the me makes it possible to use odes in high peak and average e applications. A hard-glass fused to the terminal pins and th periphery of the silicon chip ues ultimate reliability under e RF stress conditions.

A Family of PIN Diodes Designed for High Power, Low Loss Microwave Switching Applications from 2MHz to Above X-Band.

Applications are in high power Duplexers, Phase Shifters, Receiver Protectors, RF Attenuators and RF Modulators.



eal packaging, such as insulated d ribbon leads, and pills for pie, are also available.

- **Series resistance to 0.1 ohms; Total capacitance to 0.5 pf**
- **Low reverse loss at zero volts bias**
- **Low parasitic inductance from whiskerless construction**
- **Megawatt peak-power duplexing now economically feasible due to diode high-current capability (up to 1000 amps peak RF)**

POWER DISSIPATION	Part No.	PIV [1]	ELECTRICAL CHARACTERISTICS	
M 2000 Series 5 Watt average dissipation 5 KW peak dissipation for 1 μsec pulse	UM 2012 UM 2014 UM 2016 UM 2018 UM 2020	1200 1400 1600 1800 2000	Forward series resistance [2] Capacitance [3] Cutoff frequency Average thermal impedance	0.4 ohms max. 0.9 pf max. 300 GHz typ. 10°C/watt max.
M 4900 Series 0 watt average dissipation 00 KW peak dissipation for 1 μsec pulse	UM 4902 UM 4904 UM 4906 UM 4908 UM 4910	200 400 600 800 1000	Forward series resistance Capacitance Cutoff frequency Average thermal impedance	0.15 ohm max. 3.0 pf max. 200 GHz typ. 2°C/watt max.
M 6000 Series watt average dissipation 0 KW peak dissipation for 1 μsec pulse	UM 6002 UM 6004 UM 6006 UM 6010	200 400 600 1000	Forward series resistance Capacitance Cutoff frequency Average thermal impedance	0.7 ohms max. 0.5 pf max. 350 GHz typ. 20°C/watt max.
M 7000 Series 5 watt average dissipation 5 KW peak dissipation for 1 μsec pulse	UM 7002 UM 7004 UM 7006 UM 7008 UM 7010	200 400 600 800 1000	Forward series resistance Capacitance Cutoff frequency Average thermal impedance	0.4 ohms max. 0.9 pf max. 300 GHz typ. 10°C/watt max.

Note:
Leakage current at PIV at 25°C is 1 μa. max.
Series resistance R_s measured at 1 GHz and 500 ma bias current.

3. Total capacitance is measured at 1 GHz and zero reverse bias and remains relatively constant at all reverse bias levels at frequencies above 100 MHz.

Typical forward voltage drop at 500 ma is 1.0 volt for UM 2000 and UM 7000, 1.1 volt for UM 6000 Series, and 0.9 volt for UM 4900 Series.

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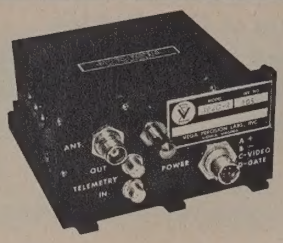
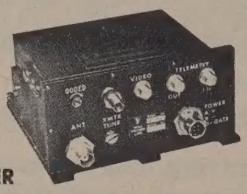


C-BAND RADAR TRANSPONDER

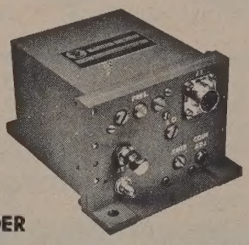
MODEL 302C-2 Freq: 5.4-5.9 GHz: **Receiver Type:** Superhet with sensitivity of - 70 dbm; **Transmitter Type:** Magnetron wity 400 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 43 cu. in.; **Weight:** 43 oz.; **Temp:** - 35° to + 75° C; **Altitude:** 230,000 ft.; **Humidity:** 100%; **Shock:** 125 g in any direction, 3 shocks in opposite directions along each axis for 6 μ sec each; **Acceleration:** 125 g applied along any axis for 3 minutes; **RFI:** Per MIL-I-26600. **Vibration:** sinusoidal, 5 to 25 Hz 0.4 in. DA and 15 g 15 to 2500 Hz.



S-BAND RADAR TRANSPONDER

MODEL 312S

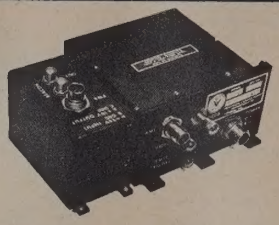
Freq: 2775 - 3000 MHz; **Receiver Type:** Superhet with sensitivity of -70 dbm; **Transmitter Type:** Triode cavity with 300 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 50 cu. in.; **Weight:** 47 oz.; **Temp:** -55° to +75° C; **Altitude:** 230,000 ft.; **Humidity:** 100% **Shock:** 125 g in any direction, 3 shocks in opposite directions along each axis for 6 μ sec each; **Acceleration:** 125 g applied along any axis for 3 minutes; **RFI:** Per MIL-I-26600; **Vibration:** sinusoidal, 5 to 25 Hz, 0.4 in. DA and 15 g 15 to 2500 Hz.



C-BAND RADAR TRANSPONDER

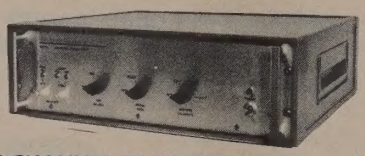
MODEL 321C

Freq: 5400-5900 MHz; **Receiver Type:** Superhet with sensitivity of - 70 dbm, 100% firing; **Transmitter Type:** Triode cavity with 300 w min. peak power outputs; **Input Power:** 24 to 32 VDC, 45 w; **Size:** 38 cu. in.; **Weight:** 44 oz.; **Temp:** -37° to +75° C.; **Altitude:** 230,000 ft.; **Acceleration:** 125 g; **Shock:** 125 g; **Vibration:** Sine, 5 to 25 Hz, 0.4 DA 25 to 2500 Hz, 15 g. **RFI:** Per MIL-I-26600.



TELESPONDER TELEMETRY SYSTEM

MODEL 603C is used in missile, satellite, drone, target and aircraft application as an enchancement device and telemetry system for a C-band tracking radar. The Model 603C telemetry system is designed to work in conjunction with Vega Models 202CD, 302CD transponders. The 603C telemetry system is comprised of two separate units: the Model 706-7 Seven Channel Telemetry Airborne Encoder and the Model 707-7A Seven Channel Telemetry Ground Demodulator. The 706-7 airborne unit is mated with the desired transponder whereas the 707-7A ground unit is mated with an appropriate C-band tracking radar, Model 706-7. **Encoder specs include: Telemetry Input Impedance:** 200,000 ohms min; **Telemetry Input Channels:** 1 to 7, serial or parallel combinations; **Telemetry Input Voltage:** 0.0 V to +5.0 VDC; **Sync Channels:** one; **Sampling Rates per Channel:** 80/sec. (160 prf); **Spacing Between Transponder and Telemetry Reply Pulse:** min. 50 μ sec., max. 137 μ sec.; **Accuracy of Voltage to Time Conversion:** ±1% of +5 v.



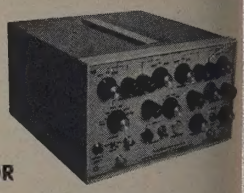
7-CHANNEL TELEMETRY DEMODULATOR

MODEL 707-7A is compatible for use with the FPS-16 and FPQ-6 radars and is an active portion of the ground readout system of the return pulse from a Vega transponder and 706-7A encoder. The demodulator outputs are suitable for readout onto a Model 1508 Minneapolis Honeywell Visicorder or for storage by a digital tape unit. The digital output for recording is a continuous serial binary train using either NRZ-M or NRZ-C format.

X-BAND RADAR TRANSPONDER

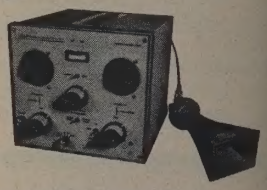
MODEL 319X

Freq: 9100 - 9600 MHz; **Receiver Type:** Superhet with sensitivity of -65 dbm; **Transmitter Type:** Magnetron with 400 w min. peak power output; **Input Power:** 22 to 32 VDC; **Size:** 43 cu. in.; **Weight:** 43 oz.; **RFI:** Per MIL-I-26600; **Humidity:** 100%; **Temp:** -35°to +75°C.



PULSE CODE GENERATOR

MODEL 715 is capable of producing up to fi pulses, independently variable in position fro 0 to 100 μ sec. Pulse width is variable from .25 sec. to 1000 μ sec. in four overlapping range Incorporated is a recovery time feature whic allows a coded pulse pair to be delayed from th first pair, up to 1000 μ sec. Any of the fi pulses may be used without the presence of an others. **Other specs include:** Repetition rate of pps to 500 KHz; Stability of 2% at 1000 pp Amplitude of 0.15 v into 50 ohms and 20 v int 1000 ohms; Polarity, neg. or pos.; Rise and fa time of 10 nanosec or less; Delay from .25 μ se to 100 μ sec.



C-BAND INTERROSPONDER

MODEL 609C is a C-band transponder test se which is essentially a small radar device used i operationally checking a C-band transponder as would be normally interrogated by the trackin radar. The unit is also designed to operate wit the Vega Model 707-7A Telemetry Demodulator fo checking out the Vega Telesponder Telemetr System. The unit provides either single or doubl pulse interrogation with a code spacing adjust ment. The self-contained unit operates on 24 t 30 VDC and/or 115 V, 60 - 400 cps. An interna battery supply with self-contained charging circu is optional. A waveguide horn antenna is avai able with the unit or can be user supplied. Check the following transponder parameters: Receive Frequency; Receiver Sensitivity; Transmitte Frequency; Transmitter Power Output; Cod Spacing. X-Band available.

S-BAND RADAR TRANSPONDER

MODEL 206S

Freq.: 2700 - 2950 MHz; **Receiver Type:** Crystal video with sensitivity of -41 dbm (min.); **Transmitter Type:** Triode cavity with 150 w power output and 300 - 500 w on special order; **Input Power:** 6.9 VDC ± 10% or 28 VDC ± 10%, 9 watts quiescent; **Size:** 25.5 cu. in; **Weight:** 26 oz.; **Pressurized:** 15 PSI; **Temp.:** -20° to +70° C; **Vibration:** 5 to 200 cps at 10 g 3 min. sweep; **Shock:** 100 g all planes, 11 msec duration; **Acceleration:** 80 g in all planes.

Full specifications are available on request and quotations can be made to your requirements and special applications. All these units are of high environmental specifications for space, aircraft, targets and other uses.

For further details write or phone: **VEGA PRECISION LABORATORIES, INC.**

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ADVANCED MICROWAVE DEVICES • TRANSPONDERS • BEACONS • TRANSMITTERS • TELEMETRY • RECEIVERS • ANTENNAS • POWER DIVIDERS

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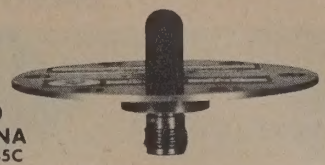
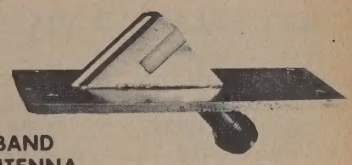
-BAND NTENNA ODEL 835X

op Vee Antenna was developed primarily for craft application in association with an X-Band dar transponder. The antenna is a circularly larized omni-directional antenna enclosed within iberglass radome. The antenna is characterized its compactness and is extremely lightweight hile still maintaining the electrical and vironmental characteristics required by this be antenna. The height of the radome is apoximately one-half inch and the diameter of the dome is approximately one inch. Mounting of e antenna is accomplished via a three-inch ameter mounting plate which also serves as a ound plane for the antenna. A C-Band version odel 836C) of this antenna is available. **Freq.:** 0 - 9.69 GHz; **VSWR:** < 1.5:1; **Beamwidth:**)° ; **Pol:** circular; **Power:** 1.5 kw peak; **Conector:** TNC; **Weight:** 1.5 oz.

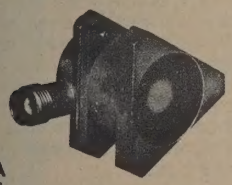


C-BAND ANTENNA
MODEL 845C

Stub Antenna was developed primarily for aircraft application in association with a C-Band radar transponder. The antenna is a vertical polarized omni-directional antenna enclosed within a radome. The antenna is characterized by its compactness and is extremely lightweight while still maintaining the electrical and environmental characteristics required by this type antenna. The height of the radome is approximately three-quarter inch and the diameter of the radome is approximately three-eighth inch. Mounting of the antenna is accomplished via a three-inch diameter mounting plate which also serves as a ground plane for the antenna. **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 1.5:1; **Beamwidth:** 70°; **Pol:** Vert.; **Power:** 1.5 kw peak; **Connector:** TNC; **Weight:** 1.5 oz.

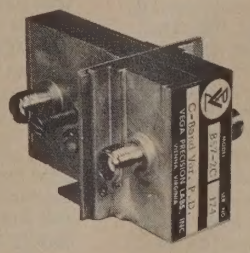


C-BAND ANTENNA
MODEL 801C is a lightweight slotted blade antenna developed as part of a C-Band Radar Transponder System for use on the Nike Apache Vehicle. Linear radiation coverage with minimum aerodynamic drag were key requirements in the design of this antenna. The body of the antenna is constructed of stainless steel which gives excellent reliability in missile environments with no degradation in electrical performance. The antenna may be used as a single element or in multi element arrays depending on the particular application and desired pattern coverage. The companion dividers are Models 853-2C, 854-3C and 855-4C (two-way, three-way and four-way respectively). **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 2.0:1; **Imp:** 50 ohms; **Pol:** Linear; **Connector:** TNC; **Weight:** < 3.0 oz.; **Power:** 1.0 kw peak.



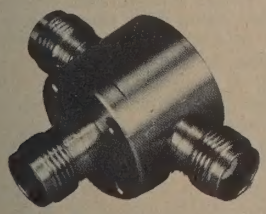
C-BAND ANTENNA
MODEL 820C

ntenna is an optical quartz-loaded, cavity acked helix radiator which produces a right hand ircular polarized radiation pattern. The use of uartz material provides for high and low temperture stability with no degradation in electrical erformance. Flush mounting is normally used on eentry vehicles with no performance deterioration s a result of reentry heat. Low thermal conductivity f the quartz material controls the heat transfer rom the face of the antenna so that very little eentry heat is conducted to the antenna connector. his permits the use of standard mating connectors. Companion power dividers Models 853-2C, 854-3C and 855-4C are used for arraying two, three or our antennas about the missile. **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 1.5:1; **Pol:** RHC; power 1.5 kw peak; **Gain:** 6.0 db; **Beamwidth:** 130°; **Temp.:** 1700° front surface exposure; **Weight:** < 2.0 oz.; **Shock:** 300 g's.

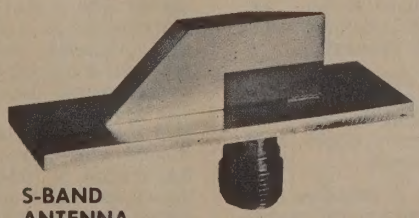


C-BAND POWER DIVIDER
MODEL 857-2C Variable Power Divider was designed to divide the output power of a C-Band Radar Transponder equally between two antenna elements when mounted in airborne vehicles and using unequal lengths of coaxial transmission lines. The design is such that the output power to each leg can be varied from a balanced condition to that of all power in either output leg. With the power divider adjusted to compensate for unequal cable losses, equal power will be radiated by each element of a two element array. The input VSWR is less than 1.3:1 and is tunable over the frequency range of operation. Also available are Models 856-2S (S-Band, 2.7 - 3.0 GHz) and 858-2X (X-Band, 9.1 - 9.6 GHz). **Freq.:** 5.4 - 5.9 GHz; **Insertion Loss:** < 0.5 db; **Power:** 1.0 kw peak; **Size:** 3 1/4" x 2 1/2" x 2"; **Weight:** 12 oz.

S-BAND ANTENNA
MODEL 815S was developed as part of a lightweight S-Band Antenna System for use in the Nike Tomahawk missile for purpose of transmitting tracking data. The antenna is a cavity backed helix with the helix embedded in quartz which is also used as the dielectric cavity. Mounting is accomplished via a mounting flange which can be adapted to a variety of mounting configurations. Flush mounting is used on reentry vehicles with no performance deterioration as a result of reentry heat. Low thermal conductivity of the quartz allows little of the heat to be conducted to the antenna connector therefore standard mating connectors may be used. A C-Band version of this antenna is also available. **Freq.:** 2.7 - 2.95 GHz; **Pol:** RHC; **Gain:** 7.0 db; **Beamwidth:** 130° nominal; **VSWR:** < 1.5:1; **Temp:** 1000° F, front surface exposure; **Vibration (random):** 48 g. rms; **Shock:** 78 g; **Acceleration:** 100 g.

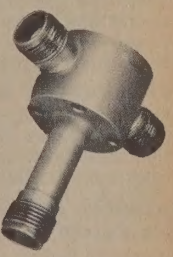


C-BAND POWER DIVIDER
MODEL 853-2C was developed as part of a lightweight C-Band Antenna System which can be installed in any of a large groupe of missiles. Model 853-2C and 855-4C, three-way and four-way respectively, are also available. The body of the power divider is constructed of stainless steel which gives exellent reliability in missile environments. The interior of each power divider consists of an output arm which goes through one or more transformer stages, and then couples with two or more output arms to complete the power division. Each power divider has pre-drilled holes for mounting purposes. **Freq.:** 5.4 - 5.9 GHz; **VSWR:** < 1.3:1; **Imp:** 50 ohms; **Insertion Loss:** < 0.5 db; **Power Div:** ± 0.5 db; **Power:** 1.5 kw peak;; Weight: 853-2C, 2.3 oz.; 854-3C, 2.5 oz.; 855-4C, 2.7 oz.



S-BAND ANTENNA
MODEL 802S

Slotted Blade Antenna was developed for Telemetry and Command functions on the Nike Apache vehicle. The antenna provides linear radiation coverage with minimum aerodynamic drag. The body of the antenna is constructed of stainless steel which gives excellent reliability in missile environments with no degradation in electrical performance. The antenna may be used as a single element or in multi element arrays depending on the particular application and desired pattern coverage. The companion power dividers are Models 850-2S, 851-3S and 852-4S (two-way, three-way and four-way respectively). **Freq.:** 2.2 - 3.3 GHz; **VSWR:** 2.0:1; **Imp:** 50 ohm; **Pol:** Linear; **Power:** 1.0 kw peak; **Connector:** TNC; **Weight:** < 2.0 oz.



S-BAND POWER DIVIDER
MODEL 850-2S was developed as part of a lightweight S-Band Antenna System for use in the Nike Tomahawk missile. Models 851-3S and 852-4S, three-way and four-way respectively, are also available. Tracking coverage may be obtained with two, three or four antennas in operation with the use of the appropriate power divider. The interior of the power divider consists of an input arm which goes through one or more transformer stages, and then couples with two or more output arms to complete the power division. TNC connectors are brazed to the power divider body in which mounting holes are provided. **Freq.:** 2.7 - 2.95 GHz; **VSWR:** < 1.25:1, **Insertion Loss:** < 0.5 db; **Vibration (random):** 48 g rms; **Shocks:** 78 g; **Acceleration:** 100 g; **Weight:** 850-25, 2.2 oz.; 851-3S, 2.4 oz.; 852-4S, 2.7 oz.

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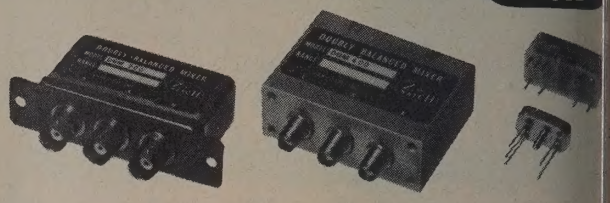
Z-MATCH

DOUBLY BALANCED MIXERS



WIDE BANDWIDTH
HIGH ISOLATION
LOW INSERTION LOSS
LOW NOISE FIGURE
FLAT CONVERSION EFFICIENCY
LOW INTERMODULATION PRODUCTS

ADVANTAGES OF BALANCED MIXERS:

Mixing consists of the non linear multiplication of two signals as for example W_{RF}, and W_{LO}. In communication work the object of this process, also referred to as "modulation," is to extract the frequency terms, $W_{IF} = (W_{LO} + W_{RF})$ or $W_{IF} = (W_{LO} - W_{RF})$, corresponding to either up or down conversion respectively.

The semiconductors used to accomplish this function depart from ideal square law operation and, in non balanced mixers, produce undesired output products in addition to the desired IF signal. An additional problem arises when the RF or LO frequencies fall within the bandwidth of the IF amplifiers following the mixer. These fed-through signals can overload the subsequent stages causing blocking or additional troublesome products. The solution to this problem in the past has been carefully to select LO, RF, and IF frequencies so that spurious products and fed-through input signals occurred as much as possible outside the IF band. The IF amplifier was usually designed with a very sharp bandpass characteristic so as to reject troublesome signals near the IF band, and in some cases multiple conversion IF amplifiers were needed.

The balanced mixer greatly reduces these problems for the system designer. The **singly balanced,** or two diode, mixer suppresses **one** of the input signals and its associated **even** harmonic components. The other input signals and its harmonics still come through the mixer along with harmonic sum and difference frequency products. The **doubly balanced** mixer improves still further the suppression of unwanted spurious signals. In this device **both** of the input signals and their **respective harmonics** are greatly suppressed at the IF output port.

Further advantages of the Doubly Balanced Mixer result from its interport isolating properties. For instance, an LO signal applied to the mixer is attenuated at both the RF and IF ports. This attenuation (typically 40 DB) reduces the problem of oscillator re-radiation as well as IF amplifier overloading. Similarily for low IF frequencies this same isolating property tends greatly to reduce the problem of local oscillator pulling. The Shottky barrier diode is ideal for balanced mixers because of its inherent fast turn on, low noise, and highly consistent parameters. In practice the diodes for any given mixer are matched for forward resistance at several points on the EI curve. The use of these devices allows the balanced mixer to handle linearly a wide range of input signal levels. The above information is expanded and illustrated in graphic form in Vari-L Bulletin 106 which is available upon request.

Z-MATCH DOUBLY BALANCED MIXERS are packaged in two ways: 1. laboratory-test-equipment style with coaxial connectors; and 2. as pin types suitable for circuit boards. This permits cable connection during the breadboard phase, and then permanent adaption as a circuit component.

ADDITIONAL APPLICATIONS: MODULATOR / Because one port is coupled to DC, the unit may be used as a pulse modulator with unlimited pulse duration. Insertion Loss is —4 dB at f_{max}, and less at the lower frequencies. The RF input is made to port L, modulation to port X, and the output from port R. Total current should not exceed 50 ma. The modulator will exhibit a 35 dB on/off ratio at f_{max} (greater at the lower frequencies) and a turn-on/turn-off time of less than one nanosecond. As an AM modulator, with the X port used for the modulation-signal input, the mixer has excellent carrier rejection at high frequencies. The carrier may be reinserted after the modulator, or can be caused to feed through the mixer in controlled amounts by the introduction of a DC bias (suitably isolated from the modulation source) into the X port. The bias can be of either polarity, but should not create current in excess of 50 ma.

CURRENT-CONTROLLED ATTENUATOR / By the use of a DC bias as described above, the mixer can function as a current-voltage controlled attenuator. With zero current into the X port the attenuation of an RF signal of frequency up to the specified f_{max} will be at least 35 dB, reducing to approximately 3 dB when the bias current is increased to 10 ma. Response time from full-on to full-off condition is less than one nanosecond. For this service the signal is introduced to the R port and the output taken from the L port.

PHASE DETECTOR / The X port, being DC coupled, makes it possible to extract a DC voltage as a function of the phase difference between two signals. The mixer introduces minimal 1/fnoise because of the inherent low-noise quality of the diodes, and their superior balance makes a DC adjustment of the phase detector unnecessary.

CONSTRUCTION

The mixers housed in the CA style enclosure are moderately priced, of general utility and have coaxial connectors. Standard units listed in the tabular columns are BNC equipped but parts are carried in stock for fast delivery of corresponding models with TNC connectors. The enclosure is brass, tin nickel plated and is sealed. The EA style units are epoxy imbedded and are designed for the ruggedness and space economy associated with an encapulsated device. The transformers and connections thereto have the time-proven Vari-L cushioning means and are completely sealed into the epoxy. A small well houses the diodes and permits a final check on matching, and this is then filled with polystyrene foam and sealed with a thin layer of encapsulant. The SPA types are constructed on a glass-seal header with pin connections and are completely shielded. A mounting stud is provided for strength and good grounding. The two "G" terminals are connected to the base internally by the shortest possible path. The case and cover of the CB type units are of cast aluminum, and the diodes are replaceable. This is a deluxe series of mixers which have no equal in this size and price range. Application of model DBM-400A, including a DC-1GHz test sweep generator are described in Vari-L Bulletin 101. The CC series units are housed in a manner similar to the CA units but are smaller. The CC style mixers all have OSM connectors.

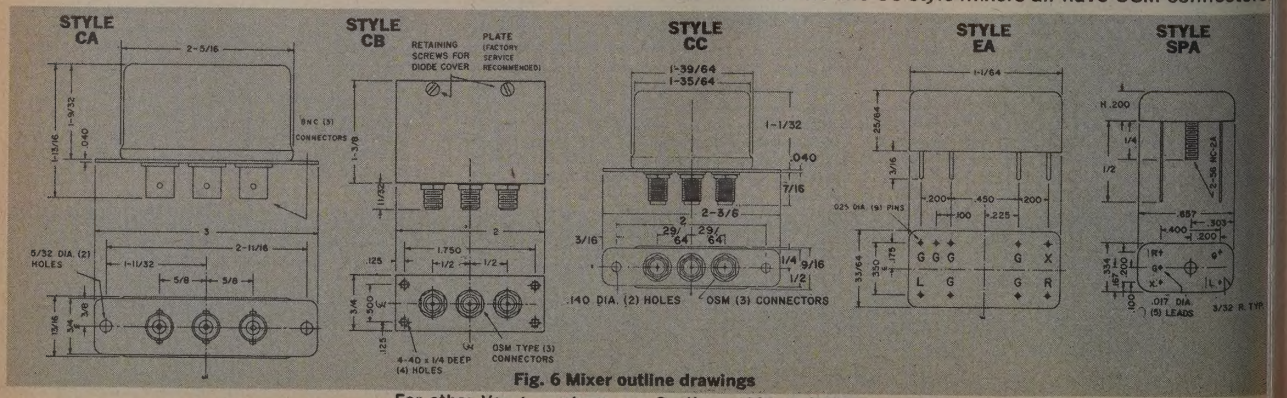


Fig. 6 Mixer outline drawings

For other Vari-L products see Sections 1800 and 5600.

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UBLY BALANCED MIXER SPECIFICATIONS

SPECIFICATIONS									
MODEL	OVERALL FREQUENCY RANGES (MHz)	FREQUENCY BANDS (MHz)	CONV. LOSS SSBNF (Db, MAX.)	LO-RF	ISOLATION (Db, MIN.) LO-IF	RF-IF	PACKAGE STYLE (see outline)	PRICE 1-9	SPECIAL NOTES
DBM-152	R&L: 002-15 X: DC-15	.002-1 1-15	5.5 5.5	50 50	40 40	25 20	EA	$40.00	
DBM-162	R&L: .002-15 X: DC-15	.002-1 1-15	6.0 6.0	45 45	35 35	25 20	EA	$35.00	
DBM-153	R&L: .01-50 X: DC-50	.01-1 1-35 35-50	8.5 5.0 5.5	40 40 40	35 35 30	25 25 20	EA	$30.00	
DBM-163	R&L: .01-50 X: DC-50	.01-1 1-35 35-50	8.5 5.5 6.0	35 35 35	30 30 25	25 20 20	EA	$25.00	
DBM-151	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 7.5	40 35	35 30	25 20	EA	$30.00	
DBM-161	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 8.0	35 30	30 25	20 20	EA	$25.00	
DBM-150	R&L: 5-500 X: DC-500	10-100 5-250 5-500	6.5 7.5 8.5	40 35 30	35 30 25	25 20 20	EA	$30.00	
DBM-160	R&L: 5-500 X: DC-500	10-100 5-250 5-500	6.5 7.5 9.0	35 30 30	30 25 20	25 20 15	EA	$25.00	
DBM-170	R&L: .2-700 X: DC-700	1-100 1-250 .5-500 .2-700	6.5 7.0 7.5 8.0	50 40 35 30	35 30 25 25	30 25 20 20	SPA "H" .200	$60.00	
DBM-171	R&L: .2-600 X: DC-600	1-100 1-250 .5-500 .2-600	6.5 7.0 7.5 8.0	45 35 30 30	35 30 25 25	20 25 20 20	SPA .200	$45.00	
DBM-172	R&L: .2-500 X: DC-500	1-100 1-250 .5-400 .2-500	6.5 7.0 7.5 8.5	40 35 30 30	35 30 25 25	30 25 20 20	SPA .200	$40.00	
DBM-173	R&L: .2-500 X: DC-500	1-100 1-250 .5-400 .2-500	6.5 7.0 7.5 8.5	35 30 30 30	30 30 25 20	25 20 20 20	SPA .200	$35.00	
DBM-174	R&L: .2-400 X: .2-400	1-100 1-250 .2-400	6.5 7.5 8.5	30 30 25	25 20 20	20 20 20	SPA .200	$30.00	
DBM-175	R&L: .2-600 X: DC-600	1-100 1-250 .5-500 .2-600	6.5 7.0 7.5 8.0	45 35 30 30	35 30 25 25	30 25 20 20	SPA* .250	$70.00	
DBM-181	R&L: 300-1750 MHz X: DC-500 MHz	300-1250 1250-1750	8.0 10	35 25	25 10	20 10	SPA .350	$90.00	
DBM-100B	R&L: .2-600 X: DC-600	.5-100 .5-250 .2-500 .2-600	6.5 7.0 8.0 8.5	45 40 30 30	35 30 25 25	25 20 20 20	CA	$45.00	High level, low VSWR highest performance mixer of its type
DBM-110	R&L: 5-600 X: DC-600	10-100 10-250 10-500 5-600	7.0 7.5 8.0 8.5	40 30 30 30	35 30 25 25	25 20 20 20	CA	$38.00	High performance low cost
DBM-111	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 7.5	40 35	35 30	25 20	CA	$38.00	Low frequency companion to the DBM-110
DBM-200	R&L: 5-1000 X: DC-500	10-100 10-250 250-500 5-1000	6.5 7.0 8.0 9.5	40 35 35 30	40 35 30 25	30 25 25 20	CA	$65.00	High level, low VSWR ultra-high performance up to 1GHz
DBM-210B	R&L: 100-1000 X: DC-500	100-500 500-1000	8.0 9.0	35 30	30 25	25 20	CA	$55.00	Low cost, optimumized for 200-1000 MHz range
DBM-300B	R&L: 300-1500 X: DC-500	300-1000 1000-1500	8.0 7.0	35 30	30 25	25 10	CC	$125.00	High performance, optimumized for Tacan
DBM-300A	R&L: 300-2000 X: DC-750	300-1000 1000-2000	8.0 9.5	35 30	30 20	25 10	CC	$175.00	High performance optimumized for L Band
DBM-400	R&L: 10-3000 X: 10-1500	30-500 50-1800 10-2800 2800-3000 See Note 1	7.0 8.5 9.0 9.5	40 35 30 25	40 30 20 20	20 20 20 20	CB	$275.00	Best high level full spectrum miniature mixer available
DBM-400A	R: 100-3000 L: 10-3000 X: DC-1000						CB	$295.00	DC coupled equal of the DBM-400

T IDENTIFICATION: L: LO PORT; R: RF PORT; X: IF PORT. All measurements made in a 50 ohm system with LO power of +7 DBM (5 W). MAX. input power (total): 50 MW. Rated conv. loss and LO-RF ges maintained over a range from −55 to +100C°. Notes for models DB-400 and DBM-400A: 1. Conversion loss figures apply to RF and/or D frequencies in the ranges shown and an IF output frequency of 0 GHz (750 MHz for DBM-400A) or lower. The X port response extends to 1.5 GHz (1.0 GHz for DBM-400A) with approx. 1 Db increase in conversion loss. 2. (DBM-400 only) for UP conversion with IF frequencies above 1.5 GHz, interchange R and X ports. (R port is now IF output.) Apply the lower frequencies (below 1.5 GHz) to the X port.

* Potted for high shock and vibration requirements. MAX operating temperature: −55 to +125°C

For other Vari-L products see Sections 1800 and 5600.

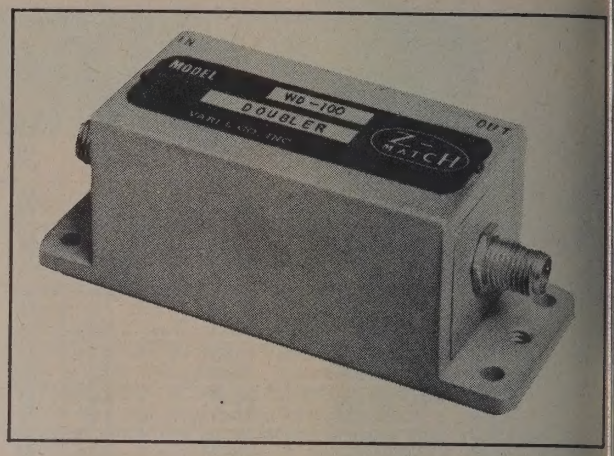
VARI-L CO., INC.

3883 MONACO PARKWAY/DENVER, COLORADO 80207
TELEPHONE: (303) 321-1511/TWX 910•931•0590

Z-MATCH

WIDEBAND FREQUENCY DOUBLERS

Models WD-100, 101, and 102 were developed as components of laboratory equipment to double the frequency of high-level sweep generators, thus extending their range of usefulness. Since the output of the doubler is of relatively high level, the signal obtained is comparable to that of an expensive BWO unit, and a set-up can be made with existing equipment and appreciable savings are effected. The units, being quite small and compact, are often used as part of the local oscillator source for receivers, so they are recommended both as components of larger equipment and as laboratory test devices. The doublers are housed in extruded aluminum cases and are fitted with 3.6 mm. input and output connectors and have 50 ohm input and output impedances. The circuit employs a custom-designed Z-Match input transformer and two carefully matched Schottky barrier diodes. The output circuit (Model WD-100 only) is isolated for DC by a special chip capacitor. The circuit elements and supporting structure are encapsulated in high-temperature polyurethane foam. Full electrical specifications are listed in the table below. Operating temperature range is −55 to +100°C.



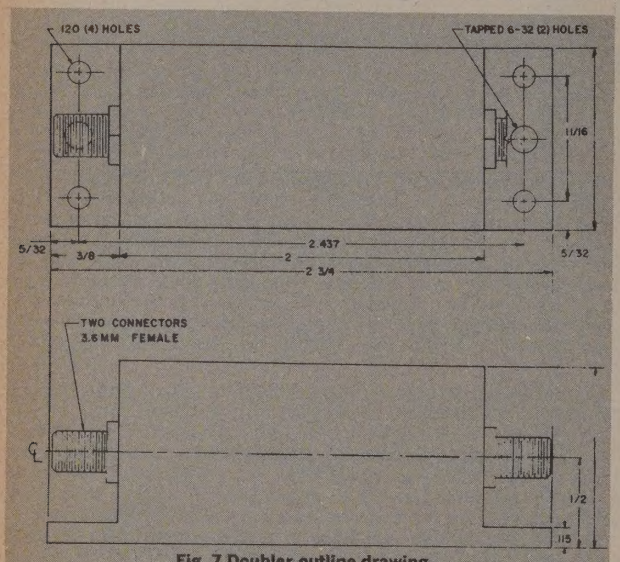


Fig. 7 Doubler outline drawing

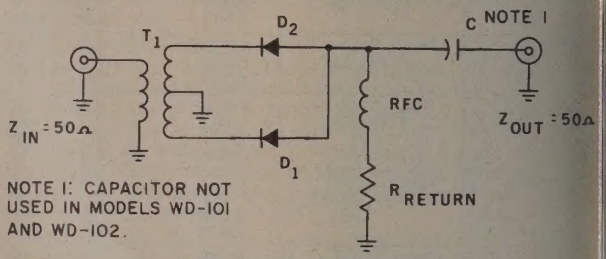


Fig. 8 Doubler schematic

SPECIAL WIDEBAND PRODUCTS

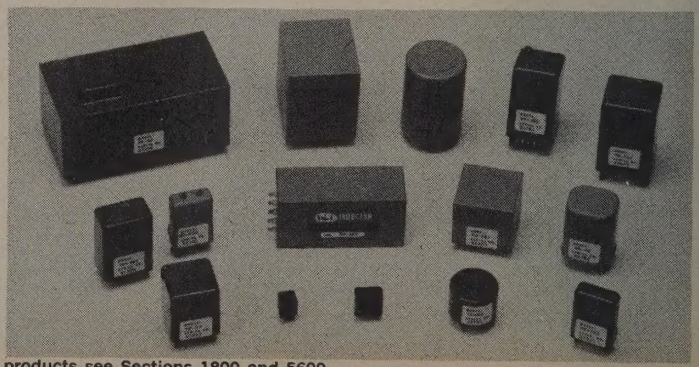
The engineering staff which has developed the components shown in this catalogue has a diversified knowledge of wide band and other RF components for applications from VLF up into the microwave region. We have made two, four, and eight way power dividers, directional couplers, special antenna couplers, hybrid junctions, and numerous other custom devices to solve difficult circuit problems. We invite your inquiry and will give it prompt and careful attention. A competent technical person is always available for consultation by telephone or visit to your plant.

DOUBLER SPECIFICATIONS

MODEL	FREQUENCY RANGE INPUT-OUTPUT	IMPEDANCE INPUT-OUTPUT	INPUT POWER NORMAL OPERATION	CONVERSION LOSS	FUNDAMENTAL +3rd HARM. SUPPRESSION	OUTPUT LEVEL VARIATION OVER THE BAND	PRICE 1-9
WD-101	.5-600 MHz 1-1200 MHz	50 ohms 50	+5 to +20DBM	13 dB max.	40 dB min.	±1.5 dB	$ 90.00
WD-100	1-2 GHz 2-4 GHz	50 ohms 50	+5 to +20DBM	15 dB max.	40 dB min.	±1.5 dB	225.00
WD-102	2-4 GHz 4-8 GHz	50 ohms 50	+5 to +20DBM	15 dB max.	30 dB min.	±1.5 dB	350.00

ELECTRICALLY VARIABLE (CURRENT CONTROLLED) INDUCTORS

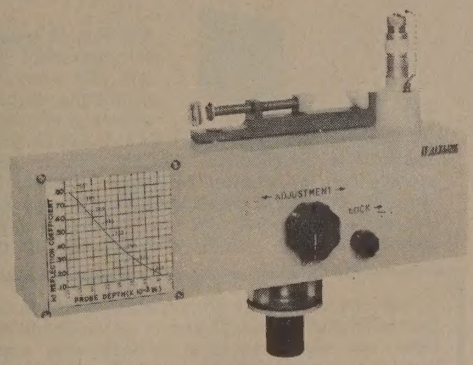
Vari-L Co., Inc. was founded in 1953 and derived its corporate name from its first product—variable inductors. A catalogue line has been maintained, and in addition several hundred special designs, some of which are illustrated at the right, have been made for critical applications. Many of these serve an important part in the performance of industrial measuring equipment and in apparatus important to our national defense. The catalogue line now consists mostly of the very versatile MITE series units listed on the following page, but the technical know-how to design and build special wide-sweep inductors still exists and is at your service.

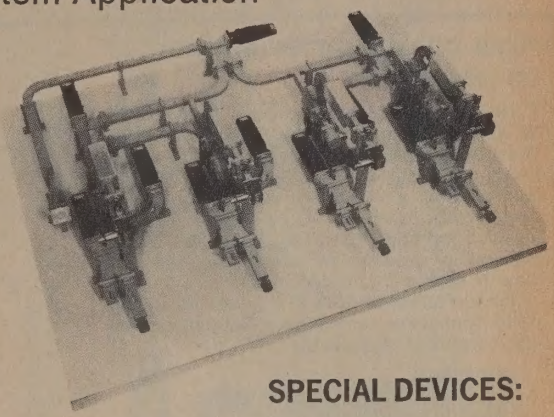


For other Vari-L products see Sections 1800 and 5600.

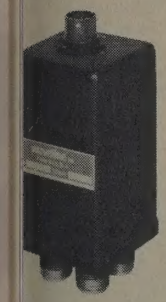
Check first with Waveline

for: ✓Microwave Test Equipment ✓System Application ✓Special Devices ✓Hardware

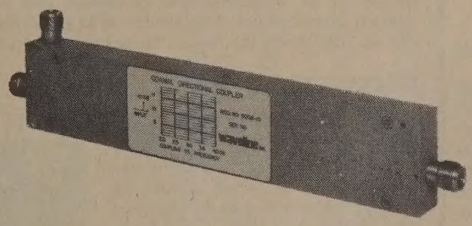




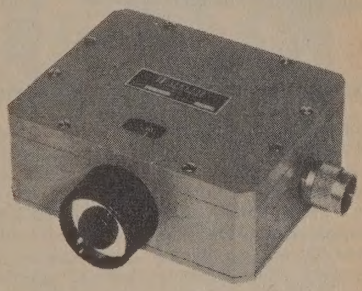
SPECIAL DEVICES:



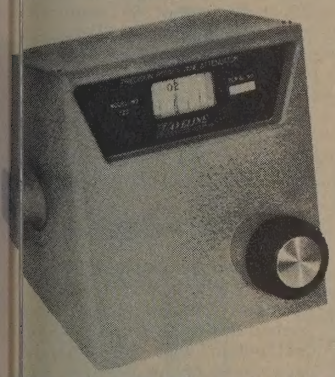
SWITCHES:

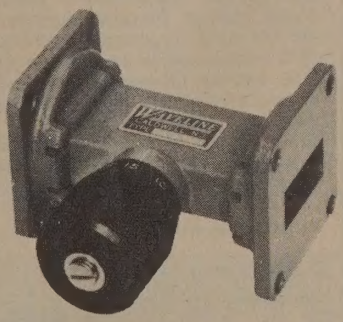


DIRECTIONAL COUPLERS:

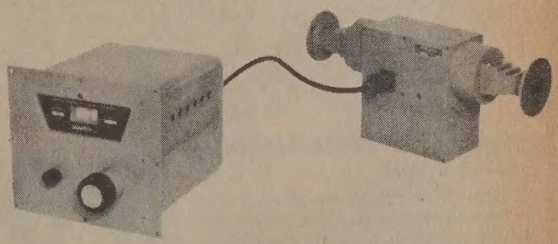


TEST INSTRUMENTS:





ATTENUATORS:



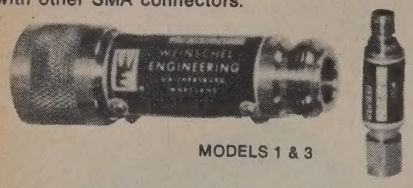
ATTENUATORS: 100 units are available from simple vane to remotely controlled Rotary Vane Types. This selection enables you to satisfy every requirement of attenuation, phase measurement and control in waveguide and coaxial lines. **SWITCHES:** Solenoid and manually operated four way units in "E" and "H" planes provide switching in all bands from 2.6 to 40.0 GHz. Isolation greater than 60 db; VSWR less than 1.10. Special units are available. **DIRECTIONAL COUPLERS:** Available for every application in any frequency band include broad wall, narrow wall, ultra-flat coupling, cross-guide and high directivity coaxial units. Hundreds of custom units have been produced to meet special requirements. **SPECIAL DEVICES:** Waveline's capability to design and manufacture special components offers the widest range of engineering and production skills possible from one facility. Waveline is capable of generating basic designs in the form of a prototype or production of system components in strict compliance with your specifications. **TEST INSTRUMENTS:** A complete line of instrumentation is available for all testing functions in bands from DC-12.4 GHz for coax and 26-40.0 GHz for waveguide. Over 1300 standard units are available. Send for our new 1969 catalog, showing one of the most complete microwave component lines in the industry. Write—Waveline Inc., P.O. Box 718, West Caldwell, New Jersey or call (201) 226-9100.

waveline

Precision Microwave Component and Instruments

FIXED COAXIAL ATTENUATORS DC—18.0 GHz

has the largest product line of fixed coaxial RF attenuators in standard and miniature sizes. These attenuators feature long-term stability; the ability to withstand a wide temperature environment and high peak powers; excellent connector repeatability, resulting in repeatable insertion loss and low VSWR; and excellent durability. All attenuators are supplied with stainless steel Type N connectors, except the Models 3 and 4 which are furnished with stainless steel Type WPM connectors which mate nondestructively with other SMA connectors.

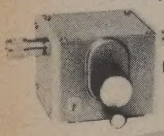


MODELS 1 & 3

MINIATURE STEPATTENUATORS DC—18.0 GHz

offers the most complete product line of miniature stepattenuators available in both manual and programmable models. Features of these stepattenuators are long performance life with no change in operating characteristics; a choice of 17 standard attenuation ranges in 1 and 10 dB increments; short switching time of typically 2 sec/10 steps; and repeatability better than 0.03 dB/drum up to 18.0 GHz. These durable stepattenuators will operate in excess of 1,000,000 steps without significant mechanical wear, due to a unique slide-switch* action. Both manual and programmable models are available in frequency ranges of DC to 8.0 GHz, DC to 12.4 GHz, DC to 18.0 GHz, 8.0 to 12.4 GHz, and 12.4 to 18.0 GHz. All models of stepattenuators are available in a choice of either Type N or Type WPM stainless steel connectors, or waveguide flange (X or P band).

*Patent Pending

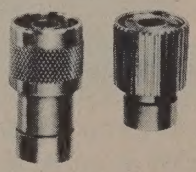


MODEL 93-90

MODEL 96-90

COAXIAL RF TERMINATIONS DC—18.0 GHz

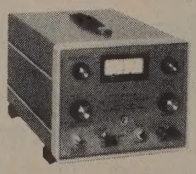
Coaxial RF terminations produced by feature extremely low VSWR. All terminations will dissipate 1 watt average power and 1 kW peak, except the Model 569A which handles 20 watts average and 6 kW peak. All terminations are supplied with stainless steel connectors.



MODEL 1404

PRECISION RF POWER LEVELER

The Model 1805 ensures precision results in transferring calibration factors of a primary standard to secondary standards (terminating or feed-through mounts) and power meters. In conjunction with a DC-to-RF continuously variable attenuator (PIN modulator), it establishes and maintains constant, precisely known RF power reference levels. It employs DC substituted and bias power. Selectable DC substituted levels are 0.5, 1.0, 5.0, and 10 mW, also external capability. Selected levels maintained to within ± 0.1% + 1 μW over RF source variations of ± 3dB.



MODEL 1805

VARIABLE ATTENUATORS DC—11.0 GH

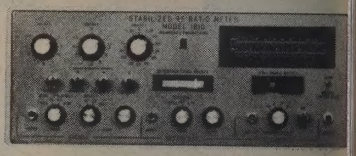
MODEL 940

precision variable attenuators provide long life operation; continuously variable operation with linear, broad attenuation coverage long-time stability, resulting from using proven resistive films; and direct reading individually calibrated incremental insertion loss scales. Many models are available in uncalibrated level set versions and with locking devices; all models can be obtained in bench or panel-mounting configurations. All variable attenuators are supplied with stainless steel Type N connectors except the Model 940 which is furnished with stainless steel Type WPM connectors which mate nondestructively with other SMA connectors.

A dual-channel system employing a reference and measurement channel is recommended for independence of variations in source level when making fixed- and swept-frequency measurements, especially when a greatly expanded display is desired. provides the Model 1810 Stabilized RF Ratio Meter for use in dual-channel measuring systems. The addition of the Model 1815 Data Nomalizer to swept-frequency systems results in the elimination of all reference line variations due to the frequency sensitivity of system components. The Model 1815 provides a direct rectilinear output in dB vs. frequency for recording on standard chart paper.

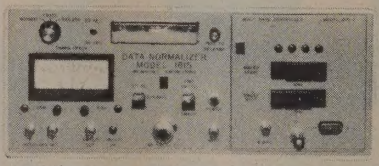
STABILIZED RF RATIO METER

MODEL 1810



The Model 1810, when used with an RF source and appropriate microwave components, permits making accurate swept-frequency measurements of insertion loss, VSWR, and gain. It can measure these microwave parameters, expressed as a power or voltage ratio, over a 30 dB RF range. (Measurements in excess of 60 dB are possible with a slight reduction in accuracy and resolution.) It permits matching the swept RF response of crystal mounts, barretter mounts, couplers, attenuators, equalizers, etc. with the swept response of a selected reference unit or standard. The Model 1810 measurements are independent of power level variations of active devices and can be made without the need for a power-leveling loop. Its two channels (reference and signal) have a common mode rejection of better than 0.002 dB/dB for a 12-dB RF level change. The Model 1810 permits direct reading of VSWR in .005 increments on a 1.5 full scale, and with square-law inputs (crystal or barretter), provides a linear dB output which is the log of the ratio of its two inputs.

MODELS 1815 w/1815-2



DATA NORMALIZER

Selecting components, which track within the specified limits of a standard, can be easily accomplished using the Model 1815 in conjunction with the measuring capabilities of the Model 1810. The Model 1815, with plug in capability, is used for normalizing the amplitude vs. frequency reference curves of a swept-frequency measuring system, and results in an output from the Normalizer of only the measured characteristic of the device under test. The Normalizer output, reading in dB vs. frequency, can be recorded directly on rectilinear chart paper without the need to plot a complete set of reference curves. The Model 1815 normalized, rectilinear output permits automatic swept-frequency testing and eliminates time-consuming computations and interpolations which can provide inaccurate results. Sweep speed output is selectable, 25 and 50 seconds. A GO-NO/GO limit testing option is also available.

DATA NORMALIZER PLUG-INS

MODEL 1815-1

MODEL 1815-2

Plug-ins for the Model 1815 are the Model 1815-1 Log Converter which adapts the Normalizer to operate with many existing audio measuring systems having a linear output, and the Model 1815-2 Multi-Band Controller which automatically controls the sequencing and RF switching of up to four sweep generators to obtain a single continuous display.

WEINSCHEL ENGINEERING CO., INC.

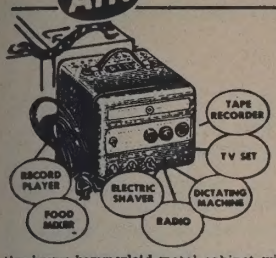
Designers and Manufacturers of Precision Microwave Equipment

Gaithersburg, Md. 20
Tel: (301) 948-3
Twx: 710-828-9

INVERTERS, VIBRATORS, "A" ELIMINATORS, ETC.

ATR ELECTRONICS, INC.

Tel. (612) 222-3791 • 300 East Fourth St., St. Paul, Minnesota 55101



DC TO AC UNIVERSAL INVERTERS

New, universal inverters for operating 110-v., 60 cycle AC equipment from DC voltages in autos, buses, trucks, boats, trains, planes and DC districts. Designed especially for standard 110-volt AC tape recorders, TV sets, radios, PA systems, electric razors, test equipment, etc. Units are carefully engineered and ruggedly constructed to provide long life operation. All feature complete RF interference suppression and exceptional frequency stability. Have operating efficiency in excess of 75%. Four-point voltage regulator corrects output voltage for minimum and maximum loads, and also helps compensate for input voltages lower or higher than normal. Inverters are recommended for use with loads having power factors in excess of 70%. Built-in toggle switch selects most efficient operation for use with TV sets or tape recorders. Inverters are not recommended for use with large motor driven appliances such as refrigerators, washing machines, etc. All have ON-Off switches. Housed in attractive brown hammerloid metal cabinet with convenient leather carrying strap. Sizes: Standard Model RSF, 9½x9¾x5¼"; Heavy-Duty Model RHG 6¾x11¼x8½", Extra-Heavy-Duty Model HSJ, 6½x12¾x8½". With battery clips for instant connection to power source. Models with "P" suffix equipped with adapter cord for use in auto cigarette lighter receptacles. *Recommended for24 volt battery operation. **Before ordering, check wattage of equipment with which inverter will be used.**

Stock No.	Mfr's Type	Input D.C. Volts	A.C. Output 60 Cycles	Output Watt. Int.	Output Watt. Cont.	Shipping Weight	List Price	Net Price
	6U-RSF	6	110 Volts	100	80	22 lbs.	$119.50	$ 79.66
	6U-RSF-P	6	110	100	80	22	119.50	79.66
	6U-RHG	6	110	150	125	27	155.25	103.50
	6U-HSJ	6	110	175	150	37	187.55	125.00
	12U-RSF	12	110	150	125	22	99.00	66.00
	12U-RSF-P	12	110	150	125	22	99.00	66.00
	12U-RHG	12	110	200	175	27	131.25	87.50
	12U-HSJ	12	110	250	225	37	170.75	113.82
*	28U-RSF	28	110	125	100	22	119.50	79.66
*	28U-RHG	28	110	175	150	27	145.00	96.66
*	28U-HSJ	28	110	250	200	37	187.55	125.00
	32U-RSF	32	110	150	100	22	119.50	79.66
	32U-RHG	32	110	200	180	30	145.00	96.66
	32U-HSJ	32	110	325	225	37	187.55	125.00
	50U-RSF	50	110	150	100	22	119.50	79.66
	50U-RHG	50	110	225	200	27	155.25	103.50
	110U-RSF	110	110	250	150	22	99.00	66.00
	110AU-RHG	110	110	325	250	27	131.25	87.50
	110BU-RHG	110	110	450	350	30	155.25	103.50
	110U-HSJ	110	110	600	400	37	187.55	125.00
	220U-RSF	220	110	250	150	22	109.50	73.00
	220U-RHG	220	110	325	250	27	155.25	103.50
	220U-HSJ	220	110	500	300	37	187.55	125.00

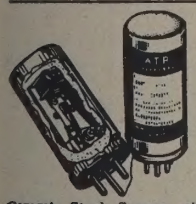
PORTABLE PLUG-IN TYPE INVERTERS

SPECIALLY DESIGNED FOR OPERATING STANDARD A. C. DICTATING MACHINES, RECORD PLAYERS, INCANDESCENT LAMPS, ELECTRIC RAZORS, ELECTRONIC TEST EQUIPMENT, AND OTHER SMALL ELECTRICAL AND ELECTRONIC DEVICES FROM D. C. VOLTAGES IN AUTOMOBILES, BUSES, TRUCKS, BOATS, PLANES, TRAINS, AND D. C. DISTRICTS.

Lightweight inverters for operating 110 v. AC equipment from DC voltage sources. Feature excellent frequency stability and high efficiency. 6 and 12-volt units plug into cigarette lighter receptacle of any vehicle; others are equipped with standard 2-prong plugs. All are designed especially for use with dictating machines; record players, electric razors, test equipment, etc. Not recommended for large tape recorders and motor driven appliances such as refrigerators, washing machines, etc. Brown Hammerloid case with leather carrying strap. Sizes: DME, 5¼x4¾x2¾"; RME and RMF, 8¾x8x3¾". *Recommended for 24-volt operation. **Check wattage rating of equipment before ordering. RMF/RME Model Inverters equipped with voltage regulator.**

Stock No.	Mfr's Type	Input D.C. Volts	A.C. Output 60 Cycles	Output Watt. Int.	Output Watt. Cont.	Shipping Weight	List Price	Net Price
	6-DME (1)	6	110 Volts	40	30	5 lbs.	$36.85	$24.55
	6C-DME (1)	6/12	110	40	30	5	42.25	28.15
	6-RMF (2)	6	110	80	60	12	72.35	48.15
	6C-RMF (2)	6/12	110	80	60	12	79.69	53.15
	12-DME (1)	12	110	50	40	5	32.97	21.98
	12T-RME-1 (2) (3)	12	110	125	110	14	69.25	46.15
*	28-RME (2)	28	110	100	80	12	82.45	54.95
	32-RME (2)	32	110	100	80	12	82.45	54.95
	110-RME (2)	110	110	150	100	12	78.95	52.60
	220-RME	220	110	150	100	12	82.45	54.95

(1) These Inverters primarily recommended for Edison VP dictating machines. May also be used with Model 200 Sound-scriber (with engine of car not running).
(2) Primarily recommended for Dictaphone's Time Master, DeJur Stenorette, and Gray Audograph dictating machines or other similar types. Also recommended for use with Norelco tape recorder Model EL-3516 and Geloso Model G 255-S tape Recorder.
(3) This Inverter specially designed and recommended also for use with portable TV set.



VIBRATORS

FOR ALL AUTO RADIO SETS SINCE 1954 USE ONE OF THE ATR VIBRATORS LISTED BELOW ... ATR VIBRATORS FEATURE

Ceramic Stack Spacers with Two-Bolt Stack construction.

Instant Starting—as a result of highly efficient magnetic circuit with formed base for more uniform operation on both high and low voltages.

Large Oversize Tungsten Contacts having Full Wiping Action—for greater reliability and longer life.

Perforated Reed of Highest Quality Swedish Spring Steel.

Highest Precision Construction and Workmanship—Practically all parts used are held to within a tolerance of 0.0005 of inch.

Value Plus—as readily evidenced by the Larger Contacts, Ceramic Spacers and Precision Construction and Workmanship. Available in TEN-PAK.

ATR No. 1400 (Bulk), 4-Prong, 6-Volt For All 6-Volt Sets Since 1954

ATR No. 1843 (Bulk), 3-Prong, 12-Volt For All 12-Volt General Motors Since 1954

ATR No. 1843 also used in following automobiles: 1956 Ford (Philco), Lincoln (Bendix), and Mercury (Bendix); 1956 Chrysler (Philco); 1955-57 Packard; 1956-57 Plymouth (Philco); 1956 Studebaker (Philco) and 1957 Mercury (Philco)

ATR No. 1840 (Bulk), 4-Prong, 12-Volt For 12 Volt Cars other Than GM Since 1954

ELECTRONIC TUBE PROTECTOR

A "MUST" FOR EVERY TV HOME! WILL DOUBLE OR TRIPLE THE LIFE OF ALL TYPES OF ELECTRONIC TUBES, INCLUDING TV PICTURE TUBE. Automatic in operation, for use with any electronic equipment having input wattage of 100 to 300 watts. Fuse protected; rugged construction; and enclosed in interior decorator's golden brown hammerloid-finish metal case. Wall Model 250 is 1 - 15/16" OD x 3⅛" in length and plugs directly into wall socket. Shipping weight is 1 lb.

—Wall Model 250

(115 volt A.C.) . . . . . **Net $2.95**

SHAV-PAKS

Every man should have this lightweight ATR Inverter in his car for that "Keep Clean-Shaved Look." Will operate standard A.C. Electric Shavers from your CAR or Boat*. Complete with 3 ft. cord set. Plugs into cigarette lighter receptacle. Fuse protected, rugged construction, and attractively housed in grey hammerloid-finish steel case. Size 4"x2⅜"x 2¾". Shipping weight 2½ lbs.

Model 6-SPB (6 volt) . . . . . **Net $16.50**
Model 12-SPB (12 volt) . . . . . **Net 14.25**

"A" BATTERY ELIMINATOR

FOR DEMONSTRATING AND TESTING TRANSISTOR OR VIBRATOR-TYPE AUTO RADIOS. Designed for testing D.C. Electrical Apparatus on regular 110 volt A. C. lines . . . equipped with full-wave dry disc-type rectifier, assuring noiseless, interference-free operation. Fully Automatic and Fool-Proof; has voltmeter, ammeter, and 8-position voltage control. Fuse protected, and housed in heavy gauge brown hammerloid-finish metal case. 6 ft. cord set included. Size: Model 610C-ELIF, 6½"x9¼"x8½"—shipping weight 22 lbs.; Model 620C-ELIT, 6½"x12¼"x8½"—shipping weight 33 lbs.

IDEAL AS A POWER SUPPLY FOR MODEL RAILROAD TRAINS, RADIO SETS, ELECTRO PLATING OUTFITS, AND OTHER 6 OR 12 VOLT, D.C. EQUIPMENT. MAY ALSO BE USED AS A BATTERY CHARGER.

—Model 610C-ELIF (6 volt at 10 amps. or 12 volt at 6 amps.) . . . . . **Net $65.80**

—Model 620C-ELIT (6 volt at 20 amps. or 12 volt at 10 amps.) . . . . . **Net $87.75**

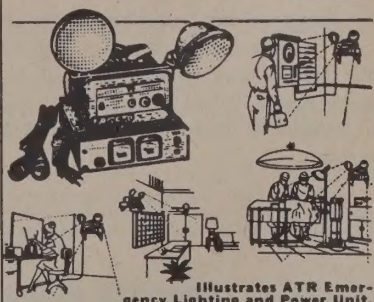
AUTO PLUG-IN, HOME-TYPE PORTABLE BATTERY CHARGERS

No installation . . . just plug into cigarette lighter receptacle! Makes motor starting easy! Keeps your car battery fully charged in your own garage. Operates directly from standard 110 volt A.C. Household Current. Available in three portable sizes for both 6 or 12 volt cars. Light in weight, rugged in construction, economical, and built to last. Each battery charger is housed in grey hammerloid-finish metal case. Complete with cord sets. Size of G1 is 5¾"x4⅞"x2¾"—shipping weight is 6 lbs.; G2 is 8½"x5½"x3⅞"—shipping weight is 8 lbs.; and G3 is 8½"x5½"x5¼"—shipping weight is 10 lbs.

(G-1) **—Model 612CA4** (4 amp.) 6 or 12 volt . . . . . **Net $19.46**

(G-2) **—Model 612CA6** (6 amp.) 6 or 12 volt . . . . . **Net $22.46**

(G-3) **—Model 612CA10** (10 amp.) 6 or 12 volt . . . . . **Net $27.71**



Illustrates ATR Emergency Lighting and Power Unit, Model ETS complete with lamps.

EMERGENCY LIGHTING and POWER UNIT

Completely Automatic Standby-Power Units Specially Designed to Permit the Instantaneous Continued Operation of Critical Lighting Equipment, PA Systems, Amplifiers, Intercom Systems, Burglar Alarms, Fire Alarms, Synchronous Electric Clocks, Electric Time and Recording Clocks, Incubators, Gas Valves, Telephone and Test Equipment, and Similar Critical Devices in the Event of 115 Volt AC Commercial Power Line Failure. For Use: In Hospitals, Banks, Hotels, Theatres, Factories, Office Buildings, Schools, Homes, and Many Other Areas of Operation.

Type	*Storage Battery Input	A.C. Output 60 Cycles	Output Wattage Int.	Output Wattage Cont.	Net With Lamps
661-ETM	6-volts	110-volts	80	60	$231.75
662-ETS	6	110	100	80	253.50
663-ETH	6	110	150	125	275.50
1232-ETS	12	110	125	100	247.50
1233-ETH	12	110	175	150	267.00
1234-ETJ	12	110	250	200	287.25

For Units Without Lamps Deduct $37.50 Net.

All ATR Inverters Listed Above are Frequency Stable and have Automatic Frequency Control

ACDC Power Supply Modules

acdc
POWER SUPPLIES

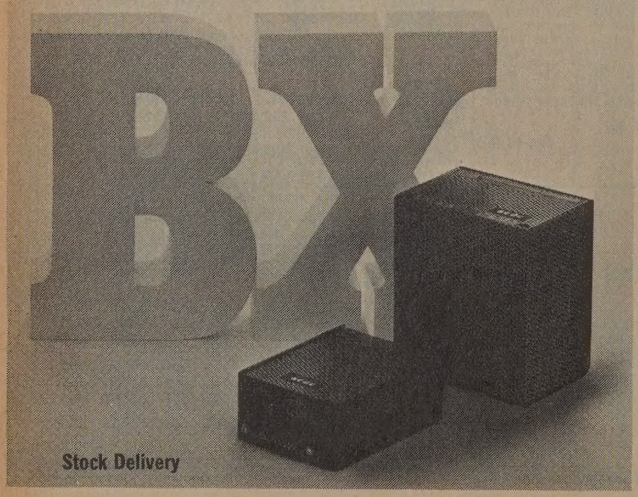
JR — Miniaturized Power Supply Modules
Here's the first precision-regulated DC power supply in a truly miniaturized package. You get AC conversion, isolation, and regulation in a package so slim and light you could actually put five of ours into one of theirs. So you can tuck it into impossible spaces. Yet there's only a modest price differential over conventional units, despite JR's drastically improved efficiency.

Stock Delivery

IC — 5V Power Supply Modules for ICs
The application's in the name — if you're in digital ICs, then this unusually complete line of 5VDC power supply modules has been designed especially for you. Performance, too, has been optimized for the end use and we've multi-rated the power output to make IC ideal for you under every possible condition.

Stock Delivery

BX — Precision Power Supply Modules for all Applications
You name it and we'll ship it. From 0 to 28VDC it's off the shelf — higher voltages take just a little longer. When you specify BX, you'll get our best regulated series that's designed to cover every conceivable power supply requirement.



Stock Delivery

OA — Dual Output Power Supply Modules for Op Amps
If you're in op amps, you need power supplies with built-in tracking and long-term stability. That's what you get in our OA line.

Stock Delivery

acdc electronics inc. Oceanside Industrial Center, Oceanside, California 92054, (714) 757-1880

General Specifications

acdc POWER SUPPLIES

Stock Delivery

	JR Miniaturized Power Supply	IC Optimized 5V Modules	BX Precision Modules	OA Dual Output Modules
Input	105-125VAC, 47-420Hz, single phase.	105-125VAC, 47-63Hz (usable also to 400Hz — consult **acdc** for derating). All models of 20A and greater are provided with a 105-125/210-250VAC input.		
Output	Voltage range shown in tables on following two pages is continuously variable between limits by externally accessible screwdriver adjustment of multiturn pot. Output is floating — either positive or negative terminal may be grounded. Current: zero to full load as shown in tables.			
Regulation	0.1% +5mV NL-FL. ±0.1% ±5mV for ±10% input variation.	0.05% for line changes of 10%. 0.05% for NL to FL changes.	0.01% or 0.001 volt for line changes of 10%. 0.01% or 0.002 volt for NL to FL changes.	
Ripple	3mV RMS max (120Hz). 25mV P-P (spikes at 50KHz rep. rate).	2mV RMS and 20mV P-P max.	0.5mV or 0.001% max. RMS (whichever is greater).	
Temperature Stability	Typical 10mV for eight hour period after initial warmup.		Maximum 0.1% or 10mV for eight hour period after initial warmup.	
Transient Response	Typically less than 1 msec in response to an NL-FL step.	Output voltage returns to within regulation limits within 50μsec in response to a 50% step change in load current.		
Remote Sensing	Terminals are provided to maintain regulation at the load, compensating for the DC voltage drop in the load cable.			
Remote Voltage Adjustment	Terminals are provided to adjust the output voltage by means of a remote variable resistor. On the wide range models, in addition to being internally adjustable over the full range, remote programming is possible at an accurately adjustable 1000 Θ/V and a separate zero adjustment is provided. Remote voltage adjustment is not provided on dual output models but may be ordered as a special feature.			
Ambient Temperature	Unit must be mounted to allow conductive heatsinking to hold the case temperature below 80°C.	Operating: Full rated output at operating temperatures of 0° to 71°C without forced air or heatsinking. Storage: —55°C to +85°C.		
Mil Specs	The listed catalog models are constructed with the highest quality components and have MTBF ratings in the neighborhood of 50,000 hours per MIL-HDBK-217. **acdc** will also build supplies to meet specific MIL specs such as MIL-E-4158A, MIL-E-16400, MIL-T-21200, and meet environmental requirements such as MIL-E-5400, MIL-E-5272, MIL-E-4970, and RFI specs MIL-I-26600 and MIL-I-6181. **acdc's** own environmental laboratory is able to perform qualification testing when required and is used extensively to prove out designs. In order to provide the most efficient design, customer inquiries are invited, outlining exact specifications and environmental conditions required for the end product.			
Weight	Approx. 1½ lbs.	4 to 83 lbs. Weight for individual models is given in the tables on the following two pages.	1.6 to 46 lbs.	4 to 11 lbs.
Mounting	Fits into 1¾" rack panel assembly.	Unit can be mounted in any position on either one of two sides. Mounting faces have threaded mounting holes.		
Dimensions	H-W-L dimensions for individual models are given in the tables on the following two pages.			
Overload Protection	All models are inherently protected against overload and short circuits of any duration. Except for certain higher voltage units, no fuses or reset buttons are used — automatic recovery is electronically accomplished. On higher voltage units, short circuit protection is furnished by means of an accessible, replaceable fuse.			
Overvoltage Protection (Optional)	A completely independent overvoltage protection module is available and straddles the output terminals. This protection does not depend on the regulating circuitry of the supply. Trip voltage adjustable from 5-30 volts.	Any model, up to 50 volts, can be furnished with overvoltage protection which "crowbars" the output in the event of a rise in the output voltage of 10% or 2 volts (whichever is greater). On dual models, overvoltage protection "crowbars" both voltages to near zero in the event of a rise of one or both of the voltages of 20% or 4 volts (whichever is greater).		
Connector	All cases have barrier strip termination.		Cases A through F are supplied with a solder hook terminal header. Case M1 is furnished with an attached 10 terminal PC edge connector which may be used either as a solder connection or readily removed by the user and mounted in his equipment to provide plug-in convenience. G and H cases have barrier strip termination.	
Construction	Black anodized aluminum case. Unit may be removed from case for complete serviceability.	Modules are constructed of heavy gage aluminum with integral extruded heatsinks; color is black. Removable covers of perforated steel have a light gold enamel finish. Regulating circuitry is mounted on a PC board.		
Output Impedance	(See Regulation and Transient Response).	DC — 1KHz 0.001 R_L or 0.005 ohm max. 1-100KHz 0.005 R_L or 0.3 ohm max (whichever is greater). R_L = rated load.	DC — 1KHz 0.0001 R_L or 0.001 ohm max. 1-10KHz 0.0003 R_L or 0.01 ohm max. 10-100KHz 0.006 R_L or 0.3 ohm max. (whichever is greater). R_L = rated load.	
Temperature Coefficient	0.02%/°C max.	1mV/°C max.	Maximum .015% or 1mV/°C.	

acdc electronics inc. Oceanside Industrial Center, Oceanside, California 92054. (714) 757-1880

Specifications | **acdc** POWER SUPPLIES | **Stock Delivery**

JR Miniaturized Power Supply Module

Nominal Output Voltage (VDC)	Output Voltage Range* (VDC)	Maximum Current Rating (Amps)	Maximum Dimensions (inches) H	W	L	Weight approx. (lbs.)	Case Size	Model (Add —1 for Overvoltage Protection)	Quantity	Price (add $30 for OVP)
5	3.0 5.0 5.5 6.0	10 10 9 8	1.375	3.125	6.5	1.5	K1	JR5K10	1-9 10-24 25-49 50-99	$298 291 285 280
15	12 15 18	4.0 4.0 3.0	1.375	3.125	6.5	1.5	K1	JR15K4.0	1-9 10-24 25-49 50-99	$298 291 285 280
25	22 25 30	2.5 2.0 2.0	1.375	3.125	6.5	1.5	K1	JR25K2.0	1-9 10-24 25-49 50-99	$298 291 285 280

*Continuously adjustable

IC 5V Power Supply Module for IC's

Nominal Output Voltage (VDC)	Output Voltage Range (VDC)	Maximum Current Rating (Amps)	Maximum Dimensions (inches) H	W	L	Weight approx. (lbs.)	Case Size	Model (Add —1 for Overvoltage Protection)	Price
5	4.75 to 5.25	2.0 @ 71°C 2.5 @ 55°C 2.7 @ 40°C	5.0	2.5	4.38	4	J1	IC5N2.7	98.00 Add $20 for overvoltage protection
5	4.75 to 5.25	6.2 @ 71°C 8.0 @ 55°C 9.5 @ 40°C	5.0	5.0	5.0	7.5	L1	IC5N9.5	134.00 Add $30 for overvoltage protection
5	4.75 to 5.25	9.2 @ 71°C 11.5 @ 55°C 13.5 @ 40°C	5.0	5.0	7.5	11	N1	IC5N13.5	186.00 Add $30 for overvoltage protection
5	4.75 to 5.25	16.5 @ 71°C 21.5 @ 55°C 25.0 @ 40°C	5.0	5.53	11.0	19	P1	IC5N25	258.00 Add $30 for overvoltage protection
5	4.75 to 5.75	50 @ 71°C 60 @ 55°C 70 @ 40°C	5.25	19.00	14.00	52	S1	IC5N70	529.00 Add $60 for overvoltage protection
5	4.75 to 5.25	75 @ 71°C 90 @ 55°C 100 @ 40°C	5.25	19.00	21.00	83	S2	IC5N100	835.00 Add $85 for overvoltage protection

pecifications | **acdc** POWER SUPPLIES | **Stock Delivery**

3X Precision Power Supply Modules for All Applications

Nominal Output Voltage (VDC)	Output Voltage Range (VDC)	Maximum Current Rating (Amps)	Maximum Dimensions (inches) H	W	L	Weight approx. (lbs.)	Case Size	Model (Add —1 for Overvoltage Protection)	Price
2 through 28 n even voltages	±1 from nominal	0.3	1.88	2.75	4.75	1.6	M1	BX2N0.3 through BX28N0.3	76.00 Add $20 for overvoltage protection
2 through 28 n even voltages	±1 from nominal	1.2	5.00	3.12	4.37	4	A1	BX2N1.2 through BX28N1.2	116.00 Add $20 for overvoltage protection
2 through 28 n even voltages	±1 from nominal	2.5	5.00	4.37	6.00	8	B1	BX2N2.5 through BX28N2.5	137.00 Add $20 for overvoltage protection
2 through 10 n even voltages	±1 from nominal	5.0	5.25	5.00	6.00	11	C1	BX2N5 through BX10N5	184.00 Add $30 for overvoltage protection
12 through 28 n even voltages			5.00	6.87	6.00	14	D1	BX12N5 through BX28N5	
2 through 6 n even voltages	±1 from nominal	10.0	6.50	6.62	8.25	18	E3	BX2N10 through BX6N10	274.00 Add $30 for overvoltage protection
8 through 28 n even voltages			6.50	7.75	8.25	25	F2	BX8N10 through BX28N10	
2 through 14 n even voltages	±1 from nominal	20.00	5.50	8.00	15.00	42	G1	BX2N20 through BX14N20	395.00 Add $30 for overvoltage protection
16 through 28 n even voltages			5.50	9.75	15.00	46	H1	BX16N20 through BX28N20	

F applications requiring 0.5% regulation, see BC series, also available from stock.

OA Dual Output Power Supply Modules for OP Amps

Nominal Output Voltage (VDC)	Output Voltage Range (VDC)	Maximum Current Rating (Amps)	Maximum Dimensions (inches) H	W	L	Weight approx. (lbs.)	Case Size	Model (Add —1 for Overvoltage Protection)	Price
±12	11-13	0.350 @ 71°C 0.425 @ 55°C 0.500 @ 40°C	5.00	2.50	4.38	4	J2	OA12D0.5	119.00 Add $20 for overvoltage protection
±15	14-16							OA15D0.5	
±12	11-13	0.750 @ 71°C 0.900 @ 55°C 1.1 @ 40°C	5.00	3.12	4.37	5	A1	OA12D1.1	149.00 Add $20 for overvoltage protection
±15	14-16							OA15D1.1	
±12	11-13	3.0 @ 71°C 3.5 @ 55°C 3.7 @ 40°C	5.00	5.25	6.00	11	C1	OA12D3.7	195.00 Add $20 for overvoltage protection
±15	14-16							OA15D3.7	

Other ACDC Power Supply Modules

acdc POWER SUPPLIES

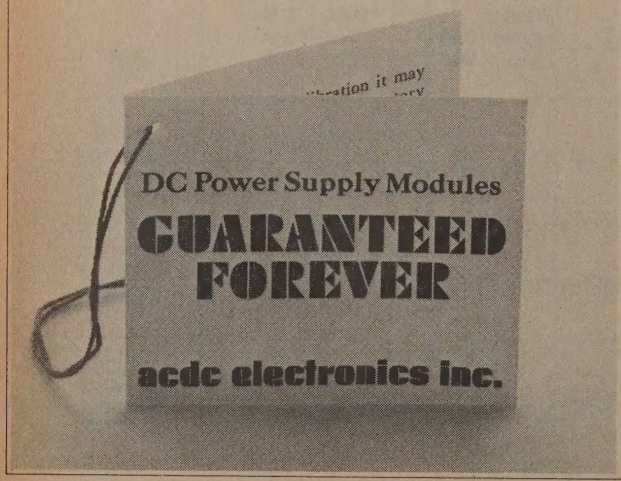
BC — This series of DC power supply modules has 0.5% regulation. 15 voltage ranges 2 to 28VDC, each available in six current ratings from 300mA to 20A. Available from stock.

0.3A	$ 73.00	5.0A	$178.00
1.2	$111.00	10.0	$265.00
2.5	$132.00	20.0	$384.00

30 to 400VDC Modules — Both the BC (0.5% regulation) and the BX series (0.01% regulation) are offered in 22 voltage ranges to meet 30 to 400VDC precision requirements. The 11 ranges from 30 to 50VDC are available with 0.3, 1.2, 2.5, and 5.0A current ratings. Those from 60 to 100VDC are made with 0.1, 0.4, 0.6, and 1.2A ratings. An additional 0.2A rating is offered in the 100VDC range. The 150, 200, 250, 300, 350, and 400VDC range modules are rated 0.1, 0.2, 0.4, and 0.6A. Prices range from $82.00 to $282.00.

Wide Range Programmable Modules — These unique ACDC modules are adjustable from zero to full output voltage and will deliver rated current at all voltages. A screwdriver makes both the fine and coarse voltage controls easily accessible. May be used with an external programming resistor. In the 0 to 25VDC range, available with 0.1, 0.4, 1.2, and 2.5A ratings. In the 0 to 50VDC range, the ratings are 0.1, 0.2, 0.6, and 1.2A. From $119.00 to $178.00.

Dual Output Modules — ACDC's BX and BC series are also available to meet dual output requirements, in 25 ranges from ±2 to ±50VDC. Each range is offered in four current ratings from 300mA to 2.5A. From $154.00 to $275.00.



Warranty

When used within its specified operating environments, ACDC power supplies are unconditionally guaranteed to meet all published specifications for an unlimited length of time. This guarantee covers all parts of the module, including semi-conductors, fuses, and mechanical parts, without regard to the date of purchase or installation. All terms of this guarantee are fully transferable when the power supply is sold as original equipment.

If at any time the power supply is in need of warranty service or calibration it may be returned directly to the factory where, without charge, it will be adjusted to meet its original specifications. ACDC will pay surface freight charges to and from the factory.

Rack Assemblies

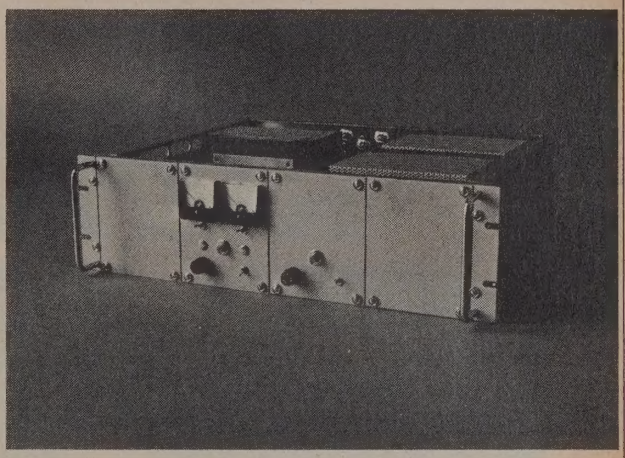
acdc
POWER SUPPLIES

New from ACDC! Universal 19″ Rack Adapters for mounting any ACDC power supply. Available in 3½″, 5¼″, or 7″ high and 14″ or 21″ deep. There are no holes to drill, just assemble the power supply mounting plates with the hardware furnished with each Rack Adapter. Front panels are finished in grey enamel and the chassis is cadmium plated. Panel options range from blank front panels to metered control panels.

The 3½″ and 5¼″ Rack Adapters provide an enclosed wire trough located in the center of the chassis. Feed-through barrier strips can be installed on the back panels to simplify cable terminations. Two cable entrance holes are also provided on each Rack Adapter.

The Switch Panels contain Line Switch, Red Pilot Light and a Fuse Holder. The 3½″ Metered Panels provide Line Switch, Red Pilot Light, Fuse Holder, and 1½″ Voltmeter and Ammeter. The 5¼″ and 7″ Metered Panels have in addition two Selector Switches and are designed to monitor two outputs. Buttoned holes allow for customer's installation of remote voltage adjust pots.

When ordering, specify the desired Rack Adapter and specify the number and types of cases which are intended to be accommodated (this provides you with the required special mounting plates and recommended installation drawing shipped free with your order). Choose the desired front panel or panels and possibly a set of slides.



ACDC Case / Rack Chart

The following line-up lists the cases that can be accommodated in each rack adapter. Contact your ACDC representative or the factory for exact total module capacity of each adapter.

3.50″ Rack	5.25″ Rack		7.00″ Rack		
A1	A1	J1	A1	E3	J2
J1	A2	J2	A2	E4	K1
J2	B1	K1	B1	F1	L1
M1	B2	L1	B2	F2	M1
K1	C1	M1	C1	G1	N1
	D1	N1	D1	H1	P1
	D2	P1	D2	J1	

ACDC Case / Rack Chart

	3½″		5¼″		7″	
Basic Rack 14″	RA3X14	$50.00	RA5X14	$50.00	RA7X14	$55.00
Basic Rack 21″	RA3X21	60.00	RA5X21	60.00	RA7X21	65.00
Full Panel	RP3XF	9.00	RP5XF	9.00	RP7XF	9.50
¾ Panel	RP3X3	8.00	RP5X3	8.00	RP7X3	8.50
½ Panel	RP3X2	6.50	RP5X2	6.50	RP7X2	7.00
¼ Panel	RP3X1	5.00	RP5X1	5.00	RP7X1	5.50
Switch Panel (¼)	RP3X1P	18.00	RP5X1P	18.00	RP7X1P	18.00
Metered Panel (¼) (Specify V/A Ranges)	RP3X1M	45.00	RP5X1M	45.00	RP7X1M	45.00
Barrier Strip	RH8	1.90	RH8	1.90	RH8	1.90
Barrier Strip	RH8	1.90	RH10	1.90	RH10	1.90
Chassis Slides (14″)	RS1X14	48.00	RS1X14	48.00	RS1X14	48.00
Chassis Slides (21″)	RS1X21	52.00	RS1X21	52.00	RS1X21	52.00

acdc electronics inc. Oceanside Industrial Center, Oceanside, California 92054, (714) 757-1880

A-MP★ SOLID STATE HIGH VOLTAGE POWER CONVERSION

FOR COMMERCIAL AND MILITARY APPLICATIONS

The CAPITRON Division of AMP Incorporated has complete in-house facilities for designing and manufacturing power assemblies, including metal forming, printed circuit board fabrication, magnetics winding, encapsulating, and environmental testing. In addition, the use of AMPLIFILM★ capacitor products enables CAPITRON engineers to design higher power into smaller packages for both military and commercial applications.

Solid state and conventional units are characterized by tight regulation, low ripple voltage, and dense, rugged construction. All are pre-engineered to specific customer requirements.

The rack and panel mounted multiple output supply shown is intended for use in normal office environments. All output voltages and current are read from a single panel meter. All voltages are short-circuit proof and a system malfunction will turn off the 17 KV output until it is reset.

A unique feature is the operation of the "power present" indicators: Low input line voltage turns off logic circuits, all supplies and indicators; high output voltage from any supply turns off logic, but not output power; overcurrent from any supply turns off its logic and its indicator.

SPECIFICATIONS:

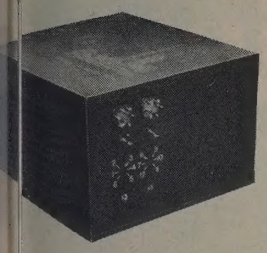
Adjustable outputs	17 KV, 1 KV
Fixed output	400 V
Current ranges	0.1 to 1 ma
Regulation	.01% to 1%
Ripple	.05%

Also available are special purpose power supplies for CRT, Energy Storage, Laser, Traveling Wave Tube and Programmable applications. The CAPITRON Division is equipped to satisfy special design requirements on short notice.

★Trademark of AMP Incorporated

MORE POWER TO

LOW VOLTAGE POWER SUPPLIES



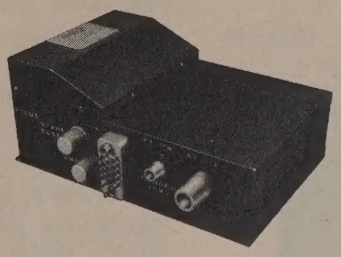
A typical multiple output type, this unit is not only short circuit proof between any output and ground, and between all outputs, but provides automatic overvoltage / undervoltage shutdown and output current limitation to 150% of rated value. All outputs are isolated with respect to the input, and the unit meets RFI requirements of MIL-I-6181.

Input: 20-29 VDC
Outputs:
300 VDC ±2% @ 70 ma.
250 VDC ±2% @ 150 ma.
55 VDC ±2% @ 220 ma.
22 VDC ±2% @ 800 ma.
6 VDC ±2% @ 10 ma.
–0.5 VDC nom. @ 10 ma. (ext. adj. from +.0.2 to –1.4 VDC)
–20 VDC ±2% @ 25 ma.
–150 VDC ±2% @ 180 ma.

Regulation: ±1.0% line and load
Ripple: 0.017% pk-pk
Altitude: 10,000 ft. (operational)
Temperature: –54° to +55° C
Shock Vibration: MIL-E-5400
Size: 8" x 8" x 5"
Weight: 19 lb. max.

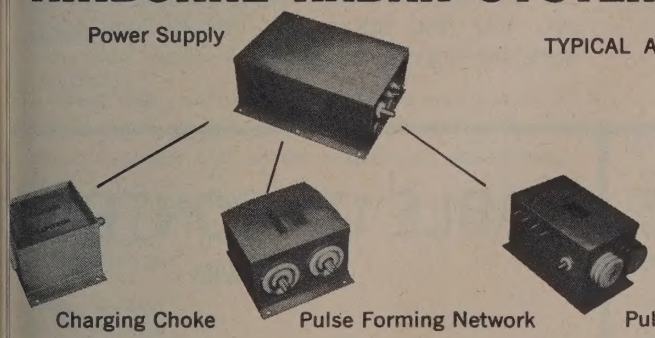
HEADS-UP CRT POWER SUPPLIES

Ripple: .05%
Regulation: ±0.1%
Volume: less than 50 cu. in.
Weight: 3¼ lbs.
Temperature: —55°C to 110°C
MIL-E-5400



Input: 115 V, 400 cps MIL-STD-704
Outputs:
15 KVDC, 400 μa pk.
1.7 KV (adj. 1.4 to 2.0 KV), +30 μa to —30 μa
300 VDC, +15 μa to —15 μa

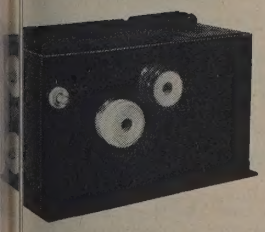
AIRBORNE RADAR SYSTEMS AND COMPONENTS



TYPICAL AIRBORNE RADAR POWER CONVERSION SYSTEM

A compact 4-module pulse system with extremely good heat sinking and klystron filament voltage regulation between 7.35 and 7.75 volts at 2 to 2½ amps. Maximum pulse ripple is only 1.0%. The largest unit is approximately ½ cu. ft. in size and weighs less than 12 lbs.

Pulse Modulator for Airborne Radar



This oil-filled pulse modulator is designed to drive the V-24 klystron family. Offering maximum power (300 KW peak) for minimum size, it has excellent square wave characteristics, providing pulses of long duration for the required repetition rate. A unique heat sinking technique effectively removes 400 watts of heat, permitting operation at 107°C ambient temperature. The package also supplies klystron input voltage variation tightly regulated to 9 +.5V/–0V with variations in temperature from –7 to 107°C, filament power from 107.5 to 119.5 volts, load current from 2 to 2.5 amps, and input frequency from 380 to 420 cps.

Performance Specifications

Input: 5 KVDC ±.25 KVDC @ 510 ma.
Output: 40 KV @ 7½ amps. 1800 pps for search followed by 2235 pps. for indefinite duration
Pulse: 2.1 μsec. read at 100% amplitude; 0.5 μsec. rise time; 0.9 μsec. fall time; 1.5% max. ripple; 10% max. backswing
Ambient Temperature: –7° C to +107° C (operational); –60° C to 121° C (storage)
Size: 10¼" x 4¾" x 5⅞"
Weight: 26 lbs. max.

YOU, FROM →

CAPITRON DIVISION, AMP INCORPORATED
155 PARK STREET, ELIZABETHTOWN, PA. 17022.
TWX: 510-657-4561 • PHONE: 717-367-1105.

AMP
INCORPORATED

NOTE: See other CAPITRON High Voltage products under Catalog Sections 2100 and 1500.

ABBOTT POWER MODULE

The Next 20 Pages List 2700 Regulate Modules with Specifications and Price

The most complete line of small size MIL-SP type power modules available in the industry is f described in the following 20 pages. The Abb line of power modules includes output volta from 5 volts to 10,000 volts DC, output curr from 2 milliamperes to 20 amperes and out power from 1 watt to 300 watts. Sizes, weig regulations and environments are shown for various input and output powers. Abbott is pr to list two completely new lines of power modu this year: 400 Hz to DC and DC to DC high-p formance modules. Optional features are shown the last page. Look through the next 20 pages you may find the power module you want i standard Abbott model.

See Abbott's 1970 catalog for complete information on all our products plus additional items such as:

- Quality Control System
- Thermal Data
- Input Currents
- Overvoltage Protectors
- Input Line Filters
- Operating Hints
- Reliability & MTBF
- EMI/RFI
- MIL Spec Environments

To receive your free copy of this comprehensive 76 page Power Supply Catalog, simply call or write Abbott.

TABLE OF CONTENT

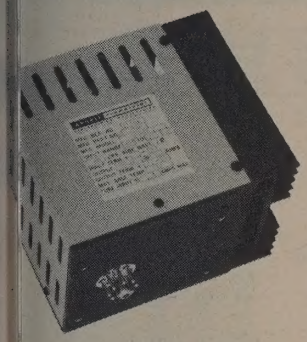
NEXT 20 PAGES

60 HERTZ to: DC, regulated
DC, hermetically sealed
400 HERTZ to: DC, regulated
DC, hi-temp.
DC, hi-performance
DC to: 60 Hz, regulated
Sine Wave, 1ϕ or 3ϕ
Sine Wave, hi-temp.
DC, regulated
DC, hi-temp.
DC, hi-performance
OPTIONAL FEATURES

abbott transistor
LABORATORIES, INCORPORATED

5200 W. Jefferson Blvd. / Los Angeles 9001
(213) WEbster 6-8185 Cable: ABTLAB

bbott 60 ∼ to DC (Regulated)



POWER MODULES

features

- −4 to +160°F ambient
- 5 to 100 VDC
- 0.15 to 20 amps
- ±0.05% regulation
- All silicon
- High reliability
- Short circuit protection
- Voltage transient protection
- MIL-T-27C transformers used throughout
- For military and industrial applications

DELIVERY IS NORMALLY 12 DAYS

CIFICATIONS

OLTAGE RANGE
2VRMS

REQUENCY RANGE
lertz 1 phase

VOLTAGE AND CURRENT
ific models listed on next page

ULATION
or 10 mv (whichever is greater) for input change of 105-125 VRMS

GULATION
or 10 mv (whichever is greater) for change from no load to full load

E
r 5 mv RMS (whichever is greater)

VOLTAGE ADJUSTMENT
is continuously adjustable between the limits shown in table by an externally accessible screwdriver adjustment potentiometer

ENT RESOLUTION
ax. for outputs 5 thru 16 VDC; 50 mv max. for outputs 18 thru 50 VDC
av for outputs 55 thru 95 VDC

N VOLTAGE
between output terminals and chassis ground

ON RESISTANCE
hms between output terminals and chassis ground when measured at DC

d outputs are isolated; either positive or negative side may be grounded

TURE
: −4°F (−20°C) to +160°F (+71°C) without derating, forced air, inking. Storage: −67 to +185°F

TURE COEFFICIENT
er degree Centigrade

eet above sea level

IRCUIT PROTECTION
t is completely protected against an overload or short circuit of any The output voltage automatically restores to normal when the is removed

RANSIENT PROTECTION
for 0.1 sec in accordance with MIL-STD-704A, figure 3, limit 1

ANSIENT RECOVERY TIME
oltage returns to regulation limits within 75 microseconds after a p change in load current

ERROR SENSING
t contains a means by which the regulator circuit monitors the voltage at the load using extra "sensing" leads. The resulting circuit action ates for a DC voltage drop up to 0.5 volts in the load leads.

OPERATION
nore power supplies can be operated in series so that the output volt- the supplies are additive. Total output voltage is not to exceed 200 VDC

IMPEDANCE
Hz — 0.003 R_L or 0.03 ohms max., whichever is greater.
10K Hz — 0.008 R_L or 0.08 ohms max., whichever is greater.
o 100K Hz — 0.015 R_L or 0.30 ohms max., whichever is greater.
ted load resistance.

LITY
n time between failure (MTBF) per MIL-HDBK-217 under worst case g conditions of full output current, max. input voltage, and +160°F is 22,026 hrs. for 20 amp models, increasing to 47,281 hrs. for 0.15 dels. At +104°F ambient, the MTBF increases to 63,898 hrs. and hrs., respectively (Consult factory for complete reports)

NG
d inserts are provided on two surfaces for versatile mounting of cases h F (see case drawings).

MODEL DESIGNATION (For Model "R" series only)

For your assistance and understanding, we have included a complete explanation of our model designation for this series of units, using Model **R28S2.5-14** as an example.

R Designates the general series of the power supply.

28 Designates the nominal output voltage of the unit.

S Designates the output connector as follows:
- S — 8 pin solder hook terminal. Standard on all units with case size A through F.
- T — Terminal strip. Standard on all units with case size G through J.
- P — Octal plug. Optional on case sizes A through F at $10 for one piece and $5 each for two to four pieces.
- C — Cannon connector MS3112E-16-8P with mate. Optional on case sizes A through F at $30 for one piece and $20 for two to four pieces.

2.5 Designates the continuous full load output current.

14 Designates the inclusion of the desired optional features. For a list of the features available, and their numbers, please see the "Optional Features" section for Model R series, below. For example, R28S2.5-14 designates a 60 Hz to 28 VDC at 2.5 amps unit using an 8 pin solder hook terminal, having the optional features "overvoltage protection" and "remote voltage adjustment"

OPTIONAL FEATURES (For Model "R" series only)

To include the optional features desired in the power supply, simply add a dash and the feature number to the end of the model number. (See "Model Designation" section above.)

Feature	Description	Feature Number	Price 1 pc.	Price 2-4 pcs.
Overvoltage Protection	If the output voltage rises 10% or 2V WIG above the nominal setting, the overvoltage protection circuitry reduces the voltage to approximately 1 volt within 15 microseconds. Under worst case conditions the output voltage could rise an additional 10% max during this 15 microsecond period.	1	$30	$20
Connector Location	The output connector can be supplied on the surface labeled "Optional Location" on the dimensional drawing for case size B through F.	2	10	5
230 VAC Operation	Units can be modified to operate with an input voltage of 210 to 250 VRMS, 50 to 420 Hz.	3	20	10
Remote Voltage Adjustment	Provision is made for locating an adjustment potentiometer in a remote location from the power supply.	4	20	10
Output Voltage Resolution	Provisions can be made to increase the output voltage adjustment resolution as follows: **Nominal Output Voltage / Resolution**: 5V through 16V — 1.5 mv max.; 18V through 50V — 3.0 mv max.; 55V through 95V — 5.0 mv max.	5	20	10
Parallel Operation	Units can be modified for parallel operation providing: a) Each unit has the same output voltage. b) Output current of each unit is derated 20%.	6	20	10

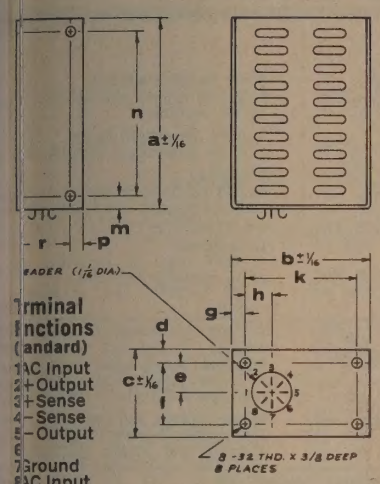
FOR MODEL LISTINGS, PLEASE TURN PAGE →

abbott 60 ∼ to DC (Regulated)

Output Voltage Range	Output Curr. (Amps)	Size (See Dwg.)	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
4.5-5.5	0.15	A	3.0	R5S0.15	$ 94	$ 86
	0.3	A	3.0	R5S0.3	111	101
	0.6	B	6.0	R5S0.6	130	119
	1.2	B	6.0	R5S1.2	149	136
	2.5	C	8.0	R5S2.5	179	163
	5.0	D	13.0	R5S5	247	225
	10	F	22.0	R5S10	332	302
	15	G	28.0	R5T15	424	386
	20	J	33.0	R5T20	508	462
5.5-6.5	0.15	A	3.0	R6S0.15	94	86
	0.3	A	3.0	R6S0.3	111	101
	0.6	B	6.0	R6S0.6	130	119
	1.2	B	6.0	R6S1.2	149	136
	2.5	C	8.0	R6S2.5	179	163
	5.0	D	13.0	R6S5	247	225
	10	F	22.0	R6S10	332	302
	15	G	28.0	R6T15	424	386
	20	J	33.0	R6T20	508	462
6.5-7.5	0.15	A	3.0	R7S0.15	94	86
	0.3	A	3.0	R7S0.3	111	101
	0.6	B	6.0	R7S0.6	130	119
	1.2	B	6.0	R7S1.2	149	136
	2.5	C	8.0	R7S2.5	179	163
	5.0	D	13.0	R7S5	247	225
	10	F	22.0	R7S10	332	302
	15	G	28.0	R7T15	424	386
	20	J	33.0	R7T20	508	462
7.5-8.5	0.15	A	3.0	R8S0.15	94	86
	0.3	A	3.0	R8S0.3	111	101
	0.6	B	6.0	R8S0.6	130	119
	1.2	B	6.0	R8S1.2	149	136
	2.5	C	8.0	R8S2.5	179	163
	5.0	D	13.0	R8S5	247	225
	10	F	22.0	R8S10	332	302
	15	G	28.0	R8T15	424	386
	20	J	33.0	R8T20	508	462
8.5-9.5	0.15	A	3.0	R9S0.15	94	86
	0.3	A	3.0	R9S0.3	111	101
	0.6	B	6.0	R9S0.6	130	119
	1.2	B	6.0	R9S1.2	149	136
	2.5	C	8.0	R9S2.5	179	163
	5.0	D	13.0	R9S5	247	225
	10	F	22.0	R9S10	332	302
	15	H	31.0	R9T15	424	386
	20	J	33.0	R9T20	508	462
9.5-10.5	0.15	A	3.0	R10S0.15	94	86
	0.3	A	3.0	R10S0.3	111	101
	0.6	B	6.0	R10S0.6	130	119
	1.2	B	6.0	R10S1.2	149	136
	2.5	C	8.0	R10S2.5	179	163
	5.0	D	13.0	R10S5	247	225
	10	F	22.0	R10S10	332	302
	15	H	31.0	R10T15	436	397
	20	J	33.0	R10T20	508	462
10.5-11.5	0.15	A	3.0	R11S0.15	94	86
	0.3	A	3.0	R11S0.3	111	101
	0.6	B	6.0	R11S0.6	130	119
	1.2	B	6.0	R11S1.2	149	136
	2.5	C	8.0	R11S2.5	179	163
	5.0	D	13.0	R11S5	247	225
	10	F	22.0	R11S10	332	302
	15	H	31.0	R11T15	436	397
	20	J	33.0	R11T20	508	462
11-13	0.15	A	3.0	R12S0.15	94	86
	0.3	A	3.0	R12S0.3	111	101
	0.6	B	6.0	R12S0.6	130	119
	1.2	B	6.0	R12S1.2	149	136
	2.5	C	8.0	R12S2.5	179	163
	5.0	D	13.0	R12S5	247	225
	10	F	22.0	R12S10	332	302
	15	H	31.0	R12T15	436	397
	20	J	33.0	R12T20	508	462
13-15	0.15	A	3.0	R14S0.15	94	86
	0.3	A	3.0	R15S0.3	111	101
	0.6	B	6.0	R14S0.6	130	119
	1.2	B	6.0	R14S1.2	149	136
	2.5	C	8.0	R14S2.5	179	163
	5.0	D	13.0	R14S5	247	225
	10	G	28.0	R14T10	342	311
	15	H	31.0	R14T15	436	397
15-17	0.15	A	3.0	R16S0.15	$ 94	$ 86
	0.3	A	3.0	R16S0.3	111	101
	0.6	B	6.0	R16S0.6	130	119
	1.2	B	6.0	R16S1.2	149	136
	2.5	C	8.0	R16S2.5	179	163
	5.0	D	13.0	R16S5	247	225
	10	G	28.0	R16T10	342	311
	15	H	31.0	R16T15	436	397
17-19	0.15	A	3.0	R18S0.15	94	86
	0.3	A	3.0	R18S0.3	111	101
	0.6	B	6.0	R18S0.6	130	119
	1.2	B	6.0	R18S1.2	149	136
	2.5	C	8.0	R18S2.5	179	163
	5.0	D	13.0	R18S5	247	225
	10	G	28.0	R18T10	342	311
19-21	0.15	A	3.0	R20S0.15	94	86
	0.3	A	3.0	R20S0.3	111	101
	0.6	B	6.0	R20S0.6	130	119
	1.2	B	6.0	R20S1.2	149	136
	2.5	C	8.0	R20S2.5	179	163
	5.0	D	13.0	R20S5	247	225
	10	G	28.0	R20T10	342	311
21-23	0.15	A	3.0	R22S0.15	94	86
	0.3	A	3.0	R22S0.3	111	101
	0.6	B	6.0	R22S0.6	130	119
	1.2	B	6.0	R22S1.2	149	136
	2.5	C	8.0	R22S2.5	179	163
	5.0	E	13.0	R22S5	247	225
	10	G	28.0	R22T10	342	311
23-25	0.15	A	3.0	R24S0.15	94	86
	0.3	A	3.0	R24S0.3	111	101
	0.6	B	6.0	R24S0.6	130	119
	1.2	B	6.0	R24S1.2	149	136
	2.5	C	8.0	R24S2.5	179	163
	5.0	E	13.0	R24S5	247	225
	10	G	28.0	R24T10	342	311
25-27	0.15	A	3.0	R26S0.15	94	86
	0.3	B	6.0	R26S0.3	122	111
	0.6	B	6.0	R26S0.6	130	119
	1.2	C	8.0	R26S1.2	149	136
	2.5	D	13.0	R26S2.5	201	183
	5.0	E	20.0	R26S5	247	225
27-29	0.15	A	3.0	R28S0.15	94	86
	0.3	B	6.0	R28S0.3	122	111
	0.6	B	6.0	R28S0.6	130	119
	1.2	C	8.0	R28S1.2	149	136
	2.5	D	13.0	R28S2.5	201	183
	5.0	E	20.0	R28S5	247	225
29-31	0.15	A	3.0	R30S0.15	94	86
	0.3	B	6.0	R30S0.3	122	111
	0.6	B	6.0	R30S0.6	130	119
	1.2	C	8.0	R30S1.2	149	136
	2.5	D	13.0	R30S2.5	201	183
	5.0	E	20.0	R30S5	247	225
31-33	0.15	A	3.0	R32S0.15	94	86
	0.3	B	6.0	R32S0.3	122	111
	0.6	B	6.0	R32S0.6	130	119
	1.2	C	8.0	R32S1.2	149	136
	2.5	D	13.0	R32S2.5	201	183
	5.0	E	20.0	R32S5	247	225
33-35	0.15	A	3.0	R34S0.15	94	86
	0.3	B	6.0	R34S0.3	122	111
	0.6	B	6.0	R34S0.6	130	119
	1.2	C	8.0	R34S1.2	149	136
	2.5	D	13.0	R34S2.5	201	183
	5.0	E	20.0	R34S5	247	225
35-37	0.15	A	3.0	R36S0.15	94	86
	0.3	B	6.0	R36S0.3	122	111
	0.6	B	6.0	R36S0.6	130	119
	1.2	C	8.0	R36S1.2	149	136
	2.5	D	13.0	R36S2.5	201	183
	5.0	E	20.0	R36S5	247	225
37-39	0.15	A	3.0	R38S0.15	$ 94	
	0.3	B	6.0	R38S0.3	122	
	0.6	B	6.0	R38S0.6	130	
	1.2	C	8.0	R38S1.2	149	
	2.5	D	13.0	R38S2.5	201	
	5.0	E	20.0	R38S5	247	
39-41	0.15	A	3.0	R40S0.15	94	
	0.3	B	6.0	R40S0.3	122	
	0.6	B	6.0	R40S0.6	130	
	1.2	C	8.0	R40S1.2	167	
	2.5	D	13.0	R40S2.5	201	
	5.0	F	22.0	R40S5	295	
41-43	0.15	A	3.0	R42S0.15	94	
	0.3	B	6.0	R42S0.3	122	
	0.6	B	6.0	R42S0.6	130	
	1.2	C	8.0	R42S1.2	167	
	2.5	D	13.0	R42S2.5	201	
	5.0	F	22.0	R42S5	295	
43-45	0.15	A	3.0	R44S0.15	94	
	0.3	B	6.0	R44S0.3	122	
	0.6	B	6.0	R44S0.6	130	
	1.2	C	8.0	R44S1.2	167	
	2.5	D	13.0	R44S2.5	201	
	5.0	F	22.0	R44S5	295	
45-47	0.15	A	3.0	R46S0.15	94	
	0.3	B	6.0	R46S0.3	122	
	0.6	B	6.0	R46S0.6	130	
	1.2	C	8.0	R46S1.2	167	
	2.5	D	13.0	R46S2.5	201	
	5.0	F	22.0	R46S5	295	
47-49	0.15	A	3.0	R48S0.15	94	
	0.3	B	6.0	R48S0.3	122	
	0.6	B	6.0	R48S0.6	130	
	1.2	C	8.0	R48S1.2	167	
	2.5	D	13.0	R48S2.5	201	
	5.0	F	22.0	R48S5	295	
49-51	0.15	A	3.0	R50S0.15	94	
	0.3	B	6.0	R50S0.3	122	
	0.6	B	6.0	R50S0.6	130	
	1.2	C	8.0	R50S1.2	167	
	2.5	D	13.0	R50S2.5	201	
	5.0	F	22.0	R50S5	295	
50-60	0.15	B	6.0	R55S0.15	112	
	0.3	B	6.0	R55S0.3	122	
	0.6	C	8.0	R55S0.6	169	
	1.2	D	13.0	R55S1.2	200	
	2.5	E	20.0	R55S2.5	234	
60-70	0.15	B	6.0	R65S0.15	112	
	0.3	B	6.0	R65S0.3	122	
	0.6	C	8.0	R65S0.6	169	
	1.2	D	13.0	R65S1.2	200	
	2.5	E	20.0	R65S2.5	234	
70-80	0.15	B	6.0	R75S0.15	112	
	0.3	B	6.0	R75S0.3	122	
	0.6	C	8.0	R75S0.6	169	
	1.2	D	13.0	R75S1.2	200	
	2.5	E	20.0	R75S2.5	234	
80-90	0.15	B	6.0	R85S0.15	112	
	0.3	B	6.0	R85S0.3	122	
	0.6	C	8.0	R85S0.6	169	
	1.2	D	13.0	R85S1.2	200	
	2.5	E	20.0	R85S2.5	234	
90-100	0.15	B	6.0	R95S0.15	112	
	0.3	B	6.0	R95S0.3	122	
	0.6	C	8.0	R95S0.6	169	
	1.2	D	13.0	R95S1.2	200	
	2.5	E	20.0	R95S2.5	234	

60 HERTZ TO DC (Regulated)

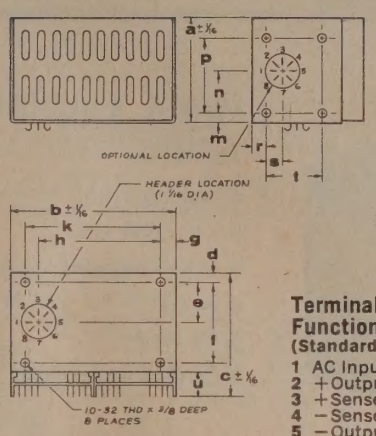
Case Size Drawings for Model "R" Series



erminal
unctions
(andard)
1 AC Input
2 +Output
3 +Sense
4 −Sense
5 −Output
6
7 Ground
8 AC Input

Case A

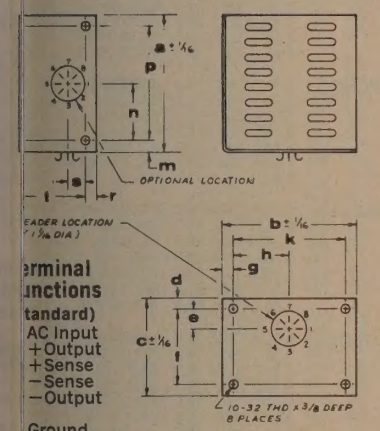
a — 6½
b — 4
c — 1⅞
d — ¼
e — 11/16
f — 1⅜
g — ½
h — ⅝
k — 3
m — ⅜
n — 5¾
p — ¼
r — 1⅜



Terminal
Functions
(Standard)
1 AC Input
2 +Output
3 +Sense
4 −Sense
5 −Output
6
7 Ground
8 AC Input

Case E

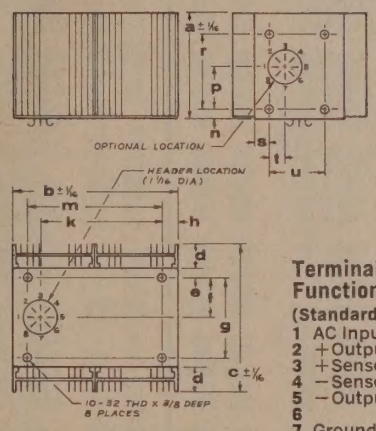
a — 5
b — 8
c — 8⅜
d — ½
e — 2⅝
f — 5¼
g — ¾
h — 5⅞
k — 6½
m — ⅝
n — 1⅞
p — 3 13/16
r — ¾
s — ½
t — 4
u — 2⅛



erminal
unctions
tandard)
AC Input
+Output
+Sense
−Sense
−Output
Ground
AC Input

Case B

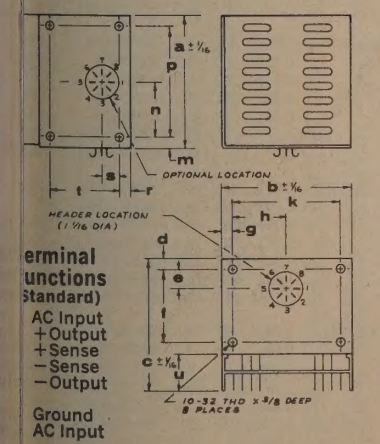
a — 5
b — 4
c — 4½
d — ⅜
e — ⅞
f — 3¾
g — 9/16
h — 1 7/16
k — 3 1/16
m — 9/16
n — 1 15/16
p — 4 1/16
r — ⅜
s — 1½
t — 3¾



Terminal
Functions
(Standard)
1 AC Input
2 +Output
3 +Sense
4 −Sense
5 −Output
6
7 Ground
8 AC Input

Case F

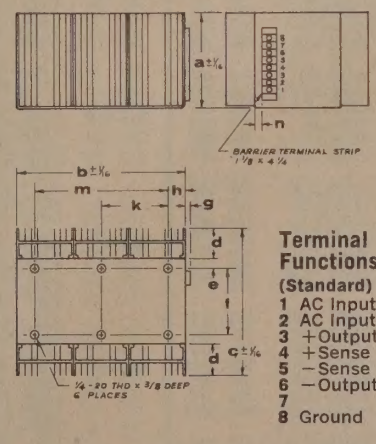
a — 5
b — 8
c — 8¾
d — 1¼
e — ½
f — 2⅝
g — 5¼
h — ¾
k — 5⅞
m — 6½
n — ⅝
p — 1⅞
r — 3 13/16
s — ¾
t — ½
u — 4



erminal
unctions
Standard)
AC Input
+Output
+Sense
−Sense
−Output
Ground
AC Input

Case C & D

	C	D
a	5	6½
b	4	4
c	5¾	7½
d	⅜	⅜
e	⅞	½
f	3 7/16	4⅜
g	9/16	½
h	1 7/16	1½
k	2 7/16	2½
m	9/16	½
n	1 15/16	2 7/16
p	4 1/16	5⅝
r	⅜	⅜
s	1 9/16	1⅛
t	3 7/16	4⅜
u	1¼	2⅛



Terminal
Functions
(Standard)
1 AC Input
2 AC Input
3 +Output
4 +Sense
5 −Sense
6 −Output
7
8 Ground

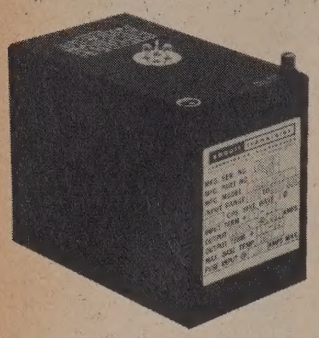
Case G, H, J

	G	H	J
a	5	6½	6½
b	12	12	12
c	8	8	9¾
d	1¼	1¼	2⅛
e	⅜	⅜	⅜
f	4¾	4¾	4¾
g	½	½	½
h	1¼	1¼	1¼
k	4¾	4¾	4¾
m	9½	9½	9½
n	⅜	⅜	⅜

DIMENSIONAL TOLERANCES: ±1/32 unless otherwise specified.

abbott transistor
LABORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott 60 ∼ to DC (Reg.) Hermetically Sealed



POWER MODULES

features

- Close regulation
- 5 to 10,000 volts
- Hermetically sealed
- Compact
- Low ripple
- For aerospace application

specifications

Input Voltage and Frequency
105-125 VAC, 55-65 Hertz, 1 phase, per MIL-STD-704A, Category B

Line Regulation
±0.2% for input 105-125 VAC on Model V's, HA's, HAL's and HC's
±0.5% for input 105-125 VAC on Model HAK's, HCK's and HN's

Voltage Regulation
±0.5% — for input 105-125 VAC and from ½ load to full load on Model V's
±1.5% — for input 105-125 VAC and from ½ load to full load on Model HA's
±2.5% — for input 105-125 VAC and from ½ load to full load on Model HAK's, HAL's, HC's and HN's

Ripple
0.2% RMS — Model V's
0.5% RMS — Model HA's
1% RMS — Model HAK's, HAL's and HC's
2% RMS — Model HN's

Short Circuit Protection
Protected against overload and sho circuit conditions

Voltage Adjustment Range
12% by screwdriver adjustment

Reliability
80,000 hours MTBF typical per Mil HDBK-217 under worst case opera ing conditions

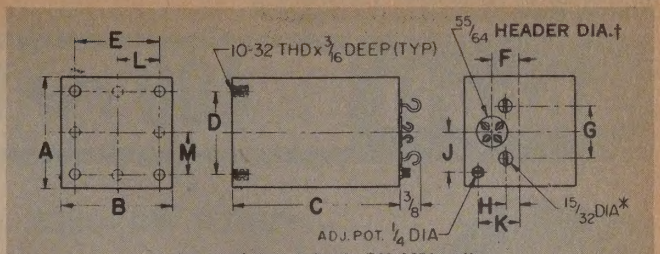
Environment
+160°F max. at mounting bas using adequate heat sink
−4°F (−20°C) min. at mountin surface
Altitude: to vacuum (true hermet seal)
Vibration, shock, sand, dust, humi ity, salt spray, fungus, sunshin rain, and explosion to MIL-E-5272

Output Voltage and Current
See specific models listed
(Outputs and inputs are isolate

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	1.0	9B	4.0	V05DS-5A	$220	$185
	2.0	9A	4.2	V1DS-5A	235	190
	4.0	10A	6.1	V2DS-5A	245	200
	6.0	11C	8.3	V3DS-5A	255	210
	12.0	13A	16.1	V6DS-5A	315	365
5.3-5.9	0.9	9B	4.0	V05DS-5.6A	220	185
	1.8	9A	4.2	V1DS-5.6A	235	190
	3.6	10A	6.1	V2DS-5.6A	245	200
	5.4	11C	8.3	V3DS-5.6A	255	210
	10.8	13A	16.1	V6DS-5.6A	315	365
5.9-6.6	0.8	9B	4.0	V05DS-6.3A	220	185
	1.6	9A	4.2	V1DS-6.3A	235	190
	3.2	10A	6.1	V2DS-6.3A	245	200
	4.8	11C	8.3	V3DS-6.3A	255	210
	9.6	13A	16.1	V6DS-6.3A	310	260
6.6-7.4	0.7	9B	4.0	V05DS-7A	220	185
	1.4	9A	4.2	V1DS-7A	235	190
	2.8	10A	6.1	V2DS-7A	245	200
	4.2	11C	8.3	V3DS-7A	255	210
	8.4	13A	16.1	V6DS-7A	310	260
7.4-8.3	0.63	9B	4.0	V05DS-7.9A	215	180
	1.26	9A	4.2	V1DS-7.9A	220	185
	2.52	10A	6.1	V2DS-7.9A	240	195
	3.78	11C	8.3	V3DS-7.9A	250	205
	7.56	12A	11.6	V6DS-7.9A	310	260
8.3-9.3	0.57	9B	4.0	V05DS-8.8A	215	180
	1.14	9A	4.2	V1DS-8.8A	220	185
	2.28	10A	6.1	V2DS-8.8A	240	195
	3.42	11C	8.3	V3DS-8.8A	250	205
	6.84	12A	11.6	V6DS-8.8A	310	260
9.3-10.4	0.50	9B	4.0	V05DS-9.9A	215	180
	1.00	9A	4.2	V1DS-9.9A	220	185
	2.00	10A	6.1	V2DS-9.9A	240	195
	3.00	11C	8.3	V3DS-9.9A	250	205
	6.00	12A	11.6	V6DS-9.9A	310	260
	12.00	13A	16.1	V12DS-9.9A	390	325
10.4-11.6	0.45	9B	4.0	V05DS-11A	215	180
	0.91	9A	4.2	V1DS-11A	220	185
	1.82	10A	6.1	V2DS-11A	240	195
	2.73	11C	8.3	V3DS-11A	250	205
	5.46	12A	11.6	V6DS-11A	310	260
	10.92	13A	16.1	V12DS-11A	390	325
11.6-13.0	0.40	9B	4.0	V05DS-12.3A	215	180
	0.81	9A	4.2	V1DS-12.3A	220	185
	1.62	10A	6.1	V2DS-12.3A	240	195
	2.43	11C	8.3	V3DS-12.3A	250	205
	4.86	12A	11.6	V6DS-12.3A	305	255
	9.72	13A	16.1	V12DS-12.3A	380	315
	19.44	16A	16.3	V24DS-12.3A	475	395
13.0-14.8	0.36	9B	4.0	V05DS-13.8A	210	175
	0.72	9A	4.2	V1DS-13.8A	215	180
	1.44	10A	6.1	V2DS-13.8A	235	190
	2.16	11C	8.3	V3DS-13.8A	245	200
	4.32	12A	11.6	V6DS-13.8A	305	255
	8.64	13A	16.1	V12DS-13.8A	380	315
	17.28	16A	16.3	V24DS-13.8A	475	395
14.8-16.6	0.32	9B	4.0	V05DS-15.7A	210	175
	0.64	9A	4.2	V1DS-15.7A	215	180
	1.28	10A	6.1	V2DS-15.7A	235	190
	1.92	11C	8.3	V3DS-15.7A	245	200
	3.84	12A	11.6	V6DS-15.7A	305	255
	7.68	13A	16.1	V12DS-15.7A	370	305
	15.36	16A	16.3	V24DS-15.7A	465	385
16.6-18.6	0.28	9B	4.0	V05DS-17.6A	210	175
	0.57	9A	4.2	V1DS-17.6A	215	180
16.6-18.6	1.14	10A	6.1	V2DS-17.6A	$235	$190
	1.71	11C	8.3	V3DS-17.6A	245	200
	3.42	12A	11.6	V6DS-17.6A	305	255
	6.84	13A	16.1	V12DS-17.6A	370	305
	13.68	16A	16.3	V24DS-17.6A	465	385
18.6-20.8	0.255	9B	4.0	V05DS-19.7A	210	175
	0.510	9A	4.2	V1DS-19.7A	215	180
	1.02	10A	6.1	V2DS-19.7A	235	190
	1.53	11C	8.3	V3DS-19.7A	245	200
	3.06	12A	11.6	V6DS-19.7A	300	250
	6.12	13A	16.1	V12DS-19.7A	370	305
	12.24	16A	16.3	V24DS-19.7A	465	385
20.8-23.3	0.230	9B	4.0	V05DS-22A	205	170
	0.460	9A	4.2	V1DS-22A	210	175
	0.920	10A	6.1	V2DS-22A	220	185
	1.38	11C	8.3	V3DS-22A	240	195
	2.76	12A	11.6	V6DS-22A	300	250
	5.52	13A	16.1	V12DS-22A	360	300
	11.02	16A	16.3	V24DS-22A	450	375
23.3-26.1	0.205	9B	4.0	V05DS-24.7A	205	170
	0.410	9A	4.2	V1DS-24.7A	210	175
	0.820	10A	6.1	V2DS-24.7A	220	185
	1.23	11C	8.3	V3DS-24.7A	240	195
	2.46	12A	11.6	V6DS-24.7A	300	250
	4.92	13A	16.1	V12DS-24.7A	360	300
	9.84	16A	16.3	V24DS-24.7A	450	375
26.1-29.2	0.180	9B	4.0	V05DS-27.6A	205	170
	0.360	9A	4.2	V1DS-27.6A	210	175
	0.720	10A	6.1	V2DS-27.6A	220	185
	1.08	11C	8.3	V3DS-27.6A	240	195
	2.16	12A	11.6	V6DS-27.6A	300	250
	4.32	13A	16.1	V12DS-27.6A	350	290
	8.64	16A	16.3	V24DS-27.6A	435	365
29.2-32.6	0.160	9B	4.0	V05DS-31A	205	170
	0.320	9A	4.2	V1DS-31A	210	175
	0.640	10A	6.1	V2DS-31A	220	185
	0.960	11C	8.3	V3DS-31A	240	195
	1.92	12A	11.6	V6DS-31A	300	250
	3.84	13A	16.1	V12DS-31A	370	305
	7.68	16A	16.3	V24DS-31A	465	385
32.6-36.5	0.145	9B	4.0	V05DS-34.6A	205	170
	0.290	9A	4.2	V1DS-34.6A	210	175
	0.580	10A	6.1	V2DS-34.6A	220	185
	0.870	11C	8.3	V3DS-34.6A	240	195
	1.74	12A	11.6	V6DS-34.6A	300	250
	3.48	13A	16.1	V12DS-34.6A	390	325
	6.96	16A	16.3	V24DS-34.6A	480	400
36.5-40.9	0.130	9B	4.0	V05DS-38.7A	205	170
	0.260	9A	4.2	V1DS-38.7A	210	175
	0.520	10A	6.1	V2DS-38.7A	220	185
	0.780	11C	8.3	V3DS-38.7A	245	200
	1.56	12A	11.6	V6DS-38.7A	305	255
	3.12	13A	16.1	V12DS-38.7A	415	350
	6.24	16A	16.3	V24DS-38.7A	505	420
40.9-45.8	0.115	9B	4.0	V05DS-43.3A	205	170
	0.230	9A	4.2	V1DS-43.3A	210	175
	0.460	10A	6.1	V2DS-43.3A	220	185
	0.690	11C	8.3	V3DS-43.3A	245	200
	1.38	12A	11.6	V6DS-43.3A	305	255
	2.76	13A	16.1	V12DS-43.3A	435	365
	5.52	16A	16.3	V24DS-43.3A	530	445
45.8-51.4	0.103	9B	4.0	V05DS-48.6A	210	175
	0.206	9A	4.2	V1DS-48.6A	215	180
	0.412	10A	6.1	V2DS-48.6A	235	190
	0.618	11C	8.3	V3DS-48.6A	250	205
	1.24	12A	11.6	V6DS-48.6A	310	260
	2.48	13A	16.1	V12DS-48.6A	465	385
	4.94	16A	16.3	V24DS-48.6A	555	460
51.4-59.0	0.091	9B	4.0	V05DS-55.2A	$235	$
	0.182	9A	4.2	V1DS-55.2A	240	
	0.365	10A	6.1	V2DS-55.2A	250	
	0.546	11C	8.3	V3DS-55.2A	260	
	1.10	12A	11.6	V6DS-55.2A	315	
	2.20	13A	16.1	V12DS-55.2A	465	
	4.40	16A	16.3	V24DS-55.2A	555	
59.0-66.0	0.080	9B	4.0	HA05D-63A	270	
	0.160	9A	4.2	HA1D-63A	275	
	0.320	11A	6.9	HA2D-63A	285	
	0.480	12A	10.3	HA3D-63A	330	
	0.960	14	12.9	HAL6D-63A	385	
	1.900	17A	25.8	HAL12D-63A	450	
	3.800	18	44.5	HCL24D-63A	540	
66.0-74.0	0.071	9B	4.0	HA05D-70A	270	
	0.143	9A	4.2	HA1D-70A	275	
	0.286	11A	6.9	HA2D-70A	285	
	0.429	12A	10.3	HA3D-70A	325	
	0.858	14	12.9	HAL6D-70A	380	
	1.72	17A	25.8	HAL12D-70A	450	
	3.44	18	44.5	HCL24D-70A	540	
74.0-83.0	0.063	9B	4.0	HA05D-79A	270	
	0.127	9A	4.2	HA1D-79A	275	
	0.254	11A	6.9	HA2D-79A	285	
	0.381	12A	10.3	HA3D-79A	320	
	0.762	14	12.9	HAL6D-79A	355	
	1.52	17A	25.8	HAL12D-79A	450	
	3.04	18	44.5	HCL24D-79A	540	
83.0-93.0	0.057	9B	4.0	HA05D-88A	270	
	0.114	9A	4.2	HA1D-88A	275	
	0.228	11A	6.9	HA2D-88A	285	
	0.342	12A	10.3	HA3D-88A	315	
	0.684	14	12.9	HAL6D-88A	345	
	1.38	17A	25.8	HAL12D-88A	450	
	2.76	18	44.5	HCL24D-88A	540	
93.0-104	0.050	9B	4.0	HA05D-99A	270	
	0.100	9A	4.2	HA1D-99A	275	
	0.200	11A	6.9	HA2D99A	285	
	0.300	12A	10.3	HA3D-99A	300	
	0.600	14	12.9	HA6D-99A	330	
	1.20	17A	25.8	HAL12D-99A	450	
	2.40	18	44.5	HCL24D-99A	540	
104-116	0.045	9B	4.0	HA05D-110A	270	
	0.091	9A	4.2	HA1D-110A	275	
	0.182	11A	6.9	HA2D-110A	285	
	0.273	12A	10.3	HA3D-110A	300	
	0.546	14	12.9	HA6D-110A	330	
	1.092	17A	25.8	HAL12D-110A	450	
	2.184	18	44.5	HCL24D-110A	540	
116-130	0.040	9B	4.0	HA05D-123A	270	
	0.081	9A	4.2	HA1D-123A	275	
	0.162	11A	6.9	HA2D-123A	285	
	0.243	12A	10.3	HA3D-123A	300	
	0.486	14	12.9	HA6D-123A	330	
	0.972	17A	25.8	HAL12D-123A	450	
	1.944	18	44.5	HCL24D-123A	540	
130-148	0.036	9B	4.0	HA05D-138A	270	
	0.072	9A	4.2	HA1D-138A	275	
	0.144	11A	6.9	HA2D-138A	285	
	0.216	12A	10.3	HA3D-138A	300	
	0.432	14	12.9	HA6D-138A	330	
	0.864	17A	25.8	HAL12D-138A	440	
	1.728	18	44.5	HCL24D-138A	530	

A	B	C	D	E	F	G	H	J	K	L	M
3/4	4 3/4	3 3/4	2.25	4.25	0	2	0	1 1/8	2 1/8	—	—
3/4	4 3/4	3 1/2	2.25	4.25	0	2	0	1 1/8	2 1/8	—	—
	5	4	2.50	4.50	0	2	0	1 1/4	2 1/4	—	—
1/4	4 1/2	4	3.75	4.00	1 5/8	2	1 5/8	1 7/8	2	—	—
1/4	5 1/4	4	3.75	4.75	0	2	0	1 7/8	2 3/8	2.37	—
1/2	6	4	4.00	5.50	0	2	0	2	2 3/4	2.75	—
1/2	6 1/2	4 1/2	5.00	6.00	0	2	0	2 1/2	3	3.00	2.50
	6	4	5.50	5.50	2 3/8	2	2 3/8	2 3/4	2 3/4	2.75	2.75
	7 1/2	4 1/4	5.50	7.00	2 7/8	2	2 7/8	2 3/4	3 1/2	3.50	2.75
3/4	7 1/2	4 1/4	6.25	7.00	2 3/4	2	2 3/4	3 1/8	3 1/2	3.50	3.12
	8	4 1/4	6.50	7.50	3	2	3	3 1/4	3 3/4	3.75	3.25
1/2	11 1/2	4 1/2	6.00	11.00	2 1/4	2	4 7/8	3	5 1/2	5.50	3.00
3/4	9 3/4	5	8.25	9.25	2 7/8	2	2 7/8	4 1/8	4 5/8	4.62	4.12

IONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



* Used only on outputs 740-3650 volts; On outputs above 3650 Dia. is 3/4, Height 1 1/2.

To have the header located on the mounting base, change the model number character preceding the first dash of Model Number to "B". (Example: V05B-5A indicates a header out the base.) See page 949. No increase in price for this service.

60 HERTZ TO DC (Regulated)

INPUT VOLTAGE: 115 VAC, 60 Hz, 1 PHASE

Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
0.032	9B	4.0	HA05D-157A	$270	$225
0.064	9A	4.2	HA1D-157A	275	230
0.128	11A	6.9	HA2D-157A	285	240
0.192	12A	10.3	HA3D-157A	300	255
0.384	14	12.9	HA6D-157A	330	275
0.768	17A	25.8	HAL12D-157A	425	355
1.536	18	44.5	HCL24D-157A	510	430
0.028	9B	4.0	HA05D-176A	270	225
0.057	9A	4.2	HA1D-176A	275	230
0.114	11A	6.9	HA2D-176A	285	240
0.171	12A	10.3	HA3D-176A	300	255
0.342	14	12.9	HA6D-176A	330	275
0.648	17A	25.8	HAL12D-176A	410	345
1.368	18	44.5	HCL24D-176A	505	425
0.025	9B	4.0	HA05D-197A	270	225
0.051	9A	4.2	HA1D-197A	275	230
0.102	11A	6.9	HA2D-197A	285	240
0.153	12A	10.3	HA3D-197A	300	255
0.306	14	12.9	HA6D-197A	330	275
0.612	17A	25.8	HA12D-197A	400	335
1.224	18	44.5	HCL24D-197A	495	410
0.023	9B	4.0	HA05D-220A	270	225
0.046	9A	4.2	HA1D-220A	275	230
0.092	11A	6.9	HA2D-220A	285	240
0.138	12A	10.3	HA3D-220A	300	255
0.276	14	12.9	HA6D-220A	330	275
0.552	17A	25.8	HA12D-220A	390	330
1.104	18	44.5	HCL24D-220A	480	400
0.020	9B	4.0	HA05D-247A	270	225
0.041	9A	4.2	HA1D-247A	275	230
0.082	11A	6.9	HA2D-247A	285	240
0.123	12A	10.3	HA3D-247A	300	255
0.246	14	12.9	HA6D-247A	330	275
0.492	17A	25.8	HA12D-247A	390	330
0.984	18	44.5	HCL24D-247A	480	400
0.018	9B	4.0	HA05D-276A	270	225
0.036	9A	4.2	HA1D-276A	275	230
0.072	11A	6.9	HA2D-276A	285	240
0.108	12A	10.3	HA3D-276A	300	255
0.216	14	12.9	HA6D-276A	330	275
0.432	17A	25.8	HA12D-276A	400	335
0.864	18	44.5	HCL24D-276A	490	405
0.016	9B	4.0	HA05D-310A	270	225
0.032	9A	4.2	HA1D-310A	275	230
0.064	11A	6.9	HA2D-310A	285	240
0.096	12A	10.3	HA3D-310A	300	255
0.192	14	12.9	HA6D-310A	330	275
0.384	17A	24.8	HA12D-310A	400	335
0.768	18	44.5	HCL24D-310A	495	410
0.014	9B	4.0	HA05D-346A	275	230
0.029	9A	4.2	HA1D-346A	280	235
0.058	11A	6.9	HA2D-346A	290	245
0.087	12A	10.3	HA3D-346A	315	260
0.174	14	12.9	HA6D-346A	335	280
0.348	17A	25.8	HA12D-346A	405	340
0.696	18	44.5	HCL24D-346A	500	420
0.013	9B	4.0	HA05D-387A	275	230
0.026	9A	4.2	HA1D-387A	280	235
0.052	11A	6.9	HA2D-387A	290	245
0.078	12A	10.3	HA3D-387A	315	260
0.156	14	12.9	HA6D-387A	335	280
0.312	17A	25.8	HA12D-387A	410	345
0.624	18	44.5	HCL24D-387A	500	420
0.011	9B	4.0	HA05D-433A	275	230
0.023	9A	4.2	HA1D-433A	280	235
0.046	11A	6.9	HA2D-433A	290	245
0.069	12A	10.3	HA3D-433A	315	260

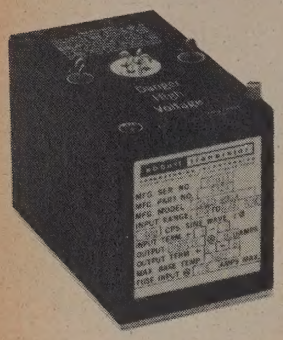
Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
409-458	0.138	14	12.9	HA6D-433A	$345	$285
	0.276	17A	25.8	HA12D-433A	420	350
	0.552	18	44.5	HC24D-433A	505	425
458-514	0.010	9B	4.0	HA05D-486A	280	235
	0.021	9A	4.2	HA1D-486A	285	240
	0.041	11A	6.9	HA2D-486A	295	250
	0.062	12A	10.3	HA3D-486A	320	265
	0.124	14	12.9	HA6D-486A	345	285
	0.248	17A	25.8	HA12D-486A	425	355
	0.496	18	44.5	HC24D-486A	510	430
514-590	0.009	9B	4.0	HA05D-552A	280	235
	0.018	9A	4.2	HA1D-552A	285	240
	0.036	11A	6.9	HA2D-552A	295	250
	0.055	12A	10.3	HA3D-552A	320	265
	0.110	14	12.9	HA6D-552A	345	285
	0.220	17A	25.8	HA12D-522A	440	365
	0.440	18	44.5	HC24D-552A	515	435
590-660	0.008	9B	4.0	HA05D-630A	285	240
	0.016	9A	4.2	HA1D-630A	290	245
	0.032	11A	6.9	HA2D-630A	300	255
	0.048	12A	10.3	HA3D-630A	325	270
	0.096	14	12.9	HA6D-630A	350	290
	0.190	17A	25.8	HA12D-630A	450	375
	0.380	18	44.5	HC24D-630A	535	445
660-740	0.007	9B	4.0	HA05D-700A	285	240
	0.014	9A	4.2	HA1D-700A	290	245
	0.028	11A	6.9	HA2D-700A	300	255
	0.043	12A	10.3	HA3D-700A	325	270
	0.086	14	12.9	HA6D-700A	350	290
	0.172	17A	25.8	HA12D-700A	455	380
	0.344	18	44.5	HC24D-700A	540	450
740-830	0.006	9B	4.0	HA05D-790A	290	245
	0.012	9A	4.2	HA1D-790A	295	250
	0.025	11A	6.9	HA2D-790A	315	260
	0.038	12A	10.3	HA3D-790A	330	275
	0.076	14	12.9	HA6D-790A	355	305
	0.152	17A	25.8	HA12D-790A	475	395
	0.304	18	44.5	HC24D-790A	545	450
830-930	0.005	9B	4.0	HA05D-880A	295	250
	0.011	9A	4.2	HA1D-880A	300	255
	0.022	11A	6.9	HA2D-880A	320	265
	0.034	12A	10.3	HA3D-880A	335	280
	0.068	14	12.9	HA6D-880A	360	300
	0.138	17A	25.8	HA12D-880A	490	405
	0.276	18	44.5	HC24D-880A	555	460
930-1040	0.005	9B	4.0	HA05D-990A	300	255
	0.010	9A	4.2	HA1D-990A	315	260
	0.020	11A	6.9	HA2D-990	325	270
	0.030	12A	10.3	HA3D-990A	345	285
	0.060	14	12.9	HA6D-990A	365	305
	0.120	17A	25.8	HA12D-990A	490	405
	0.240	18	44.5	HC24D-990A	565	470
1040-1160	0.004	9B	4.0	HAK05D-1100A	315	260
	0.009	9A	4.2	HAK1D-1100A	320	265
	0.018	11A	6.9	HAK2D-1100A	330	275
	0.027	12A	10.3	HAK3D-1100A	350	290
	0.054	14	12.9	HAK6D-1100A	375	315
	0.109	17A	25.8	HAK12D-1100A	495	410
	0.218	18	44.5	HCK24D-1100A	570	475
1160-1300	0.004	9B	4.0	HAK05D-1230A	320	265
	0.008	9A	4.2	HAK1D-1230A	325	270
	0.016	11A	6.9	HAK2D-1230A	335	280
	0.024	12A	10.3	HAK3D-1230A	355	295
	0.048	14	12.9	HAK6D-1230A	380	320
	0.097	17A	25.8	HAK12D-1230A	500	420
	0.194	18	44.5	HCK24D-1230A	575	480

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
1300-1480	0.003	9B	4.0	HAK05D-1380A	$325	$270
	0.007	9A	4.2	HAK1D-1380A	330	275
	0.014	11A	6.9	HAK2D-1380A	345	285
	0.021	12A	10.3	HAK3D-1380A	360	300
	0.043	14	12.9	HAK6D-1380A	385	325
	0.086	17A	25.8	HAK12D-1380A	505	425
	0.172	18	44.5	HCK24D-1380A	590	490
1480-1660	0.003	9B	4.0	HAK05D-1570A	330	275
	0.006	9A	4.2	HAK1D-1570A	335	280
	0.013	11A	6.9	HAK2D-1570A	350	290
	0.019	12A	10.3	HAK3D-1570A	365	305
	0.038	14	12.9	HAK6D-1570A	390	330
	0.076	17A	25.8	HAK12D-1570A	510	430
	0.152	18	44.5	HCK24D-1570A	605	505
1660-1860	0.002	9B	4.0	HAK05D-1760A	345	285
	0.005	9A	4.2	HAK1D-1760A	350	290
	0.010	11A	6.9	HAK2D-1760A	360	300
	0.017	12A	10.3	HAK3D-1760A	380	320
	0.034	14	12.9	HAK6D-1760A	405	340
	0.068	17A	25.8	HAK12D-1760A	515	435
	0.136	18	44.5	HCK24D-1760A	615	515
1860-2080	0.002	9B	4.0	HAK05D-1970A	355	295
	0.005	9A	4.2	HAK1D-1970A	360	300
	0.010	11A	6.9	HAK2D-1970A	375	315
	0.015	12A	10.3	HAK3D-1970A	390	330
	0.030	14	12.9	HAK6D-1970A	420	350
	0.061	17A	25.8	HAK12D-1970A	535	445
	0.122	18	44.5	HCK-24D-1970A	640	535
2080-2330	0.027	14	13.9	HAK6D-2200A	430	360
	0.055	17A	25.8	HAK12D-2200A	545	455
	0.110	18	44.5	HCK24D-2200A	665	555
2330-2610	0.024	14	13.9	HAK6D-2470A	455	380
	0.049	17A	25.8	HAK12D-2470A	555	465
	0.098	18	44.5	HCK24D-2470A	680	570
2610-2920	0.024	14	13.9	HAK6D-2760A	460	385
	0.043	17A	25.8	HAK12D-2760A	565	470
	0.086	18	44.5	HCK24D-2760A	705	590
2920-3260	0.019	14	13.9	HAK6D-3100A	480	400
	0.038	17A	25.8	HAK12D-3100A	570	475
	0.076	18	44.5	HCK24D-3100A	735	610
3260-3650	0.017	14	13.9	HAK6D-3460A	495	410
	0.034	17A	25.8	HAK12D-3460A	595	495
	0.068	18	44.5	HCK24D-3460A	770	645
3650-4090	0.005	15B	16.5	HN2D-3870A	515	435
	0.010	17B	24.6	HN4D-3870A	725	605
4090-4580	0.004	15B	16.5	HN2D-4330A	570	475
	0.009	17B	24.6	HN4D-4330A	770	645
4580-5140	0.004	15B	16.5	HN2D-4860A	615	515
	0.008	17B	24.6	HN4D-4860A	820	685
5140-5900	0.003	15B	16.5	HN2D-5520A	675	565
	0.007	17B	24.6	HN4D-5520A	865	720
5900-6600	0.003	15B	16.5	HN2D-6300A	720	600
	0.006	17B	24.6	HN4D-6300A	915	765
6600-7400	0.002	15B	16.5	HN2D-7000A	775	650
	0.005	17B	24.6	HN4D-7000A	960	800
7400-8300	0.002	15B	16.5	HN2D-7900A	815	680
	0.005	17B	24.6	HN4D-7900A	1010	845
8300-9300	0.002	15B	16.5	HN2D-8800A	880	735
	0.004	17B	24.6	HN4D-8800A	1055	880
9300-10400	0.002	15B	16.5	HN2D-9900A	930	780
	0.004	17B	24.6	HN4D-9900A	1110	925

For no load operation, add a resistance on the output to draw a minimum 4% of the rated current.

abbott transistor
LABORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott 400 ∼ to DC (Regulated)



POWER MODULES

features

- Close regulation
- 5 to 10,000 volts
- Hermetically sealed
- Compact, low cost
- Low ripple
- For aerospace application

Input Voltage & Frequency
105-125 VAC, 380-420 Hertz, 1 phase, per MIL-STD-704A, Category B.

Line Regulation
±0.2% for input 105-125 VAC on Model T's, GA's, GAL's, and GC's
±0.5% for input 105-125 VAC on Model GAK's, GCK's and GN's

Voltage Regulation
±0.5% — for input 105-125 VAC and from ½ load to full load on Model T's
±1.5% — for input 105-125 VAC and from ½ load to full load on Model GA's
±2.5% — for input 105-125 VAC and from ½ load to full load on Model GAK's, GAL's, GC's and GN's

Ripple
0.2% RMS — Model T's
0.5% RMS — Model GA's
1% RMS — Model GAK's, GAL's and GC's
2% RMS — Model GN's

Short Circuit Protection
Protected against overload and circuit conditions

Voltage Adjustment Range
12% by screwdriver adjustme

Reliability
140,000 hours MTBF typical MIL- HDBK-217 under worst operating conditions

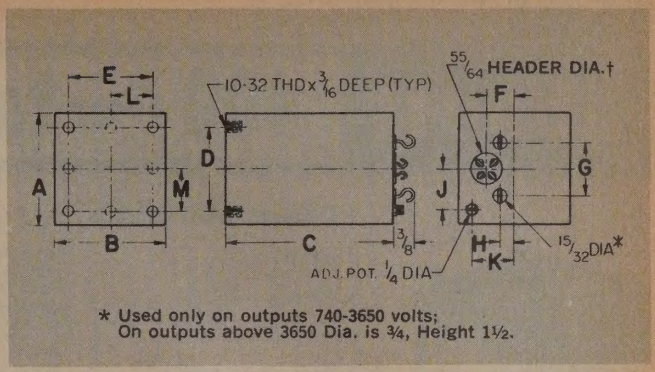
Environment
+160°F max. at mounting using adequate heat sink.
−65°F min. at mounting su
Altitude: To vacuum (true her seal)
Vibration, shock, sand, dust, h ity, salt spray, fungus, sun rain, and explosion to MIL-E- and MIL-E-5400K, Class 1

Output Voltage & Current
See specific models listed
(Outputs and inputs are isolate

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	2C	0.8	T02DS-5A	$215	$180
	1.0	3A	1.7	T05DS-5A	220	185
	2.0	3	1.8	T1DS-5A	235	190
	4.0	5	2.0	T2DS-5A	245	200
	6.0	6	2.3	T3DS-5A	255	210
	12.0	11	5.7	T6DS-5A	315	265
5.3-5.9	0.357	2C	0.8	T02DS-5.6A	215	180
	0.9	3A	1.7	T05DS-5.6A	220	185
	1.8	3	1.8	T1DS-5.6A	235	190
	3.6	5	2.0	T2DS-5.6A	245	200
	5.4	6	2.3	T3DS-5.6A	255	210
	10.8	11	5.7	T6DS-5.6A	315	265
5.9-6.6	0.318	2C	0.8	T02DS-6.3A	215	180
	0.8	3A	1.7	T05DS-6.3A	220	185
	1.6	3	1.8	T1DS-6.3A	235	190
	3.2	5	2.0	T2DS-6.3A	245	200
	4.8	6	2.3	T3DS-6.3A	255	210
	9.6	11	5.7	T6DS-6.3A	310	260
6.6-7.4	0.286	2C	0.8	T02DS-7A	215	180
	0.7	3A	1.7	T05DS-7A	220	185
	1.4	3	1.8	T1DS-7A	235	190
	2.8	5	2.0	T2DS-7A	245	200
	4.2	6	2.3	T3DS-7A	255	210
	8.4	11	5.7	T6DS-7A	310	260
7.4-8.3	0.253	2C	0.8	T02DS-7.9A	215	180
	0.63	3A	1.7	T05DS-7.9A	220	185
	1.26	3	1.8	T1DS-7.9A	235	190
	2.52	5	2.0	T2DS-7.9A	245	200
	3.78	6	2.3	T3DS-7.9A	255	210
	7.56	7	2.8	T6DS-7.9A	310	260
8.3-9.3	0.227	2C	0.8	T02DS-8.8A	210	175
	0.57	3A	1.7	T05DS-8.8A	215	180
	1.14	3	1.8	T1DS-8.8A	220	185
	2.28	5	2.0	T2DS-8.8A	240	195
	3.42	6	2.3	T3DS-8.8A	250	205
	6.84	7	2.8	T6DS-8.8A	310	260
9.3-10.4	0.202	2C	0.8	T02DS-9.9A	210	175
	0.50	3A	1.7	T05DS-9.9A	215	180
	1.00	3	1.8	T1DS-9.9A	220	185
	2.00	5	2.0	T2DS-9.9A	240	195
	3.00	6	2.3	T3DS-9.9A	250	205
	6.00	7	2.8	T6DS-9.9A	310	260
	12.00	11	5.7	T12DS-9.9A	390	325
10.4-11.6	0.182	2C	0.8	T02DS-11A	210	175
	0.45	3A	1.7	T05DS-11A	215	180
	0.91	3	1.8	T1DS-11A	220	185
	1.82	5	2.0	T2DS-11A	240	195
	2.73	6	2.3	T3DS-11A	250	205
	5.46	7	2.5	T6DS-11A	310	260
	10.92	11	5.7	T12DS-11A	390	325
11.6-13.0	0.163	2C	0.8	T02DS-12.3A	210	175
	0.40	3A	1.7	T05DS-12.3A	215	180
	0.81	3	1.8	T1DS-12.3A	220	185
	1.62	5	2.0	T2DS-12.3A	240	195
	2.43	6	2.3	T3DS-12.3A	250	205
	4.86	7	2.8	T6DS-12.3A	305	255
	9.72	11	5.7	T12DS-12.3A	380	315
	19.44	14	12.3	T24DS-12.3A	475	395
13.0-14.8	0.145	2C	0.8	T02DS-13.8A	205	170
	0.36	3A	1.7	T05DS-13.8A	210	175
	0.72	3	1.8	T1DS-13.8A	215	180
	1.44	5	2.0	T2DS-13.8A	235	190
	2.16	6	2.3	T3DS-13.8A	245	200
	4.32	7	2.8	T6DS-13.8A	305	255
	8.64	11	5.7	T12DS-13.8A	380	315
	17.28	14	12.3	T24DS-13.8A	475	395
14.8-16.6	0.127	2C	0.8	T02DS-15.7A	205	170
	0.32	3A	1.7	T05DS-15.7A	210	175
	0.64	3	1.8	T1DS-15.7A	215	180
	1.28	5	2.0	T2DS-15.7A	235	190
	1.92	6	2.3	T3DS-15.7A	245	200
	3.84	7	2.8	T6DS-15.7A	305	255
	7.68	11	5.7	T12DS-15.7A	370	305
	15.36	14	12.3	T24DS-15.7A	465	385
16.6-18.6	0.114	2C	0.8	T02DS-17.6A	$205	$170
	0.28	3A	1.7	T05DS-17.6A	210	175
	0.57	3	1.8	T1DS-17.6A	215	180
	1.14	5	2.0	T2DS-17.6A	235	190
	1.71	6	2.3	T3DS-17.6A	245	200
	3.42	7	2.8	T6DS-17.6A	305	255
	6.84	11	5.7	T12DS-17.6A	370	305
	13.68	14	12.3	T24DS-17.6A	465	385
18.6-20.8	0.101	2C	0.8	T02DS-19.7A	205	170
	0.255	3A	1.7	T05DS-19.7A	210	175
	0.510	3	1.8	T1DS-19.7A	215	180
	1.02	5	2.0	T2DS-19.7A	235	190
	1.53	6	2.3	T3DS-19.7A	245	200
	3.06	7	2.8	T6DS-19.7A	300	250
	6.12	11	5.7	T12DS-19.7A	370	305
	12.24	14	12.3	T24DS-19.7A	465	385
20.8-23.3	0.098	2C	0.8	T02DS-22A	200	165
	0.230	3A	1.7	T05DS-22A	205	170
	0.460	3	1.8	T1DS-22A	210	175
	0.920	5	2.0	T2DS-22A	220	185
	1.38	6	2.3	T3DS-22A	240	195
	2.76	7	2.8	T6DS-22A	300	250
	5.52	11	5.7	T12DS-22A	360	300
	11.02	14	12.3	T24DS-22A	450	375
23.3-26.1	0.081	2C	0.8	T02DS-24.7A	200	165
	0.205	3A	1.7	T05DS-24.7A	205	170
	0.410	3	1.8	T1DS-24.7A	210	175
	0.820	5	2.0	T2DS-24.7A	220	185
	1.23	6	2.3	T3DS-24.7A	240	195
	2.46	7	2.8	T6DS-24.7A	300	250
	4.92	11	5.7	T12DS-24.7A	360	300
	9.84	14	12.3	T24DS-24.7A	450	375
26.1-29.2	0.073	2C	0.8	T02DS-27.6A	200	165
	0.180	3A	1.7	T05DS-27.6A	205	170
	0.360	3	1.8	T1DS-27.6A	210	175
	0.720	5	2.0	T2DS-27.6A	220	185
	1.08	6	2.3	T3DS-27.6A	240	195
	2.16	7	2.8	T6DS-27.6A	300	250
	4.32	11	5.7	T12DS-27.6A	350	290
	8.64	14	12.3	T24DS-27.6A	435	365
29.2-32.6	0.065	2C	0.8	T02DS-31A	200	165
	0.160	3A	1.7	T05DS-31A	205	170
	0.320	3	1.8	T1DS-31A	210	175
	0.640	5	2.0	T2DS-31A	220	185
	0.960	6	2.3	T3DS-31A	240	195
	1.92	7	2.8	T6DS-31A	300	250
	3.84	11	5.7	T12DS-31A	360	305
	7.68	14	12.3	T24DS-31A	465	385
32.6-36.5	0.058	2C	0.8	T02DS-34.6A	200	165
	0.145	3A	1.7	T05DS-34.6A	205	170
	0.290	3	1.8	T1DS-34.6A	210	175
	0.580	5	2.0	T2DS-34.6A	220	185
	0.870	6	2.3	T3DS-34.6A	240	195
	1.75	7	2.8	T6DS-34.6A	300	250
	3.48	11	5.7	T12DS-34.6A	390	325
	6.96	14	12.3	T24DS-34.6A	480	400
36.5-40.9	0.052	2C	0.8	T02DS-38.7A	200	165
	0.130	3A	1.7	T05DS-38.7A	205	170
	0.260	3	1.8	T1DS-38.7A	210	175
	0.520	5	2.0	T2DS-38.7A	220	185
	0.780	6	2.3	T3DS-38.7A	245	200
	1.56	7	2.8	T6DS-38.7A	305	255
	3.12	11	5.7	T12DS-38.7A	415	350
	6.24	14	12.3	T24DS-38.7A	505	420
40.9-45.8	0.046	2C	0.8	T02DS-43.3A	200	165
	0.115	3A	1.7	T05DS-43.3A	205	170
	0.230	3	1.8	T1DS-43.3A	210	175
	0.460	5	2.0	T2DS-43.3A	220	185
	0.690	6	2.3	T3DS-43.3A	245	200
	1.38	7	2.8	T6DS-43.3A	305	255
	2.76	11	5.7	T12DS-43.3A	435	365
	5.52	14	12.3	T24DS-43.3A	530	445
45.8-51.4	0.041	2C	0.8	T02DS-48.6A	205	170
	0.103	3A	1.7	T05DS-48.6A	210	175
	0.206	3	1.8	T1DS-48.6A	215	180
	0.412	5	2.0	T2DS-48.6A	235	190
	0.618	6	2.3	T3DS-48.6A	250	205
45.8-51.4	1.24	7	2.8	T6DS-48.6A	$31	
	2.47	11	5.7	T12DS-48.6A	46	
	4.94	14	12.3	T24DS-48.6A	55	
51.4-59.0	0.036	2C	0.8	T02DS-55.2A	22	
	0.091	3A	1.7	T05DS-55.2A	23	
	0.182	3	1.8	T1DS-55.2A	24	
	0.364	5	2.0	T2DS-55.2A	25	
	0.546	6	2.3	T3DS-55.2A	26	
	1.10	7	2.8	T6DS-55.2A	31	
	2.20	11	5.7	T12DS-55.2A	46	
	4.40	14	12.3	T24DS-55.2A	55	
59.0-66.0	0.032	2C	0.8	GA02D-63A	26	
	0.08	8A	2.2	GA05D-63A	27	
	0.16	8	2.5	GA1D-63A	27	
	0.32	9	3.0	GA2D-63A	28	
	0.48	10	3.9	GA3D-63A	33	
	0.96	12	5.8	GAL6D-63A	38	
	1.9	13	8.8	GAL12D-63A	45	
	3.8	17	25.5	GCL24D-63A	54	
66.0-74.0	0.029	2C	0.8	GA02D-70A	26	
	0.071	8A	2.2	GA05D-70A	27	
	0.143	8	2.5	GA1D-70A	27	
	0.286	9	3.0	GA2D-70A	28	
	0.429	10	3.9	GA3D-70A	32	
	0.858	12	5.8	GAL6D-70A	38	
	1.72	13	8.8	GAL12D-70A	45	
	3.44	17	25.5	GCL24D-70A	54	
74.0-83.0	0.025	2C	0.8	GA02D-79A	26	
	0.063	8A	2.2	GA05D-79A	27	
	0.127	8	2.5	GA1D-79A	27	
	0.254	9	3.0	GA2D-79A	28	
	0.381	10	3.9	GA3D-79A	3	
	0.762	12	5.8	GAL6D-79A	38	
	1.52	13	8.8	GAL12D-79A	45	
	3.04	17	25.5	GCL24D-79A	54	
83.0-93.0	0.023	2C	0.8	GA02D-88A	26	
	0.057	8A	2.2	GA05D-88A	27	
	0.114	8	2.5	GA1D-88A	27	
	0.228	9	3.0	GA2D-88A	28	
	0.342	10	3.9	GA3D-88A	31	
	0.684	12	5.8	GAL6D-88A	3	
	1.38	13	8.8	GAL12D-88A	45	
	2.76	17	25.5	GCL24D-88A	54	
93.0-104	0.020	2C	0.8	GA02D-99A	2	
	0.050	8A	2.2	GA05D-99A	2	
	0.100	8	2.5	GA1D-99A	2	
	0.200	9	3.0	GA2D-99A	2	
	0.300	10	3.9	GA3D-99A	3	
	0.600	12	5.8	GA6D-99A	3	
	1.20	13	8.8	GAL12D-99A	4	
	2.40	17	25.5	GCL24D-99A	5	
104-116	0.018	2C	0.8	GA02D-110A	2	
	0.045	8A	2.2	GA05D-110A	2	
	0.091	8	2.5	GA1D-110A	2	
	0.182	9	3.0	GA2D-110A	2	
	0.273	10	3.9	GA3D-110A	3	
	0.546	12	5.8	GA6D-110A	3	
	1.092	13	8.8	GAL12D-110A	4	
	2.184	17	25.5	GCL24D-110A	5	
116-130	0.016	2C	0.8	GA02D-123A	2	
	0.040	8A	2.2	GA05D-123A	2	
	0.081	8	2.5	GA1D-123A	2	
	0.162	9	3.0	GA2D-123A	2	
	0.243	10	3.9	GA3D-123A	3	
	0.486	12	5.8	GA6D-123A	3	
	0.972	13	8.8	GAL12D-123A	4	
	1.944	17	25.5	GCL24D-123A	5	
130-148	0.014	2C	0.8	GA02D-138A	2	
	0.036	8A	2.2	GA05D-138A	2	
	0.072	8	2.5	GA1D-138A	2	
	0.144	9	3.0	GA2D-138A	2	
	0.216	10	3.9	GA3D-138A	3	
	0.432	12	5.8	GA6D-138A	3	
	0.864	13	8.8	GAL12D-138A	4	
	1.728	17	25.5	GCL24D-138A	5	

A	B	C	D	E	F	G	H	J	K	L	M
	2¾	2⅛	1.50	2.25	0	—	—	¾	1⅛	—	—
¾	2¾	3	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	2¾	2¾	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	2¾	3¼	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	3	3¼	2.25	2.50	¾	2	½	1⅛	1¼	—	—
¾	2¾	4	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	4¼	3	2.25	3.75	0	2	0	1⅛	1⅞	—	—
¾	4¼	2¾	2.25	3.75	0	2	0	1⅛	1⅞	—	—
¾	4⅝	3¼	2.25	4.12	0	2	0	1⅛	2 1/16	—	—
¾	5¼	3¼	2.25	4.75	0	2	0	1⅛	2⅜	2.37	—
	5½	3¼	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	5½	4	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	8¼	4	2.50	7.75	2¼	2	½	1¼	3⅞	3.87	—
	6	3¼	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75
	6	4	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75
	9	4	5.50	8.50	3⅞	2	3⅞	2¾	4¼	4.25	2.75
	12	4	5.50	11.50	4¾	2	4¾	2¾	5¾	5.75	2.75

ESIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



† To have the header located on the mounting base, change the model number character preceding the first dash of Model Number to "B". (Example: T05B-5A indicates a header out the base.) See page 949. No increase in price for this service.

400 HERTZ TO DC (Regulated) INPUT VOLTAGE: 115 VAC, 400 Hz, 1 PHASE

Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
0.013	2C	0.8	GA02D-157A	$265	$220
0.032	8A	2.2	GA05D-157A	270	225
0.064	8	2.5	GA1D-157A	275	230
0.128	9	3.0	GA2D-157A	285	240
0.192	10	3.9	GA3D-157A	300	255
0.384	12	5.8	GA6D-157A	330	275
0.768	13	8.8	GAL12D-157A	425	355
1.536	17	25.5	GCL24D-157A	510	430
0.011	2C	0.8	GA02D-176A	265	220
0.028	8A	2.2	GA05D-176A	270	225
0.057	8	2.5	GA1D-176A	275	230
0.114	9	3.0	GA2D-176A	285	240
0.171	10	3.9	GA3D-176A	300	255
0.342	12	5.8	GA6D-176A	330	275
0.684	13	8.8	GAL12D-176A	410	345
1.368	17	25.5	GCL24D-176A	505	425
0.010	2C	0.8	GA02D-197A	265	220
0.025	8A	2.2	GA05D-197A	270	225
0.051	8	2.5	GA1D-197A	275	230
0.102	9	3.0	GA2D-197A	285	240
0.153	10	3.9	GA3D-197A	300	255
0.306	12	5.8	GA6D-197A	330	275
0.612	13	8.8	GA12D-197A	400	335
1.224	17	25.5	GCL24D-197A	495	410
0.009	2C	0.8	GA02D-220A	265	220
0.023	8A	2.2	GA05D-220A	270	225
0.046	8	2.5	GA1D-220A	275	230
0.092	9	3.0	GA2D-220A	285	240
0.138	10	3.9	GA3D-220A	300	255
0.276	12	5.8	GA6D-220A	330	275
0.552	13	8.8	GA12D-220A	390	330
1.104	17	25.5	GCL24D-220A	480	400
0.003	2C	0.8	GA02D-247A	265	220
0.020	8A	2.2	GA05D-247A	270	225
0.041	8	2.5	GA1D-247A	275	230
0.082	9	3.0	GA2D-247A	285	240
0.123	10	3.9	GA3D-247A	300	255
0.246	12	5.8	GA6D-247A	330	275
0.492	13	8.8	GA12D-247A	390	330
0.984	17	25.5	GCL24D-247A	480	400
0.007	2C	0.8	GA02D-276A	265	220
0.018	8A	2.2	GA05D-276A	270	225
0.036	8	2.5	GA1D-276A	275	230
0.072	9	3.0	GA2D-276A	285	240
0.108	10	3.9	GA3D-276A	300	255
0.216	12	5.8	GA6D-276A	330	275
0.432	13	8.8	GA12D-276A	400	335
0.864	17	25.5	GCL24D-276A	490	405
0.006	2C	0.8	GA02D-310A	265	220
0.016	8A	2.2	GA05D-310A	270	225
0.032	8	2.5	GA1D-310A	275	230
0.064	9	3.0	GA2D-310A	285	240
0.096	10	3.9	GA3D-310A	300	255
0.192	12	5.8	GA6D-310A	330	275
0.384	13	8.8	GA12D-310A	400	335
0.768	17	25.5	GCL24D-310A	495	410
0.006	2C	0.8	GA02D-346A	270	225
0.014	8A	2.2	GA05D-346A	275	230
0.029	8	2.5	GA1D-346A	280	235
0.058	9	3.0	GA2D-346A	290	245
0.087	10	3.9	GA3D-346A	315	260
0.174	12	5.8	GA6D-346A	335	280
0.348	13	8.8	GA12D-346A	405	340
0.696	17	25.5	GCL24D-346A	500	420
0.005	2C	0.8	GA02D-387A	270	225
0.013	8A	2.2	GA05D-387A	275	230
0.026	8	2.5	GA1D-387A	280	235
0.052	9	3.0	GA2D-387A	290	245
0.078	10	3.9	GA3D-387A	315	260

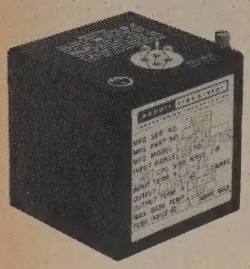
Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
365-409	0.156	12	5.8	GA6D-387A	$335	$280
	0.312	13	8.8	GA12D-387A	410	345
	0.624	17	25.5	GCL24D-387A	500	420
409-458	0.005	2C	0.8	GA02D-433A	270	225
	0.011	8A	2.2	GA05D-433A	275	230
	0.023	8	2.5	GA1D-433A	280	235
	0.046	9	3.0	GA2D-433A	290	245
	0.069	10	3.9	GA3D-433A	315	260
	0.138	12	5.8	GA6D-433A	345	285
	0.276	13	8.8	GA12D-433A	420	350
	0.552	17	25.5	GC24D-433A	505	425
458-514	0.004	2C	0.8	GA02D-486A	275	230
	0.010	8A	2.2	GA05D-486A	280	235
	0.021	8	2.5	GA1D-486A	285	240
	0.041	9	3.0	GA2D-486A	295	250
	0.062	10	3.9	GA3D-486A	320	265
	0.124	12	5.8	GA6D-486A	345	285
	0.248	13	8.8	GA12D-486A	425	355
	0.496	17	25.5	GC24D-486A	510	430
514-590	0.004	2C	0.8	GA02D-552A	275	230
	0.009	8A	2.2	GA05D-552A	280	235
	0.018	8	2.5	GA1D-552A	285	240
	0.036	9	3.0	GA2D-552A	295	250
	0.055	10	3.9	GA3D-552A	320	265
	0.110	12	5.8	GA6D-552A	345	285
	0.220	13	8.8	GA12D-552A	440	365
	0.440	17	25.5	GC24D-552A	515	435
590-660	0.008	8A	2.2	GA05D-630A	285	240
	0.016	8	2.5	GA1D-630A	290	245
	0.032	9	3.0	GA2D-630A	300	255
	0.048	10	3.9	GA3D-630A	325	270
	0.096	12	5.8	GA6D-630A	350	290
	0.190	13	8.8	GA12D-630A	450	375
	0.380	17	25.5	GC24D-630A	535	445
660-740	0.007	8A	2.2	GA05D-700A	285	240
	0.014	8	2.5	GA1D-700A	290	245
	0.028	9	3.0	GA2D-700A	300	255
	0.043	10	3.9	GA3D-700A	325	270
	0.086	12	5.8	GA6D-700A	350	290
	0.172	13	8.8	GA12D-700A	455	380
	0.344	17	25.5	GC24D-700A	540	450
740-830	0.006	8A	2.2	GA05D-790A	290	245
	0.012	8	2.5	GA1D-790A	295	250
	0.025	9	3.0	GA2D-790A	315	260
	0.038	10	3.9	GA3D-790A	330	275
	0.076	12	5.8	GA6D-790A	355	305
	0.152	13	8.8	GA12D-790A	475	395
	0.304	17	25.5	GC24D-790A	545	450
830-930	0.005	8A	2.2	GA05D-880A	295	250
	0.011	8	2.5	GA1D-880A	300	255
	0.022	9	3.0	GA2D-880A	320	265
	0.034	10	3.9	GA3D-880A	335	280
	0.068	12	5.8	GA6D-880A	360	300
	0.138	13	8.8	GA12D-880A	490	405
	0.276	17	25.5	GC24D-880A	555	460
930-1040	0.005	8A	2.2	GA05D-990A	300	255
	0.010	8	2.5	GA1D-990A	315	260
	0.020	9	3.0	GA2D-990A	325	270
	0.030	10	3.9	GA3D-990A	345	285
	0.060	12	5.8	GA6D-990A	365	305
	0.120	13	8.8	GA12D-990A	490	405
	0.240	17	25.5	GC24D-990A	565	470
1040-1160	0.004	8A	2.2	GAK05D-1100A	315	260
	0.009	8	2.5	GAK1D-1100A	320	265
	0.018	9	3.0	GAK2D-1100A	330	275
	0.027	10	3.9	GAK3D-1100A	350	290
	0.054	12	5.8	GAK6D-1100A	375	315
	0.109	14	9.9	GAK12D-1100A	495	410
	0.218	17	25.5	GCK24D-1100A	570	475

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
1160-1300	0.004	8A	2.2	GAK05D-1230A	$320	$265
	0.008	8	2.5	GAK1D-1230A	325	270
	0.016	9	3.0	GAK2D-1230A	335	280
	0.024	10	3.9	GAK3D-1230A	355	295
	0.048	12	5.8	GAK6D-1230A	380	320
	0.091	14	9.9	GAK12D-1230A	500	420
	0.194	17	25.5	GCK24D-1230A	575	480
1300-1480	0.003	8A	2.2	GAK05D-1380A	325	270
	0.007	8	2.5	GAK1D-1380A	330	275
	0.014	9	3.0	GAK2D-1380A	345	285
	0.021	10	3.9	GAK3D-1380A	360	300
	0.043	12	5.8	GAK6D-1380A	385	325
	0.086	14	9.9	GAK12D-1380A	505	425
	0.172	17	25.5	GCK24D-1380A	590	490
1480-1660	0.003	8A	2.2	GAK05D-1570A	330	275
	0.006	8	2.5	GAK1D-1570A	335	280
	0.013	9	3.0	GAK2D-1570A	350	290
	0.019	10	3.9	GAK3D-1570A	365	305
	0.038	12	5.8	GAK6D-1570A	390	330
	0.076	14	9.9	GAK12D-1570A	510	430
	0.152	17	25.5	GCK24D-1570A	605	505
1660-1860	0.002	8A	2.2	GAK05D-1760A	345	285
	0.005	8	2.5	GAK1D-1760A	350	290
	0.010	9	3.0	GAK2D-1760A	360	300
	0.017	10	3.9	GAK3D-1760A	380	320
	0.034	12	5.8	GAK6D-1760A	405	340
	0.068	14	9.9	GAK12D-1760A	515	435
	0.136	17	25.5	GCK24D-1760A	615	515
1860-2080	0.002	8A	2.2	GAK05D-1970A	355	295
	0.005	8	2.5	GAK1D-1970A	360	300
	0.010	9	3.0	GAK2D-1970A	375	315
	0.015	10	3.9	GAK3D-1970A	390	330
	0.030	12	5.8	GAK6D-1970A	420	350
	0.061	14	9.9	GAK12D-1970A	535	445
	0.122	17	25.5	GCK24D-1970A	640	535
2080-2330	0.027	12	5.8	GAK6D-2200A	430	360
	0.055	14	9.9	GAK12D-2200A	545	455
	0.110	17	25.5	GCK24D-2200A	665	555
2330-2610	0.024	12	5.8	GAK6D-2470A	455	380
	0.049	14	9.9	GAK12D-2470A	555	465
	0.098	17	25.5	GCK24D-2470A	680	570
2610-2920	0.021	12	5.8	GAK6D-2760A	460	385
	0.043	14	9.9	GAK12D-2760A	565	470
	0.086	17	25.5	GCK24D-2760A	705	590
2920-3260	0.019	12	5.8	GAK6D-3100A	480	400
	0.038	14	9.9	GAK12D-3100A	570	475
	0.076	17	25.5	GCK24D-3100A	735	610
3260-3650	0.017	12	5.8	GAK6D-3460A	495	410
	0.034	14	9.9	GAK12D-3460A	595	495
	0.068	17	25.5	GCK24D-3460A	770	645
3650-4090	0.005	12B	6.7	GN2D-3870A	515	435
	0.010	16	14.1	GN4D-3870A	725	605
4090-4580	0.004	12B	6.7	GN2D-4330A	570	475
	0.008	16	14.1	GN4D-4330A	770	645
4580-5140	0.004	12B	6.7	GN2D-4860A	615	515
	0.008	16	14.1	GN4D-4860A	820	685
5140-5900	0.003	12B	6.7	GN2D-5520A	675	565
	0.006	16	14.1	GN4D-5520A	865	720
5900-6600	0.003	12B	6.7	GN2D-6300A	720	600
	0.006	16	14.1	GN4D-6300A	915	765
6600-7400	0.002	12B	6.7	GN2D-7000A	775	650
	0.004	16	14.1	GN4D-7000A	960	800
7400-8300	0.002	12B	6.7	GN2D-7900A	815	680
	0.004	16	14.1	GN4D-7900A	1010	845
8300-9300	0.002	12B	6.7	GN2D-8800A	880	735
	0.004	16	14.1	GN4D-8800A	1055	880
9300-10400	0.002	12B	6.7	GN2D-9900A	930	780
	0.004	16	14.1	GN4D-9900A	1110	925

For no load operation, add a resistance on the output to draw a minimum 4% of the rated current.

abbott transistor
LABORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott 400 ~ to DC (Reg.) Hi-Temp.



POWER MODULES

features

- Hi-temp. +212°F.
- 5 to 3500 volts
- Hermetically sealed
- Compact, low cost
- Low ripple
- For aerospace application

specifications

Input Voltage & Frequency
105-125 VAC, 380-420 Hertz, 1 phase, per MIL-STD-704A, Category B

Line Regulation
±0.2% for input 105-125 VAC on Model U's, GB's and GBL's
±0.5% for input 105-125 VAC on Model GBK's

Voltage Regulation
±0.5%—for input 105-125 VAC and from ½ load to full load on Model U's
±1.5%—for input 105-125 VAC and from ½ load to full on Model GB's
±2.5%—for input 105-125 VAC and from ½ load to full load on Model GBK's and GBL's

Voltage Adjustment Range
12% by screwdriver adjustment

Ripple
0.2% RMS—Model U's
0.5% RMS—Model GB's
1% RMS—Model GBK's, and GBL's

Short Circuit Protection
Protected against overload and short cir conditions

Reliability
70,000 hours MTBF typical per MIL-HD 217 under worst case operating condit

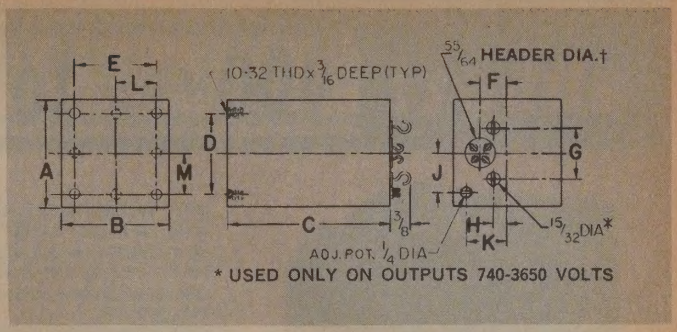
Environment
+212°F max. at mounting base using quate heat sink
−65°F min. at mounting surface
Altitude: To vacuum (true hermetic sea
Vibration, shock, sand, dust, humidity, spray, fungus, sunshine, rain, and explo to MIL-E-5272C and MIL-E-5400K, Clas

Output Voltage & Current
See specific models listed
(Outputs and inputs are isolated)

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	2C	0.8	U02DS-5A	$258	$214
	1.0	3A	1.7	U05DS-5A	265	220
	2.0	3	1.8	U1DS-5A	272	226
	4.0	5	2.0	U2DS-5A	286	238
	6.0	6	2.3	U3DS-5A	302	251
	10.0	11	5.5	U5DS-5A	376	313
5.3-5.9	0.357	2C	0.8	U02DS-5.6A	258	214
	0.9	3A	1.7	U05DS-5.6A	265	220
	1.8	3	1.8	U1DS-5.6A	272	226
	3.6	5	2.0	U2DS-5.6A	286	238
	5.4	6	2.3	U3DS-5.6A	302	251
	8.91	11	5.5	U5DS-5.6A	376	313
5.9-6.6	0.318	2C	0.8	U02DS-6.3A	258	214
	0.8	3A	1.7	U05DS-6.3A	265	220
	1.6	3	1.8	U1DS-6.3A	272	226
	3.2	5	2.0	U2DS-6.3A	286	238
	4.8	6	2.3	U3DS-6.3A	302	251
	7.92	11	5.5	U5DS-6.3A	369	307
6.6-7.4	0.286	2C	0.8	U02DS-7A	258	214
	0.7	3A	1.7	U05DS-7A	265	220
	1.4	3	1.8	U1DS-7A	272	226
	2.8	5	2.0	U2DS-7A	286	238
	4.2	6	2.3	U3DS-7A	302	251
	7.15	11	5.5	U5DS-7A	369	307
7.4-8.3	0.253	2C	0.8	U02DS-7.9A	249	207
	0.63	3A	1.7	U05DS-7.9A	256	213
	1.26	3	1.8	U1DS-7.9A	265	220
	2.52	5	2.0	U2DS-7.9A	279	232
	3.78	6	2.3	U3DS-7.9A	302	251
	6.32	7	3.0	U5DS-7.9A	369	307
8.3-9.3	0.227	2C	0.8	U02DS-8.8A	249	207
	0.57	3A	1.7	U05DS-8.8A	256	213
	1.14	3	1.8	U1DS-8.8A	265	220
	2.28	5	2.0	U2DS-8.8A	279	232
	3.42	6	2.3	U3DS-8.8A	302	251
	5.68	7	3.0	U5DS-8.8A	369	307
9.3-10.4	0.202	2C	0.8	U02DS-9.9A	249	207
	0.50	3A	1.7	U05DS-9.9A	256	213
	1.00	3	1.8	U1DS-9.9A	265	220
	2.00	5	2.0	U2DS-9.9A	279	232
	3.00	6	2.3	U3DS-9.9A	295	245
	5.05	7	3.0	U5DS-9.9A	369	307
	10.10	11	5.5	U10DS-9.9A	466	388
10.4-11.6	0.182	2C	0.8	U02DS-11A	249	207
	0.45	3A	1.7	U05DS-11A	256	213
	0.91	3	1.8	U1DS-11A	265	220
	1.82	5	2.0	U2DS-11A	279	232
	2.73	6	2.3	U3DS-11A	295	245
	4.55	7	3.0	U5DS-11A	369	307
	9.10	11	5.5	U10DS-11A	466	388
11.6-13.0	0.163	2C	0.8	U02DS-12.3A	249	207
	0.40	3A	1.7	U05DS-12.3A	256	213
	0.81	3	1.8	U1DS-12.3A	265	220
	1.62	5	2.0	U2DS-12.3A	279	232
	2.43	6	2.3	U3DS-12.3A	295	245
	4.06	7	3.0	U5DS-12.3A	362	301
	8.12	11	5.5	U10DS-12.3A	452	376
	13.83	14	14.5	U17DS-12.3A	530	441
13.0-14.8	0.145	2C	0.8	U02DS-13.8A	242	201
	0.36	3A	1.7	U05DS-13.8A	249	207
	0.72	3	1.8	U1DS-13.8A	256	213
	1.44	5	2.0	U2DS-13.8A	272	226
	2.16	6	2.3	U3DS-13.8A	286	238
	3.62	7	3.0	U5DS-13.8A	362	301
	7.24	11	5.5	U10DS-13.8A	452	376
	12.31	14	14.5	U17DS-13.8A	530	441
14.8-16.6	0.127	2C	0.8	U02DS-15.7A	242	201
	0.32	3A	1.7	U05DS-15.7A	249	207
	0.64	3	1.8	U1DS-15.7A	256	213
	1.28	5	2.0	U2DS-15.7A	272	226
	1.92	6	2.3	U3DS-15.7A	286	238
14.8-16.6	3.18	7	3.0	U5DS-15.7A	$362	$301
	6.36	11	5.5	U10DS-15.7A	436	363
	10.81	14	14.5	U17DS-15.7A	515	429
16.6-18.6	0.114	2C	0.8	U02DS-17.6A	242	201
	0.28	3A	1.7	U05DS-17.6A	249	207
	0.57	3	1.8	U1DS-17.6A	256	213
	1.14	5	2.0	U2DS-17.6A	272	226
	1.71	6	2.3	U3DS-17.6A	286	238
	2.84	7	3.0	U5DS-17.6A	362	301
	5.68	11	5.5	U10DS-17.6A	436	363
	9.65	14	14.5	U17DS-17.6A	515	429
18.6-20.8	0.101	2C	0.8	U02DS-19.7A	242	201
	0.255	3A	1.7	U05DS-19.7A	249	207
	0.510	3	1.8	U1DS-19.7A	256	213
	1.02	5	2.0	U2DS-19.7A	272	226
	1.53	6	2.3	U3DS-19.7A	286	238
	2.54	7	3.0	U5DS-19.7A	355	295
	5.08	11	5.5	U10DS-19.7A	436	363
	8.62	14	14.5	U17DS-19.7A	515	429
20.8-23.3	0.098	2C	0.8	U02DS-22A	235	195
	0.230	3A	1.7	U05DS-22A	242	201
	0.460	3	1.8	U1DS-22A	249	207
	0.920	5	2.0	U2DS-22A	265	220
	1.38	6	2.3	U3DS-22A	279	232
	2.27	7	3.0	U5DS-22A	355	295
	4.54	11	5.5	U10DS-22A	429	357
	7.72	14	14.5	U17DS-22A	502	418
23.3-26.1	0.081	2C	0.8	U02DS-24.7A	235	195
	0.205	3A	1.7	U05DS-24.7A	242	201
	0.410	3	1.8	U1DS-24.7A	249	207
	0.820	5	2.0	U2DS-24.7A	265	220
	1.23	6	2.3	U3DS-24.7A	279	232
	2.02	7	3.0	U5DS-24.7A	355	295
	4.04	11	5.5	U10DS-24.7A	429	357
	6.88	14	14.5	U17DS-24.7A	502	418
26.1-29.2	0.073	2C	0.8	U02DS-27.6A	235	195
	0.180	3A	1.7	U05DS-27.6A	242	201
	0.360	3	1.8	U1DS-27.6A	249	207
	0.720	5	2.0	U2DS-27.6A	265	220
	1.08	6	2.3	U3DS-27.6A	279	232
	1.81	7	3.0	U5DS-27.6A	355	295
	3.62	11	5.5	U10DS-27.6A	415	345
	6.16	14	14.5	U17DS-27.6A	488	406
29.2-32.6	0.065	2C	0.8	U02DS-31A	235	195
	0.160	3A	1.7	U05DS-31A	242	201
	0.320	3	1.8	U1DS-31A	249	207
	0.640	5	2.0	U2DS-31A	265	220
	0.960	6	2.3	U3DS-31A	279	232
	1.61	7	3.0	U5DS-31A	355	295
	3.22	11	5.5	U10DS-31A	436	363
	5.48	14	14.5	U17DS-31A	515	429
32.6-36.5	0.058	2C	0.8	U02DS-34.6A	235	195
	0.145	3A	1.7	U05DS-34.6A	242	201
	0.290	3	1.8	U1DS-34.6A	249	207
	0.580	5	2.0	U2DS-34.6A	265	220
	0.870	6	2.3	U3DS-34.6A	279	232
	1.44	7	3.0	U5DS-34.6A	355	295
	2.88	11	5.5	U10DS-34.6A	466	388
	4.91	14	14.5	U17DS-34.6A	539	449
36.5-40.9	0.052	2C	0.8	U02DS-38.7A	235	195
	0.130	3A	1.7	U05DS-38.7A	242	201
	0.260	3	1.8	U1DS-38.7A	249	207
	0.520	5	2.0	U2DS-38.7A	265	220
	0.780	6	2.3	U3DS-38.7A	286	238
	1.29	7	3.0	U5DS-38.7A	362	301
	2.58	11	5.5	U10DS-38.7A	496	413
	4.39	14	14.5	U17DS-38.7A	569	474
40.9-45.8	0.046	2C	0.8	U02DS-43.3A	235	195
	0.115	3A	1.7	U05DS-43.3A	242	201
	0.230	3	1.8	U1DS-43.3A	249	207
40.9-45.8	0.460	5	2.0	U2DS-43.3A	$265	
	0.690	6	2.3	U3DS-43.3A	286	
	1.15	7	3.0	U5DS-43.3A	362	
	2.30	11	5.5	U10DS-43.3A	519	
	3.92	14	14.5	U17DS-43.3A	597	
45.8-51.4	0.041	2C	0.8	U02DS-48.6A	242	
	0.103	3A	1.7	U05DS-48.6A	249	
	0.206	3	1.8	U1DS-48.6A	256	
	0.412	5	2.0	U2DS-48.6A	272	
	0.618	6	2.3	U3DS-48.6A	295	
	1.03	7	3.0	U5DS-48.6A	369	
	2.06	11	5.5	U10DS-48.6A	549	
	3.49	14	14.5	U17DS-48.6A	622	
51.4-59.0	0.036	2C	0.8	U02DS-55.2A	265	
	0.091	3A	1.7	U05DS-55.2A	272	
	0.182	3	1.8	U1DS-55.2A	279	
	0.364	5	2.0	U2DS-55.2A	295	
	0.546	6	2.3	U3DS-55.2A	309	
	0.905	7	3.0	U5DS-55.2A	376	
	1.81	11	5.5	U10DS-55.2A	549	
	3.07	14	14.5	U17DS-55.2A	622	
59.0-66.0	0.032	2C	0.8	GB02D-63A	31	
	0.080	8A	2.2	GB05D-63A	32	
	0.160	8	2.8	GB1D-63A	33	
	0.320	9	3.0	GB2D-63A	34	
	0.480	10	3.8	GB3D-63A	39	
	0.792	12	5.8	GBL5D-63A	45	
	1.590	13	8.8	GBL10D-63A	54	
	2.69	17	25.5	GBL17D-63A	61	
66.0-74.0	0.029	2C	0.8	GB02D-70A	31	
	0.071	8A	2.2	GB05D-70A	32	
	0.143	8	2.8	GB1D-70A	33	
	0.286	9	3.0	GB2D-70A	34	
	0.429	10	3.8	GB3D-70A	39	
	0.715	12	5.8	GBL5D-70A	44	
	1.43	13	8.8	GBL10D-70A	54	
	2.42	17	25.5	GBL17D-70A	61	
74.0-83.0	0.025	2C	0.8	GB02D-79A	31	
	0.063	8A	2.2	GB05D-79A	32	
	0.127	8	2.8	GB1D-79A	33	
	0.254	9	3.0	GB2D-79A	34	
	0.381	10	3.8	GB3D-79A	38	
	0.634	12	5.8	GBL5D-79A	42	
	1.27	13	8.8	GBL10D-79A	54	
	2.15	17	25.5	GBL17D-79A	61	
83.0-93.0	0.023	2C	0.8	GB02D-88A	31	
	0.057	8A	2.2	GB05D-88A	32	
	0.114	8	2.8	GB1D-88A	33	
	0.228	9	3.0	GB2D-88A	34	
	0.342	10	3.8	GB3D-88A	37	
	0.568	12	5.8	GBL5D-88A	41	
	1.14	13	8.8	GBL10D-88A	54	
	1.93	17	25.5	GBL17D-88A	61	
93.0-104	0.020	2C	0.8	GB02D-99A	31	
	0.050	8A	2.2	GB05D-99A	32	
	0.100	8	2.8	GB1D-99A	33	
	0.200	9	3.0	GB2D-99A	34	
	0.300	10	3.8	GB3D-99A	38	
	0.510	12	5.8	GBL5D-99A	39	
	1.02	13	8.8	GBL10D-99A	54	
	1.71	17	25.5	GBL17D-99A	61	
104-116	0.018	2C	0.8	GB02D-110A	31	
	0.045	8A	2.2	GB05D-110A	32	
	0.091	8	2.8	GB1D-110A	33	
	0.182	9	3.0	GB2D-110A	34	
	0.273	10	3.8	GB3D-110A	37	
	0.455	12	5.8	GBL5D-110A	39	
	0.910	13	8.8	GBL10D-110A	54	
	1.545	17	25.5	GBL17D-110A	61	

A	B	C	D	E	F	G	H	J	K	L	M
	2¾	2⅛	1.50	2.25	0	—	—	¾	1⅛	—	—
¾	2¾	3	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	2¾	2¾	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	2¾	3¼	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	3	3¼	2.25	2.50	¾	2	½	1⅛	1¼	—	—
¾	2¾	4	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¾	4¼	3	2.25	3.75	0	2	0	1⅛	1⅞	—	—
¾	4½	2¾	2.25	3.75	0	2	0	1⅛	1⅞	—	—
¾	4⅝	3¼	2.25	4.12	0	2	0	1⅛	2 1/16	—	—
¾	5¼	3¼	2.25	4.75	0	2	0	1⅛	2⅜	2.37	—
	5½	3¼	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	5½	4	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	6	3¼	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75
	6	4	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75
	12	4	5.50	11.50	4¾	2	4¾	2¾	5¾	5.75	2.75

SIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



To have the header located on the mounting base change the model number character preceding the first dash of Model Number to "B". (Example: U05B-5A indicates a header out the base.) See page 949. No increase in price for this service.

400 HERTZ TO DC (Reg.) HI-TEMP. INPUT VOLTAGE: 115 VAC (Nominal), 380-420 Hz, 1 PHASE

Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
0.016	2C	0.8	GB02D-123A	$314	$262
0.040	8A	2.2	GB05D-123A	321	268
0.081	8	2.8	GB1D-123A	330	275
0.162	9	3.0	GB2D-123A	344	287
0.243	10	3.8	GB3D-123A	367	306
0.406	12	5.8	GBL5D-123A	397	331
0.812	13	8.8	GBL10D-123A	540	450
1.381	17	25.5	GBL17D-123A	613	511
0.014	2C	0.8	GB02D-138A	314	262
0.036	8A	2.2	GB05D-138A	321	268
0.072	8	2.8	GB1D-138A	330	275
0.144	9	3.0	GB2D-138A	344	287
0.216	10	3.8	GB3D-138A	367	306
0.362	12	5.8	GBL5D-138A	397	331
0.724	13	8.8	GBL10D-138A	524	437
1.231	17	25.5	GBL17D-138A	597	498
0.013	2C	0.8	GB02D-157A	314	262
0.032	8A	2.2	GB05D-157A	321	268
0.064	8	2.8	GB1D-157A	330	275
0.128	9	3.0	GB2D-157A	344	287
0.192	10	3.8	GB3D-157A	367	306
0.318	12	5.8	GB5D-157A	397	331
0.636	13	8.8	GBL10D-157A	510	425
1.082	17	25.5	GBL17D-157A	583	486
0.011	2C	0.8	GB02D-176A	314	262
0.028	8A	2.2	GB05D-176A	321	268
0.057	8	2.8	GB1D-176A	330	275
0.114	9	3.0	GB2D-176A	344	287
0.171	10	3.8	GB3D-176A	367	306
0.284	12	5.8	GB5D-176A	397	331
0.568	13	8.8	GBL10D-176A	494	412
0.965	17	25.5	GBL17D-176A	572	477
0.010	2C	0.8	GB02D-197A	314	262
0.025	8A	2.2	GB05D-197A	321	268
0.051	8	2.8	GB1D-197A	330	275
0.102	9	3.0	GB2D-197A	344	287
0.153	10	3.8	GB3D-197A	367	306
0.254	12	5.8	GB5D-197A	397	331
0.508	13	8.8	GBL10D-197A	480	400
0.862	17	25.5	GBL17D-197A	558	465
0.009	2C	0.8	GB02D-220A	314	262
0.023	8A	2.2	GB05D-220A	321	268
0.046	8	2.8	GB1D-220A	330	275
0.092	9	3.0	GB2D-220A	344	287
0.138	10	3.8	GB3D-220A	367	306
0.228	12	5.8	GB5D-220A	397	331
0.456	13	8.8	GBL10D-220A	471	393
0.772	17	25.5	GBL17D-220A	544	454
0.008	2C	0.8	GB02D-247A	314	262
0.020	8A	2.2	GB05D-247A	321	268
0.041	8	2.8	GB1D-247A	330	275
0.082	9	3.0	GB2D-247A	344	287
0.123	10	3.8	GB3D-247A	367	306
0.203	12	5.8	GB5D-247A	397	331
0.406	13	8.8	GBL10D-247A	471	393
0.688	17	25.5	GBL17D-247A	544	454
0.007	2C	0.8	GB02D-276A	314	262
0.018	8A	2.2	GB05D-276A	321	268
0.036	8	2.8	GB1D-276A	330	275
0.072	9	3.0	GB2D-276A	344	287
0.108	10	3.8	GB3D-276A	367	306
0.181	12	5.8	GB5D-276A	397	331
0.362	13	8.8	GBL10D-276A	480	400
0.615	17	25.5	GBL17D-276A	553	461

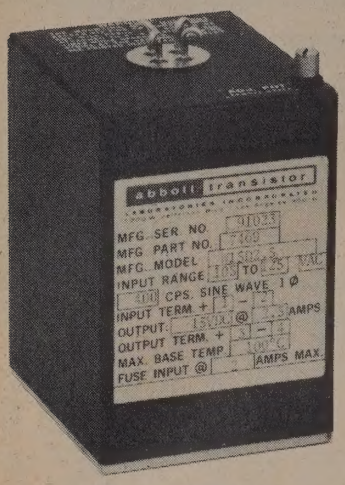
Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
292-326	0.006	2C	0.8	GB02D-310A	$314	$262
	0.016	8A	2.2	GB05D-310A	321	268
	0.032	8	2.8	GB1D-310A	330	275
	0.064	9	3.0	GB2D-310A	344	287
	0.096	10	3.8	GB3D-310A	367	306
	0.161	12	5.8	GB5D-310A	397	331
	0.322	13	8.8	GB10D-310A	480	400
	0.548	17	25.5	GBL17D-310A	558	465
326-365	0.006	2C	0.8	GB02D-346A	323	269
	0.014	8A	2.2	GB05D-346A	330	275
	0.029	8	2.8	GB1D-346A	337	281
	0.058	9	3.0	GB2D-346A	351	293
	0.087	10	3.8	GB3D-346A	374	312
	0.145	12	5.8	GB5D-346A	404	337
	0.290	13	8.8	GB10D-346A	487	406
	0.491	17	25.5	GBL17D-346A	565	471
365-409	0.005	2C	0.8	GB02D-387A	323	269
	0.013	8A	2.2	GB05D-387A	330	275
	0.026	8	2.8	GB1D-387A	337	281
	0.052	9	3.0	GB2D-387A	351	293
	0.078	10	3.8	GB3D-387A	374	312
	0.129	12	5.8	GB5D-387A	404	337
	0.258	13	8.8	GB10D-387A	494	412
	0.439	17	25.5	GBL17D-387A	567	473
409-458	0.005	2C	0.8	GB02D-433A	323	269
	0.011	8A	2.2	GB05D-433A	330	275
	0.023	8	2.8	GB1D-433A	337	281
	0.046	9	3.0	GB2D-433A	351	293
	0.069	10	3.8	GB3D-433A	374	312
	0.166	12	5.8	GB5D-433A	411	343
	0.232	13	8.8	GB10D-433A	501	418
	0.392	17	25.5	GBL17D-433A	574	479
458-514	0.004	2C	0.8	GB02D-486A	330	275
	0.010	8A	2.2	GB05D-486A	337	281
	0.021	8	2.8	GB1D-486A	344	287
	0.041	9	3.0	GB2D-486A	360	300
	0.062	10	3.8	GB3D-486A	381	318
	0.103	12	5.8	GB5D-486A	411	343
	0.206	13	8.8	GB10D-486A	510	425
	0.349	17	25.5	GBL17D-486A	583	486
514-590	0.004	2C	0.8	GB02D-552A	330	275
	0.009	8A	2.2	GB05D-552A	337	281
	0.018	8	2.8	GB1D-552A	344	287
	0.036	9	3.0	GB2D-552A	360	300
	0.055	10	3.8	GB3D-552A	381	318
	0.090	12	5.8	GB5D-552A	411	343
	0.180	13	8.8	GB10D-552A	524	437
	0.307	17	25.5	GBL17D-552A	592	494
590-660	0.008	8A	2.2	GB05D-630A	344	287
	0.016	8	2.8	GB1D-630A	351	293
	0.032	9	3.0	GB2D-630A	367	306
	0.048	10	3.8	GB3D-630A	390	325
	0.079	12	5.8	GB5D-630A	420	350
	0.158	13	8.8	GB10D-630A	540	450
	0.269	17	25.5	GBL17D-630A	600	500
660-740	0.007	8A	2.2	GB05D-700A	344	287
	0.014	8	2.8	GB1D-700A	351	293
	0.028	9	3.0	GB2D-700A	367	306
	0.043	10	3.8	GB3D-700A	390	325
	0.071	12	5.8	GB5D-700A	420	350
	0.142	13	8.8	GB10D-700A	547	456
	0.242	17	25.5	GBL17D-700A	615	513
740-830	0.006	8A	2.2	GB05D-790A	351	293
	0.012	8	2.8	GB1D-790A	360	300
	0.025	9	3.0	GB2D-790A	374	312

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
740-830	0.038	10	3.8	GB3D-790A	$397	$331
	0.063	12	5.8	GB5D-790A	427	356
	0.126	13	8.8	GB10D-790A	370	475
	0.215	17	25.5	GBL17D-790A	627	523
830-930	0.005	8A	2.2	GB05D-880A	360	300
	0.011	8	2.8	GB1D-880A	367	306
	0.022	9	3.0	GB2D-880A	381	318
	0.034	10	3.8	GB3D-880A	404	337
	0.057	12	5.8	GB5D-880A	434	362
	0.014	13	8.8	GB10D-880A	584	487
	0.193	17	25.5	GBL17D-880A	687	531
930-1040	0.005	8A	2.2	GB05D-990A	367	306
	0.010	8	2.8	GB1D-990A	374	312
	0.020	9	3.0	GB2D-990A	390	325
	0.030	10	3.8	GB3D-990A	411	343
	0.051	12	5.8	GB5D-990A	441	368
	0.102	13	8.8	GB10D-990A	584	487
	0.171	17	25.5	GBL17D-990A	646	539
1040-1160	0.018	9	3.0	GB2D-1100A	397	331
	0.027	10	3.8	GBK3D-1100A	420	350
	0.045	12	5.8	GBK5D-1100A	450	375
	0.090	14	8.9	GBK10D-1100A	591	493
	0.154	17	25.5	GBK17D-1100A	655	546
1160-1300	0.016	9	3.0	GBK2D-1230A	404	337
	0.024	10	3.8	GBK3D-1230A	427	356
	0.041	12	5.8	GBK5D-1230A	457	381
	0.082	14	8.9	GBK10D-1230A	600	500
	0.138	17	25.5	GBK17D-1230A	662	552
1300-1480	0.014	9	3.0	GBK2D-1380A	411	343
	0.021	10	3.8	GBK3D-1380A	434	362
	0.036	12	5.8	GBK5D-1380A	464	387
	0.072	14	8.9	GBK10D-1380A	607	506
	0.123	17	25.5	GBK17D-1380A	675	563
1480-1660	0.013	9	3.0	GBK2D-1570A	420	350
	0.019	10	3.8	GBK3D-1570A	441	368
	0.032	12	5.8	GBK5D-1570A	471	393
	0.064	14	8.9	GBK10D-1570A	614	512
	0.108	17	25.5	GBK17D-1570A	692	577
1660-1860	0.010	9	3.0	GBK2D-1760A	434	362
	0.017	10	3.8	GBK3D-1760A	457	381
	0.028	12	5.8	GBK5D-1760A	487	406
	0.056	14	8.9	GBK10D-1760A	621	518
	0.096	17	25.5	GBK17D-1760A	705	588
1860-2080	0.010	9	3.0	GBK2D-1970A	450	375
	0.015	10	3.8	GBK3D-1970A	471	393
	0.025	12	5.8	GBK5D-1970A	501	418
	0.051	14	8.8	GBK10D-1970A	637	531
	0.086	17	25.5	GBK17D-1970A	726	605
2080-2330	0.023	12	5.8	GBK5D-2200A	517	431
	0.045	14	8.9	GBK10D-2200A	651	543
	0.077	17	25.5	GBK17D-2200A	751	626
2330-2610	0.020	12	5.8	GBK5D-2470A	547	456
	0.040	14	8.9	GBK10D-2470A	667	556
	0.068	17	25.5	GBK17D-2470A	771	643
2610-2920	0.018	12	5.8	GBK5D-2760A	554	462
	0.036	14	8.9	GBK10D-2760A	674	562
	0.061	17	25.5	GBK17D-2760A	794	662
2920-3260	0.016	12	5.8	GBK5D-3100A	577	481
	0.032	14	8.9	GBK10D-3100A	681	568
	0.054	17	25.5	GBK17D-3100A	818	682
3260-3650	0.014	12	5.8	GBK5D-3460A	591	498
	0.029	14	8.9	GBK10D-3460A	711	593
	0.049	17	25.5	GBK17D-3460A	859	716

For no load operation, add a resistance on the output to draw a minimum 4% of the rated current.

abbott transistor
ORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott 400 ~ to DC Hi-Performance



FEATURES

- Low Peak-to-Peak Ripple
- RFI/EMI to MIL-STD-461
- Small
- Hermetically Sealed
- +100°C Operation
- ±0.05% Regulation

DELIVERY FROM STOCK*

SPECIFICATIONS

INPUT VOLTAGE RANGE: 105 to 125 VRMS

INPUT FREQUENCY RANGE: 380 to 420 Hertz, 1 phase

INPUT POWER: Per MIL-STD-704A for category B equipment

OUTPUT VOLTAGE AND CURRENT: See specific models listed in table

LINE REGULATION: ±0.05% or 10 mv (whichever is greater) for input change of 105 to 125 VRM load constant

LOAD REGULATION: ±0.05% or 20 mv (whichever is greater) for change from no load to full loa line constant

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 25 mv peak to-peak maximum

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the ta means of an externally accesible screwdriver adjustment potentiometer

ADJUSTMENT RESOLUTION:

Nom. Output Voltage	Resolution
5 - 16 vdc	35 mv
18 - 50 vdc	60 mv
55 - 95 vdc	90 mv

ISOLATION VOLTAGE: 750 vdc input to output and input to case • 200 vdc output to case

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and outp case when measured at 50 vdc

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55° to +100°C maximum at center of mounting base
Storage: −55°C to +125°C

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-E-5272C and MIL-E-5400K 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, explosion, etc.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit duration. The output voltage automatically restores to normal when the overload is removed

INPUT TRANSIENT PROTECTION: MIL-STD-704A Figure 3, Limit 1 (180 VAC for 0.1 seconds)

OVER VOLTAGE PROTECTION: Over voltage protection modules are available for these units. Please the factory.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 micros after 50% step change in load current

SERIES OPERATION: Two or more power supplies can be operated in series so that the output vol the supplies are additive. Total output voltage is not to exceed 200 vdc

OUTPUT IMPEDANCE:
DC to 1K Hz — 0.004 R_L or 0.04 ohm max.
1K Hz to 10K Hz — 0.015 R_L or 0.15 ohm max.
10K Hz to 100K Hz — 0.030 R_L or 0.50 ohm
R_L = Rated Load

ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation susceptability to radiated and conducted interference

RELIABILITY: The Mean Time Between Failure (MTBF) per MIL-HDBK-217 under worst case operating co of full rated output current, 125 vac input voltage, and +100°C base plate temperature, range 47,393 hours for Model W95D0.3 to 56,148 hours for Model W5D10.

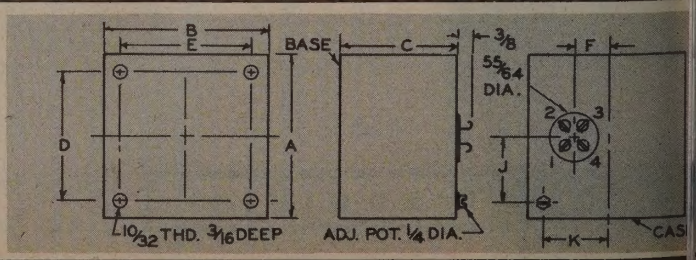
Output Voltage Range	Output Curr. (Amps)	Size (See Dwg.)	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
4.5-5.5	2.5	2E	1.9	W5D2.5	$310	$260
	5.0	4D	2.7	W5D5.0	350	295
	10.0	10B	5.1	W5D10	455	380
5.5-6.5	2.5	2E	1.9	W6D2.5	310	260
	5.0	4D	2.7	W6D5.0	350	295
	10.0	10B	5.1	W6D10	455	380
6.5-7.5	2.5	2E	1.9	W7D2.5	310	260
	5.0	4D	2.7	W7D5.0	350	295
	10.0	10B	5.1	W7D10	455	380
7.5-8.5	2.5	2E	1.9	W8D2.5	310	260
	5.0	4D	2.7	W8D5.0	350	295
	10.0	10B	5.1	W8D10	455	380
8.5-9.5	2.5	2E	1.9	W9D2.5	320	270
	5.0	4D	2.7	W9D5.0	395	330
	10.0	10B	5.1	W9D10	490	410
9.5-10.5	2.5	2E	1.9	W10D2.5	320	270
	5.0	4D	2.7	W10D5.0	395	330
	10.0	10B	5.1	W10D10	490	410
10.5-11.5	2.5	2E	1.9	W11D2.5	320	270
	5.0	4D	2.7	W11D5.0	395	330
	10.0	10B	5.1	W11D10	490	410
11-13	2.5	2E	1.9	W12D2.5	320	270
	5.0	4D	2.7	W12D5.0	395	330
	10.0	10B	5.1	W12D10	490	410
13-15	1.2	2E	1.9	W14D1.2	315	265
	2.5	4D	2.7	W14D2.5	410	345
	5.0	10B	5.1	W14D5.0	490	410
14-16	1.2	2E	1.9	W15D1.2	315	265
	2.5	4D	2.7	W15D2.5	410	345
	5.0	10B	5.1	W15D5.0	490	410
15-17	1.2	2E	1.9	W16D1.2	315	265
	2.5	4D	2.7	W16D2.5	410	345
	5.0	10B	5.1	W16D5.0	490	410
17-19	1.2	2E	1.9	W18D1.2	$315	$265
	2.5	4D	2.7	W18D2.5	410	345
	5.0	10B	5.1	W18D5.0	490	410
19-21	1.2	2E	1.9	W20D1.2	315	265
	2.5	4D	2.7	W20D2.5	410	345
	5.0	10B	5.1	W20D5.0	490	410
21-23	1.2	2E	1.9	W22D1.2	315	265
	2.5	4D	2.7	W22D2.5	410	345
	5.0	10B	5.1	W22D5.0	490	410
23-25	1.2	2E	1.9	W24D1.2	315	265
	2.5	4D	2.7	W24D2.5	410	345
	5.0	10B	5.1	W24D5.0	490	410
25-27	1.2	2E	1.9	W26D1.2	315	265
	2.5	4D	2.7	W26D2.5	410	345
	5.0	10B	5.1	W26D5.0	490	410
27-29	1.2	2E	1.9	W28D1.2	315	265
	2.5	4D	2.7	W28D2.5	410	345
	5.0	10B	5.1	W28D5.0	490	410
29-31	0.6	2E	1.9	W30D0.6	305	255
	1.2	4D	2.7	W30D1.2	380	320
	2.5	10B	5.1	W30D2.5	545	455
31-33	0.6	2E	1.9	W32D0.6	305	255
	1.2	4D	2.7	W32D1.2	380	320
	2.5	10B	5.1	W32D2.5	545	455
33-35	0.6	2E	1.9	W34D0.6	305	255
	1.2	4D	2.7	W34D1.2	380	320
	2.5	10B	5.1	W34D2.5	545	455
35-37	0.6	2E	1.9	W36D0.6	305	255
	1.2	4D	2.7	W36D1.2	380	320
	2.5	10B	5.1	W36D2.5	545	455
37-39	0.6	2E	1.9	W38D0.6	305	255
	1.2	4D	2.7	W38D1.2	380	320
	2.5	10B	5.1	W38D2.5	545	455
39-41	0.6	2E	1.9	W40D0.6	$305	
	1.2	4D	2.7	W40D1.2	380	
	2.5	10B	5.1	W40D2.5	545	
41-43	0.6	2E	1.9	W42D0.6	305	
	1.2	4D	2.7	W42D1.2	380	
	2.5	10B	5.1	W42D2.5	545	
43-45	0.6	2E	1.9	W44D0.6	330	
	1.2	4D	2.7	W44D1.2	420	
	2.5	10B	5.1	W44D2.5	575	
45-47	0.6	2E	1.9	W46D0.6	330	
	1.2	4D	2.7	W46D1.2	420	
	2.5	10B	5.1	W46D2.5	575	
47-49	0.6	2E	1.9	W48D0.6	330	
	1.2	4D	2.7	W48D1.2	420	
	2.5	10B	5.1	W48D2.5	575	
49-51	0.6	2E	1.9	W50D0.6	330	
	1.2	4D	2.7	W50D1.2	420	
	2.5	10B	5.1	W50D2.5	575	
50-60	0.3	2E	1.9	W55D0.3	395	
	0.6	4D	2.7	W55D0.6	455	
	1.2	10B	5.1	W55D1.2	585	
60-70	0.3	2E	1.9	W65D0.3	395	
	0.6	4D	2.7	W65D0.6	455	
	1.2	10B	5.1	W65D1.2	585	
70-80	0.3	2E	1.9	W75D0.3	395	
	0.6	4D	2.7	W75D0.6	455	
	1.2	10B	5.1	W75D1.2	585	
80-90	0.3	2E	1.9	W85D0.3	395	
	0.6	4D	2.7	W85D0.6	455	
	1.2	10B	5.1	W85D1.2	585	
90-100	0.3	2E	1.9	W95D0.3	395	
	0.6	4D	2.7	W95D0.6	455	
	1.2	10B	5.1	W95D1.2	585	

* All models with output voltages from 5 to 30 vdc are normally available from stock.

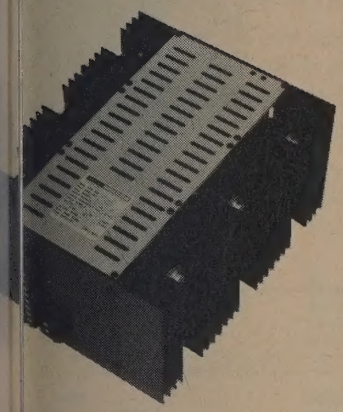
Size	A	B	C	D	E	F	J	K
2E	2⅛	3¼	3¼	1.62	2.75	⅞	13/16	1⅜
4D	2½	3½	3½	2.00	3.00	0	1	1½
10B	2⅞	4¼	4⅜	2.37	3.75	1⅜	13/16	1⅞

TOLERANCES

FRACTION = ±1/16 **DECIMAL** = ±0.015



bbott DC to 60 ∼ (Regulated)



POWER MODULES

features

- −4° to +160°F ambient
- 115, 220 and 440 VRMS Models
- 30 to 240 VA
- All Silicon
- High Reliability
- Short Circuit Protection
- Reverse Polarity Protection
- Close Regulation

specifications

Input Voltage Range
11-13 VDC on 'K' Models
22-26 VDC on 'P' Models

Load Regulation
±1% for load change of ½ load to full load

Line Regulation
±0.2% for specified input voltage range

Output Frequency
Adjustable between 55 and 65 Hz by screwdriver adjustment

Frequency Stability
±1% from −4°F to +160°F
±1% over eight hour period at constant temperature

Wave Form
Sinusoidal, with maximum distortion into a resistive load as shown in table below.

Synchronization
Terminals are provided for external synchronization. Input of 6.3 vrms ±20%, 55 to 65 Hz required

Load Power Factor
Full rated output VA from unity to 0.7 PF lagging or leading

Efficiency
45% minimum on 'K' Models at nominal input voltage. 50% minimum on 'P' Models at nominal input voltage

Operating Temperature
−4°F to +160°F ambient without derating, forced air, or heatsinking

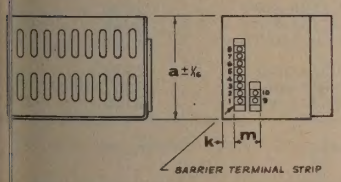
Altitude
10,000 feet above sea level

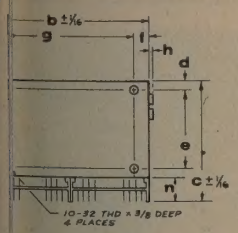
Input Transient Protection
45 VDC for 0.1 seconds

Output Voltage and Power
See specific Models listed in the table below

p Voltage Range (VDC)	Output Voltage Range* (V RMS)	Output Power (VA)	Harmonic Distortion (%)	Size (See Dwg.)	Weight (Lbs.)	Model Number	Price 1 Pc.	Price 2-4 Pcs.
-13	105-125	30	4	KI	20	K3T-115-60	$430	$395
		60	4	FI	22	K6T-115-60	625	570
		120	5	JI	30	K12T-115-60	735	670
-13	200-240	30	4	KI	20	K3T-220-60	455	415
		60	4	FI	22	K6T-220-60	645	590
		120	5	JI	30	K12T-220-60	760	690
-13	400-480	30	4	KI	20	K3T-440-60	465	425
		60	4	FI	22	K6T-440-60	660	600
		120	5	JI	30	K12T-440-60	770	700
-26	105-125	60	4	KI	20	P6T-115-60	430	395
		120	4	FI	22	P12T-115-60	625	570
		240	5	JI	30	P24T-115-60	735	670
-26	200-240	60	4	KI	20	P6T-220-60	455	415
		120	4	FI	22	P12T-220-60	645	590
		240	5	JI	30	P24T-220-60	760	690
-26	400-480	60	4	KI	20	P6T-440-60	465	425
		120	4	FI	22	P12T-440-60	660	600
		240	5	JI	30	P24T-440-60	770	700

djustable between limits shown.



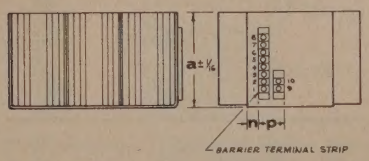


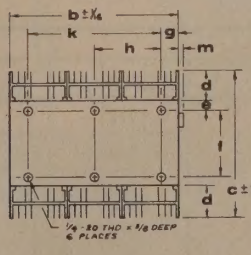
Terminal Functions

1, 2 } Ext. Sync.
3, 4, 5, 6, 7, 8 } Output
9 +Input
10 −Input

Case K1

a	5
b	8
c	7½
d	½
e	5¼
f	¾
g	6½
h	¾
k	⅜
m	3
n	1¼





Terminal Functions

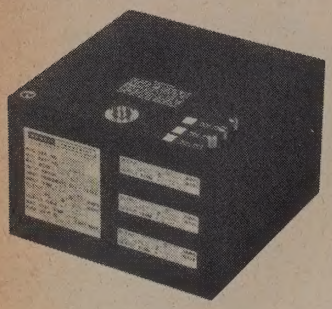
1, 2 } Ext. Sync.
3, 4, 5, 6, 7, 8 } Output
9 +Input
10 −Input

Case F1, J1

	F1	J1
a	5	6½
b	8	12
c	8¾	9¾
d	1¼	2⅛
e	½	⅜
f	5¼	4¾
g	¾	1¼
h	—	4¾
k	6½	9½
m	¾	¾
n	⅜	⅜
p	3	3

bbott transistor
ABORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott DC to Sine Wave 1ϕ or 3ϕ



POWER MODULES

features

- Close regulation
- 400 or 800 Hertz
- Hermetically sealed
- No moving parts
- Compact
- For aerospace application

specifications

Input Voltage Range
24 to 30 volts DC

Line Regulation
±0.2% for input 24 to 30 VDC

Voltage Regulation
±1% for input 24 to 30 VDC and from ½ load to full load

Frequency Stability ±1%

Phase Displacement (3 ϕ only)
120° ±5° from ½ to full load and P.F. 0.7 lag or lead

Voltage Adjustment Range
12% by screwdriver adj.

Reliability
100,000 hours MTBF typical per MIL-HDBK-217 under worst case operating conditions on Model N's

Short Circuit Protection
Standard on all models

Input Transient Protection
In accordance with MIL-STD- Limit 1, Category B (80 volt 0.1 sec.)

Environment
+160°F max. at mtg. base only) using adequate heat sink +212°F max. at mtg. base only) using adequate heat sink −65°F min. at mounting surfa Altitude: To vacuum (true her seal)

Vibration, shock, sand, dust, hi ity, salt spray, fungus, suns rain, and explosion to MIL-E-5 and MIL-E-5400K

Output Voltage, Current and Frequency
See specific models listed (Ou and inputs are isolated)

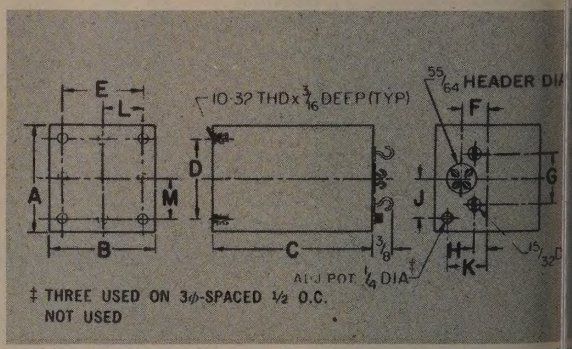
DC TO SINE WAVE (1 ϕ or 3 ϕ) INPUT VOLTAGE RANGE: 24 TO 30 VOLTS DC

Output No. of Phases	Output Frequency (Hertz)	Output Voltage Range (Per Phase)	Output Power (Volt-Amps)	Harmonic Distortion (%)	Size (See Dwg.)	Weight (Lbs.)	Model Number	Price 1 Piece	Price 2-4 Pi
1	400	25.4-28.6	5	3	4	1.4	N05D-27A-400	$249	$20
			10	3	4C	1.5	N1D-27A-400	251	21
			20	3	4A	2.1	N2D-27A-400	253	21
			30	3	6	2.2	N3D-27A-400	255	21
			60	4	11	4.5	N6D-27A-400	410	35
			120	5	13	9.1	N12D-27A-400	770	64
1	400	108-122	5	3	4	1.4	N05D-115A-400	220	18
			10	3	4C	1.5	N1D-115A-400	226	18
			20	3	4A	2.1	N2D-115A-400	228	18
			30	3	6	2.2	N3D-115A-400	230	19
			60	4	11	4.5	N6D-115A-400	390	33
			120	5	13	9.1	N12D-115A-400	750	62
1	800	25.4-28.6	5	3	4	1.4	N05D-27A-800	274	22
			10	3	4C	1.5	N1D-27A-800	276	23
			20	3	4A	2.1	N2D-27A-800	278	23
			30	3	6	2.2	N3D-27A-800	280	23
			60	4	11	4.5	N6D-27A-800	445	37
			120	5	13	9.1	N12D-27A-800	795	66
1	800	108-122	5	3	4	1.4	N05D-115A-800	249	20
			10	3	4C	1.5	N1D-115A-800	251	21
			20	3	4A	2.1	N2D-115A-800	253	21
			30	3	6	2.2	N3D-115A-800	255	21
			60	4	11	4.5	N6D-115A-800	410	35
			120	5	13	9.1	N12D-115A-800	770	64
3 *	400	108-122	33	4	13	8.3	Q3D-115A-400Y	1905	15
			66	4	14	9.2	Q6D-115A-400Y	1975	16
			100	5	14	9.2	Q10D-115A-400Y	2081	17
3*	400	25.4-28.6	33	4	13	8.3	Q3D-27A-400Y	1940	16
			66	4	14	9.2	Q6D-27A-400Y	2046	16
			100	5	14	9.2	Q10D-27A-400Y	2142	17
3*	800	108-122	33	4	13	8.3	Q3D-115A-800Y	1940	16
			66	4	14	9.2	Q6D-115A-800Y	2046	16
			100	5	14	9.2	Q10-115A-800Y	2142	17
3*	800	25.4-28.6	33	4	13	8.3	Q3D-27A-800Y	1975	16
			66	4	14	9.2	Q6D-27A-800Y	2081	17
			100	5	14	9.2	Q10D-27A-800Y	2152	17

* The output of the three phase models is normally four wire "WYE" connected. To obtain "Delta" instead of "WYE" change last letter of number to "D." (Example: Q3D-115A-400**D**.)

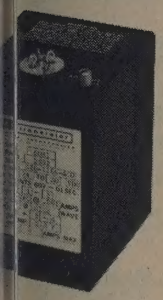
Size	A	B	C	D	E	F	G	H	J	K	L	M
4	2¼	2¾	3¼	1.75	2.25	¾	—	—	⅞	1⅛	—	—
4C	2¼	2¾	3½	1.75	2.25	¾	—	—	⅞	1⅛	—	—
4A	2½	3	3¼	2.00	2.50	¾	—	—	1	1¼	—	—
6	2¾	3	3¼	2.25	2.50	¾	—	—	1⅛	1¼	—	—
11	3	5½	3¼	2.50	5.00	2⅛	—	—	1¼	2½	2.50	—
13	6	6	3¼	5.50	5.50	2⅜	—	—	2¾	2¾	2.75	2.75
14	6	6	4	5.50	5.50	2⅜	—	—	2¾	2¾	2.75	2.75

DIMENSIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



† To have the header located on the mounting base, change the mod ber character preceding the first dash of Model Number to "B". (E N3B-115A-400 indicates a header out the base.) See page 949. No inc price for this service.

abbott DC to Sine Wave 1ϕ Hi-Temp.



POWER MODULES *specifications*

features

- Close regulation
- 400 to 1600 Hertz
- Hermetically sealed
- High Reliability
- Compact
- For aerospace
- Short circuit protected

Input Voltage Range
24 to 30 volts DC

Line Regulation
±0.2% change of output voltage for input 24-30 VDC

Load Regulation
±0.5% from ½ load to full load

Frequency Stability
±1%

Voltage Adjustment Range
12% by screwdriver adjustment

Input Transient Protection
In accordance with MIL-STD-704A, Limit 1, Category B (80 volts for 0.1 sec.)

Short Circuit Protection
Standard on all Models

Reliability
55,000 hours MTBF typical per MIL-HDBK-217 under worst case operating conditions

Environment
+212°F max. at mounting base, using adequate heat sink
−65°F min. at mounting surface
Altitude: to vacuum (true hermetic seal)
Vibration, shock, sand, dust, humidity, salt spray, fungus, sunshine, rain, and explosion to MIL-E-5272C and MIL-E-5400K, Class 2

Output Voltage, Current and Frequency
See specific models listed below
(Outputs and inputs are isolated)

DC TO SINE WAVE (1ϕ) HI-TEMP.

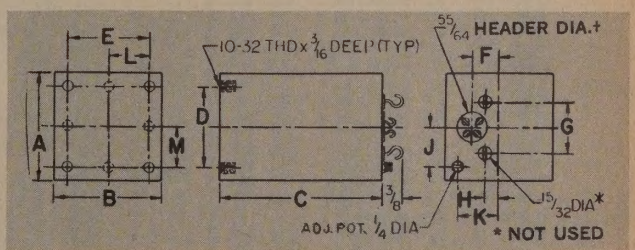
INPUT VOLTAGE RANGE: 24 TO 30 VOLTS DC

Output Frequency (Hertz)	Output Voltage Range	Output Power (Volt-Amps)	Harmonic Distortion (%)	Size (See Dwg.)	Weight (Lbs.)	Model Number	Price 1 Pc.	Price 2-4 Pcs.
400	25.4-28.6	5	2.0	4	1.6	**S05D-27A-400**	$297	$248
		10	2.5	4C	1.7	**S1D-27A-400**	301	251
		20	2.5	4B	2.3	**S2D-27A-400**	303	253
		30	2.5	6A	2.4	**S3D-27A-400**	307	256
		60	3.0	12	4.8	**S6D-27A-400**	501	418
		120	4.0	14	8.5	**S12D-27A-400**	921	768
400	108-122	5	2.0	4	1.6	**S05D-115A-400**	267	223
		10	2.5	4C	1.7	**S1D-115A-400**	271	226
		20	2.5	4B	2.3	**S2D-115A-400**	273	228
		30	2.5	6A	2.4	**S3D-115A-400**	277	231
		60	3.0	12	4.8	**S6D-115A-400**	471	393
		120	4.0	14	8.5	**S12D-115A-400**	891	743
800	25.4-28.6	5	2.0	4	1.6	S05D-27A-800	327	273
		10	2.5	4C	1.7	S1D-27A-800	331	276
		20	2.5	4B	2.3	S2D-27A-800	333	278
		30	2.5	6A	2.4	S3D-27A-800	337	281
		60	3.0	12	4.8	S6D-27A-800	501	418
		120	4.0	14	8.5	S12D-27A-800	951	793
800	108-122	5	2.0	4	1.6	S05D-115A-800	297	248
		10	2.5	4C	1.7	S1D-115A-800	301	251
		20	2.5	4B	2.3	S2D-115A-800	303	253
		30	2.5	6A	2.4	S3D-115A-800	307	256
		60	3.0	12	4.8	S6D-115A-800	501	418
		120	4.0	14	8.5	S12D-115A-800	921	768
1200	25.4-28.6	5	2.0	4	1.6	S05D-27A-1200	327	273
		10	2.5	4C	1.7	S1D-27A-1200	331	276
		20	2.5	4B	2.3	S2D-27A-1200	333	278
		30	2.5	6A	2.4	S3D-27A-1200	337	281
		60	3.0	12	4.8	S6D-27A-1200	501	418
		120	4.0	14	8.5	S12D-27A-1200	951	793
1200	108-122	5	2.0	4	1.6	S05D-115A-1200	297	248
		10	2.5	4C	1.7	S1D-115A-1200	301	251
		20	2.5	4B	2.3	S2D-115A-1200	303	253
		30	2.5	6A	2.4	S3D-115A-1200	307	256
		60	3.0	12	4.8	S6D-115A-1200	501	418
		120	4.0	14	8.5	S12D-115A-1200	921	768
1600	25.4-28.6	5	2.0	4	1.6	S05D-27A-1600	327	273
		10	2.5	4C	1.7	S1D-27A-1600	331	276
		20	2.5	4B	2.3	S2D-27A-1600	333	278
		30	2.5	6A	2.4	S3D-27A-1600	337	281
		60	3.0	12	4.8	S6D-27A-1600	501	418
		120	4.0	14	8.5	S12D-27A-1600	951	793
1600	108-122	5	2.0	4	1.6	S05D-115A-1600	297	248
		10	2.5	4C	1.7	S1D-115A-1600	301	251
		20	2.5	4B	2.3	S2D-115A-1600	303	253
		30	2.5	6A	2.4	S3D-115A-1600	307	256
		60	3.0	12	4.8	S6D-115A-1600	501	418
		120	4.0	14	8.5	S12D-115A-1600	921	768

Model numbers printed in bold type indicate factory stock items normally available in small quantities.

A	B	C	D	E	F	G	H	J	K	L	M
¼	2¾	3¼	1.75	2.25	¾	—	—	⅞	1⅛	—	—
¼	2¾	3½	1.75	2.25	¾	—	—	⅞	1⅛	—	—
½	3	3¾	2.00	2.50	¾	—	—	1	1¼	—	—
¾	3	4	2.25	2.50	¾	—	—	1⅛	1¼	—	—
	5½	4	2.50	5.00	2⅛	—	—	1¼	2½	2.50	—
	6	4	5.50	5.50	2⅜	—	—	2¾	2¾	2.75	2.75

IONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



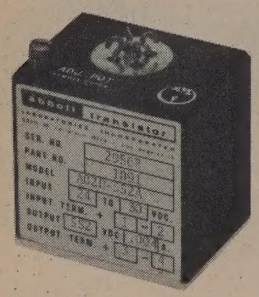
† To have the header located on the mounting base, change the model number character preceding the first dash of Model Number to "B". (Example: S3B-27A-400 indicates a header out the base.) See page 949. No increase in price. for this service.

abbott transistor
ORATORIES, INCORPORATED

5200 W. Jefferson Blvd. / Los Angeles 90016

(213) WEbster 6-8185 Cable: ABTLABS

abbott 28 VDC to DC (Regulated)



POWER MODULES

features

- Close regulation
- 5 to 10,000 volts
- Hermetically sealed
- Short circuit protection
- Compact, low cost
- Input spike protection

specifications

Input Voltage Range
24 to 30 volts DC

Line Regulation
±0.2% for input 24 to 30 VDC on Model A's, AL's and C's
±0.5% for input 24 to 30 VDC on Model AK's, AN's and CK's

Voltage Regulation
±1.5% for input 24 to 30 VDC and from ½ load to full load on Model A's
±2.5% for input 24 to 30 VDC and from ½ load to full load on Model AK's, AL's, AN's and C's

Ripple
0.5% RMS — Model A's
1.0% RMS—Model AK's, AL's and C's
2% RMS — Model AN's

Voltage Adjustment Range
12% by screwdriver adjustment

Input Transient Protection
In accordance with MIL-STD-7
Limit 1, Category B (80 volts
0.1 sec.)

Reliability
150,000 hours MTBF typical
MIL-HDBK-217 under worst case
erating conditions

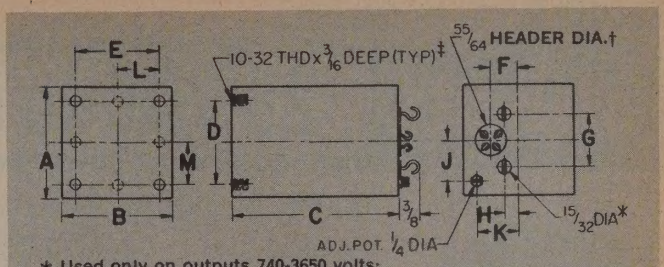
Environment
+160°F max. at mounting
using adequate heat sink
−65°F min. at mounting surfa
Altitude: to vacuum (true herr
seal)
Vibration, shock, sand, dust, hu
ity, salt spray, fungus, suns
rain, and explosion to MIL-E-5
and MIL-E-5400K, Class 1

Output Voltage and Current
See specific models listed
(Outputs and inputs are isolate

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	1B	0.5	AL02D-5A	$220	$180
	1.0	1A	0.9	AL05D-5A	230	190
	2.0	1	1.0	AL1D-5A	245	200
	4.0	2	1.2	AL2D-5A	260	220
	6.0	4	1.4	AL3D-5A	285	240
	12.0	7	2.5	AL6D-5A	330	275
5.3-5.9	0.357	1B	0.5	AL02D-5.6A	215	175
	0.9	1A	0.9	AL05D-5.6A	225	185
	1.8	1	1.0	AL1D-5.6A	235	195
	3.6	2	1.2	AL2D-5.6A	255	215
	5.4	4	1.4	AL3D-5.6A	280	235
	10.8	7	2.5	AL6D-5.6A	325	270
5.9-6.6	0.318	1B	0.5	AL02D-6.3A	215	175
	0.8	1A	0.9	AL05D-6.3A	225	185
	1.6	1	1.0	AL1D-6.3A	235	195
	3.2	2	1.2	AL2D-6.3A	255	215
	4.8	4	1.4	AL3D-6.3A	280	235
	9.6	5	1.9	AL6D-6.3A	325	270
6.6-7.4	0.286	1B	0.5	AL02D-7A	215	175
	0.7	1A	0.9	AL05D-7A	225	185
	1.4	1	1.0	AL1D-7A	235	195
	2.8	2	1.2	AL2D-7A	255	215
	4.2	4	1.4	AL3D-7A	270	230
	8.4	5	1.9	AL6D-7A	320	265
7.4-8.3	0.253	1B	0.5	AL02D-7.9A	215	175
	0.63	1A	0.9	AO5D-7.9A	225	185
	1.26	1	1.0	AL1D-7.9A	235	195
	2.52	2	1.2	AL2D-7.9A	255	215
	3.78	4	1.4	AL3D-7.9A	270	230
	7.56	5	1.9	AL6D-7.9A	320	265
8.3-9.3	0.227	1B	0.5	AL02D-8.8A	215	175
	0.57	1A	0.9	AO5D-8.8A	225	185
	1.14	1	1.0	AL1D-8.8A	230	190
	2.28	2	1.2	AL2D-8.8A	250	210
	3.42	4	1.4	AL3D-8.8A	265	225
	6.82	5	1.9	AL6D-8.8A	315	260
9.3-10.4	0.202	1B	0.5	A02D-9.9A	210	170
	0.50	1A	0.9	A05D-9.9A	220	180
	1.00	1	1.0	AL1D-9.9A	230	190
	2.00	2	1.2	AL2D-9.9A	245	200
	3.00	4	1.4	AL3D-9.9A	260	220
	6.00	5	1.9	AL6D-9.9A	315	260
	12.00	11	3.9	AL12D-9.9A	365	305
10.4-11.6	0.182	1B	0.5	A02D-11A	210	170
	0.45	1A	0.9	A05D-11A	220	180
	0.91	1	1.0	AL1D-11A	225	185
	1.82	2	1.2	AL2D-11A	235	195
	2.73	4	1.4	AL3D-11A	260	220
	5.46	5	1.9	AL6D-11A	305	255
	10.92	11	3.9	AL12D-11A	360	300
11.6-13.0	0.163	1B	0.5	A02D-12.3A	210	170
	0.40	1A	0.9	A05D-12.3A	220	180
	0.81	1	1.0	AL1D-12.3A	225	185
	1.62	2	1.2	AL2D-12.3A	245	200
	2.43	4	1.4	AL3D-12.3A	260	220
	4.86	5	1.9	AL6D-12.3A	295	250
	9.72	11	3.9	AL12D-12.3A	350	290
	19.44	14	11.9	CL24D-12.3A	445	370
13.0-14.8	0.145	1B	0.5	A02D-13.8A	210	170
	0.36	1A	0.9	A05D-13.8A	220	180
	0.72	1	1.0	AL1D-13.8A	225	185
	1.44	2	1.2	AL2D-13.8A	255	215
	2.16	4	1.4	AL3D-13.8A	265	225
	4.32	5	1.9	AL6D-13.8A	290	245
	8.64	11	3.9	AL12D-13.8A	345	285
	17.28	14	11.9	CL24D-13.8A	440	365
14.8-16.6	0.127	1B	0.5	A02D-15.7A	210	170
	0.32	1A	0.9	A05D-15.7A	220	180
	0.64	1	1.0	AL1D-15.7A	225	185
	1.28	2	1.2	AL2D-15.7A	255	215
	1.92	4	1.4	AL3D-15.7A	265	225
	3.84	5	1.9	AL6D-15.7A	290	245
	7.68	11	3.9	AL12D-15.7A	335	280
	15.36	14	11.9	CL24D-15.7A	425	355
16.6-18.6	0.114	1B	0.5	A02D-17.6A	195	165
	0.28	1A	0.9	A05D-17.6A	215	175
16.6-18.6	0.57	1	1.0	A1D-17.6A	$220	$180
	1.14	2	1.2	AL2D-17.6A	250	210
	1.71	4	1.4	AL3D-17.6A	265	225
	3.42	5	1.9	AL6D-17.6A	285	240
	6.84	11	3.9	AL12D-17.6A	330	275
	13.68	14	11.9	CL24D-17.6A	420	350
18.6-20.8	0.101	1B	0.5	A02D19.7A	195	165
	0.255	1A	0.9	A05D-19.7A	215	175
	0.510	1	1.0	A1D-19.7A	220	180
	1.02	2	1.2	AL2D-19.7A	250	210
	1.53	4	1.4	AL3D-19.7A	260	220
	3.06	5	1.9	AL6D-19.7A	275	230
	6.12	11	3.9	AL12D-19.7A	330	275
	12.24	14	11.9	CL24D-19.7A	420	350
20.8-23.3	0.091	1B	0.5	A02D-22A	190	160
	0.230	1A	0.9	A05D-22A	210	170
	0.460	1	1.0	A1D-22A	215	175
	0.920	2	1.2	AL2D-22A	245	200
	1.38	4	1.4	AL3D-22A	250	210
	2.76	5	1.9	AL6D-22A	275	230
	5.52	11	3.9	AL12D-22A	330	275
	11.00	14	11.9	CL24D-22A	420	350
23.3-26.1	0.081	1B	0.5	A02D-24.7A	190	160
	0.205	1A	0.9	A05D-24.7A	210	170
	0.410	1	1.0	A1D-24.7A	215	175
	0.820	2	1.2	AL2D-24.7A	245	200
	1.23	4	1.4	AL3D-24.7A	250	210
	2.46	5	1.9	AL6D-24.7A	275	230
	4.92	11	3.9	AL12D-24.7A	330	275
	9.84	14	11.9	CL24D-24.7A	420	350
26.1-29.2	0.073	1B	0.5	A02D-27.6A	190	160
	0.180	1A	0.9	A05D-27.6A	210	170
	0.360	1	1.0	A1D-27.6A	215	175
	0.720	2	1.2	AL2D-27.6A	235	195
	1.08	4	1.4	AL3D-27.6A	250	210
	2.16	5	1.9	AL6D-27.6A	275	230
	4.32	11	3.9	AL12D-27.6A	330	275
	8.64	14	11.9	CL24D-27.6A	420	350
29.2-32.6	0.065	1B	0.5	A02D-31A	190	160
	0.160	1A	0.9	A05D-31A	210	170
	0.320	1	1.0	A1D-31A	215	175
	0.640	2	1.2	A2D-31A	230	190
	0.960	4	1.4	AL3D-31A	250	210
	1.92	5	1.9	AL6D-31A	275	230
	3.84	11	3.9	AL12D-31A	330	275
	7.68	14	11.9	CL24D-31A	420	350
32.6-36.5	0.058	1B	0.5	A02D-34.6A	190	160
	0.145	1A	0.9	A05D-34.6A	210	170
	0.290	1	1.0	A1D-34.6A	215	175
	0.580	2	1.2	A2D-34.6A	220	180
	0.870	4	1.4	AL3D-34.6A	250	210
	1.74	5	1.9	AL6D-34.6	275	230
	3.48	11	3.9	AL12D-34.6A	330	275
	6.96	14	11.9	CL24D-34.6A	420	350
36.5-40.9	0.052	1B	0.5	A02D-38.7A	190	160
	0.130	1A	0.9	A05D-38.7A	210	170
	0.260	1	1.0	A1D-38.7A	215	175
	0.520	2	1.2	A2D-38.7A	220	180
	0.780	4	1.4	AL3D-38.7A	250	210
	1.56	5	1.9	AL6D-38.7A	275	230
	3.12	11	3.9	AL12D-38.7A	330	275
	6.24	14	11.9	CL24D-38.7A	420	350
40.9-45.8	0.046	1B	0.5	A02D-43.3A	190	160
	0.115	1A	0.3	A05D-43.3A	210	170
	0.230	1	1.0	A1D-43.3A	215	175
	0.460	2	1.2	A2D-43.3A	220	180
	0.690	4	1.4	AL3D-43.3A	250	210
	1.38	5	1.9	AL6D-43.3A	275	230
	2.76	11	3.9	AL12D-43.3A	330	275
	5.52	14	11.9	CL24D-43.3A	420	350
45.8-51.4	0.041	1B	0.5	A02D-48.6A	190	160
	0.103	1A	0.9	A05D-48.6A	210	170
	0.206	1	1.0	A1D-48.6A	215	[illegible]
	0.412	2	1.2	A2D-48.6A	220	180
	0.618	4	1.4	A3D-48.6A	250	210
45.8-51.4	1.24	5	1.9	AL6D-48.6A	$275	
	2.48	11	3.9	AL12D-48.6A	330	
	4.96	14	11.9	CL24D-48.6A	420	
51.4-59.0	0.036	1B	0.5	A02D-55.2A	190	
	0.091	1A	0.9	A05D-55.2A	210	
	0.182	1	1.0	A1D-55.2A	215	
	0.364	2	1.2	A2D-55.2A	220	
	0.546	4	1.4	A3D-55.2A	250	
	1.10	5	1.9	AL6D-55.2A	275	
	2.20	11	3.9	AL12D-55.2A	330	
	4.40	14	11.9	CL24D-55.2A	420	
59.0-66.0	0.032	1B	0.5	A02D-63A	190	
	0.080	1A	0.9	A05D-63A	210	
	0.160	1	1.0	A1D-63A	215	
	0.320	2	1.2	A2D-63A	220	
	0.480	4	1.4	A3D-63A	250	
	0.960	5	1.9	AL6D-63A	275	
	1.90	11	3.9	AL12D-63A	330	
	3.80	14	11.9	CL24D-63A	420	
66.0-74.0	0.029	1B	0.5	A02D-70A	190	
	0.071	1A	0.9	A05D-70A	210	
	0.143	1	1.0	A1D-70A	215	
	0.286	2	1.2	A2D-70A	220	
	0.429	4	1.4	A3D-70A	245	
	0.858	5	1.9	AL6D-70A	265	
	1.72	11	3.9	AL12D-70A	330	
	3.44	14	11.9	CL24D-70A	420	
74.0-83.0	0.025	1B	0.5	A02D-79A	190	
	0.063	1A	0.9	A05D-79A	210	
	0.127	1	1.0	A1D-79A	215	
	0.254	2	1.2	A2D-79A	220	
	0.381	4	1.4	A3D-79A	245	
	0.762	5	1.9	AL6D-79A	255	
	1.52	11	3.9	AL12D-79A	330	
	3.04	14	11.9	CL24D-79A	420	
83.0-93.0	0.023	1B	0.5	A02D-88A	190	
	0.057	1A	0.9	A05D-88A	210	
	0.114	1	1.0	A1D-88A	215	
	0.228	2	1.2	A2D-88A	220	
	0.342	4	1.4	A3D-88A	230	
	0.684	5	1.9	AL6D-88A	245	
	1.38	11	3.9	AL12D-88A	330	
	2.76	14	11.9	CL24D-88A	420	
93.0-104	0.020	1B	0.5	A02D-99A	190	
	0.050	1A	0.9	A05D-99A	210	
	0.100	1	1.0	A1D-99A	215	
	0.200	2	1.2	A2D-99A	220	
	0.300	4	1.4	A3D-99A	225	
	0.600	5	1.9	A6D-99A	230	
	1.20	11	3.9	AL12D-99A	330	
	2.40	14	11.9	CL24D-99A	420	
104-116	0.018	1B	0.5	A02D-110A	190	
	0.045	1A	0.9	A05D-110A	210	
	0.091	1	1.0	A1D-110A	215	
	0.182	2	1.2	A2D-110A	220	
	0.273	4	1.4	A3D-110A	225	
	0.546	5	1.9	A6D-110A	230	
	1.092	11	3.9	AL12D-110A	330	
	2.184	14	11.9	CL24D-110A	420	
116-130	0.016	1B	0.5	A02D-123A	190	
	0.040	1A	0.9	A05D-123A	210	
	0.081	1	1.0	A1D-123A	215	
	0.162	2	1.2	A2D-123A	220	
	0.243	4	1.4	A3D-123A	225	
	0.486	5	1.9	A6D-123A	230	
	0.972	11	3.9	AL12D-123A	330	
	1.944	14	11.9	CL24D-123A	420	
130-148	0.014	1B	0.5	A02D-138A	190	
	0.036	1A	0.9	A05D-138A	210	
	0.072	1	1.0	A1D-138A	215	
	0.144	2	1.2	A2D-138A	220	
	0.216	4	1.4	A3D-138A	225	
	0.432	5	1.9	A6D-138A	230	
	0.864	11	3.0	AL12D-138A	320	
	1.728	14	11.9	CL24D-138A	400	

	B	C	D	E	F	G	H	J	K	L	M
½	2¾	3	1.00	2.25	9/16	15/16	1/16	½	1⅛	—	—
½	2¾	2¾	1.00	2.25	9/16	15/16	1/16	½	1⅛	—	—
½	2	2	1.00	1.50	0			½	¾	—	—
⅞	2¾	3¼	1.37	2.25	¾	1⅜	½	11/16	1⅛	—	—
¼	2¾	3¼	1.75	2.25	¾	1⅝	½	⅞	1⅛	—	—
¼	2¾	3¼	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
¼	2¾	4	2.25	2.25	¾	2	½	1⅛	1⅛	—	—
	5½	3¼	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	5½	4	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
	6	4	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75

NIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



* Used only on outputs 740-3650 volts; On outputs above 3650 Dia. is ¾, Height 1½.

‡ 6-32 THD x 3/16 DEEP (TYP) FOR MODELS AL02 AND A02

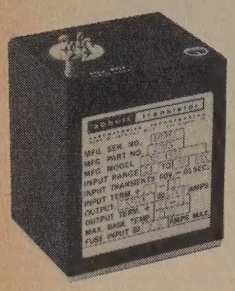
† To have the header located on the mounting base, change the model number character preceding the first dash of Model Number to "B". (Example: AL05B-5A indicates a header out the base.) See page 949. No increase in price for this service. Not available on Model A02 series.

DC TO DC INPUT VOLTAGE RANGE: 24 TO 30 VOLTS, DC

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
	0.013	1B	0.5	A02D-157A	$190	$160
	0.032	1A	0.9	A05D-157A	210	170
	0.064	1	1.0	A1D-157A	215	175
	0.128	2	1.2	A2D-157A	220	180
	0.192	4	1.4	A30-157A	225	185
	0.384	5	1.9	A6D-157A	230	190
	0.768	11	3.9	AL12D-157A	300	255
	1.536	14	11.9	CL24D-157A	390	330
	0.011	1B	0.5	A02D-176A	190	160
	0.028	1A	0.9	A05D-176A	210	170
	0.057	1	1.0	A1D-176A	215	175
	0.114	2	1.2	A2D-176A	220	180
	0.171	4	1.4	A3D-176A	225	185
	0.342	5	1.9	A6D-176A	230	190
	0.684	11	3.9	AL12D-176A	290	245
	1.368	14	11.9	CL24D-176A	385	325
	0.010	1B	0.5	A02D-197A	190	160
	0.025	1A	0.9	A05D-197A	210	170
	0.051	1	1.0	A1D-197A	215	175
	0.102	2	1.2	A2D-197A	220	180
	0.153	4	1.4	A3D-197A	225	185
	0.306	5	1.9	A6D-197A	230	190
	0.684	11	3.9	AL12D-197A	280	235
	1.368	14	11.9	CL24D-197A	375	315
	0.009	1B	0.5	A02D-220A	190	160
	0.023	1A	0.9	A05D-220A	210	170
	0.046	1	1.0	A1D-220A	215	175
	0.092	2	1.2	A2D-220A	220	180
	0.138	4	1.4	A3D-220A	225	185
	0.276	5	1.9	A6D-220A	230	190
	0.552	11	3.9	A12D-220A	270	230
	1.104	14	11.9	CL24D-220A	360	300
	0.008	1B	0.5	A02D-247A	190	160
	0.020	1A	0.9	A05D-247A	210	170
	0.041	1	1.0	A1D-247A	215	175
	0.082	2	1.2	A2D-247A	220	180
	0.123	4	1.4	A3D-247A	225	185
	0.246	5	1.9	A6D-247A	230	190
	0.492	11	3.9	A12D-247A	270	230
	0.984	14	11.9	CL24D-247A	360	300
	0.007	1B	0.5	A02D-276A	190	160
	0.018	1A	0.9	A05D-276A	210	170
	0.036	1	1.0	A1D-276A	215	175
	0.072	2	1.2	A2D-276A	220	180
	0.108	4	1.4	A3D-276A	225	185
	0.216	5	1.9	A6D-276A	230	190
	0.432	11	3.9	A12D-276A	280	235
	0.864	14	11.9	CL24D-276A	365	305
	0.006	1B	0.5	A02D-310A	190	160
	0.016	1A	0.9	A05D-310A	210	170
	0.032	1	1.0	A1D-310A	215	175
	0.064	2	1.2	A2D-310A	220	180
	0.096	4	1.4	A3D-310A	225	185
	0.192	5	1.9	A6D-310A	230	190
	0.348	11	3.9	A12D-310A	280	235
	0.768	14	11.9	CL24D-310A	375	315
	0.006	1B	0.5	A02D-346A	195	165
	0.014	1A	0.9	A05D-346A	215	175
	0.029	1	1.0	A1D-346A	220	180
	0.058	2	1.2	A2D-346A	225	185
	0.087	4	1.4	A3D-346A	230	190
	0.174	5	1.9	A6D-346A	235	195
	0.348	11	3.9	A12D-346A	285	240
	0.768	14	11.9	CL24D-346A	380	320
	0.005	1B	0.5	A02D-387A	195	165
	0.013	1A	0.9	A05D-387A	215	175
	0.026	1	1.0	A1D-387A	220	180
	0.052	2	1.2	A2D-387A	225	185
	0.078	4	1.4	A3D-387A	230	190
	0.156	5	1.9	A6D-387A	235	195
	0.312	11	3.9	A12D-387A	290	245
	0.624	14	11.9	CL24D-387A	380	320
409-458	0.005	1B	0.5	A02D-433A	$195	$165
	0.012	1A	0.9	A05D-433A	215	175
	0.023	1	1.0	A1D-433A	220	180
	0.046	2	1.2	A2D-433A	225	185
	0.069	4	1.4	A3D-433A	230	190
	0.138	5	1.9	A6D-433A	245	200
	0.276	11	3.9	A12D-433A	295	250
	0.552	14	11.9	C24D-433A	385	325
458-514	0.004	1B	0.5	A02D-486A	210	170
	0.010	1A	0.9	A05D-486A	220	180
	0.021	1	1.0	A1D-486A	225	185
	0.041	2	1.2	A2D-486A	230	190
	0.062	4	1.4	A3D-486A	235	195
	0.124	5	1.9	A6D-486A	245	200
	0.248	11	3.9	A12D-486A	300	255
	0.496	14	11.9	C24D-486A	390	330
514-590	0.004	1B	0.5	A02D-552A	210	170
	0.009	1A	0.9	A05D-552A	220	180
	0.018	1	1.0	A1D-552A	225	185
	0.036	2	1.2	A2D-552A	230	190
	0.055	4	1.4	A3D-552A	235	195
	0.110	5	1.9	A6D-552A	245	200
	0,220	11	3.9	A12D-552A	320	265
	0.440	14	11.9	C24D-552A	395	335
590-660	0.008	1A	0.9	A05D-630A	225	185
	0.016	1	1.0	A1D-630A	230	190
	0.032	2	1.2	A2D-630A	235	195
	0.048	4	1.4	A3D-630A	245	200
	0.096	5	1.9	A6D-630A	250	210
	0.192	11	3.9	A12D-630A	330	275
	0.384	14	11.9	C24D-630A	410	345
660-740	0.007	1A	0.9	A05D-700A	225	185
	0.014	1	1.0	A1D-700A	230	190
	0.028	2	1.2	A2D-700A	235	195
	0.043	4	1.4	A3D-700A	245	200
	0.086	5	1.9	A6D-700A	250	210
	0.172	11	3.9	A12D-700A	335	280
	0.344	14	11.9	C24D-700A	420	350
740-830	0.006	1A	0.9	A05D-790A	230	190
	0.012	1	1.0	A1D-790A	235	195
	0.025	2	1.2	A2D-790A	245	200
	0.038	4	1.4	A3D-790A	250	210
	0.076	5	1.9	A6D-790A	255	215
	0.152	11	3.9	A12D-790A	355	295
	0.304	14	11.9	C24D-790A	425	355
830-930	0.005	1A	0.9	A05D-880A	235	195
	0.011	1	1.0	A1D-880A	245	200
	0.022	2	1.2	A2D-880A	250	210
	0.034	4	1.4	A3D-880A	255	215
	0.068	5	1.9	A6D-880A	260	220
	0.138	11	3.9	A12D-880A	365	305
	0.276	14	11.9	C24D-880A	430	360
930-1040	0.005	1A	0.9	A05D-990A	245	200
	0.010	1	1.0	A1D-990A	250	210
	0.020	2	1.2	A2D-990A	255	215
	0.030	4	1.4	A3D-990A	260	220
	0.060	5	1.9	A6D-990A	265	225
	0.120	11	3.9	A12D-990A	365	305
	0.240	14	11.9	C24D-990A	445	370
1040-1160	0.004	1A	0.9	AK05D-1100A	250	210
	0.009	1	1.0	AK1D-1100A	255	215
	0.018	2	1.2	AK2D-1100A	260	220
	0.027	4	1.4	AK3D-1100A	265	225
	0.054	7	1.9	AK6D-1100A	270	230
	0.109	12	3.9	AK12D-1100A	375	315
	0.218	14	11.9	CK24D-1100A	450	375
1160-1300	0.004	1A	0.9	AK05D-1230A	255	215
	0.008	1	1.0	AK1D-1230A	260	220
	0.016	2	1.2	AK2D-1230A	265	225
	0.024	4	1.4	AK3D-1230A	270	230
	0.048	7	1.9	AK6D-1230A	280	235
	0.097	12	3.9	AK12D-1230A	380	320
	0.194	14	11.9	CK24D-1230A	455	380
1300-1480	0.003	1A	0.9	AK05D-1380A	$260	$220
	0.007	1	1.0	AK1D-1380A	265	225
	0.014	2	1.2	AK2D-1380A	270	230
	0.021	4	1.4	AK3D-1380A	280	235
	0.043	7	1.9	AK6D-1380A	285	240
	0.086	12	3.9	AK12D-1380A	385	325
	0.172	14	11.9	CK24D-1380A	470	390
1480-1660	0.003	1A	0.9	AK05D-157A	265	225
	0.006	1	1.0	AK1D-1570A	270	230
	0.013	2	1.2	AK2D-1570A	280	235
	0.019	4	1.4	AK3D-1570A	285	240
	0.038	7	1.9	AK6D-1570A	290	245
	0.076	12	3.9	AK12D-1570A	390	330
	0.152	14	11.9	CK24D-1570A	485	405
1660-1860	0.002	1A	0.9	AK05D-1760A	280	235
	0.002	1	1.0	AK1D-1760A	285	240
	0.010	2	1.2	AK2D-1760A	290	245
	0.017	4	1.4	AK3D-1760A	295	250
	0.034	7	1.9	AK6D-1760A	300	255
	0.068	12	3.9	AK12D-1760A	395	335
	0.136	14	11.9	CK24D-1760A	500	420
1860-2080	0.002	1A	0.9	AK05D-1970A	290	245
	0.005	1	1.0	AK1D-1970A	295	250
	0.010	2	1.2	AK2D-1970A	300	255
	0.015	4	1.4	AK3D-1970A	315	260
	0.030	7	1.9	AK6D-1970A	320	265
	0.061	12	3.9	AK12D-1970A	410	345
	0.122	14	11.9	CK24D-1970A	515	435
2080-2330	0.027	7	1.9	AK6D-2200A	330	275
	0.055	12	3.9	AK12D-2200A	425	355
	0.110	14	11.9	CK24D-2200A	545	455
2330-2610	0.024	7	1.9	AK6D-2470A	355	295
	0.049	12	3.9	AK12D-2470A	440	365
	0.098	14	10.7	CK24D-2760A	565	470
2610-2920	0.021	7	1.9	AK6D-2760A	360	300
	0.043	12	3.9	AK12D-2760A	445	370
	0.086	14	11.9	CK24D-276A	585	490
2920-3260	0.019	7	1.9	AK6D-3100A	380	320
	0.038	12	3.9	AK12D-3100A	450	375
	0.076	14	11.9	CK24D-3100A	610	510
3260-3650	0.017	7	1.9	AK6D-3460A	390	330
	0.034	12	3.9	AK12D-3460A	475	395
	0.068	14	11.9	CK24D-3460A	650	545
3650-4090	0.005	12	6.0	AN2D-3870A	440	365
	0.010	14	7.9	AN4D-3870A	665	555
4090-4580	0.004	12	6.0	AN2D-4330A	480	400
	0.009	14	7.9	AN4D-4330A	665	555
4580-5140	0.004	12	6.0	AN2D-4860A	525	440
	0.008	14	7.9	AN4D-4860A	705	590
5140-5900	0.003	12	6.0	AN2D-5520A	575	480
	0.007	14	7.9	AN4D-5520A	740	615
5900-6600	0.003	12	6.0	AN2D-6300A	630	525
	0.006	14	7.9	AN4D-6300A	800	670
6600-7400	0.002	12	6.0	AN2D-7000A	675	565
	0.005	14	7.9	AN4D-7000A	855	710
7400-8300	0.002	12	6.0	AN2D-7900A	735	610
	0.005	14	7.9	AN4D-7900A	900	755
8300-9300	0.002	12	6.0	AN2D-8800A	785	655
	0.004	14	7.9	AN4D-8800A	960	800
9300-10400	0.002	12	6.0	AN2D-9900A	830	695
	0.004	14	7.9	AN4D-9900A	1010	845

TE For no load operation, add a resistance on the output to draw a minimum 4% of the rated current.

abbott 28 VDC to DC (Reg.) Hi-Temp.



POWER MODULES

features

- Hi-temp. +212°F.
- 5 to 3500 volts
- Hermetically sealed
- Short circuit protection
- Input spike protection

specifications

Input Voltage Range
24 to 30 volts DC

Line Regulation
±0.2% for input 24 to 30 VDC on Model B's and BL's
±0.5% for input 24 to 30 VDC on Model BK's

Voltage Regulation
±1.5% for input 24 to 30 VDC and from ½ load to full load on Model B's
±2.5% for input 24 to 30 VDC and from ½ load to full load on Model BK's and BL's

Ripple
0.5 RMS — Model B's
1.0% RMS — Model BK's and BL's

Voltage Adjustment Range
12% by screwdriver adjustment

Input Transient Protection
In accordance with MIL-STD-704A, Limi
Category B (80 volts for 0.1 sec.)

Reliability
120,000 hours MTBF typical per MIL-HI
217 under worst case operating condit

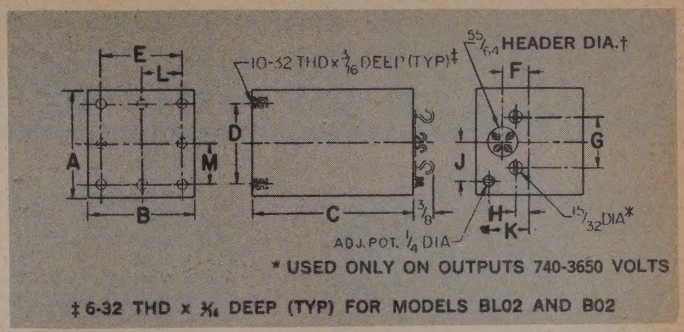
Environment
+212°F max. at mounting base using
quate heat sink
−65°F min. at mounting surface
Altitude: To vacuum (true hermetic s
Vibration, shock, sand, dust, humidity,
spray, fungus, sunshine, rain, and explo
to MIL-E-5272C and MIL-E-5400K, Class

Output Voltage and Current
See specific models listed
(Outputs and inputs are isolated)

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
4.7-5.3	0.400	1B	0.5	BL02D-5A	$261	$218
	1.0	1A	0.9	BL05D-5A	277	231
	2.0	1	1.0	BL1D-5A	291	243
	4.0	2	1.1	BL2D-5A	321	268
	6.0	4	1.3	BL3D-5A	344	287
	10.0	6A	2.5	BL5D-5A	397	331
5.3-5.9	0.357	1B	0.5	BL02D-5.6A	254	212
	0.9	1A	0.9	BL05D-5.6A	270	225
	1.8	1	1.0	BL1D-5.6A	284	237
	3.6	2	1.1	BL2D-5.6A	307	256
	5.4	4	1.3	BL3D-5.6A	337	281
	8.91	6A	2.5	BL5D-5.6A	390	325
5.9-6.6	0.318	1B	0.5	BL02D-6.3A	254	212
	0.8	1A	0.9	BL05D-6.3A	270	225
	1.6	1	1.0	BL1D-6.3A	284	237
	3.2	2	1.1	BL2D-6.3A	307	256
	4.8	4	1.3	BL3D-6.3A	337	281
	7.92	6	1.9	BL5D-6.3A	390	325
6.6-7.4	0.286	1B	0.5	BL02D-7A	254	212
	0.7	1A	0.9	BL05D-7A	270	225
	1.4	1	1.0	BL1D-7A	284	237
	2.8	2	1.1	BL2D-7A	307	256
	4.2	4	1.3	BL3D-7A	330	275
	7.15	6	1.9	BL5D-7A	381	318
7.4-8.3	0.253	1B	0.5	BL02D-7.9A	254	212
	0.63	1A	0.9	B05D-7.9A	270	225
	1.26	1	1.0	BL1D-7.9A	284	237
	2.52	2	1.1	BL2D-7.9A	307	256
	3.78	4	1.3	BL3D-7.9A	330	275
	6.32	6	1.9	BL5D-7.9A	381	318
8.3-9.3	0.227	1B	0.5	BL02D-8.8A	254	212
	0.57	1A	0.9	B05D-8.8A	270	225
	1.14	1	1.0	B1D-8.8A	277	231
	2.28	2	1.1	BL2D-8.8A	300	250
	3.42	4	1.3	BL3D-8.8A	321	268
	5.68	6	1.9	BL5D-8.8A	374	312
9.3-10.4	0.202	1B	0.5	B02D-9.9A	247	206
	0.50	1A	0.9	B05D-9.9A	261	218
	1.00	1	1.0	BL1D-9.9A	277	231
	2.00	2	1.1	BL2D-9.9A	291	243
	3.00	4	1.3	BL3D-9.9A	314	262
	5.05	6	1.9	BL5D-9.9A	374	312
	10.10	11	3.7	BL10D-9.9A	441	365
10.4-11.6	0.182	1B	0.5	B02D-11A	247	206
	0.45	1A	0.9	B05D-11A	261	218
	0.91	1	1.0	B1D-11A	270	225
	1.82	2	1.1	BL2D-11A	284	237
	2.73	4	1.3	BL3D-11A	314	262
	4.55	6	1.9	BL5D-11A	367	306
	9.10	11	3.7	BL10D-11A	434	362
11.6-13.0	0.163	1B	0.5	B02D-12.3A	247	206
	0.40	1A	0.9	B05D-12.3A	261	218
	0.81	1	1.0	B1D-12.3A	270	225
	1.62	2	1.1	BL2D-12.3A	291	243
	2.43	4	1.3	BL3D-12.3A	314	262
	4.06	6	1.9	BL5D-12.3A	360	300
	8.12	11	3.7	BL10D-12.3A	420	350
	13.83	14	10.3	BL17D-12.3A	498	465
13.0-14.8	0.145	1B	0.5	B02D-13.8A	247	206
	0.36	1A	0.9	B05D-13.8A	261	218
	0.72	1	1.0	BL1D-13.8A	270	225
	1.44	2	1.1	BL2D-13.8A	307	256
	2.16	4	1.3	BL3D-13.8A	321	268
	3.62	6	1.9	BL5D-13.8A	351	293
	7.24	11	3.7	BL10D-13.8A	411	343
	12.31	14	10.3	BL17D-13.8A	490	409
14.8-16.6	0.127	1B	0.5	B02D-15.7A	247	206
	0.32	1A	0.9	B05D-15.7A	261	218
	0.64	1	1.0	BL1D-15.7A	270	225
	1.28	2	1.1	BL2D-15.7A	307	256
	1.92	4	1.3	BL3D-15.7A	321	268
	3.18	6	1.9	BL5D-15.7A	351	293
	6.36	11	3.7	BL10D-15.7A	404	337
	10.81	14	10.3	BL17D-15.7A	477	398
16.6-18.6	0.114	1B	0.5	B02D-17.6A	240	200
	0.28	1A	0.9	B05D-17.6A	254	212
	0.57	1	1.0	BL1D-17.6A	261	218
16.6-18.6	1.14	2	1.1	BL2D-17.6A	$300	$250
	1.71	4	1.3	BL3D-17.6A	307	256
	2.84	6	1.9	BL5D-17.6A	344	287
	5.68	11	3.7	BL10D-17.6A	397	331
	9.65	14	10.3	BL17D-17.6A	470	392
18.6-20.8	0.101	1B	0.5	B02D-19.7A	240	200
	0.255	1A	0.9	B05D-19.7A	254	212
	0.510	1	1.0	BL1D-19.7A	261	218
	1.02	2	1.1	BL2D-19.7A	300	250
	1.63	4	1.3	BL3D-19.7A	307	256
	2.54	6	1.9	BL5D-19.7A	330	275
	5.08	11	3.7	BL10D-19.7A	397	331
	8.62	14	10.3	BL17D-19.7A	470	392
20.8-23.3	0.091	1B	0.5	B02D-22A	231	193
	0.230	1A	0.9	B05D-22A	247	206
	0.460	1	1.0	BL1D-22A	254	212
	0.920	2	1.1	BL2D-22A	291	243
	1.38	4	1.3	BL3D-22A	300	250
	2.27	6	1.9	BL5D-22A	330	275
	4.54	11	3.7	BL10D-22A	397	331
	7.72	14	10.3	BL17D-22A	476	392
23.3-26.1	0.081	1B	0.5	B02D-24.7A	231	193
	0.205	1A	0.9	B05D-24.7A	247	206
	0.410	1	1.0	BL1D-24.7A	254	212
	0.820	2	1.1	BL2D-24.7A	291	243
	1.23	4	1.3	BL3D-24.7A	300	250
	2.02	6	1.9	BL5D-24.7A	330	275
	4.04	11	3.7	BL10D-24.7A	397	331
	6.88	14	10.3	BL17D-24.7A	470	392
26.1-29.2	0.073	1B	0.5	B02D-27.6A	231	193
	0.180	1A	0.9	B05D-27.6A	247	206
	0.360	1	1.0	BL1D-27.6A	254	212
	0.720	2	1.1	BL2D-27.6A	284	237
	1.08	4	1.3	BL3D-27.6A	300	250
	1.81	6	1.9	BL5D-27.6A	330	275
	3.62	11	3.7	BL10D-27.6A	397	331
	6.16	14	10.3	BL17D-27.6A	470	392
29.2-32.6	0.065	1B	0.5	B02D-31A	231	193
	0.160	1A	0.9	B05D-31A	247	206
	0.320	1	1.0	B1D-31A	254	212
	0.640	2	1.1	B2D-31A	261	231
	0.960	4	1.3	BL3D-31A	300	250
	1.61	6	1.9	BL5D-31A	330	275
	3.22	11	3.7	BL10D-31A	397	331
	5.48	14	10.3	BL17D-31A	470	392
32.6-36.5	0.058	1B	0.5	B02D-34.6A	231	193
	0.145	1A	0.9	B05-34.6A	247	206
	0.290	1	1.0	B1D-34.6A	254	212
	0.580	2	1.1	B2D-34.6A	261	218
	0.870	4	1.3	BL3D-34.6A	300	250
	1.44	6	1.9	BL5D-34.6A	330	275
	2.88	11	3.7	BL10D-34.6A	397	331
	4.91	14	10.3	BL17D-34.6A	470	392
36.5-40.9	0.052	1B	0.5	B02D-38.7A	231	193
	0.130	1A	0.9	B05D-38.7A	247	206
	0.260	1	1.0	B1D-38.7A	254	212
	0.520	2	1.1	B2D-38.7A	261	218
	0.780	4	1.3	BL3D-38.7A	300	250
	1.29	6	1.9	BL5D-38.7A	330	275
	2.58	11	3.7	BL10D-38.7A	397	331
	4.39	14	10.3	BL17D-38.7A	470	392
40.9-45.8	0.046	1B	0.5	B02D-43.3A	231	193
	0.155	1A	0.9	B05D-43.3A	247	206
	0.230	1	1.0	B1D-43.3A	254	212
	0.460	2	1.1	B2D-43.3A	261	218
	0.690	4	1.3	BL3D-43.3A	300	250
	1.15	6	1.9	BL5D-43.3A	330	275
	2.30	11	3.7	BL10D-43.3A	397	331
	3.92	14	10.3	BL17D-43.3A	470	392
45.8-51.4	0.041	1B	0.5	B02D-48.6A	231	193
	0.103	1A	0.9	B05D-48.6A	247	206
	0.206	1	1.0	B1D-48.6A	254	212
	0.412	2	1.1	B2D-48.6A	261	218
	0.618	4	1.3	B3D-48.6A	300	250
45.8-51.4	1.03	6	1.9	BL5D-48.6A	$330	
	2.06	11	3.7	BL10D-48.6A	397	
	3.49	14	10.3	BL17D-48.6A	470	
51.4-59.0	0.036	1B	0.5	B02D-55.2A	231	
	0.091	1A	0.9	B05D-55.2A	247	
	0.182	1	1.0	B1D-55.2A	254	
	0.364	2	1.1	B2D-55.2A	261	
	0.546	4	1.3	B3D-55.2A	300	
	0.905	6	1.9	BL5D-55.2A	330	
	1.81	11	3.7	BL10D-55.2A	397	
	3.07	14	10.3	BL17D-55.2A	470	
59.0-66.0	0.032	1B	0.5	B02D-63A	231	
	0.080	1A	0.9	B05D-63A	247	
	0.160	1	1.0	B1D-63A	254	
	0.320	2	1.1	B2D-63A	261	
	0.480	4	1.3	B3D-63A	300	
	0.795	6	1.9	BL5D-63A	330	
	1.59	11	3.7	BL10D-63A	397	
	2.69	14	10.3	BL17D-63A	470	
66.0-74.0	0.029	1B	0.5	B02D-70A	231	
	0.071	1A	0.9	B05D-70A	247	
	0.143	1	1.0	B1D-70A	254	
	0.286	2	1.1	B2D-70A	261	
	0.429	4	1.3	B3D-70A	291	
	0.715	6	1.9	BL5D-70A	321	
	1.43	11	3.7	BL10D-70A	397	
	2.42	14	10.3	BL17D-70A	470	
74.0-83.0	0.025	1B	0.5	B02D-79A	231	
	0.063	1A	0.9	B05D-79A	247	
	0.127	1	1.0	B1D-79A	254	
	0.254	2	1.1	B2D-79A	261	
	0.381	4	1.3	B3D-79A	291	
	0.634	6	1.9	BL55-79A	307	
	1.27	11	3.7	BL10D-79A	397	
	2.15	14	10.3	BL17D-79A	470	
83.0-93.0	0.023	1B	0.5	B02D-88A	231	
	0.057	1A	0.9	B05D-88A	247	
	0.114	1	1.0	B1D-88A	254	
	0.228	2	1.1	B2D-88A	261	
	0.342	4	1.3	B3D-88A	277	
	0.568	6	1.9	BL5D-88A	291	
	1.14	11	3.7	BL10D-88A	397	
	1.93	14	10.3	BL17D-88A	470	
93.0-104	0.020	1B	0.5	B02D-99A	231	
	0.050	1A	0.9	B05D-99A	247	
	0.100	1	1.0	B1D-99A	254	
	0.200	2	1.1	B2D-99A	261	
	0.300	4	1.3	B3D-99A	270	
	0.510	6	1.9	BL5D-99A	277	
	1.02	11	3.7	BL10D-99A	397	
	1.71	14	10.3	BL17D-99A	470	
104-116	0.018	1B	0.5	B02D-110A	231	
	0.045	1A	0.9	B05D-110A	247	
	0.091	1	1.0	B1D-110A	254	
	0.182	2	1.1	B2D-110A	261	
	0.273	4	1.3	B3D-110A	270	
	0.455	6	1.9	BL5D-110A	277	
	0.910	11	3.7	BL10D-110A	397	
	1.545	14	10.3	BL17D-110A	470	
116-130	0.016	1B	0.5	B02D-123A	231	
	0.040	1A	0.9	B05D-123A	247	
	0.081	1	1.0	B1D-123A	254	
	0.162	2	1.1	B2D-123A	261	
	0.243	4	1.3	B3D-123A	270	
	0.406	6	1.9	BL5D-123A	277	
	0.812	11	3.7	BL10D-123A	397	
	1.381	14	10.3	BL17D-123A	470	
130-148	0.014	1B	0.5	B02D-138A	231	
	0.036	1A	0.9	B05D-138A	247	
	0.072	1	1.0	B1D-138A	254	
	0.144	2	1.1	B2D-138A	261	
	0.216	4	1.3	B3D-138A	270	
	0.362	6	1.9	BL5D-138A	277	
	0.724	11	3.7	BL10D-138A	38	
	1.231	14	10.3	BL17D-138A	45	

Size	A	B	C	D	E	F	G	H	J	K	L	M
1	1½	2¾	3	1.00	2.25	9/16	15/16	1/16	½	1⅛	—	—
1A	1½	2¾	2¾	1.00	2.25	9/16	15/16	1 1/16	½	1⅛	—	—
1B	1½	2	2	1.00	1.50	0	—	—	½	¾	—	—
2	1⅞	2¾	3¼	1.37	2.25	¾	1⅜	½	11/16	1⅛	—	—
4	2¼	2¾	3¼	1.75	2.25	¾	1⅝	½	⅞	1⅛	—	—
5	2¾	3	3¼	2.25	2.50	¾	2	½	1⅛	1¼	—	—
6A	2¾	3	4	2.25	2.50	¾	2	½	1⅛	1¼	—	—
11	3	5½	3¼	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
12	3	5½	4	2.50	5.00	2⅛	2	1⅞	1¼	2½	2.50	—
14	5	6	4	5.50	5.50	2⅜	2	2⅜	2¾	2¾	2.75	2.75

DIMENSIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.



† To have the header located on the mounting base, change the model number character preceding the first dash of Model Number to "B". (Example: BL5B-5A indicates a header out the base.) See page 949. No increase in price for this service. Not available on Model B02 series.

28 VDC TO DC (Reg.) HI-TEMP.

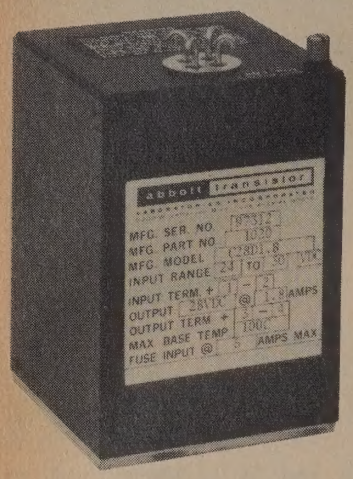
INPUT VOLTAGE RANGE: 24 TO 30 VOLTS, DC

Output Voltage Range	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
14-56	0.013	1B	0.5	B02D-157A	$231	$193
	0.032	1A	0.9	B05D-157A	247	206
	0.064	1	1.0	B1D-157A	254	212
	0.128	2	1.1	B2D-157A	261	218
	0.192	4	1.3	B3D-157A	270	225
	0.318	6	1.9	B5D-157A	277	231
	0.636	11	3.7	BL10D-157A	367	306
	1.082	14	10.3	BL17D-157A	440	367
16-66	0.011	1B	0.5	B02D-176A	231	193
	0.028	1A	0.9	B05D-176A	247	206
	0.057	1	1.0	B1D-176A	254	212
	0.114	2	1.1	B2D-176A	261	218
	0.171	4	1.3	B3D-176A	270	225
	0.284	6	1.9	B5D-176A	277	231
	0.568	11	3.7	BL10D-176A	351	293
	0.965	14	10.3	BL17D-176A	430	359
18-08	0.010	1B	0.5	B02D-197A	231	193
	0.025	1A	0.9	B05D-197A	247	206
	0.051	1	1.0	B1D-197A	254	212
	0.102	2	1.1	B2D-197A	261	218
	0.153	4	1.3	B3D-197A	270	225
	0.254	6	1.9	B5D-197A	277	231
	0.508	11	3.7	BL10D-197A	337	281
	0.862	14	10.3	BL17D-197A	415	346
20-33	0.009	1B	0.5	B02D-220A	231	193
	0.023	1A	0.9	B05D-220A	247	206
	0.046	1	1.0	B1D-220A	254	212
	0.092	2	1.1	B2D-220A	261	218
	0.138	4	1.3	B3D-220A	270	225
	0.228	6	1.9	B5D-220A	277	231
	0.456	11	3.7	BL10D-220A	330	275
	0.772	14	10.3	BL17D-220A	403	336
23-61	0.008	1B	0.5	B02D-247A	231	193
	0.020	1A	0.9	B05-247A	247	206
	0.041	1	1.0	B1D-247A	254	212
	0.082	2	1.1	B2D-247A	261	218
	0.123	4	1.3	B3D-247A	270	225
	0.203	6	1.9	B5D-247A	277	231
	0.406	11	3.7	BL10D-247A	330	275
	0.688	14	10.3	BL17D-247A	403	336
26-92	0.007	1B	0.5	B02D-276A	231	193
	0.018	1A	0.9	B05D-276A	247	206
	0.036	1	1.0	B1D-276A	254	212
	0.072	2	1.1	B2D-276A	261	218
	0.108	4	1.3	B3D-276A	270	225
	0.181	6	1.9	B5D-276A	277	231
	0.362	11	3.7	BL10D-276A	337	281
	0.615	14	10.3	BL17D-276A	410	342
29-26	0.006	1B	0.5	B02D-310A	231	193
	0.016	1A	0.9	B05D-310A	247	206
	0.032	1	1.0	B1D-310A	254	212
	0.064	2	1.1	B2D-310A	261	218
	0.096	4	1.3	B3D-310A	270	225
	0.161	6	1.9	B5D-310A	277	231
	0.322	11	3.7	B10D-310A	337	281
	0.548	14	10.3	BL17D-310A	415	346
32-65	0.006	1B	0.5	B02D-346A	240	200
	0.014	1A	0.9	B05D-346A	254	212
	0.029	1	1.0	B1D-346A	261	218
	0.058	2	1.1	B2D-346A	270	225
	0.087	4	1.3	B3D-346A	277	231
	0.145	6	1.9	B5D-346A	284	237
	0.290	11	3.7	B10D-346A	344	287
	0.491	14	10.3	BL17D-346A	422	352
365-409	0.005	1B	0.5	B02D-387A	$240	$200
	0.013	1A	0.9	B05D-387A	254	212
	0.026	1	1.0	B1D-387A	261	218
	0.052	2	1.1	B2D-387A	270	225
	0.078	4	1.3	B3D-387A	277	231
	0.129	6	1.9	B5D-387A	284	237
	0.258	11	3.7	B10D-387A	351	293
	0.439	14	10.3	BL17D-387A	424	354
409-458	0.005	1B	0.5	B02D-433A	240	200
	0.012	1A	0.9	B05D-433A	254	212
	0.023	1	1.0	B1D-433A	261	218
	0.046	2	1.1	B2D-433A	270	225
	0.069	4	1.3	B3D-433A	277	231
	0.116	6	1.9	B5D-433A	284	237
	0.232	11	3.7	B10D-433A	360	300
	0.392	14	10.3	BL17D-433A	433	361
458-514	0.004	1B	0.5	B02D-486A	247	206
	0.010	1A	0.9	B05D-486A	261	218
	0.021	1	1.0	B1D-486A	270	225
	0.041	2	1.1	B2D-486A	277	231
	0.062	4	1.3	B3D-486A	284	237
	0.103	6	1.9	B5D-486A	291	243
	0.206	11	3.7	B10D-486A	367	306
	0.349	14	10.3	BL17D-486A	440	367
514-590	0.004	1B	0.5	B02D-552A	247	206
	0.009	1A	0.9	B05D-552A	261	218
	0.018	1	1.0	B1D-552A	270	225
	0.036	2	1.1	B2D-552A	277	231
	0.055	4	1.3	B3D-552A	284	237
	0.090	6	1.9	B5D-552A	291	248
	0.180	11	3.7	B10D-552A	381	318
	0.307	14	10.3	BL17D-552A	450	375
590-660	0.008	1A	0.9	B05D-630A	270	225
	0.016	1	1.0	B1D-630A	277	231
	0.032	2	1.1	B2D-630A	284	237
	0.048	4	1.3	B3D-630A	291	243
	0.079	6	1.9	B5D-630A	300	250
	0.158	11	3.7	B10D-630A	397	331
	0.269	14	10.3	BL17D-630A	465	388
660-740	0.007	1A	0.9	B05D-700A	270	225
	0.014	1	1.0	B1D-700A	277	231
	0.028	2	1.1	B2D-700A	284	237
	0.043	4	1.3	B3D-700A	291	243
	0.071	6	1.9	B5D-700A	300	250
	0.142	11	3.7	B10D-700A	404	337
	0.242	14	10.3	BL17D-700A	472	394
740-830	0.006	1A	0.9	B05D-790A	277	231
	0.012	1	1.0	B1D-790A	284	237
	0.025	2	1.1	B2D-790A	291	243
	0.038	4	1.3	B3D-790A	300	250
	0.063	6	1.9	B5D-790A	307	256
	0.126	11	3.7	B10D-790A	427	356
	0.215	14	10.3	BL17D-790A	484	404
830-930	0.005	1A	0.9	B05D-880A	284	237
	0.011	1	1.0	B1D-880A	291	243
	0.022	2	1.1	B2D-880A	300	250
	0.034	4	1.3	B3D-880A	307	256
830-930	0.057	6	1.9	B5D-880A	$314	$262
	0.114	11	3.7	B10D-880A	441	368
	0.193	14	10.3	BL17D-880A	494	412
930-1040	0.005	1A	0.9	B05D-990A	291	243
	0.010	1	1.0	B1D-990A	300	250
	0.020	2	1.1	B2D-990A	307	256
	0.030	4	1.3	B3D-990A	314	262
	0.051	6	1.9	B5D-990A	321	268
	0.102	11	3.7	B10D-990A	441	368
	0.171	14	10.3	BL17D-990A	505	421
1040-1160	0.018	2	1.1	BK2D-1100A	314	262
	0.027	4	1.3	BK3D-1100A	321	268
	0.045	6A	2.3	BK5D-1100A	330	275
	0.090	12	4.4	BK10D-1100A	450	375
	0.154	14	11.2	BK17D-1100A	512	427
1160-1300	0.016	2	1.1	BK2D-1230A	321	268
	0.024	4	1.3	BK3D-1230A	300	275
	0.041	6A	2.3	BK5D-1230A	337	281
	0.082	12	4.4	BK10D-1230A	457	381
	0.138	14	11.2	BK17D-1230A	519	433
1300-1480	0.014	2	1.1	BK2D-1380A	330	275
	0.021	4	1.3	BK3D-1380A	337	281
	0.036	6A	2.3	BK5D-1380A	344	287
	0.072	12	4.4	BK10D-1380A	464	387
	0.123	14	11.2	BK17D-1380A	532	444
1480-1660	0.013	2	1.1	BK2D-1570A	337	281
	0.019	4	1.3	BK3D-1570A	344	287
	0.032	6A	2.3	BK5D-1570A	351	293
	0.064	12	4.4	BK10D-1570A	471	393
	0.108	14	11.2	BK17D-1570A	550	459
1660-1860	0.010	2	1.1	BK2D-1760A	351	293
	0.017	4	1.3	BK3D-1760A	360	300
	0.028	6A	2.3	BK5D-1760A	367	306
	0.056	12	4.4	BK10D-1760A	480	400
	0.096	14	11.2	BK17D-1760A	564	470
1860-2080	0.010	2	1.1	BK2D-1970A	367	306
	0.015	4	1.3	BK3D-1970A	374	312
	0.025	6A	2.3	BK5D-1970A	381	318
	0.051	12	4.4	BK10D-1970A	494	412
	0.086	14	11.2	BK17D-1970A	583	486
2080-2330	0.023	6A	2.3	BK5D-2200A	397	331
	0.045	12	4.4	BK10D-2200A	510	425
	0.077	14	11.2	BK17D-2200A	609	508
2330-2610	0.020	6A	2.3	BK5D-2470A	427	356
	0.040	12	4.4	BK10D-2470A	524	437
	0.068	14	11.2	BK17D-2470A	628	524
2610-2920	0.018	6A	2.3	BK5D-2760A	434	362
	0.036	12	4.4	BK10D-2760A	531	443
	0.061	14	11.2	BK17D-2760A	652	544
2920-3260	0.016	6A	2.3	BK5D-3100A	457	381
	0.032	12	4.4	BK10D-3100A	540	450
	0.054	14	11.2	BK17D-3100A	675	563
3260-3650	0.014	6A	2.3	BK5D-3460A	471	393
	0.029	12	4.4	BK10D-3460A	570	475
	0.049	14	11.2	BK17D-3460A	716	597

NOTE: For no load operation, add a resistance on the output to draw a minimum 4% of the rated current.

abbott transistor LABORATORIES, INCORPORATED
5200 W. Jefferson Blvd. / Los Angeles 90016
(213) WEbster 6-8185 Cable: ABTLABS

abbott 28 VDC to DC Hi-Performance



FEATURES

- Low Peak-to-Peak Ripple
- RFI/EMI to MIL-STD-461
- Small
- Hermetically Sealed
- +100°C Operation
- ±0.05% Regulation

DELIVERY FROM STOCK*

SPECIFICATIONS

INPUT VOLTAGE RANGE: 24 to 30 vdc.

LINE REGULATION: ±0.05% or 10 mv (whichever is greater) for input change of 24 to30 vdc with load consta

LOAD REGULATION: ±0.05% or 20 mv (whichever is greater) for load change of no load to full load v line constant.

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 50 mv peak-to-peak maximum.

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table means of an externally accessible screwdriver adjustment potentiometer.

ADJUSTMENT RESOLUTION:

Nominal Output Voltage	Resolution
5 thru 16 vdc	35 mv max.
18 thru 50 vdc	60 mv max.
55 thru 95 vdc	90 mv max.

ISOLATION VOLTAGE: 200 volts DC between input and output, input and case, and output and case.

INSULATION RESISTANCE: 50 megohms minimum at 50 volts DC between input and output, input and c and output and case.

POLARITY: Inputs and outputs are isolated; either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base.
Storage: −55°C to +125°C.

TEMPERATURE COEFFICIENT: 0.03% per degree centigrade maximum.

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-E-5272C and MIL-E-5400K, C 2, including altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fun explosion, etc.

SHORT CIRCUIT PROTECTION
Each unit is completely protected against an overload or short circuit of any duration. The output vol automatically restores to normal when the overload is removed.

INPUT TRANSIENT PROTECTION: MIL-STD-704A, Limit 1, Category B (80 volts for 0.1 sec.).

OVER VOLTAGE PROTECTION: Over voltage protection modules are available for use with these units. Pl consult the factory.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 microsec after a 50% step change in load current.

SERIES OPERATION: Two or more power supplies can be operated in series so that output voltage of supplies are additive. Total output voltage is not to exceed 200 vdc.

OUTPUT IMPEDANCE:
DC to 1 K Hz — 0.004 R_L or 0.04 ohm max.
1K Hz to 10K Hz — 0.015 R_L or 0.15 ohms max.
10K Hz to 100K Hz — 0.030 R_L or 0.50 ohms
R_L = Rated Load.

ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of susceptability to radiated and conducted interference.

RELIABILITY: The mean time between failure (MTFB) per MIL-HDBK-217 under worst case operating co tions of full rated output current, 30 vdc input voltage, and +100°C base plate temperature, ranges 41,305 hours for Model C5D10 to 55,463 for Model C95D0.25.

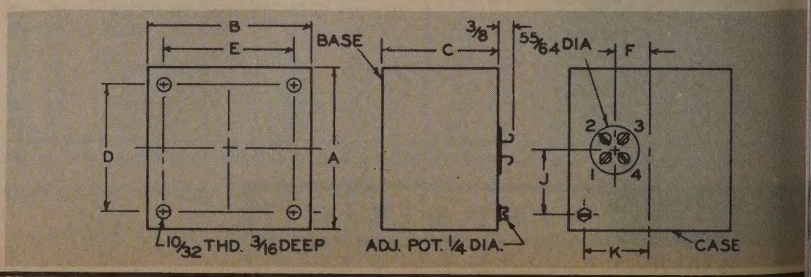
Output Voltage Range	Output Curr. (Amps)	Size (See Dwg.)	Wt. (Lbs.)	Model Number	Price 1 pc.	Price 2-4 pcs.
4.5-5.5	2.5	2D	1.2	C5D2.5	$336	$280
	5.0	6B	1.7	C5D5.0	375	313
	10.0	7A	2.6	C5D10	450	375
5.5-6.5	2.5	2D	1.2	C6D2.5	336	280
	5.0	6B	1.7	C6D5.0	375	313
	10.0	7A	2.6	C6D10	450	375
6.5-7.5	2.5	2D	1.2	C7D2.5	336	280
	5.0	6B	1.7	C7D5.0	375	313
	10.0	7A	2.6	C7D10	450	375
7.5-8.5	1.8	2D	1.2	C8D1.8	330	275
	3.5	6B	1.7	C8D3.5	369	308
	7.5	7A	2.6	C8D7.5	444	370
8.5-9.5	1.8	2D	1.2	C9D1.8	330	275
	3.5	6B	1.7	C9D3.5	369	308
	7.5	7A	2.6	C9D7.5	444	370
9.5-10.5	1.8	2D	1.2	C10D1.8	330	275
	3.5	6B	1.7	C10D3.5	369	308
	7.5	7A	2.6	C10D7.5	444	370
10.5-11.5	1.8	2D	1.2	C11D1.8	330	275
	3.5	6B	1.7	C11D3.5	369	308
	7.5	7A	2.6	C11D7.5	444	370
11-13	1.2	2D	1.2	C12D1.2	324	270
	2.5	6B	1.7	C12D2.5	364	304
	5.0	7A	2.6	C12D5.0	438	365
13-15	1.2	2D	1.2	C14D1.2	324	270
	2.5	6B	1.7	C14D2.5	364	304
	5.0	7A	2.6	C14D5.0	438	365
14-16	1.2	2D	1.2	C15D1.2	324	270
	2.5	6B	1.7	C15D2.5	364	304
	5.0	7A	2.6	C15D5.0	438	365
15-17	1.2	2D	1.2	C16D1.2	324	270
	2.5	6B	1.7	C16D2.5	364	304
	5.0	7A	2.6	C16D5.0	438	365
17-19	1.2	2D	1.2	C18D1.2	$324	$270
	2.5	6B	1.7	C18D2.5	364	304
	5.0	7A	2.6	C18D5.0	438	365
19-21	0.8	2D	1.2	C20D0.8	319	266
	1.8	6B	1.7	C20D1.8	360	300
	3.5	7A	2.6	C20D3.5	430	359
21-23	0.8	2D	1.2	C22D0.8	319	266
	1.8	6B	1.7	C22D1.8	360	300
	3.5	7A	2.6	C22D3.5	430	359
23-25	0.8	2D	1.2	C24D0.8	319	266
	1.8	6B	1.7	C24D1.8	360	300
	3.5	7A	2.6	C24D3.5	430	359
25-27	0.8	2D	1.2	C26D0.8	319	266
	1.8	6B	1.7	C26D1.8	360	300
	3.5	7A	2.6	C26D3.5	430	359
27-29	0.8	2D	1.2	C28D0.8	319	266
	1.8	6B	1.7	C28D1.8	360	300
	3.5	7A	2.6	C28D3.5	430	359
29-31	0.6	2D	1.2	C30D0.6	309	258
	1.2	6B	1.7	C30D1.2	351	293
	2.5	7A	2.6	C30D2.5	424	354
31-33	0.6	2D	1.2	C32D0.6	309	258
	1.2	6B	1.7	C32D1.2	351	293
	2.5	7A	2.6	C32D2.5	424	354
33-35	0.6	2D	1.2	C34D0.6	309	258
	1.2	6B	1.7	C34D1.2	351	293
	2.5	7A	2.6	C34D2.5	424	354
35-37	0.6	2D	1.2	C36D0.6	309	258
	1.2	6B	1.7	C36D1.2	351	293
	2.5	7A	2.6	C36D2.5	424	354
37-39	0.6	2D	1.2	C38D0.6	309	258
	1.2	6B	1.7	C38D1.2	351	293
	2.5	7A	2.6	C38D2.5	424	354
39-41	0.5	2D	1.2	C40D0.5	$306	$
	0.8	6B	1.7	C40D0.8	342	
	1.8	7A	2.6	C40D1.8	417	
41-43	0.5	2D	1.2	C42D0.5	306	
	0.8	6B	1.7	C42D0.8	342	
	1.8	7A	2.6	C42D1.8	417	
43-45	0.5	2D	1.2	C44D0.5	306	
	0.8	6B	1.7	C44D0.8	342	
	1.8	7A	2.6	C44D1.8	417	
45-47	0.5	2D	1.2	C46D0.5	306	
	0.8	6B	1.7	C46D0.8	342	
	1.8	7A	2.6	C46D1.8	417	
47-49	0.5	2D	1.2	C48D0.5	306	
	0.8	6B	1.7	C48D0.8	342	
	1.8	7A	2.6	C48D1.8	417	
49-51	0.5	2D	1.2	C50D0.5	306	
	0.8	6B	1.7	C50D0.8	342	
	1.8	7A	2.6	C50D1.8	417	
50-60	0.25	2D	1.2	C55D0.25	288	
	0.5	6B	1.7	C55D0.5	331	
	1.0	7A	2.6	C55D1.0	410	
60-70	0.25	2D	1.2	C65D0.25	288	
	0.5	6B	1.7	C65D0.5	331	
	1.0	7A	2.6	C65D1.0	410	
70-80	0.25	2D	1.2	C75D0.25	288	
	0.5	6B	1.7	C75D0.5	331	
	1.0	7A	2.6	C75D1.0	410	
80-90	0.25	2D	1.2	C85D0.25	288	
	0.5	6B	1.7	C85D0.5	331	
	1.0	7A	2.6	C85D1.0	410	
90-100	0.25	2D	1.2	C95D0.25	288	
	0.5	6B	1.7	C95D0.5	331	
	1.0	7A	2.6	C95D1.0	410	

* All models with output voltages from 5 to 30 VDC are normally available from stock

Size	A	B	C	D	E	F	J	K
2D	2	3	3½	1.50	2.50	¾	¾	1¼
6B	2¾	3⅛	3⅝	2.25	2.62	¾	1⅛	1 5/16
7A	2⅞	3⅜	4½	2.37	2.87	¾	1 3/16	1 7/16

TOLERANCES

FRACTION = ±1/32 **DECIMAL** = ±0.015

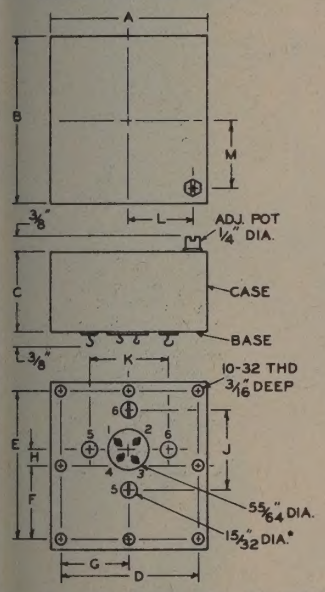


abbott OPTIONAL FEATURES

EXCEPT FOR MODELS BEGINNING WITH 'C', 'K', 'P', 'R', AND 'W'

TRMINALS ON MOUNTING BASE (B Option)

electrical terminals extending rough a glass sealed header may be ard on the mounting base on most units at no increase in price. To e this feature, simply change the number character preceding the lash to "B". (Example: V05B-5A in-s a header out the base.)



only on outputs 740-3650 volts; Not available unting base above 3650 volts.

NCES: FRACTION = ±1/32 • DECIMAL = ±0.015

SIZE	A	B	C	D	E	F	G	H	J	K	L	M
1	1½	2¾	3	1.00	2.25	—	—	0	1½	—	½	1⅛
1A	1½	2¾	2¾	1.00	2.25	—	—	0	1½	—	½	1⅛
2	1⅞	2¾	3¼	1.37	2.25	—	—	0	1½	—	11/16	1⅛
2C	2	2¾	2⅛	1.50	2.25	—	—	½	—	—	¾	1⅛
3	2¾	2¾	3	2.25	2.25	—	—	0	2	—	1⅛	1⅛
3A	2¾	2¾	2¾	2.25	2.25	—	—	0	—	2	1⅛	1⅛
4	2¼	2¾	3¼	1.75	2.25	—	—	0	1½	—	⅞	1⅛
4A	2½	3	3¼	2.00	2.50	—	—	0	—	—	1	1¼
4B	2½	3	3¾	2.00	2.50	—	—	0	—	—	1	1¼
4C	2¼	2¾	3½	1.75	2.25	—	—	0	1½	—	⅞	1⅛
5	2¾	2¾	3¼	2.25	2.25	—	—	0	—	2	1⅛	1⅛
6	2¾	3	3¼	2.25	2.50	—	—	0	2	—	1⅛	1¼
6A	2¾	3	4	2.25	2.50	—	—	0	2	—	1⅛	1¼
7	2¾	2¾	4	2.25	2.25	—	—	0	2	—	1⅛	1⅛
8	2¾	4¼	3	2.25	3.75	—	—	1¼	—	1½	1⅛	1⅞
8A	2¾	4¼	2¾	2.25	3.75	—	—	¾	—	2	1⅛	1⅞
9	2¾	4⅝	3¼	2.25	4.12	—	—	1 5/16	—	1½	1⅛	2 1/16
9A	2¾	4¾	3¾	2.25	4.25	—	—	½	—	2	1⅛	2⅛
9B	2¾	4¾	3½	2.25	4.25	—	—	⅝	—	2	1⅛	2⅛
10	2¾	5¼	3¼	2.25	4.75	2.37	—	1½	—	1½	1⅛	2⅜
10A	3	5	4	2.50	4.50	—	—	½	—	2	1¼	2¼
11	3	5½	3¼	2.50	5.00	2.50	—	0 #	—	1½	1¼	2½
11A	4¼	4½	4	3.75	4.00	—	—	1⅝	—	1½	1⅞	2
11C	4¼	5¼	4	3.75	4.37	2.37	—	0	1½	—	1⅞	2⅜
12	3	5½	4	2.50	5.00	2.50	—	1⅜	—	2	1¼	2½
12A	4½	6	4	4.00	5.50	2.75	—	0†	—	2	2	2¾
13	6	6	3¼	5.50	5.50	2.75	2.75	1½	1½	—	2¾	2¾
13A	5½	6½	4½	5.00	6.00	3.00	2.50	0	—	1½	2½	3
14	6	6	4	5.50	5.50	2.75	2.75	1½	1½	—	2¾	2¾
16A	6¾	7½	4¼	6.25	7.00	3.50	3.12	1½	1½	—	3⅛	3½
17	6	12	4	5.50	11.50	5.75	2.75	2¾	—	2	2¾	5¾
17A	7	8	4¼	6.50	7.50	3.75	3.25	1	—	2	3¼	3¾
18	8¾	9¾	5	8.25	9.25	4.62	4.12	2⅞	—	2	4⅛	4⅝

† 2 7/16 on Models HA3B and HAK3B. # ⅞ on Models T12B, U10B, T6B-5A thru T6B-7A and U5B-5A thru U5B-7A.

	PRICE	
	1 PIECE	2-4 PIECES

CIAL CONNECTORS (A & C Option)

Mitary type hermetically sealed connector is available on Abbott power modules with tput voltage of up to 740 volts. A special high voltage ceramic connector, manufac-by Amp, Inc., is available on power modules with an output voltage above 3650 volts. ly change the model number character preceding the first dash to "A" to have the ector extend out the top surface (opposite the mounting base), or to a "C" to have it d out the mounting base. Example: V05A-5A indicates a connector out the top surface V05C-5A indicates a connector out the mounting base.

CONNECTOR	MANUFACTURER	MATING PART		
MS311H-12-10P	Bendix or Cannon	MS3116F-12-10S	$ 30.00	$ 20.00
833589	Amp	832692-2 (2 ft. leads)	$ 60.00	$ 40.00

EMOTE OUTPUT ADJUSTMENT (R Option)

sion for locating an adjustment potentiometer in a remote location from the power ly can be made. To have this feature included, simply add an "R" after the character ding the first dash of the model number. Example: V05DR-5A indicates the remote ut adjustment feature has been included. Special terminal arrangement includes two ional terminals for connection to any remote 1000 ohm potentiometer.

$ 30.00 | $ 20.00

CIAL ENCAPSULATION (E Option)

f our hermetically sealed power modules are encapsulated to meet or exceed the shock, eleration, and vibration requirements of MIL-E-5272C. Special encapsulation to enable e modules to withstand shock levels of 60 g's, acceleration levels of 50 g's, and vibra-levels of 30 g's, is available. To have this feature included, simply add an "E" after character preceding the first dash of the model number. Example: V05DE-5A indicates ial encapsulation has been included.

$ 20.00 | $ 10.00

abbott transistor
LABORATORIES, INCORPORATED
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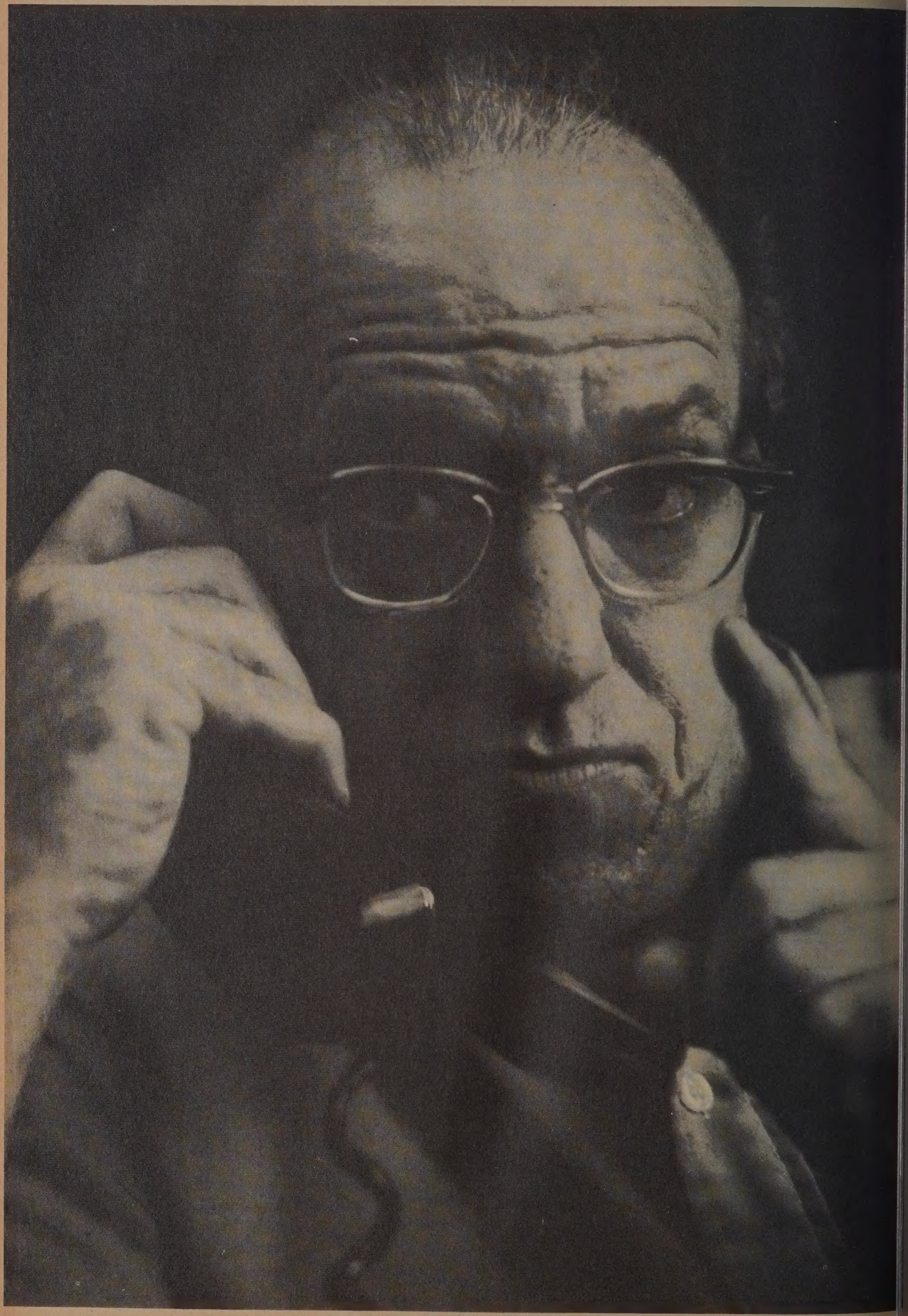
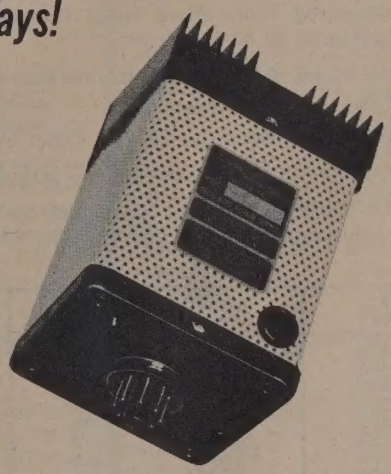
(213) WEbster 6-8185 Cable: ABTLABS



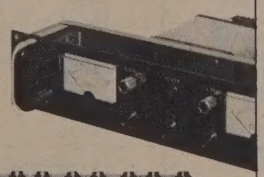
POWER SUPPLY HOTLINE: 215-258-5441

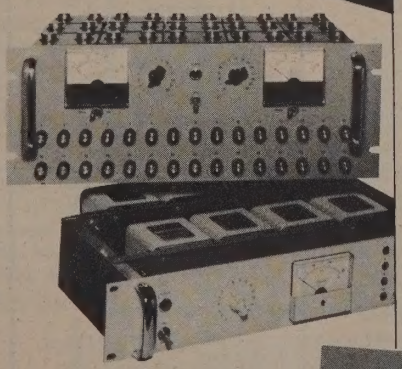
Any of 82,000 different DC power supply modules...
Shipped in just 3 days!



Depend on Acopian for guaranteed 3-day shipment of DC plug-in power supply modules. Select from 82,000 different models, including MIL Spec supplies and dual encapsulated supplies with identical or different outputs. Use the Hotline to tell us what outputs you need, singles or duals, regulated or unregulated. Your power supply modules will be on their way to you **in just 3 days!** Catalog on request.

Completely-wired custom power supply systems...
Shipped in just 9 days!





In a hurry for a **special** multiple-output power supply system? Acopian will design it, build it, test it, and ship it – completely wired – **in just 9 days!** Use the Hotline to tell us the DC output voltages, currents, and accessories you need. We'll discuss details and answer your questions, then give you a firm price – on the phone. Nine days later, your completely-wired power supply system will be on its way. Brochure on request.

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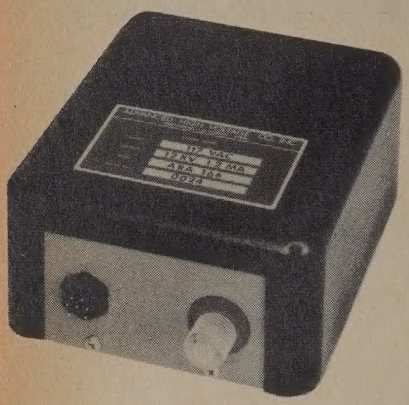
high voltage modules



features

Output voltages listed are nominal values. They are adjustable and can remotely programmed.

Units shown normally have a positive output. Negative output furnished no extra charge.

Unregulated supplies can be supplied with floating outputs and are inhe ently reversible.

The output DC return on all units can be floated within 500 volts of chassi

All units are short-circuit-proof and can remain shorted indefinitely witho damage. They will recover automatically after removal of short.

Operating Temperature range is normally −20°C to +65°C but can t increased at nominal cost.

All AC input models will operate from a single phase 117 VAC, 50 to 420 H line.

DC input models use 28 VDC. Other input voltages can be supplied.

Units are shielded and have no external magnetic field.

Units are built to best commercial standards and can meet most MIL Spec including MIL-E-5400 and MIL STD 704.

specifications

Output Voltage	Current	Load Regulation	Ripple	Input Voltage	Line Regulation	Approximate Dimensions	Model Number
200 V	20 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 016
400 V	12 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 026
600 V	8 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 036
800 V	6 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 046
1 KV	5 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 056
1.2 KV	4 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 066
1.5 KV	3 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 076
1.8 KV	3 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 086
2.2 KV	2 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 096
2.5 KV	2 mA	0.1%	0.05%	117 VAC	0.05%	4.2 x 3.0 x 2.6	ARM 106
800 V	10 mA	—	0.05%	28 VDC	—	3.1 x 2.3 x 2.0	DUM 044
1 KV	10 mA	—	0.05%	28 VDC	—	3.1 x 2.3 x 2.0	DUM 054
1.5 KV	7 mA	—	0.05%	28 VDC	—	3.1 x 2.3 x 2.0	DUM 064
2.5 KV	4 mA	—	0.05%	28 VDC	—	3.8 x 2.7 x 2.4	DUM 074
3.5 KV	3 mA	—	0.05%	28 VDC	—	3.8 x 2.7 x 2.4	DUM 084
5 KV	2 mA	—	0.05%	28 VDC	—	3.8 x 2.7 x 2.4	DUM 094
7.5 KV	1.5 mA	—	0.05%	28 VDC	—	3.8 x 2.7 x 2.4	DUM 104
10 KV	1 mA	—	0.05%	28 VDC	—	4.9 x 3.5 x 3.0	DUM 114
12.5 KV	0.8 mA	—	0.05%	28 VDC	—	4.9 x 3.5 x 3.0	DUM 124
15 KV	0.7 mA	—	0.05%	28 VDC	—	4.9 x 3.5 x 3.0	DUM 134
18 KV	0.6 mA	—	0.05%	28 VDC	—	4.9 x 3.5 x 3.0	DUM 144
22 KV	0.5 mA	—	0.05%	28 VDC	—	4.9 x 3.5 x 3.0	DUM 154
2 KV	5 mA	—	0.05%	117 VAC	—	4.4 x 3.5 x 3.0	AUP 018
5 KV	5 mA	—	0.05%	117 VAC	—	4.4 x 3.5 x 3.0	AUP 028
10 KV	3 mA	—	0.05%	117 VAC	—	4.4 x 3.5 x 3.0	AUP 038
15 KV	2 mA	—	0.05%	117 VAC	—	5.6 x 4.7 x 4.0	AUP 048
20 KV	1.5 mA	—	0.05%	117 VAC	—	5.6 x 4.7 x 4.0	AUP 058
25 KV	1 mA	—	0.1%	117 VAC	—	5.6 x 4.7 x 4.0	AUP 078
30 KV	1 mA	—	0.1%	117 VAC	—	5.6 x 4.7 x 4.0	AUP 068
2 KV	5 mA	2%	0.05%	117 VAC	0.5%	4.4 x 3.5 x 3.0	ARP 019
5 KV	5 mA	2%	0.05%	117 VAC	0.5%	4.4 x 3.5 x 3.0	ARP 029
10 KV	3 mA	2%	0.05%	117 VAC	0.5%	4.4 x 3.5 x 3.0	ARP 039
15 KV	2 mA	2%	0.05%	117 VAC	0.5%	5.6 x 4.7 x 4.0	ARP 049
20 KV	1.5 mA	2%	0.05%	117 VAC	0.5%	5.6 x 4.7 x 4.0	ARP 059
25 KV	1 mA	2%	0.01%	117 VAC	0.5%	5.6 x 4.7 x 4.0	ARP 079
30 KV	1 mA	2%	0.01%	117 VAC	0.5%	5.6 x 4.7 x 4.0	ARP 069
4 KV	3 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 116
5 KV	3 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 126
6 KV	2.5 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 136
8 KV	2 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 146
10 KV	1.5 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 156
12 KV	1.2 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 166
15 KV	1 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 176
18 KV	0.8 mA	0.1%	0.05%	117 VAC	0.1%	4.7 x 4.0 x 2.1	ARA 186

Advanced High Voltage also makes Programmable Electronic Loads for testing of High Voltage Sources.

If you don't see it here write or phone (24 hours a day). W can probably supply what you need.

ADVANCED HIGH VOLTAGE CO., INC.

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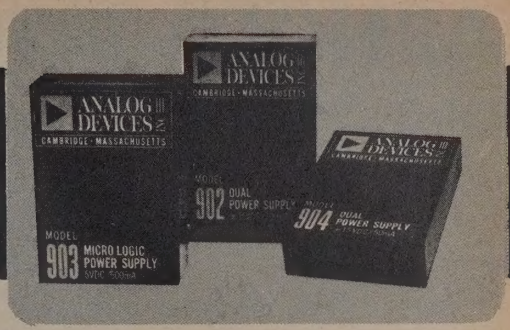
N AVAILABLE FROM

ANALOG DEVICES INC

LOW COST
ULATED MODULAR POWER SUPPLIES
FOR OP AMPS AND MICROLOGIC



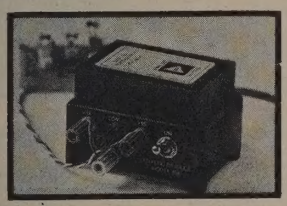
SRIES

TURES

utp ±15VDC @±50 mA or
±15VDC @±100 mA for Op Amps
00 A for Logic Cards
e fm 115 VAC 50-400 Hz[1]
Mo it Plugin accessory
le n be shorted to common indefinitely
ost
$16 0 (950 Bench Mount) $47.00 (902—quantity 10)
$38 0 (904—quantity 10) $47.00 (903—quantity 10)

ode 902 and 904 dual Power Supplies were designed all to power operational amplifiers operating from DC The units connect directly to 115VAC line power ode two fixed 15-volt outputs. Model 904 supplies fm each output, and Model 902 provides 100 mA Mo 903 is a single output 5 volt power supply for up m All three supplies are cast epoxy modules that can dir directly onto printed circuit boards or plugged o onal mating socket. Hold down nuts are provided, g a types to be secured mechanically.

nit are designed with regulation, ripple, and noise ca ns that are consistent with the requirements of most n amp and logic systems. They are small, inexpensive, all suited to OEM applications.



MOEL 950

9 is a bench mount adaptor designed to accept the m pplies. The supplies simply plug in and may be ed r replaced. Once installed, they may be safely and ie ly used in the laboratory. A line fuse is incorporated l a niversal output terminals, a toggle switch, and four bb feet.

D SERIES

ditn to the 900 series, the MPD Models from the iza ivision, offer even smaller size (2½" x 3¼" x 3/4"H), ve regulation, adjustability, and the advantages of ing Being basically DC-DC converters, they are available V and 5 VDC primary, as well as 115 VAC, and in all pr de galvanic isolation between primary common and la common.

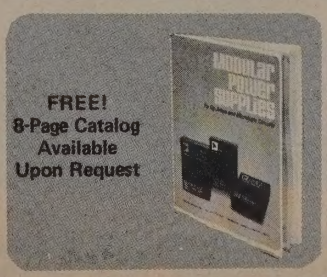
Mel MPD 15/100	±15V @ ±100 mA	$149
Mel MPD 5/150	5V @ 150 mA, (logic)	149
and	150V @ 5 mA, (neon)	

tin card (4½" x 3") with mounted adjustment pots and co ector, specify 2714A for MPD 15/100, 2714B for 5-0, $20 and $18 respectively.

ll etails on both the MPD and 900 Series, as well as p er products from Analog Devices, write, wire, or 1 factory or our nearest representative for this free c alog.

SPECIFICATIONS Note: All specifications typical @ 25°C unless otherwise noted	OP AMP POWER SUPPLIES 902	 904	MICROLOGIC SUPPLY 903
INPUT VOLTAGE	105 to 125VAC[1] 50 to 400 Hz 17VA max	105 to 125VAC[1] 50 to 400 Hz 9VA max	105 to 125VAC[1] 50 to 400 Hz 17VA max
OUTPUT VOLTAGE (fixed)	±15V @ 0 to 100mA	±15V @ 0 to 50mA	5V @ 0 to 500mA
ACCURACY	±(15.0 to 15.3)V −15V within ±1% of +15V	±(15.0 to 15.2)V −15V within ±¾% of +15V	Within ±1% of +5V
TEMP COEFFICIENT	0.015%/°C max	0.03%/°C max	0.02%/°C max
REGULATION Line (105 to 125VAC) Load (0 to 100%)	 0.05% max 0.1% max	 0.1% max 0.1% max	 0.15% max 0.3% max
WARM UP DRIFT	±0.3% (45mV)	±0.25% (37mV)	±0.3% (15mV) no overshoot on turn-on
RIPPLE	0.5mV rms, 2mVp-p max	0.5mV rms, 2mVp-p max	1mV rms, max 5mVp-p max
OUTPUT IMPEDANCE	2 ohms @ 10kHz	0.2 ohms @ 10 kHz	25 milliohms @ 10kHz
SHORT CIRCUIT PROTECTION	Either output to common indef. 0 to 71°C	Any combination of output pins indef. 0 to 71°C	Output to common indef.
OVERVOLTAGE PROTECTION	———	———	6.5V max (internal fault) (Protected against reversed polarity)
OPERATING TEMPERATURE	0 to 71°C derate 5mA/°C above 60°C derate 1mA/°C below 10°C	0 to 71°C derate 2mA/°C above 55°C derate 0.5mA/°C below 10°C	0 to 71°C derate 12mA/°C above 50°C derate 10mA/°C below 15°C
STORAGE TEMPERATURE	−25 to +85°C	−25 to +85°C	−25 to +85°C
SURFACE TEMPERATURE RISE	20°C above ambient @ full load	25°C above ambient @ full load	35°C above ambient @ full load
INPUT ISOLATION	50 Megohms	500 MΩ || 100 pF	500 Megohms
WEIGHT	16 oz.	10 oz.	17 oz.
PRICE 1-9 10-24	$49. $47.	$39. $38.	$49. $47.
MATING SOCKET Model No. Price (1-9)	 AC 1013 $3.75	 AC 1013 $3.75	 AC 1013 $3.75

[1] For 220V primary, specify 902E, 903E, 904E

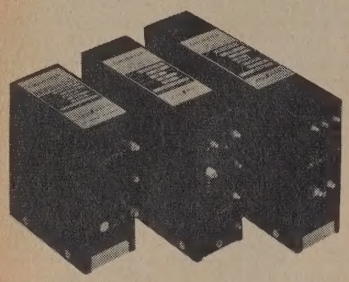


ANALOG DEVICES INC

221 FIFTH STREET • CAMBRIDGE • MASSACHUSETTS 02142
TEL: 617/492-6000 • TWX: 710/320-0326

ARNOLD POWER CONVERTERS

AC-DC CONVERTER (MINIATURE SIZE) 115 VAC 50-500 HZ TO SINGLE OR MULTIPLE D.C. OUTPUTS



FEATURES
- Miniature Size (21 Cu. In.)
- Any Voltage, Single or Multiple Outputs
- High Reliability
- Short Circuit and Transient Protected
- Fully Encapsulated
- Adjustable Output
- Meets MIL-E-5272C
- Outputs are Isolated
- RFI Qualified (Mod. "I")

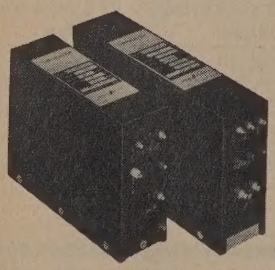
SPECIFICATIONS
Input Voltage: 108-130 VRMS, 50 to 500 Hz
Voltage Adjust: +5%, −25%
Line Regulation: 0.1% Typ.
Load Regulation: (½-FL): 0.9% Typ.
Temp. Coefficient: .05%/°C Max.
Temp. Range: −10° to +71°C at Case
Environmental: Per MIL-E-5272C
Altitude: 60,000 Ft.

MODIFICATIONS (4)
A—Remote Adjust
(CT)—Center Tap
E—Input Voltage Alteration
F—Additional AC Output
G—Flexible Leads
I—RFI Qualified (MIL-1-6181D Certification Supplied)
L—Tighter Load Regulation
R—Tighter Line Regulation
S—Short Terminals
V—"Crowbar" Overvoltage Protection
WW—8 Amp. Output

HOW TO ORDER:
1. **Standard Units:** Use Model Numbers Listed
2. **Overvoltage Protection:** Add V to P/N after each output voltage to be protected. $35.00/output.
3. **Special Units:** Specify PHU (40 Watts) PHO (80 Watts) or PHP (120 Watts) followed by output voltage/output current (amps) for all outputs. Any voltage 2 thru 2000 volts is available.
4. See Bulletin SZU for standard modification options and prices.

Nominal Output Voltage (VDC)	Output Current (Amps)	Model	Case Size (See Table)	Pr 1
3	5.0	PHU-3	A	$2
5	5.0	PHU-5	A	2
5	10.0	PHO-5	C	2
5	15.0	PHP-5	D	3
6	5.0	PHU-6	A	2
6	10.0	PHO-6	C	2
10	4.0	PHU-10	A	2
10	8.0	PHO-10	C	2
12	3.3	PHU-12	A	2
12	6.6	PHO-12	C	3
15	2.6	PHU-15	A	2
24	1.6	PHU-24	A	2
24	3.2	PHO-24	C	2
28	1.4	PHU-28	A	2
28	2.8	PHO-28	C	2
300	.13	PHU-300	A	2
500	.080	PHU-500	A	2
750	.053	PHU-750	A	2
1000	.030	PHU-1000	A	2
2000	.010	PHU-2000	A	3
±5	±4	PHU-10(CT)	A	2
±5	±8	PHO-10(CT)	C	3
±12	±1.6	PHU-24(CT)	A	2
±15	±1.3	PHU-30(CT)	A	2
5 +15 −15	2 .5 .5	PHU-30(CT)/.5-5/2-25	A	3
5 +15 −15 180	2 .3 .3 .03	PHU-180/.03-30(CT)/.3-5/2-20	A	3

AC-DC CONVERTER (TIGHT REGULATION) 115 VAC 50-500 HZ TO SINGLE OR MULTIPLE DC OUTPUTS



FEATURES
- Tight Regulation
- Miniature Size
- Short Circuit Protected
- "Crowbar" Overvoltage Option
- Isolated Output

SPECIFICATIONS
Input: 105 to 125 VAC — 50-500 Hz
Outputs: Up to three (3) isolated outputs 3 VDC to 200 VDC
Regulation: Line .01% +1 MV
Load (NF-FL) .03% +3 MV
Ripple: .2% or 5 MV
Temp. Coefficient: .01%/°C
Operating Temp.: −10° to +85°C at Case
Overvoltage Protection (Modification "V") 120 ±10% of Nominal output voltage

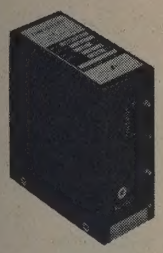
MODIFICATIONS (See Bulletin SZV for Details)
A—External Voltage Adjustment
G—Flexible Leads
V—"Crowbar" Overvoltage (set at 120 ±10% of nominal output voltage)

HOW TO ORDER:
1. **Standard Units:** Use Model Numbers listed
2. **Overvoltage Protection:** Add V to P/N
3. **Special Units:** Specify PIB (1 output), PIG (2 outputs or PIL (3 outputs) followed by output voltage/current (AMPS) for all outputs. EXAMPLE: PIG-180/.10-5V/3 delivers 180 VDC @ 100 MA and 5 VDC @ 3 amps and has overvoltage protection on the 5 VDC output

Nominal Output Voltage (VDC)	Output Current (Amps)	Model	Case Size (See Table 1)	Pr 1
5	7	PIB-5/7	B	$2
28	1.20	PIB-28/1.2	B	2
180	0.20	PIB-180/.20	B	2
15 -15	1 1	PIG-15/1-15/1	C	3
28 5	1 1	PIG-28/1-5/1	C	3
180 5	.10 3	PIG-180/.10-5/3	C	3
15 -15 5	.50 .50 4	PIL-15/.50-15/.50-5/4	C	3
24 14 5	.50 .50 3	PIL 24/.50-14/.50-5/3	C	3
180 28 5	.05 .50 2	PIL-18/.05-28/.5-5/2	C	3

ARNOLD MAGNETICS
ARNOLD MAGNETICS CORPORATION
P.O. Box K • Culver City, California 90230
Phone: (213) 870-7014 • TWX 910-343-646

-DC SWITCHING REGULATOR LOGIC SUPPLY



FEATURES
- High Efficiency
- Small Size and Light Weight
- Short Circuit Protected
- RFI/EMI Filtering

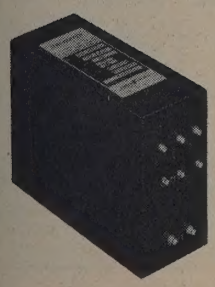
SPECIFICATIONS

Input: 105 to 125 vac
POA: 50-500 Hz
POB: 360-440 Hz
Output: 3.6 to 28 vdc @ 4 amps
Regulation:
Line: 2% (105 to 125 vac)
Load: 2% (NL-FL)
Efficiency: 70 to 85%
Operating Temp.: −20° to +71°C

Input	Nom. Output Voltage (VDC)	Output Current (A)	Efficiency %	Model	Case Size (See Table)	Price 1 pc.
115 vac 60 Hz	3.6	4	70	POA-3.6/4	C	$295
115 vac 400 Hz	3.6	4	70	POB-3.6/4	A	295
115 vac 60 Hz	5.0	4	75	POA-5/4	C	295
115 vac 400 Hz	5.0	4	75	POB-5/4	A	295

HOW TO ORDER:
Specify Model POA (50-500 Hz input) or POB (400 Hz only input) followed by output voltage/output current (Amps).

-DC POWER SUPPLIES 115 VAC 400 HZ TO SINGLE OR MULTIPLE D.C. OUTPUTS



FEATURES
- Tight Regulation
- Miniature Size
- EMI/RFI Free
- Short Circuit Protected
- "Crowbar" Overvoltage Protection
- Isolated Output

SPECIFICATIONS

Input: 105 to 125 vac, 380 to 420 Hz
Outputs: Up to three (3) isolated outputs 3 vdc to 200 vdc
Regulation:
Line: .01% +1MV
Load: (NL-FL) .03% +3 MV
Ripple: .1% or 1 MV
Temp. Coefficient: .01%/°C
Operating Temp.: −10° to +85°C at Case
Overvoltage Protection (Modication 120 ±10% or Nominal output voltage "V")

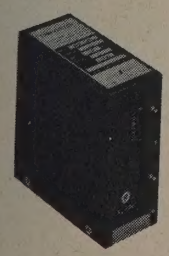
MODIFICATIONS (See Bulletin SZV for Details)

A — External Voltage Adjustment
G — Flexible Leads
V — "Crowbar" Overvoltage Protection (Set at 120 ±10% of nominal output voltage)

Nominal Output Voltage (VDC)	Output Current (Amps)	Model	Case Size (See Table 1)	Price 1 pc.
5	7	PEB-5/7	E	$195
28	1.20	PEB-28/1.2	E	195
180	.20	PEB-180/.20	E	220
15 -15	1 1	PEG-15/1-15/1	E	245
28 5	1 1	PEG-28/1-5/1	E	245
180 5	.10 3	PEG-180/.1-5/3	E	270
15 -15 5	.50 .50 4	PEL-15/.5-15/.5-5/4	E	295
24 14 5	.50 .50 3	PEL-24/.5-14/.5/3	E	295
180 28 5	.05 .50 2	PEL-180/.05-28/.50-5/2	E	320

HOW TO ORDER:
1. **Standard Units:** Use Model Numbers listed
2. **Overvoltage Protection:** Add V to P/N after each output voltage to be protected with overvoltage protection. Price: $35/Output
3. **Special Units:** Specify PEB (1 output), PEG (2 outputs) or PEL (3 outputs) followed by output voltage/output current (AMPS) for all outputs. EXAMPLE: PEG-26/.5-5V/5. Delivers 26 VDC @ .5A & 5 VDC @ 5A and has overvoltage protection on the 5 VDC output.

-DC SWITCHING REGULATOR 28 VDC TO SINGLE D.C. OUTPUT



FEATURES
- Wide Input Voltage
- High Efficiency
- Short Circuit Protected
- Small size and weight

SPECIFICATIONS

Input: 18 to 37 vdc (others available)
Output: 3.6 to 36 vdc @ 4 amps and 12 vdc @ 3 amps
Regulation:
Line: 2% (18-37 vdc)
Load: 2% (NL-FL)
Efficiency: 72 to 78%
Operating Temp.: −20° to +71°C

Nominal Output Voltage (VDC)	Efficiency %	Model	Case Size (See Table)	Price 1 pc.
3.6 @ 4A	72	SEP-3.6/4	A	$195
4.0 @ 4A	75	SEP-4/4	A	195
5.0 @ 4A	78	SEP-5/4	A	195
12. @ 3A	80	SEP-12/3	A	195

HOW TO ORDER:
Specify Model SEP followed by output voltage/Output current (AMPS). EXAMPLE: SEP-5/4 has output of 5 VDC @ 4 AMPS.

ARNOLD MAGNETICS

ARNOLD MAGNETICS CORPORATION

P.O. Box K • Culver City, California 90230
Phone: (213) 870-7014 • TWX 910-343-6468

DC-DC CONVERTER

28 VDC TO SINGLE OR MULTIPLE DC OUTPUTS

FEATURES

- Miniature Size - 40 Watts (21 Cu. In.)
- Adjustable Output
- Short Circuit & Polarity Reversal Protection
- High Reliability - Hermetically Sealed
- 15 Standard Modifications Available
- Floating Output
- Closely Regulated
- Meets MIL-E-5272C
- Delivery Stock to 4 weeks

SPECIFICATIONS

Line Regulation: (26-30 VDC): .24% (2) (3)
Load Regulation: (½-Full load): 1% typical
Ripple: .1% typical
Adjustment Range: 40% to 105% Output (nom.)
Temperature: −55°C to +100°C
Vibration: 25G Max 0-2000 CPS
Shock: 100G
Altitude: To 60,000 feet
Weight: 26 Oz. Approx.

MODIFICATIONS (4)

A—Remote E_{out} Adjust
CT—Center tapped outputs
E—Input Voltage Alteration
EE—12V input
F—Additional AC output
G—Flexible leads
I—RFI qualified (case size B)
L—Tighter load regulation
P—Programmable output
R—Tighter Line Regulation
W—60 Watt output
WW—8 amp output

NOTES:

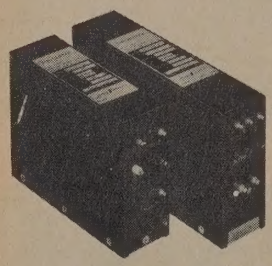
1. Any voltage in the range from 3 to 500 VDC is available.
2. Units for 12 VDC operation specify mod. EE (11-14 VDC input). $35.00
3. For inputs from 18-135 VDC specify mod. letter "E" and input voltage (min-max.). Price $35.00
4. See bulletin SZU for details & price

Nominal Output (1) Voltage (VDC	Output Current (Amps)	Model	Case Size (See Table)	Price 1 pc.
3	5.0	SHU-3	A	$195
5	5.0	SHU-5	A	195
5	8.0	SHU-5WW	A	265
6.3	5.0	SHU-6.3	A	195
10	4.0	SHU-10	A	195
24	1.6	SHU-24	A	195
30	1.3	SHU-30	A	195
50	0.8	SHU-50	A	195
100	0.4	SHU-100	A	200
250	0.16	SHU-250	A	200
300	0.13	SHU-300	A	200
500	0.080	SHU-500	A	215
750	0.053	SHU-750	A	215
1000	0.040	SHU-1000	A	230
1500	0.026	SHU-1500	A	260
2000	0.020	SHU-2000	A	305
2500	0.016	SHU-2500	A	330
3000	0.013	SHU-3000	A	345
3500	0.011	SHU-3500	A	360
4000	0.010	SHU-4000	A	375
5000 5	0.008 2.0	SHU-5000	A	390
+15 −15 5	.5 .5 3.0	SHU-30(CT)/.5-5/2-25	A	275
+15 −15 +180	.3 .3 .03	SHU-180/.03-30(CT)/.3-5/2-25	A	330

HOW TO ORDER:
Specify Model No. - Nominal Output Voltage (VDC). EXAMPLE: SHU-30CT will deliver +15 & −15 VDC at 1.3A each. $30.00

DC-DC CONVERTER

28 VDC TO SINGLE OR MULTIPLE DC OUTPUTS



FEATURES

- Tight Regulation
- Miniature Size
- Short Circuit Protected
- "Crowbar" Overvoltage Option
- Isolated Output

SPECIFICATIONS

Input: 26 to 30 VDC
Outputs: Up to three (3) isolated outputs 3 VDC to 200 VDC
Regulation: Line: .01% +1 MV
Load: (NL-FL) .03% +3 MV
Ripple: .2% or 5 MV
Temp. Coefficient: .01%/°C
Operating Temp.: −10° to +85°C at Case
Overvoltage Protection (Modification "V")
120 ±10% of nominal output voltage

MODIFICATIONS (See Bulletin SZV for Details)

A—External Voltage Adjustment
G—Flexible Leads
V—"Crowbar" Overvoltage (set at 120 ±10% of nominal output voltage)

HOW TO ORDER:

1. **Standard units:** Use Model Number listed
2. **Overvoltage Protection:** Add V to P/N after each output voltage to be protected - $35/output
3. **Special Units:** Specify STB (1 output), STG (2 outputs), or STL (3 outputs) followed by output voltage/current (AMPS) for all outputs. EXAMPLE: STL-24/.50-14V/.50-5/3. Delivers 24 VDC @ 50 MA, 14 VDC @ 50 MA and 5 VDC @ 3 amps. Overvoltage protection is provided on the 14 VDC output.

Nominal Output Voltage (VDC	Output Current (Amps)	Model	Case Size (See Table)	Price 1 pc.
5	7	STB-5/7	B	$220
28	1.20	STB-28/1.20	B	220
180	.2	STB-180/.2	B	245
15 -15	1 1	STG-15/1-15/1	C	270
28 5	1 1	STG-28/1-5/1	C	270
180 5	.10 3	STG-180/.10-5/3	C	295
15 -15 5	.50 .50 4	STL-15/.50-15/.50-5/4	C	320
24 14 5	.50 .50 3	STL-24/.50-14/.50-5/3	C	320
180 28 5	.05 .50 2	STL-180/.05-28/.50-5/2	C	345

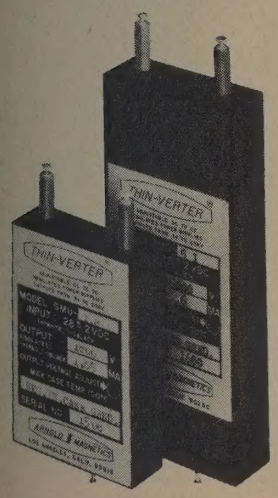
ARNOLD MAGNETICS

ARNOLD MAGNETICS CORPORATION

P.O. Box K • Culver City, California 90230
Phone: (213) 870-7014 • TWX 910-343-6468

DC-DC CONVERTER—3 WATT

28 VDC TO SINGLE OR DUAL D.C. OUTPUTS



FEATURES

- Sub-miniature Size & Weight (3 watts in 3.3 Cu. In.)
- Adjustable Output
- Short Circuit, Transient & Polarity Reversal
- High Reliability — Hermetically Sealed
- 15 Standard Modifications Available
- Floating Output
- Closely Regulated
- Meets Mil-E-5272C
- Delivery Stock to 4 weeks

SPECIFICATIONS

Input: 26-30 VDC
Line Regulation: .3% (26-30 VDC E_{in})
Load Regulation: 1-4% (½ to F.L. depends on output voltage)
Output Adjustment Range +5% −10%
Ripple: 0.3% (RMS)
Temperature: −55°C to +100°C at surface of unit
Vibration: 25G 0-200 CPS
Shock: 100G
Environment: Designed to meet MIL-5272C

MODIFICATIONS (See Bulletin SZV for Details)

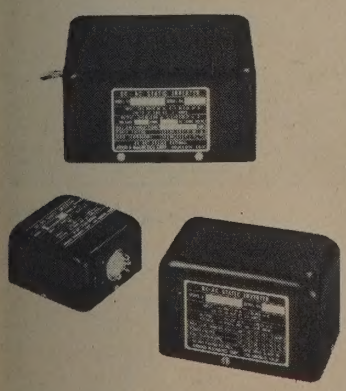
A—Remote E_{out} Adjust
CT—Center Tapped Outputs
D—Adjust Pot on Side
E—Input Voltage Alteration
F—Additional AC Outputs
I—RFI qualified (Case Size Q)
P—Programmable Output
S—Short Terminals (⅜ inch)
Z—Broader Adjustment Range

Output VDC	Output MA	Model	Case Size (See Table)	Price 1 pc.
2	750	SMU-.002	M	$200
3	750	SMU-.003	M	200
6	500	SMU-.006	M	190
12	250	SMU-.012	M	185
28	108	SMU-.028	M	180
−14 +14	108	SMU-.028CT	M	210
100	30	SMU-.1	M	180
150	20	SMU-.15	M	180
300	10	SMU-.3	M	190
500	6.0	SMU-.5	M	195
750	4.0	SMU-.75	M	200
1000	3.0	SMU-1	M	245
1500	2.0	SMU-1.5	M	250
2000	1.5	SMU-2	M	260
2500	1.2	SMU-2.5	M	270
3000	1.0	SMU-3	M	330
4000	0.75	SMU-4	M	370
5000	0.6	SMU-5	M	420
6.3 VRMS	500	SMV-.0063	M	190
1000 6.3 AC	1.5 200	SMU-1F	M	270
2000 6.3 AC	0.7 200	SMU-2F	M	285

HOW TO ORDER:
Specify model no. - Nominal Output voltage in KVDC.
EXAMPLE: SMU-1.5D will deliver 1500 VDC at 2 ma with adjust pot on side of unit.
Delivery: Stock to 4 weeks ARO

DC-SINE WAVE INVERTER

28 VDC TO 400 HZ SINE WAVE OUTPUT



FEATURES

- Miniature Size
- Closely Regulated Output Voltage
- Low Harmonic Distortion
- Meets MIL-E-5272 & MIL-STD-709A
- Closely Regulated output frequency
- Generates NO RFI-EMI

SPECIFICATIONS

Input: 24-30 VDC or 10-14 VDC for SKB & SKD
Output: Voltage: 28 or 115 VRMS, Isolated fro, case and input. (Other voltages 6-440 VRMS available.)
Frequency: 400 Hz (Other frequencies 360 to 10 KHZ available.)
Wave Shape: Sine Wave with maximum distortion of 4%
Regulation: Output Voltage: ±.5% line, ±2% load
Output Frequency: ±.3% line, ±.2% load
Temp. Coefficient: ±.05%/°C

Input (VDC)	Output (VRMS)	Output Power (VA)	Case	Model Number	Price 1 pc.
10-14	115	20	K	SKB-12-115-400-20	$270
10-14	115	40	L	SKD-12-115-400-40	479
10-14	28	20	K	SKB-12-28-400-20	270
10-14	28	40	L	SKD-12-28-400-40	479
24-30	115	12	P	SEC-28-115-400-12	195
24-30	115	50	K	SKB-18-115-400-50	270
24-30	115	100	L	SKD-28-115-400-100	479
24-30	28	12	P	SEC-28-28-400-12	195
24-30	28	50	K	SKB-28-28-400-50	270
24-30	28	100	L	SKD-28-28-400-100	479

HOW TO ORDER:

1. **Standard Units:** Use model numbers listed.
2. **Special Units:** Specify SKB (50VA), SKD (100VA) or SEC (12VA) - Nominal Input Voltage - Output Voltage - Frequency - Output Power (VA).

EXAMPLE: SKB-26-100-800-40 operates on a nominal 26 VDC input and deliver 100 VRMS at 800 Hz with output power of 40 VA.

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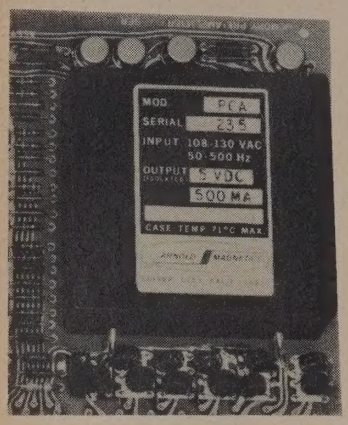
PRINTED CIRCUIT STYLE POWER SUPPLIES

115 VAC 50-500 HZ TO SINGLE OR DUAL D.C. OUTPUTS / 28 VDC TO SINGLE OR DUAL D.C. OUTPUTS / 5 VDC BUSS TO SINGLE OR DUAL D.C. OUTP



FEATURES

- Hermetically sealed steel case
- Flexible Lead Spacing
- Small size and weight
- Tight Regulation

SPECIFICATIONS

Input Range: PCA: 105 to 125 VAC 50 to 500 Hz
PCD: 4.9 to 5.1 VDC — PCE: 25 to 31 VDC

Outputs: Set to ±2% of nominal. Other output voltages available.

Regulation: Line: .01% +1 MV
Load: .03% +3 MV (NL-FL)

Ripple: .1% or 1 MV

Temp. Coefficient: .01%/°C

Operative Temp.: −10° to +85°C at case

Input	Nominal Output Voltage (VDC)	Output Current (Amps)	Model	Case Size (See Table)	Pr 1
115 VAC	5	.500	PCA-5/500	0	$
28 VDC	5	.500	PCE-5/500	N	1
115 VAC	+15 −15	.100 .100	PCA-30CT/100	0	
28 VDC	+15 −15	.125 .125	PCA-30CT/125	N	1
5 VDC	+15 −15	.050 .050	PCD-30CT/50	N	1
115 VAC	−14 −28	.040 .060	PCA-28/60-14/60	0	

HOW TO ORDER:

1. **Standard Units:** Use Model numbers listed
2. **Special Units:** Specify PCA (115 VAC input), PCD (5 VDC input) or PCE (28 VDC input followed by output voltage/output current (MA) for all outputs.

CASE SIZES FOR POWER CONVERTERS

(TABLI

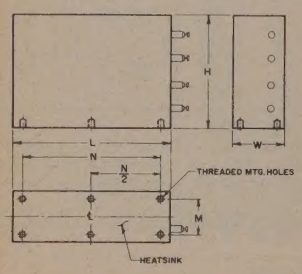


FIG. 1

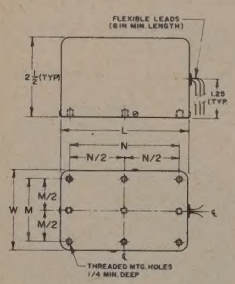


FIG. 2

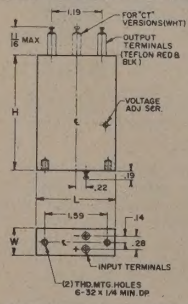


FIG. 3

Case Size	W (width)	H (height)	L (length)	M	Mounting Holes N	Mounting Holes Number	Size	Fig.	Wei (o
A	1⅝	3⅝	3½	1.125	2.750	4	6-32 NC ¼" Min	1	2
B	1⅝	3⅝	5	1.125	4.250	4	6-32 NC ¼" Min	1	3
C	1⅝	3⅝	7	1.125	5.500	6	6-32 NC ¼" Min	1	5
D	1⅝	3⅝	10½	1.125	9.000	6	6-32 NC ¼" Min	1	8
E	2⅛	4½	5	1.625	4.250	4	8-32 NC ¼" Min	1	5
F	2⅛	4½	7	1.625	5.500	6	8-32 NC ¼" Min	1	7
G	2⅛	4½	10	1.625	8.500	6	8-32 NC ¼" Min	1	10
K	2½	2½	4	2.000	3.500	6	6-32 NC ¼" Min	2	2
L	4	2½	5	3.42	4.420	6	6-32 NC ¼" Min	2	5
M	21/32	2¾	1⅞		1.59	2	6-32 NC ¼" Min	3	3
N	2½	.7	2½	2.19	2.19	2	6-32 NC ¼" Min	4	
O	2½	.9	2½	2.19	2.19	2	6-32 NC ¼" Min	4	1
P	2½	1⅜	2½		1.150	2	6-32 NC ¼" Min	5	1
Q	¾	4 9/16	1 15/16		1.59	2	6-32 NC ¼" Min	3	

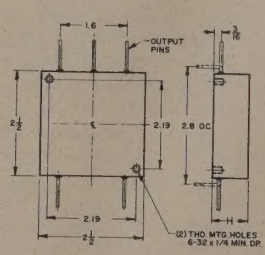


FIG. 4

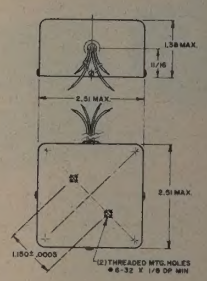


FIG.

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MINIATURE POWER TRANSFORMERS

Des	Max. Power Watts	Size L W H	Max. Output Voltage	Max. No. of Terminals	Weight (Oz.)	Outline Fig.
T	1.0	1 1/16 O.D. ½	100	8	.5	10
T	20	1⅝ O.D. 1⅛	1000	8	4	10
T	50	2 5/16 x 1 x 2⅞	1000	10	13	11
T	120	2¼ x 1 3/16 x 3	1750	10	15	11
T	235	2½ x 1½ x 3⅛	1750	10	23	11
T	335	3 x 1½ x 4	1750	10	38	11
T	160	2.4 x 2 x 2	3000	14	22	12
T	100	2.4 x 1.7 x 1.7	3000	14	11	12
T	32	1.8 x 1.4 x 1.4	2000	10	8	12
T	21	1.5 x 1.3 x 1.2	2000	10	4.5	12
T	8	1.1 x 1.2 x .9	850	8	2.0	12
T	4.6	1.1 x .9 x .9	370	8	1.2	12

put: 115V 400 Cycles 1 phase
emp.: 55°C to 100°C
nvironment: Encapsulated to meet MIL-E-5272D or MIL-T-27A
utput: Up to three windings

OW TO ORDER:
XAMPLE:
TBN - 115 - 26/3.8 - 5/3 - FE
Series No. | Primary VRMS | Secondary #1 VRMS/AMPS | Secondary #2 VRMS/AMPS | Terminations

FE—Flattened & Pierced Pins
HS—Hooked Pins
SE—Straight Pins
LS—Flexible Leads

MINIATURE INDUCTORS

Series	Inductance (MH)	Max. "Q"	Max. "Q" Freq. (KC)	Size (See Fig. 10) O.D. H
ITV	1 to 17000	175 to 52	15 to 1.7	1.44 x .75
ITW	1 to 17000	240 to 50	40 to 2.5	1.44 x .75
ITR	1 to 7000	145 to 55	19 to 3	1.06 x .47
ITS	.1 to 500	168 to 50	100 to 13	1.06 x .47
ITU	1 to 3000	190 to 50	40 to 5	1.06 x .47

HOW TO ORDER:
EXAMPLE: ITV - 15 - HS
Series No. | Inductance (MH) | Termination
HS - Hook Pins
SE - Straight Pins

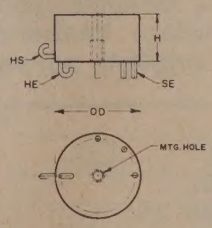


FIG. 10

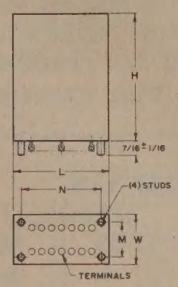


FIG. 11

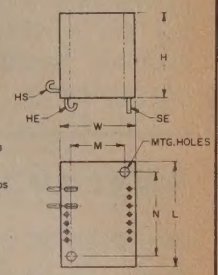
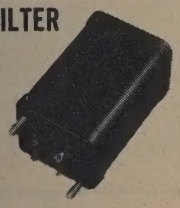


FIG. 12

LE SPIKE FILTER
MODEL FLD



Missile and aircraft applications
VOLTAGE: to 35 VDC
CURRENT: to 4 AMPS
CONSTRUCTION: Steel can with mounting studs and pin terminals on bottom
TEMPERATURE: −25°C to +85°C
ENVIRONMENT: MIL-T-27A
ATTENUATION: Of transient current & voltages
0-1.2 KC: 3 db min.
1-2.4 KC: 10 db min.
2 KC - UP: 27 db min.
WEIGHT: 8 Oz.
PRICE: 1 pc. $45.00

TOROIDAL COIL WINDER

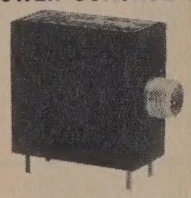
Sets up quickly . . . easy to operate . . . takes wide range of wire sizes

• Min. finished hole size: .18 in. • Max. finished toroid O.D.: 4.0 in. • Winding speed: 1500 turns/min. • Wire range: AWG 44 to AWG 26 • Dual, self-checking turns counting system • Loading (wire length) counter • Core range: 9/32" I.D. to 4" O.D. to 1½" high.

LABORATORY USE — Change wire and core size in 45 sec. • **PRODUCTION USE** — 1500 turns per minute • Insert core and load in 20 sec.

Model WTA — $890.00 includes all rings, counters and accessories • **Model WTB — $750.00** without electronic counter or extra rings.

HIGH GAIN POWER CONTROL DEVICE
MODEL ROA



FEATURES
- Power Gain of 10^{14} possible
- Combines Best Advantages of Magnetic Amplifiers and SCR's
- Zero Crossing Control for Low Noise
- Delivers Full Power Cycles
- Sums any Number of Isolated Control Signals
- Control or Interrupt low Frequency Power (60 or 400 CPS)
- 8 Amps to 100 Amps

APPLICATIONS
- Heat Controller: Thermister, Thyristor, Thermocouple or other Transducer Control. Direct Thermocouple Control
- Power Supply Protection
  Overcurrent or Undercurrent Control or AC primary — Control completely isolated
- Helix Protection for TWT
- Direct Power Control with Independent "Wired" in Programs
- Delivery: Stock to 12 weeks.

W PASS FILTER
MODEL FLU

Reduce Ripple in Converter Output
VOLTAGE: 5 to 5000 VDC
CURRENT: 8 MADC to 4 ADC
ATTENUATION: 40 DB @ 3 KHZ
For use with PHU, PHO, PHP and SHU Converters
SIZE: 1⅜" x 1⅞" x 3 5/16"
HOW TO ORDER: EXAMPLE: Specify FLU-output Voltage, FLU-30 is 30 Volt Filter
DELIVERY: Stock to 4 weeks ARO

300 WATT MINIATURE AC - DC POWER SUPPLY MODEL MAP

FEATURES
- 192 Cubic Inches (8" x 8" x 3")
- 14 pounds
- High Efficiency
- Reliable Self Compensating Circuitry
- Regulated Output

SPECIFICATIONS
- Input: 115 VAC 47 - 500 Hz
- Output: 5 VDC @ 60 amps to 1000 VDC @ .30 amp.
- Regulation: 2%

Delivery: Custom designed to satisfy customer needs

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Phone: (213) 870-7014 • TWX 910-343-6468

astro-metrix corporation

125 WEST PROVIDENCIA AVENUE, BURBANK, CALIFORNI
TELEPHONES (213) 849-4759, 842-0933

CUSTOM POWER SUPPLIES DESIGNED & BUILT TO YOUR SPECIFICAT

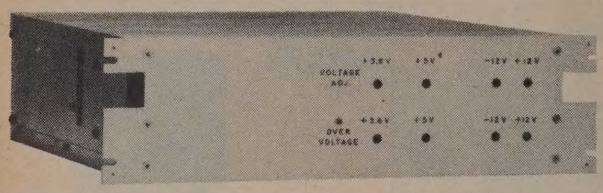
Astro-Metrix Corporation, division of J.K.F. Industries, has the complete in-house capabilities for design and production of custom and O.E.M. system power supplies. Our entire DC power supply capability is directed toward filling the **volume** requirements of the original equipment manufacturer. We are currently manufacturing computer power supplies based on **constant voltage transformer** pre-regulators, **high frequency switching** pre-regulators, **phase controlled SCR regulators** as w standard transformer input. Extensive use of grated circuits reduce circuit complexity. Wi in depth experience available at Astro-Metri poration the **most ideal** fundamental design c applied in manufacturing, resulting in low cos high reliability.

Typical multiple output O.E.M. power supplie

MODEL AMC-M-338

SPECIFICATIONS

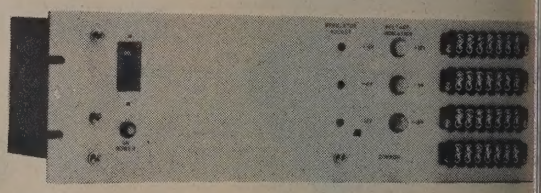
Input: 105-125 VAC 47-65 CPS
Output: 5v - 13a
+12v - 6a
−12v - 4a
+ 6v - 2a
+12 volt sequence by computer logic
Regulation: .1%
Ripple: 10mV
Size: 5" x 19" x 20"
Price: $530.00 - 100 up



MODEL AMC-M-270

SPECIFICATIONS

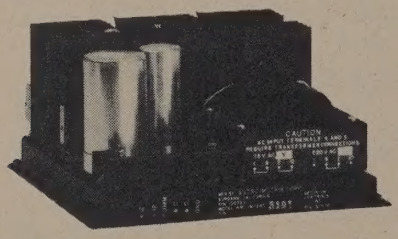
Input: 105-125 VAC 47-470 CPS
Output: +18V @ 3.5a
+12V @ 1a
− 6V @ 1.5a
Regulation line and load:
Ripple: 10mV P-P
Price: $175.00 Production Quantities



MODEL S-1070

SPECIFICATIONS

Input: 105-125 VAC 47-470 CPS
Output: +12V @ 6 amp
Regulation line and load: .1%
Ripple: 10mV P-P
Price: $165.00 Production Quantities



MODEL AMC-VA-125-30

SPECIFICATIONS

Input: 0-125V dc
Regulation: ±10%
Ripple: 1%
Current: 0-30 Amps dc
Price: $725.00 ea

MODEL AMCRC-36-200

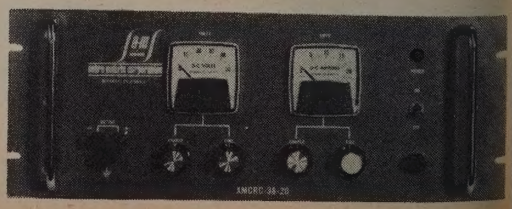
SPECIFICATIONS

Input: 220/440 VAC
Output: 0-36V dc
0-200 Amps
Regulation line and load: .1%
Ripple: .1%
Output impedance: .005 ohms
Price: $3,950.00 ea

MODEL AMCRC-36-20

SPECIFICATIONS

Input: 105-125V dc
Output: (Volts) 0-36V dc
(Amps) 0-30
Regulation: .005% line
.005% load
Ripple: 1mV RMS
Output Impedance: .005 oh
Programmable: 1,000 ohm/
Ambient: 0-70°C



OLID STATE SINE-WAVE OUTPUT FREQUENCY CONVERTERS / 400 CPS and 60 CPS

- **All Silicon • Short-Circuit Proof • MIL-Type Construction**
- **High Efficiency • Low Cost • Compact • Light Weight**
- **3 ϕ Models Have Independent Voltage Regulation/Phase.**

s NEW type of frequency converter was researched and veloped by ASTRO-METRIX CORPORATION to meet the er growing market for smaller, lower cost A.C. power sup- es. The industry-praised design employs a high-efficiency itching regulator coupled with an equally high-efficiency fer network. By providing transformer isolation in the her frequency output end of the power supply, the need for a heavy weight and bulky (50-60 cps) input power transformer has been eliminated, which also reduces much of the heat generated inside the unit. The magnetics are also "Class F" for reliability and overload capability, and can be ordered to meet MIL-T-27 if desired.

The standard Models come with input circuit-breaker, pilot lamp and output terminals on the front 19" Relay panel; the rear panel is blank except for 6 ft. line cord. The list of OPTIONS (below) enables you to CUSTOMIZE a unit to your individual needs simply by adding the appropriate suffix letters after the Model Number.

PECIFICATIONS COMMON TO ALL STANDARD MODEL FREQUENCY CONVERTERS

ut: 105 to 125 VAC, 47 to 65 CPS
age Regulation: Less than ±1.0%
tage Modulation: Less than ±0.5%
quency Stability: ±0.25% (See Options)
overy Time: 25 msec
tput: 105 to 125 VAC, 400 CPS (see Option)
tortion: Less than 3.0%
bient Temperature: 0°C to +55°C (see Option)
miconductors: Silicon
wer Factor: ±0.7%

AVAILABLE OPTIONS

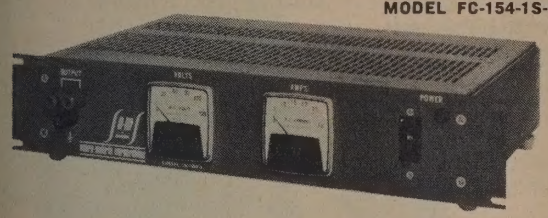
Select from the chart below the desired Model Number to meet your needs by Phase and VA rating. Then select from the list of OPTIONS the suffix letter(s) that corresponds to the option(s) needed to customize the standard model to your requirements and add them to the Model Number. EXAMPLE: FC-104-1S-V-H would be a 100 VA, 1ϕ unit with a volt meter and handles added.

Add SUFFIX

- **A** Adjustable output voltage — 0 to 130 VAC at full-rating. Not available on 3 ϕ or low distortion models.
- **C** Current Meter ±3% accuracy.
- **D** Distortion less than 0.5%.
- **F** Frequency stability of 0.01%.
- **H** Handles on front panel.
- **J** Voltage adjust ±10% control on rear panel.
- **K** Frequency adjust ±5% control on rear panel.
- **M** Frequency meter 400 CPS ±20, Accuracy ±0.1%.
- **P** 47 to 480 CPS operation.
- **R** Rear panel terminals for Output.
- **S** Synchronization terminals on rear panel to sync two identical units.
- **T** Temperature range from −55°C to +71°C.
- **V** Voltmeter ±3% accuracy.

Other output frequencies and voltages are available on request. Please contact the factory or our representatives to obtain other modifications not listed above.

MODEL FC-154-1S-M



Model Number	Output VA	Width	Height (Inches)	Depth	Appr. Weight
1-Phase					
FC-104-1S	100	19	5¼	18	25
FC-154-1S	150	19	5¼	18	25
FC-254-1S	250	19	5¼	18	30
FC-454-1S	450	19	10½	22	45
3-Phase					
FC-204-3S	200	19	7	18	50
FC-304-3S	300	19	7	18	50
FC-454-3S	450	19	10½	22	60
FC-754-3S	750	19	15¾	22	90

OLID STATE SINE-WAVE UTPUT FREQUENCY ONVERTERS / 60 CPS

ECIFICATIONS COMMON TO ALL STANDARD DEL FREQUENCY CONVERTERS

ut: 115/200 VAC, 400 CPS, 3 Phase, Steady State per MIL-STD-704.
ltage Regulation: ±2%.
equency Stability: ±0.5%.
otection: Short Circuit, Overvoltage, Undervoltage.
iciency: 85%.
tput: 105/125 VAC, 60 CPS.
tortion: 5%.
bient Temperature: 0°C to 55°C.
miconductors: Silicon.
wer Factor: ±0.7.
l: Designed to MIL-I-6181D.

Model Number	Output VA	W	H	D	Appr. Weight
1-PHASE					
CC-506-1S	500 VA	19"	5¼"	18"	30
CC-1006-1S	1 KVA	19"	5¼"	18"	40
CC-2006-1S	2 KVA	19"	7"	18"	50
CC-5006-1S	5 KVA	19"	12½"	18"	90
3-PHASE					
CC-1006-3S	1 KVA	19"	7"	14"	60
CC-2006-3S	2 KVA	19"	10¼"	16"	80
CC-5006-3S	5 KVA	19"	12¼"	18"	100
CC-10006-3S	10 KVA	19"	21"	20"	180

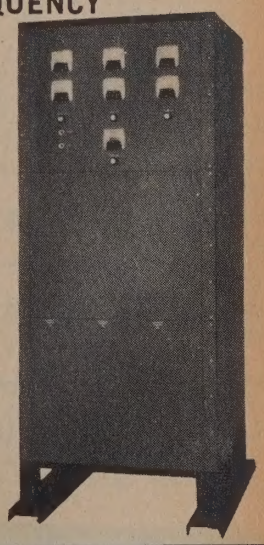
ALL SILICON SINE-WAVE OUTPUT FREQUENCY CONVERTERS / 400 CPS

SPECIFICATIONS COMMON TO ALL STANDARD MODEL FREQUENCY CONVERTERS

Input: 220/440 ±10% VAC, 60 CPS.
Voltage Regulation: Less than ±1.0%.
Voltage Modulation: Less than ±0.5%.
Frequency Stability: ±0.25% (See Options).
Recovery Time: 25 msec.
Output: 105 to 125 VAC, 400 CPS (See Option).
Distortion: Less than 3.0%.
Ambient Temperature: 0°C to +55°C Forced Air Cooled.
Semiconductors: Silicon.
Power Factor: ±0.7%.

Model Number	Output VA	W	H	D	Appr. Weight
1-PHASE					
FC-1004-1S	1 KVA	19	14	22	120
FC-2004-1S	2 KVA	19	21	22	225
FC-5004-1S	5 KVA	19	31	22	400
FC-10004-1S	10 KVA	30	48	30	600
FC-20004-1S	20 KVA	36	68	32	900
3-PHASE					
FC-1004-3S	1 KVA	19	14	22	150
FC-2004-3S	2 KVA	19	21	22	300
FC-5004-3S	5 KVA	19	48	24	500
FC-10004-3S	10 KVA	30	48	30	750
FC-20004-3S	20 KVA	36	68	32	1000

POWER CONVERSION using (Silicon Controlled Rectifier)



ILITARIZED FREQUENCY CHANGERS

— Astro-Metrix Corporation Frequency Converters are designed to con- ert Mil 400 CPS 3 phase power to 60 CPS single phase at high efficiency thru the use of silicon semiconductors operating n switching mode.

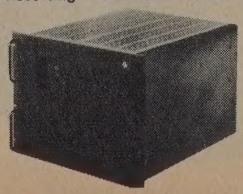
he converters provide power for **teletypewriters, test equipment, communication equipment** and various other ground support quipment.

PECIFICATIONS:

put Voltage: 115/200 VAC ±13%.
put Configuration: Three Phase, 4 Wire Wye.
put Frequency: 360 CPS, 440 CPS.
uptut Voltage: 115 Volts RMS.
utput Frequency: 60 CPS ±1%.
oltage Regulation: ±3 Volts for 0 to 100%. Change in load and for ±13% change in Input Line Voltage.
Power Factor: 0.75 Lagging to Unity. No Load to Full Load.
Distortion: 5% Maximum Distortion for All Conditions of Line, Load and Temperature.
Starting Time: 3 Seconds Maximum.
Common Connection: Input and Output Completely Isolated.
Overload: Overcurrent protection in Both Input and Output Lines.
Efficiency: 82% Minimum at Rated Load.
RFI: Radiated MIL-STD-826 Class G. Conducted MIL-STD-826 Class G.
Circuit Breaker: Self Contained Magnetic Circuit Breaker in Input Lines.
Temperature Range: STD −30°C to +71°C. OPT −50°C to +71°C.
Time Indicator (Optional): Elapsed Time Indicator Non-Resetting 9999.9 Hours Numerical Form.

INDIVIDUAL MODEL SPECIFICATION

	MC-400-1S	MC-750-1S	MC-1500-1S	MC-3500-1S	MC-8000-1S
Output Power	400VA	750VA	1.5 KVA	3.5 KVA	8.0 KVA
Weight	25 lbs	60 lbs	70 lbs	87 lbs	225 lbs
Size	7.796 W x 4.965 H x 19.398 D	10.125 W x 7.625 H x 19.5625 D	19.00 W x 10.50 H x 12.00 D	8.99 W x 12.12 H x 21.89 D	20.00 W x 12.12 H x 23.50 D



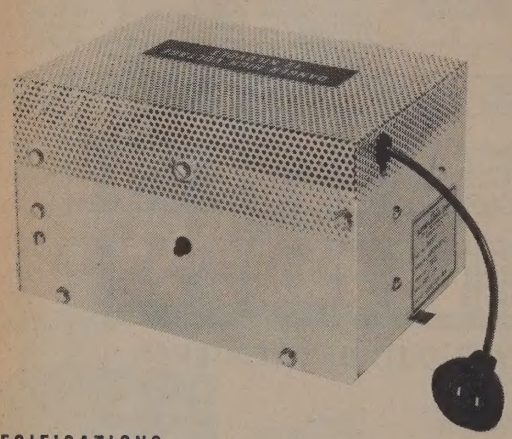
ther sizes available upon request.

astro-metrix corporation

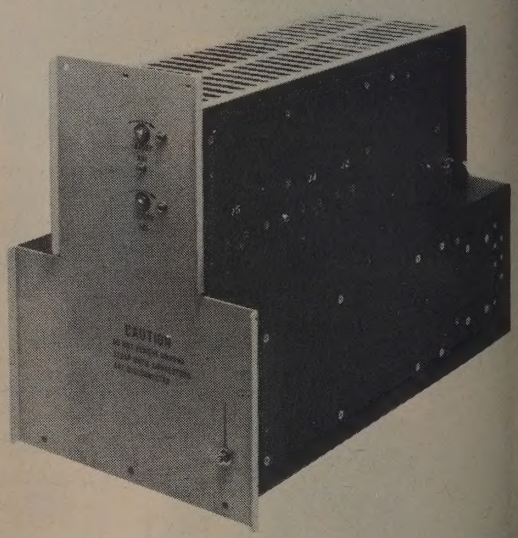
125 WEST PROVIDENCIA AVENUE, BURBANK, CALIFORNIA
TELEPHONES (213) 849-4759, 842-0933

HIGH VOLTAGE - SOLID STATE - POWER CONVERSION

Astro-Metrix Corporation has developed unique high frequency switching circuitry which combined with our in-house high voltage transformer capability results in truly outstanding high voltage power supplies for **CRTs** display and monoscope character generator display tubes. The power supplies can withstand repeated HV arcing and short circuiting without damage. We have produced thousand regulated HV dc power supplies for the industr the last two years resulting in over 1,000,000 o ating hours. These proven designs can be ada to your requirement usually with a minimum change.



Similar circuitry is being applied to airborne HC power plies to be used in radar display for both commercial military aircraft.



SPECIFICATIONS

Typical Unit: HIGH VOLTAGE

Input: 25V dc
Output #1: −1800V 1.5mA
Regulation Line and Load: .1%
Ripple: .01%

Output #2: +12 KV
Regulation Line and Load: .5%
Ripple: .1%

Output #3: +400V 5mA
Regulation: .1%
Ripple: .1%

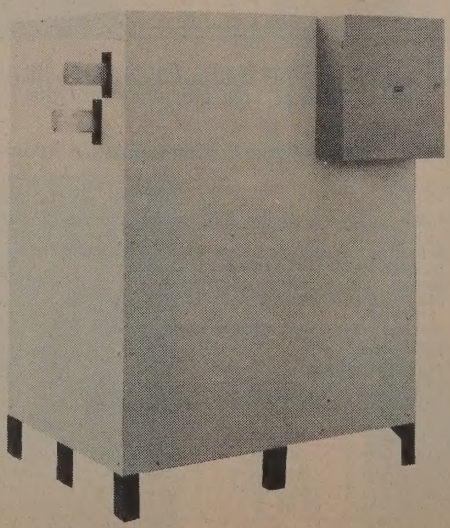
Output #4: +1500 to 2000V dc
Adjustable for focus
10uA output

Price: 500 up less than $150.00

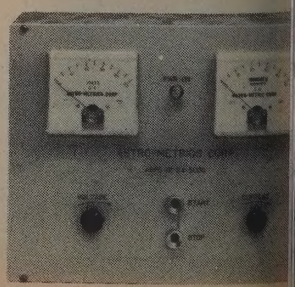
SPECIAL HIGH CURRENT POWER SUPPLIES

30,000 Amps up to 36Vdc. Astro-Metrix poration is currently producing comme and industrial regulated power conve units with output to 30,000 Amps at 36V dc. This equipment is used in anod precious metal plating, chemical milling hard chrome plating. All units are avai both current and voltage regulated to Regulation is by either saturable reactor netic amplifier or silicon controlled rec

MODEL AMCRC 36-200B



MODEL ARPS 12-24-5000

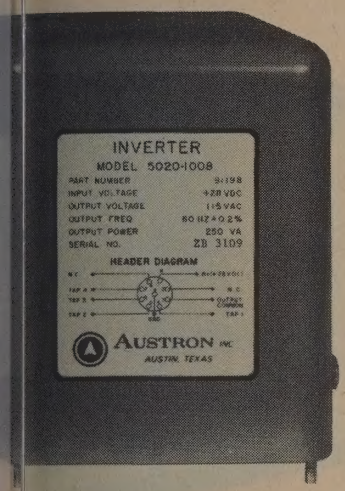


CONTROL UNIT

AUSTRON

inverter / converter power supplies

ies 5020 square-wave inverters



DESCRIPTION

The Series 5020 is a frequency controlled square-wave inverter which has been designed for applications requiring small size and high efficiency. Inherent reliability has been designed into the unit under all load and line conditions. The performance advantages of the 5020 Series are superior to any inverter of this type and size on the market.

The all-silicon circuit utilizes a fixed or adjustable internal clock for controlling the output frequency. The stability of the clock can be selected from ±1% to ±.005%.

Special design steps were taken to insure that the unit operates well below secondary breakdown conditions. Also zener protection is included to guarantee against adverse load conditions.

SQUARE WAVE INVERTER SERIES 5020

Model	1031	1040	1024	1008	1032	1027
Output Power (VA)**	25	50	120	250	500	750
Output Voltage (rms)	*115Vac Nominal					
Input Voltage DC	+22 to 32 V					
Output Taps	Four Taps, 10% Steps					
Output Frequency	*60 Hz					
Temperature Range	−20°C to +65°C					
Efficiency	>80%		>90%			
Size (Inches)	5.06x4x3.5	5.06x4.4x3.9	5x5.34x4.78	6.16x5.34x4.78	8x10x5	8x10x6
Weight (Lbs.)	<2	<4	<9	<11	<25	<40
Fuse Requirements	2A	4A	8A	12A	25A	35A
Frequency Stability	*±1%					
Cost	$145	$200	$300	$400	$700	$1000
Options	01-$5.00 02-$10.00 03-$10.00		04-$25.00 05-$50.00 06-$80.00	07-$100.00 08-$30.00		

**At 28Vdc (Models 1031 and 1040 are not available in Option 06 & 07)

Prices and Technical Specifications subject to change without notice.

*OPTIONS AVAILABLE:

01 220Vac Output
02 400 Hz Output Frequency
03 ±0.2% Frequency Stability
04 ±.05% Frequency Stability
05 ±.02% Frequency Stability
06 ±.01% Frequency Stability
07 ±.005% Frequency Stability
08 50 Hz Output Frequency

VNTAGES

- alsize
- utput Impedance
- fficiency
- eliability
- andby Current
- emperature
- Scon Design
- e Voltage Protection
- ent Protection
- ife for Battery Run-Down

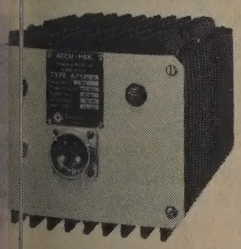
odel 30

Unregulated 55-70 cps or 340-460 cps AC input from shipboard, diesel generator, REA lines, etc., is regulated by the AUSTRON Model 30 Power Module to either 60 or 400 cps (or any required frequency) with an output frequency tolerance of as much as 5×10^{-7} and output power of 250 va.

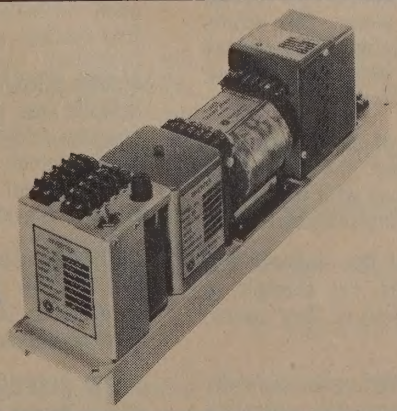
AUSTRON Model 30 Modules are used as frequency controlled power sources for all types of synchronous motors, instrumentation, tape recorders, remote clocks, depth recorders, etc.

AUSTRON crystal oscillator frequency standards are combined with the latest silicon solid state circuitry to achieve precise frequency and voltage stability at useful power loads.

odel APS-14AB



model 5020-1020



AUSTRON is active in the following areas of POWER SUPPLIES:

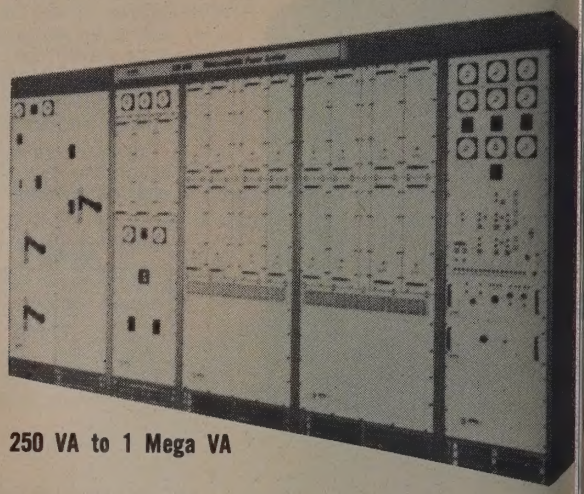
- MODULAR DC-DC CONVERTERS — microwatts to 750 watts.
- MODULAR SWITCHING MODE REGULATOR — integrated circuit power regulator.
- MODULAR DC-AC INVERTERS — 25VA to 750VA.
- STANDBY POWER SYSTEMS — battery charger and inverter system.

Austron power supplies feature all silicon semiconductors. Extremely high efficiency allows for high temperature operation, permits full MIL environmental certification.

AUSTRON INC. • 10214 NORTH INTERREGIONAL HIGHWAY, AUSTON, TEXAS 78753 • TELEPHONE (512) 836-3523

AVTEL

UPS UNINTERRUPTIBLE POWER SYSTEMS



250 VA to 1 Mega VA

CONDITIONED POWER

AVTEL's Uninterruptible Power Systems (UPS) offer the maximum in reliability and efficiency for applications where even a momentary power failure or disturbance cannot be tolerated. High mean-time-between-failure (MTBF) coupled with modular construction for low mean-time-to-repair (MTTR) make Avtel UPS the most practical systems for continuous on-line operation.

AVTEL UPS ARE DESIGNED TO PROVIDE THESE OUTSTANDING ADVANTAGES:

TRUE SINEWAVE OUTPUT: The maximum harmonic distortion under the worst combination of conditions is less than 2%. Under normal operating conditions, less than 1.5% is typical.

TIGHT FREQUENCY CONTROL: The output frequency is completely unaffected by load and line variations. If desired, the output frequency can be phase-locked to the commercial line or other reference source. 0.5% stability is standard.

MINIMUM MAINTENANCE: Modular construction throughout permits quick access to and exchange of any component. A MTTR of less than 30 minutes is typical. Cleaning the air filter is the only required preventive maintenance, other than battery watering. In non-redundant systems, the by-pass switch is used to supply power to the critical load directly from the commercial lines during maintenance.

LOW COST OF OWNERSHIP: Avtel's low maintenance, high efficiency and trouble-free operation yield substantial savings over other approaches to uninterruptible power. This advantage becomes increasingly significant with time, and savings of over 50 percent overall in ten years ownership are not improbable.

SILENT OPERATION: Unlike rotary systems which produce sub-substantial noise and vibration, these compact and silent units can be installed in close proximity to the load with which they are associated thereby avoiding expensive installations.

HIGH POWER DENSITY: These systems are the smallest and lightest yet offered in these power ranges. For example, a 125 KVA system occupies only 35 square feet of floor space, exclusive of batteries.

UNPRECEDENTED EFFICIENCY: Operating efficiencies normally exceed 85%. This low dissipation allows laboratory operation without special cooling considerations.

COMPLETE INSTRUMENTATION: Meters, status indicators, other instruments necessary for the measurement of all c cal parameters are provided as desired.

PHASE BALANCE: Poly-phase systems supply essentially anced outputs despite substantial unbalance in phase loac

IMPERVIOUS TO OVERLOADS: These units cannot be dama by overloads or short circuits. Normal output is automati reinstated upon removal of the overload.

RFI SUPPRESSION: Careful and effective filtration of both input and output lines, together with ample shielding a RFI attenuation far superior to other uninterruptible syst

OPERATING SIMPLICITY: This equipment can be operated s by non-technical personnel. Logically grouped meters, con and status-indicating lamps make the operation of this e ment virtually self-explanatory. Fully automatic, instru free systems are also offered.

ALARM CIRCUITRY: Visual and audible alarms are provide indicate loss of incoming power and switchover to secon sources. Additional alarms pinpoint failures in the UPS i in the remote possibility that they might occur. A sepa alarm system indicates battery bank status including c tions of the atmosphere in the battery room.

CHOICE OF OUTPUTS: Avtel's UPS can be ordered in stan 460 V, 60 Hz models or 50 Hz versions at voltage levels f in overseas installations. A complete line of 400 Hz m is also available.

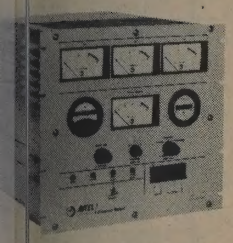
RAPID RESPONSE TIME: Regulation response time is typi faster than 9 ms at nominal line conditions for a 100% load change.

AVTEL CORPORATION

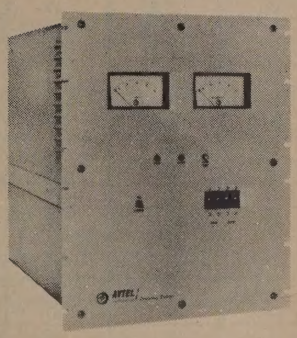
DIVISION OF AIRTRONICS, INC. • 1130 EAST CYPRESS STREET • COVINA, CALIFORNIA 91722 • PHONE (213) 331-0661 • TWX (910) 58

IIGH POWER SOLID STATE FREQUENCY CHANGERS

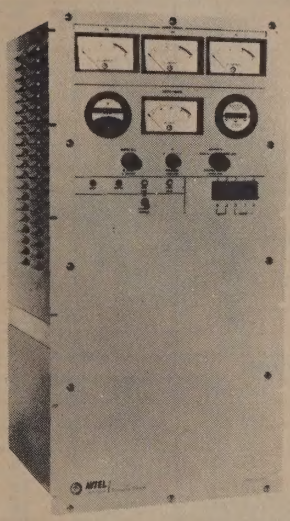
AVTEL



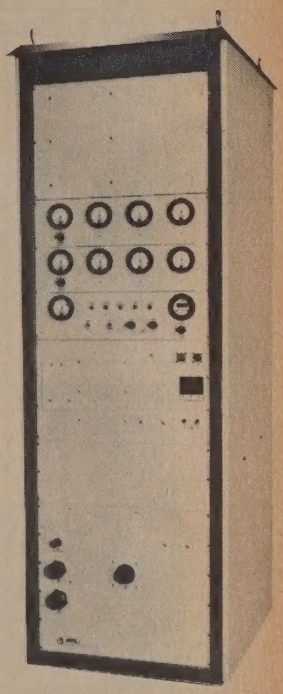
073
K, 400 Hz, 3 PHASE



CR 056-1
5 KVA, 60 Hz, 1 PHASE



CR 204-3
20 KVA, 400 Hz, 3 Phase



CR 504-3
50 KVA, 400 Hz, 3 PHASE

ERIES

175 KVA*-45-65 and 400 Hz Input.
350-450, or 700-900 Hz output
uninterruptible power option available
st models.

IIER KVA SYSTEMS AVAILABLE
ARALLELING STANDARD MODELS

nt, reliable and silent in operation, these completely solid electronic systems are ideal for any application requiring AC in the KVA ranges. In this series, there are 27 standard s in ten power ratings from 2.5 KVA to 175 KVA. Three output ncy bands are available from 45 to 65, 350 to 450, and 700 0 Hz. Most frequency and power ratings are available with single or polyphase output. Unique electronic circuitry pro- complete protection from overloads or short circuits.

s highly versatile and rugged units are capable of fulfilling the ty of AC power source requirements. Twenty-nine standard s are offered to meet virtually any special or unusual require- for conditioned AC power.

R Series utilize many advanced techniques developed and d by Avtel for highly critical military and aerospace applica- The unique design of these units, coupled with Avtel's rigid y assurance and reliability program, ensures uncompromising ence to published performance criteria.

ructed with silicon semiconductors exclusively, these units are rugged and efficient. Most of the models are available with interruptible power option providing the most reliable, transient continuous source of AC power obtainable.

other options are available to meet any application.

nique design of this equipment results in an AC source which direct replacement for motor alternator sets, but with the ing superior characteristics:

- Output frequency unaffected by load.
- Low accoustical noise.
- Efficiencies over 90%.
- Instant starting.
- Sinewave output with less than 2% total harmonic distortion.
- Ease of frequency variation.
- No maintenance required.
- Light weight.
- Impervious to overloads.
- Remote sensing.
- Remote programming.

TEL CORPORATION
ON OF AIRTRONICS, INC. • 1130 EAST CYPRESS STREET • COVINA, CALIFORNIA 91722 • PHONE (213) 331-0661 • TWX (910) 584-1311

AVTEL

SOLID STATE AC POWER FOR CRITICAL APPLICATIONS

KVA	OUTPUT VOLTS	PHASES	INPUT VOLTS	RACK MOUNT DIMENSIONS HEIGHT	WIDTH	DEPTH	UNITIZED DIMENSIONS HEIGHT	WIDTH	DEPTH	WEIGHT†	MODEL
350-450 or 700-900 Hz Output with 45-65 Hz, 3-Phase Input											
2.5	120/208	3	115/200	17.5	19	21	17.25	17	21	175	CR 024
2.5	120	1	115/200	17.5	19	21	17.25	17	21	185	CR 024
5	120/208	3	115/200	17.5	19	21	17.25	17	21	190	CR 054
5	120	1	115/200	17.5	19	21	17.25	17	21	205	CR 054
7.5	120/208	3	115/200	17.5	19	21	17.25	17	21	220	CR 074
7.5	120	1	115/200	31.5	19	24	31.25	17	24	240	CR 074
10	120/208	3	115/200	31.5	10	24	60	25	30	315	CR 104
10	120	1	115/200	31.5	10	24	60	25	30	330	CR 104
15	120/208	3	115/200	31.5	10	24	60	25	30	350	CR 154
20	120/208	3	115/200	47	19	24	60	25	30	430	CR 204
37.5	120/208	3	460	—	—	—	80	29	37	2000	CR 374
50	120/208	3	460	—	—	—	80	29	37	2200	CR 504
100	440	3	460	—	—	—	84	58	37	4400	CR 100
150	440	3	460	—	—	—	84	87	37	5500	CR 150
175	440	3	460	—	—	—	84	87	37	5500	CR 175
45-65 Hz Output with 45-65 Hz, 3-Phase Input											
2.5	120/208	3	115/200	17.5	19	21	17.25	17	21	225	CR 026
2.5	120	1	115/200	17.5	19	21	17.25	17	21	245	CR 026
5	120/208	3	115/200	24.5	19	24	24.25	17	24	310	CR 056
5	120	1	115/200	24.5	19	24	24.25	17	24	355	CR 056
7.5	120/208	3	115/200	24.5	19	24	24.25	17	24	390	CR 076
7.5	240	1	115/200	24.5	19	24	24.25	17	24	435	CR 076
10	120/208	3	115/200	47	19	24	60	25	30	1100	CR 106
10	240	1	115/200	47	19	24	60	25	30	1175	CR 106
15	120/208	3	115/200	47	19	24	60	25	30	1100	CR 156
15	240	1	115/200	47	19	24	60	25	30	1175	CR 156
20	120/208	3	460	—	—	—	72	25	37	1300	CR 206
20	240	1	460	—	—	—	72	25	37	1400	CR 206
37.5	440	3	460	—	—	—	84	58	37	3000	CR 376
50	440	3	460	—	—	—	84	58	37	3700	CR 506

125 (and above) Various CR and UPS Models available. Consult the factory.

* Third digit specifies frequency, for example: CR 024-3 = 400 Hz; CR 028.3 = 800 Hz.
† Weights given are for rack mount versions when available. Options frequently affect size and weight. Please consult the factory when requiring options.

Specifications subject to change without no

INPUT

VOLTAGE: 187 to 242 for nominally 120/208 volt input units. Allows connection to 230 three wire without modification.
±10% of nominal for all other AC inputs. See Options A through G.

POWER:

Output Frequency Band	Percent of Full Load Rating
45-65 Hz	110
350-450 Hz	120
700-900 Hz	135

FREQUENCY: 45-65 Hz. See Option A, B, C & H.

OUTPUT

VOLTAGE: Adjustable. See Options I & K.
CURRENT: Adjustable. See Options J & L.
POWER RATING: Based on continuous duty.
FREQUENCY: Continuously adjustable over the entire operating band. See Options M through R.
BANDS: 45-65, 350-450, 700-900 Hz.
REGULATION:
- **Voltage:** ±1% or 0.5 V.
- **Current:** ±1% or 1 ampere.
- **Frequency:** ±0.50% for variable frequency operation. ±0.010% for fixed frequency operation.

DISTORTION: For linear loads, the output sinewave contains less than 2% total harmonic distortion. See Option U.
POWER FACTOR: 0.7 lead to 0.7 lag for full rated power. Power factor loads to 0.2 are permissible with load ratings of 50%.
PHASE BALANCE: 2% typical deviation for 50% load unbalance in any combination. 0.25% for any balanced load.
TRANSIENT RESPONSE: Typically 20 ms but may vary from 4 to 75 ms depending on model and options.

INCIDENTAL MODULATION:
- **Amplitude:** Varies 0.1 to 1% peak to peak depending on model and options.
- **Frequency:** Less than 0.05% for variable frequency operation and negligible for fixed frequency operation.

PROTECTION CIRCUITS

LOAD: Widely adjustable current limiting capability can be set to the maximum normal requirements of the load. In the even of load malfunction, the unit will become a constant current source at the set limit.
OVERLOAD: The unit cannot be damaged by any overload or short circuit of transient or indefinite duration. Finite overloads are permitted for periods inversely proportional to the magnitude of the overload. When the permissible overload limitations are exceeded, the output voltage will reduce to such value as necessary to produce the load current limit set by the current adjust control. If the load instantaneously exceeds 150 of ratings, the output voltage will reduce to zero. If the load is gradually increased, the current will limit at 125% or the set point, whichever is lower. Reduction of the load to specification limits or current control setting will automatically reinstate normal operation.
OVERHEAT: The output is interrupted by thermoswitches in the event of excessive internal temperatures. In such event, the cooling fan continues to operate and upon reduction of internal temperatures to specification limits, normal operation is automatically reinstated.
BACKUP PROTECTION: The input power line is protected by a toggle-operated magnetic circuit breaker which doubles as the primary input and power switch. In the event of electronic protection circuitry malfunction or component failure in the power system, these breakers will prevent consequential damage to the unit, its load or the input power source.

CONTROLS

INPUT: Toggle-operated circuit breakers.
OUTPUT: Toggle switch drives regulator to output condition in standby position.
VOLTAGE CONTROL: Adjusts output voltage.
CURRENT CONTROL: Adjusts output current lim
FREQUENCY CONTROL: Adjusts output frequen
FREQUENCY SELECTOR: Selects discrete frequen Options P & R only.
VOLTMETER SWITCH: Selects voltmeter circuit.
FUNCTION SWITCH: Selects operating mode. tions M thru O only.

METERS & INDICATORS

METER ACCURACY: 2% of full scale.
METER FUNCTIONS: Input/Output voltmeter. pendent ammeter for each output phase.
INDICATORS: Input power • Output power • load • Overheat • Phase sequence (3 phase u

ENVIRONMENTAL

OPERATING TEMPERATURE: 0 to 40°C, contir operation.
STORAGE TEMPERATURE: −20 to +71°C.
HUMIDITY: 0 to 95% R. H., non-condensing.
SHOCK & VIBRATION: Normal transportation handling.

ELECTROMAGNETIC INTERFERENC

Constructed in accordance with Military EM requirements.

CONSTRUCTION

Welded frame covered with easily removable structural dust covers. See Option X and Y.

OPTIONS

See last page.

PRICE

For price quotations, specify model number options.

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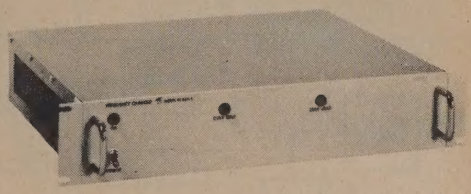
OW POWER SOLID STATE REQUENCY CHANGERS

AVTEL

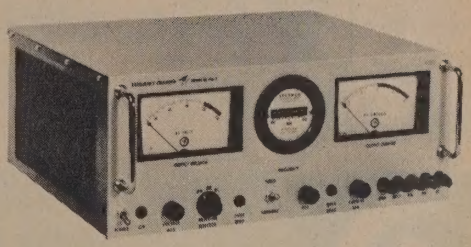
IES
2000 VA — 45 TO 450 Hz
50/60, 400, 800, OR 1600 Hz
WITH UNINTERRUPTIBLE POWER OPTION
LE ON MOST MODELS

o power Avtel TR Series Frequency Changers are all transistorized of conditioned AC power. Available in 20 standard models from to 2000 VA, the TR Series supplies output frequencies in four bands: 45-65 Hz, 350-450 Hz, 700-900 Hz, and 1500-1700 Hz. vailable as uninterruptible power systems.

que design of TR Frequency Changers ensures that output m and frequency are unaffected by changes in the load. The quiet, maintenance free, and impervious to overloads and short Avtel's TR Series Frequency Changers are the ultimate solution er load applications where well-regulated AC power is essential.



TR 154-3 (System)
1500 VA, 400 Hz, 3 PHASE



TR 104-3 (Lab)
1000 VA, 400 Hz, 3 PHASE

ICATIONS FOR STANDARD UNITS (LESS OPTIONS)

	OUTPUT		19" RACK MOUNT			
	Volts	Phases	Height	Depth	Weight	Model No.
0, 700-900, or 1500-1700 Hz Output with 115 V, 45-65 Hz, 1-Phase Input						
25	120/208	3	5.25	17	45	TR 026-3
25	120	1	5.25	17	60	TR 026-1
50	120/208	3	7.0	17	75	TR 056-3
50	120	1	7.0	17	85	TR 056-1
00	120/208	3	8.75	22	125	TR 106-3
00	120	1	8.75	22	140	TR 106-1
50	120/208	3	10.05	22	150	TR 156-3
50	120	1	10.5	22	160	TR 156-1
00	120/208	3	12.25	22	175	TR 206-3
00	120	1	12.25	22	190	TR 206-1
Hz Output with 115 V, 45-65 Hz, 1-Phase Input						
25	120/208	3	3.5	17	40	TR 024-3 *
25	120	1	3.5	17	45	TR 024-1 *
50	120/208	3	3.5	17	55	TR 054-3 *
50	120	1	3.5	17	55	TR 054-1 *
00	120/208	3	7.0	17	95	TR 104-3 *
00	120	1	7.0	17	95	TR 104-1 *
50	120/208	3	8.75	17	115	TR 154-3 *
50	120	1	8.75	17	125	TR 154-1 *
00	120/208	3	10.5	17	150	TR 204-3 *
00	120	1	10.5	17	160	TR 204-1 *

(and fourth) digit specifies frequency, for example: TR 024-3 = 400 928-3 = 800 Hz; TR 9216-3 = 1600 Hz.

The TR Series systems version is designed for continuous unattended operation. It has limited controls on the front panel (status indicators, breaker, and standby switch) with adjustments located on the rear of the unit. The laboratory version is fully metered, with frequency, voltage, and current adjustments on the front panel. This model is ideally suited for use as precision test equipment.

Specifications subject to change without notice.

PU

LTA: 115 volts ±10% is standard. ±10% is owe for Options A, E, F, G and H.
EQUNCY: 45-65 Hz. See Options A and H. 45 to 00 also available upon request.

UT UT

LTA: 120 VRMS. Lab models, 95-130 VRMS.
HRIT: 75-120% of full rating with automatic tagcurrent crossover, adjustable on lab models.
EQUNCY: ±0.5% fixed frequency is standard sy m models. Crystal controlled output with 1 % regulation at 50, 60, 400, 800, or 1600 Hz ilab. Continuously adjustable frequency over e pective band on lab models.
ND 45-65, 350-450, 700-900, 1500-1700 Hz.
GU TION:
Vo ge: ±1%.
Cu ent: ±2%.
Fr uency: ±0.5% for variable frequency, 0.01% for fixed frequency, Option Q.
ST TION: ±2% THD maximum for linear loads.
WE FACTOR: 0.7 lead to 0.7 lag.

RO ECTION

tor tic protection and recovery from overloads, or ircuits and over heating.

SYSTEM VERSION — CONTROLS AND INDICATORS

INPUT: Circuit breaker.
STANDBY: "Standby" toggle switch.
VOLTAGE CONTROL: Rear mounted screwdriver adjustment for output voltage.
CURRENT CONTROL: Rear mounted screwdriver adjustment for current limit.
FREQUENCY CONTROL: On variable frequency units only, Option AE.
INDICATORS: Front panel indicators for input power, output power, overload and overheat.

LAB VERSION — CONTROLS AND INDICATORS

INPUT AND STANDBY: Identical to system version.
INDICATORS: Same as system version.
VOLTAGE, FREQUENCY AND CURRENT CONTROLS: Front panel knobs provided.
VOLTMETER: Input/Output voltmeter.
AMMETER: Output Ammeter.
FREQUENCY METER: On variable frequency models only, Option S and T.
VOLTMETER-AMMETER SWITCH: Used to select input or output phase.

ENVIRONMENTAL

OPERATING TEMPERATURE: 0 to 50°C.
STORAGE TEMPERATURE: −20 to +71°C.
HUMIDITY: 0 to 95% R.H., non-condensing.
SHOCK AND VIBRATION: Normal transportation and handling.

ELECTROMAGNETIC INTERFERENCE

Constructed in accordance with Military EMI/RFI requirements.

CONSTRUCTION

Rack mount packaging is standard.
Connectors are rear-mounted with mating connectors provided.

OPTIONS

See last page.

PRICE

For price quotations, specify model number, options and system or lab version.

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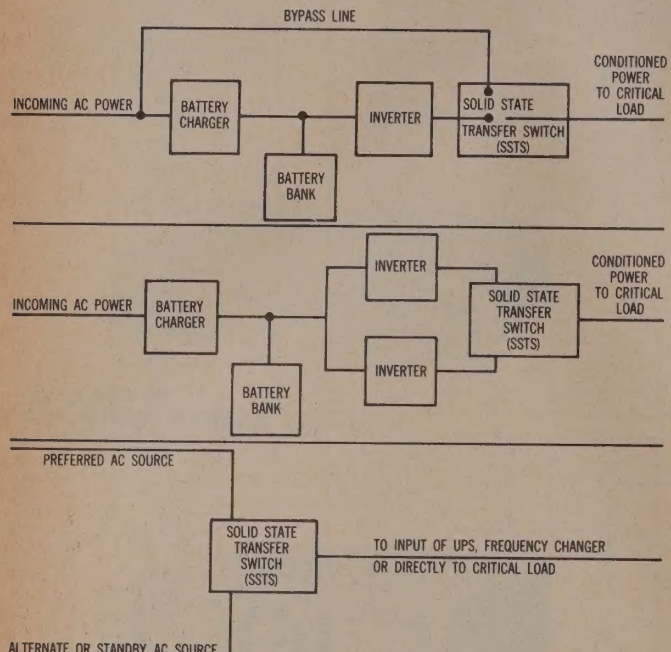
AVTEL

AVTEL SOLID STATE TRANSFER SWITCH



500 MICROSECOND TRANSFER TIME

AVTEL's revolutionary solid state transfer switch (SSTS) represent significant breakthrough in handling AC power. Available in single three phase configurations in power levels up to hundreds of k Avtel's SSTS is capable of a complete power transfer between un chronized sources in less than 500 microseconds. 600 microsecond worst case under any conditions. Internally protected against overlo and short circuits, Avtel's SSTS has many applications. As an opti accessory for an Uninterruptible Power System or Frequency Chan (Figure A) the SSTS can be used as an automatic bypass to tran power back to the input line in the event the inverter output exce specification units. It can be used for paralleling inverter outputs redundant system configurations (Figure B). In such systems the verters are normally sharing the load but in the event of internal fai the faulted inverter is switched off line. If desired, this sort of sys can be configured so that one or more inverters are on line and others off line. The switch then selects on a preferred basis. The S can also be used independently of an UPS (Figure C) for selecting tween preferred (prime) and alternate (stand-by) power sources.

To effectively achieve transfer upon the degradation of on line po without creating constant switching due to load transients and the l Avtel has developed a unique high speed sensor which is capable distinguishing faults from normal line deviations yet triggering SSTS whenever an actual problem occurs.

AVTEL

MILITARY ENVIRONMENT FREQUENCY CONVERTERS

MODEL: TRM 036-1
400 Hz, 1ϕ to 60 Hz, 1ϕ, 300 VA • QUALIFIED TO MIL-E-5400J, AIRBORNE

UNIQUE FEATURES

EXTREMELY SMALL SIZE: 8″ x 8″ x 5″ — High packaging density saves critical space — Fits in many otherwise unusable areas.

LIGHTWEIGHT: Approximately 16 lbs. About half the weight of competitive models.

RUGGED: All solid state. Meets Mil Spec MIL-T-5422 for shock.

OVERLOAD PROTECTED: Internally protected against overloads and shorts.

HIGH EFFICIENCY: In excess of 80%.

MIL QUALIFIED: All solid state, rugged construction. **Qualified** for sand, dust, vibration, fungus, humidity and salt atmosphere portion of MIL-E-5400J, and shock per MIL-T-5422.

SPECIFICATIONS

Input: ..... 115 VRMS, ±10%, 400 Hz, ±10%, 1ϕ.
Output Voltage: ..... 115 VRMS, 1ϕ
Voltage Regulation: ..... ±2% for all conditions of line, load, and temperatu
Output Frequency: ..... 60 Hz
Frequency Regulation: ..... ±0.5% for all conditions of line, load and temperat
Output Power: ..... 300 VA
Output Configuration: ..... Single phase sine wave
Distortion: ..... 5% THD at rated load, 7% THD maximum for all conditions of line, load and temperature.
Output Power Factor: ..... 0.75 leading to 0.75 lagging
Efficiency: 80%
MTBF: ..... In excess of 10,000 hours at 65°C, airborne per MIL-HDBK-217A.
Operating Temperature: ..... −20°C to +65°C
Altitude: ..... Sea level to 50,000 feet
Relative Humidity: ..... To 55%
Other Environmental Considerations: ..... Qualified for sand and dust, vibration, fungus, humidity and salt atmosphere to MIL-E-5400J; sh per MIL-T-5422.
RFI: ..... Qualified to MIL-I-6181D
Physical Size: ..... 8″ x 8″ x 5″
Weight: ..... Approximately 16 pounds

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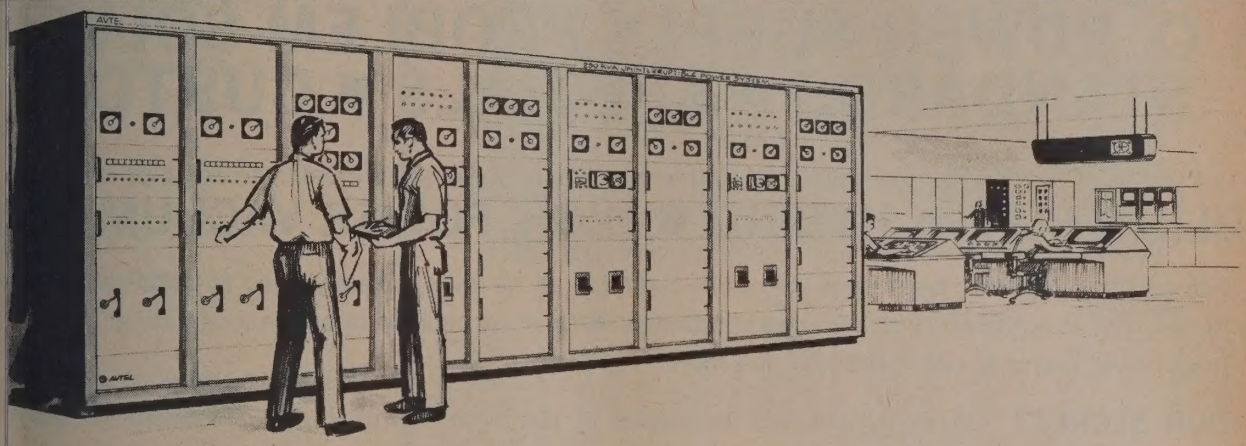
CONDITIONED AC POWER FOR ANY APPLICATIONS

AVTEL



R AND UPS STANDARD OPTIONS

tio A through G, and AB, AC, AD, AE available on most models. Options H through AA available on all models.

Option	Description
	Uninterruptible, on line, AC/DC input power system. Output remains constant despite commercial line power failure without output transients at time of input power switchover. This option utilizes DC input from a battery bank and includes battery charging circuitry. Charge is controlled at an adjustable constant current than adjustable voltage crossover and then is automatically reduced to a value sufficient to maintain the battery at full charge.
	Same as A with the addition of a manual, make-before-break, by-pass switch for taking UPS off line for maintenance or other purposes.
	Same as A with automatic bypass operation which switches the critical bus to the input line in the event of UPS output exceeding specification limits. Available in standard or solid state configurations.
	115 V, single-phase input.
	230 V, single-phase input.
	115/200, three-phase input.
	230, 410, 440, 460 or 480 V three-phase input. (Please specify).
	115/200, 45-450 Hz three-phase input. (460 V for 20 and 50 KVA units.)
	Output voltage adjustable from 0 to 135 Vrms via front panel control for CR, 10 to 130 Vrms for TR.

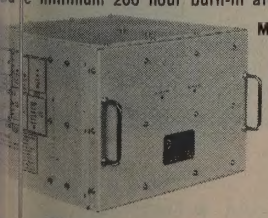
Option	Description
J.	Output current limit adjustable from 10-125% of rated output via front panel control.
K.	Output voltage adjustable from 95 to 135 Vrms via front panel control for CR, 95 to 130 Vrms for TR.
L.	Output current limit adjustable from 75-125% of rated current via front panel control.
M.	External synchronization from pulse, sine or complex waveform sources.
N.	Output phase lock for parallel on line operation.
O.	Phase lock and load coupler for parallel operation of 2 or more units. This option has provisions for alarm and automatic shut-down of a malfunctioning unit.
P.	Fixed frequency operation in addition to standard variable frequency selectable by front panel switch. The fixed frequency has a tolerance of .01% for the combined effects of line, load and environmental extremes and can be supplied at any frequency within the band.
Q.	Single fixed frequency operation in lieu of variable frequency. (0.01% tolerance).
R.	Multiple fixed frequency operation, switch-selected. No variable frequency. (±0.01% tolerance).
S.	Frequency meter, Reed type. Covers full range of unit.

Option	Description
U.	Output waveform −1% THD max.
V.	Qualified to MIL-I-6181, MIL-STD-826 or MIL-STD-461.
W.	Running time meter, 0-9999 hours. Recycles at 10,000 hrs.
X.	Unitized construction for application where rack mounting is not intended.
Y.	Unitized construction, mounted on rubber-tired, full castering wheels. (CR models only).
Z.	120 V Delta Output (3 phase models only).
AA.	Switchable delta/wye output with dual-range meter scales and front panel mode indicator.
AB.	120/240 dual range output voltage for models with single phase output.
AC.	105-140 input.
AD.	210/280 input.
AE.	Variable frequency operation (TR systems model only). Standard on CR Series and TR Lab. models.
AF.	Remote control and status panel for use up to several hundred feet from the equipment. Various combinations of controls, indicators and meters available.

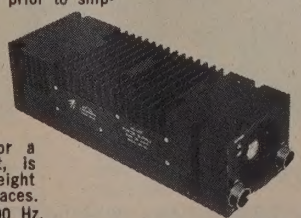
NOTE: Certain options effect equipment size and weight. When specifying options, please check with the factory on equipment physical characteristics.

PALLELED RELIABILITY:

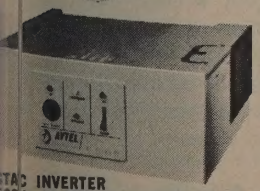
VTE s design practices incorporate maximum derating of critical components, odr construction and minimum components consistent with performance. d e minimum 200 hour burn-in all Avtel equipment receives prior to shipment, and you can be assured of maximum availability of continuous, transient free, conditioned power.



MILITARY POWER SOURCE
50-400 Hz Input, 28 VDC, 5A and 1 KVA, 400 Hz, 3 phase output.



STRAIN GAUGE POWER SUPPLY
This unit, developed for a research rocket aircraft, is one-third the size and weight of the equipment it replaces. INPUT—115 Volts AC, 400 Hz, 3-phase; OUTPUT—12 Volts DC at 10 Amperes; VOLTAGE REGULATION—0.1% for combined effects of line, load and temperature variations.



STAC INVERTER
500A, 25 VDC to 115 VAC, 60 Hz.

GUIDANCE SYSTEM POWER SUPPLY
A split phase static inverter, this unit supplies two outputs of 125 VA at 90° ±0.5° phase angle displacement. Output frequency is held to 0.001% and the true rms value of the output voltage is maintained within 0.1%.

Eleven years ago, Avtel specialized in solid state power conversion equipment and has concentrated its efforts in this area ever since. Whatever your individual power conversion requirements may be, you are assured that our technical staff will give them prompt and skillful analysis. With over 200 custom designs and years of systems experience, these power conversion specialists appreciate the value of timely recognition and consideration of potential problem areas associated with integrating power sources into complex systems. In the interest of precluding systems interface problems, Avtel offers the assistance of its applications engineers to study your requirements and formulate suitable specifications.

NOTE: Avtel also manufactures subcarrier oscillators. See Section 2900.

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from the

A. C. POWER SUPPLY PROBLEM SOLVER
STANDARDS ■ SPECIALS ■ CUSTOM

17 years of innovation bv the A. C. power supply pioneers-milliwatts to tens of kilowatts

SOLID STATE ■ HYBRID ■ HIGH POWER VACUUM TUB

The smallest, lightest, least expensive units available. ■ All units honestly rated at worst case condition — not at optimized line and load conditions. ■ All units capable of continuous duty at 150% of their power rating at optimized line and load.

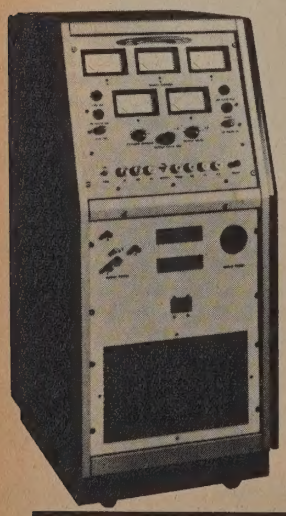
OUR SECRET? Ultra-sophisticated magnetics in combination with highly simplified circuitry.

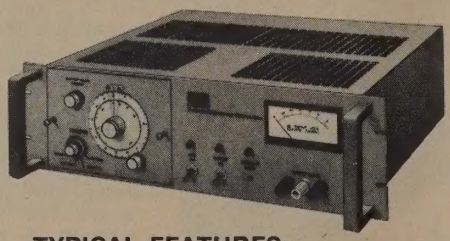
THE RESULTS? Dramatic size, weight and cost reduction plus greatly improved reliability. Basic power amplifiers are available in frequency ranges to suit your application. There is no longer any need to pay size, weight and price penalties for excess capability.

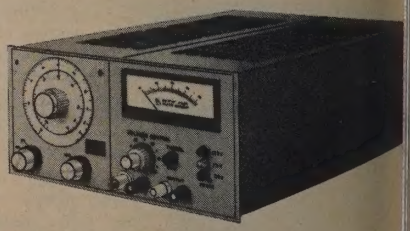
SOME TYPICAL EXAMPLES: STANDARD BASIC POWER AMPLIFIERS — ALL SILICON SOLID STATE

	150Hz/2KHz	150Hz/10KHz	45Hz/2KHz	45Hz/10KHz	
100VA	$ 425	$ 455	$ 495	$ 535	⅓ rack x 5¼" H
250VA	550	595	625	675	½ rack x 5¼" H
350VA	855	910	945	995	½ rack x 5¼" H
500VA	945	995	1035	1095	19" W x 5¼" H
750VA	1435	1490	1530	1595	19" W x 5¼" H
1000VA	1795	1855	1895	1975	19" W x 7" H

Information on Hybrid & Vacuum Tube AC Supplies available on request.
Prices less plug-in oscillators.







TYPICAL FEATURES:

Regulation: ±0.5% for any combination of load and ±10% line. ■ Distortion: 0.5% max.at frequency extremes. Less at mid-band. Complete selection of plug-in fixed and variable frequency oscillators. ■ Instantaneous overload protection. ■ Units may be stacked for power increase or arranged in two or three phase output configurations

Write for further details

Behlman Engineering Corporation
P.O. Box 4518, 427 No. Nopal St., Santa Barbara, California 93103 • (805) 963-1

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ULOVA AC POWER SUPPLIES

eaures

nw . . . with more VA per output
ollar . . . Bulova AC Power
tus Fully Regulated Sine Wave—
Solid-State Design—Up to
00VA Output—Protected
ut Output

erormance
pecifications:

TPU:

reency Output: 50 or 60 Hz (standard)—
ny her specific frequency custom

reency Accuracy: ±1%, ±.015% or
±.05%

emrature Range: 0°C to +50°C

Wa Shape: Sine Wave, 3% Distortion max.

Out t Voltage: 115 or 230 V AC nominal

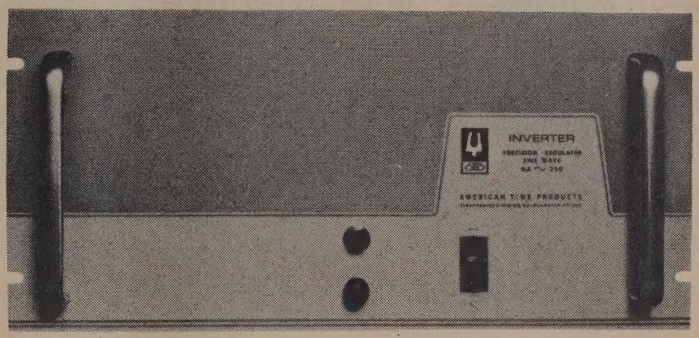
Voltge Regulation: ±1% any combination of
ulte e and load change

PUT

115 AC or 230V AC, ±10%; 22 to 30V DC
Nomal (11 to 15V DC, and 45 to 56V DC
avaible)

me odels available from stock . . . custom de-
ns t meet special needs for systems, equipment
lab atory use, up to 2500 VA and ±.005%
quecy accuracy. Meters are optional.

INVERTERS (Standard)



Type	Input VDC	Output VA	Output Freq. Hz	Output Volt	Wt. Lbs. (2)	Dimensions (For 19" Rack) H	Dimensions (For 19" Rack) W
DA-250S	22-30	250	50 or 60	115 (1)	70	8¾"	13"
DA-500S	22-30	500	50 or 60	115 (1)	130	10½"	15"
DA-1000S	22-30	1000	50 or 60	115 (1)	170	14"	24"

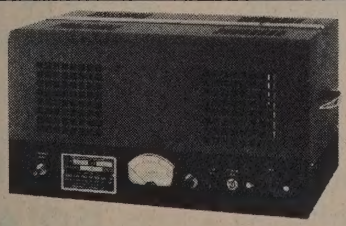
(1) 230 Volt Available (2) For 50 Hz, add about 5 lbs.

FREQUENCY CHANGERS (Standard)

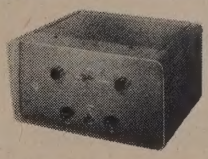
Type	Input VAC. ±10%	Input Freq. Hz	Output VA	Output Freq. Hz	Output Volt	Wt. Lbs. (2)	Dimensions (For 19" Rack) H	Dimensions (For 19" Rack) W
ADA-250S	115/230	47-65	250	50 or 60	115 (1)	80	8¾"	13"
ADA-500S	115/230	47-65	500	50 or 60	115	130	10½"	15"
ADA-1000S	115/230	47-65	1000	50 or 60	115	170	14"	24"

(1) 230 Volt Available (2) For 50 Hz, add about 5 lbs.

C
OWER SUPPLY
ype
11C-75 Watt



ut ltage—110-125V, 50 to 400
ut ttage—250 at 75 watts out,
at watts out
tpu oltage—0 to 125 volts
tpu oad—180 ohms and up
stort —8% maximum
urce npedance—Approximately 25
ms
tpu Frequency—As specified on nameplate (50, 60, 100, 400 and 500 Hz are standard, others on special order)
Frequency Accuracy—±20 parts per million .002% from 15°to 35°C.
Size—2111C—17" wide, 10" deep, 9" high; 2111CP—Rack mounting type, 19" wide, 10" deep, 8 3/4" high.
Weight—2111C—25 lbs., 2111CP—30 lbs.



PORTABLE INVERTER/BATTERY CHARGER MODEL DA30Q — 30VA

INVERTER:

Input—12 volt lead acid battery. Operating time 26 hours with 75 amp hr. battery (battery not supplied)
Output—30VA (Up to 40 VA available). Frequency: 60 to 400Hz (specify). Wave shape: Square. Voltage: 115 ±10%
Features—Reverse Voltage Protection. Automatic Reset Overload Protection. Mode Indicator Lamps. Duplex Outlet
Size—12" wide x 11" deep x 6½" high
Weight—18 lbs. (approx.)

CHARGER:

Input—105-125V, 47-420Hz
Charging Rate—6 amp tapered constant current
Charging Time—Roughly 75% previous running time
Features—Battery and Line Fuse Protection for Reverse Voltage and Short Circuit Switch Controlled Battery Connection, Mode Indicator Lamp
Temperature Range—0°C-50°C (wider range available)

Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers

BULOVA AMERICAN TIME PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

CEA *a division of Berkleonics, Inc.*

ABOUT THIS REFERENCE CATALOG...

This catalog is designed to simplify your choice of the widest variety of modular power supplies available.

- Only with CEA are you given the complete freedom to specify the exact voltage (center voltage) that you desire.
- Only with CEA are you given the flexibility of designing your own power supply through the use of the widest variety of options available.
- Only with CEA are you given the choice of regulation classes from 1% to 0.0005%.
- Only with CEA are you given a shielded transformer on every power supply ordered.

HOW TO USE THIS CATALOG...

Pick the model series from the adjacent chart which most nearly meets the needs of your requirement, and turn to the page indicated for complete ordering data.

For assistance call your local sales representative listed on the front cover or call our factory direct: Area Code 213 359-9261.

CONSTANT VOLTAGE SUPPLIES	SINGLE OUTPUT HIGHEST REGULATION
	DUAL OUTPUT HIGHEST REGULATION
	CARD SUPPLIES SMALLEST SIZE BEST REGULATION
	SINGLE OUTPUT HIGHEST EFFICIENCY
	D.C. CONVERTERS
CONSTANT CURRENT SUPPLIES	SINGLE OUTPUT HIGHLY REGULATED
ISOLATION EQUIPMENT	SHIELDED LINE ISOLATORS

ODULAR D.C. OUTPUT POWER SUPPLIES

Output Range			Best Efficiency	Best Response Time	Specification Classes			Model Series	Page No.
Volts	Amps	Watts			Line + Load Regulation (%)	Ripple (p-p.) %	Temp. Coeffi. (%/°C)		
3.5 To 500	.05 To 25	To 800	50%	10μsec	.05	.045	.01	CEA6	7
					.01	.004	.005		8
					.0025	.002	.001		9
					.0005	.0011	.0005		10
3.5 To 500	.05 To 10	To 300	50%	10μsec	.05	.04	.01	CEAD6	11
					.01	.004	.005		12
					.0025	.002	.001		13
					.0005	.0011	.0005		14
3.5 To 60	.10 To 1.00	To 12	50%	10μsec	.05	.04	.01	CEA7	15
					.01	.004	.005		16
					.0025	.002	.001		
					.0005	.0011	.0005		
3.0 To 500	.05 To 60	To 640	80%	100μsec	1.0	2.0	.10	CEA3	17
					0.1	0.2	.01		18
3.0 To 500	.05 To 40	To 640	90%	100μsec	Line: None Load: 10%	3.0	.10	CEA2	19
					Line: 1% Load: 10%	3.0	.10		20
					Line: 1% Load: 1%	1.0	.05		
0 To 200	.002 To 5.0	To 160	50%	10μsec	0.5	.40	.10	CEAC6	21
					0.1	.04	.05		22
					.025	.02	.01		
					.005	.011	.005		
110 Or 220	.85 To 17.3	100 To 2000	96%	60Hz	4.0	None	None	CEA10 thru CEA35	23
									24

O COMPLETE R ERING N RMATION E FOLLOWING A ES	SUPPLEMENTARY INFORMATION	THERMAL DATA	25&26
		EXPLANATION OF OPTIONAL FEATURES	27, 28, 29
		MOUNTING AND TERMINATION DATA	30

WHY CEA POWER SUPPLIES?

because only CEA offers you
a one-stop service that will satisfy
ALL of your modular power needs...

CHECK THESE FEATURES AGAINST YOUR NEEDS ✓

- Choice of **6** Regulation Classes, from 1% to **0.0005%** √
- **Smallest** Size Modules √
- An Option for **Every** Design Requirement √
- Highest **Insulation** Resistance Available √
- Available in **Any** Voltage from 3.5 to 500 Volts √
- Greatest **Stability** √

AND...

- **Every** CEA Supply has a Shielded Transformer for **Safe** I.C. Use

Every CEA product is fully tested and certified to meet specifications.
Specifications are guaranteed, not just typical.

STANDARD FEATURES ON **ALL** CEA SUPPLIES

• overshoot protection
Standard circuitry provides voltage limiting at 1 over maximum voltage rating for absolutely no shoot at turn on or turn off.

• short circuit protection
Standard circuitry drops output current to app mately 2% of rated. Short can be held indefin without damage to supply or system. Auton restart upon removal of short.

• series starting
Standard circuitry allows 2 or more units to be nected and operated in series without damage

• floating outputs
Either output terminal can be grounded accor to the requirement of positive or negative vo output. Both terminals can be operated at u ±500 volts with reference to the case.

• remote sensing
Terminals included to eliminate the effect of load lines.

• serviceable
Units are designed in standard Mil-T-27 cases removeable covers to facilitate servicing.

• warranty
Every CEA Power Supply is covered by a three parts and labor warranty.

WHY DOES CEA GO TO ALL THE TROUBLE OF USING A SHIELDED TRANSFORMER ON EVERY POWER SUPPLY?

...ecause it's the most logical way to provide electrical isolation for your system circuit. With today's IC, isolation of the circuit is mandatory by one means or another, so why not do it in the most direct, effective and least costly manner?

The extreme sensitivity of INTEGRATED CIRCUITS makes them highly vulnerable to both destruction and nuisance triggering by any extraneous voltages. This statement I'm sure we agree on, but did you know that your system's POWER SUPPLY is probably the culprit of your problems?

The power transformer of any Power Supply has a very significant amount of coupling capacitance between the primary and secondary windings (Reference column 2 of figure 1) which emphatically provides an undesired direct path for all transient voltages. This direct path, which allows a complete open door for unwanted signals, is the most significant factor in the majority of today's system application field problems. As the computer engineer put it, "being off by one bit is as good as a mile."

While the exact value of this coupling capacitance is a variable with the size of the transformer, and the quality of its manufacture, CEA has taken the unique approach of providing at least 20 db of shielding at the transformer on every power supply produced. Effectively this says that with a CEA supply, you will be getting ten (10) times less capacitance between primary and secondary (hence between line and circuit) than you would with an unshielded transformer. It's one of the real bargains of life where you benefit more by getting less.

The more critical your application the more shielding you need, so CEA also provides optional shielding of 40 db and 100 db for reduction factors of 100 and 100,000. For convenience, the typical values of capacitance for each of the 13 CEA power supply sizes and the classes of shielding are shown on Figure 1.

While the circuit designer will normally think of noise as coming directly from the input line, it is also common to find that dangerous signals are being generated internally by heavy demand or high speed switching circuits. The cure to this problem is the discriminate use of separate power supplies at critical points within the system to effectively isolate the sensitive circuits. The isolation function of the shielded transformer works as a wall, blocking noise from going in either direction, in or out of the supply.

Only with CEA can your power supply take on a new function — that of being an isolator within your system.

. . . So that's why we go to all the trouble of using a shielded transformer in every Power Supply!

COMMON MODE PRIMARY TO SECONDARY COUPLING CAPACITY (pfd)

	UNSHIELDED TRANSFORMER			20db SHIELDING (STANDARD)			40db SHIELDING (T OPTION)			100db SHIELDING (T1 OPTION)		
	Coupling Capacity pfd[1]	Leakage Current 60 Hz μA	Leakage Current 400 Hz μA	Coupling Capacity pfd[2]	Leakage Current 60 Hz μA	Leakage Current 400 Hz μA	Coupling Capacity pfd[2]	Leakage Current 60 Hz μA	Leakage Current 400 Hz μA	Coupling Capacity pfd[2]	Leakage Current 60 Hz μA	Leakage Current 400 Hz μA
ase ize												
FA	150	6.5	43	15	.65	4.3	1.5	.065	.43	.0015	.065	.43
GA	150	6.5	43	15	.65	4.3	1.5	.065	.43	.0015	.065	.43
HA	170	7.3	49	17	.73	4.9	1.7	.073	.49	.0017	.073	.49
JA	170	7.3	49	17	.73	4.9	1.7	.073	.49	.0017	.073	.49
KA	200	8.6	57	20	.86	5.7	2.0	.086	.57	.002	.086	.57
LA	200	8.6	57	20	.86	5.7	2.0	.086	.57	.002	.086	.57
MA	200	8.6	57	20	.86	5.7	2.0	.086	.57	.002	.086	.57
NA	350	15	100	35	1.5	10.0	3.5	.15	1.0	.0035	.15	1.0
PA	350	15	100	35	1.5	10.0	3.5	.15	1.0	.0035	.15	1.0
QA	350	15	100	35	1.5	10.0	3.5	.15	1.0	.0035	.15	1.0
RA	500	22	147	50	2.2	14.7	5.0	.22	1.47	.005	.22	1.47
SA	700	30	200	70	3.0	20.0	7.0	.30	2.00	.007	.30	2.00
TA	1000	43	285	100	4.3	28.5	10.0	.43	2.85	.010	.43	2.85

NOTES: [1] Tolerance: ±50% [2] Tolerance: ±100%

figure 1

• ordering information

All CEA products are marketed on a direct-factory basis. There ar mark-ups or discounts (other than for quantity buyers) so that t is but one price for our products throughout the United States. maintains independent sales representatives in most states — overseas. These factory-trained men will be most pleased to give any required assistance in procuring and applying these prod

Power supplies are identified by a multipart model number, us comprising a letter group prefix (identifying the design) followed series of numbers that specify the model (usually in rated volts amperes.) Options will be identified by letter suffix specifying various features which can be added.

It is important for the expeditious handling of inquiries, orders, that the full CEA model number be used for identification, ev local specification control numbers have been assigned by your o ization.

• discounts

The following discount schedule will apply for the applicable qua of each order:

Quantity	Disc
1-4	N
5-9	Less
10-24	Less
25-99	Less
100-249	Less

• shipment

Prices shown in this catalog are f.o.b. Monrovia, California. Meth shipment will be United Parcel to all points serviced, and Parcel by those not serviced. Air shipment, truck, Railway Express or preferred routing available by prior request.

• warranty

All CEA products are backed by a firm three (3) year warranty, co all parts and labor. The warranty is honored at our factory S Department, Monrovia, California. This warranty is limited to the or replacement at the factory or other designated place of any p parts of the product which CEA determines to be defective an required to return the product to the listed specifications.

• terms

Net 30 days from date of invoice.

• price and delivery

Price and delivery information given for each series on the spe tion section for each model.

• communications

Address all mail to:

CEA, a Division of Berkleonics, Inc.
1221 So. Shamrock Ave.
Monrovia, California 91016
Telephone: (213) 359-9261

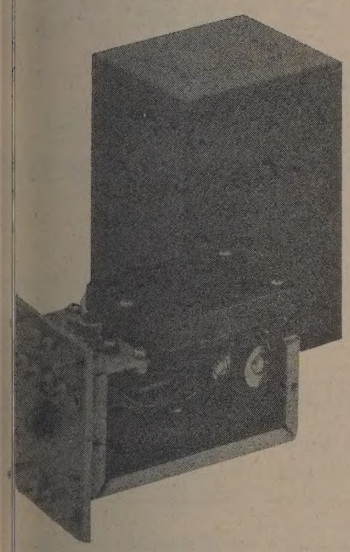
• applications assistance

Questions concerning the facilities, features, behavior, and chara tics of any product may be directed to the CEA Applications Engin Department. A staff of specialists is happy to provide any assi in the application of CEA's Power Supplies to your requirement

OW TO SELECT AND SPECIFY A CEA OWER SUPPLY OR VOLTAGE REFERENCE

is catalog is intended to allow the user to com-ely specify a standards power supply with many sm features as if he were to design it himself, nd hen to accomplish pricing and delivery without ecssarily contacting either the factory or sales psentative.

Th CEA Part Number Code System is maintained rcghout the catalog and serves as a flexible eas of identifying the model specifications.



CEA00 0 000 0 000 00...0

Output Mode

CEAC Constant Current,
CEAD Dual Outputs
Absence of C or D indicates constant voltage, single output.

Series

2 — D.C. Converter
3 — High Efficiency (Switching Regulator)
6 — Standard Modules (Series Regulated)
7 — Card Supplies (Series Regulated)

Regulation Class

Line Plus Load Regulation Values. Refer to Particular Series for Specific Values.

A
B
C
D

Output Voltage

Purchaser fills in the desired center voltage.

2 digits .....3.5 thru 9.9 volts
3 digits .....10.0 thru 500 volts

Output Voltage Decimal Location

X ..... 3.5 thru 9.9 volts
Y ..... 10.0 thru 99.9 volts
Z ..... 100 thru 500 volts

Output Current

500 ..... 50 milliamps
101 ..... 100 milliamps
251 ..... 250 milliamps
501 ..... 500 milliamps
102 ..... 1.00 amps
252 ..... 2.50 amps
502 ..... 5.00 amps
103 ..... 10.0 amps
203 ..... 20.0 amps
253 ..... 25.0 amps
403 ..... 40.0 amps
603 ..... 60.0 amps

Options

Purchaser adds the option designations for all desired options. (See Pages 27 thru 29).

or kample, to select and specify a EA Series (80°C) Module with a cen-r ltage of 16.5 volts and a rated urrt of 1.00 amps with Regulation as B the charts should be entered n ge 8 where the column states, Chose any center voltage from 12.5 2.4." On the line for 1.00 amps, proceed to the column titled Regulation Class B. The model number as given in the charts should then have the desired center voltage, 16.5 volts, inserted in the boxes. The model number for this unit is then CEA6B165Y102 and the unit price is $130.

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage and Frequency Range: 105 to 125 volts, 50 to 420 Hz.
Line Isolation: 20 db of shielding between primary and secondary of transformer.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: As fast as 10μsec depending on model
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.

• standard features

Available with any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts. from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage limiting circuitry prevents overshooting at turn on and turn Short circuit protection reduces shorted current to than 2% of rated current. Output adjustable with int potentiometer on classes A & B. Class C & D units ar ternally adjustable only (no internal pot.)

• optional features

The extra charge for each option is either a flat rate or percentage of the base model price. Add the larger number to base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
FIXED OUTPUTS				
F	Fixed output ±1.0%	No charge	None	Available in all classes. Delete "R" from class C & D P/N.
F1	Fixed output ±0.1%	$15	1	Available in classes B, C & D. Delete "R" from class C & D P/
F2	Fixed output ±0.01%	$50	1	Available in class D only. Delete "R" from class D P/N.
ADJUSTABLE OUTPUTS				
G	Output adjust range ±1%	$5	None	Increases output resolution.
Std.	Output adjust range ±5%	No charge	None	Provided unless a "G" or "F" option is specified.
G1	Output adjust range ±10%	$5 or 5%	1	Reduce maximum current to 80% of rated output.
G2	Output adjust range ±20%	$10 or 10%	1	Reduce maximum current to 60% of rated output.
G3	Output adjust range ±30%	$15 or 15%	1	Reduce maximum current to 50% of rated output.
G4	Output adjust range ±40%	$20 or 20%	1	Reduce maximum current to 45% of rated output.
G5	Output adjust range ±50%	$25 or 25%	1	Reduce maximum current to 40% of rated output.
Note: Next larger case size required for options G2, G3, G4 & G5. The temperature coefficient is degraded in classes B, C & D for options G2 thr				
EXTENDED TEMPERATURE RANGE				
H1	Temp range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temp range −40°C to +80°C	$20 or 20%	4	Storage to −55°C.
H3	Temp range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
RAPID PROGRAMMING INTO LARGE CAPACITANCE LOADS				
J	Voltage pull down circuit	$40 or 30%	2	Has circuit equivalent to an output resistor of one-tenth of rated
AC INPUT VOLTAGE AND FREQUENCY				
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 volts.
DC INPUT VOLTAGES				
L7	Input 12 VDC (11.6 to 13.8 VDC)	$35 or 20%	1	Derate output to 60% of normal.
L8	Input 24 VDC (23.2 to 27.6 VDC)	$35 or 20%	1	
L9	Input 14 VDC (12.0 to 16.0 VDC)	$45 or 25%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$45 or 25%	1	
SPECIAL CONNECTIONS				
N	Octal plug	$15	3	Specify option "R" or "F" with "N." Uses standard male octal plug in lieu of standard termination
PROTECTION CIRCUITS				Available in all sizes except FA.
P1	Current limiting	$25 or 15%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemp. cutout	$20	1	Limits base temp. to max. rated. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumsta Operates at 10% over maximum settable voltage or 1 volt, w ever is greater. Remove input power to restart.
REMOTE PROGRAMMING				
R	Remote adjust (no pot provided)	No charge	None	Remote programming options allow power supply to be exte
R1	Remote adjust with 1% linearity	$20 or 10%	1	adjusted. Resistance to output ratio is approx. 5 mv per
R2	Remote adjust plus internal pot (A & B only)	$5	1	except for class C and D units below 8.5 volts which are ap
R3	Remote adjust with pot provided (A & B only)	$5	1	mately 1 mv per ohm. For potentiometer requirements see Pa
START INTO HIGH CAPACITANCE LOADS				
S1	Start with 30,000 mfd/amp	$20 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
HIGH ISOLATION				
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 Volts to case or
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)			
	FA, GA, HA, JA	$5	1	Add no charge option letter "R" and letter "W" to model nu
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $15	1	Model number should not include either "R" or "F" optio ternal potentiometer included.

Guaranteed free from defects in workmanship and materials for three years from date of shipme

single output modules CEA6 SERIES

REGULATED AC-DC TO 800 WATTS • BASE TEMPERATURE RATING 80°C

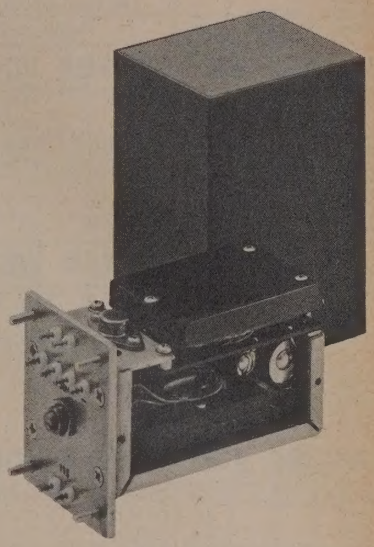
OUTPUT VOLTAGES ADJUSTABLE ±5% UNLESS SPECIFIED OTHERWISE

mplete part number for your supply is established in three eps:

ect the basic model from the appriate voltage range, current ratingand class of regulation from the hts below.

re the exact center voltage desirl in the open boxes of the model ected.

3. Tailor the power supply to meet your specific requirements by specifying as many of the optional features from the opposite page as desired. Just add the option letter(s) at the end of the model number.



gulation specifications

Cla of gtion	Guaranteed Line Regulation for 10% Line Change	Guaranteed Load Regulation for No Load to Full Load	Guaranteed Temperature Coefficient Per Degree C	Guaranteed Stability for 40 Hours	Guaranteed RMS Ripple
	±0.01%	±0.04%	±0.01%	±0.05%	0.01%
	±0.002%	±0.008%	±0.005%	±0.01%	0.001%
	±0.0005%	±0.002%	±0.001%	±0.0025%	0.0005%
	±0.0001%	±0.0004%	±0.0005%	±0.0005%	0.0003%

ter voltages 3.5 to 29.9

tpu rre mps	Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005% Model	Price	Class "C" Regulation Line Plus Load ±0.0025% Model	Price	Class "B" Regulation Line Plus Load ±0.01% Model	Price	Class "A" Regulation Line Plus Load ±0.05% Model	Price
OSE ANY CENTER VOLTAGE FROM 3.5 TO 9.9										
0	1	FA					CEA6B □□X101	$ 95	CEA6A □□X101	$ 85
25	2	GA	CEA6D □□X251R	$215	CEA6C □□X251R	$145	CEA6B □□X251	95	CEA6A □□X251	85
50	3	HA	CEA6D □□X501R	230	CEA6C □□X501R	160	CEA6B □□X501	110	CEA6A □□X501	100
00	4	JA	CEA6D □□X102R	230	CEA6C □□X102R	160	CEA6B □□X102	110	CEA6A □□X102	100
50	5	MA			CEA6C □□X252R	210	CEA6B □□X252	160	CEA6A □□X252	150
00	6	NA			CEA6C □□X502R	235	CEA6B □□X502	185	CEA6A □□X502	175
.0	7	QA					CEA6B □□X103	280	CEA6A □□X103	270
.0	8	SA					CEA6B □□X253	370	CEA6A □□X253	360
OSE ANY CENTER VOLTAGE FROM 10.0 TO 12.4										
10	1	FA					CEA6B □□□Y101	$ 95	CEA6A □□□Y101	$ 85
25	2	GA	CEA6D □□□Y251R	$215	CEA6C □□□Y251R	$145	CEA6B □□□Y251	95	CEA6A □□□Y251	85
50	3	HA	CEA6D □□□Y501R	230	CEA6C □□□Y501R	160	CEA6B □□□Y501	110	CEA6A □□□Y501	100
00	4	JA	CEA6D □□□Y102R	230	CEA6C □□□Y102R	160	CEA6B □□□Y102	110	CEA6A □□□Y102	100
50	5	MA			CEA6C □□□Y252R	210	CEA6B □□□Y252	160	CEA6A □□□Y252	150
00	6	NA			CEA6C □□□Y502R	235	CEA6B □□□Y502	185	CEA6A □□□Y502	175
.0	7	QA					CEA6B □□□Y103	280	CEA6A □□□Y103	270
.0	8	SA					CEA6B □□□Y253	370	CEA6A □□□Y253	360
OSE ANY CENTER VOLTAGE FROM 12.5 TO 27.4										
10	1	GA	CEA6D □□□Y101R	$215	CEA6C □□□Y101R	$145	CEA6B □□□Y101	$ 95	CEA6A □□□Y101	$ 85
25	2	HA	CEA6D □□□Y251R	225	CEA6C □□□Y251R	155	CEA6B □□□Y251	105	CEA6A □□□Y251	95
50	3	JA	CEA6D □□□Y501R	230	CEA6C □□□Y501R	160	CEA6B □□□Y501	110	CEA6A □□□Y501	100
00	4	KA	CEA6D □□□Y102R	250	CEA6C □□□Y102R	180	CEA6B □□□Y102	130	CEA6A □□□Y102	120
50	5	NA			CEA6C □□□Y252R	235	CEA6B □□□Y252	185	CEA6A □□□Y252	175
00	6	PA			CEA6C □□□Y502R	280	CEA6B □□□Y502	230	CEA6A □□□Y502	220
.0	7	RA					CEA6B □□□Y103	345	CEA6A □□□Y103	335
.0	8	TA					CEA6B □□□Y253	385	CEA6A □□□Y253	375
OSE ANY CENTER VOLTAGE FROM 27.5 TO 29.9										
10	2	GA	CEA6D □□□Y101R	$215	CEA6C □□□Y101R	$145	CEA6B □□□Y101	$ 95	CEA6A □□□Y101	$ 85
25	3	HA	CEA6D □□□Y251R	225	CEA6C □□□Y251R	155	CEA6B □□□Y251	105	CEA6A □□□Y251	95
50	4	KA	CEA6D □□□Y501R	250	CEA6C □□□Y501R	180	CEA6B □□□Y501	130	CEA6A □□□Y501	120
00	5	LA	CEA6D □□□Y102R	255	CEA6C □□□Y102R	185	CEA6B □□□Y102	135	CEA6A □□□Y102	125
50	6	NA			CEA6C □□□Y252R	235	CEA6B □□□Y252	185	CEA6A □□□Y252	175
00	7	PA			CEA6C □□□Y502R	280	CEA6B □□□Y502	230	CEA6A □□□Y502	220
.0	8	RA					CEA6B □□□Y103	345	CEA6A □□□Y103	335
.0	9	TA					CEA6B □□□Y253	385	CEA6A □□□Y253	375

DLIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks
Class "D" Units — 4 Weeks
Some Options Extend Delivery

single output modules CEA6 SERIES to 80°

center voltages 30.0 to 139

Output Current (Amps)	Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005% Model	Price	Class "C" Regulation Line Plus Load ±0.0025% Model	Price	Class "B" Regulation Line Plus Load ±0.01% Model	Price	Class "A" Regulation Line Plus Load ±0.05% Model	
CHOOSE ANY CENTER VOLTAGE FROM 30.0 TO 39.9										
0.10	2	GA	CEA6D □□□Y101R	$215	CEA6C □□□Y101R	$145	CEA6B □□□Y101	$ 95	CEA6A □□□Y101	$
0.25	3	JA	CEA6D □□□Y251R	230	CEA6C □□□Y251R	160	CEA6B □□□Y251	110	CEA6A □□□Y251	
0.50	4	LA	CEA6D □□□Y501R	255	CEA6C □□□Y501R	185	CEA6B □□□Y501	135	CEA6A □□□Y501	
1.00	5	NA	CEA6D □□□Y102R *	305	CEA6C □□□Y102R	235	CEA6B □□□Y102	185	CEA6A □□□Y102	
2.50	6	PA			CEA6C □□□Y252R	280	CEA6B □□□Y252	230	CEA6A □□□Y252	
5.00	7	QA			CEA6C □□□Y502R	330	CEA6B □□□Y502	280	CEA6A □□□Y502	
10.0	8	SA					CEA6B □□□Y103	370	CEA6A □□□Y103	
CHOOSE ANY CENTER VOLTAGE FROM 40.0 TO 49.9										
0.10	2	HA	CEA6D □□□Y101R	$230	CEA6C □□□Y101R	$160	CEA6B □□□Y101	$110	CEA6A □□□Y101	$
0.25	3	JA	CEA6D □□□Y251R	230	CEA6C □□□Y251R	160	CEA6B □□□Y251	110	CEA6A □□□Y251	
0.50	4	LA	CEA6D □□□Y501R	255	CEA6C □□□Y501R	185	CEA6B □□□Y501	135	CEA6A □□□Y501	
1.00	5	NA	CEA6D □□□Y102R	305	CEA6C □□□Y102R	235	CEA6B □□□Y102	185	CEA6A □□□Y102	
2.50	6	PA			CEA6C □□□Y252R	280	CEA6B □□□Y252	230	CEA6A □□□Y252	
5.00	7	QA			CEA6C □□□Y502R	330	CEA6B □□□Y502	280	CEA6A □□□Y502	
10.0	8	SA					CEA6B □□□Y103	370	CEA6A □□□Y103	
CHOOSE ANY CENTER VOLTAGE FROM 50.0 TO 59.9										
0.05	2	HA	CEA6D □□□Y500R	$230	CEA6C □□□Y500R	$160	CEA6B □□□Y500	$110	CEA6A □□□Y500	$
0.10	3	JA	CEA6D □□□Y101R	230	CEA6C □□□Y101R	160	CEA6B □□□Y101	110	CEA6A □□□Y101	
0.25	4	KA	CEA6D □□□Y251R	250	CEA6C □□□Y251R	180	CEA6B □□□Y251	130	CEA6A □□□Y251	
0.50	5	MA	CEA6D □□□Y501R	280	CEA6C □□□Y501R	210	CEA6B □□□Y501	160	CEA6A □□□Y501	
1.00	6	PA	CEA6D □□□Y102R	350	CEA6C □□□Y102R	280	CEA6B □□□Y102	230	CEA6A □□□Y102	
2.50	7	QA			CEA6C □□□Y252R	330	CEA6B □□□Y252	280	CEA6A □□□Y252	
5.00	8	RA			CEA6C □□□Y502R	395	CEA6B □□□Y502	345	CEA6A □□□Y502	
10.0	9	TA					CEA6B □□□Y103	385	CEA6A □□□Y103	
CHOOSE ANY CENTER VOLTAGE FROM 60.0 TO 79.9										
0.05	2	JA	CEA6D □□□Y500R	$255	CEA6C □□□Y500R	$185	CEA6B □□□Y500	$135	CEA6A □□□Y500	$
0.10	3	KA	CEA6D □□□Y101R	275	CEA6C □□□Y101R	205	CEA6B □□□Y101	155	CEA6A □□□Y101	
0.25	4	LA	CEA6D □□□Y251R	280	CEA6C □□□Y251R	210	CEA6B □□□Y251	160	CEA6A □□□Y251	
0.50	5	MA	CEA6D □□□Y501R	310	CEA6C □□□Y501R	240	CEA6B □□□Y501	190	CEA6A □□□Y501	
1.00	6	PA	CEA6D □□□Y102R	395	CEA6C □□□Y102R	325	CEA6B □□□Y102	275	CEA6A □□□Y102	
2.50	7	QA			CEA6C □□□Y252R	380	CEA6B □□□Y252	330	CEA6A □□□Y252	
5.00	8	SA			CEA6C □□□Y502R	500	CEA6B □□□Y502	450	CEA6A □□□Y502	
10.0	9	TA					CEA6B □□□Y103	485	CEA6A □□□Y103	
CHOOSE ANY CENTER VOLTAGE FROM 80.0 TO 89.9										
0.05	2	JA	CEA6D □□□Y500R	$255	CEA6C □□□Y500R	$185	CEA6B □□□Y500	$135	CEA6A □□□Y500	
0.10	3	KA	CEA6D □□□Y101R	275	CEA6C □□□Y101R	205	CEA6B □□□Y101	155	CEA6A □□□Y101	
0.25	4	LA	CEA6D □□□Y251R	280	CEA6C □□□Y251R	210	CEA6B □□□Y251	160	CEA6A □□□Y251	
0.50	5	MA	CEA6D □□□Y501R	310	CEA6C □□□Y501R	240	CEA6B □□□Y501	190	CEA6A □□□Y501	
1.00	6	PA	CEA6D □□□Y102R	395	CEA6C □□□Y102R	325	CEA6B □□□Y102	275	CEA6A □□□Y102	
2.50	7	RA			CEA6C □□□Y252R	480	CEA6B □□□Y252	430	CEA6A □□□Y252	
5.00	8	SA			CEA6C □□□Y502R	500	CEA6B □□□Y502	450	CEA6A □□□Y502	
CHOOSE ANY CENTER VOLTAGE FROM 90.0 TO 99.9										
0.05	2	JA	CEA6D □□□Y500R	$255	CEA6C □□□Y500R	$185	CEA6B □□□Y500	$135	CEA6A □□□Y500	
0.10	3	KA	CEA6D □□□Y101R	275	CEA6C □□□Y101R	205	CEA6B □□□Y101	155	CEA6A □□□Y101	
0.25	4	LA	CEA6D □□□Y251R	280	CEA6C □□□Y251R	210	CEA6B □□□Y251	160	CEA6A □□□Y251	
0.50	5	MA	CEA6D □□□Y501R	310	CEA6C □□□Y501R	240	CEA6B □□□Y501	190	CEA6A □□□Y501	
1.00	6	QA	CEA6D □□□Y102R	450	CEA6C □□□Y102R	380	CEA6B □□□Y102	330	CEA6A □□□Y102	
2.50	7	RA			CEA6C □□□Y252R	480	CEA6B □□□Y252	430	CEA6A □□□Y252	
5.00	8	SA			CEA6C □□□Y502R	500	CEA6B □□□Y502	450	CEA6A □□□Y502	
CHOOSE ANY CENTER VOLTAGE FROM 100 TO 119										
0.05	2	KA	CEA6D □□□Z500R	$275	CEA6C □□□Z500R	$205	CEA6B □□□Z500	$155	CEA6A □□□Z500	
0.10	3	LA	CEA6D □□□Z101R	280	CEA6C □□□Z101R	210	CEA6B □□□Z101	160	CEA6A □□□Z101	
0.25	5	MA	CEA6D □□□Z251R	310	CEA6C □□□Z251R	240	CEA6B □□□Z251	190	CEA6A □□□Z251	
0.50	6	NA	CEA6D □□□Z501R	335	CEA6C □□□Z501R	265	CEA6B □□□Z501	215	CEA6A □□□Z501	
1.00	7	QA	CEA6D □□□Z102R	450	CEA6C □□□Z102R	380	CEA6B □□□Z102	330	CEA6A □□□Z102	
2.50	8	RA			CEA6C □□□Z252R	460	CEA6B □□□Z252	410	CEA6A □□□Z252	
5.00	9	TA			CEA6C □□□Z502R	535	CEA6B □□□Z202	485	CEA6A □□□Z502	
CHOOSE ANY CENTER VOLTAGE FROM 120 TO 139										
0.05	3	KA	CEA6D □□□Z500R	$275	CEA6C □□□Z500R	$205	CEA6B □□□Z500	$155	CEA6A □□□Z500	
0.10	4	LA	CEA6D □□□Z101R	280	CEA6C □□□Z101R	210	CEA6B □□□Z101	160	CEA6A □□□Z101	
0.25	5	MA	CEA6D □□□Z251R	320	CEA6C □□□Z251R	250	CEA6B □□□Z251	200	CEA6A □□□Z251	
0.50	6	NA	CEA6D □□□Z501R	355	CEA6C □□□Z501R	285	CEA6B □□□Z501	235	CEA6A □□□Z501	
1.00	7	QA	CEA6D □□□Z102R	480	CEA6C □□□Z102R	410	CEA6B □□□Z102	360	CEA6A □□□Z102	
2.50	8	SA			CEA6C □□□Z252R	560	CEA6B □□□Z252	510	CEA6A □□□Z252	
5.00	9	TA			CEA6C □□□Z502R	615	CEA6B □□□Z502	565	CEA6A □□□Z502	

Guaranteed free from defects in workmanship and materials for three years from date of shipme

CEA, a division of Berkleonics, Inc.
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

CHOOSE EXACT CENTER VOLTAGE REQUIRED AND INSERT TO COMPLETE BASIC MODEL NUMBER — OUTPUT VOLTAGES ADJUSTABLE ±5%.

ter voltages 140 to 500

Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005% Model	Price	Class "C" Regulation Line Plus Load ±0.0025% Model	Price	Class "B" Regulation Line Plus Load ±0.01% Model	Price	Class "A" Regulation Line Plus Load ±0.05% Model	Price
OSE ANY CENTER VOLTAGE FROM 140 TO 159									
3	KA	CEA6D □□□ Z500R	$275	CEA6C □□□ Z500R	$205	CEA6B □□□ Z500	$155	CEA6A □□□ Z500	$145
4	LA	CEA6D □□□ Z101R	280	CEA6C □□□ Z101R	210	CEA6B □□□ Z101	160	CEA6A □□□ Z101	150
5	MA	CEA6D □□□ Z251R	320	CEA6C □□□ Z251R	250	CEA6B □□□ Z251	200	CEA6A □□□ Z251	190
6	NA	CEA6D □□□ Z501R	355	CEA6C □□□ Z501R	285	CEA6B □□□ Z501	235	CEA6A □□□ Z501	225
7	RA	CEA6D □□□ Z102R	580	CEA6C □□□ Z102R	510	CEA6B □□□ Z102	460	CEA6A □□□ Z102	450
8	SA			CEA6C □□□ Z252R	560	CEA6B □□□ Z252	510	CEA6A □□□ Z252	500
OSE ANY CENTER VOLTAGE FROM 160 TO 199									
3	LA	CEA6D □□□ Z500R	$280	CEA6C □□□ Z500R	$210	CEA6B □□□ Z500	$160	CEA6A □□□ Z500	$150
4	MA	CEA6D □□□ Z101R	310	CEA6C □□□ Z101R	240	CEA6B □□□ Z101	190	CEA6A □□□ Z101	180
5	NA	CEA6D □□□ Z251R	355	CEA6C □□□ Z251R	285	CEA6B □□□ Z251	235	CEA6A □□□ Z251	225
6	PA	CEA6D □□□ Z501R	415	CEA6C □□□ Z501R	345	CEA6B □□□ Z501	295	CEA6A □□□ Z501	285
7	RA	CEA6D □□□ Z102R	580	CEA6C □□□ Z102R	510	CEA6B □□□ Z102	460	CEA6A □□□ Z102	450
8	SA			CEA6C □□□ Z252R	560	CEA6B □□□ Z252	510	CEA6A □□□ Z252	500
OSE ANY CENTER VOLTAGE FROM 200 TO 219									
3	LA	CEA6D □□□ Z500R	$280	CEA6C □□□ Z500R	$210	CEA6B □□□ Z500	$160	CEA6A □□□ Z500	$150
4	MA	CEA6D □□□ Z101R	320	CEA6C □□□ Z101R	250	CEA6B □□□ Z101	200	CEA6A □□□ Z101	190
5	NA	CEA6D □□□ Z251R	355	CEA6C □□□ Z251R	285	CEA6B □□□ Z251	235	CEA6A □□□ Z251	225
6	PA	CEA6D □□□ Z501R	415	CEA6C □□□ Z501R	345	CEA6B □□□ Z501	295	CEA6A □□□ Z501	285
7	RA	CEA6D □□□ Z102R	580	CEA6C □□□ Z102R	510	CEA6B □□□ Z102	460	CEA6A □□□ Z102	450
9	TA			CEA6C □□□ Z252R	615	CEA6B □□□ Z252	565	CEA6A □□□ Z252	555
OSE ANY CENTER VOLTAGE FROM 220 TO 259									
3	MA	CEA6D □□□ Z500R	$330	CEA6C □□□ Z500R	$260	CEA6B □□□ Z500	$210	CEA6A □□□ Z500	$200
4	NA	CEA6D □□□ Z101R	375	CEA6C □□□ Z101R	305	CEA6B □□□ Z101	255	CEA6A □□□ Z101	245
5	PA	CEA6D □□□ Z251R	435	CEA6C □□□ Z251R	365	CEA6B □□□ Z251	315	CEA6A □□□ Z251	305
6	QA	CEA6D □□□ Z501R	510	CEA6C □□□ Z501R	440	CEA6B □□□ Z501	390	CEA6A □□□ Z501	380
7	SA	CEA6D □□□ Z102R	690	CEA6C □□□ Z102R	620	CEA6B □□□ Z102	570	CEA6A □□□ Z102	560
9	TA			CEA6C □□□ Z252R	695	CEA6B □□□ Z252	645	CEA6A □□□ Z252	635
OSE ANY CENTER VOLTAGE FROM 260 TO 279									
4	MA	CEA6D □□□ Z500R	$330	CEA6C □□□ Z500R	$260	CEA6B □□□ Z500	$210	CEA6A □□□ Z500	$200
5	NA	CEA6D □□□ Z101R	375	CEA6C □□□ Z101R	305	CEA6B □□□ Z101	255	CEA6A □□□ Z101	245
6	PA	CEA6D □□□ Z251R	435	CEA6C □□□ Z251R	365	CEA6B □□□ Z251	315	CEA6A □□□ Z251	305
7	QA	CEA6D □□□ Z501R	510	CEA6C □□□ Z501R	440	CEA6B □□□ Z501	390	CEA6A □□□ Z501	380
8	SA	CEA6D □□□ Z102R	690	CEA6C □□□ Z102R	620	CEA6B □□□ Z102	570	CEA6A □□□ Z102	560
OSE ANY CENTER VOLTAGE FROM 280 TO 339									
4	NA	CEA6D □□□ Z500R	$385	CEA6C □□□ Z500R	$315	CEA6B □□□ Z500	$265	CEA6A □□□ Z500	$255
5	PA	CEA6D □□□ Z101R	445	CEA6C □□□ Z101R	375	CEA6B □□□ Z101	325	CEA6A □□□ Z101	315
6	QA	CEA6D □□□ Z251R	530	CEA6C □□□ Z251R	460	CEA6B □□□ Z251	410	CEA6A □□□ Z251	400
7	RA	CEA6D □□□ Z501R	660	CEA6C □□□ Z501R	590	CEA6B □□□ Z501	540	CEA6A □□□ Z501	530
8	SA	CEA6D □□□ Z102R	725	CEA6C □□□ Z102R	655	CEA6B □□□ Z102	605	CEA6A □□□ Z102	595
OSE ANY CENTER VOLTAGE FROM 340 TO 379									
4	NA	CEA6D □□□ Z500R	$385	CEA6C □□□ Z500R	$315	CEA6B □□□ Z500	$265	CEA6A □□□ Z500	$255
5	PA	CEA6D □□□ Z101R	445	CEA6C □□□ Z101R	375	CEA6B □□□ Z101	325	CEA6A □□□ Z101	315
6	QA	CEA6D □□□ Z251R	530	CEA6C □□□ Z251R	460	CEA6B □□□ Z251	410	CEA6A □□□ Z251	400
7	RA	CEA6D □□□ Z501R	660	CEA6C □□□ Z501R	590	CEA6B □□□ Z501	540	CEA6A □□□ Z501	530
8	TA	CEA6D □□□ Z102R	805	CEA6C □□□ Z102R	735	CEA6B □□□ Z102	685	CEA6A □□□ Z102	675
OSE ANY CENTER VOLTAGE FROM 380 TO 500									
4	PA	CEA6D □□□ Z500R	$445	CEA6C □□□ Z500R	$375	CEA6B □□□ Z500	$325	CEA6A □□□ Z500	$315
5	QA	CEA6D □□□ Z101R	530	CEA6C □□□ Z101R	460	CEA6B □□□ Z101	410	CEA6A □□□ Z101	400
6	RA	CEA6D □□□ Z251R	660	CEA6C □□□ Z251R	590	CEA6B □□□ Z251	540	CEA6A □□□ Z251	530
7	SA	CEA6D □□□ Z501R	725	CEA6C □□□ Z501R	655	CEA6B □□□ Z501	605	CEA6A □□□ Z501	595
8	TA	CEA6D □□□ Z102R	805	CEA6C □□□ Z102R	735	CEA6B □□□ Z102	685	CEA6A □□□ Z102	675

DELIVERY: Class "A" and "B" Units — 2 Weeks; Class "D" Units — 4 Weeks; Class "C" Units — 3 Weeks; Some Options Extend Delivery

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage and Frequency Range: 105 to 125 volts, 50 to 420 Hz.
Line Isolation: 20 db of shielding between primary and secondary of transformer.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: As fast as 10μsec depending on model
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.

• standard features

Available with any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage lim circuitry prevents overshooting at turn on and turn Short circuit protection reduces shorted current to than 2% of rated current.

• optional features

The extra charge for each option is either a flat rate or percentage of the base model price. Add the larger number t base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
FIXED OUTPUTS				
F	Fixed output ±1.0%	No charge, std.	None	Available in all classes.
F1	Fixed output ±0.1%	$30	1	Available in classes B, C & D.
F2	Fixed output ±0.01%	$100	1	Available in class D only.
ADJUSTABLE OUTPUTS				
G	Output adjust range ±1%	$15	None	Increases output resolution.
Std.	Output adjust range ±5%	No charge	None	Provided with "R" option if no other "G" option is specified.
G1	Output adjust range ±10%	$15 or 5%	1	Reduce maximum current to 80% of rated output.
G2	Output adjust range ±20%	$25 or 10%	1	Reduce maximum current to 60% of rated output.
G3	Output adjust range ±30%	$35 or 15%	1	Reduce maximum current to 50% of rated output.
G4	Output adjust range ±40%	$45 or 20%	1	Reduce maximum current to 45% of rated output.
G5	Output adjust range ±50%	$55 or 25%	1	Reduce maximum current to 40% of rated output.
Note: Next larger case size required for options G2, G3, G4 & G5. The temperature coefficient is degraded in classes B, C & D for options G2 th				
EXTENDED TEMPERATURE RANGE				
H1	Temp range −55°C to +80°C	$200 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temp range −40°C to +80°C	$40 or 20%	4	Storage to −55°C.
H3	Temp range −55°C to +115°C	$400 or 100%	6	Requires next larger case size. Storage to −62°C.
DUAL OUTPUT ISOLATION				
K	Isolated outputs	$20 or 10%	1	Outputs isolated from each other and case ±500 Volts.
AC INPUT VOLTAGE AND FREQUENCY				
L	Input 95-135V, 50-420 Hz	$20 or 20%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$25 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$25 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$40 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$25 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$50 or 20%	1	Input terminals parallel or series for 115/230 Volts.
DC INPUT VOLTAGES				
L7	Input 12 VDC (11.6 to 13.8 VDC)	$50 or 20%	1	Derate output to 60% of normal.
L8	Input 24 VDC (23.2 to 27.6 VDC)	$50 or 20%	1	
L9	Input 14 VDC (12.0 to 16.0 VDC)	$70 or 25%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$70 or 25%	1	
PROTECTION CIRCUITS				Available in all sizes except HA.
P1	Current limiting	$50 or 15%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemp. cutout	$20	1	Limits base temp. to max. rated. Self restarting.
P3	Crowbar voltage limit	$60 or 15%	1	Protects power supply and system circuit under all circumsti Operates at 10% over maximum settable voltage or 1 volt, ever is greater. Remove input power to restart.
REMOTE PROGRAMMING				
R	Remote adjust (No pot provided)	No charge	None	Remote programming options allow power supply to be exte adjusted. Resistance to output ratio is approx. 5 mv per except for class C & D units under 8.5 volts which are ap mately 1 mv per ohm. For potentiometer requirements see pa
R1	Remote adjust with 1% linearity	$40 or 10%	1	
R3	Remote adjust with pot provided (A & B only)	$10	1	
OPTIONAL STARTING CIRCUITS				
S1	Start into 30,000 mfd/amp	$40 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp
S2	Start positive output first	$20	1	
S3	Start negative output first	$20	1	
HIGH ISOLATION				
T	40 db transformer shielding	$40 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$80 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$20 or 10%	1	Either output terminal will withstand ±1000 volts to case or
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)			
	FA, GA, HA, JA	$5	1	
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	

Guaranteed free from defects in workmanship and materials for three years from date of shipm

dual output modules CEAD6 SERIES

REGULATED AC-DC TO 300 WATTS • BASE TEMPERATURE RATING 80°C

OUTPUT VOLTAGES FIXED WITHIN 1% UNLESS SPECIFIED OTHERWISE

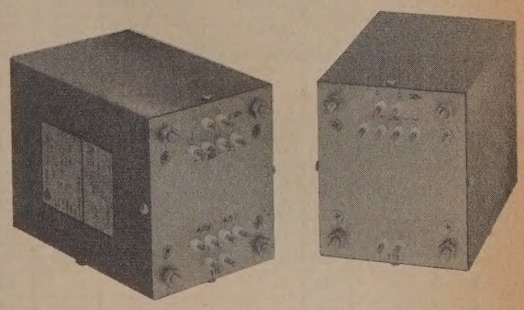
ki:ng modular dual supplies

mplete part number for your supply is estimated in three eps:

ect the basic model from the ropriate voltage range, cur- rating, and class of regula- from the charts below.

e the exact center voltage de- d in the open boxes of the el selected.

3. Tailor the power supply to meet your specific requirements by specifying as many of the optional features as desired from the opposite page. Just add the option letter(s) to the end of the model number.



ulation specifications

ssf ulon	Guaranteed Line Regulation for 10% Line Change	Guaranteed Load Regulation for No Load to Full Load	Guaranteed Temperature Coefficient Per Degree C	Guaranteed Stability for 40 Hours	Guaranteed RMS Ripple	Guaranteed Tracking
A	±0.01%	±0.04%	±0.01%	±0.05%	0.01%	±0.05%
B	±0.002%	±0.008%	±0.005%	±0.01%	0.001%	±0.01%
C	±0.0005%	±0.002%	±0.001%	±0.0025%	0.0005%	±0.0025%
D	±0.0001%	±0.0004%	±0.0005%	±0.0005%	0.0003%	±0.0005%

ter voltages 3.5 to 29.9

au ret mps	Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005%		Class "C" Regulation Line Plus Load ±0.0025%		Class "B" Regulation Line Plus Load ±0.01%		Class "A" Regulation Line Plus Load ±0.05%	
			Model	Price	Model	Price	Model	Price	Model	Price
OSE ANY CENTER VOLTAGE FROM 3.5 TO 9.9										
10	2	HA	CEAD6D □□X101F	$390	CEAD6C □□X101F	$260	CEAD6B □□X101F	$170	CEAD6A □□X101F	$155
25	3	JA	CEAD6D □□X251F	390	CEAD6C □□X251F	260	CEAD6B □□X251F	170	CEAD6A □□X251F	155
50	4	KA	CEAD6D □□X501F	415	CEAD6C □□X501F	290	CEAD6B □□X501F	200	CEAD6A □□X501F	180
00	5	LA	CEAD6D □□X102F	415	CEAD6C □□X102F	290	CEAD6B □□X102F	200	CEAD6A □□X102F	180
50	6	PA			CEAD6C □□X252F	380	CEAD6B □□X252F	285	CEAD6A □□X252F	270
00	7	QA			CEAD6C □□X502F	425	CEAD6B □□X502F	335	CEAD6A □□X502F	315
0.0	8	SA					CEAD6B □□X103F	505	CEAD6A □□X103F	485
OSE ANY CENTER VOLTAGE FROM 10.0 TO 12.4										
10	2	HA	CEAD6D □□□Y101F	$390	CEAD6C □□□Y101F	$260	CEAD6B □□□Y101F	$170	CEAD6A □□□Y101F	$155
25	3	JA	CEAD6D □□□Y251F	390	CEAD6C □□□Y251F	260	CEAD6B □□□Y251F	170	CEAD6A □□□Y251F	155
50	4	KA	CEAD6D □□□Y501F	415	CEAD6C □□□Y501F	290	CEAD6B □□□Y501F	200	CEAD6A □□□Y501F	180
00	5	LA	CEAD6D □□□Y102F	415	CEAD6C □□□Y102F	290	CEAD6B □□□Y102F	200	CEAD6A □□□Y102F	180
50	6	PA			CEAD6C □□□Y252F	380	CEAD6B □□□Y252F	285	CEAD6A □□□Y252F	270
00	7	QA			CEAD6C □□□Y502F	425	CEAD6B □□□Y502F	335	CEAD6A □□□Y502F	315
0.0	8	SA					CEAD6B □□□Y103F	505	CEAD6A □□□Y103F	485
OSE ANY CENTER VOLTAGE FROM 12.5 TO 27.4										
10	3	JA	CEAD6D □□□Y101F	$390	CEAD6C □□□Y101F	$260	CEAD6B □□□Y101F	$170	CEAD6A □□□Y101F	$155
25	4	KA	CEAD6D □□□Y251F	405	CEAD6C □□□Y251F	280	CEAD6B □□□Y251F	190	CEAD6A □□□Y251F	170
50	5	LA	CEAD6D □□□Y501F	415	CEAD6C □□□Y501F	290	CEAD6B □□□Y501F	200	CEAD6A □□□Y501F	180
00	5	MA	CEAD6D □□□Y102F	450	CEAD6C □□□Y102F	325	CEAD6B □□□Y102F	235	CEAD6A □□□Y102F	215
50	6	QA			CEAD6C □□□Y252F	425	CEAD6B □□□Y252F	335	CEAD6A □□□Y252F	315
00	7	RA			CEAD6C □□□Y502F	505	CEAD6B □□□Y502F	415	CEAD6A □□□Y502F	395
0.0	8	TA					CEAD6B □□□Y103F	620	CEAD6A □□□Y103F	605
OSE ANY CENTER VOLTAGE FROM 27.5 TO 29.9										
10	3	JA	CEAD6D □□□Y101F	$390	CEAD6C □□□Y101F	$260	CEAD6B □□□Y101F	$170	CEAD6A □□□Y101F	$155
25	3	KA	CEAD6D □□□Y251F	405	CEAD6C □□□Y251F	280	CEAD6B □□□Y251F	190	CEAD6A □□□Y251F	170
50	4	MA	CEAD6D □□□Y501F	450	CEAD6C □□□Y501F	325	CEAD6B □□□Y501F	230	CEAD6A □□□Y501F	215
00	5	NA	CEAD6D □□□Y102F	460	CEAD6C □□□Y102F	335	CEAD6B □□□Y102F	245	CEAD6A □□□Y102F	225
50	7	QA			CEAD6C □□□Y252F	425	CEAD6B □□□Y252F	335	CEAD6A □□□Y252F	315
00	8	RA			CEAD6C □□□Y502F	505	CEAD6B □□□Y502F	415	CEAD6A □□□Y502F	395
0.0	9	TA					CEAD6B □□□Y103F	620	CEAD6A □□□Y103F	605

LIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks
Class "D" Units — 4 Weeks
Some Options Extend Delivery

dual output modules CEAD6 SERIES to 80°C

center voltages 30.0 to 139

Output Current (Amps)	Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005% Model	Price	Class "C" Regulation Line Plus Load ±0.0025% Model	Price	Class "B" Regulation Line Plus Load ±0.01% Model	Price	Class "A" Regulation Line Plus Load ±0.05% Model	Pri
CHOOSE ANY CENTER VOLTAGE FROM 30.0 TO 39.9										
0.10	3	JA	CEAD6D □□□Y101F	$390	CEAD6C □□□Y101F	$260	CEAD6B □□□Y101F	$170	CEAD6A □□□Y101F	$1
0.25	4	LA	CEAD6D □□□Y251F	415	CEAD6C □□□Y251F	290	CEAD6B □□□Y251F	200	CEAD6A □□□Y251F	1
0.50	5	NA	CEAD6D □□□Y501F	460	CEAD6C □□□Y501F	335	CEAD6B □□□Y501F	245	CEAD6A □□□Y501F	2
1.00	6	QA	CEAD6D □□□Y102F	550	CEAD6C □□□Y102F	425	CEAD6B □□□Y102F	335	CEAD6A □□□Y102F	3
2.50	7	RA			CEAD6C □□□Y252F	505	CEAD6B □□□Y252F	415	CEAD6A □□□Y252F	3
5.00	8	SA			CEAD6C □□□Y502F	595	CEAD6B □□□Y512F	505	CEAD6A □□□Y502F	4
CHOOSE ANY CENTER VOLTAGE FROM 40.0 TO 49.9										
0.10	4	KA	CEAD6D □□□Y101F	$415	CEAD6C □□□Y101F	$290	CEAD6B □□□Y101F	$200	CEAD6A □□□Y101F	$1
0.25	5	LA	CEAD6D □□□Y251F	415	CEAD6C □□□Y251F	290	CEAD6B □□□Y251F	200	CEAD6A □□□Y251F	1
0.50	6	NA	CEAD6D □□□Y501F	460	CEAD6C □□□Y501F	335	CEAD6B □□□Y501F	245	CEAD6A □□□Y501F	2
1.00	7	QA	CEAD6D □□□Y102F	505	CEAD6C □□□Y102F	425	CEAD6B □□□Y102F	335	CEAD6A □□□Y102F	3
2.50	8	RA			CEAD6C □□□Y252F	505	CEAD6B □□□Y252F	415	CEAD6A □□□Y252F	3
5.00	9	SA			CEAD6C □□□Y502F	595	CEAD6B □□□Y502F	505	CEAD6A □□□Y502F	4
CHOOSE ANY CENTER VOLTAGE FROM 50.0 TO 59.9										
0.05	3	KA	CEAD6D □□□Y500F	$415	CEAD6C □□□Y500F	$290	CEAD6B □□□Y500F	$200	CEAD6A □□□Y500F	$1
0.10	4	LA	CEAD6D □□□Y101F	415	CEAD6C □□□Y101F	290	CEAD6B □□□Y101F	200	CEAD6A □□□Y101F	1
0.25	5	MA	CEAD6D □□□Y251F	450	CEAD6C □□□Y251F	325	CEAD6B □□□Y251F	235	CEAD6A □□□Y251F	2
0.50	6	PA	CEAD6D □□□Y501F	505	CEAD6C □□□Y501F	380	CEAD6B □□□Y501F	290	CEAD6A □□□Y501F	2
1.00	7	RA	CEAD6D □□□Y102F	630	CEAD6C □□□Y102F	505	CEAD6B □□□Y102F	415	CEAD6A □□□Y102F	3
2.50	8	SA			CEAD6C □□□Y252F	595	CEAD6B □□□Y252F	505	CEAD6A □□□Y252F	4
5.00	9	TA			CEAD6C □□□Y502F	710	CEAD6B □□□Y502F	620	CEAD6A □□□Y502F	6
CHOOSE ANY CENTER VOLTAGE FROM 60.0 TO 79.9										
0.05	4	LA	CEAD6D □□□Y500F	$460	CEAD6C □□□Y500F	$335	CEAD6B □□□Y500F	$245	CEAD6A □□□Y500F	$
0.10	5	MA	CEAD6D □□□Y101F	495	CEAD6C □□□Y101F	370	CEAD6B □□□Y101F	280	CEAD6A □□□Y101F	
0.25	6	NA	CEAD6D □□□Y251F	505	CEAD6C □□□Y251F	380	CEAD6B □□□Y251F	290	CEAD6A □□□Y251F	
0.50	6	PA	CEAD6D □□□Y501F	560	CEAD6C □□□Y501F	430	CEAD6B □□□Y501F	340	CEAD6A □□□Y501F	
1.00	7	RA	CEAD6D □□□Y102F	710	CEAD6C □□□Y102F	585	CEAD6B □□□Y102F	460	CEAD6A □□□Y102F	
2.50	8	SA			CEAD6C □□□Y252F	685	CEAD6B □□□Y252F	595	CEAD6A □□□Y252F	
CHOOSE ANY CENTER VOLTAGE FROM 80.0 TO 89.9										
0.05	4	LA	CEAD6D □□□Y500F	$460	CEAD6C □□□Y500F	$335	CEAD6B □□□Y500F	$245	CEAD6A □□□Y500F	$
0.10	5	MA	CEAD6D □□□Y101F	495	CEAD6C □□□Y101F	370	CEAD6B □□□Y101F	280	CEAD6A □□□Y101F	
0.25	6	NA	CEAD6D □□□Y251F	505	CEAD6C □□□Y251F	380	CEAD6B □□□Y251F	290	CEAD6A □□□Y251F	
0.50	6	PA	CEAD6D □□□Y501F	560	CEAD6C □□□Y501F	430	CEAD6B □□□Y501F	340	CEAD6A □□□Y501F	
1.00	7	RA	CEAD6D □□□Y102F	710	CEAD6C □□□Y102F	585	CEAD6B □□□Y102F	460	CEAD6A □□□Y102F	
2.50	8	TA			CEAD6C □□□Y252F	865	CEAD6B □□□Y252F	775	CEAD6A □□□Y252F	
CHOOSE ANY CENTER VOLTAGE FROM 90.0 TO 99.9										
0.05	3	LA	CEAD6D □□□Y500F	$460	CEAD6C □□□Y500F	$335	CEAD6B □□□Y500F	$245	CEAD6A □□□Y500F	$
0.10	5	MA	CEAD6D □□□Y101F	495	CEAD6C □□□Y101F	370	CEAD6B □□□Y101F	280	CEAD6A □□□Y101F	
0.25	6	NA	CEAD6D □□□Y251F	505	CEAD6C □□□Y251F	380	CEAD6B □□□Y251F	290	CEAD6A □□□Y251F	
0.50	7	PA	CEAD6D □□□Y501F	560	CEAD6C □□□Y501F	430	CEAD6B □□□Y501F	340	CEAD6A □□□Y501F	
1.00	7	SA	CEAD6D □□□Y102F	810	CEAD6C □□□Y102F	685	CEAD6B □□□Y102F	595	CEAD6A □□□Y102F	
2.50	8	TA			CEAD6C □□□Y252F	865	CEAD6B □□□Y252F	775	CEAD6A □□□Y252F	
CHOOSE ANY CENTER VOLTAGE FROM 100 TO 119										
0.05	5	MA	CEAD6D □□□Z500F	$495	CEAD6C □□□Y500F	$370	CEAD6B □□□Z500F	$280	CEAD6A □□□Z500F	$
0.10	6	NA	CEAD6D □□□Z101F	505	CEAD6C □□□Z101F	380	CEAD6B □□□Z101F	290	CEAD6A □□□Z101F	
0.25	7	PA	CEAD6D □□□Z251F	560	CEAD6C □□□Z251F	430	CEAD6B □□□Z251F	340	CEAD6A □□□Z251F	
0.50	7	QA	CEAD6D □□□Z501F	605	CEAD6C □□□Z501F	480	CEAD6B □□□Z501F	390	CEAD6A □□□Z501F	
1.00	8	SA	CEAD6D □□□Z102F	810	CEAD6C □□□Z102F	685	CEAD6B □□□Z102F	595	CEAD6A □□□Z102F	
2.50	9	TA			CEAD6C □□□Z252F	830	CEAD6B □□□Z252F	740	CEAD6A □□□Z252F	
CHOOSE ANY CENTER VOLTAGE FROM 120 TO 139										
0.05	3	MA	CEAD6D □□□Z500F	$495	CEAD6C □□□Y500F	$370	CEAD6B □□□Z500F	$280	CEAD6A □□□Z500F	
0.10	4	NA	CEAD6D □□□Z101F	505	CEAD6C □□□Z101F	380	CEAD6B □□□Z101F	290	CEAD6A □□□Z101F	
0.25	5	PA	CEAD6D □□□Z251F	575	CEAD6C □□□Z251F	450	CEAD6B □□□Z251F	360	CEAD6A □□□Z251F	
0.50	6	QA	CEAD6D □□□Z501F	640	CEAD6C □□□Z501F	515	CEAD6B □□□Z501F	425	CEAD6A □□□Z501F	
1.00	7	SA	CEAD6D □□□Z102F	865	CEAD6C □□□Z102F	740	CEAD6B □□□Z102F	650	CEAD6A □□□Z102F	

Guaranteed free from defects in workmanship and materials for three years from date of shipme

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TELEPHONE: (213) 359-9261

CHOOSE EXACT CENTER VOLTAGE REQUIRED AND INSERT TO COMPLETE BASIC MODEL NUMBER — OUTPUT VOLTAGES FIXED WITHIN 1% UNLESS SPECIFIED OTHERWISE.

ter voltages 140 to 500

Thermal Curve	Size	Class "D" Regulation Line Plus Load ±0.0005% Model	Price	Class "C" Regulation Line Plus Load ±0.0025% Model	Price	Class "B" Regulation Line Plus Load ±0.01% Model	Price	Class "A" Regulation Line Plus Load ±0.05% Model	Price
OSE ANY CENTER VOLTAGE FROM 140 TO 159									
4	MA	CEAD6D □□□ Z500F	$495	CEAD6C □□□ Y500F	$370	CEAD6B □□□ Z500F	$280	CEAD6A □□□ Z500F	$260
5	NA	CEAD6D □□□ Z101F	505	CEAD6C □□□ Z101F	380	CEAD6B □□□ Z101F	290	CEAD6A □□□ Z101F	270
6	PA	CEAD6D □□□ Z251F	575	CEAD6C □□□ Z251F	450	CEAD6B □□□ Z251F	360	CEAD6A □□□ Z251F	340
7	QA	CEAD6D □□□ Z501F	640	CEAD6C □□□ Z501F	515	CEAD6B □□□ Z501F	425	CEAD6A □□□ Z501F	405
8	TA	CEAD6D □□□ Z102F	1045	CEAD6C □□□ Z102F	920	CEAD6B □□□ Z102F	830	CEAD6A □□□ Z102F	810
OSE ANY CENTER VOLTAGE FROM 160 TO 199									
5	NA	CEAD6D □□□ Z500F	$505	CEAD6C □□□ Z500F	$380	CEAD6B □□□ Z500F	$290	CEAD6A □□□ Z501F	$270
6	PA	CEAD6D □□□ Z101F	560	CEAD6C □□□ Z101F	430	CEAD6B □□□ Z101F	340	CEAD6A □□□ Z101F	325
7	QA	CEAD6D □□□ Z251F	640	CEAD6C □□□ Z251F	515	CEAD6B □□□ Z251F	425	CEAD6A □□□ Z251F	405
7	RA	CEAD6D □□□ Z501F	750	CEAD6C □□□ Z501F	620	CEAD6B □□□ Z501F	530	CEAD6A □□□ Z501F	515
8	TA	CEAD6D □□□ Z102F	1045	CEAD6C □□□ Z102F	920	CEAD6B □□□ X102F	830	CEAD6A □□□ Z102F	810
OSE ANY CENTER VOLTAGE FROM 200 TO 219									
4	NA	CEAD6D □□□ Z500F	$505	CEAD6C □□□ Z500F	$380	CEAD6B □□□ Z500F	$290	CEAD6A □□□ Z501F	$270
5	PA	CEAD6D □□□ Z101F	560	CEAD6C □□□ Z101F	430	CEAD6B □□□ Z101F	360	CEAD6A □□□ Z101F	340
6	QA	CEAD6D □□□ Z251F	640	CEAD6C □□□ Z251F	515	CEAD6B □□□ Z251F	425	CEAD6A □□□ Z251F	405
7	RA	CEAD6D □□□ Z501F	750	CEAD6C □□□ Z501F	620	CEAD6B □□□ Z501F	530	CEAD6A □□□ Z501F	515
8	TA	CEAD6D □□□ Z102F	1045	CEAD6C □□□ Z102F	920	CEAD6B □□□ X102F	830	CEAD6A □□□ Z102F	810
OSE ANY CENTER VOLTAGE FROM 220 TO 259									
6	PA	CEAD6D □□□ Z500F	$595	CEAD6C □□□ Z500F	$470	CEAD6B □□□ Z500F	$380	CEAD6A □□□ Z500F	$360
7	QA	CEAD6D □□□ Z101F	675	CEAD6C □□□ Z101F	550	CEAD6B □□□ Z101F	460	CEAD6A □□□ Z101F	440
8	RA	CEAD6D □□□ Z251F	685	CEAD6C □□□ Z251F	760	CEAD6B □□□ Z251F	570	CEAD6A □□□ Z251F	550
9	SA	CEAD6D □□□ Z501F	920	CEAD6C □□□ Z501F	790	CEAD6B □□□ Z501F	700	CEAD6A □□□ Z501F	685
OSE ANY CENTER VOLTAGE FROM 260 TO 279									
5	PA	CEAD6D □□□ Z500F	$595	CEAD6C □□□ Z500F	$470	CEAD6B □□□ Z500F	$380	CEAD6A □□□ Z500F	$360
6	QA	CEAD6D □□□ Z101F	675	CEAD6C □□□ Z101F	550	CEAD6B □□□ Z101F	460	CEAD6A □□□ Z101F	440
7	RA	CEAD6D □□□ Z251F	685	CEAD6C □□□ Z251F	760	CEAD6B □□□ Z251F	570	CEAD6A □□□ Z251F	550
8	SA	CEAD6D □□□ Z501F	920	CEAD6C □□□ Z501F	790	CEAD6B □□□ Z501F	700	CEAD6A □□□ Z501F	685
OSE ANY CENTER VOLTAGE FROM 280 TO 339									
6	QA	CEAD6D □□□ Z500F	$695	CEAD6C □□□ Z500F	$570	CEAD6B □□□ Z500F	$480	CEAD6A □□□ Z500F	$460
7	RA	CEAD6D □□□ Z101F	800	CEAD6C □□□ Z101F	675	CEAD6B □□□ Z101F	585	CEAD6A □□□ Z101F	570
8	SA	CEAD6D □□□ Z251F	955	CEAD6C □□□ Z251F	830	CEAD6B □□□ Z251F	740	CEAD6A □□□ Z251F	760
9	TA	CEAD6D □□□ Z501F	1190	CEAD6C □□□ Z501F	1060	CEAD6B □□□ Z501F	970	CEAD6A □□□ Z501F	955
OSE ANY CENTER VOLTAGE FROM 340 TO 379									
5	QA	CEAD6D □□□ Z500F	$695	CEAD6C □□□ Z500F	$570	CEAD6B □□□ Z500F	$480	CEAD6A □□□ Z500F	$460
6	RA	CEAD6D □□□ Z101F	800	CEAD6C □□□ Z101F	675	CEAD6B □□□ Z101F	585	CEAD6A □□□ Z101F	570
7	SA	CEAD6D □□□ Z251F	955	CEAD6C □□□ Z251F	830	CEAD6B □□□ Z251F	740	CEAD6A □□□ Z251F	760
8	TA	CEAD6D □□□ Z501F	1190	CEAD6C □□□ Z501F	1060	CEAD6B □□□ Z501F	970	CEAD6A □□□ Z501F	955
OSE ANY CENTER VOLTAGE FROM 380 TO 500									
6	RA	CEAD6D □□□ Z500F	$800	CEAD6C □□□ Z500F	$675	CEAD6B □□□ Z500F	$585	CEAD6A □□□ Z500F	$570
7	SA	CEAD6D □□□ Z101F	955	CEAD6C □□□ Z101F	830	CEAD6B □□□ Z101F	740	CEAD6A □□□ Z101F	760
8	TA	CEAD6D □□□ Z251F	1190	CEAD6C □□□ Z251F	1060	CEAD6B □□□ Z251F	970	CEAD6A □□□ Z251F	955

DELIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks
Class "D" Units — 4 Weeks
Some Options Extend Delivery

CEA, *a division of Berkleonics, Inc*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage and Frequency Range: 105 to 125 volts, 50 to 420 Hz.
Line Isolation: 20 db of shielding between primary and secondary of transformer.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: As fast as 10μsec depending on model
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.

• standard features

Available with any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage limiting circuitry prevents overshooting at turn on and off. Short circuit protection reduces shorted current to than 2% of rated current. Output adjustable with int potentiometer on classes A & B. Class C & D unit externally adjustable only (no internal pot.)

• optional features

The extra charge for each option is either a flat rate or a percentage of the base model price. Add the larger numb the base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
FIXED OUTPUTS				
F	Fixed output ±1.0%	No charge	None	Available in all classes. Delete "R" from class C & D P/N.
F1	Fixed output ±0.1%	$15	1	Available in classes B, C & D. Delete "R" from class C & D P/
F2	Fixed output ±0.01%	$50	1	Available in class D only. Delete "R" from class D P/N.
ADJUSTABLE OUTPUTS				
G	Output adjust range ±1%	$5	None	Increases output resolution.
Std	Output adjust range ±5%	No charge, std.	None	Provided unless a "G" or "F" option is specified.
G1	Output adjust range ±10%	$5 or 5%	1	Reduce maximum current to 80% of rated output.
G2	Output adjust range ±20%	$10 or 10%	1	Reduce maximum current to 60% of rated output.
G3	Output adjust range ±30%	$15 or 15%	1	Reduce maximum current to 50% of rated output.
G4	Output adjust range ±40%	$20 or 20%	1	Reduce maximum current to 45% of rated output.
G5	Output adjust range ±50%	$25 or 25%	1	Reduce maximum current to 40% of rated output.
Note: Next larger case size required for options G2, G3, G4 & G5. The temperature coefficient is degraded in classes B, C & D for options G2 t				
EXTENDED TEMPERATURE RANGE				
H1	Temp range −55°C to +80°C	$100 or 50%	4	Storage to −62°C.
H2	Temp range −40°C to +80°C	$20 or 20%	4	Storage to −55°C.
H3	Temp range −55°C to +115°C	$200 or 100%	6	Storage to −62°C.
RAPID PROGRAMMING INTO LARGE CAPACITANCE LOADS				
J	Voltage pull down circuit	$40 or 30%	2	Has circuit equivalent to an output resistor of one-tenth of ratec
AC INPUT VOLTAGE AND FREQUENCY				
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 10%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 Volts.
PROTECTION CIRCUITS				
P1	Current limiting	$25 or 15%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemp. cutout	$20	1	Limits base temp. to max. rated. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumst Operates at 10% over maximum settable voltage or 1 Volt, ever is greater. Remove input power to restart.
REMOTE PROGRAMMING				
R	Remote adjust (No pot provided)	No charge	None	Remote programming options allow power supply to be ext
R1	Remote adjust with 1% linearity	$20 or 10%	1	adjusted. Resistance to output ratio is approx. 5 mv per oh
R2	Remote adjust plus internal pot (A & B only)	$5	1	cept for class C & D units below 8.5 Volts which are approxi
R3	Remote adjust with pot provided (A & B only)	$5	1	1 mv per ohm. For potentiometer requirements see Page 28
START INTO HIGH CAPACITANCE LOADS				
S1	Start into 30,000 mfd/amp	$20 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
HIGH ISOLATION				
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 Volts to input.
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)	$10	1	Add no charge option "R" and letter "W" to model number.
W1	Potted for ruggedization (with internal potentiometer)	$25	1	Model number should not include either "R" or "F" c Internal potentiometer included.

Guaranteed free from defects in workmanship and materials for three years from date of shipm

card supplies CEA7 SERIES

REGULATED AC-DC TO 12 WATTS • BASE TEMPERATURE RATING 80°C

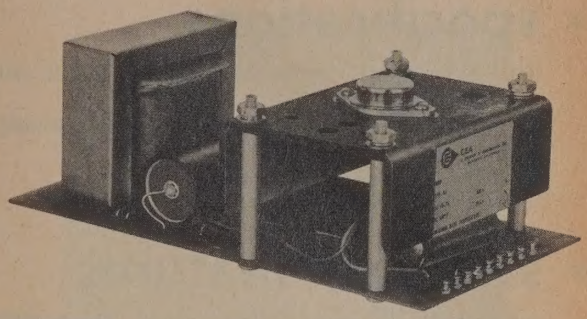
OUTPUT VOLTAGES ADJUSTABLE ±5% UNLESS OTHERWISE SPECIFIED

mplete part number for your power supply is established in easy steps:

ect the basic model from the appropriate voltage range, current ng, and class of regulation from the charts below.

e the exact center voltage desired in the open boxes of the el selected.

or the power supply to meet your specific requirements by ifying as many of the optional features from the opposite page lesired. Just add the option letter(s) at the end of the model cted.



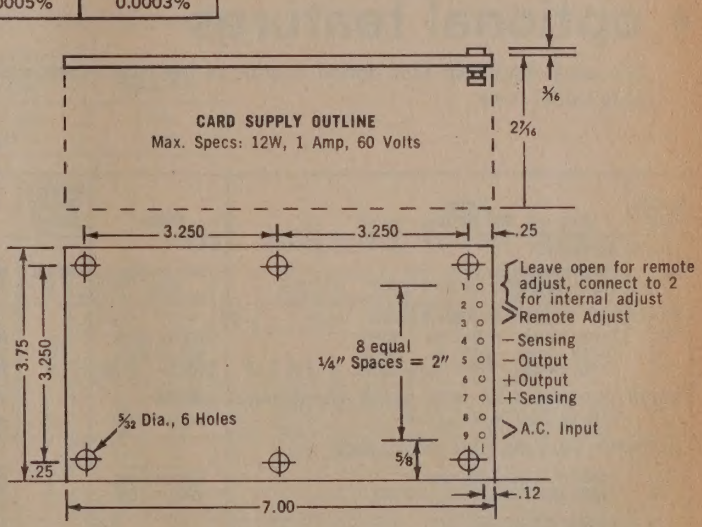
ulation specifications

s of ation	Guaranteed Line Regulation for 10% Line Change	Guaranteed Load Regulation for No Load to Full Load	Guaranteed Temperature Coefficient Per Degree C	Guaranteed Stability for 40 Hours	Guaranteed RMS Ripple
	±0.01%	±0.04%	±0.01%	±0.05%	0.01%
	±0.002%	±0.008%	±0.005%	±0.01%	0.001%
	±0.0005%	±0.002%	±0.001%	±0.0025%	0.0005%
	±0.0001%	±0.0004%	±0.0005%	±0.0005%	0.0003%

cifications

aximum current obtainable in the CEA7 Series is 1.0 the maximum voltage is 60 volts, and the maximum power is 12 watts. All of these conditions must be met cting a card type supply.

-CEA's precision power supplies on a card — at less he new CEA7 Series card supplies have identical elec- pecifications to the CEA6 Series, including the avail- of four classes of regulation. The wide variety of s and currents modules are all on one size printed board and adaptable to any plug-in card or mounted chassis with four screws and six connections. The Series with Class C & D regulation make ideal refer- nits for many applications in computers and instru- ion systems.



Out Curr t (Am)	Class "D" Regulation Line Plus Load ±0.0005%		Class "C" Regulation Line Plus Load ±0.0025%		Class "B" Regulation Line Plus Load ±0.01%		Class "A" Regulation Line Plus Load ±0.05%	
	Model	Price	Model	Price	Model	Price	Model	Price
OSE ANY CENTER VOLTAGE FROM 3.5 TO 9.9								
.00	CEA7D □□X102R	$195	CEA7C □□X102R	$125	CEA7B □□X102	$75	CEA7A □□X102	$65
OSE ANY CENTER VOLTAGE FROM 10.0 TO 60.0								
.10	CEA7D □□□Y101R	$195	CEA7C □□□Y101R	$125	CEA7B □□□X101	$75	CEA7A □□□Y101	$65
OSE ANY CENTER VOLTAGE FROM 10.0 TO 30.0								
.25	CEA7D □□□Y251R	$195	CEA7C □□□Y251R	$125	CEA7B □□□Y251	$75	CEA7A □□□Y251	$65
OSE ANY CENTER VOLTAGE FROM 10.0 TO 24.0								
.50	CEA7D □□□Y501R	$195	CEA7C □□□Y501R	$125	CEA7B □□□Y501	$75	CEA7A □□□Y501	$65
OSE ANY CENTER VOLTAGE FROM 10.0 TO 12.0								
.00	CEA7D □□□Y102R	$195	CEA7C □□□Y102R	$125	CEA7B □□□Y102	$75	CEA7A □□□Y102	$65

LIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks
Class "D" Units — 4 Weeks
Some Options Extend Delivery

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage and Frequency Range: 105 to 125 volts, 50 to 420 Hz.
Line Isolation: 20 db of shielding between primary and secondary of transformer.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: 100μsec.
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.
High Efficiency: 80%.

• standard features

Available with any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage limiting circuitry prevents overshooting at turn on and turn o Short circuit protection reduces shorted current to le than 2% of rated current. Output adjustable with intern potentiometer on classes A & B. Class C & D are externa adjustable only (no internal pot.)

• optional features

The extra charge for each option is either a flat rate or percentage of the base model price. Add the larger number to t base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
FIXED OUTPUTS				
F	Fixed output ±1.0%	No charge	None	Available in both classes.
F1	Fixed output ±0.1%	$15	1	Available in classes B only.
EXTENDED TEMPERATURE RANGE				
H1	Temp range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temp range −40°C to +80°C	$20 or 20%	4	Storage to −55°C.
H3	Temp range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
RAPID PROGRAMMING INTO LARGE CAPACITANCE LOADS				
J	Voltage pull down circuit	$40 or 30%	2	Has circuit equivalent to an output resistor of one-tenth load.
AC INPUT VOLTAGE AND FREQUENCY				
L	Input 95-135V, 50-420 Hz	$20 or 10%	1	Derate maximum current to 60% of rated output.
L4	Input 105-125V, 400 ±20 Hz	$20 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X. Input terminals parallel or series for 115/230 Volts.
PROTECTION CIRCUITS				Available in all sizes except FA.
P1	Current limiting	$25 or 10%	1	Protects system circuit. Limits current to 130% of rated.
P2	Overtemp. cutout	$20	1	Limits base temp. to max. rated. Self restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumstanc Operates at 10% over maximum settable voltage or 1 Volt, whic ever is greater. Remove input power to restart.
REMOTE PROGRAMMING				
R	Remote adjust (No pot provided)	No charge	None	Remote programming options allow power supply to be externa adjusted. Resistance to output ratio is approx. 5 mv per oh For potentiometer requirements see Page 28.
R1	Remote adjust with 1% linearity (class B only)	$20 or 10%	1	
R2	Remote adjust plus internal pot	$5	1	
R3	Remote adjust with pot provided	$5	1	
START INTO HIGH CAPACITANCE LOADS				
S1	Start into 30,000 mfd/amp	$20 or 10%	1	Recommended for all capacitance loads over 500 mfd/amp.
HIGH ISOLATION				
T	40 db transformer shielding	$30 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$60 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 Volts to case or inp
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)			
	FA, GA, HA, JA	$5	1	
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedization (With internal potentiometer)	"W" prices Plus $15	1	

Guaranteed free from defects in workmanship and materials for three years from date of shipmen

single output • smallest size CEA3 SERIES

REGULATED AC-DC TO 640 WATTS • BASE TEMPERATURE RATING 80°C

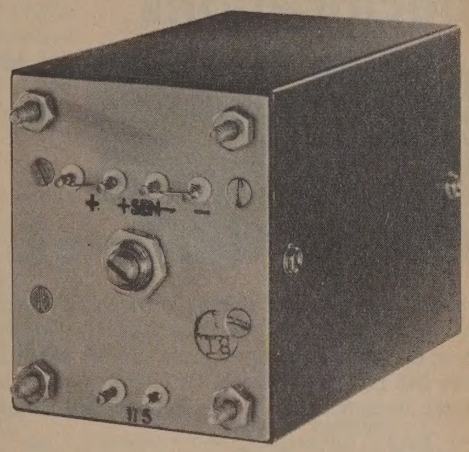
OUTPUT ADJUSTABLE OVER VOLTAGE RANGE UNLESS OTHERWISE SPECIFIED

series power supplies represent the highest power to size vailable commercially. Designed especially for the user who space problem, these modular supplies have the same high and reliability designed in as do all CEA supplies. The out- adjustable over the entire range by means of an internal iometer.

er a fixed output model:

Fixed Output: Specify exact voltage desired by substituting ge value for standard voltage in part number.

nple: To make a 25.4 volt fixed output, 2.5 amp, Class B Supply, specify a CEA3B320Y252 (normally adjustable 16 to 32 volts). As a CEA3B254Y252F. The 320Y in the standard part number indicates the normally maximum settable voltage of 32 volts).



ulation specifications

ss of lation	Guaranteed Line Regulation for 10% Line Change	Guaranteed Load Regulation for No Load to Full Load	Guaranteed Temperature Coefficient Per Degree C	Guaranteed Stability for 40 Hours	Guaranteed Ripple P-P
A	±0.5%	±0.5%	±0.1%	±1.0%	2.0%
B	±0.05%	±0.05%	±0.01%	±0.1%	0.2%

volt. adj. 3.0 to 32.0

Output Current (Amps)	Thermal Curve	Size	Class "B" Regulation Line Plus Load ±0.1% Model	Class "B" Regulation Line Plus Load ±0.1% Price	Class "A" Regulation Line Plus Load ±1.0% Model	Class "A" Regulation Line Plus Load ±1.0% Price
T. ADJ. RANGE FROM 3.0 TO 6.0						
2	2	GA	CEA3B60X252	$225	CEA3A60X252	$205
5	3	HA	CEA3B60X502	260	CEA3A60X502	240
10	4	JA	CEA3B60X103	290	CEA3A60X103	270
20	5	MA	CEA3B60X203	355	CEA3A60X203	335
40	6	NA	CEA3B60X403	405	CEA3A60X403	385
60	7	PA	CEA3B60X603	455	CEA3A60X603	435
T. ADJ. RANGE FROM 5.0 TO 10.0						
2	2	GA	CEA3B100Y252	$225	CEA3A100Y252	$205
5	3	HA	CEA3B100Y502	260	CEA30100Y502	240
10	4	JA	CEA3B100Y103	290	CEA3A100Y103	270
20	5	MA	CEA3B100Y203	355	CEA3A100Y203	335
40	7	PA	CEA3B100Y403	455	CEA3A100Y403	435
60	8	QA	CEA3B100Y603	505	CEA3A100Y603	485
T. ADJ. RANGE FROM 8.0 TO 16.0						
1	2	GA	CEA3B160Y102	$225	CEA3A160Y102	$205
2	3	HA	CEA3B160Y252	260	CEA3A160Y252	240
5	4	JA	CEA3B160Y502	290	CEA3A160Y502	270
10	5	KA	CEA3B160Y103	325	CEA3A160Y103	305
20	6	NA	CEA3B160Y203	405	CEA3A160Y203	385
40	8	RA	CEA3B160Y403	560	CEA3A160Y403	540
T. ADJ. RANGE FROM 16.0 TO 32.0						
5	2	GA	CEA3B320Y501	$225	CEA3A320Y501	$205
1	3	NA	CEA3B320Y102	260	CEA3A320Y102	240
2	4	JA	CEA3B320Y252	290	CEA3A320Y252	270
5	5	KA	CEA3B320Y502	325	CEA3A320Y502	305
10	6	NA	CEA3B320Y103	405	CEA3A320Y103	385
20	8	RA	CEA3B320Y203	560	CEA3A320Y203	540

ELIVERY: Class "A" and "B" Units — 2 Weeks

volt. adj. 32.0 to 512

Output Current (Amps)	Thermal Curve	Size	Class "B" Regulation Line Plus Load ±0.1% Model	Class "B" Regulation Line Plus Load ±0.1% Price	Class "A" Regulation Line Plus Load ±1.0% Model	Class "A" Regulation Line Plus Load ±1.0% Price
VOLT. ADJ. RANGE FROM 32.TO 64						
.25	2	GA	CEA3B640Y251	$225	CEA3A640Y251	$205
.50	3	HA	CEA3B640Y501	260	CEA3A640Y501	240
1.00	4	JA	CEA3B640Y102	290	CEA3A640Y102	270
2.50	5	KA	CEA3B640Y252	325	CEA3A640Y252	305
5.00	6	NA	CEA3B640Y502	405	CEA3A640Y502	385
10.0	8	RA	CEA3B640Y103	560	CEA3A640Y103	540
VOLT. ADJ. RANGE FROM 64 TO 128						
.10	2	GA	CEA3B128Z101	$225	CEA3A128Z101	$205
.25	3	HA	CEA3B128Z251	260	CEA3A128Z251	240
.50	4	JA	CEA3B128Z501	290	CEA3A128Z501	270
1.00	5	KA	CEA3B128Z102	325	CEA3A128Z102	305
2.50	6	NA	CEA3B128Z252	405	CEA3A128Z252	385
5.00	8	RA	CEA3B128Z502	560	CEA3A128Z502	540
VOLT. ADJ. RANGE FROM 128 TO 256						
.05	2	GA	CEA3B256Z500	$225	CEA3A256Z500	$205
.10	3	HA	CEA3B256Z101	260	CEA3A256Z101	240
.25	4	JA	CEA3B256Z251	290	CEA3A256Z251	270
.50	5	KA	CEA3B256Z501	325	CEA3A256Z501	305
1.00	6	NA	CEA3B256Z102	405	CEA3A256Z102	385
2.50	8	RA	CEA3B256Z252	560	CEA3A256Z252	540
VOLT. ADJ. RANGE FROM 256 TO 512						
.05	3	HA	CEA3B512Z500	$260	CEA3A512Z500	$240
.10	4	JA	CEA3B512Z101	290	CEA3A512Z101	270
.25	5	KA	CEA3B512Z251	325	CEA3A512Z251	305
.50	6	NA	CEA3B512Z501	405	CEA3A512Z501	385
1.00	7	QA	CEA3B512Z102	560	CEA3A512Z102	540

Some Options Extend Delivery

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage Range: 21 to 30V DC (10.5 to 15V optional at no charge).
Line Isolation: 20 db of shielding between input terminals and output terminals.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: 100μsec.
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.

• standard features

Available in any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage limiting circuitry prevents overshoot at turn on or turn off. Sh circuit protection reduces shorted current to less than 2 of rated current. Output fixed within 5% of specifi Adjustable outputs available optionally.

• optional features

The extra charge for each option is either a flat rate or percentage of the base model price. Add the larger number to base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
FIXED OUTPUTS				
F	Fixed out ±10%	No charge	None	Standard for class A. Available for CEA2B and CEA2C.
F1	Fixed output ±1%	$15	1	CEA2C series only.
ADJUSTABLE OUTPUTS				
G	Output adjust range ±1%	$10	1	CEA2C series only.
G1	Output adjust range ±10%	$5 or 5%	1	CEA2B and CEA2C only.
G2	Output adjust range ±20%	$10 or 10%	1	CEA2B and CEA2C only.
Note: Adjustable units will have an internal potentiometer unless "R" option specified.				
EXTENDED TEMPERATURE RANGE				
H1	Temp. range −55°C to +80°C	$50 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temp. range −40°C to +80°C	$15 or 15%	2	Storage to −55°C.
H3	Temp. range −55°C to +115°C	$100 or 100%	6	Requires next larger case size. Storage to −62°C.
INPUT VOLTAGE OPTIONS				
L	Input 10.5 to 15.0 VDC	No charge	None	
L1	Input 24 to 32 VDC	$10 or 10%	1	
SPECIAL CONNECTIONS				
N	Octal plug (replaces solder terminal)	$15	2	For mounting details see page 30.
PROTECTION CIRCUITS				
P2	Overtemp. cutout	$20	1	Set at base temperature rating. Self restarting.
P3	Crowbar voltage unit	$30 or 15%	1	Set at 1 Volt or 20% over max. rating, whichever is larger.
REMOTE PROGRAMMING				Remote program options allow power supply to be externally justed with resistance (5 mv/ohm).
R	Remote adjust (no pot provided)	No charge	None	Not available in CEA2A series.
R1	Remote adjust with 1% linearity	$20 or 10%	1	Available in CEA2C series only.
R2	Remote adjust plus internal pot	$5	1	Not available in CEA2A series.
R3	Remote adjust with pot provided	$5	1	For potentiometer requirements see Page 28.
START INTO HIGH CAPACITANCE LOADS				
S1	Start into 30,000 mfd/amp	$20 or 20%	1	Recommended for all capacitance loads over 500 mfd/amp.
HIGH ISOLATION				
T	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 Volts to case or in
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)			
	FA, GA, HA, JA	$5	1	
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedication (With internal potentiometer)	"W" prices Plus $15	1	

Guaranteed free from defects in workmanship and materials for three years from date of shipmer

dc to dc converters CEA2 SERIES

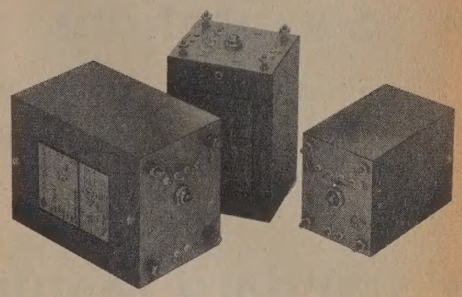
TO 640 WATTS • BASE TEMPERATURE RATING 80°C
OUTPUT ADJUSTABLE ±5% ON CLASSES "B" AND "C"

mplete part number for your con- s established in three easy steps:

ect the basic model from the ap- priate voltage range, current rat- in and class of regulation from the rts below.

te the exact center voltage de- id in the open boxes of the model ected.

3. Tailor the power supply to meet your specific requirements by specifying as many of the optional features from the opposite page as desired. Just add the option letter(s) at the end of the model number.



ulation specifications

ss of lation	Guaranteed Line Regulation for Full D.C. Input Change	Guaranteed Load Regulation from No Load to Full Load	Guaranteed Ripple P-P	Guaranteed Temperature Coefficient per Degree C	Guaranteed Typical Efficiency
A	None	10% + .5 Volt	3%	0.1%	90%
B	1%	10% + .5 Volt	3%	0.1%	60%
C	1%	1%	1%	0.05%	60%

OSER REGULATION SUPPLIES SEE DC INPUT OPTIONS FOR CEA6 SERIES ON PAGE 8.

put voltage 3.0 to 500

utt urrent Am)	Case Size	Class "C" Reulation Line 1%, Load 1% Model	Price	Thermal Curve	Class "B" Regulation Line 1%, Load 10% +.5 Volt Model	Price	Thermal Curve	Class "A" Regulation Line, None, Load 10% +.5 Volt Model	Price	Thermal Curve
HOSE ANY OUTPUT VOLTAGE FROM 3.0 TO 9.9										
	FA	CEA2C □□X102	$100	3	CEA2B □□X102	$ 90	3	CEA2A □□X102F	$ 80	1
	GA	CEA2C □□X252	102	4	CEA2B □□X252	92	4	CEA2A □□X252F	82	2
	HA	CEA2C □□X502	114	5	CEA2B □□X502	104	5	CEA2A □□X502F	94	3
10	KA	CEA2C □□X103	128	6	CEA2B □□X103	118	6	CEA2A □□X103F	108	4
20	NA	CEA2C □□X203	206	7	CEA2B □□X203	190	7	CEA2A □□X203F	174	6
40	QA	CEA2C □□X403	300	8	CEA2B □□X403	276	8	CEA2A □□X403F	252	7
HOSE ANY OUTPUT VOLTAGE FROM 10.0 TO 15.9										
	FA	CEA2C □□□Y102	$100	3	CEA2B □□□Y102	$ 90	3	CEA2A □□□Y102F	$ 80	1
	GA	CEA2C □□□Y252	102	4	CEA2B □□□Y252	92	4	CEA2A □□□Y252F	82	2
	JA	CEA2C □□□Y502	116	5	CEA2B □□□Y502	106	5	CEA2A □□□Y502F	96	4
10	MA	CEA2C □□□Y103	170	7	CEA2B □□□Y103	158	7	CEA2A □□□Y103F	146	5
20	PA	CEA2C □□□Y203	258	8	CEA2B □□□Y203	238	8	CEA2A □□□Y203F	218	7
40	RA	CEA2C □□□Y403	372	9	CEA2B □□□Y403	348	9	CEA2A □□□Y403F	324	8
HOSE ANY OUTPUT VOLTAGE FROM 16.0 TO 29.9										
0	FA	CEA2C □□□Y501	$100	3	CEA2B □□□Y501	$ 90	3	CEA2A □□□Y501F	$ 80	1
	GA	CEA2C □□□Y102	102	4	CEA2B □□□Y102	92	4	CEA2A □□□Y102F	82	2
	JA	CEA2C □□□Y252	116	5	CEA2B □□□Y252	106	5	CEA2A □□□Y252F	96	4
	MA	CEA2C □□□Y502	170	7	CEA2B □□□Y502	158	7	CEA2A □□□Y502F	146	5
10	PA	CEA2C □□□Y103	258	8	CEA2B □□□Y103	238	8	CEA2A □□□Y103F	218	7
20	RA	CEA2C □□□Y203	372	9	CEA2B □□□Y203	348	9	CEA2A □□□Y203F	324	8
HOSE ANY OUTPUT VOLTAGE FROM 30.0 TO 59.9										
0	GA	CEA2C □□□Y501	$102	4	CEA2B □□□Y501	$ 92	4	CEA2A □□□Y501F	$ 82	2
	JA	CEA2C □□□Y102	116	5	CEA2B □□□Y102	106	5	CEA2A □□□Y102F	96	4
	MA	CEA2C □□□Y252	170	7	CEA2B □□□Y252	158	7	CEA2A □□□Y252F	146	5
	PA	CEA2C □□□Y502	258	8	CEA2B □□□Y502	238	8	CEA2A □□□Y502F	218	7
10	RA	CEA2C □□□Y103	372	9	CEA2B □□□Y103	348	9	CEA2A □□□Y103F	324	8
HOSE ANY OUTPUT VOLTAGE FROM 60.0 TO 99.9										
0	FA	CEA2C □□□Y101	$100	3	CEA2B □□□Y101	$ 90	3	CEA2A □□□Y101F	$ 80	1
25	GA	CEA2C □□□Y251	102	4	CEA2B □□□Y251	92	4	CEA2A □□□Y251F	82	2
50	HA	CEA2C □□□Y501	114	5	CEA2B □□□Y501	104	5	CEA2A □□□Y501F	94	3
	KA	CEA2C □□□Y102	128	6	CEA2B □□□Y102	118	6	CEA2A □□□Y102F	108	4
	NA	CEA2C □□□Y252	206	7	CEA2B □□□Y252	190	7	CEA2A □□□Y252F	174	6
	RA	CEA2C □□□Y502	372	9	CEA2B □□□Y502	348	9	CEA2A □□□Y502F	324	8
HOSE ANY OUTPUT VOLTAGE FROM 100 TO 159										
0	FA	CEA2C □□□Y101	$100	3	CEA2B □□□Y101	$ 90	3	CEA2A □□□Y101F	$ 80	1
25	GA	CEA2C □□□Y251	102	4	CEA2B □□□Y251	92	4	CEA2A □□□Y251F	82	2
50	JA	CEA2C □□□Y501	116	5	CEA2B □□□Y501	106	5	CEA2A □□□Y501F	96	4
	MA	CEA2C □□□Y102	170	7	CEA2B □□□Y102	158	7	CEA2A □□□Y102F	146	5
	QA	CEA2C □□□Y252	300	8	CEA2B □□□Y252	276	8	CEA2A □□□Y252F	252	7
HOSE ANY OUTPUT VOLTAGE FROM 160 TO 299										
05	FA	CEA2C □□□Y500	$100	3	CEA2B □□□Y500	$ 90	3	CEA2A □□□Y500F	$ 80	1
10	GA	CEA2C □□□Y101	102	4	CEA2B □□□Y101	92	4	CEA2A □□□Y101F	82	2
25	JA	CEA2C □□□Y251	116	5	CEA2B □□□Y251	106	5	CEA2A □□□Y251F	96	4
50	MA	CEA2C □□□Y501	170	7	CEA2B □□□Y501	158	7	CEA2A □□□Y501F	146	5
0	PA	CEA2C □□□Y102	258	8	CEA2B □□□Y102	238	8	CEA2A □□□Y102F	218	7
HOSE ANY OUTPUT VOLTAGE FROM 300 TO 500										
05	GA	CEA2C □□□Y500	$102	4	CEA2B □□□Y500	$ 92	4	CEA2A □□□Y500F	$ 82	2
10	HA	CEA2C □□□Y101	114	5	CEA2B □□□Y101	114	5	CEA2A □□□Y101F	94	3
25	LA	CEA2C □□□Y251	166	6	CEA2B □□□Y251	154	6	CEA2A □□□Y251F	142	5
50	NA	CEA2C □□□Y501	206	7	CEA2B □□□Y501	190	7	CEA2A □□□Y501F	174	6
0	RA	CEA2C □□□Y102	372	9	CEA2B □□□Y102	348	9	CEA2A □□□Y102F	324	8

DLIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks

Some Options Extend Delivery

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

• specifications

Input Voltage and Frequency Range: 105 to 125 volts, 50 to 420 Hz.
Line Isolation: 20 db of shielding between primary and secondary of transformer.
Insulation Resistance: 100 megohms.
Operating Temperature Range: −20°C to +80°C.
Storage Temperature Range: −40°C to +85°C.
Recovery Time: As fast as 10μsec depending on model
Mounting and Terminations: Refer to Page 30.
Thermal Data: Refer to Page 25.

• standard features

Available with any center voltage between 3.5 and 500 volts. Floating output allows either positive or negative output biased to ±500 volts from case. Series starting circuitry allows two or more units to be operated in series without damage. Remote sense terminals provided. Voltage limiting circuitry prevents overshooting at turn on and tur Short circuit protection reduces shorted current to than 2% of rated current. Output adjustable with in potentiometer on classes A & B. Class C & D units a ternally adjustable only (no internal pot.)

• optional features

The extra charge for each option is either a flat rate or percentage of the base model price. Add the larger number t base model price.

Symbol Option	Option Description	Prices	Delivery (Weeks Added)	Remarks
EXTENDED TEMPERATURE RANGE				
H1	Temp. range −55°C to +80°C	$100 or 50%	4	Requires next larger case size. Storage to −62°C.
H2	Temp. range −40°C to +80°C	$20 or 20%	4	Storage to −55°C.
H3	Temp. range −55°C to +115°C	$200 or 100%	6	Requires next larger case size. Storage to −62°C.
AC INPUT VOLTAGE AND FREQUENCY				
L	Input 95-135V, 50-420 Hz	$10 or 10%	1	Derate maximum current to 60% of rated output.
L1	Input 208V ±10%, 50-420 Hz	$15 or 10%	1	
L2	Input 230V ±10%, 50-420 Hz	$15 or 10%	1	
L3	Input 460V ±10%, 50-420 Hz	$25 or 15%	1	
L4	Input 105-125V, 400 ±20 Hz	$15 or 10%	1	Reduce case size to next smaller. Derate ripple by 5X.
L5	Input 115/230V, 50-420 Hz	$30 or 20%	1	Input terminals parallel or series for 115/230 Volts.
DC INPUT VOLTAGES				
L7	Input 12 VDC (11.6 to 13.8 VDC)	$35 or 20%	1	
L8	Input 24 VDC (23.2 to 27.6 VDC)	$35 or 20%	1	
L9	Input 14 VDC (12.0 to 16.0 VDC)	$45 or 10%	1	Derate output to 60% of normal.
L10	Input 28 VDC (24.0 to 32.0 VDC)	$45 or 10%	1	Derate output to 60% of normal.
PROTECTION CIRCUITS				Available in all sizes except FA.
P2	Overtemp. cutout	$20	1	Limits base temp. to max. rated. Self Restarting.
P3	Crowbar voltage limit	$30 or 15%	1	Protects power supply and system circuit under all circumst e Operates at 10% over maximum settable voltage or 1 Volt, ever is greater. Remove input power to restart.
REMOTE PROGRAMMING				
R	Remote adjust (no pot provided)	—	None	Remote programming options allow power supply to be exte
R1	Remote adjust with 1% linearity	—	1	adjusted. Resistance to output ratio is approx. 5 mv per ohr
R2	Remote adjust plus internal pot (A & B only)	—	1	linearity from 10% to 100% rated output. For potentiomet
R3	Remote adjust with pot provided (A & B only)	—	1	quirements see Page 28.
HIGH ISOLATION				
T1	40 db transformer shielding	$25 or 15%	1	Reduces capacitance between line and circuit by 100X.
T1	100 db transformer shielding	$50 or 25%	1	Reduces capacitance between line and circuit by 100,000X.
HIGH FLOAT VOLTAGE				
U	Output float up to ±1000V	$10 or 10%	1	Either output terminal will withstand ±1000 Volts to case or
RUGGEDIZED				
W	Potted for ruggedization (No internal potentiometer)			
	FA, GA, HA, JA	$5	1	
	KA, LA	$10	1	
	MA, NA	$15	1	
	PA	$20	1	
	QA	$25	1	
	RA	$30	1	
	SA	$35	1	
	TA	$40	1	
W1	Potted for ruggedication (With internal potentiometer)	"W" prices Plus $15	1	

Guaranteed free from defects in workmanship and materials for three years from date of shipm

constant current supplies CEAC6 SERIES

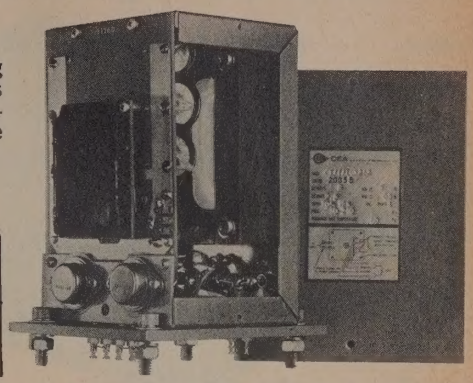
REGULATED AC-DC TO 160 WATTS • BASE TEMPERATURE RATING 80°C

OUTPUT ADJUSTABLE UNLESS OTHERWISE SPECIFIED

rt number for your constant cur- ower supply is established in two eps:

ect the basic model from the ap- priate current range, compliance age and class of regulation from charts below.

or the power supply to meet your specific requirements by specifying as many of the optional features from the opposite page as desired — just add the option letter(s) at the end of the part number.



ulation specifications

Class of Regulation	Guaranteed Line Regulation for 10% Line Change	Guaranteed 0 to 100% Rated Voltage Change	Guaranteed Temperature Coefficient per Degree C	Guaranteed Stability for 40 Hours	Guaranteed RMS Ripple
A	±.1%	±.4%	±.1%	±.5%	.1%
B	±.02%	±.08%	±.05%	±.1%	.01%
C	±.005%	±.02%	±.01%	±.025%	.005%
D	±.001%	±.004%	±.005%	±.005%	.003%

Voltage Compliance Rate Zero	Size	Thermal Curve	Class "D" Regulation Line Plus Load ±0.005% Model	Price	Class "C" Regulation Line Plus Load ±0.025% Model	Price	Class "B" Regulation Line Plus Load ±0.1% Model	Price	Class "A" Regulation Line Plus Load ±0.5% Model	Price
URRENT ADJUSTMENT RANGE FROM 0.002 TO 0.010 AMPS										
	FA	1	CEAC6D120Y100R	$225	CEAC6C120Y100R	$155	CEAC6B120Y100	$105	CEAC6A120Y100	$ 95
	GA	2	CEAC6D400Y100R	230	CEAC6C400Y100R	160	CEAC6B400Y100	110	CEAC6A400Y100	100
	HA	2	CEAC6D600Y100R	235	CEAC6C600Y100R	165	CEAC6B600Y100	115	CEAC6A600Y100	105
1	JA	2	CEAC6D100Z100R	270	CEAC6C100Z100R	200	CEAC6B100Z100	150	CEAC6A100Z100	140
1	KA	3	CEAC6D160Z100R	290	CEAC6C160Z100R	220	CEAC6B160Z100	170	CEAC6A160Z100	160
2	LA	3	CEAC6D200Z100R	300	CEAC6C200Z100R	230	CEAC6B200Z100	180	CEAC6A200Z100	170
URRENT ADJUSTMENT RANGE FROM 0.004 TO 0.020 AMPS										
	FA	1	CEAC6D120Y200R	$225	CEAC6C120Y200R	$155	CEAC6B120Y200	$105	CEAC6A120Y200	$ 95
	GA	2	CEAC6D400Y200R	230	CEAC6C400Y200R	160	CEAC6B400Y200	110	CEAC6A400Y200	100
	JA	2	CEAC6D600Y200R	235	CEAC6C600Y200R	165	CEAC6B600Y200	115	CEAC6A600Y200	105
1	KA	3	CEAC6D100Z200R	290	CEAC6C100Z200R	220	CEAC6B100Z200	170	CEAC6A100Z200	160
1	LA	4	CEAC6D160Z200R	300	CEAC6C160Z200R	230	CEAC6B160Z200	180	CEAC6A160Z200	170
2	MA	4	CEAC6D200Z200R	350	CEAC6C200Z200R	280	CEAC6B200Z200	230	CEAC6A200Z200	220
URRENT ADJUSTMENT RANGE FROM 0.013 TO 0.050 AMPS										
	GA	2	CEAC6D120Y500R	$225	CEAC6C400Y500R	$155	CEAC6B120Y500	$105	CEAC6A120Y500	$ 95
	HA	3	CEAC6D300Y500R	230	CEAC6C300Y500R	160	CEAC6B400Y500	110	CEAC6A400Y500	100
	KA	4	CEAC6D600Y500R	250	CEAC6C600Y500R	180	CEAC6B600Y500	130	CEAC6A600Y500	120
1	LA	4	CEAC6D100Z500R	300	CEAC6C100Z500R	230	CEAC6B100Z500	180	CEAC6A100Z500	170
1	MA	5	CEAC6D160Z500R	350	CEAC6C160Z500R	280	CEAC6B160Z500	290	CEAC6A160Z500	220
2	NA	5	CEAC6D200Z500R	410	CEAC6C200Z500R	340	CEAC6B200Z500	290	CEAC6A200Z500	280
URRENT ADJUSTMENT RANGE FROM 0.020 TO 0.100 AMPS										
	HA	2	CEAC6D120Y101R	$230	CEAC6C120Y101R	$160	CEAC6B120Y101	$110	CEAC6A120Y101	$100
	JA	3	CEAC6D300Y101R	235	CEAC6C300Y101R	165	CEAC6B300Y101	115	CEAC6A300Y101	105
	LA	4	CEAC6D500Y101R	265	CEAC6C500Y101R	195	CEAC6B500Y101	145	CEAC6A500Y101	135
1	MA	5	CEAC6D100Z101R	350	CEAC6C100Z101R	280	CEAC6B100Z101	230	CEAC6A100Z101	220
1	NA	6	CEAC6D160Z101R	410	CEAC6C160Z101R	340	CEAC6B160Z101	290	CEAC6A160Z101	280
2	PA	6	CEAC6D200Z101R	450	CEAC6C200Z101R	380	CEAC6B200Z101	330	CEAC6A200Z101	320
URRENT ADJUSTMENT RANGE FROM 0.040 TO 0.200 AMPS										
	JA	3	CEAC6D120Y201R	$235	CEAC6C120Y201R	$165	CEAC6B120Y201	$115	CEAC6A120Y201	$105
	KA	4	CEAC6D300Y201R	250	CEAC6C300Y201R	180	CEAC6B300Y201	130	CEAC6A300Y201	120
	NA	5	CEAC6D500Y201R	330	CEAC6C500Y201R	260	CEAC6B500Y201	210	CEAC6A500Y201	200
	PA	6	CEAC6D900Y201R	430	CEAC6C900Y201R	360	CEAC6B900Y201	310	CEAC6A900Y201	300
1	QA	7	CEAC6D140Z201R	495	CEAC6C140Z201R	425	CEAC6B140Z201	375	CEAC6A140Z201	365
2	RA	7	CEAC6D200Z201R	530	CEAC6C200Z201R	460	CEAC6B200Z201	410	CEAC6A200Z201	400
URRENT ADJUSTMENT RANGE FROM 0.13 TO 0.50 AMPS										
	MA	5	CEAC6D120Y501R	$290	CEAC6C120Y501R	$270	CEAC6B120Y501	$170	CEAC6A120Y501	$160
	NA	6	CEAC6D300Y501R	335	CEAC6C300Y501R	265	CEAC6B300Y501	215	CEAC6A300Y501	195
	PA	6	CEAC6D500Y501R	355	CEAC6C500Y501R	285	CEAC6B500Y501	235	CEAC6A500Y501	225
	QA	7	CEAC6D800Y501R	495	CEAC6C800Y501R	425	CEAC6B800Y501	375	CEAC6A800Y501	365
	RA	8	CEAC6D1207501R	530	CEAC6C120Z501R	460	CEAC6B120Z501	410	CEAC6A120Z501	400
	SA	8	CEAC6D200Z501R	670	CEAC6C200Z501R	600	CEAC6B200Z501	550	CEAC6A200Z501	540
URRENT ADJUSTMENT RANGE FROM 0.20 TO 1.00 AMPS										
	NA	6	CEAC6D120Y102R	$320	CEAC6C120Y102R	$250	CEAC6B120Y102	$200	CEAC6A120Y102	$190
	PA	7	CEAC6D300Y102R	355	CEAC6C300Y102R	285	CEAC6B300Y102	235	CEAC6A300Y102	225
	RA	8	CEAC6D600Y102R	460	CEAC6C600Y102R	390	CEAC6B600Y102	340	CEAC6A600Y102	330
	SA	8	CEAC6D100Z102R	670	CEAC6C100Z102R	600	CEAC6B100Z102	550	CEAC6A100Z102	540
	TA	9	CEAC6D140Z102R	700	CEAC6C140Z102R	630	CEAC6B140Z102	580	CEAC6A140Z102	570
URRENT ADJUSTMENT RANGE FROM 0.40 TO 2.00 AMPS										
	QA	7			CEAC6C120Y202R	$210	CEAC6B120Y202	$260	CEAC6A120Y202	$250
	RA	8			CEAC6C300Y202R	390	CEAC6B300Y202	340	CEAC6A300Y202	330
	SA	8			CEAC6C500Y202R	540	CEAC6B500Y202	490	CEAC6A500Y202	480
	TA	9			CEAC6C800Y202R	640	CEAC6B800Y202	570	CEAC6A800Y202	560
URRENT ADJUSTMENT RANGE FROM 1.3 TO 5.0 AMPS										
	SA	8			CEAC6C120Y502R	$500	CEAC6B120Y502	$450	CEAC6A120Y502	$440
	TA	9			CEAC6C300Y502R	540	CEAC6B300Y502	490	CEAC6A300Y502	480

ELIVERY: Class "A" and "B" Units — 2 Weeks
Class "C" Units — 3 Weeks
Class "D" Units — 4 Weeks
Some Options Extend Delivery

• technical specifications

Isolation: Input-to-output coupling capacity; less than 0.01, 0.001, or 0.0005 pfd.
Input-to-output DC resistance; greater than 100,000 megohms.
60 Hz leakage current less than .001μamps.

Input: 95-135 VAC, 50-65 Hz.

Output Voltage: Within 2% of the input voltage, from no load to full load.

Output Current: See model chart.

Efficiency: Better than 95%.

Mechanical: Unit has chrome handle, deep drawn case with grey baked enamel finish, 6 ft. shielded line cord, and non-scuff feet.

The new CEA Isolators are easily rack-mounted by removing the four mounting feet and using the ¼-20 inserts for bolt mounting.

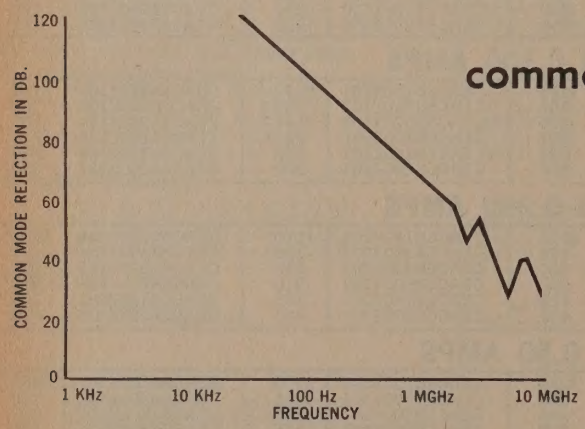
	Impedance of Capacity in Megohm			
	Common Trans-former	Shielded Line Isolato		
Frequency	5000 pfd	0.01 pfd	0.001 pfd	0.000
60 Hz	0.53	265,000	2,650,000	5,300
100 Hz	0.32	160,000	1,600,000	3,200
1 KHz	0.032	16,000	160,000	320
10 KHz	0.0032	1,600	16,000	32
100 KHz	0.00032	160	1,600	3
1 MHz	0.000032	16	160	
10 MHz	0.0000032 (3.2Ω)	1.6	16	

• description

This new series of highly-shielded power Line Isolators offers the systems and laboratory engineers an opportunity to fully isolate electronic test equipment such as oscilloscopes, DVM's, power supplies, oscillators, amplifiers, counters, VTVM's and signal conditioning equipment. For example, with a Line Isolator connected between the power source and an oscilloscope, electrical measurements may be made without fear of tripping circuit breakers or blowing fuses because of power ground loops. Most high-frequency line transients are capacitance-coupled through standard power transformers (500 to 5000 pfd), and cause considerable unexplained interference. Reduction of such coupling capacity is the CEA secret to interference-free performance and high common mode rejection. CEA offers three choices of Line Isolators with reduced coupling capacity; 0.01 pfd, 0.001 fpd, and 0.0005 pfd. The effect of input-to-output coupling capacity is illustrated by the impedance of that capacity at various frequencies (5000 pfd for an unshielded transformer).

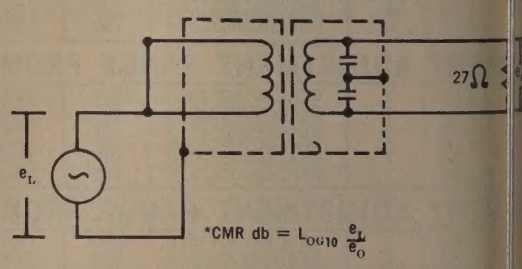
CEA shielded line isolators are also finding wide accepta among OEM manufacturers of computers and computer pheral equipment such as computer terminals. Line tr ents are coupled directly thru the unshielded power sup of such equipment and act as bona fide signals to the s tive I.C. circuits. For integral installation into OEM e ment, special physical packaging can be designed to ac modate the particular system space.

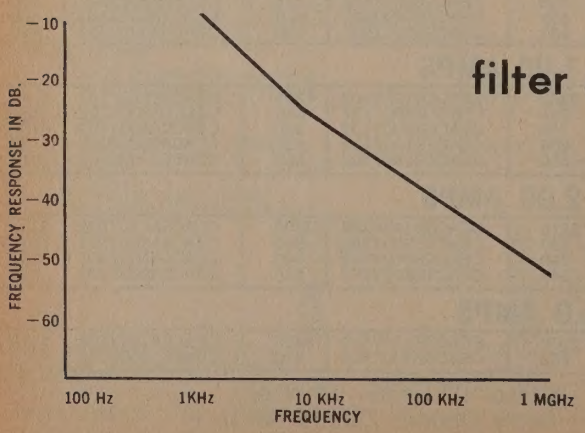
Recent investigations by safety conscious people in medical field have shown that stray currents in the ord 10 microamps can be dangerous to patients exposed to gical and intensive care instrumentation in hospitals. line isolators are capable of reducing line leakage cur to less than 0.001 microamps thus providing the nece safety factor between hospital instrumentation and pa



common mode rejection* vs. frequency

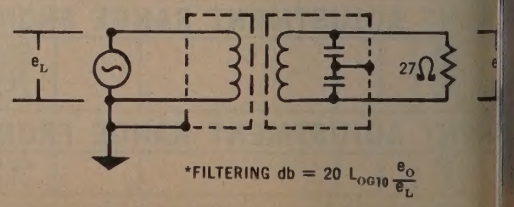
Figure 2 *DATA TAKEN FROM A STANDARD CEA12 ISOLATOR





filter action* vs. frequency

Figure 3 *DATA TAKEN FROM A STANDARD CEA12 ISOLATOR

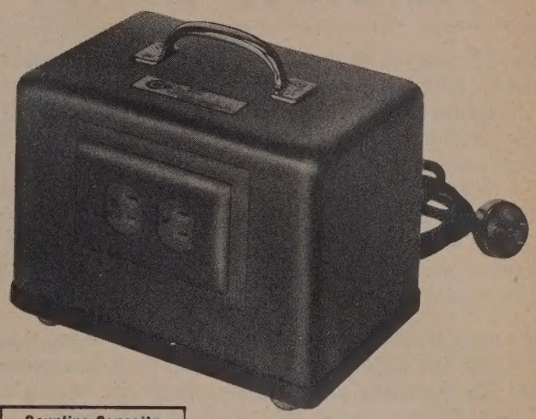


CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016 TELEPHONE: (213) 359-9261

ielded line isolators

atures

- op High-Frequency Line Transients
- op 60 cps Leakage Current
- ea AC Power Ground Loops
- rtable — Ready to Plug In and Use Anywhere
- 1 2 KVA Units Available from Stock to Two Weeks



VA tin	Max. Output (Amps)	Overall Size (Inches) W	D	H	Wt. Lbs.	Coupling Capacity 0.01 pfd Model	Price	Coupling Capacity 0.001 pfd Model	Price	Coupling Capacity 0.0005 pfd Model	Price
00	0.85	5⅜	5⅛	7	9	CEA10	$ 90.00	CEA20	$110.00	CEA30	$140.00
50	2.2	5⅜	5⅛	7	12	CEA11	100.00	CEA21	130.00	CEA31	165.00
00	4.3	6½	6⅛	8	27	CEA12	115.00	CEA22	150.00	CEA32	195.00
00	8.6	9⅜	6⅛	8	33	CEA13	140.00	CEA23	185.00	CEA33	240.00
00	13.0	9⅜	6⅛	9	38	CEA14	170.00	CEA24	215.00	CEA34	285.00
00	17.3	9	9	9	55	CEA15	220.00	CEA25	290.00	CEA35	380.00

Optional Input and Output Voltages

t option letter to model selected, add whichever price is greater to the base price).

L1	Input 200-240 VAC	Output within 2% of Input	$20 or 10%
L2	Input 200-240 VAC	Output 100-120 VAC (50% of Input)	$20 or 10%
L3	Input 95-135 VAC	Output 190-270 VAC (200% of Input)	$20 or 10%

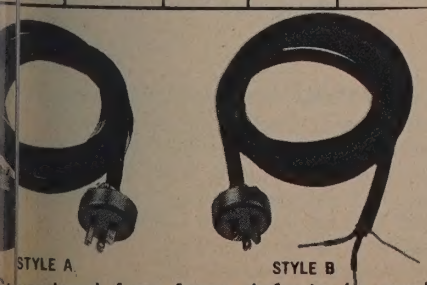
DELIVERY:
Isolators and Cables:
Limited Quantities
Available from Stock.
Back Orders, 2 Weeks ARO.

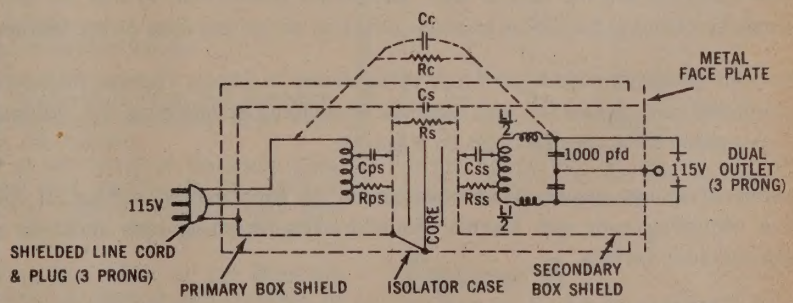
ielded line cords for isolator outputs

na optimum use of CEA Line Isolators, CEA offers specially designed shielded line cords in two styles and several lengths. e can be used as an extension cord for equipment that has a line receptacle mounted at the chassis (such as Tektronix es Style B has stripped and tinned leads on one end and can be installed into equipment as a direct replacement for un- ld line cords (such as Hewlett-Packard equipment). The plugs on these cords, as well as the cable, are shielded and are con- ct of the finest materials available. Other lengths, current ratings, and connectors are available on request.

NDARD SHIELDED LINE CORDS

Mo	Max. Current in Amps	Length in Feet	Style	Price (Each)
EA 6	5	6	A	$14.00
EA 6	5	6	B	11.00
EA 10	5	10	A	15.00
EA 10	5	10	B	12.00
EA 15	5	15	A	17.00
EA 15	5	15	B	14.00
EA 20	5	20	A	19.00
EA 20	5	20	B	16.00
EA 6	15	6	A	17.00
EA 36	15	6	B	14.00
EA 10	15	10	A	21.00
EA 310	15	10	B	18.00
EA 15	15	15	A	26.00
EA 315	15	15	B	23.00
EA 20	15	20	A	31.00
EA 320	15	20	B	28.00





Cc = CAPACITY BETWEEN PRIMARY & SECONDARY WINDINGS
Rc = RESISTANCE BETWEEN PRIMARY & SECONDARY WINDINGS
Cs = CAPACITY BETWEEN PRIMARY SHIELD PLUS CASE & SECONDARY SHIELD
Rs = RESISTANCE BETWEEN PRIMARY SHIELD PLUS CASE & SECONDARY SHIELD
Cps = CAPACITY BETWEEN PRIMARY WINDING & PRIMARY SHIELD
Rps = RESISTANCE BETWEEN PRIMARY WINDING & PRIMARY SHIELD
Css = CAPACITY BETWEEN SECONDARY WINDING & SECONDARY SHIELD
Rss = RESISTANCE BETWEEN SECONDRAY WINDING & SECONDARY SHIELD
Ll = LEAKAGE INDUCTANCE (REFERRED TO SECONDARY)

WORST VALUES FOR: CEA10	CEA35
.01 pfd	.0005 pfd
100K MEGΩ	100K MEGΩ
300 pfd	1000 pfd
100K MEGΩ	100K MEGΩ
1000 pfd	3000 pfd
100 MEGΩ	100 MEGΩ
1000 pfd	3000 pfd
100 MEGΩ	100 MEGΩ
15 mh	.7 mh

Guaranteed free from defects in workmanship and materials for three years from date of shipment.

THERMAL DATA

The basic limitation to the life of your CEA power supply is the upper temperature limit of the internal components. Most components are rated for a minimum of +85°C. In order to provide a safety factor, your CEA power supply is rated for continuous use at +80°C as measured at the base plate. All heat generating elements at mounted on internal heat sinks which are then mounted to the thick aluminum base plate. As long as the base plate does not exceed the maximum temperature, the internal components will be safe and give a good life.

As with most temperature affected items, the closer towards ambient that the unit is kept, the greater the life expectancy will be. The following data is based upon not having additional heat sinking beyond that of the supply itself.

The information presented in this section will enable the designer to determine if cooling is required and if so to select the most optimum method of cooling.

For modules with Thermal Curve Nos. 1, 2 and 3, heat dissipation area in addition to that provided by the standard module is not usually required for operation up to full load.

For modules with Thermal Curve Nos. 4 and 5, additi heat dissipation area such as the instrument chassis or dissipation radiators will usually be required for operatio full load.

The base (terminal end) is thermally connected to the po output transistor; therefore, the base must make posi mechanical and thermal bond to the mounting body. Silic grease should be applied to the base of the power su and the mounting body must be a smooth metallic surf

The maximum temperature the base will achieve, the dissipation area required, the airflow velocity in lineal per minute required or the maximum allowable ambient perature may be determined by following the appropr procedure given below.

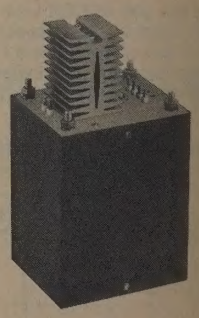
The total heat dissipation area may be determined by tota the area given for the appropriate case size from Figur the effective surface area of the mounting body which be considered as heat dissipation area, and the area of selected CEA Thermal Radiators.

SIZE	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA
AREA sq. in.	10	13	16	22	27	31	38	44	58	79	108	130	156

figure 5 Heat dissipation area of standard power supply without heat dissipation radiators.

THERMAL RADIATORS

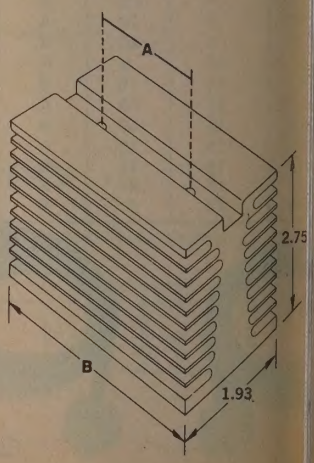
Models CEATR1 and CEATR2 Thermal Radiators are designed for use with all CEA6 Series and CEA5 Series Modular C Power Supplies and Voltage References. CEA Thermal Radiators may be mounted directly onto the module base or on the opposite side of the mounting body. The mounting hole configuration in the Thermal Radiators and the base of each Module are symmetrical so that the radiators may be mounted for airflow in either direction across the base of the Module.



Under some operating conditions it may be necessary to employ Thermal Radiators to provide the heat dissipation area required. Procedures to determine the required heat dissipation area are described on Page 26.

A coating of silicon grease should be applied on each mating surface of the Module, mounting body and Thermal Radiator. The mounting body must be a smooth metallic surface.

Case sizes MA through NA are designed for mounting one Model CEATR1 Thermal Radiator. Case sizes PA through TA are designed to accept multiple Thermal Radiators according to the requirements of the operating conditions.



Thermal Radiator Model No.	Radiation Area (sq. in.)	Dimensions A	Dimensions B	Weight (Pounds)	Price Each
CEATR1	75	1.000	1.93	0.75	$10.00
CEATR2	150	2.000	3.93	1.50	$15.00

Case Size		MA	NA	PA	QA	RA	SA	TA
Thermal Radiator	Model No.	CEATR1	CEATR1	CEATR1	CEATR2	CEATR2	CEATR2	CEATR2
	Quantity	1	1	2	2	2	4	4

Case 1

To be determined: **MAXIMUM TEMPERATURE BASE WILL ACHIEVE.**

Known: 1. Ambient temperature in °C.
2. Airflow velocity in feet per minute.
3. Heat dissipation area provided in square inches.

Procedure: 1. Choose the required Power Supply/Voltage Reference (voltage and current) from the tables in the catalog. The Thermal Curve Number for the selected unit is given in the next to last column on the chart.
2. Determine the Effective Thermal Curve Number by entering Fig. 6 or 7 (according to the intended operation of approximately 50% or 100% of load) along the X-axis at the known velocity of the air which will pass over the Power Supply/Voltage Reference. Proceed up the line representing this airflow velocity to the Thermal Curve Number selected in Step 1. Then proceed to the left to the Y-axis to determine the Effective Thermal Curve Number.
3. Enter Fig. 8 along the X-axis at the known Heat Dissipation Area. Proceed up the line representing this Heat Dissipation Area to the Effective Thermal Curve Number. Proceed to the left to the Y-axis to determine the Base Temperature Rise above ambient in °C.
4. Add the Base Temperature Rise above ambient determined in Step 3 to the known Ambient Temperature to determine the Maximum Temperature the base will achieve.

Case 2

To be determined: **HEAT DISSIPATION AREA REQUIRED.**

Known: 1. Ambient temperature in °C.
2. Airflow velocity in lineal feet per minute.
3. Maximum base temperature rating.

Procedure: 1. See Procedure No. 1 of Case 1.
2. See Procedure No. 2 of Case 1.
3. Enter Fig. 8 along the Y-axis at the known Maximum Base Temperature Rating. Proceed across the line representing the Maximum Base Temperature rating to the Effective Thermal Curve Number determined in Step 2 and then proceed down to the X-axis to determine the total Heat Dissipation Area required.
4. Subtract from the total Heat Dissipation Area required determined in Step 3, the Heat Dissipation Area of the Standard unit without Heat Dissipation Radiators to determine the additional Heat Dissipation Area required. Table 5 gives the Heat Dissipation Area of the Standard units without Heat Dissipation Radiators.
5. This additional Heat Dissipation Area may be supplied either by the chassis to which the Power Supply/Voltage Reference is mounted or by adding Heat Dissipation Radiators to the base of the Power Supply/Voltage Reference. The correct Heat Dissipation Radiator may be chosen from the table on Page 25.

Case 3

To be determined: **AIRFLOW VELOCITY IN LINEAL FEET PER MINUTE.**

Known: 1. Ambient temperature in °C.
2. Maximum base temperature rating.
3. Heat dissipation area provided in square inches.

Procedure: 1. See Procedure No. 1 of Case 1.
2. By subtracting the Ambient Temperature from the Maximum Base Temperature Rating, the maximum allowable Base Temperature Rise Above Ambient is determined.
3. Enter Fig. 8 along the Y-axis at this value of Maximum Base Temperature Rise Above Ambient and proceed to the right to the vertical line representing the Heat Dissipation Area provided. The intersection of these two lines defines the Effective Thermal Curve Number.
4. Enter either Fig. 6 or 7 along the Y-axis at the Effective Thermal Curve Number determined in Step 3 and proceed to the right to the intersection of that line and the Thermal Curve Number determined in Step 1. Proceed down from the intersection to the X-axis to determine the required Ambient Forced-Air in lineal feet per minute.

Case 4

To be determined: **MAXIMUM AMBIENT TEMPERATURE ALLOWABLE IN °C.**

Known: 1. Airflow velocity in lineal feet per minute.
2. Maximum base temperature rating.
3. Heat dissipation area provided in square inches.

Procedure: 1. See Procedure No. 1 of Case 1.
2. See Procedure No. 2 of Case 1.
3. See Procedure No. 3 of Case 1.
4. The Maximum Temperature allowable is then determined by subtracting the Base Temperature Rise Above Ambient from the Maximum Base Temperature Rating.

figure 6 — 50% LOAD

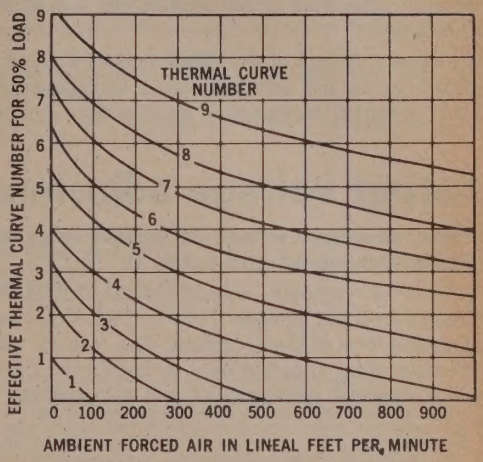


figure 7 — 100% LOAD

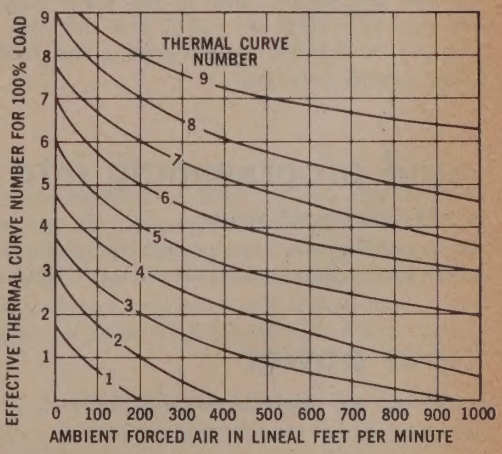
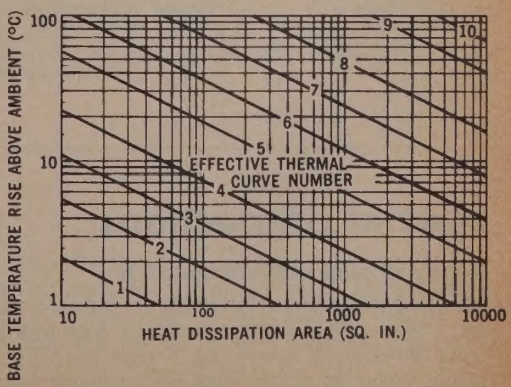


figure 8



OPTIONS

Incorporation of the various options adds breadth to the standard line of Modular DC Power Supplies/Voltage References. The options are offered in an attempt to provide modules to satisfy a wide variety of applications without the added cost of one-time engineering charges. The added charges listed are added to the unit price given in the tables for each series before discounts are applied. The longe delivery option determines the added delivery time. S Page 5 for discount schedule and delivery of standard mo ules. Option designations selected should be added as suf to the model number. See Model Numbering System Page

fixed output voltage

Make an adjustable output module into a fixed output module with Option F

The output voltage of the Power Supply/Voltage Reference is factory set to the selected center voltage value within 1%, 0.1%, or 0.01% by means of an internally mounted precision wirewound resistor. Option designations are F, F1, and F In order to hold the accuracy of the F1 and F2 options, it necessary to specify a higher regulation class with comp able stability. See the option note for each series for exa requirements.

output voltage adjustment

Choose an output voltage adjustment range to meet each specific requirement with Option G

A wider or narrower output voltage adjustment range — standard module provide 10% (±5%) — can be ordered by specifying one of the G options. The internal voltage control (potentiometer) supplied only in Regulation Classes A and B has a nominal resolution of one (1) part per 1000. When Option R is also specified — standard in Regulation Class C and D — the resistance is external and the customer p vides the potentiometer or other voltage control. The ma mum current rating for the same center voltage is decreas with each wider adjustment range so that the relative pow rating, a maximum setable voltage, is approximately the sa as a standard adjustment range unit.

extended operating temperature range

Operate down to −55°C or up to +115°C with Option H

The low temperature range of the power supplies may be extended to −40°C or −55°C and the high temperature extended to +115°C by designating the following option letters (choose only one).

Temperature Range	Option Designation	Remarks
−55°C to +80°C	H1	Usually requires the next larger ca size. Storage temperature is −62°C
−40°C to +80°C	H2	Storage range is −55°C.
−55°C to +115°C	H3	Requires next larger case size.

rapid programming into large capacitance loads

Rapidly program with Option J

When operating into a large capacitance load, it is necessary to include a voltage pull-down circuit if rapid down-voltage programming is to be accomplished. This special circuit pears as a resistor across the output terminals equal to o tenth the rated load.

input power

Power from any available line with Option L

Select any one of the following options.

Input	Option Designation	Remarks
105-125V RMS at 50-420 Hz	Standard	Provided unless any other L option is specified.
95-135V RMS at 50-420 Hz	L	Reduce maximum current output to 60% of rated output.
208V ±10% at 50-420 Hz	L1	
230V ±10% at 50-420 Hz	L2	
460V ±10% at 50-420 Hz	L3	

Input	Option Designation	Remarks
400 Hz operation only (380 to 420 Hz), 105 to 125V RMS	L4	Case size may be reduced by one s smaller.
115-230V at 50-420 Hz	L5	Input terminals connected either parallel or series for 115-230 volt op ation.
Converter Operation Options		
12VDC	L7	11.6 to 13.8VDC unregulated.
24VDC	L8	23.2 to 27.6VDC unregulated.
14VDC	L9	12.0 to 16.0VDC unregulated.
28 VDC	L10	24.0 to 32.0VDC unregulated.

special connections

Specify an octal plug with Option N

The standard feed thru terminals are replaced with a standard male octal plug for convenience in breadboarding or other rapid replacement operations. It is necessary to also specify either Option "R" or "F" (both are no charge). Option N is not available with an internal potentiometer. The benefits shielding Options T and T1 are reduced when used w Option N. In order to reach the maximum shielding values is necessary to also use coaxial shielding input and out leads.

ection circuits

protection with Option P

CIRCUIT PROTECTION IS PROVIDED IN ALL UNITS.

LTAGE PROTECTION IS PROVIDED IN ALL UNITS.

age Limiting, including overshoot limiting due to or load change, is a solid state high speed switch. It utomatically.

Limiting, Option P1, is a fast response solid state ic reset system that limits the maximum output to f rated output current. Standard modules (without the current limiting option) have a foldback current limiting characteristic whereby the current increases to 200% to 300% and then begins to foldback to a short circuit condition at less than 2% of rated current.

Crowbar overvoltage protection, Option P3, clamps the output to less than 1 volt if for any reason the output voltage rises above trip voltage. Turn off to reset.

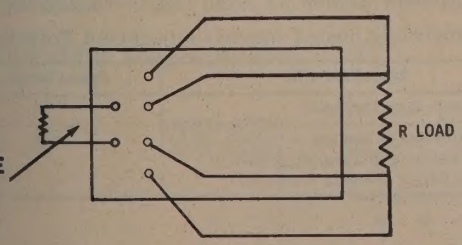
Overvoltage limiting, current limiting and thermal cutoff protections are available by designating any or all of the following options.

Limit	Provides Protection to	Option Designation	Remarks
rcuit current to ated current.	Power Supply	Standard	Standard in all units.
and turn off over- limited at 10% ximum settable or one (1) volt ver is greater.	System Circuit	Standard	Standard in all units.
f rated current.	System Circuit and Power Supply	P1	Requires next larger case for FA.
r trip voltage is er maximum e voltage or one (1) ichever is greater. input power to power supply.	System Circuit and Power Supply	P3	Requires next larger case for FA.
perature cutout	Power Supply	P2	Automatically switches off power supply when maximum base temperature is exceeded and switches on when temperature drops to a safe value. NOTE: By virtue of being a circuit between the transformer and the input, the normal high shielding effect of CEA transformers is downgraded with this option. The switch in effect adds back a measureable amount of coupling capacitance between line and circuit.

ernal output voltage adjustment

finger-tip output voltage control achieved with Option R

ARD IN REGULATION CLASSES C AND D. For Regulasses A and B, at no extra charge or added delivery, designation R permits the power supply to be exterand remotely) adjusted or programmed. Two terminals base of the power supply are provided for connection of an external potentiometer or fixed resistor. Low temperature coefficient and mechanically stable pots or fixed wirewound resistors consistent with the class of regulation should be used. For example, the external pot or wirewound resistor to be used with a Class C regulation unit should have a temperature coefficient of better than 10 parts per million per °C.



Regulation Class	External Control Temperature Coefficient	Regulation Class	External Control Temperature Coefficient
A	100 ppm/°C	C	10 ppm/°C
B	50 ppm/°C	D	5 ppm/°C

NOTE: For low voltage (below 8.4 Volts) units in classes C and D, the control value is 1 mv change/ohm.

all constant voltage supplies

ONSTANT CURRENT supplies (CEAC6 series), remote mming is accomplished by adding resistance to the e adjust terminals. With the terminals shorted, the outrrent will be at maximum. To decrease the output curn supplies rated at 1 amp and below, add approximately 1 ohm of resistance for each .1% of change wanted. For supplies rated above 1 amp, add 1 ohm per each .2% of change wanted. Constant current supplies may also be voltage programmed. Use zero to 1 volt for units 1 amp and below and zero to ½ volt for units over 1 amp.

special starting circuits

Achieve special starting with Option S

Large capacitance loads will appear as a direct short to all CEA supplies because of their short circuit protection feature. When starting into loads above 500mfd or 500mfd/amp rated, Option S1 is recommended. S1 allows starting into loads of 30,000mfd/amp to a maximum of 100,000mfd.

Standard dual output supplies may start at random wi either output starting first. Control over which output w start first can be specified with Options S2 and S3.

Starting Feature	Option Designation	Remarks
Start into 30,000 mfd/amp.	S1	Recommended for all loads over 50 mfd/amp.
Start positive output first.	S2	Applicable to dual output units only.
Start negative output first.	S3	

shielding / insulation

Stop high frequency line transient problems with Option T

A high degree of isolation can be provided by incorporating one of the two optional classes of shielding. High frequency line transients, normally capacity coupled through regulated power supplies, are attenuated by THINSHIELD the patent pending electrostatic shielding used in all CEA Modular DC Power Supplies/Voltage References. 20 DB SHIELDING WIT 100 MEGOHMS INSULATION RESISTANCE IS PROVIDED A STANDARD IN ALL CEA MODULES. For a higher degree shielding specify Option T or T1. Option designations a (choose only one of the two options):

Shielding	Insulation Resistance	Option Designation	Added Delivery	Remarks
20 db (transformer coupling capacity reduced by a factor of 10)	100 megohms input to output	Standard	None	Provided unless Option T or T1 is added to Model Number
40 db (transformer coupling capacity reduced by a factor of 100)	1000 megohms input to output	T	One Week	No change in case size
100 db (transformer coupling capacity reduced by a factor of 100,000)	10,000 megohms input to output	T1	One Week	No change in case size

high float voltage

Operate at ±1000 volts above AC power ground with Option U

All CEA supplies are rated for use at ±500 volts relative to case and AC power ground. A power supply with Option U has additional insulation so that the base of the power supply can be mounted (without an insulating panel) directly to grounded rack or tray and provide capability to operate tl DC output terminals at up to ±1000 volts DC with referen to the case and AC power ground.

ruggedized for shock and vibration

Watusi with Option W

Ruggedized construction for severe shock and vibration as required by military specifications necessitates potting of the module. This can be accomplished only with Remote Volta Adjustment (Option R), Fixed Output Voltage (Option F) or Hermetically Sealed Internal Adjustment Potentiometer.

Ruggedized with:	Option Designation
Option R or Option F	W
Hermetically Sealed Potentiometer (available only in Regulation Classes A and B)	W1

output impedance

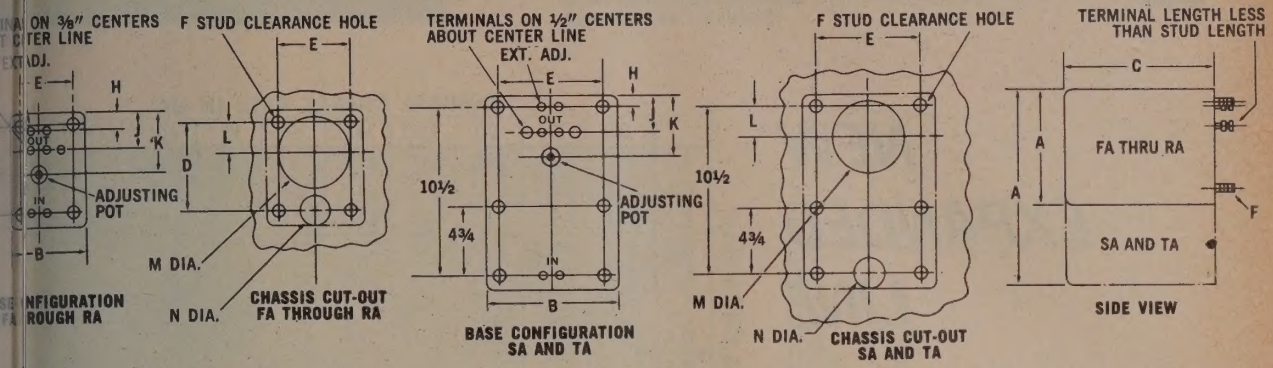
Maximum output impedance at DC can be calculated from the change in output voltage caused by changing from no load to full load current. Example: for a 10 volt, 0.10 amp unit with Class C regulation, the maximum change in output voltage is 0.0025% x 10 volts or 0.25 millivolts for a change in current from 0 to 0.10 amp. The output impedance is therefore:

$Z_{dc} = \triangle V / \triangle I = 0.25$ mv/0.10 amp = 0.0025 ohms (max.)

The AC output impedance will remain approximately equal the DC output impedance from DC to 400 cps, then increa by a factor of 100 at 40 kcps, and finally flatten out at fr quencies to 600 kcps.

MOUNTING AND TERMINATIONS

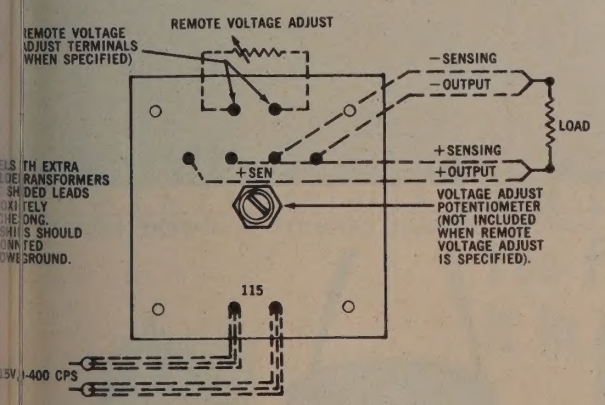
venience in mounting and handling, the entire CEA over 100,000 power supplies are packaged in only 13 different case sizes. The physical dimensions and chassis cutout dimensions are given in the chart below.



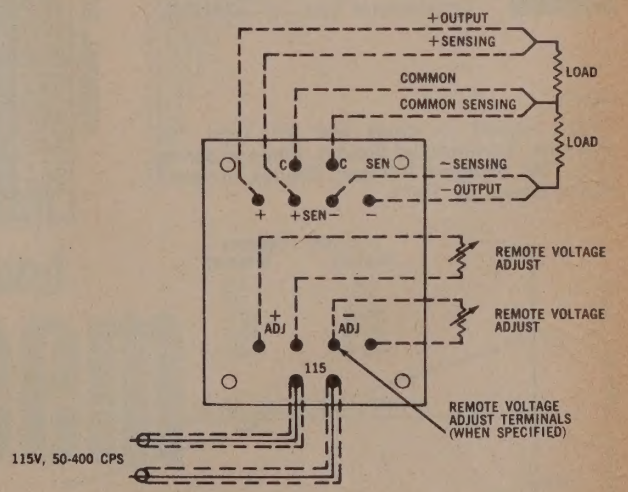
dule dimensions:

A	B	C	D	E	F	H	J	K	L	Chassis Clearance Holes M	Chassis Clearance Holes N	Standard Wt. Lbs.	Potted Units Option W Lbs.	Volume Cu. In.
2 5/16	2 1/16	3 1/8	1 11/16	1 7/16	6-32 x 3/8	5/16	13/16	1 7/16	11/16	1 11/16	3/4	1	1 1/4	13
2 3/4	2 3/8	3 13/16	2 1/8	1 3/4	6-32 x 3/8	5/16	13/16	1 7/16	11/16	1 11/16	3/4	1	2 1/4	25
3 1/16	2 5/8	4 1/4	2 19/64	1 55/64	6-32 x 3/8	3/8	7/8	1 1/2	11/16	1 11/16	3/4	2 1/2	2 3/4	34
3 5/16	3 1/16	4 7/8	2 5/8	2 1/8	8-32 x 3/8	1/2	1	1 5/8	11/16	1 11/16	3/4	3 1/2	4	53
3 15/16	3 3/8	5 1/4	3	2 7/16	10-32 x 1/2	1/2	1	1 5/8	11/16	1 11/16	3/4	4 1/4	6 1/4	70
4 5/16	3 11/16	5 5/16	3 5/16	2 11/16	10-32 x 1/2	1/2	1	1 5/8	11/16	1 11/16	3/4	5 1/2	7 3/4	88
4 11/16	4	6	3 11/16	3	1/4-20 x 5/8	1/2	1	1 5/8	11/16	1 11/16	3/4	7	9 1/2	112
5 1/16	4 5/16	6 13/16	4 1/16	3 5/16	1/4-20 x 5/8	1/2	1	1 5/8	11/16	1 11/16	3/4	9	12 1/2	149
6 1/16	4 13/16	6 13/16	5 1/16	3 13/16	1/4-20 x 5/8	1/2	1	1 5/8	11/16	1 11/16	3/4	12	16 1/2	198
7 1/16	5 5/16	7 1/16	6 1/16	4 5/16	5/16-18 x 21/32	1/2	1	1 5/8	11/16	1 11/16	3/4	17	23	277
8 1/16	6 11/16	7 1/16	7 1/16	5 11/16	5/16-18 x 21/32	1/2	1	1 5/8	11/16	1 11/16	3/4	30	38	381
11 11/16	5 5/16	7 1/16	—	4 7/16	5/16-18 x 7/8	1/2	1	1 5/8	11/16	2 1/4	3/4	35	45	463
11 11/16	6 11/16	8 1/16	—	5 5/16	5/16-18 x 7/8	1/2	1	1 5/8	11/16	2 1/4	3/4	50	65	632

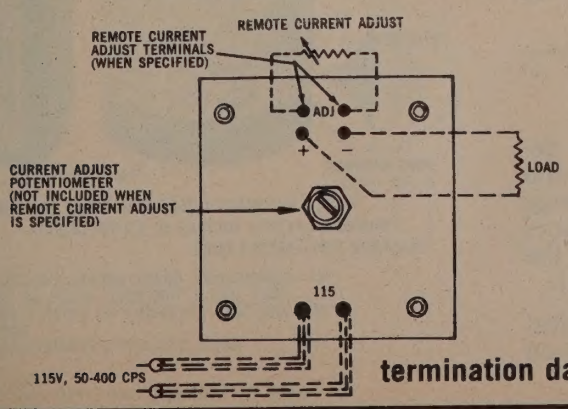
Chassis cutout dimensions are typical for all single output supplies and fixed output dual units. For dual output units with remote adjust terminals, omit "N" hole and substitute "M" diameter hole using "L" dimension both ends.



rmination data single output units



termination data dual output units



termination data constant current units

CEA, *a division of Berkleonics, Inc.*
1221 S. SHAMROCK AVENUE, MONROVIA, CALIFORNIA 91016
TELEPHONE: (213) 359-9261

BATTERY CHARGERS

NEW EXPANDED LINE

COMPACT BATTERY CHARGERS FOR NI-CAD CELLS

MIL T 27 Size AJ—1⅝x1⅝x2⅜
Commercial Size—1.52Hx1.32Dia

MIL T 27 Size EB—1 13/16x1 13/16x2 7/16
Commercial Size—1.77H x 1.82Dia

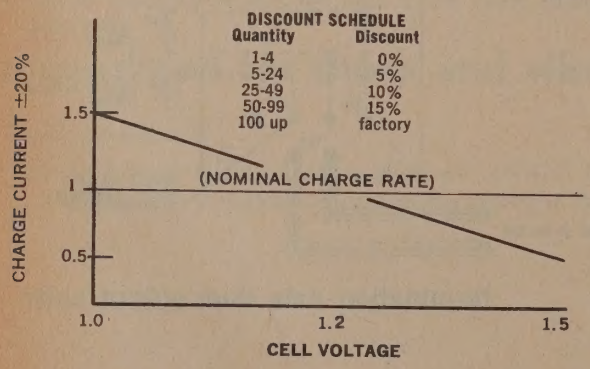
MIL T 27 Size FB—2 5/16x2 1/16x2½
Commercial Size—2.58Hx2.05Dia

MIL T 27 Size HB—3 1/16x2⅝x3 3/16
Commercial Size—3 1/16x2⅝x3 3/16

NOTE:
Prices shown in chart are for Type "C" chargers (Commercial Grade). When ordering Type "M" chargers (Military Grade), increase above prices by 100%.

NOMINAL BATTERY VOLTAGE (NUMBER OF CELLS @ 1.2 VOLTS CELL)	NOMINAL CHARGE RATE IN MA									
	22	50	90	120	160	230	300	400	600	800
1.2	$10.	$10.	$10.	$10.	$12.	$12.	$15.	$15.	$15.	$15.
2.4	$10.	$10.	$10.	$12.	$12.	$15.	$15.	$15.	$15.	$15.
3.6	$10.	$10.	$12.	$12.	$15.	$15.	$15.	$18.	$23.	$28.
4.8	$10.	$10.	$12.	$15.	$15.	$15.	$18.	$18.	$23.	$28.
6.0	$10.	$12.	$15.	$15.	$15.	$18.	$18.	$28.	$23.	$28.
7.2	$10.	$12.	$15.	$15.	$18.	$18.	$23.	$23.	$23.	$28.
8.4	$12.	$12.	$15.	$15.	$18.	$18.	$23.	$23.	$28.	$28.
9.6	$12.	$12.	$15.	$18.	$18.	$23.	$23.	$23.	$28.	$28.
10.8	$12.	$15.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$28.
12.0	$12.	$15.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$28.
13.2	$12.	$15.	$15.	$18.	$23.	$23.	$23.	$28.	$28.	$33.
14.4	$12.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$28.	$33.
15.6	$12.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$28.	$33.
16.8	$12.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$33.	$33.
18.0	$12.	$15.	$18.	$18.	$23.	$23.	$28.	$28.	$33.	$33.
19.2	$12.	$15.	$18.	$18.	$23.	$28.	$28.	$28.	$33.	$33.
20.4	$12.	$15.	$18.	$18.	$28.	$28.	$28.	$28.	$33.	$33.
21.6	$12.	$15.	$18.	$18.	$23.	$28.	$28.	$28.	$33.	$33.
22.8	$12.	$15.	$18.	$23.	$23.	$28.	$28.	$28.	$33.	$33.
24.0	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$28.	$33.	$38.
25.2	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
26.4	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
27.6	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
28.8	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
30.0	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
31.2	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
32.4	$15.	$15.	$18.	$23.	$23.	$28.	$28.	$33.	$33.	$38.
33.6	$15.	$15.	$18.	$23.	$23.	$28.	$33.	$33.	$33.	$38.
34.8	$15.	$15.	$18.	$23.	$23.	$28.	$33.	$33.	$33.	$38.
36.0	$15.	$15.	$18.	$23.	$23.	$28.	$33.	$33.	$33.	$38.
	0.22	0.5	0.9	1.2	1.6	2.3	3	4	6	8

NOMINAL STORAGE CAPACITY IN AMPERE HOURS



These 115V, 60 Hz battery chargers are designed specifically for nickel cadmium and similar rechargeable cells. Average charge time for these chargers is 14 to 16 hours with no damage to cells or charger if the charger is left on indefinitely (See Fig. 1).

Variations of mechanical sizes and electrical specifications for every need are available on special request.

PART NUMBER
C - 12 - -400
- CELL DISCHARGE CURRENT IN MA @ 10 HOUR RATE
- NOMINAL BATTERY VOLTAGE @ 1.2 VOLTS/CELL
- PACKAGE TYPE—**LETTER CODE**

"C"—COMMERCIAL GRADE (METAL ENCASED & POTTED WITH EP
UNIT HAS 2 THREADED HOLES IN END OPPOSITE LEAD
"M"—MILITARY (DESIGNED TO SATISFY MIL-T-27 / TF4RX02)
TRANSFORMER
METAL ENCASED & HERMETICALLY SEALED
105°C
10,000 HOUR LIFE
POWER TRANSFORMER SUPPLYING RECTIFIED LOAD

See YELLOW SECTION for Local Offices, Phones

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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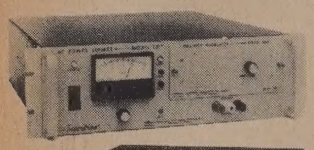
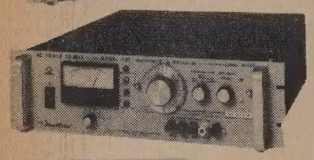
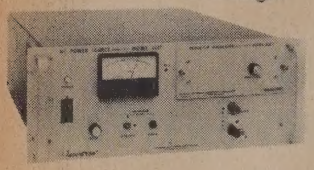




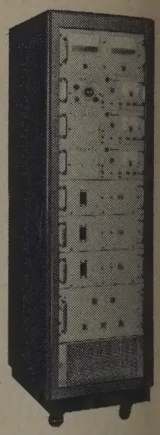


SOLID STATE *Invertron*

THE MOST RESPECTED NAME IN AC POWER ALL-SILICON SOLID-STATE POWER SOURCES

FEATURING

- 100 VA TO 2000 VA SINGLE-PHASE OUTPUT
- 100 VA 2ø TO 9000 VA 3ø OUTPUT
- SWITCHABLE OUTPUT VOLTAGE RANGES FOR FULL POWER AT LOWER VOLTAGES
- FREQUENCY RESPONSES FROM 45 Hz TO 20 KHz
- SINE-WAVE WITH LOW HARMONIC DISTORTION
- EXCELLENT LINE AND LOAD REGULATION
- BROAD CHOICE OF INTER-CHANGEABLE PLUG-IN OSCILLATORS
- OVERLOAD AND SHORT-CIRCUIT PROTECTION
- OPTIONAL INPUT VOLT-AGES: 117V1ø TO 460V3ø



Invertrons® have earned world-wide respect through their versatility, reliability, and outstanding performance. In addition to low distortion, high input stability and high power density, these silicon solid-state AC power sources use plug-in oscillators as frequency-determining elements and can be stacked electrically to provide two- or three-phase power. All Invertrons fit a standard 19" rack, or may be ordered with the appropriate cabinet for floor or bench use.

Model	Power (VA)	Preferred AC Line Input Voltage**	Standard AC Output Voltage Ranges***
101T	100, 1ø	115, 1ø	0-135
251T	250, 1ø	115, 1ø	0-301, 75, 135
501T	500, 1ø	115, 1ø	0-30, 75, 130, 260
751T	750, 1ø	115, 1ø	0-30, 75, 135, 270
1001T	1000, 1ø	230, 1ø	0-30, 75, 135, 270
1501T	1500, 1ø	230, 1ø	0-135
2001T	2000, 1ø	230, 1ø	0-135
3001T	3000, 1ø	230, 3ø	0-135
4501T	4500, 1ø	230, 3ø	0-135
6001T	6000, 1ø	230, 3ø	0-135
102T	100, 2ø	115, 1ø	0-17, 30, 75, 130 L-N
202T	200, 2ø	115, 1ø	0-135 L-N
502T	500, 2ø	115, 1ø	0-30, 75, 135 L-N
1002T	1000, 2ø	115, 1ø	0-30, 75, 130, 260 L-N
1502T	1500, 2ø	230, 1ø	0-30, 75, 135, 270 L-N
2002T	2000, 2ø	230, 1ø	0-30, 75, 135, 270 L-N
4502T	4500, 2ø	230, 3ø	0-135 L-N
6002T	6000, 2ø	230, 3ø	0-135 L-N

Model	Power (VA)	Preferred AC Line Input Voltage**	Standard AC Output Voltage Ranges***
153T	150, 3ø	115, 1ø	0-30, 52, 130, 225 L-L
*203TD	200, 3ø	115, 1ø	0-135 L-N
303T	300, 3ø	115, 1ø	0-135 L-N
*503TD	500, 3ø	115, 1ø	0-30, 75, 135 L-N
753T	750, 3ø	115, 1ø	0-30, 75, 135 L-N
*1002TD	1000, 3ø	115, 1ø	0-30, 75, 130, 260 L-N
1503R	1500, 3ø	230, 1ø	0-30, 75, 130, 260 L-N
*1503TD	1500, 3ø	230, 1ø	0-30, 75, 135, 270 L-N
*2003TD	2000, 3ø	230, 1ø	0-30, 75, 135, 270 L-N
2253T	2250, 3ø	230, 1ø	0-30, 75, 135, 270 L-N
3003T	3000, 3ø	230, 3ø	0-30, 75, 135, 270 L-N
4503T	4500, 3ø	230, 3ø	0-135 L-N
6003T	6000, 3ø	230, 3ø	0-135 L-N
9003T	9000, 3ø	460, 3ø	0-135 L-N

* Models: TD open delta configuration; all other 4-wire WYE.
** Input voltage ranges from 115V-1ø to 400V-3ø.
*** Other output ranges available on special order.

800T-SERIES PLUG-IN OSCILLATORS

Companion Plug-in Oscillators are available in three types: (A) General-purpose, fixed frequency; (B) Crystal-controlled, high-stability fixed-frequency; and (C) Continuously variable frequencies. All may be used with the Solid-State Invertrons to create 1ø, 2ø, or 3ø custom AC power sources tailored to exact requirements. The fixed-frequency oscillators may e ordered with a serve-feedback option for systems requi g extremely high amplitude stabilities and accuracies. S feature provides overall regulation of up to 0.01% aga t line and load changes.

Frequency Range	Frequency Accuracy at 25° C	Single Phase Model	Two Phase Model	Three Phase Model
800T VARIABLE FREQUENCY MODELS				
20 to 20KHz in three bands	±1.0%	800T-20/20K-1-1	800T-20/20K-1-2	800T-20/20K-1-3 800T-20/20K-1-3D
45 to 75Hz in one band	±0.25%	800T-45/75-.25-1	800T-45/75-.25-2	800T-45/75-.25-3 800T-45/75-.25-3D
300 to 500Hz in one band	±0.25%	800T-300/500-.25-1	800T-300/500-.25-2	800T-300/500-.25-3 800T-300/500-.25-3D
810T FIXED FREQUENCY GENERAL PURPOSE MODELS				
Any Single Freq. from 45Hz to 10KHz	±0.1%	810T-Freq-.1-1	810T-Freq-.1-2	810T-Freq-.1-3 810T-Freq-.1-3D
Any Single Freq. from 45Hz to 10KHz	±0.1%	810T-Freq-.1-1-115	System-Servo oscillator with servo feedback set to maintain powe source output at 115 VAC ± 0.1%. Provdies 0.01% line and loa regulation from power source. Available for single phase only.	
Any Single Freq. from 45Hz to 10KHz	±0.1%	810T-Freq-.1-1-105/135	System-Servo oscillator with servo feedback adjustable to produc power source output of 105 to 135 VAC. Provides 0.01% line and loa regulation from power source. Available for single phase only.	
820T FIXED FREQUENCY CRYSTAL CONTROLLED MODELS				
400Hz	±0.01% ±0.0001%	820T-400-.01-1 820T-400-.0001-1	820T-400-.01-2 820T-400-.0001-2	820T-400-.01-3 820T-400-.0001-3
Any Single Freq. from 45Hz to 10KHz	±0.01%	820T-Freq-.01-1	820T-Freq-.01-2	820T-Freq-.01-3 820T-Freq-.01-3D
Any Single Freq. from 45Hz to 10KHz	±0.0001%	820T-Freq-.0001-1	820T-Freq.-.0001-2	820T-Freq-.0001-3 820T-Freq-.0001-3D

ehlman ision

llowing complete f previously sup- models of Inver- s offered for com- ility with estab- d systems and cations.

INGLE PHASE	
lodel	Output (VA)
*51A	160
*51A	350
51B	750
501A	1500
501A	2500
501A	3500
001A	5000
0001A	10000
5001A	15000

TWO PHASE	
lodel	Output (VA)
*R161A	320
*02A	700
502B	1500
002A	3000
002A	5000
002A	7000
0002A	10000
0002A	20000
0002A	30000

THREE PHASE	
Model	Output (VA)
*123A	120
*R161A	480
03A	500
.003A	1000
253B	2250
503A	4500
503A	7500
.0003A	10000
.5003A	15000
0003A	30000
5003A	45000

(Available with optional nt voltages of 117-208-230.

Models R751B, and R53B: optional input volt- s of 208-220-230-440-4.

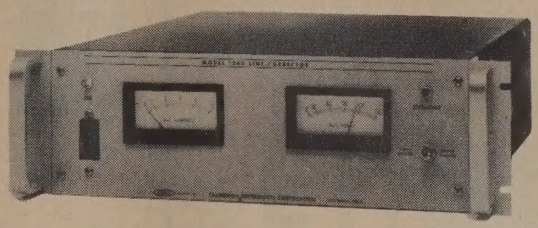
ance of models have op- al input voltages of 208-230-440-460 3ø.

"R" designated models be ordered as cabinet els by replacing the let- 'R" with the letter "C."

elin DIVISION

CALIFORNIA INSTRUMENTS CORPORATION

SERIES 1000 DYNAMIC AC LINE CORRECTORS



- REDUCES 500 VOLT 10u SEC TRANSIENTS BY 100 TO 1
- PURE SINE WAVE POWER
- HARMONIC DISTORTION REDUCTION OF 50:1
- SUPER REGULATION
  LINE — 0.025%
  LOAD — 0.025%
- IMPULSE SETTLING TIME LESS THAN 50 MICROSECONDS
- AUTOMATICALLY RECOVERS FROM OVERLOAD IN LESS THAN ONE CYCLE
- ALL-SILICON SOLID STATE

SERIES 1000 DYNAMIC AC LINE CORRECTOR SPECIFICATIONS

Model	Nominal Input Voltage	Input Voltage Range	Frequency Hz	Input Power Max VA	Output Current Master Range	Output Power Max VA	Exact Output Volts	Weight Pounds
1040	115	95-115	380-420	1600	0-10A	1000	115 Vrms ± 0.15% (± 0.25% 400 Hz Models)	55
1050	115	105-125	48-52	1600	0-10A	1000		55
1060	115	115-135	57-63	1600	0-10A	1000		55
1340	115	(selectable	380-420	4800	0-30A	3000		235
1350	115	by tap	48-52	4800	0-30A	3000		235
1360	115	switch)	57-63	4800	0-30A	3000		235
1360-520	230	208/220/230	57-63	4800	0-30A	3000		235
1052	230	180-220 198-244 216-264 (selectable by tap switch)	48-52	1600	0-5A	1000	220, 230 or 240V RMS ± 0.15% (Single output voltage only; specify on order)	55
1062	230		57-63	1600	0-5A	1000		55
1352	230		48-52	4800	0-15A	3000		235
1362	230		57-63	4800	0-15A	3000		235

CHARACTERISTICS COMMON TO ALL MODELS

INPUT

Harmonic Distortion: 10% maximum.

Isolation: 100 dB common mode isolation. One picofarad power transformer primary-to-secondary coupling capacitance. Low side of input normally strapped to chassis but may be floated to 300 V rms.

OUTPUT

Voltage Instability: ±0.05% for 24 hours under constant line, load, and ambient temperature conditions (±0.15% for Models 1040 and 1340).

Harmonic Distortion: 0.2% maximum (0.5% maximum for Models 1040 and 1340).

Line Regulation: 0.025% for 10 volt line change (Models 1050, 1060, 1350, 1360). 0.025% for 20 volt line change (Models 1052, 1062, 1352, 1362). 0.05% for 10 volt line change (Models 1040 and 1340).

Load Regulation: 0.025% for a zero to full load change (0.1% for Models 1040 and 1340).

Amplitude Temperature Coefficient: 0.005% per degree C maximum.

Peak Amplitude Instability: ±0.01 cycle to cycle.

TRANSIENT

Line (10% step change): Output transient will not exceed 0.5% peak amplitude.

Load (Zero to full load step change): Output transient will not exceed 0.5% peak amplitude.

Impulse Settling Time: 50 microseconds or less.

Overload Recovery Time: Automatically recovers in less than one cycle when overload is removed.

Overload Indication: Front panel lamp illuminates when load exceeds 1 KVA. Raw AC power is applied to load during period of illumination.

Overload Protection: Excessive overload condition actuates front panel circuit breaker.

GENERAL

Metered Input/Output: Switchable input/output monitoring on AC voltmeter. Meter accuracy ±3%F.S.

AC Ammeter: Output current is continuously monitored with an AC ammeter. Meter accuracy is ±5%F.S. for a sinusoidal current flow.

Ambient Temperature: 0 to 50° C.

Storage Temperature: —20° C to +85° C.

Cooling: A blower provides internal forced air circulation; air does not pass through front panel.

Front Panel Finish: Grey 26440. Fed. Std. 595.

MECHANICAL

	1000 VA Models	3000 VA Models
Dimensions:	10"W x 5¼"H x 17½"D	19"W x 14"H x 20¼"D
Net Weight:	55 lbs.	175 lbs.
Shipping Weight:	70 lbs.	235 lbs.

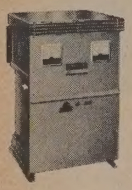
CHRISTIE SINCE 1929 ®

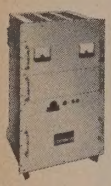
GENERAL PURPOSE HIGH CURRENT D-C POWER SUPPLIES

Send for "AC" Bulletin

MAGAMP "K & KK" SERIES, 3-PHASE

- 0.25% Static Reg.
- 1% rms Ripple
- 50 msec Response Time
- 6 v Dynamic Reg. NL ♦♦ FL





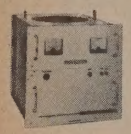
VOLTS	AMPS	MODEL
5½-8	0-50 -100 -200 -300	MH8-50K2S -100K2S -200K2S -300K2S
11-16	0-50 -100 -200 -300	MH16-50K2S -100K2S -200K2S -300K2S
22-32	0-50 -100 -200 -300	MH32-50K2S -100K24S -200K24S -300K24S
15-36	0-50 -100 -200 -400	MH36-50KK2S -100KK2S -200KK2S IC36-400KK4S
26-36	0-400 -500 -600 -800 -1000 -1200	IC36-400K4S -500K4S -600K4S 2C36-800K4S -1000K4S -1200K4S
26-32	0-1500	2C32-1500K4S
44-64	0-100 -200 -300	MH64-100K2S IC64-200K4S -300K4S
110-135	0-40 -60 -100 -200 -300	MH135-40K2S -60K2S IC135-100K4S -200K4S 2C135-300K4S
220-280	0-100	2C280-100K4S

SCR "SCO" SERIES, 1-PHASE

- 0.25% Static Reg.
- 1% rms Ripple
- 25 msec Response Time
- 5 v Dynamic Reg. NL ♦♦ FL

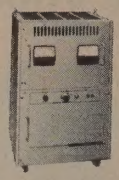
2-15 2-37 2-48	0-100 -50 -40	SCO15-100-12S SCO36-50-12S SCO48-40-12S

SCR "E" SERIES, 3-PHASE



- 0.1% Voltage Reg.
- 30 mv rms Ripple
- 1% Current Reg.
- 3 v Dynamic Reg. NL ♦♦ FL

2-40	0-150 -300 -600	IRO40-150E24S 2RO40-300E24S ICO40-600E24S
2-135	0-150 -300	2CO135-150E4S 2CO135-300E4S



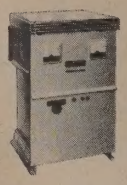
TRANSISTOR "KKGG" SERIES, 3-PHASE

- 0.01% Static Reg.
- 1 mv rms Ripple
- 50 microsec Response Time
- 0.5 v Dynamic Reg. NL ♦♦ FL

VOLTS	AMPS	MODEL
15-36	0-50 -100 -200	MH36-50KKGG24L -100KKGG24L -200KKGG24L
26-36	0-400 -600	2C36-400KGG24S -600KGG24S

SEMI-REGULATED SERIES, 3-PHASE

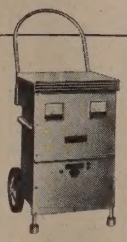
- "R & T" Load Regulated Only
- 1% rms Ripple
- "A" Unregulated



0-30	0-100 -200 -600	MH28-100AN2S -200AN2S IC28-600AN2S
0-56	0-50	MH56-50AN2S
28/14	0-100/200	MH28-100DT2S
28	0-100 -100 -200 -200 -300 -400 -600 -1000	MH28-100A2S -100R2S -200A2S -200R2S -300R2S -400R2S -600R2S A28-1000T4S
120	0-20 -40 -60 -80 -125 -200 -400	MH120-20A2S -40A2S -60A2S -80A2S -125A2S H120-200A4S IC120-400A4S
120/240	0-200	IC240-200A4S

AIRCRAFT STARTING "RA" SERIES

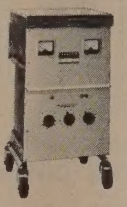
Send for "RA" Bulletin



- 2% Static Reg.
- 1% rms Ripple
- 600% Intermittent Current Rating
- Mobile

12/24	0-50	QRA24-50
28	0-100 -200 -300 -400 -600 -1000	MH28-100RA2M -200RA2M -300RA2M -400RA2M -600RA2M -1000TJA2M

UNREGULATED LOW VOLTAGE SERIES, 3-PHASE



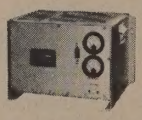
- Unregulated
- 6% rms Ripple

2-14/1-7	0-100/200 -150/300 -200/400 -300/600 -500/1000 -600/1200	MH6-200PD2S -300PD2S -400PD2S -600PD2S H6-1000PD2S -1200PD2S
4-28/2-14	0-100/200	MH12-200PD2S

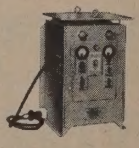
All specifications are typical only

Typical Special Army, Navy, Air Force, A.E.C. and NASA Units

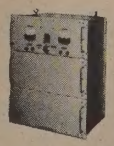
30 AMP AUTOMATIC BATTERY CHARGER



50 AMP RADIO POWER



75 AMP MISSILE TESTING SUPPLY



250 AMP MISSILE GROUND POWER

500 AMP MISSILE GROUND POWER

HELICOPTER STARTING POWER SUPPLY

175 AMP FORKLIFT TRUCK CHARGER

CHRISTIE SINCE 1929 ®

CHRISTIE ELECTRIC CORP.

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ELECTRO-OPTICAL SYSTEMS

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LEAD-ACID • NICKEL-CADMIUM • SILVER-ZINC

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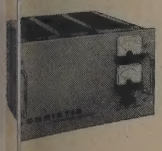
- Emergency Standby Float Service
- 0.25% Voltage Regulation
- General Purpose Chargers and Battery Eliminators



NOM. D-C VOLTS	RATED D-C AMPS	BASIC MODEL NO.	1-PH OR 3-PH	NOM. D-C VOLTS	RATED D-C AMPS	BASIC MODEL NO.	1-PH OR 3-PH
6/12	12	BCA14-12-01-S	1-Ph	48	6	BCA50-6-01-S	1-Ph
	25	BCA14-25-01-S	1-Ph		12	BCA50-12-01-S	1-Ph
	50	BCA14-50-12-S	1-Ph		25	BCA50-25-12-S	1-Ph
6/12/24	12	BCA30-12-01-S	1-Ph		50	FCA50-50-02-S	1-Ph
	25	BCA30-25-01-S	1-Ph		60	1FCB50-60-02-S	3-Ph
	50	BCA30-50-12-S	1-Ph		130	1FCB50-130-02-S	3-Ph
	150	1FCB30-150-02-S	3-Ph	120	6	BCA126-6-01-S	1-Ph
36/40	20	BCA40-20-01-S	1-Ph		12	BCA126-12-12-S	1-Ph
	40	BCA40-40-12-S	1-Ph		25	FCA126-25-02-S	1-Ph
	150	1FCB36-150-02-S	3-Ph		30	1FCB126-30-02-S	3-Ph
	150	1FCB40-150-02-S	3-Ph		50	1FCA126-50-02-S	1-Ph
					60	1FCB126-60-02-S	3-Ph
					100	2FCB126-100-02-S	3-Ph

NICKEL-CADMIUM "RPM" BATTERY CHARGER

AN ENTIRELY NEW & UNIQUE PRINCIPLE

Model BCA30-50-12BU-S

- **Complete** Automatic Recharge in only ½ to 1 hour
- Less Battery Memory, Cell Imbalance, Heating, Gassing & Loss of Electrolyte
- Higher Charging Efficiency
- Longer Battery Cycle Life
- One Universal All-Purpose Unit for different number of cells and 10 to 150 ampere-hours

CAPACITY TESTER

with "RPM" Charger

Model BCA30-50-12BBU-S

- Regulated Constant Current Discharge
- Ampere-hour Readout
- "RPM" Charger as above
- Automatic Programmed Charge-Discharge-Charge Cycle — 2½ to 4 hours total duration

BF LAMPHOUSE

XM POWER SUPPLY

IGA IGNITER

XENON LAMPS

CHRISTIE SINCE 1929

XENOLITE®

- LAMPHOUSES
- OPTICS
- POWER SUPPLIES
- IGNITERS
- LAMPS
- PROJECTORS

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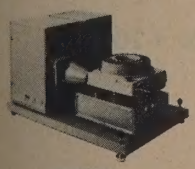
XENON AND MERCURY ARC LAMP SYSTEMS

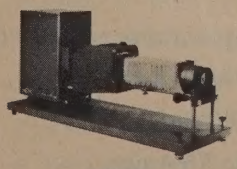
LAMP				IGNITER	LAMPHOUSE incl. Igniter			POWER SUPPLY		
NOM. WATTS	TYPE*	STD.	OZONE-FREE	MANUAL/ AUTOMATIC IGNITION	UF (ADJ. FOCUS)	BF (BRIGHT FIELD)	BSF (EXTRA BRIGHT)	CLASS I (REGULATED)	CLASS II	CLASS III (MOST ECONOMICAL)
150	X	CXL-155	—	IGM-2***	UF5	BF5	—	SCX1200-12	BXM450-1	—
200	H	CSH-200D	—	IGM-2***	UF2J-B2	—	—	—	—	Inside Lamphouse
300	X	CXL-305	—	IGM-2***	UF5	BF5	—	SCX1200-12	BXM450-1	—
450	X	CXL-451	CXL-451-0	IGA-5	UF5	BF5	—	SCX1200-12**	BXM450-1	XM450-1
500	H	CSH-500D	—	IGA-5	UF5J	BF5J	—	SCX1200-12J	BXM500B-1	—
900	X	CXL-900	CXL-900-0	IGA-5	UF10	BF10	—	SCX1200-12**	—	XM900-1**
1000	XH	—	—	IGA-5	UF10	BF10	—	SCX1200-12	—	—
1000	H	CSH-1000D	—	IGA-5	UF10J	BF10J	—	SCX1200-12	—	—
1600	X	CXL-1600	CXL-1600-0	IGA-8	UF16	BF16	BSF30	1FX1600-02S	—	XM1600-2S**
2000	X	CXL-2000K	—	IGA-8	UF16	BF16	BSF30	1FX1600-02S	—	XM1600-2 S**
2500	XH	—	—	IGA-15	UF30J	BF30J	BSF30J	1FX2500B-02S	—	—
(2500 3000	X	CXL-3000K	—	IGA-15	UF30	BF30	BSF30	1FX2500-02S	—	1FXM2500-2S
4200	X	CXL-4200K	—	IGA-15	—	—	BSF50	2FX6500-02S	—	3FXM4200-25
5000	XH	—	—	IGA-20	—	—	BSF50	2FX6500B-02S	—	—
6500	X	—	—	IGA-20	—	—	—	2FX6500-02S	—	3FXM6500-2S
12000	X	—	—	IGA-35	—	—	—	CX12000-24S	—	—
25000	X	—	—	IGA-60	—	—	—	CX25000-4S	—	—

*X = Xenon *XH = Xenon-Mercury *H = Mercury **other models also available ***Manual ignition only.

XENON ILLUMINATED PROJECTORS UP TO 6 TIMES BRIGHTER FOR FRONT OR REAR PROJECTION

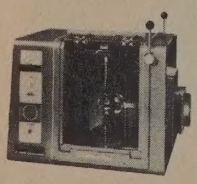


XENOLITE with 35mm & 2"x2" SLIDE PROJECTOR

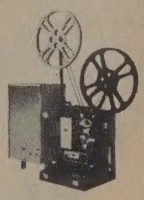


XENOLITE with 3¼"x4" SLIDE PROJECTOR

XENOLITE OVERHEAD PROJECTOR



XENOLITE for 35 & 70mm MOVIE PROJECTORS



XENOLITE with 16mm MOVIE PROJECTOR

CHRISTIE SINCE 1929

CHRISTIE ELECTRIC CORP.

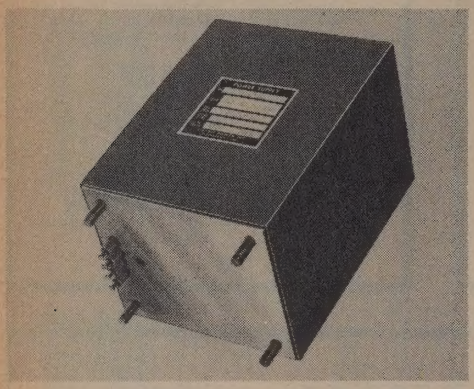
D.C. POWER SUPPLIES
BATTERY CHARGERS & TESTERS
ELECTRO-OPTICAL SYSTEMS

3404A W. 67TH ST., LOS ANGELES, CALIF. 90060 • PHONE: (213) 750-1151 • TWX 910-321-3867

CIRCUIT POWER, INC. POWER SUPPLIES

AC-DC MODULAR SUPPLIES

C-90 SERIES



OUR STANDARD SERIES featuring the greatest variety of p cisely regulated modules.

Base Operating Temperature . . . −20°C to +90°C

Input . . . 103-127 VAC, 47-420 Hz

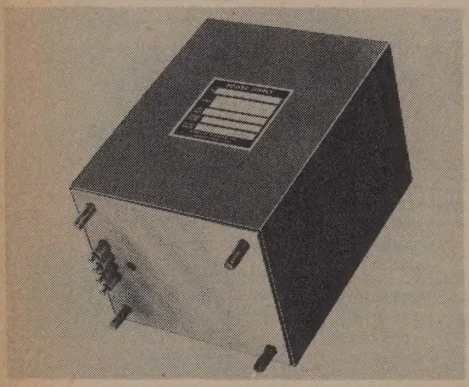
Output Voltage . . . 3.0 to 600 VDC

Output Current . . . to 25 Amps

Output Power . . . to 800 Watts

Regulation . . . ±0.02%; ±0.05%; ±0.5%

LC-75 SERIES



LOWER PRICE SERIES

Base Operating Temperature . . . −20°C to +75°C

Input . . . 103-127 VAC, 47-420 Hz

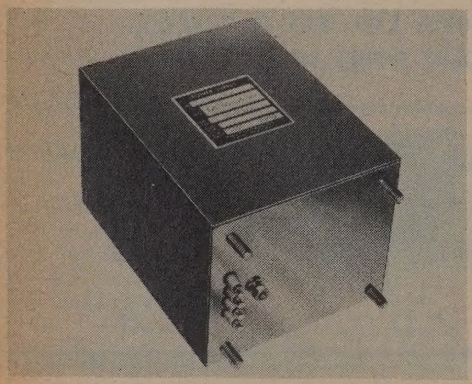
Output Voltage . . . 3.0 to 150 VDC

Output Current . . . to 25 Amps

Output Power . . . to 750 Watts

Regulation . . . ±0.05%; ±0.5%

AN-100 SERIES



DESIGNED AND QUALIFIED FOR EXTREME MILITARY ENVIRONMENTS

Base Operating Temperature . . . −55°C to +100°C

Input . . . 103-127 VAC, 47-420 Hz

Output Voltage . . . 3.0 to 600 VDC

Output Current . . . to 25 Amps

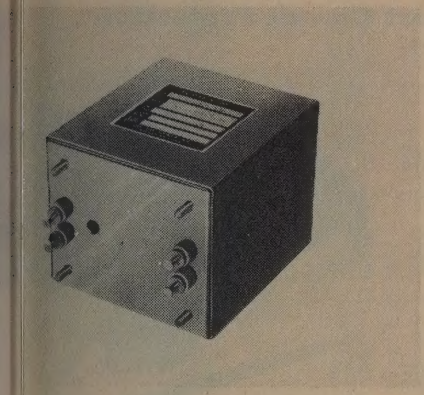
Output Power . . . to 800 Watts

Regulation . . . ±0.02%; ±0.05%; ±0.5%

CIRCUIT POWER, INC. 227 MAIN STREET, PORTLAND, CONN. PHONE: 203-342-2520

CIRCUIT POWER, INC. POWER SUPPLIES

9 SERIES



OUR MINIATURE SERIES featuring not only more power per volume but a 50% output voltage adjust range.

Base Operating Temperature . . . −20°C to +90°C

Input . . . 105-125 VAC, 50-400 Hz

Output Voltage . . . 2.8 to 120 VDC

Output Current . . . to 30 Amps

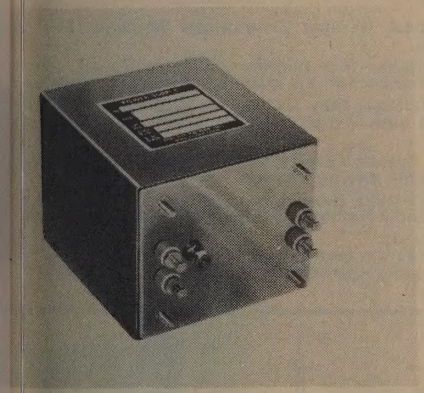
Output Power . . . to 375 Watts

Regulation . . . Line . . . ±(0.05% +5 mv)
Load . . . ±(0.1% +15 mv)

FICIENCY TO 80%

DC-DC CONVERTERS

10 SERIES



Base Operating Temperature . . . −55°C to +100°C

Input . . . 21 to 30 VDC

Output Voltage . . . 2.8 to 120 VDC

Output Current . . . to 25 Amps

Output Power . . . to 240 Watts

Regulation . . . ±(0.1% +15 mv)

ALL OF CIRCUIT POWER'S SILICON POWER MODULES ARE PACKAGED IN STANDARD MIL-T-27 CASES

CIRCUIT POWER OFFERS THE FOLLOWING OPTIONAL FEATURES:

- 208 or 230 Volt Input
- Fixed Output Voltage
- Remote Sensing
- External Output Voltage Adjust
- Overvoltage Protection
- Temperature Coefficient to 0.002% per °C
- and many others!

MULTIPLE OUTPUTS — SPECIAL SIZES AND SHAPES

CIRCUIT POWER, INC.

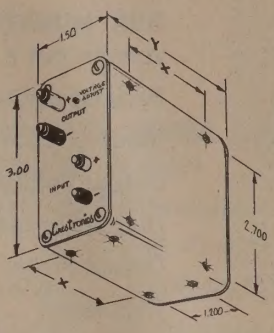
227 MAIN STREET, PORTLAND, CONN.
PHONE: 203-342-2520

DC to DC Converters

New Generation **More Efficient** **Higher Reliability**
Better Regulation **Filtered Input** **Short Circuit Protection**

REGULATED UNITS WITH CASE

Basic Model No.	Power Output Watts	Mounting Type	"X"	Length "Y"
PS 205	3	END	℄	1.2"
PS 215	3	SIDE	℄	1.2"
PS 206	10	END	.7"	1.5"
PS 216	10	SIDE	.7"	1.5"
PS 207	20	END	1.5"	2.3"
PS 217	20	SIDE	1.5"	2.3"
PS 208	40	END	2.5"	3.8"
PS 218	40	SIDE	2.5"	3.8"
PS 209	80	END	4.0"	5.2"
PS 219	80	SIDE	4.0"	5.2"



UNREGULATED UNITS WITH CASE

Basic Model No.	Input Current Max.	Mounting Type	"X"	Length "Y"
PS 210	1.0	END	℄	1.30"
PS 220	1.0	SIDE	℄	1.30"
PS 211	2.0	END	.7"	2.00"
PS 221	2.0	SIDE	.7"	2.00"
PS 212	4.0	END	1.7"	2.90"
PS 222	4.0	SIDE	1.7"	2.90"
PS 213	6.0	END	1.7"	4.60"
PS 223	6.0	SIDE	1.7"	4.60"

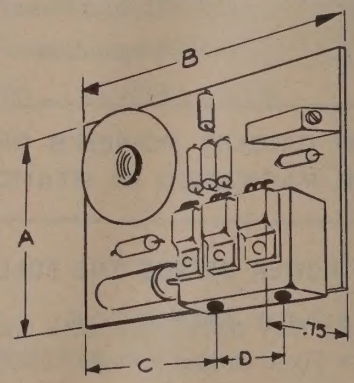
ORDERING INFORMATION

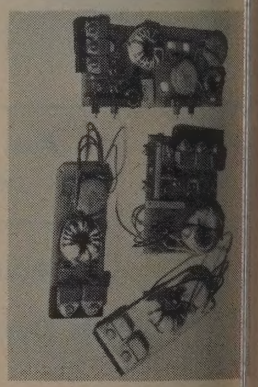
PS 207 — 22 — 3000 — VQ +F — P
1 2 3 4 5 6

1. Basic Model Number Determines Wattage, Size an Mounting.
2. Input Voltage: This number indicates $E_{IN\,MIN.}$ on th regulated units and E_{IN} Nom. on the unregulated unit
3. Output Voltage: May be any voltage between 2 volt and 1500 volts AC or between 2 volts and 6000 volt DC.
4. Rectifier System: Select for applicable output voltag refer to unit pricing column.
5. When a positive ground is required add +F after re tifier system. Nothing is added for negative ground.
6. Modifications:
   —P for program connection.
   —E for enable operation.

REGULATED PC CARDS

Basic Model No.	Output Power Watts	Mechanical Dimensions "A"	"B"	Mounting "C"	"D"
PS 229	10	3.50"	2.25"	0.40"	0.50"
PS 230	20	3.75"	3.00"	0.50"	1.00"
PS 231	40	4.00"	3.75"	0.65"	1.20"
PS 232	60	4.00"	5.00"	0.65"	1.40"





UNREGULATED PC CARDS

Basic Model No.	Input Current Amps	Mechanical Dimensions "A"	"B"	Mounting "C"	"D"
PS 225	1.0	4.00"	1.30"	0.45"	0.00"
PS 226	2.0	4.00"	2.00"	0.60"	0.60"
PS 227	4.0	4.00"	2.90"	0.70"	1.70"

GAS LASER APPLICATION

A special rectifier system can be furnished that i corporates a self-starting feature for He-Ne g lasers. The output voltage will raise to appro imately 7Kv then reduces to about 3Kv upon ig tion of the plasma tube. The output voltages a current limiting can be furnished to your specific tions.

Crestronics' Engineering Staff Will Design to Your Specifications

UNIT PRICE SCHEDULE

Rectifier	OUTPUT VOLTS 5-9	10-30	31-500	501-1500	1501-3000	3001-6000
AC	$165.00	165.00	165.00	165.00	.....	.....
FW	189.00	180.00	.....	.....	.....	.....
B	.....	.....	180.00	189.00	.....	.....
BCT	.....	198.00	189.00	206.00	.....	.....
VD	.....	.....	.....	198.00	206.00	.....
BVD	.....	.....	.....	234.00	243.00	.....
VQ	.....	.....	.....	.....	.....	234.00
AC	$165.00	165.00	165.00	165.00	.....	.....
FW	189.00	180.00	.....	.....	.....	.....
B	.....	.....	180.00	189.00	.....	.....
BCT	.....	198.00	189.00	206.00	.....	.....
VD	.....	.....	.....	198.00	206.00	.....
BVD	.....	.....	.....	234.00	243.00	.....
VQ	.....	.....	.....	.....	.....	234.00
AC	$180.00	180.00	180.00	180.00	.....	.....
FW	205.00	195.00	.....	.....	.....	.....
B	.....	.....	195.00	205.00	.....	.....
BCT	.....	215.00	205.00	224.00	.....	.....
VD	.....	.....	.....	215.00	224.00	.....
BVD	.....	.....	.....	253.00	263.00	.....
VQ	.....	.....	.....	.....	.....	253.00
AC	$190.00	190.00	190.00	190.00	.....	.....
FW	220.00	210.00	.....	.....	.....	.....
B	.....	.....	210.00	220.00	.....	.....
BCT	.....	231.00	220.00	241.00	.....	.....
VD	.....	.....	.....	231.00	241.00	.....
BVD	.....	.....	.....	273.00	283.00	.....
VQ	.....	.....	.....	.....	.....	273.00
AC	$210.00	210.00	210.00	210.00	.....	.....
FW	246.00	235.00	.....	.....	.....	.....
B	.....	.....	235.00	246.00	.....	.....
BCT	.....	258.00	246.00	270.00	.....	.....
VD	.....	.....	.....	258.00	270.00	.....
BVD	.....	.....	.....	305.00	317.00	.....
VQ	.....	.....	.....	.....	.....	305.00
AC	$ 81.00	81.00	81.00	81.00	.....	.....
FW	97.00	92.00	.....	.....	.....	.....
B	.....	.....	92.00	97.00	.....	.....
BCT	.....	101.00	97.00	106.00	.....	.....
VD	.....	.....	.....	101.00	106.00	.....
BVD	.....	.....	.....	120.00	124.00	.....
VQ	.....	.....	.....	.....	.....	120.00
AC	$ 94.00	94.00	94.00	94.00	.....	.....
FW	112.00	107.00	.....	.....	.....	.....
B	.....	.....	107.00	112.00	.....	.....
BCT	.....	116.00	112.00	123.00	.....	.....
VD	.....	.....	.....	116.00	123.00	.....
BVD	.....	.....	.....	139.00	144.00	.....
VQ	.....	.....	.....	.....	.....	139.00
AC	$115.00	115.00	115.00	115.00	.....	.....
FW	136.00	130.00	.....	.....	.....	.....
B	.....	.....	130.00	136.00	.....	.....
BCT	.....	142.00	136.00	150.00	.....	.....
VD	.....	.....	.....	142.00	150.00	.....
BVD	.....	.....	.....	169.00	175.00	.....
VQ	.....	.....	.....	.....	.....	169.00
AC	$ 42.00	42.00	42.00	42.00	.....	.....
FW	56.00	53.00	.....	.....	.....	.....
B	.....	.....	53.00	56.00	.....	.....
BCT	.....	58.00	56.00	61.00	.....	.....
VD	.....	.....	.....	58.00	61.00	.....
BVD	.....	.....	.....	69.00	72.00	.....
VQ	.....	.....	.....	.....	.....	69.00
AC	$ 50.00	50.00	50.00	50.00	.....	.....
FW	65.00	62.00	.....	.....	.....	.....
B	.....	.....	62.00	65.00	.....	.....
BCT	.....	68.00	65.00	71.00	.....	.....
VD	.....	.....	.....	68.00	71.00	.....
BVD	.....	.....	.....	81.00	84.00	.....
VQ	.....	.....	.....	.....	.....	81.00
AC	$ 82.00	82.00	82.00	82.00	.....	.....
FW	102.00	97.00	.....	.....	.....	.....
B	.....	.....	97.00	102.00	.....	.....
BCT	.....	106.00	102.00	111.00	.....	.....
VD	.....	.....	.....	106.00	111.00	.....
BVD	.....	.....	.....	126.00	131.00	.....
VQ	.....	.....	.....	.....	.....	126.00
AC	$131.00	131.00	131.00	131.00	.....	.....
FW	150.00	142.00	.....	.....	.....	.....
B	.....	.....	142.00	150.00	.....	.....
BCT	.....	156.00	150.00	163.00	.....	.....
VD	.....	.....	.....	156.00	163.00	.....
BVD	.....	.....	.....	184.00	192.00	.....
VQ	.....	.....	.....	.....	.....	184.00
AC	$141.00	141.00	141.00	141.00	.....	.....
FW	160.00	153.00	.....	.....	.....	.....
B	.....	.....	153.00	160.00	.....	.....
BCT	.....	168.00	160.00	176.00	.....	.....
VD	.....	.....	.....	168.00	176.00	.....
BVD	.....	.....	.....	199.00	206.00	.....
VQ	.....	.....	.....	.....	.....	199.00
AC	$150.00	150.00	150.00	150.00	.....	.....
FW	174.00	166.00	.....	.....	.....	.....
B	.....	.....	166.00	174.00	.....	.....
BCT	.....	182.00	174.00	197.00	.....	.....
VD	.....	.....	.....	182.00	191.00	.....
BVD	.....	.....	.....	216.00	224.00	.....
VQ	.....	.....	.....	.....	.....	216.00
AC	$174.00	174.00	174.00	174.00	.....	.....
FW	195.00	186.00	.....	.....	.....	.....
B	.....	.....	186.00	195.00	.....	.....
BCT	.....	204.00	195.00	214.00	.....	.....
VD	.....	.....	.....	204.00	214.00	.....
BVD	.....	.....	.....	242.00	226.00	.....
VQ	.....	.....	.....	.....	.....	242.00

"E" Modification Add 10% to Price
"R" Modification Add 10% to Price
"P" Modification Add 10% to Price

OUTPUT INFORMATION

POWER

On regulated units the power is specified with an input differential of 4 volts and an $E_{IN\ MIN.}$ of 22 volts.

For an input differential of greater than 4 volts, derate output to:

$$\text{Watts derated} = .7\ E_{IN\ MIN.} \frac{.5\ \text{Watts rated}}{\Delta E_{IN} + 3.7}$$

For a minimum input voltage of less than 22 volts, derate output power to:

$$\text{Watts derated} = \text{Watts rated}\ \frac{E_{IN\ MIN.}}{22}$$

On unregulated units the output power will be expressed as:

$$\text{Watts} = .8\ E_{IN}\ I_{IN}$$

With output voltages lower than 15 volts, derate output power to:

$$\text{Watts derated} = \text{Watts rated}\ \frac{\text{Output Volts} + 15}{30}$$

VOLTAGE

Regulated units

The nominal output voltage is specified in the model number and may be screwdriver adjusted from +5% to —30%.

Unregulated units

The output voltage will be proportional to the input voltage. The input/output voltage ratio will be specified in the model number.

ISOLATION

All outputs greater than 100 VDC will be isolated to 6000 VDC. All outputs less than 99 VDC will be isolated to 100 VDC. Isolation resistance will be greater than 10K Meg. For special isolation requirements call our engineering department.

ELECTRICAL SPECIFICATIONS

REGULATION:

REGULATED UNITS

LINE .... .01%/ Δ Input Volt.
TEMP. .... .02%/°C +2Mv/°C
LOAD 10% to FULL:
2 to 9 VOLTS 6%
10 to 24 VOLTS 4%
30 to 6000 VOLTS 3%

UNREGULATED UNITS

LINE .... Proportional to Input
LOAD 10% to FULL:
2 to 9 VOLTS 10%
10 to 24 VOLTS 6%
25 to 6000 VOLTS 4%

RIPPLE ALL SYSTEMS

VD., VQ. 3%
ALL OTHERS 2%

1. On output voltages less than 20 volts the switching spikes will be about 100 mv p-p. These can be easily reduced by adding a capacitor on the output terminals.
2. Because of common mode ripple it is necessary to know when a positive ground system is used (see ordering information).
3. The conversion frequency will be approximately 23KHz at nominal input and output voltages.

with our head in the clouds
. . . and our feet on the ground

Crestronics

P.O. BOX S
CRESTLINE, CALIF. 92325

744 ROCKY LOOP
PHONE (714) 338-1722

Quantity Discounts: 1 to 4, Unit Price — 5 to 19 Less 10%
20 to 49, Less 20% — 50 to 99, Less 30%

HIGH VOLTAGE EQUIPMENT

HIGHLY REGULATED ADJUSTABLE HIGH VOLTAGE MODULES SERIES "HRM"

SPECIFICATIONS

Input: 115V ±10% 60 cps
Output: Regulation for 10% line change .03% max. Regulation for NL to FL .03% max
Ripple: .03% RMS max
Temp. Range: −54°C to +65°C operating
Temp. Coefficient: 0.02%/°C

- No voltage overshoot
- Adjustable output
- Short circuit proof (no fuses)
- Meet environmental and transient requirements of MIL-E-16400

Model No. Pos. Output	Model No. Neg. Output	Output Voltage	Max. Current	Dimensions Inches	Net Wt. (Lbs.)
.6HRM5P1	.6HRM5N1	300-600V	5MA	4⅜ x 3⅜ x 4¾	7
1.2HRM5P1	1.2HRM5N1	600-1.2KV	5MA	4⅜ x 3¾ x 4¾	7½
1.7HRM5P1	1.7HRM5N1	900-1.7KV	5MA	4⅜ x 3¾ x 4¾	9
2.5HRM4P1	2.5HRM4N1	1.3-2.5KV	4MA	4⅜ x 3¾ x 4¾	9
3.5HRM3P1	3.5HRM3N1	1.7-3.5KV	3MA	4 11/16 x 4 x 4 13/16	10
5HRM2P1	5HRM2N1	2.5-5.0KV	2MA	4 11/16 x 4 x 4 13/16	10
7HRM1.5P1	7HRM1.5N1	3.5-7.0KV	1.5MA	5½ x 4½ x 6	15
10HRM1P1	10HRM1N1	5.0-10KV	1MA	5½ x 4½ x 6	15
15HRM1.5P1	15HRM1.5N1	7.5-15KV	1.5MA	7¼ x 4 5/16 x 7½	20
20HRM1P1	20HRM1N1	10-20KV	1MA	7¼ x 4 5/16 x 8	20
25HRM2P1	25HRM2N1	12-25KV	2MA	9¼ x 5½ x 9⅝	35
30HRM.75P1	30HRM.75N1	15-30KV	0.75MA	8¼ x 5 5/16 x 7⅞	37
40HRM.5P1	40HRM.5N1	20-40KV	0.5MA	6¼ x 8¼ x 8	42
50HRM.5P1	50HRM.5N1	25-50KV	0.5MA	10 x 8 x 10	60

REGULATED MODULES TRANSISTORIZED SERIES "TRHV"

The TRHV series of regulated power supplies are all solid state units. Reference and regulating circuitry is accomplished at low voltage. The units are completely self-contained and require only 115 Volt AC 60/400 cycle excitation to be operative. These supplies are rugged and feature good line, load and thermal stability. The operating temperature range is −20°C to +55°C. Regulation better than 0.25% for 10% line change & NL to FL. Ripple 0.5% RMS at max current.

Model No. Positive Output	Model No. Negative Output	Voltage Output	Max. Current	Dimensions (Inches)	Net Weight (Lbs.)
1RP5-1	1RN5-1	1 KV	5 MA	4¼x3¾x5½	8½
2.5RP4-1	2.5RN4-1	2.5 KV	4 MA	4¼x3¾x5½	8½
5RP2-1	5RN2-1	5 KV	2 MA	4¼x3¾x5½	8½
7.5RP1.5-1	7.5RN1.5-1	7.5 KV	1.5 MA	4¾x4x6	10
10RP1-1	10RN1-1	10 KV	1 MA	4¾x4x6	10½
10RP2-1	10RN2-1	10 KV	2 MA	6¾x4¼x7½	18½
15RP1.5-1	15RN1.5-1	15 KV	1.5 MA	6¾x4¼x7½	18
20RP1-1	20RN1-1	20 KV	1 MA	7¼x4¼x7½	19

UNREGULATED MODULES COMPACT HIGH VOLTAGE

SERIES "S"

These power supplies are designed for operation from either a 0-115 volt or 0-125 volt line at 60/400 cycles. Three input terminals are provided to permit proper line connection. The output is available from shielded polyethylene cables and may be varied over the full range by varying the input AC line. The two output cables are insulated for the full output voltage, so that either the positive or negative terminal may be grounded.* All units have selenium rectifiers and are hermetically sealed in an epoxy, vacuum filled, metal case.

Units for 50 cycle operation at various line voltages are available on request.

*Model 40-2-4 is designed with one output cable for single polarity operation. When ordering, please specify polarity.

Model No.	Max. Output Voltage	Max. Rated Current	**Ripple at Full Load %RMS/MA at 60 CPS	Dimensions (Inches)	Net Weight (Lbs.)
2.5-2-6	0-2.5 KV	2 MA	0.25	3 x 2⅝ x 4¼	3¼
5-2-4	0-5.0 KV	2 MA	0.25	3 x 3½ x 3⅞	4¼
10-1-12	0-10 KV	1.25 MA	0.30	3 x 3½ x 4⅞	5½
15-1-8	0-15 KV	1.25 MA	0.25	4¼ x 5 x 5¾	11½
20-1-4	0-20 KV	1.25 MA	0.25	4¼ x 5⅛ x 6¾	14
25-1-3	0-25 KV	1.25 MA	0.30	4¾ x 6 x 7¼	20¼
30-1-5	0-30 KV	1.25 MA	0.20	5 x 6½ x 8	24½
40-1-1	0-40 KV	1 MA	0.25	6¼ x 8¼ x 7	26
40-2-4*	0-40 KV	2 MA	0.30	6¼ x 8¼ x 7	30
50-1-5	0-50 KV	1 MA	0.25	9⅞ x 7¾ x 9⅜	52
60-1.5-1	0-60 KV	1.5 MA	0.35	12¼x9¼x11¼	87
1-5-2	1 KV	5 MA	.20	3 x 2¾ x 4¼	3½
2.5-5-3	2.5 KV	5 MA	.20	3½ x 3 x 5	5
5-5-4	5 KV	5 MA	.25	4 x 3⅜ x 5¼	7½
7.5-5-1	7.5 KV	5 MA	.20	4⅜ x 3¾ x 5½	8½
10-5-1	10 KV	5 MA	.25	4⅜ x 3¾ x 5½	10
15-5-1	15 KV	5 MA	.30	5¾ x 5 x 6¾	19½
20-5-3	20 KV	5 MA	.25	6⅛ x 6⅛ x 6½	21
25-5-1	25 KV	5 MA	.25	6¾ x 6¼ x 7¼	27¼
30-5-8	30 KV	5 MA	.30	7¼ x 6½ x 7¾	38
1-10-1	1 KV	10 MA	.10	3½ x 3 x 5	5
2.5-10-1	2.5 KV	10 MA	.10	4 x 3⅜ x 5¼	6½
5-10-2	5 KV	10 MA	.12	4⅜ x 3¾ x 5½	9
7.5-10-1	7.5 KV	10 MA	.10	4¾ x 4 x 7¼	13½
10-10-3	10 KV	10 MA	.10	5 x 4⅜ x 6¾	14½
15-10-2	15 KV	10 MA	.15	6⅛ x 6⅛ x 6½	22½
20-10-3	20 KV	10 MA	.15	6¾ x 6¼ x 7¼	27½
25-10-2	25 KV	10 MA	.10	7½ x 6½ x 8½	38
30-10-3	30 KV	10 MA	.15	8 x 7¾ x 8¾	50

*Single polarity unit, state positive or negative output.
**Ripple at 400 cycles is 15% of ripple at 60 cycles, shown above.

SERIES "O" OIL INSULATED TANK UNITS

DEL SERIES "O", oil insulated, High Voltage Power Supplies offers one of the most comprehensive lines of basic high voltage units available to industry and laboratories. These D.C. supplies are designed to provide long, reliable service in such applications as dielectric testing, capacitor chargers, electrostatic precipitators, electron microscopes, image intensifiers, plasma research and accelerators. Series "O" supplies feature reversible polarity on most units, shielded polyethylene output cables, high quality insulating oil in dust free tank, quiet, long life operation with low corona.

STANDARD MODELS

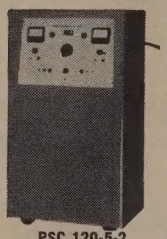
Model No.	Output Voltage (kv)	Output Current (ma)	Model No.	Output Voltage (kv)	Output Current (ma)	Model No.	Output Voltage (kv)
PS020-200-3	20	200	PS050-50-8	50	50	PS0100-300-1	100
PS020-300-2	20	300	PS050-75-1	50	75	PS0100-500-1	100
PS025-50-2	25	50	PS050-100-4	50	100	PS0120-5-3	120
PS025-200-11	25	200	PS050-200-5	50	200	PS0120-10-1	120
PS025-400-1	25	400	PS050-220-2	50	220	PS0120-30-1	120
PS025-500-6	25	500	PS050-300-1	50	300	PS0130-2-3	130
PS030-3-2	30	3	PS050-500-3	50	500	PS0150-5-5	150
PS030-5-4	30	5	PS060-1-1A†	60	1	PS0150-10-1	150
PS030-5-16	30	5	PS060-5-2	60	5	PS0150-20-1	150
PS030-20-9	30	20	PS060-10-1	60	10	PS0150-50-3	150
PS030-30-5	30	30	PS060-100-2	60	100	PS0150-100-1	150
PS030-75-1	30	75	PS070-5-1	70	5	PS0150-150-1	150
PS030-150-4	30	150	PS070-5-3	70	5	PS0150-200-1	150
PS030-200-2	30	200	PS075-30-1	75	30	PS0150-300-1	150
PS030-500-1	30	500	PS075-60-1	75	60	PS0160-2-1	160
PS040-5-6	40	5	PS080-5-1	80	5	PS0200-10-1	200
PS040-10-4	40	10	PS080-5-4	80	5	PS0200-150-1	200
PS040-20-1	40	20	PS080-10-1B	80	10	PS0200-250-1	200
PS040-220-1	40	220	PS080-60-1	80	60	PS0250-1-2	250
PS050-1-2†	50	1	PS0100-2-1	100	2	PS0250-3-2	250
PS050-5-6	50	5	PS0100-30-6	100	30	PS0250-10-2	250
PS050-5-9	50	5	PS0100-50-1	100	50	PS0300-10-1	300
PS050-10-2	50	10	PS0100-100-1	100	100	PS0300-50-2	300
PS050-20-2	50	20	PS0100-150-1	100	150		
PS050-30-4	50	30	PS0100-200-3	100	200		

† Polarity — All units feature reversible polarity except Models PSO 40-
50-1-2, and PSO 60-1-1A which supply positive outputs only.

NOTE: Larger units are shipped without oil to reduce transportation co
notations on price list.

COMPLETE LINE OF CONTROL PANELS AND REGU
CONTROLS AVAILABLE FOR ALL SERIES "O" POWER SU

INSTRUMENTED POWER SUPPLIES



PSC 120-5-2

PSC 25-200-2

PSC 30-5-1

DEL Series "P
strumented, Hi
age Power
provides a broa
tion of units
for reliable a
pendable use
search and ind

All units: Input 115V, 60 cps
noted otherwise.
All units up to 20KV are air
and utilize epoxy components.
All other units have high voltage
immersed in high grade insula
to insure freedom from electric

STANDARD MODELS

Model No.	Output Voltage Range (kv)	Max. Output Current (ma)	Model No.	Output Voltage Range (kv)	Max. Output Current (ma)	Model No.	Output Voltage Range (kv)
PSC.5-1000-1	0-0.5	1000	PSC20-25-1	0-20	25	PSC80-10-1B	0-80
PSC1-150-1	0-1 5	150	PSC20-150-1	0-20	150	PSC100-30-2	0-10
PSC1-5000-1	0-1	5000	PSC20-300-1	0-20	300	PSC100-50-1	0-10
PSC2-100-1	0-2	100	PSC25-200-2	0-25	200	PSC100-100-1	0-10
PSC2.5-750-1	0-2.5	750	PSC25-400-1	0-25	400	PSC120-5-2A	0-12
PSC2.5-1000-1	0-2.5	1000	PSC30-5-1	0-30	5	PSC120-10-1	0-12
PSC2.5-2000-1	0-2.5	2000		0-35	1	PSC120-30-1	0-12
PSC5-50-1	0-5	50	PSC30-5-7	0-30	5	PSC150-5-1	0-15
PSC5-500-1	0-5	500	PSC30-75-1	0-30	75	PSC150-10-1	0-15
PSC5-1000-3	0-5	1000	PSC30-150-1	0-30	150	PSC150-20-1	0-15
PSC10-10-8	0-10	10	PSC30-200-1	0-30	200	PSC150-50-1	0-15
PSC10-250-1	0-10	250	PSC50-30-3	0-50	30	PSC200-10-1	0-20
PSC10-500-10	0-10	500	PSC50-50-1	0-50	50	PSC250-1-1A	0-25
PSC10-750-1	0-10	750	PSC50-75-3	0-50	75	PSC250-3-1	0-25
PSC15-10-1	0-15	10	PSC50-100-2	0-50	100	PSC250-10-1	0-25
PSC15-200-1	0-15	200	PSC50-200-3	0-50	200	PSC300-10-1	0-30
PSC15-300-1	0-15	300	PSC75-30-1	0-75	30	PSC300-50-1	0-30
PSC20-10-1	0-20	10	PSC75-60-1	0-75	60		

NOTE: Some units are shipped without oil to reduce transportation char
notations on price lists.

Standard Power Supplies and Transformers are available from
Others can be built to your specific requirements with output up
KV and 250 KVA. HPS Series — High Powered, Heavy Duty Power Supp
available upon request.

SEND FOR NEW COMPLETE CATALOG COVERING
ALL HIGH VOLTAGE EQUIPMENT.

HIGH VOLTAGE EQUIPMENT

RACK MOUNT POWER SUPPLIES
"RHPT" SERIES HIGH POT TESTER

RHPT series of rack mounted Hi Pot Testers are general-purpose plies which are fully instrumented, completely enclosed, and fully These units are designed for standard 19-inch racks and have light ls. They are recommended for all cmmercial, industrial, and labora- where reliable dc high-voltage sources are required.

No.	Output Voltage Range (kv)	Max. Current (ma)	Model No.	Output Voltage Range (kv)	Max. Current (ma)
-1	0-1	5	10RHPT-1.25-1	0-10	1.25
0-1	0-1	10	10RHPT-5-1	0-10	5
5-1	0-1	25	10RHPT-10-1	0-10	10
0-1	0-1	50	10RHPT-25-1	0-10	25
00-1	0-1	100	10RHPT-50-1	0-10	50
00-1	0-1	500	10RHPT-100-1	0-10	100
000-1	0-1	1000	10RHPT-150-1	0-10	150
500-1	0-1	1500	15RHPT-1.25-1	0-15	1.25
-2-1	0-2.5	2	15RHPT-5-1	0-15	5
-5-1	0-2.5	5	15RHPT-10-1	0-15	10
-10-1	0-2.5	10	15RHPT-25-1	0-15	25
-25-1	0-2.5	25	15RHPT-50-1	0-15	50
-50-1	0-2.5	50	15RHPT-75-1	0-15	75
-100-1	0-2.5	100	20RHPT-1.25-1	0-20	1.25
-200-1	0-2.5	200	20RHPT-5-1	0-20	5
-400-1	0-2.5	400	20RHPT-10-1	0-20	10
-600-1	0-2.5	600	20RHPT-25-1	0-20	25
-1	0-5	2	20RHPT-50-1	0-20	50
-1	0-5	5	20RHPT-75-1	0-20	75
0-1	0-5	10	25RHPT-1.25-1	0-25	1.25
5-1	0-5	25	25RHPT-5-1	0-25	5
0-1	0-5	50	25RHPT-10-1	0-25	10
00-1	0-5	100	25RHPT-25-1	0-25	25
00-1	0-5	200	30RHPT-1.25-1	0-30	1.25
00-1	0-5	300	30RHPT-5-1	0-30	5
-5-1	0-7.5	5	30RHPT-10-1	0-30	10
-10-1	0-7.5	10	30RHPT-25-1	0-30	25
-25-1	0-7.5	25	40RHPT-2-1†	0-40	2
-50-1	0-7.5	50	50RHPT-1-1	0-50	1
-100-1	0-7.5	100	60RHPT-1-1	0-60	1

"HIGH POT" TESTERS
"TC" SERIES POWER SUPPLIES

DEL TC Series multi-purpose D.C. Power Supplies are compact, fully instrumented and fully protected units providing ratings up to 80,000 volts D.C. continuously variable.

Seleninum Rectifiers used throughout to provide long life and instantaneous operation. No filament warm up time required.

All high voltage components immersed in special high grade insulating oil. This assures LONG trouble-free LIFE.

RD MODELS

od No	Full Load Voltage Range (kv)	Current Range (ma)	Ripple* (% rms/ma at 60 Hz)	Dimensions** Complete Unit (in., w x d x h)	Dimensions** Tank Only (in., w x d x h)
TC1	0-30	0-5	0.4	14½ x 13½ x 25¾	14 x 13 x 16½
TC1	0-40	0-5	0.5		
TC1	0-50	0-5	0.4		
TC1	0-60	0-5	0.4		
TC-1	0-30	0-20	0.4	17 x 17 x 32	16½ x 16½ x 21½
TC-1	0-40	0-20	0.4		
TC-1	0-50	0-10	0.4		
TC-1	0-60	0-10	0.4		
TC1	0-70	0-5	0.4		
TC1	0-80	0-5	0.4		

/ is specified at maximum voltage and current. Percentage shown is iso ccurate for lower currents down to less than 15% of the maximum a ing.

ns ions are nominal. Outline drawings available on request.

ALSO AVAILABLE FOR OTHER INPUT AND OUTPUT VOLTAGES

LHRM SERIES

The Del LHRM Series of High Voltage Power Supplies offer the HRM module power supply with its high regulation, low ripple, short circuit protection and other desirable features in a lab. type rack mountable supply.

Full voltage control by ten-turn potentiometer, ammeter and voltmeter, line switch, etc., make this unit essential in lab. development and testing of high voltage equipment such as high resolution CRT displays, and other applications requiring a precision high voltage power supply. It offers the great advantage in that the characteristics are identical to the HRM modules which can be then utilized in the final equipment.

FEATURES

- Short Circuit Proof
- Full Adjustable Output
- Excellent Thermal Stability
- No Voltage Overshoot on Turn On or Turn Off
- Single Shielded Output Cable
- Fast Response
- No Warm-up Required
- All Silicon Transistors
- No r.f.i., Chopper or Hhigh Frequency Oscillator
- Automatic Resetting Thermal Cutout

Enhances selection of final power supply module.
Ten Turn Potentiometer with 0.15% Linearity.

SPECIFICATIONS — ALL MODELS

INPUT: 115V ±10% 60 to 400 Hz. single phase for units up to 10 KV.
115V ±10% 60 or 400 Hz. for units 15 KV and above.

OUTPUT: See table

REGULATION:
LINE: Less than 0.03% from 50% to 100% of max. rated output voltage increasing to 0.5% at 10% of max. rated output voltage for a ±10% line votlage change.

LOAD: Same as line regulation above from no load to full load.

RIPPLE: Less than 0.03% rms of max. rated output voltage.

LINEARITY: Better than 0.15" with a ten turn potentiometer. Models marked (*) 0.7%.

MODEL NUMBER Pos. Output	MODEL NUMBER Neg. Output	Output Voltage KV	Output Current MA	19" Rack Panel Mount (W.xD.xH.)	(Lbs.) Approx. Wgt.
1.2LHRM5P1	1.2LHRM5N1	0-1.2	5		10
1.7LHRM5P1	1.7LHRM5N1	0-1.7	5		10
2.5LHRM4P1	2.5LHRM4N1	0-2.5	4		10
3.5LHRM3P1	3.5LHRM3N1	0-3.5	3	21¾x15¼x10½	11
5LHRM2P1	5LHRM2N1	0-5	2		11
7LHRM1.5P1	7LHRM1.5N1	0-7	1.5		18
10LHRM1P1	10LHRM1N1	0-10	1		18
12LHRM5P1*	12LHRM5N1*	0-12	5		23
15LHRM1.5P1	15LHRM1.5N1	0-15	1.5		23
15LHRM5P1*	15LHRM5N1*	0-15	5		23
20LHRM1P1	20LHRM1N1	0-20	1		23
20LHRM5P1*	20LHRM5N1*	0-20	5	21¾x15¼x12¼	23
25LHRM5P1*	25LHRM5N1*	0-25	5		23
25LHRM10P1*	25LHRM10N1*	0-25	10		23
30LHRM.75P1	30LHRM.75N1	0-30	.75		42
30LHRM5P1	30LHRM5N1*	0-30	5		47
40LHRM.5P1	40LHRM.5N1	0-30	.5	21¾x15¼x14	47
50LHRM.5P1	50LHRM.5P1	0-50	.5		66

NOTE: All Models Available with Digital Voltmeter Readout, Grounding Switches, Ripple Reducers Upon Special Request.

"HI-POT" TESTERS

Del D.C. "HI-POT" supplies are fully instrumented and fully protected units providing output voltages up to 160,000 volts D.C. Supplies are well designed to provide conservative ratings.

Thirteen models offer a wide selection to meet all applications. Portable units as well as floor type with rack mountable control panels* are available

Input 115 VAC - 60 cycle.

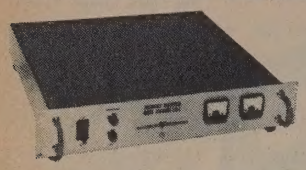
Model No.	Voltage Range Full Load	Current Range MA	Ripple at Full Load % RMS/MA	Size	Polarity
2.5 HPT-2-1	0-2,500	2	0.30	9½" x 11" x 12"	Reversible
5 HPT-2-1	0-5,000	2	0.20	9½" x 11" x 12"	Reversible
10 HPT-1-1	0-10,000	1.25	0.45	9½" x 11" x 12"	Reversible
15 HPT-1-1	0-15,000	1.25	0.30	9½" x 11" x 12"	Reversible
20 HPT-1-1	0-20,000	1.25	0.30	9½" x 11" x 12"	Reversible
20 HPT-5-1	0-20,000	5	0.50	9½" x 11" x 12"	Reversible
30 HPT-3-1	0-30,000	3	0.50	9½" x 11" x 12"	Reversible
40 HPT-1-1	0-40,000	1	0.30	9½" x 11" x 12"	Reversible
40 HPT-2-1	0-40,000	2	0.30	20" x 12" x 14"	Positive
50 HPT-1-1	0-50,000	1	0.50	20" x 12" x 14"	Positive
60 HPT-1-1	0-60,000	1	0.50	20" x 12" x 14"	Positive
*100 HPT-2-1	0-100,000	2	0.50	20¾" x 17½" x 25½" Tank Only	Reversible
*130 HPT-2-1	0-130,000	2	0.50	29¼" x 19" x 27" Tank Only	Reversible
*160 HPT-2-1	0-160,000	2	0.50	29¼" x 19" x 33½" Tank Only	Reversible

Rack Mountable Hi-Pot Testers also available from stock.

DEL ELECTRONICS CORP. MOUNT VERNON, N.Y.
250 E. Sandford Blvd. 914 - 699-2000 TWX: 710-562-0130

AUXILIARY EQUIPMENT

TRANSISTORIZED FREQUENCY CONVERTERS



ATA SERIES

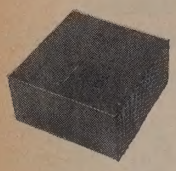
The ATA Series of frequency converters is a source of stable 400 cycle power which operates directly from a standard 50 to 60 cycle line. These units feature excellent frequency characteristics, waveform purity, voltage regulation and low dynamic impedance.

SPECIFICATIONS

INPUT VOLTAGE	105-125 VAC, 50-70 cps
OUTPUT VOLTAGE	Adj. 105-125 VAC
OUTPUT FREQ.	400 cps, adjustable, 398 to 402 cps.
DISTORTION	0.8%, Max.
POWER FACTOR	±0.7 to Unity
VOLTAGE REG.	
LOAD	Within 0.5% for no load to full load.
LINE	±0.5% for 105-125 V
METERS	Output voltage and current.
CONSTRUCTION	Designed for rack mounting.

MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	TYPE
ATA 400RS-100	100	19 x 16 x 3½	Regulated
ATA 400RS-500	500	19 x 16 x 8¾	Regulated
ATA 400RS-1000	1000	19 x 16 x 14	Regulated

TRANSISTORIED DC/AC INVERTERS



DTA 60 SERIES

The DTA 60 Series of DC to 60 cycle AC and the DTA 400 Series of DC to 400 cycle AC inverters include regulated units, for those applications requiring precise output voltage, and unregulated units where the output voltage is not critical. All units operate from a 22 to 30 volt DC source, are capable of frequency synchronization to an external source, and are protected against overvoltage, reverse polarity, overload and over-temperature.

SPECIFICATIONS

INPUT VOLTAGE: 22-30 VDC
OUTPUT VOLTAGE: 115 VAC for regulated units; 115 VAC Nom. with ±10% taps for unregulated units.
POWER FACTOR: ±0.7 to unity.
DISTORTION: 2½% for DTA 60 Series 0.8% for DTA 400 Series.
VOLTAGE REG. LOAD: Approx. 6% for 50% load change, unregualted units. 0.5% no load to full load for regulated units.
LINE: Output proportional to input for unregulated units.
0.5% for 22 to 30 VDC for regulated units.
FREQUENCY REG. 60 SERIES: 0.5% for 22 to 30 VDC
0.5% for no load to full load.
400 SERIES: 0.2% for 22 to 30 VDC.
0.2% for no load to full load.
ISOLATION: Between input, output, gnd.
HOUSING: Modular, with heat radiating finish.
MOUNTING: Tapped inserts in base.
TERMINATIONS: Input, output, ground and synchronization signal, all available under removable access plate.

UNREGULATED MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	WEIGHT LBS.	TYPE
DTA 60RS_100	100	10 x 10 x 5	25	Regulated
DTA 60RS-500	500	12 x 14 x 12	95	Regulated
DTA 60RS-1000	1000	17 x 18 x 14	180	Regulated
DTA 60RS-2500	2500	17 x 17 x 19	280	Regulated
DTA 60S-100	100	10 x 10 x 5	30	Unregulated
DTA 60S-500	500	12 x 14 x 12	85	Unregulated
DTA 60S-1000	1000	14 x 14 x 14	165	Unregulated
DTA 60S-2500	2500	17 x 17 x 19	275	Unregulated

REGULATED MODEL	OUTPUT V.A.	SIZE W x D x H (in.)	WEIGHT LBS.	TYPE
DTA 400RS-100	100	10 x 10 x 5	21	Regulated
DTA 400RS-500	500	12 x 14 x 12	65	Regulated
DTA 400RS-1000	1000	17 x 18 x 4	145	Regulated
DTA 400S-100	100	10 x 10 x 5	25	Unregulated
DTA 400S-500	500	12 x 14 x 12	75	Unregulated
DTA 400S-1000	1000	14 x 14 x 14	165	Unregulated

METER MULTIPLIERS

Del Electronics' line of multipliers is designed and built to provide high voltage DC measurements with safety and minimum corona at reasonable cost. Each unit consists of resistors immersed in high grade insulating oil and hermetically sealed grounded case. All units are designed for use with 100 ua full scale meter. Can be furnished with panel type 4½" rectangular 100 ua meter (2% accuracy), with KV scale to match.

Type	Maximum Kilovolts	Case Dimension (Max.) W	D	H	Insulator Height
M-5	5	2 5/16"	2 1/16"	2½"	1"
M-10	10	2 5/16"	2 1/16"	2½"	1¾"
M-15	15	2 5/16"	2 1/16"	3⅛"	1¾"
M-20	20	2¾"	2½"	4"	2½"
M-30	30	4¼"	3¾"	5½"	3"
M-50	50	4¾"	4"	8"	8⅛"
M-100	100	9½"	9½"	9½"	14"
M-150	150	11"	11"	12"	20"
M-250	250	16½"	16½"	22"	28¾"

ALSO AVAILABLE FOR OTHER INPUT AND OUTPUT VOLTAGES

TRANSFORMERS

ISOLATION TRANSFORMERS

Model 2-TR-250-21

DEL ELECTRONICS' line of High Voltage Isolation Transformers are designed and manufactured for use in industry and in research and development laboratories.

These DEL High Quality Transformers have the following features:

- Complete vacuum varnish impregnation
- Immersed in high grade insulating oil
- Electrostatic shield between primary and secondary
- Good regulation

STANDARD 60 HZ TYPE ISOLATION TRANSFORMERS

Model No.	Max Kva	Kvdc Insulation	Tank Size (in., w x d x h)	Insu He (in
1-TR-30-XX†	1	30	10 x 12 x 11	
1.5-TR-30-XX†	1.5	30	10 x 12 x 11	
1-TR-50-XX†	1	50	13 x 13⅞ x 16⅜	
3-TR-50-XX†	3	50		
1-TR-60-XX†	1	60	9¾ x 12⅜ x 13⅜	1
2-TR-60-XX†	2	60	9¾ x 12⅜ x 13⅜	1
3-TR-60-XX†	3	60	16½ x 16½ x 21⅜	1
5-TR-60-XX†	5	60		1
3-TR-75-XX†	3	75	16½ x 16½ x 22	1
1-TR-100-XX†	1	100	20¾ x 17½ x 17 13/16	1
3-TR-100-XX†	3	100		
3-TR-150-XX†	3	150	29¼ x 19 x 27	1
5-TR-150-XX†	5	150		
2-TR-250-XX†	2	250	25 x 33 x 37 5/16	2
3-TR-250-XX†	3	250	29¾ x 29¾ x 36⅜	2
5-TR-250-XX†	5	250	25 x 33 x 37¼	2
4-TR-300-XX†	4	300	39½ x 47½ x 50½	3

* Dimensions are nominal. Outline drawings available on request.

† NOTE — Add the following suffix in place of XX.

FOR	SUFFIX	FOR	SUF
120/120	11	240/120	2
120/240	12	240/240	2

†† If shielded polyethylene output cables are desired in place of p insulator, designate by a C prefix; e.g., 1-CTR-30-XX.

HIGH VOLTAGE ISOLATION TRANSFORMERS

OPEN TYPE CONSTRUCTION — EPOXY COATED

Primaries: 115 V, 230 V — 60 cps • Secondaries: 115 V

Type	KVA	Insulation KVDC Working	Size
AD 1640	.200	10	6⅛ x 4 x
AD 1641	.500	10	7⅝ x 5⅞ x
AD 1642	.750	10	9½ x 6 5/16 x
AD 1643	1.000	10	8½ x 8 x
AD 1644	.200	20	8½ x 4 x
AD 1645	.500	20	10¼ x 5⅝ x
AD 1646	.750	20	9¾ x 6¾ x
AD 1647	1.000	20	11¼ x 6⅝ x
AD 3060	.250	30	8½ x 7¼ x
AD 3061	.500	30	9¾ x 7 x
AD 3062	.750	30	10½ x 7½ x
AD 3063	1.000	30	11 x 9 x
AD 3064	.250	40	10 x 7 x
AD 3065	.500	40	11¼ x 7¼ x
AD 3066	.750	40	12½ x 7½ x
AD 3067	1.000	40	12¾ x 9 x
AD 3068	.250	50	13¼ x 7¼ x
AD 3069	.500	50	13¼ x 7¼ x
AD 3070	.750	50	14½ x 7½ x
AD 3071	1.000	50	14¾ x 9 x

TRANSFORMER REACTORS

SPECIA PURPOS TRANSFOR

We design and manufacture to customers' specifications a wide va High Voltage, Low Capacity Filament Transformers, and Hermetically units.

OVER 3500 PROVEN AND TESTED TRANSFORMER DESIGNS AVAI

SEND FOR DEL ELECTRONICS NEW CATALOG

CAPACITORS

SILVERCAP® • HERMETIC SEALED • PRECI
CERAMIC & BAKELITE CASED • ENERGY STO
• DELMICA • DELPLATE

MULTISYN® — INDUCTOSYN®

PRECISION ANGLE SENSING, CONTROL, AND DIGITIZING C
ITS. ACCURACIES TO 0.5 SECOND OF ARC.

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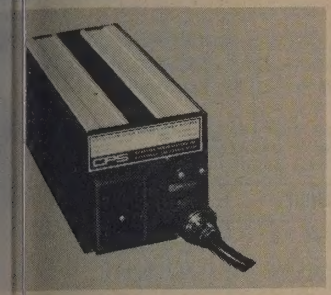
250 E. Sandford Blvd. 914 - 699-2000 TWX: 710-562-013

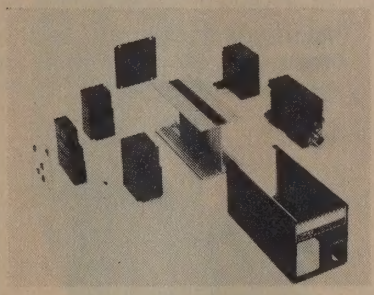
COMPUTER POWER SYSTEMS, INC.
722 EAST EVELYN AVENUE, SUNNYVALE, CALIFORNIA 94086
(408) 738-0530, Ext. 26: Sales Dept.

HIGH VOLTAGE

STABLE | **REMOTE PROGRAMMING OPTIONS** | **UP TO 30 KV DC**



SERIES ONE OUTPUT TO 30 KV



WIRELESS EPOXY CONSTRUCTION

2000 SERIES 1 OR 2 OUTPUTS TO 7.5 KV

ANY OPTIONS AVAILABLE
CURRENT, 5 PPM/°C T.C., Etc.

HIGH VOLTAGE SYSTEMS SUPPLIES GENERAL SPECIFICATIONS

CRT MULTIPLE HV ASSEMBLIES OUR SPECIALTY

OTECTION — Completely short-circuit proof. Self restoring after short removal.

105-125 volts; 47-440 Hz

RE RANGE — Operating 0°C - 50°C

UTS — Available on 2000 series, consult factory.

– CPS provides mating connectors except on models ending in 05.

FIXED OUTPUT — Specify output desired from range. ±5% adjust provided.

WIDE RANGE OUTPUT (Remotely Programmable) — Specify option "R" (costs $25) and select RPA from list at bottom right of page.

SIZE — 4½" wide, 4⅝" high, 9" long.

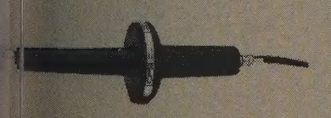
Voltage Range KV	Current MA	Line Reg. %	Load Reg. %	Ripple P-P MV	Stability 1 Hour %	Stability 8 Hour %	Repeat-ability %	Temperature Coefficient PPM/°C	Price
+0.5 to +2	10	0.001	0.001	2	0.005	0.01	0.01	25	410
−0.5 to −2	10	0.001	0.001	2	0.005	0.01	0.01	25	410
+0.5 to +3	6	0.001	0.001	2	0.005	0.01	0.01	25	410
−0.5 to −3	6	0.001	0.001	2	0.005	0.01	0.01	25	410
+2 to +5	4	0.001	0.001	20	0.005	0.01	0.01	25	495
−2 to −5	4	0.001	0.001	20	0.005	0.01	0.01	25	495
+5 to +10	0.5	0.05	0.05	100	0.1	0.2	0.2	250	545
−5 to −10	0.5	0.05	0.05	100	0.1	0.2	0.2	250	545
+5 to +10	0.5	0.001	0.001	100	0.005	0.01	0.01	25	795
−5 to −10	0.5	0.001	0.001	100	0.005	0.01	0.01	25	795
+10 to +20	0.25	0.05	0.05	200	0.1	0.2	0.2	250	575
−10 to −20	0.25	0.05	0.05	200	0.1	0.2	0.2	250	575
+10 to +20	0.25	0.001	0.001	200	0.005	0.01	0.01	25	850
−10 to −20	0.25	0.001	0.001	200	0.005	0.01	0.01	25	850
+20 to +30	0.125	0.001	0.001	300	0.005	0.01	0.01	25	1250
−20 to −30	0.125	0.001	0.001	300	0.005	0.01	0.01	25	1250

0 - 30 KV BENCH SUPPLIES — Continuously Variable

to +30	0.5	0.001	0.001	200	0.005	0.01	0.01	25	1725
to −30	0.5	0.001	0.001	200	0.005	0.01	0.01	25	1725

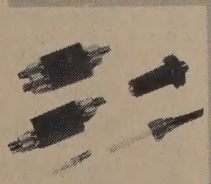
ACCESSORIES

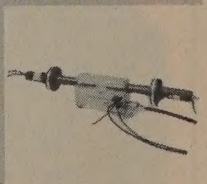
HIGH VOLTAGE DIVIDER PROBE HVP-250



.....Up to 50 KV DC
.....1000:1 50 KV IN = 50 V OUT
.....250 MΩ
.....250 KΩ
URACY .....0.01% up to 30 KV, 20-30°C
RE COEFFICIENT .....10 PPM/°C
.....12 inches
.....$395

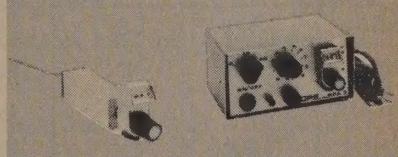
HIGH VOLTAGE CONNECTORS





HVC-30P—High voltage plug ..... $ 30
HVC-30F—High voltage flange and threaded banana jack 5
HVC-30R—High voltage receptacle 35
HVC-30C—High voltage shielded coupler 35
HVC-TC —Tri coupler 45
HVT-30 —Test module (less dividers) 150

REMOTE PROGRAMMING ASSEMBLIES



RPA-1: Encased 10 turn pot with knob .....$ 75.00
RPA-2: Small encased 10 turn pot with digital dial 170.00
RPA-3: Encased assembly of step switches and vernier digital dial. AC power control is provided 245.00
RPA-6: 22 turn panel mounted pot with screwdriver adjustment 45.00
RPA-7: Same as RPA-2 except case is larger 150.00

Deltron inc.

OS, PS SERIES

SPECIFICATIONS		
Line/Load Regulation	0.02% + 5 mv	
Ripple & Noise	500 μv rms	
Temperature Coefficient	0.02% + 2 mv	
Stability	0.05% + 5 mv	
Recovery Time	10 μs	
Overload & Short Circuit	PS — Current limiting with automatic recovery. OS — Use external fuse.	
Temperature Deratings 0-50°C Full Output	60°C	71°C
	15%	30%
Storage Temperature	−55°C to 85°C	

CA, CD SERIES

SPECIFICATIONS		
Line/Load Regulation	CV	0.01% + 1 mv
	CC	0.05% + 500 I_M μa
Ripple & Noise	CV	250 μv rms
	CC	250 I_M μa rms
Temperature Coefficient	CV	0.01% + 1 mv
	CC	0.05% + 500 I_M μa
Stability	CV	0.05% + 5 mv
	CC	0.1% + 2 I_M ma
Recovery Time	CV	50 μs
Operating Temperature		0°C to 71°C

B SERIES

Very low cost, wide range modules. Either plug-in or wire-in installation. Hardware included for mounting 2 units together. Automatic series and parallel operation. Remote sensing and programming.

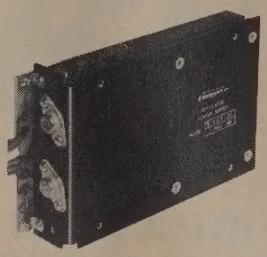
MODEL	OUTPUT Volts	OUTPUT Amps	PRICE
B10-0.6	0-10	0-6	$59
B10-1.2	0-10	1.2	$69
B20-0.35	0-20	0.35	$59
B20-0.7	0-20	0.7	$69
B40-0.2	0-40	0.2	$59
B40-0.4	0-40	0.4	$69

Built-in over voltage crowbar — Add Suffix C.....$15

REGULATED POWER SUPPLIES

CUSTOM ENGINEERING: In addition to standard catalog power supplies Deltron offers complete engineering of CUSTOM POWER SUPPLIES designed to meet your specific requirements. Multiple outputs — wide range — special packaging. Deltron guarantees performance to your specifications.

ACCESSORIES AND OPTIONS: Deltron offers a complete line of accessories, such as crowbars, meter panels, rack adapters, including options of wide slots, 230 VAC operation and other features.

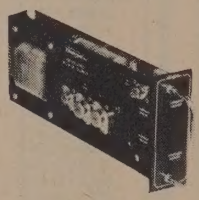


Mating Connector Available — Model J2 ..... $3

Very low cost compact card modules with d tracking or independent outputs. Series and parallel operation.

MODEL	RANGE	PRIC
OS6-0.2D	5-6 Volts 0.2 Amps	$49
PS6-0.2D		$69
OS6-0.6D	5-6 Volts 0.6 Amps	$69
PS6-0.6D		$89
OS15-0.1D	8-15 Volts 0.1 Amps	$49
PS15-0.1D		$69
OS15-0.3D	8-15 Volts 0.3 Amps	$69
PS15-0.3D		$89

Wide range compact card modules with remote sensing and programmin Automatic series or parallel operation. Automatic crossover and current limiting models.



AUTOMATIC CROSSOVER Models	Price	DC OUTPUT RANGE Volts	Amps	CURRENT LIMIT Models	P
CD10-1	$ 99	0-10	0-1	CA10-1	$
CD10-2	$119	0-10	0-2	CA10-2	$
CD20-0.5	$ 99	0-20	0-0.5	CA20-0.5	$
CD20-1	$119	0-20	0-1	CA20-1	$
CD40-0.3	$ 99	0-40	0-0.3	CA40-0.3	$
CD40-0.6	$119	0-40	0-0.6	CA40-0.6	$
CD60-0.2	$ 99	0-60	0-0.2	CA60-0.2	$
CD60-0.4	$119	0-60	0-0.4	CA60-0.4	$
CD80-0.15	$ 99	0-80	0-0.15	CA80-0.15	$
CD80-0.3	$119	0-80	0-0.3	CA80-0.3	$
CD100-0.12	$ 99	0-100	0-0.12	CA100-0.12	$
CD100-0.24	$119	0-100	0-0.24	CA100-0.24	$

SPECIFICATIONS		
Line/Load Regulation	0.02% + 5 mv	
Ripple & Noise	500 μv rms	
Temperature Coefficient	0.01% + 2 mv	
Stability	0.05% + 5 mv	
Recovery Time	10 μs	
Temperature Deratings 0-50°C Full Output	60°C	71°
	15%	30%
Storage Temperature	−55°C to 85°C	
Overload & Short Circuit	Adjustable current limi with automatic recover	

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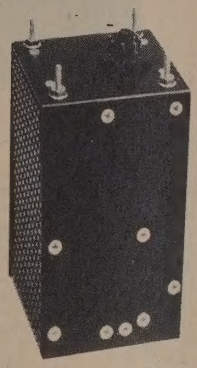
Deltron inc.

ERIES

dual independent outputs, compact construction, plug-in or installation, remote sensing and programming, c series and parallel operation.

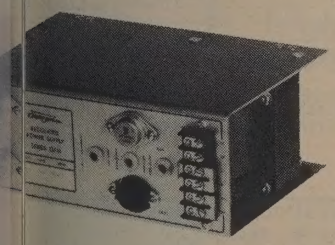
SPECIFICATIONS		
ad Regulation	0.02% + 5 mv	
Noise	1 mv rms	
ture Coefficient	0.01% + 2 mv	
	0.05% + 5 mv	
vy Time	10 μs	
ture Deratings	60°C	71°C
Full Output	15%	30%
Temperature	−55°C to 85°C	
& Short Circuit	Cutback current limiting.	



MODEL	OUTPUT A Volts	OUTPUT A Amps	OUTPUT B Volts	OUTPUT B Amps	PRICE
D5/5-0.4	4.5-6.5	0.4	4.5-6.5	0.4	$118
D5/5-1.5	4.5-6.5	1.5	4.5-6.5	1.5	$159
D5/10-0.4	4.5-6.5	0.4	9-11	0.4	$118
D5/10-1.5	4.5-6.5	1.5	9-11	1.5	$159
D5/15-0.4	4.5-6.5	0.4	14-16	0.4	$118
D5/15-1.5	4.5-6.5	1.5	14-16	1.5	$159
D10/10-0.4	9-11	0.4	9-11	0.4	$118
D10/10-1.5	9-11	1.5	9-11	1.5	$159
D10/15-0.4	9-11	0.4	14-16	0.4	$118
D10/15-1.5	9-11	1.5	14-16	1.5	$159
D15/15-0.4	14-16	0.4	14-16	0.4	$118
D15/15-1.5	14-16	1.5	14-16	1.5	$159

MSERIES

m order — 10 units of individual



cost, high power density. Remote and programming. High reliability, onse time for pulsed loads. Voltage le ±5% about Nominal.

SPECIFICATIONS			
Line/Load Regulation	0.05% + 5 mv		
Ripple & Noise	1 mv rms		
Temperature Coefficient	0.01% + 2 mv		
Stability	0.05% + 5 mv		
Recovery Time	10 μs		
Temperature Deratings 0-40° Full Output	50°C	60°C	71°C
	10%	20%	30%
Storage Temperature	−55°C to 85°C		
Overload & Short Circuit	Adjustable cutback current limiting with automatic recovery.		

Overvoltage Crowbar — Add Suffix C $20
Model P31, 1-2 Unit Rack Panel ..... $ 6

To construct model number, start with OEM followed by the Nom. Volts, then a dash followed by the Amperes; e.g., OEM15-3.8

Nom. Volts	Amperes	
3	4.5	9.0
5	3.9	7.8
9	2.9	5.8
12	2.3	4.6
15	1.9	3.8
18	1.7	3.4
21	1.5	3.0
24	1.3	2.6
28	1.1	2.2
32	1.0	2.0
36	0.90	1.8
40	0.85	1.7
48	0.70	1.4
Price	$75	$85

SRIES

hly regulated modular supplies. Minimum height modules interchangeable chanically with similar models of other manufacturers. Adjustable cutback current iti with automatic recovery. Thermal cutout with automatic recovery. mium channel and gusset construction for high strength to weight ratio. mo sensing and programming. Voltage Adjustable ±5% about Nominal.

To construct model number, start with LA followed by the Nom. Volts, then a dash followed by the Amperes; e.g., LA15-11.

Nom. Volts	Amperes							
3	3.9	5.6	7.5	11.0	13.8	19.5	27.7	39.0
5	3.6	5.2	6.8	10.1	12.7	17.9	25.4	35.8
9	3.2	4.6	6.0	8.9	11.2	15.8	22.4	31.6
12	2.8	4.0	5.3	7.8	9.8	13.8	19.6	27.7
15	2.2	3.2	4.2	6.2	7.8	11.0	15.6	22.0
18	2.0	2.9	3.9	5.7	7.2	10.1	14.3	20.2
21	1.9	2.8	3.7	5.4	6.8	9.6	13.6	19.2
24	1.8	2.6	3.4	5.0	6.3	8.9	12.6	17.7
28	1.7	2.5	3.3	4.9	6.2	8.7	12.3	17.4
Price	$109	$129	$139	$159	$179	$219	$249	$299

Tracking Overvoltage Crowbar Option — Add Suffix C $25

SPECIFICATIONS			
Line/Load Regulation	0.005% + 1 mv		
Ripple & Noise	1 mv rms		
Temperature Coefficient	0.01% + 1 mv		
Stability	0.01% + 2 mv		
Recovery Time	40 μs		
Temperature Deratings 0-40°C Full Output	50°C	60°C	71°C
	10%	20%	30%
Storage Temperature	−55°C to 85°C		

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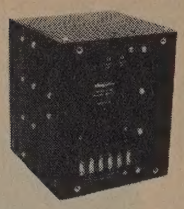
Deltron inc. N SERIES

These rugged modules combine outstanding design and quality components. Features include integrated circuit regulator system, cutback current limiting, remote sensing and programming, series and parallel operation. No thermal transients.



To construct model number, start with N, followed by the Nom. Volts, then a dash followed by the Amperes; e.g., N5-10.5.

Adjustment range is ± 5% about the nominal.

Nom. Volts	Amperes							
3	0.80	1.5	3.8	5.3	11	20	24	36
5	0.76	1.45	3.7	5.2	10.5	19	23	35
6	0.74	1.4	3.5	5.2	9	18	22	34
9	0.53	1.2	3.0	4.4	8	15	20	32
12	0.53	1.0	2.8	4.0	7.3	15	17	28
15	0.42	0.75	2.7	3.5	6.3	13	17	28
18	0.39	0.69	2.6	3.2	5.8	12	16	25
21	0.35	0.60	2.2	2.9	4.7	11	14	22
24	0.34	0.53	2.0	2.7	4.6	9.2	13	20
28	0.34	0.53	1.9	2.5	4.6	9.2	12	19
32	0.22	0.51	1.2	2.2	3.9	8.7	11	18
36	0.21	0.44	1.1	2.0	3.6	7.3	10	17
40	0.21	0.37	1.1	1.8	3.3	6.2	9	15
48	0.21	0.35	1.0	1.7	3.0	6.1	8.5	12
Price	$79	$89	$109	$129	$159	$219	$249	$299

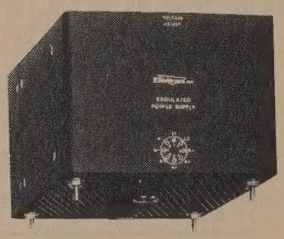
Overvoltage crowbar used on all N models — Model CB1 ..... $30

SPECIFICATIONS				
Line/Load Regulation	0.005% + 500 μv			
Ripple & Noise	500 μv rms			
Temperature Coefficient	0.02% + 500 μv			
Stability	0.01% + 1 mv			
Recovery Time	40 μs			
Temperature Deratings 0-40°C Full Output	Nom. Volts	50°C	60°C	
	3-6	10%	30%	
	9-12	10%	25%	
	over 12	10%	20%	
Storage Temperature	−25°C to 85°C			
Overload & Short Circuit	Adjustable cutback cur limiting.			

Complete rack assemblies, meter and control panels available.

C SERIES

Designed to meet MIL Specs. Integrated circuit regulation system, cutback current limiting, remote sensing and programming, automatic series and parallel operation. Thermal cutout with automatic reset. No thermal transients.



SPECIFICATIONS				
Line/Load Regulation	0.003% + 500 μv			
Ripple & Noise	500 μv rms			
Temperature Coefficient	0.01% + 500 μv			
Stability	0.01% + 1 mv			
Recovery Time	40 μs			
Temperature Deratings 0-40°C Full Output	Nom. Volts	50°C	60°C	71°C
	3-6	10%	30%	50%
	9-12	10%	25%	40%
	over 12	10%	20%	30%
Storage Temperature	−25°C to 85°C			
Overload & Short Circuit	Adjustable cutback current limiting.			

To construct model number, start with C followed by the Nom. Volts, then a dash followed by the Amperes; e.g., C 5-23.

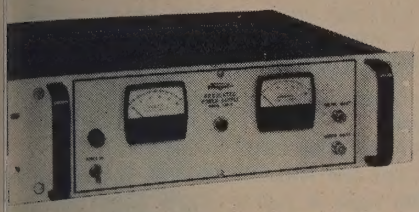
Adjustment range is ± 5% about the nominal.

	Nom. Volts	Amperes								
LOW VOLTAGE	3	0.8	1.5	3.8	5.3	11	14	20	24	32
	5	0.76	1.45	3.7	5.2	10.5	13.5	19	23	31
	6	0.74	1.4	3.5	5.2	9	13	18	22	30
	9	0.53	1.2	3	4.4	8	12	15	20	27
	12	0.53	1	2.8	4	7.3	10.5	15	17	22
	15	0.42	0.75	2.7	3.5	6.3	10	13	17	21
	18	0.39	0.69	2.6	3.2	5.8	9	12	16	19
	21	0.35	0.6	2.2	2.9	4.7	8.5	11	14	17
	24	0.34	0.53	2	2.7	4.6	8	9.2	13	16
	28	0.34	0.53	1.9	2.5	4.6	7.5	9.2	12	15
	32	0.22	0.51	1.2	2.2	3.9	6	8.7	11	13
	Price	$75	$85	$115	$135	$175	$195	$255	$295	$390
MEDIUM VOLTAGE	36	0.21	0.44	1.1	2	3.6	5.7	7.3	10	12
	40	0.21	0.37	1.1	1.8	3.3	5.5	6.2	9	12
	48	0.21	0.35	1	1.7	3	5	6.1	8.5	10
	54	0.21	0.34	0.85	1.6	2.8	4.1	6.1	7.4	8.7
	60	0.2	0.30	0.75	1.4	2.6	3.7	5	6.5	7.8
	68	0.19	0.28	0.7	1.3	2.4	3.5	4.7	5.9	7.2
	76	0.17	0.25	0.65	1.2	1.7	3.3	4.4	5.5	6.6
	84	0.17	0.24	0.6	1.1	1.6	3.1	4.2	5.1	6
	92	0.088	0.23	0.5	1	1.5	3	4	4.4	5.6
	Price	$85	$95	$125	$145	$185	$235	$285	$375	$405
HIGH VOLTAGE	100	0.088	0.16	0.37	0.58	1	1.8	2.1	2.8	3.3
	120	0.088	0.16	0.3	0.54	0.98	1.7	2	2.6	3.1
	135	0.084	0.15	0.28	0.52	0.88	1.6	1.9	2.4	2.9
	150	0.08	0.14	0.25	0.48	0.81	1.4	1.8	2.1	2.7
	165	0.078	0.11	0.23	0.42	0.59	1.3	1.6	2	2.4
	180	0.072	0.11	0.2	0.36	0.58	1.2	1.5	1.8	2.2
	195	0.062	0.1	0.17	0.33	0.52	1.1	1.3	1.7	2.1
	210	0.052	0.09	0.14	0.28	0.5	0.8	1.1	1.6	1.9
	230	0.042	0.07	0.12	0.24	0.46	0.73	1	1.5	1.8
	250	0.026	0.06	0.1	0.21	0.42	0.63	0.84	1.4	1.7
	Price	$105	$115	$135	$160	$195	$245	$295	$395	$420

Overvoltage Crowbar Models CB50-200 ..... $30
Complete rack assemblies available.

Deltron inc. WISSAHICKON AVE. • NORTH WALES, PENNA. 19454 • PHONE: (215) 699-9261 • TWX: (510) 661-8061

Deltron inc. **L SERIES**



ates include integrated circuit regulator
ste, remote sensing and programming, automatic
rie and parallel operation. Compact units
n b stacked with no derating. Thermal cutout
th utomatic recovery. No thermal transients.

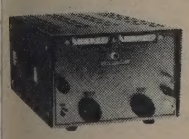
SPECIFICATIONS		
Lin/Load Regulation	0.005% + 500 μv	
Rip le & Noise	500 μv rms	
Temperature Coefficient	0.01% + 1 mv	
Stability	0.01% + 1 mv	
Recovery Time	40 μs	
Temperature Deratings 0-50°C Full Output	60°C	71°C
	15%	30%
Storage Temperature	−25°C to 85°C	
Overload & Short Circuit	Adjustable cutback current limiting.	

EACH VOLTAGE WITHIN THE GROUPING IS AVAILABLE IN ALL CURRENT RANGES DIRECTLY TO THE RIGHT

Nom. Volts	Range	Amps	Price	Amps	Price	Nom. Volts	Range	Amps	Price	Amps	Price
1.0	0.5-1.5	4	$190	40	$500	26	24-28	1.7	$192	17	$511
1.5	1.0-2.0					28	26-30				
2.0	1.5-2.5					30	28-32				
2.5	2.0-3.0	8	$240	48	$550	32	30-34	3.5	$243	21	$563
3.0	2.5-3.5					34	32-36				
3.5	3.0-4.0	16	$320	56	$595	36	34-38	7	$325	24	$610
4.0	3.5-4.5					38	36-40				
4.5	4.0-5.0					40	38-42				
5.0	4.5-5.5	24	$390	64	$635	42	40-44	10	$397	28	$652
5.5	5.0-6.0					44	42-46				
6.0	5.5-6.5	32	$450	72	$675	46	44-48	14	$459	31	$694
6.5	6.0-7.0					48	46-50				
7.0	6.5-7.5	35	$190	35	$500	52	48-56	1	$197	10	$535
7.5	7.0-8.0					56	52-60				
8.0	7.5-8.5					60	56-64				
8.5	8.0-9.0	7	$240	42	$550	64	60-68	2	$250	12	$592
9.0	8.5-9.5					68	64-72				
9.5	9.0-10	14	$320	49	$595	72	68-76	4	$336	14	$643
10.0	9.5-10.5					76	72-80				
10.5	10-11					80	76-84				
11.0	10.5-11.5	21	$390	56	$635	84	80-88	6	$412	16	$689
11.5	11-12					88	84-92				
12.0	11.5-12.5	28	$450	63	$675	92	88-96	8	$479	18	$734
12.5	12-13					96	92-100				
13	12-14	2.5	$192	25	$511	104	96-112	0.5	$217	5	$645
14	13-15					112	104-120				
15	14-16					120	112-128				
16	15-17	5	$243	30	$563	128	120-136	1	$280	6	$722
17	16-18					136	128-144				
18	17-19	10	$325	35	$610	144	136-152	2	$386	7	$793
19	18-20					152	144-160				
20	19-21					160	152-168				
21	20-22	15	$397	40	$652	168	160-176	3	$482	8	$859
22	21-23					176	160-184				
23	22-24	20	$459	45	$694	184	176-192	4	$569	9	$924
24	23-25					192	184-200				

Overvoltage Crowbar Models CB10-200 ..... **$30**
Over-Under Voltage Relay Models VK50-200 ..... **$30**

SP SERIES



These precision lab supplies all contain integrated circuit regulator systems, automatic crossover from constant voltage to constant current, 2% accurate meters, remote sensing and programming. SP Series have fast response SCR pre-regulators.

RP SERIES

FULL RACK MODELS

MODEL	DC OUTPUT RANGE Volts	DC OUTPUT RANGE Amps	PRICE
SP10-5	0-10	0-15	$380
SP10-10	0-10	0-20	$435
SP10-15	0-10	0-25	$485
SP10-20	0-10	0-30	$530
SP10-25	0-10	0-40	$610
SP10-30	0-10	0-50	$680
SP20-5	0-20	0-15	$445
SP20-10	0-20	0-20	$510
SP20-15	0-20	0-25	$570
SP20-20	0-20	0-30	$625
SP20-30	0-20	0-50	$805
SP40-10	0-40	0-10	$480
SP40-15	0-40	0-15	$585
SP40-20	0-40	0-20	$675
SP40-25	0-40	0-25	$755
SP40-30	0-40	0-30	$825
SP60-10	0-60	0-10	$515
SP60-15	0-60	0-15	$675
SP60-20	0-60	0-20	$780
SP1-4	0-100	0-4	$535
SP1-8	0-100	0-8	$755
SP1-12	0-100	0-12	$925

HALF RACK MODELS

MODEL	DC OUTPUT RANGE Volts	DC OUTPUT RANGE Amps	PRICE
SP10-5	0-10	0-5	$220
SP10-10	0-10	0-10	$320
SP20-3	0-20	0-3	$205
SP20-5	0-20	0-5	$295
SP20-10	0-20	0-10	$365
SP40-1.5	0-40	0-1.5	$195
SP40-2.5	0-40	0-2.5	$285
SP40-5	0-40	0-5	$325
SP60-1	0-60	0-1	$205
SP60-2.5	0-60	0-2.5	$325
SP60-5	0-60	0-5	$365
SP100-1	0-100	0-1	$270
SP100-2	0-100	0-2	$380
SP100-3	0-100	0-3	$465

SPECIFICATIONS

		SP	RP
Line/Load Regulation	CV	0.005% + 500 μv	
	CC	0.005% + 500 I_M μa	
Ripple & Noise	CV	500 μv rms	200 μv rms
	CC	500 I_M μa rms	250 I_M μa rms
Temperature Coefficient	CV	0.01% + 500 μv	
	CC	0.05% + 500 I_M μa	
Stability	CV	0.05% + 2mv	
	CC	0.1% + 2 I_M ma	
Recovery Time	CV	50 μs	
Temperature Deratings 0-50°C Full Output		60°C	71°C
		15%	30%
Storage Temperature		−25°C to 85°C	

RP SERIES — DUAL/SINGLE RANGE MODELS

MODEL	DC OUTPUT RANGE Volts	DC OUTPUT RANGE Amps	PRICE
RP20-1.5	0-10 0-20	0-3 0-1.5	$175
RP30-1	0-16 0-32	0-2 0-1	$175
RP40-0.75	0-20 0-40	0-1.5 0-0.75	$175
RP50-0.6	0-25 0-50	0-1.2 0-0.6	$179
RP60-0.5	0-32 0-64	0-1 0-0.5	$179
RP100-0.3	0-50 0-100	0-0.6 0-0.3	$179
RP10-3	0-10	0-3	$159
RP15-2	0-16	0-2	$159
RP20-1.5S	0-20	0-1.5	$159
RP20-3	0-20	0-3	$195
RP25-1.2	0-25	0-1.2	$159
RP30-1S	0-32	0-1	$159
RP30-2	0-32	0-2	$195
RP40-0.75S	0-40	0-0.75	$159
RP40-1.5	0-40	0-1.5	$195
RP50-0.6S	0-50	0.0.6	$163
RP50-1.2	0-50	0-1.2	$199
RP50-1.5	0-50	0-1.5	$205
RP60-0.5S	0-64	0-0.5	$163
RP60-1	0-64	0-1	$199
RP100-0.3S	0-100	0-0.3	$163
RP100-0.6	0-100	0-0.6	$199

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DB FIRST IN DC POWER

SHORT FORM CATALOG

NEW HIGH PERFORMANCE, LOW PROFILE, FIXED VOLTAGE ALL SILICON DC POWER SUPPLIES

These new low profile, convection cooled, all silicon, ±10% voltage adjustable DC Power Supplies have premium performance characteristics plus important extra features—at no extra cost!

The extra features combined with Dressen-Barnes' 23 years of power supply experience and an unconditional 5 year warranty assure you of the best power supply available at a highly competitive price.

All units feature integrated circuit regulators, military specification wire and finish, plug-in circuit boards, dual filter capacitors, automatic current limiting and an automatic thermostat for overheating protection. The units can be mounted on any one of three surfaces or rack mounted.

Remote sensing, remote voltage adjustment and remote program are standard features.

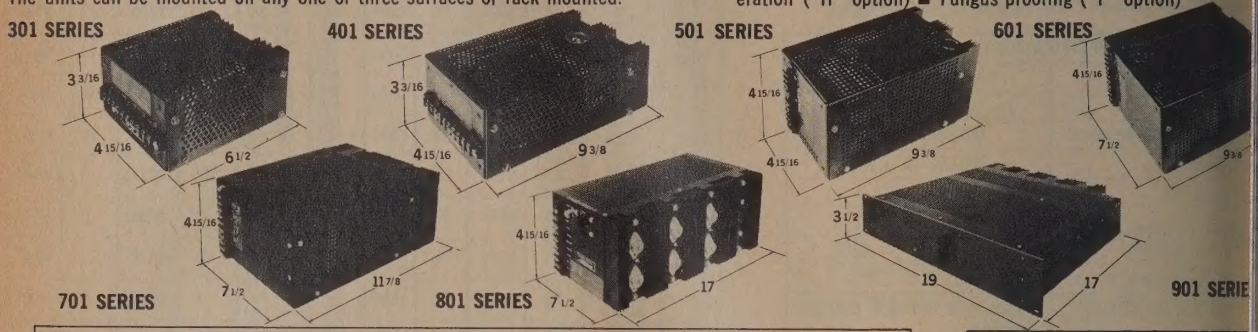
EXTRA FEATURES AT NO EXTRA COST

- .01% +1mv line regulation ■ .02% +1mv load regu
- ½mv RMS ripple ■ Built-in ±10% voltage adjustment
- Paralleling capability

OPTIONS AVAILABLE AT EXTRA COST

■ Overvoltage load protection ("L" option) ■ High humidi eration ("H" option) ■ Fungus proofing ("F" option)

See bac for war



SPECIFICATIONS FOR SUPPLIES MODEL 301 THROUGH 901

Regulation: Line: .01% +1mv for line variation from 105 to 132VAC.
Load: .02% +1mv from zero to full rated load.
Ripple: ½ millivolt RMS with plus or minus output terminal grounded, at 60 Hz and 115VAC line input.
Temperature Range, Operating: −20°C to +71°C continuous duty.
Temperature Range, Storage: −55°C to +85°C.
Input Voltage: 105 to 132VAC, 50 to 440 Hz. 205 to 265VAC, 50 to 440 Hz at no extra cost ("V" option).
Transient Recovery: Less than 50 microseconds.
Temperature Coefficient: .01% per degree centigrade.
Overload Protection: Automatic current limiting at 110% to 130% of rated current. Automatic recovery on removal of overload.
Remote Sensing: Standard feature.
Remote Voltage Adjustment: Standard feature. (except 900 series)
Remote Programming: 100 ohms per volt. (except 900 series)
Thermal Protection: Built-in thermostat on heat sink. (except 900 series)
Relative Humidity: 75%.
Input and Output Connections: Heavy duty terminal block on rear of chassis.
Finish: Black anodized aluminum, black semi-gloss enamel Fed. Std. 595, Color 27038.
Paralleling Capability: Built-in for paralleling without modification to power supplies.

OPTIONS

AC Input Option: Add suffix "V". All units are available with 205 to 265VAC, 50 to 440 Hz at no extra charge.
Overvoltage Load Protection Option: Add suffix "L". Protects easily damaged loads from overvoltage transients.
High Humidity Option: Add Suffix "H" for 95% relative humidity operation.
Fungus Proofing Operation: Add suffix "F." Treatment with MIL-V-173 varnish protects circuits from fungus.

NEW PRODUCT LINE

DB is currently developing a line of Constant Voltage Power Supplies for specific applications. Specifications and prices are available upon request from the factory.

VOLTAGE AND CURRENT TABLE

OUTPUT** VOLTAGE →		3	5	6	10	12	15	18	20	24	28	32	36	48	100	120	150
SERIES	TEMP.	OUTPUT AMPERES															
301	40°C	3.8	3.7	3.2	2.7	2.5	2.2	2.0	1.8	1.4	1.3	1.2	1.1	0.9	0.37	0.3	0.25
401		5.3	5.1	4.8	4.2	4.0	3.5	3.2	3.1	2.5	2.3	2.1	2.0	1.6	0.55	0.49	0.39
501		11.0	10.5	9.0	7.5	7.3	6.0	5.5	5.0	4.0	3.5	3.2	3.0	2.5	1.0	0.9	0.7
601		13.1	12.6	12.4	10.8	10.0	9.0	7.9	7.4	6.7	6.0	5.7	5.4	4.1	1.7	1.5	1.1
701		22.0	20.0	19.0	16.0	15.0	14.0	13.0	12.0	11.0	10.0	9.0	8.0	6.0	2.0	1.7	1.4
801		33.0	31.0	30.0	24.0	21.0	19.0	16.5	15.2	14.0	13.0	11.7	10.4	7.7	3.3	3.0	2.2
901		48.0	48.0	47.0	38.0	33.0	25.0	25.0	23.0	20.0	19.0	16.0	13.0	10.0	4.3	3.7	3.1
301	50°C	3.3	3.2	2.9	2.5	2.3	2.0	1.8	1.6	1.3	1.2	1.1	1.0	0.85	0.34	0.28	0.23
401		4.6	4.3	4.1	3.6	3.5	3.2	3.0	2.9	2.4	2.1	2.0	1.8	1.4	0.51	0.45	0.36
501		9.4	9.0	8.4	7.0	6.8	5.6	5.1	4.6	3.7	3.4	3.1	2.9	2.4	0.96	0.86	0.67
601		11.3	10.8	10.6	9.7	9.2	8.4	7.4	6.9	6.3	5.6	5.3	5.0	3.9	1.5	1.3	1.0
701		20.0	18.0	17.3	14.5	13.6	12.7	11.8	10.9	10.0	9.0	8.2	7.3	5.4	1.7	1.5	1.3
801		29.0	24.6	24.6	20.4	19.0	18.0	14.8	13.7	12.5	11.5	10.6	9.8	7.1	3.0	2.7	2.0
901		42.0	41.0	40.0	33.0	28.0	22.0	22.0	20.0	17.0	16.0	13.5	11.0	9.0	3.6	3.1	2.6
301	60°C	2.6	2.5	2.4	2.2	2.1	1.8	1.7	1.5	1.2	1.1	1.0	0.9	0.8	0.3	0.25	0.2
401		3.7	3.4	3.3	3.0	2.9	2.8	2.7	2.6	2.2	2.0	1.8	1.7	1.3	0.47	0.42	0.33
501		8.2	8.0	7.7	6.3	5.9	5.1	4.7	4.2	3.4	3.1	2.9	2.7	2.2	0.9	0.8	0.62
601		9.2	9.2	8.9	8.5	8.3	7.9	6.9	6.5	5.8	5.2	4.9	4.7	3.6	1.3	1.1	0.9
701		16.5	16.5	15.6	13.0	12.3	11.5	10.6	9.8	9.0	8.0	7.3	6.5	4.9	1.6	1.4	1.2
801		25.0	20.8	20.8	16.8	16.1	15.5	12.4	11.8	10.8	9.8	9.2	8.6	6.5	2.5	2.2	1.75
901		34.0	33.0	32.0	27.0	22.0	18.0	18.0	17.0	14.0	13.0	11.5	10.0	7.5	3.0	2.6	2.1
301	71°C	1.6	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.1	1.0	0.96	0.85	0.75	0.28	0.23	0.19
401		2.5	2.4	2.4	2.0	1.9	1.9	1.9	1.8	1.5	1.4	1.35	1.3	1.0	0.42	0.38	0.3
501		5.5	5.5	5.5	5.0	4.7	4.3	4.1	3.6	3.0	2.8	2.6	2.4	1.9	0.8	0.7	0.55
601		6.2	6.1	6.0	5.7	5.7	5.3	5.0	4.9	4.8	4.7	4.5	4.3	3.1	1.1	1.0	0.8
701		10.0	10.0	10.0	9.5	9.5	8.6	8.6	8.5	7.6	7.1	6.4	5.7	4.3	1.5	1.2	1.0
801		20.5	17.3	17.3	13.8	13.2	12.7	10.1	9.7	9.0	8.2	7.6	7.1	5.4	2.1	1.9	1.5
901		25.0	25.0	24.0	21.0	17.0	14.0	14.0	13.0	11.0	10.0	8.8	7.5	6.0	2.3	1.9	1.6

RACK ADAPTERS

Standard 19" or special racks to customer requirements can be supplied for mounting combinations of the above power supplies. Consult the factory with your requirements (outputs, meters, controls, etc.).

NOTES TO TABLE

*The model number consists of the ser indicated plus a dash number to indic voltage. Examples: The model num 301-5 is a 5 VDC, 3.7 Amp at 4 unit; the 301-28 is a 28 VDC, 1.3 A at 40°C unit. Note that current rati vary with temperature.

**Output voltage is adjustable to ±5 Higher currents available on special der. Built-in ±10% adjustment usa up to 85% of rated current.

PRICING

Prices for all power supplies listed the table to the left are shown bel Prices for other voltages and currents available from the factory.

				"L"
301-3	thru	301-48	$117.00	$25
301-100	thru	301-150	137.00	25
401-3	thru	401-28	137.00	25
401-32	thru	401-150	157.00	25
501-3	thru	501-28	177.00	28
501-32	thru	501-150	197.00	28
601-3	thru	601-12	207.00	28
601-15	thru	601-28	217.00	28
601-32	thru	601-150	237.00	28
701-3	thru	701-36	267.00	37
701-48	thru	701-150	297.00	37
801-3	thru	801-48	318.00	75
801-100	thru	801-150	348.00	75
901-3	thru	901-28	448.00	75
901-32	thru	901-48	498.00	75
901-100	thru	901-150	528.00	75

OPTION PRICING

"H" option (95% relative humi $12.50 at time of initial order, $2 when added to power supply after pletion.

"F" option (fungus proofing): 3 thru 501-150 $6.50, 601-3 thru 80 $8.50, 901-3 thru 901-150 $12.00.

Prices and specifications subject to change without notice. Minor modifications can be made on all units to meet customer requireme Quantity discounts on 25 units or more, depending on the model, available from the factory.

DB DRESSEN-BARNES ELECTRONICS CORPORATION / 250 N. VINEDO AVENUE / PASADENA, CALIFORNIA 91
TELEPHONE: (213) 681-0643 / TWX: 910-588-3780 / CABLE ADDRESS: DREBAR—PASADENA, CALIFOR

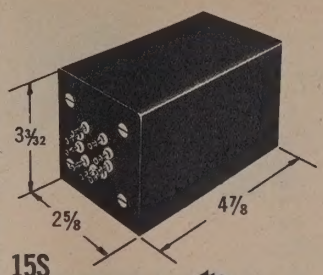
TD HIGH-DENSITY, CONVECTION COOLED, ULTRA-HIGH PERFORMANCE, ON DC POWER MODULES — IN STOCK

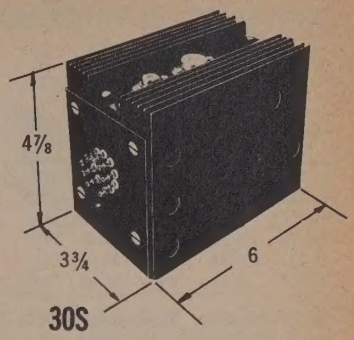
SPECIFICATIONS

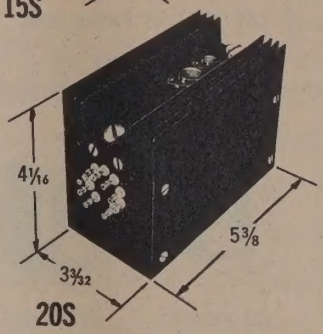
ne: 105-125 VAC: 0.01% or 5 MV (whichever is greater)
oad: NL to FL: 0.01% or 5 MV (whichever is greater)
MRMS max. (2 MV RMS max. above 100V)
erature Range: 0 to 71°C
erature Range: —55°C to 85°C
5V; 50-400 CPS, single phase, 0.2 amperes
overy Time: Less than 100 microseconds
Coefficient (Typical):
for Voltages below 45V
for Voltages 45V and above
cal):
s. for Voltages below 45V
s. for Voltages 45V and above
ance: Less than 1 ohm @ 500 KC
ection: Resistor-fuse protection above 40 volts output. Automatic current limiting up to 40 volts set between 110 and 130% of full load.
ng: Standard feature.
ge Adjust: Standard feature.
Standard feature.

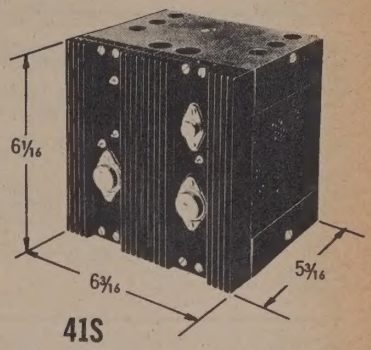
LABLE AT EXTRA COST

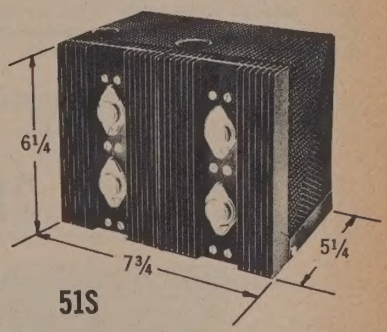
(1 option) ■ Barrier strip (M92 option) ■ Overvoltage load (3 option) ■ 95% relative humidity operation (M95 option) oofing ("F" option).

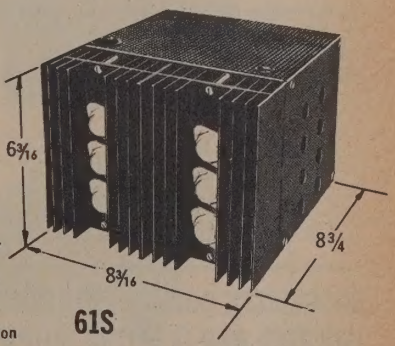












VOLTAGE AND CURRENT TABLE

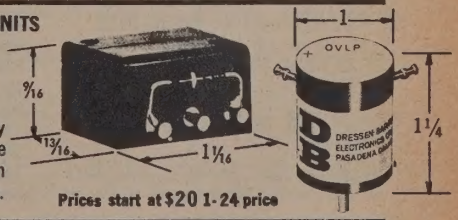
15S PRICE	20S	PRICE	30S	PRICE	41S	PRICE	51S	PRICE	61S	PRICE
	CURRENT RATING (50°C)† (65°C & 71°C)‡									
MILLIAMPERES			AMPERES							
750	59.50	1400	85.00	3.10	117.50	6.0	137.50	12.9	*	24.0	*
750	59.50	1400	85.00	3.10	117.50	6.0	137.50	11.0	197.50	21.0	265.00
735	59.50	1400	85.00	2.95	117.50	5.8	137.50	10.5	197.50	21.0	265.00
580	59.50	1100	85.00	2.34	117.50	4.8	137.50	8.6	197.50	16.0	265.00
535	59.50	1000	85.00	2.16	117.50	4.5	137.50	7.8	197.50	14.5	265.00
430	59.50	800	85.00	1.75	117.50	4.0	137.50	7.1	197.50	14.5	265.00
375	59.50	700	85.00	1.50	117.50	3.6	137.50	6.6	197.50	13.5	265.00
375	59.50	700	85.00	1.50	117.50	3.4	137.50	6.1	197.50	12.5	265.00
325	59.50	600	85.00	1.30	117.50	3.1	137.50	5.4	197.50	10.5	265.00
285	59.50	550	85.00	1.13	117.50	2.8	137.50	4.9	197.50	9.5	265.00
250	*	500	*	1.00	*	2.6	*	4.6	*	9.0	*
225	*	400	*	0.94	*	2.2	*	3.8	*	7.5	*
170	*	300	*	0.68	*	1.7	*	2.9	*	5.7	*
55	*	150	*	0.345	*	0.8	*	1.5	*	3.0	*
—	*	110	*	0.29	*	0.7	*	1.0	*	2.0	*
—	—	60	*	0.215	*	0.6	*	0.85	*	1.8	*
—	—	35	*	0.165	*	0.4	*	0.7	*	1.0	*
15.00		15.00		15.00	Not Available						
15.00		15.00		15.00		15.00		15.00		15.00	
25.00		25.00		25.00		28.00		28.00		37.00	
units $12.50 at time of initial order, $20.00 when added to power supply after completion.											
6.50		6.50		6.50		8.50		8.50		8.50	

ions contact factory.
livery information for these models and other models, from 1-200V, available from the factory.
umber consists of the series indicated, plus a dash number to indicate voltage. Examples: The model number VDC, 750 MA unit; the 30-28S is a 28 VDC, 1.13 AMP unit.
an be adjusted 10% in voltage by a screw adjustment on the supply. Slight current derating will result. ry for exact values.
er Minute over the surfaces of the power supply. Temperature is of the air, measured 2 inches up stream.
ations can be made to fit individual customer requirements. For example: different input voltages, parallel operation tput voltage swings. Consult the factory for your specific modification requirements.

OLTAGE LOAD PROTECTOR (OVLP)

ervoltage detection

TYPICAL UNITS



Prices start at $20 1-24 price

DB Electronics power supplies and other equipment requiring overvoltage protection. Primarily protecting IC circuitry from line transients but can also be used to protect any load sensitive or continuous overvoltage conditions. Features high speed overvoltage detectors in conjunction r" SCR. Units available in fixed and variable trip voltages. SCR's are sized for current loads.

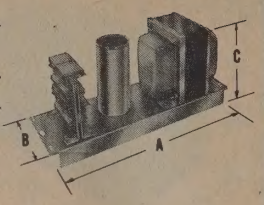
d specifications subject to change without notice. Minor modifications can be made on all units to meet customer requirements. Quantity discounts on 25 units or more, depending on the model, available from the factory.

DRESSEN-BARNES ELECTRONICS CORPORATION / 250 N. VINEDO AVENUE / PASADENA, CALIFORNIA 91107
TELEPHONE: (213) 681-0643 / TWX: 910-588-3780 / CABLE ADDRESS: DREBAR—PASADENA, CALIFORNIA

UNREGULATED DC POWER MODULES

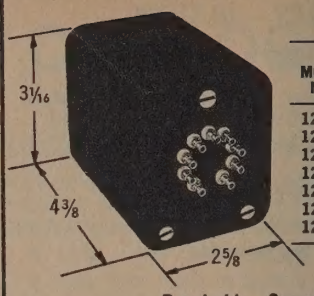
21 SERIES

MODEL NO.	OUTPUT (115 VAC. 60 CPS Input) VOLTS	AMPS	UNIT PRICE	DIMENSIONS A	B	C
21-101B	28	2	39.50	9⅜	3⅜	5 7/16
21-102B	28	5	54.50	12½	4	5⅝
21-103B	28	10	85.00	12½	5	6⅜
21-112	5-32	5	75.00	12½	4	4⅝
21-113	5-32	10	99.00	12½	5	6½
21-114	5-32	15	140.00	12½	6¼	8



Silicon Rectifier, Repairable, Output Adj. in 1.5V Steps at Barrier Strip
Input: 105-125V, 50-400 CPS.
Polarity: Floating Output, low ripple with D/B filter (request data)

121 SERIES

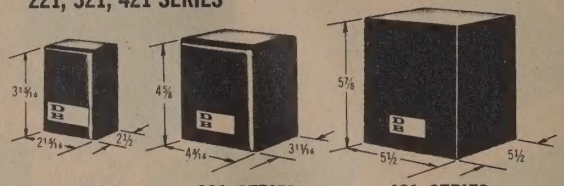


MODEL NO.	OUTPUT (115 VAC, 60 CPS Input) VOLTS	MA
121-6	6	1500
121-12	12	1150
121-24	24	550
121-28	28	500
121-48	48	300
121-90	90	150
121-150	150	90

Silicon R
Repairable, Computer Grade Capacitors, Sm
Input: 105-125V, 50-400 CPS. Max. Operating Temperatu
Polarity: Floating Output, low ripple. Voltage Tolerance: ±10

Silicon Rectifier, Non-repairable, Computer Grade Capacitors, Small Size, Completed Potted.
INPUT: 105-125V, 50-400 CPS; .25 ampere (221 series), .6 ampere (321 series), 1.5 amperes (421 series)
OPERATING TEMPERATURE: —40°C to +50°C
STORAGE TEMPERATURE: —40°C to +85°C
RELATIVE HUMIDITY: 95%
RIPPLE: 1V RMS max. (Note: Ripple decreases in direct proportion to decrease in load current; ripple can be further reduced by using external capacitor across the output.) 1.5V RMS max. on 421 series above 50V.
VOLTAGE TOLERANCE: ±10% ±1V
POLARITY: Floating output.

221, 321, 421 SERIES



221 SERIES — $32.50 each in voltages listed
321 SERIES — $45.50 each in voltages listed
421 SERIES — $57.50 each in voltages listed

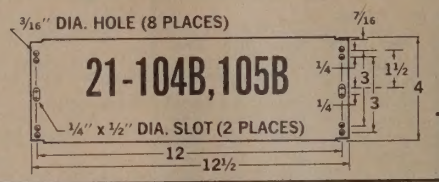
CURRENT AND VOLTAGE AT 115 60 Hz INPUT, 25°C AMBIEN

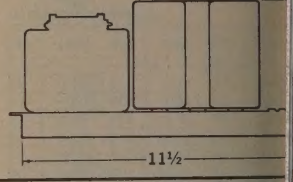
OUTPUT * VOLTS	221 SERIES	321 SERIES
	MILLIAMPERES	
6	2000	3000
12	1400	2900
24	750	1800
28	750	1500
48	300	900
90	170	500
180	80	200

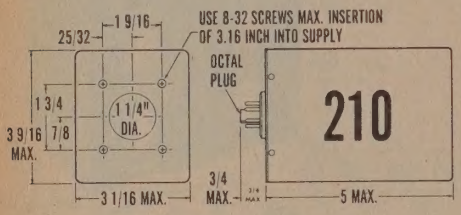
*The model number consists of the dicated plus a dash number to ind age. Example: The model number 3 12 VDC, 2900 MA unit.

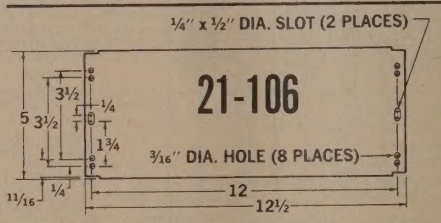
FILTERS

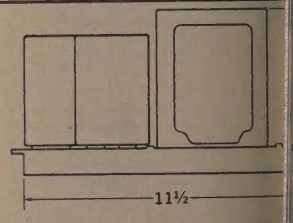
Designed for use with the DB Electronics power supplies listed below, other unregulated power supplies, and as independent filtering sources for other equipment.











FILTER MODEL NOS. CORRESPONDING TO UNREGULATED POWER SUPPLY MODEL NOS.

Unregulated Power Supply Voltage Range	221 Series	321 Series	421 Series	21-101B	21-102B 21-112	21-103B 21-113	21-114
6 to 18V	210-1	210-1	210-2	210-1	210-2 or 21-104B	21-105B	21-106
19 to 23V	210-1	210-1	210-1	210-1	210-2	21-105B	21-106
24 to 36V	210-1	210-1	210-1	210-1	21-104B	21-105B	21-106
37 to 75V	210-3	201-3	210-3	—	—	—	—
76 to 105V	210-4	210-4	210-4	—	—	—	—

FILTER OUTPUT RIPPLE: (25°C, Full Load, 120 Hz)

D/B Filter Model No.	Ripple Fraction	Unit Price
210-1	1/10th	30.00
210-2		40.00
210-3		45.00
210-4		55.00
21-104B	1/200th	45.00
21-105B	1/50th	52.50
21-106	1/40th	85.00

SPECIFICATIONS

Filter Output Voltage: I voltage is typically les below the input voltag
Temperature: Operating: +50°C.
Storage: —40°C to +
Relative Humidity: 210 S 21-104B, 21-105B, 21-

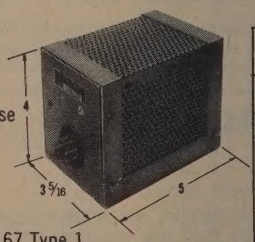
RUGGEDIZED DUAL OUTPUT UNITS TYPE 27949
ISOLATED AND FLOATING OUTPUTS

Qualified to: Vibration: Mil-Std-810B
5-15 Hz at .06 in. double amplitude
16-25 Hz at .04 in. double amplitude
26-33 Hz at .02 in. double amplitude

Shock: 50G peak for 9.0 ±0.9 ms duration

Humidity: 10% to 95% RH, 60°F to 130°F.

Input: 105 to 125 VRMS, 50 to 400 HZ single phase
Output: See table
Voltage Adjust: ±5%
Regulation, Line: 1MV MAX. **Load:** 10MV MAX.
Ripple: 1MV RMS MAX.
Temperature, Operating: 0-50°C.
Shock/Vibration Qualified: Mil-Std-810B, Mil-Std-167 Type 1.
Temperature Coefficient: .03%/°C
Short Circuit Protected.



OUTPUTS AVAIL

OUTPUT VOLTAGE	CUR
±2	
±5	
±10	
±12	
±15	
±20	
±25	
±30	
±40	
±50	

Prices and specifications subject to change without notice. Minor modifications can be made on all units to meet customer requir Quantity discounts on 25 units or more, depending on the model, available from the factory.

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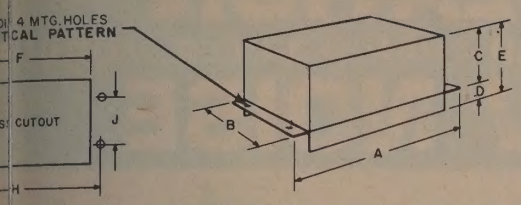
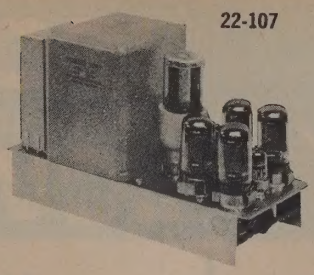
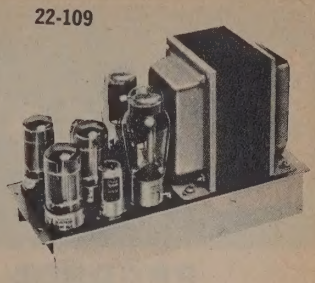
TELEPHONE: (213) 681-0643 / TWX: 910-588-3780 / CABLE ADDRESS: DREBAR—PASADENA, CALIF

HIGH PERFORMANCE, VACUUM TUBE MODULES







Exept: Models 22-102A through 22-104B = 5/32" dia.

AC OUT* (105-125V) CPS	Amps	Nominal Volts**	DC OUTPUT Adj.† Range (Volts)	Chassis Pot Adj.	Amps	UNREGULATED OUTPUT AC Volts	Amps	REGULATION—LINE (105-125V) MV	%	REGULATION—LOAD (NL-FL) (115V AC) MV	%	RIPPLE MV RMS Max (115V Line)	DIMENSIONS IN INCHES A	B	C	D	E	F	G	H	J	UNIT PRICE
50-6	0.75	150	150-200	NO	0-.070	6.3	3	600	0.4 @ 150V	450	0.3 @ 150V	5	4 1/8	5	4 1/4	1 3/4	6	3 7/16	5 1/16	3 13/16	4 1/8	75.50
50-4	0.85	150	150-200	YES	0-.070	6.3	3	300	0.2 @ 150V	150	0.1 @ 150V	2	4 1/8	5	4 1/4	2	6 1/4	3 7/16	5 1/16	3 13/16	4 1/8	99.50
50-6	0.9	250	210-310	NO	0-.070	6.3	3	600	0.24 @ 250V	450	0.18 @ 250V	5	4 1/8	5	4 1/4	1 3/4	6	3 7/16	5 1/16	3 13/16	4 1/8	75.50
50-4	0.9	250	210-260	YES	0-.070	6.3	3	300	0.1 @ 300V	150	0.05 @ 300V	2	4 1/8	5	4 1/4	2	6 1/4	3 7/16	5 1/16	3 13/16	4 1/8	99.50
50-6	1	300	240-350	NO	0-.070††	6.3	3	600	0.2 @ 300V	450	0.15 @ 300V	5	4 1/8	5	4 1/4	1 3/4	6	3 7/16	5 1/16	3 13/16	4 1/8	75.50
50-4	0.9	300	280-320	YES	0-.070	6.3	3	300	0.1 @ 300V	150	0.05 @ 300V	2	4 1/8	5	4 1/4	2	6 1/4	3 7/16	5 1/16	3 13/16	4 1/8	99.50
50-6	2	300	270-325	YES	0-.150	6.3	6	600	0.2 @ 300V	300	0.1 @ 300V	5	10 1/2	4	4 5/8	2	6 5/8	9 9/16	4 1/16	10	2 1/4	96.00
50-4	2	300	270-325	YES	0-.150	6.3	6	300	0.1 @ 300V	150	0.05 @ 300V	2	10 1/2	4	4 5/8	2	6 5/8	9 9/16	4 1/16	10	2 1/4	97.00
50-4	3	400	250-400	YES	0-.200	6.3	6	200	0.05 @ 400V	200	0.05 @ 400V	2	12 1/2	5	4 7/8	2	6 7/8	11 9/16	5 1/16	12	3	129.00
50-4	4.5	450	250-500	YES	0-.300	6.3	6	225	0.05 @ 450V	225	0.05 @ 450V	2	12 1/2	5	5 3/8	2	7 3/8	11 9/16	5 1/16	12	3	156.00
50-6	2	150	80-260	YES	0-.150	6.3	6	600	0.4 @ 150V	375	0.25 @ 150V	5	10 1/2	4	4 5/8	2	6 5/8	9 9/16	4 1/16	10	2 1/4	96.00
50-4	2	150	80-260	YES	0-.150	6.3	6	300	0.2 @ 150V	150	0.1 @ 150V	2	10 1/2	4	4 5/8	2	6 5/8	9 9/16	4 1/16	10	2 1/4	109.00
50-4	4	150	110-165	YES	0-.500	6.3	6	300	0.2 @ 150V	150	0.1 @ 150V	2	12 1/2	5 9/16	5 3/8	2	7 3/8	11 9/16	5 5/8	12	3 9/16	181.50
50-4	4	300	275-325	YES	0-.500	6.3	6	300	0.1 @ 300V	150	0.05 @ 300V	2	12 1/2	5 9/16	5 3/8	2	7 3/8	11 9/16	5 5/8	12	3 9/16	199.00
50-4	2.5	150	115-165	YES	0-.200	6.3	6	300	0.2 @ 150V	150	0.1 @ 150V	2	12 1/2	5	4 7/8	2	6 7/8	11 9/16	5 1/16	12	3	143.00

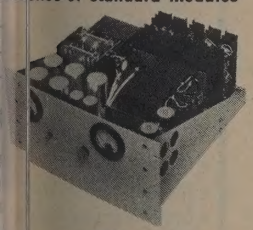
ts available with higher input voltages upon request.
set factory for nominal value ±2%. Unit may be adjusted within range indicated.
mat necessary to adjust the unit to any output within the range specified furnished with each unit.
32 volts, maximum current is from 55MA at 340V to 50MA at 350V.

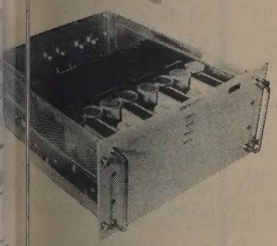
ZED POWER SUPPLIES

Dressen-Barnes makes many modifications to its standard lines of power supplies to meet special or custom supply requirements of its customers. These fall into three general types of modifications:

Type I

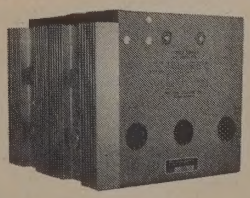
tip output packages made from sse lies of standard modules

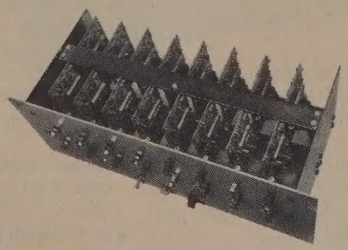




Type II

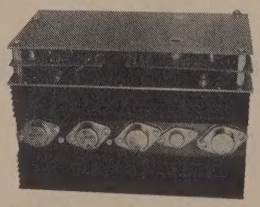
Modification of Standard units to meet special customer requirements.

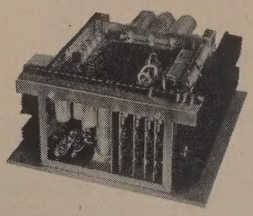




Type III

Standard Circuitry in special packages for volume requirements to meet customer specifications.





his road capability and with our modern Quick Reaction Facilities, Dressen-Barnes over the past 22 years has delivered nearly 4,000 different models of custom power supplies.

WARRANTY

-Ba s Electronics Corporation warrants each power supply manufactured by b ree from defects in material and workmanship, for a period of five years e of delivery to the original purchaser, except for vacuum tubes which are ed one year.

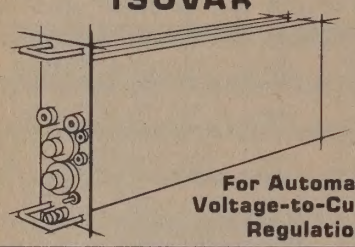
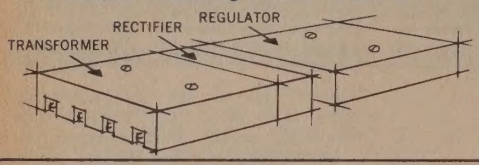
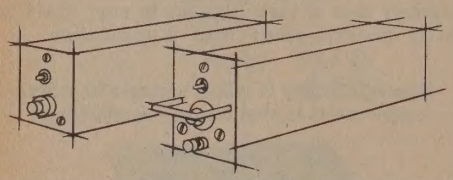
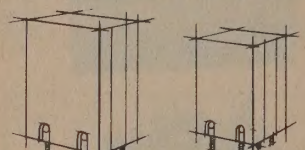
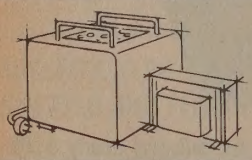
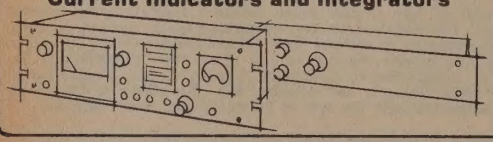
-Ba s obligation under this warranty is limited to servicing or adjusting any sup returned to the factory for that purpose, and replacing any defective ere If the failure has been caused by misuse, operation in excess of specifi- gua tees or modification by the customer, repairs will be billed at cost.

Permission must be obtained from Dressen-Barnes before a supply may be returned for warranty examination. Transportation charges are to be prepaid. Warranty is transferable by the original purchaser as received from Dressen-Barnes and/or for use in original equipment. This warranty is expressly in lieu of all other obligations or liabilities on the part of Dressen-Barnes Electronics Corporation and Dressen-Barnes Electronics Corporation neither assumes nor authorizes any other person to assume for them, any liability in connection with the sale of Dressen-Barnes power supplies.

ces nd specifications subject to change without notice. Minor modifications can be made on all units to meet customer requirements. Quantity discounts on 25 units or more, depending on the model, available from the factory.

DRESSEN-BARNES ELECTRONICS CORPORATION / 250 N. VINEDO AVENUE / PASADENA, CALIFORNIA 91107
TELEPHONE: (213) 681-0643 / TWX: 910-588-3780 / CABLE ADDRESS: DREBAR—PASADENA, CALIFORNIA

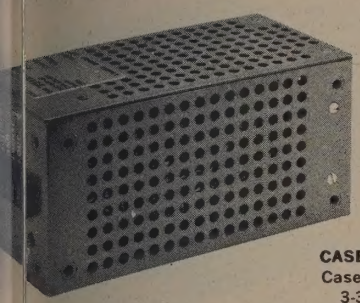
Elcor ISOLATION* DC POWER AND TRANSFORMER MODULES LOW NOISE

PRODUCT DC POWER MODULES	FEATURES		USES
ISOVAR  For Automatic Voltage-to-Current Regulation	▪ Low capacitance from ac input (primary) to dc output. ▪ Automatic change from voltage to current regulation. ▪ 0 to 36 vdc output, up to 175 ma. ▪ Control resolution 0.02%. ▪ Output load regulation—0.002%. ▪ Output line regulation—0.001%, voltage or current.	▪ Ripple 0.001% (+100 μV p-p or 2 μA p-p). ▪ Remote sensing. ▪ 5.25 in. H. x 1.4 in. W. x 16.5 in. D. (allows 12 channels in 19" rack adapter.) ▪ Provided with signal conditioner within same package as option.	▪ Eliminate noise. ▪ Provide power for pre instrumentation. ▪ Energize low-level ci ▪ Protect delicate mea ment circuits. ▪ Provide floating dc po ▪ Prevent ground loops.
DUAL ISOPLY® Precise Tracking Power Modules  	▪ ±15 vdc, 300 ma output. ▪ Isolated power for op-amps. ▪ —15 V output tracks +15 V output.	▪ Separate transformer, rectifier, and regulator modules. ▪ 1 in. H. x 3 in. W. x 6 in. L.	▪ Op-amp supply. ▪ Low noise circuits. ▪ Compact power fo board mounting. ▪ IC supply.
ISOPLY® Power Modules 	▪ Highly isolated dc supplies. ▪ From 1 to 300 vdc, 2 to 800 ma output. ▪ Ripple less than 0.005%. ▪ Regulation to 0.02%.	▪ Low temperature coefficient. ▪ Remote sensing. ▪ Plug-in, chassis, or rack mounted.	▪ Battery substitutes. ▪ Precision measureme cuits. ▪ Bridge circuits. ▪ Low-level measurem ▪ Ungrounded amplifier ▪ Servo references, fi bias. ▪ Ground loop decoupli ▪ Voltage references.
ISOLATION TRANSFORMERS			
ISOFORMER® 	▪ High degree of direct capacitive and conductive isolation. ▪ Efficient transfer of energy. ▪ Extremely low leakage current. ▪ Low primary to secondary capacitance.	▪ Line isolation to secondary < .001 pF. ▪ Leakage resistance—10^{12} ohms. ▪ 6.3 to 600 volt output for 4 and 25 watt models. ▪ Unique air-gap construction eliminates primary-to-secondary shorts.	▪ Low-noise power sup ▪ Bridge circuits. ▪ Medical instrumentat ▪ Systems ground loop nation. ▪ Electrometer circuits, filament supplies.
 **POWER** Isolation Transformers	▪ Eliminate unwanted noise in ground circuits. ▪ Provide low leakage currents.	▪ Isolate measurement circuits from common-mode noise. ▪ Available up to 6 KVA.	▪ Hospital safety progr ▪ Low noise application ▪ Instrument isolation.
INSTRUMENTS Current Indicators and Integrators 	▪ Integrates any proportional current or voltage. ▪ Sensitive and accurate current meter (to 3×10^{-10} amp sensitivity.) ▪ Internal calibration.	▪ Developed for use with high-voltage particle accelerators. ▪ Pulsed current filter also available.	▪ Precision measureme ▪ Integration of propo current or voltage, s radiation, temperatur ▪ Automatic process c

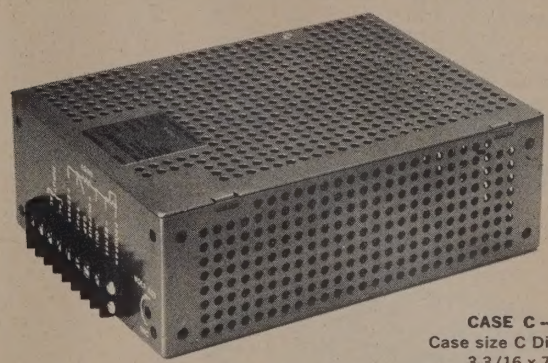
*Power modules with output circuitry highly isolated conductively and capacitively from ground (case) and ac input. Battery equivalent with variable voltage.

Elcor 2431 Linden Lane, P.O. Box 986, Silver Spring, Maryland 20910/(301) 589-661
Products by Welex Electronics, A Halliburton Company

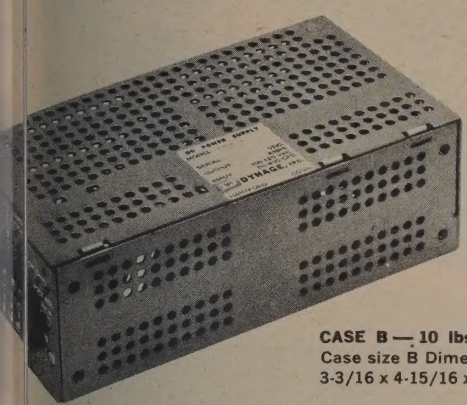
L Series Modular DC Power Supplies 72-Hr Delivery, Four-Way Mounting, Built-In O.V. and O.C. Protection Std. (Mix'N Match with H and KH Series)



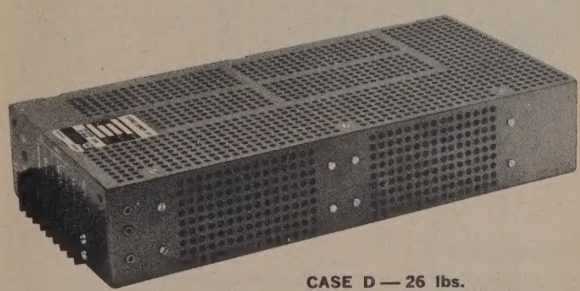
CASE A — 4 lbs.
Case size A Dimensions —
3-3/16 x 3-3/16 x 7-1/4



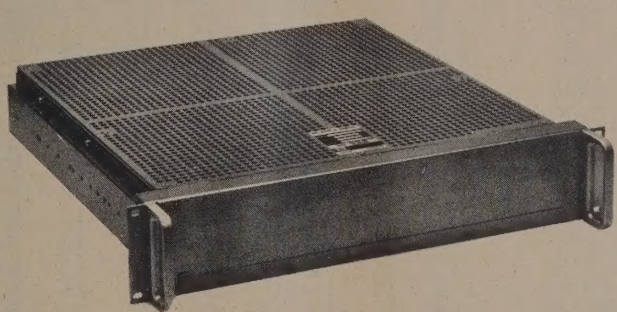
CASE C — 14 lbs.
Case size C Dimensions —
3-3/16 x 7-1/8 x 9-5/8



CASE B — 10 lbs.
Case size B Dimensions —
3-3/16 x 4-15/16 x 9-3/8



CASE D — 26 lbs.
Case size D Dimensions —
3-3/16 x 8 x 16-1/2



CASE E — 52 lbs.
Case Size E Dimensions
16-7/8" wide x 17" deep x 3-15/32" high
Standard 19" panel front mounting

ecifications

ut: 05-125 VAC, 47 to 420 Hz.
tpu Floating, Per Table.
gul on: (hi efficiency series regulator uses no switching devices, resu ng in low output noise).
Con ned: ±0.5% for combined ±10 VAC input change and 0 to full lo l variation.
Lin only: ±0.2% for ±10 VAC at constant load.
Loa only: ±0.3% for 0 to full load at 115 VAC.
±0.2% for 25% load change at 115 VAC.
ple 5 mv max rms.
5 mv max P-P.
mp ture Coefficient: ± 0.05% per °C from −20°C to 60°C.
tag Adjustment: ±5% with 0.5% resolution.
mp ture Range: −20°C to +71°C, with overtemperature protection (the ostat) on heat sink.
erc ent Protection: Set to allow maximum overload of 115 to 135% of ed 50°C load. Short circuit current is approximately 30% of d 50°C current.
erv age Protection: Adjustable, set for approximately 130% of out voltage at no load.
mo Sensing: Standard, all models.
mot Programming: Standard, all models.
rall Operation: Standard, all models.
tion Features (See optional features page):
Fixe Output — Suffix F
230 AC Input — Suffix N
Wid Range Input — Suffix W

Ordering Information

Output Voltage ±5.0% Range	Output Current (Amps) at 50°C	at 60°C	at 71°C	Case Size	Model	Price, including built-in overvoltage protection
5.0—5.5	5.5	5.0	4.5	A	L-5.25-5.5	$139.00
12.0—13.2	3.2	2.9	2.6	A	L-12.6-3.2	139.00
15.0—16.5	2.6	2.3	2.1	A	L-15.7-2.8	139.00
24.0—26.4	1.7	1.5	1.4	A	L-25.2-1.7	139.00
5.0—5.5	14	13	11.5	B	L-5.25-14	169.00
12.0—13.2	8.2	7.8	6.9	B	L-12.6-8.2	169.00
15.0—16.5	6.5	6.0	5.4	B	L-15.7-6.5	169.00
24.0—26.4	4.4	4.0	3.6	B	L-25.2-4.4	169.00
5.0—5.5	18	16.5	15.0	C	L-5.25-18	219.00
12.0—13.2	10	9.2	8.3	C	L-12.6-10	219.00
15.0—16.5	8.4	7.7	7.0	C	L-15.7-8.4	219.00
24.0—26.4	6.2	5.7	5.2	C	L-25.2-6.2	219.00
5.0—5.5	31	28	25	D	L-5.25-31	298.00
12.0—13.2	16.7	15.2	14.0	D	L-12.6-16.7	298.00
15.0—16.5	16.0	14.7	13.5	D	L-15.7-16	298.00
24.0—26.4	10.8	10.0	9.1	D	L-25.2-10.8	298.00
5.0—5.5	75	68	61	E	L-5.25-75	525.00
12.0—13.2	41.5	38	35	E	L-12.6-41.5	525.00
15.0—16.5	38.5	35	32	E	L-15.7-38.5	525.00
24.0—26.4	27.5	25.5	23	E	L-25.2-27.5	525.00

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

H Series Modular DC Power Supplies 72-Hr Deliver
Four-Way Mounting, Optional, Built-In O.V. Protecto
(Mix'N Match with L and KH series)

Specifications

Input: 105 — 125 vac, 47 — 420 Hz.

Output (floating): Volts and current: See Table of Models.

Regulation Combined: ±0.05% or 1.5 mv, whichever is greater for a combined ±10 vac input change and 0 to full load change.

Ripple: 0.002% or 1 mv, rms, whichever is greater.

Temperature Coefficient: ±0.01%/°C or 1.2 mv/°C, whichever is greater, over the range of −20°C to +60°C.

Voltage Adjustment: ±5 % at rated load. ±10% at 90% load.

Resolution of Adjustment: 0.4% or 30 mv, whichever is greater.

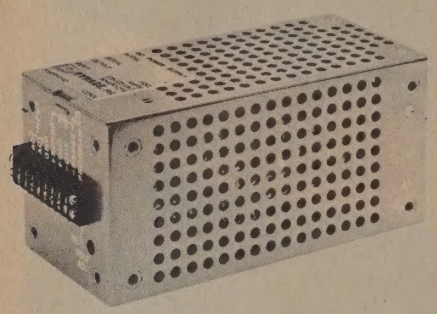
Temperature Operating: −20° to +71°C ambient (See current rati at 3 temperature).

Temperature Storage: −62°C to +85°C.

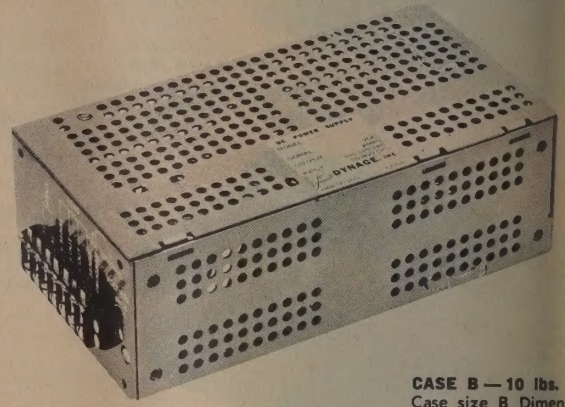
Remote Sensing, Remote Programming, Over Temperature Protecti Provided on all models.

Electronic Short Circuit Protection: Set for approx. 125% rated lo

Optional Features — see optional features page.



CASE A — 4 lbs.
Case size A Dimensions—
3-3/16 x 3-3/16 x 7-1/4



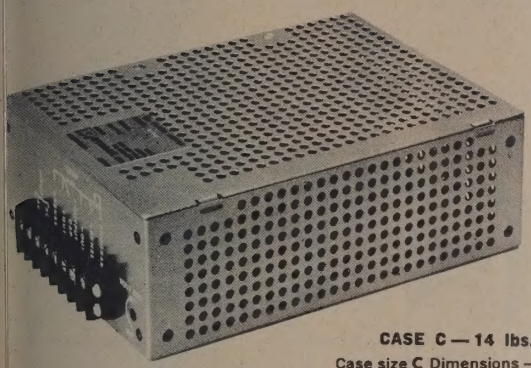
CASE B — 10 lbs.
Case size B Dimen
3-3/16 x 4-15/16 x

Ordering Information

Output Voltage ±5.0% Range	Output Current (Amps) at 50°C	at 60°C	at 71°C	Size	Model	Price .05% Regulation
0.5—1.2	3.3	2.7	2.2	A	H-0.9-3.3A	$124.00
1.2—1.8	3.3	2.7	2.2	A	H-1.5-3.3A	124.00
1.8—2.3	3.3	2.7	2.2	A	H-2.1-3.3A	124.00
2.3—2.7	3.3	2.7	2.2	A	H-2.5-3.3A	124.00
2.7—3.1	3.3	2.7	2.2	A	H-2.9-3.3A	124.00
3.1—3.5	3.3	2.7	2.2	A	H-3.3-3.3A	124.00
3.5—3.9	3.3	2.7	2.2	A	H-3.7-3.3A	124.00
3.9—4.3	3.3	2.7	2.2	A	H-4.1-3.3A	124.00
4.3—4.7	3.2	2.7	2.2	A	H-4.5-3.2A	124.00
4.7—5.3	3.2	2.7	2.2	A	H-5.0-3.2A	124.00
5.3—5.8	3.1	2.6	2.1	A	H-5.5-3.1A	124.00
5.8—6.4	2.9	2.4	2.0	A	H-6.1-2.9A	124.00
6.4—7.0	2.8	2.3	1.9	A	H-6.7-2.8A	124.00
7.0—7.7	2.7	2.3	1.8	A	H-7.3-2.7A	124.00
7.7—8.5	2.5	2.1	1.7	A	H-8.1-2.5A	124.00
8.5—9.4	2.4	2.0	1.6	A	H-8.9-2.4A	124.00
9.4—10.3	2.2	1.9	1.5	A	H-9.8-2.2A	124.00
10.3—11.4	2.1	1.8	1.4	A	H-10.8-2.1A	124.00
11.4—12.6	1.9	1.6	1.3	A	H-12.0-1.9A	124.00
12.6—13.9	1.8	1.6	1.3	A	H-13.2-1.8A	124.00
13.9—15.3	1.6	1.4	1.2	A	H-14.6-1.6A	124.00
15.3—16.9	1.5	1.3	1.1	A	H-16.1-1.5A	124.00
16.9—18.7	1.4	1.3	1.0	A	H-17.8-1.4A	124.00
18.7—20.6	1.3	1.2	.95	A	H-19.6-1.3A	124.00
20.6—22.7	1.2	1.1	.85	A	H-21.6-1.2A	124.00
22.7—25.0	1.1	1.0	.80	A	H-23.8-1.1A	124.00
25.0—27.6	1.0	.90	.75	A	H-26.2-1.0A	135.00
27.6—30.4	0.95	.85	.70	A	H-29.0-0.95A	135.00
30.4—33.6	0.85	.80	.65	A	H-32.0-0.85A	135.00
33.6—37.0	0.80	.75	.60	A	H-35.2-0.80A	135.00
37.0—40.8	0.70	.65	.55	A	H-38.8-0.70A	135.00
40.8—45.0	0.65	.60	.50	A	H-42.8-0.65A	135.00
45.0—49.5	0.60	.55	.45	A	H-47.2-0.60A	135.00
49.5—54.5	0.55	.50	.43	A	H-52.0-0.55A	139.00
54.5—60.0	0.50	.45	.38	A	H-57.2-0.50A	139.00
60.0—66.1	0.50	.44	.38	A	H-63.1-0.50A	139.00
66.1—72.8	0.48	.41	.35	A	H-69.5-0.48A	139.00
72.8—80.1	0.45	.39	.33	A	H-76.5-0.45A	139.00
80.1—88.2	0.40	.35	.30	A	H-84.2-0.40A	139.00
88.2—97.1	0.38	.33	.28	A	H-92.6-0.38A	139.00
97.1—106.8	0.33	.29	.25	A	H-102-0.33A	139.00
106.8—117.2	0.30	.26	.23	A	H-112-0.30A	139.00
117.2—128.7	0.28	.24	.20	A	H-123-0.28A	139.00
128.7—141.6	0.25	.21	.18	A	H-135-0.25A	139.00
141.6—156.1	0.20	.18	.15	A	H-149-0.20A	161.00
156.1—172.1	0.20	.18	.15	A	H-164-0.20A	161.00
172.1—189.6	0.18	.15	.13	A	H-181-0.18A	161.00
189.6—208	0.15	.14	.13	A	H-199-0.15A	182.00
208.0—228.5	0.15	.13	.10	A	H-218-0.15A	182.00
228.5—252	0.13	.11	.10	A	H-240-0.13A	182.00

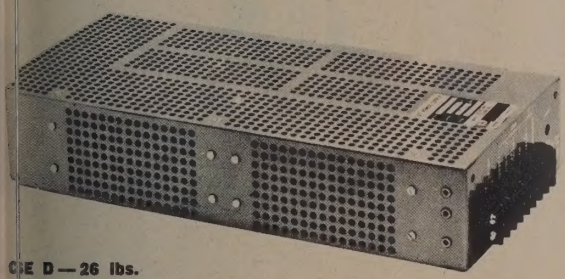
Output Voltage ±5.0% Range	Output Current (Amps) at 50°C	at 60°C	at 71°C	Size	Model	Price .05% Regula
0.5—1.2	6.4	5.3	4.3	B	H-0.9-6.4A	$147.
1.2—1.8	6.4	5.3	4.3	B	H-1.5-6.4A	147.
1.8—2.3	6.4	5.3	4.3	B	H-2.1-6.4A	147.
2.3—2.7	6.4	5.3	4.3	B	H-2.5-6.4A	147.
2.7—3.1	6.4	5.3	4.3	B	H-2.9-6.4A	147.
3.1—3.5	6.4	5.3	4.3	B	H-3.3-6.4A	147.
3.5—3.9	6.4	5.3	4.3	B	H-3.7-6.4A	147.
3.9—4.3	6.4	5.3	4.3	B	H-4.1-6.4A	147.
4.3—4.7	6.4	5.3	4.3	B	H-4.5-6.4A	147.
4.7—5.3	6.4	5.3	4.3	B	H-5.0-6.4A	147.
5.3—5.8	6.1	5.1	4.1	B	H-5.5-6.1A	147.
5.8—6.4	5.8	4.8	3.9	B	H-6.1-5.8A	147.
6.4—7.0	5.5	4.6	3.7	B	H-6.7-5.5A	152.
7.0—7.7	5.4	4.5	3.6	B	H-7.3-5.4A	152.
7.7—8.5	4.9	4.1	3.3	B	H-8.1-4.9A	152.
8.5—9.4	4.7	4.0	3.2	B	H-8.9-4.7A	152.
9.4—10.3	4.4	3.7	3.0	B	H-9.8-4.4A	152.
10.3—11.4	4.1	3.5	2.8	B	H-10.8-4.1A	152.
11.4—12.6	3.8	3.2	2.6	B	H-12.0-3.8A	152.
12.6—13.9	3.5	3.1	2.5	B	H-13.2-3.5A	154.
13.9—15.3	3.2	2.8	2.3	B	H-14.6-3.2A	154.
15.3—16.9	3.0	2.6	2.1	B	H-16.1-3.0A	154.
16.9—18.7	2.7	2.5	2.0	B	H-17.8-2.7A	154.
18.7—20.6	2.5	2.3	1.9	B	H-19.6-2.5A	154.
20.6—22.7	2.3	2.1	1.7	B	H-21.6-2.3A	154.
22.7—25.0	2.2	2.0	1.6	B	H-23.8-2.2A	154.
25.0—27.6	2.0	1.8	1.5	B	H-26.2-2.0A	162.
27.6—30.4	1.9	1.7	1.4	B	H-29.0-1.9A	162.
30.4—33.6	1.7	1.6	1.3	B	H-32.0-1.7A	162.
33.6—37.0	1.6	1.5	1.2	B	H-35.2-1.6A	162.
37.0—40.8	1.4	1.3	1.1	B	H-38.8-1.4A	162.
40.8—45.0	1.3	1.2	1.0	B	H-42.8-1.3A	162.
45.0—49.5	1.2	1.1	.90	B	H-47.2-1.2A	162.
49.5—54.5	1.1	1.0	.85	B	H-52.0-1.1A	179.
54.5—60.0	1.0	.90	.75	B	H-57.2-1.0A	179.
60.0—66.1	1.0	.87	.75	B	H-63-1.0A	179.
66.1—72.8	.95	.82	.70	B	H-69.5-0.95A	179.
72.8—80.1	.90	.77	.65	B	H-76.5-0.90A	179.
80.1—88.2	.80	.70	.60	B	H-84.2-0.80A	179.
88.2—97.1	.75	.65	.55	B	H-92.6-0.75A	181.
97.1—106.8	.65	.57	.50	B	H-102-0.65A	181.
106.8—117.2	.60	.52	.45	B	H-112-0.60A	181.
117.2—128.7	.55	.47	.40	B	H-123-0.55A	181.
128.7—141.6	.50	.42	.35	B	H-135-0.50A	181.
141.6—156.1	.45	.40	.35	B	H-149-0.45A	203.
156.1—172.1	.40	.35	.30	B	H-164-0.40A	203.
172.1—189.6	.35	.30	.25	B	H-181-0.35A	203.
189.6—208.0	.30	.27	.25	B	H-199-0.30A	210.
208.0—228.5	.30	.25	.20	B	H-218-0.30A	210.
228.5—252.0	.25	.22	.20	B	H-240-0.25A	210.

DYNAGE. INC.. Bloomfield. Connecticut 06002/203-243-0315/TWX 710-425-6063



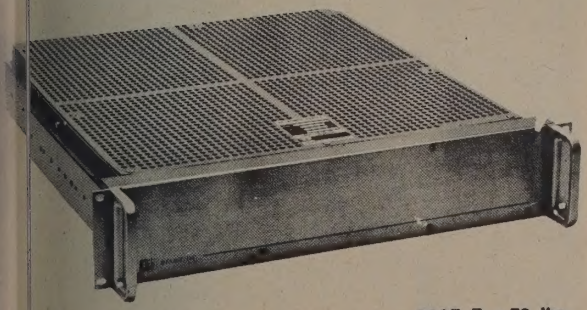
CASE C — 14 lbs.
Case size C Dimensions —
3¾ x 7⅛ x 9⅝

Output Voltage ±5.0% Range	Output Current (Amps) at 50°C	at 60°C	at 71°C	Size	Model	Price .05% Regulation
0.5—1.2	11.3	9.9	8.5	C	H-0.9-11.3A	$195.00
1.2—1.8	11.3	9.9	8.5	C	H-1.5-11.3A	195.00
1.8—2.3	11.3	9.9	8.5	C	H-2.1-11.3A	195.00
2.3—2.7	11.3	9.9	8.5	C	H-2.5-11.3A	195.00
2.7—3.1	11.3	9.9	8.5	C	H-2.9-11.3A	195.00
3.1—3.5	11.3	9.9	8.5	C	H-3.3-11.3A	195.00
3.5—3.9	11.3	9.9	8.5	C	H-3.7-11.3A	195.00
3.9—4.3	10.8	9.4	8.1	C	H-4.1-10.8A	195.00
4.3—4.7	10.8	9.4	8.1	C	H-4.5-10.8A	195.00
4.7—5.3	10.8	9.4	8.1	C	H-5.0-10.8A	195.00
5.3—5.8	9.9	8.6	7.4	C	H-5.5-9.9A	195.00
5.8—6.4	9.8	8.5	7.3	C	H-6.1-9.8A	195.00
6.4—7.0	9.6	8.4	7.2	C	H-6.7-9.6A	195.00
7.0—7.7	9.3	8.1	7.0	C	H-7.3-9.3A	195.00
7.7—8.5	9.0	7.9	6.7	C	H-8.1-9.0A	195.00
8.5—9.4	8.5	7.4	6.3	C	H-8.9-8.5A	195.00
9.4—10.3	8.0	7.0	6.0	C	H-9.8-8.0A	195.00
10.3—11.4	7.7	6.7	5.7	C	H-10.8-7.7A	195.00
11.4—12.6	7.4	6.5	5.4	C	H-12.0-7.4A	195.00
12.6—13.9	7.0	6.1	5.2	C	H-13.2-7.0A	195.00
13.9—15.3	6.7	5.8	5.0	C	H-14.6-6.7A	195.00
15.3—16.9	6.3	5.5	4.7	C	H-16.1-6.3A	195.00
16.9—18.7	6.0	5.2	4.5	C	H-17.8-6.0A	195.00
18.7—20.6	5.5	4.8	4.1	C	H-19.6-5.5A	195.00
20.6—22.7	5.2	4.5	3.9	C	H-21.6-5.2A	195.00
22.7—25.0	4.8	4.2	3.6	C	H-23.8-4.8A	195.00
25.0—27.6	4.6	4.0	3.4	C	H-26.2-4.6A	195.00
27.6—30.4	4.3	3.7	3.2	C	H-29.0-4.3A	195.00
30.4—33.6	4.0	3.5	3.0	C	H-32.0-4.0A	195.00
33.6—37.0	3.8	3.3	2.8	C	H-35.2-3.8A	195.00
37.0—40.8	3.6	3.1	2.7	C	H-38.8-3.6A	195.00
40.8—45.0	3.4	3.0	2.5	C	H-42.8-3.4A	195.00
45.0—50.0	3.1	2.7	2.3	C	H-47.2-3.1A	195.00



CASE D — 26 lbs.
Case size D Dimensions —
3⁹⁄₁₆ x 8 x 16½

0.5—1.2	23.0	20.1	17.2	D	H-0.9-23.0A	$265.00
1.2—1.8	23.0	20.1	17.2	D	H-1.5-23.0A	265.00
1.8—2.3	23.0	20.1	17.2	D	H-2.1-23.0A	265.00
2.3—2.7	23.0	20.1	17.2	D	H-2.5-23.0A	265.00
2.7—3.1	23.0	20.1	17.2	D	H-2.9-23.0A	265.00
3.1—3.5	23.0	20.1	17.2	D	H-3.3-23.0A	265.00
3.5—3.9	23.0	20.1	17.2	D	H-3.7-23.0A	265.00
3.9—4.3	21.1	18.5	15.8	D	H-4.1-21.1A	265.00
4.3—4.7	21.1	18.5	15.8	D	H-4.5-21.1A	265.00
4.7—5.3	21.1	18.5	15.8	D	H-5.0-21.1A	265.00
5.3—5.8	20.0	17.5	15.0	D	H-5.5-20.0A	265.00
5.8—6.4	19.5	17.1	14.6	D	H-6.1-19.5A	265.00
6.4—7.0	19.0	16.6	14.2	D	H-6.7-19.0A	265.00
7.0—7.7	18.0	15.7	13.5	D	H-7.3-18.0A	265.00
7.7—8.5	17.4	15.2	13.0	D	H-8.1-17.4A	265.00
8.5—9.4	16.4	14.3	12.3	D	H-8.9-16.4A	265.00
9.4—10.3	15.6	13.6	11.7	D	H-9.8-15.6A	265.00
10.3—11.4	14.8	12.9	11.1	D	H-10.8-14.8A	265.00
11.4—12.6	14.3	12.5	10.7	D	H-12.0-14.3A	265.00
12.6—13.9	13.7	12.0	10.3	D	H-13.2-13.7A	265.00
13.9—15.3	13.3	11.6	10.0	D	H-14.6-13.3A	265.00
15.3—16.9	12.4	10.8	9.3	D	H-16.1-12.4A	265.00
16.9—18.7	11.8	10.3	8.8	D	H-17.8-11.8A	265.00
18.7—20.6	11.0	9.6	8.2	D	H-19.6-11.0A	265.00
20.6—22.7	10.5	9.2	7.9	D	H-21.6-10.5A	265.00
22.7—25.0	9.5	8.3	7.1	D	H-23.8-9.5A	265.00
25.0—27.6	9.0	7.9	6.7	D	H-26.2-9.0A	265.00
27.6—30.4	8.5	7.4	6.4	D	H-29.0-8.5A	265.00
30.4—33.6	7.7	6.7	5.8	D	H-32.0-7.7A	265.00
33.6—37.0	7.3	6.4	5.5	D	H-35.2-7.3A	265.00
37.0—40.8	7.0	6.1	5.2	D	H-38.8-7.0A	265.00
40.8—45.0	6.6	5.7	4.9	D	H-42.8-6.6A	265.00
45.0—50.0	6.0	5.2	4.5	D	H-47.2-6.0A	265.00



CASE E — 52 lbs.
Case Size E Dimensions
16⅞" wide x 17" deep x 3¹³⁄₃₂" high
Standard 19" panel front mounting

0.5—1.2	46.0	40.2	34.4	E	H-0.9-46.0A	$435.00
1.2—1.8	46.0	40.2	34.4	E	H-1.5-46.0A	435.00
1.8—2.3	46.0	40.2	34.4	E	H-2.1-46.0A	435.00
2.3—2.7	46.0	40.2	34.4	E	H-2.5-46.0A	435.00
2.7—3.1	46.0	40.2	34.4	E	H-2.9-46.0A	435.00
3.1—3.5	46.0	40.2	34.4	E	H-3.3-46.0A	435.00
3.5—3.9	46.0	40.2	34.4	E	H-3.7-46.0A	435.00
3.9—4.3	42.2	37.0	31.6	E	H-4.1-42.2A	435.00
4.3—4.7	42.2	37.0	31.6	E	H-4.5-42.2A	435.00
4.7—5.3	42.2	37.0	31.6	E	H-5.0-42.2A	435.00
5.3—5.8	40.0	35.0	30.0	E	H-5.5-40.0A	435.00
5.8—6.4	39.0	34.2	29.2	E	H-6.1-39.0A	435.00
6.4—7.0	38.0	33.2	28.4	E	H-6.7-38.0A	435.00
7.0—7.7	36.0	31.4	27.0	E	H-7.3-36.0A	435.00
7.7—8.5	34.8	30.4	26.0	E	H-8.1-34.8A	435.00
8.5—9.4	32.8	28.6	24.6	E	H-8.9-32.8A	435.00
9.4—10.3	31.2	27.2	23.4	E	H-9.8-31.2A	435.00
10.3—11.4	29.6	25.8	22.2	E	H-10.8-29.6A	435.00
11.4—12.6	28.6	25.0	21.4	E	H-12.0-28.6A	435.00
12.6—13.9	27.4	24.0	20.6	E	H-13.2-27.4A	435.00
13.9—15.3	26.6	23.2	20.0	E	H-14.6-26.6A	435.00
15.3—16.9	24.8	21.6	18.6	E	H-16.1-24.8A	435.00
16.9—18.7	23.6	20.6	17.6	E	H-17.8-23.6A	435.00
18.7—20.6	22.0	19.2	16.4	E	H-19.6-22.0A	435.00
20.6—22.7	21.0	18.4	15.8	E	H-21.6-21.0A	435.00
22.7—25.0	19.0	16.6	14.2	E	H-23.8-19.0A	435.00
25.0—27.6	18.0	15.8	13.4	E	H-26.2-18.0A	470.00
27.6—30.4	17.0	14.8	12.8	E	H-29.0-17.0A	470.00
30.4—33.6	15.4	13.4	11.6	E	H-32.0-15.4A	470.00
33.6—37.0	14.6	12.8	11.0	E	H-35.2-14.6A	470.00
37.0—40.8	14.0	12.2	10.4	E	H-38.8-14.0A	470.00
40.8—45.0	13.2	11.4	9.8	E	H-42.8-13.2A	470.00
45.0—50.0	12.0	10.4	9.0	E	H-47.2-12.0A	470.00

Standard voltages up to 250 vdc can be furnished upon request, in cases, C, D and E of the "H" Series.

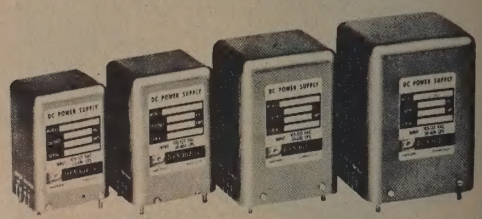
1-9 Net • 10-24 Less 5% • 25 and Above Consult Factory or Area Representative

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

D Series Modular DC Regulated Power Supplies 72-Hour Delivery, Fully Accessible, Fully Repairable, All Silicon

Specifications

Input: 105 — 125 vac, 47 — 420 Hz.
Output (floating): Volts and current: See Table of Models.
Regulation combined:
"A" MODEL — ±0.05% or 1.5 mv, whichever is greater, for a combined ±10 vac input change and 0 to full load change.
STD. MODEL — ±0.5% or 25 mv, whichever is greater, for a combined ±10 vac input change and 0 to ful load change.
Ripple:
"A" MODEL — 0.002% or 1 mv, rms, whichever is greater.
STD. MODEL — 0.01% or 5 mv, rms, whichever is greater.
Temperature Coefficient:
"A" MODEL — ±0.01%/°C or 1.2 mv/°C, whichever is greater, over the range of −20°C to +60°C.
STD. MODEL — ±0.04%/°C or 4.8 mv/°C, whichever is greater, over range −20°C to +60°C.
Voltage Adjustment: ±5% @ rated load.
±10% @ 90% load.
Resolution of Adjustment:
"A" MODEL — 0.4% or 30 mv, whichever is greater.
STD. MODEL — 0.7% or 70 mv, whichever is greater.
Temperature, operating: −20° to +71°C ambient (Base of supply must be held at 80°C or less by heat sinking).
Temperature storage: −62°C to +85°C.
Electronic Short Circuit Protection: Set for approx. 150% rated load.
Overtemperature protection: Provided on all models.
Optional Features — see optional features page.



SIZE G 2.2 lbs.
2-5/8 x 3-1/16 x 4-5/16
SIZE H 3.0 lbs.
3-1/16 x 3-9/16 x 4-15/16
SIZE F 1.9 lbs.
2-3/8 x 2-3/4 x 3-7/8
SIZE J
3-3/8 x 3-15/16

SIZE H (open)

Ordering Information

Output Voltage ±5.0% Range	Output Current Amps	Case Size	Thermal Curve No.	A Model 0.05% Regulation Model	Price
0.5-1.2	0.200	F	1	D—0.9-0.200A	$ 90.00
0.5-1.2	0.300	G	2	D—0.9-0.300A	91.00
0.5-1.2	0.750	H	3	D—0.9-0.750A	96.00
0.5-1.2	1.0	J	4	D—0.9-1.0A	101.00
1.2-1.8	0.200	F	1	D—1.5-0.200A	90.00
1.2-1.8	0.300	G	2	D—1.5-0.300A	91.00
1.2-1.8	0.750	H	3	D—1.5-0.750A	96.00
1.2-1.8	1.0	J	4	D—1.5-1.0A	101.00
1.8-2.3	0.200	F	1	D—2.1-0.200A	90.00
1.8-2.3	0.300	G	2	D—2.1-0.300A	91.00
1.8-2.3	0.750	H	3	D—2.1-0.750A	96.00
1.8-2.3	1.0	J	4	D—2.1-1.0A	101.00
2.3-2.7	0.200	F	1	D—2.5-0.200A	90.00
2.3-2.7	0.300	G	2	D—2.5-0.300A	91.00
2.3-2.7	0.750	H	3	D—2.5-0.750A	96.00
2.3-2.7	1.0	J	4	D—2.5-1.0A	101.00
2.7-3.1	0.200	F	1	D—2.9-0.200A	90.00
2.7-3.1	0.300	G	2	D—2.9-0.300A	91.00
2.7-3.1	0.750	H	3	D—2.9-0.750A	96.00
2.7-3.1	1.0	J	4	D—2.9-1.0A	101.00
3.1-3.5	0.200	F	1	D—3.3-0.200A	90.00
3.1-3.5	0.300	G	2	D—3.3-0.300A	91.00
3.1-3.5	0.750	H	3	D—3.3-0.750A	96.00
3.1-3.5	1.0	J	4	D—3.3-1.0A	101.00
3.5-3.9	0.200	F	1	D—3.7-0.200A	90.00
3.5-3.9	0.300	G	2	D—3.7-0.300A	91.00
3.5-3.9	0.750	H	3	D—3.7-0.750A	96.00
3.5-3.9	1.0	J	4	D—3.7-1.0A	101.00

Output Voltage ±5.0% Range	Output Current Amps	Case Size	Thermal Curve No.	A Model 0.05% Regulation Model	Pr
3.9-4.3	0.200	F	1	D—4.1-0.200A	$ 90
3.9-4.3	0.300	G	2	D—4.1-0.300A	91
3.9-4.3	0.750	H	3	D—4.1-0.750A	96
3.9-4.3	1.0	J	4	D—4.1-1.0A	101
4.3-4.7	0.200	F	1	D—4.5-0.200A	90
4.3-4.7	0.300	G	2	D—4.5-0.300A	91
4.3-4.7	0.750	H	4	D—4.5-0.750A	96
4.3-4.7	1.0	J	4	D—4.5-1.0A	101
4.7-5.2	0.200	F	1	D—5.0-0.200A	90
4.7-5.2	0.300	G	2	D—5.0-0.300A	91
4.7-5.2	0.500	H	3	D—5.0-0.500A	96
4.7-5.2	0.750	H	4	D—5.0-0.750A	96
4.7-5.2	1.0	J	5	D—5.0-1.0A	101
5.2-5.8	0.200	F	1	D—5.5-0.200A	90
5.2-5.8	0.300	G	2	D—5.5-0.300A	91
5.2-5.8	0.500	H	3	D—5.5-0.500A	96
5.2-5.8	0.750	H	4	D—5.5-0.750A	96
5.2-5.8	1.0	J	5	D—5.5-1.0A	101
5.8-6.4	0.200	F	2	D—6.1-0.200A	90
5.8-6.4	0.300	G	2	D—6.1-0.300A	91
5.8-6.4	0.500	H	3	D—6.1-0.500A	96
5.8-6.4	0.750	H	4	D—6.1-0.750A	96
5.8-6.4	1.0	J	5	D—6.1-1.0A	101
6.4-7.0	0.200	F	2	D—6.7-0.200A	90
6.4-7.0	0.300	G	2	D—6.7-0.300A	91
6.4-7.0	0.500	H	3	D—6.7-0.500A	96
6.4-7.0	0.750	H	4	D—6.7-0.750A	96
6.4-7.0	1.0	J	5	D—6.7-1.0A	101

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

Ordering Information

put tage :0% ge	Output Current Amps	Case Size	Thermal Curve No.	A Model 0.05% Regulation Model	Price	Standard Model 0.5% Regulation Model	Price
)- 7.7	0.150	F	1	D— 7.3-0.150A	$ 90.00	—	—
)- 7.7	0.300	G	2	D— 7.3-0.300A	91.00	—	—
)- 7.7	0.500	H	3	D— 7.3-0.500A	96.00	—	—
)- 7.7	0.750	H	4	D— 7.3-0.750A	96.00	—	—
)- 7.7	1.0	J	5	D— 7.3-1.0A	101.00	—	—
- 8.5	0.150	F	1	D— 8.1-0.150A	90.00	—	—
- 8.5	0.300	G	2	D— 8.1-0.300A	91.00	—	—
- 8.5	0.500	H	3	D— 8.1-0.500A	96.00	—	—
- 8.5	0.750	H	4	D— 8.1-0.750A	96.00	—	—
- 8.5	1.0	J	5	D— 8.1-1.0A	101.00	—	—
)- 9.4	0.150	F	1	D— 8.9-0.150A	90.00	—	—
)- 9.4	0.300	G	2	D— 8.9-0.300A	91.00	—	—
)- 9.4	0.500	H	3	D— 8.9-0.500A	96.00	—	—
)- 9.4	0.750	H	4	D— 8 9-0.750A	96.00	—	—
)- 9.4	1.0	J	5	D— 8.9-1.0A	101.00	—	—
-10.3	0.150	F	1	D— 9.8-0.150A	90.00	D— 9.8-0.150	$ 69.00
-10.3	0.300	G	2	D— 9.8-0.300A	91.00	D— 9.8-0.300	70.00
-10.3	0.500	H	3	D— 9.8-0.500A	96.00	D— 9.8-0.500	77.00
-10.3	0.750	J	5	D— 9.8-0.750A	101.00	D— 9.8-0.750	81.00
1 -11.4	0.100	F	1	D—10.8-0.100A	90.00	D—10.8-0.100	69.00
1 -11.4	0.200	F	2	D—10.8-0.200A	90.00	D—10.8-0.200	69.00
1 -11.4	0.300	G	3	D—10.8-0.300A	91.00	D—10.8-0.300	70.00
1 -11.4	0.500	H	4	D—10.8-0.500A	96.00	D—10.8-0.500	77.00
1 -11.4	0.750	J	5	D—10.8-0.750A	101.00	D—10.8-0.750	81.00
1 -12.6	0.100	F	1	D—12.0-0.100A	76.00	D—12.0-0.100	69.00
1 -12.6	0.200	G	2	D—12.0-0.200A	81.00	D—12.0-0.200	70.00
1 -12.6	0.300	G	2	D—12.0-0.300A	81.00	D—12.0-0.300	70.00
1 -12.6	0.500	H	4	D—12.0-0.500A	89.00	D—12.0-0.500	77.00
1 -12.6	0.750	J	5	D—12.0-0.750A	105.00	D—12.0-0.750	81.00
1 -13.9	0.075	F	1	D—13.2-0.075A	76.00	D—13.2-0.075	69.00
1 -13.9	0.150	F	2	D—13.2-0.150A	76.00	D—13.2-0.150	69.00
1 -13.9	0.200	G	2	D—13.2-0.200A	81.00	D—13.2-0.200	70.00
1 -13.9	0.300	H	3	D—13.2-0.300A	89.00	D—13.2-0.300	77.00
1 -13.9	0.500	H	4	D—13.2-0.500A	89.00	D—13.2-0.500	77.00
1 -13.9	0.750	J	5	D—13.2-0.750A	105.00	D—13.2-0.750	81.00
1 -15.3	0.075	F	1	D—14.6-0.075A	76.00	D—14.6-0.075	69.00
1 -15.3	0.150	F	2	D—14.6-0.150A	76.00	D—14.6-0.150	69.00
1 -15.3	0.200	G	2	D—14.6-0.200A	81.00	D—14.6-0.200	70.00
1 -15.3	0.300	H	• 3	D—14.6-0.300A	89.00	D—14.6-0.300	77.00
1 -15.3	0.500	H	4	D—14.6-0.500A	89.00	D—14.6-0.500	77.00
1 -15.3	0.750	J	5	D—14.6-0.750A	105.00	D—14.6-0.750	81.00
1 -16.9	0.075	F	1	D—16.1-0.075A	76.00	D—16.1-0.075	69.00
1 -16.9	0.150	F	2	D—16.1-0.150A	76.00	D—16.1-0.150	69.00
1 -16.9	0.200	G	2	D—16.1-0.200A	81.00	D—16.1-0.200	70.00
1 -16.9	0.300	H	3	D—16.1-0.300A	89.00	D—16.1-0.300	77.00
1 -16.9	0.500	H	4	D—16.1-0.500A	89.00	D—16.1-0.500	77.00
1 -16.9	0.750	J	5	D—16.1-0.750A	105.00	D—16.1-0.750	81.00
1 -18.7	0.075	F	1	D—17 8-0.075A	76.00	D—17.8-0.075	69.00
1 -18.7	0.150	F	2	D—17.8-0.150A	76.00	D—17.8-0.150	69.00
1 -18.7	0.200	G	2	D—17.8-0.200A	81.00	D—17.8-0.200	70.00
1 -18.7	0.300	H	3	D—17.8-0.300A	89.00	D—17.8-0.300	77.00
1 -18.7	0.500	J	4	D—17.8-0.500A	105.00	D—17.8-0.500	81.00
1 -18.7	0.750	J	6	D—17.8-0.750A	105.00	D—17.8-0.750	81.00
1 -20.6	0.075	F	1	D—19.6-0.075A	76.00	D—17.8-0.075	69.00
1 -20.6	0.150	F	2	D—19.6-0.150A	76.00	D—19.6-0.150	69.00
1 -20.6	0.200	G	2	D—19.6-0.200A	81.00	D—19.6-0.200	70.00
1 -20.6	0.300	H	3	D—19.6-0.300A	89.00	D—19.6-0.300	77.00
1 -20.6	0.500	J	5	D—19.6-0.500A	105.00	D—19.6-0.500	81.00
1 -20.6	0.750	J	6	D—19.6-0.750A	105.00	D—19.6-0.750	81.00
2 -22.7	0.050	F	1	D—21.6-0.050A	76.00	D—21.6-0.050	69.00
2 -22.7	0.100	F	2	D—21.6-0.100A	76.00	D—21.6-0-100	69.00
2 -22.7	0.150	G	2	D—21.6-0.150A	81.00	D—21.6-0.150	70.00
2 -22.7	0.200	G	2	D—21.6-0.200A	81.00	D—21.6-0.200	70.00
2 -22.7	0.300	H	3	D—21.6-0.300A	89.00	D—21.6-0.300	77.00
2 -22.7	0.500	J	5	D—21.6-0.500A	105.00	D—21.6-0.500	81.00
2 -22.7	0.750	J	6	D—21.6-0.750A	105.00	D—21.6-0.750	81.00
2 -25.0	0.050	F	1	D—23.8-0.050A	80.00	D—23.8-0.050	73.00
2 -25.0	0.100	F	2	D—23.8-0.100A	80.00	D—23.8-0.100	73.00
2 -25.0	0.150	G	2	D—23.8-0.150A	83.00	D—23.8-0.150	74.00
2 -25.0	0.200	G	2	D—23.8-0.200A	83.00	D—23.8-0.200	74.00
2 -25.0	0.300	H	4	D—23.8-0.300A	93.00	D—23.8-0.300	83.00
2 -25.0	0.500	J	5	D—23.8-0.500A	108.00	D—23.8-0.500	87.00
2 -27.6	0.050	F	1	D—26.2-0.050A	80.00	D—26.2-0.050	73.00
2 -27.6	0.100	F	2	D—26.2-0.100A	80.00	D—26.2-0.100	73.00
2 -27.6	0.150	G	2	D—26.2-0.150A	83.00	D—26.2-0.150	74.00
2 -27.6	0.200	G	3	D—26.2-0.200A	83.00	D—26.2-0.200	74.00
2 -27.6	0.300	H	4	D—26.2-0.300A	93.00	D—26.2-0.300	83.00
2 -27.6	0.500	J	5	D—26.2-0.500A	108.00	D—26.2-0.500	87.00
2 -30.4	0.050	F	1	D—29.0-0.050A	80.00	D—29.0-0.050	73.00
2 -30.4	0.100	F	2	D—29.0-0.100A	80.00	D—29.0-0.100	73.00
2 -30.4	0.150	G	2	D—29.0-0.150A	85.00	D—29.0-0.150	74.00
2 -30.4	0.200	G	3	D—29.0-0.200A	85.00	D—29.0-0.200	74.00
2 -30.4	0.300	H	4	D—29.0-0.300A	96.00	D—29.0-0.300	83.00
2 -30.4	0.500	J	6	D—29.0-0.500A	111.00	D—29.0-0.500	87.00

Output Voltage ±5.0% Range	Output Current Amps	Case Size	Thermal Curve No.	A Model 0.05% Regulation Model	Price	Standard Model 0.5% Regulation Model	Price
30.4-33.6	0.050	F	1	D—32.0-0.050A	$ 80.00	D—32.0-0.050	$ 73.00
30.4-33.6	0.100	F	2	D—32.0-0.100A	80.00	D—32.0-0.100	73.00
30.4-33.6	0.150	G	2	D—32.0-0.150A	85.00	D—32.0-0.150	74.00
30.4-33.6	0.200	G	3	D—32.0-0.200A	85.00	D—32.0-0.200	74.00
30.4-33.6	0.300	H	4	D—32.0-0.300A	96.00	D—32.0-0.300	83.00
30.4-33.6	0.500	J	6	D—32.0-0.500A	111.00	D—32.0-0.500	87.00
33.6-37.0	0.050	F	1	D—35.2-0.050A	80.00	D—35.2-0.050	73.00
33.6-37.0	0.100	F	2	D—35.2-0.100A	80.00	D—35.2-0.100	73.00
33.6-37.0	0.150	G	3	D—35.2-0.150A	85.00	D—35.2-0.150	74.00
33.6-37.0	0.200	G	3	D—35.2-0.200A	85.00	D—35.2-0.200	74.00
33.6-37.0	0.300	H	4	D—35.2-0.300A	96.00	D—35.2-0.300	83.00
33.6-37.0	0.500	J	6	D—35.2-0.500A	111.00	D—35.2-0.500	87.00
37.0-40.8	0.050	F	1	D—38.8-0.050A	80.00	D—38.8-0.050	73.00
37.0-40.8	0.100	F	2	D—38.8-0.100A	80.00	D—38.8-0.100	73.00
37.0-40.8	0.150	G	3	D—38.8-0.150A	85.00	D—38.8-0.150	74.00
37.0-40.8	0.200	G	4	D—38.8-0.200A	85.00	D—38.8-0.200	74.00
37.0-40.8	0.300	J	5	D—38.8-0.300A	111.00	D—38.8-0.300	87.00
40.8-45.0	0.050	F	1	D—42.8-0.050A	80.00	D—42.8-0.050	73.00
40.8-45.0	0.075	F	2	D—42.8-0.075A	80.00	D—42.8-0.075	73.00
40.8-45.0	0.100	G	2	D—42.8-0.100A	85.00	D—42.8-0.100	74.00
40.8-45.0	0.150	G	3	D—42.8-0.150A	85.00	D—42.8-0.150	74.00
40.8-45.0	0.200	H	4	D—42.8-0.200A	96.00	D—42.8-0.200	83.00
40.8-45.0	0.300	J	5	D—42.8-0.300A	111.00	D—42.8-0.300	87.00
45.0-49.5	0.050	F	1	D—47.2-0.050A	80.00	D—47.2-0.050	73.00
45.0-49.5	0.075	F	2	D—47.2-0.075A	80.00	D—47.2-0.075	73.00
45.0-49.5	0.100	G	2	D—47.2-0.100A	85.00	D—47.2-0.100	74.00
45.0-49.5	0.150	G	3	D—47.2-0.150A	85.00	D—47.2-0.150	74.00
45.0-49.5	0.200	H	4	D—47.2-0.200A	96.00	D—47.2-0.200	83.00
45.0-49.5	0.300	J	5	D—47.2-0.300A	111.00	D—47.2-0.300	87.00
49.5-54.5	0.050	F	1	D—52.0-0.050A	80.00	D—52.0-0.050	73.00
49.5-54.5	0.075	F	2	D—52.0-0.075A	80.00	D—52.0-0.075	73.00
49.5-54.5	0.100	G	2	D—52.0-0.100A	85.00	D—52.0-0.100	74.00
49.5-54.5	0.150	H	3	D—52.0-0.150A	96.00	D—52.0-0.150	83.00
49.5-54.5	0.200	H	4	D—52.0-0.200A	96.00	D—52.0-0.200	83.00
49.5-54.5	0.300	J	6	D—52.0-0.300A	111.00	D—52.0-0.300	87.00
54.5-60.0	0.050	F	1	D—57.2-0.050A	80.00	D—57.2-0.050	73.00
54.5-60.0	0.075	F	2	D—57.2-0.075A	80.00	D—57.2-0.075	73.00
54.5-60.0	0.100	G	2	D—57.2-0.100A	85.00	D—57.2-0.100	74.00
54.5-60.0	0.150	H	3	D—57.2-0.150A	96.00	D—57.2-0.150	83.00
54.5-60.0	0.200	H	4	D—57.2-0.200A	96.00	D—57.2-0.200	83.00
60.0-66.1	0.075	F	2	D—63.0-0.075A	97.00	D—63.0-0.075	95.00
60.0-66.1	0.100	G	2	D—63.0-0.100A	105.00	D—63.0-0.100	102.00
60.0-66.1	0.200	H	4	D—63.0-0.200A	125.00	D—63.0-0.200	122.00
66.1-72.8	0.050	F	2	D—69.5-0.050A	97.00	D—69.5-0.050	95.00
66.1-72.8	0.100	G	2	D—69.5-0.100A	105.00	D—69.5-0.100	102.00
66.1-72-8	0.200	H	4	D—69.5-0.200A	125.00	D—69.5-0.200	122.00
72.8-80.1	0.050	F	2	D—76.5-0.050A	97.00	D—76.5-0.050	95.00
72.8-80.1	0.100	G	3	D—76.5-0.100A	105.00	D—76.5-0.100	102.00
72.8-80.1	0.150	H	4	D—76.5-0.150A	125.00	D—76.5-0.150	122.00
80.1-88.2	0.050	F	2	D—84.2-0.050A	97.00	D—84.2-0.050	95.00
80.1-88.2	0.100	G	3	D—84.2-0.100A	105.00	D—84.2-0.100	102.00
80.1-88.2	0.150	H	4	D—84.2-0.150A	125.00	D—84.2-0.150	122.00
88.2-97.1	0.050	F	2	D—92.6-0.050A	97.00	D—92.6-0.050	95.00
88.2-97.1	0.100	G	3	D—92.6-0.100A	105.00	D—92.6-0.100	102.00
88.2-97.1	0.150	H	4	D—92.6-0.150A	125.00	D—92.6-0.150	122.00
97.1-106.8	0.025	F	1	D—102-0.025A	97.00	D—102-0.025	95.00
97.1-106.8	0.050	G	2	D—102-0.050A	105.00	D—102-0.050	102.00
97.1-106.8	0.100	H	3	D—102-0.100A	125.00	D—102-0.100	122.00
106.8-117.2	0.025	F	1	D—112-0.025A	97.00	D—112-0.025	95.00
106.8-117.2	0.050	G	2	D—112-0.050A	105.00	D—112-0.050	102.00
106.8-117.2	0.100	H	4	D—112-0.100A	125.00	D—112-0.100	122.00
117.2-128.7	0.025	F	1	D—123-0.025A	97.00	D—123-0.025	95.00
117.2-128.7	0.050	G	2	D—123-0.050A	105.00	D—123-0.050	102.00
117.2-128.7	0.100	H	4	D—123-0.100A	125.00	D—123-0.100	122.00
128.7-141.6	0.050	G	2	D—135-0.050A	115.00	D—135-0.050	112.00
128.7-141.6	0.100	H	4	D—135-0.100A	146.00	D—135-0.100	137.00
141.6-156.1	0.050	G	2	D—149-0.050A	115.00	D—149-0.050	112.00
141.6-156.1	0.075	H	3	D—149-0.075A	146.00	D—149-0.075	137.00
156.1-172.1	0.050	G	3	D—164-0.050A	115.00	D—164-0.050	112.00
156.1-172.1	0.075	H	4	D—164-0.075A	146.00	D—164-0.075	137.00
172.1-189.6	0.025	G	2	D—181-0.025A	125.00	D—181-0.025	117.00
172.1-189.6	0.075	H	4	D—181-0.075A	150.00	D—181.0.075	142.00
189.6-208	0.025	G	2	D—199-0.025A	125.00	D—199.0-0.025	117.00
189.6-208	0.050	G	3	D—199-0.025A	150.00	D—199.0-0.050	142.00
208-228.5	0.025	G	2	D—218-0.025A	130.00	D—218-0.025	122.00
208-228.5	0.050	H	3	D—218-0.050A	155.00	D—218-0.050	147.00
228.5-252	0.025	G	2	D—240-0.025A	130.00	D—240-0.025	122.00
228.5-252	0.050	H	4	D—240-0.050A	155.00	D—240-0.050	147.00

-9 Net • 10-24 Less 5% • 25 and Above Consult Factory or Area Representative

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

K & KH Series Dual Output Modular DC Power Supplies 72-Hour Delivery, Fully Repairable

Specifications

Input: 105-125 VAC, 47-420 Hz.

Output: Volts and current: See model description. Master output (positive voltage) adjustable.
Slave output (negative voltage) set within ±1% of master output.

Regulation, combined: ±0.1% for a combined ±10 VAC input change and 0 to full load change.

Ripple: 2 mv, rms.

Tracking: Negative output will track with positive output to within ±0.02%/°C.

Temperature Coefficient: ±0.03%/°C, over range −20°C to +60°C.

Voltage adjustment: ±1 VDC.

Temperature, operating: −20°C to +71°C (Base of K series enclosures must be held at 80°C or less by heat sinking).

Electronic Short Circuit Protection: Set for approximately 150% rated load.

Overtemperature protection: Provided on all models.

Resolution of Adjustment: 70 MV.

K Series Model	Output Voltage Range	Output Current Amps.	Case Size	Thermal Curve No.	Price
K-10/10 — 0.175/0.175	9.0 — 11.0	0.175	G	2	$117.00
K-10/10 — 0.60/0.60	9.0 — 11.0	0.600	J	6	155.00
K-12/12 — 0.15/0.15	11.0 — 13.0	0.150	G	2	117.00
K-12/12 — 0.50/0.50	11.0 — 13.0	0.500	J	6	155.00
K-15/15 — 0.15/0.15	14.0 — 16.0	0.150	G	2	117.00
K-15/15 — 0.50/0.50	14.0 — 16.0	0.500	J	6	155.00

SIZE G

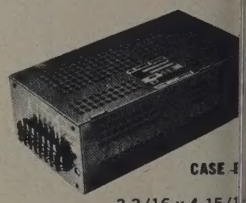
2-5/8 x 3-1/16 x 4-5/16

SIZE J

3-3/8 x 3-15/16 x

SIZE G (open)

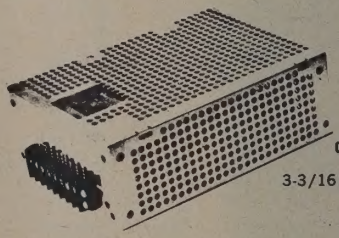
KH Series Model	Output Voltage Range	Output Current (Amps.) At 50°C	At 60°C	At 71°C	Case Size	Price
KH — 10/10	9.0 — 11.0	2.0	1.7	1.4	B	$225.00
KH — 12/12	11.0 — 13.0	1.8	1.5	1.3	B	225.00
KH — 15/15	14.0 — 16.0	1.6	1.4	1.2	B	225.00



CASE B

3-3/16 x 4-15/1

KHC Series Model	Output Voltage Range	Output Current (Amps.) At 50°C	At 60°C	At 71°C	Case Size	Price
KHC — 10/10	9.0 — 11.0	4.0	3.5	3.0	C	$295.00
KHC — 12/12	11.0 — 13.0	3.8	3.3	2.8	C	295.00
KHC — 15/15	14.0 — 16.0	3.4	3.0	2.5	C	295.00



CASE C

3-3/16 x 7-1/8 x 9-5/8

Optional Features — see optional features page.

Special Voltages and Currents available on request in quantities of 25 units or more.

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

Optional Features

OVED COMBINED VOLTAGE REGULATION,
& KH SERIES ONLY
Suffix "A" — Added Cost $10.00
ombined voltage regulation of ±0.05%. To order add a suffix "A" to the odel number

& H SERIES ONLY
Suffix "AA" — Added Cost $10.00 or 5% whichever is greater
ombined voltage regulation of ±0.025% or ±0.75 mv, whichever is reater.

Suffix "AAA" — Added Cost $30.00 or 15% whichever is greater
ombined voltage regulation of ±0.01% or ±0.5 mv, whichever is greater. his feature should only be ordered in conjunction with suffixes "F" or FF" or "R" or "P" and "T".

OUTPUT
Suffix "F" — No Added Cost
utput fixed as specified within model range to ±1% or ±50 mv, whichver is greater.

Suffix "FF" — Added Cost $5.00 or 3% whichever is greater
utput fixed as specified within Model range to ±0.25% or ±15 mv, whichver is greater.

TE SENSING Suffix S — Added Cost $5.00
ERIES
wo (2) additional terminals are provided in the base of the supply for onnection to the remotely located load. Voltage drops in the load lines hould not be allowed to exceed 0.5 vdc. Remote sensing leads should be hielded on long runs to prevent pickup into the amplifier circuitry of e supply.

ERIES
hree (3) additional terminals are provided in the base of the supply for onnection to the remotely located load. Voltage drops in the load lines hould not be allowed to exceed 0.5 VDC. Remote sensing leads should e shielded on long runs to prevent pickup into the amplifier circuitry of e supply.

SERIES
hree (3) extra terminals are provided above the connection for connection the remotely located load. Voltage drops in the load lines should not be llowed to exceed 0.5 VDC. Remote sensing leads should be shielded on ng runs to prevent pick-up into the amplifier circuitry of the supply.

TE PROGRAMMING, Suffix "P" — Added Cost $5.00 (D Series ly; Standard on H Series)
wo (2) extra terminals are provided in the base of the supply for conection of the remotely located trimpot. The standard internal trimpot will e shipped as a separate item with the supply. Use shielded leads on long ns to prevent pick-up into the amplifier circuitry of the supply. Proamming resistance is as follows:

Output Voltage Model Group	Programming Resistance, ohms/volt "A" Models	Std. Models
0.9 to 10.8	180 to 200	—
12.0 to 57.2	180 to 200	84 to 102
63.0 to 240	300 to 333	260 to 340

Suffix "P" to the model number when ordering

TE PROGRAMMING, MASTER OUTPUT ONLY,
eries Only, Suffix "P" Added Cost $5.00
e (1) extra terminal is provided in the base of the supply for connection the remotely located trimpot. The standard internal potentiometer will be ipped as a separate item with the supply. Programming resistance is 84 102 ohms/volt. Use shielded leads on long runs to prevent pickup into e amplifier circuitry of the supply. Add suffix "P" to the model number.

T-IN OVERVOLTAGE PROTECTION, Suffix "D" (H Series and J of D Series). Added Cost $30.00 or 15% whichever is greater.
is feature will drive the output voltage towards zero by electronically orting the output, if the output increases above the preset level of 125% 135% of the nominal output voltage. Protection level can be set to other lues within a setting accuracy of +5%. The supply must be turned "off" d then "on" to restore the output after the protection circuit has opated. This feature is available on the J Size "A" Model, and all H Series odules only. Minimum voltage set point 5.5 vdc.

AC INPUT — Suffix "N". H Series Only
d $5.00 when ordered in A and B case sizes. No additional charge when dered in C, D and E case sizes.

INPUT RANGE — Suffix "W" Added Cost $10.00 or 8% whichr is greater.
is feature will allow an expanded input voltage range of 95 vac to 132 c at 57-63 Hz. Derate output current by 25% on all models.

SERIES CONNECTION, Suffix "B"
Added Cost $5.00 or 3%, whichever is greater (D and H Series only).
The supplies will operate into either conventional or complex loads with series connection. When connecting units in series to achieve higher voltage levels, the power supplies must have equal current ratings. In addition, if the power supplies are to operate greater than 500 vdc above ground, then contact Dynage before proceeding to be advised of the proper procedure and precautions to be used.

FUNGUS PROOFING, Suffix "V"
Added Cost $10.00 or 3% whichever is greater
MIL-V-173 varnish is used for fungi nutrient components.

IMPROVED RESOLUTION OF ADJUSTMENT, Suffix "R"
Added Cost $10.00 or 5% whichever is greater
Improved resolution of output voltage adjustment can be obtained on the "A" models only by adding suffix "R" to the model number. The resolution and adjust span are listed opposite the range of nominal output voltages of the supplies. Specify the nominal output required when ordering. Available on "A" models only.

D & H SERIES

Output Voltage Model Group	Adjust Span, mv	Resolution (whichever is greater)
0.9 to 4.1 vdc	± 50	1 mv
4.5 to 6.7 vdc	± 75	1 mv
7.3 to 10.8 vdc	± 100	0.01% or 1 mv
12.0 to 19.6	± 200	10 mv
21.6 to 38.8	± 400	0.05% or 16 mv
42.8 to 92.6	± 1000	31 mv
102 to 199	± 2000	39 mv
218 to 240	± 4000	67 mv

K & KH SERIES

±10	±250	12 MV
±12	±250	12 MV
±15	±250	12 MV

IMPROVED TRACKING, "K" Series only Added Cost $20.00
Tracking of the −15 vdc output to the +15 VDC output within ±0.005%/°C. To order add a suffix "K" to the model number.

LOWER TEMPERATURE COEFFICIENT,
"K" Series only Added Cost $10.00
Temperature coefficient of ±0.015%/°C over the range of −20°C to +60°C. To order add a suffix "T" to the model number.

LOWER TEMPERATURE COEFFICIENT
D SERIES ONLY

Suffix	Temperature Coefficient (whichever is greater)	Range, °C	Added Cost
"T"	±0.005%/°C or ±0.6 mv/°C	−20 to 60	$20.00 or 10%
*"TT"	±0.002%/°C or ±0.24 mv/°C	0 to 50	25.00 or 15%
*"TTT"	±0.001%/°C or ±0.12 mv/°C	0 to 50	50.00 or 50%

*Suffixes "TT" and "TTT" are only available in conjunction with the following other optional features. Suffix "F" or "FF" or "R" or "P".

LONG TERM STABILITY
D SERIES ONLY

Suffix	Long Term Stability (whichever is greater)	Short Term Stability (whichever is greater)	Added Cost
*"H"	±0.05% or ±6 mv/month	±0.01% is ±1.2 mv/8 hrs.	$30.00 or 20%
*"HH"	±0.02% or ±2.4 mv/month	±0.004% or ±0.5 mv/8 hrs.	50.00 or 50%
**"HHH"	±0.005% or ±0.6 mv/month	±0.001% or ±0.12 mv/8 hrs.	90.00 or 100%

*Suffixes "H" and "HH" are only available in conjunction with Suffix "TT" (and other required Suffixes).
**Suffix "HHH" is only available in conjunction with Suffix "TTT" (and other required Suffixes).

Ordering Information

Terms

Terms are net 30 days, F.O.B. Bloomfield, Conn. Prices and specifications subject to change without notice. Blanket purchase agreements with releases over one (1) year are easily arranged.

Warranty

Dynage, Inc., warrants each product manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing, adjusting or replacing any product returned to the factory for that purpose within two (2) years after date of shipment. We assume no liability for consequential damages of any kind, and the purchaser, by acceptance of each product will assume all liability for the consequence of its use or misuse by the purchaser, his employees, or others.

rder

ify power supply by model number along with suffixes for any optional eures required. As an example, to order Model D-14.6 — 0.200A with oved 0.01% regulation (Suffix "AAA"), with fixed output, (Suffix "F"), with 0.002% temperature coefficient (Suffix "TT"); the complete model ber would be D-14.6 - 0.200AAAFTT.

nty-two (72) hour delivery can be made on quantities of 2 pieces or e of each model ordered, except those with optional features.
ne drawings and parts lists only furnished when requested.

mixed models and optional feature discounts, consult local rep or age directly.

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

DC Voltage Reference Standards—The Ultimate Solution to DC Voltage Reference Requirements

201 SERIES, DC INPUT, NO COMMON TERMINALS, dimensions in Figure 1

Model No.	Input Volts	VA	Output DC Volts ±5%	Load Ohms Constant	Thermal Stability %/°C	†Short Term Voltage Regulation %/2 min.	Long Term† Voltage Regulation %/hr.	Temp. Range °C	Price
201	28	.8	6.2	6200	±.001	±.0015	±.005	10 to 50	$47.00
201A	28	.8	6.2	6200	±.0005	±.0015	±.0035	10 to 50	52.00
201B	28	.8	6.2	6200	±.001	±.0015	±.005	−25 to 75	52.00
201C	28	.8	6.2	6200	±.0002	±.0015	±.0026	20 to 30	52.00

210 SERIES, DC INPUT, POSITIVE TERMINALS COMMON, dimensions in Figure 2

211	30	.8	6.2	6200	±.001	±.0005	±.004	10 to 50	$55.00
211A	30	.8	6.2	6200	±.0005	±.0005	±.0025	10 to 50	61.00
211B	30	.8	6.2	6200	±.001	±.0005	±.004	−25 to 75	61.00
211C	30	.8	6.2	6200	±.0002	±.0005	±.0016	20 to 30	61.00
212	38	1.0	12.4	11700	±.001	±.0005	±.004	10 to 50	60.00
212A	38	1.0	12.4	11700	±.0005	±.0005	±.0025	10 to 50	66.00
212B	38	1.0	12.4	11700	±.001	±.0005	±.004	−25 to 75	66.00
212C	38	1.0	12.4	11700	±.0002	±.0005	±.0016	20 to 30	66.00
213	46	1.3	18.6	17900	±.001	±.0005	±.004	10 to 50	65.00
213A	46	1.3	18.6	17900	±.0005	±.0005	±.0025	10 to 50	72.00
213B	46	1.3	18.6	17900	±.001	±.0005	±.004	−25 to 75	72.00
213C	46	1.3	18.6	17900	±.0002	±.0005	±.0016	20 to 30	72.00

230 SERIES, DC INPUT, POSITIVE TERMINALS COMMON, dimensions in Figure 2

231	38	1.5	6.2	620	±.001	±.0005	±.004	10 to 50	$55.00
231A	38	1.5	6.2	620	±.0005	±.0005	±.0025	10 to 50	61.00
231B	38	1.5	6.2	620	±.001	±.0005	±.004	−25 to 75	61.00
231C	38	1.5	6.2	620	±.0002	±.0005	±.0016	20 to 30	61.00
232	46	1.8	12.4	1170	±.001	±.0005	±.004	10 to 50	60.00
232A	46	1.8	12.4	1170	±.0005	±.0005	±.0025	10 to 50	66.00
232B	46	1.8	12.4	1170	±.001	±.0005	±.004	−25 to 75	66.00
232C	46	1.8	12.4	1170	±.0002	±.0005	±.0016	20 to 30	66.00

202 SERIES, AC INPUT, 50-400 CPS, OUTPUT ISOLATED,* RIPPLE 0.023% (rms), dimensions in Figure 3

Model No.	Input Volts	VA	Output DC Volts ±5%	Load Ohms Constant	Thermal Stability %/°C	†Short Term Voltage Regulation %/2 min.	Long Term† Voltage Regulation %/hr.	Temp. Range °C	Price
202	117	3.5	6.2	6200	±.001	±.0015	±.005	10 to 50	$71.00
202A	117	3.5	6.2	6200	±.0005	±.0015	±.0035	10 to 50	78.00
202B	117	3.5	6.2	6200	±.001	±.0015	±.005	−25 to 75	78.00
202C	117	3.5	6.2	6200	±.0002	±.0015	±.0026	20 to 30	78.00

220 SERIES, AC INPUT, 50-400 CPS, OUTPUT ISOLATED,* RIPPLE 0.003% (rms), dimensions in Figure 3

221	117	3.5	6.2	6200	±.001	±.0005	±.004	10 to 50	$79.00
221A	117	3.5	6.2	6200	±.0005	±.0005	±.0025	10 to 50	87.00
221B	117	3.5	6.2	6200	±.001	±.0005	±.004	−25 to 75	87.00
221C	117	3.5	6.2	6200	±.0002	±.0005	±.0016	20 to 30	87.00
222	117	3.5	12.4	11700	±.001	±.0005	±.004	10 to 50	84.00
222A	117	3.5	12.4	11700	±.0005	±.0005	±.0025	10 to 50	93.00
222B	117	3.5	12.4	11700	±.001	±.0005	±.004	−25 to 75	93.00
222C	117	3.5	12.4	11700	±.0002	±.0005	±.0016	20 to 30	93.00
223	117	3.5	18.6	17900	±.001	±.0005	±.004	10 to 50	89.00
223A	117	3.5	18.6	17900	±.0005	±.0005	±.0015	10 to 50	98.00
223B	117	3.5	18.6	17900	±.001	±.0005	±.004	−25 to 75	98.00
223C	117	3.5	18.6	17900	±.0002	±.0005	±.0016	20 to 30	98.00

240 SERIES, AC INPUT, 50-400 CPS, OUTPUT ISOLATED,* RIPPLE 0.002% (rms), dimensions in Figure 3

241	117	4.4	6.2	620	±.001	±.0005	±.004	10 to 50	$79.00
241A	117	4.4	6.2	620	±.0005	±.0005	±.0025	10 to 50	87.00
241B	117	4.4	6.2	620	±.001	±.0005	±.004	−25 to 75	87.00
241C	117	4.4	6.2	620	±.0002	±.0005	±.0016	20 to 30	87.00
242	117	4.4	12.4	1170	±.001	±.0005	±.004	10 to 50	84.00
242A	117	4.4	12.4	1170	±.0005	±.0005	±.0025	10 to 50	93.00
242B	117	4.4	12.4	1170	±.001	±.0005	±.004	−25 to 75	93.00
242C	117	4.4	12.4	1170	±.0002	±.0005	±.0016	20 to 30	93.00

* Output Isolation: 0.5 μa (rms) ac leakage current through one (1) megohm resistor connected from either output to ground.
† Voltage Regulation: For a ±10% input change.

210, 230 Series DC Input

201 Series DC Input

202, 220, 240 Series AC Input

FEATURING

- Reference voltages of 6.2, 12.4, 18.6 vdc
- ±50 ppm or better, long term stability (See optional featu
- Voltage Regulation (short term) against line changes ±5 for ±10% input changes (except 201 & 202 series)
- Models available for either AC or DC inputs
- Temperature coefficient to 1 ppm/°C (See optional featu

OPTIONAL FEATURES

Improved Temperature Coefficient, Suffixes "T", "TT" & "TT

Suffix	Temperature Coefficient	(A and C models only) Range, °C	Added Cost
T	±0.0003%/°C	10 to 50	+30%
TT	±0.0002%/°C	10 to 50	+60%
TTT	±0.0001%/°C	20 to 30	+60%

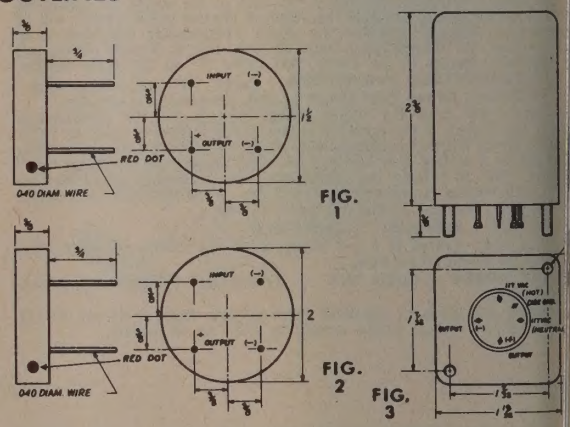
Improved Long Term Stability, Suffixes "S", "SS" & "SSS"

Suffix	Long term stability	Added Cost
None	±50ppm/1 year	None
S	±30ppm/1000 hrs.	+10%
SS	±20ppm/1000 hrs.	+30%
SSS	±10ppm/1000 hrs.	+60%

Common Negative Terminals, Suffix CN

The 210 and 230 Series can be furnished with common ga- tive input and output terminals. **Added Cost $3.00.**

OUTLINES



CONSTRUCTION

Series 201, 210 and 230 are encapsulated in cups with si one rubber. Series 202, 220 and 240 are potted in silicone ber in MIL-T-27 transformer cases.

QUANTITY PRICE DISCOUNTS

	1-4	5-9	10-24	25-49	50-99	100 U
Discount	Net	5%	10%	20%	25%	Consult fa

DYNAGE, INC., Bloomfield, Connecticut 06002/203-243-0315/TWX 710-425-6063

eem

54 PRODUCT SECTIONS IN 3 VOLUMES

eem—Electronic Engineers Master saves you engineering, specifying and purchasing time. Manufacturers' catalogs are grouped under easy-to-remember headings.

The 54 Product Sections categorize related electronic components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To pinpoint or locate specific products within any catalog page, always refer to the Product Index (Green Pages).

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2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

Vol. 3 PASSIVE COMPONENTS MATERIALS/HARDWARE

These are the 54 eem Product Sections grouped in 3 volumes

Product Section	Volume Number	Products
1100	2	Amplifiers, Audio, Operational, etc.
1200	1	Antennas & Accessories
1300	1	Audio Equipment & Accessories
1400	3	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	3	Capacitors (All Types)
1600	3	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	2	Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	3	Coils (Inductors, Chokes), Assemblies, Forms
1900	1	Communications Equipment (Facsimile, Telephone, Television)
2000	1	Computing, Data Handling Equipment & Accessories
2100	3	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2200	2	Controls, Control Components & Systems
2300	2	Crystals, Tuning Forks & Resonant Reed Devices
2350	3	Delay Lines (All Types)
2400	2	Panel Components (Incl. Lighting & Readouts)
2500	3	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	1	Environmental Test Equipment
2600	3	Fans, Blowers & Cooling Equipment
2700	2	Filters
2800	3	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
2900	1	Instruments, Measuring & Test
3000	1	Instruments, Graphic Recording
3100	3	Insulators, Insulating Materials & Parts
3130	2	Integrated Circuits & Hybrid Microcircuits
3150	3	Manufacturing, Subcontracting, Custom Fabrication
3200	3	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
3300	1	Medical Electronic Equipment
3400	1	Microwave, Radar Equipment, Components & Accessories
3500	2	Motors, Rotating Components & Accessories
3600	1	Nuclear & Radiation Equipment
3700	2	Photoelectric Equipment & Components
3800	2	Optical Equipment & Accessories
4000	1	Power Supplies, Converters, Inverters, Batteries, etc.
4100	1	Production Machinery & Automation Equipment
4200	3	Engineering Aids (Books, Drafting Equipment, Whiteprinters)
4300	1	Recording Equipment (Non-Audio Types)
4500	2	Relays
4600	3	Research, Development, Engineering Services
4700	3	Resistors, Fixed
4750	3	Resistors, Variable (Potentiometers & Rheostats)
4800	2	Semiconductors & Devices, Rectifiers (Non-Tube Types)
4900	2	Servomechanisms & Components
5000	1	Studio Equipment
5100	2	Switches, Circuit Breakers, Fuses, Protective Devices
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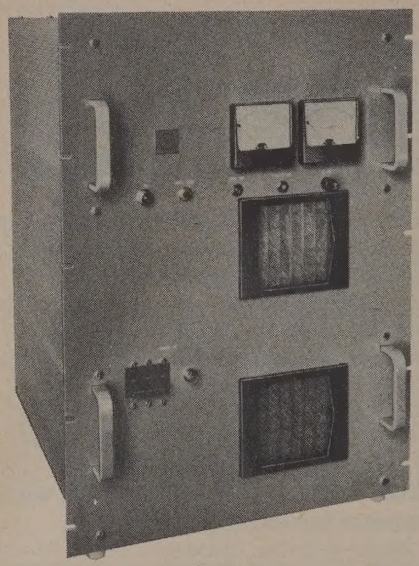
5300	2	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
5400	3	Tools (Hand & Power); Soldering Supplies
5500	2	Transducers & Associated Equipment
5600	3	Transformers
5700	2	Tubes, Tube Parts, Shields, Inserts, etc.
5800	1	Ultrasonic, Sonic, Subsonic Equipment
5850	1	Vacuum Equipment & Accessories
5900	2	Vibrators, Choppers, etc.
6000	3	Wire, Cable, Harnesses & Accessories

CML solid state frequency converters



- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 1% Voltage Regulation
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

model
CRS-2000A

LRS series
60 Hz single phase output

MODEL	OUTPUT VA	**45-65 Hz INPUT SINGLE ø VOLTS	DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
LRS-250A	250	105-125	5¼ x 19 x 15	80
LRS-500A	500	105-125	10½ x 19 x 16	100
LRS-1000A	1000	105-125	21 x 19 x 16½	220

**350-450 Hz Input also available; specify suffix -H (example: Model LRS-250A-H).

CRS series
400 Hz single phase output

MODEL	OUTPUT VA	*45-65 Hz INPUT SINGLE ø VOLTS	DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
CRS-50A	50	105-125	3½ x 19 x 14	24
CRS-100A	100	105-125	3½ x 19 x 14	26
CRS-150A	150	105-125	5¼ x 19 x 10	30
CRS-250A	250	105-125	5¼ x 19 x 15	65
CRS-500A	500	105-125	10½ x 19 x 16	88
CRS-1000A	1000	105-125	15¾ x 19 x 16	35
CRS-2000A	2000	200-240V 3ø	26¼ x 19 x 20	60

*350-450 Hz Input also available on a special basis.

NEW FOR 1970

high powered 3 phase frequency converters / TG series
1.0 KVA to 30 KVA output • 60 & 400 Hz mode

- Rugged construction for marine & ground support applications
- High efficiency
- Fixed & adjustable output frequencies
- Compact, lightweight designs
- Low distortion sinewave output
- Complete overload & short circuit protection

Write or Call Collect for Complete Specifications

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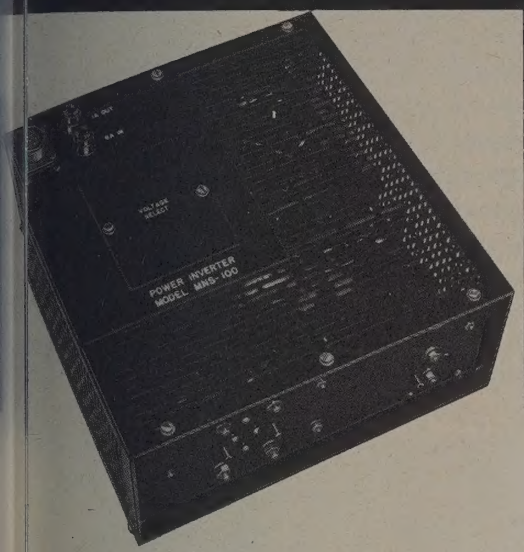
CML solid state DC to AC power inverters



- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 0.5% Voltage Regulation (DRS & MRS Series)
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

model
MNS-100

MNS series 60 Hz

Output: 105/115/125 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Frequency Regulation:** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
MNS-50	50	5 x 11 x 11	28
MNS-100	100	5 x 11 x 11	28
MNS-500	500	8 x 14 x 14	80
MNS-1000	1000	14 x 17 x 19	162

FS series 400 Hz

put 15 Volts rms. Single Phase.
ut: -30 Volts D.C. **Voltage & Frequency Regulation:** 0.5%.

DEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
-50	50	5 x 11 x 8	25
-10	100	5 x 11 x 8	26
-50	500	8 x 14 x 16	70
-10	1000	14 x 17 x 18	160

MRS series 60 Hz

Output: 115 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Voltage & Frequency Regulation:** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
MRS-500	500	12 x 14 x 14	150
MRS-1000	1000	14 x 17 x 19	175
MRS-2000	2000	17 x 17 x 22	300

NEW FOR 1970

high powered 3 phase inverters

TL series/ 1.0 KVA to 30 KVA output
60 & 400 Hz models

- Rugged, lightweight construction
- Regulated voltage & frequency
- Low distortion sinewave output
- High efficiency
- Complete overload & short circuit protection
- Output unaffected by unbalanced loads

Write or Call Collect for Complete Specifications

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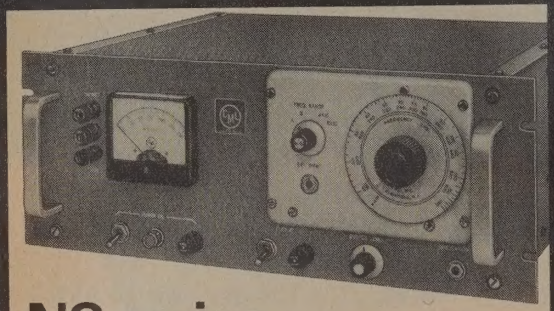
CML single phase AC power supplies

NS & NA series

- Fixed or Adjustable Output Frequencies between 45 & 6000 Hz
- Each model can be operated either as a precision AC Power Supply or as Regulated Audio Power Amplifier
- Minimum package sizes . . . 2000 VA in 14" rack height, 750 VA in 8¾" rack height
- Instantaneous Overload Protection
- Interchangeable Plug-in Oscillators Frequency Stabilities to 0.001%
- Constant Voltage Output, 0.5% regulation - response time less than 50 microseconds
- Low Distortion Sinewave Output, less than 300 to 1000 Hz, less than 3% 45 to 6000 Hz
- Full Rated Output into Load Power Factors of 0.7 Lead or Lag to Unity



model
NS175-7A-V

NS series
70 VA to 350 VA

Regulated Power Amplifiers

MODEL	OUTPUT POWER VOLT-AMPERES	*DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
NS70	70	7" x 19" x 14"	53
NS120	120	7" x 19" x 14"	57
NS175	175	7" x 19" x 14"	60
NS350	350	8¾" x 19" x 20¾"	115

*Dimensions apply to standard rack mount models. Add ¾" to height if bench adapters are included.

Standard Oscillators**

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		SUFFIX #			
Fixed	400 Hz	—4A	—4B	—4E	—4G
Fixed	800 Hz	—8A	—8B	—8E	—8G
Fixed	50 Hz	—1A	—1B	—1E	Special
Fixed	60 Hz	—2A	—2B	—2E	Order
	Selectable 50/60/400/800 Hz	—9A	—9B	X	X
Adjustable	350-450 Hz	—5A	—5B	X	X
Adjustable	45-70 Hz	—3A	—3B	X	X
Adjustable	300-2000 Hz	—6A	—6B	X	X
Adjustable	45-6000 Hz	—7A	X	X	X

Specifications:

INPUT SERVICE: 115V ±5%, 1ø, 47-65 Hz.

OUTPUT CONFIGURATION: Single phase, 2 wire floating.

OUTPUT VOLTAGE: Adjustable 0-125 volts rms by front pan control; full power available at 110-125 volts.

DUTY CYCLE: Continuous duty at rated output.

EXTERNAL SIGNAL: 5 volts rms required for rated output. Signal input impedance 600 ohms single ended.

METERS: Output voltmeter is furnished as standard equip model NS350. Voltmeter is available as accessory for mod NS120 & NS175; specify suffix (—V).

TERMINATIONS: Output terminals are furnished both front five way binding posts on front and barrier strip on rear. power termination is rear mounted barrier strip. Signal in via jack mounted on front panel.

CONSTRUCTION: Standard 19" rack mount construction wi dust covers. Bench adapters available as accessory; spec suffix (—C).

****AUDIO AMPLIFIER ONLY:** Each model is also available a audio power amplifier only (without a built-in oscillator) w full power range of 45-6000 Hz. All standard models (wit without oscillator) include an input signal jack for use w external signal source. Specify the Basic Power Supply M and Suffix # (—JA) if oscillator is not required.

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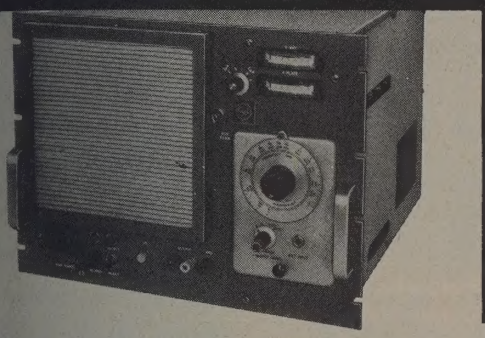
CML single phase AC power supplies



NA series
500 VA to 15 KVA

model N1000A
with SG-17A plug-in oscillator

gulated Power Amplifiers

EL	OUTPUT POWER—VA	INPUT	*DIMENSIONS H	W	D	WT. APPROX. LBS.
A	500	115V, 1ø, 47-65 Hz	8¾	19	21	175
B	750	115V, 1ø, 47-65	8¾	19	21	180
A	750	208/230V, 3ø, 47-65	14	19	20½	260
0A	1,000	208/230V, 3ø, 57-65	14	19	20½	270
0A	1,500	208/230V, 3ø, 47-65	14	19	20½	315
0A	2,000	208/230V, 3ø, 47-65	14	19	20½	325
0A	5,000	208/230V, 3ø, 57-65	51	24	24	850
00	15,000	208/230V, 3ø, 57-65	47	68	24	1600

VA 2000VA units are standard rack mount models.
3/ to height if bench adapters are included.
0V and 15000VA units are cabinet models.
el 5000A includes casters.

Plug-in Oscillators**

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		MODEL #			
Fixed	400 Hz	SG-14A	SG-14B	SG-14E	SG-14G
Fixed	800 Hz	SG-18A	SG-18B	SG-18E	SG-18G
Fixed	60 Hz	SG-12A	SG-12B	SG-12E	Special
Fixed	50 Hz	SG-11A	SG-11B	SG-11E	Order
	Selectable 50/60/400/800 Hz	SG-19A	SG-19B	X	X
Adjustable	350-450 Hz	SG-15A	SG-15B	X	X
Adjustable	45-70 Hz	SG-13A	SG-13B	X	X
Adjustable	300-2,000 Hz	SG-16A	SG-16B	X	X
Adjustable	45-6,000 Hz	SG-17A	X	X	X
		EXTERNAL SIGNAL ADAPTER			
	45-6,000 Hz	Model SA-2			

**All Plug-in-Oscillators are provided with a jack for external signal drive.

pcifications:

UT **T CONFIGURATION:** Single Phase, 2 wire floating.

UT **T VOLTAGE:** Adjustable 0-125 Volts; full power available at utp of 110-125 Volts.

UT **CYCLE:** Continuous duty at full rated output.

RO **CTIVE CIRCUITS:** All models are equipped with instantaneous verad protection and front panel reset.

ET **S:** All standard models are furnished with front panel meters o nnitor output voltage and plate currents of final amplifier tubes.

XT **NAL SIGNAL:** Signal input voltage of 5 volts rms required for ull ted output. Signal input impedance 600 ohms, single ended.

UT **T & INPUT TERMINATIONS:** Units rated at 500VA to 2000VA include output terminals on front and rear, five way binding posts on front and barrier strip on rear; input power termination is rear mounted barrier strip.

Models N5000A and N15000A have input and output terminals accessible via knockouts at cabinet rear.

CONSTRUCTION: Models rated 500VA to 2,000VA are standard 19" rack mount units with full dust covers. Bench adapters available as accessory for these models; specify suffix (—C). Side support is recommended for rack mount models. Slides available as optional accessories; specify suffix (—S). 5 KVA and 15 KVA models are furnished complete in cabinet enclosure. 5 KVA model includes casters.

NEW FOR 1970

solid state AC power supplies
ST series

- 3 models rated at 600, 1250 & 2500 VA Single Phase Output
- All models can be stacked for 2 Phase or 3 Phase Operation
- 45 to 10,000 Hz Frequency Range
- Interchangeable Plug-in Oscillators with Fixed or Adjustable Frequencies. Frequency Stabilities to 0.001%
- Selectable Output Voltage Taps
- Minimum Package Sizes
- Complete Short Circuit and Thermal Protection

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CML three phase AC power supplies

- **Minimum Package Sizes** . . . 2500 VA in 14" rack height.
- **Interchangeable Plug-in Oscillators** . . . 23 standard oscillators are available—to provide fixed or adjustable output frequencies between 45 and 6,000 Hz and stabilities to ±0.001%.
- **Instantaneous Overload Protection** . . . An overload of any one phase causes complete output shutdown, protecting 3 phase load.
- **Dual Output Voltage for △ or Y Loads** . . . Adjustable voltages 0-125 volts line-to-line as well as 0-217 volts line-to-line are presented at output terminals; output is isolated for maximum versatility.
- **Constant Voltage Output** . . . 0.5% regulation for no load to full load change.
- **Response time less than 50 microseconds.**
- **Output Voltage** unaffected by unbalanced loa

model T2500A with SG-36B oscillator

TA series / 150 VA to 20 KVA

Three Phase Amplifiers

MODEL	3ø OUTPUT POWER—VA	INPUT	DIMENSIONS H	W	D	WT. APPROX. LBS.
T150A	150	115V, 1ø, 47-65	7	19	17	105
T300B	300	115V, 1ø, 47-65	12¼	19	20	180
T500B	500	115V, 1ø, 47-65	12¼	19	20	190
T750A	750	208/230V, 3ø, 47-65	14	19	20½	275
T1200A	1,200	208/230V, 3ø, 57-65	14	19	20½	285
T1750A	1,750	208/230V, 3ø, 47-65	14	19	20½	355
T2500A	2,500	208/230V, 3ø, 47-65	14	19	20½	365
T5000A	5,000	208/230V, 3ø, 47-65	45	24	24	950
T15000A	15,000	208/230V, 3ø, 57-65	78	35	36	1700
T20000A	20,000	208/230V, 3ø, 57-65	78	35	36	1900

Plug-in Oscillators

	3ø OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.[illegible]
		MODEL #			
Fixed	400 Hz	SG-34A	SG-34B	SG-34E	SG[illegible]
Fixed	800 Hz	SG-38A	SG-38B	SG-38E	SG[illegible]
Fixed	60 Hz	SG-32A	SG-32B	SG-32E	Specia[illegible]
Fixed	50 Hz	SG-31A	SG-31B	SG-31E	Specia[illegible]
Adjustable	Selectable 50/60/400/800 Hz	SG-39A	SG-39B	X	
Adjustable	350-450 Hz	SG-35A	SG-35B	X	
Adjustable	45-70 Hz	SG-33A	SG-33B	X	
Adjustable	300-2,000 Hz	SG-36A	SG-36B	X	
Adjustable	45-6,000 Hz	SG-37A	X	X	

Specifications

OUTPUT CONFIGURATION: Three Phase, 4 wire wye, neutral floating.

OUTPUT VOLTAGE: 0-125 Volts line-to-line and 0-217 Volts line-to-line; both sets of terminals are presented at output. Full power available at output of 110-125 volts and 190-217 volts. Master gain control and phase 2 and 3 trim controls provided on front panel.

OUTPUT POWER: Rated output power for each model is shown in chart above. Maximum power per phase is ⅓ of 3ø output.

LOAD POWER FACTOR: 0.7 lead or lag to unity at rated output; wider power factor range with slight derating.

FREQUENCY RANGE: Each amplifier model is rated at full power 45-6,000 Hz except for the models T15000A and T20000A which have a 300-500 Hz full power range. The operating output frequency range is determined by the particular plug-in oscillator which is used.

HARMONIC DISTORTION: Less than 3% over the entire 45-6,000 Hz amplifier range; less than 1%, 300-1000 Hz.

HUM AND NOISE: 60 db below maximum output voltage.

OUTPUT PHASE SEPARATION: 120 ±1° for fixed frequency m[illegible] well as 350-450 Hz models. 120 ±2° for 45-70 and 300-2,00[illegible] models. 120 ±3° for 45-6,000 Hz models.

CONSTRUCTION: Models rated 150VA to 2500VA are standard rack mount units with full dust covers. Bench adapters availa[illegible] accessories for these models; specify suffix (—C). Side suppo[illegible] recommended for rack mount models. Slides are available as optional accessories; specify suffix (—S). 5KVA-20KVA models furnished complete in cabinet enclosure. 5KVA model includes

Single Phase & Two Phase Output

Standard 3 phase amplifiers may be used to provide a 2 [illegible] output at ⅔ of rated output power. Special plug-in oscil[illegible] are available with selectable 90° or 120° phase separatio[illegible] 2 phase or 3 phase operation respectively.
Standard 3 phase amplifiers may be used to provide a [illegible] phase output at 57% of rated output power over an adju[illegible] voltage range of 110-125 volts.

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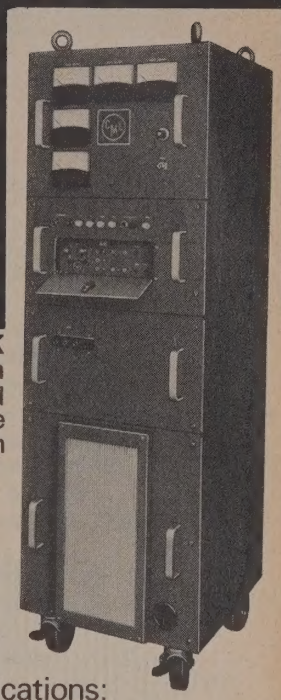
wide band power amplifiers for audio and ultrasonic testing

- ull power into reactive loads
- ow distortion
- 0.5 db frequency response
- eal for CW and PULSED duty
- electable output taps for match-g wide range of load npedances
- Rugged construction for marine or airborne installations

APPLICATIONS: SONAR TESTING/ VIBRATION TESTING/INDUSTRIAL PROCESS CONTROL / HIGH INTENSITY ACOUSTIC SYSTEMS/



model S5K passes through a standard submarine hatch

G series 1KVA to 200KVA

EL	OUTPUT POWER KVA	LOAD POWER FACTOR RANGE AT RATED KVA	STANDARD OUTPUT IMPEDANCE TAPS OHMS	DIMENSIONS* H x W x D (APPROX.) INCHES	WEIGHT (APPROX.) LBS.	TYPE OF COOLING
	1KVA	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 20½	345	FORCED AIR
	2	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 20½	400	
	3	±0.1 to Unity	4/16/36/64/144/576	53 x 27 x 26	750	
	5	±0.4 to Unity	16/64/256	62 x 17 x 17	800	
	5	±0.1 to Unity	8/32/72/128/288/1152	45 x 24 x 24	850	
K	10	±0.1 to Unity	16/64/144/256/576/2304	47 x 68 x 24	1,700	
K	20	±0.3 to Unity	16/64/144/256/576	47 x 68 x 24	2,100	
OK	30	±0.1 to Unity	16/64/144/256/576	72 x 72 x 36	3,000	VAPOR COOLED
OK	50	±0.4 to Unity	16/64/144/256/576	72 x 72 x 36	4,200	
00	100	±0.1 to Unity	16/64/144/256	2 sections, ea.: 90 x 72 x 57	9,400	
00	200	±0.1 to Unity	16/64/144/256	3 sections, ea.: 90 x 72 x 57	14,100	

*Models A1K and A2K are standard 19" rack mount units; bench adapters available on special order. All other models are furnished complete in cabinet enclosures. Models A3K, S5K and B5K include casters.

Specifications:

FREQUENCY RESPONSE: ±0.5 db, 100-10,000 Hz; model A3K ±0.5 db 200-15,000 Hz. Other frequency ranges between 5 Hz and 100 KHz available on a custom basis.

HARMONIC DISTORTION: Less than 3% over rated frequency range; less than 1.5% midband.

HUM & NOISE: At least 60 db below rated tap voltage.

ultrasonic power amplifier model HS1K

1000 VA output from 10 KHz to 1 MHz

- Full Rated Output into Load Power Factors of 0.4 Lead or Lag to Unity
- Continuous Duty Capability at Full Rated Output
- Suitable for operation with Keyed Input Signals
- Hum and Noise at least 60db below Tap Voltage
- Compact, rugged construction

NEW FOR 1970

solid state power amplifier model LSU1000

- Ideal for shipboard applications Compact, rugged construction.
- 1000 VA Output Continuous Duty
- 100 Hz to 20 KHz Frequency Range
- Selectable Output Voltage Taps: 90/180/270/360/540/1080 VAC
- Full Rated Output into Load Power Factors of 0.4 Lead or Lag to Unity
- Hum and Noise at least 70db below Tap Voltage
- Complete Short Circuit and Thermal Protection

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2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

Vol. 3 PASSIVE COMPONENTS MATERIALS/HARDWARE

These are the 54 eem Product Sections grouped in 3 volumes

Product Section	Volume Number	Products
1100	2	Amplifiers, Audio, Operational, etc.
1200	1	Antennas & Accessories
1300	1	Audio Equipment & Accessories
1400	3	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	3	Capacitors (All Types)
1600	3	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1700	2	Circuit Assemblies, Circuit Boards & Breadboarding Kits
1800	3	Coils (Inductors, Chokes), Assemblies, Forms
1900	1	Communications Equipment (Facsimile, Telephone, Television)
2000	1	Computing, Data Handling Equipment & Accessories
2100	3	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2200	2	Controls, Control Components & Systems
2300	2	Crystals, Tuning Forks & Resonant Reed Devices
2350	3	Delay Lines (All Types)
2400	2	Panel Components (Incl. Lighting & Readouts)
2500	3	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2550	1	Environmental Test Equipment
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2700	2	Filters
2800	3	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
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3200	3	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
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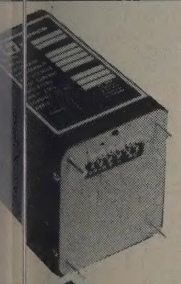
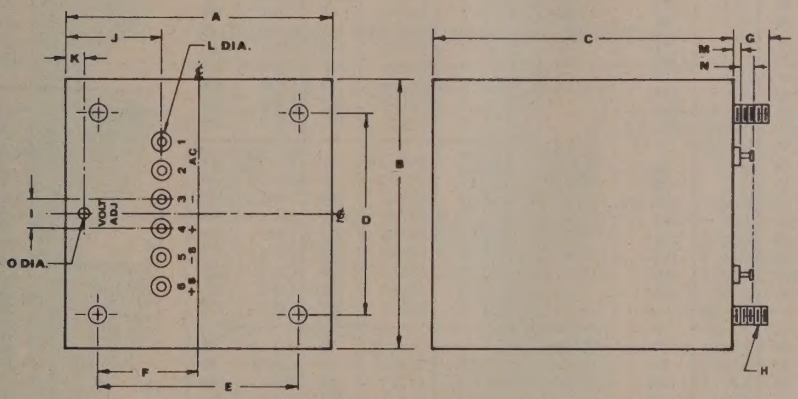
GENERAL ELECTRONIC SPECIFICATIONS

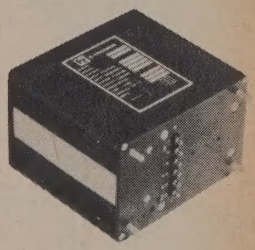
Input	105-125 Volts AC, 50-400 HZ	
Output Characteristics	**EA Models — 0.1%**	**E Models — 0.01%**
Line Regulation	0.1% or 5 MV	0.01% or 1 MV
Load Regulation	0.1% or 5 MV	0.01% or 1 MV
Ripple and Noise	3 MV RMS	0.5 MV RMS
Voltage Stability	50 MV/8 Hrs.	5 MV/8 Hrs.
Temperature Coefficient	0.05%/C°	0.01%/C°
Adjustment Resolution	0.1% Min.	0.05% Min.
Output Impedance (less than)	0.008 E/I	0.004 E/I
Frequency Range (Input)	50-440 Hz	50-440 Hz
Recovery time	Less than 50 Micro-seconds	
Operating Temperature	−28°C to 71°C full rating	
Overload and Short Circuit	Automated protection with self recovery	
Remote Programing	"ED" models only (contact factory)	
Terminals	Solder terminals, barrier strip and connectors also available	
Controls	Voltage adjust, screwdriver slotted pot	

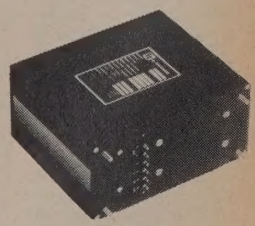


CASE DIMENSIONS

(Barrier strip terminals available)







NOTE: "EA" Models have 4 Terminals (+, −, AC, AC,) on center

MODULE DIMENSIONS

ASE IZE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	APPROX. NET LBS.	WEIGHT SHPG. LBS.
1	3 17/32	3 1/32	3 13/16	2 13/32	2 23/32	1 23/64	1/2	8-32	1/4	9/16	3/16	1/8	1/16	1/4	3/16	2 1/2	5
2	3 17/32	3 1/32	4 13/16	2 13/32	2 23/32	1 23/64	1/2	8-32	1/4	9/16	3/16	1/8	1/16	1/4	3/16	3 1/2	5 1/2
3	4	4	4 1/2	3	3	1 1/2	17/32	10-32	7/16	1 13/16	13/32	5/16	3/32	3/16	3/16	8	11
4	6	4	5 5/8	3	5	2 1/2	17/32	10-32	7/16	1 5/8	13/32	5/16	3/32	3/16	3/16	12	15
5	8	4	6 7/8	3	6 7/8	3 7/16	17/32	10-32	7/16	2 1/2	13/32	5/16	3/32	3/16	3/16	17	20

TIONS AVAILABLE:

	Price
Overvoltage Protection (Crowbar Circuit)	$15.00
220-250 Volt Input	$10.00
110-220 Volt Input	$15.00
Barrier Strip Terminals	$ 1.00

Suffix to end of Part Number

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See previous page for general specifications

Output Voltage ± Adj. Range	Amps	Case	.1% Model	Price	.01% Model	Price
3 Volts ±.5 V. ADJ.	.25	1	EA3-.25	$55	E3-.25	$70
	.5	1	EA3-.5	60	E3-.5	75
	1	1	EA3-1	65	E3-1	80
	2	2	EA3-2	70	E3-2	90
	3	3	EA3-3	90	E3-3	110
	4	4	EA3-4	130	E3-4	160
	5	4	EA3-5	140	E3-5	170
	6	5	EA3-6	150	E3-6	185
	10	5	EA3-10	190	E3-10	235
4 Volts ±.5 V. ADJ.	.25	1	EA4-.25	55	E4-.25	70
	.5	1	EA4-.5	60	E4-.5	75
	1	1	EA4-1	65	E4-1	80
	2	2	EA4-2	70	E4-2	90
	3	3	EA4-3	90	E4-3	110
	4	4	EA4-4	130	E4-4	160
	5	4	EA4-5	140	E4-5	170
	6	5	EA4-6	150	E4-6	185
	10	5	EA4-10	190	E4-10	235
5 Volts ±.5 V. ADJ.	.25	1	EA5-.25	55	E5-.25	70
	.5	1	EA5-.5	60	E5-.5	75
	1	2	EA5-1	65	E5-1	80
	2	2	EA5-2	70	E5-2	90
	3	3	EA5-3	90	E5-3	110
	4	4	EA5-4	130	E5-4	160
	5	4	EA5-5	140	E5-5	170
	6	5	EA5-6	145	E5-6	180
	10	5	EA5-10	185	E5-10	230
6 Volts ±.5 V. ADJ.	.25	1	EA6-.25	55	E6-.25	70
	.5	1	EA6-.5	60	E6-.5	75
	1	2	EA6-1	65	E6-1	80
	2	3	EA6-2	75	E6-2	95
	3	3	EA6-3	85	E6-3	105
	4	4	EA6-4	125	E6-4	155
	5	4	EA6-5	135	E6-5	165
	6	5	EA6-6	150	E6-6	185
	10	5	EA6-10	185	E6-10	230
7 Volts ±.5 V. ADJ.	.25	1	EA7-.25	55	E7-.25	70
	.5	1	EA7-.5	60	E7-.5	75
	1	2	EA7-1	65	E7-1	80
	2	3	EA7-2	80	E7-2	100
	3	3	EA7-3	90	E7-3	110
	4	4	EA7-4	140	E7-4	170
	5	4	EA7-5	160	E7-5	200
	6	5	EA7-6	180	E7-6	225
	10	5	EA7-10	200	E7-10	245
8 Volts ±.5 V. ADJ.	.25	1	EA8-.25	55	E8-.25	70
	.5	1	EA8-.5	60	E8-.5	75
	1	2	EA8-1	65	E8-1	80
	2	3	EA8-2	80	E8-2	100
	3	4	EA8-3	135	E8-3	150
	4	4	EA8-4	145	E8-4	175
	5	4	EA8-5	160	E8-5	200
	6	5	EA8-6	180	E8-6	225
	10	5	EA8-10	200	E8-10	245
9 Volts ±.5 V. ADJ.	.25	1	EA9-.25	55	E9-.25	70
	.5	1	EA9-.5	60	E9-.5	75
	1	2	EA9-1	65	E9-1	80
	2	3	EA9-2	80	E9-2	100
	3	4	EA9-3	125	E9-3	150
	4	4	EA9-4	140	E9-4	175
	5	4	EA9-5	160	E9-5	200
	6	5	EA9-6	180	E9-6	225
	9	5	EA9-9	200	E9-9	245
10 Volts ±.5 V. ADJ.	.25	1	EA10-.25	55	E10-.25	70
	.5	1	EA10-.5	60	E10-.5	80
	1	2	EA10-1	70	E10-1	90
	2	3	EA10-2	80	E10-2	100
	3	4	EA10-3	125	E10-3	150
	4	4	EA10-4	135	E10-4	165
	5	5	EA10-5	160	E10-5	200
	6	5	EA10-6	180	E10-6	225
	8	5	EA10-8	200	E10-8	245

Output Voltage ± Adj. Range	Amps	Case	.1% Model	Price	.01% Model	Price
12 Volts ±.5 V. ADJ.	.25	1	EA12-.25	$55	E12-.25	$70
	.5	1	EA12-.5	60	E12-.5	80
	1	2	EA12-1	70	E12-1	90
	2	3	EA12-2	80	E12-3	100
	3	4	EA12-3	125	E12-3	150
	4	4	EA12-4	135	E12-4	165
	5	5	EA12-5	160	E12-5	200
	6	5	EA12-6	180	E12-6	225
	7	5	EA12-7	190	E12-7	235
14 Volts ±.5 V. ADJ.	.25	1	EA14-.25	55	E14-.25	70
	.5	2	EA14-.5	65	E14-.5	80
	1	3	EA14-1	80	E14-1	100
	2	4	EA14-2	125	E14-2	150
	3	4	EA14-3	130	E14-3	160
	4	4	EA14-4	140	E14-4	170
	5	5	EA14-5	160	E14-5	200
	6	5	EA14-6	180	E14-6	225
	7	5	EA14-7	190	E14-7	235
15 Volts ±.5 V. ADJ.	.25	1	EA15-.25	55	E15-.25	70
	.5	2	EA15-.5	65	E15-.5	80
	1	3	EA15-1	80	E15-1	100
	2	4	EA15-2	125	E15-2	150
	3	4	EA15-3	130	E15-3	160
	4	4	EA15-4	140	E15-4	170
	5	5	EA15-5	160	E15-5	200
	6	5	EA15-6	180	E15-6	225
	7	5	EA15-7	190	E15-7	235
16 Volts ±.5 V. ADJ.	.25	1	EA16-.25	55	E16-.25	70
	.5	2	EA16-.5	65	E16-.5	80
	1	3	EA16-1	80	E16-1	100
	2	4	EA16-2	125	E16-2	150
	3	4	EA16-3	130	E16-3	160
	4	5	EA16-4	140	E16-4	175
	5	5	EA16-5	160	E16-5	200
	6	5	EA16-6	180	E16-6	225
	7	5	EA16-7	190	E16-7	235
18 Volts ±.5 V. ADJ.	.25	1	EA18-.25	55	E18-.25	70
	.5	2	EA18-.5	65	E18-.5	80
	1	3	EA18-1	80	E18-1	100
	2	4	EA18-2	125	E18-2	150
	3	4	EA18-3	130	E18-3	160
	4	5	EA18-4	140	E18-4	175
	5	5	EA18-5	160	E18-5	200
	6	5	EA18-6	180	E18-6	225
	7	5	EA18-7	190	E18-7	235
19 Volts ±.5 V. ADJ.	.25	1	EA19-.25	55	E19-.25	70
	.5	2	EA19-.5	65	E19-.5	80
	1	3	EA19-1	80	E19-1	100
	2	4	EA19-2	125	E19-2	150
	3	4	EA19-3	130	E19-3	160
	4	5	EA19-4	140	E19-4	175
	5	5	EA19-5	160	E19-5	200
	6	5	EA19-6	180	E19-6	225
	7	5	EA19-7	190	E19-7	235
20 Volts ±1 V. ADJ.	.25	1	EA20-.25	55	E20-.25	70
	.5	2	EA20-.5	65	E20-.5	80
	1	3	EA20-1	80	E20-1	100
	2	4	EA20-2	125	E20-2	150
	3	4	EA20-3	130	E20-3	160
	4	5	EA20-4	140	E20-4	175
	5	5	EA20-5	160	E20-5	200
	6	5	EA20-6	180	E20-6	225
22 Volts ±1 V. ADJ.	.25	1	EA22-2.5	55	E22-.25	70
	.5	2	EA22-.5	65	E22-.5	80
	1	3	EA22-1	80	E22-1	100
	2	4	EA22-2	125	E22-2	150
	3	4	EA22-3	130	E22-3	160
	4	5	EA22-4	140	E22-4	175
	5	5	EA22-5	160	E22-5	200
	6	5	EA22-6	180	E22-6	225

Output Voltage ± Adj. Range	Amps	Case	.1% Model	Price	.01% Model
24 Volts ±2 V. ADJ.	.25	1	EA24-.25	$55	E24-.2
	.5	2	EA24-.5	65	E24-.5
	1	3	EA24-1	80	E24-1
	2	4	EA24-2	125	E24-2
	3	5	EA24-3	140	E24-3
	4	5	EA24-4	160	E24-4
	5	5	EA24-5	180	E24-5
28 Volts ±2 V. ADJ.	.25	1	EA28-.25	55	E28-.2
	.5	2	EA28-.5	65	E28-.5
	1	3	EA28-1	80	E28-1
	2	4	EA28-2	125	E28-2
	3	5	EA28-3	140	E28-3
	4	5	EA28-4	160	E28-4
	5	5	EA28-5	180	E28-5
32 Volts ±2 V. ADJ.	.25	1	EA32-.25	55	E32-.
	.5	2	EA32-.5	65	E32-.
	1	3	EA32-1	80	E32-1
	2	4	EA32-2	125	E32-2
	3	5	EA32-3	160	E32-3
	4	5	EA32-4	180	E32-4
36 Volts ±2 V. ADJ.	.1	1	EA36-.1	65	E36-.
	.25	2	EA36-.25	70	E36-.
	.5	2	EA36-.5	75	E36-.
	1	3	EA36-1	125	E36-1
	2	4	EA36-2	155	E36-2
	3	5	EA36-3	190	E36-3
	4	5	EA36-4	200	E36-4
40 Volts ±2 V. ADJ.	.1	1	EA40-.1	65	E40-.
	.25	2	EA40-.25	70	E40-.
	.5	3	EA40-.5	95	E40-.
	1	3	EA40-1	125	E40-
	2	4	EA40-2	155	E40-
	3	5	EA40-3	190	E40-
	4	5	EA40-4	200	E40-
44 Volts ±2 V. ADJ.	.1	1	EA44-.1	65	E44-
	.25	2	EA44-.25	70	E44-
	.5	3	EA44-.5	95	E44-
	1	3	EA44-1	125	E44-
	2	4	EA44-2	155	E44-
	3	5	EA44-3	190	E44-
	4	5	EA44-4	200	E44-
48 Volts ±2 V. ADJ.	.1	1	EA48-.1	65	E48-
	.25	2	EA48-.25	70	E48-
	.5	3	EA48-.5	95	E48-
	1	3	EA48-1	125	E48-
	2	4	EA48-2	155	E48-
	3	5	EA48-3	190	E48-
	4	5	EA48-4	200	E48-
52 Volts ±2 V. ADJ.	.05	1	EA52-.05	65	E52-
	.1	1	EA52-.1	70	E52-
	.25	2	EA52-.25	75	E52-
	.5	3	EA52-.5	100	E52-
	1	3	EA52-1	130	E52-
	2	4	EA52-2	160	E52-
	3	5	EA52-3	205	E52-

For higher voltage ranges contact fa bulletin covering modules up to 500 vol

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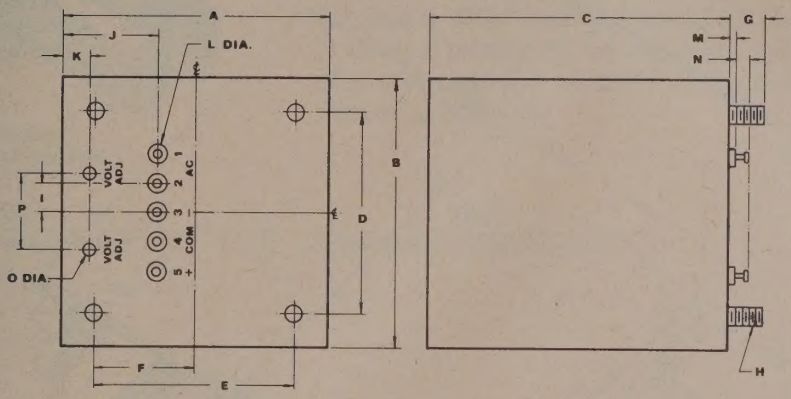
E-TRONICS

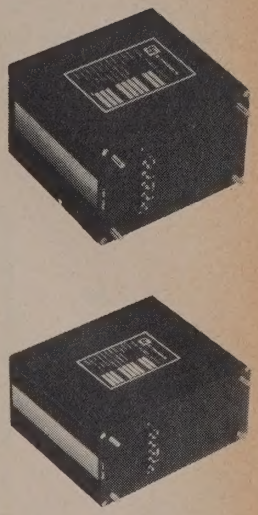
MODULAR D.C. POWER SUPPLIES
DUAL OUTPUT MODULES

48 hr. DELIVERY ON LIMITED QUANTITIES ON ALL MODELS

INTEGRATED CIRCUIT DESIGN

CASE DIMENSIONS
(Barrier strip terminals available)





See previous page for general specifications

ALL OUTPUTS ARE TRACKING

DUAL OUTPUT SUPPLIES

Output Voltage ± Adjust Range	Current Amps Ea. Output	*Case Size See Dwg.	Standard Model ±.1% Accuracy	Price	Precision Model ±.01% Accuracy	Price
5 Volts ±1 V Adj.	.100	1	EDA5-.1	$ 80	ED5-.1	$100
	.250	1	EDA5-.25	85	ED5-.25	105
	.500	2	EDA5-.5	100	ED5-.5	110
	1.0	2	EDA5-1	105	ED5-1	120
	2.0	4	EDA5-2	140	ED5-2	150
	3.0	5	EDA5-3	170	ED5-3	180
6 Volts ±1 V Adj.	.100	1	EDA6-.1	85	ED6-.1	100
	.250	1	EDA6-.25	90	ED6-.25	105
	.500	2	EDA6-.5	100	ED6-.5	110
	1.0	3	EDA6-1	115	ED6-1	120
	2.0	4	EDA6-2	140	ED6-2	150
	3.0	5	EDA6-3	170	ED6-3	180
10 Volts ±1 V Adj.	.100	1	EDA10-.1	85	ED10-.1	100
	.250	1	EDA10-.25	90	ED10-.25	105
	.500	2	EDA10-.5	110	ED10-.5	120
	1.0	3	EDA10-1	120	ED10-1	130
	1.5	4	EDA10-1.5	130	ED10-1.5	140
	2.0	4	EDA10-2	140	ED10-2	150
	3.0	5	EDA10-3	170	ED10-3	180
12 Volts ±1 V Adj.	.100	1	EDA12-.1	85	ED12-.1	100
	.250	1	EDA12-.25	95	ED12-.25	105
	.500	2	EDA12-.5	110	ED12-.5	120
	1.0	3	EDA12-1	120	ED12-1	130
	2.0	4	EDA12-2	140	ED12-2	150
	3.0	5	EDA12-3	170	ED12-3	180
15 Volts ±1 V Adj.	.100	1	EDA15-.1	85	ED15-.1	100
	.250	2	EDA15-.25	95	ED15-.25	105
	.500	3	EDA15-.5	110	ED15-.5	
	1.0	3	EDA15-1	120	ED15-1	130
	2.0	4	EDA15-2	140	ED15-2	150
	3.0	5	EDA15-3	170	ED15-3	180
18 Volts ±1 V Adj.	.100	1	EDA18-.1	85	ED18-.1	100
	.250	2	EDA18-.25	95	ED18-.25	105
	.500	3	EDA18-.5	110	ED18-.5	120
	1.0	4	EDA18-1	140	ED18-1	140
	2.0	5	EDA18-2	140	ED18-2	150
	3.0	5	EDA18-3	170	ED18-3	180

DUAL OUTPUT SUPPLIES

Output Voltage ± Adjust Range	Current Amps Ea. Output	*Case Size See Dwg.	Standard Model ±.1% Accuracy	Price	Precision Model ±.01% Accuracy	Price
20 Volts ±1 V ADJ.	.100	1	EDA20-.1	$80	ED20-.1	$100
	.250	2	EDA20-.25	90	ED20-.25	105
	.500	3	EDA20-.5	110	ED20-.5	120
	1.0	4	EDA20-1	120	ED20-1	140
	2.0	5	EDA20-2	140	ED20-2	150
	3.0	5	EDA20-3	165	ED20-3	180
24 Volts ±2 V. ADJ.	.100	1	EDA24-.1	80	ED24-.1	100
	.250	2	EDA24-.25	100	ED24-.25	105
	.500	3	EDA24-.5	110	ED24-.5	125
	1.0	4	EDA24-1	120	ED24-1	150
	2.0	5	EDA24-2	150	ED24-2	170
	2.5	5	EDA24-2.5	170	ED24-2.5	190
28 Volts ±2 V. ADJ.	.100	1	EDA28-.1	80	ED28-.1	100
	.250	2	EDA28-.25	90	ED28-.25	105
	.500	3	EDA28-.5	105	ED28-.5	125
	1.0	4	EDA28-1	120	ED28-1	150
	2.0	5	EDA28-2	150	ED28-2	170
	2.5	5	EDA28-2.5	180	ED28-2.5	190
35 Volts ±2 V. ADJ.	.100	1	EDA35-.1	80	ED35-.1	100
	.250	2	EDA35-.25	90	ED35-.25	105
	.500	3	EDA35-.5	110	ED35-.5	125
	1.0	4	EDA35-1	140	ED35-1	150
	2.0	5	EDA35-2	160	ED35-2	170

MODULE DIMENSIONS

Case Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Approx. Wt. Net Lbs.	Shpg. Lbs.
1	3 17/32	3 1/32	3 13/16	2 13/32	2 23/32	1 23/64	1/2	8-32	1/4	9/16	3/16	1/8	1/16	1/4	3/16	11/16	2 1/2	5
2	3 17/32	3 1/32	4 13/16	2 13/32	2 23/32	1 23/64	1/2	8-32	1/4	9/16	3/16	1/8	1/16	1/4	3/16	11/16	3 1/2	5 1/2
3	4	4	4 1/2	3	3	1 1/2	17/32	10-32	7/16	1 13/16	13/32	5/16	3/32	3/16	3/16	1 1/8	8	11
4	6	4	5 5/8	3	5	2 1/2	17/32	10-32	7/16	1 5/8	13/32	5/16	3/32	3/16	3/16	1 1/8	12	15
5	8	4	6 7/8	3	6 7/8	3 7/16	17/32	10-32	7/16	2 1/2	13/32	5/16	3/32	3/16	3/16	1 1/8	17	20

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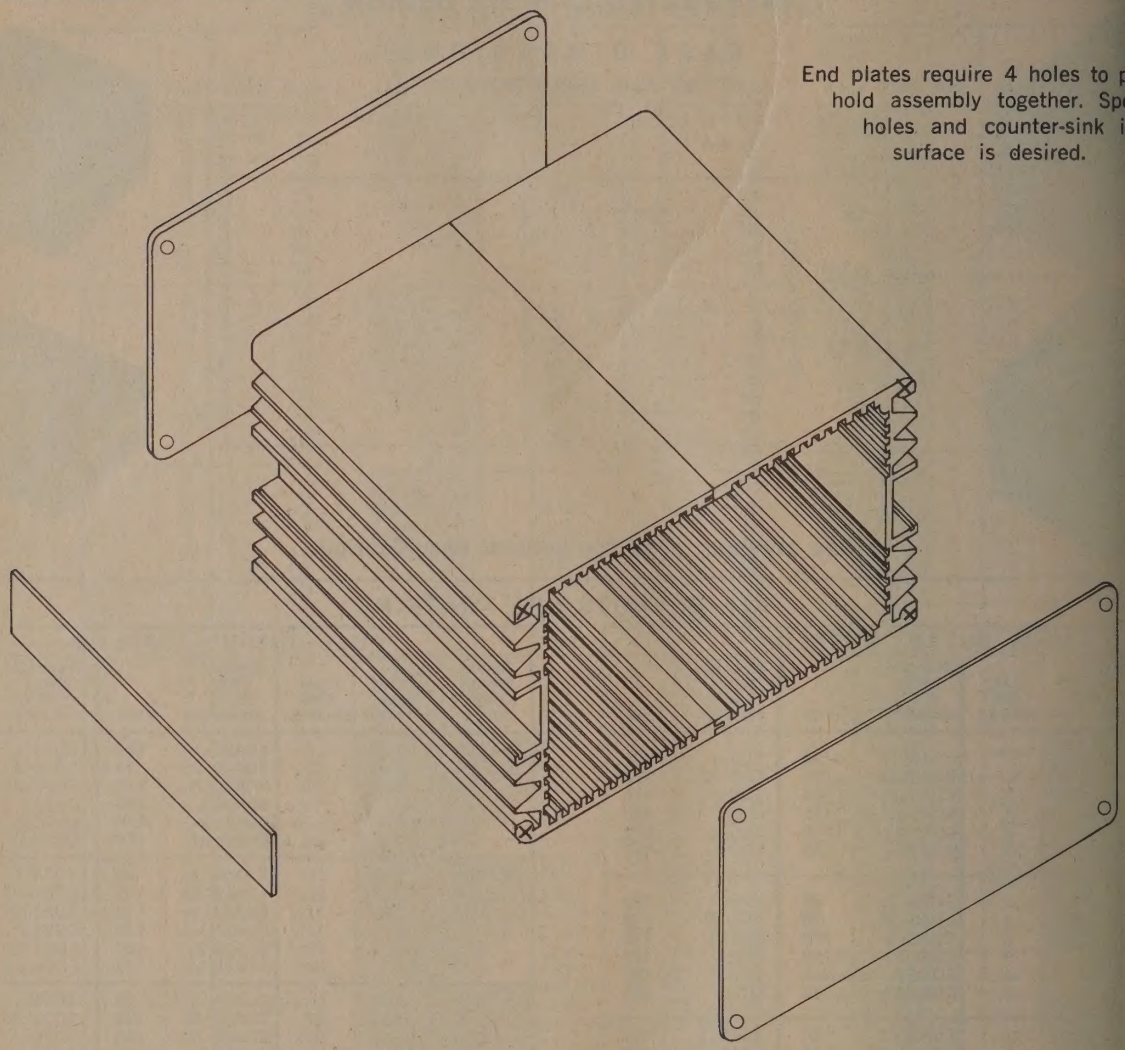
E-TRONICS
HOUSING KITS

48 hr. DELIVERY ON LIMITED QUANTITIES ON ALL MODE

End plates require 4 holes to prop hold assembly together. Specif holes and counter-sink if f surface is desired.



Complete aluminum extrusion housing kits for electronic packaging with provis for integral heat dissipation. Many variations are available. (See page 1037 extrusion configurations.) All aluminum is 6063-T5.

SELECT YOUR OWN PACKAGE

	EXTRUSIONS Drilled and Tapped for End Plates					Slide Covers Any Length	END PLATES with Mounting Holes					
	PIX4X	P2X4X	P4X4X	T2X4X	T4X4X		2" x 4"	3" x 4"	4" x 4"	5" x 4"	6" x 4"	8" x
Price per Inch (Length)	$.30	$.35	$.50	$.50	$.50	$.03"	$1.00 EA.	$1.25 EA.	$1.50 EA.	$1.75 EA.	$2.00 EA.	$2. A.

E-TRONICS will fabricate complete housings with special holes, brackets and other requests.

Typical charges for small orders are as follows
Drilled Hole (any size) ..... .01 ea.
Tapped Hole ..... .01 ea.
Counter Sinks ..... .01 ea.

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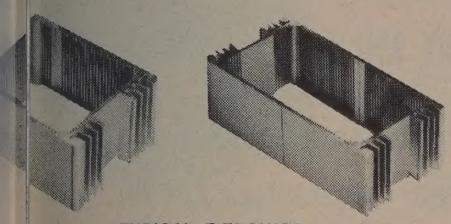
E-TRONICS

ALUMINUM EXTRUSIONS

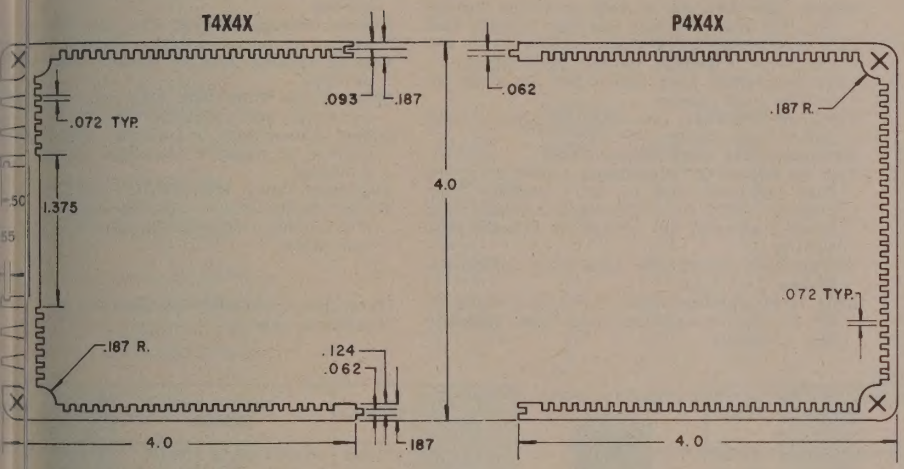
WITH INTEGRAL HEAT SINK & PC CARD PACKAGING

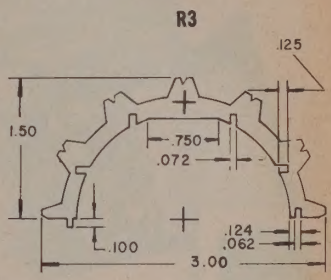
48 hr. DELIVERY ON LIMITED QUANTITIES ON ALL MODELS



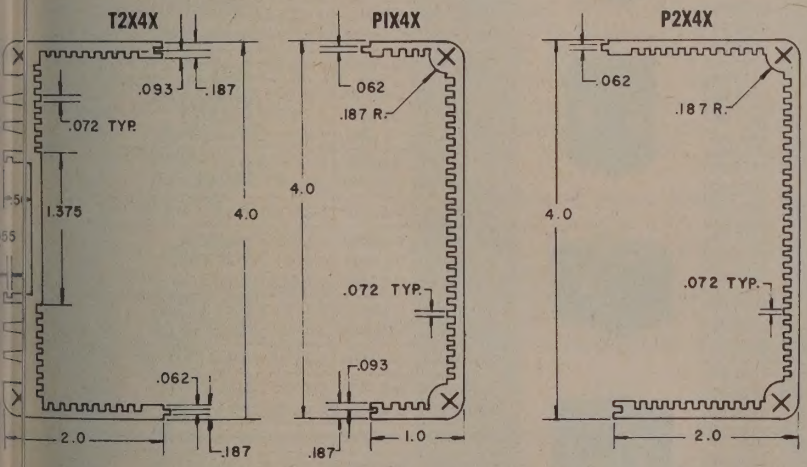
TYPICAL E-TRONICS ALUMINUM EXTRUSIONS

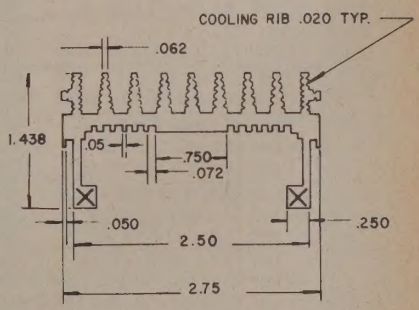
Now you can purchase an off-the-shelf family of extrusions to quickly and economically package your electronic black boxes with built-in heat dissipation capability. E-TRONICS Extrusions offer many variations of package size and ease of internal packaging. All extrusions are available in lengths of 6 feet and may be cut to any desired lengths. All aluminum is 6063-TS.





NOTE: X indicates screw boss.





NOTE: X indicates screw boss.

t Number	T2X4X	T4X4X	PIX4X	P2X4X	P4X4X	F3X	R-3
ce r Ft.	$5.50	$6.50	$3.00	$3.30	$4.00	$3.50	$3.00

ard Extrusion Length — 6 ft.
r ngths less than 6 ft. a cutting charge of $.25
r it will be made. Any length may be ordered.

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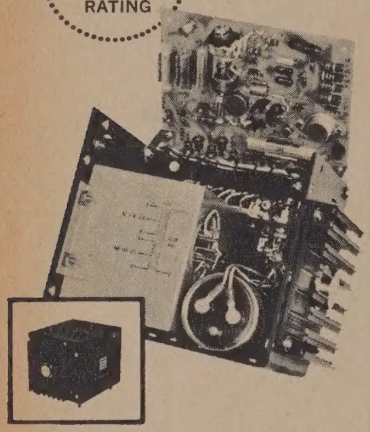
75°C FREE AIR RATING



0 through 310 VDC, 50 MA through 8 Amps

Transpac **CERTIFIED*** *Militarized Line*

Input: 103.5-126.5 VAC (standard) or 108-132 VAC (specify) 50-440 cps
Ripple: Less than 800 μv RMS except 50 through 310 VDC where ripple is less than 0.005% RMS
Line Regulation: Less than ±0.01% or 5 mv, whichever is greater, for full input change
Load Regulation: Less than 0.05% or 8 mv for 0-100% load change
Transient Response: Less than 50 μsec for step line or load change
Maximum Case Temperature: 115°C
Free Air Operating Temperature: −55°C to +75°C (full tantalum type up to 1 ampere most models) −40°C to +75°C (semi-tantalum type above 1 ampere) full ratings, no external heat sinking
Temperature Coefficient: Less than 0.01% per degree C or 3 mv
Long Term Stability: Within 5 mv for 8 hours after 20 minute warm-up (line, load, temperature constant)
Interconnection: Series or parallel operatio
Voltage Adjustment: External screwdriver v control
Remote Voltage Control: Provision for e control of output voltage
Remote Sensing: Remote sensing facilitie provided
Short Circuit Protection: Automatic short protection and automatic recovery
Output Connection: Ungrounded outputs, positive or negative terminals may be grounded
Transistor Types: MIL-STD-701 and MIL-S
Military Specs: MIL-E-4158, MIL-E-5400, MIL-E-16400, MIL-E-5272, MIL-T-21200 applicable

*Certificate of Conformity by independent labora supplied on request.

OUTPUT VOLTAGE (DC)	CURRENT	SIZE W x D x H (INCHES)	MODEL	PRICE
0-7 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS07P5	$331.00
0-7 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS071	$373.00
0-7 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS072	$415.00
0-7 VDC	0-4 AMP	6 x 8-15/16 x 6-5/16	MS074	$478.00
0-7 VDC	0-6 AMP	6 x 9-5/8 x 6-5/16	MS076	$562.00
0-7 VDC	0-8 AMP	6 x 10-5/16 x 6-5/16	MS078	$625.00
0-10 VDC	0-50MA	3 x 3 x 3-1/4	MS01P05	$231.00
0-10 VDC	0-250MA	3-1/4 x 3-1/4 x 4-31/32	MS01P3	$299.00
10-20 VDC	0-50MA	3 x 3 x 3-1/4	MS10P05	$231.00
10-20 VDC	0-250MA	3-1/4 x 3-1/4 x 4-31/32	MS10P3	$299.00
11-12 VDC	0-4 AMP	6 x 8-15/16 x 6-5/16	MS124	$478.00
11-12 VDC	0-6 AMP	6 x 9-5/8 x 6-5/16	MS126	$562.00
11-12 VDC	0-8 AMP	6 x 10-5/16 x 6-5/16	MS128	$625.00
11-13 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS12P5	$331.00
11-13 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS121	$373.00
11-13 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS122	$415.00
17-18 VDC	0-4 AMP	6 x 8-15/16 x 6-5/16	MS184	$478.00
17-18 VDC	0-6 AMP	6-15/16 x 9-15/16 x 6-5/16	MS186	$562.00
17-18 VDC	0-8 AMP	6-15/16 x 10-5/8 x 6-5/16	MS188	$625.00
17-19 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS18P5	$331.00
17-19 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS181	$373.00
17-19 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS182	$415.00
20-30 VDC	0-50MA	3 x 3 x 3-1/4	MS20P05	$231.00
20-30 VDC	0-250MA	3-1/4 x 3-1/4 x 4-31/32	MS20P3	$299.00
23-24 VDC	0-4 AMP	6 x 8-15/16 x 6-5/16	MS244	$478.00
23-24 VDC	0-6 AMP	6-15/16 x 9-15/16 x 6-5/16	MS246	$562.00
23-24 VDC	0-8 AMP	6-15/16 x 10-5/8 x 6-5/16	MS248	$625.00
23-25 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS24P5	$331.00
23-25 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS241	$373.00
23-25 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS242	$415.00
27-28 VDC	0-4 AMP	6 x 8-15/16 x 6-5/16	MS284	$478.00
27-28 VDC	0-6 AMP	6-15/16 x 9-15/16 x 6-5/16	MS286	$562.00
27-28 VDC	0-8 AMP	6-15/16 x 10-5/8 x 6-5/16	MS288	$625.00

OUTPUT VOLTAGE (DC)	CURRENT	SIZE W x D x H (INCHES)	MODEL	
27-29 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS28P5	$
27-29 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS281	$
27-29 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS282	$
30-40 VDC	0-50MA	3 x 3 x 3-1/4	MS30P05	$
30-40 VDC	0-250MA	3-5/16 x 4-3/16 x 5-1/2	MS30P3	$
31-32 VDC	0-4 AMP	6-15/16 x 9-1/4 x 6-5/16	MS324	$
31-33 VDC	0-500MA	3-5/16 x 4-3/16 x 5-1/2	MS32P5	$
31 33 VDC	0-1 AMP	4 x 4-3/4 x 5-15/16	MS321	$
31-33 VDC	0-2 AMP	5-3/4 x 7-3/16 x 5-1/4	MS322	$
40-50 VDC	0-50MA	3-1/4 x 3-1/4 x 4-31/32	MS40P05	$
40-50 VDC	0-250MA	3-5/16 x 4-3/16 x 5-1/2	MS40P3	$
44-45 VDC	0-4 AMP	6-15/16 x 9-1/4 x 6-5/16	MS454	$
44-46 VDC	0-500MA	4 x 4-3/4 x 5-15/16	MS45P5	$
44-46 VDC	0-1 AMP	5-3/4 x 7-3/16 x 5-1/4	MS451	$
44-46 VDC	0-2 AMP	6 x 8-15/16 x 6-5/16	MS452	$
50-60 VDC	0-50MA	3-1/4 x 3-1/4 x 4-31/32	MS50P05	$
50-60 VDC	0-250MA	3-5/16 x 4-3/16 x 5-1/2	MS50P3	$
58-60 VDC	0-4 AMP	6-15/16 x 9-1/4 x 6-5/16	MS604	$
59-61 VDC	0-1 AMP	5-3/4 x 7-3/16 x 5-1/4	MS601	$
59-61 VDC	0-2 AMP	6 x 8-15/16 x 6-5/16	MS602	$
60-70 VDC	0-100MA	3-1/4 x 3-1/4 x 4-31/32	MS60P1	$
70-80 VDC	0-100MA	3-1/4 x 3-1/4 x 4-31/32	MS70P1	$
80-90 VDC	0-100MA	3-1/4 x 3-1/4 x 4-31/32	MS80P1	$
90-100 VDC	0-100MA	3-1/4 x 3-1/4 x 4-31/32	MS90P1	$
100-110 VDC	0-100MA	3-1/4 x 3-1/4 x 4-31/32	MS100P1	$
150-160 VDC	0-100MA	5 x 5-3/4 x 6	MS150P1	$
200-210 VDC	0-100MA	5 x 5-3/4 x 6	MS200P1	$
250-260 VDC	0-100MA	5 x 5-3/4 x 6	MS250P1	$
300-310 VDC	0-100MA	5 x 5-3/4 x 6	MS300P1	$

Other voltages and currents available in this series.

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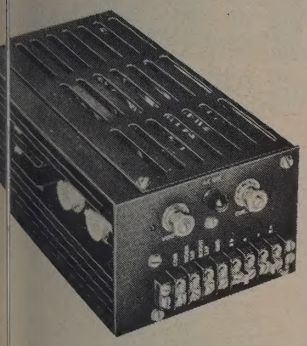
A Wholly Owned Subsidiary of Electronic Research Associates, Inc.

Transpac® 5 or 3.6 Volt IC Logic Power Modules

for cool performance, total protection



SPECIFICATIONS

Dual Input: 105-125 VAC and 210-250 VAC, 47-440 Hz
Line Regulation: 0.05% + 4 millivolts
Load Regulation: 0.03% + 3 millivolts, 0-100% load change
Ripple: < 800 microvolts RMS
Temperature Coefficient: Less than .03% per 0°C
Operating Temperature: —25°C to +71°C, free air
Storage Temperature: —62°C to +85°C
Voltage Adjustment: ±5%, local or remote
Current Limiting: Adjustable
Overvoltage Protection: Adjustable
Recovery Time: Less than 50 microseconds
Remote Sensing: Standard
Interconnection: Series or parallel operation
Finish: Black anodized, per Mil-A-8625

ATURES

- Compact size
- Low cost
- Off-the-shelf delivery
- Series and parallel operation
- Factory burn-in
- IC Op-Amp utilized for high performance
- Adjustable overvoltage protection
- Adjustable current limiting
- Reverse polarity protection
- Overload and short circuit protection with automatic recovery
- Boost tap for input correction
- Indicator pilot light
- Thermal protection with automatic recovery
- Electrostatically shielded power transformer
- Fully repairable
- All silicon design — fast warm up and stabilization
- No forced air or additional heat-sinks required
- Isolated input and output
- Dual AC voltage input
- Remote sensing
- Wide frequency range without derating
- Flush threaded inserts on more than one surface for mounting versatility

Model	Output Voltage VDC	Current @ 50°C	Current @ 60°C	Current @ 71°C	Size	Case	Price
CP-3P6-2P5	3.6	3.3	2.8	2.5	3⅜ x 4 15/16 x 6¼	18B	$125.00
CP-5-2P5	5	3.3	2.8	2.5	3⅜ x 4 15/16 x 6¼	18B	$125.00
CP-3P6-5	3.6	6.5	5.7	5.0	3⅜ x 4 15/16 x 8 15/16	18C	$145.00
CP-5-5	5	6.5	5.7	5.0	3⅜ x 4 15/16 x 8 15/16	18C	$145.00
CP-3P6-10	3.6	13.0	11.4	10.0	4 15/16 x 7½ x 8⅞	18D	$185.00
CP-5-10	5	13.0	11.4	10.0	4 15/16 x 7½ x 8⅞	18D	$185.00
CP-3P6-17	3.6	22.0	19.5	17.0	4 15/16 x 7½ x 10⅞	18E	$230.00
CP-5-17	5	22.0	19.5	17.0	4 15/16 x 7½ x 10⅞	18E	$230.00
CP-3P6-25	3.6	32.0	28.5	25.0	4 15/16 x 7½ x 14⅞	18EE	$310.00
CP-5-25	5	32.0	28.5	25.0	4 15/16 x 7½ x 14⅞	18EE	$310.00

Other voltages and currents available in above listed cases.

The Transpac CP Series incorporates latest circuit techniques and features a unique heat sinking method which permits full ratings at 71°C ambient with convection cooling. Design characteristics meet military specifications such as Mil-QQ-318, Mil-P-18177B, and Mil-A-8625.

Input to the IC Power Source is 105-125 VAC and 210-250 VAC, 47-440 Hz. An AC input boost tab is also available for crest factor correction or low line voltage conditions. Standard models are available with 3.6 or 5 VDC output.

These units incorporate short circuit protection with automatic recovery. Protective features also include adjustable current limiting thermal cutout with automatic recovery and adjustable overvoltage crowbar. The units are designed for long reliability, and incorporate a maximum-area heat sink design to lower internal temperatures for longest component life.

Each unit is subjected to burn-in under full load to qualify the CP Series for the demanding requirements of latest generation computer dependability and space age environmental requirements.

NON-REGULATED SILICON HIGH CURRENT POWER SUPPLIES

Non-regulated silicon rectifier designs with all components fully accessible. All units in one-half relay rack dimensions. Two units may be mounted side-by-side for 19" relay rack mounting. Front panel switch and pilot light; rear terminals. Ripple less than 1 volt, 5 models, 28 VDC, 5 to 40 amp ratings. Prices $110 to $273.

ERA DELIVERS SPECIAL DESIGN POWER SUPPLIES by the thousands

In addition to hundreds of off-the-shelf power sources, ERA provides a complete custom design service. ERA's custom department, fully-staffed with top power-engineering experts can supply you with "instant" quotations, prompt prototype delivery, and quality production at competitive prices. Write ERA now for a quotation on your special designs.

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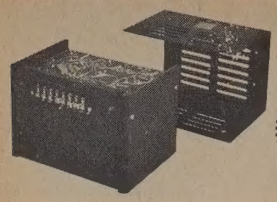


71°C FREE AIR RATING

WIDE RANGE LOW COST DC POWER MODU

4 through 60 VDC, 1 Amp through 12.5 Amps

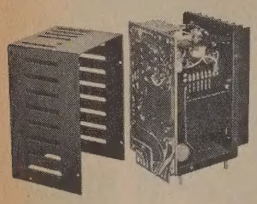
Input: 105-125 VAC, 50-400 cps
DC Output: 4-32 VDC or 30-60 VDC (see table)
Regulator Type: Solid-state, all silicon semi-conductors
Ripple: Less than 800 microvolts RMS or .005%, whichever is greater
Line Regulation: Better than ±0.01% or 5 mv for full input change
Load Regulation: Better than 0.05% or 8 mv for 0-100% load change
Transient Response: Less than 50 microseconds
Operating Temperature: —20°C to + free air, full ratings
Temperature Coefficient: Less than per degrees C or 3 millivolts
Long-Term Stability: Within 8 milliv (8 hours reference)

Features of all ERA Wide Range Modules

- Wide range output voltage flexibility
- Low and high current models
- Single model serves all voltage requirements
- All silicon
- No heat sinking or air blow required
- Compact, fully repairable
- Automatic over-current protection
- Excellent long-term stability
- Minimal temperature coefficient
- Wide input range
- Remote sensing
- Series or parallel operation
- Ungrounded outputs
- Short circuit and transient protected
- Optional accessories

Output Voltage (DC)	Current Rating Table (Amps) 35°C	55°C	71°C	Size WxDxH (inches)	Weight (lbs.)	Model	Pri
4-32	1	1	0.75	4 x 4 x 6½	6.2	LC32P7	$ 9
4-32	2.5	2.5	2	5 x 5 x 7	8.5	LC322	$12
4-32	6.5	6	5	6¾ x 8½ x 7¼	16.8	LC325	$19
4-32	12.5	11	10	8¾ x 9½ x 7½	29.0	LC3210	$23
30-60	1.25	1.25	1	5 x 5 x 7	8.5	LC601	$15

Over-Voltage Protector Option: Add $37.00 to above prices and Suffix V to Model No. (i.e. LC325V,



71°C FREE AIR RATING

WIDE RANGE ULTRA COMPACT DC POWER MODU

1 through 33 VDC, 600 MA through 9.6 Amps

The WR Series of DC Compacts features the same high quality engineering and construction as the LC Series above. This series has been designed for applications with minimum space requirements.

Output Voltage (DC)	Current Rating Table (Amps) 55°C	71°C	Size WxDxH (inches)	Weight (lbs.)	Model	Price
1-33	0.6	0.5	3¼ x 3¼ x 5¼	3.5	WR33P5	$136.00
1-33	1.2	1	3¼ x 4 x 5 15/16	5.1	WR331	$163.00
1-18	2.4	2	4 x 4 11/16 x 5 15/16	6.5	WR182	$178.00
1-33	2.4	2	4¼ x 5 x 6⅞	7.8	WR332	$194.00
1-33	4.8	4	5 9/16 x 7¼ x 6¼	13.3	WR334	$268.00
1-33	9.6	8	8¾ x 7⅝ x 6 15/16	22.5	WR338	$320.00

Input: 105-125 VAC, 50-400 cps
DC Output: 1-33 VDC or 1-18 VDC (se
Regulator type: Solid-state, all-silicon semi-conductors
Ripple: Less than 800 microvolts RMS or 0.005% whichever is greater
Line regulation: Better than ±0.01% o 5 millivolts for full input change
Load regulation: Better than 0.05% o 8 millivolts for 0-100% load change
Vernier voltage: Provision for external adjustment
Transient response: Less than 50 micro-seconds
Operating temperature: —20°C to +71 free air, full ratings
Temperature coefficient: 0.01% or 3 millivolts per degrees C
Long term stability: Within 5 millivolt or 0.02% (8 hours reference: line, lo temperature constant)
Heat sinking: Internal, convection coo

Silicon/Hybrid Wide Range High-Voltage Su

0-5,000 VDC @ 0-15 MA

MODEL HVA 515 $495.00

Features

- New Hybrid Solid-State/Vacuum Tube Designs
- All Silicon Semi-conductors
- High Stability, High Temperature Performance
- Closely Regulated
- Low Ripple Content
- Wide Range Adjustable Output
- Fast Transient Response
- Accurate Calibration and Resolution
- Overload, Short Circuit, Transient Protected
- Compact Space-Saving Designs
- Precision Engineered
- Moderately Priced
- Reverse Polarity Switch

GENERAL SPECIFICATIONS

Input: 105-125 VAC, 50-400 cps
Output: 0-5 KV DC at 0-15 ma
Line and Load Regulation: 0.01% or 50 mv, whichever is greater
Ripple (RMS): 0.0001% or 5 mv whichever is greater
Temperature Coefficient: 0.01% / °C or 10 mv/ °C, whichever is greater
Long Term Stability: Less than 25 mv, constant line, load and temperature (8 hours)
Transient Response: Less than 50 microseconds
Operating Temperature: 0°C to 50°C
Output Polarity: Either positive or negative grounding
Metering: Voltage and current m ers
Cooling: Convection
Physical: Bench or relay rack m ntin
Panel Size: 3½ x 19 x 15⅛

APPLICATIONS

- Cathode Ray indicators
- Klystron, Traveling Wave Tub
- Microwave and Laser Equipm t
- Geiger, Scintillation Counter
- Dielectric Testing
- Electron Accelerators
- Corona, Plasma Discharges
- Electro-Static Deposition
- All HV Laboratory and Equip nt Applications

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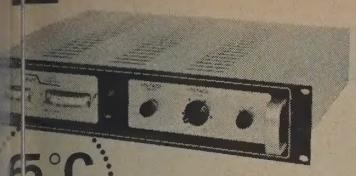
SILICON MAGITRAN® VARIABLE POWER SUPPLIES

0 to 36 VDC, 2 Amps through 25 Amps



65°C
FREE AIR
RATING

Model SL36-4M Shown

- Silicon Design
- Continuously Adjustable 0 to 36 VDC
- Operating Temperature to +65°C
- Automatic Short Circuit Protection
- Remote Sensing
- Convection Cooled
- Relay Rack or Bench Mounting

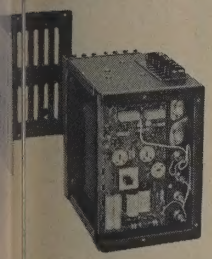
Input: 105-125 VAC, 50-400 cps
Regulation Line: ±0.01% or 5 mv
Regulation Load: 0.05% or 8 mv
Long Term Stability: Less than 8 mv, constant line, load and temperature
Ripple: Less than 1 mv, RMS
Transient Response: Less than 50 μsec
Operating Temperature: —20°C to +65°C
Temperature Coefficient: 0.01%/°C or 3 mv
Short Circuit Protection with automatic recovery
Remote Sensing
Parallel and Series Operation
Vernier Voltage Control
Output Terminals (Ungrounded)
Reverse Voltage Protection
Cooling: Convection
Metering: Separate Current and Voltage Meters

Model	Voltage	Current	Size* HxWxD	Price
SL36-2M	0-36 VDC	0-2 amps	3-1/2 x 7-1/2 x 15-7/8	$247.00
SL36-2/2M	0-36 VDC Dual	0-2 amps Dual	3-1/2 x 17 x 15-7/8	$488.00
SL36-4M	0-36 VDC	0-4 amps	3-1/2 x 17 x 15-7/8	$304.00
SL36-8M	0-36 VDC	0-8 amps	5-1/4 x 17 x 15-7/8	$373.00
SL36-12M	0-36 VDC	0-12 amps	7 x 17 x 15-7/8	$478.00
SL36-25M	0-36 VDC	0-25 amps	10-1/2 x 17 x 15-7/8	$682.00

*Relay rack mounting kit no charge. Provides for 19" rack mounting.

SOLID STATE AC REGULATOR Sinusoidal Output, Modular Design

Model	Rating	Weight	Price
RT 250	250 VA	14 lbs.	$136.
RT 500	500 VA	27 lbs.	$184.
RT 1000	1000 VA	43 lbs.	$247.



Model RT 250

FEATURES

- Sinusoidal output
- Precision RMS regulation
- Compact, modular design
- Minimum magnetic field or RFI
- Wide input range 47-440 cps
- Wide load power factor range
- Remote sensing
- Overload and short-circuit protected
- 71°C Free air rating
- Fully repairable

Input: 105-130 VAC, 47-440 cps.
Line Regulation (RMS): Within ± 0.1% for full input change, resistive load or within ± 0.2% for +0.7 to —0.7 PF load.
Load Regulation (RMS): Within 0.2% for full load change, resistive, or within 0.5% for +0.7 to —0.7 load PF change.
Wave Form Distortion: Less than 5% (115 VAC input, unity through 0.7 load PF.)
Efficiency: Better than 75% rated load, 115 VAC input.
Load Power Factors Range: +0.7 PF through —0.7 PF.
Response Time: Less than 16 millisec.
Operating Temperature: —20°C to 71°C free air, full ratings.
Heat Sinking: Internal, convection cooled.

TRANSPAC® SOLID-STATE DC to AC INVERTERS

REGULATED (Square Wave) IT-B TYPES

- Output voltage and frequency vary proportionately with input voltage change
- Voltage regulation is within approximately 6% and frequency regulation within approximately ±2% for 50-100% load change
- Unit can be synchronized externally

	POWER OUTPUT	INPUT VDC	OUTPUT (NOM.)	SIZE W x D x H (INCHES)	MODEL	PRICE
60 CPS OUTPUT	15 VA	5-7	115 VAC	2-5/8 x 3-1/16 x 4-1/2	IT616B	$ 84.00
	25 VA	10-14	115 VAC	3-1/16 x 3-9/16 x 4-7/8	IT126B	$ 94.00
	50 VA	19-29	115 VAC	3-7/8 x 3-7/8 x 4-3/4	IT256B	$110.00
	100 VA	19-29	115 VAC	3-1/4 x 4 x 5-15/16	IT2106B	$121.00
400 CPS OUTPUT	15 VA	5-7	115 VAC	2-3/8 x 2-3/4 x 3-13/16	IT614B	$ 84.00
	25 VA	10-14	115 VAC	2-5/8 x 3-1/16 x 4-1/2	IT124B	$ 94.00
	50 VA	19-29	115 VAC	3-1/16 x 3-9/16 x 4-7/8	IT254B	$110.00
	100 VA	19-29	115 VAC	3-1/4 x 4 x 5-15/16	IT2104B	$131.00

REGULATED (Square Wave) SB TYPES

- Output voltage varies proportionately with input voltage change
- Output voltage regulation within approximately 5% for a 50-100% load change
- Frequency regulation within approximately ±1% for ±10% input change or 0-100% load change
- Unit can be synchronized externally

60 CPS OUTPUT	50 VA	20-29	115 VAC	5-1/2 x 6-1/16 x 6-5/32	IT256SB	$205.00
	100 VA	20-29	115 VAC	5-1/2 x 6-1/16 x 6-5/32	IT2106SB	$257.00
	250 VA	10-14	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT2256SB(12)	$268.00
	250 VA	19-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT2256SB(24)	$278.00
	500 VA	10-14	115 VAC	7-13/32 x 9 x 6-3/16	IT2506SB(12)	$294.00
	500 VA	19-29	115 VAC	7-13/32 x 9 x 6-3/16	IT2506SB(24)	$304.00
400 CPS OUTPUT	50 VA	20-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT254SB	$215.00
	100 VA	20-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT2104SB	$241.00
	250 VA	20-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT2254SB	$283.00
	500 VA	20-29	115 VAC	7-13/32 x 9 x 6-3/16	IT2504SB	$352.00

REGULATED (Sine Wave) RS TYPES

- Load voltage variation with 0-100% change is less than 6%
- Frequency regulation within ±1% for either 10% input change or 0-100% load change
- Magnetic regulator provides voltage regulation
- Unit can be synchronized externally

60 CPS OUTPUT	50 VA	26-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT256RS	$247.00
	100 VA	26-29	115 VAC	7-13/32 x 9 x 6-3/16	IT2106RS	$275.00
	250 VA	26-29	115 VAC	12 x 9 x 8	IT2256RS	$360.00
	500 VA	26-29	115 VAC	11 x 14 x 7	IT 2506RS	$505.00
400 CPS OUTPUT	50 VA	26-29	115 VAC	6-1/8 x 5-15/16 x 6-1/2	IT254RS	$252.00
	100 VA	26-29	115 VAC	7-13/32 x 9 x 6-3/16	IT2104RS	$289.00
	250 VA	26-29	115 VAC	12 x 9 x 8	IT2254RS	$383.00
	500 VA	26-29	115 VAC	11 x 14 x 7	IT 2504RS	$520.00

Frequency changers available in VA ratings listed above.

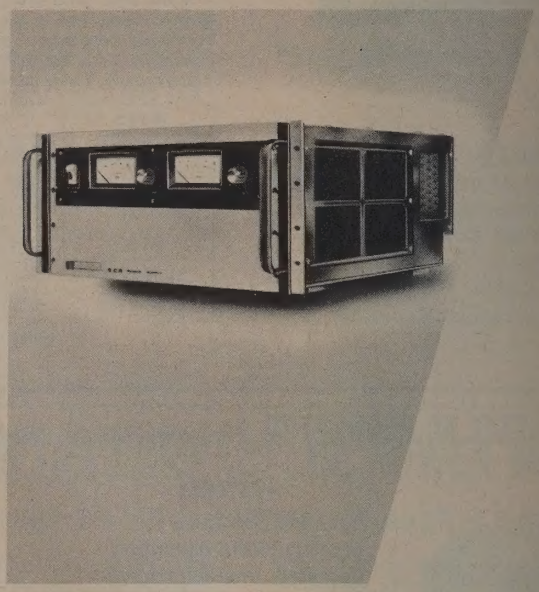
Note: Prices F.O.B. Paramus, New Jersey
Subject to change without notice

ERA Transpac® Corporation

67 Sand Park Road, Cedar Grove, N.J. 07009 • (201) 239-3000 TWX 710-994-5789

A Wholly Owned Subsidiary of Electronic Research Associates, Inc.

Power Supplies - High Wattage



Electrical Features

- 0.1% regulation constant voltage or constant current mode
- 10 MV RMS ripple maximum either voltage or current
- Remote sensing/programming
- Efficiency up to 85%
- Automatic E/I crossover
- Thermal overload protection

Mechanical Features

- Forced air cooling
- Plug-in circuit boards

SCR SERIES

The SCR Series are high current power supplies designed for a wide variety of applications, particularly where operation in both the constant current mode and in the constant voltage mode is required. Use of active components in the filter section reduces ripple in either mode by factors as high as 100 to 1 over competitive designs. The unique filter design coupled with efficient cooling results in the smallest package size per watt possible.

Ratings

Size 1				Size 2				Size 3			
Output				Output				Output			
Model #	E	I	Price	Model #	E	I	Price	Model #	E	I	Price
SCR 10-250	0-10	250	$1300	SCR 10-500	0-10	500	$1700	SCR 20-500	0-20	500	$2900
SCR 20-125	0-20	125	1150	SCR 20-250	0-20	250	1500	SCR 40-250	0-40	250	2500
SCR 30-100	0-30	100	1250	SCR 30-200	0-30	200	1600	SCR 50-200	0-50	200	2500
SCR 40-60	0-40	60	1010	SCR 40-125	0-40	125	1375	SCR 100-100	0-100	100	2500
SCR 80-30	0-80	30	995	SCR 80-60	0-80	60	1500	—	—	—	—
SCR 120-20	0-120	20	995	SCR 120-40	0-120	40	1500	—	—	—	—
SCR 160-15	0-160	15	995	SCR 160-30	0-160	30	1500	—	—	—	—
SCR 250-10	0-250	10	995	SCR 250-20	0-250	20	1500	—	—	—	—
SCR 500-5	25-500	5	1300	SCR 500-10	25-500	10	1700	—	—	—	—

All units — input 188-242V 3 PH Y or delta 50-60Hz; For 480V nominal ± 10% input add suffix 0075 and add $150.00 to price.
Size 1 — 7H x 19W x 20D
Size 2 — 8¾H x 19W x 20D
Size 3 — 12¼H x 19W x 20D
U.S. patent applied for. Prices and specifications subject to change without notice.

Specialists in Power Conversion Equipment

ELECTRONIC MEASUREMENTS INC.

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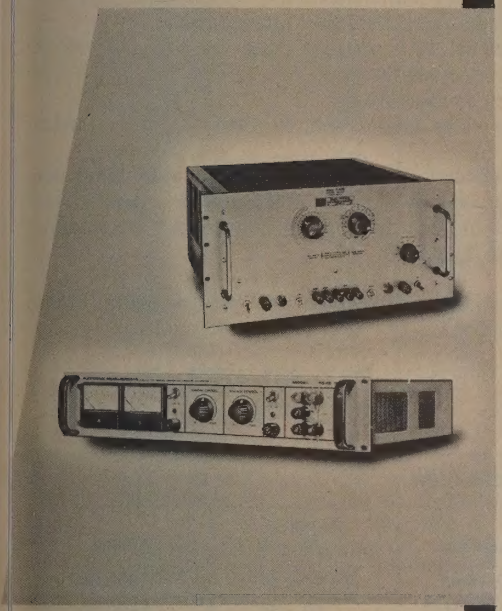
Power Supplies For Lab/Systems



RE Series

The RE Series is designed for both precise laboratory and systems use and features automatic cross-over to either constant voltage or constant current modes of operation.

Features

- .01% regulation
- Remote sensing/programming
- Automatic E/I crossover
- 0.5 MV RMS ripple
- 1000 Ohms/volt programming constant

Ratings

Model #	Output E	Output I	Size	Price
RE 40-5 ML	0-40	5	1	$320.00
RE 40-10 ML	0-40	10	2	400.00
RE 60-2.5 ML	0-60	2.5	1	320.00
RE 60-5 ML	0-60	5	2	445.00

NOTES: All units input: 105-125 VAC 50-63Hz.
Size 1 — 3½H x 19W x 17¼D.
Size 2 — 5¼H x 19W x 16¼D.
For 220V 50Hz input add suffix 0011 to Model and 15% to price.

HV Series

The HV Series is a completely solid state medium voltage power supply.

Features

- .02% regulation
- 1MV RMS ripple
- Automatic E/I crossover
- Remote sensing/programming

Ratings

Model #	E	I	Size	Price
HV 150-2M	0-150	2	3½H x 19W x 15¾D	$735.00
HV 330-1M	0-330	1	3½H x 19W x 15¾D	735.00

All units 105-125V AC 50-63Hz
For 220V 50Hz input add suffix 0011 to Model and 15% to price.

C 600 Series

The C 600 Series is designed for applications where precise constant current operation down to currents as low as 0.5 microamps is required.

Ratings

Model #	Output Compliance Full I	Output Compliance Derated I	Output Current	Regulation Line	Regulation Load	Ripple 0.4% of setting + Neg.	Ripple 0.4% of setting + Pos.	Size	Price
C 612 AM	0-100	100-260	1 ua-100ma	0.15%	0.1%	0.5 ua	0.1 ua	3¼ x 19 x 9¼	$320.00
C 630 CM	0-200	200-280	10 ua-1A	0.15%	0.1%	4 ua	4 ua	8¾ x 19 x 15	962.00
C 633 CM	0-300	300-420	2.2 ua-300ma	0.15%	0.1%	0.5 ua	0.1 ua	5¼ x 19 x 15	500.00
C 636 CM	0-600	600-730	2.2 ua-220ma	0.15%	0.1%	1 ua	0.2 ua	8¾ x 19 x 15	700.00

All units input 105-125Vac 50-63Hz; All units except 612A have a voltage limiter.
For voltage limiting on C 612A add suffix L and $50.00 to price, delete either voltmeter or front terminals.
For improved stability to 0.2%, add suffix K and $95.00 to price. For 220V 50Hz input add suffix 0011 to Model and 15% to price.

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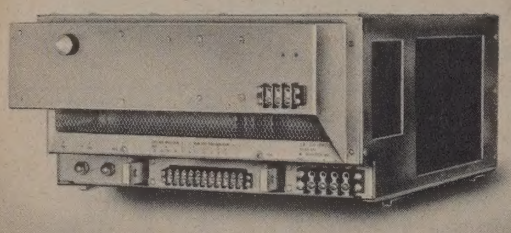
SCR Accessories



SCR Accessories

001	Remote turn on from external source	$ 50.00
002	3PH 480V ± 10% input sizes 1 & 2	150.00
003	Front panel mode indication	25.00
004	Hi-inductance load conditioners	
	Model 3030* for 250 amp load	200.00
	3031* for 500 amp load	300.00
	3032** for 1000 amp load	500.00

*Separate 7 x 19 x 15 module
**Separate 7 x 19 x 24 module

FOR NOISE SENSITIVE CIRCUIT APPLICATIONS

005	Reflected input distortion attenuators*	
	For 208 or 220 V nominal input	100.00
	For 480 V nominal input	150.00
	*Attach to rear of unit.	
006	Output noise attenuation, built-in	100.00

To order specific basic model number with applicable option or accessory desired. If 005 option is desired with overvoltage crowbar circuit, the crowbar will be mounted on separate 3½ panel.

Other options or accessories are also available. Please consult factory.

CALL 800-631-4298
TOLL FREE

SCR CROWBAR CIRCUIT PROTECTION

Part No.	Model	Range Adjustment	Response	Size W D	Price
3003	SCR 10-250	4-12V	10, usec	17 x 5″	$300.00
3004	SCR 10-500	4-12V	10, usec	17 x 5″	$400.00
3005	SCR 20-125	8-24V	10, usec	17 x 5″	$250.00
3006	SCR 20-250	8-24V	10, usec	17 x 5″	$300.00
3007	SCR 40- 60	16-48V	10, usec	17 x 5″	$200.00
3008	SCR 40-125	16-48V	10, usec	17 x 5″	$250.00
3009	SCR 80- 30	60-90V	10, usec	17 x 5″	$150.00
3010	SCR 80- 60	60-90V	10, usec	17 x 5″	$200.00
3011	SCR 120-20	100-140V	10, usec	17 x 5″	$125.00
3012	SCR 120-40	100-140V	10, usec	17 x 5″	$150.00
3013	SCR 160-15	120-180V	10, usec	17 x 5″	$125.00
3014	SCR 160-30	120-180V	10, usec	17 x 5″	$150.00
3015	SCR 250-10	200-300V	10, usec	17 x 5″	$125.00
3016	SCR 250-20	200-300V	10, usec	17 x 5″	$125.00
3017	SCR 500- 5	400-600V	10, usec	17 x 5″	$200.00
3018	SCR 500-10	400-600V	10, usec	17 x 5″	$200.00

Factory installed Crowbar type. SCR Crowbar is shorted across load within 10 usec after which power supply is disconnected from line within approximately 10 ms.

Prices and specifications subject to change without notice.

Specialists in Power Conversion Equipment

ELECTRONIC MEASUREMENTS INC.

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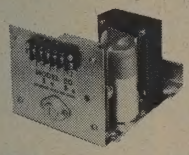
LOW COST DC POWER SUPPLIES

50 WATT-SINGLE—$59 200 WATT-SINGLE—$99
50 WATT-DUAL—$79 50 WATT-TRIPLE—$125
100% SILICON LOW RIPPLE GOOD REGULATION

VATT—SINGLE & DUAL

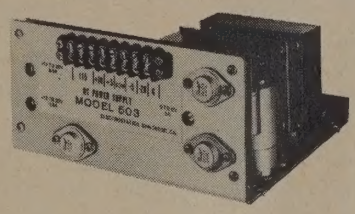


SIZE:
5" x 4.13" H
x 7" L
EIGHT 5.5 LBS.

MO L	VOLTS	AMPS
50	2.5 - 3.5	5.0
50	3.5 - 4.5	5.0
50	4.5 - 5.5	5.0
50	5.5 - 6.5	4.5
50	6.5 - 7.5	4.5
50	7.5 - 8.5	4.5
50	8.5 - 9.5	4.0
50 0	9.5 - 10.5	4.0
50 1	10.5 - 11.5	4.0
50 2	11.0 - 13.0	3.0
50 4	13.0 - 15.0	3.0
50 6	15.0 - 17.0	3.0
50 8	17.0 - 19.0	2.5
50 0	18.0 - 22.0	2.0
50 4	22.0 - 26.0	2.0
50 8	26.0 - 30.0	2.0
50 4	30.0 - 38.0	1.5
50 4	38.0 - 50.0	1.0
50 12	+10.0 - 13.5	1.0
	−10.0 - 13.5	1.0
50 15	+13.5 - 16.5	1.0
	−13.5 - 16.5	1.0
50 18	+16.5 - 20.0	1.0
	−16.5 - 20.0	1.0

PRE	SINGLE	WITH OVERVOLTAGE
9	$59.00 each	$69.00
1 24	56.00 each	65.00
	DUAL	
9	$79.00 each	
1 24	75.00 each	

50 WATT—TRIPLE



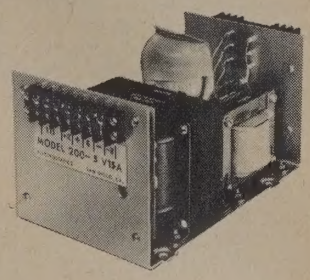
SIZE: 8" W x 4" H 8" L
WEIGHT: 8.0 LBS.

MODEL	VOLTS	AMPS
503	4.5 - 6.5	5.0
	+12 TO 20	0.5
	−12 TO 20	0.5

5 AMP OUTPUT MAY BE CONNECTED FOR + OR − OUTPUT.

PRICE		WITH OVERVOLTAGE
1 - 9	$125.00 each	$150.00
10 - 24	115.00 each	136.00

200 WATT—SINGLE



SIZE: 5.5" W x 5" H x 10.8" L
WEIGHT: 15.0 LBS.

MODEL	VOLTS	AMPS
200 - 5	4.5 - 5.5	15.0
200 - 12	11.5 - 12.5	10.0
200 - 24	23.5 - 24.5	7.5
200 - 28	27.5 - 28.5	7.0
200 - 48	47.5 - 48.5	4.0

Remote sensing standard on all models.

PRICE		WITH OVERVOLTAGE
1 - 9	$99.00 each	$114.00
10 - 24	94.00 each	107.00
Any voltage, 3 to 50, not listed above		
1 - 9	$109.00	$124.00
10 - 24	104.00	117.00

ELCTRICAL SPECIFICATIONS FOR ALL MODELS

INPUT: 105 - 125 VAC, 50 - 420 Hz

REGULATION: LINE — 0.01% OR 5 MV (10 VOLT CHANGE)
LOAD — 0.10% OR 15 MV (FULL LOAD CHANGE)

RIPPLE: 5 TO 15 A — LESS THAN 500 MICROVOLTS RMS
0.5 TO 5 A — LESS THAN 250 MICROVOLTS RMS

IMPEDANCE: 100 Hz — .001 OHMS
1 KHz — .005 OHMS
10 KHz — .01 OHMS
100 KHz — .1 OHMS

TRANSIENT RESPONSE: FOR 50% LOAD CHANGE
10 MICROSECONDS WIDE AND
5 MILLIVOLTS PEAK

OVERSHOOT: NONE ON TURN ON OR OFF

TEMPERATURE: OPERATING - −20 TO +71°C
STORAGE - −65 TO +85°C
COEFFICIENT - 0.01%/°C MAX

CURRENT LIMITING: FIXED — AUTOMATIC RECOVERY

OVERVOLTAGE: ADJUSTABLE CROWBAR — OPTIONAL

ADJUSTMENT: SCREWDRIVER

OUTPUT: FLOATING — TERMINAL STRIP

CAPACITORS: COMPUTER GRADE — 10 YEAR LIFE

ONE YEAR WARRANTY—SATISFACTION GUARANTEED
WRITE FOR QUANTITY DISCOUNTS

ELVERY — STOCK TO 2 WEEKS **F.O.B. — SAN DIEGO, CALIFORNIA**

ELECTROSTATICS Inc.

96 ENGINEER ROAD • SAN DIEGO, CALIFORNIA 92111 • PHONE: 714-279-1414

ELGAR
AC Power Sources

Elgar AC power sources are designed for continuous-duty operation and utilize all-silicon solid-state circuitry as well as the highest-grade components. The basic power amplifier consists of two DC supplies and a multiple-stage amplifier with an adjustable power output transformer.

Control circuitry is mounted on a circuit board with test points, and all adjustment controls are available from the top of the unit.

Standard output voltages of 28 V, 115 V, or 230 V are available at the rear-panel terminal strip and at the front-panel connectors.

The instruments are contained in rack-mount enclosures with a meter for output voltage monitoring, a power-ON indicator, an output voltage amplitude control, and a power switch circuit breaker located on the front panel.

The output frequency is established by a plug-in oscillator. A variety of interchangeable plug-in oscillators is available; 45 Hz to 10 KHz variable, narrow range variable, and fixed frequencies with accuracies to 0.0001%.

Power Source Selection Guide

Single-Phase Power Amplifiers

Model	Output Power
201	200 VA
501	500 VA
751	750 VA
1001	1,000 VA
1000-1	1,000 VA (2 pieces Model 501 in tandem)
C-1000-1	Model 1000-1 in rack mount enclosure
1501	1,500 VA
C-1501	1,500 VA In cabinet
2000-1	2,000 VA (2 pieces Model 1001 in tandem)
C-2000-1	Model 2000-1 in rack mount enclosure
3000-1	3,000 VA (2 pieces Model 1501 in tandem)
C-3000-1	3,000 VA (3000-1 in cabinet)

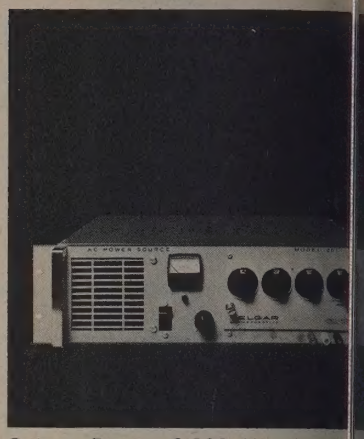
Two-Phase Power Amplifiers

Model	Output Power (Total)
153	150 VA
400-2	400 VA (2 pieces Model 201 interconnected for 2ϕ)
C-400-2	Model 400-2 in rack mount enclosure
1000-2	1,000 VA (2 pieces Model 501 interconnected for 2ϕ)
C-1000-2	Model 1000-2 in rack mount enclosure
1500-2	1,500 VA (2 pieces Model 751 interconnected for 2ϕ)
C-1500-2	Model 1500-2 in rack mount enclosure
2000 2	2,000 VA (2 pieces Model 1001 interconnected for 2ϕ)
C-2000-2	Model 2000-2 in rack mount enclosure
3000-2	3,000 VA (2 pieces Model 1501 in 2$\varnothing$ configuration)
C-3000-2	3,000 VA (3000-2 in cabinet)
4000-2	4,000 VA (2 pieces Model 2000-1 interconnected for 2ϕ)
C-4000-2	Model 4000-2 in rack mount enclosure

Three-Phase Power Amplifiers

Model	Output Power (Total)
153	150 VA
400-3D	400 VA (2 pieces Model 201 in 3ϕ delta configuration)
C-400-3D	Model 400-3D in rack mount enclosure
400-3Y	400 VA (2 pieces Model 201 in 3ϕ, 4 wire wye configuration)
C-400-3Y	Model 400-3Y in rack mount enclosure
600-3	600 VA (3 pieces Model 201 in 3ϕ, 4 wire wye configuration)
C-600-3	Model 600-3 in rack mount enclosure
1000-3D	1,000 VA (2 pieces Model 501 in 3ϕ delta configuration)
C-1000-3D	Model 1000-3D in rack mount enclosure
1000-3Y	1,000 VA (2 pieces Model 501 in 3ϕ, 4 wire wye configuration)
C-1000-3Y	Model 1000-3Y in rack mount enclosure
1503	1,500 VA
1500-3	1,500 VA (3 pieces Model 501 in 3ϕ, 4 wire wye configuration)
1500-3D	1,500 VA (2 pieces Model 751 in 3$\varnothing\Delta$ configuration)
C-1500-3	Model 1500-3 in rack mount enclosure
C-1500-3D	1,500 VA (1500-3D in cabinet)
1753	1,750 VA
2000-3D	2,000 VA (2 pieces Model 1001 in 3ϕ delta configuration)
C-2000-3D	Model 2000-3D in rack mount enclosure
2000-3Y	2,000 VA (2 pieces Model 1001 in 3ϕ, 4 wire wye configuration)
C-2000-3Y	Model 2000-3Y in rack mount enclosure
2250-3	2,250 VA (3 pieces Model 751 in 3ϕ, 4 wire wye configuration)
C-2250-3	Model 2250-3 in rack mount enclosure
3000-3	3,000 VA (3 pieces Model 1001 in 3ϕ, 4 wire wye configuration)
3000-3D	3,000 VA (2 pieces Model 1501 in 3$\varnothing$ delta configuration)
C-3000-3	Model 3000-3 in rack mount enclosure
C-3000-3D	3,000 VA (3000-3D in cabinet)
4500-3	4,500 VA (3 pieces Model 1501 in 3$\varnothing$, 4-wire wye configuration)
C-4500-3	4,500 VA (3 pieces Model 1501 in cabinet)
6000-3	6,000 VA (3 pieces Model 2000-1 in 3$\varnothing$, 4-wire wye configuration)
C-6000-3	Model 6000-3 in rack mount enclosure
7500-3	7,500 VA, 3$\varnothing$, 4-wire wye
C-7500-3	7,500-3 in cabinet
9000-3	9,000 VA (6 pieces Model 1501 in 3$\varnothing$, 4-wire wye configuration)
C-9000-3	9,000 VA (9000-3 in cabinet)

ELGAR Model 201 Single Phase 200 VA Solid-State Power Source



Output Power: 0-200 VA, 1ϕ, (1 0-400 VA, 2ϕ, (2 units); 0-400 (2 units)*; 0-600 VA, 3ϕ, (3 units tinuous duty.

Power Factor: Full current rating lagging to 0.7 leading power facto

Output Voltage: Adjustable 0-3 0-130 VAC, or 0-260 VAC.** Full power range 27-32 VAC, 110-13 or 220-260 VAC.

Output Configuration: 2-wire from ground; either output grounded.

Output Frequency Range: 45 Hz t Hz at full power output; 5 KHz to at one-half power output.

Wave Shape: Sine wave.

Distortion: Less than 0.9% over 4 5000 Hz range at full output pow than 0.5% at mid band (100 Hz t Hz) at full output power. Less th 5 KHz to 10 KHz at one-half power.

Load Regulation: ±1% no load load, 45 Hz to 5000 Hz, ad through zero for specific load co ±2% no load to one-half load, 5 10 KHz.

Response Time: Less than 50 μs

Line Regulation: ±0.25% at f vesus ±10 VAC change at 115 put. ±0.25% at full load vers VAC change at 230 VAC input.

Short Circuit Protection: Automa rent limiting protects against or short circuit; amplifier reco mediately when overload or short is removed.

Output Noise: 60 db below full voltage.

Input Power: 115 VAC ±10 VAC VAC ±20 VAC, 47 Hz to 63 Hz phase. (50 Hz to 425 Hz option

Temperature Range: 0°C to 50° tional, −20°C to +85°C non-ope

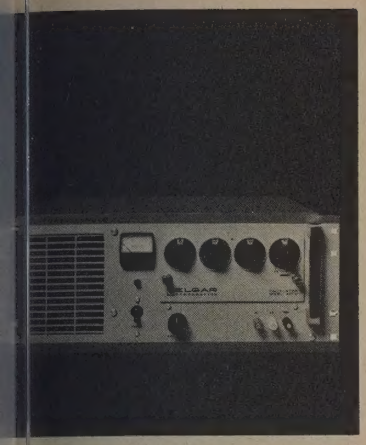
Weight: Net approx. 60 lbs., ship prox. 65 lbs.

*For 2 amplifier wye only: frequer 45 Hz to 2000 Hz at full pow regulation for balanced load.

**Output voltage range selected b change on rear panel terminal b

8159 Engineer Road, San Diego, California 92111, Phone (714) 279-0800

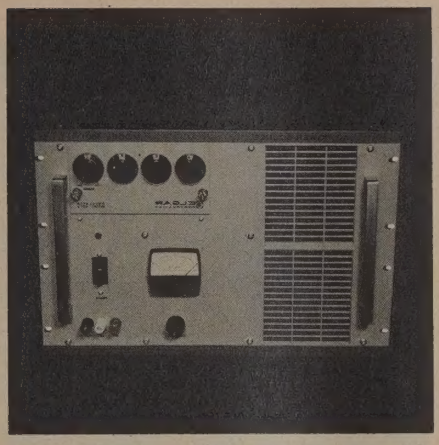
ELGAR
Model 501
Single Phase 500 VA
Solid-State
Power Source



Power: 0-500 VA, 1ϕ, (1 unit); 0-
A, 2ϕ, (2 units); 0-1000 VA, 3ϕ, (2
0-1500 VA, 3ϕ, (3 units); con-
duty.
Factor: Full current rating into
ng to 0.7 leading power factor
Voltage: Adjustable 0-32 VAC,
AC, or 0-260 VAC**. Full power
7-32 V, 110-130 V, or 220-260 V.
Configuration: 2-wire isolated
round; either output can be
d.
Frequency Range: 45 Hz to 5000
ull power output.
ape: Sine Wave.
n: Less than 0.9% over 45 Hz to
range at full output power. Less
% mid band (100 Hz to 1000 Hz)
utput power.
egulation: ±1% no load to full
5 Hz to 5000 Hz, adjustable
zero for specific load conditions.
e Time: Less than 50 μsec.
egulation: ±0.25% at full load
±10 VAC change at 115 VAC in-
0.25% at full load versus ±20
nge at 230 VAC input.
ircuit Protection: Automatic cur-
iting protects against overload or
rcuit, amplifier recovers immedi-
en overload or short circuit is
Noise: 60 db below full output
ower: 115 VAC ±10 VAC or 230
20 VAC, 47 Hz to 63 Hz, single
375 Hz to 425 Hz optional).
ture Range: 0°C to 50°C opera-
−20°C to +85°C non-opera-
Net approx. 105 lbs., shipping
115 lbs.

*For amplifier wye only: frequency range 45 to 2000 Hz at full power; ±1% regulation for balanced load.
**Output voltage range selected by jumper change on rear panel terminal block.

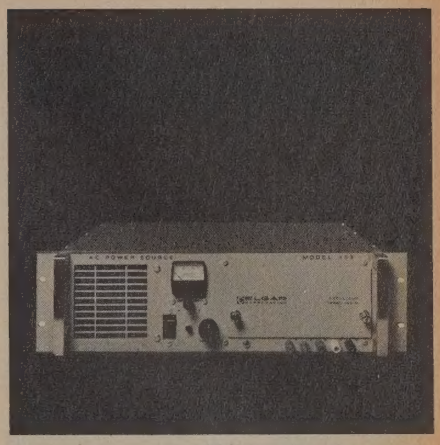
ELGAR
Model 1001
Single Phase 1000 VA
Solid-State
Power Source



Output Power: 0-1000 VA, 1ϕ, (1 unit); 0-2000 VA, 2ϕ, (2 units); 0-2000 VA, 3ϕ, (2 units)*; 0-3000 VA, 3ϕ (3 units); continuous duty.
Power Factor: Full current rating into 0 lagging to 0.7 leading power factor loads.
Output Voltage: Adjustable 0-32 VAC, 0-130 VAC, or 0-260 VAC.** Full power range 27-32 VAC, 110-130 VAC, or 220-260 VAC.
Output Configuration: 2-wire isolated from ground; either output can be grounded.
Output Frequency Range: 45 Hz to 5000 Hz at full power output.
Wave Shape: Sine Wave.
Distortion: Less than 0.9% over 45 Hz to 5 KHz at full output power. Less than 0.5% mid band (100 Hz to 1000 Hz) at full output power.
Load Regulation: ±1% no load to full load, 45 Hz to 5000 Hz, adjustable through zero for specific load conditions.
Response Time: Less than 50 μsec.
Line Regulation: ±0.25% at full load versus ±10 VAC change at 115 VAC input. ±0.25% at full load versus ±20 VAC change at 230 VAC input.
Short Circuit Protection: Automatic current limiting protects against overload or short circuit; amplifier recovers immediately when overload or short circuit is removed.
Output Noise: 60 db below full output voltage.
Input Power: 115 VAC ±10 VAC, 208 VAC or 230 VA C±20 VAC, 47 Hz to 63 Hz, single phase. (375 Hz to 425 Hz optional).
Temperature Range: 0°C to 50°C operational, −20°C to +85°C non-operational.
Weight: Net approx. 210 lbs., shipping approx. 220 lbs.

*For 2 amplifier wye only: frequency range 45 Hz to 2000 Hz at full power; ±1% load regulation for balanced load.
**Output voltage range selected by jumper change on rear panel terminal block.

ELGAR
Model 153
Three Phase 150 VA
Solid-State
Power Source



Output Power: 0-150 VA per phase, 1ϕ; 0-75 VA per phase, 2ϕ; 0-50 VA per phase, 3ϕ; continuous duty.
Power Factor: Full current rating into 0.7 lagging to 0.7 leading power factor loads.
Output Voltage: 0-130 VAC or 0-260 VAC, 2 wire 1 phase. 0-32 VAC, 0-130 VAC, or 0-260 VAC, 3 wire, 2 phase. 0-32 VAC, 0-130 VAC, or 0-260 VAC line to line, 3 wire open delta, 3 phase. 0-32 VAC, 0-130 VAC line to neutral, 4 wire wye, 3 phase.
Output Configuration: All outputs isolated from ground, any one phase or the neutral can be grounded. Voltage ranges are selected by strapping on rear panel connector.
Output Frequency Range: 350 Hz to 10 KHz at full power output.
Wave Shape: Sine Wave.
Distortion: Less than 0.5% over 350 Hz to 1000 Hz range at full power output. Less than 0.9% over 1000 Hz to 5000 Hz range at full power output. Less than 2% over 5 Hz to 10 KHz range at full power output.
Load Regulation: ±1% no load to full load, 350 Hz to 5000 Hz; ±2% no load to full load, 5 KHz to 10 KHz; adjustable through zero for specific load conditions.
Response Time: Less than 50 μsec.
Line Regulation: ±0.25% at full load versus ±10 VAC change at 115 VAC input. ±0.25% at full load versus ±20 VAC change at 230 VAC input.
Short Circuit Protection: Automatic current limiting protects against overload or short circuits, amplifier recovers immediately when overload or short circuit is removed.
Output Noise: 60 db below full output voltage.
Input Power: 115 VAC ±10 VAC or 230 VAC ±20 VAC, 47 Hz to 63 Hz, single phase. (375 Hz to 425 Hz optional).
Temperature Range: 0°C to 50°C operational, −20°C to +85°C non-operational.

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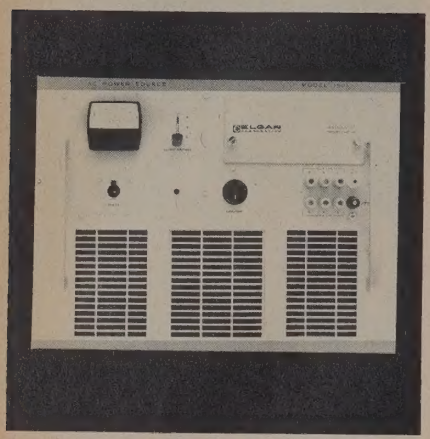
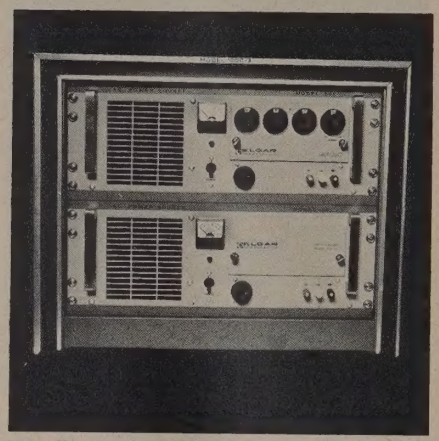
ELGAR
Model 1503
Three Phase 1500 VA
Solid-State
Power Source



Output Power: 1500 VA total, 500 VA per phase, continuous duty.
Power Factor: Full current rating into zero lagging to 0.7 leading power factor loads.
Output Voltage: 0-130 VAC line to neutral and 0-130 VAC line to line available simultaneously.
Output Configuration: 3-phase, 4-wire wye; all outputs isolated from ground, any one phase or the neutral can be grounded.
Output Frequency Range: 45 Hz to 5000 Hz at full power output.
Wave Shape: Sine Wave.
Distortion: Less than 0.9% over 45 Hz to 5000 Hz range at full output power. Less than 0.5% mid band (100 Hz to 1000 Hz) at full output power.
Line Regulation: ±0.25% at full load versus ±10 VAC change at 115 VAC input. ±0.25% at full load versus ±20 VAC change at 230 VAC input.
Load Regulation: ±1% no load to full load, 45 Hz to 5000 Hz, adjustable through zero for specific load conditions.
Response Time: Less than 50 μsec.
Short Circuit Protection: Automatic current limiting protects against overload or short circuit; amplifier recovers immediately when overload or short circuit is removed.
Output Noise: 60 db below full output voltage.
Input Power: 115 VAC ±10 VAC or 208 or 230 VAC ±20 VAC, 47 Hz to 63 Hz three phase. (375 Hz to 425 Hz optional).
Temperature Range: 0°C to 50°C operational, −20° to +85°C non-operational.
Weight: Net approx. 230 lbs., shipping approx. 240 lbs.

ELGAR
Model 1000
Single, Two or Three Phase
1000 VA Solid-State
Power Source



The Elgar Model 1000 AC power source is an all-silicon, solid-state power source designed for maximum flexibility and reliability.

It utilizes two pieces of our industry-proven Model 501 housed in a single rack mount enclosure. These units can be interconnected to provide the following ouput power configurations:
1000 VA, single phase,
1000 VA, 2 phase,
1000 VA, 3 phase, 3 wire delta, or
1000 VA, 3 phase, 4 wire wye.

Either amplifier will accept any of 40 interchangeable single or multiphase plug-in oscillators covering the range of 45 Hz to 5000 Hz, with accuracies from 1% to 0.0001%. Special oscillator modules are available providing ±0.01% amplitude and phase regulation, or amplitude and frequency BCD programming capability.

The Model 1000 is ideally suited for automated and laboratory testing of gyro, aircraft and missile and space equipment, and for operation of 60 Hz power equipment overseas.

Output Power:
Model 1000-1*, 1φ.
Model 1000-2, 2φ (500 VA/phase).
Model 1000-3D, 3φ, 3 wire delta (333 VA/phase).
Model 1000-3Y, 3φ, 4 wire wye, (333 VA/phase) continuous duty.
Power Factor: Full current rating into zero lagging to 0.7 leading for 1000-1 and 1000-2; 0.7 lagging to 0.7 leading for 1000-3D and 1000-3Y.
Output Voltage:
Model 1000-1, 0-130 VAC or 0-260 VAC, 2 wire.
Model 1000-2, 0-32 VAC, 0-130 VAC, or 0-260 VAC, 3 wire.
Model 1000-3D, 0-32 VAC, 0-130 VAC, or 0-260 VAC line to line, 3 wire open delta.
Model 1000-3Y, 0-32 VAC or 0-130 VAC line to neutral (120/208), 4 wire wye.

Output Configuration: All outputs from ground; any one phase o can be grounded. Voltage range lected by strapping changes panel terminal block.
Output Frequency Range: 1 1000-2, 45 Hz to 5000 Hz at f output. 1000-3D & 1000-3Y, 4 2000 Hz at full power output.
Wave Shape: Sine wave.
Distortion: Less than 0.9% full f range at full output power. L 0.5% mid range (100 Hz to 10 full output power.
Load Regulation: ±1% no loa load over rated frequency rang 3Y with balanced load), a through zero for specific load c
Response Time: Less than 50
Line Regulation: ±0.25% at versus ±10 VAC change at input. ±0.25% at full load ver VAC change at 230 VAC input.
Short Circuit Protection: Autom rent limiting protects against or short circuit, amplifier rec mediately when overload or sho removed.
Output Noise: 60 db below fu voltage.
Input Power: 115 VAC ±10 VA VAC ±20 VAC, single phase to 63 Hz. (375 Hz to 425 Hz op
Temperature Range: 0°C to 50 tional, −20°C to +85°C non-op
Weight: Net approx. 210 lbs., approx. 230 lbs., with cabinet 280 lbs.

*Model dash numbers are for i ordering; units are field changeab configuration with appropriate change.

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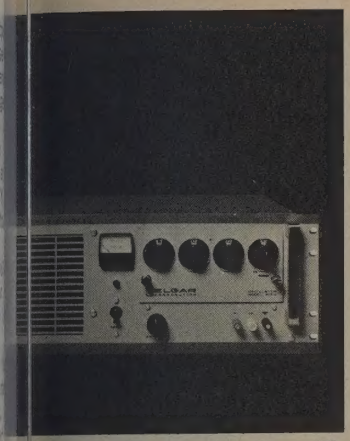
R
51
e-hase 750 VA
Site
r ource

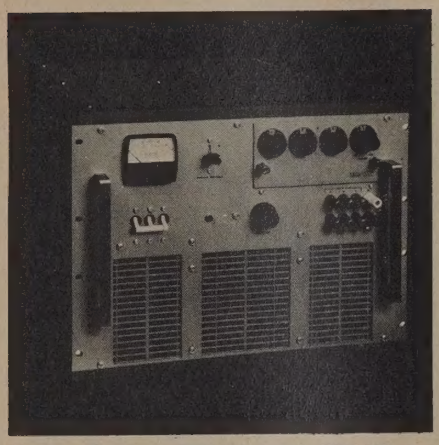


it wer: 0-750 VA, 1ϕ, (1 unit); 0 , 2ϕ, (2 units); 0-1500 VA, 3ϕ, its 0-2250 VA, 3ϕ, (3 units); con- s uty.
r ctor: Full current rating into gin to 0.7 leading power factor

t oltage: Adjustable 0-32 VAC, VC, or 0-260 VAC**. Full power 2 32 V, 110-130 V, or 220-260 V.
t Configuration: 2-wire isolated gund; either output can be
de
at equency Range: 45 Hz to 5000 f power output.
S pe: Sine wave.
rti: Less than 0.9% over 45 Hz to H range at full output power. Less 0.5 mid-band (100 Hz to 1000 Hz) l tput power.
R ulation: ±1% no load to full 45 z to 5000 Hz, adjustable through fo specific load conditions.
on Time: Less than 50 μsec.
R ulation: ±0.25% at full load s 10 VAC change at 115 VAC in- ±25% at full load versus ±20 ch ge at 230 VAC input.
t Cuit Protection: Automatic cur- lin ing protects against overload or t cuit, amplifier recovers immedi- wen overload or short circuit is ve
ut oise: 60 db below full output ge
t wer: 115 VAC ±10 VAC or 230 ±0 VAC, 47 Hz to 63 Hz, single- e 75 Hz to 425 Hz optional).
pe ure Range: 0°C to 50°C opera- al, 20°C to +85°C non-operational.
ht Net approx. 115 lbs., shipping ox 25 lbs.

or amplifier wye only: frequency range 5 to 2000 Hz at full power; ±1% egution for balanced load.
utp voltage range selected by jumper hare on rear panel terminal block.

ELGAR
Model 1753
Three-Phase 1750 VA
Solid-State
Power Source



Output Power: 1750 VA total, 585 VA per phase, continuous duty.
Power Factor: Full current rating into zero lagging to 0.7 leading power factor loads.
Output Voltage: 0-130 VAC line to neutral or 0-130 VAC line to line, both available simultaneously; full power range 110 VAC to 130 VAC.
Output Configuration: 3-phase, 4-wire wye; all outputs isolated from ground, any one phase or the neutral can be grounded.
Output Frequency Range: 45 Hz to 5000 Hz at full power output.
Wave Shape: Sine wave.
Distortion: Less than 0.9% over 45 Hz to 5000 Hz range at full output power. Less than 0.5% mid-band (100 Hz to 1000 Hz) at full output power.
Line Regulation: ±0.25% at full load versus ±10 VAC change at 115 VAC input. ±0.25% at full load versus ±20 VAC change at 230 VAC input.
Load Regulation: ±1% no load to full load, 45 Hz to 5000 Hz, adjustable through zero for specific load conditions.
Response Time: Less than 50 μsec.
Short Circuit Protection: Automatic current limiting protects against overload or short circuit, amplifier recovers immediately when overload or short circuit is removed.
Output Noise: 60 db below full output voltage.
Input Power: 115 VAC ±10 VAC or 208 or 230 VAC ±20 VAC, 47 Hz to 63 Hz, **three-phase** (375 Hz to 425 Hz optional).
Temperature Range: 0°C to 50°C operational, −20°C to +85°C non-operational.
Weight: Net approx. 230 lbs., shipping approx. 240 lbs.

ELGAR
Model 2501
Single-Phase 2.5 KVA
Solid-State
Frequency Changer

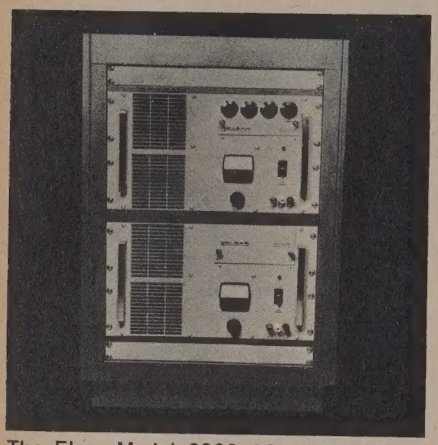
INPUT
Voltage: 120/208 V RMS ±10%.
Configuration: 3-phase, 4-wire
Frequency Range: 47 to 450 Hz.
Protection: Over-under voltage, loss of phase, overcurrent.
OUTPUT
Power: 2500 VA.
Configuration: Single-phase.
Overload: 250% of rated load for 5 sec.; 125% for 5 min.
Voltage: 105 to 125 adjustable.
Regulation: Line: 0.5% for ±10% input change. **Load:** 0.5% for no load to full load.
Frequency: 400 Hz to ±2 Hz under all conditions of line, load; (adjustable 380 to 420 minimum
Distortion: 2% maximum.
Power Factor: ±0.7 to unity at rated VA.
Efficiency: Better than 75% at rated load.
Temperature: −20°C to +55°C operating. −40°C to +85°C storage.
Altitude: Operating: 15,000 feet; Storage: 50,000 feet.
RFI: MIL-I-26600, Class III.
Humidity: 95% R.H. without condensation operating.
CONTROLS
1. Voltage adjust.
2. Input circuit breaker.
3. Output voltmeter.
4. Output current meter.
5. Frequency meter (optional).

CONNECTORS
1. Protected rear barrier strip.
2. Front panel (optional).
3. MS on rear (optional).

ELGAR
Model 7500-3
Three-Phase 7.5 KVA
Solid-State
Frequency Changer

INPUT
Voltage: 120/208 V RMS ±10%.
Configuration: 3-phase, 4-wire.
Frequency Range: 47Hz to 450 Hz.
Protection: Over-under voltage, loss of phase, over current.
OUTPUT
Power: 7500 VA.
Configuration: 3-phase, 4-wire.
Overload: 125% of rated load for 5 min.
Voltage: 105 to 125 adjustable.
Regulation Line and Load: 0.5% for ±10% input change and 0.5% for no load to full load change. Each phase, 2% for 100% phase unbalance.
Frequency: 400 Hz ±2 Hz under all conditions of line and load (adjustable 380 to 420 Hz as option).
Distortion: 2% maximum.
NOTE: All other specifications are identical to Model 2501.

ELGAR Model 2000 Single, Two or Three Phase 2000 VA Solid-State Power Source



The Elgar Model 2000 AC power source is an all-silicon, solid state power source designed for maximum flexibility and reliability.

It utilizes two pieces of our industry-proven Model 1001 housed in a single rack mount enclosure. These units can be interconnected to provide the following output power configurations:
2000 VA, single phase,
2000 VA, 2 phase,
2000 VA, 3 phase, 3 wire delta, or
2000 VA, 3 phase, 4 wire wye.

Either amplifier will accept any of 40 interchangeable single or multiphase plug-in oscillators covering the range of 45 Hz to 5000 Hz, with accuracies from 1% to 0.0001%. Special oscillator modules are available providing ±0.01% amplitude and phase regulation, or amplitude and frequency BCD programming capability.

The Model 2000 is ideally suited for automated and laboratory testing of gyro, aircraft and missile and space equipment, and for operation of 60 Hz power equipment overseas.

Output Power:
Model 2000-1, 1ϕ.
Model 2000-2, 2ϕ (1 KVA/phase).
Model 2000-3D, 3ϕ, 3 wire delta, (667 VA/phase).
Model 2000-3Y, 3ϕ, 4 wire wye (667 VA/phase).

Power Factor: Full current rating into zero lagging to 0.7 leading for 2000-1 and 2000-2; 0.7 lagging to 0.7 leading for 2000-3D and 2000-3Y.

Output Voltage:
Model 2000-1*, 0-130 VAC or 0-260 VAC, 2 wire.
Model 2000-2, 0-32 VAC, 0-130 VAC, or 0-260 VAC, 3 wire.
Model 2000-3D, 0-32 VAC, 0-130 VAC, or 0-260 VAC line to line, 3 wire delta.
Model 2000-3Y, 0-32 VAC or 0-130 VAC line to neutral (120/208), 4 wire wye.

Output Configuration: All outputs isolated from ground; any one phase or neutral can be grounded. Voltage ranges are selected by strapping changes on rear panel terminal block.

Output Frequency Range: Model 2000-1 & Model 2000-2, 45 Hz to 5000 Hz at full power output. Model 2000-3D & Model 2000-3Y, 45 Hz to 2000 Hz at full power output.

Wave Shape: Sine wave.

Distortion: Less than 0.9% full frequency range at full output power. Less than 0.5% mid range (100 Hz to 1000 Hz) at full output power.

Load Regulation: ±1% no load to full load over rated frequency range (Model 2000-3Y with balanced load), adjustable through zero for specific load conditions.

Response Time: Less than 50 μsec.

Line Regulation: ±0.25% at full load versus ±10 VAC change at 115 VAC input. ±0.25% at full load versus ±20 VAC change at 230 VAC input.

Short Circuit Protection: Automatic current limiting protects against overload or short circuit, amplifier recovers immediately when overload or short circuit removed.

Output Noise: 60 db below full output voltage.

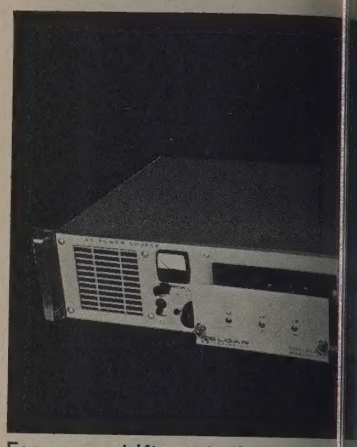
Input Power: 115 VAC ±10 VAC or 230 VAC ±20 VAC, single phase, 47 Hz to 63 Hz. (375 Hz to 425 Hz optional).

Temperature Range: 0°C to 50°C operational, −20°Cto + 85°C non-operational.

Weight: Net approx. 420 lbs., shipping approx. 440 lbs., with cabinet approx. 500 lbs.

*Model dash numbers are for initial use ordering; units are field changeable for any configuration with appropriate oscillator change.

ELGAR Super-Stable Solid-State Plug-In Oscillator Modules



For gyro drift and life testing Super-Stable (SS) plug-in o modules provide a stable-frequen distortion signal for any of the E power amplifiers. The plug-in os are designed for one, two, or thre operation depending on the amp combination of amplifiers select Super-Stable oscillators are un that they use electronic serv niques with remote sensing for an and phase regulation. Output freq are available from 300 Hz to at 0.01% accuracy. The nominal voltage must be specified along frequency when ordering any Super-Stable oscillators.

Output Voltages (Typical): 28 V VAC, 115 VAC.

Output Configuration: 1ϕ, 2ϕ or is 3-wire, open delta (floating).

Output Power: Depends on power fier selected.

Fixed Frequency (Typical): 400 Hz, 1,200 Hz, 9,600 Hz; other f cies optional.

Distortion: Less than 0.35% tota

Amplitude Stability: Load ±0.0 load to full load; Line ±0.01% fo ±10 V; Time ±0.1% for 1,00 under constant conditions; Specif refer to full wave average value form.

Temperature Coefficient: ±0.005

Phase Accuracy: Adjustable to ±

Phase Stability: ±0.1° for 1000

NOTE: Above specifications apply wh with any Elgar AC power amplifier.

Model	Frequency	Accuracy
441 - .01SS	400 Hz	0.01%
442 - .01SS	400 HZ	0.01%
443 - .01SS	400 HZ	0.01%
481 - .01SS	800 Hz	0.01%
482 - .01SS	800 Hz	0.01%
483 - .01SS	800 Hz	0.01%
41201 - .01SS	1,200 Hz	0.01%
41202 - .01SS	1,200 Hz	0.01%
41203 - .01SS	1,200 Hz	0.01%

Oscillator modules are available for quency from 400 Hz to 9.6 KHz an acies to 0.01%.

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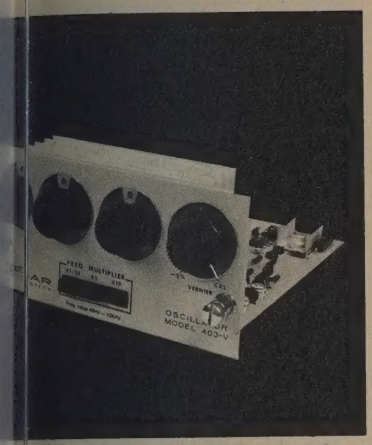
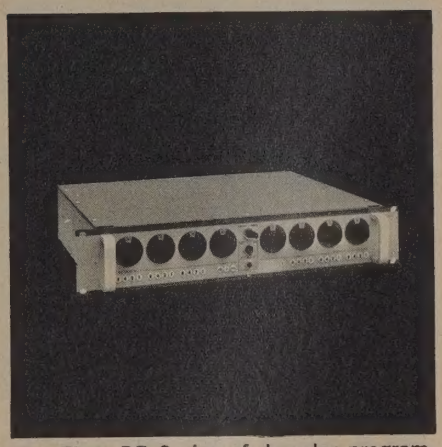
ELGAR
Decoder Programmer Solid-State Programmable Oscillators



ar oscillators are contained in a enclosure which can be inserted front panel opening of an Elgar ource. The plug-in enclosure con- horizontally-mounted printed cir- ard, and a terminal connector nates with a similar connector in er source. The oscillators are avail- ny frequency from 45 Hz to 10 KHz ial order.

	Frequency	Accuracy	Phase
-A	External Osc. Adapter		
-B	Blank Osc. Module		
-V	/ariable (45 Hz to 10 KHZ)	±1%	1
-V	" "	"	2
-V	" "	"	3
-V	ariable (45 Hz to 70 Hz)	±.5%	1
-V	" "	"	3
-V	" (300 Hz to 500 Hz)	"	1
-V	" (350 Hz to 450 Hz)	±.25%	1
-V	" (300 Hz to 500 Hz)	±.5%	3
-V	" (350 Hz to 450 Hz)	±.25%	3
1-V	" (45 Hz to 70 Hz; 300 Hz to 500 Hz)	±.5%	1
3-V	" (45 Hz to 70 Hz; 300 Hz to 500 Hz)	±.5%	3
-1	Fixed 50 Hz	±.1%	1
2-1	"	"	2
3-1	"	"	3
1-0	"	±.01%	1
2-0	"	"	2
3-0	"	"	3
1-2	Fixed 60 Hz	±.1%	1
2-2	"	"	2
3-2	"	"	3
1-0	"	±.01%	1
2-0	"	"	2
3-0	"	"	3
1-4	Fixed 400 Hz	±.1%	1
2-4	"	"	2
3-4	"	"	3
1-4	"	±.01%	1
2-4	"	"	2
3-4	"	"	3

ec Plug-in Oscillator Modules are avail- le r:
An frequency and accuracy (to .0001%) fro 45 Hz to 10 KHz.
Du frequency (switchable).
Sp al purpose functions (programmable).



The Elgar DP Series of decoder programmers are precision programmable oscillators which operate in conjunction with Elgar's wide range of AC power sources. The standard output voltage is 0-3 V rms, however, options are available to adapt to power amplifiers requiring other drive levels and, in particular, Option No. 6 which provides 0-150 V rms at 25 milliwatts as a stimulus source.

They are designed for automatic programmed frequency selection, automatic programmed amplitude selection, automatic programmed phase angle selection, and combinations of frequency and amplitude and amplitude and phase angle.

The DP Series is available in 1, 2 or 3 phase configurations, 45 Hz to 10,000 Hz frequency range, and with the appropriate Elgar power amplifier, up to 6 KVA of output power.

Salient Features

Automatic frequency selection
Automatic amplitude selection
Automatic phase angle selection
Continuous waveform amplitude programming
Standard 8421 binary coded decimal system
Frequency response: ±0.1%.
System amplitude stability: ±0.01% versus 100% load change; ±0.01% versus ±10 V line change; ±0.1% for 1000 hours under constant conditions.

Frequency: Frequency Accuracy: ±1% of programmed value; Frequency Stability: 0.02%°C; Frequency Programming Range: 45 Hz to 10 KHz; Frequency Resolution: 3 decades with 3 ranges
Range 1: 45 Hz to 109.9....0.1 Hz steps
Range 2: 100 Hz to 1.099 KHz 1 Hz steps
Range 3: 1 KHz to 10.99 KHz 10 Hz steps
Frequency Response of Amplitude: ±0.1% of full output over frequency range.

Amplitude: Amplitude Programming Range: 0-130 V (0-32 and 0-260 optional); Output Signal to Power Amplifier: 0-3 V RMS (0-150 V at 25 milliwatts optional); Amplitude Resolution: 100 MV from 1-130 V; Amplitude Programming Accuracy: ±0.25% FS of range (half-wave average); Amplitude Stability: ±0.1% for 1000 hours at constant temperature, load and line; Temperature Coefficient: ±0.005%/°C; Distortion: Less than 0.5%, less than 0.2% mid band 200-1000 Hz; System Settling Time: 100ms, includes power amplifier.

Phase (Applicable to 2 phase systems): Phase Programming Range: 0-360° in 1° steps); Phase Programming Accuracy: ±1°.

Programming: BCD 8421 (parallel entry); Option 1: Logic level "O" = 0 to +0.5 V, "I" = +3.5 V to +15 V; Option 2: Contact closures; Option 3: Program storage; storage set time is 5ms; Option 4: External amplitude modulation; Option 5: ±0.1% amplitude programming accuracy; Option 6: Output voltage 0-150 VAC at 25 milliwatts. For two or three phase outputs, phase accuracies will be ±1° 45 Hz to 2 KHz, ±2° 2 KHz to 6 KHz (programmed F and/or A).

Programming Connectors: MS type (mating connectors supplied).

Input Power: 105-125 V or 210-250 V single phase, 47 to 425 Hz 100 watts maximum.

Size: 3½" h x 14" d x 19" wide, standard rack mounting.

Actual output voltage range and output power is dependent on Elgar power amplier selected. Phase programming is not available with frequency programming.

Model DPI-A: Amplitude programming only (fixed frequency .01%).

Model DPI-F: Frequency programming only (fixed amplitude).

Model DP2-P: Phase programming only (fixed frequency .01% and fixed amplitude).

Model DPI-AF: Amplitude and Frequency only (fixed phase).

Model DP2-AP: Amplitude and Phase only (fixed frequency .01%).

Example: DPI-AF-13 would be amplitude and frequency programming with storage, 8421 "IC" logic levels.

Model DP2-XX-XX For two phase.

Model DP3-XX-XX For three phase.

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ELGAR
AC Line Conditioners

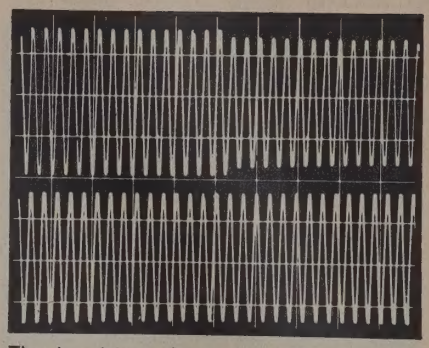
ELGAR Series 6000 High-Speed Solid-State AC Line Conditioners

Elgar AC line conditioners provide pure AC power by eliminating high-speed line and load transients as well as all other forms of power line disturbance. These versatile instruments feature response times 1,000 times faster (typically 50 microseconds) than the fastest AC line regulator. All Elgar units are designed for continuous operation and are contained in rack-mount enclosures. The front panel has meters to monitor input and output voltages and load current, an overload indicator, and power circuit breaker. Cooling air is drawn in at the front panel and exhausted at the rear. Anyone using voltage-sensitive equipment needs isolation from high-speed line transients. Unconditioned power sources are subject to fluctuating high-speed voltage changes which can cause erratic operation, component failures, and a reduction in equipment life. In the case of sensitive measuring and data handling equipment, high-speed line transients often are the cause of erroneous information. These unwanted transients, which occur on power lines, are voltage surges, high-voltage spikes, voltage dips, and low-voltage spikes. Frequencies are often in the megacycle range, with pulse durations ranging from one millisecond to just a few nanoseconds. High-frequency transients are most frequently caused by the operation of: arc welders, fluorescent lights, heaters cycling on and off, elevators, environmental chambers, shake tables, air conditioners, tape punches, thermal baths, etc. High voltage spikes appear on the power line each time the current is interrupted through an inductive load. Local user conditions such as intermittent heavy loads, long feeder lines, or multiple-customer use of common power sources cause low-voltage dips and low-voltage spikes. The speed and reliability of Elgar line conditioners completely eliminate unwanted transients, providing pure AC power.

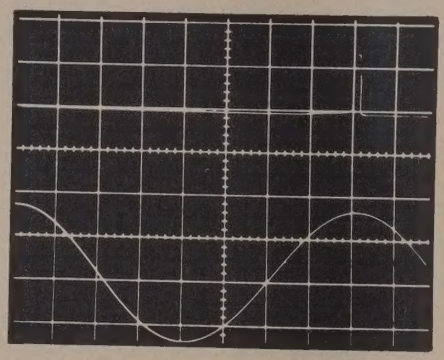
Line Conditioner Selection Guide

Output Power (KVA)	Output Voltage (VAC)	Input Voltage (VAC)	Input Freq. (Hz)	Model
0.5	115	95-135	60	7006 A
1	115	95-135	50	6005 A
1	115	95-135	60	6006 A
1	115	95-135	400	6004 A
1	230	190-270	50	6235 A
1	230	190-270	60	6236 A
2.5	115	95-135	50	3005 A
2.5	115	95-135	60	3006 A
2.5	115	95-135	400	3004 A
2.5	230	190-270	50	3235 A
2.5	230	190-270	60	3236 A
5	115	95-135	50	5005 A
5	115	95-135	60	5006 A
5	230	190-270	50	5235 A
5	230	190-270	60	5236 A

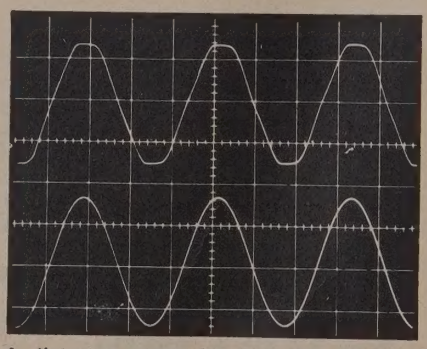
NOTES
1. Step-up or step-down combinations available such as 230 V input & 115 V output.
2. See text for detailed specifications.



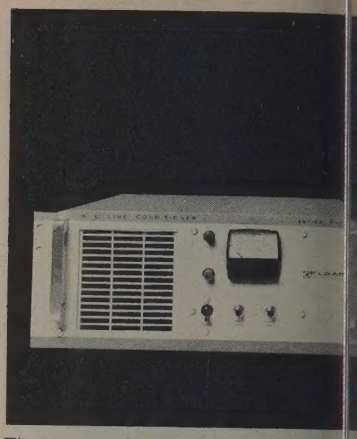
The top trace shows a sudden decrease in input line voltage. The bottom trace is the AC Line Conditioner output, showing the instrument's fast response time by lack of variation in sine wave output.



A one-half-millisecond, seven-ampere load current pulse is shown on the top trace. Careful examination of the AC Line Conditioner output shown on the bottom trace reveals 25-microsecond response at beginning and end of the transient.



A distorted power input to the AC Line Conditioner is shown on the top trace. The resulting distortion-free pure sine wave, output of the Elgar AC Line Conditioner is shown on the bottom trace.



There are four models in this
6005A, 6006A, 6235A, and 623
cept where noted, specifications
same for all models.

INPUT:

Voltage: 95-115 V rms, 105-125
115-135 V rms, selectable by tap
(6005A & 6006A); 190-230 V rm
250 V rms, 230-270 V rms, select
tap switch (Models 6235A & 623

Frequency: 47 to 53 Hz (Models
& 6235A); 57 to 63 Hz (Models 6
6236A).

Power: 1,600 watts max.

Harmonic Distortion: 10% max.

Isolation: 100 db common mode
tion; 1 pf power transformer prin
secondary coupling capacitance
side of input normally strapped t
sis but may be floated to 300 V r

OUTPUT:

Voltage: 115 V rms setable to
(Models 6005A & 6006A); 230
setable to 0.1%, with 115 V rms o
(Models 6235A & 6236A).

Voltage Instability: ±0.05% for 2
under constant line, load, and a
temperature conditions.

Power: 1,000 VA from unity to
power factor, 4,500 VA max. peak i
aneous power; half power from z
to zero lead.

Harmonic Distortion: 0.2% max.

Line Regulation: ±0.025% for a
line change (Models 6005A & 6
±0.025% for a ±20 V line
(Models 6235A & 6236A).

Load Regulation: 0.025% for a
full resistive load change; 0.05%
zero to full load change at ±0.7
factor.

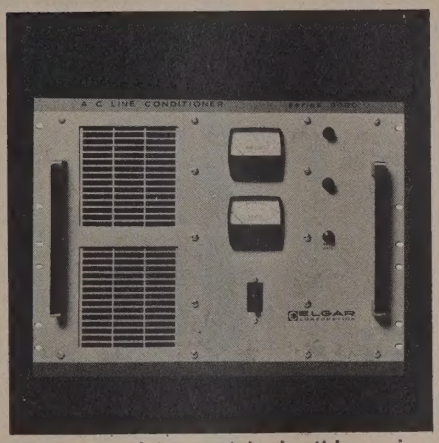
Amplitude Temperature Coef
0.005% per degree C max.

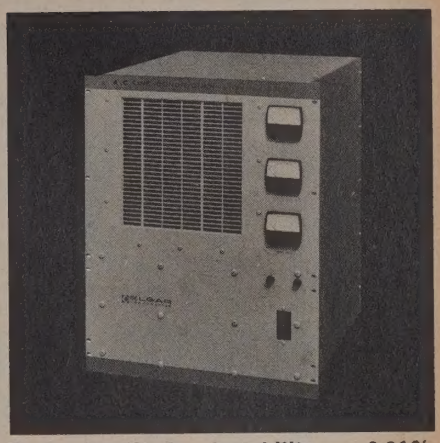
Peak Amplitude Instability: ±
cycle to cycle.

Maximum Crest Factor: (for rated
output) 2:5 times.

8159 Engineer Road, San Diego, California 92111, Phone (714) 279-0800

ELGAR
Series 3000 & 5000 High-Speed Solid-State AC Line Conditioners





There are eight models in this series: Models 3005A, 3006A, 3235A, 3236A, 5005A, 5006A, 5235A and 5236A. Except where noted, specifications are the same for all models.

INPUT:

Voltage: 95-115 V rms, 105-125 V rms, 115-135 V rms, selectable by tap switch (Models 3005A, 3006A, 5005A & 5006A); 190-230 V rms, 210-250 V rms, 230-270 V rms, selectable by tap switch (Models 3235A, 3236A, 5235A & 5236A).

Frequency: 47 to 53 Hz (Models 3005A 3235A, 5005A & 5235A); 57 to 63 Hz (Models 3006A, 3236A, 5006A & 5236A).

Input Power: 4,000 watts max. (Series 3000). 8,000 watts max. (Series 5000).

Harmonic Distortion: 10% max.

Isolation: 100 db common mode isolation; 1 pf power transformer primary to secondary coupling capacitance; low side of input normally strapped to chassis but may be floated to 300 V rms.

OUTPUT:

Voltage: 115 V rms, setable to 0.1% (Models 3005A, 3006A, 5005A & 5006A); 230 V rms, setable to 0.1%, with 115 V optional (Models 3235A, 3236A, 5235A & 5236A).

Voltage Instability: ±0.05% for 24 hours under constant line, load and ambient temperature conditions.

Output Power: (3000 Series) 2,500 VA from unity to ±0.7 power factor, 11,250 VA max. peak instantaneous power. (5000 Series) 5,000 VA from unity to ±0.7 power factor, 22,500 VA max. peak instantaneous power.

Harmonic Distortion: 0.2% max.

Line & Load Regulation: ±0.05% for a ±10 V line change and for zero to full load change (Models 3005A, 3006A, 5005A & 5006A); ±0.05% for a ±20 V line change and for zero to full load change (Models 3235A, 3236A, 5235A & 5236A).

Peak Amplitude Instability: ±0.01% cycle to cycle.

Maximum Crest Factor: 2.5 times (for rated power output).

Shunt Capacitance: Unit will operate with up to 300 μf of shunt capacitance.

TRANSIENT CHARACTERISTICS:

Line (10% step change): Output transient will not exceed 0.5% peak amplitude.

Impulse Settling Time: 50 μsec or less.

Overload Indication: Front panel lamp illuminates when load exceeds KVA rating. Raw AC power is applied to load during period of illumination.

Overload Protection: Excessive overload condition actuates front panel circuit breaker.

GENERAL

Metered Input/Output: Switchable input/output AC voltmeter and output current meter. Meter accuracies ±3% full scale.

Ambient Temperature: 0 to 55°C.

Storage Temperature: −20°C to 85°C.

Cooling: A blower provides internal forced air circulation; reversible air flow through front panel.

Dimensions: 3000 Series 19" w x 14" h x 19" d, for standard rack mounting. 5000 Series 19" w x 24½" h x 20" d, for standard rack mounting.

Net Weight: 3000 Series 175 lb. 5000 Series 400 lb.

Shipping Weight: 3000 Series 180 lb. 5000 Series 425 lb.

Capacitance: Unit will operate to 100 μf of shunt capacitance.

Characteristics

% step change): Output transient exceed 0.5% peak amplitude.

Settling Time: 50 μsec or less.

Indication: Front panel lamp illuminates when load exceeds 1 KVA. Raw power is applied to load during period of illumination.

Protection: Excessive overload condition actuates front panel circuit breaker.

GENERAL:

Input/Output: Switchable input/output and output current monitoring AC voltmeter. Meter accuracy ±3% full scale.

Temperature: 0 to 55°C.

Temperature: −20°C to +85°C.

A blower provides internal forced circulation; reversible air flow through front panel.

Dimensions: 19" w x 7" h x 17½" d, for standard rack mounting.

Weight: 105 lb.

Shipping Weight: 115 lb.

Model 7006A High-Speed Solid-State AC Line Conditioner

INPUT:

Voltage: 95-115 VAC, 105-125 VAC, 115-135 VAC, selectable by tap switch.

Frequency: 57 to 63 Hz.

Power: 325 watts.

Harmonic Distortion: 10% max.

OUTPUT:

Voltage: 115 V rms setable to 0.1%.

Power: 500 VA from unity to ±0.7 power factor, 2500 VA max. peak instantaneous power.

Harmonic Distortion: 0.25% max.

Line & Load Regulation: ±0.025% for a ±10 V line change; ±0.025% for zero to full load change.

Peak Amplitude Instability: 0.02% cycle to cycle.

Maximum Crest Factor: 3.

Shunt Capacitance: Operates with up to 100 μf.

Impulse Settling Time: 50 μsec. or less.

Overload Indication: Front panel lamp illuminates when load exceeds KVA rating.

GENERAL

Metered Input/Output: Switchable input/output and output current monitoring on AC voltmeter. Meter accuracy ±3% full scale.

Ambient Temperature: 0 to 55°C.

Storage Temperature: −20°C to +85°C.

Dimensions: 3½" h x 14" d x 19" w, for rack mounting.

Net Weight: 45 lb.

Shipping Weight: 55 lb.

8159 Engineer Road, San Diego, California 92111, Phone (714) 279-0800

FR Series – Modular *power* SUPPLIES

Package A/3 11/64" x 3 31/64" x 6 23/64"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-A-3	3.0	3.0	2.7	2.2	1.3	$105
FR-A-3.6	3.6	3.0	2.7	2.2	1.3	105
FR-A-4	4.0	3.0	2.7	2.2	1.3	105
FR-A-4.5	4.5	2.9	2.6	2.1	1.25	105
FR-A-5	5.0	2.8	2.5	2.0	1.2	105
FR-A-6	6.0	2.7	2.4	1.9	1.4	105
FR-A-8	8.0	2.3	2.1	1.7	1.1	105
FR-A-10	10.0	2.0	1.8	1.4	.9	105
FR-A-12	12.0	1.8	1.6	1.3	.8	105
FR-A-15	15.0	1.6	1.4	1.1	.7	105
FR-A-18	18.0	1.4	1.2	.9	.6	105
FR-A-20	20.0	1.3	1.1	.8	.5	105
FR-A-24	24.0	1.0	.9	.7	.4	105
FR-A-28	28.0	.9	.7	.55	.35	105
FR-A-36	36.0	.7	.55	.51	.3	105
FR-A-48	48.0	.56	.45	.35	.22	105
FR-A-100	100.0	.27	.22	.18	.2	120
FR-A-120	120.0	.22	.20	.16	.12	120
FR-A-150	150.0	.18	.16	.13	.1	120

Package B/3 11/64" x 4 29/32" x 6 23/64"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-B-3	3.0	4.0	3.5	2.8	1.8	$115
FR-B-3.6	3.6	4.0	3.5	2.8	1.8	115
FR-B-4	4.0	4.0	3.5	2.8	1.8	115
FR-B-4.5	4.5	3.9	3.4	2.7	1.7	115
FR-B-5	5.0	3.9	3.4	2.7	1.7	115
FR-B-6	6.0	3.4	3.1	2.6	1.6	115
FR-B-8	8.0	3.4	3.1	2.6	1.6	115
FR-B-10	10.0	2.9	2.7	2.4	1.6	115
FR-B-12	12.0	2.7	2.5	2.3	1.5	115
FR-B-15	15.0	2.4	2.2	2.0	1.5	115
FR-B-18	18.0	2.2	2.0	1.9	1.5	115
FR-B-20	20.0	2.0	1.8	1.7	1.4	115
FR-B-24	24.0	1.6	1.5	1.4	1.3	115
FR-B-28	28.0	1.5	1.4	1.3	1.2	115
FR-B-36	36.0	1.3	1.2	1.1	1.0	115
FR-B-48	48.0	1.1	1.0	.90	.85	115
FR-B-100	100.0	.50	.40	.32	.30	134
FR-B-120	120.0	.40	.30	.27	.25	134
FR-B-150	150.0	.30	.25	.21	.20	134

Package C/3 11/64" x 4 29/32" x 8 9/16"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-C-3	3.0	5.5	4.8	3.9	2.7	$135
FR-C-3.6	3.6	5.4	4.7	3.8	2.7	135
FR-C-4	4.0	5.4	4.7	3.8	2.7	135
FR-C-4.5	4.5	5.3	4.6	3.7	2.6	135
FR-C-5	5.0	5.3	4.5	3.6	2.6	135
FR-C-6	6.0	5.0	4.3	3.5	2.6	135
FR-C-8	8.0	4.8	4.1	3.4	2.3	135
FR-C-10	10.0	4.4	3.8	3.2	2.2	135
FR-C-12	12.0	4.2	3.7	3.1	2.1	135
FR-C-15	15.0	3.7	3.4	3.0	2.1	135
FR-C-18	18.0	3.4	3.2	2.9	2.1	135
FR-C-20	20.0	3.3	3.1	2.8	2.0	135
FR-C-24	24.0	2.7	2.6	2.4	1.7	135
FR-C-28	28.0	2.5	2.3	2.2	1.6	135
FR-C-36	36.0	2.2	2.0	1.9	1.5	155
FR-C-48	48.0	1.8	1.6	1.5	1.2	155
FR-C-100	100.0	.70	.60	.51	.45	155
FR-C-120	120.0	.60	.50	.45	.41	155
FR-C-150	150.0	.5	.40	.35	.32	155

Package D/4 29/32" x 7 1/2" x 9 3/8"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-D-3	3.0	13.5	11.7	9.6	6.6	$205
FR-D-3.6	3.6	13.5	11.7	9.6	6.6	205
FR-D-4	4.0	13.5	11.7	9.6	6.6	205
FR-D-4.5	4.5	13.5	11.7	9.6	6.6	205
FR-D-5	5.0	13.0	11.2	9.6	6.5	205
FR-D-6	6.0	12.8	11.0	9.3	6.4	205
FR-D-8	8.0	12.6	10.7	9.2	6.3	205
FR-D-10	10.0	11.2	10.1	8.9	6.1	205
FR-D-12	12.0	10.4	9.6	8.7	6.1	205
FR-D-15	15.0	9.4	8.8	8.3	5.7	215
FR-D-18	18.0	8.3	7.8	7.3	5.4	215
FR-D-20	20.0	7.8	7.3	6.9	5.3	215
FR-D-24	24.0	7.1	6.7	6.2	5.2	215
FR-D-28	28.0	6.4	6.0	5.6	5.1	215
FR-D-36	36.0	5.8	5.4	5.1	4.7	235
FR-D-48	48.0	4.5	4.3	4.0	3.5	235
FR-D-100	100.0	2.0	1.8	1.6	1.4	235
FR-D-120	120.0	1.7	1.5	1.3	1.1	235
FR-D-150	150.0	1.3	1.2	1.1	.9	235

Package E/4 29/32" x 7 1/2" x 11 3/4"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-E-3	3.0	23.0	21.0	17.5	11.0	$265
FR-E-3.6	3.6	22.0	20.0	17.5	11.0	265
FR-E-4	4.0	22.0	20.0	17.5	11.0	265
FR-E-4.5	4.5	21.0	19.0	17.4	11.0	265
FR-E-5	5.0	21.0	19.0	17.4	11.0	265
FR-E-6	6.0	20.0	18.3	16.6	11.0	265
FR-E-8	8.0	19.0	17.4	15.7	11.0	265
FR-E-10	10.0	17.0	15.5	14.0	10.5	265
FR-E-12	12.0	16.0	14.6	13.3	10.5	265
FR-E-15	15.0	15.0	13.7	12.5	9.6	265
FR-E-18	18.0	14.0	12.8	11.6	9.6	265
FR-E-20	20.0	13.0	11.9	10.8	9.5	265
FR-E-24	24.0	12.0	11.0	10.0	8.6	265
FR-E-28	28.0	11.0	10.0	9.0	8.1	265
FR-E-36	36.0	9.0	8.3	7.5	6.7	265
FR-E-48	48.0	7.0	6.4	5.9	5.3	295
FR-E-100	100.0	2.2	1.9	1.8	1.7	295
FR-E-120	120.0	1.8	1.6	1.5	1.3	295
FR-E-150	150.0	1.5	1.4	1.3	1.1	295

Package F/4 29/32" x 7 1/2" x 16 1/2"

Model	OUTPUT VOLTAGE	CURRENT vs AMBIENT 40°C	50°C	60°C	71°C	Price
FR-F-3	3.0	34.0	30.0	26.0	21.5	$315
FR-F-3.6	3.6	33.0	27.0	23.0	19.3	315
FR-F-4	4.0	33.0	27.0	23.0	19.3	315
FR-F-4.5	4.5	32.0	25.6	21.8	18.3	315
FR-F-5	5.0	32.0	25.6	21.8	18.3	315
FR-F-6	6.0	31.0	25.6	21.8	18.3	315
FR-F-8	8.0	29.0	24.5	20.7	17.5	315
FR-F-10	10.0	25.0	21.4	17.8	14.8	315
FR-F-12	12.0	22.0	20.0	17.1	14.2	315
FR-F-15	15.0	20.0	19.0	16.5	13.7	315
FR-F-18	18.0	17.5	15.8	13.4	11.1	315
FR-F-20	20.0	16.2	14.7	12.8	10.7	315
FR-F-24	24.0	15.0	13.5	11.8	10.0	315
FR-F-28	28.0	14.0	12.5	10.8	9.2	315
FR-F-36	36.0	11.4	10.8	9.6	8.1	315
FR-F-48	48.0	8.7	8.1	7.5	6.5	315
FR-F-100	100.0	3.6	3.3	2.8	2.4	345
FR-F-120	120.0	3.3	3.0	2.5	2.1	345
FR-F-150	150.0	2.4	2.2	1.9	1.6	345

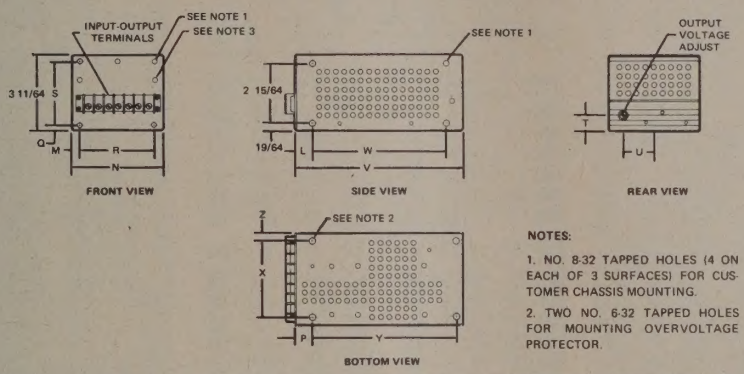
FARATRON CORPORATION 290 Lodi Street, Hackensack, New Jersey 07601 (201) 488-

power SUPPLIES

SPECIFICATIONS

INPUT: 105-132 VAC, 47-420 Hz
LINE REGULATION: 0.01% for rated input changes
LOAD REGULATION: 0.01% for rated load changes
OUTPUT VOLTAGE ADJUSTMENT: ± 5% min.
RIPPLE: Less than 0.5MV rms, 3.0MV peak to peak
STABILITY: 0.02% or 10MV - whichever is greater
TEMPERATURE COEFFICIENT: 0.02%/°C + 1MV
TEMPERATURE RANGE: - 20°C to + 71°C
RESPONSE TIME: 20 microseconds
MTE PROGRAMING (RESISTIVE): 1000 ohms/volt
REMOTE PROGRAMING (VOLTAGE): 1 volt/volt
RMOTE SENSING: Sensing leads available at barrier strip
OVERLOAD PROTECTION: Factory preset
TERMAL PROTECTION: Automatic resetting thermostat protects unit against operation in excessive ambients
CONNECTIONS: Seven connector barrier strip

FARATRON CORPORATION

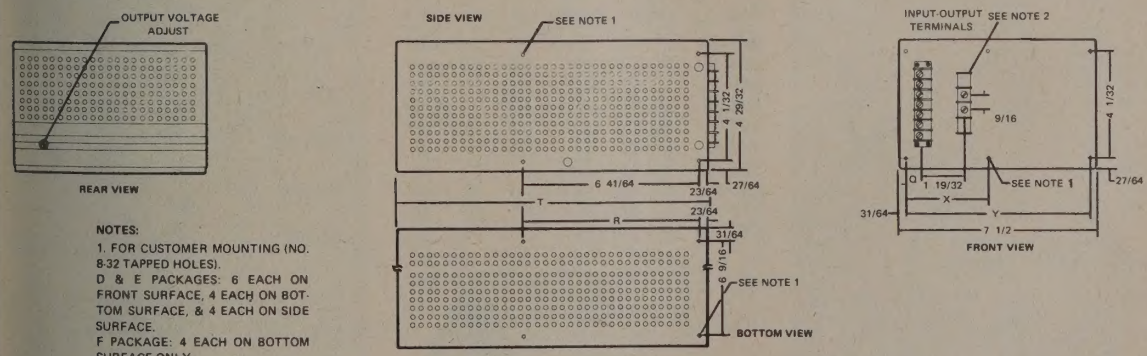


NOTES:

1. NO. 8-32 TAPPED HOLES (4 ON EACH OF 3 SURFACES) FOR CUSTOMER CHASSIS MOUNTING.
2. TWO NO. 6-32 TAPPED HOLES FOR MOUNTING OVERVOLTAGE PROTECTOR.

	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
ALL "A" PACKAGES	5/16	5/16	3 31/64	41/64	17/64	2 27/32	2 3/8	13/16	3/4	6 23/64	5 1/16	2 27/32	5 5/16	21/64
ALL "B" PACKAGES	5/16	7/32	4 29/32	41/64	31/64	4 1/32	2 15/64	13/16	1 5/64	6 23/64	5 1/16	3 3/4	5 1/16	23/64
ALL "C" PACKAGES	9/16	7/32	4 29/32	23/64	31/64	4 1/32	2 15/64	13/16	1 5/64	8 9/16	6 57/64	3 3/4	6 57/64	23/64

A,B,C



NOTES:

1. FOR CUSTOMER MOUNTING (NO. 8-32 TAPPED HOLES).
D & E PACKAGES: 6 EACH ON FRONT SURFACE, 4 EACH ON BOTTOM SURFACE, & 4 EACH ON SIDE SURFACE.
F PACKAGE: 4 EACH ON BOTTOM SURFACE ONLY.
2. THIS TERMINAL BLOCK PROVIDED ON "F" PACKAGE ONLY.
3. NO. 6-32 TAPPED HOLES FOR MOUNTING OVERVOLTAGE PROTECTOR MOUNTING.

	Q	R	T	X	Y
ALL "D" PACKAGES	47/64	6 57/64	9 3/8	3 1/4	6 33/64
ALL "E" PACKAGES	47/64	6 57/64	11 3/4	3 1/4	6 33/64
ALL "F" PACKAGES	23/64	12 3/8	16 1/2	------	------

D,E,F

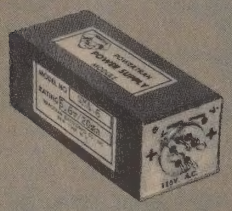
ARATRON CORPORATION 290 Lodi Street, Hackensack, New Jersey 07601 (201) 488-1440

FERROTRAN
ELECTRONICS CO., INC.

SOLID STATE POWER SUPPLY MODULE

All silicon, long-life, semi-conductor POWERTRAN power supply module
Guaranteed 3 years. Gives dual, fixed D.C. output voltages.

INPUT VOLTAGE — 115 volts A.C.
SUBMINIATURE DUAL OUTPUT



SMA-6

Case; 3"x1¾"x1¼"; Mounts on a chassis with 2 ea. 4-40 blind inserts; no projecting studs; ideal for printed circuit boards; fixed voltage. 6 pin connector.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMA-6	6, 6	20ma	1.0	.3	$47
SMA-10	10, 10	20	1.0	.1	47
SMA-12	12, 12	20	1.0	.1	47
SMA-15	15, 15	20	1.5	.1	47
SMA-20	20, 20	15	1.5	.2	49
SMA-24	24, 24	15	1.5	.2	49
SMA-28	28, 28	12	1.5	.2	49

Case; 1⅝"x1⅞"x1⅝"; Mounts on a chassis with 4 ea. 6-32 studs. ⅝" diam. connector in cover. 6 pins; case style similar to SM units (see photo).

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMAC-6	6, 6	20ma	1.0	.3	$47
SMAC-10	10, 10	20	1.0	.1	47
SMAC-12	12, 12	20	1.0	.1	47
SMAC-15	15, 15	20	1.5	.1	47
SMAC-20	20, 20	15	1.5	.2	49
SMAC-24	24, 24	15	1.5	.2	49
SMAC-28	28, 28	12	1.5	.2	49

PRINTED CIRCUIT DUAL OUTPUT

LOW CURRENT

Epoxy encapsulated dual output units for direct soldering to PC boards; 1⅝"x1⅞"x 11½"; 6-pins.

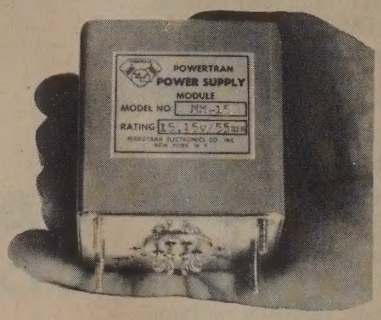
Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMMP-6	6, 6	20ma	1.0	.3	$47
SMMP-10	10, 10	20	1.0	.1	47
SMMP-12	12, 12	20	1.0	.1	47
SMMP-15	15, 15	20	1.5	.1	47
SMMP-20	20, 20	15	1.5	.2	49
SMMP-24	24, 24	15	1.5	.2	49
SMMP-28	28, 28	12	1.5	.2	49

MEDIUM CURRENT

Case Style similar to SMMP-15 but size is 2⅝"x1 13/16"x1 13/16".

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
MMP-6	6, 6	50ma	2.0	.100	$44
MMP-10	10, 10	50	1.2	.005	44
MMP-12	12, 12	50	1.2	.005	44
MMP-15	15, 15	50	1.2	.005	45
MMP-20	20, 20	40	1.2	.01	45
MMP-24	24, 24	35	1.5	.01	45

INPUT VOLTAGE — 115 volts A.C.
MEDIUM CURRENT DUAL OUTPUT



MM-15 DUAL OUTPUT OP-AMP MODULE

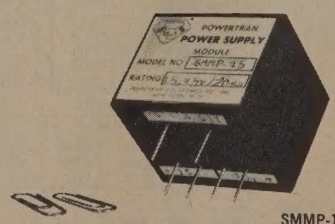
These precision engineered modules furnish two matched output voltages from independent power supply units. The current shown is available from each tap. Ideal for OP-AMPS — 6 pin connector. Wt. ea., 1¼ lbs.

Model	D.C. Volts	D.C. Cur.	% Reg.	% Rip.	Case	Price
MM-3	3,3	45ma	3.0	.40	GB	$54
MM-5	5,5	50	1.7	.08	GB	54
MM-6	6,6	50	1.6	.05	GB	54
MM-7	7,7	55	1.4	.05	GB	54
MM-10	10,10	60	1.2	.005	GB	54
MM-12	12,12	60	1.2	.005	GB	54
MM-15	15,15	55	1.0	.006	GB	55
MM-18	18,18	50	1.0	.01	GB	55
MM-20	20,20	50	1.0	.01	GB	55
MM-24	24,24	45	1.0	.01	GB	56
MM-25	25,25	45	1.0	.01	GB	56
MM-27*	27,27	45	1.0	.01	HB	58
MM-28*	28,28	45	1.0	.01	HB	58
MM-30*	30, 30	45	1.0	.01	HB	58

*Case Height is 2½".

HIGHER VOLTAGE UNITS IN SHORTENED JA CASE
JA Case; 3½"x3"x4 5/16". Wt. ea., 3¾ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
HHV-45	45, 45	40ma	1.0	.20	$60
HHV-50	50, 50	40	1.0	.20	60
HHV-55	55, 55	40	1.0	.20	60
HHV-60	60, 60	40	1.0	.20	60
HHV-65	65, 65	40	1.0	.20	60
HHV-67	67, 67	40	1.0	.20	60
HHV-70	70, 70	40	1.0	.20	60
HHV-90	90, 90	35	1.0	.10	70
HHV-100	100, 100	30	1.0	.08	80
HHV-120	120, 120	25	1.0	.05	80



SMMP-15

INPUT VOLTAGE — 115 volts A.C.
HIGH CURRENT DUAL OUTPUT

These modules contain two independe power supply units which furnish two simil voltages with rated current available fr each tap. 6 pin connector.

JB Case; 3½"x3"x3⅞". Wt. ea., 2½ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Pri
HMC-7	7, 7	150ma	1.5	.15	$7
HMC-10	10, 10	150	1.2	.05	7
HMC-12	12, 12	150	1.5	.02	7
HMC-15	15, 15	150	1.5	.02	7
HMC-20	20, 20	120	1.2	.04	7
HMC-24	24, 24	110	1.3	.04	7
HMC-28	28, 28	110	1.4	.05	7
HMC-30	30, 30	100	1.5	.15	7
HMC-45	45, 45	80	1.5	.15	7

UNSYMMETRICAL DUAL OUTPUT

These modules contain two independe power supply units which furnish two diffe ent voltages as shown. The current listed available from each tap. 6 pin connecto

GB Case; 2¾"x2⅜"x2¾". Wt. ea., 1¼ lb

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Pri
MA-515	5, 15	50ma	1.7	.1	$6
MA-612	6, 12	50	1.6	.1	6
MA-615	6, 15	50	1.6	.1	6
MA-1015	10, 15	50	1.2	.005	6
MA-1215	12, 15	50	1.2	.005	6

The modules shown below contain two ind pendent power supply units which furni two similar voltages. Two dissimilar curren are available as shown.

JB Case; 3½"x3"x3⅞". Wt. ea., 3¾ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Pri
HMJ-10	10	50ma	1.5	.10	$7
	10	250	2.0	.20	
HMJ-12	12	50	1.5	.15	7
	12	250	2.0	.20	
HMJ-15	15	50	1.5	.15	7
	15	250	2.0	.20	
HMJ-20	20	45	1.5	.15	7
	20	225	2.0	.20	
HMJ-24	24	40	1.5	.15	7
	24	200	2.0	.20	
HMJ-28	28	40	1.5	.15	7
	28	180	2.0	.20	

Since the dual supplies shown on this pa are not connected to the case nor to ea other, electrically, they can supply two po tive voltages, two negative voltages, or negative and a positive voltage. The curre listed is available from each tap.

MIL-SPEC MODULES

All power supplies described on these pag may be militarized. Will meet all environmen specs. of MIL-E-5272 C. Call us for an estima

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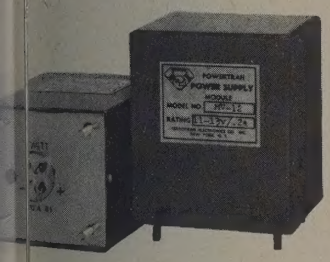
SOLID STATE POWER SUPPLY MODULES

All silicon, long-life, semi-conductor POWERTRAN power supply modules. Guaranteed 3 years.

INPUT VOLTAGE — 115 volts A.C.
ADJUSTABLE OUTPUT MODULES



MV-12

arial D.C. output; repairable; output voltage djustable thru screwdriver control on stud side case. Compact series regulated models with short circuit protection; all silicon.

A Case; 3"x2⅝"x3½". Wt. ea., 2½ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
MV-3	2.5- 3.8	200ma	.8	.1	$55
MV-4	3.5- 4.5	200	.8	.1	55
MV-5	4.5- 5.5	200	.7	.1	55
MV-6	5.8- 7	200	.6	.20	55
MV-1	9 -12	200	.4	.03	55
MV-1	11.0-13	200	.2	.025	55
MV-1	14 -16	200	.5	.03	55
MV-2	19 -22	180	.5	.03	56
MV-2	23 -26	180	.5	.04	56
MV-2	27 -29	150	.5	.04	56

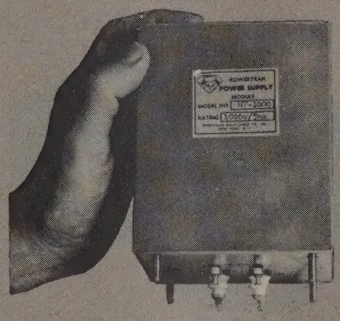
B Case; 3½"x3"x3⅞"

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
MCS-	2.5- 3.8	450ma	0.8	.1	$65
MCS-	3.5- 4.5	450	0.8	.1	65
MCS-	4.5- 5.5	450	0.8	.1	65
MCS-	5.8- 7	450	0.8	.3	65
MCS-	9 -11	450	0.5	.1	65
MCS-	11 -13	400	0.5	.05	65
MCS-	14 -16	400	0.5	.05	65
MCS-	19 -22	350	0.5	.05	68
MCS-	23 -26	350	0.5	.05	68
MCS-	27 -29	300	0.4	.04	68

A Case; 3¾"x3"x4⅞". Wt. ea., 4 lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
HCV-	4.5- 5.5	1.0amp	.40	.20	$82
HCV-	5.5- 6.8	1.0	.40	.20	82
HCV-	8.5-11.8	1.0	.40	.10	82
HCV-	11.0-14.5	1.0	.40	.05	82
HCV-	14.0-18.0	.8	.40	.10	82
HCV-	18.0-24.0	.7	.40	.30	83
HCV-	26.5-29.0	.6	.25	.30	83

INPUT VOLTAGE — 115 volts A.C.
HIGH VOLTAGE MODULES



HV-1000

All silicon components; solid state regulator; floating outputs; ideal for photomultipliers.

Model	D.C. Volts	D.C. Current	% Reg.	% Rip.	Case	Price
LOW CURRENT						
HM-100	100	6ma	1.0	.05	GB	$50
HM-200	200	5	.5	.05	GB	55
HM-300	300	3	1.0	.05	JB	65
HM-500	500	1.8	1.0	.05	JB	70
HM-750	750	1.2	1.0	.1	LB	80
HM-1000	1000	1	1.0	.1	LB	80
MEDIUM CURRENT						
HV-45	45	40	1.5	.15	GA	$48
HV-48	48	60	1.5	.15	GA	50
HV-50	50	40	1.5	.15	GA	50
HV-55	55	40	1.5	.15	GA	50
HV-60	60	40	1.5	.15	GA	50
HV-67	67	40	1.5	.15	GA	50
HV-70	70	40	1.5	.15	GA	50
HV-75	75	60	1.3	.10	GA	60
HV-90	90	60	1.2	.10	GA	60
HV-100	100	60	1.5	.10	GA	60
HV-120	120	55	1.3	.12	HA	68
HV-150	150	45	1.0	.10	HA	70
HV-175	175	40	1.2	.12	HA	70
HV-200	200	40	1.3	.12	HA	70
HV-250	250	40	1.5	.05	JA	75
HV-300	300	35	1.5	.10	JA	75
HV-400	400	20	1.5	.20	JA	85
HV-500	500	15	1.5	.20	JA	85
HV-750	750	8.5	1.2	.30	LA	125
HV-1000	1000	5	1.3	.30	LA	140
HIGH CURRENT						
HVA-60	60	90ma	1.5	.20	JA	$75
HVA-100	100	90	1.5	.20	JA	90
HVA-150	150	90	1.5	.20	JA	100

All power supplies with output volts of 750 or higher have special ceramic high voltage terminals.

SPECIAL COMPONENTS

In addition to its off-the-shelf products, FERROTRAN designs all types of power supplies and transformers to meet special requirements. This is done at no extra cost to the customer.

INPUT VOLTAGE — 115 volts A.C.
UNREGULATED MODULES

Ideal raw D.C. supplies containing transformer, rectifiers and capacitor filter. Simply attach series regulator or zener diode to convert to a regulated power supply; all solid state.

Model	D.C. Volts	D.C. Current	Case	Price
SU-5A	5	2amp	HA	$38
SU-6A	6	1	GB	36
SU-6B	6	2	HA	38
SU-10A	10	1.5	HA	38
SU-10B	10	.5	GB	36
SU-12A	12	1.5	HA	40
SU-12B	12	.5	HA	38
SU-12C	12	.25	HA	36
SU-15A	15	1.0	HA	40
SU-15B	15	.5	GB	36
SU-15C	15	.25	FB	34
SU-20A	20	.8	HA	40
SU-20B	20	.3	GA	36
SU-20C	20	1.2	HA	40
SU-25A	25	.8	HA	40
SU-25B	25	.3	HA	38
SU-28A	28	.8	HA	40
SU-28B	28	.3	GB	36
SU-30A	30	.7	HA	40
SU-30B	30	.3	GB	36
SU-40A	40	.5	HA	42
SU-40B	40	.2	GB	36
SU-48	48	.4	HA	40
SU-50A	50	.4	HA	38
SU-50B	50	.2	GA	36
SU-60	60	.38	HA	38
SU-75	75	.3	HA	38
SU-90A	90	.25	HA	38
SU-90B	90	.10	HA	36
SU-100	100	.2	HA	38
SU-120A	120	.2	HA	38
SU-120B	120	.3	JA	50
SU-150	150	.10	HA	36
SU-200A	200	.09	HA	40
SU-250	250	.065	HA	42
SU-300	300	.06	HA	45
SU-400	400	.06	HA	45
SU-500	500	.05	LB	55
SU-750	750	.03	LB	65
SU-900	900	.025	LB	65
SU-1000	1000	.02	LB	65
SU-1250	1250	10ma	LB	65
SU-1400	1400	5ma	LB	65
Unregulated Miniature Power Supply Modules.				
SUM-10	10	150ma	EB	$30
SUM-15	15	100	EB	30
SUM-20	20	75	EB	30
SUM-25	25	60	EB	30
SUM-30	30	50	EB	31
SUM-40	40	35	EB	31
Unregulated High Current Modules.				
SU-5B	5	6amp	JA	$50
SU-6C	6	6	JA	50
SU-10C	10	6	JA	50
SU-12D	12	4	JA	50
SU-15D	15	3.2	JA	50
SU-20D	20	2.4	JA	50
SU-24C	24	2.0	JA	50
SU-28C	28	1.8	JA	50
SU-50C	50	1.0	JA	50
SU-120C	120	.5	JA	50

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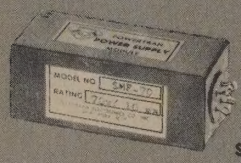
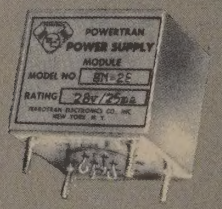
INPUT VOLTAGE — 115 volts A.C.
SUBMINIATURE MODULES



SMF-70

Case; 3"x1¼"x1¼"; Mounts on a chassis with 2 ea. 4-40 blind inserts; no projecting studs; ideal for printed circuit boards; fixed voltage. 4 pin connector.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMF-5	5	40ma	2.0	.20	$41
SMF-6	6	40	1.3	.15	41
SMF-10	10	40	1.0	.15	41
SMF-12	12	40	1.0	.15	41
SMF-15	15	40	1.0	.10	41
SMF-20	20	30	1.2	.25	42
SMF-24	24	30	1.2	.20	42
SMF-28	28	25	1.2	.30	42
SMF-30	30	20	1.5	.3	43
SMF-40	40	15	1.5	.2	43
SMF-50	50	15	1.5	.2	43
SMF-60	60	10	1.5	.1	43
SMF-70	70	10	1.2	.1	43



SM-28

Case; 1⅝"x1⅞"x1⅝"; Mounts on a chassis with 4 ea. 6-32 studs. ⅝" diam. connector in cover. 4 pin connector.

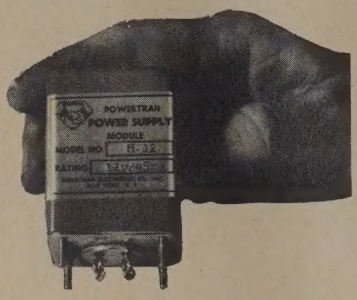
Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SM-5	5	40ma	2.0	.2	$41
SM-6	6	40	1.3	.15	41
SM-10	10	40	1.0	.15	41
SM-12	12	40	1.0	.15	41
SM-15	15	40	1.0	.10	41
SM-20	20	30	1.2	.25	42
SM-24	24	30	1.2	.20	42
SM-28	28	25	1.2	.30	42

PRINTED CIRCUIT MODULES

Epoxy encapsulated power modules in an epoxy shell; incorporates 4 pins for direct soldering to printed circuit boards 1⅝"x 1⅞"x1½".

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
SMP-5	5	40ma	2.0	.30	$41
SMP-6	6	40	1.3	.15	41
SMP-10	10	40	1.0	.15	41
SMP-12	12	40	1.0	.15	41
SMP-15	15	40	1.0	.10	41
SMP-20	20	30	1.2	.25	42
SMP-24	24	30	1.2	.20	42
SMP-28	28	25	1.2	.30	42

INPUT VOLTAGE — 115 volts A.C.
MIDGET MODULES

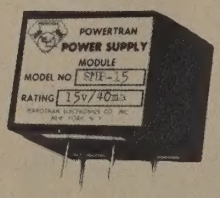


M-12 MIDGET MODULE

All silicon; 70° operation. Fixed voltage.
EB Case; 1¾"x1⅞"x2⅜". Wt. ea., ¾ lb.

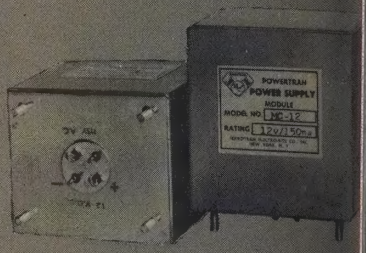
Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
M- .5	.5	30ma	4.0	.90	$35
M-1.0	1.0	30	4.0	.90	35
M-2.0	2.0	30	4.0	.45	35
M-1.5	1.5	30	4.0	.90	35
M-2.5	2.5	30	4.0	.50	35
M-3.0	3.0	30	6.0	.60	36
M-4.0	4.0	30	5.0	.50	36
M-5	5	50	3.0	.30	36
M-6	6	50	1.8	.18	36
M-8	8	50	2.0	.15	36
M-9	9	50	1.6	.20	36
M-10	10	50	1.4	.12	36
M-12	12	45	1.3	.12	36
M-15	15	45	1.5	.13	37
M-18	18	45	1.5	.18	37
M-20	20	45	1.5	.15	38
M-22	22	45	1.5	.15	38
M-24	24	40	1.5	.15	38
M-25	25	40	1.5	.15	38
M-27	27	40	1.5	.15	38
M-28	28	40	1.5	.15	38
M-30	30	40	1.5	.15	38
M-35	35	40	1.5	.15	39
M-40	40	40	1.5	.22	39
M-45	45	35	1.5	.20	39
M-50	50	30	1.5	.20	40
M-75	75	5	1.5	.10	44
M-100	100	2	1.5	.10	44

Also available in a PC case. 2¼"x1⅞"x1⅞". Order as: MP-5, MP-6 etc. with prices as above.



SMP-15
FOR PRINTED CIRCUIT BOARDS

INPUT VOLTAGE — 115 volts A.C.
HIGH TEMPERATURE MODULES



Low priced; all silicon; very small, fixed voltage modules, will operate to 80°C. without derating.
HB Case; 2½"x3"x3⅛". Wt. ea., 1¾ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
MC-7*	7	175ma	1.3	.10	$5
MC-10	10	175	1.3	.08	5
MC-12	12	150	1.3	.08	5
MC-15	15	140	1.3	.10	5
MC-18	18	140	1.5	.10	5
MC-20	20	140	1.3	.05	5
MC-22	22	130	1.3	.08	5
MC-23	23	130	1.3	.05	4
MC-24	24	125	1.3	.05	5
MC-25	25	125	1.3	.05	5
MC-26	26	125	1.3	.05	4
MC-27	27	125	1.3	.05	4
MC-28	28	125	1.3	.05	5
MC-30	30	110	1.5	.10	5
MC-45	45	100	1.5	.10	5

*MC-7 in GB Case

JB Case; 3½"x3"x3⅜". Wt. ea., 3¾ lbs.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
MCH-7*	7	280ma	1.7	.3	$
MCH-10	10	280	1.3	.3	
MCH-12	12	250	1.3	.1	
MCH-15	15	250	1.3	.1	
MCH-18	18	225	1.3	.1	
MCH-20	20	225	1.5	.1	
MCH-22	22	225	1.5	.1	
MCH-24	24	200	1.8	.1	
MCH-26	26	200	1.8	.1	
MCH-27	27	180	1.8	.1	
MCH-28	28	180	1.8	.1	
MCH-30	30	160	1.8	.1	
MCH-45	45	140	1.8	.1	

*MCH-7 and MCH-10 in HB Case.

LOW RIPPLE MIDGETS

FB Case; 2⅛"x2"x2½". Wt. ea., ¾ lb.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	P
HM-5	5	50ma	2.0	.08	
HM-6	6	50	1.5	.06	
HM-10	10	50	1.0	.03	
HM-12	12	50	1.0	.03	
HM-15	15	50	1.0	.05	
HM-20	20	50	1.0	.05	
HM-24	24	45	1.2	.02	
HM-28	28	45	1.5	.05	
HM-30	30	40	1.5	.05	

FERROTRAN ELECTRONICS COMPANY, INC
683 BROADWAY ▪ NEW YORK, N.Y. 10012 ▪ PHONE 212-254-581

FERROTRAN
ELECTRONICS CO., INC.

SOLID STATE POWER SUPPLY MODULES

All silicon, long-life, semi-conductor POWERTRAN power supply modules. Guaranteed 3 years.

115 V. A.C. INPUT

INDICATOR TUBE SUPPLIES

All solid-state, silicon, power supply modules used to operate indicator display devices, numerical lights, etc. for digital read-out. Also for power decoder drivers and diode counters.

UNREGULATED

Model	D.C. Volts	D.C. Current	Case	Price
1	170	20ma	AJ*	$32
2	175	18	AJ*	32
3	180	15	AJ*	32
4	200	12	AJ*	32
5	170	35	EB	32
6	175	35	EB	32
7	180	30	EB	32
8	200	25	EB	32
9	170	50	FB	32
10	175	48	FB	32
11	180	45	FB	33
12	200	40	FB	34

*Model NI-1 through NI-4 also available in epoxy encapsulated plastic case for PC board mounting 1⅝" x 1⅞" x 1½".

REGULATED

Model	D.C. Volts	D.C. Cur.	% Reg.	% Ripple	Case	Price
HM-170	170	8ma	1.0	.1	GB	$55
HM-175	175	7	1.0	.1	GB	55
HM-180	180	5	1.0	.1	GB	55
HM-200	200	5	1.0	.1	GB	55
HV-170	170	40	1.0	.1	HA	70
HV-175	175	40	1.0	.1	HA	70
HV-180	180	40	1.2	.12	HA	70
HV-200	200	40	1.3	.12	HA	70

NOTE: See Section 5600 for complete listing of Ferrotran Rectifier Transformers for designing solid state power supplies.

220 V. A.C. INPUT

MIDGET MODULES

These all-silicon, solid state modules operate from either 115 v. a.c. or 220 v. a.c. line voltage to furnish the d.c. outputs shown below. They will operate to 70°C. without derating.

EB Case: 1¾" x 1⅞" x 2⅜". Wt. Ea., ¾ lb.

Model	D.C. Volts	D.C. Current	% Reg.	% Ripple	Price
M-5-2	5	50	3.0	.30	$44
M-6-2	6	50	1.8	.18	44
M-10-2	10	50	1.4	.12	44
M-12-2	12	45	1.3	.12	44
M-15-2	15	45	1.5	.13	44
M-20-2	20	45	1.5	.15	44
M-24-2	24	40	1.5	.15	45
M-27-2	27	40	1.5	.15	46
M-28-2	28	40	1.5	.15	46
M-30-2	30	40	1.5	.15	46

CONNECTIONS — 5 pin connector dead center on stud side of the case.
Pins 1 & 2 — 115 v. a.c. input, or
Pins 1 & 3 — 220 v. a.c. input.
Pin 4 — positive d.c. output.
Pin 5 — negative.

POWER SUPPLY DESIGN INFORMATION

MECHANICAL FEATURES

CONNECTOR — Compression type multi-lead glass headers, 0.900" dia. for all units. Hook type solder pins are standard. Hooks are ¼-inch high. (Transformer type terminals or octal plug-in types may be specified. Transformer terminals are ⅞" high x ½" in dia. Octal plug-in terminals fit standard 8-pin sockets.

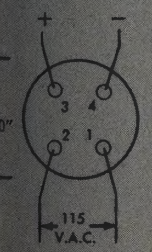
CONNECTOR MOUNTING — All connectors are mounted dead-center in stud side of case. Clearance hole for standard hook connector is 1¹⁄₁₆".

HEATSINKS — Internal, for all units. No transistors or zeners mounted externally; no fins mounted externally.

CASE MOUNTING — Chassis mounted with four threaded studs.

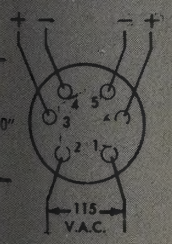
CONNECTIONS

Single D.C. Output Voltage Connections for HM, MC, MCH, HV, SMF, SM, SU, SUM, MV, HVA Modules.



pins 1 & 2 parallel to wide side of case

Dual D.C. Output Voltage Connectors for MA, MB, HMJ, HMC, HHV Modules.



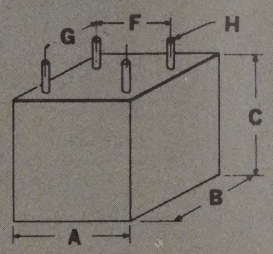
pins 3 & 4 power supply #1

pins 5 & 6 power supply #2

pins 1 & 2 input

Dual module, as per above sketch. Pins 1 & 2 115 AC input. Pins 3 & 4 DC output. Connect a fuse between Pins 5 & 6 equal to d.c. rated current of module.

DIMENSIONS PER MIL-T-27A



Case	A	B	C	F	G	H
AH	1⁵⁄₁₆	1⁵⁄₁₆	1¾	1¼	—	6-32x⅜
AJ	1⅝	1⅝	1⅜	1³⁄₁₆	1³⁄₁₆	6-32x⅜
EB	1¹⁵⁄₁₆	1¹³⁄₁₆	2⁷⁄₁₆	1⅜	1¼	6-32x⅜
FB	2⁵⁄₁₆	2¹⁄₁₆	2½	1¹¹⁄₁₆	1⁷⁄₁₆	6-32x⅜
GA	2¾	2⅜	3¹³⁄₁₆	2⅛	1¾	6-32x⅜
GB	2¾	2⅜	2¹³⁄₁₆	2⅛	1¾	6-32x⅜
HA	3¹⁄₁₆	2⅝	4¼	2¹⁹⁄₁₆	1⁵⁵⁄₆₄	8-32x⅜
HB	3¹⁄₁₆	2⅝	3³⁄₁₆	2¹⁹⁄₆₄	1⁵⁵⁄₆₄	8-32x⅜
JA	3⁹⁄₁₆	3¹⁄₁₆	4⅞	2⅝	2⅛	8-32x⅜
JB	3⁹⁄₁₆	3¹⁄₁₆	3⅞	2⅝	2⅛	8-32x⅜
LA	4⁵⁄₁₆	3¹¹⁄₁₆	5	3⁵⁄₁₆	2¹¹⁄₁₆	10-32x½
LB	4⁵⁄₁₆	3¹¹⁄₁₆	4½	3⁵⁄₁₆	2¹¹⁄₁₆	10-32x½

ELECTRICAL FEATURES

INPUT VOLTAGE RANGE — Regulated from 105 to 130 volts a.c. input; max. is 140 v.

INPUT FREQUENCY RANGE — 55 to 450 cycles; 55 to 2 kc at small additional charge.

REGULATION — Load regulation is specified in tables. Line voltage regulation is approximately 3% (105-130 v. a.c.)

RIPPLE — RMS value specified in tables at 60 cycles input and at currents indicated; will be reduced at lower currents. For approximate ripple at 400c divide 60c. ripple by 6.

OUTPUT VOLTAGE — Fixed voltage units have an output voltage within 5% of values shown. Customers may specify exact output voltage required at no extra charge.

COMPONENTS — All components rated for minimum of 85 degrees C. and are of domestic manufacture. All semi-conductors are silicon.

POLARITY — Outputs are floating off case with 1000 v. d.c. test voltage; may be used positively or negatively.

STABILITY — Fully operable on turn-on; voltage varies within a few percent during first five minutes; after half-hour of operation, voltage remains stable within a small fraction of 1%.

TEMP. (STORAGE) — −54°C to +85°C.

TEMP. (OPERATING) — −30°C to +70°C exc. where specified.

NOTE:
All modules in these pages may be obtained with a 220 v. a.c. input. These units will work at 50 cycles.

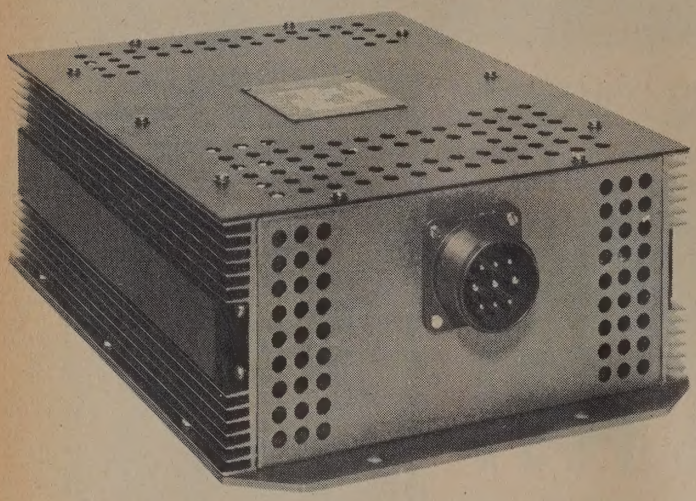
WARRANTY

The manufacturer warrants its product for a period of three years. If failure of product occurs during this time, manufacturer will repair unit at no charge, or if it is non-repairable, to replace the unit on a pro-rated basis. Ferrotran's only obligation shall be to replace such quantity of product proved to be defective. Manufacturer shall not be liable for any injury, loss or damage direct or consequential arising out of use or inability to use the product.

FERROTRAN ELECTRONICS COMPANY, INC.
683 BROADWAY ▪ NEW YORK, N.Y. 10012 ▪ PHONE 212-254-5810

FLITE-TRONICS

60 Hz 400 Hz STATIC INVERT



Other Inverters Available

- **Model PC-14B 125**
- **Model PC-15A 250**
  Specifications same as PC-1
- **12V to 24V Conve**
- **24V to 12V Conve**

For applications requiring greater than 600 VA of continuous power, the Flite-Tronics' Model PC-17 Inverter can be paralleled as necessary to double, triple, or quadruple the output power of a single unit. This is simply done by phase locking the oscillator in the PC-17. Malfunction of a single unit when connect in this manner will not damage the other units parallel. Each unit has its own overload protectio Each device is capable of self-preservation.

SPECIFICATIONS MODEL PC-17 (600 VA) STATIC INVERTER

INPUT VOLTAGE:
28 VDC ±2.0 VDC

INPUT CURRENT:
31A — full load
1.0A — no load

OUTPUT VOLTAGES:
115 VAC +5% −7%
26 VAC +5% −7%

OUTPUT FREQUENCY:
400 Hz ±1%

OUTPUT POWER:
600 VA continuous for 115 VAC output
125 VA continuous for 26 VAC output
NOTE: Total continuous output power 600 VA.

OUTPUT WAVEFORM:
Sine Wave, Single Phase

HARMONIC DISTORTION:
7% maximum (Typically 3%)

POWER FACTOR:
.8 to 1.0

ALTITUDE:
45,000 feet

EFFICIENCY:
70% typical

TEMPERATURE:
−65°F to 160°F

WEIGHT:
14.7 lbs.

SIZE:
Width 8½″
Length 12″
Height 4¹⁄₁₆″

INPUT OVERVOLTAGE:
Withstands 130% overvoltage (37 VDC) for five minutes minimum while delivering full rated 600 VA output power. Output voltage under this condition 115 VAC +5% −7%.

EMISSION RFI:
Radiated & Conducted . . . 90KC to 1000MC.
Far below levels specified in Appendix A of RTCA Paper 120-61/DO-108 Category "A".

HUMIDITY:
Greater than 95% for ten days, temperature cycled between 75°F to 160°F.

VIBRATION:
To withstand at least 10 G's from 10 to 500 cycles per second in three directions for 90 minutes each direction.

SHOCK:
To withstand at least 10 G milliseconds in three directi

OVERLOAD CAPABILITY:
Deliver 150% of rated outpu at rated output voltage for a of not less than 5 minutes volt amp load).

INPUT VOLTAGE PROTECTION:
Unit withstands transients of lasting 1 millisecond on the input line.

EXCESSIVE OVERLOAD & OUT SHORT CIRCUIT:
Withstands without damage dation loads exceeding 150% to an output short circuit. U ers rated output on removal condition.

SPECIFICATIONS MODEL PC-16 STATIC INVERTER

POWER OUTPUT:
250 VA Continuous
150% Overload 5 minutes
pf — .8 to 1.0

VOLTAGE INPUT:
1. 28 VDC ±2 Volts
2. Withstands 88 Volt Transient for 1 Millisecond

INPUT CURRENT:
14 Amp — full load
1 Amp — no load

FREQUENCY:
60 HZ ±1 Hz

VOLTAGE OUTPUT:
115 VAC RMS +5% −7%

AMPLITUDE DISTORTION:
Less than 7%

WAVE FORM:
Sine Wave

PHASE:
Single

SHORT CIRCUIT
Withstand for 1 minute or

TEMPERATURE:
−10°F to +160°F

ALTITUDE:
45,000 Ft.

WEIGHT:
16 lbs.

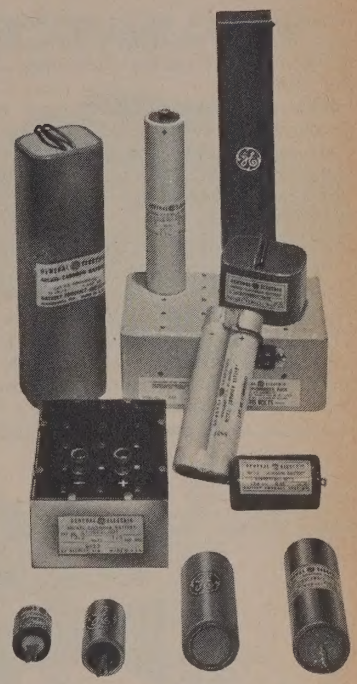
SIZE:
7½″ x 12″ x 4″ overall dim

For application requiring greater than 250 VA of continuous power Model PC-16 can be paralleled to double or triple the output power of a single unit.

FLITE-TRONICS, co., inc. 3312 Burton Avenue., Burbank, Calif. 91502 U.S.
Phone: (213) 849-1552

RECHARGEABLE NICKEL-CADMIUM BATTERIES

- **Operate over a wide temperature range**
- **High discharge rate capability with constant voltage output**
- **Long cycle life**
- **Meet severe environmental requirements**
- **Customized battery designs available**



Typical sealed-cell battery designs.

Electric rechargeable nickel-cadmium batteries are suitable for a wide variety of commer- tary, and aerospace applications. Available battery types include sealed, pressure relieved, ed cells nominally rated from 0.08 ampere-hours to 160 ampere-hours (at the one-hour rate).

lls utilize sintered-plate electrode construction to provide the following excellent operating acristics:

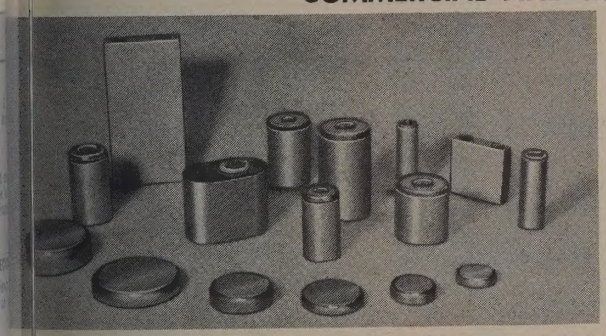
ture — the batteries will operate in temperatures ranging from −40°C to +60°C with an range of +15°C to +30°C.

rates several times rated call capacity are possible up to: 10 times for sealed cells, for pressure relieved cells, and 30 times for vented cells. Output voltage remains relatively over 90 percent of the discharge period.

e — under specified rated conditions, the number of charge/discharge cycles is normally of 1000. A life in excess of 5,000 cycles is possible at discharge rates not exceeding 25 f rated cell capacity.

esistance — the cells exhibit great resistance to shock, vibration, and physical damage. to 5,000 G's have been performed without causing cell damage.

COMMERCIAL AND MILITARY APPLICATIONS



ells are available in a wide variety of shapes and ampere-hour ratings to obtain batteries of any needed voltage or size.

CELLS — Sealed cells are available in three basic shapes: button, al, and rectangular. No maintenance is required and these cells rate in any position. In addition, all cylindrical and rectangular this classification feature a resealable vent mechanism that maximum cell life, even under infrequent abnormal operation.

Button cells are particularly suited for portable radios, flashlights, photo flash equipment, burglar alarms, and other low-drain high-capacity applications. Available ratings run from 0.08 to 1.60 ampere-hours at the one-hour rate.

Cylindrical and rectangular sealed cells provide maximum discharge rates and capacity. The special resealing vent mechanism on these cells provides added safety and reliability, making them especially suited for portable, cordless, rechargeable consumer products such as TV sets, radio receivers, and transceivers; appliances; and starting small gas engines. Available ratings run from 0.08 to 4.0 ampere-hours at the one-hour rate.

VENTED CELLS — Vented cells provide outstanding performance where large peaks of power and fast recharging are required. Typical applications include aircraft, turbine, and diesel engine starting. Available ratings run from 11.0 to 160.0 ampere-hours at the one-hour rate.

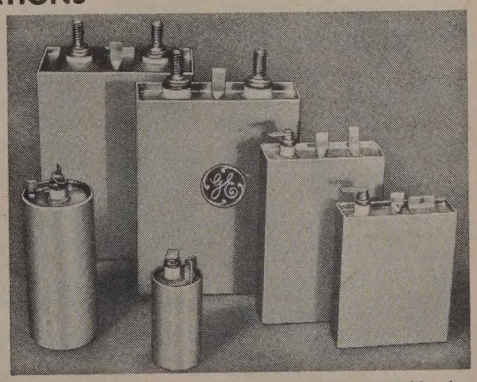
SPECIAL DESIGNS — All of these battery cell types can be customized, through use of special battery design and packaging techniques, to meet individual power and size requirements.

AEROSPACE APPLICATIONS

Electric nickel-cadmium aerospace batteries are designed to for extended periods in an outer space environment. The battery nploy a hermetic ceramic-to-metal seal (leakage rate less than 1^{8} cc/second of helium per year) construction that effectively in- the positive terminal or both terminals. The cells are also de- o withstand constant overcharging at specified rates.

alized cell and battery designs will be built to meet unusual nents. This includes special cell terminal arrangements, deep cases, cell case design, and third electrode control circuit to faster charging. Available ratings run from 0.75 to 100.0 ampere- t the one-hour rate.

WRITE FOR BULLETIN GEA-7287



Hermetically-sealed aerospace cells are available in stainless-steel cylindrical or rectangular case designs.

omplete information contact nearest GE Sales Office listed on inside front or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

AC VOLTAGE STABILIZERS

For Electronic and Electric Equipment

General Electric a-c voltage stabilizers are static-magnetic transformer-type products which provide voltage maintained within ±1% variation while input line voltage fluctuates ±15%. They are offered in the following variations:

Unfiltered output: output voltage waveform is relatively flat-topped, with harmonic content from 15 to 20%.

Harmonic filtered output: output voltage is filtered to near sinusoidal waveshape, with a maximum of 3% harmonic content.

Enclosed construction: completely metal enclosed for safe external mounting.

Open construction: for installation within electronic or electric equipment.

Cord/Receptacle units: for convenient temporary connections.

SINGLE PHASE — Magnetic-capacitor circuitry is frequency sensitive. Stabilizers designed for one frequency are not suitable for use on another.

THREE PHASE — Standard single-phase a-c voltage stabilizers can be connected for 3-phase, 4-wire loads with input connected delta. However, single-phase models cannot be connected for 3-phase, 3-wire loads: select from 3-phase delta-delta models.

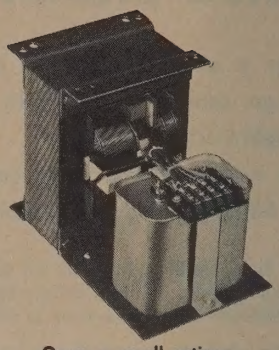
Volt-amp Output Capacity	Input Voltage Range	Stabilized Output Voltage	Unfiltered Output Model Number	Unfiltered Output Sugg'd Net Price 1-4§	Harmonic Filtered Output Model Number	Harmonic Filtered Output Sugg'd Net Price 1-4§
SINGLE PHASE — ENCLOSED — FOR 60 HERTZ						
15	95-130	118	9T91Y4070	$17.97	.....	.....
30	95-130	118	9T91Y4090	20.58	.....	.....
60	95-130	118	9T91Y4110	27.16	.....	.....
120	95-130	118	9T91Y4130	37.37	.....	.....
250	95-130	118	9T91Y4140‡	62.37	9T91Y7140‡	$64.64
250	190-260	118	9T91Y4142‡	62.37	.....	.....
250	190-260X380-520	118/236	9T91Y4144‡	69.17	.....	.....
250	380-520	118	9T91Y4145‡	62.37	.....	.....
500	95-130	118	9T91Y4150‡	98.09	9T91Y7150‡	100.93
500	190-260	118	9T91Y4152‡	98.09	.....	.....
500	380-520	118	9T91Y4155‡	98.09	.....	.....
1000	95-130	118	9T91Y4170	150.26	9T91Y7170	154.79
1000	95-130X175-235X190-260	118/236	.....	.....	9T91Y7173	174.07
1000	190-260	118	9T91Y4172	150.26	9T91Y7172	154.79
1000	190-260X380-520	118/236	.....	.....	9T91Y7174	171.23
1000	380-520	118	9T91Y4175	150.26	.....	.....
2000	95-130X175-235X190-260	118/236	9T91Y4183	301.08	9T91Y7183	315.82
2000	190-260X380-520	118/236	9T91Y4184	296.54	9T91Y7184	310.72
2000	380-520	236/472	9T91Y4186	288.04	.....	.....
3000	95-130X175-235X190-260	118/236	9T91Y4193	404.84	9T91Y7193	425.25
3000	190-260X380-520	118/236	9T91Y4194	396.33	.....	.....
3000	380-520	236/472	9T91Y4196	385.56	.....	.....
5000	190-260X380-520	118/236	9T91Y4204	610.66	9T91Y7204	644.11
5000	95-130X175-235X190-260	118/236	9T91Y4203	620.30	9T91Y7203	656.02
5000	380-520	236-472	9T91Y4206	548.10	.....	.....
7500	95-130X175-235X190-260	118/236	9T91Y4213	925.34	.....	.....
7500	190-260X380-520	118/236	9T91Y4214	907.20	9T91Y7214	1000.19
10000	95-130X175-235X190-260	118/236	.....	.....	9T91Y7223	1326.21
10000	190-260X380-520	118/236	9T91Y4224	1185.03	9T91Y7224	1301.27
15000	190-260X380-520	118/236	9T91Y4244	1739.56	9T91Y7244	1919.30
SINGLE PHASE — OPEN — FOR 60 HERTZ						
15	95-130	118	9T91Y5070	$17.01	.....	.....
30	95-130	118	9T91Y5090	19.39	.....	.....
60	95-130	118	9T91Y5110	25.34	.....	.....
120	95-130	118	9T91Y5130	35.15	.....	.....
250	95-130	118	9T91Y5140	58.97	9T91Y8140	$60.67
250	190-260	118	9T91Y5142	58.97	.....	.....
500	95-130	118	9T91Y5150	92.42	9T91Y8150	94.12
500	190-260	118	9T91Y5152	92.42	.....	.....
750	95-130	118	9T91Y5160	116.24	9T91Y8160	120.20
1000	95-130	118	9T91Y5170	140.62	9T91Y8170	145.15
1000	190-260	118	9T91Y5172	140.62	9T91Y8172	145.15
1500	95-130	118	9T91Y5010	195.05	9T91Y8010	204.69
2000	95-130X175-235X190-260	118/236	9T91Y5183	282.37	9T91Y8183	296.54
SINGLE PHASE — ENCLOSED — FOR 50 HERTZ						
250	95-130	118	9T91Y4147‡	$72.01	9T91Y7147‡	$74.28
250	95-130X175-235X190-260	118/236	9T91Y4148‡	81.08	9T91Y7148‡	83.92
500	95-130X175-235X190-260	118/236	9T91Y4158	127.58	9T91Y7158	130.98
500	190-260X380-520	118/236	9T91Y4159	124.74	9T91Y7159	128.71
1000	95-130X175-235X190-260	118/236	9T91Y4178	195.05	9T91Y7178	201.29
2000	95-130X175-235X190-260	118/236	9T91Y4188	346.44	9T91Y7188	363.45
3000	95-130X175-235X190-260	118/236	9T91Y4198	465.51	9T91Y7198	488.19
5000	95-130X175-235X190-260	118/236	9T91Y4208	714.42	9T91Y7208	750.14
7500	95-130X175-235X190-260	118/236	9T91Y4218	1061.99	9T91Y7218	1168.02
7500	190-260X380-520	118/236	9T91Y4219	1044.41	9T91Y7219	1149.31

‡ Can be used with adapter kit for quick conversion to a cord and receptacle unit.

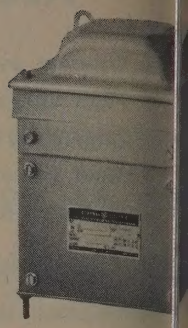
Freq.	VA	Input Voltage Range	Stabilized Output Voltage	Model Number	Sugg'd Net Price 1-4§
3 PHASE DELTA DELTA — ENCLOSED					
60	6000*	190 to 260/380 to 520 delta	230/236 delta	9T91Y3506	$1307.50
60	10000*	190 to 260 delta	236 delta	9T91Y3501G2	1884.71
50	10000*	190 to 260 delta	236 delta	9T91Y3510	2059.91

*Minimum recommended load 20% of rated; maximum harmonic content 5%.
§ OEM quantity prices available on request.

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.



Open — small ratings



Enclosed — small

Cord/Receptacle Units

Integral single-phase units with a 2-prong cord female receptacle in the case.

Volt-amp Output Capacity	Input Voltage Range	Stabilized Output Voltage	Model Number
ENCLOSED — UNFILTERED OUTPUT — FOR 60 HE			
15	95-130	118	9T91Y4070G19
30	95-130	118	9T91Y4090G19
60	95-130	118	9T91Y4110G19
120	95-130	118	9T91Y4130G19

Adapter kits are available for use with 250 volt-amp stabilizers to provide quick conversi cord and receptacle unit.

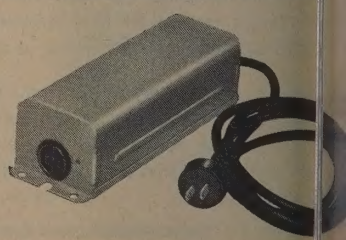
For Use With Stabilizer Model Number	Order Adapter Kit Model Number 2-prong	3-prong
9T91Y4140	9T91Y4140G55	9T91Y4140G75
9T91Y4142	9T91Y4140G55	9T91Y4140G75
9T91Y4144	9T91Y4140G55	9T91Y4140G75
9T91Y4145	9T91Y4140G55	9T91Y4140G75
9T91Y4147	9T91Y4140G55	9T91Y4140G75
9T91Y4148	9T91Y4140G55	9T91Y4140G75
9T91Y4150	9T91Y4140G55	9T91Y4140G75
9T91Y4152	9T91Y4140G55	9T91Y4140G75
9T91Y4155	9T91Y4140G55	9T91Y4140G75
9T91Y7140	9T91Y7140G55	9T91Y7140G75
9T91Y7150	9T91Y7150G55	9T91Y7150G75
9T91Y7147	9T91Y7147G55	9T91Y7147G75
9T91Y7148	9T91Y7147G55	9T91Y7147G75

Filament Ratings—Single Phase—60

For stabilized power for 6-volt nominal filame stabilizers are suitable for operation with oth loads of rated or lower output current requ Current-limiting characteristic protects cold from high current surges.

Volt-amp Output Capacity	Input Voltage Range	Output Volts	Output Amps	Model Number
OPEN				
15	95-130	6	2.5	9T91Y365
15	95-130	6.3	2.4	9T91Y367
31.5	95-130/190-260	6.3	5.0	9T91Y369
63	95-130/190-260	6.3	10.0	9T91Y370
94.5	95-130/190-260	6.3	15.0	9T91Y371
157.5	95-130/190-260	6.3	25.0	9T91Y372

Typical cord/receptacle unit



Prices subject to change wit

GENERAL ELE

STABILTRON*
AC VOLTAGE STABILIZERS

r Electronic and Electric Equipment Requiring PRECISE Voltage Control

l Electric Stabiltron a-c voltage can be used in a wide variety nic equipment applications where ntrol of voltage is required. The consists entirely of static com- there are no tubes to burn out parts to replace or maintain.

abiltron senses deviations from rmined output voltage level by etector. The error signal, through h-controlled rectifier circuit, aug- voltage stabilizer action and almost instantaneous correction voltage.

applications include computers, d communications equipment, process control, and X-ray .

tage — The most common power ltages can be handled by the models listed. Stabiltron units ovided for special voltage levels t.

oltage — Stabiltron voltage stabi- ntain extremely precise voltage spite of wide fluctuations of line equency, load, load power factor, ent temperatures.

ble below illustrates the effect tput of the maximum steady state s, within rated limits of some of ables.

TYPICAL OUTPUT VOLTAGE RISTICS

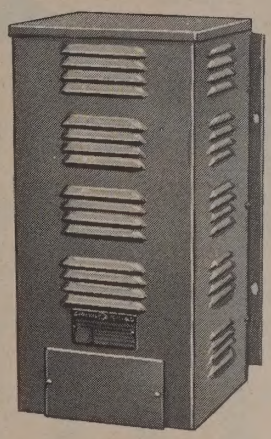
	Excursion	Output Voltage Bandwidth¶
	95 to 130	0.02 to 0.2%
	57 to 63 Hertz	0.15 to 0.4%
	0 to 100% rated load	0.02 to 0.1%
	0.4 lagging to unity	0.01 to 0.1%
	−25C to 40C	0.01%/degree C

is indicated because exact amounts are on the static level of other variables.
Stabiltron unit is operated at less than , the line voltage can be reduced con- below 95 volts without serious de- of the output voltage.

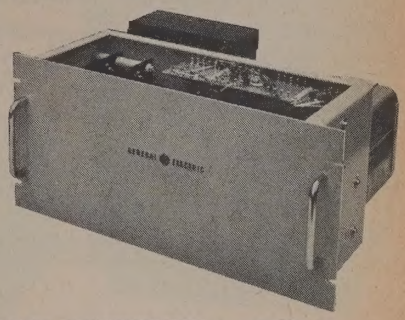
— Under transient line or load s, elapsed time for correction of oltage and transient excursion normal bandwidth are key con- s to equipment operation.

tabiltron provides fast response l transient excursion through its mbination of solid state and mag- uitry.

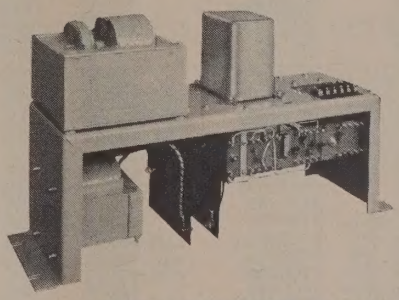
e of General Electric Co.



ENCLOSED CONSTRUCTION - 2-kva units are suitable for either wall or floor mounting. 5- and 10-kva units can be floor mounted only.



PANEL CONSTRUCTION is suitable for standard 19-inch rack mounting.



OPEN CONSTRUCTION is suitable for horizontal or vertical mounting surfaces in equipment enclosures.

57-63CPS; 3% HARMONIC: 0.4 LAG TO UNITY LOAD PF

Kva	Model Number	Sugg'd Net Price 1-4 △	Input Voltage Range	Output Voltage (Adjustable ±4%)	Approx. Net Weight (Pounds)	Construction Type	Approx. Dim. (in.) H	W	D
0.5	9T91Y3021	$465.15	95-130/190-260	118	70	Panel	7	19	14¾
0.5	9T91Y3021G2	456.23	95-130/190-260	118	70	Open	7	19	13¼
1.0	9T91Y3022	548.10	95-130/190-260	118	125	Panel	8¾	19	15½
1.0	9T91Y3022G2	540.23	95-130/190-260	118	125	Open	8¾	19	14
2.0	9T91Y3023	733.43	95-130/190-260	118/236	185	Enclosed	25	14½	11¼
2.0	9T91Y3023G2	720.83	95-130/190-260	118/236	180	Open	23½	14½	10¼
5.0	9T91Y3027	1574.48	95-130/175-235/190-260	118/236	570	Enclosed	26½	28	14
10.0	9T91Y3030	2432.33	190-260/380-520	118/236	975	Enclosed	28	39	17

△ OEM quantity prices are available on request.

TABLE 2 — TYPICAL TRANSIENT RESPONSE CHARACTERISTICS

Transient Change	Percent Peak Output Voltage Excursion	Response‡ Time	Total Recovery§ Time
0 to 115V input	14%	4 Hertz	13 Hertz
95 to 130V input	14%	3 Hertz	8 Herzt
130 to 95V input	9%	5 Hertz	9 Hertz
0 to 100% rated load	24%	1 Hertz	2 Hertz
20% to 100% rated load	21%	1 Hertz	2 Hertz
100% to 20% rated load	34%	1 Hertz	10 Hertz

‡ The time required for the output to recover 63.3% from its maximum excursion.
§ The time required for the output to recover to normal bandwidth limits.

Harmonic Content — Under all rated ranges of line variation and most load conditions, the total harmonic content of the output wave form will not exceed three percent for a sine wave power source. Even under adverse conditions, when the power source is not a sine wave, the Stabiltron voltage stabilizer will correct the wave form to the load to approximately three percent harmonic content.

Rectifier-filter Loading — Since the output wave form is low in harmonic content, the Stabiltron voltage stabilizer can be connected successfully to a rectifier (capacitor input) filter load to the input of a d-c power supply having capacitor input filters.

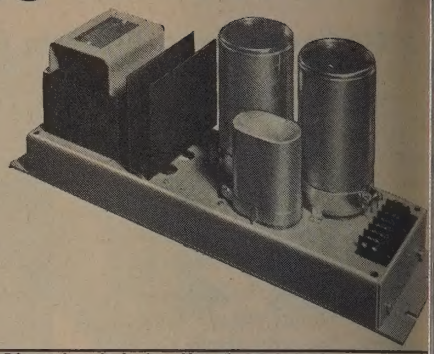
Prices subject to change without notice.

plete information contact nearest GE Sales Office listed on inside front , write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

REGULATED DC POWER SUPPLIES

Improve Performance of Computers and Other Electronic Equipment



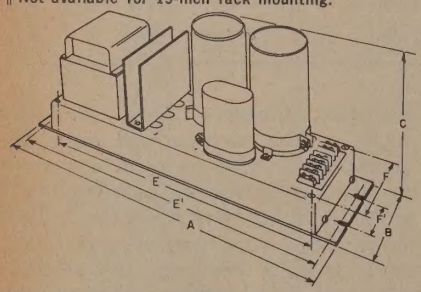
These component power supplies can be used in a wide variety of applications where relatively constant d-c voltage is required despite fluctuating line voltages. Computers, process control equipment, and electronic measuring devices are typical applications where demands for accuracy require constant regulation of voltage.

Performance-proved GE d-c power supplies can be designed to suit your needs for either 50- or 60-Hertz power sources.

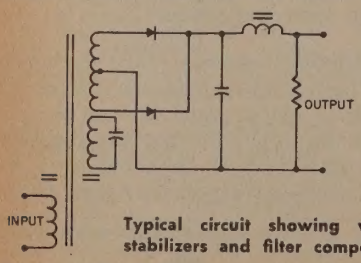
97- TO 130-VOLT INPUT RANGE, 40C AMBIENT

DC OUTPUT†				LOAD REGULATION‡		Dimensions in Inches (See sketch below)						
						OVER-ALL			MOUNTING			
									Chassis		Rack	
Volts	Amps	MODEL NO.	Suggested Net Price 1-4*	100% to 50% load	100% to 20% load	A	B	C	F	E	F′	E′
60 HERTZ												
10.0	16.0	9T66Y8	$173.25	5%	8%	19	7	6⅝	6¼	16¼	4	18⅜
12.0	5.0	9T66Y51	147.00	5%	6%	19	3½	7⅝	2¾	16¼	3	18⅜
12.0	15.0	9T66Y53	178.50	5%	7%	19	5¼	8	4½	16¼	2¼	18⅜
12.0	20.0	9T66Y978	194.25	5%	7%	19	7	8	6¼	16¼	4	18⅜
18.0	5.0	9T66Y61	134.40	4%	5%	19	3½	7⅝	2¾	16¼	3	18⅜
18.5	6.0	9T66Y966	139.65	4%	5%	19	5¼	7	4½	16¼	2¼	18⅜
18.5	12.0	9T66Y967	165.90	5%	7%	19	5¼	7¾	4½	16¼	2¼	18⅜
±18.5	24.0	9T66Y965	391.65	5%	8%	19	8¾	7	8	16¼	5¾	18⅜
24.0	2.5	9T66Y987	127.05	4%	6%	19	3½	6⅛	2¾	16¼	3	18⅜
24.0	6.0	9T66Y988	150.15	3%	5%	19	5¼	6½	4½	16¼	2¼	18⅜
24.0	10.0	9T66Y989	174.30	3%	5%	19	5¼	8	4½	16¼	2¼	18⅜
24.0	20.0	9T66Y990	227.85	3%	5%	19	7	9⅜	6¼	16¼	4	18⅜
24.0	50.0	9T66Y991	402.15	3%	5%	19	10½	11⅜	9¾	16¼	§	18⅜
28.0	8.0	9T66Y83	166.95	3%	5%	19	5¼	8	4½	16¼	2¼	18⅜
28.0	20.0	9T66Y85	247.80	3%	5%	19	7	9⅜	6¼	16¼	4	18⅜
28.0	50.0	9T66Y6	450.45	3%	5%	19	10½	12⅛	10½	17½	10½	18⅜
48.0	4.0	9T66Y93	139.65	3%	5%	19	5¼	8	4½	16¼	2¼	18⅜
48.0	10.0	9T66Y94	191.10	2%	4%	19	5¼	8	4½	16¼	2¼	18⅜
90.0	1.0	9T66Y69	120.75	2%	3%	19	3½	7⅛	2⅝	16¼	3	18⅜
90.0	10.0	9T66Y985	265.65	3%	4%	20⅞	7⅜	7	6⅛	20	¶	¶
125.0	2.0	9T66Y980	150.15	2%	3%	19	5¼	6½	4½	16¼	2¼	18⅜
125.0	4.0	9T66Y970	194.25	2%	3%	19	7	7⅝	6¼	16¼	4	18⅜
150.0	2.0	9T66Y981	158.55	2%	3%	19	5¼	6½	4½	16¼	2¼	18⅜
200.0	1.0	9T66Y982	140.70	2%	3%	19	5¼	6½	4½	16¼	2¼	18⅜
50 HERTZ												
12.0	15.0	9T66Y53G5	$187.95	5%	7%	19	5¼	6½	4½	16¼	2¼	18⅜
24.0	10.0	9T66Y989G5	182.70	3%	5%	19	5¼	8	4½	16¼	2¼	18⅜
24.0	20.0	9T66Y990G5	239.40	3%	5%	19	7	8½	6½	16¼	4	18⅜
28.0	8.0	9T66Y83G5	173.35	2%	5%	19	5¼	8	4½	16¼	2¼	18⅜
48.0	4.0	9T66Y93G5	147.00	3%	5%	19	4¼	8	4½	16¼	2¼	18⅜
48.0	10.0	9T66Y94G5	200.55	2%	4%	19	5½	9	4½	16¼	2¼	18⅜
125.0	2.0	9T66Y980G5	150.15	2%	3%	19	5¼	7⅜	4½	16¼	2¼	18⅜

* OEM quantity prices are available on request.
† May vary ±1%. All standard units come equipped with a plate for 19-inch rack mounting.
‡ Indicates approximate percent increase in output voltage due to decrease of load current from full load.
§ Rack mounting plate has four mounting slots on each end. Distance between centers of two outer slots is 7½ in., between two inner slots 3 in.
¶ Not available for 19-inch rack mounting.



Mounting holes suitable for ¼-20 screws. Length of screw may vary with chassis height.



Typical circuit showing voltage stabilizers and filter components.

EFFECT OF INPUT VOLTAGE VARIATION

D-c power supplies can be designed for various input voltages and ranges. With all other variables constant, the output voltage will not vary more than ±1 percent for a change in input voltage over the rated range of 97 to 130 volts input.

EFFECT OF TEMPERATURE CHANGE

For every 40C change in the ambient temperature, the output voltage level will change approximately one percent.

EFFECT OF FREQUENCY

A change of one percent in frequency will change output voltage level approximately one and one-half percent.

ISOLATION

All d-c power supplies provide electrical isolation between the a-c power source and the d-c load.

POLARITY

GE d-c power supplies can signed with the polarity you All standard units listed can be with either plus or minus grou

RIPPLE

Ripple levels of one perce meet most requirements. Howeve levels of ripple content can be into GE power supplies.

EFFICIENCY

Efficiency ranges from 70 to cent for normal output voltag For unusually low output vol low power ratings, some dec efficiency may occur.

REGULATION

Load regulation characteristics on the rated output voltage a power level of the power supply

Prices subject to change wit

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELEC

volt-pac® VOLTAGE REGULATORS

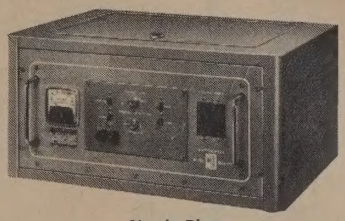
Ne solid-state control • **Precise output voltage control**

Fa voltage-correction rate • **Cabinet or rack-mounted models**

Ma netic circuit-breaker protection

ner Electric's new automatic voltage regulator line provides sely egulated output voltages from varying input voltages. ormally include a motor-operated Volt-Pac variable sfo ner, associated buck-boost transformers which handle ide range of input-voltage variation, and a new solid-state R ntrol.

se tomatic regulators maintain a preselected output volt- le l within 1 percent bandwidth, and are temperature pe ated from −20 to +40C. They can be bench or floor unt l, or in smaller sizes, mounted in standard relay racks.



Single-Phase

Three-Phase

	Freq. (Hertz)	Wide Range Input Load Max. Amps	Wide Range Input Load KVA*	Wide Range Input Correction Rate Volts/Sec.	Narrow Range Input▲ Load Max. Amps	Narrow Range Input▲ Load KVA*	Narrow Range Input▲ Correction Rate Volts/Sec.	Rack Mounted Model Number	Rack Mounted Suggested Net Price§	Cabinet Type Model Number	Cabinet Type Suggested Net Price§
		95-135V INPUT			105-125V INPUT						
	50/60	7.5	0.86	8.0	.....	.....	.....	.....	.....	9T92A100	$477.00
	50/60	10.0	1.15	8.0	21.5	2.5	4.0	9T92A101G3	$459.00	9T92A101	490.50
Sing -phase	50/60	14.8	1.70	8.0	33.0	3.8	4.0	9T92A102G3	477.00	9T92A102	504.00
115V ominal,	50/60	20.0	2.30	8.0	45.0	5.2	4.0	9T92A103G3	490.50	9T92A103	522.00
11220V	60	50.0	5.75	10.4	.....	.....	.....	9T92Y132G3	549.00	9T92Y132	576.00
just e Output¶	60	100.0	11.50	10.4	.....	.....	.....	9T92Y133G3	666.00	9T92Y133	693.00
	60	150.0	17.20	10.4	.....	.....	.....	.....	.....	9T92Y134	742.50
		190-260V INPUT‡			215-245V INPUT						
	50/60	7.5	1.70	16.0	.....	.....	.....	.....	.....	9T92A108†	$549.00
Sin -phase	50/60	12.0	2.75	12.0	26.0	6.0	6.0	9T92A109G3	$544.50	9T92A109	571.50
230V ominal,	60	32.5	7.50	17.2	.....	.....	.....	9T92Y136G3	607.50	9T92Y136	634.50
22240V	60	52.0	12.00	17.2	.....	.....	.....	9T92Y137G3	702.00	9T92Y137	729.00
just e Output¶	60	130.0	30.00	17.2	.....	.....	.....	.....	.....	9T92Y138	846.00
		400-520V INPUT			430-490V INPUT						
Sin -phase	50/60	12.0	5.50	24.0	26.0	12.0	12.0	9T92A114G3	$621.00	9T92A114	$648.00
460V ominal,	60	32.5	15.00	34.4	.....	.....	.....	9T92Y140G3	787.50	9T92Y140	814.50
44480V	60	52.0	24.00	34.4	.....	.....	.....	.....	.....	9T92Y141	945.00
just e Output¶	60	130.0	60.00	34.4	.....	.....	.....	.....	.....	9T92Y142	1179.00
		200-260V INPUT‡			215-245V INPUT‡						
	50/60	14.0	5.00	12.0	30.0	12.0	6.0	9T92A120G3	$10.17.00	9T92A120	$1044.00
Thr -phase	50/60	20.8	8.30	12.0	45.0	18.0	6.0	9T92A121G3	1071.00	9T92A121	1098.00
230V ominal,	50/60	28.5	11.50	12.0	61.0	24.0	6.0	.....	.....	9T92A122	1143.00
22240V	60	68.0	27.00	17.2	.....	.....	.....	.....	.....	9T92Y145	1404.00
just e Output¶	60	136.0	54.00	17.2	.....	.....	.....	.....	.....	9T92Y146	1863.00
	60	170.0	67.50	7.5	.....	.....	.....	.....	.....	9T92Y147	2070.00
		400-520V INPUT			430-490V INPUT						
	50/60	12.0	9.60	24.0	26.0	21.0	12.0	.....	.....	9T92A127	$1147.50
Thr -phase	60	32.5	26.00	34.4	.....	.....	.....	.....	.....	9T92Y149	1314.00
460V ominal,	60	52.0	41.50	34.4	.....	.....	.....	.....	.....	9T92Y150	1701.00
44480V	60	100.0	80.00	34.4	.....	.....	.....	.....	.....	9T92Y151	2043.00
just e Output¶	60	130.0	104.0	15.0	.....	.....	.....	.....	.....	9T92Y152	2169.00

When narrow range input ratings are not listed for certain models, units can be c tom designed as needed.

Load va is based on ontput voltage at midpoint in the output range.

When output voltage is adjusted up or down from midpoint, the rated input rang will shift proportionately.

te: A dual input voltage range models are connected for the narrow range w n shipped. Reconnection for the wide input range can be made when t unit is installed, if desired. For reconnection, follow directions in- c led with the unit.

o Waveform Distortion

o ha onic waveform distortion is introduced at any load or with any put ltage. The output voltage waveform is a precise reproduction of pplie nput waveform.

djusta le Output Voltage

utpu voltage for units nominally rated 115 volts is adjustable from 110 120 olts. Output voltage also is adjustable from 220 to 240 volts for its ed 230 volts; from 440 to 480 volts for nominally rated units of 50 vts. Please note that the specified input-voltage range is applicable r nominal output voltage. When operating at any other output voltage ithin pecified range, the input voltage range shifts in proportion with e se ted output voltage.

ccur Static-sensing Control

olid- te control combined with the new Sylvan-Kettler static-sensing evice chieve the optimum in automatic accuracy. The voltage regulator gov ned automatically by a dead-band-type voltage-sensitive control tilizi either lamp or zener bridges. The circuit includes magnetic input ircui reakers and an output voltmeter.

§ OEM quantity prices are available on request.

† This model is suitable for a wider input voltage range, i.e., 190-270V.

‡ These models can be used for 199-217V output and 181 to 236V input by changing connections as outlined in connection diagram included in shipping carton.

FEATURES

- No wave-form distortion
- Dual rated for wide or narrow input voltage ranges
- Adjustable output voltage
- ±1% output voltage band for rated input ranges
- Output voltmeter included
- Fused control circuit
- Fast voltage correction
- −20 to +40C ambient temperature range
- 0 to 100% rated load
- Not sensitive to load power factor
- Not sensitive to line frequency (59-61 Hz)
- Up to 99% efficient
- Solid State control using lamp bridge circuit (Zener diode bridge circuit is available at slightly higher price.)
- Easily replaceable control circuit

Prices subject to change without notice.

'or mplete information contact nearest GE Sales Office listed on inside front ove or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

Vol. 1 TEST INSTRUMENTS EQUIPMENT & SYSTEMS

GATES

A single source for all possible types of "brute force" and regulated power supplies that can fill your design and application needs. Gates Power Supplies give you absolutely lowest cost and lo The units are excellently constructed of high rated components for trouble free, years of

Silicon or Selenium. Single and three-phase units. 1 to 1000 volts, 1 to 1000 Amps. Mete unmetered Static or variable outputs. Rack, cabinet or chassis mounts. Unit or hundred quantities delivery. Two year guarantees. Power supplies for OEM Application, Testing, Prototype, Lab typ Plating, Motor Control, Cathodic Protection, Transistor power, Anodizing, Battery Charging, Batte versions, Marine types, Aircraft Starting.

ECONOMY RANGE DC POWER SUPPLIES — Less Than 1% Ripple - Good Regulation - Rack Mount Type - Heavy Duty Construction - Powerstat - Fused 2% Meters - 115 Vac Input

MODEL GT 12-5:	Output 0.12V,	5A	.....	$ 85.
MODEL GT 12-10:	Output 0-12V,	10A	.....	$ 130.
MODEL GT 12-15:	Output 0-12V,	15A	.....	$ 145.
MODEL GT 12-25:	Output 0-12V,	25A	.....	$ 154.
MODEL GT 12-100:	Output 0-12V,	100A	.....	$ 395.
MODEL GT 14-5:	Output 0-14V,	5A	.....	$ 120.
MODEL GT 14-15:	Output 0-14V,	15A	.....	$ 135.
MODEL GT 14-20:	Output 0-14V,	20A	.....	$ 145.
MODEL GT 14-30:	Output 0-14V,	30A	.....	$ 276.
MODEL GT 14-40:	Output 0-14V,	40A	.....	$ 285.
MODEL GT 14-50:	Output 0-14V,	50A	.....	$ 350.
MODEL GT 14-75:	Output 0-14V,	75A	.....	$ 375.
MODEL GT 14-100:	Output 0-14V,	100A	.....	$ 425.
MODEL GT 16-5:	Output 0-16V,	5A	.....	$ 85.
MODEL GT 16-10:	Output 0-16V,	10A	.....	$ 90.
MODEL GT 16-25:	Output 0-16V,	25A	.....	$ 155.
MODEL GT 16-30:	Output 0-16V,	30A	.....	$ 195.
MODEL GT 16-40:	Output 0-16V,	40A	.....	$ 260.
MODEL GT 16-50:	Output 0-16V,	50A	.....	$ 370.
MODEL GT 16-70:	Output 0-16V,	70A	.....	$ 390.
MODEL GT 16-80:	Output 0-16V,	80A	.....	$ 405.
MODEL GT 28-5:	Output 0-28V,	5A	.....	$ 90.
MODEL GT 28-12:	Output 0-28V,	12A	.....	$ 169.
MODEL GT 28-24:	Output 0-28V,	24A	.....	$ 275.
MODEL GT 32-5:	Output 0-32V,	5A	.....	$ 114.
MODEL GT 32-8:	Output 0-32V,	8A	.....	$ 149.
MODEL GT 32-12:	Output 0-32V,	12A	.....	$ 179.
MODEL GT 32-15:	Output 0-32V,	15A	.....	$ 219.
MODEL GT 32-24:	Output 0-32V,	24A	.....	$ 295.
MODEL GT 32-30:	Output 0-32V,	30A	.....	$ 325.
MODEL GT 32-50:	Output 0-32V,	50A	.....	$ 425.
MODEL GT 32-60:	Output 0-32V,	60A	.....	$ 561.
MODEL GT 48-5:	Output 0-48V,	5A	.....	$ 138.
MODEL GT 48-10:	Output 0-48V,	10A	.....	$ 164.
MODEL GT 48-15:	Output 0-48V,	15A	.....	$ 170.
MODEL GT 48-25:	Output 0-48V,	25A	.....	$ 250.
MODEL GT 48-35:	Output 0-48V,	35A	.....	$ 300.
MODEL GT 48-50:	Output 0-48V,	50A	.....	$ 350.
MODEL GT 48-60:	Output 0-48V,	60A	.....	$ 425.
MODEL GT 48-80:	Output 0-48V,	80A	.....	$ 500.
MODEL GT 48-100:	Output 0-48V,	100A	.....	$ 550.
MODEL GT 80-5:	Output 0-80V,	5A	.....	$ 220.
MODEL GT 80-10:	Output 0-80V,	10A	.....	$ 275.
MODEL GT 80-20:	Output 0-80V,	20A	.....	$ 450.
MODEL GT 115-5:	Output 0-115V,	5A	.....	$ 240.
MODEL GT 115-10:	Output 0-115V,	10A	.....	$ 260.
MODEL GT 115-15:	Output 0-115V,	15A	.....	$ 280.
MODEL GT 115-20:	Output 0-115V,	20A	.....	$ 310.
MODEL GT 115-25:	Output 0-115V,	25A	.....	$ 350.
MODEL GT 115-30:	Output 0-115V,	30A	.....	$ 390.
MODEL GT 115-40:	Output 0-115V,	40A	.....	$ 490.
MODEL GT 115-50:	Output 0-115V,	50A	.....	$ 560.
MODEL GT 115-60:	Output 0-115V,	60A	.....	$ 660.
MODEL GT 115-70:	Output 0-115V,	70A	.....	$ 700.
MODEL GT 130-2:	Output 0-130V,	2A	.....	$ 124.
MODEL GT 120-5:	Output 0-120V,	5A	.....	$ 277.
MODEL GT 130-5:	Output 0-130V,	5A	.....	$ 223.
MODEL GT 130-10:	Output 0-130V,	10A	.....	$ 386.
MODEL GT 200-10:	Output 0-220V,	10A	.....	$ 482.
MODEL GT 80-50:	Output 0-80V,	50A	.....	Inquire
MODEL GT 80-100:	Output 0-80V,	100A	.....	Inquire

3 PHASE MODEL POWERSTAT METERS

MODEL GP 125-40:	Output	40A, 0-125V	..	Inquire
MODEL GP 125-80:	Output	80A, 0-125V	..	Inquire
MODEL GP 125-125:	Output	125A, 0-125V	..	Inquire
MODEL GP 250-15:	Output	15A, 0-250V	..	Inquire
MODEL GP 250-25:	Output	25A, 0-250V	..	Inquire
MODEL GP 250-40:	Output	40A, 0-250V		Inquire
MODEL GP 250-75:	Output	75A, 0-250V	..	Inquire
MODEL GP 500-5:	Output	5A, 0-500V	..	Inquire
MODEL GP 500-10:	Output	10A, 0-500V	..	Inquire
MODEL GP 500-25:	Output	25A, 0-500V	..	Inquire
MODEL GP 500-35:	Output	35A, 0-500V	..	Inquire

LOW-COST BASIC/OEM SUPPLIES

MODEL L6.3-30	6.3VDC	@ 30A/1%	.....	$ 125.
MODEL L12-12	12VDC	@ 12A/Rip., 1Mv/.01%	.....	$ 180.
MODEL L12-15	12VDC	@ 15A/1%	.....	$ 170.
MODEL L12-24	12VDC	@ 24Amp.	.....	$ 100.
MODEL L12-24	12VDC	@ 24A/1%	.....	$ 144.
MODEL L12-50	12VDC	@ 50Amp.	.....	$ 133.
MODEL L12-50	12VDC	@ 50A/Rip. 1%	....	$ 223.
MODEL L24-30	24VDC	@ 30A/Rip.1%	....	$ 313.
MODEL L28-1	28VDC	@ 1A/0.5%	.....	$ 55.
MODEL L28-2	28VDC	@ 1A/Rip. .05%	....	$ 65.
MODEL L28-5	28VDC	@ 5Amp.	.....	$ 85.
MODEL L28-8	28VDC	@ 8Amp.	.....	$ 110.
MODEL L28-12	28VDC	@ 12Amp.	.....	$ 120.
MODEL L28-24	28VDC	@ 24Amp. (N.F.)	....	$ 115.
MODEL L28-24	28VDC	@ 24Amp.	.....	$ 180.
MODEL L28-30	28VDC	@ 30Amp.	.....	$ 313.
MODEL L28-50	28VDC	@ 50Amp. (N.F.)	....	$ 205.
MODEL L28-50	28VDC	@ 50Amp.	.....	$ 285.
MODEL L28-50	28VDC	@ 50Amp. —1% R.	.....	$ 403.

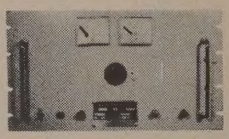
(N.F.) means not filtered

MAGNETICALLY REGULATED D.C. POWER SUPPLIES

REGULATION: Line ±1% for ±15% line voltage change load ±2% for any load change betwee load and full load. Ripple 1% RMS Maximum. Rack or cabinet types.

VOLTS	D.C. OUTPUT AMPS	VA	CATALOG NUMBER	LOAD REGULATIFON 20% F.L.	50% F.L.	PRICE
6	10	60	6GDCV10	9	7	$130.0
6	15	90	6GDCV15	9	7	140.0
12	5	60	12GDCV5	7	5	92.0
12	10	120	12GDCV10	7	5	120.0
12	15	180	12GDCV15	7	5	155.0
18	5	90	18GDCV5	5	4	96.0
18	10	180	18GDCV10	7	5	141.0
24	6	144	24GDCV6	5	4	116.0
24	10	240	24GDCV10	6	4	144.0
24	15	360	24GDCV15	5	4	200.0
24	25	600	24GDCV25	6	4	275.0
28	8	224	28GDCV8	6	4	144.0
28	15	420	28GDCV15	7	5	200.0
48	4	192	48GDCV4	3.5	2.5	109.0
48	4	480	48GDCV4	4	2	149.0
48	20	960	48GDCV20	3	2	223.0
125	2	250	125GDCV2	2.5	1.5	117.0
150	2	300	150GDCV2	2	1.5	117.0
150	1	200	200GDCV1	3	2	112.0
250	1	250	250GDCV1	3	2	120.0

NEW SCR REGULATED POWER SUPPLIES



GCR32-30 115VAC 24-32 @ 30A 1% Rip. ±1% Req. Meters 19"Wx17"Dx12¼"H

GCR32-25 115VAC 24-32 @ 25A 1% ±1% Meters 19"Wx17"Dx1

GCR32-20 115VAC 24-32 @ 20A 1% ±1% Meters 19"Wx17"Dx1

MODEL L28-100	28VDC	@ 100Amp.	.....	$ 418.
MODEL L115-2.5	115VDC	@ 2.5A	.....	$ 85.
MODEL L115-5	115VDC	@ 5A	.....	$ 124.
MODEL L115-10	115VDC	@ 10A (N.F.)	.....	$ 188.
MODEL L115-10	115VDC	@ 10A	.....	$ 340.
MODEL L220-5	220VDC	@ 5A	.....	$ 223.
MODEL L220-10	220VDC	@ 10A	.....	$ 340.
MODEL L440-5	440VDC	@ 5A	.....	$ 349.

(N.F.) means not filtered

12 VOLT POWER SUPPLIES — 1% Ripple

MODEL GS 12-1,	Output	1A, 12V	.....	$ 35.00
MODEL GS 12-3,	Output	3A, 12V	.....	$ 55.00
MODEL GS 12-5,	Output	5A, 12V	.....	$ 65.00
MODEL GS 12-10,	Output	10A, 12V	.....	$ 85.00
MODEL GS 12-15,	Output	15A, 12V	.....	$130.00
MODEL GS 12-20,	Output	20A, 12V	.....	$150.00
MODEL GS 12-25,	Output	25A, 12V	.....	$170.00
MODEL GS 12-30,	Output	30A, 12V	.....	$190.00

3 PHASE BENCH MODEL PLATING SUPPLIES

MODEL GL 6-50	6V	50A	.....	$204.00
MODEL GL 9-50	9V	50A	.....	$212.00
MODEL GL 12-50	12V	50A	.....	$220.00
MODEL GL 18-50	18V	50A	.....	$236.00
MODEL GL 6-75	6V	75A	.....	$256.00
MODEL GL 9-75	9V	75A	.....	$264.00
MODEL GL 12-75	12V	75A	.....	$276.00
MODEL GL 18-75	18V	75A	.....	$292.00
MODEL GL 6-100	6V	100A	.....	$268.00
MODEL GL 9-100	9V	100A	.....	$284.00
MODEL GL 12-100	12V	100A	.....	$300.00
MODEL GL 18-100	18V	100A	.....	$316.00
MODEL GL 6-150	6V	150A	.....	$300.00
MODEL GL 9-150	9V	150A	.....	$328.00
MODEL GL 12-150	12V	150A	.....	$352.00
MODEL GL 18-150	18V	150A	.....	$372.00
MODEL GL 6-200	6V	200A	.....	$330.00
MODEL GL 9-200	9V	200A	.....	$352.00
MODEL GL 12-200	12V	200A	.....	$372.00
MODEL GL 6-250	6V	250A	.....	$372.00
MODEL GL 9-250	9V	250A	.....	$396.00
MODEL GL 12-250	12V	250A	.....	$460.00

24 VOLT POWER SUPPLIES Rack Type — 1% Ripple

MODEL G 24-6R	24VDC	6A	.....
MODEL G 24-15R	24VDC	15A	.....
MODEL G 24-25R	24VDC	25A	.....
MODEL G 24-50R	24VDC	50A	.....

GR LINE REGULATED POWER SUPPLIES 2% Meters - 1% Ripple

MODEL GR 12-5	0-12V	5A	.....
MODEL GR 12-10	0-12V	10A	.....
MODEL GR 12-20	0-12V	20A	.....
MODEL GR 12-30	0-12V	30A	.....
MODEL GR 16-5	0-16V	5A	.....
MODEL GR 16-10	0-16V	10A	.....
MODEL GR 8-10	0-8V	10A	.....
MODEL GR 28-5	0-28V	5A	.....
MODEL GR 14-5	0-14V	5A	.....
MODEL GR 32-4	0-32V	4A	.....
MODEL GR 16-8	0-16V	8A	.....
MODEL GR 32-15	0-32V	15A	.....
MODEL GR 55-10	0-55V	10A	.....
MODEL GR 125-1	0-125V	1A	.....
MODEL GR 125-5	0-125V	5A	.....
MODEL GR 125-10	0-125V	10A	.....

INDUSTRIAL POWER UNITS — SINGL

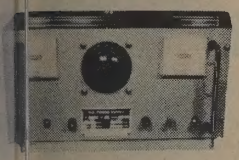
MODEL GK 115-125A	Output 115V	125W
MODEL GK 115-125B	Output 115V	125W
MODEL GK 115-125C	Output 115V	125W
MODEL GK 115-250A	Output 115V	250W
MODEL GK 115-250B	Output 115V	250W
MODEL GK 115-250C	Output 115V	250W
MODEL GK 115-375A	Output 115V	375W
MODEL GK 115-375B	Output 115V	375W

PRICES SUBJECT TO CHANGE
SEE AD IN SECTION 4800

GATE

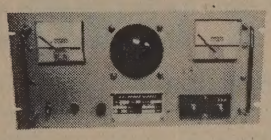
GATES ELECTRONIC COMPANY, INC. • 256 Van Nest Avenue, Bronx, N.Y. 10460 • Telephone: Tulip

MODEL GT125-5F



INPUT: 115VAC
OUTPUT: 0-125 @ 5A
RIPPLE: 0.5%
REGULATION: UNREGULATED
METERS: YES
DIMENSIONS: 21" W x 15" D x 1½" H
PRICE: $325.00

MODEL GT14-40

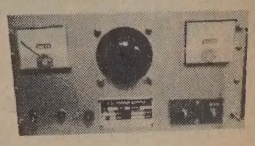


INPUT: 115VAC
OUTPUT: 0-14 @ 40A
RIPPLE: 0.1%
REGULATION: UNREGULATED
METERS: YES
DIMENSIONS: 19" W x 13½" D x 8-3/6" H
PRICE: $275.00 — RACK MOUNTED

MODEL G220-10

INPUT: 115VAC
OUTPUT: 220VDC @ 10A
RIPPLE: 48%
METERS: NONE
DIMENSIONS: 21" W x 15" D x 10" H
PRICE: $425.00
METERS $50.00 EXTRA

SILICON INDUSTRIAL POWER UNIT MODEL G30-40F

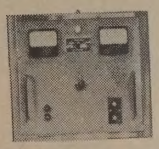


INPUT: 115 Volts AC, 60 cycles, single phase.
OUTPUT: 0-32 Volts DC, 0-40 Amperes DC, continuous duty
RIPPLE: 1% RMS
DIMENSIONS: 12¼"H x 19"W x 13"D
REGULATION: D.C.V. at full load: 32 minimum D.C.V. at 1/10 load: 35 maximum
PRICE: $425.00

SILICON AIRCRAFT BATTERY ELIMINATOR Model G30-200

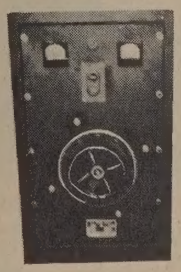
INPUT: 220 Volts AC, 60 cycles, 3 phase
OUTPUT: 0-32 Volts DC, 0-200 amperes continuous duty also avail. 300A
RIPPLE .5% RMS
REGULATION: 5-8% 1/10th load to full load with constant input and maximum output voltage setting
METERS: 2% Accuracy
DIMENSIONS: 25" x 25" x 43"

SILICON REGULATED POWER SUPPLY Model G530-40M



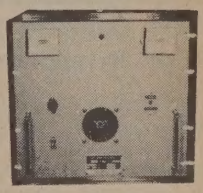
INPUT: 115 Volts AC, 60 cycles, 1 phase
OUTPUT: 5-30 Volts DC, 0-40 amperes
RIPPLE: 1% RMS
REGULATION: ±1% from no load to full load
METERS: 2% Accuracy
DIMENSIONS: 21" x 15" 19"

MODEL GT20-200



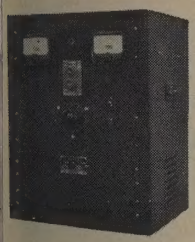
INPUT: 220 VAC 60 cy. 1 Phase
OUTPUT: 0-22 VDC @ 200A
RIPPLE: 1%
CABINET: 35" x 20" x 20"
METERS: VOLT & AMP.
PRICE $625.00

SILICON GENERAL PURPOSE RECTIFIER MODEL G-115



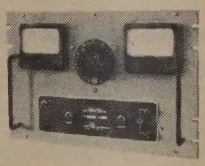
INPUT: 115 Volts AC 60 cycles, 1 Phase
OUTPUT: 0-32 Volts DC, 0-50 Amperes DC, Continuous duty variable over entire range
RIPPLE: 1% RMS
DIMENSIONS: 22"H x 19"W x 15"D
PRICE: $522.00 NET

SILICON POWER RECTIFIER Model G50-50R



INPUT: 220 Volts AC, 60 cycles, phase
OUTPUT: 0-50 volts DC, 0-50 amperes continuous duty
RIPPLE: 3% RMS
REGULATION: No Load to Full Load
METERS: 2% Accuracy
DIMENSIONS: 21" x 15" x 19"

AIRCRAFT BATTERY ELIMINATOR MODEL G101F

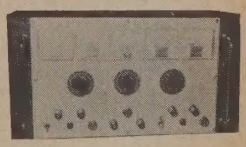


INPUT: 115 Volts AC 60 cycles, single phase
OUTPUT: 0-32 Volts DC, 0-20 Amperes, continuous duty
RIPPLE: 0.5% RMS Unique overload device prevents needle slam and shows overload condition
REGULATION: D.C.V. at full load: 30 D.C.V. at 1/10 load: 35
METERS: 2% Accuracy
DIMENSIONS: 19" x 14¼" x 12¼"
PRICE: $302.50 NET
May be used for Rack or Bench

SILICON POWER RECTIFIER For transistor circuits electronic equipment MODEL G92F

INPUT: 115 volts AC 60 cycles, 1 phase
OUTPUT: 0-32 Volts DC, 0-10 Amperes D.C. continuous duty
REGULATION: No load to full load 15%
RIPPLE: Less than 0.3% RMS
METERS: 2% Accuracy
DIMENSIONS: 17" x 9" x 9"
PRICE: $169.50 NET
*Also available in 5 Amperes
PRICE: $114.50 NET

VARIABLE AC AND DC POWER SUPPLY



INPUT: 115 Volts AC, 60 HZ, 1 Phase
OUTPUT: (1) 0-22 Volts DC at 4 amperes. (2) 0-22 VAC at 4 amperes. (3) 0-350 Volts DC at 200 MA. All very low filtered.
DIMENSION: 17" x 9" x 9"
WEIGHT: 36 Lbs. Approx.

INDUSTRIAL POWER UNITS — SINGLE PHASE Continued

MODEL GK 115-375C	Output 115V	375W	....	$ 89.00
MODEL GK 115-500A	Output 115V	500W	....	$105.00
MODEL GK 115-500B	Output 115V	500W	....	$105.00
MODEL GK 115-500C	Output 115V	500W	....	$105.00
MODEL GK 115-750A	Output 115V	750W	....	$130.00
MODEL GK 115-750B	Output 115V	750W	....	$130.00
MODEL GK 115-750C	Output 115V	750W	....	$130.00
MODEL GK 115-1000A	Output 115V	1000W	....	$150.00
MODEL GK 115-1000B	Output 115V	1000W	....	$150.00
MODEL GK 115-1000C	Output 115V	1000W	....	$150.00
MODEL GK 230-125A	Output 230V	125W	....	$ 67.00
MODEL GK 230-125A	Output 230V	125W	....	$ 67.00

PRICES SUBJECT TO CHANGE

HIGH VOLTAGE DC POWER SUPPLIES — 1% Ripple - Good Regulation - Cabinets - Meters - Heavy Duty Construction - Powerstat - Fused 1% Meters - 115 Vac Input Heavy Duty Line Cord.

MODEL GP 32-20	115V, Out 0-32V	@ 20A..	$ Inquire
MODEL GP 32-40	115V, Out 0-32V	@ 40A..	$ Inquire
MODEL GP 32-100	220V, Out 0-32V	@ 100A	$ Inquire
MODEL GP 32-150	220V, Out 0-32V	@ 150A	$ Inquire
MODEL GP 60-6	115V, Out 0-60V	@ 60A..	$ Inquire
MODEL GP 60-10	115V, Out 0-60V	@ 10A..	$ Inquire
MODEL GP 60-12	115V, Out 0-60V	@ 12A..	$ Inquire
MODEL GP 60-20	115V, Out 0-60V	@ 20A..	$ Inquire
MODEL GP 60-50	220V, Out 0-60V	@ 50A..	$ Inquire
MODEL GP 60-80	220V, Out 0-60V	@ 80A..	$ Inquire
MODEL GP 60-250	220V, Out 0-60V	@ 250A	$ Inquire
MODEL GP 125-3	117V, Out 0-125V	@ 3A....	$ Inquire
MODEL GP 125-5	117V, Out 0-125V	@ 5A....	$ Inquire
MODEL GP 125-10	117V, Out 0-125V	@ 10A..	$ Inquire
MODEL GP 125-20	117V, Out 0-125V	@ 20A..	$ Inquire
MODEL GP 125-24	220V, Out 0-125V	@ 24A..	$ Inquire
MODEL GP 125-40	220V, Out 0-125V	@ 40A..	$ Inquire
MODEL GP 125-80	220V, Out 0-125V	@ 80A..	$ Inquire
MODEL GP 125-120	220V, Out 0-125V	@ 120A	$ Inquire
MODEL GP 250-5	117V, Out 0-250V	@ 5A ..	$ Inquire
MODEL GP 250-10	117V, Out 0-250V	@ 10A..	$ Inquire
MODEL GP 250-12	220V, Out 0-250V	@ 12A .	$ Inquire
MODEL GP 250-20	220V, Out 0-250V	@ 20A .	$ Inquire
MODEL GP 250-40	220V, Out 0-250V	@ 40A .	$ Inquire
MODEL GP 250-60	220V, Out 0-250V	@ 60A .	$ Inquire
MODEL GP 300-1	220V, Out 0-250V	@ 1A....	$ Inquire
MODEL GP 300-2	220V, Out 0-250V	@ 2A ...	$ Inquire
MODEL GP 300-3	220V, Out 0-250V	@ 3A	$ Inquire
MODEL GP 300-5	220V, Out 0-250V	@ 5A....	$ Inquire
MODEL GP 500-1	220V, Out 0-500V	@ 1A....	$ Inquire
MODEL GP 500-2	220V, Out 0-500V	@ 2A....	$ Inquire
MODEL GP 500-3	220V, Out 0-500V	@ 3A....	$ Inquire
MODEL GP 500-5	220V, Out 0-500V	@ 5A....	$ Inquire
MODEL GP 500-5	220V, Out 0-500V	@ 5A....	$ Inquire
MODEL GP 500-10	220V, Out 0-500V	@ 10A..	$ Inquire
MODEL GP 500-20	220V, Out 0-500V	@ 20A .	$ Inquire
MODEL GP 500-30	220V, Out 0-500V	@ 30A..	$ Inquire

GATES

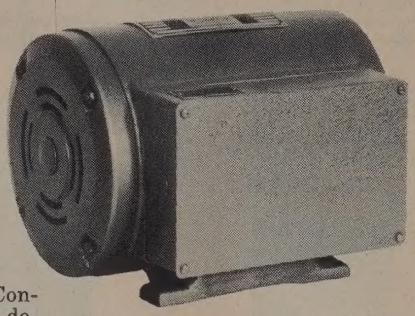
GATES ELECTRONIC COMPANY, INC. • 256 Van Nest Avenue, Bronx, N.Y. 10460 • Telephone: Tulip 1-5900

NOBRUSH® FREQUENCY CONVERTERS & GENERATORS

The heart of each "NoBrush" Frequency Converter is a "NoBrush" permanent magnet generator—a revolutionary development in its own right. The "NoBrush" permanent magnet generator features a cast aluminum rotor designed to give amazing voltage stability. It eliminates brushes, commutators, slip rings, resulting in absc minimum maintenance. Elimination of excita losses gives amazingly high efficiency, with sequent low heating. Other "NoBrush" advant are excellent wave form, and immunity to dan by repeated overload or short circuit.

FREQUENCY CONVERTER SERIES 30 UNIT SHELL DESIGN

FOR CONVERSION OF 60 TO 400 CYCLES



FEATURES:

Maximum Dependability
Cool Operation
Very Low Audible Noise
Extremely Low R.F. Noise (zero for most applications)
Compact Construction
Light Weight
High Overload Capacity
Minimum Maintenance
Withstands Short Circuit
Stable Output Voltage
Low Internal Impedance (favorable for pulse loads)
Operates in Adverse Environmen

The "NoBrush" Unit Shell Frequency Converter was developed in response to the demand for an efficient, compact, dependable quiet unit, for powering electronic and other high frequency equipment. A "NoBrush" generator is mounted with a high quality induction motor within a single shell. Oversize pre-lubricated ball bearings, sealed for life, insure long term maintenance-free operation. Magnetism is permanently "locked in" at a high level. Problems of radio interference, sparking, fouling, etc., have been eliminated. Because of its simple design and rugged construction, the unit withstands extremes of mechanical and electrical operating conditions, resulting in continuous long-life service.

FUNCTION. The Series 30 Converter is a highly compact generator set for conversion of 60 cycle to 400 cycle power. **CONST TION.** Generator and motor stators contained within aluminum unit shell. Generator and motor rotors pressed on unit shaft, wit bearings at ends of shaft. Two-bearing construction is utilized, wi any projecting shafts, couplings or belts. Single phase input model provided with starting capacitor and relay, easily accessible in a g ous-sized terminal box. **APPLICATION.** Wherever a dependable, tr free source of 400 cycle power within the range of 150 VA to 2.5 K required, where 60 cycles (and in some cases, 50 cycles) is availabl primary energy. **SPECIFIC APPLICATIONS.** As a source of high quency power for electronic apparatus; for test and research work the servicing of aircraft electrical equipment; for portable radio and tary electronic devices; for high frequency motors; for isolated p in computers.

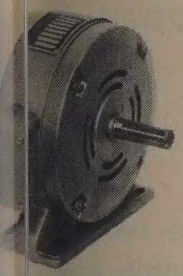
SPECIFICATIONS: INPUT. Low-slip induction motors utilized for drive, available in single and three-phase models. Single phase units are reconnectable for 115 or 230 volts and are capacitor start, induction run. Three phase units normally supplied reconnectable for 208 or 220 or 440 volts. **DUTY.** Continuous. **MOTOR SPEED.** 3500 RPM for ratings up to ¾ KVA. 1750 RPM for ratings from 1 KVA to 2½ KVA. **BEARING TYPE.** Ball bearings, sealed, lubricated-for-life. **ACCESS.** In single phase models—to starting capacitor and relay by removal of external terminal box cover. **OUTPUT VOLTAGE STABILITY.** Within 1% for constant load and constant input frequency. **EFFECT OF INPUT VOLTAGE CHANGE ON OUTPUT VOLTAGE.** Output voltage will change less than 1% for input changes of plus or minus 10%, or for short period input disturbances as great as 30%. **OUTPUT FREQUENCY.** See Chart. **OUTPUT FREQUENCY STABILITY.** Within plus or minus ½% at constant load and constant input frequency. **TEMPERATURE RISE.** 40 degrees, C. (72 degrees F.) **R. F. NOISE.** Extremely low; may be considered zero for most applications. **EXCITATION.** Internal, permanent magnet. **REGULATION.** See typical curves. **DIRECTION OF ROTATION.** Operates equally well in clockwise or counterclockwise direction. **WAVE FORM.** No sharp peaks or spikes. Total harmonics, single or three phase, withi for ratings 1 KVA or over; 5%-8% for ratings un KVA, depending on model. Improved wave form on s order. **OPERATING POSITION.** May be operated shaft horizontal, vertical or at any angle. **COOLIN** internally mounted fan. **AUDIBLE NOISE.** Approxi ly 70 db. (Measurement on "B" scale, at 3 feet distance unit, in accordance with ASA Standard No. Z 24.7-1 **AVAILABLE VARIATIONS.** The following variation available on special order, in most cases at only a m addition in price. (Not all variations are available ratings.) • Re-lubricable bearings • Militarized cons tion • Other standard single or three phase input vol • 50 cycle input • Synchronous motor drive • Other put frequencies—180, 280, 360, 840 cycles • Other sta or non-standard output voltages • Reconnectable o windings for full power at either of two voltages • voltage taps • Auxiliary D.C. output at low or high age • Two phase output • Class "B" insulatio high ambient temperature operation • Carrying ha for easy portability • Screened openings for unfavo environments.

Model No.	OUTPUT KVA Rating	Phase	Nominal Voltages No Load	Nominal Voltages Full Load	Nom. Freq Full Load	INPUT H.P.	Speed	Phase	Voltage	Current Full Load	DIMENSIONS Height	Length	Width	WEIG Net Wt lbs.
30-021	0.15	1	124	115	410	¼	3500	1	115/230 Re-connect-able	3.0/1.5	8	11	9¾	40
30-004	0.25	3	124/214	115/200	410	½	3500	1		6.6/3.3	8	11	9¾	43
30-002	0.5	1	124	115	410	¾	3500	1		11.7/5.6	8	11	9¾	51
30-025	1.0	3	124/214	115/200	410	1½	1750	1		24.0/12.0	11¾	16	14	103
30-026	1.5	3	124/214	115/200	410	2¼	1750	1		30.0/15.0	11¾	16	14	121
30-007	2.0	3	124/214	115/200	410	3	1750	1		34.0/17.0	11¾	16	14	130
30-011	0.50	1	124	115	410	¾	3500	3	208 — 220/440 Re-connect-able	3.2/1.6	8	11	9¾	51
30-006	0.75	3	124/214	115/200	410	1.1	3500	3		5.2/2.6	8	11	9¾	51
30-020	2.0	3	124/214	115/200	410	3	1750	3		9.0/4.5	11¾	16	14	112
30-029	2.5	3	124/214	115/200	410	4½	1750	3		12.6/6.3	11¾	16	14	145

OTHER 400 CYCLE CONVERTERS & GENERATORS

NOBRUSH®

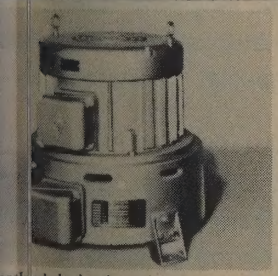
lush" machines employ permanent magnet excitation — the oldest principle in generator construction — applied th newest way. By modern principles of engineering design, performance and capabilities previously unheard of in tat g generators are made available — fitting the machine to applications where previously unsuitable. Outstanding va ages exist over other methods of power generation and frequency conversion. Quality has been tested repeatedly a ual military and industrial applications, under most exacting conditions that would have disabled machines o er types.



ALTERNATORS

The original, revolutionary, "No-Brush" generator. Permanent magnets yield stability, reproducibility, ruggedness and virtually zero R.F. noise. Available in large variety of ratings, frequencies and voltages. Supplementary windings with rectifiers available for D.C. output.

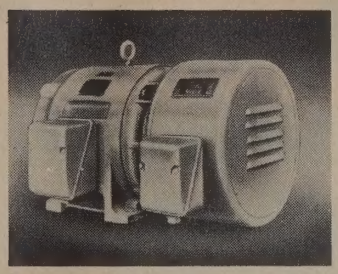
t. N	Rating KVA	Phase	Speed RPM	Height	Length	Width	Weight Lbs.
5-00	.25	1	3428	8⅛"	7 1/16"	9 7/16"	17
5-00	.50	1	3428	8⅛"	7 1/16"	9 7/16"	22
5-02	.50	3	3428	8⅛"	7 1/16"	9 7/16"	21½
5-00	.75	3	3428	8⅛"	7 1/16"	9 7/16"	21½
5-00	1	3	1714	12 3/16	8⅜"	13⅜"	35½
5-00	2	3	1714	12 3/16	8⅜"	13⅜"	45
5-01	5	3	1714	17¼"	11 13/16"	18⅜"	103½
5-01	7½	3	1714	17¼"	11 13/16"	18⅜"	120
5-01	10	3	1714	17¼"	11 13/16"	18⅜"	135



VERTICAL CONVERTER

A rugged 60-400 CPS frequency converter for power output ratings from 2.5 KVA to 10.0 KVA. High quality induction motor is close coupled to a famous "NoBrush" generator for a really outstanding unit. Sealed bearings and totally enclosed motor result in eatly minimized maintenance. Very compact, with high power wei t and size ratio. Available variations include 50 CPS input d er output frequencies.

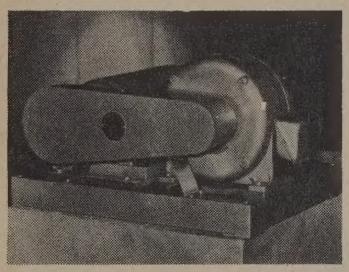
Cat. o.	Rating KVA	Phase	Dimensions Diameter	Dimensions Height	Weight Lbs.
33-1	2.5	1	19.4"	16.1"	173
33-2	3.5	1	19.4"	16.1"	215
33-3	5.0	1	21.9"	18.1"	277
33-4	5.0	3	21.9"	18.1"	248
33-5	7.5	3	21.9"	18.1"	262
33-6	10.0	3	21.9"	18.8"	334
33-9	3.0	3	19.4"	16.1"	177



SYNC. DRIVEN CONVERTER

The ultimate in frequency converter quality. Drive from 1200 R.P.M. brushless synchronous motor. Direct mounted 40-pole "NoBrush" generator delivers stable, almost pure sine-wave voltage. Immune to voltage disturbances on input line. Militarized versions available. Ratings from 2.5 KVA to 10 KVA.

Cat. No.	Rating KVA	Phase	Length	Width	Height	Weight Lbs.
35-001	2.5	1	26"	22"	16½"	470
35-002	5	1	30"	22"	16½"	650
35-003	3	3	26"	22"	16½"	475
35-004	5	3	28"	22"	16½"	590
35-005	10	3	30"	22"	16½"	660



MOTOR GENERATOR SETS

"Nobrush" Motor-Generator Sets give maximum flexibility. Units use V-belt or timing belt coupling. Available with either synchronous or induction motor drive. Components rigidly mounted on rust-proofed steel base. For conversion of either 50 or 60 cycle power to 400 cycles.

3 PHASE INPUT AND 1 PHASE OUTPUT BELT DRIVEN

Cat. No.	Rating KVA	Overall Length	Base Length	Height	Width	Weight Lbs.
37-004	1 KVA	32½"	30"	15½"	15"	225
37-024	3 KVA	36"	34"	21½"	18"	370
37-025	5 KVA	41½"	40"	21½"	21"	430
3 PHASE IN AND 3 PHASE OUT						
37-026	3 KVA	36"	34"	17½"	18"	350
37-027	5 KVA	41½"	40"	21½"	22"	400
37-028	10 KVA	45"	42"	21½"	25"	500

Note: Single phase input available in some ratings on special order.

Specifications subject to change without notice.

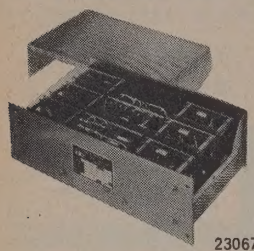
GORATOR CORPORATION • MANASSAS, VIRGINIA 22110 • TELEPHONE: (703) EMPIRE 8-2102

gti

SOLID-STATE POWER CONVERSION EQUIPMENT...

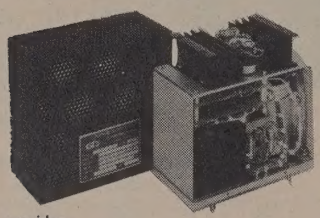
FOR THE SPACE, MILITARY, AND INDUSTRIAL MA

REPRESENTATIVE POWER CONVERSION UNITS...



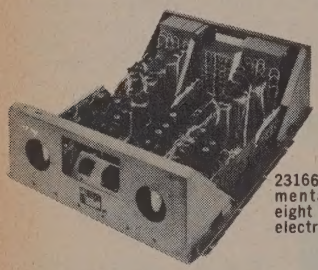
23076A

23067A features eight modular regulated outputs with line/load regulation as low as ±0.1%.



21459

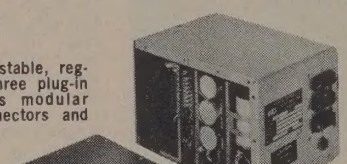
21459 . . . plug-in unit provides remotely programmable regulated output with stability of 15 mv/8 hours.



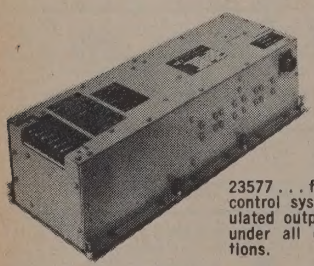
23166A

23166A is ruggedized environmentally-immune unit with eight regulated outputs with electronic short protection.

23592 has five adjustable, regulated outputs in three plug-in modules. Features modular fault isolation connectors and test points.



23592



23577

23577 . . . for electronics fire control systems, has eight regulated outputs. Tight regulation under all environmental conditions.

GLENTRONICS, INC. has, since 1959, been a su to numerous space, military, and industrial progra designing, developing, and manufacturing transist power supplies and solid-state electronics equipn products that have earned the Company a solid r tion for high quality at reasonable cost.

GLENTRONICS engineers have consistently de and provided the most reliable and practical pow version equipment available to the industry. Pow plies designed and manufactured by GLENTR include numerous exclusive features — modu construction with multiple adjustable outputs having variable overcurrent and overvoltage prot extremely low-ripple output and long-term stabili tomized packaging; subminiaturization; and other design features for special customer r ments.

GLENTRONICS' reputation is built upon qualit mensurate with applicable requirements, perfor competitive pricing, and delivery on schedule. A record of achievement is exemplified by the mo 200 customer facilities served by GLENTRONIC

GLENTRONICS INC.

ALSO...

single or multi-output AC power supplies, with high efficiency and excellent regulation. DC-AC or AC-DC with customized options.

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DC POWER

From 10μV to 4000V
From 1μA to 2000A
From $90 to $3,500
From manual to computer controlled.

how to select a Hewlett-Packard DC Power Supply for your application

DC Power Supplies — you might think of them in other terms. Such as battery substitutes, rectifiers, AC-DC converters, power amplifiers, operational amplifiers or maybe even as SCR's.

No matter what you call them, Hewlett-Packard offers more than 100 models of DC power supplies. These offer a wide range of voltages and currents, a sophisticated variety of control versatility and solid-state reliability. One of them may prove suitable for your application — whether it be for OEM use, a special system, the production table, or the research bench.

To this end, we offer the following guidelines for helping you select the right power supply. See the next three pages for a condensed listing of DC power supplies from Hewlett-Packard.

power supplies

Voltage Output: A power supply with a voltage rating about 10% higher than that required is recommended. This provides the necessary flexibility for testing and adjusting analytical and other systems.

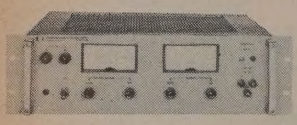
Current Output: For optimum performance, the current rating of the selected power supply should equal or exceed the maximum instantaneous (not average) output demanded by the load. Built-in fast-acting protection circuits of Hewlett-Packard instruments limit the output current to a preselected value; this protects both the power supply and the load from damage.

Output Mode: Most hp power supplies are designed to provide either a constant voltage or a constant current output. However, many hp power supplies are designed to operate in either mode and to automatically switch (cross over) from one mode to the other at any preselected point in the output range. If flexibility in operating mode is desired, these versatile hp power supplies are recommended.

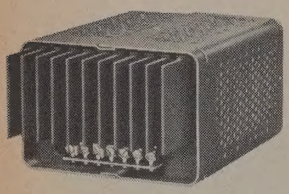
Specifications: Most applications will call for well regulated power supplies. These: fluctuate less than 0.01% for a maximum change in input AC line voltage or output load resistance. With no change in load or line conditions, a well regulated supply will drift less than 0.03% in eight hours and experience an output change of less than 0.01%/°C change in room temperature. Ripple and noise are functions of internal filtering and isolation; 200uv RMS is typical of well regulated hp supplies (for a 24V output, this is less than 10 parts per million). Performance specifications a factor of 10 times better are available from more precise units — while moderate regulation of .5 to .1% is typical of units with output ratings above 2 kW.

DC power supplies

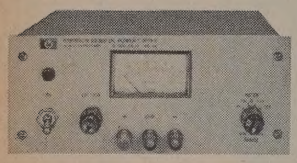
arranged by order of increasing voltage output



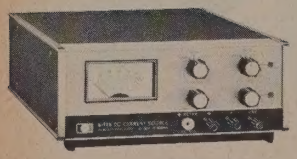
LVR



SLOT



LAB, MPB-3



CCB

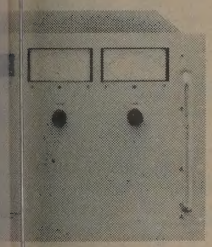
Output (volts)	Output (amperes)	Model	Series	Load regulation (mV)	Line regulation (mV)	RMS ripple & noise (mV)	Remote programming	Bench or Rack*	CV/CC**	Price
0-4	0-2000	6463A	SCR-10	50 mV combined		280	√	R	√	$35
4-5.5	0-8	6384A	ICS	1 mV	1 mV	1 mV		B		2
5.8 ±20%	0-1.5	60063A	SLOT	0.05%	0.05%	1 mV		R		
5.8 ±20%	0-3	60065A	SLOT	0.05%	0.05%	1 mV		R		
5.8 ±20%	0-8	60066A	SLOT	0.05%	0.05%	1 mV		R		
0-7.5	0-3	6203B	LAB	5 mV	3 mV	0.2	√	B	√	1
0-7.5	0-5	6281A	MPB-3	5 mV	2 mV +0.01%	0.2	√	B	√	2
0-8	0-1000	6464A	SCR-10	25 mV combined		80	√	R	√	33
0-10	0-1	6213A	BENCH	.01% +4 mV	.01% +4 mV	0.2		B		
0-10	0-1	6214A	BENCH	.01% +4 mV	.01% +4 mV	0.2		B	√	1
0-10	0-2	6113A	STB	0.001% +1.1 mV	0.001%	0.04	√	B		3
0-10	0-10	6282A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√	3
0-10	0-20	6256B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	4
0-10	0-50	6259B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.5	√	R	√	4
0-10	0-100	6260B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.5	√	R	√	5
13 ±20%	0-0.5	60122B	SLOT	0.05%	0.05%	1 mV		R		
13 ±20%	0-1	60123B	SLOT	0.05%	0.05%	1 mV		R		
13 ±20%	0-2.2	60125B	SLOT	0.05%	0.05%	1 mV		R		
13 ±20%	0-6	60126B	SLOT	0.05%	0.05%	1 mV		R		
±15 ±20%	0-0.2 A	60153D	SLOT	0.03%	0.03%	0.3		R		
±15 ±20%	0-0.75	60155C	SLOT	0.03%	0.01%	0.3		R		
0-15	0-200	6453A	SCR-3	10 mV +0.2% combined		150	√	R	√	1
0-16 or 0-18	0-600 or 0-500	6466A	SCR-10	10 mV +0.2% combined		160 or 180	√	R	√	2
−20 to +20	0-0.5	6823A	PS/A	5 mV +0.02%	5 mV +0.02%	2	√	B	√	4
0-20	0-0.6	6204B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		4
0-20 and 0-40	0-0.6 and 0-0.3	6205B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		5
0-20	0-1	6101A	STB	600 μV +0.001%	0.001%	0.04	√	B		5
0-20	0-1	6111A	STB	600 μV +0.001%	0.001%	0.04	√	B		5
0-20	0-1.5	6200B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B	√	9
0-20	0-1.5	6201B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B	√	9
0-20 Dual	0-3	6253A	DPR	4 mV +0.01%	2 mV +0.01%	0.2	√	R	√	5
0-20	0-3	6284A	MPB-3	4 mV +0.01%	2 mV +0.01%	0.2	√	B	√	0
0-20	0-5	6285A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√	0
0-20	0-10	6263B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	5
0-20	0-10	6286A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√	5
0-20	0-15	6427B	SCR-1P	20 mV	10 mV	40	√	R	√	0
0-20	0-20	6264B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	5

*"B" indicates bench type and "R" indicates full rack width type supplies. All bench supplies (except Models 72 and 715A) can be rack mounted using accessory rack mounting hardware.

**Automatic crossover between constant voltage (cv) and constant current (cc) operation.

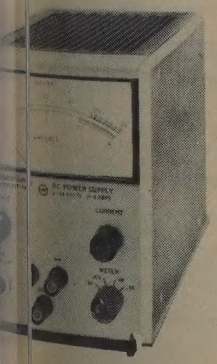
HEWLETT hp PACKARD

HVR



SCR

BENCH



MPM

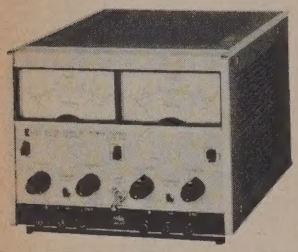
Output (volts)	Output (amperes)	Model	Series	Load regulation (mV)	Line regulation (mV)	RMS ripple & noise (mV)	Remote programming	Bench or Rack*	CV/CC**	Price
0-20	0-45	6428B	SCR-1P	40 mV	20 mV	40	√	R	√	$550
0-20	0-50	6261B	LVR-B	200 μV ±0.01%	200 μV ±0.01%	0.5	√	R	√	775
0-24	0-3	6224B	MPM	.01% +4 mV	.01% +2 mV	0.2	√	B	√	325
0-25	0-0.4	6215A	BENCH	.01% +4 mV	.01% +4 mV	0.2		B		90
0-25	0-0.4	6216A	BENCH	.01% +4 mV	.01% +4 mV	0.2		B	√	115
0-25	0-1	6220B	MPM	.01% +2 mV	.01% +2 mV	0.2	√	B	√	250
0-25 Dual	0-2	6227B	DPB	.01% +1 mV	1 mV	0.25	√	B	√	450
26 ±20%	0-0.25	60242B	SLOT	0.05%	0.05%	1 mV		R		†
26 ±20%	0-0.5	60243B	SLOT	0.05%	0.05%	1 mV		R		†
26 ±20%	0-1	60244B	SLOT	0.05%	0.05%	1 mV		R		†
26 ±20%	0-1.5	60245B	SLOT	0.05%	0.05%	1 mV		R		†
26 ±20%	0-3.5	60246B	SLOT	0.05%	0.05%	1 mV		R		†
0-30	0-0.15	721A	–	30 mV	±15 mV	0.15		B		145
0-30	0-1	6206B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		169
0-36	0-10	6433B	SCR-1P	36 mV	18 mV	36	√	R	√	370
0-36	0-100	6456B	SCR-3	10 mV +0.2% combined		160	√	R	√	1275
0-36	0-300	6469A	SCR-10	10 mV +0.2%		180	√	R	√	2300
0-40	0-0.3	6204B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		144
0-40 and 0-20	0.03 and 0-0.6	6205B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		235
0-40	0-0.5	6102A	STB	350 μV +0.001%	0.001%	0.04	√	B		265
0-40	0-0.5	6112A	STB	350 μV +0.001%	0.001%	0.04	√	B		375
0-40	0-0.75	6200B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B	√	189
0-40	0-0.75	6202B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B	√	169
0-40 Dual	0-1.5	6255A	DPR	2 mV +0.01%	2 mV +0.01%	0.2	√	R	√	445
0-40	0-1.5	6289A	MPB-3	2 mV +0.01%	2 mV +0.01%	0.2	√	B	√	210
0-40	0-3	6265B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	350
0-40	0-3	6290A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√	350
0-40	0-5	6266B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	435
0-40	0-5	6291A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√	395
0-40	0-10	6267B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√	525
0-40	0-25	6434B	SCR-1P	40 mV	18 mV	40	√	R	√	550
0-40	0-30	6268B	LVR-B	200 μV +0.01%	200 μV +0.01%	1	√	R	√	695
0-40	0-50	6269B	LVR-B	200 μV +0.01%	200 μV +0.01%	1 mV	√	R	√	875
−50 to +50	0-1	6824A	PS/A	5 mV +0.02%	5 mV +0.02%	10	√	B	√	350
0-±50	0-1	6130B	DVS	2 mV	2 mV	1 mV	√	B		1500
0-50	0-0.2	6217A	BENCH	.01% +1 mV	0.1% +4 mV	0.2		B		90
0-50	0-0.2	6218A	BENCH	.01% +1 mV	.01% +4 mV	0.2		B	√	115
0-50	0-0.5	6177B	CCB	25ppm	25ppm	40 μA	√	B		425
0-50	0-0.5	6220B	MPM	2 mV +.01%	2 mV +.01%	0.2	√	B	√	250
0-50	0-1.5	6226B	MPM	2 mV +.01%	2 mV +.01%	0.2	√	B	√	325
0-50 Dual	0-1	6228B	DPB	.01% +1 mV	1 mV	0.25	√	B	√	450
0-60	0-0.5	6206B	LAB	4 mV +0.01%	4 mV +0.01%	0.2	√	B		169

Note: Virtually all hp units can be rack mounted in accordance with standard RETMA 19" systems: Some may require rack kits.
†Check with local hp sales offices for quantity price.

additional listing on next page

DC power supplies

STB



DPB

Output (volts)	Output (amperes)	Model	Series	Load regulation (mV)	Line regulation (mV)	RMS ripple & noise (mV)	Remote programming	Bench or Rack*	CV/CC**
0-60	0-1	6294A	MPB-3	2 mV +0.01%	2 mV +0.01%	0.2	√	B	√
0-60	0-3	6296A	MPB-5	1 mV +0.01%	1 mV +0.01%	0.5	√	B	√
0-60	0-3	6271B	LVR-B	200 μV +0.01%	200 μV +0.01%	0.2	√	R	√
0-60	0-5	6438B	SCR-1P	60 mV	30 mV	120	√	R	√
0-60	0-15	6439B	SCR-1P	120 mV	60 mV	60	√	R	√
0-60	0-15	6274B	LVR-B	0.2 mV +0.01%	0.2 mV +0.01%	0.5	√	R	√
0-64	0-50	6459A	SCR-3	10 mV +0.2% combined		160	√	R	√
0-64	0-150	6472A	SCR-10	100 mV +0.2% combined		160	√	R	√
0-100	0-0.2	6106A	STB	200 μV +0.001%	0.001%	0.04	√	B	
0-100	0-0.2	6116A	STB	200 μV +0.001%	0.001%	0.04	√	B	
0-100	0-0.25	6181B	CCB	25 ppm	25 ppm	20 μA	√	B	
0-100	0-0.5	6131B	DVS	2 mV	2 mV	5.0	√	R	
0-100	0-0.75	6299A	MPB-3	2mV +0.01%	2 mV +0.01%	0.2	√	B	√
0-110	0-100	6475A	SCR-10	100 mV +0.2% combined		220	√	R	√
0-120	0-2.5	6443B	SCR-1P	120 mV	60 mV	240	√	R	√
0-160	0-0.2	6207B	LAB	2 mV +0.02%	2 mV +0.02%	0.5	√	B	√
0-220	0-50	6477A	SCR-10	100 mV +0.2% combined		330	√	R	√
0-300	0-35	6479A	SCR-10	100 mV +0.2% combined		300	√	R	√
0-300	0-0.1	6186B	CCB	25 ppm	25 ppm	5 μA	√	B	
0-320	0-0.1	6209B	LAB	2 mV +0.02%	2 mV +0.02%	1.0	√	B	√
0-320	0-0.6	890A	MVR	10 mV or 0.007%	10 mV or 0.007%	1.0	√	R	
0-320	0-1.5	895A	MVR	10 mV or 0.007%	10 mV or 0.007%	1.0	√	R	
0 to +500 −300 0 to −150	0-0.2 0-0.05 0-0.005	712C‡	—	0.01% +5 mV 50 mV 50 mV	0.01% +50 mV 50 mV 50 mV	0.5 30 15	√	B	√
0-440 or 0-500 or 0-600	0-25 or 0-20 or 0-15	6483B	SCR-10	100 mV +0.5% combined		440 500 600	√	R	√
1-600	0-1.5	6448B	SCR-1P	600 mV	600 mV	600 mV	√	R	√
0-1000	0-0.2	6521A	HVR	20 mV or 0.005%	20 mV or 0.005%	1.0		R	√
0-1600	0-0.005	6515A	HVB	16 mV or 0.01%	16 mV or 0.01%	2.0		B	
0-2000	0-0.1	6522A	HVR	20 mV or 0.005%	20 mV or 0.005%	1.0		R	√
0-3000	0-0.006	6110A	STB	100 μV +0.001%	0.001%	0.4		B	
0-3000	0-0.006	6516A	HVB	16 mV or 0.01%	16 mV or 0.01%	2.0		B	
0-4000	0-0.05	6525A	HVR	20 mV or 0.005%	20 mV or 0.005%	1.0		R	√

All Supplies: 50°C maximum ambient temperature rating. Floating output (ground either side), continuously vari low output impedance at all frequencies, 3-wire input, computer-quality electrolytics, 1 year warranty. No turn overshoot; short-circuit-proof, all semiconductor except as noted by‡.

Transistor Supplies: Glass-epoxy printed circuit board construction, fully automatic overload protection — short-cir

HP 1970 Electronics Catalog

. . . Includes guide lines for selection and specifications for over 100 power supplies.

DC Power Supply Handbook

. . . Includes power supply definitions, principles of operation, connection / operation, and performance measurements.

For your copy contact your local Hewlett Packard sales office or write Hewlett Packard Company / New Jersey Division, 100 Locust Avenue, Berkeley Heights, New Jersey 07922.

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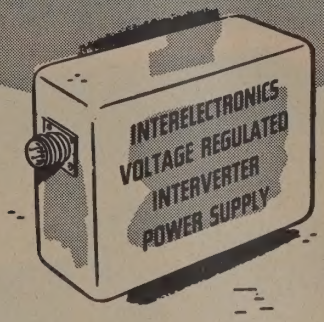
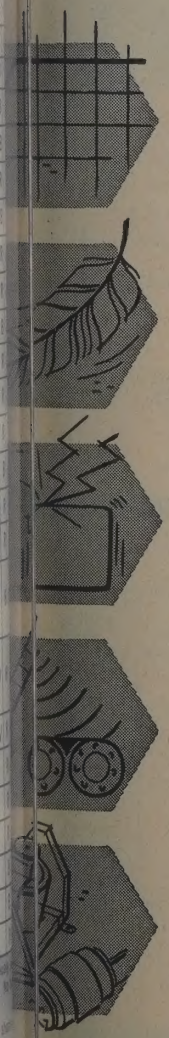
over 260,000 logged hours— voltage-regulated, frequency-controlled, for missile, telemeter, ground-support, 135°C all-silicon units available now—





Interelectronics all-silicon thyratron-like gating elements and cubic-grain toroidal magnetic components convert DC to any desired number of AC or DC outputs from 1 to 10,000 watts.

Ultra-reliable in operation (over 260,000 logged hours), no moving parts, unharmed by shorting output or reversing input polarity. High conversion efficiency (to 92%, including voltage regulation by Interelectronics patented reflex high-efficiency magnetic amplifier circuitry).

Wide input voltage range (1 to 250 volts DC). Wide input voltage regulation (output voltage maintained with variations up to 50% in input voltage).

Light weight (to 6 watts/oz.), compact (to 8 watts/cu. in.), low ripple (to 0.01 mv. p-p), excellent voltage regulation (to 0.1%), precise frequency control (to 0.2%) with Interelectronics extreme environment magnetostrictive standards or to 0.0001% with fork or piezoelectric standards.

Complies with MIL specs. for shock (100G 11 misc.), acceleration (100G 15 min.), vibration (100G 5 to 5,000 cps.), temperature (to 150 degrees C), RF noise (I-26600).

AC single and polyphase units supply sine waveform output (to 2% harmonics), will deliver up to ten times rated line current into a short circuit to actuate MIL type magnetic circuit breakers or fuses, will start gyros and motors with starting current surges up to ten times normal operating line current.

Now in use in major missiles, powering telemeter transmitters, radar beacons, electronic equipment. Single and polyphase units now power airborne and marine missile gyros, synchros, servos, magnetic amplifiers.

Interelectronics—first and most experienced in the solid-state power supply field produces its own all-silicon solid-state gating elements, all high flux density magnetic components, high temperature ultra-reliable film capacitors and components, has complete facilities and know how—has designed and delivered more working KVA than any other firm!

For complete engineering data, write Interelectronics today, or call (914) EL 8-8000 in Congers.

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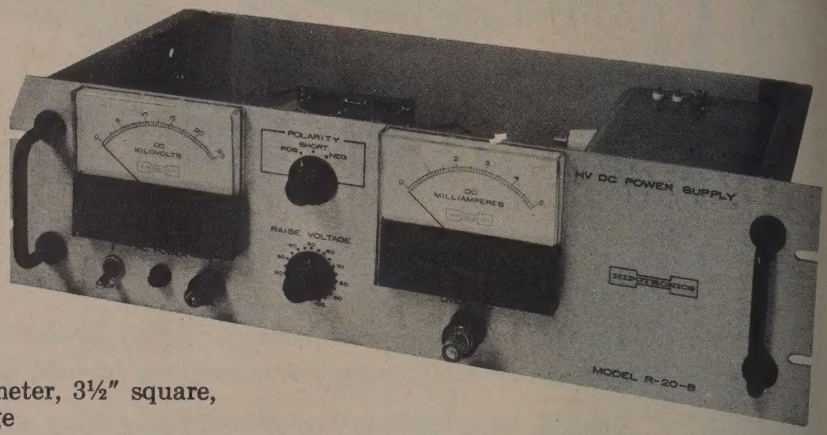
HIPOTRONICS INC

POWER PACKS
(WITH SIMPLIFIED CONTROLS)

These models consist of standard 2- and 5-ma power packs with simplified control panels. They are low cost supplies, designed for relay rack mounting; however, all components are industrial grade.



FEATURES

- Output-connected KV meter, 3½" square, 2% accuracy, single range
- Output-connected current meter, 3½" square, 2% accuracy, single range
- Continuously adjustable output control
- AC input switch, fuse, and pilot light
- HV fuse, with blown indicator
- 115-volt, 50/60-Hz input
- Surge and transient protection on all meters and powerstats
- Reversible polarity (except 60 KV)

OUTPUT (KV)	CURRENT (ma)	RIPPLE (% rms/ma)	POLARITY	MODEL NO.	KV METER	CURRENT METER (ma)	SIZE W-H-D (in.)	PRICE ($)
0-2.5	5	.5	Reversible	R 2B	0-3	0-5	19x7x8	165.00
0-5	5	.5	Reversible	R 5B	0-6	0-5	19x7x8	175.00
0-10	5	.5	Reversible	R 10B	0-12	0-5	19x7x8	190.00
0-15	5	.5	Reversible	R 15B	0-15	0-5	19x7x8	220.00
0-20	5	.5	Reversible	R 20B	0-25	0-5	19x7x8	250.00
0-30	5	.5	Reversible	R 30B	0-30	0-5	19x12x10	300.00
0-50	5	.5	Reversible	R 50B	0-50	0-5	19x12x10	450.00
0-60	2	.5	Positive	R 60AP	0-60	0-2.5	19x12x10	375.00
0-60	2	.5	Negative	R 60AN	0-60	0-2.5	19x12x10	375.00

OPTIONAL EXTRAS

1. Bench top cabinet $50.00
2. Short circuit limiter — Ideal for capacitor charging, flocking, electrostatic operations, etc. Supply will operate with short circuit on output and limit current to 5 ma ..... $ 5.00

SEND FOR CATALOG

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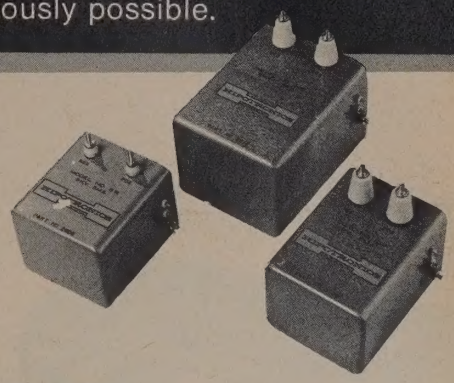
POWER PACKS

We have a wide range of compact miniaturized power packs, with output voltages from 2 to 100 KV and current ratings of 2, 5 or 10 milliamperes. They are designed for long life and trouble free operation. Our own advanced high voltage techniques permit greater size and weight reductions than previously possible.



All units are housed in hermetically sealed MIL-T-27A cans, and are vacuum filled with mineral type transformer oil or epoxy. The insulating medium insures corona-free operation and allows for running the supply at 3 or 4 times normal current rating for long periods of time. The corona-free operation precludes component failure caused by long term corona degradation of insulation, and guarantees a pure DC output free of any interfering high frequency signals which might possibly influence or affect the system which it is powering.

Every component in the supply is operated at well below its design rating and pre-assembly hipotted at 1½ times its operating voltage.

The output connections are high voltage ceramic bushings type on models 30 KV and below, and plug-in re-entrant receptacles for coaxial cables on higher than 30 KV units. Three-foot cable assemblies are supplied with each re-entrant bushing type, and longer lines are easily assembled if required.

For special requirements, consult factory.

OUTPUT VOLTAGE (KV)	CURRENT (ma)	MODEL NO.	SIZE HxWxD (in.)	PRICE ($)
2.5	2	2.5A	3½ x3¾ x2¾	50
2.5	5	2.5B	3½ x3¾ x2¾	60
2.5	10	2.5C	4¼ x3⅞ x3⅞	70
5	2	5A	4¼ x3⅞ x3⅜	65
5	5	5B	4¼ x3⅞ x3⅜	75
5	10	5C	5¼ x3⅞ x3⅜	90
7.5	10	7.5C	5¼ x3⅞ x3⅜	110
10	2	10A	5¼ x3⅞ x3⅜	75
10	5	10B	5¼ x3⅞ x3⅜	95
10	10	10C	6⅛ x4⅝ x4	125
15	5	15B	6⅛ x4⅝ x4	125
15	10	15C	6⅛ x4⅝ x4	150
20	2	20A	6⅛ x4⅝ x4	135
20	5	20B	6⅛ x4⅝ x4	180
25	10	25C	10x6x5	350
30	2	30A	10x6x5	190
30	5	30B	10x6x5	250
40	2	40A	12x6x5	270
50	5	50B	10x6x8	390
60	2	60A	10x6x8	325
100	2	100A	15½ x8⅛ x9¼	625

FEATURES

- Hermetically sealed, oil- or epoxy-filled
- Solid state rectifiers
- 10-year life
- Low ripple
- Good regulation
- Compact, highly miniaturized
- Reversible polarity

Inquiries are invited for units with outputs different than our standards, built-in line regulation, short circuit, current-limited features, lower output ripple, 220V, 50/60-cycle inputs, or center-tapped output.

SPECIFICATIONS

Input 0-125 volts, output voltages and currents stated for nominal 117 volt input.

Regulation 10 to 15% no load to full load

Ripple ½% rms per milliampere output

Life 10 years at 25°C ambient with rated output voltage and current

Terminations Ceramic bushings on models 30 KV and below. Re-entrant receptacles with 3-foot mating coaxial cables on models 40 KV and up

SEND FOR CATALOG

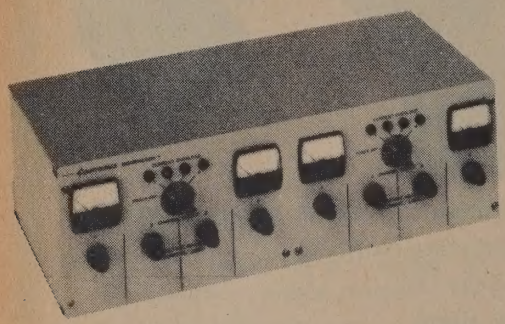
HIPOTRONICS INC

High Potential Electronics

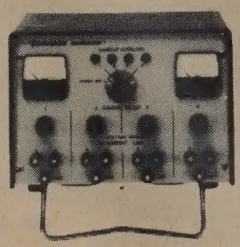
Brewster, N.Y. 10707 / (914) BR 9-8091 / Telex: 710-574-2420

CONTRONICS SUPPLIES
LAB POWER, BURN-IN POWER, COMPACT POWER, SYSTEMS POWER, DISPLAY POWER

MODEL CPS-400TP

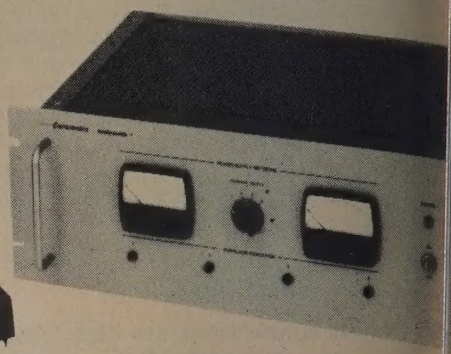


MODEL CPS-400



MODEL CPS-045

MODEL CPS-500



GENERAL SPECIFICATIONS

Model	Output	Voltage Regulation (Worst Case)	Ripple & Noise (Worst Case)	Short Circuit Protection	Recovery Time	Price	Special Feature
400	100 mV - 38 V 0 - 1.0 A	.05% max or 5 mV	< 5 mV p-p	Current limiting	No Load - Full Load, 100 μs; Full Load — No Load, 10 ms.	$395	Four isolated power in one half-rack widt ing outputs.
401	100 mV - 33 V 0 - 1.5 A	.05% max or 5 mV	< 5 mV p-p	Current limiting	No Load - Full Load, 100 μs; Full Load — No Load, 10 ms.	$455	Four isolated power in one half-rack widt ing outputs.
400TP	100 mV - 38 V	.05% max or 5 mV	< 5 mV p-p	Current limiting	No Load - Full Load, 100 μs; Full Load — No Load, 10 ms.	$895	Eight isolated power in one rack width (19 ing outputs.
401TP	100 mV - 33 V 0 - 1.5 A	.05% max or 5 mV	< 5 mV p-p	Current limiting	No Load - Full Load, 100 μs; Full Load — No Load, 10 ms.	$1015	Eight isolated power in one rack width (19 ing outputs.
500	2 V - 25 V 0 - 7.5 A	.05% max or 5 mV	< 5 mV p-p	Current limiting and crowbar	No Load - Full Load, 0.5 ms; Full Load — No Load, 5.0 ms.	$995	Four isolated power in one rack width (19 ing outputs, remote
045	+200 V @ 20 mA	Secondary regulation, No Load - Full Load, 10%	4 mV p-p	N/A	N/A	$28	Boosts +5 V input supply voltage for d to 6 numeric displ

CUSTOM POWER SUPPLIES ■ Contronics maintains a continuing program of technical assistance for customers special-purpose power supplies and pulse generators. One result of this program has been a new line of custom MOS, LSI and MSI circuits. Complete details are available on request.

INTERNATIONAL CONTRONICS INC.
1030 West Evelyn Avenue, Sunnyvale, California 94086 • Phone (408) 7

KEPCO®

power supplies

KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING, N.Y. 11352 • (212) 461-7000

KEPCO DESIGN FEATURES CHART

DESIGN GROUPS	PAGE INDEX	MODULAR GROUP	HIGH SPEED	HIGH VOLTAGE	GENERAL PURPOSE	SPECIAL PURPOSE	SOLID STATE	VACUUM TUBE	HYBRID	OPERATIONAL	RESONANT TRANSFORMER	CONVECTION COOLED	FORCED-AIR COOLED	DESCRIPTION
ABC® TRANSISTORIZED	1101				*		*			*		*		2V–100V; 10W–20W; 1/2 rack
ABC® (Hybrid)	1097			*					*	*		*		200V–2500V; 20W; 1/2 rack
BHK	1098		●	*					*	*		*		500V–2000V; 200W; full rack
BKF	1086	*			●		*					*		Slot adjustable; 5 to 48V; 15, 25 100W modules
BOP	1094	●	*			●	*			*			*	Bipolar 0 to ±15V, ±36V, ±72 at ±1.5A, ±5A and ±20A
CC	1104		●			*	*					*		0.2–2A; 20W; I-C regulated, q recovery; 1/6 rack plug-in
CDT	1105					*	*			*		*		±15V, ±40V, ±100V; 20W; dual
CPS	1106	●				*	*			*			*	For integrated circuits, I-C regu 6V–15V; 60W–750W; 1/4, 1/2
DTM	1087	*				●	*					*		Dual-tracking module, program 0 to ±16V @ 0.6A
HB	1099			*					*			*		325V–525V; 65–250W; full r
JQE (HS)	1102	●	●		*		*			*			*	I-C regulated; 6V–100V; 60W 1/4, 1/2, full rack
KG	1107					*	*			*		*		Isolated for transducers; 25V– 1/8 rack plug-in
OPS-B (TA)	1095	●	*	●		●	*			*		*		Power amplifier, I-C controlled 20W; "TA" – 1/6 rack plug-in
OPS (Hybrid)	1096		*	●		●			*	*		*		High voltage, operational ampl 0–500V/40mA, 0–1000V/20 0–2000V/10mA
PAT	1088	*					*			*		*		I-C regulated; 7V–100V; 20W
PAX (HS)	1089	*	●				*			*		*		7V–100V; 10W module; 1/6 r
PCX (MAT)	1090	*			●		*			*		*		I-C regulated; 7V–100V; 20W 1/6 rack plug-in
PRM	1091	*									*	*		4.2–260V (tapped); 60W mo 4.5–120V (fixed); 120, 180,
PVS	1108					*	*			*		*		Precision voltage source, 100. digital readout; 1/2 rack
WR	1100			*	●			*				*		Lab supplies; 600V–2500V; 125–1000W; full rack

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* PRIMARY LISTING ● CROSS

KEPCO POWER SUPPLIES

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INDEX by OUTPUT VOLTAGE

This index is specially arranged to facilitate the selection of the proper power supply for every job. It complements the *design group* listings by grouping models according to their *voltage rating*. Thus, for example, it is easy to determine which *groups* have models in any desired *voltage range* — and then to examine their comparative specifications in detail.

DC OUTPUT VOLTS	DC OUTPUT AMPS	MODEL	PAGE
0–2	0–1	ABC 2–1M	1101
4.5 (dual)	0–20 (dual)	PRM 2X4.5–20	1093
5.0 ±10%	0–3	BKF 5–3	1086
5.0 ±10%	0–5	BKF 5–5	1086
5 Nominal*	10 Nominal*	PRM 5–10	1093
5.0 ±5%	0–11	BKF 5–11	1086
5.2	0–15	PRM 5–15	1092
5.2 (dual)	0–20 (dual)	PRM 2X5–20	1093
5.2	0–25	PRM 5–25	1092
5.2	0–25	PRM 5–25F	1092
0–6	0–10	CPS 6–10M	1106
0–6	0–10	JQE 6–10M	1102
0–6	0–22	CPS 6–22M	1106
0–6	0–22	JQE 6–22M	1102
0–6	0–45	CPS 6–45M	1106
0–6	0–45	JQE 6–45M	1102
0–6	0–90	CPS 6–90M	1106
0–6	0–90	JQE 6–90M	1102
6.3 Nominal*	8 Nominal*	PRM 6.3–8	1093
6.3	0–15	PRM 6–15	1092
6.3 (dual)	0–20 (dual)	PRM 2X6–20	1093
6.3	0–25	PRM 6–25	1092
6.3	0–25	PRM 6–25F	1092
0–7	0–1	PAX 7–1	1089
0–7	0–2	CC 7–2M	1104
0–7	0–2	OPS 7–2B	1095
0–7	0–2	OPS 7–2BTA	1095
0–7	0–2	PAT 7–2	1088
0–7	0–2	PCX 7–2	1090
0–7	0–2	PCX 7–2MAT	1090
0–7.5	0–2	ABC 7.5–2M	1101
8 Nominal*	7 Nominal*	PRM 8–7	1093
8.0 ±5%	0–10	BKF 8–10	1086
0–10	0–0.75	ABC 10–0.75M	1101
10 Nominal*	6 Nominal*	PRM 10–6	1093
12.0 ±10%	0–1.4	BKF 12–1.4	1086
12.0 ±10%	0–2.4	BKF 12–2.4	1086
12 Nominal*	5 Nominal*	PRM 12–5	1093
12.0 ±5%	0–7	BKF 12–7	1086
12	0–10	PRM 12–10	1092
12 (dual)	0–12 (dual)	PRM 2X12–12	1093
12	0–15	PRM 12–15	1092
12	0–15	PRM 12–15F	1092
0–15	0–0.75	PAX 15–0.75	1089
0–15	0–1	ABC 15–1M	1101
15.0 ±10%	0–1.2	BKF 15–1.2	1086
0–15	0–1.5	CC 15–1.5M	1104
0–±15 (dual)	0–±1.5 (dual)	CDT 15–1.5M	1105
0–15	0–1.5	OPS 15–1.5B	1[illegible]
0–15	0–1.5	OPS 15–1.5BTA	1[illegible]
0–15	0–1.5	PAT 15–1.5	1[illegible]
0–15	0–1.5	PCX 15–1.5	1[illegible]
0–15	0–1.5	PCX 15–1.5MAT	1[illegible]
15.0 ±10%	0–2	BKF 15–2	1[illegible]
15 Nominal*	4 Nominal*	PRM 15–4	1[illegible]
15.0 ±5%	0–6	BKF 15–6	1[illegible]
0–15	0–6	CPS 15–6M	1[illegible]
0–15	0–6	JQE 15–6M	1[illegible]
15 (dual)	0–10 (dual)	PRM 2X15–10	1[illegible]
0–15	0–12	CPS 15–12M	1[illegible]
0–15	0–12	JQE 15–12M	1[illegible]
+15 to −15	+20 to −20	BOP 15–20M	1[illegible]
0–15	0–25	CPS 15–25M	1[illegible]
0–15	0–25	JQE 15–25M	1[illegible]
0–15	0–50	CPS 15–50M	1[illegible]
0–15	0–50	JQE 15–50M	1[illegible]
0 to ±16	0 to ±0.6	DTM 2X16–0.6	1[illegible]
0–18	0–0.5	ABC 18–0.5M	1[illegible]
18 Nominal*	3.3 Nominal*	PRM 18–3.3	1[illegible]
18	0–6.7	PRM 18–6.7	1[illegible]
18 (dual)	0–8 (dual)	PRM 2X18–8	1[illegible]
18	0–10	PRM 18–10	1[illegible]
18	0–10	PRM 18–10F	1[illegible]
0–20	0–0.05	OPS 20	1[illegible]
0–21	0–0.5	PAX 21–0.5	1[illegible]
0–21	0–1	CC 21–1M	1[illegible]
0–21	0–1	OPS 21–1B	1[illegible]
0–21	0–1	OPS 21–1BTA	1[illegible]
0–21	0–1	PAT 21–1	1[illegible]
0–21	0–1	PCX 21–1	1[illegible]
0–21	0–1	PCX 21–1MAT	1[illegible]
21 Nominal*	2.9 Nominal*	PRM 21–2.9	1[illegible]
24.0 ±10%	0–0.8	BKF 24–0.8	1[illegible]
24.0 ±10%	0–1.2	BKF 24–1.2	1[illegible]
24.0 ±5%	0–4	BKF 24–4	1[illegible]
24	0–5	PRM 24–5	1[illegible]
24 (dual)	0–6 (dual)	PRM 2X24–6	1[illegible]
24	0–8	PRM 24–8	1[illegible]
24	0–8	PRM 24–8F	1[illegible]
0–25	0–0.2	KG 25–0.2	1[illegible]
0–25	0–4	JQE 25–4M	1[illegible]
0–25	0–10	JQE 25–10M	1[illegible]
0–25	0–20	JQE 25–20M	1[illegible]
0–25	0–40	JQE 25–40M	1[illegible]
26 Nominal*	2.3 Nominal*	PRM 26–2.3	1[illegible]
28.0 ±10%	0–0.6	BKF 28–0.6	1[illegible]

DC OUTPUT VOLTS	DC OUTPUT AMPS	MODEL	PAGE
3.0 10%	0–1	BKF 28–1	1086
3.0 5%	0–4	BKF 28–4	1086
3	0–4.3	PRM 28–4.3	1092
3 (dual)	0–5 (dual)	PRM 2X28–5	1093
3	0–7	PRM 28–7	1092
3	0–7	PRM 28–7F	1092
30	0–0.3	ABC 30–0.3M	1101
30	0–0.3	PAX 36–0.3	1089
36 t–36	+1.5 to –1.5	BOP 36–1.5M	1094
36 Nominal*	1.7 Nominal*	PRM 36–1.7	1093
36.0 5%	0–3	BKF 36–3	1086
36	0–3	JQE 36–3M	1102
36 t–36	+5 to –5	BOP 36–5M	1094
36	0–8	JQE 36–8M	1102
36	0–15	JQE 36–15M	1102
36	0–30	JQE 36–30M	1102
36	0–3.3	PRM 36–3.3	1092
36 (dual)	0–4 (dual)	PRM 2X36–4	1093
36	0–5	PRM 36–5	1092
36	0–5	PRM 36–5F	1092
40	0–0.5	ABC 40–0.5M	1101
40	0–0.5	CC 40–0.5M	1104
40 (dual)	0–±0.5 (dual)	CDT 40–0.5M	1105
40	0–0.5	OPS 40–0.5B	1095
40	0–0.5	OPS 40–0.5BTA	1095
40	0–0.5	PAT 40–0.5	1088
40	0–0.5	PCX 40–0.5	1090
40	0–0.5	PCX 40–0.5MAT	1090
48 Nominal*	1.25 Nominal*	PRM 48–1.25	1093
48.0 5%	0–2.5	BKF 48–2.5	1086
48	0–2.5	PRM 48–2.5	1092
48 (dual)	0–3 (dual)	PRM 2X48–3	1093
48	0–4	PRM 48–4	1092
48	0–4	PRM 48–4F	1092
55	0–2	JQE 55–2M	1102
55	0–5	JQE 55–5M	1102
55	0–10	JQE 55–10M	1102
55	0–20	JQE 55–20M	1102
60 Nominal*	1 Nominal*	PRM 60–1	1093
60	0–2	PRM 60–2	1092
60 (dual)	0–2.5 (dual)	PRM 2X60–2.5	1093
60	0–3	PRM 60–3	1092
60	0–3	PRM 60–3F	1092
70 Nominal*	0–0.86 Nominal*	PRM 70–0.86	1093
72	0–0.15	PAX 72–0.15	1089
72	0–0.3	CC 72–0.3M	1104
72	0–0.3	OPS 72–0.3B	1095
72	0–0.3	OPS 72–0.3BTA	1095
72	0–0.3	PAT 72–0.3	1088
72	0–0.3	PCX 72–0.3	1090
72	0–0.3	PCX 72–0.3MAT	1090
72 to 72	+1.5 to –1.5	BOP 72–1.5M	1094
+72 to –72	+5 to –5	BOP 72–5M	1094
0–75	0–1.5	JQE 75–1.5M	1102
0–75	0–3	JQE 75–3M	1102
0–75	0–8	JQE 75–8M	1102
0–75	0–15	JQE 75–15M	1102
90 Nominal*	0.67 Nominal*	PRM 90–0.67	1093
0–100	0–0.05	KG 100–0.05	1107
0–100	0–0.1	PAX 100–0.1	1089
0–100	0–0.2	ABC 100–0.2M	1101
0–100	0–0.2	CC 100–0.2M	1104
0–±100 (dual)	0–±0.2 (dual)	CDT 100–0.2M	1105
0–100	0–0.2	OPS 100–0.2B	1095
0–100	0–0.2	OPS 100–0.2BTA	1095
0–100	0–0.2	PAT 100–0.2	1088
0–100	0–0.2	PCX 100–0.2	1090
0–100	0–0.2	PCX 100–0.2MAT	1090
0–100	0–1	JQE 100–1M	1102
0–100	0–2.5	JQE 100–2.5M	1102
0–100	0–5	JQE 100–5M	1102
0–100	0–10	JQE 100–10M	1102
0.0000–100.00	0–1	PVS 100–1M(G)	1108
120 Nominal*	0.50 Nominal*	PRM 120–0.50	1093
120	0–1	PRM 120–1	1092
120	0–1.5	PRM 120–1.5	1092
120	0–1.5	PRM 120–1.5F	1092
0–150	0–1.5	JQE 150–1.5M	1102
0–150	0–3.5	JQE 150–3.5M	1102
0–150	0–7	JQE 150–7M	1102
160 Nominal*	0.37 Nominal*	PRM 160–0.37	1093
0–200	0–0.1	ABC 200M	1097
240 Nominal*	0.25 Nominal*	PRM 240–0.25	1093
0–325	0–0.2	HB 2AM	1099
0–325	0–0.4	HB 4AM	1099
0–325	0–0.6	HB 6AM	1099
0–325	0–0.8	HB 8AM	1099
0–425	0–0.05	ABC 425M	1097
0–500	0–0.4	BHK 500–0.4M	1098
0–500	0–0.04	OPS 500	1096
0–525	0–0.5	HB 525M	1099
0–600	0–0.5	605	1100
0–1000	0–0.02	ABC 1000M	1097
0–1000	0–0.02	OPS 1000	1096
0–1000	0–0.2	BHK 1000–0.2M	1098
0–1000	0–0.5	1250B	1100
0–1500	0–0.01	ABC 1500M	1097
0–1500	0–0.2	1520B	1100
0–2000	0–0.01	OPS 2000	1096
0–2000	0–0.1	BHK 2000–0.1M	1098
0–2000	0–0.5	HB 2050	1100
0–2500	0–0.002	ABC 2500M	1097
0–2500	0–0.05	HB 2500	1100

*Nominal output: two settings above and below nominal are available

KEPCO®

ORDERING INFORMATION

Kepco power supplies are marketed on a direct factory basis through independent sales representatives throughout the United States and many other countries. The back page of this catalog will give you the address and telephone number of the office closest to you. These factory-trained men will be most pleased to give you every assistance in choosing, ordering and using these products.

PRICES

Prices are f.o.b. Kepco's factory in Flushing, New York, effective March 15, 1970. Please contact our sales office for delivered prices (f.o.b. destination). All prices and specifications are subject to change without notice.

DISCOUNTS

Discounts are available to quantity buyers. For details please consult with the Kepco Sales Department.

SHIPPING

Our usual means of shipment is by insured motor freight or, location permitting, United Parcel Service. Air shipments or special routing are available on request. Power supplies cannot be shipped via Parcel Post.

WARRANTY (5 YEARS)

All Kepco products listed in this catalog, shipped on or after March 1, 1970, are backed by a firm *five-year* warranty covering the cost of *parts and labor.* The warranty is honored at our factory Service Department, Flushing, New York, and at field service depots maintained at strategic cities. Consult your local sales representative concerning the availability of local service.

SHIPMENT TO THE FACTORY

All goods shipped to the factory must be prepaid and must be accompanied by documentation explaining the reason for the return.

PARTS

You can obtain service parts without cost for warranty repairs by contacting your local field representative or from Kepco directly. When ordering parts, please use the identifying Kepco part number, and give the model and serial number of the instrument for which they are intended. DO NOT SHIP ANY PARTS TO KEPCO UNLESS AUTHORIZATION TAGS AND INSTRUCTIONS HAVE BEEN PROVIDED.

SPECIAL PAINTING

Kepco will paint to your color specifications. Contact our factory sales office for prices.

INSTRUCTION MANUALS

One complete manual is packed with each model. This manual contains instructions, schematics, parts lists, locating drawings and comprehensive theory sections. We will pack an additional manual *without charge* if specified on your original order. Additional copies of the manuals are available at a cost of $5.00 each (except PRM manuals at $0.25 each). Please specify the *serial number* of the model for which supplementary manuals are ordered.

REPRODUCTION

Written permission from Kepco, Inc., is required prior to the reproduction of any technical data.

DOCUMENTATION

If specified with your order, Certified Test Reports and Certificates of Compliance (with terms of the order) will be issued without cost.

RETURNED GOODS (Ordered in Error—Restockin

Return of new/unused models is permitted within the first t (30) days only. There is a restocking fee equal to 10% of the price: $25.00 minimum charge. Please contact factory authorization prior to returning equipment for credit.

SOURCE INSPECTION

Kepco will make available facilities for inplant inspection o ished goods only. Charge: 2% of sales price or $25.00 mini For shipments requiring DD250 forms add $10.00 per DD25

OVERSEAS MODELS

All units are factory-wired for 115V a-c. Many models are e ped for easy changeover from 115V a-c to 230V a-c input. W such provision is specified in this catalog, you may reque factory to do the changeover wiring for you at a cost of $ per unit, $25.00 minimum per order. Most models will a modate a range of input frequencies that encompasses 50– and some models (as specified on their catalog page) will a source frequencies to 440 Hz. PRM models are single freq devices and must be ordered with a "–50" suffix for ope from a 50 Hz source. See PRM page for price.

EXPORT PACKING

We will crate in a separate wooden box for export shipment sult factory for prices.

MOISTURE and FUNGUS PROOFING

You may order any power supply with a moisture and fun sistant varnish coating applied to the interior surfaces. C factory for prices.

SPECIAL FEATURES

The factory will assign a special identification number to altered to your requirements. Feel free to consult our A tions Engineers with your requirements. Questions concerni facilities features, behavior, and characteristics of any p may be directed to the Kepco Applications Engineering D ment. A staff of specialists is happy to provide any assista the application of Kepco's Power Supplies to your require

PATENTS

The products described in this catalog are manufactured an under license from the *Forbro Design Corp.* Applicable numbers will be furnished on request.

PUBLICATIONS

Kepco publishes a useful Handbook and various technical dealing with the use of modern power supplies. Use the e business reply card to order your personal copy. Co Kepco's publications are also available through Kepco representatives.

COMMUNICATIONS

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Telephone: 212-461-7000
TWX Number: 710-582-2631
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Cable Address: KEPCOPOWER NEWYORK

all KEPCO® products are backed by a firm 5-Year Warranty

COVERING THE COST OF PARTS AND LABOR. THE WARRANTY IS HONORED AT OUR FACTORY SERVICE DEPARTMENT, FLUSHING, N. Y., AND THROUGH OUR FIELD REPRESENTATIVES. (SEE PAGE 1118 FOR A COMPLETE LIST OF OFFICES.)

HOW TO USE THIS CATALOG

's 170 power supply catalog is organized into major pro-
you for ready access. The groups are classified by a shared
cha cteristic:

n 1: Modules . . . . . Page 1086
n 2: High Speed (fast programming) . . . . . Page 1094
n 3: High Voltage (200V and over) . . . . . Page 1097
n 4: General Purpose . . . . . Page 1101
n 5: Special Purpose (strain gauge, I-C's, etc.) . Page 1104
n 6: Programmers (digital systems) . . . . . Page 1110
n 7: Accessories (crowbars) . . . . . Page 1112
n 8: Hardware (rack adapters) . . . . . Page 1113

nay nter this catalog in a number of ways. If you know a de gnation, you'll find its group classification in the fea res chart on page 1080. If you're looking for a certain of ower supply; for example: "Modules," the features will ggest several models groups for your attention:

Primary Listings:– BKF, PAT, PAX, PCX, PRM;
Cross Reference:– BOP, CPS, JQE, OPS.

If you are wondering what is available in certain volt/ampere ranges, the INDEX-by-OUTPUT-VOLTAGE lists *all* models, with a page reference, in the order of their maximum output voltage, then current.

Kepco power supplies are manufactured in DESIGN GROUPS, identified by a letter group prefix. All models in a given design group share major electrical and physical characteristics and are produced in a variety of voltage/current output combinations.

Within a design group, the individual models are identified by a series of numbers representing the rated output in volts and amperes—or sometimes voltage only.

Many groups are available with optional features, such as calibration controls, overvoltage protectors, high-speed modifications, cases, etc. These options are identified by the use of a suffix letter appended to the model number.

To identify a power supply, a complete model number is required, prefix, rating, and suffix. It is important for the expeditious handling of inquiries, orders, etc., that the full Kepco model number be used for identification, even if local specification control numbers have been assigned by your organization.

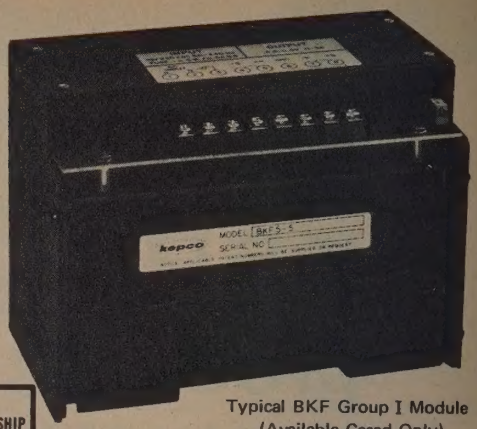
KEPCO

BKF

MODULAR

POWER SUPPLIES

The Kepco BKF design combines an I-C driven series transistor regulator, with a modified re-entrant overcurrent circuit. Voltage is controlled over a small adjustment range, protected by a built-in overvoltage crowbar. The crowbar trip point is tabulated for each model. Adjustable trip is optionally available.



Typical BKF Group I Module (Available Cased Only)

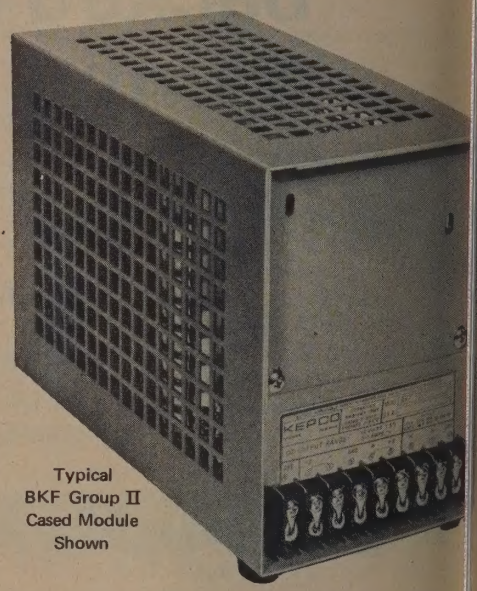
GROUP I

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS	OV TRIP POINT VOLTS (MAX.)	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+ μH	PRICE	SHIP WGT. (lbs.)
BKF 5–3	5.0 ±10%	0–3	6.5	0.003	0.02	0.1+1	$129.00	7
BKF 5–5	5.0 ±10%	0–5	6.5	0.001	0.02	0.1+1	148.00	7
BKF 12–1.4	12.0 ±10%	0–1.4	15.3	0.009	0.02	0.1+1	129.00	7
BKF 12–2.4	12.0 ±10%	0–2.4	15.3	0.005	0.02	0.1+1	148.00	7
BKF 15–1.2	15.0 ±10%	0–1.2	19.5	0.013	0.02	0.1+1	129.00	7
BKF 15–2	15.0 ±10%	0–2	19.5	0.008	0.02	0.1+1	148.00	7
BKF 24–0.8	24.0 ±10%	0–0.8	30.0	0.03	0.05	0.1+1	129.00	7
BKF 24–1.2	24.0 ±10%	0–1.2	30.0	0.02	0.05	0.1+1	148.00	7
BKF 28–0.6	28.0 ±10%	0–0.6	35.3	0.05	0.05	0.1+1	129.00	7
BKF 28–1	28.0 ±10%	0–1	35.3	0.03	0.05	0.1+1	148.00	7

GROUP II

BKF 5–11	5V±5%	0–11	6.5	0.0003	0.05	0.1+0.5	$213.00♦	20
BKF 8–10	8V±5%	0–10	11.1	0.0004	0.05	0.1+0.5	213.00♦	20
BKF 12–7	12V ±5%	0–7	15.3	0.0009	0.05	0.1+0.5	213.00♦	20
BKF 15–6	15V ±5%	0–6	19.5	0.0013	0.05	0.1+0.5	213.00♦	20
BKF 24–4	24V ±5%	0–4	30.0	0.0030	0.05	0.1+0.5	213.00♦	20
BKF 28–4	28V ±5%	0–4	35.3	0.0045	0.05	0.1+0.5	213.00♦	20
BKF 36–3	36V ±5%	0–3	45.7	0.0060	0.05	0.1+0.5	213.00♦	20
BKF 48–2.5	48V ±5%	0–2.5	59.5	0.0100	0.05	0.1+0.5	213.00♦	20

♦ Uncased, to order a cased Group II Model, add $12.00 to the price.



Typical BKF Group II Cased Module Shown

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE Group I	Group II
OUTPUT RANGE:	±10% trimmer	±5% trimmer
SOURCE: 105-125/210-250V a-c	<0.05%	<0.05%
LOAD: No load — full load	<0.05%	<0.05%
TIME: 8-hours (drift)	<0.05%	<0.05%
TEMPERATURE: Per °C	<0.05%	<0.05%
RIPPLE: (rms)	<0.5mV	<0.5mV

INPUT: 105-125 or 210-250V a-c (selected) 50-440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: (no derating)
Group I —*Cased Only:* 0°C to + 55°C
Group II—*Uncased:* 0°C to + 65°C
Cased: 0°C to + 55°C

TEMPERATURE, STORAGE: —20°C to + 85°C

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROL: Output is controlled by a built-in multiturn rheostat trimmer. There is no provision for external programming.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

OVERLOAD CURRENT CUTOFF: Modified adjustable re-entrant. Cutoff point is adjustable from 10% to 110% of the maximum current rating.

REMOTE ERROR SENSING: Compensates for up to 0.5 drop per output lead.

OVERSHOOT: (Turn-on/off): None.

SERIES/PARALLEL: BKF Modules can be series connecte additional voltage up to their rated isolation voltage. is no provision for parallel operation.

OVERVOLTAGE PROTECTOR: All models are equipped a built-in crowbar whose trip point is tabulated for model (turn-off to re-set). Triggering time is <10 μsec **Optional Adjustable Crowbar trip:** add suffix "—V" t model number for an installed trimmer which will a the crowbar trip from —10% Eo nominal to +20% Eo nor Add $15.00 to the price of the model.

TERMINALS: All input, output and sensing connection made via a single multiterminal barrier strip.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH & CASES: Group I: Cased only, finish is black ar ing. Group II: Specify a cased model by appending the "C" to the model number and $12.00 to the price. Case fin in royal blue epoxy.

MOUNTING: For rack mounting use adapters:
Group I—RA26-1: mounts single module; RA 27-2: mount modules; RA 28-4: mounts four modules.
Group II—RA 25-1: mounts single module; RA 8-2: mount modules; RA 9-3: mounts three modules
See Hardware section for a description of the various adapters.

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco G*

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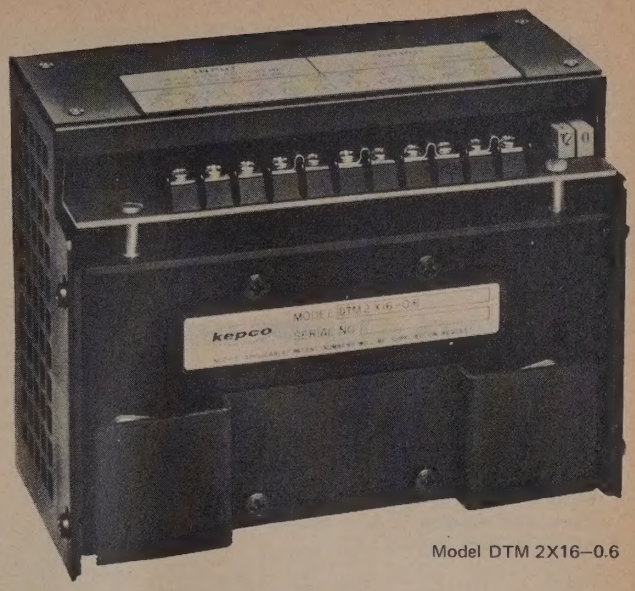
KEPCO DTM MODULAR POWER SUPPLIES

The Model DTM 2X16–0.6 provides a tracked pair of d-c voltages for operating circuit modules, amplifiers and devices requiring matched plus and minus voltages. The circuit consists of a pair of regulators sharing a common reference and driving separate series regulators.



Model DTM 2X16–0.6

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1 1kHz to 100kHz+μH	PRICE	SHIP WGT. (lbs.)
DTM 2X16–0.6	0 to +16	0 to +0.6	0.01	0.03	0.1 + 1	$129.00	5
	0 to −16	0 to −0.6					

● Full output current to 71°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE No. 1	VOLTAGE No. 2
OUTPUT RANGE:	0 to +16V	0 to −16V
SOURCE: 105-125/210-250V a-c	<0.05% or 2mV*	<0.05% or 2mV*
LOAD: No load — full load	<0.05% or 2mV*	<0.05% or 2mV*
TIME: 8-hours (drift)	<0.05% or 4mV*	<0.05% or 4mV*
TEMPERATURE: Per °C	<0.05%	<0.05%
RIPPLE: (rms)	<0.5mV	<0.5mV

**whichever is greater*

INPUT: 105–125V a-c or 210–250V a-c (selected).

TEMPERATURE, AMBIENT OPERATING: −20°C to +71°C.

TEMPERATURE, STORAGE: −40°C to +85°C

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROL/PROGRAMMING: Output is controlled by a single built-in, multi-turn rheostat trimmer, which adjusts both output voltages simultaneously. The minus output tracks the plus output in any ratio. They can be set to produce identical voltage i.e., 0 to + 15 and 0 − 15 volts or unequal voltages i.e. 0 to + 12V and 0 to −6V. Remote control may be exercised over both voltages by means of a simple external rheostat controlling the master (+) output at ≅ 1000 ohms per volt, not calibrated.

TRACKING: Adjustable to ±50mV over 1V to 15V range.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Each output individually protected by independently adjusted current limiter. Range: 10% to 110% of I_O maximum. The two outputs track with *plus out* serving as master. If the plus output goes into current limiting, the negative output will follow.

REMOTE ERROR SENSING: Compensates for up to 0.5 volts drop per output lead (3 wire).

OVERSHOOT: (Turn-on/off): No overshoot above a 25% voltage setting. For settings below 25% of E_O max, overshoot will be negligible when preloaded to 10% minimum.

SERIES/PARALLEL: Plus and minus outputs share a common terminal. They may be loaded individually or in series; no provision for parallel operation.

TERMINALS: Input and output and control connections are made to a barrier strip.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: Black anodized aluminum.

MOUNTING: Rack mount with adapters RA 26–1, RA 27–2 or RA 28–4.

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All terms used in the specifications are defined in the Kepco Glossary.

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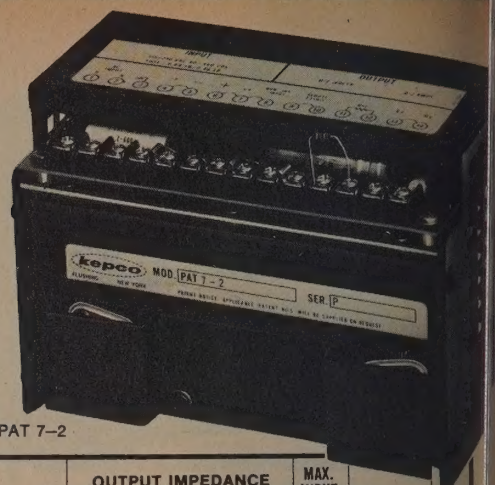
KEPCO™

PAT

MODULAR

POWER SUPPLIES

The Kepco PAT series of voltage regulated modular power supplies features compact repairable construction of a precision programmable regulator. The output is a self-cooled series NPN transistor driven by a monolithic linear I-C amplifier and protected by adjustable current limiting. The regulator will control current when equipped with an external pair of sensing and feedback resistors.



Model PAT 7–2

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE	SHIP WGT. (lbs.)
PAT 7–2	0–7	0–2	0.2×10^{-3}	0.02	0.1 + 1	0.50	$130.00	6
PAT 15–1.5	0–15	0–1.5	0.5×10^{-3}	0.02	0.1 + 1	0.65	130.00	6
PAT 21–1	0–21	0–1	1×10^{-3}	0.02	0.1 + 1	0.45	130.00	6
PAT 40–0.5	0–40	0–0.5	4×10^{-3}	0.02	0.1 + 1	0.40	130.00	6
PAT 72–0.3	0–72	0–0.3	12×10^{-3}	0.02	0.1 + 1	0.45	130.00	6
PAT 100–0.2	0–100	0–0.2	25×10^{-3}	0.02	0.1 + 1	0.45	130.00	6

● Full output current to 71°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE**	VOLTAGE AMPLIFIER OFFSETS*** OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	VOLTAGE REFERENCE (INTERNAL)***
OUTPUT RANGE:	0–100% E_o max.	1 mA–100% I_o max.	——	——	Fixed 6.2V±5%
SOURCE: 105-125/210-250V a-c	<0.0005%	<0.005%**	<10 μV	<2 nA	0.0001%
LOAD: No load – full load	<0.005% or 0.2 mV*	<0.01%**	<200 μV	<5 nA	——
TIME: 8-hours (drift)	<0.01% or 1 mV*	<0.02**	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C	<0.01%†	<0.02**†	<20 μV	<5 nA	0.005%
RIPPLE: (rms)	<0.1 mV	<0.02% of I_o max.	——	——	——

**whichever is greater*

***External sensing, using a 1V sample. Effects are measured at rated sample voltage with 20 PPM external current feedback control.*

****Offsets and the reference contribute to output change ΔE_O, by the equation $\Delta E_O = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.*

†See OPTIONS for 0.005% per °C voltage mode – 0.01% per °C current mode temperature effect coefficient.

INPUT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: Cased: –20°C to +71°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

PROGRAMMING: PAT is fully programmable by resistance or external voltage signals. Control current is 1 mA for 1000 ohms/V (option "–R" provides a calibration control). The positive terminal is common. *Note:* Programming resistance not supplied. For operational (amplifier) control, an offset voltage nulling control is available. See Option "–E".

OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.

CURRENT LIMITING: Adjustable from 10% to 105% of rated full current with provision for remote control.

REMOTE ERROR SENSING: Compensates up to 0.5 volt drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% mini m.

SERIES/PARALLEL: Series operation to rated isolation; so master/slave capability. Current limiting design permits se de- termined parallel load sharing.

TERMINALS: All input, output and control connection are made via a multi-terminal barrier strip.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: Black anodized aluminum.

MOUNTING: Rack mount with adapters RA 26-1, RA 27 or RA 28-4. *See Hardware section.*

OPTIONS: (add suffix to the model number).

"–R" CONTROL CURRENT ADJUSTMENT: ± 10% tri er provides for programming calibration. Add $10.00 to ce.

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0. % per °C in voltage mode, 0.01% per °C in current mode dd $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational pro m- ming. Zeros the fixed part of the control amplifier's v ge offset. Add $10.00 to price.

Data and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco sary

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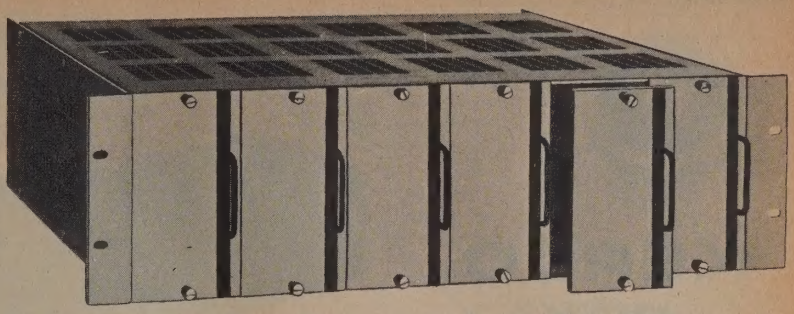
KEPCO PAX MODULAR

WER SUPPLIES

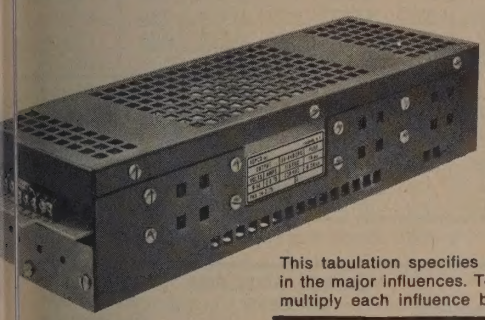


6 uncased modules mounted in RA 22-6 housing using BPA-22 slide adapters

X odules are low cost, single-amplifier power supplies that can be d th voltage or current feedback. The HS models (high speed) are e lly recommended for current control because of their fast-recov- racteristics. In the PAX design, a convection-cooled PNP series s nsistor is used, the negative output terminal is common to the n nput. The PAX models are thus the signal-complement of the X d OPS designs.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1 1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE ♦	SHIP WGT. (lbs.)
PAX 7–1	0–7	0–1	0.004	0.02	0.1+1	0.3	$101.00	5
PAX 15–0.75	0–15	0–0.75	0.010	0.02	0.1+1	0.3	101.00	5
PAX 21–0.5	0–21	0–0.5	0.025	0.02	0.1+1	0.3	101.00	5
PAX 36–0.3	0–36	0–0.3	0.06	0.02	0.1+1	0.3	101.00	5
PAX 72–0.15	0–72	0–0.15	0.25	0.02	0.1+1	0.3	101.00	5
PAX 100–0.1	0–100	0–0.1	0.5	0.02	0.1+1	0.3	101.00	5

♦ For case, add Suffix "C" to model number and $12.00 to price.
● Full output current to 50°C, no derating.



sed Module

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE** (External Sensing)
OUTPUT RANGE:	0–100% E_O max.	1 mA to 100% I_O
SOURCE: 105-125/210-250V a-c	<0.05% or 1 mV*	<0.1% at rated sample**
LOAD: No load – full load	<0.05% or 1 mV*	<0.1% at rated sample**
TIME: 8-hours (drift)	<0.05% or 3 mV*	<0.1% or 1 mA*
TEMPERATURE: Per °C	<0.05%	<0.1% at rated sample**
RIPPLE: (rms)	<0.25 mV, rms.	<0.1% I_O max.
RIPPLE, High Speed: (rms)	<0.1% of maximun output (grounded)	<0.1% of maximum output (grounded)

*whichever is greater
**Rated sample is 1 V d-c across external current sampling resistor, with external current control.

IN JT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, si e phase.

TE PERATURE, AMBIENT OPERATING: –20°C to + 50°C

TE PERATURE, STORAGE: –40°C to +85°C.

CO LING: Convection.

IS ATION: The output terminals are isolated from the gr nded case. A maximum of 500 volts (d-c or peak) can be co nected between either output terminal and the case.

PR GRAMMING: PAX is programmable by resistance or ex rnal voltage signals. Control current is ≅ 1 mA for 10 ohms/V (option "–R" provides a calibration control). Hi Speed Models provide fast response to programming co mands. The negative terminal is common. *Note*: Program- mi resistance not supplied.

VO TAGE RECOVERY (for step load current): <50 μseconds.

CU RENT LIMITING: Adjustable from 25% to 150% of rated fu current.

RE OTE ERROR SENSING: Compensates up to 0.5V drop pe output lead.

OV RSHOOT: (Turn-on/off): None above 25% voltage set- tin negligible below 25% when preloaded to 10% minimum.

SE IES/PARALLEL: Series operation to rated isolation; also m er/slave capability. Current limiting design permits self-de- te ined parallel load sharing.

TERMINALS: All input, output and control connections are made via a multi-terminal barrier strip and printed circuit connector.

FINISH: Blue anodized aluminum.

DIMENSIONS: See dimensional listings on Page 1117.

MOUNTING: The uncased model can be mounted to a BPA-22 slide adapter for use with the RA 22-6, CA-3, CA-4 and CA-5. *See hardware section.* The cased model can be rack-mounted on adapters RA 12-1, RA 13-4 or RA 11-6.

OPTIONS: (add suffix to the model number).

"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.

"–C" CASED ENCLOSURE: fully encloses the power supply. Add $12.00 to price (do not use with the BPA-22).

"–HS" HIGH SPEED MODELS: Add $10.00 to price.

Slewing Rate > 50,000 volts per second measured as the chord to the first time constant on the exponential response.

Transient Response: ("–HS" models only).

Voltage Mode: (for a step load current): recovery is an exponential with a 50 μsec. time constant.

Current Mode: (for a step load voltage): recovery is at the rate of 0.05 milliseconds per volt.

Da and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco Glossary.

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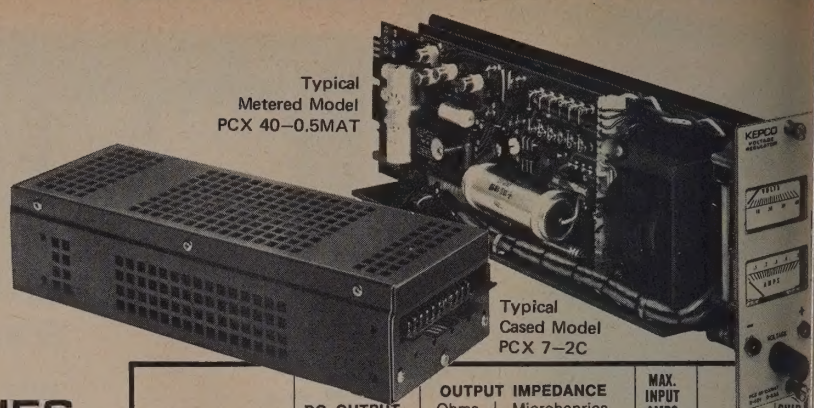
KEPCO
PCX
MODULAR
POWER SUPPLIES



The PCX group of voltage regulators are available in two forms—as programmable modules for OEM's or (with the suffix "MAT") as metered plug-ins with a built-in, 10-turn voltage control. The regulator is a self-cooled series NPN transistor driven by Kepco's monolithic linear I-C amplifier and protected by adjustable current limiting. The regulator will control current when equipped with an external pair of sensing and feedback resistors.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE	SHIP WGT. (lbs.)
PCX 7–2	0–7	0–2	$0.2X10^{-3}$	0.02	0.1+1	0.50	$119.00♦	4
PCX 15–1.5	0–15	0–1.5	$0.5X10^{-3}$	0.02	0.1+1	0.65	119.00♦	4
PCX 21–1	0–21	0–1	$1X10^{-3}$	0.02	0.1+1	0.45	119.00♦	4
PCX 40–0.5	0–40	0–0.5	$4X10^{-3}$	0.02	0.1+1	0.40	119.00♦	4
PCX 72–0.3	0–72	0–0.3	$12X10^{-3}$	0.02	0.1+1	0.45	119.00♦	4
PCX 100–0.2	0–100	0–0.2	$25X10^{-3}$	0.02	0.1+1	0.45	119.00♦	4
PCX 7–2MAT	0–7	0–2	$0.2X10^{-3}$	0.02	0.1+1	0.50	$180.00	6
PCX 15–1.5MAT	0–15	0–1.5	$0.5X10^{-3}$	0.02	0.1+1	0.65	180.00	6
PCX 21–1MAT	0–21	0–1	$1X10^{-3}$	0.02	0.1+1	0.45	180.00	6
PCX 40–0.5MAT	0–40	0–0.5	$4X10^{-3}$	0.02	0.1+1	0.40	180.00	6
PCX 72–0.3MAT	0–72	0–0.3	$12X10^{-3}$	0.02	0.1+1	0.45	180.00	6
PCX 100–0.2MAT	0–100	0–0.2	$25X10^{-3}$	0.02	0.1+1	0.45	180.00	6

♦ For case, add Suffix "C" to model number and $12.00 to price.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE**	VOLTAGE AMPLIFIER OFFSETS*** OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	VOLTAGE REFERENCE (INTERNAL)***
OUTPUT RANGE:	0–100% E_o max.	1 mA–100% I_o max.	——	——	Fixed 6.2V±5%
SOURCE: 105-125/210-250V a-c	<0.0005%	<0.005%**	<10 μV	<2 nA	0.0001%
LOAD: No load — full load	<0.005% or 0.2 mV*	<0.01%**	<200 μV	<5 nA	——
TIME: 8-hours (drift)	<0.01% or 1 mV*	<0.02**	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C	<0.01%†	<0.02**†	<20 μV	<5 nA	0.005%
RIPPLE: (rms)	<0.1 mV	<0.02% of I_o max.	——	——	——

**whichever is greater †See OPTIONS for 0.005% per °C voltage mode — 0.01% per °C current mode temperature effect coefficient.*
***External sensing, using a 1V sample. Effects are measured at rated sample voltage with 20 PPM external current feedback control.*
****Offsets and the reference contribute to output change ΔE_o, by the equation $\Delta E_o = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.*

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1Ø.
TEMPERATURE, AMBIENT OPERATING: Cased: −20°C to +65°C. Uncased: −20°C to +71°C. (no derating)
TEMPERATURE: STORAGE: −40°C to +85°C.
ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.
PROGRAMMING: PCX is fully programmable by resistance or external voltage signals. Control current is ≅1 mA for 1000 ohms/V (option "–R" provides a calibration control). The positive terminal is common. For operational (amplifier) control, an offset voltage nulling control is available, see Option "–E." Suffix "MAT" models have 10-turn voltage control built-in. Resolution: 0.05%.
OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.
VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.
CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.
REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.
OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.
SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.
COOLING: Convection.

TERMINALS: All input, output and control connection made via a multi-terminal barrier strip and printed c connector.
DIMENSIONS: See dimensional listings on Page 1117.
FINISH: Blue anodized aluminum.
CASES/MOUNTING: Model number without suffix specif uncased open model. Add suffix "C" and $12.00 to pri wraparound case — or order Case CA-1 separately. models can be rack mounted on adapters RA 12-1, RA or RA 11-6. Uncased models can be used with BPA-22 adapter for plug-in mounting. These fit interchangeably metered "MAT" — option models in Cases CA-3, CA-4, or RA 22-6. *See Hardware section.*
OPTIONS: (add suffix to the model number).
"–MAT" This option provides for a fully metered p package with separate voltmeter and ammeter and a 1 output voltage control. Furnished *uncased* for mounti single unit case CA-3, dual case CA-4 or triple case May be rack mounted in six-unit housing Model RA see Hardware Section. See table for specifications and p
"–R" CONTROL CURRENT ADJUSTMENT: ± 10% tr provides for programming calibration. Add $10.00 to
"–T" LOWER TEMPERATURE COEFFICIENT: 0.005% in voltage mode, 0.01% per °C in current mode. Add to price.
"–E" OFFSET VOLTAGE NULLING: For operationa gramming. Zero the fixed part of the control amp voltage offset. Add $10.00 to price.

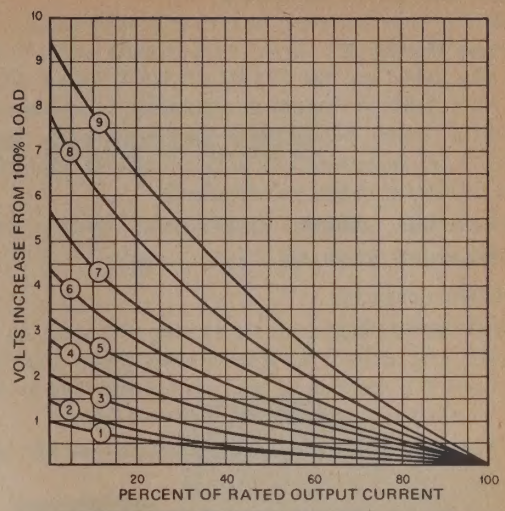
Data and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco G

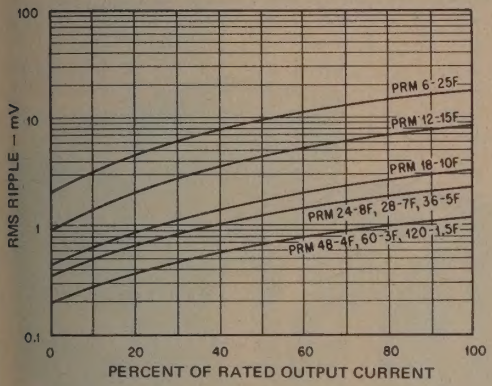
KEPCO PRM

MODULAR POWER SUPPLIES

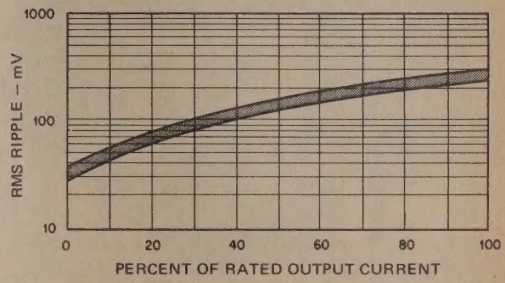
The Kepco PRM voltage regulated modules are simple, reliable, efficient, fixed output sources. The design is based on a ferroresonant power transformer called Flux-O-Tran® which provides both regulating and overload current limiting. The extra-filtered models (suffix F) have a Pi section LC filter, reducing their ripple to about a tenth that of the single section capacitor-filtered models. The *dual* output models have two independent d-c circuits that may be used in series or in parallel or separately. Size "D" models feature an adjustable output tap.



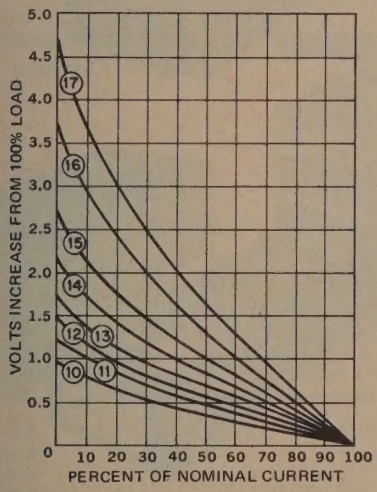
TYPICAL LOAD EFFECT CURVE FOR ALL MODELS (EXCEPT SIZE "D")



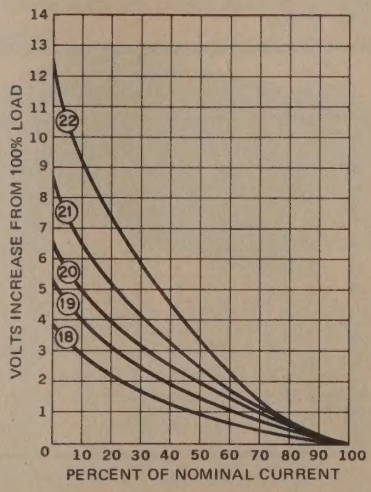
TYPICAL OUTPUT RIPPLE CURVES FOR EXTRA-FILTERED MODELS, PLOTTED AS A FUNCTION OF LOAD CURRENT



TYPICAL OUTPUT RIPPLE CURVES FOR SIZES A B and C (duals), PLOTTED AS A FUNCTION OF LOAD CURRENT



TYPICAL LOAD EFFECT CURVES FOR THE SIZE "D" PRM MODELS



This tabluation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS				
	SIZE A 180 SERIES	SIZE B 120 SERIES	SIZE C – 180F Extra-Filter	SIZE C – 300 Dual-Output	SIZE D 60 SERIES
Accuracy: (of fixed setting)*	±2%	±2%	±2%†	±2%††	±2%
Source: 100-130V a-c	±1%‡	±1%‡	±1%‡	±1%▼	±1%‡
Load: no load–full load	See charts for maximum value; the graphs show typical performance.				
Time: 8-hours (drift)	1% or 0.1V**	1% or 0.1V**	1% or 0.1V**	1% or 0.1V**	1% or 0.1V**
Temperature: per °C	0.05%	0.05%	0.05%	0.05%	0.05%
Ripple: (rms)	See charts for maximum value; the graphs show typical performance.				
Input Power: (at 115V a-c)	3A (280 W)	2A (190 W)	3A (280 W)	5A (465 W)	1.1A (100 W)

** At 115V a-c, full load and 30°C. The initial (cold) output is 1% higher.* *** Whichever is greater.*
† The extra filter stage introduces an additional 2% drop. A 10% reduction in load current will compensate for this loss.
†† Interaction between sections of the dual supply produce an extra –2% change when the other section is loaded from zero to maximum.
‡ For ±15V a-c source variation with loads between 25–100%. For loads below 25% the source effect is ±1.5%.
▼ For ±15V a-c source variations with loads between 50–100%. For loads below 50% the source effect is ±1.5%.

INPUT: 115V a-c ±15V a-c, 60 Hz ±5% single phase.

Overseas Models: For 50 Hz ±5%, specify suffix "–50." Inputs (selectable) are: 104 ±13.5V a-c, 115 ±15V a-c, 208 ±27V a-c or 230 ±30V a-c. Output current rating is decreased 20% in the 50 Hz version. Add $15.00 to the unit price.

NOTE: Input frequency variations produce an approximately equal percentage output voltage change.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

OUTPUT IMPEDANCE: 1 kHz to 10 kHz: 0.05 ohms, 10 kHz to 100 kHz: 0.05 ohms + 0.5 microhenries. Below 1000 Hz, the impedance is a function of load current and may be derived from the slope of the load regulation curve ΔE/ΔI.

VOLTAGE RECOVERY (step load current, 50–100%): <400 ms.

OVERLOAD PROTECTION: Current limiting transformer stricts short circuit current to safe value. A thermal circ breaker is employed in *dual* models.

ISOLATION: The output terminals are isolated from t grounded case. A maximum of 600 volts (d-c or peak) can connected between either output terminal and the case between the outputs of dual models.)

SERIES/PARALLEL OPERATION: Identical models, or halv of a dual supply can be paralleled for approximately doul current (allow for 10% imbalance). Series operation to rat isolation.

ACCESSORIES: Various rack adapters available, see ha ware page. *Cases:* Size A uses CA-200; Size C uses CA-3 Sizes B and D have non-removable integral enclosures. order a fully cased model in sizes A and C, add a suffix let "C" to the model number.

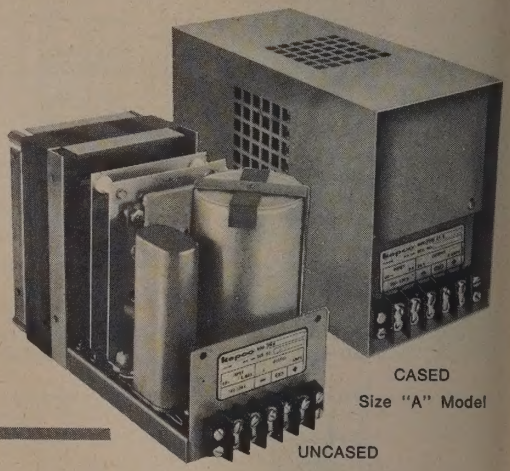
FINISH: *Cases:* royal blue.

DIMENSIONS: See dimensional listings on Page 1117.

SIZE "A" — 180 SERIES

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD EFFECT VOLTS INCREASE * 100%-50% LOAD	LOAD EFFECT VOLTS INCREASE * 100%-25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE ♦	SHIP WGT. (lbs.)
PRM 5–25	5.2	0–25	0.5	0.8	1	0.4	$134.00	22
PRM 6–25	6.3	0–25	0.5	0.8	1	0.4	134.00	22
PRM 12–15	12	0–15	0.6	1.0	1	0.4	134.00	22
PRM 18–10	18	0–10	0.6	1.0	2	0.3	134.00	22
PRM 24–8	24	0–8	0.7	1.2	2	0.3	134.00	22
PRM 28–7	28	0–7	0.7	1.2	2	0.4	134.00	22
PRM 36–5	36	0–5	0.8	1.3	3	0.4	134.00	22
PRM 48–4	48	0–4	1.0	1.8	4	0.3	134.00	22
PRM 60–3	60	0–3	1.1	1.9	5	0.3	134.00	22
PRM 120–1.5	120	0–1.5	2.2	3.6	7	0.3	134.00	22

♦ For case, add Suffix "C" to model number and $12.00 to price.
*Measured at 115V a-c Source

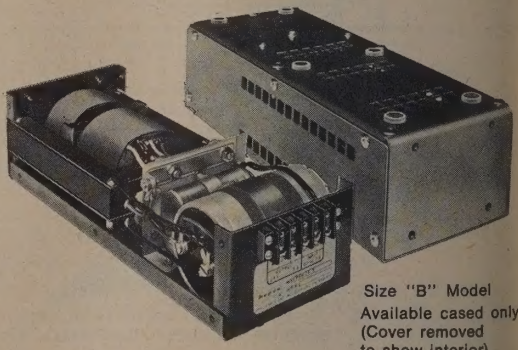


CASED
Size "A" Model
UNCASED

SIZE "B" — 120 SERIES

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD EFFECT VOLTS INCREASE * 100%-50% LOAD	LOAD EFFECT VOLTS INCREASE * 100%-25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE ♦	SHIP WGT. (lbs.)
PRM 5–15	5.2	0–15	0.5	0.8	1	0.4	$112.00	17
PRM 6–15	6.3	0–15	0.5	0.8	1	0.4	112.00	17
PRM 12–10	12	0–10	0.6	1.0	2	0.4	112.00	17
PRM 18–6.7	18	0–6.7	0.8	1.3	3	0.3	112.00	17
PRM 24–5	24	0–5	1.0	1.7	3	0.3	112.00	17
PRM 28–4.3	28	0–4.3	1.2	2.0	4	0.3	112.00	17
PRM 36–3.3	36	0–3.3	1.5	2.4	5	0.3	112.00	17
PRM 48–2.5	48	0–2.5	2.0	3.4	6	0.3	112.00	17
PRM 60–2	60	0–2	2.3	3.8	7	0.3	112.00	17
PRM 120–1	120	0–1	4.6	7.6	9	0.3	112.00	17

♦ Available cased only. Price includes case. *Measured at 115V a-c Source

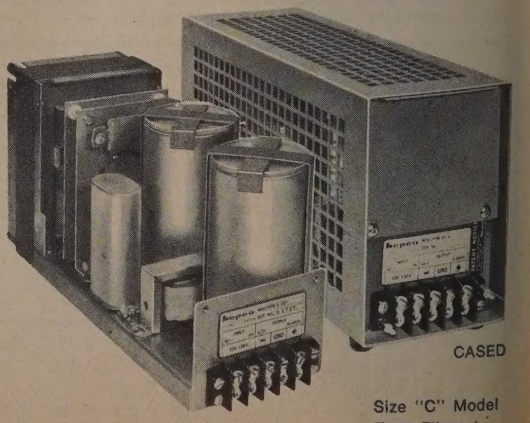


Size "B" Model
Available cased only
(Cover removed
to show interior)

SIZE "C" — 180F SERIES (Extra-Filtered)

MODEL	DC OUTPUT** VOLTS	DC OUTPUT** AMPS	LOAD EFFECT VOLTS INCREASE * 100%-50% LOAD	LOAD EFFECT VOLTS INCREASE * 100%-25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE ♦	SHIP WGT. (lbs.)
PRM 5–25F	5.2	0–25	0.7	1.2	1	0.04	$191.00	28
PRM 6–25F	6.3	0–25	0.7	1.2	1	0.04	191.00	28
PRM 12–15F	12	0–15	0.9	1.4	2	0.02	191.00	28
PRM 18–10F	18	0–10	0.9	1.5	3	0.01	191.00	28
PRM 24–8F	24	0–8	1.2	2.0	3	0.005	191.00	28
PRM 28–7F	28	0–7	1.3	2.1	3	0.005	191.00	28
PRM 36–5F	36	0–5	1.5	2.4	4	0.005	191.00	28
PRM 48–4F	48	0–4	1.7	2.9	5	0.003	191.00	28
PRM 60–3F	60	0–3	2.3	3.6	6	0.003	191.00	28
PRM 120–1.5F	120	0–1.5	3.8	6.8	8	0.003	191.00	28

♦ For case, add Suffix "C" to model number and $12.00 to price.
* Measured at 115V a-c Source ** Less 2% Filter drop (See ACCURACY)



CASED
UNCASED
Size "C" Model
Extra-Filtered

KEPCO™

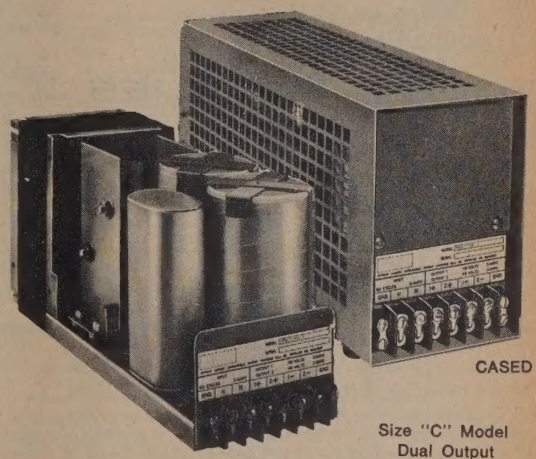
MODULAR POWER SUPPLIES

SIZE "C" — 300 SERIES (Dual Output)

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	LOAD EFFECT * VOLTS INCREASE 100%-50% LOAD	LOAD EFFECT * VOLTS INCREASE 100%-25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS VOLTS	PRICE ♦	SHIP WGT. (lbs.)
RM 2X4.5–20	4.5 4.5	0–20 0–20	0.5	0.7	1	0.3	$211.00	38
RM 2X5–20	5.2 5.2	0–20 0–20	0.5	0.7	1	0.3	211.00	38
RM 2X6–20	6.3 6.3	0–20 0–20	0.5	0.7	1	0.3	211.00	38
RM 2X12–12	12 12	0–12 0–12	0.5	0.7	1	0.3	211.00	38
RM 2X15–10	15 15	0–10 0–10	0.5	1.0	1	0.3	211.00	38
RM 2X18–8	18 18	0–8 0–8	0.6	1.6	1	0.3	211.00	38
RM 2X24–6	24 24	0–6 0–6	0.6	1.0	2	0.3	211.00	38
RM 2X28–5	28 28	0–5 0–5	0.7	1.2	2	0.3	211.00	38
RM 2X36–4	36 36	0–4 0–4	0.7	1.2	3	0.3	211.00	38
RM 2X48–3	48 48	0–3 0–3	0.8	1.4	3	0.3	211.00	38
RM 2X60–2.5	60 60	0–2.5 0–2.5	1.0	1.7	3	0.3	211.00	38

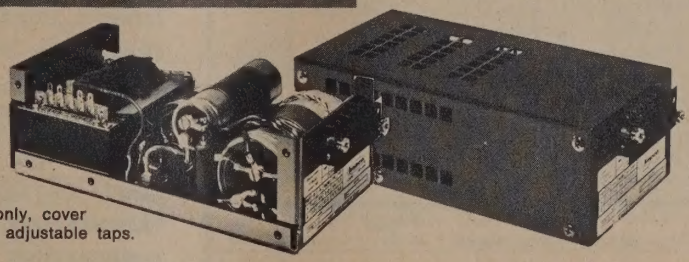
*Measured at 115V a-c Source

♦For case, add Suffix "C" to model number and $12.00 to price.



Size "C" Model
Dual Output

SIZE "D" — 60 SERIES

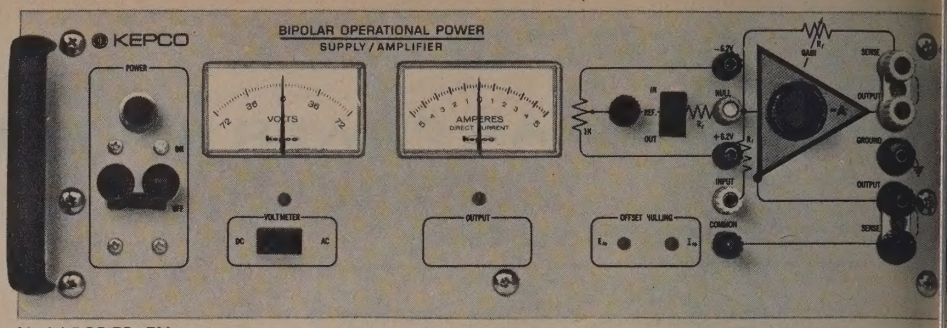


Size "D" Model
Available cased only, cover removed to show adjustable taps.

The size D, Series 60 PRM modules are equipped with an adjustable tap arrangement, selecting two increments of voltage above the nominal output and two increments of voltage below the nominal output. In the table of voltages, the nominal (center) tap is indicated by the bold face type. The table of currents has a corresponding bold face column showing the current rating at the nominal voltage. The two adjacent columns on either side correspond to the respective voltage tap increments. The specifications are computed for the nominal (center) tap.

MODEL	OUTPUT VOLTAGE VOLTS —B	—A	NOM	+A	+B	OUTPUT CURRENT AMPS —B	—A	NOM	+A	+B	LOAD EFFECT VOLTS INCREASE* 100%-50% LOAD	100%-25% LOAD	LOAD EFFECT CURVE	RIPPLE (max) RMS %	PRICE ♦	SHIP WGT. (lbs.)
RM 5–10	4.2	4.6	**5.0**	5.4	5.8	12.0	11.0	**10.0**	9.3	8.6	0.5	0.7	10	0.50	$96.00	12
RM 6.3–8	5.5	5.9	**6.3**	6.7	7.1	9.1	8.5	**8.0**	7.5	7.1	0.5	0.8	10	0.50	96.00	12
RM 8–7	7.2	7.6	**8.0**	8.4	8.8	7.8	7.5	**7.0**	6.7	6.4	0.5	0.8	10	0.33	96.00	12
RM 10–6	8.4	9.2	**10.0**	10.8	11.6	7.1	6.5	**6.0**	5.6	5.2	0.6	0.9	11	0.33	96.00	12
RM 12–5	10.4	11.2	**12.0**	12.8	13.6	5.7	5.4	**5.0**	4.7	4.5	0.7	1.2	12	0.33	96.00	12
RM 15–4	13.4	14.2	**15.0**	15.8	16.6	4.5	4.2	**4.0**	3.8	3.6	0.9	1.3	13	0.33	91.00	12
RM 18–3.3	16.4	17.2	**18.0**	18.8	19.6	3.6	3.5	**3.3**	3.2	3.1	1.0	1.6	14	0.33	91.00	12
RM 21–2.9	17.9	19.4	**21.0**	22.6	24.2	3.4	3.1	**2.9**	2.7	2.6	1.0	1.7	14	0.33	91.00	12
RM 26–2.3	22	24	**26**	28	30	2.7	2.5	**2.3**	2.1	2.0	1.3	2.0	15	0.33	91.00	12
RM 36–1.7	32	34	**36**	38	40	1.9	1.8	**1.7**	1.6	1.5	1.7	2.7	16	0.33	91.00	12
RM 48–1.25	42	45	**48**	51	54	1.43	1.33	**1.25**	1.18	1.11	2.1	3.4	17	0.33	91.00	11
RM 60–1	52	56	**60**	64	68	1.15	1.07	**1.00**	0.94	0.88	1.2	2.1	18	0.33	91.00	11
RM 70–0.85	60	65	**70**	75	80	1.00	0.92	**0.86**	0.80	0.75	1.3	2.5	18	0.33	91.00	11
RM 90–0.65	80	85	**90**	95	100	0.75	0.71	**0.67**	0.63	0.60	1.9	3.4	19	0.33	91.00	11
RM 120–0.50	110	115	**120**	125	130	0.54	0.52	**0.50**	0.48	0.46	2.3	5.0	20	0.33	91.00	11
RM 160–0.37	140	150	**160**	170	180	0.43	0.40	**0.37**	0.35	0.33	3.0	6.0	21	0.33	91.00	11
RM 240–0.25	220	230	**240**	250	260	0.27	0.26	**0.25**	0.24	0.23	4.0	8.2	22	0.33	91.00	11

*Measured at 115V a-c Source ♦ Available cased only. Price includes case.



Model BOP 72—5M

KEPCO BOP

BIPOLAR OPERATIONAL POWER SUPPLIES

The Bipolar Operational Power Supply is a distinctly different sort of instrument, capab responding to programming commands in either direction from zero. The BOP employs coupled NPN/PNP complementary-symmetry output stage, forced-cooled for efficient dissipa

The standard laboratory BOP is equipped with a patch board panel containing input/o reference and feedback elements. The unmetered instrument has a blank panel for OEM's. B strip access to all control points is provided on both styles.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	CURRENT SINK	DC OUTPUT IMPEDANCE (Ohms max.)	RACK SIZE	PRICE ♦	SHIP WGT. (lbs.)
BOP 15—20M	+15 to −15	+20 to −20	±4A	$0.2X10^{-3}$	Full	$1,150.00	80
BOP 36—1.5M	+36 to −36	+1.5 to −1.5	±0.3A	$5X10^{-3}$	1/2	525.00	20
BOP 36—5M	+36 to −36	+5 to −5	±1A	$1.5X10^{-3}$	1/2	750.00	42
BOP 72—1.5M	+72 to −72	+1.5 to −1.5	±0.3A	$10X10^{-3}$	Full	1,125.00	52
BOP 72—5M	+72 to −72	+5 to −5	±1A	$3X10^{-3}$	Full	1,475.00	80

● Full output current to 65°C, no derating.
♦ Price is for laboratory style instrument with control panel, delete suffix "M" and deduct $60.00 for modular style.

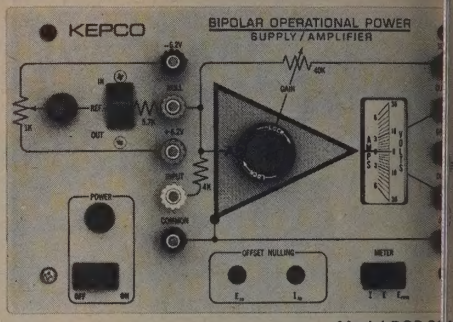
This tabulation specifies the limit of change in the amplifier offsets for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

d-c SPECIFICATION	VOLTAGE AMPLIFIER OFFSETS * E_{IO}	VOLTAGE AMPLIFIER OFFSETS * I_{IO}	* REFERENCES 6.2V ±5%
SOURCE: 105—125/210—250V a-c	<0.1 mV	<10 nA	0.0005%
LOAD: no load — full load	<1.0 mV	<10 nA	——
TIME: 8-hours (drift)	<0.1 mV	<50 nA	0.005%
TEMP.: Per °C	<0.05 mV	<50 nA	0.005%
RIPPLE: (rms)	<0.01% of E_0 Max. or 3 mV**		——

*Offsets and the reference contribute to output change ΔE_0, by the equation $\Delta E_0 = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{IO}(1+R_f/R_i) \pm\Delta I_{IO}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference.
Use the offsets to calculate the output effects. **whichever is greater

a-c SPECIFICATION	MODE	BOP 15—20M	BOP 36—1.5M	BOP 36—5M	BOP 72—1.5M	BOP 72—5M
SMALL SIGNAL FREQUENCY RESPONSE frequency at which the open loop gain becomes unity	FAST	300 kHz	300 kHz	300 kHz	300 kHz	300 kHz
	SLOW	10 kHz	30 kHz	30 kHz	30 kHz	30 kHz
LARGE SIGNAL FREQUENCY RESPONSE frequency at which the fully modulated, fully loaded output reaches 3% harmonic distortion	FAST	25 kHz	30 kHz	30 kHz	20 kHz	20 kHz
	SLOW	1 kHz	3 kHz	3 kHz	2 kHz	2 kHz
AMPLIFIER SLEWING RATE	FAST	2V/μsec	7V/μsec	7V/μsec.	9V/μsec.	9V/μsec.
	SLOW	0.1V/μsec.	0.7V/μsec	0.7V/μsec.	0.9V/μsec.	0.9V/μsec.
PROGRAMMING TIME CONSTANT input/feedback set for gain=10	FAST	12 μsec.	12 μsec.	12 μsec.	12 μsec.	12 μsec.
	SLOW	250 μsec.	150 μsec.	150 μsec.	150 μsec.	150 μsec.
VOLTAGE RECOVERY TIME CONSTANT for step load current	FAST	50 μsec.	50 μsec.	50 μsec.	50 μsec.	50 μsec.
	SLOW	500 μsec.	500 μsec.	500 μsec.	500 μsec.	500 μsec.
CURRENT RECOVERY TIME CONSTANT for step load voltage	FAST	50 μsec.	50 μsec.	50 μsec.	50 μsec.	50 μsec.
	SLOW	1 msec.	500 μsec.	500 μsec.	500 μsec.	500 μsec.

OPEN LOOP d-c GAIN: 35,000 V/V. Roll off −6dB per octave.
OUTPUT IMPEDANCE: Tabulated at d-c. Rises at 6 dB per octave. At high frequencies, include the effect of a 100 μH equivalent series inductance.
DISTORTION (for $2V_{pp}$ output, no load): Harmonic: < 0.5%
OFFSET NULLING: The fixed parts of the offset voltage and offset current can be nulled using recessed panel controls.



Model BOP 36

REFERENCES: Two, +6.2V ±5% and −6.2V ±5% ava simultaneously; loading: 1mA.

PROGRAMMING: Control by the manipulation of inpu feedback elements. The BOP is a bipolar invertin amplifier that obeys the equation: $E_{OUT} = E_{IN} \frac{Z_{feedbo}}{Z_{inpu}}$

A vernier feedback rheostat and input potentiometer is vided on the bench model, along with an operational panel and metering. The unmetered module requires ex input and feedback elements.

INPUT: 105-125/210-250V a-c, 50-65 Hz. single phase.

TEMPERATURE, AMBIENT OPERATING: −20°C to +65

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Forced air; built-in blower.

ISOLATION: The output terminals are isolated fron grounded case. A maximum of 500 volts (d-c or peak be connected between either terminal and the case.

TERMINALS: Ten-terminal front panel patch board. terminal rear mounted barrier strip duplicates func Unmetered model has rear barrier strip terminals only.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 59 *Case:* Charcoal gray texture.

MOUNTING: Full rack sized models have accessory f for direct installation in standard 19" racks. Unmetered models are in modular form for chassis mounting, half-rac models may be mounted in RA-24 by use of an adapter RAP 24-2B.

METERS: Half rack models use a single multi-function for d-c volts and amperes and a-c volts. Full rack have separate voltmeter and ammeter. The voltmeter switched to read d-c or a-c volts. Unmetered mode available in all sizes with a blank front panel. These may be used as modules with external input/feedbac ments connected to the rear barrier strip. To order a m version, delete the suffix "M" from the model number a duct $60.00 from the price.

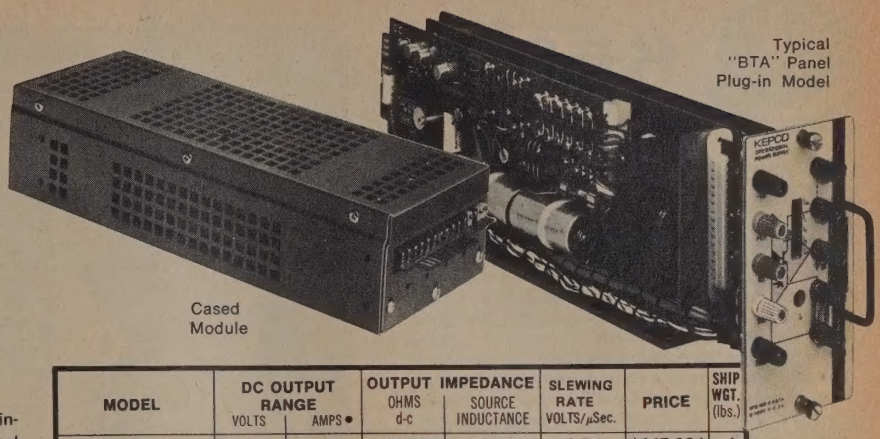
Data and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco G

KEPCO OPS-B

PLUG-IN MODULAR

POWER SUPPLIES



Cased Module

Typical "BTA" Panel Plug-in Model

pco Operational Power Supply is a unique in- rumnt; a combination self-powered operational wamplifier and d-c power supply. The OPS group sable for a wide variety of signal processing or scaling, summing, integrating and impedance ansrmation. All models incorporate a linear I-C pumplifier. The "B" models are in modular form r M's; the "BTA versions are plug-in modules hicoffer a 10-terminal patch panel for bench-type eional manipulations. Their fast output slewing ab the OPS models to be fast-recovery, program- abl current controllers or audio spectrum voltage nplers.

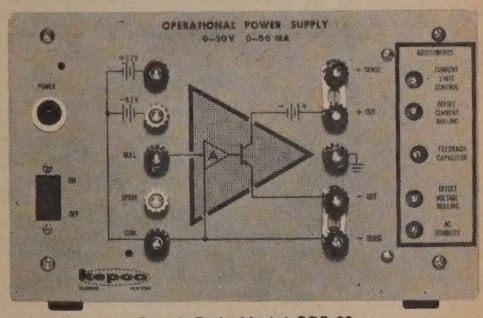
MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS●	OUTPUT IMPEDANCE OHMS d-c	OUTPUT IMPEDANCE SOURCE INDUCTANCE	SLEWING RATE VOLTS/μSec.	PRICE	SHIP WGT. (lbs.)
OPS 7–2B	0–7	0–2	0.0005	+15 μH	0.5	$147.00♦	4
OPS 15–1.5B	0–15	0–1.5	0.001	+15 μH	1.0	147.00♦	4
OPS 21–1B	0–21	0–1	0.0025	+15 μH	1.0	147.00♦	4
OPS 40–0.5B	0–40	0–0.5	0.008	+15 μH	1.5	147.00♦	4
OPS 72–0.3B	0–72	0–0.3	0.025	+15 μH	1.5	147.00♦	4
OPS 100–0.2B	0–100	0–0.2	0.050	+15 μH	2.0	147.00♦	4
OPS 20	0–20	0–0.05	0.04	+150 μH	1.0	199.00	7
OPS 7–2BTA	0–7	0–2	0.0005	+150 μH	0.25	$192.00	6
OPS 15–1.5BTA	0–15	0–1.5	0.001	+150 μH	0.25	192.00	6
OPS 21–1BTA	0–21	0–1	0.0025	+150 μH	0.5	192.00	6
OPS 40–0.5BTA	0–40	0–0.5	0.008	+150 μH	1.0	192.00	6
OPS 72–0.3BTA	0–72	0–0.3	0.025	+150 μH	1.0	192.00	6
OPS 100–0.2BTA	0–100	0–0.2	0.050	+150 μH	1.5	192.00	6

● Full output current to 65°C, no derating.
♦ For case, add Suffix "C" to model number and $12.00 to price.

his bulation specifies the limit of change in the mpler offsets for defined variations in the major fluces. To obtain a realistic appraisal of the be- avir in your environment, multiply each influence y i probable range of variation and sum the perti- ent fects.

SPECIFICATION	VOLTAGE AMPLIFIER OFFSETS* OFFSET VOLTAGE ΔE_{io}	VOLTAGE AMPLIFIER OFFSETS* OFFSET CURRENT ΔI_{io}	REFERENCES ±6.2V *
SRCE: 105-125/210-250V a-c	<10 μV	<2 nA	<0.0001%
LD: No load — full load	<200 μV	<5 nA	———
TE: 8-hours (drift)	<20 μV	<2 nA	<0.005%
TMPERATURE: Per °C	<20 μV	<5 nA	<0.005%

Ots and the reference contribute to output change ΔE_O, by the equation $\Delta E_O = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback re tor and R_i is the input resistor from the signal reference. Use the offsets to calculate the output effects.



Bench Style Model OPS 20

PEN LOOP d-c GAIN: >0.5×10⁶ volts per volt.

OUTPUT SLEWING RATE: See chart. (measured as the chord o t first time constant on the exponential response).

SINUSOIDAL FREQUENCY RESPONSE: $f_{max.} = \frac{\text{Slew Rate}}{\pi E_{pp}}$ (E_{pp} is the peak-to-peak voltage excursion.)

RIPPLE: <0.01% of max. output, or 3mV whichever is greater.

MAXIMUM CAPACITIVE LOADING: 0.001 microfarads. Excess capitance slows response and causes peaking of response and nstability. Adjustable lag networks provide for small ran of load reactance.

TRANSIENT RESPONSE Voltage Mode (for step load current): recvery is an exponential with 50 microsecond time constant. Current Mode (for step load voltage): recovery is the recip- roc of the slewing rate.

OFFSET NULLING: Fixed part of input offset voltage and inp offset currents can be nulled. OPS-BTA models feature fro panel nulling. The "B" Modules have internal trimmers.

REFERENCES: Two at +6.2V and –6.2V; 1 mA max.

PROGRAMMING: Control by the manipulation of input and feeack elements. The OPS is a high gain inverting amplifier tha obeys the equation $E_{OUT} = -E_{IN}(Z_{feedback}/Z_{input})$.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1Ø.

TEMPERATURE, AMBIENT OPERATING: –20°C to +65°C.

TEMPERATURE, STORAGE: –40°C to +85° C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CURRENT LIMITING: Adjustable from 10% to 110% of rated current.

TERMINALS: Connections via a rear mounted barrier strip. Modules and OPS-BTA include a PC connector. Bench models have front panel terminal pattern.

DIMENSIONS: See dimensional listings on Page 1117.

Model OPS 20 is available in a bench style case only.
OPS 7-2B to OPS 100-0.2B are available uncased, or with CA-1 case (-C), or as plug-in patch board units (-TA).

FINISH: *Modules:* Blue anodized aluminum.
Panels: Light gray, color 26440 per Fed Std. 595.
Bench style Case: Charcoal gray texture. (OPS 20 only)

MOUNTING: Cased modules may be racked with adapters RA 12-1, RA 13-4 or RA 11-16. Uncased modules with BPA-22 adapter and the (-TA) plug-in units, mount in housings CA-3, CA-4, CA-5 or RA 22-6. Model OPS 20 may be rack mounted with RA-24. *See Hardware Section.*

Dated prices subject to change without notice.

All terms used in the specifications are defined in the Kepco Glossary.

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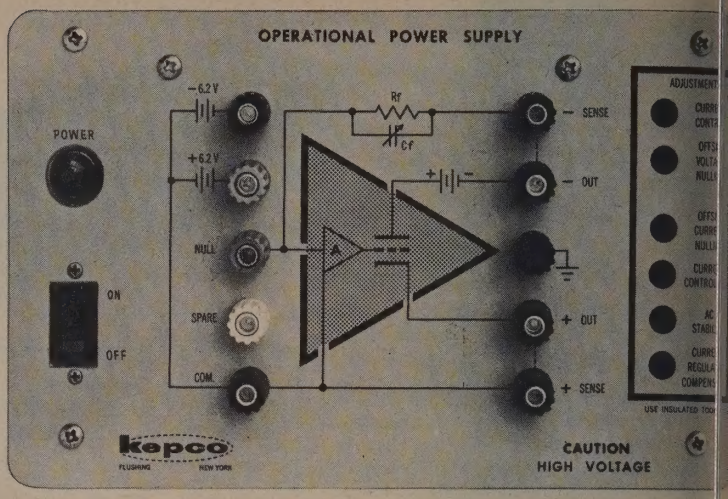
KEPCO OPS HYBRID

POWER SUPPLIES

The Kepco Operational Power Supply is a unique instrument; a combination self-powered operational power amplifier and d-c power supply. The OPS group is suitable for a wide variety of signal processing chores: scaling, summing, integrating and impedance transformation. The OPS Hybrids utilize a high voltage vacuum tube, together with a d-c coupled transistor amplifier. Their fast output slewing enables the OPS models to be fast-recovery, programmable, current controllers or audio spectrum voltage amplifiers.



Model OPS 1(

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS●	OUTPUT IMPEDANCE OHMS d-c	OUTPUT IMPEDANCE SOURCE INDUCTANCE	SLEWING RATE VOLTS/μSec.	PRICE	SHIP WGT. (lbs.)
OPS 500	0–500	0–0.04	1.25	1mH	1	$394.00	20
OPS 1000	0–1000	0–0.02	5.0	1mH	1	394.00	20
OPS 2000	0–2000	0–0.01	20.0	1mH	1	394.00	20

● Full output current to 65°C, no derating.

This tabulation specifies the limit of change in the amplifier offsets—or current mode output effects—for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	VOLTAGE AMPLIFIER OFFSETS* OFFSET VOLTAGE ΔE_{io}	VOLTAGE AMPLIFIER OFFSETS* OFFSET CURRENT ΔI_{io}	OUTPUT EFFECTS CURRENT MODE AUTO-CROSSOVER (Internal Sensing)	REFERENCES ±6.2V *
SOURCE: 105-125/210-250V a-c	<0.1mV	<10nA	<10 μA	<0.0005%
LOAD: No load — full load	<1.0mV	<10nA	<10 μA	———
TIME: 8-hours (drift)	<0.1mV	<100nA	<0.01%	<0.005%
TEMPERATURE: Per °C	<0.5mV	<100nA	<0.01%	<0.005%

Offsets and the reference contribute to output change ΔE_o, by the equation $\Delta E_o = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.

OPEN LOOP d-c GAIN: $>0.5X10^6$ volts per volt.

OUTPUT SLEWING RATE: See chart. (Measured as the chord to the first time constant on the exponential response.)

SINUSOIDAL FREQUENCY RESPONSE: f.max. $= \dfrac{\text{Slew Rate}}{\pi E_{pp}}$ (E_{pp} is the peak-to-peak voltage excursion.)

RIPPLE: <0.01% of max. output or 3mV, whichever is greater.

MAXIMUM CAPACITIVE LOADING: 0.001 microfarads. Excess capacitance slows response and causes peaking of response and ringing. Adjustable lag networks will compensate for small range of load reactance.

TRANSIENT RESPONSE Voltage Mode (for step load current): recovery is an exponential with 50 microsecond time constant. **Current Mode (for step load voltage):** Recovery is the reciprocal of the slewing rate.

OFFSET NULLING: Fixed part of input/offset voltage and input/offset currents can be nulled. OPS (Hybrid) models feature front panel nulling.

REFERENCES: Two at +6.2V and −6.2V; 1 mA maximum.

PROGRAMMING: Control by the manipulation of input d feedback elements. The OPS is a high gain inverting amp er that obeys the equation $E_{OUT} = -E_{IN}\,(Z_{feedback}/Z_{input})$. The positive terminal is common.

INPUT: 105–125V a-c or 210–250V ac (selected), 50–6 Hz single phase.

TEMPERATURE, AMBIENT OPERATING: −20°C to +65°C

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from he grounded case. A maximum of 1000 volts (d-c or peak) c be connected between either output terminal and the case.

TERMINALS: Connections via a rear mounted barrier ip. Front panel terminal pattern provides for easy access in et-ting up operational manipulations.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panels:* Light gray, Color 26440 per Fed. Std. 595. *Cases:* Charcoal gray texture.

MOUNTING: Units may be rack mounted with RA–24. ee Hardware Section.

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Gl ary.*

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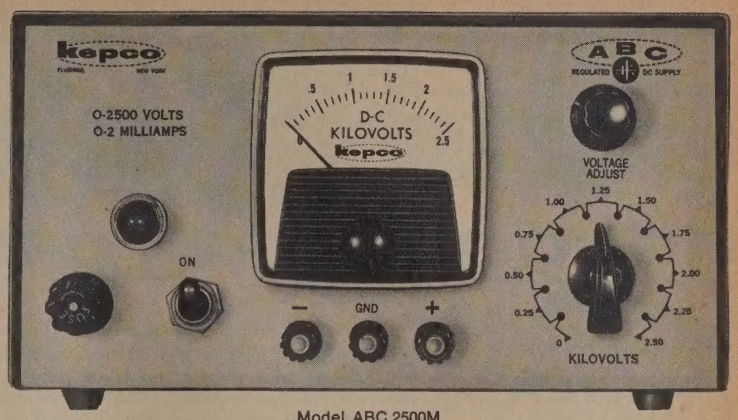
KEPCO ABC® HYBRID POWER SUPPLIES

The ABC group of bench-style programmable voltage regulators span a wide range of voltages. The transistor group covers 0–2V to 0–100V; the hybrid group 0–200V to 0–2500V. Hybrid models employ a high voltage vacuum tube series regulator, convection cooled, driven by a high gain transistor amplifier. The 0–200 and 0–425 volt models employ a continuous 1-turn wirewound, 20 PPM TC voltage control. The 0–1000 volt, 0–1500 volt and 0–2500 volt models employ a 10-step voltage selector with 10-turn vernier. They may be programmed, however, continuously from zero to their rated voltage.



Model ABC 2500M

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	RIPPLE (max) RMS mV	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE ◆	SHIP WGT. (lbs.)
ABC 200M	0–200	0–0.1	0.5	1	0.5	2.0+ 2.0	0.5	$236.00	13
ABC 425M	0–425	0–0.05	0.5	4	0.5	2.0+ 2.0	0.5	236.00	14
ABC 1000M	0–1000	0–0.02	1.0	25	1.0	2.0+10.0	0.5	331.00	14
ABC 1500M	0–1500	0–0.01	1.0	75	1.0	2.0+10.0	0.3	331.00	14
ABC 2500M	0–2500	0–0.002	1.0	625	1.0	2.0+10.0	0.3	410.00	18

◆ Price includes meter, for unmetered model, delete suffix "M" and deduct $20.00 for models ABC 200 and ABC 425. Deduct $15.00 for models ABC 1000, 1500 and 2500 (any quantity order).

● Full output current to 55°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE** (External Sensing)
OUTPUT RANGE:	0–100% E_O max.	1 mA–100% I_O max.
SOURCE: 105-125/210-250V a-c	<0.05% or 5 mV*	<0.1% at rated sample**
LOAD: No load – full load	<0.05% or 5 mV*	<0.1% at rated sample**
TIME: 8-hours (drift)	<0.05% or 50 mV*	<0.1% or 10 μA*
TEMPERATURE: Per °C	<0.05%	<0.1% at rated sample**
RIPPLE: (rms)	See Table above	<0.1% I_O max.

*whichever is greater
**Rated sample is 10V d-c across external current sampling resistor, with external current control.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz single phase.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 1000 volts (d-c or peak) can be connected between either terminal and the case.

AC OUTPUT: 6.5V AC, 2A unregulated, available at the rear terminals of Models ABC 200M and ABC 425M.

CONTROL RESOLUTION: 0.05%, 10-turn voltage control on Models ABC 200M and ABC 425M. Resolution is 0.005% with 10-position selector and 10-turn vernier voltage control on Models ABC 1000M, ABC 1500M and ABC 2500M.

PROGRAMMING: ABC Models except Model ABC 2500 are fully programmable by resistance or external voltage signals. Model ABC 2500 can be controlled throughout its range by resistances. The control range for external voltage or current signals is restricted to the upper 2/3 of its output range. Control current is 1 mA with built-in calibrating control. (100 ohms/V). The positive terminal is common.

VOLTAGE RECOVERY (for step load current): <50 μseconds.

CURRENT LIMITING: Single turn panel adjustment sets limit from 25% to 150% of rated full current on Models ABC 200M and ABC 425M. A fixed limit set to approximately 150% is provided on Models ABC 1000M, ABC 1500M and ABC 2500M.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

METERS: Suffix "M" designates a single dual scale 2½", 2% volt-ammeter with selector switch, for models ABC 200M and ABC 425M. Voltmeter only for Models ABC 1000M, ABC 1500M and ABC 2500M.
Delete suffix "M" for unmetered unit.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at the rear contains output and control terminals.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Brushed aluminum. *Case:* Charcoal gray texture.

MOUNTING: Mount single unit in rack adapter RA-5, two abreast in rack adapter RA-4. *See Hardware section.*

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glossary.*

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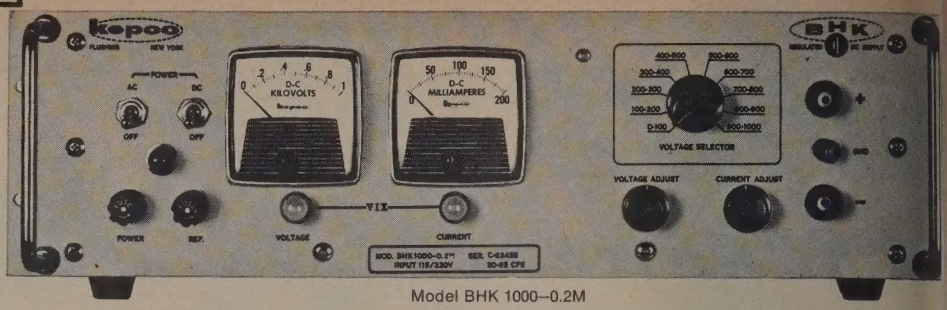
KEPCO BHK

HIGH VOLTAGE

POWER SUPPLIES



Model BHK 1000—0.2M

The high voltage hybrid BHK models employ twin-transistor amplifiers (one for voltage, the other for current) to drive a series pass tube regulator in either voltage or current mode, with automatic crossover and VIX® mode indicators. By restrapping for high speed, the same model is also a fast programmable voltage or quick recovery current source. Built-in offset nulling controls allow precision operational programming. Panel controls are 10-turn, 20 PPM TC wirewound, with a 10-position selector for additional voltage resolution.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS●	OUTPUT IMPEDANCE Ohms + Microhenries d-c-100Hz	0-1-1kHz	1-100kHz+μH	PRICE ♦	SHIP WGT. (lbs.)
BHK 500—0.4M	0—500	0—0.4	0.13	0.1	0.2 + 0.5	$883.00	40
BHK 1000—0.2M	0—1000	0—0.2	0.5	0.1	0.2 + 0.5	883.00	46
BHK 2000—0.1M	0—2000	0—0.1	2.0	0.2	0.5 + 2.0	910.00	49

♦ Price includes meters, for unmetered models, delete suffix "M". In quantities of 12 or more units, deduct $30.00 from price.

● Full output current to 55°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (Internal Sensing)	VOLTAGE AMPLIFIER OFFSETS** ΔE_{io}	ΔI_{io}	VOLTAGE REFERENCE (INTERNAL)**
OUTPUT RANGE:	0-100% E_O max.	0.2%-100% I_O max.	——	——	Fixed 6.2V±5%
SOURCE: 105-125/210-250V a-c	<0.005% or 1 mV*	<100 μA	<1 mV	<10 nA	0.0001%
LOAD: No load — full load	<0.01% or 1 mV*	<100 μA	<1 mV	<10 nA	——
TIME: 8-hours (drift)	<0.01% or 2.0 mV*	<0.01% or 20μA*	<50 μV	<50 nA	0.005%
TEMPERATURE: Per °C	<0.01%	<0.05% of I_O max.	<100 μV	<50 nA	0.005%
RIPPLE: (rms)	<1 mV	<100 μA	——	——	——

**whichever is greater.*

***Offsets and the reference contribute to output change ΔE_O, by the equation $\Delta E_O = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.*

AUTOMATIC CROSSOVER: Selects voltage regulation or current regulation operating mode automatically.

VIX® CIRCUIT: Voltage/Current mode indicators display operating conditions; also 115V a-c control signal (0.5A max.)

TEMPERATURE, AMBIENT OPERATING: −20°C to +55°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

INPUT: 105-125 V a-c or 210-250V a-c (selected), 50-65 Hz single phase. Approximately 4 amperes at 125V a-c.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 1000 volts (d-c or peak) can be connected between either terminal and the case.

CONTROL RESOLUTION: Voltage: 0.005% 10-turn vernier control and 10 position selector. *Current:* 0.05% 10-turn control.

OVERSHOOT: (Turn-on/off): None above 10% voltage setting; negligible below 10% when preloaded to 10% minimum.

SERIES/PARALLEL: Automatic crossover design permits self-determined parallel load sharing, or use of master/slave connection. Series operation to rated isolation.

PROGRAMMING: BHK has independently programmable voltage and current regulators. They can be controlled by resistance or external voltage signals. Control current is 1mA with built-in calibrating controls (1000 ohms/V). The positive terminal is common.

OFFSET NULLING: The initial part of the input offset voltage and input offset current can be nulled with internal controls.

REFERENCES: Two: +6.2 volts and −6.2 volts; maximum current 1 milliampere.

Data and prices subject to change without notice.

OPEN LOOP d-c GAIN: $>0.5 \times 10^6$ volts per volt.

OUTPUT SLEWING RATE: *(Fast slewing connection)*: Great than 500,000 volts per second, measured as the chord to th first time constant on the exponential response.

SINUSOIDAL FREQUENCY RESPONSE:

Fast Slewing Connection: $f_{max} = \frac{160}{E_{pp}}$ kHz.

(E_{pp} is the peak-to-peak excursion).

RIPPLE, Fast Slewing Connection:

Ungrounded: <0.1% E_o max.

Grounded: <0.001% E_o max.

TRANSIENT RESPONSE:

Voltage Mode, Fast Slewing: For step load current, recov ery is an exponential with a 50 microsecond time constan

Current Mode, Fast Slewing: For step load voltage, recov ery is at the rate of 2 μsec. per volt.

Voltage Mode, Normal Speed: For step load current, recov ery to regulation band within 50 microseconds.

OUTPUT IMPEDANCE:

Voltage Mode, Normal Speed: See table.

Voltage Mode, Fast Slewing: Above 1kHz, add the reactiv impedance of 500 microhenries.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

METERS: Suffix "M" designates a pair of 2½", 2% meters Delete suffix "M" for unmetered unit.

TERMINALS: Safety (recessed) output connections on front panel; two multi-terminal barrier strips at the rear contain output, sensing and control functions. Fast slewing/normal strapping is internal.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: Light gray, color 26440, per Fed.|Std. 595.

All terms used in the specifications are defined in the Kepco Glossary.

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Model HB 8AM

KEPCO HB

HYBRID POWER SUPPLIES

he high voltage hybrid HB power supplies use a high in transistor comparison amplifier to drive the series ss tube regulator. Voltage feedback is by means of a -position range switch and 10-turn, 20 PPM TC wire- ound vernier control with remote programming with- the span of any one range (to zero with derating). urrent may be regulated with external sensing and edback using the rating chart to determine the allow- ble compliance range.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	AUXILIARY OUTPUT 6.5V a-c Unregulated	MAX. INPUT AMPS at 125 V a-c	PRICE♦	SHIP WGT. (lbs.)
HB 2AM	0–325	0–0.2	0.2	0.08	0.2+0.5	EACH SUPPLY HAS TWO 6 AMPERE OUTPUTS	2.0	$348.00	35
HB 4AM	0–325	0–0.4	0.1	0.08	0.2+0.5		3.0	391.00	35
HB 6AM	0–325	0–0.6	0.06	0.08	0.2+0.5		5.0	423.00	43
HB 8AM	0–325	0–0.8	0.05	0.08	0.2+1.0		5.5	466.00	43
HB 525M	0–525	0–0.5	0.1	0.08	0.2+0.5		8.0	589.00	43

♦ Price includes meters, for unmetered models, delete suffix "M". In quantities of 12 or more units deduct $30.00 from price.

● Full output current to 55°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE (External Sensing)
OUTPUT RANGE:	0–100% E_O max.	10 mA–100% I_O max.
SOURCE: 105-125/210-250V a-c	<0.01%	<0.01% at rated sample**
LOAD: No load — full load	<0.01% or 2 mV*	<0.01% at rated sample**
TIME: 8-hours (drift)	<0.01% or 2 mV*	<0.05% or 0.2 mA*
TEMPERATURE: Per °C	<0.01%	<0.05% at rated sample**
RIPPLE: (rms)	<1 mV	<0.01% of I_O max.

**whichever is greater*
***Rated sample is 10V d-c across external current sampling resistor, with external current control.*

INPUT: 105-125 V or 210-250V a-c (selected), 50—440 Hz, single phase.

TEMPERATURE, AMBIENT OPERATING: —20°C to +55°C.

TEMPERATURE STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 600 volts (d-c or peak) can be connected between either output terminal and the case.

AC OUTPUTS: Two unregulated, 6.5V a-c, 6A outputs.

CONTROL RESOLUTION: 0.02%, 5 step range selector, 10-turn vernier.

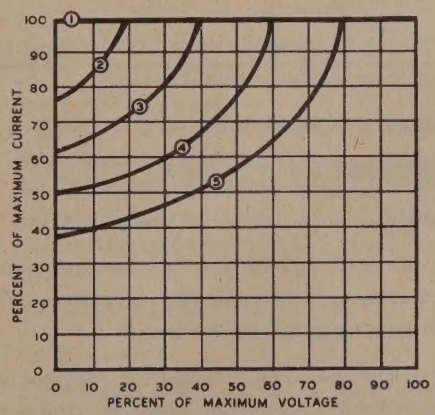
PROGRAMMING: HB is programmable by resistance or external voltage signals within the boundary of each range. By following the rating curves, programs can be executed below the range boundary. Control current is ≅ 10 mA for 100 ohms/V. The positive terminal is common.

VOLTAGE RECOVERY (for step load current): < 50 microseconds.

REMOTE ERROR SENSING: (Model HB 525M only) compensates to 0.5 volt drop per output lead.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded 10% minimum.

RATING CURVES: Output is designed to deliver 100% of rated current within the span of any one range. When operating outside the selected range, either by remote programming, or as the compliance voltage in current mode, use the graph to determine the maximum current that can be drawn at reduced voltage.



RATING CURVES

Curves represent the volt-ampere rating for range switch positions 1–5. To use, determine which position covers the desired voltage. Read the maximum current for each voltage on the left scale.

METERS: Suffix "M" designates a pair of 2½", 2% meters. Delete suffix for unmetered unit.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at the rear contains output, sensing and control terminals.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: Light gray, color 26440, per Fed. Std. 595.

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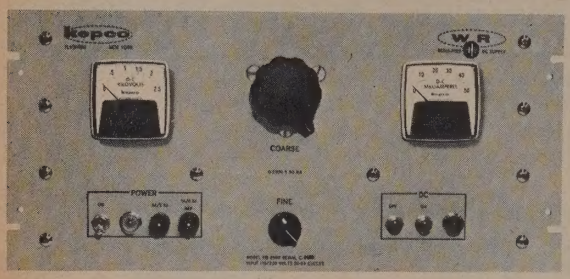
KEPCO™

WR

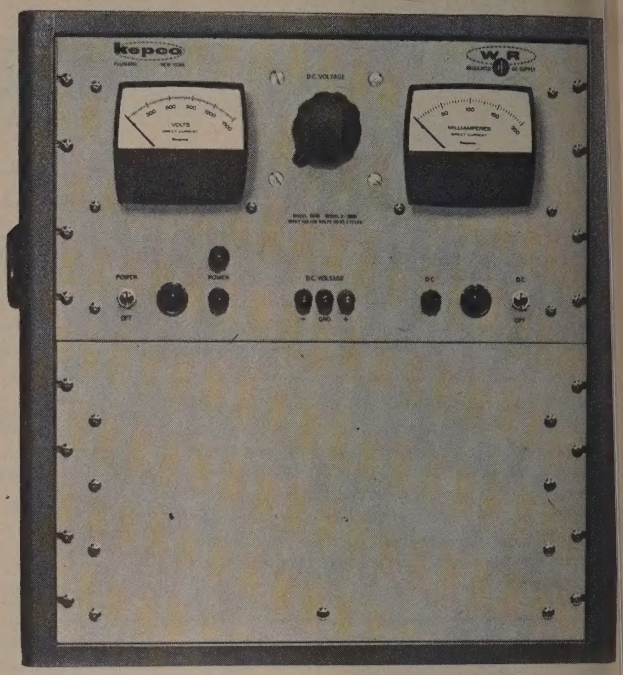
VACUUM TUBE

POWER SUPPLIES

The Kepco WR (Wide Range) design offers well regulated, high voltage in a laboratory-equipment style. Model 605 has an added bias output and an auxiliary output for filaments.



Model HB 2500



Model 1520 B

MODEL	DC OUTPUT RANGE		OUTPUT EFFECTS LOAD 0–MAX.		SOURCE		RIPPLE RMS	OUTPUT IMPEDANCE Ohms + μH			AUXILLIARY OUTPUT 6.3V a-c Unregulated	MAX. INPUT AMPS at 125 V a-c	PRICE ♦	SHIP WGT. (lbs.)
	VOLTS	mA	%	ΔV	%	ΔV	mV	d-c to 100Hz	100Hz to 1kHz	100kHz +μH				
605	0–600	0–500	0.02	0.1	0.1	0.4	3	0.24	0.05	0.2+2	20 AMP	8.0	$ 507.00	119
	Bias 0–150	0–5	—	—	—	—	1	—	—	—	—	—	—	—
1250 B	0–1000	0–500	0.01	0.1	0.05	0.4	3	0.2	0.1	1.0+2	—	12.5	782.00	203
1520 B	0–1500	0–200	0.01	0.1	0.05	0.4	3	0.75	0.3	1.0+5	—	7.0	844.00	204
HB 2050	0–2000	0–500	0.005	0.1	0.02	0.4	3	0.2	0.5	2.0+5	—	24.0	1,855.00	312
HB 2500	0–2500	0–50	0.005	0.1	0.02	0.4	5	2.5	0.5	2.0+5	—	5.0	1,096.00	85

♦ Available metered only.

INPUT: 105-125 V. a-c 50-65 Hz single phase, 400 Hz input is available on special order. Please consult the factory.

TEMPERATURE, AMBIENT OPERATING: –20°C to +55°C

TEMPERATURE, STORAGE: –40°C to +85°C

COOLING: Convection

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 400 volts (d-c or peak) can be connected between either terminal or the case.

CONTROL RESOLUTION: All models except HB 2500 use a single turn control with 0.5% resolution. Model HB 2500 has coarse and fine controls. The fine control covers a 1% range with 0.005% resolution.

VOLTAGE RECOVERY STEP LOAD CURRENT: <50 microseconds

METERS: Each model has a separate 2% voltmeter and ammeter.

TERMINALS: Output and ground terminals are on the front panel and on the rear, except models HB 2050 and HB 2500 which have rear mounted terminals only.

FINISH: Panels light gray, color 26440 per Fed. Std. 595. Cabinets are a charcoal gray texture.

CABINETS: Models 1250B, 1520B and HB 2050 are supplied in a rack cabinet.

DIMENSIONS

MODEL	HEIGHT"	WIDTH"	DEPTH"
605	10½	19	17 7/8
1250B*	28 (26¼)	22 (19)	15½ (13⅞)
1520B*	23 (21)	22 (19)	15½ (13⅞)
HB 2050*	33½ (31½)	22 (19)	18 (17⅞)
HB 2500	8¾	19	14

*Units are supplied in a cabinet. First figure includes cabinet, second figure ( ) is the equipment dimension for mounting in separate rack.

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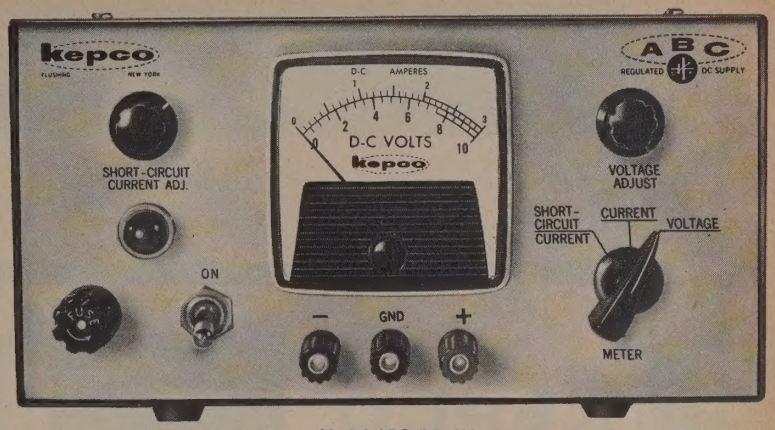
KEPCO ABC® ALL-TRANSISTOR POWER SUPPLIES



Model ABC 7.5–2M

The ABC group of bench-style programmable voltage regulators span a wide range of voltages. The transistor group covers 0–2V to 0–100V; the hybrid group 0–200V to 0–2500V. All-transistor models employ a PNP series regulator, convection cooled, driven by a high gain transistor amplifier. These models feature 10-turn wirewound, 20 PPM TC voltage controls and panel-adjustable current limiting.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	RIPPLE (max) RMS MV.	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE◆	SHIP WGT. (lbs.)
ABC 2–1M	0–2	0–1	0.25	0.001	0.01	0.1 +0.5	0.3	$141.00	10
ABC 7.5–2M	0–7.5	0–2	0.25	0.002	0.01	0.05+0.5	0.5	188.00	14
ABC 10–0.75M	0–10	0–0.75	0.25	0.007	0.02	0.1 +1	0.3	141.00	10
ABC 15–1M	0–15	0–1	0.25	0.008	0.01	0.05+0.5	0.5	188.00	13
ABC 18–0.5M	0–18	0–0.5	0.25	0.02	0.02	0.1 +1	0.3	141.00	10
ABC 30–0.3M	0–30	0–0.3	0.25	0.05	0.02	0.1 +1	0.3	141.00	10
ABC 40–0.5M	0–40	0–0.5	0.25	0.04	0.02	0.05+0.5	0.5	188.00	14
ABC 100–0.2M	0–100	0–0.2	0.25	0.25	0.05	0.05+1	0.5	211.00	14

◆ Price includes volt/ammeter, for unmetered models, delete suffix "M" and deduct $20 from price (any quantity order).
● Full output current to 50°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE** (External Sensing)
OUTPUT RANGE:	0–100% E_O max.	1 mA to 100% I_O
SOURCE: 105-125/210-250V a-c	<0.05% or 1 mV*	<0.1% at rated sample**
LOAD: No load — full load	<0.05% or 1 mV*	<0.5% at rated sample**
TIME: 8-hours (drift)	<0.05% or 3 mV*	<0.1% or 1 mA*
TEMPERATURE: Per °C	<0.05%	<0.1% at rated sample**
RIPPLE: (rms)	<0.25 mV	<0.1% of I_O max.

*whichever is greater
**Rated sample is 1V d-c across external current sampling resistor, with external current control.

INPUT: 105-125V a-c or 210-250V a-c (selected), 50-440 Hz, single phase

TEMPERATURE, AMBIENT OPERATING: –20°C to +50°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROL RESOLUTION: 0.05%, 10-turn voltage control.

PROGRAMMING: ABC is fully programmable by resistance or external voltage signals. Control current is 1 mA with built-in calibration control (1000 ohms/V) — the negative terminal is common.

VOLTAGE RECOVERY: (for step load current): <50 μsec.

CURRENT LIMITING: Single turn panel adjustment sets limit from 25% to 150% of rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting. Negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Series operation to rated isolation; also master/slave capability. Current limiting design permits self-determined parallel load sharing.

METERS: The suffix "M" designates a single dual scale volt-ammeter, 2½", 2%, with selector switch. Delete suffix for unmetered unit.

TERMINALS: Binding posts on front panel, plus, minus and ground. Multi-terminal barrier strip at rear contains output, sensing and control terminals.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Brushed aluminum
Case: Charcoal gray texture.

MOUNTING: Mount single unit in rack adapter RA-5, two abreast in rack adapter RA-4. *See Hardware section.*

Data and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco Glossary.

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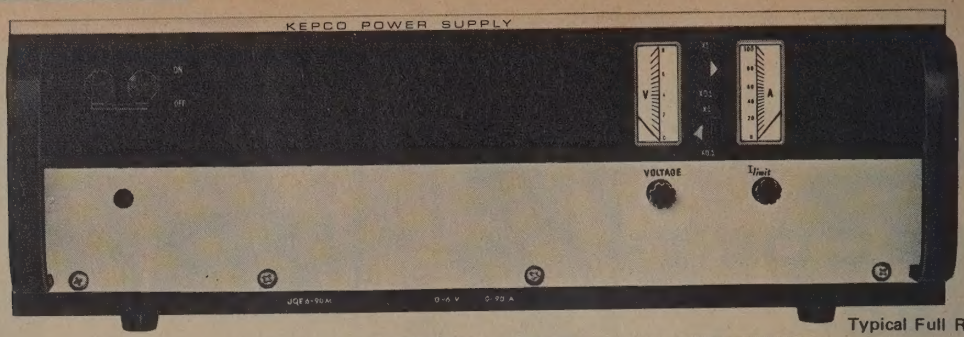
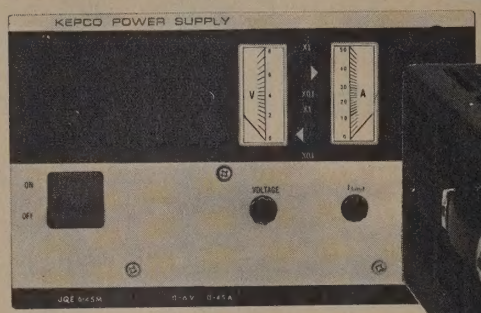
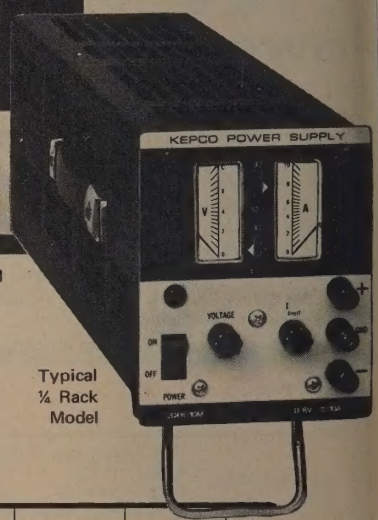


Typical Full Rack Model

KEPCO JQE COMPACT POWER SUPPLIES



Typical ½ Rack Model



Typical ¼ Rack Model

JQE power supplies are compact general-purpose laboratory voltage regulators. They are equipped with a panel-adjusted overload current limiter and can be converted to current regulation by using external sensing and feedback resistors. JQE models feature a linear full-dissipation series NPN transistor-regulator driven by a monolithic linear I-C amplifier. Output is fully programmable with an offset zeroing control available as an option. An overvoltage crowbar is also an optional accessory (mounts internally). The JQE-HS high-speed option is recommended for current control because of its fast-recovery characteristics, and for fast programming applications.

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS ●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100Hz to 1kHz	1kHz to 100kHz + μH	MAX.* INPUT AMPS at 125 V a-c	RACK SIZE	PRICE	VP OPTION	SHIP WGT. (lbs.)
JQE 6–10M	0–6	0–10	30 μΩ	0.01	0.02 +1	2.0	1/4	$ 310.00	$ 81.00	21
JQE 6–22M	0–6	0–22	14 μΩ	0.005	0.01 +0.5	4.2	1/2	557.00	102.00	34
JQE 6–45M	0–6	0–45	7 μΩ	0.005	0.01 +0.5	9.0	1/2	669.00	102.00	48
JQE 6–90M	0–6	0–90	3.5 μΩ	0.001	0.005+0.5	15.7	Full	1,046.00	124.00	95
JQE 15–6M	0–15	0–6	125 μΩ	0.01	0.02 +1	2.1	1/4	310.00	81.00	21
JQE 15–12M	0–15	0–12	63 μΩ	0.005	0.01 +0.5	4.0	1/2	557.00	102.00	34
JQE 15–25M	0–15	0–25	30 μΩ	0.005	0.01 +0.5	8.4	1/2	669.00	102.00	48
JQE 15–50M	0–15	0–50	15 μΩ	0.001	0.005+0.5	16.6	Full	1,046.00	124.00	95
JQE 25–4M	0–25	0–4	300 μΩ	0.01	0.02 +1	2.2	1/4	310.00	81.00	21
JQE 25–10M	0–25	0–10	125 μΩ	0.005	0.01 +0.5	5.3	1/2	557.00	102.00	34
JQE 25–20M	0–25	0–20	63 μΩ	0.005	0.01 +0.5	10.5	1/2	669.00	102.00	48
JQE 25–40M	0–25	0–40	31 μΩ	0.001	0.005+0.5	21.0	Full	1,046.00	124.00	95
JQE 36–3M	0–36	0–3	600 μΩ	0.01	0.02 +1	2.2	1/4	310.00	81.00	21
JQE 36–8M	0–36	0–8	225 μΩ	0.005	0.01 +0.5	6.0	1/2	557.00	102.00	34
JQE 36–15M	0–36	0–15	120 μΩ	0.005	0.01 +0.5	9.5	1/2	669.00	102.00	48
JQE 36–30M	0–36	0–30	60 μΩ	0.001	0.005+0.5	19.0	Full	1,046.00	124.00	95
JQE 55–2M	0–55	0–2	1.4 mΩ	0.01	0.02 +1	2.3	1/4	321.00	81.00	21
JQE 55–5M	0–55	0–5	550 μΩ	0.01	0.02 +1	5.0	1/2	557.00	102.00	34
JQE 55–10M	0–55	0–10	275 μΩ	0.01	0.02 +1	9.0	1/2	669.00	102.00	48
JQE 55–20M	0–55	0–20	138 μΩ	0.01	0.02 +1	18.0	Full	1,046.00	124.00	95
JQE 75–1.5M	0–75	0–1.5	2.5 mΩ	0.01	0.02 +1	2.3	1/4	321.00	81.00	21
JQE 75–3M	0–75	0–3	1.25 mΩ	0.005	0.01 +1	4.0	1/2	557.00	102.00	34
JQE 75–8M	0–75	0–8	469 μΩ	0.005	0.01 +1	10.0	1/2	669.00	102.00	48
JQE 75–15M	0–75	0–15	250 μΩ	0.005	0.01 +1	18.0	Full	1,046.00	124.00	95
JQE 100–1M	0–100	0–1	5 mΩ	0.01	0.05 +2	2.1	1/4	321.00	81.00	21
JQE 100–2.5M	0–100	0–2.5	2 mΩ	0.005	0.02 +1	4.5	1/2	557.00	102.00	34
JQE 100–5M	0–100	0–5	1.25 mΩ	0.005	0.02 +1	8.4	1/2	669.00	102.00	48
JQE 100–10M	0–100	0–10	0.62 mΩ	0.005	0.02 +1	17.0	Full	1,046.00	124.00	95
JQE 150–1.5M	0–150	0–1.5	5 mΩ	0.01	0.05 +2	4.6	1/2	568.00	102.00	34
JQE 150–3.5M	0–150	0–3.5	2.2 mΩ	0.01	0.05 +2	8.7	1/2	691.00	102.00	48
JQE 150–7M	0–150	0–7	1.1 mΩ	0.01	0.05 +2	18.0	Full	1,067.00	134.00	95

● Full output current to 71°C, no derating.

*at 125V a-c, Pf. typical 0.7

This tabluation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variations and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE**	VOLTAGE AMPLIFIER OFFSETS*** OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	VOLTAGE REFERENCE (INTERNAL)***
OUTPUT RANGE:	0–100% E_o max.	1 mA–100% I_o max.	——	——	Fixed 6.2V±5%
SOURCE: 105-125/210-250V a-c	<0.0005%	<0.005%**	<10 μV	<2 nA	0.0001%
LOAD: No load — full load	<0.005% or 0.2 mV*	<0.01%**	<200 μV	<5 nA	——
TIME: 8-hours (drift)	<0.01% or 1 mV*	<0.02**	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C	<0.01%†	<0.02**†	<20 μV	<5 nA	0.005%
RIPPLE: (rms)	<0.2 mV	<0.02% of I_o max.	——	——	——

*whichever is greater.

**External sensing, using a 1V sample. Effects are measured at rated sample voltage with 20 PPM external current feedback control.

***Offsets and the reference contribute to output change ΔE_O, by the equation $\Delta E_O = \pm\Delta E_{ref}(R_f/R_i) \pm\Delta E_{io}(1+R_f/R_i) \pm\Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.

†See OPTIONS for 0.005% per °C voltage mode — 0.01% per °C current mode temperature effect coefficient.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-65 Hz, 1Ø

TEMPERATURE, AMBIENT OPERATING: –20°C to + 71°C

TEMPERATURE, STORAGE: –50°C to + 85°C

COOLING: Forced air, built-in blower.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROLS: *Voltage:* 10-turn wirewound rheostat, Resolution: 0.05%.
Current: Multiturn vernier potentiometer.

PROGRAMMING: JQE is fully programmable by resistance or external voltage signals. Control current is 1mA with built-in calibration control (1000 ohms/V). For operational (amplifier) control, an offset voltage nulling control is available, see option "–E". High Speed models provide fast response to programming commands. (See option "–HS".) The positive terminal is common.

OPEN LOOP d-c GAIN: $>0.5\times10^6$ volts per volt.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 0.005% or 2 mV of setting.

OVERSHOOT (Turn on/off): Conventional speed models exhibit no overshoot when set above 25% of rated voltage or at any voltage setting when loaded to 10% of rated current (not applicable to HS models).

CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

SERIES/PARALLEL: Series operation to the rated isolation voltage. Units may be paralleled by employing their current limiters.

METERS: Two dual range, 2-inch, 2% recessed meters, monitor output voltage and current. 10:1 range switching. Unmetered versions available as modules, delete suffix "M" and deduct $30.00 from listed price (any quantity).

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Light gray, Color 26440, per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: JQE ¼ rack and ½ rack size models fit the RA-24 hardware system (*see hardware section*). Full rack sized models have accessory flanges for direct installation in standard 19" racks. Unmetered JQE models are in modular form for chassis mounting — or may be mounted in RA-24 by use of an adapter plate RAP 24-1J for ¼ rack size; RAP 24-2J for ½ rack size. Full rack units are predrilled for Jonathan slides 110 QD 20-1, 22-1, 24-1.

OPTIONS: (add suffix to the model number)

"–HS" HIGH SPEED OPTION for fast programming.

Output Slewing Rate: 100V per millisecond for models up to 20 amperes. 50V per millisecond for models over 20 amperes. Measured as the chord of the exponential to its first time constant.

Ripple: <0.01% of E_0 Max. or 3mV whichever is greater.

Output Impedance: From 1KHz to 100KHz add an inductance of 100 μH to the impedance specification in the table.

For HS option, add $50.00 to unit price. The HS option includes an offset voltage nulling control.

"–VP" OVERVOLTAGE CROWBAR: Shorts output terminals through an SCR if voltage attempts to exceed preset limit. Not available with HS option. (See table for price.)

Limit level range: 3 V d-c to 175V d-c.

Trigger time: 5-10 μsec., adjustable delay to minimize false alarms.

Threshold: 5% of output level — or 0.25 volts, whichever is greater.

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Add $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational programming. Zeros the fixed part of the control amplifier's voltage offset. Add $10.00 to price.

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glossary.*

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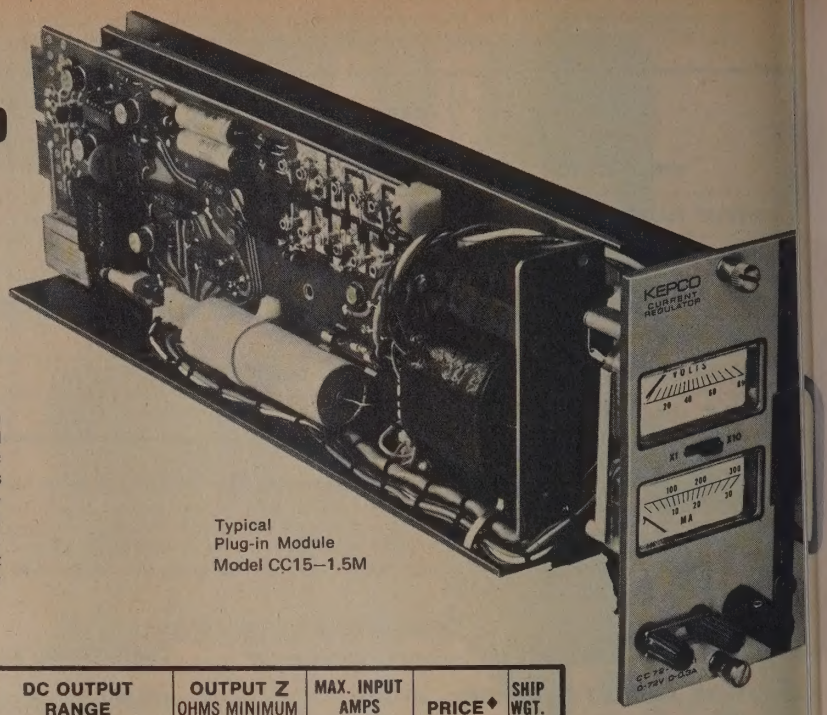
KEPCO™

CC

CONSTANT CURRENT

POWER SUPPLIES

The CC plug-in modules are current controllers with built-in dual-range, current-sensing resistors and 10-turn control. They employ Kepco's monolithic linear I-C amplifier driving a self-cooled NPN series transistor-regulator. Capacitorless output filtering ensures rapid recovery from switching or load transients. Output current ranges from true zero (no minimum) to the selected range (10% or 100% of the current rating) with 10-turn resolution. Metering is isolated by means of an I-C voltage follower.



Typical
Plug-in Module
Model CC15–1.5M

MODEL	DC OUTPUT RANGE CURRENT	DC OUTPUT RANGE VOLTAGE	OUTPUT Z OHMS MINIMUM +SHUNT μf	MAX. INPUT AMPS at 125V AC	PRICE♦	SHIP WGT. (lbs.)
CC 7–2M	**0–2A**	**0–7V**	35kΩ+0.1	0.50	**$209.00**	6
CC 15–1.5M	**0–1.5A**	**0–15V**	100kΩ+0.1	0.65	**209.00**	6
CC 21–1M	**0–1A**	**0–21V**	200kΩ+0.1	0.45	**209.00**	6
CC 40–0.5M	**0–0.5A**	**0–40V**	800kΩ+0.1	0.40	**209.00**	6
CC 72–0.3M	**0–0.3A**	**0–72V**	2.4MΩ+0.1	0.45	**209.00**	6
CC 100–0.2M	**0–0.2A**	**0–100V**	10MΩ+0.1	0.45	**209.00**	6

♦ Uncased, available metered only. See MOUNTING below.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS CURRENT MODE
OUTPUT RANGE:	0–100% or 0–10%, switched
SOURCE: 105-125/210-250V a-c	<0.0005% or 0.2 μA* (105-125)
LOAD: No load – full load	<0.005% or 2 μA*
TIME: 8-hours (drift)	<0.02% or 2 μA*
TEMPERATURE: Per °C	<0.01%
RIPPLE: (rms)	<0.02% of selected scale

**whichever is greater*

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1Ø.

TEMPERATURE, AMBIENT OPERATING: –20°C to +65°C.

TEMPERATURE, STORAGE: –40°C to +85°C.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

CONTROLS: A panel mounted output range selector switches the output either 0–100% I_o max. or 0–10% I_o max. A 10-turn precision current control operates full span through either range. Resolution: 0.05% of the full scale value. A combination on-off slide switch and pilot light provides primary power control.

PROGRAMMING: Control loop uses 0.1 milliampere, current sample is approximately 1V d-c. Supply may be programmed through either current range by a 0-10,000 ohm rheostat. (range switch is not programmable).

MAXIMUM CAPACITIVE LOADING: 0.001 microfarads.

CURRENT RECOVERY (for step load voltage): <2 μsec/volt, except Model CC 7-2M: 4 μsec/volt, measured to the first time constant on the exponential response.

VOLTAGE LIMITING: Fixed at approximately 150-200% of th rated compliance voltage.

SERIES/PARALLEL: Parallel operation of current sources ma be made without restriction. Series operation through the us of master-slave interconnection.

COOLING: Convection.

METERS: Two 2% recessed meters monitor output curren and compliance voltage. Current is displayed on a dual-scal meter whose range is switched with the range switch. Bot meters employ an isolation amplifier to minimize the loadin error.

TERMINALS: Output terminals (shorted) are located on th front panel, a-c input, output and control terminals are vi a rear PC connection which mates with the connector mount ed in the various housings and rack cabinets. These connector are. in turn, wired to barrier strips for easy access.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Light gray, color 26440, per Fed. Std. 595.
Housings: Charcoal gray texture.

MOUNTING: Power supplies are uncased, must be plugged into one of the following available housings: CA-3; single; CA-4; dual, CA-5; triple or RA 22-66-unit. *See Hardware section.*

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glossary.*

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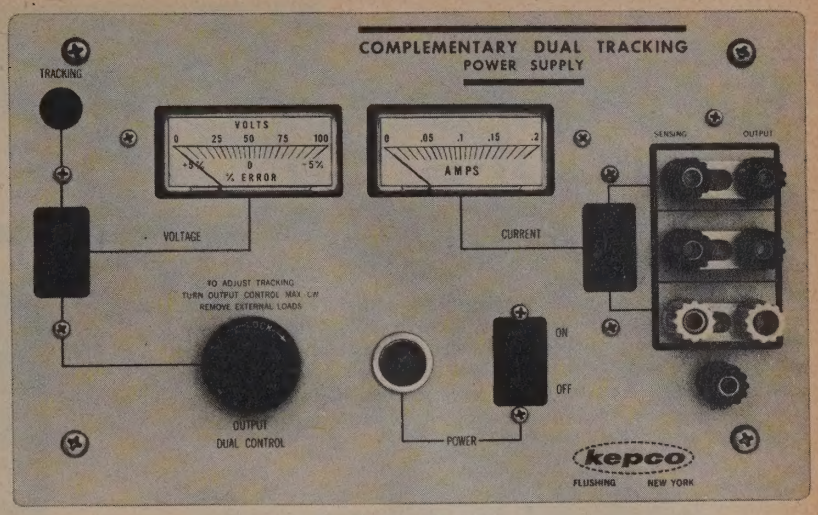
KEPCO CDT

DUAL TRACKING

POWER SUPPLIES

The complementary dual-tracking power supplies consist of two regulators coupled together in a complementary manner using a common reference and a single output voltage control. They may be used to drive independent plus (+) and minus (−) loads or may be used in series for double voltage to a single load.



Model CDT 100–0.2M

MODEL	TWIN OUTPUTS* COMPLEMENTARY VOLTS	COMPLEMENTARY AMPS●	SERIES VOLTS	SERIES AMPS●	INDIVIDUAL SUPPLIES OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE♦	SHIP WGT. (lbs.)
CDT 15–1.5M	0–±15	0–±1.5	0–30	0–1.5	0.001	0.02	0.1+1	1.3	$427.00	19
CDT 40–0.5M	0–±40	0–±0.5	0–80	0–0.5	0.008	0.02	0.1+1	0.8	427.00	19
CDT 100–0.2M	0–±100	0–±0.2	0–200	0–0.2	0.05	0.02	0.1+1	0.9	427.00	19

**Each Power Supply contains two sources with a common voltage control, may be used as complementary (plus and minus) supplies or in series for double voltage.*

♦ Available metered only.

● Full output current to 65°C, no derating.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE COMPLEMENTARY**	SERIES
OUTPUT RANGE:	0 to $+E_O$ and 0 to $-E_O$	0 to twice E_O
SOURCE: 105-125/210-250V a-c	<0.005%	<0.005%
LOAD: No load — full load	<0.01% or 1mV*	<0.01% or 2mV*
TIME: 8-hours (drift)	<0.01% or 2mV*	<0.01% or 4mV*
TEMPERATURE: Per °C	<0.01%	<0.01%
RIPPLE: (rms)	<0.25mV	<0.5mV

**whichever is greater*

***Specifications are for the individual supplies, changes in the master supply (plus output) are repeated 1:1 in the slave supply.*

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz.

TEMPERATURE, AMBIENT OPERATING: −20°C to +65°C.

TEMPERATURE, STORAGE: −40°C to +85°C.

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) can be connected between either output terminal and the case.

OUTPUT: The individual power supplies are wired in series, controlled with a single voltage control. They may be loaded in series or separately.

CONTROLS: A 10 turn voltage control adjusts the output of the positive supply, designated "master", this voltage in turn controls the negative supply or "slave" in a 1:1 ratio. The two power supplies are connected in series. Control resolution is 0.05%.

TRACKING: ±5% range of adjustment is controlled by a recessed front panel control. Units can be adjusted to within ±0.5% using panel meter. Closer adjustment with external instrumentation.

PROGRAMMING: The master supply can be controlled by resistance or external voltage signals. Control current is 1 mA with built-in calibration control (1000 ohms/V). The plus output terminal is the programming return.

VOLTAGE RECOVERY, (for step load current): <50 μseconds.

CURRENT LIMITING: Each supply is individually limited with a 10% to 105% range of adjustment.

REMOTE ERROR SENSING: Compensates for up to 0.5 volt drop per output lead.

OVERSHOOT: (Turn-on/off): None above 25% voltage setting. Negligible below 25% when preloaded to 10% minimum.

METERS: Voltmeter monitors output of MASTER, or the difference between MASTER and SLAVE, displayed as a percentage error (range ±5%). Ammeter monitors current from either supply (selectable).

TERMINALS: Binding posts on the front panel for plus, common and minus outputs, also sensing terminals and separate ground. Barrier strip at the rear has duplicate output, sensing and control terminals.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Light gray Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Rack adapter RA-24. *See Hardware section.*

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glossary.*

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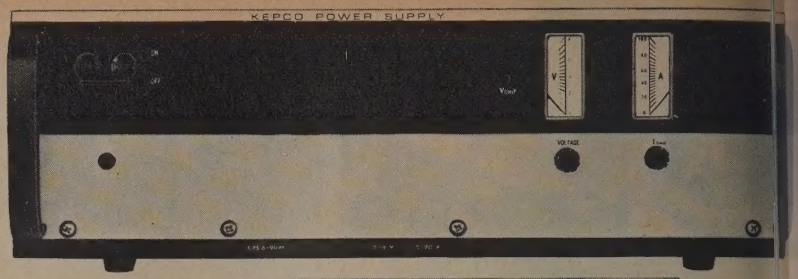
KEPCO CPS

COMPUTER I-C

POWER SUPPLIES



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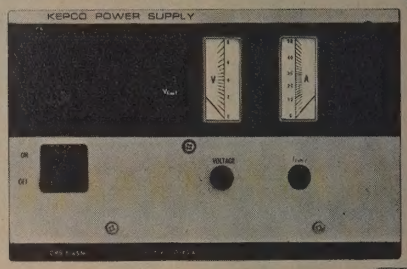

Typical
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CPS Power Supplies are especially designed for driving digital I-C's. They feature an integral overvoltage crowbar and a linear full-dissipation series NPN transistor-regulator driven by a monolithic linear amplifier. On/off switching and crowbar reset is accomplished by a panel-mounted circuit breaker. The metered models feature panel-mounted, 10-turn voltage controls and dual meters. The CPS Power Supplies are also available unmetered, in modular form for OEM's with controls recessed.

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE**	VOLTAGE AMPLIFIER OFFSETS*** OFFSET VOLTAGE ΔE_{io}	OFFSET CURRENT ΔI_{io}	VOLTAGE REFERENCE (INTERNAL)***
OUTPUT RANGE:	0–100% E_o max.	1 mA–100% I^o max.	——	——	Fixed 6.2V±5%
SOURCE: 105-125/210-250V a-c	<0.0005%	<0.005%**	<10 μV	<2 nA	0.0001%
LOAD: No load – full load	<0.005% or 0.2 mV*	<0.01%**	<200 μV	<5 nA	——
TIME: 8-hours (drift)	<0.01% or 1 mV*	<0.02**	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C	<0.01%†	<0.02**†	<20 μV	<5 nA	0.005%
RIPPLE: (rms)	<0.2 mV	<0.02% of I_o max.	——	——	——

*whichever is greater. †See OPTIONS for 0.005% per °C voltage mode – 0.01% per °C current mode temperature effect coefficient.
**External sensing, using a 1V sample. Effects are measured at rated sample voltage with 20 PPM external current feedback control.
***Offsets and the reference contribute to output change ΔE_o, by the equation $\Delta E_o = \pm\Delta E_{ref}(R_f/R_i) \pm \Delta E_{io}(1+R_f/R_i) \pm \Delta I_{io}(R_f)$ where R_f is the feedback resistor and R_i is the input resistor from the signal reference. Use the offsets to calculate output variations when external input/feedback elements are substituted for the internal reference and voltage control in special applications.

MODEL	DC OUTPUT RANGE VOLTS	AMPS●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100Hz to 1kHz	1kHz to 100kHz+μH	RACK SIZE	PRICE♦	SHIP WGT. (lbs.)
CPS 6–10M	0–6	0–10	$30X10^{-6}$	0.02	0.05+1	¼	$ 392.00	21
CPS 6–22M	0–6	0–22	$14X10^{-6}$	0.02	0.05+1	½	626.00	34
CPS 6–45M	0–6	0–45	$7X10^{-6}$	0.02	0.05+1	½	707.00	48
CPS 6–90M	0–6	0–90	$3.5X10^{-6}$	0.02	0.05+1	Full	1,065.00	95
CPS 15–6M	0–15	0–6	$125X10^{-6}$	0.02	0.05+1	¼	392.00	21
CPS 15–12M	0–15	0–12	$63X10^{-6}$	0.02	0.05+1	½	626.00	34
CPS 15–25M	0–15	0–25	$30X10^{-6}$	0.02	0.05+1	½	707.00	48
CPS 15–50M	0–15	0–50	$15X10^{-6}$	0.02	0.05+1	Full	1,065.00	95

♦ Price is for the metered unit, deduct $30.00 for modular style.
● Full output current to 71°C, no derating.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-65 Hz. 1Ø.

TEMPERATURE: AMBIENT OPERATING: –20°C to +71°C

TEMPERATURE, STORAGE: –50°C to + 85°C

COOLING: Forced air, built-in blower.

CONTROLS: *Voltage:* 10-turn, wirewound rheostat.
Resolution: 0.05%.
Current: Multiturn vernier potentiometer.

Unmetered models (without suffix M) are designed for chassis mounting as modules and have their voltage control and current limit control recessed.

PROGRAMMING: Control loop uses 1 milliampere. Supply may be programmed by resistance at 1000 ohms per volt, or may be operationally controlled as an amplifier (common positive) using voltage or current signals.

VOLTAGE RECOVERY (for step load current): <50 μseconds for recovery to within 2 mV of setting.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

CURRENT LIMITING: Adjustable from 10% to 105% of the rated full current.

REMOTE ERROR SENSING: Compensates up to 0.5V drop per output lead.

SERIES/PARALLEL: Series operation to the rated isolation v age. Units may be paralleled by employing their current limite

ISOLATION: The output terminals are isolated from t grounded case. A maximum of 500 volts (d-c or peak) m be connected between either terminal and the case.

METERS: Two dual range, 2-inch, 2% recessed meters, mo itor output voltage and current. Unmetered versions availab as modules, delete suffix "M" and deduct $30.00 from list price (any quantity).

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: (Metered models only have a panel).
Panel: Light gray, Color 26440 per Fed. Std. 5
Case: Charcoal gray texture.

MOUNTING: Full rack sized models have accessory flange for direct installation in standard 19" racks. Unmetered CP models are in modular form for chassis mounting or may b mounted in RA-24 by use of an adapter plate RAP 24-1 (fo ¼ rack size) and RAP 24-2 (for ½ rack size). Full rack unit are pre-drilled for Jonathan Slides 110 QD 20-1, 22-1, 24-

OPTIONS: (add suffix to the model number)

"–T" LOWER TEMPERATURE EFFECT COEFFICIENT: 0.005% per °C in voltage mode, 0.01% per °C in current mode. Ad $30.00 to price.

"–E" OFFSET VOLTAGE NULLING: For operational program ming. Zeros the fixed part of the control amplifier's voltag offset. Add $10.00 to price.

OVERVOLTAGE PROTECTOR: (built-in) An integral ove voltage crowbar is set by means of a recessed multitur panel control. Range is from 3V d-c to the maximum voltag rating plus 10%.

Triggering Time: 5-10 microseconds with an adjustable dela to minimize the false alarm rate.

Threshold: May be set to within 5% or 0.25 volts (whic ever is greater) of the power supply's output voltage.

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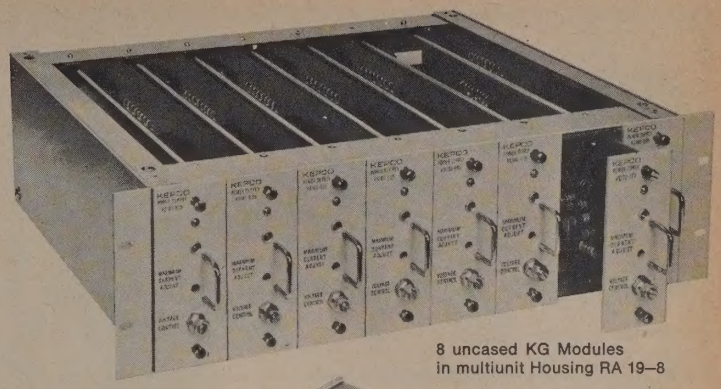
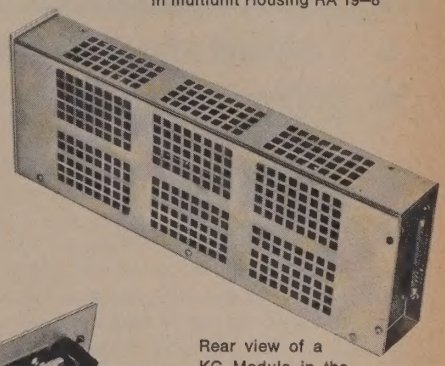


8 uncased KG Modules in multiunit Housing RA 19–8

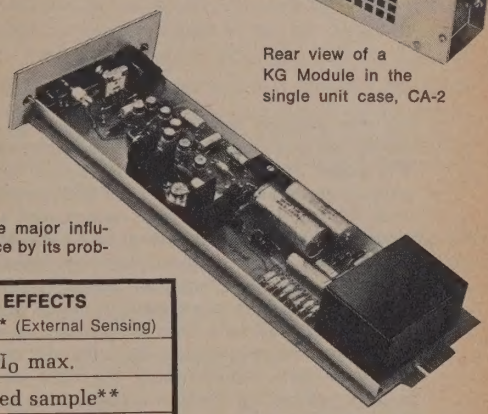
The KG isolated module is designed for driving balanced electronic circuits and bridges - often used with electromechanical transducers. The KG module offers minimal common mode line-coupled current, achieved by stringent isolation of the power transformer and line-related components, and nonmetallic, low-capacitance mounting. The modules are designed for plug-in mounting 8-abreast in a 19-inch rack or in an individual plug-in case.



Rear view of a KG Module in the single unit case, CA-2

MODEL	DC OUTPUT RANGE VOLTS	DC OUTPUT RANGE AMPS●	OUTPUT IMPEDANCE Ohms + Microhenries d-c to 100Hz	100 Hz to 1kHz	1kHz to 100kHz+μH	MAX. INPUT AMPS at 125 V a-c	PRICE ♦	SHIP WGT. (lbs.)
G 25–0.2	0–25	0–0.2	0.006	0.01	0.1+1	0.2	$188.00	4
G 100–0.05	0–100	0–0.05	0.1	0.01	0.1+1	0.2	188.00	4

Modules have been especially isolated for minimum common mode nal and least ground coupling to the power line.
Uncased, see MOUNTING below.
Full output current to 50°C, no derating.



Uncased KG Module

s tabulation specifies the limit of change in the regulated output for defined variations in the major influces. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probe range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE** (External Sensing)
OUTPUT RANGE:	0–100% E_O max.	1 mA–100% I_O max.
SOURCE: 105-125/210-250V a-c	<0.001%	<0.001% at rated sample**
LOAD: No load — full load	<0.005% or 0.5 mV*	<0.01% at rated sample**
TIME: 8-hours (drift)	<0.005% or 1 mV*	<0.01% at rated sample**
TEMPERATURE: Per °C	<0.005%	<0.01% at rated sample**
RIPPLE: (rms)	<0.1 mV	<0.01% of I_O max.

whichever is greater
Rated sample is 1Vd-c across external current sampling resistor, with external current control.

PUT: 105-125V a-c, 50-65 Hz, single phase.
verseas Models: For 210-250V a-c input, consult factory.
EMPERATURE, AMBIENT OPERATING: –20°C to +50°C.
EMPERATURE, STORAGE: –40°C to +85°C.
OOLING: Convection.
OLATION: Volts: 500 volts to ground, maximum.
Ohms: 10 K megohms to ground, minimum.
Capacitance: 200 picofarads to ground, max.
Leakage: 50 nA to ground, maximum.
Input to output: 1 picofarad, maximum.
ONTROL RESOLUTION: 0.05%, 10-turn voltage control, rewdriver adjustment, with lock.
ROGRAMMING: KG is programmable by an external rheostat 1000 ohms/V (option R provides a calibration control) the sitive terminal is common. An offeset voltage nulling conol is available, see option "E".
OLTAGE RECOVERY (for step load current): <50 microsecnds for recovery to within 0.005% or 2 mV of setting.
URRENT LIMITING: Recessed panel adjustment from 5% 110% of rated current.

OVERSHOOT (Turn-on/off): None above 25% voltage setting; negligible below 25% when preloaded to 10% minimum.

SERIES/PARALLEL: Current limiting design permits self-determined parallel load-sharing. Series operation to rated isolation.

TERMINALS: All connections are made through printed circuit connector in housing, a-c input, d-c output, sensing and control. A blank terminal is provided which can be wired for operational control using voltage or current signals.

FINISH: Light gray, Color 26440 per Fed Std. 595.

DIMENSIONS: See dimensional listings on Page 1117.

MOUNTING: The uncased KG module must be plugged into either a single unit case, CA-2 or the 8-unit rack adapter, RA 19-8. Both housings contain integral plug-in connectors. *See hardware section.*

OPTIONS: (add suffix to the model number).

"–R" CONTROL CURRENT ADJUSTMENT: ± 10% trimmer provides for programming calibration. Add $10.00 to price.

"–E" OFFSET VOLTAGE NULLING: zeros the fixed part of the control amplifier's offset voltage. Add $10.00 to price.

ta and prices subject to change without notice.

All terms used in the specifications are defined in the Kepco Glossary.

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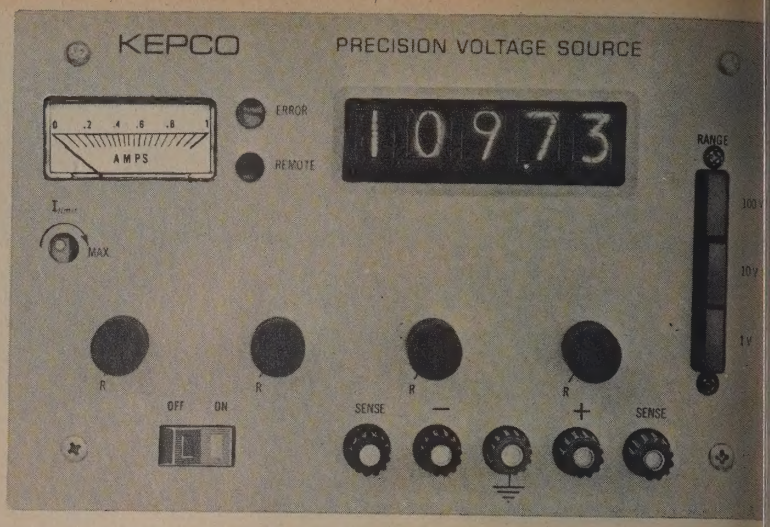
KEPCO PVS

PRECISION VOLTAGE SOURCE

POWER SUPPLIES

- *4 digit output selection*
- *3 decimal range selection*
- *BCD programming (switch closures)*
- *digital display*
- *current limiting*



Model PVS 100–1M — Price: $937.00 — Ship Wgt.: 37 l
Model PVS 100–1MG — Price: 873.00 — Ship Wgt.: 37 l

OUTPUT:	0.0000–100.00 volts
CURRENT:	0–1 ampere

This tabulation specifies the limit of change in the regulated output for defined variations in the major influences. To obtain a realistic appraisal of the behaviour in your environment, multiply each influence by its probable range of variation and sum the pertinent effects.

SPECIFICATION	OUTPUT EFFECTS VOLTAGE MODE
SOURCE: 105-125/210-250V a-c	<0.0005%
LOAD: No load — full load	<0.001% or 0.1 mV*
TIME: 8-hours (drift)	<0.005% or 1 mV*
TEMPERATURE: Per °C	<0.005% per °C
READOUT ACCURACY:	0.02% of full scale
RESOLUTION:	100 microvolts
RIPPLE: (rms)	<100μV rms
OUTPUT IMPEDANCE:	d-c–1kHz: $10^{-3}\Omega$ 1kHz–100kHz: $10^{-2}\Omega + 1\mu h$

*whichever is greater

The PVS Precision Voltage Source features an extremely low drift linear amplifier driving a self-cooled NPN power transistor stage. Voltage control is by means of digitally selected (1–2–4–8 BCD) precision —low TC, high stability feedback resistors with a 3-decade oven-controlled reference. Output is displayed on a 4½ digit readout with a built-in error-detecting system to prevent false indication. Output current is metered and the limit is adjustable. A remote digital programming connector is fitted to the voltage control (BCD switch closures). Model with suffix "G" omits the remote digital control feature. The 0.02% overall accuracy qualifies the Precision Voltage Source as an instrument calibrator.

INPUT: 105-125V a-c or 210-250V a-c (selected) 50-440 Hz, 1Ø.

TEMPERATURE, AMBIENT OPERATING: −20°C to +55°C (no derating).

TEMPERATURE, STORAGE: −40°C to +85°C

COOLING: Convection.

ISOLATION: The output terminals are isolated from the grounded case. A maximum of 500 volts (d-c or peak) may be connected between either terminal and the case.

CONTROLS: Four (4) 10-position rotary switches select voltage in conjunction with three push button decimal range selectors. A recessed current limit control is accessible through the front panel.

OVERRANGE: 10% overrange on each range; e.g., 1.099V, 10.999V and 109.99 volts (derate current to 0.6 amperes at 109.99 volts).

PROGRAMMING: External switch closures will program the output in a 1-2-4-8 BCD code. This connector is omitted in the model with suffix "G".

CURRENT LIMITING: Recessed multiturn trimmer adjusts t current limiting from 10% to 105% I_O max.

VOLTAGE RECOVERY (for step load current): <50 μsecon for recovery to within 0.005% or 2 mV of setting.

REMOTE ERROR SENSING: Compensates up to 0.5V dr per output lead. Error sensing terminals located on the fro panel.

OVERSHOOT (Turn-on/off): None above 25% voltage settin negligible below 25% when preloaded to 10% minimum.

METERS: Voltage is indicated on a four-digit numerical di play with a fifth-digit overrange. Current on a 2-inch, 2% r cessed ammeter.

TERMINALS: Binding posts on the front panel, plus/minu ground and error sensing. Connections at the rear for outpu error sensing and programming functions.

DIMENSIONS: See dimensional listings on Page 1117.

FINISH: *Panel:* Light gray, Color 26440 per Fed. Std. 595.
Case: Charcoal gray texture.

MOUNTING: Fits RA-24 rack adapter. *See hardware sectior*

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All terms used in the specifications are defined in the Kepco Glossar

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KEPCO

PROGRAMMER FUNCTION GENERATOR

Model FG 100 — Price: $616.00 — Shp. Wgt. 16 lbs.

odel FG-100 is a precision, slow speed, triangular wave-rm generator capable of generating any repetitive ramp nction. Separately adjustable, high and low limits, are pro-ded which periodically reverse the direction of the inte-ation. The rising rate and falling rate are separately adjust-ble or can be controlled symmetrically with a single control.

UTPUTS: All outputs available simultaneously.
#1 — 0–20V d-c, 0–20 ma.
#2 — 0–10 ma to program 100 ohm/volt power supply.
#3 — 0–1 ma to program 1000 ohm/volt power supply.

NPUT: 105–125V or 210–250V a-c, 50–440 Hz.

IMING: 4 ranges: 0.1V/sec., 1.0V/sec., 10V/sec., 100V/sec. ising and falling slopes continuously adjustable between anges either separately or symmetrically. For outputs #2 nd #3, divide the above timing by 2000 and 20,000 respec-ively to obtain milliamperes per second.

IMITS: Separately adjustable high limit and low limit per-nits operation between any two pre-set voltages or currents.

REVERSING SWITCHES: Programming direction is automat-ically reversed at the high and low limits. In addition, a pair of push buttons are provided which permit the direction to be reversed at any point in the operating span. A pair of directional lamps are provided to show the direction of the ramp.

METER: 2½" edgewise meter monitors output in volts (0–20V a-c) and in percent of maximum output, 0–100%.

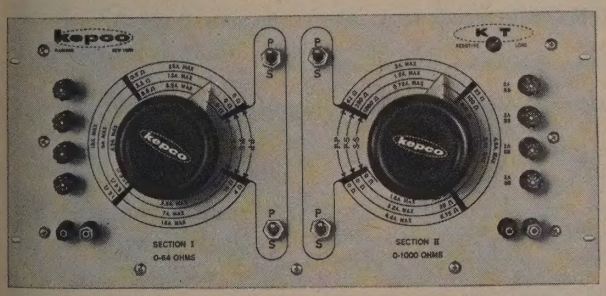
PROGRAMMING: Model FG–100 may be used by itself to generate a wide variety of very low speed triangular or saw-tooth functions, or it can be used directly with any pro-grammable d-c power supply. When connected to a pro-grammable power supply, the Model FG-100 Function Gen-erator programs the power supply throughout all or part of its rated voltage or current range as set by the power sup-ply's controls and the function generator's limit settings. NOTE: function speed is converted to programming speed by multiplying the driving current rate (ma/sec.) by the re-sistance setting of the voltage control of the power supply being programmed. This gives the programming speed of the power supply's output in volts per second.

REMOTE CONTROLS: Timing and limit setting controls are brought to a multi-terminal barrier strip at the rear of the unit for remote operation. A sync output is also provided as is provision for remote directional signals.

DIMENSIONS: 4¼"H x 8 5/32"W x 13⅝"D

MOUNTING: Mount single unit in rack adapter RA-5, two abreast in rack adapter RA-4. *See Hardware Section.*

KEPCO VARIABLE RESISTIVE LOAD



Model KT 6212 — Price: $619.00 — Shp. Wgt. 47 lbs.

The Model KT 6212 is a multiganged, eight-section group of dual-wound power rheostats used in the testing of regulated power supplies.

Model KT 6212 consists of two independent gangs of four rheostats apiece, 0-64 ohms and 0-1000 ohms. The rheostats can be switched for parallel, series parallel and series opera-tion. Each rheostat has heavy and light windings so that the maximum load current changes at approximately each third rotation point around the dial.

CONTROLS:
Switches select series and parallel combinations of the four ganged rheostats with the corresponding resistance and cur-rent rating designated by concentric bands.

Each band defines the resistance range for its particular con-nection with zero ohms (maximum current) in the clockwise position. The bands are divided into three sections that cor-respond to the position of the heavy and light windings, re-spectively. The maximum current in each section is shown on the corresponding portion of the band.

FUSING:
Each rheostat in the 0-64 ohm gang is fused at 7 amperes. Each rheostat of the 0-1000 ohm gang is fused for 2 amperes.

TERMINALS:
A pair of 5-way binding posts is provided at each gang for connection to the power source under test. These connec-tions are duplicated at the rear.

EXTERNAL POWER REQUIREMENTS:
None. The Model KT 6212 is a passive device.

DIMENSIONS:
8¾"H x 19"W x 13⅝"D. The Model KT 6212 resistive load is designed for mounting in standard 19" equipment racks.

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KEPCO DIGITAL PROGRAMMING SYSTEM

DIGITAL PROGRAMMING DECADE

MODEL	DESCRIPTION		COMPANION REGISTER	CABLE TO DPR
DPD–1	4 digit	0–1000.0V	DPR–4	Cable A
DPD–2	4 digit	0–100.00V	DPR–4	Cable B
DPD–3	5 digit	0–1000.00V	DPR–5	Cable A
DPD–4	3 digit	0–1000V	DPR–3	Cable A
DPD–5	3 digit	0–100.0V	DPR–3	Cable B
DPD–6	3 digit	0–10.00V	DPR–3	Cable B
DPD–7	3 digit	Current	DPR–3	Cable B

FUNCTION:
To control the output level (voltage or current) of a d-c Power Supply by means of digitally encoded commands.

OUTPUT RANGE: Each DPD will program 10% overrange and when using the voltage control board has three selectable decimal levels. The largest is shown in the chart; e.g., Model DPD–1, a 4 digit overranging instrument will program: 0–10.999 volts, 0–109.99 volts and 0–1099.9 volts. The DPD–7, a three-digit instrument for the control of current has two selectable decimal levels. A current code board, compatible with the *current rating* of the power supply being controlled, is needed with the DPD–7. Specify the *current code board* when ordering by appending a suffix number to the model equal to the *ampere* rating of the supply being controlled. Specify Model DPD–7–22A for an instru ment to control a 22 ampere power supply. The *current coc board* in Model DPD–7 causes the programmed current t correspond to the numerical display of the companion DPR– Register.

DESCRIPTION: The DPD's use transistor-driven reed relay to actuate resistors in a 1–2–4–8 BCD code. The input parallel (RTL) logic levels or switch closures; the output four-wire resistance and control current command capabi of programming any Kepco Operationally Programmabl Power Supplies. The DPD's may be driven by the suitabl companion DPR which provides serial-parallel conversion data storage and display.

TIMING: Commands to the DPD are sequenced: hold–execut –program, requiring a 10 millisecond sequence time. Thi sequencing is provided by the DPR when used together.

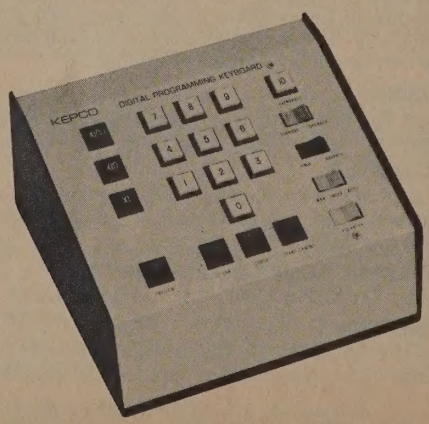
INPUT: logic "0" is 0 to 0.3V d-c
logic "1" is 1 to 3V d-c
input impedance: 3K ohms

POWER REQUIREMENTS:
115V ±10V a-c or 230V ±20V a-c, 50-440 Hz single phase

DIMENSIONS: 5 7/32"H x 8 11/32"W x 12 7/8"D
Rack adapter (Model RA-24) is available)

DIGITAL PROGRAMMING KEYBOARD

Model DPK-1



FUNCTION:
To control the output of a regulated d-c Power Supply wit an adding machine keyboard, through a DPR logic an DPD analog converter. DPK-1 is a manual input — in seria form — for the DPR registers.

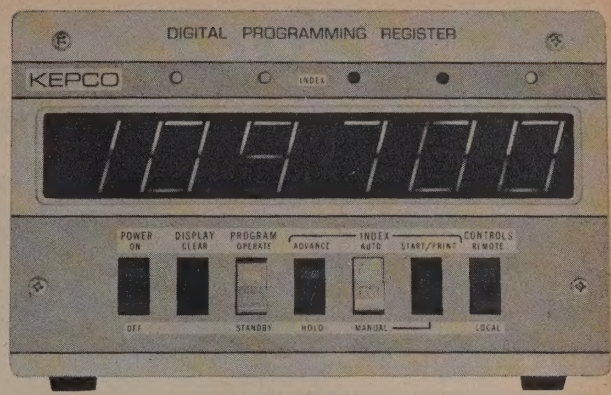
DESCRIPTION:
The DPK-1 uses SPDT keys to generate decimal code an register control signals, which are shaped and processe for delivery to the DPR storage register. Model DPK-1 will program registers DPR-3, DPR-4 and DPR-5

COMMANDS:
10 digit decimal signals, 3 ranges, Space, Clear, Start/Print Index, Hold/Advance, Standby/Operate, Preview, Polarity.

POWER: Supplied from DPR.

DIMENSIONS: 4 5/16"H x 8 11/32"W x 7 5/8"D
Rack adapter (Model RA 29-1) available.

DIGITAL PROGRAMMING REGISTER



Model DPR-5

MODEL	NUMBER OF DISPLAY REGISTERS
DPR-3	3 + Overrange
DPR-4	4 + Overrange
DPR-5	5 + Overrange

NCTION: The registers accept inputs of binary coded de- nal programming signals, display and store them; and pro- le a parallel output signal to a DPD decade for the purpose controlling a power supply. The models DPR are used for storage and display of digital input information within a mplete Digital Programming System.

PUTS: Inputs may be provided by a Model DPK-1 Key- ard or other inputs, such as magnetic or punched tape or de generators.

JTPUTS: The DPR's provide parallel output data on 21 es for presentation to a programming decade DPD-1 – DPD- Simultaneously, a separate output is provided at the front nel consisting of a segmented numeric display, decimal int and index indicator. The index indentifies the register it next in line to receive a command.

e DPR provides the logical sequencing of its companion PD for each command change. At the instant of switching, ning signals from the DPR instruct the DPD to "hold" while w command levels are established. This sequenced action events discontinuities in the output.

OWER REQUIREMENTS: 115V a-c ±10V a-c or 230V a-c 20V a-c, 50-440 Hz single phase.

IMENSIONS: 5 7/32"H x 8 11/32"W x 17 3/8"D. Rack mount with lapter RA-24.

NISH: Panel: Light gray, Color 26440 per Fed. Std. 595.
Cover: Charcoal gray texture.

INPUT LINES: (Serial data) Input Impedance: 1.5 k ohms

Decimal format:	10 lines
BCD format:	5 lines, incl. data pulse
Range selection (decimal point):	3 lines
Function commands:	5 lines
Logic level "0"	0 to 0.3V
Logic level "1":	1 to 3V

OUTPUT LINES: (Parallel data) Output impedance: 640 ohms

DATA LINES	TO DPD	TO PRINTER
DPR-3	12 + 1 common	12 + 1 common
DPR-4	16 + 1 common	16 + 1 common
DPR-5	20 + 1 common	20 + 1 common
Range selection (decimal point):	3 lines	2 lines
Overrange	—	1 line
Polarity	1 line	—
Print signal	—	1 line (150 ohms)
Print complete signal	—	1 line (1000 ohms)
Hold signal	1 line	—

ABLES: There are two types of cabling used to interconnect egister, Decade and Keyboard. Types A and B are available 3 feet and 10 feet lengths. The Type A Cable is used to con- ct a Model DPK-1 to any of the three Registers DPR-3, 4 d 5. Between the Registers and the various Decades, use the ble type listed in table. Use a 4-wire shielded cable (not pplied) between Decade (DPD) and the power supply it to program.

INTERCONNECTING CABLE ASSEMBLIES

TYPE	10' length	3' length	CONNECTS DPR–3–4–5 TO
A	A–10	A–3	DPK–1, DPD–1–3–4
B	B–10	B–3	DPD–2–5–6–7
PC-3	Unwired plug for custom cabling		Mates with all connectors

DIGITAL PROGRAMMING SYSTEM

MODEL	DESCRIPTION	PRICE	SHIP WGT. (LBS.)
DPK–1	Keyboard	$ 247.00	7
DPR–3	3-Digit Register	980.00	24
DPR–4	4-Digit Register	1,090.00	24
DPR–5	5-Digit Register	1,200.00	24
DPD–1	0–1000.0V Decade	846.00	17
DPD–2	0–100.00V Decade	787.00	17
DPD–3	0–1000.00V Decade	899.00	17
DPD–4	0–1000V Decade	760.00	17
DPD–5	0–100.0 Decade	707.00	17
DPD–6	0–10.00 Decade	707.00	17
DPD–7	Current Decade	675.00	17
A–3	Cable, 3'	33.00	2
A–10	Cable, 10'	38.00	4
B–3	Cable, 3'	33.00	2
B–10	Cable, 10'	38.00	4
PC-3	Unwired plug	7.00	½

SYSTEM OPTIONS and ACCESSORIES

PROGRAM BOARDS		SUPPLIED IN DPD MODELS:						
MODEL	PRICE	–1	–2	–3	–4	–5	–6	–7
PB–10K	$107.00	*		*	*			
PB–1K	81.00	*	*	*	*	*		
PB–100	54.00	*	*	*	*	*	*	*
PB–10	54.00	*	*	*		*	*	*
PB–1	54.00		*	*			*	*

OPTIONAL OFFSET CONTROL: Add suffix "E" to model number, e.g.: DPD–2E for an optional E_{io} (voltage offset) zeroing control. Used to control power supplies that lack zeroing facilities.

PRICE: $50.00

CURRENT CODE BOARDS: Plug into DPD–7 to control current. Board of choice is supplied with DPD–7, specified by appending suffix equal to current rating of supply being programmed, e.g.: DPD–7–15 for 15 amp code board. Additional code boards.

PRICE: $50.00 each

PRIMARY LISTIN
VIP
VP-PX
CROSS REFEREN
CPS
JQE

KEPCO™

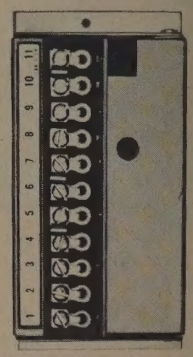
ACCESSORY EQUIPMENT

OVERVOLTAGE CROWBARS

MODEL	VOLTS	AMPS	TRIP TIME μSEC	FOR USE WITH	PRICE	SHIP. WGT. (lbs.)
VIP–1	5–200*	30	50	Stand alone, Overvoltage/Current	$142.00	21
VIP–3	5–200*	30	50	Stand alone, Over and Undervoltage/Current	254.00	21
VIP–4	5–50	200	50	Stand alone, Overvoltage/ Current	332.00	21
VP–PX	3–110	3	5–10**	PAX, PCX Model, bolt onto RA 22–6	86.00	3

* Ranges: 5–50V, 50–100V, 100–150V, 150–200V.

** This model incorporates an adjustable trigger delay which allows a closer setting without an excess false alarm rate.



Model VP–PX

The Kepco VIP (stand alone, rack mounted) and VP (bolt-on) protectors are independent voltage monitors complete with their own power supply, reference, comparator and SCR crowbar. A voltage excursion above the static trigger level (or below, in the case of VIP-3, the undervoltage protector) initiates crowbar conduction to clamp the supply terminals. Simultaneously, a power interlock relay (or connection to the power supply's circuit breaker) trips to remove the primary a-c power. Re-set is automatically accomplished when the a-c power is restored.

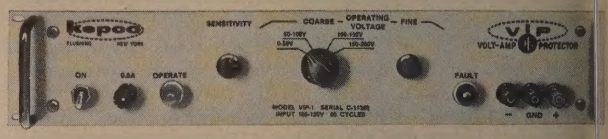
SENSITIVITY: VIP Models: 1% of the operating voltage or 0.1V

VP Model: 5% of the operating voltage or 0.25 volts, whichever is greater.

VIP-1 &-3 Current Sensitivity: 5% of the operating current producing a 1 volt drop across an external sensing resistor.

TEMPERATURE COEFFICIENT: 0.1% or 0.1V (whichever is greater) per °C.

REMOTE ERROR SENSING: Compensates for up to 1V per output lead.

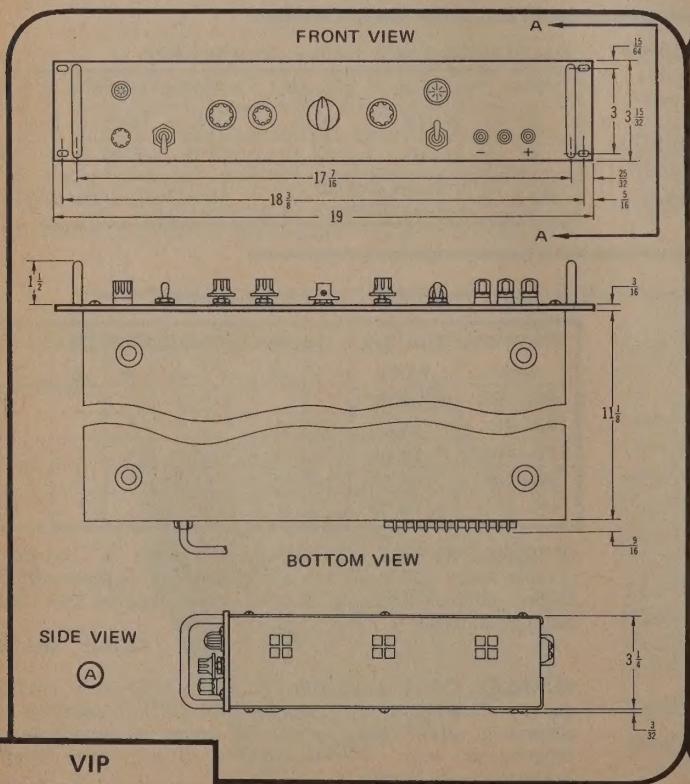


Model VIP–1

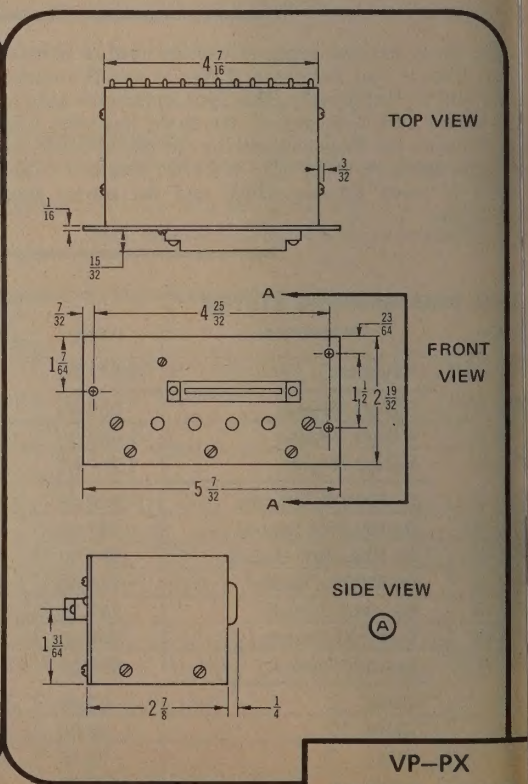
DIMENSIONS: See outline drawings, this section.

FINISH: VIP Panels, light gray, color 26440, per Fed. Std. 5

OPTIONS (Tracking Mode, VIP Models): The VIP may e interconnected with the voltage control of the power sup that it monitors to sense a voltage differential between output of the supply and the programmed voltage. For deta please consult the factory.



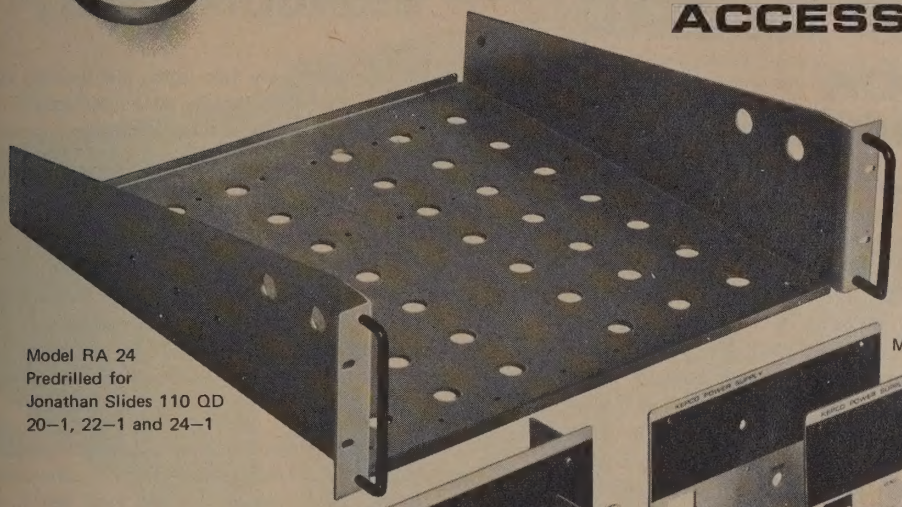
VIP DESIGN GROUP



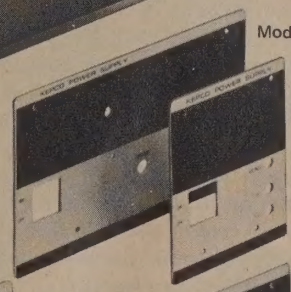
VP–PX DESIGN GROUP

OUTLINE DIMENSIONAL DRAWINGS

KEPCO™
HARDWARE AND MOUNTING ACCESSORIES



Model RA 24
Predrilled for
Jonathan Slides 110 QD
20–1, 22–1 and 24–1

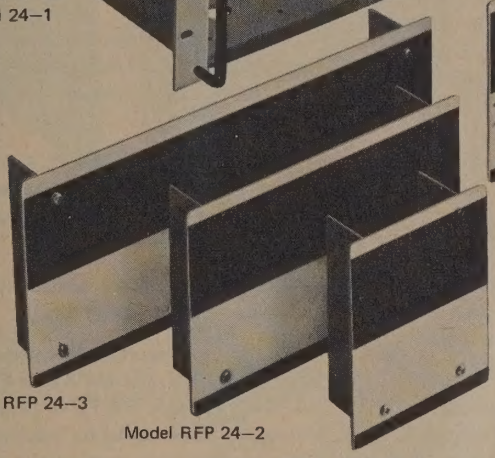


Model RAP 24–2

Model RAP 24–1

CUTOUT PANELS FOR METERLESS MODULES (USE TO FINISH RA–24 (INSTALLATION).

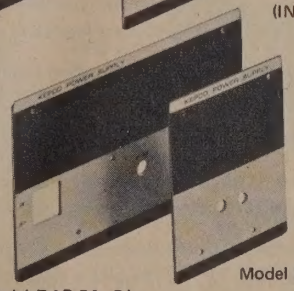
BLANK FILLER PANELS are finished with a matching stripe on one side and solid gray on the other. or 26440 per Fed. Std. 595.



Model RFP 24–3

Model RFP 24–2

Model RFP 24–1

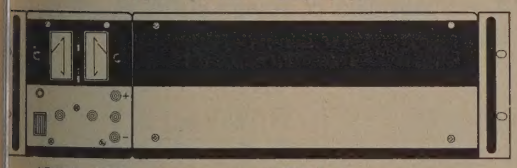


Model RAP 24–2J

Model RAP 24–1J

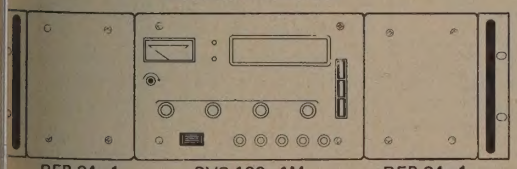
RA 24 RACK SYSTEM

RIGHT OR LEFT LOCATION



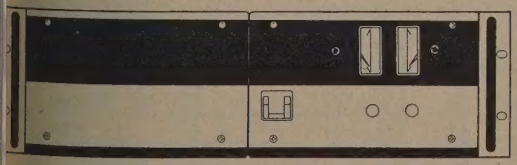
JQE 6–10M RFP 24–3

CENTER LOCATION



RFP 24–1 PVS 100–1M RFP 24–1

RIGHT OR LEFT LOCATION



RFP 24–2 CPS 6–22M

THE RA 24 WILL HOUSE ¼ & ½ RACK SIZED MODELS IN THE FOLLOWING GROUPS:

ABC*, BOP, CDT, CPS, DPD, DPR, FG*, JQE, OPS 20, OPS (Hybrid) & PVS

MODEL	DESCRIPTION	DIMENSIONS H	W	D	PRICE	SHIP. WGT. (LBS.)
RA–24	Rack Adapter for (2) ½ or (4) ¼ Rack Models	5 7/32"	19"	17 7/8"	$23.00	10
RAP 24–1	Adapter for unmetered ¼ Rack CPS Models	5 7/32"	4 5/32"	—	7.00	½
RAP 24–2	Adapter for unmetered ½ Rack CPS Models	5 7/32"	8 11/32"	—	7.00	½
RAP 24–1J	Adapter for unmetered ¼ Rack JQE Models	5 7/32"	4 5/32"	—	7.00	½
RAP 24–2B	Adapter for unmetered ½ Rack BOP Models	5 7/32"	8 11/32"		7.00	½
RAP 24–2J	Adapter for unmetered ½ Rack JQE Models	5 7/32"	8 11/32"	—	7.00	½
*RAP 24–45	Rack Adapter for ABC, FG	—	—	—	12.00	½
RFP 24–1	¼ Filler Panel for RA–24	5 7/32"	4 5/32"	1 5/8	7.00	½
RFP 24–2	½ Filler Panel for RA–24	5 7/32"	8 11/32"	1 5/8	7.00	½
RFP 24–3	¾ Filler Panel for RA–24	5 7/32"	11 3/16"	1 5/8	7.00	½

½ & ¼ RACK POWER SUPPLIES AND PROGRAMMERS CAN BE MOUNTED TOGETHER OR WITH FILLER PANELS IN RA–24.

ata and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glossary.*

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KEPCO
HARDWARE AND MOUNTING EQUIPMENT

6-in-a-RACK MOUNTING SYSTEM

The Kepco 6-in-a-rack concept is designed to solve the problem of multiple output, multiple function power supplies. There are eighteen different models available in three styles (PCX—voltage regulators, CC—current regulators and OPS—operational power supplies). Each style is available in the same six volt/ampere combinations: 0—7V @ 2A, 0—15V @ 1.5A, 0—21V @ 1A, 0—40V @ 0.5A, 0—72V @ 0.3A and 0—100V @ 0.2A. Additionally, the PCX models (voltage regulators) and the OPS models (operational power supplies) are made in two mechanical formats. They are available as modules with or without cases or can be ordered in a "laboratory format" with operating panels complete with controls, terminals and (for the PCX) meters. The CC models (current controllers) are available only in the laboratory format with a 10-turn current control, two meters, on-off switch, pilot light, etc. If you want a modular current controller, you would use the OPS module—with current feedback.

The models in laboratory format are identified by a special suffix. For the voltage regulators, the suffix is "MAT," and the model number would read (for example) PCX 21-1MAT. For the operational power supplies, the suffix is "TA," and the model number would read OPS 21—1BTA. The letter "B" in that suffix is part of the regular (module-style) model number, OPS 21—1B.

Four different mounting assemblies are offered for the three laboratory-style groups. Case CA—3 mounts a single unit with built-in printed circuit-to-barrier strip interface, line cord, handle and feet for bench mounting.

Case CA—4 mounts any two units, identical or dissimila with built-in printed circuit-to-barrier strip interfaces for both m dels. It contains a single line cord, handle and bench mounting fe

Case CA—5 mounts any three units, mixed or matched. Con- tains three printed circuit-to-barrier strip interfaces, line ord handle and feet.

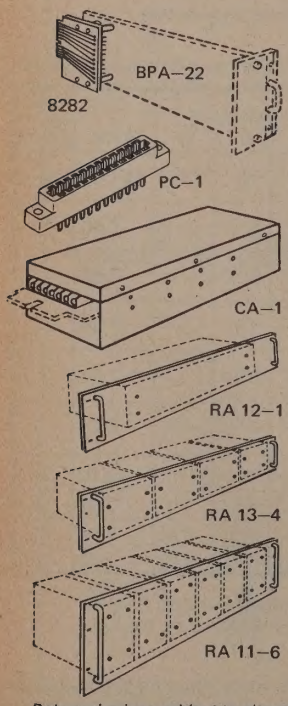
RA 22—6 is a 19" wide housing which fits in 5¼" of sta dard rack space and accepts any six units. RA 22—6 does not i lude any PC-to-barrier strip interfaces. Order these separately as odel PC—2. You'll want one Model PC—2 for each unit mounted the RA 22—6. A line cord is supplied which must be bussed t each active PC—2.

In all of these housings, the power supplies mount on rails s that they will slide in and out freely. A set of coding pins are pr ided so that you may uniquely encode each slot for a par ular supply.

The modular style of the PCX and the OPS models as vi l as Kepco's PAX model can be plugged into the various housi s by mounting an uncased module onto a Model BPA—22 slide adapter.

Various filler panels are available to close off unused slots any of the housings.

A simpler rack mounting adapter is available for the case nod- ules: PCX, OPS and the Kepco PAX models. These are l dels RA 12—1 (single), RA 13—4 (4 units) and RA 11—6 (6 its). Mount the cased model by machine screws to these adapte and make input-output connection by means of a PC con ctor Model PC—1.



HARDWARE FOR PLUG-IN MODELS OPS-BTA, PCX-MAT AND CC POWER SUPPLIES. OPS-B, PAX and PCX models can also be mounted using BPA—22 Adapter.

MODEL	DESCRIPTION	SIZE	PRICE	SHIP. WT. (S)
RA 22—6	Six-slot rack housing w/o plug boards*	5 7/32" H x 19" W x 16 3/8"D	$35.00	1
BPA—22	Blank panel assembly w/slide plate	5 7/32" H x 2 25/32"W x 14 5/8" D	12.00	2
RFP 22—1	Single filler panel	5 7/32" H x 2 25/32"W ——	7.00	½
RFP 22—2	Double filler panel	5 7/32" H x 5 9/16"W ——	7.00	½
RFP 22—3	Triple filler panel	5 7/32" H x 8 3/8" W ——	7.00	½
CA—3	Single-slot housing w/plug board	5 7/32" H x 2 25/32"W x 16" D	22.00	6
CA—4	Double-slot housing w/plug board	5 7/32" H x 5 9/16"W x 16" D	33.00	7
CA—5	Triple-slot housing w/plug board	5 7/32" H x 8 3/8" W x 16" D	43.00	8
PC—2	Plug-in adapter*	5 7/32" H x 2 21/32"W ——	10.00	1
8282	Plug-in Kit for BPA—22	—— —— ——	7.00	½

*For plug-in convenience in the RA 22—6, use (1) PC—2 per lot.

CHASSIS MOUNTING TYPES OPS-B, PAX, PCX MODELS CAN BE ENCASED WITH CASE CA— FITTED WITH PLUG PC—1 FOR QUICK-DISCONNECT AND RACK MOUNTED IF DESIRED.

CA—1	Chassis mounting case (single)	2 11/16"H x 4 1/8" W x 13 3/16"D	$12.00	2
PC—1	Connector	—— —— ——	7.00	½
RA 12—1	1 cased unit Rack Adapter	3 15/32"H x 19" W ——	12.00	3
RA 13—4	4 cased unit Rack Adapter	3 15/32"H x 19" W ——	12.00	3
RA 11—6	6 cased unit Rack Adapter	5 7/32" H x 19" W ——	12.00	3

Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco G sary*

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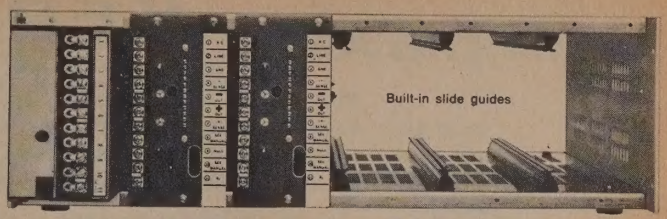
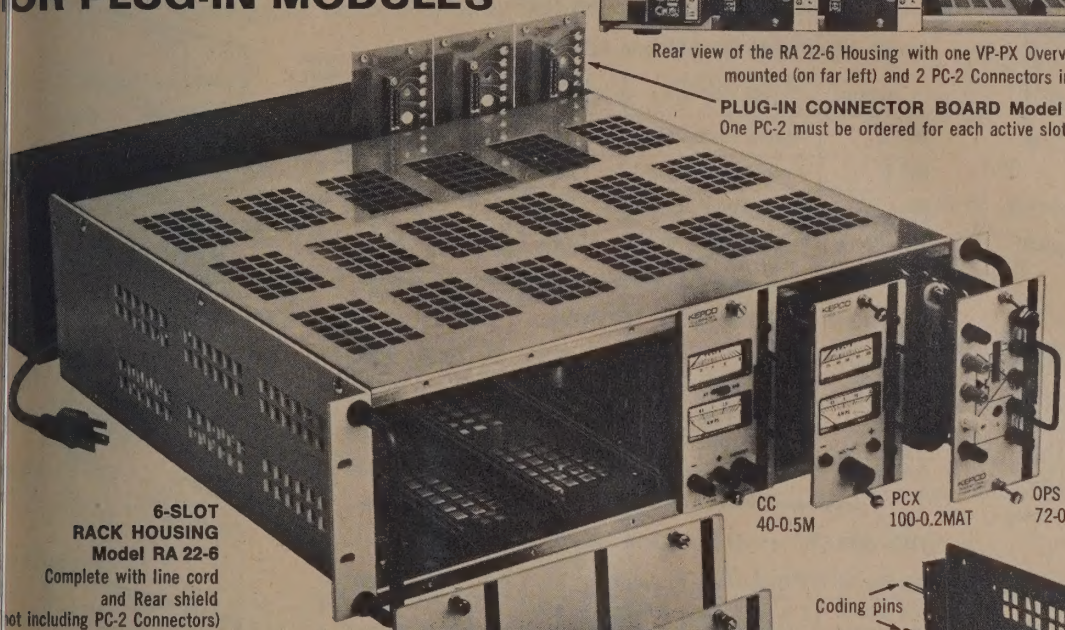
KEPCO
NCLOSURES AND ARDWARE SYSTEMS OR PLUG-IN MODULES



Rear view of the RA 22-6 Housing with one VP-PX Overvoltage Protector mounted (on far left) and 2 PC-2 Connectors installed

PLUG-IN CONNECTOR BOARD Model PC-2
One PC-2 must be ordered for each active slot in the RA 22-6.

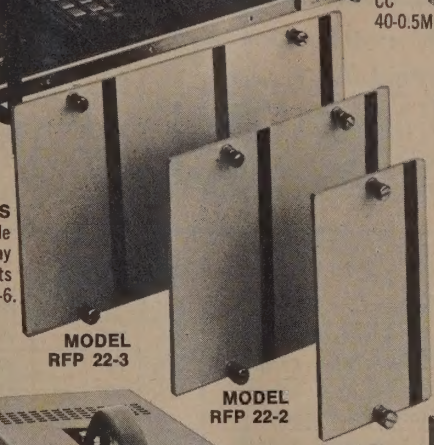


6-SLOT RACK HOUSING Model RA 22-6
Complete with line cord and Rear shield (not including PC-2 Connectors)

CC 40-0.5M

PCX 100-0.2MAT

OPS 72-0.3BTA

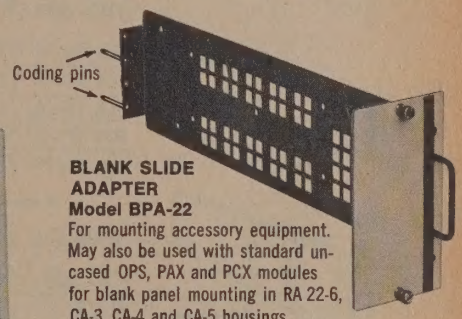


FILLER PANELS
(supplied without slide assembly and handle), may be used to fill unused slots in CA-3, CA-4, CA-5 and RA 22-6.

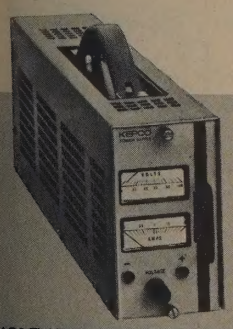
MODEL RFP 22-3

MODEL RFP 22-2

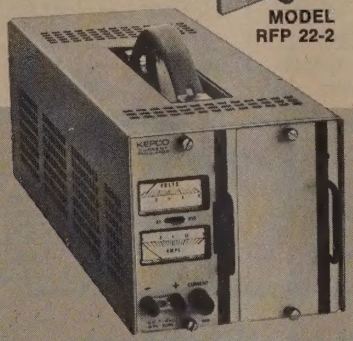
MODEL RFP 22-1



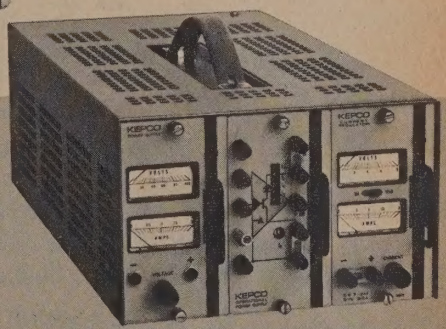
BLANK SLIDE ADAPTER Model BPA-22
For mounting accessory equipment. May also be used with standard uncased OPS, PAX and PCX modules for blank panel mounting in RA 22-6, CA-3, CA-4 and CA-5 housings.



SINGLE UNIT HOUSING Model CA-3
Supplied complete with a built-in PC-2 connector. (shown with a PCX 100-0.2MAT plugged-in)

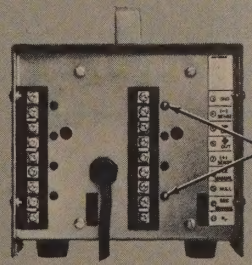


DOUBLE UNIT HOUSING Model CA-4
Supplied complete with a built-in dual PC-2 connector. (shown with a CC 40-0.5M and a BPA-22 plugged-in)



TRIPLE UNIT HOUSING Model CA-5
Supplied complete with a triple PC-2 connector.

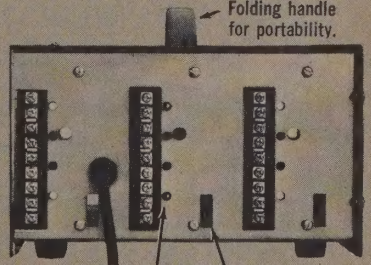
Typical rear view of CA-3, showing access terminals and connector.



Typical rear view of CA-4, showing integral connector (Double PC-2) supplied.

All plug-in models and the BPA-22 are supplied with two coding pins that can be arranged in 6 different patterns to key the housing slots.

Folding handle for portability.



Typical rear view of CA-5, showing coding pins, connectors and line cord.

Slot provides access to internal adjustments in mounted supplies.

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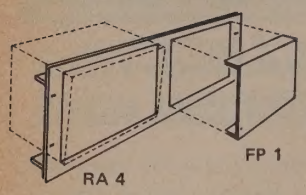
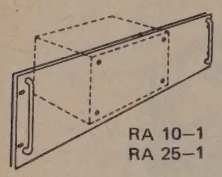
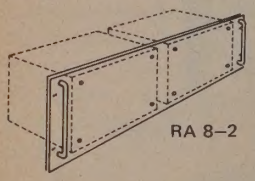
KEPCO

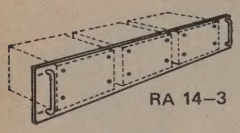
RACK ADAPTERS

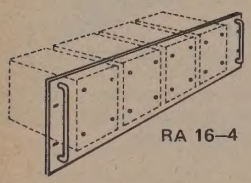
Adapt bench style, modular and half-rack Power Supplies to the standard 19" wide equipment rack or cabinet. Panels and Rack Adapters are finished light gray Color 26440 per Fed. Std. 595.

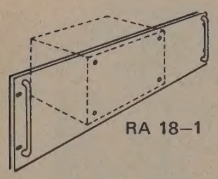


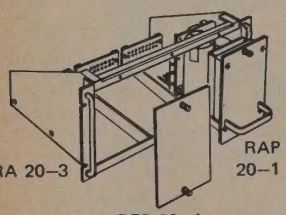


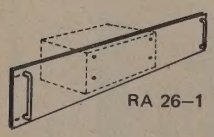


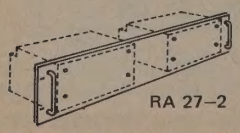












RACK ADAPTERS for ABC and FG–100

MODEL	FOR USE WITH	DIMENSIONS H	W	D	PRICE	SHIP. WGT. (LBS.)
RA 4	Above Listed Models	5 7/32"	19"	—	$18.00	4
RA 5	Above Listed Models	5 7/32"	19"	—	18.00	4
FP 1	Filler Panel for RA 4	4 1/4"	8 3/32"	—	6.00	1/2
RA 29–1	Rack Adapter for DPK–1	5 7/32"	19"	—	12.00	3

BKF II and PRM Size "A" – 180 Series

CA–200	Case	6 15/16"	5"	10 7/16"	12.00	4
RA 8–2	2 Unit Rack Adapter	5 7/32"	19"	—	12.00	4
RA 9–3	3 Unit Rack Adapter	6 31/32"	19"	—	12.00	4
RA 10–1	1 PRM Unit Adapter	5 7/32"	19"	—	12.00	4
RA 25–1	1 BKF II Unit Adapter	5 7/32"	19"	—	12.00	4

PRM Size "B" – 120 Series and Size "D" – 60 Series

RA 14–3	3 Unit Rack Adapter	3 15/32"	19"	—	12.00	3
RA 15–1	1 Size"B"Unit Adapter	3 15/32"	19"	—	12.00	3
RA 16–4	4 Unit Rack Adapter	5 7/32"	19"	—	12.00	3
RA 17–5	5 Unit Rack Adapter	5 7/32"	19"	—	12.00	3
RA 30–1	1 Size"D"Unit Adapter	3 15/32"	19"	—	12.00	3

PRM Size "C" – Dual Output and Extra-Filtered

CA–300	Case	6 15/16"	5"	14 7/16"	12.00	4
RA 8–2	2 Unit Rack Adapter	5 7/32"	19"	—	12.00	3
RA 9–3	3 Unit Rack Adapter	6 31/32"	19"	—	12.00	3
RA 18–1	1 Unit Rack Adapter for Extra-Filtered	5 7/32"	19"	—	12.00	3
RA 31–1	1 Unit Rack Adapter for Dual Output	5 7/32"	19"	—	12.00	3

PLUG-IN CABINETS for PRM Size "A" & "C"

RA 20–3	3 Unit Housing	8 23/32"	19"	18"	107.00	12
RAP 20–1	1 Unit Panel Adapter	8 23/32"	5 1/2"	—	7.00	1/2
RFP 20–1	Rack Filler Panel	8 23/32"	5 1/2"	—	7.00	1/2

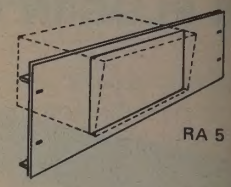
KG GROUP

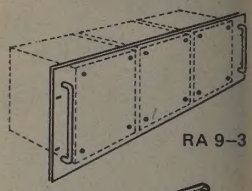
CA–2	Single Unit Housing	5 1/32"	2 3/16"	14"	18.00	2
RA 19–8	Multi Unit Housing (8)	5 1/4"	19"	14"	85.00	11
RFP 19–1	Single filler panel	5 7/32"	2 3/16"	—	7.00	1/2
RFP 19–2	Double filler panel	5 7/32"	4 3/16"	—	7.00	1/2
RFP 19–3	Triple filler panel	5 7/32"	6 5/16"	—	7.00	1/2

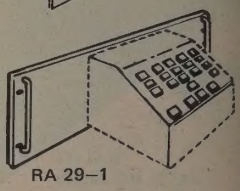
BKF I, DTM and PAT GROUPS

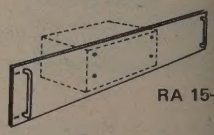
RA 26–1	1 Unit Rack Adapter	3 15/32"	19"	—	12.00	3
RA 27–2	2 Unit Rack Adapter	3 15/32"	19"	—	12.00	3
RA 28–4	4 Unit Rack Adapter	6 31/32"	19"	—	12.00	3

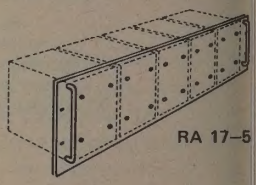
PANEL MOUNTING HOLES ARE PRE-DRILLED IN STANDARD E.I.A. PATTERN

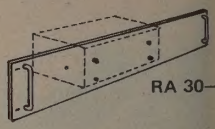


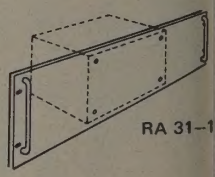


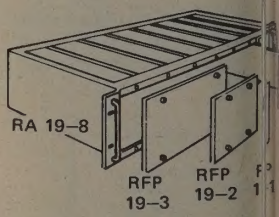


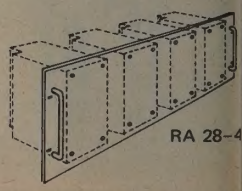












Data and prices subject to change without notice. *All terms used in the specifications are defined in the Kepco Glos*

KEPCO POWER SUPPLY DIMENSIONS

DIMENSIONS FOR EACH KEPCO POWER SUPPLY GROUP

The dimensions listed on this page are overall outline dimensions, except depth, which is given as the measurement behind panel, ie: clearance required. Dimensions do not include allowance for cables or connections. Outline drawings for each group of power supplies are available upon request.

BC (Transistor) Group — Page 1101

4¼"H x 8⁵⁄₃₂"W x 9⅝"D for Models ABC 7.5-2M, ABC 15-1M, ABC 40-0.5M and ABC 100-0.2M; 4¼"H x 8⁵⁄₃₂"W x 5⅝"D for Models ABC 2-1M, ABC 10-0.75M, ABC 18-0.5M and ABC 30-0.3M.

BC (Hybrid) Group — Page 1096

4¼"H x 8⁵⁄₃₂"W x 9⅝"D for all models except 13⅝"D for Model ABC 2500M.

HK Group — Page 1098

5⁷⁄₃₂"H x 19"W x 16⅜"D (behind panel)

KF Group I — Page 1086

3¹⁵⁄₃₂"H x 6⅜"W x 4¹⁵⁄₁₆"D

KF Group II — Page 1086

Cased: 6¹⁵⁄₁₆"H x 5"W x 11³⁄₁₆"D
Uncased: 6¾"H x 4¾"W x 10¹⁵⁄₁₆"D

OP Group — Page 1094

Metered Models:
Half-Rack:
5⁷⁄₃₂"H x 8¹¹⁄₃₂"W x 13⅛"D. (Model BOP 36—1.5M)
5⁷⁄₃₂"H x 8¹¹⁄₃₂"W x 17⅞"D. (Model BOP 36—5M)
Full-Rack:
5⁷⁄₃₂"H x 19"W x 18"D. (behind panel)
Unmetered (Modular) models:
Half-Rack:
Model BOP 36—1.5M: 5"H x 8³⁄₃₂"W x 13¹¹⁄₁₆"D
Model BOP 36—5M: 5"H x 8³⁄₃₂"W x 18³⁄₁₆"D
Full-Rack:
5"H x 16½"W x 18"D

CC Group — Page 1104

5⁷⁄₃₂" H x 2²⁵⁄₃₂" W x 15" D (behind panel)

CDT Group — Page 1105

5⁷⁄₃₂"H x 8¹¹⁄₃₂"W x 17⅜"D (behind panel)

CPS Group — Page 1106

Metered models:
¼ Rack:
5⁷⁄₃₂" H x 4⁵⁄₃₂" W x 17⅜" D. (behind panel).
½ Rack:
5⁷⁄₃₂" H x 8¹¹⁄₃₂ W x 17⅜" D. (behind panel).
Full Rack:
5⁷⁄₃₂" H x 16½" W x 18⅜" D. (behind panel).
Unmetered (modular) models:
¼ Rack: 5" H x 4¹⁄₃₂" W x 17⅜" D.
½ Rack: 5" H x 8³⁄₃₂" W x 17⅜" D.
Full Rack: 5" H x 16½" W x 18½" D.

DTM Group — Page 1187

3¹⁵⁄₃₂"H x 6⅜"W x 4¹⁵⁄₁₆"D

HB Group — Page 1099

3¹⁵⁄₃₂"H x 19"W x 14⅜"D (behind panel).

JQE Group — Page 1102

Metered models:
¼ Rack:
5⁷⁄₃₂" H x 4⁵⁄₃₂" W x 17⅜"D. (behind panel).
½ Rack:
5⁷⁄₃₂" H x 8¹¹⁄₃₂ W x 17⅜"D. (behind panel).
Full Rack:
5⁷⁄₃₂" H x 16½" W x 18½" D. (behind panel).
Unmetered (modular) models:
¼ Rack: 5" H x 4¹⁄₃₂" W x 17⅜"D.
½ Rack: 5" H x 8³⁄₃₂" W x 17⅜" D.
Full Rack: 5" H x 16½" W x 18⅜" D.

KG Group — Page 1107

Panel: 2³⁄₃₂" x 5⁷⁄₃₂";
PC connector 13¹⁹⁄₃₂" behind panel.

OPS-B Group — Page 1095

Uncased: 2½" H x 3¹³⁄₁₆" W x 12¹³⁄₁₆" D.
Cased: (Suffix C) 2¹¹⁄₁₆" H x 4⅛" W x 13³⁄₁₆" D.
OPS-20: 5⁷⁄₃₂"H x 8¹¹⁄₃₂"W x 3⅞"D. (behind panel)
OPS-BTA: 5⁷⁄₃₂" H x 2²⁵⁄₃₂" W x 15" D.

OPS (Hybrid) Group — Page 1096

5⁷⁄₃₂" Hx 8¹¹⁄₃₂"Wx 13⅞"D (behind panel)

PAT Group — Page 1088

3¹⁵⁄₃₂"H x 6⅜"W x 4¹⁵⁄₁₆"D

PAX (HS) Group — Page 1089

Uncased: 2½"H x 3¹³⁄₁₆"W x 12¹³⁄₁₆"D.
Cased: (Suffix C) 2¹¹⁄₁₆"H x 4⅛"W x 13³⁄₁₆"D.

PCX Group — Page 1090

Uncased: 2½"H x 3¹³⁄₁₆"W x 12¹³⁄₁₆"D.
Cased: (Suffix C) 2¹¹⁄₁₆"H x 4⅛"W x 13³⁄₁₆"D.
PCX-MAT: 5⁷⁄₃₂"H x 2²⁵⁄₃₂" W x 15" D

PRM Group — Page 1091

Size "A": *(Cased):* 6¹⁵⁄₁₆"H x 5"W x 11¹⁄₁₆"D
(Uncased): 6¾"H x 4¾"W x 10¹⁵⁄₁₆"D
Size "B": 3¹³⁄₃₂"H x 5"W x 13⅞"D
Size "C": *(Cased):* 6¹⁵⁄₁₆"H x 5"W x 15⅜"D
(Uncased): 6¾"H x 4¾"W x 15¼"D
Size "D": 3¹³⁄₃₂"H x 5"W x 10⅞"D

PVS Group — Page 1108

5⁷⁄₃₂" H x 8¹¹⁄₃₂" W x 17⅞" D (behind panel).

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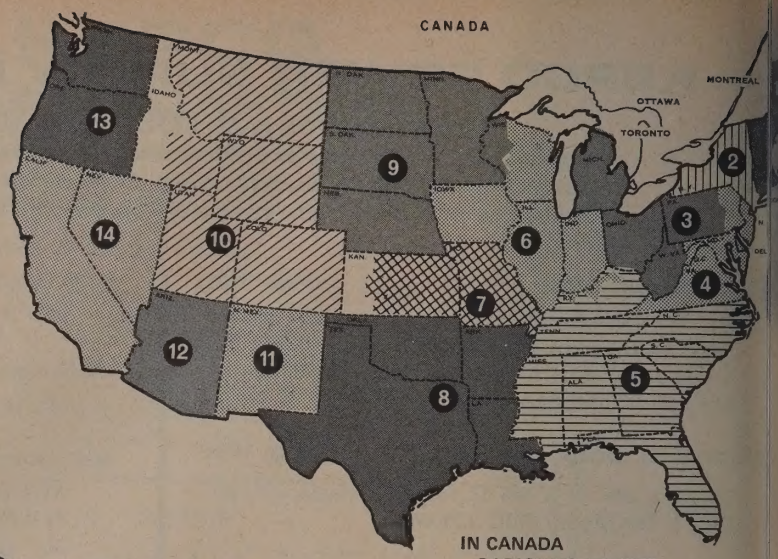

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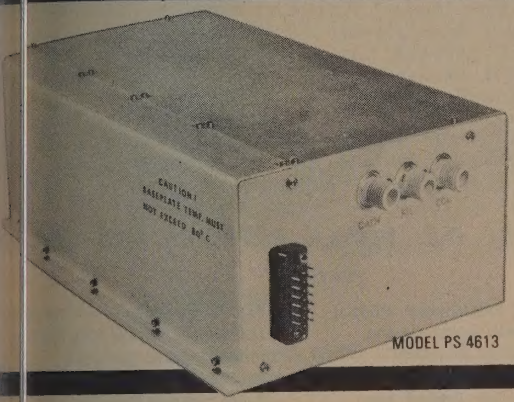
TOTAL POWER SUPPLY CAPABILITY



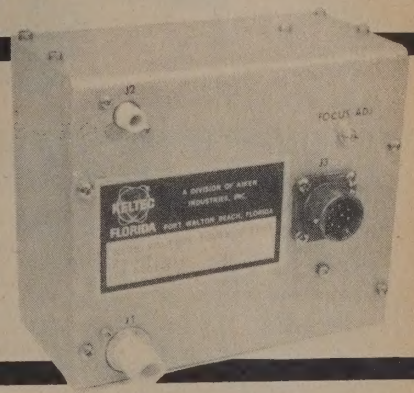
MODEL PS 4613

HIGH POWER TWT POWER SUPPLY

INPUT POWER	115 VAC, 400 cps, 3 phase per Mil-Std-704
OUTPUTS	1. Helix-Cathode: −4000 to −4800 VDC adjustable at 40 ma 2. Collector-Cathode: +2750 to +3250 VDC at 400 ma 3. Filament: 6.3 VAC ±2% at 4.0A (10A turn on surge limiting provided) 4. Focus Anode: +100 to +300 VDC at 1 ma
PROTECTIVE CIRCUITRY	1. Automatic time delay 2. Helix overload protection 3. Thermal overload protection 4. Arc protection (all modes of internal TWT arcing)
ENVIRONMENT	1. Temperature −55°C to +71°C ambient (Mounting surface temperature not to exceed 90°C) 2. Altitude: 50,000 feet 3. Shock, Vibration, Humidity, Explosion: Per Mil-Std-810
WEIGHT	20 lbs. maximum

HIGH VOLTAGE DISPLAY TUBE POWER SUPPLY

INPUT VOLTAGE	28 VDC ±10% @ .5 AMP
OUTPUTS	1. 20KV ±1000 VDC @ 200 μA Ripple 20 V Peak to Peak max Load Reg 3% max, full to half load 2. 2.2 KV ±500 VDC adjustable @ 75 μA Ripple 2.2 V Peak to Peak max 3. 300 V ±15 VDC @ 10 μA Ripple 300 mv Peak to Peak max
SIZE	5.50 x 4.5 x 2.6
WEIGHT	3.3 Lbs max
ENVIRONMENT	MIL-E-5400 Class 2



MODEL PS 4701

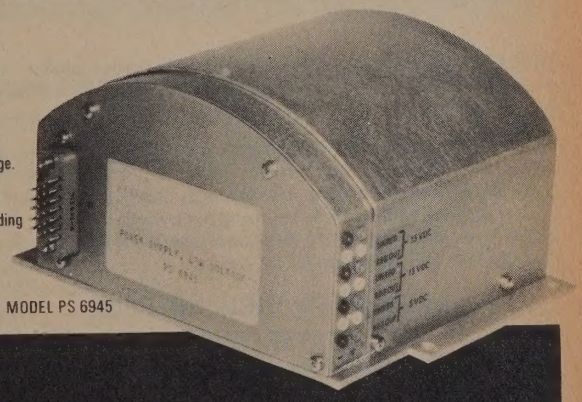
MODEL PS 4621

MULTI-GRID, LOW NOISE TWT POWER SUPPLY

INPUT VOLTAGE	103 – 127 VAC @ 50 – 420 H_z
EFFICIENCY	40% min
OUTPUTS	1. 2750 – 2850 @ 1 MA 3.5 – 3.8 VDC @ 1 AMP 2. 6 additional grids above the Cathode and 1 below 3. Max Ripple 200 mv all outputs 4. 1% Regulation
SIZE	5 x 3 x 11
WEIGHT	6 Lbs max
ENVIRONMENTAL	MIL-E-5400 Class 2

COMPUTER LOGIC POWER SUPPLY

INPUT	115 VAC, 400 H_z, 3 phase, per MIL-Std-704
OUTPUTS	+28 Volts @ 6 amps −15 Volts @ 5 amps +15 Volts @ 5 amps -- 5 Volts @ 5 amps
REGULATION	±1% line, load and temperature
RIPPLE	25 mv Peak to Peak
PROTECTIVE CIRCUITRY	1. Output protection from short circuits for indefinite period without damage. 2. Over voltage—in the event of regulation failure, supplies are terminated in less than 20 microseconds. 3. Overload—supply is protected to prevent damage resulting from overloading in any one of the outputs.
ENVIRONMENT	1. Temperature −55°C to + 71°C 2. Altitude 50,000 feet 3. Shock, Vibration, Humidity and Explosion per MIL-Std-810 4. Electromagnetic Interference per MIL-1-6181



MODEL PS 6945

KELTEC FLORIDA

A DIVISION OF AIKEN INDUSTRIES, INC.
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FEATURES

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- Adjustable Over-Voltage Shut-off
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- Zero-Start Interlock
- Dual Range Voltage and Curre
- Fail-Safe Output Shorting Mech
- Circuit-Breaker Operation
- Functional Pilot Lamps
- Surge Limiting Resistor
- External Interlock

OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER	OUTPUT KV	OUTPUT MA	MODEL NUMBER
0-1	500	KV1-500	0-10	30	KV10-30	0-30	500	KV30-500	0-150	500	KV150-50
0-1	1,000	KV1-1,000	0-10	50	KV10-50	0-30	1,000	KV30-1,000	0-200	5	KV200-5
0-1	3,000	KV1-3,000	0-10	100	KV10-100	0-50	50	KV50-50	0-200	10	KV200-10
0-1	5,000	KV1-5,000	0-10	250	KV10-250	0-50	100	KV50-100	0-250	2	KV250-2
0-1	15,000	KV1-15,000	0-10	500	KV10-500	0-50	300	KV50-300	0-250	5	KV250-5
0-3	200	KV3-200	0-10	1,500	KV10-1,500	0-50	1,000	KV50-1,000	0-250	10	KV250-10
0-3	1,000	KV3-1,000	0-20	10	KV20-10	0-60	10	KV60-10	0-250	25	KV250-25
0-3	2,000	KV3-2,000	0-20	50	KV20-50	0-120	5	KV120-5	0-350	2	KV350-2
0-3	5,000	KV3-5,000	0-20	150	KV20-150	0-120	10	KV120-10	0-350	5	KV350-5
0-3	10,000	KV3-10,000	0-20	300	KV20-300	0-120	30	KV120-30	0-500	2	KV500-2
0-5	100	KV5-100	0-20	800	KV20-800	0-120	100	KV120-100	0-500	20	KV500-20
0-5	500	KV5-500	0-30	20	KV30-20	0-150	5	KV150-5	0-600	2	KV600-2
0-5	1,000	KV5-1,000	0-30	50	KV30-50	0-150	10	KV150-10	0-600	5	KV600-5
0-5	2,000	KV5-2,000	0-30	100	KV30-100	0-150	30	KV150-30	0-600	20	KV600-20
0-5	3,000	KV5-3,000	0-30	200	KV30-200	0-150	100	KV150-100	0-1,000	5	KV1,000-5

ELECTRO-MECHANICAL REGULATION. The above models may be ordered with either voltage regulation, current regulation, or both by means of a servo regulating system.

SATURABLE REACTOR CONSTANT CURRENT. By use of a saturable reactor in conjunction with any of the standard models above, the output current can be held constant to within approximately 10% of the preset level for load variations from short circuit to full load and to within 3% for a half-load to full load change.

REGULATED HIGH VOLTAGE D.C. POWER SUPPLIES

Highly regulated against input line variations or changes in load, these power supplies employ fast response electronic regulation.

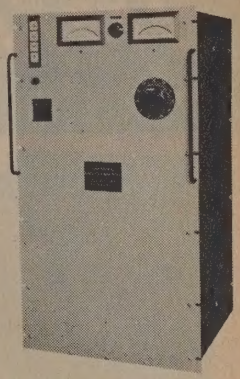
FEATURES

- Continuously Variable Output
- Overload Protection
- Zero-Start Interlock
- Cabinet Interlock
- Provisions for External Interlock
- Reversible Polarity Output (most models)
- Circuit Breaker Operation
- Monitoring Pilot Lamps
- Electronically Protected 4½" Meters

OUTPUT (MAX.) KV	OUTPUT (MAX.) MA	MODEL NUMBER	OUTPUT (MAX.) KV	OUTPUT (MAX.) MA	MODEL NUMBER
1.5	100	KVR1.5-100	10	250	KVR10-250
1.5	200	KVR1.5-200	10	500	KVR10-500
1.5	500	KVR1.5-500	10	1000	KVR10-1000
1.5	1000	KVR1.5-1000	15	7	KVR15-7
3	100	KVR3-100	15	45	KVR15-45
3	200	KVR3-200	15	150	KVR15-150
3	500	KVR3-500	15	250	KVR15-250
3	1000	KVR3-1000	15	750	KVR15-750
7	100	KVR7-100	20	10	KVR20-10
7	250	KVR7-250	20	50	KVR20-50
7	500	KVR7-500	20	150	KVR20-150
7.5	1000	KVR7.5-1000	20	500	KVR20-500
10	50	KVR10-50	20	750	KVR20-750
10	100	KVR10-100	24	10	KVR24-10

REGULATED HIGH VOLTAGE D.C. POWER SUPPLIES (cont'd.)

OUTPUT (MAX.) MA	MODEL NUMBER	OUTPUT (MAX.) KV	MA	MODEL NUMBER
45	KVR24-45	50	100	KVR50-100
200	KVR24-200	75	5	KVR75-5
500	KVR24-500	75	10	KVR75-10
1000	KVR24-1000	75	50	KVR75-50
1	KVR30-1	75	100	KVR75-100
10	KVR30-10	100	5	KVR100-5
45	KVR30-45	100	25	KVR100-25
100	KVR30-100	150	5	KVR150-5
200	KVR30-200	150	15	KVR150-15
400	KVR30-400	200	5	KVR200-5
800	KVR30-800	200	12	KVR200-12
5	KVR50-5	250	5	KVR250-5
15	KVR50-15	250	10	KVR250-10
50	KVR50-50			



CURRENT REGULATION. Voltage regulated power supplies can be provided with current regulation capability on special order.

HIGH-VOLTAGE D.C. INSULATION TESTERS

FEATURES

- ible Polarity Output (most models)
- uously Variable Output Control with Vernier Adjust
- able Overcurrent and Overvoltage Shutoffs
- Interlock
- ion for External Interlock
- tart Interlock
- Range Current Meters
- Range Voltage Meters
- ife Output Shorting Mechanism
- Meters Electronically Protected
- Functional Pilot Lamps
- Selenium Rectifiers
- Surge Limiting Resistor
- Circuit Breaker Operation

OUTPUT KV	MA	MODEL NO.	OUTPUT KV	MA	MODEL NO.
0-30	5	DC 30-5	0-250	5	DC 250-5
0-60	5	DC 60-5	0-350	5	DC 350-5
0-120	5	DC 120-5	0-600	5	DC 600-5
0-150	5	DC 150-5	0-1,000	5	DC 1,000-5

IGH VOLTAGE A.C. INSULATION TESTERS

r Dielectric Testing under ASTM, MIL and Federal Specs.

FEATURES

-Driven output control with le speeds permits selection er rate-of-rise for various ition testing. • Plexiglas, nterlocked Access Door • emory-type Voltage Meter • nal Pilot Lamps • Dual Circuit Breaker Operation n Test Jigs available, most

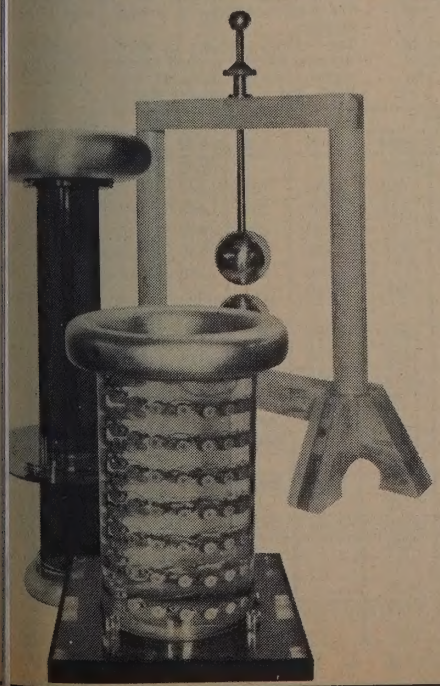
OUTPUT KV	KVA	MODEL NO.
0-15	5	AC 15-5
0-25	2.5	AC 25-2.5
0-25	5	AC 25-5
0-60	2.5	AC 60-2.5
0-100	5	AC 100-5

HIGH VOLTAGE A.C./D.C. INSULATION TESTERS

FEATURES

• Reversible Polarity D.C. Output (most models) • Continuously Variable Voltage Output Control • Adjustable D.C. Over-Current Shut-Off • Zero-Start Interlock • Safety Interlock on High Voltage Cabinet Door • Provision for External Interlock • Electronically-Protected Meters • Fail-Safe Output Shorting Mechanism • Functional Pilot Lamps • Circuit-Breaker Operation • Surge-Limiting Resistor.

OUTPUT KV Peak AC	DC	MA AC	DC	MODEL NO.
15	30	20	5	DAC 15/30-20-5
30	60	20	5	DAC 30/60-20/5
75	150	20	5	DAC 75/150-20/5
125	250	20	5	DAC125/250-20/5



HIGH VOLTAGE D.C. POWER PACKS

These units are high voltage sections of standard power supplies minus meters and controls and contain the basic components described for standard power supplies — filter system, fail-safe mechanism, surge resistor, meter multiplier, primary gaps, etc.

HIGH VOLTAGE HARDWARE AND ACCESSORIES

MULTIPLIERS AND DIVIDERS. High voltage resistance strings, accurate to 0.15% or better with division ratios which may be specified. Stability is 25 PPM/°C; current drain 1 ma. Accuracy traceable to NBS standards as an option.

ELECTRONIC CROWBAR designed to protect Klystron or other sensitive loads from damage by discharge of power supply energy can be manufactured into your custom-built power supply or provided as separate devices. A typical unit has a response time of 3-5 microseconds and is capable of discharging five microfarads in approximately one millisecond at 20 KV.

CALIBRATED SPARK GAPS provided with micrometer calibration and may be used for determining crest voltage.

HIGH VOLTAGE OUTPUT BUSHING. Oil filled and terminated with anti-corona toroids, these devices are designed for oil-to-air outlet of very high voltages; available in two ratings, 300 and 600 KV D.C.

Call or write for a copy of our latest catalog.

KILOVOLT CORPORATION

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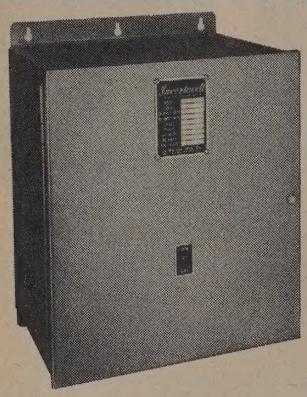
LaMARCHE

INVERTERS POWER SUPPLIES



DC to AC Power Source with Regulated Sine Wave Output

DESCRIPTION

The La Marche MODEL A-51 is a completely solid state SCR inverter which provides a regulated, sine wave output for such applications as:

- Boiler Controls
- Telephone and Microwave Communications
- Burglar Alarms
- Supervisory Control Equipment
- Data Processing and Telemetering Equipment
- Nuclear and Missile Installations
- P.A. Systems
- Fire Alarms

SPECIFICATIONS

AC OUTPUT VOLTAGE ..... 120 Volts Nominal
LINE REGULATION ..... ±1% for ±15% DC Change
LOAD REGULATION ..... ±2% No Load to Full Load
FREQUENCY ..... 60 Cycle Nominal
FREQUENCY STABILITY ..... ±1% for Load, Input Voltage and Temperature Variations
WAVE SHAPE ..... Sine Wave
DISTORTION ..... Approximately 7%
OVERALL EFFICIENCY ..... Approximately 65%
AMBIENT TEMPERATURE ..... −20° to 60°C (0° to 140°F)

MODEL A-51-120 VOLT A.C. — 60 HZ SINE WAVE OUTPU

Model No.	D.C. Input Voltage volts	D.C. Current Full Load amps	D.C. Current No Load amps	Continuous A.C. Current Load Rating V.A.	Continuous A.C. Current Continuous amps
A51-250-24V	24V	20.0	5.0	250	2.1
A51-250-48V	48V	9.0	3.0	250	2.1
A51-250-120V	120V	4.0	1.5	250	2.1
A51-500-24V	24V	40.0	10.5	500	4.2
A51-500-48V	48V	18.0	6.0	500	4.2
A51-500-120V	120V	8.0	3.0	500	4.2
A51-1K-24V	24V	80.0	18.0	1K	8.3
A51-1K-48V	48V	36.0	10.0	1K	8.3
A51-1K-120V	120V	15.0	5.5	1K	8.3
A51-2K-48V	48V	70.0	11.0	2K	16.6
A51-2K-120V	120V	28.0	6.0	2K	16.6
A51-3K-120V	120V	45.0	6.5	3K	24.9
A51-5K-120V	120V	75.0	7.0	5K	41.9

INVERTER ACCESSORIES

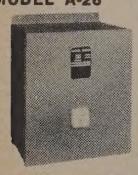
1. A.C. or D.C. Voltmeter $25.
2. A.C. or D.C. Ammeter $25.
3. Frequency meter $95.
4. A.C. Power Failure Relay $25.
5. Low D.C. Voltage Alarm Relay $38.
6. D.C. Circuit Breaker $35.
7. A.C. Circuit Breaker $25.
8. Ground Detection Relay $5
9. Automatic Demand Panel $

ORDERING SPECIFICATIONS

1. La Marche model number.
2. Number and type of battery cells.
3. Ampere hour capacity of batteries.
4. AC loads.
5. Application.
6. Type and capacity of c equipment.
7. Type of mounting, wal rack mount.
8. Optional accessories.

FILTERED D.C. POWER SUPPLIES

MODEL A-26



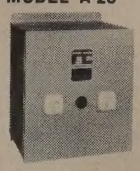
DESIGN FEATURES

1. Automatic in operation and self-regulating.
2. No moving parts. Nothing to arc or wear out.
3. No external controls. Cannot be tampered with.

The La Marche A-26 power supply features automatic load regulation and semi-automatic current limiting. The model A-26 is filtered to 10% ripple. There are no controls to be set for different applications because the amount of loading determines the current output.

The La Marche model A-26, like all La Marche units, is a solid state device employing a balanced isolation power transformer, a magnetic amplifier and sealed silicon diode rectifiers. These power supplies have no contacts, relays, switches, fans, tubes, time clocks or other moving parts.

MODEL A-28



DESIGN FEATURES

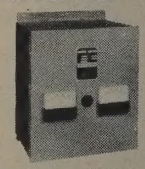
- Silicon diode rectifiers.
- Current limiting circuit.
- Automatic A.C. voltage compensation.
- D.C. voltage regulation.
- Output ammeter and voltmeter.

The model (A-28) is a solid state, fully automatic, constant voltage D.C. power supply designed for all regulated applications.

Standard features include automatic A.C. line compensation, D.C. voltage regulation and current limiting. The La Marche transistor controlled magnetic amplifier circuit is designed to automatically provide a D.C. output regulation of ±5″ from no load to full rated output. Accurate output regulation is maintained with A.C. line variations of ±10%. The A-28 is offered in a wide range of sizes and voltages.

The reliability of the La Marche circuit has led to its selection for critical communication and control systems, nuclear powered ships, missile firing stations, and utility power standby systems.

MODEL A-29



ORDER SPECIFICAT

1. La Marche mode
2. A.C. input voltag phase
3. Intermittent D. and duration
4. Continuous D.C.
5. Amount of filter measured how?

The model (A-29) is a solid state, fully a constant voltage D.C. power supply design regulated applications.

Standard features include automatic A.C. pensation, D.C. voltage regulation and limiting. The La Marche transistor contro netic amplifier circuit is designed to auto provide a D.C. output regulation of ±1% load to full rated output. Accurate outputs is maintained with A.C. line variations o The A-29 is offered in a wide range of voltages.

The reliability of the La Marche circuit h its selection for critical communication an systems, nuclear powered ships, missile f tions, and utility power standby systems.

D.C. AMPS	12 VOLT A-26	12 VOLT A-28	12 VOLT A-29	24 VOLT A-26	24 VOLT A-28	24 VOLT A-29	32-36 VOLT A-26	32-36 VOLT A-28	32-36 VOLT A-29	48 VOLT A-26	48 VOLT A-28	48 VOLT A-29	130 VOLT A-26	130 VOLT A-28	130 VOLT A-29	260 VOL A-26	260 VOL A-28
3	$ 85.	$130.	$260.	$ 92.	$140.	$260.	—	—	—	—	$145.	$295.	—	—	$475.	$480.	$550.
6	94.	145.	290.	105.	156.	290.	—	—	—	$247.	350.	450.	$325.	425.	640.	655.	740.
10	114.	177.	350.	150.	232.	430.	$160.	$246.	$490.	305.	425.	510.	395.	564.	850.	790.	850.
15	130.	197.	425.	172.	265.	490.	—	—	—	235.	485.	720.	520.	650.	980.	970.	1175.
20	153.	226.	510.	193.	298.	510.	250.	318.	640.	350.	590.	815.	655.	780.	1185.	1180.	1490.
25	—	—	—	—	—	—	—	—	—	—	—	—	760.	895.	1250.	1390.	1690.
30	182.	265.	530.	224.	347.	530.	280.	354.	715.	420.	612.	930.	820.	1146.	1565.	1660.	1950.
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1910.	2200.
40	205.	298.	745.	250.	384.	745.	340.	450.	990.	545.	781.	1020.	1120.	1330.	1750.	2100.	2450.
50	263.	375.	890.	295.	460.	890.	460.	612.	1360.	570.	820.	1260.	1260.	1550.	1970.	2350.	2950.
60	295.	425.	1050.	360.	510.	910.	540.	672.	1500.	710.	948.	1425.	1360.	2052.	2580.	2650.	3564.
75	326.	468.	1140.	455.	568.	1140.	655.	900.	2000.	765.	996.	1550.	1670.	2220.	3160.	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	1800.	2340.	3475.	—	—
100	394.	568.	1330.	582.	858.	1330.	—	—	—	860.	1140.	1750.	1990.	2460.	3840.	—	—
125	510.	702.	—	650.	995.	1540.	—	—	—	950.	1360.	2080.	—	—	—	—	—
130	626.	860.	—	695.	1080.	1660.	750.	960.	2150.	—	—	—	2400.	2868.	4550.	—	—
150	685.	950.	—	780.	1140.	1750.	820.	1194.	2650.	1050.	1420.	2180.	—	—	—	—	—
160	784.	1096.	—	860.	1252.	1790.	—	—	—	1110.	1548.	2250.	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	1190.	1620.	2490.	—	—	—	—	—
200	—	—	—	935.	1374.	1860.	1130.	1612.	3580.	1275.	1780.	2750.	—	—	—	—	—
250	—	—	—	—	1660.	2250.	—	—	—	1750.	2250.	3450.	—	—	—	—	—
300	—	—	—	—	2010.	2840.	—	—	—	2090.	2580.	3990.	—	—	—	—	—
400	—	—	—	—	2800.	3800.	—	—	—	2850.	3350.	5200.	—	—	—	—	—

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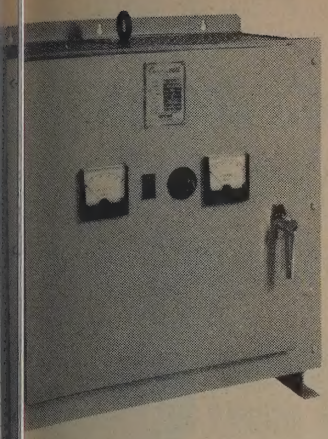

FLOAT BATTERY CHARGERS

LaMARCHE

GENERAL DESCRIPTION

The model A-11 Float Battery Charger is a completely automatic, solid state, constant voltage device having:

A.C. VOLTAGE COMPENSATION — D.C. VOLTAGE REGULATION — CURRENT LIMITING

The model (A-11) charger is designed and built to carry continuous and intermittent loads up to its maximum rated output. The A-11 is current limited at 140% of rated output. Each unit is designed and built to charge a specific type of battery containing a specific number of cells.

The La Marche Transistor Controlled magnetic-amplifier circuits provide continuous taper charging. Maintains rated output voltage within ±1% from no load to full load with A.C. input variations of ±10%. Silicon diodes are used for rectification.

The model A-11 charger floats lead-acid batteries at 2.17 volts per cell and by means of a front panel switch equalizes at 2.33 volts per cell. Both float and equalize voltages are adjustable to meet battery manufacturers recommendations. This type of charging imparts the longest battery life and is the accepted method for charging batteries used in standby service.

ESIGN FEATURES

Quality parts throughout. Silicon diode rectifiers and transistor magnetic amplifiers used exclusively.
A.C. power loss relay, output voltmeter/ammeter and fused input-output are standard on all models.
Eighty sizes available in five input voltages.
4. Adjustable equalize and float levels; float/equalize controls located on face panel for easy operation.
5. Design and operation tested and approved by battery manufacturers, utilities, railroads and military.

PECIFICATIONS

ANDARD ACCESSORIES SUPPLIED:

Potentiometer for desired float and equalize charge voltage adjustments.
Quality D.C. ammeter and voltmeter with 50 millivolt movement, 2% accuracy.
Power failure relay with terminals for connections to a remote alarm system.
4. Fused A.C. input and D.C. output for complete protection.
5. Convenient switch to transfer from float charge to high rate equalize charge.
6. Internal terminal board for easy connection of A.C. input, D.C. output and power failure equipment.

PTIONAL ACCESSORIES:

. A.C. circuit breaker replacing fuse.
. 0-24 hour equalizing timer.
. Ground detection switch.
. Low D.C. voltage alarm relay.
. High D.C. voltage alarm relay.
. Special paint.
. Export packing add 5%.
8. Individual float/equalize adjustments, specify model A-11B.
9. Filtered units available, see model A-12.
10. Dual fusing for A.C. input and D.C. output replacing single input and output fusing.
11. Dual voltage A.C. input.
12. 1% taut band meters replacing 2% meters.
13. Relay rack mounting.

Marche el No. and rage Output	6 and 12 Volt Systems†	24 Volt Systems†	32 and 36 Volt Systems†	48 Volt Systems†	130 Volt Systems†	260 Volt Systems†
	Price	Price	Price	Price	Price	Price
-11- 3-	$230.§	$240.§	$250.§	$290.§	$395.§	$497.§
-11- 6-	240.§	290.§	310.§	410.§	496.§	620.§
-11- 10-	275.§	395.§	390.§	414.§	620.§	890.§
-11- 15-	300.§	405.§	460.§	580.§	740.§	1190.§
-11- 20-	398.§	460.§	595.§	645.§	845.§	1540.*
-11- 25-	—	—	—	695.§	970.§	1715.§*
-11- 30-	480.§	525.§	730.§	780.§	1190.§	1910.§*
-11- 35-	—	—	—	—	1300.§	2080.§*
-11- 40-	560.§	660.§	795.§	890.§	1449.§*	2140.§*
-11- 50-	698.§	740.§	980.§	1190.§*	1750.§*	2745.§*
-11- 60-	890.§	910.§	1175.§	1310.§*	1950.*	3080.*
-11- 75-	980.§	995.§	1250.§*	1495.§*	2175.§*	3290.*
-11-100-	1100.*	1160.*	1350.§*	1655.§*	2900.§*	4175.*
-11-125-	—	1340.*	1550.*	1890.*	3150.§*	4970.*
-11-150-	—	1550.*	1870.*	2140.*	3440.*	5250.*
-11-175-	—	—	—	—	4275.*	—
-11-200-	—	1650.*	1980.*	2615.*	4410.*	6540.*
-11-250-	—	1980.*	2685.*	3160.*	5280.*	8450.*
-11-300-	—	2495.*	—	3675.*	5445.*	9700.*
-11-350-	—	—	—	—	6226.*	—
-11-400-	—	2625.*	3750.*	3850.*	6590.*	—

NPUT

ard models are available in nominal A.C. line voltage of 120, 208, 240, nd 550, single phase, 50/60 cycle. Models marked * are available in phase only.
writers Listed.

† BATTERY TYPES

The model A-11 chargers are available in the listed ampere capacities and **nominal D.C. voltages** for lead-ackd, nickel-cadmium, nickel-iron alkaline and other types of batteries. **Specify number and type of battery cells.**

CALL FOR COMPLETE INFORMATION ON OUR VOLTAGE SENSING RELAYS & D.C. TO D.C. CONVERTERS

02 BRADROCK DRIVE • DES PLAINES, ILLINOIS 60018 • PHONE (312) 299-1193

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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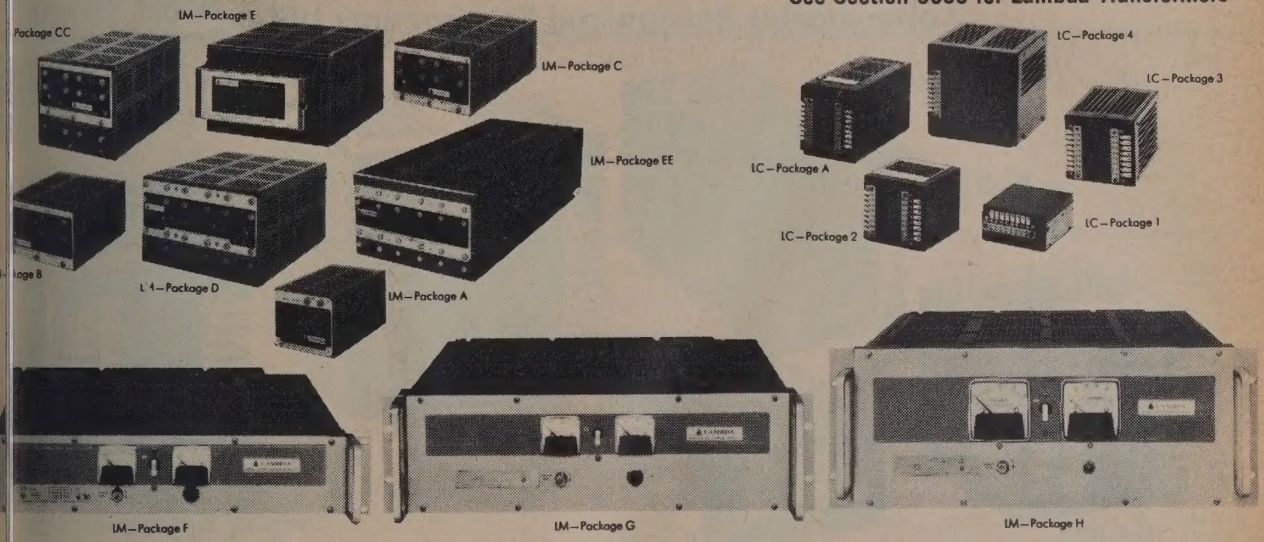
All Silicon Convection Cooled Power Supplies For Systems/Laboratory Use/Test Equipment/OEM

Up to 500 volts • Up to 300 amps

See Section 5600 for Lambda Transformers



mbda-staffed sales and service offices*

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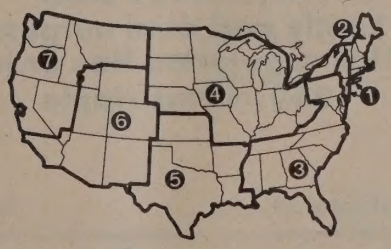

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How To Order

All information necessary to order a power supply is given on each individual page. Send your order directly to your nearest Lambda sales office or call for more specific information. In U. S., orders may be mailed or telephoned directly to the main office in New York.

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Tel. 408-738-2541 • TWX: 910-339-9243

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Lambda Electronics Corp., Export Dept.
515 Broad Hollow Road, Melville, N. Y. 11746
Tel. 516-694-4200 • TWX: 510-224-6484
Cable: Lambdatron, Melville, N. Y.

CANADA
Veeco Lambda, Ltd.
100 C Hymus Blvd., Pointe-Clair, Quebec 730
Tel. 514-697-6520 • TWX: 610-422-3029

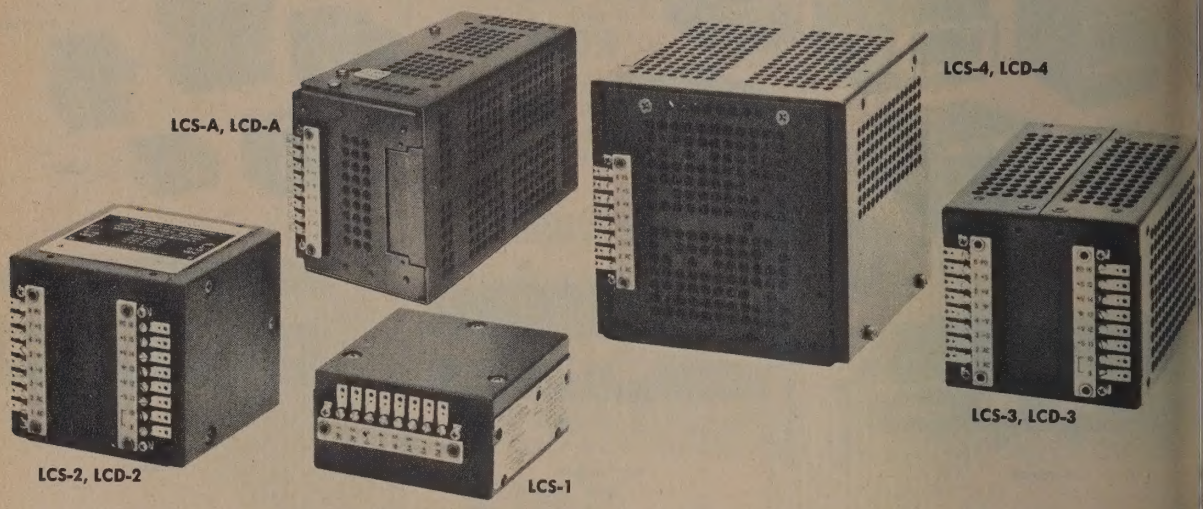
ALIBRATION AND REPAIR FACILITIES: Melville, New York • North Hollywood, Calif. • Portsmouth, Hants, England • Versailles, France

LAMBDA TRANSFORMER PLANT: Gouldsboro, Pa. Tel. 717-842-7611

bda has over 10,000 power supply units on-the-shelf for 1-day delivery. ry one is fully guaranteed for 5 years... material and labor.

New LCS-A power package... LC Series IC regulated modular power supplies

LC series power supplies are listed in Underwriters' Laboratories Recognized Components Index.



Five package sizes
Single and dual outputs
0.01% regulation line or load
250 μv rms ripple

Features

All-silicon DC power supply using integrated circuits to provide regulation system
except for input and output capacitors, rectifiers and series regulation transistors

Increased reliability
through use of integrated circuit which replaces 32 discrete components from conventional designs

Convection cooled
no external heat sinking required

Regulation
line or load .01% + 1mv

Ripple and noise
250 μv rms; 1mv p-to-p

Wide input voltage and frequency range
105-132 vac, 47-440Hz
derate current 10% for 47-53Hz operation, except for LCS-1 series (see listing). For 360-440Hz operation consult factory.

Wide temperature range
−20°C to +71°C

Temperature coefficient
.01% + 300μv/°C external programing resistor
.015% + 300μv/°C internal programing resistor

Remote programing
1000 ohm/v nominal or volt/volt

Remote sensing

Automatic current limiting

Series/parallel operation
with similar single or dual units

Multi-current-rated

More current per cubic inch

Complete serviceability

Overvoltage protection
available as accessory up to 70 vdc

No overshoot
on turn-on, turn-off or power failure

AC input option
add suffix "-V" to model number for operation at 205-265 v 47-440Hz, except LCS-1 and LCS-A series. Derate current 1 for 47-53Hz operation. For 360-440Hz operation consult f tory. In U. S. and Canada, add 10% or $10.00 to price, whic ever is greater.

Features of dual output models

Independent operation

Independent remote programing

Independent remote sensing

Each supply electrically isolated
and floating with respect to ground

Commercial contract plan
available for OEM and large-volume users contact local sal engineer for details.

C eries voltage and current ratings

CS. SINGLE OUTPUT MODELS

3 5/32" x 3 9/32" x 1 21/32"

MODEL	ADJ. VOLT. RANGE VDC	MAX. MA. AT AMBIENT OF: 40°C	50°C	60°C	71°C	PRICE(2)
		*	*	*	*	
LCS-1-01A	0-7	275 (250)	220 (180)	165 (120)	110 (75)	$70
LCS-1-02A	0-18	130 (115)	130 (115)	100 (80)	85 (40)	70
LCS-1-03A	0-32	90 (80)	90 (80)	90 (50)	50 (25)	70
LCS-1-04A	0-60	50 (45)	50 (45)	50 (35)	30 (15)	80
LCS-1-05A	0-120	18 (15)	18 (15)	18 (15)	18 (10)	85

*Bracketed ratings are for 47-53Hz operation.

UN EGULATED POWER SUPPLY

3 5/32" x 3 9/32" x 1 21/32"

LUS-1-06	180 VDC	25 ma up to 71°C at nominal line voltage for use with up to 7 Nixie® tubes.	$35

(Nixie is trademark of Burroughs Corp.)

LCS2 SINGLE OUTPUT MODELS

3 5/32" x 3 9/32" x 3 9/32"

MODEL	ADJ. VOLT. RANGE VDC	MAX. MA. AT AMBIENT OF: 40°C	50°C	60°C	71°C	PRICE(2)
LCS-2-01	0-7	550	455	350	240	$80
LCS-2-02	0-18	330	275	210	140	80
LCS-2-03	0-32	240	205	155	95	80
LCS-2-04	0-60	145	115	87	57	90
LCS-2-05	0-120	50	50	45	30	90

LC-3 SINGLE OUTPUT MODELS

3 3/16" x 3 5/16" x 5"

MODEL	ADJ. VOLT. RANGE VDC	MAX. MA. AT AMBIENT OF: 40°C	50°C	60°C	71°C	PRICE(2)
LCS-3-01	0-7	1200	1000	750	500	$90
LCS-3-02	0-18	750	620	480	320	90
LCS-3-03	0-32	400	350	265	170	90
LCS-3-04	0-60	240	190	140	85	99

LC-A SINGLE OUTPUT MODELS

3 3/16" x 3 3/4" x 6 1/2"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: 40°C	50°C	60°C	71°C	PRICE(2)
LCS-A-3	3±5%	3.0	2.5	2.0	1.4	$99
LCS-A-3P6	3.6±5%	2.9	2.4	1.9	1.3	99
LCS-A-4	4±5%	2.9	2.4	1.9	1.3	99
LCS-A-4P5	4.5±5%	2.8	2.3	1.8	1.2	99
LCS-A-5	5±5%	2.7	2.3	1.8	1.2	99
LCS-A-6	6±5%	2.6	2.2	1.8	1.2	99
LCS-A-8	8±5%	2.4	2.0	1.7	1.1	99
LCS-A-10	10±5%	2.1	1.8	1.5	1.0	99
LCS-A-12	12±5%	1.9	1.7	1.3	0.9	99
LCS-A-15	15±5%	1.8	1.5	1.2	0.9	99
LCS-A-18	18±5%	1.6	1.3	1.1	0.8	99
LCS-A-20	20±5%	1.4	1.2	1.0	0.8	99
LCS-A-24	24±5%	1.1	1.0	0.85	0.70	99
LCS-A-28	28±5%	1.0	0.9	0.75	0.60	99
LCS-A-36	36±5%	0.90	0.80	0.70	0.50	99
LCS-A-48	48±5%	0.60	0.55	0.50	0.45	99
LCS-A-100	100±5%	0.18	0.18	0.18	0.18	109
LCS-A-120	120±5%	0.15	0.15	0.15	0.15	109
LCS-A-150	150±5%	0.10	0.10	0.10	0.10	109

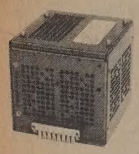
ambda has over 10,000 power supply units on-the-shelf for 1-day delivery. very one is fully guaranteed for 5 years... material and labor.

LCS-A SINGLE OUTPUT MODELS (Wide Range)

3 3/16" x 3¾" x 6½"

MODEL	ADJ. VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF [1] 40°C	50°C	60°C	71°C	PRICE
LCS-A-01	0-7	2.0	1.9	1.6	1.1	$99
LCS-A-02	0-18	1.1	1.0	0.9	0.7	99
LCS-A-03	0-32	0.69	0.64	0.60	0.45	99
LCS-A-04	0-60	0.37	0.34	0.31	0.25	99
LCS-A-05	0-120	0.10	0.10	0.10	0.10	109

LCS-4 SINGLE OUTPUT MODELS



4 29/32" x 4 29/32" x 5"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE
LCS-4-3	3±5%	4.5	3.9	3.1	2.0	$130
LCS-4-3P6	3.6±5%	4.5	3.9	3.1	2.0	130
LCS-4-4	4±5%	4.5	3.9	3.1	2.0	130
LCS-4-4P5	4.5±5%	4.4	3.7	2.9	1.8	130
LCS-4-5	5±5%	4.4	3.7	2.9	1.8	130
LCS-4-6	6±5%	4.0	3.4	2.6	1.5	130
LCS-4-8	8±5%	4.0	3.4	2.6	1.5	130
LCS-4-10	10±5%	3.2	2.8	2.2	1.3	130
LCS-4-12	12±5%	3.1	2.8	2.2	1.3	130
LCS-4-15	15±5%	2.8	2.6	2.1	1.3	130
LCS-4-18	18±5%	2.6	2.4	2.0	1.2	130
LCS-4-20	20±5%	2.4	2.2	1.9	1.1	130
LCS-4-24	24±5%	2.2	1.8	1.5	0.95	130
LCS-4-28	28±5%	2.0	1.6	1.4	0.85	130
LCS-4-36	36±5%	1.8	1.5	1.3	0.85	140
LCS-4-48	48±5%	1.2	1.1	0.9	0.75	140
LCS-4-100	100±5%	0.46	0.46	0.46	0.34	140
LCS-4-120	120±5%	0.40	0.40	0.40	0.30	140
LCS-4-150	150±5%	0.32	0.32	0.32	0.25	180

LCS-4 SINGLE OUTPUT MODELS (Wide Range)

4 29/32" x 4 29/32" x 5"

MODEL	ADJ. VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE
LCS-4-01	0-7	3.3	3.0	2.3	1.5	$130
LCS-4-02	0-18	1.8	1.6	1.2	0.8	130
LCS-4-03	0-32	1.0	0.9	0.7	0.5	130
LCS-4-04	0-60	0.55	0.5	0.43	0.3	140
LCS-4-05	0-120	0.25	0.25	0.22	0.16	140

LCD-2 DUAL OUTPUT MODELS

3 5/32" x 3 9/32" x 3 9/32"

MODEL	ADJ. VOLT. RANGE VDC (EACH SIDE)	MAX. MA. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE
LCD-2-11	0-7	300	240	175	115	$125
	0-7	300	240	175	115	
LCD-2-12	0-18	160	130	100	65	125
	0-7	300	240	175	115	
LCD-2-13	0-32	120	95	70	45	125
	0-7	300	240	175	115	
LCD-2-22	0-18	160	130	100	65	125
	0-18	160	130	100	65	
LCD-2-23	0-32	120	95	70	45	125
	0-18	160	130	100	65	
LCD-2-33	0-32	120	95	70	45	125
	0-32	120	95	70	45	
LCD-2-44	0-60	65	52	37	23	170
	0-60	65	52	37	23	
LCD-2-55	0-120	30	30	22	14	170
	0-120	30	30	22	14	

POWER COMPONENTS
LC SERIES

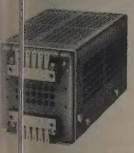
CD3 DUAL OUTPUT MODELS

3 3/16" x 3 5/16" x 5"

MODEL	ADJ. VOLT. RANGE VDC	MAX. MA. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LCD-3-11	0-7	700	590	480	340	$150
	0-7	700	590	480	340	
LCD-3-12	0-7	700	590	480	340	150
	0-18	400	350	300	210	
LCD-3-13	0-7	700	590	480	340	150
	0-32	225	190	160	120	
LCD-3-22	0-18	400	350	300	210	150
	0-18	400	350	300	210	
LCD-3-23	0-18	400	350	300	210	150
	0-32	225	190	160	120	
LCD-3-33	0-32	225	190	160	120	150
	0-32	225	190	160	120	
LCD-3-44	0-60	130	100	70	45	175
	0-60	130	100	70	45	

LC-A DUAL OUTPUT MODELS

3 3/16" x 3 3/4" x 6 1/2"



MODEL	ADJ. VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LCD-A-11	0-7	1.0	0.9	0.7	0.5	$155
	0-7	1.0	0.9	0.7	0.5	
LCD-A-12	0-18	0.5	0.45	0.4	0.3	155
	0-7	1.0	0.9	0.7	0.5	
LCD-A-13	0-32	0.35	0.3	0.25	0.2	155
	0-7	1.0	0.9	0.7	0.5	
LCD-A-22	0-18	0.5	0.45	0.4	0.3	155
	0-18	0.5	0.45	0.4	0.3	
LCD-A-23	0-32	0.35	0.3	0.25	0.2	155
	0-18	0.5	0.45	0.4	0.3	
LCD-A-33	0-32	0.35	0.3	0.25	0.2	155
	0-32	0.35	0.3	0.25	0.2	
LCD-A-44	0-60	0.2	0.18	0.14	0.12	180
	0-60	0.2	0.18	0.14	0.12	
LCD-A-55	0-120	75 ma	75 ma	75 ma	60 ma	200
	0-120	75 ma	75 ma	75 ma	60 ma	

LCD-4 DUAL OUTPUT MODELS

4 29/32" x 4 29/32" x 5"

MODEL	ADJ. VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LCD-4-11	0-7	1.8	1.5	1.2	0.7	$190
	0-7	1.8	1.5	1.2	0.7	
LCD-4-12	0-18	1.0	0.8	0.65	0.4	190
	0-7	1.8	1.5	1.2	0.7	
LCD-4-13	0-32	0.6	0.53	0.4	0.24	190
	0-7	1.8	1.5	1.2	0.7	
LCD-4-22	0-18	1.0	0.8	0.65	0.4	190
	0-18	1.0	0.8	0.65	0.4	
LCD-4-23	0-32	0.6	0.53	0.4	0.24	190
	0-18	1.0	0.8	0.65	0.4	
LCD-4-33	0-32	0.6	0.53	0.4	0.24	190
	0-32	0.6	0.53	0.4	0.24	
LCD-4-44	0-60	0.33	0.3	0.24	0.15	240
	0-60	0.33	0.3	0.24	0.15	
LCD-4-55	0-120	0.12	0.12	0.12	0.075	240
	0-120	0.12	0.12	0.12	0.075	
LCD-4-152	15±5%	1.5	1.3	1.0	0.6	220
FIXED	15±5%	1.5	1.3	1.0	0.6	

OVERVOLTAGE PROTECTOR ACCESSORIES
(separate OV required for each output)

MODEL	ADJ. VOLT. RANGE VDC	FOR USE WITH	PRICE [2]
LC-OV-10	3-24	LCS-1, LCS-2, LCS-3, LCD-2, LCD-3	$20
LC-OV-11	3-47		20
LC-OV-12	3-70		25
LM-OV-.1	3- 8	Fixed Voltage LCS-A, LCS-4, LCD-4	30
LM-OV- 2	6-20		30
LM-OV- 3	18-70		30
LH-OV- 4	3-24	Wide range LCS-A, LCD-A, LCD-4, LCS-4	35
LH-OV- 5	3-47		35
LH-OV- 6	3-70		35

NOTES: (1) For operation at 360-440Hz, consult factory for ratings and specifications.
(2) All prices FOB Melville, N. Y. All prices and specifications subject to change without notice.

Now from Lambda. Military I-C regulated power supplies & transformer

The only MIL supply available with 5 year guarantee
0-7, -18, -32, -60, -120 vdc, currents to 550 ma
400 Hz and 60 Hz operation
regulation 0.01%, ripple and noise 1mv rms

All models designed and tested to meet performance specifications of
MIL-STD-810B, -454, -461, -462, -463
MIL-E-5272C, MIL-E-16400F, MIL-E-4158D, and MIL-E-5400K

All-silicon DC power supply using integrated circuits to provide regulation system
except for input and output capacitors, rectifiers and series regulation transistors

Increased reliability
through use of integrated circuit which replaces 32 discrete components from conventional designs

Convection cooled
no external heat sinking required

Regulation
line or load .01% + 1 mv

Ripple and noise
1 mv rms

Wide input voltage and frequency range
MIL-E models 102-124 vac, 360-440 Hz as per MIL-STD-704A, Class B. MIL-S models 105-132 vac, 57-63 Hz

Wide storage temp. range
−62°C to + 85°C

Temperature coefficient
.01% + 300 μv/°C external programing resistor.
.015% + 300 μv/°C internal resistor.

Overvoltage protection
available as accessory up to 70 vdc

More current per cubic inch

Remote programing
1000 ohm/v nominal or volt/volt

Series/parallel operation
with similar single or dual units

Completely protected
automatic current limiting

Remote sensing

No overshoot
on turn-on, turn-off or power failure

Features of dual output models

Independent operation

Independent remote sensing

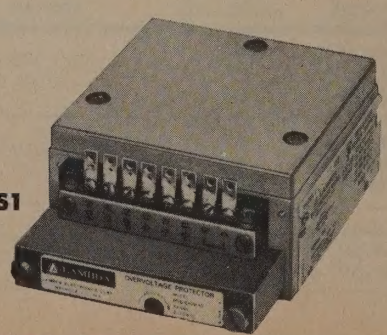
Independent remote programing

Series/parallel operation (master/slave)

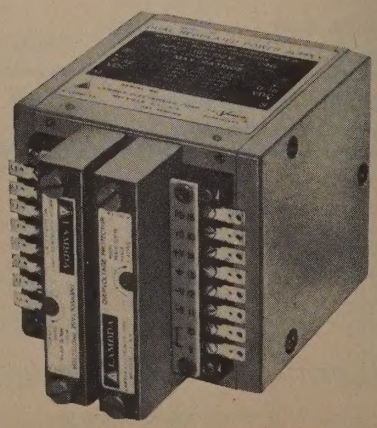
Each supply electrically isolated
and floating with respect to ground

One day delivery—all models

Guaranteed for five years material and labor



MIL-CS1



MIL-CS2

Military I-C regulated power supplies

MIL-E RATINGS: 400 Hz operation

M-E-CS1 SINGLE OUTPUT MODELS

3⅝" x 3 9/32" x 1 21/32"

Model	VOLTAGE RANGE	MAX. CONTINUOUS CURRENT OVER ENTIRE OPERATING TEMPERATURE RANGE (MA)*	Price[2]
ME-CS1-01	0-7	200	$115
ME-CS1-02	0-18	95	115
ME-CS1-03	0-32	65	115
ME-CS1-04	0-60	35	125
ME-CS1-05	0-120	10	125

*Ratings based upon Class I operation per MIL-E-5400K.

M-E-CS2 SINGLE OUTPUT MODELS

3½" x 3 9/32" x 3 9/32"

Model	VOLTAGE RANGE	MAX. CONTINUOUS CURRENT OVER ENTIRE OPERATING TEMPERATURE RANGE (MA)*	Price[2]
M-E-CS2-01	0-7	450	$130
M-E-CS2-02	0-18	270	130
M-E-CS2-03	0-32	180	130
M-E-CS2-04	0-60	110	140
M-E-CS2-05	0-120	30	140

*Ratings based upon Class I operation per MIL-E-5400K.

ML-E-CD2 DUAL OUTPUT MODELS

3½" x 3 9/32" x 3 9/32"

Model	VOLTAGE RANGE	MAX. CONTINUOUS CURRENT OVER ENTIRE OPERATING TEMPERATURE RANGE (MA)*	Price[2]
ML-E-CD2-11	0-7 0-7	250 250	$230
ML-E-CD2-12	0-18 0-7	135 250	230
ML-E-CD2-13	0-32 0-7	95 250	230
ML-E-CD2-22	0-18 0-18	135 135	230
ML-E-CD2-23	0-32 0-18	95 135	230
ML-E-CD2-33	0-32 0-32	95 95	230
ML-E-CD2-44	0-60 0-60	50 50	245
ML-E-CD2-55	0-120 0-120	25 25	245

*Ratings based upon Class I operation per MIL-E-5400K.

NOTES:

1) MIL-S modules will meet all the environmental specifications of the MIL-E models except the ratings will be based upon max. ambient temperatures as indicated.

2) All prices FOB Melville, N. Y. All prices and specifications subject to change without notice.

MIL-S RATINGS: 60 Hz operation[1]

MIL-S-CS1 SINGLE OUTPUT MODELS

3 5/32" x 3 9/32" x 1 21/32"

Model	VOLTAGE RANGE	MAXIMUM CURRENT (MA) AT AMBIENT TEMPERATURE* 40°C	50°C	60°C	71°C	Price[2]
MIL-S-CS1-01-A	0-7	275 (250)	220 (180)	165 (120)	110 (75)	$115
MIL-S-CS1-02-A	0-18	130 (115)	130 (115)	100 (80)	85 (40)	115
MIL-S-CS1-03-A	0-32	90 (80)	90 (80)	90 (50)	50 (25)	115
MIL-S-CS1-04-A	0-60	50 (45)	50 (45)	50 (35)	30 (15)	125
MIL-S-CS1-05-A	0-120	18 (15)	18 (15)	18 (15)	18 (10)	125

*Bracketed ratings are for 47-53Hz operation.

MIL-S-CS2 SINGLE OUTPUT MODELS

3 5/32" x 3 9/32" x 3 9/32"

Model	VOLTAGE RANGE	MAXIMUM CURRENT (MA) AT AMBIENT TEMPERATURE 40°C	50°C	60°C	71°C	Price[2]
MIL-S-CS2-01	0-7	550	455	350	240	$130
MIL-S-CS2-02	0-18	330	275	210	140	130
MIL-S-CS2-03	0-32	240	205	155	95	130
MIL-S-CS2-04	0-60	145	115	87	57	140
MIL-S-CS2-05	0-120	50	50	45	30	140

MIL-S-CD2 DUAL OUTPUT MODELS

3 5/32" x 3 9/32" x 3 9/32"

Model	VOLTAGE RANGE	MAXIMUM CURRENT (MA) AT AMBIENT TEMPERATURE 40°C	50°C	60°C	71°C	Price[2]
MIL-S-CD2-11	0-7 0-7	300 300	240 240	175 175	115 115	$230
MIL-S-CD2-12	0-18 0-7	160 300	130 240	100 175	65 115	230
MIL-S-CD2-13	0-32 0-7	120 300	95 240	70 175	45 115	230
MIL-S-CD2-22	0-18 0-18	160 160	130 130	100 100	65 65	230
MIL-S-CD2-23	0-32 0-18	120 160	95 130	70 100	45 65	230
MIL-S-CD2-33	0-32 0-32	120 120	95 95	70 70	45 45	230
MIL-S-CD2-44	0-60 0-60	65 65	52 52	37 37	23 23	245
MIL-S-CD2-55	0-120 0-120	30 30	30 30	22 22	14 14	245

OVERVOLTAGE PROTECTION ACCESSORIES MIL-E and MIL-S units (Separate OV required for each output)

Model	ADJ. VOLT. RANGE	Price[2]
MIL-C-OV-10	3-24 VDC	$30
MIL-C-OV-11	3-47 VDC	30
MIL-C-OV-12	3-70 VDC	35

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LM series: up to 150 volts, up to 33 amps

All silicon semiconductors

Convection cooled
no external heat sinking required

Regulation
line .05% + 4mv
load .03% + 3mv, no load to full load

Ripple and noise
1mv rms; 3mv p-to-p

Wide input voltage and frequency range
105-132 vac, 45-65 Hz, 40°C rating not applicable for 50 Hz operation

Wide operating temperature range
—20°C to + 71°C

Temperature coefficient
.03%/°C

Multi-current-rated

Complete serviceability
all components replaceable

Remote sensing

No voltage spikes or overshoot
on turn-on, turn-off or power failure

Remote programing
200 ohms/v nominal

Completely protected
automatic current limiting and self-resetting thermostats

Overvoltage protection
available as accessory up to 70vdc

Finish
grey, FED. STD. 595 No. 26081

Mounting
three surfaces for A, B, C, CC and D packages,
One surface for E and EE packages.

High performance option
All models available with these specifications at $15.00 surcharge:
line regulation .01% + 1 mv
load regulation .02% + 2 mv
ripple and noise 0.5mv rms; 1.5 mv p-to-p with 60 Hz input
temp. coeff. 01%/°C

AC input option
add suffix "-V" to model number for 205-265 vdc operation, (40°C rating not applicable), and in U.S. and Canada add $10.00 or 10% extra to the price, whichever is greater.

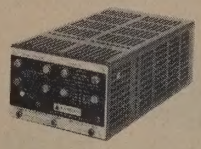
Fungus proofing option
add suffix "-R" to model number and $10.00 to price to obtain MIL-V-173 varnish on all fungi nutrient components.

Lambda is its own distributor

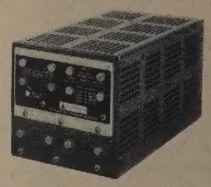
Lambda offers you 7 package sizes in these modular power supplies

A module
up to 120 volts • up to 2.0 amps

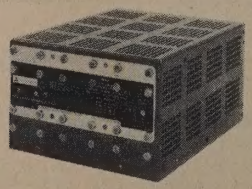
B module
up to 150 volts • up to 3.8 amps



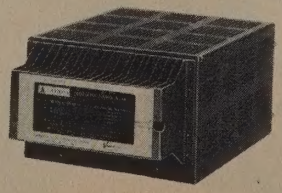
C module
up to 150 volts • up to 5.3 amps



CC module
up to 150 volts • up to 11.0 amps



D module
up to 150 volts • up to 13.1 amps



E module
up to 150 volts • up to 22.0 amps

EE module
up to 150 volts • up to 33 amps

LM series fixed-voltage models

ackage B 3 3/16" x 4 15/16" x 6 1/2"

odel	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
B-3	3 ±5%	3.8	3.3	2.6	1.6	$119
B-3-P-6	3.6±5%	3.8	3.3	2.6	1.6	119
B-4	4 ±5%	3.8	3.3	2.6	1.6	119
B-4-P-5	4.5±5%	3.7	3.2	2.5	1.5	119
B-5	5 ±5%	3.7	3.2	2.5	1.5	119
B-6	6 ±5%	3.2	2.9	2.4	1.4	119
B-8	8 ±5%	3.2	2.9	2.4	1.4	119
-B-10	10 ±5%	2.7	2.5	2.2	1.4	119
-B-12	12 ±5%	2.5	2.3	2.1	1.3	119
-B-15	15 ±5%	2.2	2.0	1.8	1.3	119
-B-18	18 ±5%	2.0	1.8	1.7	1.3	119
-B-20	20 ±5%	1.8	1.6	1.5	1.2	119
-B-24	24 ±5%	1.4	1.3	1.2	1.1	119
-B-28	28 ±5%	1.3	1.2	1.1	1.0	119
-B-36	36 ±5%	1.1	1.0	0.90	0.85	119
-B-48	48 ±5%	0.9	0.85	0.80	0.75	119
-B-100	100 ±5%	0.37	0.34	0.30	0.28	139
-B-120	120 ±5%	0.30	0.28	0.25	0.23	139
-B-150	150 ±5%	0.25	0.23	0.20	0.19	139

Package D 4 15/16" x 7 1/2" x 9 3/8"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-D-3	3 ±5%	13.1	11.3	9.2	6.2	$209
LM-D-3-P-6	3.6±5%	13.1	11.3	9.2	6.2	209
LM-D-4	4 ±5%	13.1	11.3	9.2	6.2	209
LM-D-4-P-5	4.5±5%	13.1	11.3	9.2	6.2	209
LM-D-5	5 ±5%	12.6	10.8	9.2	6.1	209
LM-D-6	6 ±5%	12.4	10.6	8.9	6.0	209
LM-D-8	8 ±5%	12.2	10.3	8.8	5.9	209
LM-D-10	10 ±5%	10.8	9.7	8.5	5.7	209
LM-D-12	12 ±5%	10.0	9.2	8.3	5.7	209
LM-D-15	15 ±5%	9.0	8.4	7.9	5.3	219
LM-D-18	18 ±5%	7.9	7.4	6.9	5.0	219
LM-D-20	20 ±5%	7.4	6.9	6.5	4.9	219
LM-D-24	24 ±5%	6.7	6.3	5.8	4.8	219
LM-D-28	28 ±5%	6.0	5.6	5.2	4.7	219
LM-D-36	36 ±5%	5.4	5.0	4.7	4.3	239
LM-D-48	48 ±5%	4.1	3.9	3.6	3.1	239
LM-D-100	100 ±5%	1.7	1.5	1.3	1.1	239
LM-D-120	120 ±5%	1.5	1.3	1.1	1.0	239
LM-D-150	150 ±5%	1.1	1.0	0.90	0.80	239

ackage C 3 3/16" x 4 15/16" x 9 3/8"

odel	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
-C-3	3 ±5%	5.3	4.6	3.7	2.5	$139
-C-3-P-6	3.6±5%	5.2	4.5	3.6	2.5	139
-C-4	4 ±5%	5.2	4.5	3.6	2.5	139
-C-4-P-5	4.5±5%	5.1	4.4	3.5	2.4	139
-C-5	5 ±5%	5.1	4.3	3.4	2.4	139
-C-6	6 ±5%	4.8	4.1	3.3	2.4	139
-C-8	8 ±5%	4.6	3.9	3.2	2.1	139
-C-10	10 ±5%	4.2	3.6	3.0	2.0	139
-C-12	12 ±5%	4.0	3.5	2.9	1.9	139
-C-15	15 ±5%	3.5	3.2	2.8	1.9	139
-C-18	18 ±5%	3.2	3.0	2.7	1.9	139
-C-20	20 ±5%	3.1	2.9	2.6	1.8	139
-C-24	24 ±5%	2.5	2.4	2.2	1.5	139
-C-28	28 ±5%	2.3	2.1	2.0	1.4	139
-C-36	36 ±5%	2.0	1.8	1.7	1.3	159
-C-48	48 ±5%	1.6	1.4	1.3	1.0	159
-C-100	100 ±5%	0.55	0.51	0.47	0.42	159
-C-120	120 ±5%	0.49	0.45	0.42	0.38	159
-C-150	150 ±5%	0.39	0.36	0.33	0.30	159

Package E 4 15/16" x 7 1/2" x 11 3/4"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-E-3	3 ±5%	22.0	20.0	16.5	10.0	$269
LM-E-3-P-6	3.6±5%	21.0	19.0	16.5	10.0	269
LM-E-4	4 ±5%	21.0	19.0	16.5	10.0	269
LM-E-4-P-5	4.5±5%	20.0	18.0	16.4	10.0	269
LM-E-5	5 ±5%	20.0	18.0	16.4	10.0	269
LM-E-6	6 ±5%	19.0	17.3	15.6	10.0	269
LM-E-8	8 ±5%	18.0	16.4	14.7	10.0	269
LM-E-10	10 ±5%	16.0	14.5	13.0	9.5	269
LM-E-12	12 ±5%	15.0	13.6	12.3	9.5	269
LM-E-15	15 ±5%	14.0	12.7	11.5	8.6	269
LM-E-18	18 ±5%	13.0	11.8	10.6	8.6	269
LM-E-20	20 ±5%	12.0	10.9	9.8	8.5	269
LM-E-24	24 ±5%	11.0	10.0	9.0	7.6	269
LM-E-28	28 ±5%	10.0	9.0	8.0	7.1	269
LM-E-36	36 ±5%	8.0	7.3	6.5	5.7	269
LM-E-48	48 ±5%	6.0	5.4	4.9	4.3	299
LM-E-100	100 ±5%	2.0	1.7	1.6	1.5	299
LM-E-120	120 ±5%	1.7	1.5	1.4	1.2	299
LM-E-150	150 ±5%	1.4	1.3	1.2	1.0	299

ackage CC 4 15/16" x 4 15/16" x 9 3/8"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
M-CC-3	3 ±5%	11.0	9.4	8.2	5.5	$179
M-CC-3-P-6	3.6±5%	11.0	9.4	8.2	5.5	179
M-CC-4	4 ±5%	11.0	9.4	8.2	5.5	179
LM-CC-4-P-5	4.5±5%	10.5	9.0	8.0	5.5	179
LM-CC-5	5 ±5%	10.5	9.0	8.0	5.5	179
LM-CC-6	6 ±5%	9.0	8.4	7.7	5.5	179
LM-CC-8	8 ±5%	8.5	7.9	7.2	5.5	179
LM-CC-10	10 ±5%	7.5	7.0	6.3	5.0	179
LM-CC-12	12 ±5%	7.3	6.8	5.9	4.7	179
LM-CC-15	15 ±5%	6.0	5.6	5.1	4.3	179
LM-CC-18	18 ±5%	5.5	5.1	4.7	4.1	179
LM-CC-20	20 ±5%	5.0	4.6	4.2	3.6	179
LM-CC-24	24 ±5%	4.0	3.7	3.4	3.0	179
LM-CC-28	28 ±5%	3.5	3.4	3.1	2.8	179
LM-CC-36	36 ±5%	3.0	2.9	2.7	2.4	199
LM-CC-48	48 ±5%	2.5	2.4	2.2	1.9	199
LM-CC-100	100 ±5%	1.0	0.96	0.90	0.80	199
LM-CC-120	120 ±5%	0.9	0.86	0.80	0.70	199
LM-CC-150	150 ±5%	0.7	0.67	0.62	0.55	199

Package EE 4 15/16" x 7 1/2" x 16 1/2"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-EE-3	3 ±5%	33.0	29.0	25.0	20.5	$320
LM-EE-3-P-6	3.6±5%	32.0	26.0	22.0	18.3	320
LM-EE-4	4 ±5%	32.0	26.0	22.0	18.3	320
LM-EE-4-P-5	4.5±5%	31.0	24.6	20.8	17.3	320
LM-EE-5	5 ±5%	31,0	24.6	20.8	17.3	320
LM-EE-6	6 ±5%	30.0	24.6	20.8	17.3	320
LM-EE-8	8 ±5%	28.0	23.5	19.7	16.5	320
LM-EE-10	10 ±5%	24.0	20.4	16.8	13.8	320
LM-EE-12	12 ±5%	21.0	19.0	16.1	13.2	320
LM-EE-15	15 ±5%	19.0	18.0	15.5	12.7	320
LM-EE-18	18 ±5%	16.5	14.8	12.4	10.1	320
LM-EE-20	20 ±5%	15.2	13.7	11.8	9.7	320
LM-EE-24	24 ±5%	14.0	12.5	10.8	9.0	320
LM-EE-28	28 ±5%	13.0	11.5	9.8	8.2	320
LM-EE-36	36 ±5%	10.4	9.8	8.6	7.1	320
LM-EE-48	48 ±5%	7.7	7.1	6.5	5.4	320
LM-EE-100	100 ±5%	3.3	3.0	2.5	2.1	350
LM-EE-120	120 ±5%	3.0	2.7	2.2	1.9	350
LM-EE-150	150 ±5%	2.2	2.0	1.75	1.50	350

LM series wide-range models

Package A 3 3/16" x 3 3/4" x 6 1/2"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-201	0–7	0.85	0.75	0.70	0.55	$79
LM-202	0–7	1.7	1.5	1.4	1.1	89
LM-252	0–7	2.0	1.8	1.4	1.1	99
LM-203	0–15	0.45	0.40	0.38	0.28	79
LM-204	0–15	0.90	0.80	0.75	0.55	89
LM-258	0–15	1.2	1.1	1.0	0.80	99
LM-261	0–24	0.70	0.65	0.60	0.45	89
LM-262	0–24	0.80	0.75	0.70	0.60	99
LM-206	0–32	0.50	0.45	0.40	0.30	89
LM-264	0–32	0.66	0.60	0.50	0.32	99
LM-266	0–60	0.35	0.31	0.28	0.25	109
LM-267	0–120	0.10	0.09	0.08	0.07	109
LM-268	0–120	0.15	0.14	0.12	0.11	119

Package B 3 3/16" x 4 15/16" x 6 1/2"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-B-0-7	0–7	2.8	2.6	2.3	1.5	$109
LM-B-0-14	0–14	1.6	1.5	1.3	1.2	109
LM-B-0-32	0–32	0.8	0.7	0.6	0.5	109
LM-B-0-60	0–60	0.45	0.4	0.35	0.3	109
LM-217	8.5–14	2.1	1.9	1.7	1.3	119
LM-218	13–23	1.5	1.3	1.2	1.0	119
LM-219	22–32	1.2	1.1	1.0	0.8	119
LM-220	30–60	0.70	0.65	0.60	0.45	129

Package C 3 3/16" x 4 15/16" x 9 3/8"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LM-225	0–7	4.0	3.6	3.0	2.4	$139
LM-C-0-14	0–14	2.2	2.0	1.8	1.5	139
LM-C-0-32	0–32	1.1	1.0	0.90	0.80	139
LM-C-0-60	0–60	0.60	0.55	0.50	0.45	139
LM-226	8.5–14	3.3	3.0	2.5	2.0	139
LM-227	13–23	2.3	2.1	1.7	1.4	139
LM-228	22–32	2.0	1.8	1.5	1.2	139
LM-229	30–60	1.1	1.0	0.80	0.60	149

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Package D 4 15/16" x 7 1/2" x 9 3/8"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Pri
LM-234	0–7	8.3	7.3	6.5	5.5	$1
LM-D-0-14	0–14	4.9	4.2	3.4	2.7	1
LM-D-0-32	0–32	2.5	2.1	1.7	1.3	1
LM-D-0-60	0–60	1.3	1.1	0.95	0.75	2
LM-235	8.5–14	7.7	6.8	6.0	4.8	1
LM-236	13–23	5.8	5.1	4.5	3.6	2
LM-237	22–32	5.0	4.4	3.9	3.1	2
LM-238	30–60	2.6	2.3	2.0	1.6	2

Package E 4 15/16" x 7 1/2" x 11 3/4"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Pr
LM-E-0-7	0–7	12.0	10.5	8.5	6.8	$
LM-E-0-14	0–14	7.4	6.4	5.2	4.1	
LM-E-0-32	0–32	3.7	3.2	2.6	2.1	
LM-E-0-60	0–60	2.1	1.7	1.4	1.1	

Package EE 4 15/16" x 7 1/2" x 16 1/2"

Model	ADJ. VOLT. RANGE VDC	MAX AMPS AT AMBIENT OF: 40°	50°	60°	71°	Pri
LM-EE-0-7	0—7	16	13.5	11.2	9.2	$3
LM-EE-0-14	0—14	10.2	8.6	7.3	6.1	3
LM-EE-0-32	0—32	5.2	4.4	3.8	3.2	3
LM-EE-0-60	0—60	2.7	2.45	2.15	1.85	3

NOTES:

[1] CURRENT RATING IS FROM ZERO TO I MAX. CURRENT RATING APPLIES OVER ENTIRE OUTPUT VOLTAGE RANGE. CURRENT RATING APPLIES FOR INPUT VOLTAGE 105-132 VAC 55-65 HZ. FOR OPERATION AT 45-55 HZ DELETE 40°C RATING. FOR OPERATION AT 360-440 HZ CONSULT FACTORY FOR RATINGS AND SPECIFICATIONS.

[2] PRICES F.O.B. FACTORY, MELVILLE, N. Y. ALL SPECIFICATIONS AND PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

Overvoltage Protectors

Model	Adj. Volt Range	Pri
LM-OV-1	3-8V	$3
LM-OV-2	6-20V	3
LM-OV-3	18-70V	3
LM-OV-7 (for EE pkg.)	3-8V	7
LM-OV-8 (for EE pkg.)	6-20V	7
LM-OV-9 (for EE pkg.)	18-70V	7

Lambda has over 10,000 power supply units on-the-shelf for 1-day delivery.

Every one is fully guaranteed for 5 years... material and labor.

LAMBDA ELECTRONICS CORP.
A Veeco Company

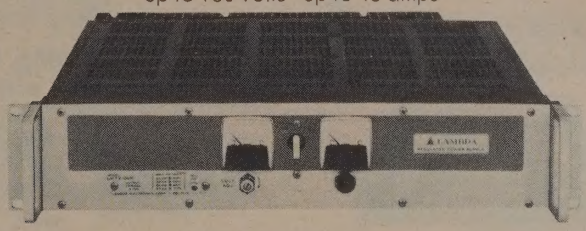
515 BROAD HOLLOW ROAD, MELVILLE, L. I., NEW YORK 11746. TELEPHONE: 516-694-4200. TWX 510-224-6484; CABLE: LAMBDATRON, MELVILLE, N.

Now from Lambda.

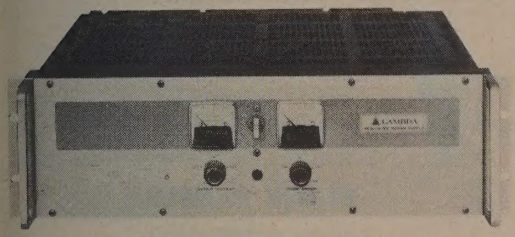
LM series full-rack power supplies

All silicon, programable, convection-cooled units up to 150 volts, up to 150 amps.

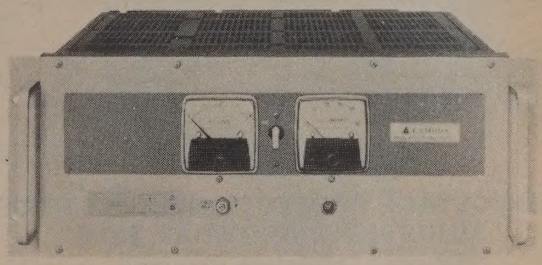
Package F
up to 150 volts • up to 48 amps



Package G
up to 150 volts • up to 95 amps



Package H
up to 12 volts • up to 150 amps



Select from this condensed list of models.

LM FULL RACK

ckage F & G	Package H
Regulation ne — .05 + 4 mV	.01% + 1 mV
Regulation oad — .06 + 3 mV	.02% + 2 mV
Ripple and oise — 1 V rms, 3 V p-p	½ mV p-to-p 1½ mV p-to-p
Temp. oeff. — .6%/°C	.01%/°C
Input — 1-132 VAC, -440 Hz	105-132 VAC, 45-440 Hz

FIXED VOLTAGE MODELS

Model No.	Voltage VDC±5%	Current Amps (40°C)	Price
Package F 3½" x 19" x 16½"			
LM-F-3	3	48.0	$450
LM-F-3-P-6	3.6	48.0	450
LM-F-4	4	48.0	450
LM-F-4-P-5	4.5	48.0	450
LM-F-5	5	48.0	450
LM-F-6	6	47.0	450
LM-F-8	8	44.0	450
LM-F-10	10	38.0	450
LM-F-12	12	33.0	450
LM-F-15	15	25.0	450
LM-F-18	18	25.0	450
LM-F-20	20	23.0	450
LM-F-24	24	20.0	450
LM-F-28	28	19.0	450
LM-F-36	36	13.0	500
LM-F-48	48	10.0	500
LM-F-100-M	100	4.3	530
LM-F-120-M	120	3.7	530
LM-F-150-M	150	3.1	530
Package G 5¼" x 19" x 16½"			
LM-G-3	3	95.0	$575
LM-G-3-P-6	3.6	85.0	575
LM-G-4	4	85.0	575
LM-G-4-P-5	4.5	85.0	575
LM-G-5	5	80.0	575
LM-G-6	6	80.0	575
LM-G-8	8	68.0	575
LM-G-10	10	64.0	575
LM-G-12	12	56.0	575
LM-G-15	15	45.0	$575
LM-G-18	18	38.0	575
LM-G-20	20	35.0	575
LM-G-24	24	32.0	575
LM-G-28	28	28.0	575
LM-G-36	36	22.0	575
LM-G-48	48	17.0	600
LM-G-100-M	100	7.5	680
LM-G-120-M	120	6.5	680
LM-G-150-M	150	5.5	680
Package H 7" x 19" x 18½"			
LM-H-3-OV-Y-M	3	150	$995
LM-H-3-P-6-OV-Y-M	3.6	130	995
LM-H-4-OV-Y-M	4	135	995
LM-H-4-P-5-OV-Y-M	4.5	120	995
LM-H-5-OV-Y-M	5	130	995
LM-H-6-OV-Y-M	6	117	995
LM-H-10-OV-Y-M	10	95	995
LM-H-12-OV-Y-M	12	90	995

WIDE RANGE MODELS

Model No.	Adj. Voltage Range VDC	Current Amps (40°C)	Price
Package F 3½" x 19" x 16½"			
LM-F-0-7	0-7	25.0	$450
Package G 5¼" x 19" x 16½"			
LM-G-0-7	0-7	35.0	$575
Package H 7" x 19" x 18½"			
LM-H-0-7-OV-Y-M	0-7	52.0	$875

OVERVOLTAGE PROTECTION

Built-in overvoltage protection is standard on all package H models and available as an option on all package F and G models up to 70 VDC. To order for F and G packages, add suffix "-OV" to model number and add $90.00 to price. Price of package H models includes overvoltage protection.

PRICES OF F AND G PACKAGES ARE FOR NON-METERED MODELS, EXCEPT FOR MODEL NUMBERS FOLLOWED BY SUFFIX "M" FOR METERED MODELS ADD SUFFIX "M" TO MODEL NUMBER AND $30.00 TO PRICE.

PACKAGE H MODELS ARE AVAILABLE ONLY WITH OVERVOLTAGE PROTECTION. HIGH PERFORMANCE OPTION, AND METERS ALL OF WHICH ARE INCLUDED IN THE PRICE.

all LM series power supplies are listed in nderwriters' Laboratories Recognized Components Index.

Guaranteed for five years material and labor

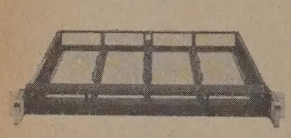
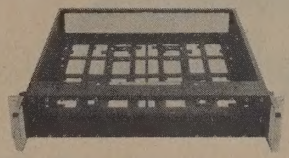
A Vecco Company

LAMBDA ELECTRONICS CORP.
515 BROAD HOLLOW ROAD, MELVILLE, L.I., N.Y. 11746
TEL. 516-694-4200, TWX: 510-224-6484
CABLE: LAMBDATRON, MELVILLE, N.Y.

Accessories for use with Lambda modular power suppli

RACK ADAPTERS

Model	Dimensions (Inches) H x W x D	For Use with Packages:	Price
LRA-3	5¼" x 19" x 2 9/16"	A, B, C, CC, D, E	$35
LRA-4	3½" x 19" x 14"	A, B, C	60
LRA-5	3½" x 19" x 2 9/16"	A, B, C	35
LRA-6	5¼" x 19" x 14"	A, B, C, CC, D, E	60
LRA-7	5¼" x 19" x 21"	A, B, C, CC, D, E, EE	70
LRA-8	3½" x 19" x 14"	1, 2, 3, A, B, C	70
LRA-9	1¾" x 19" x 14"	1	60
LRA-10	5¼" x 19" x 14"	1, 2, 3, A, 4, B, C, CC, D	70
LRA-11	5¼" x 19" x 21"	1, 2, 3, A, 4, B, C, CC, D, E, EE	70

MOUNTED CHASSIS SLIDES

For Rack Adapters	Lambda Part No.	Add to Price
LRA-4, LRA-6 LRA-8, LRA-10	KHT-34-003	$50
LRA-7, LRA-11	KHT-44-008	50
LRA-9	KHT-28-009	50

To order chassis slides add suffix -CS to rack adapter model number (Example LRA-11-CS).

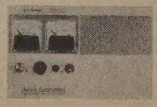
OVERVOLTAGE PROTECTION ACCESSORIES ADJUSTABLE CROWBAR TYPE

Mounting Provisions Provided... 2 Terminal Connection

Model	ADJ. VOLT. Range VDC	For Use With	Price
LC-OV-10	3-24	LCS-1, LCS-2, LCD-2 LCS-3, LCD-3	$20
LC-OV-11	3-47		20
LC-OV-12	3-70		25
MIL-C-OV-10	3-24	LCS-1, LCS-2, LCD-2 LCS-3, LCD-3	30
MIL-C-OV-11	3-47		30
MIL-C-OV-12	3-70		35
LM-OV-1	3-8	Fixed Voltage LCS-A, LCS-4, LCD-4	30
LM-OV-2	6-20	LM-A, B, C, CC, D, E	30
LM-OV-3	18-70	Packages	30
LH-OV-4	3-24	LCD-A, wide range LCS-A, LCS-4, LCD-4	35
LH-OV-5	3-47		35
LH-OV-6	3-70		35
LM-OV-7	3-8	LM — EE Packages	75
LM-OV-8	6-20		75
LM-OV-9	18-70		75

METERED PANELS

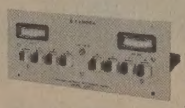
Model	Width	For use with LM Packages	For use with Rack Adapters	Height	Price
MP-3	¼ rack	A, B, C	LRA-4, LRA-5	3½"	$45
MP-5	¼ rack	A, B, C, CC, D, E	LRA-3, LRA-6	5¼"	45
MP-50	½ rack	EE only	LRA-7	5¼"	55



NON-METERED PANELS

Model	Width	For use with LM Packages	For use with Rack Adapters	Height
P-3	¼ rack	A, B, C	LRA-4, LRA-5	3½"
P-5	¼ rack	A, B, C, CC, D, E	LRA-3, LRA-6	5¼"
P-50	½ rack	EE only	LRA-7	5¼"

SYSTEMS METERING PANELS for use with all LC/LM Modules



Model	For use with Rack Adapter:	Width and Height
SMP-1	LRA-9	8 9/16" x 1¾"
SMP-3	LRA-8	8 9/16" x 3½"
SMP-5	LRA-10 & 11	8 9/16" x 5¼"

SYSTEMS POWER CONTROL PANELS for use with all LC/LM Modules

Model	For use with Rack Adapter:	Width and Height
SP-1	LRA-9	1 1/64" x 1¾"
SP-3	LRA-8	1 1/64" x 3½"
SP-5	LRA-10 & 11	1 1/64" x 5¼"
SP-50	LRA-11 (EE only)	1 1/64" x 5¼"

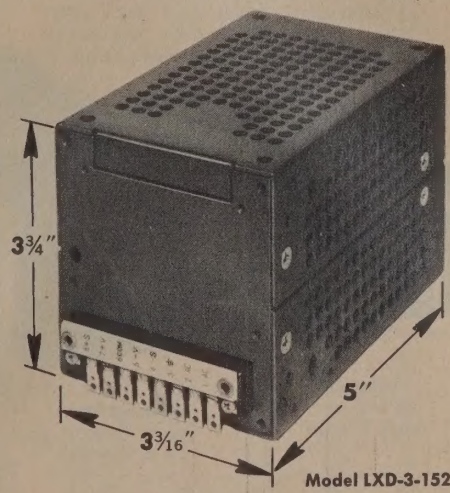
BLANK PANELS

Model	Size (For use with 3½" Height Rack Adapters LRA-4, LRA-5)	P
LBP-60	3½" H, ¼ rack width	$
LBP-50	3½" H, ½ rack width	1
LBP-30	3½" H, full rack width	1
	(For use with 5¼" Height Rack Adapters LRA-3, LRA-6, LRA-7)	
LBP-10	5¼" H, ¼ rack width	$
LBP-20	5¼" H, ½ rack width	1
LBP-40	5¼" H, full rack width	1
	(For use with 1¾" Height Rack Adapter LRA-9)	
SB-1	1 SP Panel, 1 1/64" width	$
SB-2	2 SP Panels, 2 1/32" width	
SB-3	4 SP Panels, 4 1/16" width	1
SB-4	1 SMP Panel, 8 9/16" width	1
SB-5	All Panels, 16¾" width	1
	(For use with 3½" Height Rack Adapter LRA-8)	
SB-6	1 SP Panel, 1 1/64" width	$
SB-7	2 SP Panels, 2 1/32" width	
SB-8	4 SP Panels, 4 1/16" width	1
SB-9	1 SMP Panel, 8 9/16" width	1
SB-10	All Panels, 16 25/32" width	1
	(For use with 5¼" Height Rack Adapters LRA-10 & LRA-11)	
SB-11	1 SP Panel, 1 1/64" width	$
SB-12	2 SP Panels, 2 1/32" width	
SB-13	4 SP Panels, 4 1/16" width	1
SB-14	1 SMP Panel, 8 9/16" width	1
SB-15	All Panels, 16 25/32" width	1

New LXD-3-152 tracking dual output power supply designed to power operational amplifiers

+ and − (12 to 15 vdc) at 400 ma dc series-connected dual outputs
0.1% regulation, 1.5 mv rms ripple

only $85.



Model LXD-3-152 tracking dual output power supply

Features

Tracking accuracy
1 absolute voltage difference; 0.1% change for all conditions of line, load and temperature

All-silicon dc power supply using integrated circuits to provide regulation system
except for input and output capacitors, rectifiers and series regulation transistors.

Convection cooled
no external heat sinking or forced air required

Increased reliability
through use of integrated circuits which replace discrete components from conventional designs.

Regulation
0.1% line or load

Ripple and noise
1.5 mv rms; 5 mv p-to-p

Wide input voltage and frequency range
105-132 vac, 57-63 Hz

Wide temperature range
0°C to +71°C

Temperature coefficient
0.03%/°C

Remote sensing

Fixed current limiting

Multi-current-rated

Complete serviceability

Overvoltage protection
requires only one OV accessory for both outputs
LC-OV-11 . . . . $20.00

No overshoot
on turn-on, turn-off or power failure

Outputs
positive, negative and common

Commercial contract plan
available for OEM and large-volume users. Contact local sales engineer for details.

Voltage and current ratings

LXD-3-152

3³⁄₁₆" x 3¾" x 5"

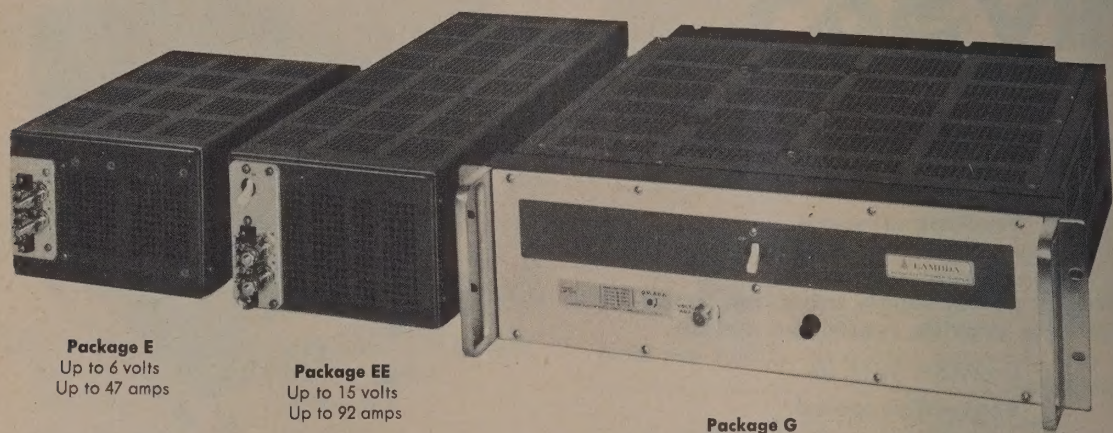
MODEL	ADJ. VOLT. RANGE VDC	MAX. MA DC AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	Price [2]
LXD-3-152	+ (12 to 15)	400	370	340	300	$85
	− (12 to 15)	400	370	340	300	
	can also be used					
LXD-3-152	24-30	400	370	340	300	$85

NOTES: (1) For operation at other than 57-63 Hz, consult factory for ratings and specifications.
(2) All prices FOB Melville, N. Y. All prices and specifications subject to change without notice.

Lambda has over 10,000 power supply units on-the-shelf for 1-day delivery. Every one is fully guaranteed for 5 years... material and labor.

New high efficiency LV series modular power supplies designed to power TTL, ECL, RTL, DTL and HTL logic

0.15% regulation line or load. Less than 10 mv rms ripple. Convection cooled—no blowers. Built-in overvoltage protection standard.



Package E
Up to 6 volts
Up to 47 amps

Package EE
Up to 15 volts
Up to 92 amps

Package G
Up to 15 volts
Up to 170 amps

Features

Efficiency
greater than 50%, with advanced SCR circuitry

All silicon semiconductors

Convection cooled
no external heat sinking or forced air required

Regulation
line 0.15% + 10 mv for line variations from 105-132 vac.
load 0.15% + 10 mv, no load to full load or full load to no load.

Low ripple
10 mv rms, max., with electronic ripple reducer

AC input voltage
105-132 vac, 57-63 Hz

Temperature coefficient
.03% + 0.5 mv/°C

Ambient temperature range
0°C to +71°C operating
−55°C to +85°C, storage

Thermally protected and short-circuit proof
current limiting circuit and self-resetting thermostats protect supplies.

No voltage spikes or overshoot
on turn-on, turn-off or power failure

Remote programming
200 ohms/v nominal, or volt/volt

Remote sensing

Multi-current-rated

Series / parallel operation

Complete serviceability
all components replaceable

Overvoltage protection
built-in, continuously adjustable overvoltage protection crow bars output when trip level is exceeded. Included on all models

Overload protection
THERMAL
thermostat: automatic reset of thermostat on all models whe overtemperature condition is eliminated; on EE and G packages, ON-OFF circuit breaker must be manually rese
ELECTRICAL
external overload protection: fixed, automatic electronic cur rent limiting circuit limits the output current upon externa overloads, including short circuit, thereby providing pro tection for load as well as power supply.

Mounting
one surface with tapped mounting holes for E and EE pack ages; package G is rack mounted.

Input connections
heavy duty terminal block on rear of chassis

Output connections
heavy duty studs on rear of chassis

Controls
DC OUTPUT CONTROL
screwdriver voltage adjustment over entire voltage range
OVERVOLTAGE PROTECTOR CONTROL
screwdriver adjustment covers entire operating range

Remote Sensing
to eliminate effect of power output lead resistance on dc reg ulation.

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Accessories

rd rack adapters and chassis slides are available for th packages E and EE. Specify:

- rack adapter 5¼" x 19" x 14" (E only) **$60.00**
- rack adapter 5¼" x 19" x 21" **70.00**
- rack adapter 5¼" x 19" x 14" (D for LW Series only)..... **70.00**
- rack adapter 5¼" x 19" x 21" **70.00**

der chassis slides, add "-CS" to the rack adapter model er and $50 to the price.

ge G is a full rack model. Chassis slides can be supplied package G. Add "-CS" to the model number and $60 price.

Physical Data:

SIZE

package D 4 15/16" x 7½" x 9⅜"
package E 4 15/16" x 7½" x 11¾"
package EE 4 15/16" x 7½" x 16½"
package G 5¼" x 19" x 16½" (full rack)

FINISH

package E, EE—gray, FED. STD. 595 No. 26081
package G—brushed aluminum clear anodized panel with gray inlay.

Commercial contract plan

available for OEM and large-volume users. Contact local sales engineer for details.

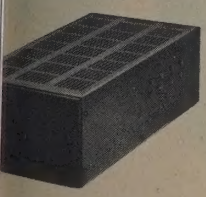
Series (Fixed Voltage)

KAGE E

4 15/16" x 7½" x 11¾"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LV-E-3-P-3-OV	2.8-3.8	47	39	28	13	$325
LV-E-4-OV	4±5%	44	39	28	13	325
LV-E-4-P-5-OV	4.5±5%	41	38	28	13	325
LV-E-5-OV	5±5%	37	34	28	13	325
LV-E-6-OV	6±5%	33	30	27	13	325

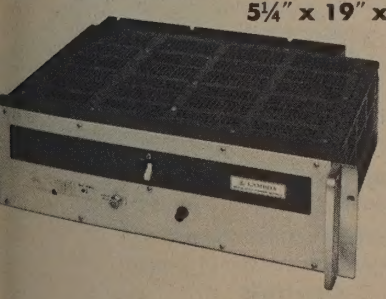
CKAGE EE



4 15/16" x 7½" x 16½"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LV-EE-3-OV	3±5%	98	90	74	61	$490
LV-EE-3-P-6-OV	3.6±5%	92	85	70	57	490
LV-EE-4-OV	4±5%	87	82	70	54	490
LV-EE-4-P-5-OV	4.5±5%	81	77	70	52	490
LV-EE-5-OV	5±5%	74	70	65	45	490
LV-EE-6-OV	6±5%	64	61	56	40	490
LV-EE-10-OV	10±5%	41	39	36	25	415
LV-EE-12-OV	12±5%	34	32	30	21	415
LV-EE-15-OV	15±5%	28	26	24	18	415

CKAGE G



5¼" x 19" x 16½"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LV-G-3-OV	3±5%	170	165	150	135	$750
LV-G-3-P-6-OV	3.6±5%	160	155	140	125	750
LV-G-4-OV	4±5%	150	145	132	120	750
LV-G-4-P-5-OV	4.5±5%	135	131	119	108	750
LV-G-5-OV	5±5%	130	126	115	100	750
LV-G-6-OV	6±5%	110	107	98	90	750
LV-G-10-OV	10±5%	74	71	65	61	750
LV-G-12-OV	12±5%	65	63	57	54	750
LV-G-15-OV	15±5%	50	48	44	40	750

Package G models are only available without meters.

Package G models are available with mounted chassis slides. Add suffix "-CS" to the model number and $60 to the price.

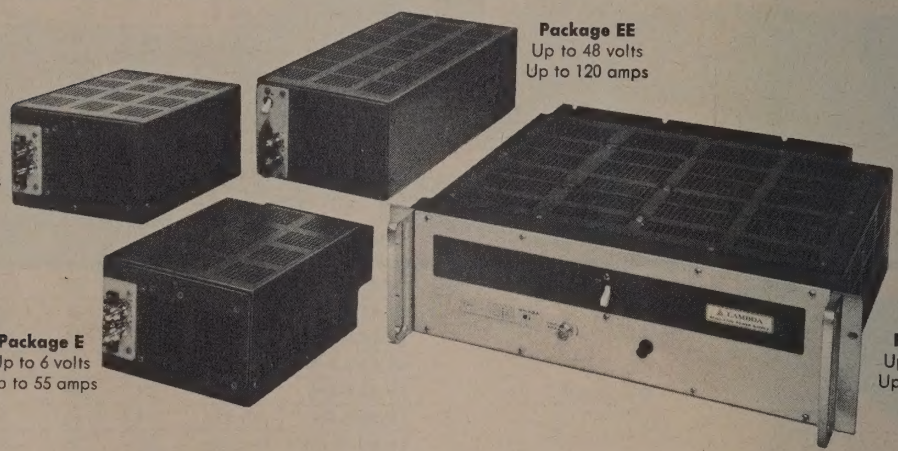
NOTES: (1) Current rating is from zero to I max. Current rating applies over entire output voltage range. Current rating applies for input voltage 105-132 vac 57-63 Hz.

(2) All prices FOB Melville, N. Y. All prices and specifications subject to change without notice.

mbda has over 10,000 power supply units on-the-shelf for 1-day delivery. very one is fully guaranteed for 5 years... material and labor.

New high efficiency LW series modular power supplies designed to power transistor circuitry, lights, motors, solenoids and relays

2% regulation line or load, 300 mv rms ripple
Convection cooled—no blowers



Features

Efficiency
greater than 50%, with unique SCR circuitry

All silicon semiconductors

Convection cooled
no external heat sinking or forced air required

Regulation
line 2%, for line variations from 105-132 vac
load 2%, 20% load to full load or full load to 20% load; or 2%, full load to no load with a 20% preload, throughout voltage adjust range

Low ripple
300 mv rms or 2% of output voltage, whichever is greater

AC input voltage
105-132 vac, 57-63 Hz

Temperature coefficient
.03% + 0.5 mv/°C

Ambient temperature range
0°C to +71°C, operating
−55°C to +85°C, storage

Thermally protected and short-circuit proof
current limiting circuit and self-resetting thermostats protect supplies.

No voltage spikes or overshoot
on turn-on, turn-off or power failure

Remote programming
200 ohms/v nominal, or volt/volt

Remote sensing
to eliminate effect of power output lead resistance on dc regulation.

Complete serviceability
all components replaceable

Overload protection

THERMAL
thermostat: automatic reset on all units when over-temperatur condition is eliminated; on EE and G units ON-OFF circu breaker must be manually reset.

ELECTRICAL
external overload protection: fixed, automatic electronic cur rent limiting circuit limits the output current upon externa overloads, including short circuit, thereby providing pro tection for load as well as power supply.

Input connections
heavy duty terminal block on rear of chassis

Output connections
heavy duty studs on rear of chassis

Controls

DC OUTPUT CONTROL
screwdriver voltage adjustment over entire voltage range

Mounting
three mounting surfaces for D packages. One mounting surface with tapped mounting holes for packages E and EE. Package G is rack mounted.

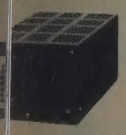
Commercial contract plan
available for OEM and large-volume users. Contact local sales engineer for details.

Accessories and physical data
see LV series

LW Series (Fixed Voltage)

PACKAGE D

4 15/16" x 7½" x 9⅜"



MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LW-D-10	10±5%	27	25	23	17	$250
LW-D-12	12±5%	26.5	20	13.7	8.8	250
LW-D-15	15±5%	22.5	20	13.7	8.8	250
LW-D-18	18±5%	19	18.3	13.7	8.8	250
LW-D-20	20±5%	17.5	16.7	13.7	8.8	250
LW-D-24	24±5%	14.7	14	13.2	8.8	250
LW-D-28	28±5%	12.5	12	11.1	7.7	250
LW-D-48	48±5%	7.6	7.3	6.8	6.2	250

PACKAGE E

4 15/16" x 7½" x 11¾"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LW-E-3-P-3	2.8-3.8	55	52	49	45	$270
LW-E-4	4±5%	53	50	47	43	270
LW-E-4-P-5	4.5±5%	49	46	43	40	270
LW-E-5	5±5%	45	42	40	37	270
LW-E-6	6±5%	39	37	35	32	270

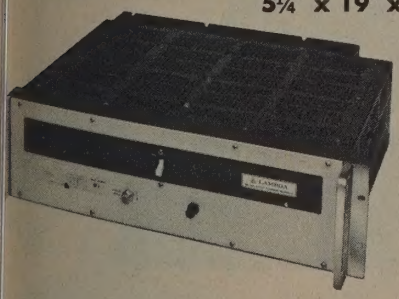
PACKAGE EE

4 15/16" x 7½" x 16½"

MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LW-EE-3	3±5%	120	113	98	80	$400
LW-EE-3-P-6	3.6±5%	113	108	98	77	400
LW-EE-4	4±5%	107	102	96	74	400
LW-EE-4-P-5	4.5±5%	99	95	89	70	400
LW-EE-5	5±5%	91	87	82	62	400
LW-EE-6	6±5%	78	75	70	54	400
LW-EE-10	10±5%	51	48	45	35	350
LW-EE-12	12±5%	42	40	37	28	350
LW-EE-15	15±5%	35	33	31	24	350
LW-EE-18	18±5%	33	32	30	23	350
LW-EE-20	20±5%	31	30	28	22	350
LW-EE-24	24±5%	26	25	23	17	350
LW-EE-28	28±5%	22	21	20	15	350
LW-EE-48	48±5%	13	13	12	9	350

PACKAGE G

5¼" x 19" x 16½"



MODEL	FIXED VOLT. RANGE VDC	MAX. AMPS. AT AMBIENT OF: [1] 40°C	50°C	60°C	71°C	PRICE [2]
LW-G-3	3±5%	200	195	180	165	$675
LW-G-3-P-6	3.6±5%	190	185	170	155	675
LW-G-4	4±5%	180	175	162	148	675
LW-G-4-P-5	4.5±5%	160	155	142	132	675
LW-G-5	5±5%	150	146	135	123	675
LW-G-6	6±5%	128	123	115	105	675
LW-G-10	10±5%	88	85	79	72	675
LW-G-12	12±5%	75	72	67	61	675
LW-G-15	15±5%	60	57	53	49	675
LWG-18	18±5%	58	56	52	47	675
LWG-20	20±5%	53	51	47	43	675
LWG-24	24±5%	48	46	42	39	675
LWG-28	28±5%	39	37	34	32	675
LWG-48	48±5%	24	23	21	19	675

Package G models are only available without meters.

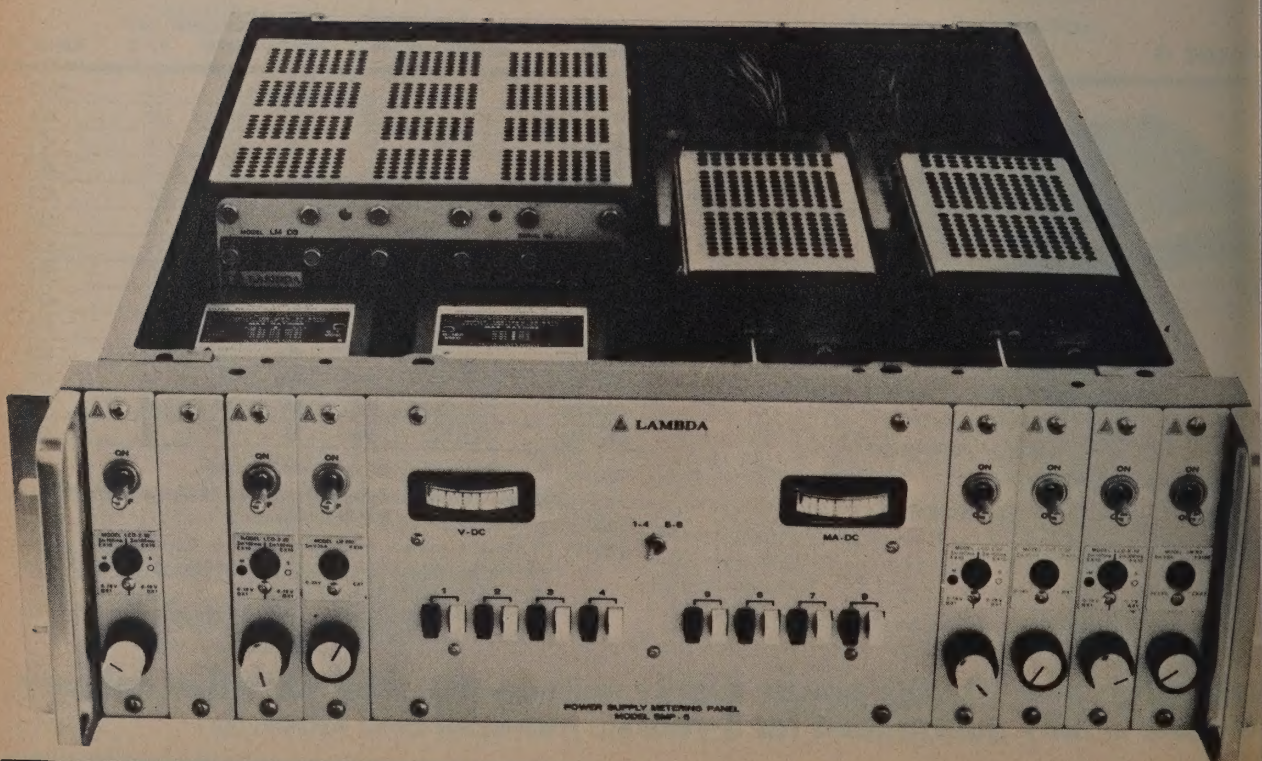
Package G models are available with mounted chassis slides. Add suffix "-CS" to the model number and $60 to the price.

NOTES: (1) Current rating is from zero to I max. Current rating applies over entire output voltage range. Current rating applies for input voltage 105-132 vac 57-63 Hz.

(2) All prices FOB Melville, N. Y. All prices and specifications subject to change without notice.

Lambda has over 10,000 power supply units on-the-shelf for 1-day delivery. Every one is fully guaranteed for 5 years... material and labor.

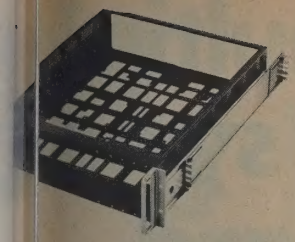
Lambda multiple output power supply systems... assembled from standard components available from stock.



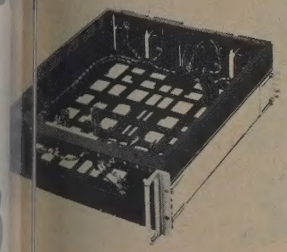
Assemble complete power supply systems to meet your specific need with *standard* Lambda component power supplies and accessories.

Here's an easy way to get multiple-output, power-supply systems with all the advantages of custom-designed systems, but without long delays and high costs. Lambda's new Power Supply Assembly Concept makes custom-design systems obsolete... greatly simplifies your job. You simply select from more than 260 component power supplies and assemble your system with standard accessories. Or let Lambda do the assembly for you at a modest charge.

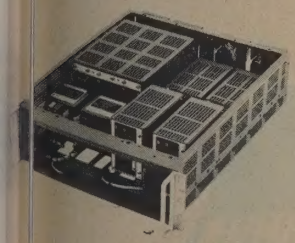
Lambda, through the 14 power packages of the LC/LM power components, can supply voltages to 150 vdc and currents to 33 amps dc to fit any application. With 4 standard rack sizes Lambda can supply up to 16 different outputs per rack.



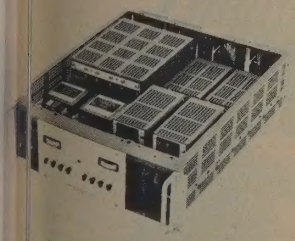
Select rack adapter, hassis slides optional.



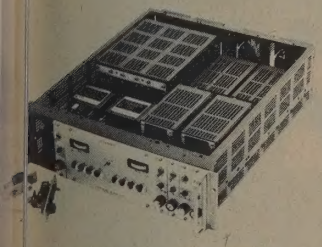
sert the selected cables.



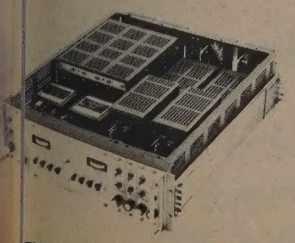
Add the power modules.



Mount and plug in the Systems Metering Panel.



g in and mount the appropriate ys ns Control Panels and blank panels.



The complete multiple-output stem has now been assembled.

Here's all you do:

1. List your individual voltage and current requirements.
2. Select the power modules you need for proper voltages and currents... remember you can series/parallel units.
3. Select the Systems Power Protector or Systems Power Sequencer if required.
4. Select the overvoltage protection units required.
5. Select the smallest rack adapter that will house your modules.
6. Select the necessary power control panels and metering panel.
7. Select all the required cables.
8. Select blank panels.
9. Order all the power supplies and accessories needed to assemble your system. If you prefer, Lambda will assemble the system for you. The cost for Lambda to assemble your system is 5% of the total cost of all the power supplies and accessories in the system.

How to use this brochure to design your power supply system.

Lambda has four standard rack adapters for use in assembling the power supply systems that meet your needs. These are standard 19-inch rack adapters with different height and depth dimensions as follows:

1¾"h x 14"d, 3½"h x 14"d, 5¼"h x 14"d, 5¼"h x 21"d.

The assemblies of power supply systems for each of these racks are described beginning on pages 4, 8, 12 and 16, respectively.

Once you have selected the power supply units to meet your voltage and current requirements, the dimensions of the individual power supply modules and the number of modules you require will determine the minimum rack adapter size you can use. Then turn to the pages describing this rack adapter for details on the accessories you need for that size assembly. Page 7 is a ready reference for various power supply combinations that might be used in the different rack adapters.

PACKAGE 1
up to 120 volts • up to 275ma

PACKAGE 2
up to 120 volts • up to 550ma
single and dual outputs

PACKAGE 3
up to 60 volts • up to 1.2 amps
single and dual outputs

PACKAGE A
up to 120 volts • up to 2.0 amps
single and dual outputs

PACKAGE B
up to 150 volts • up to 3.8 amps

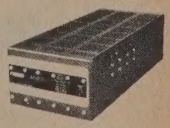
PACKAGE 4
up to 150 volts • up to 4.5 amps
single and dual outputs

PACKAGE C
up to 150 volts • up to 5.3 amps

PACKAGE CC
up to 150 volts • up to 11.0 amps

PACKAGE D
up to 150 volts • up to 13.1 amps

PACKAGE E
up to 150 volts • up to 22.0 amps

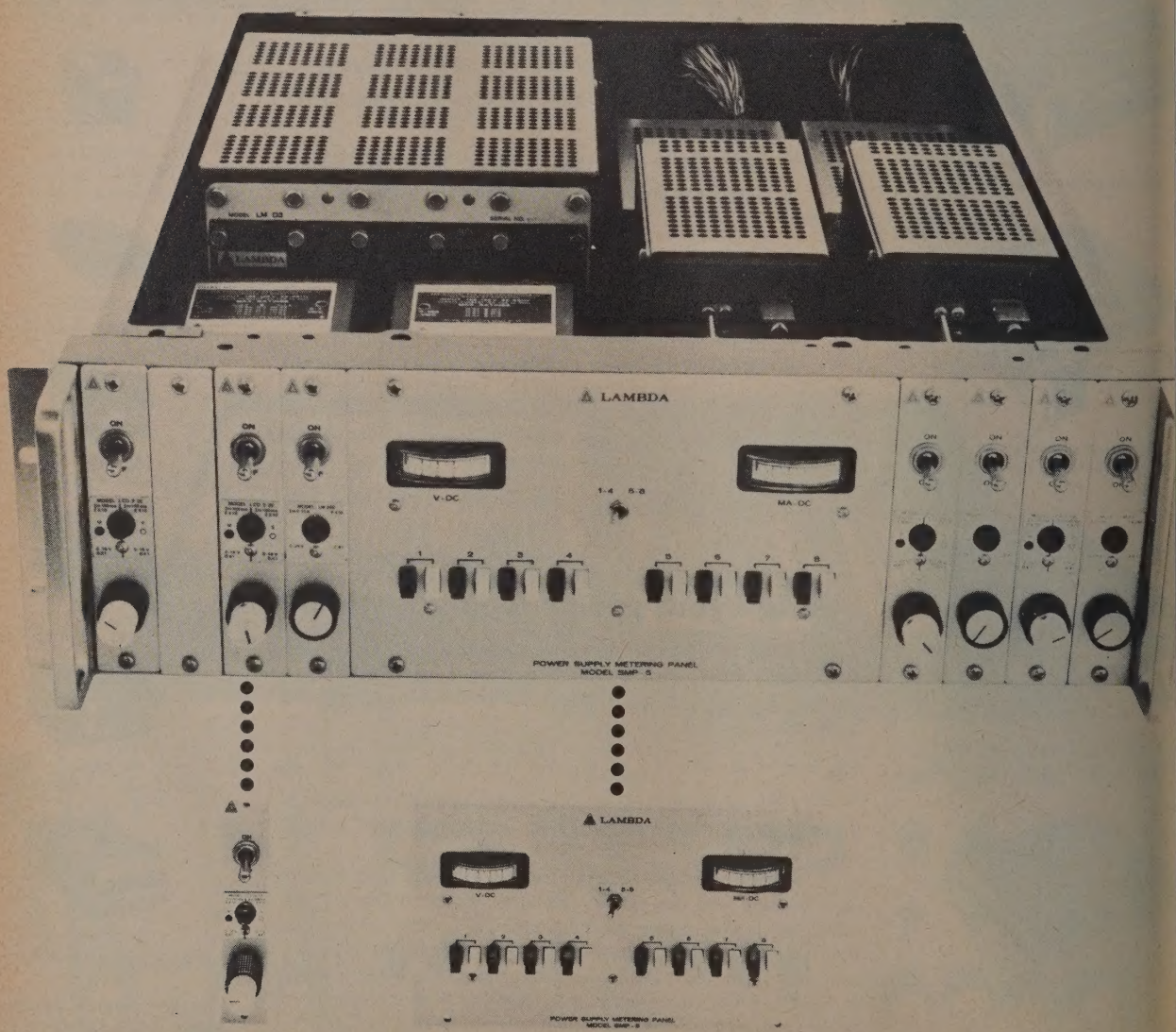


PACKAGE EE
up to 150 volts • up to 33.0 amps

SELECT POWER MODULES FROM THESE PACKAGE SIZES IN THE LC/LM SERIES.

Now you can get a multiple output power supply system by assembling standard Lambda components, available from stock

...16 outputs in a 5¼"x 21" rack.



SP-5 $30
Systems Power Control Panel

SMP-5 $100
Systems Metering Panel

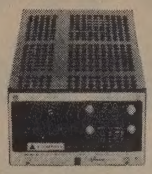
Select your voltage and current requirements from these LC/LM package sizes.

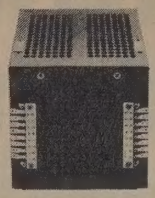
PACKAGE 1

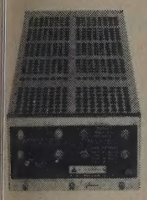
PACKAGE 2

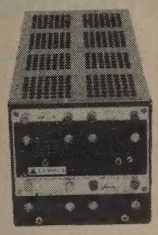
PACKAGE 3

PACKAGE A

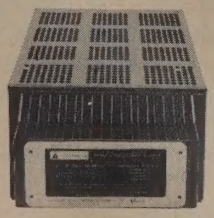

PACKAGE B

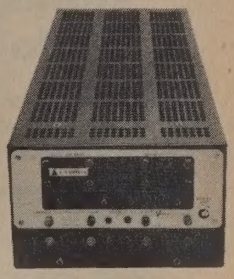

PACKAGE 4

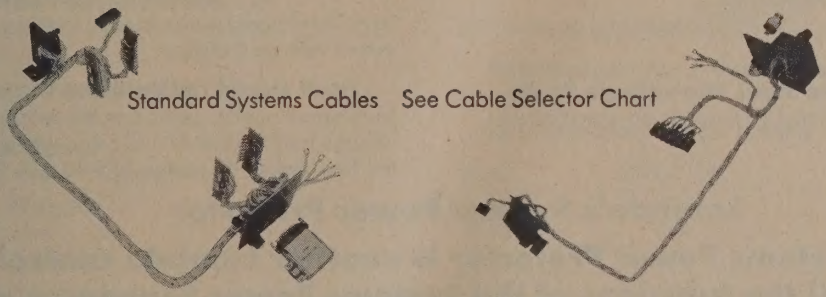

PACKAGE C

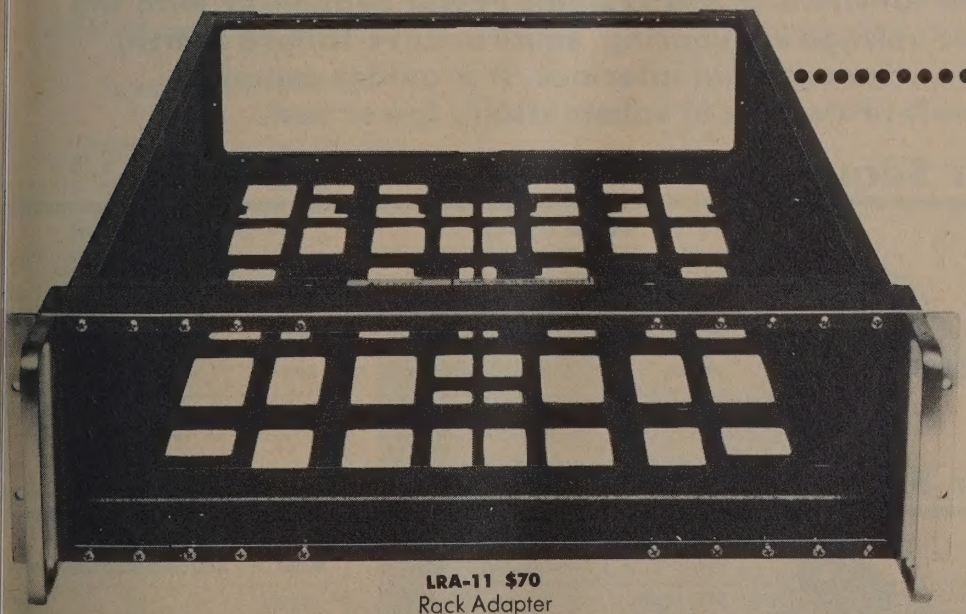

PACKAGE CC

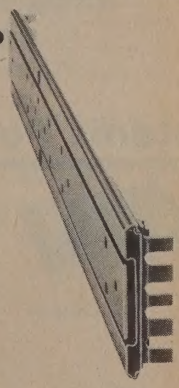
PACKAGE D


PACKAGE E


PACKAGE EE


Standard Systems Cables See Cable Selector Chart


LRA-11 $70
Rack Adapter


$50 (pr.)
Chassis Slide

Lambda has over 10,000 power supply units on-the-shelf for 1-day delivery.

Every one fully guaranteed for 5 years... material and labor.

LAMBDA
ELECTRONICS CORP.
A (Vanco) Company

Now from Lambda. Systems Power Sequencer

sequences voltage ON and OFF, monitors voltage status, protects against ac input line voltage faults, undervoltage and overvoltage

Controls up to 8 power supplies
sequences ON up to 8 power supplies in pre-determined sequence and sequences them OFF in mirror image.

Turn ON sequence incomplete
incomplete sequence causes all output voltages to be crowbarred.

Turn OFF sequence failure
protect system overrides and causes all voltages to be crowbarred.

Monitors
power supply overvoltage and undervoltage and ac input line voltage simultaneously.

Protects against ac input line voltage faults
power failure causes all output voltages to be crowbarred.

Protects against undervoltage
one fault can result in all output voltages crowbarring (w optional disable).

Protects against overvoltage
one fault causes all output voltages to be crowbarred.

Dry contact closure interlock
available for each power supply at the input/output connec Loss of interlock causes all output voltages to be crowbar

Logic-level signal alerts associated equipment
logic-level signal is provided to indicate failure. It precedes output voltage crowbar.

Fault signal indicates an output voltage fault
fault-signal output signal, a pulse train, is provided when out voltage fault occurs. An indicator light gives visual indication the front panel of models SPS-92, SPS-94, SPS-96 and SPS-

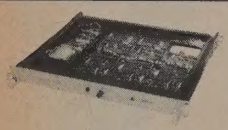
Lambda's System Power Protector

The Systems Power Protector is another Lambda control unit having all the functions of the Systems Power Sequencer with the exception of voltage sequencing, square-wave failure alarm, and two-wire external interlock. It provides complete fault protection at substantially lower cost.

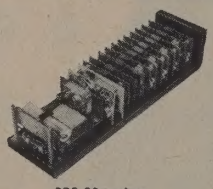
Systems Power Sequencer[1]

1¾" x 19" x 14"

3⅛" x 3 13/16" x 13¼"
(mountable in LRA-8, LRA-10 or LRA-11 rack adap



SPS-90 series



SPS-80 series

Model [3]	POWER OUTPUTS ACCOMMODATED [2]	Price [4]
SPS-92	2	$630
SPS-94	4	720
SPS-96	6	810
SPS-98	8	900

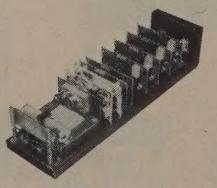
Model [3]	POWER OUTPUTS ACCOMMODATED [2]	Price
SPS-82	2	$58
SPS-84	4	67
SPS-86	6	76
SPS-88	8	85

Systems Power Protector[1]

1¾" x 19" x 14"

3⅛" x 3 13/16" x 13¼"
(mountable in LRA-8, LRA-10 or LRA-11 rack adapt

SPP-90 series



SPP-80 series

Model [3]	POWER OUTPUTS ACCOMMODATED [2]	Price [4]
SPP-92	2	$465
SPP-94	4	500
SPP-96	6	535
SPP-98	8	570

Model [3]	POWER OUTPUTS ACCOMMODATED [2]	Price
SPP-82	2	$415
SPP-84	4	450
SPP-86	6	485
SPP-88	8	520

Notes: 1. Overvoltage protectors must be used with each power supply to utilize the overvoltage a undervoltage functions of the Power Sequencer or Power Protector.
2. All power supplies of the LC/LM series to be used with the Systems Power Sequencer, cept zero-voltage units, must be specified with the "-S" option. Also, all overvoltage p tectors must be specified with the "-S" option. Simply add the suffix "-S" to the applica power supply model number or overvoltage protector if it is to be used with the Syste Power Sequencer and to all overvoltage protectors used with the Systems Power Protect
3. The Systems Power Protector and the Systems Power Sequencer can be used with Lamb power supplies furnishing up to 70 vdc. For applications above 70 vdc, consult factory.
4. All prices F.O.B. Melville, N. Y. All prices and specifications are subject to change with notice.

5 Year Guarantee

New IC regulated bench power supply with built-in, tracking overvoltage protection

0-10 volts, 1 amp, $90 with OV
0-10 volts, 1 amp, $75 less OV

Also available 0-20, 0-40, 0-120 vdc

Regulation
line 0.01% + 1mv
load 4 mv

Ripple and noise
250 μv rms; 1 mv p-to-p

A silicon DC power supply using integrated circuits to provide regulation system
except for input and output capacitors, rectifiers and series regulation transistors

Multi-position operation
lies flat or stands erect

AC input
105-132 vac 47-440 Hz (Current ratings based on 57-63 Hz.)

Weight
less than 5 lbs.

Output
5-way binding posts

Ambient operating temperature
0—50°C

Temperature coefficient
0.015% + 300 μv/°C

Adjustable current limiting
0% to 110% of rating

Storage temperature
—40°C to +85°C

Convection cooled

Die-cast aluminum construction

No overshoot
on turn-on, turn-off or power failure

Controls
coarse voltage adjust, fine voltage adjust, current adjust, ON/OFF switch, meter function switch.

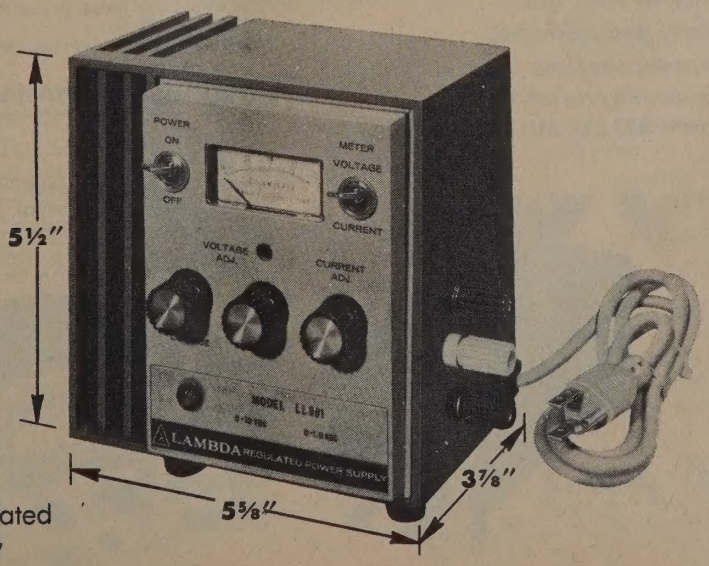
Indicators
power ON light and dual-function meter

Guaranteed for 5 years material and labor

LL series bench-type supply 5⅝" x 5½" x 3⅞"

Model	ADJ. VOLT RANGE VDC	CURRENT RANGE(1)	Price(2)
LL-901	0-10	0-1.0 amp	$75
LL-902	0-20	0-0.65 amp	85
LL-903	0-40	0-0.35 amp	85
LL-905	0-120	0-65 ma	99
WITH BUILT-IN TRACKING OVERVOLTAGE PROTECTION			
LL-901-OV	0-10	0-1.0 amp	$90
LL-902-OV	0-20	0-0.65 amp	99
LL-903-OV	0-40	0-0.35 amp	99

NOTES:
(1) Consult factory for operation at 50 Hz or temperatures above 50°C. Ratings apply 0-50°C.
(2) Independently adjustable OV protection available as accessory on LL-901, 902 (LC-OV-10, range 3-24 vdc) and LL-903 (LC-OV-11. range 3-47 vdc) price $20.
(3) All prices F.O.B. Melville, N. Y. All prices and specifications subject to change without notice.



LL series I-C regulated power supply

Lambda Electronics Corp., 515 Broad Hollow Road, Melville, L. I., New York 11746 • Tel. 516-694-4200.

Lambda's LPD series offer more amps per $ than any other general-purpose dual lab supply.

also available with single output...LP series

Features of LPD series dual output power supply

5 models with two independent DC outputs
up to ±250 vdc, up to 1.7 amps. Either output may be + or −, or both outputs may be + or −.

Series/parallel operation
of both outputs yields two times the voltage or two times the current—up to 500 volts or up to 3.4 amps.

Auto series/auto parallel (master-slave)
permits tracking to a common reference.

4 meters
provide simultaneous monitoring of both voltage and current.

Regulation
line or load .01% + 1 mv.

Ripple
500 μv rms (1.5 mv p-p)

A-C input
105-132 vac 47-440 Hz (ratings based on 57-63 Hz operation). For operation at 205-265 vac, add suffix "-V" to model numbers and 10% or $25.00 (whichever is greater) to price.

Multi-current-rated

Additional features of LP and LPD series

All silicon semiconductors
Bench or rack use
Remotely programable
Remote sensing
Continuously variable
Designed to meet RFI per MIL-STD-826A

Fungus-proofing option
add suffix "R" to model number and add $15.00 to price

Overvoltage protection
available as an option up to 70 vdc

LPD dual output models 5 3/16" x 8 3/8" x 10

Model	Voltage Range Per output/ Outputs in series	MAX AMPS AT AMBIENT OF: (1) Per output. Outputs in parallel			
	VDC	30°C	40°C	50°C	60°C
*LPD-421-FM	0-±20/0-40	1.7A/3.4A	1.5A/3.0A	1.3A/2.6A	0.9A/1.8A
*LPD-422-FM	0-±40/0-80	1.0A/2.0A	0.85A/1.7A	0.7A/1.4A	0.55A/1.1A
*LPD-423-FM	0-±60/0-120	0.7A/1.4A	0.6A/1.2A	0.5A/1.0A	0.4A/0.8A
LPD-424-FM	0-±120/0-240	0.38A/0.76A	0.32A/0.64A	0.26A/0.52A	0.20A/0.40A
LPD-425-FM	0-±250/0-500	0.13A/0.26A	0.12A/0.24A	0.11A/0.22A	0.10A/0.20A

LPD NOTES:

*OVERVOLTAGE PROTECTION AVAILABLE AS AN ACCESSORY. EACH OUTPUT REQUIRES SEPARATE OV ACCESSORY—ADD $35.00 FOR EACH OUTPUT.

(1) CURRENT RATING APPLIES OVER ENTIRE VOLTAGE RANGE. RATINGS BASED ON 57-63 HZ OPERATION.

LP single output models 5 3/16" x 4 3/16" x

Model	VOLTAGE RANGE	CURRENT RANGE AT AMBIENT OF (1): 30°C	40°C	50°C	60°C	Pr
LP-410-FM	0-10 VDC*	0-2A	0-1.8A	0-1.6A	0-1.4A	$1
LP-411-FM	0-20 VDC*	0-1.2A	0-1.1A	0-1.0A	0-0.8A	1
LP-412-FM	0-40 VDC*	0-0.70A	0-0.65A	0-0.60A	0-0.50A	1
LP-413-FM	0-60 VDC*	0-0.45A	0-0.41A	0-0.37A	0-0.33A	1
LP-414-FM	0-120 VDC	0-0.20A	0-0.18A	0-0.16A	0-0.12A	1
LP-415-FM	0-250 VDC	0-80mA	0-72mA	0-65mA	0-60mA	1

LP NOTES:

*OVERVOLTAGE PROTECTION AVAILABLE AS AN ACCESSORY—$35.0 EACH.

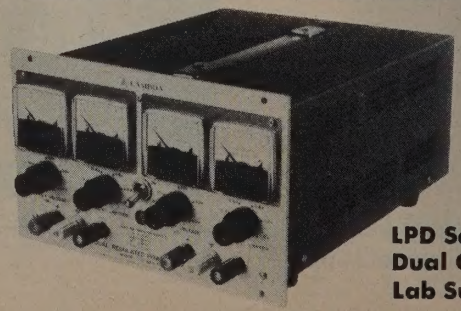
(1) CURRENT RATING APPLIES OVER ENTIRE VOLTAGE RANGE.

Overvoltage protectors (accessories)

For use with	Model	ADJ. VOLT RANGE	Pric
LP-410; (0-10VDC)	LH-OV-4	3-24V	$3
LP-411; LPD-421-FM (0-20VDC)	LH-OV-4	3-24V	3
LP-412; LPD-422-FM (0-40VDC)	LH-OV-5	3-47V	3
LP-413; LPD-423-FM (0-60VDC)	LH-OV-6	3-70V	3

*PRICE IS FOR A SINGLE OVERVOLTAGE ACCESSORY. LPD SERIES MODELS REQUIRE ONE LH-OV FOR EACH OUTPUT.

LP Series



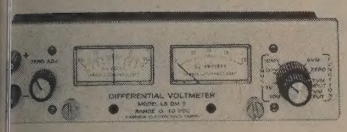
LPD Series Dual Output Lab Supply

5 Year Guarantee

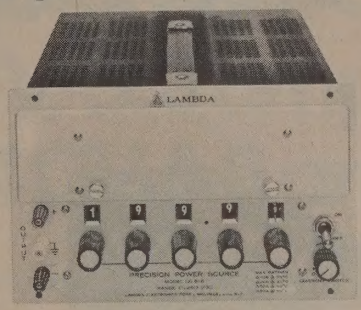
Lambda Electronics Corp. 515 Broad Hollow Road, Melville, L. I., New York 11746. Tel. 516-694-4200.

LS series is two instruments in one
Expand the capability of your laboratory

With this plug-in



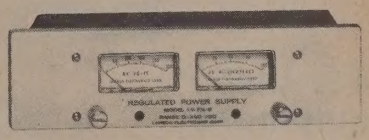
it becomes a high precision power differential voltmeter



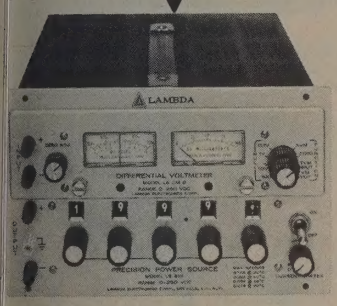
LS power source

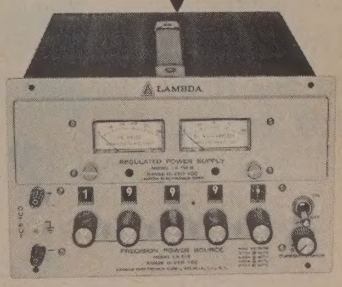
ONE DAY DELIVERY ALL MODELS

With this plug-in



it becomes a metered high precision power supply





FEATURES OF THE HIGH PRECISION POWER DIFFERENTIAL VOLTMETER

- **Draw power as you measure voltage...** The first and only differential voltmeter to furnish high stability power output while being used as a voltmeter... no need for a separate power supply.
- **Plus all power supply specifications**

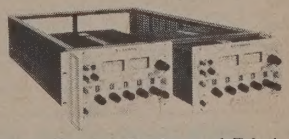
FEATURES OF THE METERED HIGH PRECISION POWER SOURCE

- **.005% plus 100μV Regulation** — best of any high stability power supply in this price range.
- **Ripple** — 35μV rms; 100μV p-p.
- **Accuracy** — 0.01% + 1mV.
- **Meters** — monitor both voltage and current simultaneously and continuously.
- **Price the power** — in a convenient 5-rack package.

- **Guaranteed for 5 years** — the only 5-year guarantee that includes labor as well as parts. Guarantee applies to operation at full published specifications at end of 5 years.

- **Multi-Current-Rated** — for 30°C, 40°C, 50°C, 60°C — Covers temperatures most often encountered in laboratory work.
- **5 Models** — with ranges of 0-10, 0-20, 0-40, 0-120, 0-250VDC—Wide selection of ranges to suit your specific needs.
- **Illuminated digital readout** — 5-digital voltage dials provide convenient precise adjustment (200μV resolution over entire range).
- **Only 5¼" high**—convenient half-rack size for rack or bench use.
- **Stability** — 0.001% + 100μV for 8 hours.
- **All silicon-designed for maximum reliability.**

- **Convection-cooled** — no blowers, no external heat sinks.
- **Remote programing**—by changes in voltage or resistance for convenience in systems, test equipment and automatic equipment applications.
- **Auto Series/Auto Parallel** — with Master-Slave tracking.
- **Constant voltage/Constant current.**
- **Completely protected** — short-circuit proof; continuously adjustable automatic current limiting.
- **Overvoltage protection**—available as low cost add-on accessory.
- **Rubber feet** — provided for bench use.
- **AC Input** — 105-132VAC, 47-440 Hz (derate dc output current 10% at 50 Hz) 205-265VAC at extra charge. ("-V" option)
- **Fungus Proofing Option**—Add suffix "R" to model number and add $20.00 to price



- **Mount in Rack Adapters**—LRA-1 ($60.00) or LRA-2 ($35.00). Rack adapter LRA-1 only is available with chassis slides mounted. Add suffix "CS" to rack adapter model number and $50 to price.

Basic Non-Metered Model	Voltage Range	Max. Amps at Ambient of (1) 30°C	40°C	50°C	60°C	(2) Price
11A	0-10VDC	2.8A	2.5A	2.1A	1.7A	$375
12A	0-20VDC	1.8A	1.6A	1.3A	1.1A	375
13A	0-40VDC	1.0A	0.9A	0.75A	0.6A	375
15A	0-120VDC	0.33A	0.29A	0.25A	0.21A	375
16A	0-250VDC	0.1A	0.09A	0.08A	0.07A	380

Metered Accessory Model	(2) Price
LS-FM1	$55
LS-FM2	55
LS-FM3	55
LS-FM5	55
LS-FM6	55

Diff. VM Accessory Model	(2) Price
LS-DM1	$85
LS-DM2	85
LS-DM3	85
LS-DM5	85
LS-DM6	85

Over Volt. Protect. Model	Adj. V. Range	Price
LHOV-4	3-24	$35
LHOV-4	3-24	35
LHOV-5	3-47	35

NOTES:

(1) Current rating applies over entire voltage range. Ratings based on 55-65 Hz operation. Derate current 10% for 50 Hz.

(2) This price is for non-metered Precision Power Source. Addition of Metered Accessory Plug-In (next two columns) is necessary to have Metered High Precision Power Supply. Addition of Differential Voltmeter Accessory Plug-In to the basic model is necessary for the unit to function as a High Precision Differential Voltmeter.

LAMBDA ELECTRONICS CORP.
515 BROAD HOLLOW ROAD, MELVILLE, L.I., N.Y. 11746
TEL. 516-694-4200, TWX: 510-224-6484
CABLE: LAMBDATRON, MELVILLE N.Y.

LR series high-performance power supplies regulation—0.0005%, ripple—35μv

For test equipment and lab use—rack or bench 0-20, 0-40, 0-120, 0-250 VDC, from 60 ma. to 1.8 amps.

ONE DAY DELIVERY ALL MODELS

¼ rack models

½ rack models

5 Year Guaran

Features and Data

- **0.0005% plus 100μV regulation.**
- **35μV rms, 100μV p-to-p ripple.**
- **AC Input:** 105-132 VAC, 47-440 Hz (Ratings based on 55-65 Hz; derate current 10% at 50 Hz.) 205-265 VAC on request at extra charge ("-V" option).
- **2 meters** monitor both voltage and current simultaneously and continuously.
- **Accuracy**—0.01% plus 1mV
- **Stability**—0.001% plus 100μV for 8 hours
- **Temperature coefficient**—0.001% plus 10μV/°C
- **Multi-Current-Rated.**
- **Guaranteed for 5 years.** The only 5-year guarantee a includes labor as well as parts. Guarantee applie to operation *at full published specifications* at end 5 years.
- **Only 5¼" high.** Convenient ¼ and ½ rack sizes for ok or bench use.
- **All silicon-designed for maximum reliability.**
- **Convection Cooled**—no blowers, no external heat s ks.
- **Auto Series/Auto Parallel** with Master-Slave trackin
- **Constant Voltage/Constant Current**
- **Completely protected**—short-circuit proof—continuo sly adjustable, automatic current limiting.
- **Overvoltage protection** available for all models up t 70 VDC.
- **Remotely Programable**

LR Series ¼-rack models — **Size: 5 3/16" x 4 3/16" x 15½"**

Model	Voltage Range	MAX. AMPS AT AMBIENT OF:[1]				Price
		30°C	40°C	50°C	60°C	
LR-602-FM	0-20 VDC	1.1	.95	.80	.64	$265
LR-603-FM	0-40 VDC	.60	.50	.42	.33	265
LR-605-FM	0-120 VDC	.23	.20	.17	.14	295
LR-606-FM	0-250 VDC	80ma	72ma	65ma	60ma	310

LR Series ½-rack models — **Size: 5 3/16" x 8⅜" x 10⅝"**

Model	Voltage Range	MAX. AMPS AT AMBIENT OF:[1]				Price[2]
		30°C	40°C	50°C	60°C	
LR-612-FM	0-20 VDC	1.8A	1.6A	1.3A	1.1A	$305
LR-613-FM	0-40 VDC	1.0A	0.9A	0.75A	0.6A	305
LR-615-FM	0-120 VDC	0.33A	0.29A	0.25A	0.21A	320
LR-616-FM	0-250 VDC	100ma	90ma	80ma	70ma	340

NOTES:
1 Current rating applies over entire voltage range. Ratings based on 55-65 Hz operation. Derate current 10% for 50 Hz input.
2 Prices are for metered models. LR Series models are not available without meters.

Accessories

Rack Adapter LRA-1 Price $60.00 • 5¼" H x 16½"

Rack Adapter LRA-2 Price $35.00 • 5¼" H

OVERVOLTAGE PROTECTION ACCESSORIES

For Use With	Model	Adj. Volt Range
LR-602-FM, LR-612-FM	LH-OV-4	3-24 V
LR-603-FM, LR-613-FM	LH-OV-5	3-47 V

Prices F.O.B. factory, Melville, N. Y. All specifications and prices sub ct t change without notice.

LAMBDA ELECTRONICS CORP.
515 BROAD HOLLOW ROAD, MELVILLE, L.I., N.Y. 11746
TEL. 516-694-4200, TWX: 510-224-6484
CABLE: LAMBDATRON, MELVILLE, N.Y.

New higher-rated power supplies for test equipment and lab use 0-20V, 3.3 amps and 0-40V, 1.8 amps.

Lambda models LH-121B and LH-124B.

All silicon semiconductors
for maximum reliability

Convection cooled
no blowers, no external heat sinks

Regulation
.015% or 1 mv (line or load)

Ripple
250 μv RMS

AC input
105-135 VAC (models with suffix B—105-132 VAC), 45-480 Hz. For operation at 205-265 VAC, add suffix "-V" to model number and add 10% or $25.00 (whichever is greater) to the price.

No voltage spikes or overshoot
on "turn-on", "turn-off" or power failure.

Temperature coefficient
0.015% + 0.5mv/°C.

Series/parallel operation

Completely protected
Short circuit proof; continuously adjustable automatic current limiting.

Constant voltage/constant current

Remotely programable
200 ohms/volt, or volt/volt

Meet Mil. environment specs.
vibration: MIL-T-4807A
shock: MIL-E-4907A Proc. 1 & 2
RFI: MIL-I-26600
humidity: MIL-STD-819 Meth. 507
temp. shock: MIL-E-5272C (ASG) Proc. 1
altitude: MIL-E-4970A (ASG) Proc. 1
marking: MIL-STD-130
quality. MIL-Q-9858

Fungus proofing option
add suffix "R" to model number and add $20.00 to price.

LH Series ½-rack models

Size 5 3/16" x 8 3/8" x 15 5/8"

Model[2]	ADJ. VOLT. RANGE VDC	CURRENT RANGE AT AMBIENT OF:[1] 30°C	50°C	60°C	71°C	Price[2]
LH-119A	0-10	0-9.0A	0-8.0A	0-6.9A	0-5.8A	$289
LH-122A	0-20	0-5.7A	0-4.7A	0-4.0A	0-3.3A	260
LH-125A	0-40	0-3.0A	0-2.7A	0-2.3A	0-1.9A	269
LH-128A	0-60	0-2.4A	0-2.1A	0-1.8A	0-1.5A	315
LH-131	0-120	0-1.2A	0-0.9A	0-0.8A	0-0.6A	320

LH Series ¼-rack models

Size 5 3/16" x 4 3/16" x 15 1/2"

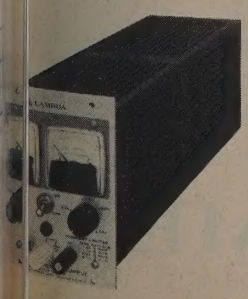
Model[2]	ADJ. VOLT. RANGE VDC	CURRENT RANGE AT AMBIENT OF:[1] 30°C	50°C	60°C	71°C	Price[2]
LH-118A	0-10	0-4.0A	0-3.5A	0-2.9A	0-2.3A	$180
LH-121B	0-20	0-3.3A	0-2.6A	0-2.3A	0-1.9A	170
LH-124B	0-40	0-1.8A	0-1.4A	0-1.2A	0-1.0A	170
LH-127A	0-60	0-0.9A	0-0.7A	0-0.6A	0-0.5A	185
LH-130	0-120	0-0.50A	0-0.40A	0-0.35A	0-0.25A	240

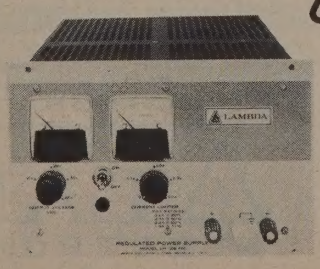
OVERVOLTAGE PROTECTION ACCESSORIES

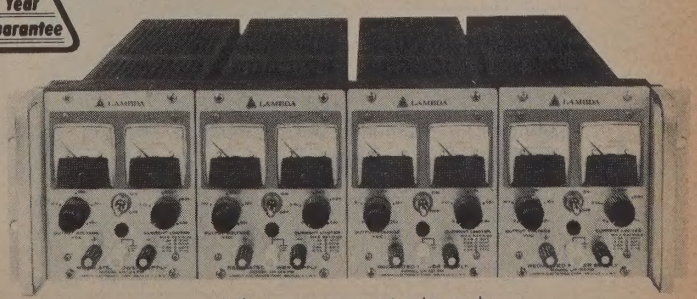
For Use With	Model	Adj. Volt. Range	Price
LH-118A–121B, 122A	LH-OV-4	3-24 VDC	$35
LH-124B–125A	LH-OV-5	3-47 VDC	35
LH-127A–128A	LH-OV-6	3-70 VDC	35

NOTES:
1 Current rating applies over entire voltage range. Derate 10% for 50 Hz operation.
2 Prices are for non-metered models. For metered models, add suffix (-FM) and add $30.00 to price.
3 Overvoltage protection up to 70 VDC is available as a bolt-on accessory for models with suffix (A) or (B). To order, see chart; add suffix (-OV) and add $35.00 to price.

5 Year Guarantee


¼ rack LH series

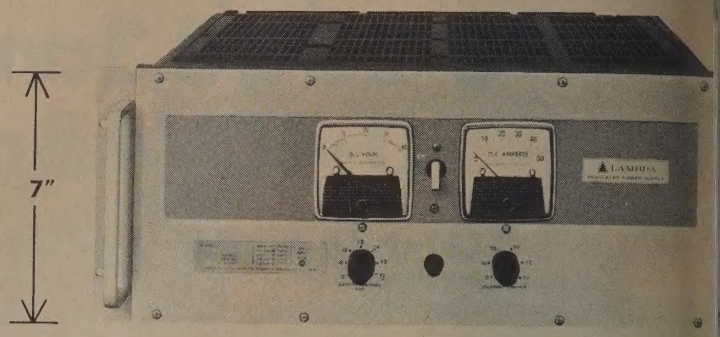

½ rack LH series


4 dc outputs in a single rack

Lambda Electronics Corp. 515 Broad Hollow Road, Melville, L. I., New York 11746. Tel. 516-694-4200.

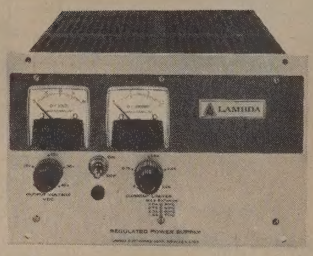
LK series high-current power supplies all silicon, convection cooled–bench or rack

For test equipment and lab use– 0-20, 0-36, 0-60 VDC from 0-4.0 amps. to 0-66 amps.

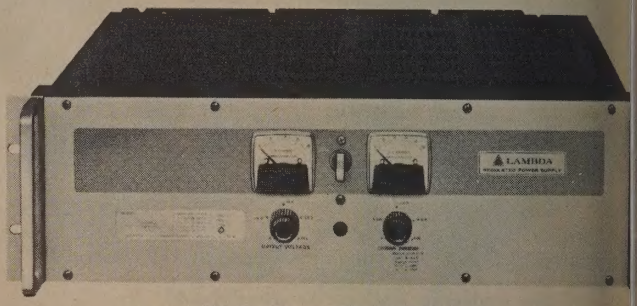


ONE DAY DELIVERY ALL MODELS

5 Year Guarantee



LK Series metered ½-rack



LK Series metered full-rack

Features and Data

- **All silicon-designed for maximum reliability**
- **Convection Cooled**—no blowers, no external heat sinks.
- **Regulation**—.015% or 1 mV (line or load)
- **Ripple**—500μV RMS
- **AC Input**—105-132 VAC, 57-63 Hz. LK7 "series" 188-238 VAC, 57-63 Hz (derate current 10% at 50 Hz.)
- **No Voltage Spikes or Overshoot** on "turn on", "turn off" or power failure
- **Temperature coefficient**—0.015% + 0.5mV/°C.
- **Series/Parallel Operation**
- **Completely Protected**—short circuit proof—Continuously adjustable automatic current limiting
- **Constant Voltage/Constant Current**
- **Remotely Programable**
- **Meet Mil. Environment Specs.**
  Vibration: MIL-T-4807A
  Shock: MIL-E-4970A Proc. 1 & 2
  Humidity: MIL-STD-819 Meth. 507
  Temp. Shock: MIL-E-5272C (ASG) Proc. 1
  Altitude: MIL-E-4970A (ASG) Proc. 1
  Marking: MIL-STD-130
  Quality: MIL-Q-9858

LK Series full-rack models — Size 7" x 19" x 18½"

Model[2]	ADJ. VOLT. RANGE VDC	CURRENT RANGE AT AMBIENT OF:[1]				Price[2]
		40°C	50°C	60°C	71°C	
LK-360 FM	0-20	0-66A	0-59A	0-50A	0-40A	$995
LK-361 FM	0-36	0-48A	0-43A	0-36A	0-30A	950
LK-362 FM	0-60	0-25A	0-24A	0-22A	0-19A	995

LK Series full-rack models — Size 5 3/16" x 19" x 16½"

Model[2]	ADJ. VOLT. RANGE VDC	CURRENT RANGE AT AMBIENT OF:[1]				Price[2]
		40°C	50°C	60°C	71°C	
LK-350	0-20	0-35A	0-31A	0-26A	0-20A	$675
LK-351	0-36	0-25A	0-23A	0-20A	0-15A	640
LK-352	0-60	0-15A	0-14A	0-12.5A	0-10A	650

LK Series ½-rack models — Size 5 3/16" x 8⅜" x 16½"

Model[2]	ADJ. VOLT. RANGE VDC	CURRENT RANGE AT AMBIENT OF:[1]				Price[2]
		40°C	50°C	60°C	71°C	
LK-340 A	0-20	0- 8.0A	0- 7.0A	0- 6.1A	0-4.9A	$330
LK-341 A	0-20	0-13.5A	0-11.0A	0-10.0A	0-7.7A	385
LK-342 A	0-36	0- 5.2A	0- 5.0A	0- 4.5A	0-3.7A	335
LK-343 A	0-36	0- 9.0A	0- 8.5A	0- 7.6A	0-6.1A	395
LK-344 A	0-60	0- 4.0A	0- 3.5A	0- 3.0A	0-2.5A	340
LK-345 A	0-60	0- 6.0A	0- 5.2A	0- 4.5A	0-4.0A	395

Prices F.O.B. factory, Melville, N. Y. All specifications and prices subject to change without notice.

OVERVOLTAGE PROTECTION ACCESSORIES

For Use With	Model	Adj. Volt Range	Price
LK-340A, 341A	LH-OV-4	3-24 VDC	$35
LK-342A, 343A	LH-OV-5	3-47 VDC	35
LK-344A, 345A	LH-OV-6	3-70 VDC	35
LK-350-352	Overvoltage Protection up to 70 VDC as a built-in option for full-rack models. To order, add suffix (-OV) and add $90.00 to price of models LK-350–352, add $120.00 for models LK-360-FM–362-FM.		
LK-360 FM-362 FM			

NOTES:

1 Current rating applies over entire voltage range.
2 Prices are for non-metered models. For metered models, add suffix (-FM) and add $30.00 to price. Models LK-360-FM, LK-361-FM, and LK-362-FM which are metered models not available without meters.
3 Chassis Slides for full rack models: Add suffix (-CS) to model number and add $60.00 to the price, except for models LK-360-FM–LK-362-FM, for which add $100.00.

LAMBDA ELECTRONICS CORP
515 BROAD HOLLOW ROAD, MELVILLE, L.I., N.Y. 117
TEL. 516-694-4200, TWX: 510-224-6484
CABLE: LAMBDATRON, MELVILLE, N.Y.

To get a high-current power supply with 80% efficiency ...get Lambda's LB Series.

Convection-cooled 7-inch panel
Only 10 mv ripple, up to 300 volts; up to 300 amps.

Up to 80% efficiency

Low ripple
10 mv rms max.

Regulation
line .05% + 6 mv.
load 0.1% + 10 mv.

AC input
208 ± 10% vac: 57-63 Hz, 3 phase 4 wire.

All silicon semiconductors
for maximum reliability

Convection cooled
no blowers, no external heat sinks

Overvoltage protection
standard on all models up to 70 vdc

Remotely programable

Remote sensing

Transformer
designed to MIL-T-27C Grade 6

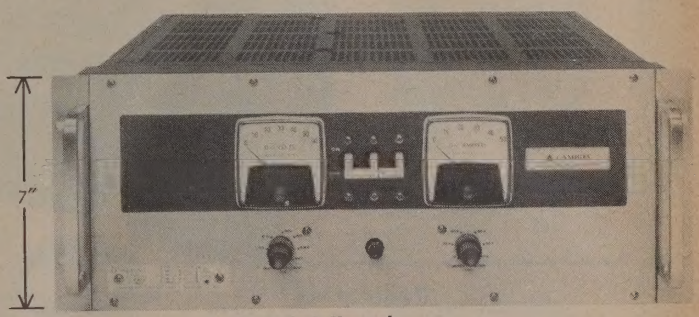
Completely protected
Short circuit proof. Continuously adjustable automatic current limiting.

Constant voltage/constant current
by automatic crossover

Temperature coefficient
0.03% + 0.5 mv/°C

Series/parallel operation

Multi-current-rated



LB Series, metered, full-rack

Size: 7" x 19" x 20 1/16"

Model	VOLTAGE RANGE	MAX. CURRENT (AMPS) AT AMBIENT OF: (1) 40°C	50°C	60°C	71°C	Price (2)
LB-701-FM-OV	0-7.5	300	270	235	200	$1,450
LB-702-FM-OV	0-15	180	170	160	150	1,450
LB-703-FM-OV	0-36	80	75	70	65	1,200
LB-704-FM-OV	0-60	50	47	44	40	1,300
LB-705-FM	0-125	25	22	19	16	1,100
LB-706-FM	0-300	10	9.5	9.0	8.0	1,250

NOTES:
(1) Current rating applies over entire voltage range.
(2) Prices include meters. LB Series models are not available without meters. Prices for all models up to and including 60 vdc include built-in overvoltage protection. Prices and specifications are subject to change without notice.
(3) Chassis Slides: Add suffix (-CS) to model number and add $100.00 to price.

Lambda has over 10,000 power supply units on-the-shelf for 1-day delivery.
Every one fully guaranteed for 5 years... material and labor.

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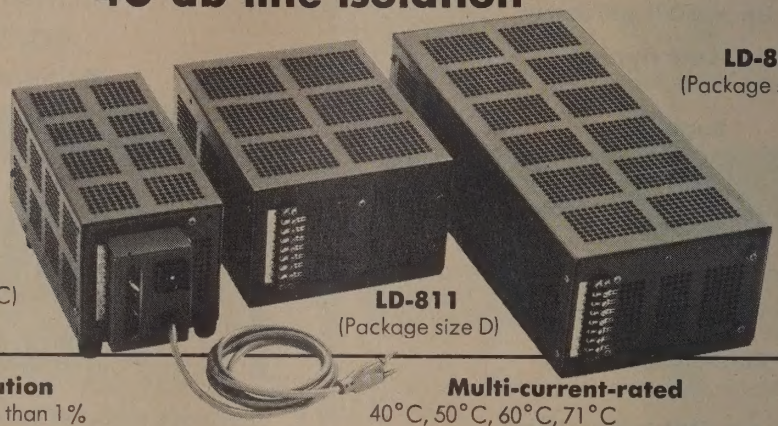
ELECTRONICS CORP.
A Veeco Company

515 ROAD HOLLOW ROAD, MELVILLE, L. I., NEW YORK 11746. TELEPHONE: 516-694-4200. TWX: 510-224-6484. CABLE: LAMBDATRON. MELVILLE. N. Y.

Now from Lambda.

All solid state ac power conditioners

1% line and load regulation 3% harmonic distortion 40 db line isolation



Regulation
line or load: less than 1%

Response time
less than 50 msec.

All silicon semiconductors

Convection cooled
no external heat sinks

Sinusoidal output
less than 3% distortion

High efficiency
greater than 80%

Wide power factor range
+0.7 PF leading to 0 PF lagging

Remote sensing

Multi-current-rated
40°C, 50°C, 60°C, 71°C

Adjustable output voltage

Remote programing
LD 802, LD 812 and LD 832

Wide frequency range
57-63 Hz or 47-53 Hz

Wide temperature range
0 to 71° C

Wide input voltage range
100-132, 180-235, 200-265 vac

Automatic current limiting
protects load as well as power supply

Completely repairable
all components replaceable

	Model (3)	INPUT VAC Resistive Load	INPUT VAC Inductive Load	OUTPUT VAC (Adjustable)	Frequency Hz	MAXIMUM VA AT AMBIENT OF (1) 40°C	50°C	60°C	71°C	Pric
4 15/16" x 4 15/16" x 9 3/8"	LD-801	100-132	105-132	110-120	57-63	250	200	160	85	$1
	LD-802*	100-132	105-132	100-132	57-63	225	180	130	70	2
	LD-803	180-235	190-235	200-220	57-63	200	165	120	70	2
	LD-803-V	200-265	210-265	220-240	47-53	200	165	120	70	2
4 15/16" x 7 1/2" x 9 3/8"	LD-811	100-132	105-132	110-120	57-63	500	440	300	170	1
	LD-812*	100-132	105-132	100-132	57-63	450	350	270	120	2
	LD-813	180-235	190-235	200-220	57-63	400	320	250	120	2
	LD-813-V	200-265	210-265	220-240	47-53	400	320	250	120	2
4 15/16" x 7 1/2" x 16 1/2"	LD-831	100-132	105-132	110-120	57-63	1000	800	600	350	2
	LD-832*	100-132	105-132	100-132	57-63	900	725	550	300	2
	LD-833	180-235	190-235	200-220	57-63	800	640	500	280	2
	LD-833-V	200-265	210-265	220-240	47-53	800	640	500	280	2

*Models LD-802, 812, and 832 are remotely programable.

Note 1. Ratings do not apply for capacitive load; consult factory.
2. All prices F.O.B. Melville, N.Y. All prices and specifications subject to change without notice.
3. "—V option" units are same as LD-803, 813 & 833 respectively except that internal taps on transform are rewired for input frequency change.

One day delivery—90% of all models

Guaranteed for five years material and labor

A Vecco Compo

LAMBDA ELECTRONICS COR

515 BROAD HOLLOW ROAD, MELVILLE, L.I., N.Y. 1
TEL. 516-694-4200, TWX: 510-224-6484
CABLE: LAMBDATRON, MELVILLE, N Y

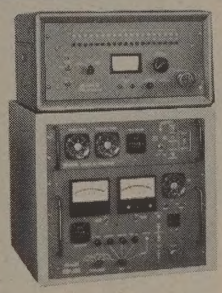
MACARR, INC.

Specialists in Reliable State-of-the-Art Static Power & Control Equipment

BATTERY SERVICE AND ANALYSIS EQUIPMENT

Complete line of units for testing, evaluation, and maintenance of all types of batteries (nickel cadmium, silver zinc, lead acid, silver cadmium, etc.), in all ratings.

Standard and Custom Units for Industrial and Military Applications.



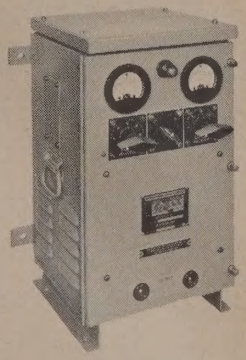
Model 50 Cell-Scanner Individual Cell Performance Tested Automatically. 19 Cells — Adjustable Failure Voltage 0.5 to 2.0 Volts. Model 50 A — 23 Cells.

ANDAC Battery Charger, Discharger, Analyzer. Model 12-30. 1-101 0-30 V, 0-30 A.

COMPLETE LINE OF BATTERY CHARGING EQUIPMENT

High performance chargers for use with aircraft batteries, all types of Alkaline batteries, fork lift truck batteries, central station and microwave station batteries, etc.

Standard and Custom/ Commercial & Military Units.

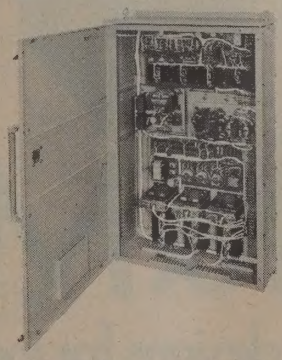


40 — 30 BCN Multi-Purpose Portable Charger 6, 8, 12, 24, 36 Volts up to 30 A Mil-B-24095

MOTOR GENERATOR CONTROL EQUIPMENT

Standard and Custom Units for Naval Shipboard and other applications. Ratings to 200 KW, DC & AC.

A.C. Variable Speed Drive Systems. Ratings from 10-200 HP. For centrifugal pumping applications of all fluids. Standard and Custom Designs.

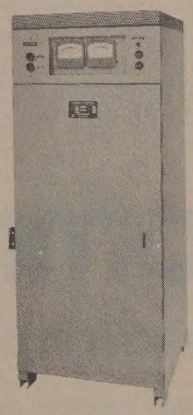


Control Panel 5 KW 60 to 400 Cycle. Precise Frequency Voltage Regulated Naval Shipboard Motor Generator System.

INDUSTRIAL POWER SUPPLIES FOR ELECTROPLATING AND OTHER APPLICATIONS

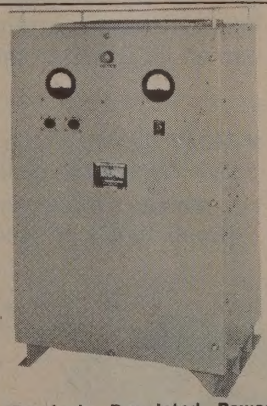
Unregulated and regulated units utilizing Solid State and Magnetic Power Control.

Standard and Custom Units to 500 Volts and 20,000 Amperes.



D.C. POWER SUPPLIES

Unregulated and regulated types. For ground power, industrial, computer, general purpose and special purpose applications. Complete line of Zenon lamp Supplies and igniters to 25 KW. Regulated units utilize magnetic, controlled rectifiers, transistors for power control. Standard and custom units for commercial and military applications. To 1000 Volts and 20,000 Amperes.



Precisely Regulated Power Supply for Naval Shipboard Helicopter Starting and Servicing. 28 V 450 A

Solid State Inverters, Converters and Frequency Changers. Complete uninterrupted power supplies from 1 to 15 KVA. Standard and Custom Units for Commercial and Military Applications.

Complete "In House" design and manufacturing facility. Quality Assurance under Mil-Q-9858 and Mil-I-45208. Call or write regarding your power problems.

MACARR, INC.

subsidiary of Tenney Engineering, Inc.

166 National Road, Edison, N. J. 08817
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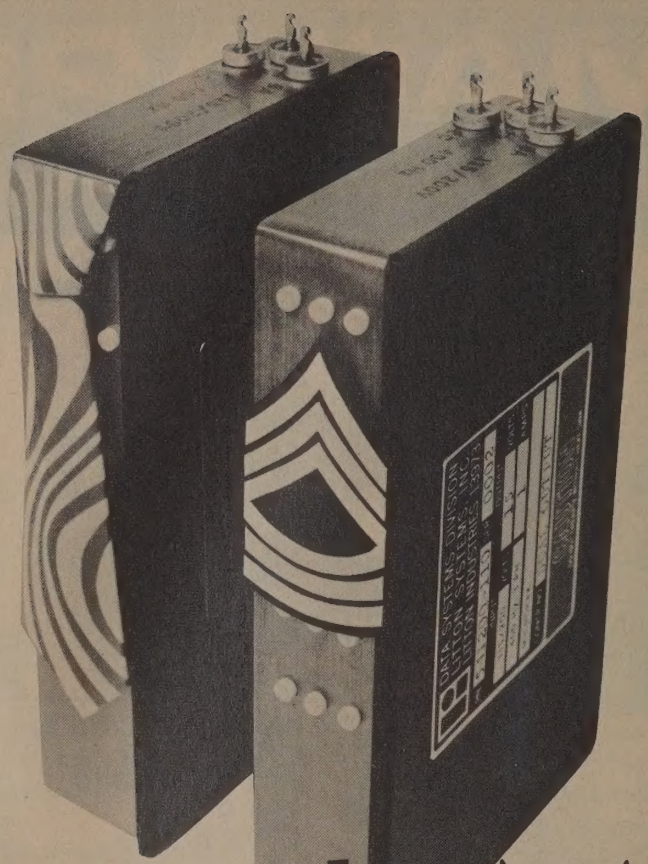


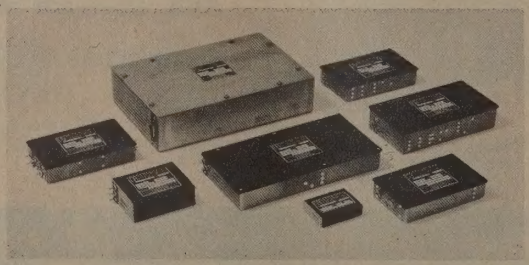
Commercial & Military

The leader in power conversion designs for every application.

Litton power supplies were originally developed to meet exacting weight and space requirements of *military* systems. Today, Litton's miniature *commercial* power supplies inherit the high performance, compactness and reliability of its military counte part. An acknowledged leader in the power supp field, Litton experience and quality are designe into all its commercial and military power product

Features:

- Small size 8.1 to 24 cubic inches (200/250 series) 13 to 108 cubic inches (400 series)
- Commercial and military standard, depending on your applications. MIL-Spec conformance (MIL-E-5400, Class 2; MIL-I-6181D; MIL-P-81279; MIL-STD-704 CAT B)
- Dual outputs (200 series)
- High Efficiency—up to 65% (200/250 series); up to 80% (400 series)
- Slot Range Voltages—3 to 40 VDC. Power rating to 300 watts
- Reliability ranging up to 162,000 hours MTBF (200/250 series); up to 93,500 hours MTBF (400 serie
- Automatic overcurrent and overvoltage protection (power supply off until overload condition removed and input power recycled)
- High current—6 to 30 ampere at power ratings up to 300 wa (400 series)
- Modular packaging for full maintainability
- Latest Litton-developed switching regulator technique

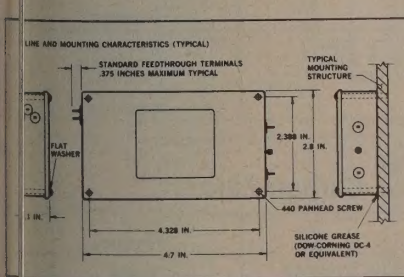


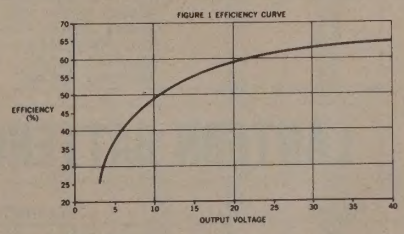
SPECIAL PRODUCTS
Data Systems Division
Litton Industries

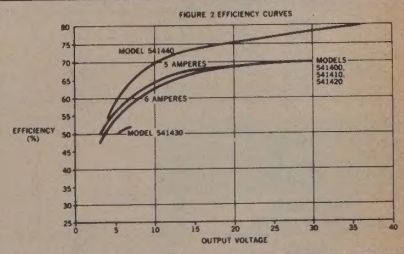
200/250 & 400 Series Microminiature Power Supplies

PERFORMANCE	UNITS OF MEASURE	MODEL 541200	MODEL 541210	MODEL 541220	MODEL 541250	MODEL 541400	MODEL 541410	MODEL 541420	MODEL 541430	MODEL 541440
INPUTS	115/200 VOLTS RMS, 400 HZ, 3 PHASE									
OUTPUTS AVAILABLE		1 OR 2	1 OR 2	1 OR 2	1	1	1	1	1	1
OUTPUT VOLTAGES AVAILABLE	VOLTS	4 to 40	4 TO 40	4 TO 40	4 TO 40	3 TO 15	3 TO 30	3 TO 30	3 TO 8	4 TO 36
OUTPUT VOLTAGE ADJUSTMENT	VOLTS	±0.2	±0.2	±0.2	±0.2	±0.3	±0.3	±0.3	±0.3	±0.3
OUTPUT CURRENT, MAXIMUM	AMPERES	2	2	2	2	6	6	5	15	30
OUTPUT POWER, MAXIMUM	WATTS	30	60	90	25	30	75	120	90	300
STATIC REGULATION (LINE AND LOAD)	%	±1	±1	±1	±1	±0.25	±0.25	±0.25	±0.25	±.5%
DYNAMIC REGULATION, MAXIMUM (FULL to ¾ LOAD)	MILLIVOLTS	—	—	—	—	200	200	200	300	300
DYNAMIC OUTPUT IMPEDANCE, MAXIMUM (0-500 KHz)	OHMS	0.05 E_o/I_o	0.05 E_o/I_o	0.05 E_o/I_o	0.05 E_o/I_o	—	—	—	—	—
RECOVERY TIME MAXIMUM (FULL TO ¾ LOAD)	μSECONDS	—	—	—	—	150	175	150	250	250
RIPPLE (PEAK-TO-PEAK), MAXIMUM	mv or % *	15mv or .25% E_o	15mv or .25% E_o	15mv or .25% E_o	15mv or .25% E_o	50	50	50	75	225**
RIPPLE AND NOISE ENVELOPE MAXIMUM	MILLIVOLTS	—	—	—	—	60	80	100	150	300**
TEMPERATURE COEFFICIENT, MAXIMUM	% PER °C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
EFFICIENCY, MINIMUM	%	SEE FIGURE 1				SEE FIGURE 2				
DIMENSIONS, MAXIMUM (PLUS TERMINALS)	INCHES	4.7 x 2.8 x 1.1	5.6 x 3.2 x 1.1	6.0 x 3.3 x 1.3	3.2 x 2.4 x 1.1	4.7 x 2.8 x 1.1	5.6 x 3.2 x 1.1	6.0 x 3.3 x 1.3	7.9 x 4.0 x 1.2	6.2 x 9.4 x 2.2
VOLUME, APPROXIMATE	INCHES³	13	17	24	8	13	17	24	35	108
WEIGHT, MAXIMUM	POUNDS	1.0	1.5	2.0	0.75	1.0	1.5	2.0	3.3	7.0
RELIABILITY DEMONSTRATED	The 200 and 250 and 400 series were designed with the same philosophy and techniques as Litton DSD's original microminiature power supplies, which considerably exceeded the calculated reliability by operating 90,000 hours without a failure (63% confidence level; 10,000 hours MTBF at 99.97% confidence level).									
CALCULATED (AT 60°C)	HOURS MTBF	81,000 (DUAL 6V, 2A)	69,000 (DUAL 12V, 2A)	36,000 (28V, 2A)	162,000 (6V, 2A) 149,000 (12V, 2A)	84,000 (5V, 6A)	86,000 (12V, 6A)	54,500 (28V, 4A)	93,500 (5V, 15A)	49,000 (5V, 30A)
OPERATING TEMPERATURE CONDUCTIVE BASE, MAXIMUM	°C	+80	+80	+80	+80	+80	+80	+80	+80	+80
PROTECTION AUTOMATIC OVERCURRENT SHUTDOWN LEVEL	% OF RATED LOAD	110-150	110-150	110-150	110-150	110-140	110-140	110-140	110-140	110-140
AUTOMATIC OVERVOLTAGE SHUTDOWN LEVEL	PER CUSTOMER REQUIREMENTS									
TURN-ON TIME (OUTPUT VOLTAGE WITHIN REGULATION BAND AFTER APPLICATION OF INPUT POWER)	MILLISECONDS	10	10	10	10	10	10	10	10	10

WHICH EVER IS GREATER. **WORST CASE.







For additional information, contact direct to:

Marketing Manager
SPECIAL PRODUCTS DATA SYSTEMS DIVISION LITTON INDUSTRIES
9001 Fullbright Ave.
Chatsworth, California 91311
Phone: (213) 781-8211
TWX: (910) 495-1708

International Sales Representatives

Litton Precision Products International, Inc.
95 High St.
Slough, Buckinghamshire, England
Phone: Slough 28267

R. F. Russell Associates
R. R. No. 1, Kennedy Rd.
Unionville, Ontario, Canada
Phone: (416) 297-1616

U.S. Sales Representatives

David Sonkin Assoc., Inc.
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Mount Vernon, N.Y. 10550
Phone: (914) 668-9809

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320 Broad St.
Red Bank, N.J. 07701
Phone: (201) 741-7490

marathon Sintered-Plate Nickel-Cadmi

(formerly SONOTONE)

SEALED CELLS Physical and Electrical Characteristics

MARATHON CELL NUMBER	SIZE	OVER ALL DIMENSIONS (in inches) DIAMETER ±.010 WITH LABEL AND JACKET	DIAMETER ±.010 WITHOUT LABEL AND JACKET	HEIGHT ±.015 WITH POSITIVE BUTTON WITH LABEL AND JACKET	HEIGHT ±.015 WITH POSITIVE BUTTON WITHOUT LABEL AND JACKET	HEIGHT ±.015 WITHOUT POSITIVE BUTTON WITH LABEL AND JACKET	HEIGHT ±.015 WITHOUT POSITIVE BUTTON WITHOUT LABEL AND JACKET	WEIGHT IN OUNCES	CAPACITY IN MAH	CHARGE IN M
S-101	AA	.568	.550	1.947	1.947	1.869	1.869	0.80	500	5
S-102	½C	1.018	1.000	1.000	1.000	.950	.945	1.2	710	8
S-103	D	1.286	1.268	2.385	2.385	2.295	2.290	5.5	4000	40
S-104	C	1.018	1.000	1.930	1.930	1.875	1.875	2.6	1800	19
S-106	CD	1.018	1.000	3.055	3.055	3.005	3.000	4.0	2800	30
S-108	F	1.286	1.268	*	*	3.445	3.435	8.3	6500	65
S-113	.875 x 1.625 (Sub-C)	—	.865	*	*	—	1.650	1.6	1200	12
S-126	.625 x .6	—	.625	*	*	—	.610	0.3	170	2
S-140	.593 x 1.92	—	.585	*	*	—	1.905	1.0	570	6
S-142	1 x 1.25	—	1.000	*	*	—	1.250	1.9	1400	14
S-143	1 x 1.14	—	1.000	*	*	—	1.140	1.7	1200	12
S-144	1.27 x 1.42	—	1.268	*	*	—	1.42	3.0	2300	23
S-147	½AA	.568	.550	1.340	1.340	1.255	1.255	0.55	250	25
†S-213	.875 x 1.625 (Sub-C)	—	.865	*	*	—	1.650	1.6	750	75
‡S-313	.875 x 1.625 (Sub-C)	—	.865	*	*	—	1.650	1.6	800	300
‡S-343	1 x 1.14	—	1.000	*	*	—	1.140	1.5	800	300

*Not Available in this Configuration
†Low Capacity, Sub-C Cell
‡Fastback Cell—Recharges at 3-hour Rate

For individual cell and battery characteristics for a specific Marathon sealed or battery — such as voltage, capacity, size and other electrical features — Marathon Battery Co., Cold Spring, New York 10516 • Phone: (914) 265-9282

MODULE BATTERIES Physical and Electrical Characteristics

MARATHON BATTERY NUMBER	BATTERY CELL SIZE	VOLTAGE	NUMBER OF CELLS	CAPACITY (5-hour rate)	DIMENSIONS (in inches) ±1/64" L	W	H	WEIGH (in poun
5-S-113	⅞ x 1⅝	6	5	1.2 A.H.	5	1	1¾	¾
10-S-113	⅞ x 1⅝	12	10	1.2 A.H.	5	2	1¾	1½
20-S-113	⅞ x 1⅝	24	20	1.2 A.H.	10	2	1¾	3
20-S-113	⅞ x 1⅝	24	20	1.2 A.H.	5	4	1¾	3
5-S-104	C	6	5	1.8 A.H.	5 15/16	1 3/16	2	1¼
10-S-104	C	12	10	1.8 A.H.	5 15/16	2 3/8	2	2½
20-S-104	C	24	20	1.8 A.H.	11⅞	2 3/8	2	5
20-S-104	C	24	20	1.8 A.H.	5 15/16	4¾	2	5
5-S-103	D	6	5	4 A.H.	7½	1½	2½	2½
10-S-103	D	12	10	4 A.H.	7½	3	2½	4½
20-S-103	D	24	20	4 A.H.	15	3	2½	9
20-S-103	D	24	20	4 A.H.	7½	6	2½	9

FLASHLIGHT BATTERIES Carbon-Zinc

MARATHON CATALOG NUMBER	SIZE	VOLTAGE	DESCRIPTION	TERMINAL
111	C	1.5	Metal Jacket Heavy-Duty Type	Flashlight
121	D	1.5	Metal Jacket Heavy-Duty Type	Flashlight
122	D	1.5	Industrial Heavy-Duty Type	Flashlight
170	AA	1.5	Labeled Jacket	Flashlight
180	AAA	1.5	Labeled Jacket	Flashlight

LANTERN BATTERIES Carbon-Zinc

MARATHON CATALOG NUMBER	SIZE	VOLTAGE	DESCRIPTION	TERMINAL
49NL	4F	6	Metal Jacket Individually Wrapped	Spring
490RR	4F	6	Industrial Paper Jacket	Spring
496F	4F	6	Metal Jacket	Plug In
496S	4F	6	Metal Jacket	Screw
896	8F	6	Metal Jacket	Binding Post
491	4F	1.5	Hobby/Ignition	Screw

ELECTRIC FENCE, IGNITION, TOY, EMERGENCY LIGHTING BATTERIES

Carbon-Zinc

MARATHON CATALOG NUMBER	SIZE	VOLTAGE	DESCRIPTION	TERMINAL
6T	No. 6	1.5	Telephone Battery	Fahnstock
66	No. 6	1.5	Heavy-Duty Industrial/Ignition	Screw
66A	No. 6	1.5	Burglar Alarm Battery	Wire/Screw
642	16G	12	Multi-Purpose/Hobby/Farm	Screw
903	20F	7.5	Emergency Lighting	Screw

lls and Batteries and Carbon Zinc-Batteries

VENTED BATTERY CELLS

Physical and Electrical Characteristics

	CELL SERIES	CELL CASE MATERIAL	CAPACITY NOM A.H.	W	T	H	CELL WEIGHT FILLED
HIGH RATE	1H120	N	0.8	1.160	.680	2.258	1.7 oz.
	2H120	N	2.0	1.160	.675	4.000	3.2 oz.
	3H120	N	4.0	2.145	.650	4.016	5.8 oz.
	5H120	N	6.5	2.180	.955	4.060	9.1 oz.
	10H120	N	13	2.740	1.195	4.750	1 lb. 4 oz.
	12H120	N	13	2.419	1.080	6.950	1 lb. 4 oz.
	20H120	N	22	3.110	1.657	5.446	2 lb. 0 oz.
	24H120	N	24	3.180	1.075	8.278	2 lb. 4 oz.
	36H120	N	40	3.135	1.390	9.400	3 lb. 8 oz.
	65H130	N	72	4.980	1.350	11.375	6 lb. 10 oz.
	81H120	N	80	5.120	1.924	8.510	6 lb. 10 oz.
MEDIUM RATE	5BM220	N	5.5	2.110	.850	3.875	9.1 oz.
	12M220	N	13	2.419	1.080	6.950	1 lb. 4 oz.
	24M220	N	25	3.180	1.075	8.278	2 lb. 2 oz.
	36M220	N	40	3.135	1.390	9.400	3 lb. 8 oz.
	65M220	N	72	4.980	1.350	11.375	6 lb. 10 oz.
	100M220	P	111	6.813	2.172	8.730	11 lb. 0 oz.
	280M220	N	260	9.126	3.655	9.925	21 lb. 0 oz.
	24ME220*	N	25	3.180	1.075	11.278	2 lb. 6 oz.
	15M320	N	16	2.317	1.063	5.548	1 lb. 1 oz.
	20M320	N	24	3.110	1.657	5.446	2 lb. 1 oz.
	40M320	P	44	4.050	1.660	7.437	3 lb. 15 oz.
	60M320	P	60	4.718	1.771	8.542	5 lb. 0 oz.
	100M320	P	121	6.813	2.172	8.730	11 lb. 2 oz.
HIGH CAPACITY	3L420	N	4.7	2.145	.650	4.016	6.3 oz.
	5L420	N	7.5	2.185	.955	4.060	9.4 oz.
	5BL420	N	6.0	2.110	.850	3.875	9.3 oz.
	10L420	N	15	2.740	1.195	4.750	1 lb. 3 oz.
	20L420	N	25	3.110	1.657	5.548	2 lb. 1 oz.
	60L420	P	70	4.718	1.771	8.542	5 lb. 3 oz.
	210L420	N	230	8.140	3.170	9.410	20 lb.

N—Nylon P—Polystyrene *Elongated Cell

COMMERCIAL AIRCRAFT BATTERIES

Marathon FAA-Approved Aircraft Battery Specifications

ARATHON BATTERY TYPE	CELL TYPE	BATTERY VOLTS	AMP. HOURS AT 5-HR. RATE	CAPACITY 20-MIN. AMP.	5-MIN. AMP.	OVERALL DIMENSIONS IN INCHES (not including mounting brackets) LENGTH	WIDTH	HEIGHT	POUND WEIGHT	CONNECTOR
-4	24M220	24	25	65	200	10½	7 13/16	8¾	55	Elcon
-5	36M220	24	40	100	320	10½	9 15/16	10¼	80	Elcon
-7	12M220	24	13	30	100	8⅜	7¾	7¾	33	Elcon
-9	24H120	24	24	75	225	10½	7 13/16	8¾	55	Elcon
-10	10H120	24	13	35	120	12¾	5 11/16	5⅜	26	Elcon
-13	36H120	14	40	100	320	9	3 11/16	4 23/32	45½	Elcon
-15A unit	12M220	12	15*	30	100	7 15/16	3⅞	7⅝	16	Nut
-15B unit**	12M220	12	15*	30	100	7 15/16	3⅞	7⅝	16	Nut
-20	20M320	24	24	60	180	12	9 13/16	6⅝	50	Cannon
-20H	20H120	24	22	65	200	12	9 13/16	6⅝	49	Elcon
-21H-1	20H120	24	22	65	200	11¾	9⅝	6½	48	Elcon
-24A unit	24M220	12	25	65	200	9	4 11/16	8⅝	26	Wing Nut
-24B unit**	24M220	12	25	65	200	9	4 11/16	8⅝	24	Wing Nut
-27†	24ME220	24	25	65	200	10½	7 13/16	11¾	68	Elcon
-31	3H120	24	4	10	30	14⅛	2⅜	4½	10	Spec Cannon
-40	40M320	24	44	110	350	15	10⅜	9⅝	95	Cannon Spike
-44A unit	40M320	12	44	110	350	12⅞	6⅛	10 13/16	48	Cannon Spike or Wing Nut
-44B unit**	40M320	12	44	110	350	12⅞	6⅛	10 13/16	44	Cannon Spike or Wing Nut
-51	5H120	24	6.5	15	50	10 1/16	4¾	4⅝	16	Special
-52	5H120	24	6.5	15	50	9 13/16	4 13/16	4⅝	15	Term Stud
-54	5H120	24	6.5	15	50	14⅜	5 1/16	6¼	16	Special
-54-1	5H120	24	6.5	15	50	14⅜	5 1/16	6¼	16	Special
-88A unit	60M320	12	60	150	450	13 15/16	7¼	10 13/16	66	Cannon Spike or Wing Nut
-88B unit**	60M320	12	60	150	450	13 15/16	7¼	10 13/16	60	Cannon Spike or Wing Nut
-101	10H120	24	13	35	120	12 7/16	5⅝	5 9/16	26	Special
-103	10H120	24	13	35	120	12⅛	5⅝	5⅝	26½	Nut
-105	10H120	24	13	35	120	12⅛	5⅝	5⅝	26½	Nut
-121	12M220	26	13	30	100	9 7/16	7 13/16	7¾	37	Elcon
-125	3H120	24	4	10	30	9	3 3/16	4 23/32	10½	Special
-727-3	24M220	24	25	65	200	10½	7 13/16	8¾	55	Elcon
-737	24H120	24	24	75	225	10½	7 13/16	8¾	52	Elcon

*At 8-hour rate. **B unit used with A unit to make 24-volt set †Elongated Battery

TRANSISTOR BATTERIES Carbon-Zinc

MARATHON CATALOG NUMBER	SIZE	VOLTAGE	DESCRIPTION	TERMINAL
113	C	1.5	Metal Jacket	Flat Button
123	D	1.5	Metal Jacket	Flat Button
173	AA	1.5	Tube Label	Flat Button
1604	6UL	9	Rectangular Metal Jacket	Flat Button

Mauratron, Incorporated

13333 N. CENTRAL EXPRESSWAY • DALLAS, TEXAS 75231 • 214-235-2640

TRANSISTOR RADIATORS • TR SERIES

Self-adjusting to the Following Outlines:

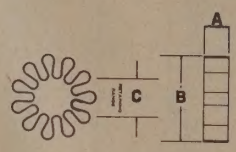
TR 118..... TO-18
TR 108..... TO- 8
TR 101..TO- 5, TO- 9, TO-11, TO-12, TO-16, TO-29, TO-33, TO-39, TO-42, TO-43

Specifications

Material..... Beryllium Copper #25
Finish..... Black Ebanol

Features

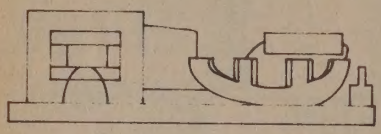
- Protects solid state devices against destructive heat rise
- Reduces stock inventory



Type	Dimensions		
	A	B	C
TR101	.250	.600 / .650	.290 / .400
TR120	.185	.600 / .650	.290 / .400
TR108	.250	.650 / .825	.360 / .525
TR118	.150	.450 / .500	.150 / .200

TR Ordering Information:
SPECIFY MODEL NO.
EXAMPLE: TR 101

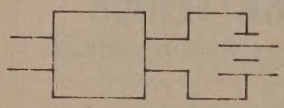
CURRENT REGULATED BATTERY CHARGERS



Current Range: 2MA to 50A Regulated Current Control
Voltage Range: 1.2 VDC to 500 VDC

Packaging: PC card (shown)
Rack
Wall Hanging

POWER PAKS

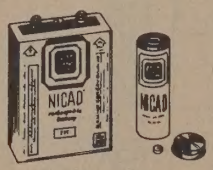


(Consisting of Current Regulated Battery Charger plus Batteries integrally packaged)

Low — Medium — High Power
Uninterruptable power systems

NICKEL - CADMIUM RECHARGEABLE BATTERIES

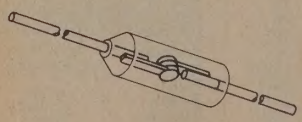
STOCKING DISTRIBUTOR FOR **GOULD, INC.**



Individual cells and packaged configurations in Button, Cylindrical, and Rectangular Cell types.
AH ratings from 20MAH to 23AH

1 WATT ZENER DIODES • VARISTORS • STABISTORS

STOCKING DISTRIBUTOR FOR **SCHAUER MANUFACTURING CORP.**



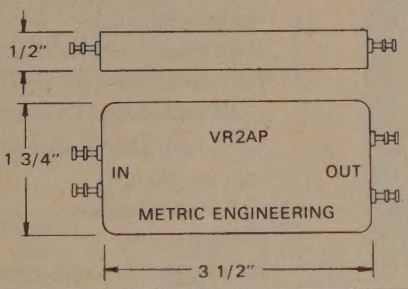
Voltage Range: 2 volts to 16 volts

FOR COMPLETE LITERATURE AND SPECIFICATIONS ON ALL MAURATRON PRODUCTS REQUEST CATALOG NO. **SDE 70**

DC VOLTAGE REGULATORS

• Completely Encapsulated • Withstand High Shock & Vibration • Efficient Series Circuit

A OUTPUT CURRENT
UT REGULATION:
Li: ±.02% for ±10% input voltage change.
±.05% for ±20% input voltage change.
Ld: ±.1% with a 40% load change.
Maxum allowable dissipation: 80 watts @ +50°C Base.
tal Potentiometer for ±10% voltage adjustment.
range from + or − 3 volts to + or − 40 volts maximum.
ted against short circuits.



VR-2 Output setting range +3.2V to +12.0V

VR-7 Output Setting range −3.2V to −12.0V

Price: 1-9 units $79.50 ea.

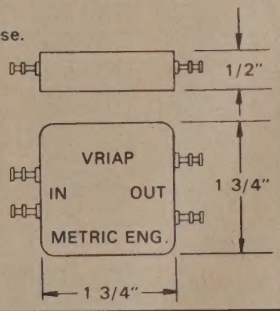
VR-2 Output setting range +12.01V to +37V

VR-7 Output setting range −12.01V to −37V

Price: 1-9 units $74.50 ea.

PLEASE SPECIFY EXACT OUTPUT VOLTAGE AND INPUT VOLTAGE RANGE (IF AVAILABLE)

A OUTPUT CURRENT
UT REGULATION:
Le: ±.02% for ±10% input voltage change.
±.05% for ±20% input voltage change.
Ld: ±.1% with a 40% load change.
Maxum allowable dissipation: 40 watts @ +50°C Base.
tal Potentiometer for ±10% voltage adjustment.
range from + or − 3 volts
+ or − 40 volts maximum.
cted against short circuits.



VR-1 Output setting range +3.2V to +12.0V

VR-6 Output setting range −3.2V to −12.0V

Price: 1-9 units $68.50 ea.

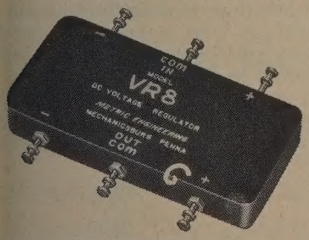
VR-1 Output setting range +12.01V to +37V

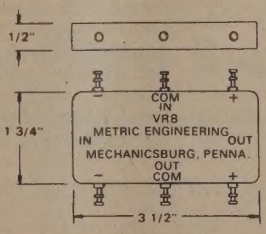
VR-6 Output setting range −12.01V to −37V

Price: 1-9 units $63.50 ea.

PLEASE SPECIFY EXACT OUTPUT VOLTAGE AND INPUT VOLTAGE RANGE (IF AVAILABLE)

SIVE AND NEGATIVE
OVOLTAGE REGULATOR PACKAGE
or 4 amperes on each output
dependently Adjustable outputs by internal pot
dependent protection against short circuits
REGULATION:
±.02% for ±10% input voltage change
±.05% for ±20% input voltage change
±.1% with a 40% load change
put Range from 3 volts differential to ±40 volts maximum





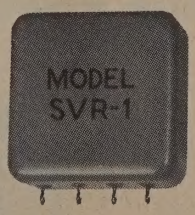
2 AMP MODEL NOS.	OUTPUT VOLTAGES	PRICE 1-9 UNITS
VR8AP	+3.6 to +12V & −3.6 to −12V	132.00 ea.
VR8BP	+3.6 to +12V & −12.01 to −37V	127.00 ea.
VR8CP	+12.01V to 37V & −3.6 to −12V	127.00 ea.
VR8DP	+12.01 to 37V & −12.01 to −37V	122.00 ea.

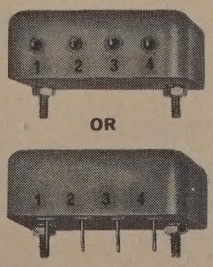
4 AMP MODEL NOS.	OUTPUT VOLTAGES	PRICE 1-9 UNITS
VR9AP	+3.6 to +12V & −3.6 to −12V	149.00 ea.
VR9BP	+3.6 to +12V & −12.01 to −37V	144.00 ea.
VR9CP	+12.01V to 37V & −3.6 to −12V	144.00 ea.
VR9DP	+12.01 to 37V & −12.01 to −37V	139.00 ea.

NEW

SWITCHING REGULATOR

MODEL SVR-1
Output voltage: 5 VDC
Output Current: 2 Amperes
Regulation: ±1% with 20% line change
±1% with 50% load change
Efficiency at 2 Amperes load current: greater than 65%
Input voltage range: +10 volts to + 40 volts maximum
Internal potentiometer for ±10% output voltage adjustment
Price 1 - 3 units $149.00 each





Order by Model No. from this page. Special Models Available to drive external transistors for high-power applications. Call or write for more information.

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A Division of Eanco, Inc.
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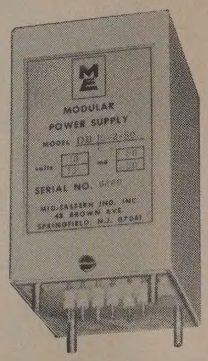
DB Dual Output Regulated Power Modules

■ Features



All Silicon Semiconductors
Low Ripple
Tight Regulation
Dust Tight
Fully Repairable
For Operational Amplifiers
Dual Isolated Outputs Available
Hermetic Sealing Available

Model	Output		Voltage Regulation			Price
	Voltage	Current Amps	Line	Load	Size	
DB 6-2-50	± 6	50 ma	0.02%	0.1%	1	$79.00
DB 10-2-50	± 10	50 ma	0.02%	0.1%	1	69.00
DB 15-2-50	± 15	50 ma	0.02%	0.1%	1	69.00
DB 20-2-50	± 20	50 ma	0.02%	0.1%	1	69.00
DB 6-2-75	± 6	75 ma	0.02%	0.1%	2	85.00
DB 10-2-75	± 10	75 ma	0.02%	0.1%	2	75.00
DB 15-2-75	± 15	75 ma	0.02%	0.1%	2	75.00
DB 20-2-75	± 20	75 ma	0.02%	0.1%	2	75.00

Size 1: 3-1/16" x 2⅝" x 4¼" — 8-32 studs —
Mounting dimensions: 1⅞" x 1¾"

Size: 2: 3-9/16" x 3-1/16" x 4⅞" — 8-32 studs —
Mounting dimensions: 2⅛" x 2⅝"

HT-HTA Transistoriz Power Supp Modules

■ Features

Remote Sensing
High Power — Small Package
No Forced Air Cooling Required
Solid State Short Circuit Protection
60°C Ambient Operation
No Heat Sinking
Fully Maintainable
Stock Delivery
All Silicon Semiconductors
High Reliability

Model Number	Price	Model Number	Pr
HT 6-4	$169.00	HTA 6-3	$16
HT 12-4	149.00	HTA 12-3	14
HT 18-2.9	149.00	HTA 18-2.1	14
HT 24-2.3	149.00	HTA 24-1.9	14
HT 28-2.1	149.00	HTA 28-1.5	14
HT 36-1.7	149.00	HTA 36-1.3	14
HT 40-1.9	169.00	HTA 40-1.1	16
HT 60-1	169.00	HTA 60- .75	16
HT 100-1	169.00	HTA 100- .75	16

NOTE: The digits of the Model Number indicate the output and current in amps. Example: HT 6-4 has an output volta and current of 4 amps. HT 12-4 has an output of 12 volts at

■ About Mid-Eastern Industries

Mid-Eastern's engineering experience in the design and manufacture of standard and custom power supplies covers a span of 11 years. Over this period Mid-Eastern power supplies have proven their performance in computers, data processing, communications, nuclear research, machine tools; medical apparatus, ground support equipment, process controls and many other special applications.

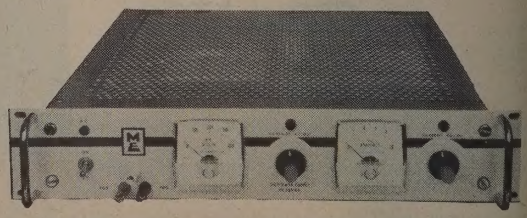
Mid-Eastern engineers have to their credit the solution of many difficult engineering problems. Superior engineering has been applied to all Mid-Eastern power supplies with the result that every unit meets the high standards of reliability and quality of the most exacting customer. Ease of ch calibration, and maintenance is maintained in each mo the use of interchangeable plug-ins and modular Complete step-by-step trouble shooting and adjustme cedures, schematics, and comprehensive parts data a vided with all standard power supplies.

Along with technical competence, Mid-Eastern offers advantages of doing business with a customer-orien ganization. Not only do we want you to buy our equ but we want you to be secure in the knowledge that w behind it with an integrity and reliability that goes bey legal terms of our warranty. We have earned the con our customers have in us.

HV Constant High Voltage Power Supplies

■ Features

All Solid State
Adjustable Current Limit
1 Millivolt Ripple
0.01% Regulation
10-Turn Voltage Adjustments
Remote Programming
Remote Sensing

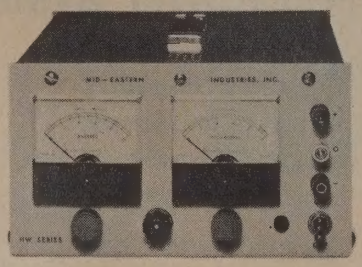


Model Number	Output		RMS Ripple	Regulation		Size	Pri
	Volts	Amps		Line	Load		
HV 350-1	0-350	1	< 1mv	0.005%	0.01%	3½ x 19 x 16½	$60
HV 350-2	0-350	2	< 1mv	0.005%	0.01%	5¼ x 19 x 16½	72
HV 350-3	0-350	3	< 1mv	0.005%	0.01%	7 x 19 x 16½	90

Mid-Eastern Industries
A Division of Eanco, Inc.
660 Jerusalem Road • Scotch Plains, New Jersey 07076 • (201) 233-5900.

W Constant Voltage/Constant Current Power Supplies

eatures



- de up to 100 Volts
- ly Programmable
- Sensing
- and Parallel Operation
- lts Ripple
- .01% Load Regulation
- Half Rack Size
- Separate Voltmeter and Ammeter
- Rack or Bench mounted
- .005% Line Regulation

Model Number	Output		Regulation				Price
	Voltage	Current Amps	Line		Load		
			CV	CC	CV	CC	
HW 0-8	0-10	0-8	0.01%	0.1%	0.01% or 1 mv	0.5%	$225.00
HW 0-15	0-10	0-15	0.01%	0.1%	0.01% or 1 mv	0.5%	310.00
HW 0-4	0-20	0-4	0.01%	0.1%	0.01% or 1 mv	0.5%	225.00
HW 0-10	0-20	0-10	0.01%	0.1%	0.01% or 1 mv	0.5%	310.00
HW 0-2	0-40	0-2	0.01%	0.1%	0.01% or 1 mv	0.5%	225.00
HW 0-5	0-40	0-5	0.01%	0.1%	0.01% or 1 mv	0.5%	295.00
HW 0-1.5	0-60	0-1.5	0.01%	0.1%	0.01% or 1 mv	0.5%	225.00
HW 0-3	0-60	0-3	0.01%	0.1%	0.01% or 1 mv	0.5%	310.00
HW 00-2	0-100	0-2	0.01%	0.1%	0.01% or 1 mv	0.5%	360.00
HW 200-1	0-200	0-1	0.01%	0.1%	0.01% or 1 mv	0.5%	395.00

ces nclude: meters, case, carry handle, and rubber feet. Options: overvoltage, 10-turn potentiometers, and special input voltage.

H w to Order

e wer supplies in this catalog are all standard produc- n its and are delivered from stock (normally within 7 ys) Call your local Mid-Eastern representative for com- ete information on price and delivery schedules. A list of pre ntatives is included for your convenience.

or r to avoid delay, use the full model number when der g your supply. Unless otherwise specified, orders are ipp via motor freight or UPS.

Wrranty

d-Estern power supplies are backed by an unconditional pai or replacement warranty for one year after date of sale.

■ Applications Assistance

If you are uncertain as to which ME power supply best meets your existing or anticipated need, please consult the factory or your nearest representative. Mid-Eastern power supply experts will welcome the opportunity to assist you and to recommend the best supply for your use.

■ Other Mid-Eastern Products

In addition to standard power supplies, Mid-Eastern manufactures custom-made power supplies and standard and custom diversity combiners. Detailed information on this other equipment is available upon request.

A Silicon Modular Power Supplies

eatures

- <1 millivolt Ripple RMS
- Remote Sensing
- 2% oad Regulation
- 1% ine Regulation
- Fully Repairable
- No Cooling Required
- All Silicon Semiconductors
- Remotely Programmable
- Models to 200 Volts Output
- Plug-in Regulator Card

Model Number	Output		Price	Model Number	Output		Price
	Volts	Amps			Volts	Amps	
LA 5-3	5-6	3.0	$135.00	LA 40-.75	38-42	0.75	$129.00
LA 7-2.5	7-9	2.5	125.00	LA 45-.75	42-45	0.75	129.00
LA 10-2.5	9-10	2.5	125.00	LA 48-.5	46-50	0.50	129.00
LA 12-2	10-12	2.0	125.00	LA 55-.5	50-58	0.50	129.00
LA 14-2	12-14	2.0	125.00	LA 60-.5	58-65	0.50	129.00
LA 15-1.5	14-16	1.5	125.00	LA 75-.375	70-80	0.375	140.00
LA 18-1.5	16-18	1.5	125.00	LA 90-.375	80-90	0.375	150.00
LA 20-1.5	18-20	1.5	125.00	LA 100-.25	90-110	0.25	155.00
LA 24-1.25	20-25	1.25	125.00	LA 125-.25	110-130	0.25	165.00
LA 28-1	26-30	1.0	125.00	LA 150-.20	130-170	0.20	175.00
LA 32-1	30-33	1.0	125.00	LA 200-.20	170-220	0.20	190.00
LA 36- .75	35-38	0.75	125.00	LA 225-.20	220-240	0.20	225.00

pe l voltage and current ranges available. Inquire of factory.

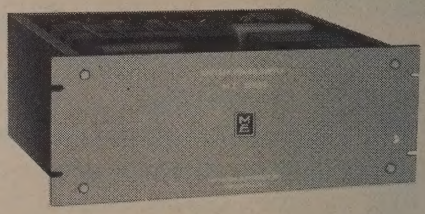
Mid-Eastern Industries
A Division of Eanco, Inc.
660 Jerusalem Road • Scotch Plains, New Jersey 07076 • (201) 233-5900.

MS High Power System Component Power Supplies

■ Features

Most Complete Coverage
Up to 600 Volts
Up to 1200 Amperes
139 Standard Models

Low Cost
All Solid State
Extreme Reliability
10 Year Guarantee



Model Number	Inches in Height
MS9-600	48⅝
MS9-1200	67⅞
MS12-12	3¼
MS12-40	5¼
MS12-60	8¾
MS12-100	12¼
MS12-150	17½
MS12-225	24
MS12-400	67⅞
MS13.5-12	3½
MS13.5-40	5¼
MS13.5-60	8¾
MS13.5-100	12¼
MS13.5-150	17½
MS13.5-225	24
MS13.5-400	67⅞
MS17-10	3½
MS17-30	5¼
MS17-45	8¾
MS17-80	12¼
MS17-120	17½
MS17-180	24
MS17-400	67⅞

Model Number	Inches in Height
MS20-10	3½
MS20-30	5¼
MS20-45	8¾
MS20-80	12¼
MS20-120	17½
MS20-180	24
MS20-400	67⅞
MS25-8	3½
MS25-25	5¼
MS25-37	8¾
MS25-60	12¼
MS25-90	17½
MS25-140	24
MS25-200	48⅝
MS25-400	67⅞
MS29-8	3½
MS29-25	5¼
MS29-37	8¾
MS29-60	12¼
MS29-90	17½
MS29-140	24
MS29-200	48⅝
MS29-400	67⅞

Model Number	Inches in Height
MS34-6	3½
MS34-20	5¼
MS34-30	8¾
MS34-50	12¼
MS34-75	17½
MS34-125	24
MS34-300	67⅞
MS38-6	3½
MS38-20	5¼
MS38-30	8¾
MS38-50	12¼
MS38-75	17½
MS38-125	24
MS38-300	67⅞
MS46-5	3½
MS46-15	5¼
MS46-22	8¾
MS46-40	12¼
MS46-60	17½
MS46-90	24
MS46-120	48⅝
MS46-240	67⅞

Model Number	Inches in Height
MS65-3	3½
MS65-10	5¼
MS65-15	8¾
MS65-25	12¼
MS65-35	17½
MS65-50	24
MS65-75	48⅝
MS65-150	67⅞
MS77-3	3½
MS77-10	5¼
MS77-15	8¾
MS77-25	12¼
MS77-35	17½
MS77-50	24
MS77-75	48⅝
MS77-150	67⅞
MS109-2	3½
MS109-6	5¼
MS109-10	8¾
MS109-15	12¼
MS109-24	17½
MS109-35	24
MS109-45	48⅝
MS109-90	67⅞

Model Number	Inches in Height
MS128-2	3½
MS128-6	5¼
MS128-10	8¾
MS128-15	12¼
MS128-24	17½
MS128-35	24
MS128-45	48⅝
MS128-90	67⅞
MS240-.75	3½
MS240-3	5¼
MS240-5	8¾
MS240-7	12¼
MS240-10	17½
MS240-15	24
MS240-40	67⅞
MS273-.75	3½
MS273-3	5¼
MS273-5	8¾
MS273-7	12¼
MS273-10	17½
MS273-15	24
MS273-40	67⅞

Model Number
MS350-1.5
MS350-3
MS350-5
MS350-7
MS350-10
MS350-30
MS410-1.5
MS410-3
MS410-5
MS410-7
MS410-10
MS410-30
MS470-2
MS470-3
MS470-5
MS470-7
MS470-10
MS470-20
MS545-2
MS545-3
MS545-5
MS545-7
MS545-10
MS545-20

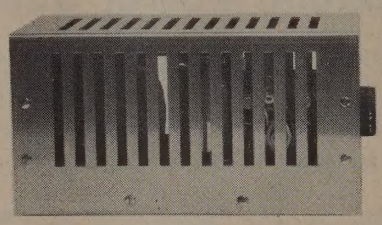
NOTE: The digits of the Model Number indicate the output voltage and current in amps. Example: MS9-600 has an output of current of 600 amps. MS9-1200 has an output of 9 volts at 1200 amps. **Consult factory for prices.**

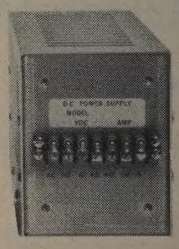
MIC Modular Power Supply System

■ Features

.02% Load Regulation
.02% Line Regulation
500 Microvolts Ripple
0-50°/71°C Operation

Low Cost
Parallel or Series Operation
Full Repairability
Remote Sensing
Integrated Circuit Control





RA5-1

B5 $5.00

B5M $35.00

Model Number	Output Volts	Output Amps	Price	Model Number	Output Volts	Output Amps	P
MIC A3	3	5.0	$129.00	MIC A36	36	1.8	$14
MIC A5	5	4.5	129.00	MIC A50	50	1.5	14
MIC A6	6	4.25	129.00	MIC A60	60	1.25	14
MIC A8	8	4.0	129.00	MIC A70	70	1.2	14
MIC A10	10	3.7	129.00	MIC A80	80	1.0	14
MIC A12	12	3.2	129.00	MIC A100	100	0.7	14
MIC A15	15	3.0	129.00	MIC A125	125	0.5	15
MIC A18	18	2.6	129.00	MIC A150	150	0.5	15
MIC A24	24	2.2	129.00	MIC A175	175	0.5	15
MIC A28	28	2.0	129.00	MIC A200	200	0.5	15

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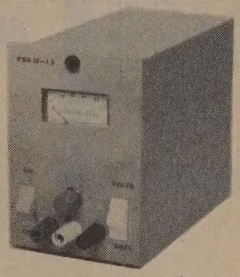
MA Miniature Silicon Power Supplies



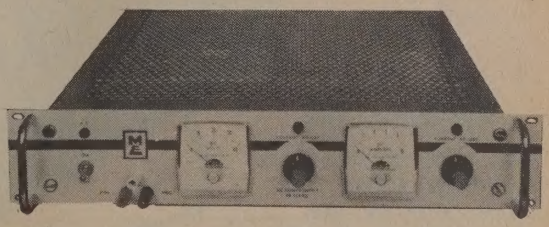
Features

- ad Regulation
- ne Regulation
- volt Ripple RMS
- Remote Sensing
- Fully Repairable
- All Silicon Semiconductors
- Remotely Programmable
- Models to 100 Volts Output
- Plug-in Regulator Card

odel umber	Output		RMS Ripple	% Regulation		Size	Price
	Volts	Amps		Line	Load		
PM 10-1.5	0-10	1.5	< 1mv	< 0.01	< 0.02	8 x 3 9/16 x 5 3/16	$165.00
PM 20-1.0	0-20	1.0	< 1mv	< 0.01	< 0.02	8 x 3 9/16 x 5 3/16	165.00
PM 40-.5	0-40	.5	< 1mv	< 0.01	< 0.02	8 x 3 9/16 x 5 3/16	175.00
PM 60-.35	0-60	.35	< 1mv	< 0.01	< 0.02	8 x 3 9/16 x 5 3/16	175.00
PM 100-.2	0-100	.2	< 1mv	< 0.01	< 0.02	8 x 3 9/16 x 5 3/16	190.00

ec voltage and current ranges available. Inquire of factory.

R Constant Voltage / Current Silicon Power Supplies

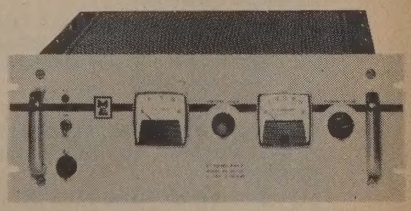


eatures

- ower — Small Size
- ely Programmable
- Si on Semiconductors
- ites
- .01% Regulation
- Low Ripple
- Constant Voltage/Constant Current
- Parallel Operation

odel umber	Output		Regulation				Panel Height	Price
			Line		Load			
	Volts	Current Amps	CV	CC	CV	CC		
PR20-15	0-20	0-15	0.01%	0.01%	0.01%	0.25%	3½″	$495.00
PR40-10	0-40	0-10	0.01%	0.01%	0.01%	0.25%	3½″	485.00
PR60-7	0-60	0-7	0.01%	0.01%	0.01%	0.25%	3½″	500.00
PR125-3.2	0-125	0-3.2	0.01%	0.01%	0.01%	0.25%	3½″	575.00
PR20-30	0-20	0-30	0.01%	0.01%	0.01%	0.25%	5¼″	670.00
PR40-20	0-40	0-20	0.01%	0.01%	0.01%	0.25%	5¼″	675.00
PR60-14	0-60	0-14	0.01%	0.01%	0.01%	0.25%	5¼″	670.00
PR125-6.5	0-125	0-6.5	0.01%	0.01%	0.01%	0.25%	5¼″	875.00

RA Constant Voltage Silicon Supplies



eatures

- ower — Small Size
- ely Programmable
- All Silicon Semiconductors
- .01% Regulation
- Low Ripple
- Parallel Operation

Model umber	Output		Voltage Regulation		Panel Height	Price
	Voltage	Current Amps	Line	Load		
R 20-15	0-20	0-15	0.01%	0.01%	3½″	$415.00
R 40-10	0-40	0-10	0.01%	0.01%	3½″	415.00
R 60-7	0-60	0-7	0.01%	0.01%	3½″	425.00
R 125-3.2	0-125	0-3.2	0.01%	0.01%	3½″	425.00
R 20-25	0-20	0-25	0.01%	0.01%	5½″	465.00
R 40-20	0-40	0-20	0.01%	0.01%	5½″	440.00
R 60-14	0-60	0-14	0.01%	0.01%	5½″	510.00
R 125-6.5	0-125	0-6.5	0.01%	0.01%	5½″	560.00
R 40-30	0-40	0-30	0.01%	0.01%	7″	665.00
R 60-20	0-60	0-20	0.01%	0.01%	7″	675.00
R 125-10	0-125	0-10	0.01%	0.01%	7″	725.00

tio include: meters, overvoltage, 10-turn potentiometers, and special input voltages.

PVC-LVC II power supplies also offer these features:

- Voltage/Current Crossover
- Three (3) Range Voltmeter
- Three (3) Range Ammeter
- Mil-T-27A Transformer
- Remote Voltage or Resistance Programming
- Master Slave Series/Parallel
- Availability in Singles and Duals

SPECIFICATIONS:

Input: 105-130 Volts, 47 to 420 Hertz, single phase.

Static Current Regulation (High Performance) **HP option**
Load: At constant input voltage, the current regulation in this High Performance mode is increased to 0.01% or 250 micro-amps by a jumper on rear barrier terminal board.

MODE OF OPERATION
Constant current and constant voltage levels may be preset with the maximum rating as listed in Table 1.

Ripple (Voltage Regulated Mode)
250 Microvolts rms from D-C to 10 Megahertz.

Ripple (Current Regulated Mode)
500 microamps rms.

TRANSIENT RESPONSE
For a no load to full load or a full load to no load step change, the output voltage will return to within 10 millivolts in less than 50 microseconds.

METERS
Three-range voltmeter and three-range ammeter are provided on the front panel.

POLARITY
The output may be floated up to 500 volts peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

DUTY
Continuous at ambient temperatures from 0°C to 60°C.

Remote Sensing: Sensing terminals separate from the load terminals provide regulation against the voltage at the load rather than the voltage at the power supply output terminals. This eliminates the otherwise unavoidable load regulation due to the voltage drop in the wires connecting the supply to the load. This feature does not eliminate voltage excursions resulting from load transients through the load line impedance.

Remote Programming: Voltage Output: The output voltage may be controlled accurately from a remote resistance or voltage, across the "remote voltage programming" terminals in the rear of the power supply. Resistance sensitivity is 200 ohms/volt.

Current Output: The output current may be controlled accurately from a remote resistance connected across the "remote current programming" terminals.

Termination: Barrier-type terminal strips at the rear of the unit provide interface connection for output, remote sensing, remote programming, tracking, HP option, and grounding. Input line cord with three-prong, in-line safety plug is provided. Front panel binding posts for output and ground are provided in addition to the output terminals at the rear.

Parallel Operation: Two like units may operate in parallel to provide twice the rated current of a single unit. Master-slave operation with single output control is provided.

Tracking: Two or more units may be connected in series, parallel or with one common voltage point and controlled with single output control and referenced to one supply's reference voltage. This connection requires the addition of tracking resistors.

OVERVOLTAGE PROTECTION OPTIONS
OVPA: Addition of an overvoltage protection circuit which will "Crowbar" the output terminals when a pre-set voltage level is exceeded. OVPA attaches to front of unit on existing output terminals. Overvoltage protection range is from approximately 6 volts to 10% above rated voltage of the supply.

OVPB: Same as OVPA option, except unit is mounted adjacent to rear terminal strips.

Protection: Load and power supply protection for any overload condition is provided by the current limiting inherent in the automatic crossover-constant current design. Protective fuse will interrupt input power in the event of internal failure.

Resolution: Continuously variable coarse and vernier output voltage adjust potentiometers provide the resolution indicated in Table 1.

MULTI-UNIT CROSS CONNECTION
Series operation: Two or more units may be operated in series to provide higher output voltage at rated current. Each unit functions independently.

NJE CORPORATION
A Subsidiary of CONDEC Corporation

20 BORIGHT AVENUE, KENILWORTH, N. J. 07033
Phone: (201) 272-6000 / Telefax: FFP / TWX: (710) 996-5797

Rack adapters

NJE Model RP101 rack adapter to mount up to 4 PVC-LVC II or two 2 PVC-LVC II units in standard 19 inch wide rack panel 5¼ inches high.

NJE Model TRA-1 rack adapter economy model slide adapter for use with RP101. Adds 1¾ inch to height.

NJE Model CP101 cover plate. Order one or more, as required, to cover unused positions in rack adapters.

Model		Voltage	Current @ 60%	Resolution	Weight (Net)	Size (Inches)	Price	
PVC	LVC II						PVC	LVC II
10-2	10-2	0-10V	0-2A	3 mv	11.5 lbs.	4¾"(H) 4"(W) 13"(D)	$148.	$124.
20-1	20-1	0-20V	0-1A	6 mv			148.	124.
50-0.5	50-0.5	0-50V	0-0.5A	15 mv			148.	124.
2PVC 10-2	2LVC II 10-2	0-10V Dual	0-2A Dual	3 mv	23 lbs.	4¾"(H) 8¼"(W) 13"(D)	$296.	$248.
		0-20V	0-2A					
		0-10V	0-4A					
2PVC 20-1	2LVC II 20-1	0-20V Dual	0-1A Dual	6 mv			296.	248.
		0-40V	0-1A					
		0-20V	0-2A					
2PVC 50-0.5	2LVC II 50-0.5	0-50V Dual	0-0.5A Dual	15 mv			296.	248.
		0-100V	0-0.5A					
		0-50V	0-1A					
10-4	10-4	0-10V	0-4A	3 mv	16 lbs.	4¾"(H) 4"(W) 15½"(D)	$195.	$171.
20-2	20-2	0-20V	0-2A	6 mv			195.	171.
50-1	50-1	0-50V	0-1A	15 mv			195.	171.
2PVC 10-4	2LVC II 10-4	0-10V Dual	0-4A Dual	3 mv	32 lbs.	4¾"(H) 8¼"(W) 15½"(D)	$390.	$342.
		0-20V	0-4A					
		0-10V	0-8A					
2PVC 20-2	2LVC II 20-2	0-20V Dual	0-2A Dual	6 mv			390.	342.
		0-40V	0-2A					
		0-20V	0-4A					
2PVC 50-1	2LVC II 50-1	0-50V Dual	0-1A Dual	15 mv			390.	342.
		0-100V	0-1A					
		0-50V	0-2A					
10-8	10-8	0-10V	0-8A	3 mv	35 lbs.	4¾"(H) 8¼"(W) 15½"(D)	$295.	—
20-4	20-4	0-20V	0-4A	6 mv			295.	—
50-2	50-2	0-50V	0-2A	15 mv			295.	—
2PVC 10-8	2LVC II 10-8	0-10V Dual	0-8A Dual	3 mv	72 lbs.	5¼"(H) 19"(W) 15½"(D)	$590.	—
		0-20V	0-8A					
		0-10V	0-16A					
2PVC 20-4	2LVC II 20-4	0-20V Dual	0-4A Dual	6 mv			590.	—
		0-40V	0-4A					
		0-20V	0-8A					
2PVC 50-2	2LVC II 50-2	0-50V Dual	0-2A Dual	15 mv			590.	—
		0-100V	0-2A					
		0-50V	0-4A					

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20 BORIGHT AVENUE, KENILWORTH, N. J. 07033
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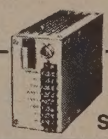
Modular power. Popular price.

SCA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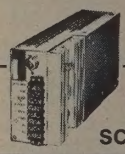
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Volt	Amps	Price	Volt	Amps	Price	Volt	Amps	Price	Volt	Amps
3	0.75	$77.	3	2.5	$107.	3	5.0	$137.	3	12.0
4	0.75	77.	4	2.5	107.	4	5.0	137.	4	12.0
5	0.75	77.	5	2.5	107.	5	4.5	137.	5	12.0
6	0.75	77.	6	2.5	107.	6	4.5	137.	6	12.0
7	0.75	77.	7	2.5	107.	7	4.5	137.	7	12.0
8	0.75	77.	8	2.4	107.	8	4.5	137.	8	12.0
9	0.75	77.	9	2.3	107.	9	4.5	137.	9	12.0
10	0.65	77.	10	2.2	107.	10	4.3	137.	10	11.0
12	0.5	77.	12	2.0	107.	12	4.0	137.	12	10.0
15	0.45	77.	15	1.5	107.	15	3.5	137.	15	9.0
18	0.42	77.	18	1.5	107.	18	3.2	137.	18	8.0
20	0.40	77.	20	1.4	107.	20	3.0	137.	20	7.5
22	0.37	77.	22	1.3	107.	22	2.8	137.	22	7.1
24	0.35	77.	24	1.2	107.	24	2.6	137.	24	6.7
28	0.3	77.	28	1.0	107.	28	2.3	137.	28	6.0
32	0.29	87.	32	0.9	117.	32	2.0	147.	32	5.5
36	0.28	87.	36	0.8	117.	36	1.8	147.	36	5.0
40	0.25	87.	40	0.75	117.	40	1.7	147.	40	4.7
44	0.23	87.	44	0.7	117.	44	1.6	147.	44	4.4
48	0.21	87.	48	0.63	117.	48	1.5	147.	48	4.1
52.5	0.19	87.	52.5	0.58	117.	52.5	1.3	147.	52.5	3.5
57.5	0.17	87.	57.5	0.53	117.	57.5	1.2	147.	57.5	3.0

All voltages adjustable ± 10%. All current ratings at 50°C.

New NJE SC series power supplies

For years we've been selling reliable laboratory power supplies at popular prices. Now you can also get these modular power supplies at our popular prices.

SC series sub-rack power supplies

- 4 basic package sizes (SCA, SCB, SCC, SCE).
- 3 different mounting surfaces (each module).
- Convection cooled—no external heat sinking required.
- Fit into racks as small as 3½" high.
- Current limiting automatic short circuit protection.
- Remote voltage adjustment, remote sensing —both standard.
- Five-year unconditional guarantee.
- All-silicon semi-conductors.
- Over voltage option available.

Specifications

Input: 105-125V AC, 47-440 cps
Regulation (Line and Load Combined): ±0.05% or 2mv, whichever is greater.
Ripple: 1 mv rms
Response Time: 20 μsecs.
Temperature Coefficient: 0.015%/°C or 1.8mv/°C, whichever is greater.
Temperature: 75°C max

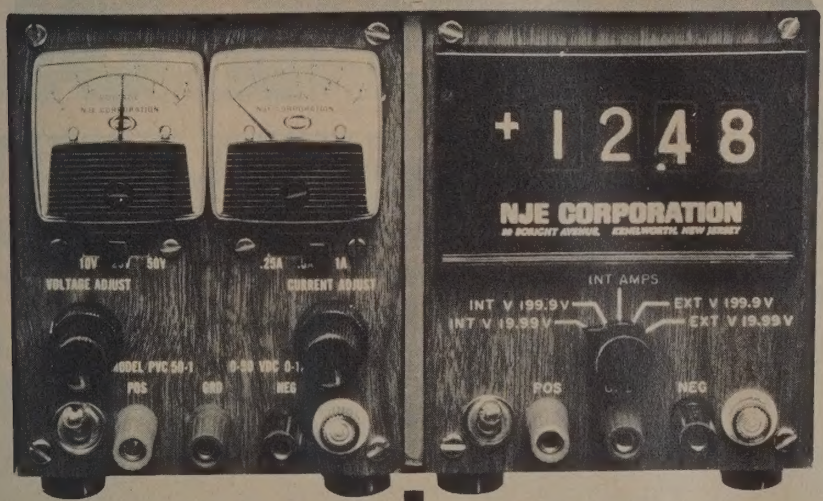
Remote voltage adjustment and remote sensing are standard. Overvoltage protection and metered panels available as options. Series start is standard on SCB, SCC and SCE and available as an option on SCA models.

5 YEAR WARRANTY!

NJE CORPORATION
Electronic Development & Manufacturing
Kenilworth, New Jersey 07033 / (201) 272-6000
TELEFAX: FFP • TWX: (710) 996-5967

a subsidiary of CONDEC Condec Corporation

OWER : DIGITAL
UPPLY with READOUT



Supply Specs:

Regulation ..... (Load) 0.01% + 1 mv
(Line) 0.005%

Regulation ..... (Load) 1.0% + 10 ma
(Line) 1.0% + 10 ma

(RMS) ..... 250 microvolts

..... Voltmeter — 3 ranges
Ammeter — 3 ranges

I.C. Regulator Cards

Resolution (3 mv-15 mv)

Digital Readout Specs:

Power Supply Output Readout
Voltage — (19.99V-199.9V) Two Ranges
Current* (.5-1.0-2.0-4.0A) Single Range

External Voltage Readout
Voltage — (19.99V-199.9V) Two Ranges
To be applied into DVM on front panel terminals.

Three Digit Display with "1" overrange

Readout Accuracy 0.1%

*current readout will depend on max. rating of mated power supply.

FEATURES

- Dial your Output Voltage or Current and Readout on Display.
- Improved Resolution and Voltage/Current Accuracy.
- BCD Signal available for Digital Printout.
- Useable as DVM to read external voltage.

odel No.	Ratings Voltage	Ratings Current	Price(1)	Model No.	Ratings Voltage	Ratings Current	Price(1)
I/DVM 10-2	0-10V	0-2A	$399	LVC II/DVM 10-4	0-10V	0-4A	$446
I/DVM 20-1	0-20V	0-1A	$399	LVC II/DVM 20-2	0-20V	0-2A	$446
I/DVM 50-.5	0-50V	0-.5A	$399	LVC II/DVM 50-1	0-50V	0-1A	$446

Pri includes Digital Readout as described above.

ALSO AVAILABLE WITH 0.01% CURRENT REGULATION (PVC POWER SUPPLY)

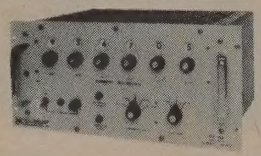
NJE CORPORATION a subsidiary of CONDEC Corporation

Electronic Development and Manufacture

nilworth, New Jersey 07033 / (201) 272-6000 / TELEFAX: FFP • TWX: (710) 996-5967

NORTH HILLS · PRECISION POWER SOURCES

DC CONSTANT CURRENT



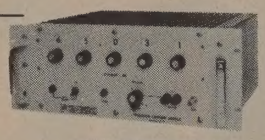
CS151
CS-152
CS-153

0.01% ACCURACY, 2 PPM STABILITY

Model No.	Current Range mA	Decades	Compliance Range V.
CS-151	±0.1/1/10	6	0 to ±10
CS-152	±0.1/1/10/100/150	6	0 to ±25
CS-153	±0.1/1/10/100/150	6	0 to ±100

FEATURES AND APPLICATIONS

All solid state, convection cooled; digital readout i- directional output, polarity reversal switch; 5 ppm e and load regulation; low noise and ripple; modul n capability; patented circuits; fast recovery from over For testing inertial gyros, IC's, reference zeners, many other precision current-sensitive devices.



CS-11
CS-12

0.015% ACCURACY, 10 PPM STABILITY

CS-11	0 to 100	5	0 to 100
CS-12	0 to 1000	6	0 to 125

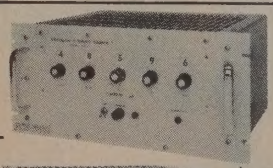
All solid state, convection cooled; 10 ppm line and regulation; low noise and ripple; modulation capab automatic overload protection. For testing gyros, conductors and calibration.

CS-111

0.1% ACCURACY. 0.01% STABILITY

CS-111	0 to 500	6	0 to 250

All solid state, convection cooled; low noise and ri 25 ppm line and load regulation; modulation capab automatic overload protection. Tests of transistors, ze relays, solenoids and other current-sensitive compon



CS-120

2% ACCURACY, 0.1% STABILITY

CS-120	0 to 10	5	0 to 2 kV

Hybrid design; modulation capability; automatic ove protection and safety high voltage shutdown. Rectifie and other semiconductor tests.

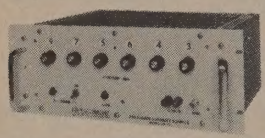
CS-210

DIGITALLY PROGRAMMABLE

CS-210	±0.01/0.1/1/10/100	4	0 to ±100

All solid state, convection cooled; local and remote gramming of range, setting, polarity and voltage lim Logic "0":0.4 V. max., logic "1":2.4 V. min. 50 stability; 50 ppm line and load regulation, low ripple noise. Computer-controlled automatic test systems.

DC CONSTANT VOLTAGE



VS-35
VS-36

0.01% ACCURACY, 25 PPM STABILITY

Model No.	Voltage Range V	Decades	Current Range mA
VS-35	0 to 111.1	6	100
VS-36	0 to 21.1	6	1000

All solid state, convection cooled; digital readout; 25 line and load regulation; low ripple and noise; over rent protection; modulated output capability. Typ used for testing semiconductors, magnetic compon resistors, and meter calibration.

DC CONSTANT VOLTAGE/ CURRENT

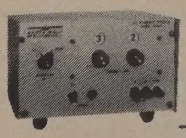
TC-100.2BR, TC-602CR

.01% ACCURACY, 3 PPM STABILITY

TC-100.2BR	1/10/100 @ 200 mA max.	5 Plus Vernier	1/10/10 @ 100 V. max.
TC-602CR	6/60 @ 2A max.	5 Plus Vernier	6/60/2000 @ 60 V. max.

Combined constant voltage and current sources; all state; digital readout; 2 ppm line and load regula low ripple and noise; programmed output capa remote sensing; automatic voltage and current lim meter monitor; 5¼" panel height. Meets all require for precision constant voltage and current sources.

AC CONSTANT CURRENT



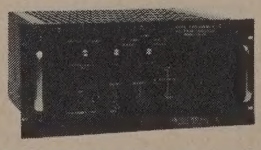
CS-180

60/400/1000 Hz

Model No.	Current Range mA rms	Decades	Compliance Range V rms
CS-180	10 to 110	2	0 to 5

All solid state. For measurement of fuel cell impe and transducer characteristics; supply for lamp filan and other ac current-sensitive devices and compon

AC CONSTANT VOLTAGE



VS-66
VS-78

GYRO, SYNCHRO, MICROSYN SUPPLIES

Model No.	Voltage Range V rms	Frequency Hz	Phase	Rating VA
VS-66	50	800	2	25/ϕ
VS-78	50	800/9600	1	25

VS-66 — All solid state, convection cooled; 0.1% stal 0.1% line and load regulation; 1% total harmonic tortion; remote sensing; phase-locked output; auto overload protection; other frequencies and outputs able. For use as gyro wheel or synchro supply.

VS-78 — All solid state, convection cooled; 0.1% stal 0.1% line and load regulation; 0.5% total harmonic tortion; phase-locked output; remote sensing; auto overload protection; other dual frequencies avai For use as microsyn supply.

SEE EEM SECTION 2200 FOR HIGH PERFORMANCE SYSTEM MODULES, AND SECTION 5600 FOR WIDE BAND TRANSFORMERS AND HY

NORTH HILLS ELECTRONICS, INC. GLEN COVE, N.Y. 11542 • 516 671-5700

NOVaerters®

The Source!

VERTERS & FREQUENCY CHANGERS

OVER ONE THOUSAND THREE PHASE AND SINGLE PHASE MODELS AT LOW CATALOG PRICES

80% Minimum Efficiency • Smallest Size • Lowest Cost
Low Distortion • Fastest Delivery

Typical specifications for all models

INPUT RANGES (VDC)
11-16, 11-32, 22-32, 42-54
105-150, 150-250, & 250-350 VDC

OUTPUT RATINGS (VA)
125, 250, 500, 1,000, 1,500
2,000, 3,000 Single Phase,
150, 375, 750, 1,000, 1,500, 3,000
4,500, 6,000, 9,000 Three Phase

OUTPUT FREQUENCIES
48 - 440 Hz continuously
variable or 50, 60, 400 Hz fixed

OUTPUT VOLTAGE
10-130 VAC continuously variable

OUTPUT REGULATION
Less than ±1% for line and load

FREQUENCY REGULATION
Less than ±0.15% for line & load

OPERATING TEMPERATURE
—40°C to 71°C

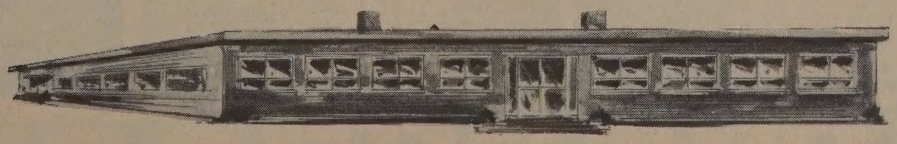
EFFICIENCY
(Except 12V models) 80% Minimum

DISTORTION
3% to 6%

FREQUENCY CHANGER INPUTS
48 - 440 Hz, Single and Three Phase,
115, 230V

All models available with output metering — New BANTAMWEIGHT miniaturized high power designs now available

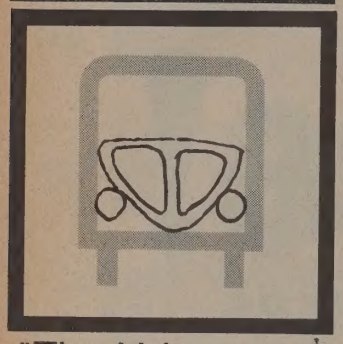
PHONE (201) NOva 1 - 3434



NOva ELECTRIC MANUFACTURING CO.

A Subsidiary of NOVa Industries, Inc. 263 Hillside Ave., Nutley, New Jersey 07110

VWS65



"The Voltswagen"

POWER SUPPLIES
REGULATED AC–DC
BASE TEMP. RATING 65°

NOTE:

All units in VWS65° & VWS95° Series have been designed using "WORST CASE ANALYSIS" incorporating components derating and prototype analysis.

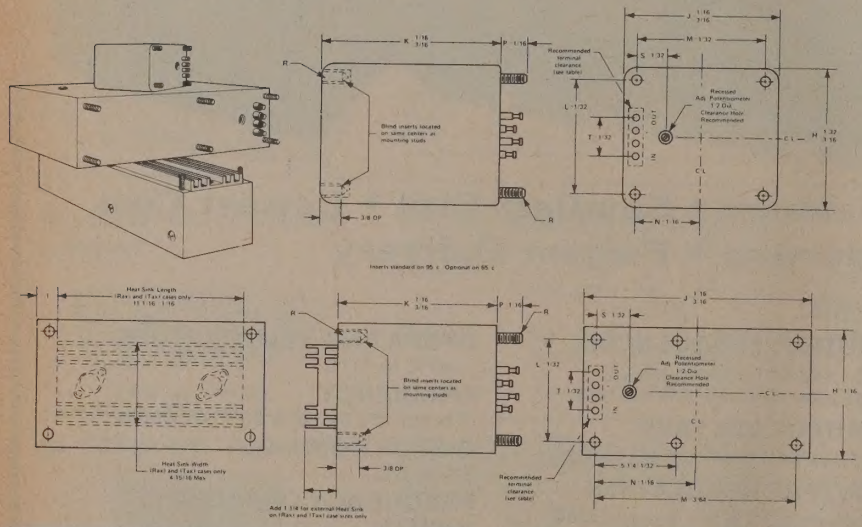
65° FEATURES

- ☐ 0°C to 65°C base plate operation
- ☐ -20°C to 85°C storage
- ☐ High grade industrial and commercial applic ns
- ☐ Temperature coefficient - 0.01%/°C or 1MV/°C
- ☐ Overload protection
- ☐ Short circuit protection
- ☐ Reverse voltage protection
- ☐ Over-temperature protection*
- ☐ Over-voltage protection (optional)
- ☐ M.T.B.F. 40,000 hours
- ☐ Recovery time - less than 50 Micro sec half lo to full load.
- ☐ Off ground operation
- ☐ Transformer design per MIL-T-27A

*Standard in all units in Case Sizes NA and or

SPECIFICATIONS VWS 65 Series

Input Voltage Range	115VAC ± 10%
Line Swing	103.5VAC to 126.5VAC
Input Frequency Range	47 Hz to 440 Hz
Regulation Accuracy	0.01% + 1MV for Full input range
Ripple	0.02% + 2MV for 0 to 100% load change
Temperature Co:	0.01%/C° of nominal output voltage
Temperature, Storage	-20°C to 85°C
Temperature, Operating	-20°C to + 65°C mounting Base, refer to specific model for maximum ambient
Polarity	VWS65 Series Power Supplies may be used with positive or negative ground or output may be floated to 250 Vdc on lowest voltage terminal. Consult factory for higher ratings
Output Voltage Adjustment Range	± 10% of Nominal
Series Operation	May be provided at no additional cost
Short Circuit Protection	Fold back current limiting
Over-Temperature Protection	Standard on NA case size and larger
Over-Voltage Protection	(Optional) will be installed internally when ordered with power supply
Recovery Time	Less than 50 micro seconds for 1/2 load to full load step change
Operation with Lamp Loads	Available upon request
400 Hz Operation Only	Power Supplies can be packaged in smaller can sizes (approx. 1 size smaller).
Stability	Less than .5% (for 8 hours continuous operation).



CASE SIZE	DIMENSIONS H	J	K	L	M	N	P	R	S	T	RECOMMENDED TERMINAL CLEARANCE
HA	2- 5/8	3- 1/16	4- 1/4	1-55/64	2-19/64	1- 5/32	11/32	8-32	19/32	15/16	3/8 x 1-5/16
JA	3- 1/16	3- 9/16	4- 7/8	2- 1/8	2- 5/8	1- 5/16	11/32	8-32	19/32	15/16	3/8 x 1-5/16
KA	3- 3/8	3-15/16	5- 1/4	2- 7/16	3	1- 1/2	15/32	10-32	19/32	15/16	3/8 x 1-5/16
LA	3-11/16	4- 5/16	5- 9/16	2-11/16	3- 5/16	1-21/32	7/16	10-32	19/32	15/16	3/8 x 1-5/16
MA	4	4-11/16	6	3	3-11/16	1-27/32	9/16	1/4-20	19/32	15/16	3/8 x 1-5/16
NA	4- 5/16	5- 1/16	6-13/16	3- 5/16	4- 1/16	2- 1/32	9/16	1/4-20	19/32	15/16	3/8 x 1-5/16
PA	4-15/16	6- 9/16	7	3- 5/8	5- 1/4	2- 5/8	21/32	5/16-18	3/4	15/16	3/8 x 1-5/16
QA	6- 9/16	6- 3/4	7	5- 1/4	5- 7/16	2-23/32	21/32	5/16-18	3/4	1-7/8	1/2 x 2-3/8
RA	4-15/16	13- 1/16	7	3- 5/8	11-13/16	5-29/32	21/32	5/16-18	3/4	1-7/8	1/2 x 2-3/8
RAX	4-15/16	13- 1/16	7	3- 5/8	11-13/16	5-29/32	21/32	5/16-18	3/4	1-7/8	1/2 x 2-3/8
TA	6- 9/16	13- 1/16	7	5- 7/16	11-13/16	5-29/32	21/32	5/16-18	3/4	1-7/8	1/2 x 2-3/8
TAX	6- 9/16	13- 1/16	7	5- 7/16	11-13/16	5-29/32	21/32	5/16-18	3/4	1-7/8	1/2 x 2-3/8

Output Voltage	Output Current	Case Size	Model Numb
4.3 - 4.7	.500	HA	VWS65-4,5/P5
	1.0	JA	VWS65-4,5/1
	2.0	LA	VWS65-4,5/2
	4.0	MA	VWS65-4,5/4
	8.0	NA	VWS65-4,5/8
	15.0	QA	VWS65-4,5/15
4.7 - 5.3	.500	HA	VWS65-5/P50
	1.0	JA	VWS65-5/1
	2.0	LA	VWS65-5/2
	4.0	MA	VWS65-5/4
	8.0	NA	VWS65-5/8
	15.0	QA	VWS65-5/15
5.3 - 5.8	.500	HA	VWS65-5,5/P5
	1.0	JA	VWS65-5,5/1
	2.0	LA	VWS65-5,5/2
	4.0	MA	VWS65-5,5/4
	8.0	NA	VWS65-5,5/8
	15.0	QA	VWS65-5,5/15
5.8 - 6.3	.500	HA	VWS65-6/P50
	1.0	JA	VWS65-6/1
	2.0	LA	VWS65-6/2
	4.0	MA	VWS65-6/4
	8.0	NA	VWS65-6/8
	15.0	QA	VWS65-6/15
6.3 - 6.9	.250	HA	VWS65-6,5/P2
	.500	HA	VWS65-6,5/P5
	1.0	JA	VWS65-6,5/1
	2.0	LA	VWS65-6,5/2
	4.0	NA	VWS65-6,5/4
	8.0	PA	VWS65-6,5/8
	15.0	QA	VWS65-6,5/15
6.9 - 7.6	.250	HA	VWS65-7/P250
	.500	HA	VWS65-7/P500
	1.0	JA	VWS65-7/1
	2.0	LA	VWS65-7/2
	4.0	NA	VWS65-7/4
	8.0	PA	VWS65-7/8
	15.0	QA	VWS65-7/15
7.6 - 8.5	.250	HA	VWS65-8/P250
	.500	HA	VWS65-8/P500
	1.0	JA	VWS65-8/1
	2.0	LA	VWS65-8/2
	4.0	NA	VWS65-8/4
	8.0	PA	VWS65-8/8
	15.0	QA	VWS65-8/15
8.5 - 9.3	.250	HA	VWS65-9/P250
	.500	HA	VWS65-9/P500
	1.0	JA	VWS65-9/1
	2.0	LA	VWS65-9/2
	4.0	NA	VWS65-9/4
	8.0	PA	VWS65-9/8
	15.0	QA	VWS65-9/15
9.3 - 10.3	.250	HA	VWS65-10/P250
	.500	HA	VWS65-10/P500
	1.0	KA	VWS65-10/1
	2.0	LA	VWS65-10/2
	4.0	NA	VWS65-10/4
	8.0	PA	VWS65-10/8
	15.0	QA	VWS65-10/15
10.3 - 11.4	.250	HA	VWS65-11/P250
	.500	HA	VWS65-11/P500
	1.0	KA	VWS65-11/1
	2.0	MA	VWS65-11/2
	4.0	NA	VWS65-11/4
	8.0	PA	VWS65-11/8
	15.0	QA	VWS65-11/15
11.4 - 12.5	.250	HA	VWS65-12/P250
	.500	HA	VWS65-12/P500
	1.0	KA	VWS65-12/1
	2.0	MA	VWS65-12/2

NUCLEAR CORPORATION OF AMERICA
POWER SUPPLY DIVISIC
2 RICHWOOD PLACE, DENVILLE, NEW JERSEY 07834
TELEPHONE 201-627-4200 (TWX) 710-98784

OPTIONS

'Ov -voltage protection — suffix	- O.V.
40 Hz input only-(Reduced Size & Wgt)	- A.
Op ration with lamp loads	- L.
Fi d output voltage	- F.
Re ote sensing	- R.
Ex rnal output adjustment	- X.
Ov -temperature protection	- O.T.
Op on for Inserts	- H.

OTHER SPECIAL OPTIONS

For simplicity we have omitted the listing of vast numbers of options. However, many other special options are available upon request, such as special configurations, special painting, closer regulation, 230 volt input, multiple outputs, etc. If your needs cannot be filled from our catalog try our factory. You may be surprised at our capabilities.

utput oltage	Output Current	Case Size	Model Number
4 - 12.5	4.0	NA	VWS65-12/4
	8.0	PA	VWS65-12/8
	15.0	QA	VWS65-12/15
5 - 13.7	.125	HA	VWS65-13/P125
	.250	HA	VWS65-13/P250
	.500	HA	VWS65-13/P500
	1.0	KA	VWS65-13/1
	2.0	MA	VWS65-13/2
	4.0	PA	VWS65-13/4
	8.0	QA	VWS65-13/8
	15.0	RA	VWS65-13/15
7 - 15.2	.125	HA	VWS65-14/P125
	.250	HA	VWS65-14/P250
	.500	JA	VWS65-14/P500
	1.0	KA	VWS65-14/1
	2.0	MA	VWS65-14/2
	4.0	PA	VWS65-14/4
	8.0	QA	VWS65-14/8
	15.0	RA	VWS65-14/15
2 - 16.5	.125	HA	VWS65-16/P125
	.250	HA	VWS65-16/P250
	.500	JA	VWS65-16/P500
	1.0	KA	VWS65-16/1
	2.0	MA	VWS65-16/2
	4.0	PA	VWS65-16/4
	8.0	QA	VWS65-16/8
	15.0	RA	VWS65-16/15
.5 - 18.5	.125	HA	VWS65-17/P125
	.250	HA	VWS65-17/P250
	.500	JA	VWS65-17/P500
	1.0	KA	VWS65-17/1
	2.0	NA	VWS65-17/2
	4.0	PA	VWS65-17/4
	8.0	QA	VWS65-17/8
	15.0	RA	VWS65-17/15
.5 - 20.2	.125	HA	VWS65-19/P125
	.250	HA	VWS65-19/P250
	.500	JA	VWS65-19/P500
	1.0	KA	VWS65-19/1
	2.0	NA	VWS65-19/2
	4.0	PA	VWS65-19/4
	8.0	QA	VWS65-19/8
	15.0	RA	VWS65-19/15
2 - 22.3	.125	HA	VWS65-21/P125
	.250	HA	VWS65-21/P250
	.500	JA	VWS65-21/P500
	1.0	KA	VWS65-21/1
	2.0	NA	VWS65-21/2
	4.0	PA	VWS65-21/4
	8.0	QA	VWS65-21/8
	15.0	RA	VWS65-21/15
3 - 24.4	.125	HA	VWS65-23/P125
	.250	HA	VWS65-23/P250
	.500	JA	VWS65-23/P500
	1.0	LA	VWS65-23/1
	2.0	NA	VWS65-23/2
	4.0	PA	VWS65-23/4
	8.0	QA	VWS65-23/8
	15.0	RA	VWS65-23/15
.4 - 26.8	.125	HA	VWS65-25/P125
	.250	HA	VWS65-25/P250
	.500	JA	VWS65-25/P500
	1.0	LA	VWS65-25/1
	2.0	NA	VWS65-25/2
	4.0	PA	VWS65-25/4
	8.0	QA	VWS65-25/8
	15.0	RA	VWS65-25/15
.8 - 29.2	.125	HA	VWS65-28/P125
	.250	HA	VWS65-28/P250
	.500	JA	VWS65-28/P500

Output Voltage	Output Current	Case Size	Model Number
26.8 - 29.2	1.0	LA	VWS65-28/1
	2.0	NA	VWS65-28/2
	4.0	PA	VWS65-28/4
	8.0	QA	VWS65-28/8
	15.0	RA	VWS65-28/15
29.2 - 32.7	.065	HA	VWS65-31/P065
	.125	HA	VWS65-31/P125
	.250	HA	VWS65-31/P250
	.500	JA	VWS65-31/P500
	1.0	LA	VWS65-31/1
	2.0	NA	VWS65-31/2
	4.0	PA	VWS65-31/4
	8.0	QA	VWS65-31/8
	15.0	TA	VWS65-31/15
32.7 - 36.2	.065	HA	VWS65-34/P065
	.125	HA	VWS65-34/P125
	.250	HA	VWS65-34/P250
	.500	JA	VWS65-34/P500
	1.0	LA	VWS65-34/1
	2.0	NA	VWS65-34/2
	4.0	PA	VWS65-34/4
	8.0	QA	VWS65-34/8
	15.0	TA	VWS65-34/15
36.2 - 40.0	.065	HA	VWS65-38/P065
	.125	HA	VWS65-38/P125
	.250	HA	VWS65-38/P250
	.500	KA	VWS65-38/P500
	1.0	MA	VWS65-38/1
	2.0	NA	VWS65-38/2
	4.0	PA	VWS65-38/4
	8.0	QA	VWS65-38/8
	15.0	TA	VWS65-38/15
40 - 44	.065	HA	VWS65-42/P065
	.125	HA	VWS65-42/P125
	.250	JA	VWS65-42/P250
	.500	KA	VWS65-42/P500
	1.0	MA	VWS65-42/1
	2.0	NA	VWS65-42/2
	4.0	QA	VWS65-42/4
	8.0	QA	VWS65-42/8
	15.0	TA	VWS65-42/15
44 - 48	.065	HA	VWS65-46/P065
	.125	HA	VWS65-46/P125
	.250	JA	VWS65-46/P250
	.500	KA	VWS65-46/P500
	1.0	MA	VWS65-46/1
	2.0	PA	VWS65-46/2
	4.0	QA	VWS65-46/4
	8.0	RA	VWS65-46/8
	15.0	TA	VWS65-46/15
48 - 52	.065	HA	VWS65-50/P065
	.125	HA	VWS65-50/P125
	.250	JA	VWS65-50/P250
	.500	KA	VWS65-50/P500
	1.0	MA	VWS65-50/1
	2.0	PA	VWS65-50/2
	4.0	QA	VWS65-50/4
	8.0	RA	VWS65-50/8
	15.0	TA	VWS65-50/15
52 - 59	.065	HA	VWS65-56/P065
	.125	JA	VWS65-56/P125
	.250	KA	VWS65-56/P250
	.500	LA	VWS65-56/P500
	1.0	NA	VWS65-56/1
	2.0	PA	VWS65-56/2
	4.0	QA	VWS65-56/4
	8.0	RA	VWS65-56/8
59 - 65	.065	JA	VWS65-62/P065
	.125	KA	VWS65-62/P125
	.250	LA	VWS65-62/P250
	.500	MA	VWS65-62/P500

Output Voltage	Output Current	Case Size	Model Number
59 - 65	1.0	NA	VWS65-62/1
	2.0	PA	VWS65-62/2
	4.0	QA	VWS65-62/4
	8.0	TA	VWS65-62/8
65 - 72	.065	JA	VWS65-68/P065
	.125	KA	VWS65-68/P125
	.250	LA	VWS65-68/P250
	.500	MA	VWS65-68/P500
	1.0	NA	VWS65-68/1
	2.0	PA	VWS65-68/2
	4.0	QA	VWS65-68/4
	8.0	TA	VWS65-68/8
72 - 80	.065	JA	VWS65-76/P065
	.125	KA	VWS65-76/P125
	.250	LA	VWS65-76/P250
	.500	MA	VWS65-76/P500
	1.0	NA	VWS65-76/1
	2.0	PA	VWS65-76/2
	4.0	QA	VWS65-76/4
	8.0	TA	VWS65-76/8
80 - 88	.065	JA	VWS65-84/P065
	.125	KA	VWS65-84/P125
	.250	LA	VWS65-84/P250
	.500	NA	VWS65-84/P500
	1.0	PA	VWS65-84/1
	2.0	QA	VWS65-84/2
	4.0	RA	VWS65-84/4
	8.0	TA	VWS65-84/8
88 - 96	.065	JA	VWS65-92/P065
	.125	KA	VWS65-92/P125
	.250	LA	VWS65-92/P250
	.500	NA	VWS65-92/P500
	1.0	PA	VWS65-92/1
	2.0	QA	VWS65-92/2
	4.0	RA	VWS65-92/4
96 - 105	.065	JA	VWS65-100/P065
	.125	KA	VWS65-100/P125
	.250	LA	VWS65-100/P250
	.500	NA	VWS65-100/P500
	1.0	PA	VWS65-100/1
	2.0	QA	VWS65-100/2
	4.0	RA	VWS65-100/4
105 - 115	.065	KA	VWS65-110/P065
	.125	LA	VWS65-110/P125
	.250	MA	VWS65-110/P250
	.500	NA	VWS65-110/P500
	1.0	PA	VWS65-110/1
	2.0	QA	VWS65-110/2
	4.0	RA	VWS65-110/4
115 - 125	.065	KA	VWS65-120/P065
	.125	LA	VWS65-120/P125
	.250	MA	VWS65-120/P250
	.500	NA	VWS65-120/P500
	1.0	PA	VWS65-120/1
	2.0	QA	VWS65-120/2
	4.0	RA	VWS65-120/4
125 - 135	.065	KA	VWS65-130/P065
	.125	LA	VWS65-130/P125
	.250	MA	VWS65-130/P250
	.500	NA	VWS65-130/P500
	1.0	PA	VWS65-130/1
	2.0	QA	VWS65-130/2
	4.0	TA	VWS65-130/4
135 - 145	.065	KA	VWS65-140/P065
	.125	LA	VWS65-140/P125
	.250	MA	VWS65-140/P250
	.500	NA	VWS65-140/P500
	1.0	PA	VWS65-140/1
	2.0	QA	VWS65-140/2
	4.0	TA	VWS65 140/4
145- 155	.065	KA	VWS65-150/P065
	.125	LA	VWS65-150/P125
	.250	MA	VWS65-150/P250
	.500	NA	VWS65-150/P500
	1.0	PA	VWS65-150/1
	2.0	QA	VWS65-150/2
	4.0	TA	VWS65-150/4

VWS95

BASE TEMP. RATING 95°

QUALIFIED FOR EXTREME MIL ENVIRONMENTS

SPECIFICATIONS VWS 95 Series

Input Voltage Range	115VAC ± 10%
Line Swing	103.5VAC to 126.5VAC
Input Frequency Range	47 Hz to 440 Hz
Regulation Accuracy	0.01% + 1MV for Full input range
Ripple	0.02% + 2MV for 0 to 100% load change
Temperature Co:	0.01%/C° of nominal output voltage
Temperature, Storage	-55°C to + 105°C
Temperature, Operating	-20°C to + 95°C mounting Base, refer to specific model for maximum ambient
Polarity	VWS95 Series Power Supplies may be used with positive or negative ground or output may be floated to 250 Vdc on lowest voltage terminal. Consult factory for higher ratings
Output Voltage Adjustment Range	± 10% of Nominal
Series Operation	May be provided at no additio
Short Circuit Protection	Fold back current limiting
Over-Temperature Protection	Standard on NA case size an
Over-Voltage Protection	(Optional) will be installed in when ordered with power supply
Recovery Time	Less than 50 micro seconds for to full load step change
Operation with Lamp Loads	Available upon request
400 Hz Operation Only	Power Supplies can be packa smaller can sizes (approx. 1 size
Stability	Less than .5% (for 8 hours con operation).

NOTE: 100% MIL Components

Output Voltage	Output Current	Case Size	Model Number	Price
4.3 - 4.7	.375	JA	VWS95-4.5/P375	$ 119.00
	.750	JA	VWS95-4.5/P750	131.00
	1.5	LA	VWS95-4.5/1.5	136.00
	3.0	MA	VWS95-4.5/3	156.00
	6.0	NA	VWS95-4.5/6	198.00
	12.0	QA	VWS95-4.5/12	281.00
4.7 - 5.3	.375	JA	VWS95-5/P375	119.00
	.750	JA	VWS95-5/P750	131.00
	1.5	LA	VWS95-5/1.5	136.00
	3.0	MA	VWS95-5/3	156.00
	6.0	NA	VWS95-5/6	198.00
	12.0	QA	VWS95-5/12	281.00
5.3 - 5.8	.375	JA	VWS95-5.5/P375	119.00
	.750	JA	VWS95-5.5/P750	131.00
	1.5	LA	VWS95-5.5/1.5	136.00
	3.0	MA	VWS95-5.5/3	156.00
	6.0	NA	VWS95-5.5/6	198.00
	12.0	QA	VWS95-5.5/12	281.00
5.8 - 6.3	.375	JA	VWS95-6/P375	119.00
	.750	JA	VWS95-6/P750	131.00
	1.5	LA	VWS95-6/1.5	136.00
	3.0	NA	VWS95-6/3	183.00
	6.0	PA	VWS95-6/6	235.00
	12.0	QA	VWS95-6/12	281.00
6.3 - 6.9	.200	HA	VWS95-6.5/P200	112.00
	.375	JA	VWS95-6.5/P375	129.00
	.750	JA	VWS95-6.5/P750	131.00
	1.5	LA	VWS95-6.5/1.5	136.00
	3.0	NA	VWS95-6.5/3	183.00
	6.0	PA	VWS95-6.5/6	235.00
	12.00	QA	VWS95-6.5/12	281.00
6.9 - 7.6	.200	HA	VWS95-7/P200	112.00
	.375	JA	VWS95-7/P375	129.00
	.750	JA	VWS95-7/P750	131.00
	1.5	LA	VWS95-7/1.5	136.00
	3.0	NA	VWS95-7/3	183.00
	6.0	PA	VWS95-7/6	235.00
	12.0	QA	VWS95-7/12	281.00
7.6 - 8.5	.200	HA	VWS95-8/P200	112.00
	.375	JA	VWS95-8/P375	129.00
	.750	JA	VWS95-8/P750	131.00
	1.5	LA	VWS95-8/1.5	136.00
	3.0	NA	VWS95-8/3	183.00
	6.0	PA	VWS95-8/6	235.00
	12.0	QA	VWS95-8/12	295.00
8.5 - 9.3	.200	HA	VWS95-9/P200	112.00
	.375	JA	VWS95-9/P375	129.00
	.750	KA	VWS95-9/P750	131.00
	1.5	MA	VWS95-9/1.5	153.00
	3.0	NA	VWS95-9/3	183.00
	6.0	PA	VWS95-9/6	235.00
	12.0	QA	VWS95-9/12	295.00
9.3 - 10.3	.200	HA	VWS95-10/P200	112.00
	.375	JA	VWS95-10/P375	129.00
	.750	KA	VWS95-10/P750	131.00
	1.5	MA	VWS95-10/1.5	153.00
	3.0	NA	VWS95-10/3	183.00
	6.0	PA	VWS95-10/6	235.00
	12.0	QA	VWS95-10/12	295.00
10.3 - 11.4	.200	HA	VWS95-11/P200	112.00
	.375	JA	VWS95-11/P375	129.00
	.750	KA	VWS95-11/P750	131.00
	1.5	MA	VWS95-11/1.5	141.00
	3.0	PA	VWS95-11/3	225.00
	6.0	QA	VWS95-11/6	274.00
	12.0	RA	VWS95-11/12	422.00
11.4 - 12.5	.100	HA	VWS95-12/P100	112.00
	.200	HA	VWS95-12/P200	123.00
	.375	JA	VWS95-12/P375	129.00
	.750	KA	VWS95-12/P750	131.00

WARRANTY: The Nucor Warranty not only guarantees you an instrument which will perform to published specification, but also expresses our pride and confidence in the materials and workmanship which have gone into that instrument. It is a warranty backed by over 12 years experience in the Electronics industry.

All Nucor products are warranted against defects in materials and workmanship. This warranty applies for One Year from date of delivery. We will repair or replace products which prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

ORDER by MODEL NUMBER: When ordering please specify the catalog model number and name of instrument desired. For example "VWS5/6-OV". To prevent misunderstanding, include option numbers and specific instructions in your order whenever you desire special options or special features such as a special color, non-standard input AC power connector, etc.

WHERE TO SEND YOUR ORDER: Your order should be sent directly to Nuclear Corp. of America, Power Supply division, 2 Richwood Place, Denville, N.J. 07834.

Output Voltage	Output Current	Case Size	Model Number	Price
11.4 - 12.5	1.5	MA	VWS95-12/1.5	$ 153.00
	3.0	PA	VWS95-12/3	225.00
	6.0	QA	VWS95-12/6	274.00
	12.0	RA	VWS95-12/12	422.00
12.5 - 13.7	.100	HA	VWS95-13/P100	106.00
	.200	HA	VWS95-13/P200	112.00
	.375	JA	VWS95-13/P375	129.00
	.750	KA	VWS95-13/P750	131.00
	1.5	MA	VWS95-13/1.5	153.00
	3.0	PA	VWS95-13/3	225.00
	6.0	QA	VWS95-13/6	274.00
	12.0	RA	VWS95-13/12	422.00
13.7 - 15.2	.100	HA	VWS95-14/100	106.00
	.200	HA	VWS95-14/P200	112.00
	.375	JA	VWS95-14/P375	129.00
	.750	KA	VWS95-14/P750	131.00
	1.5	MA	VWS95-14/1.5	153.00
	3.0	PA	VWS95-14/3	235.00
	6.0	QA	VWS95-14/6	274.00
	12.0	RA	VWS95-14/12	452.00
15.2 - 16.5	.100	HA	VWS95-16/P100	106.00
	.200	HA	VWS95-16/P200	112.00
	.375	JA	VWS95-16/P375	129.00
	.750	KA	VWS95-16/P750	131.00
	1.5	MA	VWS95-16/1.5	153.00
	3.0	PA	VWS95-16/3	235.00
	6.0	QA	VWS95-16/6	274.00
	12.0	RA	VWS95-16/12	452.00
16.5 - 18.5	.100	HA	VWS95-17/P100	106.00
	.200	HA	VWS95-17/P200	112.00
	.375	JA	VWS95-17/P375	129.00
	.750	KA	VWS95-17/P750	131.00
	1.5	NA	VWS95-17/1.5	161.00
	3.0	PA	VWS95-17/3	235.00
	6.0	QA	VWS95-17/6	274.00
	12.0	RA	VWS95-17/12	452.00
18.5 - 20.2	.100	HA	VWS95-19/P100	106.00
	.200	HA	VWS95-19/P200	112.00
	.375	JA	VWS95-19/P375	129.00
	.750	KA	VWS95-19/P750	131.00
	1.5	NA	VWS95-19/1.5	161.00
	3.0	PA	VWS95-19/3	235.00
	6.0	QA	VWS95-19/6	274.00
	12.0	RA	VWS95-19/12	452.00
20.2 - 22.3	.100	HA	VWS95-21/P100	106.00
	.200	HA	VWS95-21/P200	112.00
	.375	JA	VWS95-21/P375	129.00
	.750	LA	VWS95-21/P750	142.00
	1.5	NA	VWS95-21/1.5	161.00
	3.0	PA	VWS95-21/3	235.00
	6.0	QA	VWS95-21/6	274.00
	12.0	RA	VWS95-21/12	452.00
22.3 - 24.4	.100	HA	VWS95-23/P100	106.00
	.200	HA	VWS95-23/P200	112.00
	.375	JA	VWS95-23/P375	129.00
	.750	LA	VWS95-23/P750	142.00
	1.5	NA	VWS95-23/1.5	161.00
	3.0	PA	VWS95-23/3	235.00
	6.0	QA	VWS95-23/6	274.00
	12.0	RA	VWS95-23/12	452.00
24.4 - 26.8	.100	HA	VWS95-25/P100	108.00
	.200	JA	VWS95-25/P200	121.00
	.375	KA	VWS95-25/P375	140.00
	.750	LA	VWS95-25/P750	142.00
	1.5	NA	VWS95-25/1.5	161.00
	3.0	PA	VWS95-25/3	225.00
	6.0	QA	VWS95-25/6	274.00
	12.0	RA	VWS95-25/12	452.00
26.8 - 29.2	.100	HA	VWS95-28/P100	108.00
	.200	JA	VWS95-28/P200	121.00

NUCOR

95° FEATURES

- 0° to +95°C operation
- 55° to +125°C storage
- Qualified for extreme MIL environments
- Temperature coefficient – 0.01%/°C or 1MV/°C
- Overload protection
- Short circuit protection
- Reverse voltage protection
- Over temperature protection*
- Over voltage protection (optional)
- M.T.B.F. 40,000 hours
- Recovery time – less than 50 Micro sec half load to full load.
- Off bound operation
- Transformer design per MIL-T-27A

*Standard in all units in Case Sizes NA and larger

OPTIONS

- ☐ Over-voltage protection — Suffix O.V.
- ☐ 400 Hz input only-(Reduced Size & Wgt.) - A.
- ☐ Operation with lamp loads - L.
- ☐ Fixed output voltage - F.
- ☐ Remote sensing - R.
- ☐ External output adjustment - X.
- ☐ Over-temperature protection (see note) - O. T.

Output Voltage	Output Current	Case Size	Model Number	Price
23 - 29.2	.375	KA	VWS95-28/P375	$ 140.00
	.750	LA	VWS95-28/P750	142.00
	1.5	NA	VWS95-28/1.5	161.00
	3.0	PA	VWS95-28/3	225.00
	6.0	QA	VWS95-28/6	274.00
	12.0	RA	VWS95-28/12	452.00
32 - 32.7	.050	HA	VWS95-31/P050	105.00
	.100	HA	VWS95-31/P100	119.00
	.200	JA	VWS95-31/P200	131.00
	.375	KA	VWS95-31/P375	140.00
	.750	MA	VWS95-31/P750	165.00
	1.5	NA	VWS95-31/1.5	213.00
	3.0	PA	VWS95-31/3	265.00
	6.0	QA	VWS95-31/6	335.00
	12.0	RA	VWS95-31/12	524.00
37 - 36.2	.050	HA	VWS95-34/P050	105.00
	.100	HA	VWS95-34/P100	119.00
	.200	JA	VWS95-34/P200	131.00
	.375	KA	VWS95-34/P375	140.00
	.750	MA	VWS95-34/P750	165.00
	1.5	NA	VWS95-34/1.5	213.00
	3.0	PA	VWS95-34/3	265.00
	6.0	QA	VWS95-34/6	335.00
	12.0	RA	VWS95-34/12	524.00
42 - 40.0	.050	HA	VWS95-38/P050	105.00
	.100	HA	VWS95-38/P100	119.00
	.200	JA	VWS95-38/P200	131.00
	.375	KA	VWS95-38/P375	140.00
	.750	MA	VWS95-38/P750	165.00
	1.5	NA	VWS95-38/1.5	213.00
	3.0	PA	VWS95-38/3	265.00
	6.0	QA	VWS95-38/6	335.00
	12.0	RA	VWS95-38/12	524.00
40 - 44.0	.050	HA	VWS95-42/P050	108.00
	.100	JA	VWS95-42/P100	116.00
	.200	KA	VWS95-42/P200	127.00
	.375	LA	VWS95-42/P375	141.00
	.750	MA	VWS95-42/P750	165.00
	1.5	PA	VWS95-42/1.5	246.00
	3.0	QA	VWS95-42/3	295.00
	6.0	QA	VWS95-42/6	335.00
	12.0	RA	VWS95-42/12	643.00
44 - 48	.050	HA	VWS95-46/P050	108.00
	.100	JA	VWS95-46/P100	116.00
	.200	KA	VWS95-46/P200	127.00
	.375	LA	VWS95-46P375	141.00
	.750	MA	VWS95-46/P750	165.00
	1.5	PA	VWS95-46/1.5	246.00
	3.0	QA	VWS95-46/3	295.00
	6.0	RA	VWS95-46/6	335.00
	12.0	TA	VWS95-46/12	643.00
48 - 52	.050	HA	VWS95-50/P050	108.00
	.100	JA	VWS95-50/P100	116.00
	.200	KA	VWS95-50/P200	127.00
	.375	LA	VWS95-50/P375	141.00
	.750	MA	VWS95-50/P750	165.00
	1.5	PA	VWS95-50/1.5	246.00
	3.0	QA	VWS95-50/3	295.00
	6.0	RA	VWS95-50/6	335.00
	12.0	TA	VWS95-50/12	643.00
52 - 56	12.0	TA	VWS95-54/12	643.00
52 - 59	.050	HA	VWS95-56/P050	108.00
	.100	JA	VWS95-56/P100	116.00
	.200	KA	VWS95-56/P200	127.00
	.375	MA	VWS95-56/P375	150.00
	.750	NA	VWS95-56/P750	192.00
	1.5	PA	VWS95-56/1.5	246.00
	3.0	QA	VWS95-56/3	295.00
	6.0	RA	VWS95-56/6	495.00

Output Voltage	Output Current	Case Size	Model Number	Price
56 - 60	12.0	TA	VWS95-58/12	$ 643.00
60 - 64	12.0	TA	VWS95-62/12	643.00
59 - 65	.050	JA	VWS95-62/P050	130.00
	.100	KA	VWS95-62/P100	135.00
	.200	KA	VWS95-62/P200	140.00
	.375	MA	VWS95-62/P375	150.00
	.750	PA	VWS95-62/P750	239.00
	1.5	PA	VWS95-62/1.5	243.00
	3.0	QA	VWS95-62/3	326.00
	6.0	RA	VWS95-62/6	508.00
65 - 72	.050	JA	VWS95-68/P050	130.00
	.100	KA	VWS95-68/P100	135.00
	.200	LA	VWS95-68/P200	144.00
	.375	MA	VWS95-68/P375	150.00
	.750	PA	VWS95-68/P750	239.00
	1.5	PA	VWS95-68/1.5	248.00
	3.0	QA	VWS95-68/3	326.00
	6.0	RA	VWS95-68/6	508.00
72 - 80	.050	JA	VWS95-76/P050	130.00
	.100	KA	VWS95-76/P100	135.00
	.200	LA	VWS95-76/P200	144.00
	.375	MA	VWS95-76/P375	150.00
	.750	PA	VWS95-76/P750	239.00
	1.5	PA	VWS95-76/1.5	248.00
	3.0	QA	VWS95-76/3	326.00
	6.0	RA	VWS95-76/6	508.00
80 - 88	.050	JA	VWS95-84/P050	130.00
	.100	RA	VWS95-84/P100	135.00
	.200	LA	VWS95-84/P200	144.00
	.375	NA	VWS95-84/P375	188.00
	.750	PA	VWS95-84/P750	218.00
	1.5	QA	VWS95-84/1.5	293.00
	3.0	RA	VWS95-84/3	492.00
	6.0	TA	VWS95-84/6	621.00
88 - 96	.050	JA	VWS95-92/P050	130.00
	.100	KA	VWS95-92/P100	135.00
	.200	LA	VWS95-92/P200	144.00
	.375	NA	VWS95-92/P375	188.00
	.750	PA	VWS95-92/P750	239.00
	1.5	QA	VWS95-92/1.5	293.00
	3.0	RA	VWS95-92/3	492.00
	6.0	TA	VWS95-92/6	621.00
96 - 105	.050	JA	VWS95-100/P050	130.00
	.100	KA	VWS95-100/P100	135.00
	.200	LA	VWS95-100/P200	144.00
	.375	NA	VWS95-100/P375	188.00
	.750	PA	VWS95-100/P750	239.00
	1.5	QA	VWS95-100/1.5	293.00
	3.0	RA	VWS95-100/3	492.00
	6.0	TA	VWS95-100/6	621.00
105 - 115	.050	KA	VWS95-110/P050	140.00
	.100	LA	VWS95-110/P100	148.00
	.200	MA	VWS95-110/P200	164.00
	.375	NA	VWS95-110/P375	185.00
	.750	PA	VWS95-110/P750	239.00
	1.5	QA	VWS95-110/1.5	293.00
	3.0	RA	VWS95-110/3	492.00
	6.0	TA	VWS95-110/6	621.00
115 - 125	.050	KA	VWS95-120/P050	140.00
	.100	LA	VWS95-120/P100	148.00
	.200	MA	VWS95-120/P200	164.00
	.375	NA	VWS95-120/P375	185.00
	.750	PA	VWS95-120/P750	253.00
	1.5	QA	VWS95-120/1.5	312.00
	3.0	RA	VWS95-120/3	492.00
	6.0	TA	VWS95-120/6	621.00
125 - 135	.050	KA	VWS95-130/P050	140.00
	.100	LA	VWS95-130/P100	148.00
	.200	MA	VWS95-130/P200	164.00
	.375	NA	VWS95-130/P375	188.00
	.750	PA	VWS95-130/P750	253.00
	1.5	QA	VWS95-130/1.5	312.00
135 - 145	.050	KA	VWS95-140/P050	140.00
	.100	LA	VWS95-140/P100	148.00
	.200	MA	VWS95-140/P200	164.00
	.375	NA	VWS95-140/P375	188.00
	.750	PA	VWS95-140/P750	253.00
	1.5	QA	VWS95-140/1.5	312.00
145 - 155	.050	KA	VWS95-150/P050	140.00
	.100	LA	VWS95-150/P100	148.00
	.200	MA	VWS95-150/P200	164.00
	.375	NA	VWS95-150/P375	188.00
	.750	PA	VWS95-150/P750	253.00
	1.5	QA	VWS95-150/1.5	312.00

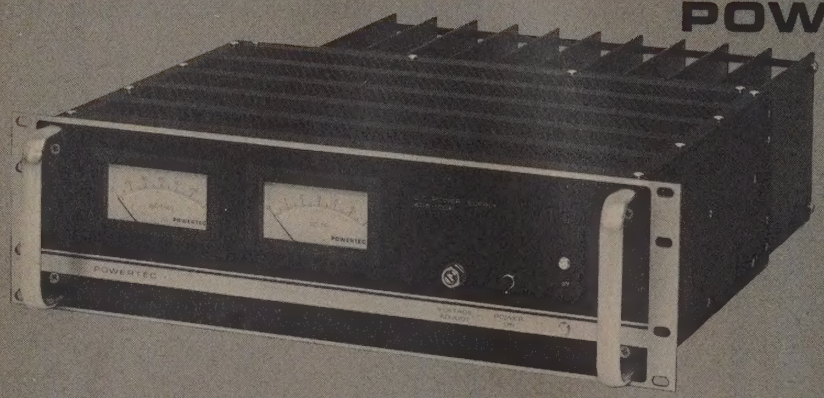
If our VW Series can't measure up, Look into our specialty; CUSTOM SUPPLIES.

NUCOR

NUCLEAR CORPORATION OF AMERICA
POWER SUPPLY DIVISION
2 RICHWOOD PLACE, DENVILLE, NEW JERSEY 07834
TELEPHONE 201-627-4200 (TWX) 710-9878487

POWERTEC RM* SERIES

*RACK MOUNTED POWER SUPPLIES



- **HIGH EFFICIENCY**... less heat dissipation—power savings is approximately $280/year over competitive units.
- **INTEGRATED CIRCUITRY**... Plug-in PC board features IC regulator for increased performance and reliability.
- **STORAGE TIME**... 2 milliseconds of operation during input power interruption.
- **CONVECTION-COOLED**... No fans t lower reliability.
- **HIGH QUALITY**... Only the finest mil tary and computer grade component are used.
- **+55°C RATING**... Full rating to +55° means more power per dollar.

SPECIFICATIONS

INPUT VOLTAGE: 115 VAC ±10%; 57 to 440 Hz (derate current 10% for operation from 57 to 47 Hz; derate current 20% for operation from 126.5 VAC to 132 VAC; operation at 132 VAC below 57 Hz not advised).

OUTPUT RATING: See chart for output rating of individual units; output voltage adjustable ±5% on all units.

LINE REGULATION: ±0.1% maximum. Line regulation measured for a 10% line voltage change.

LOAD REGULATION: ±0.1% maximum. Load regulation measured for a 50% load change.

RIPPLE: 3 MV peak to peak typical, .03% of rated output voltage + 3 MV peak to peak maximum.

TRANSIENT RESPONSE: 20-50 μsec typical for a 25% load change.

TEMPERATURE COEFFICIENT: ±0.01% per degree centigrade maximum.

STABILITY: ±0.1% maximum excursion for eight hour after warmup.

TEMPERATURE RATING: Continuous operation at fu load 0°C to +55°C. Derate to 50% at 71°C. Storag temperature −55°C to +85°C.

OVERVOLTAGE PROTECTION: Overvoltage protectio is standard on all units. This internally located circu is set to 120% ±5% of the output voltage rating of th unit.

OVERLOAD PROTECTION: All units are fully protecte against overload or short circuit utilizing foldback typ current limiting.

REMOTE SENSE: All case sizes utilize remote sensin and special circuitry to insure stable operation in th remote sense mode.

CONSTRUCTION: All aluminum construction and ex ternal heat sink insures minimum size and weight fo unit ratings.

AIRTRONICS INCORPORATED

POWERTEC DIVISION

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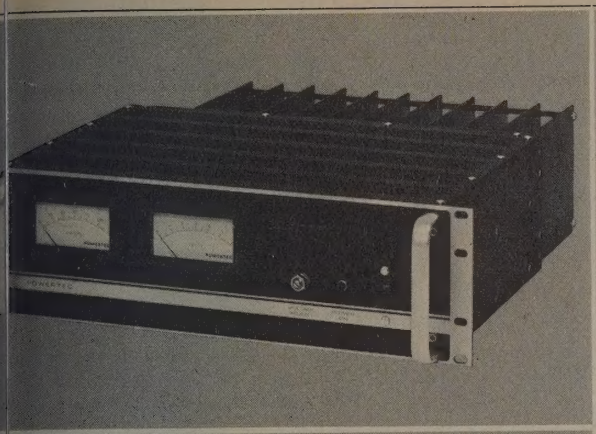

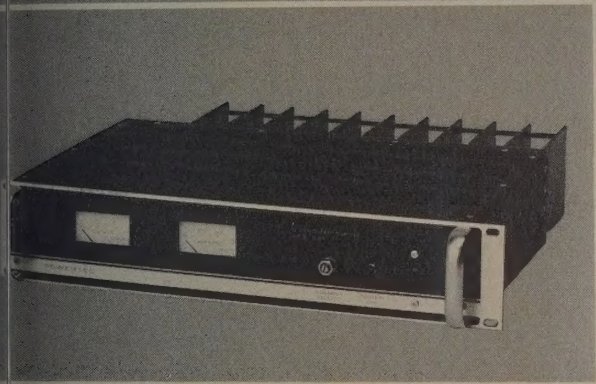

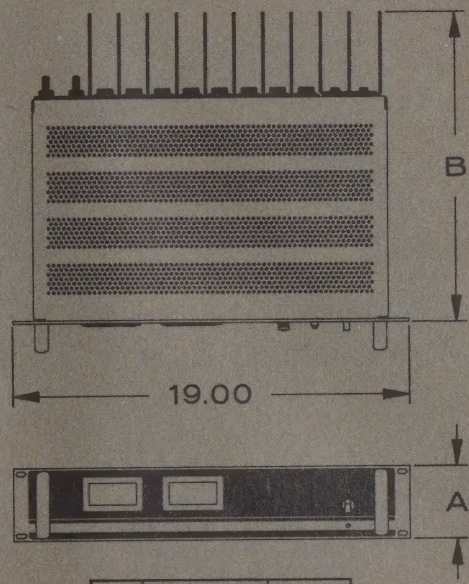

CASE SIZE	DIMENSIONS		APPROX. WEIGHT (LBS)
	A	B	
C	3.5	15.0	45.0
D	5.25	18.5	75.0

POWERTEC RM* SERIES *RACK MOUNTED* POWER SUPPLIES

MODEL NUMBER	DC OUTPUT		STANDARD STOCK ITEM
	VOLTS	AMPS	
4C5-50	5	50	Yes
4D5-100	5	100	Yes
4C6-43	6	43	Yes
4D6-88	6	88	Yes
4C7-5-37	7.5	37	No
4D7.5-73	7.5	73	No
4C8-36	8	36	No
4D8-69	8	69	No
4C10-30	10	30	Yes
4D10-57	10	57	Yes
4C12-27	12	27	Yes
4D12-49	12	49	Yes
4C15-23	15	23	Yes
4D15-40	15	40	Yes
4C18-20	18	20	Yes
4D18-34	18	34	Yes
4C20-19	20	19	No
4D20-31	20	31	No
4C24-17	24	17	Yes
4D24-26	24	26	Yes
4C28-15	28	15	Yes
4D28-24	28	24	Yes

PRICING ON STANDARD STOCK ITEMS 1-25 Pcs.

CASE SIZE	BASIC UNIT	WITH METER OPTION
C	$465.00	$495.00
D	$765.00	$795.00

Chassis Slides: All units are available with mounted chassis slides. Specify chassis slides and add $40.00 to the price of the 4C models, $50.00 to the price of the 4D models.

*On non-stocked items there is a handling charge of $50.00 for the 1st unit and $20.00 for each additional unit of a given model type.

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POWERTEC DIVISION

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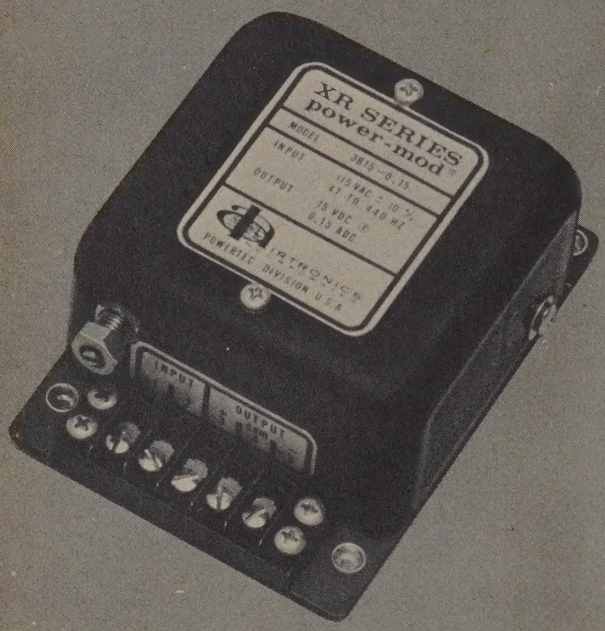

POWERTEC XR* SERIES

SILICON REGULATED MODULA POWER SUPPLIE

*EXTRA RELIABILITY

FEATURES

- **LOW COST** . . . prices start from $34.
- **HIGH QUALITY** . . . only the finest m tary and computer grade componen are used.
- **SMALL SIZE** . . . typically 40% to 50 smaller and lighter than competiti models.
- **INTERNAL OVP** . . . optional OVP is fa tory set and located inside the unit.
- **+71°C RATING** . . . full rating to +71 means more power per dollar.

SPECIFICATIONS

INPUT CHARACTERISTICS: 115 VAC ±10%; 57 to 440 Hz (derate current 10% for operations from 57 to 47 Hz; derate current 20% for operation from 126.5 VAC to 132 VAC; operation at 132 VAC below 57 Hz not advised)

OUTPUT RATING: See chart for output rating of individual units; output voltage adjustable ±3% on all units.

REGULATION: See chart for regulation of individual units; load regulation based on 50% load change; line regulation based on 10% line change.

RIPPLE: Typical ripple is 1 MV RMS or 3 MV peak to peak; maximum ripple is 5 MV peak to peak.

TRANSIENT RESPONSE: 20 to 50 μsec typical for half load to full load.

TEMPERATURE RATING: Continuous operation at load 0°C to +71°C. Storage temperature −55°C +85°C.

TEMPERATURE COEFFICIENT: ±0.01% per deg centigrade maximum.

STABILITY: ±0.1% for eight hours after warmup.

OVERVOLTAGE PROTECTION: Optional overvolta protection is offered on all units. This internally loca circuit is set to 120% ±5% of the output voltage rat of the unit.

OVERLOAD PROTECTION: All units are protect against overload or short circuit.

OUTPUT ISOLATION RESISTANCE: 500 megohm mi mum at 500 VDC.

CONSTRUCTION: All aluminum construction insu minimum size and weight for unit rating.

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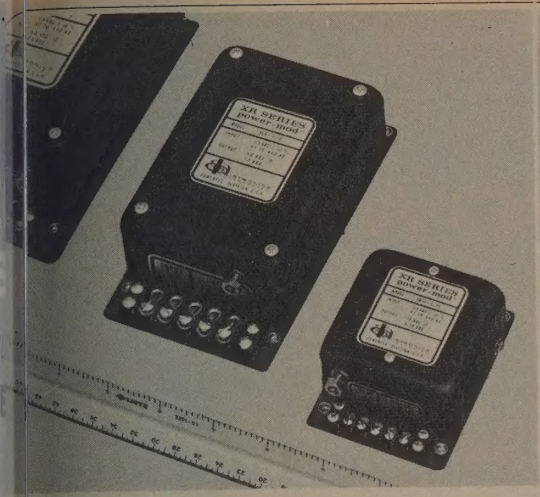

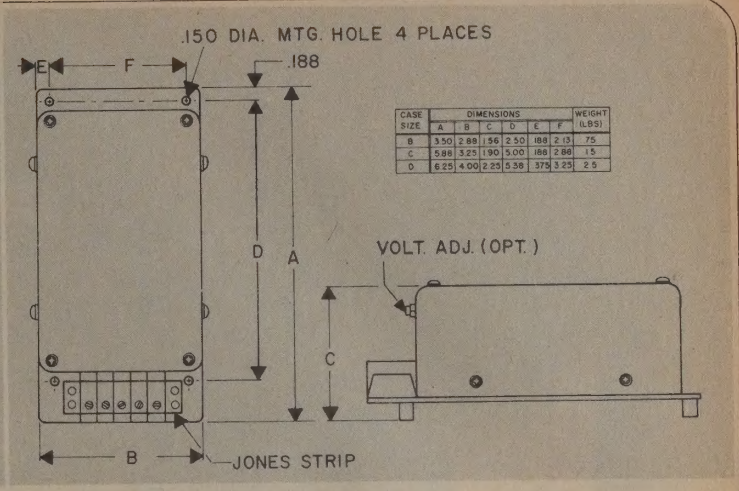

CASE SIZE	DIMENSIONS A	B	C	D	E	F	WEIGHT (LBS)
B	3.50	2.88	1.56	2.50	.188	2.13	.75
C	5.88	3.25	1.90	5.00	.188	2.88	1.5
D	6.25	4.00	2.25	5.38	.375	3.25	2.5

POWERTEC XR *LOW COST MODULAR* POWER SUPPLIES

SINGLE OUTPUT UNITS

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3B[illegible].35	3.6	.35	±0.3%	±0.3%	B	NO
3C[illegible]-1.5	3.6	1.5	±0.3%	±0.3%	C	NO
3D[illegible]-3.5	3.6	3.5	±0.3%	±0.3%	D	NO
3B[illegible]-.35	4.2	.35	±0.3%	±0.3%	B	NO
3C[illegible]-1.3	4.2	1.3	±0.3%	±0.3%	C	NO
3D[illegible]-3.2	4.2	3.2	±0.3%	±0.3%	D	NO
3B[illegible]35	5.0	.35	±0.3%	±0.3%	B	YES
3C[illegible].2	5.0	1.2	±0.3%	±0.3%	C	YES
3D[illegible].0	5.0	3.0	±0.3%	±0.3%	D	YES
3B[illegible]35	6.0	.35	±0.3%	±0.3%	B	YES
3C[illegible].0	6.0	1.0	±0.3%	±0.3%	C	YES
3D[illegible].5	6.0	2.5	±0.3%	±0.3%	D	YES
3B[illegible]-.25	7.5	.25	±0.2%	±0.2%	B	NO
3C[illegible]-.8	7.5	.8	±0.2%	±0.2%	C	NO
3D[illegible]-2.0	7.5	2.0	±0.2%	±0.2%	D	NO
3B[illegible]25	8.0	.25	±0.2%	±0.2%	B	NO
3C[illegible]8	8.0	.8	±0.2%	±0.2%	C	NO
3D[illegible]2.0	8.0	2.0	±0.2%	±0.2%	D	NO
3B[illegible]-.2	10.0	.2	±0.1%	±0.1%	B	YES
3C[illegible]-.7	10.0	.7	±0.1%	±0.1%	C	YES
3D[illegible]-1.5	10.0	1.5	±0.1%	±0.1%	D	YES
3B[illegible]-.2	12.0	.2	±0.075%	±0.075%	B	YES
3C[illegible]-.6	12.0	.6	±0.075%	±0.075%	C	YES
3D[illegible]-1.5	12.0	1.5	±0.075%	±0.075%	D	YES
3B[illegible]-.2	15.0	.2	±0.075%	±0.075%	B	YES
3C[illegible]-.5	15.0	.5	±0.075%	±0.075%	C	YES
3D[illegible]-1.2	15.0	1.2	±0.075%	±0.075%	D	YES
3B[illegible]-.15	18.0	.15	±0.075%	±0.075%	B	YES
3C[illegible]-.5	18.0	.5	±0.075%	±0.075%	C	YES
3D[illegible]-1.0	18.0	1.0	±0.075%	±0.075%	D	YES
3B[illegible]-.15	20.0	.15	±0.075%	±0.075%	B	NO
3C[illegible]-.4	20.0	.4	±0.075%	±0.075%	C	NO
3D[illegible]-.8	20.0	.8	±0.075%	±0.075%	D	NO
3B[illegible]-.1	24.0	.1	±0.075%	±0.075%	B	YES
3C[illegible]-.35	24.0	.35	±0.075%	±0.075%	C	YES
3D[illegible]-.7	24.0	.7	±0.075%	±0.075%	D	YES
3B[illegible]-.1	28.0	.1	±0.075%	±0.075%	B	YES
3C[illegible]-.35	28.0	.35	±0.075%	±0.075%	C	YES
3D[illegible]-.7	28.0	.7	±0.075%	±0.075%	D	YES
3B[illegible]-.08	32.0	.08	±0.075%	±0.075%	B	NO
3C[illegible]-.28	32.0	.28	±0.075%	±0.075%	C	NO
3D[illegible]-.5	32.0	.5	±0.075%	±0.075%	D	NO
3B[illegible]-.06	36.0	.06	±0.075%	±0.075%	B	NO
3C[illegible]-.24	36.0	.24	±0.075%	±0.075%	C	NO
3D[illegible]-.4	36.0	.4	±0.075%	±0.075%	D	NO
3B[illegible]-.05	48.0	.05	±0.075%	±0.075%	B	NO
3C[illegible]-.18	48.0	.18	±0.075%	±0.075%	C	NO
3D[illegible]-.3	48.0	.3	±0.075%	±0.075%	D	NO

[illegible] non-stocked items there is a handling charge of $25 for the first unit and $10 for each additional unit of a given model type.

DUAL OUTPUT UNITS

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3C10D-.3	10.0	.30	±0.075%	±0.075%	C	YES
3D10D-.6	10.0	.60	±0.075%	±0.075%	D	YES
3C12D-.3	12.0	.30	±0.075%	±0.075%	C	YES
3D12D-.6	12.0	.60	±0.075%	±0.075%	D	YES
3C15D-.25	15.0	.25	±0.075%	±0.075%	C	YES
3D15D-.5	15.0	.50	±0.075%	±0.075%	D	YES
3C18D-.25	18.0	.25	±0.075%	±0.075%	C	NO
3D18D-.5	18.0	.50	±0.075%	±0.075%	D	NO

FULLY ADJUSTABLE UNITS (OVP NOT AVAILABLE)

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3C18-.25-V	0-18	.25	±0.075+5MV.	±0.075+5MV.	C	YES
3D18-.5-V	0-18	.50	±0.075+5MV.	±0.075+5MV.	D	YES
3C36-.13-V	0-36	.13	±0.075+5MV.	±0.075+5MV.	C	YES
3D36-.25-V	0-36	.25	±0.075+5MV.	±0.075+5MV.	D	YES

NIXIE POWER SUPPLIES (NOT ADJUSTABLE, OVP NOT AVAILABLE)

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3B180-.01	180	.01	±3%	±3%	B	YES
3C180-.02	180	.02	±3%	±3%	C	YES
3D180-.04	180	.04	±3%	±3%	D	NO
3B200-.01	200	.01	±3%	±3%	B	NO
3C200-.02	200	.02	±3%	±3%	C	NO
3D200-.04	200	.04	±3%	±3%	D	NO

PRICING ON STANDARD STOCK ITEMS — 1-99 PC.

CASE SIZE	BASIC UNIT	WITH OVP
B	$34	$41.50
C	42	52.00
D	49	59.00
C DUAL	61	76.00
D DUAL	69	84.00
C ADJ.	47	NOT AVAILABLE
D ADJ.	57	

DELIVERY: Stocked items 7 days typical, non-stocked items 30 days, all items F.O.B., Chatsworth, California.

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POWERTEC DIVISION

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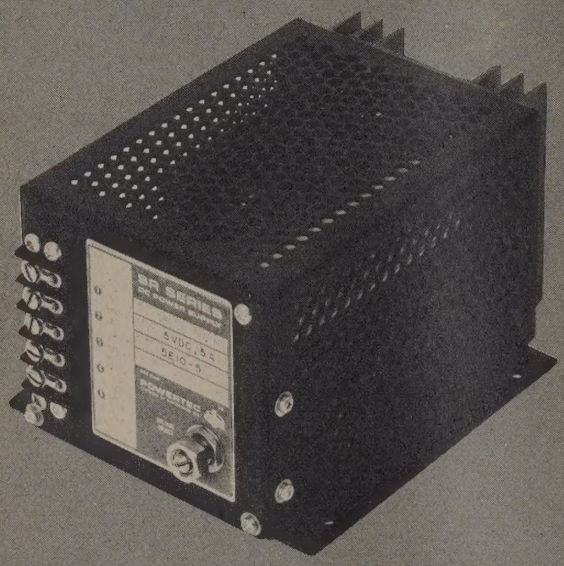

POWERTEC

SR* SERIES

*SILICON REGULATED MODULAR

POWER SUPPLIES

- **LOW COST** . . . prices start from $89.0
- **HIGH QUALITY**. . . only the finest militar and computer grade components ar used.
- **SMALL SIZE** . . . typically 40% to 50% smaller and lighter than competitiv models.
- **INTERNAL OVP** . . . optional OVP is fac tory set and located inside the unit.
- **+55°C RATING** . . . full rating to +55° means more power per dollar.

SPECIFICATIONS

INPUT VOLTAGE: 115 VAC ±10%; 57 to 440 Hz (derate current 10% for operations from 57 to 47 Hz; derate current 20% for operation from 126.5VAC to 132 VAC; operation at 132 VAC below 57 Hz not advised)

OUTPUT RATING: See chart for output rating of individual units; output voltage adjustable ±3% on all units.

REGULATION: See chart for regulation of individual units; load regulation based on 50% load change; line regulation based on 10% line change.

RIPPLE: Typical ripple is 1 MV RMS or 3 MV peak to peak; maximum ripple is 5 MV peak to peak.

TRANSIENT RESPONSE: 20 to 50 μsec typical for half load to full load.

TEMPERATURE RATING: Continuous operation at full load 0°C to +55°C. Derate to 50% @ 71°C. Storage temperature −55°C to +85°C.

TEMPERATURE COEFFICIENT: ±0.01% per degre centigrade maximum.

STABILITY: ±0.1% for eight hours after warmup.

OVERVOLTAGE PROTECTION: Optional overvoltag protection is offered on all units. This internally locate SCR crowbar circuit is set to 120% ±5% of the outp voltage rating of the unit.

OVERLOAD PROTECTION: All units are fully protecte against overload or short circuit utilizing foldback typ current limiting.

REMOTE SENSE: G and H case sizes utilize remo sensing and special circuitry to insure stable operatio in the remote sense mode.

CONSTRUCTION: All aluminum construction and e ternal heatsink insure minimum size and weight f unit rating.

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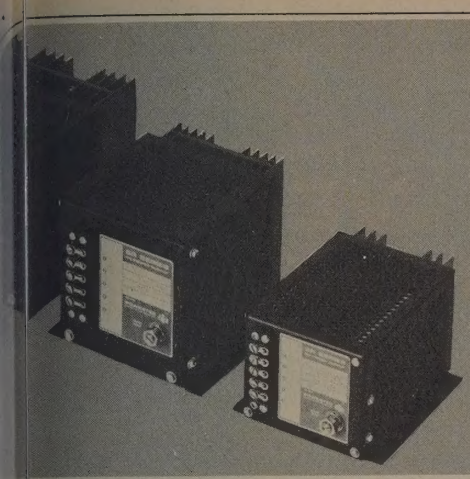

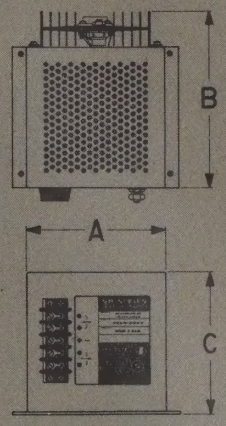

CASE SIZE	DIMENSIONS A	B	C	APPROX. WEIGHT (LBS.)
E	4.13	6.50	3.63	5.25
F	4.88	6.19	5.00	7.50
G	4.88	11.31	5.00	13.50
H	14.50	8.00	5.00	22.00

POWERTEC SR SERIES POWER SUPPLIES

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3[illegible]6-5	3.6	5.0	±0.3%	±0.3%	E	NO*
3[illegible]6-10	3.6	10.0	±0.3%	±0.3%	F	NO*
3[illegible]6-20	3.6	20.0	±0.3%	±0.3%	G	NO*
3[illegible]6-35	3.6	35.0	±0.3%	±0.3%	H	NO*
3[illegible]2-5	4.2	5.0	±0.3%	±0.3%	E	NO*
3[illegible]2-10	4.2	10.0	±0.3%	±0.3%	F	NO*
3[illegible]2-20	4.2	20.0	±0.3%	±0.3%	G	NO*
3[illegible]2-35	4.2	35.0	±0.3%	±0.3%	H	NO*
3[illegible]5	5.0	5.0	±0.3%	±0.3%	E	YES
3[illegible]10	5.0	10.0	±0.3%	±0.3%	F	YES
3[illegible]20	5.0	20.0	±0.3%	±0.3%	G	YES
3[illegible]35	5.0	35.0	±0.3%	±0.3%	H	YES
3[illegible]4.6	6.0	4.6	±0.3%	±0.3%	E	YES
3[illegible]9.0	6.0	9.0	±0.3%	±0.3%	F	YES
3[illegible]18	6.0	18.0	±0.3%	±0.3%	G	YES
3[illegible]35	6.0	35.0	±0.3%	±0.3%	H	YES
3[illegible]5-4.0	7.5	4.0	±0.2%	±0.2%	E	NO*
3[illegible]5-8.0	7.5	8.0	±0.2%	±0.2%	F	NO*
3[illegible]5-16.0	7.5	16.0	±0.2%	±0.2%	G	NO*
3[illegible]5-32.0	7.5	32.0	±0.2%	±0.2%	H	NO*
3[illegible]3.6	8.0	3.6	±0.2%	±0.2%	E	NO*
3[illegible]7.2	8.0	7.2	±0.2%	±0.2%	F	NO*
3[illegible]14.4	8.0	14.4	±0.2%	±0.2%	G	NO*
3[illegible]28.8	8.0	28.8	±0.2%	±0.2%	H	NO*
3[illegible]3.0	10.0	3.0	±0.1%	±0.1%	E	YES
3[illegible]6.0	10.0	6.0	±0.1%	±0.1%	F	YES
3[illegible]-12	10.0	12.0	±0.1%	±0.1%	G	YES
3[illegible]-24	10.0	24.0	±0.1%	±0.1%	H	YES
3[illegible]-2.5	12.0	2.5	±0.075%	±0.075%	E	YES
3[illegible]-5.0	12.0	5.0	±0.075%	±0.075%	F	YES
3[illegible]2-10.0	12.0	10.0	±0.075%	±0.075%	G	YES
3[illegible]2-20.0	12.0	20.0	±0.075%	±0.075%	H	YES

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
3E15-2.2	15.0	2.2	±0.075%	±0.075%	E	YES
3F15-4.4	15.0	4.4	±0.075%	±0.075%	F	YES
3G15-8.8	15.0	8.8	±0.075%	±0.075%	G	YES
3H15-17.6	15.0	17.6	±0.075%	±0.075%	H	YES
3E18-2.0	18.0	2.0	±0.075%	±0.075%	E	YES
3F18-4.0	18.0	4.0	±0.075%	±0.075%	F	YES
3G18-8.0	18.0	8.0	±0.075%	±0.075%	G	YES
3H18-16.0	18.0	16.0	±0.075%	±0.075%	H	YES
3E20-1.8	20.0	1.8	±0.075%	±0.075%	E	NO*
3F20-3.6	20.0	3.6	±0.075%	±0.075%	F	NO*
3G20-7.2	20.0	7.2	±0.075%	±0.075%	G	NO*
3H20-14.4	20.0	14.4	±0.075%	±0.075%	H	NO*
3E24-1.5	24.0	1.5	±0.075%	±0.075%	E	YES
3F24-3.0	24.0	3.0	±0.075%	±0.075%	F	YES
3G24-6.0	24.0	6.0	±0.075%	±0.075%	G	YES
3H24-12.0	24.0	12.0	±0.075%	±0.075%	H	YES
3E28-1.4	28.0	1.4	±0.075%	±0.075%	E	YES
3F28-2.8	28.0	2.8	±0.075%	±0.075%	F	YES
3G28-5.6	28.0	5.6	±0.075%	±0.075%	G	YES
3H28-11.2	28.0	11.2	±0.075%	±0.075%	H	YES
3E32-1.1	32.0	1.1	±0.075%	±0.075%	E	NO*
3F32-2.2	32.0	2.2	±0.075%	±0.075%	F	NO*
3G32-4.4	32.0	4.4	±0.075%	±0.075%	G	NO*
3H32-8.8	32.0	8.8	±0.075%	±0.075%	H	NO*
3E36-1.0	36.0	1.0	±0.075%	±0.075%	E	NO*
3F36-2.0	36.0	2.0	±0.075%	±0.075%	F	NO*
3G36-4.0	36.0	4.0	±0.075%	±0.075%	G	NO*
3H36-8.0	36.0	8.0	±0.075%	±0.075%	H	NO*
3E48-.8	48.0	0.8	±0.075%	±0.075%	E	NO*
3F48-1.6	48.0	1.6	±0.075%	±0.075%	F	NO*
3G48-3.2	48.0	3.2	±0.075%	±0.075%	G	NO*
3H48-6.4	48.0	6.4	±0.075%	±0.075%	H	NO*

PRICING ON STANDARD STOCK ITEMS 1-99 pc

CASE SIZE	BASIC UNIT	WITH OVP
E	$ 89	$108
F	119	138
G	169	191
H	249	279

* non-stocked items there is a handling charge of $35.00 for 1st unit and $10.00 for each additional unit of a given model e.

DELIVERY: Stocked items 7 days typical, non-stocked items 30 days, all items F.O.B., Chatsworth, California.

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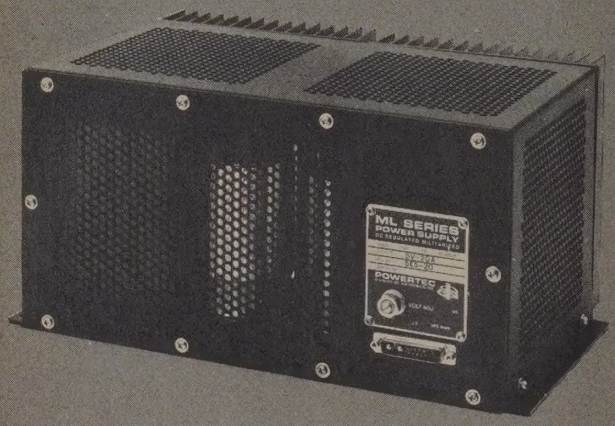

POWERTEC ML SERIES

FULLY MILITARIZED POWER SUPPLIES

- Meets MIL-E-16400, MIL-T-21200, and MIL-E-41
basic equipment specifications
- Transformers are hermetically sealed, meet MI
T-27B grade 4
- No non-standard parts; semiconductors to MI
S-19500; other components to ANA-400
- Completely reparable design, plug-in circu
board
- All aluminum construction with stainless ste
hardware
- Full power rating to 71°C
- Military documentation packages available

SPECIFICATIONS

INPUT VOLTAGE: 115 VAC ±10%; 57 to 440 Hz (derate current 10% for operations from 57 to 47 Hz; derate current 20% for operation from 126.5VAC to 132 VAC; operation at 132 VAC below 57 Hz not advised)

OUTPUT RATING: See chart for output rating of individual units; output voltage adjustable ±3% on all units.

LINE REGULATION: ±.05% maximum for standard unit; ±.00075% maximum for high performance unit. Line regulation measured for a 10% line voltage change.

LOAD REGULATION: ±.05% maximum for standard unit; ±.00075% maximum for high performance unit. Load regulation measured for a 50% load change.

RIPPLE: .01% + 1MV peak to peak maximum for standard unit. 500 μV peak to peak maximum for high performance unit.

TRANSIENT RESPONSE: 50 μsec Typical for a ½ load to full load change.

STABILITY: ±.05% maximum for standard unit; ±.002% maximum for high performance unit. For 8 hr. period after warmup.

TEMPERATURE COEFFICIENT: ±.01%/°C maximum for standard unit, ±.002%/°C maximum for high performance unit.

OVERVOLTAGE PROTECTION: All units feature SCR overvoltage protection set at 120% ±5% of output voltage rating.

REMOTE SENSE: All units feature remote sense capability.

OVERLOAD PROTECTION: All units utilize electroni foldback overload protection and are fully protecte for all overload and short circuit conditions.

SHIELDING: Transformer shield between primary an secondary grounded.

STORAGE TEMPERATURE: −62°C to +85°C.

OPERATING TEMPERATURE: 0°C to +71°C operatio for maximum current rating convection cooled. Tes method per MIL-STD-810, Method 501 procedure I II, Method 502 procedure I.

HUMIDITY: 95% per MIL-STD-810B, Method 507 prc cedure I.

FUNGUS: Per MIL-STD-810B, Method 508.

SALT FOG: Per MIL-STD-810B, Method 509

DUST: Per MIL-STD-810B, Method 510.

EXPLOSIVE ATMOSPHERE: Per MIL-STD-810B, Metho 511 Procedure I.

VIBRATION: Per MIL-STD-810B, Method 514 Proce dure X, curve AA (5G peak)

SHOCK: Per MIL-STD-810B, Method 516 Procedur I, Curve 516-2, (40G peak)

RFI: Per MIL-I-6181D

ISOLATION RESISTANCE: 500 megohm minimum a 500 VDC between input, output & case.

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POWERTEC DIVISION

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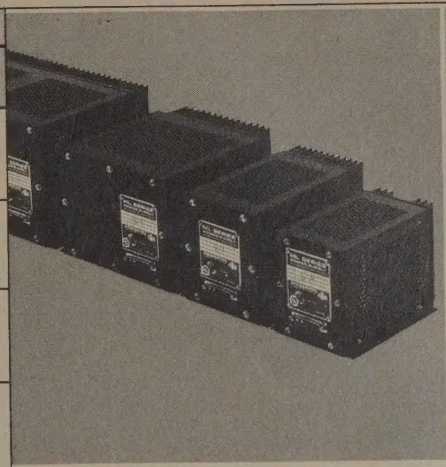
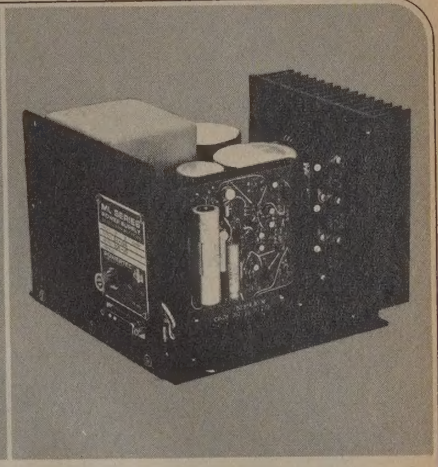
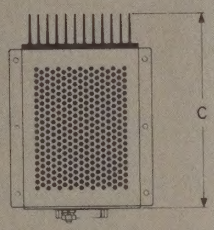
RATINGS				
MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	CASE SIZE	STD. STOCK ITEM
5B3 2.5	3.6	2.5	B	NO
5C3 5.0	3.6	5.0	C	NO
5D3 10.0	3.6	10.0	D	NO
5E3 20.0	3.6	20.0	E	NO
5B4 2.5	4.2	2.5	B	NO
5C4 5.0	4.2	5.0	C	NO
5D4 10.0	4.2	10.0	D	NO
5E4 20.0	4.2	20.0	E	NO
5B5 5	5.0	2.5	B	YES
5C5 0	5.0	5.0	C	YES
5D5 .0	5.0	10.0	D	YES
5E5 .0	5.0	20.0	E	YES
5B6 3	6.0	2.3	B	YES
5C6 6	6.0	4.6	C	YES
5D6 2	6.0	9.2	D	YES
5E6 .4	6.0	18.4	E	YES
5B7 1.9	7.5	1.9	B	NO
5C7 3.8	7.5	3.8	C	NO
5D7 7.5	7.5	7.5	D	NO
5E7 15	7.5	15.0	E	NO
5B8 9	8.0	1.9	B	NO
5C8 8	8.0	3.8	C	NO
5D8 5	8.0	7.5	D	NO
5E8	8.0	15.0	E	NO
5B1 1.7	10.0	1.7	B	YES
5C1 3.5	10.0	3.5	C	YES
5D1 7.0	10.0	7.0	D	YES
5E1 14	10.0	14.0	E	YES
5B1 1.6	12.0	1.6	B	YES
5C1 3.2	12.0	3.2	C	YES
5D1 6.4	12.0	6.4	D	YES
5E1 12.8	12.0	12.8	E	YES
5B1 1.3	15.0	1.3	B	YES
5C1 2.7	15.0	2.7	C	YES
5D1 5.4	15.0	5.4	D	YES
5E1 10.8	15.0	10.8	E	YES
5B1 1.2	18.0	1.2	B	YES
5C1 2.4	18.0	2.4	C	YES
5D1 4.8	18.0	4.8	D	YES
5E1 9.6	18.0	9.6	E	YES
5B1 1.1	20.0	1.1	B	NO
5C1 2.2	20.0	2.2	C	NO
5D1 4.4	20.0	4.4	D	NO
5E1 8.8	20.0	8.8	E	NO
5B1 .95	24.0	.95	B	YES
5C1 1.9	24.0	1.9	C	YES
5D1 3.8	24.0	3.8	D	YES
5E1 7.6	24.0	7.6	E	YES
5B1 .85	28.0	.85	B	YES
5C1 1.7	28.0	1.7	C	YES
5D1 3.4	28.0	3.4	D	YES
5E1 6.8	28.0	6.8	E	YES
5E1 .75	32.0	.75	B	NO
5C1 1.5	32.0	1.5	C	NO
5D1 3.0	32.0	3.0	D	NO
5E1 6.0	32.0	6.0	E	NO
5E1 .65	36.0	.65	B	NO
5C1 1.3	36.0	1.3	C	NO
5D1 2.7	36.0	2.7	D	NO
5E1 5.4	36.0	5.4	E	NO
5E1 .50	48.0	.50	B	NO
5C1 1.0	48.0	1.0	C	NO
5D1 2.0	48.0	2.0	D	NO
5E1 4.0	48.0	4.0	E	NO



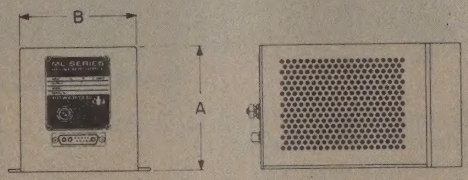


POWERTEC ML

FULLY MILITARIZED POWER SUPPLIES



CASE SIZE	DIMENSIONS W	DIMENSIONS B	DIMENSIONS C	WEIGHT (LBS)
B	5.15	4.00	7.62	6.5
C	5.62	4.62	8.85	11.75
D	6.03	7.62	9.15	16.75
E	6.90	13.00	8.65	26.25



PRICING ON STANDARD STOCK ITEMS		1-25 pc.
CASE SIZE	STANDARD UNIT (NO OPTION)	HIGH PERFORMANCE UNIT (OPTION A)
B	$229	$264
C	$259	$294
D	$299	$334
E	$379	$414

*On non-stocked items there is a handling charge of $50.00 for the 1st unit and $15.00 for each additional unit of a given model type.

DELIVERY: Stocked items 7 days typical, non-stocked items 30 days, all items F.O.B., Chatsworth, California.

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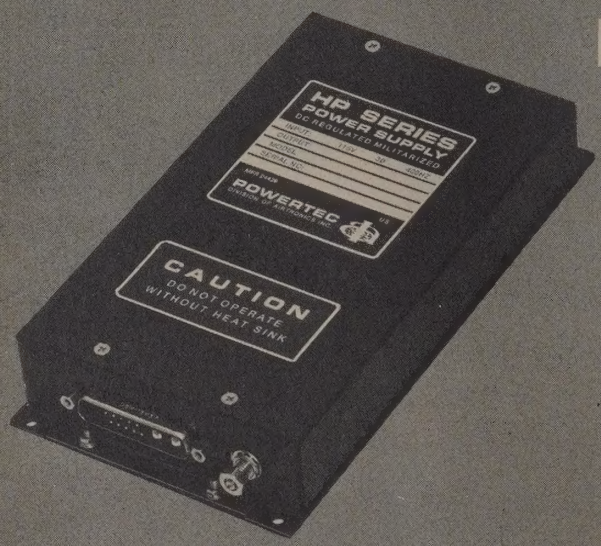

POWERTEC HP* SERIES

FLAT PACK MODULAR

*HIGH PERFORMANCE

FEATURES

- **SERIES REGULATION . . . NO** switching **SPIKES** or **RFI** problems
- **HIGH EFFICIENCY** . . . up to 75%
- **HIGH CURRENT**...up to 30 amperes at 5 VDC
- **DENSE PACKAGING** . . . approximately **2 watts/in²**
- **MILITARIZED** . . . meets **MIL-E-5400** airborne equipment specifications

SPECIFICATIONS

INPUT VOLTAGE: 115 VAC ±10% line to neutral 3Ø, 400 Hz ±5% standard. Optional adders:
A) Input per MIL-STD-704 category B
B) 120 VAC ±10%

OUTPUT RATING: See chart for output rating of individual units; output voltage adjustable ±5% on all units.

REGULATION: See chart for regulation of individual units; load regulation based on 50% load change; line regulation based on 10% line change.

RIPPLE: Typical ripple is 3 MV peak to peak, maximum ripple is 10 MV peak to peak.

TRANSIENT RESPONSE: 50 μsec maximum for a ⅓ load change.

PROGRAMMING: ±5% remote voltage margining standard on all units.

REMOTE SENSING: Remote sense capability standard on all units.

STABILITY: ±0.1% for 8 hours after warmup.

TEMPERATURE RATING: Continuous operation at full load from −55°C to +80°C base plate temperature (base plate cooled design). Storage temperature −62°C to +125°C. Test method per MIL-STD-810B Method 501.

TEMPERATURE COEFFICIENT: ±0.01% per degree centigrade maximum.

OVERVOLTAGE PROTECTION: All units feature SCR overvoltage protection set at 120% ±5% of output voltage rating.

OVERLOAD PROTECTION: All units utilize electronic foldback overload protection and are fully protected for all overload and short circuit conditions.

HUMIDITY: 95% per MIL-STD-810B, Method 507 procedure I.

FUNGUS: Per MIL-STD-810B, Method 508.

SALT FOG: Per MIL-STD-810B, Method 509.

EXPLOSIVE ATMOSPHERE: Per MIL-STD-810B, Method 511 Procedure I.

VIBRATION: Per MIL-STD-810B, Method 514 Procedure I, Curve Z.

SHOCK: Per MIL-STD-810B, Method 516 Procedure I, Curve 516-1

RFI: Per MIL-I-6181D

ISOLATION RESISTANCE: 500 Megohm minimum between input, output and case.

CONSTRUCTION: All aluminum with stainless steel hardware. Basic component selection per ANA 400.

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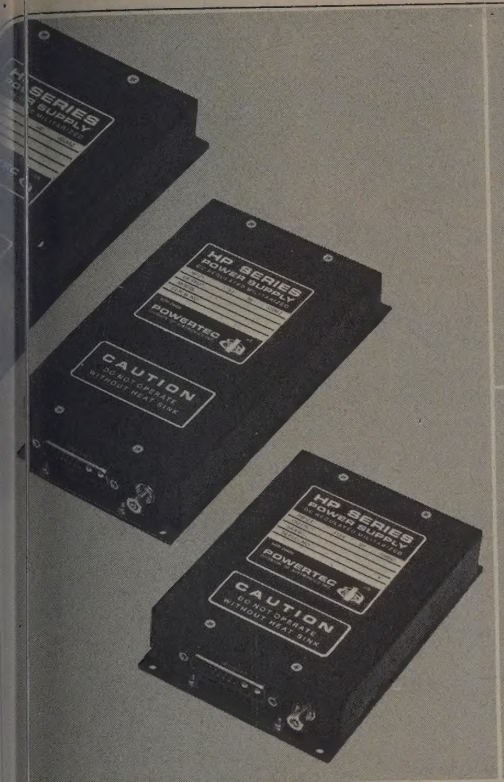
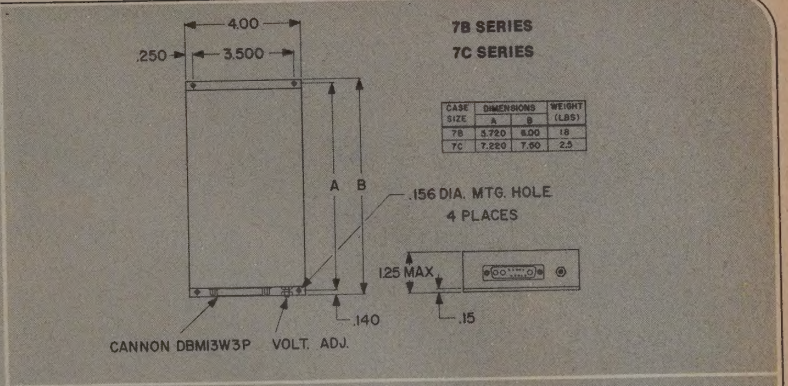
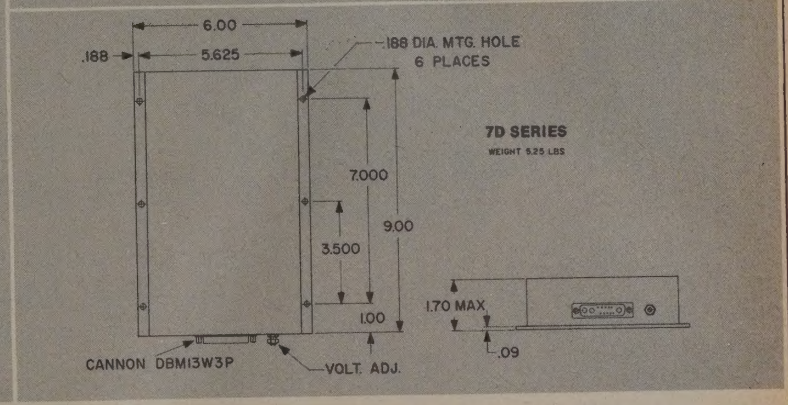




CASE SIZE	DIMENSIONS A	DIMENSIONS B	WEIGHT (LBS)
7B	5.720	6.00	1.8
7C	7.220	7.50	2.5



POWERTEC HP *FLAT PACK MILITARY* POWER SUPPLIES

MODEL NUMBER	DC OUTPUT VOLTS	DC OUTPUT AMPS	REGULATION LINE	REGULATION LOAD	CASE SIZE	STD. STOCK ITEM
7B-7.5	3.6	7.5	±0.20%	±0.05%	B	NO*
7C-17	3.6	17.0	±0.20%	±0.05%	C	NO*
7D-34	3.6	34.0	±0.20%	±0.05%	D	NO*
7B-7.5	4.2	7.5	±0.20%	±0.05%	B	NO*
7C-16	4.2	16.0	±0.20%	±0.05%	C	NO*
7D-32	4.2	32.0	±0.20%	±0.05%	D	NO*
7B7.5	5.0	7.5	±0.15%	±0.05%	B	YES
7C15	5.0	15.0	±0.15%	±0.05%	C	YES
7D30	5.0	30.0	±0.15%	±0.05%	D	YES
7B6	6.0	6.0	±0.10%	±0.05%	B	YES
7C13	6.0	13.0	±0.10%	±0.05%	C	YES
7D26	6.0	26.0	±0.10%	±0.05%	D	YES
7B5-6	7.5	6.0	±0.20%	±0.1%	B	NO*
7C5-10.5	7.5	10.5	±0.20%	±0.1%	C	NO*
7D5-21	7.5	21.0	±0.20%	±0.1%	D	NO*
7B5.5	8.0	5.5	±0.20%	±0.1%	B	NO*
7C10.5	8.0	10.5	±0.20%	±0.1%	C	NO*
7D21	8.0	21.0	±0.20%	±0.1%	D	NO*
7B-4.5	10.0	4.5	±0.05%	±0.05%	B	YES
7C-9	10.0	9.0	±0.05%	±0.05%	C	YES
7D-18	10.0	18.0	±0.05%	±0.05%	D	YES
7B12-3.7	12.0	3.7	±0.05%	±0.05%	B	YES
7C12-8	12.0	8.0	±0.05%	±0.05%	C	YES
7D12-16	12.0	16.0	±0.05%	±0.05%	D	YES
7B15-3.1	15.0	3.1	±0.03%	±0.03%	B	YES
7C15-7	15.0	7.0	±0.03%	±0.03%	C	YES
7D15-14	15.0	14.0	±0.03%	±0.03%	D	YES
7B18-2.5	18.0	2.5	±0.03%	±0.03%	B	YES
7C18-6	18.0	6.0	±0.03%	±0.03%	C	YES
7D18-12	18.0	12.0	±0.03%	±0.03%	D	YES
7B20-2.2	20.0	2.2	±0.03%	±0.03%	B	NO*
7C20-5.5	20.0	5.5	±0.03%	±0.03%	C	NO*
7D20-11	20.0	11.0	±0.03%	±0.03%	D	NO*
7B24-2.0	24.0	2.0	±0.03%	±0.03%	B	YES
7C24-5	24.0	5.0	±0.03%	±0.03%	C	YES
7D24-10	24.0	10.0	±0.03%	±0.03%	D	YES
7B28-1.7	28.0	1.7	±0.03%	±0.03%	B	YES
7C28-4.2	28.0	4.2	±0.03%	±0.03%	C	YES
7D28-8.5	28.0	8.5	±0.03%	±0.03%	D	YES
7B32-1.4	32.0	1.4	±0.03%	±0.03%	B	NO*
7C32-3.8	32.0	3.8	±0.03%	±0.03%	C	NO*
7D32-7.5	32.0	7.5	±0.03%	±0.03%	D	NO*

PRICING ON STANDARD STOCK ITEMS

CASE SIZE	1-9 pc.	10-24 pc.
7B	$492	$430
7C	$593	$514
7D	$789	$690

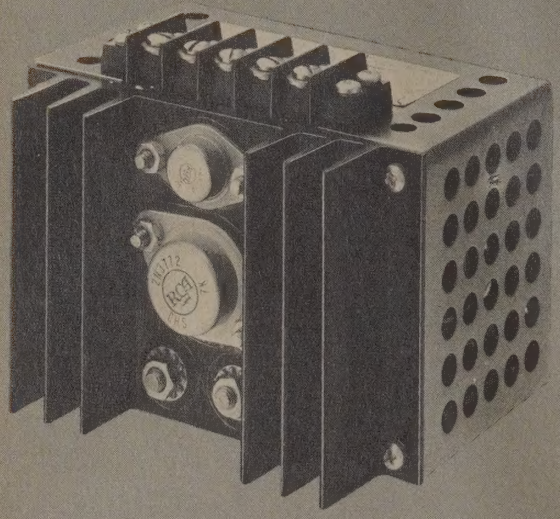
On non-stock items there is a set up charge of $75.00 for the first unit and $25.00 for each additional unit of a given model type.

DELIVERY: Stocked items 15 days typical, non-stocked items 30 days, all items F.O.B., Chatsworth, California.

AIRTRONICS INCORPORATED

POWERTEC DIVISION

9168 DESOTO AVE., CHATSWORTH, CALIF. 91311 • Phone (213) 882-0004



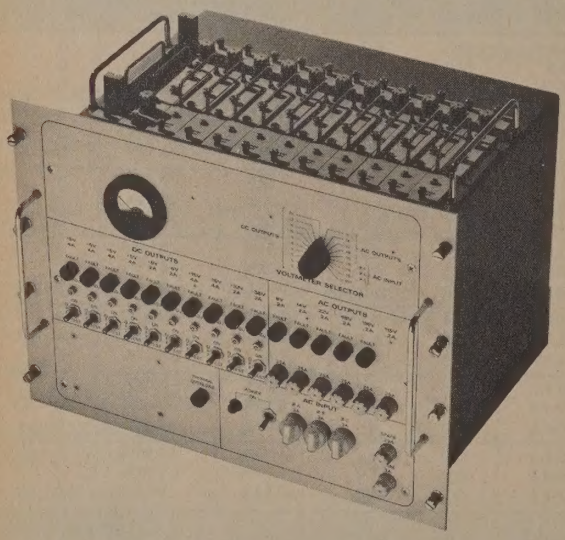
POWERTEC FC* SERIES

ULTRA MINIATURE POWER SUPPLIES

FEATURES

- **COMPACT** . . . 30 watts in 30 cubic in.
- **LIGHT WEIGHT** . . . only 1½ pounds
- **RELIABILITY** . . . calculations per MIL HDBK-217A in excess of 100,000 hour MTBF
- **QUALITY** . . . only finest military an computer grade components used.

*FREQUENCY CONVERSION . . . A revolutionary design breakthrough! Outstanding performance in this ultra-miniature configuration is achieved through the elimination of all 60Hz magnetic components using a proprietary high-frequency conversion method.



POWERTEC CUSTOM POWER SUPPLIES

MODEL 8D164 FULLY MILITARIZED, COMPUTER-CONTROLLED POWER SUPPL

Model 8D164 is a CUSTOM design used in an air trans portable shelter in the Air Force 407L Program. Sem conductors are per **MIL-S-19500,** other components i accordance with **ANA-400.** Full documentation has bee produced in compliance with Air Force **375L** series dat configuration controls: drawings per **MIL-D-1000, categor E, Class 2;** technical manual per **MIL-T-9941;** maintain ability analysis per **MIL-HDBK-472;** reliability calculation per **MIL-HDBK-217A.** Features include ten precision regu lated DC supplies, 5 AC outputs. Each DC supply is completely removable and repairable module with adjust able current compensation, and each has a computer pro grammed high speed output. Complete protection packag includes OVP, reverse voltage protection, current limit overtemperature and fault indicators.

Powertec has a capable experienced engineering staff to help solve your custom power supply problems.

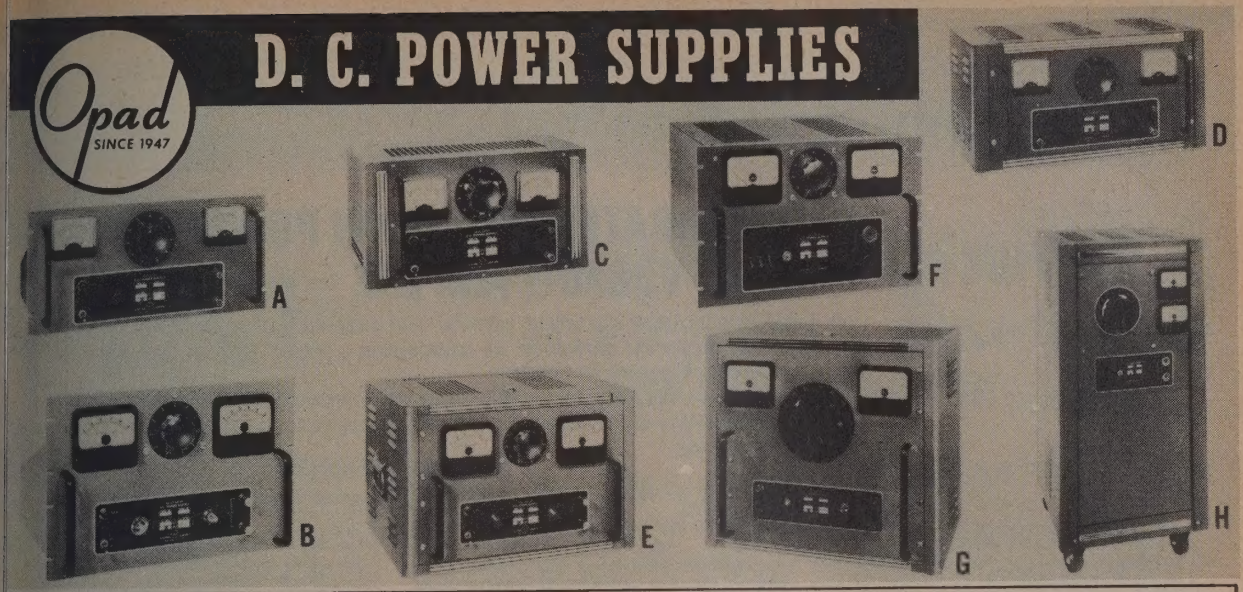
AIRTRONICS INCORPORATED

POWERTEC DIVISION

9168 DESOTO AVE., CHATSWORTH, CALIF. 91311 • Phone (213) 882-0004

D. C. POWER SUPPLIES

Opad SINCE 1947



D.C. VOLTS	D.C. AMPS	MODEL	STYLE	MAX. RIPPLE NL to FL	DIMENSIONS H	X	W	X	D	FIG.	A.C. INPUT	WRITE FOR BULLETIN
0-32	0-5	KM75	RACK	100MV	8¾"	X	19"	X	9½"	A	115 VOLTS A.C. 60 Hz SINGLE PHASE	102A
	0-5	KM75B	BENCH	100MV	9"	X	17"	X	9"	C		
	0-10	KM81	RACK	100MV	8¾"	X	19"	X	9½"	A		
	0-10	KM81B	BENCH	100MV	9"	X	17"	X	9"	C		
	0-20	KM87	RACK	100MV	8¾"	X	19"	X	9½"	A		
	0-20	KM87B	BENCH	100MV	10½"	X	22"	X	12"	D		
	0-40	KM93	RACK	100MV	12¼"	X	19"	X	13"	B		
	0-40	KM93B	BENCH	100MV	14"	X	22"	X	15"	E		
	0-100	KM100	RACK	160MV	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	104
	0-150	KM150	BENCH	160MV	19¼"	X	22"	X	18"	G		
0-60	0-10	KN5	RACK	100MV	10½"	X	19"	X	13½"	B	115 VOLTS A.C. 60 Hz SINGLE PHASE	106
	0-10	KN5B	BENCH	100MV	12¼"	X	22"	X	15"	E		
	0-20	KN10	RACK	100MV	12¼"	X	19"	X	13½"	B		
	0-20	KN10B	BENCH	100MV	14"	X	22"	X	15"	E		
0-125	0-5	RS20	RACK	1.25V	10½"	X	19"	X	13"	B	117 VOLTS A.C. 60 Hz SINGLE PHASE	204A
	0-5	RS20B	BENCH	1.25V	12¼"	X	22"	X	15"	E		
	0-10	RS30	RACK	1.25V	12¼"	X	19"	X	13"	B		
	0-10	RS30B	BENCH	1.25V	14"	X	22"	X	15"	E		
	0-20	RS40	RACK	1.25V	17½"	X	19"	X	13"	—		
	0-20	RS40B	BENCH	1.25V	19¼"	X	22"	X	15"	G		
	0-24	RS50	RACK	250MV	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	205
	0-40	RS60	BENCH	250MV	19¼"	X	22"	X	18"	G		
	0-80	RS70	FLOOR	1.25V	48"	X	22"	X	18"	H		
	0-120	RS80	FLOOR	1.25V	48"	X	22"	X	24"	H		
0-250	0-5	RU60	RACK	2.5V	12¼"	X	19"	X	13½"	B	117 VOLTS A.C. 60 Hz SINGLE PHASE	206
	0-5	RU60B	BENCH	2.5V	14"	X	22"	X	15"	E		
	0-10	RU70	RACK	2.5V	17½"	X	19"	X	13½"	—		
	0-10	RU70B	BENCH	2.5V	19"	X	22"	X	15"	G		
	0-12	RU80	RACK	625MV	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	207
	0-20	RU90	BENCH	625MV	19¼"	X	22"	X	18"	G		
	0-40	RU100	FLOOR	625MV	48"	X	22"	X	18"	H		
	0-60	RU150	FLOOR	625MV	48"	X	22"	X	24"	H		
0-500	0-5	RW80	RACK	500MV	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	210
	0-10	RW90	BENCH	500MV	19¼"	X	22"	X	18"	G		
	0-20	RW100	FLOOR	500MV	48"	X	22"	X	18"	H		
	0-30	RW150	FLOOR	500MV	48"	X	22"	X	24"	H		
	0-40	RW200	FLOOR	500MV	52"	X	22"	X	24"	H		
0-1000	0-2.5	SX80	RACK	1V	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	215
	0-5	SX90	BENCH	1V	19¼"	X	22"	X	18"	G		
	0-10	SX100	FLOOR	1V	48"	X	22"	X	18"	H		
	0-15	SX150	FLOOR	1V	48"	X	22"	X	24"	H		
	0-20	SX200	FLOOR	1V	52"	X	22"	X	24"	H		
0-1500	0-1.5	TY80	RACK	2.5%	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	217
	0-3	TY90	BENCH	2.5%	19¼"	X	22"	X	18"	G		
	0-7	TY100	FLOOR	2.5%	48"	X	22"	X	18"	H		
	0-10	TY150	FLOOR	2.5%	48"	X	22"	X	24"	H		
	0-13	TY200	FLOOR	2.5%	52"	X	22"	X	24"	H		
0-2000	0-1.25	VZ80	RACK	2.5%	12¼"	X	19"	X	17¼"	F	208-230 VAC 60 Hz 3 PHASE*	219
	0-2.25	VZ90	BENCH	2.5%	19¼"	X	22"	X	18"	G		
	0-5	VZ100	FLOOR	2.5%	48"	X	22"	X	18"	H		
	0-7.5	VZ150	FLOOR	2.5%	48"	X	22"	X	24"	H		
	0-10	VZ200	FLOOR	2.5%	52"	X	22"	X	24"	H		

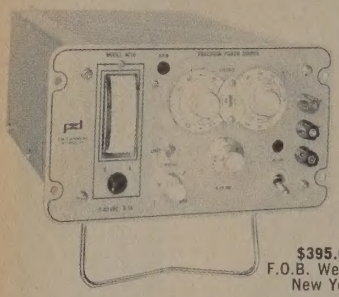
* Three-phase units incorporate the exclusive FAZEGUARD Sensor (Patented); a solid state circuit that trips the power supply circuit breaker if power fails on one or more of the three input phases.

Opad

OPAD ELECTRIC COMPANY, INC.

43-12 WALKER STREET • NEW YORK, N. Y. 10013 Telephone: (212) WOrth 6-0380

power designs inc.



$395.00
F.O.B. Westbury
New York

CALIBRATED PRECISION POWER SOURCES 0-40 VDC/0-1 AMPERE

The Model 4010 DC power source designed to combine the accuracy of 5-digit potentiometric or digital voltmeter with a general purpose power supply.

Critical circuits and components are maintained at a constant ambient temperature in an RF free, temperature stabilized chamber.

The output voltage may be remotely resistance programmed with an accuracy of 0.1%.

The Model 4010 is self-contained in portable housing designed for bench or rack applications

• Four decade switches and 10-turn potentiometer provide digital readout to six significant figures • Sixth place interpolation with 10 microvolt resolution • Dial accuracy is 0.1% plus one millivolt up to one volt, 0.1% absolute from one to forty volts • Continuously adjustable output current limiter • Flashing indicator signals output short circuit, overload or current limiter operation • Self-restoring electronic overload and short circuit protection • Output voltage or current monitored by panel voltammeter with full scale accuracy of ±2% • Front and rear access output terminals • Separately fused line and load circuits • Bail-carrying handle tilts front panel for viewing ease.

SPECIFICATIONS:

Output: 0 to 40 VDC continuously adjustable at 0 to 1 ampere.

Input: 105 to 125 volts, 47 to 440 Hz, 90 watts nominal.

Regulation: Line or load less than 0.001% + 100 microvolts for line variations or load variations over the operating range. Without remote sensing, the load regulation is 250 microvolts at the front panel terminals.

Ripple and Noise: Less than 100 mv peak-to-peak at 60 Hz line frequency (measured with an oscilloscope with a bandwidth of 50 MHz).

Resetability: 0.003% or 50 microvolts (whichever is greater) of the original dial setting.

Stability: Better than 0.001% + 100 microvolts per 8 hours

Source Impedance: Less than .0005 ohms at DC; 0.04 ohms at 20 KHz, 0.5 ohms at 1 MHz

Recovery Time: Less than 30 microseconds to return to within 1 millivolt or 0.005% (whichever is greater) of the set voltage for a step change in rated load (1 microsecond rise time) of 10% to 100%; less than 50 microseconds to return to within 500 microvolts.

Temperature Coefficient:
< 0.001% per °C to 45°C
< 0.002% per °C from 45° to 60°C

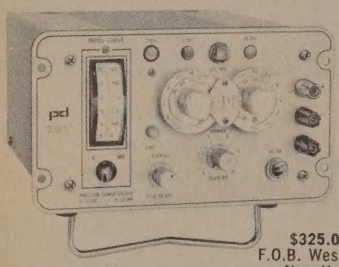
Current Limiting: 0 to 1 ampere continuously adjustable by a front panel control.

Remote Sensing: Two terminals on rear barrier strip

Remote Programming: Rear panel terminals provide resistance programming at 1000 ohms per volt.

Dimensions: 8⅜" x 4¾" x 11 9/16"

Weight: 12 lbs.



$325.00
F.O.B. Westbury
New York

CALIBRATED PRECISION POWER SOURCES 0-20 VDC/0-500 MA

The Model 2005A is a calibrated precision power source designed to supply extremely stable DC output with low noise content. Compact and light, the Model 2005A is self-contained in a portable housing designed for bench or rack applications.

• Two dual concentric decade switches provide digital readout to five significant figures below 10 volts; to six significant figures above 10 volts. Last-place interpolation by a potentiometer with a 10μV resolution. A toggle switch provides an additional digit in the 10 to 20 volt range • Current limiting – maximum output may be limited to any value below 500 mA with a front panel control, • Limit indicator lamp on the front panel flashes when the output of the supply is in the current-limited region

SPECIFICATIONS:

Output: 0 to 20 VDC continuously adjustable at 0 to 500 mA.

Input: 105 to 125 volts, 47 to 440 Hz, 40 watts nominal.

Regulation: Line or load: < less than 0.0005% + 100 microvolts

Ripple & Noise: Less than 100 microvolts peak-to-peak

Stability: (8hr.): < 0.001% + 100 microvolts

Source Impedance: < 0.002 ohm at DC; 0.04 ohm at 20 KHz; 0.5 ohm at 1 MHz

Recovery Time: Less than 25 microseconds to return to within 100 microvolts of the set voltage, for a step change (1 microsecond rise time) of 80% of rated load. (20% minimum load.)

Temperature Coefficient: DC output voltage changes less than 0.001% or 50 microvolts (whichever is greater) per °C over the range 0° to +45°C; less than 0.002% or 100 microvolts (whichever is greater) per °C from +45°C to +60°C.

Current Limiting: 0 to 500 mA continuously adjustable by a front panel control.
Flashing lamp indicates overload or short circuit

Remote Sensing: Two terminals on rear

Remote Programming: Rear panel terminals provide resistance programming at 1000 ohms per volt.

Metering: Front-panel volt-ammeter with an accuracy of ±2% of full scale.

Dimensions: 8⅜" x 4¾" x 8 7/32".

Weight: 9 pounds.

• All silicon semiconductor regulator system with new, low noise diff-amp input transistor and specially processed zener voltage reference • Advanced solid state circuitry • Exceptional stability through design simplicity • Critical components maintained at constant ambient in temperature controlled oven • Self-restoring electronic overload and short circuit protection with continuously adjustable current limiting control • Adjustable voltage limiter on 2005P avoids voltage runaway with open remote programming resistor • Performance specifications based on anticipated ratings at end of five years of service • Built-in protection against turn-on or turn-off transients • 100 hour minimum pre-aging of power supply prior to test and calibration • Individual calibration data furnished with each unit

PARTIAL LIST OF AVAILABLE PRECISION POWER SOURCES

MODEL	RANGE VOLTS	CURRENT AMPS	REGULATION LINE/LOAD	MAX. RIPPLE PK TO PK	STABILITY	TC PER °C	SIZE	SPECIAL FEATURES	† PRICE
2005A	0-20	0-0.5	.0005%	100μv	<.001% +100μv/8hrs.	.001%	8⅜x4¾ x 8 7/32	4 decade readout with .1% accuracy. Continuous current limiting with panel push button setting. Remote programmable 1000Ω/v.	$325
C400	0-100	0-0.4	.001% +100μv	250μv	.001%	.001%	8⅜ x 4¾ x 11 9/16	4 decade readout with .1% accuracy. Continuous current limiting. Remote programmable 1000Ω/v.	395
2020	0-20	0-2.0	100μv	100μv	<.001% +100μv/8hrs.	.001%	5¾ x 8⅝ x10 ⅞	4 decade readout with 0.1% accuracy. Remote programmable 1000Ω/v.	475
UPMD-11	+15 −15	0-1.0 0-1.0	100μv/150μv 100μv/150μv	150μv 150μv	.01%/wk .01%/wk	0.001% 0.001%	5⅜x4½ x7½	Modular operational amplifier source. Dual tracking supply – better than 2 mv	275
X-336	10.0	0-0.250	.0001%	500μv	.005%/mo.	2.5PPM	3x3½ x5¼	Modular secondary standard (adj. ±50mv).	275

WRITE FOR TECHNICAL DATA SHEETS

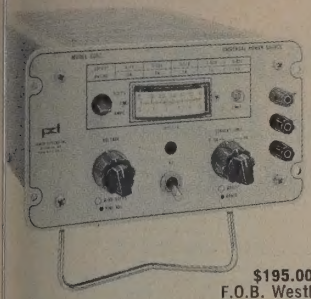
†FOB Westbury

Power Designs Inc. / 1700 Shames Drive, Westbury, L.I., New York 11590 / Tel: 516/333-6200 • TWX 510-222-6561

power designs inc.

UNIPLY™...
A LABORATORY OF POWER SUPPLIES

0-7V at 5A; 0-15V at 3A; 0-25V at 2A; 0-50V at 1A; 0-60V at 0.5A



$195.00
F.O.B. Westbury
New York

DEL 6050 UNIPLY™ is a regulated DC wer source that functionally replaces e conventional power supplies. It utiles a new regulator technique which proles additional features not available in ndard instruments. Output voltage and rrent ranges cover a broad spectrum of oratory requirements for both digital d analogue applications. Ranging is tranent-free and automatic with changes in ad and the setting of voltage and current ntrols. Operation is completely electron, without relays or manual switching. A ashing panel indicator signals loss of gulation when load demands are in exss of control setings or the AC line ltage is too low to support increased tput levels. The supply may be operated ntinuously into an overload or short cirit without damage. Portable and light, e Model 6050 is designed for laboratory ench or rack use.

SPECIFICATIONS:

Input: 105-125 volts, 57-440 Hz, 100 watts nominal.

Output: 0-60 volts DC, continuously adjustable with the following minimum output:
0-7V, 0-5A 0-25V, 0-2A 0-60V, 0-0.5A
0-15V, 0-3A 0-50V, 0-1A

Line Regulation: 0.01% +1 millivolt

Load Regulation: 0.01% +1 millivolt for load variations from 0-100% of rated output current.

Polarity: Either positive or negative output terminal may be operated at ground potential.

Ripple and Noise: Less than 1 millivolt peak-to-peak

Source Impedance: < 0.005Ω at DC, 0.1 ohm to 20 KHz, 1.0 ohm to MHz.

Recovery Time: Less than 50 microseconds to return to within a 15 millivolt band of the original voltage for a step change in rated load of 10% to 100% (1 microsecond rise time).

Stability: < 0.02% +3 millivolts per 24 hours

Operating Temperature: 0-50°C at full load. Storage: —20°C to +85°C.

Temperature Coefficient: < 0.02% per degree C

Current Limiting: Concentric switch/potentiometer provides continuous adjustment in two ranges: 0-500 milliamperes, 0-5 amperes.

Metering: Front panel "edgewise" meter and a selector switch permits monitoring voltage or current with an accuracy of ±2% of full scale. Current range changes automatically with current limiter range switch.

Output Terminals: Front Panel: Three binding posts for positive, negative and ground.

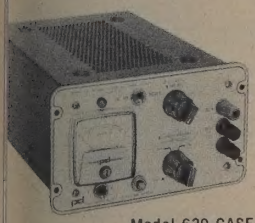
Rear Panel: Seven terminal barrier strip for output voltage sensing & voltage programming.

Dimensions: 8⅜" wide x 4¾" high x 11⁹⁄₁₆" deep

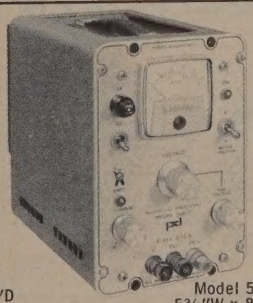
Weight: 15½ lbs.

Finish: Brushed anodized natural aluminum etched panel with black nomenclature. Blue vinyl laminated steel dust cover. Gold iridite bottom plate.

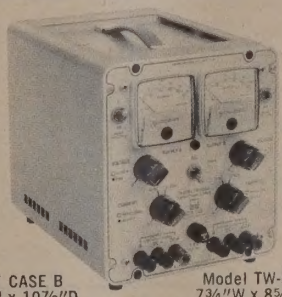
Rack Panel Adapters: Panel adapters are available for mounting a single unit or two units side by side in standard 19" rack.



Model 630 CASE A
8⅜"W x 4¾"H x 11⁹⁄₁₆"D



Model 5015T CASE B
5¾"W x 8⅝"H x 10⅞"D



Model TW-5005 CASE C
7¾"W x 8⅝"H x 13½"D

LABORATORY DC POWER SOURCES

• All units have remote sensing*; remote programming • Front and rear output terminals • Continuously adjustable voltage and current limiting controls • Model 5015T, 1010T, 1210S and 3650S feature a current limit indicating monitor • Modular package construction suitable for rack mounting. Single or dual mounting in 19" panel • Processed under Power Designs' "Predictable-Reliability" program for a 5-year MTBF. The program features: avalanche-controlled silicon rectifiers, stress-tested transistors, pre-aged zener references with extrapolated stability criteria based on 1/f noise changes, computer-grade capacitors, tin-oxide-film resistors, and components operated at 50% of manufacturers' published ratings. Units pre-aged under full-load conditions for a minimum of 50 hours

*Except Models 5005S and TW5005

PARTIAL LIST OF AVAILABLE UNITS

MODEL	VOLTAGE	CURRENT AMPS	REGULATION LINE/LOAD	RIPPLE Pk to Pk MV	CASE	*PRICE
2015R	0-20	0-1.5	†0.03% or 5mv	0.45	A	175.00
5005S	0-50	0-0.5	0.005% + 1mv	1.00	A	149.50
5015T	0-50	0-1.5	†0.01% or 3mv	0.75	B	234.50
1010T	1-100	0-1.0	†0.05% or 15mv	1.50	C	339.50
1210S	0-12	0-10	0.01% + 2mv	1.50	C	329.00
TW5005 (Dual)	0-50, 0-0.5A each output 0-100 @ 0.5A Series Oper. 0-50 @ 1.0A Parallel Oper.		0.005% + 1mv	1.00	C	297.50
3650S	0-36	0-5.0	0.01% + 3mv	1.50	C	299.00

†whichever is greater

*FOB WESTBURY

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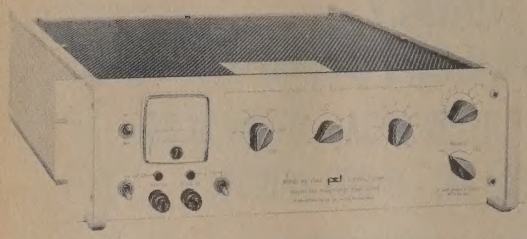
power designs inc.



HIGH VOLTAGE CALIBRATED POWER SOURCES

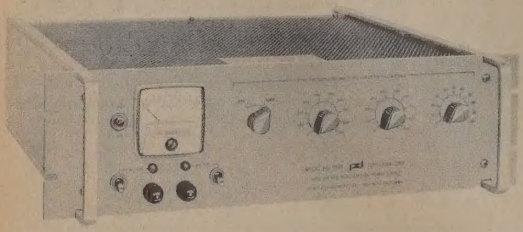
• High Stability—.005%/hr.; .02%/24 hrs. • All solid state on Model 3K10 • Low noise level • Superior performance and reliability • Self-restoring overload and short circuit protection with fault indicator • All silicon semiconductor amplifier with low TC zener reference. Vacuum tube "pass" element • Sealed transformers • 105-125 V, 50-400 Hertz input • 0.25% calibration accuracy • 10 MV resolution: 25 MV on Model 3K10* • 50 μS recovery time • Voltage and current metering • Field proven service • TC less than 50 PPM/°C

*ALL SOLID STATE

PARTIAL LIST OF AVAILABLE UNITS

MODEL	VOLTAGE	CURRENT MA	REGULATION LINE OR LOAD	RIPPLE Pk to Pk MV	SIZE PANEL HT.	† PRICE
2K10	1-2012	0-10	.002%+2mv	1.0	3½	$ 299
*1565	1-2012	0-20	.001%+2mv	1.0	3½	$ 415
1544	1-3012	0-20	.001%+2mv	1.0	5¼	$ 520
1547	1-3012	0-40	.001%+2mv	1.0	5¼	$ 575
1556A	10-6021	0-20	.001%+2mv	1.0	7	$ 625
1543A	10-10021	0-10	.001%+2mv	5.0	10½	$ 950
3K10	50 -3kv	0-10	0.0025%+5mv	10	3.0	$ 390

*0.15% Calibration Accuracy WRITE FOR SPECIFICATION SHEETS †FOB WESTBURY



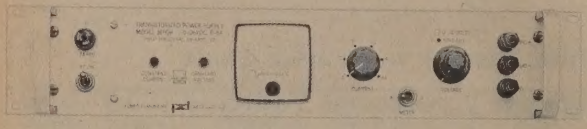
HIGH VOLTAGE CRT DISPLAY POWER SOURCES

ALL SOLID STATE / CORONA-FREE
HIGH STABILITY / LOW NOISE OUTPUT
ONLY 5¼" H x 19" W x 16" D

• Stability: .005%/hour • Regulation: 0.0025% line or load • Calibration Accuracy: 0.25% of output voltage • Temp. Coefficient 50 PPM/°C • 50 KV Corona-Free mating connector supplied • Environmental Isolation: All high voltage circuitry encapsulated in specially developed epoxies to effectively provide Corona-Free operation under adverse environmental conditions

Model	Output Voltage	Output Current	Ripple Pk to Pk	Polarity	*Price
1584	1kv to 20kv	0-3ma	250 mv	Positive	$1875.00
1584R	1kv to 20kv	0-1ma	200 mv	Reversible	$2200.00
1579	10kv to 30kv	0-1ma	250 mv	Positive	$2250.00
1579R	10kv to 30kv	0-1ma	250 mv	Reversible	$2575.00

*FOB WESTBURY



SCR CONTROLLED POWER SOURCES

CONSTANT VOLTAGE/CONSTANT CURRENT
Remote Voltage & Current Programming: Remote Sensing

• All silicon solid state circuitry • Constant voltage/current with operating mode indicating lights • Compound regulator system with SCR pre-regulator and high speed output regulator • Available with line filters to meet MIL-I-26600 • Provisions for remote indication of operating mode • Front and rear access terminals on 3650R and 36100R families • High reliability shaped pulse SCR trigger circuitry • Fast recovery rectifiers minimize transients at input and output lines

PARTIAL LIST OF AVAILABLE UNITS

MODEL	RANGE VOLTS	CURRENT AMPS	Mode: Constant Voltage REG.	Constant Voltage RMS RIPPLE	Constant Current REG.	Constant Current RMS RIPPLE	SOURCE IMPEDANCE TO 20KC	SOURCE IMPEDANCE TO 1MC	SIZE	WEIGHT LBS.	FOB WESTBURY PRICE
3650R	0-36	0-5.0	.01% +3mv	500μv	.02% +1ma	3ma	0.025Ω	1.0Ω	19x3½x16	35	$349.50
*3650RF	0-36	0-5.0	.01% +3mv	500μv	.02% +1ma	3ma	0.025Ω	1.0Ω	19x3½x16	35	375.00
36100R	0-36	0-10.0	.01% +3mv	500μv	.02% +3ma	3ma	0.025Ω	1.0Ω	19x5¼x16	45	463.00
*36100RF	0-36	0-10.0	.01% +3mv	500μv	.02% +3ma	3ma	0.025Ω	1.0Ω	19x5¼x16	45	483.00

* Meets MIL-I-26600 for RFI

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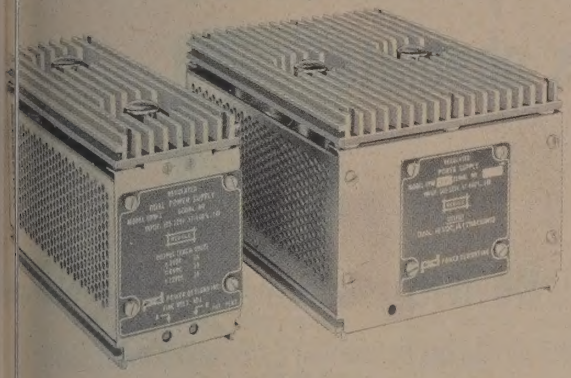


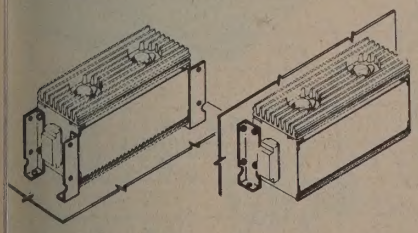
REDULE® UNIVERSAL MODULAR POWER SUPPLIES

Single or dual outputs with choice of several output voltage levels in one package • Multi-turn remental voltage adjustment potentiometer • Parallel or series operation with any terminal at ound potential • Remote sensing • Remote programming • Self-restoring fold-back overload d short protection • Thermal overload cutout • 100% inspected "reliability controlled" silicon miconductors • 50 hour power supply pre-aging prior to test • 50 μs recovery time • 105-5 V, 57-440 Hz input • Mounts in any plane, to any surface • No external heat sink required Connector keying system prevents mating errors • Complete maintainability, reliability and rkmanship to most AEC & NASA standards

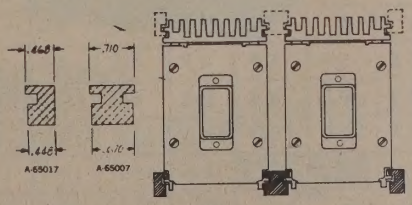
PARTIAL LIST OF AVAILABLE UNITS

MODEL	OUTPUT RATING	NUMBER OUTPUTS	REGULATION LINE/LOAD	MAX. RIPPLE PK TO PK	INPUT POWER @ NOM. LINE	†PRICE
UPM-6	24V @ 1½A, 27V @ 1¼A, 30V @ 1A	1	.01% + 2mv	1mv	90w	$139.50
UPM-11	0-16V @ 1A	2	.01% + 1mv	1mv	80w	199.00
UPM-16*	5, 6V @ 5A	1	.01% + 2mv	1mv	85w	169.00
UPM-22	16-30V @ ½A, 30-60V @ ¼A	2	.01% + 1mv	1mv	70w	199.00
UPM-33	0-16V @ 2A	1	.01% + 1mv	1mv	80w	147.50
UPM-44	16-30V @ 1A, 30-60V @ ½A	1	.01% + 1mv	1mv	70w	147.50
UPMD-6 UPMD-6V	3, 4, 5, 6V @ 10A	1	.01% + 2mv	1mv	150w	245.00 270.00
	Same as UPMD-6 but with adjustable overvoltage protection					
UPMD-10	24V @ 3A	1	.04% + 2mv	2mv	180w	180.00
UPMD-11	±15V @ 1A (precision tracking)	2	See precision power supply page	105 μv	85w	275.00
UPMD-15 UPMD-15V	15V DC @ 2A	2	.01% + 2mv	1mv	125w	265.00 290.00
	Same as UPMD-15 with overvoltage crowbar protection					
UPMD-X9	100V DC @ ¼A	2	.03% + 1mv	1mv	90w	260.00
UPMD-56*	5, 6V @ 10A	1	.01% + 2mv	1mv	170w	225.00
UPMD-530 †	500-3000V @ 10ma	1	.0025% + 5mv	10mv	60w	385.00
FPM-101	±15V @ 1A (precision tracking)	2	.01%	1mv	65w	164.00

*Includes built-in overvoltage crowbar protection. †"N" Suffix for Neg. Output Polarity. "P" Suffix for Pos. Output Polarity. †FOB Westbury



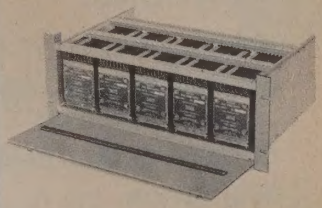
UNIVERSAL MOUNTING BRACKETS P/N A-64039 **$1.25 ea.** Brackets permit mounting of module to either horizontal or vertical surface.



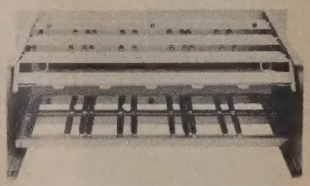
HOLD-DOWN GUIDE TRACKS

Single Track	A-65017	$1.25/ft.
Dual Track	A-65007	$1.25/ft.

REDULE® ACCESSORIES



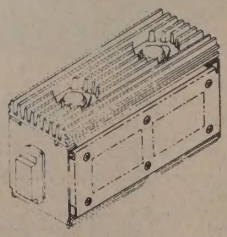
FRONT LOADING POWER SUPPLY BIN CO-1120A $59.50 Accommodates up to 5 UPM modules or 2 UPMD modules plus 1 UPM module or any combination thereof. The bin may be mounted within a standard 19 inch equipment cabinet.



REAR LOADING POWER SUPPLY BIN CO-1102A $49.50 Accepts modular power supplies from rear of bin. Has same capacity as the Front Loading Bin.

MATING CONNECTORS P/N-00-8016-038-217-008 (Gray) $3.85 for Models UPMD-X9, UPMD-11. **P/N 802338MC (Red) $3.85** for Models UPM-6, 11, 22, 33, 44, UPMD-6, 15

MATING CONNECTOR HOOD AND CABLE CLAMP ASSEMBLY P/N 8016 $1.90 Fits either mating connector.



SIDE MOUNTING COVER P/N B-67057 $5.00 ea. Permits mounting of module to horizontal or vertical surface.

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PMC

The UniPower Wide Range Series of Nine from POWER/MATE CORP. make slot supplies obsolete!

SPECIFICATIONS:

INPUT—105-125V, 47-420 CPS.

OUTPUT VOLTAGE—0-30 volts for all units except Uni-76 (0-34V); Uni-88 (0-34V); and UniTwin 1 (0-25V dual output).

OUTPUT VOLTAGE RANGE—Set in overlapping ranges by means of internal quick disconnect taps.

REGULATION—Uni-76 and Uni-88 better than ±0.005% or 1MV for line and load. All other units bet than ±0.01% or 1MV for line and load.

RIPPLE—Less than 250 microvolts.

RESPONSE TIME—Less than 20 microseconds.

TEMPERATURE COEFFICIENT—Better than 0.01%/°C.

LONG TERM STABILITY—Better than 0.025% for 8 hours.

OVERLOAD & SHORT CIRCUIT PROTECTION—Solid state short circuit and overload protected. Instantaneous recovery, and automatic reset. Unit cannot be damaged by prolonged short circuits overloads.

POLARITY—May be either positive, negative or floating up to 300 volts.

AMBIENT OPERATING TEMPERATURE—Continuous duty from −20°C to +71°C ambient.

STORAGE TEMPERATURE— −55.C to +85°C.

OUTPUT CURRENT vs. TEMPERATURE—Unit is rated full output at 40°C ambient, and is derat for operation to 71°C. A modest amount of forced air cooling will permit full output at 71°C. Consult factory.

REMOTE-LOCAL SENSING—Provision is included to permit remote sensing of the output voltage direc at the load for improved over-all regulation. Unit may be connected for local sensing if desired.

REMOTE-LOCAL VOLTAGE ADJUST—Output voltage may be remotely adjusted, or internally adjusted w coarse and fine controls. Both are accessible through holes in the terminal end of the supply.

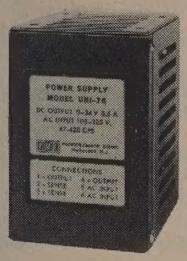
OUTPUT VOLTAGE vs. OUTPUT CURRENT FOR VARI-RATED UNI SERIES

MODEL	VOLTAGE															
	0-3	5	6	8	10	12	14	15	16	18	20	22	24	26	28	30
UNI-76	0.5 amp throughout range															
UNI-88	1.5 amps throughout range															
UNI-30C	4	4	4	4	4	3.75	3.6	3.5	3.4	3.25	3.0	2.9	2.75	2.5	2.5	2.
UNI-30D	6	6	6	5.6	5.2	5.0	4.7	4.5	4.3	4.2	4.1	3.7	3.5	3.4	3.3	3.
UNI-30E	12	12	11	10.5	9.5	9.3	8.5	8.0	7.7	7.5	7.0	6.5	6.0	5.7	5.5	5.
UNI-30F	15	15	15	14.2	12.8	12.0	11.5	11.0	10.0	9.9	9.4	8.9	8.7	8.5	8.0	7.
UNI-30G	24	22	21	20	18	17	16.5	16.0	15.5	15	14	13.5	13	12.5	12	11.
UNI-30H	34	32	31	29	25	23	22	21	20	19	17	16.5	16	15.5	15	14.

PMC **POWER/MATE CORP.**
514 S. River Street • Hackensack, N.J. 07601
Phone (201) 343-6294/TWX 710-990-5023

SAME DAY SHIPMENT

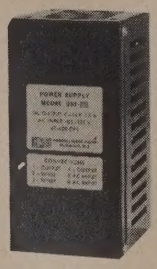
ne versatile, regulated, adjustable otage power supplies from **POWER/MATE!**



N-76 0-34 volts, 0.5 amp ver ntire voltage range. Regulation: ett than ±0.005% or 1 Mv for line nd ad.

$76.00

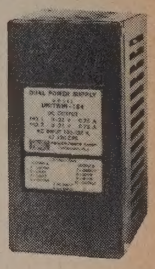
x 3⅞"H x 5⅛"D
IT: Net 3¾ lbs., Shipping 4¾ lbs.



UNI-88 0-34 volts, 1.5 amps over entire voltage range. Regulation: Better than ±0.005% or 1 Mv for line and load.

$99.00

3⅝"W x 3⅞"H x 6⅞"D
WEIGHT: Net 5¼ lbs., Shipping 6¾ lbs.



UniTwin-164 DUAL OUTPUT 0-25 volts, 0.75 amps over entire voltage range. Regulation: Better than ±0.005% or 1 Mv for line and load.

$164.00

3⅝"W x 4¾"H x 6⅞"D
WEIGHT: Net 5¾ lbs., Shipping 7½ lbs.

II-30C 0-30 volts, 4 amps. Regation: Better than ±0.01% or 1 Mv r line and load.

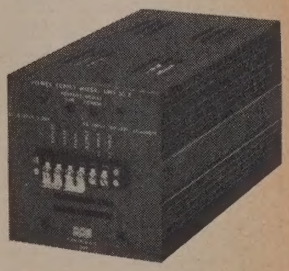
$134.00

x 3⅝"H x 7⅝"D
HT: Net 8¼ lbs., Shipping 10¼ lbs.

UNI-30D 0-30 volts, up to 6 amps (see chart). Regulation: ±0.01% or 1 Mv for line and load.

$151.00

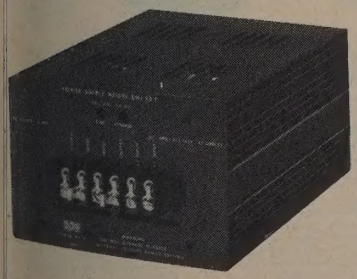
5⅜"W x 3⅝"H x 9⅜"D
WEIGHT: Net 11½ lbs., Shipping 14 lbs.



UNI-30E 0-30 volts, up to 12 amps (see chart). Regulation: ±0.01% or 1 Mv for line and load.

$174.00

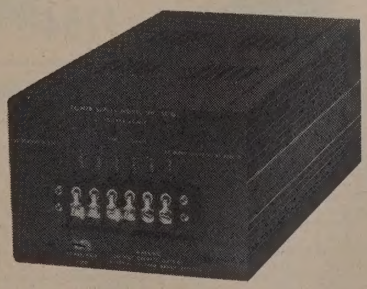
5⅜"W x 5⅜"H x 9⅜"D
WEIGHT: Net 15½ lbs., Shipping 19 lbs.



II-30F 0-30 volts, up to 15 am (see chart). Regulation: ±0.01% or Mv for line and load.

$205.00

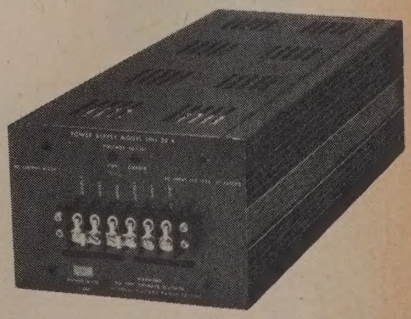
7½"W x 5⅜"H x 9⅜"D
WEIHT: Net 20¼ lbs., Shipping 24¼ lbs.



UNI-30G 0-30 volts, up to 24 amps (see chart). Regulation: ±0.01% or 1 Mv for line and load.

$265.00

7½"W x 5⅜"H x 11⅞"D
WEIGHT: Net 25¾ lbs., Shipping 30¼ lbs.



UNI-30H 0-30 volts, up to 34 amps (see chart). Regulation: ±0.01% or 1 Mv for line and load.

$315.00

7½"W x 5⅜"H x 16½"D
WEIGHT: Net 34½ lbs., Shipping 39½ lbs.

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PMC

OEM REGULATED POWER SUPPLIES

Developed from proven UniPower principles / Liberal OEM discounts*

GENERAL SPECIFICATIONS

Voltage Input: 105-125VAC, 47-420cps
Current Output: Up to 34 amps
Voltage Output: 3 to 48 volts
Regulation: ± 0.01% line and load
Ripple: Less than 250 microvolts
Response Time: Less than 20 microseconds
Temperature Coefficient: Better than 0.01%/°C.
Long Term Stability: Better than 0.025% for 8 hours.
Overload & Short-Circuit Protection: Solid state protection gives instantaneous recovery and automatic reset. Cannot be damaged by prolonged short-circuits or overloads.

Polarity: May be either positive, negative or floating up to 300 vol
Ambient Operating Temperature: Continuous duty from −20°C +71°C ambient.
Storage Temperature: −55°C to +85°C.
Output Current vs Temperature: Rated for full current output at t peratures between −20°C and +45°C. Linearly derated f +45°C as shown in charts below.
Remote or Local Sensing: Provision included for remote sensing output voltage directly at the load, for improved overall regulat Also may be connected for local sensing.
Remote or Local Voltage Adjust: Output voltage may be remotely justed, or internally adjusted with coarse and fine controls. control is accessible through hole in terminal end of supply.

OEM SERIES A

3 5/16"W x 3 7/8"H x 5 1/8"D
Net Wt.: 3 3/4 pounds
Shipping Wt.: 4 3/4 pounds
Price:
$79.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-A	3.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-3.6-A	3.6 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-4-A	4.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-4.5-A	4.5 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-5-A	5.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-6-A	6.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-8-A	8.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-10-A	10.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-12-A	12.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-15-A	15.0 ±.5 volts	1.25 amps	1.17	1.03	.88
OEM-18-A	18.0 ±.5 volts	1.00 amps	.94	.82	.70
OEM-20-A	20.0 ±.5 volts	.90 amps	.84	.74	.63
OEM-24-A	24.0 ±.5 volts	.80 amps	.75	.66	.56
OEM-28-A	28.0 ±.5 volts	.70 amps	.66	.58	.49
OEM-36-A	36.0 ±.5 volts	.60 amps	.56	.49	.42
OEM-48-A	48.0 ±.5 volts	.30 amps	.28	.25	.21

OEM SERIES C

5 3/32"W x 3 5/16"H x 7 5/8"D
Net Wt.: 8 1/4 pounds
Shipping Wt.: 10 1/4 pounds
Price:
$137.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-C	3.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-3.6-C	3.6 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-4-C	4.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-4.5-C	4.5 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-5-C	5.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-6-C	6.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-8-C	8.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-10-C	10.0 ±.5 volts	4.00 amps	3.7	3.3	2.8
OEM-12-C	12.0 ±.5 volts	3.75 amps	3.5	3.1	2.6
OEM-15-C	15.0 ±.5 volts	3.50 amps	3.3	2.9	2.4
OEM-18-C	18.0 ±.5 volts	3.25 amps	3.0	2.6	2.2
OEM-20-C	20.0 ±.5 volts	3.00 amps	2.8	2.4	2.1
OEM-24-C	24.0 ±.5 volts	2.75 amps	2.6	2.2	1.9
OEM-28-C	28.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-36-C	36.0 ±.5 volts	2.00 amps	1.9	1.6	1.4
OEM-48-C	48.0 ±.5 volts	1.25 amps	1.17	1.03	.8

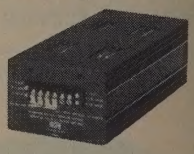
OEM SERIES B

3 5/16"W x 3 7/8"H x 6 7/8"D
Net Wt.: 5 1/4 pounds
Shipping Wt.: 6 3/4 pounds
Price:
$102.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-B	3.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-3.6-B	3.6 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-4-B	4.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-4.5-B	4.5 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-5-B	5.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-6-B	6.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-8-B	8.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-10-B	10.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-12-B	12.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-15-B	15.0 ±.5 volts	2.50 amps	2.3	2.0	1.7
OEM-18-B	18.0 ±.5 volts	2.25 amps	2.1	1.8	1.6
OEM-20-B	20.0 ±.5 volts	2.00 amps	1.9	1.6	1.4
OEM-24-B	24.0 ±.5 volts	1.90 amps	1.8	1.5	1.3
OEM-28-B	28.0 ±.5 volts	1.80 amps	1.7	1.4	1.2
OEM-36-B	36.0 ±.5 volts	1.20 amps	1.1	1.0	0.8
OEM-48-B	48.0 ±.5 volts	0.60 amps	.56	0.5	.42

OEM SERIES D

5 3/32"W x 3 5/16"H x 9 3/8"D
Net Wt.: 11 1/2 pounds
Shipping Wt.: 14 pounds
Price:
$154.00



MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-D	3.0 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-3.6-D	3.6 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-4-D	4.0 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-4.5-D	4.5 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-5-D	5.0 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-6-D	6.0 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM-8-D	8.0 ±.5 volts	5.60 amps	5.3	4.6	3.9
OEM-10-D	10.0 ±.5 volts	5.20 amps	4.9	4.3	3.6
OEM-12-D	12.0 ±.5 volts	5.00 amps	4.7	4.1	3.5
OEM-15-D	15.0 ±.5 volts	4.50 amps	4.2	3.7	3.1
OEM-18-D	18.0 ±.5 volts	4.20 amps	3.9	3.4	2.9
OEM-20-D	20.0 ±.5 volts	4.10 amps	3.8	3.3	2.8
OEM-24-D	24.0 ±.5 volts	3.50 amps	3.3	2.9	2.4
OEM-28-D	28.0 ±.5 volts	3.30 amps	3.1	2.7	2.3
OEM-36-D	36.0 ±.5 volts	3.00 amps	2.8	2.4	2.1
OEM-48-D	48.0 ±.5 volts	2.00 amps	1.9	1.6	1.4

PMC

POWER/MATE CORP.
514 S. River Street • Hackensack, N.J. 07601
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***QUANTITY DISCOUNTS UP TO 50%**
HIGH PERFORMANCE AT NO EXTRA COST

PMC

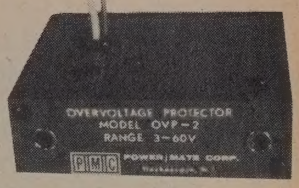
AVAILABLE OPTIONS

over-voltage protection at $30 per unit. Use suffix

proofing, with MIL-V-173 varnish, for all fungus nu- components, at $10 per unit. Use suffix "F".

ut. All units are available with 208 VAC ±10% (use "L") or 230 VAC ±10% (use suffix "LL") at no extra

MODEL OVP-2



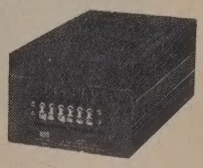
Over-voltage Protection is provided by this self-contained, crowbar-type solid state unit. It is independent of the power supply or the type of failure. It is continuously adjustable between 3 to 60 volts and is rated for use with any power supply in the Uni or OEM Series with current outputs up to 34 amperes. Response time is between 3-6 microseconds. Dimensions are 1" x 2⅞" x 3⅜". Price: **$30.00**

OEM SERIES E

5⅜"W x 5⅜"H x 9⅜"D
Net Wt.: 15½ pounds
Shipping Wt.: 19 pounds
Price:
$177.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM E	3.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM 6-E	3.6 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM E	4.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM 5-E	4.5 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM E	5.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM E	6.0 ±.5 volts	11.00 amps	10.3	9.1	7.7
OEM E	8.0 ±.5 volts	10.50 amps	9.9	8.6	7.3
OEM 0-E	10.0 ±.5 volts	9.50 amps	8.9	7.8	6.6
OEM 2-E	12.0 ±.5 volts	9.30 amps	8.7	7.7	6.5
OEM 5-E	15.0 ±.5 volts	8.00 amps	7.5	6.6	5.6
OEM 8-E	18.0 ±.5 volts	7.50 amps	7.0	6.2	5.2
OEM 0-E	20.0 ±.5 volts	7.00 amps	6.6	5.8	4.9
OEM 4-E	24.0 ±.5 volts	6.00 amps	5.6	4.9	4.2
OEM 8-E	28.0 ±.5 volts	5.50 amps	5.2	4.5	3.8
OEM 6-E	36.0 ±.5 volts	5.00 amps	4.7	4.1	3.5
OEM 8-E	48.0 ±.5 volts	3.00 amps	2.8	2.5	2.1

OEM SERIES G



7½"W x 5⅜"H x 11⅞"D
Net Wt.: 25¾ pounds
Shipping Wt.: 30¼ pounds
Price:
$268.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-G	3.0 ±.5 volts	24.00 amps	22.5	19.8	16.8
OEM-3.6-G	3.6 ±.5 volts	23.00 amps	21.6	19.0	16.1
OEM-4-G	4.0 ±.5 volts	23.00 amps	21.6	19.0	16.1
OEM-4.5-G	4.5 ±.5 volts	22.00 amps	20.7	18.2	15.4
OEM-5-G	5.0 ±.5 volts	22.00 amps	20.7	18.2	15.4
OEM-6-G	6.0 ±.5 volts	21.00 amps	19.8	17.4	14.7
OEM-8-G	8.0 ±.5 volts	20.00 amps	18.8	16.5	14.0
OEM-10-G	10.0 ±.5 volts	18.00 amps	16.9	14.8	12.6
OEM-12-G	12.0 ±.5 volts	17.00 amps	16.0	14.0	11.9
OEM-15-G	15.0 ±.5 volts	16.00 amps	15.1	13.2	11.2
OEM-18-G	18.0 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-20-G	20.0 ±.5 volts	14.00 amps	13.2	11.5	9.8
OEM-24-G	24.0 ±.5 volts	13.00 amps	12.2	10.7	9.1
OEM-28 G	28.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM-36-G	36.0 ±.5 volts	10.00 amps	9.4	8.7	7.0
OEM-48-G	48.0 ±.5 volts	7.00 amps	6.6	5.8	4.9

OEM SERIES F

7"W x 5⅜"H x 9⅜"D
Net Wt.: 20¼ pounds
Shipping Wt.: 24¼ pounds
Price:
$208.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-F	3.0 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-3.6-F	3.6 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-4-F	4.0 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-4.5-F	4.5 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-5-F	5.0 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-6-F	6.0 ±.5 volts	15.00 amps	14.1	12.4	10.5
OEM-8-F	8.0 ±.5 volts	14.20 amps	13.4	11.7	9.9
OEM-10-F	10.0 ±.5 volts	12.80 amps	12.0	10.6	8.9
OEM-12-F	12.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM-15-F	15.0 ±.5 volts	11.00 amps	10.3	9.1	7.7
OEM-18-F	18.0 ±.5 volts	9.90 amps	9.3	8.2	6.9
OEM-20-F	20.0 ±.5 volts	9.40 amps	8.8	7.7	6.5
OEM-24-F	24.0 ±.5 volts	8.70 amps	8.2	7.2	6.1
OEM-28-F	28.0 ±.5 volts	8.00 amps	7.4	6.6	5.6
OEM-36-F	36.0 ±.5 volts	7.40 amps	6.9	6.1	5.2
OEM-48-F	48.0 ±.5 volts	4.50 amps	4.2	3.7	3.15

OEM SERIES H

7½"W x 5⅜"H x 16½"D
Net Wt.: 34½ pounds
Shipping Wt.: 39½ pounds
Price:
$318.00

MODEL	ADJUSTABLE VOLTAGE RANGE, ±0.5 volts	AMBIENT TEMPERATURE 45°C	50°C	60°C	71°C
OEM-3-H	3.0 ±.5 volts	34.00 amps	32.0	28.1	23.8
OEM-3.6-H	3.6 ±.5 volts	33.00 amps	31.0	27.3	23.1
OEM-4-H	4.0 ±.5 volts	33.00 amps	31.0	27.3	23.1
OEM-4.5-H	4.5 ±.5 volts	32.00 amps	30.1	26.5	22.4
OEM-5-H	5.0 ±.5 volts	32.00 amps	30.1	26.5	22.4
OEM-6-H	6.0 ±.5 volts	31.00 amps	29.2	25.6	21.7
OEM-8-H	8.0 ±.5 volts	29.00 amps	27.3	24.0	20.3
OEM-10-H	10.0 ±.5 volts	25.00 amps	23.5	20.7	17.5
OEM-12-H	12.0 ±.5 volts	23.00 amps	21.6	19.0	16.1
OEM-15-H	15.0 ±.5 volts	21.00 amps	19.8	17.4	14.7
OEM-18-H	18.0 ±.5 volts	19.00 amps	17.9	15.7	13.3
OEM-20-H	20.0 ±.5 volts	17.00 amps	16.0	14.0	11.9
OEM-24-H	24.0 ±.5 volts	16.00 amps	15.1	13.2	11.2
OEM-28-H	28.0 ±.5 volts	15.00 amps	14.1	12.4	10.8
OEM-36-H	36.0 ±.5 volts	12.00 amps	11.3	9.9	8.4
OEM-48-H	48.0 ±.5 volts	8.50 amps	8.0	7.0	5.9

Searching? Should you not find the exact OEM supply you need, don't hesitate to call your PMC representative. The supply you want has probably been designed and is in our "design bank" waiting to be specified.

PMC **POWER/MATE CORP.**
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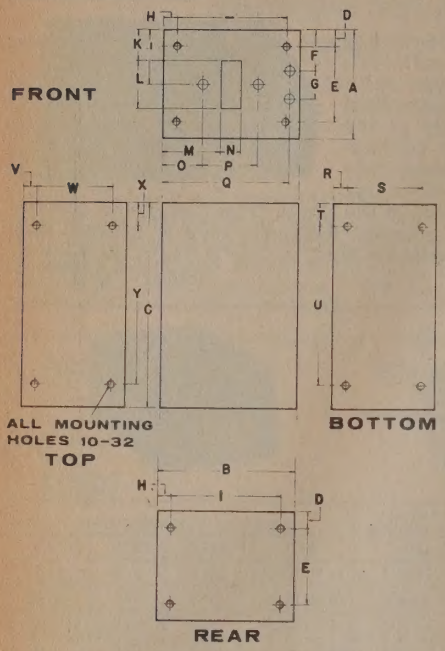
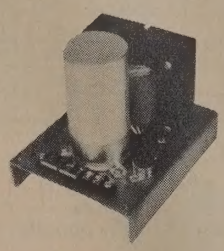
PMC CASE SIZES FOR UNI & OEM SERIES



MODEL	OEM( )A UNI-76	OEM( )B UNI-88	UNI-164	OEM( )C UNI-30C	OEM( )D UNI-30D	OEM( )E UNI-30E	OEM( )F UNI-30F	OEM( )G UNI-30G	OEM( ) UNI-
A	3 5/16	3 5/16	3 5/16	5 3/32	5 3/32	5 3/32	7 1/2	7 1/2	7
B	3 7/8	3 7/8	4 3/16	3 5/16	3 5/16	5 3/32	5 3/32	5 3/32	5
C	5 1/8	6 7/8	6 7/8	7 5/8	9 3/8	9 3/8	9 3/8	11 7/8	16
D	3/8	3/8	3/8	1 17/64	1 17/64	1 17/64	1 17/64	1 17/64	1
E	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	4 31/32	4 31/32	4
F	1 1/8	1 1/8		2 11/64	2 11/64	2 11/64	3 3/8	3 3/8	3
G	1 1/16	1 1/16		3/4	3/4	3/4	3/4	3/4	3
H	13/16	13/16	13/16	3/8	3/8	43/64	43/64	43/64	4
I	2 9/16	2 9/16	2 9/16	2 9/16	2 9/16	3 3/4	3 3/4	3 3/4	3
J			1 21/32						
K	1/2	1/2	21/32	1 3/32	1 3/32	1 3/32	1 5/64	1 5/64	1
L	2 5/16	2 5/16	2	2 29/32	2 29/32	2 29/32	4 11/32	4 11/32	4
M	1 5/16	1 3/8	1 3/4	1 9/16	1 9/16	2 3/32	1 9/16	1 9/16	1
N	7/8	7/8	7/8	7/8	7/8	7/8	1 5/16	1 5/16	1
O			1 1/16						
P			2 1/16						
Q	2 5/8	2 5/8		2 11/16	2 11/16	4 5/16	4 5/16	4 5/16	4
R	3/8	3/8	3/8						
S	2 9/16	2 9/16	2 9/16						
T	15/16	1 1/16	1 1/16						
U	3 1/4	4 3/4	4 3/4						
V				1/4	1/4	1/4	1/4	1/4	1
W				4 19/32	4 19/32	4 19/32	7	7	
X				1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1
Y				5 1/4	7	7	7	9 1/2	14

Low-Cost Regulated Power Supplies for Integrated Circuit Use



FEATURES:

- ADJUSTABLE 5 VOLT, 1, 5 or 10 AMP OUTPUT
- OVERVOLTAGE CROWBAR PROTECTION
- OVERLOAD AND SHORT-CIRCUIT PROOF
- +0.1% LINE AND LOAD REGULATION
- 115 VOLT 47-420 CPS AC INPUT
- ALL SILICON SEMICONDUCTORS
- TOP QUALITY COMPONENTS
- FIVE YEAR WARRANTY
- LOW COST...GENEROUS OEM DISCOUNTS

Power/Mate's IC power supplies are competitively priced units designed expressly for integrated circuit applications. Using open-chassis construction for economy, they contain all of the essentials for high reliability with no unnecessary extras. Components are of highest quality and industrially rated for long life. In addition, the IC 5/1, IC 5/5, and IC 5/10 are backed by the same 5-year warranty given all Power/Mate Corp. power supplies!

PRICE

IC 5/1—$88 IC 5/5—$128 IC 5/10—$158

SPECIFICATIONS:

INPUT VOLTAGE: 105-125 VAC, 47-420 CPS

OUTPUT VOLTAGE: 5.0 V + 2% adjustable

LINE REGULATION: ±0.1% or 8 MV for ±10% line chan s.

LOAD REGULATION: ±0.1% or 8 MV from full load to no-l d.

OPERATING AMBIENT TEMPERATURE: 0-55°C.

POLARITY: May be either positive, negative or floating (u o 300 Volts).

LOAD CURRENT: 1.0, 5.0, or 10.0 Amperes

RIPPLE: .01% or 1 MV (RMS)

OVERLOAD PROTECTION: Power supply cannot be dama d by current overloads. Overload trip point is adjuste y means of an internal potentiometer.

OVERVOLTAGE PROTECTION: Internal crow-bar protects x-ternal circuits against excessive output voltage. Crow r firing point is adjustable by means of an internal potenti n-eter. DC output is fused.

DIMENSIONS: 6"L x 5"W x 5½"H.

WEIGHT: 5¾ pounds net; 6¾ pounds shipping.

PMC POWER/MATE CORP.
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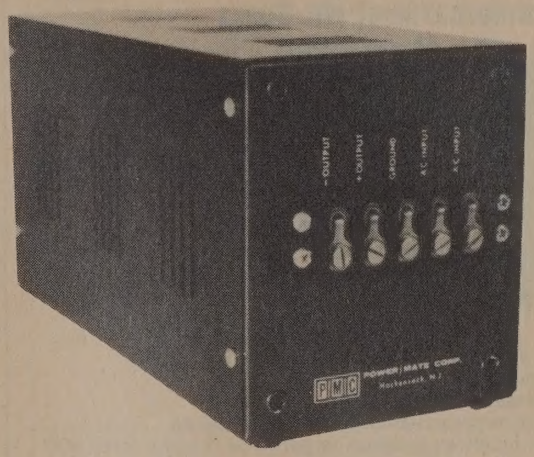
Phone (201) 343-6294/TWX 710-990-5023

PS Series FERRORESONANT REGULATED CPOWER SUPPLIES



ATIRES:

- ligh fficiency—70-90%
- ow ıst
- ligh eliability—over 150,000 hours MTBF
- thor circuit proof
- ligh uality components
- ul sicon semiconductors
- uilt limiting for over-voltage and over-current
-)pere in series parallel
- Jomtible with standard PMC Power Supplies and ccesories

FPSSeries units supply DC outputs from 5 to 48 lts, ith currents to 25 amps. The inherent simcity f design of these supplies greatly increases pir riability. Components are conservatively rated - funer assure optimum performance. All FPS its ay be used with the standard Power/Mate cks nd metered accessories.

An tra low ripple version is offered in which the tpuripple is reduced below that of standard FPS ode This is denoted by the suffix "F" after the odenumber (example: FPS 15-12F). The added teri increases the unit length by four inches. ise ze, FCF.

PEIFICATIONS:

CCLACY: ±2%, measured at 115 VAC, full load, 30C. Initial cold output is 1% higher.

EGUATION LINE: ±1%, for ±15 volt AC line variatio at 25-100% load. For loads below 25%, line reglation is +1.5% output change.

EGUATION LOAD: Refer to specific model on chart at ght.

TAEITY (8 hr.): 1% or 0.1V, whichever is greater.

EMIRATURE COEFFICIENT: 0.05%/C°.

IPU 115 VAC-., ±15 VAC-., 60Hz ±5% single phe. Input frequency variations produce an aproximate equal percentage output voltage chige.

MBNT OPERATING TEMPERATURE: —20°C to +°C.

TOFGE TEMPERATURE: —40°C to +85°C.

OOING: Convection.

UTIIT IMPEDANCE: 1 kHz-10 kHz: 0.05 ohms, 10kHz-100 kHz: 0.05 ohms +0.5 microhenries.

RAIIENT RESPONSE: (50-100% current) 50 milliseends.

VELOAD PROTECTION: Current limiting transfoner restricts short circuit current to safe value.

SOLTION VOLTAGE: 600 volts to chassis.

ERIS/PARALLEL OPERATION: Identical models, cabe paralleled for approximately double current (aow for 10% imbalance). Series operation to rad isolation.

CCSSORIES: Various PMC rack adapters and accesories are available. (PMC AR-525 and related sees of accessories.)

MODELS AND SPECIFICATIONS FPS SERIES

Model	DC Output Volts	DC Output Amps	Load Regulation Volt. Increase Full ½ Load	Load Regulation Volt. Increase Full ¼ Load	Ripple V. RMS	Net Weight Pounds	Case Size†	Price with Case	Price without Case
FPS 5-15	5	15	0.5	0.8	0.4	16	FC	$112	$100
FPS 5-15F	5*	15	0.7	1.2	0.04	22	FCF	165	155
FPS 5-25	5	25	0.5	0.8	0.4	18	FC	135	123
FPS 5-25F	5*	25	0.7	1.2	0.04	24	FCF	185	175
FPS 6-15	6	15	0.5	0.8	0.4	16	FC	112	100
FPS 6-15F	6*	15	0.7	1.2	0.04	22	FCF	165	155
FPS 6-25	6	25	0.5	0.8	0.4	18	FC	135	123
FPS 6-25F	6*	25	0.7	1.2	0.04	24	FCF	185	175
FPS 12-10	12	10	0.6	1.0	0.4	16	FC	112	100
FPS 12-10F	12*	10	0.9	1.4	0.02	22	FCF	165	155
FPS 12-15	12	15	0.6	1.0	0.4	18	FC	135	123
FPS 12-15F	12*	15	0.9	1.4	0.02	24	FCF	185	175
FPS 15-8	15	8	0.6	1.0	0.3	16	FC	112	100
FPS 15-8F	15*	8	0.9	1.4	0.02	22	FCF	165	155
FPS 15-12	15	12	0.6	1.0	0.3	18	FC	135	123
FPS 15-12F	15*	12	0.9	1.4	0.02	24	FCF	185	175
FPS 18-6.7	18	6.7	0.6	1.0	0.3	16	FC	112	100
FPS 18-6.7F	18*	6.7	0.9	1.5	0.01	22	FCF	165	155
FPS 18-10	18	10	0.6	1.0	0.3	18	FC	135	123
FPS 18-10F	18*	10	0.9	1.5	0.01	24	FCF	185	175
FPS 24-5	24	5	0.7	1.2	0.3	16	FC	112	100
FPS 24-5F	24*	5	1.2	2.0	0.005	22	FCF	165	155
FPS 24-8	24	8	0.7	1.2	0.3	18	FC	135	123
FPS 24-8F	24*	8	1.2	2.0	0.005	24	FCF	185	175
FPS 28-4.3	28	4.3	0.7	1.2	0.3	16	FC	112	100
FPS 28-4.3F	28*	4.3	1.3	2.1	0.05	22	FCF	165	155
FPS 28-7	28	7	0.7	1.2	0.4	18	FC	135	123
FPS 28-7F	28*	7	1.3	2.1	0.05	24	FCF	185	175
FPS 36-3.3	36	3.3	0.8	1.3	0.3	16	FC	112	100
FPS 36-3.3F	36*	3.3	1.5	2.4	0.005	22	FCF	165	155
FPS 36-5	36	5	0.8	1.3	0.4	18	FC	135	123
FPS 36-5F	36*	5	1.5	2.4	0.005	24	FCF	185	175
FPS 48-2.5	48	2.5	1.0	1.8	0.3	16	FC	112	100
FPS 48-2.5F	48*	2.5	1.7	2.9	0.003	22	FCF	165	155
FPS 48-4	48	4	1.0	1.8	0.3	18	FC	135	123
FPS 48-4F	48*	4	1.7	2.9	0.003	24	FCF	185	175

* Less 2% filter drop
† FC = 3¾W x 4 27/32H x 10⅝D (inches)
FCF = 3¾W x 4 27/32H x 14⅝D (inches)

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PMC RC & RD POWER SUPPLY MODULES

High performance/Meet MIL Specs

FEATURES:

- All silicon solid state circuitry • MIL T-27 Transformer • 85°C Capacitors
- 100,000 hours MTBF
- Short circuit proof
- And more! Check the regulation and current handling abilities.

SPECIFICATIONS:

Input—105-125V AC, 47-420 CPS
Output—See Specific Model rating
Regulation—See Specific Model rating
Ripple—Less than 4MV RMS for RC
Less than 8 MV for RD
Operating Ambient Temperature— —20° to +71°C
Storage Temperature— —55° to +85°C
Output Adjustment—Internal pot
Cooling—None required within specified ambients
Polarity—May be either positive, negative or floating up to 300 Volts
Overload Protection—Solid state short circuit protected, auto-reset
Mechanical—Housing 3¼" x 3¼" x 5" with standard octal plug for input-output

RC SERIES, all models $65 RD Series, all models $55

Model No.	Output Volts	Output Amps	Regulation ±% Line	Regulation ±% Load	Model No.	Output Volts	Output Amps	Regulation ±% Line	Regulation ±% Load
RC-5	3-7	1.0	0.3	0.7	RD-5	3-7	1.0	0.6	1.4
RC-9	7-11	1.0	0.1	0.3	RD-9	7-11	1.0	0.2	0.6
RC-12	11-13	1.0	0.075	0.1	RD-12	11-13	1.0	0.15	0.2
RC-15	13-16	0.5	0.075	0.1	RD-15	13-16	0.5	0.15	0.2
RC-19	16-21	0.5	0.075	0.1	RD-19	16-21	0.5	0.15	0.2
RC-24	21-26	0.5	0.075	0.1	RD-24	21-26	0.5	0.15	0.2
RC-28	26-31	0.5	0.06	0.1	RD-28	26-31	0.5	0.12	0.2
RC-34	31-37	0.5	0.05	0.1	RD-34	31-37	0.5	0.1	0.2
RC-40	37-43	0.5	0.05	0.1	RD-40	37-43	0.5	0.1	0.2
RC-48	43-50	0.5	0.05	0.1	RD-48	43-50	0.5	0.1	0.2

POWERTWIN-99 TRACKING OP-AMP SUPPLY

ELECTRICAL SPECIFICATIONS:

INPUT—105-125 V AC 50-40 single phase.
OUTPUT VOLTAGE — 12.0-1 DC, 0.400 amps (each out
REGULATION— ±0.05%.
RIPPLE—1.0 MV rms (max.)
TEMPERATURE COEFFICIEN Better than 0.01%/°C.
OVERLOAD PROTECTION—Unit will withstand direct sho cuit across either output to common or across + to — put terminals for an indefinite period without dama the supply.
OUTPUT CURRENT vs. TEMPERATURE—Each output is for 0.400 amperes at 50°C ambient and is derated lin to 0.300 amps at 71°C.
WEIGHT—Net 3¾ pounds, Shipping 4¾ pounds.

MILITARY SPECIFICATIONS:

Designed to meet the environmental requirements of M 5272 and RFI requirements of MIL-I-6181.
Mean-Time-Between Failures—In excess of 100,000 per MIL HDBK 217.
MIL-T-27 TRANSFORMERS

ACCESSORIES:

The POWERTWIN-99 may be readily converted to a bench dual output power supply for lab use simply by removin front panel barrier strip assembly on the standard mode replacing it with the lab adapter front panel. The supply also be converted back to the standard module type a time. No soldering is required. The Lab Adapter kit c complete with panel shown and four rubber mounting Model number LD-1. Price $14.50.
An octal plug output also may be installed in place o barrier strip. This is easily accomplished without solde Model number OP-1. Price $4.00.

RA & RB Series Power Modules

Regulation 0.05% or 0.5%
Voltages 0 to 400
Current Outputs to 25 Amps

All Silicon Semiconductors Throughout
All Units Rated For Continuous Duty at —20° To +71°C Ambient
Short Circuit Proof—May Be Shorted Indefinitely Without Damage
Automatic Overload And Short Circuit Recovery
No External Heat Sink Or Cooling Required Up To +71°C
MTBF—Over 100,000 Hours
All Components Accessible And Replaceable For Maintenance
Top Quality Components And Rugged Construction
All Power Supplies Subjected To Rigorous QC Inspections

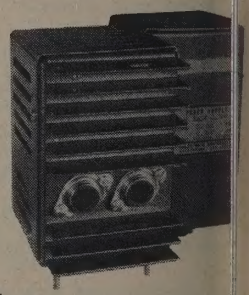
The RA and RB Series of modular power supplies provide regulated voltage outputs between 0 and 400 volts at output currents up to 25 amperes, at regulations of 0.05 or 0.5%, according to the model selected.

Silicon semiconductors are used exclusively in the power supply circuitry. This together with the internal heat sinking provided in the supply enables full load operation of the unit at ambient temperatures of 71°C without any additional cooling, heat sinking, and without derating.

The RA and RB Series power supplies are completely short circuit proof. The output may be short circuited indefinitely without damage. A unique circuit reduces the output current and voltage if the full load rating of the supply is exceeded. This not only protects the power supply, but serves to protect the load against further damage due to excessive current flow. The power supply automatically restores itself to normal operation after the short or overload is removed.

All components are accessible and replaceable in the field if required. All components are conservatively rated and are of the highest quality. For example, the electrolytic capacitors are 85°C types and the transformers are MIL-T-27 quality.

Connections at the connector permit either internal or remote adjustment of the output voltages. External connections also permit the remote sensing of the voltage directly at the load for improved overall load regulation on the RA Series.



SPECIFICATIONS:

Input—105-125V AC. 47-420 CPS.
Output—See Specific Model Listed
Regulation— ±0.05% or 2mv (whichever is greater) vs and load for RA Series; ±0.5% vs line and load fo Series
Ripple—Less than 0.002%, or 1mv RMS (whichever is gre for RA Series; 0.01% or 5mv RMS for RB Series
Response Time—50 Microseconds
Operating Ambient Temperature— —20° to +71°C
Temperature Coefficient—0.015%/°C or 1.8mv, whiche greater
Output Adjustment—Either internal or external as desired
Cooling—None required at specified ambients
Polarity—May be either positive, negative, or floating (300 volts)
Overload Protection—Solid state short circuit and ove protected, instantaneous recovery and automatic res
Mean Time Between Failures—100,000 hours typical, c lated according to MIL Handbook 217A
Military Specifications—Designed to meet the environm requirements of MIL-E-5272, and RFI requirements of I-6181

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A and RB Series Specifications

PMC

Output Current (Amps)	Case Size	0.05% Regulation Price	0.05% Regulation Model No.	0.5% Regulation Price	0.5% Regulation Model No.
0.375	R	$115	RA2- 0.375	$110	RB2- 0.375
0.750	R	120	RA2- 0.750	110	RB2- 0.750
1.5	R	150	RA2- 1.5	140	RB2- 1.5
3.0	RH	190	RA2- 3.0	180	RB2- 3.0
6.0	TH	230	RA2- 6.0	220	RB2- 6.0
12.0	2TH	325	RA2-12.0	315	RB2-12.0
25.0	4TH	425	RA2-25.0	415	RB2-25.0
0.375	R	70	RA4- 0.375	60	RB4- 0.375
0.750	R	85	RA4- 0.750	75	RB4- 0.750
1.5	R	105	RA4- 1.5	95	RB4- 1.5
3.0	RH	135	RA4- 3.0	125	RB4- 3.0
6.0	TH	180	RA4- 6.0	165	RB4- 6.0
12.0	2TH	255	RA4-12.0	240	RB4-12.0
25.0	4TH	360	RA4-25.0	345	RB4-25.0
0.375	R	70	RA6- 0.375	60	RB6- 0.375
0.750	R	85	RA6- 0.750	75	RB6- 0.750
1.5	R	105	RA6- 1.5	95	RB6- 1.5
3.0	RH	135	RA6- 3.0	125	RB6- 3.0
6.0	TH	180	RA6- 6.0	165	RB6- 6.0
12.0	2TH	275	RA6-12.0	260	RB6-12.0
25.0	4TH	405	RA6-25.0	390	RB6-25.0
0.200	R	65	RA8- 0.200	60	RB8- 0.200
0.375	R	80	RA8- 0.375	70	RB8- 0.375
0.750	R	95	RA8- 0.750	85	RB8- 0.750
1.5	R	105	RA8- 1.5	95	RB8- 1.5
3.0	RH	135	RA8- 3.0	125	RB8- 3.0
6.0	TH	190	RA8- 6.0	175	RB8- 6.0
12.0	2TH	280	RA8-12.0	265	RB8-12.0
25.0	4TH	415	RA8-25.0	400	RB8-25.0
0.200	R	65	RA10- 0.200	60	RB10- 0.200
0.375	R	80	RA10- 0.375	70	RB10- 0.375
0.750	R	95	RA10- 0.750	85	RB10- 0.750
1.5	R	105	RA10- 1.5	95	RB10- 1.5
3.0	RH	135	RA10- 3.0	125	RB10- 3.0
6.0	TH	195	RA10- 6.0	180	RB10- 6.0
12.0	2TH	290	RA10-12.0	275	RB10-12.0
25.0	4TH	425	RA10-25.0	410	RB10-25.0
0.200	N	65	RA12- 0.200	60	RB12- 0.200
0.375	N	85	RA12- 0.375	75	RB12- 0.375
0.750	R	95	RA12- 0.750	85	RB12- 0.750
1.5	R	115	RA12- 1.5	105	RB12- 1.5
3.0	RH	135	RA12- 3.0	125	RB12- 3.0
6.0	TH	200	RA12- 6.0	190	RB12- 6.0
12.0	2TH	290	RA12-12.0	275	RB12-12.0
25.0	4TH	440	RA12-25.0	425	RB12-25.0
0.100	N	65	RA14- 0.100	60	RB14- 0.100
0.200	N	75	RA14- 0.200	65	RB14- 0.200
0.375	N	85	RA14- 0.375	75	RB14- 0.375
0.750	R	100	RA14- 0.750	90	RB14- 0.750
1.5	R	125	RA14- 1.5	115	RB14- 1.5
3.0	TH	165	RA14- 3.0	155	RB14- 3.0
6.0	2TH	210	RA14- 6.0	195	RB14- 6.0
12.0	3TH	295	RA14-12.0	280	RB14-12.0
25.0	4TH	455	RA14-25.0	440	RB14-25.0
0.100	N	65	RA15- 0.100	60	RB15- 0.100
0.200	N	75	RA15- 0.200	65	RB15- 0.200
0.375	N	85	RA15- 0.375	75	RB15- 0.375
0.750	R	100	RA15- 0.750	90	RB15- 0.750
1.5	R	125	RA15- 1.5	115	RB15- 1.5
3.0	TH	165	RA15- 3.0	145	RB15- 3.0
6.0	2TH	210	RA15- 6.0	190	RB15- 6.0
12.0	3TH	310	RA15-12.0	290	RB15-12.0
25.0	5TH	455	RA15-25.0	440	RB15-25.0
0.100	N	65	RA16- 0.100	60	RB16- 0.100
0.200	N	75	RA16- 0.200	65	RB16- 0.200
0.375	N	85	RA16- 0.375	75	RB16- 0.375
0.750	R	105	RA16- 0.750	95	RB16- 0.750
1.5	R	125	RA16- 1.5	115	RB16- 1.5
3.0	TH	170	RA16- 3.0	150	RB16- 3.0
6.0	2TH	215	RA16- 6.0	200	RB16- 6.0
12.0	3TH	325	RA16-12.0	310	RB16-12.0
25.0	5TH	460	RA16-25.0	445	RB16-25.0
0.100	N	65	RA18- 0.100	60	RB18- 0.100
0.200	N	75	RA18- 0.200	65	RB18- 0.200
0.375	N	85	RA18- 0.375	75	RB18- 0.375
0.750	R	105	RA18- 0.750	95	RB18- 0.750
1.5	R	125	RA18- 1.5	115	RB18- 1.5
3.0	TH	170	RA18- 3.0	150	RB18- 3.0
6.0	2TH	230	RA18- 6.0	215	RB18- 6.0
12.0	3TH	335	RA18-12.0	320	RB18-12.0
25.0	5TH	460	RA18-25.0	445	RB18-25.0

Output Voltage Adjust Range	Output Current (Amps)	Case Size	0.05% Regulation Price	0.05% Regulation Model No.	0.5% Regulation Price	0.5% Regulation Model No.
19-22	0.100	N	$ 65	RA20- 0.100	$ 60	RB20- 0.100
	0.200	N	75	RA20- 0.200	65	RB20- 0.200
	0.375	N	85	RA20- 0.375	75	RB20- 0.375
	0.750	R	105	RA20- 0.750	95	RB20- 0.750
	1.5	R	125	RA20- 1.5	115	RB20- 1.5
	3.0	TH	170	RA20- 3.0	150	RB20- 3.0
	6.0	2TH	235	RA20- 6.0	220	RB20- 6.0
	12.0	3TH	340	RA20-12.0	325	RB20-12.0
	25.0	5TH	465	RA20-25.0	450	RB20-25.0
22-25	0.100	N	65	RA23- 0.100	60	RB23- 0.100
	0.200	N	75	RA23- 0.200	65	RB23- 0.200
	0.375	R	85	RA23- 0.375	75	RB23- 0.375
	0.750	R	110	RA23- 0.750	100	RB23- 0.750
	1.5	RH	130	RA23- 1.5	120	RB23- 1.5
	3.0	TH	175	RA23- 3.0	160	RB23- 3.0
	6.0	2TH	240	RA23- 6.0	225	RB23- 6.0
	12.0	3TH	345	RA23-12.0	330	RB23-12.0
	25.0	5TH	475	RA23-25.0	460	RB23-25.0
25-28	0.100	N	65	RA26- 0.100	60	RB26- 0.100
	0.200	R	75	RA26- 0.200	65	RB26- 0.200
	0.375	R	85	RA26- 0.375	75	RB26- 0.375
	0.750	R	110	RA26- 0.750	100	RB26- 0.750
	1.5	T	140	RA26- 1.5	130	RB26- 1.5
	3.0	TH	180	RA26- 3.0	165	RB26- 3.0
	6.0	2TH	255	RA26- 6.0	240	RB26- 6.0
	12.0	4TH	370	RA26-12.0	355	RB26-12.0
26.5-29.5	0.100	N	65	RA28- 0.100	60	RB28- 0.100
	0.200	R	80	RA28- 0.200	105	RB28- 0.200
	0.375	R	90	RA28- 0.375	70	RB28- 0.375
	0.750	R	115	RA28- 0.750	80	RB28- 0.750
	1.5	T	140	RA28- 1.5	130	RB28- 1.5
	3.0	TH	180	RA28- 3.0	170	RB28- 3.0
	6.0	2TH	255	RA28- 6.0	240	RB28- 6.0
	12.0	4TH	370	RA28-12.0	355	RB28-12.0
28-32	0.050	N	60	RA30- 0.050	60	RB30- 0.050
	0.100	N	70	RA30- 0.100	60	RB30- 0.100
	0.200	R	80	RA30- 0.200	70	RB30- 0.200
	0.375	R	90	RA30- 0.375	80	RB30- 0.375
	0.750	R	115	RA30- 0.750	105	RB30- 0.750
	1.5	T	140	RA30- 1.5	130	RB30- 1.5
	3.0	TH	185	RA30- 3.0	175	RB30- 3.0
	6.0	2TH	265	RA30- 6.0	250	RB30- 6.0
	12.0	4TH	380	RA30-12.0	365	RB30-12.0
32-36	0.050	N	60	RA34- 0.050	60	RB34- 0.050
	0.100	N	70	RA34- 0.100	60	RB34- 0.100
	0.200	R	85	RA34- 0.200	75	RB34- 0.200
	0.375	R	95	RA34- 0.375	85	RB34- 0.375
	0.750	R	115	RA34- 0.750	105	RB34- 0.750
	1.5	T	150	RA34- 1.5	140	RB34- 1.5
	3.0	TH	200	RA34- 3.0	190	RB34- 3.0
	6.0	2TH	285	RA34- 6.0	270	RB34- 6.0
	12.0	4TH	400	RA34-12.0	385	RB34-12.0
36-40	0.050	N	65	RA38- 0.050	60	RB38- 0.050
	0.100	N	75	RA38- 0.100	65	RB38- 0.100
	0.200	R	85	RA38- 0.200	75	RB38- 0.200
	0.375	R	100	RA38- 0.375	90	RB38- 0.375
	0.750	R	115	RA38- 0.750	105	RB38- 0.750
	1.5	T	160	RA38- 1.5	145	RB38- 1.5
	3.0	TH	215	RA38- 3.0	200	RB38- 3.0
	6.0	2TH	310	RA38- 6.0	295	RB38- 6.0
	12.0	4TH	450	RA38-12.0	435	RB38-12.0
40-45	0.050	N	70	RA42- 0.050	60	RB42- 0.050
	0.100	N	80	RA42- 0.100	70	RB42- 0.100
	0.200	R	90	RA42- 0.200	80	RB42- 0.200
	0.375	R	105	RA42- 0.375	95	RB42- 0.375
	0.750	T	120	RA42- 0.750	110	RB42- 0.750
	1.5	T	170	RA42- 1.5	160	RB42- 1.5
	3.0	TH	225	RA42- 3.0	210	RB42- 3.0
	6.0	2TH	315	RA42- 6.0	300	RB42- 6.0
	12.0	4TH	455	RA42-12.0	440	RB42-12.0
45-50	0.050	N	70	RA47- 0.050	60	RB47- 0.050
	0.100	N	80	RA47- 0.100	70	RB47- 0.100
	0.200	R	90	RA47- 0.200	80	RB47- 0.200
	0.375	R	105	RA47- 0.375	95	RB47- 0.375
	0.750	T	125	RA47- 0.750	115	RB47- 0.750
	1.5	T	170	RA47- 1.5	160	RB47- 1.5
	3.0	TH	230	RA47- 3.0	215	RB47- 3.0
	6.0	3TH	320	RA47- 6.0	305	RB47- 6.0
	12.0	5TH	465	RA47-12.0	450	RB47-12.0

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FOR VOLTAGES FROM 50 TO 400. AND DUAL POWER SUPPLIES (SERIES DRA & DRB), SEND FOR THE COMPLETE PMC RA AND RB SERIES CATALOG.

PMC BENCH PACS

23 different UniPower DC Laboratory Supplies, voltage & current regulated

FEATURES:

- High accuracy
- Regulation for **both** voltage and current
- Adjustable current limiting
- Five-way binding posts
- Concentric controls for coarse and fine voltage adjustment
- Constant voltage and/or constant current
- On/off switch
- AC indicator
- Easy-to-read dual meters
- Built-in short circuit protection
- Front panel remote sensing of output voltage (Models "E" thru "H")

You are sure to fill your lab and systems power supply ne s with Power/Mate Corp.'s economical new Bench Pac Ser . Twenty-three individual models cover from 0 to 60 volts d current up to 15 amps. The same field-proven designs d state-of-the-art solid-state silicon circuitry found in our wi y accepted UniPower Series and OEM Series power supplies p vide PMC Bench Pacs with maximum reliability. Thus, Be n Pacs carry Power/Mate's full five year warranty.

SPECIFICATIONS

INPUT: 105-125 Volts, 47-420 cps, single phase.

OUTPUT VOLTAGE AND CURRENT: See Respective Tables.

REGULATION:
Load: The regulation for load changes is less than .01% or 1 millivolt, whichever is greater from no load to full load.
Line: The regulation is less than 0.01% or 1 millivolt, whichever is greater, for a line change from 125V to 105V at constant load.

RIPPLE: Less than 250 microvolts.

TRANSIENT RESPONSE: For a ±10 Volt step change in line voltage or for a no load to full load, or a full load to no load step change, the output voltage will return to within 10 millivolts of the regulated region in less than 20 microseconds.

METERS: Voltmeter and ammeter, rated accurate to 2% of full scale value, are provided on the front panel.

POLARITY: The output may be "floated" up to 300V peak above ground. Either polarity may be grounded to chassis by means of terminals provided.

CONSTANT CURRENT/CONSTANT VOLTAGE: Constant current and constant voltage levels may be preset within the maximum rated voltage and current levels specified in appropriate tables. The intersection of the constant voltage and constant current operation lines called the "Crossover Point" may be located anywhere within the output volt-ampere range of the unit. Regardless of the demands of the load, the output voltage and/or the output current will never exceed the limits (1% or better) preset by the output voltage and output current controls.

CONTROLS
VOLTAGE: Continuously variable coarse and vernier DC OUTPUT ADJUST potentiometers on concentric shafts provide variable DC Output.
CURRENT: Continuously variable single turn potentiometer provides current limiting adjustment.

TEMPERATURE COEFFICIENT: Better than 0.01%/°C.

LONG TERM STABILITY: Better than 0.025% for 8 hours.

DUTY: Continuous at ambient temperatures from 0°C to 50 . Operation above 50°C is allowed provided the output c rent is derated 20% for every 10°C rise above 50°C.

REMOTE SENSING: Sensing terminals, separate from the C put terminals, provide sensing and load regulation agai t the voltage at the load rather than the voltage at the po r supply output terminals. This eliminates the otherwise avoidable load regulation due to the voltage drop in wires connecting the supply to the adjacent load.

REMOTE PROGRAMMING: The output voltage may be c trolled accurately from a remote point if desired by ins ing a resistance across the REMOTE PROGRAM termin . The sensitivity of this circuit is approximately 100 ohms volt.

PARALLELING: Two or more units may be operated in ser to provide higher voltage output at rated current. Units the same voltage and current ratings may be operated parallel.

PROTECTION: Load and power supply protection for any ov load condition is accomplished by an adjustable electro current limiting circuit controlled by a front panel pot tiometer.

MOUNTING: Unit is designed for bench operation. Howe Rack Adapters are available (see below).

AIRFLOW: All units are convection cooled and do not requ internal blowers or depend on internal forced air cooli

FINISH: Front panel is finished with dual tone grey and bla baked enamel. All other finishes are appropriate pai plating, or chemical film as required.

INSPECTION: MIL-Q-9858 Procedures.

ACCESSORIES

Bench Pacs can be rack mounted as required. Up to three Series "C," or two Series "D" power supplies will mount in a standard 19" rack, just 3½" high. Adapters available are: Model RK-118 for one or two Series "D." Price $22. Model RK-89 for one, two, or three Series "C." Price $22.

Consult factory for special systems configurations.

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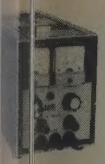
514 S. River Street • Hackensack, N.J. 07601
Phone (201) 343-6294/TWX 710-990-5023

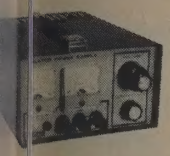
SAME DAY SHIPMEN

BENCH PACS PMC



"SERIES C" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8C	0-8	0-1.5	3⅜	5⅜	7¼	$ 89.00	6.5 lbs.
BP-18C	0-18	0-1.0	3⅜	5⅜	7¼	89.00	6.5 lbs.
BP-34C	0-34	0-.5	3⅜	5⅜	7¼	89.00	6.5 lbs.

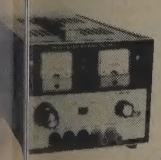


"SERIES D" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8D	0-8	0-4	3⅜	6⅞	7¼	129.00	8.0 lbs.
BP-18D	0-18	0-2.5	3⅜	6⅞	7¼	129.00	8.0 lbs.
BP-34D	0-34	0-1.5	3⅜	6⅞	7¼	118.00	8.0 lbs.
BP-60D	0-60	0-.750	3⅜	6⅞	7¼	129.00	8.0 lbs.

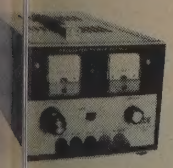
"SERIES E" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8E	0-8	0-6.5	5 3/32	5 3/32	9⅜	210.00	20.0 lbs.
BP-18E	0-18	0-3.5	5 3/32	5 3/32	9⅜	210.00	20.0 lbs.
BP-34E	0-34	0-2.5	5 3/32	5 3/32	9⅜	210.00	20.0 lbs.
BP-60E	0-60	0-1.25	5 3/32	5 3/32	9⅜	219.00	20.0 lbs.



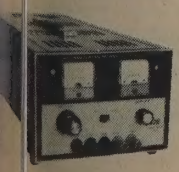
"SERIES F" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8F	0-8	0-9	5 3/32	7½	9⅜	235.00	25.0 lbs.
BP-18F	0-18	0-5	5 3/32	7½	9⅜	235.00	25.0 lbs.
BP-34F	0-34	0-3.5	5 3/32	7½	9⅜	235.00	25.0 lbs.
BP-60F	0-60	0-1.75	5 3/32	7½	9⅜	244.00	25.0 lbs.



"SERIES G" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8G	0-8	0-12	5 3/32	7½	11⅞	290.00	31.0 lbs.
BP-18G	0-18	0-6.5	5 3/32	7½	11⅞	290.00	31.0 lbs.
BP-34G	0-34	0-5	5 3/32	7½	11⅞	290.00	31.0 lbs.
BP-60G	0-60	0-2.5	5 3/32	7½	11⅞	299.00	31.0 lbs.



"SERIES H" BENCH PACS

Model	DC Output Volts	DC Output Amperes	Case Size Height	Case Size Width	Case Size Depth	Price	Shipping Weight
BP-8H	0-8	0-15	5 3/32	7½	16½	345.00	40.0 lbs.
BP-18H	0-18	0-9	5 3/32	7½	16½	345.00	40.0 lbs.
BP-34H	0-34	0-6.5	5 3/32	7½	16½	345.00	40.0 lbs.
BP-60H	0-60	0-3.25	5 3/32	7½	16½	359.00	40.0 lbs.

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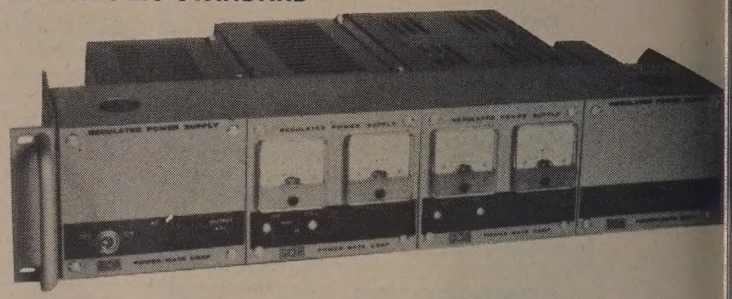
SAME DAY SHIPMENT

PMC RACKS AND ACCESSORIES

assemble your CUSTOM Power Supply system with PMC STANDARD modules, racks, and accessories



The "building block" approach to designing a custom power supply system provides a new dimension in design freedom for the engineer.

Now you can assemble a "special" power supply to fit your special application or system requirements with the wide assortment of STANDARD Power/Mate power supply modules, off-the-self mounting racks, metered and non-metered control panels, plus many other accessories.

In this way you get a "special" power supply, and you gain in reliability through the use of proven and industry-accepted STANDARD Power/Mate power supplies.

The economical, in-stock "building block" components and racks are shown below. They accommodate a variety of PMC modules in configuration in a standard 19" rack, 3½" high or 5¼" high, with five different styles. All are finished in durable, baked gray enamel, with predrilled and tapped holes, ready for easy assembly.

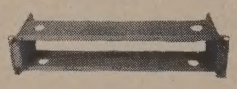
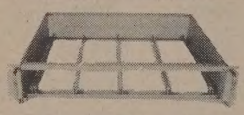
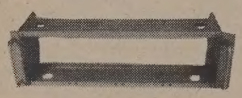
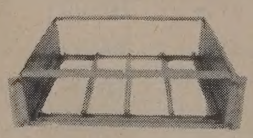
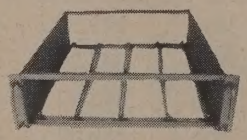
HOW TO ORDER

Determine the quantity of the various units you nee order them by Model Numbers shown below. Notice numbers ending in 35 represent the 3½" rack and ending in 525 indicate the 5¼" rack. In ordering me control panels, be sure to indicate meter ratings by a first the volt meter rating and then the ammeter rating the panel Model Number, i.e. CPM35-36-1.5 indicates a ter rack metered panel with a 0-36 voltmeter and a ammeter.

For further details, send for Power/Mate Corp.'s And Accessories Catalog (Form number 13-70).

POWER SUPPLY MODULE MOUNTING RACKS

*See description of CPM panels for complete ordering d
**These models to be used with adapter A-525-1.

	MOUNTING RACK TYPE AND DATA	RACKS FOR USE WITH	PANELS FOR US WITH
	**Model: AR-35** Price: **$40.00** Size: 19 x 3½ x 5¼	OEM ( ) A UNI76 OEM ( ) B UNI88 OEM ( ) C UNI30C OEM ( ) D UNI30D UNITWIN-164	P-35-1 P-35-2 P-35-4 CP35 CPM35-( )-( )*
	**Model: AR-35-14** Price: **$65.00** Size: 19 x 3½ x 14⅝	OEM ( ) A UNI76 OEM ( ) B UNI88 OEM ( ) C UNI30C OEM ( ) D UNI30D UNITWIN-164	P-35-1 P-35-2 P-35-4 CP35 CPM35-( )-( )*
	**Model: AR-525** Price: **$40.00** Size: 19 x 5¼ x 5 5/16	OEM ( ) A**UNI-76** OEM ( ) B**UNI-88** OEM ( ) C**UNI30C** OEM ( ) D**UNI30D** OEM ( ) E UNI30E OEM ( ) F UNI30F OEM ( ) G UNI30G OEM ( ) H UNI30H UNITWIN-164	P525-1 P525-2 P525-4 CP525 CPM525-( )-( )
	**Model: AR-525-14** Price: **$65.00** Size: 19 x 5¼ x 14⅝	OEM ( ) A**UNI-76** OEM ( ) B**UNI-88** OEM ( ) C UNI30C OEM ( ) D UNI30D OEM ( ) E UNI30E OEM ( ) F UNI30F OEM ( ) G UNI30G OEM ( ) H UNI30H UNITWIN-164	P525-1 P525-2 P525-4 CP525 CPM525-( )-( )
	**Model: AR-525-21** Price: **$75.00** Size: 19 x 5¼ x 21⅝	OEM ( ) A**UNI-76** OEM ( ) B**UNI-88** OEM ( ) C UNI30C OEM ( ) D UNI30D OEM ( ) E UNI30E OEM ( ) F UNI30F OEM ( ) G UNI30G OEM ( ) H UNI30H UNITWIN-164	P525-1 P525-2 P525-4 CP525 CPM525-( )-( )

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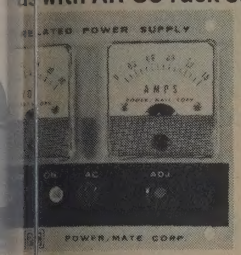
SAME DAY SHIPMEN

S AND ACCESSORIES (continued)

PMC

ELS

us with AR-35 rack series

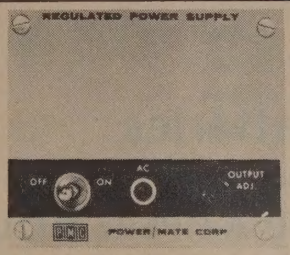


PM-35-( )-( ) Quarter rack metered nel with voltmeter and ammeter, on- , and AC indicator. Screw driver out- e adjust from front panel. On panel ut cable, AC fuse and output solder

ERS: 0-10, 18, 36, 50, 150 volts

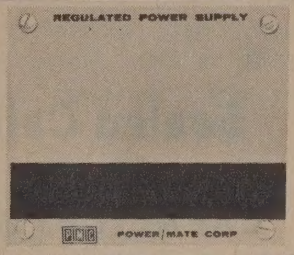
S: 0—.5, 1.5, 6, 15, 36 amps

Price $45.00



MODEL CP-35 Quarter rack control panel with same features as at left, with no meters.

Price $25.00



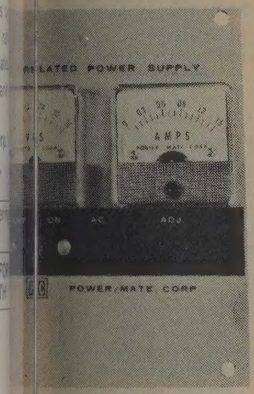
BLANK PANELS for use in AR-35 series racks. For filling spaces in front panel after selection of control panels, or for use in adding your own controls or instrumentation.

MODEL P-35-4 ¼ rack size blank panel — **Price $4.00**

MODEL P-35-2 ½ size blank panel — **Price $5.00**

MODEL P-35-1 Full size blank panel — **Price $7.50**

us with AR-525 rack series

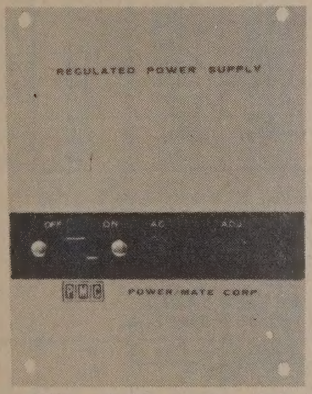


PM-525-( )-( ) Quarter rack metered anel with voltmeter and ammeter, on- , and AC indicator. Screwdriver out- ge adjust from front panel. On panel ut cable, AC fuse, and output solder

ERS: 0-10, 18, 36, 50, 150 volts full

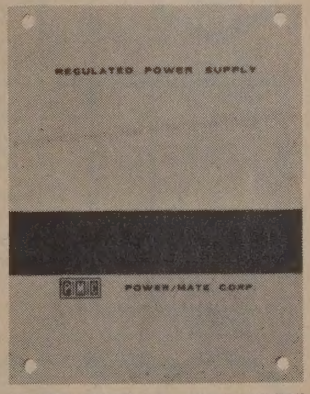
RS: 0—.5, 1.5, 6, 15, 36 amps full

Price $45.00



MODEL CP-525 Quarter rack control panel with same features as at left, with no meters.

Price $25.00



BLANK PANELS for use in AR-525 series racks. For filling spaces in front panel after selection of control panels, or for use in adding your own controls or instrumentation.

MODEL P-525-4 ¼ rack size blank panel — **Price $4.00**

MODEL P-525-2 ½ rack size blank panel — **Price $5.00**

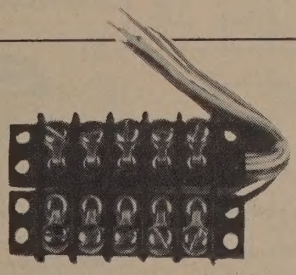
MODEL P-525-1 Full size blank panel — **Price $7.50**

ERVOLTAGE PROTECTOR

us on any Power/Mate power ply up to 34 amps. Self con- ed owbar type solid state unit. ep ent of power supply or type fail e. Output adjustable to trip we 3 and 60 volts. Trips within mic seconds.

nen ns 2⅞ x 3⅜ x 1

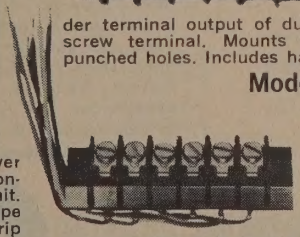
od OVP-2, Price $35.00



BARRIER STRIP ADAPTER

for use on UNI-TWIN-164 power supply. Adapts solder terminal output of dual supply to barrier strip screw terminal. Mounts directly on case in pre-punched holes. Includes hardware and cable.

Model BT-2, Price $8.00



BARRIER STRIP ADAPTER

for use on UNI-76 and UNI-88 power supplies. Adapts solder terminal output to screw type barrier strip terminals. Mounts directly on pre-punched holes in case. Includes hardware and cable.

Model BT-1, Price $4.00

Model AM35

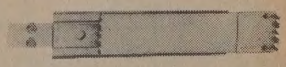
Module Adapter permits the use of up to four POWER/MATE style R, RH, or N case supplies on one AR35 Rack Adapter.

Price $8.00

ADAPTER

for MOUNTING type A, B, C & D cases in AR525 rack. Permits mounting 3½ inch height modules in 5¼ inch mounting space on AR525 rack. Permits complete intermixing of both 3½ and 5¼ inch supplies in this rack. Complete with hardware.

Model A525-1, Price $6.00 per pair



RACK SLIDE

for use with all Power/Mate Corp. racks. Feature quick disconnect and ball bearing action. Includes hardware for mounting.

Model CS-1, Price $45.00

PMC **POWER/MATE CORP.**
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SAME DAY SHIPMENT

Nickel - Cadmium

R E C H A R G E A B L E

by POWER INCORPORATED

Sealed Cells and Batteries

CAPACITIES UP TO 2000 AMPERE HOURS ON REQUEST

TYPICAL CYLINDRICAL CELLS (FIG. A) 1.2 VOLTS PER CELL

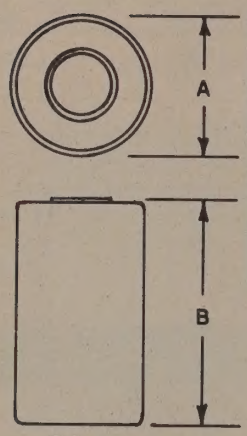


FIG. A

Type	Capacity mAH	Dimensions (in) A	Dimensions (in) B	Wt. oz.
170SC	170	0.625	0.600	0.4
250SC	250	0.542	1.209	0.6
500SC	500	0.554	1.920	1.0
600SC	600	0.625	1.920	1.0
750SC	750	1.020	0.910	1.1
1000SC	1000	1.000	1.280	1.1
1200SC	1200	.875	1.600	1.5
1800SC	1800	1.000	1.840	2.5
2000SC	2000	1.272	1.400	2.8
4000SC	4000	1.289	2.300	4.6
7000SC	7000	1.290	3.490	7.6
8000SC	8000	1.344	4.218	9.8

Oval cell also available (Fig. C) in 4000mAH, W-2.080 T-1.260 and H-1.656 Wt. .37 lbs.

All battery configurations available with pressure contact buttons or solder lug terminals.

TYPICAL BUTTON CELLS (FIG. B) 1.2 VOLTS PER CELL

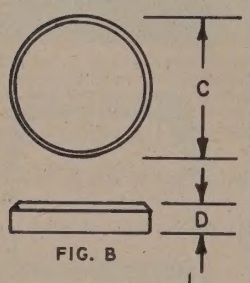


FIG. B

Type	Capacity mAH	Dimensions (in) C	Dimensions (in) D	Wt. oz.
20B	20	0.449	0.201	0.04
50B	50	0.606	0.230	0.09
100B	100	0.984	0.240	0.28
150B	150	0.984	0.260	0.30
180VBH*	180	0.984	0.290	0.39
225B	225	0.984	0.339	0.41
225BH*	225	0.984	0.347	0.44
250VBH*	250	1.340	0.210	0.58
400B	400	0.992	0.571	0.66
450B	450	1.689	0.299	1.10
500BH*	500	1.340	0.374	0.90
1000VBH*	1000	2.000	0.330	2.24
2000VBH*	2000	2.000	0.590	3.50
3000BH	3000	2.000	.976	5.00

*H denotes high rate discharge capability.

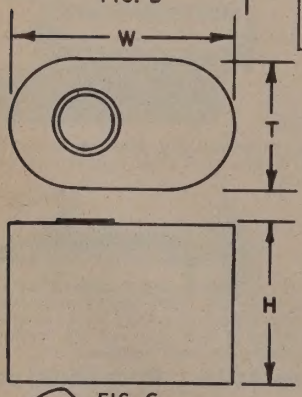


FIG. C

POWER INCORPORATED ALSO MARKETS:

Emergency lighting units.
Flashlight and lantern rechargeable batteries.
Custom and prototype design battery packs built to your specifications.
Battery chargers for all types of batteries.
Batteries - **NICKLE CADMIUM - SILVER CADMIUM - SILVER ZINC - MERCURY - SEALED LEAD-ACID.**

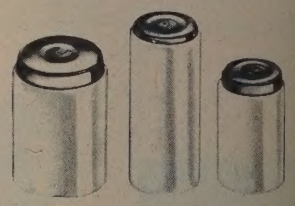
All cylindrical and oval battery typ feature a pressure safety device for sec rity and reliability making them especial suited for cordless consumer and ele tronic products.

CUSTOM BATTERY PACKS

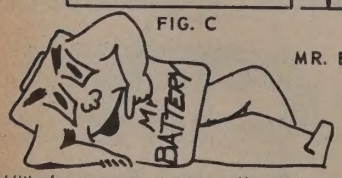
Cylindrical cells are incased in a rigi high impact case. Case materials a highly dielectric to provide maximum ce insulation at minimum cost. The case vented to each cell to provide cooling a long life. Packs are available to yo specifications in any voltage.

Button cell batteries are constructed sealed nickle cadmium button cells (s fig. B) to meet almost any applicati requirement. The compact size of butt cells permits easy stacking to form m tiple cell batteries of optimum powe volume ratio and space utilization. Co pletely sealed button cells are ideal suited for portable radios, flashlight photoflash, alarms, and any low-drai high capacity application.

TYPICAL BUTTON CELL BATTERIE



INVESTIGATE direct current emergen power sources available in any regulat voltage or current, featuring automatic SC solid state switchover to a self-contain battery. We have the answer to reliab economical D.C. power with automat emergency back-up.



MR. BATTERY SAYS: ®

"We have over 10,000 cell and battery sizes in stock. If you don't see exactly what you are looking for here, let us know, chances are we'll be able to take care of your application immediately. We'd be happy to answer any questions. If we can't help you, no one can."

POWER INCORPORATED

FOR COMPLETE SPECIFICATIONS, PRICE, AND DELIVERY, WRITE OR PHONE
POWER INC. • MARKETING DIVISION • 12809 Eagle Ridge Drive • Burnsville, Minnesota 55378 • (612) 890-1360

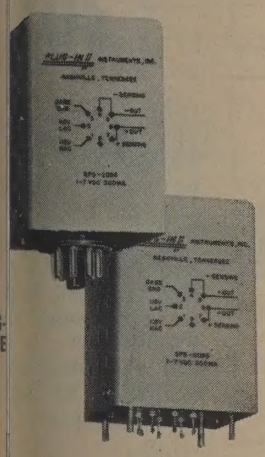
COMPARE...

Unequaled for low cost, accurate, dependable performance under widely varying load and environmental conditions, Plug-In Instruments' power supplies are ideally suited for all commercial, ground support and industrial applications where precise dc power is required for electronic equipment and instrument systems.

DESIGN FEATURES

- Adjustable Voltages: 1 to 28 vdc
- Current Ranges: 0 - 75 to 0 - 800 madc
- Excellent Regulation as Noted
- 0.1 ohm Output Impedance
- 105 to 125 vac 50 to 400 cps Power Required
- Transistorized — Repairable
- Electronic Overload Protection on Series "D" and "E"

EGULATED DC POWER SUPPLIES



SOLDER HEADER STYLE

LUG-TYLE

SIZ **A:** 2½" H x 1⁷⁄₁₆" W x 1⁷⁄₁₆" D
All silicon design

SIZ **B:** 3" H x 2" W x 2" D
Germanium design
Amb. temp.: 30 to 120 °F

SIZ **D:** 3⅛" H x 2¼" W x 2⅛" D
All silicon design
Amb. temp.: 20 to 130°F

SIZ **E:** 3¹⁵⁄₁₆" H x 2¼" W x 2⅛" D
All silicon design
Amb. temp.: 20 to 130°F

Model	DC Output Rating Volts	Curr. (ma)	Regulation Line	(mv dc) Load	Ripple (mv rms)	Temp. Coeff. (%/°F)	Size	Mounting	Price (1-9 Qty.)
PS-2077-P	9-13	0-50	3	6	1.5	0.02	A	Plug-In	$ 48.00
PS-2078-P	13-17	0-40	3	6	1.5	0.02	A	Plug-In	48.00
PS-2079-P	17-21	0-30	3	6	1.5	0.02	A	Plug-In	48.00
PS-2017-P	9	0-175	4	9	1	0.03	B	Plug-In	$ 51.00
PS-2010-P	12	0-175	6	12	1	0.03	B	Plug-In	51.00
PS-2018-P	15	0-125	6	12	1	0.03	B	Plug-In	51.00
PS-2019-P	18	0-100	7	14	1	0.025	B	Plug-In	51.00
PS-2047-P	20	0-100	6	12	1	0.025	B	Plug-In	51.00
PS-2020-P	22.5	0-90	4	12	1	0.025	B	Plug-In	51.00
PS-2011-P	24	0-90	5	12	1	0.025	B	Plug-In	51.00
PS-2021-P	28	0-80	6	14	1	0.025	B	Plug-In	51.00
NARROW ADJUSTMENT RANGE									
PS-2055-P PS-2055-S	1-6.5	0-300	15	5	1.5	0.03	D D	Plug-In Solder-Header	$ 68.00 70.00
PS-2056-P PS-2056-S	5-9	0-250	15	5	1.5	0.03	D D	Plug-In Solder-Header	68.00 70.00
PS-2057-P PS-2057-S	9-13	0-200	2	5	0.5	0.025	D D	Plug-In Solder-Header	61.00 63.00
PS-2058-P PS-2058-S	13-17	0-175	2	5	0.5	0.02	D D	Plug-In Solder-Header	61.00 63.00
PS-2052-P PS-2052-S	9-13	0-200	2	5	0.5	0.01	D D	Plug-In Solder-Header	73.00 74.00
PS-2062-P PS-2062-S	1-6.5	0-600 0-800	15	10	1.5	0.03	E E	Plug-In Solder-Header	72.00 74.00
PS-2072-P PS-2072-S	21-25	0-175 0-225	4	6	0.5	0.02	E E	Plug-In Solder-Header	68.00 69.00
WIDE ADJUSTMENT RANGE									
PS-2110-P PS-2110-S	10-20	0-200	15	15	1	0.02	E E	Plug-In Solder-Header	$ 69.00 70.00
PS-2111-P PS-2111-S	20-30	0-175	15	15	1	0.02	E E	Plug-In Solder-Heater	69.00 70.00
DUAL VOLTAGE OUTPUT									
PS-2073D-P PS-2073D-S	±12	0-75	3	6	1	0.025	D D	Plug-In Solder-Header	$ 83.00 84.00
PS-2074D-P PS-2074D-S	±15	0-65	5	6	1	0.02	D D	Plug-In Solder-Header	83.00 84.00
PS-2121-P PS-2121-S	±15	0-150	5	10	1.5	0.020	E E	Plug-In Solder-Header	102.00 104.00

WRITE TODAY FOR DETAILED INFORMATION ON OTHER MODELS OF DC POWER SUPPLIES

ROSEMOUNT PLUG-IN, INC.

MANUFACTURED BY
• P. O. BOX 107 • NASHVILLE, TENNESSEE 37210

A6 5/244-1330

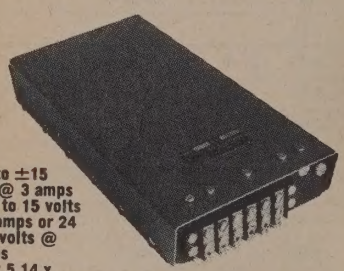
Prices and Specifications Subject to Change Without Notice.
TLX: 55-4349

TWX-810-371-1699

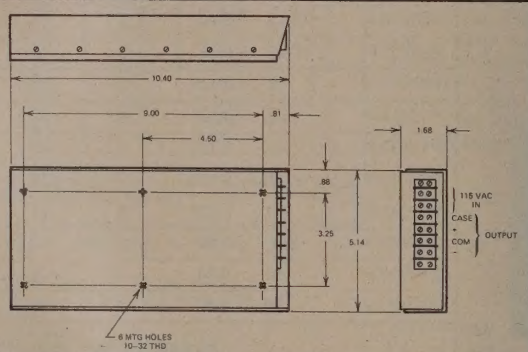
RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

Miniature Power Converter for Analog and Memory Applications:

Mode 301



±12 to ±15 volts @ 3 amps or 12 to 15 volts @ 6 amps or 24 to 30 volts @ 3 amps
1.60 x 5.14 x 10.6 inches, 94 cubic inches



FEATURES

- 90 watts in 94 inches
- Dual outputs
- High Efficiency Cir
- Fast Transient Res
- Current Limited, Sh Circuit Proof
- Multiple Output Ch
- Completely RFI filt
- 115 VAC input

DESCRIPTION

The RO 300 series is designed specifically for analog and memory circuit application. In this single unit, there is a large choice of output voltages, dual and single, at full output power. This amazing flexibility is coupled with RO's high efficiency circuitry utilizing 20 KHz techniques, re in extremely small size. These units supplement the F series for digital applications.

SPECIFICATIONS

DC Outputs
*A. ±12 to ±15 VDC @ 3A each side or B. 12 to 15 VDC @ 6A or C. 24 to 30 VDC @ 3A

*All outputs available by choice of connection. When using both plus and minus outputs at same time, any combination of 6 amps can be taken from both polarities.

Input
103 to 130 VAC, 50 to 1000 Hz (Also 115 to 170 VDC)

Efficiency
65% typical at ±15 VDC at ±3 amps output

Regulation
±0.01% for ±10% change in line 0.1% zero to full load, + and − tracking

Ripple and noise
Less than 500 microvolts RMS Less than 10 millivolts peak to peak

Transient response
For no load to full load switching, recovery is less than 20 microseconds ,and peak excursions are less than 200 mv typical

Protection
Power supply is protected against continuous overlo short circuit conditions, by electronic current limit ci

Temperature stability
Better than .015%/°C

Cooling
Unit will provide full output with **no** (air or cond cooling up to an ambient of 30°C.
Full output is obtainable if base plate is maintained a

Operating temperature
−20° to +75°C (see above cooling spec.)

Size
5.26″ x 10.6″ x 1.69″ (94 cubic inches)

Mounting
Mounting on 5″ x 10″ surface with 6 threaded size 10-32

Weight
3 lbs.

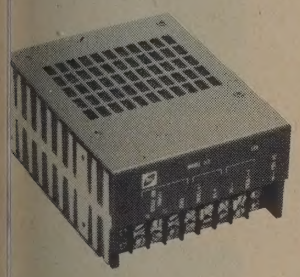
Price $350.00.

Delivery Stock to 60 days.

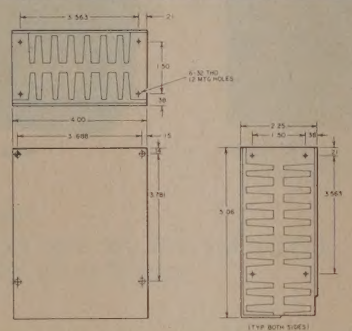
RO
SSOCIATES
05 HAVEN AVE.
O PARK
LIFORNIA 94025

Miniature Power Converters for Digital I.C. and Analog Circuits:

200 Series



20 SERIES



FEATURES

- 55 watts in 45 cubic inches
- 5 1/16" x 4" x 2 1/4", weighs 2 lbs.
- Multiple outputs
- 70% efficiency
- Fully protected
- 20 KHz operation, no audible noise
- RFI filtered
- 110VAC INPUT
- 48VDC INPUT AVAILABLE

COMMON SPECIFICATIONS

INPUT
105 to 130 VAC, 50 to 1000 Hz or 160 VDC ±10%
48 VDC input available.

Protection
All outputs current limited, continuous overload and short circuit proof. 5 volts outputs have self recovering overvoltage protection set at 6.8 to 7 volts, no overvoltage protection on other outputs.

Temperature Stability
Better than 0.01%/°C

Cooling
Maximum mounting base temperature for full output is 85°C. For no (air or conductive) cooling, max. ambient temperature of 30°C for full output. Derate linearly to 60% power at 60°C ambient and no cooling.

Operating Temperature
−20°C to +85°C

Remote Sensing
On model 210 only

MTBF
Over 100,000 hours calculated in accordance with MIL-HDBK-217A

Size
5 1/16" x 4" x 2 1/4", 45 cubic inches

Weight
2 pounds

Mounting
Mouting available on 3 sides by 4, #6-32 tapped inserts

Model	DC Out - Volts, DC	Amps	Regulation		Ripple & Noise	Price 1 - 99
			Load*	Line ±10%		
210	3.5 to 5.5 adj.	10A	0.1% or 5 mv	±0.1%	25 mv p-p	$225.00
211	(A) 4.5 to 5.5 adj. (B) 24	5A 1A	0.2% 0.2%	±0.1% ±0.05%	25 mv p-p 25 mv p-p	$265.00
212	(A) 4.5 to 5.5 adj. (B) 200V	5A 25 ma	0.2% 1%	±0.1% ±0.5%	25 mv p-p 1% p-p	$265.00
213	(A) 4.5 to 5.5 adj. (B) ±15	5A 400 ma each side	0.2% 0.1%	±0.1% ±0.05%	25 mv p-p 20 mv p-p	$325.00
250	12 to 15 adj.	3A	0.2%	±0.02%	30 mv p-p	$245.00
251	24 to 28 adj.	2A	0.2%	±0.02%	30 mv p-p	$245.00

* LOAD REGULATION is from 0.5 A to F.L. on all 5 volt outputs, 0 to F.L. on all other outputs, from 0 to 0.5 A on 5 volt output regulation is better than 1%.

RO ASSOCIATES, Incorporated / 3705 Haven Ave. / Menlo Park, California 94025 / (415) 322-5321 / TWX 910-378-5929

RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

Low Cost Modular and Bench Supplies:

FOR ANALOG and DIGITAL SYSTEMS

500 Series

FEATURES

Single output and
Dual output, 3 wire tracking
Current limited
Adjustable voltage
All system voltages
Low cost bench supplies
Universal mounting

500 SERIES

500X SERIES

5 VOLTS, 2.5 AMPS LOGIC SUPPLY FOR $59.00

COMMON SPECIFICATIONS

Input
105-125 VAC, 50 to 400 Hz

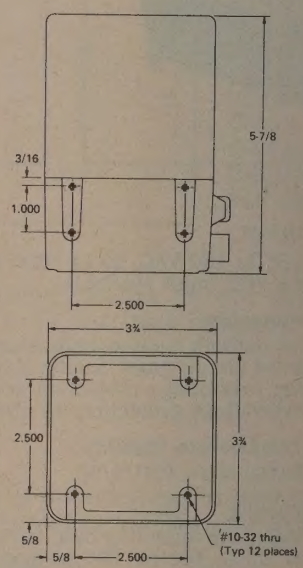
Ambient Temperature
0 to 55°C; Derate to 70% Power @ 70°C

Protection
Current Limited, Short Circuit Proof

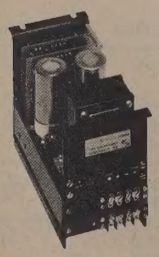
Controls
Includes Voltage Adjust Pot. Dual Outputs Adjust With One Pot.

Model	Volts	Current	Ripple p-p	Regulation Line ±10%	Regulation Load 0 - FL	Stability %/°C & 24 hours	Wt. lbs.	Price
506	±12 to ±24	150 ma	< 2 mv	0.03%	0.15%	0.02%	2.0	$95.00
513	±21 to ±28	300 ma	<10 mv	0.1%	0.3%	0.03%	2.8	98.00
514	±12 to ±15	500 ma	< 1 mv	0.02%	0.02%	0.01%	2.8	99.00
515	±24	60 ma	<10 mv	0.2%	0.2%	0.2%	1.8	49.00
516	150-200 v adj.	40 ma	0.2 v	0.5%	1.0%	0.05%	2.5	85.00
517*	5 ±0.5	2.5 A	< 5 mv	0.03%	0.2%	0.03%	2.8	59.00*
518	12 to 15	1.0 A	<10 mv	0.03%	0.2%	0.03%	2.8	59.00
519	24 to 28	0.5 A	<10 mv	0.03%	0.2%	0.03%	2.8	59.00

* Includes overvoltage crowbar
For Bench Model shown above add suffix X and add $15.00 to price.



ULTRA STABLE, 0.02% REGULATED SYSTEM POWER SUPPLIES FOR ANALOG SYSTEMS



FEATURES

Excellent Regulation
Completely Protected
Low Ripple
Remote Sensing
Programmable
Adjustable Voltage

SPECIFICATIONS

Input
105 - 125 VAC. 45 to 440 Hz

Regulation
±0.01%, for ±10% input change 0.02%, zero to full loa

Protection
Current limit, short circuit proof

Temperature
−20° to +70°C operating

Stability
Less than 0.02% per day or per degree C

Ripple
Less than 1 mv P-P

Application	Model	Volts	Amps	Price
Dual analog system	504	3 to 32 v	1 A each channel	$230.00
12 volt system	508	11 to 15 v	4 A	$199.00

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600 Series

System Power Supplies for Digital I.C. Systems:

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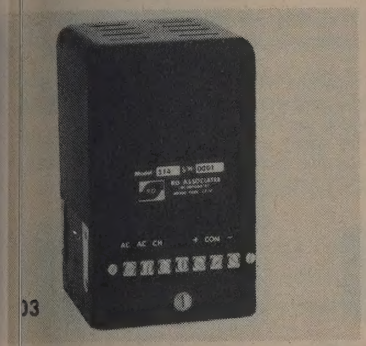
MENLO PARK
CALIFORNIA 94025

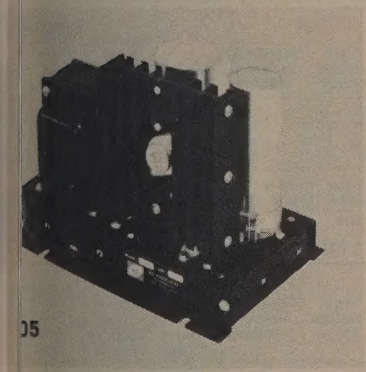


03

FEATURES

- Excellent Transient Response
- Low Line and Load Regulation
- Adjustable Voltage
- Current Limit Short Circuit Protection
- High Speed Crow Bar Overvoltage Protection
- Convection Cooled

LOW COST
2.5 TO 25 AMP
FROM $59.00



05

SPECIFICATIONS

DC output
4.5 to 5.5 volts adj (3.6 volt models available) 2.5 to 25 amps

Input
105 to 125 VAC, 45 to 440 Hz

Regulation
±0.1% for ±10% change in input voltage less than 0.25% for zero to full load change

Ripple and Noise
Less than 1 mvpp (603 has 4 mvpp max)

Transient response
125 mv for 30 μsec for change of half-load to full-load current or vice versa. 250 mv for 30 μsec for change of no-load to full-load current or vice versa.

Power supply protection
Current limited at 120% of rated load: short circuit proof

Cooling
By convection, no forced air required

Operating Temperature
−25° to +55°C, to +70°C at 80% current

Load protection
Optional fast response crow bar, will not exceed adjustable trip point voltage for transients with rise times slower than 0.2 volt/μsec

Will not exceed static trip point volts for more than 200 nanoseconds for step function over-voltage

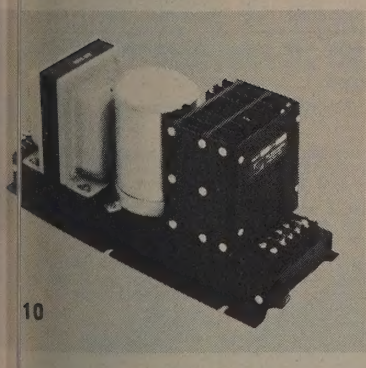
Remote Sensing
Sensing terminals provided to enable specific regulation directly at load

Stability
Output voltage changes less than 0.05% over a 24 hour period after warm up

Temperature coefficient
Output voltage changes less than 0.05%/°C over −25° to +55°C ambient

Output impedance
See regulation and transient response specifications

Controls
Built in potentiometer adjusts output voltage ±10% with resolution of 15 mv



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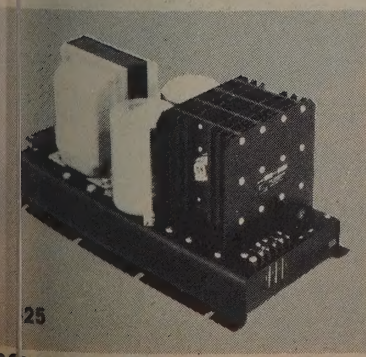

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Model	Volts	Amps	Price	Crow Bar Option	Size
603	5 ±0.5	2.5	$ 59.00	included	3¾″ x 3¾″ x 5.8″
605	5 ±0.5	7.0	125.00	$18	5″ x 5.8″ x 7.6″
610	5 ±0.5	12	139.00	18	5″ x 5.8″ x 13.2″
625	5 ±0.5	25	204.00	18	7.5″ x 8″ x 15″

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SOLA ELECTRIC SB

DIVISION OF SOLA BASIC INDUSTRIES

SOLATRON® ±½% LINE VOLTAGE REGULATORS

What It Is

The Solatron® LVR is the first regulator to combine in one unit the qualities of **fast response, "tight" voltage regulation, no moving parts, adjustable output, remote sensing, compactness, and high KVA capacity.**

The Solatron is a solid-state device with no moving parts, requiring no adjustment, maintenance, or attention. It combines the ruggedness typical of transformers with the light weight of electronic control circuitry, resulting in a regulator of remarkable compactness. It has great versatility in mounting, and installation.

Solatron® regulators are available as standard units in KVA ranges from ½ to 500 KVA, and yet they furnish a degree of regulation associated in the past with small VA capacity constant-voltage transformers and power supplies.

Units are available for single or three-phase applications, for either delta or wye connection depending on the service available or the load requirements of your equipment.

And What It Does

Regulation: ±0.5% for line changes. ±1% maximum for any combination of line, load, temperature and frequency changes within limits listed below.

Variation limits: line ±10%, or + 10%/—20%. Frequency 57-63 cycles, 47-53 cycles, or 380-420 cycles depending on model chosen (see catalog listings). Load zero to full load. Temperature 15° to 40°C.

Response: correction begins in first ½ cycle and is typically 100% complete in less than 10 cycles of the AC frequency.

Harmonic content: no harmful wave-form distortion.

Adjustable output: output voltage is adjustable ±10% of nominal output voltage.

No maintenance: contains no relays, switches, contacts, solenoids, tap, bearings, or other moving parts. No drive motors, servos, or hand cranks. Requires no maintenance: operates completely unattended.

Current capability: withstands high inrush load currents and momentary overloads.

Motor loads: will handle inrush starting current without serious voltage collapse; provides adequate starting torque; no necessity to oversize KVA rating.

Mounting flexibility: may be mounted on wall, floor, or in equipment being regulated. Large terminal compartment, stud or screw-type terminals, knockouts for ease of wiring and installing.

Remote sensing: sensing leads easily connected to load for remote location of Solatron® LVR or for line drop compensation where desired.

SINGLE-PHASE (60 Hz ±3 Hz)

Maximum Output KVA Rating 1	Nominal Output Voltage 2	Output Voltage Adjustability 3	Input Voltage Range 4	Maximum Harmonic Content 5	Catalog Number	Approx. Shipping Weight	Suggested User Price F.O.B. Factory
.5	120	108-132	±10%	3%	31-16-150	30	311.85
.5	120	108-132	+10/—20%	5%	33-16-150	40	340.20
.5	240	216-264	±10%	3%	31-26-150	30	311.85
.5	240	216-264	+10/—20%	5%	33-26-150	40	340.20
1	120	108-132	±10%	3%	31-16-210	40	334.50
1	120	108-132	+10/—20%	5%	33-16-210	58	374.20
1	240	216-264	±10%	3%	31-26-210	40	334.50
1	240	216-264	+10/—20%	5%	33-26-210	58	374.20
2	120	108-132	±10%	3%	31-16-220	55	374.20
2	120	108-132	+10/—20%	5%	33-16-220	100	498.95
2	240	216-264	±10%	3%	31-26-220	55	374.20
2	240	216-264	+10/—20%	5%	33-26-220	100	498.95
3	120	108-132	±10%	7% 6	31-16-230	78	464.95
3	120	108-132	+10/—20%	5%	33-16-230	130	555.65
3	240	216-264	±10%	7% 6	31-26-230	78	464.95
3	240	216-264	+10/—20%	5%	33-26-230	130	555.65
5	120	108-132	±10%	7% 6	31-16-250	100	532.95
5	120	108-132	+10/—20%	5%	33-16-250	185	680.40
5	208	188-228	+10/—20%	5%	33-06-250	185	680.40
5	240	216-264	±10%	7% 6	31-26-250	100	532.95
5	240	216-264	+10/—20%	5%	33-26-250	185	680.40
5	277	250-304	+10/—20%	5%	33-36-250	185	680.40
5	480	432-528	±10%	7% 6	31-46-250	100	532.95
5	480	432-528	+10/—20%	5%	33-46-250	185	680.40
7.5	120	108-132	±10%	7% 6	31-16-275	132	612.35
7.5	120	108-132	+10/—20%	5%	33-16-275	275	827.80
7.5	208	188-228	+10/—20%	5%	33-06-275	275	827.80
7.5	240	216-264	±10%	7% 6	31-26-275	132	612.35
7.5	240	216-264	+10/—20%	5%	33-26-275	275	827.80
7.5	277	250-304	+10/—20%	5%	33-36-275	275	827.80
7.5	480	432-528	±10%	7% 6	31-46-275	132	612.35
7.5	480	432-528	+10/—20%	5%	33-46-275	275	827.80
10	120	108-132	±10%	7% 6	31-16-310	170	680.40
10	120	108-132	+10/—20%	5%	33-16-310	310	918.55
10	208	188-228	+10/—20%	5%	33-06-310	310	918.55
10	240	216-264	±10%	7% 6	31-26-310	170	680.40
10	240	216-264	+10/—20%	5%	33-26-310	310	918.55
10	277	250-304	+10/—20%	5%	33-36-310	310	918.55
10	480	432-528	±10%	7% 6	31-46-310	170	680.40
10	480	432-528	+10/—20%	5%	33-46-310	310	918.55
15	120	108-132	±10%	7% 6	31-16-315	275	850.50
15	120	108-132	+10/—20%	5%	33-16-315	400	1088.65
15	208	188-228	+10/—20%	5%	33-06-315	400	1088.65
15	240	216-264	±10%	7% 6	31-26-315	275	850.50
15	240	216-264	+10/—20%	5%	33-26-315	400	1088.65
15	277	250-304	+10/—20%	5%	33-36-315	400	1088.65
15	480	432-528	±10%	7% 6	31-46-315	275	850.50
15	480	432-528	+10/—20%	5%	33-46-315	400	1088.65
25	120	108-132	±10%	7% 6	31-16-325	400	1020.60
25	120	108-132	+10/—20%	5%	33-16-325	520	1445.85
25	208	188-228	+10/—20%	5%	33-06-325	520	1445.85
25	240	216-264	±10%	7% 6	31-26-325	400	1020.60
25	240	216-264	+10/—20%	5%	33-26-325	520	1445.85
25	277	250-304	+10/—20%	5%	33-36-325	520	1445.85
25	480	432-528	±10%	7% 6	31-46-325	400	1020.60
25	480	432-528	+10/—20%	5%	33-46-325	520	1445.85
37.5	120	108-132	±10%	8% 6	31-16-337	525	1247.40
37.5	240	216-264	±10%	8% 6	31-26-337	525	1247.40
37.5	480	432-528	±10%	8% 6	31-46-337	525	1247.40
50	120 9	114-126	±10%	9%	31-16-350-5	1050	2086.55 10
50	240 9	228-252	±10%	9%	31-26-350-5	1050	2086.55 10
50	480 9	456-504	±10%	9%	31-46-350-5	1050	2086.55 10
75	120 9	114-126	±10%	9%	31-16-375-5	1625	2613.85 10
75	240 9	228-252	±10%	9%	31-26-375-5	1625	2613.85 10
75	480 9	456-504	±10%	9%	31-46-375-5	1625	2613.85 10
100	120 9	114-126	±10%	9%	31-16-410-5	1900	3129.85 10
100	240 9	228-252	±10%	9%	31-26-410-5	1900	3129.85 10
100	480 9	456-504	±10%	9%	31-46-410-5	1900	3129.85 10
150	120 9	114-126	±10%	9%	31-16-415-5	2200	3747.65 10
150	240 9	228-252	±10%	9%	31-26-415-5	2200	3747.65 10
150	480 9	456-504	±10%	9%	31-46-415-5	2200	3747.65 10

Other Capacities available on order from factory. Contact your nearest Sola Electric distributor or representative. (6 to 8 week delivery).
NOTE: 50Hz units are also available.

THREE-PHASE DELTA (60 Hz ±3 Hz)

Maximum Output KVA Rating 1 11	Nominal Output Voltage 2	Line-to-Line Output Voltage Adjustability	Input Voltage Range	Maximum Harmonic Content	Catalog Number	Approximate Shipping Weight	Suggested User Price F.O.B. Factory
13	208△	188-228	+10/—20%	5%	39-09-313	905	2239.65
17	208△	188-228	+10/—20%	5%	39-09-317	1045	24[illegible].45
26	208△	188-228	+10/—20%	5%	39-09-326	1300	2948.40
43	208△	188-228	+10/—20%	5%	39-09-343	1645	3912.30

Other Capacities available on order from factory. Contact your nearest Sola Electric distributor or representative. (6 to 8 week delivery).
NOTE: 50Hz units are also available.

THREE-PHASE WYE (60 Hz ±3 Hz)

Maximum Output KVA Rating 1	Nominal Output Voltage 2	Line-to-Neutral Output Voltage Adjustability 3	Input Voltage Range 4	Maximum Harmonic Content 5	Catalog Number	Approximate Shipping Weight	Suggeste User Price F.O.B. Factory
15	208/120 Y	108-132	+10/—20%	5%	39-06-315	695	1842.75
30	208/120 Y	108-132	+10/—20%	5%	39-06-330	1045	2483.45
45	208/120 Y	108-132	+10/—20%	5%	39-06-345	1300	2948.40

Other Capacities available on order from factory. Contact your nearest Sola Electric distributor or representative. (6 to 8 week delivery).
NOTE: 50 Hz units are also available.

FOOTNOTES

1. At unity power factor and nominal output voltage. Although the KW efficiency is greater than 90%, the VA efficiency under worst-condition operation can be 60% for +10/—20% input voltage range units.
2. The output voltage regulation is ±0.5% for line voltage changes or ±1% for any combination of line voltage, frequency, load or temperature changes within the limits specified.
3. The output voltage adjustability is accomplished by an internal multi-turn potentiometer. Regulation in accordance with note (2) will be maintained at any output voltage setting within the specified adjustable range.
4. The input voltage range (either ±10% or +10/—20%) is based on the output voltage setting. The output voltage is adjustable ±10% of the rated nominal output by means of an internal multi-turn potentiometer. Therefore, the input voltage range shifts lineally with the setting of this control.
5. Maximum additive RMS harmonic content at nominal frequency.
6. 3% maximum additive RMS harmonic content may be obtained by using an auxiliary harmonic filter. See selection chart A.
7. 3% maximum additive RMS harmonic content may be obtained by using three auxiliary harmonic filters (one each line-to-neutral). See selection chart B.
8. 3% maximum additive RMS harmonic content may be obtained by using three auxiliary harmonic filters (one each line-to-line). See selection chart C.
9. Special sensing circuit filters must be ordered when feeding a rectified load. These are furnished at no additional charge.
10. F.O.B. Goldsboro, North Carolina. All other units are F.O.B. Elk Grove Village, Illinois.
11. The lowest line-to-line load should not be less than 70% of the highest line-to-line load, and the highest line-to-line load equal to, or less than, ⅓rd of the three-phase delta nameplate KVA rating. Additionally, the lowest line current should not be less than 90% of the highest line current.

EOLA® CVDC power supplies, available off-the-shelf.

Sol offers a wide range of CVDC type power supplies whi are available from stock of your local electronic par distributor or the factory. These standard desig are available in any quantity and are the result of Sla custom engineering efforts.

Inherently highly reliable, the CVDC supplies are rugedly built and use simple circuitry. Fast and dependable regulation, current limiting, and high efficiency are provided by the heart of the supply: the famus Sola Constant Voltage Transformer.

CHARACTERISTICS

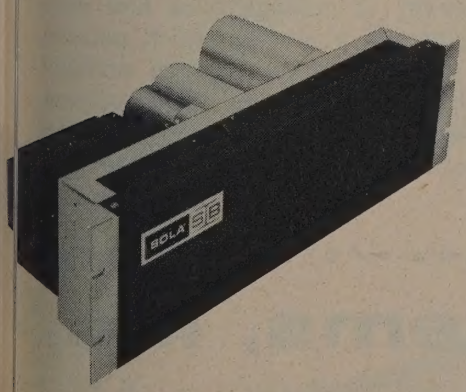
- Fst, dependable line-voltage regulation: within ±1% f fluctuations of ±15%; voltage will return to regul on envelope in approximately 50 milliseconds.
- Lad regulation: from 1/2% to 8%, one half to full lad.
- Atomatic current limiting: short circuit protection; vhstands load faults; high overloads cannot damage pwer supply or equipment components.
- Hgh efficiency: upwards of 75%; low input-power rquirements.
- Snplified operation: no adjustments or maintenance; cntinuous duty.
- Cnvection cooling.
- Fple: 1% rms maximum.
- Ambient operating temperature: 50° C maximum.

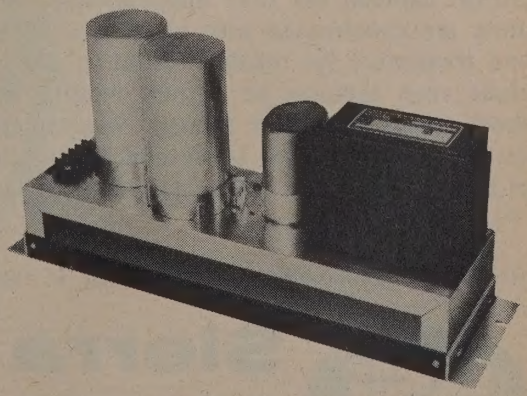
Constant-voltage Sola transformer provides ±1% regulation for line voltage variations as great as ±15%, serves as the heart of CVDC power supplies for voltage-sensitive equipment.

STANDARD CVDC MODELS

(fixed output for pulse, variable, intermittant and fixed loads-Inputs 100-130 volts, 60Hz)

CATALOG NO.	OUTPUT RATINGS VOLTS	AMPS	VA	PANEL HT.	WT. LBS.	PRICE 1-4
281513-2	6	10	60	3½	27	$115.50
282123	6	15	90	5¼	38	126.50
281514-2	12	5	60	3½	18	115.50
282124	12	10	120	5¼	31	132.00
281515-2	18	5	90	3½	20	121.00
282125	18	10	180	5¼	45	159.50
281024-1	24	6	144	5¼	30	115.50
282126	24	10	240	5¼	48	137.50
281203	24	15	360	8¾	64	170.50
282127	24	25	600	7	72	222.20
28626-1	28	8	224	5¼	42	132.00
282128	28	15	420	7	55	214.50
281048	48	4	192	5¼	32	121.00
281561	48	10	480	5½	48	170.50
282129	48	20	960	8¾	95	275.00
281125	125	2	250	5¼	44	137.50
281150	150	2	300	5¼	48	143.00
281200	200	1	200	5¼	39	121.00
281250	250	1	250	5¼	45	126.50





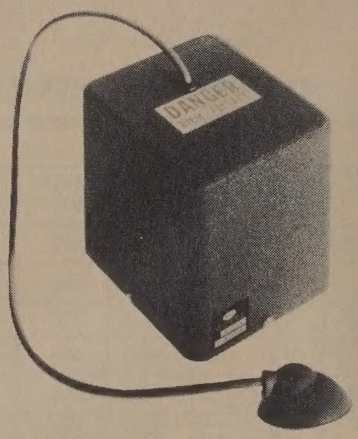
SOLA ELECTRIC SB

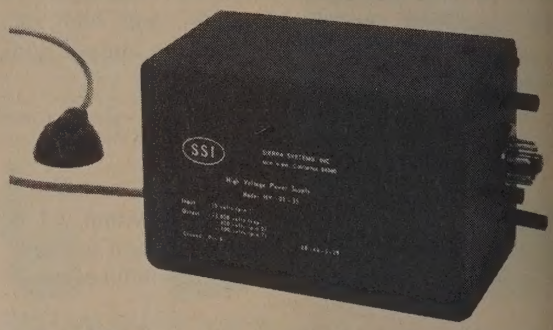
DIVISION OF SOLA BASIC INDUSTRIES

m ufacturers of AC & DC Power Supplies • Sola Constant-Voltage Transformers • Solatron Line-Voltage Regulators • DC-to-AC Inverters • Lighting Ballasts

C. R. T. Power Supplies

DC-DC Converters





Model HV-725

Input:	+28 volts
Output #1:	12,000 volts @ 250 μa. Ripple and Regulation: 0.1%
Output #2:	+400 volts @ 1 ma. Ripple:: 0.1% Regulation: 5%
Output #3:	−100 volts @ 1 ma. Ripple: 0.1% Regulation: 5%
Price:	$149.00 (in small quantities)

Model HV-01-35B

Input:	+32 volts
Output #1:	10,000 volts @ 200 μa. Ripple and Regulation: 0.1%
Output #2:	1,500 to 2,500 volts @ 200 μa. Ripple and Regulation: 0.1%
Output #3:	+400 volts @ 1 ma.
Output #4:	−100 volts @ 1 ma.
Price:	$195.00 (in small quantities)

Sierra Systems, Inc. specializes in the production of high voltage power supply modules for critical cathode ray tube applications. These units are constructed with all silicon diodes and transistors for reliable operation and include such features as current limiting and short circuit protection. Custom requirements are processed with the speed and at the price of off-the-shelf items while requirements such as miniature high voltage power supplies and units designed for military specifications are easily met. Sierra Systems, Inc. has the in-house capability to produce thick film integrated circuits . . . a process which permits quick and economical response to unusual packaging requirements and large volume orders. Contact S.S.I. the next time you need a high voltage power supply.

Also leading manufacturer of other types of High Voltage Power Supplies and R. F. Amplifiers and systems.

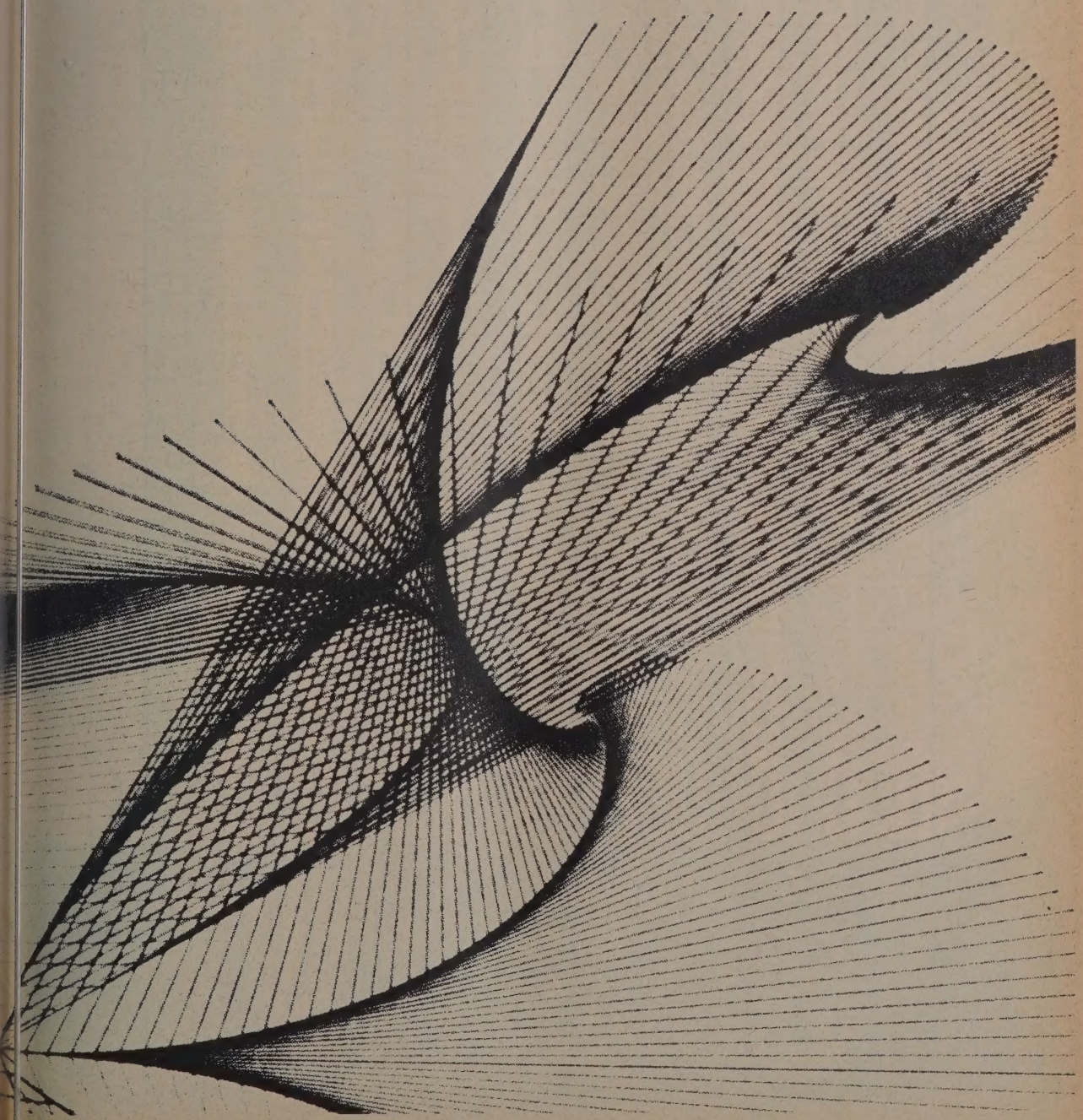
Sierra Systems, Inc.

2255 Old Middlefield Way, Mountain View, Calif. 94040

Telephone (415) 969-3056

Sorensen Power Supplies

Short Form Catalog

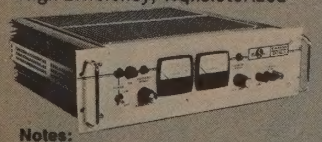


DC power supplies

QRS Series
Full Range, Transistorized

QRD Series
With high speed programming[2]

QRC Series
High Efficiency, Transistorized



MODEL	Output Voltage (Vdc)	Output Current (amps.) max. 40°C	55°C	71°C	Volt. Regulation line & load (comb.)	Voltage Ripple (PARD)*	Curr. Regulation line & load (comb.)	Current Ripple (PARD)* rms	peak to peak	Drift (8 hrs.)	Temperature Coeff.	Transient Response Time	Optional Overvolt. Protect.	% Efficiency (Typ.)	Input Voltage (Vac)	Input Current (amps) @ 115 VAC	Input Freq. (Hz.)	Input Phase	Cabinet[1] Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg.	Price
QRS15-2	0-15	2.2	2.0	1.2	±0.01% or ± 1 mV	400μV rms (10 Hz to 7 MHz) 6 mV peak to peak (10 Hz to 25 MHz)	± (.02% + 200 μA)	300μA	3 mA	0.04%	0.015% + 300 μV/°C	50μs	VP1	35	105-125/200-240/210-250	0.95	47 to 440	1φ	8 3/16	3 15/32	12¾	12½	27	$145
QRS20-4	0-20	4.4	4.0	2.4			± (.02% + 350 μA)	600μA	3 mA				VP1	42		2.3			8 3/16	5 7/32	13	19½	35	$255
QRS30-1	0-30	1.1	1.0	0.6			± (.02% + 200 μA)	300μA	3 mA				VP1	35		0.95			8 3/16	3 15/32	12¾	12½	27	$145
QRS40-.75	0-40	0.825	0.750	0.450			± (.02% + 200 μA)	300μA	3 mA				VP1	35		0.95			8 3/16	3 15/32	12¾	12½	27	$145
QRS40-2	0-40	2.2	2.0	1.2			± (.02% + 350 μA)	600μA	3 mA				VP1	42		2.3			8 3/16	5 7/32	13	19½	35	$255
QRS60-.5	0-60	0.55	0.50	0.30			± (.02% + 200 μA)	300μA	3 mA				VP3	35		0.95			8 3/16	3 15/32	12¾	12½	27	$145
QRS60-1.5	0-60	1.65	1.50	0.90			± (.02% + 350 μA)	600μA	3 mA				VP3	46		2.3			8 3/16	5 7/32	13	19½	35	$249
QRD15-2	0-15	2.2	2.0	1.2	±0.005% or ± 1 mV	200μV rms (10 Hz to 7 MHz) 3 mV peak to peak (10 Hz to 25 MHz)	± (.01% + 125 μA)	150μA	2 mA	0.025%	0.015% + 200 μV/°C	50μs	VP1	35	105-125/200-240/210-250	0.95	47 to 440	1φ	8 3/16	3 15/32	12¾	12½	27	$178
QRD20-4	0-20	4.4	4.0	2.4			± (.01% + 250 μA)	400μA	2 mA				VP1	42		2.3			8 3/16	5 7/32	13	19½	35	$278
QRD30-1	0-30	1.1	1.0	0.6			± (.01% + 125 μA)	150μA	2 mA				VP1	35		0.95			8 3/16	3 15/32	12¾	12½	27	$178
QRD40-.75	0-40	0.825	0.750	0.450			± (.01% + 125 μA)	150μA	2 mA				VP1	35		0.95			8 3/16	3 15/32	12¾	12½	27	$178
QRD40-2	0-40	2.2	2.0	1.2			± (.01% + 250 μA)	300μA	2 mA				VP1	42		2.3			8 3/16	5 7/32	13	19½	35	$278
QRD60-.5	0-60	0.55	0.50	0.30			± (.01% + 125 μA)	150μA	2 mA				VP3	35		0.95			8 3/16	3 15/32	12¾	12½	27	$185
QRD60-1.5	0-60	1.65	1.50	0.90			± (.01% + 250 μA)	300μA	2 mA				VP3	46		2.3			8 3/16	5 7/32	13	19½	35	$285
QRC20-8A	0-20	8.0	6.4	4.0	±0.005% or ± 1 mV	1 mV rms	± 0.05% or ± 4 MA	2mA	—	0.025% of Eo Max.	0.01% + 500 μV/°C	25μs	VP4	47	105-125/200-240/210-250	4.5	47 to 440	1φ	19	3½	17¾	36½	60	$425
QRC20-15A	0-20	15.0	12.0	7.5			± 0.05% or ± 8 MA	4mA	—			25μs	VP4	49		6.8			19	5¼	18½	54	75	$525
QRC20-30A	0-20	30.0	24.0	15.0			± 0.05% or ± 16 MA	8mA	—			50μs	VP6	52		12.6	47-63		19	7	18½	75	95	$695
QRC40-4A	0-40	4.0	3.2	2.0			± 0.075% or ± 3 MA	1mA	—			25μs	VP4	56		3.5	47 to 440		8⅛	5	16⅛	26	45	$350
QRC40-8A	0-40	8.0	6.4	4.0			± 0.05% or ± 4 MA	2mA	—			25μs	VP4	58		7.0			19	3½	17¾	45	65	$470
QRC40-15A	0-40	15.0	12.0	7.5			± 0.05% or ± 8 MA	4mA	—			25μs	VP6	61		11.2			19	5¼	18½	67	90	$650
QRC40-30A	0-40	30.0	24.0	15.0			± 0.05% or ± 16 MA	8mA	—			50μs	VP6	64		20.8	47-63		19	7	18½	92	115	$775

NOTE: All prices above are U.S.A. list.

Notes:

1. The following 19" adapter panels are available for QRS, QRD, QHS and QRD Dual Range units at $15 per panel:
   One unit panel (3½" high): RP12
   One unit panel (5¼" high): RP13
   One unit panel (7" high): RP16
   Two unit panel (3½" high): RP14
   Two unit panel (5¼" high): RP15
   Two unit panel (7" high): RP17
   For QRC 40-4A a one unit 19" adapter panel (RP1) and a two unit 19" adapter panel (RP2) are available at $15 per 5¼" panel.

See YELLOW SECTION for Local Offices, Phones

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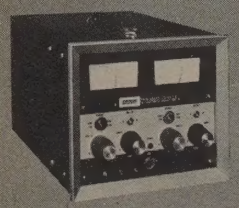
QHS Series
High Stability[3]
0.1% + 1mV accuracy

QRD Dual Range Series
with high speed programming[2]



MODEL	Output Voltage (Vdc)	Current 40°C	Current 55°C	Current 71°C	Volt. Regulation line & load	Voltage Ripple (PARD)*	Curr. Regulation line & load	Ripple (PARD)* rms.	Ripple (PARD)* peak to peak	Drift (8 hrs)	Temp Coef. mV/°C	Transient Response	Optional Overvolt. Prot.	% Efficiency (Typ.)	Input Voltage (VAC)	Input Current (amps)	Input Frequency (Hz)	Input Phase	Cabinet Size (in.) Width	Height	Depth	Net Wgt. (lbs.)	Shpg. Wgt. (lbs.)	Price
QHS20-1.0	0-20	1 Amp (0°C to 50°C)			1ppm + 30μV — line 5ppm + 50μV — load	100μV p-p				See Note 3	10ppm + 10μV/°C	50μs	VP1	31	105-125 200-240 210-250	0.7	47 to 440	1φ	8 3/16	3 1/2	12 3/4	12	25	$345
QHS40-.5	0-40	.5 Amp (0°C to 50°C)											VP1	31					8 3/16	3 1/2	12 3/4	12	25	$345
QHS100-.2	0-100	.2 Amp (0°C to 50°C)											VP3	31					8 3/16	3 1/2	12 3/4	12	25	$345
QHS20-1.0L	0-20	1 Amp (0°C to 50°C)			1ppm + 30μV — line 5ppm + 50μV — load	100μV p-p				.005% + 200μV	25ppm + 25μV/°C	50μs	VP1	31	105-125 200-240 210-250	0.7	47 to 440	1φ	8 3/16	3 1/2	12 3/4	12	25	$265
QHS40-.5L	0-40	.5 Amp (0°C to 50°C)											VP1	31					8 3/16	3 1/2	12 3/4	12	25	$265
QHS100-.2L	0-100	.2 Amp (0°C to 50°C)											VP3	31					8 3/16	3 1/2	12 3/4	12	25	$265
QRD15-2/ 7.5-3	0-15 0-7.5	2.2 3.3	2.0 3.0	1.2 1.8	±0.005% or ±0.75mV	200μV rms (10 Hz to 7 MHz) 3 mV peak to peak (10 Hz to 25 MHz)	± (.01% + 125μA)	150μA	2mA	0.025%	0.015% + 200μV/°C	50μs	VP1	35	105-125/200-240/210-250	0.95	47 - 440	1φ	8 3/16	3 15/32	12 3/4	12 1/2	27	$198
QRD40-.75/ 20-1.5	0-40 0-20	0.825 1.65	0.750 1.5	0.450 0.90			± (.01% + 125μA)	150μA	2mA				VP1	35		0.95			8 3/16	3 15/32	12 3/4	12 1/2	27	$198
QRD40-2/ 20-4	0-40 0-20	2.2 4.4	2.0 4.0	1.2 2.4			± (.01% + 350μA)	400μA	2mA				VPI	42		2.3			8 3/16	5 7/32	13	19 1/2	35	$298
QRD60-.5/ 30-1	0-60 0-30	0.55 1.1	0.50 1.0	0.30 0.6			± (.01% + 125μA)	150μA	2mA				VP3	35		0.95			8 3/16	3 15/32	12 3/4	12 1/2	27	$205
QRD60-1.5/ 30-3	0-60 0-30	1.65 3.3	1.5 3.0	0.90 1.8			± (.01% + 250μA)	300μA	2mA				VP3	40		2.3			8 3/16	5 7/32	13	19 1/2	35	$305
†QRD15-2/ 7.5-3(2)	0-15 0-7.5	2.2 3.3	2.0 3.0	1.2 1.8			± (.01% + 125μA)	150μA	2mA				VP1	35		1.9			8 1/8	6 31/32	13 3/4	22 1/2	39	$396
†QRD40-.75/ 20-1.5(2)	0-40 0-20	0.825 1.65	0.750 1.50	0.450 0.90			± (.01% + 125μA)	150μA	2mA				VP1	35		1.9			8 1/8	6 31/32	13 3/4	22 1/2	39	$396

†Two completely isolated power supplies mounted in one cabinet. Both outputs may be operated simultaneously and each output at either of two output ranges.

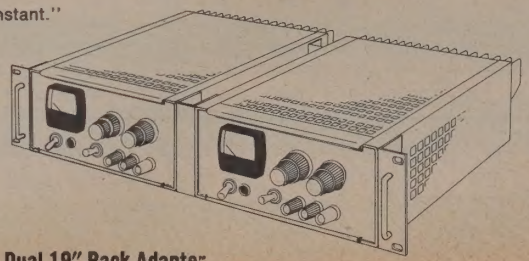
* *PARD*—"The 'Periodic and Random Deviation' of the output DC voltage, current or power from its average value, with all external operational and environmental parameters maintained constant."

Notes:

2. Also operates in High Speed Mode. Programming Time: 25 μs from zero to Emax; 10 μs from Emax to zero (measured at the 10% and 90% points).
3. Drift for 8 hours
   QHS 20-1 — 10 ppm + 100μV
   QHS 40-.5 — 10 ppm + 100μV
   QHS 100-.2 — 10 ppm + 100μV

   Drift for 1 week
   QHS 20-1 — 35 ppm + 200μV
   QHS 40-.5 — 35 ppm + 200μV
   QHS 100-.2 — 35 ppm + 200μV

Single and dual 19" adapters available for QRS, QRD, QHS and QRD Dual Range models. See note 1.



Dual 19" Rack Adapter

DCR Series
Full Range, Silicon Controlled Rectifiers (meets MIL-I-26600 and MIL-I-6181D)

Notes:

4. Ripple and transient specifications apply at 60Hz and will vary by a factor of $(60/f)^2$ where "f" is the input frequency.
5. Optional auxiliary chassis permits operation from 342-418, 390-440 or 414-506 Vac input: ST101 $250
6. DCR40-250A, DCR150-70A, DCR300-35A and DCR600-18A input voltages: 187-229Vac, 207-253Vac, or 414-506 Vac, at 57-63Hz (0-100% Eo max)
   390-440Vac at 47-63Hz (0-100% Eo max)
   342-418Vac at 47-63Hz (0-90% Eo max)
   DCR20-1000A and DCR40-500A input voltages:
   342-418Vac at 47-63Hz (0-75% Eo max)
   390-440Vac at 47-63Hz (0-92% Eo max)
   414-506Vac at 57-63Hz (0-100% Eo max)

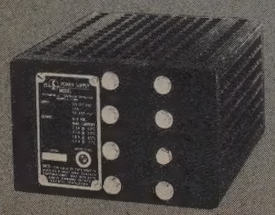
MODEL	Output Voltage (Vdc)	Output Current (amps) max. 30°C	55°C	71°C	Volt. Regulation line & load (comb.)	Voltage Ripple (rms) PARD*	Curr. Regulation line & load (comb.)	Current Ripple (PARD)* rms.	Drift (8 hrs.)	Temp. Coeff. (mV/°C)	Transient Response Time	Optional Overvolt. Protect.	% Efficiency (Typ.)	Input Voltage (Vac)	Input Current (amps)	Input Frequency[4] (Hz.)	Input Phase	Cabinet Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg.	Price
DCR20-125A	0-20	144	125	82.5	±0.075% or ±8mV	.4%E_0 +20mV	±125mA	0.5% Io	.05%	3	30ms	VP 9	62	187-229 207-253	29	47-63	1ϕ	19	10½	20	169	200	$1150
DCR20-250A	0-20	275	250	165	±0.10% or ±8mV	.8%E_0 +60mV or 160mV	±500mA	0.8% Io	.10%	8	40ms	VP 18	66	187-229[5] 207-253	37	47-63	3ϕ	19	17½	22	312	342	$1725
DCR20-1000A	0-20	1100	1000	660	±0.10% or ±8mV	.8% E_0 +60mV or 160mV	±2000mA	0.8% Io	.10%	8	40ms	—	74	Note 6	60	Note 6	3ϕ	25	42½	23	805	835	$4500
DCR40-10A	0-40	11.5	10	6.6	±0.075% or ±15mV	.4%E_0 +40mV	±20mA	0.5% Io	.05%	6	30ms	VP 10	60	105-125	8	47-63	1ϕ	19	5¼	15	55	65	$360
DCR40-20A	0-40	23	20	13	±0.075% or ±15mV	.4%E_0 +40mV	±25mA	0.5% Io	.05%	6	30ms	VP 10	60	105-125	16	47-63	1ϕ	19	5¼	18	77	90	$500
DCR40-35A	0-40	40	35	25	±0.075% or ±15mV	.4%E_0 +40mV	±35mA	0.5% Io	.05%	6	30ms	VP 11	67	105-125	27	47-63	1ϕ	19	7	18	102	120	$750
DCR40-60A	0-40	69	60	39.6	±0.075% or ±15mV	.4%E_0 +40mV	±60mA	0.5% Io	.05%	6	30ms	VP 11	66	187-229 207-253	25	47-63	1ϕ	19	7	20	131	150	$925
DCR40-125A	0-40	138	125	82.5	±0.10% or ±15mV	.4%E_0 +60mV or 160mV	±250mA	0.45% Io	.10%	16	40ms	VP 19	72	187-229[5] 207-253	35	47-63	3ϕ	19	17½	22	318	348	$1600
DCR40-250A	0-40	275	250	165	±0.10% or ±15mV	.4%E_0 +60mV or 160mV	±500mA	0.45% Io	.10%	16	40ms	VP 19	75	Note 6	60 27	Note 6	3ϕ	19	22¾	24	485	515	$2300
DCR40-500A	0-40	550	500	330	±0.10% or ±15mV	.4%E_0 +60mV	±1000mA	0.45% Io	.10%	16	40ms	—	79	Note 6	60	Note 6	3ϕ	25	42½	23	805	835	$4200
DCR60-13A	0-60	15	13	8.6	±0.075% or ±15mV	.4%E_0 +60mV	±20mA	0.5% Io	.05%	9	30ms	VP 12	64	105-125	16	47-63	1ϕ	19	5¼	18	77	90	$500
DCR60-25A	0-60	28.8	25	16.5	±0.075% or ±15mV	.4%E_0 +60mV	±25mA	0.5% Io	.05%	9	30ms	VP 13	69	105-125	30	47-63	1ϕ	19	7	18	100	120	$875
DCR60-40A	0-60	45	40	26.4	±0.075% or ±15mV	.4%E_0 +60mV	±40mA	0.5% Io	.05%	9	30ms	VP 13	68	187-229 207-253	23	47-63	1ϕ	19	7	20	130	150	$1000
DCR80-5A	0-80	5.75	5	3.3	±0.075% or ±20mV	.4%E_0 +80mV	±15mA	0.5% Io	.05%	12	30ms	VP 12	64	105-125	8	47-63	1ϕ	19	5¼	15	55	65	$400
DCR80-10A	0-80	11.5	10	6.6	±0.075% or ±20mV	.4%E_0 +80mV	±20mA	0.5% Io	.05%	12	30ms	VP 12	64	105-125	16	47-63	1ϕ	19	5¼	18	77	90	$600
DCR80-18A	0-80	20.7	18	11.9	±0.075% or ±20mV	.4%E_0 +80mV	±25mA	0.5% Io	.05%	12	30ms	VP 13	71	105-125	28	47-63	1ϕ	19	7	18	98	120	$875
DCR80-30A	0-80	34.5	30	19.8	±0.075% or ±20mV	.4%E_0 +80mV	±30mA	0.5% Io	.05%	12	30ms	VP 13	69	187-229 207-253	23	47-63	1ϕ	19	7	20	121	140	$1000
DCR150-2.5A	0-150	2.88	2.5	1.65	±0.075% or ±30mV	.4%E_0 +150mV	±15mA	0.5% Io	.05%	23	30ms	VP 14	68	105-125	8	47-63	1ϕ	19	5¼	15	55	65	$360
DCR150-5A	0-150	5.75	5	3.3	±0.075% or ±30mV	.4%E_0 +150mV	±15mA	0.5% Io	.05%	23	30ms	VP 14	66	105-125	16	47-63	1ϕ	19	5¼	18	77	90	$600
DCR150-10A •	0-150	11.5	10	6.6	±0.075% or ±30mV	.4%E_0 +150mV	±20mA	0.5% Io	.05%	23	30ms	VP 15	72	105-125	28	47-63	1ϕ	19	7	18	95	120	$875
DCR150-15A	0-150	17.3	15	9.9	±0.075% or ±30mV	.4%E_0 +150mV	±25mA	0.5% Io	.05%	23	30ms	VP 15	72	187-229 207-253	22	47-63	1ϕ	19	7	18	115	135	$1000
DCR150-35A	0-150	38.5	35	23	±0.10% or ±30mV	.4%E_0 +200mV or 500mV	±70mA	0.4% Io	.10%	60	40ms	VP 20	77	187-229[5] 207-253	35	47-63	3ϕ	19	17½	22	312	342	$1650
DCR150-70A	0-150	77	70	47	±0.10% or ±30mV	.4%E_0 +200mV or 500mV	±140mA	0.4% Io	.10%	60	40ms	VP 20	81	Note 6	60 27	Note 6	3ϕ	19	22¾	24	480	510	$2495

See YELLOW SECTION for Local Offices, Phones

DCR Series (Cont.)
Full Range, Silicon Controlled Rectifiers

MODEL	Output Voltage (Vdc)	Output Current (amps) max. 30°C	55°C	71°C	Volt. Regulation line & load (comb.)	Voltage Ripple (rms) PARD	Curr. Regulation line & load (comb.)	rms.	Drift (8 hrs.)	Temp. Coeff. (max.)	Transient Response Time	Optional Overvolt. protect.	% Efficiency (Typ.)	Input Voltage (Vac)	Input Current (amps) @ 115 Vac.	Input Freq. (Hz)	Input Phase	Cabinet Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg.	Price
DCR300-1.25A	0-300	1.44	1.25	.83	±0.075% or ±60mV	.4%E_o +300mV	±15mA	0.5% Io	.05%	45	30ms	VP 16	64	105-125	8	47-63	1ϕ	19	5¼	15	55	65	$400
DCR300-2.5A	0-300	2.88	2.5	1.65	±0.075% or ±60mV	.4%E_o +300mV	±15mA	0.5% Io	.05%	45	30ms	VP 16'	68	105-125	14	47-63	1ϕ	19	5¼	18	77	90	$600
DCR300-5A	0-300	5.75	5	3.3	±0.075% or ±60mV	.4%E_o +300mV	±15mA	0.5% Io	.05%	45	30ms	VP 17	73	105-125	25	47-63	1ϕ	19	7	18	95	120	$875
DCR300-8A	0-300	9.2	8	5.3	±0.075% or ±60mV	.4%E_o +300mV	±20mA	0.5% Io	.05%	45	30ms	VP 17	73	187-229 207-253	22	47-63	1ϕ	19	7	18	115	135	$1000
DCR300-18A	0-300	19.8	18	12	±0.10% or ±60mV	.4%E_o +400mV or 1V	±36mA	0.4% Io	.10%	120	40ms	VP 21	78	187-229[5] 207-253	35	47-63	3ϕ	19	17¼	22	318	348	$1650
DCR300-35A	0-300	38.5	35	23	±0.10% or ±60mV	.4%E_o +400mV or 1V	±70mA	0.4% Io	.10%	120	40ms	VP 21	82	Note 6	60 27	Note 6	3ϕ	19	22¾	24	485	515	$2495
DCR600-2.5A	6-600	2.87	2.5	1.65	±0.075% or ±120mV	.4%E_o +600mV	±7mA	0.5% Io	.05%	90	30ms	Std	72	105-125	25	47-63	1ϕ	19	10½	18	126	150	$875
DCR600-18A	0-600	19.8	18	12	±0.10% or ±120mV	.4%E_o +800mV or 2V	±36mA	0.4% Io	.10%	240	40ms	VP 22	81	Note 6	60 27	Note 6	3ϕ	19	22¾	24	485	515	$2495
DCR1500-1A	15-1500	1.15	1.0	.66	±0.075% or ±300mV	.4%E_o +1.5V	±4.5mA	0.5% Io	.05%	225	30ms	Std	71	105-125	25	47-63	1ϕ	19	12¼	18	150	175	$995
DCR3000-.5A	30-3000	.575	.5	.33	±0.075% or ±600mV	.4%E_o +3V	±3.8mA	0.5% Io	.05%	450	30ms	Std	70	105-125	27	47-63	1ϕ	19	12¼	18	166	190	$1250
DCR6000-.25A	60-6000	.287	.25	.165	±0.075% or ±1.2V	.4%E_o +6V	±3.4mA	0.5% Io	.05%	900	30ms	Std	68	105-125	27	47-63	1ϕ	19	14	20	170	195	$1495
DCR12,000-.125A	120-12,000	.125	.125		±.075% or ±3V	.3% E_o max.	±500μA	0.3% I_o max.	.05%	1.8V	30ms	Std	70	105-125	32	57-63	1ϕ	19	26¼	21¾	170	200	$2250
DCR20,000-.075A	200-20,000	.075	.075		±.075% or ±5V	.3% E_o max.	±400μA	0.3% I_o max.	.05%	3.0V	30ms	Std	66	105-125	32	57-63	1ϕ	19	26¼	21¾	197	227	$2500
DCR30,000-.05A	300-30,000	.05	.05		±.075% or ±7.5V	.3% E_o max.	±350μA	0.3% I_o max.	.05%	4.5V	30ms	Std	68	105-125	32	57-63	1ϕ	19	26¼	21¾	225	255	$2750

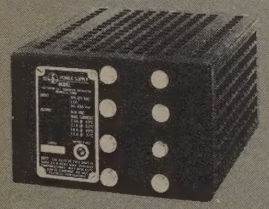
QSA Series
Modular, Wide Range



MODEL	Output Voltage (Vdc)	Output Current (amps) max. 40°	55°	71°	Volt. Regulation line & load (comb.)	Voltage Ripple (PARD)	RFI Specification	Drift (8 hrs.)	Temperature Coeff.	Transient Response Time	Optional Overvolt. Protect.	% Efficiency (Typ.)	Input Voltage (Vac)	Input Current (amps) @ 115 Vac.	Input Freq. (Hz)	Input Phase	Cabinet Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg	Price
QSA5-6.4	3-7	7.0	5.9	3.1	±.01%	300 microvolts rms (3 millivolts peak to peak)	Meets MIL-I-26600, MIL-I-6181D, MIL-I-16910C	0.025% (after 30 minute warmup)	.015%/°C	20μs	VP4	30	105-125/200-240/210-250	1.6	47 to 440	1ϕ	5⅛	3 5/16	10	10	13	$149
QSA5-14.6	3-6.5	17.6	14.5	6.0	±.01%				.015%/°C	35μs	VP4	36		3.4			7½	4 15/16	10	22	30	$209
QSA5-18.2	3-6.5	20.5	17.2	12.2	±.01%				.015%/°C	35μs	VP4	36		4.6			7½	4 15/16	12⅝	29	40	$249
QSA10-1.4	0-10	1.5	1.3	0.9	±.005% or ±.2 mV				.01%/°C or .5mV/°C	20μs	VP1	29		.6			3⅞	3 9/16	7	5	8	$89
QSA10-2.2	0-10	2.4	2.15	1.9	±.005% or ±.2 mV				.01%/°C or .5mV/°C	20μs	VP1	35		.8			5⅛	3 5/16	7	8	11	$109
QSA10-3.7	0-10	4.0	3.4	2.5	±.005% or ±.2 mV				.01%/°C or .5mV/°C	20μs	VP1	39		1.4			5⅛	3 5/16	10	10	13	$129

QSA Series (Cont.)
Modular, Wide Range

(Optional rack mounting adaptors and meters available. Consult factory.)



MODEL	Output Voltage (Vdc)	Output Current (amps) max. 40°C	55°C	71°C	Volt. Regulation line & load (comb.)	Voltage Ripple (PARD)*	RFI Specification	Drift (8 hrs.)	Temperature Coeff.	Transient Response Time	Optional Overvolt. Protect.	% Efficiency (Typ.)	Input Voltage (Vac)	Input Current (amps) @ 115 Vac.	Input Freq. (Hz)	Input Phase	Cabinet Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg.	Price
QSA12-1.3	8-14	1.4	1.2	0.9	±.005%	300 microvolts rms (3 millivolts peak to peak)	Meets MIL-I-26600, MIL-I-6181D, MIL-I-16910C	0.025% (after 30 minute warmup)	.01%/°C	20μs	VP1	30	105-125/200-240/210-250	.6	47 to 440	1φ	3⅞	3 5/16	7	5	8	$89
QSA12-2.1	8-14	2.3	1.95	1.4	±.005%				.01%/°C	20μs	VP1	32		1.0			5⅛	3 5/16	7	8	11	$109
QSA12-3.8	8-14	4.2	3.5	2.5	±.005%				.01%/°C	20μs	VP1	34		1.6			5⅛	3 5/16	10	10	13	$129
QSA12-9.3	8-14	11.0	9.25	5.3	±.005%				.015%/°C	35μs	VP4	43		3.8			7½	4 15/16	10	22	30	$199
QSA12-13	8-14	15.4	13.0	8.7	±.005%				.015%/°C	35μs	VP4	49		5.2			7½	4 15/16	12⅝	29	40	$249
QSA18-1.1	14-22	1.2	1.0	0.7	±.005%				.01%/°C	20μs	VP1	31		.8			3⅞	3 5/16	7	5	8	$89
QSA18-1.9	14-22	2.1	1.75	1.3	±.005%				.01%/°C	20μs	VP1	33		1.3			5⅛	3 5/16	7	8	11	$109
QSA18-3.0	14-22	3.3	2.75	2.0	±.005%				01%/°C	20μs	VP1	38		1.8			5⅛	3 5/16	10	10	13	$129
QSA18-6.8	14-22	7.9	6.65	3.3	±.005%				.015%/°C	35μs	VP4	40		4.0			7½	4 15/16	10	22	30	$199
QSA18-10.1	14-22	14.0	10.1	5.8	±.005%				.015%/°C	35μs	VP4	46		5.6			7½	4 15/16	12⅝	29	40	$249
QSA28-.7	22-35	0.77	0.65	0.5	±.005%	300 microvolts rms (3 millivolts peak to peak)	Meets MIL-I-26600, MIL-I-6181D, MIL-I-16910C	0.025% (after 30 minute warmup)	.01%/°C	20μs	VP1	33	105-125/200-240/210-250	.7	47 to 440	1φ	3⅞	3 5/16	7	5	8	$89
QSA28-1.3	22-35	1.4	1.2	0.9	±.005%				.01%/°C	20μs	VP1	34		1.3			5⅛	3 5/16	7	8	11	$109
QSA28-2.0	22-35	2.2	1.85	1.3	±.005%				.01%/°C	20μs	VP1	38		1.8			5⅛	3 5/16	10	10	13	$129
QSA28-6.0	22-30	6.8	5.75	3.4	±.005%				.015%/°C	35μs	VP4	54		4.4			7½	4 15/16	10	22	30	$209
QSA28-8.8	22-30	10.2	8.6	5.0	±.005%				.015%/°C	35μs	VP4	55		6.0			7½	4 15/16	12⅝	29	40	$249
QSA48-.4	35-60	0.44	0.37	0.27	±.005%				.015%/°C	20μs	VP3	38		.7			3⅞	3 5/16	7	5	8	$89
QSA48-.8	35-60	0.88	0.74	0.53	±.005%				.015%/°C	20μs	VP3	44		1.3			5⅛	3 5/16	7	8	11	$119
QSA48-1.2	35-60	1.3	1.1	0.8	±.005%				.015%/°C	20μs	VP3	45		1.8			5⅛	3 5/16	10	10	13	$129
QSA75-.5	60-90	0.55	0.46	0.33	±.005%				.015%/°C	20μs	VP3	51		1.2			5⅛	3 5/16	7	8	11	$119
QSA75-.8	60-90	0.88	0.74	0.53	±.005%				.015%/°C	20μs	VP3	53		1.7			5⅛	3 5/16	10	10	13	$139
QSA120-.5	90-150	0.55	0.46	0.33	±.01%				.015%/°C	20μs	VP8	50		1.8			5⅛	3 5/16	10	10	13	$149
QSA175-.25	150-200	0.28	0.23	0.17	±.01%				.015%/°C	20μs	Consult Factory	54		1.2			5⅛	3 5/16	10	10	13	$160
QSA265-.15	200-330	0.17	0.14	0.1	±.01%				.015%/°C	20μs		48		1.3			5⅛	3 5/16	10	10	13	$175

*PARD = The Periodic and Random Deviation of the output DC voltage, current or [illegible]

NOTE: All prices above are U.S.A. list

See YELLOW SECTION for Local Offices, Phones

QSB/QRE Series
Medium Range, Transistorized

MODEL	Output Voltage (VdC)	Output Current (amps) max. 40°C	55°C	71°C	Voltage Reg. line & load (%)	Ripple (PARD)* rms	P-P	Curr. Reg. line & load (%)	Current rms (PARD)*	Drift (8 h)	Temperature	Transient Response	Optional Overvoltage	% Efficiency	Meters	Input Voltage	Input Current	Input Freq.	Input Phase	Cabinet Size (in.) Width	Height	Depth	Weight (lbs.) Net	Shpg.	Price
QRE7.5-10	0-7.5	10	9.25	6.6	±.01% or ±.4mV	300μV	2mV	±.2	—		.015%/°C or .5mV/°C	50μs	Std.	37	✓		2.5 1.25	47-440		19	3½	13¼	26	41	$345
QRE7.5-20	0-7.5	20	18.5	13	±.01% or ±.4mV	300μV	2mV	±.2	—		.015%/°C or .5mV/°C	50μs	Std.	33	✓		5.0 2.5	47-63		19	5¼	12⅞	37	52	$495
QRE7.5-50	0-7.5	50	46.25	33	±.01% or ±.4mV	300μV	2mV	±.2	—		.015%/°C or .5mV/°C	50μs	Std.	40	✓		11.0 5.5	47-63		19	5¼	16⅛	63	78	$645
QSB6-4	5-9	4.4	4	3	±.015	250μV	1mV	±.01	100μA		.015%/°C	40μs	VP2	44	—		.75 .38	47-440		7 1/16	3½	8¾	8½	15	$120
QSB6-8	5-9	8.8	8	6	±.015	250μV	1mV	±.01	200μA		.015%/°C	40μs	VP2	35	—		1.6 .8	47-440		7 1/16	3½	12 1/16	13	28	$180
QSB6-15	5-9	16.5	15	11.2	±.015	250μV	1mV	±.01	370μA		.015%/°C	40μs	VP2	35	✓		3.0 1.5	47-440		19	3½	12½	26	42	$315
QSB6-30	5-9	33	30	22.5	±.015	250μV	1mV	±.01	740μA		.015%/°C	40μs	VP7	33	✓		6.0 3.0	47-63		19	5¼	12 1/16	40	55	$420
QSB12-2	9-18	2.2	2	1.5	±.005	250μV	1mV	±.01	50μA		.015%/°C	30μs	VP2	44	—		.75 .38	47-440		7 1/16	3½	8¾	8½	15	$120
QSB12-4	9-18	4.4	4	3	±.005	250μV	1mV	±.01	100μA		.015%/°C	30μs	VP2	47	—		1.6 .8	47-440		7 1/16	3½	12 1/16	13	28	$180
QSB12-8	9-18	8.8	8	6	±.005	250μV	1mV	±.01	200μA		.015%/°C	30μs	VP2	46	✓		3.0 1.5	47-440		19	3½	12½	26	42	$270
QSB12-15	9-18	16.5	15	11.2	±.005	250μV	1mV	±.01	370μA		.015%/°C	30μs	VP2	45	✓		6.0 3.0	47-63	1φ	19	5¼	12 1/16	40	55	$340
QSB28-1	18-36	1.1	1	.7	±.005	250μV	1mV	±.01	25μA	0.025% (after warmup)	.015%/°C	25μs	VP2	48	—	105-125/200-240/210-250	.75 .38	47-440		7 1/16	3½	8¾	8½	15	$120
QSB28-2	18-36	2.2	2	1.5	±.005	250μV	1mV	±.01	50μA		.015%/°C	25μs	VP2	59	—		1.6 .8	47-440		7 1/16	3½	12 1/16	13	23	$180
QSB28-4	18-36	4.4	4	3	±.005	250μV	1mV	±.01	100μA		.015%/°C	25μs	VP2	44	✓		3.0 1.5	47-440		19	3½	12½	26	42	$270
QSB28-8	18-36	8.8	8	6	±.005	250μV	1mV	±.01	200μA		.015%/°C	25μs	VP2	56	✓		6.0 3.0	47-63		19	5¼	12 1/16	40	55	$340

Notes:
7. The following 19" adapter panels are available for QSB 7 1/16" wide units at $15 per panel:
   One unit panel (3½" high): RP5
   Two unit panel (3½" high): RP6

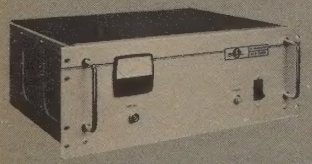
■ Temperature Range: —20°C to +71°C. ■ Series Operation: Up to 200 volts maximum. ■ Parallel Operation: QRE models . . . 4 units maximum; QSB models . . . 20 units maximum. ■ RFI: Meets MIL-1-6181D and MIL-1-16910C. ■ Overload/short circuit protection. ■ Remote sensing. ■ Overvoltage protection: Standard on QRE models and QSB12-30, optional accessory for QSB models (see chart above).

**PARD*—"The 'Periodic and Random Deviation' of the output DC voltage, current or power from its average value, with all external operational and environmental parameters maintained constant."

NOTE: All prices above are U.S.A. list.

AC line voltage regulators

ACR Series
Silicon Controlled Rectifiers
(Meets MIL-I-26600 spec. for Class III equipment)



FR Series
Precision, Solid State
AC Line Voltage Conditioners

Notes:

8. ACR models are furnished for standard rack mounting (ACR500 is furnished in self contained cabinet or with optional $15 rack panel – RP7.) Optional cabinet end bells may be furnished at $50 for models ACR3000, ACR5000, ACR7500, ACR10,000 and ACR-15,000.
9. 115 Vac output optional at additional cost.
10. With constant load, line and ambient temperature (ACR models 8 hours, FR models 24 hours).

"VR" Series
(±0.5%) Line Regulators

MODEL	Output Voltage (Vac)	Output VA 1φ	Voltage Regulation: Line	Voltage Regulation: Load	Load Power Factor (Typ.)	Distortion (max.) Introduced	Voltmeter	Drift[10] (%)	Transient Response Time	Temperature Range	Remote Sensing/Prog.	Overload Protection	Efficiency % (Typ.)	Input Voltage (Vac) 1φ	Input Current (Aac)	Input Freq. (Hz)	Cabinet[8] Size (in.): Width	Height	Depth	Weight (lbs.): Net	Shpg.	Price
ACR500	110-120	500	±.1%	±.1%	1.0 to 0 lag.	3%	Standard	0.05	30 ms	−20°C to +50°C	✓	✓	88	95 to 130	6	45-55/54-66	15	5	9	30	40	$330
ACR1000		1000									✓	✓	90		12		19	5¼	11	45	55	$375
ACR2000		2000									✓	✓	92		24		19	5¼	15	65	77	$475
ACR3000		3000									✓	✓	95		36		19	7	15	85	100	$575
ACR5000		5000	±.15%	±.15%							✓	✓	95		60		19	7	20	145	165	$765
ACR7500		7500									✓	✓	95		90		19	12¼	20	190	260	$875
ACR10,000		10,000									✓	✓	95		123		19	12¼	20	190	260	$1270
ACR15,000		15,000									✓	✓	95		181		19	17¼	20	275	350	$1575
FR516A	115	500	0.05% for ±9% line voltage change and full load change combined (±0.05% for model FR516A)		1.0 to ± 0.7	0.2%	Switchable Volt/Amp meter	±0.15	50 ms	0°C to 55°C	—	✓	59	95 to 135	7.4	59-61	19	3½	15	35	45	$925
FR1016A	115	1000				0.2%		±0.05			—	✓	63		13.9	57-63	19	7	17½	105	115	$1500
FR1015A	115	1000				0.2%		±0.05			—	✓	63		13.9	47-53	19	7	17½	105	115	$1500
FR1014A	115	1000				1.0%		±0.15			—	✓	63		13.9	380-420	19	7	17½	105	115	$1650
FR1026A	230 (115)[9]	1000				0.2%		±0.05			—	✓	63	190 to 270	6.9	57-63	19	7	17½	105	115	$1650
FR1025A	230 (115)[9]	1000				0.2%		±0.05			—	✓	63		6.9	47-53	19	7	17½	105	115	$1650
FR2516A	115	2500				0.2%		±0.05			—	✓	63	95 to 135	34.8	57-63	19	14	19	175	185	$3425
FR2515A	115	2500				0.2%		±0.05			—	✓	63		34.8	47-53	19	14	19	175	185	$3425
FR2514A	115	2500				1.0%		±0.15			—	✓	63		34.8	380-420	19	14	19	175	185	$3525
FR2526A	230 (115)[9]	2500				0.2%		±0.05			—	✓	63	190 to 270	17.4	57-63	19	14	19	175	185	$3650
FR2525A	230 (115)[9]	2500				0.2%		±0.05			—	✓	63		17.4	47-53	19	14	19	175	185	$3650
FR5016A	115	5000				0.2%		±0.05			—	✓	63	95 to 135	69.6	57-63	19	24½	20	400	425	$6800
FR5015A	115	5000				0.2%		±0.05			—	✓	63		69.6	47-53	19	24½	20	400	425	$6800
FR5026A	230 (115)[9]	5000				0.2%		±0.05			—	✓	63	190 to 270	34.8	57-63	19	24½	20	400	425	$7025
FR5025A	230 (115)[9]	5000				0.2%		±0.05			—	✓	63		34.8	47-53	19	24½	20	400	425	$7025
VR6110	115 Vac nominal (±2% taga setting tolerance)	15	±0.5%	±5.0% (Typ.)	1.0	20% Typ.	—		25 ms	−20°C to +40°C	—	✓	50	95 to 130	.37	39-61	2 5/16	3	6¼	3	4	$25
VR6111		30					—				—	✓	70		.41		3⅜	4 3/16	7½	4	5	$30
VR6112		60					—				—	✓	90		.82		3⅜	4 7/16	7½	5	6½	$36
VR6113		120					—				—	✓	90		1.65		3⅜	5 5/16	7½	8½	10½	$43
VR6114		250					—				—	✓	90		3.45		5	5 5/16	12 3/8	24	27	$76

See YELLOW SECTION for Local Offices, Phones

supplies

	MODEL	Output	Output	Output Impedance	Voltage Resolution	Ripple (% rms)	Voltage	Current	Meters	Temperature	Overload Protection	Indicator Lights	Input Voltage	Input Current	Input Frequency	Width (in./lbs.)	Height (in./lbs.)	Depth (in./lbs.)	Weight (in./lbs.)	Width (in./lbs.)	Height (in./lbs.)	Depth (in./lbs.)	Weight (in./lbs.)	Price
200 Series 0-30 KV, 3-12 MA	230-6P	0-30	0-6	2.0	✓	6.5	—	—	✓	0°C to 40°C	✓	Five Front Panel Indicator Lights	105 to 125	3.5	57 to 63 Hz (For 50 Hz operation ripple may increase 20%)	9	11	15¾	50	—	—	—	—	$685
	230-3/12P	0-30 0-15 0-7.5	0-3 0-6 0-12	1.0 .47 .47	✓	3.5 6.0 18.0	— — —	— — —	✓		✓			1.75		9	11	15¾	55	—	—	—	—	$750
1000 Series 3-150 KV, 5-200 MA	1003-200	0-3	200	.002	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	80	—	—	—	—	$790
	1006-100	0-6	100	.01	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	80	—	—	—	—	$790
	1012-50	0-12	50	.05	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	80	—	—	—	—	$815
	1020-30	0-20	30	.133	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	80	—	—	—	—	$865
	1030-20	0-30	20	.30	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	80	—	—	—	—	$895
	1061	0-60	10	1.2	✓[11]	1.5[12]	—	—	✓		✓			10.0		19	8¾	15⅝	50	14	14¼	14	145	$1195
	1101	0-100	1.5	7.0	✓[11]	4.0[12]	—	—	✓		✓			3.0		19	8¾	15⅝	50	14	14½	14	145	$1195
	1121	0-120	5	5.0	✓[11]	2.0[12]	—	—	✓		✓			10.0		19	8¾	15⅝	50	18¾	17¼	17¼	275	$1595
	1151	0-150	5	5.0	✓[11]	2.0[12]	—	—	✓		✓			12.0		19	8¾	15⅝	50	22½	27	22½	650	$1795
5000 Series 1-30 KV, 0-8 MA	5010-8	1kV to 10kV	8.0	—	Line ±.05 Load ±.05	0.003	1 Vdc	—	✓		✓	"Power ON" "HV Ready"		2.5	60	19	9½	15¾	60	—	—	—	—	$890
	5030-4	5kV to 30kV	4.0	—	Line ±.005 Load ±.025	0.015	20 Vdc	—	✓		✓	"Power ON" "HV ON" "HV Ready"		2.8	60	19	21¾	19¼	105	—	—	—	—	$1085
DCR-HV Series 0.6-30 kV, 0-2.5 A	DCR600-2.5A	6V to .6kV	2500	4Ω	±.075% or ±120mV	.4% E_o + 600 mV	0.3 Vdc	12.5 mA	✓	0°C to 55°C	✓	Eight Front Panel Indicator Lights	105 to 125 Vac	25	47 to 63	19	10½	18	126	—	—	—	—	$875
	DCR1500-1A	15V to 1.5kV	1000	25Ω	±.075% or ±300mV	.4% E_o + 1.5V	0.75 Vdc	5mA	✓		✓			25	47 to 63	19	12¼	18	150	—	—	—	—	$995
	DCR3000-.5A	30V to 3kV	500	60Ω	±.075% or ±600mV	.4% E_o + 3V	1.5 Vdc	2.5mA	✓		✓			27	47 to 63	19	12¼	18	166	—	—	—	—	$1250
	DCR6000-.25A	60V to 6kV	250	300Ω	±.075% or ±1.2V	.4% E_o + 6V	3 Vdc	1.3mA	✓		✓			27	47 to 63	19	14	20	170	—	—	—	—	$1495
	DCR12,000-.125A	100V to 12kV	125	—	±.075% or ±3V	.3% E_o max.	6 Vdc	625μA	✓		✓			32	57 to 63	19	26¼	21¾	170	—	—	—	—	$2250
	DCR20,000-.075A	200V to 20kV	75	—	±.075% or ±5V	.3% E_o max.	10 Vdc	375μA	✓		✓			32	57 to 63	19	26¼	21¾	197	—	—	—	—	$2500
	DCR30,000-.05A	300V to 30kV	50	—	±.075% or ±7.5V	.3% E_o max.	15 Vdc	250μA	✓		✓			32	57 to 63	19	26¼	21¾	225	—	—	—	—	$2750

Notes:

11. Line regulation available — Option #C2 regulates the output to ±0.2% (For ±10% line change). $475
12. Ripple attenuator available — Option #L2 reduces the output ripple to 0.01% rms.
13. 1000 Series Controller supplied for rack mounting. 5000 Series is furnished as standard rack mounted unit with optional $50.00 cabinet side enclosures.

NOTE: All prices are U.S.A. list.

See YELLOW SECTION for Local Offices, Phones

Sales and Service Facilities

Sales and Service Headquarters: Raytheon Company, Sorensen Operation, Richards Avenue, Norwalk, Conn. 06856 • Tel: 203-838-6571 • TWX: 710-468-2940 • TELEX 96-5953

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4900 East Indian School Rd.
602-959-2115

CALIFORNIA — Pasadena 91105 ■
Ward-Davis Associates
770 South Arroyo Parkway
213-684-2840

CALIFORNIA — Palo Alto 94303 ■
Ward-Davis Associates
3941 E. Bayshore
415-968-7116

CALIFORNIA — San Diego 92110
Ward-Davis Associates
3442 Hancock Street
714-297-4619

COLORADO — Denver 80226 ■
Barnhill Associates
1170 S. Sheridan Blvd.
303-934-5505

CONNECTICUT — Hartford 06114 ■
Instrument Associates, Inc.
234 Murphy Road, Brainard Ind. Park
203-525-9367

DISTRICT OF COLUMBIA
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4720 Montgomery Lane, Washington 20014
301-654-5226

FLORIDA — Orlando 32803 ■
BCS. Associates, Inc.
940 N. Fern Creek Ave.
P.O. Box 6578
305-843-1510

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Earl Associates, Inc.
1638 Kona Street
808-949-6953

ILLINOIS — Chicago 60645 ■
Pivan Engineering Company
3535 West Peterson Avenue
312-539-4838

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Pivan Engineering Company
8545 Northcrest Court — Suite B
317-253-1681

IOWA — Cedar Rapids 52402
Pivan Engineering Company
P.O. Box 1274

KANSAS — Mission 66202
Pivan Engineering Company
5920 Nail Avenue
913-722-1030

MASSACHUSETTS — Boston Area ■
Instrument Associates, Inc.
30 Park Avenue, Arlington 02174
617-648-2922

MICHIGAN — Southfield 48075 ■
S. Sterling Company
21250 10½ Mile Road
313-357-3700

MINNESOTA — Minneapolis 55422
Pivan Engineering Company
3307 N. Highway 100
612-537-4501

MISSOURI — Hazelwood 63042
Pivan Engineering Company
400 Brookes Drive
314-731-3000

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Union, N. J. 07083
201-687-8737

NEW MEXICO — Albuquerque 87110
Barnhill Associates
827 Pennsylvania, N.E.
505-265-7766

NEW YORK — Metropolitan Area ■
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Pleasantville, N. Y. 10570
914-769-1811

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See YELLOW SECTION for Local Offices, Phones

E UP TO THE ST ADVANCED GENERATION F STATIC INVERTERS!

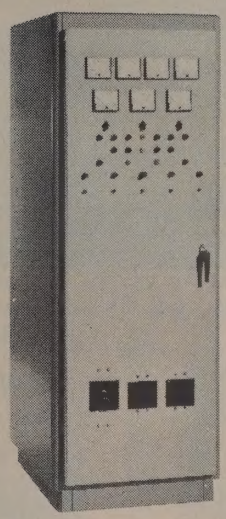
STATIC PRODUCTS

OR NTERRUPTIBLE OWER YSTEMS

OF REQUENCY NVERTERS

Specify

STATIC PRODUCTS



25 KVA
Uninterruptible
Power System

Static Products has developed unique Static Inverters which combine advances in high speed thyristors (SCR) and integrated circuits. These inverters offer improved performance, reliability and lower cost than older methods. Extensive use of integrated circuits affords more sophisticated methods to improve short circuit, overload, fuse clearing and transient response capability. Check these resulting advantages:

EFFICIENCY

The inverter efficiency exceeds 90%, generating less heat and providing substantial electric cost savings over the ten year equipment life.

POWER RANGES

Inverter modules of 5, 25, and 75 KVA are available and can be paralleled to supply single and three phase loads, 5 through 300 KVA.

EXPANDABILITY

The power capability of Static Products' systems can be expanded by modular additions to meet increased load requirements.

INPUT/OUTPUT

Virtually any combination of voltage and frequency input/output is available, including 60/400 Hz, 400/60 Hz, 50/60 Hz, 60/50 Hz, and 60/60 Hz uninterruptible power systems, 5 through 300 KVA.

UNINTERRUPTIBLE POWER

Static Products provides battery chargers, transfer switches, and inverters completely packaged as shown. These systems maintain AC power to the load without **any** interruption, regardless of utility fluctuation or outage.

SPACE SAVING

The 25 KVA uninterruptible power system, including battery charger, transfer switch and static inverter occupies only 5 square feet of floor space and is less than 72 inches in height. The 75 KVA system is 72 inches in height and occupies only 10 square feet.

Technical literature pertaining to the evolution of fourth generation static inverters, pulse width modulation, and a detailed reliability report is available. Please contact Mike George, Vice President of Marketing for detailed specifications and application information.

STATIC PRODUCTS

STATIC PRODUCTS, INC.

2511 NATIONAL DRIVE • P.O. BOX 2226
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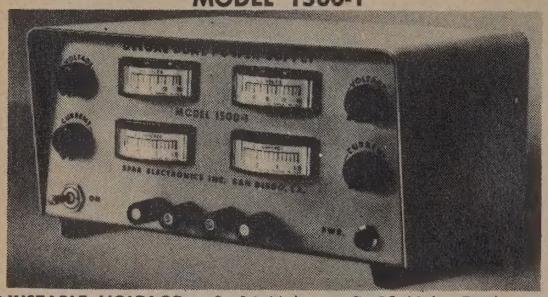
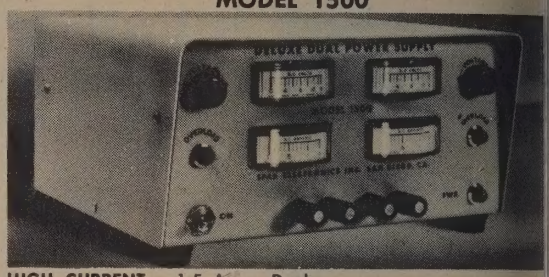
REGULATED D.C. POWER SUPPLIES HIGH PERFORMANCE/LOW COST

MODEL 1500-1



ADJUSTABLE VOLTAGE — 0 - 16 Volts or 0 - 32 Volts Dual
ADJUSTABLE CURRENT — 0.05 - 1.5 Amps (both sides)
$145.00 F.O.B.

MODEL 1500



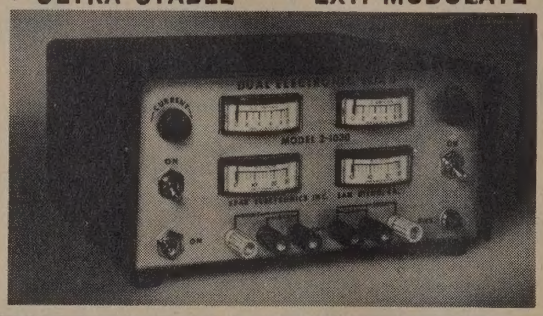
HIGH CURRENT — 1.5 Amps Dual
ADJUSTABLE VOLTAGE — .75 - 16 Volts or 1.5 - 32 Volts Dua
FLASHING OVERLOAD INDICATOR — Both Sides
$115.00 F.O.

MODEL 100 SINGLE

ADJUSTABLE
±16V DC at 1.0 Amp
$45.00 F.O.B.

NEW! POWER SUPPLY TESTER

- 300 WATTS PER SIDE
- PROTECTED
- ULTRA STABLE
- EXT. MODULATE



MODEL 500 DUAL

ADJUSTABLE — ±16V D.C. at 0.5
ADJUSTABLE — ±16V D.C. at 0.5
$69.00

TYPICAL PERFORMANCE[1] — GENERAL INFORMATION (AC to DC Power Supplies)

MODEL[4]	117C-0-12-1.5R	117C-0-24-.75R	#100	#500	#1500	#1500-1	#1500-B	#1500-C	#1500-1(B)	#1500-A
PRICE[2]	$22.00	$25.00	$45.00	$69.00	$115.00	$145.00	$180.00	$195.00	$220.00	$270.00
D.C. OUTPUT	0 to 13V Reg. & 20V Non Reg.	0 to 24V Reg. & 40V Non Reg.	.75 to 16V	.75 to 32V or .75 to 16V Dual	.75 to 32V or .75 to 16V Dual	0 to 32V or 0 to 16V Dual	.75 to 60V or .75 to 30V Dual	.75 to 32V or .75 to 16V Dual	0 to 60V or 0 to 30V Dual	.75 to 60V or .75 to 30V Dual
CURRENT-OUTPUT	1.5A	0.75A	1.0A	0.5A	1.5A	1.5A	1.5A	5.0A	1.5A	5.0A
POWER INPUT	105-125VAC 50-400 Hz	105-125VAC 50-400 Hz	105-125VAC 50-400 Hz	105-125VAC 50-400 Hz	105-125VAC 210-250VAC 50-400 Hz	105-125VAC 210-250VAC 50-400 Hz	105-125VAC 210-250VAC 50-60 Hz	105-125VAC 210-250VAC 50-60 Hz	105-125VAC 210-250VAC 50-60 Hz	105-125VAC 210-250VAC 50-60 Hz
RIPPLE-OUTPUT[3]	30 MV at 1.0A	25MV at .75A	.2MV at .5A	.2MV at .5A	.2MV at .5A	.1MV at 1.5A	.2MV at .5A	1.0MV at 5A	.15MV at 1.5A	.2MV at 5A
REGULATION-NL/FL	0.5V at 1.0A	0.7V at .75A	20MV at 1.0A	20MV at .5A	25MV at 1.5A	10MV at 1.5A	25MV at 1.5A	35MV at 5A	20MV at 1.5A	35MV at 5A
REGULATION-LINE[4]	±.20V	±.15V	10MV	10MV	15MV	8MV	10MV	10MV	10MV	10MV
CONSTANT-CURRENT	No	No	No	No	No	Yes	No	No	Yes	No
CURRENT-ADJUST	No	No	Internal 1.1A	Internal 0.6A	Internal 1.6A	8¾ Turn Pot .05 - 1.5A	Internal 1.5A	Internal 6.0A	8¾ Turn Pot 1.5A	Internal 6.0A
IMPEDANCE-OUTPUT	—	—	0.06Ω/100Hz	0.06Ω/100Hz	0.06Ω/100Hz	0.04Ω/100Hz	0.06Ω/100Hz	0.06Ω/100Hz	0.04Ω/100Hz	0.06Ω/100Hz
RECOVERY TIME	—	—	≦25μSec.	≦25μSec.	≦25μSec.	≦25μSec.	≦25μSec.	≦50μSec.	≦25μSec.	≦50μSec.
TEMP. OPERATING	0-120°F	0-120°F	0-120°F 2MV/°F	0-120°F 2MV/°F	0-120°F 2MV/°F	0-120°F 0.5MV/°F	0-120°F 2MV/°F	0-120°F 2MV/°F	0-120°F 0.5MV/°F	0-120°F 2MV/°F
THERMAL PROTECTION	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SHORT PROTECTION	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
REMOTE SENSING	No	No	No	No	No	Yes	No	No	Yes	No
VOLTAGE ADJUST	1 Turn	1 Turn	1 Turn	1 Turn	10 Turn	10 Turn	10 Turn	10 Turn	10 Turn	10 Turn
OVERLOAD INDICATOR	No	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
METERS	No	No	No	No	2-Volt 2-Amp	2-Volt 2-Amp	2-Volt 2-Amp	2-Volt 2-Amp	2-Volt 2-Amp	2-Volt 2-Amp
SIZE (WxHxD)	2¾" x 2½" x 6"	2¾" x 2½" x 6"	4¾" x 5½" x 4"	8½" x 5½" x 4"	8¾" x 4½" x 8½"	8¾" x 4½" x 8½"	8¾" x 4½" x 9½"	8¾" x 4½" x 9½"	8¾" x 4½" x 9½"	8¾" x 4½" x 9½"
WEIGHT	1¾ Lbs.	1¾ Lbs.	2½ Lbs.	4 Lbs.	7 Lbs.	7 Lbs.	7¼ Lbs.	12¼ Lbs.	7½ Lbs.	15¼ Lbs.
OPTIONS	Fixed or Adjustable	Fixed or Adjustable	Rack Mount	Rack Mtg. Fan	Rack Mtg. XXX Shield	Rack Mtg. XXX Shield	Rack Mtg. XXX Shield	Rack Mtg. XXX Shield	Rack Mtg. XXX Shield	Rack Mtg. XXX Shield

(Electronic Load)

#2-1030	MODEL[6]
$350.00	PRICE[2]
1 to 30 VDC 10 Amp. (each size)	DC INPUT[7] LOAD CURRENT
105/125 VAC 60 HZ	AC PWR. INPUT
.01% or 10MA	RESOLUTION
.001% or 1 MA	CURRENT STABILITY VS AC PWR. INPUT
.001% or 1 MA	VS DC INPUT
.1% or 50 MA	VS WARM UP
.01%/C° or 1 MV/C°	VS AMBIENT TO 50°C
≦50μ Sec.	RECOVERY TIME (Modulated)
8-3/4x4-1/2 x9-1/2	SIZE (WxHxD)
8 Lbs.	WEIGHT
Yes 32/36 VDC	PROTECTION OVERVOLTAGE
Yes 0.8 VDC	REVERSE VOLTAGE
Yes 100°C (Heat Sink)	OVER-TEMP
0 to 50°C	TEMP. OPERATING
Rack Mtg. Up to 300 VDC	OPTIONS

(NOTE: Special single loads available up to 1000 Amps, 300 VDC (10,000 watt

NOTES: [1] Typical Performance x 2 = Specification Limit for Regulation, Ripple & Output Impedance. [2] FOB Factory, San Diego, Calif. [3] RMS [4] 105/125 [5] Triple Shielded Power Transformer [6] Special Models Available on Request [7] At 1 amp. load

SPAR

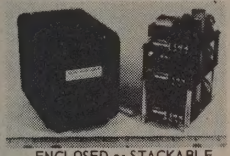
*** ALL PRICES F.O.B. SAN DIEGO, CALIF. — CALIFORNIA RESIDENTS ADD 5% SALES TAX.**

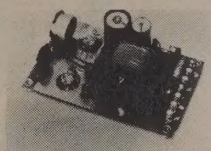
ELECTRONICS, INC. • 7585 CONVOY CT., SAN DIEGO, CALIF. 92111 • 714-279-164

REGULATED D. C. POWER SUPPLIES
HIGH PERFORMANCE/LOW COST

MODULE CARD SUPPLIES

PLUG IN TYPE

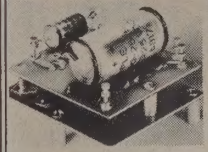

ENCLOSED or STACKABLE

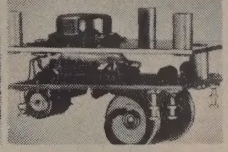

HARD-WIRED TYPE

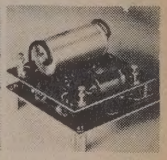
TYPICAL PERFORMANCE – GENERAL INFORMATION (MODULAR AC TO DC POWER SUPPLIES)

	Mod. #0820	Mod. #1615	Mod. #2512	Mod. #3010	Mod. #0840	Mod. #1630	Mod. #2525	Mod. #3020
	$33.00	$33.00	$35.50	$35.00	$38.50	$38.50	$41.00	$41.00
	27.50	27.50	30.00	30.00	33.00	33.00	35.50	35.50
	22.00	22.00	25.00	25.00	27.50	27.50	30.00	30.00
	0-8V	7.5-16V	15.5-25V	24-30V	0-8V	7.5-16V	15.5-25V	24-30V
	200 MA	150 MA	120 MA	100 MA	400 MA	300 MA	250 MA	200 MA
	105-125 VAC	105-125 VAC	105-125 VAC	105-125 VAC	105-125 VAC	105-125 VAC	105-125 VAC	105-125 VAC
	0.2 MV RMS	0.3 MV RMS	0.3 MV RMS	0.3 MV RMS	0.5 MV RMS	0.5 MV RMS	0.4 MV RMS	0.3 MV RMS
	9.0 MV DC	8.0 MV DC	8.0 MV DC	7.0 MV DC	12.0 MV DC	11.0 MV DC	10.0 MV DC	8.0 MV DC
	4.0 MV DC	5.0 MV DC	6.0 MV DC	6.0 MV DC	4.0 MV DC	5.0 MV DC	6.0 MV DC	6.0 MV DC
	50-200 MA	50-150 MA	50-120 MA	50-100 MA	50-400 MA	50-300 MA	50-250 MA	50-200 MA
ted	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	–20 to +70°C	–20 to +70°C	–20 to +70°C	–20 to +70°C	–20 to +70°C	–20 to +70°C	–20 to +70°C	–20 to +70°C
ut	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ	3 Ω at 10 MHZ
	2.5"x1.8"x4"	2.5"x1.8"x4"	2.5"x1.8"x4"	2.5"x1.8"x4"	2.5"x2"x4"	2.5"x2"x4"	2.5"x2"x4"	2.5"x2"x4"
	0.5 lb.	0.5 lb.	0.5 lb.	0.5 lb.	0.75 lb.	0.75 lb.	0.75 lb.	0.75 lb.
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	A0820	A1615	A2512	A3010	A0840	A1630	A2525	A3020
	Add -2 & -3	Add -2 & -3	Add -2 & -3	Add -2 & -3	Add -2 & -4	Add -2 & -4	Add -2 & -4	Add -2 & -4

DC SPOT REGULATORS





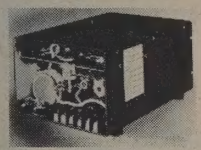


Model	SR 5-1	SR6-1	SR12-1	SR15-1	SR20-1	SR24-1	SR28-1
Price 1/4	$14.70	$14.70	$14.70	$14.70	$14.70	$14.70	$14.70
Price 1000 up	$ 8.80	$ 8.80	$ 8.80	$ 8.80	$ 8.80	$ 8.80	$ 8.80
DC Output	5V/1.0A	6V/1.0A	12V/1.0A	15V/1.0A	20V/1.0A	24V/1.0A	28V/1.0A
DC Input	9.5/16V	10.5/17V	17/22V	20/25V	25/30V	29/34V	33/39V
AC Input (RMS)	10/17V	11/18V	18/23V	21/26V	26/31V	30/35V	34/40V
Ripple Output	35MV(RMS)	35MV(RMS)	35MV(RMS)	40MV(RMS)	50MV(RMS)	65MV(RMS)	90MV(RMS)
Reg. NL/FL	±.25V	±.25V	±.25V	±.25V	±.25V	±.25V	±.25V
Reg. US Input	±.1V	±.1V	±.1V	±.1V	±.1V	±.1V	±.1V
Z Output (IKHZ)	2Ω	2Ω	2Ω	1Ω	1Ω	1Ω	1Ω
Temp. Operating	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C

Model	SRA5-1	SRA6-1	SRA12-1	SRA15-1	SRA20-1	SRA24-1	SRA28-1
Price 1/4	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Price 1000 up	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00
DC Output	5V/1.0A	6V/1.0A	12V/1.0A	15V/1.0A	20V/1.0A	24V/1.0A	28V/1.0A
DC Input	9.5/16V	10.5/17V	17/22V	20/25V	25/30V	29/34V	33/39V
AC Input (RMS)	10/17V	11/18V	18/23V	21/26V	26/31V	30/35V	34/40V
Ripple Output	500μV(RMS)	500μV(RMS)	500μV(RMS)	500μV(RMS)	500μV(RMS)	500μV(RMS)	500μV(RMS)
Reg. NL/FL	.001V	.001V	.01%	.01%	.01%	.01%	.01%
Reg. VS Input	.001V	.001V	.01%	.01%	.01%	.01%	.01%
Z Output	.05Ω	.05Ω	.05Ω	.05Ω	.05Ω	.05Ω	.05Ω
Temp. Stability	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°
Temp. Operating	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C	-20/+70°C

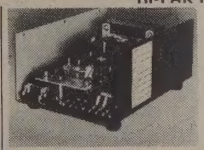
HI-PAK POWER SUPPLIES

-51000-B-C
163.00 (1/4), $97.80 (1000 up)
to 6 Volt at 10 Amp.
00μV(RMS)
05/125 Vac-50/60 HZ
025V
005V
-7/8 x 3-3/4 x 9-3/4
Over Voltage/Fan/71°C



HM-53000-B-C

Price	$212.00 (1/4), $127.20 (1000 up)
DC Output	3 to 6 Volt at 30 Amp.
Ripple-Out	2 MV(RMS)
AC Input	105/125 Vac-50/60 HZ
Reg. NL/FL	.06V
Reg. VS Line	.005V
Size (WXHXL)	6-7/8 x 4-7/8 x 10-3/4
Features	Over Voltage/Fan/71°C

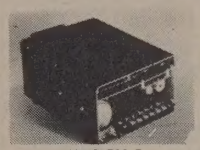


H-12400

Price	$68.00 (1/4), $40.00 (1000 up)
DC Output	12±1VDC at 4 Amp
Ripple-Out	30 MV(RMS)
AC Input	105/125 or 210/250 VAC-50/1000 HZ
Reg. NL/FL	±2%
Reg. VS Line	±1%
Size (WXHXL)	5-7/8 x 3-3/4 x 8"
Features	Short/Thermal Protection

H-12700

Price	$98.00 (1/4), $60.00 (1000 up)
DC Output	12±1 VDC at 7 Amp
Ripple-Out	5 MV(RMS)
AC Input	105/125 or 210/250 Vac 50/1000 HZ
Reg. NL/FL	±2.5%
Reg. VS Line	±1%
Size (WXHXL)	6-7/8 x 4-7/8 x 9
Features	Short/Thermal Protection



HM-24700-C

Price	$170.00 (1/4), $102.00 (1000 up)
DC Output	20 to 25 VDC at 7 Amp
Ripple-Out	500μV (RMS)
AC Input	105/125 VAC-50/60 HZ
Reg. NL/FL	±0.05%
Reg. VS Line	±0.03%
Size (WXHXL)	6-7/8 x 4-7/8 x 10-3/4
Features	Fan/71°C

NEW!! HM-55000-B-C

Price	$395.00 (1/4), $237.00 (1000 up)
DC Output	2 to 5.2 VDC at 50 Amp.
Ripple Out	1 MV (RMS)
AC Input	105/125 VAC-50/60 HZ 210/250 VAC-50/60 HZ
Reg. NL/FL	.01% + 1 MV
Reg. VS Line	.01% + 1 MV
Size (WXHXL)	7-1/16"x6"x11-1/2"
Features	Overvoltage, Fan operation to 50°C.

MODULAR POWER SUPPLIES – 3.6V/7 AMP SINGLE TO 28V/1 AMP DUAL

OWE COST
AL IZE
IGH WER
ULATION
ER L STABILITY
EMO SENSING
P T OUR OUTPUTS

T27D-3.6-2

T27-5-4

T27D-15-2.5

T27-24-4

- SEALED
- RUGGED
- RACK MTG.
- REPAIRABLE
- 11 PIN PLUG
- SHORT PROTECTED
- THERMAL PROTECTION

SINGLE OUTPUT - MEDIUM POWER TYPES - TYPICAL PERFORMANCE

	T27-3.6-4	T27-5-4	T27-6-4	T27-10-3	T27-12-3	T27-15-3	T27-20-2.4	T27-24-2.6	T27-28-2
	$98.50	$98.50	$98.50	$98.50	$98.50	$98.50	$98.50	$98.50	$98.50
	$59.10	$59.10	$59.10	$59.10	$59.10	$59.10	$59.10	$59.10	$59.10
(3)	3.6±.2V	5±.2V	6±.3V	10±.4V	12±.4V	15±.5V	20±.5V	24±.5V	28±.5V
(4)	4 Amp	4 Amp	4 Amp	3 Amp	3 Amp	3 Amp	2.4 Amp	2.6 Amp	2 Amp
	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac
	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)
	.001V	.001V	.001V	.01%	.01%	.01%	.01%	.01%	.01%
	.002V	.002V	.002V	.01%	.01%	.01%	.01%	.01%	.01%
	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec
	0.4MV/C°	0.4MV/C°	0.4MC/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°
	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C
	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω
	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8
	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.

SINGLE OUTPUT – HIGH POWER TYPES - TYPICAL PERFORMANCE

	T27-3.6-7	T27-5-7	T27-6-7	T27-10-5	T27-12-5	T27-15-5	T27-20-4	T27-24-4	T27-28-3
	$105.50	$105.50	$105.50	$105.50	$105.50	$105.50	$105.50	$105.50	$105.50
	$ 63.30	$ 63.30	$ 63.30	$ 63.30	$ 63.30	$ 63.30	$ 63.30	$ 63.30	$ 63.30
	3.6±.2v	5±.2v	6±.3v	10±.4v	12±.4v	15±.5v	20±.5v	24±.5v	28±.5v
	7 Amp	7 Amp	7 Amp	5 Amp	5 Amp	5 Amp	5 Amp	4 Amp	3 Amp
	105/125 or 210/250 vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac
	1.0mv(Rms)	1.0mv(Rms)	1.0mv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)
	.002V	.002V	.002V	.01%	.01%	.01%	.01%	.01%	.01%
	.002V	.002V	.002V	.01%	.01%	.01%	.01%	.01%	.01%
	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec
	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°
	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C
	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω
	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8
	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.

DUAL OUTPUT - MEDIUM POWER TYPES - TYPICAL PERFORMANCE

	T27D-3.6-2	T27D-5-2	T27-6-2	T27D-5-2	T27D-12-1.5	T27D-15-1.5	T27D-20-1.2	T27D-24-1.3	T27D-28-1
	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00
	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00
(3)	3.6±.2v(x2)	5±.2v(x2)	6±.3v(x2)	5±.2v(x2)	12±.4v(x2)	15±.5(x2)	20±.5v(x2)	24±.5v(x2)	28±.5v(x2)
(4)	2 Amp. ea.	2 Amp. ea.	2 Amp. ea.	2 Amp. ea.	1.5 Amp. ea.	1.5 Amp. ea.	1.2 Amp. ea.	1.3 Amp. ea.	1.0 Amp. ea.
	105/125 or 210/250 vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac
	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)
	.001V	.001V	.001V	.001V	.01%	.01%	.01%	.01%	.01%
	.001V	.001V	.001V	.001V	.01%	.01%	.01%	.01%	.01%
	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec
	0.4MV/C°	0.4MV/C°	0.4MV/C°	0.4MV/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°
	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C
	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω
	4¼x5½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x4½x3-5/8	4¼x3½x3-5/8	4¼x3½x3-5/8	4¼x3½x3-5/8
	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.	5½ lbs.

DUAL OUTPUT – HIGH POWER TYPES – TYPICAL PERFORMANCE

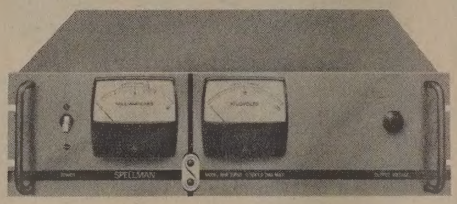
	T27D-3.6-3.5	T27D-5-3.5	T27D-6-3.5	T27D-10-2.5	T27D-12-2.5	T27D-15-2.5	T27D-20-2	T27D-24-2	T27D-28-1.5
	$128.00	$128.00	$128.00	$128.00	$128.00	$128.00	$128.00	$128.00	$128.00
	$ 76.80	$ 76.80	$ 76.80	$ 76.80	$ 76.80	$ 76.80	$ 76.80	$ 76.80	$ 76.80
	3.6±.2v(x2)	5±.2v(x2)	6±.3v(x2)	10±.4v(x2)	12±.4v(x2)	15±.5v(x2)	20±.5v(x2)	24±.5v(x2)	28±.5v(x2)
	3.5 Amp. ea.	3.5 Amp. ea.	3.5 Amp.ea.	2.5 Amp.ea.	2.5 Amp.ea.	2.5 Amp.ea.	2 Amp.ea.	2 Amp.ea.	1.5 Amp.ea.
	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac	105/125 or 210/250vac
	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)	500μv(Rms)
	.001V	.001V	.001V	.01%	.01%	.01%	.01%	.01%	.01%
	.001V	.001V	.001V	.01%	.01%	.01%	.01%	.01%	.01%
	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec	≤25μsec
	0.4MV/C°	0.4MV/C°	0.4MV/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°	.01%/C°
	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C	71°C
	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω	0.05Ω
	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8	4½x5½x3-5/8
	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.	7¾ lbs.

s available etc., 3 or 4 outputs, over-voltage. (2) Discounts at various levels. (3) Other voltages and adjustable models available. (4) Approx. 20% increase–output current–cover off. (5) 100 Hz

SPAR ELECTRONICS, INC. • 7585 CONVOY CT., SAN DIEGO, CALIF. 92111 • 714-279-1641

SPELLMAN
HIGH VOLTAGE POWER SUPPLIES

for industry, science instrumentation, education, aerospace, defense, displays



RACK MOUNTED

Spellman High Voltage Power Supplies are the result of more than twenty years of development and refinement. Employing high frequency oscillator circuitry with an exclusive low stored energy feature, Spellman HV power supplies ensure low corona, low leakage, and long trouble free life.

- All Solid State, Silicon Semiconductors
- Short Circuit and Overload Protected
- High Performance—0.01% Regulation*
- Low Price
- Available with positive, negative or reversible polarities. Polarity indicated by P, N, or PN.
- Fast Delivery
- Kilovoltmeter and Milliammeter
- Precision Multiturn Potentiometer enables adjustment from zero to rated voltage with 0.02% resolution**
- Focus Tap Option on 30KV and 40KV units indicated by PF.

MAX. RATINGS			REGULATED RHR SERIES		UNREGULATED UHR SERIES	
KV	MA.	WATTS				
5	2	10	RHR-5P10 RHR-5N10	$400 400	UHR-5P10 UHR-5N10	$325 325
5	6	30	RHR-5P30 RHR-5N30 RHR-5PN30	425 425 475	UHR-5P30 UHR-5N30 UHR-5PN30	350 350 400
5	10	50	RHR-5P50 RHR-5N50 RHR-5PN50	475 475 525	UHR-5P50 UHR-5N50 UHR-5PN50	400 400 450
10	1	10	RHR-10P10 RHR-10N10	470 470	UHR-10P10 UHR-10N10	345 345
10	3	30	RHR-10P30 RHR-10N30 RHR-10PN30	495 495 575	UHR-10P30 UHR-10N30 UHR-10PN30	370 370 420
10	6	60	RHR-10P60 RHR-10N60 RHR-10PN60	535 535 625	UHR-10P60 UHR-10N60 UHR-10PN60	400 400 450
10	10	100	RHR-10P100 RHR-10N100 RHR-10PN100	575 575 675	UHR-10P100 UHR-10N100 UHR-10PN100	430 430 480
15	0.67	10	RHR-15P10 RHR-15N10	615 615	UHR-15P10 UHR-15N10	355 355
15	2	30	RHR-15P30 RHR-15N30 RHR-15PN30	650 650 750	UHR-15P30 UHR-15N30 UHR-15PN30	390 390 440
15	4	60	RHR-15P60 RHR-15N60 RHR-15PN60	705 705 805	UHR-15P60 UHR-15N60 UHR-15PN60	430 430 480
15	8	120	RHR-15P120 RHR-15N120 RHR-15PN120	755 755 855	UHR-15P120 UHR-15N120 UHR-15PN120	470 470 520
20	0.50	10	RHR-20P10 RHR-20N10	670 670	UHR-20P10 UHR-20N10	380 380
20	1.5	30	RHR-20P30 RHR-20N30 RHR-20PN30	720 720 820	UHR-20P30 UHR-20N30 UHR-20PN30	410 410 460
20	3	60	RHR-20P60 RHR-20N60 RHR-20PN60	770 770 870	UHR-20P60 UHR-20N60 UHR-20PN60	450 450 500

MAX. RATINGS			REGULATED RHR SERIES		UNREGULATED UHR SERIES	
KV	MA.	WATTS				
20	6	120	RHR-20P120 RHR-20N120 RHR-20PN120	$825 825 925	UHR-20P120 UHR-20N120 UHR-20PN120	490 490 540
30	0.33	10	RHR-30P10 RHR-30N10	730 730	UHR-30P10 UHR-30N10	380 380
30	1	30	RHR-30P30 RHR-30N30 RHR-30PN30 RHR-30PF30	790 790 890 865	UHR-30P30 UHR-30N30 UHR-30PN30 —	430 430 480 —
30	2	60	RHR-30P60 RHR-30N60 RHR-30PN60 RHR-30PF60	840 840 940 915	UHR-30P60 UHR-30N60 UHR-30PN60 —	470 470 520 —
30	4	120	RHR-30P120 RHR-30N120 RHR-30PN120 RHR-30PF120	895 895 995 970	UHR-30P120 UHR-30N120 UHR-30PN120 —	510 510 560 —
40	0.75	30	RHR-40P30 RHR-40N30 RHR-40PN30 RHR-40PF30	920 920 1070 995	UHR-40P30 UHR-40N30 UHR-40PN30 —	580 580 630 —
40	1.5	60	RHR-40P60 RHR-40N60 RHR-40PN60 RHR-40PF60	980 980 1130 1055	UHR-40P60 UHR-40N60 UHR-40PN60 —	620 620 670 —
40	3	120	RHR-40P120 RHR-40N120 RHR-40PN120 RHR-40PF120	1065 1065 1215 1140	UHR-40P120 UHR-40N120 UHR-40PN120 —	660 660 710 —
60	0.50	30	RHR-60P30 RHR-60N30 RHR-60PN30	1380 1380 1630	UHR-60P30 UHR-60N30 UHR-60PN30	790 790 880
60	1	60	RHR-60P60 RHR-60N60 RHR-60PN60	1500 1500 1750	UHR-60P60 UHR-60N60 UHR-60PN60	850 850 940
60	2	120	RHR-60P120 RHR-60N120 RHR-60PN120	1620 1620 1870	UHR-60P120 UHR-60N120 UHR-60PN120	910 910 1000
100	1	100	RHR-100P100 RHR-100N100	2250 2250	UHR-100P100 UHR-100N100	1200 1200

RACK MODELS Size and Weight

19" relay rack panels with standard notching. Behind-panel depth is 16½". Any rack model can be furnished installed in a bench-mounting cabinet.

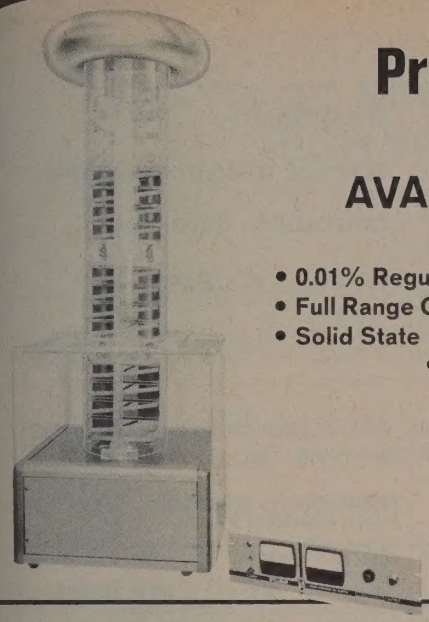
Output Voltage	Rack Panel Height	Weight	Shipping Weight
5KV thru 30KV	5¼"	22 lbs.	30 lbs.
40KV	8¾"	30 lbs.	50 lbs.
60KV	12¼"	35 lbs.	75 lbs.
100KV	17½"	40 lbs.	100 lbs.

SPECIFICATIONS

	RHR SERIES	UHR SERIES
REGULATION		
No load to full load	0.01% or 1V	±2% of max. rated voltage
Line from Min.-Max.	±0.01% or ±1V	±2% of max. rated voltage
RIPPLE	0.02% RMS or 2V	0.1% RMS of max. rated voltage
TEMP. COEFF.	0.01% between 0°C and 60°C	0.2% between 0°C and 60°C
INPUT	105-125V, 50-60Hz, Single phase	

*RHR Series

**Single turn pot on UHR Series



Precision Power Supplies

AVAILABLE TO 300KV

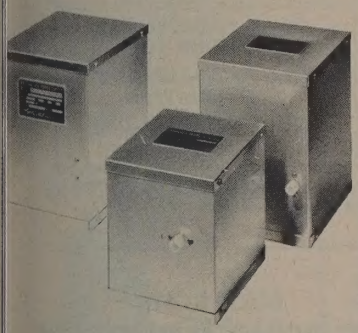
- 0.01% Regulation
- Full Range Control
- Solid State
- 0.02% RMS Ripple
- Custom Units Available
- Short Circuit and Overload Protected
- Available with positive or negative polarities

MAXIMUM RATINGS KV.	MA.	WATTS	MODEL	PRICE	HEIGHT	WEIGHT	SHIPPING WEIGHT
150	1	150	RHR150P150 RHR150N150	$3800	34″	125 lbs.	300 lbs.
300	0.5	150	RHR300P150 RHR300N150	$4200	48″	175 lbs.	350 lbs.

UNREGULATED (UHR) UNITS ALSO AVAILABLE IN THIS SERIES

MODULAR STYLE

HIGH VOLTAGE POWER SUPPLIES



Modules are built into heavy-gage aluminum housings. Seven standard sizes are available.

			FRHM—REGULATED FIXED OUTPUT				UHM—UNREGULATED INPUT—CONTROLLABLE			
			DC—INPUT 24-32V		AC—INPUT 105-125V		DC—INPUT 0-24V		AC-INPUT 0-115V	
REGULATION No load to full load			0.01% or 1V		0.01% or 1V		20% of max. voltage		20% of max. voltage	
Line from Min.-Max.			±0.01% or ±1V		±0.01% or ±1V		Not applicable		Not applicable	
Ripple			0.02% RMS or 2V		0.02% RMS or 2V		0.1% of max. voltage		0.5% of max. voltage	
Temp. Coeff.			0.01%/°C between 0°C and 60°C		0.01%/°C between 0°C and 60°C		0.2%/°C between 0°C and 60°C		0.2%/°C between 0°C and 60°C	
MAX. RATINGS KV	MA.	WATTS								
5	2	10	FRHM-5P10D FRHM-5N10D	$235 235	FRHM-5P10A FRHM-5N10A	$285 285	UHM-5P10D UHM-5N10D UHM-5PN10D	$ 75 75 95	UHM-5P10A UHM-5N10A UHM-5PN10A	$110 110 130
5	6	30	FRHM-5P30D FRHM-5N30D	335 335	FRHM-5P30A FRHM-5N30A	385 385	UHM-5P30D UHM-5N30D UHM-5PN30D	200 200 220	UHM-5P30A UHM-5N30A UHM-5PN30A	235 235 255
10	1	10	FRHM-10P10D FRHM-10N10D	260 260	FRHM-10P10A FRHM-10N10A	310 310	UHM-10P10D UHM-10N10D UHM-10PN10D	75 75 95	UHM-10P10A UHM-10N10A UHM-10PN10A	110 110 130
10	3	30	FRHM-10P30D FRHM-10N30D	400 400	FRHM-10P30A FRHM-10N30A	450 450	UHM-10P30D UHM-10N30D UHM-10PN30D	220 220 240	UHM-10P30A UHM-10N30A UHM-10PN30A	255 255 275
15	0.67	10	FRHM-15P10D FRHM-15N10D	435 435	FRHM-15P10A FRHM-15N10A	485 485	UHM-15P10D UHM-15N10D UHM-15PN10D	125 125 145	UHM-15P10A UHM-15N10A UHM-15PN10A	160 160 180
15	2	30	FRHM-15P30D FRHM-15N30D	505 505	FRHM-15P30A FRHM-15N30A	555 555	UHM-15P30D UHM-15N30D UHM-15PN30D	240 240 260	UHM-15P30A UHM-15N30A UHM-15PN30A	275 275 295
20	0.50	10	FRHM-20P10D FRHM-20N10D	435 435	FRHM-20P10A FRHM-20N10A	485 485	UHM-20P10D UHM-20N10D UHM-20PN10D	125 125 145	UHM-20P10A UHM-20N10A UHM-20PN10A	160 160 180
20	1.5	30	FRHM-20P30D FRHM-20N30D	570 570	FRHM-20P30A FRHM-20N30A	620 620	UHM-20P30D UHM-20N30D UHM-20PN30D	260 260 280	UHM-20P30A UHM-20N30A UHM-20PN30A	295 295 315
30	0.33	10	FRHM-30P10D FRHM-30N10D	480 480	FRHM-30P10A FRHM-30N10A	535 535	UHM-30P10D UHM-30N10D	150 150	UHM-30P10A UHM-30N10A	185 185
30	1	30	FRHM-30P30D FRHM-30N30D	635 635	FRHM-30P30A FRHM-30N30A	685 685	UHM-30P30D UHM-30N30D	280 280	UHM-30P30A UHM-30N30A	315 315

SIZE AND WEIGHT

MODEL TYPE	INPUT	RATED KV	OUTPUT WATTS	DIMENSIONS W″	L″	H″	NET WEIGHT	SHIPPING WEIGHT
FRHM	DC	5, 10, 15, & 20	10	5½	7½	7½	4	12
		30		5½	10	9	5	13
FRHM, UHM	DC	all	30	5½	10	9	5	13
FRHM	AC	5, 10, 15 & 20	10	5½	10	8	13	23
		30		5½	12	10	15	25
FRHM, UHM	AC	all	30	5½	12	10	15	25
UHM	DC	5, 10	10	5	6	6	2	10
		15, 20, 30		5¼	6¾	8¼	3	11
UHM	AC	5, 10	10	5	6	9	10	20
		15, 20, 30		5¼	6¾	11¼	11	21

OPTIONAL ITEMS

Floating outputs, positive/negative dual outputs and special taps available on order. Other modules at higher voltages available on request. Modules with adjustable output available for both DC and AC input.

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Our Third Decade of Leadership
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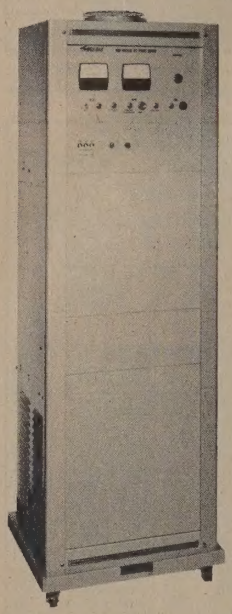
SPELLMAN HIGH VOLTAGE POWER SUPPLIES

for industry, science instrumentation, education, aerospace, defense, displays

SERIES REGULATED POWER SUPPLIES



REGULATION

Line ±0.01% or ±100 MV over specified range
Load ±0.01% or ±100 MV from no load to full load

RIPPLE

0.02% RMS

CONTROL FEATURES

- Circuit breaker protection
- Overload trip circuit
- Kilovoltmeter and milliammeter
- Safety interlock
- Zero start interlock
- Functional indicators and controls

Constant current units available for high power gas lasers with unique start-up features.

Positive, Negative, or Reversible Polarity available on all units.

MODEL NO.	VOLTAGE RATING (KV)	CURRENT RATING (MA)	INPUT VOLTAGE
HP5-250SR	0-5 KV	250	105-125V, 60Hz, Single Phase
HP5-500SR	0-5 KV	500	200-240V, 60Hz, Three Phase
HP5-1000SR	0-5 KV	1000	200-240V, 60Hz, Three Phase
HP10-100SR	0-10 KV	100	105-125V, 60Hz, Single Phase
HP10-250SR	0-10 KV	250	200-240V, 60Hz, Three Phase
HP10-500SR	0-10 KV	500	200-240V, 60Hz, Three Phase
HP20-50SR	0-20 KV	50	105-125V, 60Hz, Single Phase
HP20-100SR	0-20 KV	100	200-240V, 60Hz, Three Phase
HP20-200SR	0-20 KV	200	200-240V, 60 Hz, Three Phase

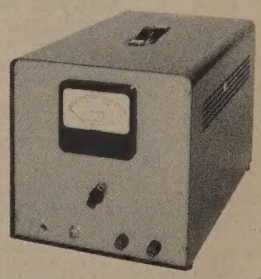
Table above is an abbreviated listing of standard models. Other units up to 150KVDC and 30KW are also available.

60 Cycle Heavy Duty PORTABLE POWER SUPPLY

0-60 KV DC

Low priced stock item for industrial process and test applications.

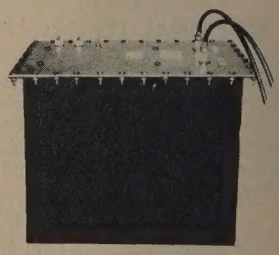
Provided with kilovoltmeter.



MODEL NO.	ST-60	PF-60
Input	115V. RMS 60Hz Single Phase	
Output Voltage	Continuously adjustable from 0-60 KV DC	
Output Current	250 microamps at 60 KV 1 milliamp max. below 20 KV	50 microamps at 60 KV 250 microamps max. below 20 KV
Ripple	Less than 2% RMS at rated voltage	
Polarity	Positive with respect to ground	Negative with respect to ground
Size & Weight	11″w x 18″d x 11″h carrying case with handle. Net weight 40 lbs. Shipping weight 55 lbs.	

SOLID STATE DC POWER SUPPLY for LASERS

15 KV @ 250 ma.



- Input 115 V 50 amp. AC
- Output 15 KV DC @ 250 ma.
- HV floating full wave bridge
- Either negative or positive may be grounded or left floating
- Ideal for gas laser or condenser charging

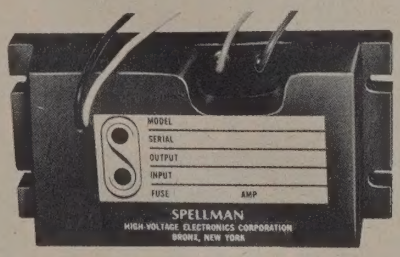
Model RS-21 .....$575 Net

DC-TO-DC MINIATURE ENCAPSULATED HIGH VOLTAGE MODULES

for CRT and Photomultiplier uses and other applications requiring modular packaging.

REGULATED MODEL NO.	UNREGULATED MODEL NO.	OUTPUT VOLTAGE RANGE (volts)*	OUTPUT CURRENT (micro-amps)
RM 1.5P1500D	UM 1.5P1500D	1200-1500	1000
RM 1.5N1500D	UM 1.5N1500D	1200-1500	1000
RM 3P1500D	UM 3P1500D	2500-3000	500
RM 3N1500D	UM 3N1500D	2500-3000	500
RM 6P1500D	UM 6P1500D	5000-6000	250
RM 6N1500D	UM 6N1500D	5000-6000	250
RM 12P1200D	UM 12P1200D	10,000-12,000	100
RM 12N1200D	UM 12N1200D	10,000-12,000	100
RM 18P1200D	UM 18P1200D	15,000-18,000	60
RM 18N1200D	UM 18N1200D	15,000-18,000	60
RM 24P1200D	UM 24P1200D	20,000-24,000	50
RM 24N1200D	UM 24N1200D	20,000-24,000	50

*UM models operate from 0 to rated maximum voltage. In-between voltages available on special order.

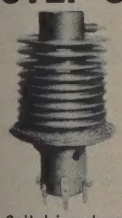


SPECIFICATIONS:

REGULATION: (RM ONLY)	Line: ±0.01% for ±10% input variations Load: 0.3% for no load to full load change
TEMP. COEF.:	0.025% per °C from 0 to 60°C
RIPPLE:	0.1% RMS
EFFICIENCY:	50% minimum
OUTPUT POLARITY:	Positive (P) or Negative (N) Available with respect to ground
INPUT:	+28VDC ±10% for RM Models +3 to +24 VDC ±10% Nominal for UM Models
ADJUSTMENT:	Resistance programming terminals provided for RM Models. Output voltage proportional to input voltage for UM Models
PACKAGE:	3 3/16 x 5 1/2 x 1 1/4 high, RM Models, up to 18KV 3 3/16 x 6 1/2 x 1 1/4 high, RM Models, 24 KV 2 5/16 x 4 3/4 x 1 1/4 high, UM Models, up to 12KV 2 5/16 x 5 3/4 x 1 1/4 high, UM models, 18 and 24KV

Dimensions include mounting flanges. Units fully encapsulated.

MODEL TRF10
High Voltage
STEP-UP COIL



for transistor drive circuits

OUTPUT TO 10 KV DC @ 1 ma.

Coil driven by single transistor self-oscillating circuit • Input voltage up to 28 V DC approx. 1 amp. • Coil height—4 1/4" • Diameter—3" • Approx. operating frequency 120 KHz
Higher voltages available when used with proper rectifier/multiplication circuit.

Complete with technical data and schematic diagram for construction of self-oscillating RF circuit at approximately 120kHz. Other coils available for vacuum-tube circuits.

Model TRF10 ....$29.75 Net

ELECTROSTATIC FLOCKING SYSTEMS

Through our specialized work in high voltage technology we have established a reputation as a leading source for electrostatic flocking systems. We now produce a variety of electrostatic flocking systems for manual and production line use. Spellman Model PB-3 for flat surface flocking and Spellman Model PB-4 for three dimensional flocking are available off the shelf.

CUSTOM AND SPECIAL PURPOSE DESIGNS

Over the years, we have developed and built many thousands of custom power supplies, in hundreds of non-standard mechanical configurations, and hundreds of non-standard ratings. We are prepared to quote promptly and accurately, and deliver on short schedules as well, on most custom requirements.

MODEL PB70AC
HEAVY DUTY ELECTROSTATIC FLOCKING SYSTEM

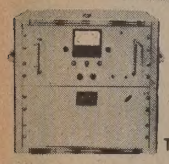
- Latest AC electrostatic flocking technique
- Stepless variable speed from 0 to 30 ft/min
- High voltage AC power supply
- Heavy neoprene belt conveyor

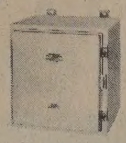
SPELLMAN
HIGH-VOLTAGE ELECTRONICS CORPORATION

Our Third Decade of Leadership in High-Voltage Technology
1930 ADEE AVENUE
BRONX, NEW YORK 10469
(212) 547-0306

STABILINE® automatic VOLTAGE REGULATORS

TYPE IES9101





TYPE EMT10228

TYPE EMT4115B

Deliver a constant output voltage regardless of variations in input voltage or changes in line current. Types available from 0.25 to 275 kva. Submit specifications for ratings desired but not given in the charts. Input voltage ranges shown are at nominal output voltage; input range shifts with output voltage setting.

EMT SERIES – Electro Mechanical Transistorized types with virtually zero waveform distortion, 47-63 hertz frequency range, very low internal impedance, negligible phase shift and efficiency approximately 99%. Rated accuracy ±.75% for all line voltage or load current variations within unit stated range. Insensitive to load magnitude and power factor; no effect on system power factor.

EMS SERIES – Electro Mechanical Transistorized types for heavier load requirements. Same operating characteristics as EMT Series. Units with letter I before first digit in type number have individual control for each line-to-neutral voltage.

EMK SERIES – Electro Mechanical Transistorized types providing faster correction times than other electromechanical models.

IES SERIES – Instantaneous Electronic Solid-State types having extremely fast correction, no moving parts. Will maintain output voltage within a 100 millivolt rms band for any combination of rated input voltage and/or load from 1.0 to 0 power factor lagging. Efficiency to 95%. All units have provision for remote sensing and have plug-in solid-state circuit boards.

MILITARIZED – Meet requirements of applicable military specifications. Type EMTH41007MH is 3½ x 6 x 4½"; type EM4108MCR fits standard 19" relay rack. Accuracy ±1.0%.

STABILINE® Full Range REGULATOR CONTROLLERS

TYPE FR500MP

Designed for use with any motor-driven POWERSTAT Variable Transformer. Provide *full range:*

REGULATED AC VOLTAGE – Output voltage will remain within a 2-volt band when used with 120 volt unit and a 4-volt band when used with 240 volt types.

REGULATED AC CURRENT — Current can be regulated accurate within ±1% of maximum current setting with user supplied current transformer and Superior Electric transformer type T6049.

REGULATED DC VOLTAGE – Type FR500DC with a user-supplied d-c power supply will provide regulated d-c voltage.

THE SUPERIOR ELECTRIC COMPANY

1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

EMT SERIES

NOMINAL OUTPUT VOLTAGE	OUTPUT VOLTAGE (ADJUSTABLE)	INPUT VOLTAGE RANGE‡‡	MAXIMUM OUTPUT AMPERES	RATED OUTPUT KVA	CORRECTION RATE AT 60 HERTZ (SECONDS/VOLT)	TY
50/60 HERTZ, SINGLE PHASE OPERATION						
115	110-120	95-135	20	2.3	*0.075	EMT4
			57	6.6	0.075	EMT4
		90-115	52	6.0	0.12	EMT1
		105-125	114	13.0	0.15	EMT4
		95-135	144	16.6	0.125	EMT4
120◀	110-120	108-137	35	4.2	0.10	EMT4
230‡	220-240	195-255	36	8.3	0.083	EMT4
			93	21.4	0.083	EMT4
		205-250	130	29.9	0.111	EMT4
240‡◀	220-240	228-256	35	8.4	0.10	EMT4
460	440-480	400-520	20	9.2	0.041	EMT4
			45	20.7	0.041	EMT4
50/60 HERTZ, THREE PHASE OPERATION						
230‡	220-240	195-255	33	13.1	0.083	EMT6
			48	19.1	0.083	EMT6
			63	25.1	0.083	EMT6
			145	57.8	0.25	EMT6
			188	74.9	0.25	EMT6
460	440-480	400-520	18	14.3	0.041	EMT6
			24	19.1	0.041	EMT6
			35	27.9	0.041	EMT6
			75	59.8	0.125	EMT6
			100	75.0	0.125	EMT6
		420-500	148	118	0.188	EMT6

EMS SERIES

60 HERTZ, SINGLE PHASE, 2-WIRE						
115	110-120	103.5-126.5	833	100	0.65	EMS4
230‡	220-240	218.5-241.5	435	100	0.22	EMS4
50/60 HERTZ, SINGLE PHASE, 3-WIRE, INDIVIDUAL LINE CONTROL						
240/120	230-250/115-125	204-276/102-138	104	25.0	.03/.06	EMS1
			250	60.0	.03/.06	EMS1
	220-240/110-120	228-252/114-126	417	100	.10/.21	EMS1
50/60 HERTZ, THREE PHASE, SINGLE CONTROL						
230‡	220-240	203-257	339	135	0.28	EMS6
460	440-480	445-495	230	180	0.30	EMS6
			347	275	0.30	EMS6
50/60 CYCLE, THREE PHASE, INDIVIDUAL LINE CONTROL						
208/120	191-217/115-125	177-239/102-138	250	90.0	.08/.14	EMS1
		165-233/95-135	525	190	.37/.22	EMS1

EMK SERIES

50/60 CYCLE, SINGLE PHASE						
115	110-120	95-135	23	2.6	0.02	EMK4
		105-125	46	5.3	0.04	

IES SERIES

50 OR 60 CYCLE ±10%, SINGLE PHASE						
115	110-120	95-135**	4.4	0.5	—	IES91
			8.7	1.0	—	IES91
			26.1	3.0	—	IES91
			52.2	6.0	—	IES91
			130	15.0	—	IES91
230	220-240	195-255**	13	3.0	—	IES92
			26.1	6.0	—	IES92
			65	15.0	—	IES92

MILITARIZED TYPES

45-66 HERTZ, SINGLE PHASE						
120	115-125	105-135	66.6	8.0	0.10	EM41
380-420 HERTZ, SINGLE PHASE						
115	115	103.5-126.5	6	0.69	0.13▲	EMT

▲At 400 Hertz.
†Also available as rack model (suffix R when ordering).
◀For 60 Hertz operation only.
*Can also be operated on an input range of 95 to 135 volts with a rating of 57 amperes, 6.6 kva and a correction rate of 0.075 seconds per v
§Also available as rack (suffix R when ordering) or wall mounted (suffix W when ordering) models.
‡Unit can be converted for 208 volt operation by simple tap changes. Input and output voltage ranges change proportionally.
**At nominal output. Shifts with output voltage setting but not proportionally.
††Also available in open construction (suffix U) and with screened and enclosed (suffix UT) construction.
‡‡At nominal output. Shifts proportionally with output voltage setting.

SEE OTHER SUPERIOR ELECTRIC PRODUCT PAGES IN SECTIONS 2100, 3500 AND

25 page condensed catalog

Technipower offers the largest selection of all-silicon power modules and power supplies in the industry.

AC-DC Regulated & Unregulated Modules
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Modular DC-DC Converters
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Rack Mounts*

* For full information on these items, and on the entire Technipower line, see the complete Technipower catalog of more than 4000 models. Your rep has a copy for you, or call us direct.

PLEASE NOTE: Technipower maintains a deep shelf inventory of over 400 most used models. If you need a power supply in a hurry it can very likely be shipped from stock!

Field-serviceable modular construction power supplies (PK Series)

New!

Low silhouette, high current point of load regulators (CX Series)

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY
BENRUS CENTER • RIDGEFIELD, CONNECTICUT 06877
PHONE: (203) 438-0333 • TWX: 710-467-0666

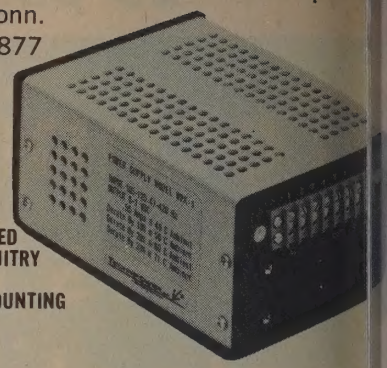
TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

New!

PK SERIES
POWER MODULES

0 to 32VDC, Up to 80 watts



- AMBIENT RATED
- CONVECTION COOLED
- IC CONTROL CIRCUITRY
- EASILY SERVICED
- MULTI-SURFACE MOUNTING

NPK (NARROW RANGE)

WPK (WIDE RANGE)

DPK (DUAL WIDE RANGE)

TDPK (TRACKING DUAL WIDE RANGE)

DESIGN PARAMETERS (Typical)

Recovery time: Less than 50 μsec, 1/2 L to FL.

M.T.B.F. for product line: 60,000 hrs. per MIL-HBK-217A with module stressed at 71°C and rated load.

Designed to meet MIL environmental specifications:
Vibration — MIL-STD-202 Test Method 210A;
Shock — MIL-STD-202 Test Method 205C;
Moisture Resistance — MIL-STD-202 Test Method 103;
RFI — (Radiated & Conducted) — MIL-I-16910.

OPTIONAL FEATURES

	SUFFIX
Fixed output voltage	F
Lower temperature coefficient	T
Wide input range	W

208 and 230VAC input available — consult factory

Fungus proofing — consult factory

SPECIFICATIONS

Input voltage range: 105-125 volts.
Input frequency range: 47-420 Hz.
Regulation-Line and Load Combined: 0.05% + 2 mv.
Ripple (RMS): (with either positive or negative ter grounded): 1 mv
Temperature Coefficient: 0.03%/°C or 2 mv/°C whiche greater.
Polarity: May be used positive or negative.
Output voltage and current: See model listings.
Output adjustment range: See model listings.
Remote programming resistance: 350 ohms/volt nominal
Short circuit protection: Automatic circuit protects the supply if the output is shorted continuously. Auto return upon removal of the short circuit.
Characteristic curve for short circuit protection:
NPK models — Figure 1
WPK models — Figure 2
DPK or TDPK models — Figure 3
DC output control:
NPK and WPK models: Screw driver adjustment over age range specified in model listings.
DPK models: Each output can be adjusted indepen by dual screw driver adjustments.
TDPK models: Both outputs adjusted simultaneous single screw driver adjustment.
Remote sensing: Provisions are made for remote sensi eliminate effects of lead resistance on DC regulation.
Series operation: The series starting circuitry employe quires that input AC voltage be applied at a rate g than 150V rms/sec. Consult factory if slow rising in anticipated.
Operating temperature: —20°C to +71°C for maximum current ratings specified in model listings.
Storage temperature: —62° to +85°C.
Overvoltage protection: Available for all models as an ac ory. Provides both transient and power supply malfu protection.
Tracking accuracy (TDPK models): Each output will be fa set within 1.0% of the other. Outputs will track 20.0 mv or ±0.05% (whichever is greater) of each during pot adjustment.

TYPICAL SHORT CIRCUIT PROTECTION CHARACTERISTICS

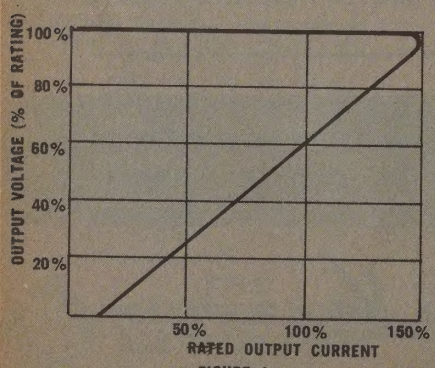


FIGURE 1
NPK MODELS (TYPICAL)

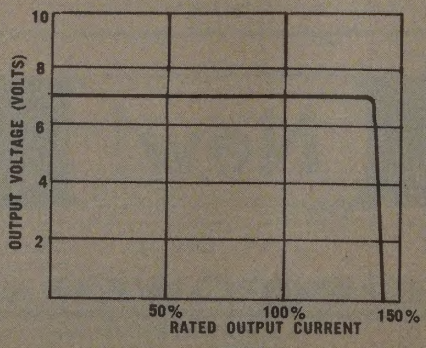


FIGURE 2
WPK MODELS (TYPICAL)

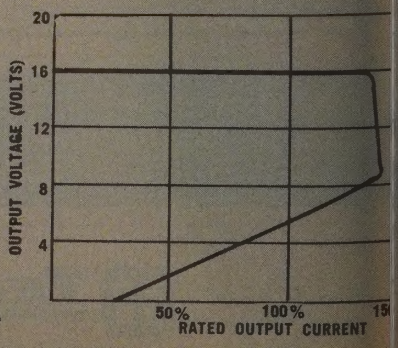


FIGURE 3
DPK & TDPK MODELS (TYPICAL)

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

RIES — VOLTAGE AND CURRENT RATINGS

e Size 5 7/16 x 3 15/16 x 2 23/32

ge Models

	Adjustable voltage range	Maximum current at an ambient temperature of 40°C	50°C	60°C	71°C	Price
5	5.0±5%	1.1	1.0	0.90	0.75	95
6	6.0±5%	1.0	0.90	0.80	0.67	95
-1	10.0±5%	0.85	0.76	0.68	0.57	95
-1	12.0±5%	0.75	0.67	0.60	0.50	95
-1	15.0±5%	0.70	0.63	0.56	0.47	95
-1	18.0±5%	0.65	0.60	0.50	0.44	95
-2	20.0±5%	0.60	0.55	0.48	0.40	95
-2	24.0±5%	0.50	0.45	0.40	0.34	95
-2	28.0±5%	0.45	0.40	0.36	0.30	95
-3	32.0±5%	0.40	0.36	0.32	0.27	95
e models						
-1	0-7	0.55	0.49	0.44	0.37	95
ut models						
Tracing						
-1	±9-16	0.15	0.13	0.12	0.10	130
ckin						
-1 5	±9-16	0.15	0.13	0.12	0.10	135

Case Size 3 6 7/16 x 6 3/32 x 3 1/2

Narrow Range Models

Model Number	Adjustable voltage range	Maximum current at an ambient temperature of 40°C	50°C	60°C	71°C	Price
NPK-3-5	5.0±5%	5.0	4.5	4.0	3.3	140
NPK-3-6	6.0±5%	4.6	4.1	3.7	3.1	140
NPK-3-10	10.0±5%	3.9	3.5	3.1	2.6	140
NPK-3-12	12.0±5%	3.7	3.3	3.0	2.5	140
NPK-3-15	15.0±5%	3.3	3.0	2.6	2.2	140
NPK-3-18	18.0±5%	3.0	2.7	2.4	2.0	140
NPK-3-20	20.0±5%	2.9	2.6	2.3	1.9	140
NPK-3-24	24.0±5%	2.4	2.2	1.9	1.6	140
NPK-3-28	28.0±5%	2.2	2.0	1.8	1.5	140
NPK-3-32	32.0±5%	1.9	1.7	1.5	1.3	140
Wide range models						
WPK-3-7	0-7	2.2	2.0	1.8	1.5	140

Case Size 2 5 7/16 x 3 15/16 x 3 3/32

ange Models

	Adjustable voltage range	Maximum current at an ambient temperature of 40°C	50°C	60°C	71°C	Price
-2	5.0±5%	2.3	2.1	1.8	1.5	105
-2	6.0±5%	2.0	1.8	1.6	1.3	105
-2	10.0±5%	1.7	1.5	1.4	1.1	105
-2	12.0±5%	1.5	1.4	1.2	1.0	105
-2	15.0±5%	1.4	1.3	1.1	0.94	105
-2	18.0±5%	1.3	1.2	1.0	0.87	105
-2	20.0±5%	1.2	1.1	0.96	0.80	105
-2	24.0±5%	1.0	0.90	0.80	0.67	105
-2	28.0±5%	0.90	0.81	0.72	0.61	105
-2	32.0±5%	0.80	0.72	0.64	0.54	105
ge models						
-2	0-7	1.1	1.0	0.88	0.73	105
ut models						
Tracking						
-2 5	±9-16	0.50	0.45	0.40	0.33	145
cki						
-16	±9-16	0.50	0.45	0.40	0.33	150

Case Size 4 7 1/8 x 7 1/8 x 3 7/8

Narrow Range Models

Model Number	Adjustable voltage range	Maximum current at an ambient temperature of 40°C	50°C	60°C	71°C	Price
NPK-4-5	5.0±5%	7.7	6.9	6.2	5.2	160
NPK-4-6	6.0±5%	7.0	6.3	5.6	4.7	160
NPK-4-10	10.0±5%	5.7	5.1	4.6	3.8	160
NPK-4-12	12.0±5%	5.2	4.7	4.2	3.5	160
NPK-4-15	15.0±5%	4.8	4.3	3.8	3.2	160
NPK-4-18	18.0±5%	4.3	3.9	3.4	2.9	160
NPK-4-20	20.0±5%	4.0	3.6	3.2	2.7	160
NPK-4-24	24.0±5%	3.3	3.0	2.6	2.2	160
NPK-4-28	28.0±5%	2.9	2.6	2.3	1.9	160
NPK-4-32	32.0±5%	2.5	2.3	2.0	1.7	160
Wide range models						
WPK-4-7	0-7	3.4	3.1	2.7	2.3	160
Dual output models						
Non Tracking						
DPK-4-16	±9-16	1.5	1.4	1.2	1.0	210
Tracking						
TDPK-4-16	±9-16	1.5	1.4	1.2	1.0	215

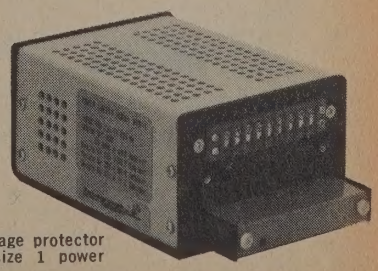
LTAGE OPTION:

OP-1 OVERVOLTAGE PROTECTOR

$25

- Miniature size (5/8x1 1/16x3 1/4)
- One model fits cases 1, 2, 3, 4
- Mounts conveniently to PK supply
- Adjustable overvoltage trip point

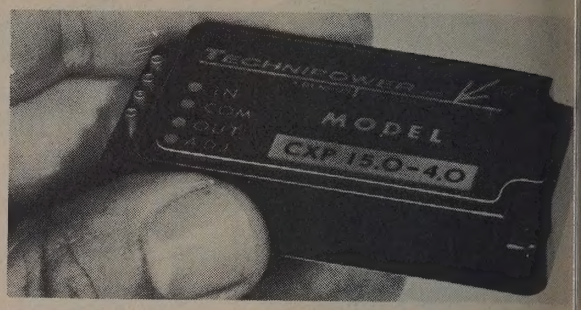
e overvoltage protection for all models of case sizes 1, 2, 3, and 4 of the s. Installed on a PK series supply, the OP-1 offers full overvoltage pro- rom both transients and power supply malfunctions.



OP-1 Over voltage protector mounted on size 1 power supply.

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY
Ridgefield, Conn.
06877

New!



CX-95

POWER MODULES

VERSATILE, MINIATURE DC-DC "POINT-OF-LOAD" SERIES REGULATORS

DESIGN PARAMETERS (Typical)

- Current up to 4 amperes.
- Short circuit protection.
- Adjustable output voltage.
- Positive & negative regulators.
- Input ripple reduction.
- Wide range of output voltages.
- Miniature packaging—flat pack design permits card type mounting.
- Temperature coefficient: 0.04%/°C
- Recovery time: Less than 50 μs ½L to FL
- Output impedance: See impedance curve below.
- Load capacitance: Up to 6000 mfd ÷ E_{nom} permissible.
- Low cost.

SPECIFICATIONS

Input voltage: See model listings below.

Output voltage: See model listings below. Output voltage is fixed at factory at nominal setting ±3% and is adjustable by external resistor or 200 ohm potentiometer.

Output current: Up to 4 amperes maximum (see formula and table on next page).

Regulation: Line: 1.0 mv +(0.05% Eo per volt input change)
Load: ±0.5%.

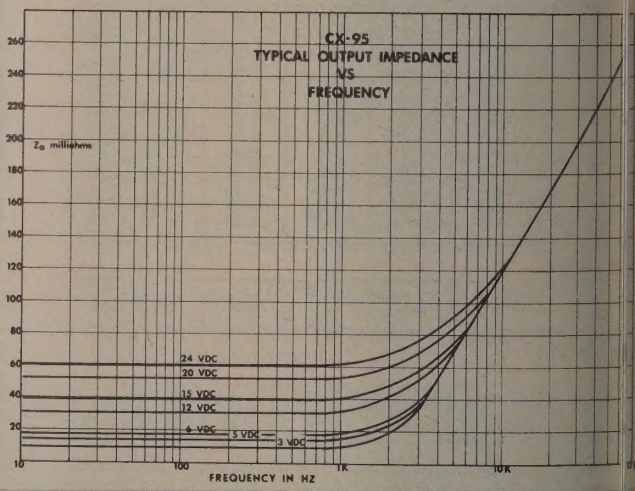
Output ripple (mv rms): 1.0 mv + (0.1% E out DC per volt RMS of input ripple). (up to 1 KHz).

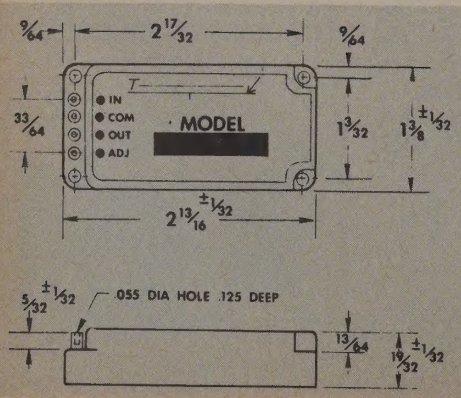
Output adjustment range: ±5% of nominal setting.

Temperature: Storage: —55°C to +100°C
Operating: Ambient —20°C to +85°C
Base —20°C to +95°C

Isolation: None. "P" type models provide control in positive line, with negative line common between input and output. "N" type models provide control in negative line, with positive line common.

Short circuit protection: Protected for continuous short circuit conditions. Temporary removal of DC input after short will return module to operation.





MODELS & DATA

Nominal setting	Output Voltage* Adjustment Range	Input Voltage Range**	"P" Type Models	"N" Type Models	Pri
3.0 VDC	2.9- 3.1 VDC	7-35 VDC	CXP- 3.0-4.0	CXN- 3.0-4.0	4
5.0 VDC	4.8- 5.2 VDC	9-35 VDC	CXP- 5.0-4.0	CXN- 5.0-4.0	4
6.0 VDC	5.7- 6.3 VDC	10-35 VDC	CXP- 6.0-4.0	CXN- 6.0-4.0	4
12.0 VDC	11.4-12.6 VDC	16-35 VDC	CXP-12.0-4.0	CXN-12.0-4.0	4
15.0 VDC	14.3-15.7 VDC	19-35 VDC	CXP-15.0-4.0	CXN-15.0-4.0	4
20.0 VDC	19.0-21.0 VDC	24-35 VDC	CXP-20.0-4.0	CXN-20.0-4.0	4
24.0 VDC	22.8-25.2 VDC	28-35 VDC	CXP-24.0-4.0	CXN-24.0-4.0	4

NOTES: *Other nominal voltages available between 3-24 VDC
**Absolute DC input range. Input voltage variations including ripple and spikes must not exceed this range. E in — E out must be 4 volts minimum

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O DETERMINE MAXIMUM ALLOWABLE OUTPUT CURRENT (NOT TO EXCEED 4 AMPS.)

IBIENT TEMPERATURE RATING FORMULA — (WHERE AMBIENT TEMPERATURE IS A KNOWN VALUE)

$$\text{amps out max.} = \frac{130 - \text{known ambient temp.}}{\theta\,(E\text{ in max} - E\text{ o min})}$$

THERMAL RESISTANCE TABLE (θ)

Type Of Heat Sink	Natural Convection	FORCED AIR COOLING — LFM ACROSS CHASSIS OR THROUGH HEAT SINK			
		100	200	400	600
None	14	—	—	—	—
Chassis*	4.7	4	3.6	3.3	3.2
Thermal Radiator No. 140-0895	4.7	3.7	3.2	2.9	2.8
Thermal Radiator No. 140-0747	8	5.3	3.6	3.3	3.2
Other	2.2 + Thermal Resistance of Heat Sink (To Base of CX-95)				

*Chassis heat sink refers to flat aluminum 1/16" thick plate extending 3" beyond each side of the CX-95 base dimensions. Refer to Technipower thermal section in catalog for additional information on heat sinking.

Imple:

A. Output required: 6VDC at 3 amperes
B. Input voltage range: 10VDC to 12VDC
C. Ambient temperature: 40°C
D. Positive regulator desired with negative line common between input and output.
E. To be used with thermal radiator 140-0895. No forced air cooling available.

1. - Eo is 6 VDC, E in maximum is 12 VDC, Tamb is 40°C and from the thermal resistance table, is 4.7 for thermal radiator 140-0895 utilizing natural convection cooling.
2. - Inserting these factors in the formula results in:

$$I\text{ out} = \frac{130\text{-}40}{(4.7)\,(12\text{-}6)} = 3.19 \text{ amperes}$$

3. - Therefore, with 40°C ambient natural convection cooling and thermal radiator 140-0895, a CXP 6.0-4.0 module may be used up to 3.19 amperes, thus satisfying the required operating conditions. If forced air is available, a lower thermal resistance factor may be used, thereby allowing higher operating output current.

BE TEMPERATURE RATING FORMULA — (WHERE CX-95 BASE TEMPERATURE IS A KNOWN VALUE)

$$\text{amps out max} = \frac{130 - \text{known base temp.}}{2.2\,(E\text{ in max} - Eo\text{ min})}$$

ample

A. Output required: 6 VDC at 3 amperes
B. Input voltage range: 10 VDC to 12 VDC
C. Maximum base temperature of CX-95 is 80°C
D. Positive regulator desired with negative line common between input and output.

1. - E out minimum is 6 VDC, E out maximum is 12 VDC, known base temperature is 80°C.
2. - Inserting these factors into the formula results in:

$$I\text{ amps out max} = \frac{130\text{-}80}{2.2\,(12\text{-}6)} = 3.8 \text{ amperes}$$

3. - Therefore, with a known 80°C base temperature, a CXP 6.0-4.0 module may be operated up to 3.8 amperes, thus satisfying the required operating conditions.

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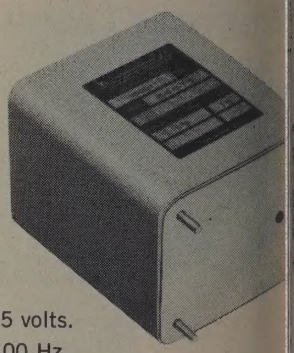
P-80
POWER MODULES

REGULATED AC-DC 3.0 to 325 VDC. Up to 800 watts
BASE TEMP. RATING 80°C

STANDARD OF THE INDUSTRY



DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.
Recovery time: Less than 50 μsec, 1/2L to FL.
Designed to meet MIL environmental specifications:
RFI: MIL-I-6181D;
Shock — MIL-STD-202C, Method 205C;
Vibration — MIL-STD-202C, Method 201A;
Hi-temp — MIL-E-5400, Classes 1 & 1A;
Humidity — MIL-STD-202C, Method 103B.
M.T.B.F. for Product Line: 50,000 hours, per MIL-HBK-217A, with module stressed at 80°C base temperature.
Output impedance: See curve.

OPTIONAL FEATURES

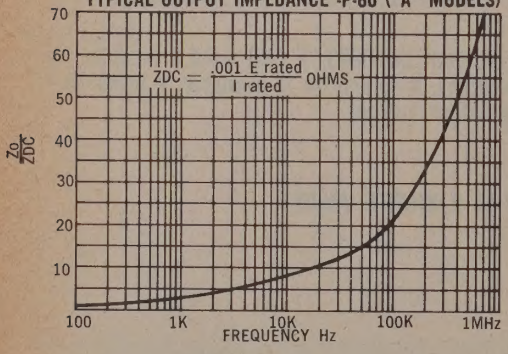
	SUFFIX
Closer regulation	AA
Reduced size and weight, 400 Hz input	D
Operation with lamp loads	E
Fixed output voltage	F
Shock and vibration mounts	G, V
External output adjust	H
Fully epoxy encapsulated	K
Sealed internal potentiometer	P
Remote sensing	R, Y
Lower temperature coefficient	T, TT
Off ground operation	U
Wide input range	W

Special cases, shapes and finishes

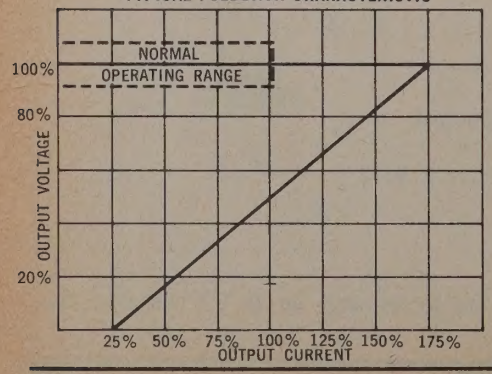
SPECIFICATIONS

Input voltage range: 105-125 volts.
Input frequency range: 50-400 Hz.
Regulation — Line ±0.05% — "A" models.
and load combined: ±0.5% — standard models.
Ripple: "A" models — 0.002% or 1 mv rms, whichev is greater, with 60 Hz input; 0.004% or 3 mv rms whic is greater, with 400 Hz input.
Standard models — 0.01% or 5 mv, rms, whichever is gre with 60 Hz input; 0.04% or 10 mv, rms, whichever is gre with 400 Hz input.
Output adjustment range: 10% (screwdriver adj. in base 80% of rated load the output may be adjusted a full (±10%) of nominal.
Operating temperature: —20°C to +80°C (max base t
Storage temperature: —62°C to +85°C.
Polarity: May be used positive or negative.
Output voltage and current: See specific model listings.
Series operation:
Series starting circuitry employed requires that inpu voltage be applied at a rate greater than 150 v rms/sec Consult factory if low rising input is anticipated.
Short circuit protection: Unique foldback circuitry (see c protects each module if output should be shorted tinuously. Automatic return after short removal.
Overvoltage protection: See model listings.

TYPICAL OUTPUT IMPEDANCE -P-80 ("A" MODELS)

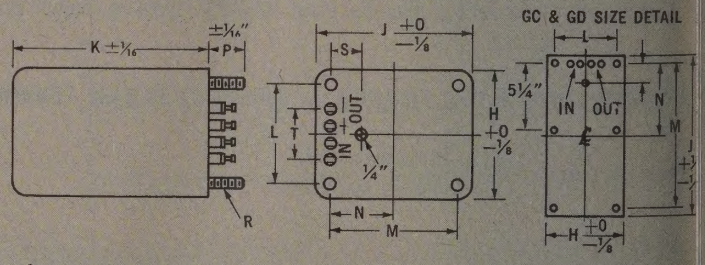


TYPICAL FOLDBACK CHARACTERISTIC



MECHANICAL DATA

(Case size is called out in list of models and prices)



Case Size	MODULE DIMENSIONS H	J	K	L	M	N	P	R	S	T	Tolerances L,M,N,S	Recommended Clearance Terminal Cutouts	Termi Heig ±1/
A	2 3/8	2 3/4	3 13/16	1 3/4	2 1/8	1 1/16	11/32	6-32	19/32	15/16	±1/64	3/8x1 5/16	19/32
B	2 5/8	3 1/16	4 1/4	1 55/64	2 19/64	1 5/32	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16	19/32
C	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16	19/32
D	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	19/32	15/16	±1/32	3/8x1 5/16	19/32
E	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	15/16	±1/32	3/8x1 5/16	19/32
F	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16	19/32
G	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 1/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16	19/32
GA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2	5/8
GB	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2	5/8
GC*	4 15/16	13 1/16	7	3 5/8	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2	5/8
GD*	6 9/16	13 1/16	7	5 7/16	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2	5/8

*See detail

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ODELS AND PRICES

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
2.8-3	0.375	B	P-3.0-0.375A	95	P-3.0-0.375	90	1	A
2.8-3	0.750	C	P-3.0-0.750A	100	P-3.0-0.750	95	3	A
2.8-3	1.5	E	P-3.0-1.5A	105	P-3.0-1.5	100	5	A
2.8-3	3.0	F	P-3.0-3.0A	110	P-3.0-3.0	105	6A	B
2.8-3	6.0	G	P-3.0-6.0A	140	P-3.0-6.0	135	7A	B
2.8-3	12.0	GB	P-3.0-12.0A	200	P-3.0-12.0	195	8A	D
2.8-3	25.0	GC	P-3.0-25.0A	290	P-3.0-25.0	285	9A	D
3.2-3	0.375	B	P-3.3-0.375A	95	P-3.3-0.375	90	1	A
3.2-3	0.750	C	P-3.3-0.750A	100	P-3.3-0.750	95	3	A
3.2-3	1.5	E	P-3.3-1.5A	105	P-3.3-1.5	100	5	A
3.2-3	3.0	F	P-3.3-3.0A	110	P-3.3-3.0	105	6A	B
3.2-3	6.0	G	P-3.3-6.0A	145	P-3.3-6.0	140	7A	B
3.2-3	12.0	GB	P-3.3-12.0A	205	P-3.3-12.0	200	8A	D
3.2-3	25.0	GC	P-3.3-25.0A	300	P-3.3-25.0	295	9A	D
3.5-4	0.375	B	P-3.7-0.375A	95	P-3.7-0.375	90	1	A
3.5-4	0.750	C	P-3.7-0.750A	100	P-3.7-0.750	95	3	A
3.5-4	1.5	E	P-3.7-1.5A	105	P-3.7-1.5	100	5	A
3.5-4	3.0	F	P-3.7-3.0A	115	P-3.7-3.0	110	6A	B
3.5-4	6.0	G	P-3.7-6.0A	150	P-3.7-6.0	145	7A	B
3.5-4	12.0	GB	P-3.7-12.0A	215	P-3.7-12.0	210	8A	D
3.5-4	25.0	GC	P-3.7-25.0A	310	P-3.7-25.0	305	9A	D
3.9-4	0.375	B	P-4.1-0.375A	95	P-4.1-0.375	90	1	A
3.9-4	0.750	C	P-4.1-0.750A	100	P-4.1-0.750	95	3	A
3.9-4	1.5	E	P-4.1-1.5A	105	P-4.1-1.5	100	5	A
3.9-4	3.0	F	P-4.1-3.0A	115	P-4.1-3.0	110	6A	B
3.9-4	6.0	G	P-4.1-6.0A	155	P-4.1-6.0	150	7A	B
3.9-4	12.0	GB	P-4.1-12.0A	220	P-4.1-12.0	215	8A	D
3.9-4	25.0	GC	P-4.1-25.0A	310	P-4.1-25.0	305	9A	D
4.3-5	0.375	B	P-4.5-0.375A	95	P-4.5-0.375	90	1	A
4.3-5	0.750	C	P-4.5-0.750A	100	P-4.5-0.750	95	3	A
4.3-5	1.5	E	P-4.5-1.5A	105	P-4.5-1.5	100	5	A
4.3-5	3.0	F	P-4.5-3.0A	115	P-4.5-3.0	110	6A	B
4.3-5	6.0	G	P-4.5-6.0A	160	P-4.5-6.0	155	7A	B
4.3-5	12.0	GB	P-4.5-12.0A	225	P-4.5-12.0	220	8A	D
4.3-5	25.0	GC	P-4.5-25.0A	325	P-4.5-25.0	320	9A	D
4.7-5.3	0.375	B	P-5.1-0.375A	95	P-5.1-0.375	90	1	A
4.7-5.3	0.750	C	P-5.1-0.750A	100	P-5.1-0.750	95	3	A
4.7-5.3	1.5	E	P-5.1-1.5A	105	P-5.1-1.5	100	5	A
4.7-5.3	3.0	F	P-5.1-3.0A	120	P-5.1-3.0	115	6A	B
4.7-5.3	6.0	G	P-5.1-6.0A	165	P-5.1-6.0	160	7A	B
4.7-5.3	12.0	GB	P-5.1-12.0A	235	P-5.1-12.0	230	8A	D
4.7-5.3	25.0	GC	P-5.1-25.0A	335	P-5.1-25.0	330	9A	D
5.1-5.8	0.375	B	P-5.5-0.375A	95	P-5.5-0.375	90	1	A
5.1-5.8	0.750	C	P-5.5-0.750A	100	P-5.5-0.750	95	3	A
5.1-5.8	1.5	E	P-5.5-1.5A	105	P-5.5-1.5	100	5	A
5.1-5.8	3.0	F	P-5.5-3.0A	120	P-5.5-3.0	115	6A	B
5.1-5.8	6.0	G	P-5.5-6.0A	170	P-5.5-6.0	165	7A	B
5.1-5.8	12.0	GB	P-5.5-12.0A	240	P-5.5-12.0	235	8A	D
5.1-5.8	25.0	GC	P-5.5-25.0A	335	P-5.5-25.0	330	9A	D
5.6-6.3	0.375	B	P-6.0-0.375A	95	P-6.0-0.375	90	1	A
5.6-6.3	0.750	C	P-6.0-0.750A	100	P-6.0-0.750	95	3	A
5.6-6.3	1.5	E	P-6.0-1.5A	105	P-6.0-1.5	100	5	A
5.6-6.3	3.0	F	P-6.0-3.0A	125	P-6.0-3.0	120	6A	B
5.6-6.3	6.0	G	P-6.0-6.0A	170	P-6.0-6.0	165	7A	B
5.6-6.3	12.0	GB	P-6.0-12.0A	250	P-6.0-12.0	245	8A	D
5.6-6.3	25.0	GC	P-6.0-25.0A	345	P-6.0-25.0	340	9A	D
6.6-6.9	0.200	A	P-6.6-0.200A	90	P-6.6-0.200	85	1	A
6.6-6.9	0.375	B	P-6.6-0.375A	95	P-6.6-0.375	90	2	A
6.6-6.9	0.750	C	P-6.6-0.750A	100	P-6.6-0.750	95	3	A
6.6-6.9	1.5	E	P-6.6-1.5A	105	P-6.6-1.5	100	5	A
6.6-6.9	3.0	G	P-6.6-3.0A	145	P-6.6-3.0	140	6A	B
6.6-6.9	6.0	GA	P-6.6-6.0A	170	P-6.6-6.0	165	7A	B
6.6-6.9	12.0	GB	P-6.6-12.0A	250	P-6.6-12.0	245	8A	D
6.6-6.9	25.0	GC	P-6.6-25.0A	350	P-6.6-25.0	345	9A	D
6.9-7.6	0.200	A	P-7.3-0.200A	90	P-7.3-0.200	85	1	A
6.9-7.6	0.375	B	P-7.3-0.375A	95	P-7.3-0.375	90	2	A
6.9-7.6	0.750	C	P-7.3-0.750A	100	P-7.3-0.750	95	3	A
6.9-7.6	1.5	E	P-7.3-1.5A	105	P-7.3-1.5	100	5	A
6.9-7.6	3.0	G	P-7.3-3.0A	145	P-7.3-3.0	140	6A	B
6.9-7.6	6.0	GA	P-7.3-6.0A	180	P-7.3-6.0	175	7A	B
6.9-7.6	12.0	GB	P-7.3-12.0A	250	P-7.3-12.0	245	8A	D
6.9-7.6	25.0	GC	P-7.3-25.0A	365	P-7.3-25.0	360	9A	D
7.6-8.5	0.200	A	P-8.1-0.200A	90	P-8.1-0.200	85	1	A
7.6-8.5	0.375	B	P-8.1-0.375A	95	P-8.1-0.375	90	2	A
7.6-8.5	0.750	C	P-8.1-0.750A	100	P-8.1-0.750	95	3	A
7.6-8.5	1.5	E	P-8.1-1.5A	110	P-8.1-1.5	105	5	A
7.6-8.5	3.0	G	P-8.1-3.0A	150	P-8.1-3.0	145	6A	B
7.6-8.5	6.0	GA	P-8.1-6.0A	185	P-8.1-6.0	180	7A	B
7.6-8.5	12.0	GB	P-8.1-12.0A	250	P-8.1-12.0	245	8A	D
7.6-8.5	25.0	GC	P-8.1-25.0A	375	P-8.1-25.0	370	9A	D
8.5-9.3	0.200	A	P-8.9-0.200A	90	P-8.9-0.200	85	1	A
8.5-9.3	0.375	B	P-8.9-0.375A	95	P-8.9-0.375	90	2	A
8.5-9.3	0.750	C	P-8.9-0.750A	100	P-8.9-0.750	95	3	A
8.5-9.3	1.5	E	P-8.9-1.5A	110	P-8.9-1.5	105	5	A
8.5-9.3	3.0	G	P-8.9-3.0A	150	P-8.9-3.0	145	6A	B
8.5-9.3	6.0	GA	P-8.9-6.0A	195	P-8.9-6.0	190	7A	B
8.5-9.3	12.0	GB	P-8.9-12.0A	250	P-8.9-12.0	245	8A	D
8.5-9.3	25.0	GC	P-8.9-25.0A	375	P-8.9-25.0	370	10	D
9.3-10.3	0.200	A	P-9.8-0.200A	95	P-9.8-0.200	90	1	A
9.3-10.3	0.375	B	P-9.8-0.375A	100	P-9.8-0.375	95	2	A
9.3-10.3	0.750	D	P-9.8-0.750A	105	P-9.8-0.750	100	3	A
9.3-10.3	1.5	E	P-9.8-1.5A	110	P-9.8-1.5	105	6	A
9.3-10.3	3.0	G	P-9.8-3.0A	155	P-9.8-3.0	150	6A	B
9.3-10.3	6.0	GA	P-9.8-6.0A	195	P-9.8-6.0	190	8	B
9.3-10.3	12.0	GB	P-9.8-12.0A	260	P-9.8-12.0	255	9	D
9.3-10.3	25.0	GC	P-9.8-25.0A	395	P-9.8-25.0	390	10	D
10.3-11.4	0.200	A	P-10.8-0.200A	95	P-10.8-0.200	90	1	A
10.3-11.4	0.375	B	P-10.8-0.375A	100	P-10.8-0.375	95	2	A
10.3-11.4	0.750	D	P-10.8-0.750A	105	P-10.8-0.750	100	3	A
10.3-11.4	1.5	F	P-10.8-1.5A	115	P-10.8-1.5	110	6	A
10.3-11.4	3.0	G	P-10.8-3.0A	160	P-10.8-3.0	155	7	C
10.3-11.4	6.0	GA	P-10.8-6.0A	205	P-10.8-6.0	200	8	C
10.3-11.4	12.0	GB	P-10.8-12.0A	270	P-10.8-12.0	265	9	D
10.3-11.4	25.0	GC	P-10.8-25.0A	400	P-10.8-25.0	395	10	D
11.4-12.5	0.200	B	P-12.0-0.200A	95	P-12.0-0.200	90	1	A
11.4-12.5	0.375	B	P-12.0-0.375A	100	P-12.0-0.375	95	2	A
11.4-12.5	0.750	D	P-12.0-0.750A	105	P-12.0-0.750	100	3	A
11.4-12.5	1.5	F	P-12.0-1.5A	115	P-12.0-1.5	110	6	A
11.4-12.5	3.0	G	P-12.0-3.0A	160	P-12.0-3.0	155	7	C
11.4-12.5	6.0	GA	P-12.0-6.0A	210	P-12.0-6.0	205	8	C
11.4-12.5	12.0	GB	P-12.0-12.0A	275	P-12.0-12.0	270	9	D
11.4-12.5	25.0	GC	P-12.0-25.0A	410	P-12.0-25.0	405	10	D
12.5-13.7	0.100	A	P-13.1-0.100A	90	P-13.1-0.100	85	1	A
12.5-13.7	0.200	B	P-13.1-0.200A	95	P-13.1-0.200	90	1	A
12.5-13.7	0.375	B	P-13.1-0.375A	100	P-13.1-0.375	95	2	A
12.5-13.7	0.750	C	P-13.1-0.750A	105	P-13.1-0.750	100	3	A
12.5-13.7	1.5	F	P-13.1-1.5A	115	P-13.1-1.5	110	6	A
12.5-13.7	3.0	GA	P-13.1-3.0A	165	P-13.1-3.0	160	7	C
12.5-13.7	6.0	GB	P-13.1-6.0A	210	P-13.1-6.0	205	8	C
12.5-13.7	12.0	GC	P-13.1-12.0A	300	P-13.1-12.0	295	9	D
12.5-13.7	25.0	GD	P-13.1-25.0A	410	P-13.1-25.0	405	10	D
13.7-15.2	0.100	A	P-14.5-0.100A	90	P-14.5-0.100	85	1	A
13.7-15.2	0.200	B	P-14.5-0.200A	95	P-14.5-0.200	90	1	A
13.7-15.2	0.375	C	P-14.5-0.375A	100	P-14.5-0.375	95	2	A
13.7-15.2	0.750	D	P-14.5-0.750A	105	P-14.5-0.750	100	3	A
13.7-15.2	1.5	F	P-14.5-1.5A	120	P-14.5-1.5	115	6	A
13.7-15.2	3.0	GA	P-14.5-3.0A	165	P-14.5-3.0	160	7	C
13.7-15.2	6.0	GB	P-14.5-6.0A	215	P-14.5-6.0	210	8	C
13.7-15.2	12.0	GC	P-14.5-12.0A	305	P-14.5-12.0	300	9	D
13.7-15.2	25.0	GD	P-14.5-25.0A	415	P-14.5-25.0	410	10	D

TECHNIPOWER, INC.

A BENRUS SUBSIDIARY

Ridgefield, Conn. 06877

MODELS AND PRICES

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
15.2-16.5	0.100	A	P-15.8-0.100A	90	P-15.8-0.100	85	1	A
15.2-16.5	0.200	B	P-15.8-0.200A	95	P-15.8-0.200	90	1	A
15.2-16.5	0.375	C	P-15.8-0.375A	100	P-15.8-0.375	95	2	A
15.2-16.5	0.750	D	P-15.8-0.750A	105	P-15.8-0.750	100	3	A
15.2-16.5	1.5	F	P-15.8-1.5A	125	P-15.8-1.5	120	6	A
15.2-16.5	3.0	GA	P-15.8-3.0A	165	P-15.8-3.0	160	7	C
15.2-16.5	6.0	GB	P-15.8-6.0A	215	P-15.8-6.0	210	8	C
15.2-16.5	12.0	GC	P-15.8-12.0A	305	P-15.8-12.0	300	9	D
15.2-16.5	25.0	GD	P-15.8-25.0A	415	P-15.8-25.0	410	10	D
16.5-18.5	0.100	A	P-17.5-0.100A	90	P-17.5-0.100	85	1	A
16.5-18.5	0.200	B	P-17.5-0.200A	95	P-17.5-0.200	90	1	A
16.5-18.5	0.375	C	P-17.5-0.375A	100	P-17.5-0.375	95	2	A
16.5-18.5	0.750	D	P-17.5-0.750A	105	P-17.5-0.750	100	4	A
16.5-18.5	1.5	G	P-17.5-1.5A	140	P-17.5-1.5	135	6	A
16.5-18.5	3.0	GA	P-17.5-3.0A	170	P-17.5-3.0	165	7	C
16.5-18.5	6.0	GB	P-17.5-6.0A	220	P-17.5-6.0	215	8	C
16.5-18.5	12.0	GC	P-17.5-12.0A	305	P-17.5-12.0	300	9	D
16.5-18.5	25.0	GD	P-17.5-25.0A	420	P-17.5-25.0	415	10	D
18.5-20.2	0.100	A	P-19.2-0.100A	90	P-19.2-0.100	85	1	A
18.5-20.2	0.200	B	P-19.2-0.200A	95	P-19.2-0.200	90	1	A
18.5-20.2	0.375	C	P-19.2-0.375A	100	P-19.2-0.375	95	2	A
18.5-20.2	0.750	D	P-19.2-0.750A	105	P-19.2-0.750	100	4	A
18.5-20.2	1.5	G	P-19.2-1.5A	140	P-19.2-1.5	135	6	A
18.5-20.2	3.0	GA	P-19.2-3.0A	170	P-19.2-3.0	165	7	C
18.5-20.2	6.0	GB	P-19.2-6.0A	225	P-19.2-6.0	220	8	C
18.5-20.2	12.0	GC	P-19.2-12.0A	305	P-19.2-12.0	300	9	J
18.5-20.2	25.0	GD	P-19.2-25.0A	420	P-19.2-25.0	415	10	F
20.2-22.3	0.100	A	P-21.2-0.100A	90	P-21.2-0.100	85	1	A
20.2-22.3	0.200	B	P-21.2-0.200A	95	P-21.2-0.200	90	1	A
20.2-22.3	0.375	C	P-21.2-0.375A	100	P-21.2-0.375	95	2	A
20.2-22.3	0.750	D	P-21.2-0.750A	105	P-21.2-0.750	100	4	A
20.2-22.3	1.5	G	P-21.2-1.5A	140	P-21.2-1.5	135	6	A
20.2-22.3	3.0	GA	P-21.2-3.0A	175	P-21.2-3.0	170	7A	C
20.2-22.3	6.0	GB	P-21.2-6.0A	225	P-21.2-6.0	220	8	C
20.2-22.3	12.0	GC	P-21.2-12.0A	310	P-21.2-12.0	305	9	J
20.2-22.3	25.0	GD	P-21.2-25.0A	425	P-21.2-25.0	420	10	F
22.3-24.4	0.100	A	P-23.3-0.100A	90	P-23.3-0.100	85	1	A
22.3-24.4	0.200	B	P-23.3-0.200A	95	P-23.3-0.200	90	1	A
22.3-24.4	0.375	C	P-23.3-0.375A	100	P-23.3-0.375	95	2	A
22.3-24.4	0.750	E	P-23.3-0.750A	105	P-23.3-0.750	100	4	A
22.3-24.4	1.5	G	P-23.3-1.5A	145	P-23.3-1.5	140	6	A
22.3-24.4	3.0	GA	P-23.3-3.0A	175	P-23.3-3.0	170	7A	C
22.3-24.4	6.0	GB	P-23.3-6.0A	225	P-23.3-6.0	220	8	C
22.3-24.4	12.0	GC	P-23.3-12.0A	310	P-23.3-12.0	305	9	J
22.3-24.4	25.0	GD	P-23.3-25.0A	425	P-23.3-25.0	420	10A	F
24.4-26.8	0.100	A	P-25.7-0.100A	90	P-25.7-0.100	85	1	A
24.4-26.8	0.200	B	P-25.7-0.200A	95	P-25.7-0.200	90	1	A
24.4-26.8	0.375	C	P-25.7-0.375A	100	P-25.7-0.375	95	3	A
24.4-26.8	0.750	E	P-25.7-0.750A	105	P-25.7-0.750	100	4	A
24.4-26.8	1.5	G	P-25.7-1.5A	145	P-25.7-1.5	140	6A	A
24.4-26.8	3.0	GA	P-25.7-3.0A	175	P-25.7-3.0	170	7A	C
24.4-26.8	6.0	GB	P-25.7-6.0A	240	P-25.7-6.0	235	8A	C
24.4-26.8	12.0	GC	P-25.7-12.0A	310	P-25.7-12.0	305	9A	J
24.4-26.8	25.0	GD	P-25.7-25.0A	425	P-25.7-25.0	420	10A	F
26.8-29.2	0.100	A	P-28.0-0.100A	95	P-28.0-0.100	90	1	A
26.8-29.2	0.200	B	P-28.0-0.200A	100	P-28.0-0.200	95	1	A
26.8-29.2	0.375	C	P-28.0-0.375A	105	P-28.0-0.375	100	3	A
26.8-29.2	0.750	E	P-28.0-0.750A	120	P-28.0-0.750	115	5	A
26.8-29.2	1.5	G	P-28.0-1.5A	145	P-28.0-1.5	140	6A	A
26.8-29.2	3.0	GA	P-28.0-3.0A	175	P-28.0-3.0	170	7A	C
26.8-29.2	6.0	GB	P-28.0-6.0A	240	P-28.0-6.0	235	8A	C
26.8-29.2	12.0	GC	P-28.0-12.0A	320	P-28.0-12.0	315	9A	J
26.8-29.2	25.0	GD	P-28.0-25.0A	425	P-28.0-25.0	420	10A	F
29.2-32.7	0.050	A	P-31.5-0.050A	95	P-31.5-0.050	90		
29.2-32.7	0.100	A	P-31.5-0.100A	100	P-31.5-0.100	95		
29.2-32.7	0.200	B	P-31.5-0.200A	105	P-31.5-0.200	100		
29.2-32.7	0.375	C	P-31.5-0.375A	110	P-31.5-0.375	105		
29.2-32.7	0.750	E	P-31.5-0.750A	125	P-31.5-0.750	120		
29.2-32.7	1.5	G	P-31.5-1.5A	150	P-31.5-1.5	145		
29.2-32.7	3.0	GA	P-31.5-3.0A	190	P-31.5-3.0	185		
29.2-32.7	6.0	GB	P-31.5-6.0A	255	P-31.5-6.0	250		
29.2-32.7	12.0	GC	P-31.5-12.0A	340	P-31.5-12.0	335		
32.7-36.2	0.050	A	P-34.5-0.050A	95	P-34.5-0.050	90		
32.7-36.2	0.100	A	P-34.5-0.100A	100	P-34.5-0.100	95		
32.7-36.2	0.200	B	P-34.5-0.200A	105	P-34.5-0.200	100		
32.7-36.2	0.375	C	P-34.5-0.375A	110	P-34.5-0.375	105		
32.7-36.2	0.750	E	P-34.5-0.750A	130	P-34.5-0.750	125		
32.7-36.2	1.5	G	P-34.5-1.5A	155	P-34.5-1.5	150		
32.7-36.2	3.0	GA	P-34.5-3.0A	215	P-34.5-3.0	210		
32.7-36.2	6.0	GB	P-34.5-6.0A	270	P-34.5-6.0	265		
32.7-36.2	12.0	GC	P-34.5-12.0A	360	P-34.5-12.0	355		
36.2-40.0	0.050	A	P-38.0-0.050A	95	P-38.0-0.050	90		
36.2-40.0	0.100	A	P-38.0-0.100A	100	P-38.0-0.100	95		
36.2-40.0	0.200	B	P-38.0-0.200A	105	P-38.0-0.200	100		
36.2-40.0	0.375	D	P-38.0-0.375A	110	P-38.0-0.375	105		
36.2-40.0	0.750	F	P-38.0-0.750A	135	P-38.0-0.750	130		
36.2-40.0	1.5	G	P-38.0-1.5A	160	P-38.0-1.5	155		
36.2-40.0	3.0	GA	P-38.0-3.0A	215	P-38.0-3.0	210		
36.2-40.0	6.0	GB	P-38.0-6.0A	285	P-38.0-6.0	280		
36.2-40.0	12.0	GC	P-38.0-12.0A	375	P-38.0-12.0	370		
40.0-44.0	0.050	A	P-42.0-0.050A	95	P-42.0-0.050	90		
40.0-44.0	0.100	B	P-42.0-0.100A	100	P-42.0-0.100	95		
40.0-44.0	0.200	B	P-42.0-0.200A	105	P-42.0-0.200	100		
40.0-44.0	0.375	D	P-42.0-0.375A	110	P-42.0-0.375	105		
40.0-44.0	0.750	F	P-42.0-0.750A	140	P-42.0-0.750	135		
40.0-44.0	1.5	G	P-42.0-1.5A	170	P-42.0-1.5	165		
40.0-44.0	3.0	GB	P-42.0-3.0A	215	P-42.0-3.0	210		
40.0-44.0	6.0	GB	P-42.0-6.0A	300	P-42.0-6.0	295		
40.0-44.0	12.0	GC	P-42.0-12.0A	400	P-42.0-12.0	395		
44.0-48.0	0.050	A	P-46.0-0.050A	95	P-46.0-0.050	90		
44.0-48.0	0.100	B	P-46.0-0.100A	100	P-46.0-0.100	95		
44.0-48.0	0.200	C	P-46.0-0.200A	105	P-46.0-0.200	100		
44.0-48.0	0.375	D	P-46.0-0.375A	110	P-46.0-0.375	105		
44.0-48.0	0.750	F	P-46.0-0.750A	145	P-46.0-0.750	140		
44.0-48.0	1.5	GA	P-46.0-1.5A	180	P-46.0-1.5	175		
44.0-48.0	3.0	GB	P-46.0-3.0A	225	P-46.0-3.0	220		
44.0-48.0	6.0	GC	P-46.0-6.0A	300	P-46.0-6.0	295		
44.0-48.0	12.0	GD	P-46.0-12.0A	425	P-46.0-12.0	420		
48.0-52.0	0.050	A	P-50.0-0.050A	100	P-50.0-0.050	95		
48.0-52.0	0.100	B	P-50.0-0.100A	105	P-50.0-0.100	100		
48.0-52.0	0.200	C	P-50.0-0.200A	110	P-50.0-0.200	105		
48.0-52.0	0.375	D	P-50.0-0.375A	115	P-50.0-0.375	110		
48.0-52.0	0.750	F	P-50.0-0.750A	150	P-50.0-0.750	145		
48.0-52.0	1.5	GA	P-50.0-1.5A	185	P-50.0-1.5	180		
48.0-52.0	3.0	GB	P-50.0-3.0A	255	P-50.0-3.0	250		
48.0-52.0	6.0	GC	P-50.0-6.0A	345	P-50.0-6.0	340		
48.0-52.0	12.0	GD	P-50.0-12.0A	450	P-50.0-12.0	445		
52.0-59.0	0.050	B	P-56.0-0.050A	105	P-56.0-0.050	100		
52.0-59.0	0.100	C	P-56.0-0.100A	110	P-56.0-0.100	105		
52.0-59.0	0.200	D	P-56.0-0.200A	115	P-56.0-0.200	110		
52.0-59.0	0.375	E	P-56.0-0.375A	140	P-56.0-0.375	135		
52.0-59.0	0.750	G	P-56.0-0.750A	155	P-56.0-0.750	150		
52.0-59.0	1.5	GA	P-56.0-1.5A	195	P-56.0-1.5	190		
52.0-59.0	3.0	GB	P-56.0-3.0A	270	P-56.0-3.0	265		
52.0-59.0	6.0	GC	P-56.0-6.0A	365	P-56.0-6.0	360		
52.0-59.0	12.0	GD	P-56.0-12.0A	475	P-56.0-12.0	470		
59.0-65.0	0.050	C	P-62.0-0.050A	105	P-62.0-0.050	100		
59.0-65.0	0.100	D	P-62.0-0.100A	110	P-62.0-0.100	105		
59.0-65.0	0.200	E	P-62.0-0.200A	115	P-62.0-0.200	110		
59.0-65.0	0.375	F	P-62.0-0.375A	145	P-62.0-0.375	140		
59.0-65.0	0.750	G	P-62.0-0.750A	165	P-62.0-0.750	160		
59.0-65.0	1.5	GA	P-62.0-1.5A	205	P-62.0-1.5	200		
59.0-65.0	3.0	GB	P-62.0-3.0A	285	P-62.0-3.0	280		
59.0-65.0	6.0	GC	P-62.0-6.0A	385	P-62.0-6.0	380		
59.0-65.0	12.0	GD	P-62.0-12.0A	500	P-62.0-12.0	495		

TECHNIPOWER, INC.

A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

DES AND PRICES

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
0-72	0.050	C	P-68.0-0.050A	110	P-68.0-0.050	105	1	
0-72	0.100	D	P-68.0-0.100A	115	P-68.0-0.100	110	1	
0-72	0.200	E	P-68.0-0.200A	120	P-68.0-0.200	115	3	
0-72	0.375	F	P-68.0-0.375A	150	P-68.0-0.375	145	5	
0-72	0.750	G	P-68.0-0.750A	170	P-68.0-0.750	165	6A	
0-72	1.5	GA	P-68.0-1.5A	215	P-68.0-1.5	210	7A	
0-72	3.0	GB	P-68.0-3.0A	300	P-68.0-3.0	295	8A	
0-72	6.0	GC	P-68.0-6.0A	405	P-68.0-6.0	400	9A	
0-80	0.050	C	P-76.0-0.050A	110	P-76.0-0.050	105	1	
0-80	0.100	D	P-76.0-0.100A	115	P-76.0-0.100	110	2	
0-80	0.200	E	P-76.0-0.200A	125	P-76.0-0.200	120	3	
0-80	0.375	F	P-76.0-0.375A	155	P-76.0-0.375	150	5	
0-80	0.750	G	P-76.0-0.750A	180	P-76.0-0.750	175	6A	
0-80	1.5	GA	P-76.0-1.5A	225	P-76.0-1.5	220	7A	
0-80	3.0	GB	P-76.0-3.0A	320	P-76.0-3.0	315	8A	
0-80	6.0	GC	P-76.0-6.0A	430	P-76.0-6.0	425	9A	
0-80	0.050	C	P-84.0-0.050A	115	P-84.0-0.050	110	1	
0-80	0.100	D	P-84.0-0.100A	120	P-84.0-0.100	115	2	
0-80	0.200	E	P-84.0-0.200A	125	P-84.0-0.200	120	3	
0-80	0.375	G	P-84.0-0.375A	160	P-84.0-0.375	155	5	
0-80	0.750	GA	P-84.0-0.750A	190	P-84.0-0.750	185	6	
0-80	1.5	GB	P-84.0-1.5A	240	P-84.0-1.5	235	8	
0-80	3.0	GC	P-84.0-3.0A	330	P-84.0-3.0	325	8A	
0-80	6.0	GD	P-84.0-6.0A	450	P-84.0-6.0	445	9A	
0-90	0.050	C	P-92.0-0.050A	115	P-92.0-0.050	110	1	
0-90	0.100	D	P-92.0-0.100A	125	P-92.0-0.100	120	2	
0-90	0.200	E	P-92.0-0.200A	130	P-92.0-0.200	125	4	
0-90	0.375	G	P-92.0-0.375A	170	P-92.0-0.375	165	6	
0-90	0.750	GA	P-92.0-0.750A	200	P-92.0-0.750	195	7	
0-90	1.5	GB	P-92.0-1.5A	250	P-92.0-1.5	245	8	
0-90	3.0	GC	P-92.0-3.0A	340	P-92.0-3.0	335	9	
0-90	6.0	GD	P-92.0-6.0A	465	P-92.0-6.0	460	10	
0-105.0	0.050	C	P-100.0-0.050A	120	P-100.0-0.050	115	1	
0-105.0	0.100	D	P-100.0-0.100A	125	P-100.0-0.100	120	2	
0-105.0	0.200	E	P-100.0-0.200A	160	P-100.0-0.200	155	4	
0-105.0	0.375	G	P-100.0-0.375A	170	P-100.0-0.375	165	6	
0-105.0	0.750	GA	P-100.0-0.750A	210	P-100.0-0.750	205	7	
0-105.0	1.5	GB	P-100.0-1.5A	280	P-100.0-1.5	275	8	
0-105.0	3.0	GC	P-100.0-3.0A	380	P-100.0-3.0	375	9	
0-105.0	6.0	GD	P-100.0-6.0A	505	P-100.0-6.0	500	10	
105.0-115.0	0.050	D	P-110.0-0.050A	125	P-110.0-0.050	120	1	
105.0-115.0	0.100	E	P-110.0-0.100A	130	P-110.0-0.100	125	2	
105.0-115.0	0.200	F	P-110.0-0.200A	165	P-110.0-0.200	160	4	
105.0-115.0	0.375	G	P-110.0-0.375A	180	P-110.0-0.375	175	6	
105.0-115.0	0.750	GA	P-110.0-0.750A	215	P-110.0-0.750	210	7	
105.0-115.0	1.5	GB	P-110.0-1.5A	295	P-110.0-1.5	290	8	
105.0-115.0	3.0	GC	P-110.0-3.0A	405	P-110.0-3.0	400	9	
105.0-115.0	6.0	GD	P-110.0-6.0A	550	P-110.0-6.0	545	10	
115.0-125.0	0.050	D	P-120.0-0.050A	130	P-120.0-0.050	125	1	
115.0-125.0	0.100	E	P-120.0-0.100A	135	P-120.0-0.100	130	2	
115.0-125.0	0.200	F	P-120.0-0.200A	170	P-120.0-0.200	165	4	
115.0-125.0	0.375	G	P-120.0-0.375A	190	P-120.0-0.375	185	6	
115.0-125.0	0.750	GA	P-120.0-0.750A	225	P-120.0-0.750	220	7	
115.0-125.0	1.5	GB	P-120.0-1.5A	305	P-120.0-1.5	300	8	
115.0-125.0	3.0	GC	P-120.0-3.0A	435	P-120.0-3.0	430	9	
115.0-125.0	6.0	GD	P-120.0-6.0A	590	P-120.0-6.0	585	10	
125.0-144.0	0.050	D	P-135.0-0.050A	130	P-135.0-0.050	125	1	
125.0-144.0	0.100	E	P-135.0-0.100A	140	P-135.0-0.100	135	3	
125.0-144.0	0.200	F	P-135.0-0.200A	170	P-135.0-0.200	165	5	
125.0-144.0	0.375	G	P-135.0-0.375A	200	P-135.0-0.375	195	6	
125.0-144.0	0.750	GA	P-135.0-0.750A	240	P-135.0-0.750	235	7A	
125.0-144.0	1.5	GB	P-135.0-1.5A	335	P-135.0-1.5	330	8A	
125.0-144.0	3.0	GC	P-135.0-3.0A	465	P-135.0-3.0	460	9A	

CONSULT FACTORY

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
144.0-160.0	0.050	D	P-152.0-0.050A	135	P-152.0-0.050	130	1	
144.0-160.0	0.100	E	P-152.0-0.100A	145	P-152.0-0.100	140	3	
144.0-160.0	0.200	F	P-152.0-0.200A	180	P-152.0-0.200	175	5	
144.0-160.0	0.375	G	P-152.0-0.375A	205	P-152.0-0.375	200	6A	
144.0-160.0	0.750	GA	P-152.0-0.750A	255	P-152.0-0.750	250	7A	
144.0-160.0	1.5	GB	P-152.0-1.5A	360	P-152.0-1.5	355	8A	
144.0-160.0	3.0	GC	P-152.0-3.0A	495	P-152.0-3.0	490	9A	
160.0-176.0	0.050	E	P-168.0-0.050A	135	P-168.0-0.050	130	2	
160.0-176.0	0.100	E	P-168.0-0.100A	145	P-168.0-0.100	140	3	
160.0-176.0	0.200	G	P-168.0-0.200A	180	P-168.0-0.200	175	5	
160.0-176.0	0.375	GA	P-168.0-0.375A	215	P-168.0-0.375	210	6A	
160.0-176.0	0.750	GB	P-168.0-0.750A	270	P-168.0-0.750	265	7A	
160.0-176.0	1.5	GC	P-168.0-1.5A	380	P-168.0-1.5	375	8A	
160.0-176.0	3.0	GD	P-168.0-3.0A	550	P-168.0-3.0	545	9A	
176.0-192.0	0.050	E	P-184.0-0.050A	140	P-184.0-0.050	135	2	
176.0-192.0	0.100	E	P-184.0-0.100A	145	P-184.0-0.100	140	3	
176.0-192.0	0.200	G	P-184.0-0.200A	190	P-184.0-0.200	185	5	
176.0-192.0	0.375	GA	P-184.0-0.375A	220	P-184.0-0.375	215	6A	
176.0-192.0	0.750	GB	P-184.0-0.750A	280	P-184.0-0.750	275	7A	
176.0-192.0	1.5	GC	P-184.0-1.5A	395	P-184.0-1.5	390	8A	
176.0-192.0	3.0	GD	P-184.0-3.0A	565	P-184.0-3.0	560	9A	
192.0-210.0	0.050	E	P-200.0-0.050A	140	P-200.0-0.050	135	2	
192.0-210.0	0.100	E	P-200.0-0.100A	175	P-200.0-0.100	170	4	
192.0-210.0	0.200	G	P-200.0-0.200A	190	P-200.0-0.200	185	6	
192.0-210.0	0.375	GA	P-200.0-0.375A	230	P-200.0-0.375	225	6A	
192.0-210.0	0.750	GB	P-200.0-0.750A	300	P-200.0-0.750	295	8	
192.0-210.0	1.5	GC	P-200.0-1.5A	420	P-200.0-1.5	415	9	
192.0-210.0	3.0	GD	P-200.0-3.0A	585	P-200.0-3.0	580	10	
210.0-230.0	0.050	E	P-220.0-0.050A	145	P-220.0-0.050	140	2	
210.0-230.0	0.100	F	P-220.0-0.100A	180	P-220.0-0.100	175	4	
210.0-230.0	0.200	G	P-220.0-0.200A	205	P-220.0-0.200	200	6	
210.0-230.0	0.375	GA	P-220.0-0.375A	245	P-220.0-0.375	240	7	
210.0-230.0	0.750	GB	P-220.0-0.750A	340	P-220.0-0.750	335	8	
210.0-230.0	1.5	GC	P-220.0-1.5A	465	P-220.0-1.5	460	9	
210.0-230.0	3.0	GD	P-220.0-3.0A	620	P-220.0-3.0	615	10	
230.0-250.0	0.050	E	P-240.0-0.050A	150	P-240.0-0.050	145	2	
230.0-250.0	0.100	F	P-240.0-0.100A	185	P-240.0-0.100	180	4	
230.0-250.0	0.200	G	P-240.0-0.200A	215	P-240.0-0.200	210	6	
230.0-250.0	0.375	GA	P-240.0-0.375A	260	P-240.0-0.375	255	7	
230.0-250.0	0.750	GB	P-240.0-0.750A	365	P-240.0-0.750	360	8	
230.0-250.0	1.5	GC	P-240.0-1.5A	495	P-240.0-1.5	490	9	
230.0-250.0	3.0	GD	P-240.0-3.0A	665	P-240.0-3.0	660	10	
250.0-275.0	0.050	E	P-265.0-0.050A	150	P-265.0-0.050	145	2	
250.0-275.0	0.100	F	P-265.0-0.100A	190	P-265.0-0.100	185	4	
250.0-275.0	0.200	G	P-265.0-0.200A	225	P-265.0-0.200	220	6	
250.0-275.0	0.375	GA	P-265.0-0.375A	280	P-265.0-0.375	275	7	
250.0-275.0	0.750	GB	P-265.0-0.750A	390	P-265.0-0.750	385	8	
250.0-275.0	1.5	GC	P-265.0-1.5A	525	P-265.0-1.5	520	9	
250.0-275.0	3.0	GD	P-265.0-3.0A	690	P-265.0-3.0	685	10A	
275.0-315.0	0.050	F	P-290.0-0.050A	155	P-290.0-0.050	150	3	
275.0-315.0	0.100	G	P-290.0-0.100A	195	P-290.0-0.100	190	5	
275.0-315.0	0.200	GA	P-290.0-0.200A	240	P-290.0-0.200	235	6	
275.0-315.0	0.375	GB	P-290.0-0.375A	300	P-290.0-0.375	295	7A	
275.0-315.0	0.750	GC	P-290.0-0.750A	410	P-290.0-0.750	405	8A	
275.0-315.0	1.5	GD	P-290.0-1.5A	550	P-290.0-1.5	545	9A	
315.0-340.0	0.050	G	P-325.0-0.050A	160	P-325.0-0.050	155	3	
315.0-340.0	0.100	GA	P-325.0-0.100A	215	P-325.0-0.100	210	5	
315.0-340.0	0.200	GB	P-325.0-0.200A	260	P-325.0-0.200	255	6A	
315.0-340.0	0.375	GB	P-325.0-0.375A	325	P-325.0-0.375	320	7A	
315.0-340.0	0.750	GC	P-325.0-0.750A	450	P-325.0-0.750	445	8A	
315.0-340.0	1.5	GD	P-325.0-1.5A	600	P-325.0-1.5	595	9A	

CONSULT FACTORY

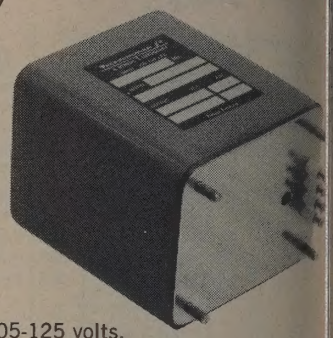
TECHNIPOWER, INC. Ridgefield, Conn. 06877
A BENRUS SUBSIDIARY

PL-80

POWER MODULES

REGULATED AC-DC 3.0 to 152 VDC Up to 75 watts
BASE TEMP. RATING 80°C

HIGHEST DENSITY for SERIES REGULATORS



DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.

Recovery time: Less than 50 μsec, 1/2L to FL.

Designed to meet MIL environmental specifications:
RFI — MIL-I-6181D
Shock — MIL-STD-202C, Method 205C;
Vibration — MIL-STD-202C, Method 201A
Hi-temp — MIL-E-5400, Classes 1 & 1A;
Humidity — MIL-STD-202C, Method 103B.

M.T.B.F. For Product Line: 60,000 hours, per MIL-HBK-217A, with module stressed at 80°C base temperature.

Output impedance: See curve.

OPTIONAL FEATURES

	SUFFIX
Fixed output voltage	F
External output adjust	H

SPECIFICATIONS

Input voltage range: 105-125 volts.

Input frequency range: 50-400 Hz.

Regulation-Line and Load Combined: ±0.05% — "A" models. ±0.5% — standard models.

Ripple: "A" models — 0.002% or 1 mv rms, whichever is
er, with 60 Hz input; 0.004% or 3 mv rms whiche
greater, with 400 Hz input.
Standard models — 0.01% or 5 mv rms, whichever is gr
with 60 Hz input; 0.04% or 10 mv, rms, whichever is gr
with 400 Hz input.

Output adjustment range: 10% (screwdriver adj. in bas
80% of rated load the output may be adjusted 20% (±
of nominal.

Operating temperature: —20°C to +80°C (max. base t

Storage temperature: —62°C to +85°C.

Polarity: May be used positive or negative.

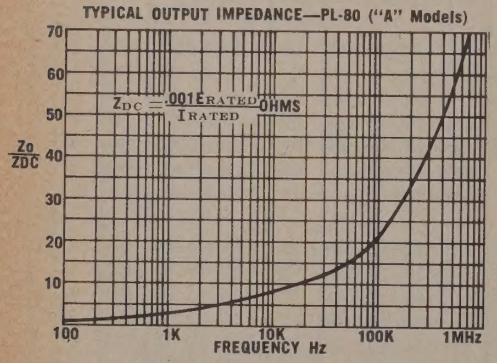
Output voltage and current: See specific model listings.

Series operation: Series starting circuitry employed re
that input AC voltage be applied at a rate greater than
rms/second. Consult factory if slow rising inp
anticipated.

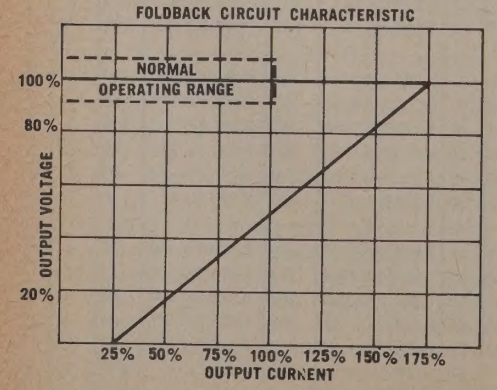
Short circuit protection: Unique foldback circuitry (see
protects each module if output should be shorted c
uously. Automatic return after short removal.

Overvoltage protection: See model listings.

TYPICAL OUTPUT IMPEDANCE—PL-80 ("A" Models)

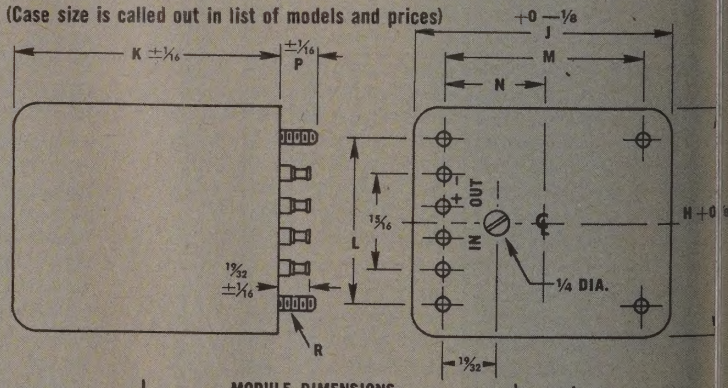


FOLDBACK CIRCUIT CHARACTERISTIC



MECHANICAL DATA

(Case size is called out in list of models and prices)



CASE SIZE	MODULE DIMENSIONS H	J	K	L	M	N	P	R	CASE SIZE	TOLERANCES L M N S
AL	2 3/8	2 3/4	2 13/16	1 3/4	2 1/8	1 1/16	11/32	6-32	AL	±1/64
BL	2 5/8	3 1/16	3 3/16	1 55/64	2 19/64	1 5/32	11/32	8-32	BL	±1/64
CL	3 1/16	3 9/16	3 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	CL	±1/64
DL	3 3/8	3 15/16	4 5/16	2 7/16	3	1 1/2	15/32	10-32	DL	±1/32
EL	3 11/16	4 5/16	4 3/4	2 11/16	3 5/16	1 21/32	7/16	10-32	EL	±1/32
FL	4	4 11/16	5 3/16	3	3 11/16	1 27/32	9/16	1/4-20	FL	±3/64
GL	4 5/16	5 1/16	5 1/2	3 5/16	4 1/16	2 1/32	9/16	1/4-20	GL	±3/64

RECOMMENDED CLEARANCE TERMINAL CUTOUT 3/8 x 1 5/16

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

MODELS AND PRICES

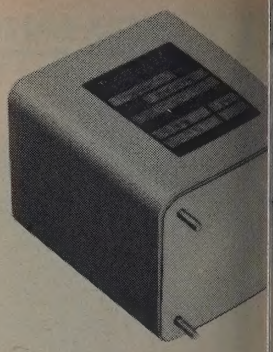
Output Voltage Adjust Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
2-3.2	0.375	AL	PL-3.0-0.375A	90	PL-3.0-0.375	85	1	A
2-3.2	0.750	BL	PL-3.0-0.750A	95	PL-3.0-0.750	90	3	A
2-3.2	1.5	DL	PL-3.0-1.5A	100	PL-3.0-1.5	95	5	A
2-3.2	3.0	EL	PL-3.0-3.0A	105	PL-3.0-3.0	100	6A	B
2-3.2	6.0	FL	PL-3.0-6.0A	135	PL-3.0-6.0	130	7A	B
3-3.5	0.375	AL	PL-3.3-0.375A	90	PL-3.3-0.375	85	1	A
3-3.5	0.750	BL	PL-3.3-0.750A	95	PL-3.3-0.750	90	3	A
3-3.5	1.5	DL	PL-3.3-1.5A	100	PL-3.3-1.5	95	5	A
3-3.5	3.0	EL	PL-3.3-3.0A	110	PL-3.3-3.0	105	6A	B
3-3.5	6.0	FL	PL-3.3-6.0A	140	PL-3.3-6.0	135	7A	B
3-3.9	0.375	AL	PL-3.7-0.375A	90	PL-3.7-0.375	85	1	A
3-3.9	0.750	BL	PL-3.7-0.750A	95	PL-3.7-0.750	90	3	A
3-3.9	1.5	DL	PL-3.7-1.5A	100	PL-3.7-1.5	95	5	A
3-3.9	3.0	EL	PL-3.7-3.0A	110	PL-3.7-3.0	105	6A	B
3-3.9	6.0	FL	PL-3.7-6.0A	150	PL-3.7-6.0	145	7A	B
4-4.3	0.375	AL	PL-4.1-0.375A	90	PL-4.1-0.375	85	1	A
4-4.3	0.750	BL	PL-4.1-0.750A	95	PL-4.1-0.750	90	3	A
4-4.3	1.5	DL	PL-4.1-1.5A	100	PL-4.1-1.5	95	5	A
4-4.3	3.0	EL	PL-4.1-3.0A	110	PL-4.1-3.0	105	6A	B
4-4.3	6.0	FL	PL-4.1-6.0A	150	PL-4.1-6.0	145	7A	B
4-4.7	0.375	AL	PL-4.5-0.375A	90	PL-4.5-0.375	85	1	A
4-4.7	0.750	BL	PL-4.5-0.750A	95	PL-4.5-0.750	90	3	A
4-4.7	1.5	DL	PL-4.5-1.5A	100	PL-4.5-1.5	95	5	A
4-4.7	3.0	EL	PL-4.5-3.0A	110	PL-4.5-3.0	105	6A	B
4-4.7	6.0	FL	PL-4.5-6.0A	150	PL-4.5-6.0	145	7A	B
5-5.3	0.375	AL	PL-5.1-0.375A	90	PL-5.1-0.375	85	1	A
5-5.3	0.750	BL	PL-5.1-0.750A	95	PL-5.1-0.750	90	3	A
5-5.3	1.5	DL	PL-5.1-1.5A	100	PL-5.1-1.5	95	5	A
5-5.3	3.0	EL	PL-5.1-3.0A	110	PL-5.1-3.0	105	6A	B
5-5.3	6.0	FL	PL-5.1-6.0A	155	PL-5.1-6.0	150	7A	B
5-5.8	0.375	AL	PL-5.5-0.375A	90	PL-5.5-0.375	85	1	A
5-5.8	0.750	BL	PL-5.5-0.750A	95	PL-5.5-0.750	90	3	A
5-5.8	1.5	DL	PL-5.5-1.5A	100	PL-5.5-1.5	95	5	A
5-5.8	3.0	EL	PL-5.5-3.0A	110	PL-5.5-3.0	105	6A	B
5-5.8	6.0	FL	PL-5.5-6.0A	160	PL-5.5-6.0	155	7A	B
6-6.3	0.375	AL	PL-6.0-0.375A	90	PL-6.0-0.375	85	1	A
6-6.3	0.750	BL	PL-6.0-0.750A	95	PL-6.0-0.750	90	3	A
6-6.3	1.5	DL	PL-6.0-1.5A	100	PL-6.0-1.5	95	5	A
6-6.3	3.0	EL	PL-6.0-3.0A	110	PL-6.0-3.0	105	6A	B
6-6.3	6.0	FL	PL-6.0-6.0A	165	PL-6.0-6.0	160	8	B
6.6-6.9	0.200	AL	PL-6.6-0.200A	90	PL-6.6-0.200	85	1	A
6.6-6.9	0.375	AL	PL-6.6-0.375A	95	PL-6.6-0.375	90	1	A
6.6-6.9	0.750	BL	PL-6.6-0.750A	100	PL-6.6-0.750	95	3	A
6.6-6.9	1.5	DL	PL-6.6-1.5A	110	PL-6.6-1.5	105	5	A
6.6-6.9	3.0	FL	PL-6.6-3.0A	120	PL-6.6-3.0	115	6A	B
6.6-6.9	6.0	GL	PL-6.6-6.0A	165	PL-6.6-6.0	160	8	B
6.9-7.6	0.200	AL	PL-7.3-0.200A	90	PL-7.3-0.200	85	1	A
6.9-7.6	0.375	AL	PL-7.3-0.375A	95	PL-7.3-0.375	90	1	A
6.9-7.6	0.750	BL	PL-7.3-0.750A	100	PL-7.3-0.750	95	3	A
6.9-7.6	1.5	DL	PL-7.3-1.5A	110	PL-7.3-1.5	105	5	A
6.9-7.6	3.0	FL	PL-7.3-3.0A	145	PL-7.3-3.0	140	6A	B
6.9-7.6	6.0	GL	PL-7.3-6.0A	165	PL-7.3-6.0	160	8	B
7.6-8.5	0.200	AL	PL-8.1-0.200A	90	PL-8.1-0.200	85	1	A
7.6-8.5	0.375	AL	PL-8.1-0.375A	95	PL-8.1-0.375	90	1	A
7.6-8.5	0.750	BL	PL-8.1-0.750A	100	PL-8.1-0.750	95	3	A
7.6-8.5	1.5	DL	PL-8.1-1.5A	110	PL-8.1-1.5	105	5	A
7.6-8.5	3.0	FL	PL-8.1-3.0A	145	PL-8.1-3.0	140	6A	B
7.6-8.5	6.0	GL	PL-8.1-6.0A	170	PL-8.1-6.0	165	8	B
8.5-9.3	0.200	AL	PL-8.9-0.200A	90	PL-8.9-0.200	85	1	A
8.5-9.3	0.375	AL	PL-8.9-0.375A	95	PL-8.9-0.375	90	1	A
8.5-9.3	0.750	BL	PL-8.9-0.750A	100	PL-8.9-0.750	95	3	A
8.5-9.3	1.5	DL	PL-8.9-1.5A	110	PL-8.9-1.5	105	5	A
8.5-9.3	3.0	FL	PL-8.9-3.0A	150	PL-8.9-3.0	145	6A	B
8.5-9.3	6.0	GL	PL-8.9-6.0A	170	PL-8.9-6.0	165	8	B
9.3-10.3	0.200	AL	PL-9.8-0.200A	90	PL-9.8-0.200	85	1	A
9.3-10.3	0.375	AL	PL-9.8-0.375A	95	PL-9.8-0.375	90	2	A
9.3-10.3	0.750	CL	PL-9.8-0.750A	100	PL-9.8-0.750	95	3	A
9.3-10.3	1.5	DL	PL-9.8-1.5A	110	PL-9.8-1.5	105	5	A
9.3-10.3	3.0	FL	PL-9.8-3.0A	150	PL-9.8-3.0	145	6A	B
9.3-10.3	6.0	GL	PL-9.8-6.0A	170	PL-9.8-6.0	165	8	B
10.3-11.4	0.200	AL	PL-10.8-0.200A	90	PL-10.8-0.200	85	1	A
10.3-11.4	0.375	AL	PL-10.8-0.375A	95	PL-10.8-0.375	90	2	A
10.3-11.4	0.750	CL	PL-10.8-0.750A	100	PL-10.8-0.750	95	3	A
10.3-11.4	1.5	EL	PL-10.8-1.5A	110	PL-10.8-1.5	105	5	A
10.3-11.4	3.0	FL	PL-10.8-3.0A	150	PL-10.8-3.0	145	6A	C
10.3-11.4	6.0	GL	PL-10.8-6.0A	175	PL-10.8-6.0	170	8	C
11.4-12.5	0.200	AL	PL-12.0-0.200A	90	PL-12.0-0.200	85	1	A
11.4-12.5	0.375	BL	PL-12.0-0.375A	95	PL-12.0-0.375	90	2	A
11.4-12.5	0.750	CL	PL-12.0-0.750A	105	PL-12.0-0.750	100	3	A
11.4-12.5	1.5	EL	PL-12.0-1.5A	110	PL-12.0-1.5	105	5	A
11.4-12.5	3.0	FL	PL-12.0-3.0A	150	PL-12.0-3.0	145	6A	C
11.4-12.5	6.0	GL	PL-12.0-6.0A	175	PL-12.0-6.0	170	8	C
12.5-13.7	0.100	AL	PL-13.1-0.100A	90	PL-13.1-0.100	85	1	A
12.5-13.7	0.200	AL	PL-13.1-0.200A	95	PL-13.1-0.200	90	1	A
12.5-13.7	0.375	BL	PL-13.1-0.375A	100	PL-13.1-0.375	95	2	A
12.5-13.7	0.750	CL	PL-13.1-0.750A	105	PL-13.1-0.750	100	3	A
12.5-13.7	1.5	EL	PL-13.1-1.5A	115	PL-13.1-1.5	110	6	A
12.5-13.7	3.0	GL	PL-13.1-3.0A	155	PL-13.1-3.0	150	6A	C
13.7-15.2	0.100	AL	PL-14.5-0.100A	90	PL-14.5-0.100	85	1	A
13.7-15.2	0.200	AL	PL-14.5-0.200A	95	PL-14.5-0.200	90	1	A
13.7-15.2	0.375	BL	PL-14.5-0.375A	100	PL-14.5-0.375	95	2	A
13.7-15.2	0.750	CL	PL-14.5-0.750A	105	PL-14.5-0.750	100	3	A
13.7-15.2	1.5	EL	PL-14.5-1.5A	140	PL-14.5-1.5	135	6	A
13.7-15.2	3.0	GL	PL-14.5-3.0A	155	PL-14.5-3.0	150	7	C
15.2-16.5	0.100	AL	PL-15.8-0.100A	90	PL-15.8-0.100	85	1	A
15.2-16.5	0.200	AL	PL-15.8-0.200A	95	PL-15.8-0.200	90	1	A
15.2-16.5	0.375	BL	PL-15.8-0.375A	100	PL-15.8-0.375	95	2	A
15.2-16.5	0.750	CL	PL-15.8-0.750A	105	PL-15.8-0.750	100	4	A
15.2-16.5	1.5	EL	PL-15.8-1.5A	140	PL-15.8-1.5	135	6	A
15.2-16.5	3.0	GL	PL-15.8-3.0A	155	PL-15.8-3.0	150	7	C
16.5-18.5	0.100	AL	PL-17.5-0.100A	90	PL-17.5-0.100	85	1	A
16.5-18.5	0.200	AL	PL-17.5-0.200A	95	PL-17.5-0.200	90	1	A
16.5-18.5	0.375	BL	PL-17.5-0.375A	100	PL-17.5-0.375	95	2	A
16.5-18.5	0.750	CL	PL-17.5-0.750A	105	PL-17.5-0.750	100	4	A
16.5-18.5	1.5	FL	PL-17.5-1.5A	140	PL-17.5-1.5	135	6	A
16.5-18.5	3.0	GL	PL-17.5-3.0A	155	PL-17.5-3.0	150	7	C

Models available to 152VDC. See catalog 701.

TECHNIPOWER, INC. Ridgefield, Conn. 06877

A BENRUS SUBSIDIARY

MC-65, MCS-65



MORE WATTS PER DOLLAR

POWER MODULES

REGULATED AC-DC: 3.0 to 152 VDC. Up to 750 watts
BASE TEMP. RATING: 65°C

DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.

Recovery time: Less than 50 μsec, 1/2L to FL.

Designed to meet MIL environmental specifications:
- **RFI** — MIL-I-6181D;
- **Shock** — MIL-STD-202C, Method 205C;
- **Vibration** — MIL-STD-202C, Method 201A;
- **Humidity** — MIL-STD-202C, Method 103B.

M.T.B.F. For Product Line: 50,000 hours, per MIL-HBK-217A, stressed at 65°C base temperature.

Output impedance: See curve.

OPTIONAL FEATURES

	SUFFIX
Closer regulation	AA
Operation with lamp loads	E
Fixed output voltage	F
Shock and vibration mounts	G, V
External output adjustment	H
Fully epoxy encapsulated	K
Sealed internal potentiometer	P
Remote sensing	R, Y,
Lower temperature coefficient	T, TT
Off ground operation	U
Wide input range	W
Special cases, shapes and finishes	

SPECIFICATIONS

Input voltage range: 105-125 volts.

Input frequency range: 50-400 Hz.

Regulation: ±0.05% — MC models.
Line & Load Combined: ±0.5% — MCS models.

Ripple: MC models — 0.004% or 2 mv, rms, whiche greater, with 60 Hz input; to 0.008% or 4 mv, rms, whic is greater, with 400 Hz input.
MCS models — 0.01% or 5 mv, rms, whichever is gr with 60 Hz input; 0.04% or 10 mv, rms, whichever is gr with 400 Hz input.

Output adjustment range: 10% (screwdriver adj. in bas 80% of rated load the output may be adjusted 20% (± of nominal.

Operating temperature: —20°C to +65°C (max. base t

Storage temperature: —62°C to +85°C

Polarity: May be used positive or negative.

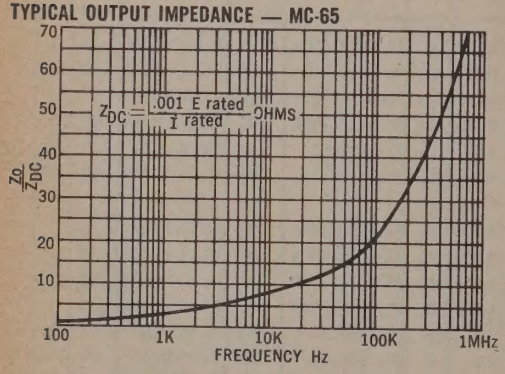
Output voltage and current: See specific model listin

Series operation: Series starting circuitry employed rec that input AC voltage be applied at a rate greater than 50 v rms/sec. Consult factory if slow rising input is anticip

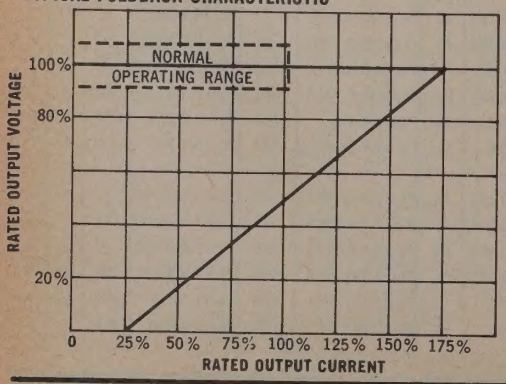
Short circuit protection: Unique foldback circuitry (see protects each module if output should be shorted c uously. Automatic return after short removal.

Overvoltage protection: See model listings.

TYPICAL OUTPUT IMPEDANCE — MC-65

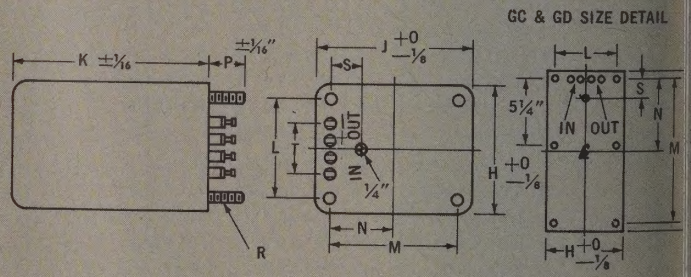


TYPICAL FOLDBACK CHARACTERISTIC



MECHANICAL DATA

(case size is called out in list of models and prices)



Case Size	MODULE DIMENSIONS H	J	K	L	M	N	P	R	S	T	Tolerances L,M,N,S	Recommended Clearance Terminal Cutouts
A	2 3/8	2 3/4	3 13/16	1 3/4	2 1/8	1 1/16	11/32	6-32	19/32	15/16	±1/64	3/8x1 5/16
B	2 5/8	3 1/16	4 1/4	1 55/64	2 19/64	1 5/32	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16
C	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16
D	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	19/32	15/16	±1/32	3/8x1 5/16
E	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	15/16	±1/32	3/8x1 5/16
F	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16
G	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 1/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16
GA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2
GB	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2
GC*	4 15/16	13 1/16	7	3 5/8	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2
GD*	6 9/16	13 1/16	7	5 7/16	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2

*See detail

See YELLOW SECTION for Local Offices, Phones

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

AND PRICES

Output Current (amps)	Case Size (see dwg.)	MC MODELS ±0.05% Accuracy Model No.	Price	MCS MODELS ±0.5% Accuracy Model No.	Price	Thermal Ref. No.	O.V. Ref.
0.500	B	MC- 3.0- 0.500	100	MCS- 3.0- 0.500	95	2	A
1.0	C	MC- 3.0- 1.0	105	MCS- 3.0- 1.0	100	4	A
2.0	E	MC- 3.0- 2.0	110	MCS- 3.0- 2.0	105	6	A
4.0	F	MC- 3.0- 4.0	115	MCS- 3.0- 4.0	110	7	B
8.0	G	MC- 3.0- 8.0	150	MCS- 3.0- 8.0	145	8	B
15.0	GB	MC- 3.0-15.0	210	MCS- 3.0-15.0	205	9	D
30.0	GC	MC- 3.0-30.0	305	MCS- 3.0-30.0	300	10	D
0.500	B	MC- 3.3- 0.500	100	MCS- 3.3- 0.500	95	2	A
1.0	C	MC- 3.3- 1.0	105	MCS- 3.3- 1.0	100	4	A
2.0	E	MC- 3.3- 2.0	110	MCS- 3.3- 2.0	105	6	A
4.0	F	MC- 3.3- 4.0	115	MCS- 3.3- 4.0	110	7	B
8.0	G	MC- 3.3- 8.0	150	MCS- 3.3- 8.0	145	8	B
15.0	GB	MC- 3.3-15.0	215	MCS- 3.3-15.0	210	9	D
30.0	GC	MC- 3.3-30.0	315	MCS- 3.3-30.0	310	10	D
0.500	B	MC- 3.7- 0.500	100	MCS- 3.7- 0.500	95	2	A
1.0	C	MC- 3.7- 1.0	105	MCS- 3.7- 1.0	100	4	A
2.0	E	MC- 3.7- 2.0	110	MCS- 3.7- 2.0	105	6	A
4.0	F	MC- 3.7- 4.0	120	MCS- 3.7- 4.0	115	7	B
8.0	G	MC- 3.7- 8.0	155	MCS- 3.7- 8.0	150	8	B
15.0	GB	MC- 3.7-15.0	225	MCS- 3.7-15.0	220	9	D
30.0	GC	MC- 3.7-30.0	325	MCS- 3.7-30.0	320	10	D
0.500	B	MC- 4.1- 0.500	100	MCS- 4.1- 0.500	95	2	A
1.0	C	MC- 4.1- 1.0	105	MCS- 4.1- 1.0	100	4	A
2.0	E	MC- 4.1- 2.0	110	MCS- 4.1- 2.0	105	6	A
4.0	F	MC- 4.1- 4.0	120	MCS- 4.1- 4.0	115	7	B
8.0	G	MC- 4.1- 8.0	165	MCS- 4.1- 8.0	160	8	B
15.0	GB	MC- 4.1-15.0	230	MCS- 4.1-15.0	225	9	D
30.0	GC	MC- 4.1-30.0	325	MCS- 4.1-30.0	320	10	D
0.500	B	MC- 4.5- 0.500	100	MCS- 4.5- 0.500	95	2	A
1.0	C	MC- 4.5- 1.0	105	MCS- 4.5- 1.0	100	4	A
2.0	E	MC- 4.5- 2.0	110	MCS- 4.5- 2.0	105	6	A
4.0	F	MC- 4.5- 4.0	120	MCS- 4.5- 4.0	115	7	B
8.0	G	MC- 4.5- 8.0	170	MCS- 4.5- 8.0	165	8	B
15.0	GB	MC- 4.5-15.0	235	MCS- 4.5-15.0	230	9	D
30.0	GC	MC- 4.5-30.0	340	MCS- 4.5-30.0	335	10	D
0.500	B	MC- 5.1- 0.500	100	MCS- 5.1- 0.500	95	2	A
1.0	C	MC- 5.1- 1.0	105	MCS- 5.1- 1.0	100	4	A
2.0	E	MC- 5.1- 2.0	110	MCS- 5.1- 2.0	105	6	A
4.0	F	MC- 5.1- 4.0	125	MCS- 5.1- 4.0	120	7	B
8.0	G	MC- 5.1- 8.0	175	MCS- 5.1- 8.0	170	8	B
15.0	GB	MC- 5.1-15.0	245	MCS- 5.1-15.0	240	9	D
30.0	GC	MC- 5.1-30.0	350	MCS- 5.1-30.0	345	10	D
0.500	B	MC- 5.5- 0.500	100	MCS- 5.5- 0.500	95	2	A
1.0	C	MC- 5.5- 1.0	105	MCS- 5.5- 1.0	100	4	A
2.0	E	MC- 5.5- 2.0	110	MCS- 5.5- 2.0	105	6	A
4.0	F	MC- 5.5- 4.0	125	MCS- 5.5- 4.0	120	7	B
8.0	G	MC- 5.5- 8.0	180	MCS- 5.5- 8.0	175	8	B
15.0	GB	MC- 5.5-15.0	250	MCS- 5.5-15.0	245	9	D
30.0	GC	MC- 5.5-30.0	350	MCS- 5.5-30.0	345	10	D
0.500	B	MC- 6.0- 0.500	100	MCS- 6.0- 0.500	95	2	A
1.0	C	MC- 6.0- 1.0	105	MCS- 6.0- 1.0	100	4	A
2.0	E	MC- 6.0- 2.0	110	MCS- 6.0- 2.0	105	6	A
4.0	F	MC- 6.0- 4.0	130	MCS- 6.0- 4.0	125	7	B
8.0	G	MC- 6.0- 8.0	180	MCS- 6.0- 8.0	175	8	B
15.0	GB	MC- 6.0-15.0	260	MCS- 6.0-15.0	255	9	D
30.0	GC	MC- 6.0-30.0	365	MCS- 6.0-30.0	360	10	D
0.250	A	MC- 6.6- 0.250	95	MCS- 6.6- 0.250	90	1	A
0.500	B	MC- 6.6- 0.500	100	MCS- 6.6- 0.500	95	2	A
1.0	C	MC- 6.6- 1.0	105	MCS- 6.6- 1.0	100	4	A
2.0	E	MC- 6.6- 2.0	110	MCS- 6.6- 2.0	105	6	A
4.0	G	MC- 6.6- 4.0	150	MCS- 6.6- 4.0	145	7A	B
8.0	GA	MC- 6.6- 8.0	180	MCS- 6.6- 8.0	175	8	B
15.0	GB	MC- 6.6-15.0	260	MCS- 6.6-15.0	255	9	D
30.0	GC	MC- 6.6-30.0	385	MCS- 6.6-30.0	380	10	D
0.250	A	MC- 7.3- 0.250	95	MCS- 7.3- 0.250	90	1	A
0.500	B	MC- 7.3- 0.500	100	MCS- 7.3- 0.500	95	2	A
1.0	C	MC- 7.3- 1.0	105	MCS- 7.3- 1.0	100	4	A
2.0	E	MC- 7.3- 2.0	110	MCS- 7.3- 2.0	105	6	A
4.0	G	MC- 7.3- 4.0	150	MCS- 7.3- 4.0	145	7A	B
8.0	GA	MC- 7.3- 8.0	190	MCS- 7.3- 8.0	185	8	B
15.0	GB	MC- 7.3-15.0	260	MCS- 7.3-15.0	255	9	D
30.0	GC	MC- 7.3-30.0	385	MCS- 7.3-30.0	380	10	D

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg.)	MC MODELS ±0.05% Accuracy Model No.	Price	MCS MODELS ±0.5% Accuracy Model No.	Price	Thermal Ref. No.	O.V. Ref.
7.6-8.5	0.250	A	MC- 8.1- 0.250	95	MCS- 8.1- 0.250	90	1	A
7.6-8.5	0.500	B	MC- 8.1- 0.500	100	MCS- 8.1- 0.500	95	2	A
7.6-8.5	1.0	C	MC- 8.1- 1.0	105	MCS- 8.1- 1.0	100	4	A
7.6-8.5	2.0	E	MC- 8.1- 2.0	115	MCS- 8.1- 2.0	110	6	A
7.6-8.5	4.0	G	MC- 8.1- 4.0	155	MCS- 8.1- 4.0	150	7A	B
7.6-8.5	8.0	GA	MC- 8.1- 8.0	195	MCS- 8.1- 8.0	190	8	B
7.6-8.5	15.0	GB	MC- 8.1-15.0	260	MCS- 8.1-15.0	255	9	D
7.6-8.5	30.0	GC	MC- 8.1-30.0	395	MCS- 8.1-30.0	390	10	D
8.5-9.3	0.250	A	MC- 8.9- 0.250	95	MCS- 8.9- 0.250	90	1	A
8.5-9.3	0.500	B	MC- 8.9- 0.500	100	MCS- 8.9- 0.500	95	2	A
8.5-9.3	1.0	C	MC- 8.9- 1.0	105	MCS- 8.9- 1.0	100	4	A
8.5-9.3	2.0	E	MC- 8.9- 2.0	115	MCS- 8.9- 2.0	110	6	A
8.5-9.3	4.0	G	MC- 8.9- 4.0	155	MCS- 8.9- 4.0	150	7A	B
8.5-9.3	8.0	GA	MC- 8.9- 8.0	205	MCS- 8.9- 8.0	200	8	B
8.5-9.3	15.0	GB	MC- 8.9-15.0	260	MCS- 8.9-15.0	255	9	D
8.5-9.3	30.0	GC	MC- 8.9-30.0	395	MCS- 8.9-30.0	390	10	D
9.3-10.3	0.250	A	MC- 9.8- 0.250	100	MCS- 9.8- 0.250	95	1	A
9.3-10.3	0.500	B	MC- 9.8- 0.500	105	MCS- 9.8- 0.500	100	2	A
9.3-10.3	1.0	D	MC- 9.8- 1.0	110	MCS- 9.8- 1.0	105	4	A
9.3-10.3	2.0	E	MC- 9.8- 2.0	115	MCS- 9.8- 2.0	110	6	A
9.3-10.3	4.0	G	MC- 9.8- 4.0	165	MCS- 9.8- 4.0	160	7A	B
9.3-10.3	8.0	GA	MC- 9.8- 8.0	205	MCS- 9.8- 8.0	200	8	B
9.3-10.3	15.0	GB	MC- 9.8-15.0	275	MCS- 9.8-15.0	270	9	D
9.3-10.3	30.0	GC	MC- 9.8-30.0	415	MCS- 9.8-30.0	410	10	D
10.3-11.4	0.250	A	MC-10.8- 0.250	100	MCS-10.8- 0.250	95	1	A
10.3-11.4	0.500	B	MC-10.8- 0.500	105	MCS-10.8- 0.500	100	2	A
10.3-11.4	1.0	D	MC-10.8- 1.0	110	MCS-10.8- 1.0	105	4	A
10.3-11.4	2.0	F	MC-10.8- 2.0	120	MCS-10.8- 2.0	115	6	A
10.3-11.4	4.0	G	MC-10.8- 4.0	170	MCS-10.8- 4.0	165	7A	B
10.3-11.4	8.0	GA	MC-10.8- 8.0	215	MCS-10.8- 8.0	210	8	B
10.3-11.4	15.0	GB	MC-10.8-15.0	285	MCS-10.8-15.0	280	9	D
10.3-11.4	30.0	GC	MC-10.8-30.0	420	MCS-10.8-30.0	415	10	D
11.4-12.5	0.250	B	MC-12.0- 0.250	100	MCS-12.0- 0.250	95	1	A
11.4-12.5	0.500	B	MC-12.0- 0.500	105	MCS-12.0- 0.500	100	2	A
11.4-12.5	1.0	D	MC-12.0- 1.0	110	MCS-12.0- 1.0	105	4	A
11.4-12.5	2.0	F	MC-12.0- 2.0	120	MCS-12.0- 2.0	115	6	A
11.4-12.5	4.0	G	MC-12.0- 4.0	170	MCS-12.0- 4.0	165	7A	B
11.4-12.5	8.0	GA	MC-12.0- 8.0	220	MCS-12.0- 8.0	215	8	B
11.4-12.5	15.0	GB	MC-12.0-15.0	290	MCS-12.0-15.0	285	9	D
11.4-12.5	30.0	GC	MC-12.0-30.0	430	MCS-12.0-30.0	425	10	D
12.5-13.7	0.125	A	MC-13.1- 0.125	95	MCS-13.1- 0.125	90	1	A
12.5-13.7	0.250	B	MC-13.1- 0.250	100	MCS-13.1- 0.250	95	1	A
12.5-13.7	0.500	B	MC-13.1- 0.500	105	MCS-13.1- 0.500	100	2	A
12.5-13.7	1.0	C	MC-13.1- 1.0	110	MCS-13.1- 1.0	105	4	A
12.5-13.7	2.0	F	MC-13.1- 2.0	120	MCS-13.1- 2.0	115	6	A
12.5-13.7	4.0	GA	MC-13.1- 4.0	175	MCS-13.1- 4.0	170	7A	B
12.5-13.7	8.0	GB	MC-13.1- 8.0	220	MCS-13.1- 8.0	215	8A	B
12.5-13.7	15.0	GC	MC-13.1-15.0	315	MCS-13.1-15.0	310	9	D
13.7-15.2	0.125	A	MC-14.5- 0.125	95	MCS-14.5- 0.125	90	1	A
13.7-15.2	0.250	B	MC-14.5- 0.250	100	MCS-14.5- 0.250	95	1	A
13.7-15.2	0.500	C	MC-14.5- 0.500	105	MCS-14.5- 0.500	100	3	A
13.7-15.2	1.0	D	MC-14.5- 1.0	110	MCS-14.5- 1.0	105	4	A
13.7-15.2	2.0	F	MC-14.5- 2.0	125	MCS-14.5- 2.0	120	6A	A
13.7-15.2	4.0	GA	MC-14.5- 4.0	175	MCS-14.5- 4.0	170	7A	B
13.7-15.2	8.0	GB	MC-14.5- 8.0	225	MCS-14.5- 8.0	220	8A	B
13.7-15.2	15.0	GC	MC-14.5-15.0	320	MCS-14.5-15.0	315	9A	D
15.2-16.5	0.125	A	MC-15.8- 0.125	95	MCS-15.8- 0.125	90	1	A
15.2-16.5	0.250	B	MC-15.8- 0.250	100	MCS-15.8- 0.250	95	1	A
15.2-16.5	0.500	C	MC-15.8- 0.500	105	MCS-15.8- 0.500	100	3	A
15.2-16.5	1.0	D	MC-15.8- 1.0	110	MCS-15.8- 1.0	105	5	A
15.2-16.5	2.0	F	MC-15.8- 2.0	130	MCS-15.8- 2.0	125	6A	A
15.2-16.5	4.0	GA	MC-15.8- 4.0	175	MCS-15.8- 4.0	170	7A	B
15.2-16.5	8.0	GB	MC-15.8- 8.0	225	MCS-15.8- 8.0	220	8A	B
15.2-16.5	15.0	GC	MC-15.8-15.0	320	MCS-15.8-15.0	315	9A	D
16.5-18.5	0.125	A	MC-17.5- 0.125	95	MCS-17.5- 0.125	90	1	A
16.5-18.5	0.250	B	MC-17.5- 0.250	100	MCS-17.5- 0.250	95	1	A
16.5-18.5	0.500	C	MC-17.5- 0.500	105	MCS-17.5- 0.500	100	3	A
16.5-18.5	1.0	D	MC-17.5- 1.0	110	MCS-17.5- 1.0	105	5	A
16.5-18.5	2.0	G	MC-17.5- 2.0	145	MCS-17.5- 2.0	140	6A	A
16.5-18.5	4.0	GA	MC-17.5- 4.0	180	MCS-17.5- 4.0	175	7A	C
16.5-18.5	8.0	GB	MC-17.5- 8.0	230	MCS-17.5- 8.0	225	8A	C
16.5-18.5	15.0	GC	MC-17.5-15.0	320	MCS-17.5-15.0	315	9A	D

Models available to 152VDC. See catalog 701.

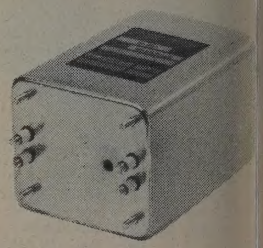
TECHNIPOWER, INC.
A BENRUS SUBSIDIARY
Ridgefield, Conn.
06877

HF-80, HFC-80

POWER MODULES

REGULATED AC-DC 2.8 to 1000 VDC, 10 —375 watts
BASE TEMP. RATING: 80°C

10 TO 375 WATT WIDE RANGE MINIATURE MODULES



DESIGN PARAMETERS (Typical)

Ripple (p-p): 0.5% + 50 mv.

Recovery time: Less than 5 ms 1/2L to FL.

Efficiency: To 80%.

M.T.B.F.: 35,000 hours per MIL-HBK-217A, with module stressed at 80°C base temperature.

Temperature coefficient: 0.02%/°C.

E.M.I.: Suppression filters designed to meet MIL-I-6181D (Consult factory if full qualification is required).

OPTIONAL FEATURES

	SUFFIX
Fixed output voltage	F
Shock and vibration mounts	G, V
External output adjust	H
Fully epoxy encapsulated	K
Sealed internal potentiometer	P
Remote sensing	R
Wide input voltage range	W
Off-ground operation	U
External output adjustment with remote sensing	Y
Special shapes and finishes	

SPECIFICATIONS

Input voltage range: 105-125 VAC.

Input frequency range: 50-400 Hz.

Regulation accuracy: Line: ±(0.05% + 5 mv); Load: ±(0.1% + 5 mv).

Ripple (rms): 0.2% + 10 mv.*

Operating temperature range: —20°C to +80°C (max. base temp.)

Storage temperature range: —55°C to +85°C.

Polarity: May be used positive or negative.

Output voltage & current: See specific model listings.

Series operation: May be operated with conventional or complex loads provided total voltage in series connection does not exceed 350 v. Consult factory for operation of units above 350 v.

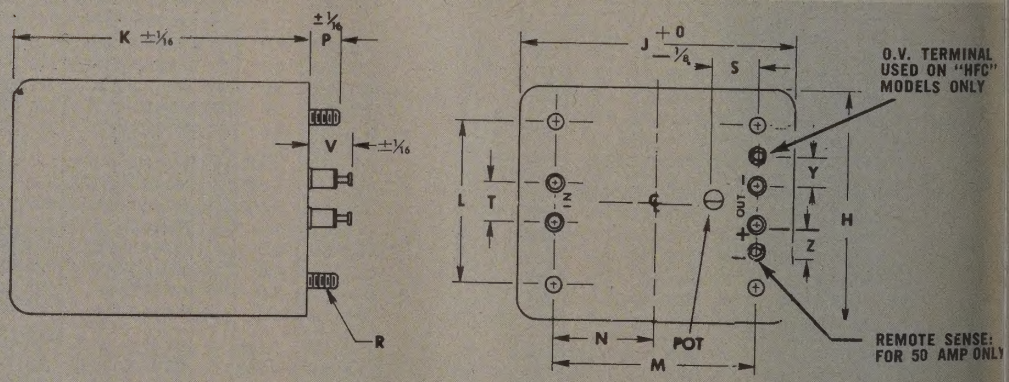
Short circuit protection: Automatic current limiting protects against momentary overloads and continuous shorts. Restores to normal operation after short is removed.

Overvoltage protection: HFC-80 model incorporates internal circuitry to protect load against possible overvoltage condition in event of power supply failure. Trip point is factory 25 ± 5% above maximum rated output voltage; trip point may be adjusted downward (5 volts minimum) by inserting selected resistors between negative output terminal and terminal marked "O.V." Output voltage will never exceed trip point more than 5% of maximum output voltage + 0.5 volt. To re-energize after overvoltage condition, turn input power off, then on again after a short delay. Individual external overvoltage protectors (to 0.5 volts output) also available.

*Increase to 0.6% + 20 mv at —20°C.

MECHANICAL DATA

(Case size is called out in list of models and prices)



CASE SIZE	MODULE DIMENSIONS H	J	K	L	M	N	P	R	S	T	V	Y	Z	Tolerances L, M, N, S	Recommended Terminal Clearance Cutouts INPUT	OUTPUT
CS	3 1/16	3 9/16	3 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	1/2	9/16	3/8	11/32	±1/64	CS thru F	CS thru F
C	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	1/2	9/16	3/8	11/32	±1/64	3/8 x 7/8	3/8 x 1 5/8
D	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	19/32	1/2	9/16	3/8	11/32	±1/32		
E	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	1/2	9/16	3/8	11/32	±1/32	G	G
F	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	19/32	1/2	9/16	3/8	11/32	±3/64	1/2 x 1"	1/2 x 2
G	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 1/32	9/16	1/4-20	19/32	1/2	5/8	1/2	1/2	±3/64		
GA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	21/32	5/16-18	3/4	3/4	5/8	1/2	1/2	±3/64[1]	GA & GB	GA & GB
GB	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	21/32	5/16-18	3/4	3/4	3/4	1/2	9/16	±3/64	1/2 x 1 1/4	1/2 x 2 1/4

See YELLOW SECTION for Local Offices, Phones

TECHNIPOWER, INC.

A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

MODELS AND PRICES

Output Voltage Adjust. Range (VDC)	Output Current (Amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
2.8-5.5	3.0	D	HF-5.5-3.0	$220	4
	6.0	E	HF-5.5-6.0	240	6A
	12.0	F	HF-5.5-12.0	285	8
	25.0	G	HF-5.5-25.0	345	8A
	50.0	GB	HF-5.5-50.0R*	485	9A
4.0-8.0	2.0	D	HF-8.0-2.0	215	4
	4.0	E	HF-8.0-4.0	235	6A
	8.0	F	HF-8.0-8.0	275	8
	15.0	G	HF-8.0-15.0	320	8A
	30.0	GB	HF-8.0-30.0	440	9A
5.5-11.0	2.0	D	HF-11.0-2.0	225	4
	4.0	E	HF-11.0-4.0	250	6
	8.0	F	HF-11.0-8.0	295	8
	15.0	G	HF-11.0-15.0	390	8A
	30.0	GB	HF-11.0-30.0	505	9A
7.5-15.0	1.5	D	HF-15.0-1.5	220	4
	3.0	E	HF-15.0-3.0	245	6
	6.0	F	HF-15.0-6.0	285	8
	12.0	G	HF-15.0-12.0	380	8A
	25.0	GB	HF-15.0-25.0	510	9A
11.3-22.5	1.0	C	HF-22.5-1.0	215	4
	2.0	D	HF-22.5-2.0	230	5
	4.0	E	HF-22.5-4.0	270	7
	8.0	G	HF-22.5-8.0	360	8
	15.0	GA	HF-22.5-15.0	455	9
15.0-30.0	0.750	C	HF-30.0-0.750	210	4
	1.5	D	HF-30.0-1.5	220	5
	3.0	E	HF-30.0-3.0	255	7
	6.0	F	HF-30.0-6.0	330	8
	12.0	GA	HF-30.0-12.0	445	9
22.5-45.0	0.500	C	HF-45.0-0.500	205	4
	1.0	D	HF-45.0-1.0	220	5
	2.0	E	HF-45.0-2.0	240	7
	4.0	F	HF-45.0-4.0	305	8
	8.0	GA	HF-45.0-8.0	415	9
30.0-60.0	0.375	C	HF-60.0-0.375	200	4
	0.750	D	HF-60.0-0.750	210	5
	1.5	E	HF-60.0-1.5	225	7
	3.0	F	HF-60.0-3.0	285	8
	6.0	GA	HF-60.0-6.0	385	9
70.0-120.0	0.200	C	HF-120.0-0.200	215	4
	0.375	D	HF-120.0-0.375	225	5
	0.750	E	HF-120.0-0.750	245	7
	1.5	F	HF-120.0-1.5	320	8
	3.0	GA	HF-120.0-3.0	385	9
150.0-250.0	0.050	CS	HF-250.0-0.050	215	2
	0.100	C	HF-250.0-0.100	225	4
	0.200	D	HF-250.0-0.200	240	5
	0.375	E	HF-250.0-0.375	260	7
	0.750	F	HF-250.0-0.750	340	8
	1.5	GA	HF-250.0-1.5	410	9
225.0-375.0	0.030	CS	HF-375.0-0.030	215	2
	0.065	C	HF-375.0-0.065	220	4
	0.125	D	HF-375.0-0.125	230	5
	0.250	E	HF-375.0-0.250	265	7
	0.500	F	HF-375.0-0.500	340	8
	1.0	GA	HF-375.0-1.0	415	9
300.0-500.0	0.020	CS	HF-500.0-0.020	220	2
	0.050	C	HF-500.0-0.050	235	4
	0.100	D	HF-500.0-0.100	250	5
	0.200	E	HF-500.0-0.200	270	7
	0.375	F	HF-500.0-0.375	350	8
	0.750	GA	HF-500.0-0.750	425	9
450.0-750.0	0.012	CS	HF-750.0-0.012	220	2
	0.030	C	HF-750.0-0.030	230	4
	0.065	D	HF-750.0-0.065	250	5
	0.125	E	HF-750.0-0.125	275	7
	0.250	F	HF-750.0-0.250	370	8
	0.500	GA	HF-750.0-0.500	465	9
600.0-1000.0	0.010	CS	HF-1000.0-0.010	225	2
	0.025	C	HF-1000.0-0.025	245	4
	0.050	D	HF-1000.0-0.050	265	5
	0.100	E	HF-1000.0-0.100	295	7
	0.200	F	HF-1000.0-0.200	400	8
	0.375	GA	HF-1000.0-0.375	505	9

Output Voltage Adjust. Range (VDC)	Output Current (Amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
2.8-5.5	3.0	D	HFC-5.5-3.0	250	4
	6.0	E	HFC-5.5-6.0	270	6A
	12.0	F	HFC-5.5-12.0	315	8
	25.0	G	HFC-5.5-25.0	375	8A
	50.0	GB	HFC-5.5-50.0R*	515	9A
4.0-8.0	2.0	D	HFC-8.0-2.0	245	4
	4.0	E	HFC-8.0-4.0	265	6A
	8.0	F	HFC-8.0-8.0	305	8
	15.0	G	HFC-8.0-15.0	350	8A
	30.0	GB	HFC-8.0-30.0	470	9A
5.5-11.0	2.0	D	HFC-11.0-2.0	255	4
	4.0	E	HFC-11.0-4.0	280	6
	8.0	F	HFC-11.0-8.0	325	8
	15.0	G	HFC-11.0-15.0	420	8A
	30.0	GB	HFC-11.0-30.0	535	9A
7.5-15.0	1.5	D	HFC-15.0-1.5	250	4
	3.0	E	HFC-15.0-3.0	275	6
	6.0	F	HFC-15.0-6.0	315	8
	12.0	G	HFC-15.0-12.0	410	8A
	25.0	GB	HFC-15.0-25.0	540	9A
11.3-22.5	1.0	C	HFC-22.5-1.0	245	4
	2.0	D	HFC-22.5-2.0	260	5
	4.0	E	HFC-22.5-4.0	300	7
	8.0	G	HFC-22.5-8.0	390	8
	15.0	GA	HFC-22.5-15.0	485	9
15.0-30.0	0.750	C	HFC-30.0-0.750	240	4
	1.5	D	HFC-30.0-1.5	250	5
	3.0	E	HFC-30.0-3.0	285	7
	6.0	F	HFC-30.0-6.0	360	8
	12.0	GA	HFC-30.0-12.0	475	9
22.5-45.0	0.500	C	HFC-45.0-0.500	235	4
	1.0	D	HFC-45.0-1.0	250	5
	2.0	E	HFC-45.0-2.0	270	7
	4.0	F	HFC-45.0-4.0	335	8
	8.0	GA	HFC-45.0-8.0	445	9
30.0-60.0	0.375	C	HFC-60.0-0.375	$230	4
	0.750	D	HFC-60.0-0.750	240	5
	1.5	E	HFC-60.0-1.5	255	7
	3.0	F	HFC-60.0-3.0	315	8
	6.0	GA	HFC-60.0-6.0	415	9
70.0-120.0	0.200	C	HFC-120.0-0.200	245	4
	0.375	D	HFC-120.0-0.375	255	5
	0.750	E	HFC-120.0-0.750	275	7
	1.5	F	HFC-120.0-1.5	350	8
	3.0	GA	HFC-120.0-3.0	415	9
150.0-250.0	0.050	CS	HFC-250.0-0.050	245	2
	0.100	C	HFC-250.0-0.100	255	4
	0.200	D	HFC-250.0-0.200	270	5
	0.375	E	HFC-250.0-0.375	290	7
	0.750	F	HFC-250.0-0.750	370	8
	1.5	GA	HFC-250.0-15	440	9
225.0-375.0	0.030	CS	HFC-375.0-0.030	245	2
	0.065	C	HFC-375.0-0.065	250	4
	0.125	D	HFC-375.0-0.125	260	5
	0.250	E	HFC-375.0-0.250	295	7
	0.500	F	HFC-375.0-0.500	370	8
	1.0	GA	HFC-375.0-1.0	445	9
300.0-500.0	0.020	CS	HFC-500.0-0.020	250	2
	0.050	C	HFC-500.0-0.050	275	4
	0.100	D	HFC-500.0-0.100	280	5
	0.200	E	HFC-500.0-0.200	300	7
	0.375	F	HFC-500.0-0.375	380	8
	0.750	GA	HFC-500.0-0.750	455	9
450.0-750.0	0.012	CS	HFC-750.0-0.012	250	2
	0.030	C	HFC-750.0-0.030	260	4
	0.065	D	HFC-750.0-0.065	280	5
	0.125	E	HFC-750.0-0.125	305	7
	0.250	F	HFC-750.0-0.250	400	8
	0.500	GA	HFC-750.0-0.500	495	9
600.0-1000.0	0.010	CS	HFC-1000.0-0.010	255	2
	0.025	C	HFC-1000.0-0.025	275	4
	0.050	D	HFC-1000.0-0.050	295	5
	0.100	E	HFC-1000.0-0.100	325	7
	0.200	F	HFC-1000.0-0.200	430	8
	0.375	GA	HFC-1000.0-0.375	535	9

*Ampere Unit Supplied Only With Remote Sense Suffix (R) At No Extra Charge If Y Suffix is ordered, R Suffix Is Not Necessary

TECHNIPOWER, INC.
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Ridgefield, Conn.
06877

CD-95, CDC-95
POWER MODULES

WIDE RANGE DC-DC CONVERTERS
BASE TEMP. RATING 95°C

HIGH EFFICIENCY CONVERTERS FOR DIRECT DC POWER LINE OR LOCAL SYSTEM REGULATION

DESIGN PARAMETERS (Typical)

Ripple (p-p): 0.5% + 50 mv.

Temperature coefficient: 0.02%/°C.

Recovery time: Less than 5 ms, ½L to FL.

Fully encapsulated. Designed to meet environmental requirements of MIL-E-16400 (all classes) and MIL-E-5400 (classes 1, 1A, and 2).

E.M.I.: Suppression filters designed to meet portions of MIL-I-6181D (Consult factory if full qualification is required).

Efficiency: To 80%.

Output fully isolated from input and case

M.T.B.F. For Product Line: 30,000 hours per MIL-HBK-217A

OPTIONAL FEATURES

	SUFFIX
Fixed output voltage	F
External output adjust	H
Remote sensing	R
Off-ground operation	U
External output adjustment with remote sensing	Y
Special shapes and finishes	

SPECIFICATIONS

Input voltage range: 21-30 VDC*

Input ripple (rms): 5% maximum.

Regulation accuracy-Line: ±(0.1% +5 mv);
Load: ±(0.1% +5 mv).

Output ripple (rms): 0.2% + 10 mv.**

Operating temperature range: —55°C to +95°C (max. temp.).

Storage temperature range: —62°C to +105°C

Polarity: May be used positive or negative.

Short circuit protection: Automatic current limiting protects against momentary overloads and continuous shorts. Restores to normal operation after short is removed.

Series operation: May be operated with conventional or complex loads provided total voltage in series connection does not exceed 350 v. Consult factory for operation of above 350 v.

Output voltage & current: See specific model listings.

Overvoltage protection: CDC-95 model incorporates internal circuitry to protect load against possible overvoltage condition in event of power supply failure. Trip point set at factory 25±5% above maximum rated output voltage; trip point may be adjusted downward (5 volts minimum) by inserting selected resistors between negative output terminal and terminal marked "O.V." Output voltage will never exceed trip point more than 5% of maximum output voltage + 0.5 volt. To re-energize after overvoltage condition, turn input power off and then on after a short delay. Individual external overvoltage protectors are also available.

Reverse polarity protection: Protected against reversal of input voltage polarity.

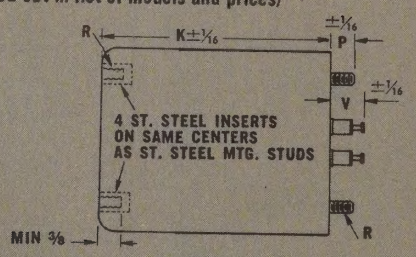
*Protection against MIL-STD-704A type surges available at extra cost (consult factory) —

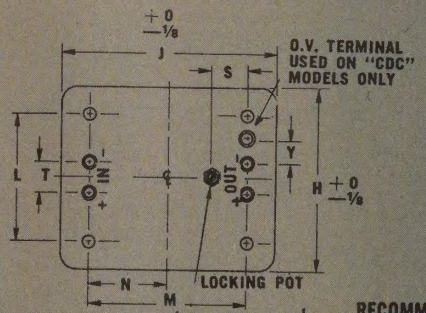
Input voltage may be reduced below 21 VDC (to 15.0 VDC minimum) provided that for every volt below 21 VDC, the allowable output current is reduced by 10% and regulation (line and load respectively) is deteriorated by 0.2%.

Input voltages up to 150 VDC are available on special request.

**Increases to 1.0% + 50 mv at —55°C.

MECHANICAL DATA
(Case size is called out in list of models and prices)





MODULE DIMENSIONS

CASE SIZE	H	J	K	L	M	N	P	R	S	T	V	Y	TOLERANCES L, M, N, S
CSS	3 1/16	3 9/16	3 1/4	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	1/2	9/16	3/8	±1/64
CS	3 1/16	3 9/16	3 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	1/2	9/16	3/8	±1/64
DS	3 3/8	3 15/16	4 5/16	2 7/16	3	1 1/2	15/32	10-32	19/32	1/2	9/16	3/8	±1/32
ES	3 11/16	4 5/16	4 1/2	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	1/2	9/16	3/8	±1/32
FS	4	4 11/16	4 15/16	3	3 11/16	1 27/32	9/16	1/4-20	19/32	1/2	9/16	3/8	±3/64
GS	4 5/16	5 1/16	5 1/2	3 5/16	4 1/16	2 1/32	9/16	1/4-20	19/32	1/2	5/8	1/2	±3/64
GAS	4 15/16	6 9/16	5 3/4	3 5/8	5 1/4	2 5/8	21/32	5/16-18	3/4	3/4	5/8	1/2	±3/64
GBS	6 9/16	6 3/4	5 3/4	5 1/4	5 7/16	2 23/32	21/32	5/16-18	3/4	3/4	3/4	1/2	±3/64

RECOMMENDED CLEARANCE TERM. CUTOUTS

INPUT	OUTPUT
CSS thru FS 3/8 x 7/8	CSS thru FS 1/2 x 1 5/8
GS 1/2 x 1	GS 1/2 x 2
GAS & GBS 1/2 x 1 1/4	GAS & GBS 1/2 x 2 1/4

See YELLOW SECTION for Local Offices, Phones

TECHNIPOWER, INC.
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ODELS AND PRICES

Output Voltage Adjust. Range (VDC)	Output Current (Amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
2.5-5.5	1.0	CSS	CD-5.5-1.0	$215	4
	2.0	CS	CD-5.5-2.0	225	5
	4.0	DS	CD-5.5-4.0	240	6
	8.0	FS	CD-5.5-8.0	280	7
	15.0	GS	CD-5.5-15.0	330	8
	30.0	GBS	CD-5.5-30.0	485	9
4-8.0	0.750	CSS	CD-8.0-0.750	215	4
	1.5	CS	CD-8.0-1.5	225	5
	3.0	DS	CD-8.0-3.0	240	6
	6.0	FS	CD-8.0-6.0	280	7
	12.0	GS	CD-8.0-12.0	345	8
	25.0	GBS	CD-8.0-25.0	500	9
5-11.0	0.750	CSS	CD-11.0-0.750	215	4
	1.5	CS	CD-11.0-1.5	225	5
	3.0	DS	CD-11.0-3.0	250	6
	6.0	FS	CD-11.0-6.0	300	7
	12.0	GS	CD-11.0-12.0	370	8
	25.0	GBS	CD-11.0-25.0	530	9
7-15.0	0.500	CSS	CD-15.0-0.500	215	4
	1.0	CS	CD-15.0-1.0	225	4
	2.0	DS	CD-15.0-2.0	240	5
	4.0	FS	CD-15.0-4.0	285	7
	8.0	GS	CD-15.0-8.0	345	8
	15.0	GBS	CD-15.0-15.0	475	9
11-22.5	0.375	CSS	CD-22.5-0.375	215	3
	0.750	CS	CD-22.5-0.750	225	4
	1.5	DS	CD-22.5-1.5	240	5
	3.0	ES	CD-22.5-3.0	275	6A
	6.0	FS	CD-22.5-6.0	330	7A
	12.0	GAS	CD-22.5-12.0	450	8A
15-30.0	0.250	CSS	CD-30.0-0.250	210	3
	0.500	CS	CD-30.0-0.500	220	4
	1.0	DS	CD-30.0-1.0	230	5
	2.0	ES	CD-30.0-2.0	255	6A
	4.0	FS	CD-30.0-4.0	295	7A
	8.0	GAS	CD-30.0-8.0	400	8A
22-45.0	0.200	CSS	CD-45.0-0.200	210	3
	0.375	CS	CD-45.0-0.375	220	4
	0.750	DS	CD-45.0-0.750	230	5
	1.5	ES	CD-45.0-1.5	250	6A
	3.0	FS	CD-45.0-3.0	285	7A
	6.0	GAS	CD-45.0-6.0	380	8A
30-60.0	0.125	CSS	CD-60.0-0.125	210	3
	0.250	CS	CD-60.0-0.250	220	4
	0.500	DS	CD-60.0-0.500	230	5
	1.0	ES	CD-60.0-1.0	240	6A
	2.0	FS	CD-60.0-2.0	270	7A
	4.0	GAS	CD-60.0-4.0	360	8A
70-120.0	0.065	CSS	CD-120.0-0.065	220	3
	0.125	CS	CD-120.0-0.125	230	4
	0.250	DS	CD-120.0-0.250	240	5
	0.500	ES	CD-120.0-0.500	250	6A
	1.0	FS	CD-120.0-1.0	280	7A
	2.0	GAS	CD-120.0-2.0	360	8A
150-250.0	0.030	CSS	CD-250.0-0.030	220	3
	0.065	CS	CD-250.0-0.065	230	4
	0.125	DS	CD-250.0-0.125	240	5
	0.250	ES	CD-250.0-0.250	255	6A
	0.500	FS	CD-250.0-0.500	295	7A
	1.0	GAS	CD-250.0-1.0	375	8A
225-375.0	0.025	CSS	CD-375.0-0.025	225	3
	0.050	CS	CD-375.0-0.050	235	4
	0.100	DS	CD-375.0-0.100	245	5
	0.200	ES	CD-375.0-0.200	270	6A
	0.375	FS	CD-375.0-0.375	305	7A
	0.750	GAS	CD-375.0-0.750	395	8A
300-500.0	0.015	CSS	CD-500.0-0.015	225	3
	0.030	CS	CD-500.0-0.030	235	4
	0.065	DS	CD-500.0-0.065	245	5
	0.125	ES	CD-500.0-0.125	260	6A
	0.250	FS	CD-500.0-0.250	300	7A
	0.500	GAS	CD-500.0-0.500	390	8A
450-750.0	0.012	CSS	CD-750.0-0.012	230	3
	0.025	CS	CD-750.0-0.025	240	4
	0.050	DS	CD-750.0-0.050	250	5
	0.100	ES	CD-750.0-0.100	280	6A
	0.200	FS	CD-750.0-0.200	320	7A
	0.375	GAS	CD-750.0-0.375	420	8A
600-1000.0	0.008	CSS	CD-1000.0-0.008	230	3
	0.015	CS	CD-1000.0-0.015	240	4
	0.030	DS	CD-1000.0-0.030	250	5
	0.065	ES	CD-1000.0-0.065	275	6A
	0.125	FS	CD-1000.0-0.125	320	7A
	0.250	GAS	CD-1000.0-0.250	420	8A

Output Voltage Adjust. Range (VDC)	Output Current (Amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
2.8-5.5	1.0	CSS	CDC-5.5-1.0	245	4
	2.0	CS	CDC-5.5-2.0	255	5
	4.0	DS	CDC-5.5-4.0	270	6
	8.0	FS	CDC-5.5-8.0	310	7
	15.0	GS	CDC-5.5-15.0	360	8
	30.0	GBS	CDC-5.5-30.0	515	9
4.0-8.0	0.750	CSS	CDC-8.0-0.750	245	4
	1.5	CS	CDC-8.0-1.5	255	5
	3.0	DS	CDC-8.0-3.0	270	6
	6.0	FS	CDC-8.0-6.0	310	7
	12.0	GS	CDC-8.0-12.0	375	8
	25.0	GBS	CDC-8.0-25.0	530	9
5.5-11.0	0.750	CSS	CDC-11.0-0.750	245	4
	1.5	CS	CDC-11.0-1.5	255	5
	3.0	DS	CDC-11.0-3.0	280	6
	6.0	FS	CDC-11.0-6.0	330	7
	12.0	GS	CDC-11.0-12.0	400	8
	25.0	GBS	CDC-11.0-25.0	560	9
7.5-15.0	0.500	CSS	CDC-15.0-0.500	245	4
	1.0	CS	CDC-15.0-1.0	255	4
	2.0	DS	CDC-15.0-2.0	270	5
	4.0	FS	CDC-15.0-4.0	315	7
	8.0	GS	CDC-15.0-8.0	375	8
	15.0	GBS	CDC-15.0-15.0	505	9
11.3-22.5	0.375	CSS	CDC-22.5-0.375	245	3
	0.750	CS	CDC-22.5-0.750	255	4
	1.5	DS	CDC-22.5-1.5	270	5
	3.0	ES	CDC-22.5-3.0	305	6A
	6.0	FS	CDC-22.5-6.0	360	7A
	12.0	GAS	CDC-22.5-12.0	480	8A
15.0-30.0	0.250	CSS	CDC-30.0-0.250	240	3
	0.500	CS	CDC-30.0-0.500	250	4
	1.0	DS	CDC-30.0-1.0	260	5
	2.0	ES	CDC-30.0-2.0	285	6A
	4.0	FS	CDC-30.0-4.0	325	7A
	8.0	GAS	CDC-30.0-8.0	430	8A
22.5-45.0	0.200	CSS	CDC-45.0-0.200	240	3
	0.375	CS	CDC-45.0-0.375	250	4
	0.750	DS	CDC-45.0-0.750	260	5
	1.5	ES	CDC-45.0-1.5	280	6A
	3.0	FS	CDC-45.0-3.0	315	7A
	6.0	GAS	CDC-45.0-6.0	410	8A
30.0-60.0	0.125	CSS	CDC-60.0-0.125	240	3
	0.250	CS	CDC-60.0-0.250	250	4
	0.500	DS	CDC-60.0-0.500	260	5
	1.0	ES	CDC-60.0-1.0	270	6A
	2.0	FS	CDC-60.0-2.0	300	7A
	4.0	GAS	CDC-60.0-4.0	390	8A
70.0-120.0	0.065	CSS	CDC-120.0-0.065	250	3
	0.125	CS	CDC-120.0-0.125	260	4
	0.250	DS	CDC-120.0-0.250	270	5
	0.500	ES	CDC-120.0-0.500	280	6A
	1.0	FS	CDC-120.0-1.0	310	7A
	2.0	GAS	CDC-120.0-2.0	390	8A
150.0-250.0	0.030	CSS	CDC-250.0-0.030	250	3
	0.065	CS	CDC-250.0-0.065	260	4
	0.125	DS	CDC-250.0-0.125	270	5
	0.250	ES	CDC-250.0-0.250	285	6A
	0.500	FS	CDC-250.0-0.500	325	7A
	1.0	GAS	CDC-250.0-1.0	405	8A
225.0-375.0	0.025	CSS	CDC-375.0-0.025	255	3
	0.050	CS	CDC-375.0-0.050	265	4
	0.100	DS	CDC-375.0-0.100	275	5
	0.200	ES	CDC-375.0-0.200	300	6A
	0.375	FS	CDC-375.0-0.375	335	7A
	0.750	GAS	CDC-375.0-0.750	425	8A
300.0-500.0	0.015	CSS	CDC-500.0-0.015	255	3
	0.030	CS	CDC-500.0-0.030	265	4
	0.065	DS	CDC-500.0-0.065	275	5
	0.125	ES	CDC-500.0-0.125	290	6A
	0.250	FS	CDC-500.0-0.250	330	7A
	0.500	GAS	CDC-500.0-0.500	420	8A
450.0-750.0	0.012	CSS	CDC-750.0-0.012	260	3
	0.025	CS	CDC-750.0-0.025	270	4
	0.050	DS	CDC-750.0-0.050	280	5
	0.100	ES	CDC-750.0-0.100	310	6A
	0.200	FS	CDC-750.0-0.200	350	7A
	0.375	GAS	CDC-750.0-0.375	450	8A
600.0-1000.0	0.008	CSS	CDC-1000.0-0.008	260	3
	0,015	CS	CDC-1000.0-0.015	270	4
	0.030	DS	CDC-1000.0-0.030	280	5
	0.065	ES	CDC-1000.0-0.065	305	6A
	0.125	FS	CDC-1000.0-0.125	350	7A
	0.250	GAS	CDC-1000.0-0.250	450	8A

TECHNIPOWER, INC.
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Ridgefield, Conn.
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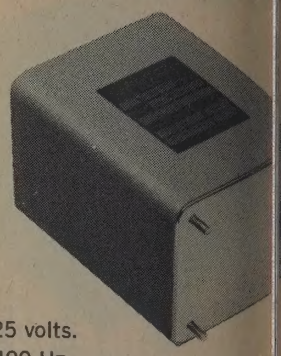
PM-95

POWER MODULES

REGULATED AC-DC 3.0 to 325 VDC. Up to 750 watts
BASE TEMP. RATING 95°C

QUALIFIED FOR EXTREME MIL ENVIRONMENTS



DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.

Recovery time: Less than 50 μsec, 1/2L to FL.
Qualified for MIL environmental operation.

M.T.B.F. for Product Line: 40,000 hours per MIL-HBK-217A, with module stressed at 95°C base temperature.

Output impedance: See curve

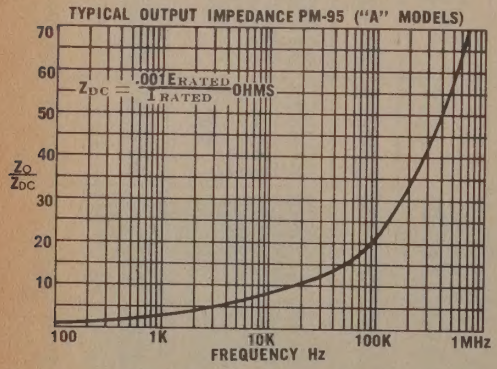
OPTIONAL FEATURES

	SUFFIX
Closer regulation	AA
Reduced size and weight, 400 Hz input	D
Operation with lamp loads	E
Fixed output voltage	F
Shock and vibration mounts	G
External output adjust	H
Remote sensing	R, Y
Lower temperature coefficient	T, TT
Off ground operation	U
Wide input range	W
Multiple outputs	
Special cases, shapes and finishes	

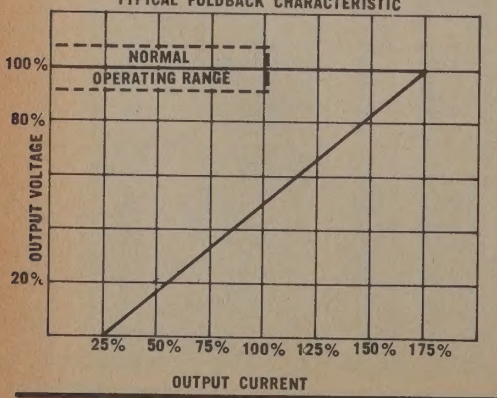
SPECIFICATIONS

Input voltage range: 105-125 volts.
Input frequency range: 50-400 Hz.
Regulation-Line and Load Combined: ±0.05% — "A" models. ±0.5% — standard models.
Ripple: "A" models—0.002% or 1 mv rms, whichever is greater, with 60 Hz input; 0.004% or 3 mv rms, whichever is greater, with 400 Hz input.
Standard models — 0.01% or 5 mv rms, whichever is greater, with 60 Hz input; 0.04% or 10 mv rms, whichever is greater, with 400 Hz input.
Output adjustment range: 10% (screwdriver adj. in back). 80% of rated load the output may be adjusted a full 20% (±10%) of nominal.
Operating temperature: —55°C to +95°C. (max. base temp.)
Storage temperature: —62°C to +105°C.
Polarity: May be used positive or negative.
Output voltage and current: See specific model listings.
Series operation: Either conventionally or with complex loads. Series starting circuitry employed requires that input voltage be applied at a rate greater than 150 v rms/sec. Consult factory if slow rising input is anticipated.
Short circuit protection: Unique foldback circuitry (see curve) protects each module if output should be shorted continuously. Automatic return after short removal.
Overvoltage protection: See model listings.

TYPICAL OUTPUT IMPEDANCE PM-95 ("A" MODELS)



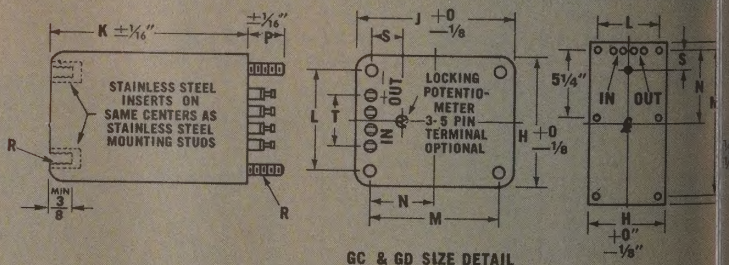
TYPICAL FOLDBACK CHARACTERISTIC



MECHANICAL DATA

(Case size is called out in list of models and prices)

GC & GD SIZE DETAIL



GC & GD SIZE DETAIL

Case Size	H	J	K	L	M	N	P	R	S	T	Tolerances L,M,N,S	Recommended Clearance Terminal Cutouts
	MODULE DIMENSIONS											
A	2 3/8	2 3/4	3 13/16	1 3/4	2 1/8	1 1/16	11/32	6-32	19/32	15/16	±1/64	3/8x1 5/16
B	2 5/8	3 1/16	4 1/4	1 55/64	2 19/64	1 3/32	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16
C	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	19/32	15/16	±1/64	3/8x1 5/16
D	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	19/32	15/16	±1/32	3/8x1 5/16
E	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	19/32	15/16	±1/32	3/8x1 5/16
F	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16
G	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 21/32	9/16	1/4-20	19/32	15/16	±3/64	3/8x1 5/16
GA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2
GB	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	21/32	5/16-18	3/4	1 1/2	±3/64	1/2x2
GC*	4 15/16	13 1/16	7	3 5/8	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2
GD*	6 9/16	13 1/16	7	5 7/16	11 13/16	5 29/32	21/32	5/16-18	3/4	1 7/8	±3/64	5/8x2 1/2

*See detail

See YELLOW SECTION for Local Offices, Phones

TECHNIPOWER, INC.

A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

MODELS AND PRICES

Output Voltage Adjust. Range	Output Current (amps)	Case Size (see dwg)	"A" Models ±0.05% Accuracy Model	Price	Standard Models ±0.5% Accuracy Model	Price	Thermal Ref. No.	O.V. Ref.
2-3.2	0.375	D	PM-3.0-0.375A	100	PM-3.0-0.375	95	1	C
2-3.2	0.750	D	PM-3.0-0.750A	110	PM-3.0-0.750	105	3	C
2-3.2	1.5	E	PM-3.0-1.5A	120	PM-3.0-1.5	115	5	C
2-3.2	3.0	G	PM-3.0-3.0A	130	PM-3.0-3.0	125	6A	C
2-3.2	6.0	GA	PM-3.0-6.0A	160	PM-3.0-6.0	155	7A	C
2-3.2	12.0	GB	PM-3.0-12.0A	250	PM-3.0-12.0	245	8A	D
2-3.2	25.0	GC	PM-3.0-25.0A	335	PM-3.0-25.0	330	9A	D
3-3.5	0.375	D	PM-3.3-0.375A	100	PM-3.3-0.375	95	1	C
3-3.5	0.750	D	PM-3.3-0.750A	110	PM-3.3-0.750	105	3	C
3-3.5	1.5	E	PM-3.3-1.5A	120	PM-3.3-1.5	115	5	C
3-3.5	3.0	G	PM-3.3-3.0A	135	PM-3.3-3.0	130	6A	C
3-3.5	6.0	GA	PM-3.3-6.0A	165	PM-3.3-6.0	160	7A	C
3-3.5	12.0	GB	PM-3.3-12.0A	250	PM-3.3-12.0	245	8A	D
3-3.5	25.0	GC	PM-3.3-25.0A	345	PM-3.3-25.0	340	9A	D
3-3.9	0.375	D	PM-3.7-0.375A	100	PM-3.7-0.375	95	1	C
3-3.9	0.750	D	PM-3.7-0.750A	110	PM-3.7-0.750	105	3	C
3-3.9	1.5	E	PM-3.7-1.5A	120	PM-3.7-1.5	115	5	C
3-3.9	3.0	G	PM-3.7-3.0A	140	PM-3.7-3.0	135	6A	C
3-3.9	6.0	GA	PM-3.7-6.0A	200	PM-3.7-6.0	195	7A	C
3-3.9	12.0	GB	PM-3.7-12.0A	260	PM-3.7-12.0	255	8A	D
3-3.9	25.0	GC	PM-3.7-25.0A	365	PM-3.7-25.0	360	9A	D
4-4.3	0.375	D	PM-4.1-0.375A	105	PM-4.1-0.375	100	1	C
4-4.3	0.750	D	PM-4.1-0.750A	110	PM-4.1-0.750	105	3	C
4-4.3	1.5	E	PM-4.1-1.5A	120	PM-4.1-1.5	115	5	C
4-4.3	3.0	G	PM-4.1-3.0A	145	PM-4.1-3.0	140	6A	C
4-4.3	6.0	GA	PM-4.1-6.0A	205	PM-4.1-6.0	200	7A	C
4-4.3	12.0	GB	PM-4.1-12.0A	270	PM-4.1-12.0	265	8A	D
4-4.3	25.0	GC	PM-4.1-25.0A	380	PM-4.1-25.0	375	9A	D
4-4.7	0.375	C	PM-4.5-0.375A	105	PM-4.5-0.375	100	1	C
4-4.7	0.750	C	PM-4.5-0.750A	115	PM-4.5-0.750	110	3	C
4-4.7	1.5	E	PM-4.5-1.5A	120	PM-4.5-1.5	115	5	C
4-4.7	3.0	F	PM-4.5-3.0A	135	PM-4.5-3.0	130	6A	C
4-4.7	6.0	G	PM-4.5-6.0A	210	PM-4.5-3.0	205	7A	C
4-4.7	12.0	GB	PM-4.5-12.0A	275	PM-4.5-12.0	270	8A	F
4-4.7	25.0	GC	PM-4.5-25.0A	405	PM-4.5-25.0	400	9A	F
5-5.3	0.375	C	PM-5.1-0.375A	105	PM-5.1-0.375	100	1	C
5-5.3	0.750	C	PM-5.1-0.750A	115	PM-5.1-0.750	110	3	C
5-5.3	1.5	E	PM-5.1-1.5A	120	PM-5.1-1.5	115	5	C
5-5.3	3.0	F	PM-5.1-3.0A	145	PM-5.1-3.0	140	6A	C
5-5.3	6.0	G	PM-5.1-6.0A	225	PM-5.1-6.0	220	7A	C
5-5.3	12.0	GB	PM-5.1-12.0A	280	PM-5.1-12.0	275	8A	F
5-5.3	25.0	GC	PM-5.1-25.0A	405	PM-5.1-25.0	400	9A	F
5-5.8	0.375	C	PM-5.5-0.375A	105	PM-5.5-0.375	100	1	C
5-5.8	0.750	C	PM-5.5-0.750A	115	PM-5.5-0.750	110	3	C
5-5.8	1.5	E	PM-5.5-1.5A	125	PM-5.5-1.5	120	5	C
5-5.8	3.0	F	PM-5.5-3.0A	145	PM-5.5-3.0	140	6A	C
5-5.8	6.0	G	PM-5.5-6.0A	230	PM-5.5-6.0	225	7A	C
5-5.8	12.0	GB	PM-5.5-12.0A	280	PM-5.5-12.0	275	8A	F
5-5.8	25.0	GC	PM-5.5-25.0A	410	PM-5.5-25.0	405	9A	F
6-6.3	0.375	C	PM-6.0-0.375A	105	PM-6.0-0.375	100	1	C
6-6.3	0.750	C	PM-6.0-0.750A	115	PM-6.0-0.750	110	3	C
6-6.3	1.5	E	PM-6.0-1.5A	125	PM-6.0-1.5	120	5	C
6-6.3	3.0	G	PM-6.0-3.0A	150	PM-6.0-3.0	145	6A	C
6-6.3	6.0	GA	PM-6.0-6.0A	235	PM-6.0-6.0	230	7A	C
6-6.3	12.0	GB	PM-6.0-12.0A	290	PM-6.0-12.0	285	8A	F
6-6.3	25.0	GC	PM-6.0-25.0A	420	PM-6.0-25.0	415	9A	F
6-6.9	0.200	B	PM-6.6-0.200A	105	PM-6.6-0.200	100	1	C
6-6.9	0.375	B	PM-6.6-0.375A	110	PM-6.6-0.375	105	2	C
6-6.9	0.750	C	PM-6.6-0.750A	120	PM-6.6-0.750	115	3	C
6-6.9	1.5	E	PM-6.6-1.5A	130	PM-6.6-1.5	125	5	C
6-6.9	3.0	G	PM-6.6-3.0A	155	PM-6.6-3.0	150	6A	C
6-6.9	6.0	GA	PM-6.6-6.0A	225	PM-6.6-6.0	220	7A	C
6-6.9	12.0	GB	PM-6.6-12.0A	280	PM-6.6-12.0	275	8A	H
6-6.9	25.0	GC	PM-6.6-25.0A	430	PM-6.6-25.0	425	9A	H
6.9-7.6	0.200	B	PM-7.3-0.200A	105	PM-7.3-0.200	100	1	C
6.9-7.6	0.375	B	PM-7.3-0.375A	110	PM-7.3-0.375	105	2	C
6.9-7.6	0.750	C	PM-7.3-0.750A	120	PM-7.3-0.750	115	3	C
6.9-7.6	1.5	E	PM-7.3-1.5A	130	PM-7.3-1.5	125	5	C
6.9-7.6	3.0	G	PM-7.3-3.0A	185	PM-7.3-3.0	180	6A	C
6.9-7.6	6.0	GA	PM-7.3-6.0A	225	PM-7.3-6.0	220	7A	C
6.9-7.6	12.0	GB	PM-7.3-12.0A	285	PM-7.3-12.0	280	8A	H
6.9-7.6	25.0	GC	PM-7.3-25.0A	435	PM-7.3-25.0	430	9A	H
7.6-8.5	0.200	B	PM-8.1-0.200A	105	PM-8.1-0.200	100	1	C
7.6-8.5	0.375	B	PM-8.1-0.375A	110	PM-8.1-0.375	105	2	C
7.6-8.5	0.750	C	PM-8.1-0.750A	120	PM-8.1-0.750	115	3	C
7.6-8.5	1.5	E	PM-8.1-1.5A	130	PM-8.1-1.5	125	5	C
7.6-8.5	3.0	G	PM-8.1-3.0A	190	PM-8.1-3.0	185	6A	C
7.6-8.5	6.0	GA	PM-8.1-6.0A	230	PM-8.1-6.0	225	7A	C
7.6-8.5	12.0	GB	PM-8.1-12.0A	295	PM-8.1-12.0	290	8A	H
7.6-8.5	25.0	GC	PM-8.1-25.0A	445	PM-8.1-25.0	440	9A	H
8.5-9.3	0.200	B	PM-8.9-0.200A	105	PM-8.9-0.200	100	1	C
8.5-9.3	0.375	C	PM-8.9-0.375A	110	PM-8.9-0.375	105	2	C
8.5-9.3	0.750	D	PM-8.9-0.750A	120	PM-8.9-0.750	115	3	C
8.5-9.3	1.5	F	PM-8.9-1.5A	135	PM-8.9-1.5	130	5	C
8.5-9.3	3.0	G	PM-8.9-3.0A	190	PM-8.9-3.0	185	6A	C
8.5-9.3	6.0	GA	PM-8.9-6.0A	235	PM-8.9-6.0	230	7A	C
8.5-9.3	12.0	GB	PM-8.9-12.0A	300	PM-8.9-12.0	295	8A	H
8.5-9.3	25.0	GC	PM-8.9-25.0A	450	PM-8.9-25.0	445	10	H
9.3-10.3	0.200	B	PM-9.8-0.200A	105	PM-9.8-0.200	100	1	C
9.3-10.3	0.375	C	PM-9.8-0.375A	110	PM-9.8-0.375	105	2	C
9.3-10.3	0.750	D	PM-9.8-0.750A	120	PM-9.8-0.750	115	3	C
9.3-10.3	1.5	F	PM-9.8-1.5A	135	PM-9.8-1.5	130	6	C
9.3-10.3	3.0	G	PM-9.8-3.0A	195	PM-9.8-3.0	190	6A	C
9.3-10.3	6.0	GA	PM-9.8-6.0A	240	PM-9.8-6.0	235	8	C
9.3-10.3	12.0	GB	PM-9.8-12.0A	315	PM-9.8-12.0	310	9	H
9.3-10.3	25.0	GC	PM-9.8-25.0A	455	PM-9.8-25.0	450	10	H
10.3-11.4	0.200	B	PM-10.8-0.200A	105	PM-10.8-0.200	100	1	C
10.3-11.4	0.375	C	PM-10.8-0.375A	115	PM-10.8-0.375	110	2	C
10.3-11.4	0.750	D	PM-10.8-0.750A	120	PM-10.8-0.750	115	3	C
10.3-11.4	1.5	F	PM-10.8-1.5A	135	PM-10.8-1.5	130	6	C
10.3-11.4	3.0	GA	PM-10.8-3.0A	195	PM-10.8-3.0	190	7	C
10.3-11.4	6.0	GB	PM-10.8-6.0A	240	PM-10.8-6.0	235	8	C
10.3-11.4	12.0	GC	PM-10.8-12.0A	315	PM-10.8-12.0	310	9	H
10.3-11.4	25.0	GD	PM-10.8-25.0A	455	PM-10.8-25.0	450	10	H
11.4-12.5	0.200	B	PM-12.0-0.200A	105	PM-12.0-0.200	100	1	C
11.4-12.5	0.375	C	PM-12.0-0.375A	115	PM-12.0-0.375	110	2	C
11.4-12.5	0.750	D	PM-12.0-0.750A	120	PM-12.0-0.750	115	3	C
11.4-12.5	1.5	F	PM-12.0-1.5A	140	PM-12.0-1.5	135	6	C
11.4-12.5	3.0	GA	PM-12.0-3.0A	205	PM-12.0-3.0	200	7	C
11.4-12.5	6.0	GB	PM-12.0-6.0A	250	PM-12.0-6.0	245	8	C
11.4-12.5	12.0	GC	PM-12.0-12.0A	360	PM-12.0-12.0	355	9	H
11.4-12.5	25.0	GD	PM-12.0-25.0A	480	PM-12.0-25.0	475	10	H
12.5-13.7	0.100	A	PM-13.1-0.100A	100	PM-13.1-0.100	95	1	C
12.5-13.7	0.200	B	PM-13.1-0.200A	105	PM-13.1-0.200	100	1	C
12.5-13.7	0.375	C	PM-13.1-0.375A	115	PM-13.1-0.375	110	2	C
12.5-13.7	0.750	C	PM-13.1-0.750A	120	PM-13.1-0.750	115	3	C
12.5-13.7	1.5	F	PM-13.1-1.5A	140	PM-13.1-1.5	135	6	C
12.5-13.7	3.0	GA	PM-13.1-3.0A	200	PM-13.1-3.0	195	7	C
12.5-13.7	6.0	GB	PM-13.1-6.0A	250	PM-13.1-6.0	245	8	C
12.5-13.7	12.0	GC	PM-13.1-12.0A	345	PM-13.1-12.0	340	9	H
12.5-13.7	25.0	GD	PM-13.1-25.0A	480	PM-13.1-25.0	475	10	H
13.7-15.2	0.100	A	PM-14.5-0.100A	100	PM-14.5-0.100	95	1	C
13.7-15.2	0.200	B	PM-14.5-0.200A	105	PM-14.5-0.200	100	1	C
13.7-15.2	0.375	C	PM-14.5-0.375A	115	PM-14.5-0.375	110	2	C
13.7-15.2	0.750	D	PM-14.5-0.750A	120	PM-14.5-0.750	115	3	C
13.7-15.2	1.5	F	PM-14.5-1.5A	170	PM-14.5-1.5	165	6	C
13.7-15.2	3.0	GA	PM-14.5-3.0A	205	PM-14.5-3.0	200	7	C
13.7-15.2	6.0	GB	PM-14.5-6.0A	255	PM-14.5-6.0	250	8	C
13.7-15.2	12.0	GC	PM-14.5-12.0A	355	PM-14.5-12.0	350	9	H
13.7-15.2	25.0	GD	PM-14.5-25.0A	480	PM-14.5-25.0	475	10	H

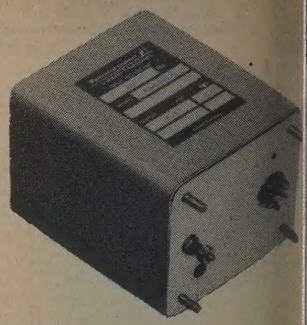
Models available to 325VDC. See catalog 701.

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

F-115, FD-115
POWER MODULES
REGULATED AC-DC 3 to 325 VDC. Up to 500 watts.
BASE TEMP. RATING 115°C

QUALIFIED FOR EXTREME MIL ENVIRONMENTS



DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.

Recovery time: Less than 50 μsec, 1/2L to FL.

Qualified for MIL environmental operation

Remote sensing: Connections provided for remote sensing of the output voltage so as to compensate for an IR drop of up to 0.5 volts total in the leads connecting the module to the load.

M.T.B.F. for product line: 25,000 hours, per MIL-HBK-217 A, with module stressed at 115°C base temperature.

Output impedance: See curve.

OPTIONAL FEATURES

	SUFFIX
Closer regulation	AA
Operation with lamp loads	E
Fixed output	F
Shock and vibration mounts	G
External output adjust	H
Lower temperature coefficient	T, TT
Off ground operation	U
Wide input range	W
Special finishes	

SPECIFICATIONS

Input voltage range: 105-125 volts.

Input frequency range: **50-400Hz** (F-115 Series)
400Hz (FD-115 Series).

Regulation-Line and Load Combined: ±0.05%.

Ripple: **F-115 Series:** 0.002% or 1 mv rms (whichever is
er)—0.004% or 3 mv rms with 400 Hz input.
FD-115 Series: 0.004% or 3 mv rms (whichever is
greater).

Output adjustment range: 10%. At 80% of rated lo
output may be adjusted 20% (±10%) of nominal.

Operating temperature: —62°C to +115°C (max. base

Storage temperature: —62°C to +125°C.

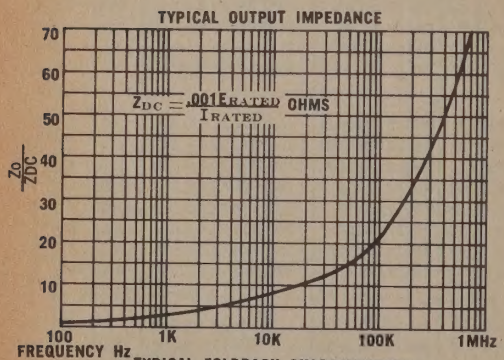
Polarity: May be used positive or negative.

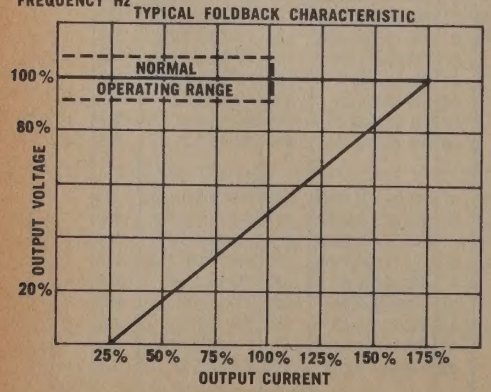
Output voltage and current: See specific model listings.

Series operation: Series starting circuitry employed re
that input AC voltage be applied at a rate greater than
rms/sec. Consult factory if slow rising input is antici

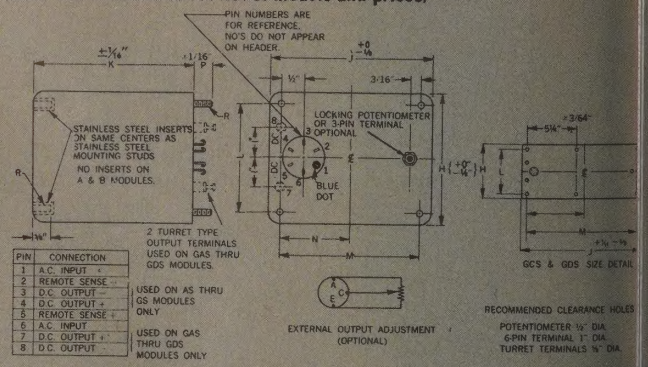
Short circuit protection: Unique foldback circuitry (see
protects each module if output should be shorted
uously. Automatic return after short removal.

Overvoltage protection: Consult factory.





MECHANICAL DATA
(Case size is called out in list of models and prices)



PIN	CONNECTION
1	A.C. INPUT +
2	REMOTE SENSE +
3	D.C. OUTPUT —
4	D.C. OUTPUT +
5	REMOTE SENSE +
6	A.C. INPUT
7	D.C. OUTPUT +
8	D.C. OUTPUT —

CASE SIZE	MODULE DIMENSIONS H	J	K	L	M	N	P	R	TOLERANCES L, M, N	TER HE
BS	2⅝	3 1/16	3 3/16	1 55/64	2 19/64	1 5/32	11/32	8-32	±1/64	
CS	3 1/16	3 9/16	3⅞	2⅛	2⅝	1 5/16	11/32	8-32	±1/64	
DS	3⅜	3 15/16	4 5/16	2 7/16	3	1½	15/32	10-32	±1/32	
ES	3 11/16	4 5/16	4½	2 11/16	3 5/16	1 21/32	7/16	10-32	±1/32	
FS	4	4 11/16	4 15/16	3	3 11/16	1 27/32	9/16	¼-20	±3/64	
GS	4 5/16	5 1/16	5½	3 5/16	4 1/16	2 1/32	9/16	¼-20	±3/64	
GAS	4 15/16	6 9/16	5¾	3⅝	5¼	2⅝	21/32	5/16-18	±3/64	
GBS	6 9/16	6¾	5¾	5¼	5 7/16	2 23/32	21/32	5/16-18	±3/64	
GCS*	4 15/16	13 1/16	5¾	3⅝	11 13/16	5 29/32	21/32	5/16-18	±3/64	
GDS*	6 9/16	13 1/16	5¾	5 7/16	11 13/16	5 29/32	21/32	5/16-18	±3/64	

*See detail

TECHNIPOWER, INC.
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Ridgefield, Conn.
06877

ODELS AND PRICES

Output Voltage Adjust. Range	Output Current (amps)	50-400 Hz Model	Size (see dwg)	Price	400 Hz Model	Size (see dwg)	Price	Thermal Ref. No.
1.8-3.	0.375	F-3.0-0.375	DS	115	FD-3.0-0.375	DS	95	1
1.8-3.	0.750	F-3.0-0.750	ES	130	FD-3.0-0.750	DS	110	3
1.8-3.	1.5	F-3.0-1.5	FS	150	FD-3.0-1.5	ES	125	5
1.8-3.	3.0	F-3.0-3.0	GS	180	FD-3.0-3.0	FS	150	6A
1.8-3.	6.0	F-3.0-6.0	GAS	235	FD-3.0-6.0	GS	195	7A
1.8-3.	12.0	F-3.0-12.0	GBS	350	FD-3.0-12.0	GAS	290	8A
1.8-3.	25.0	F-3.0-25.0	GDS	530	FD-3.0-25.0	GBS	440	9A
2.2-3.	0.375	F-3.3-0.375	DS	115	FD-3.3-0.375	DS	95	1
2.2-3.	0.750	F-3.3-0.750	ES	130	FD-3.3-0.750	DS	110	3
2.2-3.	1.5	F-3.3-1.5	FS	155	FD-3.3-1.5	ES	130	5
2.2-3	3.0	F-3.3-3.0	GS	185	FD-3.3-3.0	FS	155	6A
2.2-3	6.0	F-3.3-6.0	GAS	250	FD-3.3-6.0	GS	210	7A
2.2-3	12.0	F-3.3-12.0	GBS	360	FD-3.3-12.0	GAS	300	8A
2.2-3	25.0	F-3.3-25.0	GDS	550	FD-3.3-25.0	GBS	460	9A
3.5-3	0.375	F-3.7-0.375	DS	120	FD-3.7-0.375	DS	100	1
3.5-3	0.750	F-3.7-0.750	ES	140	FD-3.7-0.750	DS	115	3
3.5-3	1.5	F-3.7-1.5	FS	155	FD-3.7-1.5	ES	130	5
3.5-3	3.0	F-3.7-3.0	GS	190	FD-3.7-3.0	ES	160	6A
3.5-3	6.0	F-3.7-6.0	GAS	265	FD-3.7-6.0	GS	220	7A
3.5-3	12.0	F-3.7-12.0	GBS	385	FD-3.7-12.0	GAS	320	8A
3.5-3	25.0	F-3.7-25.0	GDS	580	FD-3.7-25.0	GBS	485	9A
3.9-4	0.375	F-4.1-0.375	CS	120	FD-4.1-0.375	BS	100	1
3.9-4	0.750	F-4.1-0.750	DS	140	FD-4.1-0.750	CS	115	3
3.9-4	1.5	F-4.1-1.5	ES	160	FD-4.1-1.5	DS	135	5
3.9-4	3.0	F-4.1-3.0	GS	200	FD-4.1-3.0	ES	165	6A
3.9-4	6.0	F-4.1-6.0	GAS	275	FD-4.1-6.0	FS	230	7A
3.9-4	12.0	F-4.1-12.0	GBS	410	FD-4.1-12.0	GAS	340	8A
3.9-4	25.0	F-4.1-25.0	GDS	610	FD-4.1-25.0	GBS	510	9A
4.3-4	0.375	F-4.5-0.375	CS	125	FD-4.5-0.375	BS	105	1
4.3-4	0.750	F-4.5-0.750	DS	145	FD-4.5-0.750	CS	120	3
4.3-4	1.5	F-4.5-1.5	ES	160	FD-4.5-1.5	DS	135	5
4.3-4	3.0	F-4.5-3.0	GS	205	FD-4.5-3.0	ES	170	6A
4.3-4	6.0	F-4.5-6.0	GAS	290	FD-4.5-6.0	FS	240	7A
4.3-4	12.0	F-4.5-12.0	GBS	425	FD-4.5-12.0	GAS	355	8A
4.3-4	25.0	F-4.5-25.0	GDS	640	FD-4.5-25.0	GBS	535	9A
4.7-5	0.375	F-5.1-0.375	CS	125	FD-5.1-0.375	BS	105	1
4.7-5	0.750	F-5.1-0.750	DS	145	FD-5.1-0.750	CS	120	3
4.7-5	1.5	F-5.1-1.5	ES	170	FD-5.1-1.5	DS	140	5
4.7-5	3.0	F-5.1-3.0	GS	210	FD-5.1-3.0	ES	175	6A
4.7-5	6.0	F-5.1-6.0	GAS	305	FD-5.1-6.0	FS	255	7A
4.7-5	12.0	F-5.1-12.0	GBS	450	FD-5.1-12.0	GAS	375	8A
4.7-5	25.0	F-5.1-25.0	GDS	670	FD-5.1-25.0	GBS	560	9A
5.3-	0.375	F-5.5-0.375	CS	125	FD-5.5-0.375	BS	105	1
5.3-	0.750	F-5.5-0.750	DS	145	FD-5.5-0.750	CS	120	3
5.3-	1.5	F-5.5-1.5	ES	170	FD-5.5-1.5	DS	140	5
5.3-	3.0	F-5.5-3.0	GS	215	FD-5.5-3.0	ES	180	6A
5.3-	6.0	F-5.5-6.0	GAS	320	FD-5.5-6.0	FS	265	7A
5.3-	12.0	F-5.5-12.0	GBS	470	FD-5.5-12.0	GAS	390	8A
5.3-	25.0	F-5.5-25.0	GDS	700	FD-5.5-25.0	GBS	585	9A
5.8-	0.375	F-6.0-0.375	CS	130	FD-6.0-0.375	BS	110	1
5.8-	0.750	F-6.0-0.750	DS	150	FD-6.0-0.750	CS	125	3
5.8-	1.5	F-6.0-1.5	FS	170	FD-6.0-1.5	DS	140	5
5.8-	3.0	F-6.0-3.0	GS	230	FD-6.0-3.0	ES	190	6A
5.8-	6.0	F-6.0-6.0	GAS	325	FD-6.0-6.0	FS	270	7A
5.8-	12.0	F-6.0-12.0	GCS	480	FD-6.0-12.0	GAS	400	8A
5.8-	25.0	F-6.0-25.0	GDS	720	FD-6.0-25.0	GBS	600	9A
6.3-	0.200	F-6.6-0.200	CS	115	FD-6.6-0.200	BS	95	1
6.3-	0.375	F-6.6-0.375	CS	130	FD-6.6-0.375	BS	110	2
6.3-	0.750	F-6.6-0.750	DS	150	FD-6.6-0.750	CS	125	3
6.3-	1.5	F-6.6-1.5	FS	175	FD-6.6-1.5	DS	145	5
6.3-	3.0	F-6.6-3.0	GS	240	FD-6.6-3.0	ES	200	6A
6.3-	6.0	F-6.6-6.0	GAS	330	FD-6.6-6.0	FS	275	7A
6.3-	12.0	F-6.6-12.0	GCS	490	FD-6.6-12.0	GAS	410	8A
6.3-	25.0	F-6.6-25.0	GDS	740	FD-6.6-25.0	GBS	615	9A
6.9-7.6	0.200	F-7.3-0.200	CS	120	FD-7.3-0.200	BS	100	1
6.9-7.6	0.375	F-7.3-0.375	CS	130	FD-7.3-0.375	BS	110	2
6.9-7.6	0.750	F-7.3-0.750	DS	150	FD-7.3-0.750	CS	125	3
6.9-7.6	1.5	F-7.3-1.5	FS	175	FD-7.3-1.5	DS	145	5
6.9-7.6	3.0	F-7.3-3.0	GS	250	FD-7.3-3.0	ES	210	6A
6.9-7.6	6.0	F-7.3-6.0	GBS	335	FD-7.3-6.0	FS	280	7A
6.9-7.6	12.0	F-7.3-12.0	GCS	505	FD-7.3-12.0	GAS	420	8A
6.9-7.6	25.0	F-7.3-25.0	GDS	750	FD-7.3-25.0	GBS	625	9A
7.6-8.5	0.200	F-8.1-0.200	CS	120	FD-8.1-0.200	BS	100	1
7.6-8.5	0.375	F-8.1-0.375	CS	140	FD-8.1-0.375	BS	115	2
7.6-8.5	0.750	F-8.1-0.750	DS	155	FD-8.1-0.750	CS	130	3
7.6-8.5	1.5	F-8.1-1.5	FS	180	FD-8.1-1.5	DS	150	5
7.6-8.5	3.0	F-8.1-3.0	GS	260	FD-8.1-3.0	ES	215	6A
7.6-8.5	6.0	F-8.1-6.0	GBS	350	FD-8.1-6.0	GS	290	7A
7.6-8.5	12.0	F-8.1-12.0	GCS	515	FD-8.1-12.0	GAS	430	8A
7.6-8.5	25.0	F-8.1-25.0	GDS	775	FD-8.1-25.0	GBS	645	9A
8.5-9.3	0.200	F-8.9-0.200	CS	125	FD-8.9-0.200	BS	105	1
8.5-9.3	0.375	F-8.9-0.375	CS	140	FD-8.9-0.375	BS	115	2
8.5-9.3	0.750	F-8.9-0.750	DS	155	FD-8.9-0.750	CS	130	3
8.5-9.3	1.5	F-8.9-1.5	FS	180	FD-8.9-1.5	DS	150	5
8.5-9.3	3.0	F-8.9-3.0	GS	265	FD-8.9-3.0	ES	220	6A
8.5-9.3	6.0	F-8.9-6.0	GBS	360	FD-8.9-6.0	GS	300	7A
8.5-9.3	12.0	F-8.9-12.0	GCS	530	FD-8.9-12.0	GAS	440	8A
8.5-9.3	25.0	F-8.9-25.0	GDS	790	FD-8.9-25.0	GBS	660	10
9.3-10.3	0.200	F-9.8-0.200	CS	125	FD-9.8-0.200	BS	105	1
9.3-10.3	0.375	F-9.8-0.375	CS	140	FD-9.8-0.375	BS	115	2
9.3-10.3	0.750	F-9.8-0.750	DS	155	FD-9.8-0.750	CS	130	3
9.3-10.3	1.5	F-9.8-1.5	GS	180	FD-9.8-1.5	DS	150	6
9.3-10.3	3.0	F-9.8-3.0	GAS	270	FD-9.8-3.0	FS	225	6A
9.3-10.3	6.0	F-9.8-6.0	GBS	370	FD-9.8-6.0	GS	310	8
9.3-10.3	12.0	F-9.8-12.0	GCS	540	FD-9.8-12.0	GAS	450	9
9.3-10.3	25.0	F-9.8-25.0	GDS	810	FD-9.8-25.0	GBS	675	10
10.3-11.4	0.200	F-10.8-0.200	CS	125	FD-10.8-0.200	BS	105	1
10.3-11.4	0.375	F-10.8-0.375	CS	140	FD-10.8-0.375	BS	115	2
10.3-11.4	0.750	F-10.8-0.750	ES	160	FD-10.8-0.750	DS	135	3
10.3-11.4	1.5	F-10.8-1.5	GS	180	FD-10.8-1.5	DS	150	6
10.3-11.4	3.0	F-10.8-3.0	GAS	275	FD-10.8-3.0	FS	230	7
10.3-11.4	6.0	F-10.8-6.0	GBS	385	FD-10.8-6.0	GS	320	8
10.3-11.4	12.0	F-10.8-12.0	GCS	550	FD-10.8-12.0	GBS	460	9
10.3-11.4	25.0	F-10.8-25.0	GDS	830	FD-10.8-25.0	GBS	690	10
11.4-12.5	0.200	F-12.0-0.200	CS	125	FD-12.0-0.200	BS	105	1
11.4-12.5	0.375	F-12.0-0.375	CS	145	FD-12.0-0.375	BS	120	2
11.4-12.5	0.750	F-12.0-0.750	ES	160	FD-12.0-0.750	DS	135	3
11.4-12.5	1.5	F-12.0-1.5	GS	185	FD-12.0-1.5	ES	155	6
11.4-12.5	3.0	F-12.0-3.0	GAS	280	FD-12.0-3.0	FS	235	7
11.4-12.5	6.0	F-12.0-6.0	GBS	395	FD-12.0-6.0	GS	330	8
11.4-12.5	12.0	F-12.0-12.0	GCS	565	FD-12.0-12.0	GBS	470	9
11.4-12.5	25.0	F-12.0-25.0	GDS	850	FD-12.0-25.0	GBS	710	10
12.5-13.7	0.100	F-13.1-0.100	CS	115	FD-13.1-0.100	BS	95	1
12.5-13.7	0.200	F-13.1-0.200	CS	130	FD-13.1-0.200	BS	110	1
12.5-13.7	0.375	F-13.1-0.375	DS	145	FD-13.1-0.375	CS	120	2
12.5-13.7	0.750	F-13.1-0.750	ES	170	FD-13.1-0.750	DS	140	3
12.5-13.7	1.5	F-13.1-1.5	GS	190	FD-13.1-1.5	ES	160	6
12.5-13.7	3.0	F-13.1-3.0	GAS	295	FD-13.1-3.0	FS	245	7
12.5-13.7	6.0	F-13.1-6.0	GBS	410	FD-13.1-6.0	GS	340	8
12.5-13.7	12.0	F-13.1-12.0	GDS	600	FD-13.1-12.0	GBS	500	9
13.7-15.2	0.100	F-14.5-0.100	CS	120	FD-14.5-0.100	BS	100	1
13.7-15.2	0.200	F-14.5-0.200	CS	130	FD-14.5-0.200	BS	110	1
13.7-15.2	0.375	F-14.5-0.375	DS	150	FD-14.5-0.375	CS	125	2
13.7-15.2	0.750	F-14.5-0.750	ES	170	FD-14.5-0.750	DS	140	3
13.7-15.2	1.5	F-14.5-1.5	GS	220	FD-14.5-1.5	ES	185	6
13.7-15.2	3.0	F-14.5-3.0	GAS	305	FD-14.5-3.0	FS	255	7
13.7-15.2	6.0	F-14.5-6.0	GBS	420	FD-14.5-6.0	GS	350	8
13.7-15.2	12.0	F-14.5-12.0	GDS	625	FD-14.5-12.0	GBS	520	9

TECHNIPOWER, INC. Ridgefield, Conn. 06877

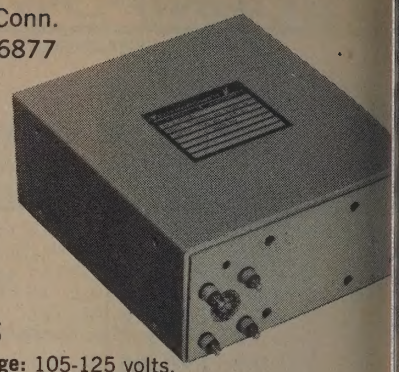
A BENRUS SUBSIDIARY

RA-80

POWER MODULES

ZERO ADJUST REGULATED AC-DC
BASE TEMP. RATING 80°C

IMPROVED CIRCUITRY REDUCED RIPPLE



DESIGN PARAMETERS (Typical)

Temperature coefficient: 0.015%/°C or 1 mv/°C, whichever is greater.
Recovery time: Less than 3 ms, 1/2L to FL.
Efficiency: Up to 80%.
Programmability: From zero (±200 mv) to maximum voltage.
Remote sensing of output voltage: Provided so as to compensate for an IR drop of up to 0.5 volts total in the leads connecting the module to the load.
External output adjustment: Terminals are provided for voltage control from an external potentiometer.

OPTIONAL FEATURES

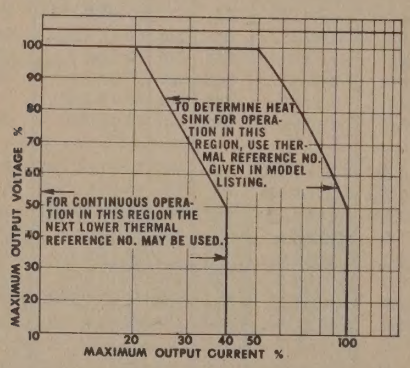
	SUFFIX
Fixed output	F
Fully epoxy encapsulated	K
Off-ground operation	U

Special shapes and finishes

208 or 230 volt input available — consult factory

RA-80 SUPPLY MAY BE ORDERED IN BENCH OR RACK MOUNT — SEE LA-80 SERIES.

POWER CURVE



SPECIFICATIONS

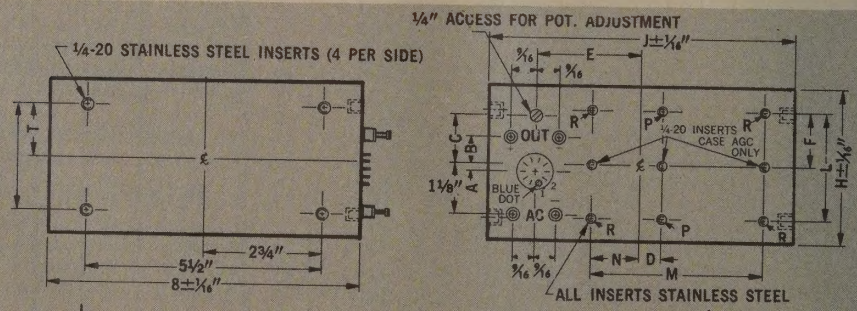
Input voltage range: 105-125 volts.
Input frequency range: 50-400 Hz.
Regulation accuracy-Line: ±(0.10% + 5 mv).
Load: ±(0.15% + 5 mv).
Ripple (rms): 0.2% of maximum output voltage.*
Output adjustment range: From zero (±200 mv) to maxi[illegible] voltage setting.
Operating temperature: —20°C to +80°C. (max. base ter[illegible]).
Storage temperature: —62°C to +85°C.
Polarity: May be used positive or negative.
Output voltage and current: See specific model listing[illegible]
Series operation: Standard unit provides for series opera[illegible] either in conventional manner or with complex loads.
Short circuit protection: Terminals are provided for adjus[illegible] output current limit from zero to the output current ra[illegible] by an external potentiometer. See power curve below.
Overvoltage protection: See model listings.
* 1% of max. output voltage at —20°C.

MODEL & PRICES

Output Voltage Range (VDC)*	Maximum Output Current (amps.)*	Maximum Output Power (watts)	Size (See dwg)	Model	Price	Thermal Curve No.	O R
0-10	12.0	60	AGA	RA-10.0-12.0	300	8	
	25.0	120	AGB	RA-10.0-25.0	355	9	
0-20	6.0	60	AGA	RA-20.0-6.0	280	7	
	12.0	120	AGA	RA-20.0-12.0	315	8	
	25.0	240	AGB	RA-20.0-25.0	390	8A	
0-40	3.0	60	AG	RA-40.0-3.0	270	6	
	6.0	120	AGA	RA-40.0-6.0	305	7	
	12.0	240	AGA	RA-40.0-12.0	370	8	
	25.0	500	AGC	RA-40.0-25.0	455	9A	
0-80	1.5	60	AG	RA-80.0-1.5	275	6	
	3.0	120	AG	RA-80.0-3.0	310	6A	
	6.0	240	AGA	RA-80.0-6.0	380	8	
	12.0	500	AGC	RA-80.0-12.0	465	9	
	25.0	1000	AGC	RA-80.0-25.0	605	9A	
0-160	0.750	60	AG	RA-160.0-0.750	290	5	
	1.5	120	AG	RA-160.0-1.5	320	6A	
	3.0	240	AGA	RA-160.0-3.0	390	8	
	6.0	500	AGC	RA-160.0-6.0	500	8A	
	12.0	1000	AGC	RA-160.0-12.0	625	9A	

* Maximum output voltage and current are not available simultaneously. [illegible] power curve.
** Consult Factory.

MECHANICAL DATA
(Case size is called out in list of models and prices)



CASE SIZE	A	B	C	D	E	F	H	J	L	M	N	P	R	S	T	TERMINAL* HEIGHT ± 1/16 INPUT	OUTPUT
	MODULE DIMENSIONS																
AG	5/16	3/8	15/16	1 5/16	2½	1⅛	3½	7 5/16	2¼	4 3/16	1¼	¼-20	¼-20	2½	1¼	⅝	⅝
AGA	1/16	¾	1½	1 5/16	2½	1¾	5¼	7 5/16	3½	4¼	1 5/16	¼-20	5/16-18	4¼	2⅛	⅝	5/[illegible]
AGB	5/16	⅜	15/16	1 9/32	6 7/16	1⅛	3½	15¼	2¼	8 5/16	2⅞	¼-20	¼-20	2½	1¼	⅝	*[illegible]
AGC	1/16	¾	1½	¼	6⅜	2 1/16	5¼	15¼	4⅛	8	3¾	5/16-18	5/16-18	4¼	2⅛	⅝	*⅝

* ¾ on 25 amp units on

TECHNIPOWER, INC.
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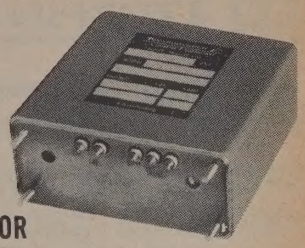
Ridgefield, Conn.
06877

P-80, TDP-80

UAL POWER MODULES



LATED AC-DC INDEPENDENT & KING OUTPUTS S TEMP. RATING 80°C

SLIMLINE PACKAGING FOR OPERATIONAL AMPLIFIER, POTENTIOMETRIC APPLICATIONS

IN PARAMETERS (Typical)

rature coefficient: 0.015%/°C or 1 mv/°C, whichever is ter, each output.

ry time: 50 μsec, 1/2L to FL, each output.

ed to meet MIL environmental specifications:
RI — MIL-I-6181D;
ck — MIL-STD-202C, Method 205C;
iation — MIL-STD-202C, Method 201A;
emp — MIL-E-5400, Classes 1 & 1A;
nidity — MIL-STD-202C, Method 103B.

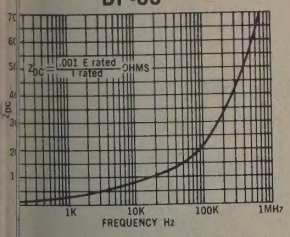
p impedance: See typical curve for impedance of each ut.

F. of Product Line: 25,000 hours per MIL-HBK-217A module stressed at 80°C base temperature.

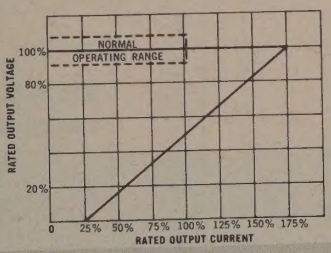
NAL FEATURES

	SUFFIX
al output adjust	H
epoxy encapsulated	K
l internal potentiometer	P
temperature coefficient	T
e sensing	Y

pical Output Impedance
DP-80



Typical Foldback Characteristic



SPECIFICATIONS

Input voltage range: 105-125 volts.

Input frequency range: 50-400 Hz.

Regulation-Line & Load Combined: ±0.05%.

Ripple (rms): Less than 0.002% or 1 mv, whichever greater, for 60 Hz input (each output).
Less than 0.004% or 3 mv, whichever greater, for 400 Hz input (each output).

Output adjustment range: DP Models: Each output adjusted independently by screwdriver adjustment in base.
TDP Models: Both outputs adjusted simultaneously by single screwdriver adjustment in base.
Adjustment range 10%. At 80% of rated load the outputs may be adjusted a full 20% (±10%) of nominal.

Operating temperature: —20°C to +80°C (max. base temp.).

Polarity: One positive, one negative, common return.

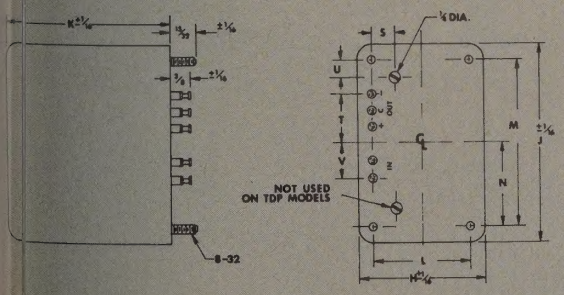
Output voltage and current: See specific model listings.

Tracking accuracy (TDP models): Each output will be factory set within 1.0% of the other. Outputs will track within 20.0 mv or ±0.05% (whichever is greater) of each other during pot adjustment.

Short circuit protection (DP models): Each output independently protected by unique "fold-back" circuitry, which protects the module if output should be shorted continuously. Automatic return after short removal.

Short circuit protection (TDP models): As above, but if positive output is shorted both outputs will "fold back" simultaneously; if negative output only is shorted, positive output will not be affected.

Series operation: Either conventionally or with complex loads. The series starting circuitry employed requires that input AC voltage be applied at a rate greater than 150v rms/sec. Consult factory if slow rising input is anticipated.



SIZE	H	J	K	L	M	N	S	T	U	V
A	1 13/32	4 7/32	4 1/4	1 5/16	3 5/8	1 13/16	7/16	1 1/32	7/16	11/16
B	3 11/32	3 29/32	4 5/16	2 7/16	3	1 1/2	5/8	27/32	1/4	7/8

MODELS & PRICES/SERIES DP & TDP-80

Output voltage Adjust range Each output	Output current (Amp.) Each output	Case Size (see dwg)	MODEL AND PRICE Standard Type		Tracking Type		Thermal Reference No.
5.7-6.3	0.250	MA	DP-6.0-0.250	145	TDP-6.0-0.250	155	2
5.7-6.3	0.500	MB	DP-6.0-0.500	165	TDP-6.0-0.500	175	3
11.4-12.6	0.125	MA	DP-12.0-0.125	145	TDP-12.0-0.125	155	1
11.4-12.6	0.500	MB	DP-12.0-0.500	155	TDP-12.0-0.500	165	4
14.2-15.8	0.125	MA	DP-15.0-0.125	150	TDP-15.0-0.125	160	1
14.2-15.8	0.500	MB	DP-15.0-0.500	155	TDP-15.0-0.500	165	4
17.1-18.9	0.065	MA	DP-18.0-0.065	145	TDP-18.0-0.065	155	1
17.1-18.9	0.250	MB	DP-18.0-0.250	160	TDP-18.0-0.250	170	3
23.7-26.3	0.065	MA	DP-25.0-0.065	145	TDP-25.0-0.065	155	1
23.7-26.3	0.125	MB	DP-25.0-0.125	155	TDP-25.0-0.125	165	2
34.2-37.8	0.035	MA	DP-36.0-0.035	145	TDP-36.0-0.035	155	1
34.2-37.8	0.125	MB	DP-36.0-0.125	155	TDP-36.0-0.125	165	3
57.0-63.0	0.065	MB	DP-60.0-0.065	155	TDP-60.0-0.065	165	2
118.0-132.0	0.065	MB	DP-125.0-0.065	220	TDP-125.0-0.065	230	3
142.0-158.0	0.065	MB	DP-150.0-0.065	230	TDP-150.0-0.065	240	4

TECHNIPOWER, INC.
A BENRUS SUBSIDIARY

Ridgefield, Conn.
06877

NP-80

POWER MODULES

UNREGULATED AC-DC 3.0 to 1000 VDC. Up to 975 watts
BASE TEMP. RATING 80°C

ALL SILICON, LOW COST AC-DC POWER SUPPLIES

DESIGN PARAMETERS (Typical)

Designed to meet MIL environmental specifications:
- **RFI** — MIL-I-6181D;
- **Shock** — MIL-STD-202C, Method 205C;
- **Vibration** — MIL-STD-202C, Method 201A;
- **Hi-temp** — MIL-E-5400, Classes 1 & 1A;
- **Humidity** — MIL-STD-202C, Method 103B.

M.T.B.F.: 200,000 hours per Mil-HBK-217A, with module stressed at 80°C base temperature.

Output isolated from ground.

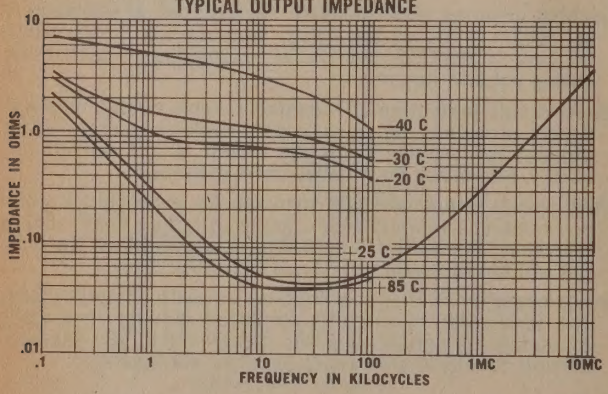
Sealed construction.

Output impedance: See curve.

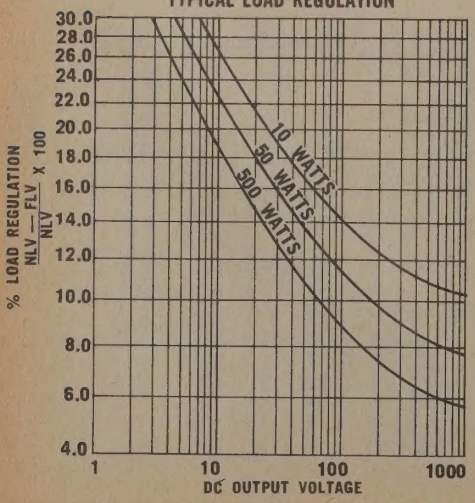
OPTIONAL FEATURES

	SUFFIX
Reduced size and weight	D
Shock and vibration mounts	G, V
Fully epoxy encapsulated	K
Off-ground operation	U
Special cases, shapes and finishes	

TYPICAL OUTPUT IMPEDANCE



TYPICAL LOAD REGULATION



SPECIFICATIONS

Input voltage range: 105-125 VAC.

Input frequency range: 50-400 Hz.

Regulation Line: proportional to input voltage.
Load: refer to load regulation curve.

Operating temperature: —20°C to + 80°C (max. base te

Storage temperature: —62°C to +85°C.

Ripple: Less than 5% rms.**

Polarity: May be used positive or negative.

Output voltage and current: See specific model listings.

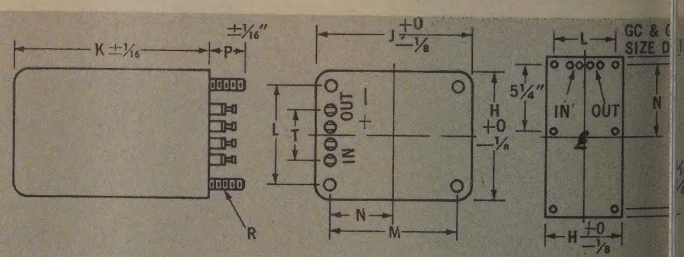
Voltage setting accuracy: ±5% under full load cond with 115 v, 60 Hz input. Output voltage may vary 10% as input frequency is increased over a range 60 to 400 Hz.

*Modules can be designed to meet higher temperature requirements. Consult factory concerning price and delivery.

**The output ripple can be reduced to 2% rms. If this option is to corporated, the case size of the catalog unit must be increased by size, and the suffix "L" must be added to the model number of th power module (e.g. NP-28.0-3.0L, case size GB). Additional charge:

MECHANICAL DATA

(case size is called out in list of models and



Case Size	H	J	K	L	M	N	P	R	T	Tolerances L,M,N,S	Recommended Clearance Terminal Cutouts	Term Hei ±
	* See detail			MODULE DIMENSIONS								
A	2 3/8	2 3/4	3 13/16	1 3/4	2 1/8	1 1/16	11/32	6-32	15/16	±1/64	3/8x1 5/16	19
B	2 5/8	3 1/16	4 1/4	1 55/64	2 19/64	1 5/32	11/32	8-32	15/16	±1/64	3/8x1 5/16	19
C	3 1/16	3 9/16	4 7/8	2 1/8	2 5/8	1 5/16	11/32	8-32	15/16	±1/64	3/8x1 5/16	19
D	3 3/8	3 15/16	5 1/4	2 7/16	3	1 1/2	15/32	10-32	15/16	±1/32	3/8x1 5/16	19
E	3 11/16	4 5/16	5 9/16	2 11/16	3 5/16	1 21/32	7/16	10-32	15/16	±1/32	3/8x1 5/16	19
F	4	4 11/16	6	3	3 11/16	1 27/32	9/16	1/4-20	15/16	±3/64	3/8x1 5/16	19
G	4 5/16	5 1/16	6 13/16	3 5/16	4 1/16	2 21/32	9/16	1/4-20	15/16	±3/64	3/8x1 5/16	19
GA	4 15/16	6 9/16	7	3 5/8	5 1/4	2 5/8	21/32	5/16-18	1 1/2	±3/64	1/2x2	5
GB	6 9/16	6 3/4	7	5 1/4	5 7/16	2 23/32	1/2 2/32	5/16-18	1 1/2	±3/64	1/2x2	5
GC*	4 15/16	13 1/16	7	3 5/8	11 13/16	5 29/32	21/32	5/16-18	1 7/8	±3/64	5/8x2 1/2	5
GD*	6 9/16	13 1/16	7	5 7/16	11 13/16	5 29/32	21/32	5/16-18	1 7/8	±3/64	5/8x2 1/2	5

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ODELS AND PRICES

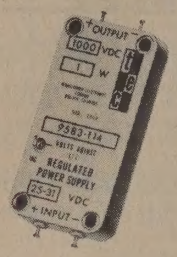
Output Voltage	Output Current (amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
0	0.750	B	NP-3.0-0.750	40	1
0	1.5	D	NP-3.0-1.5	50	2
0	3.0	E	NP-3.0-3.0	55	4
0	6.0	F	NP-3.0-6.0	65	6
0	12.0	GA	NP-3.0-12.0	105	7
0	25.0	GB	NP-3.0-25.0	130	8
3	0.750	B	NP-3.3-0.750	40	1
3	1.5	D	NP-3.3-1.5	50	2
3	3.0	E	NP-3.3-3.0	55	4
3	6.0	F	NP-3.3-6.0	70	6
3	12.0	GA	NP-3.3-12.0	105	7
3	25.0	GB	NP-3.3-25.0	130	8
7	0.750	B	NP-3.7-0.750	40	1
7	1.5	D	NP-3.7-1.5	50	2
7	3.0	E	NP-3.7-3.0	55	4
7	6.0	F	NP-3.7-6.0	70	6
7	12.0	GA	NP-3.7-12.0	105	7
7	25.0	GB	NP-3.7-25.0	130	8
1	0.750	B	NP-4.1-0.750	40	1
1	1.5	D	NP-4.1-1.5	50	2
1	3.0	E	NP-4.1-3.0	60	4
1	6.0	F	NP-4.1-6.0	85	6
1	12.0	GA	NP-4.1-12.0	110	7
1	25.0	GB	NP-4.1-25.0	135	8
.5	0.750	B	NP-4.5-0.750	45	1
.5	1.5	D	NP-4.5-1.5	50	2
.5	3.0	E	NP-4.5-3.0	60	4
.5	6.0	F	NP-4.5-6.0	90	6
.5	12.0	GA	NP-4.5-12.0	115	7
.5	25.0	GB	NP-4.5-25.0	140	8
.1	0.750	B	NP-5.1-0.750	45	1
.1	1.5	D	NP-5.1-1.5	55	2
.1	3.0	E	NP-5.1-3.0	65	4
.1	6.0	F	NP-5.1-6.0	95	6
.1	12.0	GA	NP-5.1-12.0	120	7
.1	25.0	GB	NP-5.1-25.0	145	8
.5	0.750	B	NP-5.5-0.750	45	1
.5	1.5	D	NP-5.5-1.5	55	2
.5	3.0	E	NP-5.5-3.0	65	4
.5	6.0	F	NP-5.5-6.0	95	6
.5	12.0	GA	NP-5.5-12.0	120	7
.5	25.0	GB	NP-5.5-25.0	150	8
.0	0.750	B	NP-6.0-0.750	45	1
.0	1.5	D	NP-6.0-1.5	55	2
.0	3.0	E	NP-6.0-3.0	65	4
.0	6.0	F	NP-6.0-6.0	100	6
.0	12.0	GA	NP-6.0-12.0	120	7
.0	25.0	GB	NP-6.0-25.0	150	8
.6	0.375	B	NP-6.6-0.375	40	1
.6	0.750	C	NP-6.6-0.750	45	1
.6	1.5	D	NP-6.6-1.5	55	2
.6	3.0	F	NP-6.6-3.0	65	4
.6	6.0	GA	NP-6.6-6.0	90	6
.6	12.0	GB	NP-6.6-12.0	115	7
.6	25.0	GC	NP-6.6-25.0	155	8
.3	0.375	B	NP-7.3-0.375	40	1
.3	0.750	C	NP-7.3-0.750	45	1
.3	1.5	D	NP-7.3-1.5	55	3
.3	3.0	F	NP-7.3-3.0	80	4
.3	6.0	GA	NP-7.3-6.0	95	6
.3	12.0	GB	NP-7.3-12.0	120	7
.3	25.0	GC	NP-7.3-25.0	160	8
8.1	0.375	B	NP-8.1-0.375	40	1
8.1	0.750	C	NP-8.1-0.750	45	1
8.1	1.5	D	NP-8.1-1.5	55	3
8.1	3.0	F	NP-8.1-3.0	80	4
8.1	6.0	GA	NP-8.1-6.0	100	6
8.1	12.0	GB	NP-8.1-12.0	120	7
8.1	25.0	GC	NP-8.1-25.0	160	8
8.9	0.375	B	NP-8.9-0.375	40	1
8.9	0.750	C	NP-8.9-0.750	45	1
8.9	1.5	D	NP-8.9-1.5	55	3
8.9	3.0	F	NP-8.9-3.0	80	4
8.9	6.0	GA	NP8.9-6.0	100	6
8.9	12.0	GB	NP-8.9-12.0	125	7
8.9	25.0	GC	NP-8.9-25.0	165	8
9.8	0.375	B	NP-9.8-0.375	40	1
9.8	0.750	C	NP-9.8-0.750	50	1
9.8	1.5	D	NP-9.8-1.5	60	3
9.8	3.0	F	NP-9.8-3.0	85	4
9.8	6.0	GA	NP-9.8-6.0	105	6
9.8	12.0	GB	NP-9.8-12.0	125	7
9.8	25.0	GC	NP-9.8-25.0	170	8
0.8	0.375	B	NP-10.8-0.375	40	1
0.8	0.750	C	NP-10.8-0.750	50	1
0.8	1.5	D	NP-10.8-1.5	60	3
0.8	3.0	F	NP-10.8-3.0	85	4
0.8	6.0	GA	NP-10.8-6.0	105	6
0.8	12.0	GB	NP-10.8-12.0	130	7
0.8	25.0	GC	NP-10.8-25.0	175	8
2.0	0.375	B	NP-12.0-0.375	40	1
2.0	0.750	C	NP-12.0-0.750	50	1
2.0	1.5	D	NP-12.0-1.5	60	3
2.0	3.0	F	NP-12.0-3.0	90	4
2.0	6.0	GA	NP-12.0-6.0	105	6
2.0	12.0	GB	NP-12.0-12.0	135	7
2.0	25.0	GC	NP-12.0-25.0	180	8

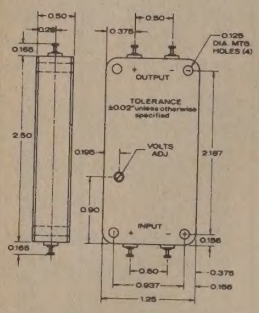
Output Voltage	Output Current (amps)	Case Size (see dwg)	Model	Price	Thermal Ref. No.
13.1	0.200	B	NP-13.1-0.200	35	1
13.1	0.375	B	NP-13.1-0.375	40	1
13.1	0.750	C	NP-13.1-0.750	50	1
13.1	1.5	E	NP-13.1-1.5	60	3
13.1	3.0	G	NP-13.1-3.0	90	4
13.1	6.0	GA	NP-13.1-6.0	110	6
13.1	12.0	GC	NP-13.1-12.0	145	7A
13.1	25.0	GD	NP-13.1-25.0	190	8
14.5	0.200	B	NP-14.5-0.200	35	1
14.5	0.375	B	NP-14.5-0.375	40	1
14.5	0.750	C	NP-14.5-0.750	50	1
14.5	1.5	F	NP-14.5-1.5	70	3
14.5	3.0	G	NP-14.5-3.0	90	4
14.5	6.0	GA	NP-14.5-6.0	110	6
14.5	12.0	GC	NP-14.5-12.0	145	7A
14.5	25.0	GD	NP-14.5-25.0	195	8
15.8	0.200	B	NP-15.8-0.200	35	1
15.8	0.375	B	NP-15.8-0.375	45	1
15.8	0.750	C	NP-15.8-0.750	50	1
15.8	1.5	F	NP-15.8-1.5	70	3
15.8	3.0	G	NP-15.8-3.0	90	4
15.8	6.0	GA	NP-15.8-6.0	110	6
15.8	12.0	GC	NP-15.8-12.0	140	7A
15.8	25.0	GD	NP-15.8-25.0	195	8
17.5	0.200	B	NP-17.5-0.200	40	1
17.5	0.375	B	NP-17.5-0.375	45	1
17.5	0.750	C	NP-17.5-0.750	50	2
17.5	1.5	F	NP-17.5-1.5	70	3
17.5	3.0	G	NP-17.5-3.0	90	5
17.5	6.0	GA	NP-17.5-6.0	110	6
17.5	12.0	GC	NP-17.5-12.0	145	7A
17.5	25.0	GD	NP-17.5-25.0	195	8A
19.2	0.200	B	NP-19.2-0.200	40	1
19.2	0.375	C	NP-19.2-0.375	45	1
19.2	0.750	C	NP-19.2-0.750	50	2
19.2	1.5	F	NP-19.2-1.5	70	3
19.2	3.0	G	NP-19.2-3.0	90	5
19.2	6.0	GA	NP-19.2-6.0	110	6A
19.2	12.0	GC	NP-19.2-12.0	145	7A
19.2	25.0	GD	NP-19.2-25.0	200	8A
21.2	0.200	B	NP-21.2-0.200	40	1
21.2	0.375	C	NP-21.2-0.375	45	1
21.2	0.750	C	NP-21.2-0.750	50	2
21.2	1.5	F	NP-21.2-1.5	75	3
21.2	3.0	GA	NP-21.2-3.0	90	5
21.2	6.0	GB	NP-21.2-6.0	110	6A
21.2	12.0	GC	NP-21.2-12.0	155	7A
21.2	25.0	GD	NP-21.2-25.0	205	8A
23.3	0.200	B	NP-23.3-0.200	40	1
23.3	0.375	C	NP-23.3-0.375	45	1
23.3	0.750	D	NP-23.3-0.750	50	2
23.3	1.5	F	NP-23.3-1.5	70	3
23.3	3.0	GA	NP-23.3-3.0	90	5
23.3	6.0	GB	NP-23.3-6.0	110	6A
23.3	12.0	GC	NP-23.3-12.0	155	7A
23.3	25.0	GD	NP-23.3-25.0	210	8A
25.7	0.200	B	NP-25.7-0.200	40	1
25.7	0.375	C	NP-25.7-0.375	45	1
25.7	0.750	D	NP-25.7-0.750	55	2
25.7	1.5	F	NP-25.7-1.5	75	3
25.7	3.0	GA	NP-25.7-3.0	90	5
25.7	6.0	GB	NP-25.7-6.0	125	6A
25.7	12.0	GC	NP-25.7-12.0	165	7A
25.7	25.0	GD	NP-25.7-25.0	220	8A
28.0	0.200	B	NP-28.0-0.200	40	1
28.0	0.375	C	NP-28.0-0.375	45	1
28.0	0.750	D	NP-28.0-0.750	65	1
28.0	1.5	F	NP-28.0-1.5	75	3
28.0	3.0	GA	NP-28.0-3.0	90	5
28.0	6.0	GB	NP-28.0-6.0	125	6A
28.0	12.0	GC	NP-28.0-12.0	170	7A
28.0	25.0	GD	NP-28.0-25.0	225	8A
31.5	0.200	B	NP-31.5-0.200	40	1
31.5	0.375	C	NP-31.5-0.375	45	1
31.5	0.750	E	NP-31.5-0.750	65	1
31.5	1.5	G	NP-31.5-1.5	80	3
31.5	3.0	GA	NP-31.5-3.0	95	5
31.5	6.0	GB	NP-31.5-6.0	135	6A
31.5	12.0	GC	NP-31.5-12.0	180	8
34.5	0.200	B	NP-34.5-0.200	40	1
34.5	0.375	C	NP-34.5-0.375	45	1
34.5	0.750	E	NP-34.5-0.750	65	2
34.5	1.5	G	NP-34.5-1.5	80	3
34.5	3.0	GA	NP-34.5-3.0	105	5
34.5	6.0	GB	NP-34.5-6.0	140	6A
34.5	12.0	GC	NP-34.5-12.0	190	8
38.0	0.200	B	NP-38.0-0.200	40	1
38.0	0.375	C	NP-38.0-0.375	45	1
38.0	0.750	E	NP-38.0-0.750	60	2
38.0	1.5	G	NP-38.0-1.5	85	3
38.0	3.0	GA	NP-38.0-3.0	110	6
38.0	6.0	GB	NP-38.0-6.0	145	6A
38.0	12.0	GC	NP-38.0-12.0	200	8
42.0	0.200	C	NP-42.0-0.200	45	1
42.0	0.375	C	NP-42.0-0.375	50	1
42.0	0.750	E	NP-42.0-0.750	75	2
42.0	1.5	G	NP-42.0-1.5	90	3
42.0	3.0	GA	NP-42.0-3.0	115	6
42.0	6.0	GB	NP-42.0-6.0	160	7
42.0	12.0	GC	NP-42.0-12.0	210	8

Models available to 1000VDC. See catalog 701.

tecnetics inc.

regulated DC-DC power supplies





All dimensions in inches

CASE MATERIAL: extruded aluminum
FINISH: black anodize
(per MIL-A-8625)

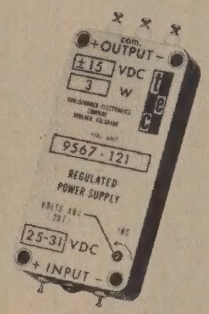
1 watt DC-DC regulated power supplies 9583 series

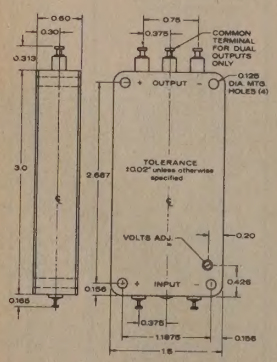
COMMON SPECIFICATIONS

(3) Input Voltage: 28VDC ±3VDC, continuous. 50VDC, 1 second max.
Input Current: 27ma typical @ 30 mw load. 87ma typical @ full load.
Output Voltage Adjust: ±10% @ full load. —40% @ 330mw load.
Temperature: Operating, —55 to +100°C case. Storage, —55 to +150°C. Case rise, 5°C full load.
(2) Isolation: Models 101-114,121, 1000VDC. Models 115-118, 3000VDC.
Output Power Derating: None to 100°C case.
Weight: 2.4 oz. fully encapsulated.
Minimum Load: 30 mW.

MODEL SPECIFICATIONS

Model	Output			Regulation (Vdc)					Price
	Voltage (Vdc)	Current (mA)	Ripple (4) (Vp-p)	Line (Vin = 25 to 31 Vdc)		Load (½ to Full)		Temp. (—55°C to 100°C Case)	
9583-	Nom.	Max.	Max.	Typ.	Max.	Typ.	Max.	Typ.	1 ea.
101	3	330	.020	.025	.035	.098	.110	0.09	$196.00
102	5	200	.015	.035	.045	.110	.130	0.15	185.00
103	7.5	130	.025	.035	.045	.150	.165	0.23	180.00
104	10	100	.030	.045	.055	.210	.230	0.30	180.00
105	15	67	.050	.075	.085	.250	.275	0.45	175.00
106	30	33	.050	.135	.160	.440	.480	0.90	168.00
107	50	20	.030	.210	.225	.800	.850	1.50	185.00
108	75	13	.020	.300	.350	1.20	1.60	2.25	192.00
109	100	10	.150	.390	.420	1.30	1.60	3.00	192.00
110	150	6.7	.200	.670	.750	2.60	3.10	4.50	177.00
111	300	3.3	.225	1.20	1.70	4.00	5.50	9.00	177.00
112	500	2.0	.300	2.00	2.60	6.00	8.00	15.0	201.00
113	750	1.3	2.4	3.00	3.50	19.0	21.0	22.5	202.00
114	1000	1.0	3.0	4.00	5.00	24.0	26.0	30.0	232.00
115	1500	0.67	21	6.00	7.50	40.0	50.0	45.0	248.00
116	2000	0.50	25	9.50	10.5	68.0	75.0	60.0	254.00
117	2500	0.40	20	10.0	13.0	68.0	75.0	75.0	258.00
118	3000	0.33	25	12.0	15.0	68.0	75.0	90.0	270.00
121	±15	±33	.010	.060	.090	.250	.280	0.30	209.00





All dimensions in inches

CASE MATERIAL: extruded aluminum
FINISH: black anodize
(per MIL-A-8625)

3 watt DC-DC regulated power supplies 9567 series

COMMON SPECIFICATIONS

(3) Input Voltage: 28VDC ±3VDC, continuous. 50VDC, 1 second max.
Input Current: 38ma typical @ 100mw load. 210ma typical @ full load.
Output Voltage Adjust: ±10% @ full load. —40% @ 1W load.
Temperature: Operating, —55 to +100°C case. Storage, —55 to +150°C. Case rise, 25°C full load.
(2) Isolation: Models 101-114, 121-124, 1000VDC, Models 115-120, 5000VDC.
Output Power Derating: None to +55°C case.
Weight: 4.0 oz. fully encapsulated.
Minimum Load: 100 mW.

MODEL SPECIFICATIONS

Model	Output			Regulation (Vdc)					Price
	Voltage (Vdc)	Current (mA)	Ripple (1) (Vp-p)	Line (Vin = 25 to 31 Vdc)		Load (½ to Full)		Temp. (—55°C to 100°C Case)	
9567-	Nom.	Max.	Max.	Typ.	Max.	Typ.	Max.	Typ.	1 ea.
101	3	1000	0.06	.016	.025	.145	.165	0.45	$178.00
102	5	600	0.05	.026	.035	.170	.210	0.10	168.00
103	7.5	400	0.08	.036	.045	.200	.260	0.15	164.00
104	10	300	0.20	.045	.055	.220	.265	0.20	164.00
105	15	200	0.60	.080	.080	.360	.410	0.30	159.00
106	30	100	0.15	.130	.175	.425	.500	0.60	153.00
107	50	60	0.10	.220	.270	.600	.700	1.0	168.00
108	75	40	0.38	.300	.350	.900	1.20	1.5	175.00
109	100	30	0.20	.450	.550	1.00	1.30	2	175.00
110	150	20	0.25	.650	.850	1.50	1.75	3	161.00
111	300	10	0.60	1.25	1.75	3.00	3.60	6	161.00
112	500	6	0.45	2.20	3.00	4.50	5.20	10	183.00
113	750	4	0.50	3.00	4.00	16.0	19.5	15	184.00
114	1000	3	0.55	4.00	5.50	16.5	20.0	20	211.00
115	1500	2	13.0	6.50	9.00	43.0	55.0	30	226.00
116	2000	1.5	16.0	8.00	10.0	39.0	55.0	40	231.00
117	2500	1.2	12.0	10.0	13.5	45.0	55.0	50	235.00
118	3000	1.0	33.0	12.5	17.0	130	160	60	246.00
119	4000	0.75	28.0	17.0	21.0	145	165	80	256.00
120	5000	6.60	45.0	20.0	32.0	140	170	100	267.00
121	±15	±100	0.09	.060	.090	.350	.410	0.30	190.00
122	±25	±60	0.03	.100	.130	.500	.600	0.50	190.00
123	±50	±30	0.01	.200	.300	1.00	1.25	1.00	207.00
124	±100	±15	0.05	.400	.500	1.50	2.00	2.00	216.00

NOTES:
(1) Filter in Positive Leg, for negative filter prefix part # with "N"
(2) Input terminals shorted to case, output terminals shorted
(3) Reverse polarity protection provided to 50 Vdc. Contact factory for overload, short circuit, overvoltag
EMI (MIL-I-6181), Surge (MIL-STD-704).

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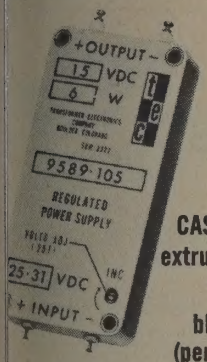
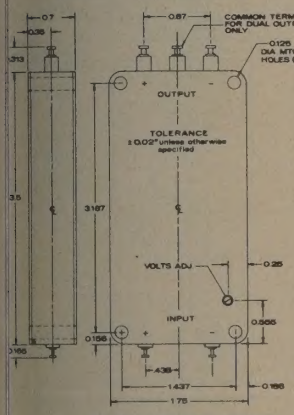
tecnetics inc.

regulated DC-DC power supplies



CASE MATERIAL: extruded aluminum
FINISH: black anodize (per MIL-A-8625)



All dimensions in inches

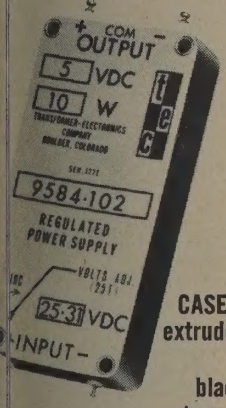
6 watt DC-DC regulated power supplies 9589 series

COMMON SPECIFICATIONS

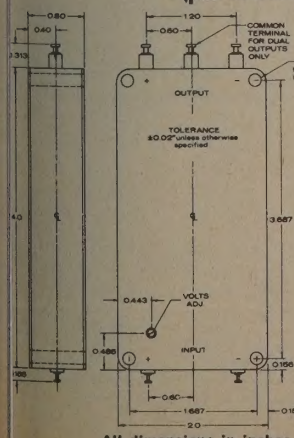
(3) Input Voltage: 28VDC ±3VDC continuous. 50VDC, 1 second max.
Input Current: 100ma typical @ 200mw load. 400ma typical @ full load.
Output Voltage Adjust: ±10% @ full load. −40% @ 2W load.
Temperature: Operating, −55 to +100°C. Storage, −55 to +150°C. Case rise, +30° full load.
(2) Isolation: Models 102-114, 121-124, 1000VDC. Models 115-120, 5000VDC.
Output Power Derating: None to 100°C case.
Weight: 7.0 oz. fully encapsulated.
Minimum Load: 200 mW.

MODEL SPECIFICATIONS

Model	Output			Regulation (Vdc)					Price
	Voltage (Vdc)	Current (mA)	Ripple (1) (Vp-p)	Line (Vin = 25 to 31 Vdc)		Load (½ to Full)		Temp. (−55°C to 100°C Case)	
9589-	Nom.	Max.	Max.	Typ.	Max.	Typ.	Max.	Typ.	1 ea.
102	5	1200	.050	.003	.005	.150	.230	.075	$177.00
103	7.5	800	.060	.003	.006	.200	.300	.113	172.00
104	10	600	.120	.003	.006	.240	.325	.150	172.00
105	15	400	.090	.005	.013	.260	.380	.225	167.00
106	30	200	.090	.010	.016	.360	.450	.450	161.00
107	50	120	.250	.015	.025	.700	.850	.750	176.00
108	75	80	.430	.030	.050	1.00	1.50	1.13	184.00
109	100	60	.600	.040	.065	1.10	1.60	1.50	184.00
110	150	40	.900	.050	.070	1.50	2.00	2.25	169.00
111	300	20	1.80	.100	.125	2.75	4.00	4.50	169.00
112	500	12	2.50	.200	.250	5.00	7.00	7.50	192.00
113	750	8.0	4.10	.400	.550	7.00	11.0	11.3	193.00
114	1000	6.0	6.0	.450	.700	12.5	17.0	15.0	222.00
115	1500	4.0	9.0	.500	1.25	35.0	45.0	22.5	238.00
116	2000	3.0	12.0	1.25	2.00	35.0	45.0	30.0	243.00
117	2500	2.4	15.0	1.40	2.00	50.0	75.0	38.0	247.00
118	3000	2.0	18.0	1.50	3.00	85.0	100	45.0	259.00
119	4000	1.5	24.0	1.60	2.20	105	125	60.0	269.00
120	5000	1.2	30.0	3.00	5.00	125	165	75.0	281.00
121	±15	±200	.090	.005	.012	.250	.300	.225	198.00
122	±25	±120	.120	.007	.012	.410	.500	.38	198.00
123	±50	±60	.300	.025	.050	.800	1.10	.75	218.00
124	±100	±30	.500	.025	.060	1.70	2.20	1.50	227.00



CASE MATERIAL: extruded aluminum
FINISH: black anodize (per MIL-A-8625)



All dimensions in inches

10 watt DC-DC regulated power supplies 9584 series

COMMON SPECIFICATIONS

(3) Input Voltage: 28VDC ±3VDC, continuous. 50VDC, 1 second max.
Input Current. 120ma typical @ 300mw load. 690ma typical @ full load.
Output Voltage Adjust: ±10% @ full load. −40% @ 3.3W load.
Temperature: Operating, −55 to +100°C. Case rise, +30°C full load.
(2) Isolation: Models 102-114, 121-124, 1000VDC. Models 115-120, 5000VDC.
Output Power Derating: None to 100°C case.
Weight: 9.6 oz. fully encapsulated.
Minimum Load: 300 mW.

MODEL SPECIFICATIONS

Model	Output			Regulation (Vdc)					Price
	Voltage (Vdc)	Current (mA)	Ripple (1) (Vp-p)	Line (Vin = 25 to 31 Vdc)		Load (½ to Full)		Temp. (−55°C to 100°C Case)	
9584-	Nom.	Max.	Max.	Typ.	Max.	Typ.	Max.	Typ.	1 ea.
102	5	2000	.030	.003	.008	.200	.260	.075	$192.00
103	7.5	1300	.045	.004	.010	.210	.270	.112	187.00
104	10	1000	.020	.005	.012	.250	.300	.150	187.00
105	15	670	.015	.008	.013	.290	.360	.225	182.00
106	30	330	.060	.011	.015	.500	.750	.450	175.00
107	50	200	.050	.025	.035	.700	1.10	.750	192.00
108	75	130	.075	.030	.045	1.10	1.50	1.13	200.00
109	100	100	.100	.037	.065	1.20	2.00	1.5	200.00
110	150	67	.150	.055	.080	2.20	3.00	2.25	184.00
111	300	33	.30	.100	.220	4.00	6.00	4.50	184.00
112	500	20	1.0	.200	.320	7.00	10.0	7.50	209.00
113	750	13	1.5	.300	.500	9.00	13.0	11.30	210.00
114	1000	10	2.5	.750	1.50	16.0	22.0	15.0	241.00
115	1500	6.7	3.0	1.00	1.60	20.0	30.0	22.5	258.00
116	2000	5.0	5.5	1.50	2.70	25.0	40.0	30.0	264.00
117	2500	4.0	5.0	2.00	3.30	60.0	75.0	38.0	268.00
118	3000	3.3	9.0	2.50	4.00	75.0	100	45.0	280.00
119	4000	2.5	14.0	2.50	4.50	85.0	125	60.0	288.00
120	5000	2.0	17.5	4.00	6.00	120	220	75.0	299.00
121	±15	±335	.030	.007	.017	.300	.450	.225	217.00
122	±25	±200	.050	.010	.030	.750	.850	.38	217.00
123	±50	±100	.100	.016	.030	1.25	1.50	.75	238.00
124	±100	±50	.100	.040	.065	1.60	2.75	1.50	243.00

NOTES:
(1) Filter in positive leg, for negative filter prefix part # with "N"
(2) Input terminals shorted to case, output terminals shorted
(3) Reverse polarity protection provided to 50 Vdc. Contact factory for Overload, Short Circuit, Overvoltage, EMI (MIL-I-6181), Surge (MIL-STD-704).

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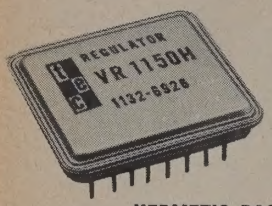
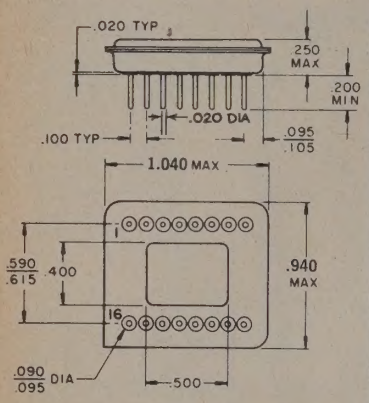
hybrid regulators



HERMETIC PACKAGE
cold-weld — gold plated



All dimensions in inches

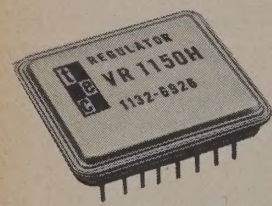
+12 to +32 VDC hybrid voltage regulator VR series

COMMON SPECIFICATIONS

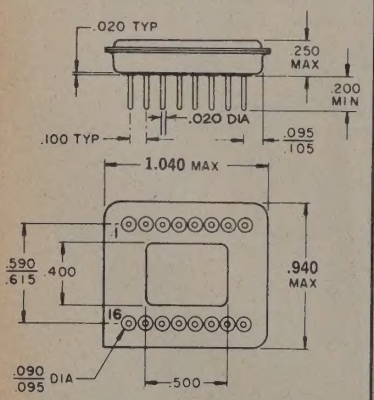
Input: Voltage max., 40VDC. Voltage min., Vout +4VDC typ. Current min., 8ma no load, typ.
Output Voltage: All units externally adjustable from +12 to +32VDC.
Current: 300ma absolute max.
(5) Current: 5A with ext. pass elem.
Impedance: DC to 100Hz 0.1 typ. 100Hz to 100KHz 1.5 typ.
Power Dissipation: 2 watts max. @ 25°C derating to 0.4W @ 125°C. (Typ. P.C. Mtg.)
Temperature Operating: —55 to +125°C.
Protection: Short Circuit proof, current foldback, knee ext. adj.
Ripple Attenuation: 4000: 1 typ.

MODEL SPECIFICATIONS

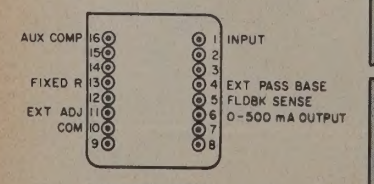
Model	Output		Regulation (mv)			Price
	Voltage VDC	Current ma	Line mV/V	Load ½-F	Temp. mv/°C	
VR-	(1) Nom.	Max.	Max.	Max.	Typ.	1 ea.
1150	15	250	0.5	7	1.0	$56.00
1180	18	250	0.5	7	1.2	56.00
1200	20	250	0.5	7	1.3	56.00
1220	22	250	0.5	7	1.5	56.00
1240	24	250	0.5	7	1.6	56.00
1280	28	250	1.0	7	1.9	56.00
1320	32	250	1.0	7	2.0	56.00



HERMETIC PACKAGE
cold-weld — gold plated



All dimensions in inches



—12 to —32 VDC hybrid voltage regulators VR series

COMMON SPECIFICATIONS

Input: Voltage max., 40VDC. Voltage min., Vout +4VDC typ. Current min., 8ma no load, typ.
Output Voltage: All units externally adjustable from —12 to —32VDC.
Current: 300ma absolute max.
(5) Current: 5A with ext. pass elem.
Impedance: DC to 100Hz 0.1 typ. 100Hz to 100KHz 1.5 typ.
Power Dissipation: 2 watts max. @ 25°C derating to 0.4W @ 125°C. (Typ. P.C. Mtg.)
Temperature Operating: —55 to +125°C.
Protection: Short Circuit proof, current foldback, knee ext. adj.
Ripple Attenuation: 2000: 1 typ.

MODEL SPECIFICATIONS

Model	Output		Regulation (mv)			Price
	Voltage VDC	Current ma	Line mV/V	Load ½-F	Temp. mv/°C	
VR-	(1) Nom.	Max.	Max.	Max.	Typ.	1 ea.
2150	15	250	0.5	12.0	1.0	$56.00
2180	18	250	.8	12.0	1.2	56.00
2200	20	250	.8	12.0	1.3	56.00
2220	22	250	.8	12.0	1.5	56.00
2240	24	250	1.0	12.0	1.6	56.00
2280	28	250	1.2	12.0	1.9	56.00
2320	32	250	2.5	12.0	2.1	56.00

NOTES:
(1) Factory set internally to ±1%, other fixed voltages available on request.
(2) For operation without foldback tie pin 11 to pin 13 and tie pin 4 to 5 to 6.
(3) For operation with foldback tie pin 11 to pin 13 and tie pin 4 to 5 and R_S from 4 and 5 to pin 6.
(4) For adjustable output, tie 10K pot between pin 6 and 11 and remove pin 11 to pin 13 jumper.
(5) For extended current range connect PNP transistor with B > 25 as follows: collector to pin 1, base to pin 4, emitter to pin 5 and 6 and a 10 ufd capacitor from pin 6 to Com, and jumper pins 11 and 13.

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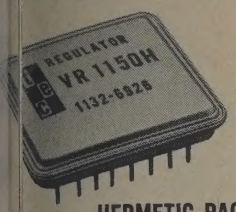
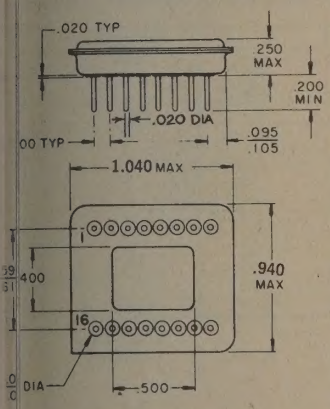
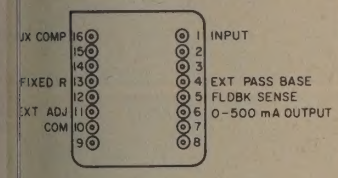
regulators and other hybrid products

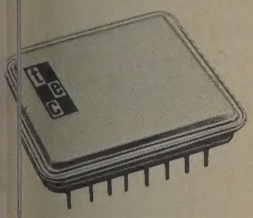


HERMETIC PACKAGE
cold-weld — gold plated

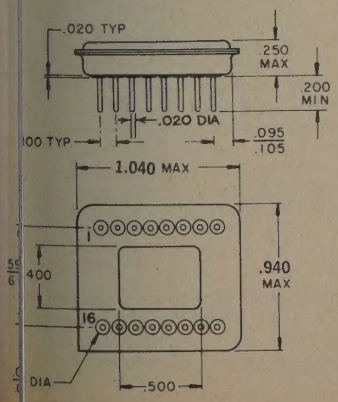


All dimensions in inches





HERMETIC PACKAGE
cold-weld — gold plated



All dimensions in inches

+3 to +12 VDC hybrid voltage regulators VR series

COMMON SPECIFICATIONS

Input: Voltage max., 40VDC. Voltage min., Vout +4VDC typ. Current min., 8ma no load, typ.
Output Voltage: All units externally adjustable from +3 to +12VDC.
Current: 300ma absolute max.
(5) Current: 5A with ext. pass elem.
Impedance: DC to 100Hz 0.1Ω typ. 100Hz to 100KHz 1.5 typ.
Power Dissipation: 2 watts max. @ 25°C derating to 0.4W @ 125°C. (Typ. P.C. Mtg.)
Temperature Operating: −55 to +125°C.
Protection: Short Circuit proof, current foldback, knee ext. adj.
Ripple Attenuation: 200: 1 typ.

MODEL SPECIFICATIONS

Model	Output		Regulation (mv)			Price
	Voltage VDC	Current ma	Line mV/V	Load ½-F	Temp. mv/°C	
VR-	(1) Nom.	Max.	Typ.	Typ.	Typ.	1 ea.
1030	3.	250	0.6	4.2	0.6	$56.00
1050	5.	250	1.0	7.0	1.0	56.00
1060	6.	250	1.2	8.4	1.2	56.00
1080	8.	250	1.6	11.2	1.6	56.00
1100	10.	250	2.0	14.0	2.0	56.00
1120	12.	250	2.4	16.8	2.4	56.00

NOTES:
(1) Factory set internally to ±1%, other fixed voltages available on request.
(2) For operation without current foldback tie pin 11 to pin 13 and tie pin 4 to 5 to 6.
(3) For operation with foldback, tie pin 11 to pin 13 and tie pin 4 to 5 and R_S from 4 and 5 to pin 6.
(4) For adjustable output, tie 10K pot between pin 6 and 11 and remove pin 11 to pin 13 jumper.
(5) For extended current range, connect NPN transistor with B > 25 as follows: collector to pin 1, base to pin 4, emitter to pin 5 and a 10 ufd capacitor from pin 6 to com, and jumper pins 11 and 13.
(6) Pin 9 is caseground.

other hybrid power conditioning products

custom

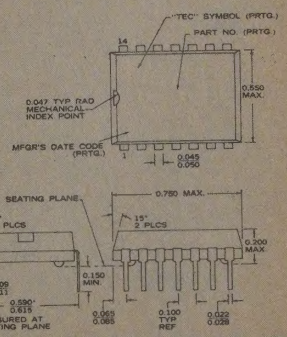
THICK FILM HYBRID CIRCUITS

- Compatible with monolithic I/C's-DIP package
- High power capability — 30 watts/in²
- Wide range of resistance values — 10 ohms to megohms
- Wide range of capacitance values — to 0.1 mfd
- Wide selection of NPN/PNP and FET devices
- Parasitic capacitance and inductance negligible
- Low "set-up" and unit costs in moderate quantities

Rapid response is given to your microelectronic circuit requirements within the above definition. Your circuit prototypes are rapidly optimized by our experienced semiconductor and hybrid integrated circuit staff, with quality production units supplied from our modern hybrid circuit production facility in Boulder, Colorado.

Watch for new **Hybrid Circuit Products** from TEC in major electronics publications.

alternate plastic package



standards

- dual regulators
- converters
- inverters
- drivers (clocks)
- protection circuits
- special purpose regulators

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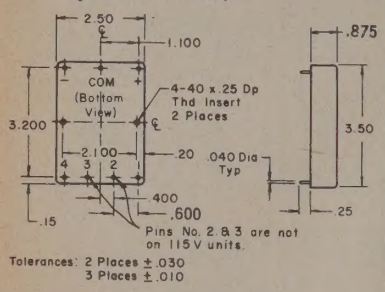
tecnetics inc.

AC-DC power supplies

CASE MATERIAL: aluminum

FINISH: black anodize (per MIL-A-8625)



Tolerances: 2 Places ±.030
3 Places ±.010

All dimensions in inches

3 watt AC-DC regulated power supplies PM series

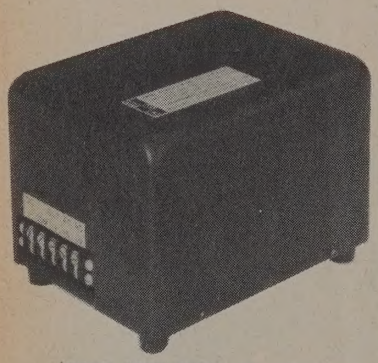
COMMON SPECIFICATIONS

Input Voltage: 105-125Vac
Input Frequency: 47-420 Hz
Temperature Operating: −40° to +85°C
Protection: Short Circuit
Weight: 11 oz.

MODEL SPECIFICATIONS

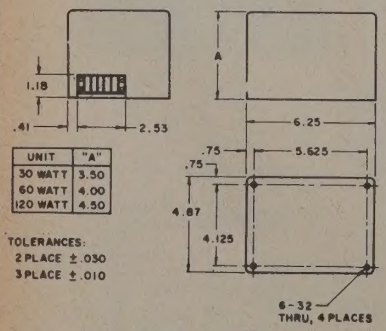
Model	Output			Regulation		
	Voltage VDC	Current ma	Ripple mVrms mv	Line 105-125Vac	Load 0-F	Price
PM-	Nom.	Max.	Typ.	Typ.	Typ.	1 ea.
1050(3)	+5	500	5.0	2.0	5	$49.0
1120	+12	500	5.0	3.0	3	49.0
1150	+15	200	7.5	4.0	3	49.0
2120	−12	250	6.0	3.0	5	49.0
2150	−15	200	7.5	3.0	5	49.0
3120	±12	±125	6.0	3.0	2	59.0
3150(3)	±15	±100	7.5	4.0	2	59.0
4201(2)	+200	30	2.7V	30V	60V	39.0
4280(2)	+28	216	0.38V	4.2V	8.4V	37.0

Notes:
(1) 115/230 Vac Models available.
(2) Unregulated; contact factory for further information.
(3) Available from stock.



CASE MATERIAL: aluminum

FINISH: black anodize (per MIL-A-8625)



UNIT	"A"
30 WATT	3.50
60 WATT	4.00
120 WATT	4.50

TOLERANCES:
2 PLACE ±.030
3 PLACE ±.010

All dimensions in inches

30, 60, and 120 watt AC to DC power supplies PP series

COMMON SPECIFICATIONS

Input Voltage: 105-135Vac
Input Frequency: 50-400 Hz
Efficiency: 80% typical
Temperature Operating: −25° to +70°C

MODEL SPECIFICATIONS

Model	Output			Regulation			
	Voltage VDC	Current A	Ripple Vp-p	Line 105-135Vac	Load ½-F	Temp. 25-70°C	Price
PP-	Nom.	Max.	Typ.	Typ.	Typ.	Typ.	1 ea.
1280	+28	1.07	1.9	6.5	2.1	0.2	$41.20
2200	±20	±0.75	1.4	3.9	1.4	0.1	48.60
3280	+28	2.15	1.9	6.9	2.4	0.1	46.40
4200	±20	±1.5	1.0	5.0	1.1	0.1	58.20
5280	+28	4.3	2.0	7.5	2.2	0.1	55.80
6200	±20	±3.0	1.7	5.0	1.0	0.2	61.00

NOTES:
(1) Input slow blow fuse recommended.
(2) Contact factory for units designed for 400Hz only, and/or 230Vac input. Other inputs also available.

DESCRIPTION

The Prime Power Series AC/DC Power Supplies are especially useful as central unregulated pov sources for feeding "Point-of-Load" regulators. Three power levels, 30W, 60W, and 120W, and t choices of output voltages (±20VDC and +28VDC) make these rugged supplies well suited many applications. High reliability components and conservative ratings provide trouble-fi operation.

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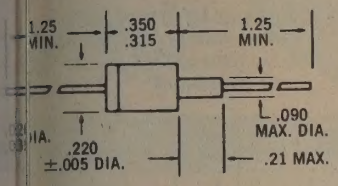
tecnetics inc.

transient limiters—reliability data



CASE DO-13

rmetically sealed, gold plated

otr models

he are 75 other models available with staoff voltages ranging from 6VDC to 200C.

otr applications

- ervoltage protection
- ntning protection
- tifier protection

ebility data

TEC has a flexible quality control program and organization which has been certified to eet all of the requirements of **MIL-Q-98A.**

TEC has been manufacturing highly reliable mi ture DC-DC converters and associated sol state products since 1959 for industri aerospace, and military applications and has established engineering, manufactu g, and quality control procedures. TEC's pr cts utilize high quality components and ma rials. MTBF data has been calculated pe **MIL-HDBK-217** (90,000 hours, typical).

Ma products have been designed to meet the environmental requirements of **MIL-E-54** as specified by **MIL-T-5422.**

TE products have been utilized in equipme designed to meet **MIL-I-6181D.**

Pr cts are designed for an input voltage co rming to **MIL-STD-704A** and include re se polarity protected to 50V and for in t transient of 50V for one second. Ad nal protection can be provided to meet th total requirements of **MIL-STD-704A.** Re rence catalog for TEC LT Series.

MIL-STD-704A transient suppressor limitran LT series

COMMON SPECIFICATIONS

Peak Voltage Protection: to 1200Vac; 600VDC/10 μsec max.
Response Time: 1 x 10^{-12} secs.
Peak Pulse Power Dissipation @ 25°C: 1500 Watts.
Continuous Power Dissipation: 1 Watt.
Failure Mode: Short Circuit.
Forward Surge: 200 amps for 8.3msecs @ 25°C.
Storage and Operating Temperature: —65°C to +175°C.
Equipment Protection: From 80V surges 70msecs. From 50V surges to 1 sec.
Weight: 1.5 grams (approx.).

MODEL SPECIFICATIONS

TEC Model	Jedec Type Number	Stand-Off or Rev. Volt. VR	A.C. Stand-Off or (RMS) Rev. Voltage Vr	Max. Rev. Leak. @ VR IR	Min. Break-down Volt. @ 1 mA Bv	Max. Clamp. Volt. @ ipp Vc	Max. Peak Pulse Cur. (fig. 2) Icr	Max. Temp. Coef.	Price
LT-		Volts D.C.	Volts RMS	Micro-Amps	Volts D.C.	Volts D.C.	Amps	%°/	1 ea.
1300	1N5555	30.5	21.5	5	33.0	47.5	32	+.093	$ 9.70
1400	1N5556	40.3	28.5	5	43.7	63.5	24	+.094	9.70
1490	1N5557	49.0	34.5	5	54.0	78.5	19	+.096	9.70
1171	1N5558	175.0	124.0	5	191.0	265.	5.7	+.100	12.20

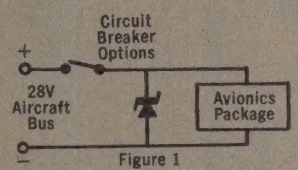


Figure 1
28V D.C. Supply Protection

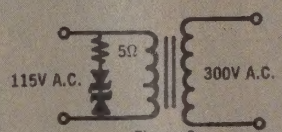


Figure 2
Circuit Protection from Overvoltage Supply Power

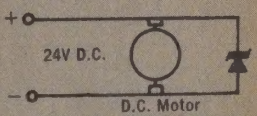


Figure 3 EMI Limiting

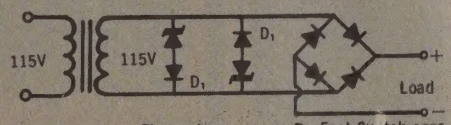


Figure 4
Extra Fast A.C. Transient Clipping

D_1 Fast Switch core driver diode

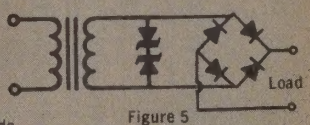


Figure 5
115V A.C. Supply Protection

TEC hybrid products are available in a hermetically sealed package which meets the following requirements of **MIL-STD-883:**

TEST	SPECIFICATION	PARAGRAPH NO.
Internal Visual Inspect.	MIL-STD-883	Method 2010, Cond. "C"
High-Temp. Storage	MIL-STD-883	Method 1008, Cond. "C", for 24 hours
Temperature Cycle	MIL-STD-202	Method 102, Cond. "C"
Mechanical Shock	MIL-STD-883	Method 2002, 1-1500G's along Y Axis
Fine Leak	MIL-STD-883	Method 1014, Cond. "A"
Gross Leak	MIL-STD-883	Method 1014, Cond. "C"
Burn-In	None	160°F. @ Full Load for 48 hours
Vibration	MIL-STD-883	Test Cond. "A" —5 shocks @ 1500G's on each axis

TEC products have been designed and manufactured in accordance with requirements of the following:

MIL-E-5400	MIL-STD-130	MIL-Q-9858A
MIL-E-16400	MIL-STD-202	MIL-A-8625
MIL-STD-883	MIL-I-6181D	MIL-S-19500
MIL-STD-704A	MIL-HDBK-217	MIL-T-5422

Terms and conditions are in accordance with ASPR.

Prices and specifications in this catalog are effective 1 January 1970 and are subject to change without notice. Discounts up to 30% for 100 pieces. Contact factory for other quantity discounts.

Terms: Net 30 Days

F.O.B. Boulder, Colorado U.S.A.

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TODD SYSTEMS POWER SUPPLIES

...sets the standards for the industry!

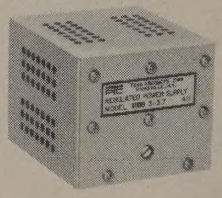
FEATURES

- .01% Regulation
- .5 mV rms ripple
- All silicon—no heat sink required
- 71 degree C operating temperature
- Short circuit / overload protection
- Electronic current foldback with automatic recovery
- Over Voltage protection option
- Designed to meet MIL environmental specificatior
- No turn-on or turn-off spike or overshoot

SINGLE OUTPUT—SLOT RANGE

MMS SERIES

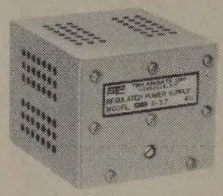
M = Module
M = Miniature 3 7/64 x 3 21/32 x 4 1/2
S = Slot Range (±10%)



Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C	Unit Price
MMS-3-1.1	3	1.1	1.0	0.8	69.
MMS-4-1	4	1.0	0.9	0.7	69.
MMS-5-.88	5	.88	.80	.72	69.
MMS-6-.82	6	.82	.75	.60	69.
MMS-7-.75	7	.75	.68	.54	69.
MMS-8-.69	8	.69	.63	.50	69.
MMS-10-.59	10	.59	.54	.43	69.
MMS-12-.53	12	.53	.48	.38	69.
MMS-14-.46	14	.46	.42	.33	69.
MMS-16-.42	16	.42	.38	.30	69.
MMS-20-.35	20	.35	.32	.25	69.
MMS-24-.32	24	.32	.29	.23	69.
MMS-28-.26	28	.26	.24	.19	69.
MMS-36-.21	36	.21	.19	.15	69.
MMS-48-.16	48	.16	.15	.12	69.
MMS-100-.08	100	.08	.07	.06	89.
MMS-120-.06	120	.06	.06	.05	89.
MMS-150-.05	150	.05	.05	.04	89.

MMS SERIES

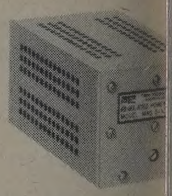
M = Module
M = Miniature 3 7/64 x 3 21/32 x 4 1/2
S = Slot Range (±10%)



Model	Nom. Volt	MAX I AT AMBIENT 50°C	60°C	71°C	Unit Price
MMS-3-1.6	3	1.6	1.4	1.2	79.
MMS-4-1.5	4	1.5	1.3	1.1	79.
MMS-5-1.3	5	1.3	1.1	1.0	79.
MMS-6-1.2	6	1.2	1.0	.90	79.
MMS-7-1.1	7	1.1	1.0	.80	79.
MMS-8-1.0	8	1.0	.90	.76	79.
MMS-10-.88	10	.88	.79	.67	79.
MMS-12-.80	12	.80	.72	.61	79.
MMS-14-.69	14	.69	.62	.52	79.
MMS-16-.63	16	.63	.56	.48	79.
MMS-20-.52	20	.52	.46	.40	79.
MMS-24-.48	24	.48	.43	.36	79.
MMS-28-.42	28	.42	.37	.32	79.
MMS-36-.31	36	.31	.28	.24	79.
MMS-48-.24	48	.24	.21	.18	79.
MMS-100-.12	100	.12	.10	.09	99.
MMS-120-.09	120	.09	.08	.07	99.
MMS-150-.07	150	.07	.06	.05	99.

MAS SERIES

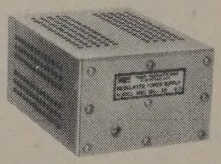
M = Module
A = 3 7/64 x 3 21/32 x 6 1/4
S = Slot Range (±10%)



Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C
MAS-3-3.7	3	3.7	3.4	1.8
MAS-4-3.6	4	3.6	3.3	1.8
MAS-5-3.5	5	3.5	3.2	1.8
MAS-6-3.4	6	3.4	3.1	1.8
MAS-7-3.1	7	3.1	2.8	1.8
MAS-8-2.8	8	2.8	2.6	1.8
MAS-10-2.4	10	2.4	2.2	1.7
MAS-12-2.2	12	2.2	2.0	1.6
MAS-14-2.0	14	2.0	1.8	1.4
MAS-16-1.8	16	1.8	1.7	1.3
MAS-20-1.4	20	1.4	1.3	1.0
MAS-24-1.2	24	1.2	1.1	.88
MAS-28-1.1	28	1.1	1.0	.80
MAS-36-.88	36	.88	.80	.64
MAS-48-.70	48	.70	.63	.50
MAS-100-.34	100	.34	.31	.25
MAS-120-.28	120	.28	.26	.21
MAS-150-.23	150	.23	.21	.17

MBS SERIES

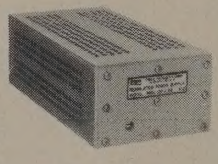
M = Module
B = 3 7/64 x 4 27/32 x 6 1/4
S = Slot Range (±10%)



Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C	Unit Price
MBS-3-5.0	3	5.0	4.5	2.9	115.
MBS-4-5.0	4	5.0	4.5	2.9	115.
MBS-5-5.0	5	5.0	4.5	2.9	115.
MBS-6-5.0	6	5.0	4.5	2.9	115.
MBS-7-4.6	7	4.6	4.2	2.9	115.
MBS-8-4.2	8	4.2	3.8	2.9	115.
MBS-10-3.8	10	3.8	3.5	2.8	115.
MBS-12-3.2	12	3.2	2.9	2.3	115.
MBS-14-2.8	14	2.8	2.6	2.1	115.
MBS-16-2.6	16	2.6	2.4	1.9	115.
MBS-20-2.1	20	2.1	1.9	1.5	115.
MBS-24-1.8	24	1.8	1.6	1.3	115.
MBS-28-1.5	28	1.5	1.4	1.1	115.
MBS-36-1.2	36	1.2	1.1	.88	135.
MBS-48-1.0	48	1.0	.91	.73	135.
MBS-100-.50	100	.50	.46	.37	135.
MBS-120-.42	120	.42	.38	.30	135.
MBS-150-.34	150	.34	.31	.25	135.

MCS SERIES

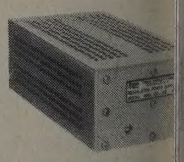
M = Module
C = 3 7/64 x 4 27/32 x 8 3/4
S = Slot Range (±10%)



Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C	Unit Price
MCS-3-7.5	3	7.5	6.5	4.3	135.
MCS-4-7.5	4	7.5	6.5	4.3	135.
MCS-5-7.5	5	7.5	6.5	4.3	135.
MCS-6-7.5	6	7.5	6.5	4.3	135.
MCS-7-7.0	7	7.0	6.4	4.3	135.
MCS-8-6.6	8	6.6	6.0	4.3	135.
MCS-10-5.9	10	5.9	5.4	4.3	135.
MCS-12-5.3	12	5.3	4.8	3.8	135.
MCS-14-4.8	14	4.8	4.4	3.5	135.
MCS-16-4.5	16	4.5	4.1	3.3	135.
MCS-20-3.7	20	3.7	3.4	2.6	135.
MCS-24-3.4	24	3.4	3.1	2.5	135.
MCS-28-3.0	28	3.0	2.7	2.2	135.
MCS-36-2.4	36	2.4	2.2	1.7	155.
MCS-48-2.0	48	2.0	1.8	1.3	155.
MCS-100-1.0	100	1.0	.94	.75	155.
MCS-120-.87	120	.87	.79	.63	155.
MCS-150-.70	150	.70	.64	.51	155.

MDS SERIES

M = Module
D = 4 25/32 x 7 1/2 x 9 3/8
S = Slot Range (±10%)



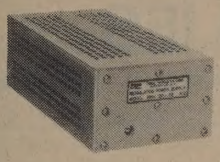
Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C
MDS-3-15.0	3	15.0	13.0	10.0
MDS-4-15.0	4	15.0	13.0	10.0
MDS-5-15.0	5	15.0	13.0	10.0
MDS-6-15.0	6	15.0	13.0	10.0
MDS-7-14.0	7	14.0	12.0	9.0
MDS-8-13.0	8	13.0	11.0	9.0
MDS-10-12.0	10	12.0	10.0	8.0
MDS-12-11.0	12	11.0	10.0	8.0
MDS-14-10.0	14	10.0	9.0	8.0
MDS-16-9.0	16	9.0	8.1	7.0
MDS-20-7.4	20	7.4	6.6	5.7
MDS-24-6.8	24	6.8	6.2	5.1
MDS-28-6.0	28	6.0	5.4	4.6
MDS-36-5.4	36	5.4	4.8	4.1
MDS-48-4.1	48	4.1	3.7	3.1
MDS-100-2.0	100	2.0	1.8	1.5
MDS-120-1.7	120	1.7	1.5	1.3
MDS-150-1.4	150	1.4	1.2	1.0

TODD PRODUCTS CORP.
123 MILBAR AVENUE, FARMINGDALE, N.Y. 11735 — (516) 293-3440

TODD SYSTEMS POWER SUPPLIES

MES SERIES

M = Module
E = 4 25/32 x 7 1/2 x 11 9/16
S = Slot Range (±10%)



Model	Nom. Volt.	MAX I AT AMBIENT 50°C	60°C	71°C	Unit Price
MES-3-22	3	22.0	19.7	16.8	265.
MES-4-21	4	21.0	18.9	16.1	265.
MES-5-20	5	20.0	18.0	15.3	265.
MES-6-19	6	19.0	17.1	14.5	265.
MES-7-18.5	7	18.5	16.6	14.1	265.
MES-8-18	8	18.0	16.2	13.7	265.
MES-10-16	10	16.0	14.4	12.2	265.
MES-12-15	12	15.0	13.5	11.5	265.
MES-14-14	14	14.0	12.6	10.7	265.
MES-16-13	16	13.0	11.7	9.9	265.
MES-20-12	20	12.0	10.8	9.2	265.
MES-24-11	24	11.0	9.9	8.4	265.
MES-28-10	28	10.0	9.0	7.6	265.
MES-36-8	36	8.0	7.2	6.1	265.
MES-48-6	48	6.0	5.4	4.6	295.
MES-100-3.0	100	3.0	2.7	2.0	295.
MES-120-2.5	120	2.5	2.2	1.9	295.
MES-150-2.0	150	2.0	1.8	1.5	295.

SPECIFICATIONS — SINGLE OUTPUT

PUT 05-132 Volts ac 47-420 Hz.

TPU Floating, isolated from ground, 300 Vdc max.

GUL TION: LINE: .01% or 1 mV whichever is greater, for rated input line ltage changes.

LOA .01% or 1mV whichever is greater, for no-load to full load chan at any output within specification.

PPL Less than .5mV rms, 5 mV Peak to Peak (to 10 MHz) (50-60 Hz).

ABI Y: .02% or 10 mV, whichever is greater, for 8 hrs., after 30 min armup. Measured at constant input line, load and amb. temp.

MPE ATURE COEFFICIENT: (.02% + 100 uV)/Deg. C.

MPE ATURE RANGE: OPERATING: −20 to +71 Deg. C. (see power ratin chart). NON-OPERATING: −55 to +85 Deg. C.

COV RY TIME: 50 microseconds to within 50 mV of regulation spec for n load to full-load change.

MO PROGRAMMING: RESISTANCE: 1000 ohms/volt. VOLT: 1 v/v

EMO SENSING: The amplifier is capable of compensating for a 1 volt ad lead loss and still maintain regulation at the load. An addi-tion 1 volt is available at the output if local sensing is used.

VER AD PROTECTION: Fixed, automatic electronic current foldback limi output current for overload and short circuit conditions. Auto-mat recovery upon removal of fault condition.

MER L PROTECTION: Self-resetting thermostat turns supply off for exc ive ambient.

VER VLTAGE PROTECTION (OPTIONAL): Adjustable overvoltage pro-tect , mounts externally.

ODE F OPERATION: Constant voltage / automatic current foldback.

ONT LS: Recessed screwdriver adjust over output range.

ONN TIONS: Barrier strip.

M SPECS, DES NED TO ET THE FO OWING:

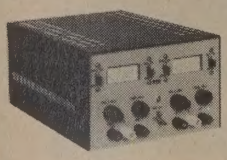
RFI	MIL-I-16910
Vibration	MIL-T-4807A
Shock	MIL-E-4970A Proc. 1 & 2
Humidity	MIL-STD-810 Method 507
Temp. Shock	MIL-E-5272C(ASG) Proc. 1
Altitude	MIL-E-4970A Proc 1
Marking	MIL-STD-130 (Component Board)
Quality	MIL-Q-9858
Transformers	MIL-T-27B Grade 6, Class S
Wire	MIL-W-16878
Fungus Nutrients:	None used

All ices are FOB, Hicksville, N.Y. Prices and pecifications are subject to change with t prior notice.

Constant Voltage/ Constant Current

HAD SERIES

½ Rack
Two Output Dual Range

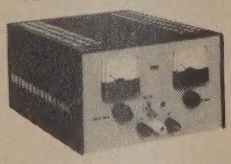


Model		Output Voltage (dc)	Current (A)	Unit Price
HAD15/15 2.5/2.5	#1	0-15 or 0-7	at 1.25 at 2.5	229.
	#2	0-15 or 0-7	at 1.25 at 2.5	
HAD50/50-1/1	#1	0-50 or 0-20	at 0.5 at 1.0	229
	#2	0-50 or 0-20	at 0.5 at 1.0	

Constant Voltage/ Constant Current

HBW SERIES

½ Rack–High Power

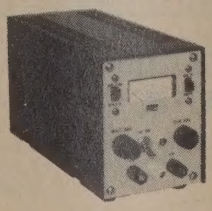


Model	Output Voltage (dc)	Current (A)	Unit Price
HBW20-12	0 to 20	0 to 12	399.
HBW40-5	0 to 40	0 to 5	349.
HBW40-8	0 to 40	0 to 8	419.
HBW60-5	0 to 60	0 to 5	409.

Constant Voltage/ Constant Current

QAD SERIES

¼ Rack–Dual Range

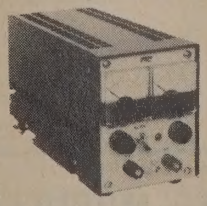


Model	Output Voltage (dc)	Current (A)	Unit Price
QAD15-2.5	0 to 15 or 0 to 7	0 to 1.25 0 to 2.5	119.
QAD50-1	0 to 50 or 0 to 20	0 to 0.5 0 to 1	119.

Constant Voltage/ Constant Current

QBW SERIES

¼ Rack–Single Range



Model	Output Voltage (dc)	Current (A)	Unit Price
QBW20-3	0 to 20	0 to 3	189.
QBW40-2	0 to 40	0 to 2	189.

SPECIFICATIONS

INPUT: 105-132 Volts ac, 47 to 65 Hz.
OUTPUT: Floating, Isolated from ground up to 300 Vdc max.

CONSTANT VOLTAGE MODE

REGULATION: LINE: 0.01% or 1 mV whichever is greater for rated line voltage changes within specifications.
LOAD: 0.01% or 1 mV no load to full load at any output within specs.
RIPPLE: Less than 0.5 mV rms.

CONSTANT CURRENT MODE

REGULATION: LINE: 0.4% of I max. for 105 to 132 Vac line change at any output within rating.
LOAD: 0.1% of I max. over rated compliance range.
RIPPLE: .1% rms.

TODD PRODUCTS CORP.
123 MILBAR AVENUE, FARMINGDALE, N.Y. 11735 (516) 293-3440

TIC THUNDER INTERNATIONAL CORPORATION

POWER SUPPLIES

64 TUTTLE RD. • MIDDLETOWN, CONN. • PHONE (203) 347-8536

AC-DC MODULAR SUPPLIES:

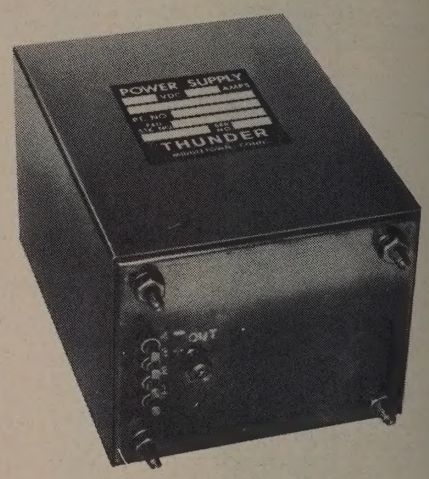
Single, Dual, and Multi-Outputs

FEATURES:

Industrial, Computer, Ground Support Models
Fully Repairable — removable case
Instant Short Circuit Protection
Rugged Design — all units meet highest MIL-Shock and vibration tests

SPECIFICATION RANGES:

Output Voltage.....4.5 VDC - 1,000 VDC
Output Current .....0 - 30 Amps
Regulation .....5% - .05% - .02%
Base Temperature .....75°C to 115°C



FULL MILITARY SPECIFICATION LINE DESIGNED TO COMPLY WITH:

MIL-T-27A	Transformers
MIL-Std-701, MIL-S-19500	Semiconductors
MIL-C-3965	Capacitors
MIL-E-4158, MIL-E-5400, MIL-E-16400, MIL-E-5272, MIL-T-21200	Workmanship and Environmental

CERTIFIED TEST DATA ON MILITARY COMPLIANCE

CUSTOM SPECIALS

- Integrated Circuit Types
- Open Frame
- Micro-Miniature Versions
- Commercial Types

DC to DC CONVERTERS — MODULAR

SPECIFICATION RANGES:

Input Voltage .....24 VDC - 30 VDC
Output Voltage .....5.0 VDC - 5,000 VDC
Base Temperature .....75°C to 115°C

FEATURES:

Rugged Design
Spike Protection

FULL MILITARY VERSION AVAILABLE

TIC THUNDER INTERNATIONAL CORPORATION

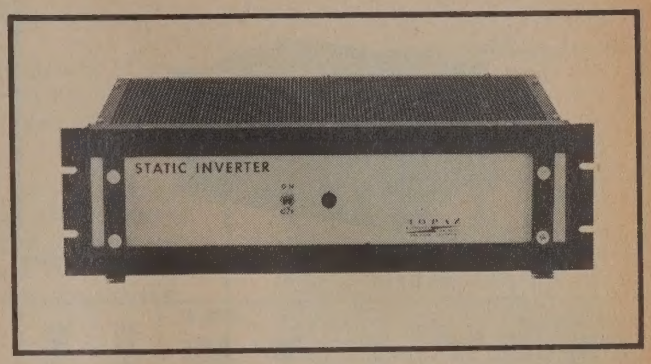
WEST COAST — 16024 VENTURA BLVD. • ENCINO, CALIF. • PHONE (213) 788-4540
EAST COAST — 64 TUTTLE ROAD • MIDDLETOWN, CONN. • PHONE (203) 347-8536

TOPAZ ELECTRONICS

3855 RUFFIN ROAD, SAN DIEGO, CALIFORNIA 92123 • TELEPHONE (714) 279-0111

SRIES • DC to AC SINE WAVE INVERTERS

W series inverters supply quality AC power from DC Output regulation and frequency stability are closely d, normally exceeding the specifications of public wer. A wide tolerance from nominal input voltage is to accommodate the characteristics of storage bat- lso, because most AC equipment exhibits a higher load than running load, the GW series is designed omatic current limiting. This feature prevents turn e inverter even under continuous overload. Other tions as outlined below exemplify the quality and ght that have gone into the GW design.



RAL SPECIFICATIONS

NCY STABILITY:	±1% as listed. Std. Options (see below) offer 0.05% and 0.001%.
ATURE:	Operating −20°C. to +50°C. • Storage −40°C. to +80°C.
TION (Circuits included):	Input reverse polarity • Low or high input voltage • Overload and short circuit.
HARMONIC DISTORTION:	<5% at full load
VOLTAGE:	115 VAC normally supplied • 230 VAC available where listed.
E REGULATION:	Line: ±2% • Load: ±3%
FILTERING:	Filter S-1 — Reduces noise level at battery input to less than 30 dbrn. Filter S-2 — Protects unit from spikes on input of 1000 V. for up to 5 microseconds. Filter S-3 — Protects unit from spikes on input of 3000 V. for up to 1 millisecond.

Portable and rack-mounted units are available. Dimensions given in tables are for rack-mount versions. Add letter "D" in model number (GWD) to obtain portable mount.

Mod "A" Frequency Stability: ±0.001%
Mod "C" Frequency Stability: ±0.05%
Mod "E" External Synchronization: By pulse or sine wave
Mod "M" 2 meters (input or output voltage or amps.)
Mod "R" Automatic Restart

z SINE WAVE OUTPUT

NPUT 12 or 24 VOLTS DC

ble input range for operation 1-15 VDC or 22-30 VDC)

RACK MODEL NO. (Request GWD for portable version)	OUTPUT (SINEWAVE) Power VA	Volts AC	INPUT Amperage (No load to full load) @ 12 VDC	@ 24 VDC	Full Load Eff.	HEIGHT Inches Overall All units 19" w x 13½" d	Net Wt. (Lbs.)	Ship Wt. (Lbs.)
125 GW-12-24-60	125	115	4 - 18	2 - 9	60%	5-1/4	30	44
250 GW-12-24-60	250	115	8 - 32	4 - 16	60%	5-1/4	39	55
500 GW-12-24-60	500	115	15 - 60	7.5- 30	70%	8-3/4	70	100
1000 GW-12-24-60	1000	115/230	22 - 120	11 - 60	70%	8-3/4	95	130
2000 GW-12-24-60	2000	115/230	44 - 240	22 - 120	70%	17-1/2	190	260
3000 GW-12-24-60	3000	115/230	70 - 360	35 - 180	70%	26-1/4	285	390
4000 GW-12-24-60	4000	115/230	90 - 480	45 - 240	70%	35	380	520

ALSO AVAILABLE AS: GW-28-60 (24-32 VDC INPUT); GW-48-60 (42-56 VDC INPUT); GW-125-60 (105-140 VDC INPUT); GW-250-60 (210-280 VDC INPUT).

Hz SINE WAVE OUTPUT

INPUT 12 or 24 VOLTS DC

able input range for operation 1-15 VDC or 22-30 VDC)

125 GW-12-24-400	125	115	10 - 20	5 - 10	53%	5-1/4	25	40
250 GW-12-24-400	250	115	12 - 35	7 - 18	53%	5-1/4	30	45
500 GW-12-24-400	500	115	24 - 66	12 - 33	63%	8-3/4	43	75
1000 GW-12-24-400	1000	115	48 - 132	24 - 66	63%	8-3/4	56	90
2000 GW-12-24-400	2000	115	96 - 264	48 - 132	63%	17-1/2	112	182
3000 GW-12-24-400	3000	115	144 - 396	72 - 198	63%	26-1/4	168	273
4000 GW-12-24-400	4000	115	192 - 528	96 - 264	63%	35	224	364

ALSO AVAILABLE AS: GW-28-400 (24-32 VDC INPUT); GW-125-400 (100-140 VDC INPUT).

z SINE WAVE OUTPUT

INPUT 12 or 24 VOLTS DC

able input range for operation 1-15 VDC or 22-30 VDC)

100 GW-12-24-50	100	115/230	5 - 14	2.5- 7	60%	5-1/4	30	44
200 GW-12-25-50	200	115/230	9 - 26	4.5- 13	60%	5-1/4	39	55
400 GW-12-24-50	400	115/230	15 - 60	7.5- 30	70%	8-3/4	70	100
800 GW-12-24-50	800	115/230	18 - 96	9 - 48	70%	8-3/4	95	130
1600 GW-12-24-50	1600	115/230	36 - 192	18 - 96	70%	17-1/2	190	260
2400 GW-12-24-50	2400	115/230	54 - 288	27 - 144	70%	26-1/4	285	390
3200 GW-12-24-50	3200	115/230	72 - 384	36 - 192	70%	35	380	520

ALSO AVAILABLE AS: GW-48-50 (42-56 VDC INPUT); GW-125-50 (105-140 VDC INPUT).

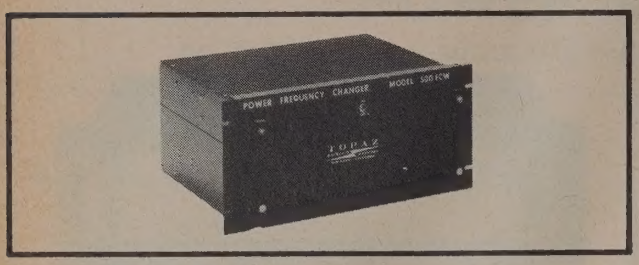
"IF IT'S NOT ALREADY A TOPAZ STANDARD, LET US DESIGN A UNIT FOR YOU."

TOPAZ ELECTRONICS

3855 RUFFIN ROAD, SAN DIEGO, CALIFORNIA 92123 • TELEPHONE (714) 27

FW SERIES • FREQUENCY CHANGERS SINE WAVE OU

(SINGLE OR THREE-PHASE* I



Topaz frequency changers are designed to convert any line frequency of 45 Hz to 500 Hz to a single outp quency of either 50, 60, or 400 Hz. In addition to the c use of changing from one power system frequency to a frequency changers also find wide application in stat frequency and amplitude for critical electronic equi

* WRITE FACTORY FOR 3-PHASE AVAILABILITY.

60 Hz OUTPUT MODELS

RACK MODEL NO. (Request FWD for portable version)	OUTPUT Power VA	OUTPUT Volts AC	OUTPUT Freq. Hz	RACK HT. Inches Overall	Net Wt. (Lbs.)	Ship Wt. (Lbs.)
125 FW-60	125	115	60	5-1/4	38	52
250 FW-60	250	115	60	5-1/4	47	63
500 FW-60	500	115	60	8-3/4	80	110
1000 FW-60	1000	115/230	60	8-3/4	110	145
2000 FW-60	2000	115/230	60	17-1/2	220	290
3000 FW-60	3000	115/230	60	26-1/4	330	435
4000 FW-60	4000	115/230	60	35	440	580

400 Hz OUTPUT MODELS

125 FW-400	125	115	400	5-1/4	35	50
250 FW-400	250	115	400	5-1/4	40	55
500 FW-400	500	115	400	8-3/4	53	85
1000 FW-400	1000	115	400	8-3/4	60	95
2000 FW-400	2000	115	400	17-1/2	120	190
3000 FW-400	3000	115	400	26-1/4	180	285
4000 FW-400	4000	115	400	35	240	380

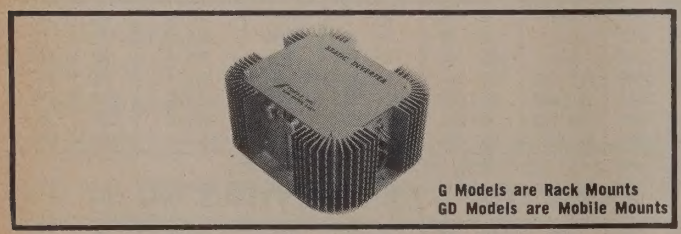
50 Hz OUTPUT MODELS

100 FW-50	100	115/230	50	5-1/4	38	52
200 FW-50	200	115/230	50	5-1/4	47	63
400 FW-50	400	115/230	50	8-3/4	90	110
800 FW-50	800	115/230	50	8-3/4	110	145
1600 FW-50	1600	115/230	50	17-1/2	220	290
2400 FW-50	2400	115/230	50	26-1/4	330	435
3200 FW-50	3200	115/230	50	35	440	580
4000 FW-50	4000	115/230	50	43-3/4	550	725

GENERAL SPECIFICATIONS

INPUT:	
Voltage:	95 to 125 VAC 190 to 250 VAC available
Frequency:	45 to 500 Hz
OUTPUT:	
Voltage:	115 VAC at fixed frequency 115/230 where listed
Voltage Regulation:	Line ±2%; Load ±3%
Frequency Stability:	±1% standard (Mod A & C a
Total Harmonic Distortion:	< 5% at full load
PROTECTION: (Circuits included)	Low or high input voltage, Overload and short circuit (current limiting).
TEMPERATURE:	Operating −20°C. to +50°C. Storage −40°C. to +80°C.
PACKAGING:	Rack width: 19" Rack depth: 19¾" Height listed in tables.
AVAILABLE OPTIONS:	Frequency Stability: ±0.05%, "Mod C" after model nu ±0.001% add Mod "A". External Synchronization: By or sine wave, add "Mod E" model number. Automatic Restart: add "Mo after model number.

G SERIES • DC-to-AC INVERTERS SQUARE WAVE OU



G Models are Rack Mounts
GD Models are Mobile Mounts

"G" series square wave inverters, while modestly retain many features of the Topaz "GW" sine wave The square wave output and reduced voltage regula satisfactory for many less stringent applications w extremely stable frequency is required.

60 Hz OUTPUT

Model Number	OUTPUT Power VA	OUTPUT Volts AC 60 Hz	INPUT Amperage (No load to full load) @ 12 VDC	INPUT Amperage @ 24 VDC	Full Load Eff.	DIMENSIONS Inch. Overall (H x W x D)	Net Wt. (Lbs.)	Ship Wt. (Lbs.
250 G-12-24-60	250	125	3 - 25	1.5-12.5	80%	8¾ x 19 x 4½	20	36
250-GD-12-24-60	250	125	3 - 25	1.5-12.5	80%	4½ x 8½ x 10	20	36
500 G-12-24-60	500	125	6 - 50	3 -25	84%	5¼ x 19 x 11	40	59
500 GD-12-24-60	500	125	6 - 50	3 -25	84%	5¼ x 19 x 11	40	59

50 Hz OUTPUT

200 G-12-24-50	200	125/250	3 - 25	1.5-12.5	78%	8¾ x 19 x 4½	25	40
200 GD-12-24-50	200	125/250	3 - 25	1.5-12.5	78%	4½ x 8½ x 10	25	40
400 G-12-24-50	400	125/250	6 - 50	3 -25	81%	5¼ x 19 x 11	50	65
400 GD-12-24-50	400	125/250	6 - 50	3 -25	81%	5¼ x 17 x 11	50	65

GENERAL SPECIFICATIONS

FREQUENCY STABILITY:	±1% as listed; Mods " "C" available.
TEMPERATURE:	Operating −20°C. to Storage −40°C. to +8
PROTECTION: (Circuits included)	Input reverse polarity, Overload and short cir (current limiting)
OUTPUT REGULATION:	Line: Proportional to in Load: Less than 10%
PACKAGING:	Dimensions listed in ta "GD" mobile mount pi
AVAILABLE OPTIONS:	Frequency Stability: ±0 add "Mod C" after model ber. External Synchronizatio pulse or sine wave, add E" after model number.

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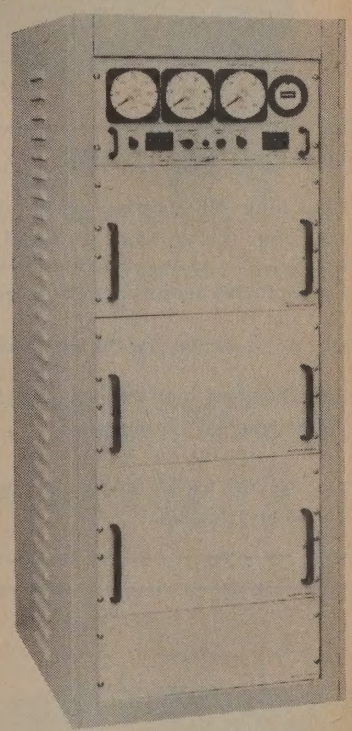
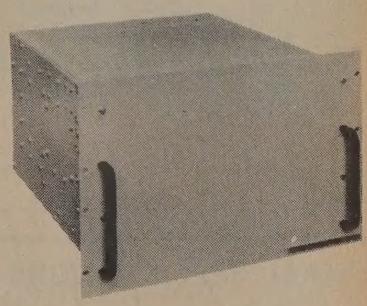
ERIES • SCR HIGH POWER SINGLE AND THREE PHASE, VAVE INVERTERS AND FREQUENCY CHANGERS

TOPAZ "X" series equipment represents an important advance in the the-art of off-the-shelf FREQUENCY CHANGERS and INVERTERS. The es circuit uses SCR's to quasi-square wave commutate input DC into a l harmonic suppressing (sine wave output) transformer.

regulation is accomplished by pulse width modulation of each half of the uare wave. Because this is a time domain control, a high gain feedback n be used to achieve very tight regulation at extremely high electrical ies. SCR switching noise is suppressed and filtered and the resulting NCY CHANGERS and INVERTERS are rugged, compact and very reliable.



7.5 KVA FREQUENCY CHANGER



5 KVA INVERTER

RAL SPECIFICATIONS

T TEMPERATURE:	−20° to 55°C
ITY:	100%
DE:	20,000 Feet
& VIBRATION:	MIL-E-5400 Curve II
REGULATION:	±2% all conditions — line, load and p.f.
FACTOR:	±0.7 (as an option, any constant-load power factor can be corrected for within the unit).
ARMONIC DISTORTION:	(5% max. all conditions) 3% at full load nominal line
RY TIME:	50 ms. 10 to 90% load change
OOT & UNDERSHOOT:	±10%
ANGLE:	120° ±2° for balanced load
NCY:	$\frac{\text{P-out}}{\text{P-in}}$ = 70% min. for FX, 75% min. for GX at nominal line and full load.

DARD PACKAGE AND FEATURES FOR "X" SERIES

cial 19″ rack mounted modules • Modules on slides for ease of main- • Input and output on rear rail • Indicator lights and circuit breaker t and output • Thermal switch and indicator light • Reverse input protection.

INS

limiting — Adjustable where unit becomes a constant current source. — ±3% (a) Input and/or output voltage; (b) running time meter 0-9999 hrs. connected in 120 VAC or 240 VAC 3-wire delta for balanced loads. r output of 240 VAC single phase. hase input 240 VAC delta, 480 VAC delta, or 277/480 Y. elay alarm contacts for loss of input and/or output or overload. Other stan- Topaz modifications Mods A, C, E, R.

-1 — Reduces noise level at battery input to less than 30 dbrn.
-2 — Protects unit from spikes on input of 1000 V. for up to 5 microseconds.
-3 — Protects unit from spikes on input of 3000 V. for up to 1 millisecond.

PHASE OUTPUT FREQUENCY CHANGERS

el ber	Wt. Lbs. (1)	Rack Ht. (5)	Input (3)
-400	60	7″	120
-(F)	125	14″	120/240
-(F)	190	21″	120/240
-(F)	380	42″	120/240

HASE OUTPUT FREQUENCY CHANGERS

-400	180	21″	120
-(F)	375	42″	120/240
-(F)	570	63″	120/240
-(F)	1140	2-63″	120/240

1φ

Power KVA	OUTPUT V	F (Hz)
1	115	400
2.5	115 or 230	50, 60 or 400
5	115 or 230	50, 60 or 400
10	115 or 230	50, 60 or 400

3φ Y (4)

3	115	400
7.5	115 or 230	50, 60 or 400
15	115 or 230	50, 60 or 400
30	115 or 230	50, 60 or 400

SINGLE PHASE OUTPUT INVERTERS

Model Number	Wt. Lbs. (1)	Rack Ht. (5)	Input (2)
—			
2.5 GX-125-(F)	100	14″	125 VDC
5 GX-125-(F)	130	21″	125 VDC
10 GX-125-(F)	260	42″	125 VDC

THREE PHASE OUTPUT INVERTERS

—			
7.5 GX-125-(F)	300	42″	125 VDC
15 GX-125-(F)	390	63″	125 VDC
30 GX-125-(F)	780	2-63″	125 VDC

(1) Weights listed are for 400 Hz output models. 50 or 60 Hz models are 25-45% heavier; (2) Standard inverter input is 125 VDC, however 48, 250, and nput voltages are available on order. For other input, substitute desired voltage in place of 125 in model number. Example: 7.5 GX-48-60; (3) 3φ input s listed are line to neutral; (4) 3φΔ outputs are available for balanced loads; (5) All units are 19″ wide (rack mount) and 21″ deep.

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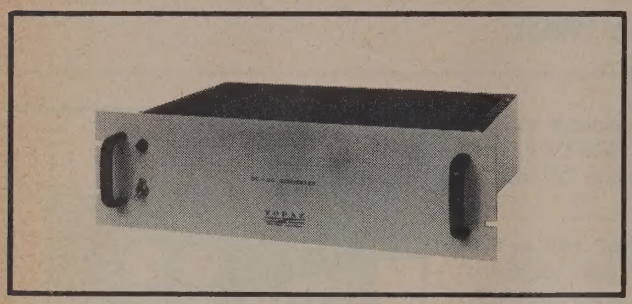


HIGH EFFICIENCY DC-to-DC CONVERT

TOPAZ DC-to-DC Converters . . . constructed completely modular basis . . . are available up t KW output and standard voltage regulation is ± using switching regulators. Input modules, o modules and control circuits all plug into a dard 19″ chassis assembly, which incorporates filtering, controls, circuit breakers, etc. The provide custom power for a system without the one-time engineering charges usually incurre creating a custom system.

DC INPUT VOLTAGES AVAILABLE:
12, 24, 32, 48, 125, 250 (others on special

DC OUTPUTS AVAILABLE:
3 VDC to 1,000 VDC (others on special order).

STANDARD FEATURES

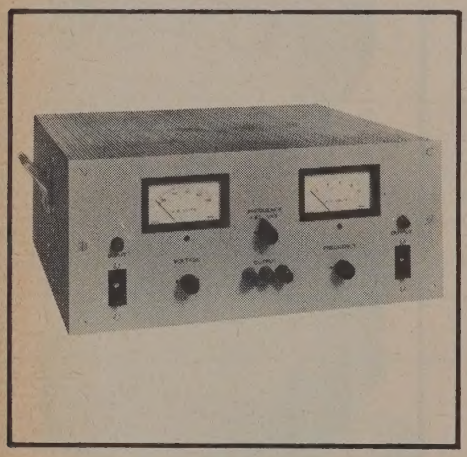
DC input filter will suppress up to 1,000-volt spikes on the DC input line. (Other filters available)

Input is protected against accidental reverse-polarity hook-up.

Outputs are protected against overload, even to short circuits.

MIL Specifications type circuits and construction insure reliable environmental performance.

Note: If desired, an AC output for operation of cooling fans can be made available.



POWER SUPPLIES FOR MIL-STD-704 SIMULAT

Provides 400 Hz variable ±10%, 115 VAC variable ±10% for design, checkout, and manufacture of military electronic syst

Supplies a full kilowatt of 400 Hz sine wave power in a portable which draws less than 15 amps of 60 Hz input.

GENERAL SPECIFICATIONS

OUTPUT VOLTAGE: (Selectable)	Fixed, 115 VAC ±1% nominal Variable, 100-130 VAC
OUTPUT FREQUENCY: (Selectable)	Fixed, 400 Hz ±½% or Variable, 360-440 Hz
INPUT:	120 VAC ±10% single phase 50-450 Hz
SINE WAVE OUTPUT:	Total Harmonic distortion less than 3% at full load.
OPERATING TEMPERATURE:	−20° to +50°C.
CIRCUIT PROTECTION:	Overload, short circuit, current limiting
WEIGHT:	60 pounds per kilowatt
OTHER FEATURES:	Talk to your Topaz applications engineer

MODELS AVAILABLE:

Model No.	Description
1-FXD-400	1 KVA, Single ϕ, Portab
1-FX-400	1 KVA, Single ϕ, Rack
2-FX-400	2 KVA, Single ϕ, Rack
3-FX-400	3 KVA, Single ϕ, Rack
3-FX-400-3	3 KVA, Three ϕ, Rack

Standard Topaz modifications are avail

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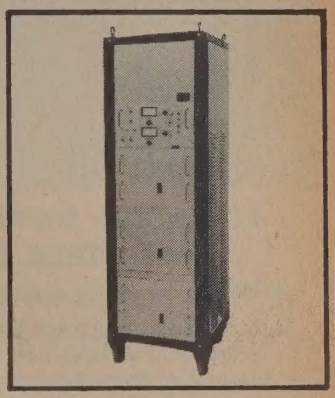
NERRUPTIBLE POWER SYSTEMS (UPS)



PAZUPS invert auxiliary or standby (battery) power to high quality AC power supplying critical processes and equipment during a failure of the public utility supply.

e uninterruptible power system (UPS) typically consists of: (1) Battery; (2) Bat- charger; (3) Inverter; (4) Control circuitry. There are three common types of s or Control Circuits).

YPE A — Continuous on-line (Fig. A)

e critical equipment always operates from the inverter tput. In the event of a failure of utility power, the "floated" tter immediately picks up the load and there is no sen of power.

YPE B — Off-line (Fig. B)

e utility power line supplies the critical equipment until fail at which time the UPS is manually or automatically ut nevertheless leisurely) turned on and switched into the sten In this type of system the inverter may be maintained the line, drawing quiescent power during standby, to mini- ze power transfer time.

YPE C — No-break (Fig. C)

s is an off-line standby system which incorporates a fast ting automatic sensor and transfer switches to supply ase correlated power to the critical equipment with a xim m of ¼ cycle drop-out time in the event of utility wer line failure. The system may be externally controlled hen desired.

cau the usual UPS has many parameters which must be ore to each individual application, it is extremely diffi- t to "catalog" a UPS capability. TOPAZ Inc., however, has olve a program which will calculate optimum system con- ants based on already designed off-the-shelf system oul. If you desire a proposal on your UPS simply pro- e t following information:

1. Description of critical system, including power require- nts.
2. Discussion of system "times": Time on batteries, time to recharge batteries, time to switch, MTBF, allowable transfer time, etc.
3. Any special requirements, noise suppression required, signals and alarms, interfaces, MIL specs, type of bat- tery material preferred, etc.

ing his data, TOPAZ will optimize a system for your spe- al requirements. Normally, a proposal for this equipment n be provided in less than one week.

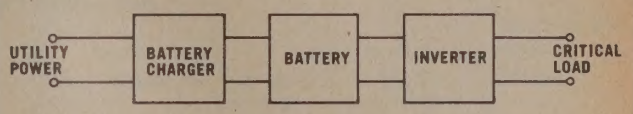


FIGURE A, CONTINUOUS ON-LINE UPS

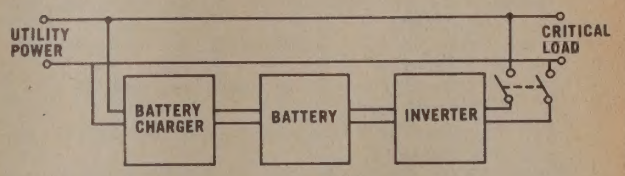


FIGURE B, OFF-LINE UPS

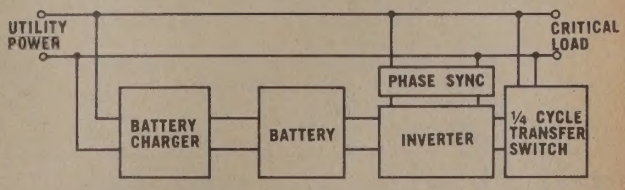


FIGURE C, NO-BREAK UPS

C POWER SUPPLIES

OPA ability to create AC waveforms from DC power urce is employed in the manufacture of extremely small nd lightweight AC-to-DC power supplies. The size and weight a power supply can be significantly reduced if the power ansformer operates at frequencies above 60 Hz. Typically, OPA builds power supplies which operate at 18-20 KHz owe interstage frequency. Extremely small and lightweight C power supplies for critical applications are the result. OPA also manufactures a line of conventional 60 Hz high owe supplies for use as system building blocks. These DC owe supplies may also be used to convert any 24 volt input wer to a frequency changer and are shown in the table.

SPECIFICATIONS:

INPUT: 105-125 VAC or 210-250 VAC
45 to 500 Hz

OUTPUT: 26 VDC ±15%
5% ripple

Model No.	Output VA	Weight	Rack Height*
250P50	400	37	5¼"
500P50	675	65	5¼"
1000P50	1350	90	8¾"
2000P50	2700	180	17½"
4000P50	5500	360	35"

* All units 19" wide x 12" deep.

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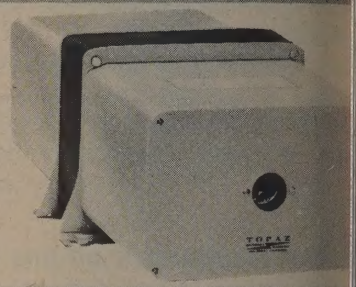
POWER CONDITIONERS

FOR NOISE SUPPRESSION UNEQUALLED BY ANY OTHER DEVICE AT ANY PRICE



ELIMINATES noise pollution caused by . . .

- Electromagnetic Noise Pick-Up (Inductive)
- Electrostatic Noise Pick-Up (Capacitative)
- Leakage Noise Pick-Up (Resistive or Dielectric)

PROTECTS AGAINST . . .

- High, Low, Too-Variable Power-Line Voltages

SHIELDS your own (and everyone else's) power line from noise-generating equipment containing . . .

- Power Switches
- Silicon-Controlled Rectifiers
- Motors
- X-Ray
- Diathermy
- Furnaces
- Plasmas
- Welders

SPECIFICATIONS

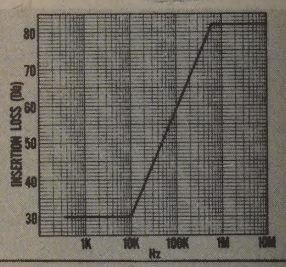
POWER TO LOAD 2 KVA

INPUT 100 to 130 volts, 60 Hz

OUTPUT 115 volts, 60 Hz, sinusoidal wave, with harmonic distortion dependent upon input. Generally less than 3% T.H.D.

COMMON MODE REJECTION 120 DB minimum (by method of MIL-T-27B). One million-to-one attenuation.

NORMAL MODE REJECTION (Measurements made under full-power operation into a resistive load.)



VOLTAGE REGULATION

To Line ±1% for ±15% line variations

To Load —1% for variations of 20% to 100% of full load, resistive.

Power factor	1.	0.9	0.8	0.7	0.6	0.5
% Regulation*	1	2	4	4	4	5

*Regulation negative for lagging power factor (inductive load)
Regulation positive for leading power factor (capacitive load)

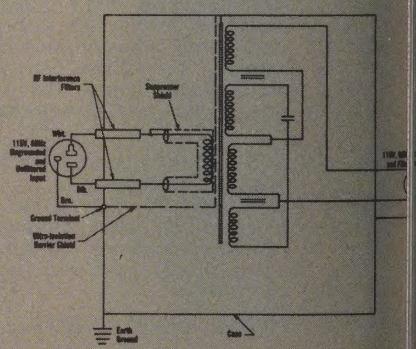
Frequency Effect Above regulation data apply for any given frequency in a band of 60 Hz ±5%
A variation of 1% in line frequency causes output-voltage change of 1.5% in the same direction.

Temperature Effect Output voltage changes —.025% per degree centigrade increase.

ISOLATION
- More than 10,000 megohms insulation resistance between input and output terminals; also between terminals and chassis.
- Less than .005 picofarads effective capacitance** between input and output terminals.
- Ground loops avoided.
- Shock hazards minimized.

SHIELDING

- The Topaz ultra-isolation barrier shield is the guaranty of minimum input-to-output effective capacitance**.
- The suppressor shield minimizes normal mode noise created by the normal process of common-mode noise rejection.
- Special precautions are taken to insure minimum RF leakage.
- RF gaskets are used throughout.
- Bulkhead mounted RF filters are on each side of incoming power line.
- RFI back shell is on matching plug which mates with output receptacle. This facilitates connecting to shielded cable and shielding the load circuits.



***Effective capacitance (sometimes called leakage capacitance) is the capacitance measured between input and output when barrier shield is grounded.*

OVERLOAD & SHORT CIRCUIT PROTECTION
- When loaded beyond rated KVA output voltage drops rapidly reaching zero at short circuit. Output current at this point will be between 125% and 200% of normal rated value.

EFFICIENCY
- 80% at full load and standard output voltage levels.

RESPONSE TIME
- 25 milliseconds (1½ cycles) following step input voltage change within rated limits before output returns to specified regulation range.

MECHANICAL DIMENSIONS

Length	Width	Height
26.00"*	12.50"	8.50"

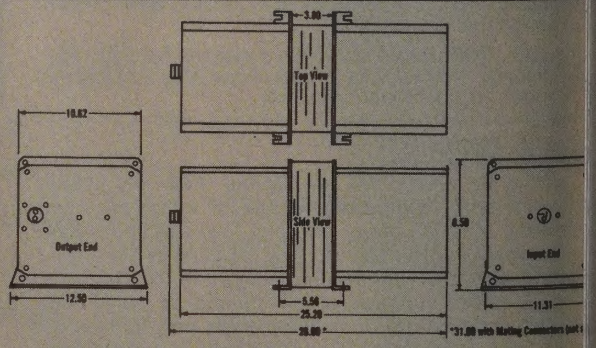
*Length is 31.00" including mating connectors

- Mounting dimensions (on center):

Length	Width
5.56"	11.31"

- Mounting is by means of 4 slotted pads accommodating ⅜" diameter bolts.

WEIGHT		TEMPERATURE	
Unit	130 lbs.	Operating	—20 to +40°C
Shipping	167 lbs.	Storage	—40 to +80°C



RECEPTACLES AND PLUGS FURNISHED
Input receptacle: Arrow-Hart 5878
Input power line matching connector: Hubbel 5474
Output receptacle: Amphenol 97-3102A-22-8-P
Output line matching connector: Glen-aire G-61877 w RFI back shell*

**Customer should connect his two conductor cable (not furnished) to the out matching connector above.*

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ULTRA-ISOLATION TRANSFORMERS

60 Hertz Single-Phase Models
GENERAL SPECIFICATIONS

ISOLATION *Three categories of guaranteed interwinding capacitance are available as listed below. Leakage resistance from either winding to the other or to ground greater than 10,000 megohms.*

COMMON MODE REJECTION *Greater than 125 DB (for .005 pf) to more than 145 DB (for .0005 pf) as previously defined. Transverse noise rejection greater than 40 DB (see preceding text).*

CONSTRUCTION *Class B (130° C. operating) materials used throughout. Hi-Pot 1000 volts (RMS) winding to winding or ground.*

MODEL NUMBER GUAR. INTERWINDING CAPACITANCE ≤.005 pf	≤.001 pf	≤.0005 pf	PRIMARY (VAC) 60 Hz.	SECONDARY (VAC)	STYLE See Diagrams Next Page	% REGULATION NO LOAD TO FULL LOAD	TEMP. RISE °C. FULL LOAD	TERMINATIONS	See drawings, bottom next page. DIMENSIONS (Inches) CASE H	HT	W	D	MOUNTING MW	MD	WT. (Lbs.)
1/811T25SR			120	120	R	4.5	25	Single	4-1/2		5-1/4	7-9/16	4-3/8	2-1/8	11
	1/811T21SR		120	120	R	4.5	25	Outlet	4-1/2		5-1/4	7-9/16	4-3/8	2-1/8	11
		1/811T35SR	120	120	R	4.5	25	Receptacle	4-1/2		4-1/4	7-9/16	4-3/8	2-1/8	11
1/811T25ST			120	120	T	4.5	25		4-1/2		5-1/4	5-11/16	4-3/8	2-1/8	10
	1/811T21ST		120	120	T	4.5	25	Terminals	4-1/2		5-1/4	5-11/16	4-3/8	2-1/8	10
		1/811T35ST	120	120	T	4.5	25		4-1/2		5-1/4	5-11/16	4-3/8	2-1/8	10
1/211T25SR			120	120	R	4	50	Single	4-1/2		5-1/4	8-13/16	4-3/8	3-3/8	18
	1/211T21SR		120	120	R	4	50	Outlet	4-1/2		5-1/4	8-13/16	4-3/8	3-3/8	18
		1/211T35SR	120	120	R	4	50	Receptacle	4-1/2		5-1/4	8-13/16	4-3/8	3-3/8	18
1/211T25ST			120	120	T	4	50		4-1/2		5-1/4	6-15/16	4-3/8	3-3/8	17
	1/211T21ST		120	120	T	4	50	Terminals	4-1/2		5-1/4	6-15/16	4-3/8	3-3/8	17
		1/211T35ST	120	120	T	4	50		4-1/2		5-1/4	6-15/16	4-3/8	3-3/8	17
0111T25SR			120	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
0131T25SR			240	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
0111T25ST			120	120	T	4	55	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
0131T25ST			240	120	T	4	55	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
0155T25FT			125/250*	115/230	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
0111T25FT			120	120	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
	0111T21SR		120	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
	0131T21SR		240	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
	0111T21ST		120	120	T	4	55	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
	0131T21ST		240	120	T	4	55	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
	0155T21FT		125/250*	115/230	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
	0111T21FT		120	120	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
		0111T35SR	120	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
		0131T35SR	240	120	R	4	55	Duplex	6-5/16		8-5/32	10-1/8	6-15/16	3-1/4	28
		0111T35ST	120	120	T	4	66	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
		0131T35ST	240	120	T	4	55	Terminals	6-5/16		8-5/32	8-1/4	6-15/16	3-1/4	27
		0155T35FT	125/250*	115/230	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
		0111T35FT	120	120	F	5.5	42	Terminals	2-1/2	3-3/4	15-1/8	12-5/8	13-7/8	11-3/8	57
*Consists of (2) 125 volt coils with taps at 102, 110, and 118 volts															
0211T25SR			120	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
0231T25SR			240	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
	0211T21SR		120	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
	0231T21SR		240	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
		0211T35SR	120	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
		0231T35SR	240	120	R	4.5	50	Duplex	6-5/16		8-5/32	11-1/8	6-15/16	4-1/4	43
0211T25SR			120	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
0231T25ST			240	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
	0211T21ST		120	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
	0231T21ST		240	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
		0211T35ST	120	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
		0231T35ST	240	120	T	4.5	50	Terminals	6-5/16		8-5/32	9-1/4	6-15/16	4-1/4	42
0511T25FT			120	120	F	5.5	38	Terminals	4-1/4	6-1/4	15-1/8	12-5/8	13-7/8	11-3/8	112
0511T25ST			120	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
0531T25ST			240	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
0541T25ST			480	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
	0511T21FT		120	120	F	5.5	38	Terminals	4-1/4	6-1/4	15-1/8	12-5/8	13-7/8	11-3/8	112
	0511T21ST		120	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
	0531T21ST		240	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
	0541T21ST		480	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
		0511T35FT	120	120	F	5.5	38	Terminals	4-1/4	6-1/4	15-1/8	12-5/8	13-7/8	11-3/8	112
		0511T35ST	120	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
		0531T35ST	240	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
		0541T35ST	480	120	T	6.5	65	Terminals	6-5/16		8-5/32	11	6-15/16	6	62
1065T25ST			240 or 480	120 or 240	T	5	60	Terminals	8		9-1/2	18-1/4	8	7-3/4	125
	1065T21ST		240 or 480	120 or 240	T	5	60	Terminals	8		9-1/2	18-1/4	8	7-3/4	125
		1065T35ST	240 or 480	120 or 240	T	5	60	Terminals	8		9-1/2	18-1/4	8	7-3/4	125
1565T25ST			240 or 480	120 or 240	T	5	65	Terminals	8		9-1/2	21-1/4	8	10-3/4	187
	1565T21ST		240 or 480	120 or 240	T	5	65	Terminals	8		9-1/2	21-1/4	8	10-3/4	187
		1565T35ST	240 or 480	120 or 240	T	5	65	Terminals	8		9-1/2	21-1/4	8	10-3/4	187
2065T25ST			240 or 480	120 or 240	T	3	65	Terminals	8		9-1/2	24-1/4	8	13-3/4	250
	2065T21ST		240 or 480	120 or 240	T	3	65	Terminals	8		9-1/2	24-1/4	8	13-3/4	250
		2065T35ST	240 or 480	120 or 240	T	3	65	Terminals	8		9-1/2	24-1/4	8	13-3/4	250

TOPAZ ELECTRONICS
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ULTRA-ISOLATION TRANSFORMERS

400 Hertz Single-Phase Models

GENERAL SPECIFICATIONS

ISOLATION *Three categories of guaranteed interwinding capacitance are available as listed below. Leakage resistance from either winding to the other or to ground greater than 10,000 megohms.*

COMMON MODE REJECTION *Greater than 125 DB (for .005 pf) to more than 145 DB (for .0005 pf) as previously defined. Transverse noise rejection greater than 40 DB (see preceding text).*

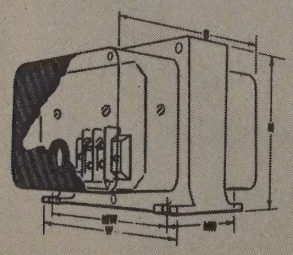
CONSTRUCTION *Class B (130° C. operating) materials used throughout. Hi-Pot 1000 volts (RMS) winding to winding or ground.*

POWER	MODEL NUMBER GUAR. INTERWINDING CAPACITANCE ≤.005 pf	≤.001 pf	≤.0005 pf	PRIMARY (VAC) 400 Hz	SECONDARY (VAC) 400 Hz	% REGULATION NO LOAD TO FULL LOAD	TEMP. RISE °C. FULL LOAD	OVERALL SIZE (In.) H	W	D	MOUNTING DIMENSIONS (±1/16) MW	MD
500 VA	1/211T25S4			120	120	6	70	4-1/2	5-1/4	5-9/16	4-3/8	2
500		1/211T21S4		120	120	6	70	4-1/2	5-1/4	5-9/16	4-3/8	2
500			1/211T35S4	120	120	6	70	4-1/2	5-1/4	5-9/16	4-3/8	2
1 KVA	0111T25S4			120	120	6	70	4-1/2	5-1/4	7-3/16	4-3/8	3-5/8
1		0111T21S4		120	120	6	70	4-1/2	5-1/4	7-3/16	4-3/8	3-5/8
1			0111T35S4	120	120	6	70	4-1/2	5-1/4	7-3/16	4-3/8	3-5/8
2.5 KVA	0211T25S4			120	120	6	75	4-1/2	5-1/4	10-11/16	4-3/8	7-1/8
2.5		0211T21S4		120	120	6	75	4-1/2	5-1/4	10-11/16	4-3/8	7-1/8
2.5			0211T35S4	120	120	6	75	4-1/2	5-1/4	10-11/16	4-3/8	7-1/8
5 KVA	0511T25S4			120	120	6	75	6-5/16	8-5/32	9-1/2	6-15/16	4-1/2
5		0511T21S4		120	120	6	75	6-5/16	8-5/32	9-1/2	6-15/16	4-1/2
5			0511T35S4	120	120	6	75	6-5/16	8-5/32	9-1/2	6-15/16	4-1/2
6.7 KVA	0611T25S4			120	120	6	75	6-5/16	8-5/32	10-3/4	6-15/16	5-3/4
6.7		0611T21S4		120	120	6	75	6-5/16	8-5/32	10-3/4	6-15/16	5-3/4
6.7			0611T35S4	120	120	6	75	6-5/16	8-5/32	10-3/4	6-15/16	5-3/4
10 KVA	1011T25S4			120	120	6	75	6-5/16	8-5/32	13-1/2	6-15/16	8-1/2
10		1011T21S4		120	120	6	75	6-5/16	8-5/32	13-1/2	6-15/16	8-1/2
10			1011T35S4	120	120	6	75	6-5/16	8-5/32	13-1/2	6-15/16	8-1/2

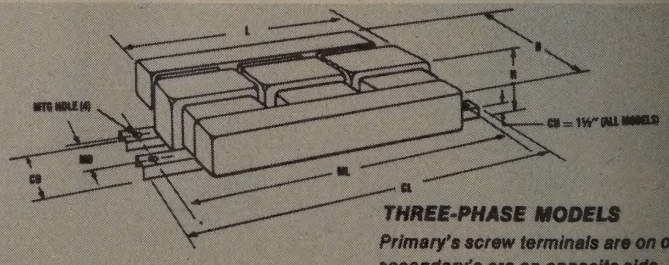
400 Hertz Three-Phase Models

All models listed below are 120/208 volts primary and secondary. Either primary or secondary may be connected as 120 volts phase-to-phase △ or as 120/208 volts Y (that is, 120 volts phase-to-neutral and 208 volts phase-to-phase).

POWER	MODEL NUMBER GUAR. INTERWINDING CAPACITANCE ≤.005 pf	≤.001 pf	≤.0005 pf	% REGULATION NO LOAD TO FULL LOAD	TEMP. RISE °C. FULL LOAD	H	OVERALL SIZE (Inches) L	D	CL	CD	MOUNTING DIMENSIONS (±1/16) ML	MD	MTG. HOLE DIA.
1.5 KVA	1½11T25T4			6	35	6	16-1/4	10	20-1/4	6	18-1/4	3	7/16
1.5		1½11T21T4		6	35	6	16-1/4	10	20-1/4	6	18-1/4	3	7/16
1.5			1½11T35T4	6	35	6	16-1/4	10	20-1/4	6	18-1/4	3	7/16
3 KVA	0311T25T4			6	35	6	16-1/4	11-3/4	20-1/4	6-5/8	18-1/4	3-5/8	7/16
3		0311T21T4		6	35	6	16-1/4	11-3/4	20-1/4	6-5/8	18-1/4	3-5/8	7/16
3			0311T35T4	6	35	6	16-1/4	11-3/4	20-1/4	6-5/8	18-1/4	3-5/8	7/16
7.5 KVA	0711T25T4			6	40	6	16-1/4	15-1/4	20-1/4	10-1/8	18-1/4	7-1/8	7/16
7.5		0711T21T4		6	40	6	16-1/4	15-1/4	20-1/4	10-1/8	18-1/4	7-1/8	7/16
7.5			0711T35T4	6	40	6	16-1/4	15-1/4	20-1/4	10-1/8	18-1/4	7-1/8	7/16
15 KVA	1511T25T4			6	50	7-13/16	25	14-1/2	29	7-1/2	27	4-1/2	7/16
15		1511T21T4		6	50	7-13/16	25	14-1/2	29	7-1/2	27	4-1/2	7/16
15			1511T35T4	6	50	7-13/16	25	14-1/2	29	7-1/2	27	4-1/2	7/16
20 KVA	2011T25T4			6	53	7-13/16	25	15-3/4	29	8-3/4	27	5-3/4	7/16
20		2011T21T4		6	53	7-13/16	25	15-3/4	29	8-3/4	27	5-3/4	7/16
20			2011T35T4	6	53	7-13/16	25	15-3/4	29	8-3/4	27	5-3/4	7/16
30 KVA	3011T25T4			6	75	7-13/16	25	18-1/2	29	11-1/2	27	8-1/2	7/16
30		3011T21T4		6	75	7-13/16	25	18-1/2	29	11-1/2	27	8-1/2	7/16
30			3011T35T4	6	75	7-13/16	25	18-1/2	29	11-1/2	27	8-1/2	7/16



SINGLE-PHASE MODELS



THREE-PHASE MODELS

Primary's screw terminals are on one sid secondary's are on opposite side. All terminals are covered and electrostatically shielded.

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ULTRA-ISOLATION TRANSFORMERS

60 Hertz Three-Phase Models
GENERAL SPECIFICATIONS

ISOLATION *Three categories of guaranteed interwinding capacitance are available as listed below. Leakage resistance from either winding to the other or to ground greater than 10,000 megohms.*

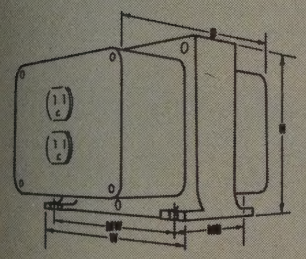
COMMON MODE REJECTION *Greater than 125 DB (for .005 pf) to more than 145 DB (for .0005 pf) as previously defined. Transverse noise rejection greater than 40 DB (see preceding text).*

CONSTRUCTION *Class B (130° C. operating) materials used throughout. Hi-Pot 1000 volts (RMS) winding to winding or ground.*

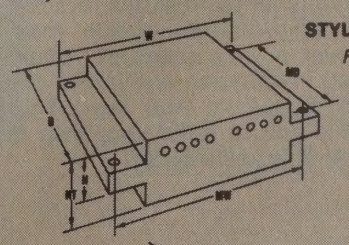
MODEL NO. GUAR. INTERWINDING CAPACITANCE ≤.005 pf	≤.001 pf	≤.0005 pf	PRIMARY (VAC) Δ	or Y	SECONDARY (VAC) Δ	or Y	% REGULATION NO LOAD TO FULL LOAD	TEMP. RISE °C. FULL LOAD	DIMENSIONS (Inches) H	L	B	CL	MOUNTING DIM. ON CENTERS (±1/16) CD	ML	MD	HOLE DIA.	WT. (Lbs.)
0311T25T			120	120/208	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
0331T25T			240	*	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
	0311T21T		120	120/208	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
	0331T21T		240	*	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
		0311T35T	120	120/208	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
		0331T35T	240	*	120	120/208	4	55	7-13/16	25	13-1/4	29	6-1/4	27	3-1/4	7/16	92
0711T25T			120	120/208	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
0731T25T			240	*	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
	0711T21T		120	120/208	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
	0731T21T		240	*	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
		0711T35T	120	120/208	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
		0731T35T	240	*	120	120/208	4.5	50	7-13/16	25	14-1/4	29	7-1/4	27	4-1/4	7/16	136
1511T25T			120	120/208	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
1531T25T			240	*	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
1541T25T			480	**	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
	1511T21T		120	120/208	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
	1531T21T		240	*	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
	1541T21T		480	**	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
		1511T35T	120	120/208	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
		1531T35T	240	*	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
		1541T35T	480	**	120	120/208	6.5	65	7-13/16	25	16	29	9	27	6	7/16	196
3065T25T			240 or 480	*/**	120 or 240	120/208 or*	5	60	9-1/2	29	28-1/4	33	10-3/4	31	7-3/4	9/16	386
	3065T21T		240 or 480	*/**	120 or 240	120/208 or*	5	60	9-1/2	29	28-1/4	33	10-3/4	31	7-3/4	9/16	386
		3065T35T	240 or 480	*/**	120 or 240	120/208 or*	5	60	9-1/2	29	28-1/4	33	10-3/4	31	7-3/4	9/16	386
4565T25T			240 or 480	*/**	120 or 240	120/208 or*	5	65	9-1/2	29	31-1/4	33	13-3/4	31	10-3/4	9/16	575
	4565T21T		240 or 480	*/**	120 or 240	120/208 or*	5	65	9-1/2	29	31-1/4	33	13-3/4	31	10-3/4	9/16	575
		4565T35T	240 or 480	*/**	120 or 240	120/208 or*	5	65	9-1/2	29	31-1/4	33	13-3/4	31	10-3/4	9/16	575
6065T25T			240 or 480	*/**	120 or 240	120/208 or*	3	65	9-1/2	29	34-1/4	33	16-3/4	31	13-3/4	9/16	765
	6065T21T		240 or 480	*/**	120 or 240	120/208 or*	3	65	9-1/2	29	34-1/4	33	16-3/4	31	13-3/4	9/16	765
		6065T35T	240 or 480	*/**	120 or 240	120/208 or*	3	65	9-1/2	29	34-1/4	33	16-3/4	31	13-3/4	9/16	765

Note: A. A 277/480 volt Y connection is available for either primary or secondary on 3 phase units of 15 KVA or larger.
B. A 208 volt Δ connection is available for either primary or secondary on 3 phase units of 15 KVA or larger.
C. Other voltages or taps are available on special order. For information call or write the factory.
D. All input and output connections are made with screw terminals.
*Denotes 240/416 Y is available but not generally used.
**Denotes 480/832 Y is available but not generally used.

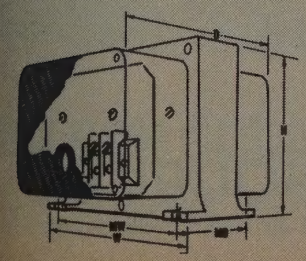
ULTRA-ISOLATION TRANSFORMER — MECHANICAL OUTLINES
SINGLE-PHASE MODELS (3 STYLES)



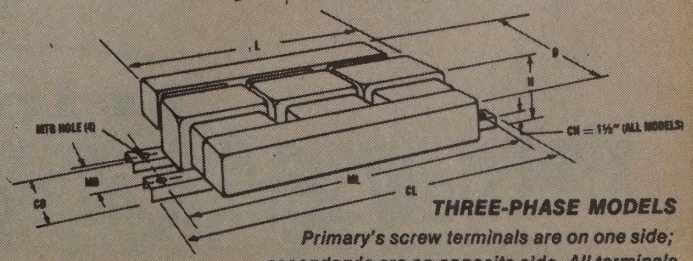
STYLE "R" — *Receptacle*
(125 & 500 VA — SINGLE 1 & 2.5 KVA — DUPLEX) Not available for 5KVA or higher power



STYLE "F" — *Flat (space saver) available with terminals only.*



STYLE "T" — *Terminals*

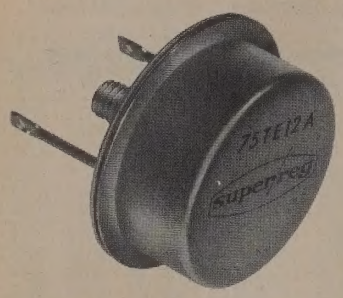


THREE-PHASE MODELS
Primary's screw terminals are on one side; secondary's are on opposite side. All terminals are covered and electrostatically shielded.

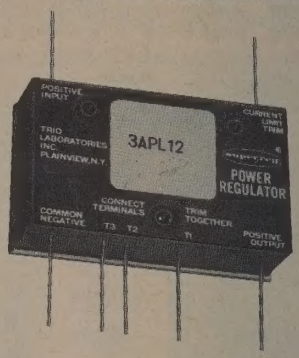
superreg®

PRECISION POWER REGULATORS BUILD A POWER SUPPLY IN MINUTES USING ANY DC SOURCE

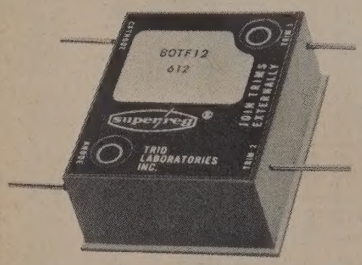
- Low Output Impedance: .01% Regulation
- Temperature Compensated: .01%/°C
- 125°C Operation
- Adjustable Output: ±10%
- Short Circuit Protection
- 104 Models Available



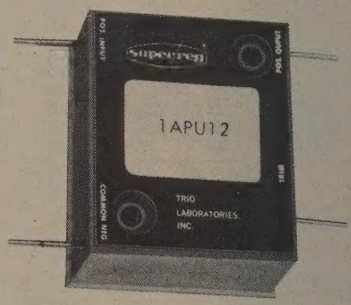
Type 75TE
Shunt Regulator
- 75 Watt or 3 Amp capability
- Output voltages from 3.9-56 Volts
- .01% Regulation — output Z from .002 ohms
- Hermetically sealed TO-36 case



Type 80TF
Shunt Regulator
- 80 Watt or 3 Am capability
- Output voltages 3.9-56 Volts
- .01% Regulatio output Z from .0
- Encapsulated construction



Type 3AP
Series Regulator
- Full 3 Amp Load Capability
- Output voltages from 10-33 Volts
- .01% Regulation — output Z from .002 ohms
- Adjustable overload protection



Type 1AP
Series Regulator
- Economy priced
- Output voltages 5-24 Volts
- 1% Regulation - output Z from
- Full 1 Amp Loa Capability

Super/reg miniature regulators, uniquely designed for maximum heat transfer and power handling capability, contain all the electronic circuits necessary for the most sophisticated system needs. Simply connect rough DC from any source — a semi-filtered, half-wave rectified transformer output or even a battery — and you have instant, precision DC power where you need it: at the load itself.

Available in shunt and series versions, these ultra-compact configurations provide maximum layout flexibility over a wide range of voltage levels. The point-of-load installation eliminates distribution-line losses and cross-talk. And the off-the-shelf stock levels enable you to build your own custom power supply — literally in minutes!

WE'RE ALSO NARROW-MINDED POWER SUPPLY DESIGNERS

We concentrate exclusively on a very narro vital portion of the power supply spectrum — output MIL-design supplies.

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When the supply you need must be smaller, reliable, more efficient and provide that seem impossible combination of parameters, pleas on our narrow-minded designers.

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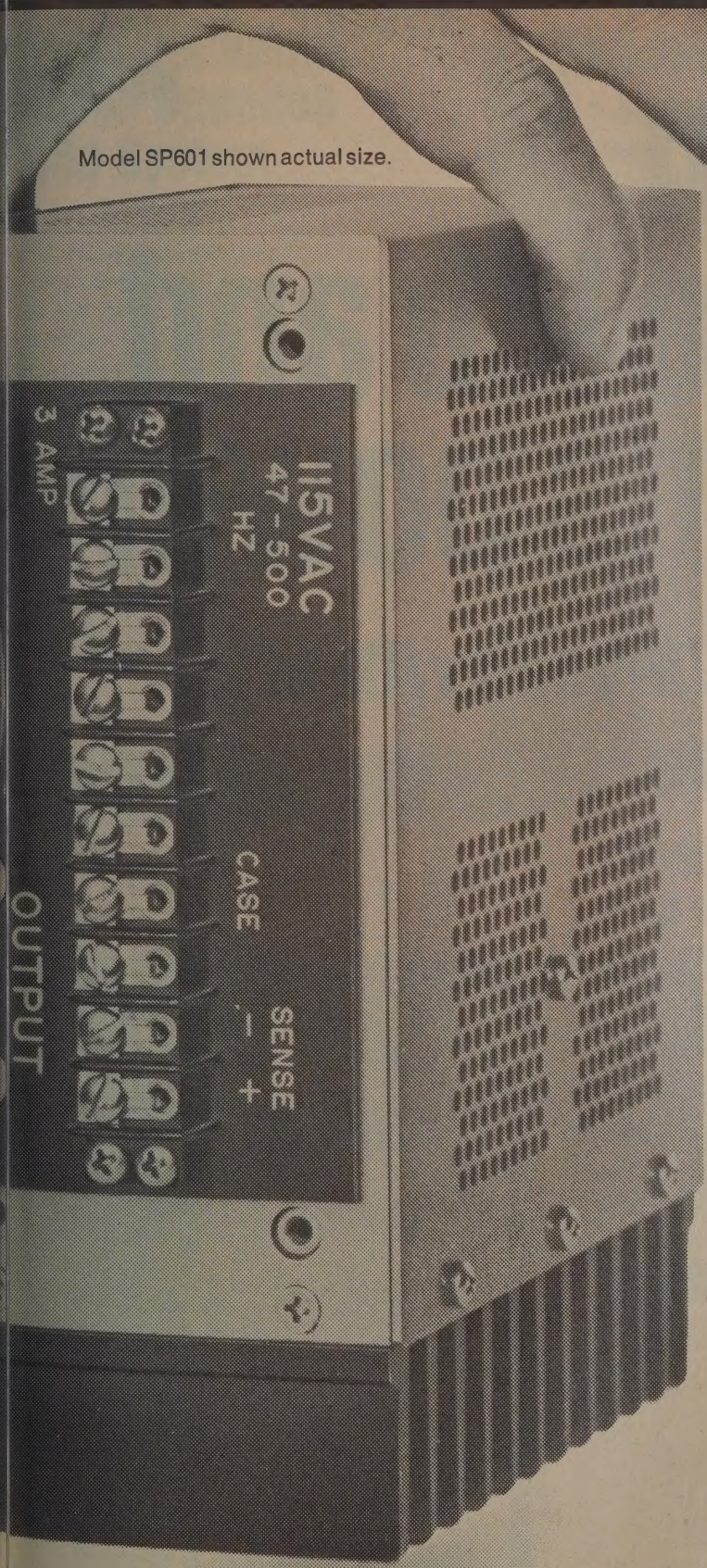

TRIO/LABS' 600 Series 100 Watt Switching Regulator Power Supplies setting new standards for high efficiency, low noise, computer/military applications.

We make it possible by harnessing the space-saving advantages of the switching regulator — but have pulled its RFI fangs (input and output meet MIL-1-6181). When you read our data sheet carefully, you'll also find it full of hidden features that other manufacturers would loudly acclaim. Such as an IC regulating amplifier, automatic overvoltage crowbar, self-resetting automatic overload and short circuit protection, and even 30 ms full-load storage after the input voltage disappears. Efficiency is so high that the very hottest spot on the heat sink has a rise of only 25°C. You can actually hold our unit after hours of full-load bench operation without smelling burning flesh! And is there any other unit you've heard about that will continue to deliver full-load at 71°C. — without derating, heat sinking or forced air cooling. Single, dual, or triple outputs at voltage levels of 3V to 30V can be provided to your specific needs. By the way, if you think our $400 price is high, try adding the "optional extras" to anybody else's standard you had in mind.

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you can squeeze your 5V/20A power supply down to fit your microcircuitry.

TRYGON/Condensed Catalog
March 1970
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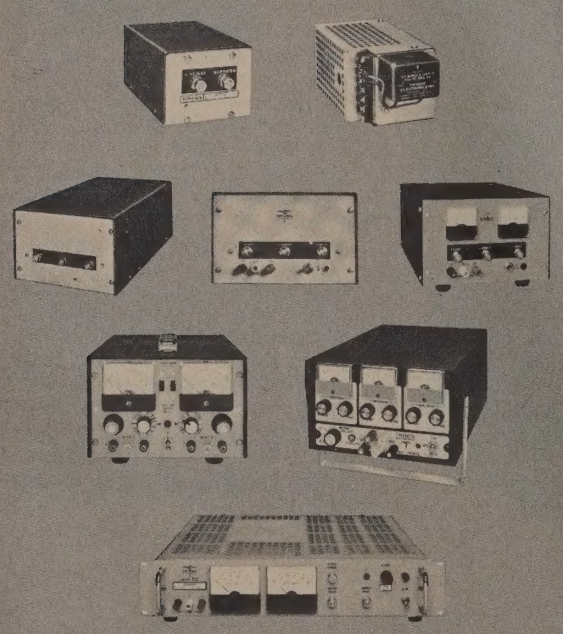
Precision Lab/Modular/OEM Power Supplies



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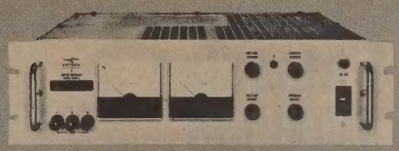


Super Mercury M-C/M-P Series

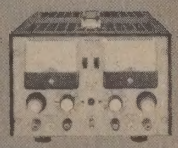
Silicon Rack RS Series

Quarter Rack HH Series

Economy Lab EAL Series

Triple Lab TL Series

Half Rack HR, SHR Series



Dual Lab DL Series

odel	Adj. Voltage Range VDC	Max. Current ADC	Price Metered$	OV Option$
70 130 OV	0-5	130	995	STD
H7 OV	0-7	4	189	STD
L8- (3 output)	0-8, 0-32, 0-32	3	199	30²
3F 25 OV	0-8	25	575	STD
5F 50 OV	0-8	50	750	STD
70 100 OV	0-8	100	995	STD
AL -1	0-10	1	99	—
H 3	0-15	3	169	45
5R5-30	0-15	30	660	90
50 5-50	0-15	50	845	90
70 5-80	0-15	80	1250	120
AL -500	0-20	0.5	99	—
R2 10B	0-20	10	369	65
S2 15A	0-20	15	465	95
R2 150	0-20	150	1450	325
H3 1.5	0-32	1.5	165	45
5R 6-15	0-36	15	615	90
R3 100	0-36	100	1350	300
L 1 (2 output)	2X0-40	1	249	—
R4 5B	0-40	5	325	65
R4 7.5B	0-40	7.5	395	65
S4 10A	0-40	10	475	95
50 0-30	0-40	30	690	90
70 0-50	0-40	50	975	120
AL -250	0-50	0.25	99	—
R6 2.5B	0-60	2.5	355	65
R6 5B	0-60	5	375	90
S6 7.5A	0-60	7.5	625	130
50 0-10	0-60	10	660	90
50 0-15	0-60	15	725	90
70 0-30	0-60	30	1070	120
CR 0-55	0-65	55	1350	300
CR 0-30	0-110	30	1450	—
SH 60-500B	0-160	0.5	329	—
RS 0-1A	0-160	1	550	130
HR 0-2B	0-160	2	510	90
RS 0-3A	0-160	3	685	130
5 60-5	0-160	5	995	120
7 60-8	0-160	8	1250	130
7 60-15	0-160	15	1550	150
RS 0-1.5B	0-320	1.5	625	—

Other Features and Options

M-C/M-P SERIES: *Automatic Load Share Paralleling; Master Slave Tracking; CV/CC Mode Light; 47-65Hz Input Frequency; M-C Units, 60°C operation; M-P Units 50°C operation; Overvoltage Protection Option; Ultra High Stability Option; Panel Heights from 3½" to 7".*

RS SERIES: *CV/CC Mode Light; 55-65Hz Input Frequency; 71°C operation; Overvoltage Protection Option; High Stability Option; Panel Height 3½".*

HH SERIES: *CV/CC Mode Light; 47-420Hz Input Frequency; 60°C operation; Overvoltage Protection Option; High Stability Option; Panel Height 5¼" Quarter Rack.*

HR SERIES: *CV/CC Mode Light; 55-65Hz Input Frequency; 60°C operation; Overvoltage Protection Option; High-Stability Option; Precision Current Regulation Option; Panel Height 5¼" Half Rack.*

TL SERIES: *Three Outputs, 0 to +8 VDC at 3A; 0 to +32 VDC at 1A; 0 to -32 VDC at 1A; Independently adjustable; Switchable Ammeter/Voltmeter for each supply; Automatic Current Limiting; Tilt Handle, Overvoltage Protection Module optionally available; 57-420Hz Input Frequency; 40° C Operation; Panel Height 5-1/4" Half Rack.*

DL SERIES: *Dual Outputs, Independently Adjustable; Dual Range on Each Output; Switchable Dual Range Ammeter/Voltmeter for each supply: Selectable Current Limit Ranges; 47-420Hz Input Frequency; 50°C Operation; Panel Height 5¼" Half Rack.*

EAL SERIES: *Economy Lab Supply; Switchable Front Panel Ammeter/Voltmeter; Three-Wire Line Cord; 57-65Hz Input Frequency; Panel Height 4¼".*

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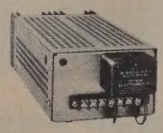
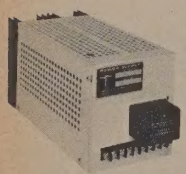
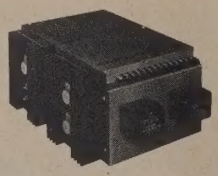
OVS Module



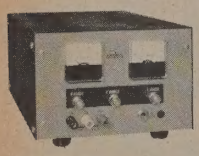
Super Trypack
TP-A, TP-C Series



Super Trypack
TP-D Series

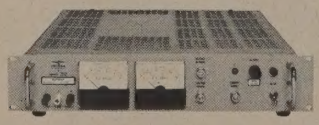


Super Trypack-
Multiple Output
TP3E, TP-E Series



Liberator Sub-Rack
LHS Series Metered Option

Liberator Sub-Rack
LVS-LVW Series



Liberator Rack Series L3R/L5R

Model	Adj. Voltage Range VDC	Max. Current ADC	Price[3] Non-Metered $	Price Metered $
LVW12-1.4	0-12	1.4	98-112	—
TPWC12-3.3	0-12.5	3.3	114-169	—
TPWE12-9	0-12.5	9	173-249	—
LVW20-1	0-20	1	98-112	—
TPWC20-2.4	0-20	2.4	114-169	—
TPWE20-6	0-20	6	173-249	—
LVW50-.32	0-50	0.32	98-112	—
TPWC50-1.2	0-52	1.2	116-179	—
TPWE50-3.2	0-52	3.2	174-259	—
TP3E[5](3 output)	3.2-5.5	6	175-245	—
	10-26	1.8		—
	5-16	1.5		—
LVS4-2.1	2.5-5.5	2.1	95-110	—
TPZC5-6 OV	2.5-5.5	6	118-160	—
TPZD5-9 OV	2.5-5.5	9	136-194	—
TPZE5-17 OV	2.5-5.5	17	179-245	—
LHS4-25	2.5-5.5	25	320	365
L3R4-40	2.5-5.5	40	450[4]	470
L5R4-70	2.5-5.5	70	555[4]	575
LVS6-1.9	4.5-7.8	1.9	95-110	—
TPSA6-1.25 OV	3.2-6.0	1.25	76-111	—
TPSC6-5 OV	3.2-6.0	5	107-135	—
TPZC6-5.5 OV	3.5-6.5	5.5	118-160	—
TPZD6-8 OV	3.5-6.5	8	136-194	—
TPZE6-16 OV	3.5-6.5	16	179-245	—
FTR6-25	6	25	119-152	—
LHS6-24	4.5-7.8	24	320	365
L3R6-40	4.5-7.8	40	450[4]	470
L5R6-70	4.5-7.8	70	575[4]	595
LVS8-1.6	6.5-10.5	1.6	95-118	—
TPZC8-4.6	5.5-8.5	4.6	106-139	—
TPZD8-7	5.5-8.5	7	124-169	—
TPZE8-13	5.5-8.5	13	154-209	—
LHS8-21	6.5-10.5	21	320	365
L3R8-25	6.5-10.5	25	450[4]	470
L5R8-50	6.5-10.5	50	575[4]	595
LVS10-1.7	8.5-11.5	1.7	95-118	—
LHS10-21	8.5-11.5	21	320	365
L3R10-25	8.5-11.5	25	485[4]	505
L5R10-50	8.5-11.5	50	600[4]	620
LVS12-1.4	11-15	1.4	95-110	—
TPZC12-4	7.5-12.5	4	105-130	—
TPZD12-6	7.5-12.5	6	121-159	—
TPZE12-11	7.5-12.5	11	153-199	—
FTR12-15	12	15	119-179	—
LHS12-18	11-18	18	320	365
L3R12-25	11-18	25	450[4]	470
L5R12-50	11-18	50	545[4]	565
TPSA15-.75	11.5-15.5	0.75	66-86	—
TPSA15D-.5[6]	11.5-15.5	2 x 0.5	98-121	—
TPSC15D-1.8[6]	11.5-15.5	2 x 1.8	130-163	—
TPSC15-3	11.5-15.5	3	90-125	—
TPZC15-3.6	11-16	3.6	106-139	—
TPZD15-5.5	11-16	5.5	123-169	—
TPZE15-9.5	11-16	9.5	154-209	—
FTR15-10	15	10	119-179	—
LVS18-1.1	13.5-20.5	1.1	95-120	—
LHS18-13	13.5-20.5	13	310	355
L3R18-20	13.5-20.5	20	485[4]	505
L5R18-40	13.5-20.5	40	600[4]	620
FTR18-10	18	10	119-179	—
LVS24-.8	18.5-27.5	0.8	95-110	—
TPZC24-2.5	16-26	2.5	105-130	—
TPZD24-3.8	16-26	3.8	121-159	—
TPZE24-6.4	16-26	6.4	153-199	—
LHS24-10	18.5-27.5	10	279	324
L3R24-15	18.5-27.5	15	450[4]	470
L5R24-30	18.5-27.5	30	545[4]	565
FTR24-8	24	8	119-179	—

Notes:

1. Includes three outputs; 0 to +8 VDC at 3A; 0 to +32 VDC at 1A; 0 to -32 VDC at 1A.
2. OVS Modules available for LVS, LVW, TL8-3 and TP units. OVS Modules mount externally.
3. Price varies with quantity. Contact factory for full pricing structure.
4. This unit is normally stocked in metered version. NM (non-metered) units available on special order.
5. Includes three outputs: +3.2 to +5.5 VDC (OV) at 6A; +10 to +26 VDC at 1.8A; -5 to -16 VDC at 1.5A.
6. Dual output modules.

See overleaf for higher voltage units.

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r Features
Options

: Low power modules for systems integration. *Over-ection Modules, OVS Series, optionally available; , 6¼" deep, 3" high; 71°C operation; 47-420Hz input djustable current limiting; remotely programmable; g.*

S: Low power wide range modules for systems use; *Protection Modules, OVS Series, optionally available; , 6¼" deep, 3" high, 71°C operation; 47-420Hz input djustable current limiting; remotely programmable; g.*

: Systems Modules. *Two package sizes; Dual Output ilable; 60°C operation; .02% regulation; 47-420Hz in-y; built in or optional OV.*

: Systems Modules. Three package sizes; 50° C Opera-gulation; 47-420Hz input frequency; remote sensing; ment; built in or optional OV.

: Systems Modules, Wide Range. Two package sizes; ion; .02% regulation; 47-420Hz input frequency; g; remote adjustment; built in or optional OV.

e Output Systems Module; 50°C operation; .02% 7-420Hz input frequency; built in sequencing option;

: Systems Modules. Unregulated units for lamps and

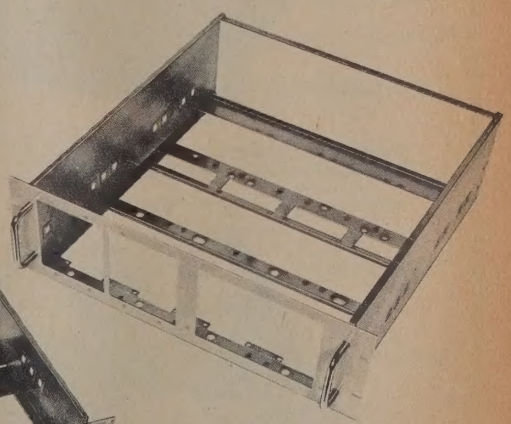
: Half Rack, Sub-rack Modules *with meters and con-lly available; Internal Overvoltage Protection optionally " panel height; 71°C operation; 47-420Hz input fre-djustable current limiting; remotely programmable: g.*

RIES: Full Rack Systems Power Supplies: *.01% High ndard on this series; Automatic Load Share Paralleling; e Light; 71°C operation; 47-65Hz Input Frequency; Protection Optionally available; Panel Heights 3½" and ble current limiting; remotely programmable; remote*

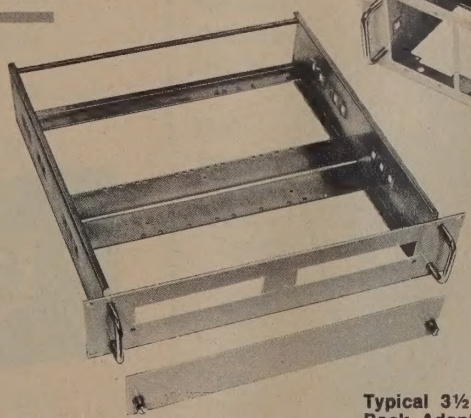
: Fixed Output Module *and Rack Mount Version with h; 55°C operation; Line Regulation ±1%; Panel Height Rack.*

Model	Adj. Voltage Range VDC	Max. Current ADC	Price[3] Non-Metered $	Price Metered $	OV Option $
TPSA28-.5	22-30	0.5	66-86	—	30[2]
LVS28-.75	22-33	0.75	95-110	—	30[2]
TPSC28-2	22-30	2	90-110	—	30[2]
TPZC28-2.4	20-30	2.4	105-130	—	30[2]
TPZD28-3.6	20-30	3.6	121-159	—	40[2]
TPZE28-6	20-30	6	153-199	—	40[2]
TPUA28-1	28	1	35	—	—
FTR28-7	28	7	119-179	—	—
LHS28-9	22-33	9	279	324	75
L3R28-15	24-33	15	450[4]	470	90
L5R28-30	24-33	30	545[4]	565	90
LVS48-.37	32-53	0.37	101-123	—	30[2]
TPZC48-1.7	32-52	1.7	106-139	—	30[2]
TPZD48-2.5	32-52	2.5	123-169	—	40[2]
TPZE48-4	32-52	4	154-209	—	40[2]
FTR48-4	48	4	119-179	—	—
LHS48-5.8	32-53	5.8	295	340	75
L3R48-8.5	32-53	8.5	500[4]	520	90
L5R48-17	32-53	17	620[4]	640	90
LVS65-.23	50-83	0.23	101-129	—	30[2]
LHS65-2.8	50-83	2.8	320	365	75
L3R65-6	50-83	6	510[4]	530	120
L5R65-12	50-83	12	630[4]	650	120
LVS100-.18	80-126	0.18	101-129	—	30[2]
TPZC100-.6	60-110	0.6	108-159	—	—
TPZE100-1.8	60-110	1.8	155-219	—	—
LHS100-2.1	80-126	2.1	320	365	75
L3R100-4	80-126	4	510[4]	530	120
L5R100-8	80-126	8	660[4]	680	120
LVS150-.15	115-161	0.15	101-135	—	—
TPZC150-.35	110-160	0.35	108-159	—	—
TPZE150-1.3	110-160	1.3	155-219	—	—
FTR150-1	150	1	119-179	—	—
LHS150-1.9	115-161	1.9	320	365	75
L3R150-3	115-161	3	510[4]	530	120
L5R150-6	115-161	6	670[4]	690	120
TPZC200-.24	160-210	0.24	108-159	—	—
TPZE200-.75	160-210	0.75	155-219	—	—
TPUA200-.15	200	0.15	35	—	—
FTR300-500	300	0.5	119-179	—	—

See other side for notes.



Typical 5¼" Rack Adapter



Typical 3½" Rack Adapter

d Multiple DC
t Flexibility with
inations of Modules,
ter Racks, Half Racks,
Sub-Racks.

- ty for Multiple Outputs — and Sub-Rack Units
- utout Models for Mounting tered Models
- Slot Models for mounting HS models
- 3½" and 5¼" Panel Heights
- Full 19" Wide Standard Construction
- Slide Provisions Standard
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5 YEAR WARRANTY

on every standard Trygon Power Supply

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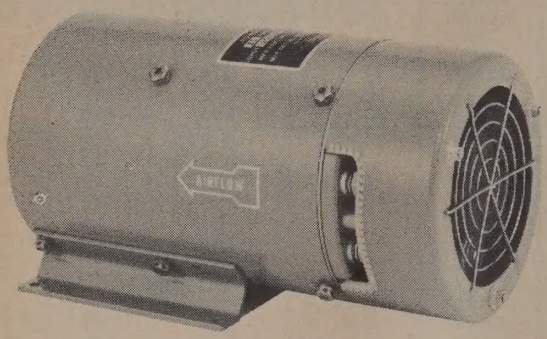
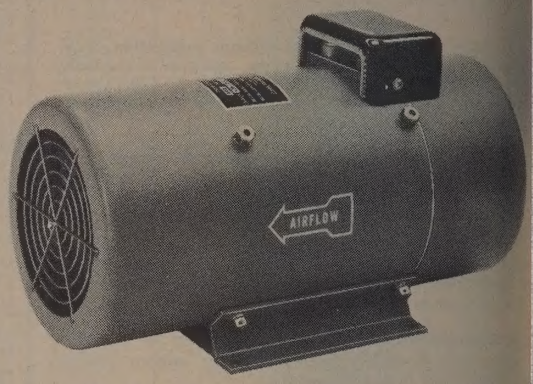
TUNG-SOL POWER SUPPLIES

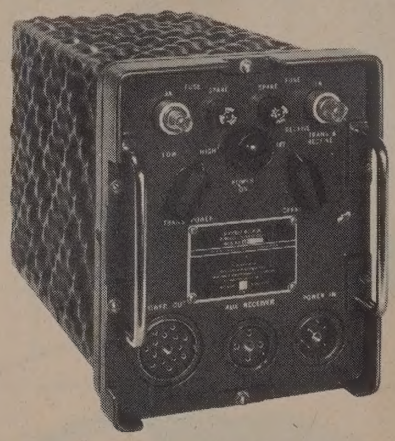
Standard units that meet a lot of special requirements



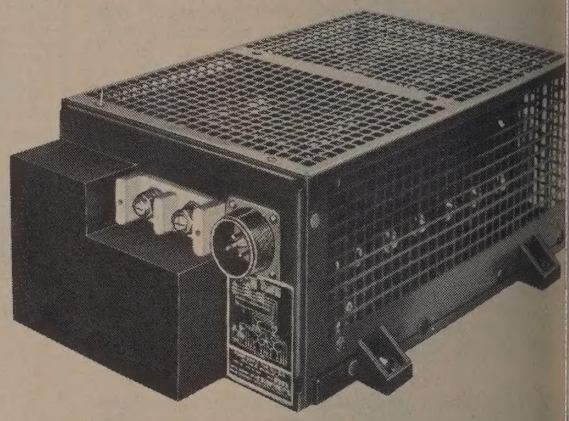
Miniaturized power supply available in four models that provide 28VDC at 25, 50, 100 or 200 amps. All operate from 120/208 v, 47-65 Hz, 3-phase, 4-wire AC inputs.



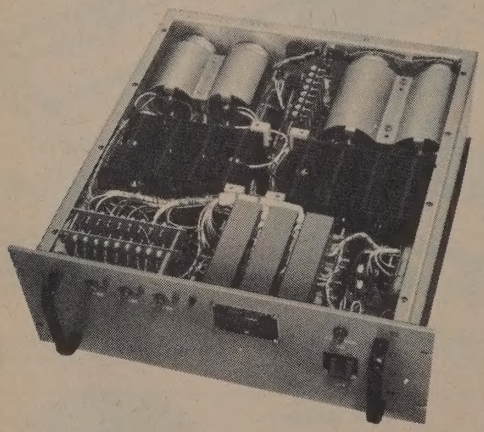
Ground power supply providing 28 VDC at 100, 200, 300, or 400 amps from input power of 400 cps, 200V. RFI per MIL-E-55301 and Environmental per MIL-E-5272.



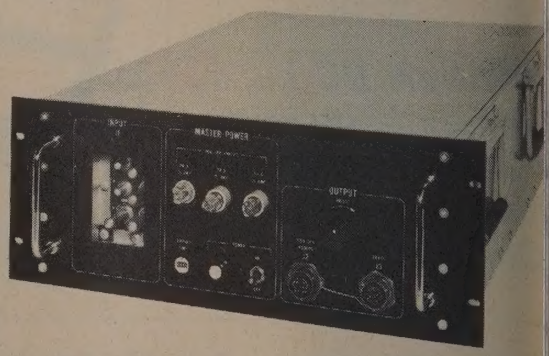
Transmitter-receiver power supply. Eleven different outputs, remotely controllable. Meets MIL-E-16400.



Convection cooled, high voltage regulated airborne power supply. Output: 200A at 28 VDC. Regulation: 8% at 200V.



Highly regulated, multiple output: —24 VDC @ 10 A; —10 VDC @ 10 A and +10 VDC @ 6A. Meets MIL-E-16400.



Three phase line regulator and power supply. Multiple AC-DC regulated outputs at 13.5 and 25A. Meets MIL-T-21200C.

TUNG-SOL®

TUNG-SOL DIVISION

Wagner Electric Corporation

630 W. Mt. Pleasant Avenue, Livingston, N. J. 07039
TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U.S. Pat. Off. and Marcas Registradas

Tung-Sol has engineered an extensive line of produ
power supplies that meet requirements not covered b
usual off-the-shelf types. In-house capability in circuitry,
state devices, vital components and packaging, is co
with thorough field experience. As a result, Tung-Sol is
ducing custom-performance units at prices competiti
less precise types. Why not make your own compar
Describe your requirements. Our recommendations may
in a better device, a lower price, or both.

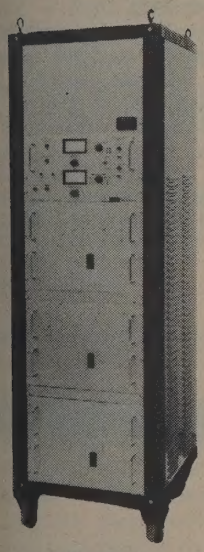
VARADYNE
POWER SYSTEMS
DIVISION OF VARADYNE, INC.

HIGH EFFICIENCY POWER CONVERSION

14943 CALIFA STREET, VAN NUYS, CALIFORNIA 91401 • TEL. (213) 781-4090, (213) 873-5488

AC POWER CONVERSION

CONVERTERS AND INVERTERS



15 KVA Converter

3 KVA Uninterruptable Power System

FEATURES

- mple design, patented SCR output transformer-filter circuit
- gh reliability, all solid state, silicon semiconductors
- andard units available from 0.5 KVA to 30 KVA with single or ree phase outputs
- esigned for military applications
- egulation to ±1% for line and load changes
- armonic distortion to 2%
- tandard frequency stability of 0.25%
- TBF exceeds 10,000 hours per MIL-HANDBOOK 217A
- utomatic overload and short circuit protection
- vailable with automatic output transfer and self contained attery charger for uninterruptable power systems
- Jnits available for frequency synchronized or parallel operation

DC SWITCHING REGULATORS

CUSTOM MULTIPLE OUTPUT DC POWER SUPPLIES

FEATURES

- High efficiency switching regulators
- Small size / high power ratio
- IC control circuits
- Plug in circuit boards
- Fast delivery
- Ripple to 10 MV, peak-to-peak
- Designed to customer specifications
- Input 120 VAC or 240 VAC 47 to 440 Hz
- Regulation to ±1% typical
- Temperature coefficient .01%/°C
- Low Cost

Typical Unit: 5 Regulated Outputs, 175 Watts Output Power

STANDARD MODULES FOR PRODUCTION AND PROTOTYPE

ELECTRICAL SPECIFICATIONS

Input:	120 VAC or 240 VAC ±10%, 47 Hz to 440 Hz
Regulation:	±1% of output voltage for line and load
Output Impedance:	Less than 0.5 ohms to 1 MHz
Short Circuit:	Complete protection to zero output at full load current
Ripple:	50 MV peak-to-peak (maximum)
Overvoltage Protection:	Set to 20% above nominal output voltage (standard)
Temperature Coefficient:	.01%/°C of output, 0°C to 50°C

Model Number	Output Voltage	Output Current	Size H W D	Price*
P1020	5 VDC	10A	4 x 5½ x 8	$187
P1021	5 VDC	20A	4 x 5½ x 10	$252
P1022	5 VDC	30A	4 x 5½ x 12	$339
P1023	5 VDC	50A	8 x 5½ x 12	$467
P1030	15 VDC	5A	4 x 5½ x 8	$186
P1031	15 VDC	10A	4 x 5½ x 10	$202
P1032	15 VDC	20A	4 x 5½ x 12	$308
P1040	28 VDC	10A	4 x 5½ x 14	$260
P1041	28 VDC	20A	8 x 5½ x 14	$385

*PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

VARADYNE Power Systems offers complete power conversion capability; power converters, power inverters, DC switching regulators, and uninterruptible emergency AC power sources up to 150 KVA. The company's technical staff will be pleased to review your power conversion requirements and assist you in specifying the optimum equipment for your application.

STATIC POWER

From

UNITRON

DIVISION OF ELECTRIC MACHINERY MFG. COMPANY

SPECIALISTS IN SOLID STATE POWER CONVERSION

UNINTERRUPTABLE POWER SYSTEMS

FREQUENCY CONVERTERS AND STATIC INVERTERS FOR MILITARY AND INDUSTRIAL SYSTEMS APPLICATIONS

VARIABLE SPEED DRIVES FOR CONTROL OF AC MOTORS

SPECIAL PURPOSE STATIC POWER EQUIPMENT

Since its establishment in 1960, Unitr specialized in the design and developm solid-state static power conversion equi Pioneering in power applications, Unitr continued to help define the state of the now supplies power conversion equipm military, commercial and industrial user tron's leadership has been accomplishe philosophy which stresses the use of the design and manufacturing techniques an ity components to produce equipment reliability and superior performance withi tical economic limits.

Many units developed by Unitron to me cific requirements have a wide range of p applications and have become a part tron's standard line. In addition, Unitr signs, develops and manufactures spe custom power equipment. Unitron engine be glad to discuss your specific static conversion problem with you, and show y Unitron can help you achieve the best s

UNINTERRUPTABLE POWER SYSTEMS
Static Inverter / Battery / Battery Charger

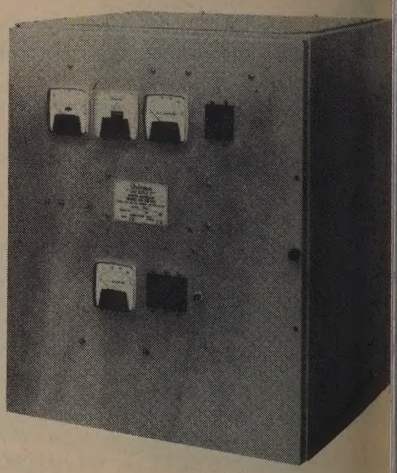
1, 3, and 5 KVA single phase units ▪ Versatile, low-cost standby power system ▪ For continuous line supply or continuous inverter supply operation ▪ Manual, relay or static switching ▪ Optional line synchronization ▪ Fully metered ▪ Overload protected ▪ Excellent voltage and frequency regulation ▪ Low maintenance

APPLICATIONS: To provide continuous power for data processing and critical process controls, or to allow the orderly shutdown of a process, in the event of line power failure.

Static Inverter	USI-100	USI-101	USI-102
Input	105-140 VDC	105-140 VDC	105-140 VDC
Output	1 KVA	3 KVA	5 KVA
Voltage Regulation*	118 RMS ± 4%	118 RMS ± 4%	118 RMS ± 4%
Frequency Regulation*	60 Hz ±1%	60 Hz ±1%	60 Hz ±1%
Harmonic Distortion*	5% max.	5% max.	6% max.
Power Factor	0.80 lagging to 1.0		
Operating Temperature	–20°C to +40°C (–4°F to +104°F)		

*Under all conditions of line, load and temperature

Please consult factory for higher power ratings.



MODEL USI-102
5KVA

Battery Chargers: Model UBC-100, 18 amp; UBC-101, 50 amp, and UBC-102, 90 amp.

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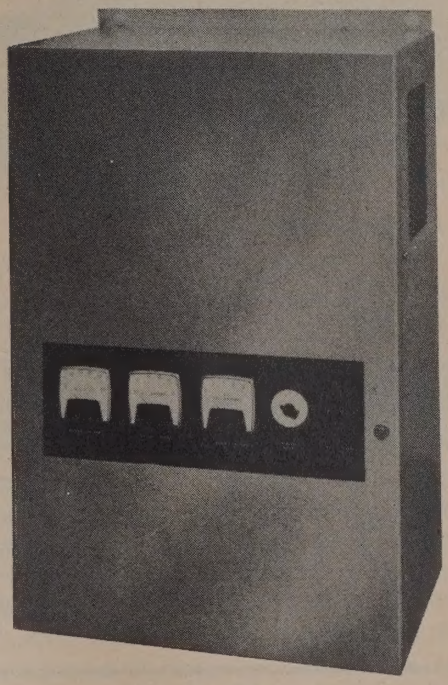
SPECIALISTS IN SOLID STATE POWER CONVERSION

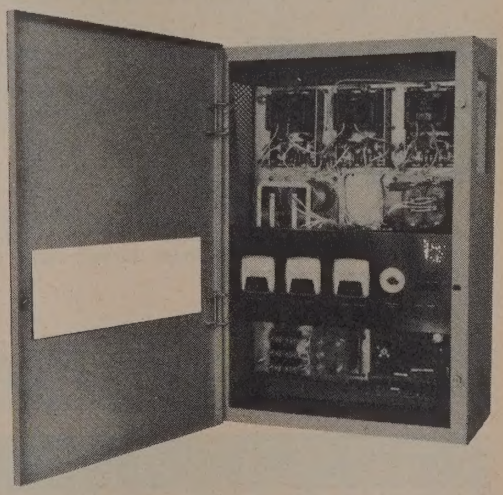
VARIABLE SPEED DRIVES FOR CONTROL OF AC MOTORS



▪ Soft start capability ▪ Full range speed control ▪ Self compensating for load variations ▪ Maintains full torque into load ▪ Open- or closed-loop operation ▪ Easily installed on existing motors ▪ No structural modifications required ▪ Metered for simple check-out

APPLICATIONS: Rotary, reciprocating and centrifugal pumps and compressors; large circular saws and fans; cranes and hoists; winding, polishing, grinding, milling and textile machinery; motor generator sets; and all applications where speed control, torque control, or soft starts are required.

Simple, low-cost controller provides variable frequency supply with constant volt-seconds to AC motors; maintains full torque into load. Precision control makes AC motors practical for changing or high inertial loads. Soft start and overload limiting capabilities reduce inrush current to 1.5 full load motor current, eliminate need for external starters. May be located in any convenient location; no structural modifications required. Modular construction facilitates ease of check-out and low mean time to repair. Available in special housings for hazardous, corrosive, and other hostile environments. ***Standard units 10-100 HP; consult factory for higher HP ratings.***



GENERAL SPECIFICATIONS

HORSEPOWER: 10 through 100 HP with full range of intermediate values.

INPUT VOLTAGE: 3 ϕ, 220 or 440 VAC, $\pm$15%.

INPUT FREQUENCY: 50 or 60 Hz, $\pm$1.5%

OUTPUT VOLTAGE (AT FULL SPEED): 3 ϕ, 220 or 440 VAC (nominal)

OUTPUT FREQUENCY: 2 to 60 Hz (higher maximum frequencies available on special order).

OUTPUT FREQUENCY STABILITY: $\pm$1%

CONVERSION EFFICIENCY (AT FULL LOAD): 95%

OPERATING TEMPERATURE RANGE: –30°C to +55°C

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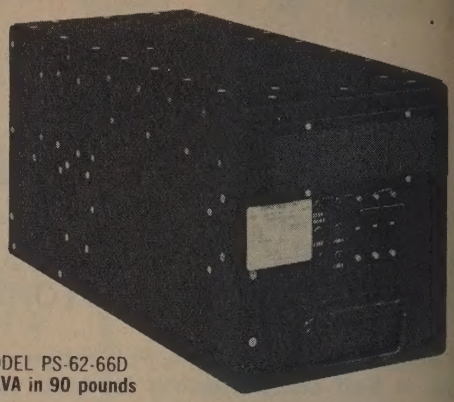
SPECIALISTS IN SOLID STATE POWER CONVERSION

1624 NORTH FIRST STREET • P.O. BOX 1331 • GARLAND, TEXAS 75040 • (AC 214) 276-8591 • TWX 910-860-5195

FREQUENCY CONVERTERS

400 Hz to 60 Hz SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support Equipment



MODEL PS-62-66D
3.5KVA in 90 pounds

FEATURES

■ High efficiency ■ RFI protection ■ Short circuit and overload protection ■ Long, maintenance-free operation ■ Self-contained cooling ■ Light weight ■ Low distortion

APPLICATIONS

These converters provide a dependable source of 60 Hz sine wave power for airborne and air-transportable test equipment. They are also used with 60 Hz ground equipment wherever primary power available is 400 Hz. Applications include use with oscilloscopes, metering equipment, recorders, cryptographic machines, and teletypes.

MODEL	POWER	INPUT		OUTPUT		SIZE (Dim. in Inches)
PS-65-225-7	400 VA	115/200 VAC	400 Hz	115 VAC ± 5 %	60 Hz ± 1.0%	7.8 x 5.2 x 21.3
PS-64-162	750 VA	115/200 VAC	400 Hz	115 VAC ± 5 %	60 Hz ± 1.0%	7.5 x 12 x 20.5
PS-61-41B	1500 VA	115/200 VAC	400 Hz	115 VAC ± 10 %	60 Hz ± 1.0%	19 x 10.5 x 14.25
PS-62-66D	3500 VA	115/200 VAC	400 Hz	115 VAC ± 2.5%	60 Hz ± 1.0%	10 x 9 x 21.6
PS-61-33D	8000 VA	115/200 VAC	400 Hz	115 VAC ± 2.5%	60 Hz ± 1.0%	12.2 x 20 x 23.5

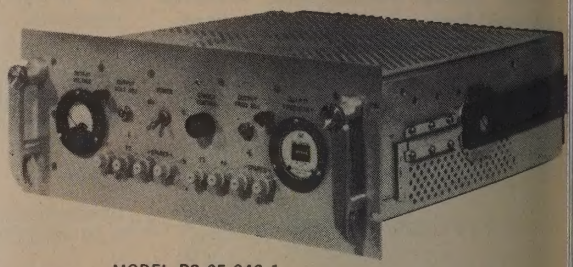
All units available with other input voltages, and frequencies of 360-1000 Hz.

All units available with output frequency to 0.01%.

FREQUENCY CONVERTERS

60 Hz to 400 Hz SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Shipboard and Ground Support Equipment



MODEL PS-65-243-1

FEATURES

■ High efficiency ■ Small size ■ Light weight ■ Low distortion ■ Virtually no audible noise ■ Long, maintenance-free operation ■ Short circuit and overload protection ■ RFI protection

APPLICATIONS

Extremely stable and quiet-operating, these converters are excellent for flight simulators, and wherever 400 Hz power is required to operate airborne-type equipment. Other applications include ground support systems, design and test labs, and shipboard installations.

MODEL	POWER	INPUT		OUTPUT		SIZE (Dim. in Inches)
PS-65-243-1	1000 VA	115 VAC	60 Hz 1ϕ	*115 VAC ± 2%	§400 Hz ± 1.0%	19 x 7 x 20.5
PS-67-325-1	2000 VA	115/200 VAC	60 Hz 3ϕ	115 VAC ± 2%	400 Hz ± 1.0%	11.75 x 18 x 22.75
PS-67-326-1	2500 VA	115/200 VAC	60 Hz 3ϕ	115/200 VAC ± 2%	400 Hz ± 1.0%	14 x 18 x 25.25
PS-68-346R	3500 VA	115/200 VAC	60 Hz 3ϕ	115 VAC ± 2%	400 Hz ± 1.0%	19 x 17.5 x 21.5
PS-65-216-2	8000 VA	115/200 VAC	60 Hz 3ϕ	115/200 VAC ± 2%	400 Hz ± 0.5%	19 x 19 x 21.75
PS-67-337	15000 VA	120/208 VAC	60 Hz 3ϕ	120/208 VAC ± 2%	400 Hz ± 1.0%	19 x 42 x 21.75

*Adjustable, 105 to 125 VAC §Adjustable, 380 to 420 Hz

Model PS-67-325-R available in rack-mount, fully-metered configuration.

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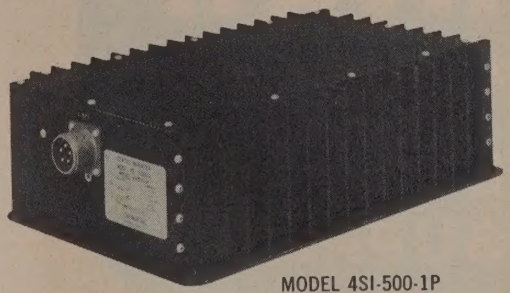
SPECIALISTS IN SOLID STATE POWER CONVERSION

STATIC INVERTERS

28 VDC to 400 Hz SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support Equipment



MODEL 4SI-500-1P

FEATURES

■ Overload and short-circuit protected ■ High efficiency ■ Light weight ■ Voltage-regulated ■ Low distortion ■ Stable output frequency ■ Long, maintenance-free operation ■ Virtually no audible noise ■ RFI protection

APPLICATIONS

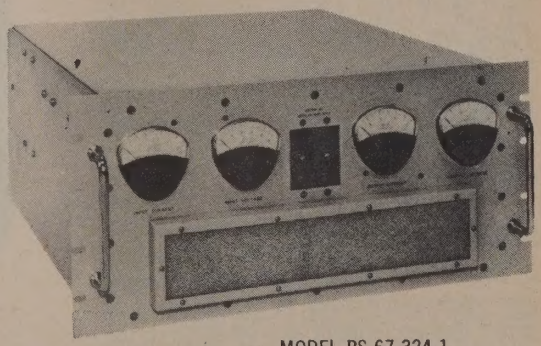
These inverters are ideal for providing AC power from DC sources to one or more items of airborne equipment, and also are excellent sources of power for 400 Hz ground support equipment. Typical applications include use with weather radar, Doppler navigation systems, artificial horizons, omni's, autopilots, ADF, DME, transceivers, transponders, and engine analyzers.

MODEL	POWER	INPUT	OUTPUT		SIZE (Dim. in Inches)
PS-67-321	75 VA	24 to 32 VDC	26 VAC ± 5%	400 Hz ± 5%	11.5 x 7 x 5
4SI-125-1P	125 VA	24 to 32 VDC	115 VAC ± 2%	400 Hz ± 1%	9.7 x 6 x 3.4
4SI-250-1P	250 VA	24 to 32 VDC	115 VAC ± 2%	400 Hz ± 1%	11.2 x 6.5 x 4.2
4SI-500-1P	500 VA	24 to 32 VDC	115 VAC ± 2%	400 Hz ± 1%	14.2 x 8.7 x 4.2
4SI-750-3P	750 VA	24 to 32 VDC	115/200 VAC ± 2%	400 Hz 3ϕ ± 1%	17.4 x 10.2 x 7.7
4SI-3000-3P	3000 VA	22.5 to 30 VDC	115/200 VAC ± 3%	400 Hz 3ϕ ± 5%	21.5 x 20 x 26

STATIC INVERTERS

28 VDC to 60 Hz SINE WAVE OUTPUT

Meets Applicable MIL Specifications for Airborne and Ground Support



MODEL PS-67-324-1

FEATURES

■ High efficiency ■ Light weight ■ Small size ■ Low distortion ■ Virtually no audible noise ■ Long, maintenance-free operation ■ Short circuit and overload protection ■ RFI protection

APPLICATIONS

For aircraft instrumentation systems with 28 VDC electrical systems, and for flying laboratories, these instruments provide an excellent source of 60 Hz power. Applications for these inverters include power for oscilloscopes, meters, cryptographic machines, teletypes, and recorders.

MODEL	POWER	INPUT	OUTPUT		SIZE (Dim. in Inches)
PS-65-178-B	250 VA	24 to 32 VDC	115 VAC ± 2%	60 Hz ± 1.0%	7.9 x 10.4 x 14
PS-65-236	500 VA	24 to 32 VDC	115 VAC ± 2%	60 Hz ± 1.0%	7.9 x 10.4 x 17.3
PS-63-81A	1000 VA	24 to 32 VDC	115 VAC ± 2%	60 Hz ± 0.1%	19 x 8.75 x 20.2
PS-67-324-1	2000 VA	24 to 32 VDC	115 VAC ± 5%	60 Hz ± 1.0%	19 x 8.75 x 20
PS-64-154	3600 VA	24 to 32 VDC	115 VAC ± 5%	60 Hz ± 1.0%	13 x 22.8 x 24.4

All units available with output frequency of 0.01%.

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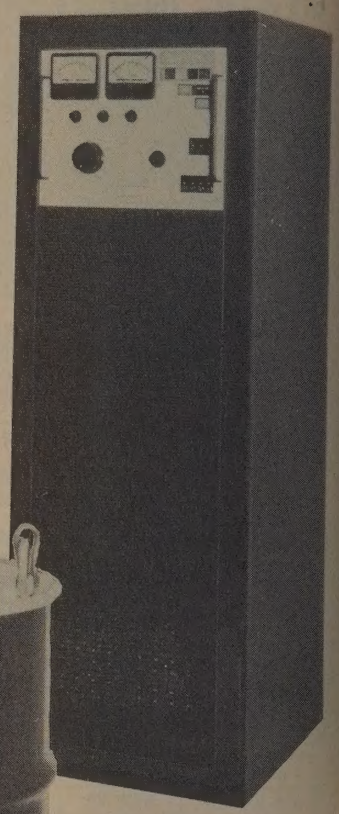
high VOLTAGE DC POWER SUPPLIES

A



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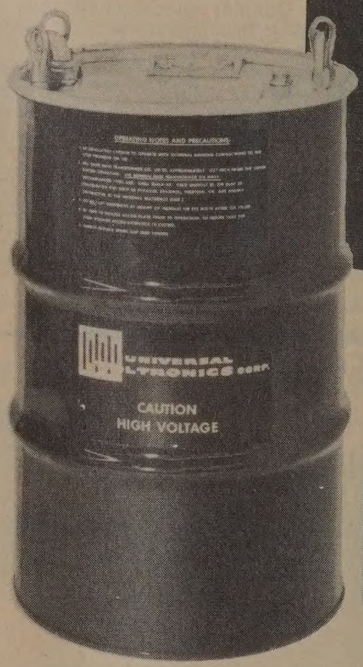

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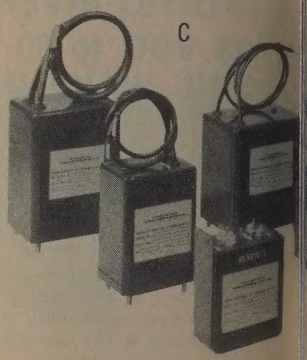

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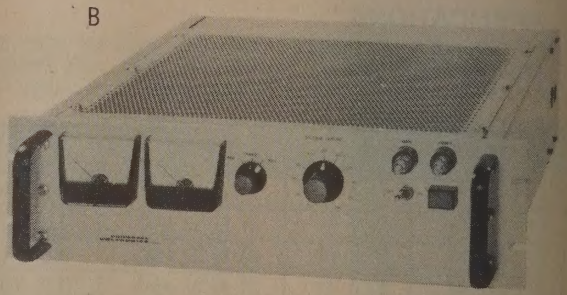


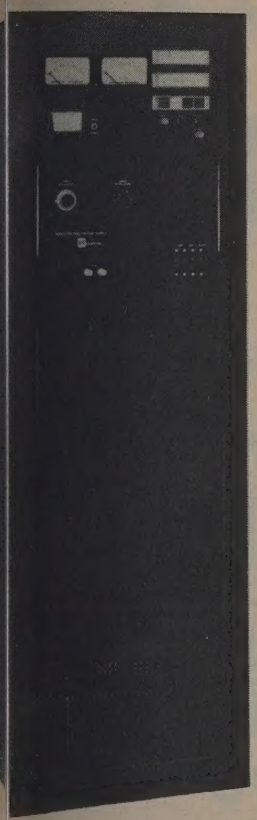
ADJUSTABLE OUTPUT POWER SUPPLIES

Series "BA" adjustable power supplies and series "BP" power packs are available at voltage ratings from 1 KVDC through 2000 KVDC at output power ratings from 1 watt to 250 kilowatts continuous. The adjustable series includes applications oriented control features and package design as shown in photos A and B. The power pack series (photos C and D) has many applications in OEM systems and for general laboratory use.

Every UVC power supply includes conservatively rated high voltage components designed and manufactured under the strict control of the specialized UVC technical staff to insure continuous duty, long term, trouble free operation. A one year factory backed and field supported warranty policy accompanies each shipment.

LOOK AT THESE FEATURES

1. **Ripple** Each power supply offers a standard ripple specification of 5% maximum or better. Optional filters and attenuators are available for every UVC supply to reduce ripple to as low as .01% rms.
2. **Polarity** Each power supply offers the flexibility of reversible output polarity performance.
3. **Protection** Overvoltage and overcurrent protection features are available as both adjustable range and fixed value circuits. All access areas and doors are interlocked for personnel protection and all energy storage components and circuits are discharge protected for personnel protection.
4. **Package** Rack mounted, floor and bench operable as well as portable design are among the packages available for UVC standard high voltage power supplies.



PRECISELY REGULATED EQUIPMENT

Precisely regulated performance over wide adjustment range, low ripple, fast response and high stability enable the series "BRE" power supplies to be used in exacting work for x-ray spectroscopy, electron microscopes, TWTs, ion bombardment experiments, particle separators.

These precisely regulated power supplies are available in voltage ratings from 1 KV through 500 KVDC at continuous duty output power up to 40 KW. Our regulation circuitry techniques realize performance specifications which are virtually independent of input line variations or no load-full load changes. Ripple in most cases is 0.01% rms and the output polarity is available as both fixed and reversible. Two voltage adjustment schemes are offered, namely digital dialable control for the most exacting applications and continuous coarse and vernier controls. In the digital dialable scheme, we allow for adjustment in increments of 10 KV, 1 KV, 100 volts, 10 volts, 1 volt and 0-1 volt vernier. This system provides the assurance that the actual output is always within 1% of the dial readings. As indicated, you may select a coarse and vernier voltage adjustment scheme and realize economic savings without sacrificing basic regulated performance. Regulation accuracy of ±0.25%; ±0.1%; ±0.05% and ±0.01% for line or load changes are available on most series "BRE" power supplies.

A new line of solid state, precisely regulated power packs for photo multiplier and CRT applications have also been recently introduced. These supplies are available at voltage ratings up to 20 KVDC.

Write or phone for Catalog UVC-670 containing complete specifications for the extensive line of UVC high voltage power supplies.

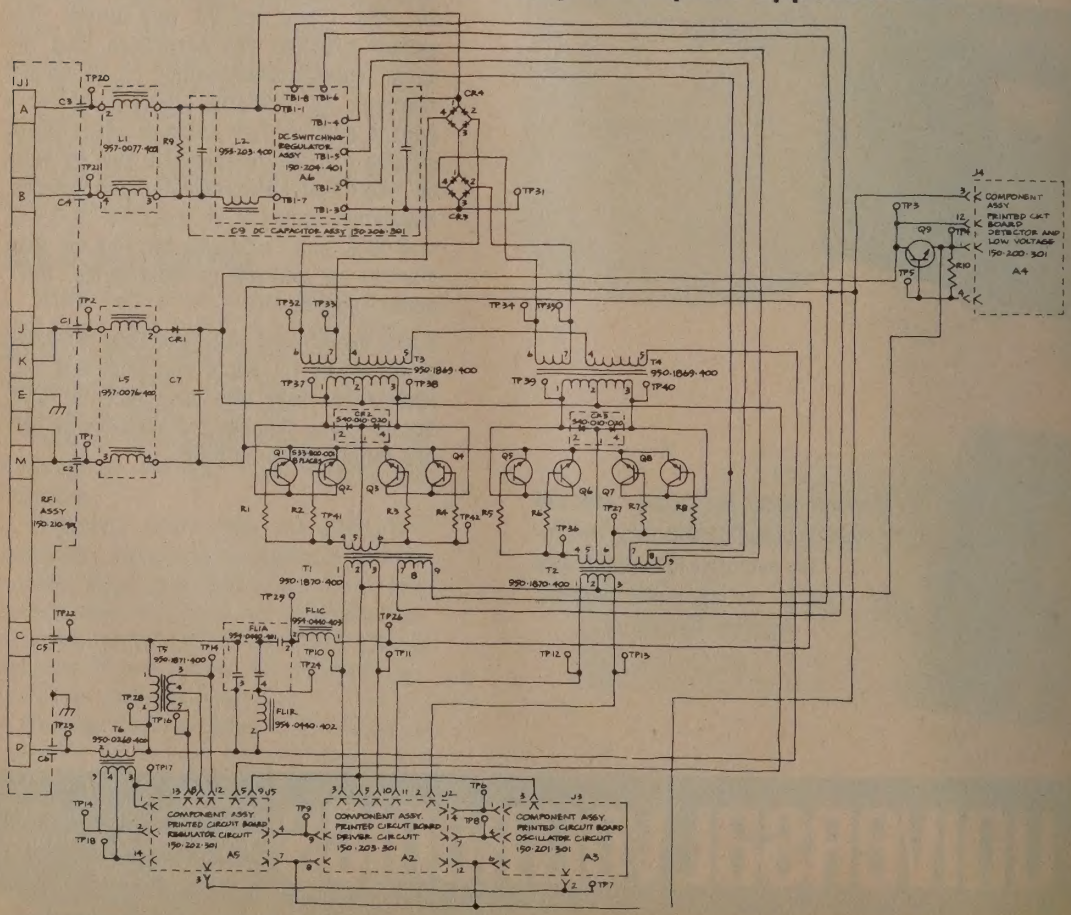
UNIVERSAL VOLTRONICS

27 Radio Circle Drive,
Mt. Kisco, N.Y. 10549
914-241-1300

IF YOU HAVEN'T FOUND IT,

VARO, INC., STATIC POWER CONVERSION EQUIPMENT IS CUSTOM DESIGNED TO MEET YOUR SPECIFIC REQUIREMENTS. BUT ENGINEERING IS NOT ALL WE CAN OFFER YOU—

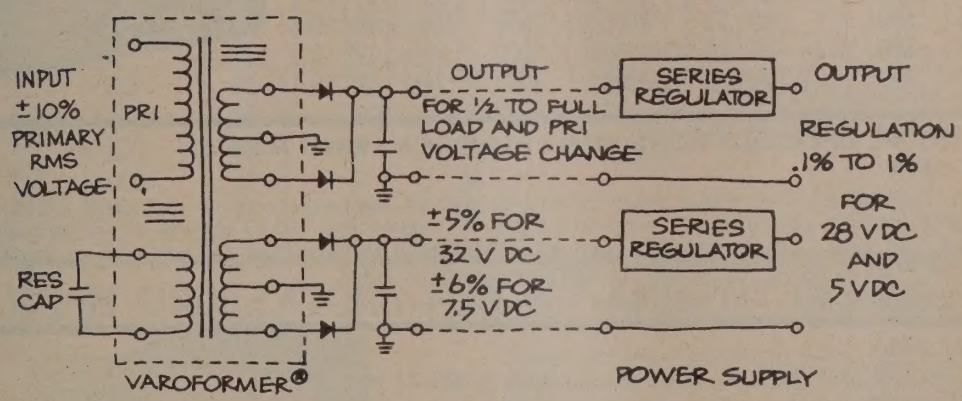
We are specialists in complex, reliable, state-of-the-art power conversion for military/aerospace applications.



LET US CREATE IT FOR YOU.

WE HAVE THE CAPABILITY TO PRODUCE FROM 50 TO 50,000. DO YOU WANT IT SOPHISTICATED, OR IS SIMPLICITY YOUR GOAL?

We're also computer/peripheral power supply experts. Which means you don't have to be.



Whatever you need, we have the capability to design, develop, and manufacture magnetic components (including the Varoformer® CVT) converters, inverters, power supplies, and regulators for aircraft, missiles, ships, submarines, night vision, surface carriers, computers/peripherals, and office equipment. Our engineering staff has at its fingertips the finest data processing equipment available to aid in its decisions of what best meets your requirements. Our manufacturing facility contains the latest and most modern production equipment. Give us the opportunity to quote on your requirements—and—if you haven't found it, let us create it for you.

VARO

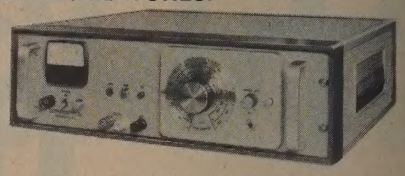
STATIC POWER DIVISION
1600 DALLAS NORTH PARKWAY
PLANO, TEXAS 75074

TEL: 214-424-5621
TWX: 910-860-5640
TELEX: 73-0164

REGULATED, WIDE BAND AC to AC POWER SUPPLIES

"S" SERIES POWER SUPPLIES THE STANDARD "S" SERIES FEATURES:

- All silicon solid state components
- Single phase and multi-phase outputs
- Advanced, state-of-the-art designs
- Accepts over 50 different plug-in oscillators
- Rack mounted units and bench models
- 18 Models from 130 VA to 6000 VA.



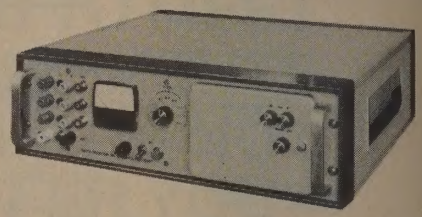
All aluminum parts are finished in gold iridite or black anodize. Steel parts are cadmium plated and finished with gold iridite. Front panels are standard Vector light blue gray semi-gloss enamel. Other paint available on special order. Furnish color chip and federal specification number.

SINGLE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (Inches) H	W	D	MODEL	POWER OUTPUT VA	DIMENSIONS (Inches) H	W	D
130-S	130	5¼	19	14	750-S	750	12¼	19	20
200-S	200	5¼	19	14	1000-S	1000	12¼	19	20
300-S	300	7	19	20	1500-S	1500	14	19	20
500-S	500	7	19	20	2000-S	2000	14	19	20

3 PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (IN.) H	W	D	MODEL	POWER OUTPUT VA	DIMENSIONS (IN.) H	W	D
Y-150-S	150	5¼	19	17	Y-1500-S	1500	12¼	19	20
Y-390-S	390	5¼	19	17	Y-1800-S	1800	14	19	20
Y-500-S	500	7	19	20	Y-2500-S	2500	14	19	20
Y-600-S	600	7	19	20	Y-4500-S	4500	24½	19	20
Y-900-S	900	12¼	19	20	Y-6000-S	6000	24½	19	20



ELECTRICAL SPECIFICATIONS (APPLY TO SINGLE & 3 PHASE MODELS)

INPUT DATA

VOLTAGE: 105 to 125 V AC, single phase for all units 600 VA and below (nominal 115 volts). If 210 to 250 V input voltage desired, add suffix "2" to model number. All models from 750 VA to 6000 VA are normally supplied with 208/230 V AC 3 phase input. 440/460 AC 3 phase input also available, add suffix "3" to model number.

FREQUENCY: 47 to 65 Hz. 47 to 480 Hz available on special order.

INPUT CONNECTION: All units have barrier strips at the rear.

OUTPUT DATA

BASIC FREQUENCY RANGE: All single phase output models 45 Hz to 10 KHz.

DISTORTION: 2% or less including plug-in oscillator.

VOLTAGE: Variable from 0 to 130 volts.

POWER OUTPUT: Full rated VA from 110 to 130 volts.

POWER FACTOR: Full rated VA from unity to 0.7 lead or lag. Greater power factor with some derating.

LINE REGULATION: ±0.25% over input voltage range, at full rated VA.

LOAD REGULATION: ±0.25% from no load to full load.

RECOVERY: 100 microseconds.

OVERLOAD: Automatic overload protection with manual reset and overload indicator.

HUM AND NOISE: —60 DB below full output.

OUTPUT CONNECTIONS: Five way binding posts on front panel and barrier strips at rear.

OUTPUT CONFIGURATION: Single phase models have two wire floating output (one side may be grounded) insulated for 500 volts RMS.

ADDITIONAL SPECIFICATIONS FOR 3 PHASE UNITS

All electrical specifications shown above apply to 3 phase units plus the following:

PHASE UNBALANCE: 100% phase unbalance will not affect any electrical specification.

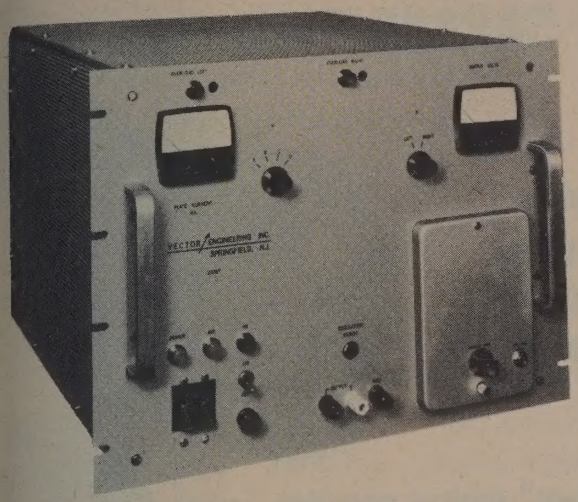
OUTPUT CONFIGURATION: Four wire, neutral floating. Units will accept Δ or Y loads. The neutral, or any one leg may be grounded.

OUTPUT VOLTAGE: 0-130 volts, line to neutral.
0-225 volts, line to line Y.
0-130 volts, line to line Δ.

METERING: Units of 900 VA and over are supplied with 3 output volt meters. Units below 900 VA are supplied with one meter and a switch to read line to neutral, line to Y, and line to Δ.

VECTOR engineering inc.
58 BROWN AVENUE, SPRINGFIELD, NEW JERSEY 07081 • TEL. 201: 379-7800

"T" SERIES AMPLIFIERS



The "T" series of regulated A.C. power sources is an extension of the "S" series in the higher power range with outputs up to 20,000 VA. The standard "T" series feature all silicon solid state components except for the output stage where rugged, forced air vacuum tubes are used. These units can also be used as high power audio amplifiers. The supplies are compact, ruggedly constructed, and contain all of the electrical and mechanical features of the "S" series except as follows: Distortion: 2% max., Line regulation: ±0.5%, Load regulation: ±0.5%.

SINGLE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (Inches) H	W	D
2000-T	2000	14	19	20
3000-T	3000	45	25	25
5000-T	5000	45	25	25
7500-T	7500	45	36	26
10000-T	10,000	56	42	34
15000-T	15,000	56	42	34
20000-T	20,000	56	42	34

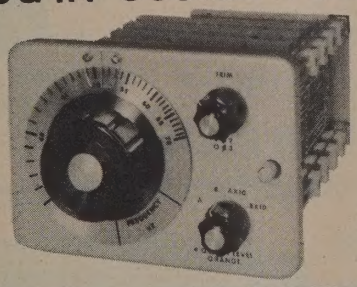
THREE PHASE OUTPUT

MODEL	POWER OUTPUT VA	DIMENSIONS (Inches) H	W	D
Y-5000-T	5000	45	25	25
Y-7500-T	7,500	58	30	30
Y-10000-T	10,000	58	30	30
Y-15000-T	15,000	78	34	34
Y-20000-T	20,000	78	34	34

NOTE:

Two phase and four phase units are available on short delivery. All "T" units are in semi-military angle and skin enclosures. The bottom is fitted with skids for fork lift truck. Casters and/or removable lifting eyes are available on request.

PLUG-IN OSCILLATORS FOR "S" AND "T" SERIES



These oscillators feature all silicon solid state components and precision variable frequency determining elements and are available in **single phase, two phase,** and **three phase.** All single phase oscillators are provided with an external signal input.

Frequency stability: Oscillators may be ordered with frequency stability ranges from ±0.5% thru ±0.001% as shown in the table below.

FREQUENCY RANGE	FREQUENCY STABILITY ±0.5%	±0.25%	±0.1%	±0.01%	±0.001%
ANY FIXED FREQUENCY BETWEEN 45 and 10 KHz	X	X	X	X	X
VARIABLE					
45 to 75 Hz	X	X	X		
320 to 480 Hz	X	X	X		
320 to 2000 Hz	X	X	X		
45 to 6000 Hz	X	X			
45 to 10000 Hz	X	X			

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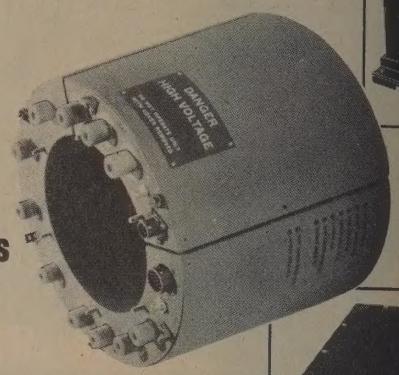
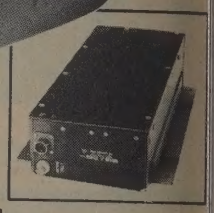
VENUS SCIENTIFIC IN

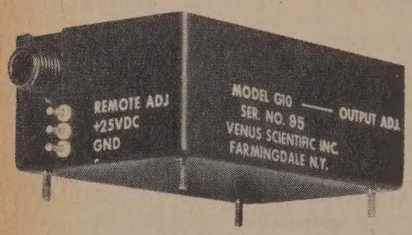
MINIATURE HIGH VOLTAGE CAPABILITIES

- variable DC to DC converters
- photomultiplier power supplies
- precision cathode ray tube power supplies
- multiple-output high voltage power supplies
- image intensifier tube gated power supplies
- nanosecond-switching kilovolt pulse generators
- high voltage multipliers
- high voltage oscillators
- remote controlled intensifier tube "zoom" power supplies
- kilovolt test sets for gated image intensifier tubes
- fast switching power supplies for TWO-COLOR cathode ray tubes





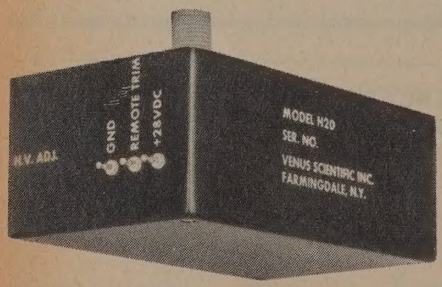
CATHODE RAY TUBE POWER SUPPLIES Model G-10



G-10
PRICE $490

- output adjustable from 1000 to 10,500 VDC @ 500 μa
- ripple 0.15% peak-to-peak at full load
- line regulation $\pm$.01%
- load regulation $\pm$.1%
- efficiency >50% at full load
- MTBF 42, 100 hours at 71°C
- 3¾" x 2$^{9}/_{16}$" x 1½" (15 cu. in.) 1¼ lb.
- operates from —55 to +71°C
- 50,000 ft. altitude
- MIL-E-5400
- input voltage 24 to 32 VDC
- short circuit and reverse-polarity protected
- temperature coefficient 0.025%/°C from —55°C to +71°C

Model H-20



H-20
PRICE $650

- output adjustable from 10 KV to 20 KVDC @ 500 μa
- ripple 0.05% P/P at full load
- line/load regulation $\pm$0.05%
- efficiency >50% at full load
- 4⅞"x3⅛"x1⅞" (30 cu. in.) 2.5 lbs.
- operates from —55 to +71°C
- shielded, encapsulated
- short circuit and reverse-polarity protected
- temperature coefficient 0.005%/°C from —55°C to +71°C
- input 28 VDC $\pm$10%
- available with negative output same price— Model H20N

Send for Catalog

(All prices and specifications subject to change without notice)

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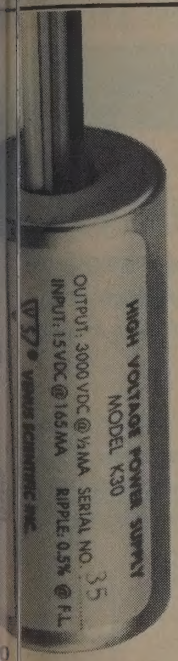
ENUS SCIENTIFIC INC.



TUAL SIZE

PHOTOMULTIPLIER POWER SUPPLIES

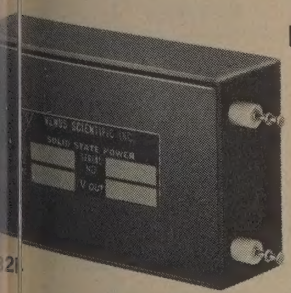
- small — 1" dia. x 2¼" long
- shielded, encapsulated
- operates from —55 to +71°C
- qualified per MIL-STD-810
- MTBF >100,000 hr at 71°C
- output proportional to input
- fast response
- output floating; input floating
- short circuit protected
- reverse-polarity protected

photomultipliers — flying spot scanners — image dissectors — ionization chambers
scan converters — CRT bias circuits — scintillation tubes — geiger tubes

Model	Input	Output Range	Ripple (p-p)	Efficiency at Full Load	Price (1-9)
K15	3V to 15V	300V to 1500V @ 1.0 ma	0.1%	>50%	$149
K30	3V to 15V	600V to 3000V @ 0.5 ma	0.5%	>50%	$158
Q30*	2V to 12V	600V to 3000V @ 0.2 ma	0.25%	>60%	$168

**Designed for battery applications—Idling current only 8 ma.*

For operation in vacuum environments, these units will be supplied in a 3" long can having a high vacuum seal. In specifying a vacuum unit, add the suffix "Z" to the model number (i.e. K30Z) and an additional $30 to the unit price.



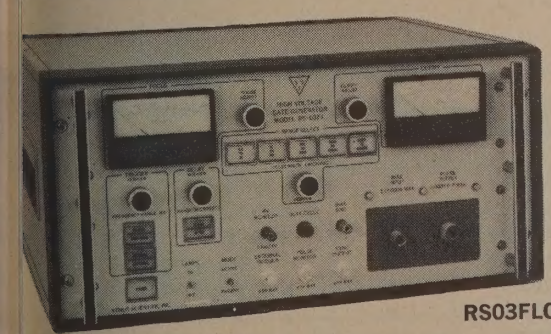
0-6.75

HIGH VOLTAGE OSCILLATORS

- fixed or proportional output
- short circuit protected
- reverse-polarity protected
- miniature packages
- flat packs for insert mounting
- designed for image intensifier applications

Model	Input	Output (p-p)	Nominal Frequency	Type	Price
32R4	18 to 32 Vdc	1200 Vac to 3500 Vac	10 KHz	Adjustable, line regulated	$265
0-6.75	6.75 Vdc	2800 Vac (overvoltage protection)	3 KHz	Output proportional to input	$98

32R4 Dimensions: 3" x 1¾" x ⅞"
0-6.75 Dimensions: 1" Dia. x 1⅞" L



RS03FLC

HIGH VOLTAGE GATE GENERATOR IMAGE INTENSIFIER TEST SET

- PRF to 10 KHz
- Output gate can be floated to ±25 KV
- Completely solid state
- 55 ns rise and fall times
- Max. Pulse Amplitude . . . 3000 v P/P
- Pulse Width Adj. from 0.5 μsec. to 100 msec.
- Pulse Delay Adj. from 0.3 μsec. to 50 μsec.

PLICATIONS:
QC nspection/test ■ laboratory simulation ■ high speed shutter for image intensifier tube ■ automatic exposure control in nsifier tube or photomultiplier ■ LIDAR range gate ■ direct viewing image intensifiers ■ vidicon coupled image intensifiers

(All prices and specifications subject to change without notice)

o fo Catalog

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VMI

VIKING MODULES, INC.
WALTHAM, MASSACHUSETTS 02154

223 CRESCENT STREET WALTHAM, MASS. 02154 PH. 617-891-7

SINGLE OUTPUT

WIDE ADJUSTMENT RANGE

- SAME DAY DELIVERY
- LOW COST
- 0.01% REGULATION
- LOW RIPPLE
- FULL 5 YEAR WARRANTY
- 3 WAY MOUNTING

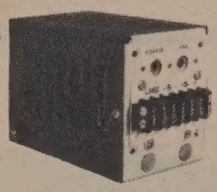
. . . developed for use in applications requiring PRECISION, STABILITY, RELIABILITY, FLEXIBILITY in terms of wide adjustment capability, and QUICK DELIVERY all at a reasonable cost.

Using a unique circuit approach and only the highest quality components, VIKING MODULES "100" Series Power Supply Modules enable you to select and cover the great majority of your modular power supply requirements from a small list of modules.

100 SERIES Specifications

CASES

A



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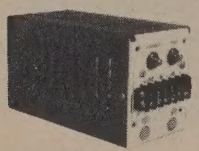

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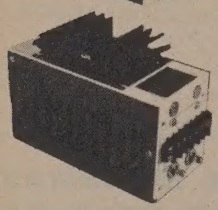


Input Voltage: 105-125VAC, 47-420Hz
Output Voltage: See Table Below
Output Current: See Table Below
Polarity: Positive, Negative, or floating to 300 Volts
Regulation: 0.01% or 1MV
Ripple: See Table Below
Temp. Coefficient: 0.01%/°C
Operating Temp. Range: -20°C to +71°C
Long Term Stability: 0.025% for 8 hours
Response Time: Less than 20 microseconds
Overload & Short Circuit Protection: Electronic Instantaneous recovery and automatic reset from o loads or short circuit conditions. Complete protection
Remote/Local Sensing: Connections on terminal block
Remote/Local Adjustment: Simple wiring change
Series/Parallel Operation: For higher voltage or for higher current. Consult factory.
Overvoltage Protection: Available as option. Add Prefix "C" to model number.

MODEL NO.	OUTPUT VOLTAGE RANGE	OUTPUT CURRENT (AMPS.)	PRICE (1 to 4 PCS)	RIPPLE (RMS)	STYLE	CASE DIMENSIONS H x W x D
101	0-40VDC	0.50	79.00	0.25MV	A	3 25/32 x 3 7/32 x 5 1/8
102	0-40VDC	1.0	89.00	0.25MV	B	3 25/32 x 3 7/32 x 6 13/16
118	0-40VDC	1.5	94.00	0.25MV	B	3 25/32 x 3 7/32 x 6 13/16
103	0-40VDC	2.0	99.00	0.25MV	C	5 1/32 x 3 7/32 x 6 13/16
104	0-20VDC	4.0	129.00	0.5MV	C	5 1/32 x 3 7/32 x 6 13/16
108	0-30VDC	3.0	119.00	0.5MV	C	5 1/32 x 3 7/32 x 6 13/16
109	0-110VDC	0.5	129.00	0.5MV	C	5 1/32 x 3 7/32 x 6 13/16
111	0-10VDC	6.0	149.00	0.5MV	D	5 x 4 x 8½
112	0-15VDC	7.0	174.00	0.5MV	D	5 x 4 x 8½
113	0-24MDC	5.0	174.00	0.5MV	D	5 x 4 x 8½
114	0-30VDC	4.0	174.00	0.5MV	D	5 x 4 x 8½
115	0-40VDC	3.0	139.00	0.5MV	D	5 x 4 x 8½
116	0-10VDC	10.0	199.00	0.5MV	D	5 x 4 x 8½
117	0-100VDC	15.0	169.00	0.5MV	D	5 x 4 x 8½

Note: Also Available, A Wide Variety of "Slot" Type Supplies.

VMI

VIKING MODULES, INC.
WALTHAM, MASSACHUSETTS 02154

DUAL OUTPUTS

200 SERIES

. . . two independent and isolated outputs for supplying op amp or IC power. High quality, Fast Delivery, "Right kind" of Pricing.

Specifications

Input Voltage: 105-125VAC, 47-420Hz
Output Voltage: See Table Below
Output Current: See Table Below
Polarity: Positive, Negative, or Floating to 300 Volts
Regulation: See Table Below
Ripple: See Table Below
Temp. Coefficient: 0.01%/°C

Operating Temp. Range: -20°C to +71°C
Long Term Stability: 0.025% for 8 hours
Overload & Short Circuit Protection: Electronic Instantaneous recovery and automatic reset from overloads or short circuit conditions. Complete protection

MODEL NO.	OUTPUT VOLTAGE RANGE	OUTPUT CURRENT (AMPS.)	REGULATION	RIPPLE (RMS)	STYLE	CASE DIMENSIONS H x W x D
203	12-21/12-21	0.500/0.500	0.025%	0.5MV	A	3 25/32 x 3 7/32 x 5 1/8
204	12-21/12-21	1.5/1.5	0.05%	0.5MV	C	5 1/32 x 3 7/32 x 6 13/16
206	13-18/13-18	0.025/0.025	0.05%	1.0MV	Card	1½ x 3 x 4
207	13-18/13-18	0.050/0.050	0.05%	1.0MV	Card	1½ x 3 x 4
208	13-18/13-18	0.100/0.100	0.05%	1.0MV	Card	1½ x 3 x 4
210	0-20/0-20	3.0/3.0	0.05%	1.0MV	D	5 x 4 x 8½
211	0-20/0-20	2.0/2.0	0.05%	1.0MV	D	5 x 4 x 8½

300 SERIES

MODEL NO.	CASE SIZE	OUTPUT VOLTAGE RANGE	OUTPUT CURRENT (AMPS.)	ADJUSTABLE OVERVOLTAGE	RIPPLE (RMS)	REGULATION	PRICE
301	A	3-7	1A	YES	1MV	.05%	89.00
302	B	3-7	3A	YES	1MV	.05%	139.00
303	C	3-7	6A	YES	1MV	.05%	179.00
307	D	3-7	1.5A	YES	1MV	.05%	255.00

Accessories

Overvoltage Protector	OV-1 Adjustable from 3 to 25V	$ 25.00
Overvoltage Protector	OV-2 Adjustable from 24 to 45V	25.00
Rack Panel Adaptor	RP 500 Accommodates up to four "100", "200", or "300" series modules	

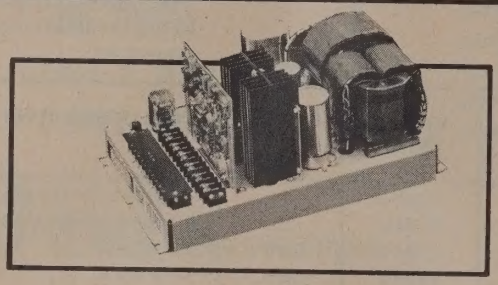
500 SERIES

MODEL	DESCRIPTION	PRICE
RP500	Rack Panel Adaptor	$ 35.00
P540	¼ Rack Panel Blank	3.50
P541	¼ Rack Panel w/Switch, Pilot lite, fuse Adjustment	17.00
P542	¼ Rack Panel w/Voltmeter, Ammeter, Pilot lite, fuse	35.00
P543	½ Rack Panel Blank	5.00
P544	Full Rack Panel Blank	7.50

THE **ONE** SOURCE FOR **ALL** YOUR POWER CONVERSION EQUIPMENT REQUIREMENTS

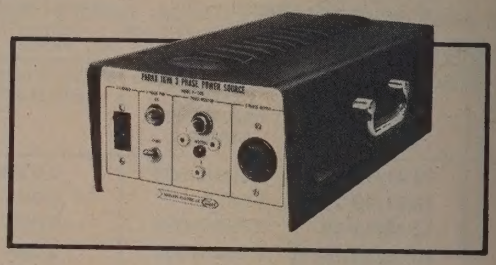
WANLASS POWER

Wanlass Power Supplies...



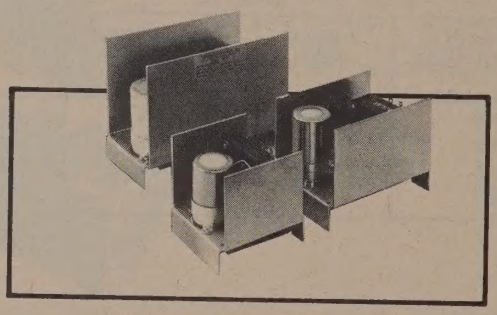
CUSTOM OEM ASSEMBLIES

Power supplies, voltage regulators, inverters, converters, frequency converters and filters custom designed to meet your exact need. Conventional solid-state designs or Wanlass proprietary PARAX®, CLIP-AC™ and VARAX™ techniques in any configuration.



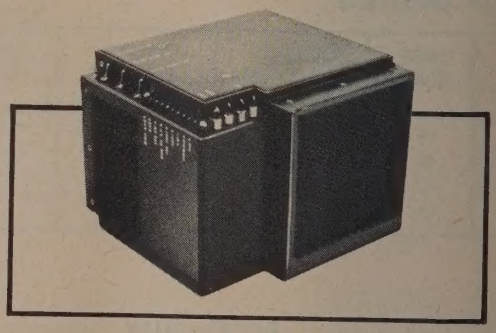
LAB INSTRUMENTS

Complete instruments in rack-panel or bench configurations for multi-purpose power supply requirements, AC power conditioning, dynamic line filtering, and voltage regulation, including PARAX® and VARAX™ technology for transient-free lab power!



STANDARD OEM ASSEMBLIES

The same technologies applied to standard OEM units available for immediate delivery from stock of more than 100 distributors across the nation. The "special" you have in mind could be a standard "off-the-shelf" unit stocked locally.



MILITARY ASSEMBLIES

High reliability power supplies designed and produced at state-of-the-art levels of technology. You'll get production with quality control conforming to MIL-Q-9858A, performed in highly automated "clean room" facilities.

Call Toll-Free! (800) 854-3258

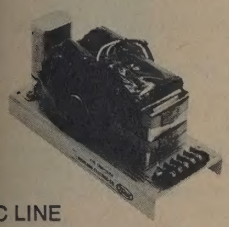
FROM CALIF. & CANADA (714) 545-8467 COLLECT

WANLASS ELECTRIC COMPANY
A DIVISION OF AMBAC INDUSTRIES INC.

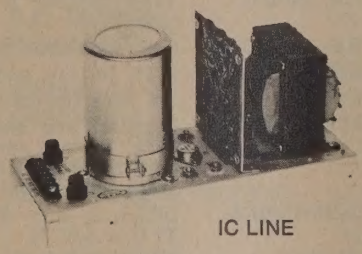
1815 RITCHEY STREET/SANTA ANA, CALIFORNIA 92705

Wanlass WANLASS POWER

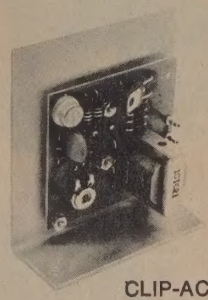
STANDARD OFF-THE-SHELF INDUSTRIAL & DISTRIBUTOR ECONOMY OEM & SYSTEMS AC & DC POWER SUPPLIES



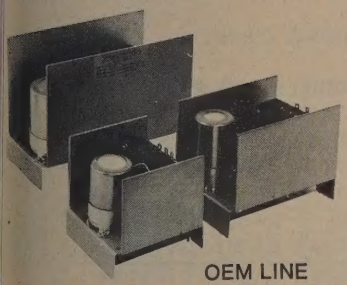
PEC LINE



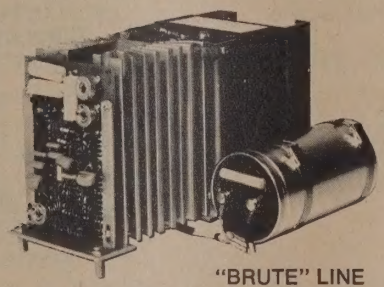
IC LINE



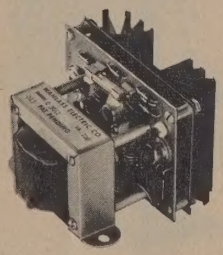
CLIP-AC LINE



OEM LINE

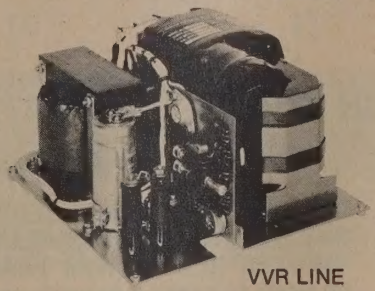


"BRUTE" LINE

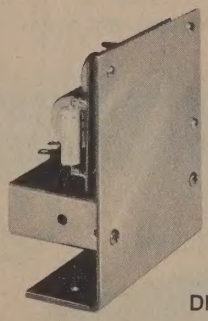


C-3000 LINE

MARK III LINE

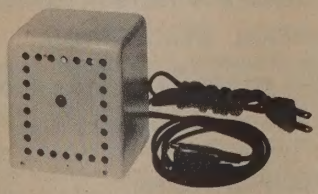


VVR LINE

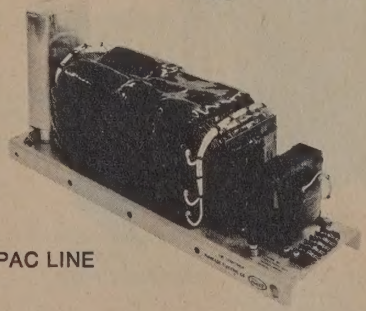


DPS LINE

"MAVERICK" LINE



ELIMINATOR LINE

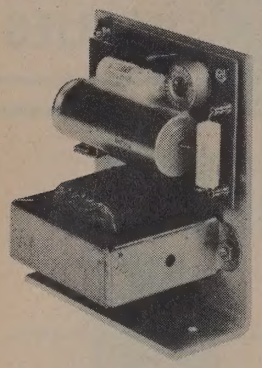


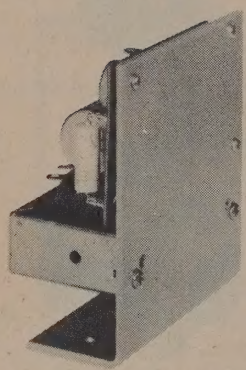
PAC LINE

ALL OF THE PRODUCTS SHOWN ABOVE ARE AVAILABLE IMMEDIATELY FROM OVER 71 DISTRIBUTOR LOCATIONS THROUGHOUT THE UNITED STATES FROM ALLIED, CRAMER, ELECTRONIC MARKETING, ELECTRONIC SALES, ELECTRONIC WHOLESALERS, NEWARK, OLIVE INDUSTRIAL, PHILADELPHIA ELECTRONICS, RADIO PRODUCTS, STERLING ELECTRONICS, HARRY STARKS, SUMMIT & ZACK ELECTRONICS.

WANLASS "DPS" LINE — 5/6, 12/15, 24 & 200V SUPER ECONOMY D.C. UNITS FOR OEM SYSTEMS

WANLASS O.E.M. ECONOM by DESIGN





MODEL NO. DPS-1

REGULATED 5/6, 12/15, 24 & 200V. LOW COST OEM SYSTE D.C. POWER SUPPLIES ONLY $24.95!* — 4 DIFFERENT MODE OF 6 POPULAR D.C. OUTPUT VOLTAGE AND CURRENT RATING

SPECIFICATIONS

A.C. INPUT: 115V ±10%, 1 phase, 60 Hz (Derate 20% for 50 operation).

D.C. OUTPUT: See "tabulation of models and rating available".

REGULATION: ±1% for line and load changes.

RIPPLE: 1% RMS (typically 0.5% RMS).

FEATURES: Overload and short circuit protection — automatic "fo back" current limiting — automatic recovery after short c cuit or overload is removed. Optional overvoltage protecti available at slight additional cost.

DIMENSIONS: DPS-1, 2, & 3: 4" W. x 2.5" D. x 4.5" H.; DPS-4: 4" W 3" D. x 4.5" H.

WEIGHT: DPS-1, 2, & 3: 2 lbs.; DPS-4: 2.5 lbs.

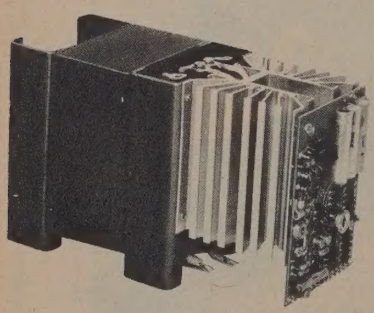
TABULATION OF MODELS AND RATINGS AVAILABLE

Wanlass Model	D.C. Output	PRICES 1-9	10-24	25-49	50-9
DPS-1*	5/6V. @ 3.0A	$24.95	$23.70	$22.50	$21.2
DPS-2*	12/15V. @ 1.5A	$24.95	$23.70	$22.50	$21.2
DPS-3*	24V. @ 1.0A	$24.95	$23.70	$22.50	$21.2
DPS-4**	180V.-220V. @ 0.1A	$36.00	$34.20	$32.40	$30.6

** Specifications shown above not applicable to DPS-4; Specifications on DPS-4 are as follows:
REGULATION: ±2% for Line • **RIPPLE:** ±2% RMS Max.

WANLASS "BRUTES" — HIGH POWER D.C. SLOT SUPPLIES

WANLASS O.E.M. ECONOM by DESIGN



WANLASS BRUTE II; REGULATED 600 WATT 5-50 V @ 12 A and/or 2-25 V @ 24A.

FOR HIGH POWER D.C. SLOT SUPPLY REQUIREMENTS, CHOO ONE OF THE THREE WANLASS WIDE VOLTAGE RANGE "BRUTES"!!; AT LOWER THAN "SLOT" SUPPLY PRICES!

NO NEED TO STOCK A VARIETY OF "SLOT" SUPPLIES — ONE UNIT PROVID WIDE OUTPUT CONTINUOUSLY ADJUSTABLE VOLTAGE RANGE OF 5 TO VOLTS OR 2-25 VOLTS IN RATINGS OF 300, 600 and 1200 WATTS!

GENERAL DESCRIPTION

High Efficiency, High Power, Low Cost, Quiet Operation and Immediate Ava ability are features of the new WANLASS "BRUTES"!
These Silicon Controlled Rectifier Regulated D.C. Power Supplies employ hi reliability phase control for power regulation. The efficient, noise-free operati is achieved through the use of a series inductance and capacitor filter circu

SPECIFICATIONS:

A.C. INPUT: 115/230 V ± 10%, 1ϕ, 47-63 Hz

D.C. OUTPUT: See Tabulation

REGULATION:
- **Line:** ± 0.1% or 50 mV
- **Load:** ± 0.1% or 50 mV

RIPPLE: 1% or 500 mV RMS

PROTECTION: Adjustable Current limiting for overload & short circu protection.

NOTE: Unit also features adjustable "damping" for reactive loac

TABULATION OF MODELS

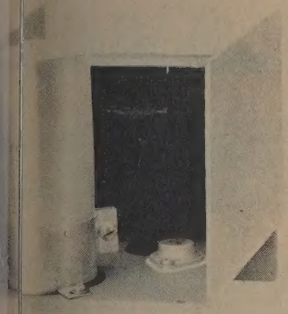
MODEL NO.	D.C. OUTPUT Voltage*	Current	DIMENSIONS H" x W" x D"	WEIGHT LBS.	PRICES 1-9	10-24	25-49	50-9
BRUTE I	5-50/2-25	6/12 A	6.75" x 8" x 11.5"	20	$148.	$141.	$133.	$12
BRUTE II	5-50/2-25	12/24 A	6.75" x 8" x 12"	30	$195.	$185.	$176.	$16
BRUTE III	5-50/2-25	24/50 A	10" x 12" x 14"	50	$315.	$299.	$284.	$26

* Can be connected either for 5 to 50 volt or 2 to 25 volt depending upon output current desired.

OPTIONAL EQUIPMENT:
K1 — Ten Turn Potentiometer Kit for Fine Voltage Adjust — $20.00 each
K2 — Ripple Reduction Kit (Reduces Ripple by 50%) — K2-I & K2-II for BRUTE I & II: $25.00; K2-III for BRUTE III @ $52.
K3 — OVP for all BRUTES: $49.50 (Universal unit — may be used with any D.C. Power Supply within 6-60 volts a 0-500 A Range

ASS PHASE II OEM
OWER SUPPLIES

WANLASS O.E.M. — ECONOMY by DESIGN

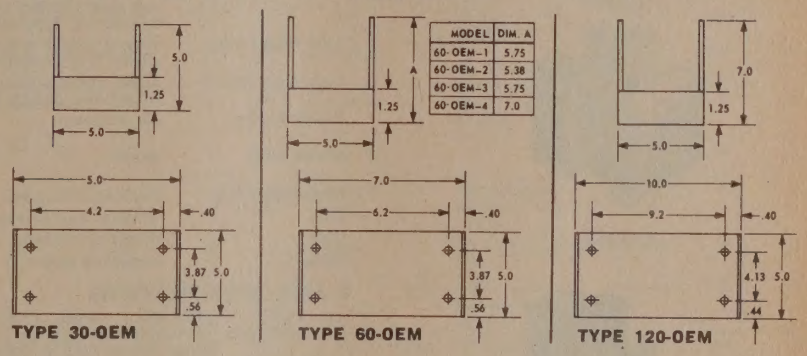


WANLASS TYPES 30, 60, and 120-O.E.M. THREE RATINGS TO CHOOSE FROM — 30-60-120 WATTS WITH FOUR VOLTAGE RANGES EACH!

SPECIFICATIONS:

A.C. INPUT:	105-125V, 57-63 Hz, 1 phase
D.C. OUTPUT:	See tabulation
REGULATION:	±1% for ±10% line change ±1% for No load to full load
RIPPLE:	0.1% +10Mv RMS maximum
GROUNDING:	Floating output; either positive or negative may be grounded
PROTECTION:	Automatic short circuit protection
DIMENSIONS & WEIGHTS:	30-OEM 5"Hx5"Wx5"L; 5 # max. 60-OEM 7"Hx5"Wx7"L; 7 # max. 120-OEM 7"Hx5"Wx10"L; 12 # max.
CONSTRUCTION:	Open Chassis type for OEM systems
TEMPERATURE:	0°C to 45°C

OEM POWER SUPPLY DIMENSIONAL DATA



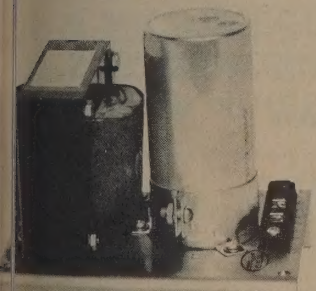
30EM-1
5V 2.5A—Unit

IO OF TYPES AND RATINGS

	VOLTAGE RANGE	POWER RATING	APPLICABLE PRICES	
M-1	3.6—9 V	30 Watts	1—9	$46.00
M-2	9—17V	or 2.5	10—24	$43.75
M-3	17—30V	Amperes	25—49	$41.50
M-4	30—60V	Maximum	50—99	$39.00
M-1	3.6—9 V	60 Watts	1—9	$57.50
M-2	9—17V	or 5	10—24	$54.50
M-3	17—30V	Amperes	25—49	$51.75
M-4	30—60V	Maximum	50—99	$49.00
EM-1	3.6—9 V	120 Watts	1—9	$86.25
EM-2	9—17V	or 10	10—24	$82.00
EM-3	17—30V	Amperes	25—49	$77.75
EM-4	30—60V	Maximum	50—99	$73.50

ASS MARK III PRECISION
LATED ECONOMY DC POWER SUPPLIES

WANLASS O.E.M. — ECONOMY by DESIGN



MARK III

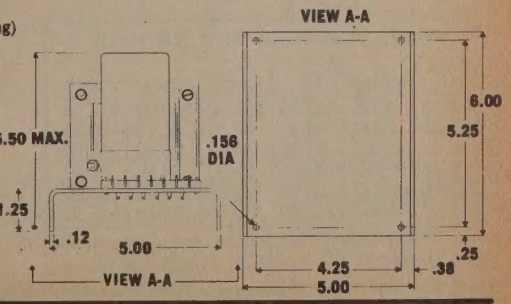
60 WATTS — PRICED AS LOW AS $76.00!

Better regulation and ripple plus "Built-in" current limiting **and** overvoltage protection are featured in the new MARK III power supply line.

SPECIFICATIONS . . . WANLASS MARK III O.E.M. D.C. POWER SUPPLIES

A.C. INPUT: (Also available for 380-420 Hz A.C.)	115/230V. ±10%, single phase, 47-63 Hz (derate 15% at 50 Hz)
REGULATION:	±0.1% or 10 mV for ±10% line changes ±0.1% or 10 mV for 0 to 100% load changes
RIPPLE:	.01% rms or 1 mV
GROUNDING:	Output floating; either positive or negative may be grounded
VOLTAGE ADJUST:	±2% (±10% w/derating)
OVERLOAD PROTECTION:	Adjustable automatic current limit overload and short circuit protection
OVERVOLTAGE PROTECTION:	Adjustable overvoltage crowbar operates automatically; factory set at approximately 20% above nominal output voltage
DIMENSIONS:	5" W x 6.25" H x 12" L
TERMINALS:	Terminal strip on chassis for A.C. input and D.C. output
TEMPERATURE RANGE:	0°C to +55°C
CONSTRUCTION:	Open chassis type construction—clear anodized aluminum

DIMENSIONAL DATA

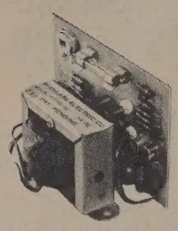


MODELS, RATINGS & PRICES
s available immediately from distributor stock.

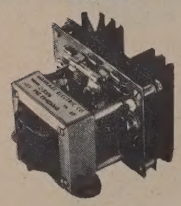
	D.C. Output	Quantity	Prices
M 5*	5 V., 5 A.	1- 9	$89.50
M 6	6 V., 5 A.		
M 5*	12 V., 5 A.	10-24	$85.00
M 4	15 V., 4 A.		
M 3	18 V., 3 A.	25-49	$80.50
M 2.5*	24 V., 2.5 A.	50-99	$76.00
M 2	28 V., 2 A.		
M 5*	5 V., 10 A.	1- 9	$137.50
M 10*	12 V., 10 A.	10-24	$130.60
		25-49	$123.75
M 5*	24 V., 5 A	50-99	$116.85

WANLASS CLIP-AC

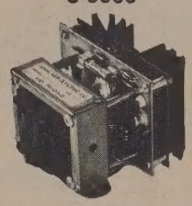
WANLASS CLIP-AC C-3000 117V. A.C. VOLTAGE REGULATORS



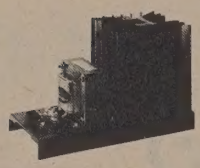
C-3003



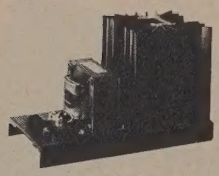
C-3006



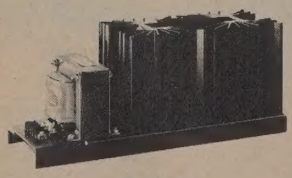
C-3012



C-3025



C-3050



C-3100

HERE ARE SOME OF THE OUTSTANDING CHARACTERISTICS OF WANLASS C-3000 VOLTAGE REGULATORS USING THE CLIP-AC™ PRINCI

C-3000 FEATURES

- Line and Load Regulator
- Wide Input Voltage & Frequency Range
- Peak Clipping Regulation Technique
- Quiet Operation—No Magnetic Noise
- Repairable All Silicon Solid-State Circuits
- High Efficiency
- Suppresses Line Transients
- Excellent Surge Loading Characteri
- Instantaneous Response
- "Clipped" Sinusoidal Output
- Excellent Temperature Coefficient
- No "Magnetic" Fields Nor RFI

C-3000 APPLICATIONS

- Instruments Pre-Regulator
- Electronic Systems
- Electrical Systems
- Photo-Optical Systems
- Initial Surge Loading Applications
- Motor Starting and Regulation
- All Resistive Loads such as Lightin Heating

APPLICATION

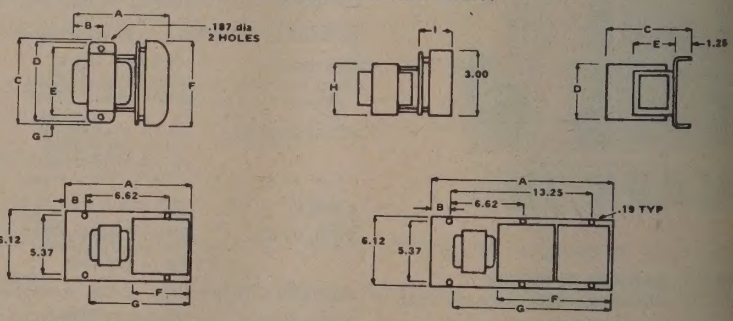
The CLIP-AC™ type AC regulator is the logical successor to the ferrores transformer for the bulk of the AC regulation requirements for up to 1

	CLIP-AC™ Principle	Ferroresonant Principle
Input Frequency	Wide range acceptable without degradation in regulation (47-420Hz typical)	Single frequency (output volta shifts 1.5% for 1% change in input frequency)
Line Regulation	Any reasonable degree of precision (0.1% easily achievable)	Cannot be modified (1-3% typi
Load Regulation	Load compensation circuitry inherent in design (1% typical)	No compensation (5-7% typica
Power Factor	No problem	Shifts output voltage level appreciably
Phase Shift	None	Appreciable — dependent on l current
Response Time	Typical 10-50 μsec	Typically 25,000 μsec
Cost	Smaller and Cheaper-less	Inherent weight and expense c
Size	material content	iron and copper
Weight	(typically 50%)	

C-3000 SPECIFICATIONS

A.C. INPUT: 100-130V., 1-Phase, 47-420 Hz
A.C. OUTPUT: 117V. nominal (see table of Model Numbers and ratings below)
Surge output rating: 400% of full power rating for 10 seconds
REGULATION (RMS): ±0.5% (for ±10% A.C. line change)
±0.5% (for 10% to full load change)
TYPE OF VOLTAGE REGULATION: True RMS with RMS sensor type referenc
REGULATION TECHNIQUE: Peak Clipping
POWER FACTOR REGULATION: ±0.5% (+0.7 to —0.7)
FREQUENCY REGULATION: ±0.5%
EFFICIENCY: 75% minimum at nominal input voltage full load
PHASE SHIFT: None
RESPONSE TIME: 10-50 microsecond
TEMPERATURE COEFFICIENT: 0.025% per degree C
OPERATING TEMPERATURE: —20°C to +50°C. Convection self-cooling; no external heat sinking required
OVERLOAD PROTECTION: Fused against overloads and short circuits

C-3000 INSTALLATION & DIMENSIONAL DATA



MODEL NUMBERS AND RATINGS

Model No.	Ratings	1-9	10-24	25-49	50-99
C-3003	30VA	$39.00	$37.00	$35.00	$33.00
C-3006	60VA	46.00	43.75	41.50	39.00
C-3012	120VA	51.00	48.50	46.00	43.50
C-3025	250VA	89.50	85.00	80.50	76.00
C-3050	500VA	125.00	118.75	112.50	106.00
C-3100	1000VA	210.00	199.50	189.00	178.50

Also see complete installation and dimensional data contained elsewhere in this bulletin.

TABULATION BLOCK

Model	A	B	C	D	E	F	G	H	I	Wt. Lbs.
C-3003	2.80	.875	4.00	3.25	2.81	1.75	.59	1.93	.75	1.5
C-3006	3.75	1.00	4.12	3.81	3.12	4.12	.50	2.25	1.62	2.5
C-3012	4.50	1.25	4.15	4.00	3.60	4.15	.23	2.62	1.62	3.2
C-3025	9.50	1.44	5.50	4.00	4.38	4.25	6.87			6.5
C-3050	10.88	2.12	7.25	5.00	4.38	5.00	8.25			10.25
C-3100	16.00	1.37	7.25	5.00	5.00	10.40	14.20			17.5

Wanlass Instruments | PRECISION A.C. AND D.C. POWER SUPPLIES

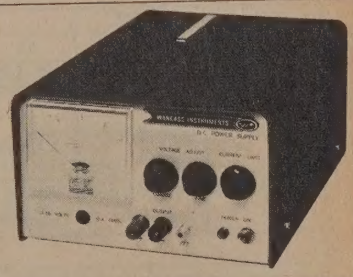
LINE CONDITIONERS

- FILTER 50 DB TO 1 MHZ
- REGULATES —.25%

MODEL NO.	AC INPUT	AC OUTPUT	LINE REG. (±10) VAC	LOAD (±) REG. (10 or 25% TO FL)	RESPONSE TIME	DISTORTION %	FREQ. HZ	VA	FILTERING TO 1 MHZ	PHASE	APPLICATIONS	SIZE H"xW"xD"	WT.	PRICE
[illegible]	105-125	118	0.25	1.5	0	<5%	60	500	50 db	1	Filter and regulate lab or prod. quiet	5-3/4 x 9-3/4 x 16-1/2	50	$ 325.
[illegible]	105-125	118	0.25	1.5	0	<5%	60	1000	50 db	1	Test Stand 100 db between loads	7 x 19 x 17-1/4	97	550.
[illegible]	118 236 472	118 236	.5	2.0	0	<5%	60	2500	50 db	1	Computer or system	10-1/2 x 19 x	155	750.
[illegible]	118 236 472	118 236	.5	2.0	0	<5%	60	5000	50 db	1	Industrial, production or entire lab	21 x 19 x 20	325	1500.
[illegible]	105-125	112	1.0	2.5	0	<5%	60	575	50 db	1	Scope & CRT	10 x 8 x 16	50	375.
[illegible]	105-125	110-120	0.1	.25	0 for 1% 10-20 ms for .1%	3%	380-420	500	50 db	1	For testing precision 400 Hz gyros, components and instruments	5-3/4 x 8-1/2 x 10-1/2	22	925.
[illegible]-3	105-125	110-120	0.1	.25	0 for 1% 10-20 ms for .1%	3%	380-420	500	50 db	3		8-3/4 x 19 x 20	150	2875.
[illegible]	105-125	110-120	0.1	.25	0 for 1% 50-100 ms for .1%	3%	57-63	500	50 db	1	60 Hz for controlled critical measurements	7 x 19 x 16	80	775.
[illegible]-0	95-130	110-120	0.1	0.1	Reg 30 ms, Filter 1 μs	3%	60	1000	40 db Decade	1	Reg. & filters for sensitive instruments built-in F-3000 filter for lab or production	5-1/4 x 19 x 12	40	575.
[illegible]-0	95-130	110-120	0.1	0.1	Reg 30 ms, Filter 1 μs	3%	60	3000	40 db Decade	1		5-1/4 x 19 x 12	75	975.
[illegible]-0	95-130	110-120	0.1	0.1	Reg 30 ms, Filter 1 μs	3%	60	5000	40 db Decade	1		5-1/4 x 19 x	100	1275.
[illegible]	115-Nom	115 Nom	—	—	—	1%	60	10A RMS 25A Peak	40 db Decade	1	Filter SCR spikes and any low level noise for lab & test	4-7/8 x 8-3/8 x 10-5/8	6	225.
[illegible]	105-125	0-140 AC 0-8 DC	0.25 5 MV	1.5 5 MV	0 10 μs	6% Typical	60 60	500 15A	50 db —	1	Q.C. test & development labs	5-1/4 x 19 x 17	70	875.
[illegible]	115-Nom	208/240 (3 or 4W)	—	—	—	—	60	1000 333/φ	—	1 to 3	1 to 3 φ conversion at a fraction of the cost — portable	5-3/4 x 8-1/2 x 16	60	475.
[illegible]-0	115	208/240 (3 or 4W)	—	—	—	—	400	1000 333/φ	—	1 to 3	400 Hz 3φ for quick economical 3φ	5-3/4 x 8-1/2 x 12	30	675.

D.C. POWER SUPPLIES

- .005 REGULATION
- 5 MICROSECOND RESPONSE TIME
- 250 MICROVOLT RIPPLE
- 100 DB NOISE REJECTION



MODEL NO.	DC VOLTS	AMPS	LINE REG.	LOAD REG.	RIPPLE (RMS)	RESPONSE TIME	FILTER TO 1 MHZ	PROTECT FEATURES	APPLICATIONS REMARKS	WT. LBS.	SIZE H"xW"xD"	PRICE
[illegible]	0-16	0-4	.005	.005	500 μV	5 μs	100 db	All	Parametric Lab DC	32	6 x 8-1/2 x 17	$375.
[illegible]	0-40	0-1.63	.005	.005	500 μV	5 μs	100 db	All	Parametric Lab DC	32	6 x 8-1/2 x 17	375.
[illegible]	0-40	0-1.6	.01	.01	250 μV	5 μs	—	All	Universal Lab	12	4-7/8 x 8-3/8 x 10-5/8	225.
[illegible]	0-16	0-4	.01	.01	250 μV	5 μs	—	All	IC/MOS-FETS/LSI	12	4-7/8 x 8-3/8 x 10-5/8	225.
[illegible]	0-7	0-5	.05	.05	750 μV	100 μs	—	OL/SC	IC's	9	5-1/4 x 8-1/2 x 8	125.
[illegible]	2-18 or 4-36	1.25 2.5	.05	.05	750 μV	100 μs	—	OL/SC	OP-AMP	9	5-1/2 x 8-1/2 x 8	150.
[illegible]	5, 12, 15, 18, or 24	60 W	.05	.05	750 μV	25-50 μs	—	OL/SC OVP	Multi output 1, 2 or 3, rack	16 32 48	5-1/4 x 19 x 8 5-1/4 x 19 x 8 7 x 19 x 8	125. 225. 325.
[illegible]	3-6.5 11-19 22-38	120 W 120 W 120 W	.03	.03	500 μV	40-80	—	OL/SC OVP	Systems Slot Rack	18	5-1/4 x 19 x 8	250.
[illegible]	3-6.5 11-19 22-38	200 W 200 W 200 W	.03	.03	500 μV	40-80	—	OL/SC OVP	Systems Slot Rack	48	7 x 18 x 10	315.

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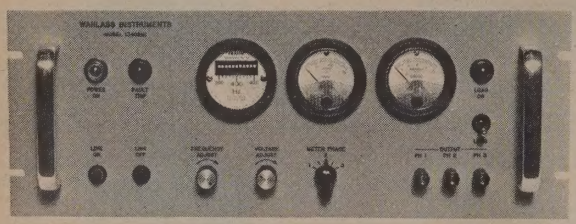
Wanlass WANLASS POWER SOLID STATE CONVERTERS

• AC to AC FREQUENCY CONVERTERS • DC to AC POWER INVERTERS
• SINGLE and 3-PHASE • From 50 Hz to 800 Hz • From 125 VA to 25 KVA*

*Provisions available for operating two or more units in parallel for power output requirements above 25 KVA.



AC TO AC FREQUENCY CONVERTERS

	INPUT			OUTPUT			
	Volts	PH	Hz	VA	Volts	PH	Hz*
11000 SERIES	120	1	47-63 or 360-440	125, 250 500 & 1000	120	1	47-63 or 360-440
13000 SERIES	120	1	47-63 or 360-440	125, 250 500 & 1000	120/208	3	47-63 or 360-440
21000 SERIES	220	3	47-63 or 360-440	2.5, 5 & 10 KVA	120	1	47-63 or 360-440
23000 SERIES	220	3	47-63 or 360-440	2.5, 5, 10, 15 & 25 KVA	120/208	3	47-63 or 360-440

*Adjustable

CHARACTERISTICS

Input
Input Voltage: Nominal ±15%

Output
Output Voltage Regulation: ±0.5% line and load
Output Frequency Stability: ±0.25%
Transient Voltage Dip: 25% with full load application
Response Time: 100 MS for 400 Hz output, 250 MS for 60 Hz output
Maximum Harmonic Distortion: 5% total, 3% any single harmonic
Voltage Adjustment: ±10%
Frequency Adjustment: ±5%
Overload: 110% for 1 minute at 1.0 power factor 180% for 10 seconds at 0.5 power factor (for motor starting)

Protection
Output current limiting up to and inc short circuit conditions. Instant shu from internal failure with fault trip ind light and manual reset.
Input current limiting fuses.
Internal over-temperature trip with i ing light and manual reset.
Units with forced air fans have aut shutdown and trip indication in the ev air flow loss.

Controls & Meters
Line On-Off switch with indicator
Load On-Off switch with indicator
Voltage adjustment knob.
Frequency adjustment knob.
Output Voltmeter.
Output Ammeter.

Ambient Temperature
0° C. to 55° C.

DC TO AC POWER INVERTERS

	INPUT	OUTPUT			
	Volts DC	VA	Volts	PH	Hz
39000 SERIES	28V ± 10%	125, 500, 1000 & 2000	120	1	60 or 400
41000 SERIES	240V ±15%	2.5, 5, & 10KVA	120	1	47-63* or 360-440*
43000 SERIES	240V ±15%	2.5, 5, 10, 15 & 25KVA	120/208	3	47-63* or 360-440

*Adjustable

CHARACTERISTICS

39000 Series: Voltage Regulation: ±3% line & load.
Frequency Stability: ±0.25%.
Harmonic Distortion: 7% maximum.
Current limiting overload and short-circuit protection.

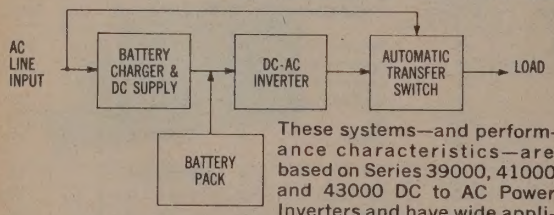
31000 Series: Voltage Regulation: ±0.5%.
Frequency Stability: ±0.25%.
Harmonic Distortion: 5% maximum.
Current limiting overload and short-circuit protection.

33000 Series: (Same as 13000)

41000 Series: (Same as 21000)

43000 Series: (Same as 23000)

EMERGENCY AND NO-BREAK POWER SYSTEMS



These systems—and performance characteristics—are based on Series 39000, 41000 and 43000 DC to AC Power Inverters and have wide applicability. Static and mechanical automatic switching both available.

LINE VOLTAGE REGULATORS

Qualified and approved to MIL-R-23098 (U.S. Navy) Type SPR 400. Regulators available in 1, 5, 10 and 25 KVA ratings.

MODIFICATIONS AND SPECIAL DESIGNS

We welcome and will quote inquiries for deviations from standard specifications or special designs to meet specific requirements.

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GTI CORPORATION
Dix Engineering Division

SEALING, CLASSIFYING AND BONDING EQUIPMENT

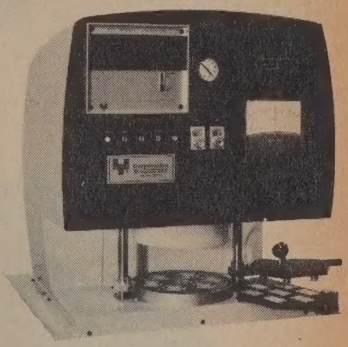
LABORATORY AND PILOT FLAT PACK SEALER/FP-VP-1M

A perimeter type, hermetic sealer for IC, Thick and Thin Film Packages. Sophisticated solid state circuitry permits complete control over the sealing atmosphere, location of heat, time at temperature and rate of heat-up and anneal rates. All the sealing stages are adjustable, flexible as to sequence and preprogrammed when desired; though any stage can be suspended or by-passed for experimental purposes.

Packages can range from ¼" x ⅛" to 1¾" x 1¾" and may be of glass, "Kovar"* or ceramic.

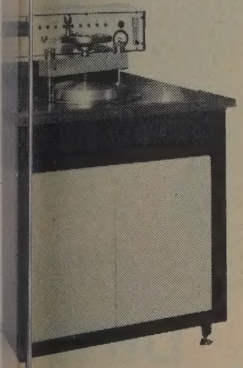
PRODUCTION FLAT PACK SEALER/FP-VP-17

(Seven head model illustrated)



ato precision at production rates is adntage of this perimeter type, multi-hemetic sealer for IC, Thick and Thin Packages. Similar to the FP-VP-1M de-ed bove, this sealer can be provided or to ten independently monitored ng eads.

Preprogrammed to the proper sealing profile for the particular package, the sealer automatically purges, evacuates, backfills with inert gas, perimeter heats (heatsinks protect the device), anneals the package automatically and recycles precisely. Depending on the number of sealing heads, packages up to 1¾" x 1¾" can be sealed.



GLASS-TO-METAL PROGRAMMABLE SEALER/DAP-700

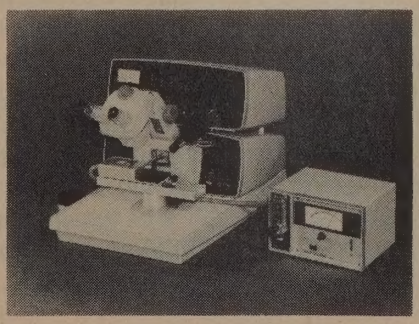
For glass-to-metal sealing, soldering and brazing operations at precisely controlled temperatures up to 1,000°C with complete control over the sealing atmosphere for vacuum, positive pressure and inert gas, this solid state controlled sealer can be completely preprogrammed for all parameters of the sealing cycle. Custom tooled for semi-automatic loading, the sealer can seal most standard types of semiconductor packages and component parts.

PACKAGE SEALING APPLICATION CENTERS

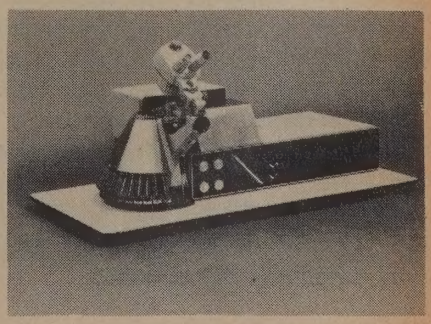
As a major supplier of glass and metal parts, "Flat Packs" and many other "Hi Integrity" packages as well as sealing equipment, GTI is uniquely equipped to help the engineer develop reliable sealing procedures and maximum production yields. Application centers are located in Costa Mesa, Calif., Providence, R. I., Peabody, Mass., and Miesbach, West Germany. Any GTI Sales Engineer can arrange for analysis and recommendations on your package situation.

*"Kovar" is a registered trademark of Westinghouse Electric Corporation.

290 Ultrasonic Wire Bonder is a semi-mat unit that eliminates circuit heating pro ctive atmospheres when bonding cu g off aluminum or gold leads to e. nsistor, or monolithic chips, hybrid tra interconnect pads or packages act

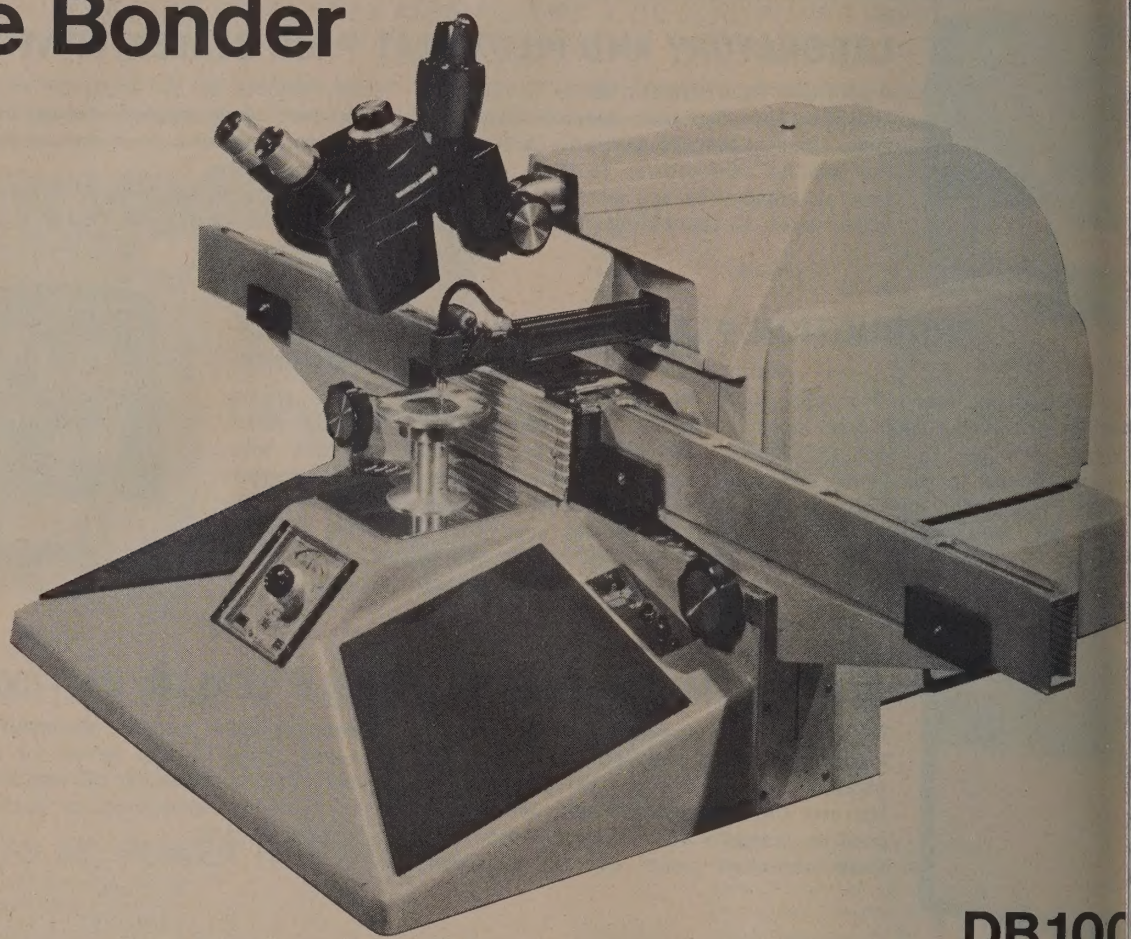


The 2906 Ultrasonic Flip Chip Bonder completely eliminates wire bonding with the new Glass Ambient Devices with their integrated uniplane "bump" for direct bonding to metallized thin or thick film circuit pads without heating of the circuits or protective atmospheres.



The 2907 Automatic Die Classifier is a self-contained, trouble-free handler for high speed production testing and classifying of semiconductor dice and flip chips.

NEW High Speed Thermo-compression Die Bonder



DB100

5 Times Faster and More Accurate

Meet your new "Money-Maker" — our high speed Thermo-compression Die Bonder, Model DB 1000. You'll hear much of this one.

It's fast — capable of 7200 cycles, or 6000 parts per hour. That's a 500% increase (minimum) over present semiconductor production capacities.

It's versatile — strip bond to 1½" width, discrete strip devices or I/C strips; or adapt to carrier belts and a wafer capacity of 3½" diameter. Strip index is infinite within a range of .050" to 1.500" spacings. Choose programmed XY stage die loading or fully automatic die bonding.

It has the features — such as high speed ac eration pick up and deposit. Adjustable bon force between 30 and 200 grams. Solid s machine controls. Proportional heat control wi ±2°C accuracy at the bonding point.

Next of kin to our wafer alignment systems, new Die Bonder is the latest accomplishment series of sophisticated electro-mechanical ins ments designed to increase your production yi

For details, contact Kasper Instruments, Inc., Shulman Avenue, Santa Clara, California 95 (408) 246-2696.

KASPER

ew full line of Kasper Tri-optical afer alignment systems corporates new high solution optics

el 17A 2¼″ automatic wafer alignment system, n the job, throughout the industry, ng the finest accuracy, highest capacity, greatest operator convenience . . . by far.

el 800 NEW 3½″ automatic wafer alignstem that provides all the work-proven ntges of the 17A, plus the capability ne any wafer you are apt to uer for quite some time, udig square substrate eri to 2½″ and larger.

el 900 "The Mask er. Proximity expo- wfer alignment ten. . . thinks for lf . . never lets ve masks ne contact con, to lon mask life ely. *Plus* eglar spe features ions.

LUS Options ever before seen...

Ultraviolet Integrator . . . senses and integrates the ultraviolet light source for absolute exposure control.

Infrared See-Through Option . . . enables the operator to see right through, for back side wafer alignment.

Vacuum Assist Chuck . . . saves masks by eliminating tendency to bow. Wafer conforms exactly to mask.

Carousel Loader . . . new super-speed rotary loader is standard on the Model 1900 . . . optional on Models 17A

LAMINAR FLOW HOODS AND WORK STATIONS
Tables designed to assist maximum efficiency for each production operation, with or without ultraclean laminar flow hoods . . . integrated design, but mechanically isolated from hood assembly to maintain minimum vibration at work station.

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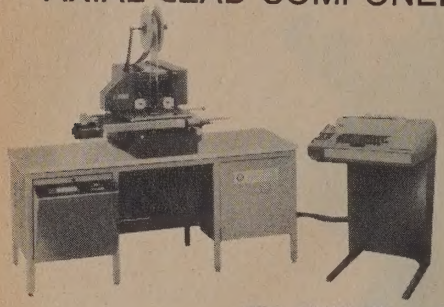
Universal ENGINEERED ELECTRONI

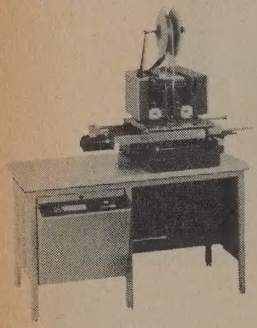
PRINTED CIRCUIT BOARD INSERTION MACHINE

COMPUTERIZED TOTAL SYSTEMS . . . PANTOGRAPH OPERATED . . . NUMERICALLY CONTROLLE

AXIAL LEAD COMPONENTS

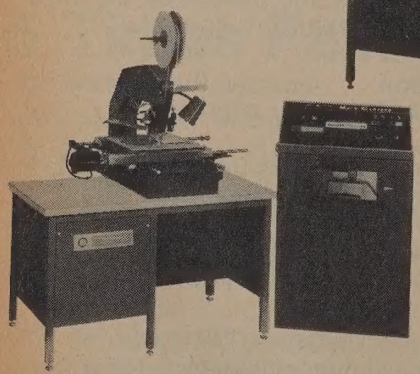


NEW COMPUTER CONTROLLED VARIABLE CENTER DISTANCE MODEL 6264 inserts axial lead parts into PC boards on as many as 999 different center distances between pads from 0.300″ to 1.260″ with a single board handling. Programmable for wire diameters from 0.015″ to 0.32″ and 0.020″ to 0.037″



DUAL CENTER DISTANCE MODEL 6271 N/C (also available with computer control or pantograph) for insertion at two adjustable center distances. Programmable 8-position depth stop. More economical to purchase than a fixed head machine plus a second head for alternate center distance—with all downtime for changeover eliminated.

PANTOGRAPH — FIXED CENTER DISTANCE inserts reel packaged axial lead components at rates in excess of 2,000 an hour; rates as high as 5,600 have been attained.



N/C FIXED CENTER DISTANCE MODEL 6253 (also available with dual heads) inserts sequenced axial lead components at rates in excess of 4,500 an hour.

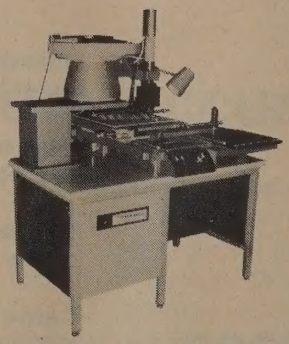
OTHER INSERTION MACHINES include jumper wire . . . square "wire wrap pin" . . . wire "stitcher" . . . PC board terminals . . . drill press. Additional adaptations of Universal's basic pantograph and N/C positioning systems can be produced to meet special requirements where close tolerance parts location is needed.

DUAL IN-LINE PACKAGES

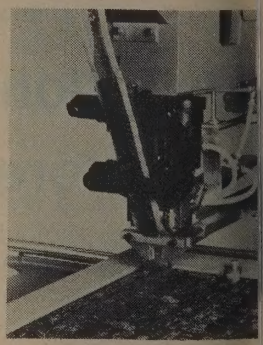
N/C SEQUENCE-INSERT MOD 6752 selects DIPs from up to 16 Barnes carr magazines and inserts in programmed sequences at rat as high as 2,500 an hour. Also available with computer contr

PANTOGRAPH — INSERT MODEL 6413 inserts DIP's from Barnes carrier magazines at rates up to 1,800 an hour. Models also available to sequence and insert 4, 8, or 16 different DIP's from Barnes magazines or stick input.

TRANSISTORS



LEAD TAPED transistors can be i serted as "axial lead" componen at rates of approx. 4,000 an hr.fro this N/C Model 6352. Also availab with pantograph operation.



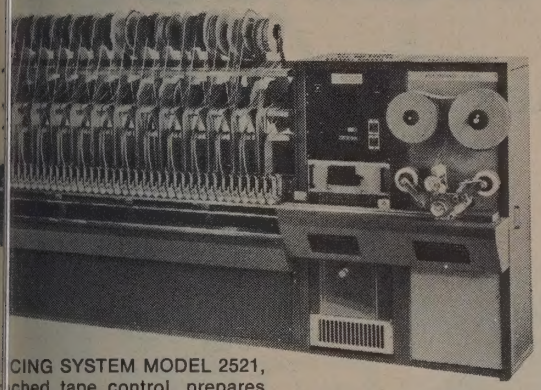
BOWL FED transistors are inserted as "axial lead" components at rates as high as 3600 from this Model 6351. Other models available to insert transistors "conventional" position.

CONTRACT MANUFACTURING . . . SHORT RUN STAMPING. Universal also offers extensive modern facilities for contract manufacturing, ranging from prototypes to production scale runs, using latest facilities for electronic assembling and short run stamping.

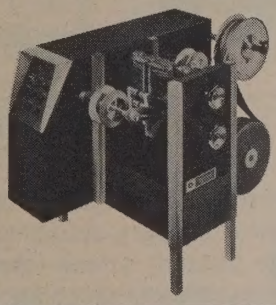
CTRO-MECHANICAL PRODUCTION EQUIPMENT

MPONENT PACKAGING MACHINES

AXIAL LEAD COMPONENTS



CING SYSTEM MODEL 2521, ched tape control, prepares axial lead components in se- or automatic PC board inser- to 39 dispensing stations can rom lead taped units, maga- cardboard packages.

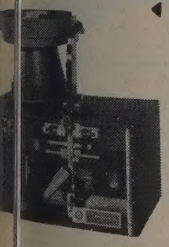


LEAD TAPING MACHINE 315 lead tapes and reel pack- nponents. Available with bowl d straightening & trimming, and orienting accessories. at rates as high as 15,000

DUAL IN-LINE MODULES

BARNES CARRIER LOADER MODEL 4411 inserts bowl fed DIP's into carriers at rates up to 4,000 an hour.

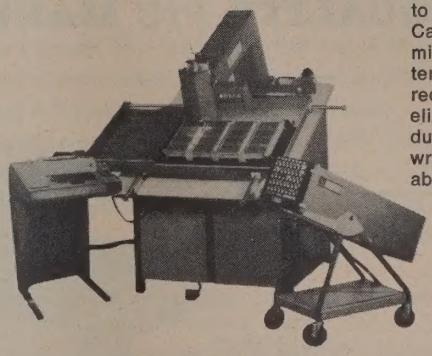
TRANSISTORS



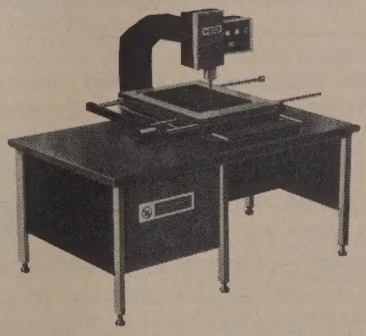
◀ "PREPPER" — LEAD TAPING MACHINE MODEL 3315 forms bowl fed transistors into "axial lead" components and reel packages them ready for PC board insertion at rates as high as 7,000 an hour.

PREPPER MODEL 3421 pre- ▶ TO-18 and other transistors for nical insertion into PC boards at p to 5,000 an hour.

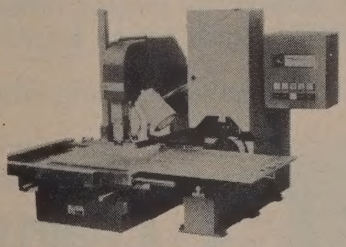
SEMI-AUTOMATIC WIRE TERMINATION SYSTEMS



NEW COMPUTER CONTROLLED SINGLE HEAD MODEL 6954 terminates 24 and 30 AWG wires, including twisted pairs, at rates up to 400 wires an hour. Can be changed over in minutes for clip on wire termination. Drastically reduces rework time by eliminating wiring errors due to misplacement or wrap quality. Also available with N/C.



SINGLE HEAD MODEL 6951 is designed for smaller back panels with a wiring area not larger than 16″ by 18″. Operating features are similar to Model 6952.



COMBINATION N/C WIRE TERMINATION & DIP INSERTION system designed for use where volume does not justify separate machines. Production rates equal single function models, but only one assembly operation can be performed at a time.

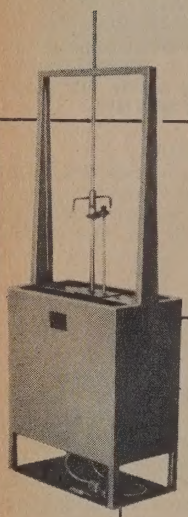
COMPONENT PROCESS SYSTEMS & CUSTOM PRODUCTION EQUIPMENT

Process line sub-assemblies and complete systems can be supplied for automated operations including diode, capacitor and resistor assembly, testing, orienting, sorting, body coating, marking, curing, and reel packaging. For full information send for Bulletin 2000.

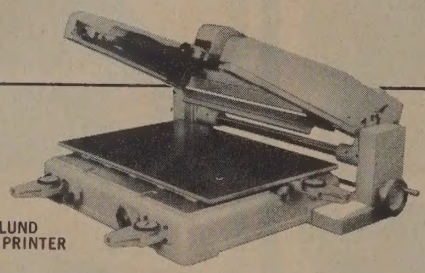
Universal INSTRUMENTS CORPORATION • East Frederick St. / Binghamton, New York 13902 / 607-772-1710

Kressilk is headquarters

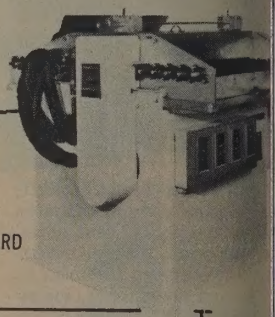
FOR QUALITY P/C MANUFACTURING EQUIPMENT



K-P DIP COATING SYSTEM



FORSLUND CIRCUIT PRINTER



SOMACA CIRCUIT BOARD CLEANER

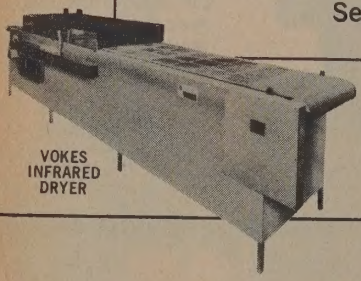
The Kressilk Line features Excellence. Every item has been tested for quality of manufacture, but more importantly for efficiency of operation. You can depend on K-P for top performance in every department.

Arc lamps, dark room accessories, plate printers, screen fabrics, chases, screen printers, inks, resists, etchers, degreasers, cleaning and drying equipment, soldering and drilling machines, every one tested and guaranteed to deliver the ultimate in circuit board manufacturing efficiency.

In this "precision-minded" profession, Kressilk has been supplying the finest fabricating equipment for many years and all our products stand up to rigid demands for precise, repeatable calibration, register and processing. Kressilk stands behind everything it delivers.

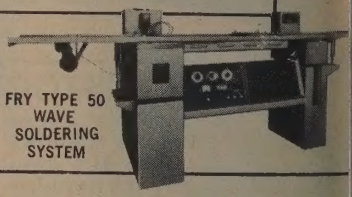
Send for complete catalog and technical bulletins.

BAROI DEGREAS



VOKES INFRARED DRYER

A COMPLETE LINE OF AUXILIARY EQUIPMENT AND SUPPLIES



FRY TYPE 50 WAVE SOLDERING SYSTEM

KRESSILK PRODUCTS, INC.

420 SAW MILL RIVER ROAD ELMSFORD, NEW YORK 10523

AREA CODE 914 592-5010 TELEX 01-37331

PRECISION INDUSTRIAL EQUIPMENT
2446 University Avenue
St. Paul, Minnesota 55114

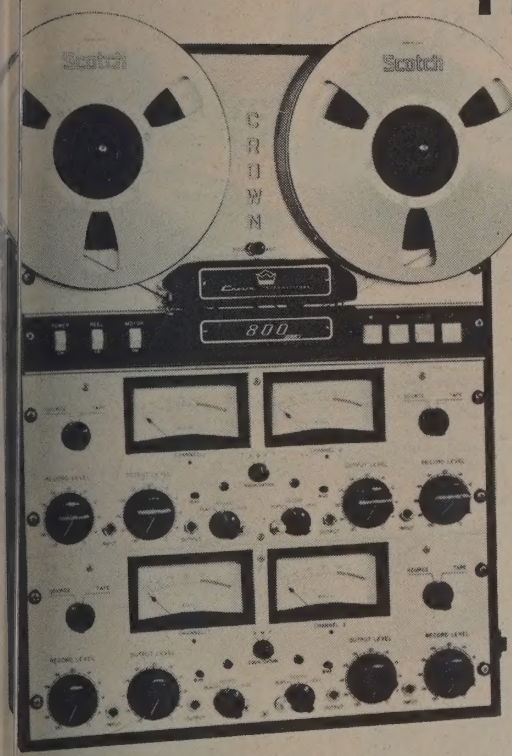
STEVEN DANIELS CORPORATION
2619 Tarna Drive
Dallas, Texas

KRESSILK PRODUCTS

KRESSILK PRODUCTS, INC.
2434 Dempster St.
Des Plaines, Illinois

ALL TRECK PHOTOGRAPHIC STORE

Crown® PRECISION TAPE RECORDERS WIDEBAND POWER AMPS



All models handle ¼-inch tape and reels 5" to 10½", all 19" rack mount.

Standard speeds 15 - 15/16 ips with 1 to 4 channels.

Patented electro-magnetic brakes never need adjustment.

Lifetime lubrication of all bearing surfaces.

True straight-line threading with easy-edit design.

Individual erase, record and play heads for 1, 2 or 4 tracks.

Six years proven solid state circuitry - etched circuit modules.

Extremely low noise electronics; modular transport construction.

Strict quality control with individual proof-of-performance records - entirely American made.

Over 40 standard models $545-$3700; custom modifications for OEM use.

Also available: slow speed data loggers (down to 0.33 ips), duplicator systems, and complete series of players and decks.

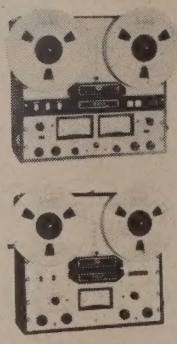
TO BASIC TAPE DECK STYLES:

70 Rugged, high quality simple unit with only 9 moving parts; automatic stop in "play" mode.

80 Basic 700 construction plus computer logic control which never breaks tape; IC logic levels for remote control and function readout; ideal for systems integration; 10 moving parts; photocell tape sensor, edit switch, cue lever; automatic replay accessory.

FOUR STYLES OF ELECTRONICS:

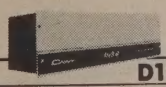
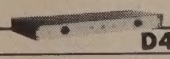
Varying features and degrees of flexibility to match user requirements. Contact sales dept. for complete descriptions.



TYPICAL PERFORMANCE CHARACTERISTICS

(varies with model & options selected)

Speed	Response-Hz	S/N	Wow
15 ips	±2db 50-30K	60db	0.06%
7 1/2	±2db 30-25K	60db	0.09%
3 3/4	±2db 50-15K	55db	0.18%
1 7/8	±3db 50-10K	45db	0.35%
15/16	±3db 50-5K	45db	0.50%

AMPLIFIERS	DC300	D150	D40
Output 4Ω load	300 watts/channel	125 watts/channel	40 watts/channel
Response 1 watt	±0.1db DC-20KHz	±0.1db 20Hz-20KHz	±0.1db 20Hz-20KHz
S/N 8Ω load	100db below 150w	100db below 75w	100db below 30w
IM Distortion—	under 0.1%—	under 0.1%—	under 0.3%—
8Ω load	0.01-150 watts	0.01-75 watts	0.01-30 watts
Dimensions	7"x19"x9¾"	5¼"x19"x7"	1¾"x19"x7½"
Weight	40 lbs	16 lbs	7½ lbs
Price*	$685	$440	$199

*Subject to change without notice

DC300 - Lab Standard DC Amplifier
Outstanding for exceptional signal purity and stability coupled with unusually high power capabilities. Output ±50 volts DC, 35 volts RMS AC. DC drift under 3mv up to 55° C.

D150 - High Power Audio Amplifier
Excellent general-purpose power amp with outstanding response, distortion and stability.

D40 - Ultra-Compact Audio Amplifier
Small, high quality amplifier with unusually wide power band-width.

All Crown amplifiers are completely stable two-channel units with internal protection for all loads. Rugged instrument-grade construction guaranteed three years for parts and labor. Custom modifications available for quantity OEM purchases.

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EXTENSION 21M - CLYDE W. MOORE

Kinelogic

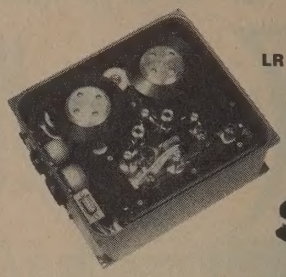
Kinelogic Corporation / 873 South Fair Oaks Avenue / Pasadena, California 91105 / (213) 449-8707 / TWX 910-588-3287 / a Dictaphone Company

YE

SC

special purpose magnetic tape recorders

Leading manufacturer of instrumentation type recorders for field and space environments. Widest line of standard recorders — optimized to your application • Proprietary drive system reduces operating parts 30%; withstands severe environments, gives bidirectional operation, constant tape tensioning and very low flutter.



LR

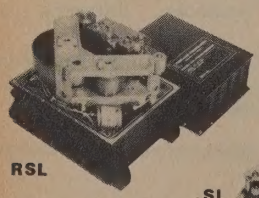
HM

RECORDERS FOR AIR/SEA/GROUND APPLICATIONS

CHARACTERISTICS		MODEL SC	MODEL LR	MODEL L	MODEL HM	MODEL YE	MODEL DP	TYPE F
TAPE CAPACITY	WIDTH (INCHES)	1.0	0.5 or 1.0	0.5 or 1.0	0.5 or 1.0	1.0	0.25	0.5 or 1.0
	LENGTH (FEET)	60	650	1000	2250	4600	615	220
TAPE SPEEDS	SPEEDS (ips) IN STD. RECORDER	15	3.75/1.875, 15/7.5, 60/30	3.75/1.875, 15/7.5, 60/30	3.75/1.875, 15/7.5, 60/30	3.75/1.875, 15/7.5, 60/30	1.875	45/22.5
	ELEC. SEL. RATIOS	—	2:1	2:1	2:1	2:1	—	2:1
SIZE IN INCHES	WIDTH	4	7.6	9.5	10.75	15	5	6.12
	LENGTH	4	6.6	7.5	15.375	21	8	6.12
	HEIGHT	4	3.87	4.25	4.905	5	3	3.25
WEIGHT IN POUNDS		4	7	11	30	45 (incl. elec.)	6.1	10
POWER REQUIRED	VOLTAGE	28 Vdc	28 Vdc	28 Vdc	28 Vdc or 115 Vac	28 Vdc	28 Vdc Control 115Vac, 400 Hz ± 1 Hz	28 Vdc
	WATTS	15	15 (at 30 ips)	22	45	30 (w/o elec.)	3 (DC) <15 VA	22
DATA RECORDING SUITABILITY		Digital	Analog & Digital	Analog & Digital	Analog or Digital	Analog or Digital	VOICE	Digital

SPACE RECORDERS (SATELLITE, DEEP PROBES)

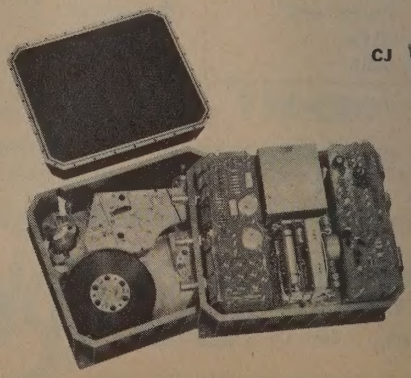
CHARACTERISTICS		MODEL SL	MODEL CJ	MODEL LS-1	MODEL LS-2	MODEL RSL	MODEL LL
TAPE CAPACITY	WIDTH (INCHES)	1.0	0.25	1.0	1.0	1.0	0.25
	LENGTH (FEET)	125	480	1090	1090	400	625 (cartrldg
TAPE SPEED (ips) in Std. Recorder		30	single speed 1 to 30 ips	2.4 & 4.8 Record 19.2 Playback	4.5 Record 24 Playback	4	two speed 0.468, 15
SIZE IN INCHES	WIDTH	4.2 Dia.	6.0	10.5	10.5	6.0	6.9
	LENGTH	4.2 Dia.	7.75	9.0	9.0	5.0	11.0
	HEIGHT	4.125	4.0	6.0	6.0	5.0	3.5
WEIGHT IN LBS*		3.8	5.9	12	12	5.5	8
REQUIRED POWER	VOLTAGE	28 Vdc	2ϕ, 21 Vac	28 Vdc	28 Vdc	28 Vdc	28 Vdc
	WATTS	25	2.5 at 4 ips	16 in Record 22 in Playback	16 in Record 22 in Playback	6	10
DATA RECORDING SUITABILITY		Analog or Digital	Digital	Digital	Digital	Digital	Analog, Digital and F



RSL

SL

*All specifications nominal. Size and weight include control electronics but exclude data electronics, except for RSL, which includes two Rec. & P/B channels. Write or phone Kinelogic for additional information on these or other Kinelogic recorders.



LS-1/LS-2

CJ

Kinelogic

Kinelogic Corporation / 873 South Fair Oaks Avenue / Pasadena, California 91105 / (213) 449-8707 / TWX 910-588-3287 / a Dictaphone Company

Low frequency, long term, real time magnetic tape recorders, systems

33⅓ days

- ONE-INCH: Model RM300
- ONE-HALF INCH: Model RM200

APPLICATIONS

oceanography
off-shore platform monitoring
submerged buoy monitoring
medical
seismology
geomagnetic
meteorological
process monitoring
maintenance recording

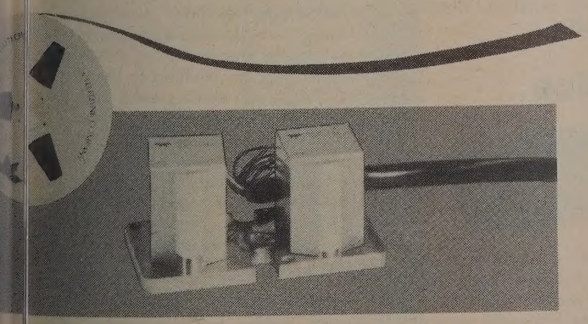
photo: model RM300

SPECIFICATIONS FOR FM RECORDING: DIRECT RECORDING AVAILABLE

NO. OF CHANNELS ½"	NO. OF CHANNELS 1"	DATA FREQUENCY RANGE ± 3 db [1]	FM CENTER FREQUENCY	RECORDING TIME (7200 FT TAPE)	SIGNAL TO NOISE RATIO (RMS TO RMS)	POWER (WATTS) [2] ½" DC	½" AC	1" DC	1" AC
7	14	dc to 5 Hz	27 Hz	33.3 days	40 db	19	21	25	27
7	14	dc to 10 Hz	54 Hz	16.6 days	40 db	19	21	25	27
7	14	dc to 17 Hz	84.4 Hz	10.6 days	40 db	19	21	25	27
7	14	dc to 170 Hz	844 Hz	25.5 hours	40 db	28	30	34	36

[1] Direct-recording Frequency Range: (dc to 3 KHz, All Speeds)

[2] One-half inch also available: low-power, dc



& REPRODUCE HEADS

h supplies tape, and builds flux-responsive uce heads with associated electronics for ic applications/requirements. Geotech's flux-responsive real-time playback heads luce analog signals with a dynamic range to that obtained in higher-speed instrumen- recorders.

Recorders are instrumentation-grade units suitable for field or laboratory use. Reproduce channel may be used to read out data from magnetic tape as it is being recorded without interrupting recording process, which allows continuous monitoring of entire data system. Reproduce channel is switchable to any record channel. Recorders are IRIG compatible. Recording speeds and center frequencies allow analysis on any IRIG standard unit.

For additional information, write c/o Dept. 14; TELEDYNE GEOTECH; 3401 Shiloh Road; Garland, Texas 75040

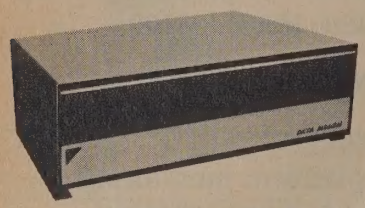
TELEDYNE GEOTECH

COMMUNICATIONS DIVISION

Since 1922

Transmission Terminals For Data, Control, Telephone, Telegraph and Telemetering Applications

Data



RFL Industries, Inc. offers a complete line of data modems for all computer, data terminal and time sharing applications. Now with the advent of the FCC's decision concerning "foreign attachments" you may electrically connect privately purchased, rented or leased data modems to your conventional telephone line.

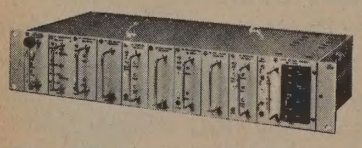
A complete line of data modems are available and are all compatible and will transmit into Bell data sets (103A-103B-103F-201B-202B-202D) with the same dependability and reliability that goes into all RFL equipment.

The Model 3952 Data Modem is a high speed unit for transmitting and receiving digital data. It transmits and receives serial binary data over a voice bandwidth at a synchronous rate of 2400 bits per second. Applications include all present day transmission equipment including conventional and dedicated telephone lines, power lines, microwave transmission and radio. The 3952 is compatible with all features and options of the Western Electric 201B data set and will operate end-to-end with W. E. equipment

The 13AO/TTY is an asynchronous modem for either direct hardwire or acoustical coupling, providing TTY models 28, 33 or 35 interfaces. The unit operates over two-wire circuits, such as the DDD network or four-wire circuits, such as a leased dedicated line. Particularly designed for computer time sharing over the DDD network and intercommunication with teletype terminals, it will also operate with a Western Electric 103A Dataphone.

The new Model 3227, coherent modem, is capable of transmitting high speed binary coded data and clock information simultaneously. There is no need for expensive synchronized clocks in end-equipment. The need for accurate timing is also eliminated, permitting operation through adverse conditions.

AM and FS Voice

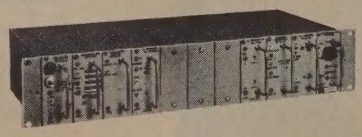


The 2056 Series represents the ultimate in tone channel design in as much as a single packaging concept is employed to accommodate all tone channel requirements for any application.

AM channels may be intermixed with FS channels and various combinations of both types of receivers and transmitters are accommodated.

Basic modules are provided which are common to all applications. Special requirements which are peculiar to particular systems and applications are provided by accessory modules mounted on plug-in cards similar to the basic modules and connected at the rear of the mounting shelf. This packaging concept provides for maximum economy and versatility since basic modules are common to all applications encountered in telemetering, control and telegraph applications.

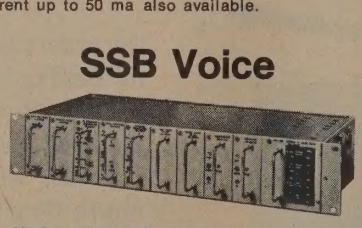
Analog Telemeter



The Model 2203 Variable Frequency Telemeter system provides complete circuitry for telemetering DC or low frequency AC voltages by means of an audio frequency shift carrier which is modulated at a sub-audio frequency rate of 10 to 30 Hz or by polar current pulsed at 10 to 30 Hz. Full-scale span of the measured DC quantity is represented by the 10 to 30-cycle modulation frequency which is directly proportional to the EMF applied to the transmitter. At the receiver, the telemeter signals are demodulated, and the output DC potential or current is directly proportional to the modulated signal. This output may be used to operate potentiometer recorders and DC milliammeters. Modified modules are also available for modulation frequencies of 7.5 to 15 Hz for use over narrow band transmission facilities. Other frequencies are also available.

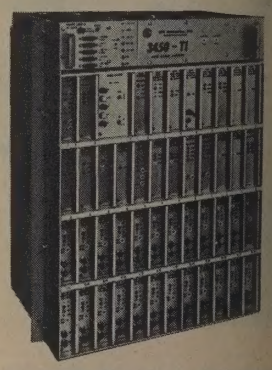
Any DC input voltage range of 20-millivolt to 1000-millivolt span is available as standard. Modules are also available for slide-wire and higher voltage inputs. Output current from the receiver has a 2 milliampere span into 2500 ohms maximum for 10 to 30-Hz modulation frequency variation. Output current up to 50 ma also available.

SSB Voice



The Model 2710 SSB Terminal was designed to provide a high quality voice channel for voice communication or data transmission for application to microwave, static, power line and radio system basebands. Two basic groups, one of 14 channels, and occupying the frequency spectrum 4-60 kHz, the other of 12 channels, and occupying the frequency spectrum from 60-108 kHz are available. The channels may be applied singly or in groups without common equipment. Since the 2710 ticularly suitable to low density requireme attempt has been made to overcrowd comp which would reduce system flexibility and cate system and maintenance procedures. Al circuitry including channel filters are provid front panel test points and controls for conve in system monitoring and servicing. By dual lation, channels up to 300 kHz are available.

"TELCO" Equipme



RFL is telephone oriented — with nearly century of experience in the manufacture o munications equipment and systems. The new 3450 T1 PCM cable carrier uses pulse code m tion techniques, time division multiplexing, transmission circuits and has minimal maint requirements. The 3450 T1 carrier is com and identical in overall system design wi Western Electric "T1". Various standard ty naling modes, compatible repeaters, one-wa dial, revertive pulsing modules and carrier alarm facilities are just some of the availab options.

OTHER TELEPHONE EQUIPMENT

The Universal Wire-Wrap Chassis provides to accept eleven separate "plug-in" modules applications are obtainable by simply inserti proper modules and wiring the wire-wrap ter associated with the modules to be used. Th versal Chassis will serve present and future and is available in 19" rack mounting, wall ing or desk set models. Applications for this tile chassis include seven port resistance b active amplitude equalizers, impedance com tors, power supplies, regulators, filter net 4-way 4-wire bridges, repeaters and a wide of circuits using standard RFL modules.

All terminals are fully transistorized and mi ized using modular type construction for mi space requirements and ease of maintenanc lowing a maximum of channels to be installe out sacrificing versatility, performance and adaptability. All units are standard 19" rack mo with other mounting options available.

RFL Industries, Inc.

Communication Division • Boonton, New Jersey 07005 • U.S.A.

Tel. (201) 334-3100 / TWX: 710-987-8352 / CABLE: RADAIRCO, N. J.

See page 781 Thermocontrol Division Temperature Measurement C

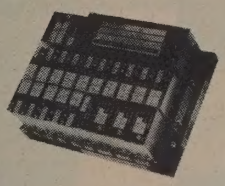
See page 780 Instrumentation Division Metrology, Magnetics

Sonex

TELEMETRY SYSTEMS AND COMPONENTS

FM MULTIPLEX EQUIPMENT

uen division multiplexing allows a number of different data nnels o be transmitted simultaneously on a single link — either tele one or coaxial cable — or to be recorded on a single track a ma etic tape recorder. The measurement signals from trans- ers odulate subcarrier oscillators (VCO's) tuned to different uen s. The outputs of the VCO's are linearity summed and the posi signal is transmitted or recorded. At the receiving end, carri discriminators divide the composite signal into the indi- al ocarrier signals and demodulate them to produce the inal easurement signals. FM multiplexing equipment includes:



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olat Input
igh-vel Input (5v)
ow-Level Input (10mv)
iniare or Micro-Miniature
8-Vo Operation
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ibra n Switches
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ansla rs and Detranslators
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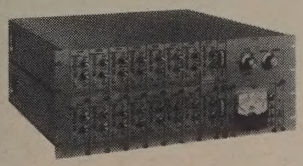
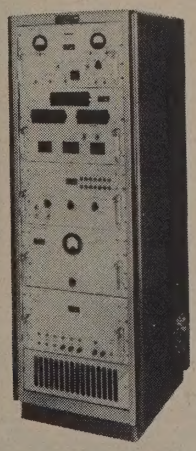


METEOROLOGICAL SYSTEMS

he del 3703 Meteorological Data Processor operates in conjunc- on th an AN/GMD Rawin Set or WBRT Radiotheodolite to auto- atic ly acquire digital meteorological data for storage on punched ape tape or magnetic tape. The data, which includes tracking ngle slant range, temperature, humidity and elapsed time, is roce ed to suit transmission line and/or computer input. Peri- hera equipment includes:

igita Printer
ape splay Unit
utpu Format Converter
est uipment



TIME DIVISION MULTIPLEX EQUIPMENT

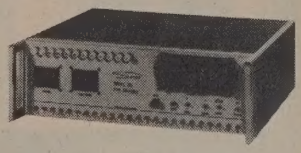
Time-division multiplexing allows a number of different data channels to be transmitted sequentially on a single link—either RF, telephone or coaxial cable — or to be recorded on a single track of a magnetic tape recorder. A commutating device (multiplexer) sequentially samples the measurement signals from transducers. The commutator output is a series of pulses whose amplitudes correspond to the sampled values of the input channels from the transducers. This train of pulses is then transmitted by pulse amplitude modulation (PAM) or further processed to other transmission formats such as pulse duration modulation (PDM) or pulse code modulation (PCM). At the receiving end, the process is reversed to decommutate the pulse train to produce signals which correspond to the original measurement data. Available equipment includes:

Airborne Digital

PCM Systems
PAM Commutators
PDM Commutators
Addressable Commutators and Multiplexers
Voice Multiplexing and Demultiplexing Systems

Ground Digital

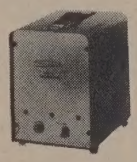
Single-Channel Decoders
Digital Demultiplexers
Signal Conditioners



MEDICAL ELECTRONIC SYSTEMS

The Model 56 Data Transmitter, combined with the Model 57 Data Receiver, provides the capability to multiplex up to six channels of analog data for transmission over leased telephone lines. This data modem has found wide use in transmitting ECG data from a remote intensive care center to a central monitoring hospital. Other physiological uses include transmission of information such as EEG, temperature and pressure. Specifications include:

Isolated Input
All Solid-State
Tape-Speed Compensation
DC to 100 Hz Bandwidth
±2.5-Volt Input



FM TRANSMITTERS

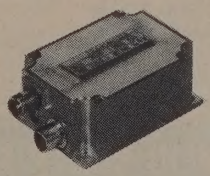
Airborne solid-state units, available for either VHF or UHF applications, feature:

VHF

130 to 140 MHz
216 to 260 MHz
0.1 to 15 Watts
±0.005% Stability
200 kHz Bandwidth
28-Volt Operation

UHF

1435 to 1540 MHz
2200 to 2300 MHz
0.5 to 10 Watts
Output Isolator
±0.003% Stability
1 MHz Bandwidth
28-Volt Operation



Sonex
Main Office & Plant: 20 East Herman St. • Phila., Pa. 19144 • Tel. 215-843-6400 • TWX 710-670-6372
West Coast Office: Airport Imperial Bldg., 999 N. Sepulveda Blvd., El Segundo, Calif. 90245 • Tel. 213-772-2181 • TWX 910-348-6292

SOLID STATE FREQUENCY-TO-DC CONVERTERS

FM DISCRIMINATORS • PHASEMETERS UNDER/OVER FREQUENCY & SPEED DETECTORS MODULES & VISUAL READOUTS

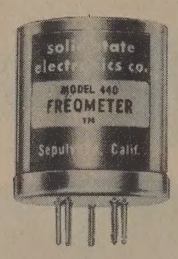


FIG. 1

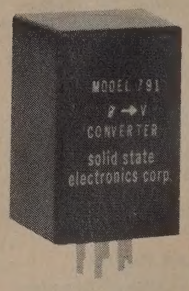


FIG. 2

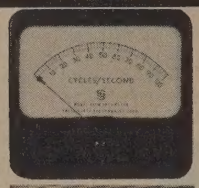


FIG. 3

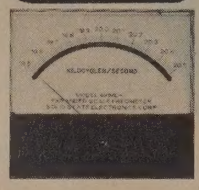


FIG. 4

FIG. 5

microminiature lightweight | low power low level | high speed high efficiency | rugged linear | indefinitely long life temperature stable

FREQMETERS, DISCRIMINATORS, PHASEMETERS

Solid state frequency-to-dc converters and discriminators will linearly convert frequency or repetition rate of signals to a proportional dc output. Waveforms can be sine, square, pulse, sawtooth or triangular. Standard models are available to cover a wide range from zero to 300 kcps. Expanded scale, differential frequency, under/over frequency and phase detectors are available (meter, meter relay and relay types are also available). These units have been designed for applications where stability, ruggedness, long life, efficiency and freedom from maintenance are prime requisites. Miniature, stable and rugged designs make these units ideal for military, aerospace, industrial and portable applications.

Only the Models 400 to 440 Freqmeters are basic f-dc converters, the output being proportional to the product of frequency and peak input voltage. The 410KF to 440KF are solely frequency dependent (independent of peak input voltage). 450KF to 480KF units require lower drive (millivolts). 410M to 440M units have a visual panel meter readout. The 410MR to 440MR have visual panel meter relay readout with external min-max adjustments. Tl 486E is an expanded scale Freqmeter while the 491ME is a mirrored-sca visual panel meter version. The 411 and 421 units are difference Freqmeter The 401 series FM discriminators are for IRIG channel telemetering. The 4 is a Hi-Lo pass frequency sensitive relay suitable for under/over frequen and speed detection and control. The 476 frequency detector is a narr bandpass frequency sensitive relay. The 791 Phasemeter is a phase-t voltage converter.

You'll find microfilm data sheets and application notes in VSMF or t Thomas Supplementary File.

If you have a special requirement, phone, wire or write for an immedia reply or catalog. Shipments can be same day, if you call early.

COMPARATIVE TABLE OF SPECIFICATIONS FOR FREQMETERS, DISCRIMINATORS & PHASEMETERS

		INPUT			OUTPUT						SUPPLY		ENVIRONMENTAL				MECHANICAL		
Model	Type	Freq. kcps	Volts pk-pk	Z kΩ	Volts DC	Ripple %	Drift %/°C	Z kΩ	Resp. msec	Linear %	V Volt	I ma	Temp. °C	Shock G	Vib. G	Acc. G	Size inches	Wt. grams	Fi
410	Basic Freqmeter	0-0.1	5-18	2	0-5	2	.01	10	500	0.5	−28	1	−55 to +85	5K	100	5K	2 x .88 Dia.	60	1
420	Basic Freqmeter	0-1	5-18	2	0-5	2	.01	10	50	0.5	−28	1	−55 to +85	5K	100	5K	1.3x.88 Dia.	38	1
430	Basic Freqmeter	0-10	5-18	2	0-5	2	.01	10	5	0.5	−28	1	−55 to +85	5K	100	5K	1.3x.88 Dia.	38	1
440	Basic Freqmeter	0-100	5-18	2	0-5	2	.01	10	0.5	0.5	−28	1	−55 to +85	5K	100	5K	1 x .88 Dia.	30	1
410KF	Normal Freqmeter	0-0.1	2-18	40	0-5	2	.01	10	500	1.0	+28	25	−55 to +80	1K	100	1K	.9 x .9 x 1.3	100	2
420KF	Normal Freqmeter	0-1	2-18	40	0-5	2	.01	10	50	1.0	+28	25	−55 to +80	1K	100	1K	.9 x .9 x 1.3	100	2
430KF	Normal Freqmeter	0-10	2-18	40	0-5	2	.01	10	5	1.0	+28	25	−55 to +80	1K	100	1K	.9 x .9 x 1.3	100	2
440KF	Normal Freqmeter	0-100	2-18	40	0-5	2	.01	10	0.5	1.0	+28	25	−55 to +80	1K	100	1K	.9 x .9 x 1.3	100	2
450KF	Hi Sens Freqmeter	0-0.1	.02-2	1 & 40	0-5	1	.01	10	500	1.0	+28	25	0 to +70	1K	100	1K	.9 x .9 x 1.3	100	2
460KF	Hi Sens Freqmeter	0-1	.02-2	1 & 40	0-5	1	.01	10	50	1.0	+28	25	0 to +70	1K	100	1K	.9 x .9 x 1.3	100	2
470KF	Hi Sens Freqmeter	0-10	.02-2	1 & 40	0-5	1	.01	10	5	1.0	+28	25	0 to +70	1K	100	1K	.9 x .9 x 1.3	100	2
480KF	Hi Sens Freqmeter	0-100	.02-2	1 & 40	0-5	1	.01	10	0.5	1.0	+28	25	0 to +70	1K	100	1K	.9 x .9 x 1.3	100	2
410M	Visual Freqmeter	0-0.1	2-18	40	0-5	2	.05	10	500	1.0	+28	25	+10 to +40	—	—	—	4.2x4.7x3.8	450	3
420M	Visual Freqmeter	0-1	2-18	40	0-5	2	.05	10	50	1.0	+28	25	+10 to +40	—	—	—	4.2x4.7x3.8	450	3
430M	Visual Freqmeter	0-10	2-18	40	0-5	2	.05	10	5	1.0	+28	25	+10 to +40	—	—	—	4.2x4.7x3.8	450	3
440M	Visual Freqmeter	0-100	2-18	40	0-5	2	.05	10	0.5	1.0	+28	25	+10 to +40	—	—	—	4.2x4.7x3.8	450	3
410MR	Visual Freqmeter-Relay	0-0.1	2-18	40	0-5	2	.05	10	500	1.0	+28	25	+10 to +40	—	—	—	4.2 x 4.7 x 4	450	3
420MR	Visual Freqmeter-Relay	0-1	2-18	40	0-5	2	.05	10	50	1.0	+28	25	+10 to +40	—	—	—	4.2 x 4.7 x 4	450	3
430MR	Visual Freqmeter-Relay	0-10	2-18	40	0-5	2	.05	10	5	1.0	+28	25	+10 to +40	—	—	—	4.2 x 4.7 x 4	450	3
440MR	Visual Freqmeter-Relay	0-100	2-18	40	0-5	2	.05	10	0.5	1.0	+28	25	+10 to +40	—	—	—	4.2 x 4.7 x 4	450	3
486E	Expanded Freqmeter	.01-300	5-10	40	±5	1	.01	0.1	—	1.0	±15	±25	0 to +70	100	30	200	2.8x2.4x3.8	500	3
491ME	Visual Distriminator	.01-300	5-10	40	±5	0	.05	—	—	1.0	+28	40	+10 to +40	—	—	—	4 x 4.6 x 4	450	3
411	Differential Freqmeter	.05-50	5-10	0.6	0-5	1	.01	—	500	1.0	+28	25	−55 to +80	50	25	100	1.3x1.3x1.8	115	3
421	Differential Freqmeter	.05-50	5-10	0.6	0-5	1	.01	—	50	1.0	+28	25	−55 to +80	50	25	100	1.3x1.3x1.8	115	3
401	IRIG Discriminator	0.4-80	8-28	50	±5	1	.05	0.1	—	0.5	±15	±75	−55 to +85	50	25	100	2.8x2.4x3.8	500	3
471	Freq. Sens. Relay	.05-100	15-30	2	—	—	.05	0/∞	—	—	+28	20	−30 to +80	50	50	75	1.3x1.3x1.8	115	3
476	Freq. Sens. Relay	.05-250	15-30	10	—	—	.05	0/∞	—	—	+28	20	−30 to +80	50	50	75	1.3x1.3x1.8	115	3
791	Phasemeter	0.3-20	0-10	0.5	±5	1	0.3	3	7	1.0	No	No	−55 to +85	1K	100	1K	.9 x .9 x 1.3	100	2

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary)

SOLID STATE ELECTRONICS CORP.
15321 RAYEN STREET
SEPULVEDA, CALIFORNIA 91343
Area Code 213 — 894-2271 • 785-4473

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DC DIFFERENTIAL OPERATIONAL AMPLIFIERS
XTAL PULSE GENERATORS
VOLTAGE CONTROLLED OSCILLATORS
TONE OSCILLATORS - TRANSFORMERS
RELAYS (SOLID STATE, TIME DELAY, REED, LIGHT)
MINIATURE TELEMETER SYSTEMS
PRESSURE TRANSDUCERS
DIGITAL LOGIC MODULES
SOLID STATE CHOPPERS

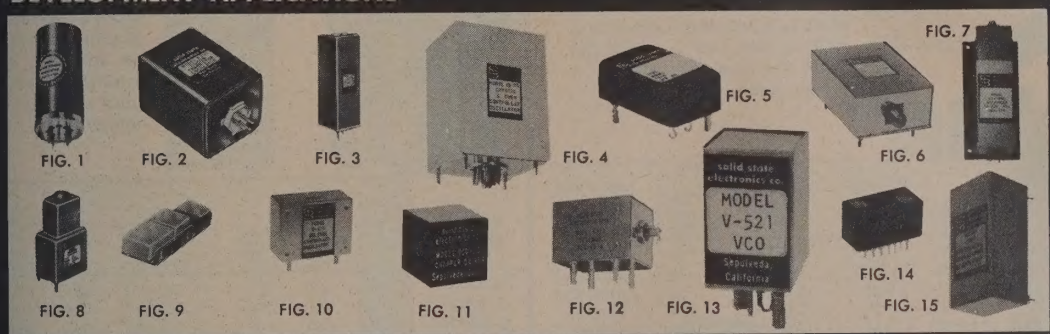
SOLID STATE

OSCILLATORS — PULSE, SQUARE WAVE, RAMP, SAWTOOTH, TRIANGULAR, SINE
CLOCKS, PULSE GENERATORS — XTAL, TUNING FORK, RC, LC VOLTAGE CONTROLLED

CONVERTERS — VOLTAGE-TO-FREQUENCY, PRESSURE-TO-FREQUENCY

AMPLIFIERS — MICROVOLT OPERATION, LO DRIFT, ZERO OFFSET, NO COMPENSATION, 300MΩ INPUT IMPEDANCE, NO LATCHUP
OPERATIONAL—DIFFERENTIAL

TELEMETERING, SIGNAL CONDITIONING, DATA ACQUISITION & PROCESSING • SPACE, AIRBORNE, MILITARY, GROUND SUPPORT • INDUSTRIAL, RESEARCH & DEVELOPMENT APPLICATIONS



microminiature lightweight | low power low level | high speed high efficiency | rugged linear | indefinitely long life temperature stable

OSCILLATORS, CONVERTERS & OPERATIONAL AMPLIFIERS

DESCRIPTION

Solid state oscillators and converters are available in many types (MIL-SPEC too). S-100, S-200 are LC sine oscillators (rugged and stable). The S-300 is tuneable, not as rugged, but excellent for ground support equipment. C-110, CH-114 (400 cps reference) are heater-crystal controlled, fully encapsulated for ruggedness. PG-111, PG-112 and PG-113 are crystal controlled, (no heater) square wave generators, ruggedized and miniature for airborne, military and space applications. The TF-120 is a tuning fork reference sine oscillator. Series 300VF Voltage-To-Frequency converters change analog signals to the frequency (time) or digital domain (use electronic counter) and are perfectly matched to our Series 400KF Freqmeters. The V-510, V-513 (20 millivolt input) Voltage Controlled Oscillators (VCO) are designed for IRIG FM telemetering. The V-521 is a micro-version of the V-510 (without output bandpass filter). AD-551, AD-552 (20 millivolts input) are Voltage-To-Frequency Converters with sine wave output. PF-1001, PF-1007 are Pressure-To-Frequency Converters (potentiometer type) respectively matched to a V-510 VCO and a 300 VF V-to-F converter. The OS-1005 converts Pressure-to-Frequency directly via varying inductance (diaphragm type). The 5001 FM Transmitter and the 5002 VCO go together for a single channel miniature telemeter. The 5021 TELEMOD combines the two in a single micro-package. The TCD-101 is a solid state chopper or demodulator driver (square wave inverter) with 4 isolated output windings. The Model 3001 differential operational amplifier is a workhorse and you can assign it to a multitude of analog functions. The Model 3051 is an isolated single-supply (28 VDC) version of the 3001 (dual-supply). The Model 3002 op-amp is superlative in its capabilities, i.e. microvolt input, 0.6 microvolts/°C. and 2 picoamps/°C. drift, 300 megohm input impedance, short-circuit proof, no compensation required, no latch-up, zero offset adjustable, wide temperature range, microminiature, replaces chopper-stabilized amplifiers. You'll find microfilm data sheets and application notes in VSMF or the Thomas Supplementary File. Phone, wire or write our engineering department for a quick considered quote on your specifications or for our catalog. Shipments can be same day if you call early.

COMPARATIVE TABLE OF SPECIFICATIONS FOR OSCILLATORS, CONVERTERS & OPERATIONAL AMPLIFIERS

		INPUT		OUTPUT						SUPPLY		ENVIRONMENTAL				MECHANICAL		
Model	Type	Volts-*Pressure	Z MΩ	Freq. kcps	Wave Form	Volts Min.	Load kΩ	Drift %/°C	Accuracy %	V Volt	I ma	Temp. °C	Shock G	Vib. G	Acc. G	Size inches	Wt. grams	Fig.
S-100	LC Fix Tuned Oscillator	—	—	.025-50	sine	2Vrms	35	0.05	0.50	28	1	0 to +80	500	35	700	2.32x0.94 Dia.	30	1
S-200	LC Fix Tuned Oscillator	—	—	.025-50	sine	2Vrms	35	0.05	0.50	28	1	0 to +80	500	35	700	1.32x1.32x1.69	60	2
S-300	LC Tuneable Oscillator	—	—	.025-100	sine	2Vrms	35	0.10	1	28	2	0to+ 80	15	10	200	0.97x1.60x3.40	65	8
C-110	Xtal-Heater Oscillator	—	—	15-125	sine	2Vrms	10	0.0005	.002	3-28	100	−55 to +85	50	15	200	1.37x1.37x3.90	200	3
CH-114	Xtal-Heater Oscillator	—	—	.001-20000	sine	2Vrms	5	0.0001	.001	10-35	100	−55 to +85	15	10	20	2.38x2.75x3.81	500	4
PG-111	Xtal Cont. Pulse Generator	—	—	2-500	square	10Vp-p	5	0.0005	.003	28	50	−55 to +85	50	15	200	1.00x1.55x0.56	100	2
PG-112	Xtal Cont. Pulse Generator	—	—	500-20000	square	10Vp-p	5	0.0005	.003	28	50	−55 to +85	50	15	200	1.25x2.00x1.75	40	5
PG-113	Xtal Cont. Pulse Generator	—	—	16-500	square	10Vp-p	5	0.0005	.005	15	20	−55 to +85	50	15	200	1.00x1.55x0.56	40	5
TF-120	Tuning Fork Cont. Osc.	—	—	.06-7	sine	1Vrms	0.6	0.005	.01	20-35	8	−55 to +85	—	—	—	1.37x1.37x3.90	225	3
310VF	Volt-To-Freq Converter	0-10	15	0-0.1	pulse	10Vp-p	10	0.05	1	±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	4
320VF	Volt-To-Freq Converter	0-10	15	0-1	pulse	10Vp-p	10	0.05	1	±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	4
330VF	Volt-To-Freq Converter	0-10	15	0-10	pulse	10Vp-p	10	0.05	1	±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	4
340VF	Volt-To-Freq Converter	0-10	15	0-100	pulse	10Vp-p	10	0.05	1	±10	±20	0 to +50	250	25	500	1.31x1.31x1.75	100	4
V-510	Volt Controlled Oscillator	0-5	0.5	0.3-80	sine	2Vrms	100	0.003	0.25	−28	− 7	0 to +80	125	25	200	1.06x2.25x1.66	50	10
MV-514	Volt Controlled Oscillator	0-0.2	0.5	0.3-12	sine	2Vrms	100	0.003	1	±28	±25	0 to +85	125	25	200	1.06x2.25x1.66	50	10
V-521	Volt Controlled Oscillator	0-5	0.5	0.3-12	square	2Vp-p	10	0.003	0.50	−28	− 2	0 to +71	500	50	1000	0.75x0.75x1.13	20	13
AD 551	Volt-To-Freq Converter	0-5	0.5	0-1	sine	1Vrms	10	0.02	0.25	−28	−25	0 to +50	100	15	150	2.38x2.75x3.81	500	4
AD-552	Hi Gain Volt-To-Freq Conv.	0-0.2	0.5	0-1	sine	1Vrms	10	0.04	1	±28	±25	0 to +50	100	15	150	2.38x2.75x3.81	500	4
PF-1001	Lo Pressure-To-Freq Conv.	*0-5000	—	0.3-12	square	5Vp-p	25	0.01	1	28	5	−55 to +85	50	15	200	2.31x3.38x1.19	115	6
PF-1007	Pressure-To-Freq Conv.	*0-5000	—	0-100	pulse	10Vp-p	10	0.05	1	±10	±20	0 to +50	50	15	200	2.31x3.38x1.19	115	6
OS-1005	Pressure-To-Freq Conv.	*0-10000	—	1.3-22	sine	3Vrms	25	0.01	0.50	28	2	0 to +100	400	60	500	1.72x3.82x1.22	300	7
5001	FM Transmitter	0-5	0.5	88K-100K	sine	0.5Vrms	100	0.10	3	−9	−4	+10 to +80	600	50	800	1.28x1.43x0.70	50	9
5002	Volt Controlled Oscillator	0-5	0.5	0.3-80	square	2Vp-p	10	0.003	0.50	−9	−4	0 to +75	600	50	800	1.28x1.43x0.70	50	9
5021	VCO-FM Transmitter	0-5	.005	88K-100K	sine	0.5Vrms	100	0.10	0.50	28	5	+10 to +40	500	50	1000	1.00x1.00x1.38	40	12
TCD-101	Chopper Driver-Inverter	—	—	2-10	square	3-10Vp-p	3	0.10	2-10	10	40	−55 to +100	1000	100	2000	0.89x0.84x0.75	25	11
3001	Diff Op-Amp	0 to ±.01	1	2000	dc	±10	1	0.01	0.1	±15	± 7	−55 to +100	300	50	500	0.89x0.84x0.75	25	11
3002	Diff Op-Amp (Microvolt)	0 to ±.001	1000	2000	dc	±14	1	0.0006	0.1	±15	±20	−55 to +125	10000	100	5000	0.50x0.95x0.47	8	14
3051	Diff Op-Amp (Isolated)	0 to ±.01	0.5	2000	dc	±10	1	0.01	0.1	28	50	−55 to +100	500	50	700	1.41x1.75x1.06	115	15

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary)

OTHER PRODUCTS—SEE EEM SECTIONS 4500 & 5900

SOLID STATE ELECTRONICS CORP.
15321 RAYEN STREET
SEPULVEDA, CALIFORNIA 91343
Area Code 213 — 894-2271 • 785-4473

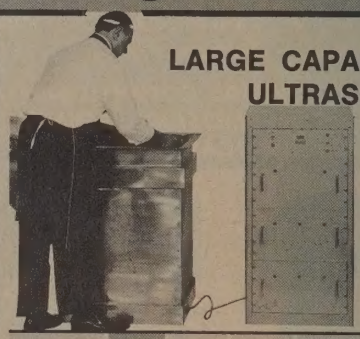
FREQMETERS (MODULAR & VISUAL)
DC DIFFERENTIAL OPERATIONAL AMPLIFIERS
XTAL PULSE GENERATORS
TRANSFORMERS
RELAYS (SOLID STATE, TIME DELAY, REED, LIGHT)
MINIATURE TELEMETER SYSTEMS
PRESSURE TRANSDUCERS
DIGITAL LOGIC MODULES
SOLID STATE CHOPPERS

PREFERRED ALL OVER THE WORLD
ULTRASONIC DEVICES
for the Ultimate in Cleaning Performance

TWO-PIECE SONATRON® ULTRASONIC CLEANERS

IDEAL FREQUENCY - 80kc, for hi-speed precision cleaning. Intense, but safe . . . will not harm the most delicate components.

Group No.	Price of Generator and Tank Combined $	Generator Model	Generator Power-output Peak Watts	Tank Model	Tank Capacity (gals.)	Tank Inside Dimensions (inches) L x W x D
60-1	114.95	G- 60-80	240	T- 60-80-1	¼	6x3⅜x4
80-1	149.95	G- 80-80	320	T- 80-80-1	½	5¾x5¼x4
80-2	159.95	G- 80-80	320	T- 80-80-2	¾	5¾x5¼x6
100-1	219.95	G-100-80	400	T-100-80-1	⅞	9½x5x4
100-2	229.95	G-100-80	400	T-100-80-2	1⅓	9½x5x6
120-1	259.95	G-120-80	480	T-120-80-1	1½	12x6x6
120-2	329.95	G-120-80	480	T-120-80-2	2	12x6x9
240-1	399.95	G-240-80	960	T-240-80-1	3	12x10x6
240-2	439.95	G-240-80	960	T-240-80-2	4	12x10x9
360-1	629.95	G-360-80	1440	T-360-80-1	5	14x10x9½
360-2	679.95	G-360-80	1440	T-360-80-2	7	14x10x12
360-3	679.95	G-360-80	1440	T-360-80-3	8	28x6x12
600-1	1029.95	G-600-80	2400	T-600-80-1	10	20x11½x11
600-2	1129.95	G-600-80	2400	T-600-80-2	12	20x12x14
600-3	1129.95	G-600-80	2400	T-600-80-3	15	52x6x14



LARGE CAPACITY SONATRON ULTRASONIC CLEANERS

CONSTANT POWER - Modulated output insures no variation in cleaning intensity regardless of liquid level, load, or temperature.

Modular Generator Model	Price $	Total Output Avg.	Power (Watts) Peak	Tank Model Number	Tank Price $	Tank (Interior Dimensions) (inches) (LxWxD) (see note)	Capa (ga
G- 300-20-1	350.	300	600	T- 300-20-1	405.	14x10x12	
G- 600-20-1	700.	600	1200	T- 600-20-1	735.	20x12x14	1
G- 900-20-1	1000.	900	1800	T- 900-20-1	1035.	20x16x14	1
G-1200-20-1	1275.	1200	2400	T-1200-20-1	1335.	24x20x16	3
G-1500-20-1	1530.	1500	3000	T-1500-20-1	1665.	28x20x18	4
G-1800-20-1	1780.	1800	3600	T-1800-20-1	1995.	30x22x18	5
G-2100-20-1	2030.	2100	4200	T-2100-20-1	2325.	34x24x20	7
G-2400-20-1	2275.	2400	4800	T-2400-20-1	2655.	48x24x24	10

ONE-PIECE CONSOLETTE SONATRON® ULTRASONIC CLEANERS

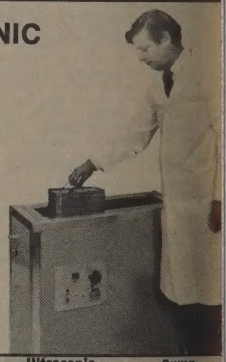
INSTANT START - Just press switch on . . . no waiting . . . no warm-up.

RUGGED COMPONENTS - Highest reliability and long life No maintenance.

CONSOLETTE / One-Piece Console Generator and Tank incorporated in gleaming, solvent proof, rust-proof, stainfree, lifetime stainless steel cabinet with instrument style control panel.

Consolette Model #	Complete Price $	Consolette Overall Dimensions (LxWxD in inches)	Tank Dimensions (LxWxD in inches)
CS- 80D	179.95	13x17x15	5¾x5¼x6
CS-100D	249.95	13x17x15	9½x5x6
CS-120D	299.95	13x17x15	12x6x6
CS-240D	399.95	13x21x15	12x10x6
CS-360D	649.95	16x26x20	14x10x9½
CS-600D	999.95	22x28x24	20x12x12

SONATRON® ULTRASONIC VAPOR-DEGREASERS



HETEROSONIC FREQUENCY SWEEP - Absolute uniformity of cavitation effect throughout cleaning solution. No hot spots . . . no dead spots . . . no stripping . . . no banding . . . no transducer overloading.

Two Stage Model	Price $	Boil Sump Dimensions LxWxD	Ultrasonic Sump Dimensions LxWxD	Sump Capacity in Gals. (each)
2UVD-120-80-1	1600	12x 6x12	12x 6x 9	2
2UVD-360-80-1	2500	14x10x14	14x10x12	7
2UVD-600-80-1	3200	20x12x18	20x12x 4	12

Three Stage Model	Price $	Boil Sump Dimensions LxWxD	Ultrasonic Sump Dimensions LxWxD	Distillate Reservoir LxWxD
3UVD-120-80-1	1800	12x 6x 9	12x 6x 9	12x 6x 6
3UVD-360-80-1	2800	14x10x14	14x10x12	14x10x 9
3UVD-600-80-1	3500	20x12x18	20x12x14	20x12x10

*Add $395. for Self Contained Refrigeration System
Add $445. for Recirculating Filter System
Add $275. for Pressure Spray Lance and Pump (not app'l. to Two Stage Models).

100,000 ULTRASONIC CLEANERS, ***based on my design are installed in every corner of the world.***

The new SONATRON® Ultrasonic Cleaners represent the ultimate in cleaning performance and quality construction at prices less than or equal to competitive Ultrasonic Cleaners. ■ The new SONATRON® Ultrasonic Cleaner continues all the best features of its predecessors, plus exclusive "firsts" of its own. PAUL PLATZMAN, *Div. Mgr.*

ULTRASONIC DEVICES
DIVISION OF KENYON ELECTRONICS, IN
An International Controls Corp. Subsidiary
1057 Summit Avenue,
Jersey City, N. J. 07307
(201) 656-1100 (212) 964-2016
DIVISION MANAGER: PAUL M. PLATZMAN

VOLUME 2

Pages 1317 to 2143

Active Components / Circuit Assemblies / Controls & Drives

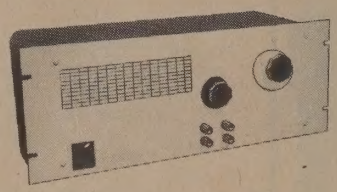
Product Section	Products
1100	Amplifiers, Audio, Operational, etc.
1700	Circuit Assemblies, Circuit Boards & Breadboarding Kits
2200	Controls, Control Components & Systems
2300	Crystals, Tuning Forks & Resonant Reed Devices
2400	Panel Components (Incl. Lighting & Readouts)
2700	Filters
3130	Integrated Circuits & Hybrid Microcircuits
3500	Motors, Rotating Components & Accessories
3700	Photoelectric Equipment & Components
3800	Optical Equipment & Accessories
4500	Relays
4800	Semiconductors & Devices, Rectifiers (Non-Tube Types)
4900	Servomechanisms & Components
5100	Switches, Circuit Breakers, Fuses, Protective Devices
5300	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
5500	Transducers & Associated Equipment
5700	Tubes, Tube Parts, Shields, Inserts, etc.
5900	Vibrators, Choppers, etc.

eem CATALOG SECTION

FILTERS
RANDOM NOISE SOURCES
AMPLIFIERS
POWER SUPPLIES

2 SERIES VARIABLE FILTERS

2AB, 2B, 2C, 2D
High Pass, Low Pass,
Band Pass



Model 210 R
Band Reject

- ☐ Passive Network
- ☐ Continuously Variable
- ☐ No Power Required
- ☐ No Internal Noise
- ☐ Portable or Rack Mount

PRICES — FOB FACTORY

Model	Freq. Range	Wt.	Price
2AB	15Hz to 20KHz	27	$495.00
2B	60Hz to 20KHz	24	395.00
2D	240Hz to 80KHz	21	385.00
2C	9KHz to 670KHz	21	375.00
210	35Hz to 20KHz	20	425.00
AL483 Input Transformer	10K ohms to 600 ohms		35.00
AL484 Output Transformer	600 ohms to 50K ohms		35.00

Frequency Range 20Hz to 20KHz
Hermetic Sealed Capacitors — Plus 15%

The 2 Series are general purpose tunable audio and low R filters. Independent high pass and low pass sections can b combined for band pass operation. Low pass filter will pas DC to cutoff frequency. Hum-bucking construction and shielde from electromagnetic fields. Model 210 Band Eliminatio filter has one octave width at −3 db points and center fre quency attenuation from 28 to 45 db. Plug in impedanc matching transformers available to change 600 ohms to 10 input and 50K output.

Size: Portable — 7½″ H. x 17″ W. x 8″ D. overall
Rack — 7″ H. x 19″ W. x 8″ D. overall

MODEL 655C RANDOM NOISE SOURCE

- ☐ Solid State
- ☐ Non Microphonic
- ☐ Flat 20Hz to 20KHz
- ☐ Broadband Output 1.0 Vrms
- ☐ Pink Filter Available

The Allison Model 655C is a miniaturized unit with uniform frequency response from 20Hz to 20KHz and usable noise spectrum from 5Hz to 500KHz. The unit requires only 22 Vdc ±20% and mounts with 2 — 6-32 screws into molded in tapped inserts. The output is approximately .3 Vrms when limited to the flat portion of the spectrum. The Model 663 produces an equal energy per octave (Pink) spectrum. This filter is packaged in the same configuration as the 655C.

PRICES — FOB FACTORY

Model 655C
1-9 $65.00; 10-24 $55.00; 25-49 $48.00; 50-99 $45.00; 100 & up $42.00

Model 663
1-9 $28.00; 10-24 $24.00; 25-49 $20.00; 50-99 $19.00; 100 & up $18.00

MODEL 660A PREAMPLIFIER

- ☐ Low Noise
- ☐ All Silicon
- ☐ Wide Bandwidth
- ☐ Adjustable Gain

The Allison 660A Preamplifier module is an a silicon, instrument quality, low noise, low disto tion unit having an open feedback loop for adjus ment of gain and bandwidth.

This also provides opportunity for selective ampl fication. Frequency Response: 10Hz low end an 50KHz to 1MHz, depending on gain setting. D Supply: 13.5 to 24 Volts.

Size: 1¾″ W. x 2¼″ H. x 9/16″ D.

PRICES — FOB FACTORY

1 to 9	$19.50	25 to 49	$17.75
10 to 24	18.50	50 and up	17.00

MODEL 666 POWER SUPPLY

- ☐ Designed to Power Allison Modules
- ☐ ±1% Voltage Regulation
- ☐ 3 Millivolt Maximum Ripple
- ☐ Zener Regulation
- ☐ Solid State Rectifier
- ☐ Positive or Negative Common

Allison 666 Modular Power Supply, consisting of a Transformer module and Rectifier/Regulator module, provides 24 Vdc ±2% output voltage from 110 Vac to 130 Vac, 50-60Hz input. Two compact units provide high versatility in mounting.

Size: Transformer — 1 13/16″ x 1½″ x 1½″
Regulator — 2⅛″ x 2⅛″ x 1″

PRICES — FOB FACTORY

666P (Positive Common) or 666N (Negative Common)
1-9 $29.50; 10-24 $25.00; over 24 $23.00

MODELS 658A and 659A AMPLIFIERS

- ☐ Low Noise
- ☐ Wide Bandwidth
- ☐ All Silicon
- ☐ Low Output Impedance
- ☐ Adjustable Gain

Capable of 6.0 volts into 600 ohms, these instrument quality an plifiers are furnished for either Class A (658A) or Class B (659A operation. Socket mounted all silicon transisters facilitate service An open feedback loop provides for adjustment of gain and band width, with gain variable from 25 to 50 db.

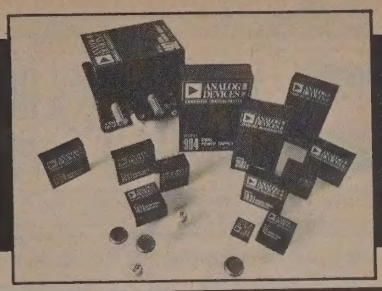
Frequency Response: 10Hz low end to approximately 500KHz, de pending on gain. Input Impedance: 40K ohms. Output Impedance approximately 2 ohms. DC Supply: 22.5 Vdc at 10 ma required Size: 1¾″ W. x 2¼″ H. x 9/16″ D.

PRICES — FOB FACTORY

1 to 9	$27.50	25 to 49	$23.00
10 to 24	25.00	50 and up	21.50

ALLISON LABORATORIES, INC.
P.O. BOX 9849 / AUSTIN, TEXAS 78757 / (512) 454-9591

OPERATIONAL AMPLIFIERS FROM ANALOG DEVICES, INC.



Analog Devices line of operational amplifiers is specifically designed to excel in a wide spectrum of applications. Our standard product line is conceived and engineered with the specific objective of *greater user value.* Check these features:

LOW DRIFT CHOPPERLESS TYPES:
0 μV/°C, Model 184L, $70 (1–9)
5 V/°C, Model 183J, $35 (1–9)

CHOPPER STABILIZED AMPLIFIERS
0 μV/°C, Model 233K, $59 (1–9)

LOW COST FET-INPUT MODELS
5 pA I_{bias}, Model 40J, $12 (1–9)

ELECTROMETERS—SOLID-STATE PARAMETRIC
femtoampere (10 x 10^{-15}A), Model 310J, $75 (1–9)

FAST-SETTLING TYPES
6 μsec to 0.01%, Model 45, $38 (1–9)

NEW PRODUCTS (POST-eem)

This catalog shows our product line as frozen in suspended animation at a particular moment in time, late winter, 1970. Space prevents detailed mention of a number of new products that will probably be available at the time you read this. They include:

- IC AMPLIFIERS IN TO-5 CANS: FET-Input, Low-Drift, Fast-Slewing, Darlington-Input, General Purpose, etc.
- MULTIPLIERS & DIVIDERS: 0.1%, Fast, IC, G.P., etc.

Please consult the factory or our nearest rep for further information.

OTHER ANALOG FUNCTION MODULES

In addition to operational amplifiers and products listed elsewhere in eem, a variety of function circuits and accessories are also available from Analog. Please inquire.

- DIFFERENTIAL VOLTAGE COMPARATORS
  high input impedance
- LOG/ANTILOG CIRCUITS
  fully temperature compensated
- INSTRUMENTATION AMPLIFIERS
  modular and IC
- OPERATIONAL MANIFOLDS
  op amp breadboards
- SOCKETS, POTENTIOMETERS, etc.

WHERE ELSE TO LOOK IN eem

Other products of Analog Devices are also catalogued in eem:

Product	eem File System
A/D AND D/A CONVERTERS	Section 2000
ACTIVE FILTERS	Section 2700
POWER SUPPLIES	Section 4000

PRESELECTED OPERATIONAL AMPLIFIERS

On the next two pages is a brief summary of a group of amplifiers PRE-SELECTED by our applications engineers as being the types most likely to be used in some 80% of the applications where our recommendation is called for. Specs and price are near optimum for the state of the art, and they are not easily obsoleted. Because availability is usually an important factor in making amplifier choices, we conscientiously strive to maintain these products in stock for immediate shipment in moderate quantities. Complete data and catalog information on any of these types is available from us or our representative upon request.

SEE NEXT TWO PAGES

RELATED TYPES

In addition to the Pre-Selected Operational Amplifiers, there are a number of other popular models that are, for the most part, variations of the preselected amplifiers in which certain performance parameters have been optimized. They include units having increased power output (voltage or current), battery-powered units, non-inverting chopper amplifiers, non-inverting parametric electrometers, FET-input comparators, etc.

FREE SELECTION GUIDE

Available upon request, this compact six-page catalog lists the Preselected Amplifiers and related types, as well as information on compact modular low-cost power supplies for op amps, function modules, and logic circuits. Copies of our 1969 *Selection Handbook and Catalog Guide* are also still available.

OTHER SERVICES

Analog Devices is people as well as products. Here are some of the services that we provide routinely because we view service to customers as being good business:

- **DATA SHEETS, CATALOGS, APPLICATIONS NOTES, ANALOG DIALOGUE**
- **EVALUATION SAMPLES** on loan with no obligation to buy
- **APPLICATIONS ENGINEERING** at all levels, from field to factory
- **SPECIALS:** We have produced many items that are not listed in our catalog to special order. "What you don't see, ask for."

ANALOG DEVICES INC

221 FIFTH STREET • CAMBRIDGE • MASSACHUSETTS 02142
TEL: 617/492-6000 • TWX: 710/320-0326

ANALOG DEVICES INC
221 FIFTH STREET • CAMBRIDGE • MASSACHUSETTS 02142
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Preselected Operational Amplifiers

The operational amplifiers featured in this short form catalog have been preselected by our applications engineering staff because, ultimately one or more of these products are recommended and used in about 85% of the applications problems solved annually by our applications engineers. Each is a proven product . . . value engineered to provide maximum performance per dollar available from today's op amp technology. In general, if an amplifier can be chosen from this "preselected" group the designer may specify it with the confidence that he is using a device that will not be easily obsoleted.

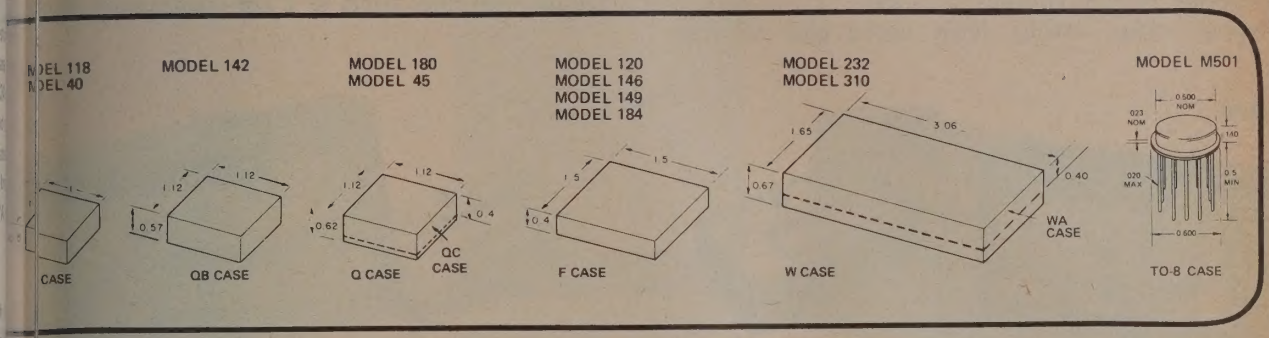
Another important factor in amplifier selection is prompt and reliable delivery. For this reason, Analog Devices has made a commitment to the maintenance of substantial stock l each of these preselected products. Orders are pr promptly and in nearly all cases quantities up to 24 pie be shipped immediately. It should also be realized that Devices manufactures over 100 models of operationa fiers, many types of function modules, and a broad modular power supplies, as well as A/D and D/A con

Three comprehensive catalogs are available which list specifications. We will be happy to send them to you charge upon request.

	LOW COST		FET-HIGH INPUT IMPEDANCE										
										NEW			
MODEL	MODEL 118		MODEL 142			MODEL M501			MODEL 40		MODE		
	A	K	A	B	C	A	B	C	J	K	J	K	
All specifications typical @ 25°C and nominal supply voltage unless otherwise specified.	GENERAL PURPOSE $11		GENERAL PURPOSE 20mA OUTPUT			MINIATURE HERMETIC FET HYBRID			LOW COST FET $12		LOW D 2μV		
OPEN LOOP GAIN													
dc, rated load, min	2.5×10^5		8×10^4			2.5×10^4			5×10^4		10		
RATED OUTPUT, min	±10V @ 5mA		±10V @ 20mA			±10V @ 5mA			±10V @ 5mA		±10V @		mA
FREQUENCY RESPONSE													
Unity gain, small signal	1.5MHz		5MHz			4MHz			4MHz		5MH		
Full power response, min	100kHz		150kHz			70kHz			100kHz		150k		
Slew rate, min	6V/μsec		10V/μsec			3V/μsec			6V/μsec		10V/		
Overload recovery	0.5msec		1.5msec			0.5msec			4μsec		1.5m		
INPUT OFFSET VOLTAGE @ 25°C, max	Adj to 0		Adj to 0			±2mV	±1mV	±1mV	Adj to 0		±70		
Average vs. temp 10 to 60°C, max, μV/°C		±5							±50	±20	±7		±2
−25 to 85°C, max, μV/°C	±20		±50	±25	±15	±75	±25	±25					
vs. supply	±10μV/%		±75μV/%			±50μV/%			±50μV/%		±15μ		
vs. time	±200μV/mo		±250μV/mo			±250μV/mo			±250μV/mo		±100μ		mo
INPUT BIAS CURRENT @ 25°C, max	(0,+) 35nA		−50pA	−25pA	−25pA	−10pA	−10pA	−5pA	−50pA	−20pA	−30pA		0pA
Average vs. temp 10 to 60°C, max, nA/°C		±0.5							doubles every 10°C		doubles ev		10
−25 to 85°C, max, nA/°C	±0.6		doubles every 10°C			doubles every 10°C							
INPUT DIFFERENCE CURRENT @ 25°C	±3nA		±10pA						±25pA	±10pA	±10		
Average vs. temp 10 to 60°C , nA/°C		±.05							doubles every 10°C		doubles ev		10
−25 to 85°C , nA/°C	±0.1		doubles every 10°C										
INPUT IMPEDANCE													
Differential	1MΩ		$10^{11}\Omega \parallel 3.5pF$			$10^{11}\Omega \parallel 4pF$			$10^{11}\Omega \parallel 3.5pF$		$10^{11}\Omega \parallel$		5pF
Common mode	1000MΩ		$10^{11}\Omega \parallel 3.5pF$			$10^{11}\Omega \parallel 4pF$			$10^{11}\Omega \parallel 3.5pF$		$10^{11}\Omega \parallel$		5pF
INPUT NOISE													
Voltage .01Hz to 1Hz p-p	1μV		6μV			6μV			6μV		6μ		
5Hz to 50kHz rms	3μV		16μV			6μV			3μV		16μ		
Current .01Hz to 1Hz p-p	20pA		0.1pA			.05pA			0.1pA		.1p		
INPUT VOLTAGE RANGE													
Absolute max. differential	±15V		±15V			±15V			±15V		±15		
Common mode voltage	>±10V		>±10V			>±10V			±10V		>±1		
Common mode rejection	20,000 @ ±10V		2000 @ ±9V			10,000 @ ±5V			10k, @ +8, −10V[1]		10k @ +5		10V
POWER SUPPLY	±15V @ ±4mA		±15V @ ±4.5mA			±15V @ ±7mA			±15V @ ±5.5mA		±15V @		mA
OPERATING TEMPERATURE RANGE	−25°C to +85°C		−25°C to +85°C			−25°C to +85°C			−25°C to +85°C		−25°C to		5°
CASE STYLE AND MATING SOCKET	M-1, AC-1003		QB-1, AC-1003			TO-8, AC1020			M-2, AC-1003		F-1, AC		10
PRICE													
1-9	$11.	$21.	$35.	$40.	$45.	$35.	$40.	$50.	$12.	$19.50	$57.		$70
10-24	$10.50	$19.	$33.	$38.	$42.	$33.	$37.	$47.	$11.80	$18.70	$55.		$66

All specifications subject to change without notice.

[1] 5k min @ ±10V - Specify 40JV



	LOW-DRIFT CHOPPERLESS DIFFERENTIAL					FAST SETTLING TO 0.01%								CHOPPER STABILIZED		ELECTROMETER	
			NEW					NEW									
	MODEL 180		MODEL 184			MODEL 120		MODEL 45		MODEL 149				MODEL 232		MODEL 310	
	J	K	J	K	L	A	B	J	K	A	B			J	K	J	K
	OW VOLTAGE & DRIFT		ULTRA LOW VOLTAGE DRIFT ±0.25μV/°C			FAST SETTLING .01% IN 1μsec INVERTING ONLY		FAST SETTLING .01% IN 0.6μsec FET DIFFERENTIAL		FAST SETTLING .01% IN 1.5μsec FET DIFFERENTIAL				LOWEST DRIFT 0.1 μV/°C		BIAS CURRENT .01pA, max.	
	3 10^5		3 x 10^5			3 x 10^4		10^5		10^5				10^7		10^5	
	±10V 2.5mA		±10V @ 5mA			±10V @ 25mA		±10V @ 20mA		±10V @ 15mA				±10V @ 4mA		±10V @ 5mA	
	Hz		500kHz			10-100MHz(Adj.)		10MHz		15MHz				500kHz		2kHz	
	Hz		5kHz			4MHz (peak)		1MHz		1.5MHz				3kHz		7Hz	
	0.8μsec		0.3V/μsec			250V/μsec		75 V/μsec		100V/μsec				0.2V/μsec		0.4V/msec	
	sec		2msec			10μsec		0.5μsec		0.5μsec				(0.5μs,ext. lim.)		10msec	
	0μV ±100μV	±250μV	±100μV	±100μV		Adj to 0		Adj to 0		Adj to 0				±15μV(Adj.)	±10μV(Adj.)	Adj to 0	
	1.5 ±.5	±1.5	±0.5	±0.25										±0.25	±.1	±30	±10
						±15	±8	±50	±15	±25	±15						
	±V/%		±10μV/%			±20μV/%		±50μV/%		±20μV/%				±0.1μV/%		±100μV/%	
	±5/mo		±5μV/mo			±50μV/mo		±250μV/mo		±250μV/mo				±1μV/mo		±100μV/mo	
	nA		(0,+) 25nA			(0,+) 55nA		−50pA	−25pA	−30pA	−15pA			±100pA	±50pA	±.01pA	
	±0.1 ±0.05		−0.25											±1.0pA/°C	±0.5pA/°C	doubles every 7°C	
						±0.9	±0.7	doubles every 10°C		doubles every 10°C							
	nA		±2nA			±4nA		±25pA	±10pA	±10pA				NA		NA	
	02		±.02											NA		NA	
						±0.2		doubles every 10°C		doubles every 10°C						NA	
	MΩ		4MΩ			200kΩ @ dc		10^11Ω ‖ 3.5pF		10^11Ω ‖ 3.5pF				300kΩ		3 x 10^11Ω ‖ 30pF	
	10MΩ		1000MΩ			NA		10^11Ω ‖ 3.5pF		10^11Ω ‖ 3.5pF				NA		NA	
	μV		1μV			0.5μV		5μV		3μV				1.5μV		10μV	
	μV		8μV			3μV		3μV		4μV				5μV		above 1 Hz→1μV/√Hz	
	pA		50pA			100pA		0.1pA		.05pA				10pA		.001pA	
	5V		±15V			±15V		±15V		±15V				±15V		±300V	
	10V		>±10V			NA		>±10V		±10V				NA		NA	
	100,0 @ ±10V		100,000 @ ±10V			NA		3000, +5 to -10V [2]		15,000 @ ±9V				NA		NA	
	±15 ±6mA		±15V @ ±9mA			±15V @ ±17mA		±15V @ ±7nA		±15V @ ±13mA				±15V @ +3/−6mA		±15V @ +15/−6mA	
	−25 to +85°C		−25°C to +85°C			−25°C to +85°C		−25°C to +85°C		−25°C to +85°C				−25°C to +85°C		−25°C to +85°C	
	Q-1 C-1003		F-1, AC-1010			F-3, AC-1011		QC, AC-1003		F-1, AC-1010				WA-1, AC-1014		W-1, AC-1017	
	$75.	$95.	$45.	$60.	$75.	$65.	$75.	$38.	$48.	$75.	$85.			$64.	$99.	$75.	$125.
	$72.	$90.	$43	$57.	$71.	$62.	$71.	$36.	$46.	$71.	$81.			$58.	$90.	$70.	$113.

[2] 3k min @ ±10V - Specify 45JV

ARVEE AMPLIFIERS for dependable service

Wideband and Video Amplifiers use type BNC connectors others on request.

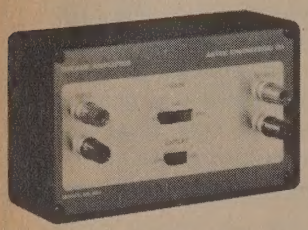
Response flatness typically ±.5 DB.

Supply voltage usually single ended plus 15 volts.

Additional RFI shielding available for critical en ronments.

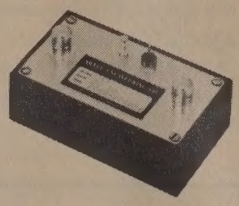
Output capability refers to 1 DB compression of ga

FIGURE 1



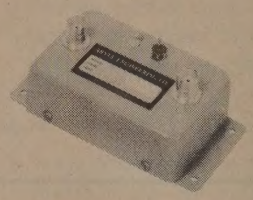
Laboratory instrument case with internal battery and shield.
3¾ x 6¼ x 2

FIGURE 2



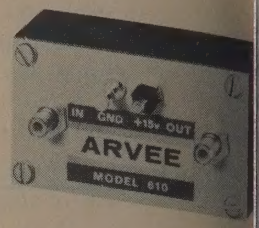
Machined aluminum case for maximum strength and RFI protection. 3¼ x 2 x 1

FIGURE 3



Rugged drawn aluminum case for economical commercial use.
4 x 2⅛ x 1 1/16

FIGURE 4



Miniature machined alumi case.
1.75 x 1.0 x .6

WIDEBAND AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Equivalent Input Noise (microvolts)	Case Style	Price
610	1 MHz - 100MHz	20 DB±.5	50	50	1 Vp-p	15	Fig. 4	$150
521	20 Hz - 200 MHz	20 DB	50	50	1 Vp-p	40	Fig. 2	$250
520	20 Hz - 120 MHz	20 DB	50	50	1 Vp-p	35	Fig. 2	200
508	.2 MHz - 200 MHz	20 DB	50	50	1 Vp-p	30	Fig. 2	190
507	.2 MHz - 150 MHz	20 DB	50	50	1 Vp-p	25	Fig. 2	175
506	.1 MHz - 100 MHz	20 DB	50	50	1.2 Vp-p	20	Fig. 2	170
505	.1 MHz - 50 MHz	20 DB	50	50	1.5 Vp-p	18	Fig. 2	150
504	1 MHz - 35 MHz	20 DB±.5	50	50	2 Vp-p	12	Fig. 2	140
301	.5 MHz - 10 MHz	40 DB	50	50	2 Vp-p	12	Fig. 3	75
311	20 Hz - 150 MHz	20 DB	50	50	1 Vp-p	45	Fig. 3	140
310	20 Hz - 100 MHz	20 DB	50	50	1 Vp-p	40	Fig. 3	120
308	.25 MHz - 200 MHz	20 DB	50	50	1 Vp-p	50	Fig. 3	120
307	.25 MHz - 150 MHz	20 DB	50	50	1 Vp-p	40	Fig. 3	100
306	.25 MHz - 100 MHz	20 DB	50	50	1.2 Vp-p	30	Fig. 3	90
305	.25 MHz - 50 MHz	20 DB	50	50	1.4 Vp-p	25	Fig. 3	75
304	2 MHz - 32 MHz	20 DB±.5	50	50	2 Vp-p	15	Fig. 3	75

AUDIO & VIDEO AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Distortion	Equivalent Input Noise (microvolts)	Case Style	Price
502	20 Hz - 10 MHz	X 10	93	93	4 Vp-p	5%	20	Fig. 2	$150
501	20 Hz - 5 MHz	X 100	93	93	5 Vp-p	5%	20	Fig. 2	140
302	20 Hz - 10 MHz	X 10	93	93	4 Vp-p	5%	25	Fig. 3	85
201	20 Hz - 50 KHz	X 100	50 K	8	1 Watt	1%	10	not shown	80
202	10 Hz - 30 KHz	X 100	50 K	8	10 Watt	1%	10	not shown	150
203	20 Hz - 30 KHz	X 100	50 K	8	50 Watt	1%	15	not shown	290

DC AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Drift	Equivalent Input Noise (microvolts)	Case Style	Price
701	DC - 100 KHz	X 1000 Adj.	10 K	1 K	±5v	10 uv/°C	10	not shown	$150
702	DC - 1 MHz	X 100 Adj.	1 K	1 K	±3v	10 uv/°C	15	not shown	125

DECADE AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Distortion	Equivalent Input Noise (microvolts)	Case Style	Price
851 B	5 Hz - 1 MHz	X1 X10 X100	100 K	10 K	10 Vp-p	1%	5	Fig. 1	$ 79.5
852	20 Hz - 5 MHz	X1 X10 X100	600	600	5 Vp-p	5%	20	Fig. 1	150.0

In addition to the standard items shown special designs can often be supplied with very reasonable lead time.

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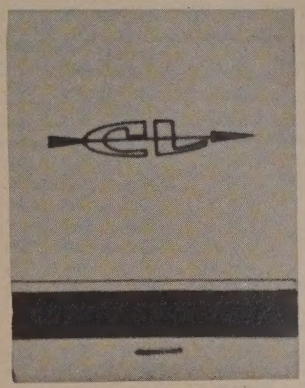
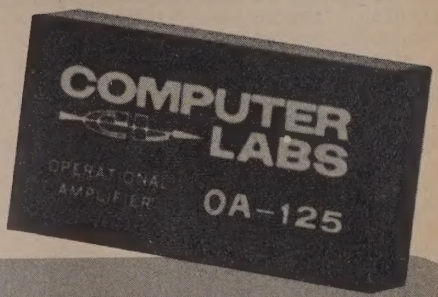
Operational Amplifiers with Matchless Performance





If settling time is important, specify FS-125

The Model FS-125 is designed for fast settling **(maximum 80 ns to 0.1% final value)** on step function signals but does not sacrifice low drift operation. It can be calibrated with dc and remain within 0.1% up to 12 MHz. This makes it an ideal choice for sample-and-holds, A/D's, D/A's, comparators, and similar "time domain" applications.

If gain bandwidth is important, specify OA-125

The Model OA-125 has a 6 dB/octave roll-off which gives it the widest bandwidth of any unconditionally stable amplifier available. **No compensating networks are required.** This makes it an ideal choice for active filters, video amplifiers, and similar "frequency domain" applications.

	FS-125	OA-125	
INPUT: Single ended	√	√	
VOLTAGE GAIN (Open loop)	100,000	100,000	
INPUT IMPEDANCE	10	5	K ohms
INPUT OFFSET VOLTAGE	3.5	3.0	mV
SLEW RATE	250	180	V/us
SMALL SIGNAL BANDWIDTH (Gain=1)	30	100	MHz
RISETIME (Gain=1)	15	17	ns
OUTPUT VOLTAGE (100-ohm load)	+2.4 −2.2	+2.4 −2.2	volts
SUPPLY REQUIREMENTS: ±15V ±3%	√	√	
PRICE (small lot)	$97.00	$135.00	

Analog Multiplexers / Analog-to-Digital Converters / Digital-to-Analog Converters / Operational Amplifiers

COMPUTER LABS

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C-COR AMPLIFIERS

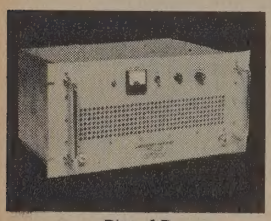
WIDEBAND POWER

LINEAR OPERATION (UP TO 80 WATTS)—*SOLID STATE, TUBE, & HYBRID*

Model	Passband 3 dB Nom.	Power Output Max. @ 1 dB Comp. dBm	dBm	Gain Nom. dB	Z in	Z out	Dimensions & Wt. H in.	W in.	L in.	Wt. lb.	Pkg.	Description Power Req'd.
1029	100-300 MHz	+47	+44	8	50	50	21	19	17	185	1A	105/125 Vac
1029-A	0.1-250 MHz	+47	+44	10	50	93	21	19	17	185	1A	50/60 Hz
1029-B	5-160 MHz	+49	+48	16	75	50	21	19	17	185	1A	3 KVA
1012	0.001-185 MHz	+40	+41	7.5	50	93	8¾	19	12½	24	1B	117 Vac 50/400 H
1012-A	0.1-60 MHz	+41	+44	12	75	50	8¾	19	12½	24	1B	275 Watts
1028	30-300 MHz	+37	+35	30	50	50	8¾	19	12½	18	1B	
4009	1-40 MHz	—	+35 to +38.5	40,20 Select.	50	50	5¼	16½	13	15	4B	105/125 Vac 50 Hz to 400 Hz 210/250 Vac
3008	1-40 MHz	+38.5	+35 to +38.5	20	50	50	3½	4½	12	4	3A/3E	+37 Vdc @ 2A
4013-SA	1-425 MHz	—	+27	40,20 Select.	50	50	5¼	16½	13	12	4B	115 Vac or 230 Va 50-400 Hz
4013-SB	4-470 MHz	—	+27	40,20 Select.	50	50	5¼	16½	13	12	4B	
3010-A	1-425 MHz	—	+27	25	50	50	1½	3½	11½	4	3A	+36 Vdc @ 800 m
4375-S	0.1-230 MHz	—	+26 to +30	60,40,20 Select.	50,75 Select.	50,75 Select.	5¼	15½	10	10	4A	105-125 Vac 50/60 Hz
3016-S	0.1-240 MHz	—	+26 to +30	23	50	50	1¼	3½	10	3	3A	+40 Vdc @ 750 m
3502	1-300 MHz	—	+20	6	50	50	1¼	2¼	3¼	0.5	ML	+20 Vdc @ 175 m

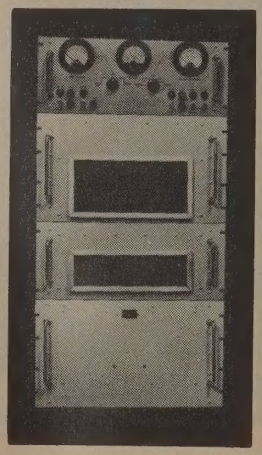
***DISTRIBUTED AMPLIFIERS**

The distributed amplifier is an effective means of paralleling state-of-the-art solid-state and tube devices to obtain very high output powers. C-COR has been designing and manufacturing this type of device since 1953, and now offers a complete line ranging from 50 watt vacuum tube models to 5 watt solid-state units, most of which are listed in the tables.
New designs are coming out of our laboratory on a regular basis. Contact us for the most difficult requirements regarding power and bandpass. Some of our amplifiers are being used by NASA at Cape Kennedy in many critical applications.



Pkg. 1B

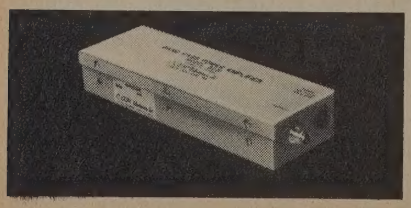
The 1012 Series is useful as a broadband power amplifier or a high level pulse amplifier.
The frequency range 1 kHz to 185 MHz and power output to 20 Watts — provide great versatility in linear amplification. Amplifiers in this group can be supplied with solid state preamps to provide any gain requirement.



The illustration shows M el 1029 integrated into a com x amplifying system, designed d built for NASA, which del rs in excess of 20 watts of li ar power. Available in se al bandpass configurations, M el 1029 is capable of supplyin p to 50 watts of power. is adaptable for operation at l er powers on the order of 5 v ts with intermod products o 0 dB. Many special requirem ts can be met, including EI shielding.

BAND-PASS POWER AMPLIFIERS
INTERSTAGE FILTER DESIGNS FOR SELECTIVE AMPLIFICATION—*SOLID STATE*

Model	Freq. Range	Bandwidth 3 dB Nom.	Sat. dBm	Power Output @ 1 dB Comp. dBm	Gain Nom. dB	Z In	Z Out	Dimensions & Wt. H in.	W in.	L in.	Wt. lb.	Pkg.	Description Power Req'd.
3230	90-175 MHz	30 MHz	37	+36	33	50	50	2	3	7	2.3	3A	+28 Vdc at .6A ma
3231	175-325 MHz	40 MHz	34	+33	27	50	50	2	3	7	2.3	3A	+28 Vdc at .6A ma
3232	325-500 MHz	60 MHz	31	+30	22	50	50	2	3	9	3	3A	+28 Vdc at .6A ma



Pkg. 3A

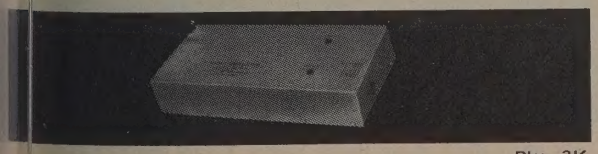
The 3230 Series is a line of bandpass power amplifiers capable of delivering up to 4 Watts Class A linear power. Bandpass characteristics are sufficiently broad to provide excellent versatility in processing CW signals as well as excellent pulse response. These units are normally supplied at center frequencies specified by the customer. Some variation in bandwidth, in gain and power can be supplied on special order.

ALSO AVAILABLE - - -
Solid State Amplifiers similar to 3230 Series
- CLASS A power up to 10
- CLASS B or C up to 100

GENERAL PURPOSE WIDEBAND C-COR AMPLIFIERS

WIDE DYNAMIC RANGE FOR SUPER VIDEO R.F. WIDEBAND USE—*SOLID STATE*

Model	Passband 3 dB Nom.	Output Capability @ 1 dB Comp. dBm	Output Capability Test Spec. (1)	Gain Nom. dB	Gain (rms) (μV)	Noise Z In:Out	H in.	W in.	L in.	Wt. lb.	Pkg.
323-A	0.2-1 GHz	+8	1.4 Vp-p @ 50Ω	20	4-7 dB	50:50	1 5/8	2½	1½	1	ML
331-A	0.02-550 MHz	+20 ea. output	6 Vp-p @ 50Ω	20	60	50:50	2	3	9	2	3P
334-A	0.02-500 MHz	+17	12 Vp-p @ 100Ω	20	60	1 MΩ:50 7 pF	1¾	3	4¾	1	3P
300	5-500 MHz	+30	20 Vp-p @ 50Ω	20	60	50:50	1½	3½	11½	4	3A
403-SB	4-475 MHz	+27	14 Vp-p @ 50Ω	40,20 select.	50	50:50	5¼	16½	13	12	4B
403-SA	1-425 MHz	+27	14 Vp-p @ 50Ω	40,20 select.	50	50:50	5¼	16½	13	12	4B
300-A	1-425 MHz	+27	14 Vp-p @ 50Ω	23	60	5-:50	1½	3½	11½	4	3A
306	6-300 MHz	+4	1 Vp-p @ 50Ω	20	30	50:50	1¼	2¼	3¼	0.5	35A
310	30-300 MHz	+25 to +27	14 Vp-p @ 75Ω	25	6 dB	50:75	2	3	6	1	3F
415-S	0.1-230 MHz	+30 @ 50 MHz	25 Vp-p @ 75Ω	60,40,20 select.	35	50:50 75:75	5¼	15½	10	10	4A
316-A	0.1-240 MHz	+26 @ 200 MHz	15 Vp-p @ 75Ω	23	50	50:50	2½	4	10	2.5	3A
313	dc-300 MHz	+8	2 Vp-p @ 50Ω	20	50	50:50	1 5/8	2½	1½	1	ML
413	20-240 MHz	+2	7.5 Vp-p @ 75Ω	20-25 adj.	10 dB	75:75	3½	3¾	9¼	3	4C
312-E	1-kHz-200 MHz	+20 min.	6.3 Vp-p min.	20	35	50:50	1¾	3½	6	1	3A
314-E	1-kHz-200 MHz	+20 min.	@ 50Ω	40	35	50:50	1¾	3½	9	1	3A
316-E	1 kHz-200 MHz	+20 min.	to 175 MHz	60	35	50:50	1¾	3½	12	1	3A
416	10 Hz-200 MHz	+13	2.8 Vp-p @ 50Ω 1.4 Vp-p @ 50Ω 5% distn.	40,20 select.	60	1M:50	5¼	6	10	3	4B
310	25 kHz-175 MHz	+4 to +10	1 Vp-p @ 50Ω	20	35	50:50	1¼	2¼	3¼	0.5	35A
319-E	5 Hz-130 MHz	+25 min.	10 Vp-p @ 50Ω	20	40	50:50	1¾	3½	7½	1	3C
318-E	5 Hz-130 MHz	to	5% distn.	40	35	50:50	1¾	3½	10½	1.5	3C
338-E	5 Hz-130 MHz	70 MHz	to 70 MHz	60	35	50:50	1¾	3½	13½	2	3C
329	5 Hz-70 MHz	+20 to +25	12 Vp-p to 10 MHz 6 Vp-p to 50 MHz	20	30	50:50	1¾	3½	7½	1	3B
378-A	18 kHz-100 MHz	+32	40 Vp-p @ 150 & 10 pF, 5% distn.	34	—	50:<50	3¼	4	8	1	3K
328	100 Hz-100 MHz	+12	2.5 Vp-p min. @ 50Ω	20	25	50:50	1¼	2¼	3¼	0.5	35A
331-E	20 kHz-60 MHz	+4	1 Vp-p @ 50Ω	20	20	50:50	1¼	2¼	3¼	0.5	35A
433	dc-20 MHz	—	10 Vp-p @ 93Ω 5% distn.	0 or 6	—	93:93	3½	4	9		4E
382	15 Hz-20 MHz	+17 to +20	2 Vp-p @ 50 Ω 1% distn.	10×	25	5k:50	1¼	2¼	3¼	0.5	35A
319-F	2 Hz-20 MHz	+23	8 Vp-p min. @ 75 Ω 2% distn.	25-40 adj.	10	75:75	3½	19	11	7	1D
392	dc-20 MHz	+30	20 Vp-p @ 50 Ω 5% distn.	20	50	50:50	3½	19	10	7	1D
301	20 Hz-20 MHz	+5	1 Vp-p @ 50 Ω 5% distn.	35	35	50:50	1¼	2¼	3¼	0.5	35A
377	15 Hz-12 MHz	+18 to +21	4 Vp-p @ 50 Ω 5% distn. 2 Vp-p @ 50Ω 1% distn.	20	20	2.2M:50 4 pF	1¼	2¼	3¼	0.5	35A



Pkg. 3K

Illustrated is Model 3378 Solid State High Voltage Amplifier ideally suited for driving special CRT's and other capacitive loads at ±40 Volt peak and 100 MHz Bandwidth. Other designs are available including direct coupled performance and outputs to 250 Vp-p.

IF AMPLIFIERS

HIGH OUTPUT FOR POST AMPLIFICATION—*SOLID STATE*

Model (Series)	Center Freq. MHz	Bandwidth 3 dB Nom. dBm	Power Output @ 1 dB Comp dB	Gain Nom. dB	Noise Figure In	Z Out	Z in.	H in.	W in.	L lb.	Wt.	Pkg.
507	20	13	+19	10 or 30	10	50	50	1¾	2½	6		35B
503	30 or 60	1 or 10	+20	60 or 70	8	50	50	1 5/8	2½	11		3K
611	see below		+16	45 to 75	3-5	50	50	2	3	12		3N

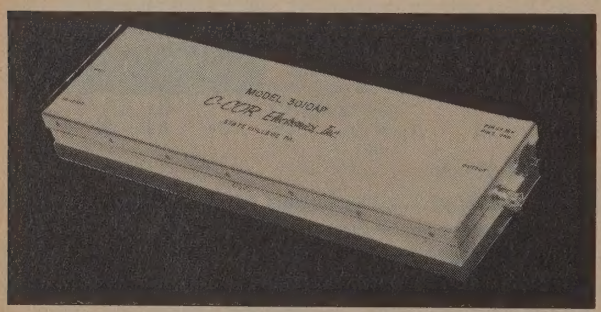
Standard Models of 3611 series available, 30, 60 or 120 MHz @ 10% or 30% Bandwidth. Gain Adjustable. Options include video output and AGC.

C-COR AMPLIFIERS

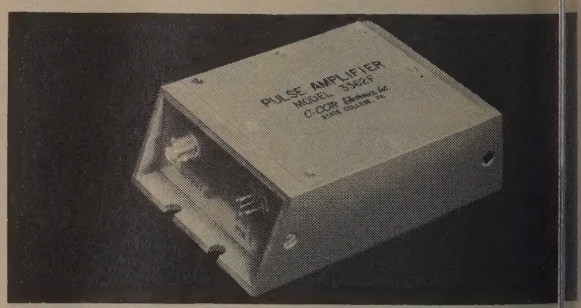
FAST RISE TIME PULSE

1 TO 10 ns RISE TIMES, OPTIMIZED FOR MINIMUM RINGING AND DISTORTION—*SOLID STATE*

Model	Rise Time nanosec. Typ.	Rise Time nanosec. Max.	Droop % @ PW	Linear Output	Gain Nom. dB	Noise μ Volts rms	Z In:Out	Dimensions & Wt. H in.	W in.	L in.	Wt. lb.
4013-P	1-1.2	1.3	10% @ 350 ns	±6 VP @ 50	40,20 select.	50	50:50	5¼	16½	13	12
3010-AP	1-1.2	1.3	10% @ 350 ns	±6 VP @ 50	23	60	50:50	1½	3½	11½	4
3371-AP	1-1.2	1.3	10% @ 0.5 μs	±4 VP @ 50 ±8 VP @ 100	20	60	50:50	2	3	9	2
3374-AP	1-1.2	1.3	10% @ 1 μs	±2 VP @ 50	20	60	1 MΩ:50 7 pF	1¾	3	4¾	1
3693-AP	2	2	10% @ 2 μs	±5 VP @ 50	unity	60	1 M Ω:50 7 pF	¾ (dia.)	—	6	0.5
4375-P	2.1	2.5	10% @ 100 ns	±7.5 VP @ 75	60,40,20 select.	35	50:50 75:75	5¼	15½	10	10
3016-AP	2.1	2.5	10% @ 350 ns	±7.5 VP @ 75	23	45	50:75	1½	3½	10	2
Available aligned to drive a capacitive load (5-50 pF)											
3596-A	1.8	2	10% @ 1μ s	±0.5 VP @ 50	20	30	50:50	1¼	2¼	3¼	0.5
3692-AP	2	2	10% @ 20 μ s	±0.5 VP @ 50	unity	50	1 MΩ :50 7 pF	¾ (dia.)	—	6	0.5
3362-F	2	3	10% @ 3μ s	±3 VP @ 50 -6 VP @ 50 (G Model)	23	30	50:50	1¾	3½	6	1
3364-F	2	3	10% @ 3 μ s		40	35	50:50	1¾	3½	9	1.5
3366-F	2.2	3	10% @ 1 μ s		60	35	50:50	1¾	3½	12	2
3329-F	3	5	2% @ 2 ms	+4, -8 VP @ 50 -12 VP @ 50 (G Model)	20	40	50:50	1¾	3½	7½	1
3368-F	3.5	5	2% @ 1 ms		40	35	50:50	1¾	3½	$10^5/_8$	1.5
3388-F	4	5	2% @ 1 ms		60	20	50:50	1¾	3½	$13^5/_8$	2
3518	3-4	5	2% @ 20 μ s	±1.5 VP @ 50	20	20	50:50	1¼	2¼	3¼	0.5
3587-A	25	35	10% @ 1μ s	±25 VP @ 0.5 M Ω, 50 pF	20-48 adj.	100	100:100	1¼	2¼	3¼	0.5



Pkg. 3A



Pkg C

New Products featuring - - -

- ±10 V pk with 2 nS risetime and d.c. response.
- Outputs up to ± 150 V pk are some of the new products in process at the present time. Write for more information.

The illustration above shows Model 3362F one of a variet of R.C. coupled solid state amplifiers available with risetime 2- S and low frequency response down to 5 Hz. These series e available in 20, 40 or 60 dB gain.

WIDEBAND TV DISTRIBUTION AMPLIFIERS

FOR PRODUCTION LINE OR LABORATORY DISTRIBUTION OF TV RF SIGNALS

Model	Passband 3dB Nom. MHz	Outputs	Channels	Z In	Z Out	Typical Operation X-Mod	Gain Nom. dB	Pkg.	Description
1324	100 kHz-230 MHz	1	1-12	50, 75 select	50, 75 select	53-63 dBmV @ -57 dB	23	1C	117 Vac 50/60 Hz
2306	50-220 MHz	2	1-12	75	75	53 dBmV @ -63 dB	45	4D	Bulkhead Mount
4223	20-240 MHz	1	1-12	75	75	43 dBmV @ -57 dB	25	4C	117 Vac 50-400 Hz

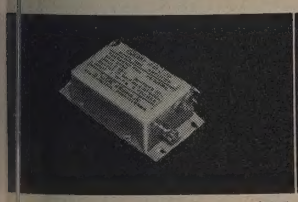
MIN-ECON C-COR AMPLIFIERS

THE COMPLETE LINE OF LOW COST "OFF THE SHELF" AMPLIFIERS—*SOLID STATE*

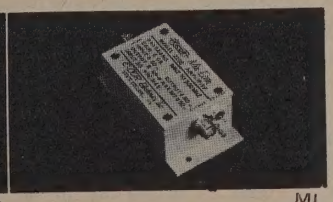
Model	Passband 3 dB Nom.	Output Capability @ 1 dB Comp. dBm	Output Capability Test Spec. (1)	Gain Nom. dB	Noise (rms) (μV)	Z In:Out	Power Req'd.	Description
355	6-300 MHz	+4	1 Vp-p @ 50	20	30	50:50	+15 VDC @ 50 mA	ultra wide passband.
352	1-300 MHz	+20	6.3 Vp-p @ 50	6	—	50:50	+22 VDC @ 200 mA	linear power amplifier.
350	25 kHz-175 MHz	+4 to +10	1 Vp-p min. @ 50	20	35	50:50	+15 VDC @ 40 mA	flat align. for RF or pulse.
348	100 Hz-100 MHz	+12	2.5 Vp-p min. @ 50	20	25	50:50	+15 VDC @ 150 mA	wide dynamic range
341-E	10 Hz-60 MHz	+4 to +11	1 Vp-p min. @ 50	20	20	50:50	+10 VDC @ 25 mA	unusually low freq. response.
342	5 Hz-30 MHz	+12 to +15	2 Vp-p @ 50	unity V gain	100	70 k:50	+15 VDC @ 20 mA	impedance transformation.
347	dc-20 MHz	+13	1.5 Vp-p @ 50 5% distn.	20	25	1 k:50	±10 V	direct coupled video.
343-A	5 Hz-20 MHz	+13	1 Vp-p @ 75 undistorted TV	0.5 @ 10 MHz	50	75:75	+24 VDC @ 50 mA	variable cable equalizer.
342	15 Hz-20 MHz	+17 to +20	2 Vp-p @ 50 1% distortion	10x V gain	25	5 k:50	+25 VDC @ 70 mA	high output video and RF.
341	20 Hz-20 MHz	+5	1 Vp-p @ 50 5% distortion	40	35	50:50	±6 VDC @ 50 mA	bal. or unbal. input. high gain IC.
347	15 Hz-12 MHz	+18 to +21	4 Vp-p @ 50 5% distortion 2 Vp-p @ 50 1% distortion	20x V gain	20	2.2 MΩ:50 4 pF	+25 VDC @ 70 mA	high Z input with FET
339	5 Hz-2.5 MHz	—	6-15 Vp-p @10 k 25 pF 5% distortion	100x V gain	50	1MΩ:50 25 pF	-36 VDC @ 15 mA	highly stable and flat
395	50 Hz-120 kHz	+20	5 Vp-p @ 50 5% distortion 2.8 Vp-p @ 50 0.3% distortion	10x V gain	20μV 50Ω source	5 kΩ⩽10 to 100 kHz	+15 VDC @ 60 mA	audio-ultrasonic use
379	Fc range 100-250 MHz	-2 to +1	0.5 Vp-p @ 50	25	3 dB	50:50	+15 VDC @ 12 mA	VHF preamp. (specify Fc)
378	Fc range 250-500 MHz	-4 to +2	0.4 Vp-p @ 50	20	4 dB	50:50	+15 VDC @ 12 mA	UHF preamp. (specify Fc)
383	1.5-50 MHz	+4 min.	1 Vp-p @ 50 5% distortion	20	4 dB	50:50	+10 VDC @ 30 mA	HF preamp.
397	300 Hz-10 MHz w/500Ω source	1 Vrms @ 2 kΩ	+1.5 VPulse @ 2 kΩ lin.	100x V gain	2 dB avg.	2 k:50 nom.	-15 VDC @ 25 mA	low noise video detector
396-A	2 ns RT 10% droop @ 1μs	—	±0.5 VP @ 50, lin.	20	30	50:50	+15 VDC @ 50 mA	ultra fast pulse
318	5 ns RT 2% droop @ 20 μ s	—	±1.5 VP @ 50, lin.	20	20	50:50	+15 VDC @ 150 mA	wide dynamic range
387-A	35 ns RT 10% droop @ 1μ s	—	+25 VP @ 500 kΩ, 50 pF, linear	10-250x V gain adj.	100	100:100	+50 VDC @ 20 mA	high voltage pulse

-22B Power Supply for up to Six Min-Econ Amplifiers.

Min-Econ prices range from $50 to $200.



35A



ML

n-Econ 1¼" x 2¼" x 3¼" ML Type Package

POWER CONVERSION CHART

dBm	mW	Vrms 50 ohms	Vp-p 50 ohms
-4	.398	.141	.399
-3	.501	.168	.447
-2	.631	.177	.501
-1	.794	.199	.563
0	1.000	.233	.631
+1	1.26	.254	.718
+2	1.58	.282	.797
+3	2.00	.316	.894
+4	2.51	.354	.997
+5	3.16	.307	1.12
+6	3.98	.446	1.26
+7	5.01	.500	1.41
+8	6.31	.561	1.59
+9	7.94	.629	1.78
+10	10.00	.707	2.00
+13	19.9	.998	2.82
+16	39.8	1.41	3.99
+20	100.0	2.24	6.32
+30	1.0W	7.07	19.99
+40	10W	22.4	63.11
+43	20W	31.6	89.36

NOTES:

(1) Output capability Test Spec. is test limit for given percent distortion. If % not given, limit is at 1 dB gain compression.

PACKAGE CODE:

The first digit in a model number indicates the basic configuration.

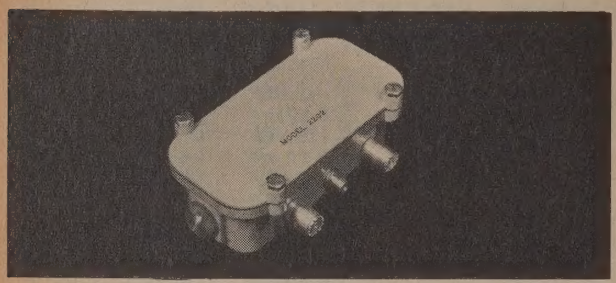
1. Rack mounting
2. Weatherproof
3. Modular (requiring DC power)
4. Instrument case

The package code letter designates the style of the package. Photos in this catalog show a few of the standard package styles. Many units are available in several style packages.

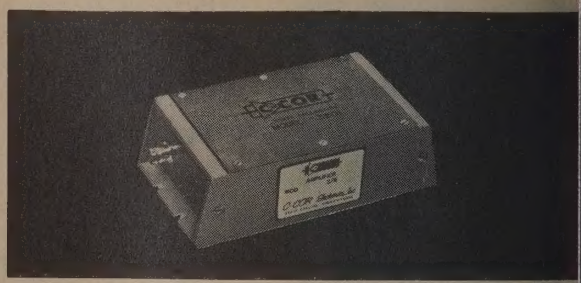
C-COR LOW NOISE AMPLIFIERS

FOR ANTENNA PREAMPS AND LOW NOISE INSTRUMENTATION
SOLID STATE AND CERAMIC TUBE

Model	Center Freq. MHz	BW 3 dB Nom.	Pass-band	Power Output @ 1 dB Comp. dBm	Gain Nom. dB	Noise dB	Z In:Out	Dimensions & Wt. H in.	W in.	L in.	Wt. lb.	Power Required	Pkg.
3203-A	—	—	200 MHz-1 GHz	+8	20	4-7	50:50	1½	2	4	0.5	+30 Vdc @ 60 mA	ML
3251	—	—	50-500 MHz	+5	20	5		1½	2	4	0.5	—	ML
2202	250-750	20 MHz	—	4 to +1	20	3-6	50:50	2½	3 5/8	6½	1.5	+15 Vdc @ 12 mA	2A
3206	—	—	30-300 MHz	—	20	4	50:50	1¼	2½	6	1	+20 Vdc @ 50 mA	3C
3201-A	100-750	20 MHz	—	0	25-30	2-5	50:50	1¼	2½	6	1	+15 Vdc 21 mA	3C
3205	30-300	20-40 MHz	—	+13	20	3-5	50:50	1¼	2½	6	1	—	3C
3578	250-500	20 MHz	—	-4	20	4	50:50	1¼	2¼	3¼	0.5	+15 Vdc @ 12 mA	35A
3579	100-250	20 MHz	—	-2	25	3	50:50	1¼	2¼	3¼	0.5		
3583	—	—	1.5 MHz-50 MHz	+4	20	4	50:50	1¼	2¼	3¼	0.5	+10 Vdc @ 30 mA	
3583-AA	—	—				2.5							
3103	470-1000	10-20 MHz	—	+5	24	7-10	50:50	3	3	8	1.5	200 Vdc 20 mA 6.3 Vac .6A	3M
2113	470-1000	10-20 MHz	—	+5	12	7-10	50:50	3½	5	12	2	117 Vac 50/60 Hz	2B
3110	50-500	10-20 MHz	—	+5	15-35	3-7	50:50	3	3	5¾	1.5	200 Vdc 30 mA 6.3 Vac .9A	3M



Pkg. 2A



Pkg. 3

* The Model 2202 solid-state UHF preamplifier provides the ultimate in low-noise performance in an economical package suitable for outdoor mounting. This amplifier is ideally suited for any communication requirement where low-level signals must be amplified. The PS-25 dc power supply is a companion unit which is housed in an identical package.

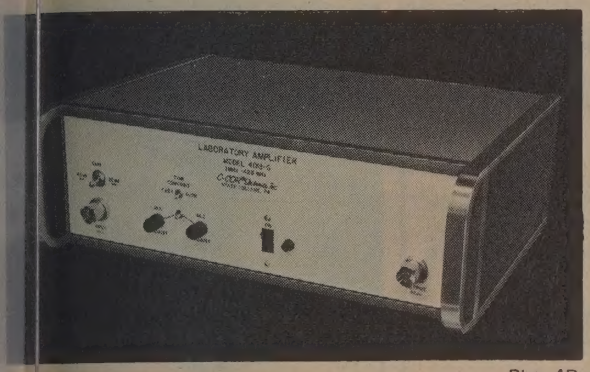
**Model 3201 is available in any center frequency from 100 MH to 650 MHz with a noise figure of from 2 dB to 5 dB, dependir on frequency and other specs. The module is housed in a rugge aluminum extrusion which features accessibility for repair ar tuning. Similar to 2202, except Pkg. Other circuit designs ava able in Min-Econ packaging.

VIDEO AMPLIFIERS
FOR AMPLIFICATION AND DISTRIBUTION OF EXTENDED BANDWIDTH TV VIDEO AND OTHER SIGNALS—*SOLID STATE*

Model	Passband 3 dB Nom. MHz	Output Capability @ 1 dB Comp. dBm	Test Spec.	No. of Out-puts	Gain Nom. dB	Noise µV rms	Z In:Out	Dimensions & Wt. H in.	W in.	L in.	Wt. lb.	Power Req'd.	Pkg.
3407	100 Hz-60 MHz	+20	5.5 Vp-p @ 50	8	5.5	100 Nom.	50:50	2	4	10	—	+25 Vdc @ 1A	3J
3471	60 Hz-35 MHz	+13	2.8 Vp-p @ 50 <1% distn.	4	-3 to +3 adj.	75	200:50	3½	2½	9	—	+32 Vdc @ 100 mA	3R
1319-F	2 Hz-20 MHz	+23	8 Vp-p @ 75 2% distortion	1	25-40 adj.	10	75:75	3½	19	11	7	105-125 Vac 50-400 Hz	1D
1392	dc-20 MHz	+30	20 Vp-p @ 50 5% distortion	1	20	50	75:75	5	19	10	7		1D
3453	5 Hz-20 MHz	+16	4 Vp-p @ 75 5% distortion	4	0-8 adj.	125 Nom.	40 k:75		2½	9	—		3R
4454	5 Hz-3 MHz	+24	10 Vp-p @ 75 2% distortion	4	0-6 adj.	100 Nom.	2 k:75	3½	4	9	—		4E/1E
3593-A	5 Hz-20 MHz	+13	1 Vp-p @ 75	1	0-5 @ 10 MHz	50 Nom.	75:75	1¼	2¼	3¼	0.5	+24 Vdc 50 mA	35A
3592	5 Hz-30 MHz	+12 to +15	2 Vp-p @ 50	1	unity volt gain	100	70 k:50	1¼	2¼	3¼	0.5	+15 Vdc 20 mA	35A

LABORATORY C-COR AMPLIFIERS

GENERAL PURPOSE WIDEBAND AND FAST PULSE AMPLIFIERS
INTEGRAL POWER SUPPLIES, SPECIAL FEATURES—VERSATILE LABORATORY INSTRUMENTS

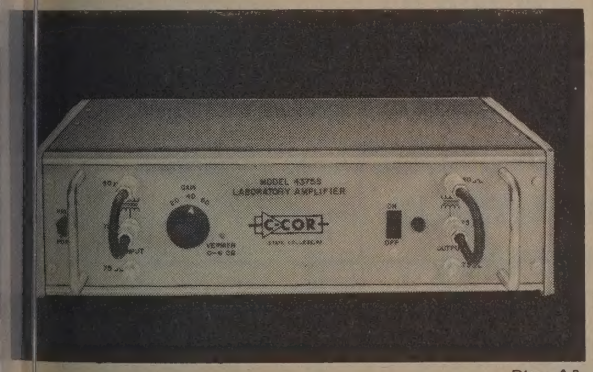


Pkg. 4B

The Model 4013-S is a general purpose laboratory instrument providing ½ watt of linear power from 1 MHz to 425 MHz.

The amplifier includes an internal electronic gain control circuit which provides convenient automatic levelling with CW and sweep input signals. A manual gain vernier control and a step attenuator are also provided to increase the versatility of this instrument.

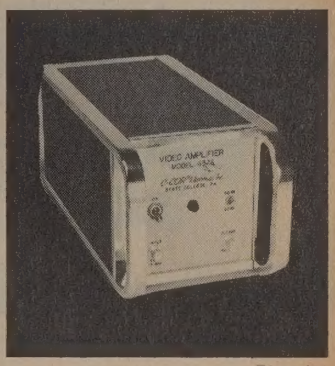
The Model 4013-P is an extremely versatile laboratory instrument with a 1.3 ns rise time and an output of ±6V into 50 ohms.



Pkg. 4A

The Model 4375-S is designed for laboratory and systems use. It combines high output and wide bandwidth in an all solid-state unit. C-COR's unique solid-state distributed amplifier circuitry is used in the output stage to provide high output capability. A gain of 20, 40, and 60 dB is available in switched steps (by use of a step attenuator) with a vernier control of 0 to 6 dB for each step. The 4375-S is calibrated for flat response to serve as a general purpose sine wave amplifier or preamplifier. The 4375-P is calibrated for use as a fast rise time pulse amplifier.

The Model 4376 is a compact economical broadband amplifier with wide application in any laboratory. It features bandpass 10 Hz - 200 MHz, high input impedance and overload protection.



Pkg. 4D

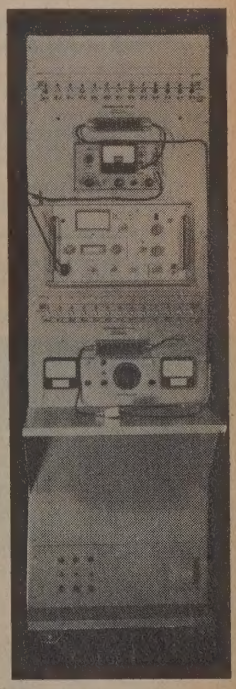
NEW PRODUCTS

- dc - 500 MHz low noise, wide dynamic range
- Wideband non-linear video signal processors for log and square-root.
- Solid state high voltage for capacitive load. Output to 250 Vp-p for video display and electro-optics.

In addition, C-COR offers systems and specialized test equipment.

The illustrated Model TSI-20 is a complete signal generation and measuring unit designed specifically for measuring cross modulation in wideband amplifiers (50 - 250 MHz) operating under normal load conditions.

The test method is to load each amplifier with the desired signals each 100% modulated except for the signal channel to be measured. Percent cross mod (or dB down from 100%) as induced by the amplifier on the unmodulated channel is measured by selective voltmeter wave analyses calibrated to known percentage modulation.



Model TSI-20

Above listings are some of the new products in process at the time of publication.

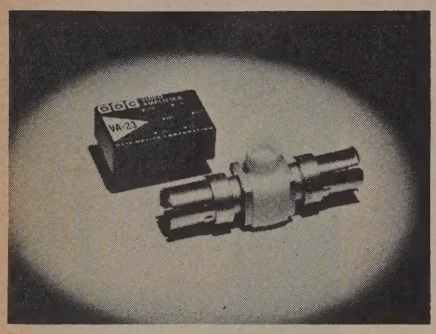
Also see other functional listings for added data and new products.

AUXILIARY EQUIPMENT

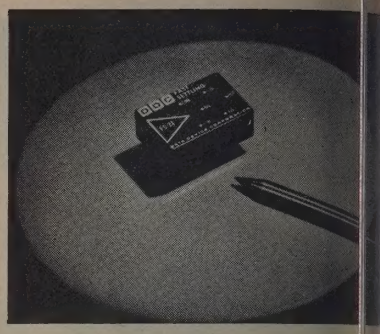
Model	Description	Specifications
3692-A	high impedance probe preamplifier	10 Hz-200 MHz @ 3 dB nom. passband, unity voltage gain. 3692-AB available aligned for pulse use 2 ns rise time.
3693-A	high impedance, probe amplifier	10 kHz-400 MHz @ 3 db nom. passband, unity voltage gain. Model 3693-AB available for pulse use.
4622	battery powered preamplifier with rechargeable battery	10 Hz-60 MHz @ 3 dB nom. passband, 20 dB gain @ 75 Ω. Use PS-22 charger for AC or battery operation.
-760	matching transformer	50-75 Ω, 100 kHz-220 MHz passband
T-1	matching transformer	50-75 Ω, 1 MHz-425 MHz passband
T-2	matching transformer	50-200 Ω, 100 kHz-400 MHz passband
S-22	battery charger and power supply	for Model 4622 preamplifier
S-22B	power supply for Min-Econ amplifiers	voltage range: 6 Vdc to 36 Vdc; current range: 30 mA to 90 mA
GR	crystal controlled VHF signal source	solid state. Filtered output at specified frequency from 50 MHz-250 MHz.

DATA DEVICES from DDC

SIGNAL CONDITIONING MODULES



WIDEBAND AMPLIFIERS:
- Slewing rates to 1,000 V/μs
- Gain-bandwidth products to 150 MHz
- Settling times to 60 ns (0.1%)
- Outputs to 100 mA at $\pm$10 V
- Models available for differential as well as inverting applications
- Short circuit protected versions available



FET INPUT AMPLIFIERS:
- Common Mode Voltage ratings to 10 V
- Common Mode Rejection Ratios to 106 dB
- Outputs to 20 mA at $\pm$10 V
- Voltage drifts as low as 2 μV/°C
- Hermetically sealed hybrid units operate over complete MIL temperature range

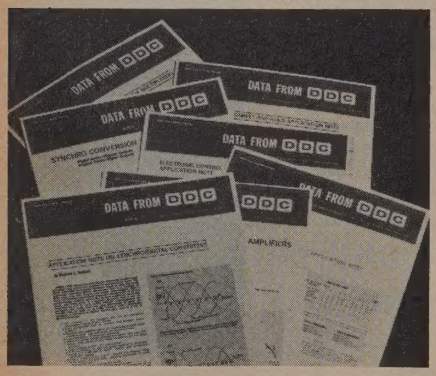
BIPOLAR AMPLIFIERS:
- Common Mode Rejection Ratios to 106 dB
- Gain-bandwidth products to 20 MHz
- Current outputs to $\pm$20 mA
- Voltage outputs to $\pm$ 20V
- Voltage drifts as low as 1.5 μV/°C

HIGH POWER AMPLIFIERS:
A wide range of output currents and voltages, including 250 mA at $\pm$14 V peak. Ideal for driving synchro loads, and in other applications requiring high power and small size.

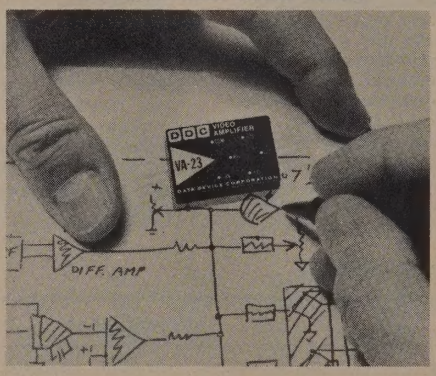
POWER SUPPLIES & OTHER MODULES:
Single, dual, and multi-output power supplies can be furnished to satisfy most requirements. Encapsulated modules, card mounted models, and other form factors are available. Standard models include units meeting MIL temperature and other environmental requirements.
Also Logarithmic elements, and Pico-Power Comparators. PLEASE SEE SECTION 2000 FOR DATA CONVERSION MODULES.

DDC IS DIRECTED TO CUSTOMER SATISFACTION; WE OFFER YOU:

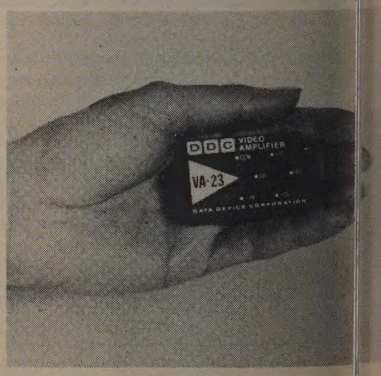
APPLICATIONS INFORMATION



APPLICATIONS ASSISTANCE



EVALUATION UNITS



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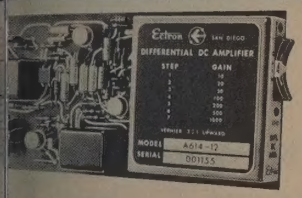
A DIVISION OF SOLID STATE SCIENTIFIC DEVICES CORP.

DIFFERENTIAL D.C. AMPLIFIERS AND SIGNAL CONDITIONERS



MODEL A614

DIGITAL SYSTEMS

MODEL A614

Gains of 10 to 2500, 10V output.
No thermal breathing, low I/F noise.
No transient with temp. shift.
.5V/°C including 500Ω source.
High reliability, no adjustment.
Multipole filter, 175V common mode.

MODEL A414

AIRBORNE

MODEL A414

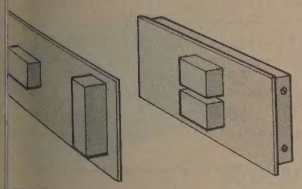
Rocket testing, helicopters, aircraft.
Up to 1,000 G shock, 100 G vibration.
−50° to +125°C avail.,100% humidity.
Same stability as A614. Gains to 1,000.
120db common mode rejection.
Integral bridge excitation supply avail.

MODEL 3300A

GENERAL LABORATORY

3,000 SERIES

Wide bandwidth. High input R.
Integral 115V power supply.
Choice of 12 or 300V common mode.
Excellent linearity and stability.
Full 10V, 100ma output.
Bench and rack mount accessories.



LOW $

CUSTOM O.E.M. AMPLIFIERS

OEM PRODUCTS

Custom packaging at low prices.
Includes customer name and logo.
Full warranty and/or training.
Reproducible manual and drawings.
Applications engineering.

MODEL A418

MOBILE

MODEL A418

Same rugged performance as A414.
Full range panel adjustments.
Ultra-stable RTI zero suppression.
12, 24, 28VDC or 115VAC operation.
Systems with Meter Monitors avail.
Signal conditioning options avail.

STRAIN GAGE
(Options available)

olated bridge excitation.
ridge completion networks.
w. or relay calib. check.
w. or relay zero check.
alance or zero suppression.

THERMOCOUPLE
(Options available)

Most common junction types.
Integral reference junction.
Linearization & special filters.
Stable zero suppression.
Low noise gains to 100,000.

SPECIAL APPLICATIONS

Any classic or special filter.
Use with unique pwr lines.
Multiple isolated inputs.
Computer readout of controls.
Many other custom features.

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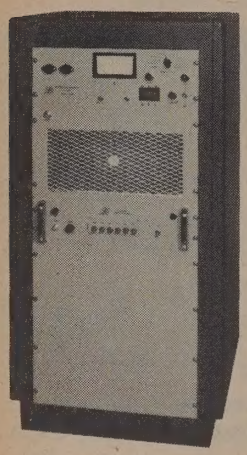
(714) 278-0600

ASK FOR ILLUSTRATED TECHNICAL BULLETIN "NOISE IN DATA AMPLIFIERS"

Ectron CORPORATION

BROADBAND POWER AMPLIFIERS

(no tuning, no plug-in's, no bandswitching)



BANDPASS.....10 kHz to 220 M

POWER OUTPUT.....up to 400 watts continuo

POWER GAIN.....up to 64

The M404A shown at left is the most powerful and most versatile broadband amplifier on the market. Standard unit produces 200 to 400 watts continuous power output with minimum of 50-db power gain from 200 kHz to 220 MHz.

The M5000L is a low-cost broadband power amplifier capable of 5 to 10 watts continuous output with 30-db gain from 10 kHz to 220 MHz.

BROADBAND, LABORATORY POWER AMPLIFIER SPECIFICATIONS

MODEL	M530	M510	M500	M5000	M402	M404A	M404P
Power Output in Watts:	0.08	0.75	3	10	50	200	1,000
Power Gain (minimum):	16 db	14 db	10 db	30 db	40 db	50 db	50 db
Frequency Maximum:	300 MHz	220 MHz					
Frequency Minimum:	10 kHz	200 kHz standard. For 10 kHz lower limit, add suffix "L" to Model number					
Bandpass Ripple:	±2 db maximum; ±1 db typical						
Input for full rated Output:	2 mW	30 mW	300 mW	10 mW	5 mW ; for 0.1 mW add suffix "G"		
Input Impedance, Nominal:	135 ohms	90 ohms		50 ohms			
Output Impedance:	150 ohms	135 ohms		50 ohms			
Duty Factor:	No Restrictions						Limited
Rise/Fall Time:	Less than 10 nanoseconds						
Mismatch Tolerance:	Protected against damage from *any* mismatch; can operate continuously at 4:1 vswr (reduced pwr)						
Distortion:	All harmonic products down 20 db minimum at ½ rated output						
Input Connector:	Type BNC standard; others on special order						
Output Connector:	Type BNC standard; others available				Type N standard; others available		
Cooling:	None required			Internal fans	Internal fans and blower and filter		
Weight in Pounds:	13			33	200	375	
Packaging:	Rack mount				Bench Cabinet	Floor cabinet on casters	
Dimensions: H" x W" x D":	3½ x19x10			5¼x19x20	36x23½x22	49x23½x22	
Metering:	None required				All major voltages and currents		
Primary Protection:	Fuse				Front-panel circuit breakers		
Secondary Protection:	All secondaries fused				Final protected by overload relay		
Safety Features:	Completely enclosed				Cabinet electrically interlocked		
Power Requirements:	115 V ±10%, 50/60 Hz, single phase				115/230 V	208 V, 50/60 Hz, 3 phase	
Gain Control:	Cont. 16 db	Cont. 14 db	Cont. 10 db	41 db calibrated input atten. plus gain control			

INSTRUMENTS FOR INDUSTRY, INC.

151 Toledo Street, Farmingdale, N. Y. 11735 ■ Tel. 516-694-1414 ■ Cable: Electronic, Hicksville, N. Y.

Quality Line of

intronics Analog Components

MULTIPLIER/DIVIDERS

PRECISION

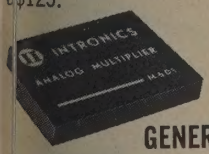
The 300 Series Multiplier/Dividers are plug height-width types featuring accuracy to 0.02% and temperature stability of 50 μV/°C. All models available in MIL spec versions. Prices start at $25.

ECONOMY

Moderate specifications at op amp prices highlight the 400 Series. Accuracy is adjustable to better than 1.0% with stability of 0.03%/°C. Prices begin at $18 in quantity. MIL spec versions available.

WIDEBAND

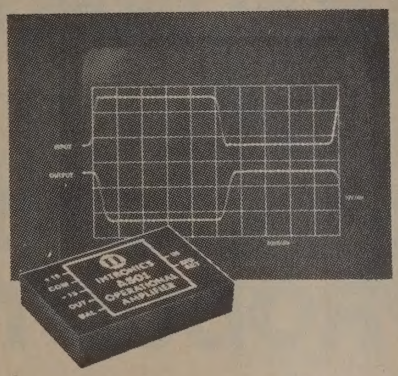
The 500 Series Multiplier/Dividers are variable transconductance types having frequency response up to 10 MHz, better than 1% accuracy, and 0.02%/°C temperature stability. MIL spec versions available. Prices begin at $125.



GENERAL PURPOSE

The 600 Series transconductance type Multiplier/Dividers offer the best value for dollar available anywhere. They feature small signal response to 1 MHz, 0.5% accuracy, and 0.02%/°C temperature stability. MIL spec versions available. Prices begin at $75.

OPERATIONAL AMPLIFIERS



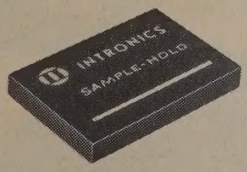
VERY FAST

Specifically designed for wideband applications, these units reproduce a higher speed signal than any other op amp. They feature 1000 V/μs slew rate, 100 MHz gain bandwidth, and down to 60 ns, 0.1% settling time. Packaged in rugged modules, they are the ideal choice in A-D and D-A conversion, in video summing applications, as high speed integrators, and in deflection control amplifiers. All models available in MIL spec versions. Prices start at $105.

FET INSTRUMENTATION

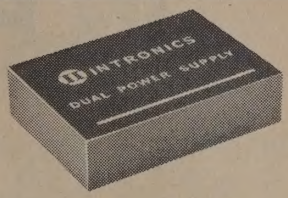
A new line of FET differential input, high performance Instrumentation Amplifiers features low cost with gains of 1 to 1000 selected by a single resistor. These economical encapsulated modules are the unequalled choice for all instrumentation applications. Prices begin at $45.

SAMPLE-HOLD MODULES



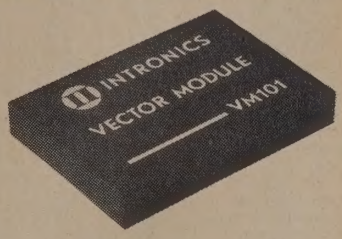
A line of encapsulated units featuring acquisition times to 1 μs, accuracy to 0.01%, voltage decay rates to 2 millivolts per minute, and an economy version under $50.

DC POWER SUPPLIES



Intronics offers a full line of modular, regulated, dual output power supplies for your analog instrumentation needs. Featured is a $\pm$15 Vdc, 25 mA unit at $18. Other units are available at $\pm$12, 15, 18, and 24 Vdc at 60, 75, and 100 mA, with 0.05% regulation. All are economical, short circuit protected, encapsulated modules. Standard units operate from 115 Vac, 50 to 400 Hz input. Also available in modular form is a 5 V, 1 A unit for logic applications and a $\pm$15 V, 200 mA model for general purpose applications. All 5 V units come with optional overvoltage crowbar protection.

VECTOR MODULE



The Model VM101 Vector Module, housed in an 0.4" high package, features 1 MHz bandwidth, 1% accuracy, and low cost — $95. Operating at −25°C to +85°C, this high performance unit computes:

- $\sqrt{X^2 + Y^2}$ based on two inputs
- The average of $\sqrt{X^2 + Y^2}$
- The average of either/both inputs

Model VM101 is ideally suited for rectangular-polar conversion in CRT displays, provides intensity correction for CRT character displays, and can be used as a high speed rectifier.

Full MIL temperature range version available.

Intronics produces a broad range of high quality, analog components — both off-the-shelf and custom designed. Pioneers in multipliers, Intronics has become a leading supplier of a variety of advanced design analog modules. Contact our applications engineering dept. to discuss your requirements.

intronics

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Intech modular products outperform the performers. Using creative circuit technology, today's top performing components, and a firm below-the-market standard price, Intech has designed the best proprietary modular products for your application.
We believe that this capability-in-a-package will more than meet your performance and price needs. But a test is worth a thousand words.
Quantity discounts are available and all Intech modular products are right from factory or distributor stock.

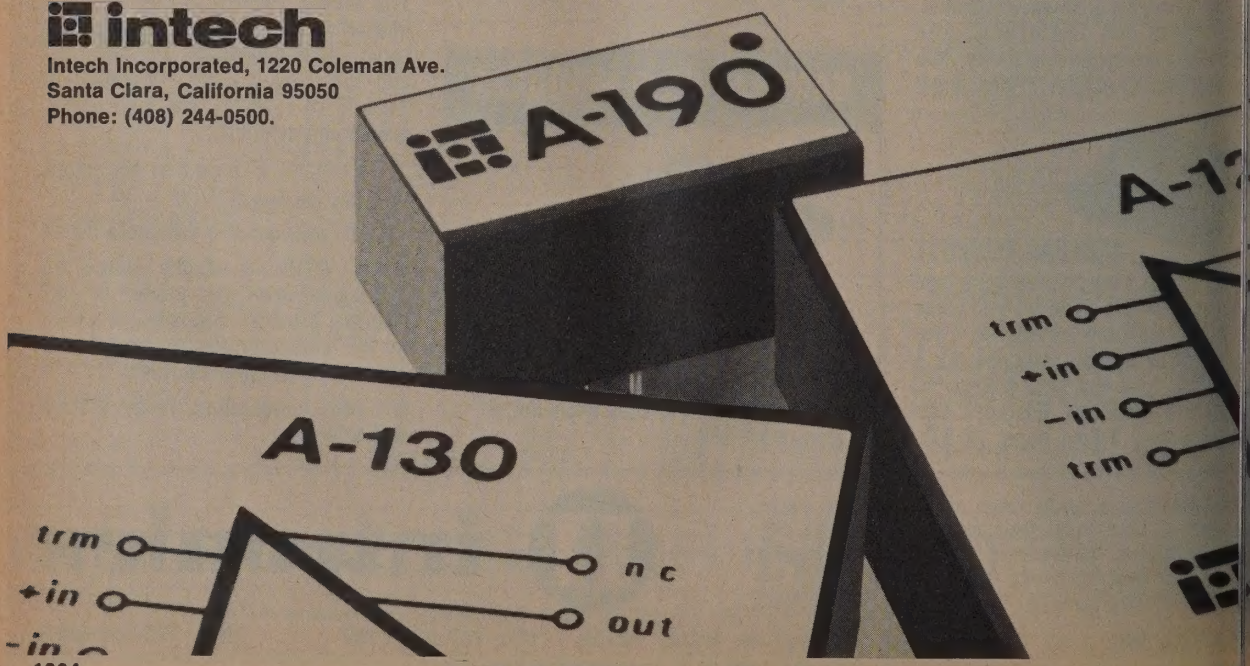
For more information on any of these proprietary products, contact your local Intech representative, or write directly.

Proprietary Modular Operational Amplifiers

SPECIFICATIONS		MODELS								
		A-100/1	A-102/3	A-122/3	A-125	A-130/1	A-136/7	A-160	A-190/1	A-300
DC Voltage Gain (000)	min	100	100	100	100	50	100	200	1	1
Unity Gain (MHz)	min	2	2	5	2	15	10	4 typ	0.8 typ	1
Full Output Frequency (kHz)	min	150	150	800	150	7.5/5 MHz	1200	40	400	
Gain Roll-Off (dB/Oct)	typ	6	6	6	6	6	6	6	6	
Slew Rate (V/μs)	min	10	10	50	10	500/300	100	20	0.5	1
Settling Time (0.01% – μs)	max	3 typ	5 typ	2	4	0.5	1	5 typ	——	–
Input Offset (initial – mV)	max	Adj	Adj	1.5	2	Adj	1	1	5/3	4/4
Offset Drift (μV/°C)	max	50/20	50/20	5/2	25	50	10/5	25	50/25	10/1
Supply Rejection (μV/V)	max	500 typ	20/%	20	20	100 typ	50	20 typ	1000/300	50
Input Bias (pA)	max	20/10	40	10	0.5	50	10	10	40	100/50
Z_{in} (Ω)	typ	10^{11}	10^{11}	10^{12}	10^{12}	10^{12}	10^{12}	10^{11}	10^{11} min	2
Input Noise (10 to 2 kHz – μV)	typ	3	3 max	4	3	10	3	3	——	
Common Mode (± V)	min	10	10	10	10	10	10	40	10	
CMRR (dB)	min	66 typ	100	94	100	80 typ	94	94 typ	80/86	
V_{out} (± V)	min	10	10	10	10	10	10	40	12	
I_{out} (± mA)	min	5	5	5	5	20	20	5	5	
Capacitive Load (pF)	min	1000	1000	250	1000	100	250	250 typ	1000	–
Supply Voltage (± V)	max	18	18	20	20	18	20	12 to 50	18	
Supply Current (mA)	typ	5	5	10	10	20	15	10 max	4	

intech

Intech Incorporated, 1220 Coleman Ave.
Santa Clara, California 95050
Phone: (408) 244-0500.



THE FIRST
pin-for-pin, spec-for-spec
ALTERNATE SOURCE FOR MODULAR PRODUCTS

Intech Modular Products Alternate Source Guide

We believe the market needs one.

That's why we're publishing ours. A review of this Alternate Source Guide will prove our capabilities as your first source in the modular product line.

We're interested in supplying you alternate source units at prices lower than the competition, yet with guaranteed quality. We can assure you this because our designs are up to date and take full advantage of the improvements in component performance and prices.

For more information on specifications and prices of any unit, contact your local Intech representative, or write us directly. In the meantime, file this guide.

intech

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ALTERNATE SOURCE — ANALOG DEVICES

Intech	Alternate	Intech	Alternate
A-142A	142A	A-180K	180K
A-142B	142B	A-183J	183J
A-142C	142C	A-183K	183K
A-146J	146J	A-183L	183L
A-146K	146K	A-230J	230J
A-147A	147A	A-230K	230K
A-147B	147B	A-230L	230L
A-147C	147C	A-232J	232J
A-148A	148A	A-232K	232K
A-148B	148B	A-602-100A	602-J/K-100A
A-148C	148C	A-602-100B	602-J/K-100B
A-180A	180A	A-602-10	602-J-10
A-180B	180B	A-901	901
A-180J	180J	A-902	902

ALTERNATE SOURCE — PHILBRICK/NEXUS

Intech	Alternate	Intech	Alternate
A-1008	1008	A-1011-2	1011/02
A-1009	1009	A-1018	1018
A-1009-1	1009/01	A-1018-1	1018/01
A-1009-2	1009/02	A-1018-2	1018/02
A-1011	1011	A-1018-3	1018/03
A-1011-1	1011/01	A-1018-4	1018/04

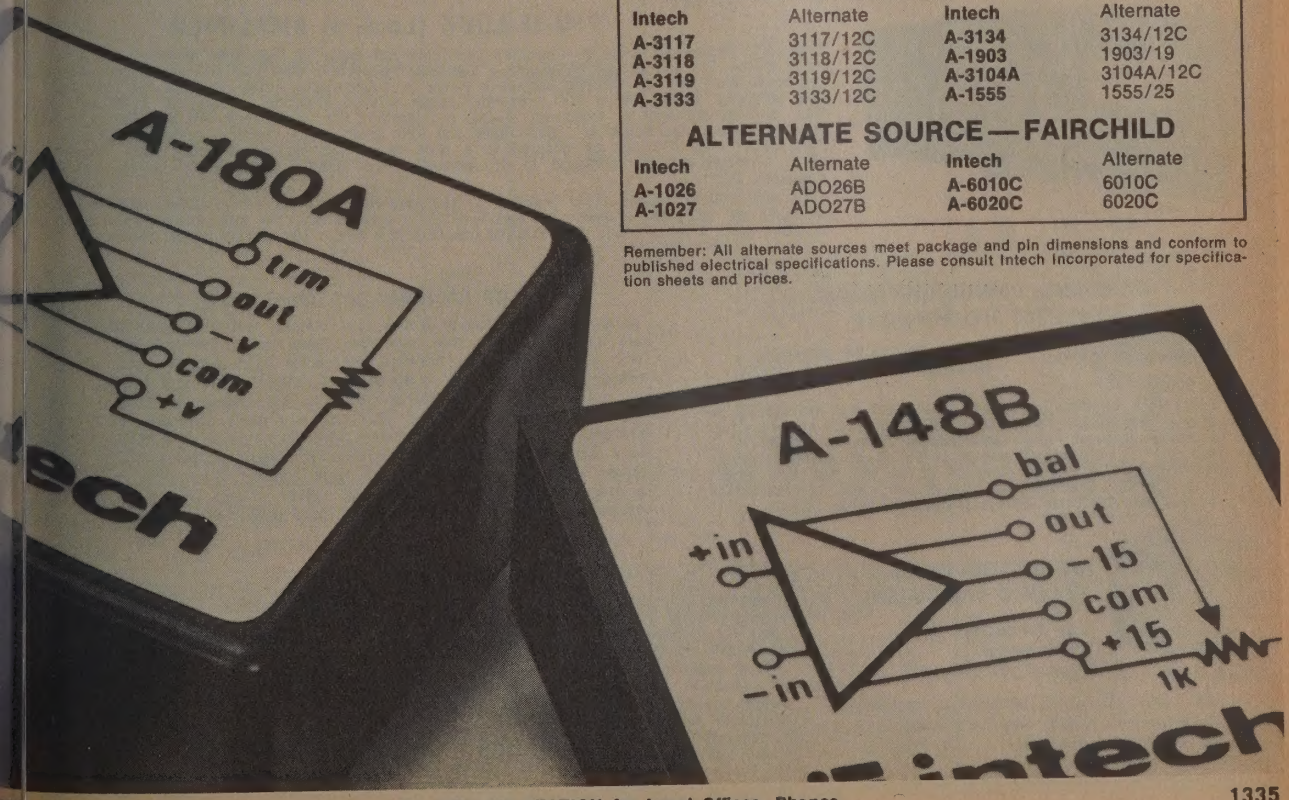
ALTERNATE SOURCE — BURR-BROWN

Intech	Alternate	Intech	Alternate
A-3117	3117/12C	A-3134	3134/12C
A-3118	3118/12C	A-1903	1903/19
A-3119	3119/12C	A-3104A	3104A/12C
A-3133	3133/12C	A-1555	1555/25

ALTERNATE SOURCE — FAIRCHILD

Intech	Alternate	Intech	Alternate
A-1026	ADO26B	A-6010C	6010C
A-1027	ADO27B	A-6020C	6020C

Remember: All alternate sources meet package and pin dimensions and conform to published electrical specifications. Please consult Intech Incorporated for specification sheets and prices.



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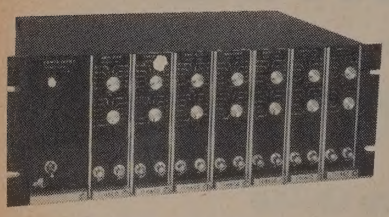
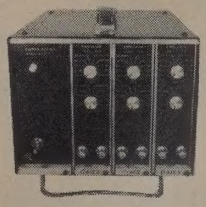
ITHACO

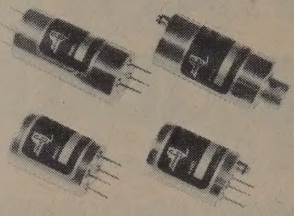
INSTRUMENTATION for DYNAMIC DATA ACQUISITION & SIGNAL CONDITION



450 SERIES AMPLIFIERS



MODEL 450S2 PORTABLE CASE



MODELS 143/144 PREAMPLIFIERS

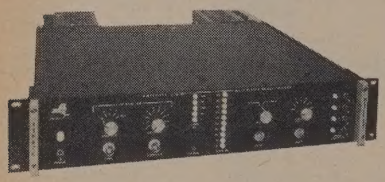
MODEL 241 DYNAMIC STRAIN GAGE AM

ITHACO dynamic data acquisition amplifiers and preamplifiers generally operate in the 1 Hz to 200 KHz range, and are used in a wide variety of applications requiring:

- Shaping of frequency and phase response
- Voltage or change inputs; single-ended or differential
- State-of-the-art noise performance at any impedance level
- Fully automatic (ITHACO's AUTO-GAIN® Amplifiers) computer oriented, data acquisition systems
- All products provide stable and precise gain; as low as −20 db an as 100 db

ITHACO manufactures high and low impedance, single-ended or dif voltage or charge preamplifiers in various packages. The 250, 450 Series are general purpose amplifiers for dynamic data, available choice of electrical configurations — including single-ended or di front ends. Model 241 is specifically designed for acquisition of strain data over a 60 KHz bandwidth.

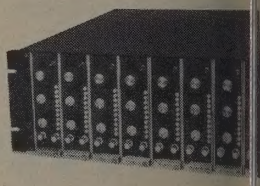
FULLY AUTOMATIC DYNAMIC DATA ACQUISITION AND RECOVERY SYSTEMS



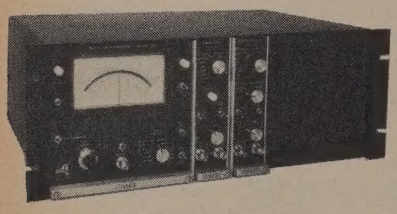
MODEL 541
AMPLIFIER STATUS MULTIPLEXER-DEMULTIPLEXER

AUTOMATIC GAIN RANGING, 32 CHANNEL STATUS RECOVERY

ITHACO's fully automatic data acquisition and recovery systems condition wide-dynamic range signals to amplitudes suitable for recording processing and display. They prevent loss of costly data due to operator error and manual response time. Model 441 Amplifiers automatically condition the amplitude of signals in the range of 1 Hz to 100 KHz to a level within the limited dynamic range of the tape recorder (or A/D converter, real-time analyzer, etc.). Gain is automatically switched in the precise steps as required to hold output signal amplitude in the range 0.2 to 1.0 volts. The Model 541 multiplexes the amplifier status signals and supplies the data processing equipment with amplifier status for each data channel.



MODEL 441 AUTO-GAIN® AMP



MODEL 353

PHASE-LOCK (Lock-in) AMPLIFIER

Model 353 Phase-Lock Amplifier measures amplitude and phase of repetitive signals in the presence noise levels. The 353 design represents a significant departure from that of conventional lock-in an Synchronization with an external reference signal is substantially automatic, and the instrument w this reference signal over a 10:1 frequency range without affecting accuracy of phase calibration time is minimum and no frequency tuning is required. The instrument will accommodate peak coherent signals or noise of 1,000 times the full scale signal setting without saturating. Mo construction, the 353 can be adapted to a wide variety of specialized applications. Standard se of 1 microvolt can be increased to 10 nanovolts with remote preamplifiers in the 1 Hz to 2 frequency range.

A new plug-in, Model 3151, provides a true logarithmic output for 10,000:1 input signal ran available are ratio, phase angle, in-phase/quadrature outputs, etc. For multichannel applications, Mo provides up to 7 synchronous demodulation channels in a single 19″ standard rack adapter.

WIDEBAND, OMNIDIRECTIONAL, SENSITIVE HYDROPHONE

MODEL 601-1

30 Hz TO 150 KHz RESPONSE, INTERNAL 20 db PREAMPLIFIERS

Model 601-1 is a sensitive, wideband, omnidirectional hydrophone incorporating a low noise ITHACO preamplifier within its molded structure to provide optimum noise performance. Midband sensitivity is −69 dbv/μbar at preamplifier output (−89 db at amplifier input). Frequency response is ±3 db from 30 Hz to 100 KHz with usable response to 150 KHz. Spectral noise, 1.0 Hz bandwidth, at preamplifier output is less than Sea State Zero at frequencies below 10 KHz.

VOLTAGE CONTROLLED AMPLIFIER

Some salient features of Model 3151 voltage controlled amplifier are the following: a true logarithmic gain control characteristic with negligible coupling between the control input and the signal output, gain range of up to 80 db, gain control accuracy of ±0.5 db, gain slewing rate of over a million db per second, and bandwidth of more than 200 KHz. This unit is directly applicable to systems with computer-programmed gain. The addition of a feedback loop (detector and integrator) permits logarithmic conversion, signal compression, and automatic gain control. This model is a plug-in amplifier which mounts in either a rack adapter or portable carrying case and is powered by a plug-in power supply.

MODE 3151

MODEL 1541

ULTRA-LOW NOISE SEISMIC AMPLIFIER

Low Frequency Preamplifier
Free of 1/f Effects

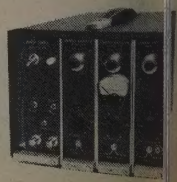
Model 1541 has a .001 Hz to 100 Hz basic frequency range. High/low pass plug-in filters are available at up to 24 db/octave rolloff. Gain is 60-100 db, externally adjustable.

CHARGE AMPLIFIER

Model 461 is an improved charge amplifier for use with piezoelectric accelerometers. The use of a demountable charge preamplifier provides for optimum noise performance over a 1 Hz to 100 KHz bandwidth with no transients induced by range switching.

Front panel controls consist of a 10-turn dial calibrated by 2 ranges of transducer sensitivity, 1-11 pc/g and 10-110 pc/g and a range switch covering a .03 to 3000g, psi, lb fullscale. Meter, galvo driver and servo output are optional.

Model 460P1 Power Supply-Calibration Generator when operating with Model 460S1 Rack Adapter (7 channels) or Model 460S2 Portable Case (3 channels) form a calibration system for the 461 Charge Amplifier.



MODEL 461
CHARGE AMPLIFI

See YELLOW SECTION for Local Offices, Phones

ITHACO LOW NOISE VOLTAGE PREAMPLIFIERS, CHARGE PREAMPLIFIERS, VELOCITY PREAMPLIFIERS AND SEISMIC PREAMPLIFIERS

DESCRIPTION	FREQUENCY RESPONSE	GAIN	NOISE		OUTPUT RATED LOAD AND OUTPUT Z	MAXIMUM INPUT	DC POWER	CAN SIZE
			1Hz BW	BROADBAND				
0 meg Input Z. ity Gain, Utility amplifiers	—1 db @ 0.1Hz, 200KHz	0.0 ±0.1db	—158dbv @10KHz	8μv rms	5v rms into 10K. 100 ohms in series with 100μf	5v rms, ±75v abs. max.	—12v to —24v 2.5 to 5ma +12v to +24v 2.5 to 5ma	1.13" dia. 2.25" long
K Input Z lb gain	—3db at 0.1Hz, 10KHz	60 ±0.1db	Not Specified	0.8μv rms 0.5μv rms	5v rms into 5K. 50 ohms dc coupled	5mv rms; ±1v abs. max.	+20v to +30v —20v to —30v	3"x2.05" x .55"
0 meg Input Z, mium Noise, and 40db amplifiers	—3db @ 0.5Hz, 200KHz	20 ±0.2db		2.5μv rms	5v rms into 5K. 50 ohms dc coupled 5v rms into 1K. 50 ohms, 40μf	0.5v rms, ±75v abs. max.	+12 to +25v 4 to 8ma +20 to +28v 15 to 20ma	1.13" dia. 1.57" long 1.13" dia. 2.25" long
		40 ±0.2db			5v rms into 5K. 50 ohms dc coupled 5v rms into 1K. 50 ohms, 40μf	50mv rms, ±75v abs. max.	+12 to +25v 4 to 8ma +20 to +28v 15 to 20ma	1.13" dia. 1.57" long 1.13" dia. 2.25" long
in selected by con- ctions at socket	—2db@0.5Hz, 100KHz	20/30/40db	—164dbv @10KHz		5v rms into 5K. 50 ohms dc coupled	.5v rms @20db, ±75v abs. max.	+12 to +25v 4 to 8 ma	1.13" dia. 2.25" long
) meg Input Z, high essure package	—1db @ 5Hz, 75KHz	14 ±0.5db		2μv rms	3v rms into 50 ohms. 50 ohms dc coupled	.6v rms, ±75v abs. max.	26 ±2v, 60ma	1.5" dia. 4.5" long
0 meg Input Z. Re- itely switched gain	—3db max @ 0.5Hz 200KHz	20 ±0.5db		2.5μv rms	5v rms into 1K. 50 ohms, 40μf	.56v rms, ±75v abs. max.	+20 to +28v 12 to 18ma	1.13" dia. 2.25" long
0 meg Z in flat, niature package	—3db @ 0.2Hz, 200KHz	10 to 40db			5v rms into 5K. 50 ohms	1.2v rms, ±75v abs. max.	+12 to +28v 7 to 10ma	2.25" x 1" x .38"
00 meg, Adjust- le Gain	0.1Hz to 200KHz	0db to —10db		8μv rms	5 rms into 10K. 100 ohms	5v rms, ±75v abs max.	+12 to +28v 15 to 20ma	1.13" dia. 2.25" long
w Cost Charge nverters	—1% @5Hz, 20KHz —1% @15Hz, 20KHz	1mv/pc 10mv/pc		25μv rms 200μv rms	5v rms into 1K. 50 ohms, 40μf	±5000pc ±500pc	+28±5v, 15ma regulated	1.13" dia. 2.25" long
arge Converters °C flight rated	—1% @5Hz, 20KHz —1% @15Hz, 20KHz	1mv/pc 10mv/pc		25μv rms 200μv rms	±5v into 5K. 50 ohms, 16μf	±5000pc ±500pc	+28v. 15ma unregulated	1.13" dia. 3.00" long
gh Z preamps w/both CELERATION and LOCITY outputs for bration Measurements	acc (2%@5Hz,20KHz) vel(10%@5Hz,10KHz)	acc(gain x 1.0) vel(x1.00@61.4Hz) acc(gain x 1.0) vel(x3.0 to 12 adj. @100KHz)	Not Specified	7μv rms 8μv rms ±10mv pk	±5v into 5K, both outputs. 100 ohms, 40μf	±5v peak, ±75v abs. max.	+28 ±5v 8ma	1.13" dia. 2.25" long
arge Converters, °C flight rated w/ th ACCELERATION VELOCITY outputs r Vibration Meas- ement	acc(—1%5Hz, 20KHz) vel(±2%5Hz, 5KHz) acc(—1%5Hz, 20KHz) vel(—1%5Hz, 5KHz) acc(—1%5Hz, 20KHz) vel(—1%50Hz, 5KHz)	acc(1mv/pc) vel(1mv/pc @61.4Hz) acc(1mv/pc) vel(10mv/pc @61.4Hz)		acc(25μv rms) vel(200μv rms) acc(25μv rms) vel(±10mv pk) acc(25μv rms) vel(±3mv pk)	±5v into 5K load @ midband acc(50 ohms, 16μf) vel(50 ohms, 160μf)	±5000pc	+28v, un- regulated 15ma	1.75" dia. 3.6" long
ry low Frequency, emium noise, diff. meg .01μf Input Z.	—3db @ .001Hz, 100Hz. High/Low pass filters available	60-100db externally adjustable	—156db in passband	.16μv rms	14 volts pk to pk into 30K ohm load	determined by gain setting	±20vdc, 10 ma each	3.938"x 4.625"x 3.938"

) RACK-MOUNTED VOLTAGE, CHARGE, STRAIN GAGE AND VIBRATION AMPLIFIERS FOR DYNAMIC DATA ACQUISITION AND SIGNAL CONDITIONING

DESCRIPTION	FREQUENCY RESPONSE —3 db Points	GAIN			NOISE	OUTPUT, RATED LOAD	MAX. LIN. INPUT	POWER SUPPLY AND MOUNTING
		RANGE	COARSE	FINE				
meg input Z, lectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +90db	10±0.1 db steps	1.0db steps (10db vernier available)	3μv rms	Output Z is 20 ohms dc coupled. Max. offset ±10mv. 5v rms sinewave output into 500 ohm load. 1v rms into 100 ohm load	5v rms sinewave	INDIVIDUAL ISOLATED ±15v DC POWER SUPPLY IN EACH CHANNEL. Primary Power 95v to 130v, 50Hz to 400Hz Model 430S1—rack adapter holds up to 8 channels, 7" high
meg input Z, neral Purpose	1Hz to 100KHz				4μv rms			
meg input Z, lectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz							
meg input Z, st Amplifier	1Hz to 100KHz				3μv rms			
meg Z differential put, 100db CMR	LF 1, 10, 100, 1K, 10KHz HF 100KHz 1Hz to 100KHz				10μv rms			
tomatic gain rang- g Post Amplifiers	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +80db		Special order only	3μv rms			Similar to 430 Series. Uses 440S1 rack adapter
meg input Z, lectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +90db		1.0db steps (10db vernier available)				COMMON ±15 VDC POWER SUPPLY FOR UP TO 7 CHANNELS, ±50 ma/channel Additional—55v for Models 455/456 Model 450S1—rack adapter holds up to 7 channels, 7" high Model 450S2—portable case holds 3 channels plus 450R power supply Models 450S1 and 450S2—takes plug-in power supplies: Model 450P1—AC type Model 450P2—AC type with preamp power
0 meg input Z, neral Purpose	1Hz to 100KHz				4μv rms			
0 meg input Z, lectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz							
meg input Z, st Amplifier	1Hz to 100KHz				3μv rms			
meg Z differential put, 100db CMR	LF 1, 10, 100, 1K, 10KHz HF 100KHz				10.0 μv rms			
	1Hz to 100KHz							
meg input Z, Remote ntrol of Gain	LF 1, 10, 100, 1K, 10KHz HF 100KHz	0 to +80db	20±0db steps in response to static BCD commands		3μv rms			Similar to 430 Series. Uses 490S1 rack adapter
arge Amplifier with mountable Charge eamp	±5% 2Hz to 50KHz ±10% 1Hz to 100KHz	.03 to 3000g, psi, lb		10-turn dial sets accelerometer sensitivity, pC/g, psi, lb	.004 pC +.002pC/ 1000pf RTI or 200μv RTO	1, 1.414, 2.5 or 5v peak direct coupled from 15 ohms max. Optional galvo driver, servo output and meter	±10,000pC	Model 460P1—power supply with cal oscillator Model 460S1—rack adapter Model 460S2—portable case
ynamic Strain Gage mplifier complete ith Constant Current ource. Very High Gain.	0.5Hz to 60KHz (±3% 2Hz to 10KHz)	1 volt out for 10 to 30,000μ strain		2 normalizing dials set GF (1 to 4) and gage R (100 to 1000 ohm)	0.25μ strain rms w/120 ohm gage	Output Z is 100 ohms, 100μf. 5v pk output into a 10K load (full scale is 1v pk)	30,000 strain for 1v out	105 to 125v, 60-400 Hz Model 240T—6 channel rack adapter w/power, 5¼" high Model 240P A & B—one channel system
ifferential Input oltage Controlled mplifier	10Hz to 200KHz	0 to 80 db	10-turn dial for manual control		10μv rms	Balanced output 6v peak to peak from 100 ohms, 40μv into 10K ohms	1v rms	Similar to 450 Series

MELCOR
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MELCOR OPERATIONAL AMPLIFIERS

These versatile solid state modules are used in a wide range of applications for control instrumentation, computation, test equipment, medical instruments, data logging, etc. Melcor has developed and produced in large quantities, one of the broadest and most up-to-date product lines in the industry. These are available for OFF-THE-SHELF delivery. In addition, Melcor manufactures many customized modules to industry specifications.

- FET INPUTS
- ECONOMY UNITS
- HIGH VOLTAGE SWING
- CHOPPER STABILIZED
- HIGH SLEW–LOW DRIFT
- CURRENT BOOSTERS
- FAST SETTLING
- LOG MODULES
- FUL MIL SPEC UNITS

CASE	SIZE
A, B, C, I	1.13″x1.13″x.5″
D	.75″x.75″x.35″
E	.6″x.6″x.25″
F	1.5″x1.5″x.5″

	GENERAL PURPOSE				FET INPUT							HIGH POWER			CHOPPER STABILIZED	FAST SETTLING
SPECIFICATIONS (Typical at 25°C Unless Noted) MODEL ▶	1573	1614	1616	1779	1810	1821	1619-1671	1672	1719 1720 1765	1881	1841 1842 1843	1527	1731	1757	1859	1915
Rated Output Voltage ±V Min Current ±ma Min	10 2	10 5	10 10	2 to 10 2 to 4	10 5	10 5	10 10	10 20	5 to 21 20	10 5	10 5	100 10	10 100	20 200	10 5	5 to 21 20
Voltage Gain Open Loop at Rated Load Min	10K	20K	100K	75K to 140K	40K	20K	50K	50K	100K	20K	300K	100K	50K	50K	10,000K	100K
Frequency Response Small Signal Unity Gain MHz Power Bandwidth KHz	1.0 10	4.0 20	1.5 20	0.5 15	8 300	10 200	10 200	25 2000	10 300	1.0 20	1.5 40	1.0 15	2 50	2 50	0.5 20	10 300
Input Voltage Offset Ext Trim Pot K ohms Avg vs. Temp μV/°C Max	1000 30	50 15	50 15	1000 15	5 40	0.5 75	2 50-15	0.5 50	2 25-15-5	0.5 75	10-5-3	1.0 30	50 20	50 20	25 μV .05	2 25
Input Current Offset Initial Difference nA Avg vs. Temp nA/°C	70 1.0	50 1.5	10 1.0	25 0.5	0.015 2X/10°C	0.1 2X/10°C	0.03 2X/10°C	0.03 2X/10°C	0.03 2X/10°C	0.25 2X/10°C	0.03 2X/10°C	30 1.0	150 1.5	150 1.5	Not Applicable	0.03 2x/10°C
Input Bias Current Initial Bias nA Max Avg vs. Temp nA/°C Max	125 2.0	100 2.5	20 1.0	50 1.5	0.025 2X/10°C	0.1 2X/10°C	0.1 2X/10°C	0.1 2X/10°C	0.05 2X/10°C	0.25 2X/10°C	0.05 2X/10°C	200 4	300 3.0	300 3.0	.050 .001/°C	0.05 2x/10°C
Input Impedance Differential K ohms Common Mode M ohms	200 100	100 100	200 30	1000 100	10^8 10^5	10^8 10^5	10^8 10^5	10^8 10^5	10^8 10^5	10^8 10^5	10^8 10^5	250 100	200 10	200 10	200 Not Applicable	10^8 10^5
Input Voltage Range Common Mode Voltage ±V Min Common Mode Rejection Ratio	5 2K	10 10K	10 20K	2 to 10 10K	10 3K	10 5K	10 5K	10 5K	5 to 21 100K	10 3K	10 5K	10 10K	4 10K	8 10K	Not Applicable	5 to 21 100K
Input Noise Voltage 10 KC Bandwidth μV ms	5	1	2	1	5	5	4	4	4	5	4	10	0.5	0.5	5	4
Power Supply Voltage ±V	15	15	15	4.5 to 15	15	15	15	15	10 to 26	15	15	125	15	25	15	10 to 26
Current—Full Load	+5, −15	12	15	2.5 to 5.5	12	12	15	30	25	10	12	18	115	225	20	25
Temperature Range °C	−25,+85	−25,+85	−25,+85	−25,+85	−25,+85	−25,+85	−25,+85	−55,+85	−55,+85	−25,+85	−0,+85	−25,+85	−25,+85	−25,+85	060 I	−55,+85
Case	D	A	A	I	E	B	A	A	C	B	B	F	A	A	H	A
Unit Price	$15.00	$12.00	$20.00	$35.00	$33.00	$14.25	$48.00 $85.00	$70.00	$80.00 $90.00 $96.00	$10.00	$55.00 $70.00 $85.00	$88.00	$34.00	$49.00	$64.00	$80.00

Partial listing only—write for complete catalog.

Partial listing only—write for complete catalog.

MODEL	OUTPUT		INPUT			GAIN		PHASE SHIFT	TEMP. RANGE	SUPPLY		SIZE	UNIT PRICE (1-9)
	Voltage RMS	Power Watts	Freq. Hz	Impedance Ω	Voltage Max. RMS	Initial 25°C	Stability plus Initial Tol. DB	Degrees	°C	Volts DC	Current MA Max.	LxWxH Inches	
1030	40	6.3	380-420	10K	26	1-2.5K	±3	0 ±10	–55 +125	28	400	1.25Dx1⅜	$85.00
1033	40	16	380-420	10K	26	1-20K	±3	0 ±10	–55 +125	28	1000	2.78x1x2	$110.00
1034	40	3.5	380-420	20K	26	1-750	±3	90 ±10	–55 +125	28	235	2 1/16x1⅛x⅝	$60.00
1035	40	3.5	380-420	10K	26	1-5K	±3	0 ±10	–55 +125	28	235	1Dx1 3/16	$57.00
1399	40	6.0	57-63	10K	26	1-1K	±3	0 ±10	–55 +125	28	400	1.5Dx2⅝	$98.00
1483	40	3.5	380-420	10K	26	1-3K	±3	0 ±10	–55 +100	28	235	0.83x.46x.97	$89.00

MELCOR SERVO AMPLIFIERS

To drive servo motors in closed loop position and velocity control.

- RESOLVER DRIVE AMPLIFIERS
- QUADRATURE REJECTION AMPLIFIERS
- AUTOMATIC GAIN CONTROL AMPLIFIERS
- AC OPERATIONAL AMPLIFIERS

	MODEL	GAIN	INPUT NOISE	INPUT IMPED.	RATED OUTPUT	DIST.	FREQ. RESPONSE	SUPPLY		SIZE	UNIT PRICE	
		DB	DBM Max. 20 to 20KHz	Ohms	DBM Min.	% Max. 30 to 20KHz	30 to 20KHz DB Max.	Voltage ±V	Current Full Load ±MA	L x W x H Inches		NOTES
Pre-Amp	AM-20	20 to 60	–129	1500	20	0.3	±0.5	15	20	4x2¾x¾	$ 74.00	Input Transformer
	AM-220	20 to 45	–120	1000	+20	0.5	±0.5	15	40	4x2¾x¾	98.00	Dual Unit, Phantom Powering for Condenser Microphone
	AML-27	25 to 60	–129	1500/6000	27	0.5	±0.5	15	36	4x2¾x1⅜	100.00	Input and Output Transformer
	ATP-20	0 DBM Out Tape 6MV Phone 3MV	–125	300K/47K	20	0.5	±1.0 NAB RIAA	15	20	4x2¾x¾	77.50	NAB or RIAA Equalization
Mixer	MM-20	–6 to 20	–105	20 Inputs 6.2K	20	0.25	±.25	15	20	4x2¾x¾	81.00	
Line Amp	AL-27	20 to 50	–125	10K	27	0.5	±0.5	15	36	4x2¾x1⅜	74.00	Output Transformer
Speaker Drive	PM-37	100MV 11 Watts Peak Output	–125	10K	11 Watts Peak 8Ω	0.5	±0.5	15	*175	4x2¾x¾	107.00	Drives an 8 Ohm Speaker Program Material
	PM-40	100MV 16 Watts Peak Output	–125	10K	16 Watts Peak 16Ω	0.5	±0.5	25	*150	4x2¾x¾	125.00	Drives a 16 Ohm Speaker Program Material

Partial listing only—write for complete catalog.

MELCOR AUDIO AMPLIFIERS

A complete line of Microphone Preamplifiers, Mixers, Line Amplifiers, Equalizers, Compressors, Monitor Amplifiers, Channel Select Switching for Custom Audio Consoles. Modules feature ultra low noise and distortion, flat frequency response, output power to 16 watts on plug-in PC cards. Rack mounted power amplifiers to 100 watts output. Line Transformers, Power Supplies, Rack Mounting Frame and numerous accessory items available.

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a MULTITECH company

Dynamics Instrumentation

DIFFERENTIAL DC AMPLIFIERS

AUTOMATIC/PROGRAMMABLE DIFFERENTIAL DC AMPLIFIER Model 7511

Dynamics Model 7511 Differential DC Amplifiers provide a choice of either fully automatic or remotely programmable gain switching. Solid state switches are used for gain changing to achieve high speed and reliability. The amplifier input circuitry is a symmetrical, true differential configuration that may be connected for either inverting or noninverting gain polarity. Front panel lights are used to indicate gain settings. Several design options are available for application flexibility. Key features are 50 μSec. Switching. Completely automatic or programmable. Three gain options. Dual outputs. Filtered dual outputs. Multiplex outputs. Interrogate gain feature. Gain lock feature. 50 μSec. overload recovery.

General Purpose DIFFERENTIAL DC AMPLIFIER Model 7520

Dynamics Model 7520 Differential DC Amplifiers are designed to satisfy a broad range of operating requirements. Two standard models accommodate fourteen options to offer system designers the widest selection of operating parameters possible: Three Gain Step Sequences, Accuracy to ±0.01%, Single, dual outputs and Dual Isolated Outputs (±100 mA), Five and Seven-position Band Limiting Filters, Fixed or Variable Current Limiting and offset control. All controls are front panel mounted. Both models permit mounting of 10 channels in standard 19-inch RETMA rack mounts.
Advanced Feedback design rejects connom-mode signals and provides excellent input-to-output isolation. Input circuit allows for inverting or noninverting gain polarity.
Key Features include: Fast overload recovery, Gain accuracies to 0.01%, Self-contained power supply, Low noise, Output short circuit protected, Several design options.

Line Isolation Driver DIFFERENTIAL DC AMPLIFIER Model 7504

The Model 7504 offers: DC to 100 kHz, Gains from 0.1 to 33, Source Impedance — 100 k-ohms, Output — 10 V, 100 mA. FET input circuit eliminates zero errors from pump-out current flowing in signal source. Tolerates floating sources, long input cables. Typical applications include buffering single-ended amplifiers for ground isolation, driving galvanometers, long lines, and tape recorder preamplification. Gain accuracy; ±0.1%. Size 5¼" H.

High Performance DIFFERENTIAL DC AMPLIFIER 7514 Series

Dynamics Model 7514 Differential DC Amplifiers are designed to satisfy a broad range of operating requirements. Two standard models accommodate eighteen options to offer system designers the widest selection of operating parameters possible: Six Gain Step Sequences, Accuracy to ±0.01.%, Single and Dual Outputs (±100 mA), Five and Seven-position Wideband Filters, and Fixed or Variable Current Limiting settings. All controls are front-panel mounted. Both models permit mounting of 10 channels in standard 19-inch RETMA rack mounts.
Advanced Feedback design rejects common-mode signals and provides excellent input-to-output isolation. Input circuit allows for inverting or noninverting gain polarity. Low pump-out current is maintained over a wide temperature range permitting low drift operation.

Extremely Wide-bandwidth DIFFERENTIAL DC AMPLIFIER Model 7575 Series

The Dynamics 7575 Series is a family of 1 megacycle differential dc amplifiers capable of operation in the presence of 100 volts (p-p) of common-mode signal. A slewing rate of 50 volts per microsecond and a full scale output of ±10 volts, ±100 milliamperes at all gain settings are standard for all models. These wide-band instrumentation amplifiers meet the frequency response specification (1 Mc) when operating into a resistive load of 50 ohms or greater. Common-mode rejection ratio is 120 db at 60 cps with a 5000 ohm unbalance. A wide variety of option combinations are available in standard models.
The series has a wide range of applications including: Wide-band links; Low-level commutation; Applied research in turbulence, blast or shock studies; Direct reference recording; Tape recorder preamplification.

Small Size DIFFERENTIAL DC AMPLIFIER Model 7830

Dynamics Model 7830 is a small, chopperless, solid-state, instrumentation differential dc amplifier. Multiple feedback techniques are used to reject common-mode signals and provide input to output isolation. The input circuitry may be connected for either inverting or noninverting gain polarity. Standard power is ±20 VDC or by appropriate option selection it can be operated from ±28 VDC or 115 VAC; 400 Hz. A mating series of active electronic filters are available (Model 7831). For multiple usage, rack adaptors with common power supplies are available. Key features include: Small, rugged construction, Meets MIL-E-5400, Fast overload recovery, Gains 10 to 1000, Mating active electronic filters, ±20 VDC, 28 VDC, 115 V — 60 Hz and 400 Hz, 50 Channel Rack Adaptors.

Flux-Coupled DIFFERENTIAL DC AMPLIFIER Model 7530

Dynamics Model 7530 Differential DC Amplifiers are designed to satisfy a broad range of operating requirements. Options include three Gain Steps Sequences, Accuracy to ±0.01%, Single Dual Outputs, Five and Seven-position Band Limiting Filters, Fixed or Variable Current Limiting, and Offset Control. All controls are front panel mounted. Ten amplifiers are housed in standard 19-in. RETMA rack mounts. Advanced flux-coupled design rejects common mode signals up to ±300 VDC and provides excellent input to output isolation.
Some of the features are: ±300 VDC common-mode level; Fast overload recovery; Wide bandwidth; Low noise; Output short circuit protected; Several design options.

DC AMPLIFIERS

Galvanometer Driver DC AMPLIFIER Model 7202

The Dynamics Model 7202 is a solid state, single-ended dc amplifier. With 100 milliampere output current, variable offset, current limiting and filtering capability, it is ideally suited for driving galvanometers. Ten amplifiers mount in a standard 19" RETMA rack cabinet.
Features included are: Output reversal switch, Offset and current limiting. Selectable output "Tee" pads.

CHARGE AMPLIFIERS

AUTOMATIC CHARGE AMPLIFIER Model 7306/PD

The Dynamics Model 7306/PD AC Charge Amplifier is an all solid-state, wideband instrument suitable for use with piezoelectric transducers. Individual internal power supplies provide maximum isolation and flexibility in multi-channel systems. Ample feedback is used to achieve stability, low distortion and long-term reliability.
The Model 7306/PD features a fully automatic range switching circuit which covers a 1.0 to 1000 (g) full-scale range in seven, 10 dB steps. Upranging is dependent upon the peak value of input signal and the circuit will start to up-range 1.0 μSec. after a preset trip level has been exceeded. The amplifier will settle on the most optimum range within 1.0 millisecond. A recessed front panel control varies the trip level from 1.0 to 5.0 volts, relative to full-scale output.
Features include: Solid-state — FET circuit, Remote and/or local series-shunt calibration, Automatic range switching.

ed CHARGE AMPLIFIER
7306

hics' Charge Amplifier, Model Series are all solid-state wide- instruments especially suitable se with piezoelectric transducers. dual internal power supplies pro- maximum isolation and flexibility lti-channel systems. Ample feed- is used to achieve stability, low tion, and long term reliability. asic charge amplifier incorporates put/output isolation feature that ates ground loops when con- d to a grounded transducer. basic amplifier plus one range h will provide a fully operational e amplifier with one output, suit- for driving a tape recorder, oscil- pe or other low current load. basic amplifier also includes the amics Range Master Control" h provides a positive read-out of full scale and transducer sensitiv- values, thus eliminating reading guities.

TRIPLE MODE AMPLIFIER

ersal
ATION DC AND CHARGE AMPLIFIER
el 7350

amics Model 7350 Universal Data lifier incorporates in one package provisions necessary to process low analog signals from all types of and dc transducers. the DC MODE, performance is that a high quality differential dc ampli- . Low drift and noise together with 0 volt common-mode operating level es the Model 7350 particularly ful for processing low level signals n strain gauge and thermocouple rces. CHARGE MODE permits operation h all types of piezoelectric trans- ers. Input-output isolation elimi- ed ground loop problems normally ountered with grounded transducers multi-channel systems. h of the range switch options in- des a range switch and a ten-turn nting dial. The range switch in- ates input units per volt of output. ten-turn counting dial reads di- tly in pC/g in the charge amplifier erating mode and is used to dial-in transducer sensitivity value to match transducer being used. A total span 1 to 100 pC/g is covered in two nges (1-10) and (10 to 100). The unting dial is accurate to within 1.0% of reading. In the dc operating de, the counting dial is used as a riable gain control to obtain sen- tivity values between the fixed steps.

ACTIVE ELECTRONIC FILTERS

ROGRAMMABLE FILTER
odel 7812

ynamics Model 7812 is a third-order ilter with programmable cut-off fre- uencies. A 3-bit binary input is used o select eight individual cutoff requencies.

Balanced differential input circuitry is used to provide input-output isolation and permit operation with either inverting or noninverting gain polarity.
Other features include: Solid State Switching, less than 10μs between any two cutoff frequencies. Differential Input Terminals, Self-contained Power Supply. Output Protected, $\pm$10 V at $\pm$10 mA. Output may be shorted without damage. 8 Cutoff frequencies available.

Solid-state Active
ELECTRONIC FILTERS
Models 6364/6371

Dynamics Models 6364 and 6371 series of Electronic Filters are variable, direct-coupled active filters with Butterworth and Linear Phase characteristics. Terminal slope on each skirt is 36 dB per octave. Cut-off frequencies can be selected over four decades in 0.1 decade steps. Model 6371 is a low-pass instrument only. Model 6364 has both low and high-pass circuits with switching provisions providing bandpass and band reject capabilities as well. Low-pass or high-pass filtering can be independently switched out.
Both Models, 6364 and 6371, are available in two frequency ranges: Low frequency units cover four decades from 1 Hz to 1 MHz. Versatile packaging enables these filters to be mounted in single, dual or eight-channel rackmount configurations. A portable benchmount is also available.

Small Size
ACTIVE ELECTRONIC FILTERS
Models 7831/7850 Series

These series of Active Electronic Filters are both low-pass direct-coupled filters with Butterworth Bessel (Linear Phase) or Chebyshev characteristics.
Two sizes in the Model 7850 series accommodate cutoff frequencies of 1 Hz to 50 Hz or 51 Hz to 50 KHz in either the 4th or 6th order. (24dB/octave or 36dB/octave terminal slope). The 7831 series cutoff frequencies are 1 Hz to 50 KHz in either the 4th or 6th order. If preamplification is required for this series (Model 7831), mating model 7830 Differential DC Amplifier is available.

BRIDGE POWER SUPPLIES

BRIDGE POWER SUPPLY
Model 7827

The Dynamics Model 7827 Bridge Power Supply is an isolated, regulated instrument especially suited for the exciting strain-gauge transducers.
A solid-state regulator provides continuously variable output from 1 to 16 volts and will deliver up to 150 milliamperes of direct current to the bridge. Constant current and remote calibration are available as options. Controls for shunt calibration, bridge monitoring, and balancing are provided on the front panel. The Bridge supply accommodates 2 to 8 wire strain-gauge systems.

MISCELLANEOUS INSTRUMENTS

GALVANOMETER CONDITIONING UNIT
Models 301/303

The Dynamics Model 301 is a 12 channel rack mounted Galvanometer Conditioning Unit which provides variable signal level attenuation and matching between a wide range of signal sources and oscilligraph galvanometers.
Galvanometers ranging from low frequency-high sensitivity to high frequency-low sensitivity types are accommodated. Each of the channels have an 11-position sensitivity control with multi-turn trimming potentiometers, damping resistor selector, galvanometer reversing switch and disconnect switch. Model 303 is a 6-channel configuration and is equal in respects as the model 301.

DIGITAL ISOLATION SWITCH
Models 601/602

The Model 601 Digital Isolation Switch is an isolating digital circuit with 500 nanosecond response, capable of transmitting dc logic levels.
Eight models provide all combinations of inversion, translation and bipolar operation. The dimensions, 0.4" x 1⅛"-x 1½" make it suitable for mounting on PC cards. Proper operation requires that power be supplied separately on both input and output sides.
The Model 602 High Speed Digital Isolation Switch, provides an isolating interface for digital logic signals with 100 nanosecond response. Input-to-Output isolation prevents signal contamination in interface processes by eliminating ground loops. Input has variable threshold Schmitt trigger characteristics. Output is fully floating-power is carrier derived from the input side and is sufficient to provide a dc to 3 MHz response.

PORTABLE/LINE MULTIMETERS
Models 503/504

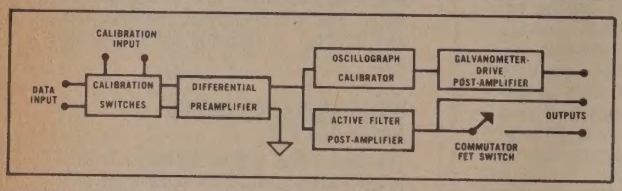
The Model 503, dc Microvolt-Ammeter operates from line or automatically recharged, internal power source. The unit provides fifteen ranges from: $\pm$100 μV to $\pm$1 kV $\pm$100 nA to $\pm$1.0 A.
The Model 504, dc Micromultimeter provides eighteen ranges from: $\pm$100 μV to $\pm$1 kV, $\pm$100 nA to $\pm$1.0 A, 10 ohms to 100 megohms.

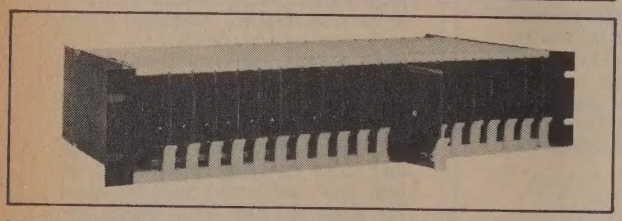
GAIN BRIDGE
Model 520

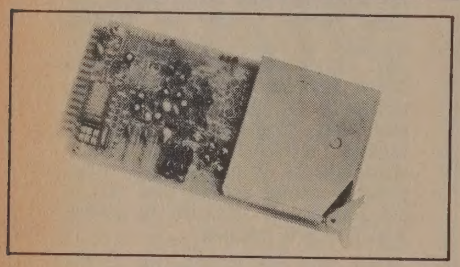
The Model 520 is a solid state Gain Bridge that provides an inexpensive means of calibrating all types of dc and charge amplifiers.
Ease of operation and calibration make for an extremely versatile instrument. The Dynamic gain null method is used to calibrate gains thus eliminating all dc zero errors. Accuracy to $\pm$0.01%.

a MULTITECH company
Dynamics Instrumentation
583 Monterey Pass Road, Monterey Park
California 91754 Telephone: (213) 283-7773

NEWPORT LABORATORIES, INC. ■ 630 East Young Street, Santa Ana, California 92705 ■ (714) 5







DC DATA AMPLIFIERS

series 60 & 70

- 10 amplifiers in 3½" panel height
- Up to 4 poles active filtering
- Switchable bandwidth
- Operate on 115V AC power
- Multiple, buffered outputs

FOR VERSATILITY IN A MULTI-PURPOSE INSTRUMENTATION SYSTEM, Series 70 amplifiers come with your selection of features and controls from those ally available: output multiplexer switch, input calibration switch, osc calibrator and scaling controls, oscillograph zero suppression, switche attenuator for gains down to 1/100, convenient selector switch for calib continuously-adjustable gain, up to two post-amplifiers. For the conven Government users, Series 60 and 70 amplifiers are available on a GSA

series 50 & 55

- Low cost, small size
- 20 amplifiers in 3½" panel height
- 2-pole active filter (fixed bandwidth)
- Operate on ±25V DC power

FOR PRECISE, DIFFERENTIAL AMPLIFICATION WITH SIMPLICITY, use low-cos 50/55 amplifiers. Series 50 and 55 consist of just the high-performance plifier section extracted from Series 60 and 70 respectively. They are su economical to obviate low-level multiplexing in many applications. To your low-level subsystem, options are available for input calibration switch output mutiplexing within the 50/55 package.

highlight specifications

Newport data amplifiers measure full-scale signals as small as 10 millivolts, even in the pres extreme common-mode voltages. Typical signal sources are transducers having unbalanced im on the order of 1 kilohm. Notice particularly the high input-impedance, high common-mode r low drift and excellent linearity which the amplifiers have for this purpose. Depending on mental conditions, errors are limited to the range from 0.1% to 0.01%.

For use with low-level multiplexers, consult the factory for amplifiers capable of changing precision gains and settling to 0.01% in 100 microseconds or less.

DIFFERENTIAL INPUT	Input source may be either floating or grounded.
Impedance	No bias current return path is required. 30 Megohms
COMMON MODE	
Common-Mode Rejection at Gain = 1000, DC to 60 Hz	
0Ω Source	130 dB
1 KΩ Unbalance Source	126 dB
Common-Mode Voltage Peak Rejected	Series 50 & 60 — ±10V Series 55 & 70 — ±300V
DC GAIN	
Range of Switch Settings	X1 to X1000
Calibration Accuracy of Switch Settings	Optionally 0.1% or 0.01%
Non-Linearity	±0.01% FS
Continuous Gain Adjustment (Screwdriver)	Increases gain as required to cover the range between switch steps
DYNAMIC RESPONSE	
Small-Signal Bandwidth, −3 dB Corner Frequency	10 Hz to 100 kHz
Slewing Rate	3.1 v/μs RTO 1 v/μs RTI
ZERO DRIFT — RTI	
Time	±2 μv ±1 nA per day
Temperature	±0.5 μv ±0.5 nA per °C
AC NOISE —	
1 KΩ Source Impedance	0.1 Hz to 100 Hz: 2 μv RTI peak 99.9% confidence 0.1 Hz to 100 kHz: 10 μv RTI rms
OUTPUT CHARACTERISTICS	
Voltage	±10V Full Scale
Rated Current	Optionally 10 ma or 100 ma
POWER REQUIREMENTS	Series 50 & 55 — ±25V DC Series 60 & 70 — Optionally 115V AC or ±25V DC

OPAMP LABS

172 S. Alta Vista Blvd., Los Angeles, Calif. 90036
Telephone: (213) 934-3566

AMPLIFIERS

—SEND FOR CATALOG—
We manufacture over 50 products

RE—50
rial &
Operational
ier
ations

	MODEL 360M Microphone Preamplifier	MODEL 416 D.C. Thru Audio Operational Power Amplifier	MODEL 435 Medium Voltage D.C. Operational Amplifier	MODEL 440 D.C. Thru Audio Operational Power Amplifier	MODEL S-50K Dual Channel 50 W RMS Power Amplifier Kit
WE REQUIREMENTS	±12v to ±24v @ 30ma or +12v to +50v @ 30ma or −12v to −50v @ 30ma	±12v to ±36v ±12 ma to ±30 ma plus load current	+12v to ±25v ±8 ma to ±15 ma plus load current	±12v to ±36v ±12ma to ±30ma plus load current	115v - 60 Cy. - 1 Phase @ 2.0 Amps
PERING TEMPERATURE ANGE Case)	−20°C to +85°C	−20° to +85°C	−55°C to +85°C	−55°C to +85°C	−20°C to +70°C
NPUT ance (Open Loop) Off Voltage (= 10K) Bia Current Co on Mode Voltage ge Eq alent Drift (= 10K) Eq alent Noise mon Mode ection Ratio	50 to 600 Ohms −125 DBM Has internal input isolation transformer	20K ±100 mv 0.2 μa Up to ±30v ±0.5 mv/°C 20 μv 80 DB	20K ±20 mv 0.5 μa Up to ±20v ±20 μv/°C 2 μv (−115 dbm) 80 DB	20K ±100mv 0.2 μa Up to ±30v ±0.5 mv/°C 20 μv 80 DB	Per Channel 100K 20 μv
RAN ER Vo e Gain Un — Gain Ba Width	20 cy to 25 kc (−3 DB)	650 2 mc	20,000 2 mc	650 2 mc	10 (20 DB) May be changed via Fead Back Resistor
UTP ance (open loop) Vo e Swing/Load Sle ng Rate Fu Power Ma num Current Pe Power RM Power Lo To Harmonic distor-ti at full power.	10 ohms +14 DBM with B± = ±24v	0.5 Ohm Up to ±20v/8 Ohms 5v/μsec D.C. to 25 kc 2 Amps 40w music 10w +40 dbm 0.5%	50 Ohms ±20v/50 Ohms 5v/μsec D.C. to 25 kc ±400 ma 2 w +33 dbm 0.05% @ +24 dbm	0.1 Ohm ±24v/4 Ohms 5v/μs D.C. to 25 kc 15 Amps 120 Watts 60 Watts < 0.5% any supply voltage & power level	0.1 Ohm ±28v/8 Ohms D.C. to 20 kc 10 Amps 100 Watts 50 Watts 0.5%
SIZE	1" Dia. x 1⅝" Seated Height	2" dia. x 3" Seated height	5-Pin Modified TO-3 Case Mates with 9-Pin Noval Tube Socket	4¾" x 5½" x 2⅝" Seated Height	7" H x 19" w Panel—Chassis Plug-in Ampl. and Power Supply
PRIC	$30.00/1 to 99 $27.00/100 to 999	$30.00/1 to 99 $25.00/100 to 999	$30.00/1-99 $25.00/100-999	$60.00 Model 440 $30.00 Model 440K Kit	Kit $155.00/ea. Wired $230.00/ea.

MODEL 4009
Medium Voltage
D.C. Operational Amplifier

POW REQUIREMENTS Po r Supply Voltage Po r Supply Current	±12v ±2.5 ma	±24v ±5 ma	±36v ±8 ma
OPE ING TEMPERATURE RA E (Case)	−55°C to +125°C	−55°C to +125°C	−55°C to +70°C
NPU Int Offset Voltage Int Bias Current Int Impedance Int Common Mode ltage Range Eq alent Input Drift Eq alent Input Noise	< 100 mv 0.2 μa 20 K ±10v < 0.5 mv/°C 10 μv	< 100 mv 0.2 μa 20K ±20v < 0.5 mv/°C 10 μv	< 100 mv 0.2 μa 20K ±30v < 0.5 mv/°C 10 μv
TRA ER Int nal Power ssipation Op Loop Voltage Gain Un y-Gain Bandwidth Co mon Mode Rejection tio	60 mw 500 30 mc 60 DB	240 mw 650 30 mc 80 DB	600 mw 800 30 mc 80 DB
UT Out Impedance Out Voltage ing/Load Out Capacitance ading Out Slewing Rate Ov load Recovery	2.5K ±10v/50K ± 8v/10K ± 3v/ 2K 0.1 μf 10v/μs 5 μs	2.5K ±20v/50K ±15v/10K ± 8v/ 2K 0.1 μf 10v/μs 5 μs	2.5K ±30v/50K ±20v/10K ±10v/ 2K 0.1 μf 10v/μs 5 μs
SIZ	Low Silhouette Modified TO-5 Can	Low Silhouette Modified TO-5 Can	Low Silhouette Modified TO-5 Can
PRI	$10.00/1 to 999 $8.00/1K to 10K		

MODEL 425
Medium Voltage
D.C. Operational Amplifier

POWER REQUIREMENTS Power Supply Voltage Power Supply Current (Standby)	±12v ±8 ma	±25v ±15 ma
OPERATING TEMPERATURE RANGE (Case)	−20°C to +85°C	−20°C to +85°C
INPUT Input Offset Voltage Input Bias Current Input Impedance (Open Loop) Input Common Mode Voltage Range Equivalent Input Drift (R_S = 10K) Equivalent Input Noise (R_S = 1K)	±20 mv 0.5 μa 20K ±10v ±20 μv/°C 2 μv (−115 dbm)	±20 mv 0.5 μa 20K ±20v ±20 μv/°C 2 μv (−115 dbm)
TRANSFER Internal Power Dissipation Open Loop Voltage Gain Unity-Gain Bandwidth Common Mode Rejection Ratio	200 mw 5,000 2 mc 80 DB	750 mw 20,000 2 mc 80 DB
OUTPUT Output Impedance (Open Loop) Output Voltage Swing/Load Output Slewing Rate Full Power Output	100 Ohms ±10v/1K ±8v/600 Ohms (+16 dbm) ±3v/50 Ohms 5v/μs D.C. to 25 kc	100 Ohms ±20v/1K ±18v/600 Ohms (+24 dbm) ±7v/50 Ohms 5v/μs D.C. to 25 kc
SIZE	1" Dia. x 1⅝" Seated Height	1" Dia. x 1⅝" Seated Height
PRICE	$25.00/1 to 99 $22.00/100 to 999	

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OPERATIONAL AMPLIFIERS AND FUNCTION MODU

FET-INPUT AMPLIFIERS

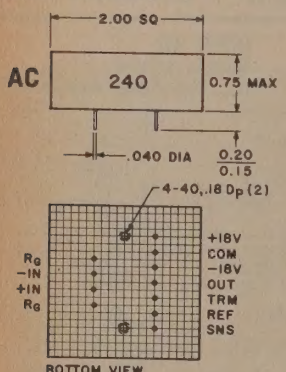
	FET INPUT AMPLIFIERS Model	RATED INPUT, min. ±V@±mA	OPEN LOOP GAIN @ dc, 10K Load, min. V/V	FREQUENCY RESPONSE (@ Unity Gain) MHz	kHz	@ Full Power Output, min. V/µs	Slew Rate, min. mV	INPUT VOLTAGE OFFSET Adjusted to zero with External Trimpot KΩ	Av. vs. Temp., max. (−25 to +85°C) µV/°C	Av. vs. Time µV/Day	Av. vs. Supply µV/%	INPUT CURRENT, max. pA	Avg. vs. Temp., max. (−25 to +85°C) Dbls every:	INPUT IMPEDANCE Differential Ohms	Common Mode Ohms	INPUT VOLTAGE RANGE (absolute max.) Differential ±V	COMMON MODE VOLTAGE, min. ±V	COMMON MODE REJECTION RATIO (CMRR) V/V	INPUT NOISE, rms (10 Hz to 10 kHz) µV	OUTPUT IMPEDANCE (Open Loop) Kohm	TEMPERATURE RANGE Operating °C	Storage °C	POWER SUPPLY REQUIREMENTS, Voltage ±V	Current (Quiescent) mA	Current (Full Load) mA	Cas
HYBRID	ZA801D1 (New) ZA801E1 (New) ZA801T1 (New)	10@7	10^5 @ 1.4K load	4	100	6	—	5	50	75	10	25	10°C	10^{11} ‖ 5 pF	10^{11} ‖ 5 pF	15	10	10,000	3	1	−25 to +85	−55 to +125	15	3	10	D E T
HYBRID	830	10@7	3×10^5	1.5	100	6	—	5	50	75	50	25	10°C	10^{11}	10^{11}	15	10	2,000	4	1	−25 to +85	−40 to +125	15	5	10	D
DISCRETE	ZA801M1 (New)	Same as ZA801D1, ZA801E1, and ZA801T1, except for package																								M
DISCRETE	ZA802M1 (New)	10@7	10^5 @ 1.4K load	2	100	6	—	5	50	75	10	15	10°C	10^{11} ‖ 5 pF	10^{11} ‖ 5 pF	15	10	100,000	3	1	−25 to +85	−55 to +125	15	3	9	M
DISCRETE	133	10@5	3×10^5	1.5	100	6	—	5	50	75	7	25	10°C	10^{11}	10^{11}	15	10	20,000	4	1	−25 to +85	−25 to +125	15	5	10	E1
DISCRETE	133-03	10@5	3×10^5	1.5	100	6	—	5	4 2(0-60°C)	15	7	25	10°C	10^{11}	10^{11}	15	10	20,000	4	1	−25 to +85	−25 to +125	15	5	9	E1
DISCRETE	133-04	10@5	3×10^5	1.5	100	6	—	5	10	25	7	25	10°C	10^{11}	10^{11}	15	10	20,000	4	1	−25 to +85	−25 to +125	15	5	9	E1
DISCRETE	134	10@4	5×10^4	1.3	100	6	—	2	50	—	—	100	10°C	10^{11}	10^{11}	15	7	1,000 @ ±5V	8	1000	−25 to +85	−25 to +125	15	3	7	E1
DISCRETE	134D	10@4	5×10^4	1.3	100	6	—	2	100	—	—	100	10°C	10^{11}	10^{11}	15	7	1,000 @ ±5V	8	1000	−25 to +85	−25 to +125	15	3	7	E1
DISCRETE	135	10@20	2×10^4	5	1.5 MHz	100	—	2	20	40	30	100	10°C	10^{11}	10^{11}	15	10	300,000	15	500	−25 to +85	−25 to +125	15	18	38	P2
DISCRETE	136	100@20	10^5	1	700	25	0.5	5	25	50	50	100	10°C	10^{11}	10^{11}	120	100	10^5	1	1000	−25 to +85	−25 to +125	125	8	30	K2 (D st Al um)
DISCRETE	240*	10@4	**1	1	80	5	—	50	50	—	—	100	10°C	10^{11}	10^{11}	—	10	10^4	***2	—	−25 to +85	−25 to +125	18	12	—	AC

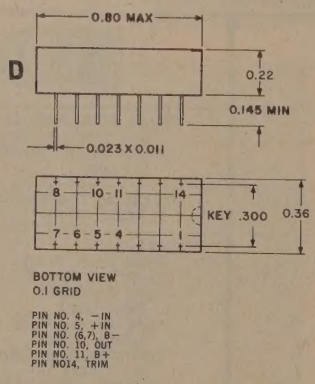
* Instrumentation Amplifier.
** Gain Stability (−25 to +85°C) (1 ≤ Av ≤ 100) min. = 0.5%
(100 ≤ Av ≤ 1000) min. = 1%

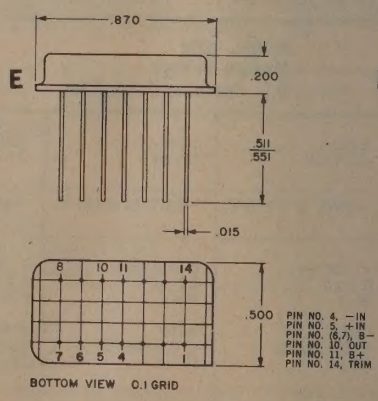
*** Noise (Referred to Output) a. (100 Hz) = 200 uV + Av (10 uV), RMS
b. (10 kHz) = 500 uV + Av (25 uV), RMS

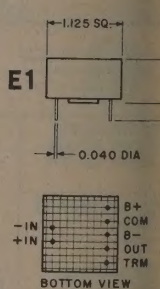
Specifications typical @ 25°C unless otherw

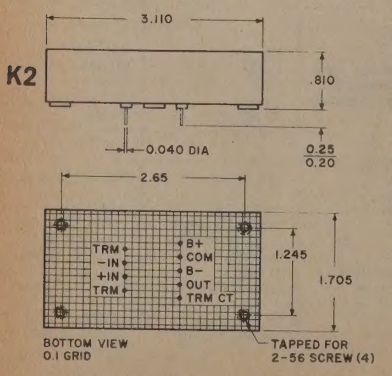
CASE STYLES

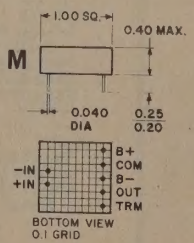


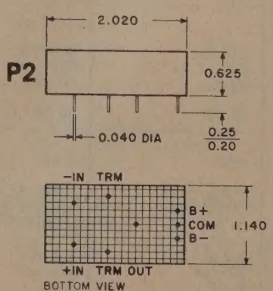


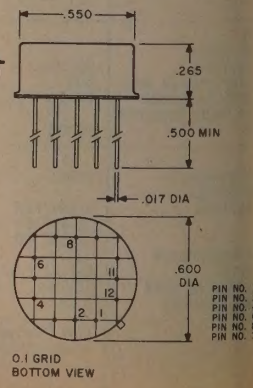










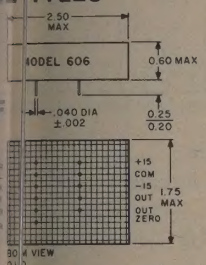


ANALOG MULTIPLIERS, MODULAR

Models	SCALE FACTOR (E OUT)	INPUT VOLTAGE RANGE (Full Scale)	RATED OUTPUT, min.	DC ERROR (@ 10V FULL SCALE) with external trim, max	without external trim, max	FEQUENCY RESPONSE Full Output, min	Small Signal (−3db min)	Slew Rate, min.	INPUT IMPEDANCE X Input	Y Input	OUTPUT IMPEDANCE (DC) max	DRIFT OUTPUT (X = Y = 0)	GAIN ERROR	NOISE (X = Y = 0) DC to 500 kHz	POWER SUPPLY Voltage	Current, Quiescent	TEMPERATURE Operating & Storage	CASE STYLE (Epoxy, Encapsulated)
		±V	±V	mA	mV	mV	kHz	kHz	V/μs	Ohms	Ohms	Ohms	mV/°C	%/°C	mV, rms	±V	m A	°C	
605	XY/10	X=Y= ±10	10	4	70	100	100	500	6	50K	100K	1	2	0.03 (3mV)	2	15 (±0.1%) tracking	12	−25 to +85	AK
606 (New)	XY 10	X=Y= ±10	10	4	25	50	100	500	6	6K‖ 10 pF	20K‖ 10 pF	1	1	0.03 (3mV)	2	15 (±1%)	20	−25 to +85	AF

Specifications typical @ 25°C and B+ @ ±15V unless noted otherwise.

CASE STYLES



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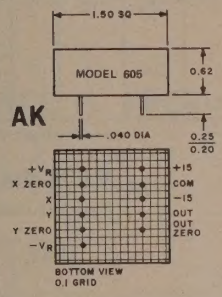

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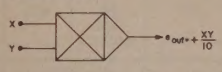
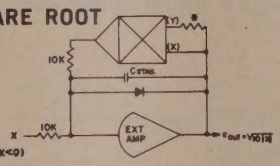
MULTIPLIER APPLICATIONS

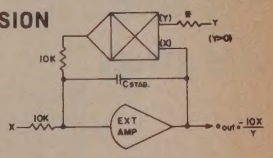
MULTIPLICATION



SQUARE ROOT



DIVISION



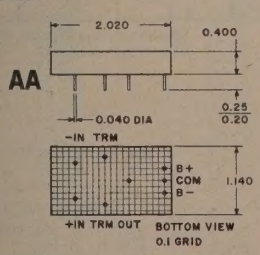
BIPOLAR INPUT AMPLIFIERS

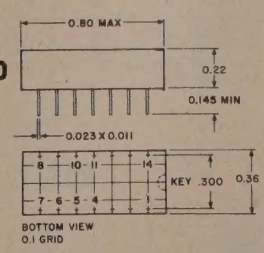
Models	RATED OUTPUT, min.	OPEN LOOP GAIN @ D.C. 10K Load, min.	FREQUENCY RESPONSE @ Unity Gain	@ Full Power Output, min.	Slew Rate, min.	INPUT VOLTAGE OFFSET Adjustable to Zero with External Trimpot	Avg. vs. Temp., max. (−25 to 85°C)	Avg. vs. Time	Avg. vs. Supply	INPUT CURRENT Initial max.	Avg. vs. Temp., max. (−25 to 85°C)	Avg. vs. Supply	Initial Input Difference Current	INPUT IMPEDANCE Differential @ DC	Differential @ AC	Common Mode	INPUT VOLTAGE RANGE (absolute max., differential)	COMMON MODE VOLTAGE, min.	COMMON MODE REJECTION RATIO	INPUT NOISE, rms (10 Hz to 10 kHz)	OUTPUT IMPEDANCE (Open Loop)	TEMPERATURE RANGE Operating	Storage	POWER SUPPLY REQUIREMENTS Voltage	Current — Quiescent	Current — Full Load	CASE STYLE (Epoxy, Encapsulated)
	±V@mA	V/V	MHz	kHz	V/μs	Kohm	μV/°C	μV/Day	μV/%	nA	nA/°C	nA/%	nA	Mohm	Kohm	Mohm	±V	±V		μV	Ohms	°C	°C	±V	mA	mA	
820	10@5	5 x 10⁵	1.5	100	6	50	25	40	10	50	0.6	0.25	5	1	10	500	15	10	20,000	2	1000	−25 to +85	−40 to +125	15	5	10	D (DIP)
ZA101 (New)	10@5	5 x 10⁴	4	100	6	50	15	40	10	50	0.5	1	5	1	1M‖ 5 pF	10⁹ ‖5pF	15	10	50,000	2	1000	−25 to +85	−55 to +125	15	5	10	D (DIP)
ZEL-01 ZEL-02 (New) ZEL-03 (New) ZEL-04 (New)	10@5	5 x 10⁵	1.5	100	6	50 *	20	40	10	50	0.6	0.25	5	1	10	500	15	10	20,000	2	1000	−25 to +85	−55 to +125	15	5	10	W E1 E1 E1 E1
ZEL-C ZEL	10@20	5 x 10⁵	1.5	70	6	50	20	40	10	50	0.6	0.25	5	1	10	500	15	10	20,000	2	200	−25 to +85	−55 to +125	15	5	25	W E1
ZEL	20@4	5 x 10⁵	1.5	50	6	50	20	40	10	50	0.6	0.25	5	1	10	500	15	18	20,000	2	1000	−25 to +85	−55 to +125	24	5	10	E1
ZEL-C	20@20	5 x 10⁵	1	50	6	50	20	40	10	5	0.5	0.25	5	1	10	500	15	18	20,000	2	200	−25 to +85	−55 to +125	24	5	25	AA
170	5@1, 4@5	10⁵	300 kHz	5	0.3	50	20	40	10	50	0.6	0.25	5	1	10	500	—	1.5	5,000	2	1000	−25 to +85	−55 to +125	6	0.12	5	E1

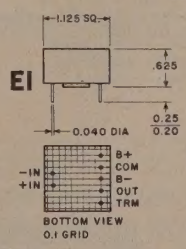
Models 02, -1/03, -1/04, use 10 Kohm.

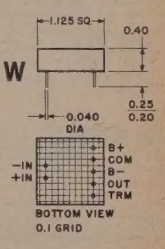
Specifications typical @ 25°C unless otherwise noted.

CASE STYLE









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A Subsidiary of REDCOR CORP. • 1000 CHALOMAR ROAD, CONCORD, CALIFORNIA 94520 • TEL: 415-686-6660, E

OPERATIONAL AMPLIFIERS AND FUNCTION MODU

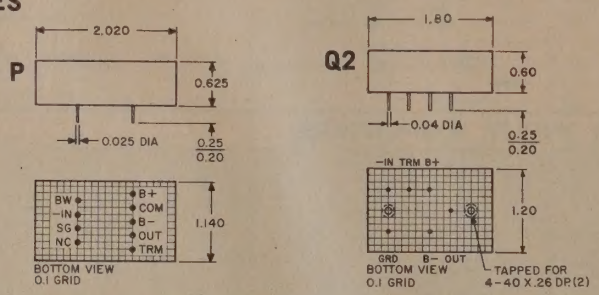
INVERTING AMPLIFIERS

INVERTING AMPLIFIERS	RATED OUTPUT, min.	OPEN LOOP GAIN @ dc, 10K load, min.	FREQUENCY RESPONSE @ Unity Gain	@ Full Power Output, min.	Slew Rate, min.	INPUT VOLTAGE OFFSET (adj. to zero w/ext. trimpot)	Avg. vs. Temp., max. (−25 to 85°C)	Av. vs. Time	Avg. vs. Supply	INPUT BIAS CURRENT Initial Bias, max. (at 25°C, ea. input)	Avg. vs. Temp., max. (−25 to 85°C)	INPUT IMPEDANCE @ d-c	@ a-c	INPUT NOISE, rms (10 Hz to 10 KHz)	OUTPUT IMPEDANCE, (open loop)	TEMPERATURE RANGE (operating)	POWER SUPPLY REQUIREMENTS Voltage	Current (Qui
Model	±V@mA	V/V	MHz	MHz	V/μs	Kohm	μV/°C	μV/Day	μV/%	nA	nA/°C	Kohm	Kohm	μV	Ohm	°C	±V	mA
147	10 @ 20	10^5	100 (See Note 1)	4	250	50	25	50	50	25	1	200	10	7	200	−55 to +85	15	10
147A	10 @ 30	10^5	20	2 (See Note 2)	300	50	25	50	50	25	1	200	5	7	200	−55 to +85	15	15

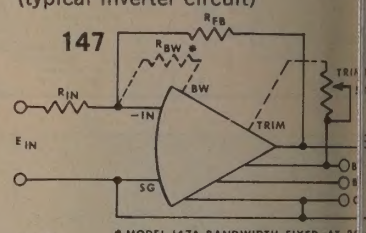
NOTE: (1) Equivalent GBW Product (adjustable between 10 MHz and 100 MHz w/ext. resistor).
(2) Full frequency output is 7 MHz for 0 to 20 mA load.

Specifications typical @ 25°C unless othewis

CASE STYLES



BLOCK DIAGRAM
(typical inverter circuit)



NOTE:
Trimpot and external resistors not supp d.

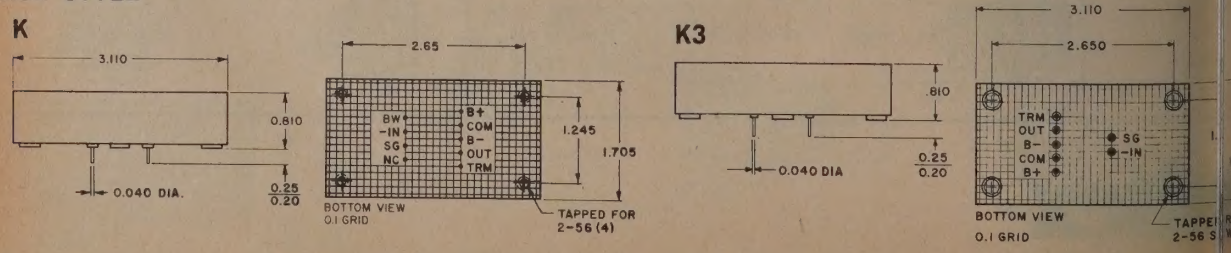
CHOPPER-STABILIZED AMPLIFIERS

CHOPPER-STABILIZED AMPLIFIERS	RATED OUTPUT, min.	OPEN LOOP GAIN @ DC, 10K Load, min.	FREQUENCY RESPONSE @ Unity Gain	@ Full Power Output, min.	SLEW RATE, min.	INPUT VOLTAGE OFFSET Initial Offset, max. (See note 5)	Avg. vs. Temp., max. (−25 to 85°C)	Avg. vs. Time	Avg. vs. Supply	INPUT BIAS CURRENT Initial Bias, max.	Avg. vs. Temp., max. (−55 to 85°C) (See Note 3)	INPUT IMPEDANCE	OUTPUT IMPEDANCE	INPUT NOISE (To 10 KHz)	INPUT NOISE, rms (10 Hz to 10 KHz)	TEMPERATURE RANGE Operating	POWER SUPPLY REQUIREMENTS Voltage	Current (Quiescent)
Model	±V @ mA	V/V	MHz	MHz	V/μs	μV	μV/°C	μV/Day	μV/%	pA	pA/°C	Kohm	Ohms	μv, pK	μV	°C	±V	mA
145 145L (See Note 4) 145-08 (Low Drift)	10 @ 25	10^8	100 (Note 1)	4	250	25	0.5 (Notes 2, 3)	1	0.1	100	0.5	300	200	10	20	−55 to +85	15	12
148 148C	10 @ 5 10 @ 25	10^8	1.5	100 KHz	6	15	0.25	1	0.05	50	0.5	300	1000 200	5	2.5	−25 to +85	15	10

NOTES:
1. Adjustable between 10 and 100 MHz.
2. Model 145-08 has max. drift of 0.25 μV/°C.
3. Voltage and bias current drifts double that shown between −55°C and −25°C.
4. Output of Model 145L is limited to ±10.5V (other output limiting levels available).
5. Offset adjustable to zero with 100 Kohm potentiometer.

Specifications typical @ 25°C unles otherwise noted.

CASE STYLE

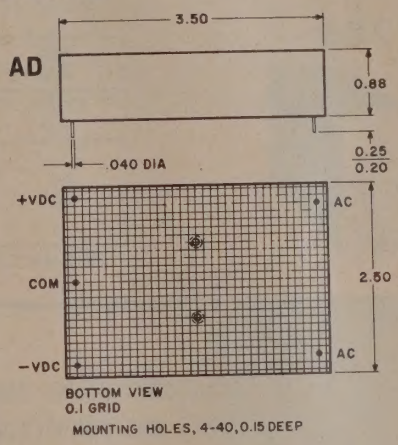


MODULAR POWER SUPPLIES

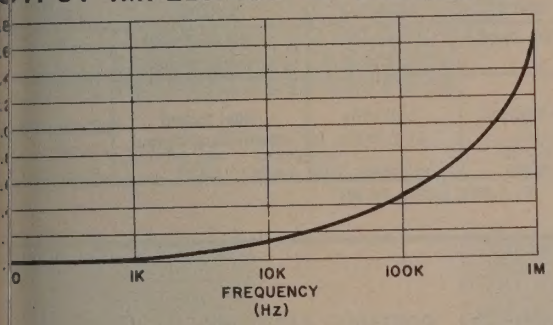
LIES	OUTPUT VOLTAGE	OUTPUT CURRENT	INPUT VOLTAGE (50 to 400 Hz)	REGULATION MAX. Line (105-125 Vac)	Load (0-100%)	RIPPLE & NOISE (Typ.)	TEMPERATURE COEFFICIENT	DRIFT, WARM-UP	INPUT ISOLATION	OUTPUT IMPEDANCE	TEMPERATURE Operating	Storage	CASE STYLE (Epoxy, Encapsulated)
	±V	mA	Vac	%	%	mV, (rms)	%/°C	mV	Mohms	@ 1 mHz	°C	°C	
	±15	25	105-125	0.2 typ	0.2 typ	1	0.02	25	50, min 200, typ	—	−25 to +71	−25 to +85	AD
	±12 ±12 ±15 ±15 ±18	60 100 50 100 50	105-125	0.02	0.05	0.5	0.01	37	50, min 200, typ	2 ohms	−25 to +71	−25 to +85	AD

ifications typical @ +25°C unless noted otherwise.

CASE STYLE



OUTPUT IMPEDANCE vs. FREQUENCY



RICES:
Check with us or with your nearest ZELTEX Representative for latest pricing and delivery information. See our ZELTEX Representative Listing.

MODEL No.	PRICES (1-9)	PRICES (10-24)	MATING CONNECTOR (Model Number)
FET — INPUT AMPLIFIERS			
13	$ 27.00	$ 26.00	MC-19A
13)3	65.00	60.00	MC-19A
13)4	51.00	48.00	MC-19A
13	16.00	14.50	MC-19A
13)	15.00	13.50	MC-19A
13	79.00	75.00	MC-20
13	125.00	115.00	MC-14
24	65.00	60.00	MC-26
ZM)1D1	30.00	28.00	MC-24
ZM)1E1	45.00	42.00	MC-24
ZM)1M1	14.75	14.00	MC-19A
ZM)1T1	35.00	33.00	—
ZM)2M1	26.00	25.00	MC-19A
83	34.00	31.00	MC-24
BIPOLAR — INPUT AMPLIFIERS			
Z -1	$ 11.00	$ 10.50	MC-19
Z -1A	17.00	16.00	MC-19
Z -1AC	29.00	26.00	MC-19
Z -1C	24.00	22.00	MC-19
Z -1E	16.00	15.00	MC-19
Z -1EC	39.00	38.00	MC-20
Z -1/02	35.00	32.00	MC-19
Z -1/03	19.00	18.00	MC-19
Z -1/04	16.00	15.00	MC-19
Z 01D1	20.00	19.00	MC-24
1	20.00	18.00	MC-19
8	26.00	24.00	MC-24
ANALOG MULTIPLIERS			
Z605	$ 43.00	$ 41.00	MC-25
Z606	129.00	122.00	MC-25

With the new models we are constantly introducing, we may have a new product which will fit your application. Call us today — collect of course! Applications Department: (415) 686-6660, Ext. 34.

MODEL No.	PRICES (1-9)	PRICES (10-24)	MATING CONNECTOR (Model Number)
CHOPPER-STABILIZED AMPLIFIERS			
145	$130.00	$125.00	MC-14
145-08	140.00	135.00	MC-14
145L	150.00	140.00	MC-14
148	64.00	58.00	MC-14
148C	77.00	73.00	MC-14
INVERTING AMPLIFIERS			
147	$ 59.00	$ 54.00	MC-17
147A	75.00	70.00	MC-18
MODULAR POWER SUPPLIES			
ZM1260	$ 46.00	$ 43.00	MC-27
ZM12100	59.00	53.00	MC-27
ZM1525	23.50	22.00	MC-27
ZM1550	39.00	37.00	MC-27
ZM15100	49.00	47.00	MC-27
ZM1850	59.00	53.00	MC-27
MATING CONNECTORS			
MC-11*	$ 2.00	MC-20	$ 4.00
MC-14	4.00	MC-24	1.00
MC-17	3.50	MC-26	5.00
MC-18	3.50	MC-27	5.00
MC-19	2.00		
MC-19A**	3.00		

*Used with -1, -2 pc cards (for pre-mounted amplifiers)
**Low profile connector (0.125″ high)

PC CARD-MOUNTED AMPLIFIERS

ZELTEX Amplifiers can be ordered pre-mounted on a small pc card. Contact nearest ZELTEX Sales Representative or factory for complete details.

All ices are subject to change without notice. Quantity prices are available upon request from the factory

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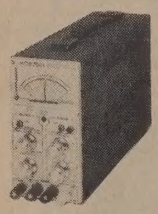
SCIENTIFIC INCORPORATED
805 East Cerritos Ave., Anaheim, Calif. 92805
Tel. (714) 776-6400

AMPLIFIERS

- 0.01% Gain Accuracies and Linearities
- Low Noise to 0.2 Microvolts RTI
- Low Drifts to 0.1 Microvolts/°C
- Common Mode Rejections Greater Than 150 DB at DC
- Floating Differential
- Output Impedance Less Than 1 0
- Temperature Range from 0°C to

8300 XWB

X-MOD 706



SPECIFICATIONS

Model	Description	Gain	Bandwidth (−3 DB)	Lin	COMMON Reject
706	DC Amplifier/ Null Meter	10-10^7	Selectable 10-1-0.1 Hz	±0.1%	140 db
8300 XWB	Floating Differential Amplifier	10-position 1, 2, 5 seq. K = 1 to 1000	100 kHz	±0.005% ±3uv RTI	120 db
8300 XWBRC	Programmable Gain Amplifier				

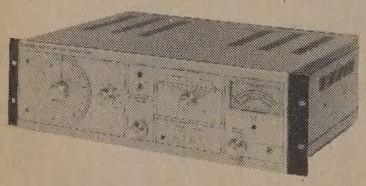
RMS Noise	Drift	Input Z	Output Capability	Options	Size**
RTI (P-P) .3uv	0.1uv/°C	200K ohms	±10 volts at ±10ma	100 Hz Bandwidth Gain Switch Readout	S
7uv RTI	0.2uv/°C	100 megohms	±10 volts at ±100ma	Dual Output	B
				Multiplexed Output	B

** (S) Single 6.70H, 3.45W, 12.22L. (B) 8.75H, 2.12W, 20.38L.

ACCESSORY ITEMS SUCH AS RACK ADAPTERS, PORTABLE CARRYING CASES AND CONNECTOR ASSEMBLIES ARE AVAILABLE FOR ALL MODELS.

SINEWAVE SOURCE

X-MOD 134A



SINEWAVE SOURCE

- Frequency Selectable in Decade Steps wit Ve Control
- Calibrated Switch-Selectable Output Volta s Vernier Control
- Low Noise and Distortion
- Output Monitor

X-Mod	Description	Range	Waveform	Output Volt	Distortion	Temp.
134A	Sinewave Source	10 Hz-10 MHz	Sine	3.16/50, 600 ohm	Less than 1%	+4°C to +50°C

** (A) 5.25H, 19.00W, 22.50L.

PRESTON SCIENTIFIC also manufactures Digital Voltmeters, Panel Meters and Multimeters. See EEM Section 2900 Page 769 . . . Analo Converters and Multiplexers. See EEM Section 2000 Page 591. For the location of your nearest PRESTON representative refer to the Yello

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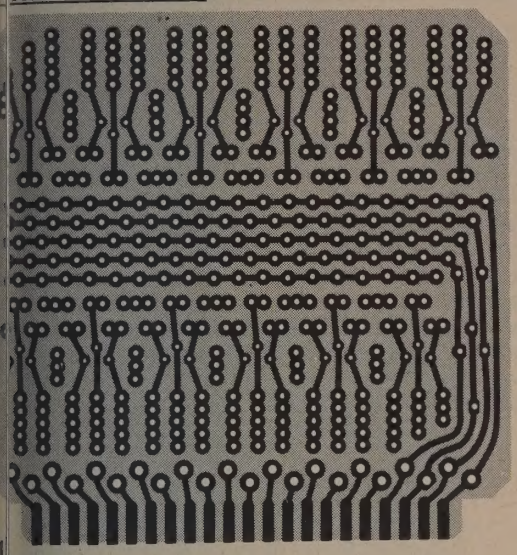
READBOARDS



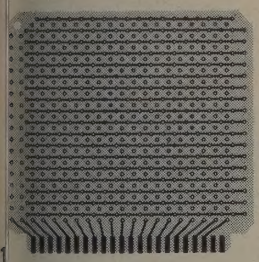
The following pages contain photos and specifications for our line of breadboard printed circuit boards. All boards are made on 2 ounce copper clad glass epoxy FR4 (except as noted), are finished with .00002 gold over .0002 nickel, and are available from stock. When the part number contains the letters DE-1, the board conforms in size to the drawing on page 1352.

TRANSISTOR BREADBOARD

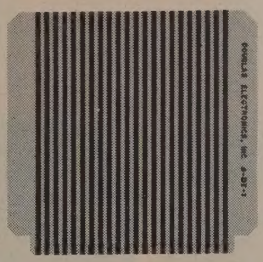
A low cost breadboard for holding up to 12 transistors and plenty of associated components. Eyelets at the connector fingers give the added reliability of parallel redundant contacts through the 22 pin edge connector. This Breadboard is available on either FR-3 or FR-4 material.

and discrete
.....FR-3
.....22 pin
quantity) $3.50

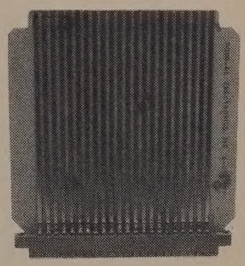
Material FR-4
Connector .....22 pin
Price (any quantity) $4.20



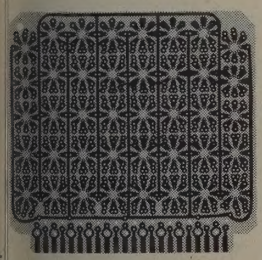
ode Matrix
.....44 pin
quantity) $10.00



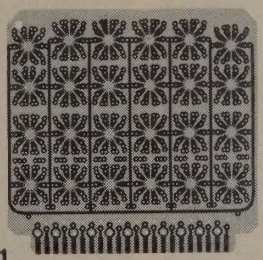
6-DE-1
Board extender
Connector .....44 pin
Price (any quantity) $3.50



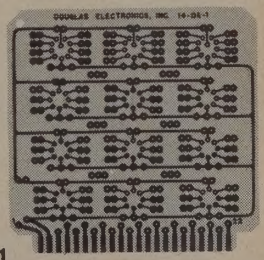
6-DE-1-44C
Board extender with socket
Connector .....44 pin
Price (any quantity) $7.85



5
r .....44 pin
$10.00 50-99....$9.50 100 & up....$9.00

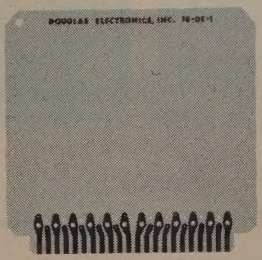


13-DE-1
10 pin TO-5
Connector .....44 pin
Price
1-49....$10.00 50-99....$9.50 100 & up....$9.00

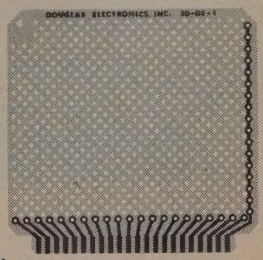


14-DE-1
Low cost TO-5
Connector .....22 pin
Price (any quantity) $3.50

r .....44 pin
y quantity) $6.50



18-DE-1
Blank board — connector only
Connector .....44 pin
Price (any quantity) $3.50



20-DE-1
Vector board
Connector .....44 pin
Price
1-49....$4.95 50-99....$4.45 100 & up....$4.00

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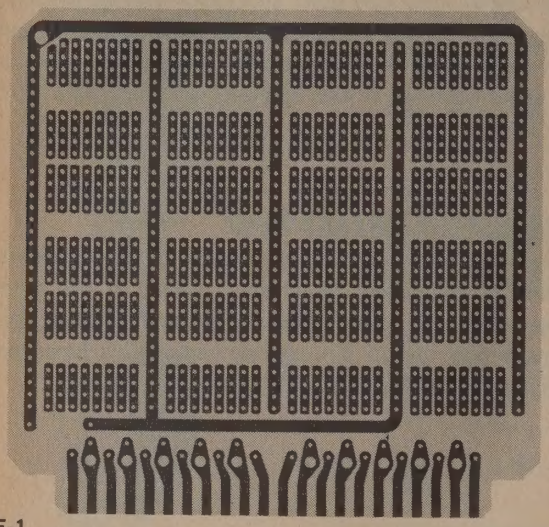
DUAL IN-LINE BREADBOARDS



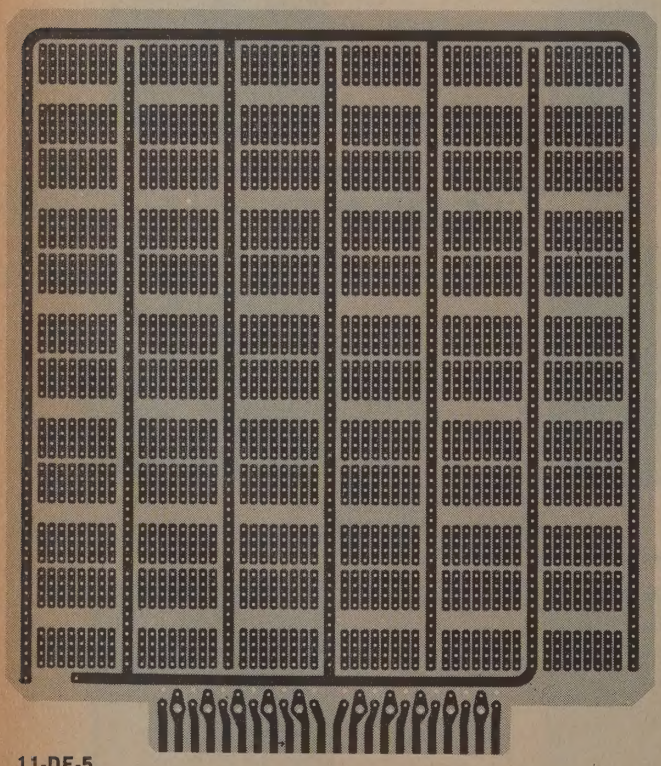
The breadboards shown on these two pages are design[illegible] to hold the popular dual in-line I.C. packages; either 14 [illegible] 16 pin, and in two board types, 24 pin. The basic board pro[illegible]es etched pads with holes for mounting the I.C. package e[illegible]er directly or in a socket. In addition, each pad contains [illegible]di-tional holes for interwiring and tying in the power s[illegible]ly leads, which have been left isolated to allow for maxi[illegible]m versatility in using DIP's of various manufacture and pin [illegible]n-figuration. Except where noted otherwise, all boards are [illegible]de of glass epoxy material, plated with gold over nickel, d[illegible]ed No. 62, and have 44 contact connector tongues.

11-DE-1

12 & 14 pin Dual-in-line board ..... 12 packages
Connector ..... 44 pin
Price
1-49.....$6.50 50-99.....$6.25 100 & up.....$6.00

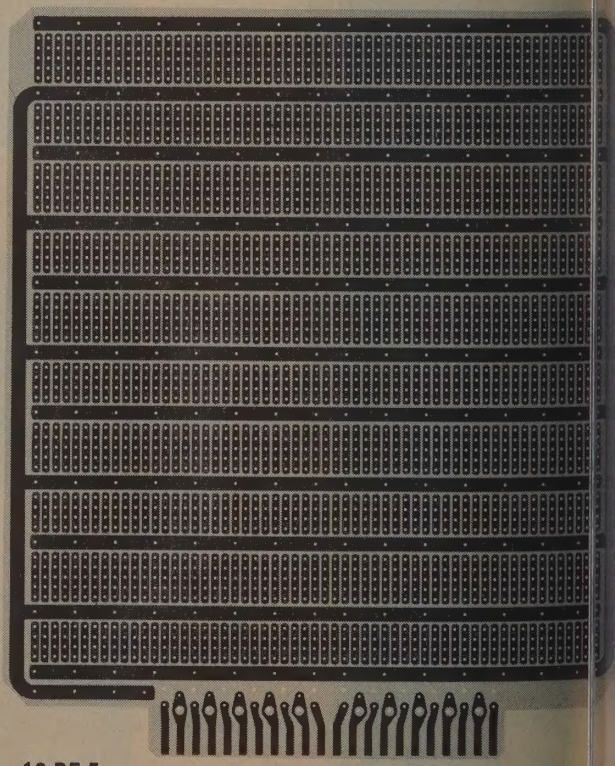
Note: The 11-DE-1 is also available in a 4.5" board w[illegible]h. Part number is 11-DE-1-4.5. Price is $7.0[illegible]a.

All other breadboards can also be made on special size c[illegible]s. Please contact our sales office for price and delivery info[illegible]a-tion.



11-DE-5

12 & 14 pin Dual-in-line board ..... 36 packages
Connector ..... 44 pin
Price
1-49.....$15.00 50-99.....$14.00 100 & up.....$13.00



12-DE-5

12, 14 & 24 pin Dual-in-line breadboard
Connector ..... 4[illegible] in
Price
1-49.....$17.00 50-99.....$16.00 100 & up.....$[illegible]10

Board dimensions for DE-5 breadboards:
width — 6.5" overall length — 7[illegible]

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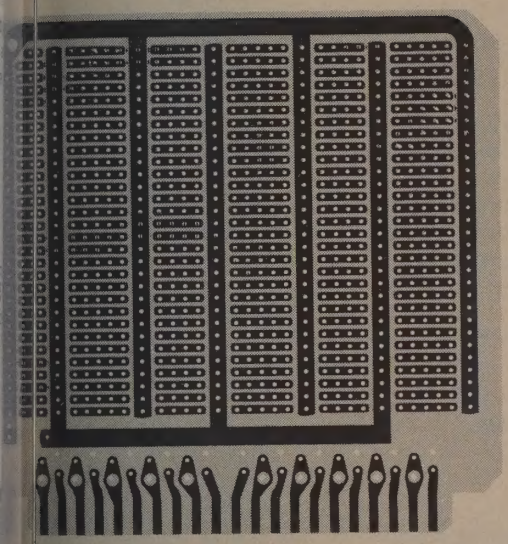
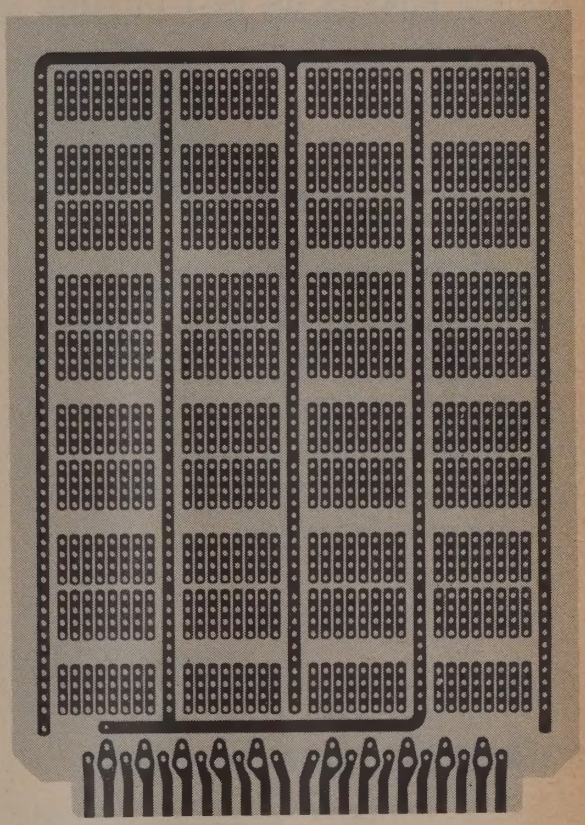
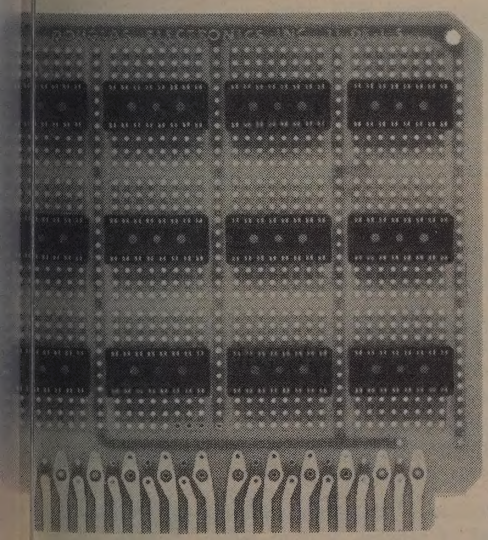
IA IN-LINE BREADBOARDS

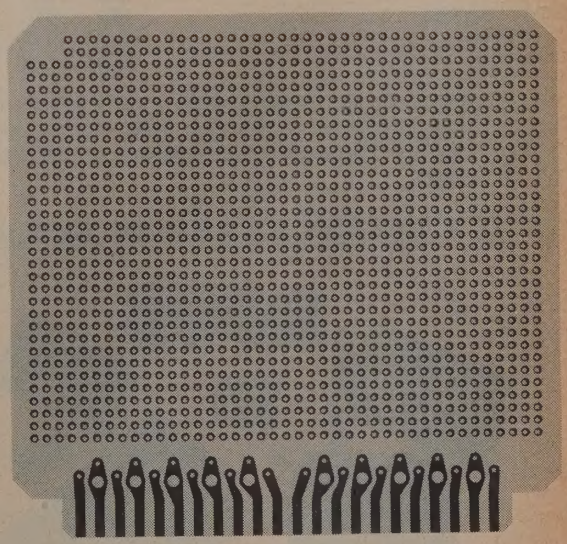




2-DE
14 24 pin Dual-in-line board
nnector ..... 44 pin
ice
1-49 ..... $7.00 50-99 ..... $6.50 100 & up $6.00

11-DE-6
12 & 14 pin Dual-in-line ..... 20 packages
Board size ..... 4.5 x 6.5
Connector ..... 44 pin
Price (any quantity) $9.75





1-DE-S
& 1 pin Dual-in-line with sockets
nnector ..... 44 pin
ice (any quantity) $19.50

22-DE-1
General purpose, .038 dia. plated thru holes on .100 grid, pads and connector on both sides.
Connector ..... 44 pin
Price (any quantity) $9.00

DOUGLAS ELECTRONICS, INC.

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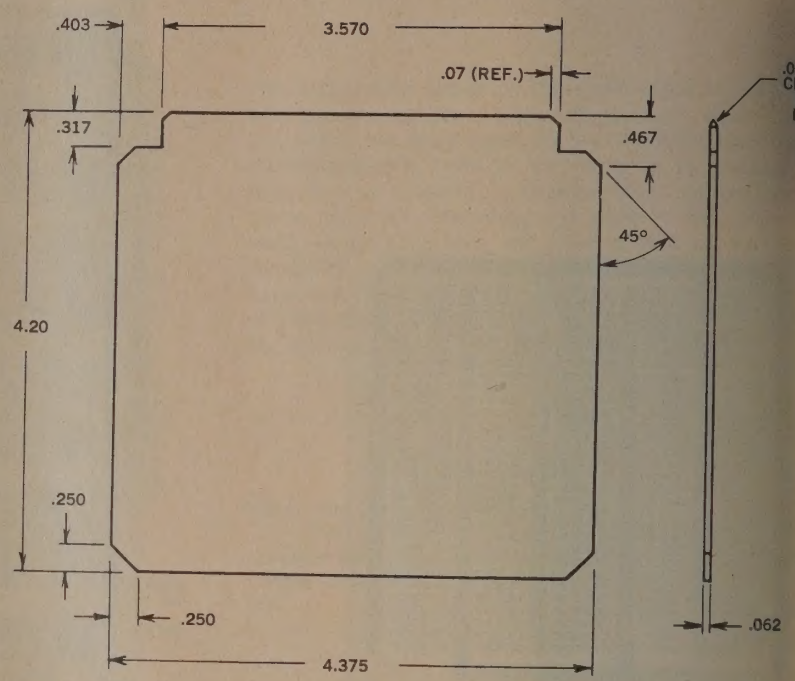
CUSTOM BOARDS ON DE-1 OUTLINE SHAPE

Douglas Electronics, Inc., has developed a standard printed circuit board outline shape to help you decrease your circuit board costs. Through the economies of this standardization we are able to offer firm standard prices provided basic design rules are followed. These prices are much lower than those offered by other manufacturers who must produce boards to custom outline shapes. All DE-1 board are blanked out on a punch press, thus assuring consistent dimensional stability, as well as fast economical production. The DE-1 boards also fit our standard line of hardware.



STANDARD DE-1 PRICING SCHEDULE

	.00002 gold over .0002 nickel 1-99	100-300	Plain copper 1-99	100-300
1 side FR-3	2.75	2.50	2.50	2.25
2 side FR-3	3.25	3.00	2.75	2.50
1 side FR-4	3.25	3.00	3.00	2.75
2 side FR-4	3.75	3.50	3.25	3.00
Plate thru FR-4	5.60	4.75		

Set-up charges	one side	two side	plate thru
1st time	25.00	35.00	35.00
Repeat	15.00	25.00	30.00

Normal shipping date on all custom circuit boards is two weeks following receipt of purchase order and artwork. For faster delivery, a 25 percent price increase on the total job will be charged.

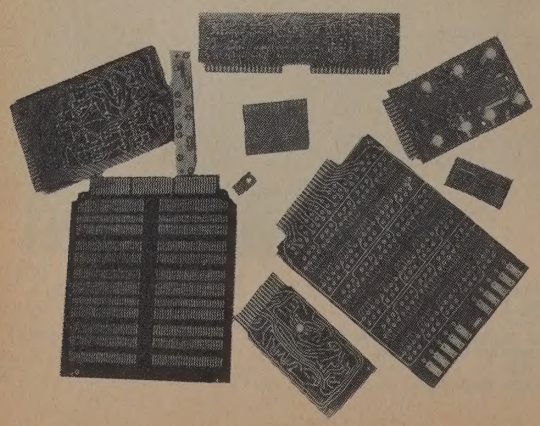
When ordering boards from this pricing schedule, be sur[illegible] to include all necessary information to manufacture them [illegible]terial, finish, hole sizes, etc). The above prices will ap[illegible], subject to the following conditions:

1. Your artwork meets with our approval.
2. Hole count not more than 300 holes.
3. No more than three hole sizes.
4. No more than thirty eyelets to be installed.

ARTWORK MASTERS

To make layout of DE-1 size boards easier, see page 1354 [illegible] our assortment of DE-1 artwork masters.

CUSTOM BOARDS ON CUSTOM OUTLINE SHAPES



Douglas Electronics, Inc., has for many years b[illegible] manufacturing printed circuit boards with cus[illegible] outline shapes. Over the years we have acqu[illegible] equipment and experience which allows us to m[illegible]ufacture such boards in an efficient and econom[illegible] manner, and therefore allows us to pass our sav[illegible] on to our customers.

Because of the many different requirements in [illegible] area of custom printed circuit boards, we are [illegible] able to offer a standard price table, but we in[illegible] you to send us your requirements for a quota[illegible].

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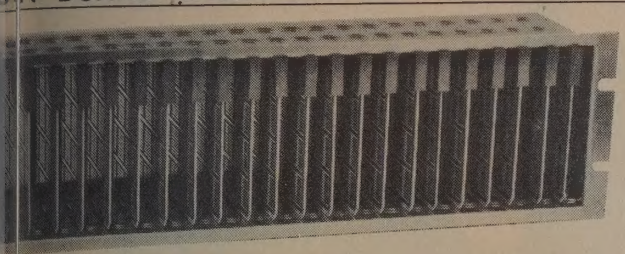
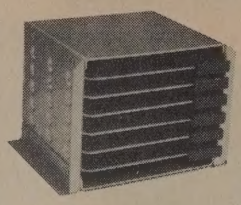
CIRCUIT BOARD RACKS FOR DE-1 OUTLINE SHAPE



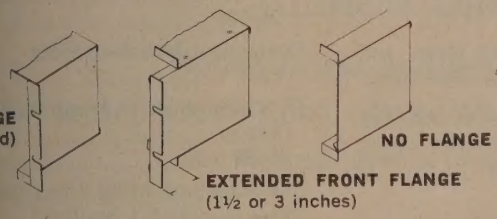


unique card racks have been designed exclusively for our DE-1 outline shape printed circuit boards. The racks are made of clear anodized aluminum and are designed so that the board is held in position by rows of dimples in the rack sides. Connectors are rigidly mounted at the back of the rack and the guiding dimples designed so as to allow for alignment with connectors, yet still hold the cards in position. The result is a sturdy one piece unit which has no plastic parts and which requires no assembly.

Several variations are available to fill various customer requirements. Card center to center distances of ¾" and ½" are available and the racks are offered in a choice of three different sizes. The 19" rack is for standard rack mounting, the 19" and 11½" lengths are designed to fit our cases shown on page 10 and the 4⅝" mini rack is for chassis mounting. The height of rack bodies is 4½", the width across the flanges is 5⅛". For the 19" and 11½" racks, four different flange types are offered for various mounting situations. The R-6 is furnished only as shown.

Order specify rack number and type of mounting flange desired. If no flange is specified, we will furnish the standard front flange. Prices are for racks only and do not include the connectors. If desired, will install the connectors shown below, charging only for the price of the connectors only.

OPTICIAL MOUNTING BRACKETS



STANDARD CARD RACKS

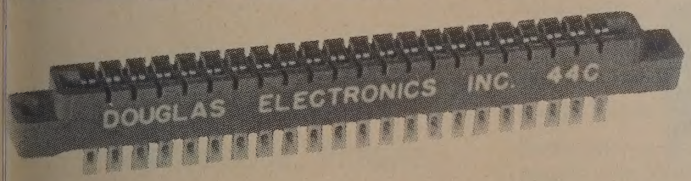
Part Number	R-23	R-34	R-13	R-19	R-6
Nominal length (inches)	19	19	11½	11½	4⅝ (Height)
Center to Center (inches	¾	½	¾	½	½
Number of Cards	23	34	13	19	6

PRICES

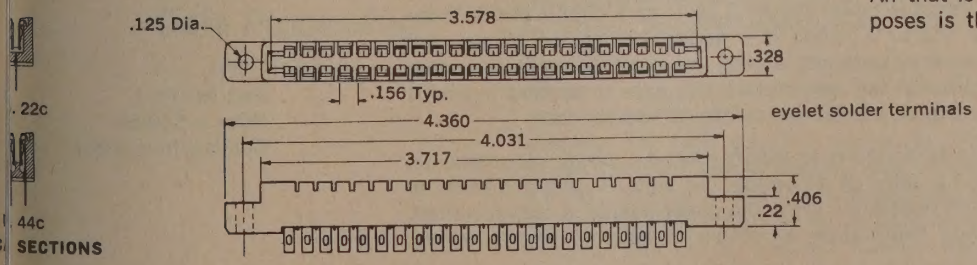
	R-6	All others
1-9	12.20	24.45
10-24		22.95
25-49		19.45

50 & up — request quote

PRINTED CIRCUIT CONNECTORS



For the convenience of one source purchasing, the connectors as described on this page are carried in stock at all times. All of our breadboards and custom boards are made to fit them and they can be installed in the card racks shown on this page. All that is required for ordering purposes is the part number.



CONNECTOR PRICES

	1-49	50-99	100-249	250 & up
22	2.82	2.41	2.08	1.75
44	2.86	2.44	2.11	1.78

CONNECTOR SPECIFICATIONS

Material	Glass-filled alkyd
Color	Blue
Size	22 positions: 22 and 44 pins
Contacts	0.156; centers — Copper alloy, flashed .000010" minimum gold

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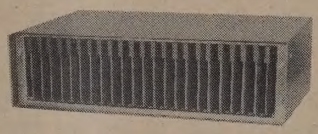
CARD RACK & INSTRUMENT CASES

Front View



Rear View

Our card rack and instrument cases have been designed to hold the card racks as shown on the previous page, in addition to associated components and a panel. They are very useful for making one of a kind instruments and similar projects which require packaging in attractive enclosures.

In use, the card rack is mounted at the rear so cards can be inserted and removed when the rear panel is taken off. An inner frame mounts both the front panel and card rack as well as an optional component mounting plate (for transformers, etc.), so the unit is held together even when the outer case is removed.

Two widths are made to accommodate both the 11½" and 19" card racks, and offering three choices of clearance between the front panel and card rack. (See table).

Material is .063 aluminum and we offer as standard both blue and clear anodized finishes. For special colors, contact our Sales Department and allow two weeks delivery. Cases are normally carried in stock for immediate shipment.

When ordering please specify the le th depth, type of back and the colo ou wish from the following chart.

Length	11½"	19"	
Depth	7"	10"	1
Back	Solid	Perforated	
Color	Blue	Clear	O er

*Allow one additional week.

Clearance between the front panel nd the circuit card rack is determine by the Nominal Depth of the case ed

Nominal Depth	Clearanc
7"	1½"
10"	4½"
13"	7½"

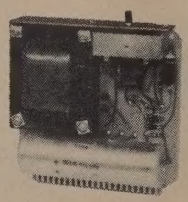
PRICES

Cases (all basic cases are the same p e)
- 1-9 ..... $195
- 10-24 120
- 25-100 145

Component Mounting Plate
- Each ..... $ 50

Punching Holes in Front Panel
- Set-up $100
- Each hole 10

Silk Screening White Epoxy Ink on nt Panel (supply 1:1 positive)
- Set-up $100
- Each panel 50



DE-1 POWER SUPPLY

As a supplement to our breadboard line and our packaging products, we now offer a DE-1 power supply. This versatile power supply is built on a circuit board of our standard DE-1 dimensions, and as a result, is a perfect companion to our card racks and breadboard cards. It is designed to plug into our card racks and when so installed in the end position of the card racks it occupies three card positions on the ½" center rack and two card positions on the ¾" center rack.

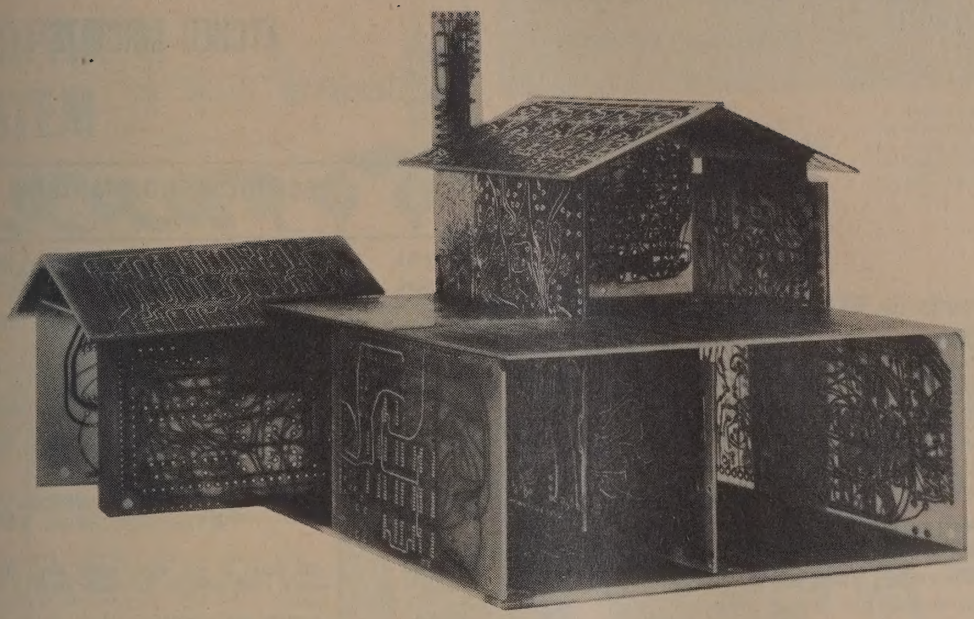
The regulated power supply is designed to satisfy most i.c. power requirements, having an output of about 1.2 amps @ a nominal 5.5 volts. A circuit breaker is mounted on a bracket so it is accessible when the power supply is rack mounted. Also, terminals on the power leads allow an option of external line switching.

Part No. PS-1
Price — $52.50
Delivery from Stock

MYLAR MASTERS

For the convenience of the designer, we offer mylar sheets with our board outline and with 22 pin connector fingers already photographically reproduced on the mylar. This helps save time in layout as well as helping to obtain a better finished product. There are six different types of pa erns available, four for our DE-1 size board and two for ou E-7 size (for installation in DEC assemblies). Order by part nu ber

All masters are the same price: 2:1—$3.50 ea. 1:1—$1 ea



CINCH-GRAPHIK...

World's largest independent manufacturer of

- Precision double-sided, printed circuit boards with plated-thru holes
- Multilayer printed circuit boards

High volume production for Aerospace, Missile, Instrumentation and Data Processing Industries

At Cinch-Graphik you'll find the industry's newest, most modern facilities combined with the industry's most knowledgeable, experienced people... the people that have made Cinch-Graphik foremost in its field. These are the people who have devised and developed the innovations and techniques that enabled Cinch-Graphik to develop the first through-hole plating and the first multilayer boards with 36 layers on automated equipment.

Perfection is a creed at Cinch-Graphik... out of 800 people, one in every five is directly involved in inspection and quality control. To these people, meeting the requirements of Military Specifications such as MIL-P-55110 and MIL-S-9858 has become second nature.

Cinch-Graphik can handle your largest delivery requirements... our 125,000 square foot plant houses the most advanced precision production equipment in the industry. For high volume commercial, industrial, or military printed circuit boards, look to the leader in printed circuitry... look to Cinch-Graphik. Contact your local Cinch-Sales office listed in EEM or write Cinch-Graphik, 200 South Turnbull Canyon Road, City of Industry, California 91744. Phone (213) 333-1201.

CINCH-GRAPHIK

GTI CORPORATION
Dytronics Division

DIE STAMPED AND ETCHED CIRCUITS

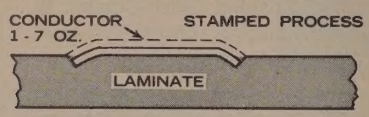
Die stamped circuits by GTI have these advantages over etched circuits:

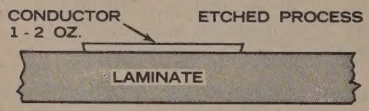
Tucked-in edge conductor that's ideal for cams, commutators, switches, slip rings.

Thicker conductors up to 10 oz./sq. ft. and 0.150 in. thickness with heavier current carrying ability, increased life in switching functions and greater thermal capacity and heat dissipation.

Die stamping is a dry process — chemicals are not used to print or laminate circuitry. Voids are eliminated, as well as pinholes, shorts, or undercuts. There are no chemicals that can leach out later, when circuits are in use.

Positive and accurate registration is maintained throughout the production run. Conductors are embossed and the board is blanked from the same locator holes.





TEST SPECIFICATIONS

The following specifications have been certified by Detroit Testing Laboratory, Detroit, Michigan.

HUMIDITY **Die stamped boards will withstand:**
1. 100°F @ 100% R.H. for 2 hours.
2. 160°F @ 100% R.H. in 1 hour for 3 hours.
3. 100°F @ 100% R.H. over 6 hour period.

Repeat cycle five times, totalling 60 hours, and following this:

THERMAL **Die stamped boards will withstand:**
1. From −40°F to +160°F over 3 hour period.
2. +160°F for 1 hour to −40°F over 3 hour period.
3. −40°F for 1 hour.

Repeat cycle five times, totalling 60 hours.

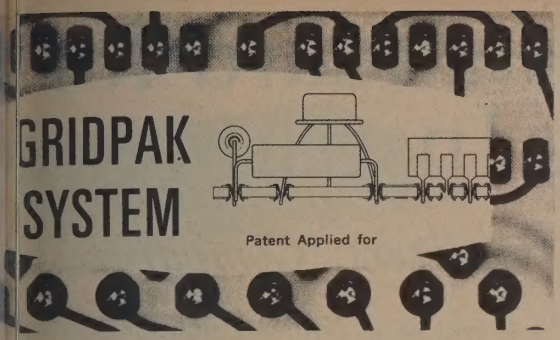
Die stamped circuits will pass these tests and show no broken conductors, no adhesive bond failures, no base material delamination, no excessive warpage. There will also be no loss of electrical continuity in hardware connections.

This is true also in economy grade base laminates; IE: XP, XXP.

TECHNICAL COMPARISON

	DIE STAMPED		ETCHED
LAMINATES			
Standard	XP, XXP, XXXP, FR-2, FR-3, CE, LE, G10, FR4 and glass polyester.		Same
Special	Epoxy coated metals Nylon paper Flexibles		Flexibles only
CONDUCTORS	1 oz., 10 oz. electrolytic copper.		1 - 2 oz. electr ic aluminum; nic
FINISHES	Solder hot flow, silver plate, solder mask, seal brite, tin, lead, precious metals.		Same
HARDWARE	Connector pins, terminals, eyelets, blades, contacts.		Same
HOLES			
Punched	.020 holes in 1/16″ thick paper phenolics, .030 holes in 1/16″ thick glass base		Same
Drilled	.0132 in any material		
TOLERANCES			
1. Registration (Hole to conductor)	**Standard**	**Special**	
Temporary Tools	±.015	±.010 ±.005	Same
Permanent Tools	±.010	±.005	
1a. Repeatability of registration (throughout production run)	±.003		Same
2. Punching	±.003 minimum	±.005 standard	Same
3. Angular	±1°	±0°30′	Same
4. Line width	.030″ minimum, 1-2 oz. (Slightly wider on heavier copper)		Less than .0
5. Line spacing	.030″ minimum, 1-2 oz. (Slightly wider on heavier copper)		Less than .0
ECONOMIC	If the board can either be etched or die stamped, die stamping becomes more economical at about 3500 square feet of circuitry/yr./part., where die stamping has features superior to etching, such as ramp angle, heavier copper, or dry processing, it is economical in lesser quantities		
CONTAMINATES	None		Inks, etchant and cleaners
ADHESION	Exceeds NEMA standard		Equal to or g ter than NEMA standards
TOOLING			
1. Prototype (Temporary)			
Artwork	Yes		Yes
Emboss section	Yes		No
Drill template	Yes		Yes
Router guide	Yes		Yes
2. Production (Permanent)			
Artwork	Yes		Yes
Emboss die	Yes		Prepunch die
Pierce & blank die	Yes		Yes
FLATNESS (NEMA standards) .025″/Lin. inch)	Exceeds NEMA standards		Equal NEMA standards
ENVIRONMENTAL TEST	Dytronics D100 specification (See test specifications)		XP and XXP not pass D10
UNDERWRITERS' LABORATORY APPROVAL	Yes		Yes

NOTE: We do not supply precious metals in either our etching stamping with the exception of silver on die stamped circ



PRINTED CIRCUIT TERMINAL BOARDS for

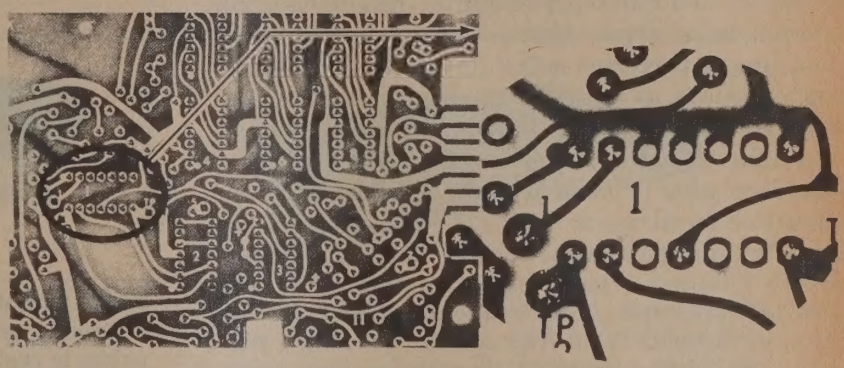
- LOCKED-IN CIRCUITRY
- FASTER DELIVERY CYCLES
- COMPONENT HOLDING TERMINALS
- IMPROVED RELIABILITY
- GRID-ORIENTED DESIGNS
- THROUGH-CONNECTING
- STANDARD TOOLING ECONOMIES
- HAND OR FLOW SOLDERING
- ENGINEERING FLEXIBILITY
- MULTI-LEAD SPACE SAVINGS

LOCKED-IN CIRCUITRY AND THROUGH-CONNECTING

ircuits with grip-type terminals mechanically into any or all of the connecting holes pro- oldered connection which virtually locks the n onto the circuit pad. Where two-sided is required, the terminals can provide an flow-through connection through use of controlled wave soldering equipment.

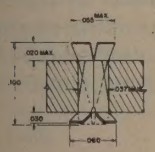
COMPONENT HOLDING, HAND OR WAVE SOLDERED

-type terminals provide very valuable pre- lead-holding features for component and o for stand-off components. Terminals, with t leads inserted, solder very well using auto- dering equipment, and also provide an ef- nnecting base for hand soldering. This may ble when prototyping for small runs and for

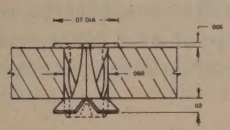


Available on all standard laminates, copper thicknesses and coatings.

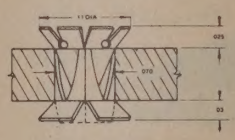
TERMINALS



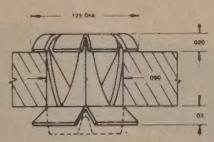
.036" TERMINAL
(.039" Nom. Hole Size)



(Available with funnel head)
.050" TERMINAL
(.052" Nom. Hole Size)



.070" TERMINAL
(.072" Nom. Hole Size)



.090" TERMINAL
(.092" Nom. Hole Size)

Other Sizes and Types Available

GRATED CIRCUIT PROTOBOARDS (GRIDPAKS)

For Breadboards or Prototype Design and Production

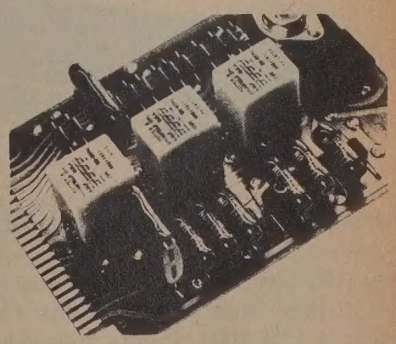
CIRCUIT PROTOBOARDS for circuit designs utilizing Dual In-Line or T05 types of in- circuit packaging are available as shelf items in several sizes. These boards have grip- inals in two sizes: .070" (for wiring) and .050" (for IC pins or leads). Rows of the smaller can accommodate any combination of IC leads. The larger terminals are for insertion and of one or more connecting leads. Terminals can be pre-soldered for testing before final ow soldering.

C protoboards can be used as breadboards or for the development of actual prototypes. version has a greater proportion of the larger terminals for connecting discrete components IC's. All the boards have single and double-sided edge connector strips to plug into ard-edge connectors.

Type	Universal IC Protoboards (01) Version	
	Materials	Terminals
246-01-22	G-10 (1 oz. Cu., one side)	499 (.070"); 390 (.050")
246-01-44	G-10 (1 oz. Cu., two side)	499 (.070"); 390 (.050")
	IC Protoboards for Hybrid Circuitry	
246-03-22	G-10 (1 oz. Cu., one side)	781 (.070"); 312 (.050")
246-03-44	G-10 (1 oz. Cu., two side)	781 (.070"); 312 (.050")

CUSTOM ASSEMBLY SERVICE

In addition to fabricating your boards with terminals, GRIDCRAFT also assembles complete circuit board packages made to your specifications. Automated cut and form. Flow soldering. Testing. Assembly brochure on request.

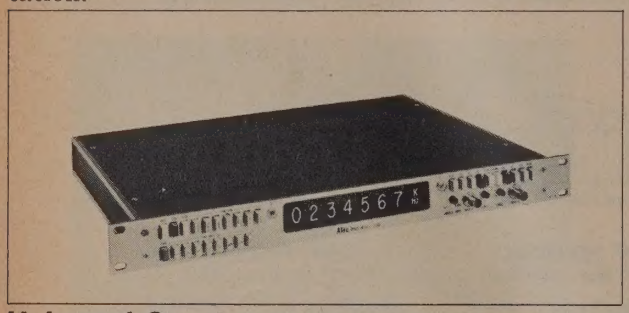


GRIDCRAFT INC. **14520 LIMA RD., R.R. #1, FORT WAYNE, INDIANA 46805**
219-637-3141

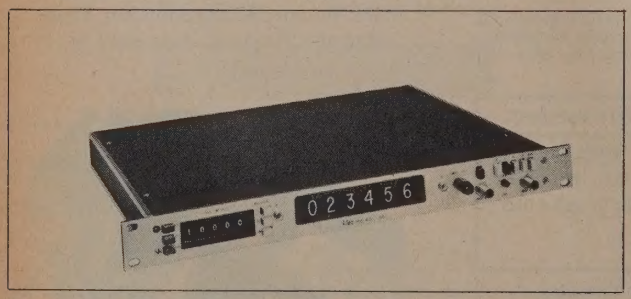
Atec sets the standard for Digital Counting Instruments

Counters, Timers, Clocks, Totalizers, Comparators

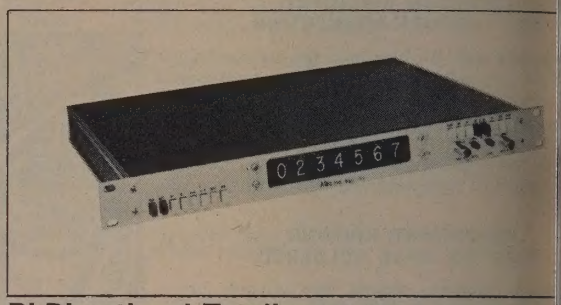
Precision and reliability in digital instrumentation at economical prices—that's Atec. *Versatility:* each instrument performs many functions. *Flexibility:* such features as extra digits, display storage, and high stability frequency standard may be added at any time. *Modern Design:* extensive use of IC's; standard plug-in modules; motherboard PC construction to minimize wiring. *Compact:* 1¾" high panels mount in standard 19" RETMA racks. *Extra Features:* remote programming, BCD output at TTL levels, inline readout, and self-testing are user benefits from Atec digital counting / timing / totalizing / sampling / comparing instrumentation.



Universal Counter Model 2000 provides six measurement functions: frequency, period, multiple period, time interval, ratio, scale (totalize) at frequencies up to 12.5 MHz. Registers and displays five decimal digits (up to seven optional). Inputs from 0.01 V RMS to 125 V RMS, AC or DC coupling. Crystal-controlled 1 MHz oscillator as frequency standard with excellent time, voltage and temperature stability. Price: $850.

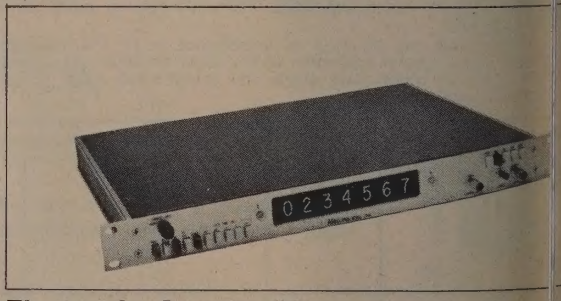


Variable Time Base or Rate Counter Model 2300 measures rate data over a wide range of counting intervals, 100 seconds down to 10 microseconds. Registers and displays four decimal digits (up to six optional). Rates to 12.5 MHz. Inputs from 0.01 V RMS to 125 V RMS. Frequency standard is 100 kHz crystal-controlled oscillator. Manual or remotely programmed control of gate time, multiplier, reset and storage. Price: $940.



Bi-Directional Totalizer Model 2400 offers m or remote selection of six operating modes: A+ pulses to register total at rates up to 10 MHz; A− tracts pulses from register, 10 MHz maximum other modes, 3 MHz maximum rate: A + B sums at Inputs A and B and adds them to register; adds pulses at Input A, subtracts at Input B; A B adds or subtracts pulses, depending on phase rel ship; A as a function of B, pulses added or subtr based on levels compared to threshold. Price: $89

Time Interval Meter Ultra-precise resolution 0.1 microseconds to 10^8 seconds is possible with 2503, used for such measurements as ballistic velo acceleration rates, nuclear phenomena, relay res times and many other transients. Inputs are adju for level, slope, polarity and coupling to trigger e at desired point on input waveform. Readout in seconds. Manual or remote programming. Price:



Electronic Counter/Timer Model 2802 me frequencies from DC to 12.5 MHz, time interv 1μsec (0.1 μsec with external clock), and also pr totalizing and ratio functions. Easily upgraded options: registration and display of up to seven d 1 MHz crystal-controlled time base. Input: 1 DC to 5 MHz; 30 mV, DC to 12.5 MHz. Overlo 125 V. BCD output drives digital printers, tape units. Price: $455.

25 MHz Electronic Counter Model 2806 is a general-purpose counter that measures frequency, ratio and totalizes. Frequency range is 10 Hz to 250 MHz without prescaling or time-base modification. Readout is displayed in Hz with a counting time of one second. Input sensitivity is 50 mV over the entire frequency range. Standard features include a 1 MHz crystal-controlled time base, stable to ±1 part in 10^8/day, 1-2-4-8 BCD output and remote programming. An optional oven-stabilized crystal is available. All solid-state IC construction, insures long, trouble-free service. Price: $1395. Crystal oven option: $75.

Digital Comparator Model 3200 is one of four comparators which generate output control signals ("Go-No-Go" or "High/Low/In" limits) based on input data and preset limit values. Measurement comparisons are made by parallel computation (as opposed to coincidence logic) permitting moving or static BCD inputs to be compared to preset limits. Models 3200 (dual limit) and 3201 (single limit) are priced at $625 and $425; Models 3202 (dual limit) and 3203 (single limit) provide algebraic comparisons and interface with bi-directional totalizers and digital voltmeters, and are priced at $575 and $525.

Digital Clock Model 3000 produces a visual display and 1-2-4-8 BCD output of elapsed or real time in days, hours, minutes and seconds. Time reference is provided by either an internal crystal-controlled oscillator or a 1 MHz or external signal. Any digit can be sent to any desired number with operator controls. BCD output for counters, printers, etc. Price $1425. Model 2906 available with standby battery supply.

Digital Frequency Meter/Totalizer Model 1130A measures frequency to 3 MHz for 0.1 and 0.1-second intervals and totalizes at rates of 3 MHz. The unit uses the power line for a time base. Four-digit readout is provided with a fifth "1" digit for overflow display. A rear panel connector provides 1-2-4-8 BCD output. Price: $189.95.

Electronic Counter Model 1131A is a general purpose frequency counter for use between 10 Hz and 3 MHz. Readout is provided by four numerical indicators with a fifth "1" digit for overflow display. Time base is provided by a precision crystal-controlled oscillator stable ±1 part in 10^6/month. Display storage retain the readout during the subsequent measurement cycle. A rear panel connector provides 1-2-4-8 BCD output. Price: $325.

Counter/Timer Model 2200A is a general purpose counter/timer with a range of from 5 Hz to 35 MHz. Standard features include display storage, remote programming, BCD output and a crystal-controlled time base. Measurement functions include frequency, period averge, totalize and timing. The standard Model 2200A provides 5-digit readout but a sixth is available as an option. Price: $495.

Universal Preset Counter The Model 2304 measures period, batch, rate, a preset number, ratio, and it totalizes. Frequency response is from DC to 15 MHz. Front-panel preset switches allow the operator to vary the time base for rate measurements, or to preset the digits representing a "batch" size. The instrument can also be used to measure the time required for a selected number of events to occur. BCD output is provided. Price: $1090.

Reciprocal Computer Model 2926 is a reciprocal computer which operates in conjunction with counters having standard 1-2-4-8 BCD output. Typical applications are the calculation of velocity, RPM or frequency from time measurements. Price: 995.

Electronic Totalizer Model 2203 is a totalizer which operates at a maximum rate of 12.5 MHz. Input sensitivity is 10 mV. Four-digit readout is standard but up to seven digits (total) is available as an option. The instrument provides 1-2-4-8 BCD output as an additional option. Price: $360.

Atec, Inc.

1125 Lumpkin St., Houston, Texas • Phone (713) 468-7971
Mailing Address: P. O. Box 19426, Houston, Texas 77024

Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

BISSETT BERMAN E-CELL (TM)

Timing & Integrating Components

- *μWatt Power Drain*
- *One-Shot or Reusable*
- *Military or Commercial Specs*
- *Timing Range: Seconds to Months*
- *Integrating Range: 1 to near ∞ Events*

Something New Under the Sun!

1. WHAT IS AN E-CELL DEVICE?

An E-CELL device is a new kind of circuit element that looks like a discrete electronic component but does the work of a complex assemb main functional part is a center electrode, which is surrounded by an electrolyte; the metallic container also serves as the second electrode. I of its physical operation, an E-CELL unit is a reversible micro-coulometer, i.e. it converts the current-time integral of an electrical function equivalent mass integral (or the converse operation) up to a maximum of several thousand microampere-hours. Exactly one atom is transfer each electron impressed on the E-CELL unit. Power drain is normally in the microwatt region. The mass integral can be read out at a known the time to read it out being proportional to the original integral. When a mass is given as part of the initial condition, this same process ge a precise time interval.

2. WHAT DOES AN E-CELL DEVICE DO?

For *timing* applications a constant current is applied to a *pre-charged* E-CELL unit. The selected time delay is determined by a combination E-CELL type and the specific constant current being used. The range of timing is from seconds to months. The output voltage swing that when the mass has been completely transferred is normally used as a bias transition with semiconductor devices. For *integration* applicati *uncharged* E-CELL unit accepts d-c, periodic, or random inputs in any waveshape and stores these as the mass equivalent of a current-time i Readout is handled in essentially the same manner that the timing function is handled for a pre-charged E-CELL unit, i.e. the measured time r to reach the point of the abrupt voltage swing, multiplied by the readout current, will be the accumulated charge integral. This could represent t "count" of a series of events analogous to the input pulses.

3. APPLICATIONS

The scope of applications is as broad as timing and counting functions themselves. New uses are continually being devised. Here are tw applications areas:

Control: You can use E-CELL devices in circuits for timing, gating, starting, stopping, delaying, relaying, monitoring, actuating, sequencing, me —wherever the control condition can be represented by an electrical signal.

Information Handling: You can use E-CELL devices in circuits for data capture, totaling and subtotaling time periods or discrete events, elaps logging, running time monitoring, out-of-limits logging, maintenance status reporting, real-time analog computing—wherever the input data represented by an electrical signal. Readout can be formatted as either analog or digital data.

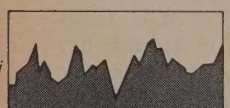
PART NUMBER	PHYSICAL CHARACTERISTICS
400 SERIES	Single anode cell with leads; mil specs; ±4% charge accuracy for precharged types; −55°C to +71°C.
410† SERIES	Dual anode cell, with leads; mil specs; ±5% anode 2 charge accuracy; −23°C to +55°C.

Actual size shown.

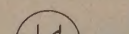
†No. 410 Dual cells are available on special order with anode 1 charges from 0 to 40 μamp-hr and anode 2 charges from 0 to 3000 μamp-hr.

E-CELL TIMING COMPONENTS		
TYPE	NOMINAL CHARGE	NOMINAL RA
400-0400	40 μamp-hr	0.4-20 h
400-2400	240 μamp-hr	2.4-80 h
400-1441	1440 μamp-hr	14-480 h
400-3001	3000 μamp-hr	30-1000 h

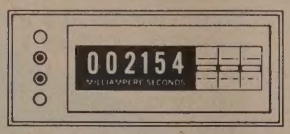
E-CELL Timing Components with other pre-charges are available on special order.



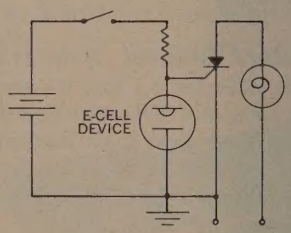
Typical Analog Input Signal



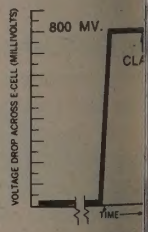
E-CELL Integrator



Model 300 EDR E-CELL Digital Readout Instrument



Typical circuit using E-CELL component.



Typical E-CELL voltage rise.

E-CELL components are protected by one or more of the following U.S. patents: 2,744,217; 3,423,642; 3,423,643; 3,423,644; and 3,423,648. Other U.S. and foreign patents pending.

Specifications subject to change without notice.

For additional technical information and applications notes, contact: Components Division, The Bissett-Berman Corporation, 3860 Centinela Avenue, Los Angeles, California 90066; Telephone (213) 829-2675; TWX: 910-343-6583.

A69

E-CELL INTEGRATING COMPONENTS		
TYPE	CHARGE	NOMINAL INTEGRATING RA
400-0001	None	to 200 μamp-h
400-0002	None	to 1000 μamp-h

A subsidiary of Alloys Unlimited, Inc.

Bissett-Berman Corp.
2001 Jefferson Davis Hwy.
Arlington, Va. 22202
Telephone: (703) 521-8202
Telex 89-9420

Bissett-Berman Corp.
4930 W. 77th Street
Minneapolis, Minn. 55435
Telephone: (612) 920-2541

Bissett-Berman Corp.
3860 Centinela Ave.
Los Angeles, Calif. 90066
Telephone: (213) 829-2675
TWX 910-343-6583
Telex 65-2432

Bissett-Berman
14 Rue de L'Art
Brussels, Belgi
Telephone: (02)
Telex: (486) 22

AAC American Aerospace Controls Inc.

131 VERDI STREET • FARMINGDALE, N.Y. 11735 • 516-694-5100

INSTRUMENTATION AND CONTROL DEVICES

AC AND DC CURRENT SENSORS; VOLTAGE MONITORS; POWER TRANSDUCERS; ANALOG FUNCTION MODULES; MAGNETIC FLUX SENSITIVE ELEMENTS.

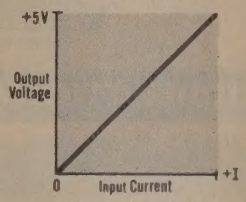
URRENT SENSORS D.C.

erican Aerospace Controls' D.C. current sensors are used for measurement and control applications requiring an accurate high level D. output signal proportional to the input current. Most models feature "pass thru hole" construction for the power cable providing mplete electrical isolation of the output. Models are available in grades suitable for industrial and military applications.

2009A

H ACCURACY
MALL SIZE

Current Ranges Amps DC
100
50
20
10
5
2
1

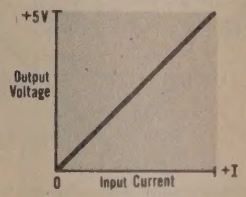


Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	±1%
Excitation	24-32 VDC
Temp. Stability	.04%/°C
Weight	7 Oz.
Size	1⅝ x 1⅝ x 2⅜

02

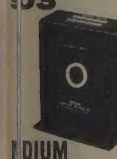
HIGH
RRENT RANGES

Current Ranges Amps DC
500
300
200
100
50



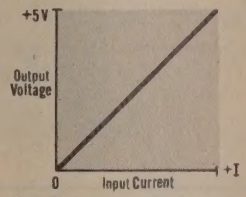
Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	2³⁄₁₆ x 3¾ x 3¹⁄₁₆

03



DIUM
RRENT RANGES

Current Ranges Amps	DC
50	0.5
20	0.2
10	0.1
5	0.05
2	0.02
1	0.01

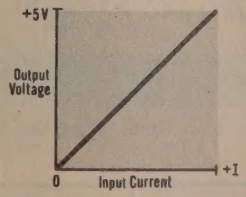


Output Volts	0 to 5 VDC
Response	50 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	2 x 2⁹⁄₁₆ x 2⅞

04

LOW
RRENT RANGES

Current Ranges Milli Amps DC
5
2
1
0.5
0.2
0.1



Output Volts	0 to 5 VDC
Response	50 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	2 x 2⁹⁄₁₆ x 2⅞

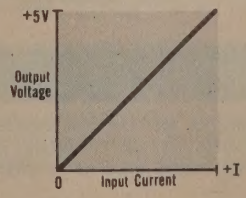
URRENT SENSORS A.C.

road line of "pass thru hole type" A.C. current sensors are available for measurement or control of current at standard line frequencies or er a broad frequency spectrum. The sensors produce a high level D.C. signal output that is electrically isolated from the current line. wer dissipation is negligible and economy models of these sensors may be used as replacements for shunts.

003

0 Hz
NOMY

Current Range Amps AC
100
50
20
10
5

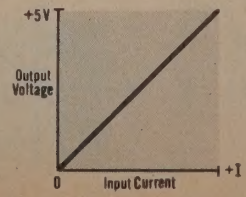


Output Volts	0 to 5 VDC
Response	50 ms
Repeatability	½%
Accuracy	5%
Excitation	Self Excited
Temp. Stability	0.1%/°C
Size	1 x 1¾ x 2¹⁄₁₆

011 AC-DC

DE FREQUENCY
RANGE

Current Range Amps AC	
500	100
300	50
250	25
200	10
150	—



Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	2%
Frequency Range	50 to 2000 Hz
Excitation	24-32 VDC
Temp. Stability	0.1%/°C
Size	1 x 1¾ x 2¹⁄₁₆

AAC

American Aerospace Controls Inc

131 VERDI STREET • FARMINGDALE, N.Y. 11735 • 516-694-5100

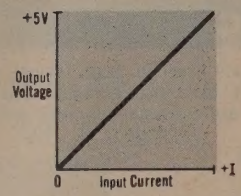
INSTRUMENTATION AND CONTROL DEVICE

CURRENT SENSORS A.C.

1001

HIGH CURRENT
REMOVABLE YOKE

Current Ranges Amps rms
2500
1500
1000
750
500
250
150



Output Voltage	0 to 5 VDC
Frequency Range	50 Hz to 2000 Hz
Accuracy	2.5% FS
Temp. Stability	.15%/°C
Response	10 ms
Size	1 9/16 x 3 1/4 x 4 5/8

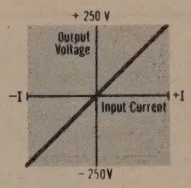
CURRENT SENSORS BIDIRECTIONAL

Bidirectional current sensors are used to sense either D.C. currents whose polarity or direction of flow may reverse or A.C. currents within the response capabilities of the device. The electrically isolated output signal duplicates the current wave form. Because of their fast response characteristics, these sensors may be used for pulse measurements and controls.

2006

FAST RESPONSE
MINIATURE SIZE

Current Range Amps DC or rms AC
250
200
150
100
50
25

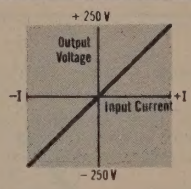


Output Volts	0 to 250 mv
Response	1 μs
Accuracy	2%
Temp. Stability	0.1%/°C
Excitation	15 VDC
Size	1 x 1 x 1

910

FAST RESPONSE
ECONOMY

Current Range Amps DC or rms AC
300
200
150
100
50
25

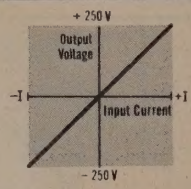


Output Volts	0 to 250 mv
Response	5 μs
Accuracy	2%
Excitation	15 VDC
Temp. Stability	0.1%/°C
Size	1 x 1 3/4 x 2 1/16

4008

HIGH CURRENT
REMOVABLE YOKE

Current Range Amps DC or rms AC
2500
1500
1000
750
500
250
150

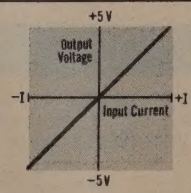


Output Volts	0 to 250 mv
Response	200 μs
Accuracy	2%
Temp. Stability	0.15%/°C
Excitation	24-32 VDC
Size	1 9/16 x 3 1/4 x 4 5/8

905

HIGH ACCURACY
HIGH OUTPUT

Current Ranges Amps	DC
50	0.5
20	0.2
10	0.1
5	
2	
1	



Output	0 to ±5 VDC
Response	50 ms
Accuracy	1%
Excitation	±15 VDC
Temp. Stability	.04%/°C
Size	2 x 2 9/16 x 2 7/8

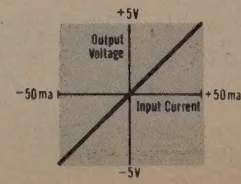
CURRENT NULL SENSORS

Current null sensors are used in feedback null balance systems. The sensors produce a large polarity sensitive D.C. output signal fo milliamp current inputs, yet will withstand high ampere over current levels. The units are thus capable of producing a null equivalent t 20 parts per million of maximum current input. The output signal is moreover electrically isolated from the input current. Application include power controls and null balance systems.

915

ACCURATE NULL
HIGH OVERCURRENT RANGE

Current Range
±50 ma
Overcurrent
100 Amps



Output	0 to ±5 VDC
Null Stability	1 ma
Excitation	±15 VDC
Temp. Stability	.04%/°C
Response	50 ms
Size	2 x 2 9/16 x 2 7/8

AAC American Aerospace Controls Inc.

131 VERDI STREET • FARMINGDALE, N.Y. 11735 • 516-694-5100

INSTRUMENTATION AND CONTROL DEVICES

A.C. VOLTAGE MONITOR

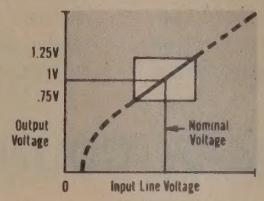
American Aerospace Controls' fast response A.C. line voltage monitors provide an isolated D.C. output voltage proportional to the A.C. RMS line voltage. The monitors respond within ½ cycle of the A.C. line voltage frequency and are very useful in protecting computer systems from program destroying transient line voltages or for detecting momentary power failures.

VM100

FAST RESPONSE
D.C. OUTPUT

Line Voltage Range
Volts rms AC

90-150	60 Hz
180-300	60 Hz
90-150	400 Hz
155-260	400 Hz



Output Voltage	1 VDC for Nominal Line Voltage
Output Scale Factor	10 mv/Volt
Excitation	Self Excited
Response	Within ½ Hz
Accuracy	2%
Size	2¼ x 2¼ x 3¾

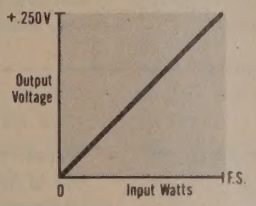
WATT TRANSDUCERS D.C.

American Aerospace Controls' D.C. watt transducers are used to measure power in a D.C. circuit. The sensors feature pass thru hole construction and zero insertion loss as well as electrical isolation of the current cable. The units generally respond in the micro second region and produce a linear D.C. output proportional to power input.

WT3011

FAST RESPONSE
ECONOMY

Current Ranges
0-10 to 0-300 Amps
Voltage Ranges
0-12 to 0-240 Volts
Wattage Ranges
0-120 W to 0-60 KW

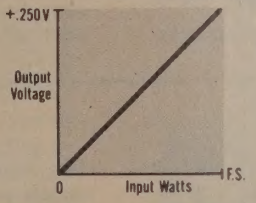


Output	0-250 mv DC
Accuracy	2% FS
Response	5 μsec
Temp. Range	−35°C to +70°C
Temp. Coef.	.15%/°C
Size	1 x 1¾ x 2 1/16

WT4007

HIGH CURRENT
REMOVABLE YOKE

Current Ranges
0-150 to 0-3000
Voltage Ranges
0-20 to 0-150
Wattage Ranges
0-3 KW to 0-450 KW



Output	0 to 250 mv
Accuracy	2.5% FS
Response	200 μsec
Temp. Range	−25°C to +75°C
Temp. Stability	0.15%/°C
Size	1 9/16 x 3¼ x 4⅝

WATT TRANSDUCERS A.C.

A.C. watt transducers are used for measurement or control of A.C. power. These low insertion loss devices provide a high level linear D.C. output. Models are available covering a broad wattage range.

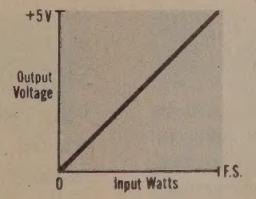
WT4

60 Hz OR 400 Hz
GENERAL PURPOSE

Current Ranges AC rms
0-10 to 0-500 Amps
Voltage Ranges

115 Volts	(60 to 170)
220 Volts	(110 to 330)
440 Volts	(220 to 660)

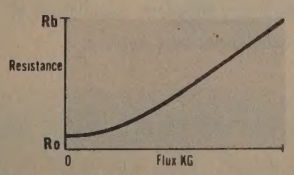
Wattage Ranges
0-1 KW to 0-200 KW



Output	0 to 5 VDC
Accuracy	2% FS
Excitation	Self Excited
Response	50 ms
Temp. Coef.	.15%/°C
Size	2¼ x 2 13/16 x 3½

MAGNETORESISTORS

Magnetoresistors are magnetic flux sensitive resistors that change resistance proportional to an applied magnetic field. They are useful for flux measurements, D.C. position sensors, pick-offs, and many other electronic functions. The MRA type elements are useful for cryogenic applications. The MRI-type elements are general purpose high sensitivity elements.

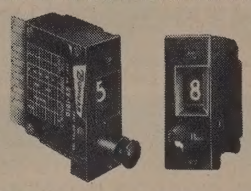


TYPE MRA—THIN FILM ELEMENTS FOR CRYOGENIC APPLICATIONS.

TYPE MRI—HIGH SENSITIVITY GENERAL PURPOSE FLUX SENSITIVE RESISTORS.

Model No.	Size — Inches A	B	T	Available Resistances At 0 Flux & 25°C Ro Ohms	Sensitivity Rb/Ro 3 KG.	10 KG.
MRA-11	1/16	1/16	.004	1 Ω to 200 Ω	1.05	1.35
MRA-12	⅛	⅛	.004	1 Ω to 1000 Ω	1.05	1.35
MRA-13	¼	¼	.004	1 Ω to 2000 Ω	1.05	1.35
MRA-14	½	½	.004	1 Ω to 3000 Ω	1.05	1.35
MRI-101	3/16	3/32	.010	100 Ω	2	7
MRI-501	⅛	⅛	.010	500 Ω	3	10

BOWMAR DIGITAL PUSH-BUTTON SWITCHES WITH BCD OUTPUT



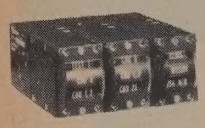
These switches provide digital or BCD output for each of the 10 switch positions. They weigh less than 0.5 ounces and have back-lighting for optimum night visibility. Designed for military and high quality commercial markets, they meet or exceed most environmental specifications and offer a life of over 1,000,000 operations. Standard models have a contact rating of 125ma @ 28 VDC or 115 VAC.

BOWMAR DIGITAL DISPLAYS AND ASSEMBLIES

Bowmar's Logicator® displays provide direct readout of decimal signals with back-lighting for optimum day and night readabilit miniature display is electromagnetically positioned and is ex reliable due to only one moving part. It eliminates the need mechanical drives, servos, or digital to analog converters.

BOWMAR COUNTERS

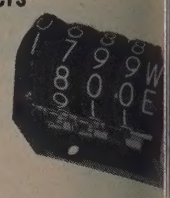
Message Displays



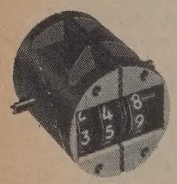
Miniature message displays feature up to 64 one-line or two-line messages. 64 position encoder output supplies one different electrical signal per message displayed. Mechanical input shown is thumbwheel, other methods available on request.

Reversing Counters

Unique design of Bowmar reversing counters permits rotation of the shaft in the same direction to provide a single sequence of both declining and increasing readings. Latitude, longitude, and decimal type readouts available on request.



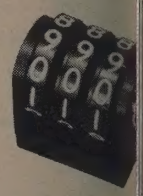
Buord Angle Counters



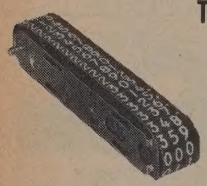
Buord angle counters provide indication of angular increments proportional to input shaft rotation from 000° to 359°, and return to 000° with full reversible operation.

Decimal Counters

Decimal counters provide indication from 000 to 999 with return to 000 in one unit increments. Units can be supplied with servo type mounting. Two, four, or five drum units optional.



Tape Angle Counters

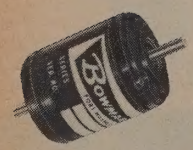


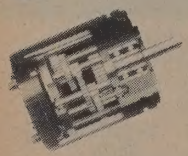
Tape angle counters provide 360° of angular indication on a reading face occupying less than a half square-inch of area. Operation is continuous and reversible at any point.

Internal Pinion Counters

This miniature variation internal pinion counter provides high readability. Starting at 999 West, readings decrease to 001 West. The counter then transfers to 000 East and increases to 999 East. Special mask symbols available on request.

BOWMAR 'POSTLESS' GEARHEADS AND SPEED REDUCERS





Sizes 8 through 18 available in practically unlimited variations, ratios and configurations. Features include postless construction for rigidity and precision ball bearings throughout. Types offered include conventional designs, multiple shafts, concentric shafts, square designs with clamp or screw mounting. Available separately or matched, mounted and prechecked with Bowmar servo motors. IMMEDIATE DELIVERY in prototype quantities.

Write for Stock List Brochure.

BOWMAR TIMING DEVICES

Digital readouts of hours or events are provided in Bowmar's completely self-contained units. The subminiature events indicator provides digital indication of electrical occurrences in one unit increments from 0000 to 9999 with return to 0000. The unit advances one increment with each input pulse. Ideally suited for use in reliability studies or permanent installation in systems requiring periodic service.

BOWMAR®

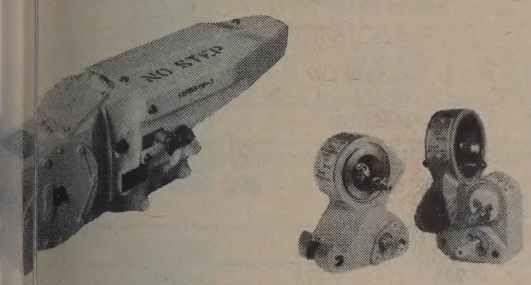
Bowmar Instrument Corporation
8000 Bluffton Road, Fort Wayne, Ind. 46809
Phone (219) 747-3121 • TWX 810-332-1510

BOWMAR ELECTROMECHANICAL CONTROLS

AN ESTABLISHED CAPABILITY

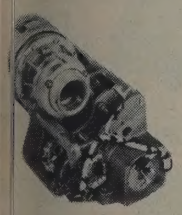
Given a definite type of input and required output, Bowmar provides comprehensive engineering know-how, manufacturing resources and testing programs to produce equipment required to perform the intervening functions. Modules may be Bowmar designed, built to customer print or redesigned and manufactured for improvements in size, weight, performance and other values.

OWMAR AIRBORNE CONTROL ACTUATORS



ctro chanical devices shown illustrate Bowmar's capability in the uato ield. These high reliability actuators are used in current high form ce military aircraft. Designs can be provided with rotary and ear puts.

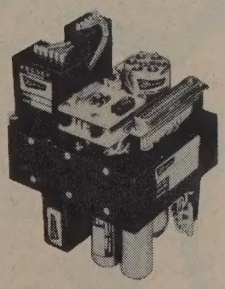
BOWMAR ELECTRO-OPTIC ASSEMBLIES



This optical guidance assembly provides continuous tracking capability for an advanced tank missile system. Custom designed electro-optic devices can readily be provided to meet the most critical performance requirements.

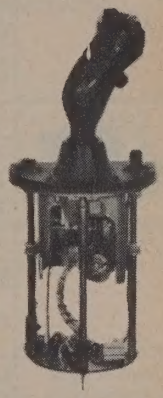
BOWMAR NAVIGATIONAL AND TRACKING DEVICES

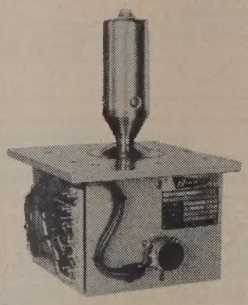
pres tative of Bowmar capabilities com ning many servo components o a ulti-parameter assembly. Pro- es givational control within 12 mute of arc. Contains two control nsfo ers, two servo amplifiers, two tors precision geartrain, differen- l, re output synchros and two tenti eters.



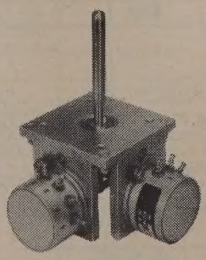
BOWMAR JOYSTICK CONTROLS

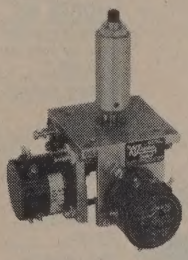
The X-Y Control handle is capable of 60° conical movement providing corresponding rotation of two synchros. The handle protrudes 7″ above mounting surface but is capable of being stowed and locked to a height of 4″ and provides for five distinct switching functions. Switch on mounting plate provides for additional switching, light panel displays positions and functions of this switch. Unit contains relays, transformer and diodes for additional radar interfacing. Unit excluding handle is 4 x 6 x 8 inches.





Movement of handigrip in any direction produces corresponding rotation of potentiometers or other precision control components in both X and Y coordinates depending on stick position. The stick features a dead man thumb switch on top and may be positioned at any point in a 54° vertical cone. When released, the stick self-centers. Enclosure is 5¼ x 3¼ x 5¼ inches. IMMEDIATE DELIVERY with standard Size 9 potentiometers.





Two-axis control is provided by deflection of 1½″ fingersticks (std.) in a 57° cone of rotation. 1:6 sector gears operate precision control components mounted on outside of 1½ x 1½ x 1¼ inch enclosure. Small size and light weight (3 oz.) are especially advantageous for airborne uses and compact instrument panels. Self-centering stick is standard, with or without safety interlock switch provision. IMMEDIATE DELIVERY with standard Size 9 potentiometers in both axes.

BOWMAR ®

Bowmar Instrument Corporation
8000 Bluffton Road, Fort Wayne, Ind. 46809
Phone (219) 747-3121 • TWX 810-332-1510

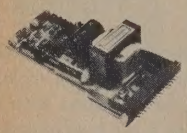
VOLTSENSORS • Precision Solid State Voltage Comparators, Relays, Relay Drivers

MODEL NO.	500 Logic Level	520 Single Set Point	525 Precision Single Set Point	555 Dual Set Single Out	552 Dual Set Dual Out	575 Built-In Relay	560 Built-In Time Delay	B Tim
Trip Point Range	0.7 Volt ±0.05 Volt	Set by external potentiometers to 95% of supply voltage (Up to ±24 volts DC or peak AC)						
Input Impedance	>10K Ohms	>100K Ohms	>100K Ohms	>50K Ohms	>50K Ohms	>100K Ohms	>100K Ohms	>10
Operating time	<100 nanoseconds	<25 μs	<10 μs	<10 μs	<10 μs	<1 millisecond	Time delay	Tim
Output rise & fall	<50 nanoseconds	<2 μs	<2 μs	<2 μs	<1 μs	N/A	N/A	
Output	Approx. Supply voltage at 0-100 ma	Approximately 80% of supply voltage at 50ma						
Hysteresis	Approx. 100mv @ 15 v	<50mv	<4mv	<4mv	<4mv	<4mv	<50mv	
Power Required	5-25 VDC @ 3-15 ma plus output	±15 VDC @ 6ma to ±25 VDC @ 10ma plus relay load	±15 VDC @ 7ma to ±25 VDC @ 12ma plus relay load	±15 VDC @ 14ma to ±25 VDC @ 24ma plus relay load	±15 VDC @ 7ma to ±24 VDC @ 12ma plus relay load	±15 VDC @ 30ma to ±25 VDC @ 55ma	±15 VDC @ 6ma to ±25 VDC @ 10ma plus relay load	±15 7ma VDC plus r
Built-In Time Delay	No	No	No	No	No	No	Variable from 5-1 Specials to 10 s	
Size	0.6"×1.0"×0.65"	1.5"×1.5"×.7"						
Weight	0.6 oz.	2 oz.						
Price FOB Factory	$14.00 ea. ($9.80 @ 100 pc.)	$38.00 ea. (26.60 @ 100 pc.)	$48.00 ea. ($33.60 @ 100 pc.)	$68.00 ea. (47.60 @ 100 pc.)	$78.00 ea. ($54.60 @ 100 pc.)	$55.00 ea. ($38.50 @ 100 pc.)	$58.00 ea. ($40.60 @ 100 pc.)	$6 (4 1

MOUNTING KITS FOR VOLTSENSORS

Includes Printed Circuit Board, Connector and your choice of the following to complete your "plug-in" cir
Hi resolution potentiometer • Standard resolution potentiometer • Industrial 5 amp relay • ½ CC rela
Reed 2 form C • Reed 2 form A • Misc. • Send for details

±15 VDC DUAL REGULATED POWER SUPPLIES

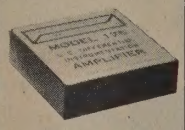


MODEL NO.	220A	222A	224A	226	215	230	22
Output	±15V @ 60ma (±25V @ 100ma) (Unregulated)	±15V @ 60ma (±25V @ 100ma) (Unregulated)	±15V @ 150ma	±15V @ 300ma	+15V @ 300ma	2-12V cont. adjustable @ 100ma	±15 (±24V (Unreg +5V @
Load Regulation	0.5%	0.05%				0.01%	0.05% 0.5%
Line Regulation	0.5% w/±10% voltage change	0.05% with ±10% voltage change					
Optional fixed output range	Any fixed voltage between ±10V and ±24V available (Add $7.00 ea.)				+10V to +24V available	Adjustable 2-12V	±10 +3
Operating Temperature	0°C to 60°C						
Power required	120V, 50-60 CPS						
Connector (1 ea. supplied)	AMPHENOL 143-015-01-110			AMPHENOL 143-022-01-110	AMPHENOL 143-015-01-110		143-022
Size Including Connector	2" high, 6¼" long, 3³⁄₁₆" wide			2"×7⅛"×4¼"	2"×6¼"×3³⁄₁₆"		2"×7⅛
Weight	13 oz.			15 oz.	13 oz		14
Price F.O.B. Factory	$38.00 ea. ($26.60 @ 100 pc.)	$48.00 ea ($33.60 @ 100 pc.)	$58.00 ea. ($40.60 @ 100 pc.)	$68.00 ea. ($47.60 @ 100 pc.)	$48.00 ea. ($33.60 @ 100 pc.)	$68.00 ea. ($47.60 @ 100 pc.)	$78.0 ($54. 100

"I" Supplies—Constant Current Modules

MODEL NO.	920	925
Output Current (set by external 10K pot.)	0-50ma	10-50ma
Supply voltage	+12V to +25V	+22V to +32V
Supply regulation	0.1% Volt Max.	0.001% @ 10ma load 0.005% @ 50ma load
Load regulation	0.05% @ 100% load change	0.001% @ 50% load change 0.002% @ 100% load change
Temperature Range	−40° to +75°C	−40° to +75°C
Temperature Stability	0.1%/°C	0.01%/°C
	Plus external component effect	
Transient Responses	>10 μs	1 μs
	Full load to dead short	
Compliance Voltage	0 to ≈ power supply voltage	0-10V
Dimensions	1.5"×1.5"×.7" max.	
Weight	2 oz.	
Price	$38.00 ea. ($26.60 @ 100 pc.)	$78.00 ea. ($54.60 @ 100 pc.)

DC Differential Instrumentation Amplifier



MODEL NO.	175
Gain	10 to 1000 continuously adj
Frequency Response	DC to 100kc (@ all gain se
Input Impedance	>1 megohm at all gain se
Output	±10 Volts at 50ma
Noise	5 microvolts rms wideband (gain
Common Mode Rejection	90 db; ±6 volts max common mode signal
Drift	Less than 10 microvolts (typical 5 microvolts /
Operating Temperature Range	−40°C to +75°C
Power Required	±15 volts at 8ma plus
Size	1.5"×1.5"×.7" ma
Weight	2 oz.
Price F.O.B. Factory	$78.00 ea. ($54.60 @ 100 pc.)

FOR INFORMATION OR TO ORDER NOW—

Phone Steve Cuff (415) 932-3911

CALIF. ELECTRONIC MFG. CO., INC.

FOR ADDITIONAL DATA WRITE, P.O. BOX 555 Alamo, Calif. 94507

MAGSENSE®

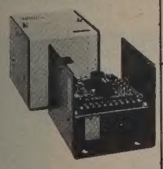
CONTROLLERS, RELAYS, COMPARATORS, ALARMS

AGSENSE Instrumentation-Current and Voltage sensing devices that will mpare electrical signals of 10^{-10} watts with a known variable reference. is enables you to connect directly to such transducers as thermocouples, ain gauges, and DC tach generators. **No pre-amplifiers required.** Power in of **100 BILLION** makes it possible to accomplish a variety of control/ arm tasks with these products.

FEATURES

- ☐ Input versatility—AC or DC isolated input
- ☐ Proven in service
- ☐ Zener stabilized set point
- ☐ Adjustable hysteresis—0 to 200%
- ☐ Solid-state reliability

BRIEF SPECIFICATIONS

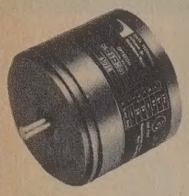
MODEL	TYPICAL APPLICATIONS	INPUT RANGES	INPUT RESISTANCE	RESPONSE TIME	POWER REQUIRED	OUTPUT LOAD
EL 30	Voltage sensitive relay, battery voltage monitor, pressure, force, strain, speed monitor	1 to 3 VDC, expandable	>100K ohms	<1 ms	12 or 28 VDC	Nonlatching – 100 ma max. Latching – 500 ma max.
EL 70	Comparator, control relay, alarm, gap or band controller	0-20 μa 0-100 μa 0-1 ma 0-10 ma 0-100 ma	2300 ohms to 0.1 ohm	100 ms max. (10 ms available)	12 or 28 VDC	Nonlatching—.1 amp, .5 amp, DC; pulse output Latching – .5 amp max., DC
EL 71	Time-proportional temperature controller (not a stock item)	0 to 1000°F	For use with 15 ohm thermocouple	500 ms	27 VDC at 40 ma	Pulses at 2 KC rate—3 volts, open circuit voltage for 5 μs
EL 73	Thermocouple relay for temperature alarm, control relay, proportional controller	0 to 50 mv	105 ± 10 ohms	500 ms	12 or 28 VDC	Nonlatching/latching – .1 amp, .5 amp, DC; pulse output
EL 77	Dual set point version of Model 70	0-20 μa 0-100 μa 0-1 ma 0-10 ma 0-100 ma	4600 ohms to less than 1 ohm	100 ms max.	12 or 28 VDC	Nonlatching—up to 100 ma
EL 80	Comparator meets MIL-E-5272, temperature alarms, go/no-go logic, control relay, controller	0 to 500 μa with external set point pot	100 ohms ±10%	100 ms max. (10 ms available)	22 to 32 VDC	Nonlatching—100 ma max. Latching—1 amp max.
EL 82	Comparator meets MIL-E-5272, internal set point, output equivalent of SPDT	DC, AC and bipolar DC volts, current	100 ohms ±10%	100 ms max. (10 ms available)	22 to 32 VDC	Nonlatching—500 ma max. Latching—1 amp
EL 90	Thermocouple amplifier, thermocouple transmitter with cold junction compensation and excellent C.M.R.	0 to 50 mv	For use with 10 ohm thermocouple	1 cps	24 to 30 VDC	Proportional output, 4 to 20 ma DC
EL 101	Single channel alarm/controller for temperature, pressure, speed, strain systems. Differential or time proportioning control action through use of Series 30, 70 or 73 MAGSENSE BD.	micro-amp and millivolt signals from referenced transducers	2300 ohms to 0.1 ohm	1 ms up	115 VAC, 60 to 400 Hz	Isolated DPDT 5A resistive load; or pulse output to drive SCRs.
 EL 102	Dual channel alarm/controller for temperature, pressure, speed, strain systems. Differential or time proportioning control action through use of Model 77 MAGSENSE Board.	micro-amp and millivolt signals from referenced transducers	4600 ohms to less than 1 ohm	100 ms up	115 VAC, 60 to 400 Hz	2 isolated DPDT 5A resistive

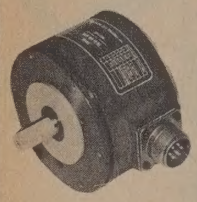
Pr s on request. Characteristics quoted in these specifications indicate the general area of operation for e model. Models with a variety of other input/output and operating capabilities are also available. F THE DISTRIBUTOR NEAREST YOU, check the listing in this catalog or contact C rol Data Corporation. Phone 612/545-2851, TWX 910/576-2978.

CONTROL DATA CORPORATION

COMPONENTS DIVISION—MAGNETIC PRODUCTS OPERATION
2300 Berkshire Lane, North, Minneapolis, Minn. 55427

SHAFT ENCODERS





OPTECON™—Optical Incremental Encoders . . . economy price basis . . . four physical configurations:

- OC25 (Industrial/Instrument Class); servo-size 25
- OS25 (Light-Duty Industrial Class); servo-size 25
- ON25 (General-Purpose Industrial Class); servo-size 25
- ON35 (Heavy-Duty Industrial Class); servo-size 35

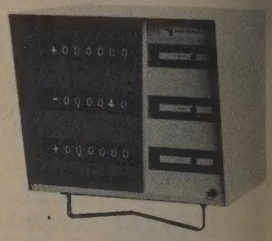
. . . fully integral circuitry (quadrature square wave, pulse and/or zero outputs) . . . bi-directional or non-directional sensing . . . hysteresis feedback for jitter-free operation . . . 150,000-hr. lamps . . . +5V or +12V operation . . . all-metal, rugged housings . . . standard resolutions: 64, 75, 100, 128, 200, 250, 254, 256, 360, 500, 508, 512, 600, 625, 635, 900, 1000, 1016, 1024, 1250, 1800, 2000, 2048 and 2500 cycles/turn . . . accuracy to 6 arc minutes.

PHOTOSYN™—Optical Incremental Encoders . . . high-resolution, high-accuracy models . . . servo-size 35, all-metal housing . . . standard resolutions: 2048, 2500, 2540, 3600, 4096, 5000, 5400, 6350, 6400, 7854, 8192, 9000 and 10000 cycles/turn . . . accuracy to 10 arc seconds.

BI-DIRECTIONAL COUNTERS

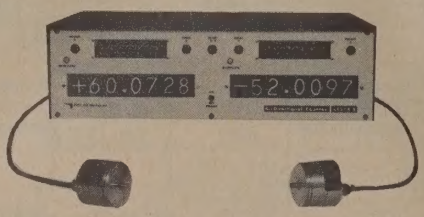
Model CIC — all-TTL circuitry on plug-in PC cards . . . counting and reversing rates >5 MHz . . . single and dual axis with ±4 to 7 decades . . . in-line numerical display . . . selectable inputs: A Quad B (x1, x2 and x4), Af(B), A-B . . . BCD output . . . axis resets . . . overflow indicators . . . thumbwheel preset option . . . self-contained 118 VAC ±10%, 50-60 Hz supply . . . rack mountable and table models.

Model CII — industrial version of model CIC . . . rugged TENV steel cabinet in single, dual and triple axis configurations . . . high noise immunity . . . in-line numerical display with ±5 to 7 decades . . . BCD output and thumbwheel presets optional . . . mounting options include table, rack or swivel base . . . self-contained power supply.



New MOS Counter — economical, compact bi-directional display counter . . . 100 KHz counting and reversing rates . . . LSI circuit modules on single PC card . . . extra noise immunity . . . single, dual and triple axis configurations . . . in-line numerical display with ±4 to 7 decades . . . self-contained power supply.

Counter Modules — both TTL and MOS bi-directional display counters available as modules for OEM applications.

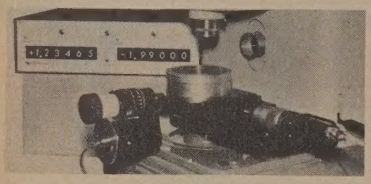


DIGITAL POSITION READOUTS

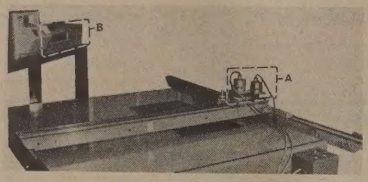
Digital measurement or control of rotational or linear position for machine-tool, process control, tracking, servo system and digital instrumentation applications.

Features:

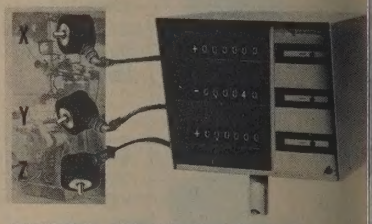
ECONOMY — Greatest Value per dollar . . . FULLY INTEGRAL SYSTEM — self-contained power supply for encoder as well as counter . . . MAXIMUM NOISE IMMUNITY — high-level encoder output coupled with line-receiver counter input . . . MATCHED ENCODERS and COUNTERS for best performance, reliability and accuracy . . . selection of TTL and MOS models . . . MULTI-FEATURE FLEXIBILITY satisfies a wide range of application requirements.



Digitized Micrometer Assembly and Readout



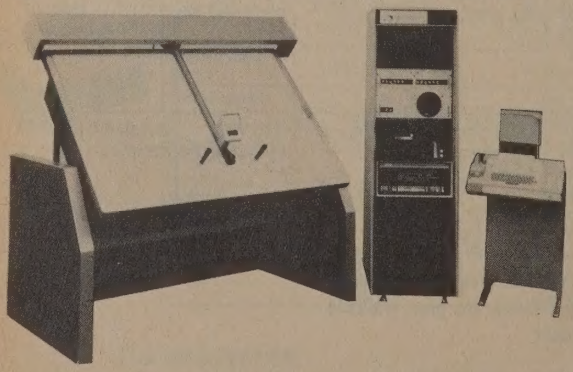
Coordinatograph Digital Readout Adaptor Kit



DATASYN™ Digital Readout Packages

COORDINATE DIGITIZERS

DATA TECH offers a full line of Coordinate Digitizers for N/C Tape Preparation and Graphical Codification in complete systems . . . great flexibility and advantages in: tape preparation for numerical control; image plane digitizing of projections; pattern, chart and photographic digitizing; precision drawing of templates and reticles; verification, precision plotting, cutting or positioning; and numerous others.



APD SERIES

Adaptable Program Digitizer: hard-wired coordinate digitizer tailored to specific format requirements of NC tools . . . prepares final control tapes directly from artwork, non-dimensioned drawing or negatives . . . reduces operating costs, increases productivity. Rugged, fixed-position or tilt-top light tables in popular sizes . . . complete selection of **must** features and useful accessories . . . economical solution for NC tape preparation requiring extensive dimensioning; accuracy to 0.002", resolution and repeatability to 0.001".

IPD SERIES

Image Plane Digitizer: coordinate digitizer specifically for work with film projections (such as bubble chamber tracks) . . . user oriented, consists of a rugged, stable, formica covered 1" cast aluminum digitizing table with Readout/Buffer Control Electronics . . . resolution is 0.001", accuracy to 0.002" . . . compatible outputs provided for data compilation on punched cards, paper tape, magnetic tape or direct feed to computer.

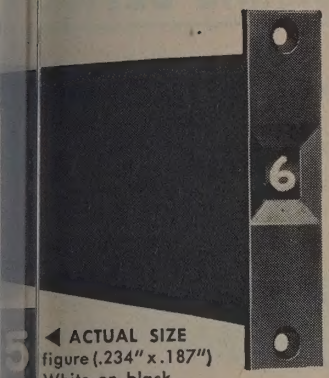
UPD SERIES

Universally Programmable Digitizer: integrated coordinate digitizing system to handle a wide variety of NC format requirements . . . computer along with GRAFTRAN software provide complete program and functional flexibility (self monitoring, repeat patterns, editing, code conversion, etc.) . . . wide variety of operating features and accessory options along with selection of fixed-position or tilt-top light table . . . accuracy to 0.002", resolution and repeatability to 0.001".

DATA TECHNOLOGY, INC

65 GROVE ST., WATERTOWN, MASSACHUSETTS 02172 / 617 • 924-1773 TWX: 710 • 329-0607

DURANT®
STRUMENT COUNTERS

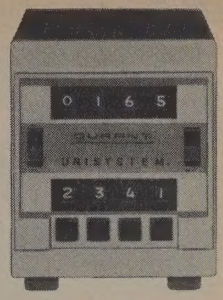


◀ ACTUAL SIZE
figure (.234" x .187")
White on black.

UNIPULSER®
HI-SPEED DECADE COUNTER
with both VISUAL and ELECTRIC READOUT

An important, off-the-shelf component providing Extreme VERSATILITY, Space-saving COMPACTNESS, 100 Million COUNT LIFE, plus Attractive LOW COST.

This unique decade counter of modular design, with speed of 40 pulses/sec. combines visual readout on a printed number wheel and electrical readout by means of an internal etched circuit switch. Each unit incorporates circuitry for resetting to zero and transferring the pulse from decade to decade in sequential counting. A Unipulser system can be adapted to Predetermined Counting (including automatic recycle), or for many other digital control requirements. Send for Catalog 90.



Durant 49600 and 49800 Unisystems are available as complete systems for desk, panel or relay rack mounting. 49600 model is additive with a variable predetermined number; 49800 is subtractive, with a factory-wired prewarn value.

STANDARD ELECTRIC COUNTERS for INSTRUMENTATION

Dura Electrics, combining dependability, fast speed, legib ty and long life with the advantages of remote coun g of impulses, make them particularly adaptable or certain instrumentation applications. Most mod available from stock — ready to be installed with ther instrumentation in control panels, or as an integ l part of a machine, instrument or system. Coils com tely within frame — will not burn out if left on sed circuit. UL approval on 115 V AC models.

"Y" SERIES

Available with 4-6-7 figures (also dozens unit wheel). Built-in rectifier operates coil on dependable DC current. Speeds up to 1500 CPM. Knob, lock, or non-reset. Operates under severe shock and vibrations. *Models also available without rectifiers.*

"YE" SERIES

A six figure model with instant push-button or electric reset. Can be reset under power or when coil is energized. High speed, up to 2400 CPM.

PANEL MOUNT

"Y" and "YE" Series can be mounted singly or in batteries with reading line flush with front of panel.

NEW "ME" SERIES

A small, precise electric counter. Available as six-figure non-reset and four-figure reset models, with base or panel mounting. DC and 115 VAC voltages available. Speeds to 1000 cpm. Request "ME" Bulletin.

SECIAL ELECTRICS: If standard models cannot do r job, variations or specially developed counters can engineered upon application.

STANDARD DIGITAL READOUT COUNTERS for SYSTEMS and INSTRUMENTATION

Durant pioneered the development of the first standardized line of stocked instrument counters for high speed, easy-to-read digital presentations. In just a few years this "first family" has grown from 96 model variations to over 200. This extensive selection of precision counters provides you with a wide choice of wheel sizes, number of figures, types of unit wheels, rotation and side of drive. In quickly satisfying virtually all of your design requirements, Durant will save you time and engineering costs. All models available Right or Left Drive, Clockwise or Anti-clockwise Rotation.

"Y" SERIES

Series Y — 11285 (24 models)
Hi-Speed Index, 2 to 7 figures

Series Y-8822 (24 models)
Single width unit wheel, 2 to 7 figures

Series Y-8823 (24 models)
1½ width unit wheel, 2 to 7 figures

Series Y-8829 (20 models)
Double width unit wheel, 2 to 6 figures

Series Y-8831 (16 models)
Dual Bank, in line. 2 to 5 figures/bank

Series Y-8831-1 (12 models)
Dual Bank, in line. Double width unit wheel. 2 to 4 figures/bank

Series Y-9425 (12 models)
Dual Bank, stacked. Single width unit wheel. 3 to 5 figures/bank

Series Y-9448 (12 models)
Dual Bank, stacked. 1½ width unit wheel

BEARING DEGREE COUNTERS

Series Y-9994 (4 models)
Double width unit wheel. Hi-speed Geneva Index. 4 figures only

Series Y-9992 (4 models)
Single width unit wheel. Hi-speed Geneva Index. 3 figures only

"D" SERIES

Series D-8856 (16 models)
Single width unit wheel, 3 to 6 figures

Series D-8861 (12 models)
1½ width unit wheel, 3 to 5 figures

Series D-11256 (12 models)
Hi-speed Geneva Index, 3 to 6 figures

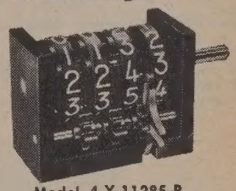
"S" SERIES

Series S-9679 (12 models)
Sub-miniature, single width unit wheel. 3 to 5 figures

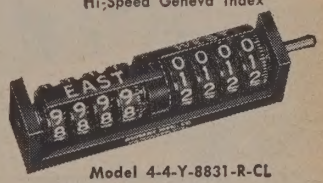
SPECIAL REVOLUTION COUNTERS

— In addition to the above listed standard models, many other minor variations can be made on request for specific requirements.

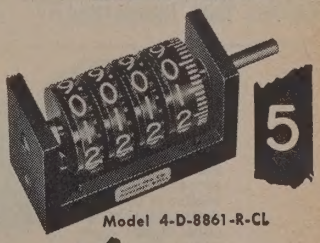
ACTUAL FIGURE SIZE



Model 4-Y-11285-R
Hi-Speed Geneva Index



Model 4-4-Y-8831-R-CL



Model 4-D-8861-R-CL

Model 4-S-9679-R-CL

NUMBER WHEELS and pinions available in all three sizes.

Send for Catalog 400

625 North Cass Street • Milwaukee 1, Wisconsin

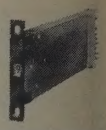
DURANT®
DIGITAL INSTRUMENTS
A CUTLER-HAMMER COMPANY

REPRESENTATIVES IN ALL PRINCIPAL CITIES 5010-3

ELECTRICAL AND MECHANICAL COUNTERS AND NUMBERING DEVICES

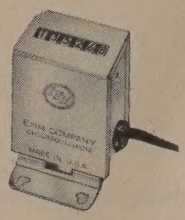
INDICATING MODULE

Model U44 — Panel mount, indicating, up to 40 pulses per second, resettable by external switch using half wave rectified A.C. source with fixed plug and removable socket.
Dimensions: Front panel 1.680″ high x ¼″ wide; Overall length 4.216″; Body height 1.125″.
Price each: $12.00
Also available with electrical readout, print wheels, high speed operation 80 pulses/second.

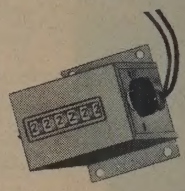


ELECTRICAL COUNTERS

BASE MOUNT

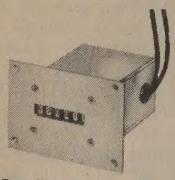


Model E2B—Economy electric counter, 6 digit, 110 V. 60 hz. 600 CPM, 12″ leads, non-resettable, base mount, "L" shaped mounting holes. U.L. Recognized.
Dimensions: 2.340″ long x 1.718″ wide x 1.187″ high
Price each: $5.58

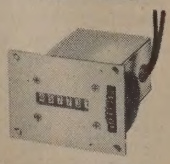


Model E3A—Basemount electrical impulse counter, standard speed (500 counts per min.), knob resettable 6 digits, 115 V. 60 hz. U.L. Recognized.
Dimensions: 2.63″ long x 2.03″ wide x 2.00″ high
Price each: $16.00

PANEL MOUNT

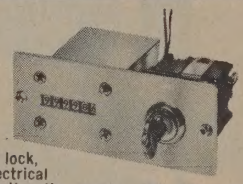


Model P2A—Panel mount electric counter, 6 digits, 115 V. 60 hz., (U.L. Recognized) 500 CPM, non-resettable.
Dimensions: 2.63″ long x 2.75″ wide x 1.87″ high
Price each: $14.00



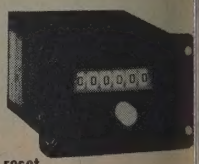
Model P3A—Panel mount electric counter, 6 digit, knob reset, 500 CPM, 115 V. 60 hz. (U.L. Recognized)
Dimensions: 2.63″ long x 2.25″ wide x 1.87″ high
Price each: $21.25

Model P4A—Panel mount electric counter, 6 dig key reset, 500 CPM, 115 V. 60 hz. (U.L. Recogniz
Dimensions: 2.63″ long x 4.50″ wide x 1.88″ high
Price each: $31.00



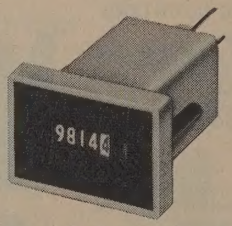
Model P6A—Panel mount electric counter non-reset with key lock, controlling two electrical circuits, one operating the counter, the other operating the equipment, 6 digit, 500 CPM, 115 V. 60 hz. key switch; D.P.S.T. standard 25 AMP, 120-250 V. A.C
Dimensions: 2.63″ long x 4.5″ wide x 1.87″ high
Price each: $24.00

Model P7A—Panel mount electric resettable counter with an exclusive key switch which turns the equipment on or off. Key necessary for manually resetting to zero, 6 digit, 500 CPM, 115 V. 60 hz., switch D.P.S.T. standard 25 AMP, 120-250 V. A.C. (U.L. Recognized)
Dimensions: 2.63″ long x 4.5″ wide x 1.88″ high
Price each: $36.00

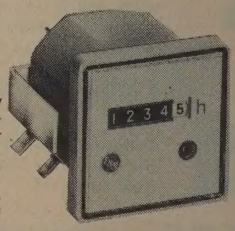


Model 443—Panel mount electric impulse counter, high speed, add only, push button reset 6 digits, 24 V. D.C., also available with electric reset or add/subtract push butt reset.
Dimensions: 3.98″ long x 2.75″ wide x 1.81″ hig
Price each: $34.72.

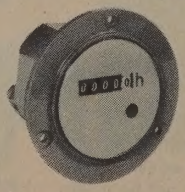
ELAPSED TIME INDICATORS



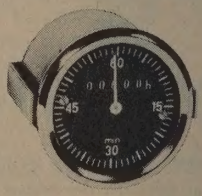
Stock T4B — Miniature elapsed time indicator, 5 digit, non-reset, 115 V. 60 hz., scale 9999.9 hours, with tenths in red, panel mount.
Dimensions: 1.72″ long x 1.59″ wide x 1.03″ high
Price each: $15.50



Stock T5B—Economy elapsed time indicator, 5 digit, non-reset, 110 V. 60 hz., scale 9999.9 hours, with tenths in red, mounting in 1.968 dia. hole or 1.781 square panel cutout.
Dimensions: 1.86″ long x 2.05″ wide x 2.05″ high
Price each: $15.00



Model T5BB—Economy elapsed time indicator, 5 digit non-reset, 110 V. 60 hz., scale 9999.9 hours with tenths in red, mounting in 1.968 dia. hole.
Dimensions: 2.88″ dia., 2.14″ long.
Price each: $15.95

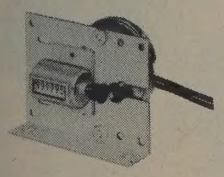


Model T8B—Panel mounted elapsed time indicator, records hours and minutes only in 6 V., 12 V. and 24 V. D.C. only, mounts in 2⅜″ dia. hole.
Dimensions: 2.6″ dia., 2.36″ long.
Price each: $27.63

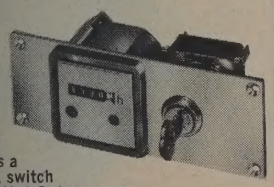
ENM Company, Inc. • 5306 W. LAWRENCE AVE., CHICAGO, ILLINOIS 60630 • 312-282-8787

ELECTRICAL AND MECHANICAL COUNTERS AND NUMBERING DEVICES

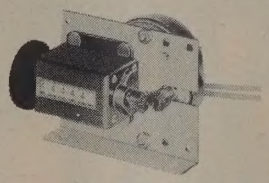
ELAPSED TIME INDICATORS



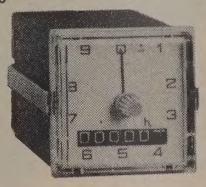
Model T10A — Low cost elapsed time indicator, 5 or 6 digit, hours or minutes scale with tenths in red, non-resettable, 115 V. 60 hz., other voltages available, universal bracket mount.
Dimensions: 2.25″ long x 3.0″ wide x 2.31″ high.
Price each: $15.10.



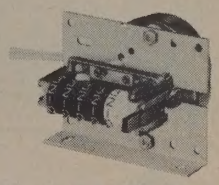
Model P8C — Economy elapsed time indicator with security lock and key, only actuates a standard D.P.S.T. switch 25 AP, 120-250 V. A.C. to start equipment; thus true operating hours are recorded. 5 digit, non-reset, 110 V. 60 hz., scale 9999.9 hours with tenths in red, panel mount.
Dimensions: 1.828″ long x 5.505″ wide x 1.891″ high
Price each: $29.50



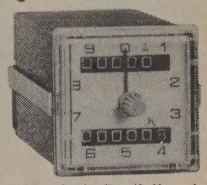
Model T20A — Elapsed time indicator, 5 or 6 digit, hours or minutes scale with tenths in red, knob resettable, 115 V. 60 hz., other voltages available, universal bracket mount.
Dimensions: 2.45″ long x 3.0″ wide x 2.31″ high.
Price each: $18.60



Model T2B — Low cost 7 digit elapsed time indicator, records hours, tenths and hundredths, tenths in red, hundredths with sweep hand, knob resettable, 110 voltage, 60 hz. panel mount.
Dimensions: 4″ long x 1.87″ wide x 1.87″ high
Price each: $22.00

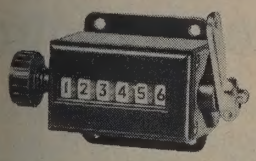


Model T30A — Elapsed time indicator, 4 or 5 digits, hours, minutes or seconds scale with tenths in red, push button resettable, 115 V. 60 hz., other voltages available, universal bracket mount.
Dimensions: 2.81″ long x 3.0″ wide x 2.31″ high.
Price each: $20.73

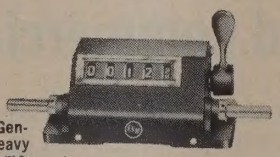


Model T3B — Low cost dual 7 digit odometer elapsed time indicator, records hours, tenths and hundredths, tenths in red, hundredths with sweep hand, one odometer knob resettable, other total time, 110 voltage, 60 hz., panel mount.
Dimensions: 4″ long x 1.87″ wide ″ 1.87″ high
Price each: $27.50

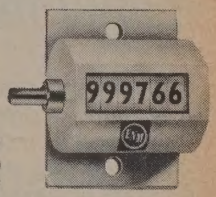
MECHANICAL COUNTERS



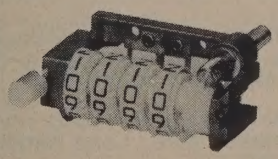
Model 426 — Small medium duty 6 digit mechanical stroke counter with resettable knob and operating lever, 1000 CPM, base mount.
Dimensions: 1.63″ long x 1.00″ wide x 1.045″ high
Price each: $7.68



Model 428 — General purpose heavy duty, 6 digit, mechanical double shaft counter, revolution drive, adds or subtracts one count for each complete revolution of input shaft, 10,000 CPM, base mount with resettable lever.
Dimensions: 3.094″ long x 2.250″ wide x 1.781″ high
Price each: $30.94



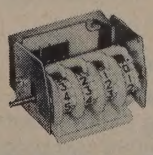
Model 421—Small medium duty 6 digit mechanical revolution counter, 3000 CPM, non-resettable, base mount.
Dimensions: .994″ long x 0.790″ wide x .838″ high
Price each: $5.18



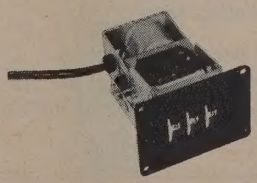
Model 433 — Tape recorder counter with push button reset, worm drive, 1 count per input revolution, 4 digit, high speed, adds and subtracts.
Dimensions: 1.66″ long x 1.89″ wide x .87″ high
Price each: $7.50

Model M99 — Exceptionally economical tachometer combines hand speed counter and stop watch to measure rpms, rated to 6000 rpm max., knob resettable.
Dimensions: 2.36″ dia.
Price each: $52.92

PREDETERMINING COUNTERS



Model M36 — Predetermining mechanical counter, 3 digit, 200 strokes per min. Predetermined contact is a single pole double throw switch, capacity 5 A., 250 V. A.C. Terminals on switch, panel mount, preset by 3 setting knobs.
Dimensions: 2.155″ long x 3.062″ wide x 2.312″ high
Price each: $20.50



Model PE 35 — A three digit 115 W. electrical predetermining counter 200 pulses per min. Predetermining contact is a single pole double throw switch, capacity 5A, 250 V. A.C. panel mount. Preset by three setting knobs. U.L. Recognized.
Dimensions: 3.580″ long x 3.062″ wide x 2.312″ high
Price each: $24.98, 2 figures; $26.53, 3 figures

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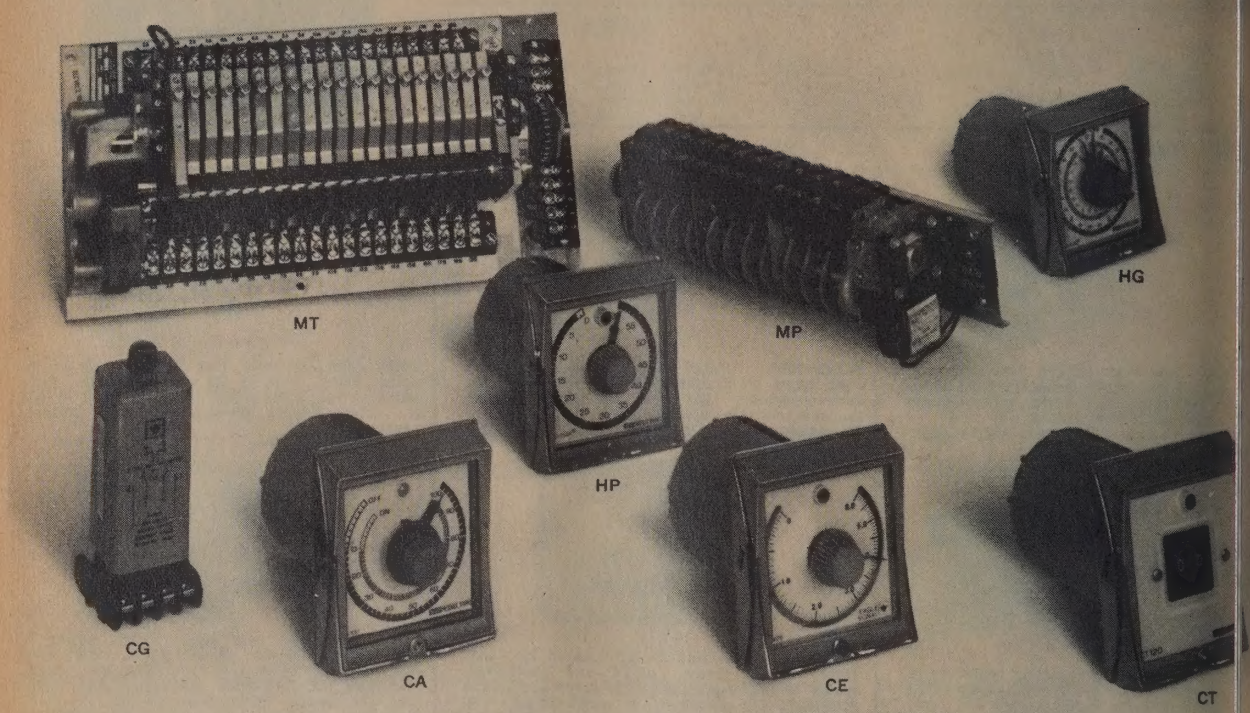


Eagle industrial and commercial time/count contro

A complete line that includes solid-state, electronic, electromechanical, and pneumatic types in commercial, industrial and military grades. Eagle also designs and produces custom time/count devices and systems for special applications. More than $1 million in stock plus professional ser e at 35 major areas throughout the world, inclu g U.S.A., S.A., Europe, U.K., Canada and Austr a. For complete data, write Eagle Signal, 736 Fed al Street, Davenport, Iowa 52803.

Time-Delay or Single-Cycle Timers

HP Cycl-Flex®—Plug-in case easy to install, reduces downtime. Dial ranges from 5 sec. to 60 hrs. Series also includes solid-state reset timer, 80-count timer, pulse timer, and percentage timer.

CE400 New Solid State—Adjustable delay between actuation of control and operation of load circuits. Mirror dial minimizes parallax errors. Plug-in case.

CG Solid-State Series—Reliable, accurate and economical for applications requiring delay up to 60 sec. Adjustable knob timer plugs into octal relay socket . . . a perfect replacement for pneumatic timers.

Repeat Cycle Timers

HG Flexopulse®—Dual-function with single dial for 30-sec. to 60-hr. cycles. Adjustable without setting cams or changing gears.

MP Multipulse Adjustable Cam Actuator—2-12 SPDT switches. Cycles from 6 sec. to 36 hours. Contact t- ing, 10 amps @ 120 VAC.

CA Solid-State—Continuous on-off cycles from 3 o 1000 times/minute. Load handling capacity 1 a p @ 120 VAC.

Counters

CT120, CT130—Solid-state. 1200 contact clos e counts/minute. Min. closure 40 milliseconds, m . opening 10 milliseconds. Binary thumbwheels; plug n case.

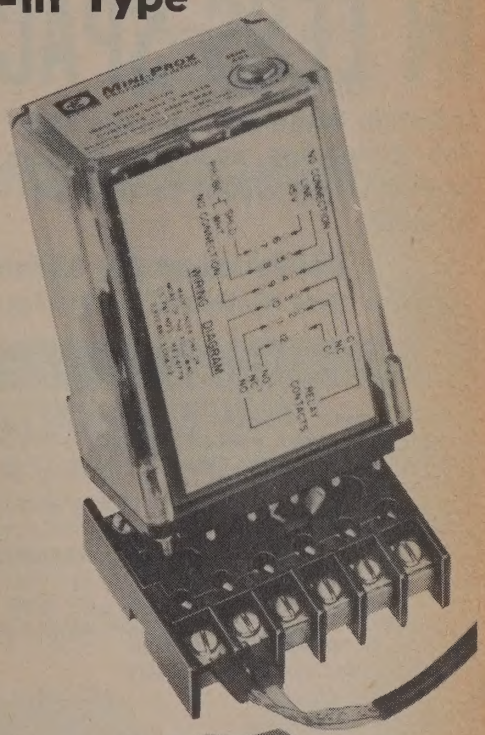
Sequence Programmers

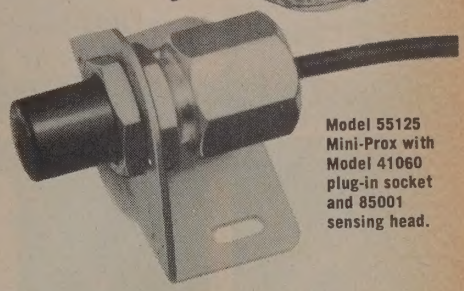
MT Step Switch—Up to 19 circuits turned on and f in sequence established by break-out cams. For c - trol of machines and processes.

G+W **Eagle Signa**
a systems division of
GULF + WESTERN INDUSTRIES, INC

ELECTRO MINI-PROX

Low Cost — Plug-in Type





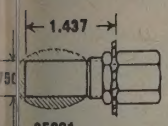
Model 55125 Mini-Prox with Model 41060 plug-in socket and 85001 sensing head.

Compact Proximity Sensing System for Non-contact, Detection and Control of Ferrous and Nonferrous Metals

Accuracy of sensing distance is often a critical factor in sensing and control applications. Mini-Prox accuracy can be depended upon in any environment; heat to +160°F or cold to −30°F at either probe or control. Line voltage variations from 105 to 130 volts — dust — moisture — vibration, none of these affect its accuracy. You can set it and forget it.

Plug-in design provides for easy wiring. Unitized construction eliminates soldering or wiring of sensitivity controls. Connections for power, sensing head and relays are made to screw-type socket terminals. Operations up to 600 per minute may be controlled or monitored by the Model 55125 illustrated. Electronic output models for higher speeds are also available.

5 STANDARD TEMPERATURE-STABLE SENSING HEADS



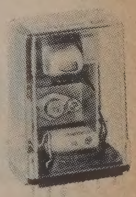
Model No.	Sensing Face Dia.	Sensing Range	Overall Length	Mounting	Cable
4943	.312″	.050″ to .250″	1⅝″	⅜″ - 24	10′
4944	.375″	.050″ to .250″	1¼″	clamp	10′
85.001	.655″	.050″ to .250″	2⅛″	bracket	10′
85.002	.655″	.100″ to .500″	2⅝″	bracket	10′
85.003	.750″	.300″ to 1.000″	3¾″	bracket	10′

MINI-PROX MODELS FOR A VARIETY OF FUNCTIONS

Model No.	Output	Additional Data
5125	10A DPDT Relay output	115V Power
5126	10A DPDT Relay output	230V Power
5141	Electronic output +12V metal near; −0.5V metal away	115V Power
5145	Electronic output +12V metal near; −0.5V metal away	230V Power
5132	Delayed-make relay unit	.05 - 1 sec. delay
5133	Delayed-make relay unit	.5 - 10 sec. delay
5136	Delayed-break relay unit	.05 - 1 sec. delay
5137	Delayed-break relay unit	.5 - 10 sec. delay
5148	Solid State AC output	3 Amp 200 Vp
5147	Solid State DC output	1 Amp 150 V max.
MINI-PROX OR MAGNETIC PICKUP SPEED CONTROLS		
5149	These 5 models cover 5 ranges from 0.1 Hz min. to 15,000 Hz max. Each have optional under or over-speed control and optional latching feature.	Freq. .1 to 1.5 Hz
5150		Freq. 1 to 15 Hz
5151		Freq. 10 to 150 Hz
5152		Freq. 100 to 1500 Hz
5153		Freq. 1000 to 15,000 Hz

ELECTRO MANUFACTURES A COMPLETE FAMILY OF MINI CONTROLS TO SOLVE A BROAD VARIETY OF PROBLEMS

Mini-Speed Solid-State control for under/over speed detection of shafts —gears—any moving ferrous or non-ferrous metal. Activated by electronic output Prox, Magnetic Pick-up, or Di-Mag.



Mini-Prox Switch Solid-State AC or DC controls for applications demanding limitless switching activations or extremely high switching speeds. For use with Mini-Prox Models 55141, 55145 only.

Mini-Delay Solid State Delay Relays for delayed-make or delayed-break control applications. Both types activated by contact closure or Mini-Prox electronic output.

Mini-Tach Frequency to DC Converters for applications requiring the conversion of any time varying electrical signal into a DC voltage or current.

ELECTRO PRODUCTS LABORATORIES, INC.
61P Howard Street, Chicago, Illinois 60648 • 312/647-8744

Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

MORE FUNCTIONS IN LESS SPACE

radiation hardened magnetic Flat Pak modulators, analog multipliers, demodulators mount directly on IC cards.

- **Flat Pak design only 0.1″ thick.**
- **Zero Hysteresis.**

Accuracy 1% absolute or 2 MV whichever is greater

As an Analog Multiplier of a Bipolar DC signal times an AC signal, the output **product accuracy** is 1% of point, or 2 MV, whichever is greater over a dynamic range of 10,000:1 in each quadrant.

Over the temperature range of —55°C to +125°C, the following parameters hold:

1) Zero Point Drift: ..... Less than 2 MV of in phase component
2) Gain Slope Stability ..... Less than 2% change.
3) Dynamic range and output wave quality independent of temperature variations

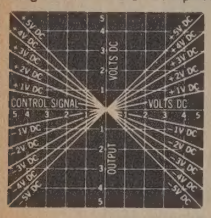
Typical input/output parameters:

X Signal: ..... 0 to ±5V
Y Signal: ..... 0 to ±5V
Output: ..... 0 to 5V RMS across 5K or greater load impedance

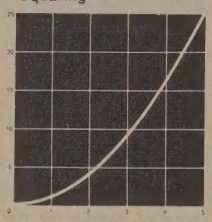
- Hybrid assemblies mount directly on IC cards.
- Space saver design . . . typical dimensions 0.1″ th x 0.5″ x 0.75″.
- Rugged design, extreme reliability, MTBF design goal 25 per million hours.
- Extremely low drift over —55° to +125°C range.
- Not affected by high intensity nuclear radiation.
- Capable of operating on carrier frequencies as high as ve Mhz.
- One or more isolated or floating input signals may be ed for modulating, multiplying, dividing, squaring or extra ng a root.
- No external nulling or offset adjustments.
- No additional components or compensation required.
- No external operational amplifiers required.
- Standard ±15V DC power supplier unless otherwise s ci- fied.

Magnetic Multipliers, Dynamic Product Range: **80 db** **Magnetic Modulators,** Dynamic Range: **60 d**

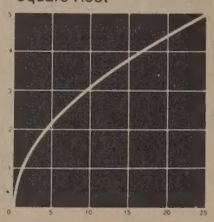
Magnetic DC x DC Multiplier



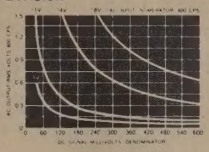
Squaring



Square Root



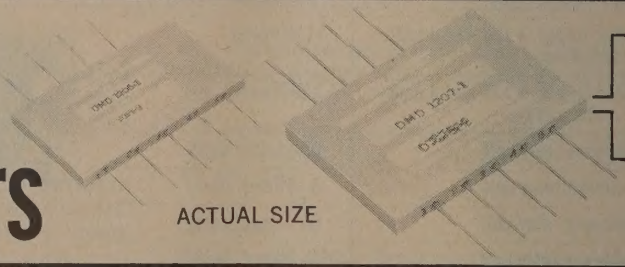
Division



Amplitude Modulation

Balanced Modulato

Flat Pak Demodulators



ACTUAL SIZE

NEW FLAT PAK DESIGN ONLY 0.1″ THICK

TYPE NUMBER	DMD 1206-1	DMD 1207-1	TYPE NUMBER	DMD 1206-1	DMD 1207-1	TYPE NUMBER	DMD 1206-1	DMD 120
REFERENCE			OUTPUT			AMBIENT TEMP.		
A. Voltage	26 V	26 V	A. Maximum Output	1.0 V	1.0 V	RANGE	—55°C to +125°C	—55°C to +12
B. Frequency	400 Hz	2 KHz	B. Load	30 K	30 K	PHYSICAL SIZE	0.95 X 1.65 X 0.1	0.95 X 1.3 X
C. Impedance	> 50 K	> 50 K	C. Linearity	0.5% fs	0.5% fs	D.C. POWER	±15 V	±15 V
SIGNAL			D. Frequency Response	30 Hz	30 Hz			
A. Voltage Range	0-1 V	0-1 V	E. Ripple	> 30 mv	> 10 mv			
B. Frequency	400 Hz	2 KHz	F. Null	1 mv	1 mv			
C. Impedance	> 15 K	> 15 K						

There is No Substitute for Reliability

A typical unit gives 1 v. DC per 1 v. AC and provides 10K impedances on both signal and reference windings. This demodulator provides less than 2% absolute linearity from 0.1 v. to 10.0 v. output. Operation is over an ambient range of —55°C to +125°C. Output impedance less than 500 ohms DC; offset null less than 8 mv over the entire ambient range.

GENERAL MAGNETICS • INC

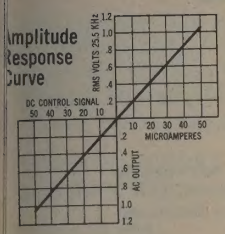
135 Bloomfield Ave., Bloomfield, New Jersey 07003—Tel. (201) 743-2700

See YELLOW SECTION for Local Offices, Phones

'Mag Mod' Micro-miniature Magnetic Modulators

... Design Analog Computers with Micro Magnetics

General Magnetics



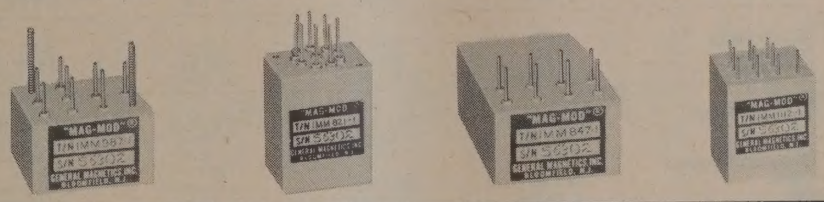
Typical Performance Data — Model 748-3

- Output distortion as low as 1%
- Electrical zero point and gain, repeatability and stability over the entire service life
- Extremely broad bandwidth
- Carrier frequencies as high as 5 MHz
- Input signal current resolution better than 0.001 μa
- Low milliwatt power consumption

Circuit Isolation—DC to AC Sinusoidal Conversion and Amplification

"MAG MODS" PROVIDE FOUR QUADRANT OPERATION, extreme stability with negligible change of phase, gain and zero position over a wide temperature range. Design is simple, featherweight and rugged—with no vacuum tubes, semiconductors or moving parts to limit life.

MICRO MAGNETIC MODULATORS FEATURE an essentially drift-free circuit with superior phase and gain stability over wide environmental ranges. All the ruggedness, dependability, wide dynamic range and stability that are characteristic of the larger magnetic modulators are engineered into this new magnetic circuit. MICRO "MAG MODS" are shock and vibration proof, provide infinite standby and service life. The micro modulators below are typical; for specifications on other models request literature.



TYPE NUMBER	IMM 987-1	IMM 821-1	IMM 847-1	IMM 1112-1
Reference Carrier Voltage and Frequency	115 V 400 Hz	3 V RMS @ 96 KHz	5 V @ 800 Hz	3.5 V RMS @ 1 MHz
Input Control Signal Range	0 to ±150 μa DC	0 to ±100 μa (DC to 1000 Hz)	0 to ±200 μa DC	0 to ±3 ma DC (DC to 200 KHz)
Resistance of Input DC Signal Winding	3 Inputs — 4.5 K each	150 ohms	12.5 K ohms	1000 ohms
180 Phase Reversing AC Output Range	0 to 5 V RMS @ 400 Hz	0 to 0.6 V RMS @ 96 KHz	0 to 1 V RMS @ 800 Hz	0 to 3 V RMS @ 1 MHz
Differential Gain RMS mv. AC Output/ua DC Sig. Input	33 mv RMS/μa DC	6 mv RMS/μa	5 mv RMS/μa DC	1 V RMS/ma DC
AC Output Null (Noise Level) RMS	25 mv RMS	20 mv RMS Max.	5 mv RMS	30 mv RMS
Output Impedance	1.2 K ohms	7.5 K ohms	10 K ohms	3 K ohms
External Load	25 K ohms	100 K ohms	50 K ohms	50 K ohms
Excitation (Carrier Winding) Impedance	200 K ohms	115 ohms	12 K ohms	800 ohms
Zero Point Drift over Temp. Range Referred to DC Input Terminals	±0.2 μa DC	±0.2%	±0.5 μa DC	±0.5%
Hysteresis in Percent of Max. Input DC Signal	±0.2%	±0.2%	±0.4%	±0.5%
Harmonic Distortion in Output Wave	10%	5%	10%	3%
Temperature Range	−55°C to +80°C	0°C to +100°C	−55°C to +100°C	−55°C to +85°C
Frequency Response	DC to 100 Hz	DC to 1000 Hz	DC to 200 Hz	DC to 200 KHz
Overall Dimensions (in inches)	.550 X .750 X .550	0.562 X 0.40 X .750	1 3/16 X 1 3/16 X ½	0.4 X 0.5 X 0.6
Type of Mounting	2-56 Studs	Printed Circuit Board	Printed Circuit Board	Printed Circuit Board 1/10" Grid
Approximate Weight (in ounces)	0.3 ounce	0.12 ounce	0.2 ounce	0.1 ounce

"MAG MODS" conform to MIL-T-27A and MIL-E-5400 Specifications

Prime Components in Solid State Design—The "MAG MOD" family of Magnetic Modulators has proven to be the most reliable module circuit block in aircraft and space vehicle flight control systems developed to date. They are universally accepted and in use in many military and commercial products where reliability is a price factor. Request literature.

There is No Substitute for Reliability

GM INC.

GENERAL MAGNETICS • INC

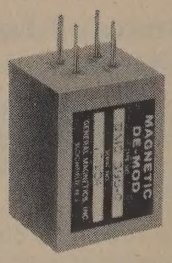
135 Bloomfield Ave., Bloomfield, New Jersey 07003—Tel. (201) 743-2700

Design Analog Computers with Micro Magnetics..

G/M Solid State Magnetic Demodulators

FREQ. RANGE 60 Hz to 10 KHz

General Magnetics



G/M MAGNETIC DEMODULATORS are solid state circuits for converting phase reversing AC signal voltages into phase detected polarity reversing DC voltages; the amplitude and polarity of the DC output are directly proportional to the phase and amplitude of the AC signal.

- High reference impedance resulting in very small reference power requirements
- Output as high as ±10 v. DC in present units
- Unit operation frequencies; 60 Hz to 10 KHz
- Operation over wide environmental range
- Very low DC offset null voltages (as low as 0.1% of full scale)
- Signal and reference terminals may be isolated
- Low output impedance
- Small physical size

TYPE NUMBER	DMD 1012-1	DMD 1013-1	DMD 1017-1	DMD 1023-1	DMD 1024-1	DMD 1[illegible]-1
REFERENCE						
A. Voltage	115 V	115 V	115 V	30 V-P-P	30 V	15 V
B. Frequency	60 Hz	400 Hz	400 Hz	55 Hz	900 Hz	50 to 6[illegible]
C. Impedance	> 50 K	> 50 K	> 5 K	≈ 2.7 K	≈ 31 K	≈ 5.1
SIGNAL						
A. Voltage Range	0-1 V	0-10 V	0-10 V	0-5 V	0-3 V	0-10
B. Frequency	60 Hz	400 Hz	400 Hz	55 Hz	900 Hz	50 to 6[illegible]
C. Impedance	10 K ±10%	10 K +10%	> 10 K	> 10 K	> 3 K	≈ 3
OUTPUT						
A. Maximum Output	±0.5 V ±5%	±5 V ±5%	±3 V ±5%	±4 V ±5%	±100 mv ±10%	±10 V ±[illegible]
B. Load	25 K ohms	5 K ohms	2 K ohms	10 K ohms	250 ohms	10 K o[illegible]
C. Linearity	±1% fs	±1% fs	±1% fs	±1% fs	±1% fs	±1%
D. Frequency Response	—	—	40 Hz	0.5 Hz	0.5 Hz	—
E. Ripple	No Filter	No Filter	< 150 mv	< 200 mv	< 0.5 mv	< 400
F. Null	< 10 mv	< 10 mv	< 10 mv	< 10 mv	< 60 μv	< 15
AMBIENT TEMP. RANGE	—30°C to +85°C	—30°C to +85°C	—30°C to +71°C	0°C to +50°C	0°C to +50°C	—10°C to [illegible]
PHYSICAL SIZE	1 X 1 X 2.5	1 X 1 X 2.5	1 X 1 X 2.5	0.95 X 1 X 2.5	1 X 1.7 X 0.75	1.9 X 1.25 [illegible]
D.C. POWER	+15 V	+15 V	+28 V	±15 V	±15 V	+15

TYPE NUMBER	DMD 1034-1	DMD 1040-1	DMD 1053-1	DMD 1074-1	DMD 1066-1	DMD 1[illegible]-1
REFERENCE						
A. Voltage	26 V	115 V	115 V	115 V ±5%	115 V ±10%	115
B. Frequency	400 Hz	400 Hz	400 Hz	400 ≈ ±5%	400 Hz	400 [illegible]
C. Impedance	> 8 K	> 100 K	> 100 K	> 100 K	> 40 K	> 100
SIGNAL						
A. Voltage Range	0-5 V	0-3.2 V	0-0.5 V	0-50 V	0-10 V	0-2.5
B. Frequency	400 Hz	400 Hz	400 Hz	400 ≈	400 Hz	400 [illegible]
C. Impedance	> 10 K	> 3 K	> 200 K	> 1 meg	> 15 K	> 200
OUTPUT						
A. Maximum Output	±5 V ±5%	±5 V ±5%	±2.5 V ±5%	±50 V ±5%	±1.0 V ±5%	±1.0 V ±[illegible]%
B. Load	10 K ohms	50 K ohms	10 K ohms	100 K	1 K	10 [illegible]
C. Linearity	±1% fs	±1% fs	±1% fs	±1% fs	± 1% fs	±1%
D. Frequency Response	≈ 100 Hz	—	30 Hz	80 ≈	N.S.	> 30
E. Ripple	< 450 mv	No Filter	< 125 mv	< 50 mv	< 40 mv	< 30
F. Null	< 15 mv	< 10 mv	< 4 mv	< 100 mv	< 4 mv	< 4 [illegible]
AMBIENT TEMP. RANGE	0°C to +85°C	—30°C to +85°C	—20°C to +50°C	0°C to +65°C	—55°C to +90°C	—40°C to [illegible]8°C
PHYSICAL SIZE	0.6 X 0.9 X 1.8	1 X 1 X 2.5	1 X 1 X 2.5	2.6 X 1.95 X 2	1.6 X 0.8 X 0.6	1 X 1 X [illegible]
D.C. POWER	±15 V	No	+24-32 V	±15 V ±60 V	±10 V	+24 — [illegible]V

All units available in wider temperature ranges. See Bulletin 108B for other stock types.

There is No Substitute for Reliability

A typical unit gives 1 v. DC per 1 v. AC and provides 10K impedances on both signal and reference windings. This demodulator provides less than 2% absolute linearity from 0.1 v. to 10.0 v. output. Operation is over an ambient range of −55°C to +125°C. Output impedance less than 500 ohms DC; offset null less than 8 mv over the entire ambient range.

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Micro Magnetic Multipliers

AC x DC MONOLITHIC ANALOG COMPUTING MODULES

..For Unlimited Life and Superior Performance!

General Magnetics

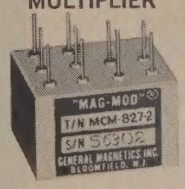
MONOLITHIC MICRO CIRCUIT BLOCK for analog voltage multiplying of DC x AC voltages.

ADDITION, SUBTRACTION, MULTIPLICATION, AND SQUARING of many voltage variables may be handled by one G/M Magnetic Microblock.

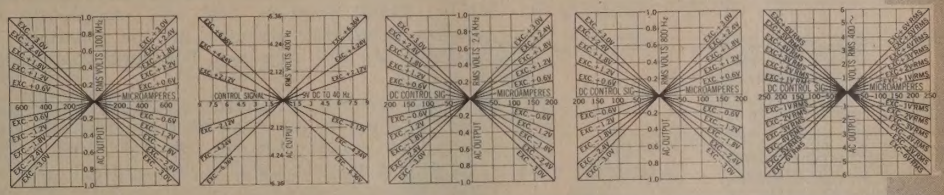
PRODUCT ACCURACY of up to 0.2% of full scale, with very slight derating over a wide temperature range.

- Proven reliability—unlimited life
- Extreme stability with negligible change of product accuracy over a wide temperature range
- High shock and vibration proof
- Bandwidth may be extended into the kilocycle
- Low milliwatt power consumption
- Four quadrant operation
- Repeatable data over years of continuous unattended operation
- Simple, lightweight, rugged
- May be mounted directly on printed circuit cards

World's Smallest and Most Reliable G/M ANALOG VOLTAGE MULTIPLIER



New micro-miniature G/M Analog Voltage Multiplier as small as 0.1 cubic inch, weighing as little as 0.1 ounce.



TYPE NUMBER	MCM 827-2	MCM 1079-2	MCM 845-1	MCM 847-1	MCM 893-2
Product Accuracy	1% Maximum	1% f.s.	Less than 1%	1% f.s.	1% f.s.
Input Control Signal Range	0 to ±800 μa (DC to 5,000 Hz	0 to ±9 V DC (DC to 50 Hz	0 to ±200 μa (DC to 100 Hz	0 to ±200 μa (0 to 50 Hz	0 to ±250 μa DC
DC Resistance of Input Signal Range	500 ohms	50 K ohms	12.5 K ohms	12.5 K ohms	2,500 ohms
Input AC Sig. Range Amplitude, Frequency	0.6 V to 3 V RMS 100 KHz	0 to 6 V RMS 400 Hz	0 to 3 V RMS 2400 Hz	0 to 3 V RMS 800 Hz	0 to 6 V RMS 400 Hz
AC Output Product Range	0 to 1 V RMS @ 100 KHz	0 to 6 V RMS @ 400 Hz	0 to 1 V RMS @ 2.4 KHz	0 to 1 V RMS @ 800 Hz	0 to 6 V RMS @ 400 Hz
Noise at Max. AC Signal, Zero DC Signal	15 mv RMS	50 mv RMS	10 mv RMS Max.	10 mv RMS Max.	30 mv RMS
Output Impedance	650 ohms	50 ohms	12 K ohms	8 to 10 K ohms	600 ohms
External Load	10 K to 100 K ohms	5 K to 50 K ohms	50 K ohms	50 K ohms	25 K or greater
Temperature Range	−55°C to +85°C	−55°C to +71°C	−55°C to +100°C	−55°C to +100°C	−55°C to +85°C
Null Drift over Temp. Range	±0.2% of f.s.	±0.2% f.s.	±0.2%	±0.2%	±1 μa RC ±μa DC*
Accuracy Variation over Temp. Range	±0.5%	±0.5%	±0.2%	±0.2%	±0.5%
Hysteresis in % of Max. Input DC Signal	±0.1%	±0.4%	±0.2%	±0.2%	±0.5%
% Harmonic Dist. in Output Prod. Wave	Less than 5%	5%	3% to 5%	5% maximum	5% maximum
Overall Dimensions (in Inches)	5/8 X 25/32 X 1/2	0.6 X 0.7 X 1.0*	37/64 X 25/32 X 1/2	37/64 X 25/32 X 1/2	1.7 X 1.560 X 0.60
Approximate Weight (in Ounces)	0.26 ounce	0.5 ounce	0.26 ounce	0.26 ounce	3 ounces

*Reference to input

For proven reliability in solid state magnetic module applications, these high reliability devices are widely employed in flight systems, fire control, analog computers, guided missiles, nuclear equipment, antennas and thousands of control systems; request literature. Customized engineering, when required, is performed on a no-charge basis. Delivery as required.

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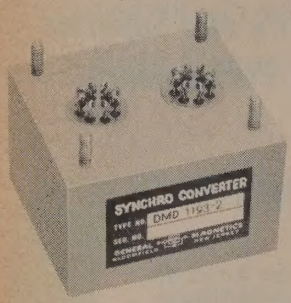
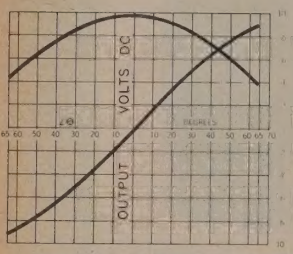
135 Bloomfield Ave., Bloomfield, New Jersey 07003—Tel. (201) 743-2700

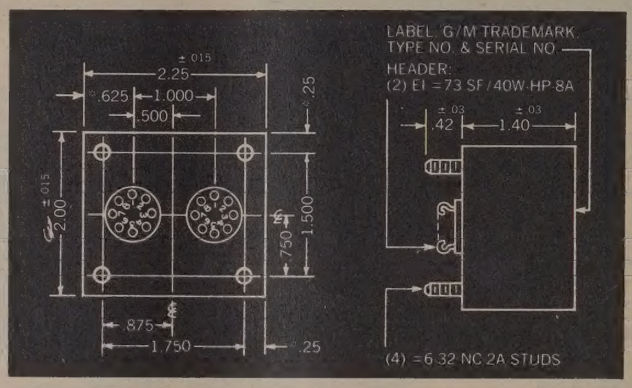
Solid State Sine-Cosine Synchro Converter



This new encapsulated circuit converts a 3-wire synchro input to a pair of d-c outputs proportional to the sine and cosine of the synchro angle.

- Complete solid state construction.
- Occupies a volume of only 3.2 cu. in. (Single Channel)
- Operates over a wide temperature range.





Typical Specifications
Type DMD 1193-2
Deal Channel Synchro Converter
ACCURACY — Overall conversion accuracy 6 minutes.
AMBIENT TEMPERATURE:
RANGE — Operating −40°C to +1[illegible]C
Storage −62°C to −1[illegible]C
APPLICATIONS — Analog computers
Flight systems
Fire control
Guided missiles

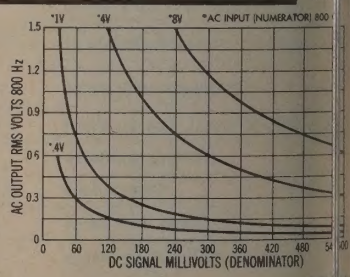
	TERMINAL	FUNCTION	
HEADER A	1	S1	SYNCHRO INPUT ±1
	2	S3	11.8 V RMS ±10% L-L 400 Hz ±5%
	3	S2	REFERENCE
	4	R2	115 V RMS ±5% @
	5	R1	400 Hz ±5%
	6	+15 V DC	
	7	DC GROUND	
	8	−15 V DC	
HEADER B	1	S1	SYNCHRO INPUT ±2
	2	S3	11.8 V RMS ±10% L-L 400 Hz ±5%
	3	S2	
	4	SINE	OUTPUT ±1
	5	COSINE	10 V DC FULL SCALE OUTPUT
	6	SINE	OUTPUT ±2 10 V DC FULL SCALE OUTPUT
	7	DC GROUND	
	8	COSINE	OUTPUT ±2 10 V DC FULL SCALE OUTPUT

DUAL CHANNEL SYNCHRO CONVERTER General Magnetics Model DMD 1193-2 provides two (2) completely independent sine-cosine synchro converter circuits in one package. Overall conversion accuracy is six (6) minutes. Temperature range is —40°C to +100°C.

This new General Magnetics circuit converts a 3 wire synchro input to a pair of d-c outputs proportional to the sine and cosine of the synchro angle. The circuit features complete solid state construction, occupies a volume of only 3.2 cubic inches and operates over a wide temperature range. Overall conversion accuracy defined by the tangent of the angle whose sine and cosine are generated is six (6) minutes. Models are available with both single and dual channel outputs.

Magnetic Division Modules

These modules can be engineered to meet the most exacting requirements. They employ a new concept which eliminates high gain operational amplifiers and logarithmic circuitry previously used in electronic dividers. This means fewer components resulting in high reliability, excellent stability, micro-miniature size and lower cost. The combination of magnetic and semiconductor circuitry results in analog division with accuracies of 1% or better over wide environmental ranges. The output is an AC sinusodial signal which is the quotient of an AC numerator and a DC denominator.

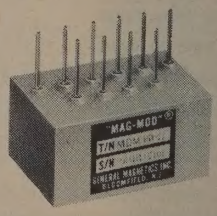


Specifications — Type MDM 889-1*

*Above specifications apply only to MDM 889-1 and may be changed to fit exact requirements

EXCITATION (NUMERATOR):	0.4 V to 8 V : 800 Hz
BIAS:	+30 V DC
OUTPUT LOAD:	5 K
SIGNAL (DENOMINATOR):	30 MV to 600 MV
AMBIENT TEMPERATURE RANGE:	0°C to +70°C

Micro-miniature Size
Completely Solid State
Low Power Consumption
Wide Numerator and Denominator Ranges
Isolated Inputs
Low Output Impedance



These dependable analog computing modules are widely employed in flight systems, fire control, analog computers, guided missiles, nuclear equipment, antennas and thousands of control systems. Micro-circuit, miniature, subminiature, standard and specials are available for proven reliability in linear division, trig function conversion, automatic gain control, etc., applications.

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ul line of high quality industrial time count, control devices

APSE TIME INDICATORS

EF 27 — **BULLETIN EF-1**
Simple through-panel stud mounting. All mounting hardware provided. Synchronous AC motor direct drives six digits, readout in minutes—or hours—and tenths. Monitors maintenance, rental time, running time . . . wherever accurate record of elapsed time is important. Square Bezel 2⅜" unit, depth 1²³⁄₃₂", barrel diameter 2.077".

EF — **BULLETIN HD-12**
Synchronous motor-driven, panel mounted non-resettable unit registers minutes and tenths, or hours and tenths. 6 digits. 120 or 240 VAC, 50 or 60 Hz. Round bezel 2⅞ diameter, unit depth 1.790" and barrel diameter 2.110".

EN & ER — **BULLETIN HD-12**
Dust cover enclosed unit with round or square bezel. These meters read in minutes and tenths or hours and tenths. Can be resettable or non-resettable. Units operate on 120 or 240 VAC, 50 or 60 Hz. Bezel diameter 3½", Rd; 3.0", Sq. Unit depth 3¾", barrel 2²³⁄₃₂" dia.

7010-004 HERMETICALLY SEALED MILITARY TYPE INDICATOR — **BULLETIN HD-12**
A very small, lightweight running time meter, hermetically sealed. Meets Mil specification requirements per Mil-M-7793C and Mil-E-5272C. Life tested over 78,000 hours. Readout four digits plus tentns. Temperature range −55°C to +85°C. Round case 1¾" square bezel, 2³⁄₆₄" deep, barrel diameter 1½". 115 volts 400 Hz. Solder terminals. Shipping weight: ¾ lb. Also available as ED 71 Commercial version 60 Hz.

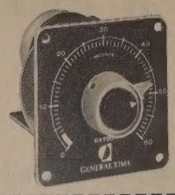
ELECTONIC

HAYDON QT21 SOLID STATE REAR MOUNTING TIMERS — **BULLETIN QT-21**
Moisture-resistant coated PC board. Knob-adjustable time periods. Rear mounting. SPDT relay 10 amps, 125 VAC resistive. Power input 117 volts, 60 Hz. Repeat accuracy ±2% of set value under constant conditions of temperature and voltage. Power standing on this timer has no damaging effect. Maximum reset time 130 milliseconds. Dial accuracy 10% of full scale. ¼" male spade terminals. Size: 3⅜" x 2⁵⁷⁄₆₄" x 3⅝". Two ⅜" x ⅝" slotted mounting holes on 2⅞" centers. Average weight, 1 lb.

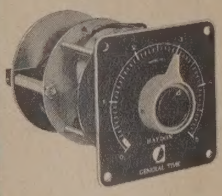
HAYDON QT52 SOLID STATE OCTAL PLUG TIMERS — **BULLETIN QT-52**
Basically same specifications as QT21, except has octal plug mounting and DPDT relay. Size: 4⅜" x 3⁹⁄₁₆" x 2⅛".

ELECTRICAL RESET TIMERS

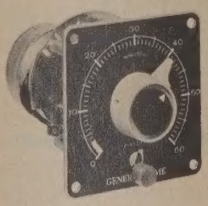
SERIES DA TIME DELAY TIMERS, REAR MOUNTING — **BULLETIN HD-12**
Type DA11. Manually adjustable by knob. Apply wherever delay, interval or repeat cycle timing functions are required (repeat cycle requires two units). Resets to start position when power is removed. SPDT switch rated 20 amps. 125 or 250 VAC, resistive; solder lug terminals. Min. setting 0 sec. Repeat accuracy ±¾% of total time range. 5 watt motor. 120 VAC 60 Hz. U/L listed. Size: 3⅜" W x 2¹³⁄₁₆" D x 3⅛" H. Weight: 1½ lbs.
Type DA21. Same as DA11 but with locknut adjustment to eliminate tampering.



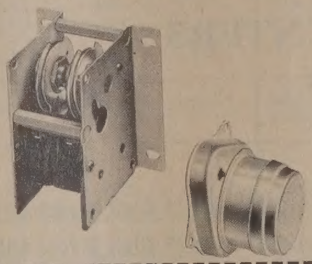
SERIES DP11 PANEL MOUNTING RESET TIMER — **BULLETIN HD-12**
Adjustable time range by simple pointer knob. Apply wherever delay, interval or repeat cycle timing are needed. Readout of elapsed time by pointer in center of knob. Unit resets to start position when power is removed. 125 or 250 VAC resistive. Timing motor rated 5 watts max. 120 VAC 60 Hz. Repeat accuracy ±1% of total time range. Screw terminals. Size 3⁵⁄₁₆" sq. x 3⁹⁄₃₂" D., behind panel; requires 3⁹⁄₁₆" dia. mounting hole cut.



BN41 (INTERVAL) AND BN42 (DELAY) PANEL MOUNT — **BULLETIN HD-12**
Dial and setting knob with readout of elapsed time by pointer in center of knob. SPDT relay rated 10 amps at 125 or 250 VAC. Timing motor rated 5 watts max. 120 VAC 60 Hz. Repeat accuracy ±¾ of 1% of total time range. Screw terminal block. Size: 3⁵⁄₁₆" sq. x 4⅜" D.; behind panel. Requires 3⁹⁄₁₆" dia. mounting hole.

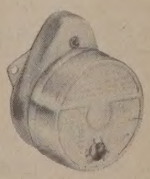


SERIES BJ-12 PUSH-BUTTON INTERVAL TIMER — **BULLETIN BJ**
Panel-mount timer. Timing interval is initiated by manually setting knob to selected position and manually depressing the push button. Readout of elapsed time by pointer in center of setting knob. Instant reset to start position automatically. SPDT switch rated 15 amps, 125 or 250 VAC resistive. 120 VAC 60 Hz. Repeat accuracy ±½% of full scale. Combination spade and solder lugs size: 3⁵⁄₁₆" Sq x 2²³⁄₃₂" D, behind panel; requires 3⁹⁄₁₆" dia. mounting hole. Weight: 1½ lbs.



SERIES RE62 REPEAT CYCLE MULTI-CAM TIMERS
BULLETIN HD-12
Run continuously, repeating set cycles of multiple switching operations as long as motor is energized. Complete unit requires one motor and one or more switch stacks. Two-switch unit size 2⁵⁄₁₆" H x 3²³⁄₃₂" W x 3⁹⁄₁₆" D; add ¹¹⁄₁₆" to depth for each additional switch.

TIMING MOTORS

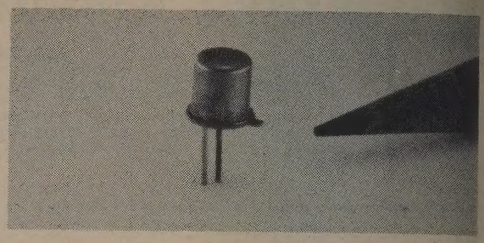


MA26 — **BULLETIN MA**
The MP26 is a hysteresis type motor designed for timing operations. Power output is 6 oz./in. at 1 RPM 60 Hz. Output shaft speeds are available from 1 rev per month to 60 RPM. 450 RPM without gear-train @ 60 Hz. Output shafts are available in four standard, plus many special configurations in round, flatted, knurled, and with cross-drilled hole. Operating voltage ranges are 24, 120 and 240 VAC. Frictions are available for manual turning of shaft below 15 RPM. MP26 has standard pear shape gear housing and mounting flange. Mounting holes are on 1.875" centers.

MP20 POWER MOTOR — **BULLETIN MP-20**
This timing size synchronous AC motor has an output rating of 200 oz./in. @ 1 RPM over the range of 103 to 132 VAC or 206 to 264 VAC at 60 Hz. Guaranteed minimum running life 10,000 hours. Output shaft speeds 1, 2, 3, 4, 5, 6, 10, 15, 20, 30 and 60 RPM. Output shaft available in 2 standard types, long round and long with flat, for other configurations consult factory. Mounting standard pear shape holes on 1⅞" centers. Rotation can be CW or CCW.

GENERAL TIME
Progress in the World of Time
INDUSTRIAL CONTROLS DIVISION
Torrington, Connecticut 06790 (203) 482-4481

ANTI DISTURBANCE SWITCHES
Model 604



(Shown Actual Size)

- Micro-miniature
- Ultra-Sensitive
- Low cost

SPECIFICATIONS

PHYSICAL

- Housed in standard TO-18 transistor package measuring only .213" in diameter by .190" length, nominal
- 1.2 to 2.5 "G" nominal sensitivity
- Other sensitivities special

ELECTRICAL

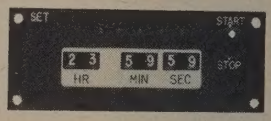
- Normally open contact configuration closes upon being subjected to accelerative disturbances beyond its rated sensitivity level
- Contacts rated up to 10MaDC at 5VDC
- Repeatability better than 20%
- Temperature effect on sensitivity is better than 1%

APPLICATIONS

- Seismic intrusion detection systems
- Burglar Alarms
- Wherever a building or device must be safe guarded against intruders
- Out of balance detector

The Model 604 represents a significant step forward in acceleration sensitive switches for those involved in anti-intrusion devices and the burglary protection business. Operating over a wide temperature range, the Model 604 series can be easily concealed in doors, floors, window frames, ceilings, filing cabinets, safes, etc. Its sensitivity to acceleration can even be used to detect footsteps from an intruder.

DIGITAL COUNTERS
Model 607 & 608



- High speed
- Instant reset
- Preset capability
- Ultra-reliable
- 4 and 6 digits available
- Remote reset capability

TESTED TO BEYOND 140 MILLION OPERATIONS!

SPECIFICATIONS

- Only 1¾" high, 4" deep and 3¾" wide (4 Digit Model 607)
- Only 1¾" high, 4" deep and 4½" wide (6 Digit Model 608)
- 115VAC 60Hz or 16-32VDC input (Specify your choice) Optional front or rear panel mounting

4 DIGIT CONFIGURATIONS

- 9999
- Also available with time of day readout
- 59:59

6 DIGIT CONFIGURATIONS

- 999999
- Also available with time of day readout
- 11:59:59
- 23:59:59

Wedge lighting and HEA-coated, non-glare glass options. Manual or remote start/stop/reset controls are standard features.

THE MOST MODERN DIGITAL COUNTER AVAILABLE

New 4 and 6 Digit counters utilizing a revolutionary magnetic drive and escapement principle resulting in an order of magnitude reliability improvement among commercially available counters. The Model 607 series counters eliminates wear parts inherent in conventional Geneva mechanisms by a unique separation of the counter wheel drive and digit advance control mechanisms, and a computer-tested magnetic clutch drive system.

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

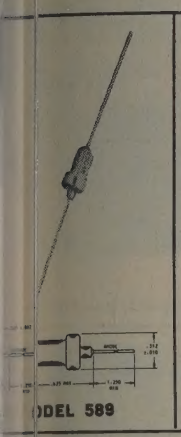
GIBBS

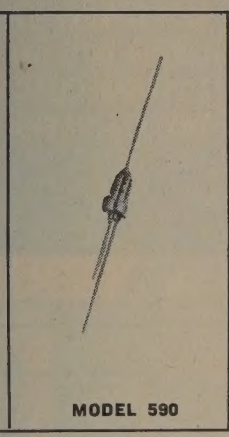
GIBBS MANUFACTURING & RESEARCH CORPORATION

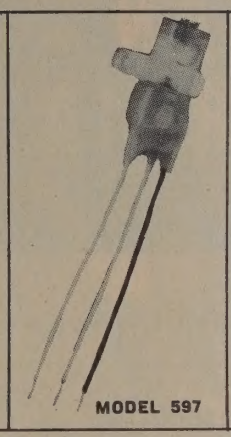
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

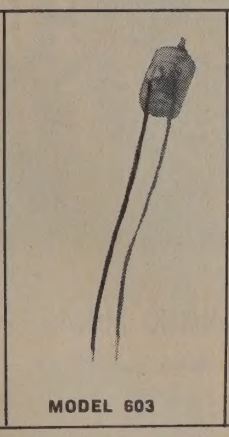
GIBBS COUL-CELLS™

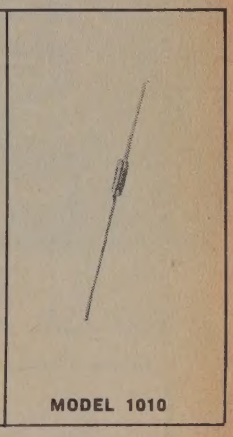
ELECTROLYTIC TIMERS & INTEGRATORS











SPECIFICATIONS — GIBBS ELECTROLYTIC CELLS

Model Number	Capacity Microamp. Hours	Time Hours	Accuracy	Size, Inches (body)	Operating Temperature	Application — Operation
9-50	50	1-10	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	Cell voltage triggers semiconductor circuit at end of timing period. Impedance-change type. Characteristic Z = 100 ohms before time-out, 50K after.
9-100	100	2-20	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
9-500	500	4-50	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
9-1000	1000	8-100	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
9-1500	1500	12-150	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
9-2500	2500	20-250	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
9-2650	2650	100-720	±5%	0.310″ dia. x 0.550″	−23°C to +76°C	
9-3200	3200	100-800	±5%	0.310″ dia. x 0.550″	−23°C to +76°C	
0-75-50	75-Anode #1 2650-Anode #2	1.5-15.0 100-720	±5% ±5%	0.310″ dia. x 0.550″	−23°C to +76°C	Dual anode cell—combines long, short times same unit.
10	1-100	.01-33	±5%	.125″ dia. x .0.400″	−55°C to +76°C	Same as Model 589.
7	5350	30 sec.-10 days	±15%	.625″ dia. x 1.50″	−20°C to +38°C	Operates mechanical switch — Close circuit at end of time period.
1	5350	1-240	±10%	.812″ dia. x 1.125″	−40°C to +76°C	Operates mechanical switch — Close circuit at end of time period.
3	5350	1-240	±10%	.812″ dia. x .812″	−40°C to +76°C	Operates stab detonator.

MJOR BREAKTHROUGH IN TIMING

ow ailable from GIBBS — two unique types of Timing Devices alled lectrolytic CELLS or COULOMETERS. The timing capability of ese hits range from thirty seconds to many months. For the first me, e Design Engineer can specify just one type of timing device at i **nfinitely variable** to accommodate a truly wide range of timing nterv, and meets all military environmental requirements.

IBBS lectrolytic CELLS are available in two classifications; **mechani-al s tching and impedance-change switching.** Both classifications re dendent on a simple current/time relationship for their opera-ion, d are specified in terms of "ampere-hour" capacity. The me-hani switching devices mechanically close (or open) switch con-acts the end of the timing period. The impedance change cells xhibi approximately a 10 to 1 change in impedance at the end of the timing period, sufficient to trigger an SCR or Transistor. Input currents range from 5 μA to 2.7 Ma.

GIBBS Electrolytic Cells are ideal for use where a predetermined time action is required. **Applications include:** Signal when maintenance is due; Indicate conclusion of warranty; End-of-life Indicator; Sonobuoy scuttling; Airframe Inspections, Ordnance Safety and Arming; or any timing function ranging from 30 seconds to many months where small size, low cost, ruggedness, accuracy and low current consumption are desirable.

GIBBS Electrolytic CELLS are almost perfect current/time integrators and respond accurately to any input — steady state, pulse, square wave, triangular, etc. Because of this unique integration capability, the designer can successfully work with almost any number of inputs to accurately monitor system operating conditions. SEND FOR FREE DATA AND ENGINEERING APPLICATION NOTES.

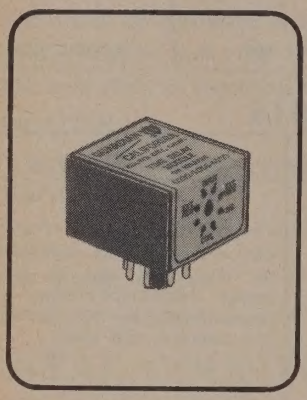
For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

GIBBS MANUFACTURING & RESEARCH CORPORATION
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

GUARDIAN® CALIFORNIA

5755 CAMILLE AVENUE
CULVER CITY, CALIFORNIA 9023
TELEPHONE: (213) 870-4642
TWX: 910-343-6464

UNIVERSAL TIMING MODULES

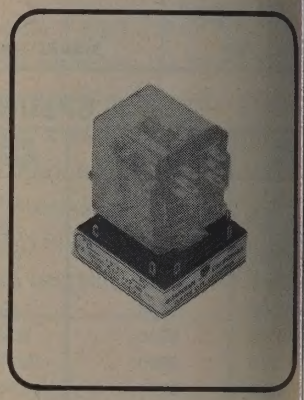


SERIES TMP

Series TMP Time Delay Modules are available in "on-operate" and "on-release" configurations with two time delay and three standard input voltage ranges. The time is externally adjustable within the two ranges from ½ to 100 seconds and 100 to 300 seconds. Repeatability is ±1 percent under normal conditions. Life expectancy is in excess of one-million cycles. Standard input voltages are 24VAC, 115VAC and 24VDC. Other ranges are available as options. The unit is terminated in an octal plug for quick mounting and remote control of relays.

SERIES TMT

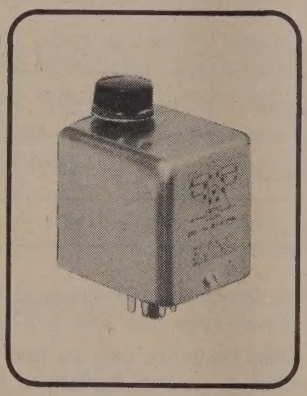
Series TMT Time Delay Modules are designed to permit a relay to be mounted directly onto the module or to permit stacking of TD modules for extended time delay periods. The unit can also be soldered directly to a printed circuit board if desired. Modules provides "on-operate" or "on-release" operation at input voltages of 24VAC, 115VAC and 24VDC. Other input voltages are available as an option. The time delay is externally adjustable within ranges of ½ to 100 seconds and 100 to 300 seconds. Repeatability is ±1 percent under normal conditions. Life expectancy is in excess of one million cycles.

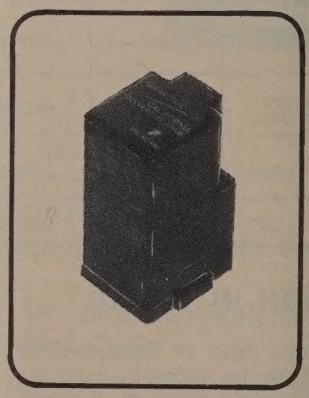


TIME DELAY RELAYS

SERIES TDO

Although it incorporates many features of more expensive units, California Guardian's Series TDO is the most economical 115VRMS solid-state time-delay on the market. Time delay is adjustable from 0.5 to 30 seconds and is controlled by a ten-turn potentiometer. The multi-turn potentiometer provides high resolution, easy reset and accuracy. Series TDO time delays are built to U/L standards. The unit terminates in a standard octal plug for easy mounting. It is accurate within 10 percent of a nominal setting over it's entire temperature range.

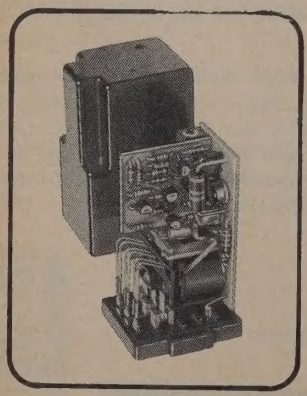




SERIES TD

Similar to high-priced military units, the lower-cost series TD is the most accurate and compact time-delay relay available from stock. Six models for 24VDC to 115VRMS provide delays from 0.5 to 180 seconds. Silicon semi-conductors and tantalum capacitors are utilized for reliability. A 15-turn screw-type potentiometer provides high resolution and accuracy. Recessed screw prevents inadvertent changing of time delay setting. Accuracy is 5 percent of nominal setting over it's complete temperature and voltage range. Repeatability is 2 percent after a line interruption of 50 milliseconds. DC units are polarity protected.

CONTROLLED SENSORS

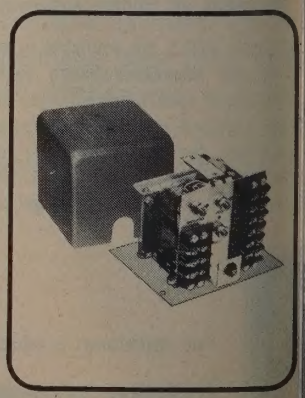


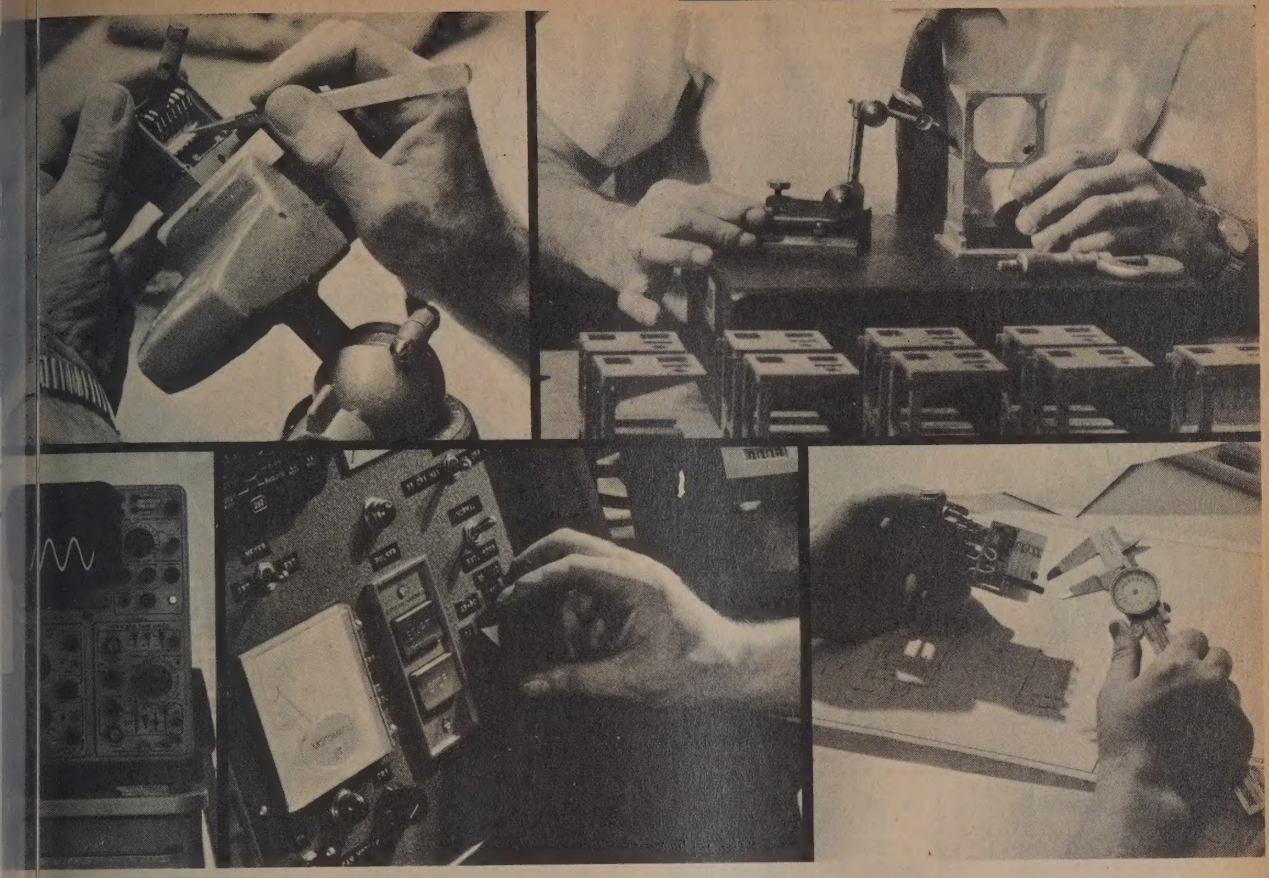
California Guardian's line of solid state controlled sensors and protective devices is the broadest available. Designed for the instrumentation and power equipment industries, sensors are available for 3-phase average sensing; over-voltage sensing; close differential voltage sensing; phase rotation sensing; and over-frequency and under-frequency sensing. Sensors are non-latching, may be interwired with a latching relay, or wired for self latching and pushbutton start and reset. The unit can be socket mounted or chassis mounted and wired with quick disconnect or soldered connections. Voltage and frequency sensors are transient protected.

SPECIAL ASSEMBLIES

California Guardian will design any type of special sensor or control assembly. In most cases, circuitry has already been designed which eliminates engineering costs. For your special circuits, contact California Guardian. Our engineering department will give your requirements immediate attention.

The unit shown is an undervoltage sensing relay alarm designed for power utility use.





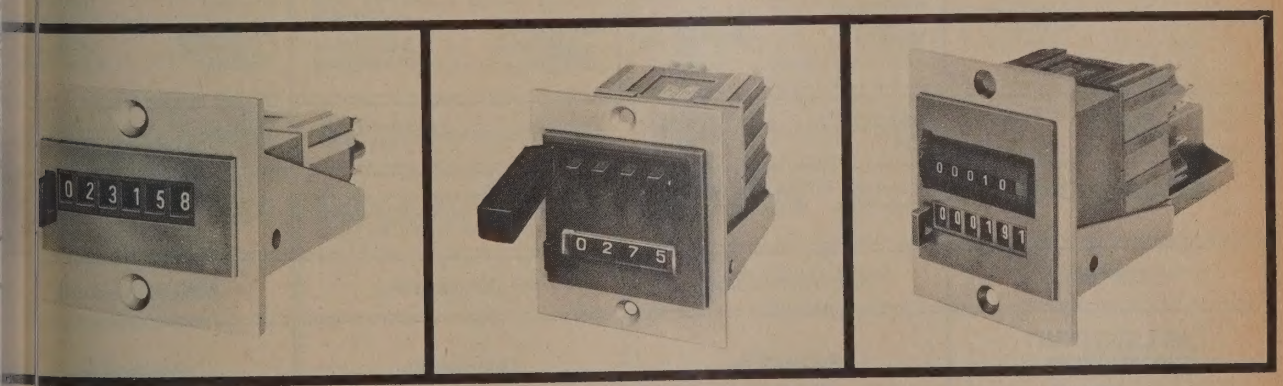
HECON QUALITY COUNTS

A Complete Line of High Performance Electro-Magnetic Counters

Hecon counters do more than count. They are highly reliable control devices that exercise control by counting.

Our exclusive building block design permits many system variations and applications. Used as an individual control instrument, or as part of a control system, Hecon counters can solve your control problems.

For reliable, low cost digital control systems, only Hecon offers a complete line of high performance electro-magnetic counters featuring closed loop design.



F 043 TOTALIZING COUNTER
Modular 6 digit plug-in unit, with either manual or electrical reset—speeds up to 60 counts per second—life in excess of 200 million operations.

FE 043 SUBTRACTING PREDETERMINING COUNTER
Modular 4 digit plug-in counter features easy push button preset and optional presignal. Available with manual/electric reset and automatic recycling. Speeds up to 40 CPS—life in excess of 200 million operations.

FA 043 PREDETERMINING COUNTER
Modular 6 digit plug-in unit, with manual, electrical or automatic reset, for speeds up to 35 counts per second—life in excess of 200 million operations.

HECON

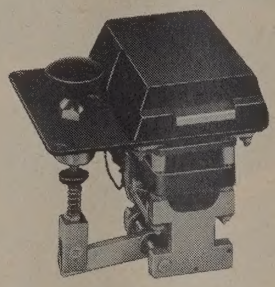
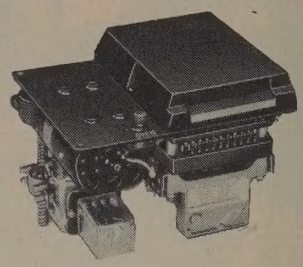
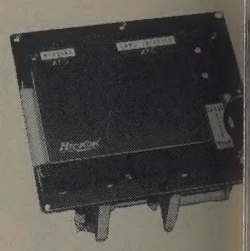
Better by Design

Hecon engineers can help you solve your counting and control problems with Hecon high performance counters—reliably and economically. Write or call today for full information on these and other Hecon counters.

HECON CORPORATION 31 Park Road, New Shrewsbury, New Jersey, (201) 542-9200 TELEX 13-223

HICKOK CONTROLS DIVISION

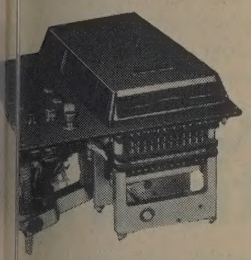
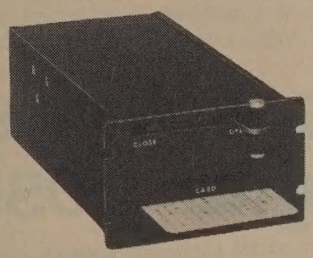
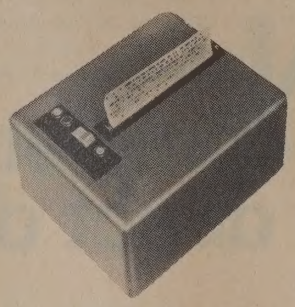
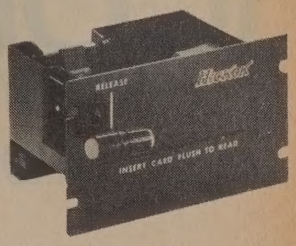
STATIC CARD READERS

	MODEL 50 (ILLUSTRATED)	MODEL 186M (ILLUSTRATED)	MODEL 324 (ILLUSTRATED)
			
	MODEL 50 & 50M Industrial Card Reader	**MODEL 186, 186M, & 187H Industrial Card Reader**	**MODEL 324 & 324 Industrial Card Read**
FEATURES	• 50 INDIVIDUAL CONTACTS • 500,000 OPERATIONS • 10 AMPERE RATING • DUAL 360° WIPING CONTACTS • FORM "A" OR FORM "B"	• 186/187 INDIVIDUAL CONTACTS • 500,000 OPERATIONS • 10 AMPERE RATING • DUAL 360° WIPING CONTACTS • FORM "A" OR FORM "B"	• 324 INDIVIDUAL CONTACTS • 500,000 OPERATIO • 10 AMPERE RATIN • DUAL 360° WIPING CONTACTS • FORM "A" OR FORM
CONTACTS	Number ..... 50 Form ..... A or B Matrix ..... 5 x 10 Spacing ..... ¼" x ¼" Current rating, resistive ..... 10 amperes Capacitance ..... 5 picofarads across open contacts Resistance, nominal ..... 15 milliohms Material ..... brass-to-brass	Number, Model 186, 186M .... 186 Number, Model 187H ..... 187 Form ..... A or B Matrix ..... 11 x 17 Spacing ..... ¼" x ¼" Current rating, resistive ..... 10 amperes Capacitance ..... 5 picofarads across open contacts Resistance, nominal ..... 15 milliohms Material ..... brass-to-brass	Number ..... Form ..... A B Matrix ..... 12 Spacing ..... per EIA RS 2, mec Current rating, resistive ..... 10 amp Capacitance ..... 5 picofa across con Resistance, nominal ..... 15 millio Material ..... brass-to-
CARD	Thickness ..... 0.007" to 0.030" Size ..... 3¾" x 1½"	Thickness ..... 0.007" to 0.030" Size ..... 5⅜" x 3"	Thickness ..... 0.007" to 0. Size .... per EIA RS292, mec
DIMENSIONS	Model 50 ... 6"H x 5½"W x 4¾"D Model 50M .. 9"H x 7½"W x 4¾"D	Model 186 .. 6¾"Hx7 13/16"Wx6 7/16"D Model 186M .. 6 9/16"Hx8 13/16"Wx8"D Model 187H .. 7¼"Hx8½"Wx7¾"D	324H ..... 7¼"H x 8½"W x 7 D 324M ..... 8"H x 9"W D
LIFE	500,000 operations	500,000 operations	500,000 operations
DIELECTRIC STRENGTH	1000 volts ac	1000 volts ac	1000 volts ac
INTERLOCK	switch actuation keyed to card geometry	switch actuation keyed to card geometry	switch actuation keyed to geometry
ENVIRONMENTAL	—55°C to +125°C storage and operating 0 to 99% relative humidity 0 to 40,000 feet altitude (motorized models; 0°C to +65°C, 0 to 20,000 feet altitude)	—55°C to +125°C storage and operating 0 to 99% relative humidity 0 to 40,000 feet altitude (motorized models; 0°C to +65°C, 0 to 20,000 feet altitude)	—55°C to +125°C storage operating 0 to 99% relative humidity 0 to 40,000 feet altitude (motorized models; 0°C to +6 0 to 20,000 feet altitude)

GENERAL DESCRIPTION

et's in the contacts. With the HICKOK developed brush contacts, and fourteen years of static card reader ex-, HICKOK Static Card Readers are still your best buy. ustrial readers (shown in the first four columns) all e HICKOK Pin/Sleeve contact that has proven itself so hrough years of usage in the severest of environments. dustrial readers are available with Form A (SPST, NO) B (SPST, NC) contacts, with the absence of a hole in actuating each switch.

The Tabulating Card Readers (for full 80 column tab cards as well as for badges and credit cards) illustrated in the three right hand columns, all use a multi-strand brush assembly for reliable, error-free reading, even with cards that may have been punched slightly out of tolerance.
HICKOK stands ready to assist you with your special requirements; we can supply variations of standard HICKOK card readers or develop a special card reader to fit your particular application.

EL 540M (LUSTRATED)	MODEL 960SL (ILLUSTRATED)	MODEL 960M (ILLUSTRATED)	MODEL 264 (ILLUSTRATED)
			
MODEL 540M **ustrial Card Reader**	**MODEL 960SL & 960SLM** **Tabulating Card Reader**	**MODEL 960M** **Tabulating Card Reader**	**MODEL 264** **Credit Card/Badge Reader**
• 40 INDIVIDUAL ONTACTS • 00,000 OPERATIONS • D AMPERE RATING • UAL 360° WIPING ONTACTS • ORM "A" OR FORM "B"	• 10^6 OPERATIONS • COMPACT — 3"Hx5"Wx9"D (960SL) 6"Hx5"Wx9"D (960SLM) • FULL 960 BIT OUTPUT • DOUBLE WIPING, MULTI-STRAND BRUSH CONTACTS • AVAILABLE WITH FULL DIODE MATRIX	• 10^6 OPERATIONS • MOTORIZED DRIVE, PUSH BUTTON OPERATED • FULL 960 BIT OUTPUT • DOUBLE WIPING, MULTI-STRAND BRUSH CONTACTS • AVAILABLE WITH FULL DIODE MATRIX	• 10^6 OPERATIONS • COMPACT—3"Hx5W"x4"D • FULL 264 BIT OUTPUT • DOUBLE WIPING, MULTI-STRAND BRUSH CONTACTS • AVAILABLE WITH FULL DIODE MATRIX • AVAILABLE WITH "COMMAND RELEASE"
Nuber ..... 540 For ..... A or B Mlx ..... 12 x 45 Spng ..... per EIA RS292, media II Cu nt rating, istive ..... 10 amperes Ca citance ..... 5 picofarads across open contacts Re tance, iminal ..... 15 milliohms Ma rial ..... brass-to-brass	Number ..... 960 Form "A" ..... hole in card makes contact Matrix ..... 12 x 80 Spacing .. per EIA RS292, Media I Current rating, resistive Switching ..... 100 milliamps Passive ..... 500 milliamps Capacitance ..... 8 picofarads, single contact to brush Resistance, nominal ..... 25 milliohms end of life ..... 100 milliohms Material ..... gold-to-gold contact	Number ..... 960 Form "A" ..... hole in card makes contact Matrix ..... 12 by 80 Spacing . per EIA RS292, Media I Current rating, resistive Switching ..... 100 milliamps Passive ..... 500 milliamps Capacitance ..... 8 picofarads, single contact to brush Resistance, nominal ..... 25 milliohms end of life ..... 100 milliohms Material ..... gold-to-gold contact	Number ..... 264 Form "A" ..... hole in card makes contact Matrix ..... 12 x 22 Spacing .. per EIA RS292, Media I Current rating, resistive Switching ..... 100 milliamps Static ..... 500 milliamps Capacitance .. 8 picofarads max, single contact to brush Resistance, nominal ..... 25 milliohms Material ..... gold-to-gold contact
Thkness ..... 0.007" to 0.015" Si ..... per EIA RS292, media II	Thickness ..... 0.007" to 0.015" Size ..... standard Media I tab card	Thickness ..... 0.007" to 0.015" Size ..... standard Media I tab card	Thickness ..... 0.007" to 0.035" Size ..... 2⅜" x 3¼"
6¾"H x 9¼"W x 8⅝"D	960SL ..... 3"H x 5"W x 9"D 960SLM ..... 6"H x 5"W x 9"D	6¾"H x 12"W x 9¾"D	3"H x 5"W x 3"D 1¼ pounds
500,000 operations	1,000,000 operations	1,000,000 operations	1,000,000 operations
1000 volts ac	500 volts ac	500 volts ac	500 volts AC
sw ch actuation keyed to card ometry	pin for corner cut, SPDT switches for proper reading indication	SPDT switches for proper reading indication	pin for corner cut, spot switch for proper reading indication
0° o +65°C storage and operating to 99% relative humidity 0 to 20,000 feet altitude	—55°C to +125°C storage and operating 0 to 99% relative humidity 0 to 40,000 feet altitude	0 to +65°C storage and operating 0 to 99% relative humidity 0 to 20,000 feet altitude	—55°C to +125°C storage and operating 0 to 99% relative humidity 0 to 40,000 feet altitude

HICKOK CONTROLS DIVISION
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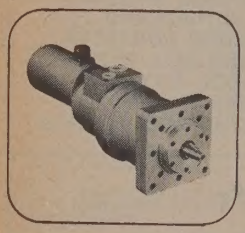
Automatic motion control in manufacturing, assembly & packaging? in production machinery & machine tools? in electronics & data processing? in research and developme welding? graphic arts & printing? or instrumentation?

ICON: your complete, ready source for direct digital positioning!

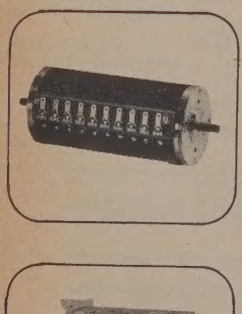
ICON automatic systems, subsystems and modules and know-how in stepping motor technology can help you automate your plant and products simply and economically!

ICON AUTOMATIC MOTION CONTROL SYSTEMS INCLUDE



ELECTROHYDRAULIC PULSE MOTORS

. . . a complete line of high power motors built by Fujitsu, Ltd., for direct digital positioning in heavy applications such as machine tools, textile and printing machinery, welders, typesetters, automated production machinery, etc. Torque output exceeds 500 in-lbs. at 2000 steps per second. Power ranges from .8 to 10 HP at 6.000 steps per second.

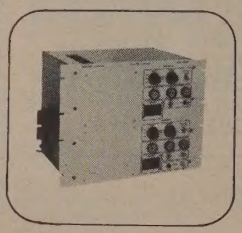


HIGH SPEED ELECTRIC STEPPER MOTORS

. . . variable reluctance steppers that are the fastest, most advanced digital actuators in America, today. Available in a wide range of torques with error-free response rates of 2000 pps, and running speeds in excess of 10,000 pps.

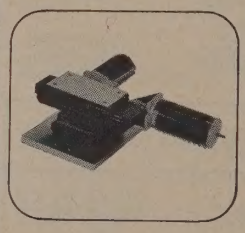
DIGITAL SYSTEM POSITIONING MODULES

. . . for the engineer who wants to design and package his own positioning control system. A full line of solid-state driver modules for most stepping motors, plus general purpose system logic modules using NAND logic.



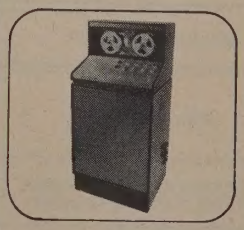
MULTI-AXIS STEPPER PROGRAMMERS & DRIVE UNITS

. . . Icon Series 400 positioning s tems emphasize high motor perfo ance and input flexibility. Able to d up to 6 independent steppers of type. Accept inputs ranging f switch closure to computer. Rea interface with other system elemen



NUMERICALLY-CONTROLLED X-Y TABLES

. . . two complete lines of X-Y tab covering the motion range from 2 2" through 12" x 12". Speeds in cess of 2 ips, resolution of .001 in Ideal for automation of producti assembly and test. Many con options available.



HIGH SPEED NUMERICAL CONTROL SYSTEMS

. . . with extremely reliable I.C. lo very flexible program structure. A vanced, low-cost control for a w range of automatic 2 or 3 axis po to-point positioning applicatio Open-loop, all-digital design for sim application, operation, service.

LEADERS IN DIGITAL MOTION

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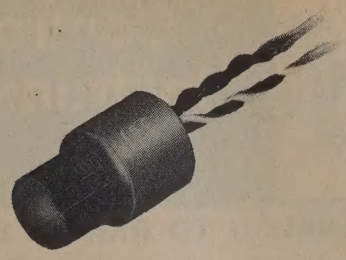
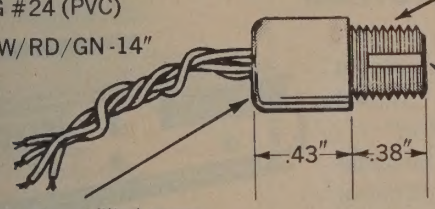
SPEED-INDEPENDENT MAGNETIC PICK-UP



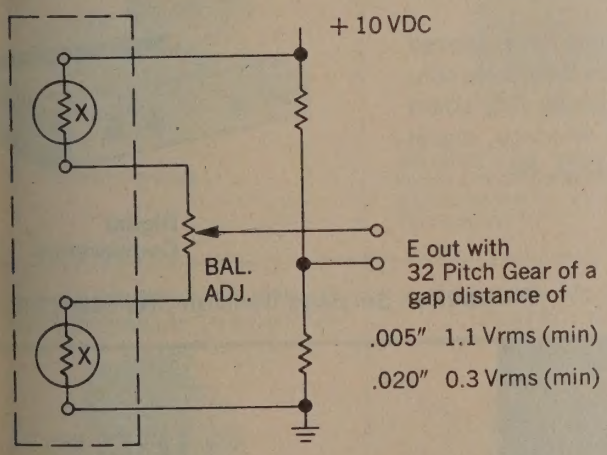
The B-12E Magnetic Pick-up is the first of a family of devices from ISC/Magnetics with output voltage amplitudes that are independent of the rate of change to the external magnetic field. This characteristic and its relatively low output impedance result in a device ideally suited for use with transistor circuitry of the type often found in flow control and computer peripheral equipments for *Static* as well as Dynamic sensing.

Typical output using a 20 pitch ferrous gear at a sensing distance of 0.020 inches is 1V peak to peak at an ouput impedance of 500 ohms.

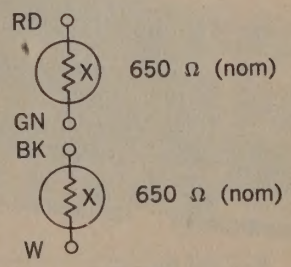
PHYSICAL DIMENSIONS



TYPICAL CIRCUIT PERFORMANCE



ELECTRICAL DATA



	Resistance	Matching
B-12E-1	550-750	5% max
B-12E-2	500-750	15% max

ENT APPLIED FOR

ISC * MAGNETICS
Division of INSTRUMENT SYSTEMS CORPORATION
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Telephone: (516) 423-6200 / TWX: 510-226-6983 / Cable Address: INSSYSTHTGN

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Electronics Corp.

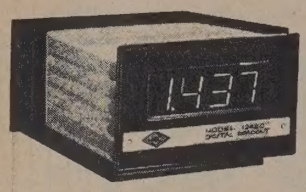
Control and Monitoring Instrumentation Division

Phone 716/586/7853

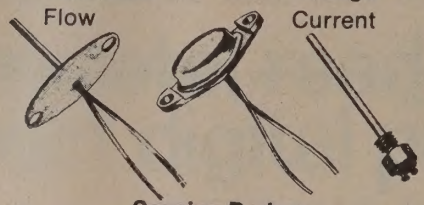
ANALOG TO DIGITAL SYSTEMS

Systems for control and measurement of:

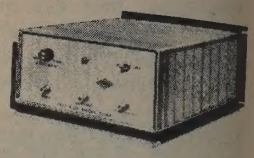
- Temperature
- Pressure
- Fluid Level
- Flow
- Light Levels
- Sound Levels
- Voltage
- Current



Analog to Digital Converters

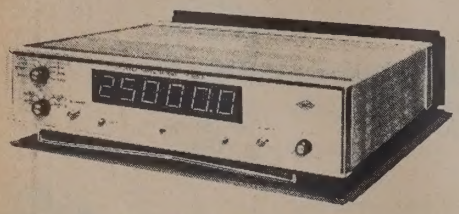


Sensing Probes



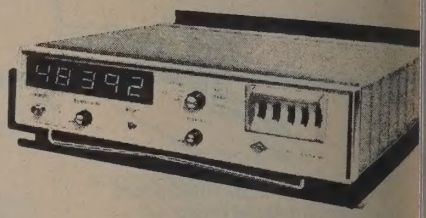
Normalizing Amplifiers

COUNTING SYSTEMS



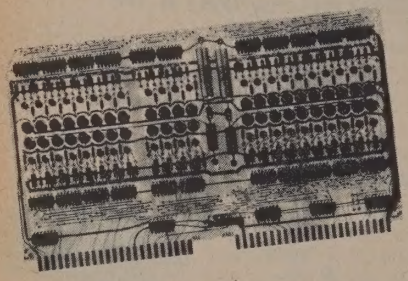
UNI/Bi-Directional Counters

Preset • Bidirectional Elapsed Time • Digital Clock • Totalizing Applications: Machine Control • Batch Control Flow Control • Speed Control



Preset Counters

SYSTEM COMPONENTS



Special Purpose Interfaces

Digital readouts, modularized power supplies, solid state controllers and timers, P.C. board controls and interface, digital multipliers, VCOs, etc.

Digital Comparators

Production Services Division 716/586/7850

why design your system around someone else's black box?

IEC specializes in CUSTOM UNITS and SYSTEMS to meet your requirements. A QRC (Quick Reaction Capability) design and manufacturing facility is available to service customer needs.

This concept provides each customer with equipment possessing the exact functional capabilities, and the physical configuration determined best for his particular needs.

It also eliminates the additional interfaces normally required for "off the shelf" equipment; reducing overall cost and providing a totally integrated system.

Let us quote on your requirements today.

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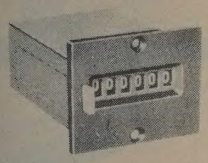
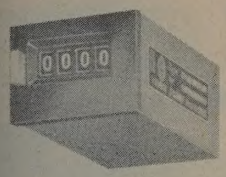
14445

ELECTRIC and PNEUMATIC COUNTERS and ACCESSORIES

E-16 TOTALIZING

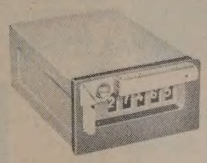


E-14 TOTALIZING

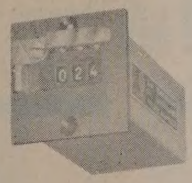


- Adds at speeds up to 100/sec.
- Long life
- Small rugged size
- Choice of 5 mountings
- Special wheels available

EVS-15 PREDETERMINING 5 DIGIT

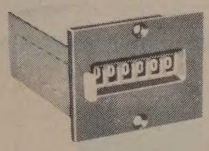


EVS-13 PREDETERMINING 3 DIGIT



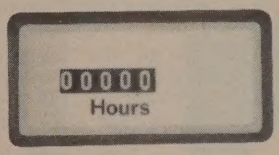
- Up to 50 counts/sec.
- Counts down from the pre-set No. to operate a built-in control switch as count passes zero.
- Electrical reset
- Automatic reset and recycling

ED-15 ADD-SUBTRACT



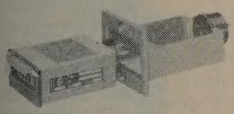
- Speeds to 40/sec. Add or Subtract
- Electrical reset available
- 5 digits maximum

B-2 RUNNING TIME METER



- Snap-in mounting
- Attractive appearance
- Small size but easily readable

MOUNTING OPTIONS

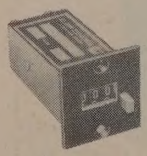


- Plug-in (illustrated)
- Snap-in
- Sealed housings

SPECIAL MODIFICATIONS

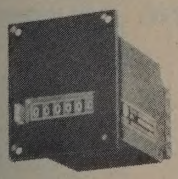
- Operating temp. down to minus 20° F.
- Shock and vibration resistant
- Special wheels for minutes, seconds, hours
- Illumination

MEDIUM DUTY ER SERIES



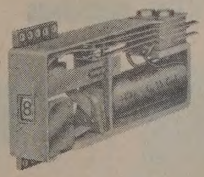
- 3, 4, 5 & 6 digits
- With or without manual reset
- Extremely small size
- Numerous mounting options

EA-16 and EDA-15 TOTALIZING OR ADD-SUBTRACT WITH READOUT



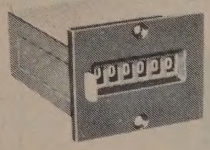
- Visual as well as electrical readout
- Very low power requirement
- BCD or 10 line readout

EQ SINGLE DECADE COUNT/ CONTROL MODULE



- Totalizing or add-subtract
- Resets from DC
- Visual as well as electrical readout

P-16 and P-15 PNEUMATIC COUNTERS PREDETERMINING and TOTALIZING



- Pneumatic reset available
- Built-in pneumatic switch
- Speeds up to 50/sec.
- Operating pressures from ¾ PSI and up

KEP

KESSLER-ELLIS PRODUCTS

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SODECO Impulse Counters for

TOTALIZING

In modern instrumentation, production controls, and data handling systems, a rapid, accurate means of totalizing is often required. Low cost, easily read totalizing impulse counters are preferred as the means of recording this information. Sodeco totalizers, due to their reliability and small size are widely specified for counting instruments, control systems and centralized control stations.

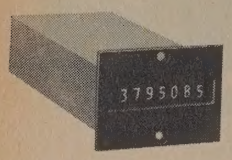
PREDETERMINING

These small 4 or 5 digit counters provide for visual in-line count and control function in a single compact unit. It is readily preset to any number from 1 to 9999 (9) and after the preselected number of counts have been registerd a SPDT contact reverses permitting a control function. Applications calling for automatic recycling or batch counting prefer Sodeco predetermining counters.

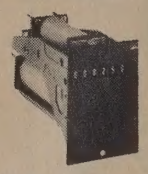
PRINTING

Whenever a permanent record of units or events is desired, the Sodeco printing counter for serial and parallel entry counting, will serve to maintain this record, with a minimum space requirement. As count is by electromagnetic action, the counter may be remotely located from the point of count generation.

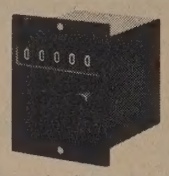
TOTALIZING



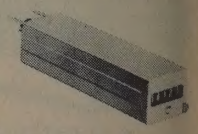
No reset 3 to 8 digits, manual toggle reset 3-6; counting speed — 10, 25 or 50 impulses/second. (8 digit non-reset 10 ips only) DC operation. Model illustrated TCe7e. **Send for Bulletin 201.**



Electric reset by single impulse; 4, 5 or 6 digits; 10, 25 or 50 impulses second; DC operation. Model illustrated TCeF6E. **Send for Bulletin 201.**



Pushbutton resets figures to zero; 4, 5 or 6 digits; AC (10 i/sec max) or DC (10 or 25 i/sec). Model illustrated TCeBZ5E — 1.654″ x 2.047″ x 1.811.″ **Send for Bulletin 212.**

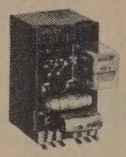


NON-RESET ECONOMY COUNTER— DC 12, 24, 48, 110; 10 i/sec; lif tation minimum 50 million i Model illustrated TCe5. 1.10″ x 4.49″. **Send for Bulletin 223.**

PREDETERMINING

This series of 4 and 5 digit DC operated counters count from a preset number toward zero. They are preset to any number from 1 to 9999 (9) and after the preselected number of counts have been registered a SPDT contact reverses permitting a control function. Model illustrated TCeF4PE. 1.722″ x 3.228″ x 4.016″. **Send for Bulletin 402.**

This predetermining counter is basically equivalent to the TCeF4PE type, however the supply is taken directly from 110 or 220 VAC and is protected by a sturdy aluminum housing. The count and reset coils are provided with a spark suppressor within the unit. 10 impulses per second AC operation. Model illustrated 2TCeF4PE — 2.01″ x 4.02″ x 4.42″. **Send for Bulletin 402 and Technical Manual 2TCeF4PE.**



For automatic recycling of predetermining impulse counters. For 24 VDC only — 1.75″ x 3.00″ x 1.65″. **Send for Bulletin 422.**

ADD-SUBTRAC

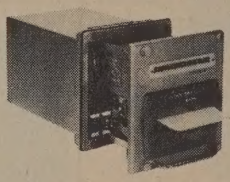
A rugged differential counter with systems and a control contact. In is on one register with 1 system and 1 system subtracting. A SP tact is actuated when the registe the zero position. AC or DC op Model illustrated TiZ4RcEh. Se **Bulletin 501.**

PRINTING COUNTERS

2 Models

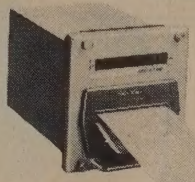
Visual readout and print; 6 digit serial entry totalizer; 10 impulses per second; AC or DC operation. Model illustrated PL103 — 2.84″ x 5.67″ x 7.72″. **Send for Bulletin 371 and Technical Manual 1112.**

Visual readout and print; 5 decades for serial and/or parallel entry counting; 10 or 20 impulses per second; DC operation. Not illustrated model PN107 — 2.84″ x 5.76″ x 7.16″. **Send for Bulletin 372 and Technical Manual 1112.**



This printing counter provides not only a 6 digit serial entry totalizer but also a synchronous motor (110 V AC) driven time and date register of month, day, hour and minute. 10 impulses per second for serial entry totalizer. If parallel entry 20 impulses per second — 5.67″ x 5.67″ x 7.72″. DC or AC operation. **Send for Bulletin 372 and Technical Manual 1113.**

Also available for printing on card or tape and card.



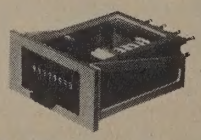
This unit consists of 10 decades for parallel entry counting. Any combination of decades may be wired for serial entry and in order to cover a wide range of applications alpha drums for code identification and special ratio drums for time and date registration have been made available. 10 or 20 impulses per second. DC operation. Model illustrated PN207 — 5.67″ x 5.67″ x 7.16.″ **Send for Bulletin 372 and Technical Manual 1113.**

A multi-element unit providing a mum 20 decade capacity, printing or card. Any 5 decade element removed and in its place a 6 digit entry totalizer or a synchronous driven time and date register. Thi capacity printer can be equippe any combination of elements suita definite applications. DC operation. illustrated PL4005. 11.34″ x 5.67″ x **Bulletin 372 and Technical Manual**

Also available for printing on c

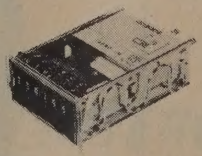
SINGLE DECADE READOUT COUNTERS

This new Sodeco ES4 Electric readout counter makes available in one compact unit a single digit, high speed impulse counter equipped with a 10 position readout switch, a transfer contact, a zero reset contact and a predetermining switch. Less than 2″ high, 1″ wide, & 3″ deep. Counting speed 25 ips. Standard voltage 24 V DC with 12 and 48 V DC on special order. **Send for Bulletin 102.**

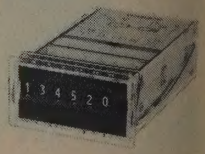


COMPACT TOTALIZER — New, compact, low wattage, long life counter, 6 digit (8 without reset); counting speeds 25 or 60 c/sec; non-reset, manual or electric reset; 24 V DC standard. 1.89″ x 0.94″ x 2.83″. Surface or flush mounting. **Send for Bulletin 801.**

NEW TOTALIZING COUNTERS



The new Sodeco Model RG..E impulse counter with front-plate and spring loaded mounting is a compact, low wattage, long life counter that is ideal for multiple counter installations. Available with manual, electric, or no reset. Available in 5, 6 or 8 digits and counting speeds of 10, 25 or 60 ips. 24 V DC is standard, 12, 36, 48, 60, 110 and 220 V DC also available. **Send for Bulletin 801.**



New, compact, low wattage, long li pectancy counter that is ideal for m counter installations. For flush mounting. Silent operation non-reset, and electric reset. Low power consum Life expectancy more than 200 impulses. 24 V DC Standard — 6, 12, 60, 110 & 220 V DC available. Also 1 Standard — 24 and 220 V AC avai 1.89″ x 0.94″ x 2.83″. **Send for Bulleti**

Write for detailed specifications and application information.

NOTE: Part numbers are for illustrated types. Also available in variations indicated.

Broad variety of types and wide range of operating voltages permits selection of the precise counter for the application.

LANDIS & GYR, IN

4 Westchester Plaza, Elmsford, New York 10

Telephone: (914) 592-4400 • TWX: 710-567-1

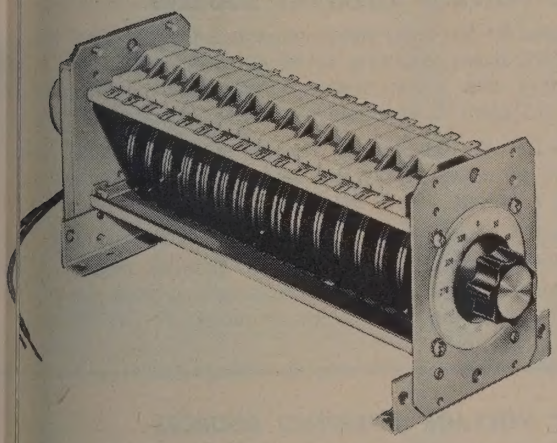
MALLORY INDUSTRIAL TIMERS

Series MIT

Miniature Industrial Sequence Programmers

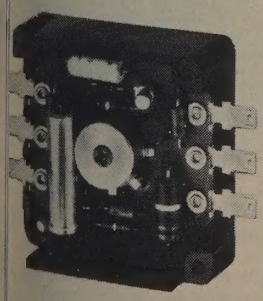
This small-size timer does big-size jobs. Measures only 2⅜" x 2⅞" x 2¾" including the motor. Comes with one or two cams, either adjustable or fixed. Select a cycle, from seconds to hours, change it with a simple manual adjustment. Designed for industrial service as interval or cycle timer.

Series IT



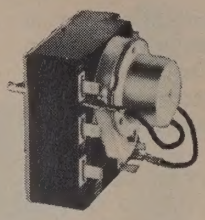
Multi-cam Industrial Sequence Programmer

Simple, quick, convenient. That's what it's like to change the cycle of this Mallory adjustable cam industrial timer. All you do is pull the spring-loaded cams apart, reposition to the cycle you want, let go... and you new cycle is locked in place. Changes as small as two degrees give flexibility to any automated product. The basic timer design comes in units of 5, 10 or 15 cams with virtually any time cycle and circuitry you need. Enclosed snap-action switches, tested for 1 million cycles, are rated 15 amps, 125 VAC.



Electronic assemblies—complete engineering and production facilities for design and manufacturing of special components.

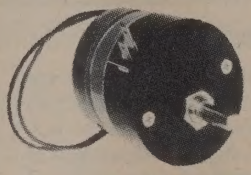
Series SD



Compact - Heavy Duty Timers

Switches four 25-amp circuits and a 10-amp circuit. The 3" x 3" x 1" size lets it fit behind a panel or inside a console. Designed for long-life, heavy-current applications such as dryers, furnaces, copying machines, battery chargers. Comes in a wide variety of time cycles and physical configurations.

Series LRT



Interval Timer

A compact, versatile hand-set electric timer. Heavy duty, 15 amp, rated switches provide a wide variety of switching functions. A neutral, or "center-off" switch position is available, as is a double upper ("make-make") configuration.

Setting the desired interval may be done by turning the shaft in either direction... even during a timing cycle. Many standard cams along with the wide range selection allow the LRT to meet most OEM dial layout specifications easily, without tooling.

"Hold" feature is available, allowing a non-timed setting during which the load under control is "on".

Applications include: hair dryers, heat lamps, blenders, battery chargers, food warmers, conveyor feeds, barn heaters, therapy machines, sterilizers and many others.

SPECIFICATIONS

OVERALL DIMENSIONS
2" dia. x 1¾"

AVAILABLE SWITCHING
SPST, SPDT, SPDT with neutral or double make positions (see other side)

SWITCH RATING
15 amp, 125/250 VAC
½ HP, 125/250 VAC

MOUNTING
Threaded bushing

TIMING MOTOR
Permanent magnet, 120 VAC, 60 Hz (standard)
24 to 240 VAC available — also 50 Hz

SHAFT ROTATION
Counter clockwise (standard), clockwise on request

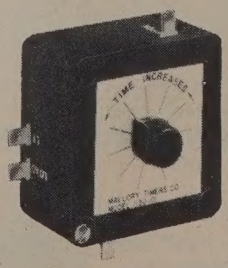
TERMINALS
3/16" flag on one lead, other stripped (standard)

TIME CYCLES AVAILABLE

SECONDS	30	40	48	60	72	90	96						
MINUTES	2	2.5	3	4	5	6	8	20	30	40	45	50	60
HOURS	2	2.5	3	4	5	6	8						

More than 100 other speeds, not listed above, are available.

Series BST



Solid State Timer

All solid state reset interval timer. No moving parts. High repeat accuracy over a wide range of temperature and voltage. Rugged housing permits easy mounting and connections. Timer and power output circuits protected against transient surges, noise. Ranges to five minutes.

Standard Mallory components are available from authorized Mallory distributors throughout the United States.

MALLORY

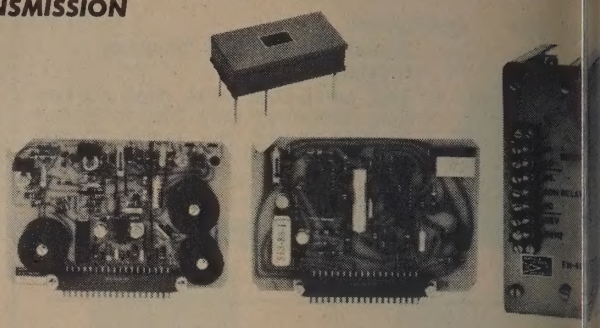
MALLORY TIMERS COMPANY
a division of P. R. MALLORY & CO. INC.
3029 E. Washington St., Indianapolis, Indiana 46206; Telephone: 317-636-5353

NORTH HILLS · HIGH-PERFORMANCE SYSTEM MODULES

ALARM, CONTROL, INSTRUMENTATION, DATA TRANSMISSION

North Hills is expending continuing engineering effort in developing families of standard System Modules for automatic test and process control applications. They are intended to free the systems engineer from the uneconomical diversions associated with the generation of detail hardware.

The System Modules briefly described below are representative of many that are being offered. North Hills is ready to extend existing or create new designs as necessary. Your inquiries are invited.



FREQUENCY AND SPEED INSTRUMENTATION

ELECTRONIC TACHOMETERS. Series SD Tachometers accept inputs from magnetic pickups, photochoppers, ac generators and similar speed sensors. Outputs are dc voltages or currents proportional to input frequency, virtually independent of waveform and amplitude. Preset trip-points can be included for alarms purposes.

FREQUENCY MONITORS — OVER, UNDER, BANDPASS. Series FM Frequency Monitors are frequency-responsive limit switches providing alarm indications by contact closure when input frequency is above or below one or more preset trip-points. Can be used for surveillance of any parameters such as speed or flow that can be represented by frequency. Fast response. Handle wide range of input voltage and waveform. Excellent repeatability and stability.

ZERO-SPEED SWITCHES. Series LK resemble FM Frequency Monitors, but are designed for alarm indication arbitrarily close to abnormal zero-speed condition.

VOLTAGE TO FREQUENCY AND FREQUENCY TO VOLTAGE CONVERTERS FOR DATA TRANSMISSION

DF and FD Series. Low-cost and compact. Standard models for full-scale frequencies of 100 and 500 Hz, 1, 5, and 10 kHz Exceptional linearity and stability.

VP and PV Series. Matched converters achieve 0.1% system linearity. 100 Hz to 10 kHz full-scale frequency models. Two-cycle response.

INDUSTRIAL CONTROL ALARMS AND TRANSMITTERS

ALARMS — CA Series. Provide relay contact closure when input level drops below preset level. Standard models for ac and dc mA, A, mV, V and thermocouple inputs.

TRANSMITTERS — CT Series. Have standard current outputs of 1-5, 4-20, 10-50 mA dc proportional to input levels derived from dc millivolt sources such as thermocouples.

DC VOLTAGE REFERENCE SOURCES

Series RA-50. Solid state compact (2.4″ x 1.3″ x 0.9″) mo for PC board mounting. Unregulated dc input, 10 V. no output with 3 ppm stability. Temperature coefficients to 0.1 ppm/°C. Loadable 0 to 5 mA. Short-circuit prot

RS-10. Ac line-powered version of series RA-50 con with dc power supply and resistor trimming string for 10 V. output. 4″ x 6″ PC card.

VS-510. Programmable 0 to 32 V, 0 to 100 mA v source. Output varied linear by external resistor. In trimmers for true zero and full-scale outputs. Four-ter remote sensing, short-circuit protected. 4″ x 6″ PC card

AC VOLTAGE REFERENCE SOURCES

VS-410 IN-PHASE REFERENCE SOURCE. Output 10 ±0.1% at 0° or 180° with respect to input 26 V rms ± 350-5000 Hz.

VS-420 QUADRATURE REFERENCE SOURCE. Same a 410 except + or −90°.

VS-430 AC VOLTAGE PROGRAMMABLE SOURCE. Mu preset, relay-selected, programmable output levels at 180° with respect to 10 V ±0.1% input, 350-5000 Hz.

VS-440 AC VOLTAGE & PHASE PROGRAMMABLE SO Multiple outputs preset, relay-selected programmable and phase angles between 0° and 360° with respect to ±0.1% input, 350-5000 Hz.

VS-450 AC CONTINUOUSLY PROGRAMMABLE VOL SOURCE. Output adjustable 0-32 V rms by means of ex potentiometer at 0° or 180° with respect to input of rms ±20%, 350-2000 Hz.

AC INSTRUMENTATION MODULES

PR Series. Precision ac to dc converters. Operational fiers accept input from 10 Hz to 10 kHz and furnis output proportional to input level. Fast response ve with low ripple for very low-frequency operation.

AS Series. Unity-gain amplifiers with narrow bandpa band-reject filters. Standard frequencies: 400, 1000, 4800 Hz.

SEE EEM SECTION 4000 FOR PRECISION POWER SOURCES, AND SECTION 5600 FOR WIDE BAND TRANSFORMERS AND HYB

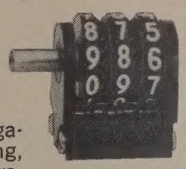
NORTH HILLS ELECTRONICS, INC.

GLEN COVE, N.Y. 11542 • 516 671-5700

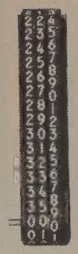
planet instruments
McGRAW EDISON
Thomas A Edison
INSTRUMENT DIVISION
ED PROGRESS ROAD, FORT WAYNE, IND. 46808
PHONE: 219-483-8124 • TWX: 810-332-1419

Precision Counters

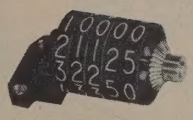
Planet readout counters can be designed for navigation, tracking, ranging, time, positioning, computing, fire control and industrial applications. Typical parameters include high speed, low torque, light-weight, miniturization and maximum reliability.



A-513-1
Three Digit
Decimal Counter

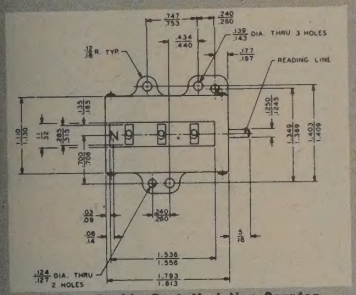


A1042
Three Digit
Tape Angle
Counter

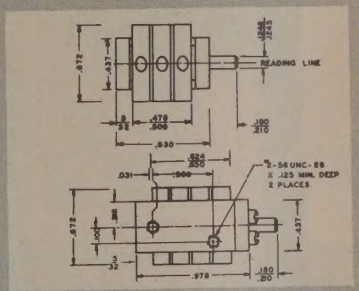


A-681-1
Digital Fuel
Metering Counter
(Internal Pinion Type)

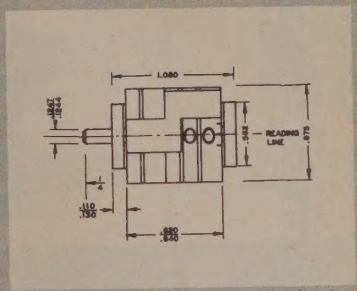
A-749-1
Digital Counter
(Internal Pinion Type)



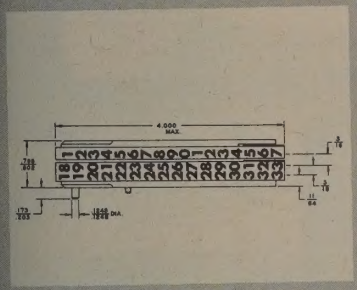
In-Line Double Bank Variation Counter
Applications—To indicate variations in navigational, dead reckoning, missile guidance and tracking systems.



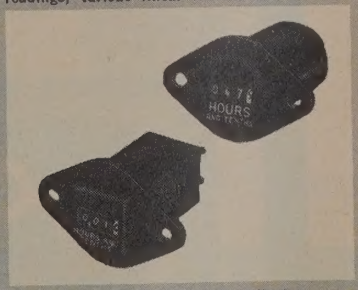
Miniature 3 and 4 Drum Internal Pinion Counters
Applications—Navigational components, missile tracking devices, fuel flow measurements, engine performance measurements, altimeter readings, various linear indications.



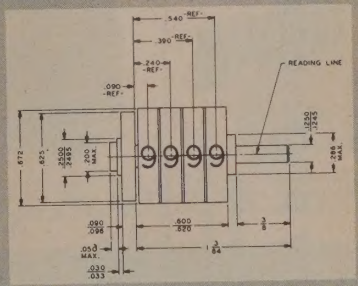
Double Bank Internal Pinion Variation Counter
Applications—To indicate variations in navigational, dead reckoning, guidance and tracking systems.



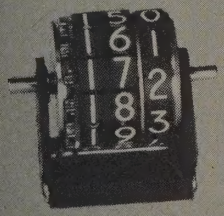
Tape Angle Counter
Applications—Navigation, servo position indication, fire control systems, azimuth indication, missile tracking systems, and any application requiring readout in angular increments.



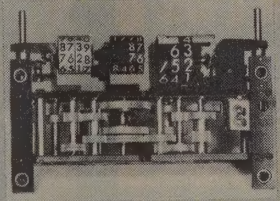
Sub-Miniature Elapsed Time Indicators
These elapsed time indicators are part of a complete line of indicating devices marketed by Planet Instruments. They are microminiature hermetically sealed units, available for operation on 400 Hz. All standard MS 17322 models, plus many optional mounting configurations are available.



Cantilevered Internal Pinion Counter
Applications—Navigational components, missile tracking devices, fuel flow measurements, engine performance measurements, altimeter readout, various linear measurements.

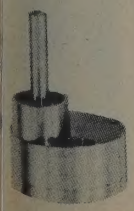


3 Digit Angle Counter
A revolutionary new concept in a mechanical angular readout counter. The Tri-Block angle counter measures only 1.250 x 1.084 x 1.392 yet incorporates large .250 high numerals. This unique design eliminates costly and complex timing assemblies found in other types of angle counters while providing distinct advantages in the area of torque, human engineering characteristics, viewing angle and numeral alignment.

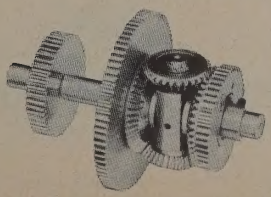


Altitude Select/Alert Controller Display
A fully integrated panel display for use on Altitude Alert Systems. All inputs are mechanically integreted thru the differential and geartrain to course and fine tune synchros or potentiometers that may be attached to the rear bearing plate. Many additional features such as built in clutches, auxiliary push to actuate micro switches may be provided as required.

OTHER PLANET INSTRUMENT QUALITY PRODUCTS

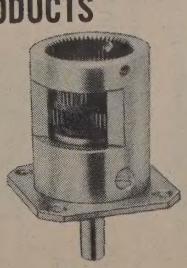


Special Gearheads



Differentials

2-Speed Gearheads
Sizes 8 and larger



Planetary
Gearheads

Precision
Angle
Compensator

printing digital voltmeter

for a permanent record of any engineering unit of measurement . . .

At $500.00 base price in a half-rack 3½" package PDM-611 makes printing possible of engineering units of measurement entered in analog fashion.

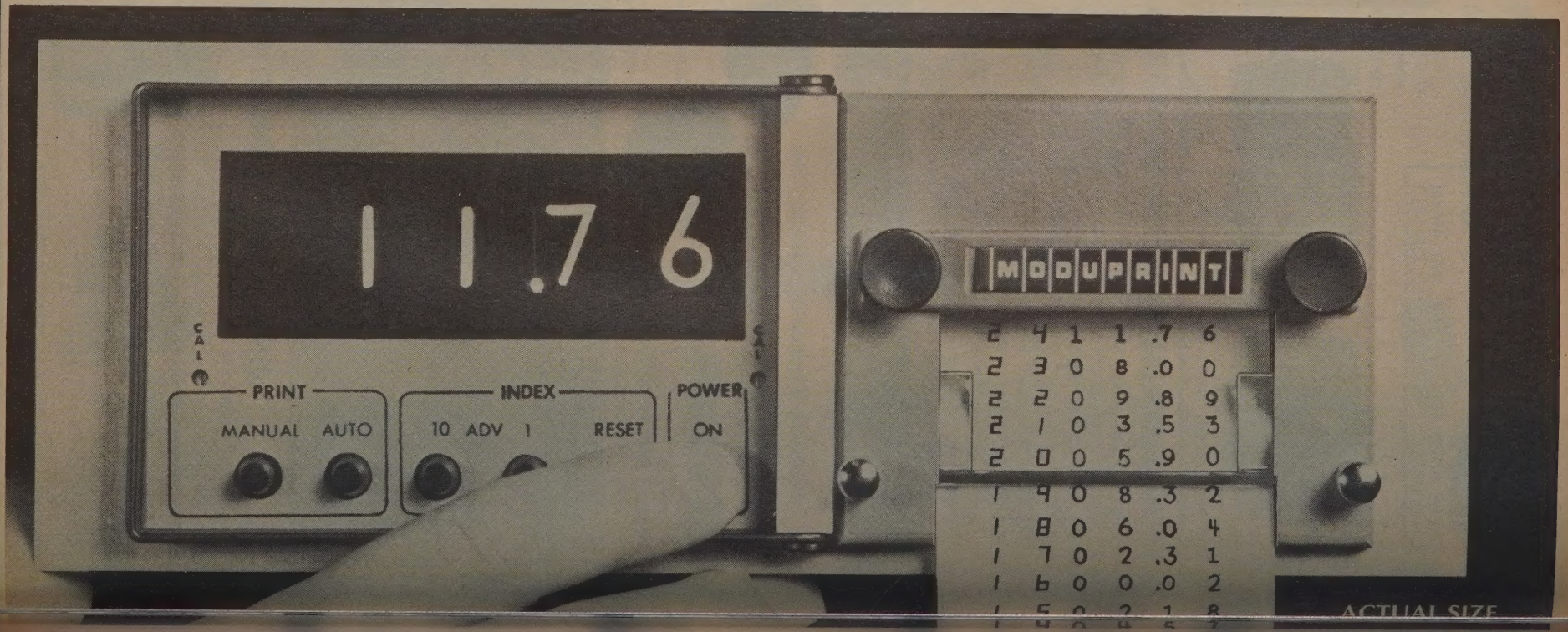
A 3½ digit DVM is mated to a new miniature 6 column printer. The printer records an identification number over- or under-range, and scale with fixed decimal point at rates to 3 lines per second. Normally recording volts from 0 - 199.9 V in 4 ranges, space is provided inside for customer supplied linearization networks, etc. for operation from a variety of tranducers. Also supplied with BCD out for data links.

Bulletin 710-B describes this basic device. Our catalog on Printers, Digital Displays and Counters is yours for the asking.

P A

PRACTICAL AUTOMATION, INC.

Trap Falls Road, Shelton, Connecticut 06484
(203) 929-1495 Telex 96-4217



See YELLOW SECTION for Local Offices, Phones

HUGE INVENTORY OF SHELF STOCK ITEMS

Precision Timer Co., Inc.

Westbrook Industrial Commons, Westbrook, Conn. 06498

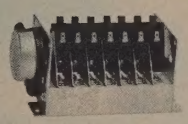
Send For This Special Edition Or If You Are In A Hurry – Call Us At Area Code 203 399-6253

PROGRAM

Economy Program Timer

Choice of — 3 to 8 Poles, 39 Stk Speeds, 7 Switch Spacings.

Program Timer

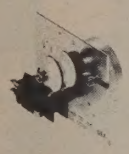


Standard Stocked Units used in Vending Machines and 100s of other products. Tab Terminals — Field Replaceable Switches — Up to 20 Load Circuits.

H. D. Program Timer Heavy Duty Switches

Choice includes: 22 or 25 Amps (1 h.p.) Many, Many Types Shelf-Stocked, Plus Specials.

Low Cost Programmer



Standard or Special Models Ideal for Continuous or Intermittent Operations.

Panel Mount Programmer

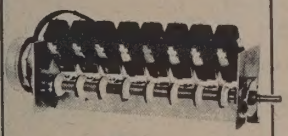
Manually Settable While Running or De-energized, Plus Completely Versatile Design.

DELAY AND INTERVAL

Pushbutton Delay Relay

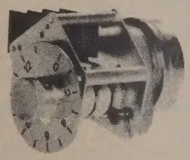
Your choice of 100s, Standard Stk, Time Delays Plus Specials.

Multi-Pole Chassis Mount



Reset Ganged Delay Relays 2 to 20 Poles.

Panel Mount Adjustable Delay Relay



10 thru 25 Amps 1, 2 or 3 Pole 8 Time Ranges.

Precision Time Delay Relay — Interval Timer

Standard or Special — Times Down to Zero Exactly, Then Holds to Your Special Program.

Time Delay Relay Interval Timer

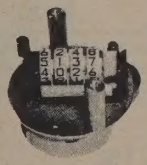
Fully Adjustable — Employed to Delay Transfer of a Heavy Duty Action Switch.

TOTALIZE

Pulse Accumulator

Produces Signal at End of Predetermined Pulse Countdown.

Hours Meter



Standard Shelf Stock with Instant Pushbutton Reset and Convenient Behind Panel, Easy Installation.

Running Time Meter For Behind-Panel Installations

Resettable with Thumb-Wheel or Non-Resettable.

Running Time Meter

Low-Low Cost, Yet Accurate and Reliable. Standard Stock Shelf Units Very Popular.

Pushbutton Reset

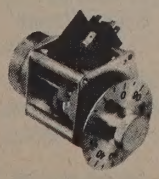
Fully Synchronous. Choose from: Square or Round Bezels — Instant Reset with Pushbutton for Extremely Fast Data Readings.

SPECIAL PURPOSE

Percentage Timer

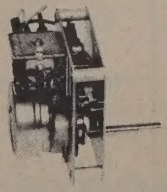
Provides Manually Selectable Output Pulse During Each Fixed Cycle.

Variable Pulse Generator



A Percentage Timer with One or Two Pair of Independent Programming Cams. An Ideal Photocopier Control.

Delay With Pulse Output

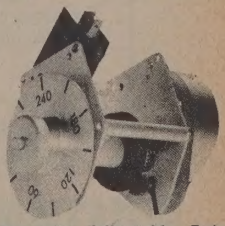


Special Purpose — 2 Pole Delay Relay, Yields Delay Plus Pulse.

Ultra-Reliable Starter Timer

Specially Built Starter Timer for Diesel-Electric Emergency Generators for Hospitals, Schools, Public Buildings.

Delay With Local Pushbutton



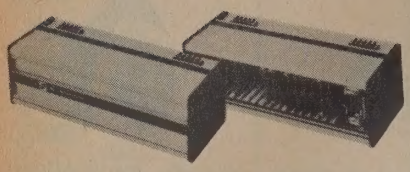
Manually Adjustable Delay Relay/Interval Timer for Local Pushbutton Operation.

Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

RO

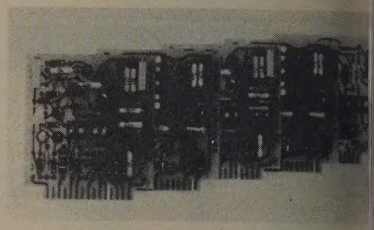
RO ASSOCIATES
3705 HAVEN AVE.
MENLO PARK
CALIFORNIA 94025

Analog Modules for Control Systems: 900 and 800 Serie



CARD CAGE

Free standing or rack mounted
Rack mounting flanges available for standard 19-inch rack
Holds power supply and 17 boards or 20 boards alone
Completely metal enclosed
Excellent flexibility for connectors, switches, meters, etc.
Size — 5½" x 6½" x 18"
Price — $75.00



Complete line of standard cards
Instant analog systems
Off-the-shelf delivery
Compatible power supplies available

900 Series / Precision modules for system accuracies of 0.01% to 0.1%

	901	905	933	950	955
Function:	Single-Ended Operational Amplifier	Differential Operational Amplifier	Voltage Follower	Voltage Comparator	Controlled Hysteresis
Gain:	300,000	300,000	1 ±0.002%	∞	
Output [4]:	±10 v @ ±15 ma	±10 v @ ±15 ma	10 v @ ±20 ma	±14 v @ 14 ma min.	
Frequency:	2 MHz gain bandwidth	1 MHz gain bandwidth	200 KHz 3 db	2 μsec rise & fall time	
Offset: Voltage	adj. [1]	adj. [1]	adj. [1]	adj. [1]	The Model 955 is used in conjunction with the 9 It provides referen voltage, adj. hystere and a 400 ma pow output; 2 circuits a contained on each boa
Current	adj. [1]	<5 na diff.	adj. [1]	—	
Drift: Voltage [2]	±10 μv/°C	<5 μv/°C	±5 μv/°C	±5 μv/°C	
Current [2]	±0.2 na/°C	±0.15 na/°C	±0.12 na/°C	—	
Input Impedance:	0.2 MΩ	0.5 MΩ diff.	4000 MΩ	> 10 MΩ	
Power Supply [3] Requirements:	±24 v @ 8 ma + Load	±24 vdc @ 3 ma + Load	±24 v @ 10 ma + Load	±24 v @ 10 ma + Load	
Price: (small quantity) [5]	$49.50	$49.50	$62.00	$49.50	

1 Adjustable with built in potentiometer.
2 Each model operates from −25° to +85°C.
3 Each model operates from ±15 to ±30 volt power supply with modified input and output swings.
4 Input and output completely protected on all models.
5 Individual prices shown. Up 25% discount when purchased in quantity.

800 Series / Low cost industrial models for system accuracies of 0.1% to 1%

	801	802	833	834	850
Function:	Dual Diff. Operational Amplifiers	Voltage to Current Converter or Voltage to Voltage Converter	Dual Voltage Follower	Dual Analog Memory	Dual Comparator
Features:	High gain, frequency compensated, 2 circuits/board	All common current outputs available. Span and zero adjusts included	FET input Unity Gain 2 circuits/board	LONG Hold Time Accuracy 2 circuits/board	Self contained references power output, adj. hysteresis 2 circuits/board
Specs:	Gain: 50,000 Output: ±10 v, @ 5 ma Freq: 1 MC	Inputs: 0 to 10, 100, 1000, 10,000 mv Outputs: 1 - 5, 4 - 20, 10 - 50 ma; 0 to 10, 100, 1000, 10,000 mv	Input Impedance: 10^{12} Ω Range: ±10 v Gain: 1 ±.04%	Decay: 500 μv/sec Out: ±10 v @ 5 ma Gain: 1 ±.04%	Input imp: 0.5 megohms Output: 7 v @ 8 ma. and ±24 @ 400 ma
Price:	$30.00/board	$85.00	$60.00/board	$62.50/board	$93.50/board

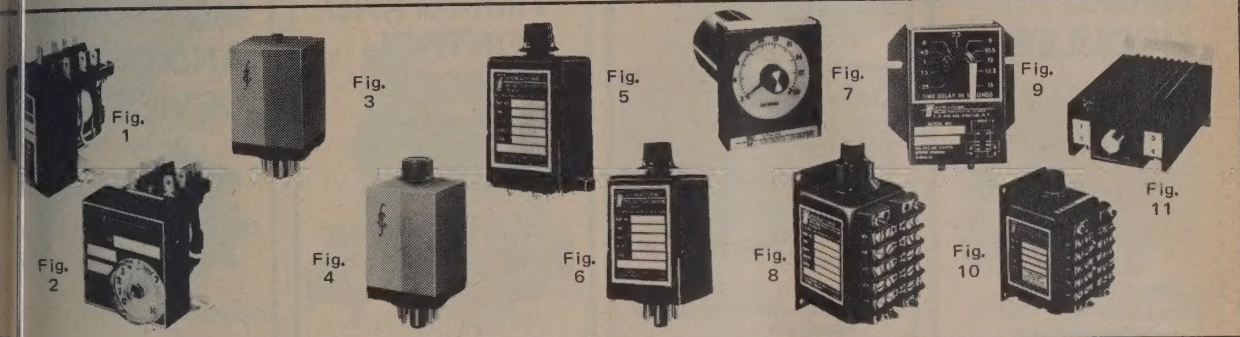
Note: All units operate from ±24 volt power supplies. Compatible units available from RO see Section 4000.

RO ASSOCIATES, Incorporated / 3705 Haven Ave. / Menlo Park, California 94025 / (415) 322-5321 / TWX 910-378-592

the broadest line of olid state timing devices

e Electronics transistorized series of timers (time elays) are of the fixed or adjustable type, designed in light or heavy industrial and commercial appli- Timers consist of solid state circuitry driving a tained relay, (except MTS — fully solid state).

Since the timer circuit eliminates cams, clutches and motors, there can be no mechanical wear, thus affording long dependable life and highly reliable operation. Many models are interchangeable with mechanical, pneumatic, thermal and other electronic timers.



EL	ENCLOSURE FIG. =	MODE OF OPERATION	MIN.-MAX. TIME DELAY RANGES (SECONDS)	REPEAT ACCURACY ±%	OUTPUT RATING (AMPS)	CONTACT FORM	TYPE TERMINATION	APPROX. SIZE L" x W" x H"	APPROX. UNIT PRICE
R	1	ON DELAY (FIXED)	.1 TO 180	±7%	10	DPDT (RELAY)	QUICK CON SOLDER	2 x 1 7/8 x 2	$9
R	2	ON DELAY	.1 TO 180	7	10	DPDT (RELAY)	QUICK CON SOLDER	2 x 1 7/8 x 2 3/16	$12
R	3-4	ON DELAY	.1 TO 480	5	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$19
R	5-6	ON DELAY	.1 TO 480	2	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$24
R	5-6	ON DELAY	.1 TO 480	1	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$29
R	7	ON DELAY	.25 TO 480	1	10	DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$68
LR	7	ON DELAY	.25 TO 480	5	10	DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$48
R	7	ON DELAY INST.	.25 TO 480	2	10	2-DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$52
TR	10	ON DELAY	.1 TO 480	2	10	DPDT (RELAY)	TERMINAL BLOCK	3 1/2 x 2 x 2 1/2	$27
TR	9	ON DELAY	.1 TO 480	5	10	DPDT (RELAY)	QUICK CON SOLDER	3 3/4 x 3 3/8 x 2 5/8	$17
DR	5-6	OFF DELAY	.1 TO 480	2	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$24
LR	3-4	OFF DELAY	.1 TO 480	5	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$19
SR	5-6	SINGLE SHOT	.1 TO 480	2	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$29
FR	8	ON-OFF RECYCLE	.25 TO 360	2	10	DPDT (RELAY)	TERMINAL BLOCK	3 1/2 x 2 x 2 1/2	$37
ATS	11	ON DELAY	.1 TO 360	3	1	SPST N.O. (SOLID STATE)	SCREW	2 3/8 x 2 3/8 x 3 1/4	$44
IS	3	ON DELAY	.1 TO 180	5	1	SPST N.O. (SOLID STATE)	OCTAL PLUG-IN	1½x1½x3	$11
DR	3	ON DELAY	1 TO 60	5	3	DPDT (RELAY)	OCTAL PLUG-IN	1½x1½x3	$8
ES	4	ON DELAY	.1 TO 240	2	1	SPDT N.O. (RELAY)	OCTAL PLUG-IN	1½x1½x3½	$19

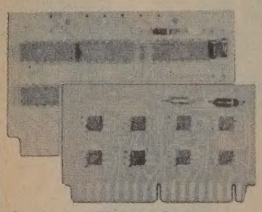
addition to the timing products shown, Syracuse Electronics Corporation manufactures Temperature, Photo, Power, uid Level, and a host of other solid state controls for the Industrial, Commercial and Military consumers.

SYRACUSE ELECTRONICS CORPORATION

P. O. Box 566 Syracuse, New York 13201 Phone: 315 488-4911

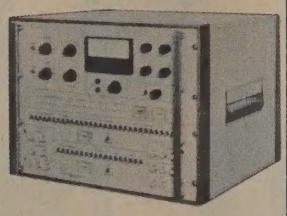
ELECTRONIC MODULE AND SYSTEM CAPABILITY

DIGITAL AND ANALOG LOGIC MODULES



- Basic DTL functions
- Functional logic configurations
- Clock and timing modules
- Logic and output interfaces
- D/A, A/D, and multiplexing modules
- Indicator, relay and logic drivers
- Power supplies
- A full line of complimentary hardware, including bus bars, connectors, chassis, slides and enclosures

CUSTOM DIGITAL SYSTEMS

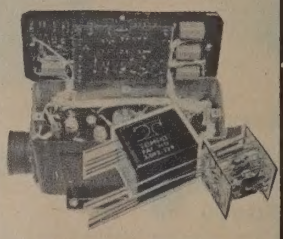


- Custom system design and fabrication

Systems available for:

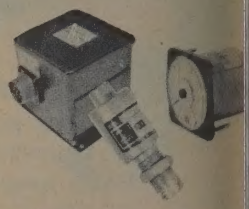
- Data acquisition
- Time coding
- Memory
- Arithmetic operations
- Multi-channel A/D conversion
- Encoding/Decoding
- Function monitoring

AEROSPACE-MILITARY TIMING AND CONTROL DEVICES



- Hi-Rel timers for use in temperature range of −250° to +250°F
- 2 of 3 voting timers with reliability of 99.999999997%
- Visual display timers
- Radiation hardened timers
- Weapon safing systems
- Ordnance weapon controls
- Airborne encoders
- Time code generators

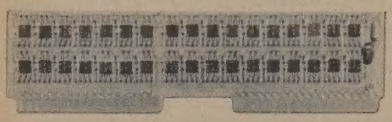
SPEED CONTROL, MONTORING, AND SENSING DEVICES



- Under/Over speed detector
- Tachometers
- Multi-point speed detection systems
- Transducers with integral electronics
- Open and closed loop DC speed control systems

SPECIALIZED HIGH-DENSITY ELECTRONIC PACKAGING

Tempo/UTI has developed HI-D®—a highly reliable, economical, and easily maintainable method of packaging electronic circuits.



TYPICAL COMPONENT DENSITY

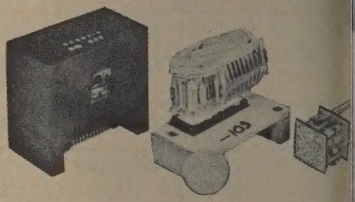
HI-D® is a stitch-wire welding process which consists of cold-flow welding insulated nickel wire to gold-plated stainless steel pins. Components are welded or soldered on the opposite side of the wired board. All connections are insulated and conformally coated for ruggedized use.

Major advantages of using this technique are:

- Only one basic board is used, from which a multitude of logic configurations can be wired.
- Design modifications can be made with relative ease—a feature not available using other interconnection techniques.
- HI-D® permits full use of LSI and MSI circuits, allowing installation of multiple packages on a single board, with a resultant decrease in back plane wiring.

INTERMIXING OF COMPONENTS

STITCH-WIRED INTERCONNECTIONS



CORDWOOD WELDED MODULE

In addition to the HI-D® packaging capab Tempo/UTI is equipped to perform other type specialized connections, including wave solde gap welding, and construction of "Cordwo welded modules using capacitance discha opposed electrode equipment.

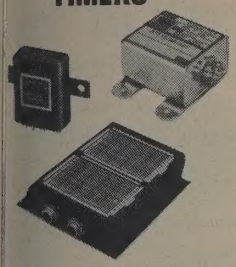
Our welding facility and operator training prog is rigidly controlled to the requirements of MS STD-271.

Contact Tempo/UTI for Your Special Requirements

TEMPO/UTI DIVISION
Allen Electric and Equipment Company
9135 Independence Ave. • Chatsworth, Calif. • 213-882-7722 • Telex 65-1439

MIL-TYPE DEVICES FOR TIMING, SENSING, CONTROLLING

TIMERS



MILITARY TIMERS, MIL-R-5757/22

TRANSISTORIZED TIME DELAY RELAYS

MICRO-MINIATURE TIMERS

REPEAT CYCLE TIMERS

SOLID STATE SEQUENTIAL PROGRAMMERS

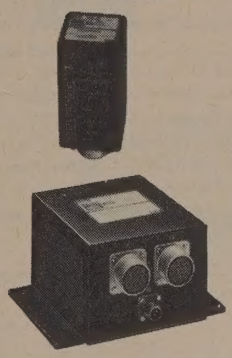
TRANSISTORIZED SIGNAL FLASHERS

SOLID STATE INTERVALOMETERS

AIRCRAFT LAVATORY TIMERS

COMPUTER TIMERS

SENSORS



FREQUENCY DETECTORS

SPEED SENSORS

RPM WARNING DETECTORS

VOLTAGE SENSORS

3-PHASE FAULT DETECTORS

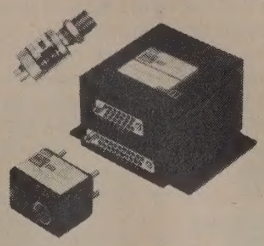
CURRENT SENSORS

PULSE DETECTORS

TEMPERATURE SENSORS

SOLID STATE SWITCHES & CIRCUIT BREAKERS

CONTROLS



SOLID STATE LAMP DIMMERS

ORDNANCE/WEAPON CONTROLS

ELECTRONIC DYNAMIC BRAKES

AIRBORNE TELEMETRY CALIBRATORS

WARNING TONE GENERATORS

SOLID STATE SPEED SWITCHES

HEATER CONTROLS

MOTOR SPEED CONTROLLER/REGULATOR

METERS/INSTRUMENTS

RPM INDICATORS
FREQUENCY METERS

SPECIAL PRODUCTS

RADIATION-HARDENED DEVICES

EXTREME ENVIRONMENT DESIGNS

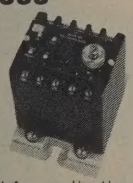
HIGH-RELIABILITY PROGRAMS

Tempo offers facilities and personnel for high reliability programs requiring special documentation, component identification and traceability, NASA-qualified personnel, etc.

INDUSTRIAL SOLID STATE TIMERS

The Most Complete Choice Available

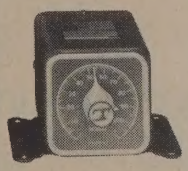
SERIES 999



Solid-State Machine Tool Control Timer

Specifically designed for applications requiring accuracy and reliability under rugged environmental conditions and high duty cycles, such as 2-million or more operations per year and cycles greater than 500 cycles per hour. Accuracy better than 2%. Unlimited life rating. Screwdriver-adjustable time delay. Switch-selectable timing logics and NO or NC static 1.2 amp output contacts.

SERIES 888

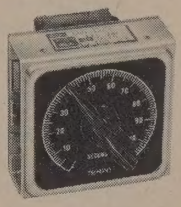


Highest quality solid state timers for the ultimate in reliability, quality and versatility. Adjustable timing from 0.15 sec. to 60 min. Complete choice of timing logics, mounting styles, and input voltages. AC timers feature transformer operation.

SERIES 666

Moderately priced solid state timers in plug-in package. Adjustable timing from 0.15 to 300 sec. Input voltage 115 VAC. All circuits are completely protected by zener regulation.

SERIES 444



Low cost solid state timers for wall or panel mounting. Adjustable timing from 0.15 to 300 sec. Plug-in output relay. Input voltage 115 VAC, 28 VDC, or other.

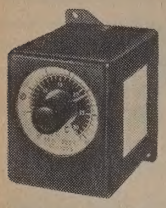
SERIES 111 & 333

NEW! The only low cost solid state timers with positive electronic latching plus choice of mounting (plug-in or rear-chassis) and three different timing logics. Adjustable timing from 0.5 to 180 sec. Input 115 VAC or other voltages.

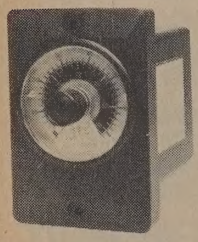
Talk to Tempo When You Want to Time, Switch, Sense or Control

TEMPO INSTRUMENT DIVISION
Allen Electric and Equipment Company
Plainview, L.I., New York • 516-694-4400 • TWX 510-224-6421

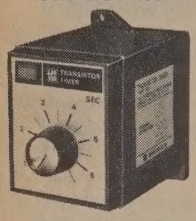
Reliable Precision Timers from TEC



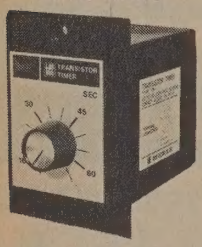
Series UT-100



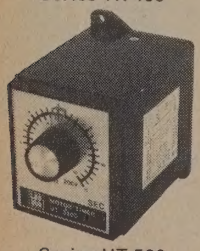
Series UT-200



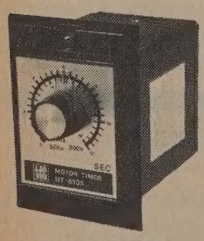
Series TR-300



Series TR-400



Series UT-500



Series UT-600

Miniature Motor Timer, Series UT-100 & UT-200

● High reliability. ● Various dials. ● Compactness. ● Easy maintenance.

The TEC Miniature Motor Timer, Type UT is a synchronous motor-driven timer in which the contacts open or close after a set time. The Timer has an indicator which moves toward "zero" during the timing, showing how much time remains. Many models are available in various time ranges from a 10-sec type to a 24-hour type.

■ **Specifications**

Repeat accuracy: 10-sec. timer...0.2 sec.(accur. / 24-hr. timer...28.8 min.

Contact ratings: AC220V, 2A (resistive load) AC220V, 0.5A (inductive load p.f.=0.4) DC110V, 0.2A (resistive load)

Life: Mechanical life: 1 million operations. Electrical life: 500,000 operations. Total operating time: 20,000 hours.

■ **Variety**

Variety	Type		Preset time		Rated voltage	Contact circuit
	Surface mounting type	Flush mounting type	50 c/s	60 c/s		
10-sec. timer	UT-110S	UT-210S	0.4~12 sec.	0.4~10 sec.	110V 50/60 Hz	Time delaye contact 1 a b, 1 a
30-sec. timer	UT-130S	UT-230S	1~36 sec.	1~30 sec.		
1-min. timer	UT-101M	UT-201M	2~72 sec.	2~60 sec.		
3-min. timer	UT-103M	UT-203M	0.1~3.6 min.	0.1~3 min.		
6-min. timer	UT-106M	UT-206M	0.2~7.2 min.	0.2~6 min.		
15-min. timer	UT-115M	UT-215M	0.5~18 min.	0.5~15 min.	220V 50/60 Hz	Instantaneo contact 1 a Note: a...normal open contact b...normal closed contact
30-min. timer	UT-130M	UT-230M	1~36 min.	1~30 min.		
1-hr. timer	UT-101H	UT-201H	2~72 min.	2~60 min.		
3-hr. timer	UT-103H	UT-203H	0.1~3.6 hr.	0.1~3 hr.		
6-hr. timer	UT-106H	UT-206H	0.2~7.2 hr.	0.2~6 hr.		
12-hr. timer	UT-112H	UT-212H	0.4~14.4 hr.	0.4~12 hr.		
24-hr. timer	UT-124H	UT-224H	0.8~28.8 hr.	0.8~24 hr.		

Solid State Timers, Series TR-300 & TR-400

The ultimate in solid state timers. Precision-made, ideal for short-time controls. Circuits designed for high frequency use and long-life service. Highly stable and accurate, small and light. Highly reliable capacitors used. Of plug-in type with pilot lamp. Six models available in time ranges of 1, 3, 6, 15, 30 and 60 seconds.

■ **Specifications**

Contact ratings: 3A at 220V a-c (resistive load) 1A at 220V a-c (p.f.=0.4) 0.5A at 220V d-c (resistive load)

Repeat accuracy: ±2% of full scale

Life:

Minimum mechanical life: 5,000,000 operation

Minimum electrical life: 2,000,000 operations

■ **Models**

Mounting		Time Range in sec.	Operating Volts		Cont
Surface type	Flush type		a-c	d-c	
TR-301	TR-401	0.1~1	110/220V 50/60Hz	24	SPD
TR-303	TR-403	0.3~3			
TR-306	TR-406	1~6			
TR-315	TR-415	3~15		48	
TR-330	TR-430	5~30			
TR-360	TR-460	15~60		110	

Miniature Motor Timers, Series UT-500 & UT-600

Compact and economical motor timer redesigned in line with the popular UT-100 and UT-200 series of motor timers.

■ **Features**

● Smart design. Plug-in type terminal. ● Economical price due to simplified mechanism requiring no moving pointer. ● Available in a variety of types ranging from 10 seconds to 24 hours in either surface-mount or flush-mount types.

■ **Specifications**

Contact ratings: 220V AC 2A (resistive load) 220V AC 0.5A (inductive load p.f.=0.4) 120V DC 0.2A (resistive load)

Repeat accuracy: ±2% of full scale

Life: Minimum mechanical life: 1 million operations/Minimum electrical life: 500,000 operations / Total operating time: 20,000 hours

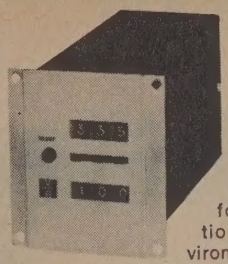
■ **Models**

Type		Time Range	
Surface-mount Type	Flush-mount Type	50 Hz	60 Hz
UT-510S	UT-610S	0.4~12 sec.	0.4~10 se
UT-530S	UT-630S	1~36 sec.	1~30 sec.
UT-501M	UT-601M	2~72 sec.	2~60 sec.
UT-503M	UT-603M	0.1~3.6 min.	0.1~3 min
UT-506M	UT-606M	0.2~7.2 min.	0.2~6 min
UT-515M	UT-615M	0.5~18 min.	0.5~15 mi
UT-530M	UT-630M	1~36 min.	1~30 min.
UT-501H	UT-601H	2~72 min.	2~60 min.
UT-503H	UT-603H	0.1~3.6 hr.	0.1~3 hr.
UT-506H	UT-606H	0.2~7.2 hr.	0.2~6 hr.
UT-512H	UT-612H	0.4~14.4 hr.	0.4~12 hr.
UT-524H	UT-624H	0.8~28.8 hr.	0.8~24 hr.

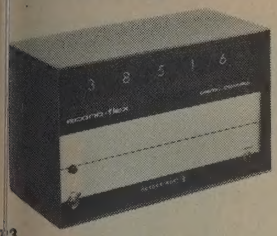
TOKYO ELECTRIC CO.,LTD.

The 5th Hasegawa Bldg., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan

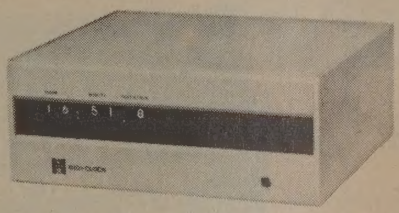
When it comes to counting, recording or controlling, come to Veeder-Root



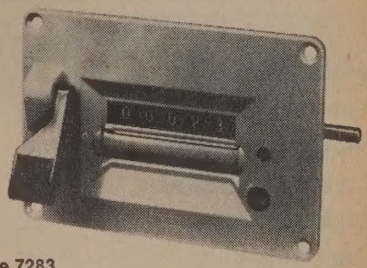
The 7102 Digi-Flex* Predetermining Counter: Electrically driven. Off-the-shelf. Both versatile and economical. Ideally suited for control applications in industrial environments.



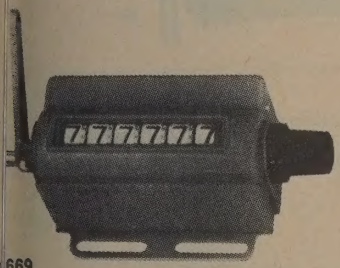
The 7[illegible]3 Econ-Flex* Totalizing Counter: Five-decade, in-line illuminated display. High speed, high readability. Solid state. Integrated electronic circuitry. Long life tubes, polarized window filter. Counts even if lamp fails. For linear measuring, rapid production totalizing of steel, metals, textiles, containers, pills, etc.



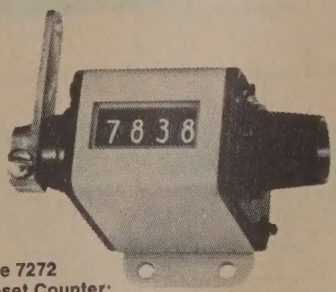
The 7108 Digi-Clock Time Display: Offers a wide range of features for computer input. Self-contained desk unit or component of larger systems. Readout code: decimal or BCD.



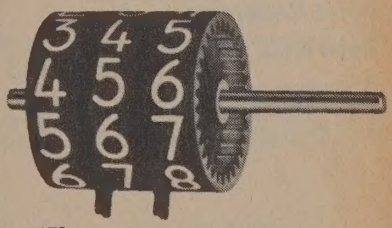
The 7283 Predetermining Counter: Rapid reset counter with positive electrical knock-off. Features a positive interlock and base or panel mount. Recommended for industrial precision control.



The [illegible]669 Visicounter* Totalizer: Ruggedly-built counter with distinct figures. Ideal for use on heavy equipment like power presses and industrial machines.

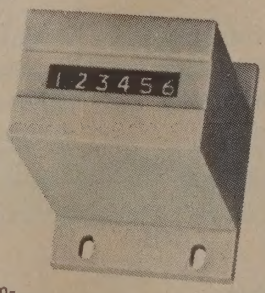


The 7272 Reset Counter: For indoor and outdoor use where small size, accuracy, and legible figures are essential. Features acetal resin components and a corrosion-resistant case.

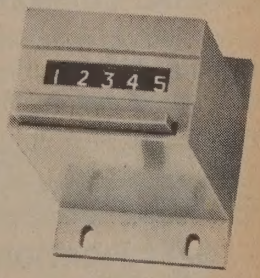


The 7170 Precision Instrument Odometer: Light yet durable counter with modular wheel construction, providing flexible design opportunities. High speed 500 rpm. Meets applicable Mil Specs.

The 7162 Jewel Bearing: Features individual wheel and pinion supports. Sturdy aluminum frame and wheels keep weight low. For use in servopneumatic altimeters. Exceptionally low torque 0.0002 oz-in.



The 7437 Electric Counter: A low cost electric counter featuring a one piece frame construction for greater reliability and simplicity of design. Ideal for office machines or coin-operated equipment. Available with 5 or 6 figures and a variety of mounting configurations. AC or DC.



The 7438 Reset Electric Counter: Offers the convenience of push-bar reset with the economy of rotary reset. Simple, one piece frame construction assures reliability. Ideal for test equipment, control equipment and office machines. Available with 5 figures and a variety of mountings. AC or DC.

The 1969 Veeder Decade* Totalizer: Single wheel, electric counter with electric readout, transfer and reset. Features narrow width with large figures for outstanding readability.

*Trademark of Veeder-Root

Veeder-Root always comes through with the finest equipment you can buy.

In fact, our line of counters is so complete, it'll solve any application problems you may have.

For further information on our full line of mechanical, electrical and electronic totalizers and controls, write to: Veeder-Root, Hartford, Connecticut 06102.

VEEDER-ROOT

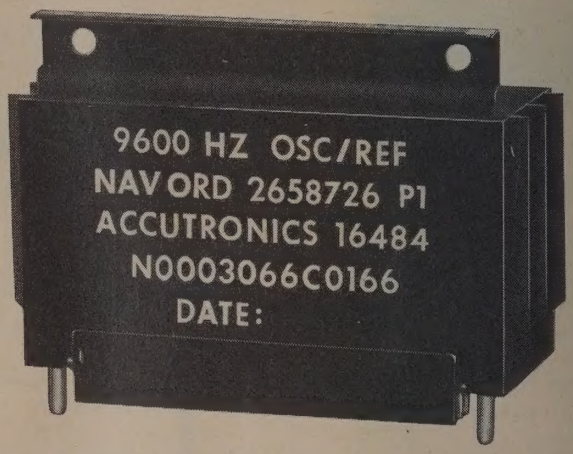
INNOVATORS IN NUMERICS: COUNTING/RECORDING/CONTROLLING

Veeder-Root World-Wide: Argentina: Buenos Aires•Australia: Melbourne•Brazil: Sao Paulo
England: New Addington, Surrey•Scotland: Dundee•West Germany: Neuhausen/Filder•Canada: Toronto

OSCILLATOR
Series SHP

100Hz to 20M

NAFI STANDARD HARDWARE PROGRAM



FEATURES
- Functionally Specified Design
- State of The Art Advances
- Crystal Controlled
- Digital Dividers
- High Reliability

APPLICATIONS
- SHP Systems
- Computer Clock
- Voltage Reference
- Pulse Generator
- Reference Oscillator

GENERAL COMMENTS

Accutronics is a qualified vendor for the U.S. Navy Standard Hardware Program. New NAFI design concepts stimulates quality control and in process production programs to insure Hi-Rel modules.

Accutronics has capabilities of production of vari s oscillators in the NAFI Functionally Specified des n approach. For further up to date information ple e contact our sales staff.

SPECIFICATIONS

Frequency Range: 100Hz to 20 MHz
Frequency Tolerance: ±0.005%
Temperature Range: 0°C to 65°C
Supply Voltage: +5VDC ±5%
Waveform: Square
Symmetry: 50/50 ±1%

Source Voltage: >2.5V and <5V peak
Sink Voltage: 0.0V ±0.3V @ 5MA
Rise & Fall Time: <20 Nano sec
Load Impedance: IC Logic
Size: NAFI "C" Dimension
Termination: 40 pin connector

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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Area Code 312 232-2600

STEM CLOCK
Series 100

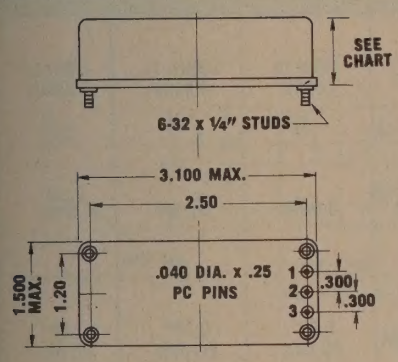
1Hz to 1MHz

EQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CD	JJ	KK	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.025%	±0.005%	±0.002%	

SE DIMENSIONS

ORDERING GUIDE
8



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	5	2	7	5
Frequency	1 Hz to 15KHz	15KHz to 1MHz	60Hz to 15KHz	15 KHz to 1MHz
Waveform	Square	Square	Sine	Sine
Case Height	1.00"	0.50"	1.50"	1.00"

TPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	27	12
Frequency Range	1Hz to 1MHz	1Hz to 1MHz	60Hz to 1MHz
Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Square	Sine
Rise Time	<50 NS 10pfd load	<100 NS 10pfd load	———
Fall Time	<25 NS 10pfd load	<50 NS 10pfd load	———
Distortion	———	———	<5%
Source Voltage	5V peak ±5% from 680Ω	12V peak ±5% from 1KΩ	———
Sink Voltage	0.0V ±0.3V @ 10MA	0.0V ±0.3V @ 10MA	———
Output Voltage	———	10V P/P nominal	1V rms ±30%
Load Resistance	IC Logic	10KΩ resistive	10KΩ resistive
Source Impedance	680Ω	1KΩ	8KΩ Max.
Output Stage	NPN Common Emitter	NPN Common Emitter	———

TERMINATION

ORDERING GUIDE
P

PRINTED CIRCUIT PINS

Pin #1 — Plus Supply
#2 — Output
#3 — Common

NERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1Hz to 4Hz	4Hz to 60Hz	60 Hz to 960 Hz	960Hz to 15 KHz	15KHz to 1MHz
Current Drain	<175MA	<140MA	<65MA	<45MA	<20MA
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±20%

Please specify standard operating supply voltages and output voltages. Other voltages are available upon request.

LL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is KK 8 7 28 P

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability	Base Dimensions	Frequency Waveform Height	Output Specifications	Terminations
CD, JJ or KK	8	5, 2, 7 or 5	28, 27 or 12	P

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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accutronics

MINIATURE OSCILLATOR
Series 110

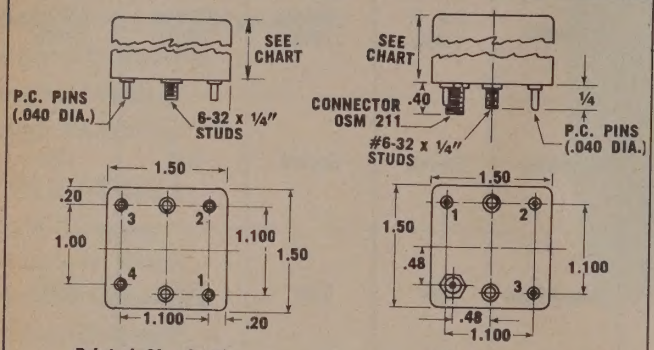
1MHz to 250M

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CJ	JL	KM	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.005%	±0.001%	±0.0005%	

BASE DIMENSIONS

ORDERING GUIDE
1



Printed Circuit Pins — OSM Connector

FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	3	2	5	
Frequency	1MHz to 10MHz	10MHz to 60MHz	1MHz to 100MHz	1[illegible] 2[illegible]
Waveform	Square	Square	Sine	[illegible]
Case Height	0.62" PC pins	0.50" PC pins	1.00" PC pins	1.5[illegible] co[illegible]

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	12	11
Frequency Range	1MHz to 60MHz	1MHz to 10 MHz	10MHz to 250MHz
*Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Sine	Sine
Rise Time	<25 NS	———	———
Fall Time	<15 NS	———	———
Distortion	———	<5%	<10%
Source Voltage	5V peak ±5% from 680Ω 5V peak ±5% from 330Ω >10MHz	——— ———	——— ———
Sink Voltage	0.0V ±0.3V @ 5MA	———	———
Output Voltage	———	1V rms ±30%	+10 dbm ±3 db
Load Resistance	IC Logic	1KΩ resistive	50Ω resistive
Output Stage	NPN Common Emitter	———	———

TERMINATION

ORDERING GUIDE	
P	L
PRINTED CIRCUIT PINS	OSM CONN[illegible]
Pin #1 Plus Supply	Pin #1 Plus [illegible]
#2 Common	#2 Com[illegible]
#3 Common	#3 Com[illegible]
#4 Output	OSM Out[illegible]

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE			
	1MHz to 10MHz	10MHz to 20MHz	20MHz to 60MHz	60MHz to 250M
Current Drain	< 10MA	< 10MA	< 20MA	< 35MA
Symmetry	50/50 ±20%	50/50 ±20%	50/50 ±20%	———

These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CJ 1 2 2

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability CJ, JL or KM	Base Dimensions 1	Frequency Waveform Height 3.2. 5 or 7	Output Specifications 28, 12 or 11	Termination P or L
	1			

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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Area Code 312 232-2600

TRAMINIATURE OSCILLATOR
Series 130

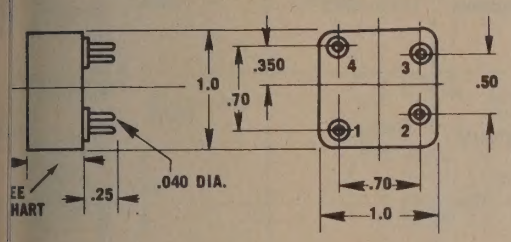
100Hz to 150MHz

EQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CJ	JK	KL	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.005%	±0.002%	±0.001%	

BASE DIMENSIONS

ORDERING GUIDE
3



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	3	2	1	4
Frequency	100Hz to 23KHz	23KHz to 6MHz	6MHz to 60MHz	6MHz to 150MHz
Waveform	Square	Square	Square	Sine
Case Height	0.62″	0.50″	0.40″	0.75″

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	29	12	11
Frequency Range	100Hz to 60MHz	6MHz to 20MHz	20MHz to 150MHz
Supply Voltage	+5VDC ±2%	+12VDC ±1%	+12VDC ±1%
Waveform	Square	Sine	Sine
Rise Time	<20 NS	———	———
Fall Time	<10 NS	———	———
Distortion	———	<5%	<10%
Source Voltage	>2.5V peak @ 2MA	———	———
Sink Voltage	<0.4V @ 5MA	———	———
Output Voltage	———	1V rms ±30%	0 dbm ±3 db
Load Resistance	IC Logic	1KΩ resistive	50Ω resistive

TERMINATION

ORDERING GUIDE
P

PRINTED CIRCUIT PINS

Pin #1 — Plus Supply
#2 — Common
#3 — Common
#4 — Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE					
	100Hz to 2KHz	2KHz to 24KHz	24KHz to 375KHz	375KHz to 1.5 MHz	1.5MHz to 6MHz	6MHz to 150MHz
Current Drain	<230MA	<180MA	<130MA	<60MA	<50MA	<40MA
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±5%	50/50 ±7%	———

These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CJ 3 3 29 P

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability	Base Dimensions	Frequency Waveform Height	Output Specifications	Terminations
CJ, JK or KL	3	3,2, 1 or 4	29, 12 or 11	P

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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CHASSIS MOUNTED OSCILLATOR
Series 140

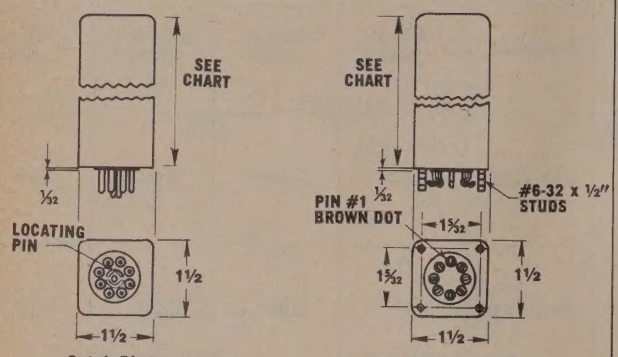
1Hz to 1M

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CD	JJ	KK	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.025%	±0.005%	±0.002%	

BASE DIMENSIONS

ORDERING GUIDE
1



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE		
	9		
Frequency	1Hz to 1MHz		
Waveform	Square or Sine		
Case Height	3.00"		

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	27	12
Frequency Range	1Hz to 1MHz	1Hz to 1MHz	60Hz to 1 MHz
*Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Square	Sine
Rise Time	<50 NS 10pfd load	<100 NS 10pfd load	———
Fall Time	<25 NS 10pfd load	<50 NS 10pfd load	———
Distortion	———	———	<5%
Source Voltage	5V peak ±5% from 680Ω	12V peak ±5% from 1KΩ	———
Sink Voltage	0.0V ±0.3V @ 10MA	0.0V ±0.3V @ 10MA	———
Output Voltage	———	10V P/P nominal	1V rms ±30%
Load Resistance	IC Logic	10KΩ resistive	10KΩ resistive
Source Impedance	680Ω	1KΩ	10KΩ Max.
Output Stage	NPN Common Emitter	NPN Common Emitter	———

TERMINATION

ORDERING GUIDE	
Z	Q
OCTAL PLUG	SOLDER TERMI
Pin #1—Common	Pin #1—Comm
#2—Plus Supply	#2—Plus S
#8—Output	#8—Outpu

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1Hz to 4Hz	4Hz to 60Hz	60Hz to 960 Hz	960Hz to 15KHz	15KHz to 1MH
Current Drain	<175MA	<140MA	<65MA	<45MA	<20MA
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±20%

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CD 1 9 28 Z

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability CD, JJ or KK	1 Base Dimensions 1	9 FrequencyWaveformHeight 9	Output Specifications 28, 27 or 12	Termination Z or Q

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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CHASSIS MOUNTED OSCILLATOR
Series 150

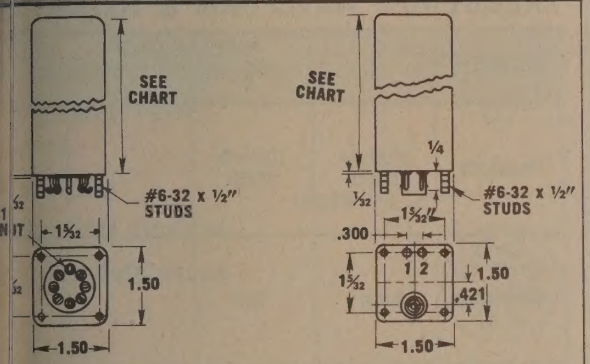
1MHz to 250MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE				
	CJ	JL	KL		
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C		
Frequency Stability	±0.005%	±0.0015%	±0.001%		

CASE DIMENSIONS

ORDERING GUIDE
1



Solder Terminals — BNC Connector

FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	9	0		
Frequency	1MHz to 250MHz	1MHz to 250MHz		
Waveform	Square to 60 MHz or Sine	Sine		
Case Height	3.00" Solder Pins	3.50" BNC Connector		

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	12	11
Frequency Range	1MHz to 60MHz	1MHz to 10MHz	10MHz to 250MHz
Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Sine	Sine
Rise Time	<30 NS	———	———
Fall Time	<20 NS	———	———
Distortion	———	<5%	<10%
Source Voltage	5V peak ±5% from 680Ω	———	———
Sink Voltage	0.0V ±0.3V @ 5MA	———	———
Output Voltage	———	1V rms ±30%	+10 dbm ±3 db
Load Resistance	IC Logic	1KΩ resistive	50Ω resistive
Output Stage	NPN Common Emitter	———	———
Spurious Response	———	———	−60db

TERMINATION

ORDERING GUIDE	
Q	M
SOLDER TERMINALS	BNC CONNECTOR
Pin #1—Common	Pin #1—Common
#2—Plus Supply	#2—Plus Supply
#3—Output	BNC—Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1MHz to 10MHz	10MHz to 20MHz	20MHz to 60MHz	1MHz to 10MHz	10MHz to 250MHz
Current Drain	<10MA	<10MA	<20MA	<25MA	<35MA
Symmetry	50/50 ±20%	50/50 ±20%	50/50 ±20%	———	———

These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CJ 1 9 28 Q

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability CJ, JL or KL	1 Base Dimensions 1	Frequency Waveform Height 9 or 0	Output Specifications 28, 12 or 11	Terminations Q or M

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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RC OSCILLATOR
Series 120

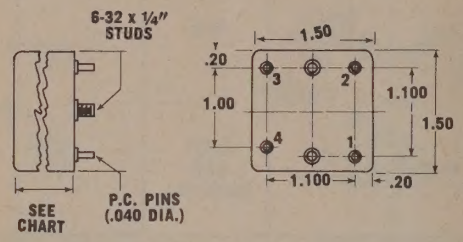
100Hz to 30KHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	JS	KQ		
Temperature Range	0°C to +60°C	+15°C to +35°C		
Frequency Stability	±1.0%	±0.5%		

BASE DIMENSIONS

ORDERING GUIDE: 1



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	1	5		
Frequency	100Hz to 30KHz	100Hz to 30KHz		
Waveform	Square	Sine		
Case Height	0.40"	1.00"		

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	12	
Frequency Range	100Hz to 30KHz	100Hz to 30KHz	
*Supply Voltage	+12VDC ±5%	+12VDC ±5%	
Waveform	Square	Sine	
Rise & Fall Time	<50 NS	———	
Distortion	———	<5%	
Source Voltage	>2.7V @ 1MA	———	
Sink Voltage	0.0V ±0.4V @ 5MA	———	
Output Voltage	———	1V rms ±10%	
Load Resistance	IC Logic	10KΩ resistive	
Current Drain	15 MA Max.	20 MA Max.	
Amplitude Stab.	———	±5%	

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

TERMINATION

ORDERING GUIDE: P

PRINTED CIRCUIT PINS

Pin #1 — Plus Supply
#2 — Common
#3 — Common
#4 — Output

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is JS 1 1 28 P

When ordering, please specify Series No., Model No. and frequency.

	1			P
Frequency Stability JS or KQ	Base Dimensions 1	Frequency Waveform Height 1 or 5	Output Specifications 28 or 12	Termination P

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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NNG FORK OSCILLATOR
rie 160

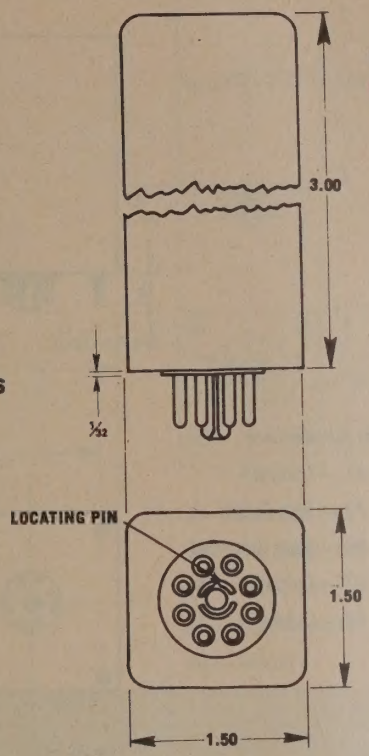
400Hz to 4KHz

ATURES

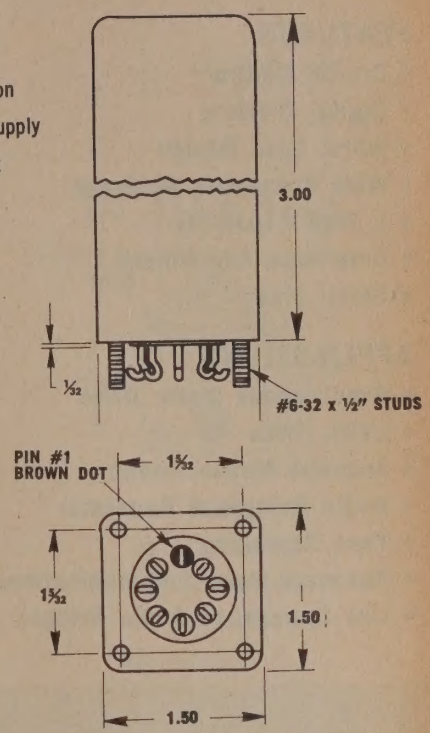
- ow urrent Drain
- ugd
- ow ost
- eliable
- ast elivery

PLI ATIONS

- udi Frequency Generators
- ow requency Pulse eneators
- -L- Bridges
- one Signaling Devices
- Serv Drive References



Pin Connections
Pin #1 — Common
#2 — Plus Supply
#8 — Output



PEC FICATIONS

PA AMETER	MODEL JC1924	MODEL JC1925	PARAMETER	MODEL JC1911	MODEL JC1912
requ cy Range	400Hz to 4kHz		Frequency Range	400Hz to 4kHz	
requ cy Tolerance	±0.1% 400 Hz to 799Hz: ±0.05% 800Hz to 4kHz		Frequency Tolerance	±0.1% 400 Hz to 799Hz: ±0.05% 800Hz to 4kHz	
Temp ture Range	0°C to +60°C		Temperature Range	0°C to +60°C	
Suppl Voltage	+12 Volts ±5%	+26 Volts ±2V	Supply Voltage	+12 Volts ±5%	+26 Volts ±2V
Wave m	Square		Waveform	Sine	
Symm ry	50/50 ±20%		Output Voltage	>2 VRMS	>4 VRMS
Outpu Voltage ("1")	12V Peak ±5% From 1.5k Source	26V Peak ±2V From 5.6k Source	Distortion	<5%	
			Load	10kΩ	
Outp Voltage ("0")	0.0 ±0.3V at 5 Ma		Current Drain	15 Ma at 12 Volts	20 Ma at 26 Volts
Outp Stage	NPN Common Emitter		Source Impedance	10kΩ Max.	
Curre Drain	20 Ma at 12 Volts	35 Ma at 26 Volts	Amplitude Stability	±8% over temperature range	
Rise ne	<2 μs		Amplitude Stability	±1% at constant ambient	
Fall Te	<1 μs				
Size	1.5" x 1.5" x 3"		Size	1.5" x 1.5" x 3"	
Head add Q	8 Pin Hook Terminals		Header add Q	8 Pin Hook Terminals	
Head add Z	Octal Plug		Header add Z	Octal Plug	
Note: Unit may be shorted to ground without damage					

These e standard operating supply voltages and output voltages. Other voltages are available upon request.

RDRING INFORMATION:

To Order, Specify Model No. (Example JC1925), Header (Q or Z) and Frequency.

r ad tional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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POWER SERIES
Series 200

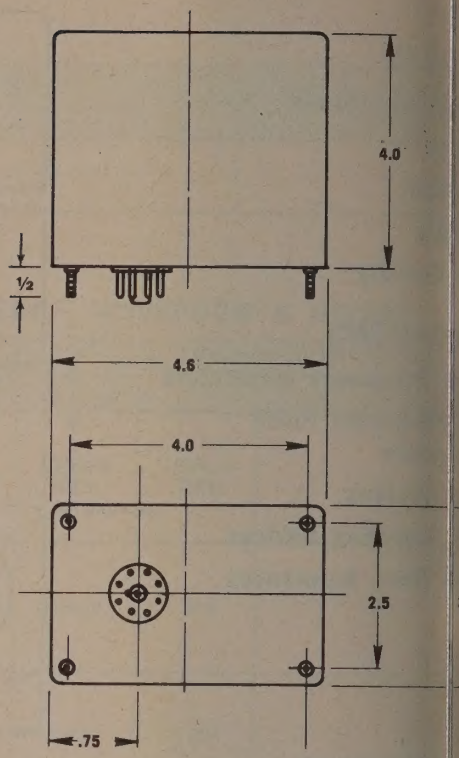
60Hz to 10k

FEATURES
- Crystal Control
- Digital Dividers
- Worst Case Design
- Wide Frequency Coverage
- 5 Watt Capability
- Amplitude Adjustment
- Small Size

APPLICATIONS
- Synchronous Motor Drive
- LVDT Drive
- Acoustic Measurement
- Audio Reference Generator
- Tone Signalling
- Resonant Reed Communications
- Low Impedance Audio Bridges

Pin Connections:

Pin #1 — Common
#2 — Plus Supply
#4 — Case Grounded
#7 — Output
#8 — Output



SPECIFICATIONS

PARAMETER	MODEL	
	JG0012Y	JG0013Y
Frequency Range	60Hz to 960 Hz	960Hz to 10kHz
Frequency Tolerance	±0.01%	±0.01%
Temperature Range	0°C to +60°C	0°C to +60°C
*Supply Voltage	26VDC ±2VDC	26VDC ±2VDC
Current Drain	400MA Max.	400MA Max.
Output Stability	±8%	±8%
Waveform	Sine	Sine
Distortion	<5%	<.3%
Power Output	5 Watts per Voltage Level	5 Watts per Voltage Level
Voltage Levels (Level desired to be specified)	30 VRMS ±10% (180Ω Load) 60 VRMS ±10% (720Ω Load) 90 VRMS ±10% (1620Ω Load) 120 VRMS ±10% (2900Ω Load)	30 VRMS ±10% (180Ω Load) 60 VRMS ±10% (720Ω Load) 90 VRMS ±10% (1620Ω Load) 120 VRMS ±10% (2900Ω Load)
Size	3.1" x 4.6" Max.	3.1" x 4.6" Max.
Header	Octal Plug	Octal Plug
Note: Unit can be operated without load		

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:
To Order, Specify Model No. (Example JG0013Y) and Frequency.

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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HIGH STABILITY OSCILLATOR
Series 165

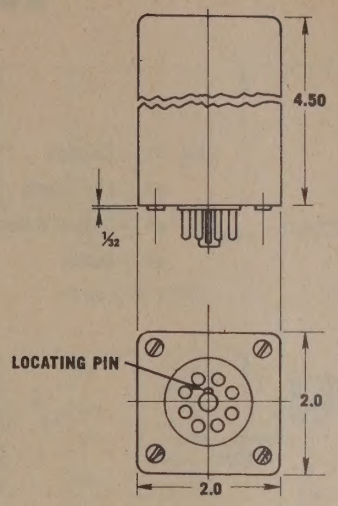
1MHz to 150MHz

FEATURES

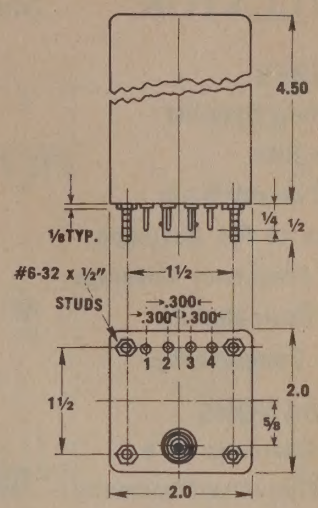
- All Units Operate On Frequency Without Multiplication
- Low Spurious Content
- Excellent Short Term Stability
- Low Harmonic Content
- Logic Compatibility

APPLICATIONS

- Frequency Source For Multiplier Chain
- Telemetry Main Carrier Source
- Integrated Circuit Clock
- Digital Scanning Clock
- Computer Time Base
- Reference Oscillator



Pin #1 — Common OSC
#2 — Plus Supply OSC
#5 — Oven Plus
#6 — Oven Common
#8 — Output



Pin #1 — Plus Supply OSC
#2 — Common OSC
#3 — Common Oven
#4 — Plus Supply Oven
BNC — Output

SPECIFICATIONS

PARAMETER	MODEL			
	JU2013	JT2013	JN2011	JT2011
Frequency Range	1MHz to 20MHz	20MHz to 60MHz	60MHz to 100MHz	100MHz to 150MHz
Frequency Adjust	±5 PPM Min.			
Temperature Range	0°C to +60°C			
Supply Voltage (OSC)	+12VDC ±2%			
Supply Voltage (Oven)	+24VDC ±5% or 28VDC ±5% (Specify)			
Waveform	Sine			
Load	50 Ohms Resistive			
Oven Power	15 Watts at turn-on: 6 Watts at 25°C Following 1 Hr. Warmup			
Power Output	0DBM ±1.5DBM	0DBM ±1.5DBM	+10DBM ±2DBM	+10DBM ±2BDM
Harmonic Content	−30DB	−30DB	−20DB	−20DB
Spurious Response	−70DB	−60DB	−60DB	−60DB
Current (OSC)	35 Ma	50 Ma	50 Ma	50 Ma
Short Term Stability	$<5x10^{-10}$ Per Sec.	$<1x10^{-9}$ Per Sec.	$<1x10^{-9}$ Per Sec.	$<1x10^{-9}$ Per Sec.
Tolerance	$\pm5x10^{-8}$	$\pm1x10^{-7}$	$\pm5x10^{-7}$	$\pm5x10^{-7}$
Unit Shipped at	$\pm5x10^{-8}$ Per 24 Hrs.	$\pm5x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.
Drift after 200 Hrs. (Typical)	$\pm2x10^{-8}$ Per 24 Hrs.	$\pm5x10^{-8}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.
Stabilization to $\pm5x10^{-7}$ of nom. freq.	35 Min.	45 Min.	45 Min.	45 Min.
Size	2" x 2" x 4½"			
Header add Y	Octal Plug	Octal Plug	N/A	N/A
Header add M	BNC & Solder Pins			

PARAMETER	MODEL	
	JU2028	JT2028
Frequency Range	1MHz to 20MHz	20MHz to 60MHz
Frequency Adjust	±5 PPM Min.	
Temperature Range	0°C to +60°C	
Supply Voltage (OSC)	+12VDC ±2%	
Supply Voltage (Oven)	+24VDC ±5% or 28VDC ±5% (Specify)	
Waveform	Square	
Output Voltage ("1")	Minimum of 3.5V peak from 100Ω Source	
Output Voltage ("0")	0.0V ±0.4V at 5 Ma Sink Current	
Oven Power	15 Watts at turn-on: 6 Watts at 25°C Following 1 Hr. Warmup	
Short Term Stability	$<\pm5x10^{-10}$/Sec.	$<\pm1x10^{-9}$/Sec.
Tolerance	$\pm5x10^{-8}$	$\pm1x10^{-7}$
Unit Shipped at	$\pm5x10^{-8}$/24 Hrs.	$\pm5x10^{-7}$/24 Hrs.
Drift after 200 Hrs. (Typical)	$\pm2x10^{-8}$/24 Hrs.	$\pm5x10^{-8}$/24 Hrs.
Stabilization to $\pm5x10^{-7}$ of nom. freq.	35 Min.	45 Min.
Rise Time	<20 NS	<10 NS
Fall Time	<20 NS	<10 NS
Size	2" x 2" x 4½"	
Header add Y	Octal Plug	
Header add M	BNC & Solder Pins	

Note: Unit must be loaded with 200 ohm load to preserve waveform fidelity

These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:

To Order, Specify Model No. (Example JU2028) Header (Y or M) and Frequency.

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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RC VOLTAGE CONTROLLED OSCILLATOR Series 180

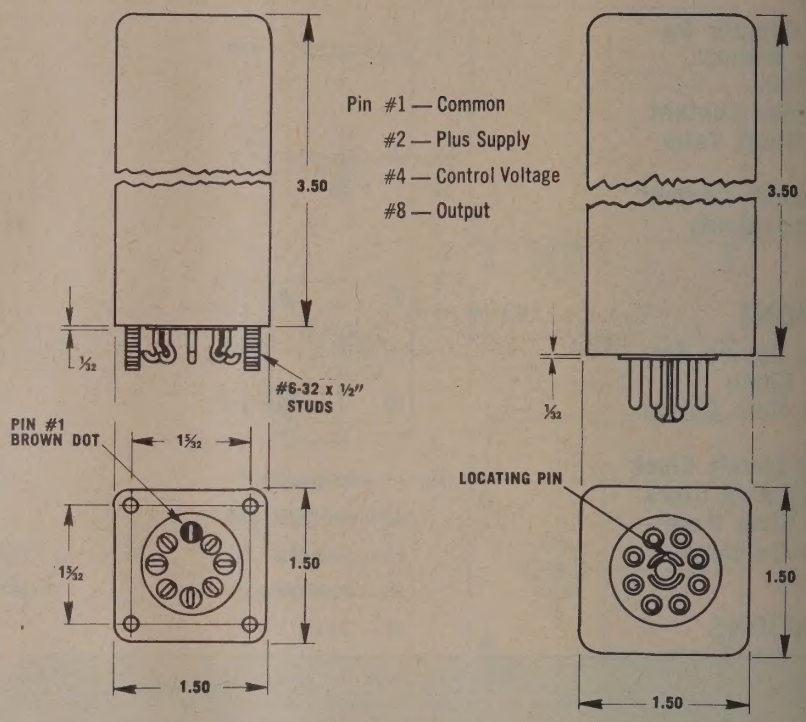
100Hz to 40KH

FEATURES

- Excellent Stability
- Small Size
- Low Current Drain
- Choice of FM Deviation
- Wide Frequency Coverage
- IRIG Compatibility
- Logic Compatibility

APPLICATIONS

- IRIG Channels 1-16
- Low Frequency Telemetry
- Transducer to Frequency Conversion
- Sub Carrier Generation
- Phase Locking
- Pulse Modulation
- Signal Averaging



SPECIFICATIONS

PARAMETER	MODEL JB1025	MODEL JB1027
Frequency Range	100Hz to 40kHz	
Frequency Adjust	±10% Minimum	
Frequency Tolerance	±0.1%	
Temperature Range	0°C to +60°C	
*Supply Voltage	+24 VDC ±5%	
Supply Current	250 Ma at Turn-on: 100 Ma at +25°C	
Waveform	Square	
Symmetry	50/50 ±2%	
Output Voltage ("1")	5.1 V ±5% from 1kΩ Source	
Output Voltage ("0")	0.0 V ±0.3 V at 5 Ma	
Output Stage	NPN Common Emitter	
Deviation	±10%	±50%
Linearity	±0.2%	±0.5%
Control Voltage	0 V to +10 VDC or ±5 VDC (Specify)	
Input Impedance	20kΩ Minimum	
Size	1.5" x 1.5" x 3.5"	
Header add Q	8 Pin Hook Terminals	
Header add Z	Octal Plug	
Note: Unit may be shorted to ground without damage		

PARAMETER	MODEL JB1011	MODEL JB1012
Frequency Range	400Hz to 40kHz	
Frequency Adjust	±3% Minimum	
Frequency Tolerance	±0.1%	
Temperature Range	0°C to +60°C	
Supply Voltage	+24 VDC ±5%	
Supply Current	250 Ma at Turn-on: 100 Ma at +25°C	
Waveform	Sine	
Output Voltage	2 VRMS ±10% at center frequency	
Distortion	<5%	
Load	10KΩ	
AM Ripple	±10% Maximum	
Deviation	±7.5%	±15%
Linearity	±0.2%	±0.5%
Control Voltage	0 V to +10VDC or ±5 VDC (Specify)	
Input Impedance	20kΩ Minimum	
Size	1.5" x 1.5" x 3.5"	
Header add Q	8 Pin Hook Terminals	
Header add Z	Octal Plug	

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:

To Order, Specify Model No. (Example JB1027), Header (Q or Z) and Frequency.

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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C VOLTAGE CONTROLLED OSCILLATOR Series 170

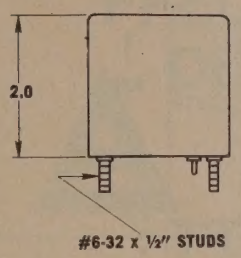
1MHz to 100MHz

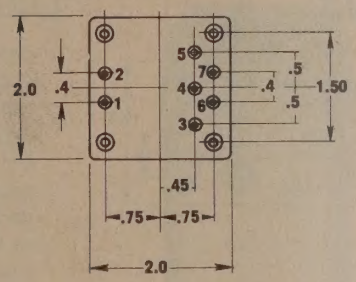
EATURES

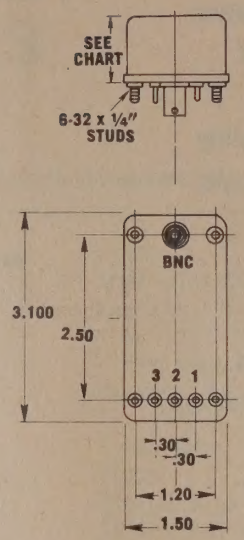
- Wid Deviation
- Low litter
- Log Compatibility
- Exc lent Stability
- Ove zed & Non-ovenized
- Low Power
- Sma l Size

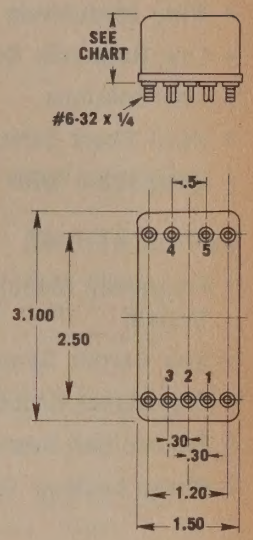
PPLICATIONS

- Phae Locking System
- Telnetry
- Pul Frequency Modulation
- Anag g to Frequency Conerters
- Tra ducer to Frequency Conersion
- Digl l Phase Locking









Models JB2828P & JB2829P
Pin #1 — Oven Plus
#2 — Oven Common
#3 — Plus Volts OSC
#4 — Control Voltage
#5 — Common OSC
#6 — Signal Output
#7 — Signal Ground

Models JW8512M & JY8512M
Pin #1 — Plus Supply
#2 — Control Voltage
#3 — Common
BNC — Output

Models JS8412P, JW8412P, JW8428P, JX8528P
Pin #1 — Plus Supply
#2 — Control Voltage
#3 — Common
#4 — Signal Output (Hi)
#5 — Signal Output (Lo)

PEC FICATIONS

RAMETER	MODEL			
	JS8412P	JW8512M	JW8412P	JY8512M
requ cy Range	1MHz to 60MHz	60MHz to 100MHz	1MHz to 60MHz	60MHz to 100MHz
requ cy Tolerance	±1%	±2%	±2%	±4%
empature Range	0°C to +60°C			
Supp Voltage	+24VDC ±1%			
Cont Voltage	0 to +10V or ±5V (Specify)			
Wave m	Sine			
Outp Voltage	>+5DBM			
Load	50Ω			
Curre Drain	<50 Ma			
Devi n	±10%	±10%	±20%	±20%
Linea y	±3%	±5%	±5%	±10%
Heig	.75"	1"	.75"	1"
Size	1.5" x 3.1"			
Head	5 PC Pins	3 PC Pins and BNC Conn.	5 PC Pins	3 PC Pins and BNC Conn.

PARAMETER	MODEL			
	JW8428P	JX8528P	JB2828P	JB2829P
Frequency Range	1MHz to 10MHz	10MHz to 60MHz	1MHz to 10MHz	10MHz to 60MHz
Frequency Tolerance	±2%	±3%	±0.1%	±0.1%
Temperature Range	0°C to +60°C			
Supply Voltage	+24VDC ±1%			
Control Voltage	0 to +10V or ±5V (Specify)			
Waveform	Square			
Output Voltage ("1")	5.1V ±5% from 470Ω Source			
Output Voltage ("0")	0.0 ±0.3V at 5 Ma			
Rise & Fall Times	<10 NS			
Current Drain	<60 Ma		<350 Ma at Turn-on 150 Ma at +25°C	
Deviation	±30%	±20%	±30%	±20%
Linearity	±5%	±10%	±5%	±10%
Height	.75"	1"	2"	2"
Size	1.5" x 3.1"		2" x 2"	
Header	5 Printed Circuit Pins	5 Printed Circuit Pins	7 Printed Circuit Pins	7 Printed Circuit Pins

hese e standard operating supply voltages and output voltages. Other voltages are available upon request.

RDRING INFORMATION:

To Order, Specify Model No. (Example JW8512M) and Frequency.

r aditional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600
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VOLTAGE CONTROLLED CRYSTAL OSCILLATOR Series 190

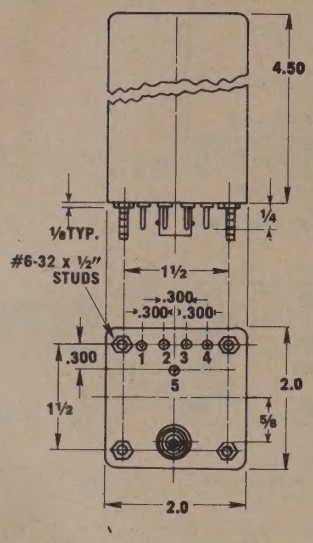
1MHz to 200M

FEATURES

- Wide Modulation Deviation
- Low Harmonic Content
- Low Spurious
- Good Short Term Stability
- Compatible With IC Logic

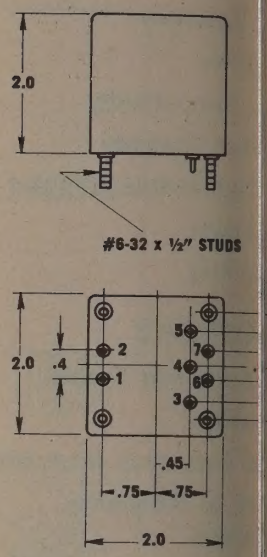
APPLICATIONS

- Frequency Modulation System
- Sub Carrier Generation
- Transducer Encoding System
- Transmitter Sources
- Phase Locking System



Model JM2011M

Pin #1 — Plus Supply OSC
#2 — Common OSC
#3 — Common Oven
#4 — Plus Supply Oven
#5 — Sync
BNC — Output



Models JM2828P & JM2829P

Pin #1 — Oven Plus
#2 — Oven Common
#3 — Plus Volts OSC
#4 — Control Voltage
#5 — Common OSC
#6 — Signal Output
#7 — Signal Ground

SPECIFICATIONS

PARAMETER	MODEL JM2011M
Frequency Range	50MHz to 200MHz
Frequency Adjust	±5 PPM Minimum
Frequency Tolerance	±0.0001%
Temperature Range	0°C to +60°C
*Supply Voltage	Oven +24 VDC ±2%: Oscillator & Multiplier +12 VDC ±1%
Supply Current	Oven 500 Ma Max. at Turn-on: 250 Ma at 25°C Oscillator & Multiplier 100 Ma Max.
Waveform	Sine
Waveform Purity	All harmonics down −20db
Output Level	+5DBM Minimum
Load	50Ω Resistive
Deviation	±0.02%
Linearity	<20% from Straight Line Between End Points
Control Voltage	0 to +10 V or ±5 VDC (Specify)
Size	2" x 2" x 4½"
Header	BNC & 5 Wire Terminals

PARAMETER	MODEL JM2828P	JM2829P
Frequency Range	1MHz to 20MHz	
Frequency Adjust	±5 PPM Minimum	
Frequency Tolerance	±0.0001%	
Temperature Range	0°C to +60°C	
Supply Voltage	Oven +24 VDC ±5%: Oscillator +12 VDC ±	
Supply Current	Oven 300 Ma Max. at Turn-on: 150 Ma at 2 Oscillator 50 Ma Max.	
Waveform	Square	
Output Voltage ("1")	+5.1 V ±5% from 470Ω Source	
Output Voltage ("0")	0.0 ±0.3 V at 5 Ma	
Rise Time	<30 NS	
Fall Time	<20 NS	
Deviation	±0.01%	±0.025%
Linearity	<20% from Straight Line Between End Po	
Control Voltage	0 to +10 VDC or ±5 VDC (Specify)	
Input Impedance	>10kΩ	
Size	2" x 2" x 2"	
Header	7 Wire Terminals	

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:

To Order, Specify Model No. (Example JM2011M) and Frequency.

For additional products see GIBBS MFG. pages 1450 to 1455 (Section 2300).

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Area Code 312 232-2600

ARVIN FREQUENCY DEVICES

complete frequency management capability

ARVIN TCXO & TCXO²

Arvin temperature compensated crystal oscillators provide precise frequency management without the use of ovens, permitting small size, light weight, instant warm-up, and low power drain. Sine, square, or pulse outputs are available. Units generating more than one frequency can be provided. All circuit values are computer optimized. Following are typical specifications. Let us know your exact requirements.

TCXO

Many units available off-the-shelf.

Example: 1 MHz $\pm 5 \times 10^{-7}$ $-40°C$ to $+75°C$ @ $150 in single quantities, 5-day delivery.

Example: 2 to 10 MHz $\pm 1 \times 10^{-5}$ $-55°C$ to $+85°C$ @ $55 in single quantities, 5-day delivery.

TCXO²

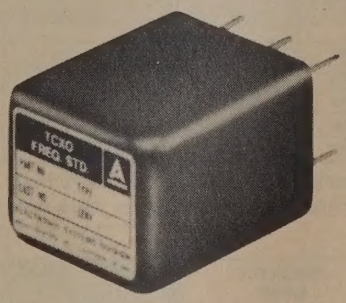
Designed to fill the gap between TCXO's and high-power ovens.

Typical specifications: 1 to 10 MHz $\pm 1 \times 10^{-8}$ $-40°C$ to $+75°C$.

Dimensions: 2″ × 2″ × 1″.

ARVIN TC/VCXO

Arvin TC/VCXO's have all the advantages of Arvin TCXO's combined with a unique voltage control capability. This gives Arvin TC/VCXO's even greater flexibility without the need for external compensating circuitry or added power. Units generating one or more frequencies can be provided with sine, sawtooth, or pulse outputs. Following are typical specifications for Arvin TC/VCXO's. Send us your exact requirements.



Frequency Range.....to 50 MHz

Frequency Deviation..to ±1000 PPM depending upon freq. and temp.

Deviation Sensitivity.....to ± 200 PPM/volt

Deviation Rate .....DC — 20 KHz

Linearity.....to ± 1% of best straight line

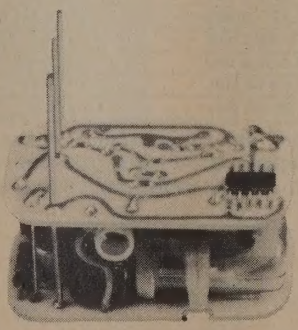
Input Voltage....± 10 to ± 50 VDC

Packaging.....MIL, NASA, or commercial

Frequency Stability.....to ±1 PPM depending on frequency and temperature

OSCILLATOR & SYNTHESIZER R&D

Arvin Frequency Devices is equipped to design, develop, and manufacture in quantity a variety of oscillators and frequency control equipment. Our specialty is high reliability TCXO, VCXO, TC/VCXO devices, low frequency crystal oscillators and synthesizers for miniaturized communications applications. We have built



TCXOs for satellite, missile, airborne, and portable ground equipment applications. Arvin Frequency Devices provide precise frequency management in the smallest possible package, some as small as one cubic inch, with low power drain and stabilities as high as 1 PP 10^7 in a range to 200 MHz. Let us help solve your frequency management problems. We welcome research and development contracts. Call us early in the design stage.

FOR ADDITIONAL INFORMATION WRITE:

ARVIN FREQUENCY DEVICES

ELECTRONIC SYSTEMS DIV., ARVIN INDUSTRIES, INC.

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CRYSTAL OSCILLATORS INCORPORATING TEMPERATURE CONTROL

CCO-23

CCO-23 Series TYPE	FREQUENCY RANGE	STABILITY (After One Hour)			AGING CHARACTERISTICS		OUTPUT WAVE SHAPE	OUTPUT (rms) WITH LOAD (ohms)	OSCILLATOR VOLTAGE	OVEN VOLTAG
		Short Term (10 sec)	Fixed Ambient (25°C ± 5°C)	Ambient Range (0° - 50°C)	24-hour Period (After 72 hours)	One Week (After 72 hours)				
CCO-23MD-7	1 MHz	5×10^{-10}	5×10^{-9}	2×10^{-8}	5×10^{-9}	2×10^{-8}	Sine	1 volt-1500	27 VDC	27 VD
CCO-23MD-6H	1 MHz	3×10^{-10}	3×10^{-9}	$\pm 1 \times 10^{-8}$	3×10^{-9}	2×10^{-8}	Sine	1 volt-500	27 VDC	27 VD
CCO-23LD-H	5 MHz	3×10^{-10}	3×10^{-9}	$\pm 1 \times 10^{-8}$	3×10^{-9}	2×10^{-8}	Sine	1 volt-1500	27 VDC	27 VD

The CCO-23 series offers a choice of 3 ultra stable time base oscillators for premium performance. Special glass seal quartz crystals are designed for high Q characteristics and are processed to assure low aging needed in sophisticat applications. All models incorporate full proportional temperature control ovens and solid state circuitry.

CCO-7

CCO-7 Series MODEL	FREQUENCY RANGE	STABILITY — AMBIENT		OUTPUT VOLTS rms
		25°C	0-60°C	
CCO-7R	10-14 kHz	5×10^{-7}	$\pm 2 \times 10^{-6}$	1.5
CCO-7R	14-35 kHz	3×10^{-7}	$\pm 5 \times 10^{-7}$	1.5
CCO-7R	35-198 kHz	2×10^{-7}	$\pm 4 \times 10^{-7}$	1.5
CCO-7R	198-300 kHz	1×10^{-7}	$\pm 1.5 \times 10^{-7}$	1.0
CCO-7M	.95-3.0 MHz	1×10^{-8}	$\pm 3 \times 10^{-8}$	1.0
CCO-7L	3-8 MHz	1×10^{-8}	$\pm 3 \times 10^{-8}$	0.5
CCO-7N	8-15 MHz	1×10^{-7}	$\pm 3 \times 10^{-7}$	1.5
CCO-7V	15-50 MHz	2×10^{-7}	$\pm 5 \times 10^{-7}$	0.5
CCO-7U	50-100 MHz	2×10^{-7}	$\pm 5 \times 10^{-7}$	0.5

Standard models in this series are supplied with glass sealed crystals for low long term aging. All models have sol state oscillators designed for operation on 27 VDC. Mercury thermostat ovens may be specified for 115 VAC or 27 VD operation. Standard output is clipped sine wave with ratings as shown above based on 1500 ohm load conditions.

CCO-25

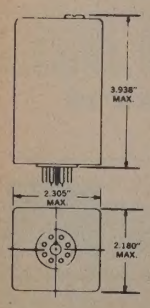
CCO-25 Series TYPE	FREQUENCY RANGE	STABILITY — AMBIENT		OUTPUT INTO 1500 OHMS	AGING/WK AFTER 72 HRS. Specify Aging Option	
		25°C	0-60°C		Standard	Special
CCO-25MD	1-3 MHz	5×10^{-8}	$\pm 5 \times 10^{-7}$	1v	1×10^{-7}	3×10^{-8}
CCO-25LD	3-8 MHz	5×10^{-8}	$\pm 5 \times 10^{-7}$	1v	1×10^{-7}	3×10^{-8}
CCO-25ND	8-15 MHz	1×10^{-7}	$\pm 5 \times 10^{-7}$	1v	2×10^{-7}	5×10^{-8}
CCO-25VD	15-50 MHz	2×10^{-7}	$\pm 5 \times 10^{-7}$	.5v	3×10^{-7}	1×10^{-7}
CCO-25UD	50-100 MHz	2×10^{-7}	$\pm 5 \times 10^{-7}$	.5v	4×10^{-7}	1×10^{-7}

This series is designed with proportional temperature control to meet high stability performance requirements in minimum size package for PC board mounting. Standard models have sine wave output and operate with 12 VD (oscillator) and 24 VDC (oven) supply.

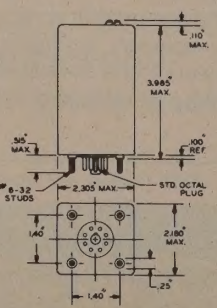
CCO-78

CCO-78 Series MODEL	FREQUENCY RANGE	STABILITY — AMBIENT		OUTPUT VOLTS rms
		25°C	0-60°C	
CCO-78R	10-14 kHz	5×10^{-7}	$\pm 2 \times 10^{-6}$	1.5
CCO-78R	14-35 kHz	3×10^{-7}	$\pm 5 \times 10^{-7}$	1.5
CCO-78R	35-60 kHz	2×10^{-7}	$\pm 4 \times 10^{-7}$	1.5
CCO-78R	60-198 kHz	2×10^{-7}	$\pm 4 \times 10^{-7}$	1.5
CCO-78R-2	198-500 kHz	1×10^{-7}	$\pm 1.5 \times 10^{-7}$	1.0
CCO-78M	.80-3.0 MHz	1×10^{-8}	$\pm 3 \times 10^{-8}$	1.0
CCO-78L	3.0-8.0 MHz	1×10^{-8}	$\pm 3 \times 10^{-8}$	.75
CCO-78N	8.0-15.0 MHz	5×10^{-8}	$\pm 8 \times 10^{-8}$	1.0
CCO-78V	15.0-50 MHz	1×10^{-7}	$\pm 2 \times 10^{-7}$	1.0
CCO-78U	50-100 MHz	2×10^{-7}	$\pm 4 \times 10^{-7}$	.75

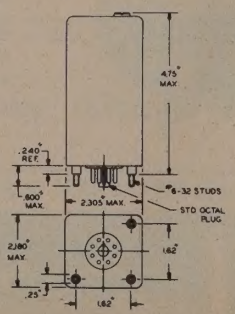
Standard models in this series incorporate solid state proportional temperature control which may be specified fo 115 VAC or 27 VDC operation with 5% regulation. Solid state oscillator circuitry is designed to operate on 27 VD (1% regulation) supply with sine wave output ratings shown for 1500 ohm load conditions.



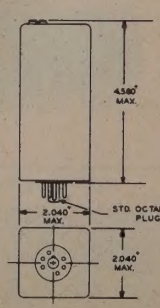
CCO-23MD-7



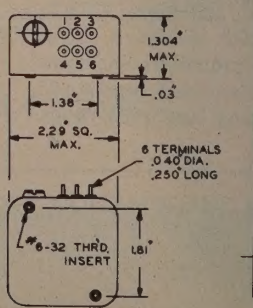
CCO-23MD-6H



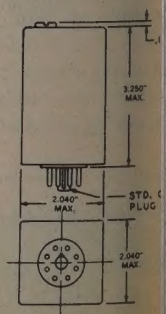
CCO-23LD-H



CCO-7



CCO-25



CCO-78

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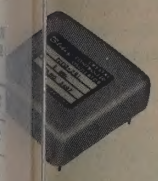
TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS



TCO Series

TCCO-26 Series RANGE 1-20 MHz	FREQUENCY STABILITY WITH TEMPERATURE DEVIATION	
TCCO-26	$\pm 1 \times 10^{-6}$	0-50°C
TCCO-26-1	$\pm 5 \times 10^{-7}$	0-50°C
TCCO-26-2	$\pm 2 \times 10^{-6}$	—20 to +70°C
TCCO-26-3	$\pm 5 \times 10^{-7}$	—20 to +70°C
TCCO-26-4	$\pm 1 \times 10^{-6}$	—40 to +70°C

FREQUENCY STABILITY WITH TIME		
24 Hour Period	5×10^{-8} Max. with Ambient Temp. 25°C	
After 72 Hours Continuous Operation	1×10^{-7}/wk.	1-10 MHz
	2×10^{-7}/wk.	10-20 MHz

TCCO is the Bliley acronym for TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS designed to integrate the characteristics of high quality crystals with temperature compensated circuitry for improved frequency stability without temperature control. Typical performance characteristics are shown for the TCCO-26 series. Standard models operate on 12 VDC (2% regulation) at 15 mils maximum. Sine wave output is 1 volt rms into 1000 ohms or 2 volts peak to peak square wave on special order.

CLOCK OSCILLATORS

LOGIC OUTPUT FOR DIGITAL APPLICATIONS SUCH AS DATA DISPLAY TERMINALS, MODEMS AND DATA SETS

CMO Series

STABILITY LIMITS							
WAVEFORM	STANDARD LOGIC OUTPUT					OPTIONAL SINE WAVE OUTPUT	
TEMPERATURE RANGE		CMO-26		CMO-3	CMO-31	CMO-26	CMO-3
	50 Hz to 4 kHz	1 kHz to 50 kHz	50 kHz to 20 MHz	200 kHz to 20 MHz	200 kHz to 20 MHz	800 kHz to 100 MHz	3 MHz to 100 MHz
15° to 35°C	±.002%	±.0015%	±.0008%	±.0008%	±.005%	±.0008%	
0° to 50°C	±.004%	±.003%	±.001%	±.001%	±.005%	±.001%	
0° to 70°C	±.006%	±.005%	±.0012%	±.0012%	±.01%	±.0012%	
—20° to 50°C	±.007%	±.006%	±.0015%	±.0015%	±.015%	±.0015%	
—40° to 70°C	±.01%	±.007%	±.002%	±.002%		±.002%	

All models are designed for operation on +5 Vdc. Logic output models have amplitude needed to drive normal DTL and TTL circuitry. Type CMO-26 and CMO-3 are hermetically sealed and Type CMO-26 is available as custom option, with mechanical or electrical trim adjustment. The CMO-31 is available with dual complementary output as custom option. Specify CMO-32 for use with 14 pin DIP sockets or CMO-33 for use with 24 pin DIP sockets.

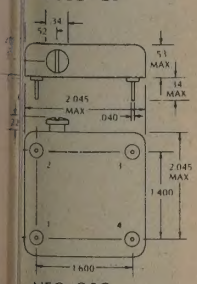
CKO Series

CKO Series — FREQUENCY TOLERANCE		
SPECIFY	DEVIATION	AMBIENT RANGE
A or B	±10 ppm	0° to 50°C
	±20 ppm	—40° to +70°C

STANDARD MODELS		
SPECIFY TYPE	FREQUENCY kHz	OUTPUT WAVEFORM
CKO-4A	200-5000	Logic
CKO-4B	200-5000	Square Wave
CKO-3	3000-15000	Sine Wave

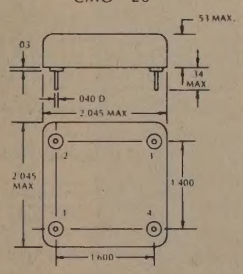
THIS IS AN ULTRA COMPACT LOW PROFILE CRYSTAL OSCILLATOR designed to provide choice of LOGIC output for IC applications where space is limited. The koldweld sealed package operates on 5 VDC with output ratings as shown above. When specified, electrical trim adjustment is available to offset long term aging.

TCCO - 26



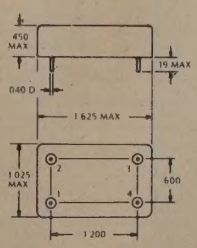
1 - NEG. OSC.
2 - CASE GROUND
3 - +12V DC OSC.
4 - OUTPUT

CMO - 26



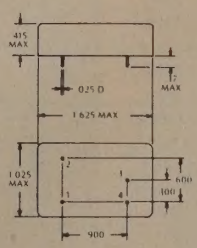
1 - NEG. OSC. & RF GND
2 - VOLTAGE CONTROL OR NC
3 - +5V
4 - OUTPUT

CMO - 3



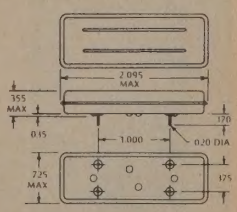
1 - NEG. OSC. & RF GND
2 - N.C.
3 - +5V
4 - OUTPUT

CMO - 31



1 - +5V
2 - COMMON
3 - COMP. OUTPUT (IF SPECIFIED)
4 - OUTPUT

CKO-4



1 - NEG. OSC.
2 - VOLTAGE CONTROL 0 TO +5V
3 - +5V DC
4 - OUTPUT

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CRYSTAL FILTERS

BLILEY CRYSTAL FILTERS are custom engineered devices that may be supplied with a wide variety of characteristics over the frequency range in which quartz crystal resonators can be produced. With over forty years of experience in the design and manufacture of quartz crystal resonators, Bliley offers a unique combination of crystal technology and filter design capability for your custom applications.

Table I is presented as a general guide in determining bandwidth limits for various segments of the frequency range. Selectivity (the ratio of 60 db bandwidth to 6 db bandwidth) is generally a compromise between desired performance and economics. Typical selectivity is 2, with requirements of 1.5 not uncommon. Passband ripple, for narrow band filters, is normally 0.3 db with 1 db maximum over the temperature range —55° to +90°C. Wide band filters typically exhibit 0.5 db ripple and very wide passbands may exhibit 2 db ripple at temperature extremes.

TABLE 1 Range kHz	Bandwidth % at 6 db Min.	Max.
100-250	.05	6
200-400	.04	5
300-600	.035	5
1000-5000	.01	2
5000-20000	.02	2
20000-30000	.03	1

The following listing presents a sample of typical Bliley filters showing performance characteristics that have been established. Our design range covers Butterworth, Gaussian (linear phase), Chebyshev, band reject, and comb sets including contiguous comb sets.

TABLE 2 Type No.	Center Frequency	Bandwidth (6 db)	Bandwidth (60 db)	Maximum Insertion Loss	Nominal Impedance (ohms)	Case Size L x W x H (in.)
BFN-0018B21	18.75 kHz	20 Hz	250 Hz	3 db	27 k	3½ x 1 17/32 x 1 5/16
BFN-0060B21	60 kHz	15 Hz	200 Hz	6 db	1 k	2 x 2 x 3 1/16
BFN-0100B31	100 kHz	500 Hz	1.5 kHz	6 db	27 k	4 x 1⅜ x 2 7/32
BFN-0100B23	100 kHz	3 kHz	7 kHz	3 db	680	4 x 1⅜ x 2 7/32
BFN-0112B21	112 kHz	5.5 kHz	12 kHz	3 db	10 k	4 x 1⅜ x 2 7/32
BFN-0200B32	200 kHz	100 Hz	400 Hz	3 db	8.2 k	2 27/64 x 1 47/64 x 1 7/16
BFN-0330B33	330 kHz	250 Hz	1 kHz	3 db	6 k	1 9/16 x 1 23/64 x 1¾
BFN-0500B41	500 kHz	300 Hz	1.2 kHz	3 db	4 k	2⅜ x 1 x 1¼
BFN-2000B21	2000 kHz	100 Hz	1000 Hz	3 db	1.5 k	2⅜ x 1 x 1¼
BFN-2000B22	2000 kHz	4 kHz	16 kHz	3 db	50	2⅜ x 1 x 1¼
BFN-2215B28	2215 kHz	250 Hz (3 db)	1 kHz	3 db	4 k	2 9/16 x 1 5/16 x 1 47/64
BFN-2215B27	2215 kHz	2.5 kHz (3 db)	10 kHz	3 db	4 k	2 9/16 x 1 5/16 x 1 47/64
BFN-2400B42	2400 kHz	4.4 kHz (3 db)	18 kHz	3 db	2 k	2⅜ x 1 x 1¼
BFN-2500B36	2500 kHz	5 kHz (3 db)	20 kHz	3 db	2 k	2 9/16 x 1 5/16 x 1 5/16
BFN-3000B14	3000 kHz	3 kHz	12 kHz	3 db	4.7 k	2⅜ x 1 x 1¼
BFN-3000B47	3000 kHz	3 kHz (3 db)	6 kHz	6 db	2 k	2 9/16 x 1 5/16 x 1⅛
BFN-4000B21	4000 kHz	5 kHz (3 db)	20 kHz	3 db	50	2⅜ x 1 x 1¼
BFN-5000B50	5000 kHz	500 Hz	2500 Hz (40 db)	3 db	1.6 k	2 27/64 x 1 47/64 x 1 7/16
BFN-5000B16	5000 kHz	3.5 kHz	12 kHz	3 db	1.6 k	2⅜ x 1 x 1¼
BFN-5000B23	5000 kHz	5 kHz (3 db)	20 kHz	4 db	50	2⅜ x 1 x 1¼
BFN-5000B22	5000 kHz	10 kHz	40 kHz	3 db	1.6 k	2 9/16 x 1 5/16 x 1 47/64
BFN-5000B53	5 MHz	80 kHz	175 kHz	10 db	100	2⅜ x 1 x 1 1/32
BFN-5000B52	5 MHz	120 kHz	300 kHz	10 db	3 k	2⅜ x 1 x 1 1/32
BFN-7000B22	7000 kHz	8 kHz	50 kHz	6 db	500	2⅜ x 1 x 1¼
BFN-9000B22	9000 kHz	1 kHz	10 kHz	3 db	1 k	2⅜ x 1 x 1
BFN-9000B13	9000 kHz	3 kHz	12 kHz	3 db	600	2⅜ x 1 x 1
BFN-11B53	10.00 MHz	1 kHz	2 kHz	3 db	220	2⅜ x 1 x 1
BFN-11B36	10.01 MHz	8 kHz	20 kHz	3 db	50	2⅜ x 1 x 1
BFN-11B8	10.7 MHz	4.2 kHz	10 kHz	3 db	400	2⅜ x 1 x 1
BFN-11B23	10.7 MHz	13 kHz	30 kHz (80 db)	3 db	1 k	2⅜ x 1 x 1 1/32
BFN-11B21	10.7 MHz	15 kHz	32 kHz	3 db	1 k	2⅜ x 1 x 1 1/32
BFN-11B22	10.7 MHz	30 kHz	60 kHz	3 db	2 k	2⅜ x 1 x 1 1/32
BFN-11B41	10.7 MHz	40 kHz	80 kHz	5 db	1 k	2⅜ x 1 x 1
BFN-11B60	10.7 MHz	90 kHz	220 kHz	3 db	3.3 k	2 9/16 x 1 5/16 x 1
BFN-11B61	10.7 MHz	210 kHz	450 kHz	10 db	50	2⅜ x 1 x 1 1/32
BFN-11B51	11.00 MHz	3 kHz	10 kHz	3 db	180	2⅜ x 1 x 1
BFN-11B34	11.5 MHz	37.5 kHz	85 kHz	3 db	50	2⅜ x 1 x 1
BFN-11B35	11.5 MHz	37.5 kHz	200 kHz (402db)	3 db	50	2⅜ x 1 x 1
BFN-12B21	12.00 MHz	41 kHz	82 kHz	3 db	1.8 k	2⅜ x 1 x 1
BFN-13B1	13 MHz	15 kHz	30 kHz	3 db	680	2⅜ x 1 x 1
BFN-13B2	13 MHz	30 kHz	60 kHz	3 db	1.5 k	2⅜ x 1 x 1
BFN-15B21	15.00 MHz	1.1 kHz	10 kHz	3 db	50	2⅜ x 1 x 1
BFN-18B21	18.00 MHz	20 kHz	50 kHz	3 db	50	2⅜ x 1 x 1
BFN-20B21	20 MHz	60 kHz	200 kHz	3 db	1 k	2⅜ x 1 x 1 1/32
BFN-20B23	20 MHz	210 kHz	500 kHz	4 db	3 k	2 9/16 x 1 5/16 x 1
BFN-21B24	21.4 MHz	30 kHz	75 kHz	3 db	1.3 k	2⅜ x 1 x 1
BFN-30B21	30 MHz	45 kHz	85 kHz	3 db	1 k	2⅜ x 1 x 1

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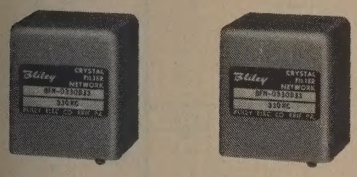
CRYSTAL FILTERS

FILTER COMB SETS

Contiguous or spaced filter comb sets for use in Doppler or airborne radar systems for the frequency range from 80 kHz to 20 MHz.

Typical contiguous filter bank for 50 filter units:



Center Frequency:	from 300,000 Hz to 304,900 Hz at 100 Hz intervals
3 db Bandwidth:	100 Hz
30 db Bandwidth:	700 Hz
Impedance in and out:	8k ohms
Insertion Loss:	3 db maximum
Ripple:	0.5 db maximum

TYPICAL SINGLE SIDEBAND FILTERS

Type	Carrier Frequency	Carrier Attenuation	Sideband Attenuation	Bandwidth (3 db)	Max. Insertion Loss	Nominal Impedance (ohms)	Case Size (L x W x H in.)
TN-0100U22	100 kHz	20 db	60 db at −300 Hz	+300 to +6000 Hz	10 db	8.2k	5⅜ x 3 x 2½
TN-1650U21	1650 kHz	50 db	65 db at −200 Hz	+300 to +3000 Hz	3 db	12k	3 5/64 x 1 7/16 x 1½
TN-1750L21	1750 kHz	25 db	50 db at +250 Hz	−250 to −2500 Hz	3 db	12k	2 9/16 x 1 5/16 x 1 5/16
TN-9000U21	9000 kHz	25 db	60 db at −500 Hz	+300 to +3300 Hz	3 db	600	2⅜ x 1 x 1

MONOLITHIC CRYSTAL FILTERS

A monolithic filter consists of a quartz wafer with pairs of metal electrodes deposited on its major surfaces. These miniature devices are available in koldweld sealed cases such as TO-5, TO-8 and flatpack configurations.

Two and three pole monolithic designs are currently available for use as single filters or in cascade combinations. Bandwidths in the range of 0.01% to 0.1% are obtainable with reasonable economy at the present design level for center frequencies in the range 5 MHz to 20 MHz. Bliley monolithics can be supplied with Butterworth, Chebyshev, Gaussian or other characteristics to meet your requirements.

CRYSTAL DISCRIMINATORS

Crystal discriminators are readily available in a wide range of frequencies and exhibit many of the advantages of other quartz crystal products; namely, frequency stability with time and temperature, ability to withstand severe environmental conditions, and compact size. Typical characteristics are shown in following tabulation.

Type	Frequency	Peak-Peak Bandwidth (min.)	Linearity	Impedance (ohms)		Case Size (L x W x H in.)
				Source	Load	
BDN-11D21	10.7 MHz	5 kHz	4% ± 1 kHz	1k	100k	1¾ x 1¼ x ½
BDN-11D22	10.7 MHz	50 kHz	4% ± 10 kHz	10k	100k	1⅛ x 1⅛ x ¾
BDN-11D23	11.5 MHz	50 kHz	4% ± 10 kHz	390	100k	1¾ x 1¼ x ½
BDN-21D21	21.4 MHz	30 kHz	4% ± 6 kHz	500	100k	1⅛ x 1⅛ x ¾
BDN-21D23	21.4 MHz	80 kHz	10% ± 25 kHz	500	100k	1⅛ x 1⅛ x ¾

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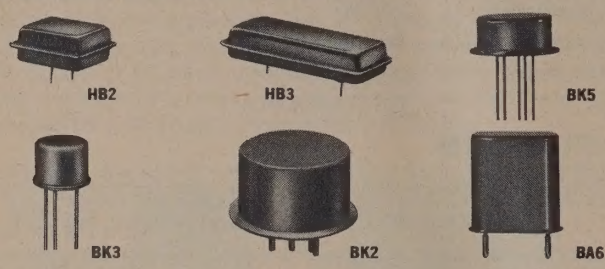
CRYSTALS

Koldweld Sealed Crystal Holders for High Reliability

This group of crystal holders is hermetically sealed by a koldweld process, without heat or flux, to minimize contamination. Crystal units supplied in these enclosures have improved aging and reliability. All units are custom built to your specifications. Data sheets for each type are available on request.



KOLDWELD SERIES

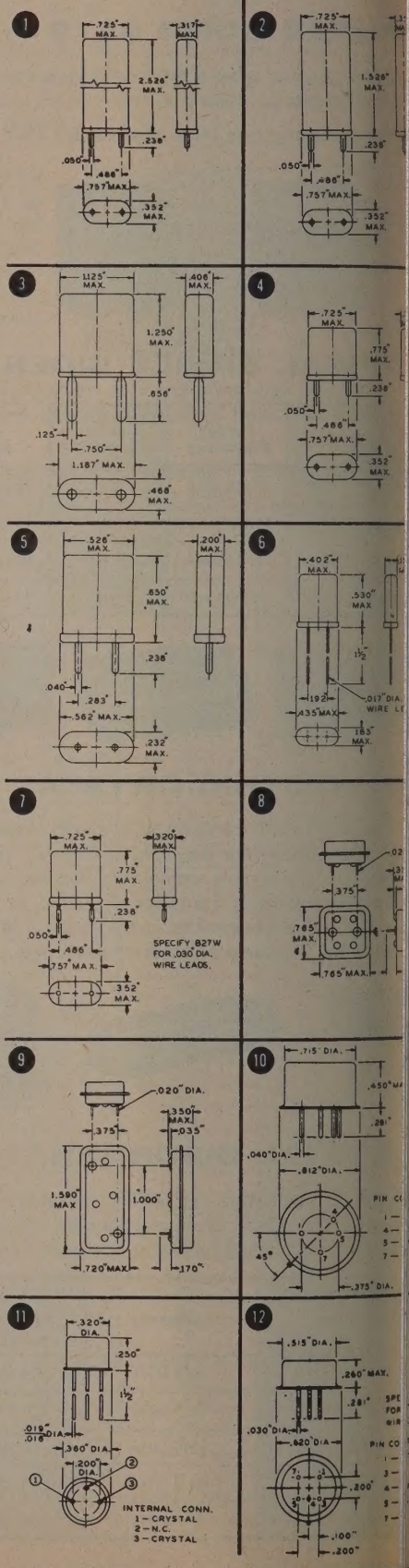
BLILEY HOLDER	HB2	HB3	BK2	BK3	BK5	BA2	BA4	BA6	BA9
FREQUENCY RANGE	0.2-100 MHz	2.5-250 kHz	1-15 MHz	8-150 MHz	2-30 MHz	3-150 MHz	2-150 MHz	0.2-150 MHz	2-250 kHz
DIMENSIONAL DRAWING	8	9	10	11	12	13	14	15	16

General Communication and Mil-Type Crystal Holders

Bliley offers a complete selection of solder sealed Mil-type crystal holders and commercial variations such as wire leads, mounting brackets and ruggedized models. For quotation, choose the basic holder style required, indicate any special variations and advise performance characteristics for complete crystal unit.

GENERAL COMMUNICATION AND MIL-TYPE CRYSTAL HOLDERS

BLILEY HOLDER	MIL HOLDER	FREQUENCY RANGE	DIMENSIONAL DRAWING
BH9T	—	1-2 kHz	1
BH9A	HC-13/U	2-250 kHz	2
BH91A	—	2-250 kHz	2
BH9W	—	2-250 kHz	2
BH120	—	100-250 kHz	3
BH120W	—	100-250 kHz	3
BH6A	HC-6/U	0.2-150 MHz	4
BH61A	HC-17/U	0.2-150 MHz	4
BH6W	—	0.2-150 MHz	4
BH4	HC-32/U	2-150 MHz	5
BH4W	—	2-150 MHz	5
BK2	HC-40/U	1-15 MHz	10
BK3	HC-35/U	8-150 MHz	11
BK5	HC-37/U	2-30 MHz	12
BXW	HC-18/U	3-150 MHz	6
BXP	HC-25/U	3-150 MHz	6
B27	HC-27/U	1-30 MHz	7
HB2	HC-39/U	0.2-100 MHz	8
HB3	HC-41/U	2.5-250 kHz	9



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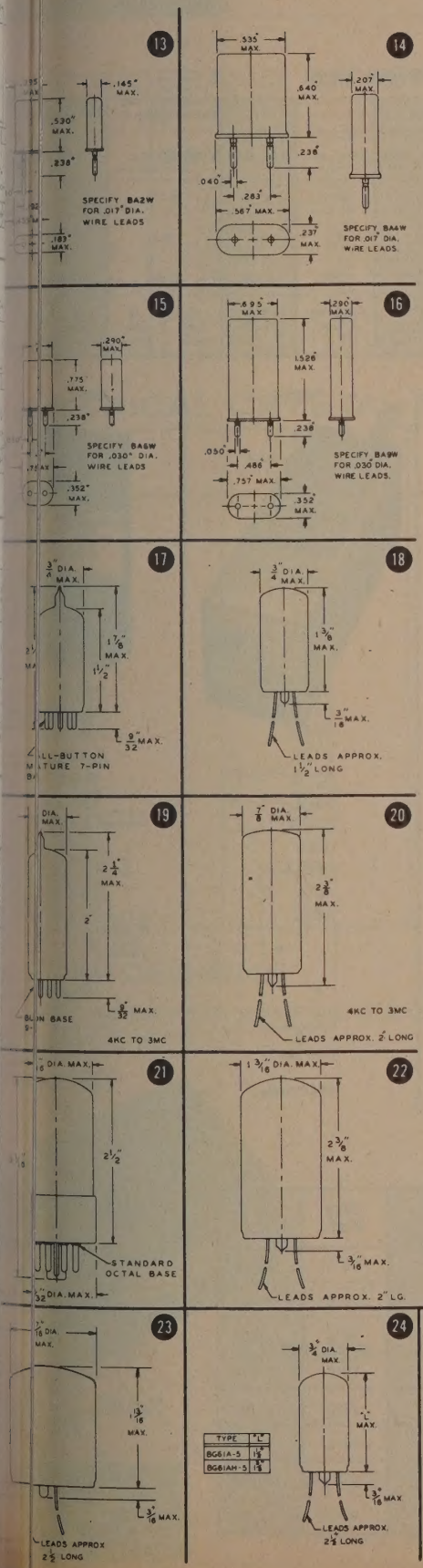
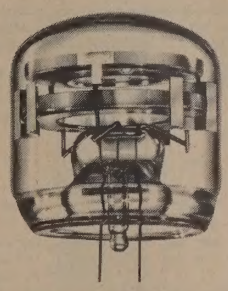
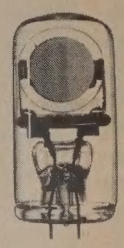
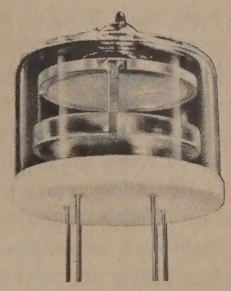


CRYSTALS

Ultra High Stability Glass Units


BG11AH-5


BG61A-5


BG61AH-5S

This is an outstanding group of crystal units incorporating the advanced technology and craftsmanship that has made Bliley famous for quality without compromise. Exceptionally low aging and high Q characteristics provide precision reference for synthesizers and systems clocks. Complete data available in special bulletins supplied on request.

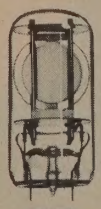
ULTRA HIGH STABILITY GLASS SEALED CRYSTAL UNITS

BLILEY TYPE	FREQUENCY RANGE	MODE	Q	AGING	DIMENSIONAL DRAWING
BG61A-5	5 MHz	Fifth	2.5×10^6	2×10^{-9}/wk.	24
BG61AH-5	5 MHz	Fifth	2.5×10^6	2×10^{-9}/wk.	24
BG61AH-5S	5 MHz	Fifth	2.5×10^6	7×10^{-10}/wk.	25
BG11AH-5	2.5 MHz	Fifth	4.5×10^6	5×10^{-10}/wk.	23
B27	5 MHz	Third	1.8×10^6	2×10^{-8}/wk.	7
B27	10 MHz	Third	1.5×10^6	2×10^{-8}/wk.	7
BG93A	1 MHz	Fund.	1.5×10^6	1×10^{-8}/wk.	22

Glass Sealed Crystal Holders

BG7N

BG9D


BG93A

B27

Vacuum sealed crystals in this group of holders exhibit superior aging characteristics and long term reliability. Ideal for use in high stability crystal and oven combinations as indicated in separate listing of crystal ovens.

GLASS SEALED CRYSTAL HOLDERS

BLILEY HOLDER	FREQUENCY RANGE	DIMENSIONAL DRAWING
B27	2-30 MHz	7
BG6A	3-100 MHz	17
BG61A	3-100 MHz	18
BG7	4-3000 MHz	19
BG7A	4-3000 MHz	20
BG9A	90-160 kHz	21
BG9A	1-5 MHz	21
BG93A	90-160 kHz	22
BG93A	1-5 MHz	22

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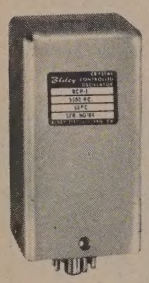
COMPONENT AND CRYSTAL OVENS

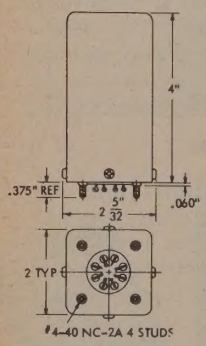
Standard oven designs in this group utilize all silicon transistors in the control circuitry. Oven types with the prefix BP are for proportional temperature control. Oven types with the prefix BC or BS utilize mercury thermostats. Detail specifications available on separate data sheets supplied on request.

COMPONENT OVENS

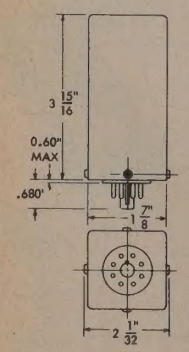
TYPE	BPO-12	BPO-13	BPOC	BPOC-1	BCR-4	BST-4	BPCO-30-1	BPCO-40-1	BPCO-31-1	BPC
AMBIENT CONDITION	0°C to +60°C	0°C to +60°C	0°C to +60°C	0°C to +60°C	0°C to +65°C	0°C to +65°C	0°C to +65°C		0°C to +65	
STABILITY	±0.2°C	±0.2°C	±0.25°C	±0.25°C	±1°C	±1°C	±1°C		±1°C	
OVEN TEMPERATURE	70°C	70°C	70°C	70°C	75°C	75°C	75°C		75°C	
OVEN VOLTAGE	12 VDC	27 VDC	12 VDC	27 VDC	115VAC	27 VDC	27 VDC		12 VDC	
CAVITY SIZE	.960" diam. 2.375" long	.960" diameter 2.375" long	1 3/16" wide 3/4" high 2 1/2" long	1 3/16" wide 3/4" high 2 1/2" long	1.450" diam. 3" height	1.450" diam. 3" height	.25 cubic inches	.46 cubic inches	.25 cubic inches	o in

BCR-1



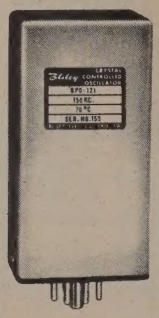


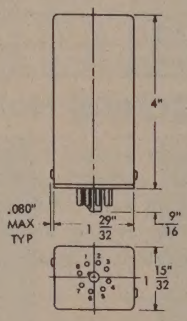
BCR-4 and BST-4



BCR-1 and BST-1 Series

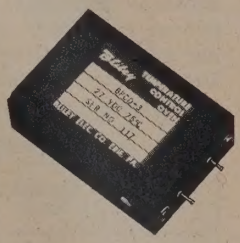
BPO-121

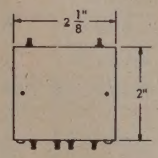


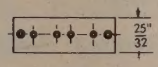


BPO Series

BPCO-3







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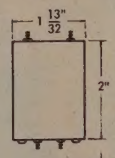
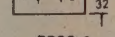
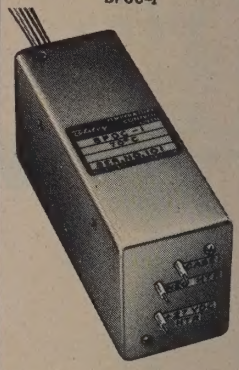
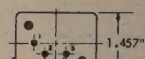


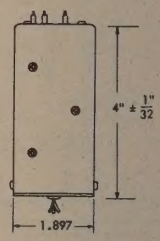


BPCO-3

BPOC-1

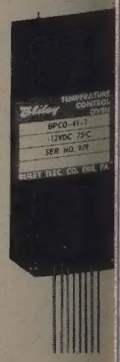


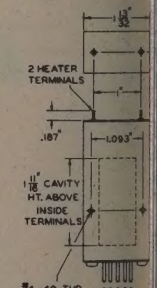


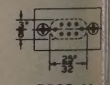


BPOC Series

BPCO-41-1







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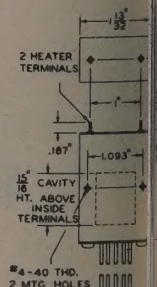
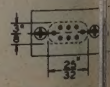




BPCO-31-1

CRYSTAL OVENS

TYPE	FOR CRYSTAL TYPE	TEMPERATURE STABILITY		OVEN TEMP.	OVEN VOLTAGE
		Fixed Ambient	Range 0°C to 60°C		
BPO-121	BG7	±.01°C	±0.1°C	70°C	12VDC
BPO-131	BG7	±.01°C	±0.1°C	70°C	27VDC
BPCO-21	BH4 (2 units)	±.05°C	±0.5°C	75°C	12VDC
BPCO-2	BH4 (2 units)	±.05°C	±0.5°C	75°C	27VDC
BPCO-31	BH6 or B27	±.05°C	±0.5°C	75°C	12VDC
BPCO-3	BH6 or B27	±.05°C	±0.5°C	75°C	27VDC
BCR-1	BG61	±.02°C	±0.2°C	68°C	115VAC
BST-1	BG61	±.02°C	±0.2°C	68°C	27VDC

BLACKHAWK NETWORKS CRYSTAL BANDPASS FILTERS

NGLE SIDEBAND CRYSTAL FILTERS

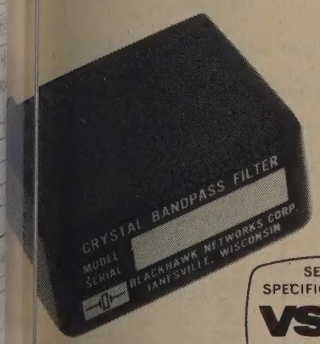
MODEL	SIDEBAND	3 db PASSBAND (cps)	60 db BANDWIDTH (cps)	ULTIMATE ATTENUATION	IMPEDANCE (ohms)	CARRIER SUPPRESSION (db)
350-300-6CL	Lower	−350 to −3100	4400 @ 50	50	600	25
350-300-6CU	Upper	+350 to +3100	4400 @ 50	50	600	25
350-400-8AL	Lower	−300 to −2700	3600	60	4000	30
350-400-8AU	Upper	+300 to +2700	3600	60	4000	30
750-700-6AL	Lower	−300 to −3000	5400	60	1000	20
750-700-6AU	Upper	+300 to +3000	5400	60	1000	20
300-700-8AL	Lower	−300 to −3000	4200	60	50	30
300-700-8AU	Upper	+300 to +3000	4200	60	50	30

MMETRICAL CRYSTAL FILTERS

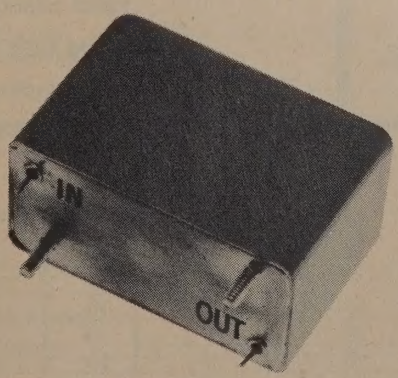
MODEL	CENTER FREQUENCY (kcs)	3 db BANDWIDTH (cps)	60 db BANDWIDTH (cps)	IMPEDANCE (ohms)	ULTIMATE ATTENUATION (db)
30-3A	30	3	15	10000	60
130-00-2A	130	80 @ 6 db	500 @ 40	10000	30
250-00-4D	250	600 @ 6 db	2500	4000	60
1000-2800-4A	1000	2800	16000	10000	50
1650-6000-4D	1650	6000 @ 6 db	20000	1000	60
2215-250-4A	2215	250	1100	4000	60
2215-1000-4A	2215	1000	4000	5600	60
2215-2000-4A	2215	2000	8000	5600	60
2215-2500-4A	2215	2500	10000	4000	60
2215-3100-6A	2215	3100	7500	4000	60
2215-4000-4A	2215	4000	16000	5600	60
2215-6000-4A	2215	6000	24000	5600	60
2215-800-4A	2215	8000	32000	5600	60
3000-500-4D	3000	500 @ 6 db	25000	2000	60
3000-1000-4A	3000	1000	5000	4700	60
3000-1500-6C	3000	1500 @ 6 db	5000	2000	60
3000-3000-6A	3000	3000 @ 6 db	7000	2000	60
3000-7000-6A	3000	7000	12000	8200	60
3395-2100-6B	3395	2100 @ 6 db	5000	2000	60

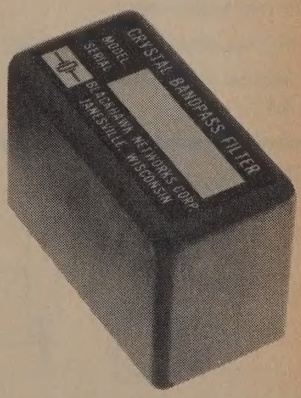
STOM DESIGNS

d u your specifications for prompt quotation service on special requirements. We will be glad to help you with our application ineeng experience, too.



SEE OUR SPECIFICATIONS IN VSMF MICROFILM CATALOG FILE





BLACKHAWK

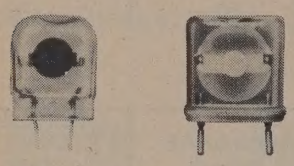
BLACKHAWK NETWORKS CORP.

14 NORTH PARKER DRIVE
JANESVILLE, WISCONSIN 53545

DIAL (608) 752-8701

BULOVA QUARTZ CRYSTALS

- AT • CT • DT • +5° (E and H Elements) GT • MT • NT • PT • SL
- Military Types • General Communications • Precision SSB
- Coldweld • Glass Sealed • Glass Bulb • Metal Holders
- Military crystals meet latest MIL-C-3098 specifications
- Special shock and vibration mounts available



HIGH PRECISION GLASS-ENCAPSULATED CRYSTALS

Covering a frequency range of 5,000 Hz thru 150 MHz, Bulova has available in glass holders the Mil types HC-26/U and HC-27/U, as well as the standard vacuum tube types. A 3rd overtone 5 MHz crystal is available in the HC-27/U holder with Q's in excess of 1 million and stability of 1 pp 10^{10} for 24 hours.

FILTER AND OSCILLATOR CRYSTAL

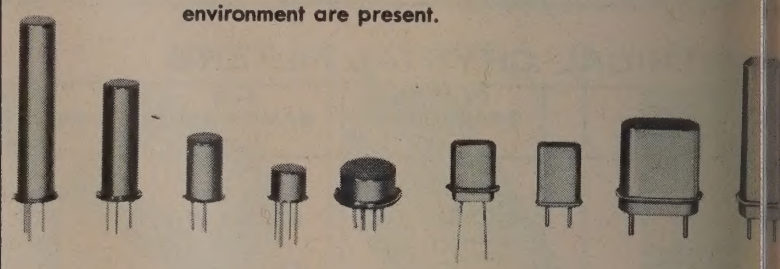
Bulova has designed a line of quartz crystals ranging in fundamental frequencies of 2,000 Hz thru 30 MHz—overtone frequencies to 150 MHz. Custom capability enables us to design to fit your most exacting requirements.

- Spurious attenuation as low as 80 db.
- Motional parameters of L, and C, held to within ±2%.

A COMPLETE LINE FOR ALL APPLICATIONS IN A FREQUENCY RA OF 2,000 Hz THRU 150 MHz

Commercial: Crystals for Aviation, Marine and CB communications e ment. Manufactured to the highest quality in standard holders or modified to suit special designs.

Military: Bulova produces all the standard military "CR" types Q.P.L. on most of the current "CR" types. Designs cryst new military applications where low power and ex environment are present.



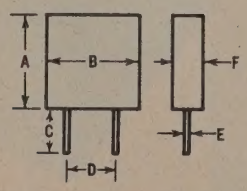
Coldweld Sealed Crystals—

Bulova has extended the developmental perimeter of col types to provide a more miniaturized package with a br frequency output. A support facility has been built capa handling volume production. Series 100 coldweld h consists of nine (9) configurations which include the fo main military types. The military crystals fit within the sional requirements of the military drawing.

Features:

- High Quality-High Reliability
- Tolerances as close as 3 ppm of nominal can be h initial adjustment.
- Aging rates of 3 pp 10^8 per week are standard.
- Small package/broad frequency capability.

CRYSTAL HOLDERS



MIL TYPE	BULOVA TYPE	DIMENSIONS IN INCHES				
		A	B	C	D	E
HC-6/U	70	.765	.750	.238	.486	.050
HC-13/U	73	1.500	.750	.238	.486	.050
HC-18/U	80	.515	.418	1.500	.192	.017
HC-25/U	83	.515	.418	.238	.192	.040
HC-27/U	77	.775	.757	.238	.486	.050
HC-26/U	76	.530	.435	1.500	.192	.017

Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks Oscillators • Ovens • Coils • Servo Amplifiers

BULOVA fcp

BULOVA FREQUENCY CONTROL PRODUCT

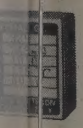
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6

BULOVA TEMPERATURE CONTROLLERS/OVENS

A wiae selection of temperature control devices and enclosures . . . compact—highly versatile

id Site Controllers:



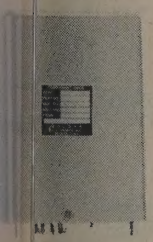
339 Transistat 184 Transistat 320 Conax

ailable as AC Switches, DC Switches or portional Controllers, they are designed to handle power requirements of little as .4 watt to 3KW. Package sizes as small as .5 cubic inches are available; temperature control as close .01C, dependent on application.

	Type 184-115 184-26	Type 339	Type 320-115* 320-26
Voltage	20VAC to 125VAC 60 to 400 cps	115VAC 400 cps	20VAC to 125VAC 60 to 400 cps
Peak Heater Current	1.5 amp. (Half Wave)	1 amp. cont. 1.5 amp. 50% Duty Cycle	1.5 amp. (Half Wave)
Set Temperature Range	Any Temperature, 5° intervals, −55°C to +125°C		
Temperature Stability Over Ambient	.1°C	.1°C	.75°C
R.F.I.	none	Mil I 26-600	none
Ambient Operating	−55°C to +125°C		
Vibration	Mil Std. 202 Method 204D		none
Shock	Mil Std. 202 Method 202		none
Size	.625 Dia. .437 Hgt.	1.390 x 1.075 .380 Hgt.	1.250 Sq. .380 Hgt.

*Commercial

ystal and Component Ovens:



341

613

BHC-18-2

ystal ovens are available to hold from ing crystal to 15 crystals; component ens are available up to 50 cubic inches. any ovens are available with either -metal thermostats or solid state control.

	BHC-18 Series	BHC-613 Series	COM-341 Typical Large Cavity Oven
Accomod.:	1-15, HC-18 or HC-25 crystal holders	Single HC-6 crystal holder to small printed circuit board	Up to 50 cubic inches
Oper. Volt:	To 28 VDC or 115 VAC dependent on controller		
Temp. Set:	5° intervals +55°C to +100°C		
Controls Available:	Bi metal or solid state	Bi metal, solid state or mercury	
Stability:	Up to ±.5°C	Up to ±.01°C	Up to ±.1°C
Mounting:	Flange, bracket or stud	Flange, octal plug or stud	
Termination:	N/A	To 15 pins	To 20 pins

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA cp

BULOVA FREQUENCY CONTROL PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
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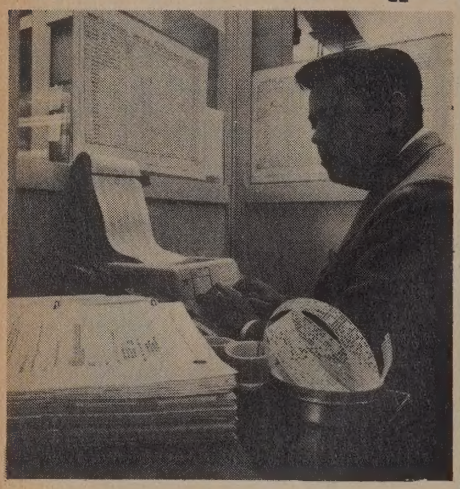
BULOVA CRYSTAL FILTERS

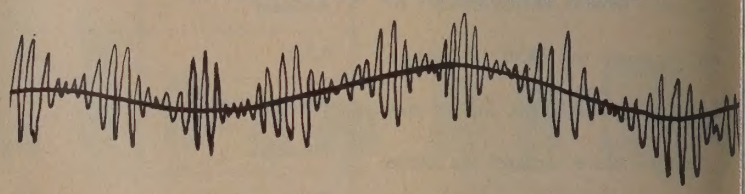


Computer Designed for Reliable Performan Accurate — 4KHz to 150MHz

The business of Crystal Filter design and production has been Bulova's business sinc It is another reason for our leadership in the broad area of frequency control and relat cision products.

We are a design/production center to fulfill the most exacting system specifications. Co many years of experience, an engineering team of many design disciplines and a computer techniques, we can produce 'state-of-the-art' filters in cost-controlled pack military and commercial specifications.

TYPICAL FILTER APPLICATIONS FROM



4KHz ← * → 15

Band Pass	Notch
Band Elimination	Time Delay
Single Side Band	Equalizer
Narrow Band	Lerner
Wide Band	Time Domain
Linear Phase	
RF & IF	Discriminators

*For areas not specified above, consult our application engineering department.

COMPUTER OPTIMIZED FILTER DESIGNS

To provide optimized designs for individual system requirements, Bulova has a co-related library of computer programs. From pre-packaging tolerance analysis of individual components to the finished product spec'd to the customer's parameters, we can determine design "trade-off" quickly and economically.

The prime parameters have been programmed to make available the following crystal filter types

1. Butterworth Designs
2. Butterworth-Thompson Designs
3. Chebyshev Designs
4. Bessel Designs
5. Elyptic Designs
6. Lerner Designs
7. Gaussian (Transitional)
8. Image Parameter

FULL PRODUCTION CAPABILITY

From crystal configuration to finished product, each segment of manufacture utilizes the most advanced and controlled production techniques. Geared to large volume requirements, Bulova's modern automated test facilities allows for a mass production output with no loss in quality—fully equipped environmental laboratory available for most testing. Short runs and engineering prototypes are handled in our pre-production shop.

CUSTOM DESIGNED TO THESE POSSIBLE PARAMETERS:

Band Widths	from .001% to 8% of Center frequency
Shape Factor:	1.08 Ratio for 60 db BW to 3 db BW
Ripple Factor	<0.5 db
Phase Linearity	<5%
Carrier Rejection	>70 db
Ringing	>40 db
Insertion Loss	<3 db
Attenuation	>100 db
Phase Matching	closer than 3° (Filter to Filter) over environmental
Temperature Tolerances	<0.005% (depending upon frequency)
Max. Operating Temperature Range	−55°C to +125°C
Shock & Vibration	All applicable MIL specifications

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

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ELECTRONICS DIVISION
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61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6

BULOVA LC FILTERS

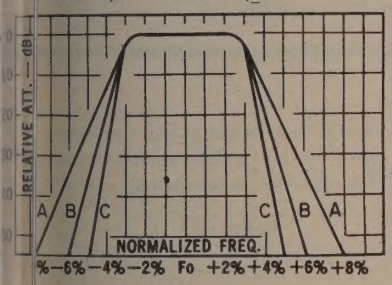
Computer Designed for Maximum Performance—To Your Spec—DC to 80MHz

n Time/frequency product design, Bulova
oped a diversified L C Filter product line
ures • Computer programmed perform-
acteristics • Competitive pricing • Custom
ophistication • High-use, long-life relia-

ng effort in L C filter design for the selec-
shaping of frequencies has culminated in
lopment of a unique series of filters,
ly engineered for spectrum analysers.

With Excellent Factor

uency filters with 45db/3db shape factors
1.5/1 and 2.3/1. They are designed to
between 100 ohm impedances and ex-
llent temperature stability.



Filters

such applications as spectrum analysis and
e as standard items in contiguous banks
Hz to 10 MHz.

IRIG BANDPASS FILTERS—Available from 400 Hz to 165 kHz with attenuation at ±7.5% of center frequency within 3 db in 21 channels. Eight other standard channels are available in frequency from 22 kHz to 165 kHz at ±15% 3 db points.

IRIG LOW PASS FILTERS—Low Pass and Linear Phase Low Pass filters are available in IRIG frequencies. The low pass are intended to attenuate the 2nd and higher harmonics of the incoming signal. Bulova's linear phase low pass filters attenuate the higher harmonics and provide minimum phase distortion and therefore low transient response. These filters are for 10k ohms terminating impedances.

TONE CHANNEL FILTERS—Designed for data transmission systems, Bulova offers a wide selection of special (and standard) tone filters (band pass and low pass) featuring high stability, small package size, a wide variety of center frequencies and shape factors, phase linearity, etc. Range: 10 Hz to 10 kHz; Stability: better than .1%; Bandwidth: as narrow as 1% can be supplied.

DISCRIMINATOR TRANSFORMERS—Employing stable, high-Q components, Bulova Discriminator Transformers perform with an excellent stability and exceptional amplification and linearity.

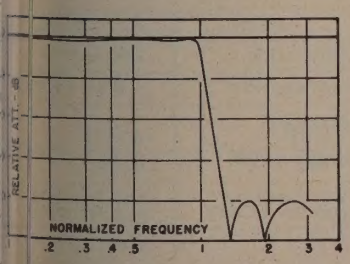
BAND REJECT FILTERS—Some of the outstanding features of Bulova LC Band Reject Filters are their high discrimination and stability. This type of filter is available in a wide range of frequencies and shape factors . . . Bulova also specializes in LC and RC Notch Filters.

LUMPED CONSTANT DELAY LINES—Bulova custom designs Delay Lines to cover any practical impedance range. Keeping physical dimensions at a minimum, these networks feature low signal attenuation, excellent thermal stability, low pulse distortion and extended band width, achieving high delay-to-rise-time ratio.

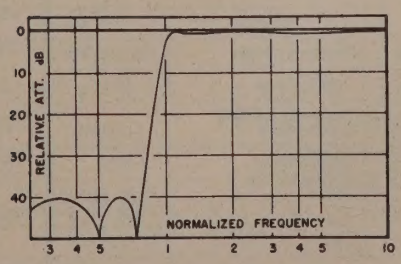
EQUALIZERS—Maintaining narrow tolerances, a wide selection of custom designed Amplitude and Phase (Delay) Equalizers have been developed to be used with transmission lines, amplifier networks etc. Bulova's engineering staff is always available to consult with you on design problems. Additional information on all networks is available upon request.

NTERSTAGE FILTERS—60 Hz to 20 kHz

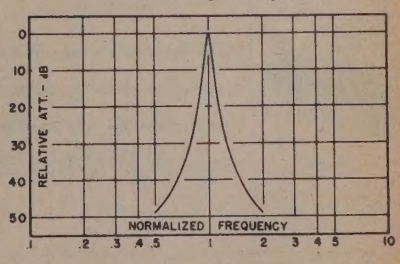
Low Pass
Available up to 30 MHz



High Pass
Available in impedance from 50 ohms to 10 K ohms



Band Pass
Standard filters available with 600 ohm and 10 K ohm terminations. All have provision for terminating into grid circuit.



Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers

BULOVA fcp

BULOVA FREQUENCY CONTROL PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA CRYSTAL OSCILLATORS

- State-of-the-Art TCXO's in Production Quantities
- Computer Designed for Maximum Performance
- Total Capability from Custom Engineering to Volume Production

HIGH STABILITY CRYSTAL OSCILLATOR

The high frequency stability of these oscillators results from housing a high precision crystal and an oscillator circuit with AGC to maintain low constant crystal drive in a stable DC proportional control oven.

Features: Plug-in oscillator with stud mounting ● Frequency trimming provided by a screwdriver adjustment.

MODEL	PCOXO-101	PCOXO-102	PCOXO-103	PCOX
Frequency Range	1.0 or 5.0 MHz	1.0 or 5.0MHz	1.0, 3.0 or 5.0MHz	1.0, 3.0 or
Temp. Range	−55°C to +70°C	−55°C to +70°C	−55°C to +70°C	−55°C to
Stability				
Temp. Range	$\pm 1PP10^8$	$\pm 1PP10^8$	$\pm 2.5PP10^8$	$\pm 2.5PP1$
Aging per day	$1PP10^9$	$3PP10^9$	$5PP10^9$	$10PP10^9$
Line Voltage ±10%	$\pm 5PP10^9$	$\pm 5PP10^9$	$\pm 5PP10^9$	$\pm 5PP10^9$
Load ±10%	$\pm 1PP10^9$	$\pm 1PP10^9$	$\pm 1PP10^9$	$\pm 1PP10^9$
Warm-up at +25°C after 1 hr.	$\pm 3PP10^8$	$\pm 3PP10^8$	$\pm 3PP10^8$	$\pm 3PP10^8$
Output	.5VRMS (min)	.5VRMS (min)	.5VRMS (min)	.5VRMS (
Load	50 ohms	50 ohms	50 ohms	50 ohms
Input Voltage	+28VDC	+28VDC	+28VDC	+28VDC
Turn on Power	18W	18W	18W	18W
Power at 25°C	4.5W (Typ)	4.5W (Typ)	4.5W (Typ)	4.5W (Ty
Size	2″ x 2″ x 4″	2″ x 2″ x 4″	2″ x 2″ x 4″	2″ x 2″ x

TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

TCXO-1

TCXO-5

Bulova temperature compensated crystal oscillators employ a computer selected and optimized variable capacitance diode and thermistor compensation network to maintain frequency stability over wide temperature ranges, without the use of an oven. They are designed for use in aerospace, military, and industrial applications where power, space and weight restrictions preclude the use of an oven for temperature stabilization.

Features: ● No warmup time, due to elimination of oven ● Low power consumption sealed crystal holder to minimize aging and ensure long life ● Self-contained voltage ● All components derated for long life and high reliability ● Hermetically sealed

MODEL	TCXO-1	TCXO-2	TCXO-
Frequency Range	3MHz to 5MHz	3MHz to 5MHz	3MHz to 5MHz
Frequency Adjustment Range	±3PPM		±3PPM
Frequency Stability	±1PPM over Temp. Range of −40°C to +70°C	±0.2PPM over Temp. Range of −40°C to +75°C	±0.5PPM over Range of −40°C +75°C
Aging Rate per week	$\pm 1PP10^8$	$\pm 1PP10^8$	$\pm 1PP10^8$
Power Input	18VDC ±2% at 150mw	12VDC ±5% at 50 mw max	12VDC ±10% a
Output	1 VP-P into 1K ohm	125 mv RMS into 50 ohms	1 VP-P into 1K
Size	2″ x 2″ x 0.5″	2″ x 2″ x 1″	2″ x 2″ x 1″
Weight	3 oz.	5 oz.	5 oz.

MINIATURE CLOCK OSCILLATORS

XO-140

These miniature clock oscillators feature crystal stability, printed circuit board mounting and outputs directly compatible with DTL or TTL loads.

MODEL	XO-140	XO-150	XO-160
Frequency Range	8KHz to 1MHz	1MHz to 4MHz	4MHz to 25MHz
Temp. Range	−40°C to +70°C	−55°C to +85°C	−55°C to +85°
Frequency Stability over Ambient	±120PPM	±50PPM	±50PPM
Input Voltage	+5VDC	+5VDC	+5VDC
Output	Logic Zero: 0 to .4V Logic One: 2.6 to 5V	Logic Zero: 0 to .4V Logic One: 2.6 to 5V	Logic Zero: 0 to Logic One: 2.6 t
Size	1″ x 2″ x .5″	1″ x 2″ x .5″	1″ x 2″ x .5″

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning For Oscillators ● Ovens ● Coils ● Servo Amplifiers

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ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335

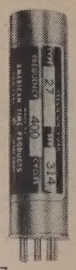
BULOVA FORK OSCILLATORS/RESONATORS

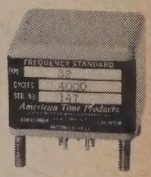
- From 100 KHz to 1 Cps
- Accuracies up to ±.002%
- Units compatible with logic circuitry available
- Multi frequency units available
- Unique capability to meet special custom requirements

Whatever your requirements for tuning forks and oscillators, Bulova has either the product available or the inherent capability to meet your need. Reliability, accuracy and size criteria can be quickly met, with appreciable savings in engineering time and production costs. Each product is founded on the same design experience that has made the ACCUTRON a by-word of precision and accuracy.

PRECISION OSCILLATORS

(Complete Standards)

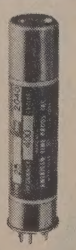


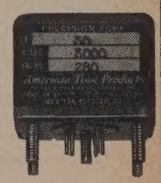


Type	FS 200	FS 11	FS 27	FS 300	FS 32
Frequency	360 to 1000 Hz	400 Hz to 50 kHz	360 to 1300 Hz	Multiple Outputs:60 120, 240, 480 Hz	240 Hz to 100 kHz
Frequency Accuracy	up to ±.01%	up to ±.02%	up to ±.002%	up to ±.002%	up to ±.002%
Temperature Range	FOR SOME ACCURACIES AS MUCH AS −65°C to + 125°C				
Input	1.5 V DC at 6 to 20 microamps	STANDARD 28 V DC (AVAILABLE 3 to 40 V DC)			
Output	0.1 volt	APPROXIMATELY 5 V RMS (UNITS CAMPATIBLE WITH LOGIC CIRCUITRY ARE AVAILABLE)			
Load	500 K ohms	10 K OHMS TO 500 K OHMS OR LOGIC CIRCUITRY			
Size	1-5/16" x 1-5/16" x 3/8"	1-1/2" x 1-1/2" x 3/8"	23/32" x 3"	1-1/2" x 1-1/2" x 1-3/16"	1-1/2" x 1-1/2" x 1-3/16"
Weight	1 ounce	2-1/2 ounces	2 ounces	2-1/2 ounces	2-1/2 ounces

PRECISION FORK RESONATORS

(External Drive Circuit Required)





Type	TF 600	TF 34	TF 25	TF 500	TF 30
Frequency	400 to 2400 Hz	240 Hz to 50 kHz	200 to 1400 Hz	240 Hz to 50 kHz	240 Hz to 50 kHz
Frequency Accuracy	up to ±.02%	up to ±.02%	up to ±.002%	up to ±.02%	up to ±.002%
Temperature Range	FOR SOME ACCURACIES AS MUCH AS −65°C TO +125°C				
Output, Input and Load	DEPENDENT ON EXTERNAL CIRCUITRY USED. RECOMMEND CIRCUITS SUPPLIED TO CUSTOMERS				
Size	1.2 x .9 x .24"	1-1/2 x 1-1/2 x 3/8"	23/32 x 3"	3/8" x 1-1/2"	1-1/2 x 1-1/2 x 1-1/8
Weight	1/2 ounce	1/2 ounce	2 ounces	1/2 ounce	2-1/2 ounces

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA AMERICAN TIME PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA INDUCOM

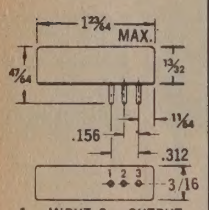
FORKS/OSCILLATORS/RESONATORS

A New, Low Cost Line Of Industrial/Commercial Tuning Fork Products

- Lightweight—Small Size
- Based upon 30 years of ATP Experience in Fork Design Capability
- For Industrial/Commercial Applications Where Price Is Critical

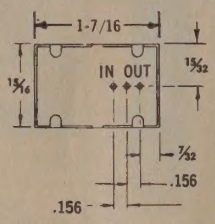
FORK RESONATORS AND FILTERS (encoders or decoders)

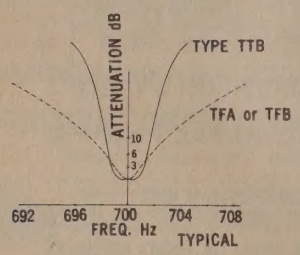
TYPE TFB OR TFA



1. - INPUT 2. - OUTPUT
3. - GND.

TYPE TTB

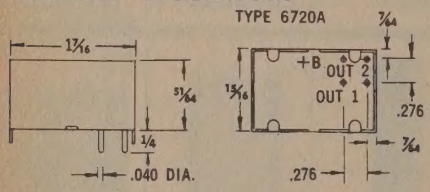




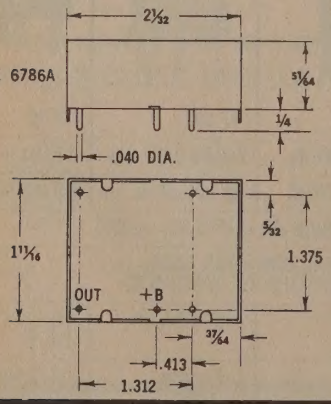
	TFB or TFA (Single Fork)	TTB (Dual Fork)
Center Frequency:	300 to 3000Hz	700 to 1500Hz
Frequency Stability:	±0.1% max	±0.1% max.
Operating Temperature:	−40°C to +60°C	−40°C to +60°C
Bandwidth: 3dB 6dB	0.3% (approx.) 0.5% (approx.)	0.35% (approx.) 0.45% (approx.)
Insertion Loss:	8 db (approx.)	8 db (approx.)
Ripple:	—	2 db (approx.)
Impedance-In and Out:	Range: 50k to 200k ohms	Range: 50k to 200k oh
In Moderate Quantities, priced as low as:	$5.00 (considerably lower in large quantities)	$12.50 (considerably lo in large quantities)

STANDARD OSCILLATORS

TYPE 6720A



TYPE 6786A



	Type 6720A	Type 6786A
Frequency Range:	300 to 3000Hz	60 to 1500Hz
Frequency Accuracy:	±0.1% max.	±0.1% max.
Input Voltage:	10 to 16V DC	10 to 16V DC
Input Current:	1.0mA max.	12mA max.
Operating Temperature:	−40°C to +60°C	−40°C to +60°C
Output Voltage:	1.0V P-P into 5k ohms	1.0V P-P into 5k ohm
Wave Form:	Limited Sine	Square
In Moderate Quantities priced as low as:	$15.00 (considerably lower in large quantities)	$30.00 (considerably lo in large quantities)

Countdown circuit, Type 6766, is available for dividing by 8.
Better frequency accuracies available.
Many other low cost versions available.

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA atp

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ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

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CTS Knights, Inc., Sandwich, Illinois
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JK® PRODUCTS

Frequency Control Devices

LS, CRYSTAL FILTERS, CRYSTAL OSCILLATORS, COMPONENT OVENS, RYSTAL-OVEN COMBINATIONS

s a complete line of crystals with frequencies rang- 1 KHz to 200 MHz. Precision crystals, providing as little as 1 x 10^{-10}, are regularly manufactured for equency standards and similar ultra-stable devices. quency crystals are available in evacuated glass en- conventional metal holders and COLDWELD metal es. Low frequency crystals, in both metal and glass are manufactured at high volume rates for Govern- d commercial users. Military standard crystals offer rance of maximum quality by adherence to MIL and close supervision by a resident Government r.

tal filters are compact, rugged, hermetically sealed ple. Frequencies are available from 1 KHz to 100 nolithic Filters in the range of 5 to 25 MHz with ths of .3% max. of center frequency are also .

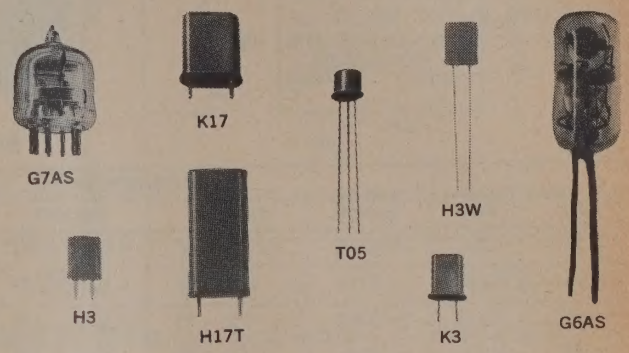
oscillators are offered in a wide line of precision, crystal controlled signal sources from 10 Hz to 130 ese oscillators are available with sine or square tputs. Stabilities range to ±5 x 10^{-10} per day. can be made to specifications for laboratory, vehicu- full military environmental performance. Each r is aged in and its performance certified before ipped.

ent ovens are compact, high temperature stability efully made to accommodate crystals or other com- . Single, dual, and multiple crystal types are avail- any sizes and types are available including snap- hermostats and proportional controlled ovens giving mate in quiet, precise operation with stabilities 5°C.

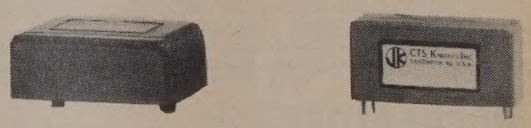
ystal-oven combinations, "THERMYSTALS," cover a nge of packages for use where close temperature of crystals is required. Frequency ranges for these oven combinations are 1 KHz to 200 MHz. Propor- ontrol and snap-action thermostat control ovens are e in combination with precision, glass-enclosed, and ased crystals with frequency stabilities from ±.0001% 00001%.

ights TCXO, always on frequency regardless of environ- From −40°C to +70°C, in outer space or down on CTS Knights **Temperature Compensated Crystal Oscil-** re right on frequency with excellent stability (±1 x er limited temperature ranges. With instantaneous on cy operation and minimal power requirements in a t design, a CTS Knights TCXO can supply the stable source to fit your design requirements.

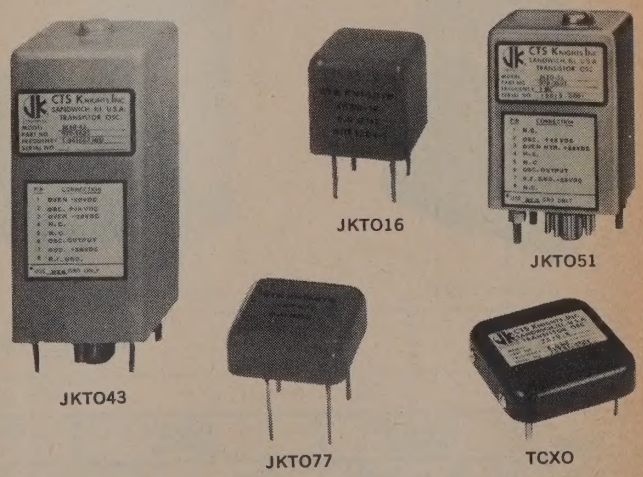
Crystals



Filters



Oscillators

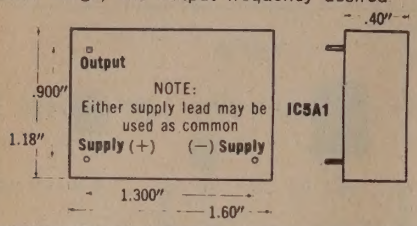


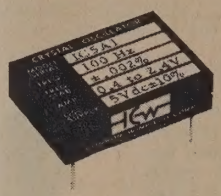
RING INFORMATION: Place orders using the following address:
CTS Knights, Inc., 400 Reimann Avenue, Sandwich, Illinois 60548 • Telephone 815-786-8411 • TWX 910-642-0860

OSCILLATORS FOR IC SYSTEMS

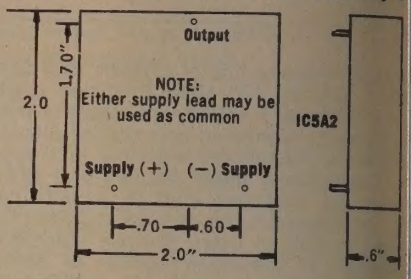
CRYSTAL CONTROLLED OSCILLATORS

These crystal oscillators are designed primarily for use with I.C. systems and are completely compatible with Series "930" as well as o devices. Priced equal to or lower than their larger equivalents, they provide low output frequencies with true crystal accuracy. Their o is silent and the output frequency is not affected by mounting position or variation in "G" forces. A total of eight different Models prov frequency accuracies and five temperature ranges as shown in the table below. The cost of a unit is determined by the frequency a temperature range, and output frequency desired.





MODEL IC5A1

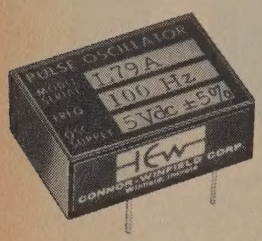


Square Wave Model	Sine Wave Model	Frequency Accuracy	Temperature Range	
			Degrees C	Degrees F
IC5A1	IC5A2	±.002%	+20 to +40	+68 to +104
IC5B1	IC5B2	±.005%	0 to +50	+32 to +122
IC5C1	IC5C2	±.005%	0 to +65	+32 to +149
IC5D1	IC5D2	±.01%	0 to +65	+32 to +149
IC5E1	IC5E2	±.01%	−25 to +70	−13 to +158
IC5F1	IC5F2	±.02%	−25 to +70	−13 to +158
IC5G1	IC5G2	±.02%	−55 to +70	−67 to +158
IC5H1	IC5H2	±.05%	−55 to +70	−67 to +158

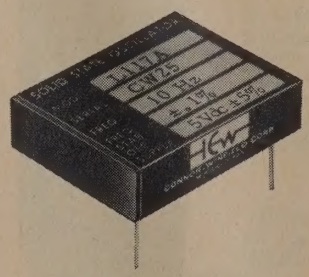
Output Waveform:	Square Wave Duty Cycle 50% Rise Time <50ns	Sine Wave Distortion <
Frequencies Available:	1.0Hz to 500kHz	50Hz to 500k
Output Amplitude:	Logic Zero, <0.4V Logic One, >2.4V	3Vrms nomina into 10kΩ
Supply Voltage:	5Vdc ±10%, 20ma to 100ma depe on frequency	
Termination:	Gold plated solder pins	

RC OSCILLATORS

These solid state RC oscillators are not effected by magnetic fields or severe mechanical vibration. Each unit is ag custom compensated over the operating temperature range. The pulse and square wave units are completely com with Series "930" IC devices. A 15 turn screwdriver adjustment is provided to allow setting to exact frequency. Term and mounting is by gold plated solder pins.



MODEL L79A



MODEL L117A

MODEL L199

Model	Frequencies Available	Output Waveform	Size	Price
L79A	1Hz to 50kHz	Pulse	1.2" x 0.8" x .48"	$48.00
L117A	1Hz to 20kHz	Square Logic Zero < 0.4V Logic One > 2.4V	1.6" x 1.2" x .40"	$63.00
L199B	50Hz to 20kHz	Sine, 3V rms nom. into 10kΩ load	2.0" x 2.0" x 0.6"	$83.00

Frequency Accuracy
±0.1% from 0°C to 0

Supply Voltage
5V dc ±5%

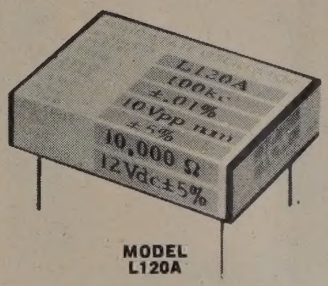
Termination
Gold plated solder pin

CONNOR-WINFIELD CORPORATION
PHONE (312) 231-5270 WINFIELD, ILLINOIS 60190

STANDARD TRANSISTORIZED OSCILLATORS

YSTAL CONTROLLED OSCILLATORS

MODEL P150A



MODEL L120A

AC VOLTAGE REFERENCE

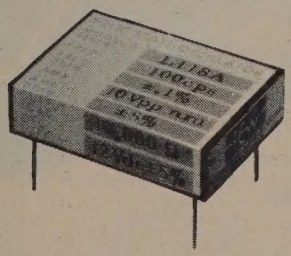
The units shown on this page are available with ±0.1% amplitude stability and Sine wave distortion < 1% for use as an AC Voltage Reference. Phone or write for further information.

ic is indicated by Part No. prefix: P, Octal Plug; S, Solder Hooks; L, Gold Plated Pins.
ut al 5Vrms nominal to 10,000 Ω load. Accessory power amplifiers are available up to 5 watts output. Typical supply voltage is 12VDC.
other ltages can be accommodated.

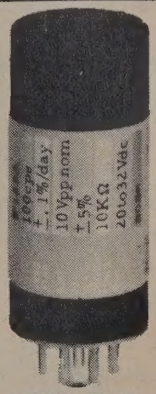
Frequencies Available	Frequency Tol. over Temp. Range	Amplitude Stab. over Temp. Range	Temperature Range	Output Waveform	Size	Price Single Unit
1Hz to 100kHz	±.001%	±2%	−55°C to +50°C oven stabilized	Square or Sine (specify)	2″ x 2″ x 3½″H	$128.00 to $283.00
1Hz to 100kHz	±.002%	±2%	+20°C to +40°C	Square or Sine (specify)	1½″ x 1½″ x 2½″H	$113.00 to $233.00
1Hz to 100kHz	±.005%	±5%	0°C to +50°C	Square or Sine (specify)	1½″ x 1½″ x 2½″H	$ 98.00 to $208.00
1Hz to 100kHz	±.02%	±5%	−25°C to +85°C	Square or Sine (specify)	1½″ x 1½″ x 2½″H	$ 73.00 to $193.00
15kHz to 1MHz	±.005%	±5%	0°C to +50°C	Square, duty cycle 50%	1.6″ x 1.2″ x 0.4″	$ 58.00 to $ 73.00
200Hz to 500kHz	±.005%	±5%	0°C to +50°C	Sine, <5% distortion	2″ x 2″ x 0.6″	$98.00 to $183.00

SCILLATORS

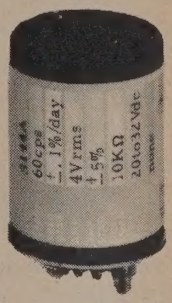
MODEL L80A



MODEL L118A



MODEL P125A



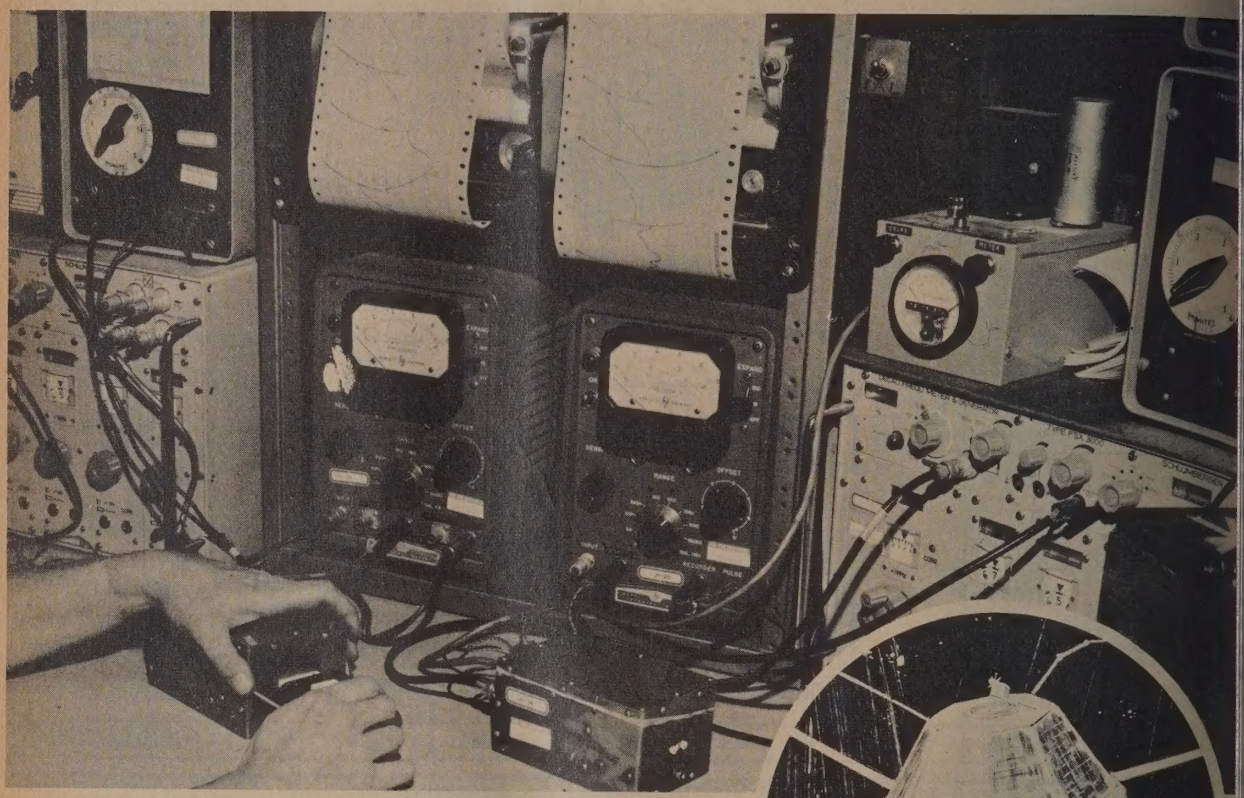
MODEL S144A

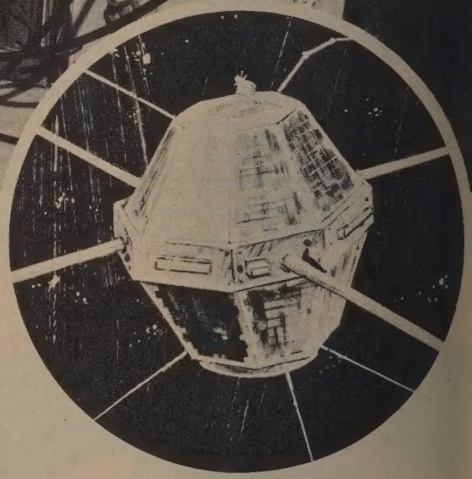
Frequencies Available	Frequency Tol. over Temp. Range	Amplitude Stab. over Temp. Range	Temperature Range	Output Waveform	Size	Price Single Unit
1Hz to 50kHz	±.1%	±5%	0°C to +50°C	Neg. Pulse	1.2″ x 0.8″ x .48″	$43.00
1Hz to 20kHz	±.1%	±5%	0°C to +50°C	Square, <1μs rise time	1.6″ x 1.2″ x .40″	$58.00
50Hz to 20kHz	±.1%	±5%	0°C to +50°C	Sine, <5% distortion	2″ x 2″ x 0.6″	$78.00
1Hz to 20kHz	±.1%	±5%	0°C to +50°C	Square, <500ns rise time	1¼″D x 2¾″H	$43.00
20Hz to 20kHz	±.1%	±5%	0°C to +50°C	Sine, 5% distortion	1¼″D x 3¾″H	$58.00
1Hz to 20kHz	±.1%	±5%	0°C to +50°C	Square, <500ns rise time	1 7/16″D x 2″H	$43.00
20Hz to 20kHz	±.1%	±5%	0°C to +50°C	Sine, 5% distortion	1 7/16″D x 2¾″H	$58.00
10Hz to 3kHz	±1%	±5%	0°C to +60°C	Square, <1μs rise time	1⅜″ x 1⅜″ x 2⅛″	$23.00

CONNOR-WINFIELD CORPORATION
PHONE (312) 231-5270 WINFIELD, ILLINOIS 60190

CROVEN CRYSTALS

leading the way to discovery





Tomorrow's scientific advancements depend on the technological skills applied today. Croven is consistently the supplier of crystals used in exploring new fields. We manufacture all quartz crystals including a complete line of the finest quality coldweld crystals. Croven's exceptional reliability and frequency stability has made us a preferred supplier. Croven crystals used in frequency control have met the highest specifications demanded for use in Canada's ISIS 1 and other space projects. Skilled hands at Croven help shape tomorrow's world.

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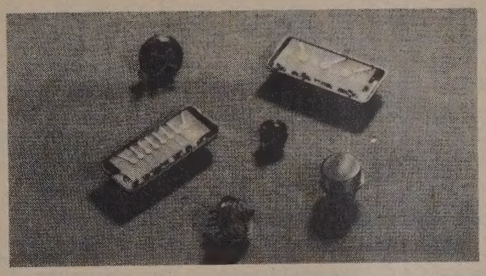
Whatever your signal-shaping needs . . . from a narrow band-reject "spike" to a broad band-pass . . . you can rely on the form-factor specialists at Damon. Computer assisted custom designs. Production quantities. Frequency selection from 10 KHz to 75 MHz. Bandwidths from 10 Hz to 400 KHz. Competitive pricing. You name it. Damon will deliver it — on schedule. Here are five examples typical of Damon's broad capability in frequency control devices:

c Crystal Filters

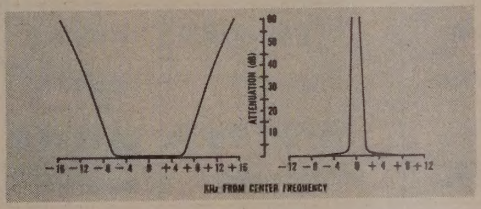
Monolithic Filters utilize a rtz plate for multiple resona- e coupling medium between vantages over conventional ers include smaller size, supe- ty, and lower cost. Available variety of computer-assisted om Chebyshev to Gaussian stics and from 2 to 8 poles.



Center Frequency	3 - 30 MHz
3 dB Bandwidth	0.3 - 30 KHz
No. of Coupled Resonators	2 - 8
Insertion Loss	1 - 6 dB
Ripple	0.5 dB max
Terminations	50 ohms to 20 kilohms
Size	TO-5, TO-8, or Flat-Pack

s/Reject Crystal Filters

ariety of conventional crystal produced at Damon Engi- tandards designs such as But- Chebyshev, Gaussian, Bessel, ndre, as well as custom tai- gns are available.

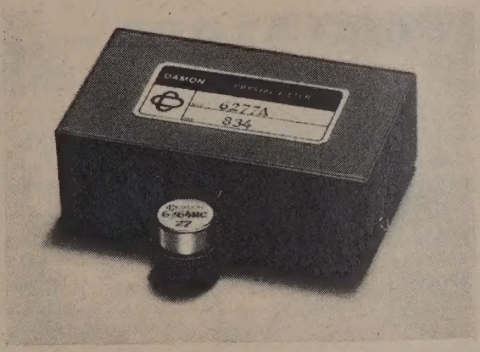


RANGE OF PARAMETERS:

Center Frequency	10 KHz - 75 MHz
Bandwidth	.01% - 3% of C. F.
Phase Linearity	± 5%
Transient Overshoot	40 dB down
Shape Factor	down to 1.4:1
Differential Phase Shift	± 2°
Group Delay Uniformity	± 5%

ssi Crystal Filters

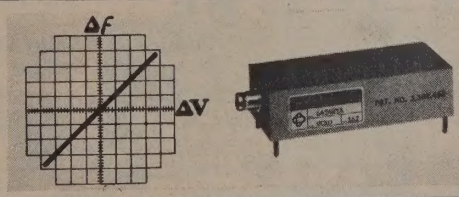
ssi Crystal Filters of either con- tion or monolithic design. Useful FM ommunications or radar sys- ns were flat time delay is required. a herent pulsed radar, it can nimi return-pulse overshoot. Elim- tes ging problems in swept spec- m alysis. Available in 2 to 6 pole signs



Center Frequency	
Conventional	100 KHz - 35 MHz
Monolithic	3 - 30 MHz
3 dB Bandwidth	100 Hz - 30 KHz
Shape Factor, 30 dB to 3 dB	3:1 to 7:1
Ringing, Pulse or Impulse	25 - 40 dB down
No. of Poles	
Conventional	2 - 6
Monolithic	2 - 4
Volume	
Conventional	1 - 6 cu. in.
Monolithic	0.016 - 0.4 cu. in.

CXO — 1 KHz to 500 MHz

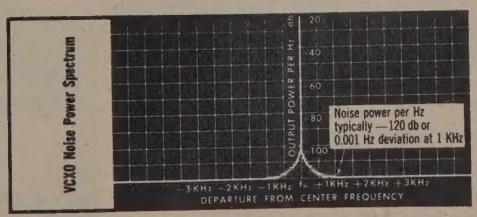
amo VCXO's provide high stability er a road range of center frequen- es. A optional square wave or pulse tpu signal compatible with I. C. gic cuits is available.



Center Frequency	1 KHz to 500 MHz
Deviation	.01% to 0.2% of Center Frequency
Linearity	1% to 2% of Peak Deviation
Frequency Stability	1% of Peak Deviation over 0° to 50°C temp. range

w Noise VCXO's

amo low noise miniaturized VCXO's e al solid state quartz crystal stable cill rs whose frequencies can be ried inearly by an external DC or C mulating signal. Only a source of owe nd control signal are required . no uxiliary compensating circuitry.



TYPICAL CHARACTERISTICS:

Center Frequency	10.000 MHz ± 1 KHz
Deviation	± 10 KHz
Linearity	± 1%
Modulation Rate	Flat to 4 KHz
Output Power	>1 MW

Write for technical bulletins.
Electronics Division, Damon Corporation
115 Fourth Avenue, Needham, Mass. 02194
(617) 449-0800

DAMON

a Textron company

electronic research co.

10,000 W. 75th • Overland Park, Kans. 66204 • 913-631-6700

FREQUENCY CONTROL PRODUCTS • DIGITAL INSTRUMENT

TCXO OSCILLATORS

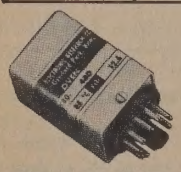
EROS NO.	FREQUENCY	STABILITY	TEMPERATURE	AGING	OUTPUT	SIZE
600 EC 23	5.0 mHz	1ppm	−55°C to +85°C	1ppm/yr	2V p-p, 1k ohm	2.0 x 1.0 x 0.6
600 IE 6	170.0 mHz	2ppm	0 to 50°C	3ppm/yr	2mw, 50 ohm	2.48 x 1.48 x 0
600 R4 6	10.0 kHz	0.5%	0 to 50°C	0.5%/yr	TTL	1.5 x 1.5 x .34
600 DL 5	10.0 mHz	0.1ppm 0.5ppm	20 to 30 0 to 50	1ppm/yr	TTL	2 x 2 x .75

VCXO OSCILLATORS

EROS NO.	FREQUENCY	DEVIATION	TEMPERATURE	STABILITY	SENSITIVITY	SIZE
400 7	10 mHz	±5ppm	−55°C to +110°C	±1ppm	−2ppm/volt	1.5 x 1.5 x 2.5
400 SL 3	60 mHz	±100kHz	0 to +65°C	±5ppm	4kHz to 20kHz/volt	2.5 x 3.5 x 1.5
400 SL 47	4.6 mHz	±85ppm	−35°C to +85°C	± .002%	±22ppm/volt	3.0 x 1.75 x 1.
400 SL 36	1.0 mHz	±200Hz	−30°C to +80°C	± .001%	67Hz/volt	4.5 x 1.4 x 2.0

PRECISION OSCILLATORS

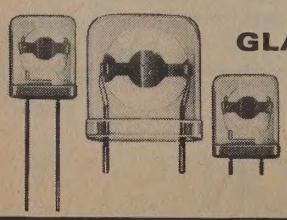
EROS NO.	FREQUENCY	AGING	TEMPERATURE	STABILITY	OUTPUT	SIZE
800 CM26	1.0 mHz	5×10^{10}/day	0 to 55°C	$\pm 2.5 \times 10^{-9}$	Sine	2 x 2 x 4
800 DL8	10.0 mHz	1×10^{9}/day	0 to 50°C	$\pm 5 \times 10^{-9}$	TTL	2 x 2 x 4
800 DL9	5.0 mHz	2×10^{9}/day	0 to 55°C	$\pm 5 \times 10^{-9}$	Sine	1.5 x 1.9 x 3.6
800 MG12	1.0 mHz	1×10^{8}/day	0 to 55°C	$\pm 5 \times 10^{-8}$	Sine	2 x 2 x 4



OVENS–AC or DC

Solid State, Proportional Control, Snap Action or Mercury Control. Custom designs in excess of 10 for either component or crystal application. Crystal designs from 1 to 18 holders, components as precision oscillators, yig filters, etc.

ERO NO.	TYPE	CAVITY	TEMPERATURE	SET TOL.	WARM-UP	VOLTS	SIZE
480	Snap-Action	Eight HC-25	60, 75, 85°C	±2.5°C	10 min.	6 to 120v dc or ac	1.32 x 1.32 x 1
710	Solid State Adjust	One HC-6	50 to 95°C	±0.1°C	30 min. from −30°C	12 to 28 vdc, 6 to 120 vac	1.44 x 1.88 x 3
160	SCR	One HC-6	60, 75, 85°C	±2.5°C	15 min.	6 to 120 vac	1.50D x 2.75



GLASS, COLDWELD and METAL CAN CRYSTALS

Complete frequency range from 2kz to 200mHz with total QPL approval on nearly all Military crystals to Mil. 3098E. Precision glass and coldweld crystals for applications needing superior long term aging, maximum reliability and crystal Q. Aging rates of 5×10^{-10}/day now being achieved on precision time base crystals. Improved process techiniques provide for production of tight tolerance temperature crystals for use in Temperature Compensated Crystal Oscillators. (TCXO's)

COMPLETE FILTER CAPABILITY

L • 2 kHz to 100 mHz; Bandpass, Sideband, Rejection, Linear Phase
• dc to 150 mHz; Bandpass, Lowpass, Highpass, Rejection
ACTIVE • dc to 1 mHz; Bandpass, Lowpass, Highpass
RF COAXIAL • 100 mHz to 1 gHz; Bandpass, Lowpass, Highpass

FILTERS

LC NO	FREQUENCY	BANDWIDTH	TEMPERATURE	IMPEDANCE In	IMPEDANCE Out	SIZE
79 ndpas	500kHz	6 db 90kHz 60 db 150kHz	−50°C to +125°C	5600	100k	3.19 x .82 x .82
87 wpass	80mHz	0.5db dc to 80.0mHz	−45°C to +80°C	50	50	1 x 2.25 x 3.0
79 ppreson	12kHz	0.5db 1kHz to 11kHz 50db 11.95kHz to 12.05kHz	0 to 50°C	75	75	3.75 x 1.13 x 7.75

YSTAL FILTERS

RXF N.	FREQUENCY	BANDWIDTH	TEMPERATURE	IMPEDANCE In	IMPEDANCE Out	SIZE
400 pectra urity	60kHz	3db 4Hz 40db 1kHz	−30 to +60°C	600	600	4.5 x 2.5 x 1.75
500 rborn	75.0mHz	6db ±12kHz 70db ±400kHz	−55 to +90°C	50	500	1.0 x 2.19 x .75
700 near ase	15mHz	3db 80kHz 40db 900kHz	−40 to +70°C	50	300	2.0 x .6 x .8

HERMOSTATS/Snap Action

g life, expensive for commercial or Military application. Temperature range from 50°C to 95°C. Guaranteed for 100,000 cycles 10 amp resistive load.

Typical applications; temperature overload protectors for motors, relays, etc., household appliances such as electrical blankets, heaters, dryers, etc.

GITAL INSTRUMENTS

New!

perature instrumentation with high resolution and accuracy, optional readability and easy operation. Direct temperature control and/or readout from —60.0°C to +160.0°C or —76.0°F to +320.0°F. High accuracy is attributed to development of hole junction silicon sensor. Six standard probe designs available. Write for descriptive literature today.

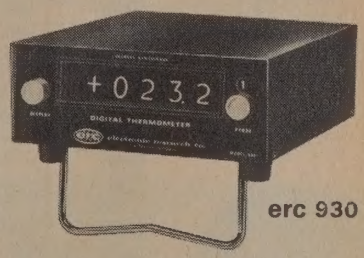
GITAL CONTROLLER (erc 920)

Digitally adjusts to a resolution of 0.1°C for any temperature within its control range. Controls any size chamber where heaters do not exceed 3600 watts, (Display monitors changes in temperature). Zero cross-over switching prevents RFI. Automatic heat/cold operation with no external switching. Accurate temperature control.

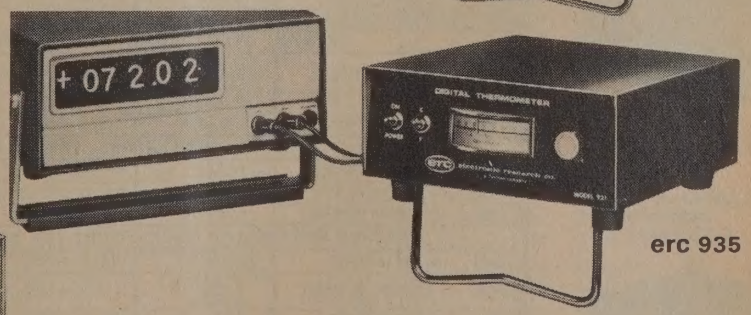
GITAL THERMOMETER (erc 930)

Resolution of 0.1°C with accuracy of 0.6°C over temperature range of −60.0°C to 160.0°C. Ten input channels. Automatic polarity indicator with display memory. Direct digital display indicates temperature without conversion tables.

erc 920



erc 930



erc 935

erc 1050

DIGITAL THERMOMETER (erc 935)

Provides direct digital display of temperature when used with any digital voltmeter. Accuracy of 0.6°C, resolution 0.1°C. Interface to DVM is achieved by two leads or coaxial cable to input of DVM. Ten input channels.

DIGITAL TEMPERATURE CHAMBER (erc 1050)

Equipped with Model 920 Temperature Controller that provides automatic heat/cold control and display. Zero cross-over switching eliminates RFI. Laminar Air Flow technique essentially elimiates thermal gradience to ±0.5°C for any 50°C span. Removeable doors with options.

W H FERWALT, INC.

LAPWAI, IDAHO 83540
PHONE: (208) 843-2463
(208) 843-2631

PRECISION OSCILLATORS

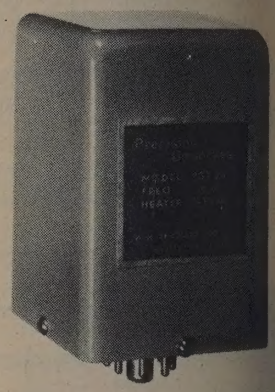
.0005 Hz TO 75 MHz

USES INTEGRATED CKTS • DRIVES INTEGRATED
CRYSTAL CONTROLLED • LC & RC • PHASE
TEMPERATURE COMPENSATED • VOLTAGE CONTR

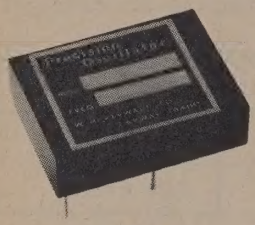
GENERAL CHARACTERISTICS AVAILABLE—

- Square-wave or Sine-wave output
- Manual trim or preset to ±.001% or better
- Supply voltages to suit customer requirements
- Internal dividing and gate control
- Special logic gating or memory
- Shock and vibration specifications

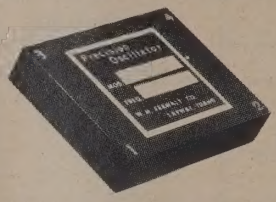
PKG STYLE C
7-pin plug-in
Encapsulated
1.5″ x 2.0″ x .56″



PKG STYLE D
Octal plug-in
Removable cover
2.0″ x 2¼″ x 3⅝″



PKG STYLE A
Printed ckt mount
Encapsulated
1.5″ x 2.0″ x .56″
(AX: Without mtg. hole)



PKG STYLE B
Printed ckt mount
Encapsulated
1.9″ x 2.5″ x .5″
(BX: 2.12″ x 5.0″ x .5″)

PKG STYLE E
4-pin plug-in or solder-in
Removable cover
1.0″ x 1.0″ x 1.0″

PKG STYLE F
Printed ckt mount
Encapsulated
1.0″ x 1.25″ x .5″

PKG STYLE G
I.C. plug-in
Encapsulated
.78″ x 1.125″ x .5″
(GX: .75″ x 1.5″ x .5″)

MODEL SERIES	FREQUENCY RANGE	STABILITY	TEMPERATURE RANGE	PK-TO-PK OUTPUT	LOAD	SUPPLY VOLTAGE	PKG. STYLE	PRICE
CRYSTAL OSCILLATORS, NON-OVEN TYPE								
X026	200KHz to 700KHz	±.005%	0°C to +70°C	2V Sine	500 ohms	+25V	E	$85.0
X032	12.5KHz to 5.99MHz	±.004 to ±.01%	0°C to +75°C	3V Square	25 DTL	+5V	A	$72 t
X032A	12.5KHz to 5.99MHz	±.01%	−55°C to +125°C	3V Square	25 DTL	+5V	A	$96 t
X032C	6MHz to 30MHz	±.004%	0°C to +75°C	3V Square	9 TTL	+5V	A	$82 t
X032CA	6MHz to 30MHz	±.01%	−55°C to +125°C	3V Square	9 TTL	+5V	A	$106 t
X033	.001Hz to 30MHz	±.004%	0°C to +75°C	3V Square	9 DTL/TTL	+5V	B	$74 t
X033A	1Hz to 30MHz	±.01%	−55°C to +125°C	3V Square	9 DTL/TTL	+5V	B	$98 t
X033R	1Hz to 5MHz	±.001%	0°C to +50°C	1V Square	2 RTL	+5V	B	$94 t
X045	1MHz to 5MHz	±.001%	+10°C to +50°C	.63 V Sine	50 Ohms	+15V	C	$109.
X071	200KHz to 16MHz	±.004%	0°C to +75°C	3V Square	9 DTL/TTL	+5V	G	$70 t
X081	12.5KHz to 199KHz	±.004%	0°C to +75°C	3V Square	10 DTL/TTL	+5V	GX	$98 t
X082	190KHz to 16MHz	±.004%	0°C to +75°C	3 V Square	9 DTL/TTL	+5V	F	$58 t
X082A	190KHz to 16MHz	±.01%	−55°C to +125°C	3V Square	9 DTL/TTL	+5V	F	$74 t
PG049	800Hz to 1MHz	±.01%	0°C to +75°C	8V Square	3.9K ohms	−12V	D	$90 t
ULF55	7.5Hz to 30KHz	±.01%	0°C to +50°C	3V Sine	10K ohms	+12V	D	$120
CRYSTAL OSCILLATORS, OVEN-REGULATED (115VAC, 28VDC, or 6.3VAC)								
PGT	1KHz to 250KHz	±.0001% to ±.0008%	−54°C to +65°C	8V Square	3.9K ohms	+12V	D	$168
PGX50	65KHz to 17MHz	±.00001%	0°C to +50°C	3V Sine	1K ohms	+28V	D	$225
PGX63	1Hz to 17MHz	±.00001%	0°C to +50°C	3V Square	1.5K ohms	+12V	D	$208
CRYSTAL OSCILLATORS, TEMPERATURE-COMPENSATED (no oven)								
TCX034	30Hz to 30MHz	±.0001%	0°C to +50°C*	3V Square	9 DTL/TTL	+5V	B	$158
TCX034L	.0005Hz to 30Hz	±.0001%	0°C to +50°C*	3V Square	9 DTL/TTL	+5V	BX	$256
TCX056	100KHz to 30MHz	±.0001%	0°C to +50°C*	3V Square	9 DTL/TTL	+5V	A	$158
VOLTAGE-CONTROLLED OSCILLATORS (OV to +6V typical control range for ±20PPM to ±10%								
VCX025	1Hz to 30MHz	±.004%	0°C to +75°C	3V Square	9 DTL/TTL	+12V	B	$99 t
VCX032	200KHz to 30MHz	±.004% to ±.025%	0°C to +75°C	3 V Square	25 DTL	+5V	A	$99 t
VC047	1Hz to 75MHz	±3%	0°C to +75°C	2V Square	270 Ohms	+5V	B	$82 t
ECONOMY OSCILLATORS (RC, LC & XTAL)								
LC035	75KHz to 5MHz	±½%	0°C to +85°C	2V Sine	10K ohms	+12V	A	$34.9
PS057	340Hz to 40KHz	±2%	0°C to +50°C	8V Sine	10K ohms	+12V	A	$39.3
RC036	50Hz to 1MHz	±3%	0°C to +75°C	3V Square	8 DTL	+5V	A	$29 t
UJ039A	.1Hz to 100Hz	±2%	0°C to +50°C	3V Square	1.5K ohms	+12V	A	$25.5
X062	4KHz to 16MHz	±.01% to ±.025%	−20°C to +70°C	3V Square	1.5K ohms	+12V	AX	$44 t

*Stability at constant ambient: ±.000002% per day average over 30-day period. We invite your specifications. These are only

W. H. FERWALT, INC.

WEBB ROAD LAPWAI, IDAHO 83540 PHONE (208) 843-2463

HOUSANDS OF FREQUENCIES FROM FORK STANDARDS, INC.

Precision Oscillators

ndards tuning fork and crystal oscillators provide racy outputs at frequencies from sub-audio through sizes range from miniature PC board-mount types to oven-stabilized frequency standards. Both square sine wave outputs are available.

orks are limited to frequencies up to about 15 kHz, generally preferred for low-frequency applications they require less frequency-division circuitry than alent crystal unit. A low-frequency tuning fork oscil- hus more compact, draws less current, and is usually less expensive and more reliable than a low-frequency crystal unit. However, for highest accuracy or for higher frequencies, crystals are preferred.

Accuracy and stability of both types of oscillators is a function of temperature; this is shown graphically on page 1442, along with descriptions of the various output options. The Fork Standards oscillators most often specified are summarized below and described in more detail on the following pages. An explanation of how they are specified also appears on page 1442.

MODEL G: Plug-in general purpose unit with very-low-frequency capability. Also available with studs and solder hooks.

MODEL FO: Very compact, designed for printed circuit board applications. Use where space is at a premium.

MODEL P: Larger printed circuit board unit than Model FO. Increased capabilities and slightly lower unit cost. Can be chassis mounted.

MODEL LO: Smallest oscillator available, with square wave output only. PC board mount.

MODEL R: Largest PC board mount model, with lowest case profile at sub-audio frequencies.

MODEL FR, LR: Tuning fork resonator in F or L case. For use where user provides oscillator circuitry, or as a highly selective audio filter element.

MODEL GQ: General-purpose plug-in crystal oscillator, with output frequencies down to .125 Hz. Can be supplied with studs and solder hooks:

MODEL UQ: Smallest crystal unit, designed for PC board mount. PC pins hold unit to board. Vernier frequency adjustment available.

MODEL PQ: General-purpose flat case unit for PC board or chassis mounting. Larger case volume than UQ.

MODEL RQ: Largest board-mounted crystal model, with lowest profile in sub-audio frequency range.

MODEL DQ: Available with either snap-action or proportional control oven, plug-in or stud-mounted base with solder hooks. Accuracy to .0001% over extreme temperatures.

TUNING FORK OSCILLATORS

Model	Frequency Range	Output	Height	Price
G	2 Hz to 15 kHz	Square	2½"	$ 65 up
	.017 Hz to 2 Hz	Square	3½"	147 up
	100 Hz to 15 kHz	Sine	2½"	80 up
	25 Hz to 100 Hz	Sine	3½"	131 up
FO	1 kHz to 15kHz	Square	⅜"	$ 72 up
	.25 Hz to 1 kHz	Square	.6"	88 up
	1 kHz to 15 kHz	Sine	½"	97 up
P	30 Hz to 15 kHz	Square	17/32"	$ 72 up
	.1 Hz to 30 Hz	Square	15/16"	121 up
	60 Hz to 15 kHz	Sine	15/16"	92 up
LO	1 kHz to 15 kHz	Square	⅜"	$ 82 up
R	.25 Hz to 15 kHz	Square	.6"	$ 72 up
	20 Hz to 15 kHz	Sine	.85"	97 up

TUNING FORK RESONATOR

FR, LR	1000 Hz to 15 kHz	⅜"	$ 50 up

CRYSTAL OSCILLATORS

Model	Frequency Range	Output	Height	Price
GQ	32 Hz to 10 MHz	Square	2½"	$ 59 up
	.12 Hz to 32 Hz	Square	3½"	171 up
	800 Hz to 10 MHz	Sine	2½"	74 up
	25 Hz to 800 Hz	Sine	3½"	141 up
UQ	12 Hz to 10 MHz	Square	½" or	$ 59 up
	50 kHz to 10 MHz	Sine	.6"	74 up
PQ	32 kHz to 10 MHz	Square	17/32"	$ 59 up
	100 Hz to 32 kHz	Square	15/16"	81 up
	800 Hz to 10 MHz	Sine	15/16"	74 up
RQ	200 Hz to 10 MHz	Square	.6"	$ 59 up
	.125 Hz to 200 Hz	Square	.85"	148 up
	400 Hz to 10 MHz	Sine	.85"	74 up

OVEN-STABILIZED CRYSTAL OSCILLATOR

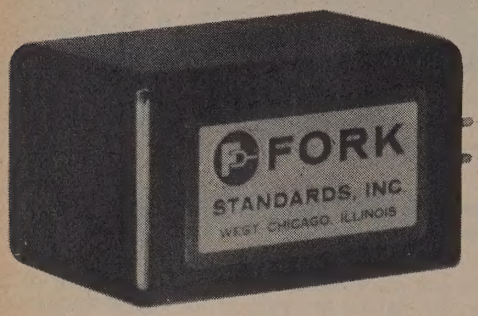
DQ	.125 Hz to 10 MHz	Either	4"	$134 up

· .1 Hz sine wave; modular frequency dividers; modular oscillator power supplies also available.

See our full page of inverter data under "Inverters," page 1443

rk Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

PLUG-IN OSCILLATOR G, G



With their convenient octal plug bases, the Models G and GQ designed for use in applications where space is not restr Either is also available with solder hooks and studs. Circuits u silicon semiconductors and cases are hermetically sealed, ass reliable operation under the most extreme environmental c tions. Most models can be supplied to meet MIL Spec requirem

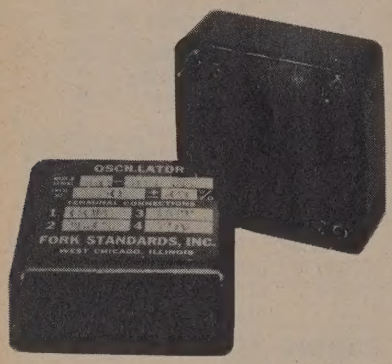
Size: 1½" sq. x 2½" or 3½" h.
Weight: 4-7 oz. (120-210 gm), depending on frequency
Supply: 5 or 12 VDC standard; others available
Accuracy: (See Table, Page 1442, for detailed information)
Tuning Fork (Model G): to .005% (Classes 2-5)
Crystal (Model GQ): to .001% (Classes 6, 7)

OUTPUT/FREQUENCY RANGE

(Complete definitions on Page 1442)

OUTPUT / MODEL	SINE WAVE TYPE AA: 25 Hz up AT, DT: 200-20000 Hz	SQUARE WAVE TYPES B, BL, BN, BD (some restrictions above 1
G (Tuning Fork)	25-800 Hz, 3½" h. 800-15000 Hz, 2½" h.	.012-2 Hz, 3½" h. 2-15000 Hz, 2½" h.
GQ (Crystal)	25-800 Hz, 3½" h. 800 Hz-10 MHz, 2½" h.	.125-32 Mz, 3½" h. 32 Hz-10 MHz, 2½" h

MINIATURE OSCILLATOR FO, U



The Models FO and UQ occupy the least board area of any profile Fork Standards' oscillator. Typically the Model FO h lower profile at a given frequency, though either is capable of audio outputs.

Because of their compact size and rugged construction, models have seen use in various aerospace and military proj The Model FO is also available as a tuning fork resonator without driving circuits, as the Model FR.

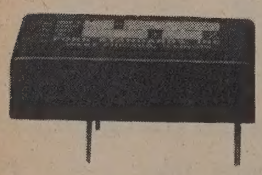
Size: 1½" sq. x ⅜", .5" or .6" h.
Weight: 1.75 oz. (49 gm) max., either model
Supply: 5 VDC preferred; 12 VDC available only above 1000 Hz (FO) or 200 kHz (UQ)
Accuracy: (See Table, Page 1442, for detailed information)
Tuning Fork (Model FO): to .005% (Classes 2-5)
Crystal (Model UQ): to .001% (Classes 6, 7)

OUTPUT/FREQUENCY RANGE

(Complete definitions on Page 1442)

OUTPUT / MODEL	SINE WAVE TYPE AA only	SQUARE WAVE Types: B, BL, BN (some restrictions above 1
FO (Tuning Fork)	1000-15000 Hz, .5" h.	.25-250 Hz, .6" h. 250-15000 Hz, ⅜" h.
UQ (Crystal)	50 KHz-10 MHz, .6" h.	50 Hz-50 KHz, .6" h. 50 KHz-10 MHz, .5"

ULTRA-COMPACT OSCILLATOR LO



With a volume of less than ½ cubic inch, the Model LO is Standards' smallest model. It is rugged and reliable, and has extensive use in applications where space is at a premium.

Size: 1½" x ¾" x ⅜" h.
Weight: .66 oz. (17.5 gm)
Supply: 5 or 12 VDC (specify)

Frequency Range/Accuracy (See Table, Page 1442)
Accuracy: .05% (Class 2): 1000 to 15000 Hz.
Accuracy: to .01% (Class 3, 4): 1920 to 10000 Hz.
Output: Square wave (Type B) only

Fork Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

P, PQ

STANDARD BOARD–MOUNT OSCILLATOR

ze: 55" x 3.55" x 17/32" or 15/16" h.
eight: 3½ oz. (100 gm) max.
pply: 5 or 12 VDC standard
curacy: (See Table, Page 1442, for detailed information)
Tuning Fork (Model P): to .005% (Classes 2-5)
Crystal (Model PQ): to .001% (Classes 6, 7)

The Models P and PQ are general purpose flat package oscillators that can be printed circuit board or chassis mounted. Their nominal base area is economical of board space, which necessitates a rather high profile for lower frequency units.

OUTPUT/FREQUENCY RANGE

(Complete definitions on Page 1442)

OUTPUT / MODEL	SINE WAVE Type AA: 60 Hz up AT, DT: 120-20000 Hz	SQUARE WAVE TYPES B, BN, BL (some restrictions above 1 MHz)
P (Tuning Fork)	60-120 Hz, 15/16" h. 120-15000 Hz, 15/16" h.	.125 Hz-60 Hz, 15/16" h. 60 Hz-15 kHz, 17/32" h.
PQ (Crystal)	800-64000 Hz, 15/16" h. 64 kHz-10 MHz, 17/32" h.	100 Hz-32 kHz, 15/16" h. 32 kHz-10 MHz, 17/32" h.

R RQ

ULTRA LOW FREQUENCY OSCILLATOR

ze: 1/16" sq. x .6" or .85" h.
eight: 5 oz. (150 gm) max.
pply: 5 or 12 VDC standard
curacy: (See Table, page 1442, for detailed information)
Tuning Fork (Model R): to .005% (Classes 2-5)
Crystal (Model RQ): to .001% (Classes 6, 7)

With their large board area, the Models R and RQ have the lowest frequency capability of any printed circuit board mounted Fork Standards oscillator. Output options include both capacitor and transformer coupled sine waves as well as a variety of square wave types.

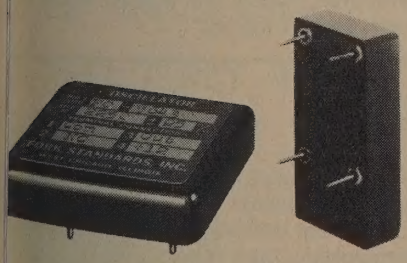
OUTPUT/FREQUENCY RANGE

(Complete definitions on Page 1442)

OUTPUT / MODEL	SINE WAVE TYPE AA: 20 Hz up AT, DT: 60-20000 Hz	SQUARE WAVE TYPES B, BN, BL (some restrictions above 1 MHz)
R (Tuning Fork)	20-120 Hz, .85" h. 120-15000 Hz, .85" h.	.25-15000 Hz, .6" h.
RQ (Crystal)	400-64000 Hz, .85" h. 64 kHz-10 MHz, .6" h.	.125-200 Hz, .85" h. 200 Hz-10 MHz, .6" h.

FR, LR

TUNING FORK RESONATOR



TONE SIGNALLING SYSTEM

cillator and matched tuning fork resonator pairs. Provide to 25 separate simultaneous control functions.

Tuning forks are highly selective audio frequency resonant elements, and thus are very useful in a variety of control and decoding applications. Two resonator configurations are available from Fork Standards; performance is identical so mounting considerations determine the choice.

Frequency Range/Accuracy: (See Table, Page 1442)
1000 - 1920 Hz: .05% (Class 2)
1920 - 15000 Hz: to .01% (Class 3, 4)

Coil Resistance (input and output):
1000 - 8000 Hz = 500 ohms
8000 - 15000 Hz = 130 ohms

Size:
FR: 1½" sq. x ⅜" h.
LR: 1½" x ¾" x ⅜" h.

Weight:
FR: 1 oz. (32 gm)
LR: .6 oz. (17.5 gm)

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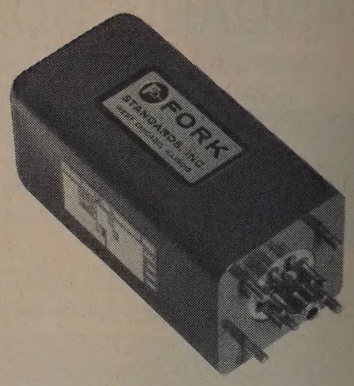
HIGH STABILITY CRYSTAL OSCILLATORS

DC



Low Drift Models (Class 7R)
Any Fork Standards crystal oscillator can be supplied with a premium cold-weld sealed, low-drift crystal. Minimum frequencies available are higher than those shown in the specifications for a standard unit; unit cost is higher.

Standard accuracies are:
.0005%, 10 to +60°C; .002%, −25 to +85°C.

To assure best long-term accuracy a Class 7R oscillator receives four weeks testing before shipment.

Oven-Stabilized Oscillators (Model DQ)
Oven stabilization is recommended for maximum stability over temperature extremes. Two types of oven are available from Fork Standards; snap action and mercury switch. Snap action ovens are less expensive and operate from either AC or DC; 22 to 115 V models are available. Mercury-switch models are DC only, in 6, 12, 24, or 28 V inputs. Howe mercury switch thermostat has a temperature hysteresi 1/10 that of the snap action type, providing best short stability.

Both types consume 10 VA (on); cases are 2″ square a high, with octal plug and hold-down studs.

Oscillators with proportional-control ovens are also ava Consult factory for further information.

SPECIFYING; ACCURACY VS TEMPERATURE

Specifying a Fork Standards Oscillator:
A Fork Standards specification number completely describes the oscillator to which it refers. Conversely, a specification number may be determined whenever an oscillator requirement is completely defined. The parameters required are:

1. Frequency
2. Accuracy
3. Temperature Range
4. Output Waveform
5. Supply Voltage
6. Case Size
7. Mounting and Terminals

The first step is to select a model that satisfies the output waveform requirement at the needed frequency. Then select the proper accuracy/temperature code from the table at the right. For example:

G - 3C - 4K - BL - 5
- 5 = 5 VDC Power Supply
- BL = Square Wave Output for Micrologic Drive
- 4K = 4 kHz Output Frequency
- 3C = .05% Accuracy, 0 - 65°C
- G = Model G Case

CLASS NUMBERS INDICATING OSCILLATOR ACCURACY VS. OPERATING TEMPERATU

TEMPERATURE RANGE

Accuracy (%)	+15° to +35° C	0° to +65° C	−25° to +65° C	−40° to +65° C	− +
.2	2A	2C	2F	2N	
.1	2A	2C	3F	3N	
.05	2A	3C	4F	4N	
.01	4A	5C	6F	6N	
.005	5A	6C	6F	7N	
.0025	6A	7C	7F	8N	
.001	7A	8C	8F	8N	
.0005	8A	8C	8F	8N	
.0001	9A	9C	9F	9N	

- ☐ Tuning fork, Classes 2-5
- ■ Crystal without oven, Classes 6-7
- ☐ Special crystal without oven. Accuracy .0005% from +10° to +60°C. Specify Class 7R.
- ▩ Crystal with oven, Classes 8-9. Specify Model DC

* Special oven unit. Consult factory.

STANDARD OUTPUTS

Most Fork Standards oscillators can be supplied with any of several standard outputs. Buffered outputs are available with most models. Transformer coupled sine wave, types AT or DT, can be provided with most tuning fork and Model GQ oscillators; minimum frequency is restricted.

The most popular output types (referenced to 12V supply) are:

Square Wave:
- **B:** 8 V p-p min. into 10 k ohm resistive load.
- **BN:** Same as B except rise time under 1 μs and equa metry from binary divider.
- **BB:** Same as BN except has two outputs, 180° out of
- **BL:** To drive micrologic. Specify manufacture and t

Sine Wave:
- **AA:** 3 V rms into 10 k ohm resistive load. Harmonic tion 1 to 10%, depending on frequency.
- **AT:** Like AA except transformer isolated output.
- **DT:** 1 mW into 600 ohms, transformer isolated.

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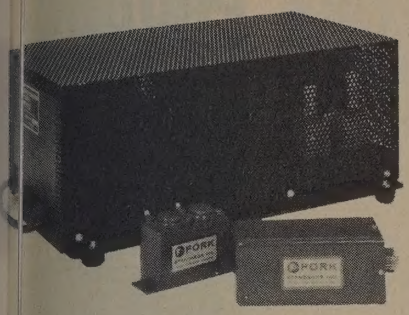
PRECISE FREQUENCY POWER INVERTERS

from FORK STANDARDS

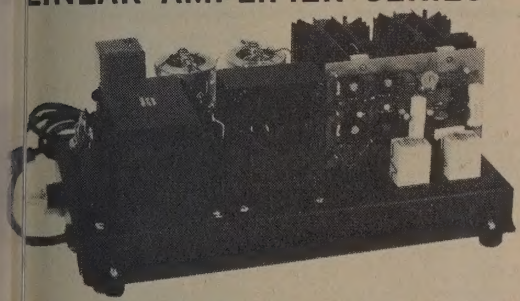


- Line referenced counters
- Clocks
- Tape transports
- Facsimile machines
- Chart recorders
- Movie cameras

A precise frequency power source is a necessity if the power line is used as a frequency reference. Fork Standards' power sources use a precision crystal or tuning fork oscillator to control frequency, so frequency is independent of input or load.

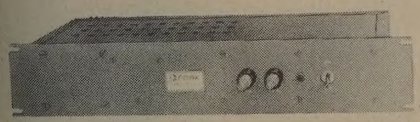
The models described below are representative of Fork Standards' extensive experience in this field. A variety of models of the sizes shown or larger, both standard or custom designed, can be supplied to meet specific requirements.

LINEAR AMPLIFIER SERIES



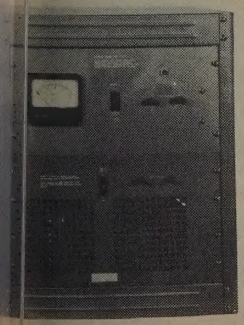
ers table, low distortion sine wave power from unregulated AC lines.
quen accuracy determined by plug-in oscillator. Output regulated,
stat.
uts: 5-130/210-260 VAC, 50-1000 Hz
ut: ine wave, 0-125 VAC, 75 VA (standard), regulated
quen: 50, 60, or 400 Hz standard. 50-1000 Hz available. Also direct-
oupt sine wave as low as 10 Hz at reduced voltage
urac .1 to .005%
: 1⅛" x 8¼" x 5½" High; weight: 22 lbs.
ce:) Hz output) From $480.00

TAPE DECK SERIES



k nted, to power instrumentation tape transport in field applica-
ns. Spec construction, portable models available.
ut: 5-125 VAC, 55-65 Hz
tput: 15 VAC, sine wave, 60 VA
quey: 60 Hz, ±.01%, −55° to +85°C

) FREQUENCY, 400 VA INVERTER



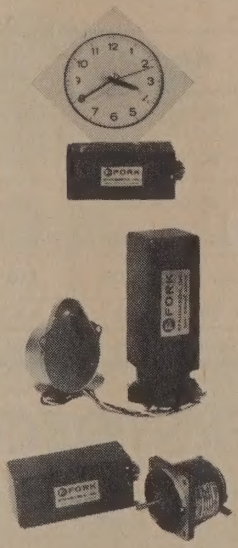
For lab testing 60 Hz instruments on 50 Hz, and 50 Hz instruments on 60 Hz. Output frequency changed by switch on plug-in oscillator and changing output filter taps.

Input: 115/230 VAC, 50-400 Hz

Output: 115/230 VAC, sine wave, regulation 5% half to full load, 400 VA

Frequency: 50 or 60 Hz (switchable), .001% accuracy

CLOCK-MOTOR DRIVERS



Operating from a DC source, these square wave output units will drive a small synchronous motor at speeds accurate to .001% (less than one second per day error). The Model HCD has a transformer coupled, 115 V, 3 VA output to drive standard electric clocks. For higher power applications specify the Model HCD, 35 VA at 24 V p-p, center tapped, or a Model HMD, which has 115 V output at 35 to 100 VA.

SPECIFICATIONS

Model	LMD	HCD	HMD
Freq. Range	10-1000 Hz	40-1000 Hz	50-1000 Hz
Power	35 VA	3 VA	35-100 VA
Output Voltage	24 V p-p (C.T.)	115 V rms	115 V rms
Size	2" sq., 4" h.	2" sq., 4" h.	Various

ACCURACY (%) VS. TEMPERATURE

Specify	15 to 35°C	Specify	−55 to 85°C
2A	.05	2S	.200
4A	.005	4S	.020
7A	.001[1]	7S	.005

[1]Requires special precautions. Consult factory.
Mounting: Octal plug; studs, solder hooks available.

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FREQUENCY CONTROL, INC
TUNING FORK PRODUCTS

new . . . insensitive to shock and vibration . . . miniature

FILTERS/RESONATORS Replaces 1 to 50 KHz Crystals

TYPE	FREQUENCY RANGE	DIMENSIONS	FREQUENCY vs. TEMP.	BANDWIDTH % of Fc	INSERTION LOSS — TYPICAL
TFF/TFR-38	10 to 50 KHz	.290 x .14 x .7	±10 PPM/°C	.01 to .1	<−6db
TFF/TFR-30	400 Hz to 50 KHz	2 x .625 x .5	±10 PPM/°C	.01 to .1	<−3db
TFF/TFR-54	400 Hz to 50 KHz	.40 Diam. x 1.75	±10 PPM/°C	.01 to .1	<−3db

Send for application notes with recommended circuits.

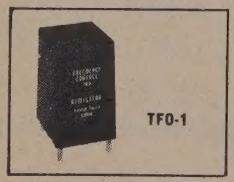
OSCILLATORS TTL compatible

TYPE	FREQUENCY RANGE	DIMENSIONS	(−5 to +55°C) STABILITY TYPICAL	INPUT VDC	OSCILLATOR CURRENT
TFO-1	DC to 50 KHz	1.65 x 1.65 x 2.4	±.005%	5 ±5% 12 ±5%	10 to 100ma
TFO-37	DC to 50 KHz	1″ Diam. x 2	±.01%	5 ±5% 12 ±5%	10 to 100ma
TFO-50	DC to 50 KHz	2.0 x 2.0 x .5	±.01%	5 ±5% 12 ±5%	10 to 100ma
TFO-30	400 Hz to 50 KHz	2.0 x .625 x .5	±.02%	5 ±5%	<4ma
TFO-22	400 Hz to 50 KHz	1.06 x 2.1 x .5	±.01%	5 ±5% 12 ±5%	<4ma
TFO-46	10 to 50 KHz	1.3 x .64 x .35	±.05%	5 ±5%	<2ma

Send for catalog specifying complete range of tolerances and temperature ranges.

ENCODERS/DECODERS For remote tone control

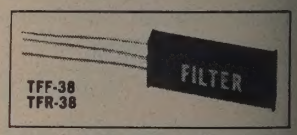
TYPE	FREQUENCY RANGE	DIMENSIONS	FREQUENCY vs. TEMP.	FREQUENCY TOLERANCE
TFE/TFD-22	400 Hz to 4 KHz	1.06 x 2.1 x .5	10 PPM/°C	±.05%
TFE/TFD-37	400 Hz to 4 KHz	1″ Diam. x 2	10 PPM/°C	±.05%
TFE/TFD-50	400 Hz to 4 KHz	2.0 x 2.0 x .5	10 PPM/°C	±.05%


TFO-1

TFF-30
TFR-30
TFO-30

TFO-37 TFE-37
TFD-37

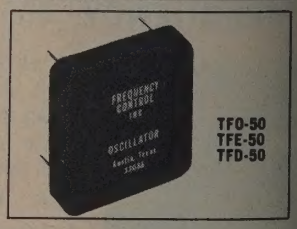
TFF-54
TFR-54



TFF-38
TFR-38

TFO-22
TFE-22
TFD-22

TFO-46


TFO-50
TFE-50
TFD-50

Let us analyze your production requirements and submit a quotation on tuning fork products for your comparison.

FREQUENCY CONTROL, INC.

P.O. BOX 671 / AUSTIN, TEXAS 78767 / (512) 444-7401

FREQUENCY PRODUCTS

INSTRUMENTS

High Stability Frequency Standards

Digital Phase Comparators

High Performance Distribution Amplifiers

High Stability Portable Clocks

High Precision Low Frequency Variable Oscillators

OSCILLATORS

High Stability Crystal Oscillators
Oven Proportionally Controlled

Sub-Miniature Crystal Oscillators
No Ovens Utilized

High Stability Crystal Oscillators
Low Power Oven

High Precision Crystal Oscillators
Frequency Voltage Controlled

Temperature Compensated Oscillators

High Stability Proportional Ovens

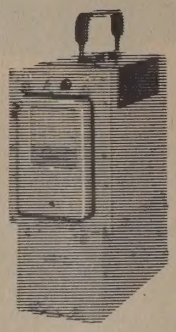
Linear Discriminators

END FOR COMPLETE CATALOG E

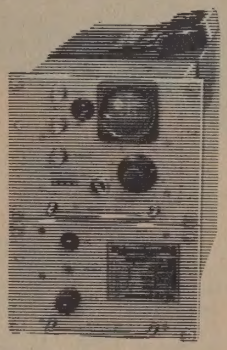
FREQUENCY ELECTRONICS, INC.

3 Delaware Drive
Lake Success, New York 11040
(516) 328-0100

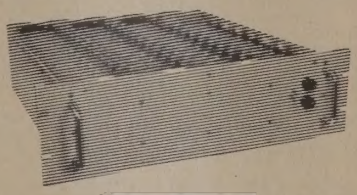
INSTRUMENTATION



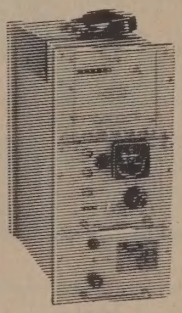
DIGITAL PHASE COMPARATORS



HIGH STABILITY FREQUENCY STANDARDS



DISTRIBUTION AMPLIFIERS

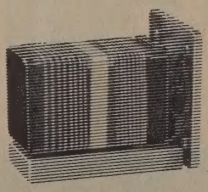


PORTABLE DIGITAL CLOCKS

COMPONENTS

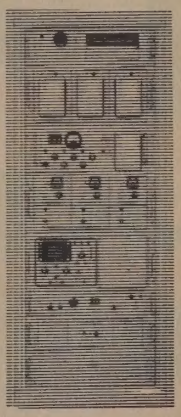
CRYSTAL OSCILLATORS

LINEAR DISCRIMINATORS



PROPORTIONAL OVENS

SYSTEMS



FREQUENCY-TIME STANDARD

VOLTAGE CONTROLLED OSCILLATORS

Through continuous research and specialization, Greenray Industries offers the most complete and advanced line of Frequency Standards and Oscillators in the industry.

P-201

L-C Voltage Controlled Oscillator—Stabilities of ±.2%. Frequency deviations as great as ±20%.

PH-229 & PH-230

L-C Voltage Controlled Oscillator—Proportional oven units offer stabilities of ±.001% and frequency deviations to ±10%.

NH-203A

Voltage Controlled Crystal Oscillator—Proportional oven unit for FM and phase locked loop applications.

NH-314

Voltage Controlled Crystal Oscillator—High frequency 60 MHz to 300 MHz.

Model No. and Type	Center Frequency Range	Maximum Range of Frequency Swing	Stability over Temp. Range (at a fixed frequency)	Temperature Range	Output Wave Form and Minimum Voltage	Input	Size	P 1-3
Q-200 R-C VCO	20 Hz to 100 kHz	±10% or ±30%	±.5% ±2%	0 to 50°C −40°C to +60°C	Pulse, Square or Sine	+28V D.C.	2" x 2" x 4" high	$275 $375
P-200 L-C VCO	1 kHz to 99.99 kHz	±1% or ±4%	±.5% ±1%	0 to 50°C −40°C to +70°C	Sine 2V RMS	+28V D.C.	1¾" dia. x 3⅝" high	$489
P-201 L-C VCO	100 kHz to 19.99 MHz	±1%, ±5%, ±10% or ±20%	±.2% ±.5%	0 to 50°C −40°C to +70°C	Sine 2V RMS	+28V D.C.	1½" dia. x 3 3/16" high	$389 $485
P-202 L-C VCO	20 MHz to 200 MHz	±10% or ±20%	±.4% ±1%	0 to 50°C −40°C to +70°C	Sine 1 Milliwatt into 50 ohms	+28V D.C.	2" x 2" x 4" high	$389
PH-229 L-C VCO	100 kHz to 20 MHz	±10%	±.01%/hr. ±.02%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2" x 2" x 4"	$525
PH-230 L-C VCO	100 kHz to 20 MHz	±2%	±.001%/hr. ±.01%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2" x 2" x 4"	$795
N-200 VCXO	4 kHz to 999.9 kHz	±.01%, ±.05% or ±.1%	±.015%	−20°C to +60°C	Sine 1V RMS	+28V D.C.	2" x 2" x 4" high	$525 $675
N-201 VCXO	1 MHz to 60 MHz	±.01%, ±.05% ±.1%	±.008%	0°C to +60°C	Sine 1V RMS	+28V D.C.	1½" dia. x 3 3/16" high	$385 $485
N-330 VCXO	50 kHz to 250 kHz	±1% ±.05%	±.01%/day	0 to +60°C	Square to drive T²L micrologic	+5V D.C.	2 9/16" x 2 15/16" x ⅞"	$545
N-331 VCXO	250.1 kHz to 999 kHz	±.1% ±.05%	±.01%/day	0 to +60°C	Square to drive T²L micrologic	+5V D.C.	2 9/16" x 2 15/16" x ⅞"	$475
N-332 VCXO	1 MHz to 25 MHz	±.1% ±.05%	±.01%/day	0 to +60°C	Square to drive T²L micrologic	+5V D.C.	2 9/16" x 2 15/16" x ⅞"	$385
NH-203A VCXO	1 MHz to 60 MHz LOW NOISE	±.01% or ±.05% or ±.1%	±.0001%	0 to 50°C	Sine 1 Milliwatt into 50 ohms	+28V D.C. for oscillator and proportional oven	2" x 2" x 4" high	$565 $645
NH-314 VCXO	60.1 MHz to 300 MHz LOW NOISE	±.01% ±.05% ±.1%	±.0005%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2¾" x 2¾" x 4⅝"	$748 $975
SH-219 Wide Band VCXO	500 kHz to 60 MHz LOW NOISE	±.25% or ±.5% or ±1%	±.001% ±.0025% ±.005%	0 to 50°C	Sine 1 Milliwatt into 50 ohms	+28V D.C. for oscillator and proportional oven	2¾" x 2¾" x 4⅝" high	$975 $145

Typical control voltage input: 2V RMS up to 15 kHz rate or ±3V D.C. for full modulation at 1000 ohm input impedance.—**Standard modifications available.**

NEW
N-330, N-331 & N-332

Voltage Controlled Crystal Oscillator—Designed to direct-drive all popular types of micrologic. 25 nanosecond maximum rise and fall time.

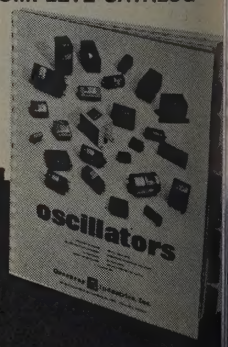
N-201

Voltage Controlled Crystal Oscillator—Nonoven unit available in flat pack or plug-in construction. Very popular.

SH-219

Wide Band Voltage Controlled Crystal Oscillator — Uses special techniques for ±1% frequency deviation.

CALL OR WRITE FOR OU COMPLETE CATALOG



Greenray Industries, Inc.

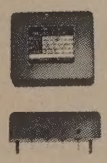
840 West Church Road, Mechanicsburg, Pa.

Phone — (Area Code 717) 766-0223

SCILLATORS and FREQUENCY STANDARDS

OVER 120 STANDARD MODELS IN OUR GIANT CATALOG

Frequency (Fixed)	Accuracy over Temp. Range	Temperature Range	Minimum Output	Input	Size	Price 1-3 (each)
00 Hz to MHz	±.5%	−40°C to +70°C	Sine 1.5V RMS	28V D.C.	2 9/16" x 2 15/16" x 7/8" (P-C Mount)	$89.50
00 Hz to 0 MHz ± 0% Adj.	±.5%	−30°C to +60°C	Sine 2.5V RMS	28V D.C.	1½" D x 3 11/16" H	$114.50
Hz to 000 Hz	±.015%	−40°C to +70°C	Square 6V P to P	28V D.C.	2" x 2" x 4" H	$290.00 & up
0 kHz to 0 MHz	±.005% or ±.025%	−55°C to +90°C	Square 0 to 6V P to drive micrologic	+3V D.C. to +6V D.C.	1⅝" x 2¼" x ¾" H	$199.00 to $209.00
00 Hz to 00 MHz	±.012% or ±.005%	−40°C to +70°C	Sine 1V RMS or 1 milliwatt	28V D.C.	2" × 2" × 4" H maximum	$119.00 to $169.00
3000 Hz o 150 MHz	±.015% or ±.005%	−40°C to +70°C	Sine 1V RMS or 1 milliwatt	28V D.C. or +12V D.C.	2" x 2" x ¾" H (P-C Mount)	$139.00 to $195.00
3 MHz to 5 MHz	Up to ±.0001%	−40°C to +70°C or −32°C to +100°C	Distorted Sine 1V P to P	No Oven 17.5V D.C. 20Ma maximum	Approx. 1¼" x 3¾" x ¾" H	$390.00 to $485.00
3200 Hz to 100 MHz	±.0002% to ±.00001%	0°C to +50°C	Sine 1V RMS	28V D.C. & 6V A.C. or 28V D.C.	1¾" D x 3¾" H	$197.00 to $287.00
100 kHz to 90 MHz LOW NOISE	Up to ±.00005%	0°C to +50°C	Sine 1 Milliwatt	28V D.C. for oscillator and proportional oven	2 9/16" x 2 15/16" x 7/8" H (P-C Mount)	$370.00 to $399.00
1 MHz to 10 MHz LOW NOISE	$\pm 1 \times 10^{-9}$	+20°C to +55°C	Sine 1V RMS	28V D.C. for oscillator & proportional oven	2¾" x 2¾" x 4⅝" H	$770.00
5 MHz to 50 MHz	±.0001%	0°C to +55°C	Sine 1V RMS	28V D.C. for oscillator & oven	2 9/16" x 2 15/16" x 3 1/16" deep	$490.00 for 10 channels
10kHz to 30 MHz	$\pm 4 \times 10^{-6}$	0°C to +50°C	Square 0 to 6V P to drive micrologic	+5V D.C.	1" x 2" x ½" H	$209.00 to $339.00
3 MHz to 30 MHz	$\pm 4 \times 10^{-6}$	0°C to +50°C	Sine 2V PK-PK	+5V D.C.	1" x 1" x ½" H	$169.00
12 MHz to 600 MHz	$\pm 5 \times 10^{-6}$	−10°C to +60°C	Sine 1 MW	+28V D.C.	1½" x 1½" x 3¾" H	$204.50 to $520.00
3 MHz to 30 MHz	±.005%	−40°C to +70°C	.22V RMS	+3 to +12V D.C.	½" x ½" x 1 1/16"	$119.00 to $149.00
1 MHz to 10 MHz	$\pm 1 \times 10^{-8}$	0°C to +55°C	1V RMS	+28V D.C. for oscillator & proportional oven	2¼" x 2¼" x 4¼" H	$489.00
5 MHz to 75 MHz	$\pm 5 \times 10^{-7}$	+10°C to +50°C	1 MW	+28V D.C. for oscillator & proportional oven	3 5/16" W x 3⅞" x 4" D	$890.00



L-217

L-C Oscillators for printed circuit board mounting. Ideal where an AUDIO TONE or an RF signal is required. Used widely in test equipment.

313100A

General Purpose Oscillator—Crystal controlled. For very low frequency, high stability requirements.

Y-367

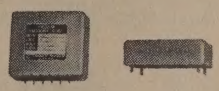
Crystal Oscillators for printed circuit mounting—3 kHz to 150 MHz.

28100, Y-656 & Y-657

Crystal Oscillators for general application with excellent stability. 800 Hz to 600 MHz.

Y283-3

Crystal Oscillators—designed to direct-drive all popular types of micrologic.



T-224

ture Compensated Crystal **illators**—High stability over **nperature range. No Oven** **atures instant warm-up.**

356000C

Frequency Standard—Ultra stable. Uses proportional type oven.

±1 part in 10^9

228200C

Multiple Channel Crystal Oscillator—Up to 20 output frequencies in the 5 MHz – 50 MHz Range (Rotary Switch Selection).

YH-320

Frequency Standard—Low noise, for printed circuit board mounting.

Greenray Industries, Inc.

840 West Church Road, Mechanicsburg, Pa.

Phone — (Area Code 717) 766-0223

Leaders in Precision Temperature Control for the Electronics Indust

NEW for the 70's!

TempMonitor

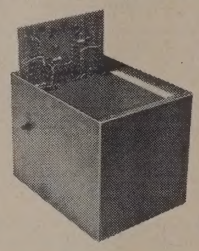
INDICATE-CONTROL-DELAY

These are just some of the jobs that can be done with Oven Industries exclusive **TempMonitor** circuit. In the model 7427 oven below, the **TempMonitor** produces a visual indication if the internal temperature is above or below the specified control point.

Latching or non-latching outputs allow **TempMonitor** to delay application of power until your components are in their operating temperature range, shut down in event of excessive heat rise, etc. **TempMonitors** with multiple set points as close as 0.1°C are available as an option on all new ovens.

Designed to house plug-in printed circuit boards, the Model 7427 provides the stable environment necessary for critical circuits.

The 7427 can be modified to accommodate up to ten 4 1/2" x 5" plug-in boards.



MODEL 7427

NEW for the 70's!

THE SILENT ONE

Sock him with 40 G's and he doesn't say a word. Hit his inp terminals with 50 to 600 Hz and he never protests. You expect him to ask for novocaine when you fill his cavity wi 3 1/2 watts.

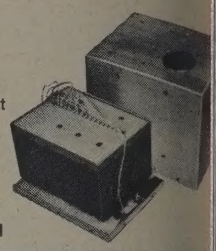
He doesn't - he just sits there, quietly keeping his inside at 75° ± 0.15°. That's pretty darned good for a guy his siz But -

Why is he so quiet?

Because we knew you might be offended by words li "RFI", "Mechanical Resonance", etc. So we built him tou enough to take the roughest treatment - and sealed his li forever with a noiseless AC control circuit.

SPECIFICATIONS

Cavity size (ID): 3.7" x 5.1" x 3.0"
Case Size (OD): 4.7" x 6.1" x 5.2"
Cavity set temperature: 75°C
Stability: ± 0.15°C over an ambient range of 0°C to 50°C
Cavity Load: 3.5 watts
Warm-up time: 30 minutes at 20°C ambient
Price: 1-3 units, $390



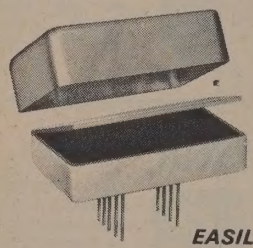
MODEL 7297-1

A NEW KIND OF PACKAGE DEAL!

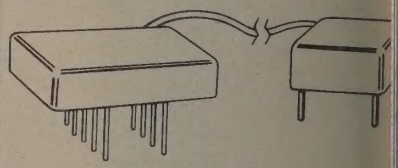
We can't call it insulation. Sure, it makes other insulators look like fish nets. That means you get faster warm-up and lower pow consumption. But it's more than just a super-insulation.

We can't call it an oven either, even though it regulates temperature as well as an oven. You see, this stuff doesn't take any space. Well, hardly any. A form-fitting temperature - stabilizer should be called something grander than "oven".

We call it **ThermoWrap**



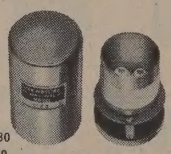
TAKE YOUR COMPONENT -
THERMOWRAP IT -
ADD COVER -
AND CONNECT TO ANY OF OUR REMOTELY LOCATED CONTROLLERS (SEE OUR AD-EEM SEC. 5300)



EASILY DESIGNED AND PRODUCED TO FIT YOUR EXACT NEEDS,
ThermoWrap *IS AVAILABLE NOW. WHY NOT ASK US ABOUT IT?*

NOW! A CRYSTAL OVEN WITH AC DIGIPROP* CONTROL

WILL ACCEPT 2 HC-6/U CRYSTALS



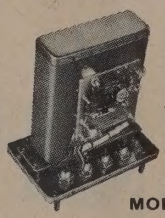
MODEL 5169

Cavity Size: (ID) .962 Dia. x 2.330
Case Size: (OD) 1.297 Dia. x 2.330
Cavity Temperature: Selectable from 55°C to 85°C ±2°C setting tolerance
Cavity Temperature Stability: .5°C over 0°C to within 15°C of Cavity set temperature. ±.15°C at any fixed ambient (±.5°C)
Input Voltage Range: 28—135 VAC ±10%
Max Power: 10 W
Warm-up Time: 15 mins. from 0°C
Header: 8 Pin Octal
Price: 1-3 units $118.00 each

*Digital Proportional

WHAT ARE YOUR REQUIREMENTS?

Oven Industries is the world leader in custom-designed ovens. In many cases one of thousands of our standard designs can be modified in thermal electrical, or physical spe cations to suit your requirements. Typical of this is the 3157 series, designed to acce PC board and components.



MODEL 3157

MODEL NO.	STABILITY	AMBIENT RANGE	PRICE, 1-3
3157-3	±0.5°C	0°C to +50°C	$154
3157-4		−55°C to +50°C	170
3157-5	±0.25°C	0°C to +50°C	162
3157-6		−55°C to +50°C	186
3157-7	±0.2°C	0°C to +50°C	178
3157-8		−25°C to +50°C	194
3157-9	±0.1°C	0°C to +50°C	202
3157-10		−10°C to +50°C	210

Cavity Size (ID): 0.7" x 2.2" x 2.2" **Case Size:** 1.9" x 3.0" x 3.5"
Input: 28VDC, 14 watts max.

Oven Industries specializes in the design and production of unique components oven meet exacting military or industrial specifications. May we offer you our services?

WE HAVE RESERVED A COPY OF OUR 1970 CATALOGUE FOR YOU

OVEN INDUSTRIES, INC.

A Division of Greenray Industries, Inc.

P.O. Box 229
1106 E. Simpson Rd.
Mechanicsburg, Pa.

HUGHES

FREQUENCY CONTROL DEVICES

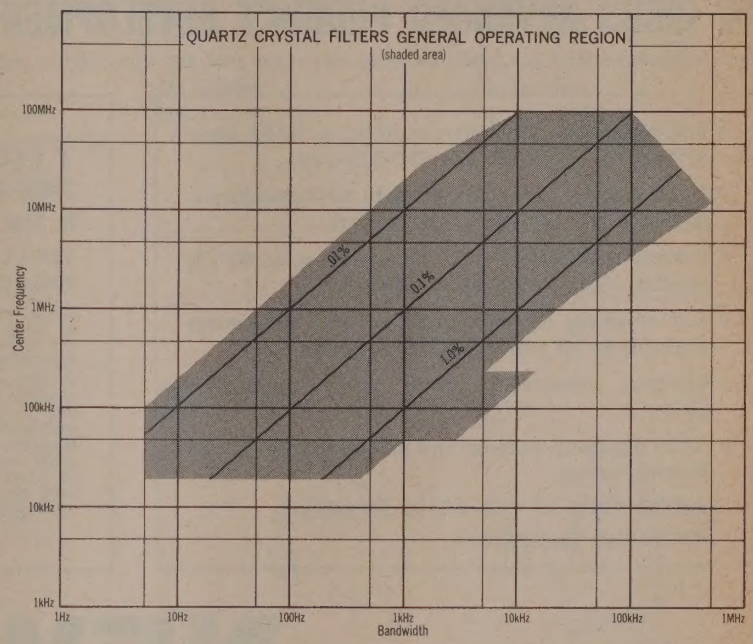
CRYSTAL FILTERS

s the nation's leading supplier of precision ystal filters, Hughes offers years of technical xperience backed by the industry's most dvanced production and test facilities. Thousands of Hughes crystal filters are currently in se in missiles, space vehicles, radar systems and ommunications equipment. Available in various requencies, sizes and environmental standards, ughes filter types include bandpass, single sideand, and rejection, contiguous comb doppler nd thin-film monolithic.

andpass & Single Sideband Filters. Narrow passands steep shape factors and low insertion osses are characteristic of all Hughes bandpass nd single sideband filters. General specifications nclude

enter Frequency Range	250kHz to 100MHz
actual Bandwidth Range	0.002% to 6%
hape Factor (60 db/3 db ratio)	As low as 1.15 to 1
nsertion Loss	Down to 0.1 db
assband Ripple	Down to ±0.1 db

ote: Refer to the General Operating Regions Chart right) to determine producible design combinations of andwidth and center frequency.

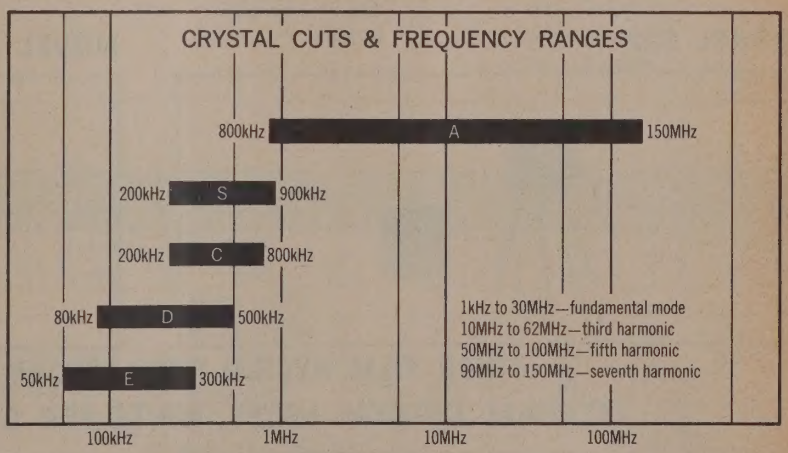


QUARTZ CRYSTALS

ughes supplies a full range of low and high frequency quartz crystals from 250kHz up to 50MHz. Both standard and custom units in prototype or production quantities can be supplied or a variety of precision, frequency control applications.

Military Standard Crystals. Manufactured to MIL-3098E, Hughes military standard quartz crystal units are offered in a full range of low and high requencies.

Coldweld Sealed Crystals. For applications requiring exceptionally high reliability and long term frequency stability, Hughes employs the Coldweld process for hermetically sealing the crystal enclosure. Only pressure is used in welding the cover to the base, thereby eliminating all possibility of contamination from fluxes, sparking or heating. Hughes Coldweld quartz crystals are available in 250kHz to 150MHz frequencies and in TO-5, HC-6 or HC-18 Coldweld holders.



Hughes is the country's leading supplier of precision crystal filters and related frequency control devices. A partial list of major programs using these products includes BMEWS, Apollo, Pioneer, Nimbus, Surveyor, Mauler, Hawk, Minuteman, Polaris, Phoenix and Standard Missile. A staff of competent engineers backed by the industry's most advanced quality control and test facilities, stands ready to handle your toughest assignment. Call collect or contact your nearest Hughes representative for assistance.

Hughes Aircraft Company
Frequency Control Devices
500 Superior Avenue, Dept. EO
Newport Beach, California 92663
Telephone (714) 548-0671
TWX 714-642-1353

HUGHES

HUGHES AIRCRAFT COMPANY
FREQUENCY CONTROL DEVICES
NEWPORT BEACH, CALIFORNIA

GIBBS MANUFACTURING & RESEARCH CORPORATION

GIBBS

CALL (608) 756-1261 FOR DETAILED SPECIFICATIONS
or Write GIBBS at 450 N. Main St. Janesville, Wis. 53545

FREQUENCY STANDARDS & OSCILLATORS SHOWN ARE TYPICAL OF GIBBS ADVANCED PRODUCT DEVELOPMENT CAPABILITIES

For additional products see GIBBS manufacturing pages 1380 and 1381 (Section 2200).

- Full white room facilities controlled to NASA Spec. NPC-200-4, Class 100 per FED-STD-209...
- Environmental test chambers with full temperature, humidity and vibration test facilities...
- Frequency Standard Lab, monitored with WWVB, keeping rigid schedules of calibration...
- Full reliability documentation and I&T procedures available to all projects when requested...
- Resident government quality control representatives...
- NASA approved welding and soldering with on-site training school.
- Latest state of the art in Radiation Hardened Oscillators

Throw Gibbs the Challenge!

GIBBS Custom Builds Crystal Oscillators to Your Specifications

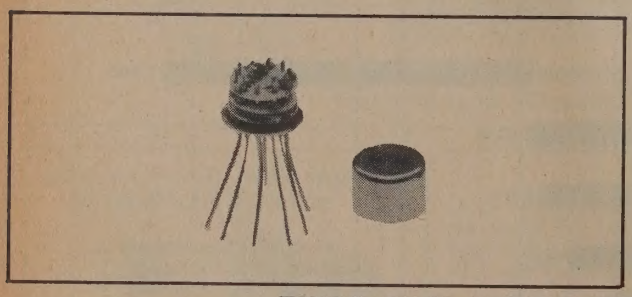
MODULAR DESIGN TECHNIQUES PROVIDE MAXIMUM FLEXIBILITY

Gibbs' capabilities are by no means limited to the manufac of stock items... All of these facilities are available to you the development of equipment of highest reliability for the n specialized applications.

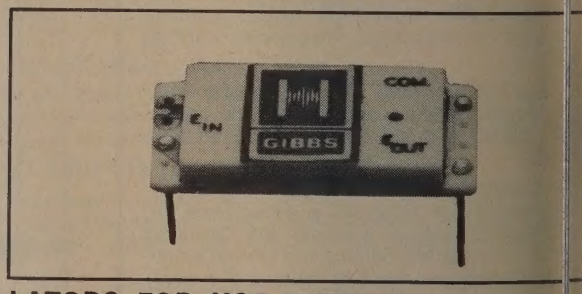
Whatever your particular application, it is likely that some c bination of Gibbs stock modular designed oscillators will n your requirements. Through this concept the oscillator is frequency source and additional output circuits are sin plugged in to meet the specific requirements of the applicat Such modular design makes high reliability oscillators avail on short delivery at relatively modest cost. The models sh here are typical GIBBS Oscillators. We can tailor a unit to your requirements.

NEW

MODEL 622



MODEL 1007



THICK FILM HYBRID OSCILLATORS FOR USE WITH EXTERNAL CRYSTAL UNITS, WRITE FOR DETAIL SPECIFICATIONS

TO-5 MODEL 622
5kHz to 100kHz
Use with Low Freq. Crystals
Temp. Range −40°C to 100°C
Use with Series "R" of 25K to 120K
Square Wave Output
100 Milliwatts @ 12VDC

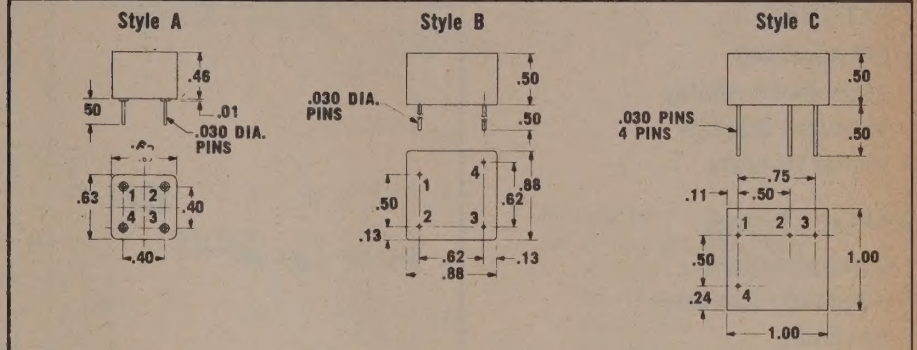
FLAT PACK MODEL 1007
1MHz to 20MHz
Use with "AT" Cut Crystals
Temp. Range −55° to 100°C
Use with TCXO and Conventional Design
Square Wave Output
100 Milliwatts @ 10VDC

OMPUTER CLOCK
rie CX

1MHz to 20MHz

ATIRES
- ow ost
- Hast Case
- Logi Compatibility
- P.C. lounting
- rysl Controlled
- Custm Designed Packages

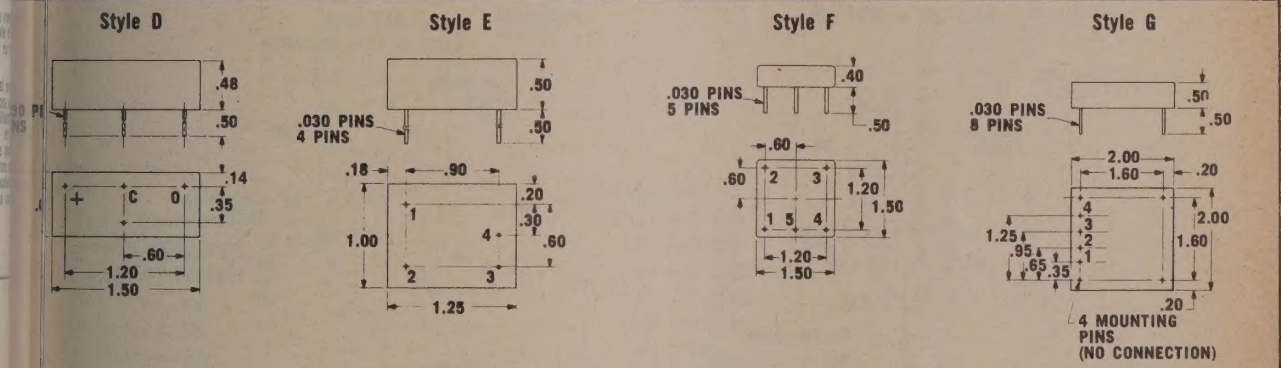
PLCATIONS
- Tim Reference
- Data Transmission
- Facsmile
- Mar r Generators
- State Frequency Source



Pin Functions
Pin #1 — Output
#2 — No Connection
#3 — +5VDC
#4 — Common

Pin Functions
Pin #1 — Output
#2 — N/C
#3 — +5VDC Input
#4 — Common

Pin Functions
Pin #1 — Output
#2 — Common
#3 — Spare N/C
#4 — +5VDC



Pin Functions
Pin + — +5VDC
C — Common (−)
O — Output

Pin Functions
Pin #1 — Common
#2 — +5VDC
#3 — Output
#4 — Spare N/C

Pin Functions
Pins #1 & #2 — Common
#2 & #4 — +5VDC
#5 — Output

Pin Functions
Pin #1 — +5VDC
#2 — Output
#3 — Output
#4 — Common

PEIFICATIONS

ARAMETER	MODEL NUMBER						
	PK02-28A	PK02-28B	PK32-28C	PK02-28D	PK02-28E	PJ11-28F	PL22-28G
equ y Range (MHz)	2.5 to 20	1 to 20	1 to 20	1 to 20	1 to 20	1 to 20	5Hz to 20MHz
equ y Tol. Percent (%)	±.002	±.002	±.002	±.002	±.002	±.005	±.001
omp ange	All 0°C to 50°C						
upp oltage	All +5 ±0.5VDC						
nput wer (Milliwatts)	100	150	100	100	200	200	400
Wave m	Square Compatible with IC Logic All TTL. Logic "I", 2.4V Min., Logic "O", 0.5V Max.						
ymm y	All 50/50 ±5%. R_t & F_t, 10 Nanosec. typical						
Sink rent	All 10 ma. typical (Fan out)						
Style	A	B	C	D	E	F	G
eigh Max.)	.500	.500	.500	.475	.500	.400	.500

oser equency tolerances available in all styles upon request.

ORDERING INFORMATION
To order, specify Model No. (Example PK32-28C) plus frequency.

For additional products see ACCUTRONICS, pages 1402 to 1414.

GIBBS MANUFACTURING & RESEARCH CORPORATION
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

CRYSTAL OSCILLATORS SYSTEM CLOCK

1KHz to 30MH

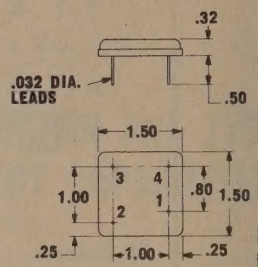
FEATURES

- Mil Approved
- Logic Compatibility
- Excellent Stability
- Digital Dividers

APPLICATIONS

- Computer Clock
- Reference Oscillator
- Facsimile
- Hi-Rel Applications

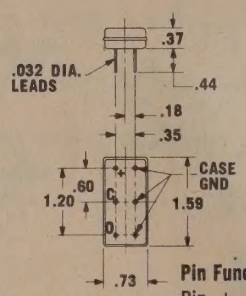
AG11-29P or JK11-29P



Pin Functions
Pin #1 — Common
#2 — +5VDC
#3 — Output
#4 — Case

FIGURE 1

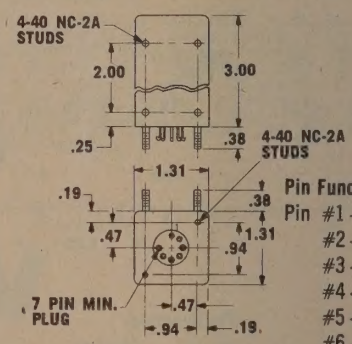
AG01-29P or JK01-29P



Pin Functions
Pin + — +5VDC
C — Common
O — Output

FIGURE 2

LG09-21U or LG09-12U
OPTIONAL
Horiz. or Vert. Mounting



Pin Functions
Pin #1 — Common
#2 — N/C
#3 — +12VDC
#4 — Case
#5 — Output
#6 — N/C
#7 — Also Common

FIGURE 3

SPECIFICATIONS

PARAMETER	MODEL NUMBER					
	AG11-29P	JK11-29P	AG01-29P	JK01-29P	LG09-21U	LG09-1
Frequency Range	2.5MHz to 20MHz	2.5MHz to 20MHz	2.5MHz to 30 MHz	2.5MHz to 30 MHz	1kHz to 100kHz	1kHz to 1
Frequency Tolerance	±0.01%	0.002%	±0.01%	0.002%	±0.01%	±0.01
Temperature Range	−55°C to +125°C	0°C to +60°C	−55°C to +125°C	0°C to +60°C	−40°C to +60°C	−40°C to
Supply Voltage	+5VDC ±5%	+5VDC ±5%	+5VDC ±5%	+5VDC ±5%	+24VDC ±5%	+24VDC
Current Drain	<30MA	<20MA	<20MA	<20MA	<40MA	<40M
Waveform	Square	Square	Square	Square	Square	Sine
Source Voltage	>2.5V peak	>2.5V peak	>2.5V peak	>2.5V peak	—	—
Sink Voltage	0.0V ±0.4 @ 20MA	0.0V ±0.4 @ 4MA	0.0V ±0.4 @ 4MA	0.0V ±0.4 @ 4MA	—	—
Output Voltage	—	—	—	—	>8V P/P	>1VR
Rise & Fall Time	<20 Ns	<20 Ns	<20 Ns	<20 Ns	<10 μsec	—
Distortion	—	—	—	—	—	<5%
Load Resistance	IC Logic	IC Logic	IC Logic	IC Logic	10 KΩ	10 K
Size	Figure 1	Figure 1	Figure 2	Figure 2	Figure 3	Figure

ORDERING INFORMATION

To order, specify Model No. (Example AG11-29P) plus frequency.

For additional products see ACCUTRONICS, pages 1402 to 1414.

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RYSTAL OSCILLATORS
ROPORTIONAL OVEN CONTROLLED

1Hz to 10MHz

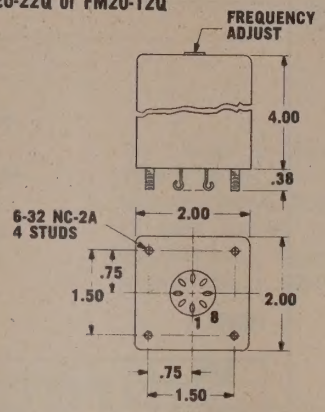
EATURES

- Ult High Stability
- Proportional Control
- Whe Room Assembled
- Log: Compatibility

PPICATIONS

- Mo le Seismograph Equipment
- Sy hronus Motor Drive
- 60Hz for Inverter/Converter
- Au o Frequency Generators

FM20-22Q or FM20-12Q

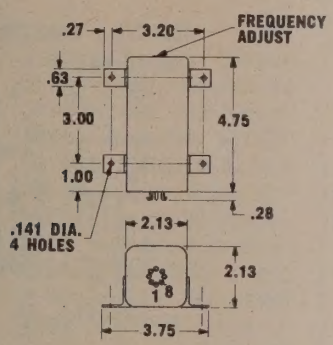


Pin Functions

Pin #1 — + Oscillator Supply
#2 — Com. Osc. Return
#3 — N/C
#4 — Output
#5 — Case
#6 — N/C
#7 — + Oven Supply
#8 — Comm. Oven Return

FIGURE 3

PZ08-12K

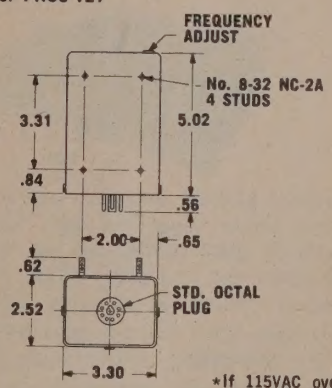


Pin Functions

Pin 1 — Com. Oven Return
2 — + Oven Supply
3 — + Oscillator Supply
4 — N/C
5 — N/C
6 — Output
7 — Com. Osc. Return
8 — Case

FIGURE 2

PN09-21Y or PN09-12Y



Pin Functions

Pin #1 — Output
#2 — Output
#3 — 115VAC Input
#4 — 115VAC Input
#5 — Common
#6 — Case
#7 — + Oven Input*
#8 — N/C

*If 115VAC oven is used it will be internally connected to Pins #3 & #4. Pin #7 will have N/C.

FIGURE 1

PECIFICATIONS

PARAMETER	MODEL NUMBER				
	PN09-21Y	PN09-12Y	PZ08-12K	FM20-22Q	FM20-12Q
Frequency Range	30Hz to 100kHz	30Hz to 100kHz	1MHz to 10MHz	1Hz to 100kHz	1Hz to 100kHz
Frequency Tolerance	$\pm 1 \times 10^{-6}$	$\pm 1 \times 10^{-6}$	$\pm 5 \times 10^{-8}$	$\pm 5 \times 10^{-6}$	$\pm 5 \times 10^{-6}$
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	−20°C to +75°C	−20°C to +75°C
Supply Voltage	115VAC ±10%	115VAC ±10%	+28VDC ±3VDC	+28VDC ±2VDC	+28VDC ±2VDC
Current Drain	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C
Waveform	Square	Sine	Sine	Square	Sine
Output Voltage	>8V p/p	>2VRMS	>1VRMS	>5V p/p	>1VRMS
Rise & Fall Time	<10 μsec	—	—	<5 μsec	—
Distortion	—	<5%	<5%	—	<5%
Load Resistance	5KΩ	5KΩ	5KΩ	10KΩ	10KΩ
Size	Figure 1	Figure 1	Figure 2	Figure 3	Figure 3

ORDERING INFORMATION

To order, specify Model No. (Example FM20-22Q) plus frequency.

For additional products see ACCUTRONICS, pages 1402 to 1414.

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CRYSTAL OSCILLATORS TEMPERATURE COMPENSATED

60Hz to 10M

FEATURES

- Mil Approved
- Small Size
- PC Mounting
- Excellent Stability

APPLICATIONS

- Computer Time Base
- Spaceborne Use
- Navigation Systems
- Communications Systems

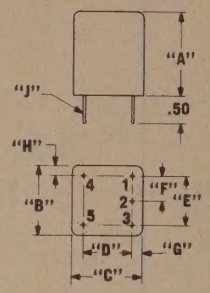
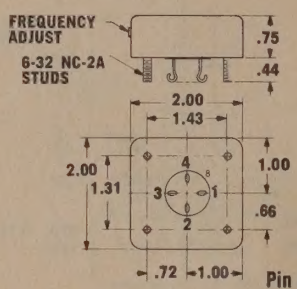


FIGURE 1

Pin Functions
Pin #1 — Output
#2 — Common
#3 — N/C
#4 — +5VDC (Osc.)
#5 — + Supply (T.C. Networks)

MOD.	DIMENSION								
	A	B	C	D	E	F	G	H	J
PM06-29P	1.25	.88	.88	.62	.62	.31	.12	.12	#22AWG
PM37-29P	1.5	1.12	1.12	.75	.75	.38	.18	.18	#22AWG
PM17-29P	1.5	1.25	1.25	.88	.88	.44	.19	.19	#20AWG

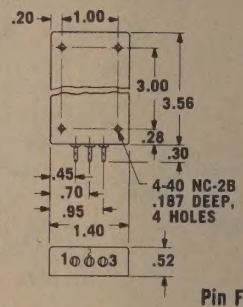
SI24-290



Pin Functions
Pin #1 — Case
#2 — Common
#3 — Output
#4 — + Osc. Supply

FIGURE 2

TL02-27H or LM02-27H



Pin Functions
Pin #1 — + Supply
#2 — Common
#3 — Output

FIGURE 3

SPECIFICATIONS

PARAMETER	MODEL NUMBER					
	PM17-29P	PM37-29P	PM06-29P	SI24-29U	TL02-27H	LM02-
Frequency Range	60Hz to 200kHz	200kHz to 500kHz	500kHz to 4MHz	1MHz to 10MHz	500kHz to 10MHz	500kHz to M
Frequency Tolerance	$\pm 5 \times 10^{-6}$	$\pm 5 \times 10^{-6}$	$\pm 5 \times 10^{-6}$	$\pm 2 \times 10^{-6}$	$\pm 10 \times 10^{-6}$	$\pm 5 \times$
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	−40°C to +75°C	−55°C to +85°C	−40°C to 0
Supply Voltage	+5VDC and +24VDC	+5VDC and +24VDC	+5VDC and +24VDC	+24VDC ±1%	+12VDC ±1%	+12VDC %
Current Drain	<250MW Typical	<250MW Typical	<250MW Typical	<20MA	<40MA	<40
Waveform	Square	Square	Square	Square	Square	Squa
Source Voltage	>2.5V	>2.5V	>2.5V	>2.5V	—	—
Sink Voltage	0.0V ±0.4V @ 16MA	0.0V ±0.4V @ 16MA	0.0V ±0.4V @ 16MA	0.0V ±0.4V @ 4MA	—	—
Output Voltage	—	—	—	—	>4V p/p	>4V
Rise & Fall Time	<20 Ns	<20 Ns	<20 Ns	<20 Ns	<100 Ns	<100
Load Resistance	IC Logic	IC Logic	IC Logic	IC Logic	2.2KΩ	2.2K
Size	Figure 1	Figure 1	Figure 1	Figure 2	Figure 3	Figur

ORDERING INFORMATION

To order, specify Model No. (SI24-29U) plus frequency.

For additional products see ACCUTRONICS, pages 1402 to 1414.

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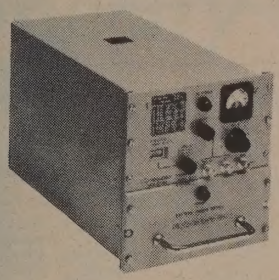
ULTRA HIGH STABILITY FREQUENCY STANDARDS

FOR LABORATORY STANDARDS, NAVIGATION SYSTEMS, TIME BASES

100KHz to 5MHz

GIBBS MODEL 570

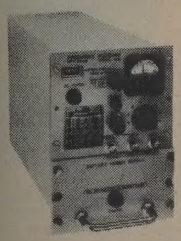


The ultimate in high stability Frequency Standards. **LONG TERM STABILITY:** 1 x 10^{-11} per day. **OUTPUT FREQ.:** 5 MHz, 1 MHz and 100 KHz. **POWER REQUIREMENTS:** 115 V ±10%, 60 Hz, 18 watts nominal. Automatically recharged internal battery maintains output frequency without interruption during transport or power failure. **DIMENSIONS:** 8¼″ high; 8″ wide; 16″ deep.

ULTRA-STABLE

100KHz to 5MHz

GIBBS MODEL 53

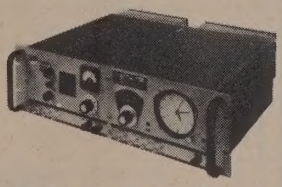


A portable Frequency Standard of high stability manufactured to Mil-F-21584C (Ships) specs. Military designation AN/URQ-10. **FREQ. STABILITY:** 5 x 10^{-10} per day (long term); 5 x 10^{-12} rms average of 100 consecutive 1 second periods (short term). **OUTPUT FREQ.:** 5 MHz, 1 MHz and 100 KHz. **POWER REQUIREMENTS:** 115 V ±10%, 50 to 400 Hz; 12 watts nominal. Automatically recharged battery maintains output frequency without interruption during transport or power failure. **DIMENSIONS:** 7 13/16″ high, 5½″ wide; 12½″ deep.

MILITARY
HIGH STABILITY AN/URQ-10

1Hz to 5MHz

GIBBS MODEL 572



A rack mounted 5 MHz Frequency Standard combined with analog-type 24 hour clock with sweep second hand. **FREQ. STABILITY:** 5 x 10^{-10} per day. **OUTPUT FREQ.:** 5 MHz, 1 MHz, 100 KHz, 10 KHz, 1 KHz, 100 PPS and 1 PPS. **POWER REQUIREMENTS:** 115 V ±10%, 50 to 400 Hz; 28 watts, nominal. Automatically recharged battery maintains clock operation without interruption during power failures. **DIMENSIONS:** 5¼″ panel, 19″ rack; 15¼″ deep behind panel; 16¾″ overall depth.

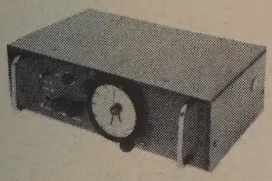
MODEL 571

Same as MODEL 572 above except without clock but with redundant circuitry and outputs.

PRECISION
MASTER TIME SYSTEM

1Hz to 400Hz

GIBBS MODEL 438



The Gibbs Model 438 Frequency Standard Clock is a completely transistorized, quartz crystal-controlled clock, timer, and frequency standard.

Some applications are: aircraft terminals and bases, air traffic control timing systems, time clock checks and updating, recorders laboratory standards, slave clocks, and seismographic use.

SUPPLY VOLTAGE:

110 VAC 60 Hz or 12 VDC battery @ 20 watts max.

FEATURES:

Time Indication: Front panel 24 hour clock with sweep second hand. All hands can be instantaneously reset to zero using a simple ¼ turn reset knob.

Mechanical Programmer: Cam operated contacts that close at 12 hours, 1 hour, and 1 minute intervals.

Accuracy: Better than 0.0001% with a drift rate of less than .0004% per year.

Auxiliary Power Output: 60 Hz square @ approx. 150 V PP into a 2K load.

LOW COST PORTABLE MASTER TIME SYSTEM

For additional products see ACCUTRONICS, pages 1402 to 1414.

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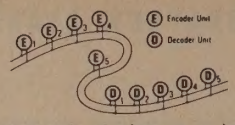
TONE OSCILLATORS . . . TONE DETECTORS . . . RESONANT REED COMPONENTS AND MODULES . . . TOUCH-TONE DECODERS

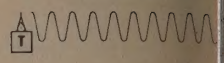
An audio tone can be generated by an electronic oscillator or resonant reed encoder circuit, then transmitted by wire or radio. The tone activates a resonant reed or LC tone detector to perform a control function.

Bramco reeds permit over 60 selective control frequencies within the 67 to 3000 Hz spectrum. This is assured by: (1) the narrow response bandwidth of about 1% for decoders and (2) the high accuracy of Bramco reed encoders (1/10 of 1% of design frequency).

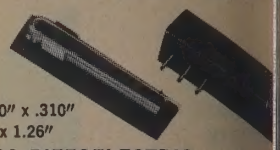
Shown here is a partial list of Bramco components and stability of most Bramco reed products is .002% per °C. Bramco also custom designs special modules, LC filters (see sec. 2700) and complete telemetry systems.



A single pair of wires, or a leased telephone line, can carry the audio signals for a complete control system.



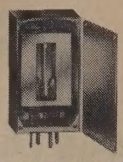
For inaccessible areas or mot stallations, a radio transmitt receiver system can carry the



.310″ x .310″ x 1.26″

RF30 PIEZOELECTRIC TUNING FORK FILTER

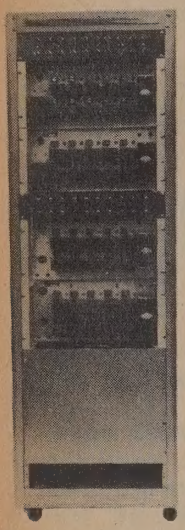
Smallest, most economical of Bramco auc family. **Frequency Range:** 300 to 3000 **pedance:** approx. 300K (input and output **Level:** 2 VRMS. **Temperature Stability:** 0.0035% per °C. Ideal when shock and ing characteristics of RF20 are not re



.395″ x .620″ x 1.10″

RF20 CONTACTLESS RESONANT REED FILTER

Works as audio tone filter with sharp selectivity or as frequency source for stable audio tone generator. ***Frequency range:** 80 to 3000 Hz. **Frequency tolerance:** ±0.15%. **Impedance:** approx. 1000 ohms at resonance (input and output). **Input signal:** 0.1 VRMS. **Transfer ratio:** 30 to 60% at resonance (varies inversely to frequency). **Bandpass (typical):** ±0.35% at −12 db. ±2.5% at −18 db. **Price:** 1-9 qty., $20. A major state-of-the-art advance. Contactless concept makes it ideal for continuous tone fail-safe applications. Twin coil design with isolated input and output. Ideal for use as either encoder or decoder. Internally shock mounted, plug-in design.



BRAMCO 20/20 AM TONE TELEMETRY SYSTEM—

Just one of several readily available standard packages.

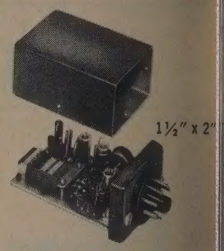
The Bramco tone transmitters and receivers are mounted onto standard 19″ chassis. All components, including the tone transmitters, tone receivers, amplifiers, power supplies, and relays, plug into the factory-wired chassis. This building block concept permits the user to begin with a partial complement of tone channels, then add modules as the system expands.

Price is approximately $150 per channel, compared to $250 per channel for the most popular LC type AM tone channels.

TOUCH-TONE DECODER MODULE

Use Bell System Touch-Tone telephone as encoder. Frequencies of Bramco decoder match the two simultaneous tones generated by standard Touch-Tone telephone. Proper two audio frequencies energize form C output relay. Includes wideband detector to prevent false triggering. Unit shown is for selective control of single functions at 12 different locations. 12-digit models also available.

*Registered service mark, A.T.&T. Co.



1½″ x 2″

ME201C SINGLE CHANNEL R NANT REED ENCODER MO

***Frequency range:** 80 to 3000 Hz. **Frequ erance:** ±0.15%. **Output:** Sine wave, adj to 2 VRMS into 600 ohms. **Power required** at 12 or 24 VDC. **Price:** 1-9 qty., $59. A co transistorized fixed frequency oscillator with plug-in, dual coil, RF20 resonant ree tures independent feedback and output le justments. Standard octal tube base.

MD201C SINGLE CHANNEL R NANT REED DECODER MO

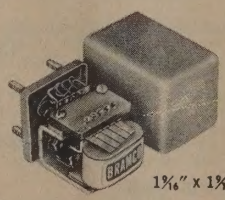
***Frequency range:** 80 to 3000 Hz. **Nomina width:** ±0.75%. **Input signal:** 0.1 to 2.0 **Output function:** 50 ma maximum. **Po quired:** 15 ma at 12 VDC or 24 VDC plus e load. **Price:** 1-9 qty., $59. A complete tra ized high gain amplifier, contactless RF filter and secondary switching circuit. S octal tube base. Designed for continuo fail-safe applications. Ideal for systems to 10 simultaneous tones over phone lin

ALSO IN STOCK:

MA25C Solid State Linear Amplifier, 600 ohm input, adjustable gain 0 to 47 db. For up to 20 simultaneous tones. 1-9 qty., $69.

MPS1C Power Supply, 24 VDC at 800 ma, regulated and filtered, 1-9 qty., $59.

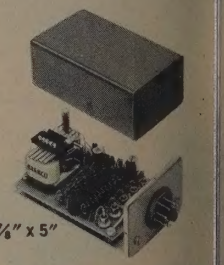
If the product you need isn't shown please contact factory or local representative for details on other stock models.



1⁹⁄₁₆″ x 1⁹⁄₁₆″ x 2¼″

RD5S MULTI-CHANNEL FREQUENCY SENSING RESONANT REED

***Frequency range:** 200 to 600 Hz. **Nominal bandwidth:** ±1% at 6 VRMS. **Coil resistance:** 530 ohms. **Contact rating:** 100 ma peak at 50 VDC. **Price:** RD5S (housed) 1-9 qty., $21. RD5 (open) 1-9 qty., $12.50. Compact low cost, multi-frequency tone detector. It controls five switching circuits, individually or simultaneously.



2⅛″ x 2⅞″ x 5″

MD5C FIVE CHANNEL RESO REED DECODER MODULE

***Frequency range:** 200 to 600 Hz. **Nomin width:** ±1% (constant above 2.0 VRMS **Input signal:** 1.5 to 5.0 VRMS (into 0.2 me **Output functions:** 5 with 50 ma at 24 VDC **required:** 30 ma at 24 VDC plus externa **Price:** 1-9 qty., $79. A complete transi high gain, constant output amplifier, mu nel decoder with 5 secondary transistor ing circuits. Standard octal tube base. D for non-simultaneous tone systems.

LEDEX

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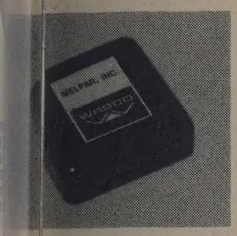
550 South College Street, Piqua, Ohio 45356 • phone (513) 773-2

TO BE PRECISE
Specify Melpar Oscillators



CRYSTAL CONTROLLED OSCILLATORS

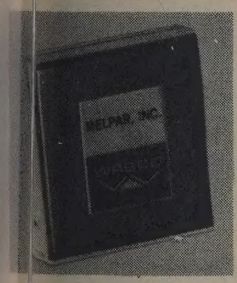
Frequency Range: 25K Hz to 50M Hz

SERIES	ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
C15	±0.05% (−30°C to 105°C)	5 to 28 VDC	Square Wave	1⅛" x ¾" x ⅝"	Solder Pin
C35	±0.005% (−55°C to 105°C)			1 17/64" x 1 17/64" x 1¾"	Octal Plug
C65	±0.001% (−40°C to 85°C)			1 19/32" x 1 19/32" x .4"	Solder Pin
C80	±0.005% (−55°C to 105°C)			2" x 2" x .4"	

TUNING FORKS

Frequency Range: 240Hz to 25000Hz

SERIES	ACCURACY	SIZE	TERMINALS
22	±0.05% (−55°C to 125°C) ±0.02% (15°C to 35°C)	11/32" x ¾" x 1 17/32"	Wire Leads
23	±0.02% (−55°C to 125°C) ±0.01% (−55°C to 85°C) ±0.005% (20°C to 30°C)	1 3/16" x 1 5/16" x ⅜"	Solder Pin
24	±0.05% (−55°C to 125°C) ±0.03% (−55°C to 85°C) ±0.01% (0 to 65°C)	1½" x 1½" x ⅜"	Solder Pin
27	Low Cost — 1000 pcs — Price less than $10.00 each. ±.1% 25°C ±10°	1" x 1.5" x .6"	Solder Pin



TUNING FORK OSCILLATORS

Frequency Range: 1Hz to 25000Hz

SERIES	ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
10	±0.005% @ 25°C ±0.02% (0 to 60°C) ±0.1% to .05% (−55° to 125°)	3 to 32VDC	Sine or Square Wave	1 29/32" x 1 15/32" x .4"	Loop or Solder Pin
10H				1 29/32" x 1 15/32" x 1 5/16"	
10HD				1 29/32" x 1 15/32" x 1 21/32"	
30	±0.1% (−55°C to 125°C) ±0.05% (−55°C to 85°C) ±0.02% (15°C to 35°C)	12 to 32VDC		1 17/64" x 1 17/64" x 1¾"	Solder Loop
31				1⅝" x 1¾" x ⅞"	Solder Pin
50	±0.1% (−55°C to 125°C) ±0.05% (−55°C to 125°C) ±0.01% (0 to 50°C) ±0.005% @ 25°C			1½" x 1½" x ⅜"	Solder Pin
50H				1½" x 1½" x 1½"	Octal Plug
51 52				1½" x 1½" x ⅜"	Solder Pin
80				2" x 2" x .4"	Solder Pin

SOLID STATE OSCILLATORS

Frequency Range: 1Hz and up

SERIES 5

ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
±0.05% (25°C ±10°C) ±0.1% (−25°C to 85°C) ±0.5% (−40°C to 85°C)	6 to 28VDC	Square Wave	1" x 1" x 1" or 1.6" x 1.6" x 1.5"	Solder Pin

Our units are ideally suited for use in ground, shipboard, airborne, and satellite equipment.

We also have a versatile line of: • **TIME BASE GENERATORS** • **FREQUENCY DIVIDERS** • **TIMERS**

We have many models designed to meet your shock and vibration requirements of MIL-E-5400, MIL-E-5272, MIL-STD-67 and MIL-STD-202. Our application engineers would appreciate the opportunity of assisting you in selecting a model to meet your specific requirements.

FOR PRICE AND DELIVERY INFORMATION CONTACT
SPECIAL PRODUCTS DEPARTMENT

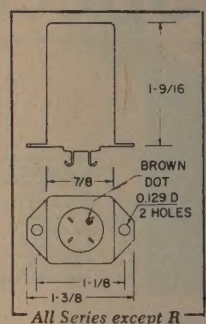
MELPAR

6631 IRON PLACE
SPRINGFIELD, VA. 22150
PHONE: 703-354-4450

OSCILLATORS

FIXED OR SLIGHTLY VARIABLE FREQUENCY AND/OR AMPLITUDE

- Sine wave frequencies from 50 cps to 80 kc
- Temperature: —25 to +55°C
- Size: 7/8" sq. x 1-9/16" high
- For shock and vibration, specify R (2-1/32" high) or S (1-9/16" high)
- Each oscillator may be adjusted for your requirements of load, voltage output and input, etc.
- 600 ohm balanced output available
- Extremely low distortion units available



All Series except R — R series and trans output unit

ELECTRICAL SPECIFICATIONS

Series 101 and 102 are fixed frequency and amplitude units to be used as a signal source into a light load. These sh be used where no field adjustments are required. Series 101 and 102 usually supplied with 4 pin solder hook terminals. If des specify NOVAL plug.

	Series 101	Series 101A	Series 102	Series 102A
Input Volts, DC	10.5-13.5	24-32	10.5-13.5	24-32
Input Current, ma.	10	10	10	10
Output Frequency	Fixed. Any frequency from 50 cycles to 80 KC			
Initial Frequency Accuracy per cent	± 2½	± 2½	± ½	± ½
Frequency Drift, maximum, per cent	± 2½	± 2½	± 1½	± 1½
Maximum Load, kilohms	10	20	10	20
Output Voltage, VRMS, minimum	1	2	1	2
Change in Amplitude, maximum db.	± 1	± ½	± 1	± ½
Distortion, maximum, per cent	1	1	1	1

Series 103 thru 105 are similar to Series 102 except adjustment of amplitude and frequency may be made with an ext variable resistor. They may be used as signal source into a light load where exact voltage or frequency is required. Series 103 104 are supplied with 4 pin solder hook terminals and Series 105 oscillators are supplied with 7 pin solder hook terminals. If a p unit is required, specify NOVAL plug.

	Series 103	Series 103A	Series 104	Series 104A	Series 105	Series 1
Input Volts, DC	10.5-13.5	24-32	10.5-23.5	24-32	10.5-13.5	24-32
Input Current, ma.	10	10	10	10	10	10
Output Frequency	Variable ±3% around any specified frequency from 50 cy. to 80 KC		Fixed. Any frequency from 50 cy. to 80 KC.		Variable ±3% around specified frequency from cy. to 80 KC	
Initial Frequency Accuracy, per cent	0	0	± 1	± 1	0	0
Frequency Drift, maximum, per cent	± 1½	± 1½	± 1½	± 1½	± 1½	± 1½
Maximum Load, kilohms	10	20	10	20	10	20
Output Voltage, VRMS, Minimum	1	2	Variable, from 0.5 to 1 VRMS or greater	Variable, from 1 to 2 VRMS or greater	Variable, from 0.5 to 1 VRMS or greater	Variable, 1 to 2 V or grea
Change in Amplitude, maximum db.	± 1	± ½	± 1	± ½	± 1	± ½
Distortion, maximum, per cent	1	1	1	1	1	1

Series 106 through 110 are for use into a lower impedance load. All require a 600 ohm resistive termination except 110 which requires a 220 ohm termination. Since these units are capable of a small power output, they are recommended for g support use in temperatures from —25 to +50°C. Series 106 oscillators are supplied with 4 pin solder hook terminal and 107 through 110 are supplied with 7 pin solder hook terminals. If a plug-in unit is required, specify NOVAL plug.

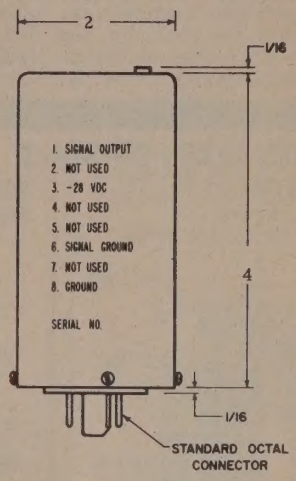
	Series 106	Series 106A	Series 107	Series 107A	Series 108	Series 108A	Series 109	Series 109A	Seri
Input Volts, DC	10.5-13.5	24-32	10.5-23.5	24-32	10.5-13.5	24-32	10.5-13.5	24-32	10.5
Input Current, ma.	14	14	14	14	14	14	14	14	
Output Frequency	Fixed. Any frequency from 50 cy. to 80 KC		Variable ± 3% around any specified frequency from 50 cy. to 80 KC		Fixed. Any frequency from 50 cy. to 80 KC		Variable specified	±3% around frequency from cy. to 80 KC	
Initial Frequency Accuracy, per cent	± 1	± 1	0	0	± 1	± 1	0	0	
Frequency Drift, maximum, per cent	± 3	± 3	± 3	± 3	± 3	± 3	±3	± 3	±
Required Resistive load, ohms	600	600	600	600	600	600	600	600	2
Output Voltage, VRMS, minimum	1	1.5	1	1.5	Variable, from 0.5 to 1 VRMS or greater	Variable, from 1 to 2 VRMS or greater	Variable, from 0.5 to 1 VRMS or greater	Variable, from 1 to 2 VRMS or greater	Vari fro to 1 or g
Change in Amplitude, maximum db.	± 1	±¾	± 1	±¾	± 1	±¾	± 1	±¾	±
Distortion, maximum per cent	2	2	2	2	2	2	2	2	

Note—UNITS EASILY MODIFIED TO MEET YOUR SPECIFICATIONS. WRITE FOR COMPLETE LITERATURE

M F Electronics Corp.
118 EAST 25TH STREET, NEW YORK, N.Y. 10010 / 212 OR 4-536

CRYSTAL OSCILLATORS 3.5 KHZ to 10 MHZ

- Modular Construction — Easily repairable in the field
- MIL-E-16400E, Class 4, with temperature to 60°C
- High Reliability; high MTBF; parts from MIL-STD-242
- Output drives 500 ohms

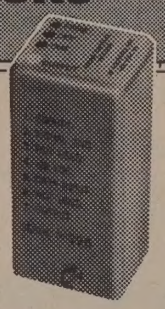


	Series 401	Series 401A	Series 402	Series 402A
Vtage Input	−28 ±2 volts	+28 ±2 volts	−28 ±2 volts	+28 ±2 volts
Crent	25 ma., max.		25 ma., max.	
Fquency Stability	±.01%		±.01%	
Oput Voltage	0 to 2.5 VRMS, adjustable		2.5 VRMS, min.	
Oput Stability	1 db, total		1db, total	
Dtortion	5%, max.		5%, max.	

SEES 403A IS GATED CRYSTAL OSCILLATORS FOR COMMAND FUNCTIONS.

VOLTAGE CONTROLLED OSCILLATORS

SERIES 300



- Modular construction — easily repairable in the field
- MIL-E-16400E, Class 4, with temperature to 60°C
- High reliability; high MTBF; parts from MIL-STD-242
- Frequency stability 0.15% of frequency
- High deviation

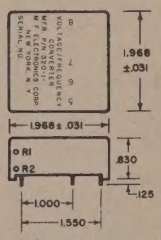
VOLTAGE TO FREQUENCY CONVERTERS

(WIDE BAND VCO)

Used to convert an analog voltage into digital form. May be applied to register to read digital output.

SERIES 320-1 full military unit meeting MIL-E-16400. Accuracy of conversion is (1% of reading +0.7% of full scale).

SERIES 320-2 for commercial application in the conversion from analog to digital. Range of frequencies is 0 to 50 kHz.



AC DATA VCO MODULATOR AND DEMODULATOR, SERIES 310 AND 410

The 310-1 and 410-1 comprise a modulator-demodulator pair which can be used for transmission of very low frequencies via standard voice channels. Frequency response is 1 Hz to 200 Hz. Carrier is nominal 2500 Hz. Quantity cost for the pair is $95.00. Useful in oceanagraphic, geodetic, seismographic applications, wherever transmission of low frequencies are involved. Detailed data sheets available.

UNITS PRODUCED TO MEET YOUR REQUIREMENTS . . .
WRITE OR TELEPHONE FOR INFORMATION

MF Electronics Corp.

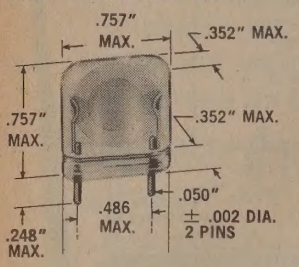
118 EAST 25TH STREET, NEW YORK, N.Y. 10010 / 212 OR 4-5360

McCOY ELECTRONICS COMPANY a subsidiary of OAK ELECTRO/NETICS
MT. HOLLY SPRINGS, PENNSYLVANIA 17065 - Tel. 717—486-3411 - TWX: 510—650-354

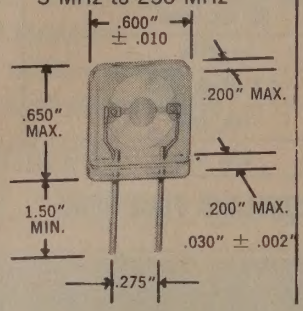
Quartz crystals are produced over the frequency range of 700 Hz to over 250 MHz, with development effort to 400 MHz. McCoy Electronics manufactures solder seal, glass, and cold weld crystals for oscillator and filter applications. A vast amount of knowledge of design capability in spurious suppression, temperature compensation, and pullability has been developed over the years, and benefits our custom assuring that the industry's finest technology is at the posal with every order. Crystals are available to tole as tight as ±.0025% over −55 to +105°C. TC charts on the opposite page may be used as a guide in det ing the types of temperature curves that can be ob

PRECISION GLASS CRYSTALS

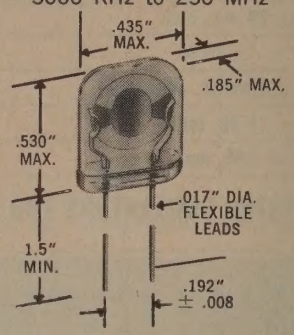
HOLDER SERIES G-1
Frequency Range:
2000 KHz to 250 MHz



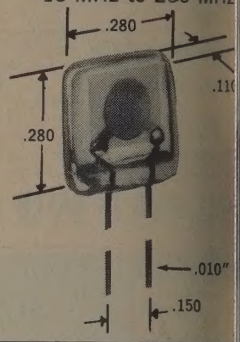
HOLDER SERIES G-30
Frequency Range:
3 MHz to 250 MHz



HOLDER SERIES G-20
Frequency Range:
5000 KHz to 250 MHz

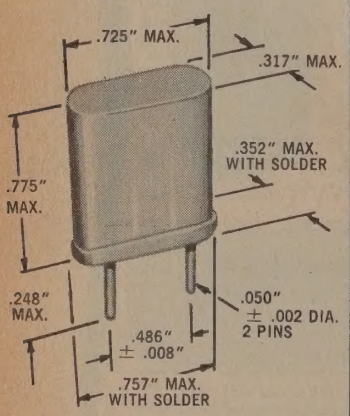


HOLDER SERIES MM
Frequency Range:
10 MHz to 250 MHz

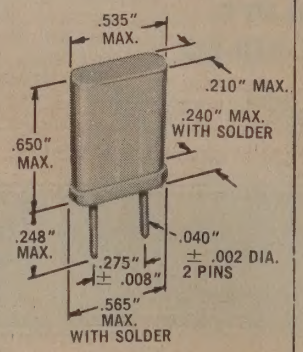


QUALITY METAL CRYSTALS

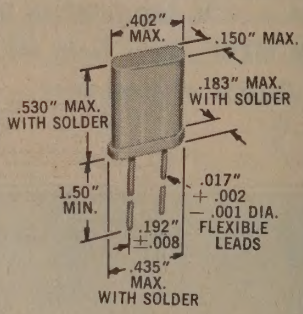
HOLDER SERIES M-1



HOLDER SERIES M-25

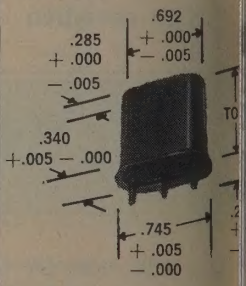


HOLDER SERIES M-20

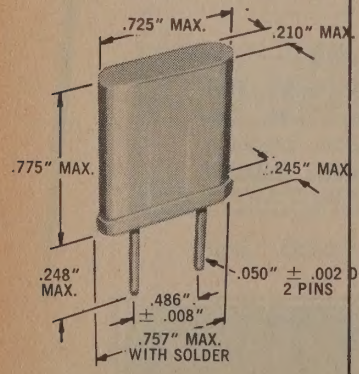


HIGH FREQUENCY CLEANSEAL CRYST

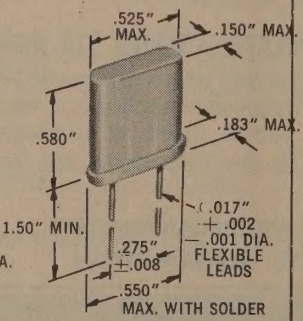
HOLDER SERIES W-1
Frequency Range:
1 MHz to 250 MHz



HOLDER SERIES M-35
Frequency Range:
500 KHz to 250 MHz

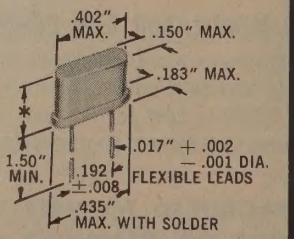


HOLDER SERIES M-40
Frequency Range:
2 MHz to 250 MHz



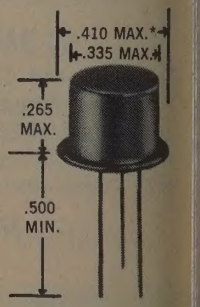
M-41 — Dimensions as shown, with .040" diam. pins, .238" long.

HOLDER SERIES M-20A
Frequency Range:
2.5 MHz to 250 MHz



*Dimensions as shown with seated height as follows:
M-20A — .460" M-20D — .315"
M-20B — .425" M20E — .250"
M-20C — .360"
(M-20A and B — optional above 5MC)

HOLDER SERIES W-6
Frequency Range:
10 MHz to 250 MH



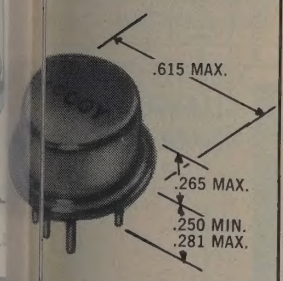
*Available at additional cost flange trimmed to .370" maxi

CONTI

McCOY ELECTRONICS COMPANY a subsidiary of OAK ELECTRO/NETICS CORP
MT. HOLLY SPRINGS, PENNSYLVANIA 17065 - Tel. 717—486-3411 - TWX: 510—650-3548

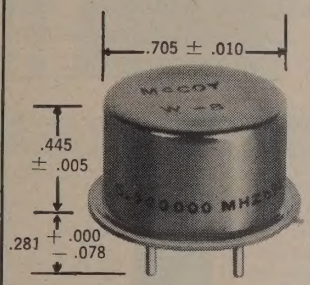
FREQUENCY CLEANSEAL CRYSTALS CONTINUED

HOLDER SERIES W-7
Frequency Range:
3 MHz to 250 MHz

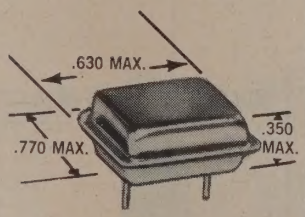


available at additional cost with case trimmed to .560" maximum.

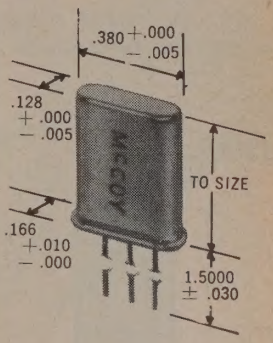
HOLDER SERIES W-8
Frequency Range:
800 KHz to 250 MHz



HOLDER SERIES W-10
Frequency Range:
1 MHz to 250 MHz



HOLDER SERIES W-20
Frequency Range:
2.9 MHz to 250 MHz



SPECIFICATION REQUIREMENTS OF TYPICAL UNITS

McCoy Electronics Company has supplied many crystals, filters, and oscillators for missile and space programs. As an illustration of the company's capability, listed here are some of the typical units furnished.

Frequency	McCoy Holder	RS max. (ohms)	Tolerance over Temperature Range		Aging Limits	Shock	Vibration
9.200 kc	M-22	75 K	±0.02%	−20°C to +85°C	±0.0025%/yr.	100 g, 6 ms	400 to 3000 cps, 20 g
3.988 kc	W-8	125	± .00125%	0 to +75°C	3p × 10^8/wk.	Not Specified	Not Specified
1.3000 mc	W-1 (HC-6/U cold weld)	340	± .005%	−55°C to +105°C	5ppm/2000 hrs.	500 g, 7 ms	10 to 2000 cps, 20 g
2.0000 mc	G-4	50	±20 cps @ 62°C	None	+1 −0p × 10^9/day	100 g, 7 ms	5 to 2000 cps, 3 g
2.0241 mc	W-10	75	± .002%	−17°C to +85°C	14p × 10^7wk.	100 g, 7 ms	10 to 2000 cps, 20 g
2.048 mc	G-4	75	± .005%	−10°C to +75°C	7p × 10^8/day	100 g, 7 ms	10 to 2000 cps, 20 g
4.0432 mc	W-7 (TO-8)	25	± .002%	0 to +85°C	14p × 10^7/wk.	100 g, 7 ms	10 to 2000 cps, 20 g
4.770 mc	G-1	10	1.5p × 10^7/°C	−30°C to +130°C	Stabilize to 50p × 10^9	100 g, 7 ms	10 to 2000 cps, 20 g
2.51 mc	G-20-1	15	± .0015%	−40°C to +75°C	± .0003%/yr.	100 g, 11 ms	45 to 3000 cps, 40 g
7.559 mc	G-20-1	30	± .0015%	−40°C to +75°C	± .0003%/yr.	100 g, 11 ms	45 to 3000 cps, 40 g
9.060 mc	G-1	30	± .001% drift	−55°C to +85°C	± .00055%/3000 hrs.	50 g, 7 ms	10 to 2000 cps, 30 g
9.12 mc	W-6	10	±0.0015%	−20°C to +70°C	±0.0005%/30 days	50 g, 7 ms	10 to 2000 cps, 10 g
1.9400 mc	M-20	100	±0.0025%	−20°C to +50°C	±0.001%/yr.	100 g, 11 ms	Not Specified
3.98 mc	G-21	30	± .0025%	−55°C to +105°C	± .0003%/3000 hrs.	MIL-STD-202B Method 202	55 to 2000 cps, 20 g
0.0725 mc	G-20-1	55	±0.0015%	−35°C to +75°C	±0.0003%/yr.	100 g, 11 ms	Not Specified
5.2500 mc	W-6	50	± .001% drift	−20°C to +70°C	90 cps/1000 hrs.	100 g, 7 ms	10 to 2000 cps, 20 g min.
5.565 mc	W-6	60	± .002%	−10°C to +75°C	14p × 10^7/wk.	100 g, 7 ms	10 to 2000 cps, 20 g
3.93 mc	G-20	60	± .0015%* ± .0035%	− 5 to +60°C +60°C to +90°C	.0007%/3000 hrs.	100 g. 7 ms	10 to 2000 cps, 20 g
2.50 mc	W-6	100	± .0015%	−10°C to +60°C	5ppm/yr.	Not Specified	Not Specified
[illegible]0 kc	M-1	10 K	± .0075%	−20°C to +55°C	1p × 10^5/yr.	100 g, 7 ms	5 to 2000 cps, 3 g
[illegible] mc	G-20	40	± .0002%	25°C	± 3p × 10^6/yr.	100 g, 7 ms	5 to 2000 cps, 3 g
[illegible] mc	W-7	40	± .0015% drift	0 to +85°C	.0005%/4 wks.	Not Specified	100 to 3000 cps, 60 g
[illegible]0 mc	W-6	60	± .0025% drift	0 to +85°C	.0005%/4 wks.	Not Specified	100 to 3000 cps, 60 g

*from the reading at 25°C

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LOW FREQUENCY QUARTZ CRYSTALS

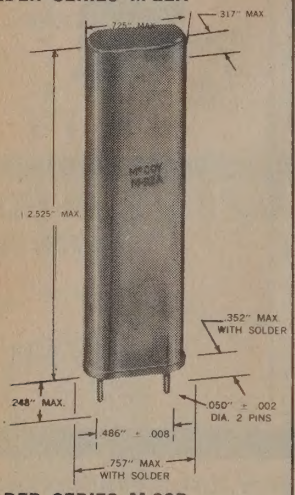
"Low Frequency" at McCoy is defined as the ten (10) variations of cuts that are used in designing crystals from 700 Hz to 700 KHz. The ability to meet sophisticated electrical and environmental requirements reliably has highlighted the growth of our low frequency capability and is the most complete offered in the industry today. Listed below are typical tolerances and holders available.

All units are custom designed and manufactured, and innovations are our specialty.

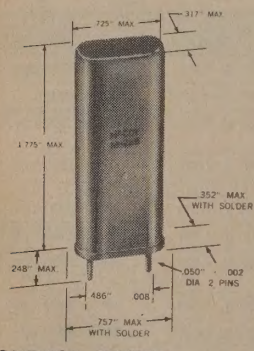
FREQUENCY DEVIATION WITH TEMPERATURE

TEMP RANGE °C		−55 +105	−55 +90	−40 +70	0 +50	+20 +40
Type Cut	*Frequency Range	FREQUENCY DEVIATION ± P X				
JT	700 CPS-15 KC	25	20	10	5	2
NT	4-150 KC	20	15	10	5	2
5° X FLEX	4-150 KC	60	50	25	10	4
5° X	50-250 KC	25	20	12	3	2
MT	50-250 KC	12	10	8	4	2
GT	80-300 KC	NA	NA	2	1	0.25
BD	80-300 KC	12	10	6	3	2
DT	80-550 KC	12	10	8	4	2
CT	150-700 KC	18	15	12	6	2
SL	200-700 KC	10	8	5	3	2

HOLDER SERIES M-22A



HOLDER SERIES M-22B



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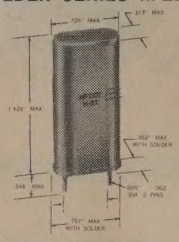

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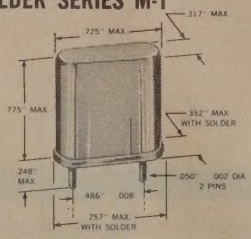
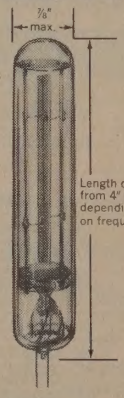


HOLDER SERIES G-65



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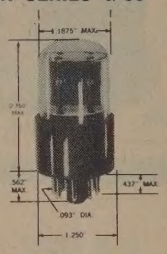
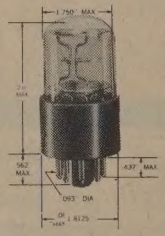
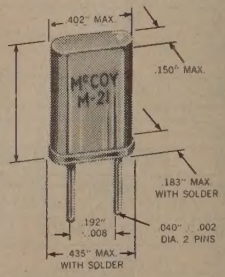


HOLDER SERIES G-130

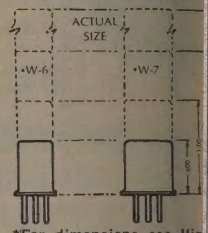


HOLDER SERIES M-21



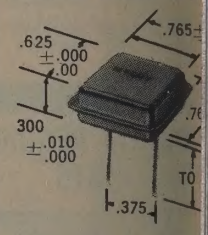
CLEANSEAL

HOLDER SERIES W6



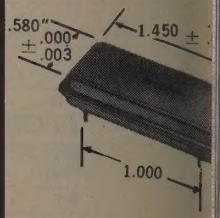
*For dimensions see Hig Cleanseal section on rev this page.

HOLDER SERIES W-1



3

HOLDER SERIES W-1



FREQUENCY RANGE

	McCOY TYPE HOLDER	JT	NT	5°X Flex	5°X	MT	GT	BD	DT	CT	SL
		FREQUENCY RANGE, KHz									
SOLDER SEAL	M-22A	700 Hz-1.5	2.75-10	4-12	50-70	—	—	—	—	—	—
	M-22B	1.5-4	10-15	12-15	70-80	—	—	—	—	—	—
	M-22	4-15	15-100	15-80	80-250	150-185	—	150-185	—	—	200-3
	M-1	—	80-150	80-150	175-250	185-250	250-300	185-300	80-500	250-700	300-5
	G-90	—	—	—	—	50-100	150-300	80-100	80-175	150-250	—
	G-65	—	—	—	—	100-150	—	100-150	—	—	—
	M-21	—	—	—	—	—	80-150	—	—	—	—
	G-130	—	—	—	—	—	—	—	—	—	500-7
CLEANSEAL	W-6	1-15	4-15, 50-125	—	60-250	—	—	—	350-500	500-700	350-7
	W-7	1-15	4-15, 50-125	—	60-250	—	—	—	230-500	300-700	175-7
	W-10	—	100-125	—	—	—	—	—	230-500	300-700	350-7
	W-11	3-15	15-100	—	85-250	—	—	—	—	—	175-3

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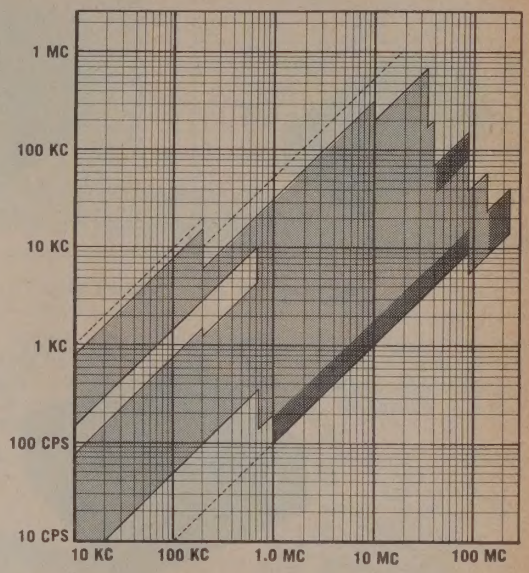
STAL FILTERS

mos difficult indeed to cover McCoy's capability in crystal filters in w pas. Conventional narrow, mid, and wide band filters from 1 KHz ver 50 MHz, and monolithic devices utilizing modern computer-ted esigns are produced to demanding specifications in miniature ages Linear phase, switchable bandwidths, single side band, and filters are designed under the auspices of professional design engi-s po essing years of experience, thus permitting maximum latitude eeti difficult requirements.

d bow is a brief cross section of the devices recently produced at cy Electronics, along with charts establishing guidelines for band-hs ailable over the center frequency ranges produced.

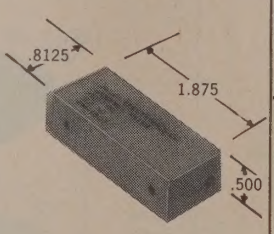
This logarithmic chart indicates the practical and theoretical possibilities in crystal filters. Read center frequency along X axis, bandwidth along Y axis. As a rule, filters selected near the middle of the "narrow and intermediate" band can be produced with the greatest variety of characteristics. Darkest areas show new bandwidths and higher frequencies available now.



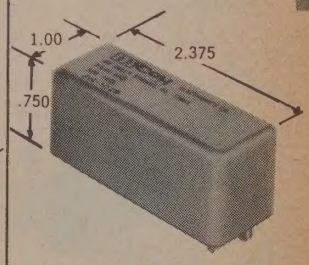
CAL FILTERS AVAILABLE

Freq	BW 3 db	BW 60 db	I L	Ripple	Impedance	Configuration
00 KI	10 Hz	40 Hz	6 db	1 db	10K ohms	FM-3954
00 KI	2 Hz	6 Hz	8 db	.5 db	10K ohms	FM-2877
00 KI	10 Hz	25 Hz	7 db	1 db	1K ohms	FM-1115
00 KI	2.7 Hz	3.4 KHz	3 db	.5 db	600 ohms	FM-3954
00 KI	10 Hz	100 Hz	3 db	.5 db	5K ohms	FM-1922
00 KI	300 Hz	1200 Hz	2 db	1 db	600 ohms	FM-1029
00 KI	3 KHz	5.4 KHz	4 db	1 db	1K ohms	FM-1590
00 M	100 Hz	400 Hz	6 db	1 db	50 ohms	FM-1719
00 M	3.05 KHz	3.90 KHz	5 db	1 db	500 ohms	FM-2873
00 M	(BW 1 db) +300 to 3100 Hz (BW 15 db down) 1750 KHz (BW 40 db) —270 to —10 KHz		3 db	—	1000 ohms	FM-2853
00 M	40 KHz	44 KHz	3 db	1 db	500 ohms	FM-1115
00 M	30 KHz	75 KHz	3 db	1 db	50 ohms	FM-1029
00 M	±115 KHz	±600 KHz	4 db	—	50 ohms	FM-2856-1
00 M	50 KHz (6 db)	200 KHz	3 db	—	50 ohms	F-1007
00 M	±24.5 KHz (6 db)	±30.6 KHz	4 db	—	500 ohms	FM-3318
00 M	±22.5 KHz (6 db)	±45 KHz	2.5 db	1 db	2K ohms	F-1139
00 M	5 KHz	20 KHz	5 db	1 db	50 ohms	FM-1058
00 M	100 KHz	220 KHz	4 db	1 db	50 ohms	FM-1029
00 M	25 KHz	62 KHz	6 db	1 db	50 ohms	FM-1029
00 M	±50 KHz (6 db)	±600 KHz	4 db	1 db	(50 Ω in, 600 Ω out)	FM-2874
00 M	30 KHz	300 KHz 30 db	6 db	±.5 db	50 ohms	FM-3956-1
00 M	±5 KHz (.5 db)	±50 KHz	2 db	.5 db	500 ohms	FM-2562
00 M	65 KHz	350 KHz	8 db	±.5 db	50 ohms	FM-4956-2
00 M	±7 KHz	±50 KHz	2.5 db	±.5 db	50 ohms	FM-1513
00 M	15 KHz	70 KHz 20 db	6 db	.5 db	200 ohms	FM-3922
00 M	25 KHz	100 KHz	6 db	1 db	50 ohms	FM-1036
88 M	30 KHz	100 KHz 40 db	8 db	1 db	50 ohms	FM-1029
00 M	30 KHz	300 KHz 40 db	4 db	1 db	50 ohms	FM-1948
00 M	30 KHz	150 KHz 40 db	8 db	1 db	50 ohms	FM-2204

FM-1007



FM-1029



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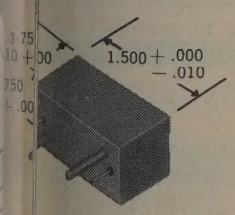
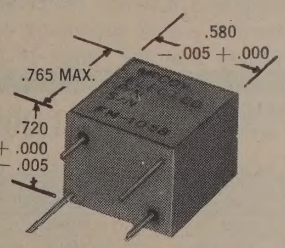
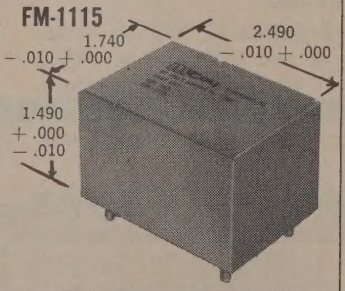


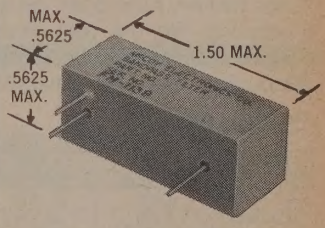
FM-1058



FM-1115



FM-1139



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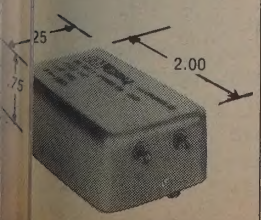
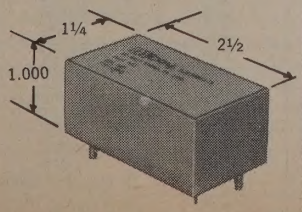
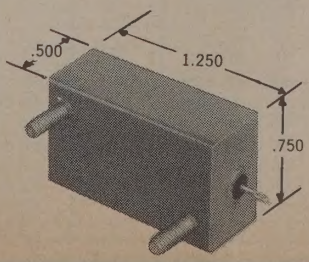


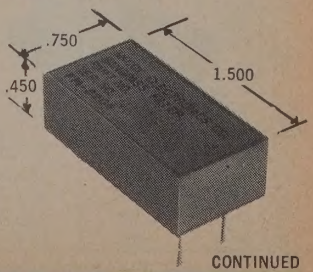
FM-1590



FM-1948



FM-2204



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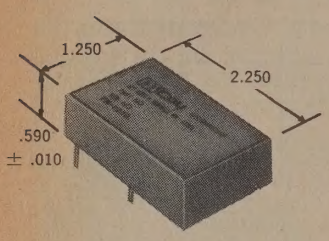
CRYSTAL FILTERS CONTINUED

FM-2220



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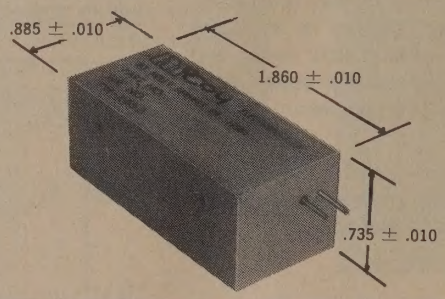

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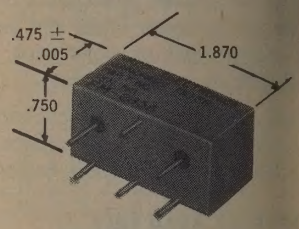
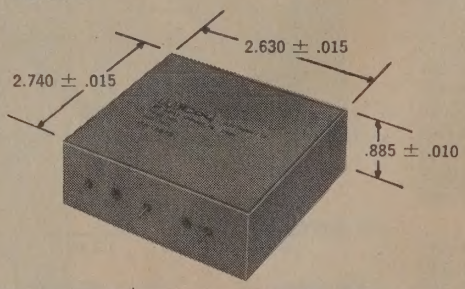


FM-2873



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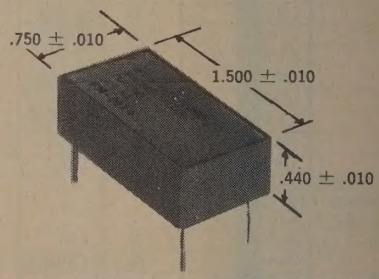

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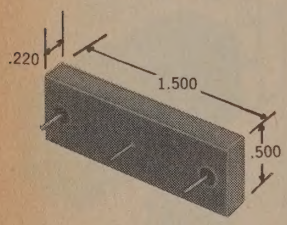
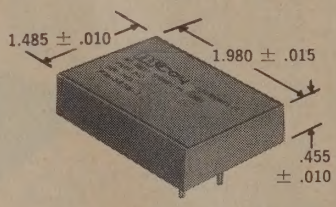


FM-3956-1



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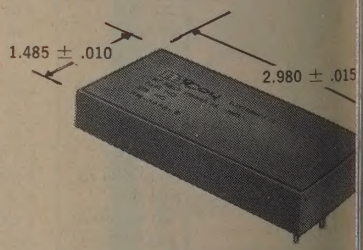

QUARTZ MECHANICAL FILTERS

Quartz mechanical filters, or monolithic as they are sometimes termed, have been designed and fabricated at McCoy Electronics for the past several years. These acoustically coupled resonators replace many of the conventional crystal filters with improved reliability, lower aging rates, smaller size, and superior temperature characteristics. McCo tronics is now producing custom-designed QMF's in variety over the range of 5 MHz to over 200 MHz. herein are typical quartz mechanical filters availabl McCoy Electronics.

TYPICAL DEVICES

Center Frequency	% Bandwidth	3 db Bandwidth	Shape Factor	No. Poles	Insertion Loss	Max. Ripple	Nominal Impedance	Ultimate Attenuation	Packa Configur
11.5 MHz	0.180	21 KHz	2.8:1, 40/3 db	4	2.5 db	1.0 db	2700Ω	60 db	FM-2885,
12.8 MHz	0.180	22 KHz	3.6:1, 30/3 db	2	1.0 db	1.0 db	1000Ω	50 db	W-20
14.5 MHz	0.124	18 KHz	4.4:1, 30/3 db	2	1.5 db	.5 db	1000Ω	50 db	W-20
14.5 MHz	0.100	15 KHz	4.5:1, 30/3 db	2	1.0 db	.5 db	400Ω	50 db	W-20
22.8 MHz	0.220	50 KHz	2.4:1, 40/3 db	4	1.0 db	.5 db	2700Ω	60 db	FM-2893
30.0 MHz	0.070	21 KHz	3.6:1, 30/3 db	2	1.5 db	.5 db	1000Ω	50 db	W-20
60.0 MHz	0.120	70 KHz	3.0:1, 30/3 db	2	2.5 db	.5 db	2000Ω	50 db	W-20
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	2000Ω	50 db	W-6, W-2
75.0 MHz	0.043	32 KHz	2.7:1, 40/3 db	4	3.5 db	.5 db	1800Ω	60 db	FM-2898
110.0 MHz	0.018	20 KHz	2.5:1, 40/3 db	4	4.0 db	.7 db	2000Ω	60 db	FM-2895
148.0 MHz	0.007	11 KHz	4.5:1, 30/3 db	2	2.0 db	1.0 db	2500Ω	40 db	W-6, W-2
150.0 MHz	0.010	16 KHz	3.6:1, 30/3 db	2	2.0 db	.5 db	1500Ω	40 db	W-6, W-2
156.0 MHz	0.009	15 KHz	3.6:1, 30/3 db	2	1.0 db	.5 db	1500Ω	40 db	W-6, W-2
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	75Ω	50 db	FM-1058
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	in 50Ω, out 2000Ω	50 db	FM-1058
21.4 MHz	.084	18 KHz	4.4:1, 30/3 db	2	1.5 db	.5 db	in 50Ω, out 1000Ω	50 db	FM-1058

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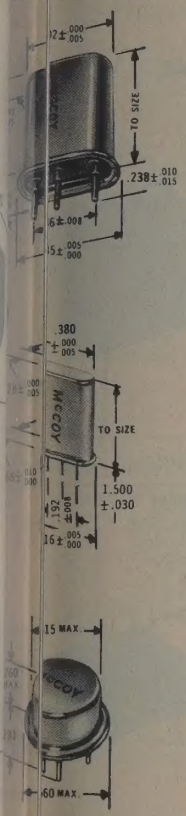
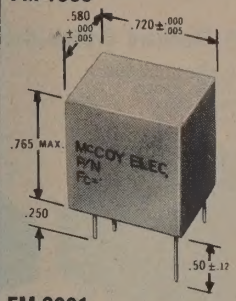
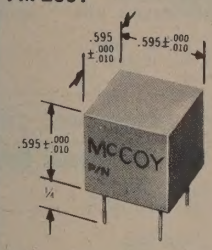
FILTERS CONTINUED



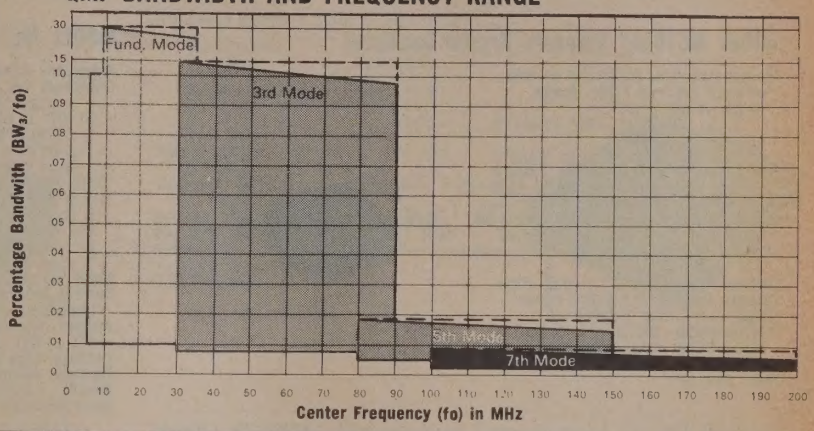
FM-1058



FM-2881

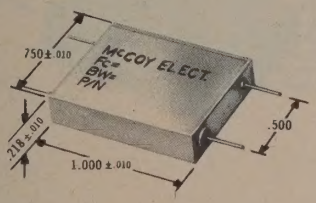


QMF BANDWIDTH AND FREQUENCY RANGE

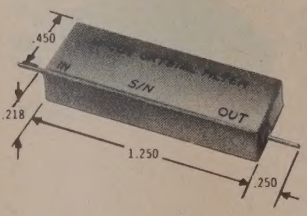


Quartz Mechanical Filters may be produced as single sectioned, two pole devices operating at their nominal impedance, up to and including ten pole devices complete with impedance matching networks and intersection inductive or capacitive coupling to satisfy the customer's requirements.

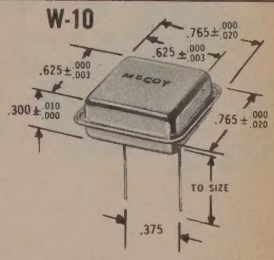
FM-2893

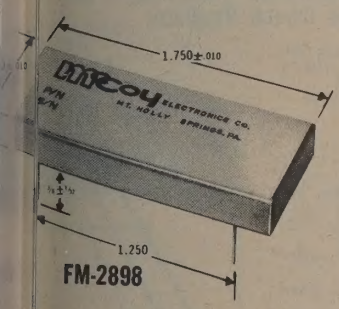


FM-2885

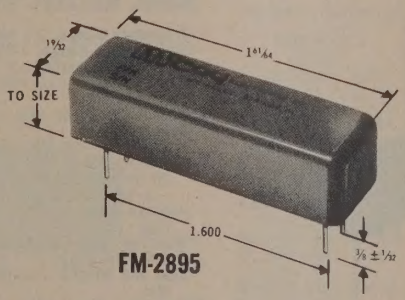


W-10



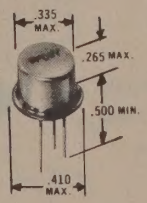


FM-2898

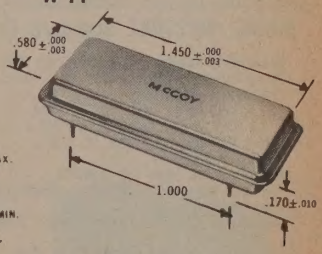


FM-2895

W-6



W-11

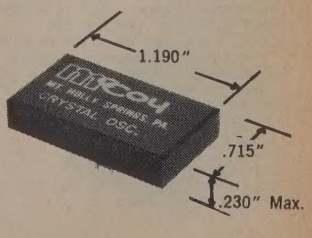


CRYSTAL CONTROLLED OSCILLATORS

ectronics manufactures a complete line of crystal oscillators including TCXO's, VCXO's, oven con- on-oven controlled, and combinations thereof such TCXO. Where size, performance, stability, and relia- of prime importance, the McCoy oscillator line is ed. Most of the models are designed to allow the MIL-approved parts, but commercial versions of available. The electrical specifications noted for el are suggested values only and can be altered specific customer requirements. The requirements 5400, MIL-STD-202 and other environmental speci- can be met with most of the models described e urge you to list your requirements and allow us u our solution to your problem.

MODEL MC1000A1 Standard Crystal Oscillator

Frequency Range: 188 KHz to 50 MHz
Frequency Tol. and Temp. Range:
±50 PPM over —55° to +105°C
±50 PPM over —40° to + 85°C
±50 PPM over 0° to + 75°C
Input Voltage: + 5VDC ± 5%
Output: Square Wave Compatible with TTL or DTL Logic
Package Size: 1.190" × .715" × .230" High Max.
Package Volume: .196 Cubic Inches
Mounting: Printed Circuit Board or Direct Plug in to a Dual In-Line Socket
Seal: Hermetic



CONTINUED

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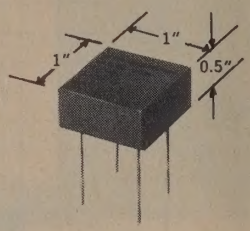
OSCILLATORS CONTINUED

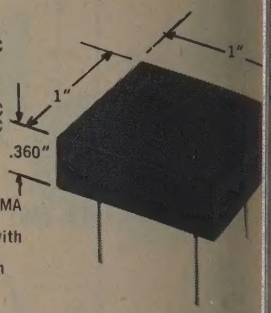
MODEL MC109A1 Standard Crystal Oscillator

Frequency Range: 30 KHz to 50 MHz
Frequency Tol. and Temp. Range
30KHz to 650 KHz:
±150 PPM over —55° to 105°C
650 KHz to 50 MHz:
±50 PPM over —55° to +125°C
±50 PPM over —55° to +105°C
±50 PPM over 0° to + 75°C
Input Voltage: +5 VDC ± 5%
Current Drain: Low as 10 MA to 50 MA Depending on Frequency Selected
Output: Square Wave Compatible with TTL or DTL Logic
Package Size: 1" × 1" × 0.5" High
Package Volume: 0.5 Cubic Inches
Weight: Less Than 1 Ounce
Environmental: Designed to meet MIL-E-5400. Commercial Versions Also Available.
Seal: Hermetic



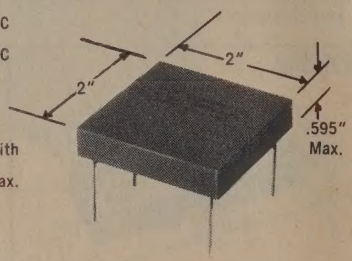
MODEL MC110A1 Standard Crystal Oscillator

Frequency Range: 30 KHz to 50 MHz
Frequency Tol. and Temp. Range
(Suggested Values Only)
30 KHz to 650 KHz:
±100 PPM over —55° to +85°C
±65 PPM over —40° to +70°C
±50 PPM over 0° to +75°C
650 KHz to 30 MHz:
±70 PPM over —55° to +125°C
±50 PPM over —55° to +105°C
650 KHz to 50 MHz:
±50 PPM over —40° to +85°
±50 PPM over 0° to +75°C
Input Voltage: +5 VDC ± 5%
Current Drain: Low as 10 MA to 50 MA Depending on Frequency Selected
Output: Square Wave Compatible with TTL or DTL Logic
Package Size: 1" × 1" × .360" High
Package Volume: .360 Cubic Inches
Weight: 1 Ounce Maximum
Seal: Hermetic



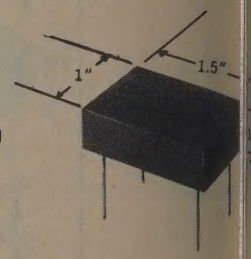
MODEL MC166X1 Standard Crystal Oscillator

Frequency Range: 0.9 Hz to 150 KHz
Frequency Tol. and Temp. Range
0.9 Hz to 15 KHz:
±250 PPM over —55° to +105°C
4.0 Hz to 150 KHz:
±200 PPM over —55° to +105°C
0.9 Hz to 15 KHz:
±150 PPM over 0° to +70°C
4.0 Hz to 150 KHz:
±150 PPM over 0° to +70°C
Input Voltage: +5 VDC ± 5%
Output: Square Wave Compatible with TTL or DTL Logic
Package Size: 2" × 2" × .595" H. Max.
Weight: Less than 3 Ounces
Seal: Hermetic



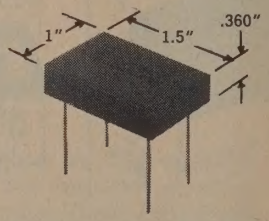
MODEL MC209A1 Standard Crystal Oscillator

Frequency Range: 1.8 KHz to 650 KHz
***Temperature Range:** —55° to +105°C
***Frequency Stability:**
1.8 KHz to 12 KHz: ±150 PPM
12 KHz to 650 KHz: ±50 PPM
Input Voltage: +5 VDC ± 5%
Output: Logic
Weight: Less than 1.5 Ounces
Package Size: 1" × 1.5" × 0.5" High
Seal: Hermetic
Mounting: Direct Printed Circuit Board Mounting
*Suggested Values Only — List Your Actual Requirements



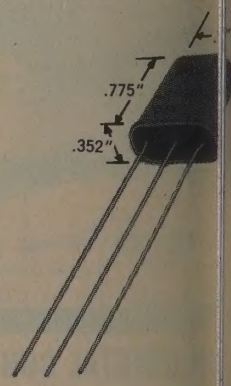
MODEL MC210A1 Standard Crystal Oscillator

Frequency Range: 1.8 KHz to 650 KHz
***Temperature Range:** —55° to +85°C
***Frequency Stability:**
1.8 KHz to 12 KHz: ±150 PPM
12 KHz to 650 KHz: ±50 PPM
Input Voltage: +5 VDC ± 5%
Output: Logic
Weight: Less than 1.5 Ounces
Package Size: 1" × 1.5" × .360" High
Seal: Hermetic
Mounting: Direct Printed Circuit Board Mounting
*Suggested Values Only — List Your Actual Requirements



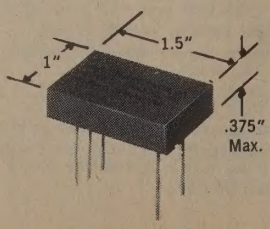
MODEL MC222X1 Standard Crystal Oscillator

Frequency Range: 3.0 MHz to 125 MHz
Temperature Range: —55°C to +105°C
Frequency Tolerance: ±50 PPM
Input Voltage: +10 VDC ± 5% at 10 MA Max.
Output Waveform: Sine
Output Levels
3.0 MHz — 20 MHz: Typically 4 VP-P Min. into a 5000 Ω Load
20 MHz — 125 MHz: 1 MW Min. into a 50 Ω Load
Package Size: .352" × .757" × .775" High
***Mounting and Terminals:** 3 ea., .030" Dia. Wire Leads
Seal and Weight: Hermetic, 100 grams Max.
*This unit also available with .050" dia. Pins, .248" Long for plug-in application. This is Model MC223X1.
The unit is also available with outside trim capability. Contact McCoy Electronics Co., Oscillator Engineering for details.



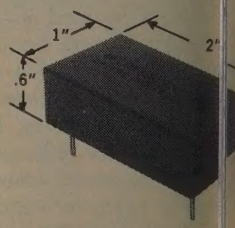
MODEL MC262X1 Standard Crystal Oscillator

Frequency Range: 180 KHz to 25 MHz
***Frequency Tolerance:** ±50 PPM
***Temperature Range:** —55° to +105°C
Input Voltage: +5 VDC ± 5%
Current Drain: Low as 10 MA to 50 MA Depending on Frequency Selected
Output: Square Wave Compatible with TTL or DTL Logic
Package Size: 1" × 1.5" × .375" High Max.
Package Volume: .563 cubic inch
Weight: Less than 2 Ounces
Seal: Hermetic
*Suggested Values Only — List Your Actual Requirements



MODEL MC302X1 Standard Crystal Oscillator

Frequency Range: 4 MHz to 150 MHz
***Frequency Stability:** ±50 PPM
***Temperature Range:** —55° to +105°C
Input Voltage: ±10 VDC to ±28 VDC (Must Select Value)
Output: Sine Wave
Output Level: 5 MW Min. into 50 Ω Typical
Weight: Less than 2 Ounces
Package Size: 1" × 2" × .6" High
Seal: Hermetic
*Suggested Values Only — List Your Actual Requirements



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ATOR CONTINUED

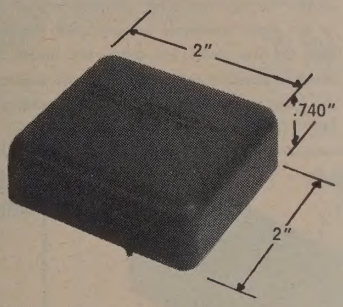
L M062C2 Temperature Compensated Crystal Oscillator

ncy Ra e: 12 KHz to 75 MHz

mperat Range	Frequency Stability
to +)°C	±0.5 PPM
to +)°C	±1.0 PPM
to + °C	±0.5 PPM
to + °C	±1.0 PPM
to +1 °C	±5.0 PPM

oltag +12 VDC ± 2% and VDC ±5%

Wave 2 KHz to 75 MHz: MW Minimum re Wa 12 KHz to 25 MHz: L or L Compatible e Trim vailable on Request e Size " × 2" × .740" High ngs 4 ., 6-32 Threaded Inserts Hermet

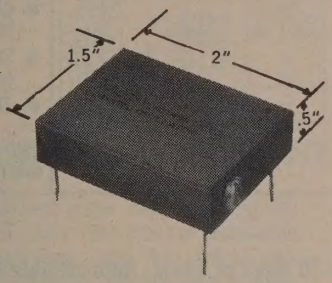


L M080A2 Temperature Compensated Crystal Oscillator

ncy Ra e: 187.5 KHz to 25 MHz

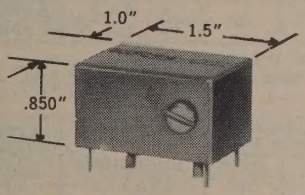
mperat Range	Frequency Stability
to -50°C	±0.5 PPM
to +0°C	±1.0 PPM
to +0°C	±2.0 PPM
to +5°C	±5.0 PPM

oltag +5 VDC ± 1%
Sque Wave Compatible with or DTLogic
e Trim Available on Request
M Total Pull
e Siz 2" × 1.5" × .5" High
ng: Fated Circuit Mounting via .03 Dia. Wire Leads
Herme



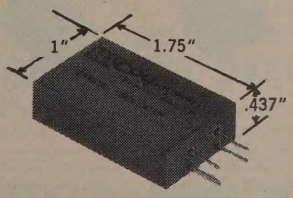
L M260X2 Temperature Compensated Crystal Oscillator

ncy Ra ge: 2.0 MHz to 25 MHz
ncy Tolerance: ±0.5 PPM
ratur ange: −20° to +55°C
Volta +12 VDC ± 5%
Wav rm: Sine
Pow 1 MW Minimum into a Load
e Tri Available on Some Models
e Siz 1.0" × 1.5" × .850" High
ng: 2 a., 4-40 Studs
als: ea., .030" Dia. Wire Leads
Hermc
Le than 2 Ounces



L M275X2 Temperature Compensated Crystal Oscillator

ncy nge: 15 MHz to 25 MHz
ratu Range: −40° to +70°C
ical)
ncy bility: ±4 PPM (Typical)
Volt : +17 VDC ± 1 VDC at MA Minimum
t 1 MS ± 2 db into a 100 Ohm d Sin Wave
e Si 1" × 1.75" × .437" High
e V me: .77 Cubic Inch
atio 4 ea., .030" Dia. Wire Leads
ng: ea., #2-56 Inserts on 1" × 5" Space
Hermic

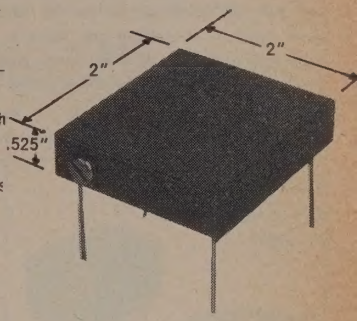


MODEL MC163X2 Temperature Compensated Crystal Oscillator

Frequency Range: 8.0 KHz to 28.0 MHz

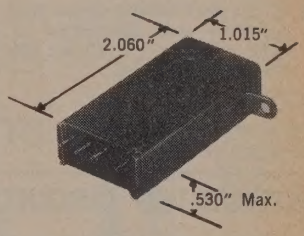
Temperature Range	Frequency Tolerance
−30° to + 60°C	±0.5 PPM
−40° to + 70°C	±1.0 PPM
−55° to +105°C	±5.0 PPM

Input Voltage: +12 VDC ± 2% and +5 VDC ± 5%
Output: Square Wave Compatible with TTL or DTL Logic
Outside Trim: Available on Request
Package Size: 2" × 2" × .525" High
Mounting: 5 ea., .030" Dia. Wire Leads for PC Board Mounting
Seal: Hermetic



MODEL MC200X1 Temperature Compensated Crystal Oscillator

Frequency Range: 10 MHz to 25 MHz
Temperature Range: −30° to +75°C
Frequency Tolerance: ±5 PPM
Frequency Accuracy at RT: 1 PPM Max.
Outside Frequency Trim Capability: ±20 PPM Minimum
Input Voltage: +9 VDC ± 1%
Output: 72 MV ± 2.0 db into a 50 Ω Load
Output Waveform: Sine
Package Size: 1.015" × .530" × 2.060" High Maximums
Mounting: Optional (Unit shown has mounting bracket)
Terminals: 4 ea., .040" Dia. Pins, .200" Long
Weight: 1.5 Ounces Maximum



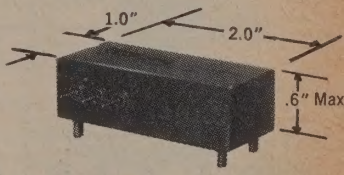
MODEL MC301X2 Temperature Compensated Crystal Oscillator

Frequency Range: 12.0 MHz to 85 MHz

Temperature Range	Frequency Tolerance
−10° to + 60°C	± 1.0 PPM
−55° to +105°C	±10.0 PPM

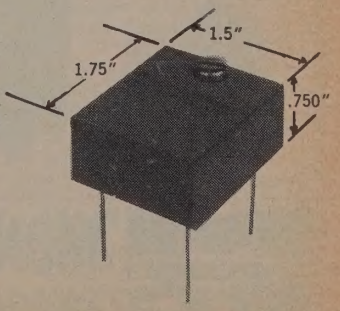
Input Voltage: +12 VDC ± 5% at 25 MA Max.
Output Waveform: Sine
Output Power: Typically 5 MW into a 50 Ω Load
Package Size: 1.0" × 2.0" × .6" High Maximum
Mounting: 4 ea., 4-40 Studs
(1) Terminals: 3 ea., .030" Dia. Wire Leads
Weight: Less than 3 Ounces
Seal: Hermetic

Note 1: The leads of the MC301X2 are brought out the side of the case. Another version (MC302X2) is available with the leads coming out the bottom of the case.



MODEL MC550C7 Temperature Compensated Voltage Controlled Crystal Oscillator (TCVCXO)

Frequency: 3.579545 MHz
Temperature Stability: ±0.0002%
Temperature Range: 0° to +50°C
Mechanical Trim: ±0.0003% @ 0 Volts on AFC
Input: +12 V ± 0.1% at 5 MA Max.
Output: 1.5 VP-P Min. Sine Wave
Load Impedance: 3.3K Ω Shunted by 22 Pf Capacitance
AFC Characteristics:
Pull Range: ±20 Hz Min. to ±40 Hz Max.
AFC Voltage: ±0.5 Volts
Package Size: 1.75" × 1.5" × .750" High
Seal: Hermetic



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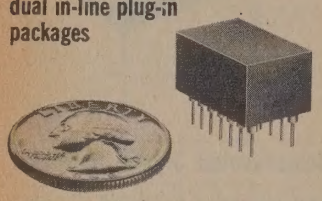
OFF THE SHELF DELIVERY ! as low as $32.90 each in 10 quantity

Monitor's new Integrated Circuit Oscillators make it uneconomical to buy crystals (even ours) and design your own oscillator. Why are they so economical? They were designed specifically for the less stringent temperature and stability requirements found in commercial and industrial EDP and digital control applications. But don't think the low price means lower quality. They feature the same high quality, workmanship and reliability as the 700 Series IC Oscillators shown below.

Who pioneered the Koldwell Crystal . . . MONITOR! Who was first with a complete line of integrated Circuit Subminiature Oscillators . . . MONITOR! NOW—who is going to be first to break the Availability Barrier . . . you know it . . . is! We say it's "STOCK IT TO ME TIME!" That's right—off the shel to you for the first time, complete crystal oscillators. Not just one or t of the most commonly manufactured frequencies. Naturally, we are not have all the items you need, but beside the crystal oscillators, we h sands of crystals ready to go—in all shapes and sizes—give us a chanc we mean business. Call us—tell us what you need and just say "STO ME!" (We've got some OVENS in stock, too . . .)

50Hz to 125MHz dual in-line plug-in packages

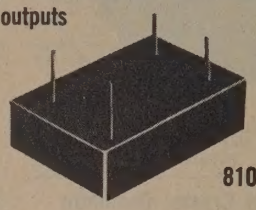


- Complete crystal controlled IC oscillator in sizes from .350 to 2 cubic inches.
- Off the shelf delivery of the most commonly used frequencies i.e. 60Hz; 100 KHz; 1, 5, 10 and 100 MHz plus 30 others.
- TTL outputs.

Call or write for complete specifications and prices.

16KHz to 40MHz, TTL and Logic outputs

820, 830, 840, 850



810

TYPE	FREQUENCY RANGE	OUTPUT	OSC INPUT VDC	OSC CURRENT DRAIN MA	DIMENSIONS (INCHES)	TYPICAL STABILITY (0-60°C)
810	16-80 KHZ	Logic 0:+.2V±.2V	5 ±10%	15	1.87 x 1.25 x .5	±80 ppm
820	80-900 KHZ	Logic 1:+2.8V min			1.00 x 1.25 x .5	±60 ppm
830	1 MHZ	TTL		25	1.00 x 1.25 x .5	±30 ppm
840	1.5-3 MHZ			15		±30 ppm
850	3-40 MHZ					±30 ppm

10 to 40MHz Low power temperature controlled pac

- Complete crystal controlle IC oscillators.
- Stabilities to ±2ppm fro 60°C.
- TTL outputs.

Call or write for complete specifications and prices.

INTEGRATED CIRCUIT CLOCK STANDARDS

New Model 613 1 MHZ IC Oscillator with parts in 10^{-9} stability after 30 days of aging. Approximately $60 each in 100 q

	TYPE	FREQUENCY RANGE	OUTPUT	INPUT VDC OSC	INPUT VDC OVEN	CURRENT DRAIN MA OSC	CURRENT DRAIN MA OVEN	DIMENSIONS	TYPICAL STABILITY (0-50°C)	TYPICAL STABILITY (25°C ±2°C)	TY A (PE
1 MHZ	613†	1 MHZ	Logic 0:+.2V ±.2V Logic 1:2.8V min. Square Wave TTL	+5 ±1% +12 ±1% +28 ±1%	115 VAC 28 VDC	30	350	1.5 x 1.5 x 2.75	.005 PPM/°C	±.003 PPM	.0
	761†	1 MHZ				30	500	2 x 2 x 4.2	.002 PPM/°C	±.002 PPM	.0
	3249†	1 MHZ				30	350	1.1 x 2.1 x 2.5	.005 PPM/°C	±.003 PPM	.0
	762*	1 MHZ			28 VDC	30	350	2 x 2 x 4.2	.002 PPM/°C	±.001 PPM	.0
	726*	1 MHZ			28 VDC	28	75	2 x 1.06 x .7	.01 PPM/°C	±.005 PPM	.0
	748	1 MHZ		+5 ±5%	NA	25	NA	.8 x .4 x .8	.5 PPM/°C	±1 PPM	.0
	751					25		1 x 1.25 x .5	.2 PPM/°C	±.5 PPM	.0

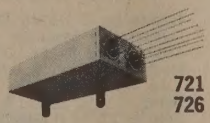
* Proportional control. † Solid state mercury. ** Aging after 45 days of dynamic usage.
Note: Standards at other frequencies are available in above packages with similar specifications.

	TYPE	FREQUENCY RANGE	OUTPUT	INPUT VDC OSC	INPUT VDC OVEN	CURRENT DRAIN MA OSC	CURRENT DRAIN MA OVEN	DIMENSIONS	TYPICAL STABILITY (0-50°C)	TYPICAL STABILITY (25°C ±2°C)	TY A (PE
100 MHZ	624†	40-120 MHZ	2 VPP min. 50 ohm load	−20 ±1%	28 VDC	50	500	2 x 2 x 4.4	.5 PPM	±.05 PPM	.0
	770	40-100 MHZ	Logic 0:−1.6V Logic 1:−.75V MECL	−5.2 ±5%	NA	40	NA	.8 x .4 x 1.5	60 PPM	NA	.5

† Solid state mercury. ** Aging after 45 days of dynamic usage.
"DUAL INLINE PACKAGING": Equivalent packages are available with .6" dual inline pin spacing for standard logic P.C. board. Fo information, please consult factory.

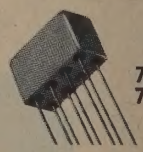
761
762
624

613

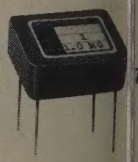


721
726

711



748
770



MONITOR PC

MONITOR PRODUCTS COMPANY, INC.

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see our VSI VISUAL S MICROFI

YSTAL FILTERS

e of a nation's leading suppliers of high reliability crystals and subminia- integrd circuit oscillators, Monitor Products recently expanded their product o inc e quartz crystal filters in the 20-1000 KHz region.

he lization of the computer in the realization and most importantly in the sis of lter networks, Monitor is now able to provide a suitable tool to produce lit for our customers.

ad l of catalog items is not available, but Monitor will quote directly to filter uirements.

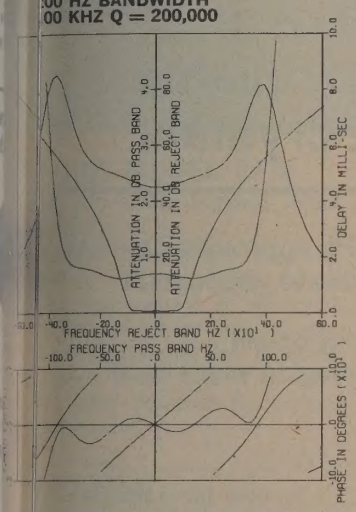
or h developed several prototype networks based on computer-aided design. compr-graphic analysis of these networks is shown below. The figures are in selves omewhat unique in that all of the pertinent characteristics of the net- are a lable to the customer with a single graphic presentation.

While these are theoretical curves, it can be noted that they are not the common textbook variety, and the physical losses of both crystals and coils are included in the analysis. In the majority of these cases where a computer-graphic analysis is presented, the characteristics far exceed the specifications. If the design in any way appears borderline, element perturbations are made and a sensitivity projection indicated to justify or eliminate the design.

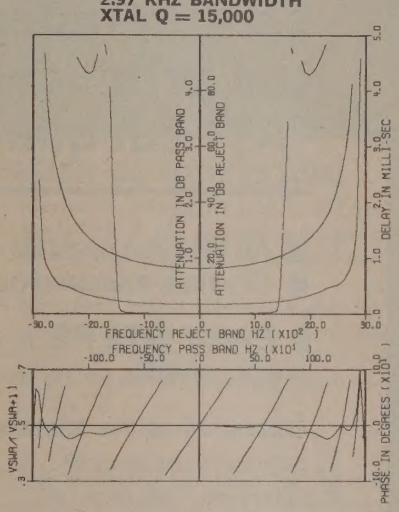
While Monitor is new in the filter field, we feel that the crystal is the heart of the device, and our capabilities in this area are well known. We cannot guarantee that we can produce every one of your requirements. However, we can guarantee that we will not lead you into production delays by a faulty and unrealistic design.

Please forward your production requirements to Monitor for our analysis and quotation.

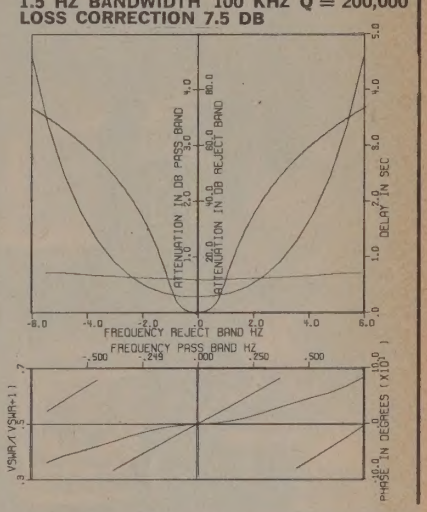
FOUR POLE — FOUR ZERO
00 HZ BANDWIDTH
00 KHZ Q = 200,000



100 KHZ SSB FLTR
2.97 KHZ BANDWIDTH
XTAL Q = 15,000

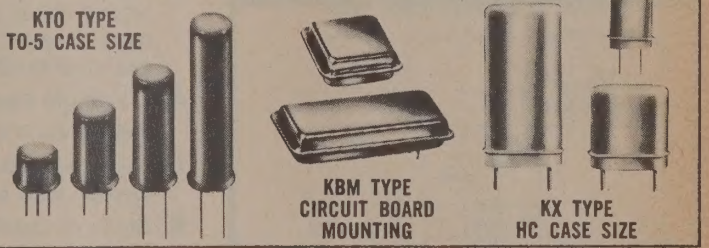


FOUR POLE — NO ZERO
1.5 HZ BANDWIDTH 100 KHZ Q = 200,000
LOSS CORRECTION 7.5 DB

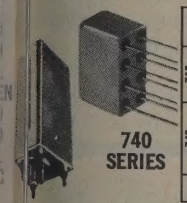


HIGH RELIABILITY "KOLDWELD" CRYSTALS 10KHZ TO 170MHZ

The LDWELD process is the first major advance in crystal relia ity and packaging in 20 years. The process eliminates contnating solder, flux and heat from the sealing process nd improves aging and reliability. Each crystal is manufacred under decontaminant conditions, then leak tested to 1 cc of helium per second prior to final QC testing. ers a Monitor crystal for all your high reliability frequency contl applications. Monitor also manufactures a complete line crystals to MIL-C-3098D.



LL STATE AND INTEGRATED CIRCUIT OSCILLATORS: 60 HZ TO 150 MHZ



OSCILLATOR MODEL NUMBER		FREQUENCY RANGE	OUTPUT	INPUT VDC OSC	INPUT VDC OVEN	CURRENT DRAIN MA OSC	CURRENT DRAIN MA OVEN	DIMENSIONS INCHES	BASIC STABILITY OVER AMBIENT PPM
710 SERIES	710, 11	20-200KHZ	Logic zero: +.2V ±.2V Logic one: +2.8V min.	5±10%	NA	15	NA	As small as .38 cu. in.	150
	712, 13	201-400KHZ						As small as .22 cu. in.	100 to 400
	714, 15, 16	400-1000KHZ						As small as .16 cu. in.	100 to 400
740 SERIES	740, 41	125-700KHZ	Logic zero: +.2V ±.2V Logic one: +2.8V min.	5±10%	NA	15 & 25	NA	.8 X .4 X .8	100 to 250
	742, 43, 44	2-700KHZ				15, 25 & 50		.8 X .4 X 1.44	100 to 250
	745	455-1000KHZ				15		.8 X .4 X .5	120 to 400
	746, 47	500KHZ-40MHZ				25		.8 X .4 X 1.0 max.	40
750 SERIES		4KHZ-4MHZ	Dual complimentary compatible TTL	5±10%	NA	15 (60 below 75 KC)	NA	1.0 X 1.25 X .5	40 to 350

ODEL MBER	FREQUENCY RANGE	OUTPUT	INPUT4VDC OSC	INPUT4VDC OVEN	CURRENT DRAIN MA OSC	CURRENT DRAIN MA OVEN	DIMENSIONS	TYPICAL STABILITY 0-50°C	TYPICAL STABILITY 25°C ±2°C	TYP.** AGING PER DAY
), 21*	20-200 KHZ	Logic zero: +.2V ±.2V Logic one: +2.8V min.	5 ±10%	26 ±4	15	—55°C 150 0°C 75 +25°C 35 +55°C 20	As small as 1.48 cu. in.	.05 PPM/°C	±.2 PPM	.5 PPM
?, 23*	201-400 KHZ				25					
, 5, 6, 7*	400 KHZ-10 MHZ				15		As small as 1.11 cu. in.	.01 PPM/°C	±.005 PPM	.08 PPM
†, 613	7 KHZ-20 MHZ	2V pp, 2K sine 4V pp, 4K sq. (2MV min. into 50 ohms above 15 MHZ)	12 or 26	28 or 115 VAC	15	500 to 130	1.875 x 1.437 x 4	.005 PPM/°C	±.003 PPM	.003 PPM
†, 761	75-250 KHZ				65		2 x 2 x 4.5	.02 PPM/°C	±.02 PPM	.02 PPM
†, 761	3 KHZ-70 MHZ				15 to 65			Stability varies with frequency. Consult factory.		
*, 762	75 KHZ-70 MHZ		26	28	15 to 65	500 max.				

ptional control. † Solid state mercury. ** Aging after 45 days of dynamic usage.

RYSTAL AND COMPONENT OVENS

100 DIFFERENT DESIGNS

SOLID STATE MERCURY AND PROPORTIONAL CONTROLLED

nitor solid state mercury and proportional control ovens are ilable in a variety of high reliability subminature packages and also in larger configurations. Each oven is designed for high stability, wide variety of temperature and environmental conditions.

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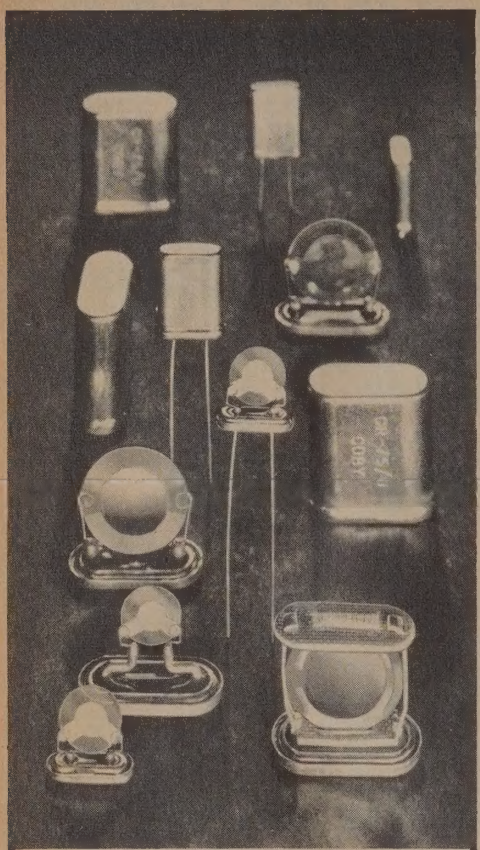
WRITE FOR A COPY OF OUR NEW 40 PAGE CATALOG



M-tron INDUSTRIES, INC.

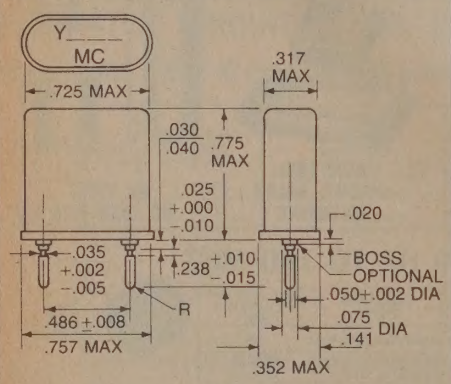
Largest independent U.S. producer of reliable "AT" cut quartz crystals

- All Mil-type crystals—QPL approvals on most
- Crystals matched perfectly to your circuit

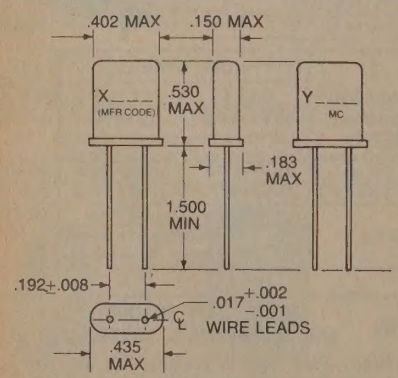
9 EASY STEPS to quickly obtain M-tron Crystals perfectly matched to your circuit.

Please tell us the following...

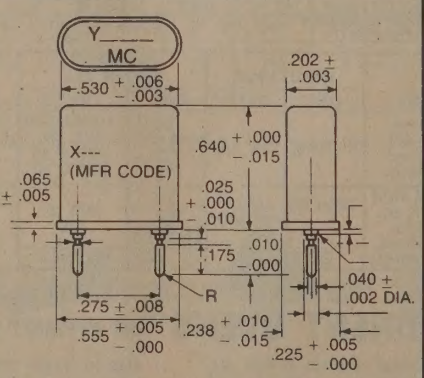
1. Nominal Frequency @_____°C, ±_____%
2. Maximum Tolerance: ±_____%, over temp. range _____°C to _____°C.
3. Holder and/or case configuration. Choices include: HC-6, HC-[illegible], HC-18, TO-5. Specify pins or wire leads; solder seal or cold-w[illegible]. Note: Below 3.000 MHz, HC-6 or larger is the only economica[illegible] practical holder.
4. Maximum Resistance allowed (if unknown, standard Mil resistance will be supplied).
5. Designate series or parallel resonance. If parallel resonant, specify load capacitance.
6. Mode of Oscillation i.e. Fundamental, Third Overtone, Fifth Overtone, etc.
7. Specify Drive Level. If unknown, standard drive level for equi[illegible] Mil-type crystal will be supplied. CAUTION: Excessive drive le[illegible] may cause frequency shifts or damage to crystal blank.
8. Environmental parameters, if applicable.
9. Can marking.



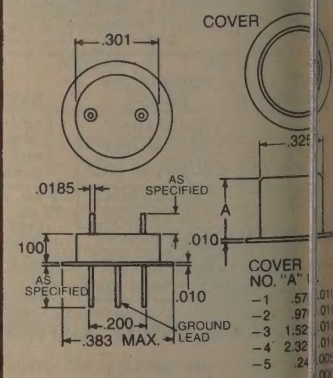
HC-6/U



HC-18/U



HC-32/U



HC-35/U (TO-5 TYPE)

For complete information, contact **M-tron INDUSTRIES, I[illegible]**

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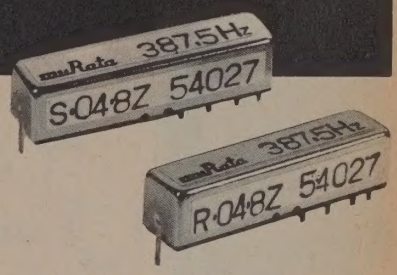
LOW FREQUENCY FILTER?

SPECIFY MURATA *MICROFORK*®
a unique piezoelectric tuning fork.



CROFORK MODEL EFM

Microfork is a newly designed submi-ature tuning fork.
This model is now widely used for boy system, selective calling, remote trol and tone control of electronic sic struments, where compactness, gedness and economy are required. Nickel plated brass case is mounted a plastic base designed for printed cuit arrangement.

SPECIFICATION

Item	for Receiver EFM-R	for Sender EFM-S
Frequency	360~2900Hz	
Frequency accuracy	360~ 999Hz ; ±0.5Hz 1000~2900Hz ; ±1.0Hz	
Input and output impedance	300KΩ	
Insertion loss*	10dB max.	
Temperature coefficient of Frequency	3.5×10^{-5}/°C max.	
Allowable temperature range	−20~+60°C	

$$\text{Insertion Loss} = 20\log\frac{E_1}{E_2} - 6(\text{dB})$$

STANDARD FREQUENCY (Hz)

37.5	532.5	697.5	862.5	1000
42.5	547.5	712.5	877.5	1500
47.5	562.5	727.5	892.5	1700
52.5	577.5	742.5	907.5	1900
57.5	592.5	757.5	922.5	2100
62.5	607.5	772.5	937.5	2300
67.5	622.5	787.7	952.5	2500
72.5	637.5	802.5	967.5	2700
77.5	652.5	817.5	982.5	2900
82.5	667.5	832.5	997.5	
87.5	682.5	847.5		

DESIGN CONSIDERATION

1. Maximum voltage of input is 10Vrms.
2. Microfork is not effected by magnetic field and is not mutually coupled even in close lay-out.
3. Microfork may oscillate in higher harmonics. In this case, you should use high pass capacitor (0.001~0.005 μF) at the output of Microfork, as shown in Fig. 3.
4. EFM-R is adjusted by the test circuit of Fig 1.
   But oscillating frequency by the self-oscillator circuit of Fig. 3 is lower about 0.2% than the adjusted frequency.
   So, EFM-S is adjusted by the test circuit of Fig. 3.
5. The input and output impedance of Microfork is 300 KΩ as shown in the specification.
   The band-width of Microfork is maximum when terminated by this valued resistance as shown in Fig. 1.
   When the resistance value is smaller, both band-width and resonant frequency decrease the more as shown in Fig. 2.

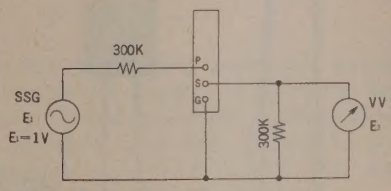


Fig. 1

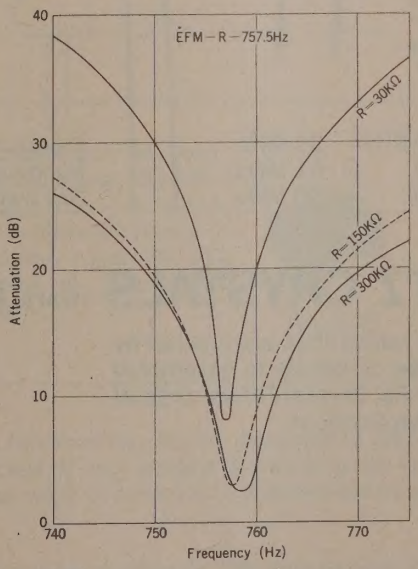


Fig. 2

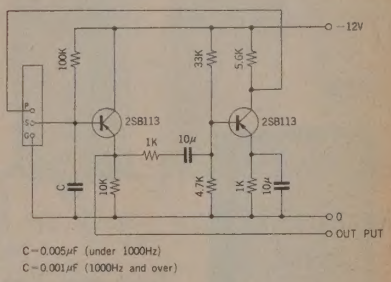


Fig. 3

VOLTAGE CHARACTERISTIC

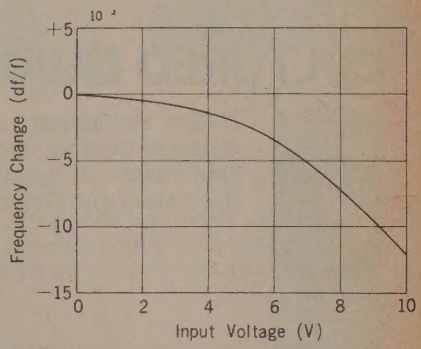


Fig. 4

muRata

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Nagaoka, Kyoto, Japan
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Cable Address: MURATAKYOTO

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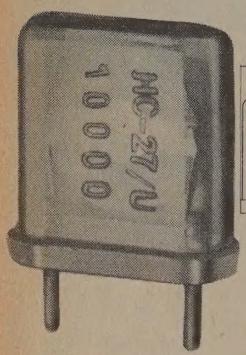
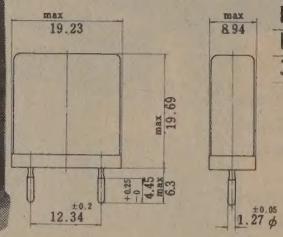
Newest & Highest Quality

NDK Products

CRYSTAL UNITS (including Glass types & Coldweld types)

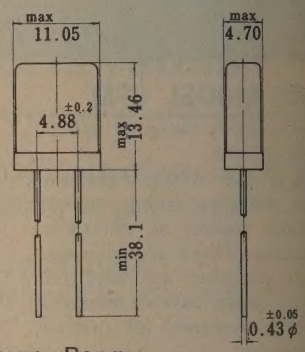


HC-27/U



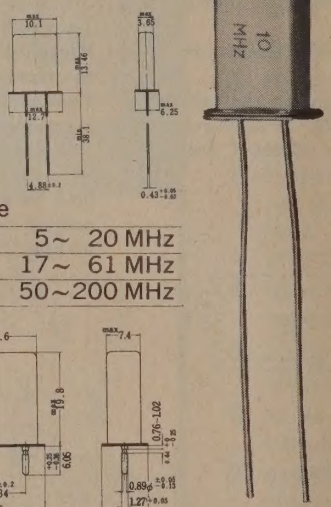
Frequency Range	
Fundamental	2~ 20 MHz
3rd and 5th	10~100 MHz

HC-26/U



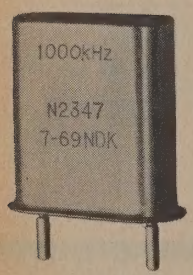
Frequency Range	
Fundamental	5~ 20 MHz
3rd and 5th	15~100 MHz

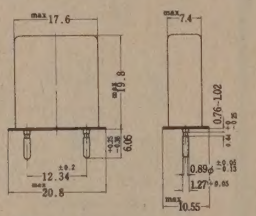
NC-18



Frequency Range	
Fundamental	5~ 20 MHz
3rd overtone	17~ 61 MHz
5th, 7th, 9th	50~200 MHz

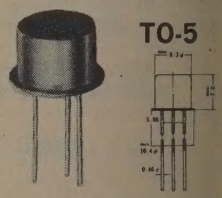
NC-6





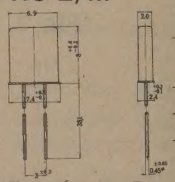
Frequency Range	
Fundamental	200 KHz~ 25 MHz
3rd overtone	10 ~ 61 MHz
5th, 7th, 9th	50 ~200 MHz

TO-5



Frequency Range	
Fundamental	550 KHz~
	10~ 20
3rd overtone	30~ 60
5th, 7th, 9th	50~200

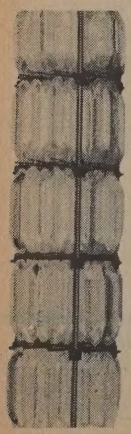
HC-2/M



Frequency Range	
Fundamental	9~20 MHz
3rd overtone	27~60 MHz

Many other types a

CULTURED QUARTZ CRYSTALS (Bars, Blanks)



Widest applications and reliabilities are insured by products ranging from raw materials to assembled goods such as Crystal Units, Crystal Filters, Crystal Oscillators and Optical Applications.

World's Leading Manufacturer of:

NDK Since 1948

NIHON DEMPA KOGYO CO., L

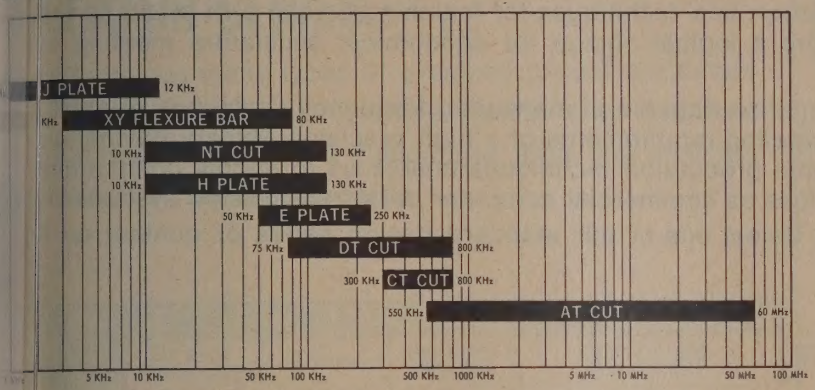
1-21-2, Nishihara, Shibuya-ku, Tokyo, Japan

Tel.: 460-2111 Cable: CRYSTALUNITS TOKYO Telex: T

Cultured Quartz Crystals ☐ Crystal Units ☐ Crystal Filters ☐ Crystal Oscillators ☐ Synthetic Crystals (LH, ADP, KDP) ☐ Light Modulation

FREQUENCY CONTROL DEVICES

CRYSTALS

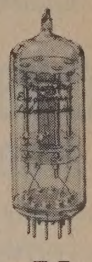


Leadership in the design and manufacture of low frequency crystals enables us to provide the widest variety in choosing the proper crystal for your application. Dependable quality and producible specifications help you to keep your production schedules. Complete spectrum coverage from under 1 KHz to over 50 MHz means one source that can handle most applications. For technical information, see our catalog.

NE-6

NE-13

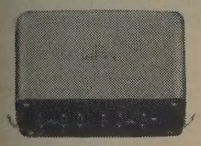
NE-14


T-7

OVENS

NE-62

EC-62


EC-66

CRYSTAL OVENS **COMPONENT OVENS**

Crystal and component ovens that employ dynamic thermal design and utilize the best components and construction techniques. Either standard or custom designs to provide optimum performance for your application. Contact us for details.

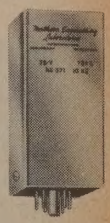
Electronic or Thermostatic Control

NE-461

EC-461

NE-100

NE-200

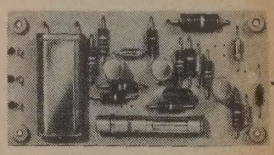

NE-300

OSCILLATORS

Timebase for TV, navigation, clocks, computers, fax, calibration, counters and numerous other applications. Standard and custom designs for digital or linear requirements. Optional temperature or voltage control. Several forms of packaging. Complete design and production capability. We supply the most compatible combination of crystal and circuitry because both are our specialties.

TO-2110

NE-200TO


TO-118

SERVICE

Complete application assistance followed by prompt, dependable delivery of reliable frequency control devices will help ensure the success of your product. Contacting our sales representative or factory will bring a rapid, useful response. The value of our service is enhanced by allowing us to work with you early in the design stage.

Write for catalog and pamphlet on "Writing Crystal Specifications"

Northern Engineering Laboratories Incorporated

SEE OUR SPECIFICATIONS IN VSMF MICROFILM CATALOG FILE

357 Beloit Street. Burlington, Wisconsin 53105 Phone: Area Code 414 763-3591

FREQUENCY CONTROL DEVICES

Ovenaire, Inc. for many years recognized as one of the world leaders in the design and manufacture of crystal and component ovens has utilized this experience and capability to establish an equally high reputation for oven stabilized crystal oscillators. Our specialized knowledge of crystal specifications coupled with production line techniques for matching crystal turn points to oven control temperatures make Ovenaire a logical choice for economical oscillators meeting any specified level of stability.

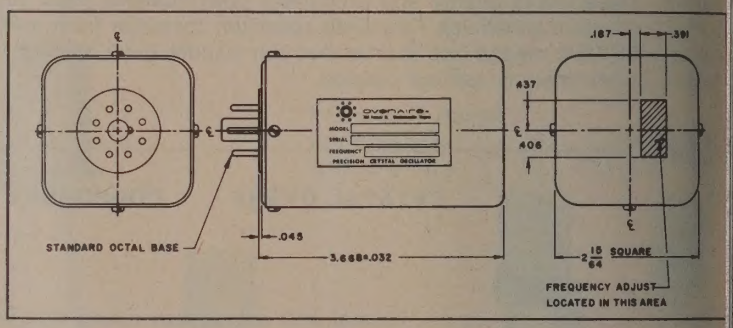
Ovenaire is versatile with instrumentation capable of measuring frequency deviations of parts in 100 billion we can meet the most exacting requirements of a high precision Military navigational system. At the same time, our volume production techniques enable us to supply competitively priced oscillators for such applications as commercial computer data transmission systems.

Consult the tables on these pages. Select one of our standard design series or contact us for special requirements.

OSC 18 SERIES

HIGH STABILITY CRYSTAL OSCILLATORS FEATURING:

Precision Glass Enclosed Crystals
High Gain DC Proportional Oven
Low Power — 3 Watts at +25°C
Designed for Hi-Impact Shock
Now in 3rd Year of Production
Unbeaten for Price and Performance
Options — Size 2" x 2" x 4" —
Logic Output — Voltage Control



STABILITY CLASS	HIGH PRECISION	PRECISION	HIGH	HIGH	EXTENDED FREQUENCY
FREQ. RANGE	1 or 3 MHz	1 MHz	0.5 to 2 MHz	1 to 5 MHz	5 to 30 MHz
PART NO.	OSC 18-6	OSC 18-2	OSC 18-1	OSC 18-5	OSC 18-7
OUTPUT	1 VOLT RMS MINIMUM SINE WAVE INTO 500 OHMS				0.7v RMS INTO 50 Ω
STABILITY — LONG TERM	$1x10^{-8}$/WK	$3x10^{-9}$/DAY	$7x10^{-9}$ PER DAY		$3.5x10^{-6}$/YR
STABILITY — SHORT TERM	$2x10^{-10}$RMS	$\pm 5x10^{-10}$P-P	$5x10^{-10}$RMS	$\pm 5x10^{-9}$P-P	—
STABILITY — AMBIENT	0 to +55°C <$1x10^{-8}$	−20 to +55°C $2x10^{-10}$/°C	−20 to +55°C $1x10^{-9}$/°C	−20 to +65°C <$5x10^{-7}$	−20 to +65°C $5x10^{-9}$/°C
STABILITY — VOLTAGE	$5x10^{-10}$/1%	$5x10^{-10}$/1%	$5x10^{-9}$/1%	$2x10^{-8}$/1%	$3x10^{-8}$/1%
STABILITY — LOAD	$5x10^{-10}$/1%	$1x10^{-9}$/1%	$2x10^{-9}$/1%	$2x10^{-8}$/5%	$5x10^{-8}$/5%
WARM-UP FROM +25°C	$1x10^{-7}$ IN < 20 MIN	$1x10^{-7}$ IN < 30 MIN	$2x10^{-7}$ IN < 30 MIN	$5x10^{-7}$ IN < 30 MIN	$5x10^{-7}$ IN < 20 MIN
FREQ. ADJUSTMENT	COARSE AND FINE PISTON TRIMMERS		SINGLE PISTON TRIMMER		
INPUT POWER	24 VDC WITH 10 WATTS MAXIMUM DURING WARM-UP				

Technical data subject to change

For complete catalog, information or technical assistance— Call, TWX or write:

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CHARLOTTESVILLE, VA.
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RIQUENCY CONTROL DEVICES

VEI STABILIZED SCLLATOR SERIES

venaie produces many types of ovenized crystal oscillators met widely varying performance needs. Your ovenized scillator requirement can be customized from one of these opoionately controlled standards.

FIG 1

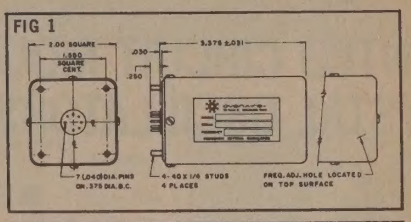


FIG 2

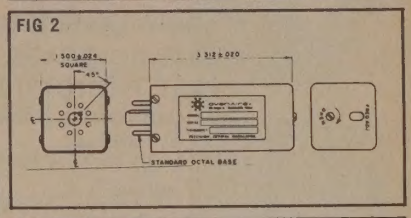


FIG 3

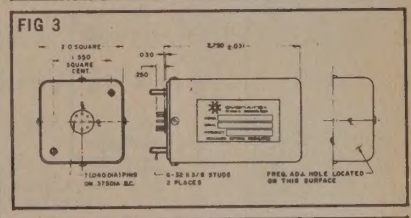


FIG 4

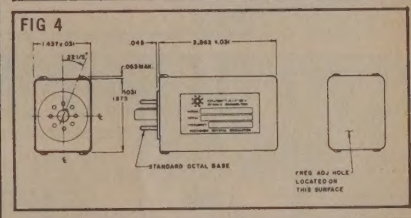
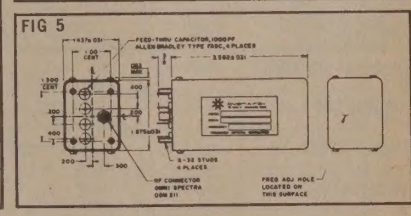


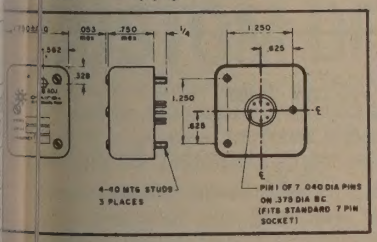
FIG 5



SIES	OSC 11	OSC 24	OSC 32	OSC 29	OSC 70
JOR FTURE	AC or DC SMALL SIZE	FAST WARM-UP	LOW OVEN POWER	EXTENDED FREQ. COMPACT SIZE	
RIUENCY	1 to 22 MHz	1 to 10 MHz	2 to 10 MHz	5 to 25 MHz	22 to 150 MHz
TPUT	1 VOLT RMS INTO 500 OHMS			1v RMS 300 Ω	+10 dBm 50 Ω
IONAL TPUT	LOGIC	LOGIC	LOGIC	LOGIC	NONE
BIENT RGE °C	−20° to +60°	−30° to +55°	0° to +55°	−20° to +60°	−10° to +60°
BIENT SBILITY	$5x10^{-9}$/°C	$5x10^{-10}$/°C	$1x10^{-9}$/°C	$1x10^{-8}$/°C	$2x10^{-8}$/°C
RM-UP FM 0°C	$\pm1x10^{-6}$ IN 30 MIN	$\pm5x10^{-7}$ IN 5 MIN	$\pm5x10^{-7}$ IN 45 MIN	$\pm1x10^{-6}$ IN 30 MIN	$\pm1x10^{-6}$ IN 30 MIN
P O W E R COLD START	10 to 15W	25 WATTS	3.6 WATTS	8 WATTS	8 WATTS
STEADY STATE +25°	APPROX. 3.5W	2 WATTS	1 WATT	APPROX 2.5 WATTS	
SUPPLY VOLTAGE	115V AC 24V DC	24V DC	24V DC	28V DC	28V DC
ILLATOR JPPLY	12 to 24V DC	24V DC	24V DC	15V DC	15V DC
M RANGE	MECHANICAL AND/OR ELECTRICAL TRIM AVAILABLE				
SIZE	FIG 2	FIG 1	FIG 3	FIG 4	FIG 4 or FIG 5

TCXO SERIES

Logi Compatible Output — Sma Size Supply +12V DC



PART NO.	OSC 37-1-1	OSC 37-2-1	OSC 37-3-1	OSC 37-1-2	OSC 37-2-2
FREQUENCY	1 to 5 MHz	5.01 to 10 MHz	1 to 5 MHz		5.01 to 10MHz
AMBIENT RANGE	0°C to +55°C		−5°C to +60°C	−10°C to +65°C	
AMBIENT STABILITY	$\pm2x10^{-6}$ REF +25°C		$\pm1x10^{-6}$ REF +25°C	$\pm1.5x10^{-6}$ REF +25°C	
AGING RATE	$1x10^{-6}$/YR	$2.5x10^{-6}$/YR	$1x10^{-6}$/YR		$2.5x10^{-6}$/YR
TRIM RANGE	$\pm5x10^{-6}$	$\pm8x10^{-6}$	$\pm4x10^{-6}$	$\pm5x10^{-6}$	$\pm8x10^{-6}$

VCXO SERIES AVAILABLE IN VARIOUS PHYSICAL CONFIGURATIONS

- Frequency Range 5 to 50 MHz
- ±0.005% to ±0.03% Deviation
- ±100 PPM to 0.2 PPM Stabilities
- Low Distortion F.M. Oscillators
- Oven and Non-Oven Models
- Compact Size

Technical data subject to change

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Kidde

FREQUENCY CONTROL DEVICES

PRINTED CIRCUIT MOUNT CRYSTAL OSCILLATORS 1MHz to 150MHz

● EXTENDED CAPABILITY

- LOGIC LEVELS TO 60 MHz
- SINE COVERAGE TO 150 MHz
- FAST PROTOTYPE SERVICE
- LOW COST
- SMALL SIZE
- RELIABLE

Pin Connections
PIN 1 +VSUP
PIN 2 OVDC
PIN 3 OVDC
PIN 4 OUTPUT

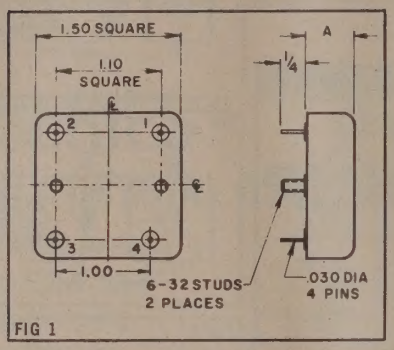

FIG 1

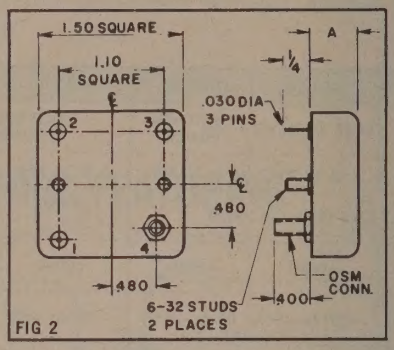

FIG 2

Pin Connections
PIN 1 +VSUP
PIN 2 OVDC
PIN 3 OVDC
OSM OUTPUT

FREQUENCY RANGE (MHz)		1 to 6	>6 to 10	>10 to 25	>25 to 60	>60 to 150
TOLERANCE		±0.001%			±.0012%	±.0015%
TEMP. RANGE		0°C to +60°C				
SERIES NO.	LOGIC	OSC 51-1-1	OSC 51-1-2	OSC 51-1-3	OSC 51-1-4	—
	SINE	OSC 51-2-1	OSC 51-2-2	OSC 52-2-1	OSC 52-2-2	OSC 52-2-3
LOGIC	SUPPLY VOLTAGE	+5V DC ±5%				
	SYMMETRY	50/50 ±20%	50/50 ±20%	50/50 ±20%	50/50±30%	—
	LOGIC HIGH	3VP @3Ma	3VP @3Ma	3VP @5Ma	3VP @5Ma	—
	LOGIC LOW	±0.4V @5Ma				—
	RISE TIME	<50 NS	<15 NS	<10 NS	<5 NS	—
	FALL TIME	<50 NS	<15 NS	<10 NS	<4 NS	—
	CONFIGURATION	FIGURE 1				—
	HEIGHT DIM A	.625	.50			—
SINE	SUPPLY VOLTAGE	+12V DC ±5%				
	OUTPUT VOLTAGE	1 VRMs ±30%		+10 DBM ±3db		
	LOAD	1 KΩ Resistive		50Ω Resistive		
	HARMONIC LEVEL	−30 DB		−25 DB		
	CONFIGURATION	FIGURE 1		FIGURE 2		
	HEIGHT DIM A	.625	.50	1.00		

ORDERING INFORMATION
Specify Series Number and Desired Frequency
Example: 8.3 MHz Logic Unit would be OSC 51-1-2 (8.3 MHz)

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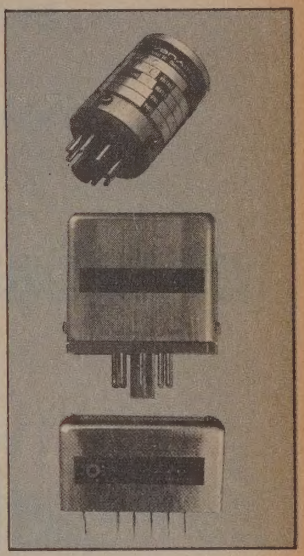
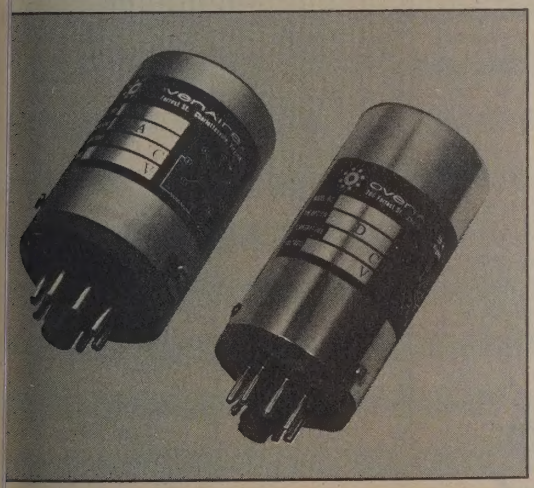
OVENS

CRYSTAL OVENS

Model No.	Accommodates	External Size (Seated Height)	Operating Temperature	Voltage	Temperature Control	Temperature Cycling	Mounting
T-2	1 or 2 HC-6/U	1-1/4" Dia. 1-3/4" High	Factory Set 50° to 110° ± 2°C	6, 12, 28 V DC/AC	Bi-Metal Creep T/S	±0.5°C	Octal Plug
A-2	1 or 2 HC-6/U	1-1/4" Dia. 1-3/4" High	65°, 75°, 85° ±2.5°C	6, 12, 28 V DC/AC	Snap Action T/S	±1°C	Octal Plug
A-2C	1 or 2 HC-6/U	1-1/4" Dia. 1-3/4" High	65°, 75°, 85° ±2.5°C	6, 12, 28V DC 115V AC	Snap Action T/S	±0.3°C	Octal Plug
SA-101	1 or 2 HC-6/U	1-1/2" Dia. 2-3/16" High	65°, 75°, 85° ±2.5°C	6, 12, 28V DC 115V AC	Snap Action T/S	±0.05°C	Octal Plug
MSCR	1 or 2 HC-6/U	1-1/2" Dia. 3-3/16" High	65°, 75°, 85° ±0.5°C	115V AC	Mercury T/S W/SCR	±0.005°C	Octal Plug
C-2	1 or 2 HC-6/U	1-1/4" Dia. 1-3/4" High	65°, 75°, 85° ±2.5°C	6, 12, 28 V DC	Proportional Control	±0.05°C	Octal Plug
A-3	3 HC-6/U	1-1/2" Dia. 2-3/16" High	65°, 75°, 85° ±2.5°C	6, 12, 28V DC 115V AC	Snap Action T/S	±0.2°C	Octal Plug
A-4	4 HC-6/U	1-57/64" x 1" x 1-3/4" High	65°, 75°, 85° ±2.5°C	6, 12, 28 V DC/AC	Snap Action T/S	±1°C	Octal Plug
A-10	10 HC-6/U	2-7/8" x 2-13/32" x 1-3/4" High	65°, 75°, 85° ±2.5°C	28V DC 115V AC	Snap Action T/S	±0.3°C	Terminals or wire leads.
A-12	12 HC-6/U	3-1/4" x 2-9/16" x 1-3/4" High	65°, 75°, 85° ±2.5°C	28V DC 115V AC	Snap Action T/S	±0.3°C	Terminals or wire leads.

Similar models to accommodate HC-13/U, HC-18/U and HC-25/U crystals also available.
Above operating temperatures and voltages standard. Other temperatures and voltages available.





COMPONENT OVENS

Model	External Size (Seated Height)	Cavity Size	Maximum Power	Temperature Cycling	Mounting and Internal Socket
C-101	1-1/2" Dia. 2-3/16" High	61/64" Dia. 15/16" High	15 Watts	±0.05°C	Octal or 11 Pin 4, 7 or 9 Pin
C-102	1-1/2" Dia. 2-15/16" High	61/64" Dia. 1-11/16" High	15 Watts	±0.05°C	Octal or 11 Pin 4, 7 or 9 Pin
C-103	1-1/2" Dia. 2-3/16" High	1-11/64" Dia. 1-3/32" High	15 Watts	±0.1°C	Octal or 11 Pin 4, 7 or 9 Pin
C-104	1-1/2" Dia. 2-15/16" High	1-11/64" Dia. 1-27/32" High	15 Watts	±0.1°C	Octal or 11 Pin 4, 7 or 9 Pin
C-105	1-1/4" Dia. 1-3/4" High	61/64" Dia. 11/16" High	10 Watts	±0.1°C	Octal or 11 Pin 4, 7 or 9 Pin
C-106	1-1/4" Dia. 2-5/8" High	61/64" Dia. 1-7/16" High	10 Watts	±0.1°C	Octal or 11 Pin 4, 7 or 9 Pin
C-107	2" Dia. 4-1/4" High	1-27/64" Dia. 2-59/64" High	20 Watts	±0.1°C	Octal or 11 Pin 4, 7 or 9 Pin

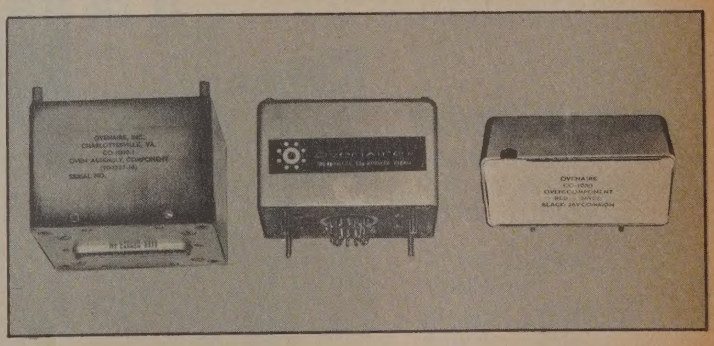
All models available with operating temperatures of 65°, 75°, 85° ±2.5°C.
Voltages up to 115 V for AC operation and 28 V for DC operation.
All models available with plug-in component board for 4, 7 or 9 pin internal socket.

CUSTOM DESIGN OVENS

Ovenaire maintains a large inventory of basic parts as well as a completely equipped model shop. This makes it possible for us to move swiftly on special designs for prototypes as well as production models.

Research and development of crystal and component ovens at Ovenaire have kept pace with the state of the art requirements. Today ovens ranging from economical units for competitively priced mobile equipment to ultra precision units for demanding instrument applications are in daily production at our facility.

Our engineers will assist you in specifying an oven to meet your exact requirements.



For complete catalog, information or technical assistance— Call, TWX or write:

ovenaire INC.
CHARLOTTESVILLE, VA.
703-293-5148 / TWX 510-587-5461

a member of the
Communications Products Division
Walter Kidde & Company, Inc.

Kidde

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what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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UNITED TECHNICAL PUBLICATIONS

PR CRYSTALS

ETERSEN RADIO

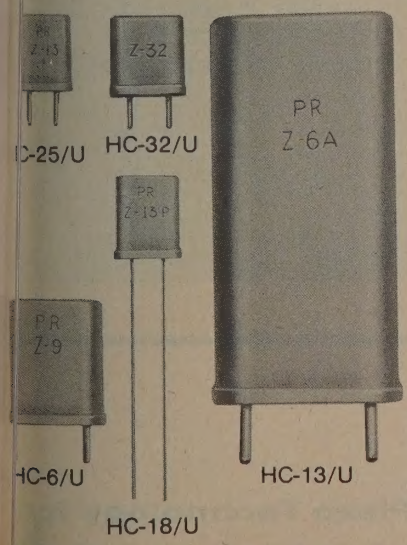
Crystals

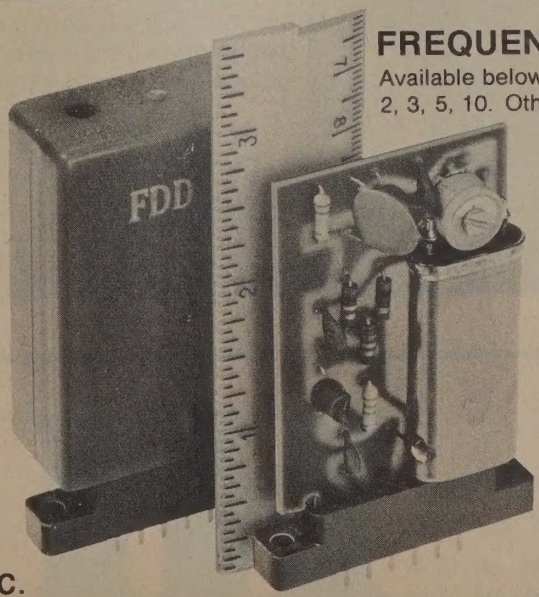
Frequency Dividers

Oscillators

IF Military Type Crystals for Aircraft Requirements or Special Applications

Frequencies (Nominal KHZ)	Tolerance (% Freq.)	Military No.	Operating Temps (°C)	Military Holder	Mode	C_1 PF
3,00 to 10,000	±0.02	CR-1A/AR	—55° to +90°C	HC-11/U	F	35.0
30 to 20,000	0.005	CR-18A/U	—55° to +105°C	HC-6/U	F	32.0
30 to 20,000	0.005	CR-19A/U	—55° to +105°C	HC-6/U	F	—
30 to 20,000	0.002	CR-27A/U	75°C ±1°	HC-6/U	F	32.0
30 to 20,000	0.002	CR-28A/U	75°C ±1°	HC-6/U	F	—
1000 to 75,000	0.002	CR-32A/U	75°C ±1°	HC-6/U	O	—
1000 to 25,000	0.005	CR-33A/U	—55° to +105°C	HC-6/U	O	32.0
1000 to 61,000	0.005	CR-52A/U	—55° to +105°C	HC-6/U	O	—
5000 to 125,000	0.005	CR-54A/U	—55° to +105°C	HC-6/U	O	—
1000 to 61,000	0.005	CR-55/U	—55° to +105°C	HC-18/U	O	—
5000 to 125,000	0.005	CR-56A/U	—55° to +105°C	HC-18/U	O	—
80 to 20,000	0.005	CR-58A/U	—55° to +105°C	HC-17/U	F	32.0
5000 to 125,000	0.002	CR-59A/U	85°C ±1°	HC-18/U	O	—
1,000 to 61,000	0.001	CR-65/U	75°C ±1°	HC-6/U	O	—
200 to 25,000	0.002	CR-69A/U	—40° to +90°C	HC-18/U	F	30.0
1,000 to 61,000	0.002	CR-76/U	—40° to +90°C	HC-18/U	O	—
5,000 to 125,000	0.002	CR-80/U	—40° to +90°C	HC-18/U	O	—
144 to 12,500	0.01	CR-91/U	—55° to +90°C	HC-11A/U	F	55.0
,000 to 61,000	0.001	CR-113/U	75°C ±1°	HC-18/U	O	—





FREQUENCY DIVIDERS

Available below 10Mhz Standard divisors 2, 3, 5, 10. Others special.

OSCILLATORS

1-5Mhz, 5-17Mhz, 25-60 Mhz, 100Khz, 455Khz, others on request.

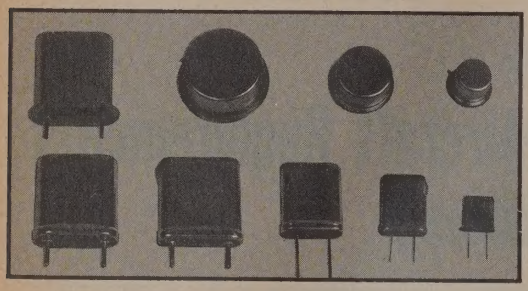
Oscillator output (1-60Mhz): 50 ohms impedance, minimum 10Mw

ETERSEN RADIO CO., INC.
300 WEST BROADWAY. COUNCIL BLUFFS, IOWA 51501 • PHONE 712-323-7530

Quartz Crystals and Crystal Filters

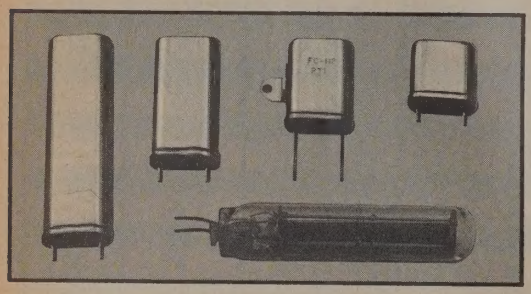
We manufacture an extremely wide variety of high-frequency and low-frequency quartz crystal units, conventional, discrete-element crystal filters, and monolithic and tandem monolithic crystal filters. We offer an excellent selection of standard types plus the know-how to meet your special requirements most economically.

High Frequency Crystals – .8 MHz to 250 MHz



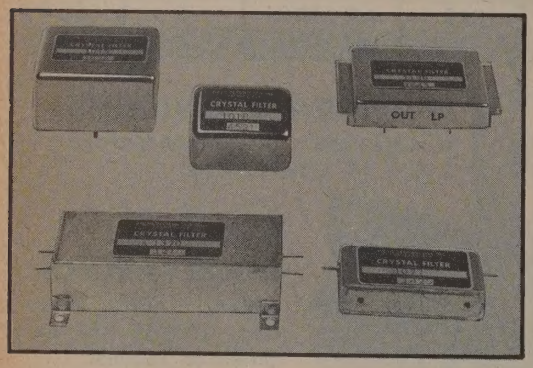
Standard military and commercial types as well as special units including mode-controlled VCXO crystals, tight tolerance, and high shock units. All popular holders — coldweld and solder-seal — are available.

Low Frequency Crystals – 1 kHz to 1 MHz



Some ten or more different crystal cuts are used at frequencies below 1 MHz. We make them all and can provide the one that is best for your application, military or commercial.

Conventional Crystal Filters



Bandpass, bandstop, and single-sideband designs from 10 kHz to 30 MHz. Bandwidths from .01% to 8%. Modern insertion-loss design techniques insure maximum performance. We specialize in production designs, not prototypes.

Kidde a subsidiary of Walter Kidde & Company, Inc.

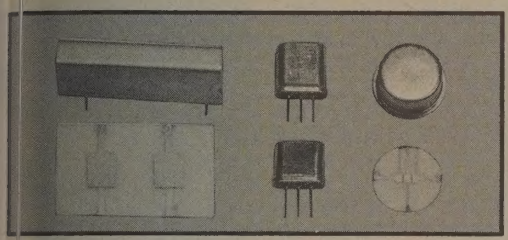
Piezo Technology Inc.

P. O. Box 7877 • Orlando, Florida 32804
(305) 425-1574 • TWX 810 - 850-4136

Integrated Monolithic Crystal Filters

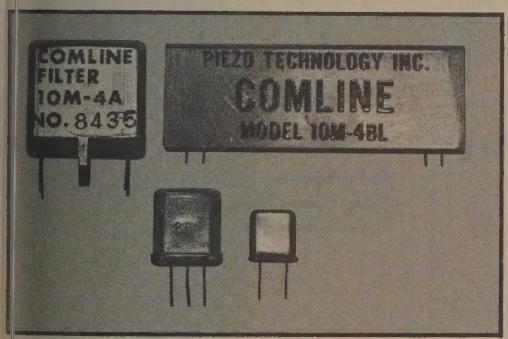
Piezo Technology specializes in integrated crystal filters — both monolithic and tandem monolithics — from 2 MHz to 350 MHz. PTI is first in the technology of monolithics. Our pioneering achievements include — the first VHF monolithic crystal filter (1966), high-performance tandem monolithics using modern filter design techniques (1967), the first monolithics above 300 MHz (1968), the first volume-produced multi-resonator VHF monolithics (1969). Piezo Technology has more experience in monolithics and tandem monolithics than anyone else, anywhere in the country. And we can prove it.

IXF® Integrated Crystal Filters



Standard models include VHF front-end filters for mobile and aircraft communications, marker beacon filters, and 30 MHz IF filters. Custom models, both monolithic and tandem monolithic, are available with a wide variety of performance characteristics and package configurations.

Comline® Integrated Crystal Filters



Piezo Technology offers the broadest line of standard model 10.7 and 21.4 MHz crystal filters on the market. Two-pole up to twelve-pole response available in a variety of popular bandwidths. Our upright mount and flatpacks are far and away the smallest standard model 10.7 and 21.4 MHz crystal filters available. Models are also in stock to fit existing equipment without modification. Take advantage of the reduced cost, small size and improved performance of these tandem monolithic integrated crystal filters.

Guide to Standard Models 10.7 MHz

13 kHz Bandwidth	15 kHz Bandwidth	30 Khz Bandwidth	No. Poles (Resonators)
10M–1E	10M–1B	10M–1A	2
10M–2E, –2EL	10M–2B, –2BL	10M–2A, –2AL	4
10M–3E, –3EL	10M–3B, –3BL	10M–3A, –3AL	6
10M–4E, –4EL	10M–4B, –4BL	10M–4A, –4AL	8
10M–5E, –5EL	10M–5B, –5BL	10M–5A, –5AL	10
10M–6E, –6EL	10M–6B, –6BL	10M–6A, –6AL	12

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REEVES-HOFFMAN

Described are typical units of commonly used types. Descriptive data, including measured capabilities, furnished on request. If your need concerns types and parameters not shown, please contact our plant.

Available with special C_0, C_1, and L_1 for filter applications • temperature coefficients to your specifications • pre-aging to guarantee stability of high precision units • special designs for high shock and vibration. All units meet mil-3098 requirements. Special high precision units, with aging characteristics up to 2×10^{-11} per day, are available in standard frequencies of 1, 2.5 and 5 MHz.

CRYSTALS

Frequency Range	Frequency Tolerance/Temperature Range			Holder Size (Military)*
	−55°C to +105°C	−40°C to +85°C	0°C to +50°C	
.85 to 50 kHz	±0.02%	±0.015%	±0.01%	HC-6, HC-13, HC-14
1 to 14 kHz	±0.02%	±0.015%	±0.01%	HC-13
14 to 150 kHz	±0.015%	±0.010%	±0.008%	HC-6, HC-13, HC-14, HC-17
90 to 300 kHz	±0.025%	±0.018%	±0.01%	HC-6, HC-13, HC-17
200 to 500 kHz	±0.012%	±0.008%	±0.003%	HC-6, HC-14, HC-17, HC-21(**)
200 to 800 kHz	±0.009%	±0.005%	±0.003%	HC-6, HC-13, HC-14, HC-17
250 to 800 kHz	±0.018%	±0.015%	±0.008%	HC-6, HC-14, HC-17
500 to 1,400 kHz	±0.005%	±0.004%	±0.0025%	HC-6, HC-14, HC-17
1.4 to 20 MHz	±0.004%	±0.004%	±0.002%	HC-6, HC-14, HC-17, 511, 512
10 to 200 MHz	±0.004%	±0.003%	±0.002%	HC-6, HC-13, HC-14, HC-17, HC-18

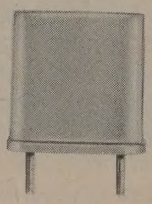
* All units listed are also available in T-5 ½ glass holder.

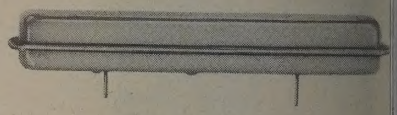
** Also available in T-9 glass bulb.

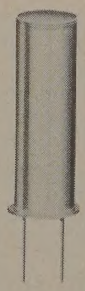
QUARTZ CRYSTAL HOLDERS

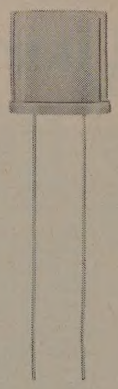
CW—Coldweld
SS—Solderseal

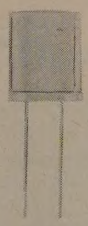
RH-13 (SS)

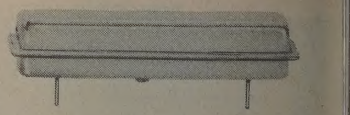

RH-6 (SS)


E-1 (CW)


A-3 (CW)


RH-512 (SS)

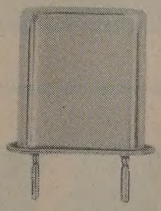

RH-18 (SS)


E-2 (CW)

A-2 (CW)

A-5 (CW)

C (CW)


DA (CW)

B-5 (CW)

E-3 (CW)

Illustrations show actual sizes

REEVES-HOFFMAN
DIVISION OF DCA
400 WEST NORTH STREET, CARLISLE, PA. 17013

REEVES-HOFFMAN CRYSTAL FILTERS

Note: The frequencies and bandwidths indicated are not to be considered production limitations. Variations of these filters can be made over the frequency range of approximately 10 kHz to 30 MHz (or higher).

BAND PASS

Center Frequency	3 dB Bandwidth	Shape Factor	Impedance (Ohms)	Size (in.) (L x W x H)
8 kHz	4 Hz	50:1 @ 40 dB	600	1.82 x 1.5 x 5.0
100 kHz	2 Hz	4:1 @ 60 dB	3K	4.25 x 2.0 x 3.82
250 kHz	100 Hz	3:1 @ 60 dB	8K	2.0 x 2.0 x 3.5
455 kHz	200 Hz	10:1 @ 60 dB	2K	3.5 x 1.5 x 2.0
700 kHz	1000 Hz	10:1 @ 80 dB	2.5K	1.5 x 1.5 x 3.5
1.75 MHz	400 Hz	5:1 @ 60 dB	1K	1.0 x 1.5 x 1.5
1.75 MHz	110 Hz	2:1 @ 60 dB	200	3.75 x 1.75 x 1.25
3.0 MHz	400 Hz	6:1 @ 60 dB	5K	3.0 x 2.0 x 1.5
4.0 MHz	1200 Hz	10:1 @ 70 dB	50	3.5 x 1.5 x 1.5
* 9.0 MHz	5400 Hz	2:1 @ 60 dB	470	1.5 x .75 x .32
*10.7 MHz	2700 Hz	2:1 @ 60 dB	470	1.5 x .75 x .32
*10.7 MHz	13 kHz	2:1 @ 60 dB	470	1.5 x .75 x .32
10.7 MHz	800 Hz	1.5:1 @ 60 dB	600	2.0 x 2.0 x 1.0
11.5 MHz	120 kHz	4:1 @ 40 dB	2K	1.5 x 1.5 x 1.0
20.0 MHz	30 kHz	1.7:1 @ 60 dB	1K	1.5 x 1.5 x 1.0
*25.0 MHz	26 kHz	3:1 @ 50 dB	2K	1.75 x .70 x .50
30.0 MHz	25 kHz	3:1 @ 60 dB	2K	1.5 x 1.5 x 1.0

* "MINILITH," Reeves-Hoffman monolithic design.
† Reeves-Hoffman "Hi-Fidelity" SSB design.

SINGLE SIDE BAND

Center Frequency	3 dB Passband	Min. Attenuation	Insertion Loss	Passband Variation	Impedance (Ohms)
250 kHz	−230 to −7730 Hz	60 dB	6.0 dB	3 dB max.	3K
250 kHz	+240 to +7740 Hz	60 dB	6.0 dB	3 dB max.	3K
1750 kHz	−350 to −3040 Hz	70 dB	6.0 dB	1.5 dB	3K
1750 kHz	+350 to +3040 Hz	70 dB	6.0 dB	1.5 dB	3K
†1743.71 kHz	−3255 to −5935 Hz	70 dB	3.0 dB	.5 dB	220
†1750.00 kHz	−255 to −3035 Hz	70 dB	3.0 dB	.5 dB	220
†1750.00 kHz	+255 to +3035 Hz	70 dB	3.0 dB	.5 dB	220
†1756.29 kHz	+3255 to +5935 Hz	70 dB	3.0 dB	.5 dB	220
* 9.0 MHz	(6 dB) +500 to +3000 Hz	60 dB	3.0 dB	1.5 dB	470
* 9.0 MHz	(6 dB) −500 to −3000 Hz	60 dB	3.0 dB	1.5 dB	470
*10.7 MHz	+500 to +3200 Hz	60 dB	2.0 dB	2.0 dB	470
*10.7 MHz	−500 to −3200 Hz	60 dB	2.0 dB	2.0 dB	470

REEVES-HOFFMAN CRYSTAL OSCILLATORS

Note: Parameters shown are not production limitations. Custom designing is available from 1 Hz to 200 MHz. Stability, aging, output voltage, waveform, and environment to your specifications.

Frequency	Aging	Output	Supply Voltage	Temp. Range	Size in.) (L x W x H)
60 Hz	3×10^{-8}/day	1v, rms	12v, ac	10°C to 60°C	4 x 4.7 x 4.9
400 Hz	25×10^{-6}/yr.	sq. wave	24v, dc	−32°C to +52°C	1.75 x 1.75 x 4.33
100.000 kHz	3×10^{-8}/day	1v, rms	28v, dc	−40°C to +70°C	1.88 x 1.44 x 3
90-650 kHz	25×10^{-6}/yr.	1v, rms	30v, dc	−30°C to +55°C	1.290 dia. x 4.062
1000.000 kHz	1×10^{-9}/day	1v, rms	28v, dc	0°C to 65°C	2 x 2 x 4.75
2500.000 kHz	2×10^{-11}/day	100 kc 1.0 mc 5.0 mc 1v, rms	24v, dc	0°C to 40°C	Rack mount 5¼" panel
5000.000 kHz	1×10^{-8}/wk	55mv	12v, dc and 26v, dc	0°C to 60°C	8.5 x 5 x 5

If You Need Oscillators...

Custom or Standard...

You're Looking in the Right Place.

With us, "custom" is customary.

That's exactly what you would expect from the company who offers the most comprehensive "SPECTRUM" of frequency control devices available, from less than 1 Hz to 100 MHz. With 20 years experience in our field (we were formerly Varo T & F) we've learned that nearly all oscillator requirements are a little bit different.

Sure we have standard designs, and we start with these and adapt them to fit YOUR requirements. Chances are, we have an existing design similar to your requirements no how complex. Some examples of our standard designs from Tuning Fork Resonators to Temperature Comp Crystal Oscillators are described briefly on the opposi

If you have a system application that requires custom fork oscillators, crystal oscillators, logic clocks, or fork resonators; phone or wire for complete technic

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Crystal and Tuning Fork Oscillators

ERATURE COMPENSATED CRYSTAL OSCILLATORS

for applications where no warm-up time ower is available, and minimal size and important to the user. Thermistor-var- pensation networks and Silicon IC active rovide optimum performance. Excellent stability results from use of glass-en- cold weld quartz crystal.

ting, hermetically sealed

curacy: ±1 x 10-4 at +25°C

ability: To ±3 x 10-7 at 0° to 50°C

00

10 kHz to 20 MHz, TTL, DTL output
2" x 2" x .63"

01

: 100 kHz to 20 MHz, TTL, DTL or sine wave output
2" x 2" x .75"

02

: 2.7 MHz to 20 MHz, TTL, DTL output
2" x 2" x ½"

TAL OSCILLATOR I.C. LOGIC CLOCK

specifically for commercial crystal oscil- Logic clock applications, this series wide range of accuracy vs. temperature Complimentary or single ended outputs are Printed circuit mounting.

031

y: 200 kHz to 20 MHz

ure: 0 to 55°C

: to .005%
Q Logic "0" = +0.5V Max. Sink 5 ma
Q Logic "1" = +3.0V Min. Source 1 ma
$\overline{Q}$ Logic "1" = +3.0V Min. Source 1 ma
$\overline{Q}$ Logic "0" = +0.5V Max. Sink 5 ma

1.25" x 1" x .5"

INIATURE CRYSTAL OSCILLATOR I.C. LOGIC CLOCK

y oscillator supplies a clocking signal for digital computer applications where space er are limited. Simple design allows use of quality components to attain high reli- Can be used in high shock, high vibration ents, including aircraft, shipboard, ocean- , missile, or mobile.

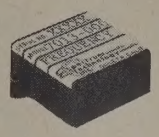
003

y: 3 MHz to 100 MHz

: ±10 ppm at 25°C
±50 ppm, −55°C to +125°C

: ±1 x 10⁷/24 hours at 25°C

: .88" x .88" x .45" Can be mounted on printed circuit board. Hermetically sealed.

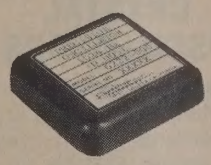


SUB-MINIATURE TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR

Designed for applications where no warm-up time or oven power is available, this series represents the smallest TCXO known. Employing state-of-the-art technology, these subminiature devices dissipate less than 80 mW of power. Excellent long-term stability results from the use of glass enclosed, or cold-weld quartz crystals.

SERIES 7013

Frequency: 8 MHz to 20 MHz
Accuracy: ±1 x 10-6 at +25°C
Stability: To ±1 x 10-6, −40 to +70°C
Package: 1" x 1" x ½" Can be mounted by terminals on PCB. Hermetically sealed.



PRECISION OSCILLATOR

Sub-miniature tuning fork oscillator. Combines advantages of ceramic transducers and modern integrated circuitry for high performance in a small package. Resonator element is mounted in silicon-rubber to provide isolation from shock and vibration.

SERIES 6222

Frequency: 1 kHz to 40 kHz without multipliers.
Output: 1 volt rms minimum to 10,000 ohm load, sine.
Package: 2" x 2" x ½" seated height. Lead mounted directly to printed circuit board. Hermetically sealed.

CRYSTAL OSCILLATOR I.C. LOGIC CLOCK

This series of high reliability, low power consumption I.C. Logic Clocks provide complimentary outputs for computer systems requiring both Q and $\overline{Q}$ logic levels. Low profile makes printed circuit mounting practical for high density packaging. This design has been found appropriate in high shock and vibration environments.

SERIES 7017

Frequency: 187.5 kHz to 20 MHz
Stability: ±.005%
Output: Q Logic "0" = +0.5V Max. Sink 5 ma
Q Logic "1" = +3.0V Min. Source 1 ma
$\overline{Q}$ Logic "1" = +3.0V Min. Source 1 ma
$\overline{Q}$ Logic "0" = +0.5V Max. Sink 5 ma
Temp. Range: −55°C to +125°C
Input: 5Vdc ±10%, 7 to 20 mA
Package: 1.2" x .6" x .5"

RUGGED TUNING FORK OSCILLATOR

Produces stable output frequency where reliable low frequency signals, small size and low weight are essential. All solid state. For use in all military and aerospace environments. Performs function of frequency standard, time base generator, computer clock source, speed control reference source, program controller, or frequency coding.

SERIES 6203

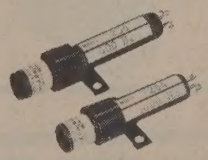
Frequency: 800 Hz-4,000 Hz
Output: 8V minimum peak to peak at 12 Vdc supply, to 10 K ohms, sine or square, with 10 microseconds maximum rise and fall time.
Package: 1¼" x 1½" x 1½" Stud mounted. Hermetically sealed.

SUB-MINIATURE TUNING FORK OSCILLATOR

Tiny eleven-gram package combines the advantages of ceramic transducers and modern integrated circuitry. Unit mounts by leads directly on printed circuit board. Tuning fork element is mounted in silicon-rubber which provides isolation from shock and vibration.

SERIES 6205

Frequency: 2 kHz to 40 kHz
Output: Logic "0", <+0.5 volts
Logic "1", +4.0 ±0.5 volts
Waveshape: Square
Rise-Fall Time: Less than 5% of total period measured from 10% to 90% of maximum.
Package: ⅞" square. Only 7/16" high when seated. Hermetically sealed.



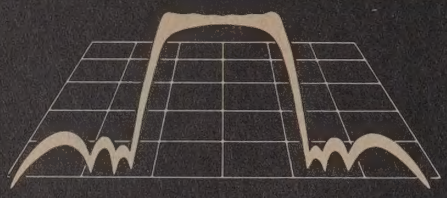
ELECTROMAGNETICALLY COUPLED TUNING FORK RESONATORS

Designed for use in oscillator circuits where frequency stability requires use of a mechanical resonator. Will withstand severe mechanical shock without calibration change. Resilient mounting clips provide vibration isolation. Hermetically sealed in drawn, cold-rolled steel cans.

	SERIES 256	SERIES 264
Frequency:	360 Hz — 2 kHz	1 kHz — 4 kHz
Accuracy:	±.05%	±.05%
Operating* Temp.:	−55°C — +100°C	−55°C — +100°C
Package:	2 7/16" long, ⅜" dia.	1 15/16" long, ⅜" dia.

*Closer tolerance over narrower temperature ranges available.

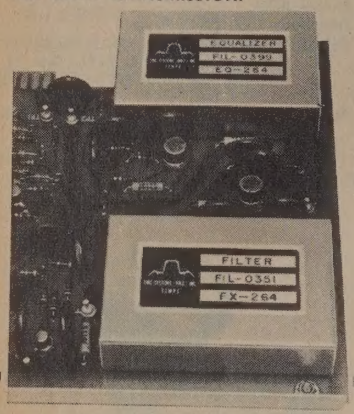
Spectrum Technology Inc
BLDG. 240, SANTA BARBARA AIRPORT • P.O. BOX 948
GOLETA, CALIFORNIA 93017 • PHONE (805) 964-7791 • TWX 910-334-1176
FEDERAL STOCK CODE NO. 32464



T.M.C. SYSTEMS (ARIZ.) INC.
930 W. 23rd ST. • TEMPE, ARIZONA 8528
PHONE (602) 967-7874
TWX 910-950-1943

CREATIVE LEADERS IN COMPONENTS FOR COMMUNICATION TECHNOLOGY

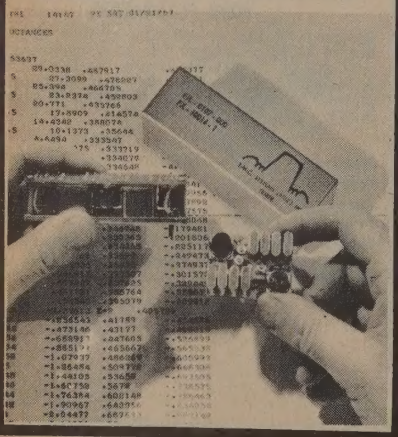
BANDPASS FILTERS & DELAY EQUALIZERS FOR VOICE, RTTY MULTI-PLEX OR DATA TRANSMISSION.



MINIATURIZED CRYSTAL OSCILLATOR

MINIATURIZED 8 POLE CRYSTAL FILTER

COMPUTER OPTIMIZED DESIGNS OF CRYSTALS, OSCILLATORS AND FILTER NETWORKS.



CRYSTAL FILTERS

DCA and/or MIL-STD-188 Type Crystal Filters that provide required amplitude and envelope delay characteristics without use of separate equalizers are available. Carrier Frequencies of 100KHz through 1750KHz for both two and four channel applications.

Standard and custom designs for bandpass, band reject, phase matched filters plus discriminators are available at frequencies of 10KHz through 30MHz.

CRYSTAL OSCILLATORS

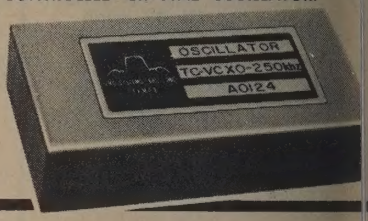
Fixed frequency, voltage controlled, temperature compensated or ovenized. Standards, miniaturized and custom designs available from 5Hz through 100MHz.

MAGNETIC COMPONENTS AND RESONATORS

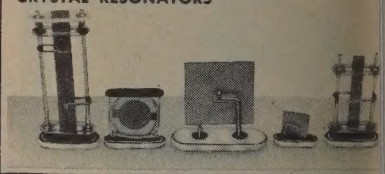
Lowpass, highpass, bandpass, band reject and prescribed transfer function characteristics available from 1Hz to 150MHz.

Custom resonator design and production is available for frequencies from 10KHz through 30MHz.

TEMPERATURE COMPENSATED VOLTAGE CONTROLLED CRYSTAL OSCILLATOR:

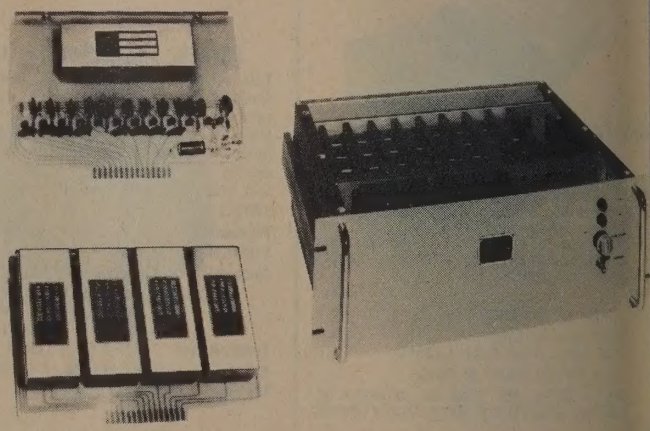


10 KHz TO 60 MHz STANDARD OR CUSTOM CRYSTAL RESONATORS



LC BANDPASS FILTERS

COMB FILTER ASSEMBLY 32 CHANNELS



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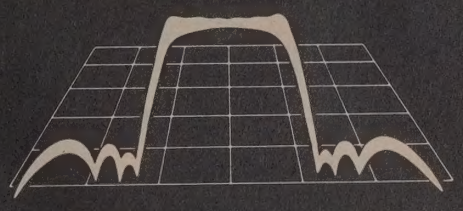
T.M.C. SYSTEMS (ARIZ.) INC.
30 W. 23rd ST. • TEMPE, ARIZONA 85281
PHONE (602) 967-7874
TWX 910-950-1943



Th is a partial listing of available designs. Modified or Custom designs are available for your specific ap ication. Contact our local representative (see yellow section) for technical or sales assistance.

Center requency	Passband	Stopband Bandwidth	Case Size in Inches	Insertion Loss (dB)	Source & Load Z (Ω)	Part Number
0.000 KHz	75 Hz USB	250 Hz at 40 dB	1.5 x 4 x 3	10	1K	FIL-0228
6.000 KHz	40 Hz	2 KHz at 30 dB	2 x 2 x .80	4.5	600	FIL-0055
9.275 KHz	217 Hz	1120 Hz at 20 dB	1.75 x 1.75 x 3.5	10	10K	FIL-0030
7.700 KHz	50 Hz	250 Hz at 50 dB	2.25 x 4 x 1.5	1	12K x 10K	FIL-0244
1.150 KHz	600 Hz	2300 Hz at 70 dB	1 x 2 x 3.5	4	1.8K-8.2K	FIL-0273
0.000 KHz	10 Hz	120 Hz at 40 dB	1.25 x 1 x 1.75	5	1500	FIL-0283
0.000 KHz	250 Hz	1 KHz at 60 dB	2 x 3.5 x .75	3	330	FIL-0099
0.000 KHz	2790 Hz USB	4790 Hz at 70 dB	2.5 x 3.5 x 2	3	330	FIL-0095
0.000 KHz	2790 Hz LSB	4790 Hz at 70 dB	2.5 x 3.5 x 2	3	330	FIL-0097
5.000 KHz	±10 Hz at 3 dB	3 Hz at 50 dB notch	2 x 6 x 2.5	3	1K	FIL-0131
0.000 KHz	400 Hz at 1 dB	30 Hz at 30 dB notch	2.9 x 2 x 2.5	2	12K	FIL-0008
0.000 KHz	2780 Hz USB	3500 Hz at 60 dB	1.875 x 2.75 x .65	4	500	FIL-0127
5.000 KHz	300 Hz at 6 dB	1700 Hz at 60 dB	.5 x 2.75 x .76	14	100K	FIL-0063
5.000 KHz	Dual 6 dB 100 Hz & 1000 Hz	1 KHz & 5 KHz Dual 60 dB	1.45 x 3.5 x 1	4 & 7	2.5K	FIL-0100
5.000 KHz	10 KHz at 6 dB	50 KHz at 60 dB	1 x 3.5 x 1	8	500-2K	FIL-0274
0.000 KHz	2 KHz at 6 dB	5 KHz at 40 dB	.6 x 4.66 x 1.5	7	50-500	FIL-0317
0.000 KHz	6 KHz at 6 dB	35 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0345
0.000 KHz	12 KHz at 6 dB	30 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0344
0.000 KHz	22 KHz at 6 dB	75 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0343
1.000 MHz	900 Hz at 6 dB	24 KHz at 50 dB	1 x 2.8 x 1.07	3	50K	FIL-0043
1.250 MHz	12 KHz at 6 dB	72 KHz at 60 dB	.8 x 1.25 x 3.5	10	500	FIL-0366
1.600 MHz	750 Hz at 6 dB	4 KHz at 60 dB	1 x 2.8 x 1.07	6	9K	FIL-0031
1.600 MHz	2800 Hz at 6 dB	15.2 KHz at 60 dB	1 x 2.8 x 1.07	6	9K	FIL-0005
1.750 MHz	2750 Hz USB	6 KHz at 60 dB	1 x 1.12 x 3.38	3	3.3K-500	FIL-0107
1.750 MHz	2750 Hz LSB	6 KHz at 60 dB	1 x 1.12 x 3.38	3	3.3K-500	FIL-0108
2.500 MHz	12 KHz	72 KHz at 60 dB	.8 x 1.25 x 3.5	10	500	FIL-0367
5.000 MHz	12 KHz	72 KHz at 60 dB	.8 x 2.5 x 1.25	10	500	FIL-0368
5.000 MHz	50 KHz	250 KHz at 50 dB	1 x 2.37 x 1.03	8	50	FIL-0377
5.750 MHz	3000 Hz at 3 dB	450 Hz at 60 dB notch	1 x 3.5 x 1	2	50	FIL-0230
6.290 MHz	500 Hz	20 KHz at 60 dB	.625 x 2⅛ x .750	6	470	FIL-0044
6.400 MHz	8000 Hz	20 KHz at 60 dB	.825 x 3 x .562	3	2.8K-150	FIL-0003
8.242 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0134
10.000 MHz	6300 Hz	63 KHz at 40 dB	1 x 1.77 x .88	6	50-500	FIL-0039
10.000 MHz	36 KHz	160 KHz at 60 dB	1 x 2.5 x 1	3	100	FIL-0035
10.125 MHz	40 KHz	80 KHz at 50 dB	.7 x 2.2 x .7	4	50	FIL-0375
10.700 MHz	70 KHz	140 KHz at 60 dB	1.31 x 2.35 x .782	8	50	FIL-0231
11.500 MHz	50 KHz	450 KHz at 60 dB	½ x 1.27 x .718	4	1K	FIL-0288
12.300 MHz	3200 Hz	52 KHz at 20 dB	.93 x 1.68 x .75	2	470	FIL-0113
13.418 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0295
15.542 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0296
16.533 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0314
21.400 MHz	20 KHz	40 KHz at 60 dB	1.2 x .6 x .4	3	700	FIL-0511
21.400 MHz	40 KHz	80 KHz at 60 dB	1.2 x .6 x .4	2	1400	FIL-0512
21.400 MHz	60 KHz	120 KHz at 60 dB	1.2 x .6 x .4	1	2100	FIL-0513
21.953 MHz	1600 Hz	20 KHz at 50 dB	1 x 1.5 x .875	5	2K	FIL-0028

If you need Custom Designs at Standard Prices — you need the experience of TMC working for you. Our Computerized Techniques provide you with Optimum Designs and Rapid Response at Cost Savings.

Complete sales and technical information available, contact Factory or Sales Rep. See Yellow section for local representative.

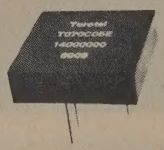
A Subsidiary of **THE TECHNICAL MATERIEL CORPORATION**

TOROTEL

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
PHONE: 816-761-6314 TWX-910-7777037

CRYSTAL CONTROLLED CLOCK OSCILLATOR

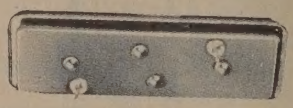
- **1 HZ to 25 MHZ Fixed Frequency Crystal Oscillator**



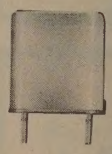
- **Available in Encapsulated P/C Mount or Hermetic**
- **Excellent Rise/Fall Time, Square Wave**
- **Compatible with T^2L Logic**
- **Minimum Power Required, All Solid State**
- **Economically Priced for Industrial Applications**

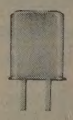
TYPE	*FAN OUT	FREQUENCY RANGE	TEMP. RANGE DEG. C.	TOLERANCE	POWER REQUIREMENT
T070E10E	10	7 KHZ to 100 HKZ	−20 to + 70	±200 PPM (.02%)	Operating Voltage 3.5 to 5.5 V DC
T070G10E	10	7 KHZ to 100 HKZ	−20 to + 70	±300 PPM (.03%)	Nominal Power 30 MW 100 KHz
T070F10E	10	7 KHZ to 100 KHZ	−20 to + 70	±500 PPM (.05%)	Special Order for other operating voltage.
T070E05E	5	100 KHZ to 500 KHZ	−20 to + 70	±200 PPM (.02%)	Logic Out:
T070G05E	5	100 KHZ to 500 KHZ	−20 to + 70	±300 PPM (.03%)	1 = 2.4 V Minimum
T070F05E	5	100 KHZ to 500 KHZ	−20 to + 70	±500 PPM (.05%)	0 = 0.4 V Maximum
T070D05E	5	500 KHZ to 2.5 MHZ	−20 to + 70	±100 PPM (.01%)	*1.6 MA Maximum per Unit
T070E05E	5	500 KHZ to 2.5 MHZ	−20 to + 70	±200 PPM (.02%)	Duty Cycle 40% to 60%
T100F05E	5	500 KHZ to 2.5 MHZ	−55 to + 100	±500 PPM (.05%)	RISE/FALL TIME (10% to 90% Points)
T070D05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	±100 PPM (.01%)	20 Nanoseconds or less — 2.5 MHZ and U
T070C05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	± 50 PPM (.005%)	50 Nanoseconds or less — .1 MHZ to 2.5 MHZ
T105D05E	5	2.5 MHZ to 25 MHZ	−55 to + 105	±100 PPM (.01%)	Size 1.5" x 1.5" x 0.45" Max.
T105C05E	5	2.5 MHZ to 25 MHZ	−55 to + 105	± 50 PPM (.005%)	For Metal Case Hermetic Seal Use H
T070J05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	± 20 PPM (.002%)	Suffix in Place of E Suffix.

QUARTZ CRYSTALS



COLD WELD





RESISTANCE WELD

Frequencies from 15 KHz to 100 MHz manufactured to the highest tolerances and hermetically sealed with e latest methods.

Torotel's cold welding process provides crystals to the most severe tolerances in the HC-38/U, HC-39/U and HC-4 U crystal holders. These holders are checked for helium leaks at parts in 10^{-9} CC per second. Crystals packaged in t s manner are especially suited for PC board mounting.

Resistance weld sealing is available **at no extra cost** in the HC-6/U, HC-18/U, HC-25/U and HC-33/U stand d holders. This process uses an electrical weld to seal the crystal unit in a helium-nitrogen atmosphere. Solder balls a d aging due to flux contamination are completely eliminated.

QPL-3098

In house laboratory facilities can perform testing to MIL-C-3098E. Many standard types are QPL approved a l custom designs are available on request.

CRYSTAL FILTERS

Crystal filters from 10 KHz to 30 MHz are computer designed for maximum performance. Custom designs a considered a challenge. Contact Torotel's engineering staff for assistance. See EEM Section 2700 for LC and Mode Filters.

TOYOCOM SYNTHETIC QUARTZ

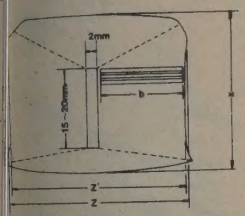
TOP IN QUALITY, WIDE SELECTION AND APPLICATION!!

TOYO QUARTZ is manufactured under strict controls and must pass severe testing before it is released, and then it is almost completely flawless and easier to use.

TOYO QUARTZ, the product of TOYO's many years of experience in quartz crystal manufacture, comes in various types and sizes for easy adaptation by the customer to fit his requirements. Although manufactured primarily for use in electronic communications equipment, especially in oscillators, TOYO QUARTZ is also suitable for optical applications particularly since its optical characteristics are superior to those of natural crystal.

or LOW FREQUENCY

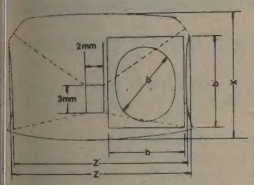
+2 5°Raw Synthetic Quartzs Size and Blanks Size



Types	Z (mm)	X (mm)	Max. b (mm)
Z-30	28~33	25~30	12~14
Z-35	33~38	30~35	14~16
Z-40	38~43	35~40	16~18

or HIGH FREQUENCY

0°Raw Synthetic Quartzs Size and Blanks Size

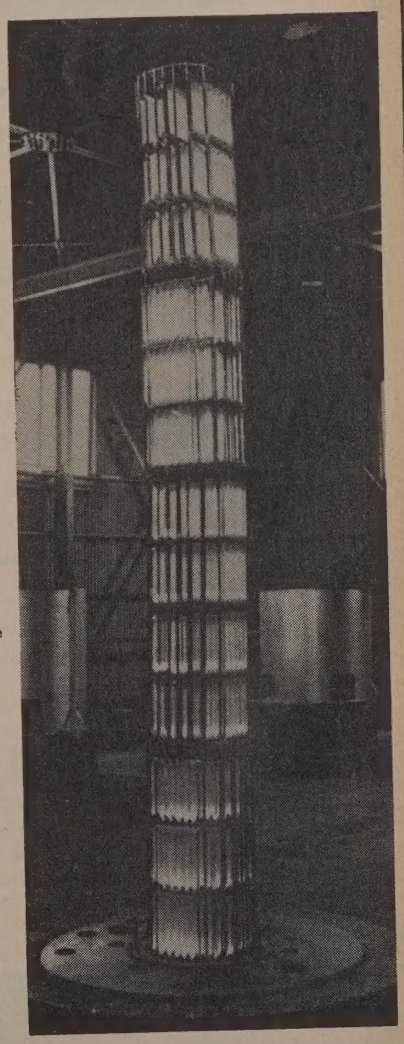


Blanks size (mmϕ)	b (mm)	b′(mm)	Z (mm)	X (mm)	Types
6.5	8~8.5	8~8.5	17~20	11~14	Yo-15,Yo-20
8.0	9.5~10	9.5~10	20~23	12~15	Yo-20
10.0	12~12.5	12~12.5	23~26	14~17	Yo-25
12.0	14~14.5	14~14.5	27~30	16~20	Yo-30
14.0	16~16.5	16~16.5	31~34	17~21	Yo-30,Yo-35

CLASSIFICATION OF TOYO QUARTZ

Types	Dimensions (mm) (a) Length	(b) Width	(c) Thickness	Weight/Bar (approx.)	Typical Application
Yo-20	130 to 160	19 to 23	12 or over		AT cuts, 7 to 9.5 mm, square
Yo-25	130 to 160	23 to 28	12 or over		AT cuts, 9.5 to 11 mm, square
Yo-30	130 to 160	28 to 33	15 or over		AT cuts, 11 to 14 mm, square
Yo-35	130 to 160	33 to 38	15 or over		AT cuts, 14 to 17.5 mm, square
Y2-30	130 to 160	28 to 33	15 or over		AT cuts, 11 to 14 mm, square
Y2-35	130 to 160	33 to 38	15 or over		AT cuts, 14 to 17.5 mm, square
Y5-30	130 to 160	28 to 33	12 or over		X cuts, 8.5 to 11 mm wide
X5-35	130 to 160	33 to 38	12 or over		X cuts, 11 to 13.5 mm wide
Zo-25	110 to 160	23 to 28	25 or over		X cuts, 7 to 8.5 mm wide
Zo-30	130 to 160	28 to 33	25 or over		X cuts, 8.5 to 11 mm wide
Zo-35	130 to 160	33 to 38	25 or over		X cuts, 11 to 13.5 mm wide
Z2-30	130 to 160	28 to 33	25 or over		X cuts, 8.5 to 11 mm wide
Z2-35	130 to 160	33 to 38	25 or over		X cuts, 11 to 13.5 mm wide
Z5-30	130 to 160	28 to 33	25 or over		X cuts, 8.5 to 11 mm wide
Z5-35	130 to 160	33 to 38	25 or over		X cuts, 11 to 13.5 mm wide

Please ask us when you want to have lumbert (predimensioned) quartz, then we can supply on your request.



TOYOCOM
TOYO COMMUNICATION EQUIPMENT CO., LTD.

EXPORT DEPARTMENT:
TORANOMON BLDG.,
15, SHIBA-TORANOMON, MINATO-KU,
TOKYO, JAPAN.
CABLE: EXPORTOYOCOM TOKYO

VECTRON

CRYSTAL OSCILLATORS Frequency St

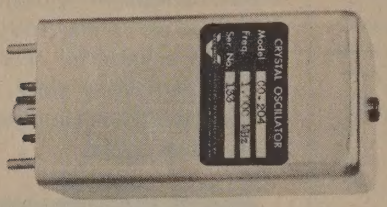
High Stability Crystal Oscillators (Oven Controlled)

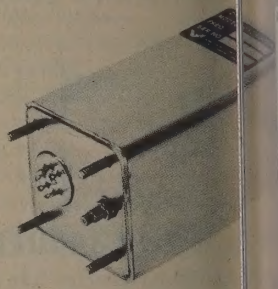
MODEL	CO-204	CO-203	CO-202	CO-201
AGING RATE	$1x10^{-9}$/day	$3x10^{-9}$/day	$5x10^{-9}$/day	$1x10^{-8}$/day
TEMPERATURE	0°C to +50°C: $\pm5x10^{-9}$ −20°C to +70°C: $\pm1x10^{-8}$ −55°C to +85°C: Optional			
FREQUENCY	1-15 MHz (lower and higher frequencies with inclusion of dividers or multipliers; have delivered units with output as low as 1 KHz)			
INPUT VOLTAGE	Oscillator: 5-32 VDC Oven: 5-32 VDC			
OVEN CONTROL	Proportional (integrated circuit)			
SIZE	2"x2"x4"; octal plug-in (Other configurations available)			

MODEL	CO-214	CO-213	CO-212	CO-211
AGING RATE	$1x10^{-8}$/day	$3x10^{-8}$/day	$5x10^{-8}$/day	$1x10^{-7}$/day
TEMPERATURE	0°C to +50°C: $\pm5x10^{-8}$ −55°C to +85°C: Optional			
FREQUENCY	500 KHz to 50 MHz (lower frequencies with inclusion of dividers)			
INPUT VOLTAGE	Oscillator: 5-32 VDC Oven: 5-32 VDC			
OVEN CONTROL	Proportional			
SIZE	2"x2"x3"; octal plug-in (Other configurations available)			

VHF

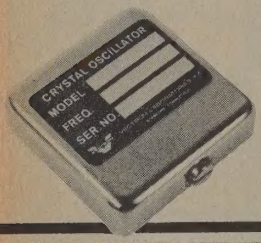
MODEL	CO-223	CO-222	O-22
AGING RATE	$3x10^{-8}$/day	$5x10^{-8}$/day	10-7
TEMPERATURE	0°C to +50°C: x10- −55°C to +80°C: ional		
FREQUENCY	Up to 125 M		
INPUT VOLTAGE	Oscillator: 20-3 DC Oven: 20-3 DC		
OVEN CONTROL	Proportional (integrated rcuit)		
SIZE	2"x2"x4"; 7 pin der and rf connect		





TCXOs (Temperature Compensated Crystal Oscillators)

MODEL	CO-251	CO-252	CO-252-3	CO-252-4
TEMPERATURE	0°C to 50°C $\pm1x10^{-6}$	−20°C to +70°C $\pm1x10^{-6}$	0°C to +50°C $\pm2x10^{-7}$	−55°C to +85°C $\pm5x10^{-6}$
INPUT	5-30V, 5ma	12-30V, 10ma	12-30V, 10ma	12-30V, 10
OUTPUT	1 VRMS into 1K (DDT/TTL compatible output optional)			
AGING	Better than $1x10^{-8}$/day and $1x10^{-6}$/year			
FREQUENCY	1-10 MHz (Higher and lower frequencies optional)			
SIZE	2"x2"x3¾" (smaller size and other configurations available)			



VCXOs (Voltage Controlled Crystal Oscillators)

MODEL	CO-271V	CO-273V	CO-22
FREQUENCY	10 MHz	1 MHz	100 M
VCXO RANGE	±0.1%	±0.5%	±.05
LINEARITY	±1%	±5%	±1%
STABILITY	0-50°C ±.001%	0-50°C ±.01%	0-50° ±1x10
OVEN	NONE	NONE	PROPORTI AL
SIZE	2"x2"x3¾"	2"x2"x3¾"	2"x2"x

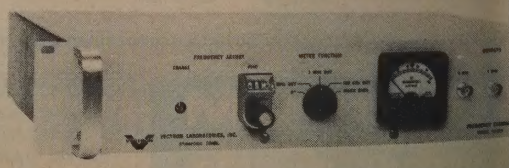
Clock Oscillators

MODEL	CO-231	CO-232	CO-234	CO-233M
OUTPUT	DTL/TTL	DTL/TTL	DTL/TTL	ECL
INPUT	5 VDC	5 VDC	5 VDC	−12 VDC
FREQUENCY	4 KHz-25 MHz	3-25 MHz	16 Hz-50 KHz	25-150 MHz
SIZE	*1½"x1½"x½"	1"x1"x½"	2"x2"x½"	1½"x1½"x⅝"
TEMPERATURE	STANDARD: 0°C to +70°C: ±.0025% Option-1: −55°C to +85°C: ±.005% Option-2: −55°C to +105°C: ±.005% Option-3: 0°C to +50°C: ±.0003%			

*For ⅜" height, specify CO-231L

Frequency Standards

MODEL	FS-323	FS-321A	CO-2
AGING	$1x10^{-10}$/day typical 30-60 days after turn-		
WARM-UP	$5x10^{-10}$/day, four hours after turn-on following 24 hour off period		
FREQUENCY	5, 1 & 0.1 MHz	5, 1 & 0.1 MHz	5 M
LEVEL	1 VRMS/50 ohms	1 VRMS/50 ohms	1 VRMS/5 hm
0-50°C	$\pm5x10^{-10}$	$\pm3x10^{-10}$	±3x1
INPUT	115/230 VAC	115/230 VAC	22-30
SIZE	3½"Hx19"Wx14"D	5¼"Hx19"Wx14"D	4"x4"x



ALCOKNOB

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

ALUMINUM INSTRUMENT KNOBS

STANDARD SERIES

"K"eries knobs are a completely matched family in four basic ia ters to enhance equipment appearance. Each knob is ma ined from one-piece aluminum and then anodized in either na al, black or gold. ALCO's 1¼" dia. K-1250-S Spinner Knobs are art of this "K" Series family and have the addition of a kn ed handle. The K-5700 matched knobs for concentric shaft co ols consist of two separate knobs: an upper knob for the in control shaft (⅛" dia.), and lower knob for the outer co ol shaft (¼" dia.)

Model	Finish — See Box Below	O.D.	One-99	100-249	250-499	500-999
K-( )	A, B, G	.500"	.45	.41	.39	.36
K-( )	A, B, G	.750"	.50	.45	.43	.40
K-( )	A, B, G	.937"	.55	.50	.47	.44
K-50	A, B, G	1.250"	.65	.59	.56	.52
K-50( )-S	A, B	1,250"	1.55	1.40	1.32	1.24
K-00	A, B	.500 & .750"	1.10	.99	.94	.88

SKIRTED ANODIZED KNOBS FOR ¼" SHAFTS

T "KS" and "KSP" Skirted Series offer an excellent matching kn group to the ALCO "K" Series described above. You may ch se between a solid aluminum skirt (KS Series), or the clear ac lic plastic skirt (KSP Series). The "KS" Series is available in ree body sizes, and the "KSP" Series is available in two si . These knobs have exceptional styling for the modern sp e-age technology, yet are reasonably priced for production u . The color grouping includes natural aluminum, and bl k anodizing.

Model	Finish — See Box Below	O.D.	Skirt Dia.	One-99	100-249	250-499	500-999
K 00	A, B	.500"	.750"	.60	.54	.51	.48
K 00	A, B	.750"	1.125"	.65	.59	.56	.52
K 00	A, B	.937"	1.406"	.85	.77	.73	.68
K-700	A, B	.750"	1.125"	.60	.54	.51	.48
K-900	A, B	.937"	1.406"	.65	.59	.56	.52

KNURLED ALUMINUM KNOBS

DIAMOND KNURL SERIES

T conical top of this series adds a new dimension to knob s ing. The nonslipping diamond knurl knobs feature precision ch ining, unbreakable strength, and uncompromizing anod- i l colors of natural, black or gold finish with hairline indi- ors. This fine diamond knurl knob combines the rich, a dized look in a metal knob, yet with all these quality features t ALCO "KD" Series costs far less than you would expect to . The diamond knurl family is available in four sizes.

Model	Finish — See Box Below	O.D.	One-99	100-249	250-499	500-999
500	A, B, G	.500"	.55	.50	.47	.44
700	A, B, G	.750"	.60	.54	.51	.48
-900	A, B, G	.937"	.70	.63	.60	.56
-1250	A, B, G	1.250"	.85	.77	.73	.68

STRAIGHT KNURL SERIES

CO's new "KN" Series of straight knurl knobs with hairline licators includes the lustrous solid anodized color types and decorative two-tone models. The straight knurl knobs have an, precision serrations of the highest quality. The anodized o-tone knob is available in two variations: (AB) natural minum body with black top, or (BA) black anodized body h natural top. For the first time ALCO is proud to offer a ting one-piece aluminum pointer knob (KPN-700) — thus mplementing this series.

Model	Finish — See Box Below	O.D.	One-99	100-249	250-499	500-999
N-500	A, B	.500"	.55	.50	.47	.44
N-700	A, B	.750"	.60	.54	.51	.48
N-900	A, B	.937"	.70	.63	.60	.56
N-1250	A, B	1.250"	.85	.77	.73	.68
N-500	AB, BA**	.500"	.75	.68	.64	.60
N-700	AB, BA**	.750"	.80	.72	.68	.64
N-900	AB, BA**	.937"	.90	.81	.77	.72
N-1250	AB, BA**	1.250"	1.10	.99	.94	.88
PN-700	A, B	.750"	1.40	1.26	1.20	1.12
PN-700	AB or BA**	.750"	1.60	1.44	1.36	1.28

RROWHEAD INDICATOR KNOBS FOR ⅛" AND ¼" SHAFTS

rowhead indicator on top of straight knurl body. Black ano- zed body with natural top only.

Model	Finish — See Box Below	O.D.	One-99	100-249	250-499	500-999
N-501	BA only	.500"	.80	.72	.68	.64
N-701	BA only	.750"	.85	.77	.73	.68

SKIRTED KNURL KNOBS FOR ⅛" AND ¼" SHAFTS

luminum skirt is added to straight knurl body. Engraved RROWHEAD indicator on skirt. Anodized two-tone.

Model	Finish — See Box Below	Knob O.D.	Skirt O.D.	One-99	100-249	250-499	500-999
NS-501	BA only	.500"	.750"	1.00	.90	.85	.80
NS-701	BA only	.750"	1.125"	1.15	1.04	.98	.92

ALUMINUM INSTRUMENT KNOBS

MINIATURE SERIES

With the development of solid state circuitry and the "squeeze" on the instrument panel, ALCO has created a mating series for miniature switches and controls having a ⅛" diameter shaft. The "KC" Series is designed for the MRA Series Alcoswitch, but usable with other components. "KCVS" Knobs provide the need for setting a predetermined stop position on controls or rotary switches with a ⅛" shaft. KC-500-10 has engraved numerals 0 through 9. KR-1 Knob Reducing Adapter can convert any knob having a ¼" shaft hole to fit a ⅛" size shaft.

Model	Finish—See Box Below	Description	One-99	100-249	250-499	500-999
K-500( )-⅛	A, B, G	Standard	.45	.41	.39	.36
KN-500( )-⅛	A, B	Straight Knurl	.55	.50	.47	.44
KN-500( )-⅛	AB, BA	Straight Knurl	.75	.68	.64	.60
KN-501( )-⅛	BA	Knurl-Arrowhead	.80	.72	.68	.64
KNS-501( )-⅛	BA	Knurl-Skirted	1.00	.90	.85	.80
KD-500( )-⅛	A, B, G	Diamond Knurl	.55	.50	.47	.44
KS-500( )-⅛	A, B	Skirted	.60	.54	.51	.48
KC-500( )	A, B	Skirted	.55	.50	.47	.44
KC-500( )-10	A, B	0-9 Numerals	.65	.59	.56	.52
KCVS-500( )	A, B	Adj. Stop	.10	.99	.94	.88
KR-1		Shaft Reducer ¼-⅛	.06	.045	.04	.036

DELUXE SERIES

These deluxe knobs are functionally styled to enhance the appearance and improve the operation of quality equipment. The unique, saw-cut indicator brings about the mod-trend in a complete family of knobs in four body sizes for use with ¼" shafts only; single set screws. More than any other component on your instrument panel, control knobs are in constant contact with the user. Customers first touch, twist, and use knobs (and are often influenced by this reaction) when purchasing hi-fi/stereo, tape recorder, test, lab and medical equipment. Model KHF-1250 is supplied with 2 set screws, and has 120° spacing.

Model	Finish*	O.D.	One-99	100-249	250-499	500-999
KHF-500	A, G	.500"	.45	.41	.39	.36
KHF-700	A, G	.750"	.50	.45	.43	.40
KHF-900	A, G	.937"	.55	.50	.47	.44
KHF-1250	A, G	1.250"	.65	.59	.56	.52

PLASTIC KNOBS WITH ALUMINUM TOPS

KNURLED KNOBS FOR ⅛" AND ¼" SHAFTS

Alco's new series of molded instrument knobs have been selected specifically for functional utility and attractive eye appeal. Designed to harmonize and enhance the appearance of any commercial and consumer electronic equipment. Available only in black plastic, each knob features an attractive spun aluminum cap plate thereby offering a pleasing two-tone effect. Equipped with molded-in brass bushing and standard 6/32 set screw. An indicating dot or hair line is provided on all knobs and is filled with white paint.

Model	Knob O.D.	Skirt O.D.	Shaft Dia.	One-99	100-249	250-499	500-999
PK-50B-⅛	.500"	.750"	⅛"	.25	.23	.22	.20
PK-50B	.500"	.750"	¼"	.25	.23	.22	.20
PK-70B	.750"	1.000"	¼"	.30	.27	.26	.24
PK-90B	.937"	1.250"	¼"	.35	.33	.30	.28

PKS dial skirt is natural anodized aluminum with or without numerals. The serrated knob body is of contrasting black with the aluminum spun plate on top. Available in the most popular size. Color: black. Indications: black arrow or 0 through 10 with 30° spacing. Brass insert and 6/32 set screw.

Model	Knob O.D.	Skirt O.D.	Shaft Dia.	One-99	100-249	250-499	500-999
PKS-90B	.937"	1.437"	¼"	.50	.45	.41	.40
PKS-90B-10	.937"	1.437"	¼"	.55	.50	.47	.44

STANDARD KNOBS FOR ⅛" AND ¼" SHAFTS

This new ALCO series has the advantage of slip-proof construction and still maintains maximum comfort which is important in the smaller size knobs. Extended plastic skirt and aluminum spun plate give this series a similar appearance to the other series listed. Color: black. Brass insert and 6/32 set screw.

Model	Knob O.D.	Skirt O.D.	Shaft Dia.	One-99	100-249	250-499	500-999
PKA-50B-⅛	.500"	.812"	⅛"	.30	.27	.26	.24
PKA-50B	.500"	.812"	¼"	.30	.27	.26	.24
PKA-70B	.750"	1.000"	¼"	.35	.32	.30	.28

FLUTED KNOBS FOR ⅛" AND ¼" SHAFTS

The knob body has deep flutes, dial skirt, aluminum spun plate, and medium gloss finish that complements any panel design. The PKB is ideal for commercial and deluxe instruments. Color: black. White indicator. Brass insert and 6/32 screw.

Model	Knob O.D.	Skirt O.D.	Shaft Dia.	One-99	100-249	250-499	500-999
PKB-70B	.750"	1.125"	¼"	.35	.32	.30	.28
PKB-90B	.937"	1.500"	¼"	.40	.36	.34	.32

K-500A-⅛

KS-500B-⅛

KC-500A

KC-500B-10

KCVS-500A

KR-1
Shaft Reducer

KHF-700A

PK-70B

PKS-90B-10

PKA-70B

PKB-70B

SPECIFY FINISH CODE FOR TYPES LISTED ABOVE

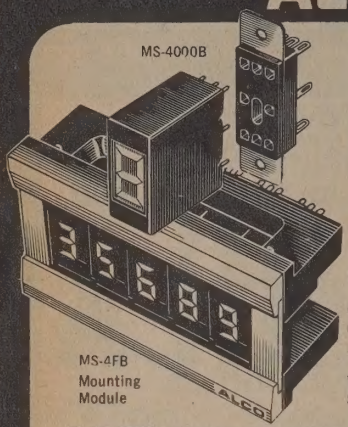
AB — Natural Body With Black Top; Black Indicator
BA — Black Body With Natural Top; White Indicator

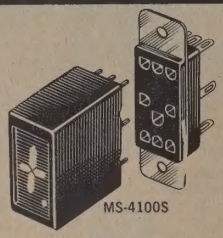
A — Natural Aluminum; Black Indicator
B — Black; White Indicator
G — Gold; Red Indicator

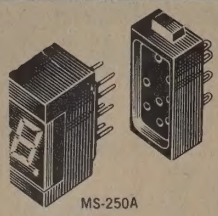
ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842
AREA CODE 617
686-3887

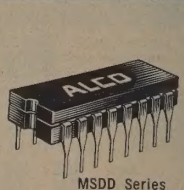
ALCOLiTE

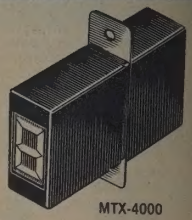
DIV. OF ALCO ELECTRONIC PRODUCTS, INC.











	4000 Series	250 Series
Lamps:	3-5 @ 40-60 ma. per segment	2.5V @ 20 ma. per segment
Current Drain:	80 ma (min.)	40 ma (min.)
Consumption:	420 ma (max.)	160 ma (max.)
Power:	.24 watt (min.) 2.1 watt (max.)	0.1 watt (min.) 0.4 watt (max.)
Weight:	15 grams	5.6 grams
Size:	.522x1.18x1.18″	

(A) MS-4000B—7-segment incandescent readout has a bright display that is clearly read under all ambient lighting conditions. The flat, single-plane display allows a wide-angle viewing without distortion. Large character size (.325″ x .600″) relative to case size (.552″ x 1.18″). Makes use of high temperature material housed in a one-piece, black matte metal case. Terminal pine are nickel-plated brass. Lamps are closely fitted into a compartmented block with short leads virtually eliminating vibration problems. Vibration test: 2000 c/s. Lamps are separately lit to form any numeral as desired by use of an external decoder/driver. High reliability, long life #683 T-1 subminiature lamps have a life expectancy of 150,000 hours.

MS-4100—as above, but with decimal and a slightly smaller figure. External dimensions same as above.

(B) MS4100S—symbol indicator with +, −, 1, and decimal, to match either the MS-4000 or MS-4100 readout.

(C) MS-250A—smaller version of 7-segment display. 0-to-9 characters. Snap-mount socket. Plastic housing.

MS-250S—symbol indicator (+, −, 1, and decimal) mates with MS-250A.

(D) MSDD Series 7-Segment Decoder-Drivers are monolithic MSI integrated circuits which decode BCD (8-4-2-1 code) inputs to 7-line outputs representing a decimal number from 0 to 9 on 7-segment incandescent display devices. 30 mA-per-line devices are: **MSDD-700** with decimal point, and **MSDD-701** with ripple blanking; both are for use with Alco MS-250 series. 80 mA-per-line devices are: **MSDD-702** with decimal point, and **MSDD-703** with ripple blanking; both are for use with Alco MS-4000, MS-4100, MS-6 and MSM-5 series. These devices are supplied in 16-lead dual in-line plastic packages which can be used over the operating temp. range of 0°C to +75°C.

(E, F) MTX Series Decimal-to-Seven Segment Decoders are designed to drive the Alco MS-4000B and MS-250A readout indicators. The MTX Decoder consists of an integrated circuit using a unique diode matrix which allows you to ea 0-to-9 (MS-4000B), and 0-to-9 numerals plus decimal point (MS-250A) readouts plug in directly to the logic module that has connections ma a 9-conductor flat cable. The MTX-4000 Decoder and MS-4000B readou can be installed in the MS-4FB bezel and mount assembly and provides modular digits.

(G) MS-4FB—provides custom look to MS-4000 or MS-4100 readouts. Bezel has a top and bottom aluminum extrusion. Assembly provides a maximum of 5 modular digits. Rear blocks accept the sockets generally supplied with readouts. Assembly comes complete with red filter; less sockets and 1″ mounting screws. Use with clear readouts.

	MTX-4000
ALCO Readout Used:	MS-4000B
Vcc Voltage to Ground:	5.7V
Lamp Terminal Voltage:	5.0V
Current (Max):	420 mA
Life:	300,000 hrs.
Temperature (environment):	60°C

Model	Description	Filter	One-99
†MS-4000BR	Numeric Readout*	Red	6.93
†MS-4000BC	Numeric Readout*	Clear	6.93
MS-4100BR	Numeric Readout*	Red	7.95
MS-4100BS	Numeric Readout*	Clear	7.95
MS-4100SR	Symbol Readout*	Red	7.95
MS-4100SC	Symbol Readout*	Clear	7.95
MS-250AR	Numeric Readout*	Red	8.25
MS-250AC	Numeric Readout*	Clear	8.25
MS-250SR	Symbol Readout*	Red	8.25
MS-250SC	Symbol Readout*	Clear	8.25
MSDD-700	Decoder 30mA/Seg., w/decimal point		12.75
MSDD-701	Decoder 30mA/Seg., w/ripple blanking		12.75
MSDD-702	Decoder 80mA/Seg., w/decimal point		14.75
MSDD-703	Decoder 80mA/Seg., w/ripple blanking		14.75
MTX-4000	Decoder/Driver for MS-4000B		12.85
MTX-250	Decoder/Driver for MS-250A		12.85
MS-4FBA	Module Section Kit, Natural		4.95
MS-4FBB	Module Section Kit, Black		4.95
MS-4BA	Bezel Only, Natural, pr.		1.25
MS-4BB	Bezel Only, Black, pr.		1.25
SKT-4B	Socket for MS-4000		.48

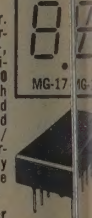
* Supplied with socket. † Available without socket, 6.45 each 1-99; 4.80 each 100-999; 3.85 each 1000-over.

MS Series Incandescent Mosaic—single plane 0 to 9 and some alphabet is displayed through diode-matrix (not supplied). Decimal points used as colon. Segmented bars are closely linked. Symbols with a +, —, figure "one" are available separately. Figures: .800″ high. Body Size: .834″ w. x 1.750″ h. x 2.104″ d. Lamp life: 20,000 hrs. Plug-in at rear of case. **MSM Series (miniature)**—as above, except smaller. Lamps: 5V 60 mA. Figures: .475″ h. Body: .475″ w. x .985″. Lamp life: 50,000 hrs.

Model	Volt	Description	One-99	100-999	1000-Over
MS-6A	6.3	Mosaic, Numeric	8.25	6.19	4.97
ME-6S	6.3	Mosaic, (+, −, 1)	8.25	6.19	4.97
MS-14A	14.0	Mosaic, Numeric	8.25	6.19	4.97
MS-14S	14.0	Mosaic, (+, −, 1)	8.25	6.19	4.97
MSM-5A	5.0	Mini Mosaic, Numeric	8.25	6.19	4.97
MSM-5S	5.0	Mini Mosaic, (+, −, 1)	8.25	6.19	49.7
MS-MTX	—	49 Diode Matrix	12.45	9.35	7.47
MS-SK-R	—	Right Angle Socket (MS)	1.55	1.16	1.03
MS-SKT	—	Socket (MS)	1.15	.92	.82
MSM-SK	—	Socket (MSM)	.85	.68	.57
MS-FLV	—	Filter, violet	.40	.28	.20
MS-FLR	—	Filter, red	.40	.28	.20
MS-FLG	—	Filter, green	.40	.28	.20

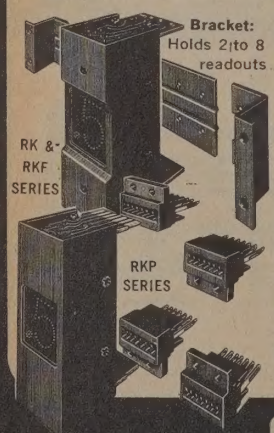
ELFIN® NEON INDICATORS

Elfin is a single plane cold cathode neon indicator. 0.413″ dia. allows more figures for panel space. Character 0.433″ h. 9-Segmented MG-19 displays 0 to 9, +, −, decimal, some alpha. MG-17 has 7 segments, 2 decimals. Suitable for DC or pulsed operation. **MSDD-720** Series are hybrid BCD to 7-Output Decoder/Drivers with active high voltage outputs designed to drive segmented displays or other devices requiring high voltages and medium current-sinking capabilities. **MGDL-200** Decode/Display module with MG-19 Elfin features integrated circuit compatible 4 line BCD input. **PC-117** Power Supply for MGDL-200 provides unregulated +200 VDC for the readout and regulated +5V for the circuit requirements.



Model	Description	One-99	100-999	1000-Over
MG-19	9-Segment Neon Indicator	4.95	3.75	2.99
MG-17	7-Segment Neon Indicator	4.95	3.75	2.99
MSDD-721	Decoder Driver	14.60	10.95	8.76
MSDD-722	Decoder Driver With Memory	17.85	13.39	10.71
MSDD-723	Decoder Driver With Memory and Decade Counter	Write for prices		

		1-24	25-99	100-499
MGDL-200	MG-19 Elfin Mounted on PC with Driver & Decoder Module	29.95	22.50	19.97
PC-117	Logic Power Supply	39.95	29.95	23.99



RK Series—precision machined from 1-piece aluminum which also serves as a heat sink for the bulbs. Front and rear tapped holes for mounting on a panel or on RKA-2-8 brackets. RK-FLV violet filter reduces reflected lighting for a better contrast. Unique in-line design provides clear displays without focusing problems. Compact size. Long life bulbs—20,000 hrs. Engraved acrylic plates are tightly-packed, edge-lit. **RKP Series**—plug-in readout indicators are designed for ease of use. **RKF Series**—has a larger 1-piece aluminum body with 1″ high numerals, along with 2 long-life bulbs per numeral for increased brightness. Numeral Size: 55″ h. (RK, RKP, RKF). Bulbs Used (T-1¾): #2181 (6.3V), 2182 (14V), A-24 (24V). Current Drain: 6.3V @ 200 ma., 14V @ 80 ma., 24V @ 50 ma. (RK, RKP). 6.3V @ 400 ma., 14V @ 160 ma., 24V @ 100 ma. (RKF). Body Size: 2.56 x .78 x 83″ (RK, RKP). 3.30 x 1.18 x 1.18″ (RKF).

Model	Volt	Description	One-99	100-999
RK-6	6.3	Edgelighted, Numeric & Period	8.25	6.19
RK-14	14.0	Edgelighted, Numeric & Period	8.25	6.19
RK-24	24.0	Edgelighted, Numeric & Period	8.75	6.56
RK-6S	6.3	Edgelighted, Symbol (+, − VΩ %)	8.25	6.19
RK-14S	14.0	Edgelighted, Symbol (+, − VΩ %)	8.25	6.19
RK-24S	24.0	Edgelighted, Symbol (+, − VΩ %)	8.75	6.56
RKP-6	6.3	Edgelighted, Numeric & Period	8.25	6.19
RKP-14	14.0	Edgelighted, Numeric & Period	8.25	6.19
RKP-24	24.0	Edgelighted, Numeric & Period	8.75	6.56
RKP-6S	6.3	Edgelighted, Symbol (+, − VΩ %)	8.25	6.19
RKP-14S	14.0	Edgelighted, Symbol (+, − VΩ %)	8.25	6.19
RKP-24S	24.0	Edgelighted, Symbol (+, − VΩ %)	8.75	6.56
RKF-6	6.3	Edgelighted, Numeric & Period	15.75	11.80
RKF-14	14.0	Edgelighted, Numeric & Period	15.75	11.80
RKF-24	24.0	Edgelighted, Numeric & Period	16.60	12.45
RKF-6S	6.3	Edgelighted, Symbol (+, − VΩ %)	15.75	11.80
RKF-14S	14.0	Edgelighted, Symbol (+, − VΩ %)	15.75	11.80
RKF-24S	24.0	Edgelighted, Symbol (+, − VΩ %)	16.60	12.45
RKA-2.8	—	Bracket (RK, RKP)	1.65	1.24
RK-FLV	—	Violet Filter (RK, RKP)	.40	.28
RKF-FLV	—	Violet Filter (RKF)	.50	.35
RK-SKT	—	Pr. Sockets (RKP, RKF)	1.65	1.24
RK-SKT-C	—	Pr. Sockets w/cover (RKP, RKF)	2.45	1.85

ALCO® ELECTRONIC PRODUCTS, INC.

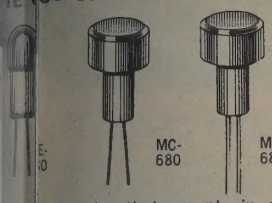
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CO
686-3

ALCOLiTE

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

TE CO® 5V PILOT LAMPS



iniat zed series that mounts in a 3/16" vaila only with the most popular 5V @ rat lamps having a 100,000-hr. life. high emperature plastic assembly con- ong e leads (Type ME-680L), or with tand #680 T-1 lamp. Supplied either ntact (ME-680) for PC boards. MC-680 ns a 3 T-1 lamp. Lead length 6"

	Description	One-24	25-99	100-499	500-999
80	W Pin Contacts	.89	.59	.54	.45
80L	Vn 6" Leads	.89	.59	.54	.45
80	Vn Pin Contacts	.99	.67	.60	.49
80L	Vn 6" Leads	.99	.67	.60	.49

ly Cho — Red, White, Green, Blue, Yellow.
ly Cho — Red, Green, Amber, Blue, White.

ATUR INCANDESCENT T-1 LAMPS

mmerc-MIL Grade Lamps produced to needs f today's design engineers. The T-1 ps list below are for applications where e is t a premium and long life is a ting nuirement. Each lamp in this series ubjec to a 16-hour aging period and is selled as to shade, brightness, and rent n.

Amp (±10%)	M.S.C.P. (±25%)	Average Hr. Life	One-24	25-99	100-499	500-999
.060	.032	100,000	.79	.53	.48	.40
.060	.053	100,000	.79	.53	.48	.40
.075	.088	60,000	.79	.53	.48	.40
.115	.147	40,000	.79	.53	.48	.40

5V MIL-GRADE T-1 LAMPS

e Tolance assures the user of the high- n reability by an initial burn-in period of hours minimum at or above the rated ages. ring this period, strains are re- ed ar early failures are detected. Each p is lected for close light output toler- e wh assures predicted average life n ve close limits.

Amp (±10%)	M.S.C.P. (±15%)	Average Hr. Life	One-24	25-99	100-499	500-999
.060	.032	100,000	1.29	.86	.78	.65
.060	.053	100,000	1.29	.86	.78	.65
.075	.088	60,000	1.29	.86	.78	.65
.115	.147	40,000	1.29	.86	.78	.65

MINIURE NEON T-1-1/8 LAMPS

smalst Neon Lamp is unique for its size bri nce. Ignition voltage is 75 VAC or VDC. urrent should be limited to 800 μA. eries sistor of 150K is recommended for 1V peration or 180K for 220V. Light out- vari ons are possible with changes in tage series resistance with resultant anges life expectancy of 10,000 hours.

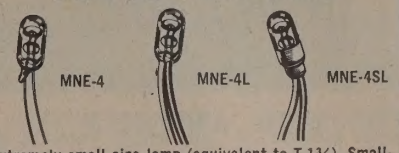
odel	Description	One-24	25-99	100-499	500-999
E-3	Standard	.59	.39	.35	.29
E-3H	High Intensity	.69	.46	.41	.35

EXTRA LONG NEON LAMP

dial in lamp replaces readout tubes in "over nge" position of digital voltmeters. usu as "⊥" or "−" display or where nger umination is needed and not avail- with a conventional NE-2. The lighted trode designed to mate with Alco MG-17 MG- Elfin tube, or other comparable n re outs. Breakdown: 90 VDC; Main- ed V VDC; Design Current: 1.3 mA. Life: 00 h 1.0" overall length.

	Description	One-24	25-99	100-499	500-999
211	Short Bare Leads	.39	.27	.24	.20

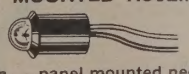
BRITE GLO® NEON LAMPS



Extremely small size lamp (equivalent to T-1 3/4). Smallest neon in the industry. Bullseye appearance gives the largest glow where needed on top. Rounded top places the illuminated area closer to the viewing point. Metal base (Model MNE-4SL) increases light output and protects lamp from damage.

Model	Description	One-24	25-99	100-499	500-999
MNE-4	With Short Bare Leads	.49	.33	.29	.24
MNE-4L	With 10" Insulated Leads	.53	.35	.31	.27
MNE-4SL	With 10" Insulated Leads and Metal Base	.59	.39	.35	.29

PANEL MOUNTED ASSEMBLIES

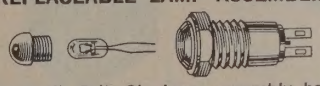


PLN-100 Neon — panel mounted neon Brite Glo lamp assembly incorporates the crater electrode T-1 3/8 **MNE-4L** in a black phenolic case. It has 10" leads and mounts in a 1/4" hole.

PL-105 Incandescent — panel mounted lamp assembly is ultraminiature in size. A mate to the Brite Glo panel mounting series (PLN-100 above) only with incandescent lamp that operates on 5V @ 60 ma. and having 100,000-hr. life. Mounts in 1/4" hole; has 10" insulated leads.

Model	Panel Mtg.	Lamp	One-24	25-99	100-499	500-999
PLN-100	10" Leads	Neon	.89	.59	.54	.45
PL-105	10" Leads	Incand.	.79	.53	.48	.40

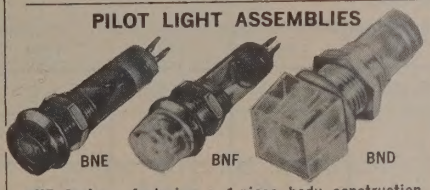
REPLACEABLE LAMP ASSEMBLIES



Ultra small, Brite-Glo lamp assembly has a simple lamp replacement feature. The removable round dome lens unscrews and the tiny T-1 lamp is exposed for easy removal from the front of the panel, without tools. Standard #680 lamp rated 5 volts @ 60 ma, supplied installed. Mounts with 9/32-32 nut. Colors available: Red, Green, Blue, Yellow, or White — specify.

Model	Description*	One-24	25-99	100-499	500-999
BFK-5	Replaceable Lamp Assy.	1.29	.88	.77	.65

PILOT LIGHT ASSEMBLIES



BNE Series — featuring a 1-piece body construction, this miniature neon pilot is ideally suited to indicate toggle switch positions, or for other display configurations with space limitations. A particular characteristic of this model is the compact lens system protruding slightly above the panel. Operating voltage, 75 VAC without resistor; for 115 VAC operations use external resistors (150K for standard intensity, 33K for high intensity) not supplied. Single 5/16-32 mounting.

BNF Series — similar to the BNE Series except that the lens system extends a greater distance beyond the panel for a bright illumination. This model has a permanent built-in neon and operates on 75 VAC. An external resistor required for 115 VAC. Turret type lugs are used for simplified hookup. Single 5/16-32 mounting.

BND Series — combines an entirely new look in a space-saving pilot assembly. The neon protrudes beyond the panel to provide maximum light intensity. This model is available with or without built-in series resistor for 75V or 115V operation, and is also available as standard or high intensity. Single 3/8-32 mounting.

Model	Description*	One-24	25-99	100-499	500-999
BNE-2	Standard, Less res.	.59	.39	.35	.29
BNE-3	Hi-Int., less res.	.69	.46	.41	.35
BNF-2	Standard, less res.	.59	.39	.35	.29
BNF-3	Hi-Int., less res.	.69	.46	.41	.35
BND-2	Standard, less res.	.59	.39	.35	.29
BND-2R	Std., with 150K res.	.69	.46	.41	.35
BND-3	Hi-Int., less res.	.69	.46	.41	.35
BND-3R	Hi-Int., with 33K res.	.79	.53	.48	.40

* Specify Choice — Red, Amber, Clear, White.

MINIATURE TRANSISTORIZED LOGILITE

ALCO FIRST — Created to provide a neon glow presentation operating from a low voltage supply source. Has a self-contained transistorized generator that provides the high voltage necessary to excite the neon. Design problems are thus simplified in computers, data processing and industrial control systems. Bushing length, 3/8" long. Dimensions behind panel, 1 3/8" less terminals. 5/8" dia. **LVN-ML-5V lens** is flat cylindrical with internal fresnal ring; specify red or clear. **LVN-SL-5V lens** is flat cylindrical lens with internal concentric circles to enhance lighting effect.

LVN-ML-5V

LVN-SL-5V

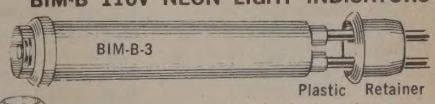
SPECIFICATIONS

	LVN-ML-5V	LVN-SL-5V
Normal Operating V.:	5 VDC	5 VDC
Normal Current:	30 mA	40 mA
Max. Range:	6V @ 36 mA	6V @ 52 mA
Min. Range:	4V @ 21 mA	4V @ 28 mA
Mounting:	3/8-32 NEF-2A	15/32-32 NEF-2A

Model	Mtg. Hole	One-24	25-99	100-499	500-999
°LVN-ML	3/8"	4.85	3.30	2.91	2.43
°LVN-SL	15/32"	4.95	3.37	2.97	2.48

Specify lens color: red, or clear

BIM-B 110V NEON LIGHT INDICATORS



General purpose panel indicators have more versatility than similar models. 8 Lens Styles: Allow a greater variety to choose from (see below). **NE2H High Intensity Lamp** is incorporated and contains built-in series resistors for 110V operation. Flexible 6" leads, tinned conductors, high temperature insulation 105°C. Black wire size: solid 22 AWG. Polypropylene indicator housing (white) with acrylic lens — available in Red, Amber, and Clear — specify. Mounts 5/16" dia. hole.

RETAINER — use of the mounting retainer supplied with each BIM indicator allows the installer to have 2 methods of panel installation. One choice is the conventional way where the retainer is pushed against the back of the panel and the indicator is placed through it. An optional choice of mounting is to fit the retainer on the front side of the panel, in a 11/32" dia. hole.

BIM-R Metal Retainer (available separately) provides a snug-fit in a minimum of space. Used only with BIM Series having a 3/16" hole mounting. Packaged, sold in multiples of 25.

Model	Description*	One-24	25-99	100-499	500-999
BIM-B-1	With Lens 1*	.59	.39	.35	.29
BIM-B-2	With Lens 2*	.59	.39	.35	.29
BIM-B-3	With Lens 3*	.59	.39	.35	.29
BIM-B-4	With Lens 4*	.69	.46	.41	.35
BIM-B-5	With Lens 5*	.69	.46	.41	.35
BIM-B-6	With Lens 6*	.69	.46	.41	.35
BIM-B-7	With Lens 7*	.69	.46	.41	.35
BIM-B-8	With Lens 8*	.69	.46	.41	.35
BIM-R	Metal Retainer	—	.02	.018	.015

* Specify color: Red, Amber, or Clear.

BIM-A SERIES NEON INDICATORS

BIM-A-1

These neon light indicators, with one lens style, are described in the BIM story (at left) but are fitted with solder lugs, and body lengths are shorter. BIM-A-1 has a NE2H lamp and is for use with an external resistor (not supplied); body length is 2 1/32". BIM/4A has a NE2H lamp and contains a built-in series resistor for 110V operation; body length is 1". Colors available for both types: Red, Amber, Clear — specify. Retainer is included.

Model	Description*	One-24	25-99	100-499	500-999
BIM-A-1	Without Resistor	.69	.46	.41	.35
BIM-A-4	With Resistor	.79	.53	.48	.40

* Specify color: Red, Amber, or Clear.

MINIATURE NEON PANEL INDICATORS

General purpose sub-miniature panel indicator for use with an external series resistor. The 1-piece body houses a sub-miniature high intensity neon lamp. The metal mounting retainer push fits into a 1/4" dia. hole. Wire leads, metal retainer included. Choice of colors: Red, Amber, or Clear — specify.

Model	Description*	One-24	25-99	100-499	500-999
SM-1	Less Resistor	.89	.59	.54	.45

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ELECTROMAGNETIC INDICATORS

ALLARD INSTRUMENT

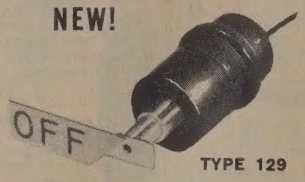
Designed for compact instrument and control panels, Allard miniature electromagnetic indicators provide positive visual signaling, are not subject to burnout, assure high readability in strong incident light. One-piece balanced rotor for dependable performance under shock and vibration. Models for momentary or latch g operation, from DC or rectified AC. All models can e supplied to meet particular requirements for operat g voltage, type of display and mounting, to commer or MIL specifications.

NEW!

TYPE 130

Tiny indicator, totally enclosed structure. Rotation up to 60°. CW or CCW. For use with plug-on (demountable) flags. Operates in any position. Case size 7/16" OD x 25/32" L.

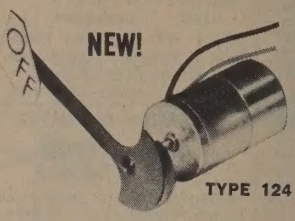
NEW!



TYPE 129

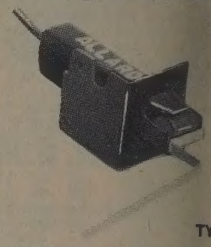
Shorter version of the Type 104 and just as powerful. For CW or CCW rotation using demountable flag arms. Rotational angles to 60°. Works in any position. 7/16" diam. x 3/4" long.

NEW!



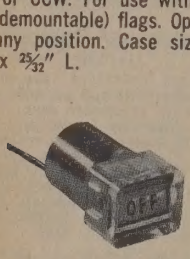
TYPE 124

Miniaturized version of Type 104 with rotation up to 45°. Available with CW or CCW rotation. For use with plug-on (demountable) flags. Operates in any position. Case size — 3/8" O.D. x .575" long.



TY

Relatively inexpensive rsi of our old Type 101. C di play legends on the dru fa or rotate a flag arm / CCW. Two position mor ta or latching operation. In ato drum is .300" wide x 30 diam. Total length is 1 .

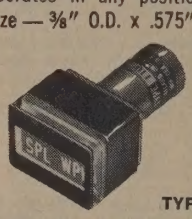


TYPE 120

Tiny broad faced indicator available in 2- or 3-position momentary or 2-position latching indication. Capped or sealed. Shows colors or legends. Head is 9/16" wide by 7/16" high. Body 1/2" dia. Overall length 15/16".

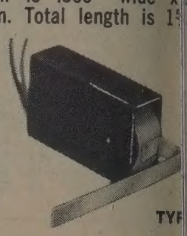
TYPE 108

Small indicator for 2- or 3-position momentary or 2 position latching (memory) indications. Plastic head can pipe external light to indicating face. Colors or legends as required. 1 1/8" long, 3/8" dia., 7/16" square head.



TYPE 110

Extended face indicator, permits display of complete words or multiple symbols. For 2- or 3-position momentary, or 2-position latching indication. Plastic capped for dust and moisture protection, or hermetically sealed. Length 1 3/4", head 1" by 3/4".



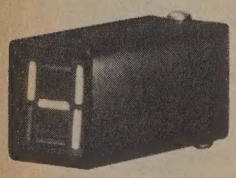
TYP 10

Two or three position sli ind cator for narrow location Ca supply power to rotate fla arm up to 60° or can dis y legend directly on rotor ac CW or CCW for two p tio operation. .270" x .562" 1

Types	129	108	109	110	120	130	219	1
D.C. VOLTAGES	To 40	To 90	To 40	To 50	To 40	To 28	To 40	To
OPERATING POWER (WATTS)	0.9	1.0	1.0	0.5	0.5	0.8	0.9	1
NO. OF CONNECTIONS	2	2, 3	2, 3, 4	2, 3, 4	2, 3	2	2, 3, 4	
WEIGHT (GRAMS)	10.5	10.6	9.	35	9.5	10	15	

ELECTROMECHANICAL READOUTS

High Visibilit! Inherent Mer



A wide variety of other sizes available in single and multi-unit packages.

TYPE 213

Compact digital indicating modules for instrument, data presentation and other display systems. Seven electromagnetic indicating segments can be operated in any desired combination by low power DC signals. Momentary or latching types. Windings for a wide variety of DC voltages. 1 1/16" h. x 5/8" w. x 1 5/8" d. Digit size: 1/2" h. x 3/8" w. Less than 0.03 sec. operating time.

TYPE 1218

Complete readout display operating as remote repeater of cash register readings. Contains readouts, encoding matrices, pulsing and cycling circuitry and its own power supply. Use of latching (memory) type readouts makes average power consumption negligible. Packaged for all-weather, outdoor use. Uses 4 Type 218 readouts, 4" high.

Other sizes available

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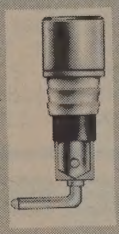
10-48 43rd AVENUE CORONA, NEW YORK 11368 212-899-5588

MINI-BRITE "simplicity" in subminiature indicator lights

MINI-BRITE 75001 Panel mount

MINI-BRITE 75002 Panel/Printed Circuit Mount



MINI-BRITE 75003 Printed Circuit Mount

MINI-BRITE subminiature indicators have been engineered and manufactured with the idea of achieving the ultimate simplicity, standardization, reliability and cost efficiency . . . this has been accomplished by the design unique housing and contact arrangement centered on use of standard, wire terminal lamps . . . which provides intensity comparable to units five times their size.

MINI-BRITE subminiature indicators feature unique design characteristics which will offer maximum advantage to the equipment designer . . . such as —

- **Standard Lamps Simple Plug-in Installation**
- **Optional Wiring and Mounting Types**
- **Hi-Density — Low Weight Design**
- **Coded Caps • Letters Numbers • Symbols**

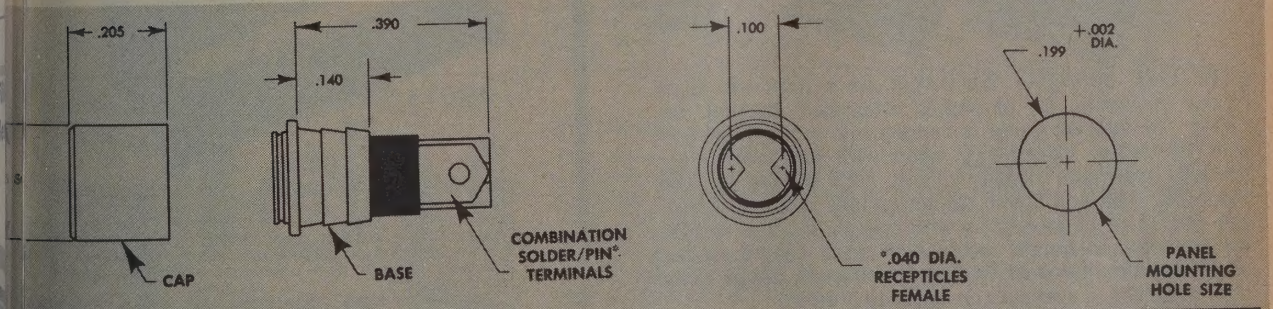
WRITE FOR BULLETIN 1470

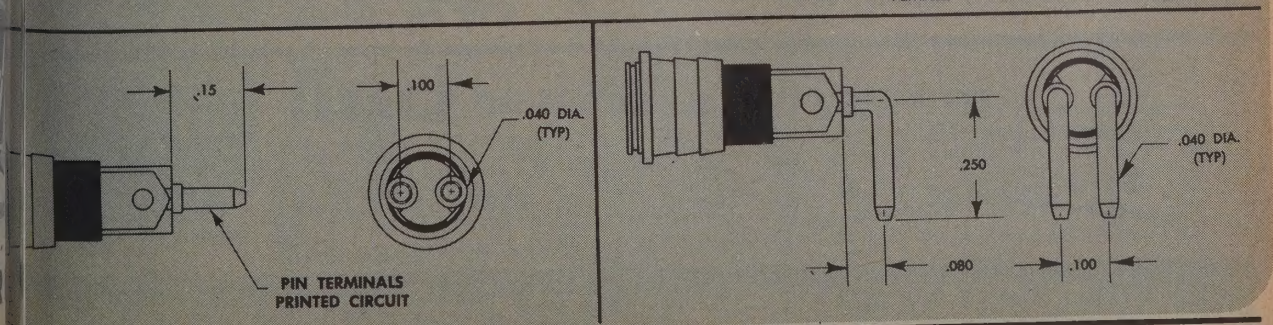
SEE OUR CO-ORD SWITCH MATRIX PROGRAM BOARDS IN SECTION 2100

HOUSING GUIDES LAMP LEADS TO CONTACTS

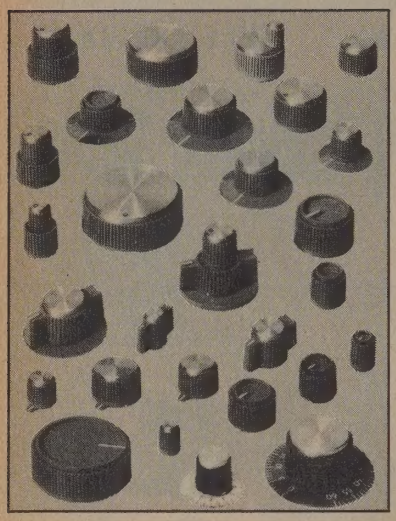
Housing is keyed so that wire leads of lamp will only be accepted by the electrical contacts.

MINI-BRITE SPECIFICATION





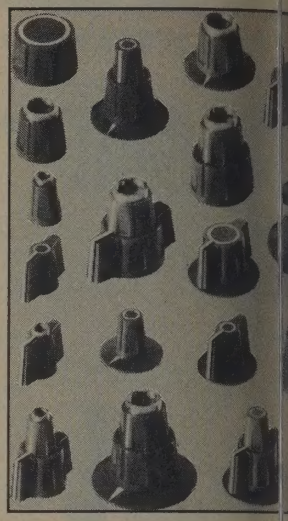
BUCKEYE



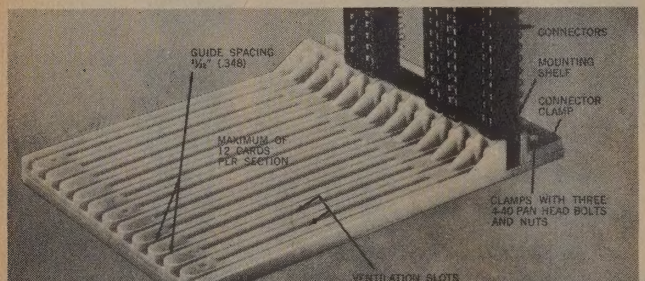
KNOBS

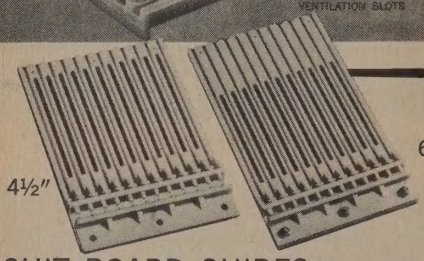
Your instrumentation can now be greatly enhanced by the use of a harmonizing style of the uniquely designed Buckeye Matching Instrument Knobs. They're available in six attractive styles in four stock colors, and in six basic sizes.

This "MATCHING INSTRUMENT LINE" features single-round, concentric, bar and half bar, spinners, pointers and skirted knobs with numerous variations. Molded of Cycolac, Buckeye knobs are noted for their toughness, rigidity, dimensional stability, high gloss and resistance of stain, weather and heat. They are fitted with metal bushings and 2 set screws. All caps are spun aluminum and are corrosion protected by anodizing.



bord-pak®

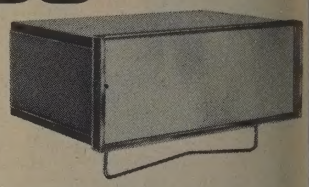




NEW
½" spacing also available

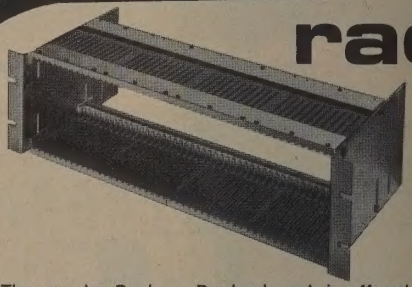
CIRCUIT BOARD GUIDES are a time and labor saving innovation for packaging integrated modular circuitry. The Cycolac guide is molded into a single section with 12 tracks, spaced 11/32" apart with ventilation slots for safe maximum density circuit card packaging. The mounting shelf and clamp design assures quick and positive alignment of connectors with only three bolts. Guides are available to accept either 4½" or 6" length etched or printed circuit boards. Module spacing and design other than standard is available on quantity orders.

cases

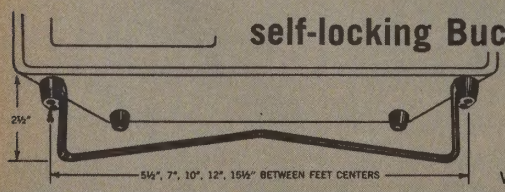


Bord-pak cases are designed in three popular funct
to facilitate economical assembly of standard 4½" cir
The recessed satin anodized front panel and polis
num frame trim harmonizes with the "over-tone" g
grain finish to give extra attractiveness to any finishe
assembly. Bottom is provided with safety snap ele
and nylon feet. Internally the cases are designed to
two, four or six Bord-pak sets.
The overall sizes range from 5 5/16" wide x 5 5/16" hi
deep to 15 7/16" wide x 5 5/16" high x 11 3/8" deep.

rack



The popular Buckeye Bord-pak rack is offered in four
sizes — for 1, 2, 3 or 4 Bord-pak circuit guide set
accommodate circuit board modules of either the 4½"
The racks are sturdily designed of rigid aluminum s
and flanged end plates to either stack or facilitate an
assembly of your own choice of stationary multiple
tronic systems.
The overall sizes range from 5 7/8" high x 5" deep
to 8 5/8" high x 5¼" deep x 19" wide.



self-locking Buckeye Instrument bail

A safe, positive-locking bail to elevate — and that eliminates collapse — of your bench instruments. Offered in five standard sizes (custom sizes in quantity) in bright chrome finished 3/16" rod, nylon feet and necessary mounting screws. Folds away completely for level bench work.

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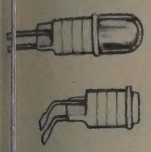
A GENERAL INSTRUMENT COMPANY

M2 SERIES T-1 BRITE LITES

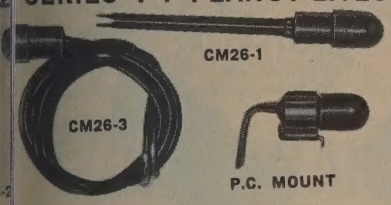


FEATURES:

CM25 Series Brite-Lites are subminiature T-1 indicators built to meet MS90308. An unbased T-1 lamp is inserted into the housing and a cap snapped-on to hold the lamp and provide color identification.

New features include dimpled terminals (patent pending) to assure positive electrical contact together with internally flared lead guides for ease of lamp insertion. Hot stamped legends can be provided with the new cylindrical cap style. The units are small enough to mount on .250″ centers and still allow adequate wiring room and space to re-lamp.

M2 SERIES T-1 PEANUT-LITES



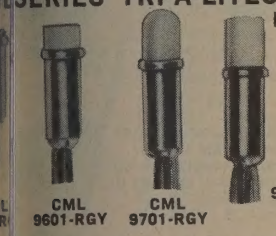
FEATURES:

T-1 Peanut-Lites are a new approach to the ultra-miniature panel indicator applications. Each T-1 Peanut-Lite contains a subminiature lamp sealed in a high-temperature polycarbonate housing. Lamps are available in a wide range of voltages from 1.5 volts to 28 volts. Mounting is easily accomplished with spring mounting clips.

Strain relieved wire leads are available when soldered connections are required. Pin contacts can be supplied for "quick-disconnect" with the CM21-1 socket. Where circuit board mounting is required, a 10384 clip is available.

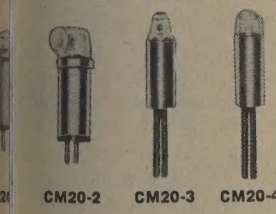
T-1 Peanut-Lites are low cost commercial substitutes for MS25446 and MS90308 indicators.

ML SERIES TRI-A-LITES



FEATURES: Chicago Miniatures new Tri-A-Lites offer a unique and new approach to lighted indicator devices. All Tri-A-Lites appear white in the off position, and take on color only when an input voltage is applied to one of the color coded lead wires. With the use of long life T-¾ lamps, three colors can be obtained from a single indicator light while allowing the designer to use the minimum amount of panel space. Tri-A-Lites mount in 19/64″ clearance holes and are retained with a single mounting clip. The standard color combination is red, green, and yellow but other combinations are available. Options include: hot stamped legends, other color combinations, different lead lengths and clear anodized housings. Electrical characteristics are: Volts — 5.0; Amps — .11/Lamp; Life — 15,000 hours average; Activated Colors — red, green, yellow.

M2 SERIES SUBMINIATURE LENS END-LITES



FEATURES: The CM20 family offers a variety of Lens End-Lites, each with finely controlled characteristics for the most demanding optical applications. Spots produced by these assemblies are axially centered, which minimizes adjustment problems and simplifies lamp replacement.

The CM20 Series family is ideally suited for close proximity use with photo sensors where an intense spot of luminous and infrared energy is required. Typical applications are encoders, tape sensors, card readers and optical scanners.

The CM20-1 and CM20-2 are mounted in CML Series Cartridge Holders. CM20-3 and CM20-4 are packaged in gold anodized aluminum sleeves.

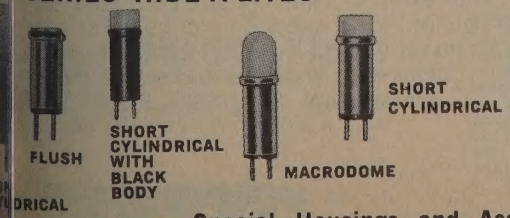
Part Number	Current Design Design Volts	±10% (Amps)	Average Life (Hours)	Spot Specifications
20-1	2.50	.350	10,000	When projected 3/8″ from end of bulb, spot produced covers a 1/8″ diameter target which is concentric with the axis at a minimum intensity of 750 foot-candles.
20-2	3.00	.325	10,000	1″ diameter spot at 1″ with minimum intensity of 350 foot candles at 3.0 V.
20-3	2.50	.350	10,000	When projected 3/8″ from end of bulb, spot produced covers a 1/16″ diameter target which is concentric with sleeve. Intensity 3/8″ from bulb is a minimum of 750 foot-candles measured over a 1/16″ diameter circle. Spot is narrow elliptical in shape.
20-4	2.50	.350	10,000	Same as CM20-3 except spot covers 1/8″ diameter target. Spot is "round" elliptical in shape.

M SERIES CARTRIDGE INDICATORS

FEATURES:

Cap colors include: red, yellow, white, blue, green and amber. Available both in transparent and translucent colors. Cap materials: Polycarbonate; resistive to color fading and high temperature and Butyrate; color matched to standard industry colors. Legends are hot stamped. Lamps: Any T-1¾ Incandescent. Mil-Spec: Built to meet Mil-L-3661. Polarization: Stainless steel pins are located off-center. This provides polarization or one way insertion in Cartridge Holders.

M SERIES HIDE-A-LITES



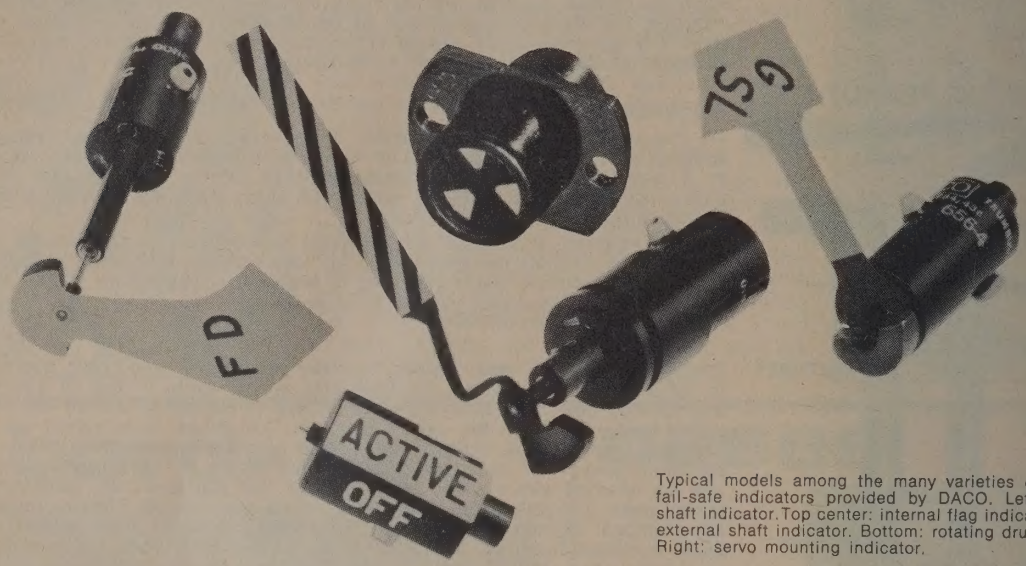
FEATURES:

Hide-A-Lites are a new concept in panel and display lighting. All indicators appear **white** in the off position and **take on color only when activated.** When mounted in multiple indicator panels, a glance is all that is necessary to quickly ascertain which indicators are on. Hide-A-Lites are ideally suited for use as warning lights or on systems control panels where signal and indicator speed is important. Their esthetic value is also of importance to design engineers concerned with panel appearance.

Special Housings and Assemblies May Be Designed to Customer Specifications.

For Complete Specifications on Chicago Miniature Lited Devices, Request CML Series Catalog.

DACO Miniature Fail-Safe Indicators for aircraft, spacecraft and ground support instrumentation.



Typical models among the many varieties of miniatur fail-safe indicators provided by DACO. Left: extende shaft indicator. Top center: internal flag indicator. Cente external shaft indicator. Bottom: rotating drum indicato Right: servo mounting indicator.

High reliability • Extreme ruggedness Positive indication • Widest selection of models, sizes, message and mounting

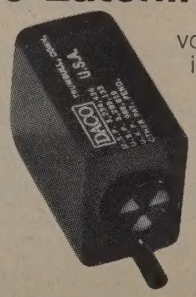
DACO Solenoid-Actuated Fail-Safe Indicators offer a combination of advantages that has made them the standard with leading international instrument manufacturers. Designed and built specifically to meet the exacting demands of aerospace instrumentation, the indicators are widely used in commercial and militar aircraft. Specially designed DACO indicators ar being used in a number of space projects. In additio to their many applications in general system annun ciation, they are used for sun-shutters, video ligh sensors and photocell interrupters in spacecraf optical systems; digit maskers, request-action indi cators and special system condition indicators.

	Size 5	Size 6
Weight (without flag or mounting bracket)	4.5 grams	9 grams
Dimensions (without flag or mounting bracket)	Length—0.57 in Diameter—0.38 in	Length—0.82 in Diameter—0.44 in
Power input range	DC—0.5 to 1 watt @ 25°C AC—0.7 to 1.3 watt @ 25°C	DC—0.4 to 1.3 watt @ 25°C AC—1.2 to 1.8 watt @ 25°C
Operating voltage	DC operation: up to 45 volts AC operation: 26 and 115 volts 400 Hz	
Rotation	Up to 60° CW or CCW. Standard tolerance ±2.5°	
Response time	0.5 seconds maximum	

For additional details, complete specifications, dimension drawings and ordering information, ask for DACO Bulletins 100-104.

DACO Miniature Latching Indicators

Highly reliable, extremely rugged, and positive indicating, these 2-position electromechanical latching indicators are widely used for visual indication of transitory circuit conditions, registering and holding "over-temperature" and "G-level" indications, monitoring firing circuits, and many other applications. Operating



voltage is up to 45 VDC continuous, anc input power is 0.75 watt at 25°C. Available with external switch, actuated by the rese button, for a secondary circuit. *For additional details, complete specifications dimension drawings and ordering information, ask for DACO Bulletin 105*

DACO Instrument Company, Inc.
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INSTANT LETTERING® words and symbols transfer to almost any surface including glass, plastic, even painted and bare metals. Now you can quickly mark all panels, even especially calibrated two-color nomenclatures, pilot light jewels, sub-assemblies, circuit boards, etc. Reproduction quality **INSTANT LETTERING®** transfers are clean and sharp, leave no background haze or film, make prototypes look like finished production equipment and give all equipment and drawings a professional look.

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REFILL SETS—12 sheets per set	
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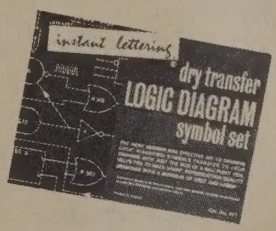
No. 968R—(specify sheet number)	**$2.00**

ELECTRONIC SYMBOL DRAFTING SET

The quick way to more readable schematics. Contains 40 sheets of electronic symbols plus letters and numerals. Symbols designed to conform with MIL-STD-15-1A. Sheets have heat resistant adhesive for perfect reproduction in any blue- or white-printer. Also included is a complete guide to drawing with dry transfer symbols.

No. 970—Complete Set	**$19.15**
REFILL SHEETS—set of four identical sheets	
No. 970R—(specify sheet number)	**$2.00**



LOGIC DIAGRAM SYMBOL SET

NEW! The most modern and effective aid to drawing logic diagrams. Symbols transfer to your drawing in seconds. All you need do is add the connecting leads. Heat resistant adhesive allows perfect reproduction even in diazo and other high speed printers. Symbols conform fully to MIL-STD-806B and ASA-Y32.14.

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REFILL SHEETS—set of four identical sheets	
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1 sets of logic, schematic, component rted circuit symbols. Each has a clear, astic overcoat that transfers with the Tough! Scratch Resistant! Use with ape and ink. Suited for mylar, stan- ting vellums. All kits $6.50 each.

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Coating Kit — contains a 1 oz. bottle of with applicator brush in cap and a 1 oz. hinner.

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atings — the handy aerosol can form of (16 oz. cans).

— Glossy $2.95

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STANDARD SHEETS — Full 10" x 15" sheets of alphabets and numerals are available in over 80 different type faces in sizes ranging from 8 pt. to 288 pt. Also available are arrows, math symbols, line and dot rules, etc. All are available in black, many also come in white and all feature heat resistant adhesive. Free sample and complete type chart available upon request.

SPECIAL SHEETS — Sheets made to your own specifications can include logos, drawings, symbols, preset words — anything that you use repeatedly. Hundreds of lettering and marking problems that were impossible or too expensive become practical with "Instant Lettering". Tell us your problem and let us suggest a "dry transfer" solution.

LETRATAPES — Here's a revolutionary advance in the application of dry transfer component references. The special dispenser does half the job for you. The range of tapes comprises 122 different items including letters of the alphabet, numerals, 0-9, common component designations, frequently used preset words, etc. Letratapes provide an ideal method for a wide range of repetitive marking or coding jobs. Write for complete details.

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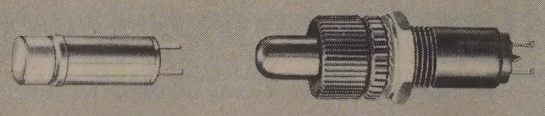
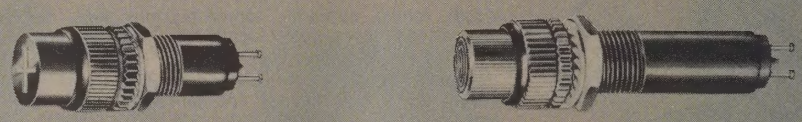
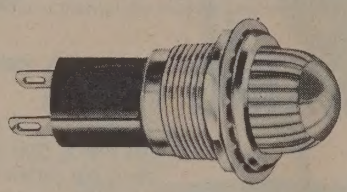
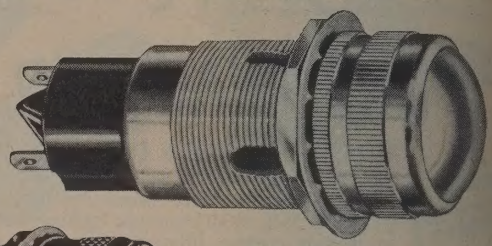
Ultra-Miniature DATALIT —and multiple indicato
Meet requirements MIL-L-3661 Incandescent a Neon. Mount in 3/ clearance hole. For da processing, computer a automation applicatio

ASK FOR CATALOGS L-160 AND L-20

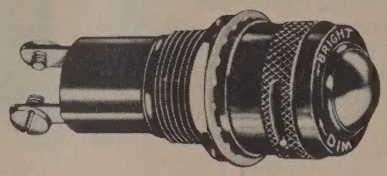




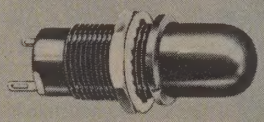


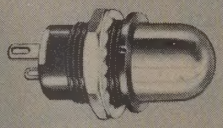


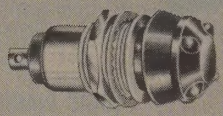
Miniature and Large Indicator Lights. Incandescent and Neon. **Miniature** units mount in 9/16" or 11/16" clearance holes; **Large** units in 1" clearance hole. Wide choice of cap shapes and colors—also include caps with mechanical dimming feature.

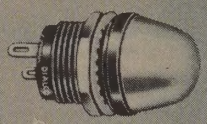


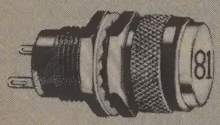
ASK FOR CATALOG L-161





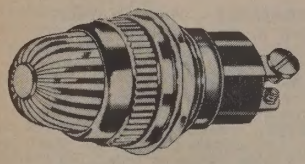


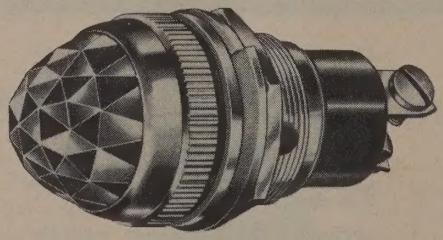




Sub-Miniature Indicator Lights. Incandescent and Neon. Mount in 13/32" to 17/32" clearance holes. Meet or exceed environmental requirements of MIL-L-6723 and MIL-L-3661B. Edge Lighting Indicators meet requirements of MIL-L-7806, conform to MS25010—Revision D.

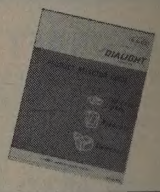
ASK FOR CATALOGS L-157, L-158, L-178.





Oil-Tight Indicator Lights. Incandescent and Neon. Mount in 11/16", 1" or 1-3/16" clearance holes. For heavy duty industrial applications.

ASK FOR CATALOG L-200.



NEW 56 PAGE PRODUCT SELECTOR GUID

Aids in the selection and procurement of more than 1,500,000 indicator lights, readouts and switches.

ASK FOR CATALOG SG690

DIALIGHT CORPORATION

60 STEWART AVE., BROOKLYN, N.Y. 11237 • Area Code 212 497-7600

CURRENT DIALCO LITERATURE

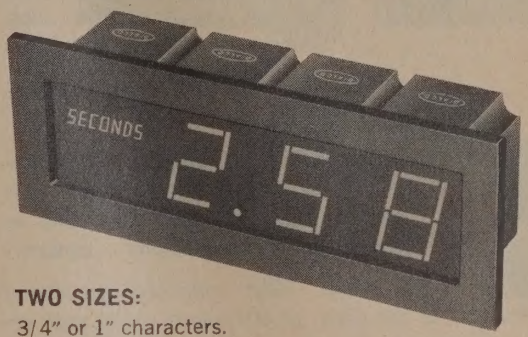
	Catalog No.
Sub-Miniature Indicator Lights	
Two Terminals, Fully Insulated	L-178
One Terminal (for Grounded Circuits)	L-157
Edge Lighting for Plastic Plates	L-158
Sub-Sub-Miniatures (with Long Life Lamps)	L-168
Indicator Light – 911 Series	L-205
Datalites: Ultra-Miniature Indicator Lights Lampholders, Cartridges, Multiple Indicators	L-160
Permanent Lamp Indicator Lights (Ultra-Miniature)	L-203
Miniature & Large Indicator Lights	L-161
Illuminated Push Button Switch – 913 Series	L-204
Illuminated Push Button Switch – 922 Series	L-173
Illuminated Snap-in Mounting Push Button Switches and Matching Indicator Lights	L-209
Illuminated Panel Mounting Push Button Switches and Matching Indicator Lights	L-169
Twin Lamp Placard Lights	L-170
Single Plane Numeric Readout	L-181
Heavy Duty Oil-Tight Indicator Lights	L-200
Press-To-Test Indicator Lights	L-201
Flashing Indicator Light	L-202
Transistorized Indicator Light for IC	L-207
A Cross Reference of DIALIGHT Catalog numbers to Military Type Designations and MS Drawings	CR-680
Product Selector Guide	SG-690

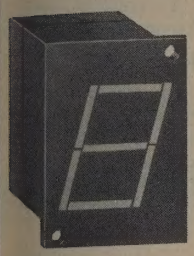
Send for your copies of these Catalogs.

DIALCO®

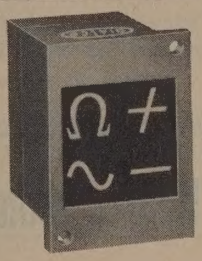
Single Plane Numeric Readouts.

Incandescent and Neon—
14 to 170 volts.





(U.S. Pat. No. 3,210,876)

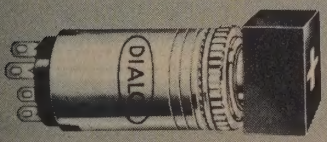


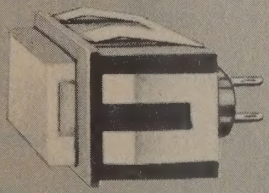
(Illus. approx. 75% actual size.)

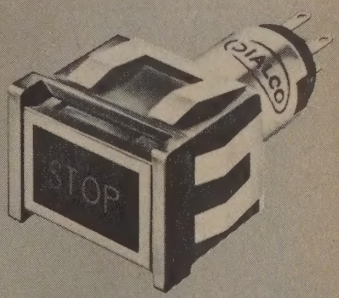
TWO SIZES:
3/4" or 1" characters. Display 10 numbers and 10 letters. Compatible Caption Modules.
ASK FOR CATALOG L-181.

(Illus. approx. 50% actual size.)

Illuminated Push Button Switches and Matching Indicators. NEW low-profile snap-in switches... and standard mounting switches. Momentary non-snap, snap or alternate switch actions. Ratings up to 5 amps. Cap sizes and shapes include 1/2", 5/8" and 3/4" round or square; 3/4" x 1" rectangle.







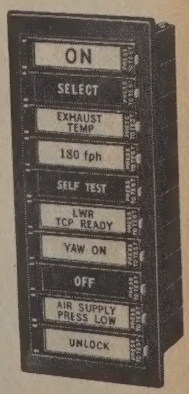
ASK FOR CATALOGS L-169 and L-209.

ansistorized Indicator Lights.
candescent and Neon. A "single ckage" containing light source, itching circuit, and all power cir- it and bias voltage connections.
SK FOR CATALOG L-207.

Press-to-Test Indicator Lights.
Incandescent and Neon. Mount in 15/32", 5/8" and 1" clearance holes. Equal or exceed the operational and environmental requirements of MIL-L-7961B.

ASK FOR CATALOG L-201.

Twin Lamp Placard Lights.
Conform to the operational and environmental requirements of MIL-L-3661B, MIL-E-5272 and ABMA-MPD-11023 and 11064.
ASK FOR CATALOG L-170.



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DIALIGHT CORPORATION

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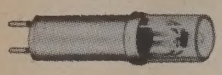
DRAKE INDICATOR LIGHTS

CARTRIDGE-



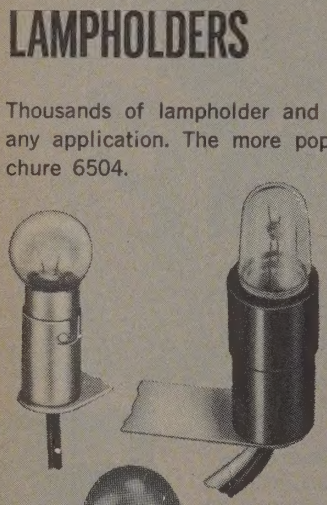
— **LAMPS,** bodies aluminum, 6 volts and up, long life incandescent or neon, fit Drake or any mfgr.'s holders. Inexpensive all plastic cartridges also available.

— **LAMPHOLDERS,** black anodized aluminum, indexed to accept lamps with legends; ideal for data processing or other computer applications — commercial or Military.

— **CONNECTOR AND FASTENER,** economical for commercial application with cartridge lamp eliminating lampholder.

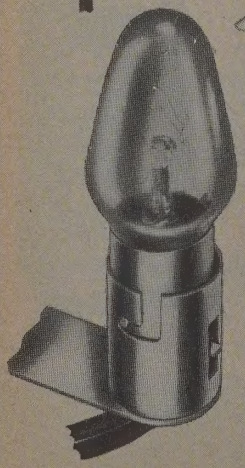
LAMPHOLDERS

Thousands of lampholder and bracket combinations for any application. The more popular are detailed in Brochure 6504.



MINIATURE BAYONET— For instruments, radio, TV, automotive, marine and other miniaturized devices.

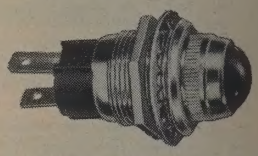
← Shell without & with housing



CANDELABRA SCREW — For illumination, on-off indicators in appliances and other equipment. →

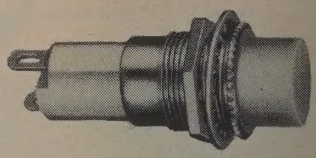
DC CAND. BAYONET — Rugged construction for appliances, vending machines and automotive. ←

"PSB" SLIDE BASE INDICATOR LIGHTS



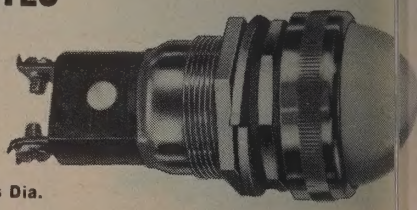
Uses Sylvania PSB slide base lamps; choice 9 styles of lenses and solder or screw base lu

"Deluxe Molded" Indicator Lig

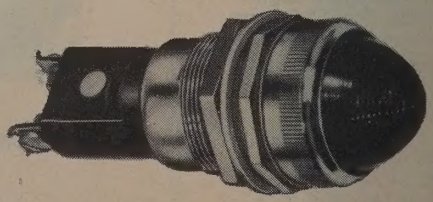


Drake's durable and finest — using T3¼ min b lamps and 120 V. incandescent for commercial cation. Incandescent or neon. Screw or friction fit of many shapes and variety, also mech. dimmer fo tary use. "Titelite" type for water-proof and application.

"TITELITES"



1¼" Lens Dia.



1" Lens Available MIL-L-366

Oil, water or dust-proof indicator lights with many styles for most incandescent lamps.

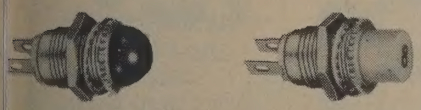
LAMPHOLDERS . . . Reliability Since 1932

ROLITES" and "GEMLITES"

rol s" — Military or commercial — are Drake's est, with built-in long life incandescent T1 lamp. ice f 5, 12 volts; wire leads.

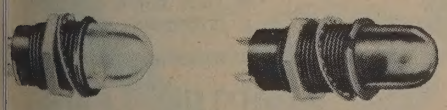
mli," small for commercial application with 2 lug min on using T1 Sub-Midget Flanged replaceable p i 5, 12, and 28 volts.

YLITES"



clus e Drake, economical, with midget screw based np, r limited space requirements, choice of dome, or fa d lens, with or without legends.

MI' INDICATOR LIGHTS

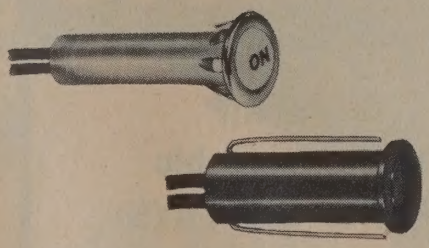


can scent and neon Midget Flanged lamps are used th r commercial and Military having hundreds of riet s, lens shapes and colors including "Press-to-st," Titelite," etc.

RKE MANUFACTURING CO.

4626 N. OLCOTT AVENUE
HARWOOD HEIGHTS, ILLINOIS 60656
312 AREA 867-7227 • TWX 910-221-0236

"GLO-LITES"



Commercial one-piece nylon, amber, red or white body and lens (flush or protruding lens with or without metal bezels). Built-in resistor and long life neon lamp. Choice of NEW "Twist-lock," plug button or nut mount; wire or lug termination. Also NEW High Temp. Aluminum "Glo-Lite."

ALL PHOTOS APPROXIMATELY ¾ ACTUAL SIZE.

DRAKE

Free Literature . . .
on the Complete Drake Line

Lit. No.	Description
6302-B	Indicator Light Catalog
6403	Project Data Sheet — for customer's specification requirements
6504	Lampholder Brochure
6607-A	"Astrolite" — "Gemlite" Data Sheet
6702-A	"Lite-Panel" Brochure
6706	Drake Numbering System
6713	"Glo-Lite" Folder
6800	1¼" Lens "Titelite" Data Sheet
6802-A	Cartridge Lamp Catalog
6803	5100 Type Indicator Light
6807	5200 Type Indicator Light
6808	5204 Military Type Indicator Light
6809	5201 Military Type Indicator Light
6900-A	Drake Representative List
6901	Product Index Chart
6902	Cross Ref. Military To Drake
6904	Resale Price List
6906	Easy Mount MF Indicator Light
6911	Distributor Catalog Sheet
7100	All Midget Indicator Lights

Request Literature Today

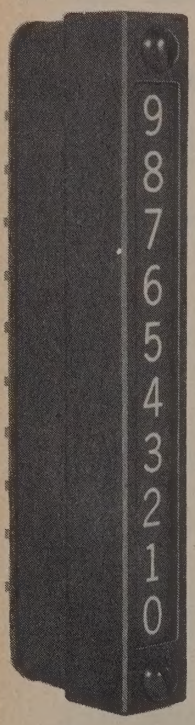
Ask your Drake Representative for location of nearest Distributor.

display devices

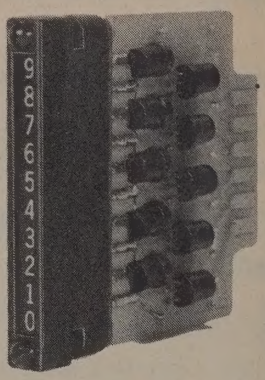
DIGISTRIP front relampable DIGITAL DISPLAYS

For a wide range of console and instrument display applications. Can be mounted horizontally or vertically, directly on p.c. boards, or ganged for high-density readout.

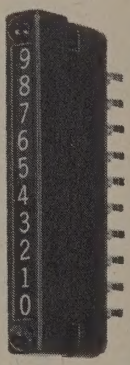
All Digistrip models are available with standard 0-9 legend, or with custom read-out information.



Digistrip II
3" legend area.



Digistrip I with high-gain transistor drivers on integral printed circuit board.



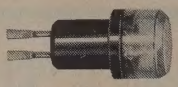
Digistrip I
1½" legend area.

All illustrations are actual size

Write for detailed specification sheets

MINIATURE T-1 INDICATOR LIGHTS

Designed to provide the brightest light in the least space. Available off-the-shelf, or designed to your application.



QUICK-LENS
Front-relampable miniature indicator light with built in light reflector for maximum brightness, even in high ambient light.

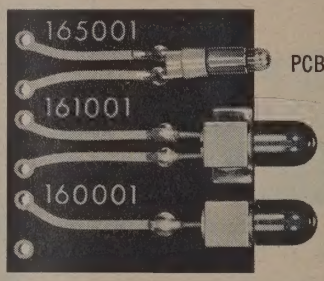
MINI-LENS
Front relampable, micro-miniature indicator light, featuring minimum panel spacing. Can be RFI shielded. Threaded body can mount directly to panel.

FLUSH-L
For panel mount out protrusio able with RF Unit is relampa rear of panel. connections re

TRANS-LENS

TDML

Each front relampable, with high-gain transistor driver on compact, p.c. board. Minimum depth behind panel. Both available in "bare boa figuration for customer to install own components. Trans-Lens is tr driven version of Quick-Lens; TDML is transistor-driven version of M

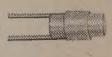


PCB LIGHT

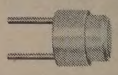
P.C. BOA INDICATO

SINGLE-SIDED BOARDS

DOUBLE-SIDED BOARDS



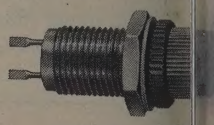
T-1 UNBASED



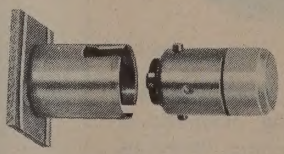
T-1¾ BI-PIN

Basic sockets for custom designed lamp holders or p.c. board mounting used as lighting chassis for back lighted display.

Also available in side mounting.



TWIST-LENS
Quick-change lens, ava clear or colors. Waterp RFI shielded units availa T-1¾ Bi-Pin base lamp brightness.



ADAPTER LENS AND SOCKET

Midget T-1¾ flanged base lamp used with T-3¼ printed circuit socket. Furnished with or without color filter.

ALSO AVAILABLE: Custom back lighted panel asse and DF991 (Dead Front) legend screens.

d² **display devices, inc**
mailing address: **p.o. box 667 encinitas, california**
plant location: **second and E streets** **(714) 753**

ELECTRONIC HARDWARE CORPORATION

KNOBS

ELECTRONIC HARDWARE CORPORATION
Subsidiary of HI-TECH INDUSTRIES, INC.
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ELDEMA
INDICATOR LITES

C-LITES

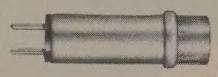
Eldema C-Lites are 2-pin cartridge lamps that are easily inserted from the f of the panel into the D-Holder assembly. C-Lites are in three basic ser CF—incandescent, CG—neon, and CR—neon with built-in resistor.
Clear anodized aluminum case — stainless steel pins — plastic lens cap — h dielectric insulation — meets Mil-L-3661. Mate with all DH Series holders.

INCANDESCENT C-LITES

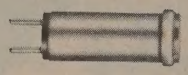
SERIES CF - Mates with all DH Holders

STYLE

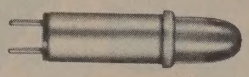
CF03
Short Flat



CF02
Flush



CF01
Dome



LENS COLORS

ACS	Amber Clear
BCS	Blue Clear
CCS	Cloudy Clear
GCS	Green Clear
RCS	Red Clear
WCS	Water Clear
YCS	Yellow Clear
ATS	Amber Translucent
BTS	Blue Translucent
GTS	Green Translucent
RTS	Red Translucent
WTS	White Translucent
YTS	Yellow Translucent

SPECIFY STYLE — LENS COLOR AND LAMP NUMBER

Example: CF03-RTS-2187

LAMP NO.	VOLTS	M.A.	LIFE HI
2158*	3	15	10,000
680	5	60	50,000
1730	6	40	1,000
2114	6	60	3,000
1784	6	200	1,000
2180	6.3	40	50,000
2181	6.3	200	50,000
1869*	10	15	50,000
2107*	10	40	5,000
2174	12	40	3,000
1705	14	80	750
2182	14	80	50,000
2102	18	40	1,000
1762	28	40	1,000
2187	28	40	25,000

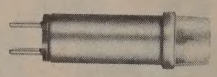
*Use with clear colors only.

NEON C-LITES Mates with DH Holders

SERIES CG- SERIES CR

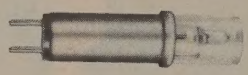
STYLE

CG03 or CR03



CG01 or CR01

CG04 or CR04



LENS COLORS

CLEAR ONLY

ACS	Amber Clear
CCS	Cloudy Clear
RCS	Red Clear
WCS	Water Clear
YCS	Yellow Clear

SPECIFY STYLE — LENS COLOR LAMP OR LAMP/RESISTOR

Examples: CG03-RCS-N110
CR01-ACS-N123

NEON LAMP-CG SERIES

N110 - Standard brightness
N120 - High brightness

NEON LAMP/RESISTOR-CR SERIES

N114 - Standard brightness medium life - 56K
N117 - Standard brightness long life - 100K
N121 - High brightness medium life - 22K
N123 - high brightness long life - 33K

C-LITES

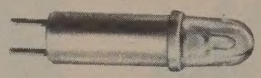
SERIES CN, CL AND CM

These are special purpose C-Lite types, each with mating single lamp D-Holder The CL and CM have long life, higher voltage incandescent telephone type lam bulbs. The CN is an older style neon C-Lite with resistor.

NEON C-LITES

SERIES CN- - neon lamp built-in resistor
Mate with DN Holders

CN01-RCS-N117



CN04-WCS-N123

Slightly longer than new CR series. Otherwise the two types are identical. Specify in same manner except use CN instead of CR. CN03 style is available.

INCANDESCENT C-LITES

TYPE CL24

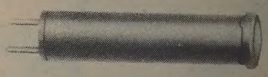
Mate with DL lampholders with D06, D09 or D25 lens caps. Bulb end exposed.

PART NO.	VOLTS	MA	LIFE HRS
CL24-6PS	6	140	5,000+
CL24-12PS	12	170	5,000+
CL24-24PS	24	73	5,000+
CL24-28PS	28	40	5,000+
CL24-48PS	48	53	5,000+
CL24-60PS	60	50	5,000+
CL24-120PS	120	25	5,000+

INCANDESCENT C-LITES

TYPE CM65

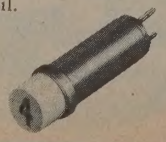
Mate with DM lampholders with D06, D09 or D25 lens caps. Light diffusing frosted lens.



PART NO.	VOLTS	MA	LIFE HRS
CM65-6PS	6	140	5,000+
CM65-12PS	12	170	5,000+
CM65-28PS	28	40	5,000+
CM65-48PS	48	53	5,000+
CM65-60PS	60	50	5,000+
CM65-120PS	120	25	5,000+

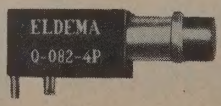
LENS MARKING

Eldema flat top lens styles may be provided with hot stamped legends. Normal markings in black-other colors to order. Specify marking requirements in complete detail.



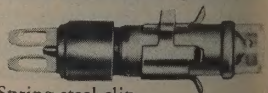
Q-SERIES

CLIPS AND SOCKETS



Q-082-4P P.C. Board Socket with CF03 C-Lite. Socket Mounts in 4 .040 Holes on .200 Centers.

Mounts C-Lites in 19/64" hole — ½" centers. Requires access to both sides of panel.



Q-081-905, Spring steel clip.
Q-082-2K, Socket with solder lug terminal.
Q-082-1M, Socket with solder cup terminals (not illustrated).
Q-145-008, Rubber washer to ease installation (not shown).

ELDEMA
INDICATOR LITES

D-HOLDER

Eldema D-Holders mate with the plug-in C-Lite cartridge lamps. The standard DH Series is available in single lampholders, dual lampholders and matching switchlites. Other special length single lamp holders — Series DN, DL and DM to mate with the longer C-Lites are included. Anodized housings, nickel plated hardware — high temperature plastic lens caps — meets MIL-L-3661. RFI/EMI shielded versions are also available.

DH-10B-D14B
with CF03

DN-10B-D15B
with CF03

DH-30B-D09BWC

DN-60B-D06BRT

DH-60B-D25BRT

DH SERIES SINGLE LAMPHOLDERS

Mate with CF, CG and CR C-Lites

HOLDER STYLE

DHO - Rear mounting, 3/8" hole
DHN - Front mounting, 15/32" hole

HOLDER TERMINAL AND FINISH

10B - Turret pin black housing
30B - Solder cup black housing
60B - Solder lug black housing

SPECIFY HOLDER STYLE — TERMINAL AND FINISH THEN LAMP COLLAR OR LENS CAP STYLE AND LENS COLOR.

For example: DHO-10B-D14B
DHN-60B-D06BRT

For clear anodized finish change letter B in terminal - finish and in lamp collar or lens cap to S - DHN-60S-D06SRT.

An installation wrench that mates with the knurled ring on rear mounting holders and switchlites is available. Part number — Z-090-375

LAMP COLLARS

D14B - Use with DHO
D15B - Use with DHN or DHO

Note: No lens color specified for collars. For use with C-Lite cartridges with colored lenses.

LENS CAP STYLE

D06B - Smooth lens
D07B - Long smooth lens
D09B - Fluted lens, clear colors only
D25B - Shroud lens, translucent colors only.

Note: For use with C-Lite cartridges with water clear lenses.

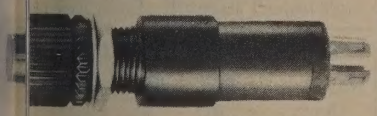
LENS COLORS

AC - Amber Clear*
BC - Blue Clear
CC - Cloudy Clear*
GC - Green Clear
RC - Red Clear*
WC - Water Clear*
YC - Yellow Clear*
AT - Amber Translucent
BT - Blue Translucent
GT - Green Translucent
RT - Red Translucent
WT - White Translucent
YT - Yellow Translucent

*Recommended for neon C-Lites

DH SERIES - TYPE DHS MOMENTARY SWITCH-LITE

Rear mounting, 3/8" hole
Mate with CF, CG and CR C-Lites



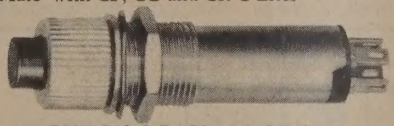
DHS-60B-A-D16B with CF03
Black anodized finish

DHS-60B-A-D16B normally open
DHS-60B-B-D16B normally closed
DHS-60B-P-D16B press-to-test

Black or clear finish — specify B — black, S — clear (underlined letters in part numbers by illustrations, 2 places)

DH SERIES - TYPE DHT MOMENTARY SWITCH-LITE

Front mounting, 15/32" hole
Mate with CF, CG and CR C-Lites



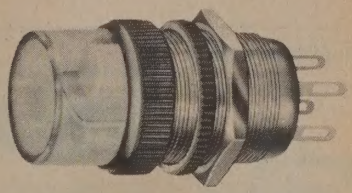
DHT-61S-A-D16S with CF03
Clear anodized finish

DHT - 61B-A-D16B normally open
DHT - 61B-B-D16B normally closed
DHT - 61B-P-D16B press-to-test

Four lug terminals — separate light and switch circuit — 1/2 amp rating for normally open and closed types.

DH SERIES - TYPE DHF DUAL LAMPHOLDER

Front or rear mounting 3/4" hole.



DHF-61B-D17BWC

Mates with any two CF, CG, or CR C-Lites. Four lug terminals — clear lens. Black anodized finish.

DN SERIES SINGLE LAMPHOLDERS

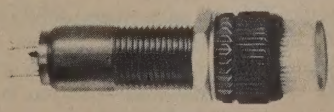
Rear mounting 3/8" Hole.
Mate with CN neon C-Lites

DNO-10B-D14B with CN01

Slightly longer than DHO holder, otherwise identical and specified in same manner except use DNO instead of DHO. Rear mounting 3/8" hole only.

DL SERIES SINGLE LAMPHOLDERS

Rear mounting 3/8" Hole.
Mate with CL24 C-Lites



DLO-10B-D09BWC

Medium length holder for high voltage incandescent CL24. Specify in same manner as DHO — requires lens cap.

DM SERIES SINGLE LAMPHOLDERS

Rear mounting 3/8" Hole.
Mate with CM65 C-Lites

DMO-10B-D06BRT

Long length holder for high voltage CM65 C-Lites. Specify in same manner as DHO — requires lens cap.

For complete Technical information and detail catalogs contact our representatives listed in the EEM yellow pages.

ELDEMA DIVISION
GENISCO TECHNOLOGY CORPORATION
18435 SUSANA ROAD
COMPTON, CALIFORNIA 90221
(213) 774-1850

ELDEMA
INDICATOR LITES

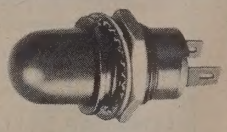
R — LITES

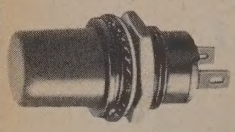
R-Lites are Eldema's product family of relampable holders and lens caps for midget flange based T-1 ¾ incandescent and T-2 neon bulbs. The lamps and l caps are replaceable from the front of the panel. There are five R-Lite groups each with its own features — the holder and lens cap part numbers in each gr start with the same two letters to insure mating parts.

RM AND RN SERIES

The RM-RN groups meet MIL-L-3661 and MIL-L-6723. The RM is incandescent lamps — the RN Series with a built in resistor is for n lamps. Standard types RMA and RNA — waterproof types RMW RNW — two tin plated lug terminals — black anodized aluminum cases high impact plastic lenses. Mount from the front in 15/32" holes.

RMA-64BO-RM120RC





RMA-64BO-RM160RC

RMA-64BO-RM22BRC

RM SERIES

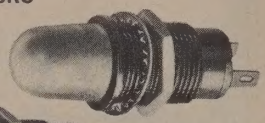
HOLDER P/N

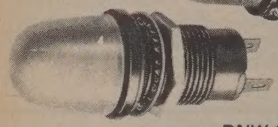
RMA - 64BO Standard — black finish

RMW - 62BO Waterproof — black finish

CAP STYLE	LENS COLORS	
RM120 Dome	AC	Amber Clear
RM160 Flat top	BC	Blue Clear
RM22B Rotating type	CC	Cloudy Clear
RM130 Waterproof dome	GC	Green Clear
	RC	Red Clear
	WC	Water Clear
	YC	Yellow Clear
	AT	Amber Translu
	BT	Blue Translucen
	GT	Green Translu
	RT	Red Translucen
	WT	White Translu
	YT	Yellow Transl

RNA-64B5-RN120RC





RNW-62B5-RN130RC

RN SERIES

HOLDER P/N

RNA - 64B5 Standard — black finish with 62KΩ for NE2D lamp

RNA - 64B2 Standard — black finish with 27KΩ for NE2J lamp

RNW - 62B5 Waterproof — black finish with 62KΩ for NE2D lamp

RNW - 62B2 Waterproof — black finish with 27KΩ for NE2J lamp

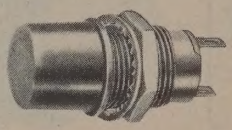
CAP STYLE	LENS COLOR	
RN120 Dome	AC	Amber C
RN130 Waterproof dome	CC	Cloudy C
	RC	Red Clea
	WC	Water Cl
	YC	Yellow C

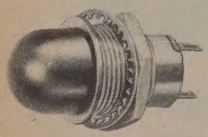
SPECIFY HOLDER
LENS STYLE AND LENS COLO

RA SERIES

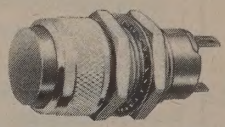
The RA Series is for flange based T-1 ¾ incandescent bulbs. Three mounti styles are available and three metal finishes. Rugged two terminal lamp holders brass housings — tin plated lug terminals — high impact strength plastic lens ca

RAA-6020-RA220RT





RAB-6010-RA210RT



RAC-6030-RA343RT
(ROTATING LENS CAP)

HOLDER STYLE

RAA - 15/32" Front mounting
RAB - 17/32" Front mounting
RAC - 15/32" Front or rear mounting

HOLDER FINISH

6010 Bright nickel
6020 Black nickel
6030 Polished chrome

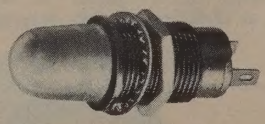
SPECIFY HOLDER STYLE
HOLDER FINISH
LENS STYLE AND LENS COLOR

CAP STYLE	LENS COLORS	
RA210 Dome	AC	Amber Clear
RA220 Flat top	BC	Blue Clear
RA341 Bright nickel	CC	Cloudy Clear
RA342 Black nickel	GC	Green Clear
RA343 Polished chrome	RC	Red Clear
	WC	White Clear
	YC	Yellow Clear
	AT	Amber Translu
	BT	Blue Transluce
	GT	Green Translu
	RT	Red Translucen
	WT	White Translu
	YT	Yellow Transl

MIL-LITES

Specific Eldema parts meet MS25256, MS25257 and MS25446 per MIL 6723. Under MIL-L-3661 Eldema meets almost all configurations for la holders (LH nos.), Lens caps (LC nos.), and indicator lites (LHC nos.). Co plete cross reference information is available upon request.

TCF-6220-TC222RC

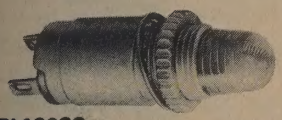


ELDEMA
INDICATOR LITES

RL SERIES

In the RL Series the lamp holders and lens caps accommodate either based incandescent or neon lamps for uniform appearance. Neon holders may have built in resistors. Two tin plated lug terminals — black or clear anodized housings — fresnel ring light diffusing lens caps give maximum brilliance. This series matches Eldema Logic-Lites.

RLD-60BO-RL090WC



RL-60SO-RL130CC

RLA-60BO-RL150RC

HOLDER STYLE

RLA - Front mounting, 15/32" Hole
RLD - Rear mounting, 3/8" Hole, 1/8" Panel
RLE - Rear mounting, 3/8" Hole, 3/16" Panel

HOLDER FINISH AND RESISTOR

60B0 - Black finish — No Resistor
60S0 - Clear finish — No Resistor

60B2 - Black finish with 27KΩ for NE2J lamp
60S2 - Clear finish with 27KΩ for NE2J lamp

60B5 - Black finish with 62KΩ for NE2D lamp
60S5 - Clear finish with 62KΩ for NE2D lamp

SPECIFY HOLDER STYLE, FINISH AND RESISTOR-LENS STYLE AND LENS COLOR

FRESNEL RING LENS CAPS

STYLE	COLORS
RL090 Flat top	AC - Amber Clear*
	BC - Blue Clear
RL130 Dome	CC - Cloudy Clear*
	GC - Green Clear
RL150 Skirted	RC - Red Clear*
	WC - Water Clear*
	YC - Yellow Clear*

*Recommended for neon lamps

SMOOTH FACE LENS CAPS

STYLE	COLORS
RL100 Flat top	AT Amber Translucent
	BT Blue Translucent
RL140 Dome	GT Green Translucent
	RT Red Translucent
RL160 Skirted	WT White Translucent
	YT Yellow Translucent

LOGIC-LITES

Indicator lights with built-in transistorized lamp driver networks. Available in neon and relampable incandescent types for operation from IC and discrete component circuits. Matching indicator lights and switchlites are also available. Contact Eldema for more detailed information.

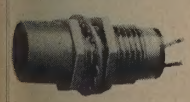
HL-LITES

Eldema Series HL holders and lens caps are for sub-miniature based T-1 incandescent lamps. Military type construction — brass housing — either single or two terminal style — relampable from the front of the panel — mount on centers as close as 0.360. RFI/EMI shielded versions available-see H-Lite brochure.

HLA-1010-HL230WT

HLB-1010-HL321RT

HLC-2020-HL230WT



HLD-1010-HL321RT

HOLDER PART NUMBER

HLA-1010	Front mounting ¼" hole, single terminal, bright finish.
HLB-1010	Front mounting 5/16" hole, lug and center terminal — bright finish — insulating washers.
HLC-2010	Two terminal — front mounting 5/16" hole, bright finish.
HLC-2020	Two terminal — front mounting 5/16" hole, black finish.
HLD-1010	Two terminal — front or rear mounting — 5/16" hole — bright finish
HLD-1020	Two terminal — front or rear mounting — 5/16" hole — black finish.

LENS CAP STYLE

HL230	All plastic
HL321	Shroud, bright finish
HL321	Shroud, black finish

LENS COLORS

AT	Amber Translucent
BT	Blue Translucent
GT	Green Translucent
RT	Red Translucent
WT	White Translucent
YT	Yellow Translucent
WC	Water Clear
CC	Cloud Clear

SPECIFY HOLDER — LENS STYLE AND LENS COLOR.

Eldema products are available from authorized stocking parts distributors throughout the United States and Canada.

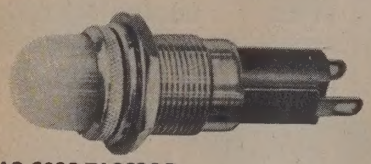
ELDEMA DIVISION
GENISCO TECHNOLOGY CORPORATION
18435 SUSANA ROAD
COMPTON, CALIFORNIA 90221
(213) 774-1850

ELDEMA
INDICATOR LITES

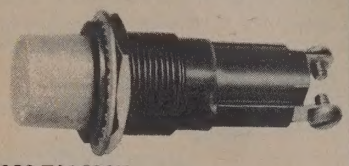
T-SERIES

Eldema T-Series lampholders and lens caps are for the T-3¼ bayonet based in- descent and neon lamps. Four basic types — TAF and TCF for incandescent TAG and TCG with built-in resistors for neons. Meets Mil-L-3661 — polis chrome, black nickel or bright nickel finish — front mounting in 11/16" h water proof types — lug or screw terminals.

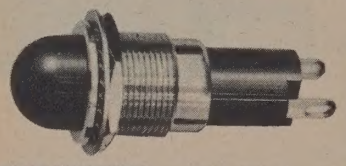
TCF-6220-TC222RC



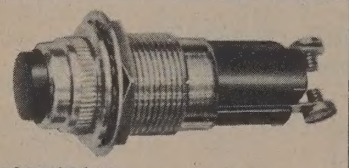
TAG-6032-TA263CD



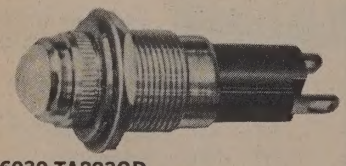
TAF-7020-TA160AT



TAF-6030-TA120RT



TAF-7030-TA243RT



TAF-6030-TA223CD

HOLDER STYLE

TAF - Incandescent lampholder Screw-in lens caps

TAG - Neon lampholder Screw-in lens caps

TCF - Incandescent lampholder Screw-on lens caps

TCG - Neon lampholder Screw-on lens caps

NOTE: TAF and TAG holders mate with lens caps starting with letters TA. TCF and TCG holders mate with TC lens caps.

HOW TO SPECIFY HOLDER FEATUR

Example — 6010

First digit: (Terminals)	6 = Solder lug 7 = Screw terminal
Second digit: (Mounting)	0 = Standard part 2 = Water proof
Third digit: (Finish)	1 = Bright nickel 2 = Black nickel 3 = Polished chrome
Fourth digit: (Resistor)	0 = None (TAF & TCF) 2 = 27KΩ for NE51H lar 4 = 56KΩ for NE51 lamp 7 = 100KΩ for NE51 lam 25,000 hour life ratin

SCREW-IN LENS CAP STYLE

TA120	- Smooth dome — clear or translucent colors
TA130	- Fluted dome — clear colors only
TA140	- Semi-Fluted dome — clear colors only
TA160	- Flat top — clear or translucent colors
TA223†	- Convex — clear or diffusing colors (no cloudy clear)
TA243†	- Flat top — clear, translucent or diffusing colors
TA263†	- Smooth dome — clear or diffusing colors (no cloudy cle
TA283†	- Fluted dome — clear colors (no cloudy clear)

SCREW-ON LENS CAP STYLE

TC223†	Smooth dome — clear or diffusing colors (no cloudy clear)
TC243†	Fluted dome — clear colors only (no cloudy clear)

† These lens caps have a metal ring with polished chrome finish specified by the digit 3, or bright nickel, change to 1, black nickel, change to 2. For example: TA221RC and TC242C.

To specify water proof lens caps in the TA styles change the first digit as follo TA100 series to TA400, TA200 series to TA300. For example: TA120RC to TA420R Standard TC lens cap may be used. All necessary sealing gaskets are on the TC hol when it is specified water proof.

LENS COLORS

AC — Amber Clear*	AT — Amber Translucent	AD — Amber Diffusi
BC — Blue Clear	BT — Blue Translucent	BD — Blue Diffusing
GC — Green Clear	GT — Green Translucent	GD — Green Diffusin
RC — Red Clear*	RT — Red Translucent	RD — Red Diffusing
WC — Water Clear*	WT — White Translucent	WT — White Translu
YC — Yellow Clear*	YT — Yellow Translucent	YD — Yellow Diffusi
CC — Cloudy Clear*		CD — Clear Diffusing

* These colors recommended for neon lamps

Diffusing colors have surface nearest lamp frosted — Note white is translucent only.

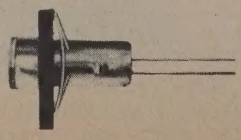
SPECIFY HOLDER STYLE — HOLDER FEATURES — LENS STYLE AND LENS COLOR

SEE PART NUMBERS BY ILLUSTRATIONS FOR EXAMPLES

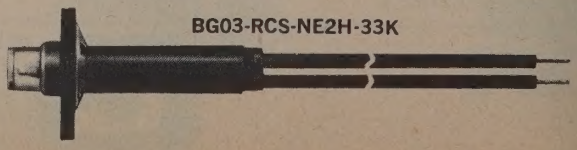
B — LITES

Commercial neon indicators permanently, clip mounted — 5/16" mounti hole all plastic construction — inexpensive — two basic types — neon lan with resistor and attached wire leads and neon lamps only with bare wi leads. Mounting clips furnished. Designed for 120 volt operation.

BG90-RC-NE2H



BG03-RCS-NE2H-33K



ELDEMA
INDICATOR LITES

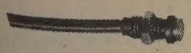
JLITES

Permanent mounting indicators with built-in long life sub-miniature T-1 incandescent lamps. Front panel mounting in 0.193 hole — moisture and dust proof — completely sealed — 6 inch leads — commercial and military versions.

J151-050-210RT

J111-050-220WT

JL0B1-120-230GT



J151-280-810WC

J0Y1-180-830YT

SPECIFY HOUSING — LAMP NO.
LENS SHAPE — LENS COLOR

HOUSING STYLE

JK8111	Commercial - brass case
JK9151	Military - steel case
JL70B1	Commercial - Aluminum case
JM9151	RFI Shielded
JN70Y1	RFI Shielded

LAMP NUMBERS

Lamp No.	Volts	Current (MA)	Life (Hours)
031	3	60	100 M
050	5	60	100 M
051	5	60	100 M
100	10	27	10 M
120	12	60	16 M
180	18	26	10 M
280	28	24	16 M

LENS STYLE

210	Dome
220	Flat top
230	Low profile
810	RFI - dome
830	RFI - low profile

LENS COLORS

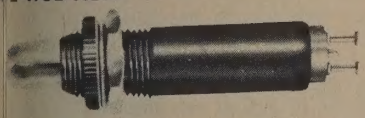
AT	Amber Translucent
BT	Blue Transparent
GT	Green Translucent
RT	Red Translucent
WT	White Translucent
YT	Yellow Translucent
AC	Amber Clear
BC	Blue Clear
CC	Cloudy Clear
GC	Green Clear
RC	Red Clear
WC	Transparent
YC	Yellow Clear

Clear for low power lamps

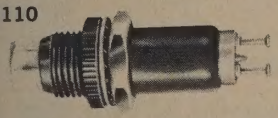
E-LITES

Two basic types — Series EG, neon lamp only — Series ER, neon lamp with built-in resistor — permanent neon lamp indicators — military type construction — black anodized aluminum body — tin plated turret terminals, high impact plastic lens — five lens colors. Use wrench Part number Z-090-375 to simplify installation.

E01-WCB-N117



E03-WCB-N110



STYLE - NO RESISTOR

EG01 Dome lens
EG03 Flat lens

STYLE WITH RESISTOR

ER01 Dome lens
ER03 Flat lens

LENS COLORS

ACB Amber Clear
CCB Cloudy Clear
RCB Red Clear
WCB Water Clear
YCB Yellow Clear

LAMP - EG SERIES

N110 Medium brightness
N120 High brightness

LAMP/RESISTOR - ER SERIES

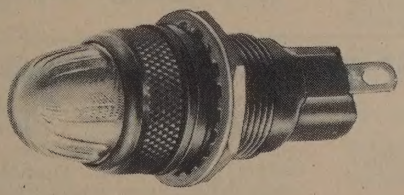
N117 Medium brightness, 25,000 hr — 100KΩ
N123 High brightness, 25,000 hr — 33KΩ

SPECIFY STYLE — LENS COLOR — LAMP OR LAMP/RESISTOR

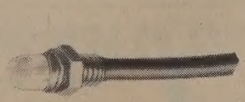
RFI/EMI SHIELDED INDICATOR LITES

Special lens caps with internally retained wire mesh cloth used in lampholders with a conductive finish provides effective attenuation for interference shielding requirements. Shielded versions of most Eldema products are available and match the standard units. Contact Eldema for the technical bulletin covering complete RFI/EMI tests and results of these shielded indicator lights.

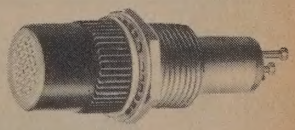
R-LITES



T-SERIES



J-LITES



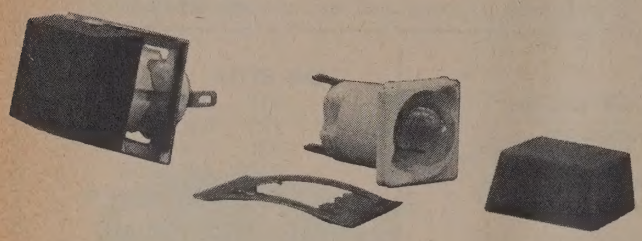
D-HOLDER

Complete catalogs and cross-reference information to Military parts and those of other manufacturers are available from our representative listed in the EEI yellow pages.

ELDEMA DIVISION
GENISCO TECHNOLOGY CORPORATION
18435 SUSANA ROAD
COMPTON, CALIFORNIA 90221
(213) 774-1850

INDICATING LIGHTS

CR103 TYPE B MINIATURE SQUARE INDICATING LIGHTS



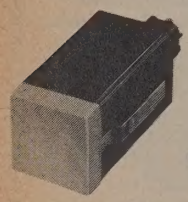
The CR103 Type B general-purpose miniature indica is a small, "square look" unit that provides positive v cation on control panels and consoles, data processi ment, and wherever production and automated syst A complete light consists of a base unit with bulb, spring clip.

FEATURES

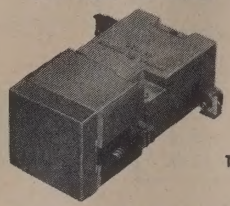
2-pin type lamp replaceable from front of panel; inter lenses of snap-on construction; choice of red, white, green lenses; optional arrow indicator on lens ideal for flow c power requirement of 6, 12, or 24 volts; simple one-hole m

Write for Bulle

CR103 TYPE C SQUARE INDICATING LIGHTS



Full-voltage type



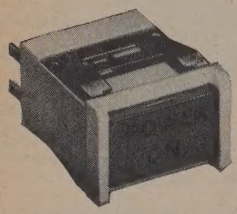
Transformer type

CR103 C square indicating lights are designed for wide variety of applications such as: business operator panels, consoles, control desks, motor contr and for the panel building, electronic and intrumenta

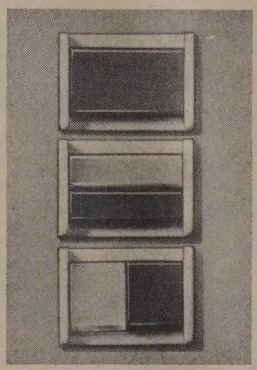
Full voltage and transformer types in a variety of available. Lenses may be translucent type or transpa used with a diffuser. Legends can be engraved and translucent lenses.

Write for Bulle

CR103 TYPE D INDICATING LIGHTS



With solid lens cap installed



Solid or split color fields give added flexibility. Colors can be mixed in the split field forms for even more combinations.

General Electric's new line of CR103 Type D indicat are designed for a wide variety of applications such and instrument panels, office machines, laboratory ins computers and other data processing equipment. illuminated push button switches are shown in Sect on page of General Electric switches.

FEATURES

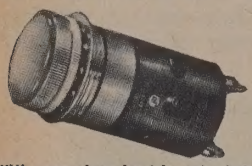
- Units snap into panels from front without tools, and ca mounted horizontally to save space or for group functions
- Convenient slide-on lens caps in five colors; four hous Units are single button only. and have solid horizontally- or split color fields. 2-lamp and 4-lamp forms are available.
- Legend inserts for all forms can be printed or engraved or similar material of 10 mils or less thickness.

Write for Bulle

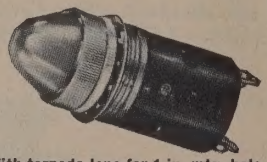
CR103 TYPE H INDICATING LIGHTS

With spherical lens for 11/16-in. mtg. hole

With crown lens for 15/32-in. mtg. hole



With crown lens for 1-in. mtg. hole



With torpedo lens for 1-in. mtg. hole

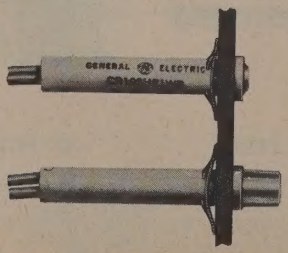
CR103 Type H indicating lights give bright visual indi circuit operating conditions for applications where oil is not required.

FEATURES

- **Vivid Colors** — yellow (amber), blue, green, red, white an
- **Even Illumination** — Lexan diffuses light and gives off an
- **Durable** — lenses will not shatter, resist high temperature
- **Compact** — forms for 15/32, 11/16, or 1-inch mounting holes.
- **Rating Flexibility** — wide variety of lamp voltages availabl supplied by the customer.
- **Ease of Installation** — lamps and lenses install from the f

Write for Bulle

CR103 TYPE HE LOW-COST MINIATURE INDICATING LIGHTS



CR103 Type HE indicating lights are new, low-cost applications requiring a minimum of space. They ar suited for business machines, major appliances, smal meters, gages, timers, illuminated pointers, dial indica many other places where panel appearance and visua are important.

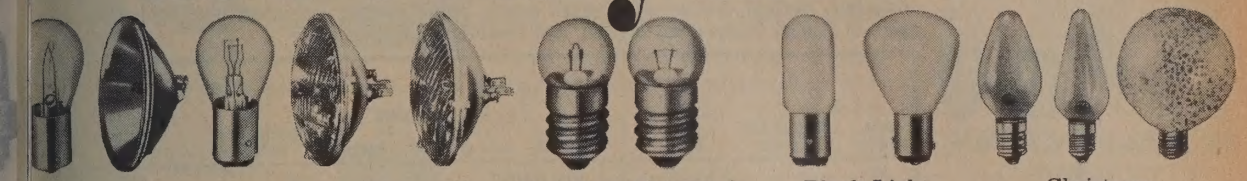
Only 1 11/16" long, they mount with a speed nut in a hole. Choice of amber, clear, red, or white lenses in cylindrical lens style. Body colors are black, gray, tan, For 120, 240, or 480 volts.

Write for Bulleti

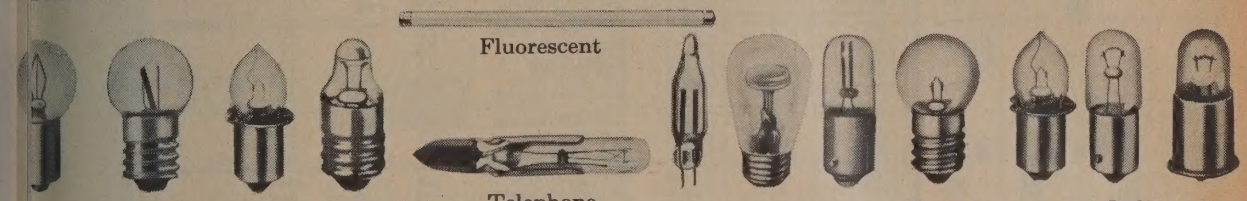
For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELE

E Miniature Lamps for every need

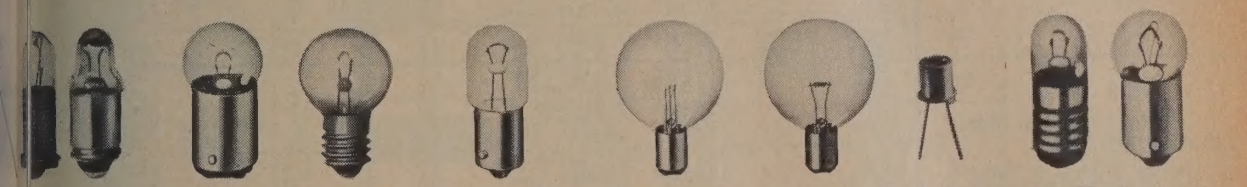


rcraft — Automotive — Bicycle & Motorcycle — Black Light — Christmas

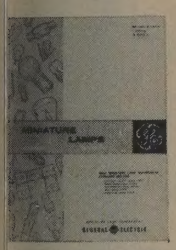


Fluorescent

ine — Flasher — Flashlight — Telephone — Glow — Hand Lantern — Indicator



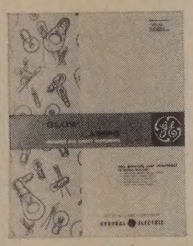
ment — Marine — Medical — Radio & TV — Searchlight — Signal — Solid State — Toy



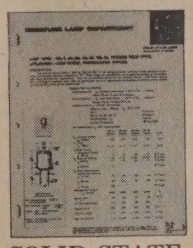
MINIATURE
#3-6253 EM

SUB-MINIATURE
#3-6252 EM

SEALED BEAM
#3-6251 EM



GLOW
#3-6254 EM



SOLID STATE
#SSL-EM

GE Miniature Lamps for Your Products

e the and money by selecting the lamp you d bore your product design is frozen. Consider ors like size, power source, shock, life, light, perture and assembly cost. Get complete and o-date electrical and physical specifications for over 1200 lamps from the General Electric catalogs shown above. Contact one of the offices below, or write General Electric, Miniature Lamp Dept., MO-1, Nela Park, Cleveland, Ohio 44112.

For helpful service contact one of these offices:

NTA, GA.	120 Ottley Drive, N. E. P. O. Box 13917	30324	875-0921
IMO E, MD.	1401 Parker Rd. Mail: P. O. Box 74_7, Baltimore, Md.	21227	242-5700
ON ASS.	50 Industrial Place, Newton Upper Falls, Mass.	02164	332-6200
LO E, N.C.	1001 Tuckaseegee Rd. Mail: P. O. Box 2144	28201	376-6585
AG ILL.	550 West Jackson Blvd.	60606	332-4712
INN I, OHIO	49 Central Ave.	45202	421-6810
UMB S, OHIO	800 Northwest Blvd.	43212	294-4115
AS, EXAS	6500 Cedar Springs Road	75235	351-3725
VER OLO.	6501 Stapleton Dr., North	80216	388-4611
ROIT MICH.	15135 Hamilton Ave.	48203	883-0200
ASC EXAS	2800 N. Stanton St., Room 210	79910	533-1961
OLU I, HAWAII	Suite 300, 1149 Bethel	96813	537-3280
STO TEXAS	5615 Lymbar Drive	77035	923-2549
ANA OLIS, IND.	2511-F-1 East 46 St.	46205	547-5511
SO ILLE, FLA.	4077 Woodcock Dr., Suite 222	32207	396-1_05
ANS CITY, MO.	535 East 14th Ave.	64116	471-0123
ANG LES, CALIF.	2747 S. Malt Ave.	90022	723-2541
SVI E, KY.	2311 S. Brook Street	40208	637-3651
PHI TENN.	2021 S. Latham St.	38109	948-2642
MIL, I.	3655 N. W. 71st St.	33147	693-3811
AU E, WIS.	8100 West Florist Ave., Mail: P. O. Box 299	53201	462-3860
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NEW ORLEANS, LA.	4800 River Road, Mail: Box 10236, Jefferson Branch	70121	835-6421
NEW YORK, N.Y.	219 E. 42 St.	10017	750-2000
OAKLAND, CALIF.	999-98th Avenue	94603	569-3422
OKLAHOMA CITY, OKLA.	Executive Terrace Bldg., 2809 N.W. Expressway	73112	842-4028
PHILADELPHIA, PA.	Rt. 202, At Expressway, King of Prussia, Pa.	19406	688-5900
PITTSBURGH, PA.	238 W. Carson St.	15219	471-9050
PORTLAND, ORE.	2800 N.W. Nela St.	97210	223-2101
RICHMOND, VA.	1510 Willow Lawn Dr., Mail: P. O. Box 8627	23226	282-7644
ROCHESTER, N.Y.	Gibbs St. Bldg., 31 Gibbs St., Room 500	14604	454-2990
ST. LOUIS, MO.	1530 Fairview Ave.	63132	429-6930
SEATTLE, WASH.	2400—6th Avenue, South	98134	622-8081
UTICA, N.Y.	c/o Radio Receiver Dept., P. O. Box 175, 1001 Broad St.	13501	733-0922

MINIATURE LAMP DEPARTMENT

GENERAL ELECTRIC

Hudson Lamps: Tiny Bulbs for Your Big Lighting Jobs

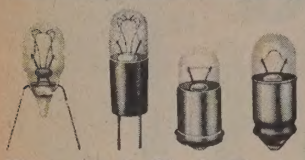

Fig. 1 Fig. 2 Fig. 3 Fig. 4

Fig. 5 Fig. 6 Fig. 7

Fig. 9 Fig. 10

Illustrations Actual Size

SUB-MINIATURE LAMPS

(Top Section of chart at right.) Designed for maximum service life under conditions of shock and vibration. Will not introduce noise into audio circuits. Manufactured and tested to rigid quality control standards.

"TU-PIN" SUB-MINIATURE LAMPS

Ideal for printed circuits and transistor sockets. Bases color coded to electrical characteristics. Easy to insert and remove, especially in difficult locations. So small twelve can be mounted in one square inch.

MICRO-MINIATURE LAMPS

(Lower Section of chart at right.) Design lives of 100,000+ hours is common. Tipless bulbs for undistorted end viewing. Pre-aged and photometered to assure reliability, stability, and electrical accuracy.

Ask for Catalog #106

REPLACEABLE ILLUMINATOR FOR EDGE LIGHTED PANELS

The Hudson Disc Lamp is an integral light source for edge lighted panels. Easily installed or removed from companion socket hard mounted to a one piece panel. Ask for Bulletin #301. T.M.

HUDSON DISC LAMPS

ENGINEERING ASSISTANCE

If you have an application for which no standard lamp is suitable, Hudson will design and manufacture a special lamp to meet your requirements. Please ask us for recommendations, which are furnished to you without obligation, of course.

Designers and production men prefer these dependable incandescent lamps for use in aircraft computers, read-out devices, edge-lighted panels, switch buttons, instrument pilot lights, and similar space is limited, replacement difficult, and reliability essential.

Lamp Number	Military Std. Number	Bulb	Base	DESIGN Volts	DESIGN Amperes	Approximate M S C P	Approx. Hours Life	FILAM Type
331	—	T-1 3/4	S. C. Mid. Flanged	1.35	.06	.01	500	C-2R
1728	—	T-1 3/4	5/8″ Wire Term.	1.35	.06	.01	500	C-2R
2301	—	T-1 3/4	Mid. 2-Pin (White)	1.35	.06	.01	500	C-2R
368	—	T-1 3/4	S. C. Mid. Flanged	2.5	.20	.15	500	C-2R
1767	—	T-1 3/4	Midget Screw	2.5	.20	.15	500	C-2R
1769	—	T-1 3/4	Midget Screw	2.5	.20	.15	500	C-2R
1783	—	T-1 3/4	5/8″ Wire Term.	2.5	.20	.15	500	C-2R
2302	—	T-1 3/4	Mid. 2-Pin (Brown)	2.5	.20	.15	500	C-2R
338	—	T-1 3/4	S. C. Mid. Flanged	2.7	.06	.03	500	C-2R
1738	—	T-1 3/4	5/8″ Wire Term.	2.7	.06	.03	500	C-2R
2303	—	T-1 3/4	Mid. 2-Pin (Lt. Grn.)	2.7	.06	.03	500	C-2R
2129	—	T-1 3/4	5/8″ Wire Term.	3.0	.30	.34	1,500	C-2R
2304	—	T-1 3/4	Mid. 2-Pin (Black)	3.0	.30	.34	1,500	C-2R
345	—	T-1 3/4	S. C. Mid. Flanged	6.0	.04	.05	1,000	C-6
1730	—	T-1 3/4	5/8″ Wire Term.	6.0	.04	.05	1,000	C-6
2305	—	T-1 3/4	Mid. 2-Pin (Silver))	6.0	.04	.05	1,000	C-6
328	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	.34±15%[1]	1,000	C-2R
328-10	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	.34±10%[1]	1,000	C-2R
328R[2]	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	—	1,000	C-2R
337	—	T-1 3/4	Midget Grooved	6.0	.20	.6	1,000	C-2R
1768	—	T-1 3/4	Midget Screw	6.0	.20	.6	1,000	C-2R
1784	—	T-1 3/4	5/8″ Wire Term.	6.0	.20	.6	1,000	C-2R
2306	—	T-1 3/4	Mid. 2-Pin (Orange)	6.0	.20	.6	1,000	C-2R
349	—	T-1 3/4	S. C. Mid. Flanged	6.3	.20	.34	5,000	C-2R
2112	—	T-1 3/4	5/8″ Wire Term.	6.3	.20	.34	5,000	C-2R
2307	—	T-1 3/4	Mid. 2-Pin (Dk. Blu.)	6.3	.20	.34	5,000	C-2R
344	—	T-1 3/4	S. C. Mid. Flanged	10.0	.014	.004	5,000+	C-2F
1869	—	T-1 3/4	5/8″ Wire Term.	10.0	.014	.01	5,000+	C-2F
2308	—	T-1 3/4	Mid. 2-Pin (Beige)	10.0	.014	.01	5,000+	C-2F
367	—	T-1 3/4	S. C. Mid. Flanged	10.0	.04	.05	5,000+	C-2R
2107	—	T-1 3/4	5/8″ Wire Term.	10.0	.04	.05	5,000+	C-2R
2309	—	T-1 3/4	Mid. 2-Pin (Lt. Blue)	10.0	.04	.05	5,000+	C-2R
330	—	T-1 3/4	S. C. Mid. Flanged	14.0	.08	.5	750	C-2F
336	—	T-1 3/4	Midget Grooved	14.0	.08	.5	750	C-2F
383	—	T-1 3/4	Midget Screw	14.0	.08	.5	750	C-2F
1705	—	T-1 3/4	5/8″ Wire Term.	14.0	.08	.5	750	C-2F
2310	—	T-1 3/4	Mid. 2-Pin (Yellow)	14.0	.08	.5	750	C-2F
370	—	T-1 3/4	S. C. Mid. Flanged	18.0	.04	.25	1,000	C-2F
346	—	T-1 3/4	Midget Grooved	18.0	.04	.25	1,000	C-2F
2102	—	T-1 3/4	5/8″ Wire Term.	18.0	.04	.25	1,000	C-2F
2311	—	T-1 3/4	Mid. 2-Pin Dk. Grn.)	18.0	.04	.25	1,000	C-2F
327	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	.34±25%	1,000	C-2F
327-15	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	.34±15%	1,000	C-2F
327R[2]	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	—	1,000	C-2F
334	—	T-1 3/4	Midget Grooved	28.0	.04	.34	1,000	C-2F
335	—	T-1 3/4	Midget Screw	28.0	.04	.34	1,000	C-2F
369	—	T-1 3/4	Midget Screw	28.0	.04	.34	1,000	C-2F
1762	—	T-1 3/4	5/8″ Wire Term.	28.0	.04	.34	1,000	C-2F
1764	—	T-1 3/4	1″ Wire Term.	28.0	.04	.34	1,000	C-2F
2312	—	T-1 3/4	Mid. 2-Pin (Red)	28.0	.04	.34	1,000	C-2F
680	MS24367	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—
682	MS24515	T-1	Sub-Midget Flg'd.	5.0	.06	.03 ±15%	100,000	—
683	MS24367	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—
685	MS24515	T-1	Sub-Midget Flg'd.	5.0	.06	.05 ±15%	100,000	—
713	MS24367	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—
714	MS24515	T-1	Sub-Midget Flg'd.	5.0	.075	.08 ±15%	100,000	—
715	MS24367	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—
718	MS24515	T-1	Sub-Midget Flg'd.	5.0	.115	.14 ±15%	50,000	—
6801	—	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—
6831	—	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—
7131	—	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—
7151	—	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—
6802	MS90451	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—
6832	MS90451	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—
7132	MS90451	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—
7152	MS90451	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—
6803	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—
6833	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—
7133	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—
7153	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—

[1] At 5 volts; at 6 volts, approximately 0.6 cp [2] Coated A

Hudson LAMP COMPANY

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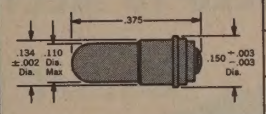
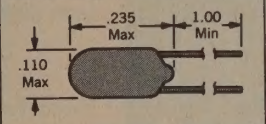
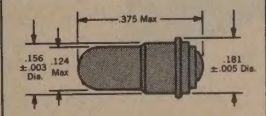
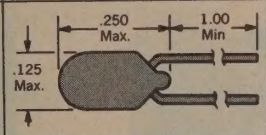
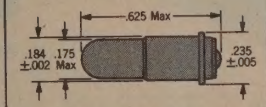
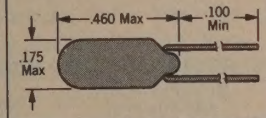
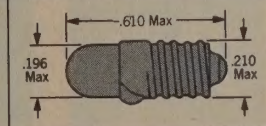
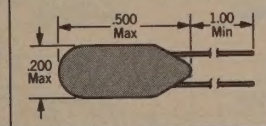
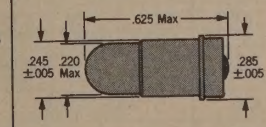
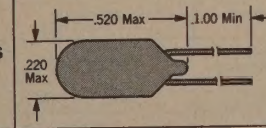
IEE Subminiature Incandescent Lamps

Hand workmanship insures accurate filament location and superior mechanical characteristics. • Handblown, seamless and tipless envelope provides unmatched clarity. • Machined bases for precision fit. • All lamps aged to stability and selected to insure long life and uniform brightness. • Cost savings as much as 40% below competitive manufacturers.

Orders for any one T-size lamp may be grouped for best price.

		Lamp No.	Volt	Amp	M.S.C.P.*	Average Life (Hrs.)	Price** (Each)	
T 7/8 LAMPS BASED		1	5	.115	.132	40,000	.44	A totally new lamp designed and developed by IEE. Now being widely accepted throughout the industry as a standard. This lamp offers all the features of a standard T1 lamp but requires much less space. Supplied in both standard types and commercial types for low cost applications.
		A3	14	.04	.132	16,000	.588	
		A5	12	.06	.132	16,000	.588	
T 7/8 LAMPS UNBASED		3	5	.115	.147	40,000	.35	
		AU3	14	.04	.147	16,000	.49	
		AU5	12	.06	.147	16,000	.49	
T 1 LAMPS BASED		685	5	.06	.048	100,000	.417	IEE offers price savings of up to 50% on T 1 lamps, and at the same time provides higher quality. This includes aging and selection as a standard at no increase in price. Aging and selection provide a lamp with much longer life and more uniform light.
		714	5	.075	.080	60,000	.417	
		718	5	.115	.132	40,000	.417	
T 1 LAMPS UNBASED		683	5	.06	.053	100,000	.287	
		713	5	.075	.088	60,000	.287	
		715	5	.115	.147	40,000	.287	
T 1-1/4 LAMPS BASED		632	28	.04	.34	5000	.308	IEE provides industry standards on T 1-1/4 lamps and also ages and selects them at no increase in price. Models are also offered with average life of 100,000 hours.
		646	14	.08	.50	2500	.308	
		628	6	.20	.63	3000	.277	
T 1-1/4 LAMPS UNBASED		627	28	.04	.36	5000	.183	
		640	14	.08	.53	2500	.183	
		634	6	.20	.66	3000	.160	
T 1-1/2 LAMPS BASED		317	14	.065	.400	500	.116	IEE T 1-1/2's are special lamps developed to meet the increasing demand for a quality lamp at a very low price for commercial applications.
		318	7	.065	.120	1000	.088	
		333	28	.040	.400	1000	.130	
T 1-1/2 LAMPS UNBASED		GU1	7	.065	.150	1000	.080	
		GU2	14	.065	.400	500	.105	
		GU3	28	.040	.400	1000	.120	
		Lamp No.	**Volt**	**Amp**	**M.S.C.P.***	**Average Life (Hrs.)**	**OEM† or 100,000 and over**	
T 1-3/4 LAMPS BASED		327	28	.04	.34	5000	.178	Standard IEE T 1-3/4 lamp life rated at 3 to 5 times the industry standard. However, the lamps are priced considerably below the industry standard. IEE also ages and selects these lamps and does not increase the pricing for this service. The lamps are well stabilized and have a very uniform output of light.
		328	6	.20	.34 at 5V	3000	.160	
		330	14	.08	.50	2500	.178	
T 1-3/4 LAMPS UNBASED		2187	28	.04	.29	25,000	.154	
		1784	6	.20	.36 at 5V	3000	.120	
		1705	14	.08	.52	2500	.139	

†Any OEM user is entitled to purchase T 1-3/4 lamps from OEM price bracket regardless of quantity ordered.

*Mean spherical candle power. **Qty. price on 100,000 and over.

IEE Subminiature lamps are used exclusively in IEE Rear-Projection Readouts. *See pages 1516, 1517.*

Industrial Electronic Engineers, Inc., 7740 Lemona Ave., Van Nuys, California

The world's broadest line of rear projection readouts

Industrial Electronic Engineers, In

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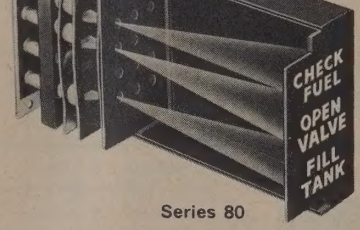
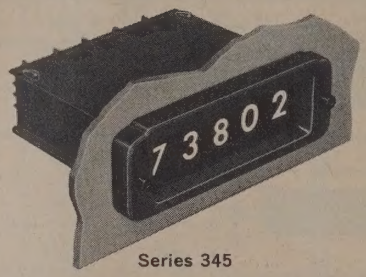
REAR PROJECTION READOUTS—MODELS TO MEET EVERY APPL

- SINGLE-PLANE PRESENTATION for crispness, not visual "hash."
- BOLD, BRIGHT DISPLAYS for high readability at wide angles, long distances, in brightest light. (Character brightness up to 100 foot-lamberts.)
- FROM 11 TO 64 MESSAGE POSITIONS per readout. May be displayed individually or in combination.
- NO MOVING PARTS for unlimited unit life; easily replaceable lamps provide up to 240,000 hours of operation per lamp.
- LOW VOLTAGE OPERATION.

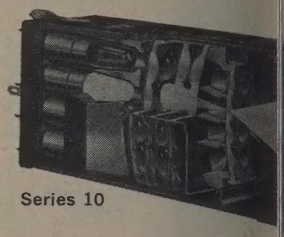


Series 80

Series 340
Front Relampable

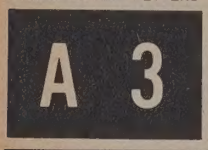


Series 345

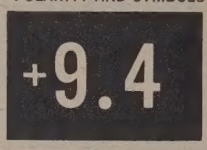

Series 10

- INFINITE DISPLAY VERSATILITY. IEE readouts permit you to display anything that can be put on film:

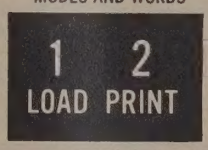
NUMERALS AND LETTERS



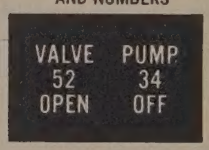
POLARITY AND SYMBOLS



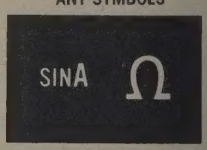
MODES AND WORDS

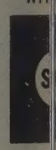


MULTIPLE WORDS AND NUMBERS



ANY SYMBOLS





	SERIES 345		SERIES 340		SERIES 120H			SERIES 220H		
Number of Message Areas	11		11		12			12		
Usable Projected Message Area	.38H x .34W		.38H x .34W		.59 Square			.62 Square		
Average Character Brightness at Rated Voltage	#C1 5 Volts	#C1 6 Volts	#1 5 Volts	#1 6 Volts	#328 6 Volts	#330 14 Volts	#327 28 Volts	#328 6 Volts	#330 14 Volts	#327 28 Volts
	30 F/L	60 F/L	30 F/L	60 F/L	100 F/L	35 F/L	25 F/L	100 F/L	35 F/L	25 F/L
IEE Rated Lamp Life	10,000 Hours	1,000 Hours	40,000 Hours	4,000 Hours	3,000 Hours	2,500 Hours	5,000 Hours	3,000 Hours	2,500 Hours	5,000 Hours
Rated Lamp Life at 30 Foot Lamberts	10,000 Hours	N/A	40,000 Hours	N/A	240,000 Hours	4,500 Hours	2,500 Hours	240,000 Hours	50,000 Hours	2,500 Hours
Standard Character Height Viewing Distance	.37 in. — 8 ft.		.37 in. — 8 ft.		.59 in. — 12 ft.			.59 in. — 12 ft.		
Overall Dimensions	2.50 x .75 x .50		2.41 x .760 x .505		4.16 x 1.31 x .995			3.96 x 1.475 x 1.07		
Lamp Replacement Access	Front Panel		Front Panel		Rear Panel			Front Panel		
Method of Removing Unit from Panel	Pull Forward by Hand		Push In to Release Latch and Pull Forward		Rear Removable			Push In to Release Latch and Pull Forward		
Type of Lamp Recommended for Optimum Performance	Based T-⅞ #C1		Based T-⅞ #1		Based T-¾ #328			Based T-1¾ #328		
Maximum Operating Ambient Temperature. 1 Lamp Cont.	85°C		85°C		85°C			85°C		
Method of Changing Film Reticle	Remove 2 Screws and Open Case		Remove 2 Screws and Open Case		Remove 2 Screws and Open Case			Remove 4 Screws and Open Case		
Unit Cost (1-49 Quantity — with recommended lamp). Consult Factory for Quantity Prices.	$21.00		$30.00		$35.00			$31.25		
IEE Lamp Replacement Costs	$.280 — .40 each		$.44 — .63 each		$.160 — .178 each			$.160 — .178 each		
Assembly Hardware Costs	$5.00 plus $3.00 per unit *		$5.00 plus $10.50 per unit *		$5.00 plus $1.00 per unit			$5.00 plus $5.75 per unit *		

*Front relampable units must be ordered with assembly hardware as individual inserts have no mounting provision.

The world's broadest line of rear projection readouts

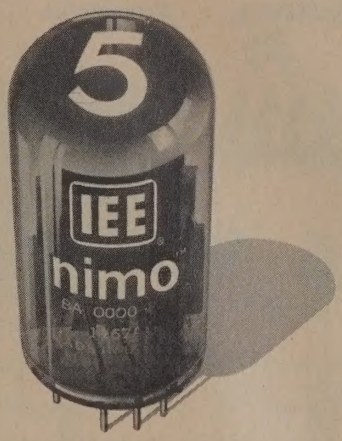
Industrial Electronic Engineers, Inc.

7740 Lemona Avenue, Van Nuys, Calif. 91405 • Phone (213) 787-0311 • TWX 910-495-1707

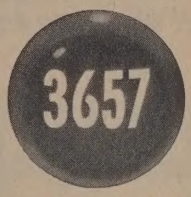
mo™ Display Tubes

4-decade models available now.
model in development.

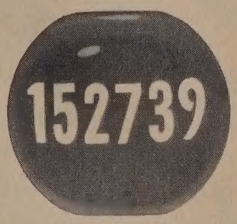
ne digital displays unsurpassed for bright-larity. Numbers, letters and words are pro-o a fluorescent screen from a 10-gun CRT. ges easily viewed in direct sunlight. Excep-ide viewing angle. Extremely low power ion. Small grid control swing. Available antity in standard single decade and four odels; a six decade Nimo™ is on the way.



Single



Four Decade



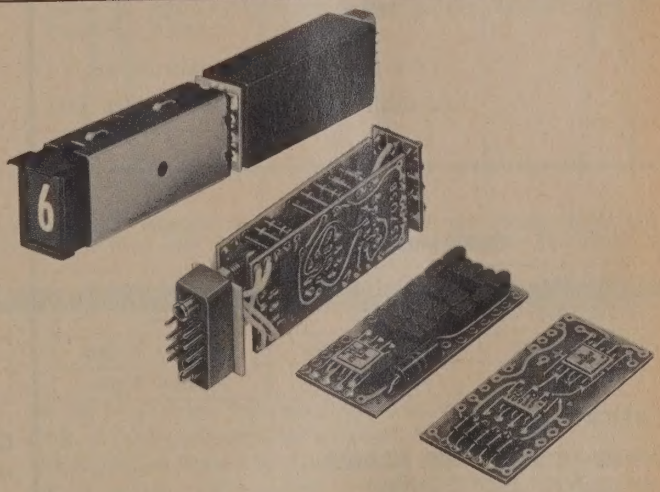
Six Decade

IC DRIVER/DECODERS

ler IC models for converting binary to decimal

npact units for driving incandescent lamps jection readouts. Utilize the latest integrated hniques. Fully compatible with modern in-ircuits. Can drive lamps up to 250 ma. and C. Require no reset function. Other features ternal data storage for pulsed operation, low nsumption (typically 600 mw), high noise (1.0 volts), same logic voltage (Vee) as IC's, and high reliability.

ls incorporated forbidden code rejection minates ambiguous displays. Standard 8-4-2-1 de accepted, equivalent decimal output de.



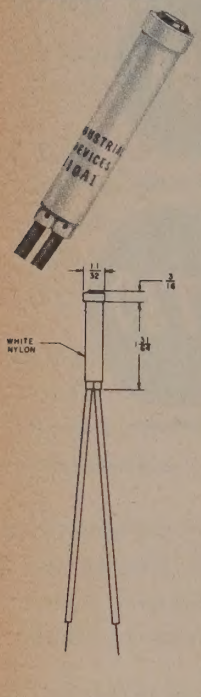
	SERIES 10H			SERIES 160H		SERIES 360H			SERIES 80			Bina-View			Status Indicator		
	12			12		12			12			64 Maximum			12		
	.94 Square			1.562H x 1.125W		2.0H x 1.5W			3.375H x 2.75W			1.38H x 1.25W			.43 Square		
	#44 6.3 Volts	#1815 14 Volts	#1820 28 Volts	#238 Lamp 6.3 Volts	#44 Lamp 6.3 Volts	#238 6.3 Volts	#1815 14 Volts	#313 28 Volts	#1886 6.3 Volts	#1414 14 Volts	#1495 28 Volts	#1886 6.3 Volts	#1414 14 Volts	#1495 28 Volts	#47 6.3 Volts	#1815 14 Volts	#1820 28 Volts
	75 F/L	60 F/L	32 F/L	45 F/L	24 F/L	60 F/L	20 F/L	25 F/L	45 F/L	35 F/L	19 F/L	85 F/L	80 F/L	40 F/L	200 F/L	220 F/L	140 F/L
	3,000 Hours	3,000 Hours	1,000 Hours	2,000 Hours	3,000 Hours	2,000 Hours	3,000 Hours	5,000 Hours	3,000 Hours	500 Hours	500 Hours	3,000 Hours	500 Hours	500 Hours	3,000 Hours	3,000 Hours	1,000 Hours
	90,000 Hours	45,000 Hours	N/A	8,000 Hours	N/A	24,000 Hours	N/A	N/A	12,000 Hours	900 Hours	N/A	135,000 Hours	17,500 Hours	15,000 Hours	30,000 Hours	30,000 Hours	10,000 Hours
	.94 in. — 20 ft.			1.50 in. — 30 ft.		2.00 in. — 40 ft.			3.37 in. — 70 ft.			1.37 in. — 38 ft.			.37 in. — 8 ft.		
	5.50 x 2.625 x 1.562			7.00 x 2.69 x 1.56		7.80 x 3.935 x 2.00			12.12 x 5.30 x 3.29			6.25 x 3.30 x 3.22			2.62 x 2.415 x 1.935		
	Rear Panel			Rear Panel		Rear Panel			Rear Panel			Rear Panel			Front Screen is Removable by Hand for Lamp Access		
	Rear Removable			Rear Removable		Rear Removable			Rear Removable			Rear Removable			Front Removable by Hand		
	Bayonet Base T-3¼ #44			Bayonet Base T-3¼ #44		Bayonet Base T-3¼ #238			Bayonet Base T-4½ #1886			Based T-4¼ #1886			Bayonet Base T-3¼ #47		
	70°C			70°C		70°C			70°C			70°C			85°C		
	Remove 4 Screws and Open Case			Not Changeable by Customer		Remove 4 Screws and Open Case			Remove 4 Screws and Open Case			No Film			Release Screen and Remove Display Grid		
	$20.00			$25.50		$38.50			$43.00			$130.50 4 Bit 16 Character Model			$17.50 — $20.00		
	$.10 — .16 each			#238 Lamp $.20 each	#44 Lamp $.10 each	$.20 each			$.20 each			$.20 — .26 each			$.10 — .37 each		
	$5.00 plus $1.00 per unit			$5.00 plus $1.00 per unit		$6.00 plus $1.50 per unit			$6.00 plus $2.00 per unit			$5.00 plus $1.00 per unit			N/A		

IDI PILOT AN

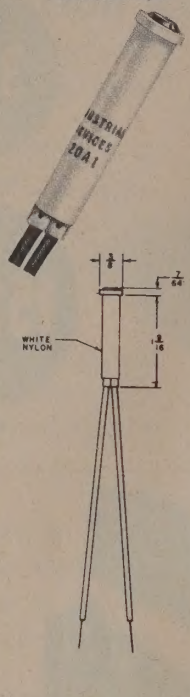
glo-dot

Miniature neon pilot lights
Mounting hole—5/16" diameter.

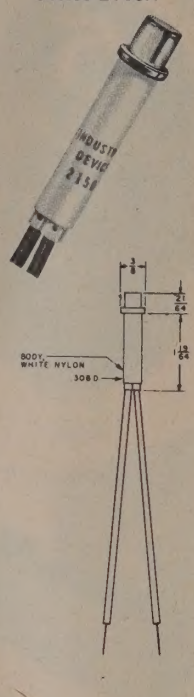
Series 2110A



Series 2120A



Series 2150A



STOCK MODELS AVAILABLE

2110A1 Red	2120A1 Red	2150A1 Red
2110A2 Clear	—	—
2110A3 Amber	2120A3 Amber	2150A3 Amber
2110A4 White	2120A4 White	2150A4 White

SPECIFICATIONS

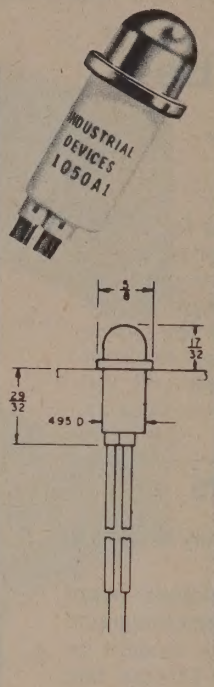
(COMMON TO ALL STOCK MODELS
Except GLO-DOT 2990D Series.)

Voltage: 105—125 A.C.
Leads: 4½" 105°C plastic stripped ½".
Lamp: High brightness neon with built-in resistor.
Speednut: Hardened spring steel, rust-resistant finish.

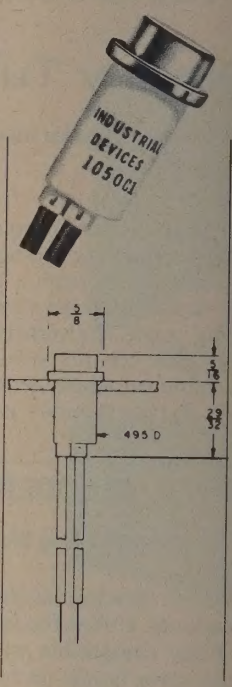
omni-glow

Versatile general purpose neon
Mounting hole—½" diameter.

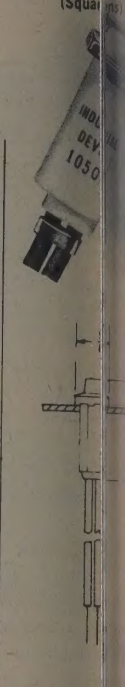
Series 1050A



Series 1050C



Series 50
(Squa

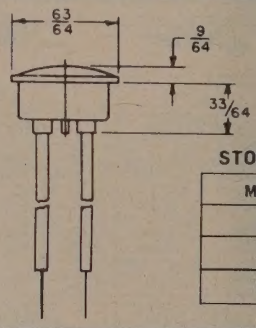


STOCK MODELS AVAILABLE

1050A1 Red	1050C1 Red	1050N1
1050A2 Clear	—	—
1050A3 Amber	1050C3 Amber	1050N3
1050A4 White	1050C4 White	1050N4

OMNI-GLOW SERIES 2600

Mounting hole—7/8" diameter.



STOCK MODELS AVAILABLE

MODEL NO.	LENS COLOR
2620K1	Red
2620K3	Amber
2620K4	White

glo-dot 2990d series

Stock Models Available
One-piece lens/body 6 and 12 volt pilot lights
Mounting hole—5/16" diameter

STOCK MODELS

6 VOLT PART #	LENS COLOR	12 VOLT PART #
2990D1-6V	RED	2990D1-12V
2990D4-6V	WHITE	2990D4-12V
2990D5-6V	GREEN	2990D5-12V
2990D6-6V	BLUE	2990D6-12V
2990D7-6V	YELLOW	2990D7-12V

line-o-lite

*Mounting hole—
1⅜₃₂" x .395/.400".

*Will snap-fit into panels .055-.070" thick without speednut

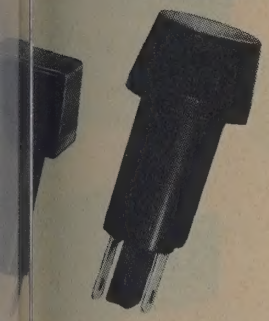
INDUSTRIAL DEVICES, INC.

Edgewater, New Jersey 07020 Phone: 201-943-4084

DICATOR LIGHTS

MINI-SLIDE

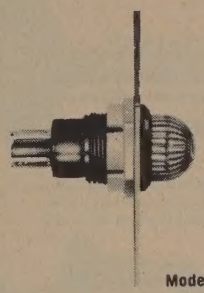
PILOT LIGHT ASSEMBLIES



Model 3060 Series

lens shapes, round and square for nd series.

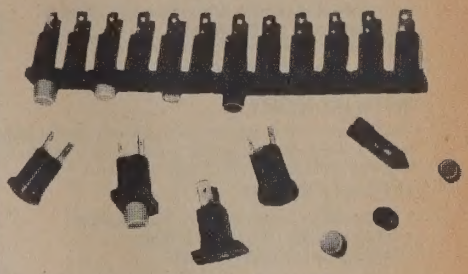
"Pilot" lamps including 120 and "Indicator" lamps.



Model 2800 Series

- Screw-in design for easy relamping from front of pane.
- Unique torque-limiting, self-locking nylon mounting nut.

INDIVIDUAL SOCKETS
MULTI-SOCKET STRIPS • END CAPS



- Round and rectangular single sockets.
- Socket strips of 12 sockets on ½" or ¾" centers, individual or common ground.

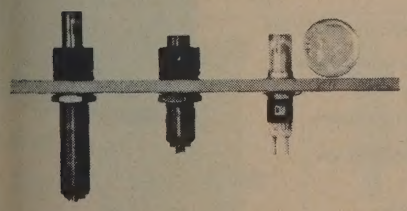
- ctive on or off. Uniform brilliant light.
- omical yet reliable and rugged.
- es in a full range of colors.
- to install with push-on speednut mounting, simple panel aration. Keyed to prevent rotation.
- es can be imprinted.
- Easy relamping from front of panel. No special tools needed.
- Lamps are extreme long-lived, rugged, reliable, available from 4 volts to 120 volts.
- U.L. approved (phenolic sockets) for 120 volts.
- Either solder or use quick-connect receptacles.

LIDE-BASE LAMPS

ine of rugged, long-life miniature incandescent lamps is available to fit Industrial Devices individual and multi-socket strips. Several ered to cover a wide range of voltages up to 120 volts and ratings up to three watts. Lamps are available in two lengths; the shorter "Indi- e longer "Pilot" lamps.

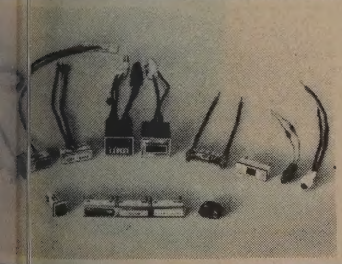
MINI-CATOR

MINIATURE INDICATOR LIGHTS



For use in electronic instrumentation, computers, display panels, precision machinery and electronic equipment in general — including military applications. Neon models available for 65 VAC (90 VDC) and over, with or without built-in resistor. Incandescent models available for 6.3V-.20A, 14V-.08A and 28V-.04A, as well as other voltages and currents. MINI-CATOR consists of replaceable lamp cartridge and mating lampholder. Lamp cartridge has nylon body for long-life ruggedness. Lampholder with built-in resistor for neon cartridges available.

- Lens available in variety of colors, with or without imprints.
- Lampholders mount in ⅜" hole for space economy.
- Lamp cartridge may be mounted directly in 19/64" dia. hole with mounting clip and lamp connector.



specials . . . of every description

IDI specializes in designing or adapting pilot lights to particular specifications. Lights can be provided as complete assemblies to meet circuit design requirements — a capability that can drastically reduce cost by eliminating delicate assembly of resistors, capacitors or diodes. Whatever your requirement, special pilot light or pilot light assembly, IDI progressive manufacturing techniques and engineering capabilities will provide quick, economical service.

INDUSTRIAL DEVICES, INC.

Edgewater, New Jersey 07020

Phone: 201-943-4084

THE MOST COMPLETE LINE OF DIGITAL DISPLAYS, COUNTERS, PRESET COUNTERS, CLOCKS, ANNUNCIATORS AND COMPATIBLE POWER SUPPLIES IS NOW AVAILABLE FROM A SINGLE SUPPLIER.

mini-digit

DECODE DISPLAY ASSEMBLIES–UNI-DIRECTIONAL COUNT DISPLAY ASSEMBLIES

MD SERIES—DECODE DISPLAY

The Mini-Digit decode display assemblies provide decimal readout on cold cathode display tubes directly from BCD inputs at typical I.C. voltage levels.

KEY SPECIFICATIONS

- **Compact, attractive front bezel**
- **Long life cold cathode tubes mounted to provide excellent wide angle viewing.**
- **Single printed circuit finger connector.**

MDM SERIES DECODE DISPLAYS WITH MEMORY

These units are also available with a memory buffer stage and are useful when a constant unchanging display is required, while the input changes.

KEY SPECIFICATIONS

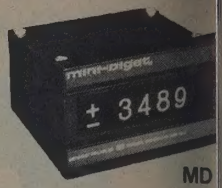
- **BCD output available from the storage stage**
- **BCD inputs from DTL or TTL circuits.**
- **Decimal point in every position**

MDC SERIES COUNT DISPLAY

The Mini-Digit count display assemblies are uni-directional counters capable of a 2 MC count rate. As input pulses occur they are displayed directly on a cold cathode display tube.

KEY SPECIFICATIONS

- **BCD outputs available from the counter**
- **Reset to zero circuits**
- **Simple installation. Only one input and reset line needed regardless of the number of decades.**



MD

MDCM SERIES COUNT DISPLAYS WITH MEMORY

These units are also available with a memory stage permitting the readout to directly follow any input pulses or to display the previous number while still monitoring the count input.

KEY SPECIFICATIONS

- **BCD outputs available from the memory stage**
- **2 MC count rate**
- **Plus/Minus sign option available.**

MDC

PRESET COUNTER–BI-DIRECTIONAL COUNT DISPLAY ASSEMBLY

MDP SERIES

The MDP series of uni-directional counters feature a built-in preset comparator circuit set by individual thumb wheel switches. The entire unit is mounted in a standard compact I.D.I. bezel housing with the preset thumb wheels positioned on the right side of the readout. From 2-5 decades are available in this series which will give an output when the predetermined point set on the thumb wheels is reached. The digital display follows any changes at its input and can be wired to hold the count at the preset point, or continue to monitor the input.

KEY SPECIFICATIONS

- **Entire unit mounted in standard I.D.I. bezel housing.**
- **Available from 2-5 decades of counting display**
- **Preset point set in on thumb wheel switches**
- **BCD outputs available from the counting stage**
- **Coincidence signal at preset point**
- **Zero reset**
- **Extremely compact unit**
- **Fast, simple mounting**

MDBC SERIES

The MDBC series of Bi-directional counters accept pulse rates up to 15 MC and provide decimal readout on cold cathode display tubes. Input is on 2 lines—one line is for input pulses and the other determines count direction. With the count direction line "low", pulses are considered subtractive and when "high", they are additive. With an optional quadrature input card the counter will accept input in quadrature form typical of most transducers.

KEY SPECIFICATIONS

- **Any number of decades from 2—6**
- **BCD output available from the counter stage**
- **Preload input feature in BCD form enables the counter to start accumulating pulses from either zero or any other number**
- **Optional ± sign**
- **Compact attractive unit with bezel customizing capability.**
- **Single printed circuit finger connector**

MDP

MDBC

DIGITAL PANEL METER

MDPM-B BI-POLAR SERIES

The mini digit series of digital panel meters are 3 1/2 digit units providing decimal readout on cold cathode display tubes direct from an analog input. They are available in 5 voltage and 5 current ranges and feature bi-polar operation with BCD outputs.

MOUNTING

The size of the MDPM series is 2.4H x 3.6 D x 3.8 W and weighs only 14 oz's. A rugged extended aluminum shielded assembly houses all the electronics and provides for a fast simple means of mounting the unit. All input/output is on a single rear gold plated printed circuit finger connector: the front bezel as with the entire IDI line of displays has an added feature of allowing the user to customize the front bezel with their logo, or unit function and provides excellent wide angle viewing up to 160°

KEY SPECIFICATIONS . . .

- **Bi-polar operation**
- **Buffered BCD outputs plus overrange and polarity bits**
- **100 % overrange**
- **Compact size 2.4H x 3.6D x 3.8W (3 1/2 digits plus sign)**
- **Remote triggering**
- **Latching non blinking cold cathode tube display.**
- **Built-in power supply**
- **Indicator provided when unit exceeds its range**
- **Accuracy 0.1% ± 1 digit**
- **High input impedance**
- **Single printed circuit board connector.**

MDPM-B

DIGITAL ANNUNCIATOR

MDDA SERIES

The MDDA series of digital Annunciator's combine in one compact package both alphanumeric and numeric display in any combination.

KEY SPECIFICATIONS

- **Cold cathode display tube for both alpha and numeric characters.**
- **operates from 5 volt logic**
- **simple fast mounting**
- **unique mounting provides excellent wide angle viewing.**

POWER SUPPLY

The Model PS2A power supply provides in one compact package both required voltages for I.D.I.'s. line of displays, 200 volts and 5 volts. The 200 volts is at 50 ma unregulated and the 5 volts at 1 amp regulated.

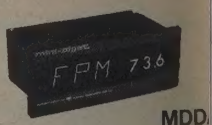
DIGITAL CLOCK DISPLAY

MD600T SERIES—6 DIGIT CLOCK

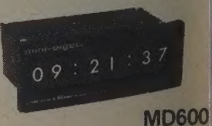
The Mini-Digit digital clock accepts BCD data and displays it as decimal time of day. The MD600T displays time in hours, minutes and seconds

KEY SPECIFICATIONS

- **Input in BCD form at typical IC voltage levels.**
- **Complete packaged unit provides fast easy mounting**
- **long life cold cathode display tubes**



MDD



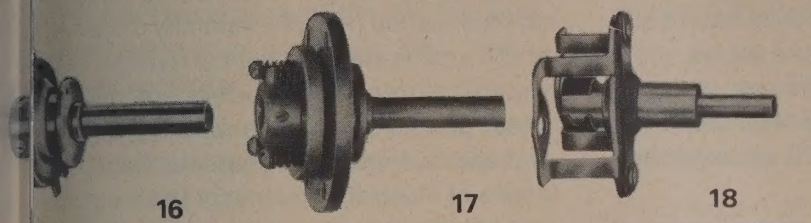
MD600

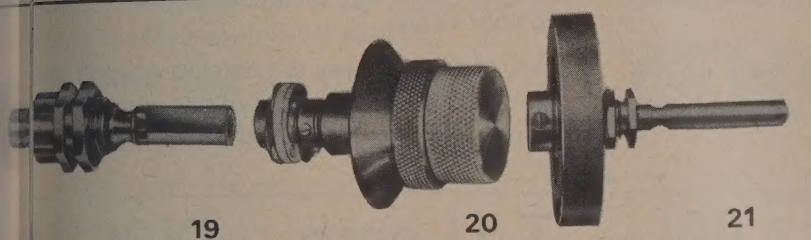
IDI

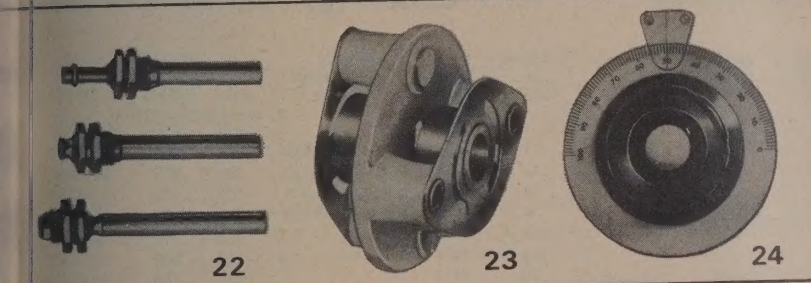
INSTRUMENT DISPLAYS INC.
18-36 GRANITE ST.,
HAVERHILL, MASS. 01830
617-374-0311

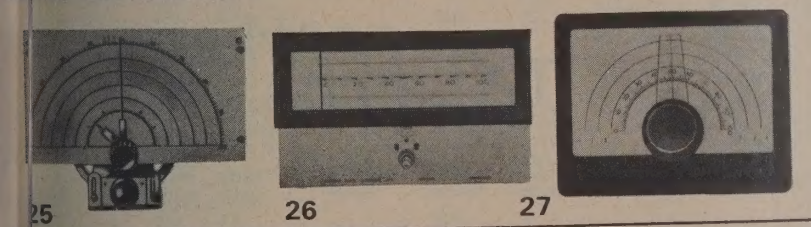
JACKSON BROS. (LONDON) LTD.

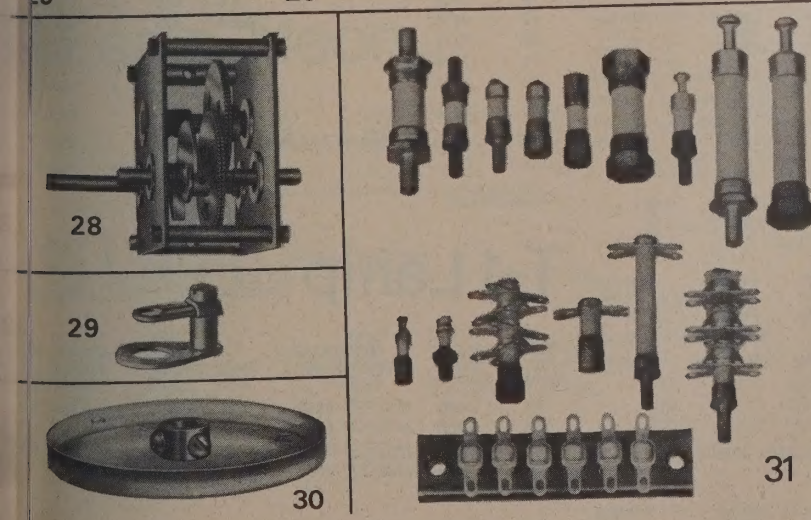
TUNING CONTROLS/DRIVES/ TERMINALS MADE IN ENGLAND











16. Ball Drives Powerful Precision Epicyclic 1/4″ base, 1/4″ shaft concentric 6:1 ratio. 1 3/32″ diameter steel cage. 4511 basic design; 4511 F with flange for dial.

Dual Ratio Ball Drives As above but with 2 ratio reverse vernier action 6:1, 36:1.

17. Adjustable Torque Ball Drives As above but in precision machined aluminum housing 1 1/2″ diameter and adjustable spring tension, 6:1 or 6/36:1 available.

18. Mini Ball Drive To fit 6mm shaft designed for use with plastic film variable capacitors or any other. Front area 31/32″ x 63/64″.

19. Epicyclic Drives 3/8″ 1 hole fixing, 5:1 ratio. Various arrangements; Direct-slow R.V., Slow through spindle or Direct-slow R.V. Cord Drive.

20. D Type 2 Speed Drive 1 1/2″ diameter flange aluminum knobs. Universal joint shaft coupling; 4 1/2:1 ratio.

21. Spinwheel Drive Various designs including Ball Bearing, Nylon Bearing, Plain Bearing Spindles grooved for Cord Drive. Plain available. Flywheels 1 3/4″ or 2″ diameter lead, 2 1/4″ diameter zinc.

22. Cord Drives Various silky action lubricated Plain Bearing Spindles with cord grooves. Plain Spindles available.

23. Universal Couplings Constant velocity shaft Couplings. High Torque. Compensates both linear and angular. Insulated by rigid moulding. 4693 1 3/8″ diameter for maximum flex, 5610 3/4″ diameter for minimum size. **Solid Brass Couplings** and extension spindles also available.

24. Ball Drive Dial 6:1 Ball Drive, 4″ diameter aluminum scale 0-100, reversable other side plain. Fits external to panel.

25. Caliband Drive Dual control, 2 pointers 6:1 search 48:1 bandspread escutcheon 7 7/16″ x 4 1/4″ overall.

26. SL15 Slide Rule Drive 10:1 ratio. Escutcheon 7 1/4″ x 2 5/8″ overall. Calibrated 0-100 with provision for logging.

27. 6/36 Drive Uses Ball Drive Type DR 6/36:1 ratios. Escutcheon 4 5/8″ x 3 1/2″ overall.

28. Gear Drives Types G1 56.25 precise ratio. Type G4 75:1 with friction first driver shaft. Both backlash free; all Ball Bearing Spindles. Front area 3″ x 2 7/8″. Depth 1 19/32″.

Type G80 Concentric friction input geared output. Front area 2 1/4″ x 1 7/8″. Depth 3/4″.

29. "Pot Lock" Spindle Lock Fits 1/4″ spindle, secure, stress-free locking.

30. Drums Fit 1/4″ shaft (or other to order) overall diameters 1 1/4″, 1 1/2″, 1 13/16″, 2 1/8″, 2 3/4″, 3 1/2″, 3 3/4″, 4 1/2″, 5 1/2″. Plated steel with Brass Bush.

31. Stand-off Insulators and Terminal Strips For voltages up to 10K; rigid; ceramic insulated; better than 20^6 megohms silicone anti-tracking. No solder or adhesives. Extensively used by British Forces and Communication Industry.

U.S.A.: M. SWEDGAL · 258 BROADWAY · NEW YORK, N.Y.10007. TEL: (212) WOrth 2-5485
ENGLAND: KINGSWAY-WADDON · CROYDON, CR9 4DG. TEL: (01-688 2754)

Lamps Inc. proudly presents

The listing is incomplete because we are the world's largest manufacturer of subminiature and microminiature lamps. And it would not be practical to show them all here. Instead, we have provided specifying data for 70 of the most popular. Hundreds of other LAMPS are described in our catalog.

We'll be happy to send you a copy. And you'll be happy to receive it.

You see, the catalog includes complete specifying guides and drawings, plus: a large, full-color interpretation of the International Commiss on Illumination (ICI) chromaticity diagram; n graph scales showing the correlation betwe voltage, current, candlepower and useful lif linear graphs of rise time, spectral distribut and spectral response characteristics; and pages of illustrated technical source, to hel you choose the exact lamp design best suit to your needs.

But, of course, even the catalog doesn't des all our LAMPS. As you read this, we are putt into production new LAMPS that were still i

T-⅜ Lamp Unsupported Filament Unbased

LAMPS, Inc. Number	USASI Number*	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
156	7093	3.0	.029	.03±15%	5,000
173	7090	1.5	.015	.002 NOM	5,000

T-½ Lamp Unsupported Filament Unbased

LAMPS, Inc. Number	USASI Number*	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
157	7097	5.0	.020	.034 NOM.	5,000
174	7094	1.5	.015	.002 NOM.	5,000
176	7096	3.0	.029	.03 NOM.	5,000
186		2.5	.045	.05 NOM.	1,000

T-¾ Lamp Unsupported Filament Unbased

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
9	6833	MS90452-6833	5.0	.060	.05±15%	100,000
12	7133	MS90452-7133	5.0	.075	.09±15%	25,000
17	7153	MS90452-7153	5.0	.115	.15±15%	40,000
30	6803	MS90452-6803	5.0	.060	.03±15%	100,000

T-1 Lamp Reduced Length Unbased

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
33	7152	MS90451-7152	5.0	.115	.15±15%	40,000
58	6832	MS90451-6832	5.0	.060	.05±15%	100,000

T-1 Lamp Unsupported Filament Based

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
25	685	24515-685 AS15	5.0	.060	.05±15%	100,000
26	714	24515-714 AS15	5.0	.075	.09±15%	25,000
27	718	24515-718 AS15	5.0	.115	.15±15%	40,000
29	682	24515-682 AS15	5.0	.060	.03±15%	100,000

*FORMERLY ASA NUMBER

T-1 Lamp Unsupported Filament Unbase

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)
4	7201		1.5	.015	.01 NOM.
11	683	24367-683 AS15	5.0	.060	.05±15%
14	713	24367-713 AS15	5.0	.075	.09±15%
16	715	24367-715 AS15	5.0	.115	.15±15%
32	680	24367-680 AS15	5.0	.060	.03±15%
138	7205		3.0	.015	.02 NOM.
139	7210		5.0	.030	.03 NOM.
70	7214		5.0	.115	.22±15%
210			5.0	.020	.034±15%
229	6150		5.0	.060	.15±15%

T-1 Lamp Supported Filament Unbased

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Number Support	Candl Powe (MSCP
8	7209		5.0	.015	1	.02 NO
62	6838		28.0	.024	2	.15±25
66	7219		12.0	.060	1	.15±25
74	7218		10.0	.027	1	.10 NO
75	7220		18.0	.026	2	.15 NO
80	7204		3.0	±.008 .0015	1	.01 NO
216***	715	MS24367-715 AS15	5.0	.115	1	.15±15
227			12.0	.04	1	.15±25

***VERY HIGH SHOCK & VIBRATION RESISTANT MODEL OF MS24367-715 AS515

T-1 Lamp Helium Resistant Unsupported Filament Unbase

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)
162	6806	MS27571-6806	5.0	.060	.03±15%
163	6807	MS27571-6807	5.0	.060	.05±15%
164	6808	MS27571-6808	5.0	.075	.09±15%
165	6809	MS27571-6809	5.0	.115	.15±15%

ncomplete listing

ea age when this edition of EEM went to ress Some are logical state-of-the-art improve- ent, others are special designs to meet new ustomer requirements:

ere re just a few examples, introduced in 1969:

e fit #253 subminiature lamps that project crit ally focussed lens-end beam;

ubminiature lamps with new bi-pin bases, that r ily available commercial sockets;

gh-oltage neon lamps only 0.093 inches in iam er, the smallest of their kind;

subminiature coaxial contact lamps that can be driven directly by IC's without buffer transistors.

So, if you don't see what you want, ask us for it. Chances are, it's in our catalog. And if it isn't, we're better able to fill your need than anyone else.

You see, our product listing isn't complete because our product line is.

LAMPS, Inc.
19220 S. Normandie Ave., Torrance, Calif. 90502
(213) 323-7578

T-1 Lamp Supported Filament Based

LAMPS Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Number Support	Candle Power (MSCP)	Average Life (Hours)
64	6839	MS3338-6839 AS25	28.0	.024	2	.13±25%	16,000
71	32		12.0	.060	1	.13±25%	16,000
85	7240		10.0	.027	1	.10 NOM.	10,000
86	7241		18.0	.026	2	.13 NOM.	10,000
87	7228		3.0 ± .008 .0015		1	.01 NOM.	16,000
228			12.0	.040	1	.13±25%	10,000
243			12.0	.030	1	.10 NOM.	25,000

T-1 Lamp, Neon Unbased

LAMPS Inc. Number	USASI Number*	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)	Break-down (Max.)
95	A1K	115 VAC	.001 MAX.**	.01 NOM.	5,000	100 VAC

AT 115 WITH 400K, 1/10 WATT, SERIES RESISTOR

T-1 Lamp, Neon Based

LAMPS Inc. Number	USASI Number*	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)	Break-down (Max.)
118	A1L	115 VAC	.001 MAX.**	.01 NOM.**	5,000	100 VAC

AT 115 WITH 400K, 1/10 WATT, SERIES RESISTOR

T-1¾ Lamp Helium Resistant Unsupported Filament Groove Base

LAMPS Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Life (Hours) Average
17	341	MS27569-341 AS15	5.0	.20	.34±15%	15,000

T-1¾ Lamp Helium Resistant Unsupported Filament Flange Base

LAMPS Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
170	339	MS27569-339 AS15	5.0	.20	.34±15%	15,000

Line Filament Lamp

LAMPS, Inc. Number	USASI Number*	Design Volts	Design Amps ±10%	A Max.	B Min. Hot	C Max.	D Max.	E Max.	F	G	H
96	7105	6.0	0.12	.50	1.0	2.0	.30	.094	.12	.25	2.0
97	7107	18.0	0.12	.50	3.5	4.5	.30	.094	.12	.25	4.5
98	7108	36.0	0.12	.62	7.5	8.8	.30	.094	.12	.25	8.8
99	7223	38.0	0.20	.75	9.0	10.5	.40	.13	.16	.25	10.5
100	7224	48.0	0.20	.75	11.5	12.9	.40	.13	.16	.25	12.9
105	7104	6.0	0.12	.35	1.0	1.7	.25	.094	.12	.25	1.7
108	7106	20.0	0.12	.50	4.0	5.0	.30	.095	.12	.25	5.0
111	7092	2.5	0.04	.20	.37	.88	.12	.052			
140**	7109	6.0	0.40	.50	1.25	2.3	.55	.160	.19	.31	2.3
211		14.0	0.50	.62	3.3	4.7	.38	.160	.19	.31	4.7
218		3.0	0.40	.70	1.0	2.2	.50	.160	.19	.31	2.2
235		12.0	.12	.50	3.0	3.9	.30	.094	.12	.25	3.9

**NUMBER 140 LEAD DIA. IS .020 X 1.0 LONG, SOLDER DIP ONLY

T-1 Lamp Indicator O-Ring Mount

LAMPS, Inc. Number	Design Volts	Design Amps ±10%	Average Life (Hours)
179	1.5	.06	100,000
180	5.0	.06	100,000
181	12.0	.06	100,000
182	28.0	.024	16,000
95BE***	115 VAC	.001 MAX.**	5,000

**NEON AT 115 VAC WITH 400K, 1/10 WATT SERIES RESISTOR
***AVAILABLE IN CLEAR GLASS ONLY

T-1¼ Lamp Helium Resistant Unsupported Filament Unbased

LAMPS, Inc. Number	USASI Number*	Military Specification Number	Design Volts	Design Amps ±10%	Candle Power (MSCP)	Average Life (Hours)
166	1189	MS27570-1189 AS15	5.0	.060	.03±15%	60,000
167	1190	MS27570-1190 AS15	5.0	.060	.05±15%	40,000
168	1191	MS27570-1191 AS15	5.0	.075	.09±15%	16,000
169	8515	MS27570-8515 AS15	5.0	.115	.15±15%	16,000

SNAPLITE®

INDICATOR LIGHTS

NEON AND INCANDESCENT AND SPECIAL ASSEMBLIES

LEECRAFT

TINEON INDICATOR LIGHTS

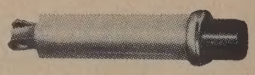
Long Life, High Brightness Lamps — Press fit into 5/16" hole — For neon types rated 110-250V — Nylon housing in colors (white standard) — Speed nut furnished — Plastic lens in colors — Legends — Built-in Resistor — Insulated Leads.
All Tineons are available with Incandescent Lamp.

3600 Series (with built-in resistor) Available in 3 flange dimensions

No. 36N2311

4100 Series (with neon less resistor or incandescent)

No. 41N1315



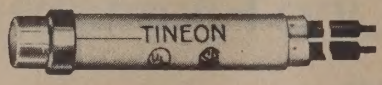
TINEONS
45 Series (Blade Terminals)

No. 45R2111T8

46 Series (Pin Type Terminals)

No. 46N2311

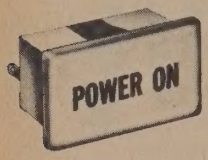
WITH ALUMINUM BEZEL
All Tineons may be furnished with aluminum bezel. Please specify when ordering.



No. 36EN2111 (Hi-Hat red lens) With aluminum bezel

RECTANGULAR INDICATOR LIGHTS

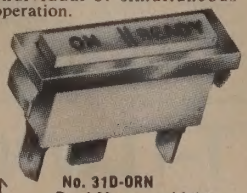
Long Life High Brightness Neon Lamps — Snap into panel securely without additional hardware — Choice of lens colors — Series 3100 has chrome bezel and plastic lens — Series 47 has one-piece plastic lens and body — Complete range of voltages — UL and CSA listed.



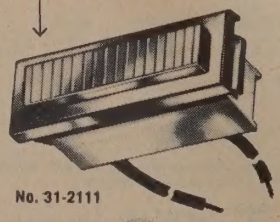
No. 47-3T (legend to specification)
For 1 3/16" x 5/8" hole

DUAL BEZEL
No. 31-ML2
For 1 9/32" x 1 3/16" hole.

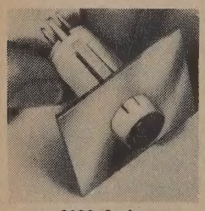
Barrier separates light into two separate message areas. Individual or simultaneous operation.



No. 31D-ORN
Dual Message Lights
For 1 9/32" x 1 3/32" hole



No. 31-2111



2900 Series

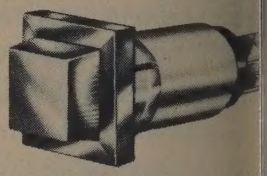
REAR - ASSEMBLY, SNAP - IN LIGHTS Neon or incandescent. All voltages. Snap in from rear, lock firmly. Simpler, swifter assembly. Eliminate threading leads as in front-of-panel lights. No additional hardware. Mtg. hole .510-.520".

No. 51-2135T
SLIDELITE™
Pilot Indicator Light, Slide-Switch Combination
Ultra-compact. Simple snap-in installation. Wide voltage range, choice of lights. May be message stamped. Lens colors: red, amber, clear, white, blue, green, others on request. Leads or terminals. 1 25/64"x 15/32"x2 1/32". Rating: 125 V. 6 Amps.

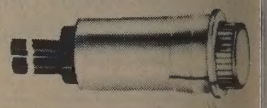
SNAPLITE INDICATOR LIGHTS

With long-life lamps, high brightness types. Built-in resistor — when neon lamps — to suit applied circuit voltage, provide req[illegible] lamp life, eliminating replacement need. Features: Snap into [illegible] in 1/2" hole with no additional hardware. Wide variety of lens [illegible] housing colors. Tab or solder terminals; or wire leads. AVAILA[illegible] WITH CHROME RINGS. To specify Chrome Rings add R aft[illegible] 2 Digits, i.e., 32-2111 becomes 32R2111.

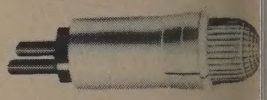
SQUARE LENS
32R2911T 7/32" high



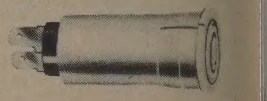
FLAT CYLINDRICAL LENS
32-2111 3/16" high



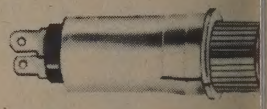
STOVE PIPE LENS
32-2211 13/32" high



FLUSH LENS
32-2311T 1/32" high



HI-HAT LENS
32-2511T 3/16" high



NOTE: Total height above panel equal to lens height plus 1/16" f[illegible] thickness. 5/32" flange thickness for Square Lens.

HOW TO ORDER LEECRAFT INDICATORS WITH INCANDESCENT LA[illegible]S

Incandescent lamps to meet low voltage characteristics may be [illegible]plied in place of neon lamps with all indicators illustrated on [illegible]is page. To specify incandescent in place of neon lamps insert [illegible] code after series number. Some of more popular voltages are li[illegible]d.

CURRENT (Milliamperes)	VOLTAGE (Volts)	CODE LAMP
200	6	G1
40	6	G2
14	10	G6
80	14	G3
40	28	G5

EXAMPLE: 41N2313 [illegible]h 14 Volt 80 Mil. LAM[illegible]e-comes 41N-G3-2313. 32-2111 with 6 volt 200 [illegible] LAMP becomes 32-G1-[illegible]

Leecraft Series	Volts	Terminations
3200	110-125	Insulated wire leads
3500	210-250	Insulated wire leads
3200T	110-125	.187 tab terminals
3500T	210-250	.187 tab terminals

1/3W, 125[illegible]
1/3W, 250[illegible]

CATALOG NUMBERS • 3200 SERIES WIRE LEADS*

Lens Color	Cylindrical Lens	Flush Lens	Stove Pipe [illegible]s
Red	32-2111	32-2311	32-221[illegible]
Amber	32-2113	32-2313	32-221[illegible]
Clear	32-2117	32-2317	32-221[illegible]
White (Translucent)	32-2115	32-2315	32-221[illegible]

To specify Square Lens, use 32R291 plus 1, 3, 7 or 5 for lens c[illegible] Example: With red lens—32R2911. To specify Hi-Hat Lens, use 32[illegible] plus 1, 3, 7 or 5. Example: With clear lens—32-2517.

* To specify TAB TERMINALS in place of WIRE LEADS, add "T" [illegible] number, i.e., 32-2111 becomes 32-2111T.

WRITE FOR PRODUCT LIGHTING GUIDE. PROTOTYPE SAMPLES AVAILABLE ON REQUEST.

LEECRAFT®

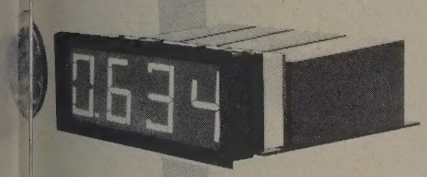
Leecraft MANUFACTURING CO., INC.

21-16 44th Road, Long Island City, N.Y. 11101 • (212) EXeter 2-8800 • TELEX #12-697[illegible]

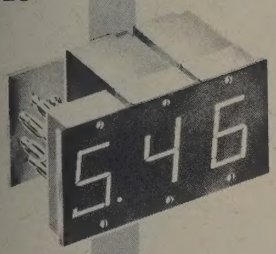
MESA
COMPANY, INC.

DIGITAL DISPLAY MODULES

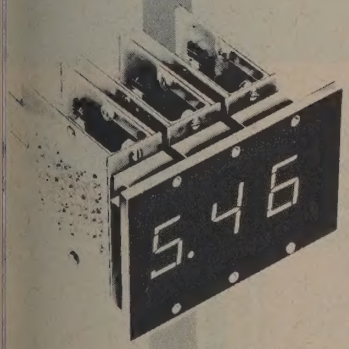
- IN-PLANE, EASY-TO-READ NUMERALS
- 1" AND .6" HIGH CHARACTERS
- INPUT LEVELS COMPATIBLE WITH I.C. LOGIC
- NEON OR INCANDESCENT LAMPS
- BCD OR DECIMAL CODES



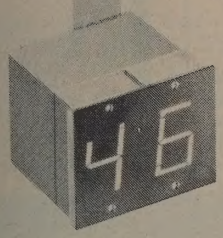
QS SERIES



QN SERIES



QZ SERIES



NQ SERIES

The NQ Series Digital Display modules employ numeric characters consisting of seven properly shaped segments which are illuminated by aged and selected high-brightness neon or incandescent lamps. The integral decoder-drivers translate 4 or 8 line BCD or 10 line decimal codes into the correct segment illumination.

The BCD decoders have a logical "one" level of 2.5v. and low signal current requirements, allowing them to be driven by I.C. or standard logic. All units are normally furnished mounted on a common panel in the exact configuration desired by the customer thus eliminating the need for bezels, brackets, filters, sockets, mounting hardware or additional assembly time. Decimal points, plus-minus signs, colons, etc. are optionally available.

Brief Specifications:

NQS . . . Available in three models; two 1" high character and one .6" high character. Employs I.C. decoder and discrete drivers for neon or incandescent lamps. Display faces, with or without lamps and decoder-drivers available. Economically priced at under $16.00 per decade in 1000 lots.

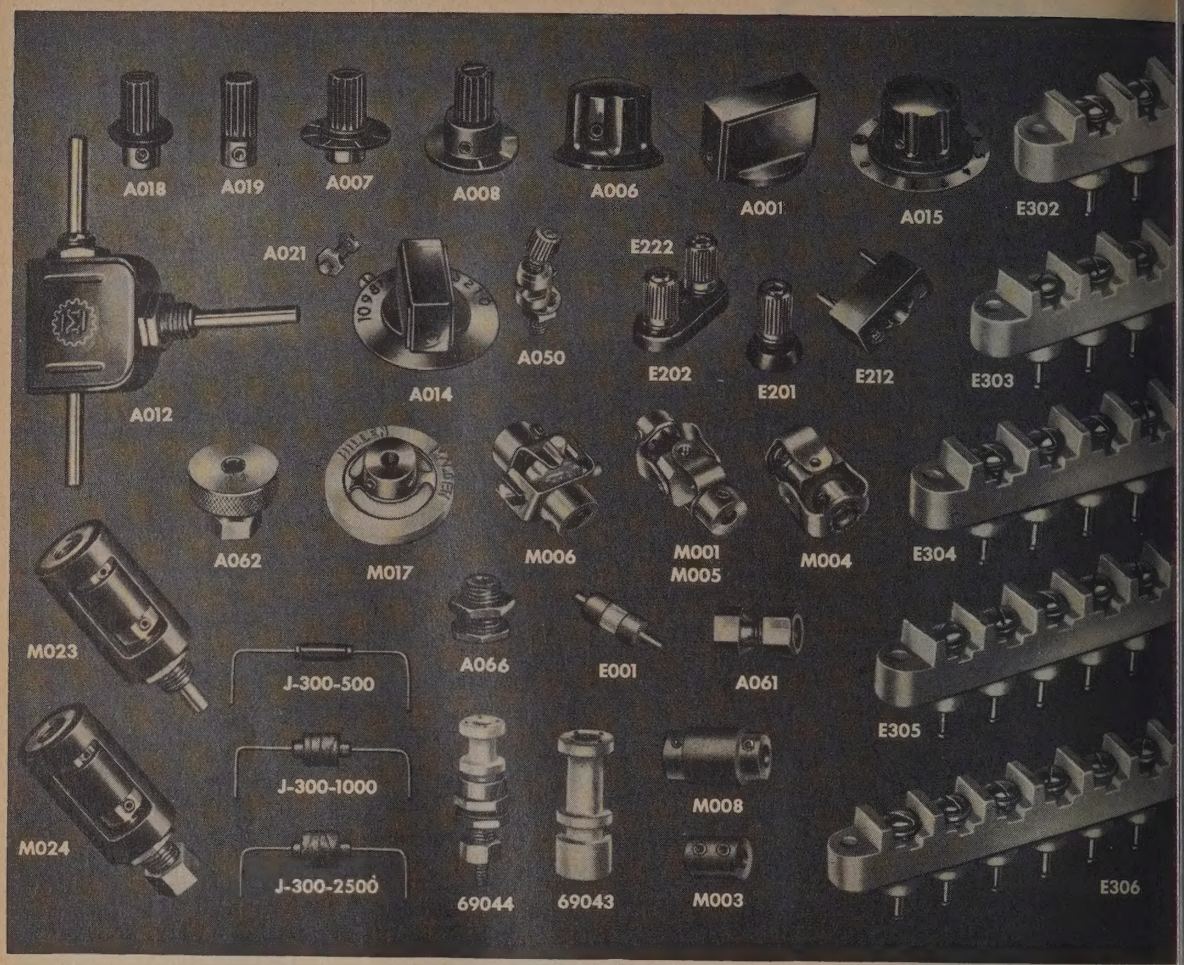
NQM . . . A miniature version available in 4 line, positive logic. 1.97" high, 2" deep and 1.06" wide, 1" high character. Sells for as little as $25. per decade in production quantities.

NQZ . . . 3" High, 4" deep, 1.25" wide, 1" high character. Available in positive or negative logic, special codes and fail-safe versions.

NQT . . . The "Two-fer" — A miniature version utilizing multiplexing techniques to achieve a two digit display driven by one decoder-driver. Priced as low as $19. per decade in production quantities, the NQTR measures 1.97" high, 2" deep and 2.250" wide.

• SEE EEM YELLOW PAGES OR VSMF FOR LOCAL REPRESENTATIVES . . . 215-788-5521

THE MESA COMPANY, INC. 216-220 MILL STREET BRISTOL, PENNA. 19007



MINIATURIZED COMPONENTS

Typical of the MILLEN line of miniature components:

No. A001 Bar knob for 1/8" shaft. 1/2" high by 3/4" long.....
No. A006 Fluted black phenolic knob with brass insert for 1/8" shaft.....
No. A007 and A008 1/4" black plastic dial knobs; inserts for 1/8" shaft.
No. A012 Right angle drive for 1/8" shafts. Single hole mounting.....
No. A014 1" bar dial for 1/8" shaft. 1/2" high. 180° or 280° dials.....
No. A015 1" fluted knob dial for 1/8" shaft. 1/2" high. 180° or 280° dials.
No. A017 1 1/8" diameter fluted black phenolic knob for 1/8" shaft.....
No. A018 and A019 Knobs. .....
No. A050 Miniature dial lock.....
No. A061 and A062 Miniature shaft locks for 1/8" shaft.....
No. A066 Miniature shaft bearing for 1/8" shaft.....
No. E201, E202, E212, and E222 Miniature binding posts and plug.
No. E302A to E306A Miniature ceramic terminal strips.....
No. J300-3.3 to J300-2500 Miniature Inductors.....
No. M001 and M006 Miniature insulated universal joint style flexible coupling for 1/8" shafts.....
No. M004 and M005 Miniature non-insulated universal joint style flexible couplings for 1/8" dia. shafts.....
No. M017 Miniature plastic insulated flexible coupling for 1/8" dia. shafts.
No. M023 and M024 Miniature high voltage insulated shaft extensions for 1/8" dia. shaft.....

MILLEN

INDUSTRIAL ELECTRONICS MASTER DATA BOOK

Comprehensive Coverage of

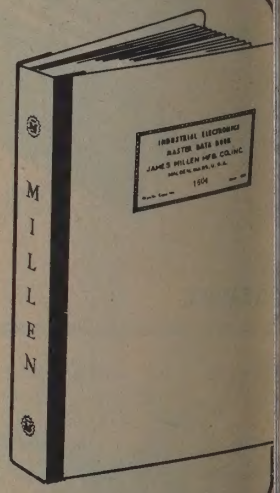
MILLEN PRODUCTS

with

Dimensional Drawings

Available to:

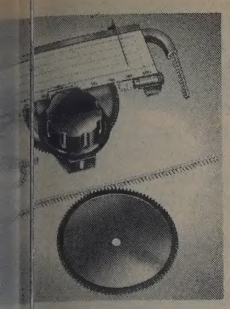
Industry Personnel
Qualified Engineers
Purchasing Agents
Design Draftsmen

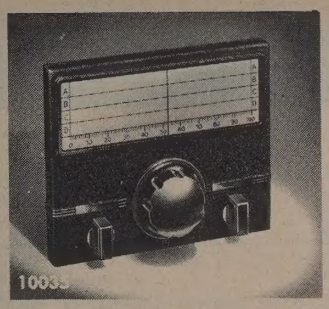


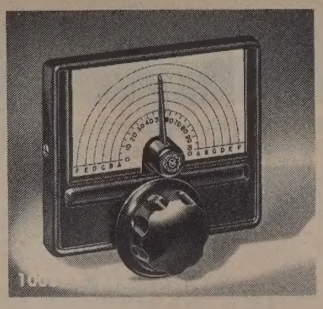
JAMES MILLEN MFG. CO., INC.

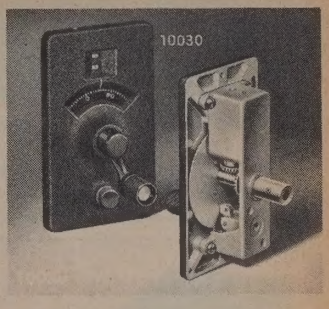
MAIN OFFICE AND FACTORY

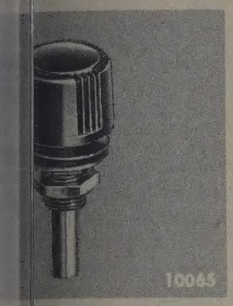
MALDEN, MASSACHUSETTS, U.S.A.

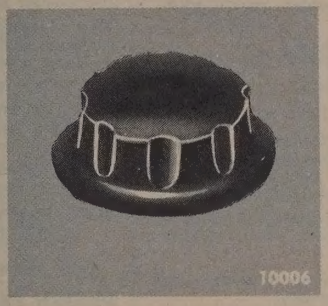


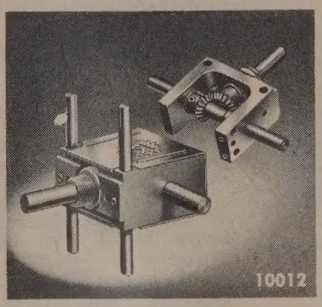


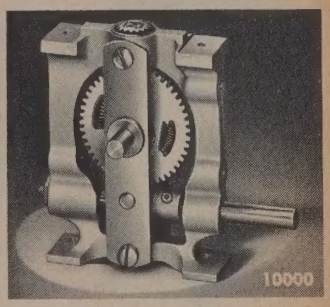


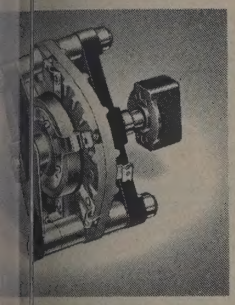


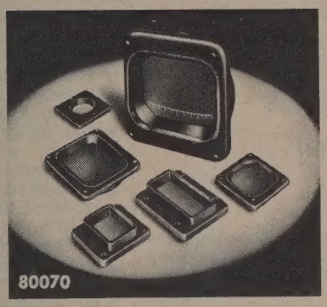


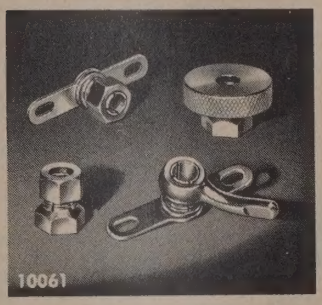


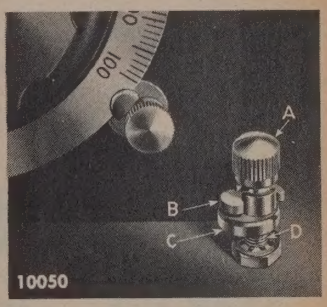












"Designed for Application"® DIALS AND COMPONENTS

NO-STRING DIAL

037- No-string illuminated slide rule dial. The pointer is driven by
ble b non-elastic molded gear driven rack which rides in a multi-slot
ed a minum channel. This girder-like channel provides rigidity.
tion 1. Scale length 6½ inches. Supplied with bezel.

FRONT OF PANEL DIALS

act r chanical design. Easy to mount. Self-contained mechanisms,
limiting back of panel interference. Flat black art metal.
035- Illuminated panel dial has 12 to 1 ratio; size 8-3/16" x 6-17/32".
ion mounting and marking auxiliary controls such as switches,
ome s, etc. provided.
039- Small panel dial has 8 to 1 ratio; size 4" x 3-9/32".
039-1- Small panel dial with positive loaded gear drive. 20 to 1
size x 3-9/32". For ten turn devices.
039-1- Small panel dial with positive loaded gear drive. 10 to 1
size x 3-9/32". For five turn devices.

COUNTER DIALS

030- Extremely sturdy instrument type indication. Control shaft has
rat Veeder type counter is direct reading in 99 revolutions.
030-1- Same as No. 10030 except that the crank handle on the
030 1 been replaced by a fluted knob.

KNOBS

- Flu black phenolic knob with brass insert for ⅛" shaft.
- 2¾ black phenolic knob with brass insert for ¼" shaft.
- ¾" black phenolic knob with brass insert for ¼" shaft.
A - fluted knob with nickel plated brass pointer.

BEZELS FOR CATHODE RAY TUBES

671- Bakelite bezel for 1 in. tube such as 1CP1. 2⅜" x 2⅜".
072- Phenolic bezel for 2 in. tube such as 2BP1. 2⅝" x 2⅝".
073- Phenolic bezel for 3 in. tube such as 3RP1. 3⅝" x 3⅝".
075- Phenolic bezel for 5 in. tube such as 5UP1. 6⅛" x 6⅛".
073-1- Bezel for rectangular tube such as 3XP1. 2½" x 3¼".

HIGH VOLTAGE R-F SWITCH

No. 51001 — High voltage r-f switch designed for high frequency requirements. The No. 51001 features high voltage breakdown, and a non-arc tracking and arc resistant molded frame. Both collector and switched contacts break contact. Heavy duty silver contacts, and insulated mount.

DRIVES

RIGHT ANGLE DRIVES

No. A012 — Miniature right angle drive for ⅛" shafts. 1 to 1 ratio.
No. 10012 — Standard size right angle drive for ¼" shafts. 1 to 1 ratio.
No. 10012-T — Thru-sleeve right angle drive for ¼" shafts. 1 to 1 ratio.

WORM DRIVE UNITS

Cast aluminum frame may be panel or base mounted. Spring loaded split gears to minimize back lash.

No. 10000-A — 16 to 1 ratio.
No. 10000-B — 48 to 1 ratio.
No. 10000-C — 12 to 1 ratio.
No. 10000-D — 36 to 1 ratio.

GEAR DRIVE

No. 10000-12 — Spring loaded split gears to minimize back lash. 2 to 1.

FRICTION DRIVE

No. 10065 — Friction drive for 0.025" to 0.032" thick disc dials.

SHAFT LOCKS

No. 10060 — Shaft lock for ¼" shaft. ⅜"-32 bushing with 7/16" hex nut.
No. 10061 — Lock for conversion of "plain" ¼" shaft to "locking type."
No. 10062 — Thumb screw shaft lock for ¼" shaft. ⅜"-32 bushing.
No. 10063 — Lever operated shaft lock for ¼" shaft. ⅜"-32 bushing.

DIAL LOCKS

No. A050 — Miniature dial lock. Compact, easy to mount, positive in action.
No. 10050 — Rotation of knob A depresses finger B locking dial against C.
No. 10050-A — Lock with index mounting to prevent rotation of assembly.
No. 10053 — Sub panel dial lock. Nickel plated brass.

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN, MASSACHUSETTS, U.S.A.

Pinlite® / MINIATURE READOUT DEVICES AND ENCODE

Pinlite® multi-filament lamps can be made in virtually any shape, making possible a very extensive range of applications. Acceptance for these lamps in various forms has rocketed forward since their development. Specific applications of these microminiature assemblies created the birth of the Midgi-Lite® and Alpha-Lite. Also, a line of driv encoders known as Midgi-Coder, compatible with Mid is now available. Models compatible with other multi-filament lamps are being developed.

Actual Size

ALPHA-LITE

ALPHANUMERIC READOUT DISPLAYS

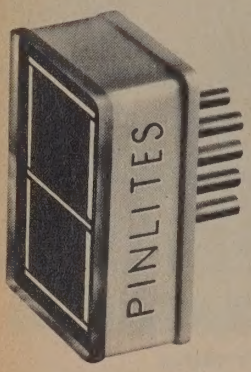
World's Smallest & Brightest Alphanumeric Readouts

DESCRIPTION

The 16 segment Alpha-Lite was designed to provide readout capability for the 26 alphabetic characters and ten digits. Actually, thousands of segment combinations are possible. They can be used to display lower register letters, punctuation marks, Greek letters, math symbols, navigation symbols, etc.

All 16 segments are mounted on the same plane, providing a wide viewing angle.

NOTE: Decoder/driver package available for above late 1970.



Actual Size

MIDGI-LITE

DIGITAL READOUT DISPLAYS

World's Smallest Brightest Digital Readouts

DESCRIPTION

Midgi-Lites are seven segment, sub-miniature digital readouts. Each segment is a directly viewed incandescent filament that gives the most millilumens per watt of all the readout types.

"Power Efficiency" is combined with "Light Power" to create a digit that radiates with a surface brightness as high as 12,000 foot lamberts. Even the lowest rated Midgi-Li minimum brightness of 4,000 foot lam the design voltage.

This superior brightness capability tungsten filament reduces the need for ambient lighting and even allows th Lite to be viewed in direct sunlight.

A viewing angle of 120 degrees is rea mounting the filaments on the same p by minimizing the distance between ament and glass lens.

Character sizes are available from 3/16

NOTE: Matching plug-in decoder/driv able for above.

DESIGN FEATURES

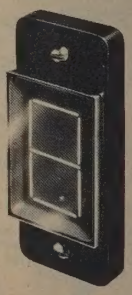
- Voltage levels are compatible with circuitry (5 volts)
- 100,000 hours design life per segme
- Requires less than 1/5 sq. inch pan
- Greatest volumetric efficiency of an alphanumeric display
- Low weight and mass — less than
- Clearly readable in 10,000 ft. L. ambi environment
- All Alpha-Lites conform to performan of MIL-E-5400 CLASS II
- Brightness and color temperatures voltage controllable
- Plug-in module replaceable from fr
- Brightest readout manufactured
- 60° angle off center viewing
- All models conform to MIL-E-5400
- Highest volumetric efficiency availab
- Typical size of 5/16" character is .302 .465 high x 3/16" deep

MAXI-LITE™ Large Commercial Readouts DIGITAL AND ALPHANUMERIC

DESCRIPTION

A new series of low cost, large character size readouts, available in both alphanumeric and digital models. The Maxi-Lite incorporates many of the design concepts originating in the Midgi-Lite series. Directly viewed tungsten filaments allow unparalleled brightness and efficient use of power. The 3/4" character size is clearly read up to 60 feet. A total package thinness of only 1/2 inch, including connector, gives the designer additional cubic inches behind the panel.

NOTE: Decoder/Driver available for Maxi-Lite as integral part of connector.

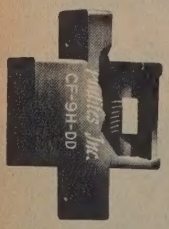


DESIGN FEATURES

- Lowest initial and installed cost
- Design life of 100,000 hours
- Wide angle viewing greater than 120°
- Connectors available with pins or color coded wire pigtails
- Alpha display has 16 segments for undistorted character format
- Operates directly from I.C. level voltages (5 volts)
- Plug-in module replaceable from front

MIDGI-CODER™ Solid State Decoders/Drivers

DECODERS



NOTE: Decoder-Drivers are available for the entire line of readouts in various package sizes.

DESCRIPTION

The Midgi-Coder Decoder/Driver accepts 8421 BCD, convert seven segment Midgi-Lite code and drives the Midgi-Lite nu readout. It is designed for 5 volt systems and is available models.

DESIGN FEATURES

- Blanking input
- Lamp test input
- Brightness control
- Automatic zero blanking (AZB)
- Low cost
- Low weight
- Can be driven by integra circuits directly. (5 volts)
- Uses monolithic RTL/DT
- Accepts 8421 BCD

Pinlites Inc. A REFAC CO 1275 BLOOMFIELD AVE., FAIRFIELD, N. J. 07006 (201) 226-7724

Pinlite® / WORLD'S SMALLEST INCANDESCENT LAMPS AND MICROMINIATURE ASSEMBLIES

CTUAL SIZE
ENS STYLE
AXI LEADED STYLE
AT-TOP STYLE

The microminiature Pinlite® lamp is made possible through a unique manufacturing method developed by Pinlites Inc. Although the smallest standard size lamp is only .016" in diameter, smaller sizes are produced on special order. Pinlites Inc., with its vast experience and technical know-how in the production and design of microminiature components, also offers an additional service . . . the designing of micromodules and microminiature assemblies to meet specific customer requirements. Pinlites comply with Mil Spec 5422-E and can withstand shock and vibration in excess of 50 G's.

Pilites when speed of response, small size, and low power are important!

PINITE® FEATURES

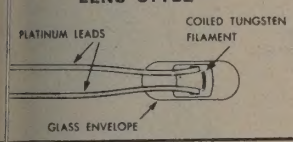
- Low t Power Consumption
- Low t Series "L" & Shunt "C"
- IR d UV Emission
- Sm est Size
- Fas st Response (Audio Range)
- Vib tion & Shock Resistant
- Bui in Lens Concentrates Light Bea Up to 10X Normal Intensity
- Thr Styles for Greater Versatility; len axial leaded, flat-top

PINLITE® APPLICATIONS

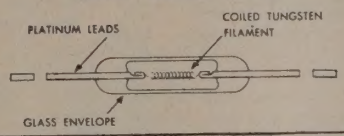
- Transistor Indicators
- Microwave Noise Sources
- Modulated Light Source
- Microwave Bolometers
- Optical Point Sources
- Medical & Industrial Light Probes
- Remote Electronic Attenuators
- Read Out Devices
- Pointer & Meter Scale Illuminators
- Photometric Instrumentation
- Light Actuated Switches
- Telemetry
- Indicator Lamps (colored Pinlites)

SPECIFICATIONS FOR STANDARD PINLITE LAMPS

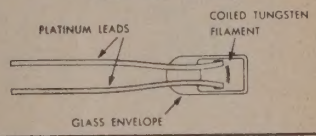
LENS STYLE



AXIAL LEADED STYLE



FLAT-TOP STYLE



Sty	AXIAL LEADED					LENS				
Typ	10-10	13-7	15-15	15-45	30-30	L12-3	L12-6	L12-12	L15-30	L15-45
Op ting Voltage ..... (Volts)	1.0	1.35	1.5	1.5	3	1.25	1.25	1.25	1.5	1.5
Op ting Current ..... (Milliamps)	10	6.00	15	45	30	3	6	12	30	45
Di ter ..... (Inches)	.016	.016	.016	.030	.030	.030	.030	.030	.030	.030
Le h ..... (Inches)	.070	.070	.070	.125	.125	.080	.080	.080	.080	.080
Co Resistance ..... (Ohms)	16	38	13.5	4	11	86	35	16	5.5	4
Ho Resistance ..... (Ohms)	100	215	100	33	100	400	200	100	50	33
Pul Response* .... (Milliseconds)	4	4	5	10	7	3	4	5	7	10
To Light Output .... (Millilumens)	25	20	60	220	250	5	15	50	160	220
Li Expectancy ..... (Hours)	750	500	800	1000	1000	500	750	1000	1000	1000
Le Diameter ..... (Mils)	3	3	3	5	5	4	4	4	4	4
Le Length ..... (Inches)	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜
Le Material	Platinum					Platinum				
Filt ent Material	Tungsten					Tungsten				

* To ½ Brightness.

FLAT TOP

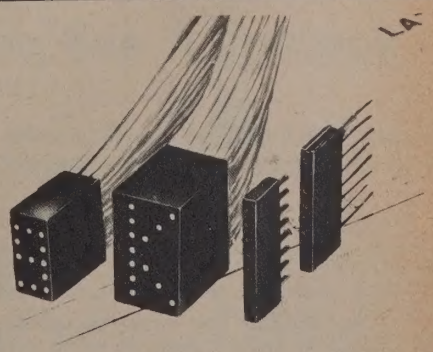
All specifications for the flat-top lamps are the same as lens style lamps. When ordering, simply prefix numbers at left in "TYPE" column with "F" in place of "L" (e.g.—L12-3 becomes F12-3).

DUAL FILAMENT

Same rigid characteristics apply as with other Pinlites plus the redundant feature for fail-safe operation. Write or call for details.

STACK-LITES—MODELS 75 AND 100

Stack-Lites are an economical micro-miniature lamp matrix, designed to accept any of 10 different Pinlite® lamps in the lens and flat top styles. Both models are available as a production unit with 5-16 lamp positions. The matching connector allows a multiple stacking of the lamp heads for densities of 168 separately controlled lamps per square inch (Model 75).



DESIGN FEATURES

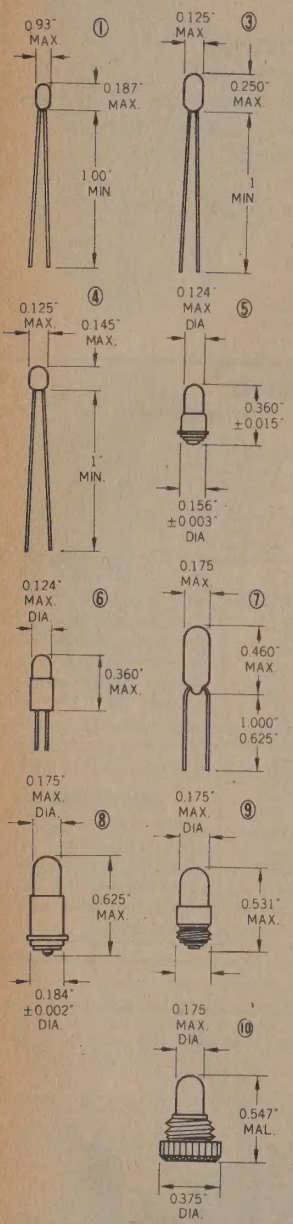
- Lamp selection offers light outputs from 2 to 220 millilumens
- Lamp pitches meet many punched tape requirements
- One common lead per connector allows each lamp to be individually controlled
- All lamp models are driven by 1.5 volts or less
- Color coded wire leads are available
- Flat top style lamps are assembled for a flush surface — Lens will project slightly above surface

SEE OTHER LISTING FOR PINLITES' MINIATURE READOUT DEVICES AND ENCODERS

Pinlites Inc. A REFAC CO
1275 BLOOMFIELD AVE., FAIRFIELD, N. J. 07006
(201) 226-7724

Oshino Subminiature Lamp Bulbs

From material selection to final test, each of our lamps is infused with the most attetive care to the highest standards of qualification.



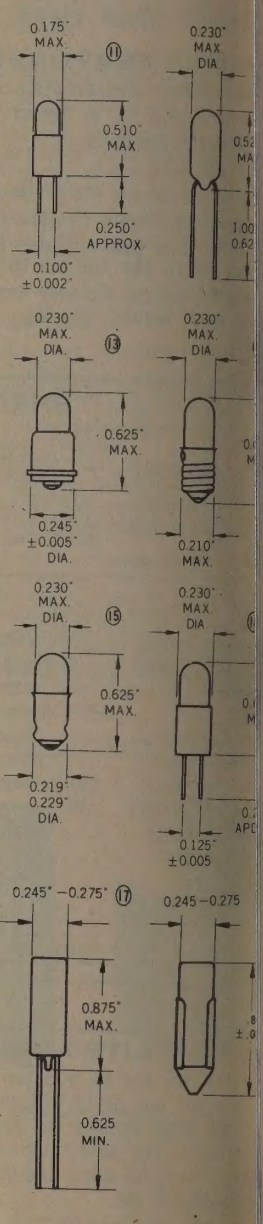
BULB	Wire ① Terminals				Bi-Pin Base	Volts	Amps	Approx. M. S. C. P.	Life (hrs.)
T-3/4	0L-6803				0L-6803BP	5.0	.060	.030±15%	100,000
	0L-6833				0L-6833BP	5.0	.060	.050±15%	100,000
	0L-7133				0L-7133BP	5.0	.075	.090±15%	16,000
	0L-7153				0L-7153BP	5.0	.115	.150±15%	40,000

	Wire ③ Terminals	Sub-Midget Flanged⑤			Bi-Pin Base ⑥	Volts	Amps	Approx. M. S. C. P.	Life (hrs.)
T-1	0L-6802 ④					5.0	.060	.030±15%	100,000
	0L-6832 ④					5.0	.060	.050±15%	100,000
	0L-7132 ④					5.0	.075	.090±15%	16,000
	0L-7152 ④					5.0	.115	.150±15%	40,000
	0L-680	0L-682			0L-682BP	5.0	.060	.030	200,000
	0L-680AS15	0L-682AS15			0L-682BP-AS15	5.0	.060	.030±15%	200,000
	0L-683	0L-685			0L-685BP	5.0	.060	.050	100,000
	0L-683AS15	0L-685AS15			0L-685BP-AS15	5.0	.060	.050±15%	100,000
	0L-713	0L-714			0L-714BP	5.0	.075	.090	16,000
	0L-713AS15	0L-714AS15			0L-714BP-AS15	5.0	.075	.090±15%	16,000
	0L-715	0L-718			0L-718BP	5.0	.115	.150	40,000
	0L-715AS15	0L-718AS15			0L-718BP-AS15	5.0	.115	.150±15%	40,000
	0L-1088	0L-1098			0L-1098BP	10.0	.027	.10	10,000
	0L-1089	0L-1099			0L-1099BP	12.0	.060	.15	16,000
	0L-1111	0L-1112			0L-1112BP	14.0	.065	.15	12,000
	0L-1092	0L-1100			0L-1100BP	18.0	.026	.15	10,000
	0L-855	0L-856			0L-856BP	28.0	.024	.15	16,000

BULB	Wire ⑦ Terminals	Sp. Midg. Flang. ⑧	Special Screw⑨	Threaded Knurled⑩	Bi-Pin Base ⑪	Volts	Amps	Approx. M. S. C. P.	Life (hrs.)
T-1 1/4	0L-2139	0L-637	0L-325	0L-323	0L-637BP	3.0	.19	.25	350
	0L-634	0L-628	0L-645	0L-639	0L-628BP	6.0	.20	.63	500
	0L-640	0L-646	0L-644	0L-654	0L-646BP	14.0	.08	.23	1,000
	0L-627	0L-632	0L-635	0L-623	0L-632BP	28.0	.04	.34	1,000

BULB	Wire ⑫ Terminals	Midget ⑬ Flanged	Midget Screw⑭	Midget⑬ Grooved	Bi-Pin Base ⑯	Volts	Amps	Approx. M. S. C. P.	Life (hrs.)
T-1 3/4	0L-1783	0L-368	0L-1769	0L-699	0L-368BP	2.5	.20	.20	500
	0L-1738	0L-338	0L-693		0L-338BP	2.7	.06	.04	500
	0L-2158	0L-375			0L-375BP	3.0	.015	.003	10,000
	0L-805	0L-782			0L-782BP	5.0	.06	.03	200,000
	0L-806	0L-783			0L-783BP	5.0	.06	.05	100,000
	0L-807	0L-815			0L-815BP	5.0	.115	.15	40,000
	0L-1730	0L-345	0L-342		0L-345BP	6.0	.04	.04	1,000
	0L-1784	0L-328			0L-328BP	6.0	.20	.34@ 5V	1,000
			0L-1768	0L-337		6.0	.20	.63	500
	0L-1739	0L-377	0L-1775		0L-377BP	6.3	.075	.23	500
	0L-2180	0L-380			0L-380BP	6.3	.04	.03	50,000
	0L-2181	0L-381	0L-378	0L-379	0L-381BP	6.3	.20	.40	50,000
	0L-2112	0L-349		0L-398	0L-349BP	6.3	.20	.55	3,000
	0L-1869	0L-344	0L-691	0L-709	0L-344BP	10.0	.014	.004	100,000
	0L-2107	0L-367		0L-397	0L-367BP	10.0	.04	.08	3,000
	0L-2174	0L-394			0L-394BP	12.0	.04	.12	10,000
	0L-2182	0L-382	0L-362	0L-386	0L-382BP	14.0	.08	.30	50,000
	0L-1705	0L-330	0L-373	0L-336	0L-330BP	14.0	.08	.50	700
	0L-2102	0L-370	0L-536	0L-346	0L-370BP	18.0	.04	.15	1,000
	0L-2185	0L-385	0L-384		0L-385BP	28.0	.04	.20	50,000
	0L-2187	0L-387	0L-388SC	0L-388	0L-387BP	28.0	.04	.30	25,000
	0L-1764	0L-327	0L-335	0L-334	0L-327BP	28.0	.04	.34	1,000
	0L-1764LS15	0L-327AS15				28.0	.04	34±15%	1,000
	0L-1764LSV	0L-327LSV	0L-335LSV	0L-334LSV		28.0	.06	.34	25,000

BULB	Wire Terminals ⑰	Slide Base ⑱	Design Volts	Design Amps	Average EFC.	Approx. M.S.C.P.	Approx. Cold Resist.	Filament Shape	Life (hrs.)
T-2	0L-6ES	0L-6ESB	6.0	.040	250	.025	19	C-2V	5,000
	0L-10ES	0L-10ESB	10.0	.040	450	.05	28	C-2V	10,000
	0L-12ES	0L-12ESB	12.0	.040	650	.06	33	C-2V	5,000
	0L-18ES	0L-18ESB	18.0	.040	1000	.11	46	C-9	5,000
	0L-24ES	0L-24ESB	24.0	.040	1100	.12	67	C-9	5,000
	0L-28ES	0L-28ESB	28.0	.040	1285	.24	80	C-9	5,000



Lamps introduced above are only representative of our lines.
Should any particular designs be wanted, please send them for our immediate attention.

*For complete information, prices & samples, write to:

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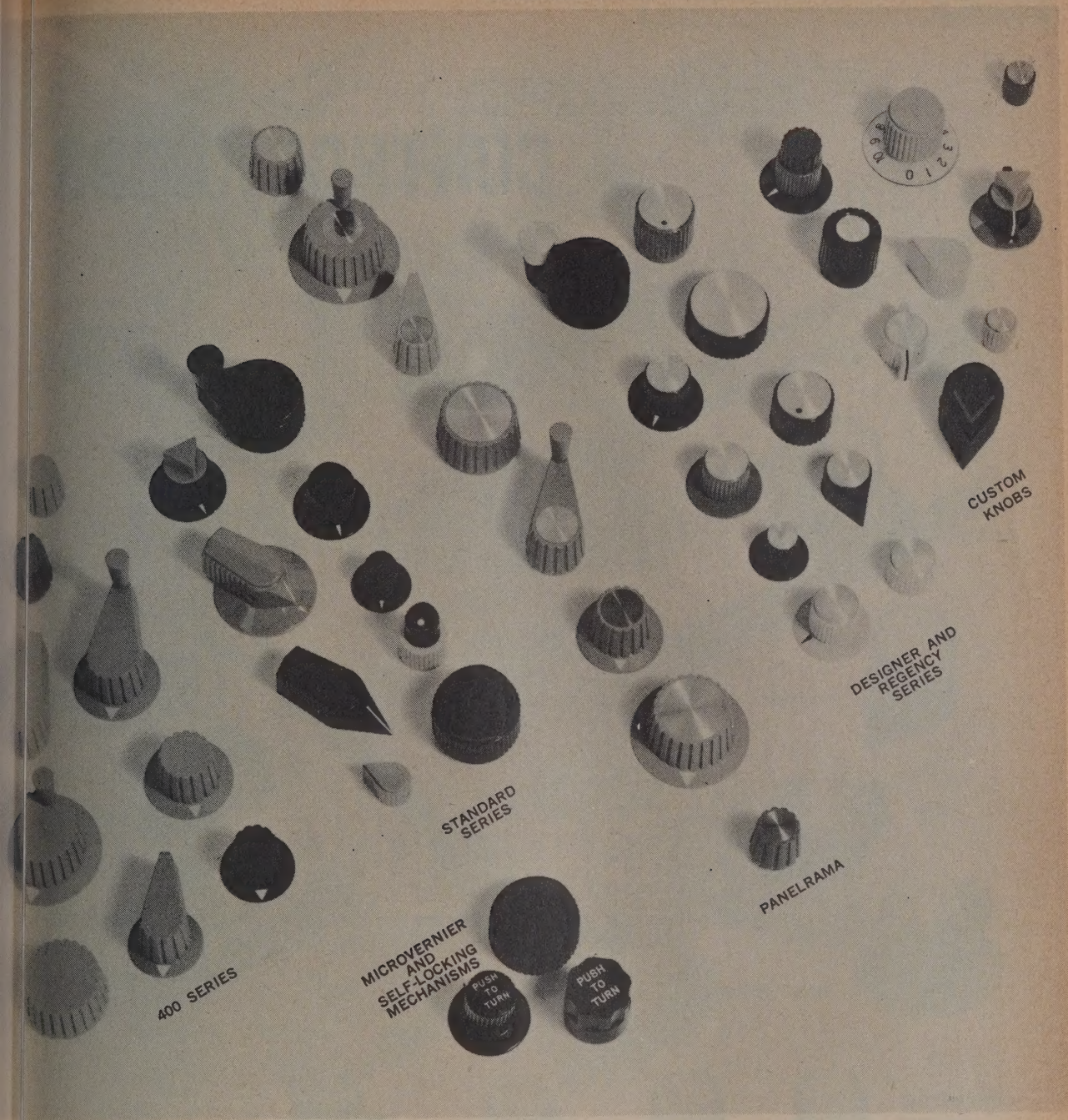
2-5-2, Minami -shinagawa, Shinagawa-ku Tokyo, Japan
CABLE: OSHINOLAMPS TOKYO, PHONE: TOKYO (03) 471-8548
TELEX: 0242-2117 OSHINOLAMPS TOK

Marubeni-Iida (America), Inc.

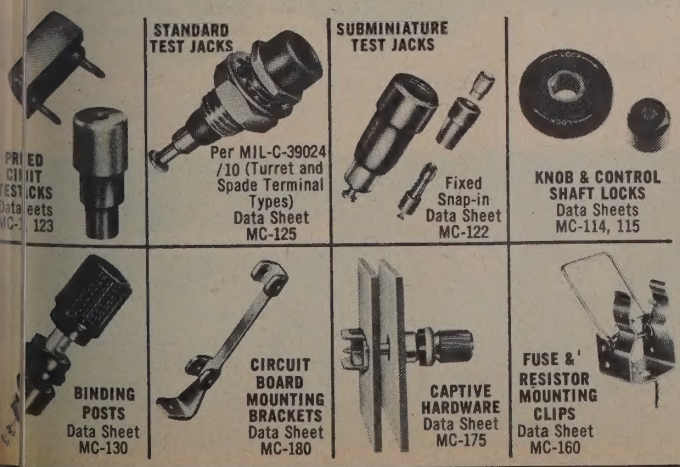
New York Head Office
Pan American Bldg.
200 Park Avenue
New York, N.Y. 10017
Phone: 212-973-6500

Chicago Branch
938 Merchandise Mart
Chicago, Ill. 60654
Phone: 527-3800

Los Angeles Branch
624 South Grand Ave.
Los Angeles
California 90017
Phone: Madison 628-6271



Pick a knob... Any knob... Raytheon has it in stock



Hundreds of standard types. More than 2,000 "specials" available from local distributors and large factory stocks.

Turn to color with new PANELRAMA knobs... mix and match caps and body colors. Specify DESIGNER SERIES knobs . . . or colorful 400 and REGENCY Series knobs. Raytheon Standard Series meet MS91528. Or, select MICRO-VERNIER CONTROLS and self-locking devices to meet your requirements. For a complete line catalog, call your Raytheon distributor or write: Raytheon Company, Industrial Components Operation, Quincy, Mass. 02169.

RAYTHEON

Rogan CONTROL KNOBS

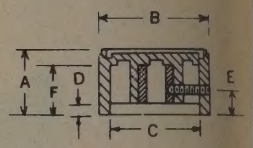
67 SERIES

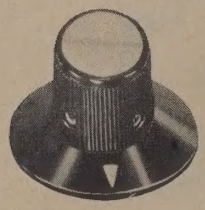
PLAIN

DIMENSIONS (INCHES)

KNOB NO.	SHAFT DIA.	A	B	C	D	D*	E	F
RB-67-0	⅛ 3/16 ¼	.483	.510	.390	.050	.160	.153	.410
RB-67-1	⅛ 3/16 ¼	.579	.713	.581	.047	.160	.146	.410
RB-67-2	⅛ 3/16 ¼	.764	.920	.760	.114	.220	.239	.575
RB-67-3	¼, ¼ × .156	.662	1.261	1.023	.114	.165	.239	.535
RB-67-4	¼ ⅜	.820	1.764	1.526	.114	.220	.239	.625
RB-67-5	¼ ⅜	.845	2.262	2.016	.114	.220	.239	.680

*D. dimension—optional deep core-out.

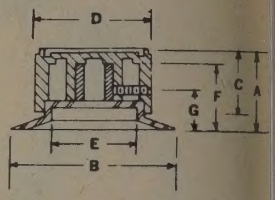




SKIRTED

DIMENSIONS (INCHES)

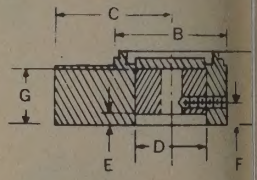
KNOB NO.	A	B	C	D	E	F	G
RB-67-0-SK	.660	.900	.483	.510	.302	.635	.325
RB-67-1-SK	.775	1.150	.579	.713	.485	.655	.349
RB-67-2-SK	1.000	1.525	.764	.920	.664	.925	.484
RB-67-3-SK	.840	1.837	.662	1.261	.897	.835	.427
RB-67-4-SK	1.070	2.468	.820	1.764	1.398	.985	.489
RB-67-5-SK	1.095	3.020	.845	2.262	1.888	1.020	.489



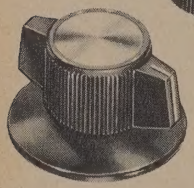
POINTER

DIMENSIONS (INCHES)

KNOB NO.	SHAFT DIA.	A	B	C	D	E	E1	F	G
RB-67-0-P	⅛"	.540	.500	.490	.420	.053	.160	.158	.410
RB-67-1-P	⅛" 3/16" ¼"	.610	.703	.680	.485	.047	.160	.187	.420
RB-67-2-P	⅛" 3/16" ¼"	.790	.906	.885	.640	.115	.220	.260	.575



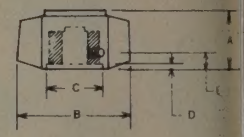
BAR

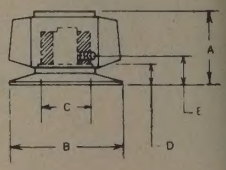


SKIRTED BAR

DIMENSIONS (INCHES)

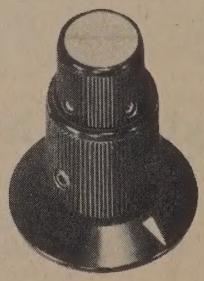
KNOB NUMBER	SHAFT DIAMETER	A	B	C	D	E
PLAIN						
RB-67-1-B	⅛ 3/16 ¼	.579	1.150	.581	.047	.146
RB-67-1-B-DC	⅛ 3/16 ¼	.739	1.150	.581	.207	.306
RB-67-2-B	⅛ 3/16 ¼	.645	1.525	.760	.114	.239
RB-67-2-B-DC	⅛ 3/16 ¼	.865	1.525	.760	.334	.459
SKIRTED						
RB-67-1-B-SK	⅛ 3/16 ¼	.775	1.150	.485	.185	.349
RB-67-2-B-SK	⅛ 3/16 ¼	.881	1.525	.664	.310	.484





CONCENTRIC KNOBS

PLAIN



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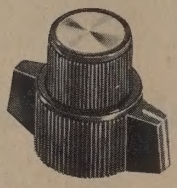

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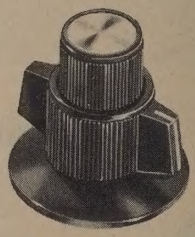
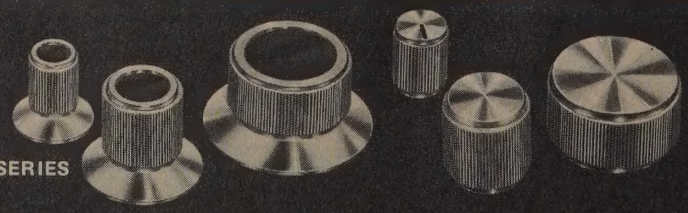


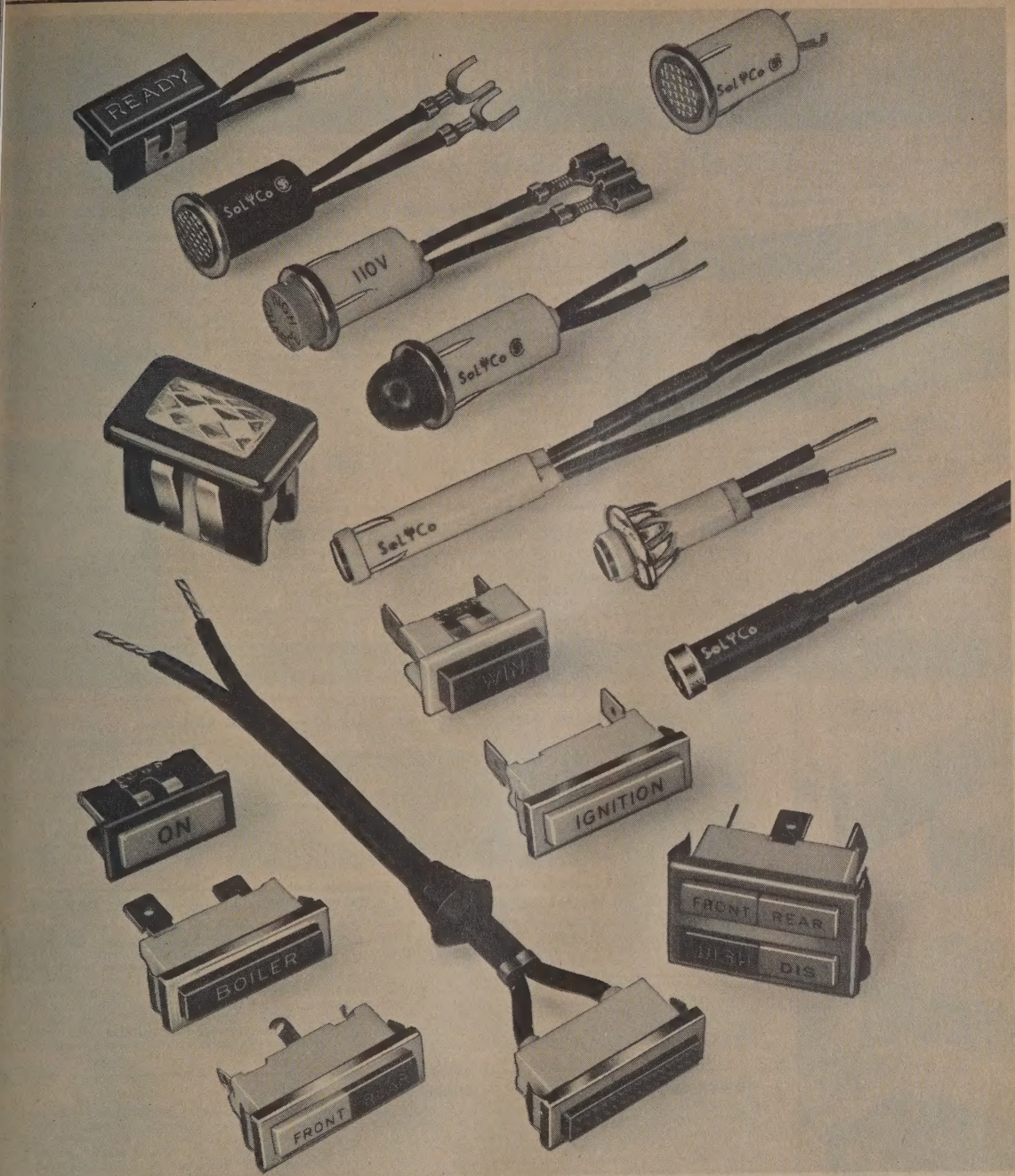
SKIRTED BAR

Items appearing on this p represent only one series of control knobs from Rogan's extensive catalog standard parts —write for complete information.



ALUMINUM XR SERIES

Rogan BROTHERS, INC
8019 N. Monticello Ave. Skokie, Ill. 6007
Phone (312) 675-1234



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- Complete range of voltages.
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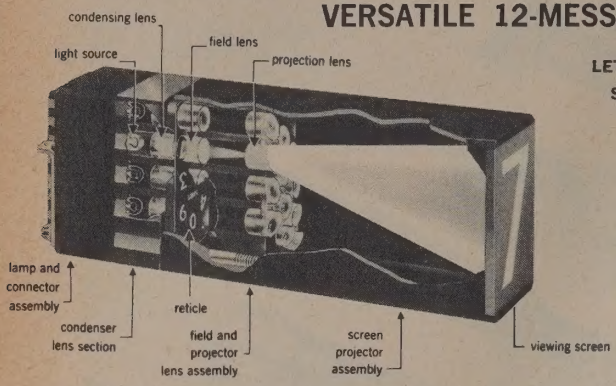
Shelly REAR PROJECTION READOUTS...

VERSATILE 12-MESSAGE READOUTS QUALIFIED TO MIL-R-3902

(READOUTS: INCANDESCEN



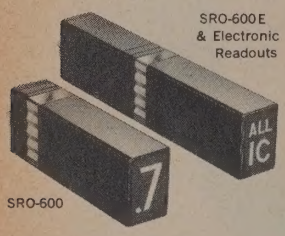
LETTERS, NUMERALS, SYMBOLS OR SIX-LINE MESSAGES TO IMAGE SIZE OF 0.700" HIGH. REMOVABLE FROM PANEL FRONT WITHOUT

Shelly projection-type readouts are precision, completely modular consisting of 12 parallel, miniature optical projectors which display ferent filmed messages on a single-plane viewing screen. Any combin characters or words can be projected from custom designed photo film reticles. To create compound messages, up to six lamps may be er simultaneously. Modular construction permits rapid "in field" ch lamps, color filters or film message reticles. To solve high density pa problems, Shelly Readouts can include built-in solid-state lamp drivers to visual decoders, or binary to visual decoders with memory. The si of the Shelly Readout assures high reliability in environmental e They meet all applicable requirements of MIL-R-39027.

EASY LAMP REPLACEMENT WITHOUT T

MIX OR MATCH COMMON FEATURES

Front removable, plug-in modules * Electronic versions all Integrated Circuit (IC) * Image height 0.700" * 12 numeral, word or symbol messages * Lamp or reticle changes without tools * Intermix message colors * Vertical, horizontal or matrix mounting * Natural or blue Polacoat screens



DECIMAL INPUT TO VISUAL DISPLAY — MODELS SRO-600 & SRO-600E

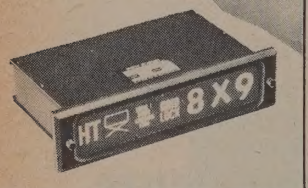
Advanced viewing screen and projector system design affords greater viewing area than conventional readouts . . . 10% larg and 30% smaller housing. Both standard length SRO-600 and extra length SRO-600E, for use with electronic readouts, accep input and provide 12 different visual displays . . . letters, numerals, symbols, characters or up to six line messages with contrast. Standard based or unbased lamps are available from most sources, minimizing special stocking or procuring of available from 3 to 28 volts. RFI and weather-proof bezels, as well as finishing types, available from stock. Printed circuit mates with connector in housing for greater shock and vibration resistance than conventional types. Optional type avai "solder-on" terminals. Terminal arrangements: 24 common terminals or 12 lamp terminals and common or split common steel individual housings are welded together providing wide mounting versatility and excellent rigidity. Aluminum housings for applications where light weight is essential. Special tabs fabricated to customer requirements, as are spacing groups for cl for message meanings. Lamp and film reticle replacement is easily accomplished without tools. Individual message colors

BINARY INPUT TO VISUAL DECIMAL DISPLAY — ALL IC — SERIES BDR-100

Converts 8-4-2-1 binary input signals to visual decimal displays. All IC hex-inverter flat paks enable packaging entire module into plug-in 1.12"H x 0.745"W x 5.17" long . . . only 1.67" longer than standard SRO-600 readout! Front panel removal fea fast, easy access to electronic circuitry, as well as lamps and reticles. Configurations accept and decode any one of the fol binary signals to visual decimal display; 10 binary signals to visual decimal display, plus two additional direct wired di binary signals to visual decimal display. Logic levels 0 to 0.8 volts "0" and greater than +2 volts for "1." BDR-100 uses 6 type T-1 lamps; BDR-100 accepts 10, 12, 18 or 28 volt T-1 based lamps. High performance and high reliability assured thr circuitry which incorporates all necessary drivers, gates and complementary function generators to decode 8-4-2-1 code decimal display. T^2L input logic compatible with DTL logic. Tolerance to wide temperature range . . . free air operation 0°C storage range −55°C to +85°C. Fully enclosed modular readouts provide excellent protection for lamps and electronic cir and easy access to module simplifies field inspection or lamp maintenance . . . without tools. Individual or multiple mess

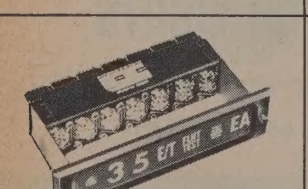
BINARY INPUT TO VISUAL DECIMAL DISPLAY WITH MEMORY — ALL IC — SERIES MBR-100

Binary input to decimal display with memory for readout of binary input data normally too fast for high accuracy. Un SRO-600 type precision 12 message readout projection system and lamp assembly module . . . also retains fast front remov The all IC binary to decimal converter and compatible memory, contain all the drivers, gates and complementary function required to decode and store 10-digit or 12-digit binary input information. Unit accepts four line parallel binary coded dec mation and displays decimal messages upon application of an external +3 volt enable pulse of 2 μsec or more; this is coupling which responds to the whole pulse rather than the leading or trailing edge. Display will be held indefinitely, or un enable pulse is applied. Display versatility increased through application of a constant 3 volt signal level which causes t to follow the input, similar to the BDR-100. Designed for use with 6 volt positive logic source, the "0" logic level requires volts; "1" logic level greater than +2 volts. Floating commons permit using the decoder with negative logic. Configurati and decode any one of the following: 10 binary signals; 10 binary signals plus two additional direct wired displays; 12 bin



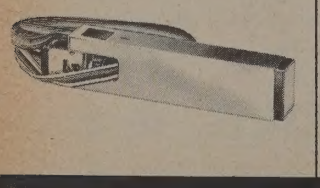
DRIVER AUGMENTED READOUT — SERIES DAR-100

Decimal inputs as low as 0.3 mA will produce crisp images up to 0.700" high with excellent contrast, when driven by 12 sili epitaxial transistor lamp drivers. The readout is comprised of a precision 12 message readout of the SRO-600 type, plus lamp drivers for each optical system projector lamp. The DAR-100 is available in both standard 1.12"H x 0.745"W x 3.5" lon as well as the 5.17" long model, compatible with the electronic readouts contained in this "Mix or Match" group. The r project numerals, symbols or up to six line words . . . singly or in combination since each lamp is individually controlled. display may be colored, or individual messages may be colored through use of color chips in the projection system. Lar miniature long-life T-1 type are used, with ratings of 5 to 28 volts . . . based or unbased for simplified stocking or proc readout incorporates a highly shock and vibration resistant printed circuit connector which is keyed for easy front panel or removal, as are the other plug-in modules in this grouping. Other similarities include high impact resistant housing an of blue or white Polacoat screens . . . blue raises the white color display temperature approximately 800°K.



ECONOMY DECIMAL INPUT TO VISUAL DISPLAY — MODEL SRO-300

Economy rear projection readouts display images up to 0.700" high. Up to 12 readouts may be arranged in a single employing a common viewing screen. This technique offers substantial cost savings over more costly individual modula and plug-in terminal/connector blocks. Readouts display 12 numerals, words or symbols . . . singly or in combination . . . white or in color. From one to twelve modules and common viewing screen are supplied completely assembled and ready tion and operation. The common mounting bracket requires only four screws to secure the entire assembly into position, thus and speeding installation. Fast direct wiring to equipment harness is accomplished with well separated, plainly marked and integral terminals mounted on the rear of each module. Removal of two screws permits access to readout for quick lamp ma as well as field inspection, changing of message reticles or film chips in each projector system. Long-life T-1 type miniat either standard based or unbased are used, thus minimizing special stocking or procuring of lamps; lamp voltages from 3 may be used in the SRO-300. A special bracket permits focusing two readouts on a single image area, for 24 message ca



12 MESSAGE REAR PROJECTION READOUT/SWITCH — MODEL ROS-600

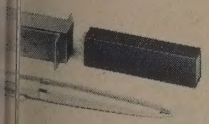
This decimal input to visual display readout/switch consists of 12 parallel miniature optical projectors, similar to the SRO six optical systems can be energized simultaneously to produce complex messages. Any message that can be put on fi projected to an image height of 0.700" . . . black and white or in color . . . singly or in combination. This unit combines the of the rear projection readout with a pushbutton switch assembly. Units can be fitted with 2DPT or 4PDT momentary o action switch assemblies for full pushbutton switch operation. The switch assembly is actuated by pressing the face of t Switches are available with silver or gold contacts, with resistive ratings of 125 or 250 vac at 5 amps. and 30 vdc at 1 amp. r Total weight is less than 5 ounces, with measurements of 1"W x 1.25"H x 5.25" long, completely assembled. Modular des unit permits grouping in intimate contact in any horizontal or vertical arrangement, as well as matrix configurations co any number of units. Housings are welded together for maximum strength. Mounting brackets may be provided at any positi The versatile readout/switch module uses long-life, miniature T-1 lamps, in either based or unbased types, offering simplifie

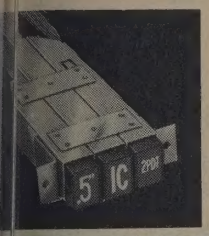
SHELLY ASSOCIATES, INC., 111 Eucalyptus Drive, El Segundo, California 90245 (213) 322-2374 — TWX 910-348-6683

shelly REAR PROJECTION READOUTS/INDICATOR LIGHTS

IX OR MATCH
MON FEATURES

able, plug-in modules * Elec-
ins all Integrated Circuit (IC)
ight 0.450" * Natural or blue
reens * Field maintenance
s * Message or background
ertical, horizontal or matrix





ULTRA-MINIATURE DECIMAL INPUT TO 12 MESSAGE VISUAL DISPLAY — MODEL SRO-90

The smallest and most versatile 12 message rear projection readout ever developed. It displays intricate messages and diagrams no other rear projection miniature readout can produce . . . a design dictated by quality, rather than cost. The precision optical system will project anything that can be put on film . . . image size up to 0.450"H . . . 12 numeral, symbol or up to four line messages with excellent focus and corner-to-corner contrast . . . 20% more image area in 20% less space than any other readout available. Smaller than a roll of pennies, this readout offers all the features available in the larger readouts in a 0.650"H x 0.460"W x 2.68" long plug-in module . . . the smallest size possible, compatible with standard T-1/MS 24367; standard lamps minimize problems normally associated with stocking or procuring of special lamps. Field maintenance may be performed from the front panel, without tools. Lamp voltages from 3 to 28 volts. Individual or common grounding for greater message control or complex signalling. Total weight, including housing, only 1½ ounce. Options are drip-proof, RFI and conventional bezels. Modular construction permits mounting vertically, horizontally, or in matrix configurations; housings are welded together for maximum strength. Gold pin terminals mate with terminal blocks held captive in each housing. Message or background colors available. Extra length version compatible with electronic readouts.

ULTRA-MINIATURE BINARY INPUT TO 12 MESSAGE VISUAL DISPLAY — ALL IC — MODEL BDR-90

This plug-in module employs IC's, containing all drivers, gates and complementary function generators required to convert 8-4-2-1 codes, from 10-digit binary inputs, to visual decimal displays. The 12 message readout provides two supplemental wired positions, which may be turned on as needed for simultaneous display of background colors, + or −, left or right decimal, or other symbol, word or numeral messages . . . anything that can be put on film. Combined with the smallest precision optical system ever developed, this front removable module provides images up to 0.450" high. As the smallest completely self-contained readout and binary converter, the BDR-90 opens a new era in high density packaging. Over-all size is 0.450"W x 0.650"H x 5.500" long, from the front of the module to the end of the housing terminals. Modular design permits vertical, horizontal or matrix mounting, with either vertical or horizontal messages. Flat pak IC's use T²L input logic, which is compatible with DTL logic. Logic "0" input, 0 to +0.5 volts; logic "1" input, greater than +2 volts. High reliability, high performance IC's permit operation over a wide temperature range . . . 0°C to +70°C; storage range −55°C to +85°C. Long-life, standard T-1 lamps (MS 24367) are used for simplified stocking and procurement. Fully enclosed housing assures protection for electronic circuitry and projector systems.

12 MESSAGE REAR PROJECTION READOUT/SWITCH — MODEL ROS-90

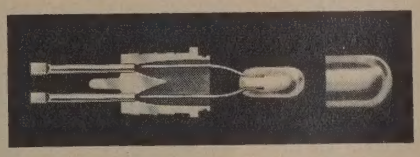
The ROS-90 combines the advantages of a standard SRO-90 rear projection readout with a switch. The standard 12 message readout is simply plugged into movable 2PDT switches for momentary or alternate operation. The switches are operated by pressing the screen of the readout. The switch can be programmed with related equipment for 1 to 12 count readout or to perform similar functions. The complete assembly is packaged in a stainless steel housing that is equipped with a wide variety of mounting tabs for quick and easy mounting. Switch assemblies may be mounted vertically, horizontally or in matrix configurations. The complete assembly measures 0.510"W x 0.710"H x 3.750" long, with total weight of less than 2 ounces each. ROS-90 assemblies are supplied with a 12 inch harness for easy wiring.

MICROMINIATURE INDICATOR LAMPS — Conform to MS 90308

IX OR MATCH
MMON FEATURES

ight intensity greater than
ive times their size * Re-
ple from front panel without
s. Mount on 0.225" centers
Gle housing makes lamp re-
ent easy * Housings lock
ition with snap-in action *
ge of lamps and voltages.

NEW HOUSING GUIDES LAMP LEADS TO CONTACTS



Funnel-shaped passages guide lamp leads to electrical contacts . . . speeds installation . . . no chance for misalignment or bent leads!

"BRITE-EYE" ACTUAL SIZE

OPTIONAL CAP STYLES

Specify ball, lens or square caps from 30 combinations of color and type...or Digi-caps, square caps in 10 color/type combinations embossed to order with high contrast letters, numerals or symbols. Ideal for decimal or binary count.

Standard "Brite-Eye"

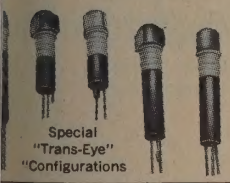
"Brite-Eye" with High Temperature, Epoxy Heat Barrier

"BRITE-EYE" MICROMINIATURE INDICATOR LAMPS — Panel Mount

Smallest front relampable indicator light available.

The panel mounted "Brite-Eye" P series is specifically designed for installations that require excellent visual indications, combined with high density packaging, to monitor important operating functions. Lightweight, of less than ½ gram each, including lamp, makes the "Brite-Eye" ideal in applications where weight is a critical factor. The unique lamp and housing combination offers many advantages not available in any other microminiature indicator light . . . funnel-shaped passage guides permit use of axial lead lamps . . . axial lamps provide highest illumination intensity available in this class lamp . . . replacement lamps slip in or out without tools . . . small diameter housing body permits mounting indicators on 0.225" centers . . . indicator housings snap into position and lock without additional hardware . . . lens caps snap off or on for easy access to lamps from the front panel . . . indicators available with a choice of 14 lamp ratings from 1.5 to 28 volts and life expectancies from 10,000 to 60,000 hours. Easy access solder terminals are provided on the rear of each housing for simplified and fast installations. Terminals are gold plated for corrosion resistance and sure flow of solder. Special "Brite-Eye" configurations are now available with high temperature, epoxy heat barrier which prevents transmission of soldering iron or solder gun heat into the body of the housing, thereby making the housing virtually impervious to damage that could occur from heat.

Standard "Trans-Eye"



Special "Trans-Eye" "Configurations

"TRANS-EYE" MICROMINIATURE TRANSISTORIZED INDICATOR LAMPS

High intensity indications from signal levels too low to illuminate conventional indicators.

The "Trans-Eye" indicator is designed for compatible "Mix or Match," with panel mounted "Brite-Eye" indicators . . . units are physically identical, except the "Trans-Eye" is ⅛ to ¼" longer. Electrically, the "Trans-Eye" incorporates a transistor in the housing which will "turn-on" the indicator when a signal as low as 0.3 mA is applied. This capability is ideal for bright front panel indications when extremely low signal levels are being used. Long operating life and dependable indications are assured through the use of silicon NPN or PNP planar transistors . . . the "Trans-Eye" also has a high temperature characteristic which makes the unit reliable in a wide range of environmental applications. Configurations are also available incorporating a built-in resistor. Lamps are available in ratings from 5 to 28 volts with life expectancies from 10,000 to 60,000 hours.

SPECIALIZED "TRANS-EYE" CONFIGURATIONS

Specialized physical and electrical configurations have been developed to meet a wide range of customer specifications. Shelly's staff will be happy to consult or quote on "Trans-Eye" indicators for any specialized application. Consult the factory or your nearest field engineering representative.

"Brite-Eye"

"BRITE-EYE" MICROMINIATURE INDICATOR LAMPS — Circuit Board Mount

The "Brite-Eye" C series is designed for use with printed circuit boards, where it is important that the state or condition of the board, or operation, be monitored rapidly. The high intensity illumination and microminiature size of the C series make it an ideal indicator for use in multiple rows, or bays of cards, as well as any other application where space is limited beyond the mounting surface. The C series "Brite-Eye" incorporates standard "Brite-Eye" features . . . it may also use any of the optional cap styles.

"GLO-EYE" MICROMINIATURE NEON INDICATORS

The Glo-Eye microminiature neon indicator series provides bright indications in the presence of 115VAC power. The indicator consists of an "easy-lamp" housing, a wire terminal neon lamp type USASI A1K, and a snap-on cap in 12 type/style/colors. The housing also contains an integral resistor for varying life expectancies. The Glo-Eye housing fits a 0.191" hole for compatibility with the Brite-Eye and Trans-Eye. Over-all flange dimension of 0.225" permits mounting the units on 0.225" centers for high density packaging applications.

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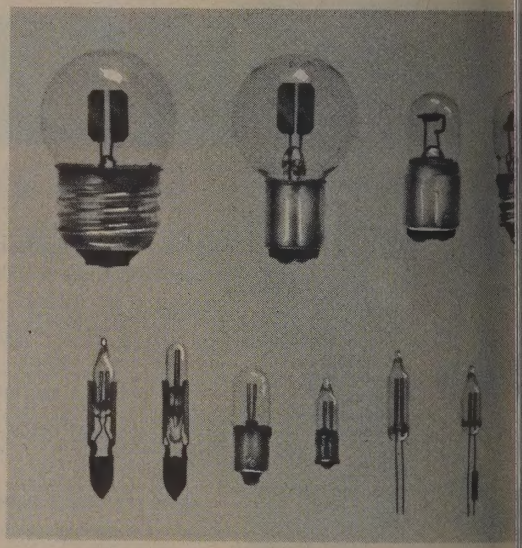
SIGNALITE

MINIATURE GLOW LAMPS

Whether you use Glow Lamps as Indicators or as Electronic Circuit Components . . . the combination of features, offered by Signalite Glow Lamps make them suitable for a wide variety of applications. Signalite Glow Lamps have solved problems in these areas: voltage regulation and references, photo drivers, SCR triggering, timing, photo choppers, oscillators, counters, regulated power supplied, digital voltmeters, timing circuits, suppressed 0 voltmeters, frequency and voltage dividers, indicating voltmeters, gating, transient and overvoltage protection, flip-flops, etc. Signalite's extensive line can provide you the design flexibility needed to achieve circuit reliability at low cost. For a creative approach to your design problem contact Signalite's Application Engineering Department.



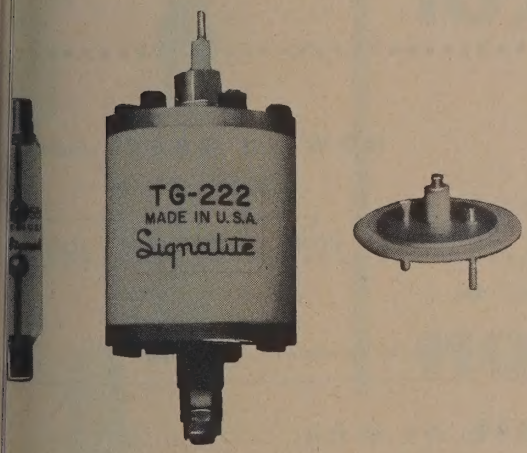
If there is a Gas Discharge Device or Glow Lamp to meet your n

SIGNALITE APPLICATION NEWS
is used to communicate new and proven techniques and applications of Signalite's neon lamps and gas discharge tubes. Signalite Application News provides a forum for an exchange of ideas to keep the design engineer aware of the versatility of neon lamps and their many applications. Copies are available from your Signalite representative or by contacting Signalite.

Your Single Source for Gas Discharge Tubes and Glow Lamps

SPARK GAPS

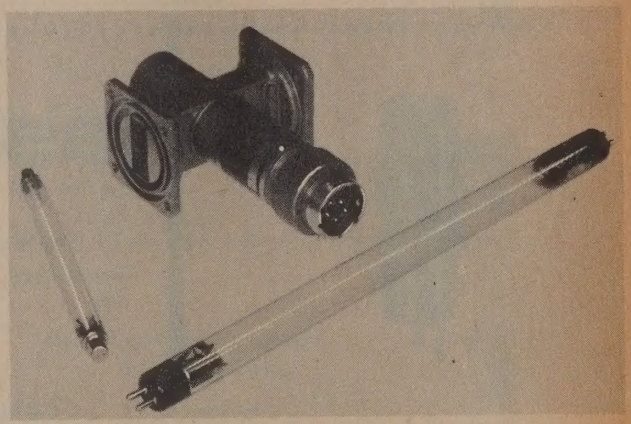
Signalite offers a wide range of two electrode and triggered spark gaps to protect your electronic components, transmit high energies, hold off a wide range of voltages, crowbar power supplies, etc. Over 300 standard gaps to fit 400 volt to 5,000 volt applications are available.



Signalite "300" Spark Gap Brochure . . . fully details the complete Signalite line of over 300 types of two-electrode spark gaps and triggered spark gaps, includes application notes, characteristics, mounting arrangements, photographs, etc.

NOISE SOURCES AND MINIATURE NOISE GENERATORS

Signalite is the largest source in the world for your noise source and noise generator requirements. With the addition of the TUCOR (ESCO) line, Signalite now offers over 200 different types for use in noise figure test equipment and for monitoring system receiver sensitivities, from UHF to 90 GHz.



Signalite "200" Noise Source Brochure . . . provides a complete dissertation on over 200 types of microwave noise sources and miniature generators available, including fundamental noise measurement discussions, typical applications, detailed characteristics, etc.

We'll have it. If there isn't, We'll Design it!

A GENERAL INSTRUMENT COMPANY

Signalite INCORPORATED

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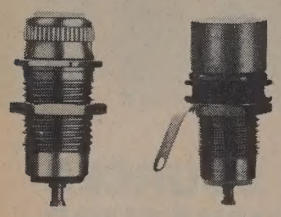
SLOAN

INDICATOR LIGHTS



855S Std. Lens Shown — 855SI DS Lens Shown

855

For use with T-1¾ based lamps

- Front removable

855S Single terminal, mounts in ⅜" dia. hole

855SI Insulated for two terminal applications, mounts in 27/64" dia. hole.

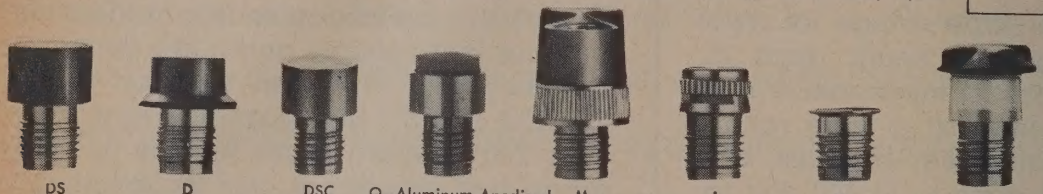
Color coding at rear of body in E I A colors to simplify wiring.

HOW TO ORDER (Example)

855SI - R - 2 - M

- MODEL
- LENS COLOR — Gen'l Purpose Lens Material (translucent)*: R—Red, W—White, B—Blue, G—Green, A—Amber, C—Clear*
- COLOR CODING — 0—Black, 1—Brown, 2—Red, 3—Orange, 4—Yellow, 5—Green, 6—Blue, 7—Violet, 8—Gray, 9—White
- LENS S[illegible]

These lenses may be used with both 855S and 855SI body styles.

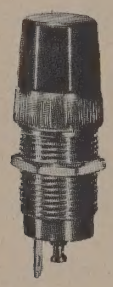


DS Black Anodized Bezel — D — DSC Aluminum Anodized Bezel — Q—Aluminum Anodized Bezel, QB—Black Anodized Bezel — M — I — U — SE

Special (G.E. Lexan) Lens Materials (NO INCREASE IN PRIC[illegible])

(Transparent)	(Translu[illegible])
RL—Red	RLUC—R[illegible]
BL—Blue	WLUC—W[illegible]
GL—Green	BLUC—B[illegible]
AL—Amber	GLUC—G[illegible]
CL—Clear	ALUC—A[illegible]

*M-Lens available in Clear. All M-Lens color transparen[illegible] except whi[illegible]



856

For use with T-1¾ & T-2 based lamps

- Front removable

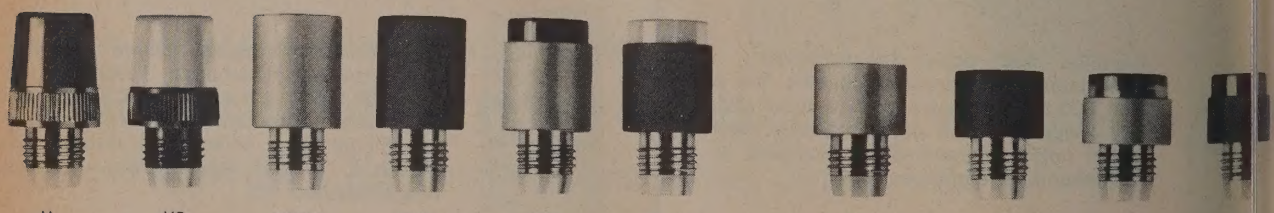
Two terminal, mounts in 7/16" dia. hole

HOW TO ORDER (Example)

856S - R - M

- MODEL
- LENS COLOR — R—Red, W—White, B—Blue, G—Green, A—Amber, C—Clear (B and G: *Not recommended for use with neon.)
- LENS STYLE

LENS STYLES



M — MB — DSCN — DSN — QN — QBN — DSC — DS — Q — Q[illegible]

Accepts all T-1¾ & T-2 based lamps

Accepts all T-1¾ & T-2 based lamps except long n[illegible] (NE2J type)

Write for Complete Catalog!
Free Samples On Request!
Hot Stamping Available

"The Touch of Brilliance in Panel Design"

All materials and processes meet or exceed applicable MIL Specs

THE SLOAN COMPANY
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SLOAN

INDICATOR LIGHTS

102SI Hex Flange — 102SK Knurled — 102SKI Flange

102SRI Round Flange — 102SS Short Hex — 102SSI Flange

102

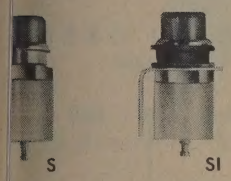
HOW TO ORDER
(See Below)

For use with T-1 based lamps
- Front removable

102S 102SK 102SR 102SS
Single terminal, mount in ¼" dia. hole

102SI 102SKI 102SRI 102SSI
Insulated for two terminal applications, mount in 5/16" dia. hole

LENS STYLES



S — SI

107

HOW TO ORDER
(See Below)

For use with T-1 based lamps

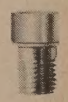
Rear relamping. Minimum mounting hole spacing 5/16".

STD

DS

110

For use with T-1 based lamps
- Front removable
- Two terminal
- ¼" mounting hole



DSC

QB

Q

HOW TO ORDER
(Example)

102SR - W - DS

MODEL

LENS COLOR

STD—Standard
DS—Black Anodized Bezel
DSC—Aluminum Anodized Bezel
Q—Aluminum Anodized Bezel
QB—Black Anodized Bezel

Special (G.E. Lexan) Lens Materials (NO INCREASE IN PRICE)

(Transparent)	(Translucent)
RL—Red	RLUC—Red
BL—Blue	WLUC—White
GL—Green	BLUC—Blue
AL—Amber	GLUC—Green
CL—Clear	ALUC—Amber

Write for Complete Catalog!
Free Samples On Request!
Hot Stamping Available

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All materials and processes meet or exceed applicable MIL Specs

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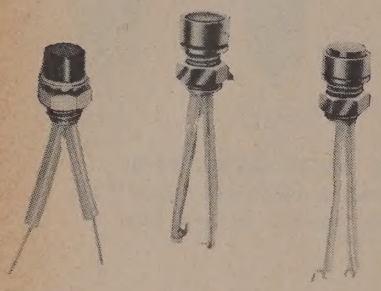
SLOAN

INDICATOR LIGHTS



STD DS & DSC Q & QB

105

T-1 incandescent lamp built-in.
Mounts in 13/64" dia. hole.

T-1 LAMP SPECIFICATIONS

Sloan	Volts	Hours Life	MSCP	Amps
F1	5.0	200,000	.03	.060
F2	5.0	100,000	.05	.060
F9	5.0	10,000	.05	.060
F11	5.0	100,000	.03	.060
F12	5.0	100,000	.05	.060
F15	5.0	100,000	.09	.075
F19	5.0	50,000	.15	.115
F38	28.0	16,000	.13	.024
F44	18.0	10,000	.15	.026
F45	12.0	10,000	.15	.060
F46	10.0	10,000	.10	.027
F47	14.0	10,000	.15	.065
F56	5.0	100,000	.03	.060
F57	5.0	60,000	.09	.075
F58	5.0	40,000	.15	.115

HOW TO ORDER
(Example)

105 - B - Q - F38

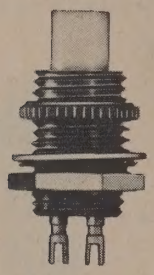
MODEL — LENS COLOR — SLOAN LAMP NO

Gen'l Purpose Lens Material (translucent)
R—Red
W—White
B—Blue
G—Green
A—Amber

Special (G.E. Lexan) Lens Materials (NO INCREASE IN PRICE)
(Transparent)
RL—Red
BL—Blue
GL—Green
AL—Amber
CL—Clear

(Translucent)
RLUC—Red
WLUC—Whi
BLUC—Blu
GLUC—Gre
ALUC—Am

LENS STYLE
STD—Standard
DS—Black Anodized Bezel
DSC—Aluminum Anodized Bezel
Q—Aluminum Anodized Bezel
QB—Black Anodized Bezel



106

T-1 incandescent lamp built-in.
Mounts in 5/16" dia. hole.

T-1 LAMP SPECIFICATIONS

Sloan	Volts	Hours Life	MSCP	Amps
F1	5.0	200,000	.03	.060
F2	5.0	100,000	.05	.060
F9	5.0	10,000	.05	.060
F11	5.0	100,000	.03	.060
F12	5.0	100,000	.05	.060
F15	5.0	100,000	.09	.075
F19	5.0	50,000	.15	.115
F38	28.0	16,000	.13	.024
F44	18.0	10,000	.15	.026
F45	12.0	10,000	.15	.060
F46	10.0	10,000	.10	.027
F47	14.0	10,000	.15	.065
F56	5.0	100,000	.03	.060
F57	5.0	60,000	.09	.075
F58	5.0	40,000	.15	.115

HOW TO ORDER
(Example)

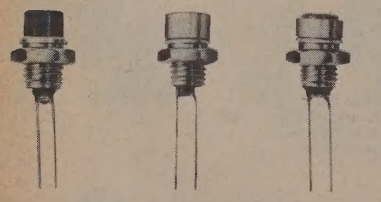
106 - B - F38

MODEL — LENS COLOR — SLOAN LAMP NO

Gen'l Purpose Lens Material (translucent)
R—Red
W—White
B—Blue
G—Green
A—Amber

Special (G.E. Lexan) Lens Materials (NO INCREASE IN PRICE)
(Transparent)
RL—Red
BL—Blue
GL—Green
AL—Amber
CL—Clear

(Translucent)
RLUC—Red
WLUC—Whit
BLUC—Blue
GLUC—Gree
ALUC—Amb



STD DS & DSC Q & QB

104

T-1⅛ neon lamp built-in mounts in 15/64" dial. hole.

LAMP SPECIFICATIONS

Volts	Hours Life	Amps	Resistor
120	30,000	.3	200K
240	30,000	.3	560K

HOW TO ORDER
(Example)

104 - R - Q

MODEL — LENS COLOR

Gen'l Purpose Lens Material (translucent)
R—Red
W—White
A—Amber

Special (G.E. Lexan) Lens Materials (NO INCREASE IN PRICE)
(Transparent)
RL—Red
AL—Amber
CL—Clear

(Translucent)
RLUC—Red
WLUC—Whit
ALUC—Ambe

LENS STYLE
STD—Standard
DS—Black Anodized Bezel
DSC—Aluminum Anodized Be
Q—Aluminum Anodized Be
QB—Black Anodized Bezel

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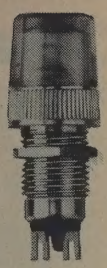
SLOAN

INDICATOR LIGHTS

WITH RESISTOR



WITHOUT RESISTOR

857

Neon or incandescent lamps built in, with or without resistor.
Mounts in 3/8" dia. hole.

HOW TO ORDER
(Example)

857 - R - NE-2H- 22K

MODEL — LENS COLOR — LAMP — RESISTOR WHEN REQUIRED

R—Red
W—White
B—Blue
G—Green
A—Amber
C—Clear
} Incandescent only

858

Long-lamp T-2 neons, T-1 3/4 and T-1 incandescent lamps built in. Also short bulb neons with resistor.
Mounts in 5/16" dia hole with Tinnerman nut.
See Model 105 for T-1 lamp specifications.

859

Long or short-lamp neons with or without resistor attached, T-1 3/4 incandescent (available).
Mounts in 5/16" dia. hole with Tinnerman nut.

HOW TO ORDER
(Example)

858 - C - A1C - 68K

MODEL — COLOR — LAMP — RESISTOR WHEN APPLICABLE

R—Red
W—White
B—Blue
G—Green
A—Amber
C—Clear
} Incandescent only

862

Short-lamp neons, T-1 3/4 and T-1 incandescent lamps built-in.
Mounts in 5/16" dia. hole with Tinnerman nut.
See Model 105 for T-1 lamp specifications.

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Lot Stamping Available

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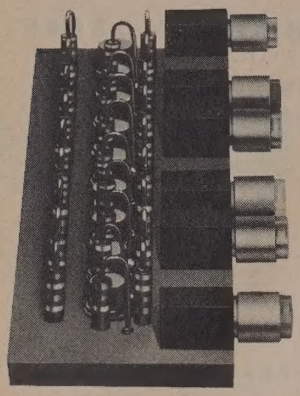
SLOAN

INDICATOR LIGHTS



101

101 Pee Cee

HOW TO ORDER

(Example)

101 - RLUC - Q

MODEL

LENS COLOR
- RL — Red Transparent
- RLUC — Red Translucent
- WLUC — White Translucent
- *BL — Blue Transparent
- *BLUC — Blue Translucent
- *GL — Green Transparent
- *GLUC — Green Translucent
- AL — Amber Transparent
- ALUC — Amber Translucent
- CL — Clear Transparent

**Not recommended for use with neon.*

LENS STYLE
- DS—Black Anodized Bezel
- DSC—Aluminum Anodized Bezel
- Q—Aluminum Anodized Bezel
- QB—Black Anodized Bezel

Description

Right angle, printed circuit board mounted, indicator light.

Lamp Accommodation

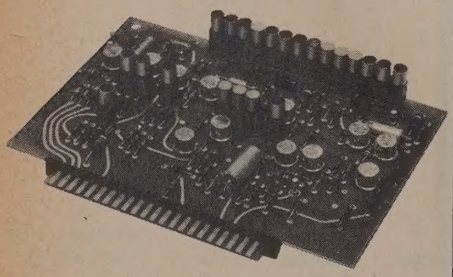
T-1 midget flanged base incandescent.

Mechanical

LAMPHOLDER BODY: Black general purpose phenolic.

LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)

MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ¼" centers.



111

111 Pee Cee

HOW TO ORDER

(Example)

111 - RL - Q

MODEL

LENS COLOR
- RL — Red Transparent
- RLUC — Red Translucent
- WLUC — White Translucent
- *BL — Blue Transparent
- *BLUC — Blue Translucent
- *GL — Green Transparent
- *GLUC — Green Translucent
- AL — Amber Transparent
- ALUC — Amber Translucent
- CL — Clear Transparent

**Not recommended for use with neon.*

LENS STYLE
- DS—Black Anodized Bezel
- DSC—Aluminum Anodized Bezel
- Q—Aluminum Anodized Bezel
- QB—Black Anodized Bezel

Description

Perpendicular, printed circuit board mounted, indicator light.

Lamp Accommodation

T-1 midget flanged base incandescent.

Mechanical

LAMPHOLDER BODY: Black general purpose phenolic.

LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)

MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ¼" centers.

GENERAL COMMENTS (Models 101, 111 and 864)

The Sloan Company "Pee Cee" replaceable lamp indicator light is designed specifically for printed circuit board mounting. This is mounted by inserting the terminals directly into the board and flow soldering directly into the circuit; two pins provide circuit contc Lamps are replaceable from the front by removing the lens. The "Pee Cee" series helps prepare the way for new packaging conce

- Permits elimination of front panel.
- Substantial contribution of soldered assemblies to production economy; can be automated.
- One central circuit board for indicator lights. (Mother Board)

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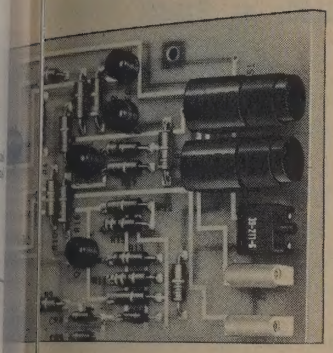
See YELLOW SECTION for Local Offices, Phones

SLOAN

INDICATOR LIGHTS



864 Pee Cee

HOW TO ORDER

(Example)

864 - AL - Q - 8 - N

MODEL

LENS COLOR

RL — Red Transparent
RLUC — Red Translucent
WLUC — White Translucent
*BL — Blue Transparent
*BLUC — Blue Translucent
*GL — Green Transparent
*GLUC — Green Translucent
AL — Amber Transparent
ALUC — Amber Translucent
CL — Clear Transparent
*Not recommended for use with neon.

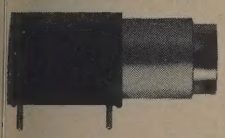
LENS STYLE

DS—Black Anodized Bezel
DSC—Aluminum Anodized Bezel
Q—Aluminum Anodized Bezel
QB—Black Anodized Bezel

DIA.

8-8/16
7-7/16

NEON



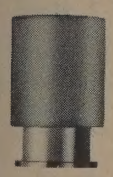
864

Description
Right angle, printed circuit board mounted, indicator light.

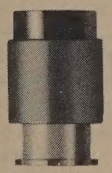
Lamp Accommodation
T-1¾ midget flanged base incandescent. Special lens available for NE-2D or NE-2J neon lamps.

Mechanical
LAMPHOLDER BODY: Black general purpose phenolic.
LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)
MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ½" centers.

LENS STYLES



DSC7
DSC8



Q7
Q8

QB7
QB8

DS7N
DS8N

DSC7N
DSC8N

Q7N
Q8N

QB7N
QB8N

862
THREE TERMINAL
TWO LAMP
TO INDICATE THE BALANCE
OF TWO CIRCUITS

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SPECIALS

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- R&D and prototype facilities

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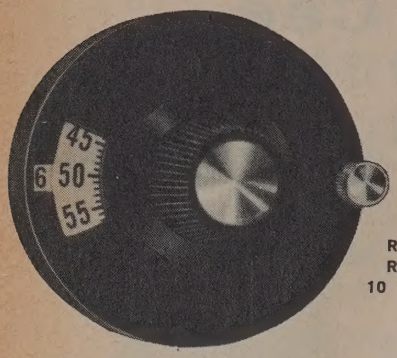
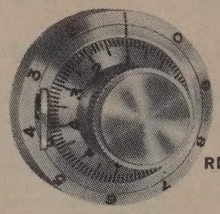
TRW® REVODEX® COUNTING DIALS

ELECTRONICS GROUP

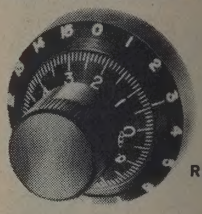


RD-1
RD-6
10 Turns

1" and 1⅞" REVODEX Dials Eliminate Reading Errors and are Available in Both Clear or Black Anodized.



RD-400 Series
10 Turns



RDK-400 Series
15 Turns

Accurate Reproducible Readings: To one part in a thousand. Settings can be estimated to fractions of a thousandth.

See exact settings quickly and clearly . . . significant digits are conveniently grouped at one spot. Reading errors are eliminated. REVODEX dials are particularly suited to IRC 3, 5, 10 and 15 turn precision potentiometers.

Locking Device: Standard on 1⅞", optional on 1" dials. Finger-tip action positively locks or unlocks the dial. Locks can be set without shifting the dial reading.

Easy Reading: Even when mounted above eye level. 1⅞" sizes give a direct reading with 3 numbers grouped for fool-proof reading. On the 1" size, an angular surface provides greater area to obtain maximum numeral size. For greatest ease of reading, numbers are rearranged to a primary and secondary scale presentation.

Full Range: 000 to 999 to indicate full ten turns. 000 to 1599 to indicate full fifteen turns.

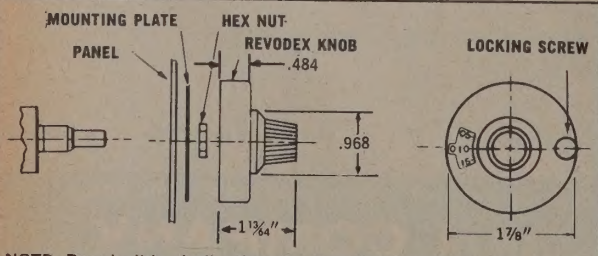
Zero Backlash: Knobs are set-screwed directly to potentiometer shaft and the non-rotating base is tight to the panel in the RD-400 series. This feature thereby eliminates dial backlash.

Sturdy Construction: Life tested for one quarter million cycles with no signs of appreciable wear.

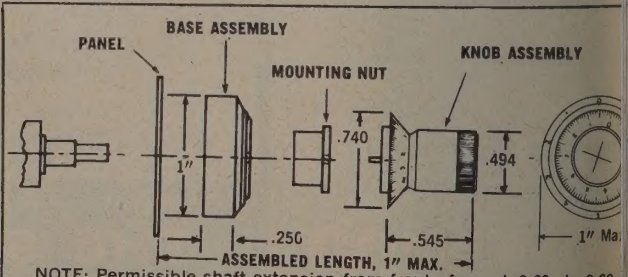
Easy Mounting: Mounting plate of 1⅞" dial fits under potentiometer mounting nut. Knob is secured to shaft with set screw. Body of 1" dial mounts directly on potentiometer bushing and knob attaches to shaft. No special panel holes required.

10 Turns*	RD-1	RD-6	RD-411	RD-412	RD-461	RD-462	RD-421	RD-422	RD-471	RD-4[illegible]
15 Turns**	—	—	RDK-411	RDK-412	RDK-461	RDK-462	RDK-421	RDK-422	RDK-471	RDK-4[illegible]
Locking Mechanism	Yes		No	Yes	No	Yes	No	Yes	No	Yes
Finish (Satin Anodized)	Black	Clear	Black		Clear		Black		Clear	
For Shaft Dia.	¼"		¼"				⅛"			
Bushing/Threads	⅜" Max. (Uses Pot Mounting Nut)		⅜" - 32 NEF2				¼" - 32 NEF2			
Shaft Ext. From Panel — Min.	0.60"		0.60" (.725" Optimum)							
Shaft Ext. From Panel — Max.	1.0"		0.80"							
Max. Bushing Extension from Panel	0.328"		0.296"							
Dial Body Dia.	1⅞"		1" Max.							

*Available from Distributor Stock. **Available on Special Order.



NOTE: Permissible shaft extension from front of panel, 0.60 to 1.0
Bushing extension beyond panel face, .328 max.



NOTE: Permissible shaft extension from front of panel, 0.60 to 0.80
Bushing extension beyond panel face, .296 max.

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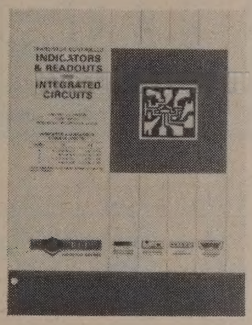
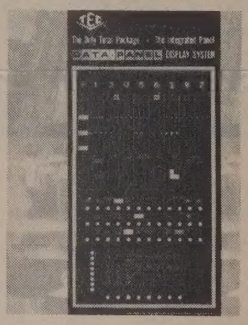
Systems, assemblies, components — including many we invented! TEC originated the transistorized indicator, and we're still ahead of the field. We also offer more readouts than anybody. And we're the largest independent display/control firm in the business, 100% involved in improving the man-machine interface. You'll find us a flexible, innovative single source for:

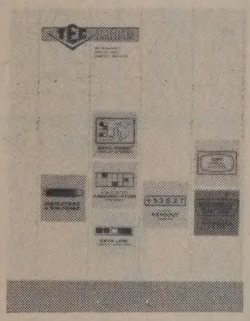


INDICATORS
Solid state, transistorized, conventional.



DISPLAY PANELS
Integrated back-lighted displays of any size.

SWITCHES
Alternate, momentary, snap, illuminated.



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Solid state, segmented, display tube, projection.

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Electronic encoding using solid state or standard switches.

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Stand-alone and multi-station.

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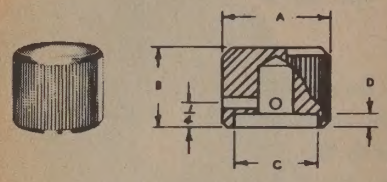
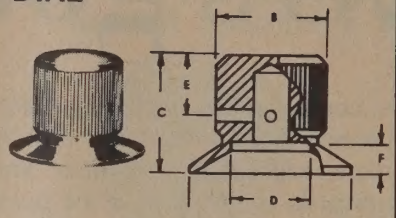
PLAIN



SERIES	A	B	C	D
1073	1¼	¾	9/16	⅛
1027	15/16	¾	9/16	⅛
1020	¾	⅝	9/16	3/32
1003	⅝	⅝	9/16	3/32
1017	½	½	7/16	3/32
1021	½	11/16	7/16	3/32

DIAL



SERIES	A DIAL	B KNURL	C HEIGHT	D	E	F
1016	⅝	½	⅝	⅜	⅜	⅛
1015	⅞	½	11/16	⅜	⅜	3/16
1002	1	⅝	13/16	⅜	7/16	3/32
1019	1⅛	¾	13/16	9/16	½	3/16
1001	1⅜	⅝	⅞	⅜	7/16	⅛
1018	1⅜	¾	⅞	9/16	½	⅛

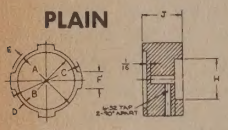
CONCENTRIC

TOP KNOB	RECOMMENDED BOTTOM KN (State "Through Hole" When Or
1017	1018, 1019 1020, 1001, 1002
1016	1018, 1019, 1020, 1073, 102
1003	1018, 1019, 1020, 1073, 102
1020	1027, 1073,

Additional shaft hole dimensions avail

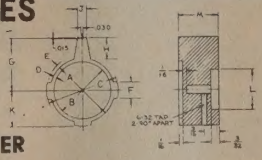
CONTEMPORARY SERIES

PLAIN



SERIES	C Dia.	J
1-10-☐	1-7/64	3/4
1-75-☐	27/32	5/8
1-62-☐	45/64	5/8
1-50-☐	9/16	1/2
1-37-☐	7/16	1/2

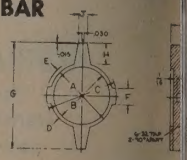
POINTER



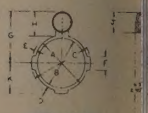
SERIES	C Dia.	G	K	M
3-10-☐	1-7/64	13/16	35/64	3/4
3-75-☐	27/32	41/64	27/64	5/8
3-62-☐	45/64	35/64	23/64	5/8
3-50-☐	9/16	15/32	9/32	1/2
3-37-☐	7/16	23/64	7/32	1/2

SERIES	C Dia.	G	M
2-10-☐	1-7/64	1-41/64	3/4
2-75-☐	27/32	1-9/32	5/8
2-62-☐	45/64	1-3/32	5/8
2-50-☐	9/16	29/32	1/2
2-37-☐	7/16	47/64	1/2

BAR



SERIES	C Dia.	G	K	N
4-10-☐	1-7/64	59/64	35/64	1-1/4
4-75-☐	27/32	51/64	27/64	1-1/8

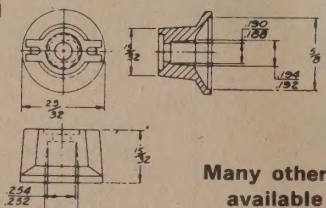


CRANK

MANY OTHER KNOBS AVAILABLE. WRITE FOR CATALG.

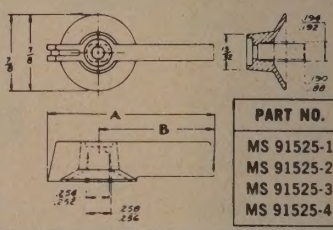
MIL. STANDARD

MS 91524



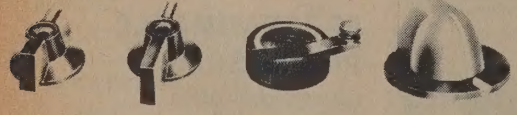
Many others available

MS 91525



PART NO.	A	B	VE
MS 91525-1	19/32	1 3/16	NO 25-
MS 91525-2	27/32	1 7/16	NO 25-
MS 91525-3	1 11/32	1 13/16	NO 25-
MS 91525-4	1 31/32	2 3/16	NO 25-

Other MIL KNOBS Available From Stock



MS 91522	MS 25167
MS 91523	MS 25168
MS 91524	MS 25169
MS 91525	MS 25170

MIL KNOBS in Aluminum
5355 Series and Signal Corps Knobs.

MS Specification shee for further data are available on request.

HOW TO ORDER: Show basic series number desired, color is denoted by a suffix "1" for Clear, "2" for Black, "A" for ⅛" shaft, "B" for ¼" shaft, "C" for 3/16" shaft.

Example: Order #1001-1-B, Series 1001 knob — clear — ¼" shaft.

(If index line is required, this must be stated on order. Cost is 10¢ more, any quantity.)

CONTACT FACTORY FOR CONCENTRIC KNOB APPLICATIONS.

ENGRAVED KNOBS TO YOUR SPECIF- TIONS AVAILABLE ON SHORT NOTI

VEMALINE PRODUCTS COMPANY

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200 / (201) TWX 337-4500

INDICATOR LIGHTS

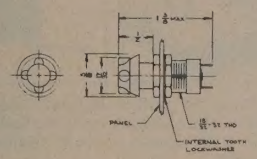
IANY OTHER LIGHTS AVAILABLE. WRITE FOR CATALOG.

VEMALINE

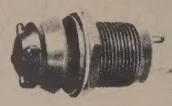
MITARY AND COMMERCIAL APPLICATIONS (COMPUTERS, INSTRUMENTS, Etc.)

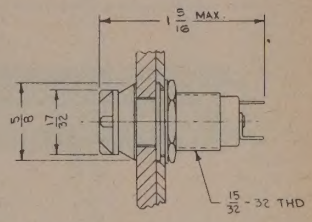
NIATURE EDGE LIGHTING ASSEMBLIES

7X29-□ LENS COLOR



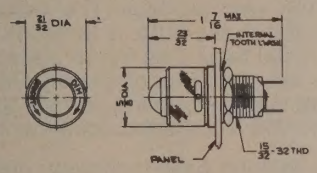
7033-29-□



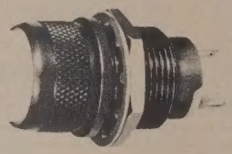


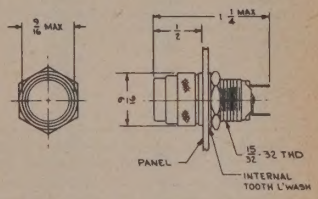
TEPROOF INDICATOR LIGHTS

10-1-□



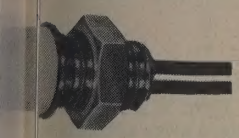
7010-28-□

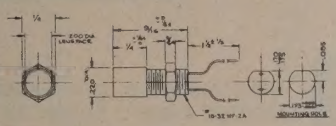




NIATURE INDICATOR LIGHTS

20-1





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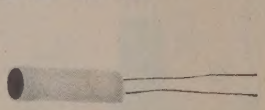
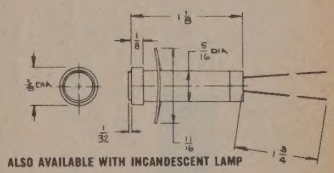
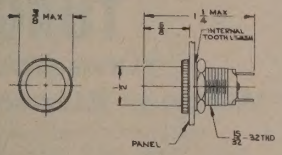




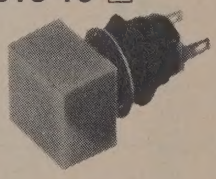
ALSO AVAILABLE WITH INCANDESCENT LAMP

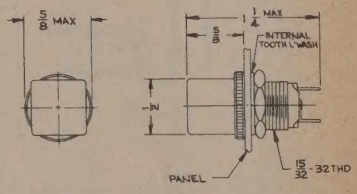
DICTOR LIGHTS

18-5-□



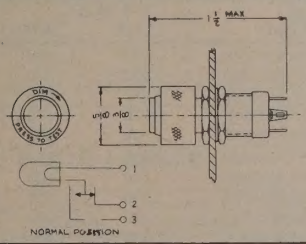
7018-16-□



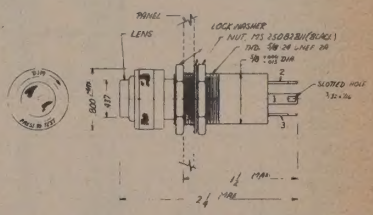


ES-TO-TEST ASSEMBLIES (DIMMER AND NON-DIMMER TYPES)

27-5-□



7052-□



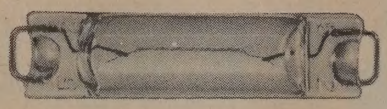
	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
D	GREEN	AMBER	BLUE	WHITE	YELLOW	CLEAR	RED	GREEN	AMBER	BLUE	WHITE	YELLOW

VEMALINE PRODUCTS COMPANY

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200 / (201) TWX 337-4500

TUNG-SOL® MOLDED BASE LAMPS AND BASELESS CARTRIDGE LAMPS

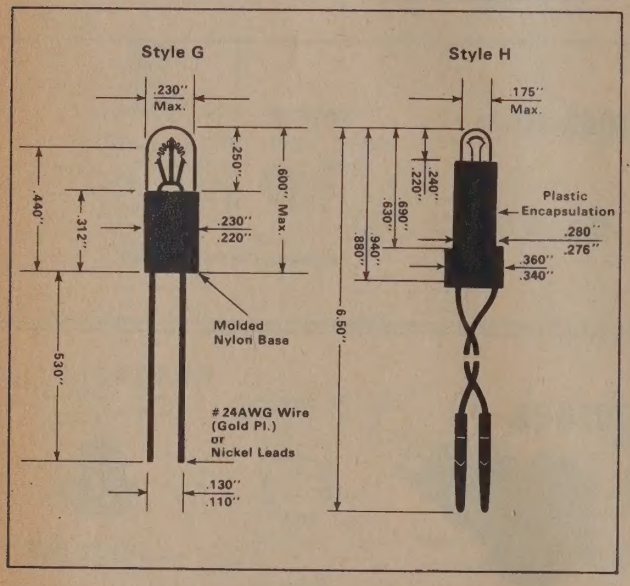
BASELESS CARTRIDGE LAMPS

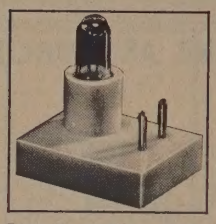


ELECTRICAL CHARACTERISTICS

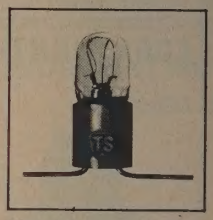
Lamp Type	Design Volts	Design Amps	Design C.P.	Life Hours
561	12.8	.97	12	600 @ 12.8V
562	13.5	.74	6	2000 @ 14V
563	13.5	.52	4	1000 @ 14V
564	14.0	.44	2	5000 @ 14V
565	28.0	.38	4.5	5000 @ 28V

These lamps may be mounted on a variety of simplified terminals. AMP Inc., Harrisburg, Pa., makes several types.





Plug-in module activates photo-electric sensor in high speed check sorter.



Molded base permits bending lead wires at acute angles.

Soft plastic e lation permits mounting in metal panels.

The molded base lamp provides important adva that simplify production and contribute added reli to the end product. The molded base is perma bonded to the bulb. It replaces the previously cem on metal base. The former receptacle that had to be into the circuit is completely eliminated. The molde lamp is self-mounting. In fact, the Tu-Pin lamp can plied with automated equipment.

The molded base technique makes it possible to p a wide variety of lamp packages—built-in key ways, in types, unusual positioning of the leads and purpose configurations.

Strip-mounted, grain-size, 21-mil lamps sna molded plastic holder to form a condition for computer circuit boards. Lamp sockets are bered to correspond to individual circuits. Spa test probe contacts is provided. Units can be ated in either normally "on" or "off" conditi can be wired to a door switch or test push

TUNG-SOL®

TUNG-SOL DIVISION

Wagner Electric Corporati

630 W. Mt. Pleasant Avenue, Livingston, N. J. 07039
TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5
Trademark "TUNG-SOL" Reg. U.S. Pat. Off. and Marcas Regist

ELECTRICAL CHARACTERISTICS						PHYSICAL CHARACTERISTICS				
Lamp No.	Style	Design Volts	Design Current	Nominal Light Output	Average Rated Life	Midget Base Style	Max. Bulb Diam.	MOL	Filament Type	Indica Base C
2301	G	1.35	.06	.02	500	Tu-Pin Molded	.230	.600	S-2	Whit
2302	G	2.5	.20	.25	500	Tu-Pin Molded	.230	.600	C-2R	Brow
2303	G	2.7	.06	.04	500	Tu-Pin Molded	.230	.600	C-2R	Lt. G
2304	G	3.0	.30	.34	1500	Tu-Pin Molded	.230	.600	C-2R	Blac
2305	G	6.0	.04	.03	1000	Tu-Pin Molded	.230	.600	C-2V	Silve
2306	G	6.0	.20	.60	1000	Tu-Pin Molded	.230	.600	C-2R	Oran
2307	G	6.3	.20	.50	3000	Tu-Pin Molded	.230	.600	C-2R	Dk. B
2319	G	6.3	.20	.40	50.000	Tu-Pin Molded	.230	.600	C-2F	Lt. B
2308	G	10.0	.014	.006	5000	Tu-Pin Molded	.230	.600	C-2F	Pink
2309	G	10.0	.04	.10	5000	Tu-Pin Molded	.230	.600	C-2V	Lt. B
2310	G	14.0	.08	.50	750	Tu-Pin Molded	.230	.600	C-2F	Yello
2339	G	15.0	.040	.075	25.000	Tu-Pin Molded	.230	.600	C-2F	Black
2311	G	18.0	.04	.25	1000	Tu-Pin Molded	.230	.600	C-2F	Dk.
2318	G	24.0	.080	.50	20.000	Tu-Pin Molded	.230	.600	C-2F	Gree
2312	G	28.0	.04	.34	1000	Tu-Pin Molded	.230	.600	C-2F	Red
2329	G	28.0	.046	.34	2500	Tu-Pin Molded	.230	.600	C-2F	Gray
2334	G	6.3	.075	.25	1000	Tu-Pin Molded	.230	.600	C-2R	Red
EN1748 *	H	2.5	400	800 ft.-cd(5)	Indef.	Encapsulated	.175	.940	C-2R	Gray
EN1748S *	H	2.5	400	1250 ft.-cd(6)	Indef.	Encapsulated	.175	.940	C-2R	Red

* Various lead lengths are available

TUNG-SOL® SUBMINIATURE LAMPS

All base and bulb types for read-out and indicator applications

SPECIFICATIONS: T-1 3/4 LAMPS

ELECTRICAL CHARACTERISTICS					PHYSICAL CHARACTERISTICS					
Lamp No.	Design Volts	Design Current	Nominal Light Output	Average Rated Life	Midget Base Style	Max. Bulb Diam.	MOL	Filament Type	LCL	Application
[illegible]	1.35	.06	.02 CP	500	Flange	.230	.625	S-2	.375	Indicator(4)
[illegible]	1.5	.05	.012 CP	Indef.	Flange	.230	.625	C-2R	.375	Indicator
69	2.5	.20	.20 CP	500	Screw	.230	.718	C-2R	.500	Indicator
87	2.5	.20	.25 CP	500	Screw	.230	.625	C-2R	.500	Indicator(4)
[illegible]	2.5	.40	.28 CP	5000	Flange	.230	.625	C-2R	.375	Indicator
[illegible]	2.5	.40	800 ft.-cd(5)	Indef.	Groove	.240	.813	C-2R		Read-out
[illegible](1)	2.5	.40	1250 ft.-cd(6)	Indef.	Groove	.240	.813	C-2R		Read-out
48(1)(2)	2.5	.40	800 ft.-cd(5)	Indef.	5/8" Leads	.240	.718	C-2R		Read-out
48S(1)(2)	2.5	.40	1250 ft.-cd(6)	Indef.	5/8" Leads	.240	.718	C-2R		Read-out
69(2)	2.5	.35	.21 CP	10,000	5/8" Leads	.230	.520	C-2R		Indicator
38(2)	2.7	.06	.04 CP	500	5/8" Leads	.230	.520	C-2R		Indicator
8	2.7	.06	.04 CP	500	Flange	.230	.625	C-2R	.375	Indicator
2	6	.04	.03 CP	1000	Screw	.230	.718	C-2V	.500	Indicator
5	6	.04	.03 CP	1000	Flange	.230	.625	C-2V	.375	Indicator(4)
8	6	.20	.60 CP	1000	Flange	.230	.625	C-2R	.375	Indicator(4)
7	6	.20	.60 CP	1000	Groove	.230	.625	C-2R	.375	Indicator
68	6	.20	.60 CP	1000	Screw	.230	.625	C-2R	.500	Indicator(4)
30(2)	6	.04	.03 CP	1000	5/8" Leads	.230	.520	C-2V		Indicator
34(2)	6	.04	.03 CP	1000	1 3/4" Leads	.230	.520	C-2V		Indicator
84(2)	6	.20	.60 CP	1000	5/8" Leads	.230	.520	C-2R		Indicator
0	6.3	.040	.02 CP	50,000	Flange	.230	.625	C-2V	.375	Indicator
739(2)	6.3	.075	.25 CP	1000	5/8" Leads	.230	.520	C-2R		Indicator
75	6.3	.075	.25 CP	1000	Screw	.230	.625	C-2R	.500	Indicator(4)
50	6.3	.15	.45 CP	3000	Flange	.230	.625	C-2R	.375	Indicator(4)
9	6.3	.20	.50 CP	3000	Flange	.230	.625	C-2R	.375	Indicator
79	6.3	.20	.40 CP	50,000	Groove	.230	.625	C-2V	.375	Indicator
31	6.3	.20	.40 CP	50,000	Flange	.230	.625	C-2V	.375	Indicator
112(2)	6.3	.20	.50 CP	3000	5/8" Leads	.230	.520	C-2R		Indicator
181(2)	6.3	.20	.40 CP	50,000	5/8" Leads	.230	.520	C-2V		Indicator
44	10	.014	.002 CP	5000+	Flange	.230	.625	C-2F	.375	Indicator(4)
67	10	.04	.10 CP	Indef.	Flange	.230	.625	C-2V	.375	Indicator
74	10	.014	.006 CP	5000+	Flange	.230	.625	C-2F	.375	Indicator
869(2)	10	.014	.002 CP	5000+	5/8" Leads	.230	.520	C-2F		Indicator
917(2)	10	.014	.006 CP	5000+	5/8" Leads	.230	.520	C-2F		Indicator
107(2)	10	.04	.10 CP	Indef.	5/8" Leads	.230	.625	C-2V		Indicator
207	10	.04	.10 CP	20,000	Groove	.230	.625	C-2V	.375	Indicator
84	11	.025	.05 CP	2000	Flange	.230	.625	C-2F	.375	Indicator
916(2)	12	.019	.012 CP	Indef.	5/8" Leads	.230	.520	C-2V		Indicator
36	14	.08	.50 CP	750	Groove	.230	.625	C-2F	.375	Indicator
73	14	.08	.50 CP	750	Screw	.230	.718	C-2F	.500	Indicator
82	14	.08	.30 CP	50,000	Flange	.230	.625	C-2F	.375	Indicator
86	14	.08	.30 CP	50,000	Groove	.230	.625	C-2F	.375	Indicator
30	14	.08	.50 CP	750	Flange	.230	.625	C-2F	.375	Indicator(4)
1705(2)	14	.08	.50 CP	750	1" Leads	.230	.520	C-2F		Indicator
2182(2)	14	.08	.30 CP	50,000	5/8" Leads	.230	.520	C-2F		Indicator
46	18	.04	.25 CP	1000	Groove	.230	.625	C-2F	.375	Indicator
70	18	.04	.25 CP	1000	Flange	.230	.625	C-2F	.375	Indicator
57	22	.04	.30 CP	2000	Groove	.230	625	C-2F	.375	Indicator
27	28	.04	.34 CP	1000	Flange	.230	.625	C-2F	.375	Indicator(4)
327X	28	.046	.34 CP	2500	Flange	.230	.625	C-2F	.375	Indicator(4)
334	28	.04	.34 CP	1000	Groove	.230	.625	C-2F	.375	Indicator(4)
335	28	.04	.34 CP	1000	Screw	.230	.718	C-2F	.500	Indicator
340(3)	28	.04	.34 CP	1000	Flange	.230	.625	C-2F	.375	Indicator(4)
369	28	.04	.34 CP	1000	Screw	.230	.593	C-2F	.593	Indicator
1762(2)	28	.04	.33 CP	1000	5/8" Leads	.230	.520	C-2F		Indicator(4)
387	28	.04	.30 CP	25,000	Flange	.230	.625	C-2F	.375	Indicator
388	28	.04	.30 CP	25,000	Groove	.230	.625	C-2F	.375	Indicator
2187(2)	28	.04	.30 CP	25,000	5/8" Leads	.230	.520	C-2F		Indicator
1764(2)	28	.04	.33 CP	1000	1" Leads	.230	.520	C-2F		Indicator
1860(2)	28	.04	.34 CP	1000	1" Tinned Leads	.230	.520	C-2F		Indicator
1762X(2)	28	.046	.34 CP	2500	5/8" Leads	.230	.520	C-2F		Indicator

These lamps are normally supplied in clear glass. Colored bulbs will be made on special order. Unless otherwise specified, all lamps have metal bases.

SPECIFICATIONS: T-3/4 LAMPS

Lamp No.	Design Volts	Design Current	Nominal Light Output	Average Rated Life	Midget Base Style	Max. Bulb Diam.	MOL	Filament Type	LCL	Application
2	5	.021	.034	Indef.	1 3/16" Tinned leads	.102	.200	C-6		Digital
8666	5	.08	.15	3000	Leads	.102	.200	C-2R		Indicator

Reference Notes Indef.—Life over 5000 hours. (1) Lens end. (2) Wire leads. (3) High temperature solder. (4) Application in aircraft service. (5) Through 3/16" min. dia. window at 3/4" from lamp tip. (6) Through 1/4" min. dia. window at 3/4" from lamp tip.

Wire Lamp Types Not Shown—Type F. 2264—2129—2176—2183—2119—2201—2265 and 2002.

TUNG-SOL DIVISION/Wagner Electric Corporation

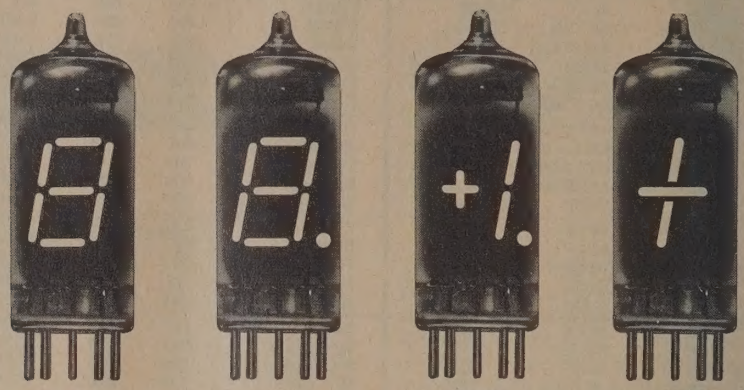
630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

TUNG-SOL® DIGITAL AND ALPHANUMERIC DISPLAYS

VACUUM TYPES

DIGIVAC S/G™ VACUUM FLUORESCENT DISPLA



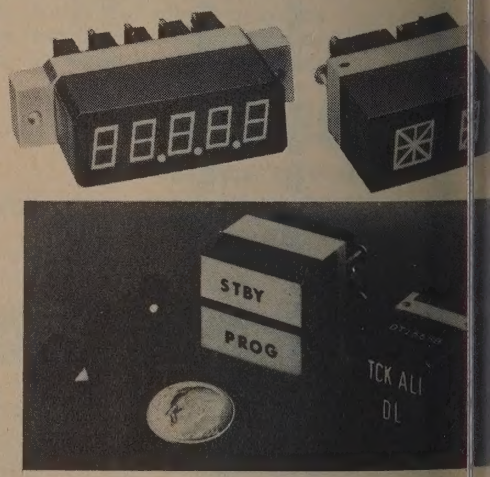
DT1704B Numerals 0 to 9 and 14 letters | DT1705D with decimal point | DT1707B plus/minus one, decimal | DT1719A plus/minus

This Tung-Sol development, which created a whole new set of digital display standards, is now made in a narrower configuration that reduces the space required for array applications. Low voltage, low power drain (25 V and 1.6 V) is ideal for low signal level requirements, especially battery-operated equipment. Digivac S/G displays meet MIL specs. They employ standard miniature tube bases and have inexpensive logic/driver requirements. Display is single plane it space-age-type segmented characters. Solderable-lea op tion provides for circuit board mounting. Common en provide unlimited color selection for identification, t heighten contrast. Illustrated types are standard. Other m bols on special order.

INCANDESCENT TYPES

7 Segments, 16 Segments, Stacked, Integrated, Status Indicat

Designed to provide optimum contrast under ambient light conditions. Light shades are not needed. Tung-Sol displays function in extreme environmental conditions. The 20 mA and 10 mA lamp banks are mechanically interchangeable.



7 Segments—Display 0 through 9.

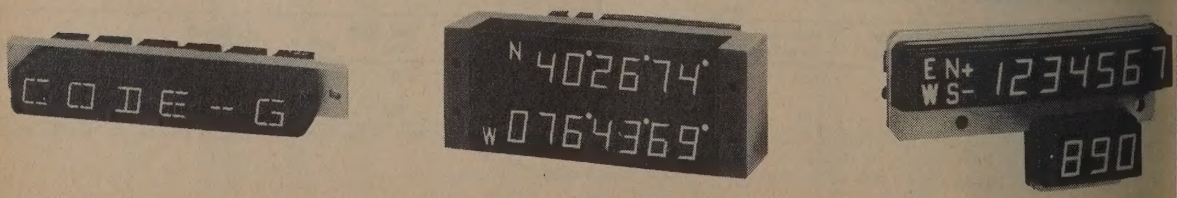
16 Segments—Full alphanumeric display.

Stacked—Digits as well as lamp blocks individually replaceable for each digit.

Integrated—Monolithic construction requires less width per character. Individual lamp blocks replaceable.

Status Indicators—Fixed messages, or symbols, to specification. Supplied readable when off, or completely blank.

TYPICAL CONFIGURATIONS



TUNG-SOL DIVISION / Wagner Electric Corporati

630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

Active Electronic Filters

These filters single out or eliminate frequency ranges of interest and help to focus on the significant frequencies. All instruments are lightweight, low power units.

FIG. A

CTIVE NOTCH FILTERS

hese ilters are available in a number of andard versions.

0 Hz OTCH FILTER—APN 60 reduces 60 Hz onter to less than 1% of input voltage but asses ll other frequencies from D.C. to 200 Hz. he rejection bandwidth can be narrowed o 1 %. Q's up to 100 can be obtained by an xtern adjustment. A power supply is available.

MODEL	FIG.	FUNCTION	PRICE
APN 60	A	60 Hz NOTCH	$155.
APN 50	A	50 Hz NOTCH	$155.
APN 120	A	120 Hz NOTCH	$155.
APN 400	A	400 Hz NOTCH	$155.
APS I		NOTCH POWER SUPPLY	$ 58.

Additional frequencies are available upon request.

FIG. B
2.5 lbs.

ORABLE VARIABLE FILTERS

hese ully transistorized variable filters let you set cut off frequencies continuously nd a available in a variety of versions as shown in the table below.

ll uits feature: Unity gain in passband, 24 DB/octave skirt, max.attenuation 80 DB, nput npedance 1 megohm, output impedance 50 ohm driving up to 20,000 ohm load. Batte or A.C. line operation. Up to 4 model APV series or two model AP 200 series an b supplied on a standard 19" rack, 5¼" high, as shown on Fig. E.

Mel **	Fig.	Low Pass	High Pass	Band Pass	Band Reject	Tuning Range	Price*
AP –41-4	C	✓				0.2Hz–2KHz	330.-
AP –42-4	C	✓				2Hz–20KHz	330.-
AP –43-5	C	✓				0.02Hz–2KHz	375.-
AP –44-5	C	✓				0.2Hz–20KHz	375.-
AP –1	C	✓				1 Decade †	210.-
AP I–41-4	C		✓			0.2Hz–2KHz	330.-
AP I–42-4	C		✓			2Hz–20KHz	330.-
AP I–43-5	C		✓			0.02Hz–2KHz	375.-
AP I–44-5	C		✓			0.2Hz–20KHz	375.-
AP I–1	C		✓			1 Decade †	210.-
AP .H–41-5	B	✓	✓			0.2Hz–20KHz	430.-
AP .H–44-5	B	✓	✓			2.0Hz–20KHz	430.-
AP 00-1	D			✓		1 Decade †	420.-
AP 40-5	D			✓		0.02Hz–2KHz	580.-
AP 245-4	D			✓		0.2Hz–2KHz	520.-
AP 250-5	D			✓		0.2Hz–20KHz	580.-
AP 55-4	D			✓		2.0Hz–20KHz	520.-
AP 30-4	D	✓	✓	✓		2Hz–20KHz	540.-
AP 35-5	D	✓	✓	✓		0.02Hz–2KHz	680.-
AP 40-4	D	✓	✓	✓		0.2Hz–2KHz	580.-
AP 45-5	D	✓	✓	✓		0.2Hz–20KHz	680.-
AP 50-4	D	✓	✓	✓	✓	0.2Hz–2KHz	650.-
AP 55-5	D	✓	✓	✓	✓	0.2Hz–20KHz	750.-
AP 60-5	D	✓	✓	✓	✓	0.1Hz–10KHz	800.-
AP 65-5	D	✓	✓	✓	✓	0.02Hz–2KHz	750.-
AP 70-4	D	✓	✓	✓	✓	2.0Hz–20KHz	590.-

** Price is for Battery Operated Units. Add $45.- for 110 volt or 220 volt A.C. supplies.*

*** Last Digit indicates Number of Decades covered.*

† Available Ranges 0.1-1.0, 0.2-2.0, 0.5-5.0 and multiples of 1, 10, 100, 1000. Other ranges upon request.

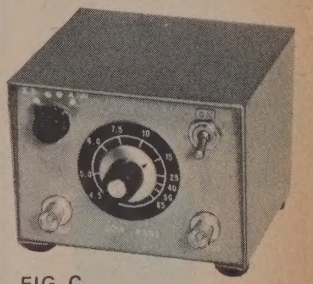


FIG. C
2.0 lbs.

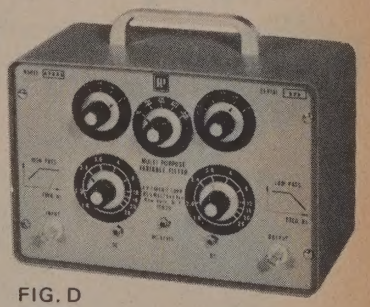


FIG. D
5.5 lbs.

VARIABLE TUNED FILTERS

olictate continuously variable narrow adjustable bandwidth. Up to 4 un can be mounted on standard 19" rack. 5¼" high.

MODEL	FIG.	RANGE	PRICE *
A 11–4	B	2.0–20KHz	$450.-
A 12–5	B	0.2–20KHz	$500.-

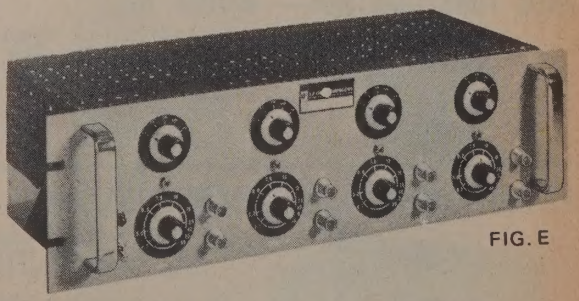


FIG. E

For Additional Information write to Dept. P.

A.P. CIRCUIT CORPORATION

865 WEST END AVENUE, NEW YORK, N. Y. 10025 • TEL: 212 - 222-0876

ALLEN AVIONICS, INC.
255 EAST SECOND STREET • MINEOLA, NEW YORK 11501 • 516-747-5450

FILTERS

CUSTOM-BUILT L-C FILTERS

200 CYCLES TO 50 MEGACYCLES FAST PROTOTYPES

TYPES: LOW PASS, HIGH PASS, BAND PASS, BAND STOP.

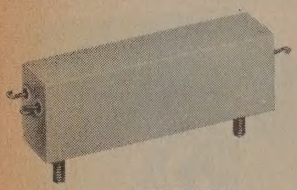
FREQUENCY RANGE: 200 Cycles to 50 Megacycles.

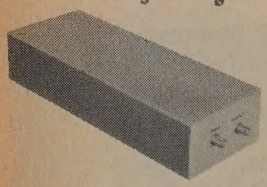
IMPEDANCE RANGE: 50 ohms to 100 K ohms.

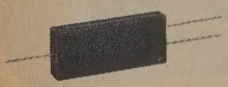
CONSTRUCTION: Epoxy encapsulated or hermetically sealed in steel cans.

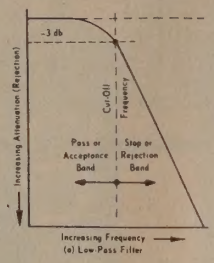
SIZE: From .625 x .625 x .450 depending on electrical specifications.

DELIVERY: Prototypes can often be delivered in 1 week.

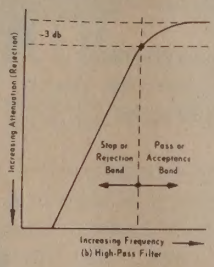




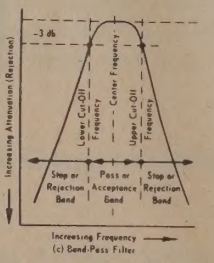




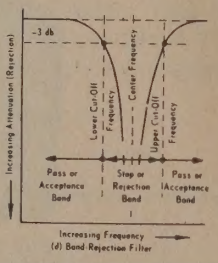
(a) Low-Pass Filter



(b) High-Pass Filter



(c) Band-Pass Filter



(d) Band-Rejection Filter

TYPICAL FILTERS

LOW PASS

Cut Off Frequency (3 db max.)	Attenuation (Minimum)	Maximum Passband Ripple	Impedance Ohms	Size Inches
375 kc	30 db @ 510 kc 50 db @ 645 kc	.5 db	600	1.5 x 2 x .8
3.3 mc	40 db @ 5.2 mc 50 db @ 5.95 mc	.25 db	100	1.2 x 1.5 x .
16.5 mc	40 db @ 26 mc	.25 db	100	.625 x .625 x .
27.5 mc	20 db @ 39.5 mc 30 db @ 46.5 mc	1 db	75	.625 x .625 x .

HIGH PASS

Cut Off Frequency (3 db max.)	Attenuation (Minimum)	Maximum Passband Ripple	Impedance Ohms	Size Inches
350 kc	30 db @ 285 kc 50 db @ 245 kc	1 db	500	1.5 x 2 x .
3.5 mc	20 db @ 2.65 mc 40 db @ 2.05 mc	.25 db	400	1.2 x 1.5 x .
10.5 mc	20 db @ 8.05 mc 40 db @ 6.25 mc	.25 db	100	1.2 x 1.5 x
17.5 mc	20 db @ 11.6 mc 40 db @ 7.75 mc	.25 db	75	.625 x .625 x

BAND PASS

Center Freq.	Bandwidth (3 db max.)	Attenuation (Minimum)	Maximum Passband Ripple	Impedance Ohms	Size Inche
80 kc	20 kc	20 db below 66 kc above 97 kc	1 db	500	1.5 x 2
1.2 mc	300 kc	30 db below 985 kc above 1.46 mc	3 db	500	1.2 x 1.5 .8
4.5 mc	1 mc	20 db below 3.8 mc above 5.4 mc	1 db	75	1.5 x .8
8 mc	1.6 mc	20 db below 6.8 mc above 9.4 mc	1 db	100	1.5 x .8

BAND STOP

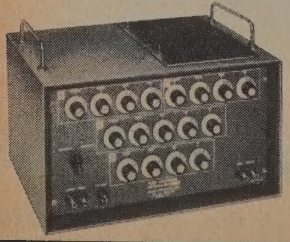
Notch Freq.	Bandwidth (3 db max.)	Attenuation (Minimum)	Maximum Passband Ripple	Impedance Ohms	Size Inche
680 kc	150 kc	35 db from 665 kc to 695 kc	.5 db	500	1.5 x 2
3.6 mc	800 kc	20 db from 3.45 mc to 3.75 mc	.25 db	75	1.2 x 1.5 .8
10.7 mc	2.5 mc	20 db from 10.3 mc to 11.1 mc	.25 db	150	1.2 x 1.5 .8

RISE TIME CONTROL — MODEL 50-1

The model 50-1 was designed for precise adjustment of the rise and fall time of pulse generators. This unit slows the pulse by a controlled amount by means of Gaussian filters. Any of 110 different filters can be selected by the use of two decade switches. Rise times are controlled in 10 nanosecond steps from 0 to 1.1 microseconds. The 50 ohm input allows for direct impedance match to the output of most pulse generators.

SPECIFICATIONS:
Impedance: 50 ohm.
Filter Type: Gaussian (passive).
Overshoot: 5%.
Maximum Rise (and Fall) Time: 1.1 microseconds
Steps: .01 microseconds.
Accuracy of Rise Time Reading: 10%.
Size: 7″ x 8″ x 8″.

FILTER SYNTHESIZER — MODEL 10K-1M



Design a filter in a minute.
Check it in your circuit in another minute.
Install the components on your breadboard.

The filter synthesizer is composed of all passive elements. As you use it, you always know the circuit that is in use, and the values that are being used.

Design the filter with the nomographs supplied. No knowledge of filter design theory is required. Choose any impedance between 100 and 1000 ohms. (Higher and lower impedances not on the nomographs can be calculated from formulas supplied.) Choose any frequency between 10 kc and 1 megacycle. (For other frequencies use the formulas.)

Choose one of the different types of elliptical high pass filters. Set the values from the nomographs in decade capacitors and inductors and check the fil your circuit. If it is satisfactory, install the capacito inductors in your breadboard and the filter is fi

Frequency Range: 10 kc to 1 megacycle (Higher and with a restriction on impedance).
Impedance Range: 100 to 1000 ohms (Higher and with a restriction on frequency).
Type: High pass or low pass elliptical function filters to 40 db attenuation.
Construction: All networks passive and controll decades.

LEN AVIONICS, INC.
ECOND STREET • MINEOLA, NEW YORK 11501 • 516-747-5450

LOWPASS • L-C FILTERS • HIGHPASS

ILTERS—SERIES "FL"

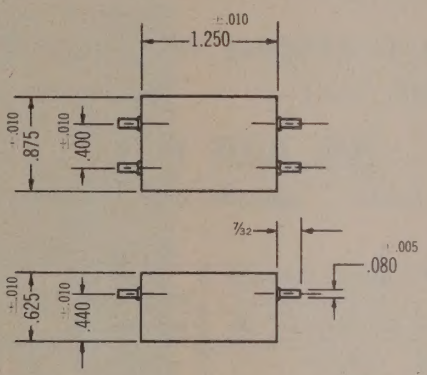
x ⅝ inches
0Ω
ipple in passband
nsertion loss (referenced at 350kc)
nuation at 3db cut-off Freq. x 1.15
nuation at 3db cut-off Freq. x 1.4

Minimum 20db Attenuation	Minimum 40db Attenuation
34.50 meg.	42.00 meg.
33.40	41.60
32.20	39.20
31.05	37.80
29.90	36.40
28.75	35.00
27.60	33.60
26.45	32.20
25.30	30.80
24.15	29.40
23.00	28.00
21.85	26.60
20.70	25.20
19.55	23.80
18.40	22.40
17.25	21.00
16.10	19.60
14.95	18.20
13.80	16.80
12.65	15.40
11.50	14.00
10.35	12.60
9.20	11.20
8.05	9.80
6.90	8.40
5.75	7.00

IMMEDIATE DELIVERY!

The "FL" & "FH" Filter Series are a group of 9 Pole Tchebycheff Low & Highpass Filters which are diminutive in size. Both Filter Groups contain components made to meet the requirements of the latest applicable Mil-Specs and conform to the best electrical and mechanical design practice.

ALL FILTERS LISTED CAN BE DELIVERED FROM STOCK



HIGHPASS FILTERS—SERIES "FH"

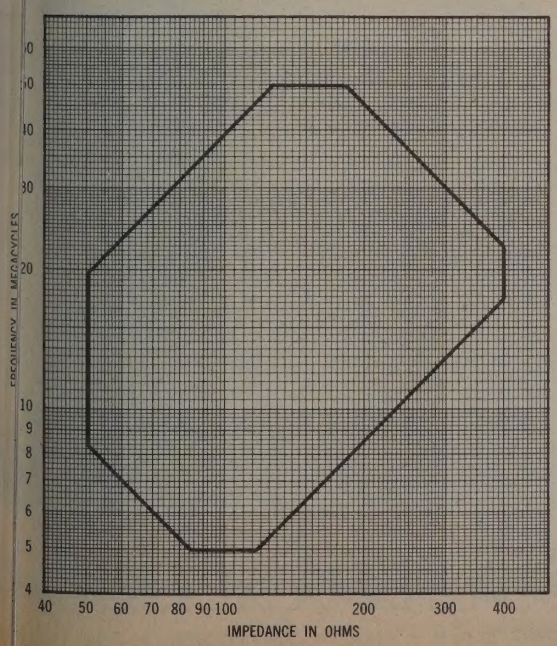
Size: 1¼ x ⅞ x ⅝ inches
Impedance: 100Ω
1db maximum ripple in passband
1db maximum insertion loss (referenced at 30 meg.)
20db Min. Attenuation at $\frac{\text{3db cut-off Frequency}}{1.15}$
40db Min. Attenuation at $\frac{\text{3db cut-off Frequency}}{1.40}$

Maximum 3db Attenuation	Minimum 20db Attenuation	Minimum 40db Attenuation
20.0 meg.	17.40 meg.	14.30 meg.
19.0	16.50	13.55
18.0	15.65	12.85
17.0	14.75	12.15
16.0	13.90	11.45
15.0	13.05	10.70
14.0	12.15	10.00
13.0	11.30	9.30
12.0	10.45	8.55
11.0	9.55	7.85
10.0	8.70	7.15
9.0	7.80	6.40
8.0	6.95	5.70
7.0	6.10	5.00
6.0	5.20	4.30
5.0	4.35	3.55
4.0	3.48	2.86
3.0	2.61	2.14

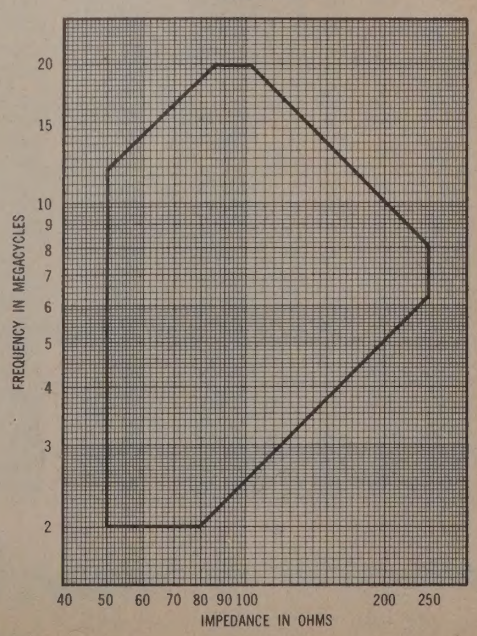
TO ORDER SPECIFY "FL" FOR LOWPASS OR "FH" FOR HIGHPASS AND THE CUT-OFF FREQUENCY

A VERY USEFUL APPLICATION is the series connection of a Lowpass & Highpass unit to produce an effective Bandpass Filter. Custom built Filters can be put into this package if they are within the Impedance-Frequency limits of the graphs.

LOWPASS



HIGHPASS



All-tronics, inc.

RADIO INTERFEREN

FILTER

RECTANGULAR TYP

EFFECTIVE TO 400 MEGAHERTZ

SELECT ELECTRICAL AND MECHANICAL FEAT

EXACTLY TO YOUR NEEDS.

STANDARDIZED FILTERS!

QUICK DELIVERY!

FOLLOW THESE EASY STEPS—

1. DETERMINE CURRENT AND VOLTAGE OF CIRCUIT WHERE THIS FILTER WILL BE US
2. OBTAIN BASIC PART NUMBER FROM TABLE BELOW BASED ON SUPPRESSION REQUIREMENTS.
3. SELECT MOUNTING STYLE AND TERMINAL TYPE FROM FOLLOWING PAGES.
4. BUILD UP PART NUMBER THIS WAY—

70D 6.3G W11

BASIC PART NUMBER — MOUNTING STYLE — TERMINAL TYPE

AMPERES	Case Size a	Case Size b	Case Size c	0-70 Volts DC Series Basic Part No.	db	400 VDC/150 VAC 0-70 Hertz Series Basic Part No.	db	150 VAC 50-1000 Hertz Series Basic Part No.	db	600 VDC/250 VAC 0-70 Hertz Series Basic Part No.	db	250 V 50-1000 Her Basic Part N
0.40	1 1/8	1	11/16	70D0.4E	48	400D0.4E	24	400A0.4E	24	*	*	*
	1 3/4	1 1/4	7/8	70D0.4F	60	400D0.4F	47	400A0.4F	47	600D0.4F	42	600A0.4F
	2	1 3/4	1 1/8	70D0.4G	90	400D0.4G	90	400A0.4G	90	600D0.4G	90	600A0.4G
0.63	1 1/8	1	11/16	70D0.6E	48	*	*			*	*	*
	1 3/4	1 1/4	7/8	70D0.6F	56	400D0.6F	40	400A0.6F	40	600D0.6F	35	600A0.6F
	2	1 3/4	1 1/8	70D0.6G	90	400D0.6G	85	400A0.6G	92	600D0.6G	83	600A0.6G
	2	2	1 1/4	*	*	*	*	*	*	600D0.6H	90	600A0.6H
1.0	1 1/8	1	11/16	70D1.0E	47	*	*	*	*	*	*	*
	1 3/4	1 1/4	7/8	70D1.0F	53	400D1.0F	30	400A1.0F	30	600D1.0F	30	600A1.0F
	2	1 3/4	1 1/8	70D1.0G	87	400D1.0G	74	400A1.0G	87	600D1.0G	75	600A1.0G
	2	2	1 1/4	*	*	*	*	*	*	600D1.0H	88	600A1.0H
2.5	1 1/8	1	11/16	70D2.5E	24	*	*	*	*	*	*	*
	1 3/4	1 1/4	7/8	70D2.5F	35	*	*	*	*	*	*	*
	2	1 3/4	1 1/8	70D2.5G	75	400D2.5G	57	400A2.5G	60	600D2.5G	59	600A2.5G
	2	2	1 1/4	70D2.5H	80	400D2.5H	63	400A2.5H	67	600D2.5H	69	600A2.5H
4.0	2	1 3/4	1 1/8	70D4.0G	72	400D4.0G	48	400A4.0G	52	600D4.0G	50	600A4.0G
	2	2	1 1/4	70D4.0H	82	400D4.0H	68	400A4.0H	68	600D4.0H	62	600A4.0H
	3 1/16	2 7/8	1 5/8	*	*	*	*	*	*	600D4.0J	77	600A4.0J
6.3	2	1 3/4	1 1/8	70D6.3G	72	400D6.3G	43	400A6.3G	45	600D6.3G	44	600A6.3G
	2	2	1 1/4	70D6.3H	80	400D6.3H	60	400A6.3H	60	600D6.3H	55	600A6.3H
	3 1/16	2 7/8	1 5/8	*	*	400D6.3J	88	400A6.3J	90	600D6.3J	75	600A6.3J
10	2	1 3/4	1 1/8	70D10G	60	400D10G	40	400A10G	43	600D10G	27	600A10G
	2	2	1 1/4	70D10H	72	400D10H	50	400A10H	54	600D10H	35	600A10H
	3 1/16	2 7/8	1 5/8	70D10J	90	400D10J	72	400A10J	75	600D10J	63	600A10J
16	2	2	1 1/4	70D16H	55	400D16H	25	400A16H	25	*	*	*
	3 1/16	2 7/8	1 5/8	70D16J	77	400D16J	65	400A16J	65	600D16J	49	600A16J
25	3 1/16	2 7/8	1 5/8	70D25J	70	400D25J	55	400A25J	55	600D25J	44	600A25J
	3 1/16	2 7/8	2 1/8	70D25K	84	400D25K	60	400A25K	65	600D25K	55	600A25K
40	3 1/16	2 7/8	1 5/8	70D40J	50	400D40J	20	400A40J	23	600D40J	35	600A40J
	3 1/16	2 7/8	2 1/8	70D40K	75	400D40K	50	400A40K	50	600D40K	45	600A40K
63	3 1/16	2 7/8	1 5/8	70D63J	50	400D63J	19	400A63J	22	600D63J	35	600A63J
	3 1/16	2 7/8	2 1/8	70D63K	55	400D63K	50	400A63K	50	600D63K	40	600A63K
	3 1/2	3 1/2	2 1/2	70D63L	80	400D63L	60	400A63L	60	600D63L	45	600A63L
100	3 1/16	2 7/8	2 1/8	70D100K	55	400D100K	50	400A100K	50	600D100K	40	600A100K
	3 1/2	3 1/2	2 1/2	70D100L	60	400D100L	55	400A100L	55	600D100L	45	600A100L

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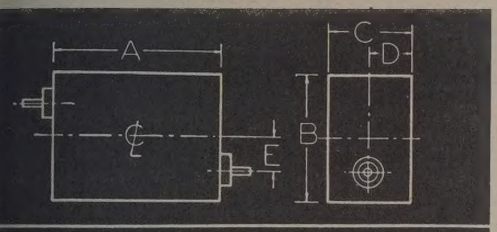
RADIO INTERFERENCE FILTERS

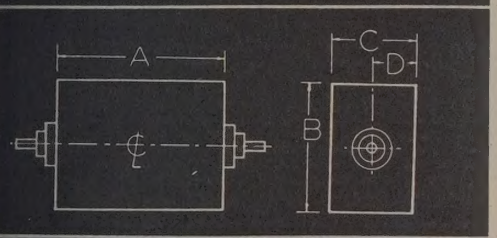
STANDARD MOUNTING STYLES & DIMENSIONS

IF BASIC PART NUMBER ENDS WITH THIS LETTER



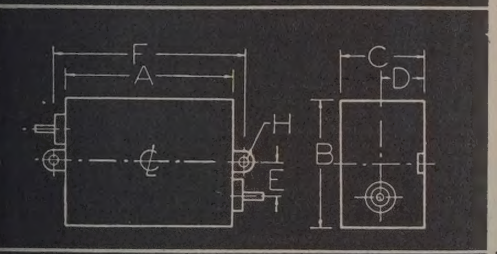
STYLE N DIMENSIONS ARE

	A	B	C	D	E
E	1⅛	1	11/16	11/32	¼
F	1¾	1¼	⅞	7/16	¼
G	2	1¾	1⅛	9/16	½
H	2	2	1¼	⅝	⅝



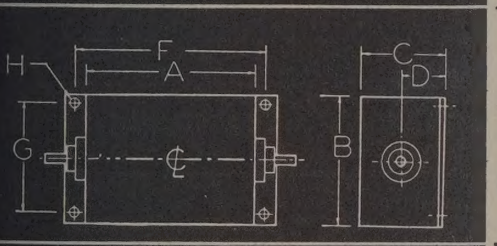
STYLE N DIMENSIONS ARE

	A	B	C	D
J	3 1/16	2⅞	1⅝	13/16
K	3 1/16	2⅞	2⅛	1 1/16
L	3½	3½	2½	1¼



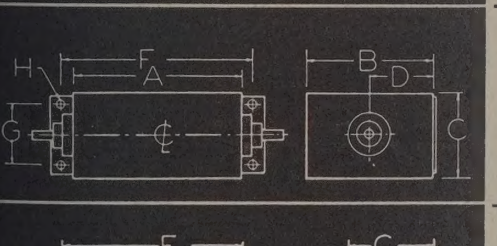
STYLE P DIMENSIONS ARE

	A	B	C	D	E	F	H
E	1⅛	1	11/16	11/32	¼	1 7/16	5/32
F	1¾	1¼	⅞	7/16	¼	2⅛	3/16
G	2	1¾	1⅛	9/16	½	2⅜	3/16
H	2	2	1¼	⅝	⅝	2⅜	3/16



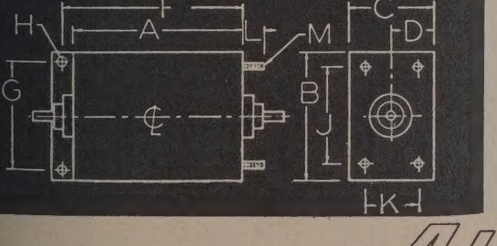
STYLE P DIMENSIONS ARE

	A	B	C	D	F	G	H
J	3 1/16	2⅞	1⅝	13/16	3⅝	2⅛	.195
K	3 1/16	2⅞	2⅛	1 1/16	3⅝	2⅛	.195
L	3½	3½	2½	1¼	4½	2	.195



STYLE R DIMENSIONS ARE

	A	B	C	D	F	G	H
J	3 1/16	2⅞	1⅝	1 7/16	3⅝	⅞	.195
K	3 1/16	2⅞	2⅛	1 7/16	3⅝	1⅜	.195
L	3½	3½	2½	1¾	4½	1¾	.195



STYLE S DIMENSIONS ARE

	A	B	C	D	F	G	H	J	K	L	M
J	3 1/16	2⅞	1⅝	13/16	3⅜	2⅛	.195	2	⅞	15/32	10-32
K	3 1/16	2⅞	2⅛	1 1/16	3⅜	2⅛	.195	2	1⅜	15/32	10-32
L	3½	3½	2½	1¼	4	2	.195	2¼	1¾	15/32	10-32

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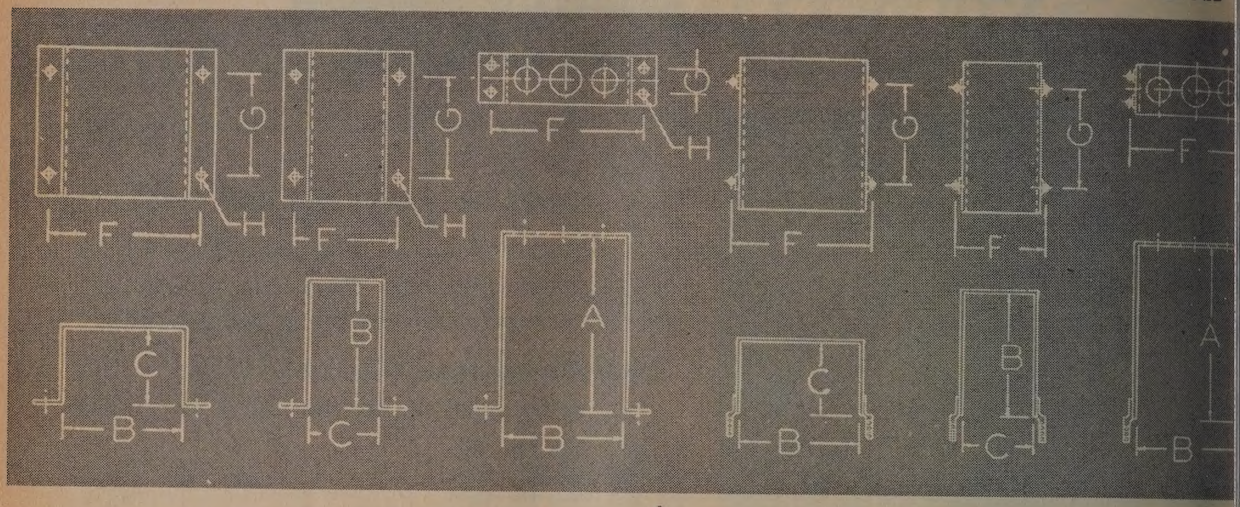
RADIO INTERFERENC

FILTERS

WRAP-AROUND MOUNTING BRACKETS

STYLE T STYLE U STYLE V STYLE W STYLE X STYLE



IF BASIC PART NUMBER ENDS WITH THIS LETTER

BRACKET DIMENSION ARE

	STYLE T B	C	F	G	H	STYLE U B	C	F	G	H
E	1	11/16	1 3/8	1/2	5/32	1	11/16	1 1/16	1/2	5/32
F	1 1/4	7/8	1 5/8	7/8	5/32	1 1/4	7/8	1 1/4	7/8	5/32
G	1 3/4	1 1/8	2 1/4	1	3/16	1 3/4	1 1/8	1 5/8	1	3/16
H	2	1 1/4	2 1/2	1	3/16	2	1 1/4	1 3/4	1	3/16
J	2 7/8	1 5/8	3 3/8	1 1/2	7/32	2 7/8	1 5/8	2 1/8	1 1/2	7/32
K	2 7/8	2 1/8	3 3/8	1 1/2	7/32	2 7/8	2 1/8	2 5/8	1 1/2	7/32
L	3 1/2	2 1/2	4	2	1/4	3 1/2	2 1/2	3	2	1/4

	STYLE V A	B	F	G	H	STYLE W B	C	F	G	H
E	1 1/8	1	1 3/8	*	5/32	1	11/16	1 7/32	1/2	6-32
F	1 3/4	1 1/4	1 5/8	7/16	5/32	1 1/4	7/8	1 7/16	7/8	6-32
G	2	1 3/4	2 1/4	1/2	3/16	1 3/4	1 1/8	1 15/16	1	6-32
H	2	2	2 1/2	5/8	3/16	2	1 1/4	2 3/16	1	6-32
J	3 1/16	2 7/8	3 3/8	7/8	3/16	2 7/8	1 5/8	3 5/32	1 1/2	10-32
K	3 1/16	2 7/8	3 3/8	1 1/4	3/16	2 7/8	2 1/8	3 5/32	1 1/2	10-32
L	3 1/2	3 1/2	4	1 1/2	1/4	3 1/2	2 1/2	3 25/32	2	10-32

*Only two mounting holes.

	STYLE X B	C	F	G	Stud Size	STYLE Y A	B	F	G	Stud Size
E	1	15/16	7/8	1/2	6-32	1 1/8	1	1 3/16	‡	6-32
F	1 1/4	7/8	1 1/32	7/8	6-32	1 3/4	1 1/4	1 3/8	7/16	6-32
G	1 3/4	1 1/8	1 1/4	1	6-32	2	1 3/4	1 29/32	1/2	6-32
H	2	1 1/4	1 7/16	1	6-32	2	2	2 5/32	5/8	6-32
J	2 7/8	1 5/8	1 29/32	1 1/2	10-32	3 1/16	2 7/8	3 5/32	7/8	10-32
K	2 7/8	2 1/8	2 13/32	1 1/2	10-32	3 1/16	2 7/8	3 5/32	1 1/4	10-32
L	3 1/2	2 1/2	2 25/32	2	10-32	3 1/2	3 1/2	3 25/32	1 1/2	10-32

‡Only two mounting studs.

ALL WRAP AROUND BRACKETS ARE PERMANENTLY ATTACHED AND CENTRALLY LOCATED ON FILTERS. WRITE FOR INFORMATION ON REMOVABLE BRACKETS IF NEEDED.

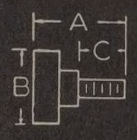
TERMINALS

IF BASIC PART NUMBER E WITH ONE OF THESE LET

USE TERMINAL T

FOR THIS CURR RANGE

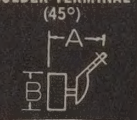
THREADED TERMINAL



Supplied with Nut and Lockwasher.

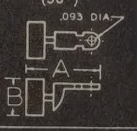
		AMP.	THREAD SIZE	A	B
EFGH	10	0-2.5	4-40	1/2	5/
FGH	11	0-10	6-32	5/8	7/
FGHJ	12	0-16	8-32	5/8	7/
JKL	13	4-25	10-32	3/4	1
JKL	14	10-63	1/4-20	1	1
JKL	15	25-100	3/8-16	1 1/4	1

SOLDER TERMINAL (45°)



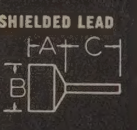
EFGHJ	16	0-16	—	13/32	5/

SOLDER TERMINAL (90°)



EFGHJ	17	0-16	—	1/2	5/

SHIELDED LEAD



			WIRE SIZE		
EFGH	18	0-2.5	20	5/16	5/
EFGH	19	0-2.5	20	5/16	5/
EFGH	20	0-2.5	20	5/16	5/
EFGH	21	0-2.5	20	5/16	5/
EFGH	22	0-2.5	20	5/16	5/
FGH	23	2.5-10	18	5/16	13/
FGH	24	2.5-10	18	5/16	13/
FGH	25	2.5-10	18	5/16	13/
FGH	26	2.5-10	18	5/16	13/

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See YELLOW SECTION for Local Offices, Phones

All-tronics, inc.

RADIO INTERFERENCE FILTERS

TUBULAR TYPES

EFFECTIVE TO 10 GHz

SELECT ELECTRICAL AND MECHANICAL FEATURES EXACTLY TO YOUR NEEDS.

FOLLOW THESE EASY STEPS —

1. DETERMINE CURRENT AND VOLTAGE OF CIRCUIT WHERE THIS FILTER WILL BE USED.
2. OBTAIN BASIC PART NUMBER FROM TABLE BELOW BASED ON SUPPRESSION REQUIREMENTS.
3. SELECT MOUNTING STYLE AND TERMINAL TYPE FROM THIS PAGE.
4. BUILD UP PART NUMBER THIS WAY —

STANDARDIZED FILTERS!

70R2.5M M 10

BASIC PART NUMBER — MOUNTING STYLE — TERMINAL TYPE

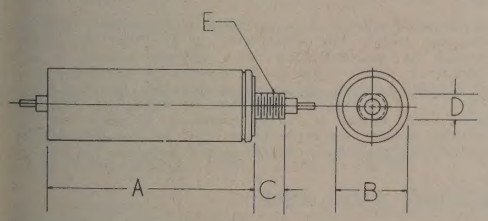
AMPERES	Case Size		0-70 Volts DC Series		400 VDC/150 VAC 0-500 Hertz Series		600 VDC/250 VAC 0-500 Hertz Series	
	Dia.	Length	Basic Part No.	db	Basic Part No.	db	Basic Part No.	db
1.0	1	2½	70R1.0M	75	400R1.0M	70	600R1.0M	55
	1	4	70R1.0P	90	400R1.0P	85	600R1.0P	70
2.5	1	2½	70R2.5M	75	400R2.5M	60	*	*
	1	4	70R2.5P	88	400R2.5P	70	600R2.5P	55
	1⅜	4⅛	*	*	400R2.5R	90	600R2.5R	75
4.0	1	4	70R4.0P	75	400R4.0P	65	600R4.0P	45
	1⅜	4⅛	70R4.0R	90	400R4.0R	85	600R4.0R	70
6.3	1	4	70R6.3P	70	*	*	*	*
	1⅜	4⅛	70R6.3R	85	400R6.3R	65	600R6.3R	45
	1½	4⅜	*	*	400R6.3S	90	600R6.3S	75
10	1	4	70R10P	60	*	*	*	*
	1⅜	4⅛	70R10R	80	400R10R	65	600R10R	45
	1½	4⅜	*	*	400R10S	80	600R10S	60
16	1⅜	4⅛	70R16R	70	400R16R	55	600R16R	35
	1½	4⅜	70R16S	85	400R16S	70	600R16S	50
20	1½	4⅜	70R20S	70	400R20S	60	600R20S	40

MOUNTING STYLES

IF BASIC PART NUMBER ENDS WITH THIS LETTER

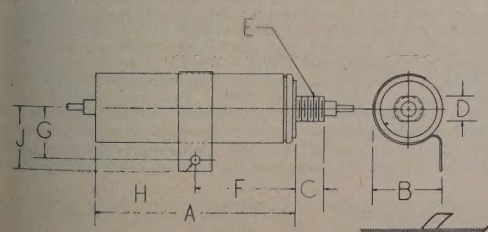
STYLE M DIMENSIONS ARE

	A	B	C	D	E
M	2½	1	7/16	3/8	7/16-20NF
P	4	1	7/16	3/8	7/16-20NF
R	4⅛	1⅜	5/8	17/32	5/8-24NF
S	4⅜	1½	5/8	17/32	5/8-24NF



STYLE L DIMENSIONS ARE

	A	B	C	D	E	F	G	H	J
M	2½	1	7/16	3/8	7/16-20NF	1¼	¾	0.156	15/16
P	4	1	7/16	3/8	7/16-20NF	2	¾	0.156	15/16
R	4⅛	1⅜	5/8	17/32	5/8-24NF	2 1/16	1	0.195	1¼
S	4⅜	1½	5/8	17/32	5/8-24NF	2 3/16	1⅛	0.195	1⅜



TERMINALS

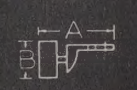
IF BASIC PART NUMBER ENDS WITH ONE OF THESE LETTERS

FOR 0-10 AMP. CURRENT RANGE USE TERMINAL TYPE

THREADED TERMINAL

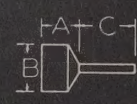
		THREAD SIZE	A	B	C
MP	10	4-40	1/2	5/16	3/16
RS	11	6-32	5/8	7/16	9/32
RS	12	8-32	5/8	7/16	5/16

SOLDER TERMINAL (90°)



MP	17	—	1/2	5/16	—
RS	31	—	1/2	15/32	—

SHIELDED LEAD



MP	27	—	5/16	5/16	6
MP	28	—	5/16	5/16	12
MP	29	—	5/16	5/16	24
MP	30	—	5/16	5/16	36
RS	23	—	5/16	13/32	6
RS	24	—	5/16	13/32	12
RS	25	—	5/16	13/32	24
RS	26	—	5/16	13/32	36

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RADIO INTERFERENC

FILTERS

STANDARDIZED FILTERS

Standardized filters are low pass filters. Rectangular and some tubular filters are pi types while the lower insertion loss tubulars are L types. They are supplied with two terminals to be connected in series with a power line. This places an inductor in series with the line and a capacitor is internally connected from terminal to the case. The filter case must be grounded for proper operation. The internal inductors and capacitors are especially designed for radio frequency filter operation to provide good filtering action over a wide frequency range.

CURRENT RATINGS

Filters are rated for continuous use at a maximum ambient temperature of 85°C (185°F). They are made to withstand occasional momentary surges for normal motor starting, etc. If you have an intermittent duty problem contact factory for a suitable rating.

VOLTAGE RATINGS

The filters are rated for continuous use at the specified voltage at temperatures up to 85°C (185°F). Filters with a dual voltage rating (e.g. 400 VDC/150 VAC) are rated for the higher voltage only in direct current applications. The rating drops to the lower value for alternating current applications. Any filter may be used at a lower voltage than its rating.

CASE SIZES

All rectangular filters are in deep drawn seamless cases. They are hermetically sealed with solder sealed covers. Dimensions shown for cases are basic sizes, but because of their deep drawn nature, dimensions will vary slightly depending upon the point of measurement.

Cases and brackets are steel, hot tin dipped finish.

TERMINALS

Standard terminal types are shown. If two different terminals are desired on one filter, insert both terminal types in the part number — for example 70D6.3GW1121. For mounting styles L, M, S, V, Y the first terminal type listed in the part number will be supplied on the end near the mounting studs or flange.

INSERTION LOSS

The column marked *db* in the table of basic part numbers is the insertion loss at a frequency of 150 kilohertz. Insertion loss is a measure of the effectiveness of a filter at a particular frequency. The insertion loss is the logarithmically adjusted ratio of signal input to signal output measured in a standard circuit of 50 ohms input and output impedance. The larger the number of *db*, the greater is the signal reducing ability of the filter.

The following table will help to illustrate the ratio between the interference voltage input to a filter and the output voltage as stated in *db*.

db	*Voltage Input : Voltage Output*
0	1:1
6	2:1
20	10:1
40	100:1
60	1,000:1
80	10,000:1
100	100,000:1

All the *db* figures in the chart represent the insertion loss for each filter at 150 kilohertz. A complete description of insertion loss requires a graph or a tabular chart showing a number of *db* readings at frequencies spread throughout the useful range of the filter. The filters in this catalog have a useful range from below 150 kilohertz to above 250 megahertz. They have been designed to maintain approximately the stated level of insertion loss in the frequency range of 150 kilohertz to about 10 megahertz and then to follow a gently sloping reduction maintaining effective levels of insertion loss to between 250 and 400 megahertz. This corresponds to the normal frequency distribution of radio interference generated by most electrical machinery, electromechanical devices and a great deal of electronic equipment.

The tubular filters are designed for more severe requirements and will maintain the stated level of insertion loss from 150 kilohertz to greater than 10 Gigahertz.

VOLTAGE DROP

All filters are designed to have a voltage drop of low value so that they will not interfere with proper operation at the equipment in which they are installed. The 70 volts D. C. series has a maximum drop of 0.3 volt when operated at full rated current. The 400 VDC/150 VAC and the 600 VDC/250 VAC have a drop of less than one percent of the AC rating when carrying full rated current.

WHY USE FILTERS?

Much electronic and electrical equipment produces interference disrupts radio communication and seriously affects the safety and operation of aircraft, marine, industrial and military communi As a result, the Federal Communications Commission is enforcing which require control of interference and interference sources. The military branches of the Department of Defense are specifying inte free operation in much of the equipment they now purchase. Manuf of sensitive and complex electronic equipment find that often their do not function properly as a result of interference produced in their own or nearby systems.

The answer to this is radio frequency interference control. This can be accomplished by one or more of the following methods.

1. Redesign to use non-interfering type components instead o which generate interference. Example—Replace commutat universal cooling blower motor with interference free i motor.
2. Provide effective shielding to prevent direct radiation. Ex Interference producing ignition system of a internal com engine shielded with complete metallic housings over spark cables and magneto.
3. Install radio interference filters in power lines to prevent i ence signals from being conducted to distant areas on those lines. Example—Filters installed in power lines to a direct aircraft motor to prevent motor interference from being co to the radio installation.

Interference reduction and control is generally a judicious balance these three methods. Usually no one method is completely effectiv the equipment design is finalized, further interference reduction bec combination of shielding and filtering. They complement each other most cases neither shielding nor filtering is completely effective al

HOW TO USE FILTERS EFFECTIVELY

First one must learn to recognize the serious sources of radio fr interference. Interference is generated wherever there is a spark or e discharge. Commutator type electric motors and generators, electric fluorescent lamps, switches and relays, thyratron and other gase charge tubes may all be sources of radio interference of which the facturer or user may not be aware. Electronic equipment which oscillating circuits may generate radio frequency signals to perform sary functions. These signals become radio interference when they le confines of the circuits and equipment where they are needed an fere with other radio frequency sensitive equipment. An example o the oscillator used in a superhetrodyne receiver. Among electronic tors those dealing with critically shaped waveforms such as saw t square wave and pulse generators can cause a considerable am interference as a result of harmonics of the fundamental frequencie

For best results, isolate the severe interference producing sour prevent them from contaminating interference free equipment or line by. This can be accomplished by shielding and enclosing case cons around the interference sources combined with filters in the power

Filters will reduce the radio interference currents flowing in lines to very low levels. This is essential to prevent unwanted signa traveling great distances and radiating into space from these distant lines. Filters are not a complete cure for all radio interference pr They need the help of adequate shielding and isolation to be con effective.

The physical placement of a filter is important. Improper po can sometimes nullify the effectiveness of a filter. The radio inte filter should be mounted close to a shielded source, or consider whole chassis a source, close to the power line entrance. Input and lines of the filter should be separated. For best results use mountin L, M, S, V or Y and project one terminal through a shielding part bulkhead in the chassis or wiring enclosure. Shielded lead style t can also help isolate input and output lines. Be sure that shielded lea the outer covering grounded to chassis at both ends.

LITERATURE AVAILABLE

A five page reprint entitled *"Radio Interference Filters — Their and Use"* showing how to obtain best results when using filters fo interference reduction in electronic equipment is available on reque

ALL-TRONICS PRODUCTS

In addition to Standardized Filters, *All-Tronics, Inc.* is a supp custom designed radio interference filters to the original equipment Filters with unusual ratings, peculiar shapes, extended environme quirements and rigid specifications are available to order. If yo any applications for which our Standardized Filters do not complete your requirements, forward your specifications to us and our engi department will gladly recommend a design to solve your problem

In keeping with our comprehensive coverage of the RF filter f also manufacture screen booth filters, line stabilization networ capsulated, impregnated and hermetically sealed networks, ass and coils to specifications.

All-Tronics, Inc. reserves the right to improve design specifica withdraw items from this catalog in the light of new technological ac

All-tronics, inc.

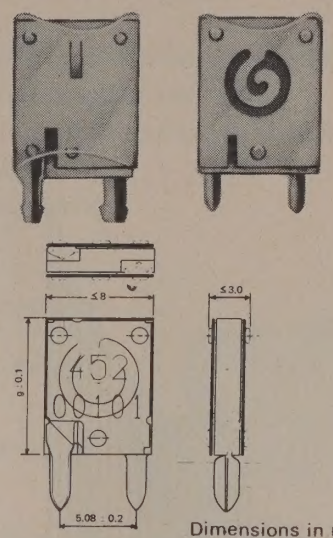
45 BOND ST., WESTBURY, L. I., N. Y. 11590 • 516-333-3090 • TWX: 510-2

Amperex PIEZOELECTRIC Ceramic Resonators

T: Amperex Piezoelectric Ceramic Resonator is designed to be u d as a selective element especially in the i.f. amplifiers of A and FM receivers (either individually, in matched pairs or q ds) for communication and entertainment applications.

A perex Piezoelectric Ceramic Resonators qualitatively allow t creation of a "lumped selectivity" in the circuit while elimi- n ing the problems associated with conventional bandpass f ers, due to the following advantages of our advanced design c cept:

- No installation alignment
- Negligible drift over long periods of time
- High selectivity and a Q about 10 times better than that of conventional coils
- Large size reduction compared to even the smallest bandpass filters available
- Shielding not required due to the absence of magnetic fields
- Negligible temperature drift over a wide temperature range

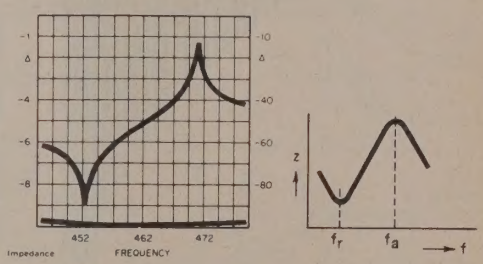


Dimensions in mm.

PECIFICATIONS: AM . . . 450-470 kHz

sonance frequency f_r	450-470kHz
erance or resonance frequency (incl. aging in 10 years)	±1 kHz
ality factor $2\pi f_r L_s/R_s$	> 800 (typical 1000)
ductance L_s	8.5 mH ±10%
pacitance $C = C_s + C_0$	190 pF ± 10% (measured at 1 kHz)
ximum permissible a.c. voltage at resonance frequency	100 $mV_{r\text{-}s}$
sponsive curve	see figure 1
rking temperature range	—25/+85°C
mperature coefficient of f_r	<60 ppm/°C
ximum d.c. voltage	30V
ysical dimensions (max)	10 x 8 x 3 mm
rminals	tags, lock fitting, gold-plated
ch	5.08 ± 0.2 mm (0.2")
ldering condition	250°C max. soldering time 5 sec.

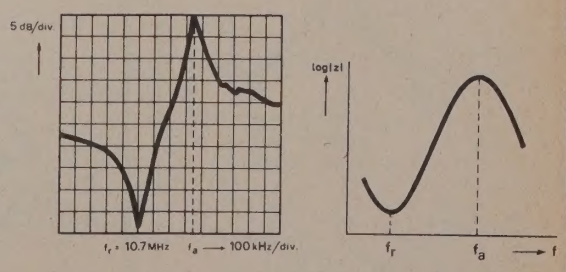
e distance between resonance- and anti-resonance-frequency is about 18 kHz e figure 1).



fa = 470kHz anti-reson. freq.
fr = 452kHz resonant freq.
horizontal scale 2.5kHz/div.
vertical scale 10dB/div.

PECIFICATIONS: FM . . . 10.7 MHz

sonant frequency	10.7 MHz
lerance on resonant frequency	±0.5% (±50 kHz)
ality factor	>350
ductance (L_1)	50 μH ± 20%
pacitance ($C = C_0 + C_1$) measured at 100 kHz	55pF ± 20%
aximum permissible a.c. voltage at resonant frequency	50$mV_{r.m.s.}$
aximum permissible d.c. voltage	30 V
mbient temperature range	—25 to +85°C
mperature coefficient of f_r	$<-60.10^{-6}$/deg. C
lderability	250°C max. soldering time 5 sec.



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Telephone: 516-234-7000 TWX 510-227-8552

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Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

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UNITED TECHNICAL PUBLICATIONS

ANALOG DEVICES INC
221 FIRST ST., CAMBRIDGE, MASS. 02142 TEL: 617/492-6000 TWX: 710/320-0326

ACTIVE FILTERS from ANALOG DEVICES, INC.

FEATURES

Wide Frequency Range	.001Hz to 20KHz in Low-Pass, High-Pass, Band-Pass and Band Reject models
Multiple Transfer Functions	Butterworth (standard), Bessel, Tchebyscheff and Paynter
Computer Designs	Standard and Special frequency — amplifier combinations available
Low Drift	$\Delta f_c < 0.05\%/^\circ C$; offset drift $< 50\mu v/^\circ C$
Low Cost, Fast Delivery	$22 (100 lot), 2 weeks ARO of Standards

DESCRIPTION

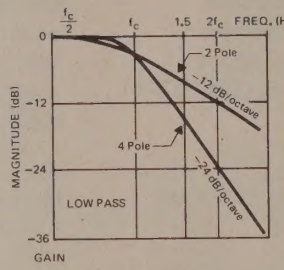
Analog Devices active filters feature precision RC networks activated by operational amplifiers to closely approximate ideal transfer functions. They overcome the passive RLC filter problems of insertion loss, input-output loading and ultra-low frequency operation. Analog Devices also offers a range of *CUSTOM DESIGNS* featuring combinations of the following characteristics:

Special Responses:	1 to 8 pole transfer functions
Adjustable Gain:	To 40 dB ±0.001 dB (0.01%); external trim
Adjustable Frequency:	10 to 1 range, external trim
Input Current and Offset:	To 0.5 pA/°C; to 0.5 μV/°C
Other Features Available	To meet the needs of a given application

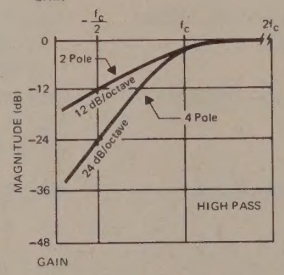
STANDARD UNITS

SPECIFICATIONS (typical at 25°C unless noted) TYPE ▶	BUTTERWORTH LOW PASS AND HIGH PASS		BAND PASS AND BAND REJECT
FREQUENCY CHARACTERISTICS	ultra-low range	standard range	BR 2 BP 2&4
NUMBER OF POLES	2 & 4	2 & 4	
CUTOFF (f_c) or CENTER (f_o) FREQUENCY	0.001 Hz to 1.0 Hz	1 Hz to 20 KHz	1 Hz to 20 KHz
Factory Preset)			
Tolerance of f_c or f_o	±2%	±2%	±1%
Stability, Avg. vs. temp (0 to 70°) max.	±0.05%/°C	±0.05%/°C	±0.05%/°C
PASS BAND GAIN, nom. (Non-Inv.)	0 dB	0 dB	0 dB
Tolerance @ DC (Low Pass, Band Reject)	±0.02 dB	±0.02 db	±0.02 db
@ 5 f_o (High Pass, Band Reject)[1]	±0.02 dB	±0.02 db	±0.02 db
@ f_o (Band Pass)			±0.2 db
SELECTIVITY (Q)			See Note 2
NOTCH REJECTION (Band Reject), min			−40 db
ACTIVE CHARACTERISTICS			
INPUT			
Input Impedance, min	1 MΩ	30 kΩ	1 MΩ
Input Voltage Range, min	±10V	same	same
Input Bias Current, max	10 pA	30 nA	30 nA
OUTPUT (Short Circuit Protected)			
Rated Output	±10V @ ±2mA	same	same
Full Power Response, min[3]	50 kHz	50 kHz	50 kHz
Output Resistance, max	10 Ω	10 Ω	10 Ω
Offset Voltage, initial (Adj. to Zero) typ	± 5 mV	± 5 mV	± 5 mV
max	±15 mV	±15 mV	±15 mV
vs. Temp., 0 to 70°C, max 2 pole	± 4 mV	± 3 mV	±10 mV
max 4 pole	± 7 mV	± 4 mV	±15 mV
POWER SUPPLY			
Voltage, rated specifications	±15 VDC	same	same
Voltage, derated specifications	±10 to ±18 VDC	same	same
Current, quiescent 2 pole	12 mA	4 mA	10 mA
4 pole	18 mA	8 mA	15 mA
CASE STYLE[4] 2 pole	R	L	L
4 pole	R	L (R < 10 Hz)	L (R < 10 Hz)
PRICE 2 pole/4 pole (1 - 9) > 10 Hz	ON	$ 34/54	$ 38/57
< 10 Hz	REQUEST	$ 38/59	$ 42/62

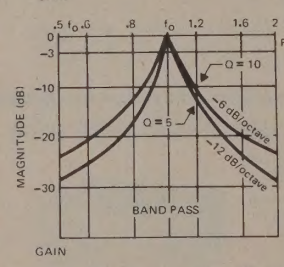
NOTES:
1. ±0.1 dB above f_c of 10 kHz for HIGH PASS AND BAND REJECT
2. Selectivity (Q) Options:
   BP 2 Pole Q = 10
   4 Pole Q = 5
   BR 2 Pole Q = 2
   Tolerance ±10%
3. Applicable to HIGH PASS AND BAND REJECT Models
4. Dimensions (L x W x H)
   L Case 2.02" x 1.14" x .62"
   R Case 2.8" x 1.3" x .95"



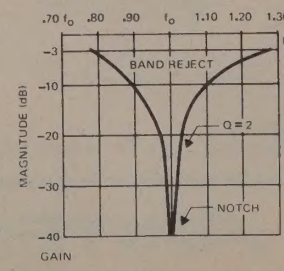
LOW PASS



HIGH PASS



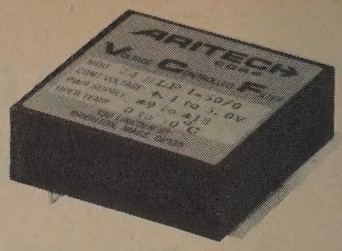
BAND PASS



BAND REJECT

Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

VCFs



VOLTAGE CONTROLLED FILTERS

SPECIFICATIONS

High Pass & Low Pass Butterworth Filters

Cutoff Frequency Range	Up to 50:1 f_{Cmin} to f_{Cmax} from 0.1 Hz to 20,000 Hz
Input Impedance	> 100 kΩ
Cutoff Control Voltage	0.1 to 5.0 volts, 10 kΩ (50:1 range Linear)
Voltage Output (max)	70% of ± Power Supply Voltage
Minimum Load Impedance	2 kΩ for full output voltage swing
Gain	0 dB LP, 20 dB HP
Asymptotic Rolloff Slopes	4-pole — 24 dB/octave
Accuracy of f_C	±5%
Linearity of f_C	2%
Stability of f_C	0.1%/°C (0.2%/°C, < 2 Hz
Control Response	See note below.
Max Input Signal	±25 volts without damage
Gain Set Accuracy	±0.5 dB
Output Noise (10kHz BW)	1 mV RMS (maximum)
Distortion	0.5% (maximum) for output signals ≦ ±.5 x Power Supply
Steady State DC Offset at Output	Typically, ±10 mV for low pass —35 mV for high pass
Instantaneous DC Offset at Output	±100 mV under worst case controller operation. See note below.
Power Supply Voltage	±9 to ±18 VDC
Size	¾" x 2.15" x 2.15" (0.1–5 Hz ¾" x 3.5" x 2.5")
Temperature Range	0°C to +50°C (standard)

PRICE in U.S.A. F.O.B. Factory, Brighton, Mass.

100 Lot — $100 to $200 per unit.
Single Unit — $275 (stock filter)

STOCK FILTERS

Immediate Delivery

MODEL	FREQUENC
High Pass	
24 BHP 0.1-5/20	0.1-5
24 BHP 1-50/20	1-50
24 BHP 10-500/20	10-500
24 BHP 100-5,000/20	100-5,000
24 BHP 1,000-20,000/20	1,000-20,0
Low Pass	
24 BLP 0.1-5/0	0.1-5
24 BLP 1-50/0	1-50
24 BLP 10-500/0	10-500
24 BLP 100-5,000/0	100-5,000
24 BLP 1,000-20,000/0	1,000-20,0

Other designs are available covering frequency ng from 0.01 Hz to 100 kHz in other configurations cl ing Band-Pass, Notch, Tchebyscheff, etc.

CUSTOM DESIGNED FILT R

Custom designs of active fixed filters with low no e a excellent phase and amplitude tracking specifi ti can be supplied.

Band pass and notch filter designs having indep d voltage controlled center frequencies and band d and featuring extremely steep skirts are also av ab Write for information.

ORDERING INFORMATIO

SPECIFY MODEL NUMBER per example below

24 — Slope (dB/octave)
BHP — Type (Butterworth High Pass)
10-500 — Cutoff Frequency Ra / In-band G

NOTE: For a complete discussion of VCF performanc le send for Application Note VCF-1.

Prices and specifications subject to change without notice

PHASE SHIFTER/METER

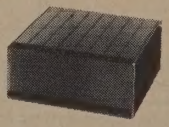
(Bulletin PSM-360A)

- 10 Hz to 1 MHz Phase Meter and Phase Shifter
- Shifts and Measures 0° to 360°
- Direct Reading in Degrees
- High Input Impedance and Input Sensitivity
- DC Output Proportional to the Phase Shift being Measured or Generated

Other instruments:
Decade Dividers and Tone Burst Generators

INSTRUMENT ENCLOSURE

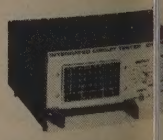
(Bulletin ENC-1000)



- Two Interlocking Aluminum Extrusions
- Good-Looking Simplicity
- Rugged Construction: ⅛" Wall
- Versatile Built-in Mounting for Multiple Circuit Boards
- Include Rubber Feet, Tilt Bail, Rear Panel, Complete Hardware
- Optional Power Supplies
- 3½" x 8⅜" x 7½" HWD
- Single or Dual Rack Adapters Available
- Clear Chromate Finish
- Blue Finish on Cover (Optional)
- Compatible Power Supply Available

DIGITAL IC TESTER

(Bulletin ICT-516)



- A Logical and Simply Connected Program
- Prewired Patch Plugs
- Rapid Manual Testing
- Self-Contained — Can Test All Digital gi Functional Failures
- Input and Output Indicator Lights for ua Analysis
- Universal Input Connector — Accepts to Pins

For more information, contact **ARITECH CORP** 130 Lincoln St., Brighton, Mass. 02135 Telephone: 617-254 9

ESC LC FILTERS.....

design and performance checked BEFORE prototyping

To meet your specific filter requirements, ESC first constructs a mathematical model based on actual physical components available. Through the use of high speed computer techniques with ESC's inhouse IBM 1130, the electrical characteristics and physical dimensions of your proposed filter are immediately tested and "proven out." Typical computer output data includes input impedance, attenuation, phase, phase delay, and group delay—all versus frequency. It is therefore possible for ESC to evaluate your filter needs, develop a suitable design and submit a quotation in a fraction of the time previously required.

The products illustrated to the right were designed and produced by ESC and are representative examples of our filter capabilities.

Please do not request that we send you a filter catalog or other descriptive literature—we don't have any. All of our designs are custom. We do have a Filter Questionnaire, however. If you fill it out, we will be able to discuss your specific requirements with you.

• LOW PASS • HIGH PASS • BAND PASS • SINGLE SIDEBAND • RFI • MINIATURE • PRINTED CIRCUIT • AUDIO • MOBILE COMMUNICATIONS • TELEMETRY • SPECIAL APPLICATIONS — to MIL-F-18327

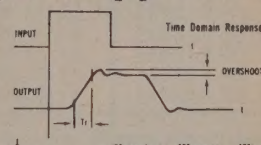
From design through production of custom-designed LC filters, contact ESC.

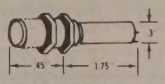
as sophisticated as your application

RFI TUBULAR FILTER WITH CONTROLLED OVERSHOOT AND RISE TIME

FREQUENCY RESPONSE

Flat within ± ½ db to 200 kHz
2 MHz > 3 db
30 MHz > 60 db
30 MHz—1 GHz > 40 db

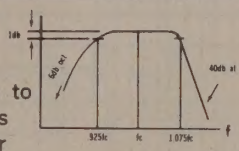


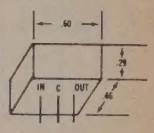


Z source = 75Ω
Z load = 50kΩ

ULTRAMINIATURE TELEMETERING FILTERS

Center frequencies from 400 Hz to 165 kHz. Available in bandwidths of ± 7½% and ± 15% of center frequency (fc)
Z source/load = 10kΩ



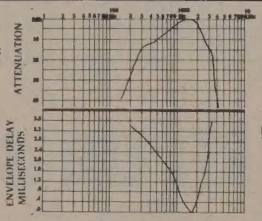


Epoxy case and straight leads for printed circuit mounting

TELEPHONE LINE SIMULATORS

Duplicate worst case conditions of amplitude and envelope delay of Bell Telephone data channel 3002 and C1, C2, and C4 conditioning.

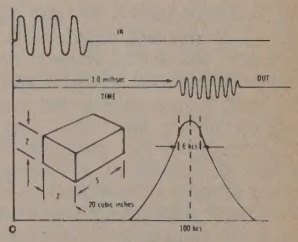
Insertion loss=16 db at 1000 Hz
Impedance Z source/load=600Ω balanced
Write for full specifications.



3002 channel
ESC Model
41F21

BANDPASS DELAY LINE FOR HIGH DELAY IN SMALL PACKAGE

Center frequency 100kHz
Passband ± 3kHz < 1 db
Group delay 1.0 millisec.
Z source/load = 1kΩ



WRITE TODAY FOR YOUR COPY OF ESC'S FILTER QUESTIONNAIRE.

ESC ELECTRONICS

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FILTRON

FSR-W POWERLINE® FILTERS

EMI/EMC FILTERS FOR 5-200 AMP CIRCUITS

ATTENUATION: 100db: 14KHz — 10GHz MIL-STD-220A — FULL RATED LOAD

FEATURES

Individual phase filters — with hermetically sealed compartments, filled with DURANOL® fluid impregnant for superior convective cooling. Operate at 85°C without external cooling. Max. temp. rise 25°C. Inner filters field-replaceable without special tools.

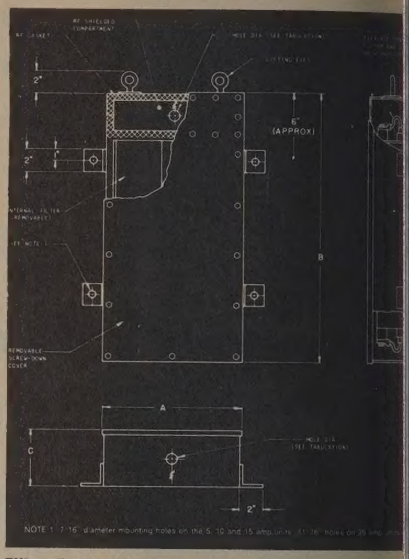
LIFE TERM® terminals. Indestructible alumina ceramic terminal assemblies brazed to hermetically sealed compartments. Flexible lead to electrical connection device.

Safety — the all-welded filter compartments are leakproof . . . soldered seams. The DURANOL® fluid is non-flammable; ending of fire or explosion. Complies with overload requirements of MIL- 140% of rated current for 15 minutes. Short term current sur bility in excess of 10 times rating without damage.

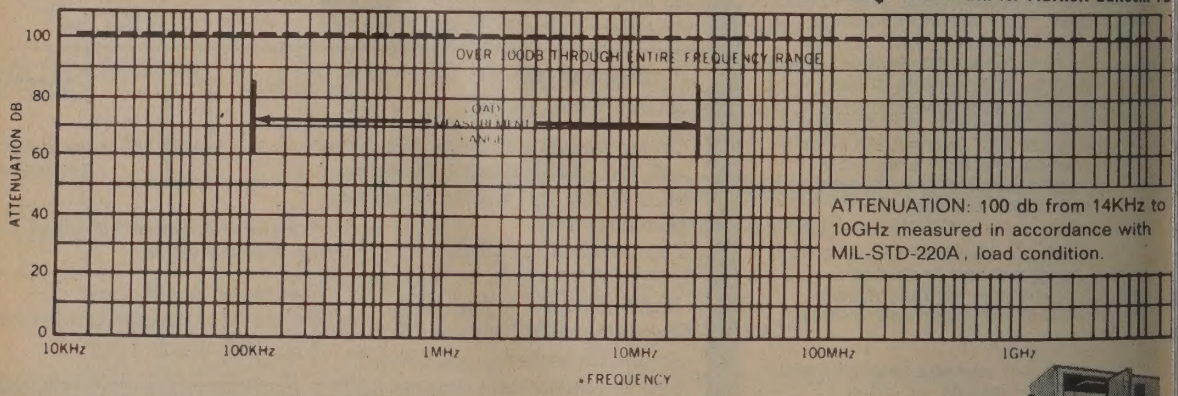
For more details and types ask for FILTRON Bulletin FSR-W.

Type	Current	A	B	C	Hole	Weight
FSR-W-5B2-E	2 x 5 AMPS	12¼	29	5	⅞	45 LBS.
FSR-W-5B3-E	3 x 5 AMPS	20	29	5	⅞	65 LBS.
FSR-W-5B4-E	4 x 5 AMPS	20	29	5	⅞	75 LBS.
FSR-W-10B2-E	2 x 10 AMPS	12¼	29	5	⅞	50 LBS.
FSR-W-10B3-E	3 x 10 AMPS	20	29	5	⅞	70 LBS.
FSR-W-10B4-E	4 x 10 AMPS	20	29	5	⅞	80 LBS.
FSR-W-15B2-E	2 x 15 AMPS	12¼	29	5	⅞	55 LBS.
FSR-W-15B3-E	3 x 15 AMPS	20	29	5	⅞	80 LBS.
FSR-W-15B4-E	4 x 15 AMPS	20	29	5	⅞	95 LBS.
FSR-W-25B2-E	2 x 25 AMPS	12¼	37	5	1⅜	105 LBS.
FSR-W-25B3-E	3 x 25 AMPS	20	37	5	1⅜	145 LBS.
FSR-W-25B4-E	4 x 25 AMPS	20	37	5	1⅜	175 LBS.
FSR-W-50B2-E	2 x 50 AMPS	12¼	37	5	1¾	105 LBS.
FSR-W-50B3-E	3 x 50 AMPS	20	37	5	1¾	145 LBS.
FSR-W-50B4-E	4 x 50 AMPS	20	37	5	1¾	175 LBS.
FSR-W-100B2-E	2 x 100 AMPS	16½	37	11	2	170 LBS.
FSR-W-100B3-E	3 x 100 AMPS	25	37	11	2	240 LBS.
FSR-W-100B4-E	4 x 100 AMPS	25	37	11	2	290 LBS.
FSR-W-150B2-E	2 x 150 AMPS	17½	40	17	2½	310 LBS.
FSR-W-150B3-E	3 x 150 AMPS	25	40	17	2½	445 LBS.
FSR-W-150B4-E	4 x 150 AMPS	25	40	17	2½	545 LBS.
FSR-W-200B2-E	2 x 200 AMPS	17½	40	17	3	310 LBS.
FSR-W-200B3-E	3 x 200 AMPS	25	40	17	3	445 LBS.
FSR-W-200B4-E	4 x 200 AMPS	25	40	17	3	545 LBS.

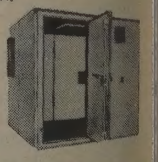
Available with grounded neutral conductor terminals in case. FSR-W-5B2-N-E, etc.
Voltage rating: 0-277VAC line-to-neutral or 0-480VAC line-to-line, 600VDC max.



Filter discharge units — ask for FILTRON Bulletin FD



RFI/EMI SHIELDED ENCLOSURES

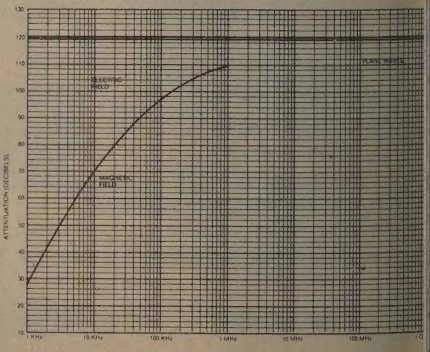


The FIL-SHIELD FSE-124 RFI/EMI shielding system is designed to meet or exceed the vast majority of shielding requirements. This system is available in both standard modular enclosures and custom-designed modular enclosures to meet exacting specifications in government, industry, research and development, university or hospital use.

The basic design incorporates new production techniques which require no gasketing materials of any kind. Weld nuts on the corner and intermediate framing members eliminate screws that penetrate the framing members; thus there can be no RFI/EMI leakage as a result of a loose screw. In addition, this exclusive FIL-SHIELD weld-nut feature provides a structure that is tamper-proof from the outside . . . an important consideration in Secure Communications.

The basic purpose of a shielded enclosure room — to attenuate radio-frequency and electromagnetic interference — is defeated if the doors, attenuducts, waveguide penetrations, etc. do not provide attenuation comparable to that of the walls. In addition, the door closure mechanism must be troublefree. Our FIL-SHIELD FSE-124 system fulfills all of these requirements — a fact proven, not only in our own test programs, but in installations all around the world over the past 20 years.

For complete details, ask for Bulletin FS-124.



FS-124 RFI/EMI ATTENTUATION

FILTRON COMPANY, INC. 131-15 FOWLER AVENUE, FLUSHING, N.Y. 11355 • (212) 445-7000 • TWX (710)

TUBULAR FILTERS

EMI/EMC FILTERS FOR .1 - 10.0 AMP CIRCUITS

ATTENUATION: 80db: 150KHz — 1GHz MIL-STD-220A — FULL RATED LOAD

F-201 tubular filters are designed to attenuate conducted or ed interference in powerline and communications equipment, digital ts including computers, solid-state switchgear and other sensitive onic equipment, commercial, industrial and military.

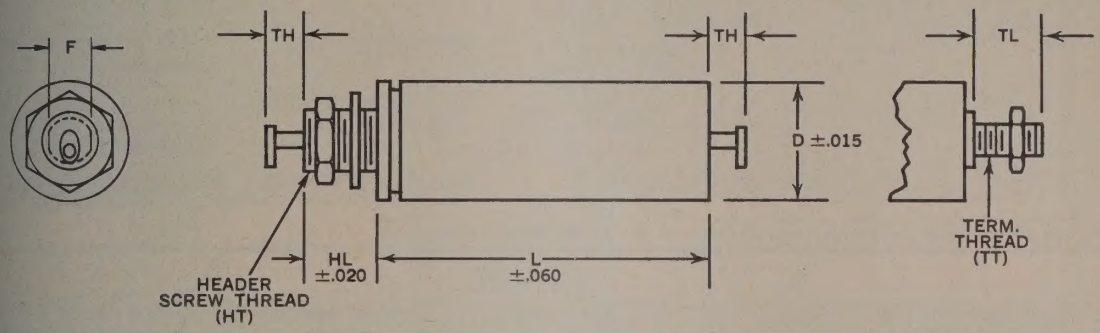
filter are small, compact and lightweight. Their tubular configuration, evolves from the shape of the rolled capacitor section and the lat inductor, makes them ideal for networks requiring high component ging density. Other attenuation values available; "L," "T" and ex- d network types also available. Can be furnished with threaded screw nals, solder lug terminals, also shielded leads.

FILTRON bulletin F-201.

Specification: MIL-F-15733-( ) as applicable.

Certificate of compliance furnished without extra charge.

Qualification test data (similarity basis) available without charge.



er lu erminals available in flat or right angle style. All types available with screw thread terminals. Specify thread size (TT) and thread length (TL).

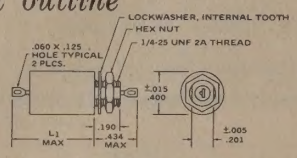
rt Number	Voltage	Current in Amps	D Diameter	L Length	HL Header Length	TH Terminal Height	HT Header Thread
E-201-310	100 VDC	.1	.750	2.250	.281	.187	5/16-24
E-201-311	100 VDC	.5	1.000	2.250	.437	.250	7/16-20
E-201-312	100 VDC	1.0	1.000	2.500	.437	.250	7/16-20
E-201-313	100 VDC	3.0	1.250	4.062	.437	.250	7/16-20
E-201-314	100 VDC	5.0	1.500	3.625	.375	.500	3/4-20
E-201-315	100 VDC	10.0	2.000	4.000	.500	.500	1-14
E-201-316	130 VAC/400 VDC	.1	.875	2.875	.437	.250	7/16-20
E-201-317	130-VAC/400 VDC	.5	1.000	3.000	.437	.250	7/16-20
E-201-318	130 VAC/400 VDC	1.0	1.250	3.312	.437	.250	7/16-20
E-201-319	130 VAC/400 VDC	3.0	1.500	3.750	.375	.500	3/4-20
E-201-320	130 VAC/400 VDC	5.0	1.500	4.187	.375	.500	3/4-20
E-201-321	130 VAC/400 VDC	10.0	2.000	5.125	.500	.500	1-14
E-201-323	250 VAC/600 VDC	.1	1.125	3.250	.437	.250	7/16-20
E-201-324	250 VAC/600 VDC	.5	1.125	3.500	.437	.250	7/16-20
E-201-325	250 VAC/600 VDC	1.0	1.250	4.250	.437	.250	7/16-20
E-201-326	250 VAC/600 VDC	3.0	1.750	4.375	.375	.500	3/4-20
E-201-328	250 VAC/600 VDC	5.0	1.750	5.375	.375	.500	3/4-20
E-201-330	250 VAC/600 VDC	10.0	2.000	6.250	.500	.500	1-14

GENISCO

EMI/RFI MINI-FILTERS

A COMPLETE LINE OF SUBMINIATURE CONTROL FILTERS

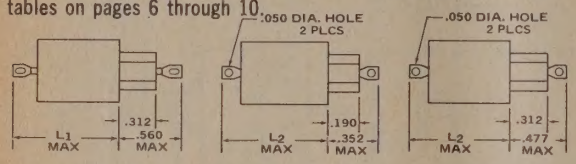
standard outline



1. Tolerance: ±0.010 unless otherwise specified.
2. Case material and finish: steel, gold plated (optional).
3. Case marked with Genisco G and part number.
4. Typical weight: 5 to 12 grams.
5. Recommended torque during installation: 40 in. oz.
6. Each filter is supplied complete with lock washer and nut/MIL-STD-130.

optional thread & terminals

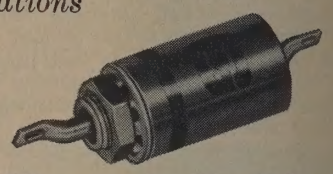
The following optional thread lengths and terminals may be specified by adding a -1, -2 or -3 to the part numbers in the tables on pages 6 through 10.



−1 −2 −3

Note: All other dimensions and tolerances remain as shown on the standard outline configuration.

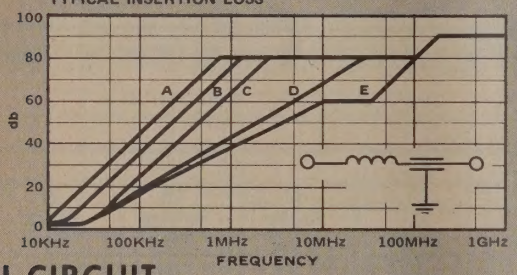
specifications



CURRENT RATING:	from 0.1 to 10 Amperes, see ta for specific values
VOLTAGE RATING:	50, 100 and 200 VDC, 28 and 115 0 - 400 Hz, see tables for rati
INSERTION LOSS:	from 10 KHz to 1 GHz per MIL 220A, at 25°C
TEMPERATURE RATING:	−55 to +125°C, at rated vo and current
DIELECTRIC WITHSTANDING VOLTAGE:	twice rated line voltage at 25°C, surge current limited to 50 MA
INSULATION RESISTANCE:	500 megohms minimum at rated age and 25°C after two mi charge.

50 VDC

TYPICAL INSERTION LOSS



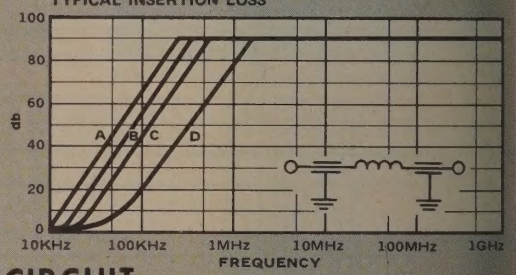
L CIRCUIT

MOST INEXPENSIVE TYPE WITH GOOD REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50A1A	0.10	2.50	A	0.80	.75
GF50A1B	0.50	.90	B	0.80	.75
GF50A1C	1.0	.20	C	0.80	.75
GF50A1D	5.0	.022	D	0.89	.84
GF50A1E	10	.005	E	0.52	.47

TYPICAL INSERTION LOSS



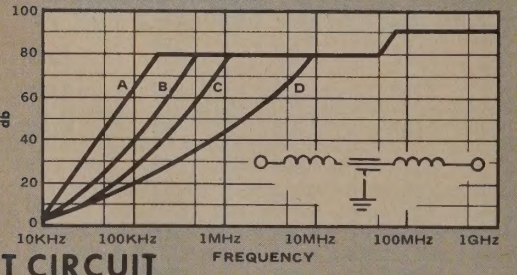
π CIRCUIT

CAPACITOR INPUT TYPE WITH EXCELLENT REJECTION CHARACTE

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50A2A	0.10	2.50	A	.89	.84
GF50A2B	0.50	.90	B	.89	.84
GF50A2C	1	.20	C	.89	.84
GF50A2D	5	.022	D	.99	.94

TYPICAL INSERTION LOSS



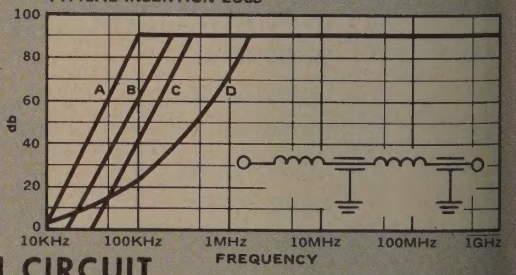
T CIRCUIT

INDUCTIVE INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50A3A	0.10	5.0	A	.99	.94
GF50A3B	0.50	1.20	B	.99	.94
GF50A3C	1	.30	C	.99	.94
GF50A3D	5	.036	D	.99	.94

TYPICAL INSERTION LOSS



2L CIRCUIT

INDUCTIVE INPUT TYPE WITH 80 DB/DECADE CUTOFF AND EXCEL REJECTION CHARACTERISTICS

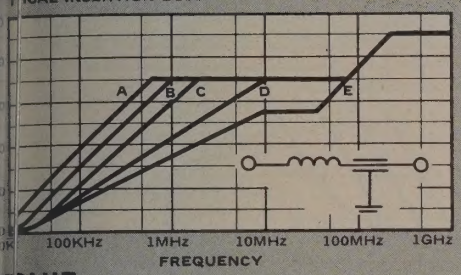
RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50A4A	0.10	5.0	A	1.09	1.04
GF50A4B	0.50	1.20	B	1.09	1.04
GF50A4C	1	.30	C	1.09	1.04
GF50A4D	5	.036	D	1.09	1.04

GENISCO

100 VDC

TYPICAL INSERTION LOSS



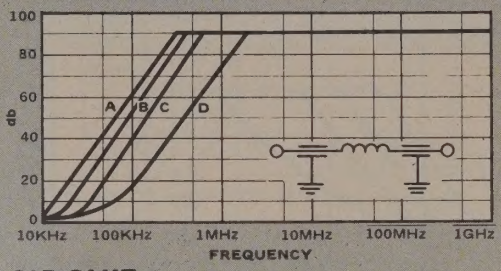
CIRCUIT

INEXPENSIVE TYPE WITH GOOD REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
50B1	0.10	2.50	A	.80	.75
50B1	0.50	.90	B	.80	.75
50B1	1	.20	C	.80	.75
50B1	5	.022	D	.89	.84
50B1	10	.005	E	.52	.47

TYPICAL INSERTION LOSS



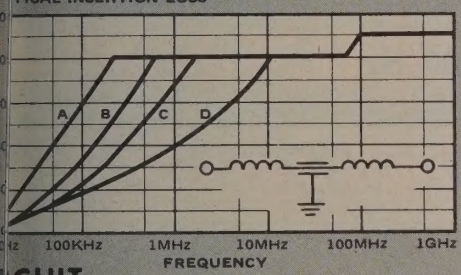
π CIRCUIT

CAPACITOR INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50B2A	0.10	2.50	A	.89	.84
GF50B2B	0.50	.90	B	.89	.84
GF50B2C	1	.20	C	.89	.84
GF50B2D	5	.022	D	.99	.94

TYPICAL INSERTION LOSS



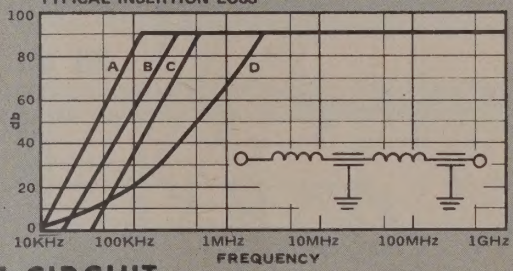
CIRCUIT

INDUCTIVE INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
50B	0.10	5.0	A	.99	.94
50B	0.50	1.20	B	.99	.94
50B	1	.30	C	.99	.94
50B	5	.036	D	.99	.94

TYPICAL INSERTION LOSS



2L CIRCUIT

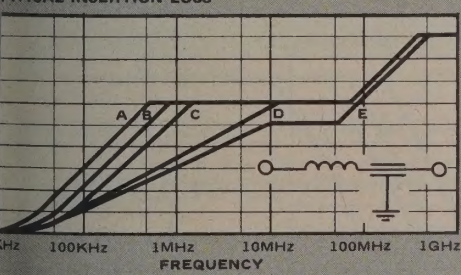
INDUCTIVE INPUT TYPE WITH 80 DB/DECADE CUTOFF AND EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50B4A	0.10	5.0	A	1.09	1.04
GF50B4B	0.50	1.20	B	1.09	1.04
GF50B4C	1	.30	C	1.09	1.04
GF50B4D	5	.036	D	1.09	1.04

200 VDC

TYPICAL INSERTION LOSS



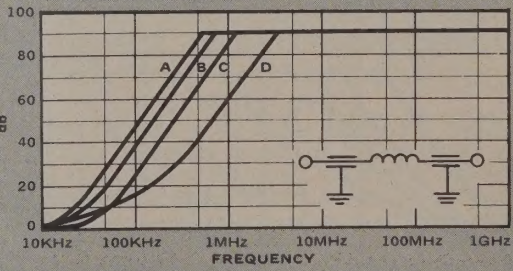
CIRCUIT

INEXPENSIVE TYPE WITH GOOD REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF C1A	0.10	2.50	A	.80	.75
GF C1B	0.50	.90	B	.80	.75
GF C1C	1	.20	C	.80	.75
GF C1D	5	.022	D	.89	.84
GF C1E	10	.005	E	.52	.47

TYPICAL INSERTION LOSS



π CIRCUIT

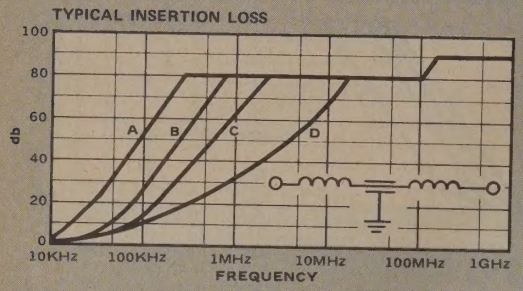
CAPACITOR INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50C2A	0.10	2.50	A	.89	.84
GF50C2B	0.50	.90	B	.89	.84
GF50C2C	1	.20	C	.89	.84
GF50C2D	5	.022	D	.99	.94

GENISCO

200 VDC Contd.

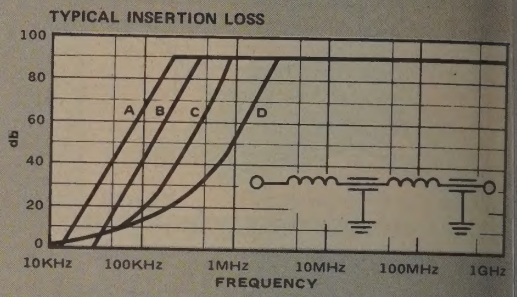


T CIRCUIT

INDUCTIVE INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50C3A	0.10	5.0	A	.99	.94
GF50C3B	0.50	1.20	B	.99	.94
GF50C3C	1	.30	C	.99	.94
GF50C3D	5	.036	D	.99	.94



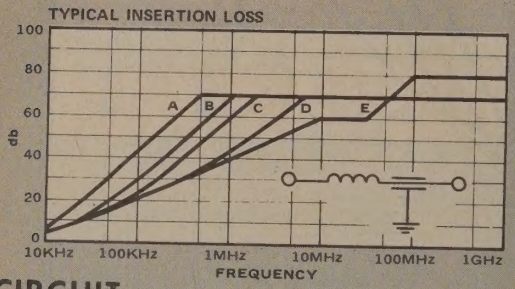
2L CIRCUIT

INDUCTIVE INPUT TYPE WITH 80 DB/DECADE CUTOFF AND EXCE NT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF50C4A	0.10	5.0	A	1.09	1.04
GF50C4B	0.50	1.20	B	1.09	1.04
GF50C4C	1	.30	C	1.09	1.04
GF50C4D	5	.036	D	1.09	1.04

28 VAC up to 400 Hz

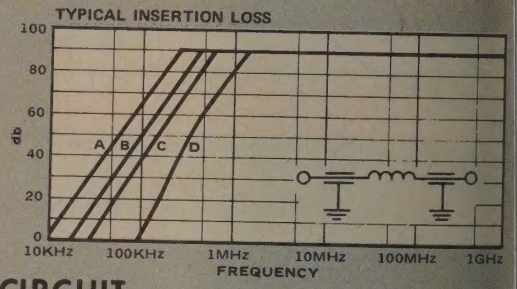


L CIRCUIT

MOST INEXPENSIVE TYPE WITH GOOD REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51F1A	0.10	1.60	A	.80	.75
GF51F1B	0.50	.33	B	.80	.75
GF51F1C	1	.18	C	.80	.75
GF51F1D	5	.017	D	.89	.84
GF51F1E	10	.005	E	.52	.47

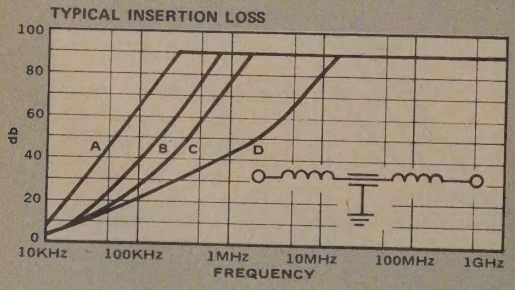


π CIRCUIT

CAPACITOR INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51F2A	0.10	1.60	A	.89	.84
GF51F2B	0.50	.33	B	.89	.84
GF51F2C	1	.18	C	.89	.84
GF51F2D	5	.017	D	.99	.94

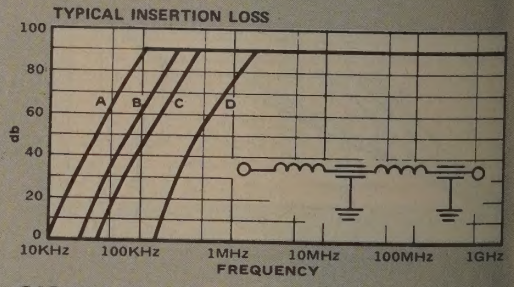


T CIRCUIT

INDUCTIVE INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51F3A	0.10	3.20	A	.99	.94
GF51F3B	0.50	.66	B	.99	.94
GF51F3C	1	.36	C	.99	.94
GF51F3D	5	.022	D	.99	.94



2L CIRCUIT

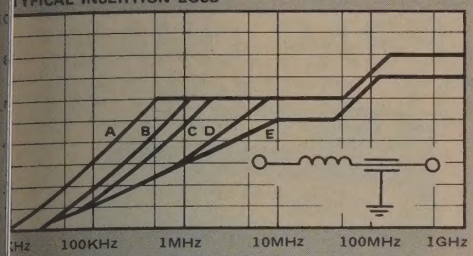
INDUCTIVE INPUT TYPE WITH 80 DB/DECADE CUTOFF AND EXCELLE REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51F4A	0.10	3.20	A	1.09	1.04
GF51F4B	0.50	.66	B	1.09	1.04
GF51F4C	1	.36	C	1.09	1.04
GF51F4D	5	.022	D	1.09	1.04

125 VAC up to 400 Hz

TYPICAL INSERTION LOSS



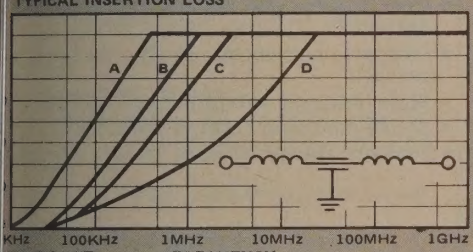
L IRCUIT

MO INEXPENSIVE TYPE WITH GOOD REJECTION CHARACTERISTICS

RA GS

RT	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
G G1A	0.10	1.60	A	.80	.75
G G1B	0.50	.33	B	.80	.75
G G1C	1	.18	C	.80	.75
G G1D	5	.017	D	.89	.84
G G1E	10	.005	E	.52	.47

TYPICAL INSERTION LOSS



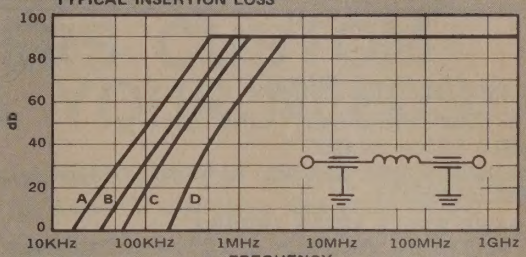
T IRCUIT

IND TIVE INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RA GS

PART	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF 3A	0.10	3.20	A	.99	.94
GF 3B	0.50	.66	B	.99	.94
GF 3C	1	.36	C	.99	.94
GF 30	5	.022	D	.99	.94

TYPICAL INSERTION LOSS



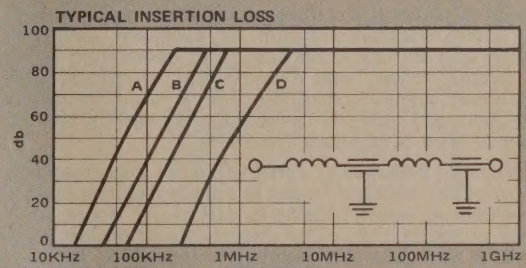
π CIRCUIT

CAPACITOR INPUT TYPE WITH EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51G2A	0.10	1.60	A	.89	.84
GF51G2B	0.50	.33	B	.89	.84
GF51G2C	1	.18	C	.89	.84
GF51G2D	5	.017	D	.99	.94

TYPICAL INSERTION LOSS



2LCIRCUIT

INDUCTIVE INPUT TYPE WITH 80 DB/ DECADE CUTOFF AND EXCELLENT REJECTION CHARACTERISTICS

RATINGS

PART NO.	CURRENT AMPS	DCR AT 25°C OHMS	INSERTION LOSS CURVE	L_1 MAX INCHES	L_2 MAX INCHES
GF51G4A	0.10	3.20	A	1.09	1.04
GF51G4B	0.50	.66	B	1.09	1.04
GF51G4C	1	.36	C	1.09	1.04
GF51G4D	5	.022	D	1.09	1.04

TEST SPECIFICATIONS

RIOR TO SHIPMENT

ch G sco Mini-filter is tested for the following performance char- eris prior to shipment:

SERT LOSS: checked to the individual loss curves published on eced Genisco pages.

SULA N RESISTANCE: to the value specified on the first page of nisc lini-Filters.

ELEC C WITHSTANDING VOLTAGE: to the value specified on the first ge o enisco Mini-Filters.

ORKM SHIP: each filter is inspected for conformance to the outline awin nd for workmanship to best instrumentation standards.

UAL CATION TESTS - ENVIRONMENTAL

nisc Minifilters will meet or exceed the following environmental ecifi ions.

LT S AY: Per MIL-STD 202 Method 101 Condition B which tests the ter f 48 hours at 35°C in a 5% saline solution after which the filter insp ted for appearance and tested for performance.

MID Y: Per MIL-STD 202 Method 103 Condition B. The filter is sub- cted 90% relative humidity for 96 hours at 40°C after which the ter ested for performance.

MOISTURE RESISTANCE: Per MIL-STD 202 Method 106 B. The filter is cycled between temperature and humidity limits for a period of 216 hours after which the filter is examined for appearance and its performance tested.

TEMPERATURE CYCLING: Per MIL-STD 202 Method 102A Condition D. The test cycles the filter 5 times from −55 to +125°C during which time the filter is in full electrical operation.

IMMERSION CYCLING: Per MIL-STD 202 Method 104A Condition A. In this test the filter is immersed in water at 25°C for 15 minutes per cycle, for two cycles. Afterward the filter is inspected and performance tested.

MECHANICAL SHOCK: Per MIL-STD 202 Method 205 Condition C. The filter is given 6 shocks (each axis) each of which is 11 msec in duration, half sine wave of 50G peak amplitude and is then performance tested.

MECHANICAL VIBRATION: Per MIL-STD 202 Method 204 Condition B. The filter is mounted on a vibration table and is subjected to 12 full cycles, each 20 minutes in duration, 10 to 2000 Hz, at 0.06 DA. Performance tests follow.

BAROMETRIC PRESSURE: MIL-STD 202 Method 105 Condition C. 125% of rated voltage is applied while the filter is at a pressure equivalent to an altitude of 70,000 feet. The filter is then performance tested.

TERMINAL STRENGTH: MIL-STD 202 Method 211 Condition A. Each terminal is pulled with a 4½ lb force axially and then examined for seal and mechanical integrity.

LIFE: MIL-STD 202 Method 108A Condition C. A 500 hour test at rated voltage and current at 125°C.

GENISCO

ACTIVE FILTERS

Genisco Active Filters

- THE COMPLETE QUALITY LINE
- PARTS STOCK IN DEPTH
- FAST PROTOTYPE SERVICE TO YOUR CUSTOM REQUIREMENTS
  - **BASIC 2-POLE ACTIVE MODULE**
    Preset to any specified fo and Q values. Completely self-contained — no external resistors or capacitors.
  - **ACTIVE FILTERS**
    2, 4, 6, or 8-pole Chebyshev, Butterworth, or Bessel type responses. Complete and ready to plug in.
  - **STANDARD COMB FILTERS**
    Bandpass filters preset to IRIG standards. Ready to use.
  - **PROGRAMMABLE ACTIVE FILTERS**
    Externally set fo and Q values, from below 1 Hz to 10 KHz, Q values to above 500.

DESIGN incorporates quality multiloop negative-feedback (State Variable) circuit for excellent long-term stability and minimum sensitivity to component aging and supply voltage and temperature variations, plus exceptional high-Q capability over a wide frequency range. Compact dual-in-line package is ideal for printed circuit or wire wrap board mounting.

COMPUTER-DIRECTED PRODUCTION and standard basic modules stocked in depth enable Genisco to ship prototypes of custom designs within 72 hours ARO. The engineering and design process is completely automated. A specified part number is translated by computer directly into complete production specifications, including settings of automated trim and test equipment. Errors and delays associated with hand-design are completely eliminated.

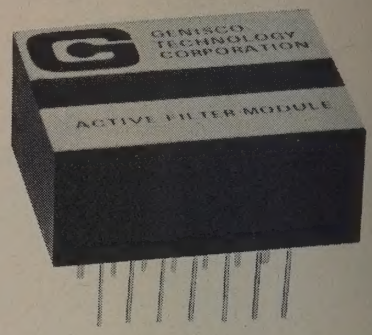
RELIABILITY is built into the fully encapsulated package which features silicon integrated circuits and thick-film hybrid construction. Amplifiers are short-circuit protected and "latch-up" proof.

PRODUCT DEPTH is your assurance of full flexibility, since Genisco markets a complete line of both active and passive wave filters. Complementing this is a varied array of signal and power type EMI/RFI filters, Mini-Filters®, and signal and power transformers and coils — all backed by one of the industries best-qualified EMI/RFI consulting engineering laboratories.

description

Genisco STATE VARIABLE active filters are general-purpose, completely self-contained, active networks capable of stable and efficient operation over the frequency range from 20 Hz to 10 KHz. Active elements are state-of-the-art monolithic-chip operational amplifiers bonded to a thick-film hybrid circuit which is permanently encapsulated. Each circuit has one high impedance input and three low impedance outputs corresponding to the lowpass, bandpass, and highpass filter functions. The multiple negative feedback paths of the active circuit and the high gain amplifiers provide stable and repeatable frequency characteristics and minimum DC drift with time and temperature.

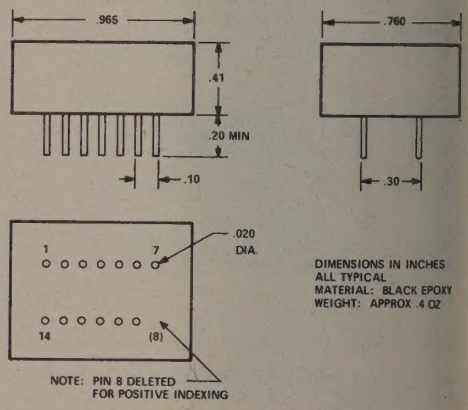
Low cost and rapid delivery are possible, since all filters are built from the same basic component which is factory-trimmed, under computer direction, to a specific customer requirement. Filters may be ordered as either the basic 2-pole module with prescribed fo and Q values or as a complete 2, 4, 6, or 8-pole active filter with a Chebyshev, Butterworth, or Bessel type response.



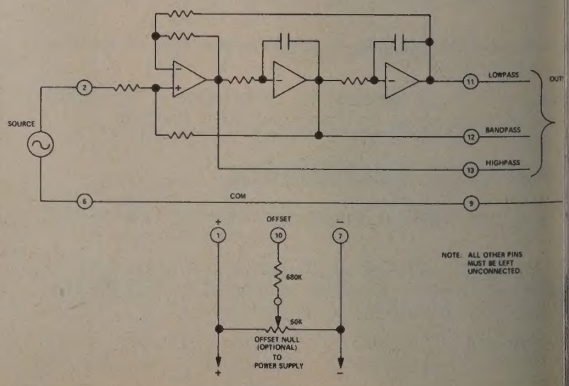
features

- Completely pre-tuned . . . ready to use
- Fast delivery with computer-directed pro duction
- Compact, convenient 14-pin, dual-in-lin package
- State-of-the-art hybrid microcircuit desig
- Stable multiloop negative feedback circu
- Frequency range 20 Hz to 10 KHz standar

outline

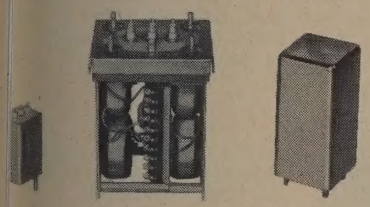


schematic



HERTZ FILTERS

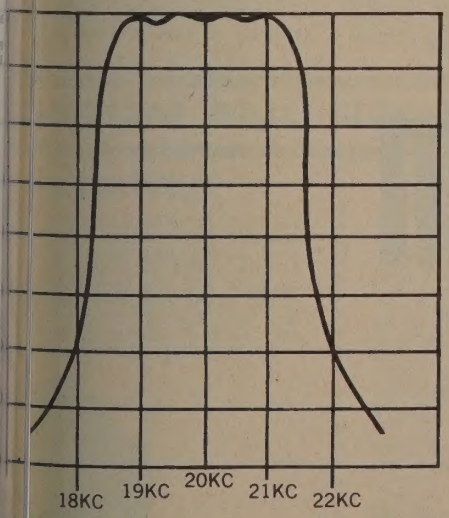
BAND PASS FILTERS CUSTOM DESIGNED TO FILL YOUR NEEDS



rtz Filter Corporations' engineering partment is made up entirely of specialist in the field of custom design of band pass filters. They are all fully experienced and prepared to help you solve your filter problems. Call or write Hertz for reable service and prompt delivery.

EATURES

- Filrs, Band Pass, Passive
- Ce er Frequencies — 50 Hz to 50 Meg Hz
- Sh e factors — better than 2.0 for ratios of 60db to 3 db
- Bdwidth to center frequency ratio — up to 0%
- Pse linearity — within 10° through passband
- L passband insertion loss
- Bter than 80 db attenuation 50% above and below center frequency
- Input and output impedances as required
- L input and output impedances in stop band
- L passband ripple
- L, and R elements only



PARTIAL LIST OF HERTZ FILTERS
(all filters in accordance with MIL-F-18327)

BAND PASS

PART NO.	PASS BAND	STOP BAND	Z_o	I.L.@CF	SIZE
BP-7907-1	3db(150-300)Hz	60db(50-850)Hz	600	1db	2 x 2¼ x 4
BP-7907-2	3db(300-900)Hz	60db(110-1700)Hz	600	1db	2 x 2¼ x 4
BP-7907-3	3db(600-1200)Hz	60db(210-3400)Hz	600	1db	2 x 2¼ x 4
BP-7907-4	3db(1.2-2.4)KHz	60db(.43-6.8)KHz	600	1db	2 x 2¼ x 4
BP-7907-5	3db(2.4-4.8)KHz	60db(.85-13.5)KHz	600	1db	2 x 2¼ x 4
BP-7907-6	3db(4.8-9.6)KHz	60db(1.7-27)KHz	600	1db	2 x 2¼ x 4
BP-7907-7	3db(8.9-11.2)KHz	60db(3.1-32)KHz	600	1db	2 x 2 x 3
BP-7996-1	3db(825-1,175)Hz	40db(650-1,350)Hz	30K	3db	1 x 2¼ x 4½
BP-8004-10	3db(8-26)KHz	30db(4-30)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-11	3db(19.5-33.5)KHz	30db(16.5-36.5)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-12	3db(26.25-40.25)KHz	30db(23.25-43.25)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-13	3db(32.6-52.6)KHz	30db(27.6-57.6)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-7897-1	3db(37.5-40.5)KHz	30db(34.5-43.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-2	3db(40.5-43.5)KHz	30db(37.5-46.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-3	3db(43.5-46.5)KHz	30db(40.5-49.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-4	3db(46.5-49.5)KHz	30db(43.5-52.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-5	3db(49.5-52.5)KHz	30db(46.5-55.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-6	3db(52.5-55.5)KHz	30db(49.5-58.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-7	3db(55.5-58.5)KHz	30db(52.5-61.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-8	3db(58.5-61.5)KHz	30db(55.5-64.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-9	3db(61.5-64.5)KHz	30db(58.5-67.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-10	3db(64.5-67.5)KHz	30db(61.5-70.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-11	3db(67.5-70.5)KHz	30db(64.5-73.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-12	3db(70.5-73.5)KHz	30db(67.5-76.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-13	3db(73.5-76.5)KHz	30db(70.5-79.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-14	3db(76.5-79.5)KHz	30db(73.5-82.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-15	3db(79.5-82.5)KHz	30db(76.5-85.5)KHz	10K/1K	4db	1¼ x 1¼ x 2

LOW PASS

PART NO.	PASS BAND	STOP BAND	Z_o	SIZE
LP-7907-1	4db@300Hz, 1db@225Hz	60db@850Hz	600	2 x 2 x 3
LP-7907-2	4db@600Hz, 1db@450Hz	60db@1700Hz	600	2 x 2 x 3
LP-7907-3	4db@1.2KHz, 1db@.9KHz	60db@3.4KHz	600	2 x 2 x 3
LP-7907-4	4db@2.4KHz, 1db@1.8KHz	60db@6.8KHz	600	2 x 2 x 3
LP-7907-5	4db@4.8KHz, 1db@3.6KHz	60db@13.5KHz	600	2 x 2 x 3
LP-7907-6	4db@9.6KHz, 1db@7.2KHz	60db@27KHz	600	2 x 2 x 3
LP-7907-7	4db@11.2Hz, 1db@10KHz	60db@32KHz	600	1⅜ x 1⅝ x 2¾
LP-7996-1	5db@1,175Hz, 2db@1,000Hz	40db@650Hz	30K	1⅜ x 1⅝ x 2¾
LP-8004 10	5db@26KHz, 1db@17KHz	30db@30KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-11	5db@33.5KHz, 1db@26.5KHz	30db@36.5KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-12	5db@40.25KHz, 1db@33.25KHz	30db@43.25KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-13	5db@52.6KHz, 1db@42.6KHz	30db@57.6KHz	10K/2K	1¼ x 1¼ x 2

PART NO. HIGH PASS	PASS BAND	STOP BAND	Z_o	SIZE
HP-7907-1	4db@150Hz, 1db@225Hz	60db@50Hz	600	2 x 2 x 3
HP-7907-2	4db@300Hz, 1db@450Hz	60db@110Hz	600	2 x 2 x 3
HP-7907-3	4db@600Hz, 1db@900Hz	60db@210Hz	600	2 x 2 x 3
HP-7907-4	4db@1.2KHz, 1db@1.8KHz	60db@.43KHz	600	2 x 2 x 3
HP-7907-5	4db@2.4Hz, 1db@3.6KHz	60db@.85KHz	600	2 x 2 x 3
HP-7907-6	4db@4.8Hz, 1db@7.2KHz	60db@1.7KHz	600	2 x 2 x 3
HP-7907-7	4db@8.9KHz, 1db@10KHz	60db@3.1KHz	600	1⅜ x 1⅝ x 2¾
HP-7996-1	5db@825Hz, 2db@1,000Hz	40db@1,350Hz	30K	1⅜ x 1⅝ x 2¾
HP-8004-10	5db@8KHz, 1db@17KHz	30db@4KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-11	5db@19.5KHz, 1db@26.5KHz	30db@16.5KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-12	5db@26.25KHz, 1db@33.25KHz	30db@23.25KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-13	5db@32.6KHz, 1db@42.6KHz	30db@27.6KHz	10K/2K	1¼ x 1¼ x 2

HERTZ FILTER CORPORATION
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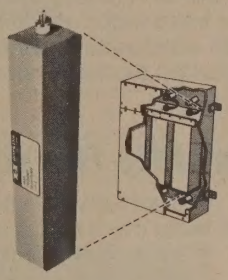
OWER FILTERS

Kin6 Pr Line Filters are designed, built and tested to deliver maximum hte-fr continuous service year-after-year. Available as individual power ns, or used in cabinet assemblies, these units are intended for use shield enclosures, secure installation and general power applications. r are ilable in various current ratings from 1 AMP through 200 AMPS.

60 Ser

1960 ries filters furnish 100 DB of attenion fr 14KHZ to 10GHZ when measured accor ce with Mil Standard 220A load ditions

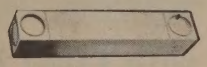


800 Ses

1260 eries filters furnish 100 DB of attenion fr 14KHZ to 10GHZ when measured accor ce with Mil Standard 220A. Also asured der full load conditions from 14KHZ 20MHZ ith special buffer networks to allow d me rements below 100KHZ.

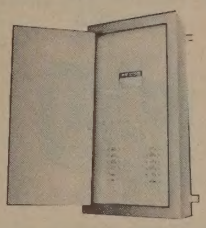
76 Se s and 1620 Series

ters a also available in single and dual cuit s offering lower performance charteristi when required.



F SIELDED & FILTERED IRCIT BREAKER PANELBOARD

pkin F Shielded and Filtered C/B Panelerds intended for use in installations ere ure communication is mandatory. e unic design of these Panelboards mainins iding integrity with the cabinet or op Designs are available utilizing both 196 eries and 12600 Series filters. Cirit Br er Complement must be specified en ring.



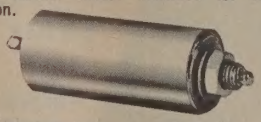
COMMUNICATIONS/ SIGNAL LINE FILTERS

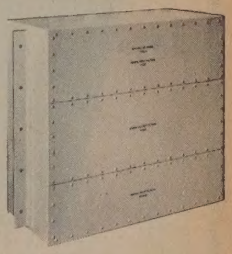
258B-S2

This unit is a Voice and Signal Line Filter offering 100 DB attenuation from 14KHZ to 1GHZ per Mil Standard 220A with outstanding reliability. Originally designed for use in 600 OHM balance system, it has been widely used in other applications such as Secure Communications.

F-4386 & F-4386-1

These Voice and Signal Filters are designed to meet the requirements of DCA Cir 175-6A Application #1. They are single circuit bulkhead mounting tubular filters intended for cabinet installation.





Special cabinet designs are available incorporating any number of the above filters modified for cabinet installation. These units are constructed with an R-F Shielded bulkhead between input and output housings in order to maintain shielding integrity required for secure installations.

UL RECOGNIZED FILTERS FOR DATA PROCESSING EQUIPMENT

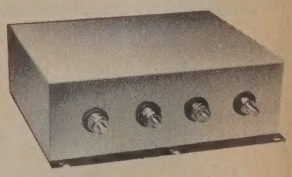
The 44 Hopkins RFI Filters designed expressly for data processing equipment provide maximum suppression of Radio Frequency Interference and other extraneous signals detrimental to efficient operation of data processing equipment.

Hopkins RFI Filters are designed and tested to deliver maximum, trouble-free duty for many years.

You will speed production and save both time and money in the manufacture of your data processing equipment when you specify, whenever possible, off-the-shelf Hopkins RFI Filters which are included as recognized components.

The Hopkins line offers the widest selection of RFI filters recognized under the component program of Underwriters' Laboratories, Inc.

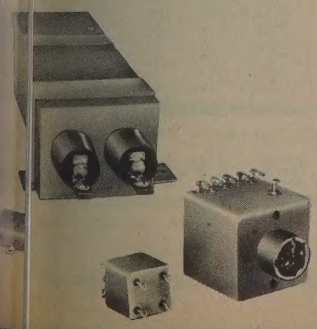
U.L. Yellow Card listings available upon request. Available in various amperage ratings and case styles.



CUSTOM AND GENERAL PURPOSE EMI/RFI FILTERS

Custom Filters

pkin as long been a leader in the design d dev pment of special custom filters to tisfy ecific customer requirements. Thouds designs are on file incorporating all ltage urrent ratings and case configurans. Sign and performance are verified by mput Our complete Engineering and Manactur Facility is available to assist in the lution f your particular filter problems.



General Purpose Tubular Filters—14000 Series

Intended for use in critical applications where the "feed-thru" characteristic is necessary for good high frequency performance. Available in various circuit configurations from a single element capacitor thru multiple element Pi and T sections. Various performance characteristics are available to allow the user to select the unit best suited to his needs. Typical ratings from 50VDC @ 1 Amp. to 277 VAC @ 50 Amp.

All units designed to meet requirements of MIL-F-15733.

These Units are available mounted in cabinets on special request. Contact Factory.

General Purpose Rectangular Filters—16000 Series

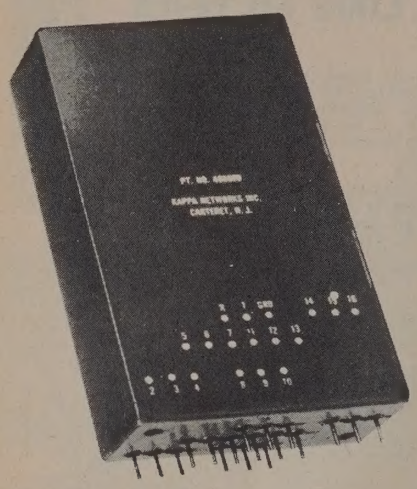
These units are intended to be used where installation is not critical. They are available in one, two and three circuit configuration as well as a wide variety of voltage and current ratings. Various attenuation characteristics allow the user to select the unit best suited to fit his particular needs. Typical ratings are from 50 VDC @ 1 Amp. to 277 VAC @ 50 Amp. All units are designed to meet the requirements of MIL-F-15733.

Electronic Wave Filters utilizing modern network design techniques are available as custom filters upon request.

SPECIAL CHOKES

BAND PASS/WAVE FILTERS

When you want high efficiency delay lines specify Kappa Super-η*



*SUPER-η LINES embody a new design principle providing the highest efficiency yet obtainable in lumped constant delay lines. Use of network synthesis techniques rather than conventional m-derived methods results in sharply improved delay line efficiency. Compared to ordinary lines of any given delay, KAPPA SUPER-η lines provide linear performance over a much greater band width. In addition these newly developed lines offer such outstanding advantages as: greater inherent reliability, smaller package size, and appreciable cost reduction.

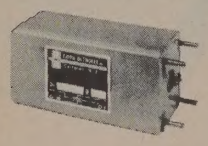
SUPER-η LINES FOR VIDEO SYSTEMS

Impedance:	75 ohms (unless otherwise specified)
Amplitude Response:	better than 0.1 db. flatness to 10 MHZ or higher
Ripple:	within ± .05 db to 10 MHZ or higher
Group Delay:	linear within ± 1% or ± 1 nsec, whichever is greater.
Group Delay Ripple:	within ± 2½% to 14 MHZ
K factor:	better than .25% for T or 2T sin² pulse for both American and European systems
Cross talk:	less than 46 db.

UPDATE YOUR VIDEO BROADCAST EQUIPMENT WITH KAPPA SUPER-η DELAY LINES!

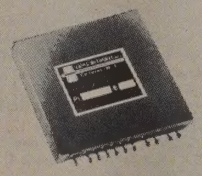
Specify KAPPA for the most complete line of electro-magnetic delay lines..

STANDARD LUMPED CONSTANT DELAY LINES SERIES LC



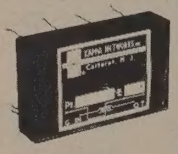
Delay: 50 Nanoseconds to 1 second
Bandwidth: DC to 250 MHZ
Rise Time: As low as 2 Nanoseconds
Impedance: 25 ohms to 50 K ohms

TRANSPONDER LINES SERIES C



Tap Spacing: 1.45 μsec., or as required
Tap Tolerance: ± .05, or as required
Delay-to-Rise-Time Ratio: 100 max.
Temperature Stability: 50 ppm °C or less

LOW DISTORTION LINES SERIES D



Distortion at Output: 2% max.
Distortion at Taps: Less than 5% at any tap
Distortion Limit: As low as 0.1% if required
Delay Range: up to 100 usec.

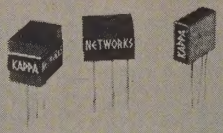
PRECISION AUDIO DELAY LINES SERIES A

Delay Range: from 500 μsec to 1 sec.
Bandwidth: 70 KHZ (max.)
Delay Linearity: nominally within ± 0.2 available to within ± 0.0

PRECISION DECADE DELAY UNITS SERIES DK

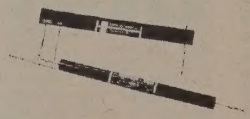
Variable delays available between input and output terminals in decade steps. Each decade has eleven (11) switch contacts and ten (10) delay increments so that the dial values overlap.

ULTRA MINIATURE DELAY LINES SERIES T



Delay Range: to 200 nsec.
Delay/Rise Time: 10 max.
Attenuation: .2 db max.
Fully encapsulated

STANDARD DISTRIBUTED CONSTANT DELAY LINES SERIES DC



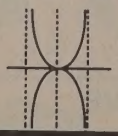
Delay Range: to 3 μsec.
Standard Tolerance: ± 5% on Delay
Delay-to-Rise-Time Ratio: 11 max.
Distortion: ± 5% (typical), ± 10% max.

DELAY TRIMMERS: TINY TRIM® SERIES

Size: ¼ Cubic In

PART NUMBER	Ø SHIFT RANGE @ 3.58 MHZ DEG.	DELAY (Nano-sec.)	RISE TIME (Nano-sec.)	IM Al (ol
TT20D	25	20	5	5
TT30C	38	30	7.5	3
TT40D	50	40	10	5
TT50C	64	50	12.5	3
TT60C	75	60	15	3

Contact us for the name of your nearest representative or consult listing in this directory. Complete new catalog available.



KAPPA NETWORKS, INC.
Delay Line Specialists • Electric Wave Filters
Manufacturing Engineers
165 ROOSEVELT AVENUE · CARTERET, NEW JERSEY 07008 · TEL. (201) 541-4226

hisonic inc.

249 N. TROOST • OLATHE, KANSAS 66061
PHONE: 913-782-0012
TELEX: 4-2562

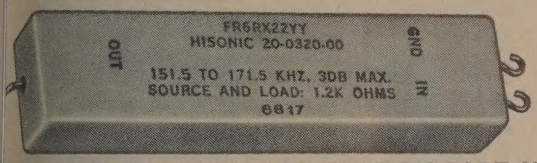
STANDARD FILTERS

FOR HIGHEST SELECTIVITY

Standard filters are designed by modern network methods for minimum stop to pass band ratios. Applications are those requiring optimum utilization of frequency spectrum.

CUSTOM FILTERS

Low, band or high pass and band stop filters with optimum characteristics can be supplied to your special requirements and MIL-F-18327. Construction utilizes toroidal inductors and high quality capacitors of special films or silvered mica, according to frequency and space requirements. Operating frequencies range to 10 mc/s. Temperature stabilization for both amplitude and frequency can be effected. Mechanical styles may be epoxy encapsulated or hermetically sealed steel sizes from 0.2 to 200 cu. in.



PARTIAL LIST OF HISONIC FILTERS BY PART NUMBER

BAND PASS FILTERS

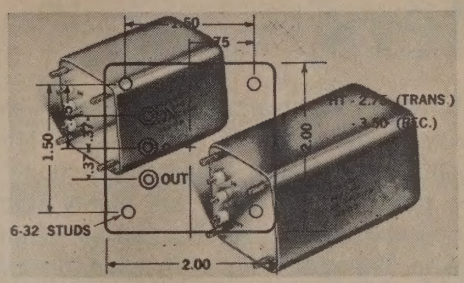
PART NUMBER	FREQ.	INS. LOSS	SOURCE/ LOAD	PASS BAND	STOP BAND	SIZE
03-0184-10	100 c/s	5 db	600/600	3 db @ ± 20 c/s	60 db @ 50 c/s 54 db @ 250	3 x 3½ x 6
03-0189-10	210 c/s	2 db	600/4.6M	3 db @ ± 4 c/s	60 db @ 170 c/s	3 x 3½ x 4½
03-0038-10	800 c/s	9 ± 1 db	15K/15K	3 db @ ± 160 c/s	35 db from 1600 to 1Mc/S	1¾ x 1¹⁄₁₆ x 2¼
03-0205-10	1150 c/s	2.8 db	600/10K	3 db @ ± 10 c/s	30 db @ ± 300 c/s	2 Sq. x 3½
03-0206-10	1600 c/s	.2 db	600/10K	3 db @ ± 50 c/s	50 db @ ± 350 c/s	2 Sq. x 3½
03-0019-10	940 c/s	6 db	1K/1K	3 db @ ± 500 c/s	40 db @ ± 1 Kc/S	1⅝ x 1¾ x 2¼
03-0027-10	3.35 K/S	6 db	1K/1.6K	3 db @ ± 180 c/s	30 db @ 1200 c/s	2½ Sq. x 1¼
03-0029-10	4 Kc/S	3 ± ½ db	1K/1.6K	3 db @ ± 175 c/s	30 db @ ± 1000 c/s	1¾ Sq. x 2¼
03-0030-10	8 Kc/S	6 db	1K/100K	3 db @ ± 225 c/s	40 db @ 11.5 Kc/S	1¹³⁄₃₂ Sq. x 2⅜
03-0060-10	12 Kc/S	11 db	33K/33K	3 db @ ± 200 c/s	60 db @ ± 6000 c/s	2 x 3 x 2¼
03-0020-11	18 Kc/S	8 db	47K/500	3 db ± @ 250 c/s	30 db @ ± 2 Kc/S	2 x 3 x 1½
03-0021-11	26 Kc/S	6 ± ½ db	10K/30K	3 db @ ± 1500 c/s	40 db @ ± 12.5 Kc/S	2 x 2¼ x 3¼
03-0030-11	48 Kc/S	4 db	15K/5M	± 1 db @ ± 50 c/s	60 db @ ± 4 Kc/S	1½ x 1⁹⁄₃₂ x 3²⁵⁄₃₂
03-0093-11	54.75 Kc/S	5 db	600/20K	3 db @ ± 2200 c/s	60 db @ ± 6250 c/s	2⅝ x 4⅛ x 3⅞
03-0104-11	88 Kc/S	6 db	600/600	.5 db @ ± .1 Kc/S	20 db @ ± 4 Kc/S	2¹⁄₃₂ x 2¹³⁄₃₂ x 1¹⁄₆₄
03-0177-11	142.5 KC/S	20 db	5K/5K	3 db @ ± 1.75 Kc/S	70 db @ ± 9 Kc/S	1¾ x 2 x ⅞
03-0158-11	156 Kc/S	6 db	300/1K	.5 db @ ± 10 Kc/S	60 db @ ± 39 Kc/S	¾ x 1¾ x 3
03-0105-11	216 Kc/S	6 db	600/600	.5 db @ ± .1 Kc/S	20 db @ ± 4 Kc/S	2¹⁄₃₂ x 2¹³⁄₃₂ x 1¹⁄₆₄
03-0103-11	216 Kc/S	1.5 db	600/600	.25 db @ ± 52 Kc/S	55 db @ 304 Kc/S	2⅝ x 1⅜ x 2⁹⁄₃₂
03-0106-11	336 Kc/S	2.5 db	600/600	2 db @ 312 to 360 Kc/S	70 db @ 250 & 450 Kc/S	1¹⁄₃₂ x 2¹³⁄₃₂ x 2⁹⁄₃₂
03-0058-11	338 Kc/S	3 db	600/600	within .5 db @ 310 to 367 Kc/S	70 db @ 479 Kc/S	2¹³⁄₃₂ x 3 x 1¹⁄₆₄
03-0059-11	384 Kc/S	3 db	600/600	within .5 db @ 360 to 408 Kc/S	70 db @ 528 Kc/S + 112	2¹³⁄₃₂ x 3 x 1¹⁄₆₄
03-0101-11	384 Kc/S	2.5 db	600/600	within 2 db @ 360 to 480 Kc/S	70 db @ — 88 Kc/S	2⅝ x 1⅜ x 2⁹⁄₃₂
03-0095-11	424 Kc/S	2.5 db	124/124	within 1 db @ ± 424 c/s	50 db @ 848 Kc/S	1 x 1½ x 1
03-0096-11	435 Kc/S	2.5 db	600/600	3 db @ ± 29 Kc/S	55 db @ 516 Kc/S	2¹³⁄₃₂ x 3 x 1¹⁄₆₄
03-0169-11	781 Kc/S	3 db	1K/1K	±.5 db @ 10 Kc/S	40 db @ 39 Kc/S + 436	¾ x 1¾ x 2
03-0155-11	2.172 Mc/S	5 db	135/135	.5 db @ ± 120 Kc/S	50 db @ — 376 Kc/S	2¾ x 7 x 1¹⁄₆₄
03-0016-11	3 Mc/S	1 ± ½ db	300/300	3 db @ ± .55 Mc/S	40 db @ ± .8 Mc/S	2¼ x 2½ x 4
03-0119-11	14 Mc/S	15 db	500/500	3 db @ ± .15 Mc/S	65 db @ 1 Mc/S	1⅝ x 2 x 1⅛
03-0034-11	21.5 Kc/S	6 db	600/2500	3 db 21.5 to 24.3 Kc/S	25 db @ 21.06 Kc/S 40 db @ 20.46 & 35 Kc/S	1¹³⁄₁₆ x 2³⁄₃₂ x 1
03-0215-11	31.8 Kc/S	7 db	3K/1.5K	3 db 31.8 to 34.5 Kc/S	25 db @ 31.29 Kc/S 40 db @ 30.69 & 45 Kc/S	1¹³⁄₁₆ x 2¹⁄₆₄ x 1

LOW PASS FILTERS

PART NUMBER	SOURCE/ LOAD	PASS BAND	STOP BAND	SIZE
03-0153-	10/5M	2 ± 1 db @ 15 to 37 c/s	40 db @ 400 c/s	1¼ Sq. x 1½
03-0127-	1K/10K	3 db @ 40 c/s	40 db @ 75 c/s	1½ Sq. x 2
03-0212-	1K/1K	3 db @ 185 c/s	60 db @ 430 c/s	⅞ x 1⅝ x 1½
03-0213-	1K/1K	3 db @ 300 c/s	24 db @ 1200 c/s	⅞ x 1⅝ x 1½
03-0221-	15K/47K	.5 db @ 430 c/s	25 db @ 800 c/s	¾ x 1¾ x 3
03-0145-	600/600	3 db @ 2350 c/s	40 db @ 2575 c/s	3½ x 3 x 6
03-0268-	1K/1K	±.5 db .3 to 3 Kc/S	50 db above 4 Kc/S	1¼ x 3⅜ x ³⁵⁄₃₂
03-0223-	600/600	±.5 db .25 to 3 Kc/S	35 db 3.4 to 4.5 Kc/S	1½ x 4 x 1¹⁄₁₆
03-0137-	600/600	±.5 db .25 to 3.4 Kc/S	35 db 3.8 to 5.0 Kc/S	1½ x 4 x 1¹⁄₁₆
03-0072-	10K/10K	within 1 db 300 c/s to 30 Kc/S	40 db @ 44 Kc/S	1½ Sq. x 2
03-0102-	600/600	within .25 db 36 to 140 Kc/S ±1	35 db @ 164 Kc/S	2¹⁄₁₆ x 2¹³⁄₁₆ x 1¹⁄₆₄
03-0190-	75/75	—.5 db @ 2.05 Mc/S	40 db @ 2.5 Mc/S	2⅜ Sq. x 1¼

HIGH PASS FILTERS

PART NUMBER	SOURCE/ LOAD	PASS BAND	STOP BAND	SIZE
03-0001-	2K/2K	3 db @ 300 c/s	50 db @ 120 c/s	1¼ Cube
03-0234-	2K/2K	3 db @ 350 c/s	40 db @ 175 c/s	⅞ x 1⅝ x 1½
03-0145-	600/600	3 db @ 2575 c/s	40 db @ 1000 c/s	3½ x 3 x 6
03-0002-	100/150	3 db @ 5 Kc/S	50 db @ 4 Kc/S	1¾ x 2⅜ x 4¼



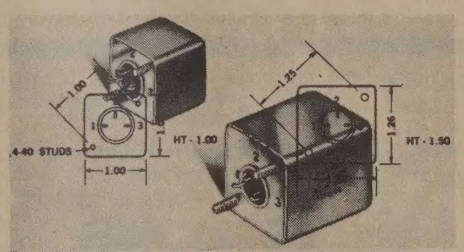
SERIES 03 TELEGRAPH TONE CHANNEL BAND PASS

(170 cycle spacing)

SPECIFICATIONS:

Relative Attenuation	Freq.	Receiver No.	Trans. No.
(Receive Filters)	425	03-01	03-21
3 db max at ± 42.5 cps	595	03-02	03-22
20 db min at ± 85 cps	765	03-03	03-23
40 db min at ± 128 cps	935	03-04	03-24
(Transmit Filters)	1105	03-05	03-25
3 db max at ± 42.5 cps	1275	03-06	03-26
15 db min at ± 85 cps	1445	03-07	03-27
30 db min at ± 128 cps	1615	03-08	03-28
	1785	03-09	03-29
Insertion Loss—10 db max	1955	03-10	03-30
	2125	03-11	03-31
Terminations	2295	03-12	03-32
Input: 600 ohms	2465	03-13	03-33
(inputs all channels may	2635	03-14	03-34
be operated in parallel)	2805	03-15	03-35
Output: Receive 50K ohms	2975	03-16	03-36
Transmit 600 ohms	3145	03-17	03-37
	3315	03-18	03-38

In addition to series listed, other tone channel series with spacings from 85 to 500 c/s are available.



SERIES 68 MINIATURE LOW PASS

SPECIFICATIONS:

Relative Attenuation	f_c cps	Part No.
3 db ± .5 @ f_c		
20 db min @ 1.3 f_c	330	68-01
40 db min @ 1.5 f_c	450	68-02
	600	68-03
Insertion loss—1 db max	660	68-04
	790	68-05
Terminations	900	68-06
Input—10K ohms	1050	68-07
Output—10K ohms	1200	68-08
	1600	68-09
Physical Specifications	2100	68-10
Case Hermetically Sealed Steel	3000	68-11
Size (330 to 900 cps)	3300	68-12
1.26"x1.26"x1.5" High	4000	68-13
Mounting: two 6-32 studs	4500	68-14
spaced 1.25"	5250	68-15
Size (1050 to 13000 cps)	6000	68-16
1"x1"x1" High	8000	68-17
Mounting: two 4-40 studs	10500	68-18
spaced 1"	11500	68-19
Terminals—3 solder type	13000	68-20

hisonic inc.

OTHER PRODUCTS: Precision Inductors • Transformers & Reactors • Tuned Circuits • Amp/Phase Equalizers • Lumped Constant Delay Lines

Gould®/Clevite Quartz and Ceramic filters

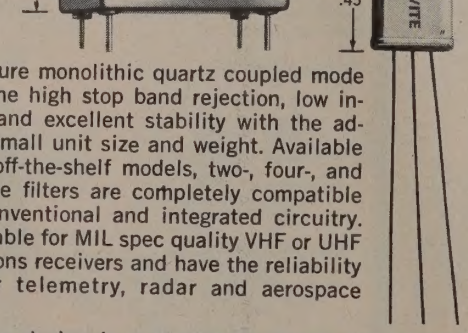
...Small, lightweight and rugged. Steep-sided selectivity. Wide range of bandwidths. Non-microphonic. Permanently tuned and immune to magnetic fields. Gould filters are highly stable with temperature and time. These high quality filters are backed by 10 years of design and manufacturing experience.

The filters described here were developed to meet the diverse requirements of electronic equipment manufacturers. Their wide range of performance characteristics and prices yields a filter for almost every application. Such breadth of line simplifies the designer's selection of an optimal filter at minimal cost. These are a few of the reasons that Gould's growing family of Quartz and Ceramic filters have replaced LC, active and mechanical filters in a broad range of military, commercial and consumer equipment.

We can customize Gould filters to your special requirements. Our engineers, salesmen and representatives can answer your specific questions.

Quartz filters

Uni-Wafer® Coupled Mode Quartz Filters — for IC's and Higher IF's



Gould miniature monolithic quartz coupled mode filters combine high stop band rejection, low insertion loss and excellent stability with the advantages of small unit size and weight. Available in standard off-the-shelf models, two-, four-, and six-pole, these filters are completely compatible with both conventional and integrated circuitry. They are suitable for MIL spec quality VHF or UHF communications receivers and have the reliability required for telemetry, radar and aerospace systems.

The Uni-Wafer design is a proprietary Gould development using the principle of "trapped energy" to confine and maximize resonant energy within the region of each electrode pair. The result: lower insertion loss, steeper skirt ratios, greater spurious mode rejection and a smaller package. High performance filters from 5MHz to 75MHz center frequencies can be computer designed to your specifications.

Coupled Mode Quartz Uni-Wafer Filters Avai ble for Immediate Delivery

Number Model	Center Frequency (MHz)	Bandwidth 3dB (Min.) (kHz)	Bandwidth 60dB (Max.) (kHz)	Spurious Mode Rej. (dB)
Two Pole				
CM9B55-10.7	10.7±1kHz	9	55*	25
CM30B180-10.7	10.7±1kHz	30	180*	20
Four Pole				
CM14D70-10.7	10.7±1kHz	14	70	70
CM9D45-30.0	30.0±2kHz	9	45	70
CM14D70-30.0	30.0±2kHz	14	70	70
CM30D150-30.0	30.0±2kHz	30	150	60
Six Pole				
CM9D25-10.7	10.7±1kHz	9	25	90
CM14D35-10.7	10.7±1kHz	14	35	90
CM30D75-10.7	10.7±1kHz	30	75	80
CM14D35-20.5	20.5±1kHz	14	35	90
CM9D25-30.0	30.0±2kHz	9	25	90

Stability:
TIME ±.0007%/year
TEMP. ±.005%

Operating Temp. Range:
−45°C to +85°C

*@ 30dB

	2-Pole Models	4-Pol Mode
Insertion Loss	2dB	3dB
Ultimate Attenuation	50dB	80dB

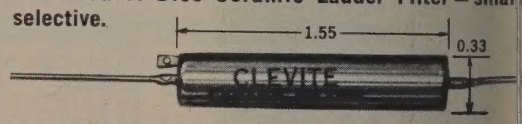
IMPEDANCES: Terminating impedances will run between 00 and 6000 ohms depending upon frequency and bandwidth. e 3 at 10.7MHz will be in the 6000 ohm range and the 9kHz at 4H be in the 500 ohm range with all others in-between. Spec in ances will be determined at the time a design is finalized.

Price: $10.00 to $30.00, depending on specifications, in lots 50

For more information, write for Bulletin 94028.

Ceramic filters

Standard 17-Disc Ceramic Ladder Filter — smal run selective.



Selectivity, small size and extreme ruggedness ha g this filter widespread acceptance among equipment sig The complete package is only 0.12 cubic inches. Th de provides excellent shock resistance. Production mo ls survived 600 g on the lead axis and 1000g perpenc ul the axis. Designed for i-f stages of military and co me superheterodyne radio receivers used in airborne gr AM and FM communications equipment.

Model Number	Bandwidth 6dB (Min.)* (kHz)	Bandwidth 60dB (Max.)* (kHz)	Inse on (B)
TL-2D5A	2	5	10
TL-4D8A	4	8	7
TL-6D11A	6	11	6
TL-8D14A	8	14	5
TL-10D16A	10	16	4
TL-16D25A	16	25	5
TL-20D32A	20	32	5
TL-30D45A	30	45	5
TL-40D55A	40	55	4
TL-45D65A	45	65	4

Center Frequency: 455kHz: ±1kHz for narrow band;
±2kHz for bandwidths above 20k

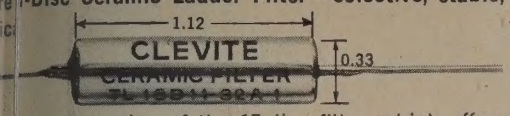
Stability: TIME — within +0.2% for 5 years. *At Room Ter era
TEMP — within 0.2% from −40°C to +85°C. 27

Impedance: 10kHz B/W and below—2500 ohms.
16kHz and 20kHz B/W—1500 ohms.
30kHz B/W and above—1200 ohms.

Price: $31.50 in lots of 500.

For more information, write for Bulletin 94017.

ature l-Disc Ceramic Ladder Filter — selective, stable, omic

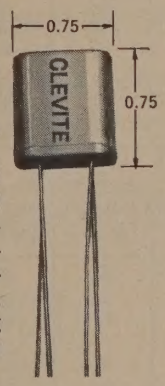


is a mpact version of the 17-disc filter, which offers llent electivity at about half the cost. Less than 0.09 in es, and rugged enough to meet MIL std. 202B. lly sued to transistorized circuitry and to applications e pr se center frequencies and the ultimate in selec- y are t required.

Model Number	Center Frequency Tolerance (kHz)	Bandwidth 6dB (Min.)* (kHz)	Bandwidth 60dB (Max.)* (kHz)	Insertion *Loss (dB)
D11-12	±2	6	12	6
D11-2	±2	10	20	4
6D11-3	±2.5	16	32	5
D11-3	±2.5	20	38	5
D11-5	±3	30	57	5
D11-7	±3	40	72	4

Room mp. 27°C.
ter Fr ency: 455kHz. Also available at 500kHz on special order.
ility: ME — within +0.2% for 5 years.
MP — within 0.2% from −40°C to +85°C.
edan 10kHz B/W and below—2000 ohms.
16kHz B/W and above—1000 ohms.
pband ejection: 60dB.
e: $15 in lots of 500.
more formation, write for Bulletin 94029.

Lo Frequency Filters — big performance a sm package.

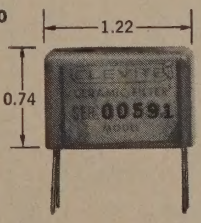


se niature fixed tuned filters provide a iqu ombination of narrow band-widths, h stality, low insertion loss, small size and t weht. They are ideal as comb filters and suc pplications as low frequency com- oica ns receivers, selective calling sys- ns, ctrol circuits, sonar, radar and ord- nce ing systems. For doubled selectivity, be scaded without serious loss. Weighing s tha ¼ ounce, they meet MIL std. 202C and re's need for magnetic shielding.

Model Number	Center Frequency (kHz)	Insertion Loss (max.) (dB)	Impedance (Kilohms)
9B	9	4	56
12B	12	5	56
15B	15	5	56
18B	18	5	47
21B	21	5	47
24B	24	5	47
27B	27	5	33
30B	30	5	33

te: Tse Filters are available at all center frequencies from 9kHz 50kH
ndwi (%fo): 1% @ 3dB; 13% @ 20dB.
bility TIME — within +0.2% for 5 years.
TEMP — within 0.2% from −40°C to +85°C.
ce: $ 50 in lots of 500.
r mo information, write for Bulletin 94030.

CF lter — just right for two-way radio



e "T" combines the advantages of a ned ansformer with the stability and gh p formance of a ceramic filter. This sign ffers greater selectivity at lowest st. ide specifically for CB, mobile rcra and marine radios in a package ss t n 0.6 cubic in. High impedance upli with low insertion loss and good ape ctors.

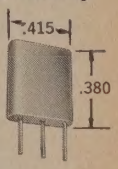
r h quality AM and FM receiving equipment, they pro- de a maller package and greater selectivity than conven- onal C filters and are competitive in cost.

TCF CERAMIC FILTERS

Model Number	Bandwidth 6dB (Min.) (kHz)	Bandwidth 60dB (Max.) (kHz)	Insertion Loss (dB)	Stopband Rejection (dB)	Impedance (Kliohms) In**	Impedance (Kliohms) Out
TCF4-8D20A	8	20	8	60	40	1.5
TCF4-12D36A	12	36	6	60	40	2.2
TCF4-18G45A	18	45	6	50	40	2.2
TCF6-4D10A	4	10	10	60	40	4.7
TCF6-30D55A	30	55	5	60	20	1.0
TCF6-35D60A	35	60	5	60	20	1.0
TCF6-12F36A	12	36***	10	99	40	2.2

Center Frequency 455kHz. Available on special order at 500kHz.
Stability: TIME — within +0.2% for 5 years.
TEMP — within 0.2% from −20 to +60°C.
Max. Ratings: 100 volts DC, 5 ma DC, *@90dB.
Prices: $6.00 to $12.00, depending on specfications, in lots of 500.
For more information, write for Bulletin 94026.

FM 4 Filter—rugged, high selectivity, miniature for Hi-Fidelity FM's



This 10.7MHz FM 4 filter, a simple monobloc of high-Q ceramic molded in epoxy, combines small size and distortion-free performance with high selectivity and economy both in component cost and cost of circuit manufacture. Fully compatible with conventional of integrated circuitry, it permits design of straightforward filtering circuits with fewer interconnections. Immune to shock, lightweight, with internal circuit integrity, thermally insulated and more . . . this filter is gaining increasing acceptance with mobile FM receiver designers.

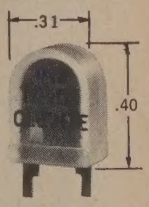
	Center Frequency* MHz	Bandwidth 3dB (kHz)	Bandwidth 40dB (kHz)	Insertion Loss dB	Stopband dB	Ripple dB
Typical	10.7*	235	825	3.5	47	0.2
Guaranteed	10.7*	200 min. 280 max.	900 max.	5 max.	40 min.	1 max.

*Production sorting delivers five groupings of center frequencies within 100 kHz of nominal 10.7 MHz, each with a tolerance of ± 25 kHz. Color dot coded as follows:

Cf	MHz	10.625	10.6625	10.700	10.7375	10.775
Dot	Color	Orange	Yellow	Green	Blue	Violet

Impedance 330 ohms ± 10% plus 5 pF ± 5
Price: $0.60 in lots of 1000.
For more information, write for Bulletin 94033.

"IR" Identical Resonator — low-cost alternative to LC filters and IF cans.



"IR" single fixed-tuned ceramic resonators enable the manufacturer to build his own 455 kHz IF stage filters to his own specifications, simply, and at the lowest possible cost. The interconnection of two or more of these "IR's" with off-the-shelf capacitors produce a high performance filter which will exactly meet your requirements. Design tables, available on request.

6dB bandwidths 2 kHz to 24 kHz
Center frequency 455 kHz
Shape factors 5:1 to 2:1
Stopband rejection 20 dB to 105 dB

Compared with conventional LC filters or IF cans, the identical resonator approach offers flexibility, design simplicity, and significant savings.

Price: $0.35 in lots of 500.
For more information, write for Bulletin 94031.

Gould sales engineers and design personnel can help you with your specific filter problems, or if you'd like, write for complete technical data and information. Piezoelectric Division, Gould Inc., 232 Forbes Road, Bedford, Ohio 44146.

GOULD CLEVITE

Gulton

TEMPERATURE STABLE BROAD BAND FILTERS

LOW PASS

Gulton TEMPERATURE STABLE broad band filter line offers 50 VDC, 100 VDC, 150 VDC, 185 VDC, 250 VDC, 300 VDC, 125 VAC and 185 VAC ratings in L, Pi and T networks. The TEMPERATURE STABLE line features:

- Guaranteed minimum insertion loss with full load applied from -55°C to +125°C
- No voltage derating to +125°C
- Low DC resistance

Contact Gulton for data on the above voltage rated L, Pi and T network broad band filters. Gulton has the most comprehensive line of broad band filters. Write for catalog.

L NETWORK 50 VDC

PART NUMBER	FIG. NO.*	CURRENT DC Max.	RESISTANCE DC Max.	MINIMUM INSERTION LOSS FULL LOAD -55°C to +125°C					
				30 KHz	150 KHz	300 KHz	1 MHz	10 MHz	10 GHz
LD-FA05B-100T	1	60 ma.	35	44	70	70	70	70	70
LD-FA05C-100T	1	100 ma.	15	30	60	70	70	70	70
LD-FA05D-100T	1	150 ma.	6	24	52	64	70	70	70
LD-FA05E-100T	1	250 ma.	4	21	44	58	70	70	70
LD-FA05F-100T	1	300 ma.	2.3	19	40	50	70	70	70
LD-FA05G-100T	1	450 ma.	1.2	16	32	40	60	70	70
LD-FA05J-100T	1	1 amp.	.2	12	30	38	55	70	70
LD-FA05L-100T	1	3 amp.	.1	11	29	35	46	70	70
LD-FA05M-100T	1	5 amp.	.04	7	18	25	37	68	70

Pi NETWORK 50 VDC

PART NUMBER	FIG. NO.*	CURRENT DC Max.	RESISTANCE DC Max.	MINIMUM INSERTION LOSS FULL LOAD -55°C to +125°C					
				30 KHz	150 KHz	300 KHz	1 MHz	10 MHz	10 GHz
PD-CA05B-100T	1	60 ma.	35	47	80	80	80	80	80
PD-CA05C-100T	1	100 ma.	15	40	76	80	80	80	80
PD-CA05D-100T	1	150 ma.	6	34	71	80	80	80	80
PD-CA05E-100T	1	250 ma.	4	28	64	80	80	80	80
PD-CA05F-100T	1	300 ma.	2.3	20	58	74	80	80	80
PD-CA05G-100T	1	450 ma.	1.2	4	50	69	80	80	80
PD-CA05J-100T	1	1 amp.	.2		43	62	80	80	80
PD-CA05L-100T	1	3 amp.	.1		30	49	80	80	80
PD-CA05M-100T	1	5 amp.	.04		20	40	75	80	80

T NETWORK 50 VDC

PART NUMBER	FIG. NO.	CURRENT DC Max.	RESISTANCE DC Max.	MINIMUM INSERTION LOSS FULL LOAD -55°C to +125°C					
				30 KHz	150 KHz	300 KHz	1 MHz	10 MHz	10 GHz
TD-BA05B-100T	3	60 ma.	70	50	80	80	80	80	80
TD-BA05C-100T	3	100 ma.	30	44	80	80	80	80	80
TD-BA05D-100T	3	150 ma.	12	36	80	80	80	80	80
TD-BA05E-100T	3	250 ma.	8	30	70	80	80	80	80
TD-BA05F-100T	3	300 ma.	4.6	18	54	70	80	80	80
TD-BA05G-100T	3	450 ma.	2.4	17	45	62	80	80	80
TD-BA05J-100T	3	1 amp.	.4	14	32	44	70	80	80
TD-BA05L-100T	3	3 amp.	.2	12	28	36	55	80	80
TD-BA05M-100T	3	5 amp.	.08	10	26	34	48	80	80

*Can also be supplied in configurations shown in Figures 2 and 3.

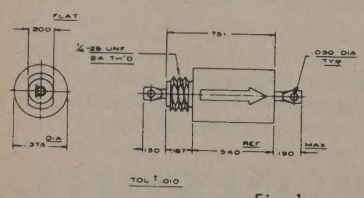


Fig. 1

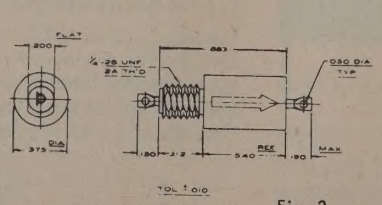


Fig. 2

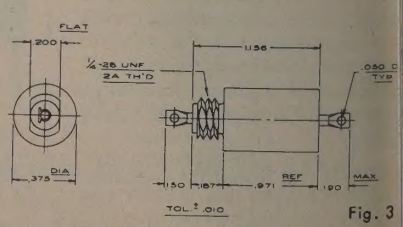


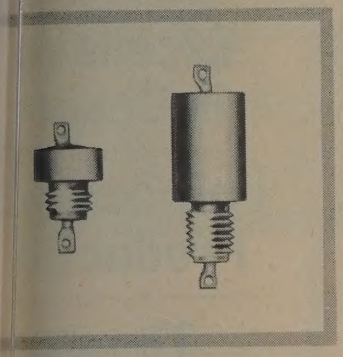
Fig. 3

Gulton Industries, Inc. Microceramics Division
Metuchen, New Jersey 08840
Phone: 201-548-2800 • TWX-710-998-059

Gulton

EMI BROAD BAND LOW PASS FILTERS

SUBMINIATURE AND MINIATURE



Gulton offers the widest range of broad band low pass filters on the market today...subminiature BUTTON series, miniature TEMPERATURE STABLE series and standard broad band series. They are available in 50 VDC to 300 VDC, 125 VAC and 185 VAC voltage ratings and 60 ma. to 15 amp. current ratings. Note...BUTTON series...the smallest broad band filters. Gulton has the most comprehensive line of broad band filters. Call Gulton to solve your EMI problems.

BUTTON SERIES L NETWORK 50 VDC

PART NUMBER	FIG. NO.	CURRENT DC Max.	CAPACITANCE Min.	VOLTAGE DC	MINIMUM INSERTION LOSS - FULL LOAD					
					30 KHz	150 KHz	300 KHz	1 MHz	10 MHz	1 GHz
MF-420-BPT	1	15 amp.	1.4μf	50	15	28	33	44	60	70
MF-470-BPT	2	15 amp.	1.4μf	50	15	28	33	44	60	70

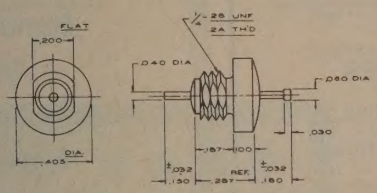


Fig. 1

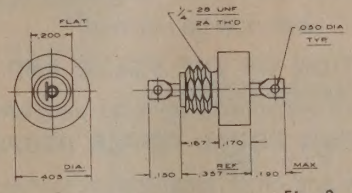


Fig. 2

STANDARD BROAD BAND SERIES L NETWORK 50 VDC

PART NUMBER	FIG. NO.*	CURRENT DC Max.	RESISTANCE DC Max.	MINIMUM INSERTION LOSS					
				30 KHz	150 KHz	300 KHz	1 MHz	10 MHz	1 GHz
LD-FB05B-100S	1	60 ma.	70	44	70	70	70	70	70
LD-FB05D-100S	1	150 ma.	12	24	52	64	70	70	70
LD-FB05E-100S	1	250 ma.	4	18	42	56	70	70	70
LD-FB05F-100S	1	300 ma.	2.3	16	35	44	62	70	70
LD-FB05G-100S	1	450 ma.	1.2	15	31	37	55	70	70
LD-FB05N-100S	1	10 amp.	.01	15	28	33	44	64	70

*Can also be supplied in configurations shown in Figures 2 and 3.

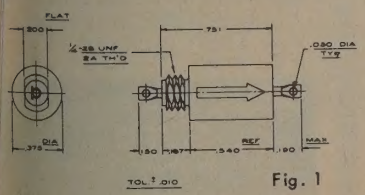


Fig. 1

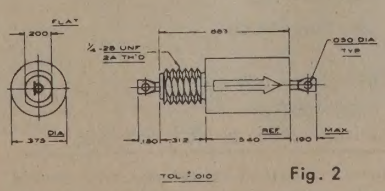


Fig. 2

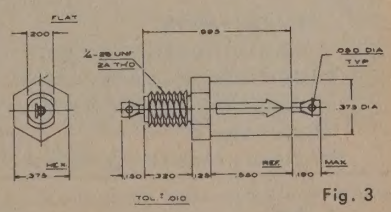


Fig. 3

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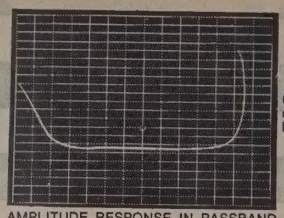
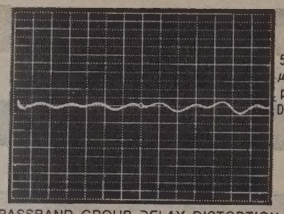
HOW KAPPA GETS CONSTANT DELAY IN *STEEP RESPONSE* FILTERS!



AMPLITUDE RESPONSE IN PASSBAND



PASSBAND GROUP DELAY DISTORTION

Difficult? . . . of course! . . . but
WE PROGRAMMED A GENERAL SOLUTION
in double precision **FOR** a high-speed digital computer,
to enable us to meet the demands of systems
requiring delay distortionless transmission.
ANY PREDETERMINED ENVELOPE DELAY
can now be attained
BY ITERATION OF THE POLES AND ZEROES
of a complete system with up to 50 equalizer sections.
By **ACHIEVING EQUAL RIPPLE RESPONSE** this
method outperforms any other equalization technique in minimizing
delay distortion. KAPPA design engineers
can assist you in attaining **ECONOMICALLY** an improved accuracy of
time correlation between signals in data transmission systems.

KAPPA 2211 SERIES FILTERS

(TYPE: BAND PASS)

PASS BAND RESPONSE:	
Frequency Range:	3300-6000 Hz (1 db points)
Amplitude ripple:	± 0.25 db.
Group Delay Distortion:	Less than ± 100 usec.
Insertion Loss at 4500 Hz:	Less than 2.5 db
STOP BAND RESPONSE:	Min 50 db at 3000 Hz and lower Min 50 db at 6420 Hz and higher
Impedance Range:	500-6000 ohms
Pass Band Harmonic Distortion:	Less than −65 db
Intermodulation Distortion between equal simultaneous level tones:	55 db below −10 dbm
Environmental:	MIL F-18237 B

For prompt engineering assistance call us collect at (201) 541-4226

Contact us for the name of your nearest representative or consult listing in this directory. Complete new catalog available.

KAPPA NETWORKS, INC.
Delay Line Specialists • Electric Wave Filters
Manufacturing Engineers
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KAPPA FILTERS

Excellence in Design

Uniformity in Production

Timely Delivery

Low Pass
High Pass
Band Pass
Band Stop
RFI
Delay Correcting Networks
DC to 100 MHZ

SPECIFY:
Type:
Frequencies:
Cutoff:
Max. Attenuation:
Impedance:

We will computer-desig your special Filter requir ments for production real

Feel free to consult our we staffed Filter Department any help, anytime.

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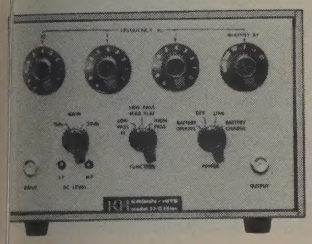
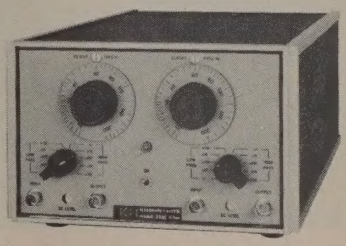
THE FINEST IN VARIABLE ELECTRONIC FILTERS

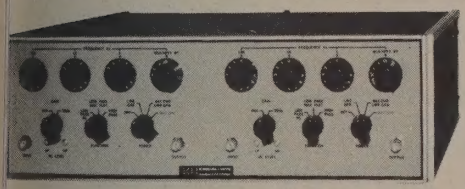


Model 3321 Single Channel
.01 Hz to 99.9 kHz

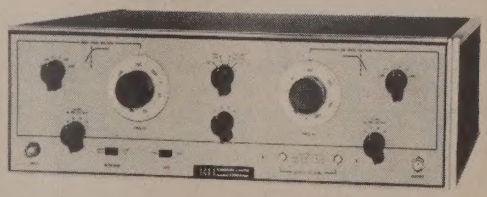
Model 3550 2 Hz to 200 kHz



Model 3202 20 Hz to 2 MHz



Model 3343 Dual Channel .01 Hz to 99.9 kHz



Model 3750 Tunable Multifunction .02 Hz to 20 kHz

Frequency Range	Filter Model*	Function BP	BR	HP	LP	Add. Feature	Freq. Acc. %	Attenuation Slope db/octave	Hum and Noise (RMS)	Max. Attenuation	Output Volt/Amps (RMS)	3 db Points	Approx. Shipping Weight lbs/kgs	Price U.S.A. Only
.001 Hz – 99.9 kHz	3320			X	X	Batt. Op.	2%	24	0.5 mv	80 db	5v/50ma	dc – 1 MHz	24/11	$ 725
.001 Hz – 99.9 kHz	3322	X	X	X	X	Batt. Op.	2%	24/48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	34/16	$1395
.001 Hz – 99.9 kHz	3340			X	X	Batt. Op.	2%	48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	27/12	$1075
.001 Hz – 99.9 kHz	3342	X	X	X	X	Batt. Op.	2%	48/96	0.5 mv	80 db	5v/50ma	dc – 1 MHz	40/18	$2075
.01 Hz – 99.9 kHz	3321			X	X	Batt. Op.	2%	24	0.5 mv	80 db	5v/50ma	dc – 1 MHz	24/11	$ 635
.01 Hz – 99.9 kHz	3323	X	X	X	X	Batt. Op.	2%	24/48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	34/16	$1225
.01 Hz – 99.9 kHz	3341			X	X	Batt. Op.	2%	48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	27/12	$ 995
.01 Hz – 99.9 kHz	3343	X	X	X	X	Batt. Op.	2%	48/96	0.5 mv	80 db	5v/50ma	dc – 1 MHz	40/18	$1825
.02 Hz – 2 kHz	330B	X					5%	24	0.1 mv	80 db	10v/1ma		35/16	$ 595
.02 Hz – 20 kHz	3750	X	X	X	X	Batt. Op.	5%	6, 12, 18, 24	0.2 mv	80 db	10v/2ma	dc – 1 MHz	26/12	$ 850
.2 Hz – 20 kHz	3700	X				Batt. Op.	5%	24	0.2 mv	80 db	5v/1ma		19/9	$ 550
2 Hz – 200 kHz	3550	X	X	X	X		5%	24	0.2 mv	60 db	5v/10ma	.2 Hz – 3 MHz	15/7	$ 525
10 Hz – 1 MHz	3100	X					5%	24	0.1 mv	80 db	3v/10ma		17/8	$ 590
10Hz – 3 MHz	3103	X					5%	24	0.15 mv	80 db	3v/10ma		17/8	$ 640
20 Hz – 200 kHz	3500	X					10%	24	0.2 mv	60 db	5v/10ma		14/7	$ 395
20 Hz – 2 MHz	3200			X	X		5%	24	0.1 mv	80 db	3v/10ma	dc – 10 MHz	16/8	$ 450
20 Hz – 2 MHz	3202	X	X	X	X		5%	24/48	0.1 mv	80 db	3v/10ma	dc – 10 MHz	22/10	$ 795

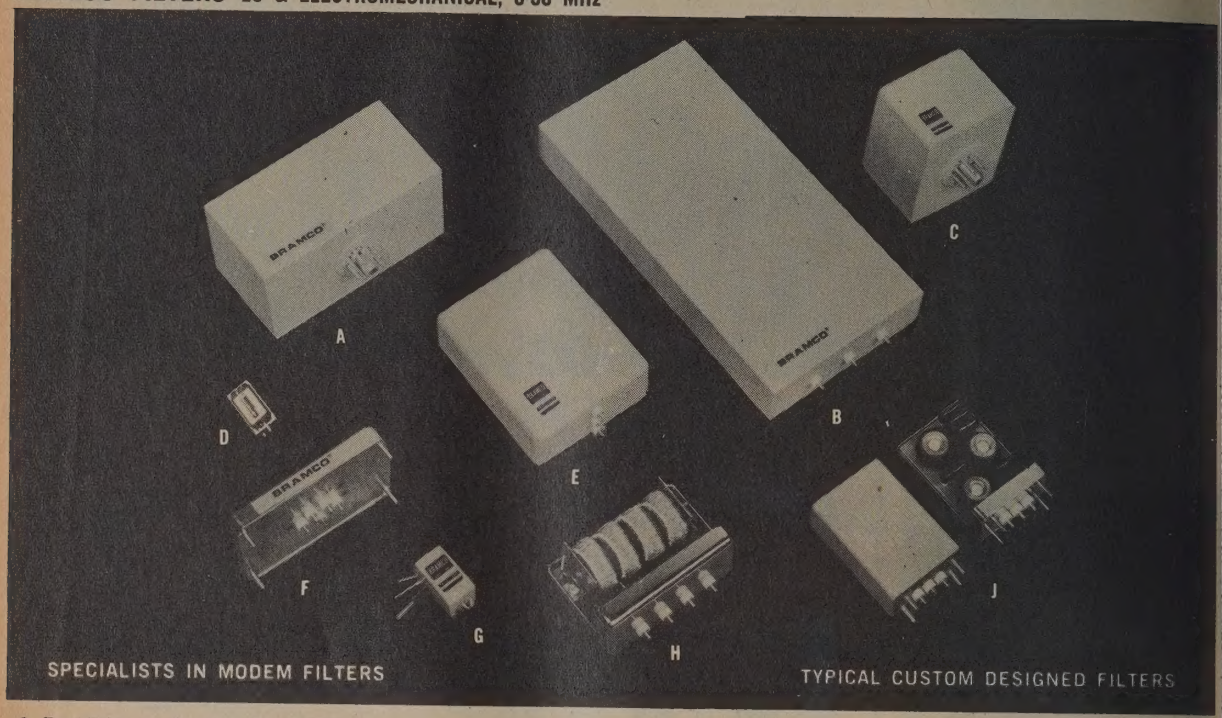
BP – Band Pass BR – Band Reject HP – High Pass LP – Low Pass *Add suffix "R" for Rack mounting

For complete details, write: The Wavemakers:
Krohn-Hite Corporation, 580 Massachusetts Avenue,
Cambridge, Mass. 02139 U.S.A.
Tel: (617) 491-3211 TWX: 710-320-6583

KROHN-HITE CORPORATION

OSCILLATORS / FILTERS / AC POWER SOURCES / AMPLIFIERS

BRAMCO FILTERS LC & ELECTROMECHANICAL, 0-50 MHz



A. Tone Telegraph Bandpass Receive Filter
(MIL-F-18327/7)
Insertion loss: less than 8 db in the pass band
fc: 425 to 3825 Hz in 170 Hz increments
Transformer isolation between input and output
Size: 4 15/16" x 2 9/16" x 2 9/16"

B. Tone Accessory Band Stop Filter
For use with 600 ohm source and load
Typical insertion loss: 3 db, 20 Hz to 1.43 kHz
60 db, 1.58 kHz to 1.9 kHz
3 db, 2.1 kHz to 20 kHz
Size: 9" x 4½" x 1¼"

C. Tone Telegraph Bandpass Transmit Filter
(Mil-F-18327/7)
Specifications same as receive filter (A) except insertion loss less than 5 db in the passband
Size: 2 15/16" x 2 1/16" x 2 9/16"

D. RF20
Contactless Resonant Reed Filter, 80 to 3000 Hz
Works as audio tone filter or stable frequency source (±0.15%) for audio tone generator. See Section 2300 for more details.

E. Tone Accessory Low Pass Filter
For use with 600 ohm source and load
Typical insertion loss: less than 3 db, 20 Hz to 3 kHz
greater than 60 db, 3.45 kHz to 20 kHz
Size: 4" x 3¼" x 1¼"

F. Dual Hipass - Lowpass Filter
Insertion loss, lowpass section: less than 1 db, 20 Hz to 400 Hz
less than 3 db, 400 Hz to 4 kHz
greater than 40 db, 9.5 kHz to 20 kHz
Insertion loss, highpass section: less than 1 db, 9 kHz to 20 kHz
greater than 40 db, 20 Hz to 4 kHz
Operating Temperature: −40 to +85°C
Size: ⅝" x 2¼" x 3¾"

G. EIA Land Mobile Low Pass Voice Filter
1000 ohms source and load impedance
Insertion loss: less than 2 db in passband
greater than 10 db at 4.4 kHz
greater than 30 db at 9.5 kHz and above
Operating Temperature: −30 to +60°C
(EIA Shock and Vibration specs)
Size: ¾" x ⅝" x 1¼"

H. Tone Telegraph Bandpass Receive Filter
fc: 420 Hz to 3180 Hz in 120 Hz increments
Insertion loss: typically 6 to 10 db in the passband
Size: 3¼ x 2¼" x 1¼"

J. Radio Receiver Low Pass Filter
(Mil-F-18327/14, Type FR60X11YY1)
Insertion loss: less than 1 db from 200 Hz to 3 kHz
less than 3 db at 3.5 kHz
greater than 20 db at 3.5 kHz
greater than 45 db from 4.5 kHz to 20 kHz
Operating Temperature: −55°C to +85°C
Size: 2¾" x 1 29/32" x 31/32"

At Bramco the emphasis is in custom engineering LC and electromechanical filters.

We offer broad experience, fast engineering response. Know how to squeeze into tight spots, odd shapes. Use computer synthesis program for optimum design. Build to Mil-F-18327 or commercial specs.

Write for helpful data sheets, or outline application requirements. We'll welcome the chance to work with you. See section 2300 for other Bramco frequency products.

LEDEX

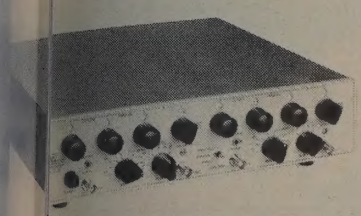
BRAMCO CONTROLS DIVISION, LEDEX INC.
550 South College Street, Piqua, Ohio 45356 • phone (513) 773-8271

active filters

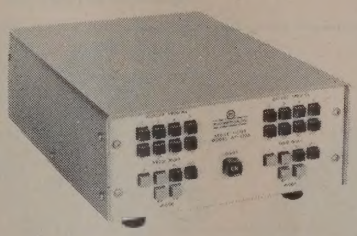
variable and fixed .0001Hz to 2MHz

This extensive line of active filters is computer-designed for optimum performance and versatility. All variable units have individual channels operable as either Low Pass or High Pass filters. The interconnection of independent channels gives Band Pass, Band Reject or steeper attenuation slopes.

Selectable T/D response enables altering filter performance from frequency domain (Butterworth) to Time Domain for optimum transient (pulse) behavior. All instruments have rack mounts available and are stocked for quick delivery.



Series AF-700
Selectable slopes (6, 12, 18 or 24db/octave); tunable spikes & notches each channel. Outstanding versatility for systems or general laboratory use. 115/230 VAC or battery operation.

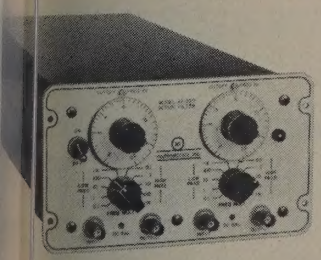


Series AF-500A
0.2Hz to 20KHz; Push Button Digital Tuning. High performance in a low cost package. Simple keyboard operation. Ideal for laboratory or production use.

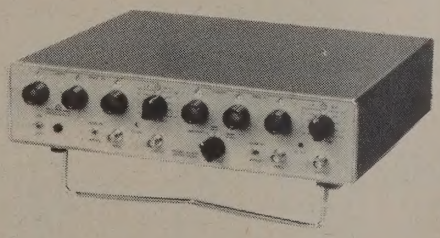
DEL	AF-110	AF-120	AF-210	AF-220	AF-410	AF-420	AF-410L	AF-420L	AF-510A	AF-520A	AF-610	AF-620	AF-710	AF-720	AF-710L	AF-720L
FREQ. NGE, Hz.	20 to 2M		0.2 to 20K		0.01 to 99.9K		0.001 to 9.99K		0.2 to 20K		REMOTELY PROGRAMMABLE VERSIONS OF AF-400 AND AF-700 SERIES		0.01 to 99.9K		0.001 to 9.99K	
ACCURY	±5%		±5%		±2%		±2%		±5%				±2%		±2%	
CHANS	1	2	1	2	1	2	1	2	1	2			1	2	1	2
TUNIN	← CONTINUOUS →				← DIGITAL SWITCH →				DIGITAL PUSH BUTTON				← DIGITAL SWITCH →			
SLOPE db/Octave	← 24 (48 — 2 CHANNELS IN SERIES) →												6, 12, 18 OR 24/CHANNEL (48 MAX. 2 CHANNELS)			
	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP	HP, LP				BP, BR		BP, BR
FUNCNS		BP, BR		BP, BR	BYPASS	BP, BR	BYPASS	BP, BR		BP, BR			HP, LP, BYPASS BPN* OR BRN† EACH CHANNEL			
						BYPASS		BYPASS								

PN = rrow Band Pass (Q = 16 or 25) each channel!

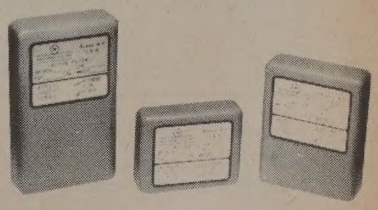
†BRN = Twin Tee Notch — Low or Medium Q each channel!



eries AF-100 & AF-200
uggy built. Designed for a wide nge f applications.



Series AF-400
Superb accuracy and stability. 115/230 VAC or battery.



Series AF-300
Fixed frequency mini-sized modules; Low, High, Band Pass, Band Reject and Notch functions; Butterworth, Chebyshev, Legendre and elliptic responses.

erie AF-600 (not shown)
esig d for manual use and to interace th computer outputs; analog or igita automatic test systems.

Other frequencies, response characteristics and pole configurations available. Call or write for information on our entire line. Our engineers talk your language.

multimetrics, inc.

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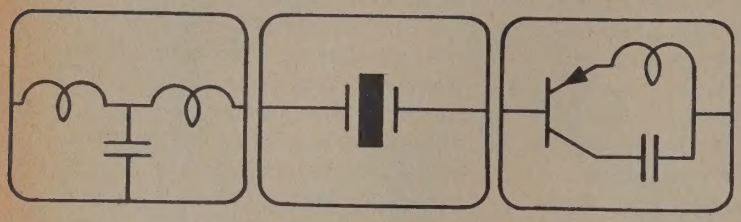


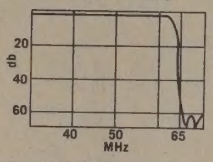
Radaro Electronics creates filters desig ed meet both special and standard require en Working from customer performance p an ters, Radaro utilizes network synthes a computer technologies to design the ro filter for the specific job to be done. S ec such values as center frequency, tole no bandwidth requirements, response, ro impedances, insertion losses, tempe tu ranges, and dimensional needs, and id can do the rest.

PRECISION FILTERS: *LC* • *CRYSTAL* • *ACTIVE*

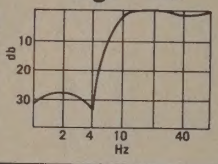
Manufactured to: MIL-F-18327C

LC

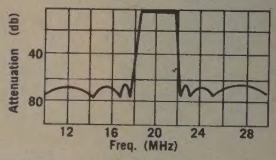
Low Pass



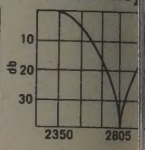
High Pass



Band Pass



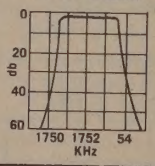
Band Rej t



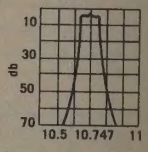
Center Frequency	—	—	20 MHz	2805 Hz
Cut-off Frequency	60 MHz	10 Hz	—	—
Bandwidth	—	—	3.2MHz	700 Hz @ 3
Ripple	0.8 db	1 db	1.5 db	—
Attenuation	60 db	40 db	70 db	> 35 db
Impedance	50 ohms	10,000 ohms	200 ohms	600 ohms

XTAL

S. S. Band



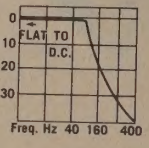
Band Pass



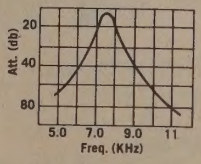
Center Frequency	1750 KHz	10.747 MHz
Cut-off Frequency	—	—
Bandwidth	3.2 KHz	800 Hz
Ripple	1.5 db	0.25 db
Attenuation	60 db	60 db
Impedance	250 ohms	600 ohms
Carrier Reject	30 db min.	—

ACTIVE

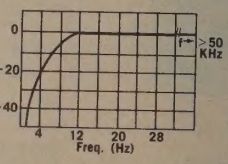
Low Pass



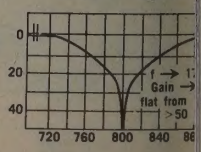
Band Pass



High Pass



Band Reject



Center Frequency	—	7.5 KHz	—	800 Hz
Cut-off Frequency	75 Hz	—	10.0 Hz	—
Input Impedance	>> 10K ohm	>> 10K ohm	>> 10K ohm	> 10K ohm
Output Impedance	1 ohm nom.	1 ohm nom.	1 ohm nom.	1 ohm nom.
Gain	1.00 ±2%	23 db ±1 db	1.00 ±2%	1.00 ±2%
Phase	248° ±3° @ fc	—	124° ±3°	—
Ripple	.1 db	1 db	.1 db	—
Bandwidth	—	200 Hz @ 3 db	—	154 Hz @ 3 d

HIGH PASS, LOW PASS, BAND PASS, NOTCH, SINGLE SIDE BAND, BAND REJECT

STANDARD DESIGNS AND SUPERGROUPS.

MEET HIGHEST PERFORMANCE AND ENVIRONMENTAL SPECIFICATIONS.

NETWORK SYNTHESIS AND COMPUTER PROGRAMMING FOR PRECISE FILTER DESIGNS.

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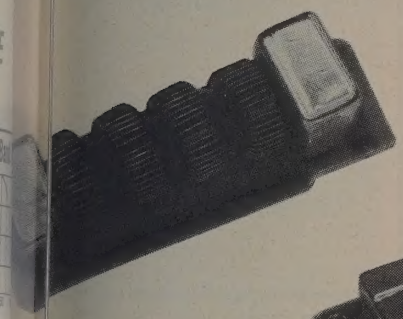
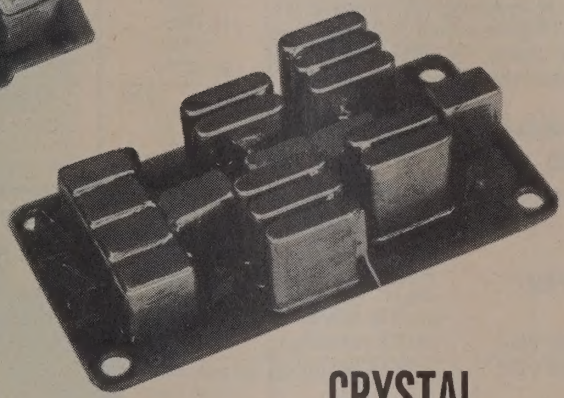
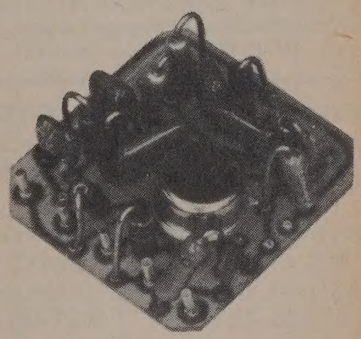
PRECISION FILTERS







LC FILTERS

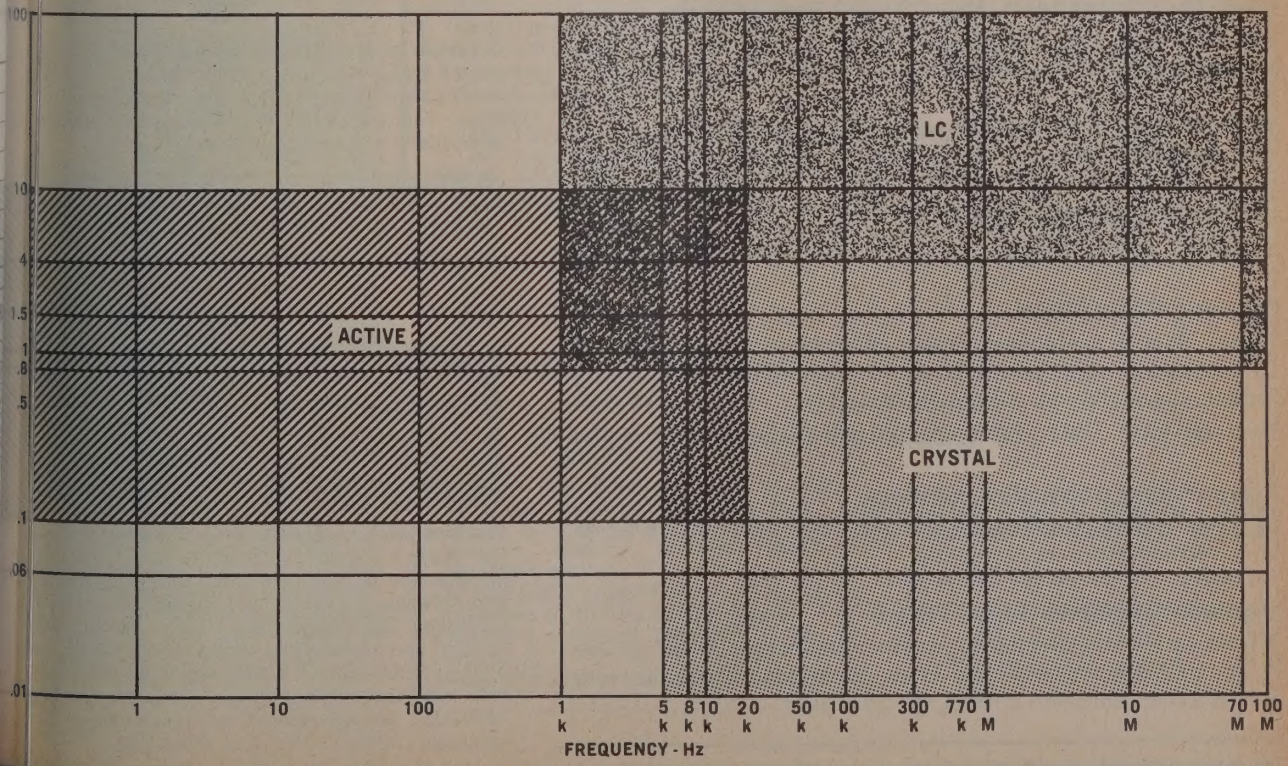
Telegraph, Telemetering, Low Pass, High Pass, Band Pass, Band Stop, Amplitude and Phase Equalizers, Discriminators, High Q Coils, Low Pass-Band Pass Combination, Low Pass-High Pass Combination, Band Pass-Band Reject Combination

CRYSTAL FILTERS

Single Side Band, Band Pass, Amplitude and Phase Equalizers, Band Reject.

ACTIVE FILTERS

Notch, Band Pass, Band Stop, Band Reject, Tunable Phase, Tunable Band Pass, Low Pass, High Pass, All Pass.



RF INTERONICS

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A Division of KDI Navcor, Inc.

Now more than ever the nation's leading producer of RFI/EMC filters and capacito

Over a period of many years, the engineering and production teams at RF Interonics have built a reputation for unsurpassed technical competence, quick-reaction capability, and proven, reliable performance. The nex RFI is a problem to you, call RF Interonics. Your i will receive a prompt and meaningful response.

RF Interonics Parts on QPL of MIL-F-15733

The types listed below are representative of thousands of standard and custom-engineered filter units and assemblies described in our catalog. With extensive inventories of off-the-shelf filters, RF Interonics stands ready to offer fast delivery and expert engineering service to meet your exacting RFI/EMC filter requirements.

Cylindrical Filters, Per MIL-F-15733

Style FL 22 ..... 100 VDC ..... 1 to 30 Amps
Style FL 24 ..... 400 VDC ..... 1 to 55 Amps

Rectangular Filters, Per MIL-F-15733

Style FL 51, FL 56 ..... 100 VDC ..... 1 to 55 Amps
Style FL 53, FL 57 ..... 125 VAC, 400 VDC ..... 1 to 55 Amps
Style FL 54, FL 58 ..... 250 VAC, 600 VDC ..... 1 to 55 Amps

L & PI Circuit Cylindrical Filters, RF700 Series

(A Standard of the Industry for more than 9 years)
100 VDC, 115 & 250 VAC ..... 0.5 to 50 Amps
Insertion loss: 40 db @ 150 KHz, to 80 db @ 150 KHz

Feed-Thru Capacitors—MIL-C-11693 Performance

Standard and custom-engineered types, subminiature to high-current units, 0.047 to 10 MFD.

PI, T & L-Circuit Subminiature Cylindrical Filters

50 & 100 VDC, 115 VAC . . . Up to 10 Amps . . . High Insertion Loss

Multiple-Circuit Assemblies

115 VAC (Line-to-Ground) ..... 3 to 50 Amps per circuit

Shielded Room Filters

Single, Dual, Triple & Four-Circuit assemblies, with a variety of configurations and performance characteristics. Completely welded assemblies for maximum reliability.

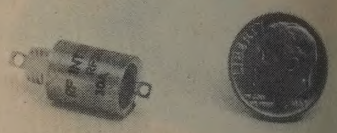
Up to 450 VAC . . . 25 to 200 Amps (Special designs to 2000 Amps)

Power Factor Correction Inductors

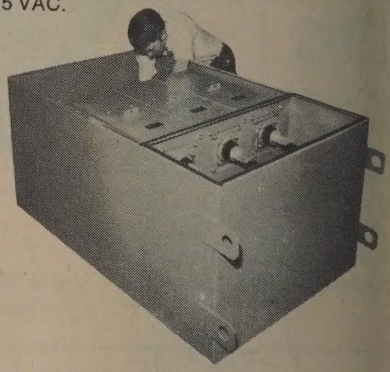
For the elimination of loading effects of high-capacitance filters on limited-current power sources.

Signal & Telephone Circuit Filters

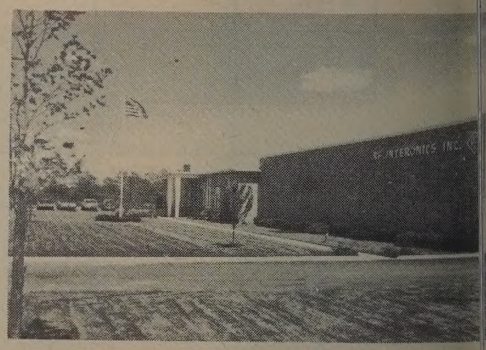
A wide variety of standard and custom-engineered filters for use in communications and data lines requiring compliance with sophisticated emission control specifications.



Subminiature Ceramic Types. We were one of th Three basic lines to choose from: 50 VDC, 100 and 115 VAC.



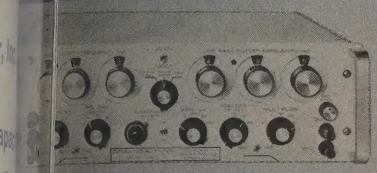
A Variety of Much Bigger Ones, Too. Thousan proven types available, as standard or custom-g neered assemblies. Ratings from 1 milliamp to 2 amps, from 0.1 volt to 20,000 volts, from fractio an ounce to more than 1,000 lbs.!



The Most Modern Facility of its Type in the Coun Our plant is industrially engineered for the effic manufacture of high-reliability radio frequency fil and capacitors. It is fully air conditioned and humi controlled. Clean rooms are maintained for capac winding and assembly of space-quality filters. A co plete in-house capability includes sheet metal fabri tion, inductor winding, vacuum impregnation and necessary processing and test equipment to ass adequate control and quick-reaction time.

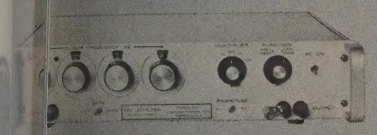
ROCKLAND

Analog and Digital Signal Processing Instrumentation



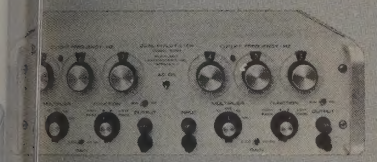
PERATIONAL* FILTER — SERIES 1000

ariable-order filter, provides high-pass, low-pass, band-pass, or band reject characteristics and up to 40 db gain; also functions as sinusoidal oscillator.



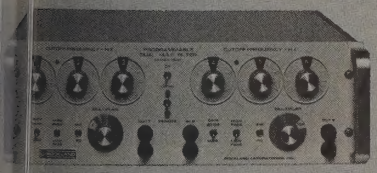
HI/LO* FILTER — MODEL 1020F

Provides fourth-order (24 db/oct) high-pass, low-pass characteristic, and 0 or 10 db passband gain. Two units are required for band-pass or band-reject response.



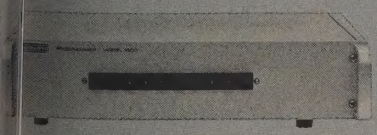
DUAL HI/LO* FILTER — MODELS 1022F, 1042F

Two dependent channels in one instrument offer low-pass, high-pass, band-pass and band reject characteristics with attenuation slopes from 24 db/oct up to 96 db/oct and up to 40 db passband gain.



PROGRAMMABLE DUAL HI/LO FILTER SERIES 1500

Intended for automatic systems applications, this series includes models with Local and Remote or Remote only programming. These instruments may be controlled by computer, punched cards, tape or contact closures.



PROGRAMMER — MODEL 1600

Provides pushbutton selection of 10 different 46-bit programs for controlling programmable instruments, such as the Series 1500 Filters, counters, DVM's, synthesizers et al. Price range: $650 to $[illegible] depending on options.

*Trademark

FEATURES:

1. Digital Frequency Selection.
2. ±2% Cutoff Frequency Accuracy across the entire tuning range.
3. Cutoff Frequency Temperature Coefficient of ±200 ppm/°C, max.
4. Butterworth (maximally flat) and RC (transient-free) response.
5. 10 Meg input impedance (except Series 1000: 2 Meg) and 50 ohm output impedance.
6. 115/230 Vac or external battery operation (except Programmable Series: AC only).
7. Bench/Rack Convertible Cabinet. Tilt stand and rack adaptors included.

MODEL	FREQUENCY RANGE	ATTENUATION SLOPE	OUTPUT	NOISE (RTI)	GAIN db	PRICE
OPERATIONAL						
1000F	.001 Hz - 11 KHz	0,6,12,18,24 db/oct	30 v, p-p	30 uv	0,6,20,40	$1495
1000F-01	.01 Hz - 11 KHz	"	"	"	"	$1375
1000T	999 sec - 1 msec	"	"	"	"	$1650
1000T-01	99 sec - 1 msec	"	"	"	"	$1530
HI/LO						
1020F	.001 Hz - 111 KHz	24 db/oct	20 v, p-p	50 uv	0,20	$ 745
1020F-01	.01 Hz - 111 KHz	"	"	"	"	$ 695
DUAL HI/LO						
1022F-01	.01 Hz - 111 KHz	24 db/oct	20 v, p-p	50 uv	0,20	$1425
1022F-02	.001 Hz - 11 KHz	"	"	"	"	$1425
1022F-03	.1 Hz - 111 KHz	"	"	"	"	$1325
1022F-04	.01 Hz - 11 KHz	"	"	"	"	$1325
1042F-01	.01 Hz - 111 KHz	48 db/oct	"	100 uv	"	$2025
1042F-02	.001 Hz - 11 KHz	"	"	"	"	$2025
1042F-03	.1 Hz - 111 KHz	"	"	"	"	$1875
1042F-04	.01 Hz - 11 KHz	"	"	"	"	$1875
PROGRAMMABLE DUAL HI/LO						
1512	.01 Hz - 111 KHz	24 db/oct	20 v, p-p	50 uv	0,20	$2175
1513	.001 Hz - 11 KHz	"	"	"	"	$2185
1514	.1 Hz - 111 KHz	"	"	"	"	$1985
1515	.01 Hz - 11 KHz	"	"	"	"	$1995
1522	.01 Hz - 111 KHz	"	"	"	"	$2450
1523	.001 Hz - 11 KHz	"	"	"	"	$2465
1524	.1 Hz - 111 KHz	"	"	"	"	$2260
1525	.01 Hz - 11 KHz	"	"	"	"	$2275

1. Series 1510 (Models 1512 thru 1515) feature Remote only programming.
2. Series 1520 (Models 1522 thru 1525) feature Local (Manual) and Remote Programming.
3. Programming is accomplished through contact closure to ground and utilizes 1-2-4-8 BCD code.
4. The following options are available:
   OPTION
   -01: 1-2-2-4 BCD, Contact closure to ground. Same price.
   -02: 1-2-4-8 BCD, Positive Logic, "0" = 0 v ± 0.5 v, "1" = + 2.5 v to +20 v. Add $250.
   -03: 1-2-2-4 BCD, Positive Logic, "0" = 0 v ± 0.5 v, "1" = + 2.5 v to +20 v. Add $250.
5. Consult factory for other options.

Prices: F.O.B. Blauvelt, New York 10913

Terms:
Net 30 Days - 1%-10 from Date of Invoice.

NEW!

DIGITAL FILTERS SERIES 4000

- Versatile digital processing of analog or digital signals (band-pass, band-reject, all-pass, comb filtering, correlation, spectral analysis, signal synthesis etc.)
- Multichannel Capability — up to 50 channels at 10 KHz sampling rate.
- Arbitrary accuracy (16 and 24 bits standard).
- Programmable or fixed characteristics.

ROCKLAND

Rockland Systems Corporation,
Rockland Laboratories Division
131M Erie St. East,
Blauvelt, N. Y. 10913

NETWORKS • FILTERS

Featuring CUSTOM DESIGNS at STOCK PRICES

PROTOTYPES AVAILABLE AS EARLY AS 2 WEEKS

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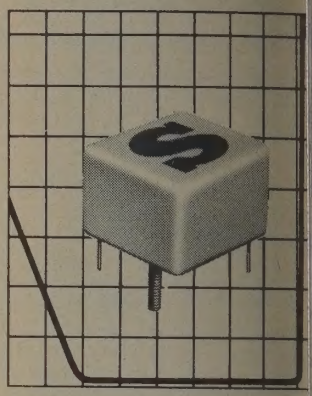
CRYSTAL
ACTIVE

• BANDPASS • BAND REJECT • LOWPASS
• HIGHPASS • DELAY CORRECTED •
PHASE MATCHED • MINIATURIZED
SUBAUDIO (DC) TO 300 MHz



OUR ENGINEERING DEPARTMENT WELOMES A DISCUSSION OF YOUR FILTER & EQUALIZER PROBLEMS

Advanced Computer Programming with an extensive computer facility plus a tremendous library of normalized designs added to the finest engineering capability in the industry enables SEG to react to your needs with amazing speed and to MIL Spec.

We have extensive experience in meeting your ne for such applications as: Telemetry, Over and unde sh control, aliasing, FSK, data-handling, time-domai s thesis, tunable characteristics, group delay, pha intercept control.

PROBLEMS SOLVED FOR: MINIATURIZATION, ANTENNA MATCHING, RINGING, DCA Specs, PULSE COMPRESSION & EXPA, FREQUENCY SWITCHING

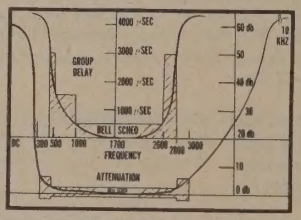
TELEPHONE LINE SIMULATION for MODEM TESTING

DELAY & ATTENUATION DISTORTION

NOMINAL "WORST-CASE"

Bell Sched.	Seg P/N
3002	FA1445
C1	FA1446
C2	FA1447
C4	FA1448

w/out of band rejection



PHASE JITTERER with LINE NOISE

0 to ±45° adjust
30 to 300Hz rep rate w/phase shift
Model FA1564

Impulse Noise FA1565
12 to 180 Pulses/min.
Broad band Noise
Model FA1566

MODEL FA1575 — The Complete Line Simulator w/4 lines, Phase Jitter and Noise

FREQUENCY SHIFTER under development

DELAY DISTORTION EQUALIZA C

with ATTENUATION EQUALIZATION

for MODEM, SATCOM — TELEPHONE LINE, Audio, RF, H

COMPROMISE EQUALIZERS

	Bell Sched	Se P
• Delay		
• Attenuation	3002	FA
• Fixed	C1	FA
• Halves Distortion	C2	FA
	C4	FA

SWITCHABLE DELAY DISTORTION EQUALIZE
with Line-Matching Parabolas and Slopes
Satcom 50-90 MHz • Telephone Lines

PROGRAMMABLE EQUALIZER AND FILTER
ADAPTIVE Equalizer under development

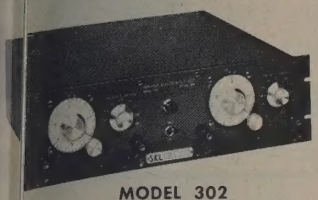
SEG ELECTRONICS has built networks for:
MINUTEMAN: extremely high reliability
MICROTACAN: sophisticated filters in small packag

FILTERS • LINE EQUALIZERS • LINE SIMULATORS • DELAY LINES • INSTRUM

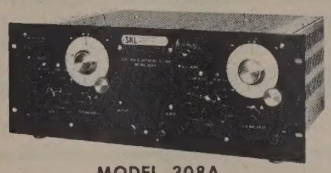
SEG ELECTRONICS CORPORATION

120-30 JAMAICA AVE. • RICHMOND HILL, N. Y. 11418 • 212 - 441-

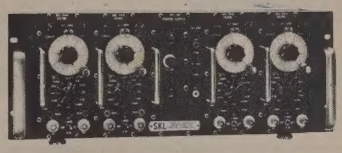
VARIABLE ELECTRONIC FILTERS



MODEL 302



MODEL 308A



SOLID STATE MODEL 364

Above: Four 364 Filter Sections, with 381 Power Supply and 391 Filter Frame

CONDENSED SPECIFICATIONS

	MODEL 302	MODEL 308A	MODEL 364
FUNCTIONS	High, Low, Band-Pass or Band Reject	High, Low, Band-Pass or Band Reject	High, Low, Band-Pass or Band Reject
CUTOFF FREQUENCY RANGE	20 Hz to 200 kHz	0.2 Hz to 20 kHz	20 Hz to 2 MHz
PASS BAND LIMITS	Low pass: 2 Hz lower half power point. High pass: 4 MHz upper half power point.	DC to 1 MHz	DC to 15 MHz (3 dB point)
MAXIMUM ATTENUATION	Greater than 90 dB	Greater than 80 dB	80 dB below 200 kHz 60 dB 200 kHz-2 MHz 50 dB above 2 MHz
ATTENUATION SLOPE	18 dB per octave	24 dB per octave	24 dB/octave
INSERTION LOSS	0 ± 1 dB 20 Hz to 20 kHz 0 ± 2 dB 20-200 kHz	4.5 dB ± 1.0 dB	GAIN: 12 dB, open circuit; 6 dB, 75-ohm load
HUM & NOISE	80 dB below 1 volt (100 μv)	80 μv or less	100 μV 0.2-2 MHz high-pass < 50 μV all other ranges
PRICE	$980.00	$1,475.00	364 Filter $950.00 ea. section 381 Power Supply $550.00 with 391 Frame

WIDE-BAND VHF (40-220 MHz) AMPLIFIER

MODEL 222B

Distributed amplifier covering complete VFH TV and FM bands. Low cross-modulation permits simultaneous amplification of 12 or more TV channels. Choice of two slopes or flat response: Bandwidth, 40-216 MHz; Frequency Response, 3.5 or 6.5 dB, sloped; flat with SKL 200-22 Equalizer; Voltage Gain, 25 dB minimum at 216 MHz; Impedance, 75 ohms, input and output; Return Loss, 20 dB minimum, input and output; Noise Figure, 13 dB maximum, at 216 MHz.

PRICE $280.00 to $350.00 dependent on quantity ordered.

MODEL 503A

Ideal for testing the transient response of wide-band systems in radar, communications and nuclear research. Rise Time, 0.5 nsec; Pulse Width, 0.6-10 nsec. int., unrestricted with ext. network; PRR, 50-120 pps; Impedance, 50 ohms; Trigger Input, 10V p-p; Pulse Amplitude, 0-150 int.; 1000V with ext. supply.

PRICE $495.00

FAST RISE PULSE GENERATOR

RISE TIME 0.5 NANOSEC. PULSE AMPLITUDE TO 1000 V.

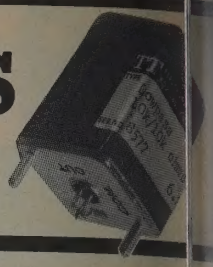
SKL also manufactures a complete line of transistorized cable television equipment, featuring double pilot equalization. For complete specifications, write:

SKL

SPENCER-KENNEDY LABORATORIES, INC.

2 LOWELL AVENUE • WINCHESTER, MASS. 01890 • TEL. (617) 729-5800

TT *miniature* FILTERS



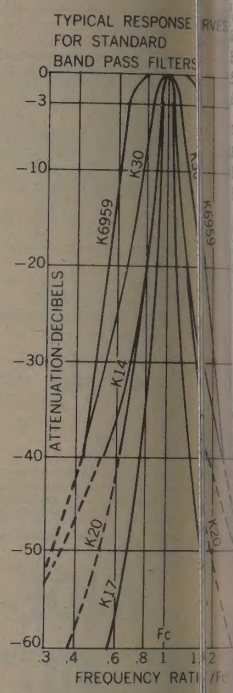
THESE PAGES CATALOG OVER 1,000,000 STANDARD FILTER TYPES — SPECIFY ANY COMBINATION OF FREQUENCY, SOURCE AND LOAD OHMS WITHIN THE MIN-MAX RANGES

These pages give complete electrical, mechanical and price information for ordering standard filters. Quality control per MIL-Q-98

BANDPASS FILTERS FOR ANY CENTER FREQ. FROM 30Hz TO 500KHz (Specials from 10Hz upward

Series	F_c Center Freq. Range Min.	Max.	Bandwidth at −3db	Attenuation	Source, Ohms Min.	Max.	Load, Ohms Min.	Max.	Case Size	Approx. Price
K10	500Hz	9.9KHz	$\pm1\%F_c$	30db at $.92F_c$ & $1.1F_c$	1K	500K	1K	500K	4	$39
K11	10KHz	200KHz	$\pm1\%F_c$		1K	10K	1K	10K	2	$39
K13	30Hz	99Hz	$\pm5\%F_c$	60db at $.5F_c$ & $2F_c$	1K	500K	1K	500K	5	$55
K14A	100Hz	100KHz	$\pm5\%F_c$	40db at $.5F_c$ & $2F_c$	500	10K	100	1Meg	3	$32
K14B	300Hz	999Hz	$\pm5\%F_c$	35db at $.5F_c$ & $2F_c$	700	15K	700	15K	11	$35
K14C	1KHz	500KHz	$\pm5\%F_c$	43db at $.5F_c$ & $2F_c$	1K	10K	1K	10K	10	$35
K17	100Hz	10KHz	$\pm5\%F_c$	60db at $.5F_c$ & $2F_c$	500	10K	100	1Meg	4	$39
K17A	300Hz	999Hz	$\pm5\%F_c$	50db at $.5F_c$ & $2F_c$	500	15K	500	30K	12	$45
K17B	1KHz	100KHz	$\pm5\%F_c$	50db at $.5F_c$ & $2F_c$	100	50K	100	100K	11	$45
K18	10KHz	100KHz	$\pm5\%F_c$	60db at $.5F_c$ & $2F_c$	100	100K	100	500K	3	$39
K20	100Hz	3.9KHz	$\pm7.5\%F_c$	40db at $.57F_c$ & $1.75F_c$	500	10K	500	10K	4	$45
K20A	250Hz	500KHz	$\pm7.5\%F_c$	35db at $.5F_c$ & $2F_c$	1K	10K	1K	10K	10	$35
K21A	4KHz	100KHz	$\pm7.5\%F_c$	40db at $.67F_c$ & $1.5F_c$	500	10K	500	10K	3	$45
K30	100Hz	3.9KHz	$\pm15\%F_c$	40db at $.4F_c$ & $2.5F_c$	500	10K	500	10K	4	$45
K30A	150Hz	500KHz	$\pm15\%F_c$	25db at $.45F_c$ & $2.2F_c$	1K	10K	1K	10K	10	$35
K31A	4KHz	100KHz	$\pm15\%F_c$	40db at $.5F_c$ & $2F_c$	500	10K	500	10K	3	$45

The bandwidth for any of the above filters can be increased or decreased to specification.



WIDE BAND FILTERS: Bandwidths of ±16% or greater can be obtained by ordering TT standard High pass and Low pass filter sections as a composite network. Select numbers from the Series H and J listings on the next page which give the desired attenuation slopes and combine these numbers. For example to obtain a slope of 40db at 0.65 of the lower freq. cut-off, F_{c1}, (High pass section) and 40db at 1.6 of the upper freq. cut-off, F_{c2}, (Low pass section) use H69A and J59A. Specify the two as K6959. **The high pass series number is first, followed by the low pass number.** Types with dissymmetrical attenuation slopes can be combined. Also specify the three db down cut-off frequencies F_{c1} and F_{c2} and impedance. The price is the sum of the HP and LP section prices.

Telemetering: Refer to series K20, K21A, K30 or K31A. TO ORDER specify IRIG Channel number or letter, source and load impedances.

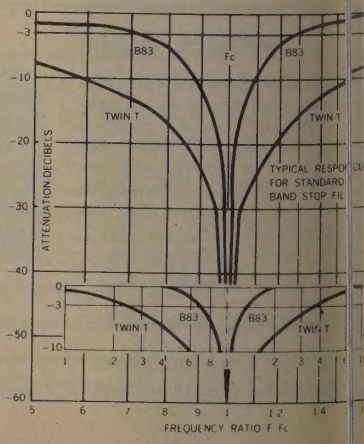
TO ORDER BANDPASS FILTERS — Specify (1) TT Series No., (2) minus 3db frequencies, (3) source impedance, (4) load impedance.

SPECIALS are available for center frequencies from 10Hz upward and 40db/3db bandwidth ratios as sharp as 1.2:1.

TO ORDER Specials, specify (5) bandwidth and (6) stop band attenuation required in addition to the above data. Terminations are regarded as resistive unless otherwise specified.

BAND REJECT STANDARD FILTERS FOR ANY CENTER FREQUENCY FROM 10Hz TO 100KHz

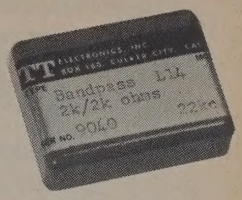
Series	F_c, Center Freq. Range Min.	Max.	Bandwidth −3db	Attenuation	Impedance Min.	Ohms Max.	Circuit	Case No.	Approx. Price
B83	10Hz	100KHz	$.77F_c$ & $1.3F_c$	50 db Notch	600	1 Meg.	L-C	4	$30
D	10Hz	100KHz	$.25F_c$ & $4\ F_c$	40 db Notch	SEE ORDERING INSTRUCTIONS BELOW		Twin-T	2	$11
E	10Hz.	100KHz	$.25F_c$ & $4\ F_c$	56 db Notch			Twin-T	2	$17
F	10Hz	100KHz	$.25F_c$ & $4\ F_c$	60 db Notch			Twin-T	2	$27
R20	100Hz	3999Hz	3db Bandwidth to 40db		10K	50K	L-C	4	$35
R30	4KHz	100KHz	Bandwidth Ratio = 5 or less		1K	10K	L-C	4	$35



TO ORDER REJECT FILTERS — Specify (1) TT Series No. or Letter, (2) center frequency, (3) source impedance, (4) load impedance. For Series R20 and R30 specify 40db bandwidth. Twin-T prices and cases apply to all filters using capacitor values from 0.1 MFD to 500 MMFD. $C = 1/8.85\ F_{HZ}\ (R_{source}\ R_{load})^{1/2}$. C is in farads, Filters with null frequencies as low as 1 Hz are available. Series E and Series F networks are available with octal plug-in bases. loads up to 10 megohms can be used with B83 filters at increased insertion loss. Low freq. B83 filters require 10K or higher loads for specified response. Prices are higher for some low frequency - low impedance or high impedance types. Multi-notch units are available. Terminations are regarded as resistive unless otherwise specified.

TT ELECTRONICS INC. P.O. BOX 180/CULVER CITY, CALIF. 90230/Phone (213) 87 600

TT *miniature* FILTERS



-2 WEEK DELIVERY FOR STANDARD AND NEAR STANDARD TYPES — ALL GROUPS AVAILABLE IN FLAT PC MOUNTING CASES

HIGH PASS

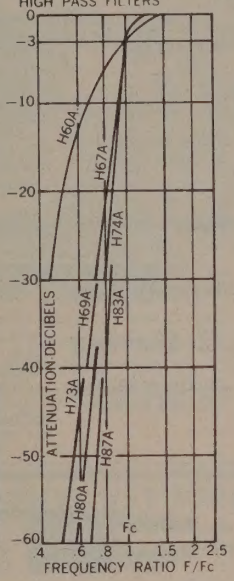
ILTERS FOR ANY CUT-OFF FREQ. OM 75Hz TO 100KHz

Min. Attn. db	Cut-off Ratio F/F_c	Approx. Price	Case Size
	.45	$25	
	.35	$25	
	.25	$25	
	.19	$25	75-124Hz CASE 5
	.72	$31	
	.65	$31	125-999Hz CASE 4
	.56	$31	
	.50	$31	1-100KHz CASE 3
	.79	$39	- or -
	.73	$39	
	.67	$39	1-10KHz CASE 12
	.58	$39	
	.83	$46	10-100KHz CASE 11
	.79	$46	
	.73	$46	
	.67	$46	

PECIALS: Special units available for ut-off frequencies down to 40Hz and bove 00KHz.

TO ORDER specify (1) T T Series No. (2) minus 3DB freq., (3) impedance, (4) Case No. See table below.

TYPICAL RESPONSE CURVES FOR STANDARD HIGH PASS FILTERS



LOW PASS

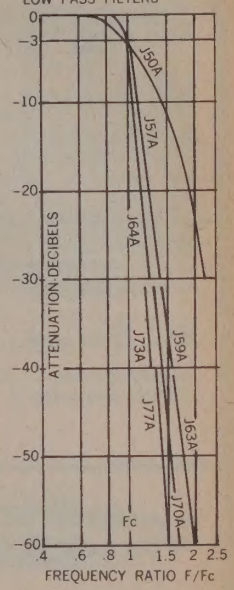
STANDARD FILTERS FOR ANY CUT-OFF FREQ. FROM 75Hz TO 100KHz
(*And from 5Hz to 29Hz or **From 30Hz to 74Hz)

Series	Min. Attn. db	Cut-off Ratio F/F_c	Approx. Price	Case Size
J50A	30	2.2	$25	
J52A	40	2.9	$25	
J54A	50	3.9	$25	
J56A	60	5.3	$25	75-999Hz CASE 4
J57A	30	1.4	$31	
J59A	40	1.6	$31	1-100KHz CASE 3
J61A	50	1.8	$31	
J63A	60	2.0	$31	- or -
J64A	30	1.2	$39	
J66A	40	1.4	$39	1-10KHz CASE 12
J68A	50	1.5	$39	
J70A	60	1.7	$39	10-100KHz CASE 11
J71A	30	1.18	$46	
J73A	40	1.3	$46	
J75A	50	1.4	$46	
J77A	60	1.5	$46	
*J80A	40	2	$65	CASE 6
**J81A	40	2	$39	CASE 4

SPECIALS: Special units available for cut-off frequencies above 100KHz.

TO ORDER specify (1) T T Series No. (2) minus 3DB freq., (3) impedance, (4) Case No. See table below.

TYPICAL RESPONSE CURVES FOR STANDARD LOW PASS FILTERS



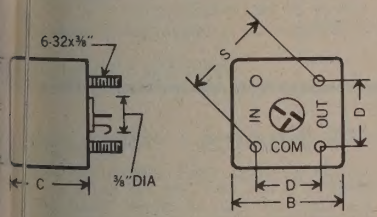
MPEDANCE GUIDE: Source and load impedances are equal and resistive for standard HP and LP filters. The insertion loss is less than 0db for ±10% matching.

SPECIALS for other impedances and unequal terminations are available. Units with cut-off ratios as sharp as 1.11 (0.9 High Pass) with 50db stop bands are available.

F_c-3DB	5Hz	30Hz	75Hz	100Hz	500Hz	1KHz	5KHz	10KHz	50KHz	100KHz
IMPED.	10K to 15K	10K to 39K	10K to 39K	5K to 39K	1K to 39K	1K to 39K	1K to 39K	1K to 20K	1K to 10K	1K to 3K

CASE DIMENSIONS AND MOUNTING INFORMATION FOR ALL FILTERS

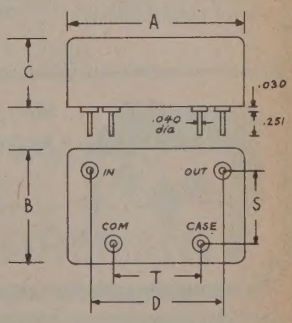
STANDARD CHASSIS TYPE



T Filters are epoxy encased within metically sealed steel cases which uce stray pickup. The maximum ver output is 20 milliwatts for st types. K10 and K11 types are ted at 100MV and B83 types at V output for all impedance levels.

CASE	A	B	C	D	S	T	Studs
STANDARD CHASSIS TYPE							
1	.75	.75	1.38	—	.56		(2)4-40 x 3/8
2	1.19	1.19	1.25	.75	—		(4)6-32 x 3/8
3	1.31	1.31	1.75	—	1.25		(2)6-32 x 3/8
4	1.63	1.63	2.38	1.19	—		(4)6-32 x 3/8
5	1.94	1.81	2.44	1.38/ 1.25	—		(4)6-32 x 3/8
6	2.31	2.06	3.13	1.69/ 1.44	—		(4)6-32 x 3/8
FLAT PC BOARD TYPE							
10	1.27	1.27	.50	.90	.90	.60	
11	1.88	1.44	.50	1.5	1.0	1.0	
12	2.00	2.00	.50	1.5	1.5	1.0	

FLAT CASES PC BOARD TYPES



OTHER T T FILTERS

- ANTENNA
- CCB
- CROSSOVER NETWORKS
- EQUALIZER
- HARMONIC
- INTERFERENCE
- INTERSTAGE
- LINEAR PHASE
- NEEDLE SCRATCH
- PHASE MATCHED
- PULSE
- SINGLE SIDEBAND
- TONE AUTOMATION
- TONE TELEGRAPH
- VIDEO

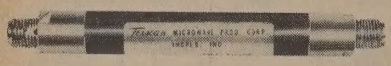
TT ELECTRONICS
INC./P.O. BOX 180/CULVER CITY, CALIF. 90230/Phone (213) 870-6001

FILTERS

Texscan Microwave Products' standard line includes tubular bandpass and lowpass filters ranging in size from 3/16 to 1-1/4 inches which operate within the frequency range of 10 MHz to 13 GHz, and tunable bandpass filters which cover the frequency range of 48 MHz to 4 GHz.

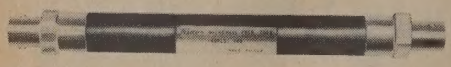
a complete line...a single sourc

BANDPASS



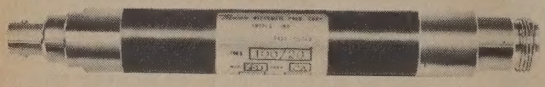
BB Series
70 MHz to 5 GHz
3/8 inch diameter

A subminiature, fixed, bandpass, filter, ⅜ inch diameter, which has features similar to the BA series plus the additional advantages of lower frequency coverage, lower insertion loss, higher power rating and adaptability for most connector types.



BC Series
50 MHz to 4 GHz
1/2 inch diameter

A low priced, fixed, bandpass, filter, ½ inch diameter, with frequency coverage from 50 MHz to 4 GHz. This series is ideal in meeting low loss and medium power applications for prototype or production use. Delivery can be made in less than 48 hours. Many optional features are available to increase the flexibility of this series.

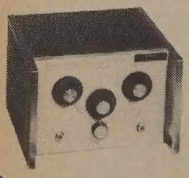


BD Series
25 MHz to 2 GHz
3/4 inch diameter

A medium power, fixed, bandpass, filter, ¾ inch diameter, which features low insertion loss and low frequency coverage. It is constructed in part aluminum and can accept all connector types.

BE Series
10 MHz to 1 GHz
1-1/4 inches diameter

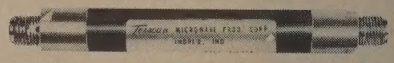
This high power, fixed, bandpass, filter series has the lowest insertion loss of all the bandpass series. It is 1¼ inches in diameter and is ideal for receiver and transmitter applications where insertion loss of 0.1 db is desirable and selectivity is of major importance.



MULTIBAND
MBF Series 48 MHz to 2 GHz

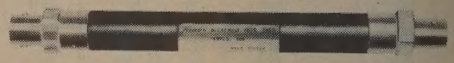
Tunable bandpass filters covering the frequency range of 48 MHz to 2 GHz. Two or three tunable filters are packaged as one unit to enable the user to have continuous frequency coverage.

LOWPA



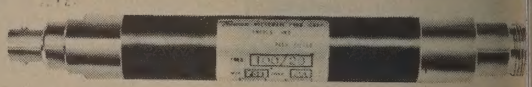
LB Series
100 MHz to 5 GHz
3/8 inch diameter

A subminiature, fixed, lowpass, filter, ⅜ inch diameter, which has features similar to LA series plus the additional advantages of lower frequency coverage, lower insertion loss, higher power rating and adaptability for most connector types.



LC Series
40 MHz to 4 GHz
1/2 inch diameter

A low priced, fixed, lowpass, filter, ½ inch diameter, with frequency coverage from 40 MHz to 4 GHz. This line is most competitive for higher prototype or production requirements. Delivery can be made in less than 48 hours. Many optional features are available to increase the flexibility of this series.



LD Series
25 MHz to 2 GHz
3/4 inch diameter

A medium power, fixed, lowpass, filter, ¾ inch diameter, which features low insertion loss and low frequency coverage. It is constructed of aluminum and can accept all connector types.

LE Series
10 MHz to 1 GHz
1-1/4 inches diameter

This high power, fixed, lowpass filter series has the lowest insertion loss and lowest cutoff frequency of the lowpass series. It is 1¼ inches in diameter and is constructed of aluminum

TUNABLE

VF Series 48 MHz to 4 GHz

Tunable bandpass filters covering the frequency range of 48 MHz to 4 GHz with any single model covering more than an octave. These units are available with either a three or five section response and have a 3 db bandwidth of 5%. Several options are available to increase the flexibility of this series.

Texscan MICROWAVE PRODUCTS CORPORATION

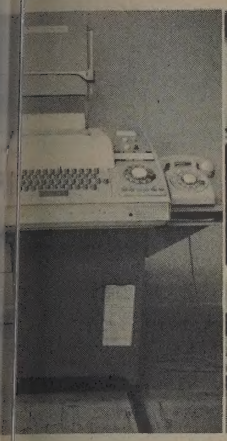
7707 N. Records Street • Indianapolis, Ind. 46226
Phone (317) 545-2101 • Telex: 27-2110 TWX 810-341-3184

WRITE FOR FREE CATALOG '69

TOROTEL
13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
PHONE: 816-761-6314 TWX-910-7777037

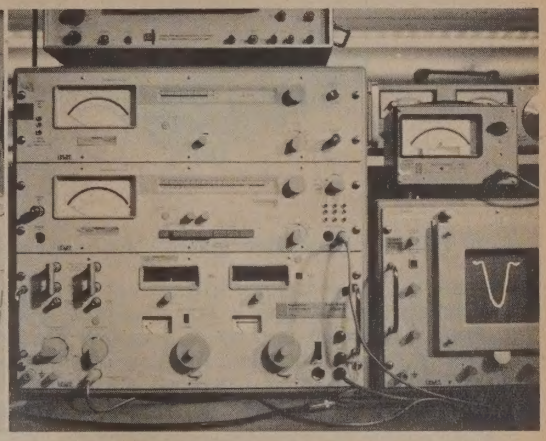
EST SOURCE FOR YOUR CUSTOM FILTER REQUIREMENTS BECAUSE WE THE BEST FACILITIES FOR:

DESIGN



PRODUCTION

TEST



extensive file of analysis synthesis software and access to either G.E. 415, G. 420, or CDC 6400 processors assures a fast accurate response from engeering staff.

We have developed an in house capability to build most of the components used in our filters . . . (Inductors, capacitors, crystals, transformers) all of which gives us better control and more flexibility in filter production.

Our filter test instrumentation is the finest available in the frequency range up to 35 MHZ thus minimizing your risk in costly test correlation problems and rejected shipments. Naturally, all of our products are tested 100% prior to shipment.

WE SPECIALIZE IN PASSIVE NETWORKS IN THE FREQUENCY RANGE FROM DC TO 35 MHZ FOR:

DATAMODEMS

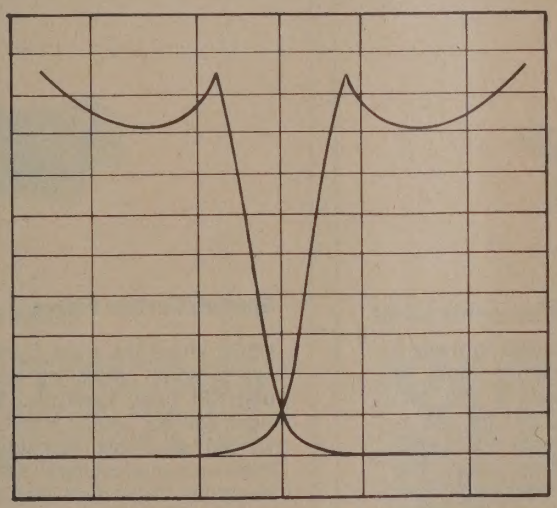
TELECOMMUNICATIONS

AVIONICS

TELEGRAPH

INSTRUMENTATION

TELEMETRY



BAND PASS
BAND REJECT
LOW PASS
HIGH PASS
LINEAR PHASE
PHASE EQUALIZER
AMPLITUDE EQUALIZER
DELAY LINES
FSK
SINGLE SIDEBAND

WE ALSO SPECIALIZE IN PACKAGING TO MEET YOUR REQUIREMENTS

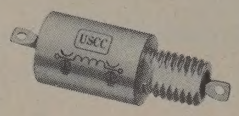
Control filters and networks can be supplied in several basic configurations with any desired mounting and termination provisions. You may want to consider:

- Epoxy encapsulated or metal enclosed for pc board mounting.
- Metal enclosed or open pc board for card cage plug-in.
- Front panel plug-in.
- Chassis mount or chassis plug-in.

Call or write and let us know about your filter requirements. We also manufacture other frequency control devices—see separate listings in EEM Section 2300 for crystals, oscillators, etc.

EMI/RFI Filters

USCC



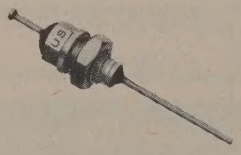
2000 Series — Miniature Filters

Here is the premier line of miniature EMI/RFI filters to eliminate conducted radio frequency interference on low voltage signal and power lines over the frequency range of 10 kHz to 10 GHz. A combination of high stability toroidal inductors and monolithic ceramic capacitors in a unique packaging concept provides units of unequalled performance. Filters available in voltage ratings of 50, 100, 200, 300 Vdc (115 Vac), and 400 Vdc (230 Vac) from .06 A to 10 A. Operating temperature range is —55°C to 125°C. Meets applicable portions of MIL-F-15733. Choice of Pi, L and T section units in a hermetically sealed case with .187" or .312" thread lengths.

5000 Series — General Purpose Filters

The requirements for general purpose filters for noise suppression in the intermediate levels of interference voltages are well covered by this filter series. Built for reliability and performance, they meet the applicable portions of MIL-F-15733. The tubular metal case, with a threaded neck, is designed to take advantage of bulkhead mounting for the highest shielding efficiency. Available in Pi, L and T sections for 200 Vdc, 400 Vdc/115 Vac and 600 Vdc/220 Vac from .5 A to 20 A. Higher current ratings may be obtained upon request.

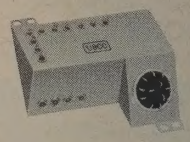
5100 Series	40 dB at 150 kHz
5200 Series	60 dB at 150 kHz



3000 Series — Subminiature Filters

These feedthrough filters were developed to meet a genuine need for reliable subminiature units in EMI/RFI applications where size, weight and performance are critical. They are excellent for use in microwave, communication and airborne equipment applications. Packaged in screw thread cases, the series offers the maximum possible attenuation from 10 MHz to 10 GHz with an operating temperature range of —55°C to 125°C.

Series	Screw Case	Current (A)	Voltage (dc)	Attenuation
3200	8/32	10	100	50 dB at 200 MHz to 10 GHz, No load 45 dB at 200 MHz to 10 GHz, 2A load
3204-003	12/32	10	50	70 dB at 10 MHz to 10 GHz
3208	3/8-32	25	2500	50 dB at 100 MHz to 10 GHz
3211-003	5/16-24	25	100	70 dB at 10 MHz to 10 GHz



Special/Custom Filters

USCC offers the most comprehensive filter technology to solve perplexing problems across the entire EMI/RFI filter spectrum. When standard filter designs will not satisfy a specific requirement, our advanced assembly techniques utilizing ceramic or layer wound capacitors with toroidal coils give us the versatility to produce single or multi-circuit units to the most rigid standards. For immediate assistance, contact our filter engineers with your design problems.

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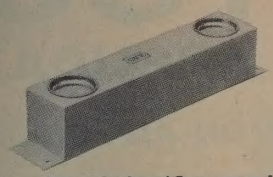
U.S. CAPACITOR CORPORATION ■ 2151 N. LINCOLN STREET, BURBANK, CALIF. 91504 ■ (213) 843-4222 ■ TWX: 910-498-2222

EMI/RFI Filters

USCC



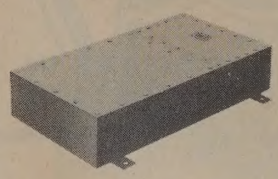
6000 Series — Signal Line/Communication Filters

This family of filters is offered with a variety of configurations and various attenuation characteristics for use in secure communication applications. They are especially valuable for preventing security breaches in telephone, signal, teletype, light and audio lines, communication rooms and computer facilities. Available in single, dual, and multi-circuit cabinet configurations.

6060-001 Series — Both ends shielded
6060-002 Series — Single end shielded
(for 600 ohm balanced lines)
A dual circuit filter for individual applications with attenuation of 100 dB from 14kHz to 10 GHz per MIL-STD-220A. Rated 300 Vac/600 Vdc at .5 A.

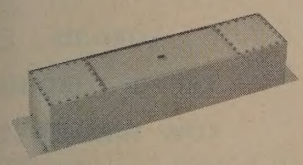
6060-003 Series — .5 A 300 Vac/600 Vdc
(for 600 ohm balanced lines)
Electrically identical to the 6060-001 Series but modified for cabinet installation. Uses a threaded neck for mounting through the internal bulkhead of a cabinet instead of a shielded end housing.

6065-001 Series — capacitive input at threaded end
6065-002 Series — inductive input at threaded end
(for 300 ohm telephone and signal lines)
These single circuit tubular filters, designed for cabinet installations, meet the requirements of DCA Circular 175-6A, Application #1. Provide attenuation of 60 dB at 14 kHz rising to 100 dB from 100 kHz to 1 GHz.



Power Line Filter Cabinet Assemblies

The 7630-CA and 7670-CA Series offer the same electrical parameters as the individual 7630 and 7670 filters but incorporate one or more filters mounted in an RF shielded NEMA enclosure. Individual filters are physically modified to facilitate cabinet installation. Available with 1, 2, 3, or 4 filters per cabinet. Neutral wire may be substituted for a filter. Have identical attenuation as the 7630 and 7670 Series. For 277 Vac and 440 Vac, 3-phase, 1 A to 200 A.



7000 Series — Power Line Filters

The 7000 Series is a line of high performance power line filters intended for use on secure communication installations and shielded enclosures. Available for 277 Vac and 440 Vac, 3-phase, from 1 A to 200 A for line frequencies up to 400 Hz.

7630 Series
Offering an attenuation of 100 dB from 100 kHz to 10 GHz, when measured in accordance with MIL-STD-220A under full load conditions.

7670 Series
Offering an attenuation of 100 dB from 14 kHz to 10 GHz, when measured in accordance with MIL-STD-220A, under full load conditions; from 14 kHz to 20 MHz, with special buffer networks for valid measurement below 100 kHz.

USCC Filters for Data Processing Equipment

Here is the USCC standard line of quality filters expressly designed for maximum suppression of EMI/RFI and other noises found in Data Processing Equipment. These units offer 60 dB of attenuation from 150 kHz to 1 GHz with a voltage rating of 120/240 Vac at 60 Hz. Current ratings are 1, 3, 5, 7, 10, 20, 30, and 50 A.

SEE SECTION 1500 FOR USCC CERAMIC CAPACITORS

PIONEERS IN MINIATURIZATION

SPECIALS (CUSTOM BUILT) and STOCK FOR EVERY APPLICATIO

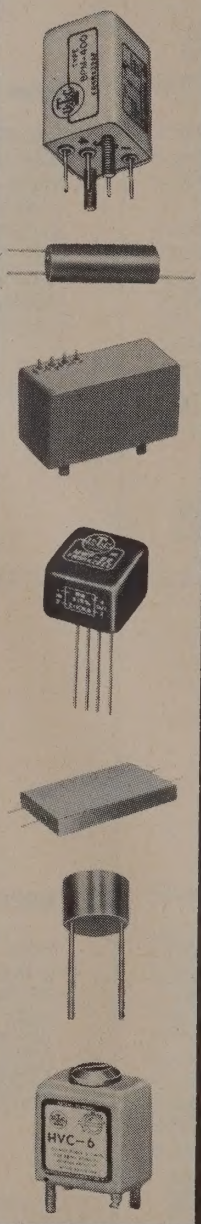
IMMEDIATE DELIVERY ON ALL STOCK ITEM

ELECTRIC WAVE FILTERS

Almost forty years of experience in the design and production of electric wave filters have resulted in UTC being a first source for top quality, reliability and advanced engineering . . . for both special and stock applications. Present designs incorporate a wide variety of core structures, winding methods, and capacitors to provide maximum performance. stability and reliability. Military (to MIL-F-18327C) and industrial types are available both metal cased and molded. Range of frequencies is from DC to 30 MHz.

AIRCRAFT
BAND PASS
BAND REJECT
DISCRIMINATORS
400 HERTZ LINE BP
400 HERTZ LINE LP
HIGH PASS
INTERSTAGE
LINEAR PHASE
LOW FREQUENCY
LOW PASS
TELEGRAPH
TELEMETERING
ULTRAMINIATURE

LUMPED CONSTANT DELAY LINES



HIGH Q INDUCTORS

Almost four decades of specialization in hi Q coils are reflected in the permalloy dust to d, ferrite, and laminated structures produced by C today. The foremost engineering staff of its ty is supported by the most modern, fully equipped a-terials and test laboratories. In addition, exter e life testing and rigid quality control standards e-ate the top quality and highly reliable compon s associated with the UTC name. Metal cased d molded units are engineered to specification r available from stock. Inductors ranging in app a-tions from DC to 30 MHz, both military (to M T-27C) and commercial types, are available, offe g maximum Q for minimum size.

TOROIDS
TAPPED TOROIDS
LOW FREQUENCY
L DECADES
VARIABLE
TAPPED VARIABLE
VERNIER VARIABLE
MINIATURE

Write for catalog containing over 1,350 stock items with UTC top quality.
Short form catalog pages appear in The Radio-Electronic MASTER

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UNITED® TRANSFORMER CO. TRW®
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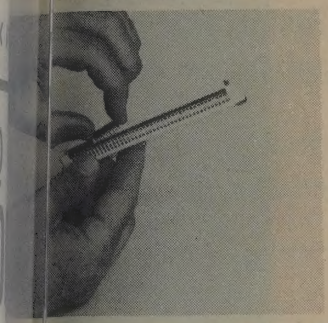
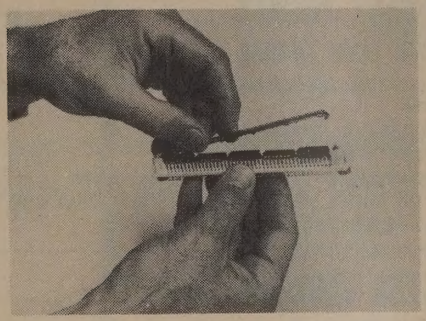
dipstik™

HIGH DENSITY - SOLID STATE ELECTRONIC PACKING SYSTEMS

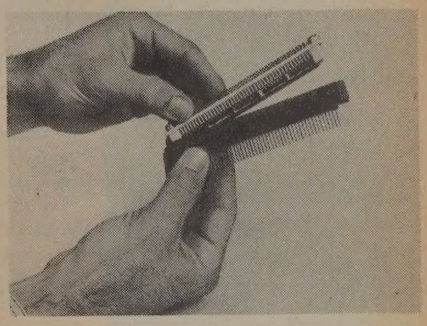
quick
easy
flexible



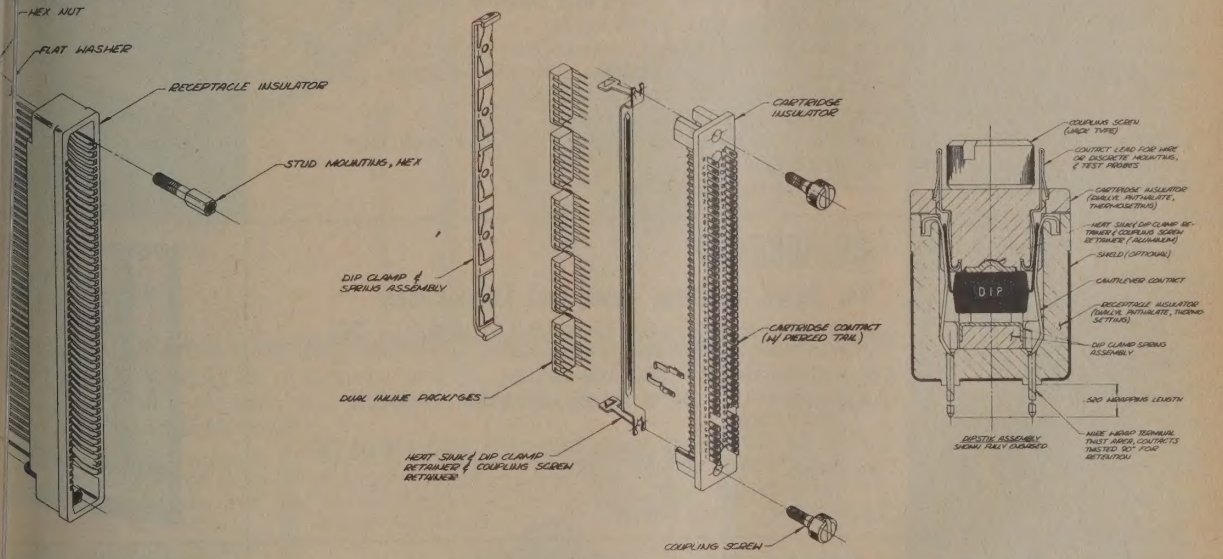
Up to 5 dual in-line assemblies (up to total) the cartridge.



CLAMP IN: The dual in-lines with the special clamp and spring assembly which holds them firmly in place.



SNAP IN: The loaded DipStik cartridge into the Dip-Stik receptacle and give the coupling screws a twist.



Vitally eliminated: Solder is not required in the DipStik system for mounting non-dual in-line discrete components where appropriate.

Circuit boards for mounting dual in-lines eliminated: DipStik eliminates the need for PC boards, connectors, associated hardware, sockets and extenders.

Test Point Capability: The DipStik system provides a test point each dual in-line lead through the use of terminals with eyelets in the DipStik cartridge.

Maintenance enhanced: Defective dual in-lines are easily replaced in the system simply by removing the cartridge assembly from the stack assembly, an operation which takes only a few seconds and can be accomplished with a minimum of equipment disassembly and handling.

Updating and Modification facilitated: Obsolete dual in-lines are replaced in the same manner as defective ones. Re-wire wrapping to meet design requirements is also relatively simple since the wire wrap terminals are easily accessible.

Increased protection for dual in-lines: The dual in-lines are protected from external objects by the DipStik which completely surrounds them. Damage from shock and vibration is also, thereby, minimized.

Versatility: 14 and 16 pin dual in-lines, as well as non discrete dual in-lines, may be mixed in the same DipStik.

Low insertion forces: Special straightening of dual in-line leads prior to insertion is unnecessary. The fragile dual in-line leads and internal bonds are protected during assembly since leads are not shoved into a socket or clearince holes in PC boards.

Ease of assembly and testing: No special tools are required for the assembly of dual in-lines into the DipStik. Terminals with eyelets for each dual in-line lead are provided in the cartridge which may be used both as test points and for the mounting of non-dual in-line discrete components.

Packaging density increased: The Dip-Stik system increases packaging density of dual in-lines as much as 100% over printed circuit mounting methods.

Complete packaging system capability: ACS Industries provides a standard line of mounting hardware and chassis specifically designed for the DipStik system.

ACS A PKL COMPANY — ACS INDUSTRIES, INC. • 13726 SATICOY STREET, VAN NUYS, CALIFORNIA 91402

INCORPORATED

LOOK TO A P for uniquely practical circuit design and test innovations.

Only A P offers complete flexibility in handling

DIP's
TO-5's
Discrete Components

Breadboarding simplified. No soldering, no alligator clips, no special patch cords with A P Terminal Strips and Breadboards.

Quick and easy assembly of both prototype and production circuits on A P OMNICARDS.

Immediate "in system" check of circuit modifications is possible with A P UNICARDS.

Ideal for lab and field testing. A P Test Clips and Digital Test Probes go everywhere.

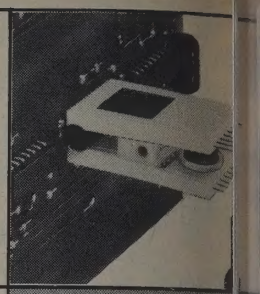
A P products are available **off-the-shelf** from your nearest COMPAR distributor. Ask about quantity price breaks.

IC TEST CLIPS

For All Dual-in-Line Packages

- Offer full accessibility to DIP terminals
- Prevent possibility of shorting adjacent terminals
- Provide reliable wiping action contact
- Solve scope probe attachment problems
- Remove DIP's damage free

List price . . . from **$5.00**

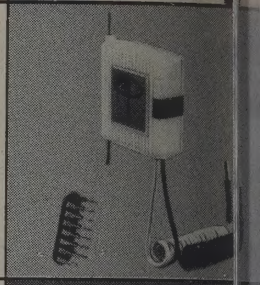


DIGITAL TEST PROBES

For Lab and Field Testing

- Provide positive, non-ambiguous identification of true logic level
- Detect pulses as narrow as 30ms
- Derive power from unit under test
- Eliminate need for a scope in many cases
- Require no hands when used with A P Test Clip

List price . . . from **$35.00**

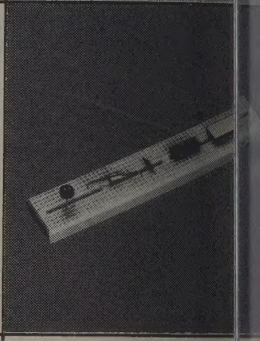


SOLDERLESS TERMINAL STRIPS

Save Time — Eliminate Heat Damage

- Accept all DIP's, TO-5's and discrete components
- Need no special patch cords
- Accept any terminal cross-section from .010" to .032"
- Unequaled holding power with wiping action gold plated beryllium copper contacts
- Contact resistance .001 ohms
- Five sizes — up to 96 terminals, each with four tie-points

List price . . . from **$6.30**

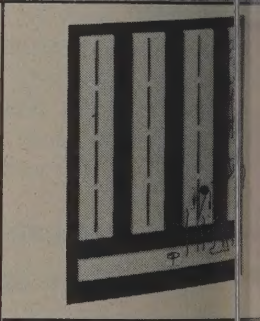


BREADBOARD

For Quick, Reliable, Solderless Connections

- Provides 2,264 connections for LSI design — 566 terminals, each with 4 tie-points
- Incorporates A P Terminal Strips
- Requires no sockets, plugs, connectors or special patch cords
- NEMA G-10 glass epoxy base with gold plated two ounce copper ground plane
- Ready to use — not a kit

List price . . . from **$85.00**

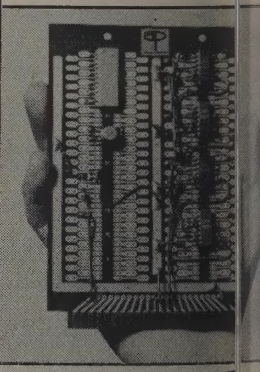


OMNICARDS

For Design, Prototype and Production

- Offer complete IC and discrete component mix capability
- Provide 768 tie-points in continuous dual-in-line matrix
- Simplify assembly — pilot holes hold components for easy front surface soldering
- Speed prototype check out
- 22 connector, 4⅜" x 6⅜" cards fit standard 5¼" card racks
- Reusable

List price . . . from **$8.35**

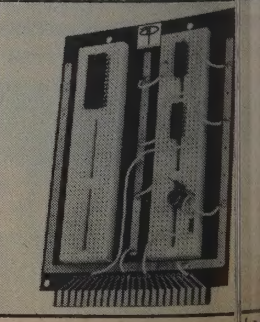


UNICARD

For Simplified Breadboarding and "In System" Testing

- Combines advantages of A P Terminal Strips and Omnicards
- All DIP's, TO-5's can be plugged in — without soldering heat damage
- Provides complete design flexibility with 784 tie-points; 22 connector pads; heavy ground and power buses
- Plugs into standard 5¼" rack for immediate functional check

List price . . . **$27.50**



For complete specifications call or write:

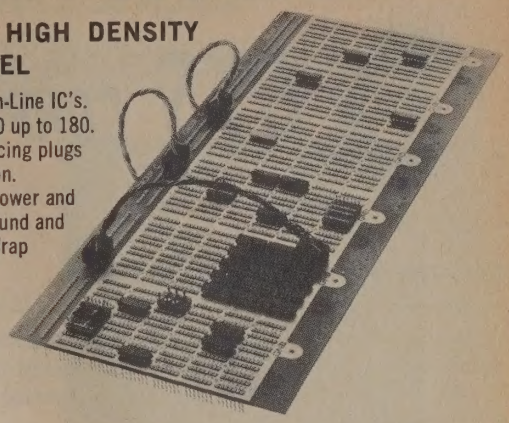
A P INCORPORATED
56 CORWIN DRIVE
PAINESVILLE, OHIO 44077
Phone: (216) 357-5597

Plug into AUGAT

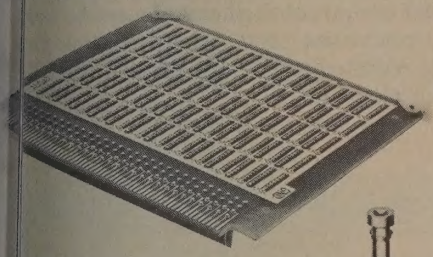
Where new concepts in IC handling originate

MODULAR TYPE HIGH DENSITY PACKAGING PANEL

for 14 and 16 Lead Dual-in-Line IC's. Patterns in multiples of 30 up to 180. Pattern accepts 3 inter-facing plugs for input-output connection. Double sided board with power and ground planes. Accepts round and flat lead packages. Wire-Wrap termination sufficient for 3 levels of 30 gauge wire.



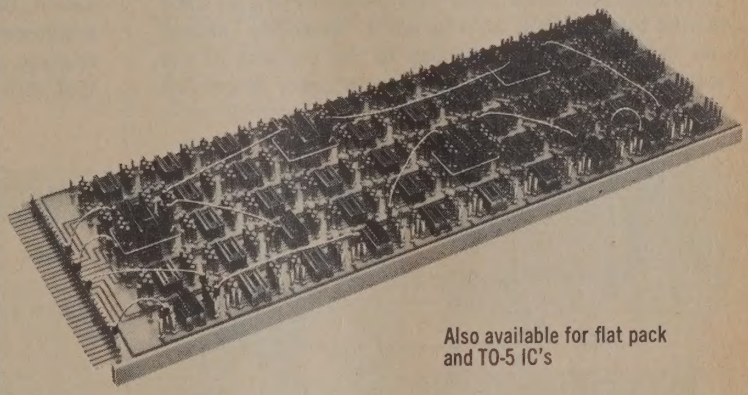
HIGH DENSITY PACKAGING PANEL
Patterns for 14 and 16 Lead Plug-In ICs



30 patterns standard
Double sided board with power and ground planes at each pattern
Wipe action contacts assure high reliability
Wire Wrap® termination

BREADBOARD AND TEST PANELS

10, 25 & 50 patterns standard. Eliminates soldering or welding IC leads. Also solderless jumper interconnections.

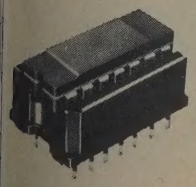


Also available for flat pack and TO-5 IC's

LOW PROFILE SOCKETS

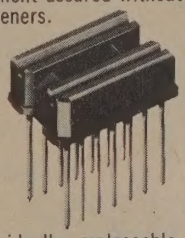
Available for 14 & 16 lead packages, accepts all packages with round or flat leads. Inner rail design. In diallyl phthalate or black phenolic with gold or tin plated contacts.

PC Style. Directly interchangeable! Exclusive socket configuration identical to IC package. Saves time, simplifies mounting on PC board.



Has wiping type beryllium copper contacts

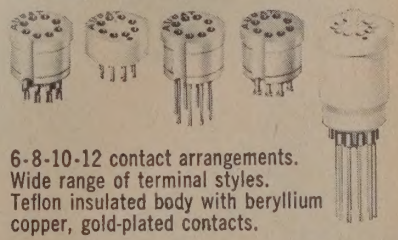
Wire-Wrap Style permits fast, easy mounting on boards. For .036 diameter holes. Retention and alignment assured without cement or special fasteners.



Contacts individually replaceable without removal of entire socket. Wire-wrap terminals — .025" square tails. Sufficient length for 3 levels of 30 gauge wire.

TO-5 CASE SIZE TEST AND PACKAGING SOCKETS

Positive retention — high contact reliability. Test sockets permit easy, fast insertion and withdrawal.



6-8-10-12 contact arrangements.
Wide range of terminal styles.
Teflon insulated body with beryllium copper, gold-plated contacts.

Large selection of Module and Transistor Sockets also available.

®Trademark Gardner-Denver Co.

Our flexible designs permit fast, easy modifications to suit particular requirements without premium charges or extended deliveries.

For fast, economical service on your I C Handling Problems, request IC Folder

Other AUGAT Products:

- Transistor Sockets
- Crystal Sockets
- Relay Sockets
- Lead Sockets
- Test Jacks
- Heat Sinks
- Component Holders
- Clamps
- Battery Holders

AUGAT INC. 36 PERRY AVE., ATTLEBORO, MASS. 02703

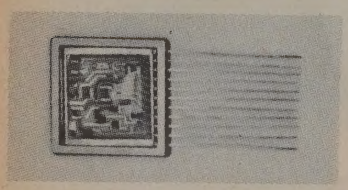
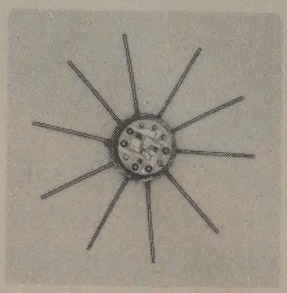
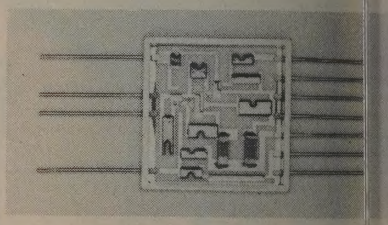
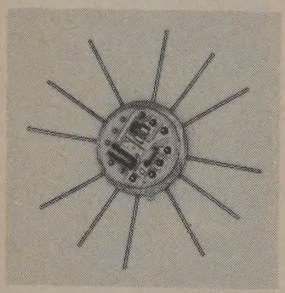
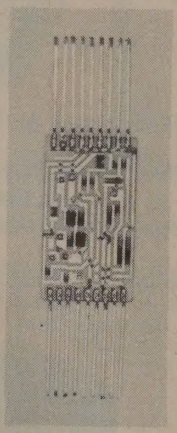
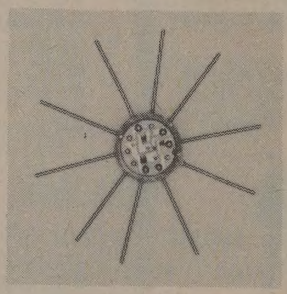
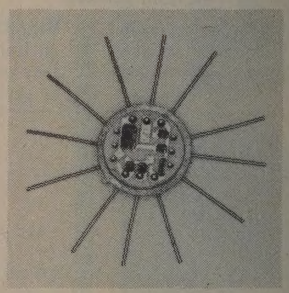
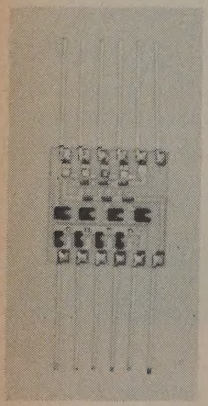
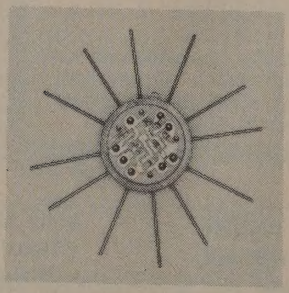
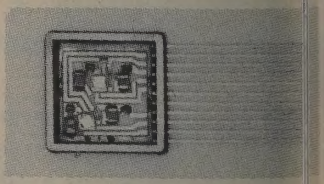
CTS CORPORATION ELKHART, INDIANA HYBRID CIRCUIT

CIRCUITRY TO SPECIFICATION

Over ten years of CTS cermet circuitry experience are concentrated in a 65,000 square foot facility in West Lafayette, Indiana, devoted to the manufacture of cermet passive and active circuits.

Cermet microelectronics offers many design possibilities to the forward-thinking engineer. Words such as high power, extremely low power, high frequency, precision, miniature size, low noise, and high reliability are all used to describe this concept. Another word "flexibility" should also be included. This is the key to the success of the CTS cermet microelectronics system. In order to provide the customer with an approach most consistent wi h application, CTS offers both prototype and prod ic facilities, several construction techniques, numerous c aging methods, three levels of quality control, and li bility data to demonstrate product performance und th environmental conditions you specify.

In order to achieve the best product for the lowest st CTS offers the flexibility required to optimize each pl cation. Careful analysis of each requirement by our d ig engineering, production, and quality control pers ne enables us to recommend the best product design co sis tent with your requirements.

ORDERING INFORMATION: Place hybrid circuit orders at the following address:

CTS Microelectronics, Inc., P.O. Box 1278, Lafayette, Indiana 47902 • Telephone 317-463-2565 • TWX 810-342-18

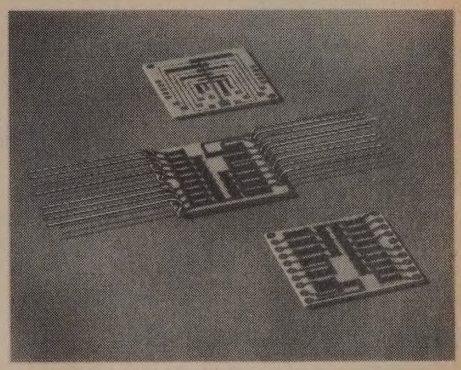
CAL-R® HYBRID MICROELECTRONICS DIVISION

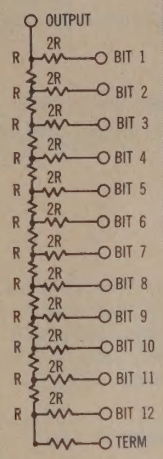
CAL-R PRECISION THICK FILM NETWORKS

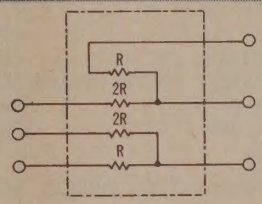
-R Thi Film Passive Systems offer a wide variety of
tal to nalog/A-D Binary Ladders (thru 12-bits), BCD a
lar Ladders and Precision Resistor networks.
-R Thi film resistor compositions fused to a high
ty 96 Alumina substrate insure low thermal gradients,
thermal stability and matched electrical characteristics.

NERAL SPECIFICATIONS

istor Values: From 5 ohms thru 10 megohms
ating Temperature Range: −55°C to +125°C
age Temperature Range: −65°C to +150°C
perature Coefficient of Resistance to: ±50 PPM/°C
cking to: 1 PPM/°C
bility to: 25 PPM/year
tling Time: 50 nSec.
Rise Time
imum size for maximum efficiency and quality.
networks are 100% inspected to applicable requirements
L-Specs or inhouse).
networks meet or exceed the performance requirements
MIL-R 059F when applicable, including the following:
ort Time Overload: (MIL-R-10509F par. 4.6.6, 2.5x rated).
mperature Cycling: (MIL-R-10509F par. 4.6.4).
ermal Shock: (MIL-STD-202C, Method 107B, Condition B).
sistance to Solder Heat:
(MIL-STD-202C, Method 210, Condition B).
ration (MIL-R-10509F par. 4.6.16).







CAL-R CERMET CHIP RESISTORS

-R Chip resistors are designed for use in thick/thin film
brid applications. Ideally suited where small size,
gh stability and superior performance are required.

ECIFICATIONS

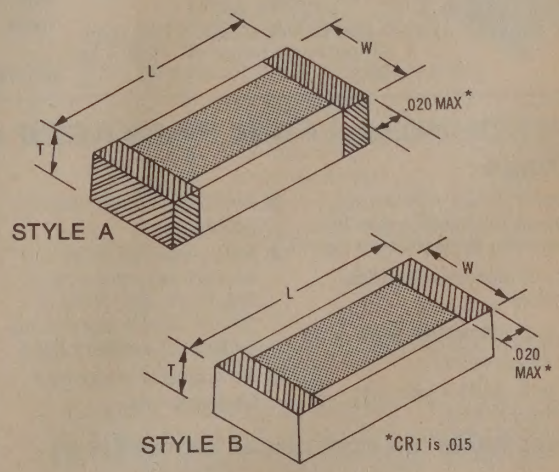
ectric
sistance Range: 10 ohms to 5.6 megohms
lerance:
1%F), 2% (G), 5% (J), 10% (K) standard and 20% (M)
wer Rating: 100 Milliwatts CR1,
20 Milliwatts CR2 and 250 Milliwatts CR3
ort Time Overload: Less than 0.50% △ R
mperature Coefficient of Resistance:
±50 PPM/°C, ±150 PPM/°C standard,
±5 PPM/°C available through .56 megohms as
measured from −55°C to +125°C with 25°C as
reference.

echanical
nfiguration: Please refer to diagrams
nstruction: 96% Alumina substrate with
proprietary CAL-R Cermet resistance element
rminations: Palladium silver is standard for Style A.
Platinum gold is standard for Style B.
Other terminations as well as gold backing available.

vironmental
perating Temperature: −55°C to +125°C
oisture Resistance: Less than 1% change when tested per
method 106 of MIL-STD-202
fe: Less than 1% change when tested per method 108D
(−55°C) of MIL-STD-202

CAL-R CHIP RESISTOR DIMENSIONS

Size	Length (L) ±.005	Width (W) ±.005	Thickness (T) ±.003
CR1	.050	.040	.012
CR2	.075	.050	.016
CR3	.10	.050	.016



STANDARD CHIP RESISTOR VALUES

Ohms (Tolerance ±10%)

10	12	15	18	22	27	33	39	47	56	68	82
100	120	150	180	220	270	330	390	470	560	680	820
1K	1.2K	1.5K	1.8K	2.2K	2.7K	3.3K	3.9K	4.7K	5.6K	6.8K	8.2K
10K	12K	15K	18K	22K	27K	33K	39K	47K	56K	68K	82K
100K	120K	150K	180K	220K	270K	330K	390K	470K	560K	680K	820K
1 Meg	1.2 Meg	1.5 Meg	1.8 Meg	2.2 Meg	2.7 Meg	3.3 Meg	3.9 Meg	4.7 Meg	5.6 Meg		

TERMINATION MATERIAL

A	Palladium Silver	B	Platinum Gold

CAL-R CHIP RESISTOR NUMBERING SYSTEM

Size	Termination Style	Termination Material	Value (ohms)	Tolerance	TCR
CR1	A	A	1K	±10%	150

(Typ. Part Number)

CAL-R® INC. / HYBRID MICROELECTRONICS DIVISION
1601 Olympic Boulevard, Santa Monica, California 90404 • (213) 451-9761 • TWX 910-343-6966

DALE for Optimum Value in Packaged Networks

THICK FILM MICROCIRCUITS

FEATURES

- Custom design allows you to specify design tolerance, packaging, environmental requirements.
- Engineering assistance for production design.
- Specialists in design of networks for high power dissipation.
- Standard dual in-line packaging or modular packaging with screened silicone coating and choice of lead types.
- Wide choice of pre-conditioning options.

ELECTRICAL CAPABILITIES

Resistors

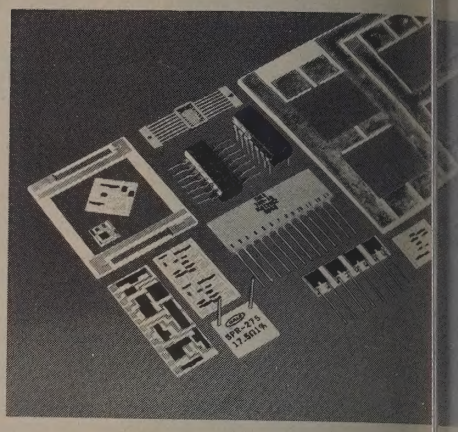
Tolerance: ± 1%
Matching Resistance Ratio: ± 0.1%
Temperature Coefficient: ± 50-250 PPM/°C
T. C. Tracking: 25 PPM
Power Dissipation: 20 w/in.²
Resistivity: 10 ohms to 1 Meg./sq.
Resistance: 1 ohm up
Voltage Coefficient: <5 PPM/V
Noise: 30db per decade
Stability: 1%/yr.

Capacitors

Tolerance: ± 5% **Voltage:** 3 VDC-100VDC **Capacitance:** 10 pf – 100 mfd

PHYSICAL

Capacitors: Screened, Tantalum, Ceramic
Substrates: Alumina, Beryllia
Terminations: Wire Leads, Ribbon Leads or Solder Pads
Conductors and Land Areas: Platinum Gold, Palladium Gold, Gold or Silver.
Crossovers: As required
Packaging: Dual in-line, Module, as required
Coating: Screened Silicone, as required

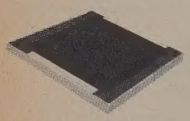


PRECONDITIONING OPTIONS

- Power Aging
- Temperature Cycling
- Temperature & Power
- Temperature Aging
- Short Time Overload
- Thermal Shock
- X-Ray
- Noise
- GARD

To obtain prototypes for your circuit...
contact your Dale representative or phone or write Dale at the address below. Dale's Microcircuit Department is geared to assist you with every phase of design—providing the shortest possible leadtime between concept and production ready component.

THICK FILM CHIP RESISTOR



Resistance Range: 100Ω to 500K
Tolerance: ±20%, ±10%, ±5%, ±2%, ±1%
Temp. Coefficient: ±200 PPM. Over a temperature range of −55° C to +150° C (+25° C Reference).

Load Life: 1% ΔR, 1000 hours at 80° C
Humidity: 1% ΔR per MIL-STD-202C
Temp. Cycling: −55° C to +150° C, ±0.5% ΔR
Operating Voltage: 100 VDC maximum

PHYSICAL	SIZE CODE	WE FIN
.050 x .050	550	0m
.050 x .075	575	0m
.050 x .100	5100	0m
.050 x .150	5150	0m

WIREWOUND and FILM PACKAGED NETWORKS

FEATURES

- Choice of linear wirewound, bobbin wirewound, metal film, carbon film or cermet elements
- Less components to stock or handle
- Reduced inspection time
- Ease of assembly
- Matched resistors cannot be mixed or lost
- Complete environmental protection
- Dale networks meet or exceed requirements of MIL-R-26, MIL-R-93 or MIL-R-10509, depending on type of element used
- Packaged to meet your requirements

GENERAL RESISTOR ELECTRICAL CAPABILITIES

	WIREWOUND	FILM (Carbon & Metal)
Power Rating	.1 to 10 W	.02 to .5 W
Resistance Range	1 ohm to 1.5 Meg.	5 ohms to 5 Meg.
Tolerance	.02% to 1%	.1% to 1%
Tolerance Match	.005%	.05%
Temp. Coefficient	5 PPM/°C from 0° C to +75° C	25 PPM/° C
Temp. Coefficient Match	2 PPM/° C from 0° C to +75° C	7 PPM/° C
Resistance Stability	.005%/yr.	.03%/yr.
Operating Temp.	−65° C to +145° C	−55° C to +175° C

LADDER NETWORKS

- **Output Accuracy:** ± .05% full scale accuracy or ± 1/2 least significant bit, whichever is less.
- **Output Variation with Temp.:** ± .1% full scale accuracy or ± 1 least significant bit, whichever is less.
- **Operating Temp. Range** (For Accuracies Specified Above): 55 to +70° C (Film Type) −55° C to +125° C (Wirewound Ty).
- **Input Resistance** (All inputs connected): 1KΩ to 500KΩ
- **Output Resistance** (All inputs grounded): 250Ω to 125KΩ
- **Insulation Resistance:** 100 Megohms minimum.
- **Terminals:** Solderable or weldable wire leads.
- **Packaging:** Epoxy or Silicone resin potting. Transfer mold, Can be encapsulated. Other types of special packaging a ila to meet your requirements.

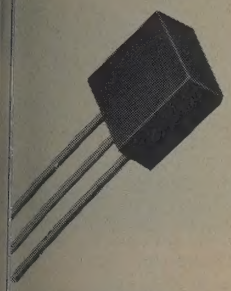
BINARY DIGITAL-TO-ANALOG LADDER NETWORKS

Resistor Parameters for meeting 4 and 8 bit dimensional requirements

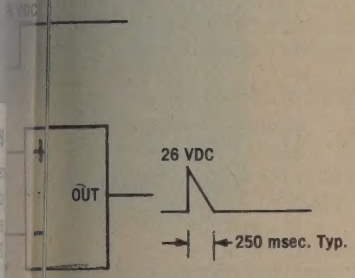
	WIREWOUND	FILM
Power Rating	1/8 watt from −55° C to +125° C, derated linearly to 0 at +145° C	1/2 watt from −55° C to 0° derated linearly to 0 at +5°
Temp. Coefficient	0 ±20 PPM/° C from −55° C to +125° C. Lower T.C.'s available upon request	400 PPM/° C max. T. C.'s available down to 25 PPM/° C
Heat Rise	20° C max. at rated power	60° C max. at rated powe

DALE ELECTRONICS, INC., P.O. Box 609 • COLUMBUS, NEBRASKA 68601 • PHONE: 402-564-3131 • TWX: 402-564-280

ANDARD DRIVER CIRCUITS — CUSTOM HYBRIDS



LMD - 3 DRIVER
PULSE DIFFERENTIATOR
.310″ x .360″ x .150″

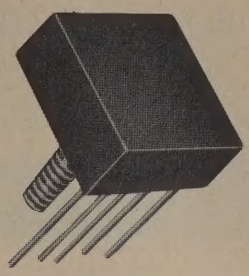


rid mocircuit converts a positive step age i a differentiated positive output e. Usul as a driver for stepping switches latclg relays to reduce the average er or old-in current when driving units puls of long duration. Upon application an inp pulse or voltage, a differentiated ut pie is produced which returns to maining negligible standby power for tinuou application of input voltage. Nega- differentiation is inhibited on removal of ied vage.

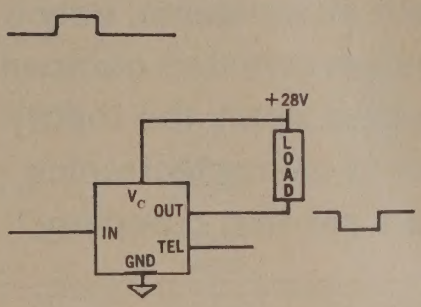
SPECIFICATIONS

	Symbol	Value
ximum put voltage	V+	35 VDC
ximum utput current	I Out	1.5 Amp
ximum ulse rate	PRF	2 PPS
ximum on drop	V on	3 V
eratin emp. range	T o	0 to +100°C
orage mp. range	T s	−55 to +150°C
se wi		50 msec at 50% amplitude

her Vages and Output waveshapes on request.



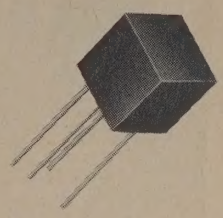
LMD - 7 DRIVER
INTEGRATED CURCUIT INTERFACE
.6″ x .6″ x .25″



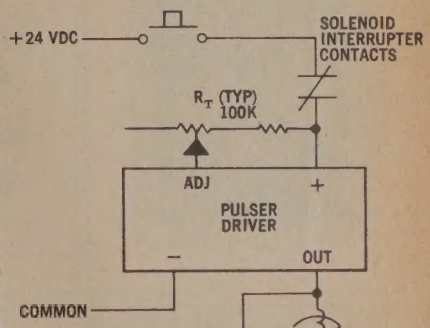
Hybrid thick film circuit converts low level input into high level output signal for driving solenoids, stepping switches, lamps and peripherial equipment. Input trigger threshold may be selected to various levels. Output switching circuit is applied between the load and common return and will switch voltage as high as 45 volts with built-in transient protection against inductive overshoot. Higher threshold levels and load switching capabilities are available on special requests.

SPECIFICATIONS

	Symbol	Min.	Typ.	Max.
Applied voltage	Vc		28V	32V
Output voltage	Out	3V		45V
Input threshold	In	1.5V	3.0V	32V
Output current	I Out			2A
Surge current	I Surge			5A
Max. "ON" voltage drop	V On		1.4V	2V



LMD - 70 PULSER DRIVER
FOR USE WITH EXTERNAL RESET
.3″ x .3″ x .3″



Miniature hybrid pulser and SCR driver circuit is designed for use with electromechanical stepping switches or solenoid / interrupter switch combinations to provide controlled long interval stepping rates. Time interval is controlled by external resistance. Due to the small size it is useful in driving light loads or heavy loads at low speed or intermittant duty. A unijunction transistor and resistor capacitor network establishes the firing rate and triggers an SCR for switching the load. SCR reset is accomplished by opening of the solenoid interrupter contacts breaking the holding current to the SCR. Max. ON time is controlled by the speed of the solenoid and opening of interrupters; therefore duty cycle and load limits are dependent upon impedance and speed of operation.

SPECIFICATIONS

Operating voltage range	12 to 35 VDC
Maximum surge current (20 msec. max.)	7 Amps
Time interval (max.)	200 msec.
Timing accuracy	±20%
Maximum case temperature	175°C

STM HYBRID MICROELECTRONICS

hethr it's producing simple driver modules, volt- e reulators, complex microelectronic switches or y oier custom circuit miniaturization, Ledex is e company that's staffed to help you

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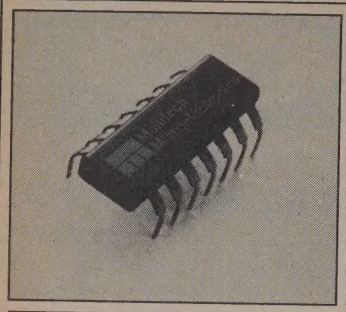
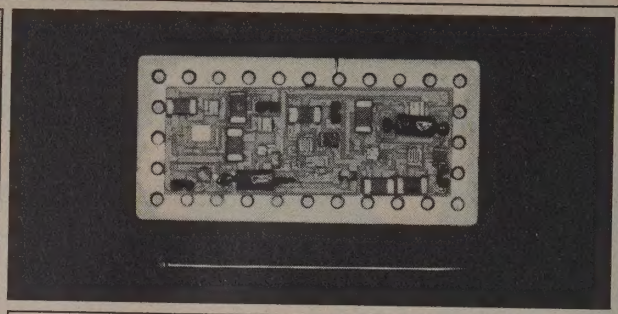
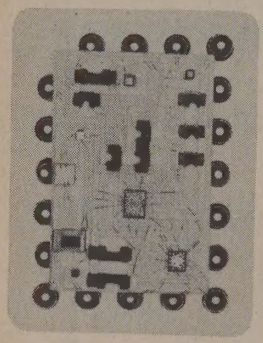
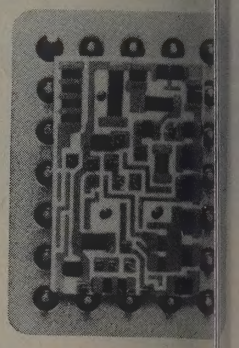
126 Webster St., Dayton, Ohio 45401 phone (513) 222-6992

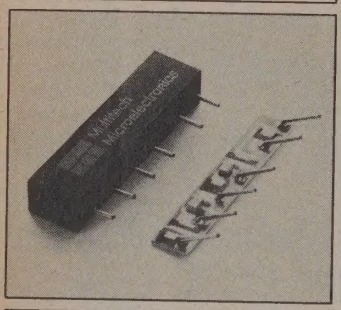


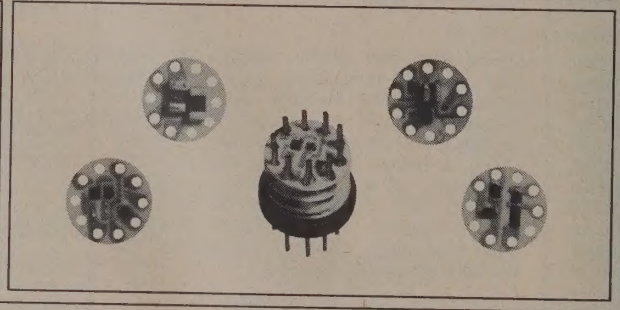


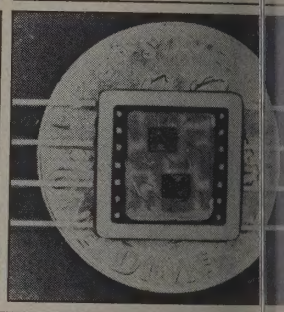


"...and because complex hybrids are not components but subsystems, only a system oriented company can best apply the theory of hybrid microelectronics — we are that company."









Free consulting services are offered to Companies who wish to investigate specific hybrid mechanizations.

Hybrid Seminars will be arranged for those groups of Engineers wishing general hybrid application knowledge.

Multitech has the capability of pretesting chip devices (I.C.'s, MOS-FET & LSI) *Over Temperature* to investigate component performance characteristics and parameter spreads prior to assembly into the hybrid.

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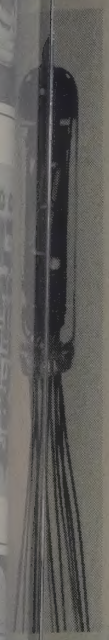
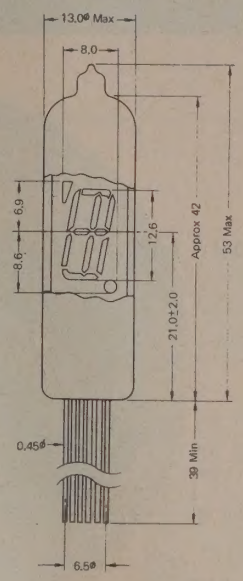


Only NEC has the latest digital indicator tubes. Shown here is the No. DG12E/LD-915. ***Equipped with the unique grid which enables dynamic drive***—these are by far the most suitable digital indicator tubes for sharp, clear focus of numerical figures. Other smaller indicator tubes available with similar characteristics. Catalog sheets on request.

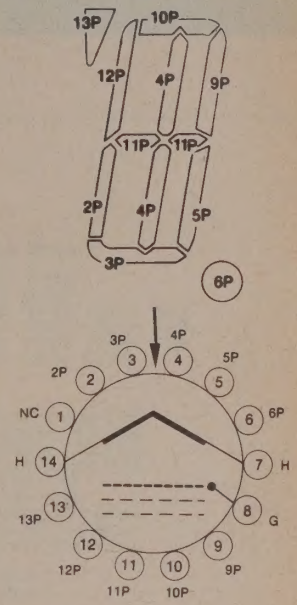
Using directly heated cathode and newly-developed phosphor materials permits uni-planar display in green color to eliminate viewing eye fatigue. FEATURES LOW POWER, LOW VOLTAGE AND COMPETITIVELY PRICED.

ELECTRICAL SPECIFICATIONS:

Filament Voltage	0.8V
Filament Current	90mA
Anode (Phosphor Segment) Voltage	20 Vdc
Grid Voltage	20 Vdc
Anode Current (Sum of all segment currents)	1mAdc
Grid Current	4mAdc
Color of Figures	Green
Brightness	80ftL

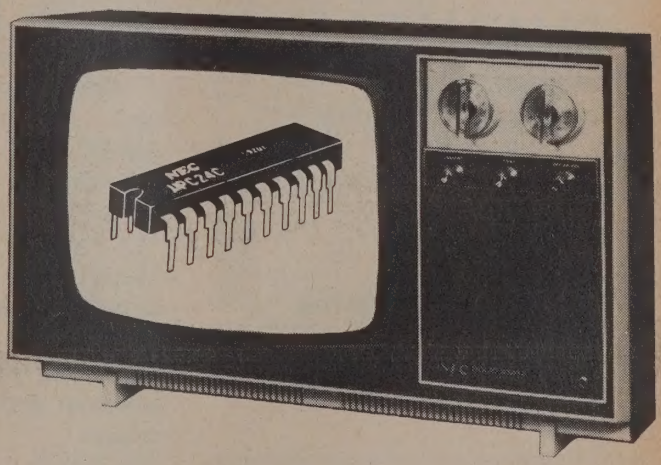


Scale of measurement 1" = 25.4 mm



A red dot is provided at root of pin No. 1. Arrow mark denotes indicator face of tube.

E FOREMOST PIONEER IN IC MINIATURIZATION FIERS NEW HORIZONS IN MASS PRODUCED PRECISION ADE INTEGRATED CIRCUITS



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Following is a partial list of the extensive range of NEC ICs for television:

μPC17C	IF Amplifier with Ratio Detector and Audio Pre-amplifier
μPC19C	Color Demodulator
μPC20C	Output Audio Amplifier
μPC23C	AFC Tuner Circuit
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We welcome customer specifications for MSI and LSI.

New types are constantly being added to our extensive range of IC's: UHF/VHF Tuner—Higher Power Monolithic Audio Amplifier—and Horizontal AFC with Vertical and Horizontal Oscillator.

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Nippon Electric Co., Ltd.
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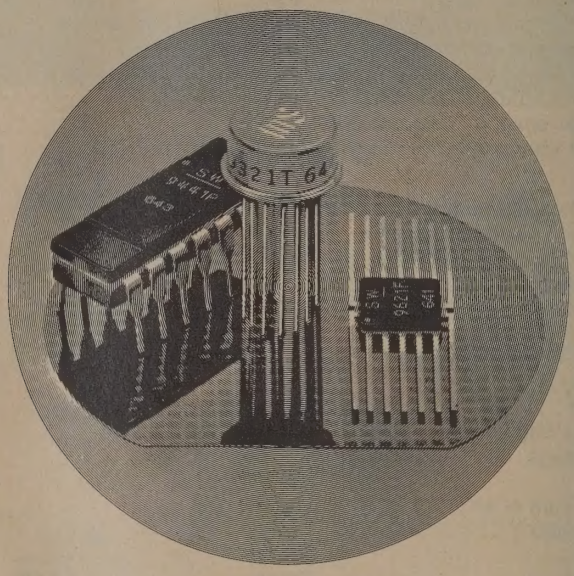
MONOLITHIC INTEGRATED CIRCUIT



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TL (Diode-Transistor Logic)

es - Inverters - Expanders

770-170-2	10-input Complementary Gate
771-171-2	10-Input Complementary Gate
774-174-2	Triple 3-Input AND Gate
775-175-2	Triple 3-Input AND Gate
776-176-2	Dual AND/OR Gate
777-177-2	Dual AND/OR Gate
778-178-2	Dual 4-Input Complementary Gate
779-179-2	Dual 4-Input Complementary Gate
930-130-2	Dual 4-Input NAND Gate
946-146-2	Quadruple 2-Input NAND Gate
949-149-2	Quadruple 2-Input NAND Gate
961-161-2	Dual 4-Input NAND Gate
962-162-2	Triple 3-Input NAND Gate
963-163-2	Triple 3-Input NAND Gate
1802 902	Expandable 8-Input NAND Gate
1805 905	10-Input NAND Gate
1806 906	Quad 2-Input AND Gate
1808 908	Quad 2-Input OR Gate
1810 910	Quad 2-Input NOR Gate
1812 912	Quad Exclusive-OR Gate
736-736-2	Hex Inverter
737-737-2	Hex Inverter
935-935-2	Expandable Hex Inverter
936-936-2	Hex Inverter
937-937-2	Hex Inverter
727-727-2	Quad 2-Input AND Expander
933-933-2	Dual 4-Input AND Expander

Buffers - Power Gates - Lamp Drivers

SW957-1/957-2	Quad 2-Input Buffer
SW932-1/932-2	Dual 4-Input Buffer
SW744-1/744-2	Dual 4-Input NAND Power Gate
SW958-1/958-2	Quad 2-Input NAND Power Gate
SW944-1/944-2	Dual 4-Input NAND Power Gate
SW729-1/729-2	Dual 4-Input Lamp Driver

Flip-Flops

SW705-1/705-2	Dual J-K Clocked Flip-Flop
SW706-1/706-2	Dual J-K Clocked Flip-Flop
SW708-1/708-2	Dual J-K Clocked Flip-Flop
SW709-1/709-2	Dual J-K Clocked Flip-Flop
*SW772-1/772-2	Triple R-S Flip-Flop
*SW773-1/773-2	Triple R-S Flip-Flop
SW945-1/945-2	R-S/J-K Clocked Flip-Flop
SW948-1/948-2	R-S/J-K Clocked Flip-Flop
SW950-1/950-2	Pulse Triggered Flip-Flop
SW1814/1914	Quad Latch
SW838/938	Decade Counter
SW839/939	Divide-By-Sixteen

Multivibrators

*SW728-1/728-2	Monostable Multivibrator
*SW751-1/751-2	Monostable Multivibrator
SW941-1/941-2	Monostable Multivibrator
SW951-1/951-2	Monostable Multivibrator

CL I and ECL II (Emitter-Coupled Logic)

W301/1	5-Input Complementary OR/NOR Gate
W302/2A	R-S Flip-Flop
W303/3	Half Adder
W304/4	Bias Driver
W305/5	Gate Expander
W306/6	3-Input Complementary OR/NOR Gate
W307/7	3-Input Complementary OR/NOR Gate
W308/8A	AC Coupled J-K Flip-Flop
W309/9	Dual 2-Input NOR Gate
W310/10	Dual 2-Input NOR Gate
W311/11	Dual 2-Input NOR Gate
L II	
W100 1201	6-Input OR/NOR Gate
W100 1202	6-Input OR/NOR Gate
W100 1203	6-Input OR/NOR Gate
W100 1204	Dual 4-Input Complementary Gate
W100 1205	Dual 4-Input Complementary Gate
W100 1206	Dual 4-Input Complementary Gate
W100 1207	Triple 3-Input NOR Gate
W100 1208	Triple 3-Input NOR Gate
SW1009/1209	Triple 3-Input NOR Gate
SW1010/1210	Quad 2-Input NOR Gate
SW1011/1211	Quad 2-Input NOR Gate
SW1012/1212	Quad 2-Input NOR Gate
SW1013/1213	85 mHz AC-Coupled J-K Flip-Flop
SW1014/1214	Dual Clocked R-S Flip-Flop (Positive Clock)
SW1015/1215	Dual Clocked R-S Flip-Flop (Negative Clock)
SW1016/1216	Dual Clocked Single-Rail R-S Flip-Flop (Positive Clock)
SW1017/1217	Translator-Saturated Logic to ECL
SW1018/1218	Translator-ECL to Saturated Logic
SW1019/1219	Full Adder
SW1020/1220	Quad Line Receiver
SW1021/1221	Full Subtractor
SW1022/1222	"D" Type Clocked Master-Slave Flip-Flop
SW1024/1224	Expandable Dual 2-Input OR/NOR Gate
SW1025/1225	Dual 4-5 Input Expander
SW1029/1229	Data Distributor
SW1030/1230	Quad Exclusive-OR
SW1031/1231	Quad Exclusive-NOR
SW1033/1233	Dual Clocked Single-Rail R-S Flip-Flop (Negative Clock)

TL (Transistor-Transistor Logic)

W5407400	Quad 2-Input NAND
W5407401	Quad 2-Input NAND w/Open Coll. "A" Pin Out
W5407402	Quad 2-Input NOR
W5407403	Quad 2-Input NAND w/Open Coll. "B" Pin Out
W5407404	Hex Inverter
W5407405	Hex Inverter w/Open Coll.
W5417410	Triple 3-Input NAND Gate
W5427420	Dual 4-Input NAND Gate
W5437430	Eight-Input NAND Gate
W5447440	Dual 4-Input Buffer
W5447442	BCD To Decimal Decoder
W5457450	Expandable Dual 2-Wide 2-Input A.O.I.
W5457451	Non-Expandable Dual 2-Wide 2-Input A.O.I.
W5457453	Expandable 4-Wide 2-Input AND/OR Invert
SW5454/7454	Non-Expandable 4-Wide 2-Input AND/OR Invert
SW5460/7460	"OR" Expander
SW5472/7472	J-K Flip-Flop
SW5473/7473	Dual J-K Master Slave Flip-Flop
SW5474/7474	Dual "D" Edge Triggered F.F.
SW5475/7475	Quad Bistable Latch
SW5476/7476	Dual J-K w/Preset and Clear
SW5490/7490	Decade Counter
SW5492/7492	Divide by 12 Counter
SW5493/7493	Four Bit Binary Counter
SW54192/74192	Up Down Decade Counter
SW54193/74193	Up Down Binary Counter
SW8220	Party Checker
SW9601	Retriggerable Monostable Multivibrator

es: our DTL line the "-1" denotes military grade,, and "-2" denotes industrial grade. In our ECL I, ECL II and TTL lines the lesser number denotes ustrial grade and the greater number denotes military grade.
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VA-741 HIGH PERFORMANCE OPERATIONAL AMPLIFIER

FEATURES

- No frequency compensation required
- Short-circuit protection
- Offset voltage null capability
- Large common mode and differential voltage ranges
- Low power consumption
- No latch up

GENERAL DESCRIPTION

The VA-741 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications. High common mode voltage range and absence of "latch-up" tendencies make the VA-741 ideal for use as a voltage follower. The high gain and wide range of operating voltages provide superior performance in integrator, summing amplifier, and general feedback applications. The VA-741 is short-circuit protected and has the same pin configuration as the popular 709 operational amplifier, but requires no external components for frequency compensation. The internal 6 db/octave roll-off insures stability in closed loop applications.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±22 v
Internal Power Dissipation (Note 1)	500 mw
Differential Input Voltage	±30 v
Input Voltage (Note 2)	±15 v
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C
Lead Temperature (Soldering, 60 sec)	300°C
Output Short-Circuit Duration (Note 3)	Indefinite

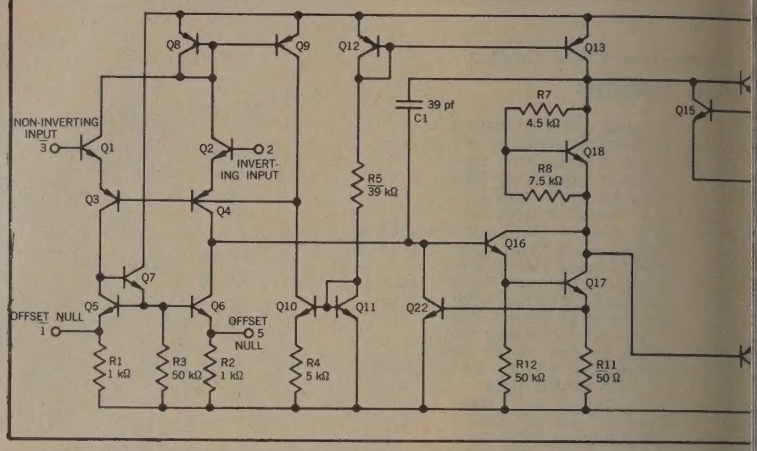
NOTES:

(1) Rating applies for case temperatures to 125°C; derate linearly at 6.5 mw/°C for ambient temperatures above +75°C.

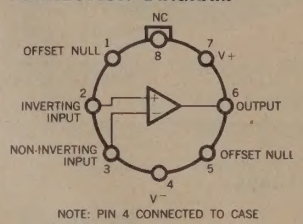
(2) For supply voltages less than ±15 v, the absolute maximum input voltage is equal to the supply voltage.

(3) Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.

SCHEMATIC DIAGRAM

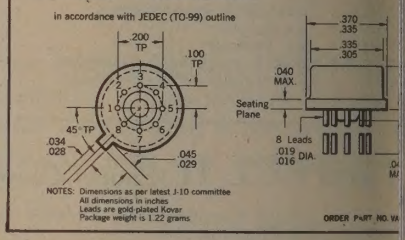


CONNECTION DIAGRAM



NOTE: PIN 4 CONNECTED TO CASE

PHYSICAL DIMENSIONS



ELECTRICAL SPECIFICATIONS

($V_S = \pm 15$ v, $T_A = 25°C$ unless otherwise specified)

Parameter	Conditions	Min.	Typ.	Max.
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	5.0
Input Offset Current			30	20
Input Bias Current			200	50
Input Resistance		0.3	1.0	
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ, $V_{out} = \pm 10$ v	50,000	200,000	
Output Voltage Swing	$R_L \geq 10$ kΩ $R_L \geq 2$ kΩ	±12 ±10	±14 ±13	
Input Voltage Range		±12	±13	
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90	
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150
Power Consumption			50	85
Transient Response (unity gain)	$V_{in} = 200$ ma, $R_L = 2$ kΩ $C_L \leq 100$ pf			
Risetime			0.3	
Overshoot			5.0	
Slew Rate (unity gain)	$R_L \geq 2$ kΩ		0.5	
The following specifications apply for $-55°C \leq T_A \leq +125°C$:				
Input Offset Voltage	$R_S \leq 10$ kΩ			6.0
Input Offset Current				500
Input Bias Current				1.5
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ, $V_{out} = \pm 10$ v	25,000		
Output Voltage Swing	$R_L \geq 2$ kΩ	±10		

HOW TO ORDER

VA	5B	741	31
GENERIC DEVICE TYPE FOR OPERATIONAL AMPLIFIER	PACKAGE CODE (TO5, 8 LEAD, 4 PINS SHORTED TO CAN, ALL 8 PINS USED, ILLUSTRATED)	BASIC CIRCUIT CODE	TEMPERATU (−55°C to ILLUST

A commercial high performance operational amplifier, the VA-741C, is also available. Order part number

See YELLOW SECTION for Local Offices, Phones

-747 (Military), VA-747C (Commercial) — HIGH PERFORMANCE DUAL OPERATIONAL AMPLIFIER

ATURE

- ffset ltage null capability
- arge mmon-mode and ifferenal voltage ranges
- o frency compensation equire
- hort cuit protection
- No latch-up
- ow pwer consumption

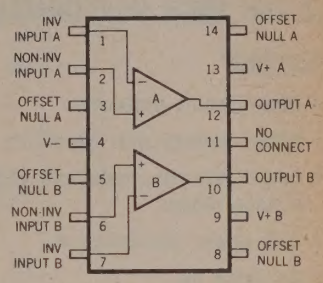
GENERAL DESCRIPTION

The VA-747 is a dual monolithic operational amplifier fabricated on a single silicon chip. The device is intended for a wide range of linear applications where conservation of weight or space is important. High gain and wide range of operating voltage provide superior performance in integrator, summing amplifier and general feedback applications. The VA-747 is ideal for use as a voltage follower because of a high common mode voltage range and absence of "latch-up". The device requires no external frequency compensation components and is short-circuit protected. The internal 6dB/octave roll-off insures stability in closed loop applications.

This device is also available in chip form.

CONNECTION DIAGRAM

(Top View)

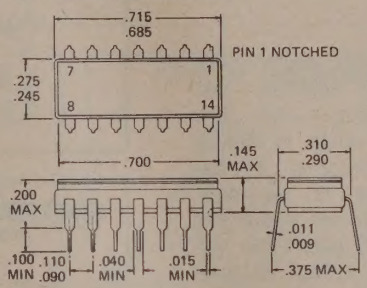


SOLU MAXIMUM RATINGS

	VA-747	VA-747C
ply Voage	±22 V	±18 V
ernal wer Dissipation	800 mW (Note 1)	800 mW (Note 4)
erent Input Voltage	±30 V	±30 V
ut Voge	±15 V (Note 2)	±15 V
tage tween Offset Null and V−	±0.5 V	±0.5 V
rage mperature Range	−65°C to +150°C	−65°C to +150°C
rating emperature Range	−55°C to +125°C	0°C to +70°C
d Tem rature (Soldering, 60 second)	300°C	300°C
put Sort-Circuit Duration	Indefinite (Note 3)	Indefinite (Note 5)

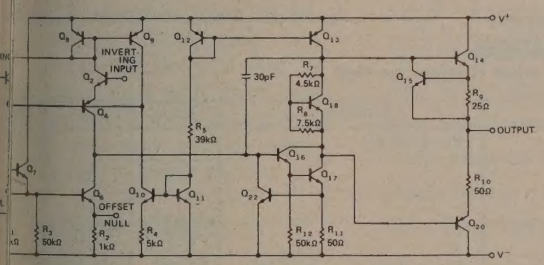
TES: (1) Rating applies for case temperature to 125°C; derate linearly at 9.0 W/°C for ambient temperatures above +60°C. (2) For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage. (3) Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +60°C ambient temperature for each side. (4) Rating applies for case temperature to +70°C; derate linearly at 9.0 mW/°C for ambient temperatures above +60°C. (5) Short circuit may be to ground or either supply. Rating applies to +70°C case temperature or +60°C ambient temperature for each side.

PHYSICAL DIMENSIONS



NOTES:
All dimension in inches. Leads are intended for insertion in hole rows on .300 centers.
They are purposely shipped with "positive" misalignment to facilitate insertion. Board-drilling dimensions should equal your practice for .02 inch diameter lead. Cap, base and leads are gold-plated Kovar.

UIVA NT CIRCUIT EACH SIDE



ECTAL SPECIFICATIONS VA-747 & VA-747C

ch Amlier ($V_S = \pm 15$ V, $T_A = 25°C$ unless otherwise specified)

ramete (see definitions)	Conditions	Min.	Typ.	Max.	Units
ut Off Voltage	$R_S \leq 10$ kΩ		1.0	5.0	mV
ut Off Current			20	200	nA
ut Bi Current			80	500	nA
ut Re tance		0.3	2.0		MΩ
ut Ca itance			1.4		pF
set Vge Adjustent Range			±15		mV
ge-Sil Voltage Gain	$R_L \geq 2$ kΩ, $V_{out} = \pm 10$ V	50,000	200,000		
put Fistance			75		Ω
put Sort-Circuit Current			25		mA
ply Crent			1.7	2.8	mA
wer Csumption			50	85	mW
nsie esponse (unity in) Rise me Ove hoot	$V_{in} = 20$ mV, $R_L = 2$ kΩ, $C_L \leq 100$ pF		0.3 5.0		μs %
w Ra	$R_L \geq 2$ kΩ		0.5		V/μs
anne paration			120		dB

ELECTRICAL SPECIFICATIONS VA-747

The following specifications apply for $-55°C \leq T_A \leq +125°C$.

Parameters (see definitions)	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	6.0	mV
Input Offset Current	$T_A = +125°C$ $T_A = -55°C$		7.0 85	200 500	nA nA
Input Bias Current	$T_A = +125°C$ $T_A = -55°C$		0.03 0.3	0.5 1.5	μA μA
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150	μV/V
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ $V_{out} = \pm 10$ V	25,000			
Output Voltage Swing	$R_L \geq 10$ kΩ $R_L \geq 2$ kΩ	±12 ±10	±14 ±13		V V
Supply Current	$T_A = +125°C$ $T_A = -55°C$		1.5 2.0	2.5 3.3	mA mA
Power Consumption	$T_A = +125°C$ $T_A = -55°C$		45 60	75 100	mW mW

VA-747C The following specifications apply for $0°C \leq T_A \leq +70°C$.

Parameters (see definitions)	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	7.5	mV
Input Offset Current			7.0	300	nA
Input Bias Current			0.03	0.8	μA
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150	μV/V
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ $V_{out} = \pm 10$ V	25,000			
Output Voltage Swing	$R_L \geq 10$ kΩ $R_L \geq 2$ kΩ	±12 ±10	±14 ±13		V V
Supply Current			200	3.3	mA
Power Consumption			60	100	mW

HOW TO ORDER

VA	6A	747	31
GENERIC DEVICE TYPE FOR OPERATIONAL AMPLIFIER	PACKAGE CODE (14 LEAD DUAL-IN-LINE ILLUSTRATED)	BASIC CIRCUIT CODE	TEMPERATURE RANGE (−55°C to +125°C ILLUSTRATED)

A commercial high performance operational amplifier, the VA-747C, is also available. Order part number VA6A74739

VARADYNE
SEMICONDUCTOR
A DIVISION OF VARADYNE, INC.

2330 MICHIGAN AVENUE, SANTA MONICA, CALIFORNIA 90404
TEL: (213) 829-2984, TWX (910) 343-6856

VA-748 HIGH PERFORMANCE OPERATIONAL AMPLIFIER

FEATURES

- Short-circuit protection
- Offset voltage null capability
- Large common-mode and differential voltage ranges
- Low power consumption
- No latch up

GENERAL DESCRIPTION

The VA-748 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications where tailoring of frequency characteristics is desirable. High common mode voltage range and absence of "latch-up" make the VA-748 ideal for use as a voltage follower. The high gain and wide range of operating voltages provide superior performance in integrator, summing amplifier, and general feedback applications. The VA-748 is short-circuit protected and has the same pin configuration as the popular VA-741 operational amplifier. Unity gain frequency compensation is achieved by means of a single 30 pF capacitor.

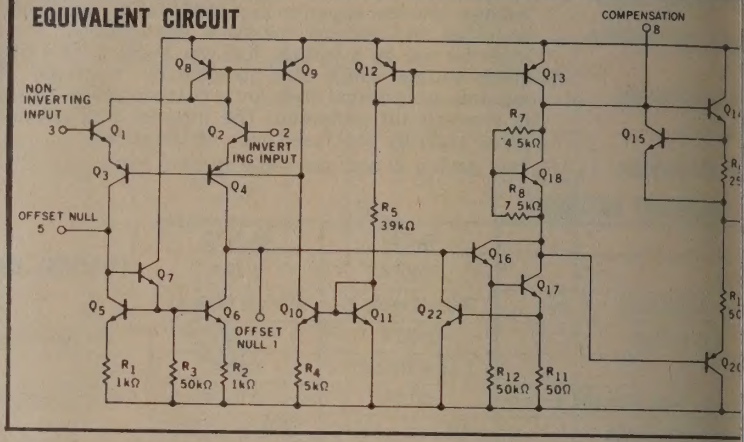
ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±22 V
Internal Power Dissipation (Note 1)	500 mW
Differential Input Voltage	±30 V
Input Voltage (Note 2)	±15 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C
Lead Temperature (Soldering, 60 seconds)	300°C
Output Short-Circuit Duration (Note 3)	Indefinite

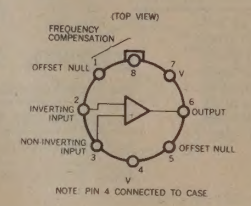
NOTES:
(1) Rating applies for case temperatures to +70°C.
(2) For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
(3) Short circuit may be to ground or either supply. Rating applies to +70°C ambient temperature.

A commercial high performance operational amplifier, the VA-748C, is also available. Order part number VA5B74839.

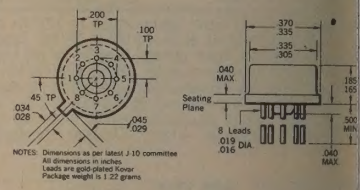
EQUIVALENT CIRCUIT



CONNECTION DIAGRAM
(TOP VIEW)



PHYSICAL DIMENSIONS



ELECTRICAL SPECIFICATIONS
(V_S = +15 V, T_A = 25°C unless otherwise specified)

Parameter	Conditions	Min.	Typ.	Ma
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	5
Input Offset Current			80	20
Input Bias Current			2.0	50
Input Resistance		0.3	2.0	
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{out} = ±10 v	50,000	200,000	
Output Voltage Swing	$R_L \geq 10$ kΩ $R_L \geq 2$ kΩ	±12 ±10	±14 ±13	
Input Voltage Range		±12	±13	
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90	
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	15
Power Consumption			50	85
Transient Response (unity gain)	V_{in} = 200 ma, R_L = 2 kΩ $C_L \leq 100$ pf			
Risetime			0.3	
Overshoot			5.0	
Slew Rate (unity gain)	$R_L \geq 2$ kΩ		0.5	
The following specifications apply for −55°C ≤ T_A ≤ +125°C:				
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	6.0
Input Offset Current			85.0	50
Input Bias Current				1.5
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{out} = ±10 v	50,000		
Output Voltage Swing	$R_L \geq 2$ kΩ	±10		

HOW TO ORDER

VA	5B	748	3
GENERIC DEVICE TYPE FOR OPERATIONAL AMPLIFIER	PACKAGE CODE (T05, 8 LEAD, 4 PINS SHORTED TO CAN, ALL 8 PINS USED, ILLUSTRATED)	BASIC CIRCUIT CODE	TEMPERAT (−55°C t ILLUST

108 OPERATIONAL LIFIER

URES

- ximu input bias current of 3.0 nA
- set rrent less than 400 pA
- ply urrent of only 300 μA, even sat tion
- aran ed drift characteristics

ERAL ESCRIPTION

VA-8 is a precision operational lifier having specifications a factor en ber than FET amplifiers over a °C +125°C temperature range. cted nits are available with offset ges ess than 1.0 mV and drifts tha 5 μV/°C, again over the mili- tem rature range. These specifica- s ma it possible to eliminate off- adj ments in most cases, and to in rformance approaching chop- stab zed amplifiers.

dev e operates with supply volt- s fro ±2V to ±20V and has suffi- nt sply rejection to use unregu- d splies. Although the circuit is rch geable with and uses the same npen tion as the 101A an alternate -npen tion scheme can be used to ke it articularly insensitive to power ply ise and to make supply bypass acit s unnecessary.

lo current error of the VA-108 kes ssible many designs that are pra ical with conventional ampli- s. In fact, it operates from 10 MΩ rce esistances, introducing less or th devices like the 709 with 10 sou es. Integrators with drifts less n 50 μV/sec and analog time delays exc s of one hour can be made ng pacitors no larger than 1 μF.

SOLU E MAXIMUM RATINGS

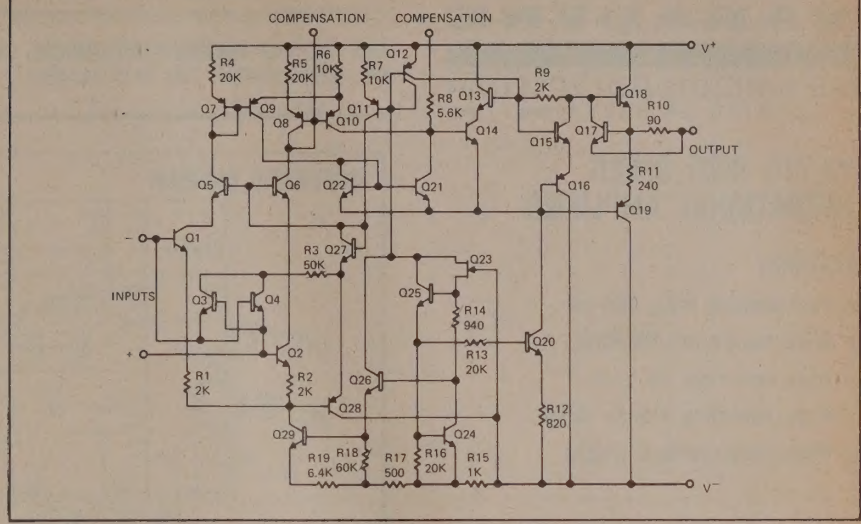
pply oltage	±20 V
wer ssipation (Note 1)	500 mW
fere al Input Current (Not 2)	±10 mA
put ltage (Note 3)	±15 V
tput hort Circuit Duration	Indefinite
erat g Temperature Range	−55°C to +125°C
orag emperature Range	−65°C to +150°C
ad Tnperature (Sol ring, 60 sec)	300°C

ES:

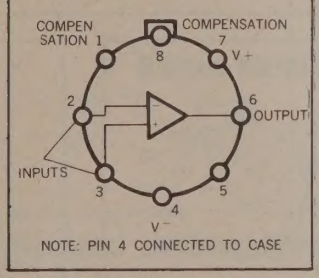
The aximum junction temperature of the 108 50°C. For operating at elevated temper- res, ices in the TO-5 package must be de- ion d on a thermal resistance of 150°C/W, ion ambient, or 45°C/W, junction to case. the it package, the derating is based on a rmal sistance of 185°C/W when mounted on /16- n-thick epoxy glass board with ten, 0.03- n-wid 2-ounce copper conductors. The thermal stan of the dual-in-line package is 100°C/W, tion ambient.

The nputs are shunted with back-to-back es overvoltage protection. Therefore, ex- sive rrent will flow if a differential input age excess of 1 V is applied between the uts ess some limiting resistance is used. For pply voltages less than ±15 V, the olute aximum input voltage is equal to the ply tage.

SCHEMATIC DIAGRAM

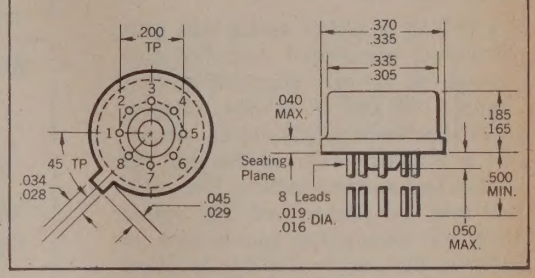


CONNECTION DIAGRAM



NOTE: PIN 4 CONNECTED TO CASE

PHYSICAL DIMENSIONS



ELECTRICAL SPECIFICATIONS

These specifications apply for ±5 V ≤ V_S ≤ ±20 V and −55°C ≤ T_A ≤ +125°C, unless otherwise specified.

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	T_A = 25°C		0.7	2.0	mV
Input Offset Current	T_A = 25°C		0.05	0.2	nA
Input Bias Current	T_A = 25°C		0.8	2.0	nA
Input Resistance	T_A = 25°C	30	70		MΩ
Supply Current	T_A = 25°C		0.3	0.6	mA
Large Signal Voltage Gain	T_A = 25°C, V_s = ±15 V, V_{out} = ±10 V, R_L ≥ 10 kΩ	50	300		V/mV
Input Offset Voltage (See Note)				3.0	mV
Average Temperature Coefficient of Input Offset Current			3.0	15	μV/°C
Input Offset Current				0.4	nA
Average Temperature Coefficient of Input Offset Voltage			0.5	2.5	pA/°C
Input Bias Current				3.0	nA
Large Signal Voltage Gain	V_s = ±15 V, V_{out} = ±10 V, R_L ≥ 10 kΩ	25			V/mV
Output Voltage Swing	V_s = ±15 V, R_L = 10 kΩ	±13	±14		V
Input Voltage Range	V_s = ±15 V	±14			V
Common Mode Rejection Ratio		85	100		dB
Supply Voltage Rejection Ratio		80	96		dB

***NOTE:** The VA-108 has a guaranteed offset voltage less than 0.5 mV at 25°C and 1.0 mV for −55°C ≤ T_A ≤ 125°C and V_S = ±15 V. The average temperature coefficient of input offset voltage is guaranteed to be less than 5 μV/°C for these conditions.

HOW TO ORDER

VA	5B	108	31
GENERIC DEVICE TYPE FOR OPERATIONAL AMPLIFIER	PACKAGE CODE	BASIC CIRCUIT CODE	TEMPERATURE RANGE (−55°C TO +125°C ILLUSTRATED)

A commercial voltage operational amplifier, the VA-108C, is also available. Order part number VA5B10839.

VARADYNE
SEMICONDUCTOR
A DIVISION OF VARADYNE, INC.

2330 MICHIGAN AVENUE, SANTA MONICA, CALIFORNIA 90404
TEL: (213) 829-2984, TWX (910) 343-6856

VA-715 HIGH SPEED OPERATIONAL AMPLIFIER

FEATURES

- Fast settling time, 300 ns
- Wide Bandwidth, 65 MHz
- High slew rate, 65 V/μs
- Wide operating supply range
- Wide input voltage ranges

GENERAL DESCRIPTION

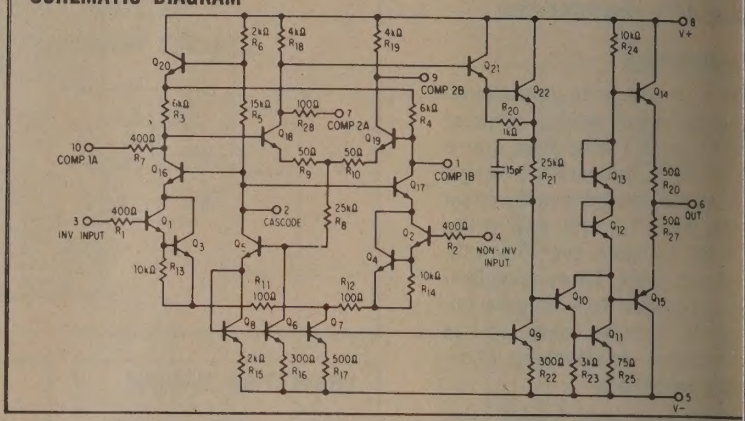
The VA-715 is a high speed, high gain, monolithic operational amplifier constructed on a single silicon chip. It is intended for use in a wide range of applications where fast signal acquisition or wide bandwidth is required. The VA-715 features fast settling time, high slew rate, low offsets, and high output swing for large signal applications. In addition, the device displays excellent temperature stability and will operate over a wide range of supply voltages. The VA-715 is ideally suited for use in A to D and D to A converters, active filters, deflection amplifiers, video amplifiers, phase locked loops, multiplexed analog gates, precision comparators, sample and holds, and general feedback applications requiring DC wide bandwidth operation.

ABSOLUTE MAXIMUM RATINGS

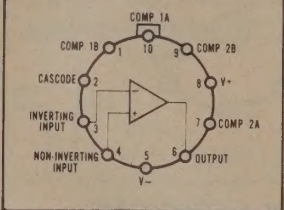
Supply Voltage	±18 V
Internal Power Dissipation (Note 1)	500 mW
Differential Input Voltage	±15 V
Input Voltage (Note 2)	±15 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C
Lead Temperature (Soldering, 60 sec)	300°C

NOTES:
(1) Rating applies for case temperatures to +125°C; derate linearly at 6.5 mW/°C for ambient temperatures above +75°C.
(2) For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

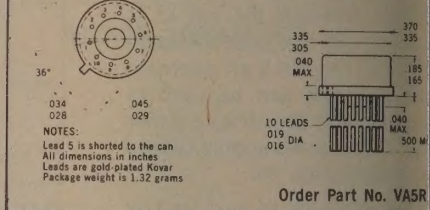
SCHEMATIC DIAGRAM



CONNECTION DIAGRAM



PHYSICAL DIMENSIONS



Order Part No. VA5R 31

ELECTRICAL SPECIFICATIONS

These specifications apply for (V_S = ±15 V, T_A = 25°C).

Parameter	Conditions	Min.	Typ.	Max.
Input Offset Voltage	$R_S \leq 10$ kΩ		2.0	5.0
Input Offset Current			70	250
Input Bias Current			400	750
Input Resistance			1.0	
Input Voltage Range		±10	±12	
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	74	92	
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		70	300
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{out} = ±10 V	15,000	30,000	
Output Voltage Swing	$R_L \geq 2$ kΩ	±10	±13	
Output Resistance			75	
Supply Current			5.5	7.0
Power Consumption			165	210
Acquisition Time (Unity Gain)	V_{out} = +5 V		800	
Settling Time (Unity Gain)			300	
Transient Response (Unity Gain) Risetime Overshoot	V_{in} = 500 mV		30 30	60 40
Slew Rate	Av = 100 Av = 10 Av = 1	 15	65 40 20	
The following specifications apply for −55°C ≤ T_A ≤ +125°C.				
Input Offset Voltage	$R_S \leq 10$ kΩ			7.5
Input Offset Current	T_A = +125°C T_A = −55°C			250 800
Input Bias Current	T_A = +125°C T_A = −55°C			750 4.0
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	74		
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ			300
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{out} = ±10 V	10,000		
Output Voltage Swing	$R_L \geq 2$ kΩ	±10		

HOW TO ORDER

VA	5R	715	3
GENERIC DEVICE TYPE FOR VOLTAGE REGULATOR	PACKAGE CODE	BASIC CIRCUIT CODE	TEMPERATURE (−55°C T ILLUST

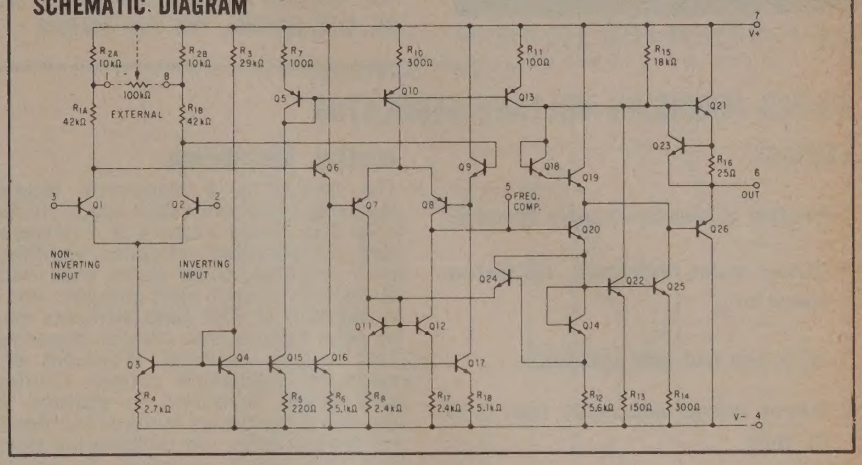
A commercial voltage regulator, the VA-715C is also available. Order part number VA5R7153

725 NSTRUMENTATION OPERATIONAL AMPLIFIER

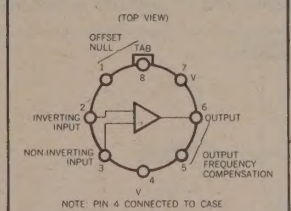
URES

- w inpt noise current, 0.6 pA/√Hz
- gh opn loop gain, 3,000,000
- w inpt offset current, 3 na
- w inpt voltage drift, 0.5 μV/°C
- gh common mode rejection, 120 dB
- gh inut voltage range, ±14 V
- ide pwer supply range, ±3 V to 22 V
- fset ull capability

SCHEMATIC DIAGRAM

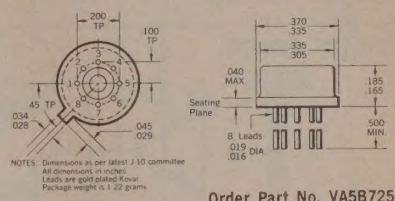


CONNECTION DIAGRAM



NOTE: PIN 4 CONNECTED TO CASE

PHYSICAL DIMENSIONS



NOTES: Dimensions as per latest J-10 committee
All dimensions in inches
Leads are gold plated Kovar.
Package weight is 1.22 grams

Order Part No. VA5B72531

ERAL DESCRIPTION

VA-75 is an instrumentation operal aplifier constructed on a single on cp. It is intended for precise, leve signal amplification applica- s wre low noise, low drift, and urate losed loop gain are required. offs null capability, low power sumpon, very high voltage gain as as ide power supply voltage range vide perior performance for a wide ge o instrumentation applications. VA-75 is pin compatible with the ular /A-741 operational amplifier.

GLU MAXIMUM RATINGS

ply ltage	±22 V
rma Power Dissipation Note)	500 mV
erenal Input Voltage Note)	±22 V
ut Vtage (Note 3)	±22 V
tage etween Offset ull nd V+	±0.5 V
rage emperature Range	−65° C to +150°C
ratig Temperature Range	−55°C to +125°C
d Tnperature Solcing, 60 sec)	300°C

ES:

Ratin applies for case temperatures to +85°C; te Iarly at 6.5 mW/°C for ambient temper- es, are 75°C.

Ratin applies for 5 ms pulses with 10% duty 8; ate to ±5 V for continuous operation.

For pply voltages less than ±22 V, the abso- ma um input voltage is equal to the supply ge.

ELECTRICAL SPECIFICATIONS

The following specifications apply for $V_S = \pm 15$ V, $T_A = 25°C$.

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage (Without external trim)	$R_S \leq 10$ kΩ		0.5	1.5	mV
Input Offset Current			3.0	20	nA
Input Bias Current			50	100	nA
Input Noise Voltage	$f_O = 10$ Hz $f_O = 100$ Hz $f_O = 1$ kHz		15 12 8		nV/√Hz nV/√Hz nV/√Hz
Input Noise Current	$f_O = 10$ Hz $f_O = 100$ Hz $f_O = 1$ kHz		1.0 0.8 0.6		pA/√Hz pA/√Hz pA/√Hz
Input Resistance			3.0		MΩ
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, Vout = ±10 V	500,000	3,000,000		
Output Voltage Swing	$R_L \geq 10$ kΩ $R_L \geq 2$ kΩ	±12 ±10	±13 ±13		V V
Input Voltage Range		±13.5	±14		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	100	120		dB
Power Supply Rejection Ratio	$R_S \leq 10$ kΩ		2.0	10	μV/V
Power Consumption			80	120	mV
The following specifications apply for $-55°C \leq T_A \leq +125°C$.					
Input Offset Voltage (Without external trim)	$R_S \leq 10$ kΩ		0.8	2.5	mV
Average Input Offset Voltage Drift (Without external trim)	$R_S = 50$ Ω		2.0	10	μV/°C
Average Input Offset Voltage Drift (With external trim)	$R_S = 50$ Ω		0.5		μV/°C
Input Offset Current	$T_A = +85°C$ $T_A = -20°C$		2.0 5.0	20 40	nA nA
Average Input Offset Current Drift			10	300	pA/°C
Input Bias Current	$T_A = +125°C$ $T_A = -55°C$		25 100	200 400	nA nA
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	100			dB
Power Supply Rejection Ratio	$R_S \leq 10$ kΩ			20	μV/V
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, $T_A = +125°C$ $R_L \geq 2$ kΩ, $T_A = -55°C$	500,000 250,000			
Output Voltage Swing	$R_L \geq 2$ kΩ	±10	±13		V

HOW TO ORDER

VA	5B	725	31
GENERIC DEVICE TYPE FOR OPERATIONAL AMPLIFIER	PACKAGE CODE (T05, 8 LEAD, 4 PINS SHORTED TO CAN, ALL 8 PINS USED ILLUSTRATED)	BASIC CIRCUIT CODE	TEMPERATURE RANGE (−55°C TO +125°C ILLUSTRATED)

A commercial high performance operational amplifier, the VA-725C is also available. Order part number VA5B72539.

VARADYNE
SEMICONDUCTOR
A DIVISION OF VARADYNE, INC.

2330 MICHIGAN AVENUE, SANTA MONICA, CALIFORNIA 90404
TEL: (213) 829-2984, TWX (910) 343-6856

VA-723 PRECISION VOLTAGE REGULATOR

FEATURES

- Positive or negative supply operation
- Series, shunt, switching, or floating operation
- .01% line and load regulation
- Output voltage adjustable from 2 to 37 volts
- Output current to 150 ma without external pass transistor

GENERAL DESCRIPTION

The VA-723 is a monolithic voltage regulator constructed on a single silicon chip. The device consists of a temperature compensated reference amplifier, error amplifier, power series pass transistor, and current limit circuitry. Additional NPN or PNP pass elements may be used when output current exceeding 150 ma are required. Provisions are made for adjustable current limiting and remote shutdown. In addition to the above, the device features low standby current drain, low temperature drift, and high ripple rejection. To extend output current capability up to .5 a, Varadyne offers the series J voltage regulator described in another brochure.

APPLICATIONS

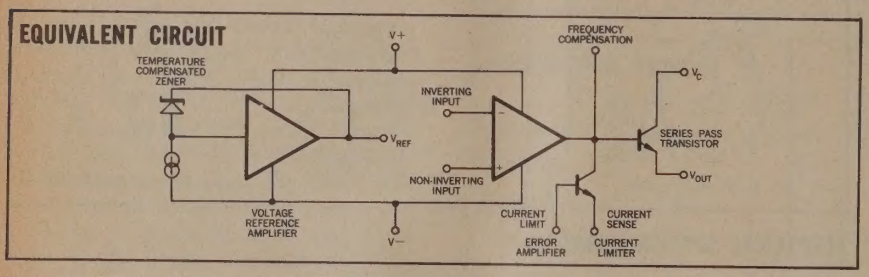
Applications include laborat supplies, isolation regulators level data amplifiers, logic c lators, small instrument power airborne systems, and other p plies for digital and linear ci

ABSOLUTE MAXIMUM RATINGS

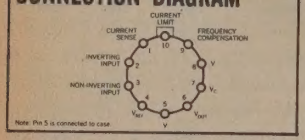
Pulse Voltage from V+ to V− (50 msec)
Continuous Voltage from V+ to V−
Input-Output Voltage Differential
Maximum Output Current
Current from V_{REF}
Internal Power Dissipation[1]
Operating Temperature Range
Storage Temperature Range (Metal Can)
Lead Temperature (Soldering, 60 sec.)

[1] Derate linearly at 6.8 mw/°C at ambi tures above 25°C.

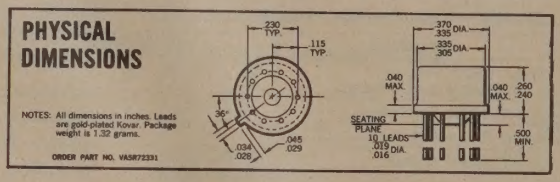
EQUIVALENT CIRCUIT



CONNECTION DIAGRAM



PHYSICAL DIMENSIONS



NOTES: All dimensions in inches. Leads are gold-plated Kovar. Package weight is 1.32 grams.

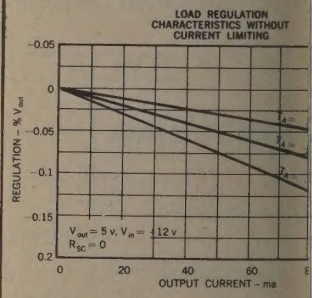
ORDER PART NO. VA5R72331

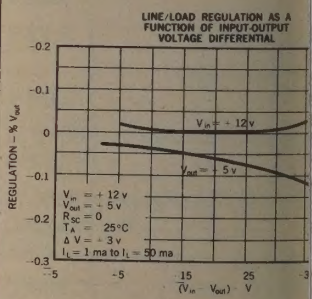
ELECTRICAL SPECIFICATIONS

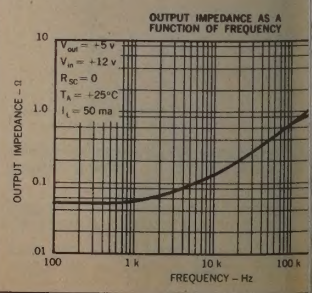
Parameter	Conditions[1]	Min.	Typ.	Max.	Units
Line Regulation	$V_{in} = 12$ v to $V_{in} = 15$ v $V_{in} = 12$ v to $V_{in} = 40$ v $-55°C \leq T_A \leq +125°C$, $V_{in} = 12$ v to $V_{in} = 15$ v		.01 .02	0.1 0.2 0.3	$\%V_{out}$ $\%V_{out}$ $\%V_{out}$
Load Regulation	$I_L = 1$ ma to $I_L = 50$ ma $-55°C \leq T_A \leq +125°C$, $I_L = 1$ ma to $I_L = 50$ ma		.03	0.15 0.6	$\%V_{out}$ $\%V_{out}$
Ripple Rejection	f = 50 Hz to 10 kHz, $C_{REF} = 0$ f = 50 Hz to 10 kHz, $C_{REF} = 5\ \mu f$		74 86		db db
Average Temperature Coefficient of Output Voltage	$-55°C \leq T_A \leq +125°C$		.002	.015	%/°C
Short Circuit Current Limit	$R_{SC} = 10\Omega$, $V_{out} = 0$		65		ma
Reference Voltage		6.95	7.15	7.35	v
Output Noise Voltage	BW = 100 Hz to 10 kHz, $C_{REF} = 0$ BW = 100 Hz to 10 kHz, $C_{REF} = 5\ \mu f$		20 2.5		μvrms μvrms
Long Term Stability			0.1		%/1000 hrs
Standby Current Drain	$I_L = 0$, $V_{in} = 30$ v		2.3	3.5	ma
Input Voltage Range		9.5		40	v
Output Voltage Range		2.0		37	v
Input-Output Voltage Differential		3.0		38	v

[1] Unless otherwise specified, $T_A = 25°C$, $V_{in} = V+ = V_C = 12$ v, V− = 0, $V_{out} = 5$ v, $I_L = 1$ ma, $R_{SC} = 0$, $C_1 = 100$ pf, and divider impedance as seen by the error amplifier ≤ 10 kΩ.

TYPICAL CHARACTERISTICS







HOW TO ORDER

VA	5R	723	31
GENERIC DEVICE TYPE FOR VOLTAGE REGULATOR	PACKAGE CODE	BASIC CIRCUIT CODE	TEMPERATURE RANGE (−55°C to +125°C ILLUSTRATED)

A commercial voltage regulator, the VA-723C, is also available. Order part number VA5R72339.

See YELLOW SECTION for Local Offices, Phones

09 VOLTAGE REGULATOR

FEATURES

- Single chip construction
- Complete 5 V regulator
- Delivers up to 200 ma in TO-5 package
- Blow-out proof
- Current limiting

GENERAL DESCRIPTION

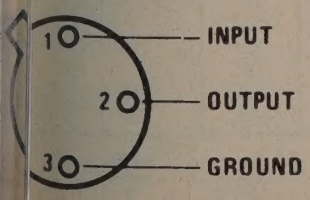
VA-109 is a complete 5 V regulator operation on a single silicon chip. It is designed for local regulation on digital cards, eliminating the distribution problems associated with single-point regulation. The device is available in a common transistor package. In the TO-5 header, it can deliver output currents in excess of 200 mA, if adequate heat sinking is provided.

Regulator is essentially blow-out proof. Current limiting is included to limit peak output current to a safe value. In addition, thermal shutdown is provided to keep the IC from overheating. If internal dissipation is too high, the regulator switches on and off in a duty cycle that prevents excessive heating.

VA-109 does not use a zener diode for the internal reference. Instead, the reference is developed from the highly-predictable emitter-base voltage of the transistor. This unique low-voltage reference makes possible operation with output voltages below 6.5 V. Further, production tolerances are tight enough that individual adjustment is unnecessary. It is a simple matter to guarantee that the output voltages under all conditions, including variations in temperature, input voltage and load as well as long-term stability, that are well within the operating range of digital IC's.

Considerable effort was expended to make the VA-109 easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response somewhat. Input bypassing is needed, however, if the regulator is located very far from the filter capacitor of the power supply. Stability is achieved by methods that provide good rejection of load or line transients as are usually seen with TTL IC's.

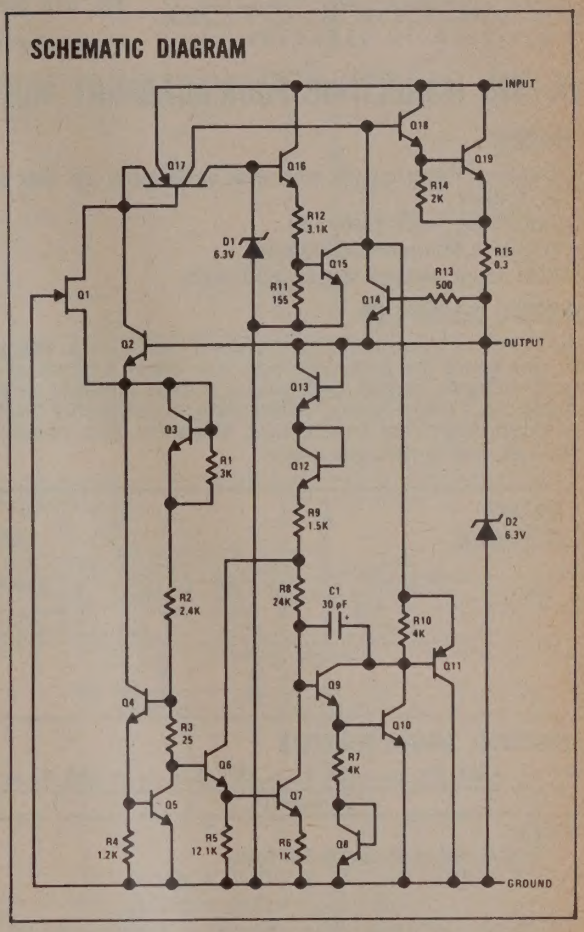
PHYSICAL DIMENSIONS



Note: Case is ground.

Bottom View Order Part No. VA5S10931

SCHEMATIC DIAGRAM



ELECTRICAL SPECIFICATIONS (NOTE 1)

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage		4.7	5.0	5.3	V
Line Regulation	$7.0\ V \leq V_{IN} \leq 25\ V$		4.0		mV
Load Regulation	$0 \leq I_{OUT} \leq 0.5\ A$		30		mV
Standby Current Drain			6.0		mA
Temperature Stability	$-55°C \leq T_j \leq 150°C$		20		mV
Thermal Resistance, Junction to Case (Note 2)	LM109H LM109K		15 1.5		°C/W °C/W
Output Voltage	$-55°C \leq T_j \leq 150°C$ $0 \leq I_{OUT} \leq 0.5\ A$ $7.0\ V \leq V_{IN} \leq 25\ V$	4.6	5.0	5.4	V
Output Noise Voltage	$10\ Hz \leq f \leq 100\ kHz$		20		μV
Long Term Stability				10	mV

A commercial 5-volt regulator, the VA-109C, is also available. Order part number VA5S10939.

ABSOLUTE MAXIMUM RATINGS

Input Voltage	35 V
Operating Junction Temperature	−55° to 150°C
Storage Temperature	−65°C to 150°C
Lead Temperature (Soldering, 60 sec)	300°C

NOTES:

(1) These specifications apply for $T_j = 25°C$, $V_{IN} = 10\ V$ and $I_{OUT} = 200\ mA$, unless otherwise specified.

(2) Without a heat sink, the thermal resistance of the TO-5 package is about 150°C/W. With a heat sink, the effective thermal resistance can only approach the values specified, depending on the efficiency of the sink.

VARADYNE
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2330 MICHIGAN AVENUE, SANTA MONICA, CALIFORNIA 90404
TEL: (213) 829-2984, TWX (910) 343-6856

VA-1595 MONOLITHIC FOUR-QUADRANT MULTIPLIER

FEATURES

- Excellent linearity: 1% max error on X-input, 2% max error on Y-input
- Adjustable scale factor, K
- Excellent temperature stability
- Wide input voltage range: ±10 volts

GENERAL DESCRIPTION

The Varadyne monolithic four-quadrant multiplier is designed for use where the output voltage is a linear product of two input voltages. Typical applications include multiply, divide,* square root,* mean square,* phase detector, frequency doubler, balanced modulator/demodulator, electronic gain control.

* When used with an operational amplifier

MAXIMUM RATINGS

(T_A = 25°C unless otherwise noted)

Applied Voltage
($V_2 - V_1$, $V_{14} - V_1$, $V_1 - V_9$, $V_1 - V_{12}$, $V_1 - V_4$
$V_1 - V_8$, $V_{12} - V_7$, $V_9 - V_7$, $V_8 - V_7$, $V_4 - V_7$)

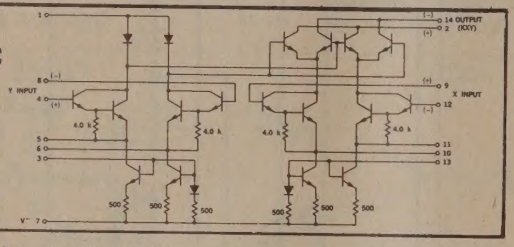
Differential Input Signal $V_{12} - V_9$ ±(6 +
$V_4 - V_8$ ±(6 +

Maximum Bias Current I_3
I_{13}

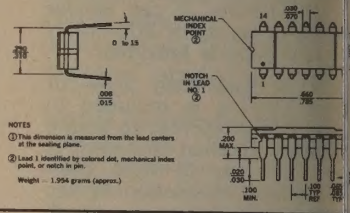
Power Dissipation (Package Limitation)
Ceramic Package
Derate above 25°C 5.

Operating Temperature Range −55°C to
Storage Temperature Range −65°C to

CIRCUIT SCHEMATIC



TYPICAL DUAL IN-LINE PACKAGE



ELECTRICAL CHARACTERISTICS

(V^+ = +32V, V^- = −15V, T_A = 25°C, $I_3 = I_{13}$ = 1mA, $R_X = R_Y$ = 15 kΩ, R_L = 11 kΩ unless otherwise noted)

Characteristic	Symbol	Min.	Typ.	Max.	
Linearity:					
Output Error in Percent of Full Scale:					
T_A = 25°C: $-10 < V_X < +10$ (V_Y = ±10 V)	E_{RX}		0.5	1.0	
$-10 < V_Y < +10$ (V_X = ±10 V)	E_{RY}		1.0	2.0	
T_A = −55°C to +125°C: $-10 < V_X < +10$ (V_Y = ±10 V)	E_{RX}		0.75		
$-10 < V_Y < +10$ (V_X = ±10 V)	E_{RY}		1.50		
Squaring Mode Error:					
Accuracy in Percent of Full Scale After Offset and Scale Factor Adjustment	E_{SQ}				
T_A = 25°C			0.5		
T_A = −55°C to +125°C			0.75		
Scale Factor (Adjustable) ($K = 2R_L/I_3R_XR_Y$)	K		0.1		
Input Resistance (f = 20 Hz)	R_{INX}		35		
	R_{INY}		35		
Differential Output Resistance (f = 20 Hz)	R_O		300		
Input Bias Current $I_{bx} = \frac{(I_9 + I_{12})}{2}$, $I_{by} = \frac{(I_4 + I_8)}{2}$	I_{bx}		2.0	8.0	
	I_{by}		2.0	8.0	
Input Offset Current $\lvert I_9 + I_{12} \rvert$	$\lvert I_{iox} \rvert$		0.2	1.0	
$\lvert I_4 + I_8 \rvert$	$\lvert I_{ioy} \rvert$		0.2	1.0	
Average Temperature Coefficient of Input Offset Current (T_A = −55°C to +125°C)	$\lvert TC_{Iio} \rvert$		2.0		
Output Offset Current ($I_{14} - I_2$)	$\lvert I_{oo} \rvert$		10	50	
Average Temperature Coefficient of Output Offset Current (T_A = −55°C to +125°C)	$\lvert TC_{Ioo} \rvert$		20		
Frequency Response: 3.0 dB Bandwidth	BW_{3dB}		3.0		
3° Relative Phase Shift Between V_X and V_Y	$f\phi$		750		
1% Absolute Error Due to Input-Output Phase Shift	$f\theta$		30		
Common Mode Input Swing (Either Input)	CMV	±11.5	±13		
Common Mode Gain (Either Input)	A_{CM}	−50	−60		
Common Mode Quiescent	V_{o1}		21		
Output Voltage	V_{o2}		21		
Differential Output Voltage Swing Capability	V_{out}		±14		
Power Supply Sensitivity	S+		5.0		
	S−		10		
Power Supply Current	I_7		6.0	7.0	
DC Power Dissipation	P_D		135	170	

HOW TO ORDER

GENERIC DEVICE TYPE FOR MONOLITHIC FOUR-QUADRANT MULTIPLIER — VA
PACKAGE CODE (14 LEAD DUAL IN-LINE, ILLUSTRATED) — 6A
BASIC CIRCUIT CODE — 1595
TEMPERATURE RANGE (−55°C TO +125°C ILLUSTRATED)

VARADYNE ALSO OFFERS THE VA-1596 BALANCED MODULATOR/DEMODULATOR.

See YELLOW SECTION for Local Offices, Phones

53INTERNALLY PENSATED OPERATIONAL LIFIER

RES

- Input offset voltage — 3.0 mV max
- Input offset current — 60 nA max
- Power — bandwidth — 20 Vp-p
- Output swing at 20 kHz min
- Short-circuit protection
- Over-voltage protection
- Class A output for excellent linearity
- Slew rate — 4.2 V/μs typ

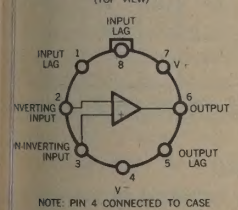
RAL DESCRIPTION

The internally compensated operational amplifier is designed for use as summing amplifier, integrator, or amplifier with operating characteristics a function of the external feedback components.

OLUTE MAXIMUM RATINGS

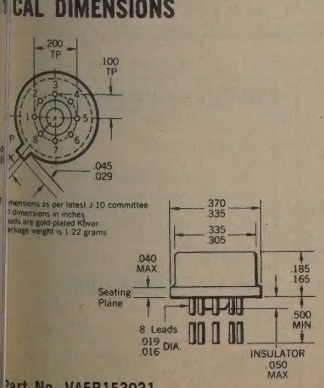
Power Supply Voltage	+18 Vdc −18 Vdc
Differential Input Signal	±V+ Volts
Common Mode Input Swing	±V+ Volts
Current	15 mA
Output Short Circuit Duration	Continuous
Power Dissipation (Package Limitation)	680 mW
Derate above T_A = 25°	4.6 mW/°C
Operating Temperature Range	−55° to +125°C
Storage Temperature Range	−65° to +150°C

CONNECTION DIAGRAM



NOTE: PIN 4 CONNECTED TO CASE

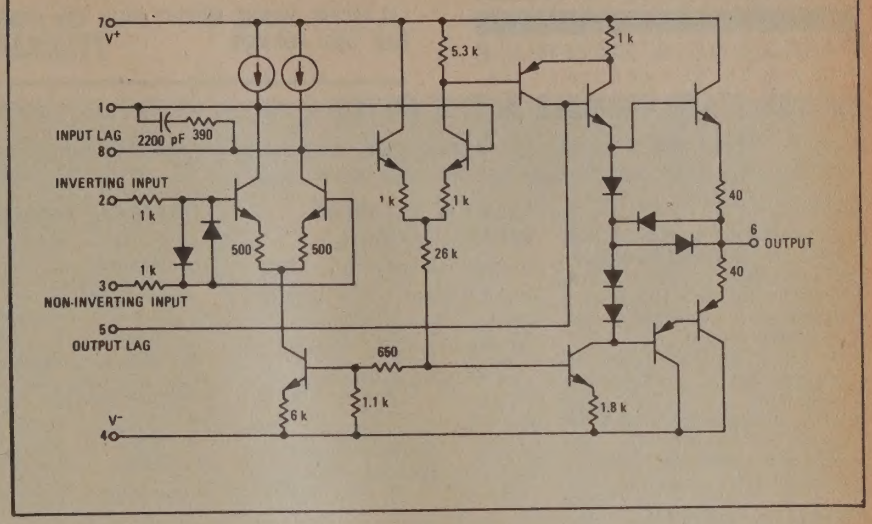
PHYSICAL DIMENSIONS



NOTE: Dimensions as per latest J-10 committee
Leads are gold plated Kovar
Package weight is 1.22 grams

Order Part No. VA5B153931

SCHEMATIC DIAGRAM



ELECTRICAL SPECIFICATIONS

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Open Loop Voltage Gain	A_{Vol}				
(V_{out} = ±10 V, T_A = −55°C to +125°C)		50,000	120,000		
Output Impedance (f = 20 Hz)	Z_{out}		4.0		kΩ
Input Impedance (f = 20 Hz)	Z_{in}	150	300		kΩ
Output Voltage Swing (R_L = 1.0 kΩ, f = 1.0 kHz)	V_{out}	±10	±13		V_{peak}
Power Bandwidth (A_v = 1, R_L = 1.0 kΩ	P_{BW}	20	50		kHz
THD ≤ 5%, V_o = 20 V_{p-p})					
Input Common Mode Voltage Swing	CMV_{in}	±11	±12		V_{peak}
Common Mode Rejection Ratio (f = 1.0 kHz)	CM_{rej}	80	110		dB
Input Bias Current $I_b = \frac{I_1 + I_2}{2}$ (T_A = +25°C) (T_A = −55°C)	I_b		0.20 0.23	0.50 0.70	μA
Input Offset Current ($I_{io} = I_1 - I_2$, T_A = −55°C) ($I_{io} = I_1 - I_2$, T_A = +25°C) ($I_{io} = I_1 - I_2$, T_A = +125°C)	I_{io}		20	75 60 75	nA
Input Offset Voltage (T_A = 25°C) (T_A = −55°C, +125°C)	$\lvert V_{io} \rvert$		1.0	3.0 4.0	mV
Step Response Gain = 1, 15% overshoot R_1 = 10 kΩ, R_2 = 10 kΩ, R_4 = 10 kΩ	t_f t_{pd} dV_{out}/dt*		160 80 4.2		ns ns V/μs
Equivalent Input Noise Voltage (Open Loop) (R_S = 10 kΩ, Noise Bandwidth = 1.0 Hz, f = 1.0 kHz)	e_n		30		nV/(Hz)$^{1/2}$
Average Temperature Coefficient of Input Offset Voltage (T_A = −55°C to +125°C) (R_S = 50 Ω) (R_S ≤ 10 kΩ)	TC_{Vio}		3.0 5.0		μV/°C
DC Power Dissipation (Power Supply = ±15 V, V_{out} = 0)	P_D		90	150	mW
Positive Supply Sensitivity (V− constant)	S+		50	150	μV/V
Negative Supply Sensitivity (V+ constant)	S−		50	150	μV/V

* dV_{out}/dt = Slew Rate

HOW TO ORDER

VA	5B	1539	31
GENERIC DEVICE TYPE FOR MONOLITHIC FOUR-QUADRANT MULTIPLIER	PACKAGE CODE (TO-5, 8 LEAD, 4 PINS SHORTED TO CAN, ALL 8 PINS USED ILLUSTRATED)	BASIC CIRCUIT CODE	TEMPERATURE RANGE (−55°C TO +125°C ILLUSTRATED)

A commercial high performance operational amplifier, the VA-1539C is also available. Order part number VA5B153939.

VARADYNE
PACKAGING & MATERIALS
A DIVISION OF VARADYNE, INC.

132 FLORAL AVENUE, MURRAY HILL, NEW JERSEY 07974
TELE: (201) 464-3300

VAF-100 STATE VARIABLE ACTIVE FILTER

NOTE: THE VAF-100 AND VAF-200 REPRESENT STANDARD PRODUCTS. VARADYNE ALSO FABRICATES CUSTOM A FILTERS AND RELATED SIGNAL PROCESSING MODULES.

FEATURES

- Simultaneous bandpass, low-pass, and highpass outputs
- Independent bandwidth, frequency, and gain adjustment
- Power gain available in all operating modes
- Damping feedback may be removed for oscillator applications
- VAF-200 has additional 'free' compensated amplifier for odd pole isolation, gain or feed forward element.

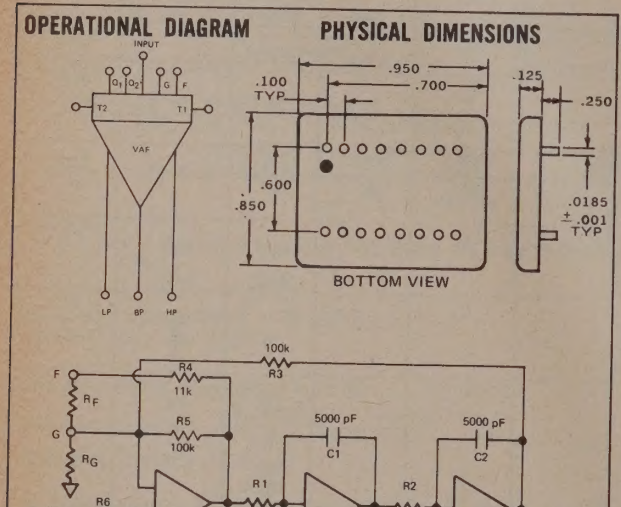
ABSOLUTE MAXIMUM RATINGS FOR VAF-100

Supply Voltage ±22V
Input Voltage ±30V
Storage Temperature Range −35°C to +85°C
Operating Temperature Range 0°C to +70°C
Output(s) Short Circuit Duration (Note 1) Indefinite

Note 1: Short Circuit may be to ground or either supply.

GENERAL DESCRIPTION

The VAF-100 is an active filter employing state variable techniques to synthesize any form of the second order polynomial, N(s)/D(s). The multiloop negative feedback used in the device results in excellent stability of polynomial coefficients while allowing independent gain, frequency, and bandwidth adjustment. Sensitivity of these parameters is comparable to passive RLC networks over the useful range of operation. The device may be used singularly, in parallel, or in cascade to realize complex filtering functions, including those containing numerator zeros. Other applications of the device include analog computer elements and low-distortion sine-cosine wave oscillators.



ELECTRICAL CHARACTERISTICS FOR VAF-100 AND VAF-20

($V_S = \pm 12V$, $T_A = 25°C$ unless otherwise specified)

* NOTE: VAF-200 has same specifications, except that it has a wider op temperature range of −55°C to +125°C and an additional oper amplifier.

Parameter	Conditions	Min	Typ	Max
The following specifications apply for $R_F = \infty$:				
Frequency Range			0-10 k	
Q Range			.05-1000	
Maximum Q			1000	
Voltage Gain	$Q \leq 100$, $f_o \leq 1$ kHz all outputs		0	
Output Noise	$Q = .707$, $f_c \leq 1$ kHz LP output HP output		50 200	
Output Offset	R1 = R2 = 100 k input shorted		±20	
Output Swing	$R_L \geq 2$ k all outputs		22	
Tuning Resistance	recommended limits	3 k		1 meg
The following specifications apply for $R_F = 0$:				
Frequency Range			0-5 k	
Q Range			.02-500	
Maximum Q			500	
Voltage Gain	$Q \leq 100$, $f_o \leq 1$ kHz BP output LP output HP output		0 +10 −10	
Output Noise	$Q = .707$, f = 1 kHz LP output HP output		400 50	
Output Offset	R1 = R2 = 100 k input shorted		±200	
Output Swing	$R_L \geq 2$ k HP output BP output LP output		2.2 6.9 22	
Tuning Resistance	recommended limits	2 k		1 meg
The following specifications apply over the temperature range $0 \leq T_A \leq 70°$				
Quiescent Power Consumption			150	
Input Resistance			100 k	
Output Resistance				50
Skirt Selectivity — LP HP BP			−12 +12 −6	
Frequency Temperature Coefficient			.01	
Q Temperature Coefficient			.01	
Gain Temperature Coefficient			.01	

NOTE: These parameters assume precision film resistors and NPO tuning ca tors as a minimum. Typical TC's of these parts are ±100 ppm/°C ±30 ppm/°C respectively.

$$\frac{V_{HP}}{V_{IN}} = \frac{s^2K(1 + A_2 + A_3)}{s^2 + s\omega_1A_1(1 + A_2 + A_3) + A_2\omega_1\omega_2}$$

$$\frac{V_{BP}}{V_{IN}} = \frac{-s\omega_1K(1 + A_2 + A_3)}{s^2 + s\omega_1A_1(1 + A_2 + A_3) + A_2\omega_1\omega_2}$$

$$\frac{V_{LP}}{V_{IN}} = \frac{\omega_1\omega_2K(1 + A_2 + A_3)}{s^2 + s\omega_1A_1(1 + A_2 + A_3) + A_2\omega_1\omega_2}$$

where
K = Voltage transfer from input to (
A_1 = Voltage transfer from BP to Q1
A_2 = Voltage transfer from LP to HP
A_3 = The ratio R_5/R_G or $(R_F + R_4)||R_5$
$\omega_1 = 1/R_1C_1$
$\omega_2 = 1/R_2C_2$

VAF-200 STATE VARIABLE ACTIVE FILTER

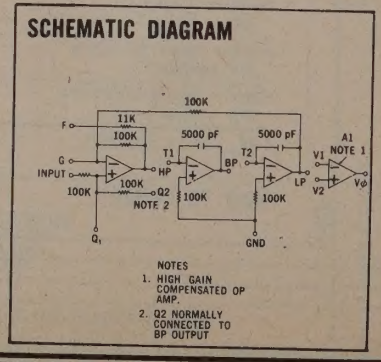
GENERAL DESCRIPTION

The VAF-200 is a state variable filter with edge mounting P.C. connector for high density instrumentation and communication systems.

The additional compensated operational amplifier may be used to advantage in realizing notch filters, oscillators and power output stages.

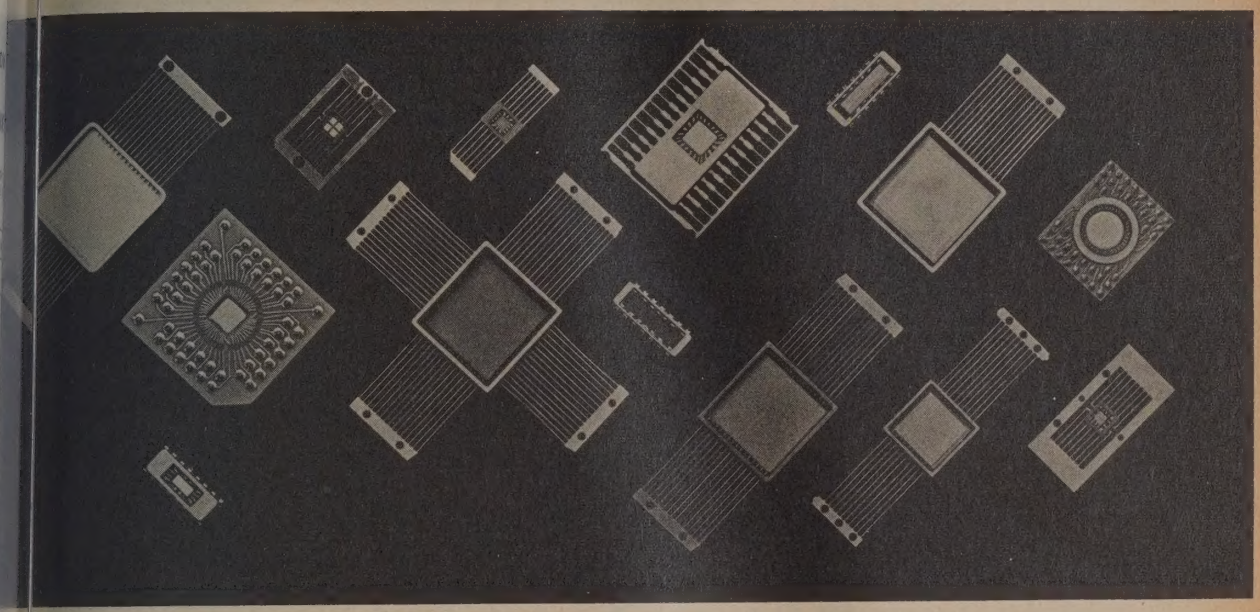
ABSOLUTE MAXIMUM RATINGS FOR VAF-200

Supply Voltage ±22 Volts
Power Dissipation 2 Watts
Input Voltage ±30 Volts
Storage Temperature Range −65°C to +150°C
Operating Temperature Range −55°C to +125°C
Output(s) Short Circuit Indefinite



See YELLOW SECTION for Local Offices, Phones

ET SEAL AND PACKAGE CAPABILITY



SIBL INGREDIENTS . . . ENTI TO QUALITY COMPONENTS

sibl ngredients?

es, t re are such things.

hey the intangibles that make the difference between rst-c s, metalized-ceramic component (or subcomponent) a f ounces of raw mineral substance.

here in each component that you purchase is the pro- sion technological, and organizational capabilities of mak. These capabilities are the **real** determinants of duct liability — the invisible ingredients that assure you quali and precision at the lowest cost.

OFES IONALISM — OUR KEY TO QUALITY

ginee best understand engineers, and we make no bones out i You need an engineer's attentive ear when you re- re, i a limited time, one or one-hundred-thousand rigidly ecifie intricately-designed, metalized-, brazed-, or glassed- ami arts. That's when you will find it profitable to talk a Va dyne engineer. He's trained to listen.

A Var yne engineer will give your ideas the professional re- ect t y deserve. He understands your problems, and he can mmu cate with you. This dialogue is built into the product.

CHN AL SKILL — OUR KEY TO PRECISION

ectro c science and ceramic technology are our business. Spec skills are needed to transform raw ceramic and etals nto high quality electronic device packages. Our ff's ility to join ceramic to metal, ceramic to glass, in y co bination . . . hermetically sealed . . . attests to the liber f their artisanship.

The pert craftsmen in our complete, modern, in-plant ating acility are skilled in common and precious metal ecifi tion electrolytic and electroless plating, as well as oduc n solder coating and other metal finishing.

Prec on is an integral part of our operation.

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r or nization begins with **you** — it's **your** design, **your** specifications, and **your** requirements. We maintain a flexible manufacturing system so that we can produce what YOU want, quickly and inexpensively.

Each job, therefore, is organized to meet **your** individual needs.

We house in 30,000 square feet of air conditioned space, a highly automated plant, a wide variety of proprietary machinery, a complete modern tool and die shop, and a multiple-staged quality control system having advanced instrumentation.

15 YEARS OF PROFICIENT PRECISION PRODUCTION

FORMING —simple and intricately-shaped ceramic components and ceramic substrates for thick and thin film circuitry formed by pressing, extruding, and casting, as well as by proprietary techniques.

LAMINATING —true monolithic laminates, thru-metalized laminates, and thin-glass metalized-ceramic sandwiches with or without enclosed conductors, and all to hermetic specifications.

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FABRICATING —ceramic to almost any metal using special reducing atmosphere BRAZING kilns; facilities to fabricate high power, high frequency packages for hot- or cold-weld, or brazed closure; multi-lead and fine resolution packages; thick film resistor-conductor circuits; hermetic housings for transistors, integrated circuits, diodes, varactors, rectifiers, capacitors, resistors; seals and assemblies for aerospace, oceanographic, and other special purpose applications.

PLATING —complete in-plant gold, nickel, and copper electroplating, electroless plating, and production solder coating.

VARADYNE
PACKAGING & MATERIALS
A DIVISION OF VARADYNE, INC.

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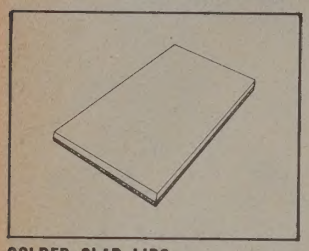
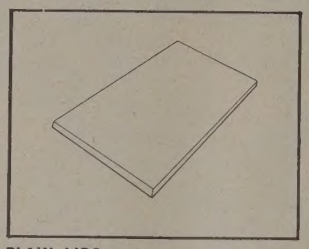
TEL: (914) MO 4-2800, (212) TA 4-3420

INTEGRATED CIRCUIT FLAT PACK LIDS & PREFORMS High Purity Precision Alloys



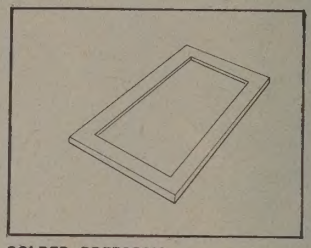
SOLDER CLAD LIDS

Made from Kovar with gold-tin or gold-germanium eutectic solder, clad on one side and pure gold plated or clad on other side. A high degree of flatness can be maintained and cladding thicknesses are available in .0005, .0010, .0015 and .002 inches.



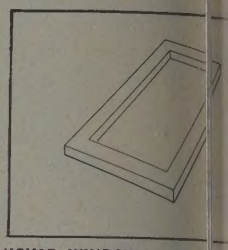
PLAIN LIDS

Can be supplied gold plated, clad or plain Kovar. Close control of base material and plating insures against contaminating the gold surface avoiding poor solder joints and voids.



SOLDER PREFORMS

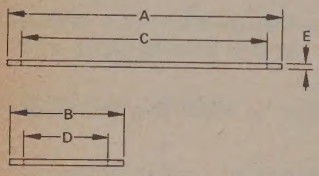
Solder (80% gold, 20% tin and 88% gold, 12% germanium eutectic) preforms are held to close tolerances on both flatness and physical dimensions. There are no chips, cracks or slivers on the edges and parts are chemically cleaned and packed in inert atmospheres to prevent contamination and insure unlimited shelf-life.



KOVAR WINDOWS

Can be supplied in all sta rd special sizes to meet your ec tions. Close tolerances ar el flatness, outside dimensions b Parts are chemically cle d packed in sealed container n atmospheres to prevent con in and oxidation.

KOVAR WINDOW SIZES Most Sizes Generally Carried In Stock

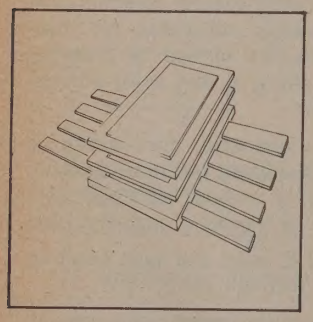


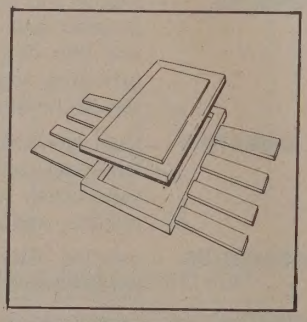
All dimensions in inches.

"E" dimension — normal thickness of .010 inches. Most other thickness available on request, except solder preforms which are normally .0015/ .002 inches thick.

STANDARD FLAT PACK SIZE	STANDARD SIZES				SPECIAL SIZES			
	Lid Size		Inside Size		Lid Size		Inside Si	
	A	B	C	D	A	B	C	
¼ x ⅛	.250	.125	.225	.100	.172	.094	.126	
¼ x 3/16	.250	.188	.225	.164	.225	.225	.168	
¼ x ¼	.250	.250	.210	.210	.234	.234	.190	
¼ x ¼	.250	.250	.190	.190	.246	.176	.196	
¼ x ⅜	.375	.250	.335	.210	.269	.164	.223	
¼ x ⅜	.375	.250	.315	.190	.332	.243	.247	
¼ x ⅜	.373	.248	.314	.198	.333	.243	.174	
¼ x ¾	.745	.245	.705	.205	.472	.472	.388	
⅜ x ⅜	.375	.375	.315	.315	.505	.505	.405	
⅜ x ½	.500	.375	.440	.315	.550	.550	.498	
⅜ x ⅝	.625	.375	.565	.315	.700	.250	.216	
½ x ½	.500	.500	.440	.440	.700	.250	.375	
.700 x .250	.700	.250	.500	.178	1.300	1.300	1.185	1.

INTEGRATED CIRCUIT FLAT PACK EXTRUDED LIDS High Purity Precision Alloys



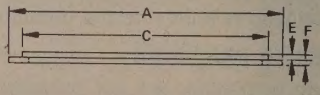


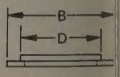
GOLD PLATED FOR USE WITH A SOLDER PREFORM

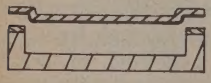
New coined lids are extremely flat and highly rigid. The manufacturing ou upsets the grain structure of the metal, preventing any warping of l du the soldering operation. Final seal-jigging operation can be eliminat if is used in inverted position.

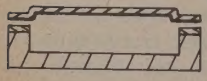
CLAD WITH GOLD-TIN FOR USE WITHOUT A SOLDER PREFORM

Clad coined lids are extremely flat and highly rigid. There is no warpi of during the solder operation and lid can also be used in inverted sit There is no extra handling or alignment of preform and edges are f chips, cracks or slivers.









All dimensions in inches.

"E" dimensions — Any thickness from .004 to .010 inches. Standard thickness .005 and .010 inches.

"F" dimension — Any dimension from .001 to .010 inches (depending upon "E" dimension).

STANDARD FLAT PACK SIZE	STANDARD SIZES				SPECIAL SIZES			
	A	B	C	D	A	B	C	
¼ x ⅛	.250	.125	.225	.100	.172	.094	.126	.0
¼ x 3/16	.250	.188	.225	.164	.234	.234	.190	.1
¼ x ¼	.250	.250	.210	.210	.246	.176	.196	.1
¼ x ¼	.250	.250	.190	.190	.269	.164	.223	.1
¼ x ⅜	.375	.250	.335	.210	.332	.243	.247	.1
¼ x ⅜	.375	.250	.315	.190	.333	.243	.174	.1
¼ x ⅜	.373	.248	.314	.198	.472	.472	.388	.3
¼ x ¾	.745	.245	.705	.205	.505	.505	.405	.4
⅜ x ⅜	.375	.375	.315	.315	.550	.550	.498	.4
⅜ x ½	.500	.375	.440	.315	.700	.250	.216	.0
⅜ x ⅝	.625	.375	.565	.315	.700	.250	.375	.1
½ x ½	.500	.500	.440	.440	.700	.250	.500	.1
					1.300	1.300	1.185	1.1

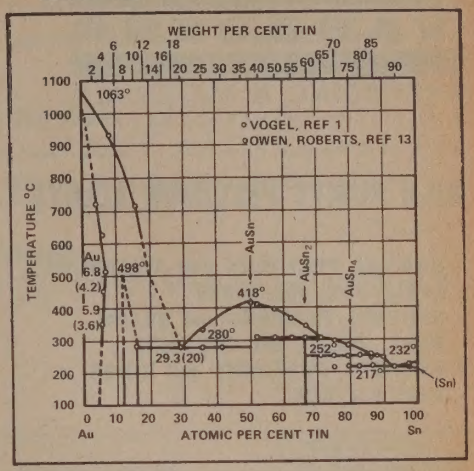
IRITY PRECISION ALLOYS
DINING ALLOYS

haracteristics and forms available are:

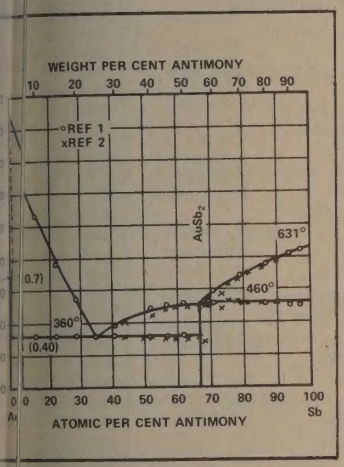
ALLOY	Melting Point Deg. C/Deg. F		Thermal Conduct Cal/cm²/cm °C/Sec.	Linear Coeff. of exp./ °Cx10-6	Foil	Strip	Pellets	Discs & Washers	Castings	Spheres	Powders
Gold 20 Tin	280	536	0.60	16.0	x	x	x	x	x	x	x
Gold 12 Germanium	356	673	0.63	12.6	x	x	x	x	x	x	x
Gold 25 Antimony	360	680	0.54	12.9	Check Factory				x	x	x
Gold 6 Silicon	370	698	0.68	13.7	x	x	x	x	x	x	x

ESE LOYS ARE EUTECTICS AND HAVE A SHARP MELTING POINT, NO PLASTIC RANGE

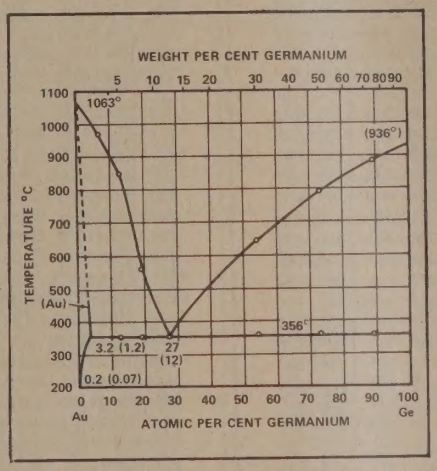
GOLD — TIN



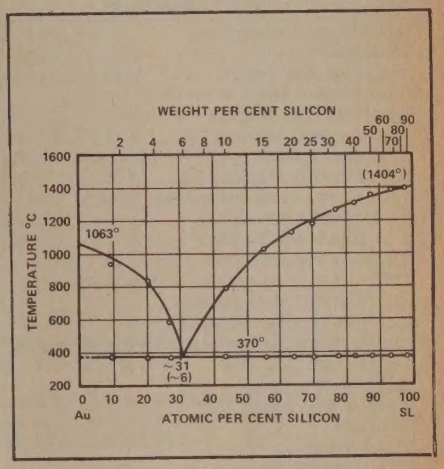
TIMONY



GOLD — GERMANIUM



GOLD — SILICON



ALLOY NO.	TEMPERATURE Deg. Centigrade Liquidus	Solidus	ALLOY	TEMPERATURE Deg. Fahrenheit Liquidus	Solidus
A901	131	131	27 Gold 73 Thallium	268	268
A902	215	215	15 Gold 85 Lead	419	419
A903	217	217	10 Gold 90 Tin	423	423
A904	241	241	18 Gold 82 Bismuth	466	466
A905	280	280	80 Gold 20 Tin	536	536
A906	283	252	29 Gold 71 Tin	541	486
A907	298	254	32 Gold 68 Lead	568	489
A908	309	309	13 Gold 87 Cadmium	588	588
A909	340	309	45 Gold 55 Tin	644	588
A910	341	341	84 Gold 16 Gallium	646	646
A911	356	356	88 Gold 12 Germanium	673	673
A912	360	360	75 Gold 25 Antimony	680	680
A914	370	370	94 Gold 6 Silicon	698	698
A915	416	416	17 Gold 83 Tellurium	781	781
A916	447	447	58 Gold 42 Tellurium	837	837
A917	451	451	73 Gold 27 Indium	844	844
A918	451	451	68 Gold 32 Gallium	844	844
A919	460	460	45 Gold 55 Antimony	860	860
A920	488	480	81 Gold 19 Indium	910	896
A921	494	494	59 Gold 41 Indium	921	921
A922	500	500	42 Gold 58 Cadmium	932	932
A923	525	525	96 Gold 4 Aluminum	977	977
A923	525	515	38 Gold 44 Silver 18 Germanium	977	959
A924	540	540	53 Gold 47 Cadmium	1004	1004
A925	540	494	50 Gold 50 Indium	1056	1056
A926	569	569	91 Gold 9 Aluminum	1056	1056
A927	576	576	39 Gold 61 Magnesium	1069	1069
A928	612	612	72 Gold 28 Cadmium	1134	1134
A929	626	626	69 Gold 31 Zinc	1159	1159
A930	642	642	5 Gold 95 Aluminum	1188	1188
A931	642	642	85 Gold 15 Zinc	1188	1188
A932	725	725	75 Gold 25 Zinc	1337	1337
A935	810	810	89 Gold 11 Thorium	1490	1490
A936	827	827	94 Gold 6 Magnesium	1521	1521

ALLOY NO.	TEMPERATURE Deg. Centigrade Liquidus	Solidus	ALLOY	TEMPERATURE Deg. Fahrenheit Liquidus	Solidus
A9500	845	835	60 Gold 20 Silver 20 Copper	1550	1535
A9510	895	885	75 Gold 5 Silver 20 Copper	1645	1625
A9524	918	899	67 Gold 33 Copper	1685	1655
A9530	910	900	81 Gold 16 Copper 3 Nickel	1670	1652
A9540	889	889	80 Gold 20 Copper	1625	1625
A9550	950	950	82 Gold 18 Nickel	1742	1742
A9560	970	955	50 Gold 50 Copper	1778	1751
A9564	977	949	94 Gold 6 Copper	1796	1742
A9570	960	960	89 Gold 11 Manganese	1760	1760
A9580	990	990	90 Gold 10 Manganese	1814	1814
A9585	990	956	38 Gold 62 Copper	1815	1755
A9590	1000	980	40 Gold 60 Copper	1832	1796
A9600	1000	980	35 Gold 65 Silver	1832	1796
A9610	1002	973	72 Gold 22 Nickel 6 Chromium	1835	1785
A9612	1015	970	20 Gold 77 Copper 3 Indium	1859	1778
A9614	1010	971	35 Gold 65 Copper	1850	1778
A9615	1025	980	20 Gold 78 Copper 2 Indium	1877	1796
A9617	1026	1010	20 Gold 80 Copper	1880	1850
A9620	1030	975	35 Gold 62 Copper 3 Nickel	1886	1787
A9630	1040	1030	75 Gold 25 Silver	1904	1886
A9640	1035	1015	30 Gold 70 Copper	1895	1859
A9650	1050	1040	83 Gold 17 Silver	1922	1904
A9660	1063	1063	100 Gold	1945	1945
A9670	1073	1073	56 Gold 44 Manganese	1958	1958
A9680	1075	965	65 Gold 35 Nickel	1967	1769
A9690	1085	1085	54 Gold 46 Manganese	1982	1982
A9700	1094	1095	59 Gold 41 Manganese	2003	2003
A9710	1180	1125	55 Gold 45 Platinum	2156	1875
A9720	1240	1190	92 Gold 8 Palladium	2264	2174
A9730	1305	1260	87 Gold 13 Palladium	2381	2300
A9740	1410	1210	75 Gold 25 Platinum	2570	2210
A9750	1410	1380	75 Gold 25 Palladium	2570	2516
A9760	1440	1421	65 Gold 35 Palladium	2624	2601
A9770	1650	1410	20 Gold 80 Platinum	3002	2570
A9780	1708	1580	9 Gold 91 Platinum	3110	2876

ALL LOYS AVAILABLE IN VACUUM TUBE GRADE, CARBON FREE & VACUUM MELTED, 99.9%—99.99%—99.999%—99.9999% Pure & Commercial Grade

VARADYNE
PACKAGING & MATERIALS
A DIVISION OF VARADYNE, INC.

20 NORTH MacQUESTEN PARKWAY, MOUNT VERNON, NEW YORK
TEL: (914) MO 4-2800, (212) TA 4-3420

HIGH PURITY PRECISION ALLOYS — SOLDER ALLOYS

- BRAZING PREFORMS and STAMPINGS
- STRIP, FOIL and SHEET
- SPHERES, POWDERS and GRAIN
- BARS, INGOTS and CASTINGS
- WASHERS, PREFORMS and RINGS
- WIRE and ROD

*Fed. Spec. QQS-571d
Bal 0.20 to 0.50 Antimony 0.25 Bismuth
**Temperatures indicated are approximate and may vary slightly. Melting range indicates liquidus and solidus points.

Alloys can be supplied mercial grade, electron vacuum tube grade, an purity 99.9%, 99.99%,

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE** Deg. Cent.	Deg. Fahr.
2350	Tin 95%, Arsenic 5%	425 - 231	797 - 448
2345	Zinc	421 - 421	787 - 787
2340	Lead 98%, Zinc 2%	417 - 318	782 - 604
2330	Cadmium 94.5%, Silver 5.5%	410 - 343	770 - 649
2320	Lead 99%, Tellurium 1%	400 - 326	752 - 618
2317	Zinc 90%, Cadmium 10%	399 - 266	750 - 509
2315	Cadmium 95%, Silver 5%	393 - 338	740 - 640
2313	Zinc 95%, Aluminum 5%	382 - 382	720 - 720
2310	Tin 99.5%, Phosphorus .5%	375 - 232	707 - 449
A914	Gold 94%, Silicon 6%	370 - 370	698 - 698
Ag 5.5*	Lead 94.5%, Tin 5.5%*	366 - 304	689 - 579
2300	Lead 95%, Silver 5%	363 - 305	685 - 581
2297	Gold 60%, Silver 20%, Tin 20%	360 - 360	680 - 680
A912	Gold 75%, Antimony 25%	360 - 360	680 - 680
A911	Gold 88%, Germanium 12%	356 - 356	673 - 673
2295	Lead 83%, Antimony 15%, Tin 1%, Arsenic 1%	353 - 312	667 - 595
2292	Tin 60%, Zinc 40%	343 - 199	645 - 390
2291	Zinc 60%, Cadmium 40%	335 - 266	635 - 509
2290	Tin 98%, Arsenic 2%	330 - 231	626 - 447
2269	Lead	327 - 327	621 - 621
2284	Cadmium	321 - 321	610 - 610
2278	Lead 99%, Antimony 1%	320 - 312	608 - 595
2270	Lead 96.5%, Silver 3.5%	317 - 310	603 - 590
2265	Cadmium 78.4%, Zinc 16.6%, Silver 5%	316 - 249	600 - 480
2262	Lead 92%, Indium 8%	315 - 315	599 - 599
2261	Lead 95%, Indium 5%	315 - 315	599 - 599
SN5*	Tin 5%, Lead 95%	312 - 270	594 - 518
2253	Lead 97.5%, Silver 1.75%, Tin .75%	310 - 310	590 - 590
Ag 1.5*	Lead 97.5%, Silver 1.5%, Tin 1%*	310 - 310	588 - 588
2245	Tin 70%, Zinc 30%	310 - 199	592 - 390
2240	Lead 97.5%, Silver 1.5%, Selenium 1%	309 - 309	589 - 589
2230	Lead 95.5%, Silver 2.5%, Tin 2%	304 - 299	580 - 570
Ag 2.5*	Lead 97.5%, Silver 2.5%*	304 - 304	580 - 580
2220	Tin 60%, Lead 34%, Silver 6%	304 - 177	580 - 350
2218	Lead 90%, Tin 10%	302 - 224	576 - 435
2217	Lead 90%, Indium 10%	300 - 294	572 - 561
2215	Lead 96%, Antimony 4%	299 - 252	570 - 486
SN10*	Tin 10%, Lead 87.9%, Silver 2.1%*	299 - 268	570 - 514
2213	Cadmium 90%, Zinc 10%	299 - 265	570 - 509
2210	Lead 95%, Antimony 5%	295 - 252	563 - 485
2200	Tin 95%, Silver 5%	295 - 221	563 - 430
2190	Lead 90%, Tin 5%, Silver 5%	292 - 292	558 - 558
1011	Indium 5%, Lead 90%, Silver 5%	292 - 292	558 - 558
2188	Lead 90%, Silver 5%, Indium 5%	290 - 290	554 - 554
2187	Lead 57%, Tin 40%, Silver 3%	289 - 179	543 - 354
2180	Lead 85%, Tin 15%	288 - 227	553 - 437
2178	Cadmium 60%, Zinc 30%, Tin 10%	288 - 157	550 - 315
2175	Lead 92%, Antimony 8%	286 - 271	552 - 520
2173	Lead 94%, Antimony 6%	285 - 252	545 - 486
1010	Indium 5%, Lead 93%, Silver 2%	285 - 285	545 - 545
2170	Lead 92%, Tin 5%, Antimony 3%	285 - 239	545 - 463
A905	Gold 80%, Tin 20%	280 - 280	536 - 536
2160	Lead 92.5%, Tin 5%, Silver 2.5%	280 - 280	536 - 536
SN20*	Tin 20%, Lead 79%, Antimony 1%*	277 - 181	530 - 360
PB80*	Lead 80%, Tin 20%*	277 - 181	530 - 360
2145	Lead 79%, Tin 20%, Antimony 1%	271 - 182	517 - 363
2140	Bismuth	271 - 271	520 - 520
2139	Tin 80%, Zinc 20%	271 - 199	518 - 390
2138	Lead 75%, Indium 25%	262 - 255	504 - 491
2137	Lead 75%, Antimony 15%, Tin 10%	268 - 240	514 - 464
2135	Lead 75%, Tin 25%	268 - 183	514 - 361
2133	Lead 91%, Antimony 9%	265 - 252	509 - 486
2131	Cadmium 82.5%, Zinc 17.5%	265 - 265	509 - 509
2129	Lead 73.7%, Tin 25%, Antimony 1.3%	262 - 184	504 - 364

ALLOY NO.	ALLOY COMPOSITION	MELTING R Deg. Cent.	D
2128	Tin 50%, Lead 47%, Silver 3%	260 - 179	5
2127	Tin 75%, Zinc 25%	260 - 204	5
2126	Lead 82%, Bismuth 14.5%, Cadmium 2.5%, Antimony 1%	259 - 127	4
2125	Lead 63%, Tin 34%, Zinc 3%	256 - 170	4
2120	Lead 85%, Antimony 10%, Tin 5%	256 - 240	4
PB70*	Lead 70%, Tin 30%*	256 - 182	4
SN30*	Lead 68.4%, Tin 30%, Antimony 1.6%*	256 - 182	4
2100	Bismuth 95%, Tin 5%	251 - 134	4
2098	Lead 83%, Cadmium 17%	248 - 248	4
2097	Tin 61.5%, Lead 35.5%, Silver 3%	248 - 179	4
2096	Lead 65%, Tin 35%	247 - 183	4
PB65*	Lead 64.5%, Tin 34.5%*	246 - 183	4
SN35*	Tin 35%, Lead 63%, Antimony 1.8%, Bismuth .2%	246 - 183	4
2095	Tin 60%, Lead 36%, Silver 4%	245 - 179	4
2094	Lead 63.2%, Tin 35%, Antimony 1.8%	243 - 184	4
2093	Tin 72%, Cadmium 28%	243 - 177	4
2092	Lead 62%, Tin 38%	242 - 183	4
SB5	Tin 94.8%, Antimony 5%, Lead .2%*	240 - 232	4
2090	Tin 95%, Antimony 5%	240 - 232	4
2080	Tin 97%, Antimony 3%	238 - 232	4
2070	Lead 62%, Tin 37%, Arsenic 1%	238 - 183	4
2060	Lead 60%, Tin 40%	238 - 183	4
SN40*	Lead 59.4%, Tin 40%*	238 - 183	4
2055	Lead 63%, Tin 35%, Antimony 2%	237 - 187	4
2050	Lead 68%, Tin 23%, Cadmium 9%	235 - 145	4
2040	Lead 60%, Tin 37%, Silver 3%	232 - 179	4
2030	Tin	232 - 232	4
2025	Lead 58%, Tin 40%, Antimony 2%	231 - 186	4
1009	Indium 25%, Lead 75%	230 - 230	4
1008	Indium 90%, Silver 10%	230 - 204	4
2010	Tin 99%, Gallium 1%	228 - 228	4
2006	Tin 99.25%, Copper .75%	227 - 227	4
2003	Tin 61%, Lead 36%, Silver 3%	227 - 179	4
2000	Bismuth 48%, Lead 28.5%, Tin 14.5%, Antimony 9%	227 - 103	4
1990	Tin 97.5%, Silver 2.5%	226 - 221	4
1994	Lead 55%, Tin 45%	225 - 183	4
1982	Tin 95%, Lead 5%	222 - 183	4
1980	Tin 95.5%, Silver 3.5%, Cadmium 1%	221 - 218	4
1978	Tin 96.5%, Silver 3.5%	221 - 221	4
SN96*	Tin 96%, Silver 4%, (Sn 96)*	221 - 221	4
1970	Lead 55%, Indium 45%	220 - 173	4
1968	Lead 52%, Tin 48%	218 - 183	4
1960	Lead 50%, Tin 50%	216 - 182	4
SN50*	Tin 50%, Lead 49.4%*	216 - 182	4
1956	Indium 50%, Lead 50%	216 - 216	4
1007	Indium 55%, Lead 45%	215 - 215	4
1952	Tin 90%, Lead 10%	213 - 183	4
1940	Lead 55%, Tin 44%, Silver 1%	210 - 177	4
1938	Tin 85%, Lead 15%	205 - 183	4
1937	Tin 50%, Lead 47%, Antimony 3%	204 - 186	3
1936	Tin 80%, Lead 20%	204 - 183	3
1935	Tin 55%, Lead 45%	200 - 183	3
1934	Tin 92%, Zinc 8%	200 - 198	3
1933	Tin 91%, Zinc 9%	199 - 199	3
1930	Lead 55.5%, Tin 40.5%, Bismuth 4%	197 - 170	3
1927	Tin 75%, Lead 25%	195 - 183	3
SN70*	Tin 70%, Lead 29.4%*	193 - 182	3
1923	Tin 70%, Lead 30%	192 - 183	3
SN60*	Tin 60%, Lead 39.4%*	189 - 176	3
SN62*	Tin 62%, Lead 35.4%, Silver 2%*	189 - 177	3
1920	Tin 60%, Lead 40%	188 - 183	3
1918	Tin 65%, Lead 34%, Antimony 1%	188 - 184	3

See YELLOW SECTION for Local Offices, Phones

— R S — TUBING

from)005 to 1¼" diameter in continuous or cut lengths.

D AN FORMED SHAPES

ities vailable for precision sections of unusual con-
tion From almost any alloy.

— IN TS — CASTINGS

eight from milligrams to several hundred pounds.

META

FOI AND SHEET

knes from .0003 to 2", widths from .005 to 24".

RINGS AND PREFORMS

Sizes from .020 to 24" inside diameter formed from almost any size, round, square, rectangular or special shaped wire.

SPHERES, POWDERS AND GRAIN

Supplied in sizes from .0005 to .250 with tolerance as close as ±.0002 (or closer for special requirements.)

PREFORMS AND STAMPINGS

In sizes from .015 to 10" I.D., thickness from .0003 to ½".

	ALLOY COMPOSITION	MELTING RANGE** Deg. Cent.	Deg. Fahr.
14	Ti 3%, Lead 37%	183 - 183	361 - 361
10	Ti 2%, Lead 38%	183 - 183	361 - 361
3*	Ti 3%, Lead 36.4%*	182 - 182	360 - 360
90	Ti 0%, Bismuth 25%, Lead 15%	180 - 96	356 - 205
80	Ti 2.5%, Lead 36%, Silver 1.5%	179 - 179	355 - 355
88	Ti 1.5%, Lead 35.5%, Silver 3%	179 - 179	355 - 355
76	Ti 2.5%, Lead 36.1%, Arsenic 1.4%	179 - 179	355 - 355
73	Ti 8%, Cadmium 32%	177 - 177	349 - 349
70	Bi uth 13%, Lead 47%, Tin 40%	176 - 146	349 - 294
66	T 0%, Lead 18%, Indium 12%	174 - 150	347 - 302
60	L 50%, Tin 30%, Bismuth 20%	173 - 130	343 - 266
40	L 51%, Tin 27%, Bismuth 22%	170 - 131	338 - 268
50	T 50%, Bismuth 40%	170 - 138	338 - 281
36	T 48.8%, Lead 41%, Bismuth 10.2%	166 - 142	331 - 288
30	T 50%, Lead 40%, Bismuth 10%	166 - 120	330 - 248
20	L 43%, Tin 43%, Bismuth 14%	163 - 144	325 - 291
60	T 70%, Lead 18%, Indium 12%	162 - 162	324 - 324
15	um 95%, Silver 5%	162 - 160	324 - 319
10	T 48%, Lead 36%, Bismuth 16%	162 - 140	324 - 284
90	T 50%, Lead 25%, Cadmium 25%	160 - 145	320 - 293
80	B uth 45%, Lead 55%	160 - 123	320 - 253
75	T 50%, Lead 25%, Bismuth 25%	160 - 144	320 - 293
70	B uth 45%, Lead 33%, Cadmium 22%	158 - 92	316 - 197
65	ium 80%, Lead 15%, Silver 5%	157 - 157	315 - 315
60	ium 100%	157 - 157	315 - 315
42	ium 99%, Copper 1%	153 - 153	307 - 307
40	d 42%, Tin 37%, Bismuth 21%	152 - 120	306 - 248
46	50%, Lead 32%, Cadmium 18%	146 - 146	295 - 295
30	58%, Indium 42%	145 - 117	292 - 242
25	51.2%, Lead 30.6%, Cadmium 18.2%	144 - 144	293 - 293
20	muth 60%, Cadmium 40%	144 - 144	291 - 291
90	51%, Lead 31%, Cadmium 18%	143 - 143	288 - 288
71	muth 33%, Lead 34%, Tin 31%	143 - 96	289 - 205
70	muth 31%, Lead 38%, Tin 31%	139 - 96	282 - 205
69	muth 5%, Lead 32%, Tin 45%, Cadmium 18%	139 - 132	282 - 270
03	lium 25%, Tin 37.5%, Lead 37.5%	138 - 138	280 - 280
80	smuth 58%, Tin 42%	138 - 138	281 - 281
67	smuth 28.50%, Lead 43%, Tin 28.50%	137 - 96	279 - 205
66	smuth 36%, Lead 32%, Tin 32%	137 - 95	279 - 203
65	smuth 36%, Lead 32%, Tin 31%, Silver 1%	136 - 95	277 - 203
64	smuth 55%, Lead 5%, Tin 40%	136 - 121	277 - 250
30	smuth 57%, Lead 1%, Tin 42%	135 - 135	275 - 275
62	smuth 38%, Lead 31%, Tin 31%	135 - 96	275 - 205
61	smuth 32%, Lead 34%, Tin 34%	133 - 96	271 - 205
60	smuth 57%, Lead 2%, Tin 41%	133 - 128	271 - 262
59	dium 95%, Gallium 5%	130 - 124	266 - 256
30	smuth 56%, Tin 40%, Zinc 4%	130 - 130	266 - 266
58	smuth 52%, Lead 5%, Tin 37%, Indium 6%	129 - 95	264 - 203
55	n 46%, Tellurium 37%, Cadmium 17%	128 - 128	262 - 262
57	ead 38%, Bismuth 37%, Tin 25%	127 - 93	260 - 200
55	n 50%, Indium 50%	127 - 116	260 - 240
54	ismuth 58%, Lead 42%	126 - 124	259 - 255
53	ismuth 55%, Lead 45%	124 - 124	255 - 255
510A	ndium 75%, Cadmium 25%	123 - 123	253 - 253
52	ismuth 31%, Lead 46%, Tin 18%, Cadmium 5%	123 - 70	253 - 158
51	ismuth 57%, Lead 41%, Cadmium 2%	121 - 92	250 - 197
50	ismuth 55%, Lead 44%, Indium 1%	121 - 120	250 - 248
49	ismuth 55%, Lead 44%, Tin 1%	120 - 117	248 - 242
48	ismuth 54%, Lead 43%, Tin 3%	119 - 108	246 - 226
47	ismuth 38%, Lead 26%, Tin 32%, Cadmium 3%, Antimony 1%	118 - 130	244 - 167
100	ndium 42%, Tin 58%	117 - 117	243 - 243
14	Bismuth 53%, Lead 42%, Tin 5%	117 - 103	243 - 217
14	Lead 70%, Bismuth 25%, Tin 5%	116 - 100	240 - 212
14	Bismuth 50%, Lead 30%, Tin 20%	115 - 95	239 - 203
14	Bismuth 40%, Lead 33%, Tin 14%, Cadmium 13%	113 - 72	235 - 162
14	Bismuth 54%, Lead 44%, Tin 1%, Cadmium 1%	113 - 104	235 - 219
14	Bismuth 52%, Lead 41%, Tin 7%	112 - 98	234 - 208

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE** Deg. Cent.	Deg. Fahr.
1400	Bismuth 68%, Indium 32%	109 - 109	228 - 228
139	Bismuth 46%, Lead 34%, Tin 20%	108 - 95	227 - 203
138A	Bismuth 55%, Lead 39%, Tin 6%	108 - 102	226 - 215
138	Bismuth 45%, Lead 35%, Tin 20%	107 - 96	225 - 205
137	Bismuth 35%, Lead 35%, Tin 20%, Cadmium 10%	105 - 70	221 - 158
136	Bismuth 52%, Lead 38%, Tin 10%	105 - 98	221 - 208
134	Bismuth 56%, Lead 22%, Tin 22%	104 - 95	219 - 203
1330	Bismuth 54%, Tin 26%, Cadmium 20%	103 - 103	217 - 217
131	Bismuth 50%, Lead 25%, Tin 25%	102 - 95	216 - 203
130	Bismuth 41%, Lead 28%, Tin 22%, Cadmium 9%	102 - 70	215 - 158
129	Bismuth 50%, Lead 31%, Tin 19%	99 - 93	210 - 200
1280	Bismuth 52%, Lead 32%, Tin 16%	96 - 96	204 - 204
1270	Bismuth 52.50%, Lead 32%, Tin 15.50%	95 - 95	203 - 203
126	Bismuth 52%, Lead 32%, Tin 15%, Cadmium 1%	94 - 90	201 - 195
125	Bismuth 50%, Lead 39%, Tin 4%, Cadmium 7%	93 - 73	200 - 165
1245	Indium 44%, Tin 42%, Cadmium 14%	93 - 93	200 - 200
124	Bismuth 51.5%, Lead 31.5%, Tin 15%, Indium 2%	93 - 87	200 - 190
123	Bismuth 52%, Lead 32%, Tin 15%, Cadmium 1%	92 - 83	198 - 181
1220	Bismuth 52%, Lead 40%, Cadmium 8%	92 - 92	197 - 197
121	Bismuth 51%, Lead 40%, Cadmium 8%, Indium 1%	89 - 87	192 - 188
120	Bismuth 51%, Lead 31%, Tin 15%, Cadmium 1%, Indium 2%	89 - 80	192 - 176
119	Bismuth 50%, Lead 39%, Tin 2%, Cadmium 8%, Indium 1%	89 - 80	192 - 176
118	Bismuth 43%, Lead 38%, Tin 10%, Cadmium 9%	88 - 71	190 - 160
117	Bismuth 50%, Lead 39%, Tin 1%, Cadmium 8%, Indium 2%	85 - 81	185 - 178
116	Bismuth 50%, Lead 39%, Tin 3%, Cadmium 8%	82 - 61	180 - 141
1150	Bismuth 57%, Tin 17%, Indium 26%	79 - 79	174 - 174
114	Bismuth 50%, Lead 35%, Tin 9%, Cadmium 6%	78 - 70	173 - 158
113	Bismuth 48%, Tin 20%, Lead 19%, Cadmium 13%	76 - 70	168 - 158
112	Bismuth 50%, Lead 24.95%, Tin 12.50%, Cadmium 12.50%, Silver .05%	73 - 70	165 - 158
111	Bismuth 50%, Lead 25%, Tin 12.50%, Cadmium 12.50%	73 - 70	165 - 158
110	Bismuth 51%, Lead 28%, Tin 12%, Cadmium 9%	73 - 70	163 - 158
1125	Indium 66%, Bismuth 34%	72 - 72	162 - 162
1100	Bismuth 52%, Lead 26%, Indium 22%	70 - 70	158 - 158
1090	Bismuth 50%, Lead 27%, Tin 13%, Cadmium 10%	70 - 70	158 - 158
107	Bismuth 43%, Lead 23%, Tin 12%, Cadmium 9%, Mercury 13%	66 - 55	151 - 131
106	Bismuth 48%, Lead 26%, Tin 13%, Cadmium 9%, Indium 4%	65 - 61	149 - 142
105	Bismuth 48%, Lead 25%, Tin 13%, Cadmium 9%, Indium 5%	65 - 57	149 - 134
1075	Indium 62%, Bismuth 30%, Cadmium 8%	62 - 62	144 - 144
1060	Indium 51%, Bismuth 33%, Tin 16%	61 - 61	142 - 142
108	Bismuth 49%, Lead 18%, Tin 15%, Indium 18%	59 - 58	156 - 136
1050	Bismuth 49%, Indium 21%, Lead 18%, Cadmium 1%	58 - 58	136 - 136
1040	Bismuth 49%, Indium 21%, Lead 18%, Tin 12%	58 - 58	136 - 136
103	Bismuth 49%, Lead 18%, Tin 11%, Cadmium 1%, Indium 21%	56 - 54	133 - 129
102	Bismuth 45%, Lead 23%, Tin 11%, Cadmium 5%, Indium 16%	52 - 47	126 - 117
1015	Bismuth 45%, Indium 19%, Lead 23%, Tin 8%, Cadmium 5%	47 - 47	117 - 117
100	Bismuth 43%, Lead 22%, Tin 8%, Cadmium 5%, Indium 18%, Mercury 4%	43 - 38	110 - 100

VARADYNE
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1639 EAST EDINGER AVENUE, SANTA ANA, CALIFORNIA 927005
TEL: (714) 542-4794

TECHNICAL GLASS

GENERAL DESCRIPTION

Direct drawing, redrawing, sintering and preforming of proprietary glasses, as well as all glasses listed in the Kimble and Corning catalogs. Such as:

KIMBLE EN-1, K772, KG-1, KG-12, KG-33, N51A, R-6
CORNING 0010, 0080, 0120, 7052 and 7720

STANDARD PRODUCTS

- Glass parts for DO-7
- End double plug diodes
- Reed switches
- Photo diodes
- Miniature lamps
- Resistor, capacitor and rectifier housings
- Compression seal windows
- High voltage feedthroughs

NOMINAL SPECIFICATIONS

	AFG	KG-1	KG-33	R-6
Working Point	750°C	970°C	1240°C	985°C
Softening Point	650°C	626°C	825°C	700°C
Annealing Point	523°C	428°C	560°C	520°C
Strain Point	480°C	397°C	520°C	490°C
Expansion Coefficient (0-300°C)	49x10-7/°C	94x10-7/°C	32x10-7/°C	93x10-7/°C
Contraction Coefficient (A.P. — 25°C)		108x10-7/°C	37x10-7/°C	111x10-7/°C
Density	4.06gm/cc	2.85gm/cc	2.23gm/cc	2.53gm/cc
Volume Resistivity (P) ohm-cm expressed as log P				
250°C	11.8	8.7	8.1	6.6
350°C	10.2	6.8	10.8	5.2
Dielectric (25°C) 60 Hz				
K	—	—	4.9	8.0
△	—	—	.95%	.85%
loss factor	—	—	4.7%	38.4%
1 megahertz				
K	—	6.7	4.6	7.2
△	—	16%	.46%	.85%
loss factor	—	1%	2.1%	6.1%
△T Thermal Shock (Estimated °C)				
⅛″ Thick	—	60	180	60
¼″ Thick	—	50	150	50
½″ Thick	—	35	100	35
Thermal Conductivity (cal cm/cm² °Cx10-5)				
−100°C	—	1.66	2.13	1.99
0°C	—	2.09	2.71	2.43
+100°C	—	2.36	3.12	2.65

Certified specifications available on request.

TYPICAL DIAMETER TOLERANCE RANGE

O.D. RANGE	O.D. TOLERANCE (Tubing and Rod)	I.D. TOLERANCE
.020″ - .060″	±.001″	±.001″
.061″ - .100″	±.0015″	±.0015″
.101″ - .150″	±.002″	±.002″
.151″ - .200″	±.003″	±.002″
.201″ - .225″	±.004″	±.002″
.226″ - .250″	±.005″	±.002″

AFG-47 is also available in multiforms. Refer to Hanibal Glass for details.

LEAD ALUMINO BOROSILICATE GLASS — AFG-47

AFG-47 is a lead alumino borosilicate glass carefull lated to match the thermal expansion character Molybdenum and Kovar.

IMPORTANT: Virtually alkali-free, this lead alumino cate glass is also finding application in high volta throughs and resistor housings.

CLEAR POTASH SODA LEAD GLASS — 0010/KG-1

0010/KG-1 is a clear potash soda lead glass offerin lent electrical characteristics.

CLEAR BOROSILICATE GLASS — KG-33/7740

KG-33/7740 is a clear borosilicate with high chem bility and excellent electrical resistivity.

SOFT LIME GLASS — R-6/0080

R-6/0080 is a soft lime glass for use where therr chemical resistance are not of prime importance.

TECHNICAL CERAMICS

GENERAL DESCRIPTION

Dielectric materials, falling in a category somewhere b glass and aluminum oxide (Al_2O_3).

Combinations of glass and ceramic to match the ex coefficients of seals closer than pure glasses.

FEATURES

- Flexible tape system permits parts to be fabrica simple punch press tooling
- Low firing temperature (982°C)
- Materials may be metallized or electroplated
- Available in four compositions
- Engineered thermal expansion to customer specifica
- Thermal expansion constant to ±.003″ or better (on orders, ±.002″ tolerance is obtainable)

TYPICAL APPLICATIONS

- Substrates
- High temperature current boards
- Microcircuit packages and lids
- Relay and crystal preforms
- Connector preform

COMPARISON OF PHYSICAL AND ELECTRICAL PROPERTI OF TECHNICAL GLASS AND CERAMICS

PHYSICAL PROPERTIES

HYBRID ALUMINUM OXIDES 50-P	50-H	90-P	90-H		GL 7052
	5.5		8.2	Thermal Expansion x 10-6 /°C 20°-500°C	4.6
	2.5		2.8	Bulk Specific Gravity	2.22
	.005		.005	Thermal Conductivity cal/(sec) (cm2) (°C/cm)	.0023
	980°		1100°	Softening Temperature — (1.) °C	710°
500	50,000			Compressive Strength — lbs/in²	
				Modules of Elasticity — x 210⁴ lb/in²	820
	12,000		12,000	Modulus of Rupture — x lb/in²	2500
975		1100		Working or Sealing Temp. °C (3.)	950

ELECTRICAL PROPERTIES

	4.9		6.3	Dielectric Constant — 1 MHz 20°C	4.9
	1.5		1.3	Loss Factor — 1 MHz 20°C	1.3
	550		520	Dielectric Strength—Volts/mil (2.)	500
	8.5		8.0	Volume Resistivity — Log 10 250°C	9.2

(1.) Viscosity of $10^{7.6}$ poises
(2.) 100 mils thick
(3.) Dependent on the time-temperature fa also needs weighted jigs

NOTE: Type H is a high-fired type P.

See YELLOW SECTION for Local Offices, Phones

TAL PACKAGES

URES

- ght enclosures for integrated and hybrid circuit lications
- id Kvar base
- thmal expansion
- teria chosen for maximum strength and reliability
- tone glass-to-metal seals
- th fl and elevated covers available
- atfo and Can types only)
- ing ad types designed to meet all requirements of L-ST-883

FORMANCE CHARACTERISTICS

ady platform enclosures are designed to meet the re- emes of latest issues of applicable military specifica- s, including MIL-STD-883.

YSICAL — ENVIRONMENTAL

metity — Terminals (round or flathead) pass helium mass ctrometer test at 10^{-8} cc/sec atm. sensitivity threshold, MIL-STD-202, Method 112A, Condition C.

ermal Shock — Meets shock requirements of MIL-STD-202, thod 107B, Condition C.

eratial Temperature — Gold plated cases (per MIL-G- 204) withstand 200°C max., continuous operation; 5 min. 415° cycle for chip bonding.

rrosi Resistance — Meets salt spray requirements of MIL- D-20 Method 202B, Condition A.

romic Pressure — Meets requirements of MIL-STD-202, thod 205C, Condition G, for aerospace environments.

ermin Strength — Meets requirements of MIL-STD-202, thod 211, with bend tests of flatleads to Condition B and undleds to Condition C, and pull test to Condition A.

lating — Available in standard gold (per MIL-G-45204), ype I lass I — tinplate also available on special order (MIL- 107).

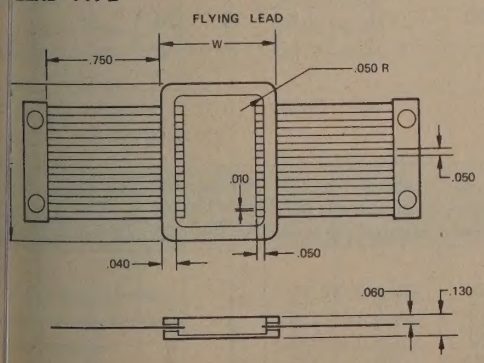
LECTICAL

nsulation Resistance — 1 megohm, min. @ 500 VDC.

Dielecic Voltage (Hipot) — Exceeds 210 VAC requirement in mallc size.

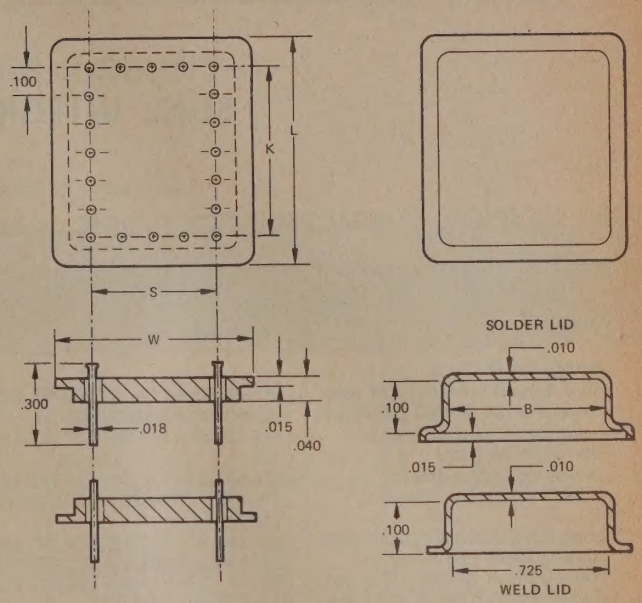
Capacance — Meets requirements for quartz crystals and filter vices.

FLYIN LEAD TYPE



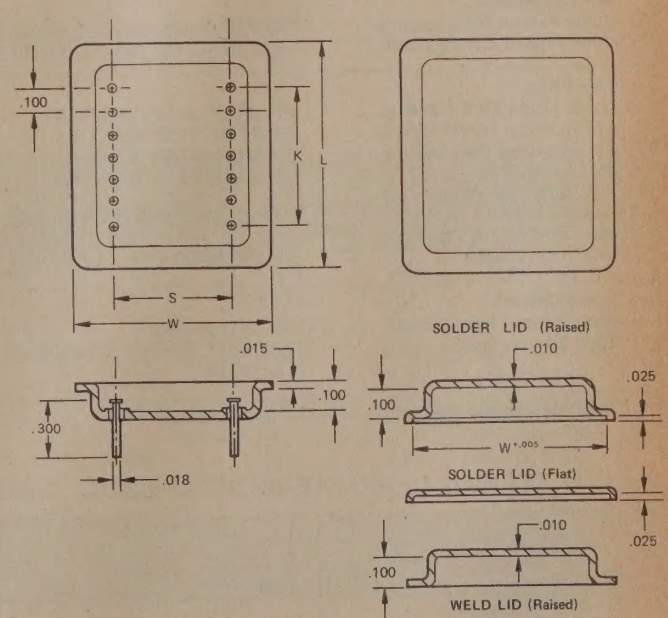
P No.	Pins (Max.)	L	W	Substrate Size
	30	1.0	.75	.875 x .625
	32	1.0	1.0	.875 x .875

PLATFORM TYPE



Part No.	Pins (Max.)	L	W	S	K	Substrate Size	B
	14	.833	.493	.300	.600	.5 x .25	.360
	16	.953	.493	.300	.700	.6 x .25	.360
	24	.750	.750	.600	.600	.5 x .5	.660
	28	.950	.750	.600	.800	.5 x .75	.660
	32	.975	.975	.800	.800	.75 x .75	.860
	42	1.800	1.300	1.100	1.600	1.5 x 1.0	1.160
	44	1.250	1.250	1.100	1.100	1.0 x 1.0	1.160

CAN TYPE CASE



Part No.	Pins (Max.)	L	W	S	K	Substrate Size
	14	.853	.493	.300	.600	.25 x .5
	16	.953	.493	.300	.700	.25 x .6
	20	1.340	1.140	.900	1.000	.75 x .900
	32	1.840	1.140	.900	1.500	.75 x 1.25

SUHL INTEGRATED CIRCUITS

SUHL I TYPICAL CHARACTERISTICS (+25°C, +5.0 Volts)

Function	Type Nos.	†pd (nsec)	Avg. Power (mw)	Noise Immunity +(volts)−	**Military (-55°C to +125°C) Prime	FO Std.	FO	**Indu (0°C to + Prime FO	T.
NAND/NOR Gates									
dual 4-input NAND/NOR gate	SG-40,SG-41,SG-42,SG-43	10	15	1.1	1.5	15	7	12	6
single 8-input NAND/NOR gate	SG-60,SG-61,SG-62,SG-63	12	15	1.1	1.5	15	7	12	6
expandable single 8-input NAND/NOR gate	SG-120,SG-121,SG-122,SG-123	18	15	1.1	1.5	15	7	12	6
dual 4-input line driver	SG-130,SG-131,SG-123,SG-133	25	30	1.1	1.5	20	15	24	2
quad 2-input line driver	TNG5511,TNG5513,TNG5512, TNG5514	18	30	1.0	1.5	36	24	36	4
quad 2-input NAND/NOR gate	SG-140,SG-141,SG-142,SG-143	10	15	1.1	1.5	15	7	12	6
triple 2-input bus driver	SG-160,SG-161,SG-162,SG-163	15	15	1.1	1.5	15	7	12	6
triple 3-input NAND/NOR gate	SG-19--,SG-191,SG-192,SG-193	10	15	1.1	1.5	15	7	12	6
quad 2-input NAND/NOR gate	SG-330,331,332,333	12	20	1.1	1.5	15	7	12	6
hex inverter	SG-370,371,372,373	12	15	1.0	1.5	15	7	12	6
AND-NOR Gates									
expandable quad 2-input OR gate	SG-50,SG-51,SG-52,SG-53	12	30	1.1	1.5	15	7	12	6
expandable dual output, dual 2-input OR gate	SG-70,SG-71,SG-72,SG-73	12	20/gate	1.1	1.5	15	7	12	6
exclusive-OR with complement	SG-90,SG-91,SG-92,SG-93	11	35	1.1	1.5	15	7	12	6
expandable triple 3-input OR gate	SG-100,SG-101,SG-102,SG-103	12	25	1.1	1.5	15	7	12	6
expandable dual 4-input OR gate	SG-110,SG-111,SG-112,SG-113	12	20	1.1	1.5	15	7	12	6
Non-Inverting Gates									
dual pulse shaper/delay-AND gate	SG-80,SG-81,SG-82,SG-83	11	30/gate	1.1	1.5	15	7	12	
dual 4-input AND/OR gate	SG-280,SG-281,SG-282,SG-283	11	38/gate	1.0	1.5	10	5	8	
AND Expanders									
dual 4-input AND expander	SG-180,SG-181,SG-182,SG-183	<1	0.9/gate	1.1	1.5				
OR Expanders									
quad 2-input OR expander	SG-150,SG-151,SG-152,SG-153	4	20	1.1	1.5				
dual 4-input OR expander	SG-170,SG-171,SG-172,SG-173	4	5	1.1	1.5				
Flip-Flops									
single phase SRT flip-flop	SF-30,SF-31,SF-32,SF-33	15MHz*30		1.1	1.5	15	7	12	
J-K flip-flop (AND inputs)	SF-50,SF-51,SF-52,SF-53	20MHz*50		1.1	1.5	15	7	12	
J-K flip-flops (OR inputs)	SF-60,SF-61,SF-62,SF-63	20MHz*55		1.1	1.5	15	7	12	
dual D flip-flop	SF-80,SF-81,SF-82,SF-83	20MHz*48		1.0	1.5		10		1
dual 35MHz flip-flop (separate clock)	SF-100,SF-101,SF-102,SF-103	35MHz*55/FF		1.0	1.5	11	6	9	
dual 35MHz J-K flip-flop (common clock)	SF-110,SF-111,SF-112,SF-113	35MHz*55/FF		1.0	1.5	11	6	9	
Lamp Driver									
quad 2-input lamp driver	SG-351,SG-353	10	37	1.0	1.5	22	12	18	1
quad 2-input lamp	TNG5611,TNG5613,TNG5612, TNG5614	18	30	1.0	1.5	36	24	36	2

*Minimum toggle frequency **Minimum fan-out

SUHL II TYPICAL CHARACTERISTICS (+25°C, +5.0 Volts)

Function	Type Nos.	†pd (nsec)	Avg. Power (mw)	Noise Immunity +(volts)−	**Military (-55°C to +125°C) Prime	FO Std.	FO	**Industria (0°C to +75° Prime FO	Std.
NAND/NOR gates									
expandable single 8-input NAND/NOR gate	SG-200,SG201,SG-202,SG-203	8	22	1.0	1.5	11	6	9	5
quad 2-input NAND/NOR gate	SG-220,SG-221,SG-222,SG-223	6	22	1.0	1.5	11	6	9	5
dual 4-input NAND/NOR gate	SG-240,SG-241,SG-242,SG-243	6	22	1.0	1.5	11	6	9	5
single 8-input NAND/NOR gate	SG-260,SG-261,SG-262,SG-263	8	22	1.0	1.5	11	6	9	5
triple 3-input NAND/NOR gate	SG-320,SG-321,SG-322,SG-323	6	22	1.0	1.5	11	6	9	5
quad 2-input NAND/NOR gate	SG-340,341,342,343	6	22	1.0	1.5	11	6	9	5
hex inverter	SG-380,381,382,383	6	22	1.0	1.5	11	6	9	5

nsitron electronic corporation 168 ALBION STREET, WAKEFIELD, MASSACHUSETTS 01880

SUHL INTEGRATED CIRCUITS

TYPICAL CHARACTERISTICS (+25°C, +5.0 Volts) (Cont'd)

	Type Nos.	†pd (nsec)	Avg. Power (mw)	Noise Immunity +(volts)–	**Military (-55°C to +125°C) Prime	FO Std.	FO	**Industrial (0°C to +75°C) Prime FO	Std. FO
D-NOR Gates									
andae dual 4-input OR gate	SG-210,SG-211,SG-212,SG-213	7	30	1.0	1.5	11	6	9	5
andae quad 2-input OR gate	SG-250,SG-251,SG-252,SG-253	7.5	43	1.0	1.5	11	6	9	5
andae triple 3-input OR gate	SG-300,SG-301,SG-302,SG-303	7	36	1.0	1.5	11	6	9	5
andae dual output dual 4-input OR gate	SG-310,SG-311,SG-312,SG-313	7	30/gate	1.0	1.5	11	6	9	5
D/OR Expander									
al 28 input AND/OR expander	SG-290,SG-291,SG-292,SG-293	7	15/gate	1.0	1.5				
Expanders									
al 2-input OR expander	SG-230,SG-231,SG-232,SG-233	2	28	1.0					
al 4-input OR expander	SG-270,SG-271,SG-272,SG-273	2	6.7	1.0	1.5				
Flip-Flop									
al D flip-flop	SG-91,SG-93	30MHz*75		1.0	1.5		7		7
al 50 Hz J-K flip-flop separate clock)	SF-120,SF-121,SF-122,SF-123	50MHz*55/FF		1.0	1.5	11	6	9	5
al 50 Hz J-K flip-flop common clock)	SF-130,SF-131,SF-132,SF-133	50MHz*55/FF		1.0	1.5	11	6	9	5
MHz J-K flip-flop (AND inputs)	SF-200,SF-201,SF-202,SF-203	50MHz*55		1.0	1.5	11	6	9	5
MHz J-K flip-flop (OR inputs)	SF-210,SF-211,SF-212,SF-213	50MHz*55		1.0	1.5	11	6	9	5
J-K flip-flop (AND inputs)	SF-250,SF-251,SF-252,SF-253	30MHz 50		1.1	1.5	11	6	9	5
J-K flip-flop (OR inputs)	SF-260,SF-261,SF-262,SF-263	30MHz 55		1.1	1.5	11	6	9	5

*Minimum toggle frequency **Minimum fan-out

TYPICAL CHARACTERISTICS (+25°C, +5.0 Volts)

Function	Type Nos.	Speed	Avg. Power (mw)	Noise Immunity +(Volts)–		Fanout
full adder	SM10 series	sum 22 carry 10	90	1.0	1.0	These circuits are available in fanouts up to 15 and are completely compatible with SUHL I and SUHL II ICs.
dependent carry fast adder	SM20 series	sum 22 carry 10	125	1.0	1.0	
independent carry fast adder	SM30 series	sum 22 carry 10	125	1.0	1.0	
carry decoder	SM40 series	2	25	1.0	1.0	
4-bit storage register	SM60 series	20	30/bit	1.0	1.0	
bus transfer output	SM70 series	20	30/bit	1.0	1.0	
4-bit storage register cascade pullup output	SM80 series	25	250	1.0	1.0	
16-bit scratch pad memory						
16-bit memory	TMC3162 series	25ns	250	1.0	1.0	These MSI circuits are available in fanouts reaching 15 and are compatible with SUHL I, SUHL II, and SUHL MSI.
low power 16-bit memory	TMC3263 series	25ns	175	1.0	1.0	
64-bit memory	TMC6464 series	35ns	500	1.0	1.0	
4-bit presettable binary counter	TRC2511 series	35MHz	180	1.0	1.0	
BCD decade presettable	TRC2515 series	35MHz	180	1.0	1.0	
divide-by-twelve counter	TRC2531 series	18MHz	155	1.0	1.0	
4-bit shift register	TSR2515 series	25MHz	150	1.0	1.0	
4-bit presettable shift register	TSR2525 series	25MHz	150	1.0	1.0	

LINEAR INTEGRATED CIRCUITS

Differential Comparators

Type	Circuit Description	Case Style	Temp. Range	Voltage Supply (Volts)	Voltage Gain	Input Offset Voltage (MV)	Input Offset Current (NA)	Response Time (N.Sec.)	Positive Output Level (Volts)	Negative Output Level (Volts)	O Cu
TDC1710	Single	V,F,J	M	+12,–6	1,700	0.6	0.75	40	3.2	–0.5	1
TDC2710	Single	V,F,E	I	+12,–6	1,500	1.6	1.8	40	3.2	–0.5	1
TDC1711	Dual, Single Output	V,F,J	M	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	0.
TDC2711	Dual, Single Output	V,F,J,E	I	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	0.
TDC4711	Dual, Single Output	V,F,J	M	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	5.
TDC5711	Dual, Single Output	V,J	I	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	5.
TDC6711	Dual, Double Output	J	M	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	0. *
TDC7711	Dual, Double Output	J	I	+12,–6	1,500	1.0	0.5	40	3.5	0.5	0. *
TDC8711	Dual, Double Output	J	M	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	2. *
TDC9711	Dual, Double Output	J	I	+12,–6	1,500	1.0	0.5	40	3.5	–0.5	2. *

Decoder/Drivers

Type	Circuit Description	Case Style	Temp. Range	Voltage Supply (Volts)	Output Voltage Breakdown (Volts)	On Stage Output Voltage (Volts)	Logic 1 Input Voltage (Volts)	Logic O Input Voltage (Volts)	Outpu Leaka (uA)
TDD1100	BCD-to-Decimal	J,E	I	+5	70 @ 1mA	2.5 @ 7mA	2.0 min.	0.8 max.	50 @ –5
TDD1101	BCD-to-Decimal High Sink	J,E	I	+5	70 @ 1mA	5 @ 14mA	2.0 min.	0.8 max.	50 @ –5

Operational Amplifiers

Type	Circuit Description	Case Style	Temp. Range	Voltage Supply (Volts)	Voltage Gain	Input Offset Voltage (MV)	Input Offset Current (NA)	Input Bias Current (NA)	Input Impedance (Megohms)	Output Voltage Swing (Volts)	T In Off Vol (uV
TOA1709	Single	V,F,J	M	±15	45,000	1.0	50	200	0.40	±14	6
TOA2709	Single	V,F,J,E	I	±15	45,000	2.0	100	300	0.25	±14	6
TOA3709	Single	V,F,J,E	I	±15	45,000	1.0	50	200	0.40	±14	6
TOA4709	Single	V,F,J	M	±15	45,000	1.0	10	100	0.70	±14	3
TOA7709	Single	V,F,J	M	±15	45,000	1.0	2	10	10	±14	6
TOA8709	Single	V,F,J,E	I	±15	45,000	2.0	6	30	3	±14	6
TOA7809	Single High Impedance	V,F,J	M	±15	25,000	1.0	0.5	4	25	±14	6
TOA8809	Single High Impedance	V,F,J,E	I	±15	25,000	2.0	0.5	2	50	±14	6
TOA1809*	Dual	J	M	±15	45,000	1.0	50	200	0.40	±14	6
TOA2809*	Dual	J,E	I	±15	45,000	2.0	100	200	0.25	±14	6
TOA1741	Single, Compendated	V,F,J	M	±15	200,000	1.0	30	200	1.0	±14	
TOA2741	Single, Compensated	V,F,J,E	I	±15	100,000	2.0	30	200	1.0	±14	
TOA3741	Single, Compensated High Impedance	V,F,J	M	±15	160,000	0.7	2.0	4	2.5	±14	
TOA7741	Single, Compensated High Impedance	V,F,J	M	±15	200,000	1.0	2.0	10	10	±14	
TOA8741	Single, Compensated High Impedance	V,F,J,E	I	±15	100,000	2.0	4.0	20	3	±14	
TOA1748	Single, External Compensation	V,F,J	M	±15	100,000	2.0	4.0	20	3	±14	
TOA2748	Single, External Compensation		I	±15	100,000	2.0	30	200	1.0	±14	
TOA3748	Single, External Compensation	V,F,J	M	±15	160,000	0.7	1.5	30	4	±14	
TOA4748	Single, External Compensation	V,F,J,E	I	±15	160,000	1.5	3.0	70	2	±14	
TOA7748	Single, External Compensation	V,F,J	M	±15	200,000	1.0	2.0	10	10	±14	
TOA8748	Single, External Compensation	V,F,J,E	I	±15	100,000	2.0	4.0	20	3	±14	
TOA1747*	Dual, Compensated	J	M	±15	200,000	1.0	30	200	1.0	±14	
TOA2747*	Dual, Compensated	J,E	I	±15	100,000	2.0	30	200	1.0	±14	
TOA7747*	Dual, Compensated High Impedance	J	M	±15	200,000	1.0	2.0	10	10	±14	
TOA8747*	Dual, Compensated High Impedance	J,E	I	±15	100,000	2.0	4.0	20	3	±14	

*Per Side or Amp

Voltage Regulators

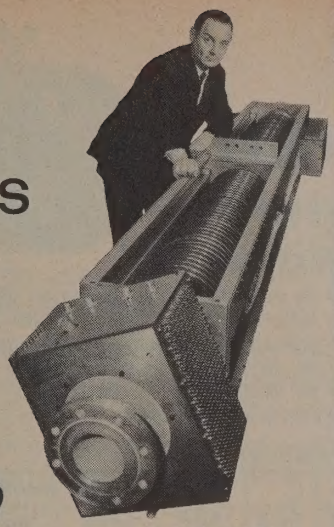
Type	Circuit Description	Case Style	Temp. Range	Input Voltage Range (Volts)	Output Voltage Range (Volts)	Output Impec (mohms)	Line Reg %V_{out}	Load Reg %V_{out}	Standby Current Drain (mA)
TVR2000	Voltage Reg	V,J	M	8-40	3-37.8	20	0.015 max.	3.5	–
TVR2001	Voltage Reg	V,J	I	8-40	3-37.5	20	0.03 max	3.5	–
TVR2002	Voltage Reg	V,J	I	8.5-30	3-27.5	40	0.02	3.5	–
TVR1723	Voltage Reg	V,J	M	9.5-40	2.0-37	–	0.2 max.	2.3	0.15 max.
TVR2723	Voltage Reg	V,J	I	9.5-40	2.0-37	–	0.5 max.	2.3	0.2 max.

*Per Side or Amp

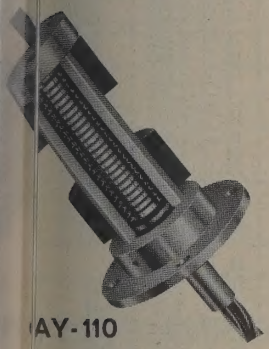
See YELLOW SECTION for Local Offices, Phones

EARING OUNTED LIP-RING SSEMBLIES

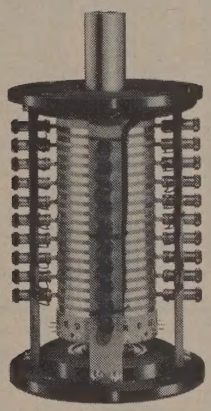
CAY-150



EAY-502



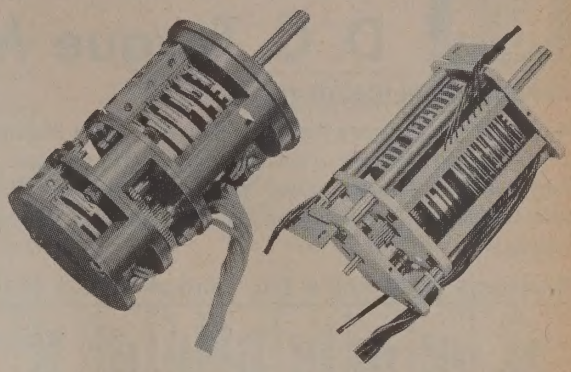
AY-110



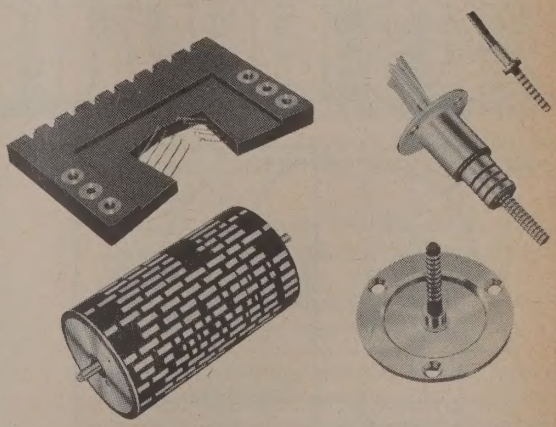
CAY-125

SHAFT POSITION ENCODERS

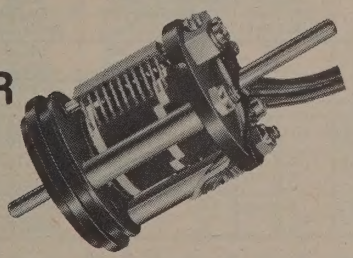
analog-digital converters



SLIP-RING AND BRUSH BLOCK ASSEMBLIES AND SWITCHING COMMUTATORS



ROTARY SELECTOR SWITCH



lust ted is a partial selection of the many and varied products available from Airflyte's complete line f ro ting components. Airflyte's extensive services and facilities, from research and design to proto- ype nd mass production, enable the manufacture of both standard and modified components, geared o cutomer specifications and application. Tooling costs can be eliminated in most instances by the vail ility of a large selection of company-owned jigs, fixtures, dies and molds. Airflyte Electronics nvit your inquiry.

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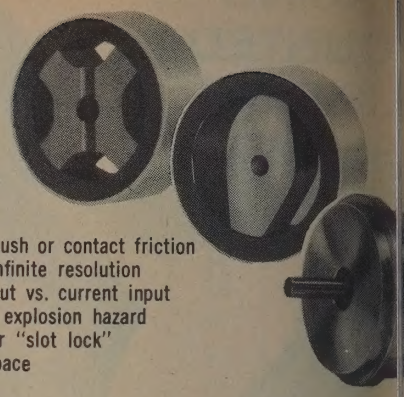
AEROFLEX

AEROFLEX
brushless-wide angle D. C. Torque Motors



TYPICAL APPLICATIONS:

Inertial Systems . . . Remote Positioning Devices . . . Stable Platforms . . . Process Control Systems . . . Vane And Control Surface Actuators . . . Throttle Control Systems . . . Chart Recorder Pen-Motor . . . Special Meter-movements . . Precision Load Testing . . . Multi-input Summing Transducers.

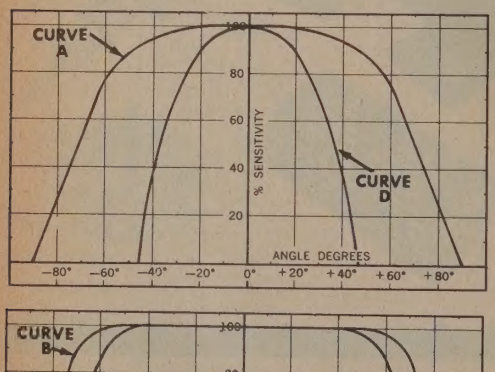
FEATURES:

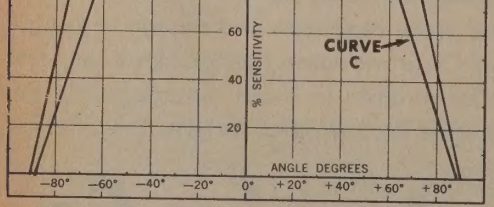
- No commutator, brush or contact friction
- Unlimited life — Infinite resolution
- Linear torque output vs. current input
- No radio noise or explosion hazard
- No motor ripple or "slot lock"
- Proven in outer space

Brushless Wide Angle D.C. Torque Motors (Partial Listing)

Basic Part Number	Peak Torque (Oz. In.)	Peak Power (Watts)	Continuous Torque (Oz. In.)	Continuous Power at 25°C (Watts)	Recommended Angular Excursion (°'s)	Torque Sensitivity (Oz. In./Amp.)	Back EMF (V/Rad/Sec)	Elect. Time Constant L/R (Sec)	Resistance[1] at 25°C (Ohms)	Rotor Inertia (Oz.In.Sec²)	VISCOUS DAMPING Infinite	VISCOUS DAMPING Zero	Weight Oz.	PANCAKE DIMENSION (Add letter "P" to basic part number) O.D. (Inch)	Thick. (Inch)
											Source Impedance (Oz. In./Rad/Sec)				
TQ10-50	1.8	12	.8	2	15	2.3	.016	$2x10^{-4}$	35	$56x10^{-6}$	$6.7x10^{-5}$	$1.1x10^{-3}$	1	1.000	.350
TQ10Y10	1.3	12	.5	1.7	90	3.0	.021	$3x10^{-4}$	60	$16x10^{-6}$	$1.5x16^{-5}$	$1.1x10^{-3}$	1	1.000	.350
TQ10Y-1	6	90	1.5	5	90	7.6	.055	$2x10^{-4}$	175	$40x10^{-6}$	$4x10^{-5}$	$2.4x10^{-3}$	2	1.000	.700
TQ10Y-2	6	90	1.5	5	90	5.8	.041	$2x10^{-4}$	100	$40x10^{-6}$	$4x10^{-5}$	$2.3x10^{-1}$	2	1.000	.700
TQ18-25	4	12	3	7	50	9	.063	$2x10^{-4}$	60	$32x10^{-5}$	$2x10^{-4}$	$1x10^{-3}$	3	1.718	.350
TQ18-7	18	85	8	14	50	15	.106	$2x10^{-4}$	48	$67x10^{-5}$	$5x10^{-4}$	$3.3x10^{-2}$	4	1.718	.700
TQ18W-30	3	30	1.5	8	120	3.2	.025	$5x10^{-4}$	36	$24x10^{-5}$	$3x10^{-4}$	$2x10^{-3}$	3	1.718	.350
TQ18W-23	8	50	4	12	120	8.5	.065	$8x10^{-4}$	48	$48x10^{-5}$	$3x10^{-4}$	$1x10^{-2}$	4	1.718	.700
TQ25-6	30	63	10	7	50	12	.085	$3x10^{-3}$	10	$15x10^{-4}$	$20x10^{-4}$	$16x10^{-2}$	6	2.500	.500
TQ25-2	80	150	25	14	50	27	.190	$5x10^{-3}$	16	$44x10^{-4}$	$5x10^{-3}$	$32x10^{-2}$	12	2.500	1.000
TQ25W-2	18	80	6	9	120	15	.110	$2x10^{-3}$	55	$9x10^{-4}$	$1x10^{-4}$	$3x10^{-2}$	4	2.500	.500
TQ-25W-1	33	130	11	14	120	18	.130	$3x10^{-3}$	38	$21x10^{-4}$	$2x10^{-4}$	$6x10^{-2}$	7	2.500	1.000
TQ34-4	130	220	40	20	50	45	.31	$1x10^{-3}$	25	$91x10^{-4}$	$1x10^{-2}$	.56	16	3.375	.725
TQ34W-1	40	90	30	36	120	21	.15	$3x10^{-3}$	18	$42x10^{-4}$	$5x10^{-3}$	.18	13	3.313	.625
TQ34W-10	40	90	30	36	120	33	.24	$3x10^{-3}$	44	$42x10^{-4}$	$5x10^{-3}$	.18	13	3.313	.625
TQ34W-12	80	180	60	85	120	28	.20	$4x10^{-3}$	18	$84x10^{-4}$	$1x10^{-2}$	.30	21	3.313	1.250
TQ40W-1	310	350	120	55	120	31	.22	$3x10^{-3}$	4	$4x10^{-2}$	$2x10^{-2}$	1.9	51	4.00	1.500
TQ52-2	700	600	200	35	20	110	.79	$3x10^{-3}$	12	$14x10^{-2}$	$2x10^{-2}$	7.2	80	5.19	1.250
TQ52W-1	550	500	220	80	120	60	.42	$6.5x10^{-3}$	6	$11x10^{-2}$	$1x10^{-2}$	4.2	80	5.12	1.500
	Lb. Ft.		Lb. Ft.			Lb. Ft./Amp.				Lb. In. Sec²	Lb. In./Rad/Sec		Lb.		
TQ74-2	15	1600	6	260	30	1.84	2.5	$6x10^{-3}$	25	.05	.06	2.2	19	7.38	2.29
TQ82W-1	7	1200	2.5	150	120	.48	.7	$28x10^{-3}$	6	.03	.02	1.2	12	8.19	1.38
TQ103-2	22	1500	10	200	40	1.0	1.4	$10x10^{-3}$	2	.24	.12	8	28	10.25	2.00
TQ120-1	25	700	10	115	40	2.3	3.1	$15x10^{-3}$	6	.32	.20	14	40	12.00	2.25
TQ140W-1	18	550	17	500	120	2	2.8	$4x10^{-2}$	5.2	.6	1.5	12	60	14.00	3.00
TQ150-2	110	2000	35	200	30	5	6.8	$2x10^{-2}$	5	1.5	1.7	110	90	15.00	3.31
TQ160-1	125	2500	30	200	50	5	6.8	$3x10^{-2}$	4	1.5	1.7	110	105	16.00	3.31

* Also Available in Flange (F), Synchro Type Mounting (S), and Completely Housed Assemblies (H).





Brushless Wide Angle D.C. Tachometers

Basic Part Number	Output Sensitivity (V/Rad/Sec)	Performance Curve (Letter)	Resistance at 25°C (Ohms)	Rotor Inertia (Oz.In.Sec²)	PANCAKE DIMENSIO O.D. (Inch)	Thick. (Inch)
TG10Y-12	.07	A	645	$16x10^{-6}$	1.000	.350
TG10Y-5	.18	A	1900	$40x10^{-6}$	1.000	.700
TG18-35	.15	D	690	$3x10^{-4}$	1.780	.312
TG18-14	.77	D	3600	$67x10^{-5}$	1.718	.700
TG18W-24	.17	B	1700	$24x10^{-5}$	1.718	.350
TG18W-25	.50	C	3600	$48x10^{-5}$	1.718	.700
TG34W-12	1.4	C	1650	$42x10^{-4}$	3.313	.625
TG34-8	3.0	D	2600	$91x10^{-4}$	3.375	.725
TG52W-5	4.5	A	1200	$107x10^{-3}$	5.125	1.50
TG52-4	4.0	D	400	$136x10^{-3}$	5.187	1.25

Brushless Wide Angle D.C. Torquer-Tachometers

Basic Part Number	TORQUE MOTOR Peak Torque (Oz. In.)	Power (Watts)	Continuous Torque (Oz. In.)	Power (Watts)	Torque Sensitivity (Oz. In./Amp.)	Resistance at 25°C (Ohms)	TACHOMETER Output Sensitivity (V/Rad/Sec)	Resistance at 25°C (Ohms)	Rotor Inertia (Oz. In. Sec²)	Weight (Oz.)	PANCAKE DIMENSIONS* O.D. (Inch)	Thick. (Inch)
TQG10Y-6	3	36	1	4	5.6	120	.04	370	$40x10^{-6}$	2	1.000	.700
TQG18-13	4	12	3	7	9	60	.3	1800	$64x10^{-5}$	4	1.718	.700
TQG25-3	30	63	10	7	12	10	1.1	3500	$30x10^{-4}$	14	2.500	1.000
TQG34-1	100	175	40	28	33	19	.3	73	$91x10^{-4}$	16	3.375	7.25
TQG34W-13	40	90	20	16	33	42	1.4	1650	$80x10^{-4}$	24	3.313	1.062

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ll Rotation *brushless* D. C. Torque Motors

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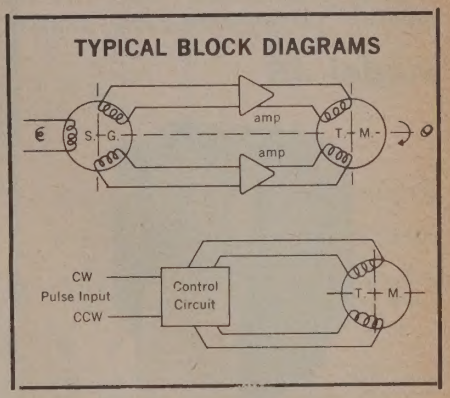
rqu delivery system designed to achieve maximum power ien within a minimum of space, weight and power. It con- s of permanent magnet brushless DC torquer mechanically oled with a brushless electromagnetic device.

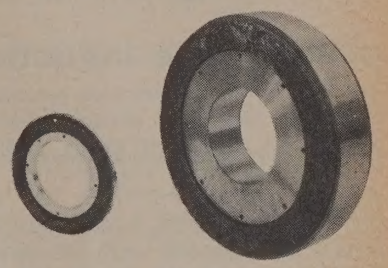
sy em operates with a torque-speed characteristic similar a D torque motor, but without brushes, commutators or ing ontacts. It provides: virtual unlimited life • no main- anc • no RFI • no friction • no explosion hazard • impervious hard vacuum, such as encountered in deep space • unusual stae to extreme temperatures, shock, vibration, and fluid ironments.

ino rearrangement of the stator windings enables the torquer be ed directly as a stepper motor.



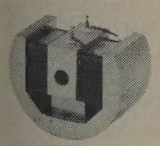
L ROTATION BRUSHLESS DC TORQUE MOTORS (PARTIAL LISTING)

racteics	TFR47-5P	TFR47-3P	TFR47-4P	TFR120-2P
k Torq	225 oz. in. (1.2 lb. ft.	800 oz. in. (4.1 lb. ft.)	1500 oz. in. (7.8 lb. ft.)	45 lb. ft.
ver	180 watts	240 watts	350 watts	450 watts
stance t 25°C	16 ohms	13 ohms	13 ohms	5.6 ohms
Load ed	1000 rpm	400 rpm	300 rpm	60 rpm
	4.625 in. O.D. x .62 in. Thk. (2.625 in. I.D.)	4.625 in. O.D. x 1.75 in. Thk. (2.625 in. I.D.)	4.625 in. O.D. x 2.25 in. Thk. (2.625 in. I.D.)	12.00 in. O.D. x 3.25 in. Thk. (4.750 in. I.D.)
ght	.95 lb.	2.8 lbs.	4 lbs .	58 lbs.

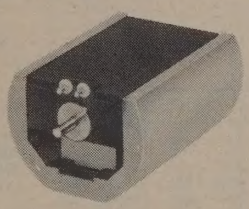


TFR 47-5P TFR 120-2P

rusless DC MOVING COIL TORQUE MOTORS



MC 23P



TMC 20-1P

USHLESS DC MOVING COIL TORQUE MOTORS

aracteics	TMC8-2P	TMC20-1P	TMC20-3P	TMC18-4P
ntinu Torque	0.1 oz. in.	40 oz. in.	3 oz. in.	3 oz. in.
ower t at 25°C	0.1 watt	18 watts	0.3 watt	2 watts
gular tion	±1 degree	±3 degrees	±0.5 degree	±0.5 degree
sistan at 25°C	400 ohms	18 ohms	220 ohms	180 ohms
ze	.94 in. x .56 in. x .50 in.	2.00 in. x 1.44 in. x 2.50 in.	2.00 in. x 1.50 in. x 1.04 in.	1.72 in. x 1.25 in. x .86 in.
eight	1.2 oz.	23 oz.	6.5 oz.	5 oz.

Ultra-precise, highly linear sensing devices for torque and force balancing systems . . .

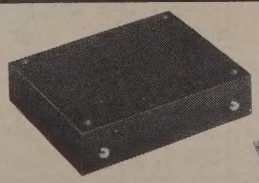
• Linearity of 0.01% or better at null • Output torque proportional to motor current • High dynamic response • No hysterises effects, no null uncertainties, no dead spots.

Typical applications include use as measuring element in air data systems, as the final balancing force and readout on torsional suspension balances, and as the nulling force in very sensitive accelerometers.

Optional windings provide biasing torque to compensate or initially null a system, produce output torque as sum of inputs, provide velocity feedback information. Independent damping coils may also be included to suit specific application.

ROFLEX ALL SILICON TRANSISTOR DC TORQUER AMPLIFIERS

erofle offers a wide variety of transistorized torquer amplifiers each atch to its associated torque motor. This assures optimum torque output nd reponse. Aeroflex provides both the all D.C. amplifier, as well as the arrier ype amplifier.



FLAT PACK

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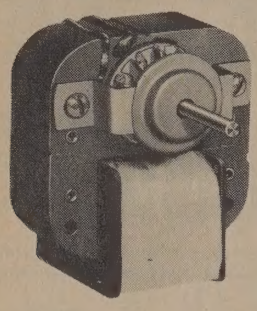
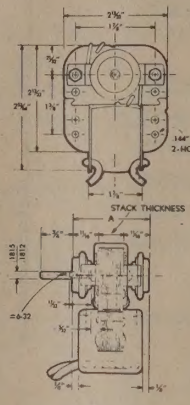
model JS





shaded pole induction motors

The Model JS Motors are mass produced with minor variations to meet the demands of specific jobs which require a highly efficient miniature power plant. It can be used as the vital power source on all kinds of electrical and mechanical devices for electronic, electro, radio and time controls, TV and radio tuners, turntable drives for phonographs and Hi-Fi, can openers, fans, hair dryers, coin operated mechanisms, switches, signals, business machines and other special uses. These motors are equipped with impregnated bronze bearings for continuous duty. They can be furnished with or without internal fans and for clockwise or counter-clockwise rotation.

The specifications shown can be varied within limits to meet your design requirements. This would include such things as corrosion resistant finish, water resistant (impregnated coil), threaded or stepped shaft, variation of the mounting arrangement, and variations in the torque and watts input.

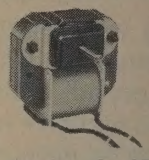
specifications

	JS0300	JS0500	JS0600*	JS0700	JS0800*	JS1100	JS1200
Stack Thickness	0.350	0.500	0.600	0.750	0.850	1.100	1.250
Voltage	117	117	117	117	117	117	117
Frequency	60	60	60	60	60	60	60
Locked Amps.—Cold	0.30	0.38	0.71	0.88	0.92	0.93	1.0
Locked Watts—Cold	15	21	35	45	50	55	62
Starting Torque—Cold—Oz. In.	0.66	.90	1.75	2.35	2.70	2.95	3.20
Idle Amps.—Hot	0.25	0.29	0.54	0.60	0.64	0.65	0.70
Idle Watts—Hot	11	15	22	28	30	32	40
Idle R.P.M.—Hot	3350	3465	3470	3475	3475	3500	3500
Full Load Amps.	0.26	0.32	0.57	0.70	0.72	0.76	0.82
Full Load Watts	13	19	29	38	42	44	53
Full Load Torque—Oz. In.	0.75	1.60	2.70	3.50	4.20	4.75	5.30
Full Load R.P.M.	2900	2900	2900	2900	2900	2900	2900
Full Load H.P.	0.002	0.004	0.008	0.010	0.012	.013	0.015
"A" Dimension (Internal Fans)	1 23/32	1 7/8	31/32	2 1/8	2 7/32	2 15/32	2 5/8
"A" Dimension (No Fans)	1 9/16	1 11/16	1 13/16	1 31/32	2 1/16	2 3/16	2 15/32
Weight	12 oz.	1 lb.	1 lb. 2 oz.	1 lb. 6 oz.	1 lb. 8 oz.	1 lb. 13 oz.	2 lb. 1 oz.
Duty	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.

* Available from stock.

custom motors for many applications

H



High starting torq it suitable for re trols, air circula trains, valve contro and many other s plications.

4 speed JPQ phonomotor

Single lever shift speeds and neutra with free movem tronic dynamically rotor. Vibration-pro ings. Minimum ru hum. Unexcelled speed regulation. Designe U. L. requirements. Occupies minimum sp The Model JPQ is also available with tr winding for transistor amplifier applicati

JS long life

Built on standard frame, has a large voir on each bear tend motor life. In reduce wear, the parts are given treatment. Ideal life applications.

JSO500

Built on standard frame. Large seale ervoir and the mat are given precisi ment to give exte The mounting show standard but illust flexibility of moun

JSG

Variations can be mounting, temper operation, clutching output shaft speed, etc. This type unit a able with friction extremely quiet oper having limited torqu Duty cycle may vary from intermittent to co dependent upon torque and ambient tempe The JSG is used for TV tuners, rotisseries controls, vending machines.

L

A shaded pole motor for typewrite ness machines, fan tions, and similar e demanding high compact design and Standard motors ar with Class "A" insulation, 117 volt, 60 Available in 1¼" and 1½" stack thickness is available with this type of motor. Furthe can be obtained through our Sales Departm

R

A compact power s reversible rotation ments. This motor re capacitor. The moto provided in variou thicknesses provi range of electric torque characteristics. The specifications here are typical for a .375 stack motor.

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This motor is for t tion type turntables tape, stereo disc and plications. It is desig manufactured to give timate in motor perf for High Fidelity eq The motor's electri physical characterist be changed to me torque, heat and mounting requirements.

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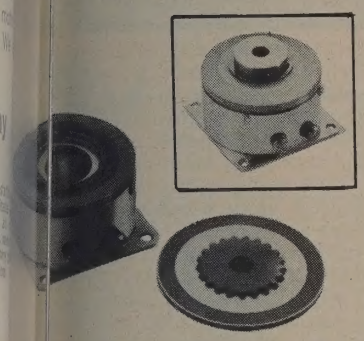
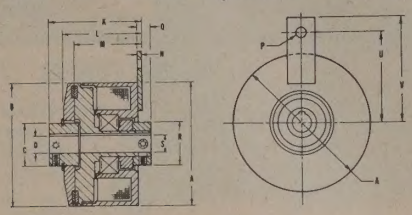
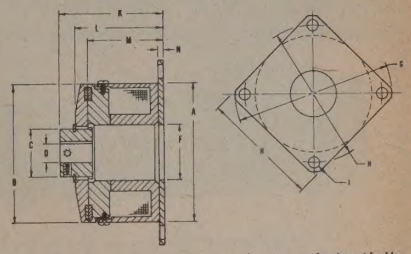




- Typical life of wear surfaces at least ten (10) times conventional material.
- Life expectancy approximately 120 million cycles (based on work performed per cycle of 144 in. oz. for Size 20 and 288 in. oz. for size 40).

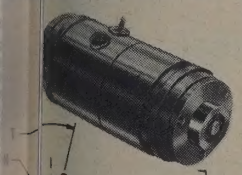


- Dust due to wear products substantially reduced.
- Physically and electrically interchangeable with most conventional units.
- A.P.I. Engineering available to establish life expectancy for specific application.

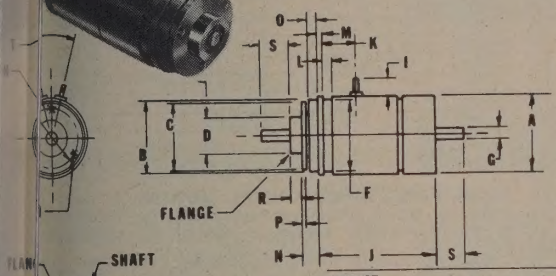
MMRCIAL

Watts	A	B	C	D	F	G	H	I	J	K	L	M	N	P	Q	R	S	U	V
D.C.	.015 .015	.015 .015	.002 .002	Max. with Max. Keyway	.001 .000	.001 .001	.005 .005	.010 .010	.015 .015	.015 .015	.015 .015	.015 .015	.015 .015	.010 .010	.015 .015	.015 .015	Max. with Max. Keyway	.015 .015	.015 .015
4	1⅛	1⅛	⅝	¼ x 1/16 x 1/32	.437	1.499	1.312	⅛	1⅛	1	.718	.625	1/16	—	—	—	—	—	—
6	1 13/16	1 13/16	⅝	⅜ x 3/32 x ¾	.750	2.436	2.125	3/16	1 13/16	1⅜	1.156	1.000	1/16	⅛	3/16	⅝	¼ x 1/16 x 1/32	1 3/16	1⅜
8	2⅛	2⅛	⅝	⅜ x 3/32 x ¾	1.000	2.874	2.500	3/16	2⅛	1 21/32	1.250	1.062	1/16	⅛	¼	¾	⅜ x 1/16 x 1/32	1⅜	1 5/16
10	2⅝	2⅝	1 3/16	¾ x 3/16 x 3/32	1.061	3.499	3.125	3/16	2⅝	1 25/32	1.437	1.250	1/16	⅛	¼	1	⅜ x ⅛ x 1/16	1 5/16	1¾

BMINIATURE CLUTCH & BRAKE



SC-MAGNETIC CLUTCH



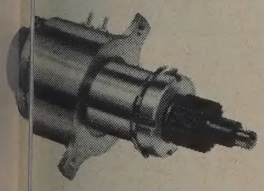
Typical A. P. I. Specifications for ultra precision clutch and brake units . . . combining excellence in design, materials, workmanship and reliability. All units contain precision ball bearings fully protected from moisture and contamination by special seals. A. P. I. units meet government specifications for environmental tests. Infinite variations of design and mountings are available.

FRAME SIZE	Torque @ 24 V.D.C. Oz. In. Min.	Drag Torque (Oz. In.) Max. Ener.		De-Ener.		Response Time @ 28 V.D.C. (Mili. Sec.) (Nom.)	Inertia x 10^{-6} (In. Lb. Sec.^{2}) (Calc.)		Weight (Nom.) Oz.	Watts @ 24 V.D.C. (Nom.)
	Clutch	Shaft & Flange	Shaft	Flange			Shaft	Flange		
5	6	.05	.05	.05		4	.22	.5	.9	2.5
8	25	.10	.05	.05		8	1.0	2.5	2.4	3.0
11	60	.20	.10	.10		10	4.5	10.0	5.5	3.5
14	110	.40	.20	.20		22	10.0	15.0	8.5	4.0
18	240	.40	.20	.20		40	40.0	45.0	16.5	4.5

FRAME SIZE	A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U
+ −	.000 .005	.0000 .0005	.005 .005	.0000 .0005	.005 .005	.0000 .0005	.005 .005	Ref.	.015 .015	Ref.	Min.	.003 .000	.005 .005	.005 .005	.002 .002	.005 .005	.020 .020	Ref.	No.
5	.594	.5000	.450	.2190	.530	.0935	.344	.118	.882	.235	.060	.047	.125	.060	.056	.079	.300	37°	0-80
8	.827	.7500	.740	.3750	.750	.1248	.625	.197	1.240	.368	.078	.060	.170	.100	.061	.120	.300	30°	2-56
11	1.090	1.0000	.934	.5000	1.000	.1248	.750	.179	1.485	.431	.078	.060	.177	.100	.064	.177	.375	30°	2-56
14	1.370	1.2500	.934	.5000	1.250	.1873	.750	.161	1.620	.255	.078	.060	.203	.125	.064	.177	.375	30°	2-56
18	1.740	1.5620	1.200	.6250	1.562	.2498	1.000	.132	1.930	.300	.078	.092	.237	.132	.090	.177	.500	30°	2-56

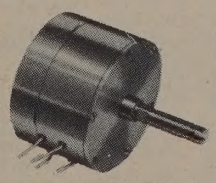
ENERGED — Output Shaft Coupled to Input Flange.
DE-ENERGIZED — Output Shaft and Input Flange Free to Rotate.

SPECIAL ENGINEERED UNITS



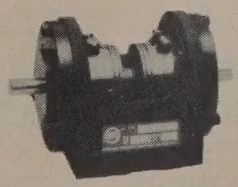
TOOTH TYPE CLUTCH

Special design to meet military reliability for airborne electronics. Specifications include operation in an explosive vapor, temperature, altitude, vibration, salt spray and humidity environments.



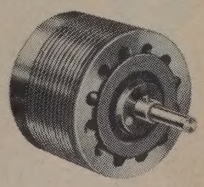
DUPLEX BRAKE

Compact Brake for use in a missile tape drive system. Hysteresis and friction brake with separate coils for excitation applied to a common shaft.



APILON®-FACED CLUTCH BRAKE PACK

Precision pre-aligned clutch/brake package eliminates installation problems. Ball bearing supported shafts permit direct coupling or belt drives. Packs available to house above Commercial Models 10, 20 and 40.



HYSTERESIS CLUTCHES / BRAKES

A continuous slip device capable of providing precise, infinitely adjustable torque control. Units are basically direct current sensitive . . . having excellent reliability, repeatability and linearity.

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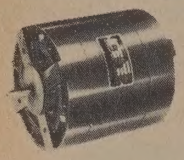
MOTORS • FANS • BLOWERS

AEP MOTORS

Units shown cover a wide application range. Co facilities are available for precisely-engineered ard and custom-designed models, for critical and commercial applications. Quality controll utmost efficiency, reliability and longer life.

MOTORS



HYSTERESIS SYNCHRONOUS MOTORS — Widely used in the tape recorder and turntable industries. Single, dual or three speed models. Made to your exacting torque and speed specifications. Modifications available to suit any physical requirement. Frame diameters 1 1/16", 1 3/4", 2", 3 5/16", 3 7/8", 4 3/8" and 5 3/8".

Model No.	RPM	Amps	Volts	Freq	Phase	Cap	Rated	Torque Oz. In. P.I.	P.O.	ST	Length (In.)	Diam. (In.)
A52AZU-1	600	.12	115	60	1	2.0	.75	.92	1.08	.64	3	2
A52BBADU-1	900/1800	.21	115	60	1	3.0	.68	.88/.96	.96/1.04	.72/.72	3	2
A54PBLDU-1	6000/12000	1.3	115	400	1	1.0	2.0	2.7/2.9	2.8/3.2	3.6/3.3	3-1/2	2
A74LAP-1	3600	.30	105	60	1	2.5	3.0	4.1	6.5	3.4	4-1/8	3-5/16
C78UBU-1	12000	3.3	115	400	1	2.0	5.6	7.6	11.5	14.0	5-5/8	3-5/16
A72LAEDP-1	900/3600	.40	115	60	1	4.0	3.5	5.2/4.9	6.5/6.5	4.7/3.8	3-3/4	3-5/16
A72DCBZU-1	600/1200	.25	115	60	1	5.0	2.0	3.2/4.6	4.0/5.7	1.5/2.2	3-3/4	3-5/16
A73KBMAU-1	1800/3600	1.0	115	50/60	1	5.0	8.5	12/11	18/12	14/11	4-1/4	3-5/16
C76LAHBEDU-1	900/1800/3600	.70	108	60	1	5.0	4.0	7/8/6	8/11/8	5/5/4	5-1/8	3-5/16
D84GZU-3	600	.60	115	60	1	5.0	8.4	9.0	10.0	6.2	4-61/64	3-7/8
D86KDU-2	900	.50	115	60	1	6.0	11	11.5	13.0	11.5	5-29/64	3-7/8
A88LDU-1	900	1.0	115	60	1	4.0	15	17.5	19.0	23.0	5-61/64	3-7/8
A80HCU-1	1200	.40	115	60	1	2.0	4.0	5.0	5.5	8.0	3-61/64	3-7/8
D80KBU-7	1800	.45	115	60	1	2.0	5.6	6.0	6.5	8.0	3-61/64	3-7/8
D84QBU-3	1800	1.0	115	60	1	4.0	18.5	20	21	27	4-61/64	3-7/8
A86RBU-4	1800	.60	230	60	1	5.0	27.7	28.5	33	44	5-29/64	3-7/8
A80HAU-1	3600	.30	115	60	1	5.0	1.8	2.5	3.0	5.0	3-61/64	3-7/8
A88UAU-3	3600	1.7	115	60	1	7.0	28.0	30.5	32.5	30.0	5-61/64	3-7/8
D84HCEZU-11	600/1200	.40	115	60	1	5.0	5.5	6/9	7/10	4/6	4-61/64	3-7/8
A88KCGZU-1	600/1200	.60	115	60	1	4.0	11.0	12/17	13/19	8/9	5-61/64	3-7/8
A86KBFZU-1	600/1800	.40	115	60	2	–	7.5	11/11	18/11	13/11	5-29/64	3-7/8
A84FBDDR-1	900/1800	.35	115	60	1	6.0	4.0	6.0/6.2	7.0/9.0	6/5	4-61/64	3-7/8
D86MBKDU-1	900/1800	.70	115	60	1	6.0	11.1	12/12	12/13	14/12	5-29/64	3-7/8
A86NBLCU-1	1200/1800	.70	115	60	1	6.0	14.0	17/15	18/17	18/17	5-29/64	3-7/8
A84KAGBDDU-1	900/1800/3600	.60	115	60	1	6.0	3.0	5/8/6	5/10/7	6/5/4	4-61/64	3-7/8
A116KZU-1	600	.50	115	60	2	–	14.0	18.5	21	35	5-5/16	4-3/8
A114LDU-1	900	.90	115	60	1	6.0	15	23	27	26	4-13/16	4-3/8
A112SCU-1	1200	2.5	115	60	1	7.0	55	61	66	65	6-13/16	4-3/8
A116UWU-1	12000	5.0	208	400	3	–	8.3	11.0	13.2	138.0	5-5/8	4-3/8
A110PBNZU-1	600/1800	2.0	115	60	1	8.0	45/20	50/28	54/32	55/22	6-13/16	4-3/8
C116KCHDGZU-1	600/900/1200	.60	115	60	1	5.0	8.3	12/13/16	14/17/25	10/10/11	5-5/16	4-3/8
A118QAMBKDU-1	900/1800/3600	2.0	105	60	1	6.0	11.0	17/12/15	20/14/16	17/11/9	5-13/16	4-3/8
A98GZKZU-1	300/600	.60	115	60	2	–	14.0	20/21	24/24	12/28	5-61/64	5-3/8
A912YAWBU-1	1800/3600	7.0	115	60	1	25.0	150/80	180/92	192/96	232/116	6-61/64	5-3/8
A90CZEDHBU-2	450/900/1800	1.0	115	60	1	10.0	8.0	10/11/9	10/14/10	9/9/8	3-61/64	5-3/8

GEAR MOTORS — Available to special order for precision applications in all frame sizes.

ROTOR & STATOR ASSEMBLIES — In all frame sizes for memory drum, video-head, special pump and similar applications.

INDUCTION MOTORS — Self-cooled or totally enclosed. Suitable for a wide variety of applications. Frame diameters from 1 1/16" to 5 3/8".

Model No.	Nom RPM	Volts	Freq	Phase	Amps	Cap	Torque Oz. In. Rated	S.T.	HP	Length (In.)
A405EJM-3	3200	115	60	1	.12	1.0	.1	.1	1/3000	1-7/8
C50EJU-1	3450	115	60	1	.30	3.0	1.0	2.5	1/300	2-1/2
A52RWR-1	10000	115	400	3	.45	–	5.0	7.0	1/20	3
A74NJM-3	3350	115	60	1	.40	4.0	12	4	1/25	4-1/8
A88TKU-1	1725	115	60	1	1.7	5.0	60	35	1/10	5-61/64
A114NMU-1	860	115	60	1	.80	6.0	30	30	1/40	4-13/16
A118VKU-1	1725	115	60	1	2.1	4.0	96	23	1/5	5-13/16
A118XWM-1	1700	208	60	3	1.1	–	150	350	1/4	5-13/16
A116ZXM-1	3400	440	60	3	1.2	–	150	–	1/2	5-5/16
A92VLU-1	1125	115	60	1	1.5	7.5	90	80	1/10	4-29/64
C94ZXR-1	3400	115	60	3	4.8	–	150	480	1/2	5-35/64

TORQUE MOTORS — Used in Tape Recorder, Servo and positioning applications. Will not overheat in continuous duty. Exceptionally low external flux field. Frame diameters from 1 1/16" to 5 3/8" to meet exact speed/torque specifications.

Model No.	No Load RPM	Volts	Freq	Phase	Amps	Cap	Stall Torque Oz. In.	Poles	Diameter (In.)
A44GKM-1	1715	115	60	1	.11	1.0	4.0	4	1-3/4
A70KKP-1	1715	115	60	1	.21	4.0	16	4	3-5/16
A72QKP-2	1720	115	60	1	1.1	6.0	60	4	3-5/16
A74NKP-10	1720	115	60	1	1.0	4.0	40	4	3-5/16
C78PKP-1	1720	115	60	1	1.3	12.0	70	4	3-5/16
A114GZU-1	850	208	60	3	.4	-	48	8	4-3/8
A118KMP-1	850	115	60	1	2.3	10.0	160	8	4-3/8
A110SMP-1	850	115	60	1	3.6	15.0	240	8	4-3/8
A118RLU-1	1125	115	60	1	1.7	15.0	140	6	4-3/8
A96SLP-1	1125	115	60	1	4.6	25.0	300	6	5-3/8
A96RMP-1	835	115	60	1	2.5	20.0	225	8	5-3/8

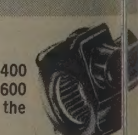
RELUCTANCE SYNCHRONOUS MOTORS — Used in ac simile and timing applications requiring phasing. Carefully des to your requirements. Available for 60 and 400 cycle applica

Model No.	RPM	Volts	Freq	Phase	Amps	Cap	Torque Oz. In. P.I.	P.O.	ST.	HP	Length (In.)
A80KFU-1	1800	115	60	1	0.4	3.0	6.0	8.0	8.0	1/100	3-61/64
A80MFU-9	1800	115	60	1	0.6	4.0	18.6	19.5	14	1/30	3-61/64
A82PFU-1	1800	115	60	1	0.8	6.0	27	28	18	1/20	4-29/64
A88UFU-1	1800	115	60	1	1.9	5.0	57	70	22	1/10	5-61/64
A82QEU-1	3600	115	60	1	1.1	4.0	14	16	10	1/25	4-29/64
A110LHU-1	900	115	60	1	0.7	5.0	15	27	13	1/75	3-13/16

FANS • BLOWERS

AXIAL-FLOW FANS — Can be supplied with or without Venturi rings. Complete unit ready to mount in your equipment for required static pressure conditions. 50, 60, 400 cycle, variable frequency and dual frequency models available.

Model No.	Volt	Freq	Phase	Nom RPM	CFM @ "0" SP	No Del " S.P.	Fan O.D. (In.)	Venturi O.D. (In.)	Mount B.C. (In.)	Overall Length (In.)	Cap	Weight
A4H3Q-1CC	208	60	3	3400	120	.45	4½	5-7/8	5-1/2	3-11/32	–	17 oz.
A4H95Q-1C	115	60	1	3300	100	.6	4	5-11/32	5	4-1/16	1.0	18 oz.
A4K2H-1C	115	320/1000	1	4300	100	–	4	5-11/32	5	3-11/32	.75	18 oz.
A4L2H-1C	115	400	1	6500	140	1.6	4	5-1/2	5	3-13/32	1.0	22 oz.
A5G3Q-1C	115	50/60	1	3300	110	.48	4½	6	3-1/2	2-15/16	1.0	22 oz.
A5K3G-1C	115	400	1	4000	150	.51	4½	6	3-1/2	2-15/16	0.5	22 oz.
A7MBQ-1C	115	50/60	1	3300	325	.65	6½	7	7-3/4	2-7/8	2.0	4 lb.
A7N13P-1C	115	50/60	1	1700	445	.6	8	10	9-11/16	5-5/8	2.0	5¼ lb.
A8V12B-1C	50/214	130/557	3	1800	200/815	.24/2.5	8	10	9-11/16	5-5/8	–	5¼ lb.
A8S11Q-2CC	115	60	1	3300	715	2.6	8	10	9-11/16	6-21/64	4.0	5¼ lb.
A11V98P-1C	115	60	1	1700	1020	.5	11½	14	13-1/2	3-3/4	5.0	7½ lb.



CENTRIFUGAL BLOWERS — For 50, 60, 400 or variable frequency power supplies up to 1600 CPS. Highest pressure to volume ratio, for the most efficient "Hot Spot" cooling.

Model No.	Nom RPM	Volts	Freq	Phase	Full Load Watts	Cap	CFM @ 0" S.P.	Length (In.)	Width (In.)	Height (In.)	Approx. Weight
C4B1P-1C	1700	115	60	1	7	.7	2	2-3/4	2-27/32	2-15/16	11 oz.
C5D2Q-9CC	3600	115	50/60	1	18	2.0	20	4-3/16	5	4-1/8	24 oz.
C5H4Q-1CC	3300	115	60	1	22	1.0	37	4-3/4	3-13/16	4-3/32	28 oz.
C5N3J-1CC	4800	208	400	3	100	–	65	5-3/64	3-13/32	3-13/32	30 oz.
C5N41G-1CC	5400	208	400	3	40	–	50	4-17/32	4-13/32	4-5/8	29 oz.
C7M7Q-6CC	3300	115	60	1	38	4.0	75	5-27/32	5-1/8	5-1/2	4½ lb.
C7P8Q-1CC	3300	115	60	1	38	4.0	120	5-15/16	4-15/16	5-1/2	4½ lb.
C7V3J-1	10200	208	400	3	315	–	212	8	3-7/8	3-11/16	6¾ lb.
C7W60Q-1	3300	115/230	50/60	1	180	2.5	445	13-1/16	6-13/64	6-25/32	10¾ lb.
C8Q6G-4C	4800	115	400	1	110	1.5	117	6-5/16	5-9/64	5-1/2	4 lb.
C8U8Q-2	3300	115	45/65	1	130	4.0	320	10-29/64	6-3/4	6-19/32	12 lb.

PROMPT DELIVERY • WRITE OR CALL FOR COMPLETE CATA

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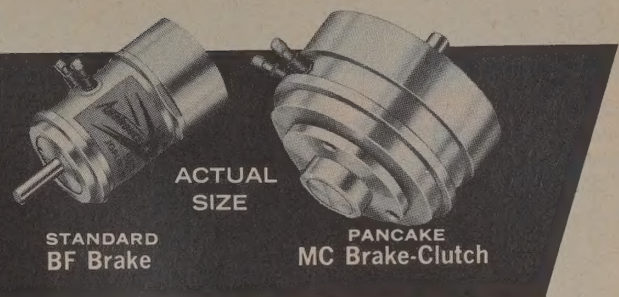
UTOTRONICS

IAURE ELECTRO - MECHANICAL
AKES — CLUTCHES



esentive brakes and clutches are shown in the con- ed dart below. General characteristics of Auto- ks uts are: Zero backlash • No axial displace- n whi energized or de-energized. End play when sured with 5 oz. reversing load: .0015″ maximum o anglar displacement when clutching or braking strument ball bearings Class ABEC 5 or better d throughout precision units • Output shaft on er or both ends • Units meet all applicable specifi- ons Military Environments • Normal operating age, to 28 volts D.C. (Special voltages available to er from 6 through 150 volts D.C.) • Coils insulated for volt R.M.S. • Coils and terminals completely impreg- ed and potted into position • Life measured in millions operations • Input flange tapped for gear or coupling, no mmer problem • Input and output shafts are concentric n serv mounting pilot within .0015″ T.I.R. • Gears can be vided in place of input flange.

= Energized D = De-energized

	Series	Range	Brake Torque Min. @ 24 VDC Oz. In.	Brake Torque Min. @ 0 VDC Oz. In.	Clutch Torque Min. @ 24 VDC Oz. In.	Clutch Torque Min. @ 0 VDC Oz. In.	Coil Resistance ±10% Ohms	Response Time @ 28 VDC MS Nom	Servo Mounting Diameter In.
Brake (D — Output Shaft Free; E — Output Shaft Braked to Housing)	B STANDARD	MIN.	6				246	5	.500
		MAX.	272				144	43	1.562
	B PANCAKE	MIN.	8				275	0.8	.750
		MAX.	200				138	12	1.562
Brake (D — Output Shaft Braked to Housing; E — Output Shaft Free)	BF STANDARD	MIN.		3.5			246	7	.500
		MAX.		120			144	52	1.562
	BF PANCAKE	MIN.		5			275	2	.750
		MAX.		100			138	20	1.562
Clutch (D — Input Gear Flange and Output Free; E — Input Clutched to Output)	C STANDARD	MIN.			6		246	5	.500
		MAX.			256		144	34	1.562
	C PANCAKE	MIN.			6		275	4	.750
		MAX.			180		138	12	1.562
Clutch (D — Input Gear Flange Clutched to Output; E — Input Free, Output Shaft Free)	CF STANDARD	MIN.				3.5	246	7	.500
		MAX.				120	144	52	1.562
	CF PANCAKE	MIN.				5	275	7	.750
		MAX.				100	138	20	1.562
Brake-Clutch (D — Input Gear Flange, Output Braked; E — Input Clutched to Output, Brake Released)	MC STANDARD	MIN.		3.5	4.5		246	2.5	.500
		MAX.		120	152		144	52	1.562
	MC PANCAKE	MIN.		3	5		275	7	.750
		MAX.		80	100		138	20	1.562
Duplex Clutch-Brake (D — Input Gear Flange Free, Output Shaft Free; E — HIGH X — Input Clutched to Output; E — LOW Y — Output Shaft Braked)	MBB STANDARD	MIN.	6		6	3.5	246	2.5	.500
		MAX.	272		256	120	144	43	1.562
	MBB PANCAKE	MIN.	6		6	3	275	0.8	.750
		MAX.	200		180	80	138	12	1.562
Duplex Clutch (— Input Gear Flanges Free, Output Shaft Free; — EITHER COIL — Respective Input Gear Flange Clutched to Output Shaft)	MCC STANDARD	MIN.			6		246	1.5	.500
		MAX.			256		144	34	1.562
	MCC PANCAKE	MIN.			6		275	4	.750
		MAX.			180		138	12	1.562

AUTOTRONICS Inc.

2700 Davis Blvd., Joplin, Mo. 64801 417/781-1812

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FACTORY STOCKED
PM STEPPING MOTORS · CONTROL CIRCUITS · GEAR MOTO

STEPCON® STEPPING MOTORS†

Stepcon® Permanent Magnet Motor—Stepping motors feature: Speeds to 1500 pps, controlled variable speed, immediate reversal, no mechanical detents or brushes, no drift, minimum overshoot, no compensation networks or feedback required, no external damping required. Motors are digital actuators which operate bidirectionally in precise increments of 15°, 30°, 45°, or 90° per pulse. Variation in precise control increments can be achieved by use of available gear heads. Provides accurate shaft rotation without feedback or position pickoff to actuate counters, x-y plotters, potentiometers, transducers, switching mechanisms, and digital to analog and analog to digital converters. Shock-free magnetic detenting between pulses permits smooth no drift operation. Available from stock in frame sizes 8, 11, 13, 15, 17, 20, 23 with a wide variety of torque, inertia, pinion, siz ance specifications with 2ø or permanent magnet rotors. De applicable paragraphs of MIL M-7969, and MIL-E-5400. double shielded and life lu are stainless steel or alumi tion; class H insulation stan rated at 28 V DC. Custom to specification.

STEPPING MOTOR PART NUMBER	Frame Size	Frame Type	Step Angle (Deg.)	Motor Type	TWO HALF PHASE OPERATION* Min. Holding Torque (Oz-In)	Max. No. Load Speed (Steps per Sec) Synch Step	Slew	Typical Motor Power Input @28VDC (Watts)	Required Controller	FULL PHASE OPERATION* Min. Holding Torque (Oz-In)	Max. No Load Speed (Steps Per Sec) Synch Step	Slew	Typical Motor Power Input @28VDC (Watts)	Required Controller	Typical Stator Resistance Per Coil (Ohms)	Max. Rotor Inertia (GM-CM²)	Pinion or Shaft Size	DIMENSIONS (Inches) Diam.	Length	Reg. Diam.
711-8-900-125	8	BW	90	6 Lead, 2ø PM	0.60	100	130	3.5	041,047	0.43	85	110	0.87	045, 062	450	0.70	13T 120P	0.750	1.135	0.5000
713-8-325-125	8	BW	90	6 Lead, 2ø PM	0.60	230	440	9.7	041,047	0.43	210	400	2.4	045, 062	163	0.25	10T 96P	0.750	1.225	0.5000
715-8-320-125	8	BW	90	6 Lead, 2ø PM	0.90	175	225	9.8	041,047	0.50	135	190	2.5	045, 062	160	0.70	10T 96P	0.750	1.135	0.5000
2710-000	11	SC	90	8 Lead, 2ø PM	2.70	230	270	24.1	041,047	3.80	300	350	24.1	045, 062	65	1.36	.125 DIA	1.062	1.880	1.0000
2710-002	11	SC	90	8 Lead, 2ø PM	2.70	230	270	24.1	041,047	3.80	300	350	24.1	045, 062	65	1.36	10T 96P	1.062	1.880	1.0000
2711-000	11	SC	45	8 Lead, 2ø PM	2.40	365	400	19.6	041,047	3.40	430	470	19.6	045, 062	80	1.36	.125 DIA	1.062	1.880	1.0000
2711-002	11	SC	45	8 Lead, 2ø PM	2.40	365	400	19.6	041,047	3.40	430	470	19.6	045, 062	80	1.36	10T 96P	1.062	1.880	1.0000
2716-000	11	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	3.4/3.8	1500/750	1650/850	20.9	071/073	25	1.36	.125 DIA	1.062	1.880	1.0000
2716-002	11	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	3.4/3.8	1500/750	1650/850	20.9	071/073	25	1.36	10T 96P	1.062	1.880	1.0000
729-11-120-125	11	BW	90	6 Lead, 2ø PM	2.00	225	400	26.2	041,047	1.40	190	340	6.6	045, 062	60	1.20	10T 96P	1.062	1.800	1.0000
2702-000	13	SC	90	8 Lead, 2ø PM	7.00	160	200	35.0	041,048	9.00	200	220	35.0	045, 049	45	7.05	.125 DIA	1.250	2.870	1.0000
2702-002	13	SC	90	8 Lead, 2ø PM	7.00	160	200	35.0	041,048	9.00	200	220	35.0	045, 049	45	7.05	10T 96P	1.250	2.870	1.0000
2703-000	13	SC	45	8 Lead, 2ø PM	7.00	275	300	35.0	041,048	9.00	318	350	35.0	045, 049	45	7.05	.125 DIA	1.250	2.870	1.0000
2703-002	13	SC	45	8 Lead, 2ø PM	7.00	275	300	35.0	041,048	9.00	318	350	35.0	045, 049	45	7.05	10T 96P	1.250	2.870	1.0000
2714-000	13	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	8.5/9	1160/580	1300/625	32.7	073/071	16	7.05	.125 DIA	1.250	2.870	1.0000
2714-002	13	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	8.5/9	1160/580	1300/625	32.7	073/071	16	7.05	10T 96P	1.250	2.870	1.0000
749-15-30-125	15	BW	90	6 Lead, 2ø PM	—	—	—	—	—	5.70	170	340	26.2	045, 049	15	5.00	15T 96P	1.437	2.100	0.8745
2704-000	17	SC	90	8 Lead, 2ø PM	12.00	128	150	46.0	041,048	17.00	150	165	46.0	045, 049	34	22.40	.187 DIA	1.687	3.250	1.3750
2704-002	17	SC	90	8 Lead, 2ø PM	12.00	128	150	46.0	041,048	17.00	150	165	46.0	045, 049	34	22.40	15T 96P	1.687	3.250	1.3750
2705-000	17	SC	45	8 Lead, 2ø PM	12.00	220	250	46.0	041,048	17.00	260	280	46.0	045, 049	34	22.40	.187 DIA	1.687	3.250	1.3750
2705-002	17	SC	45	8 Lead, 2ø PM	12.00	220	250	46.0	041,048	17.00	260	280	46.0	045, 049	34	22.40	15T 96P	1.687	3.250	1.3750
2717-000	17	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	21/25	800/420	850/470	49.8	071/073	10.5	22.40	.187 DIA	1.687	3.250	1.3750
2717-002	17	SC	15/30	6 Lead, 3ø PM	—	—	—	—	—	21/25	800/420	850/470	49.8	071/073	10.5	22.40	15T 96P	1.687	3.250	1.3750

*Measured with motor windings at 25°C, and with specified ADC controller at 28 VDC.

NOTES: 1. These data are for reference purposes only and are typical values.

2. The recommended motor case operating temperature range is −55°C to +185°C. The +185° maximum may be exceeded but bearing life will be shortened.

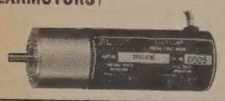
3. With typical mounting, a temperature rise of approx. 65°C above 25°C ambient can be expected. Heat radiators are available to reduce temperature rise.

4. For winding temperatures greater than 25°C, derate torque at 0. and stepping speed at 0.2%/degree C.

5. Inertia load decreases stepping rate. For inertia loads less th rotor inertia, derate no-load speed by the factor $\sqrt{\frac{\text{Rotor Inertia}}{\text{Rotor + Load}}}$

6. Gearheads are available for above motors.

STEPCON® GEARMOTORS†



Gear Motors—The STEPCON® Size 13 and 17 Gearmotors have been designed to provide an economical stepping motor/gearhead package which makes no compromise as regards performance or long life. Over 500 different ratios are available from stock in the range from 3/1 to over 800,000/1. Standard backlash is less than ±45 min. with a 2 in. oz. reversing load. Maximum static load is 150 in. oz., and maximum running load is 75 in. oz. The size 13 STEPCON® Gearhead can be adapted to either size 11 or size 15 motors on special order.

Gear Motor Part Number	Size	Motor Type	Two Half Phase Operation Max. No Load Sync Speed (Steps/Sec)	Required Controller	Full Phase Operation Max. No Load Sync Speed (Steps/Sec)	Required Controller	Step Angle Range (Degrees) FROM – TO	Max. Dimensions Inches Dia.	Lgth.	Reg. Dia.
2702-000-(Ratio)	13	90°, 8 Lead, 2ø, PM	181	065,048	190	066,049	.000102-30	1.250	4.800	1.000
2703-000-(Ratio)	13	45°, 8 Lead, 2ø, PM	261	065,048	302	066,049	.000051-15	1.250	4.800	1.000
2704-000-(Ratio)	17	90°, 8 Lead, 2ø, PM	122	065,048	143	066,049	.000102-30	1.678	5.100	1.375
2705-000-(Ratio)	17	45°, 8 Lead, 2ø, PM	209	065,048	247	066,049	.000051-15	1.678	5.100	1.375
2710-000-(Ratio)	13	90°, 8 Lead, 2ø, PM	219	065,048	285	066,062	.000102-18	1.250	4.025	1.000
2711-000-(Ratio)	13	45°, 8 Lead, 2ø, PM	347	065,048	409	066,062	.000051-9	1.250	4.025	1.000
2714-000-(Ratio)	13	15°/30°, 6 Lead, 3ø, PM	—	—	1102/551	071/073	.000017-10	1.250	4.800	1.000
2716-000-(Ratio)	13	15°/30°, 6 Lead, 3ø, PM	—	—	1425/713	071/073	.000017-6	1.250	4.025	1.000
2717-000-(Ratio)	17	15°/30°, 6 Lead, 3ø, PM	—	—	760/399	071/073	.000017-10	1.678	5.100	1.375

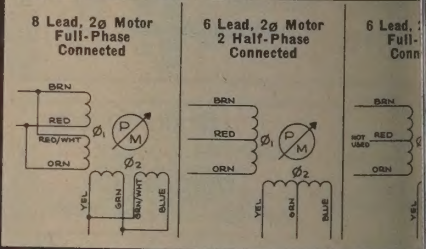
NOTES: 1. Gear ratios available between 3:1 and 886000:1. Specify tolerance allowed on desired ratio, or specify that ratio be exact.

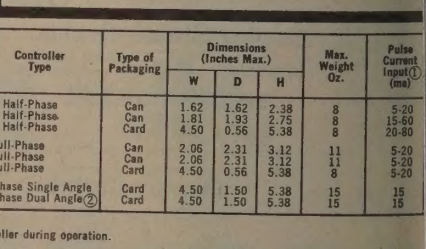
2. Max. Running Torque is 75 in. oz. Max. static torque is 150 in. oz.

3. Max. Shaft Extension is 0.56 in. Max. Shaft diameter is 0.187 in.

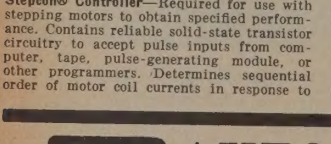
4. These data are for reference purposes only and are typical values.

STEPCON® MOTOR CONNECTIONS





STEPCON® CONTROLLERS†



† Patent 2809335; others issued and pending.

Stepping Motor Controller Part Number	Total Power Output @ 28 VDC (Watts)	Operating Temperature Range (Degrees C)	Controller Type	Type of Packaging	Dimensions (Inches Max.) W	D	H	Max. Weight Oz.	Pulse Current Input(1) (ma)
047-2P/2-120-125	31	−55 to +125	2 Half-Phase	Can	1.62	1.62	2.38	8	5-20
048-2P/2-40-125	92	−55 to +125	2 Half-Phase	Can	1.81	1.93	2.75	8	15-60
065-2P/2-30-65	123	−30 to +65	2 Half-Phase	Card	4.50	0.56	5.38	8	20-80
062-1P-30-125	31	−55 to +125	Full-Phase	Can	2.06	2.31	3.12	11	5-20
049-1P-17-125	55	−55 to +125	Full-Phase	Can	2.06	2.31	3.12	11	5-20
066-1P-17-65	55	−30 to +65	Full-Phase	Card	4.50	0.56	5.38	8	5-20
073-3P-17-65	55	−30 to +65	3 Phase Single Angle	Card	4.50	1.50	5.38	15	15
071-3P-17-65	55	−30 to +65	3 Phase Dual Angle(2)	Card	4.50	1.50	5.38	15	15

1. Nominal value based on 1 μsec rise time.
2. Step angle selection determined by logic level input to controller during operation.

Stepcon® Controller—Required for use with stepping motors to obtain specified performance. Contains reliable solid-state transistor circuitry to accept pulse inputs from computer, tape, pulse-generating module, or other programmers. Determines sequential order of motor coil currents in response to input pulses, and provides magnetic detenting between pulses. Packaged in MIL-T-27A cans or plug-in printed circuit cards designed to meet applicable MIL-E-5272, MIL-E-4158, and MIL-E-5400 requirements. Power Requirements: All units rated at 28 ±5 VDC. Input Pulse Requirements: Amplitude: Positive going transition equal to at least 60% and no more than 100% of the controller supply voltage with a rise time of 1 μsec. or less. Pulse Width: Greater than 15 μsec. Controllers of the two half phase type provide simplified switching circuits and minimum cost. Full phase type controller more efficient motor operation a higher cost. Pulse adaptor circu able to accept most any type of switching function. Controllers from stock, or to customer speci meet a wide variety of applicatio

AUTOMATION DEVELOPMENT COMPA
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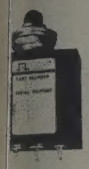
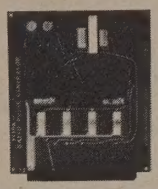
DIGITAL CONTROL EQUIPMENT

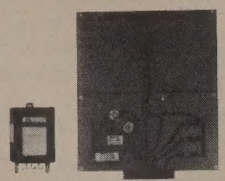
plete line of digital equipment building blocks compatible with ADC motors and controllers, allowing customer formulation of control systems to his unique requirements.



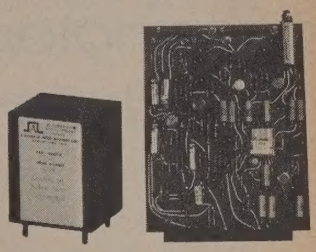
gle Pulse Generator—This exactly one pulse per push n, with characteristics to C controller requirements: pulse equal to unit supply -1.8V with a rise time of a compatable pulse width. C input. Mounts in 5/8″ dia to 3/16″ thick. A companion 7A Switch Adapter supplies hen activated by an external osure. This unit is particu- masking contact-bounce in- witches, snap action switches, or such mechanical switches, false counts.



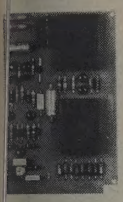
Model 1516A Gated Pulse Generator—This unit converts a single input pulse to a specified number of output pulses delivered at a specified rate. Pulse output characteristics match the ADC controller requirements: Positive going pulse equal to unit supply voltage +0V, —1.8V with a rise time of 1 μsec max and a pulse width of 15 to 75 μsec. Number of pulses out are variable from 0 to 256. Frequency range is variable within each of eleven standard ranges from .08 to 1600 Hz. Input pulse requirements: Amplitude positive going transition between 60% and 100% of the unit supply voltage with a rise time of 1 μsec max and a pulse width greater than 15 μsec. Unit rated at 28 ±5 VDC, 150 ma.



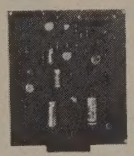
Model 576A and 1502A Pulse Generators—These units supply a string of pulses with output characteristics which match the ADC Controller requirements: Positive going pulse equal to unit supply voltage +0V, —1.8V with a rise time of 1 μsec max and a pulse width of 15 to 75 μsec. Frequency range is variable within each of eleven standard ranges from 0.8 to 1600 Hz. Pulse current output, 60 ma. Provision for controlling pulse rate remotely or inhibiting the pulse output are included. Supply voltage, 28± 5VDC. The 576A is card mounted and has a maximum operating temperature rating of 70°C, while the 1502A is mounted in a hermetically sealed can and has a maximum operating temperature of 125°C.



575A Analog to Pulse Rate Converter—Converts bi-polar analog input voltage to bi-directional pulse rate output which is compatible with ADC's Stepcon® Controllers. By adding a potentiometer to the stepper-motor shaft, a position servo can also be accomplished. The 575A can provide both angular position and step rate servo control, thus also accomplishing a DC motor function.

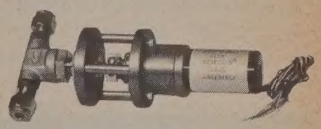


Digit Servo Comparator Series—DC alog voltage corresponding to put shaft position. Using a en potentiometer to supply ge, corresponding to the actual the 555A provides pulses to ontroller to drive the error hull. These pulses, which are nversion of the analog input, used to drive the Stepcon® emote location or used for data



Model 254A Series Power Saver—These units automatically reduce power delivered to a stepping motor during non-stepping periods where full magnetic detent is not essential and minimum total power dissipation is required. Power Savers may be used in conjunction with 048, 049, 062, 065, 066, 071 or 073 Controllers and their power supplies. Input requirements are compatible with ADC pulse generator outputs. The 254A-2 Power Saver delivers full power to the motor during the stepping period and reduces to an adjustable level of 3% to 70% during the non-stepping period. Hold-time, the period between removal of the stepping pulse and reduction to the standby level, is adjustable between 15 and 500 msec. The 254A-2M1 Power Saver is identical except the standby level is zero only.

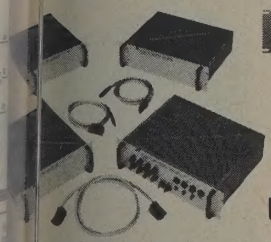
Model 1603A Stepcon® Driven Digital Counter—This unit provides readout on four or five digit wheels bi-directionally (addition or subtraction) at rates of 150 counts/second. Out-performs existing electro-mechanical and relay-operated devices. One pulse into controller advances last digit wheel one digit. Counter has mechanical reset, and each digit wheel can be set by hand to a predetermined number.



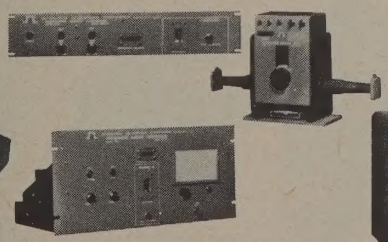
Model 1875A Remote Control Metering Valve—A high quality metering valve, driven by a Stepcon® PM Stepping motor and particularly suited to the precise low flow requirements of analytical instrumentation, chromatography, semiconductor processing or other similar process control, laboratory or industrial applications. Use of precision needle valves assures proportional and precise flow at any setting. Brass or stainless steel valve bodies and interchangeable tube, pipe, and hose fittings available. With suitable ADC modules may be operated by either digital input, analog input, or simple switch closure. Custom units available to specification.

CONTROL SYSTEMS CAPABILITIES

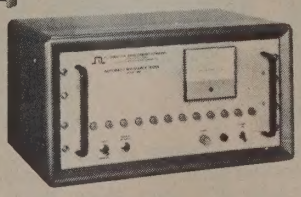
ADC can provide complete on-the-shelf, or custom designed control systems to your requirements.



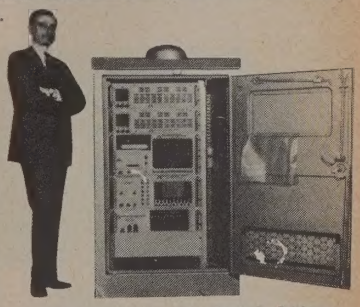
a Digital To Synchro-Analog System—Converter system ac- of 12-bit parallel binary input strobe signals. These parallel its are converted to syncho posi- an overall RMS error of 0.12°. is accomplished by means of ontroller and Motor drives. The 8B Digital to Analog Converter sists of two Model 110A single erters, one Model 110B dual out- onter and a Model 214A Power ck Generator. The 110A Contains ingle synchro digital to analog e., the encoder is driven through path to null and may go through 110B contains a linear 2-speed verter, i.e., the encoder is driven e shortest path to null and may ough zero.



833A Attenuator Remote Control System—Control system is designed to provide accurate, stable attenuation settings from 0 to 50 db when operated in conjunction with the Hewlett-Packard Model X382A Variable "X" Band Microwave Attenuator or equivalent. Digital-type control system provides a more accurate and reliable means of remote setting microwave attenuators without problems of stability and gain inherent in conventional servo systems. The Attenuator can be easily and accurately tuned or set at the Attenuator itself, or from the Master Controller, or from any Remote Controller Station. The Attenuator can be set to provide the desired attenuation in repetitive control increments of 0.5° (Average attenuation increment of 0.03 db) over the full range of 0 to 50 db. Power Required: 115V Single Phase, 100 Watt, 60 cps, AC.



Model 334A Automatic Resistance Tester—This equipment is representative of ADC's ability to custom design and produce automated test equipment for industry. It will test flash-cube lamps, twelve at a time, checking within specified limits at low resistance level without firing the lamps. If a lamp is out of limit, an appropriate indication is made and the automated test sequencing is halted until the lamp is rejected or an override is initiated. The entire cycle is completed in less than 2 seconds for all twelve lamps.



Traffic Analysis and Control Systems—Utilizing the latest in solid state circuitry, these systems offer improved factors of size, efficiency, accuracy and dependability to traffic engineering and maintenance personnel. Traffic Analyzers can be provided to offer continuously visible indications of vehicle count into and out of a test lane as well as differential count and vehicle-second occupancy accumulation. Automatic print-out is also available. Control Systems, designed to the specific application, can include electronic dial units, tone actuated encoders, master synchronizers, multiple background program cycles, and complex program timing and switching, all compatible with manual, preset, direct line, radio link and computer actuations.

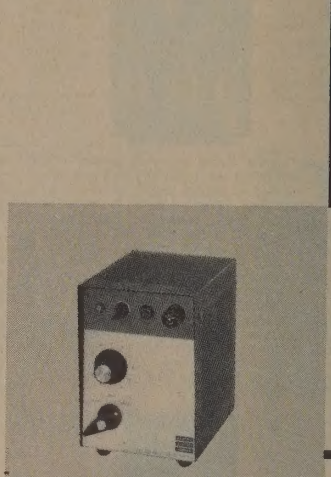
AUTOMATION DEVELOPMENT COMPANY
A DIVISION OF AMERICAN DIGITAL CORPORATION
9905 W. JEFFERSON BLVD. • CULVER CITY, CALIF. 90230 • (213) 838-7346

Bodine offers a complete line of fractional hp motors, gearmotors and speed controls

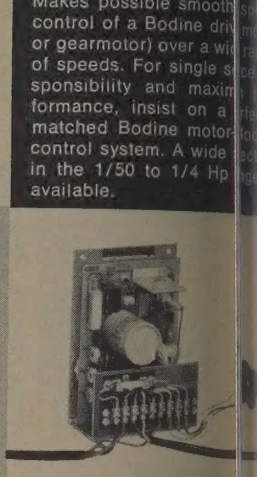
SPEED CONTROLS for Adjustable Speed Drive

A Bodine SCR-type sp trol (chassis or encas verts 50/60 Hz A-c pure D-c for shunt-woun Makes possible smooth control of a Bodine driv or gearmotor) over a wi of speeds. For single s sponsibility and maxim formance, insist on a matched Bodine motor control system. A wide in the 1/50 to 1/4 Hp available.

The Bodine line, within its horsepower range, is unusually complete. There are over 3500 standard motors and gearmotors, with horsepower ranging from 1/2000 to 1/4. Bodine also builds custom and special motors to your design requirements. Our engineers will be happy to help you pinpoint the right one for your specific application need.



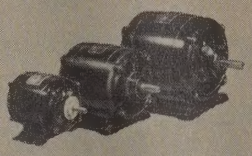
Encased Controls: Nine models are stocked. Some with extended speed range and/or torque control.



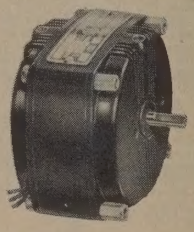
Chassis Control Kits models stocked. Un adaptability. Install in y enclosure.

FHP MOTORS & GEARMOTORS:

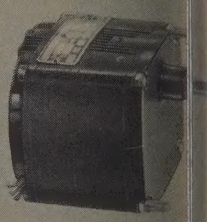
Since 1905 Bodine has manufactured fractional horsepower motors and gearmotors. Close tolerance machining and careful attention to even the smallest detail of construction enables Bodine not only to produce better motors, but to produce them at a lower cost to customers in terms of value received. STOCK Bodine motors and gearmotors are available in all types and sizes within a range of 1/2000 to 1/4 Hp; torques from 0.3 Oz-in. to well over 200 Lb-in.



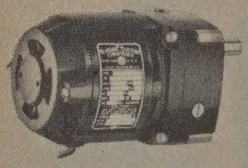
Type N Motors: Three basic sizes; 3.36", 4.50" and 5.68" in diameter. Stock ratings from 1/125 to 1/4 Hp. Almost any type of winding.



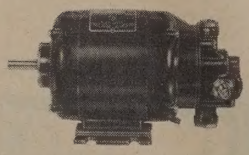
Type K Motors: Permanent-split capacitor instrument motors. Normal slip, high slip and synchronous windings. Stock ratings to 2.4 Oz-in. Only 2.405" square.



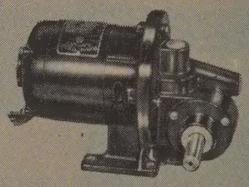
Type K Gearmotors: nent-split capacitor in gearmotors. Parallel sh cal gears. Stock ratings Oz-in. at 300-0.9 Rpm 2.405" square.



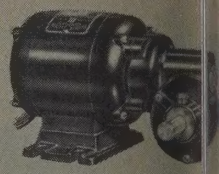
N-1D Gearmotors: Parallel shaft helical and spur gearing. Ratings to 25 Lb-in. Ratios to 900:1. Only 3.41" square.



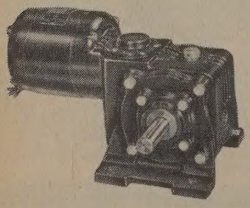
N-1R . . . single or double reduction worm gearmotors. Stock ratings to 5 Lb-in. range. Many ratios.



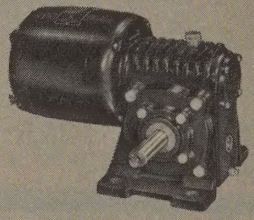
N-1RG . . . double reduction worm gearmotors. Stock ratings to 40 Lb-in. range. Many ratios.



Single reduction, right worm gearmotors. 5 fram with stock ratings to 70 range. Ratios to 60:1.



N-3RJ . . . double reduction right angle worm gearmotors for transmitting high torques at low speeds. Stock ratings over 200 Lb-in.



N-5RH . . . single reduction right angle worm gearmotors. Heavy duty reducer for continuous driving of heavy loads. Ample reserve for overloads. Stock ratings over 200 Lb-in.

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BODINE

fractional/horsepower

MOTORS/SPEED CONTROL

. . . the power behind the leading pro

See YELLOW SECTION for Local Offices, Phones

ecision Rotating Components

VO MOTORS

has long been a leader in the manufacture cision servo motors and motor tachometers fers a complete line of sizes and types, both nd without gear heads. Machine winding her advanced production techniques along arge volume manufacture assure the most mical price available. At the same time, rigid lity testing and quality assurance programs p through years of experience guarantee the quality and dependability.

CHROS

r synchros are of uniformly high quality and ility. The quality is a result of advanced n concepts, modern manufacturing techniques aterials and meticulous care in assembly and g. Cedar Synchros are tested per MIL-S-3C and ARP-461B-SAE and are available in iety of windings and shaft configurations.

RVO PACKAGES

r servo packages have been successfully used ading missles and aircraft, ranging from the A7A autopilot synchronizer to the Polaris A3 sum-to-analog converter. Other Cedar pack- include integrators, in-line servos, geared as- lies and custom units.

PPER MOTORS

use their output is in discrete increments, r stepper motors have many advantages over ntional motors for precise positioning appli- ns. They are bi-directional and have high ue output. They can be run at high stepping s or as slow as you wish. Because shaft rotation is incremental, damping is not required. Cedar Stepper Motors are available in both permanent magnet and variable reluctance types, and with a wide variety of stepping angles. All meet the full requirements of MIL-E-5272.

DC LOW INERTIA MOTORS

Cedar proprietary manufacturing techniques produce DC low inertia motors that match or exceed printed circuit motor performance, at lower cost. The motors are designed to power computer peripheral equipment, control systems, business machines or any application requiring fast acceleration and deceleration.

SUBMINIATURE RATE GYROS

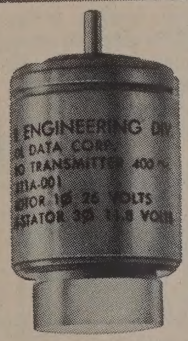
Cedar's high performance rate gyros have been designed for stability augmentation systems, autopilot damping, radar antenna stabilization and fire control applications. Two and three axes rate gyro packages can also be provided to include demodulators, amplifiers, phase splitting capacitors, chokes, etc., as required.

AC MOTORS • MOTOR TACHS • MOTOR GEARHEADS • RESOLVERS • STEPPER DRIVE CIRCUITS • ROTARY SOLENOIDS • DC TORQUERS • DIGITAL INDICATORS • DC HI PERFORMANCE MOTORS • ACCELEROMETERS • LVDT's • SYNCHRONOUS HYSTERESIS MOTORS

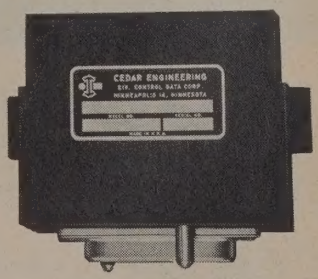
CEDAR DIVISION | **CONTROL DATA CORPORATION**

5806 West 36th St. • Minneapolis, Minn. 55416 • Phone: (612) 929-1681

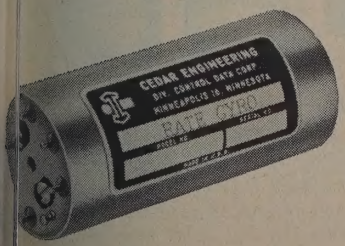
SERVO MOTORS



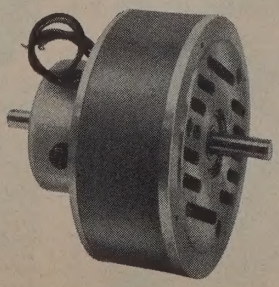
SYNCHROS



SERVO PACKAGES



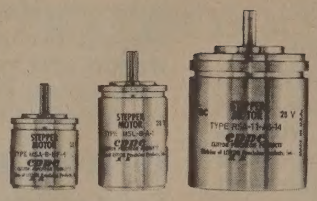
UBMINIATURE RATE GYROS



DC LOW INERTIA MOTORS

STEPPER MOTORS

BUY CLIFTON QUALITY IN SERVO MOTORS

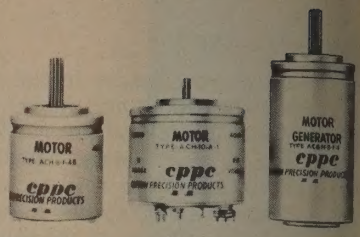


STEPPER MOTORS

Clifton offers a wide variety of permanent magnet or variable reluctance type stepper motors in sizes 8 through 15.

We also design and manufacture the logic and pulse source modules which control our stepper motors.

Stepper motors are extremely useful where signals are presented as pulse trains rather than analog voltages.

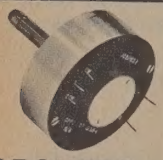


AC MOTORS, GENERATOS AND TACHOMETERS

Clifton offers a wide variety of AC motors in size 15. Our motors exhibit a very high degree of effi higher torque to inertia ratios and lower and mo starting voltages. All motors are high temperatur

Because of higher torque/inertia ratios, our and tachs are smaller and lighter.

Clifton also offers temperature compensated tachs and high signal to noise integrating type heads available on motors and tachometers.

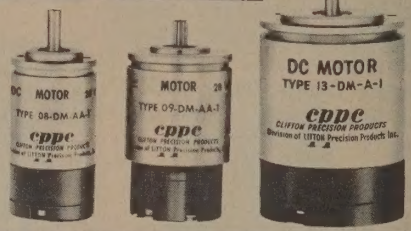


TORQUERS

Clifton can custom design torque motors to your special need. Our deep experience in the flat, "hollow shaft" configuration qualifies us uniquely in this field. A Clifton torque motor actuates the fins on Redeye, the Army ground to air missile.

1" CUBE DC MOTOR

Save space and weight with this 1" cube DC Motor which delivers the torque of units twice its size. Peak torque is 7.5 oz-in and torque sensitivity 5.3 oz-in/amp.



DC MOTOR

Clifton offers many differen cluding a new line of low co 9, and 13.

Units are available which ac 28, 20 or 14 volt inputs; governor which maintains speed within ±1%. Gearhe able for our DC motors. DC ta also available.

AND SYNCHROS

BRUSHLESS SYNCHROS

For synchro applications where conventional commutation—slip rings and brushes—is either undesirable or unwanted, Clifton had developed several varieties of brushless synchros, for both full and limited rotation.

ELECTROMAGNETIC TYPE. In the electromagnetic brushless synchro, energy is transferred from the rotor by means of a circular transformer mounted at the rear of the unit. There are no physical connections to the rotor; hence, the life of the unit is solely limited by the life of the bearings.

HAIRSPRING TYPE. Limited rotation units are made with spirally wound conductors used to pick off information from the rotor. These hairspring conductors allow a rotation of as much as ±165° from the electrical zero position. The advantage is that any standard synchro can be manufactured in a hairspri with no change in electrical parameters.

To discuss the use of either type of unit in your application, contact your lo Sales Office.

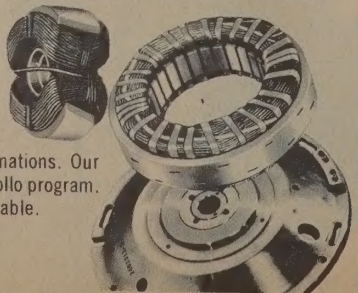
CLIFTON
DIVISION OF LITTON INDUSTRIES
General Sales Office: 5050 State Rd., Drexel Hill, Pa.
215 622-1000 TWX: 510 669-8217

SEE SECTION 4900, page 1987 for a description of our wide line of Flight Instrumentation & Control Sub-Assemblies, Electronic Modules, Digital Indicators and A/D, D/A Converters.

GYRO PICKOFF SYNCHROS AND RESOLVERS

Gyro pick-offs generally require individual mounting configurations and electrical parameters. Clifton can custom design them for your particular needs. Beryllium, aluminum or stainless steel housings. A wide selection of bores, stack heights, widths and diameters are available from existing laminations. Our gyro pick-offs are used extensively in the Apollo program.

Custom designed torque motors also available.

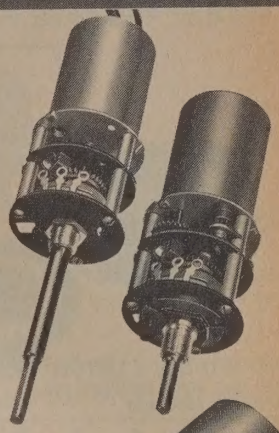


SYNCHROS

Clifton synchros offer high accuracy (7′ max. error is typi nulls, low phase shifts, corrosion resistant construction, steel or aluminum housings. Double ended shafts, BuWeps ultra high temperature resistant types (450°F) are availabl manufactures an extremely wide variety of transmitters, r control transformers, differentials, resolvers, precision c resolvers. linear transformers, as well as a complete line and motor rate tachometers.

DALE® for Optimum Value in Electromechanical Products

VERSIBLE AC MOTOR DRIVEN POTENTIOMETERS



FOR USE IN ■ Home Entertainment Appliances ■ Instrumentation ■ Controls

FEATURES

■ Available with all standard potentiometer. Single, ganged or with power switch-dimensions change accordingly.

■ Magnetic clutch eliminates coasting and allows manual control independent of gearmotor inertial load.

■ Long life expectancy ■ No lubrication in normal use ■ Operates in any position ■ Special terminal configurations available

SPECIFICATIONS

Operating Voltage: 6, 12, 24, 117 V.A.C., or any specified

Power Input: 7.5 Volt Amperes

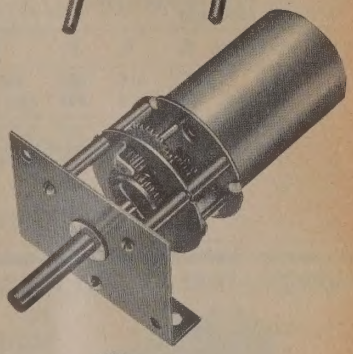
Output: Approximately 5.6 R.P.M.

Torque at Potentiometer Shaft: 10 in./oz. minimum (with decoupler); 21 in./oz. minimum (without decoupler).

Reversing: Accomplished by switching capacitor as shown in hysteresis motor circuit diagram below.

Dimensions: Length: 3.275" (not including shaft) Diameter: 1.531

VERSIBLE AC GEARHEAD MOTORS



FOR USE WITH ■ Switches ■ Potentiometers ■ Projectors ■ Turret Drives ■ Room Drives ■ Chart Drives ■ Turntable Drives ■ Business Machines ■ Displays ■ Light industrial and consumer product controls

SPECIFICATIONS

MECHANICAL

Overall Dimensions: Length: 3.275" (not including shaft) Diameter: 1.320"

Shipping Weight: .32 lbs.

Will meet normal industrial environmental requirements.

Mounting: Horizontal standard, vertical optional; bracket provided for chassis mounting and mounting control.

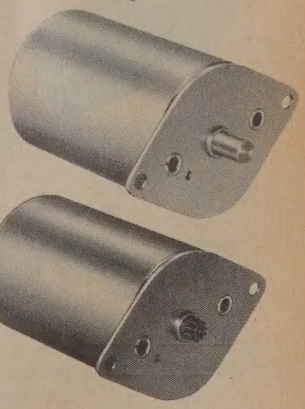
Output Torque: 14 in./oz. at 5.3 and 1.8 R.P.M.

ELECTRICAL

Operating Voltage: 117 volts AC, 60 cycles standard. Available from 6 to 220 volts AC, 60 cycles. D.C. versions available.

Capacitor size: Dependent on input voltage. (Capacitor not part of motor.)

VERSIBLE AC HYSTERESIS SYNCHRONOUS MOTORS



FOR USE IN ■ Low Power Driving Mechanisms ■ Control Circuits ■ Timers ■ Fans ■ Entertainment Appliances ■ Scanning Devices ■ Stirring Devices ■ Cassette Drives

FEATURES

■ Output shaft configuration can be specified. Standard units provided with gear.

■ Mounting arrangement can be varied to meet customer requirements.

■ Self-lubricating bearings.

■ Aluminum housing.

■ Long life expectancy.

■ Reversing accomplished by switching external capacitor as shown in circuit diagram.

SPECIFICATIONS

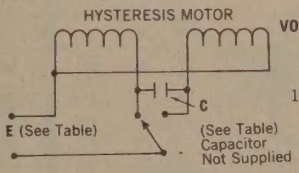
Operating Voltage: 6, 12, 117 V.A.C., or any specified.

Power Input: 7.5 Volt Amperes

Output: Approximately 1800 R.P.M.

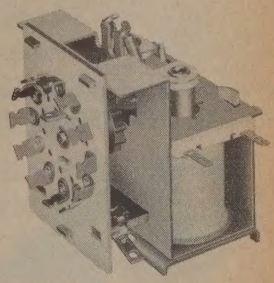
Torque: 0.1 in./oz. min. — no load

CIRCUIT DIAGRAM



E VOLTAGE	C CAPACITANCE	C VOLTAGE
6	170 MFD	20
12	50 MFD	25
24	16 MFD	50
117	.68 MFD	300

DC STEPPING RELAYS



FOR USE IN ■ Control Circuits ■ Television Controls ■ Hi-Fi, Stereo & Radio ■ Appliances ■ Telephone Devices ■ Coin Machines ■ Car Washes ■ Crystal Switching ■ Copy Machines ■ Medical Electronics ■ Computers ■ Coin-operated Laundry Equipment ■ Programmers

FOUR TYPES AVAILABLE ■ Uni-Directional A.C. & D.C. ■ Bi-Directional A.C. and D.C.

SPECIFICATIONS

ELECTRICAL

Operating Voltage: 6 V, 12 V, 24 V, 117 V (AC or DC)

Power Required: 2.5 watts with Plate Sequence Switch (Fig. A); 4.5 watts with Wafer Sequence Switch (Fig. B).

Contact Arrangement: Single Pole 4, 6, 10, 12 or 13 throw sequence. Auxiliary power switch operates at predetermined position of sequence.

Contact Rating: From Dry Circuit to 1 amp at 24 V.A.C. on Sequence Switch. Optional power switch 5 amps at 117 V.A.C.

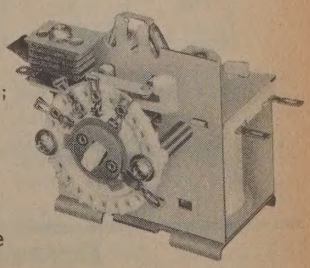
MECHANICAL

Overall Dimensions: Height: 2.200" Width: 2.190" Depth: 2.005"

Shipping Weight: 0.27 lbs. Uni-Directional; 0.40 lbs. Bi-Directional

Will meet normal commercial environmental requirements. Standard auxiliary power switch may be omitted.

Mounting: Vertical or horizontal using one screw and two locating tabs.



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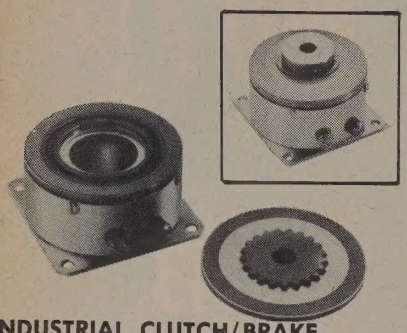
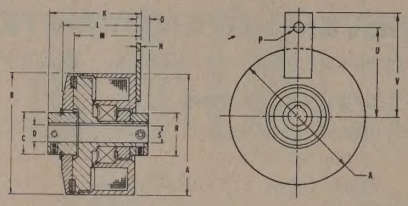
100-MILLION-CYCLE APILON®-FACED CLUTCH AND BR

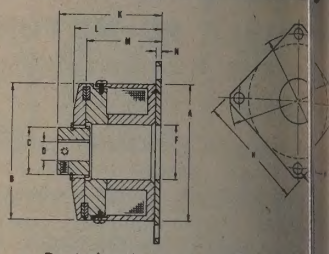
Longer Life • Cleaner Operation with Apilon® (Ceramic Type) Friction Fa



INDUSTRIAL CLUTCH/BRAKE
AVAILABLE WITH ANTIBACKLASH ARMATURE ASSEMBLY.



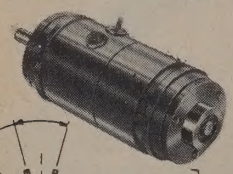
- Typical life of wear surfaces at least ten (10) times conventional material.
- Life expectancy approximately 120 million cycles (based on work performed per cycle of 144 in. oz. for Size 20 and 288 in. oz. for size 40).



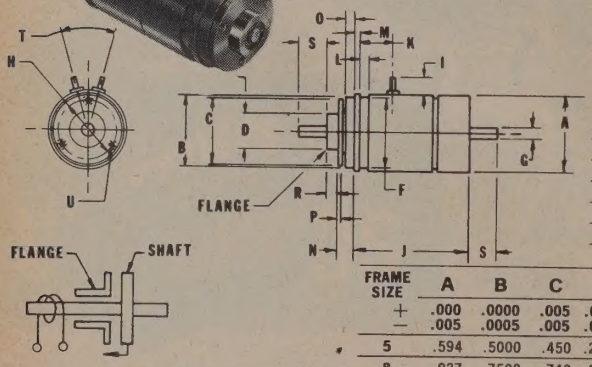
- Dust due to wear products sub reduced.
- Physically and electrically inte able with most conventional un
- Engineering available to estab expectancy for specific applicat

Model Torque Watts			A	B	C	D	F	G	H	I	J	K	L	M	N	P	Q	R	S	U
±	Lb. In.	D.C.	.015 .015	.015 .015	.002 .002	Std. with Std. Keyway	.001 .000	.001 .001	.005 .005	.010 .010	.015 .015	.015 .015	.015 .015	.015 .015	.015 .015	.010 .010	.015 .015	.015 .015	Max. with Max. Keyway	.01 .01
10	3	4	1⅛	1⅛	⅝	3/16 x 1/16 x 1/32	.437	1.499	1.312	⅛	1⅛	1	.718	.625	1/16	—	—	—	—	-
20	18	6	1 13/16	1 13/16	⅝	⅜ x 3/32 x 3/64	.750	2.436	2.125	3/16	1 13/16	1⅜	1.156	1.000	1/16	⅛	3/16	⅝	¼ x 1/16 x 1/32	13
30	35	8	2⅛	2⅛	⅝	⅜ x 3/32 x 3/64	1.000	2.874	2.500	3/16	2⅛	1 21/32	1.250	1.062	1/16	⅛	¼	¾	⅜ x 1/16 x 1/32	13
40	60	10	2⅝	2⅝	1 3/16	½ x 3/16 x 3/32	1.061	3.499	3.125	3/16	2⅝	1 25/32	1.437	1.250	1/16	⅛	¼	1	⅜ x ⅛ x 1/16	15

SUBMINIATURE CLUTCH & BRAKE



SC-MAGNETIC CLUTCH



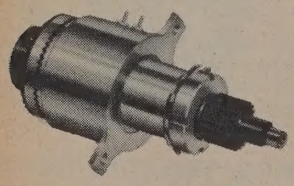
ENERGIZED — Output Shaft Coupled to Input Flange.
DE-ENERGIZED — Output Shaft and Input Flange Free to Rotate.

Typical Specifications for ultra precision clutch and brake units, excellence in design, materials, workmanship and reliability. A contain precision ball bearings fully protected from moisture and nation by special seals. Units meet government specifications for mental tests. Infinite variations of design and mountings are a

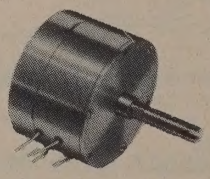
FRAME SIZE	Torque @ 24 V.D.C. Oz. In. Min.	Drag Torque (Oz. In.) Max.			Response Time @ 28 V.D.C. (Mili. Sec.) (Nom.)	Inertia x 10^{-6} (In. Lb. Sec.^{2}) (Calc.)		Weight (Nom.) Oz.
		Ener.	De-Ener.					
	Clutch	Shaft & Flange	Shaft	Flange		Shaft	Flange	
5	6	.10	.10	.10	4	.22	.5	.9
8	25	.15	.10	.10	8	1.0	2.5	2.4
11	60	.25	.15	.15	10	4.5	10.0	5.5
14	110	.40	.20	.20	22	10.0	15.0	8.5
18	240	.40	.25	.25	40	40.0	45.0	16.5

FRAME SIZE	A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	R	S
+	.000	.0000	.005	.0000	.005	.0000	.005	Ref.	.015	Ref.	Min.	.003	.005	.005	.002	.005	.020
−	.005	.0005	.005	.0005	.005	.0005	.005		.015			.000	.005	.005	.002	.005	.020
5	.594	.5000	.450	.2190	.530	.0935	.344	.200	.882	.235	.060	.047	.125	.060	.056	.079	.300
8	.827	.7500	.740	.3750	.750	.1248	.625	.200	1.240	.368	.078	.060	.170	.100	.061	.120	.300
11	1.090	1.0000	.934	.5000	1.000	.1248	.750	.200	1.485	.431	.078	.060	.177	.100	.064	.177	.375
14	1.370	1.2500	.934	.5000	1.250	.1873	.750	.200	1.620	.431	.078	.060	.203	.125	.064	.177	.375
18	1.740	1.5620	1.200	.6250	1.562	.2498	1.000	.200	1.930	.431	.078	.092	.237	.132	.090	.177	.500

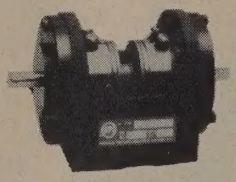
SPECIAL ENGINEERED UNITS



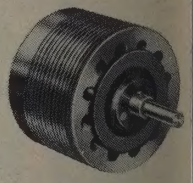
TOOTH TYPE CLUTCH
Special design to meet military reliability for airborne electronics. Specifications include operation in an explosive vapor, temperature, altitude, vibration, salt spray and humidity environments.



DUPLEX BRAKE
Compact Brake for use in a missile tape drive system. Hysteresis and friction brake with separate coils for excitation applied to a common shaft.



APILON®-FACED CLUTCH BRAKE PACK
Precision pre-aligned clutch/brake package eliminates installation problems. Ball bearing supported shafts permit direct coupling or belt drives. Packs available to house above Commercial Models 10, 20 and 40.



HYSTERESIS CLUTCHES / BR
A continuous slip device cap of providing precise, infin adjustable torque control. are basically direct current sitive . . . having excellent liability, repeatability linearity.

Delevan Division
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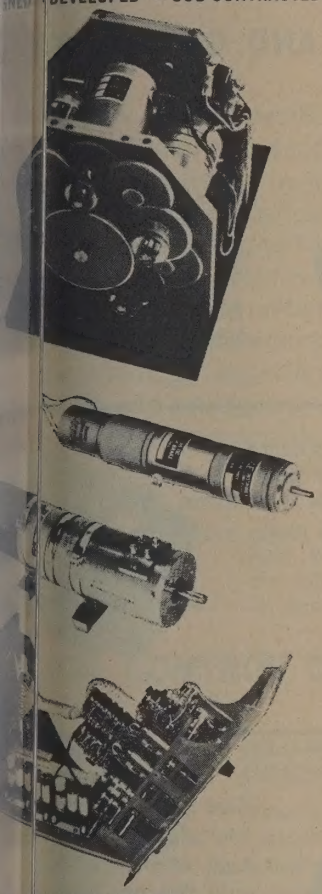
PRECISION ROTARY COMPONENTS

PRECISION INSTRUMENT PARTS AND COMPONENTS AVAILABLE FROM STOCK!

SPECIAL APPLICATIONS
DESIGNED • DEVELOPED • SUB-CONTRACTED



WE MANUFACTURE—

- CLUTCHES
- BRAKES
- CLUTCH-BRAKES
- DIFFERENTIALS
- GEARHEADS
- SPEED REDUCERS
- BELLOWS COUPLINGS
- GEAR CLAMPS
- GEAR DEVICES
- SERVO PACKAGING

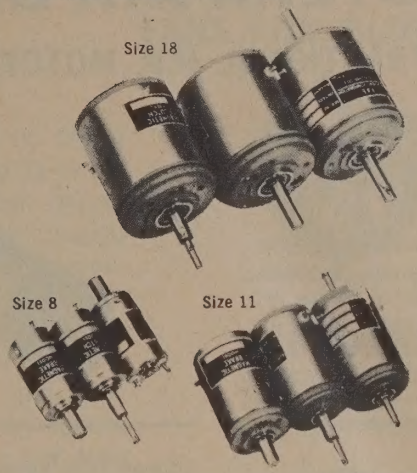
CUSTOM MADE UNITS—
All components can be custom engineered to your specific applicational requirements and MIL specifications.

EXCELLENT DELIVERY—
FAE maintains large and complete standard parts inventories. Most popular items are available from stock. Special shafts of negligible delays.

Engineering Representatives—
FAE Representatives are highly skilled and experienced specialists as well as veteran engineers. Phone or write for immediate service. Consult **eem** for nearest office.

SEND FOR COMPLETE CATALOG ILLUSTRATED WITH DRAWINGS AND DETAILED SPECIFICATIONS

MINIATURE MAGNETIC CLUTCHES • CLUTCH BRAKES • BRAKES



FEATURING—

- ★ Torque range to 100 inch/ounces
- ★ Friction or crown-tooth clutch faces
- ★ Direct action and reverse action types
- ★ Engagement time—3 to 20 milliseconds
- ★ 24-28 Volts, D.C. standard. No delay penalties for special voltages or special shaft configurations.
- ★ Precision ball bearings used throughout
- ★ Designed to meet MIL-E-5272A environmental specifications

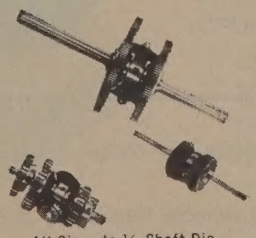
GEAR HEAD AND SPEED REDUCERS

Sizes 8, 10, 11, 15 & 18

FEATURING—

- ★ Precision ball bearings throughout
- ★ Hardened stainless Class II precision gearing
- ★ Large selection of standard ratios. Special exact ratios for timing systems available
- ★ Integral safety slip clutch. Eccentric output shafts, pinion or special output shafts available.
- ★ Special frame sizes, adapters for all non-standard motors

HOLLOW AND SOLID SHAFT PRECISION DIFFERENTIALS



All Sizes to 1/16 Shaft Dia.

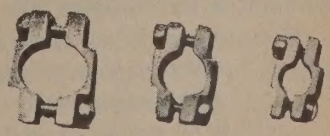
FEATURING—

- ★ High accuracy and long life
- ★ Precision ball bearings used throughout
- ★ Hardened stainless steel gearing. Choice of end gears to order
- ★ Simple pinion gear adjustment for desired backlash vs. starting torque
- ★ Zerol 3-bevel, extremely rugged high torque models available
- ★ Sub-miniature 3/32 enclosed planetary type available

PRECISION MINIATURE HARDWARE

Bellows couplings • Split hub and solid hub • Phosphor bronze • Induction soldered Palladium plated • All sizes plus any special.

HARDENED STAINLESS STEEL BALANCED CLAMPS

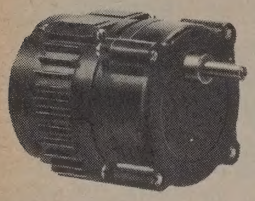


ALL SHAFT AND HUB SIZES AVAILABLE

FAE INSTRUMENT CORPORATION 16 NORDEN LANE HUNTINGTON STA., N. Y. 11746

EASTERN AIR DEVICES, IN

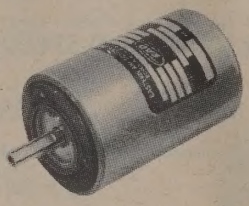
A.C. FRACTIONAL H.P. MOTORS AND GEARMOTOR



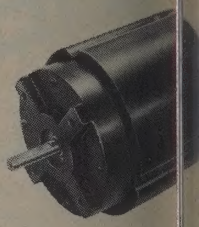
Size 25
synchronous gearmotor—NEMA Type 211 mounting — as much as twice the pull-in torque of standard instrument motors in the same package size and mounting. Diameter 2½″

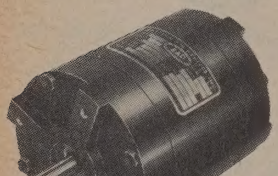
Size 10
induction motor. The st satile 1″ diameter r tor the market. Ideal for 00 airborne applications ue small size and light w ght

Size 18
TEFC induction motor — widely used in airborne and ground support equipment as a drive motor. Another versatile design suitable for 60 Hz, 400 Hz and multi-frequency applications.
Diameter 1¾″



3-speed TEFC hysteresis motor for computer tape transport features extremely low wow and flutter. Single and multi-speed versions of this high power synchronous motor are in use in many high-grade recorder applications.
Diameter 3⅞″





Size 34
3⅜″ diameter motor used in tape transport for both capstan drive (hysteresis synchronous) and take up (torque motor) applications. Primary applications are in high quality recorders and computer peripheral equipment.

Size 67
6⅝″ diameter motor. E er high efficiencies are ss with this design espe all 400 Hz applications. f ticular significance re EAD's ability to buil q low speed (1700 rpm) 00 motors and high outp b ers without the usual cr of efficiency normally in high-slip devices.

Seven frame sizes from 1″ to 6⅝″ diameter incorporate the following standard design characteristics:

ELECTRICAL 1) 60 Hz, 400 Hz, dual frequency and variable frequency; 2) single phase, permanent split-capacitor and polyphase; 3) single and dual voltage.

PERFORMANCE INDUCTION — normal slip, high slip and torque motors.

SYNCHRONOUS Hysteresis, Reluctance, Polarized.

MECHANICAL & ENVIRONMENTAL

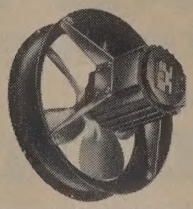
- Wide variety of standard mountings
- Various standard gearhead ratios available
- Multispeed motors
- All motors are designed for manufacture to military specifications where required.

Eastern Air Devices, Inc. DOVER, NEW HAMPSHIRE 03820 • (603) 7

EASTERN AIR DEVICES, INC.

FANS AND BLOWERS

precision air moving device is no better than the basic motor that supplies its rotary motion. Long experience in custom design of motors for specific applications coupled with our extensive aerodynamic and environmental test facilities assures you of an optimum balance of size, weight and power frame to produce maximum air delivery. The same thorough engineering, precision workmanship and painstaking quality control which have been responsible for our long standing reputation for absolute dependability combine to produce the highest reliability available for this class of component.

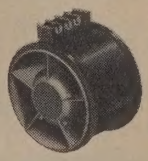


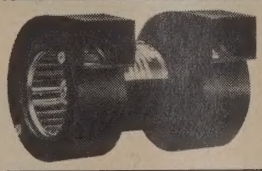
PROPELLER AND TUBEAXIAL FANS

UP to 12" in diameter, up to 1500 CFM.

VENEAXIAL FANS

Available in 1½", 2", 4¾" diameters from 3 to 500 CFM at high static pressures.

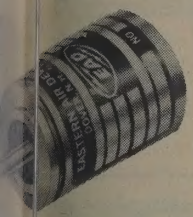




CENTRIFUGAL BLOWERS

A complete line from 3 to 2000 CFM, static pressures up to 10 inches of water.

PRECISION CONTROL COMPONENTS

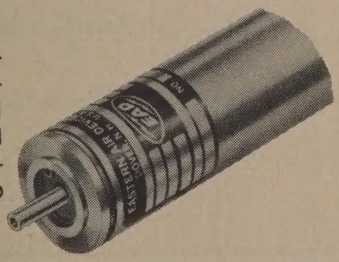


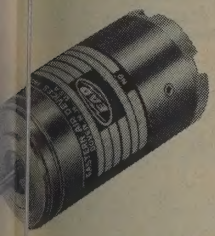
MILITARY & COMMERCIAL SERVOMOTORS

Sizes 8, 10, 11, 15, 18 and 23. Available for 60 or 400 Hz operation with wide selection of standard gearhead ratios.

SERVOMOTOR-GENERATORS

Includes temperature compensated integrating tachometers where required. Standard sizes 8 through 23 with and without gearheads. Also available as tachometer only, up to size 8.





INERTIALLY DAMPED SERVOMOTORS

Available with and without gearheads in sizes 8 through 23. Permanent magnet alternators for both military and industrial applications.

Eastern Air Devices has been manufacturing high performance control components in volume production quantities since 1942. Experience gained through serving the exacting requirements of the military and many of the country's leading instrument companies has resulted in an intimate familiarity with production tolerances and quality assurance procedures so necessary to consistently produce components of the highest quality available.

A thorough knowledge of basic application factors has enabled EAD engineers to design and produce a series of standard components capable of optimum output consistent with the high reliability for which EAD is famous. Where special requirements exist, our engineering department has the capability of relating and adapting a vast store of empiracal data to your particular needs.

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MANUFACTURERS OF SLIP RING ASSEMBLIES PHONE 213 / 443-3247 (S. El Monte)

Fabricast, Inc.

9835 ALPACA STREET, SOUTH EL MONTE, CALIFORNIA PHONE 213 / 283-9239 (Los Angeles)

STANDARD CATALOG

SLIP RING ASSEMBLIES *to choose from*

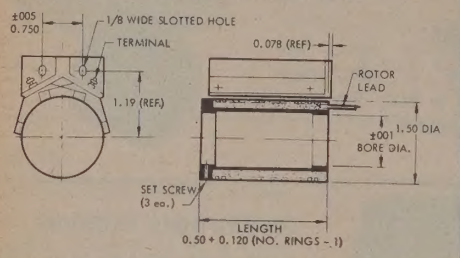
...bore sizes thru 8 inches.

SLIP RING AND BRUSH BLOCK ASSEMB

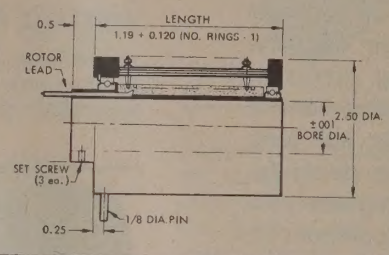
REQUEST Y CATALO

FABRICAST, INC. ... BEST DELIVERY ITEMS

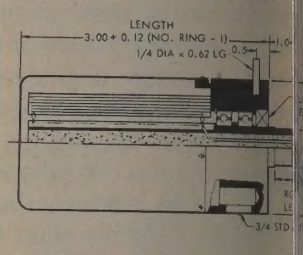
SLIP RING ASSEMBLY TYPE 1057
SEPARATE ROTOR AND BRUSH BLOCK
5 AMP -- 50 RINGS MAX -- BORE 1.002 DIA MAX



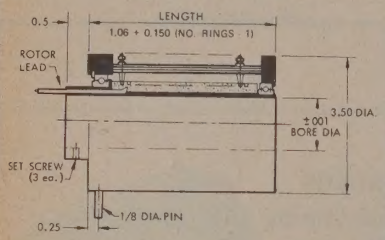
SLIP RING ASSEMBLY TYPE 1186
SELF-CONTAINED -- SHAFT MTG
5 AMP -- 50 RINGS MAX -- BORE 1.002 DIA MAX



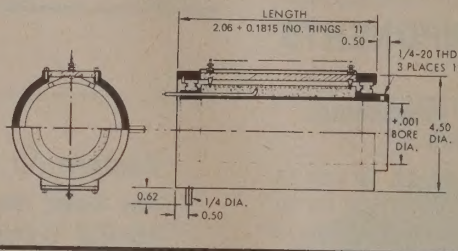
SLIP RING ASSEMBLY TYPE 1302
SELF-CONTAINED -- SEALED HOUSI
5 AMP -- 50 RINGS MAX -- SOLID B



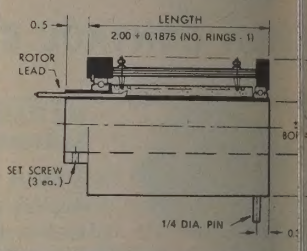
SLIP RING ASSEMBLY TYPE 1289
SELF-CONTAINED -- SHAFT MTG
5 AMP -- 100 RINGS MAX -- BORE 1.752 DIA MAX



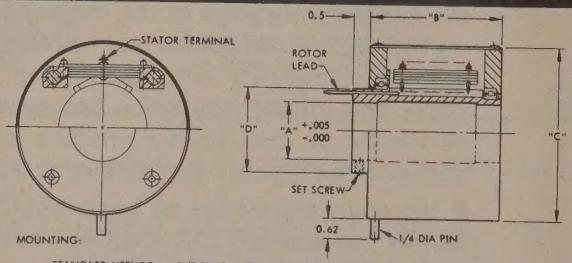
SLIP RING ASSEMBLY TYPE 1067
SELF-CONTAINED -- SHAFT MTG
5 AMP -- 100 RINGS MAX -- BORE 2.502 DIA MAX



SLIP RING ASSEMBLY TYPE 1390
SELF-CONTAINED -- SHAFT MTG
5 AMP -- 100 RINGS MAX -- BORE 4.252 DI



SLIP RING ASSEMBLY SELF CONTAINED COVERED STATOR TERMIN



MOUNTING:

STANDARD METHOD - SLIP RING ASSEMBLY SECURED TO CUSTOMER SHAFT BY SET SCREWS IN ROTOR ASSEMBLY. STATOR RESTRAINED FROM TURNING BY 1/4 DIA PIN IN HOUSING.

OPTIONAL METHOD - STATOR FLANGE MOUNTING WITH DRIVE SLOT IN ROTOR SLEEVE.

BORE DIA "A" INCHES NOMINAL	BORE DIA "A" INCHES RANGE	TYPE NO.	NO. RINGS MAX.	CURRENT AMPS	LENGTH "B" INCHES	Hous. Diam. "C"	Sleeve Exten. Dia. "D"
SOLID	——	1292	41	5 AMP STD 10 AMP OR LO NOISE TWO PARALLEL RINGS	.85 + .088 (no. rings - 1)	2.50	2.19
SOLID	——	1293	19		1.12 + .110 (no. rings - 1)	1.62	.62
SOLID	——	1294	48		1.12 + .110 (no. rings - 1)	2.25	.87
SOLID	——	1295	200		7.50 + .150 (no. rings - 1)	5.00	2.50
.250	.250 - .377	1296	48		1.25 + .110 (no. rings - 1)	2.25	.87
.500	.378 - .565	1297	50		1.25 + .120 (no. rings - 1)	2.75	1.05
1.000	.566 - 1.002	1298	50		1.25 + .120 (no. rings - 1)	3.00	1.30
1.000	1.000 - 1.750	1272	100	5 AMP STD 10 AMP OR LO NOISE 4 BRUSHES PER RING	2.00 + .150 (no. rings - 1)	5.25	2.56
2.000	1.750 - 2.625	1273	100		2.00 + .150 (no. rings - 1)	6.25	3.50
3.000	2.625 - 3.750	1274	58		2.00 + .160 (no. rings - 1)	7.50	4.50
4.000	3.750 - 4.750	1275	48		2.00 + .186 (no. rings - 1)	9.00	6.00
5.000	4.750 - 5.750	1276	63		2.00 + .186 (no. rings - 1)	10.50	7.00
6.000	5.750 - 6.750	1277	58		2.00 + .1875 (no. rings - 1)	12.00	8.00
8.000	6.750 - 8.750	1278	58		2.00 + .1875 (no. rings - 1)	15.00	10.00
1.000	1.000 - 1.250	1282	16	50 AMP STD 100 AMP 4 BRUSHES PER RING	3.00 + 1.050 (no. rings - 1)	8.00	2.56
2.000	1.250 - 2.000	1283	16		3.00 + 1.050 (no. rings - 1)	9.00	3.50
3.000	2.000 - 3.125	1284	9		3.00 + 1.120 (no. rings - 1)	10.00	4.50
4.000	3.125 - 4.375	1285	8		3.00 + 1.116 (no. rings - 1)	11.50	6.00
5.000	4.375 - 5.375	1286	10		3.00 + 1.116 (no. rings - 1)	12.50	7.00
6.000	5.375 - 6.375	1287	10		3.00 + 1.125 (no. rings - 1)	13.50	8.00
8.000	6.375 - 8.375	1288	10		3.00 + 1.125 (no. rings - 1)	16.00	10.00

PART NUMBER CODING — Specify fully when order

Type	Bore (Inches)	No. Rings	Lead Length (Inches)	Lead Type	Shiel Unshie
X —	X —	X —	X —	X	

CHARACTERISTICS

RINGS: Coin Silver 5 AMP ring.
Copper 50 AMP ring.

BRUSHES: Silver Graphite.
Fabricast Grade FAG 180 (80% AG — 20% C
Two brushes per ring.
Brushes individually removable and replacea

NOISE: 10 Milliohms dynamic resistance MAX.
5 Milliohms MAX with 4 brushes per CKT.

CURRENT: Noted in tabulated block.
Rating may be doubled with 4 brushes per C

HI-POT: 1200 VAC 60 CYCLE for 15 seconds.

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as
with epoxy dielectric.

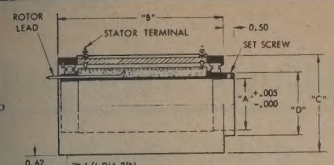
LEADS: 5 AMP Leads — 20 GA. per MIL-W-16878 TY
50 AMP Leads — 8 GA. per MIL-W-16878 TY

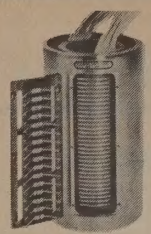
HOUSING: Bell, Bell Spacer and Cover type construction

COVER: Easily removable for brush and ring inspecti

BEARINGS: Shielded or sealed ball bearings.

RING ASSEMBLY — SELF CONTAINED — RIGID HOUSING





MOUNTING:
STANDARD METHOD - SLIP RING ASSEMBLY SECURED TO CUSTOMER SHAFT BY SET SCREWS IN ROTOR ASSEMBLY? STATOR RESTRAINED FROM TURNING BY 1/4 DIA PIN IN HOUSING.
OPTIONAL METHOD - STATOR FLANGE MOUNTING WITH DRIVE SLOT IN ROTOR SLEEVE.

"A" INCHES RANGE	TYPE	NO. RINGS MAX.	CURRENT AMPS	LENGTH "B" INCHES	HOUSING DIA "C"	SLEEVE EXTENSION DIA "D"
	1230	100	5 AMP STD 10 AMP OR LO NOISE TWO PARALLEL RINGS	3.50 + .120 (no. rings - 1)	2.50	1.30
.750	1186	50		1.56 + .120 (no. rings - 1)	2.50	1.30
.002	1186	40		1.56 + .120 (no. rings - 1)	2.50	1.30
.252	1197	70		2.50 + .130 (no. rings - 1)	3.50	2.30
.752	1289	100		1.56 + .150 (no. rings - 1)	4.00	2.60
.252	1067	75		2.06 + .1815 (no. rings - 1)	4.50	2.92
.252	1262	60		3.50 + .160 (no. rings - 1)	6.50	5.00
.00	1271	15	50 AMP STD	3.50 + 1.050 (no. rings - 1)	4.50	2.92
.252	1291	9	50 AMP STD	4.50 + 1.120 (no. rings - 1)	6.50	5.00

PART NUMBER CODING — Specify fully when ordering

Type — Bore (Inches) — No. Rings — Lead Length (Inches) — Lead Type (Shielded - S / Unshielded - U)

X — X — X — X — X

CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems at high RPM

RINGS: Coin Silver 5 AMP Rings.
Copper 50 AMP Rings.

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG — 20% C)
Two brushes per ring.
Brushes individually removable and replaceable.

NOISE: 10 Milliohms dynamic resistance MAX
5 Milliohms MAX with 4 brushes per CKT.

CURRENT: Noted in tabulated block.
Rating may be doubled with 4 brushes per CKT.

HI-POT: 1200 VAC 60 CYCLE for 15 seconds.

ROTOR: One piece steel sleeve.
Ring complement vacuum cast on sleeve as unit with epoxy dielectric.

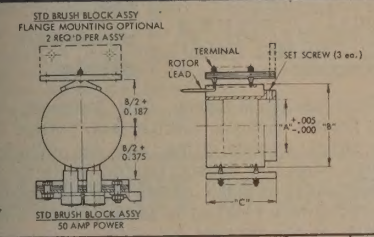
ROTOR LEADS: 5 AMP Leads — 20 GA per MIL-W-16878 TYPE "E"
50 AMP Leads — 8 GA per MIL-W-16878 TYPE "B"

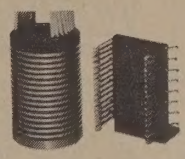
HOUSING: One piece steel tubing construction.

COVER: Easily removable for brush and ring inspection.

BEARINGS: Shielded or sealed ball bearings.

RING ASSEMBLY — SEPARATE ROTOR AND BRUSH BLOCK





DIA. "A" INCHES RANGE	TYPE	NO. RINGS MAX.	CURRENT AMPS	SLIP RING DIA "B"	LENGTH "C"
.000 - .127	2050	18	5 AMP STD	.500	.625 + .125 (no. rings - 1)
.000 - .377	2087	48	5 AMP STD	.875	.625 + .110 (no. rings - 1)
.000 - .627	2112	52	5 AMP STD	1.125	.625 + .125 (no. rings - 1)
.62 - 1.002	2150	52	5 AMP STD	1.500	.625 + .120 (no. rings - 1)
.00 - 1.502	2237	78	5 AMP STD	2.375	.750 + .130 (no. rings - 1)
.25 - 1.752	2268	107	5 AMP STD	2.687	1.000 + .150 (no. rings - 1)
.75 - 2.502	2350	78	5 AMP STD	3.500	1.000 + .1815 (no. rings - 1)
.37 - 2.875	2375	48	5 AMP STD	3.750	1.000 + .200 (no. rings - 1)
.75 - 3.752	2462	58	5 AMP STD	4.625	1.250 + .160 (no. rings - 1)
.25 - 4.002	2500	40	5 AMP STD	5.000	1.250 + .250 (no. rings - 1)
.00 - 5.002	2600	48	5 AMP STD	6.000	1.250 + .186 (no. rings - 1)
.00 - 6.002	2700	63	5 AMP STD	7.000	1.250 + .186 (no. rings - 1)
.00 - 7.002	2800	58	5 AMP STD	8.000	1.250 + .1875 (no. rings - 1)
.00 - 9.002	2900	58	5 AMP STD	10.000	1.250 + .1875 (no. rings - 1)
.750 - 1.187	3268	16	50 AMP STD	2.687	2.000 + 1.050 (no. rings - 1)
1.187 - 1.500	3300	6	50 AMP STD	3.000	2.000 + 1.000 (no. rings - 1)
1.500 - 2.000	3350	16	50 AMP STD	3.500	2.000 + 1.050 (no. rings - 1)
2.000 - 3.125	3462	9	50 AMP STD	4.625	2.000 + 1.120 (no. rings - 1)
3.125 - 4.500	3600	8	50 AMP STD	6.000	2.000 + 1.116 (no. rings - 1)
4.500 - 5.500	3700	10	50 AMP STD	7.000	2.000 + 1.116 (no. rings - 1)
5.500 - 6.500	3800	10	50 AMP STD	8.000	2.000 + 1.125 (no. rings - 1)
6.500 - 8.500	3900	10	50 AMP STD	10.000	2.000 + 1.125 (no. rings - 1)

PART NUMBER CODING — Specify fully when ordering

Type — Bore (Inches) — No. Rings — Lead Length (Inches) — Lead Type (Shielded - S / Unshielded - U) — Type Brush Block

X — X — X — X — X — X

CHARACTERISTICS

RINGS: Coin Silver 5 AMP Rings.
Copper 50 AMP Rings.

BRUSHES: Silver Graphite.
Fabricast Grade 180 (80% AG — 20% C)
Two Brushes per ring
Brushes individually removable and replaceable.

NOISE: 10 Milliohms dynamic resistance MAX.
5 Milliohms MAX with 4 brushes per CKT.

CURRENT: Noted in tabulated block.
Rating may be doubled with 4 brushes per CKT.

HI-POT: 1200 VAC 60 CYCLE for 15 seconds.

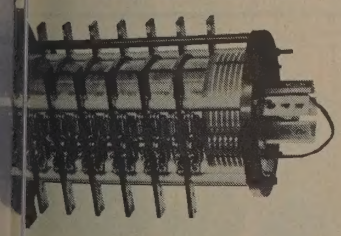
ROTOR: One piece steel sleeve.
Ring complement vacuum cast on sleeve as unit with epoxy dielectric.

ROTOR LEADS: 5 AMP Leads — 20 GA per MIL-W-16878 TYPE "E"
50 AMP Leads — 8 GA per MIL-W-16878 TYPE "B"

BRUSH BLOCK: Laminated phenolic.
Optional mounting methods shown.

CUSTOM SLIP RING CAPABILITY

CUSTOM 7000 AMP SLIP RING ASSEMBLY



This slip ring assembly, as designed and manufactured by Fabricast, Inc., is used to supply 7000 amperes of current to the rotating mandrel of the world's second largest spin forging machine.

CUSTOM 222 TRACK SLIP RING ASSEMBLY

This slip ring assembly, as designed and manufactured by Fabricast, Inc. was used to complete the electrical circuits to the rotating arm of an astronaut carrying centrifuge.

The unit consists of 50 amp. power, 5 amp. instrumentation and 50 megacycle coaxial modules.

ACTURERS OF SLIP RING ASSEMBLIES — PHONE 213 / 443-3247 (S. El Monte)
Fabricast, Inc.
5 LPACA STREET, SOUTH EL MONTE, CALIFORNIA — PHONE 213 / 283-9239 (Los Angeles)

SPECIALTY MOTORS

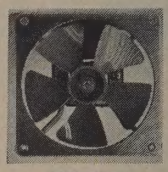
NEW! Cooling-fan Assemblies

For Electronic-equipment Cabinets

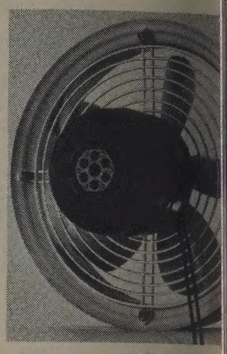
New 100 CFM fan assembly is powered by reliable GE shaded-pole motor and is equipped with a durable, five-blade molded fan and brackets. The two-pole Unitized® motor features a recirculating oil lubrication system for extra long bearing life. The assembly is only 2⅞ inches deep from mounting plate to end of motor, and measures slightly under 4¾ inchs square with mounting holes 4⅛ inches between centers.

500 CFM fan assembly is powered by GE unit-bearing, four-pole, shaded-pole motor with recirculating oil lubrication system, and includes five-blade metal fan and grill. Measuring less than 6¼ inches deep from front to back, it has a ten-inch diameter fan venturi with eight holes around venturi flange for easy mounting. Also available with two-pole motors for even greater air-flow.

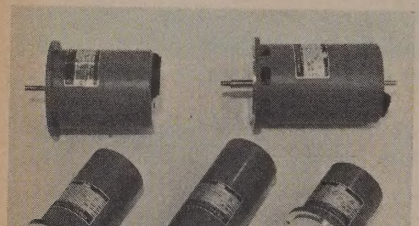
The units, which require only simple ON-OFF switches for operation, are designed for years of quiet, dependable, continuous-duty operation without maintenance. These blowers are available for 115- or 230-volt, 60-cycle duty. 50-cycle designs are available with somewhat lower output. For complete information, write for Bulletin GEA-8258.



100 CFM fan assemblies



500 CFM fan assemblies



NEW . . . ADVANCED

Hyper-Servo* MOTORS for electronic drives

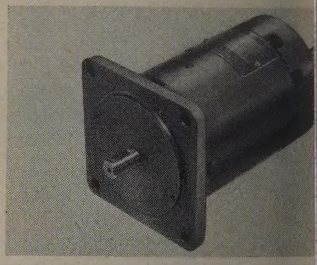
For such demanding computer applications as single-capstan tape transports, disc pa speed printers, card sorters and card readers, General Electric has created this ne high performance d-c servo motors. The motors respond in less than one millisecond wi ation rates faster than any motor previously offered by General Electric. Write for Bulletin Characteristics: Torque-to-inertia ratio approaches one-half million rad/sec²; pulse torqu ratio exceeds one-half million rad/sec²; inertial time constant is as low as one millisecond is 3.4 inches and larger; weight is as little as five pounds.

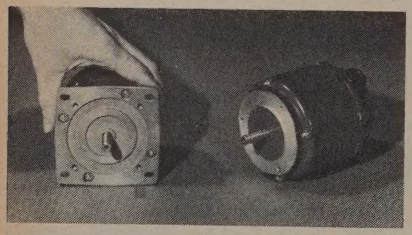
* Trade-mark of the General Electric Company.

Reel Drive Motors

For Computer Tape Transports

GE's full line of fhp direct-current motors includes four frame sizes widely used for reel drives: 3⁵⁄₁₆″, 3¹³⁄₁₆″, 4⅝″, and 6⁵⁄₁₆″ diameters. Special end mountings and shaft extensions meet exacting application requirements. Series, split-series, compound, shunt, and compensated-shunt winding designs offer a broad design choice. Stall torque ratings from 3 to 120 ounce-feet and higher span various application needs, and motor voltage requirements are normally matched to your system design. Write for Bulletin GEC-1795.





SYNCHRONOUS, REVERSIBLE

Low-speed Gearless Servo Motors

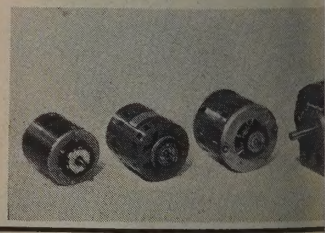
For servo, stepping, and other low-speed high-torque applications, General Electric provic of low-speed, synchronous inductor motors in 4⅛-inch diameter models. These motors choice of 50, 75, 150, or 250 oz. in. torque at exactly 75 rpm without the use of spee devices. The motors provide fast starting, stopping, and reversing for 50- or 60-cycle ap at either 120 or 240 volts. For complete information write for Bulletin GEC-1294.

Small, Compact, A-c Induction Motors

Provide High Power in a Lightweight Package

Small in size, but high in reliability, General Electric compact, powerful, a-c induction motors are available in four sizes from 15 mhp to ½ horsepower. These reversible motors provide consistent, quiet, long-life operation in any mounting position. Synchronous motors for constant-speed applications are available in 3-, 3.4-, and 3⅞-inch diameter models. Special designs can be provided for various torque motor applications such as tape reel drives. For dimensions, features, ratings, and application information, write for Bulletin GEA-8254.

Typical Electronic Applications: Computer memory drums, tape reels, capstans, disc filers, card stackers, card printers, card punchers, and data cells.



For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

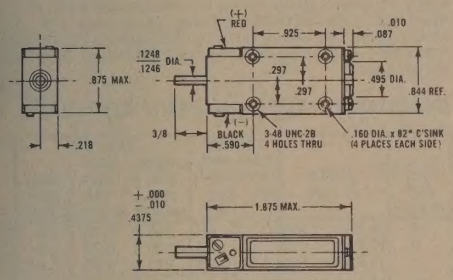
GENERAL ELEC

TRW

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

ERMANENT MAGNET MOTORS

VS (Bulletin A-0700N)



CW rotation viewed from shaft end when positive voltage is connected to red (+) terminal and negative voltage is connected to black (−) terminal. For CCW rotation reverse voltage at terminals.

Be sure to check Globe for latest data prior to preparing spec control prints.

Outstanding feature of Globe Type VS d.c. motors is the unusually compact and versatile configuration. The size and shape make them where space and weight are paramount.

Details for a Globe engineering recommendation.

rating: 1/400 hp. 8,000 to 17,000 rpm continuous duty. Higher and lower speeds available at reduced hp.
voltage: 12 to 50 v.d.c.
weight: 1.7 oz.
armature: Impregnated with fungus resistant varnish. Inertia: 1.32 gm. cm.^{2}
protection: Protected against shock, water, dust, and other environmental hazards.
magnet: Alnico V.
bearings: Double-shielded ball bearings life-lubricated.
frame: Machined aluminum housing and metal end cap form frame structure.
shaft: Precision ground #420 stainless steel shaft through hardened to Rc 45-50.
electrical connections: Solder terminals provided.
reversibility: Motor reverses when terminal voltage is reversed.
mounting: Standard mounting is by tapped holes in motor body.

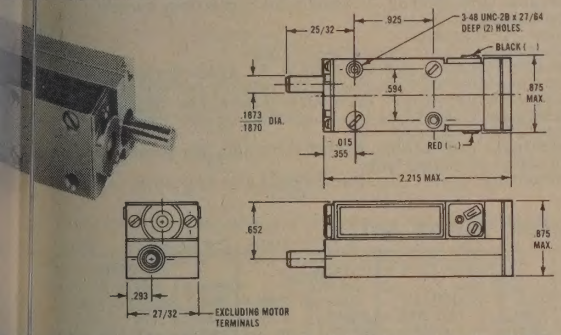
STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT max. stall (amps)	STANDARD PART NO.
12	15,000-17,000	.15	.90	.24	.45	1.73	98A102-6
12	11,500-13,500	.18	.72	.19	.35	1.05	98A102-7
12	9,500-11,000	.23	.54	.14	.33	.65	98A102-8
27	17,700-19,700	.13	1.00	.11	.22	.95	98A102-9
27	14,000-16,000	.16	.81	.10	.20	.61	98A102-10
27	11,500-13,500	.20	.63	.08	.15	.40	98A102-11
27	8,500-10,000	.23	.45	.07	.14	.28	98A102-12
50	13,500-15,500	.15	.68	.06	.09	.32	98A102-13
50	11,500-13,500	.16	.54	.05	.08	.21	98A102-14

ERMANENT MAGNET SPUR GEARMOTORS

VS (Bulletin A-0740N)

Type VS d.c. spur gearmotors provide high torque and reliability in an extremely compact package. The small size makes them ideal for applications where space and weight are paramount considerations. VS spur gearmotors are available with 15 ratios in the side shaft style. Units for operation at other voltages can be provided. Complete application data for a Globe recommendation.



Be sure to check Globe for latest data prior to preparing spec control prints.

rating: Up to 35 oz. in. at 10 rpm.
voltage: 12 to 50 v.d.c.
weight: 2.0 to 2.8 oz. max. depending upon ratio.
gears: Gears are precision manufactured and case hardened for maximum reliability.
backlash: 3° max.
protection: Protected against shock, water, dust, and other environmental hazards. Motor housing is aluminum. Geartrain housing is plastic.
bearings: Motor ball bearings are double-shielded, life-lubricated. Geartrain input shaft is supported on ball bearings; output shaft is supported by precision ground steel bushing.
lubrication: Motor and geartrain are life-lubricated.
shaft: One piece hardened stainless steel output gear and shaft.
electrical connection: Terminals are provided.
mounting: Mounting is by means of tapped holes in motor body.

STANDARD PART NUMBERS AND GEARMOTOR DATA

SPEED REDUCTION RATIO	TORQUE MULTIPLIER†	GEARTRAIN TORQUE max. cont. rating (oz. in.)	GEARTRAIN EFFICIENCY (%)	SHAFT ROTATION** red term. (+)	STANDARD PART NO.*
26.93:1	16	2.0	59	CW	128A166
59.26.1	31	3.9	53	CCW	128A168
72.21:1	38	4.8	53	CCW	128A170
130.36:1	63	7.8	48	CW	128A171
175.36:1	81	10.5	48	CW	128A174
286.80:1	123	15.4	43	CCW	128A175
349.49:1	150	19.0	43	CCW	128A177
425.88:1	183	23.0	43	CCW	128A179
630.96:1	250	30.0	39	CW	128A180
768.88:1	300	35.0	39	CW	128A182
1034.29:1	405	35.0	39	CW	128A185
1388.11:1	485	35.0	35	CCW	128A186
1691.53:1	580	35.0	35	CCW	128A188
2061.28:1	720	35.0	35	CCW	128A190
2511.84:1	880	35.0	35	CCW	128A192

†TORQUE MULTIPLIER = SPEED REDUCTION × GEARTRAIN EFFICIENCY.
OUTPUT TORQUE = MOTOR TORQUE × TORQUE MULTIPLIER. (LIMITED TO MAX. CONT. RATING OF GEARTRAIN AS SHOWN ABOVE.)

ERFORMANCE AND DATA

SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no. load (amps)†*	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	ARMATURE DASH NUMBER*
1 00-17,000	.15	.90	.310	.450	1.73	— 6
1 00-13,500	.18	.72	.235	.350	1.05	— 7
00-11,000	.23	.54	.180	.330	0.65	— 8
1 00-19,700	.13	1.00	.150	.220	0.95	— 9
1 000-16,000	.16	.81	.130	.200	0.61	—10
1 500-13,500	.20	.63	.100	.150	0.40	—11
500-10,000	.23	.45	.085	.140	0.28	—12
1 500-15,500	.15	.68	.070	.090	0.32	—13
1 500-13,500	.16	.54	.060	.080	0.21	—14

MOR NO LOAD CURRENT

DU ORDER

Number. Complete part number consists of number shown in DA PART NUMBERS AND GEARMOTOR DATA chart, plus a number from the MOTOR PERFORMANCE AND DATA chart to mature winding. EXAMPLE: 128A171-7 has a 130.36:1 spur powered by a 12 v.d.c. motor with a no-load speed of 11,000 rpm. Consult Globe for information on units to operate at wer than 12 v.d.c.

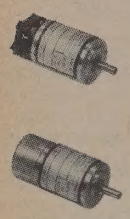
**Shaft Rotation. Direction of rotation viewed from shaft end is as shown when red terminal is (+), black terminal (—). When red terminal is (—) and black terminal (+) rotation is in opposite direction.

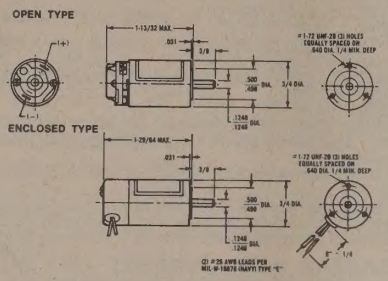
Shafts. Special shaft lengths, smaller shaft diameters, flats, holes, pinions, threaded ends or tapped holes and tapers are available.

GLOBE TRW

D.C. PERMANENT MAGNET MOTORS

Type SD (Bulletin A-1200N)





Globe Type SD d.c. motors provide high torque and reliability from an extremely small size package. A variety of standard windings are available for different speed and torque characteristics. Units can be supplied for operation at other voltages and with radio noise filtering. Planetary geartrains provide a wide range of standard speed reduction ratios. For details see Type SD Planetary Gearmotor Bulletin A-1230N.

Please send complete application details for a Globe engineering recommendation.

WHEN YOU ORDER

***Part Number.** Units shown above are standard and may be ordered by part number. See introduction to this catalog section for assistance with selection of the proper unit to meet your requirements. Consult Globe for variations to suit specific applications.

Shafts. Special shaft lengths, smaller shaft diameters, flats, holes, pinions, gears, threaded ends, or tapped holes and tapers are available.

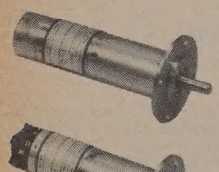
rating: 1/400 hp continuous duty at 8,000 to 18,000 rpm. H lower speeds are available with reduced hp. **voltage:** 6 to **weight:** 1.75 ounces. **armature:** Impregnated with fungus varnish. Inertia: 1.8 gm. cm². **protection:** Housing is iridited C-5511. **magnet:** Alnico V. **bearings:** Ball bearings are double life-lubricated. **frame:** Machined cylindrical aluminum hou end pieces form frame structure. **shaft:** Precision ground stai shaft through hardened to Rc 40-50. **end bell:** Precision mold **electrical connections:** Solder terminals are provided. re Motor reverses when terminal voltage is reversed. **mounting:** mounting is by means of servo clamps, or by pilot and tappe motor face.

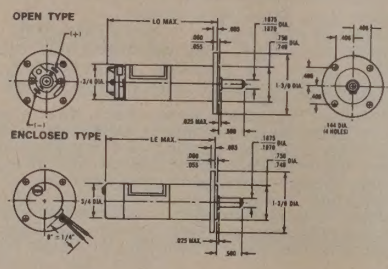
STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	PART NU open unit
6	14,500-17,500	0.20	1.50	.360	0.78	3.6	136A207-17
6	12,000-14,000	0.28	1.20	.290	0.78	2.2	136A207-16
6	9,000-10,500	0.32	0.90	.210	0.60	1.4	136A207-15
12	13,000-15,500	0.22	1.60	.170	.38	1.50	136A207-14
12	9,500-11,000	0.37	0.80	.120	.37	0.93	136A207-13
12	8,500-10,000	0.25	0.60	.105	.26	0.70	136A207-12
27	15,500-18,500	0.17	1.80	.085	.17	1.15	136A207-1
27	13,000-16,000	0.22	1.50	.075	.17	0.85	136A207-2
27	10,000-12,500	0.31	1.20	.060	.17	0.48	136A207-3
27	9,000-10,500	0.31	0.90	.050	.14	0.30	136A207-4
27	7,000- 8,500	0.24	0.80	.045	.08	0.21	136A207-5
50	13,000-15,500	0.26	0.90	.040	.10	0.22	136A207-7
50	11,500-13,500	0.31	1.10	.035	.10	0.26	136A207-6
50	11,000-13,000	0.26	0.75	.032	.08	0.18	136A207-8
50	8,000- 9,500	0.18	0.50	.025	.05	0.08	136A207-9
50	7,000- 8,300	0.15	0.45	.022	.04	0.07	136A207-10
50	5,500- 6,500	0.11	0.35	.018	.03	0.05	136A207-11

D.C. PERMANENT MAGNET PLANETARY GEARMOTORS

Type SD (Bulletin A-1230N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

STANDARD PART NUMBERS AND DATA

SPEED REDUCTION RATIO	MAXIMUM CONTINUOUS TORQUE (1) (oz. in.)	TORQUE (2) MULTIPLICATION RATIO	LO MAX.	LE MAX.	STANDARD PART NUMBERS* open type	STANDARD PART NUMBERS* enclosed type
3.82 5.77	1.0 1.5	3.1 4.6	2 3/8"	2 13/32"	168A247 168A248	168A249 168A250
14.58 22.03 33.28	3.0 4.5 7.0	9.3 14 21	2 39/64"	2 41/64"	168A204 168A205 168A206	168A223 168A224 168A225
55.66 84.11 127.1 192	10 14 21 30	28 43 65 93	2 25/32"	2 13/16"	168A207 168A208 168A209 168A210	168A226 168A227 168A228 168A229
321 485 733 1108	45 70 100 150	130 200 300 450	2 61/64"	2 63/64"	168A211 168A212 168A213 168A214	168A230 168A231 168A232 168A233
1853 2799 4230 6391	200 300 300 300	600 900 1400 2100	3 1/8"	2 5/32"	168A215 168A216 168A217 168A218	168A234 168A235 168A236 168A237
10689 16150 24403 36873	300 300 300 300	2800 4200 6400 9700	3 19/64"	3 21/64"	168A219 168A220 168A221 168A222	168A238 168A239 168A240 168A241

(1) This is the maximum continuous output torque rating of a given geartrain. Actual output depends upon the armature winding selected. See Bulletin A-1200N, Type SD motors, for rated torque of various armatures.

(2) Maximum continuous output torque of the gearmotor is the product of the multiplication ratio times the rated torque of the motor as given below. This value must not exceed the maximum continuous torque given in the second column, above. Minimum efficiency of the geartrain is the product of the multiplication ratio divided by the speed ratio times 100.

This small size, light weight gear-motor is comprised of G Type SD motor, Bulletin A-1200N coupled with a precision gear train. The combination provides smooth, dependable per and maximum output torque in the smallest possible space. signed to provide a military quality gearmotor of exception pact size.

Nineteen different reduction ratios, ranging from 3.82:1 to are available. These subminiature Globe gearmotors are de meet the applicable environmental specifications of MIL-M-8

torque: Up to 300 oz. in. maximum continuous torque.
voltage: 6 to 50 v.d.c.
size: ¾" diameter.
weight: 4 to 9 oz., depending on ratio.
gears: Planetary gearing system. All gears are precision manu and heat-treated for consistently reliable performance and life.
backlash: Varies with ratio but will have less than 3°.
bearings: Output shaft is supported by two double-shielded, cated ball bearings.
electrical connection: Solder terminals are provided on open leads on enclosed type.
mounting: Unit is mounted by pilot and four holes in flange.

BASIC MOTOR DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no. load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)
6	14,500-17,500	0.20	1.50	.460	0.78	3.6
6	12,000-14,000	0.28	1.20	.380	0.78	2.2
6	9,000-10,500	0.32	0.90	.270	0.60	1.4
12	13,000-15,500	0.22	1.60	.220	.38	1.50
12	9,500-11,000	0.37	0.80	.155	.37	0.93
12	8,500-10,000	0.25	0.60	.135	.26	0.70
27	15,500-18,500	0.17	1.80	.110	.17	1.15
27	13,000-16,000	0.22	1.50	.100	.17	0.85
27	10,000-12,500	0.31	1.20	.080	.17	0.48
27	9,000-10,500	0.31	0.90	.065	.14	0.30
27	7,000- 8,500	0.24	0.80	.055	.08	0.21
50	13,000-15,500	0.26	0.90	.050	.10	0.22
50	11,500-13,500	0.31	1.10	.045	10	0.26
50	11,000-13,000	0.26	0.75	.040	.08	0.18
50	8,000- 9,500	0.18	0.50	.032	.05	0.08
50	7,000- 8,300	0.15	0.45	.028	.04	0.07
50	5,500- 6,500	0.11	0.35	.023	.03	0.05

WHEN YOU ORDER

***Part Number.** Units shown above are standard and may be or part number. Complete part number consists of the basic part plus a dash number to designate armature voltage and speed. Globe for other voltages and variations for special applicatio

GLOBE DIVISION OF TRW INC.
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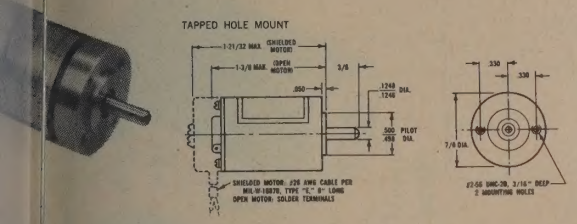
TELEX 288224 CABLE GLODAY

ERMANENT MAGNET MOTORS

S (Bulletin A-1400N)



e sure) check Globe for latest data prior to preparing spec. control prints.

lobe ype SS d.c. motor is specifically designed as a component ecisic airborne accessory equipment, but may be applied to a y of der applications where size and weight are important con- ations ype SS motors can be made with different windings to ce a riety of characteristics. Units also can be provided for ion other voltages.

SS mors are available with planetary geartrains. See Bulletin ON fo etails.

e sub t details for a Globe engineering recommendation.

N YO ORDER

Num r. Complete part numbr consists of the standard part num- lus armature dash number. EXAMPLE: 41A119-1 is a 27 v.d.c., 0-15,0 rpm shielded motor with tapped hole mount and plain See e introduction to this catalog section for assistance with ing t proper unit to meet your requirements. Consult Globe for ions suit specific applications.

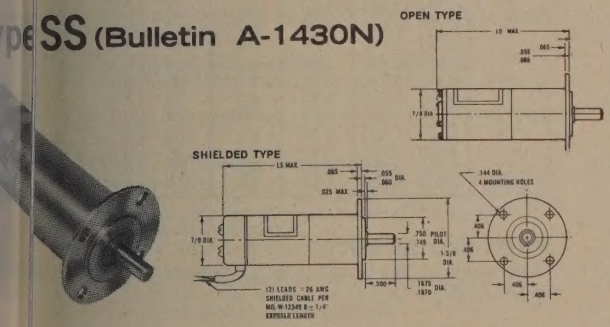
rating: 1/250 hp at 8,000 to 18,000 rpm continuous duty.
voltage: 6 to 50 v.d.c.
weight: 2 ounces.
armature: Impregnated with fungus resistant varnish. Inertia: 1.8 gm. cm².
protection: Housing is aluminum iridited per MIL-C-5541.
magnet: Alnico V.
bearings: Ball bearings are double-shielded, life-lubricated. Standard lubricant conforms to MIL-G-3278.
frame: Machined cylindrical aluminum housing and metal end cap form frame structure.
shaft: precision ground stainless steel shaft through hardened to Rc 40-50.
end bell: Metal end bell with molded plastic brush holder is standard.
electrical connections: Solder terminals are standard. Leads are optional. Shielded leads are available.
reversibility: Motor reverses when terminal voltage is reversed.
mounting: Standard mounting is by means of pilot and tapped holes in motor face, or by servo clamps to servo flange.

STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	STANDARD PART NUMBERS* open tapped hole mount	STANDARD PART NUMBERS* enclosed tapped hole mount
6	11,000-13,500	0.28	1.6	.46	1.00	3.6	41A100-17	41A119-17
6	8,500-11,000	0.38	1.3	.37	1.00	2.2	41A100-16	41A119-16
12	13,500-17,000	0.22	2.0	.27	.54	2.6	41A100-15	41A119-15
12	10,000-13,000	0.33	1.7	.21	.54	1.5	41A100-14	41A119-14
27	17,000-20,000	0.17	2.9	.15	.26	1.9	41A100-13	41A119-13
27	15,000-18,000	0.20	2.5	.135	.24	1.4	41A100-12	41A119-12
27	12,000-15,000	0.25	2.0	.11	.24	1.15	41A100-1	41A119-1
27	10,000-13,000	0.31	1.6	.095	.23	0.78	41A100-2	41A119-2
27	8,500-10,500	0.45	1.3	.075	.23	0.48	41A100-3	41A119-3
27	6,500- 9,000	0.45	1.0	.07	.20	0.29	41A100-4	41A119-4
27	5,500- 7,500	0.36	0.82	.055	.15	0.21	41A100-5	41A119-5
50	10,000-13,000	0.32	0.97	.05	.13	0.22	41A100-7	41A119-7
50	8,500-10,500	0.42	1.20	.045	.13	0.35	41A100-6	41A119-6
50	6,000- 7,500	0.38	0.80	.03	.09	0.12	41A100-9	41A119-9

PERMANENT MAGNET PLANETARY GEARMOTORS

SS (Bulletin A-1430N)



Be s to check Globe for latest data prior to preparing spec. control prints.

This extremely small size and lightweight gearmotor consists of a Globe Type SS d.c. motor and a system of precision planetary gearing. The combination provids smooth, dependable performance and maximum output torque in the smallest possible space. The design has been predicated on maximum reliability.

Units are only 7/8" in diameter. Overall length ranges from 2 17/64", depending on speed reduction ratio. Twenty-one different standard reduction ratios, ranging from 3.82:1 to 36,873:1, are available.

These sub-miniature Globe gearmotors meet all applicable military specifications.

torque: Maximum continuous torque — to 300 oz. in. depending upon ratio.
voltage: 6 to 50 v.d.c.
size: 7/8" diameter.
weight: Gearmotor weighs 5 to 10 ounces depending upon reduction ratio.
gears: Planetary gearing system. All gears are precision manufactured and heat-treated for consistently reliable performance and life.
backlash: Varies with reduction but unit will have less than 3°.
protection: Housing is cadmium plated to conform to QQ-P-416 Type 2 for protection against moisture, fungus, and salt spray.
bearings: Output shaft is supported by two double-shielded ball bearings.
shaft: No. 416 stainless steel passivated per QQ-S-763.
electrical connection: Two teflon-coated #26 AWG leads on shielded type. Two solder type terminals on open type.
mounting: Unit is mounted by means of pilot and four holes in flange.

ND D PART NUMBERS AND DATA

PEED ICTIO ATIO	MAXIMUM CONTINUOUS TORQUE (1) (oz. in.)	TORQUE MULTIPLICATION RATIO (2)	STANDARD PART NUMBERS* shielded type dim. LS	shielded type part no.	open type dim. LO	open type part no.
3.82:	1.0	3.1	2 35/64"	43A197	2 17/64"	43A196
5.77:	1.5	4.6		43A200		43A199
5.58:	3.0	9.3	2 25/32"	43A140	2 1/2"	43A100
2.03:	4.5	14		43A141		43A101
3.28:	7.0	21		43A142		43A102
5.66:	10	28	2 61/64"	43A143	2 43/64"	43A103
4.11:	14	43		43A144		43A104
27.1:	21	65		43A145		43A105
192:	30	93		43A146		43A106
321	45	130	3 1/8"	43A147	2 27/32"	43A107
485	70	200		43A148		43A108
733	100	300		43A149		43A109
108	150	450		43A150		43A110
853	200	600	3 9/32"	43A151	3"	43A111
799	300	900		43A152		43A112
230	300	1400		43A153		43A113
391	300	2100		43A154		43A114
689	300	2800	3 29/64"	43A155	3 11/64"	43A115
150	300	4200		43A156		43A116
403	300	6400		43A157		43A117
873	300	9700		43A158		43A118

his the maximum continuous output torque rating of a given geartrain. ctu utput depends upon the armature winding selected.
Maxi m continuous torque of the gearmotor is the product of the multipli- atio ratio times the rated torque of the motor as given below. This value must t exceed the maximum continuous torque given in the second column, bov Minimum efficiency of the geartrain is the product of the multiplica- ion io divided by the speed ratio times 100.

BASIC MOTOR DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE stall (oz. in.)	CURRENT gear-motor max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	ARMATURE DASH NUMBER*
6	11,000-13,500	0.28	1.6	.580	1.00	3.6	—17
6	8,500-11,000	0.38	1.3	.470	1.00	2.2	—16
12	13,500-17,000	0.22	2.0	.340	.54	2.6	—15
12	10,000-13,000	0.33	1.7	.265	.54	1.5	—14
27	17,000-20,000	0.17	2.9	.190	.26	1.9	—13
27	15,000-18,000	0.20	2.5	.170	.24	1.4	—12
27	12,000-15,000	0.25	2.0	.140	.24	1.15	—1
27	10,000-13,000	0.31	1.6	.120	.23	0.78	—2
27	8,500-10,500	0.45	1.3	.095	.23	0.48	—3
27	6,500- 9,000	0.45	1.0	.090	.20	0.29	—4
27	5,500- 7,500	0.36	0.82	.070	.15	0.21	—5
50	10,000-13,000	0.32	0.97	.065	.13	0.22	—7
50	8,500-10,500	0.42	1.20	.055	.13	0.35	—6
50	6,000- 7,500	0.38	0.80	.040	.09	0.12	—9

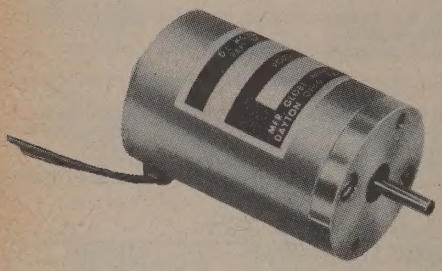
WHEN YOU ORDER

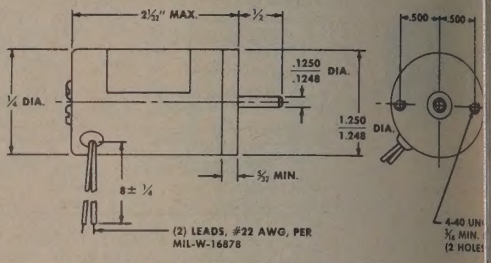
***Part Number.** Units described above are standard and may be ordered by part number. Complete part number consists of basic part number plus an armature dash number to designate armature voltage and speed.

GLOBE TRW

D.C. PERMANENT MAGNET MOTORS

Type JM (Bulletin A-1904N)





CCW rotation viewed from shaft end, when red lead is (+) and black lead is (−). For CW rotation reverse terminal voltage.

The outstanding feature of Type JM motors is an excellent voltage-speed characteristic that makes them ideal for use as control motors. A special frame design allows minimum slot-lock at low starting and running voltages.

All Type JM motors may be modified to include governors and geartrains. Type JM motors can be supplied with the same geartrains described in Bulletin A-2030N.

Please submit complete details of your application to Globe for an engineering recommendation.

rating: 1/65 hp, 6,000 to 12,000 rpm, continuous, higher speeds available.
voltage: 6 to 115 v.d.c.
weight: 5 ounces.
armature: Impregnated with fungus resistant varnish. Inertia: 11.1 gm. cm.²
protection: Housing is aluminum with iridite or cadmium plate/chromate finish per QQ-P-416 Type 2 for protection against moisture, fungus, shock, and salt spray.
magnet: Alnico V.
bearings: Ball bearings are double-shielded, life-lubricated. Standard lubricant conforms to MIL-G-3278.
frame: Metal end plate, end bell and pole pieces form structural frame. Enclosed construction is standard.
shaft: No. 420 stainless steel through-hardened to Rc 45-55 or higher.
end bell: Metal end bell is standard.
electrical connection: Two #22 AWG Teflon-coated lead wires per MIL-W-16878.
reversibility: Motor reverses when terminal voltage is reversed.
mounting: Tapped holes on motor face, or by non-magnetic clamping around motor diameter. Custom flange available.

Note: Be sure to check Globe for latest data prior to preparing spec. co

STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)
6	11,200-13,700	1.20	7.6	.70	3.50	15.0
6	9,100-11,100	1.50	6.3	.55	2.80	13.6
6	7,500- 9,200	1.80	4.5	.44	2.40	12.0
12	11,200-13,700	1.20	6.5	.35	1.45	12.4
12	9,500-11,600	1.40	6.5	.28	1.40	10.5
12	7,500- 9,200	1.60	4.5	.23	1.15	5.0
27	13,700-16,700	1.10	8.2	.18	0.80	4.3
27	10,500-13,000	1.60	7.0	.14	0.75	2.8
27	8,700-10,600	1.70	5.2	.12	0.70	1.8
27	7,000- 8,600	1.80	5.0	.09	0.55	1.4
50	10,500-13,000	1.80	6.7	.08	0.40	1.50
50	8,200-10,000	1.90	5.6	.06	0.35	0.95
50	6,500- 8,000	1.80	4.5	.05	0.26	0.60
50	5,200- 6,300	2.10	3.4	.04	0.25	0.40
115	9,500-11,600	1.90	6.2	.03	0.18	0.60
115	7,500- 9,200	1.90	5.2	.03	0.14	0.40
115	6,000- 7,500	1.90	4.2	.02	0.11	0.25
115	4,800- 5,800	1.20	3.4	.02	0.09	0.17

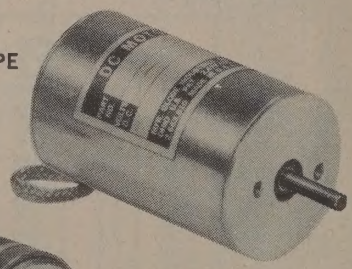
WHEN YOU ORDER

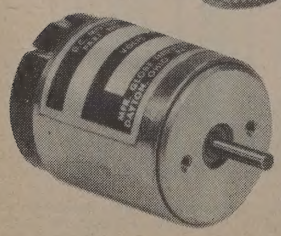
***Part Number.** The above units are standard and may be
part number.

D.C. PERMANENT MAGNET MOTORS

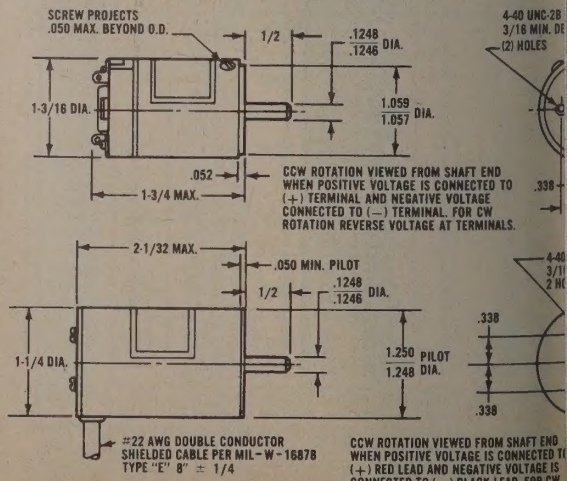
Type MM (Bulletin A-2000N)

ENCLOSED TYPE





OPEN TYPE

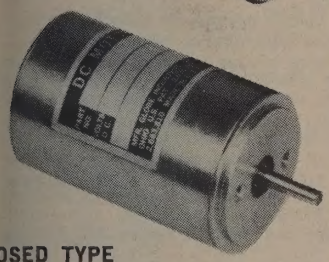


C. FERMANENT MAGNET MOTORS

GLOBE INDUSTRIES DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

pe .L (Bulletin A-2006N)

(EN TYPE



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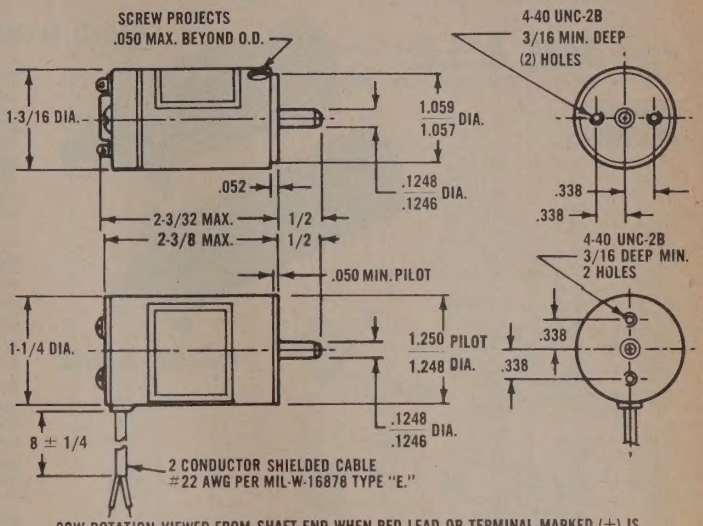


CCW ROTATION VIEWED FROM SHAFT END WHEN RED LEAD OR TERMINAL MARKED (+) IS POSITIVE AND BLACK LEAD OR TERMINAL MARKED (—) IS NEGATIVE. FOR CW ROTATION REVERSE VOLTAGE AT LEADS OR TERMINALS.

Be sure check Globe for latest data prior to preparing spec. control prints.

's Typ LL motor is a permanent magnet d.c. motor designed to requi ments for missiles, aircraft, and other types of MIL-spec ment: t is also suitable for a variety of commercial/industrial ation where small size, reliability, and high torque are desired.

LL. mors are available in both open and enclosed types for tion voltages from 6 to 75 v.d.c. Units for operation at other es are easible.

tary artrains are available. See Bulletin A-2030N for details. comp te data for a Globe engineering recommendation.

: ½s continuous duty at 6,000 to 15,000 rpm. Higher speeds ble w reduced performance.

e: 6 75 v.d.c.

t: Op type — 5.2 ounces. Enclosed type — 6.5 ounces.

ture: cuum impregnated with fungus resistant varnish. Inertia: m. cm

ction: nclosed type has cadmium plated housing which con- to GP-416 Type 2.

ets: Alico V.

ngs: Dble shielded ball bearings life-lubricated.

: Po pieces are die-cast into aluminum frame by patented ique:

Pre on ground stainless steel through hardened to Rc 45-50.

ell: Pcision molded diallyl phthalate.

rical nnections: Open type — solder terminals. Enclosed type — ded ds.

sibili Motor reverses when terminal voltage is reversed.

ting: tandard mounting is by means of tapped holes in motor r no nagnetic clamping around motor diameter.

STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. ** rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	PART NUMBER* open unit	PART NUMBER* enclosed unit
6	15,600-18,500	1.0	12.0	1.4	2.7	16.0	3A999-23	3A1003.23
6	12,500-14,500	1.3	9.5	1.1	2.4	15.0	3A999-14	3A1003-14
6	10,000-12,200	1.6	8.0	.95	2.6	13.0	3A999-6	3A1003-6
6	7,600- 9,400	1.6	6.0	.70	2.0	8.0	3A999-5	3A1003-5
12	11,500-14,000	1.1	8.0	.52	1.7	7.0	3A999-24	3A1003-24
12	9,000-11,000	1.7	5.2	.42	1.2	4.5	3A999-3	3A1003-3
24	16,000-19,000	.75	8.8	.36	1.0	7.5	3A999-21	3A1003.21
24	14,400-17,000	.85	7.8	.32	.85	6.0	3A999-4	3A1003-4
24	12,000-14,500	1.0	7.5	.28	.80	5.2	3A999-7	3A1003-7
24	10,400-12,300	1.1	6.2	.23	.75	3.3	3A999-1	3A1003-1
24	7,400- 8,900	1.6	5.5	.17	.70	2.1	3A999-2	3A1003-2
24	6,900- 8,200	1.8	3.8	.16	.65	1.6	3A999-8	3A1003.8
24	6,200- 7,400	1.8	3.4	.14	.60	1.3	3A999-22	3A1003-22
24	5,200- 6,200	1.2	2.8	.12	.45	1.2	3A999-10	3A1003-10
50	7,600- 9,400	1.5	7.5	.09	.25	1.1	3A999-11	3A1003-11
75	14,000-17,000	1.0	10.0	.10	.29	1.9	3A999-25	3A1003-25
75	9,000-11,000	1.7	8.0	.07	.29	1.0	3A999-16	3A1003-16
75	8,000-10,000	1.8	6.0	.06	.26	.6	3A999-12	3A1003-12
75	6,500- 8,000	1.2	5.5	.05	.20	.4	3A999-15	3A1003-15
75	4,500- 5,300	1.0	2.5	.04	.10	.2	3A999-13	3A1003-13

Glob Type MM d.c. motor is specifically designed for use in air- eqpment, missiles, and commercial applications where a inat of small size, reliability, and high torque is desired. se sel application details for a recommendation from Globe.

: 100 hp continuous duty at 8,000 to 18,000 rpm. Higher ds available with reduced performance.

ge: 4 to 50 v.d.c.

nt: Cn type — 3.5 ounces. Enclosed type — 5 ounces.

ture: Vacuum impregnated with fungus resistant varnish. Inertia: m. c.²

ction Enclosed type has cadmium plated housing to conform to 416 ype 2.

ets Inico V,

ngs ouble shielded ball bearings life-lubricated.

e: Fe pieces are die cast into aluminum frame by patented iqu

: Prision ground stainless steel through hardened to Rc 45-50.

ell: recision molded diallyl phthalate.

rica: connections: Open type — solder terminals. Enclosed type ield leads.

sibiy: Motor reverses when terminal voltage is reversed.

ntin Standard mounting is by means of tapped holes in motor not nagnetic clamping around motor diameter.

EN OU ORDER

k Nber. Units shown above are standard and may be ordered art mber. See the introduction to this catalog section for assist- wi selecting the proper unit to meet your requirements.

rqu For intermittent duty applications max. rated torque values be ceeded.

STANDARD PART NUMBERS AND DATA

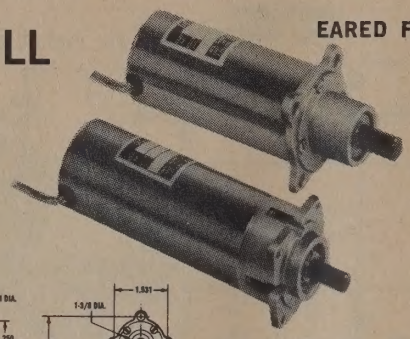
VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. ** rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	PART NUMBER* open unit	PART NUMBER* enclosed unit
4	16,000-19,000	.25	6.2	1.5	2.4	24	3A998-23	3A1002-23
6	18,900-22,500	.5	7.2	1.2	2.3	17	3A998-14	3A1002-14
6	15,600-18,600	.85	6.0	1.0	2.3	10	3A998-6	3A1002-6
6	12,000-14,000	.75	4.5	.80	2.0	9.0	3A998-5	3A1102-5
12	18,000-21,400	.50	6.8	.56	1.2	8.7	3A998-24	3A1002-24
12	14,500-17,000	.70	4.0	.50	1.2	6.0	3A908.3	3A1002-3
12	12,400-14,700	.75	4.7	.40	1.2	5.0	3A998-21	3A1002-21
12	11,000-13,000	1.0	4.0	.35	1.2	3.7	3A998-4	3A1002-4
24	19,200-22,800	.35	7.3	.30	.60	6.3	3A998-7	3A1002-7
24	16,000-19,000	.60	4.8	.25	.60	3.7	3A998-1	3A1002-1
24	11,500-14,000	1.0	4.0	.18	.60	2.2	3A998-2	3A1002-2
24	10,700-12,700	1.0	4.1	.17	.60	1.8	3A998-8	3A1002-8
24	9,600-11,400	1.0	3.6	.15	.50	1.3	3A998.22	3A1002-22
24	8,000-10,000	1.0	3.0	.13	.45	1.0	3A998-10	3A1002-10
24	6,000- 7,000	.8	2.4	.08	.30	.6	3A998-11	3A1002-11
50	14,300-17,000	.7	5.4	.11	.30	1.5	3A998-25	3A1002-25
50	9,500-11,500	1.0	3.5	.07	.30	.7	3A998-16	3A1002-16
50	8,000-10,000	1.0	2.8	.07	.20	.5	3A998-12	3A1002-12
50	6,700- 8,000	.8	2.5	.05	.16	.4	3A998-15	3A1002-15
50	4,600- 5,500	.8	1.7	.04	.12	.2	3A998.13	3A1002-13

GLOBE TRW

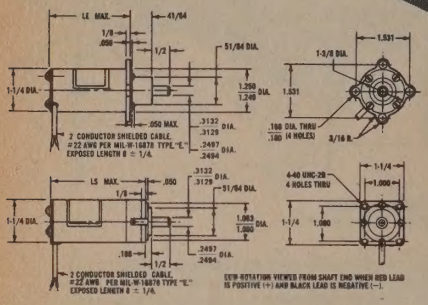
D.C. PERMANENT MAGNET PLANETARY GEARMOTORS

Type MM & LL

(Bulletin A-2030N)



EARED FLANGE



SQUARE FLANGE

Globe's Type MM and LL planetary gearmotors provide t 1,000 oz. in. Gearmotors are 1¼" in diameter and are avai eared or square flanges as shown above. Over-all length ran 5" depending upon speed reduction ratio. Eighteen different ratios, from 18.78:1 to 21,808:1, are available. These comp gearmotors are designed to meet environmental portions f M-8609.

Please submit complete application details for a Globe en recommendation.

torque: Up to 1250 oz. in. maximum continuous torque.
voltage: 4 to 75 v.d.c.
size: 1¼" diameter. Length depends on reduction ratio.
weight: 6 to 14 ounces depending on ratio.
gears: Planetary gearing system. All gears are precision man and heat treated for consistently reliable performance and lo
backlash: Varies with reduction but average unit will have les
protection: Gearmotor housing is cadmium plated to confor P-416 Type 2 for protection against moisture, fungus and sal
bearings: Output shaft is supported by life-lubed ball bearings
shaft: Shaft is No. 416 precision ground stainless steel per heat treated. Shaft and last gear carrier are of one-piece co for maximum reliability.
electrical connection: Two shielded cables #22 AWG per Mil (NAVY) Type "E."
mounting: Standard flange — four through holes.

Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

STANDARD GEARMOTOR PART NUMBERS AND DATA

SPEED REDUCTION RATIO	MAXIMUM CONTINUOUS TORQUE (oz. in.)	TORQUE MULTIPLIER RATIO	TYPE MM GEARMOTOR PART NUMBERS*						TYPE LL GEARMOTOR PART NUMBERS*				
			eared flange (3/16" shaft)	eared flange (1/4" shaft)	square flange (3/16" shaft)	square flange (1/4" shaft)	dim. LE	dim. LS	eared flange (3/16" shaft)	eared flange (1/4" shaft)	square flange (3/16" shaft)	square flange (1/4" shaft)	dim. LE
18.78	20	12	5A537	5A2292	5A538	5A2312	2.437	2.891	5A501	5A2332	5A502	5A2352	2.781
27.94	29	17	5A539	5A2293	5A540	5A2313			5A503	5A2333	5A504	5A2353	
81.37	70	41	5A541	5A2294	5A542	5A2314	2.562	3.016	5A505	5A2334	5A506	5A2354	2.928
121.10	105	62	5A543	5A2295	5A544	5A2315			5A507	5A2335	5A508	5A2355	
147.70	128	75	5A545	5A2296	5A546	5A2316			5A509	5A2336	5A510	5A2356	
352.60	247	145	5A547	5A2297	5A548	5A2317	2.828	3.281	5A511	5A2337	5A512	5A2357	3.187
524.60	366	215	5A549	5A2298	5A550	5A2318			5A513	5A2338	5A514	5A2358	
639.90	445	262	5A551	5A2299	5A552	5A2319			5A515	5A2339	5A516	5A2359	
780.60	544	320	5A553	5A2300	5A554	5A2320			5A517	5A2340	5A518	5A2360	
1528.00	850**	500	5A555	5A2301	5A556	5A2321	3.203	3.656	5A519	5A2341	5A520	5A2361	3.562
2273.00	1250**	740	5A557	5A2302	5A558	5A2322			5A521	5A2342	5A522	5A2362	
3382.00	1250**	1100	5A559	5A2303	5A560	5A2323			5A523	5A2343	5A524	5A2363	
4126.00	1250**	1350	5A561	5A2304	5A562	5A2324			5A525	5A2344	5A526	5A2364	
6621.00	1250**	1730	5A563	5A2305	5A564	5A2325	3.344	3.797	5A527	5A2345	5A528	5A2365	3,687
9851.00	1250**	2580	5A565	5A2306	5A566	5A2326			5A529	5A2346	5A530	5A2366	
12016.00	1250**	3150	5A567	5A2307	5A568	5A2327			5A531	5A2347	5A532	5A2367	
17879.00	1250**	4700	5A569	5A2308	5A570	5A2328			5A533	5A2348	5A534	5A2368	
21808.00	1250**	5700	5A571	5A2309	5A572	5A2329			5A535	5A2349	5A536	5A2369	

MM MOTORS

Volts	No Load Speed (rpm)	Rated Torque (oz. in.)	Nom. Breakaway Torque (oz. in.)	Gearmotor No Load Current Max. (amps)	Max. Current at Rated Torque (amps)	Nominal Stall Current (amps)	Winding Dash Number
4	16,000-19,000	.25	6.2	1.86	2.4	24.0	—23
6	18,900-22,500	.5	7.2	1.42	2.3	17.0	—14
6	15,600-18,600	.85	6.0	1.15	2.3	10.0	—6
6	12,000-14,000	.75	4.5	.96	2.0	9.0	—5
12	18,000-21,400	.50	6.8	.69	1.2	8.7	—24
12	14,500-17,000	.70	4.0	.60	1.2	6.0	—3
12	12,400-14,700	.75	4.7	.50	1.2	5.0	—21
12	11,000-13,000	1.0	4.0	.44	1.2	3.7	—4
24	19,200-22,800	.35	7.3	.39	.60	6.3	—7
24	16,000-19,000	.60	4.8	.31	.60	3.7	—1
24	11,500-14,000	1.0	4.0	.22	.60	2.2	—2
24	10,700-12,700	1.0	4.1	.21	.60	1.8	—8
24	9,600-11,400	1.0	3.6	.19	.50	1.3	—22
24	8,000-10,000	1.0	3.0	.16	.45	1.0	—10
24	6,000-7,000	.8	2.4	.11	.30	.6	—11
50	14,300-17,000	.7	5.4	.14	.30	1.5	—25
50	9,500-11,500	1.0	3.5	.09	.30	.7	—16
50	8,000-10,000	1.0	2.8	.08	.20	.5	—12
50	6,700-8,000	.8	2.5	.06	.16	.4	—15
50	4,600-5,500	.8	1.7	.05	.12	.2	—13

LL MOTORS

Volts	No Load Speed (rpm)	Rated Torque (oz. in.)	Nom. Breakaway Torque (oz. in.)	Gearmotor No Load Current Max. (amps)	Max. Current at Rated Torque (amps)	Nominal Stall Current (amps)
6	15,600-18,500	1.0	12.0	1.53	2.7	16.0
6	12,500-14,500	1.3	9.5	1.20	2.4	15.0
6	10,000-12,200	1.6	8.0	1.05	2.6	13.0
6	7,600-9,400	1.6	6.0	.78	2.0	8.0
12	11,500-14,000	1.1	8.0	.63	1.7	7.0
12	9,000-11,000	1.7	5.2	.47	1.2	4.5
24	16,000-19,000	.75	8.8	.45	1.0	7.5
24	14,400-17,000	.85	7.8	.38	.85	6.0
24	12,000-14,500	1.0	7.5	.33	.80	5.2
24	10,400-12,300	1.1	6.2	.28	.75	3.3
24	7,400-8,900	1.6	5.5	.20	.70	2.1
24	6,900-8,200	1.8	3.8	.19	.65	1.6
24	6,200-7,400	1.8	3.4	.17	.60	1.3
24	5,200-6,200	1.2	2.8	.15	.45	1.2
50	7,600-9,400	1.5	7.5	.10	.25	1.1
75	14,000-17,000	1.0	10.0	.12	.29	1.9
75	9,000-11,000	1.7	8.0	.08	.29	1.0
75	8,000-10,000	1.8	6.0	.07	.26	.6
75	6,500-8,000	1.2	5.5	.06	.20	.4
75	4,500-5,300	1.0	2.5	.05	.10	.2

WHEN YOU ORDER

***Part Number.** Each of the basic motor windings (bottom chart) can be used with any of the gear ratios listed in the top chart. To order, state the gearmotor part number plus a motor winding dash number. EXAMPLE: 5A537-1 is an 18.78:1 MM gearmotor with a —1 armature winding, 24 volts, 17,500 rpm, 0.5 oz. in. torque, etc.

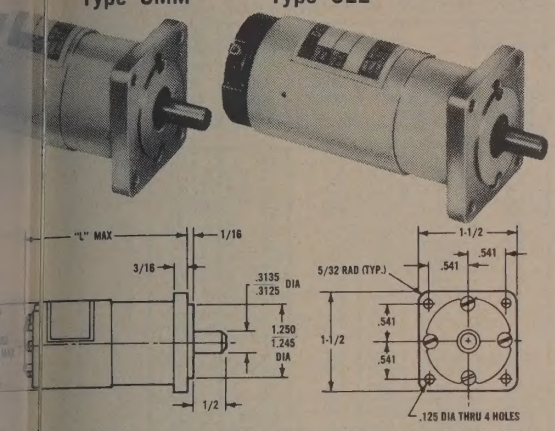
To Find Output Torque: maximum continuous output torq gearmotor is the product of motor torque times the torque r ratio. This figure is limited by the maximum continuous tor in the chart above.

**1/4" dia. shaft units limited to 600 oz. in. maximum continuous duty torque. Use 3/16" dia. shaft if torque requirements exceed this value.

ERMANENT MAGNET ITARY GEARMOTORS (Bulletin A-2029N)

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

Type CMM Type CLL



e sure check Globe for latest data prior to preparing spec. control prints.

Type CMM and CLL gear- s are rugged, high-quality com ing Type CMM and comm cial motors with a n pla tary geartrain offer- a stan ard speed reduction from 1 to 46,656:1 with num ntinuous torque up 50 oz n. These gearmotors sign for application where size reliability and high are esired.

Up 1250 oz. in continu- uty.

Th CMM — 4 to 50 Type LL — 6 to 75 v.d.c. 1¼" iameter. Length de- on r ratio chosen. 6 14 oz., depending on

gears: Planetary gearing system. All gears are precision manufactured and heat treated for consistently reliable performance and long life.
backlash: Varies with ratio, but average unit will have less than 3°.
protection: Open type motor is standard. Enclosed types can be provided.
bearings: Motor output shaft has life-lubed ball bearings; geartrain output shaft life-lubed sleeve bearing.
shaft: Standard shaft is precision-ground case-hardened steel.
electrical connection: Solder terminals.
mounting: Units are mounted by means of pilot and four holes in flange.

MTOR DATA

Load Speed (rpm)	Rated Torque (oz. in.)	Nom. Breakaway Torque (oz. in.)	Gearmotor No Load Current Max. (amps)	Max. Current at Rated Torque (amps)	Nom. Stall Current (amps)	Winding Dash Number
CMM MOTORS						
16,0-19,000	.25	6.2	2.22	2.4	24.0	—23
18,9-22,500	.5	7.2	1.64	2.3	17.0	—14
15,6-18,600	.85	6.0	1.30	2.3	10.0	—6
12,0-14,000	.75	4.5	1.12	2.0	9.0	—5
18,0-21,400	.50	6.8	.82	1.2	8.7	—24
14,5-17,000	.70	4.0	.70	1.2	6.0	—3
12,4-14,700	.75	4.7	.61	1.2	5.0	—21
11,0-13,000	1.0	4.0	.52	1.2	3.7	—4
19,2-22,800	.35	7.3	.47	.60	6.3	—7
16,0-19,000	.60	4.8	.37	.60	3.7	—1
11,5-14,000	1.0	4.0	.26	.60	2.2	—2
10,7-12,700	1.0	4.1	.225	.60	1.8	—8
9,6-11,400	1.0	3.6	.22	.50	1.3	—22
8,0-10,000	1.0	3.0	.19	.45	1.0	—10
6,0-7,000	.8	2.4	.14	.30	.6	—11
14,3-17,000	.7	5.4	.16	.30	1.5	—25
9,5-11,500	1.0	3.5	.12	.30	.7	—16
8,0-10,000	1.0	2.8	.10	.20	.5	—12
6,7-8,000	.8	2.5	.08	.16	.4	—15
4,0-5,500	.8	1.7	.06	.12	.2	—13
CLL MOTORS						
15,0-18,500	1.0	12.0	1.66	2.7	16.0	—23
12,0-14,500	1.3	9.5	1.30	2.4	15.0	—14
10,0-12,200	1.6	8.0	1.16	2.6	13.0	—6
7,0-9,400	1.6	6.0	.86	2.0	8.0	—5
11,0-14,000	1.1	8.0	.73	1.7	7.0	—24
9,0-11,000	1.7	5.2	.51	1.2	4.5	—3
16,0-19,000	.75	8.8	.53	1.0	7.5	—21
14,0-17,000	.85	7.8	.44	.85	6.0	—4
12,0-14,500	1.0	7.5	.38	.80	5.2	—7
10,0-12,300	1.1	6.2	.32	.75	3.3	—1
7,0-8,900	1.6	5.5	.24	.70	2.1	—2
6,0-8,200	1.8	3.8	.21	.65	1.6	—8
6,0-7,400	1.8	3.4	.19	.60	1.3	—22
5,0-6,200	1.2	4.8	.17	.45	1.2	—10
7,0-9,400	1.5	7.5	.11	.25	1.1	—11
14,0-17,000	1.0	10.0	.14	.29	1.9	—25
9,0-11,000	1.7	8.0	.10	.29	1.0	—16
8,0-10,000	1.8	6.0	.08	.26	.6	—12
6,0-8,000	1.2	5.5	.075	.20	.4	—15
4,0-5,300	1.0	2.5	.06	.10	.2	—13

STANDARD PART NUMBERS AND DATA

Speed Reduction Ratio	Torque Multiplier	Max. Cont. Torque (oz. in.)	TYPE CMM GEARMOTOR dim. "L"	TYPE CMM GEARMOTOR part no.*	TYPE CLL GEARMOTOR dim. "L"	TYPE CLL GEARMOTOR part no.*
4:1	3.0	5.1	2.86	317A102	3.22	319A100
5:1	3.8	6.5	2.86	317A103	3.22	319A101
6:1	4.5	7.7	2.86	317A104	3.22	319A102
16:1	10	17	3.11	317A105	3.45	319A103
20:1	13	22	3.11	317A106	3.45	319A104
24:1	15	26	3.11	317A107	3.45	319A105
25:1	16	27	3.11	317A108	3.45	319A106
30:1	19	32	3.11	317A109	3.45	319A107
36:1	23	39	3.11	317A110	3.45	319A108
64:1	33	56	3.34	317A111	3.69	319A109
80:1	41	70	3.34	317A112	3.69	319A110
96:1	49	83	3.34	317A113	3.69	319A111
100:1	51	87	3.34	317A114	3.69	319A112
120:1	61	104	3.34	317A115	3.69	319A113
125:1	64	109	3.34	317A116	3.69	319A114
144:1	74	126	3.34	317A117	3.69	319A115
150:1	77	131	3.34	317A118	3.69	319A116
180:1	92	156	3.34	317A119	3.69	319A117
216:1	110	187	3.34	317A120	3.69	319A118
256:1	105	179	3.58	317A121	3.92	319A119
320:1	130	221	3.58	317A122	3.92	319A120
384:1	157	267	3.58	317A123	3.92	319A121
400:1	164	279	3.58	317A124	3.92	319A122
480:1	197	335	3.58	317A125	3.92	319A123
500:1	205	349	3.58	317A126	3.92	319A124
576:1	235	401	3.58	317A127	3.92	319A125
600:1	246	418	3.58	317A128	3.92	319A126
625:1	256	435	3.58	317A129	3.92	319A127
720:1	295	502	3.58	317A130	3.92	319A128
750:1	306	520	3.58	317A131	3.92	319A129
864:1	352	598	3.58	317A132	3.92	319A130
900:1	370	629	3.58	317A133	3.92	319A131
1024:1	334	568	3.81	317A134	4.16	319A132
1080:1	442	757	3.58	317A135	3.92	319A133
1280:1	416	707	3.81	317A136	4.16	319A134
1296:1	530	901	3.58	317A137	3.92	319A135
1536:1	500	850	3.81	317A138	4.16	319A136
1600:1	522	887	3.81	317A139	4.16	319A137
1920:1	625	1063	3.81	317A140	4.16	319A138
2000:1	652	1108	3.81	317A141	4.16	319A139
2304:1	750	1250	3.81	317A142	4.16	319A140
2400:1	780	1250	3.81	317A143	4.16	319A141
2500:1	815	1250	3.81	317A144	4.16	319A142
2880:1	940	1250	3.81	317A145	4.16	319A143
3000:1	980	1250	3.81	317A146	4.16	319A144
3125:1	1020	1250	3.81	317A147	4.16	319A145
3456:1	1130	1250	3.81	317A148	4.16	319A146
3600:1	1170	1250	3.81	317A149	4.16	319A147
3750:1	1220	1250	3.81	317A150	4.16	319A148
4096:1	1070	1250	4.03	317A151	4.39	319A149
4320:1	1410	1250	3.81	317A152	4.16	319A150
4500:1	1470	1250	3.81	317A153	4.16	319A151
5120:1	1340	1250	4.03	317A154	4.39	319A152
5184:1	1690	1250	3.81	317A155	4.16	319A153
5400:1	1760	1250	3.81	317A156	4.16	319A154
6144:1	1610	1250	4.03	317A157	4.39	319A155
6400:1	1680	1250	4.03	317A158	4.39	319A156
6480:1	2110	1250	3.81	317A159	4.16	319A157
7680:1	2010	1250	4.03	317A160	4.39	319A158
7776:1	2530	1250	3.81	317A161	4.16	319A159
8000:1	2100	1250	4.03	317A162	4.39	319A160
9216:1	2390	1250	4.03	317A163	4.39	319A161
9600:1	2520	1250	4.03	317A164	4.39	319A162
10,000:1	2620	1250	4.03	317A165	4.39	319A163
11,520:1	3010	1250	4.03	317A166	4.39	319A164
12,000:1	3140	1250	4.03	317A167	4.39	319A165
12,500:1	3280	1250	4.03	317A168	4.39	319A166
13,824:1	3620	1250	4.03	317A169	4.39	319A167
14,400:1	3780	1250	4.03	317A170	4.39	319A168
15,000:1	3940	1250	4.03	317A171	4.39	319A169
15,625:1	4100	1250	4.03	317A172	4.39	319A170
17,280:1	4520	1250	4.03	317A173	4.39	319A171
18,000:1	4710	1250	4.03	317A174	4.39	319A172
18,750:1	4910	1250	4.03	317A175	4.39	319A173
20,736:1	5430	1250	4.03	317A176	4.39	319A174
21,600:1	5660	1250	4.03	317A177	4.39	319A175
22,500:1	4900	1250	4.03	317A178	4.39	319A176
25,920:1	6790	1250	4.03	317A179	4.39	319A177
27,000:1	7070	1250	4.03	317A180	4.39	319A178
31,104:1	8150	1250	4.03	317A181	4.39	319A179
32,400:1	8500	1250	4.03	317A182	4.39	319A180
38,880:1	10200	1250	4.03	317A183	4.39	319A181
46,656:1	12200	1250	4.03	317A184	4.39	319A182

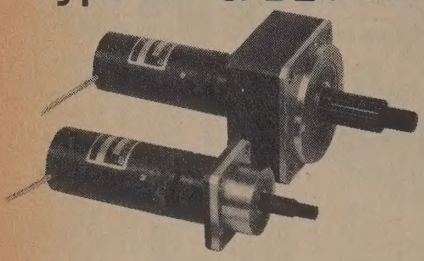
WHEN YOU ORDER

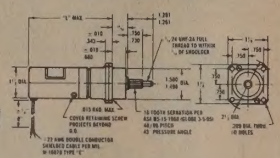
***Part Number.** Units described are standard and may be ordered by part number. Complete part number consists of the basic part number followed by the armature dash number. Consult Globe for other voltages and variations for special applications.

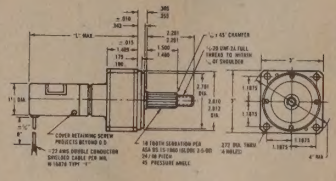
GLOBE TRW

D.C. PERMANENT MAGNET PLANETARY GEARMOTORS

Type BD & BL (Bulletin A-2430N)







Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

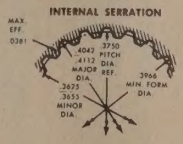
Globe's 1½" diameter planetary geartrains provide high torque outputs in a small package. Coupled to the Globe Type BD or BL motor, they are ideal for business machinery, machine tools, aircraft, and missile applications.

Anti-friction bearings in each planetary gear stage result in efficiencies of over 90% per stage. Two geartrain sizes, 1⅞" Flange and 3" Flange, provide continuous duty output torques to 100 lb. in. and 550 lb. in. respectively.

These geartrains can also be integrally coupled with other Globe units, including a.c. and universal motors. Consult Globe for an engineering recommendation to meet your requirements.

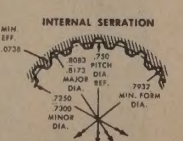
rating: To 550 lb. in. continuous duty. To 1,100 lb. in. intermittent duty.
voltage: 6 to 115 v.d.c.
weight: Varies with motor and gear reduction ratio.
gears: Precision manufactured and heat treated for reliable performance and long life.
backlash: Varies with ratio, but maximum backlash is 3°.
protection: Motor housing is black anodized per MIL-A-8625 Type II. Unit is designed for protection against moisture, fungus, shock, and salt spray. Geartrain housing is protected by paint and irridite. Normal operating temperature range is —55°C to +85°C.
bearings: Anti-friction ball or roller bearings are used at every bearing location including all planet gears.
lubrication: Life-lubricated bearings and geartrains are standard. Consult Globe about special lubricants for temperature extremes.
shaft: Carbon steel shaft per QQ-S-624 with 18 tooth spline serrations per ASA B5. 15-1960 heat treated to Rc 45-48 (1⅞" flange) and Rc 29-33 (3" flange).
electrical connection: Double conductor shielded cable (#22 AWG) per MIL-W-16878 Type "E".
mounting: Four holes and pilot are standard.

SHAFT DATA: 1⅞" FLANGE



MIN. EFF. .0357	CIRCULAR TOOTH THICKNESS	MIN. EFF. .0369
	NUMBER OF TEETH	18
	PITCH	48/96
	PRESSURE ANGLE	45°
	LENGTH OF ENGAGEMENT	¾ REF.
.4397	MIN. MEAS. OVER TWO .040 PINS	
	MAX. MEAS. BETWEEN TWO .040 PINS	.3175
	Customer's Part: For prototype use, Globe will broach holes in parts with .3575/.3585 I.D. broach hole start-ing diameter.	

SHAFT DATA: 3" FLANGE



MIN. EFF. .0726	CIRCULAR TOOTH THICKNESS	MAX. EFF. .0750
	NUMBER OF TEETH	18
	PITCH	24/48
	PRESSURE ANGLE	45°
	LENGTH OF ENGAGEMENT	1½ REF.
.8818	MIN. MEAS. OVER TWO .080 PINS	
	MAX. MEAS. BETWEEN TWO .080 PINS	6322
	Customer's Part: For prototype use, Globe will broach holes in parts with .7195/.7205 I.D. broach hole start-ing diameter.	

BASIC MOTOR PERFORMANCE AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	gear-motor max. no. load (amps)†*	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)
TYPE BD						
6	13,000-15,500	1.7	14	1.70	4.5	34.0
6	10,000-12,000	2.3	13	1.40	4.6	24.0
6	8,000- 9,500	3.2	12	1.10	4.6	17.0
12	12,500-14,500	1.8	17	.85	2.3	19.0
12	10,000-12,000	2.4	13	.70	2.3	12.5
12	8,000- 9,500	3.2	12	.55	2.3	8.4
27	14,000-16,500	1.6	19	.45	1.0	11.8
27	11,000-13,000	2.0	18	.39	1.0	8.8
27	9,000-10,500	2.8	15	.27	1.0	5.3
27	7,000- 8,500	3.6	14	.23	1.0	3.5
50	10,500-12,500	2.1	17	.18	.5	4.3
50	8,000- 9,500	2.8	14	.145	.5	2.8
50	6,500- 8,000	3.7	13	.11	.5	1.9
50	5,000- 6,500	3.5	11	.09	.4	1.3
115	13,000-15,500	1.6	17	.10	.3	2.1
115	11,000-13,000	2.2	14	.08	.3	1.5
115	9,000-10,500	2.8	12	.07	.3	1.1
115	7,000- 8,500	3.6	11	.065	.3	.7
115	6,000- 7,000	2.9	10	.05	.2	.5
115	4,500- 5,500	2.7	9	.045	.2	.5
TYPE BL						
6	10,000-12,500	3.3	24	1.60	5.2	39.0
6	8,500-10,500	4.0	20	1.30	5.2	28.0
6	6,500- 8,000	5.0	17	1.00	5.1	21.0
12	10,000-12,500	3.3	24	.77	2.6	24.0
12	8,500-10,500	4.4	21	.61	2.7	15.5
12	6,500- 8,000	5.0	18	.49	2.8	10.5
27	11,500-14,000	2.9	28	.44	1.4	16.0
27	8,500-10,500	3.7	27	.31	1.4	11.0
27	7,000- 9,000	5.0	23	.25	1.4	7.0
27	5,500- 7,000	6.0	21	.20	1.4	5.5
50	8,500-10,500	3.8	29	.17	.72	6.5
50	6,500- 8,000	5.0	25	.13	.74	4.5
50	5,500- 7,000	6.5	21	.10	.73	3.2
50	4,500- 5,500	7.5	19	.085	.66	2.0
50	3,500- 4,500	6.0	18	.065	.43	1.4
115	8,500-10,500	4.2	19	.075	.34	1.6
115	7,000- 9,000	5.0	18	.065	.40	1.2
115	5,500- 7,000	5.0	15	.050	.28	0.8
115	4,500- 5,500	4.2	14	.040	.19	0.6
115	4,000- 5,000	3.5	11	.035	.14	0.4
115	3,000- 4,000	2.9	9.5	.030	.10	0.3

STANDARD PART NUMBERS AND GEARMOTOR D

SPEED REDUCTION RATIO	TORQUE MULTI-PLIER	MAX. CONT. RATING (lb. in.)	TYPE BD "L" max.	TYPE BD standard part no.*	TYPE "L" max.	TYPE
1⅞" FLANGE						
3.81:1	3.5	1.1	3.34	102A152	3.72	
5.54:1	5.1	1.6		102A153		
14.5 :1	13	4.1	3.53	102A156	3.91	
21.1 :1	19	6.0		102A157		
30.7 :1	27	8.6		102A158		
55.3 :1	47	14.6	4.09	102A160	4.47	
80.4 :1	68	21.0		102A161		
117.0 :1	99	31.0		102A162		
170.0 :1	144	45.0		102A163		
211.0 :1	171	53.0	4.28	102A189	4.66	
306.0 :1	248	77.0		102A190		
445.0 :1	360	100.0		102A191		
647.0 :1	524	100.0		102A192		
941.0 :1	762	100.0		102A193		
3" FLANGE						
306:1	248	77	5.17	102A165	5.55	
445:1	360	112		102A166		
647:1	524	164		102A167		
941:1	762	238		102A168		
1166:1	896	280	5.34	102A194	5.72	
1696:1	1305	407		102A195		
2466:1	1900	550		102A196		
3584:1	2760	550		102A197		
5211:1	4000	550		102A198		

WHEN YOU ORDER

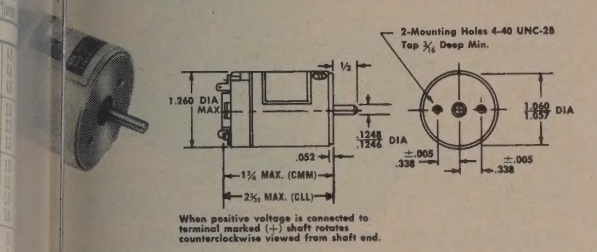
***Part Number.** Complete part number consists of gearmotor ber from STANDARD PART NUMBERS table plus dash num BASIC MOTOR PERFORMANCE table to designate armature. E P/N 102A152-9 is a Type BD planetary gearmotor with 1 reduction ratio of 3.81:1; 27 v.d.c.; and a nominal no-load mo of 12,000 rpm.

Maximum Torque. Maximum intermittent torque is twice value. Momentary stall or impact torque should not exceed the rated value, or internal damage to the geartrain may res mum continuous output torque of the gearmotor is the prod motor torque times the torque multiplier ratio. This value by the maximum continuous torque.

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

ERMANENT MAGNET MOTORS

CMM & CLL (Bulletin A-2009N)



e sure check Globe for latest data prior to preparing spec. control prints.

e Type CMM & CLL motors are designed for applications which ire sm size, reliability and high torque. Planetary geartrains are lable in wide range of speed reductions. Bulletin E-2029N.

CMM CLL motors are commercial versions of Globe military ors and ave the same performance characteristics.

se sub t details to Globe for an engineering recommendation.

ng: CM 1/100 hp continuous duty, 8,000 to 18,000 rpm.
ng: CM 1/100 hp continuous duty, 8,000 to 18,000 rpm. CLL: 1/65
continu s duty at 6,000 to 15,000 rpm. Higher speeds available
reduc performance.
age: 4 75 v.d.c.
ght: CM 3.5 oz. CLL: 5.2 oz.
ature: cuum impregnated with fungus-resistant varnish.
nets: ico V
ings: uble-shielded, life-lubricated ball bearings.
me: Po pieces are die-cast into aluminum frame by patented
ess.
ft: Pre ion ground stainless steel.
bell: R cision molded diallyl phthalate.
trical nnection: Solder terminals.
ersibil Motors reverse when terminal voltage is reversed.
unting: ounting can be made by tapped holes on front face or with
-magn c clamp around motor.

EN YU ORDER

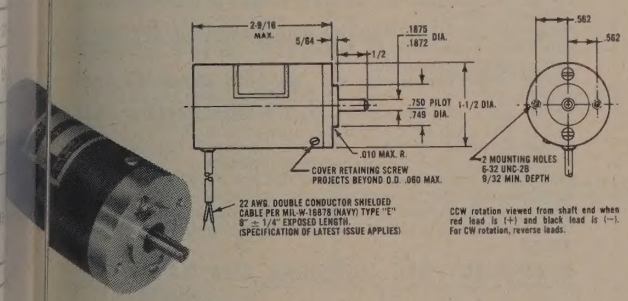
rt Nu er. Units shown above are standard and may be ordered by
numb . See the introduction to this catalog section for assistance
h sele ng the proper unit to meet your requirements. Please
sult G be for variations to suit specific applications.

STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	Standard Part No.*
TYPE CMM							
4	16,000-19,000	.25	6.2	1.5	2.4	24.0	235A106-23
6	18,900-22,500	.5	7.2	1.2	2.3	17.0	235A106-14
6	15,600-18,600	.85	6.0	1.0	2.3	10.0	235A106-6
6	12,000-14,000	.75	4.5	.80	2.0	9.0	235A106-5
12	18,000-21,400	.5	6.8	.56	1.2	8.7	235A106-24
12	14,500-17,000	.70	4.0	.50	1.2	6.0	235A106-3
12	12,400-14,700	.75	4.7	.40	1.2	5.0	235A106-21
12	11,000-13,000	1.0	4.0	.35	1.2	3.7	235A106-4
24	19,200-22,800	.35	7.3	.30	.60	6.3	235A106-7
24	16,000-19,000	.6	4.8	.25	.60	3.7	235A106-1
24	11,500-14,000	1.0	4.0	.18	.60	2.2	235A106-2
24	10,700-12,700	1.0	4.1	.17	.60	1.8	235A106-8
24	9,600-11,400	1.0	3.6	.15	.5	1.3	235A106-22
24	8,000-10,000	1.0	3.0	.13	.45	1.0	235A106-10
24	6,000-7,000	.8	2.4	.08	.30	.6	235A106-11
50	14,300-17,000	.7	5.4	.11	.30	1.5	235A106-25
50	9,500-11,500	1.0	3.5	.07	.30	.7	235A106-16
50	8,000-10,000	1.0	2.8	.07	.20	.5	235A106-12
50	6,700-8,000	.8	2.5	.05	.16	.4	235A106-15
50	4,600-5,500	.8	1.7	.04	.12	.2	235A106-13
TYPE CLL							
6	15,600-18,500	1.0	12.0	1.4	2.7	16.0	313A102-23
6	12,500-14,500	1.3	9.5	1.1	2.4	15.0	313A102-14
6	10,000-12,200	1.6	8.0	.95	2.6	13.0	313A102-6
6	7,600-9,400	1.6	6.0	.70	2.0	8.0	313A102-5
12	11,500-14,000	1.1	8.0	.52	1.7	7.0	313A102-24
12	9,000-11,000	1.7	5.2	.42	1.2	4.5	313A102-3
24	16,000-19,000	.75	8.8	.36	1.0	7.5	313A102-21
24	14,400-17,000	.85	7.8	.32	.85	6.0	313A102-4
24	14,000-17,000	1.0	7.5	.28	.80	5.2	313A102-7
24	10,400-12,300	1.1	6.2	.23	.75	3.3	313A102-1
24	7,400-8,900	1.6	5.5	.17	.70	2.1	313A102-2
24	6,900-8,200	1.8	3.8	.16	.65	1.6	313A102-8
24	6,200-7,400	1.8	3.4	.14	.60	1.3	313A102-22
24	5,200-6,200	1.2	2.8	.12	.45	1.2	313A102-10
50	7,600-9,400	1.5	7.5	.09	.25	1.1	313A102-11
75	14,000-17,000	1.0	10.0	.10	.29	1.9	313A102-25
75	9,000-11,000	1.7	8.0	.07	.29	1.0	313A102-16
75	8,000-10,000	1.8	6.0	.06	.26	.6	313A102-12
75	6,500-8,000	1.2	5.5	.05	.20	.4	313A102-15
75	4,500-5,300	1.0	2.5	.04	.10	.2	313A102-13

.C. PERMANENT MAGNET MOTORS

ype BD (Bulletin A-2400N)



te: Be e to check Globe for latest data prior to preparing spec. control prints.

tobe The BD d.c. motors are designed to missile and aircraft stand-
rds. Se n standard armature windings provide a large number of
eed a torque characteristics in a comprehensive range of voltages.
adio n e shielding is provided by the motor design, and filters can
e supp d to meet the requirements of MIL-I-26600. For gearmotor
ata see ype BD Planetary Gearmotor Bulletin A-2430N.
lease omit complete details of your application for an engineering
ecomm dation.

ating: hp at 7,500 to 12,000 rpm continuous duty.
oltage: to 115 v.d.c.
eight: oz.
rmatu Vacuum impregnated with fungus resistant varnish. Inertia:
.4 gm.²

HEN OU ORDER

Part N ber. The above units are standard and may be ordered by
part nu er. See the introduction to this catalog section for assistance
with se ting the proper unit to meet your requirements.

protection: Cover is aluminum per QQ-A-411, black anodized per MIL-A-8625 Type II for protection against moisture, fungus, shock, and salt spray.
magnet: Alnico V.
bearings: Double-shielded ball bearings life-lubricated per MIL-G-3278.
frame: Pole pieces are die cast into aluminum frame by patented process.
shaft: Precision ground #420 stainless steel through hardened to Rc 45-50.
end bell: Metal end bell with molded plastic brush holder is standard. Iridited per MIL-C-5541.
electrical connections: Two shielded 8" leads.
reversibility: Motor reverses when lead voltage is reversed.
mounting: Standard mounting is by means of pilot and tapped holes on motor face, or by non-magnetic clamping around motor diameter.

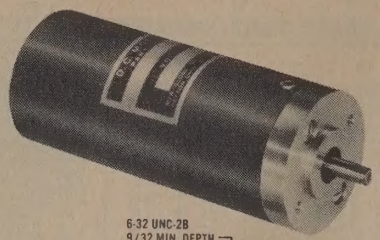
STANDARD PART NUMBERS AND DATA

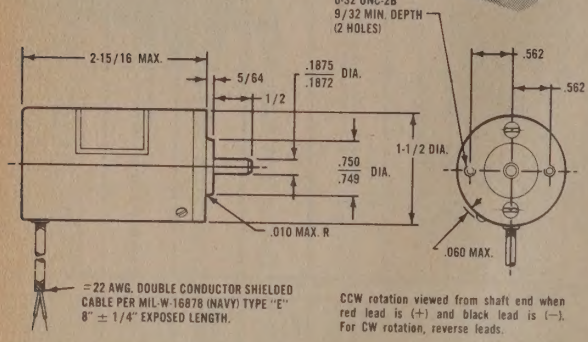
VOLTAGE (v.d.c.)	SPEED (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	Standard Part No.*
6	13,000-15,500	1.7	14	1.60	4.5	34.0	100A104-2
6	10,000-12,000	2.3	13	1.30	4.6	24.0	100A104-3
6	8,000-9,500	3.2	12	.97	4.6	17.0	100A104-4
12	12,500-14,500	1.8	17	.76	2.3	19.0	100A104-5
12	10,000-12,000	2.4	13	.60	2.3	12.5	100A104-6
12	8,000-9,500	3.2	12	.49	2.3	8.4	100A104-7
27	14,000-16,500	1.6	19	.39	1.0	11.8	100A104-8
27	11,000-13,000	2.0	18	.34	1.0	8.8	100A104-9
27	9,000-10,500	2.8	15	.24	1.0	5.3	100A104-10
27	7,000-8,500	3.6	14	.20	1.0	3.5	100A104-11
50	10,500-12,500	2.1	17	.16	.5	4.3	100A104-12
50	8,000-9,500	2.8	14	.13	.5	2.8	100A104-13
50	6,500-8,000	3.7	13	.10	.5	1.9	100A104-14
50	5,000-6,500	3.5	11	.08	.4	1.3	100A104-15
115	13,000-15,500	1.6	17	.09	.3	2.1	100A104-16
115	11,000-13,000	2.2	14	.07	.3	1.5	100A104-17
115	9,000-10,500	2.8	12	.06	.3	1.1	100A104-18
115	7,000-8,500	3.6	11	.05	.3	.7	100A104-19
115	6,000-7,000	2.9	10	.04	.2	.5	100A104-20
115	4,500-5,500	2.7	9	.04	.2	.5	100A104-21

GLOBE TRW

D.C. PERMANENT MAGNET MOTORS

Type BL (Bulletin A-2406N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

Globe Type BL d.c. motors are designed to aircraft and missile quality standards. Six standard armature windings provide a large number of speed-torque characteristics at various voltages. Radio noise shielding is provided by the motor design, and filters can be supplied to meet the requirements of MIL-I-26600. For gearmotor data, see Type BL Planetary Gearmotor bulletin A-2430N.

Please send application details for a Globe recommendation.

WHEN YOU ORDER

***Part Number.** The above units are standard and may be ordered by part number. See the introduction to this catalog section for assistance with selecting the proper unit to meet your requirements. Consult Globe for variations to suit specific applications.

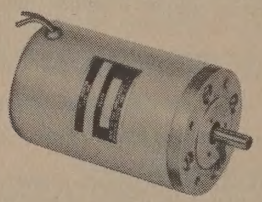
rating: 1/30 hp at 6,000 to 11,000 rpm continuous duty.
voltage: 6 to 115 v.d.c.
weight: 11.3 oz.
armature: Vacuum impregnated with fungus resistant varn 40 gm cm.²
protection: Cover is aluminum per QQ-A-411, black anodized 8625 Type II for protection against moisture, fungus, shoc spray.
magnet: Alnico V.
bearings: Double-shielded ball bearings life-lubricated per
frame: Pole pieces are die cast into aluminum frame b process.
shaft: Precision ground #420 stainless steel through hard 45-50.
end bell: Metal end bell with molded plastic brush holder i Iridited per MIL-C-5541.
electrical connections: Two shielded 8" leads.
reversibility: Motor reverses when lead voltage is reversed.
mounting: Standard mounting is by means of pilot and ta in motor face, or by non-magnetic clamping around motor

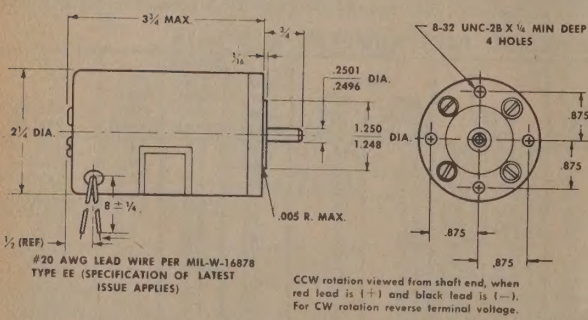
STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)
6	10,000-12,500	3.3	24	1.50	5.2	39.0
6	8,500-10,500	4.0	20	1.20	5.2	28.0
6	6,500- 8,000	5.0	17	.93	5.1	21.0
12	10,000-12,500	3.3	24	.71	2.6	24.0
12	8,500-10,500	4.4	21	.56	2.7	15.5
12	6,500- 8,000	5.0	18	.44	2.8	10.5
27	11,500-14,000	2.9	28	.40	1.4	16.0
27	8,500-10,500	3.7	27	.28	1.4	11.0
27	7,000- 9,000	5.0	23	.23	1.4	7.0
27	5,500- 7,000	6.0	21	.18	1.4	5.5
50	8,500-10,500	3.8	29	.15	.72	6.5
50	6,500- 8,000	5.0	25	.11	.74	4.5
50	5,500- 7,000	6.5	21	.09	.73	3.2
50	4,500- 5,500	7.5	19	.075	.66	2.0
50	3,500- 4,500	6.0	18	.055	.43	1.4
115	8,500-10,500	4.2	19	.065	.34	1.6
115	7,000- 9,000	5.0	18	.055	.40	1.2
115	5,500- 7,000	5.0	15	.045	.28	0.8
115	4,500- 5,500	4.2	14	.035	.19	0.6
115	4,000- 5,000	3.5	11	.030	.14	0.4
115	3,000- 4,000	2.9	9.5	.025	.10	0.3

D.C. PERMANENT MAGNET MOTORS

Type GRP (Bulletin A-3600N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

Type GRP precision permanent magnet d.c. motors provide extremely high output, and are designed to meet appropriate MIL specs.

Various armature windings can be accommodated, making it possible to meet a wide range of speed and torque characteristics.

Wound field designs are available in this frame size for series, split series, shunt, split shunt or universal operation.

Please submit application details for an engineering recommendation.

rating: 1/12 hp, at 8,000 rpm, continuous duty.
voltage: 6 to 115 v.d.c.
weight: 2 lbs. 8 oz.
armature: Impregnated with fungus resistant varnish. In gm. cm.²
protection: Housing is cadmium plated to conform to QQ-P- for protection against moisture, fungus and salt spray.
magnets: Alnico V.
bearings: Ball bearings are double-shielded, life-lubricated lubricant conforms to MIL-G-3278. Special lubricants av temperature extremes.
frame: Pole pieces are die cast into aluminum frame b technique.
shaft: #420 stainless steel shaft is through-hardened to Rc centerless ground to finish of 5 microinches.
end bell: Metal end bell with plastic brush holders is standa end bell available for special applications.
electrical connection: Two 8" leads are provided.
reversibility: Motor reverses when terminal voltage is reverse
mounting: Standard mounting is by means of pilot and tappe front face, or by clamping around motor diameter with no clamp.

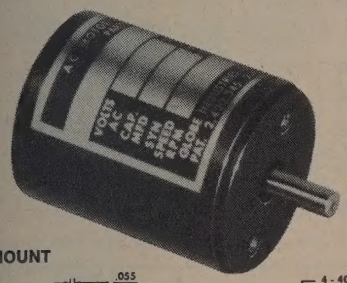
STANDARD PART NUMBERS AND DATA

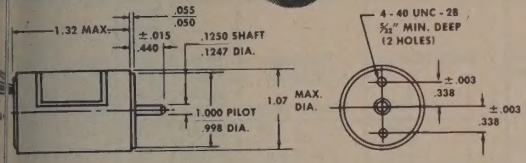
VOLTAGE (v.d.c.)	SPEED no load (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)
6	4,700- 5,300	8.0	36	2.00	7.0	28.0
12	6,300- 7,000	8.0	48	1.34	6.0	30.0
12	4,700- 5,300	12.0	44	1.00	5.8	25.0
27	8,500- 9,500	10.0	70	0.80	3.4	35.0
27	6,500- 7,300	13.0	60	0.62	3.4	22.0
27	5,300- 5,900	16.0	52	0.50	3.3	12.0
27	4,200- 4,800	16.0	52	0.40	2.7	10.0
50	6,300- 7,100	14.0	62	0.32	1.9	11.0
50	4,900- 5,500	14.5	50	0.25	1.5	6.0
50	3,900- 4,400	15.0	44	0.20	1.2	4.0
115	7,300- 8,100	12.0	70	0.16	0.90	7.0
115	5,900- 6,500	15.5	60	0.14	0.85	4.5
115	4,700- 5,300	16.0	56	0.12	0.70	3.0
115	3,700- 4,100	15.0	42	0.09	0.50	1.5
115	3,000- 3,400	14,5	44	0.07	0.45	1.3
115	2,400- 2,700	14.0	28	0.06	0.35	0.7

HYSTERESIS SYNCHRONOUS INDUCTION MOTORS

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

SC (Bulletin B-1702N)





Be sure check Globe for latest data prior to preparing spec. control prints.

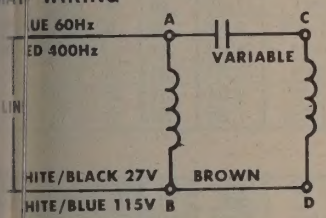
Globe Type SC a.c. motors are available in many variations. Motors are wound a) three-phase, two or four pole or b) single-phase, two, four, or six pole. Type SC motors can meet a wide range of application requirements.

Type SC motors meet environmental portions of MIL-M-7969. Integral planetary geartrains are available.

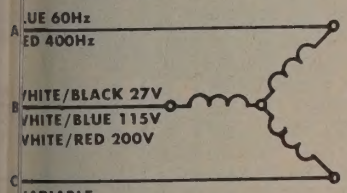
Units for other voltages and frequencies also available. Please send complete details for a recommendation by Globe application engineers.

torque: .05 to .30 oz. in. (induction). .04 to .20 oz. in. (hysteresis synchronous).
voltage: 27 to 200 v.a.c., 60 and 400 Hz.
size: 1 1/16" diameter.
weight: 2.4 oz.
nominal rotor inertia: Hysteresis synchronous; 2 pole .99 GM CM²; 4 pole .7 GM CM²; 6 pole .7 GM CM². Induction: .95 GM CM².
protection: Housing and end plate are black anodized aluminum per MIL-A-8625. Unit is designed to meet applicable portions of MIL-M-7969 including environmental protection.
winding: HML insulated magnet wire is standard.
bearings: Stainless steel ball bearings are double-shielded, life lubricated. Standard lubricant conforms to MIL-G-23827. Special lubricants for extreme temperatures are available.
shaft: Shaft is No. 416 stainless steel, centerless ground.
electrical connection: #26 AWG Teflon-coated lead wires per MIL-W-16878 Type "E"; three or four leads are standard.
reversibility: Motor can be reversed by connecting leads per schematics.
mounting: Standard mounting is by means of pilot and tapped holes in front face.

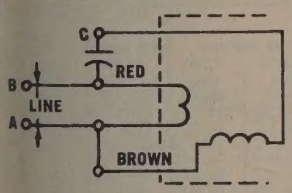
SCHEMATIC WIRING



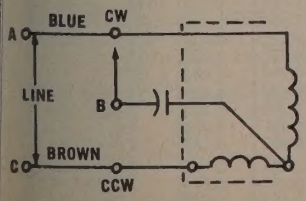
CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE C & D.



ABC PHASE SEQUENCE FOR CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE ANY TWO LEADS.



CW ROTATION VIEWED FROM SHAFT END. FOR CCW ROTATION REVERSE A AND B.



SINGLE PHASE ONLY. CAPACITOR A AND B FOR CW ROTATION VIEWED FROM SHAFT END, B TO C FOR CCW ROTATION.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage (v.a.c.)	Frequency (Hz)	Poles	Phase	Schematic Wiring	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (wvac)	Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part Number
27	400	2	1	A		Blk	1.50	100	24,000	.16	.16	11	11	53A1000-2
27	400	2	3	B		Blk	Not Req'd		24,000	.13	.13	11	11	53A1001-2
27	400	4	1	A		Grn	1.50	100	12,000	.16	.16	12	12	53A1002-2
27	400	4	3	B		Grn	Not Req'd		12,000	.20	.20	11	11	53A1003-2
27	400	6	1	C	Wht	Gry	1.50	100	8,000	.10	.10	12	12	53A111-2
115	400	2	1	A		Blk	0.068	300	24,000	.16	.16	11	11	53A1005-2
115	400	2	3	B		Blk	Not Req'd		24,000	.13	.13	11	11	53A1006-2
115	400	4	1	A		Grn	0.068	300	12,000	.16	.16	12	12	53A1007-2
115	400	4	3	B		Grn	Not Req'd		12,000	.20	.20	11	11	53A1008-2
115	400	6	1	C	Blk	Gry	0.22	300	8,000	.10	.10	15	15	53A107-2
115	60	2	1	D	Wht		2.00	200	3,600	.07	.07	8	8	53A118-2
115	60	4	1	D	Red		2.00	200	1,800	.07	.07	12	12	53A338-2
115	60	6	1	D	Blk		2.50	200	1,200	.05	.04	9	9	53A117-2
200	400	2	3	B		Blk	Not Req'd		24,000	.13	.13	11	11	53A1010-2
200	400	4	3	B		Grn	Not Req'd		12,000	.20	.20	11	11	53A1011-2

INDUCTION

Voltage (v.a.c.)	Frequency (Hz)	Poles	Phase	Schematic Wiring	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part Number
27	400	2	1	A		Blk	1.25	100	21,000	.20	.20	9	12	53A1000-1
27	400	2	3	B		Blk	Not Req'd		21,000	.30	.30	7	13	53A1001-1
27	400	4	1	A		Grn	1.50	100	10,000	.25	.25	13	13	53A1002-1
27	400	4	3	B		Grn	Not Req'd		10,000	.30	.30	11	13	53A1003-1
27	400	6	1	C	Wht	Gry	1.50	100	6,000	.20	.20	10	12	53A111-1
115	400	2	1	A		Blk	0.100	300	21,000	.20	.20	9	12	53A1005-1
115	400	2	3	B		Blk	Not Req'd		21,000	.30	.30	7	13	53A1006-1
115	400	4	1	A		Grn	0.068	300	10,000	.25	.25	13	13	53A1007-1
115	400	4	3	B		Grn	Not Req'd		10,000	.30	.30	11	13	53A1008-1
115	400	6	1	C		Blk	0.22	300	6,000	.12	.12	14	14	53A107-1
115	60	2	1	D	Wht		2.00	200	2,500	.10	.10	8	8	53A118-1
115	60	4	1	D	Red		2.00	200	1,000	.05	.05	12	12	53A338-1
115	60	6	1	D	Blk		2.50	200	500	.05	.05	11	11	53A117-1
200	400	2	3	B		Blk	Not Req'd		21,000	.30	.30	7	13	53A1010-1
200	400	4	3	B		Grn	Not Req'd		10,000	.30	.30	11	13	53A1011-1

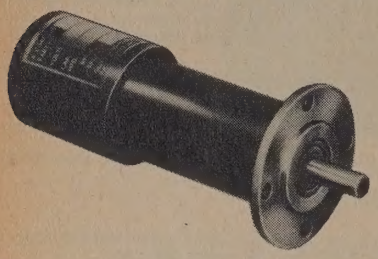
WHEN YOU ORDER

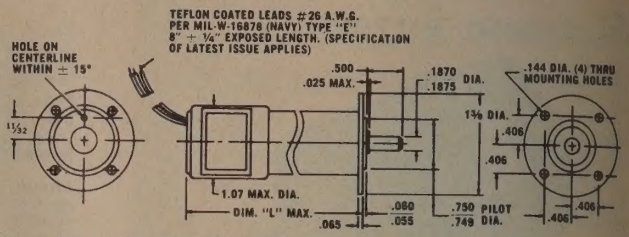
Shafts. Special shaft lengths, smaller and larger shaft diameters, flats, holes, pinions, threaded ends or tapped holes and tapers are available on standard order. Standard pinions are available with any of these units. Call Globe for complete information.

Gearmotors. Type SC motors are available with integral planetary geartrains. Please consult the Type SC Planetary Gearmotor bulletin, or send application details for a Globe recommendation.

TRW A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION PLANETARY GEARMOTORS

Type SC (Bulletin B-1732N)





This extremely small size and lightweight gearmotor consists of a precision planetary geartrain. The combination provides smooth, dependable performance and maximum output torque in the smallest possible space.

Type SC gearmotors are designed to meet military specifications, including high and low temperature and environmental protection.

Please send application details for a Globe recommendation.

torque: Maximum continuous torque to 300 oz. in. depending upon ratio.

voltage: 27, 115 or 200 v.a.c., 60 and 400 cycle.

size: Motor diameter: 1 1/16". Geartrain diameter: 7/8".

weight: Gearmotor weighs 6 to 11 ounces depending upon reduction ratio.

gears: Planetary gearing system. All gears are precision manufactured and heat-treated for consistently reliable performance and life.

backlash: Varies with reduction but average unit will have less than 3° backlash.

protection: Housing is black anodized for protection in accord with applicable portions of MIL-A-8625 (SG) Type II.

life: 1,000 hours at 12,000 rpm input at normal ratings.

bearings: Output shaft is supported by two double-shielded ball bearings.

lubrication: Life-lubricated. Standard grease used per MIL-G-23827 for temperatures from —55° to +85° C. For extreme temperatures, other lubricants available.

shaft: No. 416 stainless steel passivated per QQ-S-763.

electrical connection: Three or four wire leads are standard.

mounting: Unit is mounted by means of pilot and four holes in flange, or by clamp mounting.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage	Freq. (Hz.)	Poles	Phase	Schematic †	Lead Color B	Lead Color C	Lead Color VAR.	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load
27	400	2	1	A			BLK	1.5	100	24,000	.16	.16	11	11
27	400	2	3	B			BLK	not req'd		24,000	.13	.13	11	11
27	400	4	1	A			GRN	1.5	100	12,000	.16	.16	12	12
27	400	4	3	B			GRN	not req'd		12,000	.20	.20	11	11
115	400	2	1	A			BLK	0.068	300	24,000	.16	.16	11	11
115	400	2	3	B			BLK	not req'd		24.000	.13	.13	11	11
115	400	4	1	A			GRN	0.068	300	12,000	.16	.16	12	12
115	400	4	3	B			GRN	not req'd		12,000	.20	.20	11	11
115	400	6	1	C	BLK	GRY		0.22	300	8,000	.10	.10	15	15
200	400	2	3	B			BLK	not req'd		24,000	.13	.13	11	11
200	400	4	3	B			GRN	not req'd		12,000	.20	.20	11	11
115	60	2	1	D		WHT		2.00	200	3,600	.07	.07	8	8
115	60	6	1	D		BLK		2.50	200	1,200	.05	.05	9	9

INDUCTION

Voltage	Freq. (Hz.)	Poles	Phase	Schematic †	Lead Color B	Lead Color C	Lead Color VAR.	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Min. Speed @ Rated Load (rpm)	Motor Rated Load (oz.in.)	Motor Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load
27	400	2	1	A			BLK	1.25	100	21,000	.20	.20	9	12
27	400	2	3	B			BLK	not req'd		21,000	.30	.30	7	13
27	400	4	1	A			GRN	1.5	100	10,000	.25	.25	13	13
27	400	4	3	B			GRN	not req'd		10,000	.30	.30	11	13
115	400	2	1	A			BLK	0.10	300	21,000	.20	.20	9	12
115	400	2	3	B			BLK	not req'd		21,000	.30	.30	7	13
115	400	4	1	A			GRN	0.068	300	10,000	.25	.25	13	13
115	400	4	3	B			GRN	not req'd		10,000	.30	.30	11	13
115	400	6	1	C	BLK	GRY		0.22	300	6,000	.12	.12	14	14
200	400	2	3	B			BLK	not req'd		21,000	.30	.30	7	13
200	400	4	3	B			GRN	not req'd		10,000	.30	.30	11	13

GEARMOTOR PERFORMANCE AND DATA

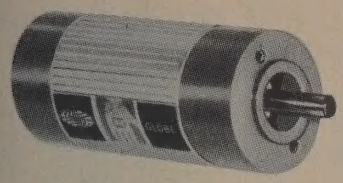
SPEED REDUCTION RATIO*	TORQ.** max. cont. limit (oz.in.)	TORQUE MULTIPLIER	OUTPUT SPEED with hysteresis synchronous drive motors 24,000 rpm input	12,000 rpm input	8,000 rpm input	3,600 rpm input	1,200 rpm input	MIN. MOTOR SPEED @ RATED LOAD with induction drive motors 21,000 rpm input	10,000 rpm input	6,000 rpm input
3.82:1	1.0	3.1	6282.272	3141.136	2104.561	942.408	314.113	5497	2617	157
5.77:1	1.5	4.6	4159.445	2079.722	1393.413	623.916	207.972	3639	1733	104
14.58:1	3.0	10.5	1646.090	823.045	551.400	246.913	82.304	1440	686	41
22.03:1	4.5	15.8	1089.423	544.711	364.956	163.413	54.471	953	454	27
33.28:1	7.0	24	721.153	360.576	241.585	108.173	36.057	631	300	18
55.66:1	10.0	34	431.189	215.594	144.447	64.678	21.559	377	179	10
84.11:1	14.0	51	285.340	142.670	95.588	42.801	14.267	250	118	7
127.10:1	21.0	77	188.827	94.413	63.256	28.324	9.441	165	78	4
192:1	30.0	117	125.000	62.500	41.875	18.750	6.250	109	52	3
321:1	45.0	166	74.766	37.383	25.046	11.214	3.738	65	31	1
485:1	70.0	250	49.484	24.742	16.577	7.422	2.474	43	21	1
733:1	100.0	382	32.742	16.371	10.968	4.911	1.637	28	14	8
1108:1	150.0	580	21.661	10.830	7.256	3.249	1.083	19	9.0	5
1853:1	200.0	817	12.951	6.475	4.338	1.942	0.647	11	5.4	3
2799:1	300.0	1,230	8.574	4.287	2.872	1.286	0.428	7.5	3.6	2
4230:1	300.0	1,860	5.673	2.836	1.900	0.851	0.283	4.9	2.4	1
6391:1	300.0	2,710	3.755	1.877	1.257	0.563	0.187	3.3	1.5	
10,689:1	300.0	3,950	2.245	1.122	0.751	0.336	0.112	1.9	.93	
16,150:1	300.0	6,000	1.486	0.743	0.498	0.223	0.074	1.3	.62	
24.403:1	300.0	9,000	0.983	0.491	0.329	0.147	0.049	.86	.41	
36,873:1	300.0	13,600	0.650	0.325	0.217	0.097	0.032	.57	.27	

†**SCHEMATIC WIRING** (See preceding page.)

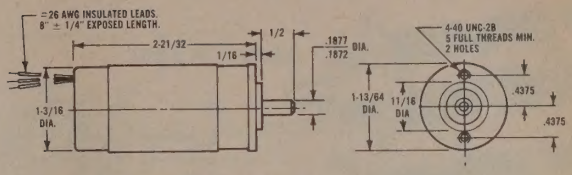
See YELLOW SECTION for Local Offices, Phones

.C. HYSTERESIS YN(HRONOUS MOTORS

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY



ype
MC
Bulletin
-190N)



Note: Be sure to creck Globe for latest data prior to preparing spec control prints.

ube Ty CMC motors are designed to meet requirements for ex-
mely c pact high-performance synchronous motors in high-quality
ustrial mmercial products. They are ideally suited to such appli-
ions as tating machines, recorders, business machines, industrial
ers, to , and controls.

que: 0 oz. in. at 3,600 rpm sync. 0.75 oz. in. at 1,800 rpm sync.
tage: 1 v.a.c., 60 cycle.
ght: 7 ounces.
or in rt: 6.5 gm. cm.²
tection Protected against dirt, moisture, shock, and vibration.
rings fe-lubricated, double-shielded ball bearings.
me: Th mosetting plastic.
ft: Pr sion-ground stainless steel.
ectrical nnection: Leads are provided.
versibility: Motor reverses by interchanging wires per schematics.
unting: Standard mounting is by means of pilot and tapped hole on
or face.

Thermosetting plastic encapsulation provides protection against shock and vibration and is impermeable to dirt and moisture.
Single phase operation requires a phasing capacitor (not furnished by Globe).
Send application details for a Globe recommendation.

STANDARD PART NUMBERS AND DATA

Voltage (v.a.c.)	Frequency (Hz)	Phase	Speed (rpm)	Torque max. start (oz. in.)	Torque max. sync. (oz. in.)	Current max. (amps)	Power Input max. (watts)	Capacitor (mfd)	Capacitor (w.v.d.c.)	Standard Part No.*
115	60	1	3,600	.70	.70	.12	11	1.2	400	144A110-2
115	60	1	1,800	.75	.75	.12	10	1.2	400	144A110-4

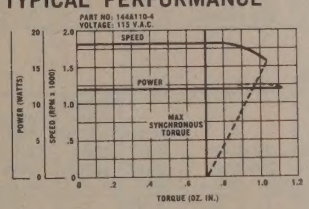
WHEN YOU ORDER

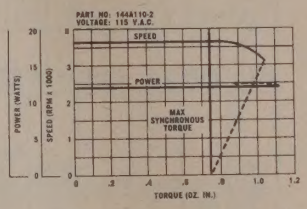
***Parts Numbers.** Units described above are hysteresis synchronous motors and may be ordered by part number. See the introduction to this catalog section for assistance with selecting the proper unit to meet your requirements.

IC WIRING

ed from shaft end. For CCW
line to blue and white (— 2)
ck (— 4).

TYPICAL PERFORMANCE





HYSTERESIS SYNCHRONOUS AND INDUCTION MOTORS

Bulletin
-2032N)

ecision miniature a.c. motors are available
e variety of performance characteristics.
rwound a) two pole — 1, or 3-phase, b) four
3-phase, and c) six pole—1-phase.

tors are designed to meet applicable portions
69 and MIL-E-5272. Integral planetary gear-
ailable. See Bulletin B-2032N.

se complete application details for a recom-
ndation.

que: 1 to 1.5 oz. in. (induction). 0.45 to 0.85 oz. in.
ysteresis synchronous).
tage: 1 and 200 v.a.c.
e: 1½ iameter.
ght: 6 ounces.
ertia: **or inertia:** Hysteresis synchronous; 2 pole
GM²; 4 pole 4.55 GM CM²; 6 pole 5 GM CM².
.6 GM CM².
tection Housing and end plate are black anodized
625. Motor is designed to meet applicable
MIL-M-7969 and MIL-E-5272.
ding: IL insulated magnet wire is standard.
rings: all bearings are double-shielded, life-lubricat-
d lubricant conforms to MIL-G-23827. Special
for temperature extremes are available.
me: Aluminum alloy.
ft: Sh is No. 416 stainless steel, centerless ground.
ectrical **onnection:** Three or four leads are standard.
versibility: Motors can be reversed by connecting leads
ematics.
unting: Standard mounting is by means of pilot and
s in front face.

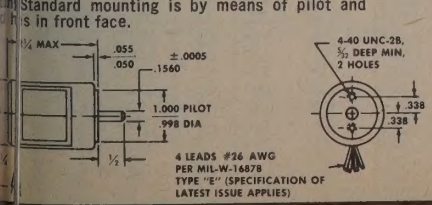
STANDARD PART NUMBERS AND DATA

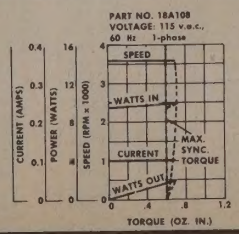
HYSTERESIS SYNCHRONOUS

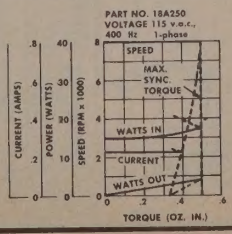
Voltage	Freq. (Hz)	Poles	Phase	Schematic	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (wvac)	Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	Part Number*
115	60	2	1	C	Wht	1.00	200	3,600	.70	.50	12	12	18A108
115	60	4	1	C	Blk	1.00	200	1,800	.65	.50	12	12	18A107
115	60	6	1	C	Yel	1.00	200	1,200	.50	.40	12	12	18A437
115	400	2	1	A	Blk	0.18	350	24,000	.80	.55	23	33	18A1003-2
115	400	2	3	B	Blk	Not Req'd		24,000	.80	.80	20	30	18A1004-2
115	400	4	1	A	Grn	0.082	500	12,000	.65	.45	17	20	18A1005-2
115	400	4	3	B	Grn	Not Req'd		12,000	.85	.85	16	21	18A1006-2
115	400	6	1	D	Gry	0.15	400	8,000	.45	.25	16	18	18A250
200	400	2	3	B	Blk	Not Req'd		24,000	.80	.80	20	30	18A1008-2
200	400	4	3	B	Grn	Not Req'd		12,000	.75	.75	14	18	18A1009-2

INDUCTION

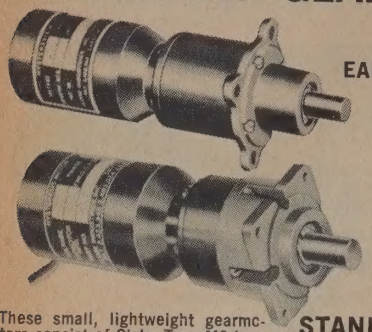
Voltage	Freq. (Hz)	Poles	Phase	Schematic	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part Number*
115	400	2	1	A	Blk	0.18	350	21,000	1.0	.8	16	32	18A1003-1
115	400	2	3	B	Blk	Not Req'd		22,000	1.5	1.5	16	40	18A1004-1
115	400	4	1	A	Grn	0.082	500	10,000	1.0	1.0	17	28	18A1005-1
115	400	4	3	B	Grn	Not Req'd		10,500	1.5	1.5	14	28	18A1006-1
200	400	2	3	B	Blk	Not Req'd		22,000	1.5	1.5	16	40	18A1008-1
200	400	4	3	B	Grn	Not Req'd		10,500	1.5	1.5	14	28	18A1009-1



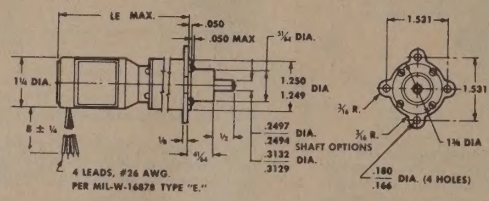




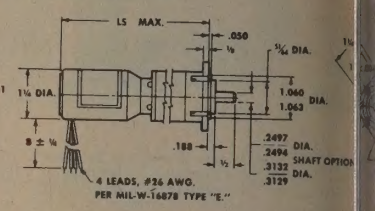
GLOBE TRW A.C. HYSTERESIS SYNCHRONOUS PLANETARY GEARMOTORS — Type MC (Bulletin B-2032N)



EARED FLANGE



SQUARE FLANGE



These small, lightweight gearmotors consist of Globe Type MC hysteresis synchronous or induction motors and a precision planetary geartrain. Type MC planetary gearmotors are designed to meet all applicable MIL-specs including high and low temperature and complete environmental protection requirements.

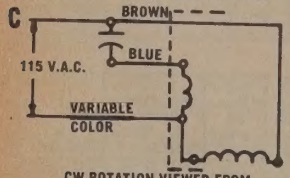
Globe Type MC motors can be furnished with either synchronous or induction rotors and wound 60 or 400 cycles, 2, 4 or 6 poles. They may be operated single, or three phase.

Please send complete details for a Globe recommendation.

torque: Up to 1250 oz. in. continuous torque. **voltage:** 115 v.a.c., 60 and 400 Hz. 200 v.a.c., 400 Hz. **size:** 1/4" dia. Length depends on ratio. **weight:** Gearmotor weighs 9 to 12½ ounces depending on ratio. **gears:** Planetary gearing system. All gears are precision manufactured and heat treated for consistently reliable performance and long life. **backlash:** Varies with ratio but average unit will have less than 3°. **protection:** Housing is black anodized per MIL-A-8625 to provide protection against moisture, fungus and salt spray. **bearings:** Output shaft is supported by two life-lubed ball bearings. **lubrication:** Units are life-lubricated. Standard lubricant used per MIL-G-7118 (geartrain) and MIL-G-3278 (motor) for temperatures from —55°C to +85°C. Special lubricants for temperature extremes and other requirements are available to suit your application. **shaft:** Shaft is No. 416 precision ground stainless steel per QQ-S-763, heat treated and black oxide coated per MIL-C-13924A Class 1. Shaft and last gear carrier are of one-piece construction for maximum reliability. Two shaft diameter options. **electrical connection:** Three or four Teflon-coated #26AWG leads per MIL-W-16878 Type "E." **mounting:** Unit is mounted by means of pilot and four holes in flange.

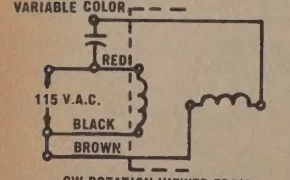
SCHEMATIC WIRING

C



CW ROTATION VIEWED FROM SHAFT END. FOR CCW ROTATION CONNECT LINE TO BLUE INSTEAD OF BROWN.

D



CW ROTATION VIEWED FROM SHAFT END. FOR CCW ROTATION REVERSE RED AND BLACK.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage	Freq. (Hz)	Poles	Phase	Schematic	Variable Lead Color	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	STANDARD PART NUMBERS* Even Ratio eared flange 1/4" shaft	Even Ratio square flange 1/4" shaft	Odd Ratio eared flange 3/4" shaft	Odd Ratio eared flange 5/16" shaft	Odd Ratio sq 1/4 sh
115	60	2	1	C	Wht	1.00	200	3,600	.70	.50	12	12	33A603	33A613	33A648	33A513	33A
115	60	4	1	C	Blk	1.00	200	1,800	.65	.50	12	12	33A604	33A614	33A649	33A514	33A
115	60	6	1	C	Red	1.00	200	1,200	.50	.40	12	12	33A1214	33A1215	33A1217	33A1216	33A
115	400	6	1	D	Gry	0.15	400	8,000	.45	.25	16	18	33A1208	33A1209	33A1211	33A1210	33A

**See "When You Order"

HYSTERESIS SYNCHRONOUS

Voltage	Freq.	Poles	Phase	Schematic	Variable Lead Color	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	STANDARD PART NU ALL RATIO eared flange 1/4" shaft	eared flange 5/16" shaft	sq 1/4 sha
115	400	2	1	A	Blk	.18	350	24,000	.80	.55	23	33	33A2008	33A2108	33A2
115	400	2	3	B	Blk	Not Req'd		24,000	.80	.80	20	30	33A2010	33A2110	33A2
115	400	4	1	A	Grn	0.082	500	12,000	.65	.45	17	20	33A2012	33A2112	33A2
115	400	4	3	B	Grn	Not Req'd		12,000	.85	.85	16	21	33A2014	33A2114	33A2
200	400	2	3	B	Blk	Not Req'd		24,000	.80	.80	20	30	33A2018	33A2118	33A2
200	400	4	3	B	Grn	Not Req'd		12,000	.75	.75	14	18	33A2020	33A2120	33A2

**See "When You Order"

INDUCTION

Voltage	Freq.	Poles	Phase	Schematic	Variable Lead Color	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Min. Speed @ Rated Load (rpm)	Motor Rated Load (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	No Load Max.	Normal Rated Load Power (watts)	STANDARD PART NU eared flange 1/4" shaft	eared flange 5/16" shaft	sq 1/4 sha
115	400	2	1	A	Blk	.18	350	21,000	1.0	0.8	16	32	33A2007	33A2107	33A2
115	400	2	3	B	Blk	Not Req'd		22,000	1.5	1.5	16	40	33A2009	33A2109	33A2
115	400	4	1	A	Grn	0.082	500	10,000	1.0	1.0	17	28	33A2011	33A2111	33A2
115	400	4	3	B	Grn	Not Req'd		10,500	1.5	1.5	14	28	33A2013	33A2113	33A2
200	400	2	3	B	Blk	Not Req'd		22,000	1.5	1.5	16	40	33A2017	33A2117	33A2
200	400	4	3	B	Grn	Not Req'd		10,500	1.5	1.5	14	28	33A2019	33A2119	33A2

**See "When You Order"

ODD RATIOS

Speed Reduction Ratio	Torque Multiplier	Geartrain Max. Cont. Rating (oz. in.)	Geartrain Efficiency (%)	FINAL OUTPUT SPEED (HYST.) 400 cycles 24,000 rpm	400 cycles 12,000 rpm	400 cycles 8,000 rpm	60 cycles 3,600 rpm	60 cycles 1,800 rpm	60 cycles 1,200 rpm	RATED LOAD (IND.) MIN. SPEED @ 400 cycles 10,000 rpm	400 cycles 10,500 rpm	400 cycles 21,000 rpm	400 cycles 22,0 rpm
4.33:1	3.2	5.4	75	5538.462	2769.231	1846.231	830.769	415.385	276.923	2309	2425	4850	508
5.28:1	4	6.8	75	4545.455	2272.727	1515.152	681.818	340.909	227.273	1894	1989	3977	416
18.78:1	12	20	64	1277.955	638.977	425.985	191.693	95,846	63.897	532	559	1118	117
27.94:1	17	29	64	858.984	429.491	286.327	128.847	64.423	42.949	358	376	752	78
81.37:1	41	70	51	294.949	147.474	98.316	44.242	22.121	14.747	123	129	258	27
121.1:1	62	105	51	198.183	99.091	66.061	29.727	14.863	9.909	83	87	173	18
147.7:1	75	128	51	162.491	81.250	54.163	24.373	12.186	8.124	68	71	142	14
352.6:1	145	247	41	68.066	34.032	22.688	10.209	5.104	3.403	28	30	60	62
524.6:1	215	366	41	45.749	22.874	15.249	6.862	3.431	2.287	19	20	40	42
639.9:1	262	445	41	37.506	18.752	12.501	5.625	2.862	1.875	16	16	33	34
780.6:1	320	544	41	30.745	15.372	10.248	4.611	2.305	1.537	13	13	27	28
1528:1	500	850*	33	15.706	7.853	5.235	2.356	1.178	.785	6.5	6.9	13	14
2273:1	740	1250*	33	10.558	5.279	3.519	1.583	.791	.527	4.4	4.6	9.2	9.6
3382:1	1100	1250*	33	7.096	3.548	2.365	1.064	.532	.354	3.0	3.1	6.2	6.5
4126:1	1350	1250*	33	5.816	2.908	1.938	.872	.436	.291	2.4	2.5	5.1	5.3
6621:1	1730	1250*	26	3.624	1.812	1.208	.543	.271	.181	1.5	1.6	3.2	3.3
9851:1	2580	1250*	26	2.436	1.218	.812	.365	.182	.121	1.0	1.1	2.1	2.2
12016:1	3150	1250*	26	1.997	.998	.665	.299	.149	.099	.83	.87	1.7	1.8
17879:1	4700	1250*	26	1.342	.671	.447	.201	.100	.067	.56	.59	1.1	1.2
21808:1	5700	1250*	26	1.100	.550	.366	.165	.082	.055	.46	.48	.96	1.0

See YELLOW SECTION for Local Offices, Phones

HYSTERESIS SYNCHRONOUS ETARY GEARMOTORS — Type MC

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

ND PERFORMANCE: EVEN RATIO

RQUE ULTI-LIER	GEAR-TRAIN MAX. CONT. RATING (oz.in.)	GEAR-TRAIN EFFI-CIENCY (%)	FINAL OUTPUT SPEED (HYST.) 400 cycles 24,000 rpm input	12,000 rpm input	8,000 rpm input	60 cycles 3,600 rpm input	1,800 rpm input	1,200 rpm input	MIN. SPEED @ RATED LOAD (IND.) 400 cycles 22,000 rpm input	21,000 rpm input	10,500 rpm input	10,000 rpm input	DIMENSION LE	LS
3.0	5.1	75	6,000.0	3,000.0	2,000.0	900.0	450.0	300.0	5,500	5,250	2,625	2,500	2.87	3.28
3.8	6.5	75	4,800.0	2,400.0	1,600.0	720.0	360.0	240.0	4,400	4,200	2,100	2,000	2.87	3.28
4.5	7.7	75	4,000.0	2,000.0	1,333.3	600.0	300.0	200.0	3,300	3,500	1,750	1,667	2.87	3.28
10	17	63	1,500.0	750.0	500.	225.0	112.5	75.0	1,375	1.313	656	625	2.87	3.28
13	22	63	1,200.0	600.0	400.0	180.0	90.0	60.0	1,100	1,050	525	500	2.87	3.28
15	26	63	1,000.0	500.0	333.3	150.0	75.0	50.0	917	875	438	417	2.87	3.28
16	27	63	960.0	480.0	320.0	144.0	72.0	48.0	880	840	420	400	2.87	3.28
19	32	63	800.0	400.0	266.6	120.0	60.0	40.0	733	700	350	333	2.87	3.28
23	39	63	666.6	333.3	222.2	100.0	50.0	33.33	611	583	292	278	2.87	3.28
33	56	52	375.0	187.5	125.0	56.2	28.12	18.75	344	328	164	156	3.02	3.42
41	70	52	300.0	150.0	100.0	45.0	22.50	15.00	275	263	131	125	3.02	3.42
49	83	52	250.0	125.0	83.3	37.5	18.75	12.50	229	219	109	104	3.02	3.42
51	87	52	240.0	120.0	80.0	36.0	18.00	12.00	220	210	105	100	3.02	3.42
61	104	52	200.0	100.0	66.6	30.0	15.00	10.00	183	175	88	83	3.02	3.42
64	109	51	192.0	96.0	64.0	28.8	14.40	9.60	176	168	84	80	3.02	3.42
74	126	51	166.6	83.3	55.555	25.0	12.50	8.333	153	146	80	69	3.02	3.42
77	131	51	160.0	80.0	53.333	24.0	12.00	8.000	147	140	70	67	3.02	3.42
92	156	51	133.33	66.66	44.444	20.0	10.00	6.666	122	117	58	56	3.02	3.42
110	187	51	111.11	55.55	38.037	16.66	8.333	5.555	102	97	49	46	3.02	3.42
105	179	41	93.75	46.87	31.250	14.06	7.031	4.687	86	82	41	39	3.28	3.68
130	221	41	75.00	37.50	25.000	11.25	5.625	3.750	69	66	33	31	3.28	3.68
157	267	41	62.50	31.25	20.833	9.37	4.687	3.125	57	55	27	26	3.28	3.68
164	279	41	60.00	30.00	20.000	9.00	4.500	3.000	55	53	26	25	3.28	3.68
197	335	41	50.00	25.00	16.666	7.50	3.750	2.500	46	44	26	21	3.28	3.68
205	349	41	48.00	24.00	16.000	7.20	3.600	2.400	44	42	21	20	3.28	3.68
236	401	41	41.66	20.83	13.888	6.25	3.125	2.083	38	36	18	17	3.28	3.68
246	418	41	40.00	20.00	13.333	6.00	3.000	2.000	37	34	18	17	3.28	3.68
256	435	41	38.40	19.20	12.800	5.76	2.880	1.920	35	34	17	16	3.28	3.68
295	502	41	33.33	16.66	11.111	5.00	2.500	1.666	31	29	15	14	3.28	3.68
306	520	41	32.00	16.00	10.666	4.80	2.400	1.600	29	28	14	13	3.28	3.68
352	598	41	27.77	13.888	9.259	4.166	2.083	1.388	25	24	12	12	3.28	3.68
370	629*	41	26.66	13.333	8.888	4.000	2.000	1.333	24	23	12	11	3.28	3.68
334	568*	33	23.43	11.718	7.812	3.516	1.758	1.172	21	21	10	9.7	3.65	4.06
442	751*	41	22.22	11.111	7.407	3.333	1.666	1.111	20	19	9.7	9.3	3.28	3.68
416	707*	33	18.75	9.375	6.250	2.812	1.406	0.9375	17	16	8.2	7.8	3.65	4.06
530	901*	41	18.51	9.259	6.172	2.777	1.388	0.9259	17	16	8.1	7.7	3.28	3.68
500	850*	33	15.62	7.812	5.208	2.344	1.172	0.7812	14	14	6.8	6.5	3.65	4.06
522	887*	33	15.00	7.500	5.000	2.250	1.125	0.7500	14	13	6.6	6.3	3.65	4.06
625	1063*	33	12.50	6.250	4.166	1.875	0.9375	0.6250	11	11	5.5	5.2	3.65	4.06
652	1108*	33	12.00	6.000	4.000	1.800	0.9000	0.6000	11	11	5.3	5.0	3.65	4.06
750	1250*	33	10.41	5.208	3.472	1.562	0.7810	0.5208	9.5	9.1	4.6	4.3	3.65	4.06
780	1250*	33	10.00	5.000	3.333	1.500	0.7500	0.5000	9.2	8.7	4.4	4.2	3.65	4.06
815	1250*	33	9.60	4.800	3.200	1.440	0.7200	0.4800	8.8	8.4	4.2	4.0	3.65	4.06
940	1250*	33	8.333	4.166	2.777	1.250	0.6250	0.4166	7.6	7.3	3.6	3.5	3.65	4.06
980	1250*	33	8.000	4.000	2.666	1.200	0.6000	0.4000	7.3	7.0	3.5	3.3	3.65	4.06
1020	1250*	33	7.680	3.840	2.560	1.152	0.5760	0.3480	7.0	6.7	3.4	3.2	3.65	4.06
1130	1250*	33	6.944	3.472	2.314	1.041	0.5205	0.3472	6.4	6.1	3.0	2.9	3.65	4.06
1170	1250*	33	6.666	3.333	2.222	1.000	0.5000	0.3333	6.1	5.8	2.9	2.8	3.65	4.06
1220	1250*	33	6.400	3.200	2.133	0.9600	0.4800	0.3200	5.9	5.6	2.8	2.7	3.65	4.06
1070	1250*	26	5.859	2.929	1.953	0.8789	0.4394	0.2929	5.4	5.1	2.6	2.4	3.78	4.18
1410	1250*	33	5.555	2.777	1.851	0.8333	0.4166	0.2777	5.1	5.1	2.4	2.3	3.65	4.06
1470	1250*	33	5.333	2.666	1.777	0.8000	0.4000	0.2666	4.9	4.7	2.3	2.2	3.65	4.06
1340	1250*	26	4.687	2.343	1.562	0.7031	0.3515	0.2343	4.3	4.1	2.1	2.0	3.78	4.18
1690	1250*	33	4.629	2.314	1.543	0.6944	0.3472	0.2314	4.2	4.1	2.0	1.9	3.65	4.06
1760	1250*	33	4.444	2.222	1.481	0.6666	0.3333	0.2222	4.1	3.9	1.9	1.9	3.65	4.06
1610	1250*	26	3.906	1.953	1.302	0.5859	0.2929	0.1953	3.6	3.4	1.7	1.6	3.78	4.18
1680	1250*	26	3.750	1.875	1.250	0.5625	0.2812	0.1875	3.4	3.3	1.6	1.6	3.78	4.18
2110	1250*	33	3.703	1.851	1.234	0.5555	0.2777	0.1851	3.4	3.2	1.6	1.6	3.65	4.06
2010	1250*	26	3.125	1.562	1.041	0.4687	0.2343	0.1562	2.9	2.7	1.4	1.3	3.78	4.18
2530	1250*	33	3.086	1.543	1.028	0.4629	0.2314	0.1543	2.8	2.7	1.4	1.3	3.65	4.06
2100	1250*	26	3.000	1.500	1.000	0.4500	0.2250	0.1500	2.8	2.6	1.3	1.3	3.78	4.18
2390	1250*	26	2.604	1.302	0.868	0.3906	0.1953	0.1302	2.4	2.3	1.1	1.0	3.78	4.18
2520	1250*	26	2.500	1.250	0.833	0.3750	0.1875	0.1250	2.3	2.2	1.1	1.0	3.78	4.18
2620	1250*	26	2.400	1.200	0.800	0.3600	0.1800	0.1200	2.2	2.1	1.1	1.0	3.78	4.18
3010	1250*	26	2.083	1.041	0.694	0.3125	0.1562	0.1041	1.9	1.8	.91	.87	3.78	4.18
3140	1250*	26	2.000	1.000	0.666	0.3000	0.1500	0.1000	1.8	1.8	.88	.83	3.78	4.18
3280	1250*	26	1.920	0.960	0.640	0.2880	0.1440	0.0960	1.8	1.7	.84	.80	3.78	4.18
3620	1250*	26	1.736	0.868	0.578	0.2604	0.1302	0.0868	1.6	1.5	.76	.72	3.78	4.18
3780	1250*	26	1.666	0.833	0.555	0.2500	0.1250	0.0833	1.5	1.5	.73	.69	3.78	4.18
3940	1250*	26	1.600	0.800	0.533	0.2400	0.1200	0.0800	1.5	1.4	.70	.67	3.78	4.18
4100	1250*	26	1.536	0.768	0.512	0.2304	0.1150	0.0768	1.4	1.3	.67	.64	3.78	4.18
4520	1250*	26	1.388	0.694	0.462	0.2083	0.1041	0.0694	1.3	1.2	.61	.58	3.78	4.18
4710	1250*	26	1.333	0.666	0.444	0.2000	0.1000	0.0666	1.2	1.2	.58	.56	3.78	4.18
4910	1250*	26	1.280	0.640	0.426	0.1920	0.0960	0.0640	1.2	1.1	.56	.53	3.78	4.18
5430	1250*	26	1.157	0.578	0.385	0.1736	0.0868	0.0578	1.1	1.0	.51	.48	3.78	4.18
5660	1250*	26	1.111	0.555	0.370	0.1666	0.0833	0.0555	1.0	.97	.49	.46	3.78	4.18
5900	1250*	26	1.066	0.533	0.355	0.1600	0.0800	0.0533	.98	.93	.47	.44	3.78	4.18
6790	1250*	26	0.926	0.463	0.308	0.1390	0.0690	0.0474	.85	.81	.41	.39	3.78	4.18
7070	1250*	26	0.888	0.444	0.296	0.1333	0.0666	0.0444	.81	.78	.39	.37	3.78	4.18
8150	1250*	26	0.771	0.385	0.257	0.1157	0.0578	0.0385	.71	.68	.34	.32	3.78	4.18
8500	1250*	26	0.740	0.370	0.246	0.1111	0.0555	0.0370	.68	.65	.32	.30	3.78	4.18
10200	1250*	26	0.617	0.308	0.205	0.0925	0.0462	0.0308	.57	.54	.27	.26	3.78	4.18
12200	1250*	26	0.514	0.257	0.171	0.0771	0.0385	0.0257	.47	.45	.23	.21	3.78	4.18

. shafts are limited to 600 oz. in. cont. duty torque.

HE YOU ORDER

rt Number. To order by part number, select the unit which meets your flange, wer source and output shaft size requirements from the STANDARD PART MBERS AND DATA table. To the basic part number thus obtained, add the ear ratio desired, using the RATIOS AND PERFORMANCE tables. EXAMPLE: A6016

Torque. To find output torque, multiply motor sync torque (see STANDARD PART NUMBERS AND DATA) times torque multiplier (see RATIOS AND PERFORMANCE). This value is limited by the maximum continuous torque given in the RATIOS AND PERFORMANCE tables.

BASIC RATIOS

Basic ratios for Globe odd ratio geartrains are 4⅓:1 and $5^2/_7$:1. Basic even ratios are 4:1, 5:1, and 6:1. Combinations of even or odd ratios result in the gear reduction ratios listed inside. For special ratios simple algebraic relationships will show final reductions available.

let a=4⅓:1 b = $5^2/_7$:1
then a^2 = 18.78:1
ab = 22.9:1
etc.

GLOBE TRW

A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION MOTO

Type CFC (Bulletin B-2508N)

Globe Type CFC motors offer highest quality materials, precision assembly, and extremely compact size with high output. Hysteresis synchronous motors are exact speed units, ideal for times and controls.

Type CFC motors are totally enclosed for dirt and moisture resistance, and have life-lubricated bearings. Single phase operation requires a phasing capacitor (not furnished by Globe.)

Please send complete application data to Globe for an engineering recommendation.

torque: To 2.0 oz. in at 1,800 rpm sync.
voltage: 115 v.a.c.
weight: 11.5 ounces.
rotor inertia: 16.8 gm. cm.²
protection: Protected against dirt, moisture, shock, and vibration.
bearings: Life-lubricated, double-shielded ball bearings.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage (v.a.c.)	Frequency (Hz)	Phase	Capacitor (mfd)	Capacitor (v.a.c.)	Speed (rpm)	Torque rated load (oz. in.)	Torque stall (oz. in.)	Power no load (watts)	Power rated load (watts)	Schematic
115	60	1	1.0	200	3600	1.40	1.80	14	15	A
115	60	1	3.5	200	1800	2.00	2.25	16	17	B
115	60	1	1.5	200	1200	1.20	1.50	15	16	C

INDUCTION

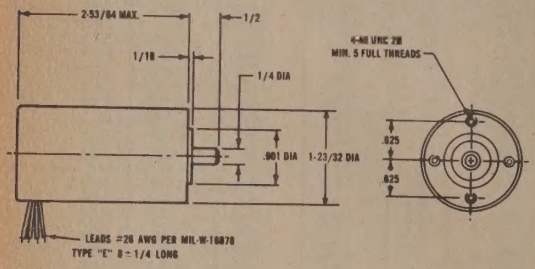
VOLT. (v.a.c.)	FREQ. (Hz)	PH.	Capacitor (mfd)	Capacitor (v.a.c.)	SPEED no load (rpm)	SPEED rated load (rpm)	TORQUE rated load (oz.in.)	TORQUE stall (oz.in.)	POWER no load (watts)	POWER rated load (watts)	SCHEMATIC
115	60	1	1.0	200	3500	3000	1.5	2.5	14	16	A
115	60	1	3.5	200	1700	1550	.75	3.8	16	17	A
115	60	1	1.5	200	1000	800	.5	2.0	15	16	C

Low slip-high torque units available on special request.

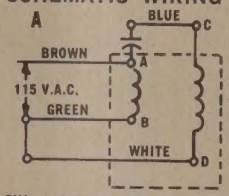
frame: Thermoplastic.
shaft: Precision ground stainless steel.
electrical connections: #26 AWG leads are provided.
reversibility: Motor reverses by connecting leads per schematics.
mounting: Standard mounting is by means of pilot and tapped hole on motor face.

WHEN YOU ORDER

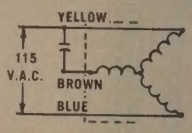
***Part Number.** The units on this page a and may be ordered by part number. Con ber consists of the basic part number reduction ratio. Example: 230A395-20 is teresis synchronous gearmotor with moto 3600 rpm and a final output speed of 18 the introduction to this catalog section fo in selection.



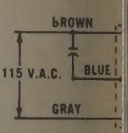
SCHEMATIC WIRING



CW Rotation, Viewing Shaft End. for CCW Rotation, Reverse C and D.



CW Rotation, Viewing Shaft End. for CCW Rotation, Connect Capacitor to Blue and Brown.



CW Rotation, Vie End. for CCW Rot nect Line to Blue

Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

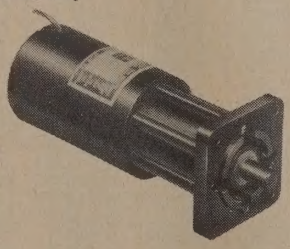
A.C. HYSTERESIS SYNCHRONOUS & INDUCTION GEARMOT

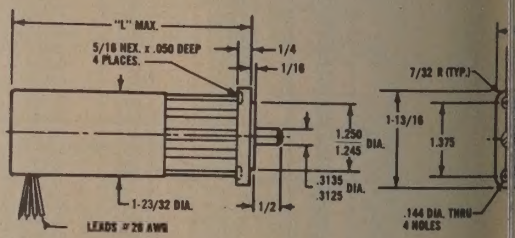
Type CFC (Bulletin B-2528N)

Type CFC planetary gearmotors are lightweight a.c. commercial/ industrial units designed to provide the performance and size advantages of military gearmotors in a lower cost package. Hysteresis synchronous versions can be provided with any of 83 standard planetary geartrains with speed reduction ratios from 4:1 to 46,656:1, and torques to 1250 oz. in.

Type CFC gearmotors offer the same high quality, compact size, and high output as Globe military units. They are totally enclosed and resist dirt and moisture.

torque: To 1250 oz. in. maximum continuous torque.
voltage: 115 v.a.c., 60 Hz.
weight: 18 to 23 ounces depending upon ratio.
gears: Planetary gearing system. All gears are precision manufactured and heat treated for consistently reliable performance and life.
backlash: Varies with reduction ratio but average unit will have less than 3° backlash.
protection: Gearmotor is encapsulated in thermoplastic.
bearings: Output shaft is supported by two lifelubricated sleeve bearings.
lubrication: Motor and geartrain are life-lubricated.
shaft: Precision ground stainless steel.
electrical connection: #26 AWG leads are provided.
mounting: Standard mounting is by four through holes in flange.





STANDARD PART NUMBERS AND BASIC MOTOR DATA

MOTOR	VOLT. (v.a.c.)	FREQ. (Hz)	PH.	SPEED Hyst. Sync. (rpm)	TORQUE rated load (oz. in.)	TORQUE stall min. (oz.in.)	POWER max. no load (watts)	POWER max. rated load (watts)	CAPACITOR (mfd)	CAPACITOR (v.a.c.)	SCHEMATIC WIRING
Hysteresis Synchronous	115	60	1	3600	1.40	1.80	14	15	1.0	200	A
	115	60	1	1800	2.00	2.25	16	16	3.5	200	B
	115	60	1	1200	1.20	1.50	15	16	1.5	200	C
Induction	115	60	1	*	1.5	2.5	14	16	1.0	200	A
	115	60	1		.75	3.8	16	17	3.5	200	B
	115	60	1		.5	2.0	15	16	1.5	200	C

*See Induction table above (Bul. B-2508N) for nominal speeds.

See YELLOW SECTION for Local Offices, Phones

HYSTERESIS SYNCHRONOUS AND INDUCTION MOTORS — Type CFC

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

PERFORMANCE

TORQ max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
5.1	4.01	900.0	450.0	300.0
6.5	4.01	720.0	460.0	240.0
7.7	4.01	600.0	300.0	200.0
17	4.25	225.0	112.5	75.0
22	4.25	180.0	90.0	60.0
26	4.25	150.0	75.0	50.0
27	4.25	144.0	72.0	48.0
32	4.25	120.0	60.0	40.0
39	4.25	100.0	50.0	33.33
56	4.48	56.25	28.12	18.75
70	4.48	45.00	22.50	15.00
83	4.48	37.50	18.75	12.50
87	4.48	36.00	18.00	12.00
104	4.48	30.00	15.00	10.00
109	4.48	28.80	14.40	9.60
126	4.48	25.00	12.50	8.333
131	4.48	24.00	12.00	8.000
156	4.48	20.00	10.00	6.666
187	4.48	16.66	8.333	5.555
179	4.68	14.06	7.031	4.687
221	4.68	11.25	5.625	3.750
267	4.68	9.375	4.687	3.125
279	4.68	9.000	4.500	3.000
335	4.68	7.500	3.750	2.500
349	4.68	7.200	3.600	2.400
401	4.68	6.250	3.125	2.083
418	4.68	6.000	3.000	2.000
435	4.68	5.760	2.880	1.920

SPEED REDUCTION RATIO	TORQUE MULTIPLIER	TORQ max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
720:1	295	502	4.68	5.000	2.500	1.666
750:1	306	520	4.68	4.800	2.400	1.600
864:1	352	598	4.68	4.166	2.083	1.388
900:1	370	629	4.68	4.000	2.000	1.333
1024:1	334	568	4.95	3.515	1.757	1.172
1080:1	442	751	4.68	3.333	1.666	1.111
1280:1	416	707	4.95	2.812	1.406	0.938
1296:1	530	901	4.68	2.777	1.388	0.926
1536:1	500	850	4.95	2.343	1.171	0.781
1600:1	522	887	4.95	2.250	1.125	0.750
1920:1	625	1063	4.95	1.875	0.937	0.625
2000:1	652	1108	4.95	1.800	0.900	0.600
2304:1	750	1250	4.95	1.562	0.781	0.521
2400:1	780	1250	4.95	1.500	0.750	0.500
2500:1	815	1250	4.95	1.440	0.720	0.480
2880:1	940	1250	4.95	1.250	0.625	0.417
3000:1	980	1250	4.95	1.200	0.600	0.400
3125:1	1020	1250	4.95	1.152	0.576	0.384
3456:1	1130	1250	4.95	1.041	0.520	0.347
3600:1	1170	1250	4.95	1.000	0.500	0.333
3750:1	1220	1250	4.95	0.960	0.480	0.320
4096:1	1070	1250	5.18	0.879	0.439	0.293
4320:1	1410	1250	4.95	0.833	0.417	0.278
4500:1	1470	1250	4.95	0.800	0.400	0.267
5120:1	1340	1250	5.18	0.703	0.352	0.234
5184:1	1690	1250	4.95	0.694	0.347	0.231
5400:1	1760	1250	4.95	0.667	0.333	0.222
6144:1	1610	1250	5.18	0.586	0.293	0.195

SPEED REDUCTION RATIO	TORQUE MULTIPLIER	TORQ max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
6400:1	1680	1250	5.18	0.563	0.281	0.188
6480:1	2110	1250	4.95	0.556	0.278	0.185
7680:1	2010	1250	5.18	0.469	0.234	0.156
7776:1	2530	1250	4.95	0.463	0.231	0.154
8000:1	2100	1250	5.18	0.450	0.225	0.150
9216:1	2390	1250	5.18	0.391	0.195	0.130
9600:1	2520	1250	5.18	0.375	0.182	0.125
10,000:1	2620	1250	5.18	0.360	0.180	0.120
11,520:1	3010	1250	5.18	0.313	0.156	0.104
12,000:1	3140	1250	5.18	0.300	0.150	0.100
12,500:1	3280	1250	5.18	0.288	0.144	0.096
13,824:1	3620	1250	5.18	0.260	0.130	0.087
14,400:1	3780	1250	5.18	0.250	0.125	0.083
15,000:1	3940	1250	5.18	0.240	0.120	0.080
15,625:1	4100	1250	5.18	0.230	0.115	0.077
17,280:1	4520	1250	5.18	0.208	0.104	0.069
18,000:1	4710	1250	5.18	0.200	0.100	0.067
18,750:1	4910	1250	5.18	0.192	0.096	0.064
20,736:1	5430	1250	5.18	0.183	0.087	0.058
21,600:1	5660	1250	5.18	0.167	0.083	0.056
22,500:1	5900	1250	5.18	0.160	0.080	0.053
25,920:1	5790	1250	5.18	0.139	0.069	0.047
27,000:1	7070	1250	5.18	0.133	0.067	0.044
31,004:1	8150	1250	5.18	0.116	0.058	0.039
32,400:1	8500	1250	5.18	0.111	0.056	0.037
38,880:1	10200	1250	5.18	0.093	0.046	0.031
46,656:1	12200	1250	5.18	0.077	0.039	0.026

TORQUE = Torque Multiplier x Motor Torque
TORQUE MULTIPLIER = Reduction Ratio x Efficiency
CONT. RATING REFERS TO MAXIMUM CONTINUOUS DUTY RATING OF GEARTRAIN

Type CFC (Bulletin B-2702N)

CFC motors are available with a wide variety of performance characteristics and are designed to applicable MIL-specs for environmental protection, integral planetary geartrains and other voltages and frequencies are available.

Bulletin B-2732N for details. Send complete data for Globe engineering recommendation.

Torque: 1.0 to 2.5 oz. in. (induction). 0.8 to 1.2 oz. in. (hysteresis synchronous).

Voltage: 115 and 200 v.a.c. 60 and 400 Hz.

Diameter: 1 1/16".

Weight: 11 ounces.

Rotor inertia: Hysteresis synchronous; 2 pole 1.2 GM CM²; 4 pole 10 GM CM²; 6 pole 9.4 GM CM². Induction: 7.2 GM CM².

Construction: Housing is black anodized aluminum alloy MIL-A-8625. Motor is designed to meet applicable parts of MIL-M-7969 as well as MIL-E-5272. Wiring: MIL insulated magnet wire is standard. Bearings: Stainless steel ball bearings are double-shielded, life-lubricated. Standard lubricant conforms to MIL-G-23827. Special lubricants for temperature extremes are available.

Shaft: Aluminum alloy.

Rotor: No. 416 stainless steel, centerless ground.

Electrical connections: #26 AWG lead wires per MIL-W-16878 (AVY) Type "E"; three or four leads are ordered.

Reversibility: Motors can be reversed by connecting as per schematics.

Mounting: Standard procedure is by means of pilot and tapped holes in front face.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage	Freq. (Hz)	Poles	Phase	Schematic	Variable Lead Color B	C	D	Phasing Capacitor (mfd.)	(wvac)	Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Rated Load	Part Number*
115	60	2	1	C	WHT	YEL		3.0	200	3,600	1.0	1.0	20	20	75A121-2
115	60	2	1	C	WHT	GRN		2.0	200	1,800	1.0	1.0	11	12	75A120-2
115	60	6	1	D	WHT	GRY		1.5	200	1,200	0.8	0.8	20	20	75A119-2
115	400	2	1	A		BLK		0.22	400	24,000	1.0	1.0	28	40	75A1003-2
115	400	2	3	B		BLK		Not req'd		24,000	1.0	1.0	23	37	75A1004-2
115	400	4	1	A		GRN		0.12	500	12,000	0.8	0.8	19	24	75A1005-2
115	400	4	3	B		GRN		Not req'd		12,000	1.2	1.2	21	26	75A1006-2
115	400	6	1	D	BLK	GRY		1.3	200	8,000	0.5	0.5	35	45	75A107-2
200	400	2	3	B		BLK		Not req'd		24,000	1.0	1.0	24	38	75A1008-2
200	400	4	3	B		GRN		Not req'd		12,000	1.2	1.2	21	28	75A1009-2

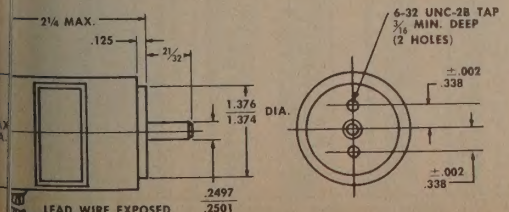
INDUCTION

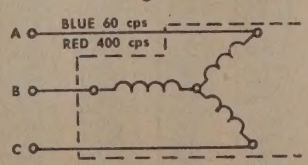
Voltage	Freq. (Hz)	Poles	Phase	Schematic	Variable Lead Color B	C	D	Phasing Capacitor (mfd.)	(wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Rated Load	Part Number*
115	60	2	1	C	WHT	YEL		3.0	200	3,000	1.4	1.4	18	20	75A121-1
115	60	4	1	C	WHT	GRN		2.0	200	1,300	1.0	1.0	11	12	75A120-1
115	60	6	1	D	WHT	GRY		1.5	200	600	1.0	1.0	15	17	75A119-1
115	400	2	1	A		BLK		0.22	400	21,500	1.5	0.8	19	50	75A1003-1
115	400	2	3	B		BLK		Not req'd		22,500	2.5	2.5	10	65	75A1004-1
115	400	4	1	A		GRN		0.12	500	10,000	1.5	1.5	15	31	75A1005-1
115	400	4	3	B		GRN		Not req'd		11,000	2.5	2.5	12	40	75A1006-1
200	400	2	3	B		BLK		Not req'd		22,500	2.5	2.5	10	65	75A1008-1
200	400	4	3	B		GRN		Not req'd		11,000	2.5	2.5	12	40	75A1009-1

WHEN YOU ORDER

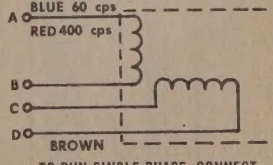
***Part Number.** Units described above are standard and may be ordered by part number.

Note: Be sure to check Globe for latest data prior to preparing spec. control prints.





TO RUN SINGLE-PHASE, CONNECT LINE TO A AND C: FOR CLOCKWISE ROTATION, CONNECT CAPACITOR B TO C; FOR COUNTERCLOCKWISE ROTATION, CONNECT CAPACITOR B TO A.



TO RUN SINGLE-PHASE, CONNECT LINE TO A AND B: FOR CLOCKWISE ROTATION, CONNECT B TO D AND CONDENSER TO A AND C; FOR COUNTERCLOCKWISE ROTATION, REVERSE C AND D.

GLOBE TRW A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION PLANETARY GEARMOTORS

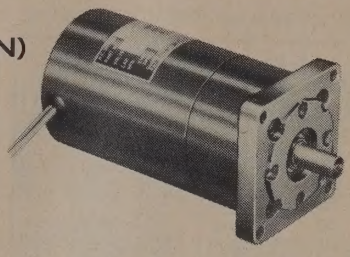
Type FC (Bulletin B-2732N)

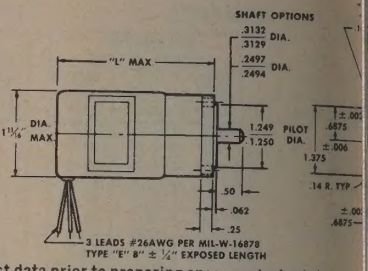
Globe Type FC planetary gearmotors offer 83 even and 20 odd ratios ranging from 4:1 to 46,656:1. Special geartrains are available with ratios up to 17,000,000:1.

Globe Type FC motors with synchronous rotors are wound 60 or 400 Hz, 2, 4, or 6 poles. They may be operated single, two or three-phase.

Send application details for a Globe recommendation.

torque: Up to 1250 oz. in. maximum continuous torque.
voltage: 115 or 200 v.a.c., 60 and 400 Hz.
size: 1 11/16" max. diameter. Length depends on ratio.
weight: 16½ to 20 oz. depending on ratio.
gears: Planetary gearing system; all gears are precision manufactured and heat treated for reliable performance and long life.
backlash: Varies with ratio, but unit will have less than 3°.
protection: Housing is black, anodized aluminum per MIL-A-8625. Motor is designed to meet applicable portions of MIL-M-7969 as well as MIL-E-5272.
bearings: Double-shielded ball bearings are life-lubricated per MIL-G-23827. Motor bearings are stainless steel. Special lubricants for extreme environments are available.
shaft: Shaft is #416 precision ground stainless steel per QQ-S-763, heat treated and black oxide coated per MIL-C-13924A Class 1.
electrical connection: Teflon-coated #26 AWG lead wires per MIL-W-16878 Type "E"; three or four leads are standard.
mounting: Standard mounting is by pilot and four holes in flange.





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

WHEN YOU ORDER

Part Number. To order by part number, select the unit which meets your flange, power source and output shaft size requirements from the STANDARD PART NUMBERS AND DATA table. To the basic part number thus obtained, add the gear ratio desired, using the RATIOS AND PERFORMANCE tables. Example: 83A1008-80.
Output Torque. To find output torque, multiply motor sync torque (see STANDARD PART NUMBERS AND DATA) times torque multiplier (see RATIOS AND PERFORMANCE). This value is limited by the maximum continuous torque given in the RATIOS AND PERFORMANCE tables.

BASIC RATIOS

Basic ratios for Globe odd ratio geartrains are 4-1/3:1 and 5-2/7:1. Basic even ratios are 4:1, 5:1, and 6:1. Combinations of even or odd ratios result in the gear reduction ratios listed inside. For special ratios simple algebraic relationships will show final reductions available:

let a = 4-1/3 b = 5-2/7:1
then a^2 = 18.78:1
ab = 22.9:1
etc.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage	Freq. (Hz.)	Poles	Phase	Schematic	Lead Color B	Lead Color C	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	Stan Part Nu Odd Ratio ¼" shaft	Odd Ratio 5/16" sha
115	60	2	1	C	WHT	YEL	3.0	200	3,600	1.0	1.0	20	20	83A510	83A1
115	60	4	1	C	BLK	GRN	2.0	200	1,800	1.0	1.0	11	12	83A509	83A1
115	60	6	1	D	WHT	GRY	1.5	200	1,200	.8	.8	20	20	83A508	83A1
115	400	6	1	D	BLK	GRY	1.3	200	8,000	.5	.5	35	45	83A113	83A1

**See "When

HYSTERESIS SYNCHRONOUS

Voltage	Freq. (Hz.)	Poles	Phase	Schematic	Variable Lead Color	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Sync. Speed (rpm)	Motor Normal Rated Load @ Sync. Speed (oz.in.)	Motor Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	Stan Part Nu All Ra ¼" shaft
115	400	2	1	A	BLK	0.22	400	24,000	1.0	1.0	28	40	83A1008
115	400	2	3	B	BLK	Not req'd		24,000	1.0	1.0	23	37	83A1010
115	400	4	1	A	GRN	0.12	500	12,000	0.8	0.8	19	24	83A1012
115	400	4	3	B	GRN	Not req'd		12,000	1.2	1.2	21	26	83A1014
200	400	2	3	B	BLK	Not req'd		24,000	1.0	1.0	24	38	83A1018
200	400	4	3	B	GRN	Not req'd		12,000	1.2	1.2	21	28	83A1020

**See "When

INDUCTION

Voltage	Freq. (Hz.)	Poles	Phase	Schematic	Lead Color B C D	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Motor Min. Speed @ Rated Load (rpm)	Rated Load (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	Stand Part Num All Ra ¼" shaft
115	400	2	1	A	BLK	0.22	400	21,500	1.5	.8	19	50	83A1007
115	400	2	3	B	BLK	Not req'd		22,500	2.5	2.5	10	65	83A1009
115	400	4	1	A	GRN	0.12	500	10,000	1.5	1.5	15	31	83A1011
115	400	4	3	B	GRN	Not req'd		11,000	2.5	2.5	12	40	83A1013
200	400	2	3	B	BLK	Not req'd		22,500	2.5	2.5	10	65	83A1017
200	400	4	3	B	GRN	Not req'd		11,000	2.5	2.5	12	40	83A1019

**See "When Y

ODD RATIOS

Speed Reduction Ratio	Torque Multiplier	Gear-train max. cont. rating (oz. in.)	FINAL OUTPUT SPEED (HYST.) 400 Hz 24,000 rpm input	400 Hz 12,000 rpm input	400 Hz 8,000 rpm input	60 Hz 3,600 rpm input	60 Hz 1,800 rpm input	60 Hz 1,200 rpm input	MIN. SPEED @ RATED LOAD (IND.) 400 Hz 22,500 rpm input	400 Hz 21,500 rpm input	400 Hz 11,000 rpm input	400 Hz 10,000 rpm input	3,000 rpm input	1,300 rpm input	600 rpm input
4.33:1	3.2	5.4	5542.725	2771.362	1847.575	831.410	415.704	277.136	5196	4965	2540	2309	692	300	139
5.28:1	4.0	6.8	4536.862	2268.431	1512.287	680.529	340.265	226.843	4261	4072	2083	1894	568	246	114
18.78:1	12	20	1277.955	638.977	425.985	191.693	95.846	63.897	1198	1145	586	532	160	69	32
27.94:1	17	29	858.984	429.491	286.327	128.847	64.423	42.949	805	769	394	358	107	47	21
81.37:1	41	70	294.949	147.474	98.316	44.242	22.121	14.747	276	264	135	123	37	16	7.4
121.1:1	62	105	198.183	99.091	66.061	29.727	14.863	9.909	186	177	91	83	25	11	5.0
147.7:1	75	128	162.491	81.250	54.163	24.373	12.186	8.124	152	145	74	68	20	8.8	4.1
352.6:1	145	247	68.066	34.032	22.688	10.209	5.104	3.403	63	61	31	28	8.5	3.7	1.7
524.6:1	215	366	45.749	22.874	15.249	6.862	3.431	2.287	42	41	21	19	5.7	2.5	1.1
639.9:1	262	445	37.506	18.752	12.501	5.625	2.862	1.875	35	34	17	16	4.7	2.0	.94
780.6:1	320	544	30.745	15.372	10.248	4.611	2.305	1.537	29	28	14	13	3.8	1.7	.77
1528:1	500	850*	15.706	7.853	5.235	2.356	1.178	.785	15	14	7.2	6.5	2.0	.85	.39
2273:1	740	1250*	10.558	5.279	3.519	1.583	.791	.527	9.9	9.4	4.8	4.4	1.3	.57	.26
3382:1	1100	1250*	7.096	3.548	2,365	1.064	.532	.354	6.6	6.4	3.3	3.0	.89	.38	.18
4126:1	1350	1250*	5.816	2.908	1.938	.872	.436	.291	5.4	5.2	2.7	2.4	.73	.32	.15
6621:1	1730	1250*	3.624	1.812	1.208	.543	.271	.181	3.4	3.2	1.7	1.5	.45	.20	.09
9851:1	2580	1250*	2.436	1.218	.812	.365	.182	.121	2.3	2.2	1.1	1.0	.30	.13	.06
12,016:1	3150	1250*	1.997	.998	.665	.299	.149	.099	1.9	1.8	.92	.83	25	.11	.05
17,879:1	4700	1250*	1.342	.671	.447	.201	.100	.067	1.2	1.2	.62	.56	.17	.072	.03
21,808:1	5700	1250*	1.100	.550	.366	.165	.082	.055	1.0	.98	.50	.46	.14	.060	.02

* ¼" O.D. SHAFTS ARE LIMITED TO 600 OZ. IN. CONTINUOUS DUTY TORQUE. USE 5/16" DIA. SHAFT IF TORQUE REQUIREMENTS EXCEED THIS VALUE.

See schematics on preceding page, Bulletin B-2702N.

See YELLOW SECTION for Local Offices, Phones

HYSTERESIS SYNCHRONOUS AND INDUCTION MOTORS

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

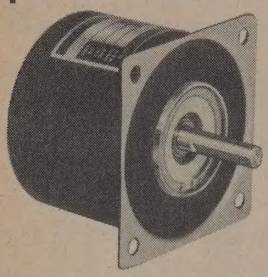
Type FC (CONTINUED) RATIOS AND PERFORMANCE: EVEN RATIOS

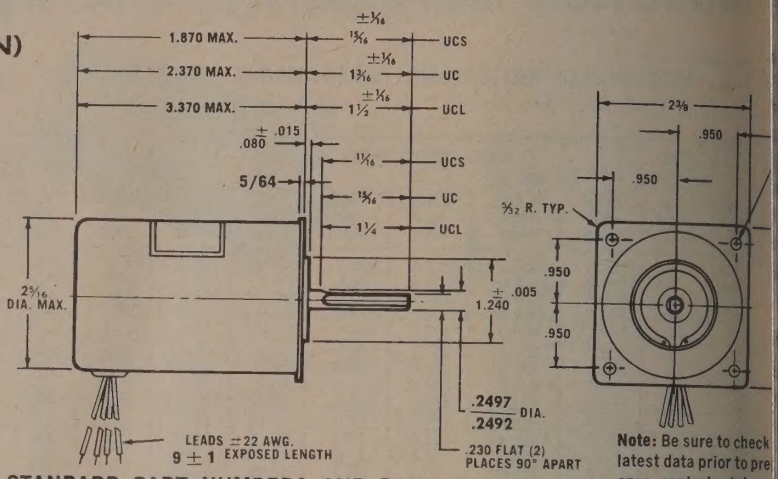
Torque Multiplier	Gear-train max. cont. rating (oz. in.)	FINAL OUTPUT SPEED (HYST.) 400 Hz 24,000 rpm input	400 Hz 12,000 rpm input	400 Hz 8,000 rpm input	60 Hz 3,600 rpm input	60 Hz 1,800 rpm input	60 Hz 1,200 rpm input	MIN. SPEED @ RATED LOAD (IND.) 400 Hz 22,500 rpm input	400 Hz 21,500 rpm input	400 Hz 11,000 rpm input	400 Hz 10,000 rpm input	60 Hz 3,000 rpm input	60 Hz 1,300 rpm input	60 Hz 600 rpm input	Dim. "L"
3.0	5.1	6000.0	3000.0	2000.0	900.0	450.0	300.0	5625	5375	2750	2500	750	325	150	3.190
3.8	6.5	4800.0	2400.0	1600.0	720.0	360.0	240.0	4500	4300	2200	2000	600	260	120	3.190
4.5	7.7	4000.0	2000.0	1333.3	600.0	300.0	200.0	3750	3583	1585	1667	500	216	100	3.190
10	17	1500.0	750.0	500.0	225.0	112.5	75.0	1406	1344	688	625	187	81	37	3.190
13	22	1200.0	600.0	400.0	180.0	90.0	60.0	1125	1075	550	500	150	65	30	3.190
15	26	1000.0	500.0	333.3	150.0	75.0	50.0	938	896	448	417	125	54	25	3.190
16	27	960.0	480.0	320.0	144.0	72.0	48.0	900	860	420	400	120	52	24	3.190
19	32	800.0	400.0	266.6	120.0	60.0	40.0	750	717	350	333	100	43	20	3.190
23	39	666.6	333.3	222.2	100.0	50.0	33.33	625	597	292	278	83	36	16	3.190
33	56	375.0	187.5	125.0	56.2	28.12	18.75	352	336	164	156	47	20	9.4	3.325
41	70	300.0	150.0	100.0	45.0	22.50	15.00	281	269	138	125	38	16	7.5	3.325
49	83	250.0	125.0	83.3	37.5	18.75	12.50	234	224	115	104	31	14	6.3	3.325
51	87	240.0	120.0	80.0	36.0	18.00	12.00	225	215	110	100	30	13	6.0	3.325
61	104	200.0	100.0	66.6	30.0	15.00	10.00	188	179	91	83	25	11	5.0	3.325
64	109	192.0	96.0	64.0	28.8	14.40	9.60	180	172	88	80	24	10	4.8	3.325
74	126	166.6	83.3	55.55	25.0	12.50	8.33	156	149	69	69	21	9.0	4.2	3.325
77	131	160.0	80.0	53.33	24.0	12.00	8.00	150	143	73	67	20	8.7	4.0	3.325
92	156	133.3	66.66	44.44	20.0	10.00	6.66	125	119	61	56	17	7.2	3.3	3.325
110	187	111.1	55.55	37.03	16.66	8.33	5.55	104	100	51	46	14	6.0	2.8	3.325
105	179	93.7	46.87	31.25	14.06	7.03	4.68	88	84	43	39	12	5.1	2.3	3.594
130	221	75.0	37.50	25.00	11.25	5.62	3.75	70	67	34	31	9.4	4.1	1.9	3.594
157	267	62.5	31.25	20.83	9.37	4.68	3.12	59	56	29	26	7.8	3.4	1.6	3.594
164	279	60.0	30.00	20.00	9.00	4.50	3.00	56	54	28	25	7.5	3.3	1.5	3.594
197	335	50.0	25.00	16.66	7.50	3.75	2.50	47	45	23	21	6.3	2.7	1.3	3.594
205	349	48.0	24.00	16.00	7.20	3.60	2.40	45	43	22	20	6.0	2.6	1.2	3.594
235	401	41.6	20.83	13.888	6.25	3.12	2.083	39	37	19	17	5.2	2.3	1.0	3.594
246	418	40.0	20.00	13.333	6.00	3.00	2.000	38	36	18	17	5.0	2.2	1.0	3.594
256	435	38.4	19.20	12.800	5.76	2.88	1.920	36	34	18	16	4.8	2.1	.96	3.594
295	502	33.3	16.66	11.111	5.00	2.50	1.666	31	30	15	14	4.2	1.8	.83	3.594
306	520	32.0	16.00	10.666	4.80	2.40	1.600	30	29	15	13	4.0	1.7	.80	3.594
352	598	27.777	13.888	9.259	4.16	2.08	1.388	26	25	13	12	3.5	1.5	.69	3.594
370	629*	26.666	13.333	8.888	4.00	2.00	1.333	25	24	11	11	3.3	1.4	.67	3.594
334	568*	23.437	11.718	7.812	3.516	1.758	1.172	22	21	11	9.7	2.9	1.3	.59	3.964
442	751*	22.222	11.111	7.407	3.333	1.666	1.111	21	20	10	9.3	2.8	1.2	.56	3.594
416	707*	18.750	9.375	6.250	2.812	1.406	0.937	18	17	8.5	7.8	2.3	1.0	.47	3.964
530	901*	18.518	9.259	6.172	2.777	1.388	0.925	17	17	8.5	7.7	2.3	1.0	.46	3.594
500	850*	15.625	7.812	5.208	2.344	1.172	0.781	15	14	7.2	6.5	2.0	.85	.39	3.964
522	887*	15.000	7.500	5.000	2.250	1.125	0.750	14	13	6.9	6.3	1.9	.81	.38	3.964
625	1063*	12.500	6.250	4.166	1.875	0.937	0.625	12	11	5.7	5.2	1.6	.68	.31	3.964
652	1108*	12.000	6.000	4.000	1.800	0.900	0.600	11	11	5.5	5.0	1.5	.65	.30	3.964
750	1250*	10.416	5.208	3.472	1.562	0.781	0.520	9.8	9.3	4.8	4.3	1.3	.56	.26	3.964
780	1250*	10.000	5.000	3.333	1.500	0.750	0.500	9.4	9.0	4.6	4.2	1.3	.54	.25	3.964
815	1250*	9,600	4,800	3.200	1.440	0.720	0.480	9.0	8.6	4.4	4.0	1.2	.52	.24	3.964
940	1250*	8.333	4.166	2.777	1.250	0.625	0.416	7.8	7.5	3.8	3.5	1.0	.45	.21	3.964
980	1250*	8.000	4.000	2.666	1.200	0.600	0.400	7.5	7.2	3.7	3.3	1.0	.43	.20	3.964
1020	1250*	7.680	3.840	2.560	1.152	0.576	0.384	7.2	6.9	3.5	3.2	.96	.42	.19	3.964
1130	1250*	6.944	3.472	2.314	1.041	0.520	0.347	6.5	6.2	3.2	2.9	.87	.38	.17	3.964
1170	1250*	6.666	3.333	2.222	1.000	0.500	0.333	6.3	6.0	3.1	2.8	.83	.36	.17	3.964
1220	1250*	6.400	3.200	2.133	0.960	0.480	0.320	6.0	5.7	2.9	2.7	.80	.35	.16	3.964
1070	1250*	5.859	2.929	1.953	0.878	0.439	0.292	5.5	5.2	2.7	2.4	.73	.32	.15	4.099
1410	1250*	5.555	2.777	1.851	0.833	0.416	0.277	5.2	5.0	2.5	2.3	.69	.30	.14	3.964
1470	1250*	5.333	2.666	1.777	0.800	0.400	0.266	5.0	4.8	2.4	2.2	.67	.29	.13	3.964
1340	1250*	4.687	2.343	1.562	0.703	0.351	0.234	4.4	4.2	2.1	2.0	.59	.25	.12	4.099
1690	1250*	4.629	2.314	1.543	0.694	0.347	0.231	4.3	4.1	2.1	1.9	.58	.25	.12	3.964
1760	1250*	4.444	2.222	1.481	0.666	0.333	0.222	4.2	4.0	2.0	1.9	.56	.24	.11	3.964
1610	1250*	3.906	1.953	1.302	0.585	0.292	0.195	3.7	3.5	1.8	1.6	.49	.21	.10	4.099
1680	1250*	3.750	1.875	1.250	0.562	0.281	0.187	3.5	3.4	1.7	1.6	.47	.20	.094	4.099
2110	1250*	3.703	1.851	1.234	0.555	0.277	0.185	3.5	3.3	1.7	1.6	.46	.20	.093	3.964
2010	1250*	3.125	1.562	1.041	0.468	0.234	0.156	2.9	2.8	1.4	1.3	.39	.17	.078	4.099
2530	1250*	3.086	1.543	1.028	0.462	0.231	0.154	2.9	2.8	1.4	1.3	.39	.17	.077	3.964
2100	1250*	3.000	1.500	1.000	0.450	0.225	0.150	2.8	2.7	1.4	1.3	.38	.16	.075	4.099
2390	1250*	2.604	1.302	0.868	0.390	0.195	0.130	2.4	2.3	1.2	1.0	.33	.14	.065	4.099
2520	1250*	2.500	1.250	0.833	0.375	0.187	0.125	2.3	2.2	1.1	1.0	.31	.14	.063	4.099
2620	1250*	2.400	1.200	0.800	0.360	0.180	0.120	2.3	2.2	1.1	1.0	.30	.13	.060	4.099
3010	1250*	2.083	1.041	0.694	0.312	0.156	0.104	2.0	1.9	.95	.87	.26	.11	.052	4.099
3140	1250*	2.000	1.000	0.666	0.300	0.150	0.100	1.9	1.8	.90	.83	.25	.11	.050	4.099
3280	1250*	1.920	0.960	0.640	0.288	0.144	0.096	1.8	1.7	.88	.80	.24	.10	.048	4.099
3620	1250*	1.736	0.868	0.578	0.260	0.130	0.086	1.6	1.6	.80	.72	.22	.094	.043	4.099
3780	1250*	1.666	0.833	0.555	0.250	0.125	0.083	1.6	1.5	.76	.69	.21	.090	.042	4.099
3940	1250*	1.600	0.800	0.533	0.240	0.120	0.080	1.5	1.4	.73	.67	.20	.087	.040	4.099
4100	1250*	1.536	1.536	0.768	0.230	0.115	0.076	1.4	1.4	.70	.64	.19	.083	.038	4.099
4520	1250*	1.388	0.694	0.462	0.208	0.104	0.069	1.3	1.2	.64	.58	.17	.075	.035	4.099
4710	1250*	1.333	0.666	0.444	0.200	0.100	0.066	1.3	1.2	.61	.56	.17	.072	.033	4.099
4910	1250*	1.280	0.640	0.426	0.192	0.096	0.064	1.2	1.1	.59	.53	.16	.069	.032	4.099
5430	1250*	1.157	0.578	0.385	0.173	0.086	0.057	1.1	1.0	.53	.48	.14	.063	.029	4.099
5660	1250*	1.111	0.555	0.370	0.166	0.083	0.055	1.0	1.0	.51	.46	.14	.060	.028	4.099
5900	1250*	1.066	0.533	0.355	0.160	0.080	0.053	1.0	.96	.49	.44	.13	.058	.027	4.099
6790	1250*	0.926	0.463	0.308	0.139	0.069	0.047	.87	.83	.42	.39	.12	.050	.023	4.099
7070	1250*	0.888	0.444	0.296	0.133	0.066	0.044	.83	.80	.41	.37	.11	.048	.022	4.099
8150	1250*	0.771	0.385	0.257	0.115	0.057	0.038	.72	.69	.35	.32	.10	.042	.019	4.099
8500	1250*	0.740	0.370	0.246	0.111	0.055	0.037	.69	.66	.34	.30	.092	.040	.019	4.099
10200	1250*	0.617	0.308	0.205	0.092	0.046	0.030	.58	.55	.28	.26	.077	.033	.015	4.099
12200	1250*	0.514	0.257	0.171	0.077	0.038	0.025	.48	.46	.24	.21	.064	.028	.013	4.099

*¼" O.D. SHAFTS ARE LIMITED TO 600 OZ. IN. CONTINUOUS DUTY TORQUE. USE 5/16" DIA. SHAFT IF TORQUE REQUIREMENTS EXCEED THIS VALUE.

GLOBE TRW A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION COMMERCIAL MOTORS

Type UC (Bulletin B-3608N)





Globe Type UC commercial motors are small precision-made units designed for use in commercial products of high quality. They provide protection against dirt and moisture, and retain all the important qualities of the MIL-spec design.

Three stack lengths are available providing a choice of torque options up to 8.5 oz. in. They operate on 115 v.a.c., 60 Hz, single phase, 2 or 4 pole. Other voltages and frequencies are available. Spur geartrains can be provided for many speed-torque combinations.

Please submit complete details of your application for an engineering recommendation.

power: At 3,600 rpm continuous, UCS—1/333 hp. UC—1/110 hp. UCL—1/35 hp.
voltage: 115 v.a.c.
size: 2 5/16" diameter.
weight: UCS—15.3 ounces. UC—25.1 ounces. UCL—34.5 ounces.
rotor inertia: UCS—67 gm. cm.²; UC—123 gm. cm.²; UCL—205 gm. cm.²
protection: Housing is painted black, crinkle finish.
winding: HML insulated magnet wire. Stator is completely molded in an epoxy encapsulation to resist dirt and moisture.
bearings: Chrome steel life-lubed ball bearings. Stainless steel bearing seat.
frame: Aluminum frame is integral with housing.
shaft: No. 303 precision ground stainless steel.
electrical connection: Leads are provided.
reversibility: Motor is reversible.
mounting: Standard mounting is by pilot and four holes in flange.

Note: Be sure to check latest data prior to pre spec. control prints.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

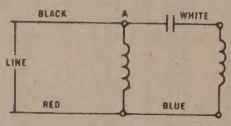
Type	Voltage	Freq. (Hz)	Poles	Phase	Schematic	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Sync. Speed (rpm)	Rated Load @ Sync. Speed (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	
UCS	115	60	2	1	A	2.0	200	3,600	0.8	0.8	20	20	1
	115	60	4	1	B	3.0	150	1,800	1.1	1.1	14	14	1
UC	115	60	2	1	A	3.0	225	3,600	2.75	2.75	29	31	1
	115	60	4	1	A	1.5	200	1,800	1.5	1.5	18	20	1
UCL	115	60	2	1	A	2.5	350	3,600	5.0	5.0	30	41	1
	115	60	4	1	A	2.0	200	1,800	4.0	4.0	30	34	1

INDUCTION

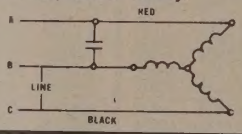
Type	Voltage	Freq. (Hz)	Poles	Phase	Schematic	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	
UCS	115	60	2	1	A	2.0	200	3,000	1.5	1.5	19	19	1
	115	60	4	1	B	2.0	200	1,600	1.25	1.25	11	12	1
UC	115	60	2	1	A	2.0	200	3,300	2.5	2.5	19	21	1
	115	60	4	1	A	1.5	200	1,650	2.25	2.25	17	19	1
UCL	115	60	2	1	A	3.9	225	3,300	5.9	5.9	25	38	1
	115	60	4	1	A	2.5	350	1,650	4.5	4.5	24	28	1

For higher torques or watts, consult factory.

SCHEMATIC WIRING

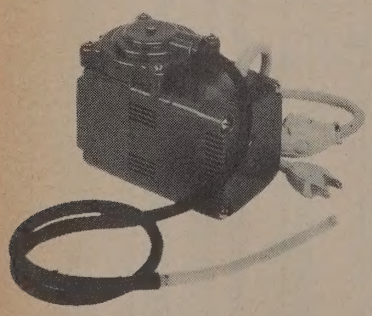


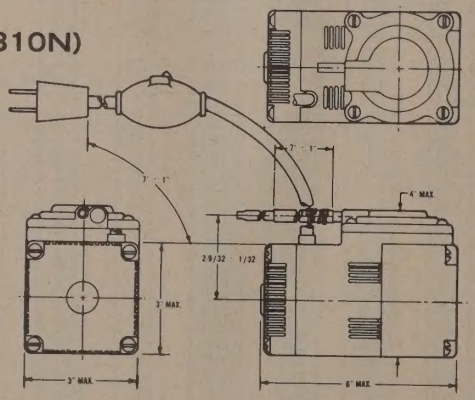
A
CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE WHITE AND BLUE.



B
ABC PHASE SEQUENCE FOR CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE ANY TWO LEADS.

Air Pump (Bulletin C-1310N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

The Globe A.C. Air Pump is a miniature air compressor powered by a Globe Type LC induction a.c. motor. The unit is equipped with a diaphragm-type compressor, and is provided with a plastic air nozzle and flexible hose. Modifications can be made for specific applications, such as air-blast cleaning, small air guns, and vacuum operation.

Units for operation on other voltages with A.C. induction or D.C. permanent magnet motors can be made available.

Send application details for Globe engineering recommendations.

rating: 1 cfm @ 5 psi.
voltage: Standard units for 115 v.a.c., 6 phase.
weight: 3.5 lbs. max. including cord, exha assembly and fitting.
construction: High-strength molded housing filled nylon. Fan cooling permits handling tinuous duty. Self-contained motor capacit
bearings: Double shielded life-lubricated b ings.
exhaust tube assembly: Plastic nozzle and tubing resistant to lubrication oils and ethylene.
electrical connection: Two-conductor male SJT cord with cord-mounted switch. Non-co case completely isolates motor from exterio

STANDARD PART NUMBERS AND DAT

Voltage (v.a.c.)	Frequency (cps)	Phase	Current max. rated (amps)	Standard No.
115	60	1	0.55	A12

WHEN YOU ORDER

***Part Number.** Units described in this bul standard and can be ordered by part numb ever, a variety of types can be supplied exact needs. Please send your application s tions to Globe for an engineering recomme

GLOBE DIVISION OF TRW INC.
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TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

MOTORS

ere re is a choice of d.c. or a.c. power sources, re are two reasons why a.c. motors may meet reme s best. One is design simplicity. Globe a.c. tors ve no rotating windings, brushes or commu- rs il thus eliminate any problems these may ng ut. A second is that the motor shaft speed be ade independent of torque load and input tage rough use of a synchronous motor design. icien of a.c. motors is somewhat lower than d.c. igns.

w the work

st Glbe a.c. motors carry a winding on the stator, ich istationary, and induce a rotating magnetic ld wi in the stator bore. The field induces eddy rrent n the rotor, exerting torque on it. The field is ated y two or more mechanically separated wind- s on he stator periphery. Each winding is fed by parat a.c. voltages displaced from each other in e ase. Out-of-phase voltages are furnished by e pov r supply. In so-called single-phase motors tual two phases) the second phase displacement sup ed by a capacitor, in series with one of the ndin. (Globe does not supply capacitors.)

ductin motors

indtion rotor is made of steel laminations with ots in which bars of highly conductive material are aced The eddy currents induced in the rotor de- nd c relative motion between the rotating mag- tic fld and rotor bars. Therefore the rotor can ver avel at the same speed as the field, but ays lower. Torque is determined by the conductivity of the rotor bars. By selecting the proper bar material, speed-torque characteristics can be varied to suit specific applications. Induction motors are versatile, rugged and reliable, and produce greater running torques than hysteresis synchronous motors of equivalent size.

Synchronous motors

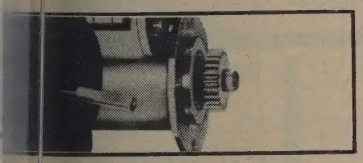
The difference between synchronous and induction motors is that induction units produce torque when the rotor is slipping behind the stator field. True synchronous motors supply torque only if the rotor is traveling at the same speed as the synchronous field. When the rotor approaches synchronous speed it locks in with the rotating field and continues to rotate synchronously with it. Globe accomplishes the initial start with a special alloy rotor with a hystereris loop. When placed in the rotating magnetic field of the stator, it will reach peak magnetization slightly after the peak flux density of the rotating field has passed. The lag in peak magnetization causes torque to be exerted on the rotor and the rotor starts turning and moves into synchronization with the field. Once in synchronization, it will hold a given speed to whatever accuracy the input frequency can be held.

With Globe a.c. motors hysteresis synchronous design is a basic standard and not a costly special type.

Gearmotors

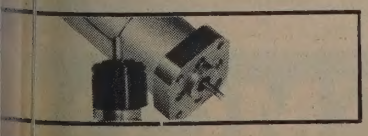
Globe a.c. motors can be furnished as gearmotors using one of many standard gear ratios. These ratios make it possible to obtain a wide range of speeds and torques. For geartrain selection, refer to bulletins.

se are examples of modifications available m Gle. For additional information on dificans for your application, consult the tory. 13) 228-3171

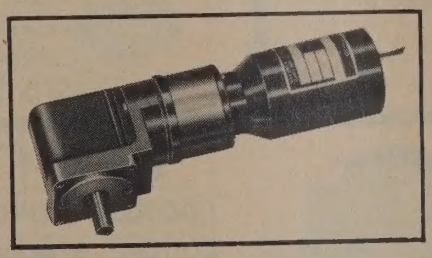


PECI. SHAFTS
obe ustries can furnish special pinions d spcal shaft configurations. Possibilities clude ats, slots, tapers, threads, keyways, d ho.

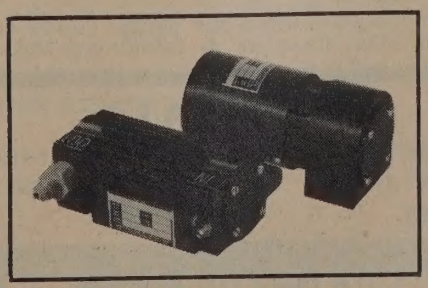
PECL ASSEMBLIES
obe an design special assemblies of otors brakes, clutches, and other power emen in a single package. This single urce pproach is generally more economical nd re ble.



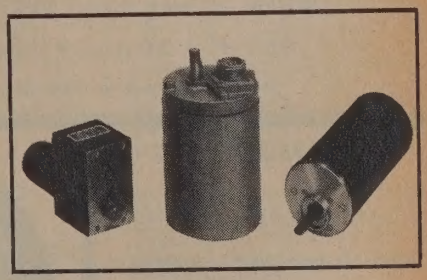
SPECL MOUNTINGS
esig can match application requirements ich servo mounts, tapped holes, special onfi ations, etc.



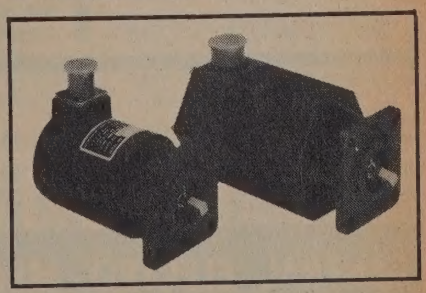
SPECIAL GEARING
Globe motors may be fitted with special gearing. The right angle gearhead shown is typical of configurations available on special order. A Globe gearmotor can be custom engineered for your application.



SPECIAL PUMPS
Our pump capability covers both liquid and air designs. Globe has a number of proven innovations, such as magnetic coupling of pump impellers to eliminate seal problems. Submit your requirements for review.



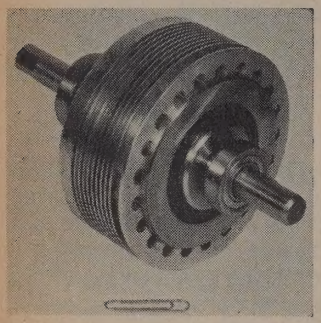
SPECIAL ACTUATORS
In production quantities, Globe actuators are complete packages incorporating all necessary take-off and control elements, together with motors and gear reducers Globe rotary and linear actuators are custom engineered for the specific application.



TACH GENERATORS
Globe tach generator experience goes back 20 years. We produce large quantities for a wide variety of specific applications. Gearmotors can be designed around most Globe frame sizes.

GEMCOR

ELECTRO MECHANICAL COMPONENTS



HYSTERESIS CLUTCHES & BRAKES

offer maximum reliability — smooth clutching — minimum maintenance. They are ideal for tension control and power absorption devices where smoothly variable slip torque is required. Torque is proportional to control current. Clutch-brake combinations also available.

SPECIFICATIONS	MODELS					
	PMC-6 PMB-6	PMC-16 PMB-16	PMC-30 PMB-30	PMC-35 PMB-35	PMC-120 PMB-120	
TORQUE - RATED OZ. IN. OUTPUT INERTIA SLUG FT² CONTROL WATTAGE	6 1.55×10^{-6} 2.5	16 3.03×10^{-6} 4.5	30 5.5×10^{-6} 5	35 6.3×10^{-6} 12	120 5.4×10^{-5} 5	
	PMC-175 PMB-175	PMC-325 PMB-325	PMC-.75K PMB-.75K	PMC-1.5K PMB-1.5K	PMC-3K PMB-3K	PM[illegible]K PM[illegible]K
TORQUE - RATED OZ. IN. OUTPUT INERTIA SLUG FT² CONTROL WATTAGE	175 1.5×10^{-4} 3	325 2.0×10^{-4} 7	750 6.3×10^{-3} 8.1	1500 1.26×10^{-2} 17	3000 2.68×10^{-2} 25	5[illegible] 4.05 [illegible]$^{-2}$

FIXED FIELD TYPE HYSTERESIS CLUTCHES also available. This type does not require commutator and b[illegible]es.

FRICTION CLUTCHES & BRAKES — FLANGE MOUNTED

LOW COST • HIGH TORQUE • LOW CONTROL POWER • FAST RESPONSE
MIN. EFFECT BY AMBIENTS

SPECIFICATIONS	MODELS						
	FC-25 FB-25	FFC-35 FFB-35	FFC-60 FFB-60	FFC-160 FFB-160	FFC-480 FFB-480	FFC-960 FFB-960	FFC-3.5K FFB-3.5K
TORQUE - RATED OZ. IN. OUTPUT INERTIA - SLUG FT.² CONTROL WATTAGE	25 1.06×10^{-6} 3	35 2×10^{-6} 6	60 2.8×10^{-5} 3.6	160 5.11×10^{-6} 9	480 1.7×10^{-5} 10	960 6.56×10^{-5} 10	3500 5.86×10^{-4} 30

CLUTCH-BRAKE COMBINATIONS AVAILABLE

FAIL-SAFE BRAKES

FOR POSITIVE SHAFT BRAKING
WHEN POWER FAILS PREVENTS

CREEPING • COASTING • HUNTING

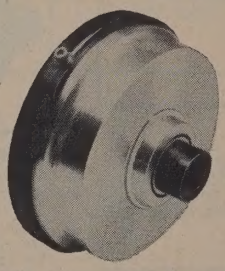
Torque Ranges 8 to 7000 oz. in.

CROWN TOOTH CLUTCHES & BRAKES

MAX. TORQUE — MIN. SIZE
POSITIVE ENGAGEMENT
LOW CONTROL POWER
FAST RESPONSE

DYNAMOMETERS

GEMCOR WILL DESIGN NON-STANDARD INSTRUMENT TYPE DYNAMOMETERS TO CUSTOMER'S EXACT REQUIREMENTS. SUBMIT FULL PARTICULARS.



NEW!

ADJUSTA-TORQ
CLUTCHES & BRAKES

- CONSTANT REPEATABLE SLIP TORQUE
- LIFE LIMITED ONLY BY BEARINGS
- CAN BE RUN IN OIL

USE AS A TORQUE LIMITING SLIP DEVICE, CLUTCH COUPLING, CONSTANT DRAG BRAKE OR IN TENSIONING APPLICATIONS.

POWER SUPPLY U[illegible]TS

TO CONVERT A.C. CURRENT TO D.C. FOR OPERATING ALL TYPES CLUTCHES & BRAKES.

VARIABLE AND FIXED VOLTAGES.

COMPACT DESIGN.

SPECIALS

GEMCOR WILL DESIGN NEW UNITS OR MODIFY EXISTING UNITS TO SUIT CUSTOMER'S SPECIAL REQUIREMENTS. THIS SERVICE IS AVAILABLE ON HYSTERESIS, FRICTION, CROWN TOOTH, MAGNETIC PARTICLE AND SUBMINIATURE TYPES.

GENERAL ELECTRO-MECHANICAL CORP.
BUFFALO 7, NEW YORK

GEMCOR

787 HERTEL AVENUE • BUFFALO NEW YORK 14207 • (716) 876-9685

GRAPHALLOY

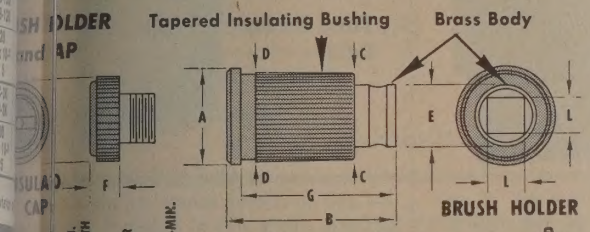
SILVER GRAPHALLOY BRUSHES and BRUSH & SLIP-RING ASSEMBLIES...

GRAPHALLOY BRUSHES

...ed in such equipment as... SERVO SYSTEMS • SYNCHROS • RADAR • GYROS • INVERTERS • THERMOCOUPLE GAGE CIRCUITS • GUIDED MISSILES • PULSE DIGITAL COMPUTERS • WAVE GUIDES • SONAR ...CERS • TORQUE INDICATORS

Silver GRAPHALLOY Brushes have been widely used because *of* LOW *and* CONSTANT CONTACT DROP, EXTREMELY LOW ELECTRICAL NOISE *and* LONG LIFE. Over 200 grades are now serving in a wide variety of applications. Silver GRAPHALLOY Brushes on ½"-diameter coin silver slip rings have operated successfully in highly critical electrical circuits at speeds up to 100,000 R.P.M. *Our Engineering Department will assist in determining the exact grade of* GRAPHALLOY *for your needs.* Ask for our Brush Inquiry Form 109.

...OLDER and CAP



Other Sizes Available

BRUSH SIZE	SUGGESTED MIN. SLIP-RING WIDTH	**MOUNTING HOLE DIAMETER	BRUSH HOLDER TO SLIP RING—MIN.	OVERALL LENGTH						BROACHED HOLE
				A	B	F	C	D	E	G	L
...6	3/16"	13/32"	1/16"	.437"	7/8"	3/16"	.404"	.418"	.281"	25/32"	.129"
5/32	1/4"	13/32"	1/16"	.437"	7/8"	3/16"	.404"	.418"	.281"	25/32"	.160"
3/16	1/4"	7/16"	1/16"	.484"	7/8"	3/16"	.441"	.451"	.313"	25/32"	.193"
1/4	5/16"	9/16"	1/8"	.616"	15/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256 x .193"
1/4	5/16"	9/16"	1/8"	.616"	15/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256"
3/8	7/16"	43/64"	1/8"	.718"	1 7/16"	1/4"	.672"	.682"	.533"	1 5/16"	.382 x .256"
3/8	7/16"	13/16"	1/8"	.921"	1 13/16"	1/4"	.813"	.828"	.628"	1 5/8"	.382"
1/2	9/16"	1 1/8"	1/8"	1.237"	1 13/16"	1/4"	1.126"	1.141"	.878"	1 9/16"	.503"
3/4	7/8"	1 33/64"	1/8"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"
3/4	7/8"	1 33/64"	1/8"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"

...are ...ded. **Mounting hole diameter for brush holder dimension D.

...est ...d fill in Brush Inquiry Sheet, Form 109, so that we can supply the proper grade of brush material.

SLIP RINGS
Solid Coin Silver

Standard Coin Silver Slip Rings, both *cylindrical* and *flat* types, are illustrated at right. We recommend the cylindrical type rings with three brushes per ring . . . spaced at 120°. The cylindrical type are designed for press fitting over standard steel shafting. The flat type rings are designed for nesting either on an insulated plate or for molding into insulation. Insulated slip rings of either type or slip-ring assemblies can be furnished with leads attached.

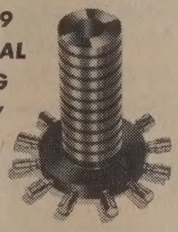
No. 168 Series flat type to 20" O.D.

Standard "Flat" rings have ¼" radial contact surface and ⅛" radial spacing between adjacent rings.

No. 116 Series cylindrical type to 36" O.D.

Copper Slip Rings, flat or cylindrical, are available.

Model 319 CYLINDRICAL SLIP-RING assembly



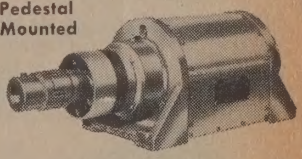
Solid Coin Silver Rings

MODEL	RINGS	LENGTH
319-4	4	2 9/16"
319-6	6	3 5/16"
319-10	10	4 13/16"
319-14	14	6 5/16"

O.D. Slip-ring 1⅝" Terminal 4" Assembly I.D.: .814"/.813" Range: Same as for Model 399

Model 399 BRUSH and SLIP-RING assembly

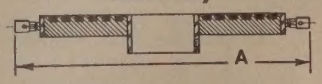
Pedestal Mounted



MODEL	RINGS	bolt slot distances CL to CL WIDTH	LENGTH	**OVERALL LENGTH
399-4	4	4½"	7¾"	13¼"
399-6	6	4½"	8½"	14"
399-10	10	4½"	10"	16"
399-14	14	4½"	11½"	18"

Specifications: Width 6½"—Height 6½". Shaft CL above base 3¼".
Applications: from strain gage or thermocouple up to 5 amperes, 125 volts, 250°F.
Speeds to 5,000 RPM.
Three Silver-GRAPHALLOY Brushes per solid coin silver slip ring.
Extraneous noise level low.
Rugged in design and construction.
Readily connected mechanically and electrically.
Complete coupling provided for 15/16" shaft.
More rings and higher speeds available upon application.

Model 409 FLAT SLIP-RING assembly

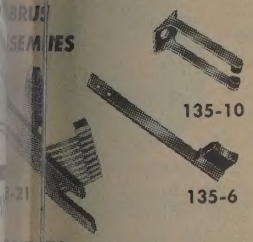


Solid Coin Silver Rings

MODEL	RINGS	OVERALL O.D.—"A"
409-2	2	5½"
409-4	4	7"
409-6	6	8½"
409-10	10	11½"

Hub: O.D. 2" I.D. 1.753"/1.751" Length 1⅛" To 5 amps., 125 v. More rings on application.

...BRUSH ASSEMBLIES



135-10

135-6

CONNECTORS (garter springs)

These silver-plated coil spring Connectors make for positive electrical connection to the brass body of the brush holder by snapping into the groove on the holder. The connecting lead can be pre-soldered to the Connector.

GARTER SPRING CONNECTORS	BRUSH SIZE	BRUSH HOLDER NO.
127-9	⅛" sq.	14326
127-9	5/32" sq.	11509
127-10	3/16" sq.	11570
127-14	¼" x 3/16"	19011
127-14	¼" sq.	11527
127-18	⅜" x ¼"	14292
127-20	⅜" sq.	12166
127-24	½" sq.	31392
127-32	¾" x ½"	35439
127-32	¾" sq.	35440

...CONTACTS

...PHALLOY, because of its inher... ...non-...lding and arc-quenching ...acteristics, is used widely for ...tacts. Ask for Data Sheet 950.

...BUSHINGS, Oil-free

...plain oil-...bricating bush... ...in ...nichros, ...ruments, tim... ...and ...ssiles.

...vantages: 1) Lower friction at ...om ...peratures. 2) No oil to ...hidify ...low temperatures. 3) No ...to ...bonize at prolonged ele... ...ted ...peratures.

*...ee ...Data Sheets 270 and 277 ...Miniature Bronze-*GRAPHALLOY

CLUTCH FACINGS and CLUTCH GEAR ASSEMBLIES

Torque remains same within close operating limits despite changes in temperature and humidity. For instrumentation, guided missiles, constant friction devices.

SPRING BINDING POSTS

(with or without Insulated Cap)

O.D.: ⅜", ½", 17/32"
Lgth.: ⅝", ¾", 25/32"

Also Miniature Spring Type!

19185 22978

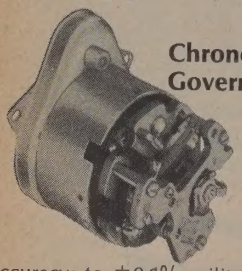
Write for data sheets

CALL ON OUR OVER 50 YEARS OF DESIGN EXPERIENCE FOR HELP IN SOLVING YOUR BRUSH PROBLEMS!

...RAPHITE METALLIZING CORPORATION : 1036 NEPPERHAN AVENUE YONKERS, NEW YORK 10702

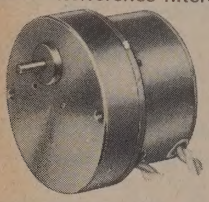
Creative Engineering in Electronic and Electromechanical Timing and Control

Timing, Drive & Stepper Motors



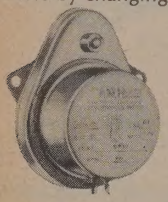
Chronometrically Governed—D.C.

Accuracy: to ±0.1% military; ±0.5% industrial, no load to full load. Many voltage ranges. Speeds: 3600 rpm to 1/144 rpm. Radio interference filtered, if required.



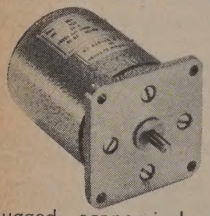
General Duty Synchronous

24 to 240 VAC, 50 or 60 Hz. Torque: 2 oz-in @ 300 rpm direct from rotor. Integral gearing provides speeds as low as 1 rpm. Gear train rated at 100 oz-in. Rotation reversible by changing one connection.



Miniature Reversible Synchronous

12 to 230 VAC, 50 or 60 Hz. Torque .75 oz-in @ 300 rpm direct from rotor. Power input 1.5 watts nominal. Output speeds from 300 rpm to 1/6 rph. 2-coil winding. Reversible. Measures only 1-7/16" x ¾".

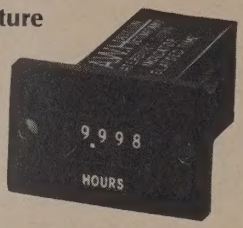


5-volt 4- and 8-Phase Steppers

Rugged, economical permanent magnet construction. Low temperature rise. 3¾°, 7½° and 15° step angles. Pull-out rates to 7500 steps/sec. Maximum working torques to 22.2 oz-in.

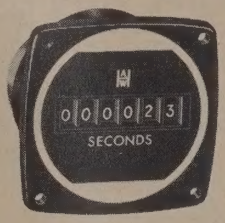
Indicating Devices

Microminiature Elapsed Time Indicators



115 VAC, 50 or 60 Hz. Only 37/64" square by 1¼" long. Either front or side readout. Reads to 9999 hours, then recycles. Ideal for warranty and maintenance controls.

Commercial Elapsed Time Indicators

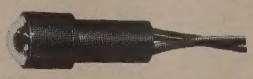


21 standard low-cost models. 6-digit readouts in "hours & tenths," "minutes & tenths" or "seconds." Round or square flange units meet NEMA standard dimensions. 50 or 60 Hz.

Microminiature "BITE" Indicators

"BITE" (Built-In-Test-Equipment) Indicators monitor circuit or system performance to DOD "Systems Readiness" requirements. Respond to pulse as low as 15 MS. Meet MIL-E-5400 H, Class 1-A. Measure only .2" x .4" x .7".

Low Cost Fault Indicators—"BITE"



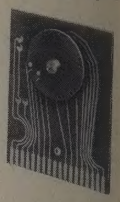
Operate on same principle as Microminiature "BITE" Indicators but lower in cost. Either manual or electrical reset types. Only .320" dia. x .812" long. DC operation.

Timing Devices

Time Delay Relays

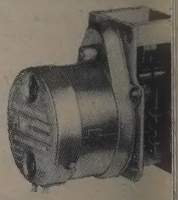
A broad line of AC or DC electromechanical and electronic timers for industrial and military applications. Fixed or adjustable delay times. Many mounting options.

Stepping Switches



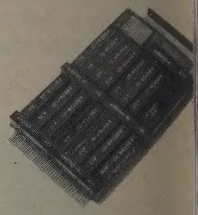
Solenoid operated printed circuit type 12 or 28 VDC or rectified 115 VAC, 50 or 60 Hz. 3, 4, 5, 6, 10 or 12 positions. Step up to 15 steps/sec. Can be factory modified to meet specific needs.

Repeat Cycle Timers



Low-cost AC or DC electromechanical and electronic industrial types for loads up to 25 amp. Standard motor-driven timers have up to 12 switches and wide range of cycle times. Electronic timers available in range of adjustable or fixed cycle times.

Time Code Generators



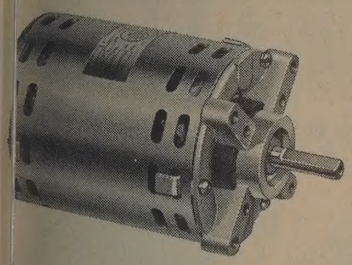
Electronic or electromechanical in IRIG or other specified codes. Available in bench rack or plug-in modular form. High degree of accuracy in all units. AC or DC.

THE A. W. HAYDON COMPANY

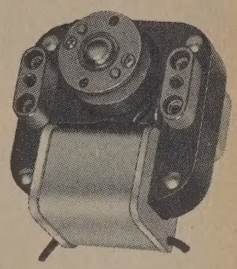
NORTH AMERICAN PHILIPS COMPANY

232 North Elm Street, Waterbury, Conn. 06720 Tel. (203) 756-4481 TWX: 710-477-3141
In Europe s.a. Polymotor • 1 Blvd. Anspach • Brussels 1 • Tel. 19.27.46

OMPUTER-RATED FRACTIONAL HORSEPOWER MOTORS



When Howard rates a motor 1/20 hp, we're not about to under-power your system with a 1/25 hp motor. We always True Rate our fhp motors this way. Our computer guarantees it . . . and your products benefit.



A-LINE SHELL FRAME INDUCTION MOTORS
- Permanent Capacitor
- Capacitor Start
- Reluctance Synchronous
- Hystersis Synchronous
- Variable Speed Permanent Capacitor

B-LINE
AST FRAME INDUCTION MOTORS
- Permanent Capacitor
- Reluctance Synchronous

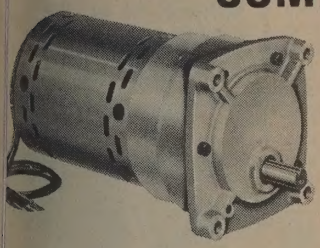
C SHUNT MOTORS

SHADED POLE MOTORS
- U-Line Unit Bearing
- K-Line Skeleton—Conventional Bearing
- Variable Speed

UNIVERSAL MOTORS
- B-Line Cast Frame
- D-Line Cast Case
- A-Line Shell Frame

SAME-DAY SHIPMENT OF STANDARD MODELS

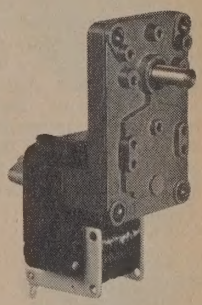
COMPUTER-MATED GEARMOTORS



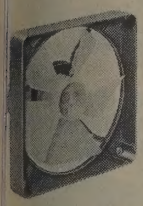
Howard gear trains and motors are computer-mated and computer-rated. This means that when Howard matches and rates a gearmotor, it's a true rating for your job. It means, too, that no Howard Gearmotor will ever destruct or destroy itself . . . or your system.

INDUCTION • UNIVERSAL AC/DC • RELUCTANCE SYNCHRONOUS • SHADED POLE

SAME-DAY SHIPMENT OF STANDARD MODELS

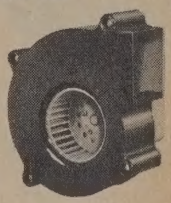


FANS & BLOWERS GUARANTEED FIVE YEARS



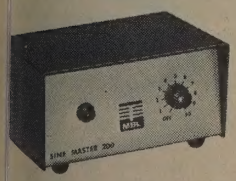
Our modest 5-year guarantee on Howard Fans and Blowers is based on an engineered lifespan of 10 years. And our customers report the fans are still blowing strong 12 or even 14 years after installation. More than 10 million successful installations.

- **Unit Bearing motor**
- **Indestructible nylon blades**
- **UL yellow card listing**
- **All metal construction**
- **Fans standard mount on 4⅛" centers**



SAME-DAY SHIPMENT OF STANDARD MODELS

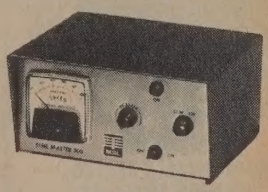
NEW SINE MASTER SOLID STATE AC MOTOR SPEED CONTROLS
for HOWARD Fractional HP Motors



SINE MASTER 200
Regulated speed control for shaded pole induction and universal motors.

- Motor speed regulated by controlling the energy input to the motor
- Power is self-controlled to meet motor demands
- Maintain rated starting torque over entire control range
- Computer-mated to selected Howard fhp motors
- Priced competitively with DC-type controls
- Eliminate brush problems and maintenance of DC motors
- Electrical limit of 130 VRMS maximum and 4 amps in 40° C ambient
- Speed range of 20:1 for two-pole induction motors

COMPLETE DATA SHEETS ON REQUEST



SINE MASTER 300
Automatic, governed speed control for permanent capacitor induction motors, universal and shaded pole induction motors.

HOWARD

MSL

HOWARD INDUSTRIES
DIVISION OF MSL INDUSTRIES, INC.
2420 18th STREET, RACINE, WISCONSIN 53403
414-632-2731 TWX 910-271-2387

H·S·I®

ELECTRO-MECHANISMS

Advanced concepts for integration of electrical and mechanical energy into useful components and systems.

SERIES 33000 "BIG INCH" SINGLE PHASE, SYNCHRONOUS INTEGRATING MOTOR

Ideal drive for elapsed time indicators, stop clocks, pulsers and interrupters, chart drives. **Fast Start-Stop:** Rotor locks in on first line frequency cycle; stops instantly without coast. **Compact:** Approximately 1" diameter by 1" long. **High Torque:** Higher than many motors twice its size. **Low Wattage:** One watt input at rated voltage. Standard voltage ratings 20V and 115V 60 Hz. Cool operation. **Unidirectional:** Shaded pole starting. No mechanical no-backs. **Sealed Gears:** Heavy duty, permanently lubricated. Standard speeds 360, 300, 60 and 3.6 RPM. **Low Cost:** For high volume applications. Tooled for mass production.
Reference: Bul. No. 33-1

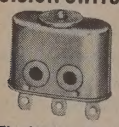
SERIES 33600 "BIG INCH" BIDIRECTIONAL 2-PHASE INTEGRATING MOTOR

Instantly reversible by switching capacitor from one coil to the other.

The fast start/stop and reversing characteristics of 33600 series motor makes it ideally suited for control functions where shafts, potentiometers, indicators, etc. must be precisely positioned.

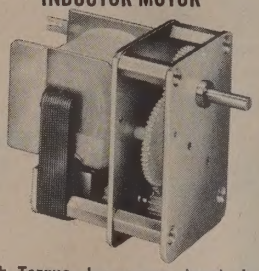
The motor can "inch" in either direction in small increments and stop without coast. **Compact:** Approximately 1" in diameter by 1¼" long. Standard voltage ratings 20V and 115V 60 Hz 2 watt. Other characteristics same as for 33000 series motor.
Reference: Bul. No. 33-2

SERIES 6100 HERMETICALLY SEALED PRECISION SWITCHES



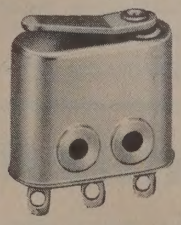
Patented Elastomer Seal and one-piece snap action blade performs reliably under extreme vibration conditions. **Temp. rating:** −65° +300°F. Available to +400°F. **Electrical ratings:** 28 VDC/115 VAC. 5 amp resistive, 3 amp inductive. Meets requirements of MIL-S-8805. **Actuators:** Leaf, roller, toggle and push button. Low operating force.
Reference: Cat. No. 72

SERIES 38 A.C. SYNCHRONOUS INDUCTOR MOTOR



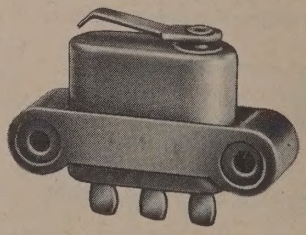
High Torque: Low power input. **Instant Start:** Locks in with line frequency within one cycle. No mechanical device needed to insure correct rotation. Readily adaptable to chart and other drives requiring constant speed output. **Compact:** 1¼" x 1 13/16" x 2". Standard speeds 60, 30, 20, 10 rpm.
Reference: Bulletin No. 38-1

SERIES 6300 HERMETICALLY SEALED PRECISION SWITCHES



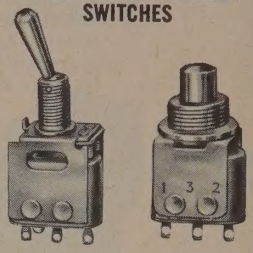
Housing: Corrosion resistant housing with integral wobble diaphragm. One piece snap action blade as in 6100 Series, proven in years of performance. **Standard rating:** −85°F +300°F. **Electrical ratings:** 28 VDC/115 VAC. 5 amps resistive, 3 amps inductive, 3 amps motor. Meets requirements of MIL-S-8805. **Operating force:** recommended for extreme environmental conditions.

SERIES 6200 HIGH TEMPERATURE HERMETICALLY SEALED SWITCHES



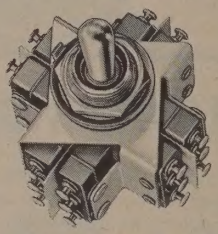
With metal to metal and glass to metal seals corrosion resistant steel base and housing heliarc welded to avoid use of fluxes normally used in solder sealing. Actuator operates switch through metal diaphragm integral with housing. **Standard rating:** −65° +660°F. **Electrical ratings:** 28 VDC/115VAC: 5 amps resistive, 3 amps inductive, 3 amps motor. Meets requirements of MIL-S-8805.
Reference: Cat. No. 72

PUSH-BUTTON AND TOGGLE ACTUATED, HERMETICALLY SEALED SWITCHES



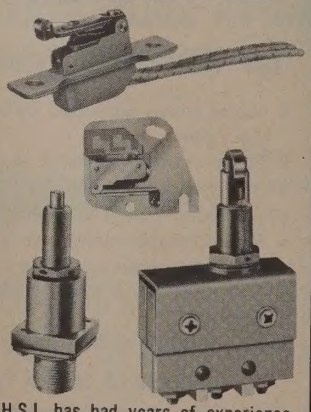
Incorporate Series 6100 basic switch to meet requirement of MIL-S-8805, enclosure 4. Also available with 6300 Series switch to meet enclosure 5 requirements of MIL-S-8805. Toggle switches are available in various configurations of one-pole and 2-pole, 2-position and 3-position. Push-Button switches are single or double pole, momentary. Corrosion resistant materials used throughout.
Reference: Bul. No. 61T-1

SERIES 5300 4 WAY TOGGLE SWITCH



2 pole double throw each position. Center off. Momentary contact, maintained contact, or combinations. 28 VDC/115 VAC: 5 amps resistive, 3 amps inductive. **Reference: Bul. No. 53T-3.** Available with water tight panel seal.

SPECIAL SEALED SWITCHES



H.S.I. has had years of experience in providing answers to difficult switching problems. Let our engineers help you.

For information on all product lines, send for Catalog 101; and for complete data on individual products, refer to Bulletin Number indicated.

SERIES 42 HIGH SPEED DIGITAL STOP CLOCK

Planetgear® totalizer measur or integrates time intervals in 100 second increments. Operate on 115V 60 Hz line power. Time ad-ings displayed in large easily ad numerals. Available with 6 8 digits. Non-reset, manual res or electrical reset. Accurate — ng life.
Reference: Bul. No. 42-3 for el mounting models.

SERIES 42005 DIGITAL STOP CLOCK AND TIME TOTALIZER

Electrically resettable Planetg® totalizer enclosed in attractiv n-strument type case with line d, remote reset switch and cord or laboratory use. Totalizes in 1 0 second increments to 9999.99 c-onds on 115V 60 Hz supply.

SERIES 44 PLANETGEAR® PULSE COUNTERS

Non-Reset, Manual Reset, Electr l Reset Models. AC or DC comp e unique Planetgear digital cou r driven by an HSI stepper mo . Large 5/16" high figures easily r . Long life, reliable. Pulse rate: u to 40 PPS standard; up to 100 S on special order. 6 and 8 di s standard.
Reference: Bul. No. 44-1R

H·S·I®

HAYDON SWITCH & INSTRUMENT, IN

Where Optimum Performance is Stand

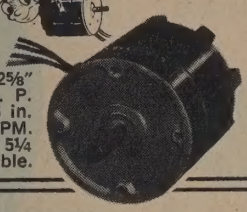
1500 Meriden Road, Waterbury, Conn. 06

Area Code (203) 756-7441

CALL ON hurst-POWER HEAVY DUTY HYSTERESIS SYNCHRONOUS MOTORS

HEAVY DUTY SYNCHRONOUS MOTORS

NEW! Mini-Bee

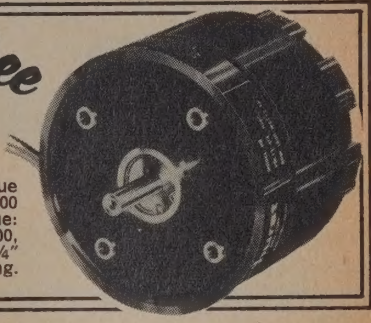


MODEL MB
Just 2 13/32" x 2 5/8" long. 1/100 H. P. Start torque 6 in. oz. at 1800 RPM. Sync torque: 5¼ in. oz. Reversible.

- VIDEO RECORDING
- INSTRUMENTATION
- DATA HANDLING
- TAPE RECORDING
- TELEMETERING
- TURNTABLES
- AND NUMEROUS OTHER DIRECT DRIVE APPLICATIONS

Hystereris synchronous. 40°C heat rise, full load. Inverted rotor for reduced flutter. Sealed ball bearings. Stainless steel shafts, lifetime lubrication.

Honey Bee

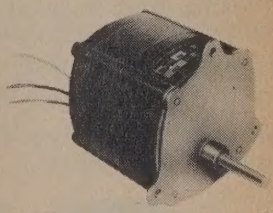


MODEL HB
1/50 H.P.Start torque 12 in. oz. at 1800 RPM. Sync torque: 11 in. oz. Avail. 1800, 1200, 900 RPM. 3¾" dia. x 3⅝" long. Reversible.

hurst MODEL GA
600 IN. OZ. OF TORQUE AT 1 RPM (Reversible)

For long life and higher torque applications. Offers instrument manufacturers high performance and economy.

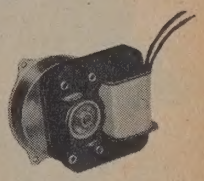
- HEAVY DUTY GEARING
- NO LUBRICATION REQUIRED
- CAPACITOR INCLUDED



MODEL GA

hurst MODEL EA
150 IN. OZ. OF TORQUE AT 1 RPM (Unidirectional)

Open frame, shaded pole, extremely cool running. Bronze bearings, brass gears, hardened steel pinions and wheel shafts, stainless steel output shaft. For dependable, low-cost timing applications. Wide range of speeds.



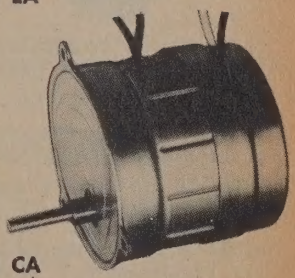
MODEL EA

hurst MODEL DA
150 IN. OZ. OF TORQUE AT 1 RPM (Reversible)

Timing accuracy both clockwise and counter-clockwise. SPDT switching. Case 2½" diam., 1¾" long. Will not overheat. Capacitor included.

hurst MODEL CA
100 IN. OZ. OF TORQUE AT 1 RPM (Reversible)

Features 1200 rpm rotor speed for quiet performance. Extremely versatile (animated displays, program instruments, outdoor advertising, etc.). Wide range of output speeds. Will not overheat. Capacitor included.



MODEL CA

hurst MODEL SM
RATED 40 IN. OZ. OF TORQUE AT 1 RPM (Unidirectional)

For tough jobs demanding accurate timing. Excellent shock and vibration resistance. Starts instantly at full torque. Will not overheat. Wide range output speeds.

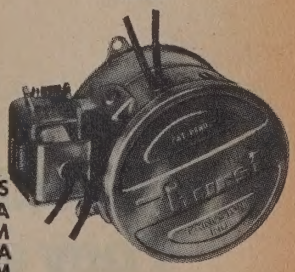
hurst MODEL PC-SM / MODEL PC-DA
MODEL PC-SM: CLUTCH AND BRAKE MOTOR 40 IN. OZ. OF TORQUE AT 1 RPM (Unidirectional)
MODEL PC-DA: CLUTCH AND BRAKE MOTOR 120 IN. OZ. OF TORQUE AT 1 RPM (Reversible)

Both are positive clutch and instantaneous brake motors. For extremely fast starts and stops. Motor runs continuously with clutch and brake controlled by switching actuator only. Clutch starts output shaft within 20 milliseconds; brake stops output shaft within 1/5° at 1 rpm; within 12° at 60 rpm. Motor on AC voltage; actuator AC or DC. Either can be supplied in any voltage combination when motor is AC. Will not overheat.

MODELS DA SM

hurst MODEL AR-DA / MODEL AR-SM
MODEL AR-DA: 100 IN. OZ. OF TORQUE AT 1 RPM (Reversible)
MODEL AR-SM: 40 IN. OZ. OF TORQUE AT 1 RPM (Unidirectional)

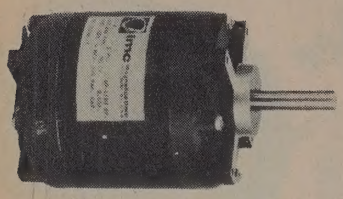
Automatic reset. Planetary-type clutch operates directly upon output shaft. When de-energized, shaft is manual or automatic reset. Addition of external return spring to output shaft provides automatic reset on either model. Motor on AC voltage; actuator on AC or DC. Either can be supplied in any voltage combination when motor is AC. Will not overheat. Capacitor included.



MODELS PC-DA PC-SM AR-DA AR-SM

AVAILABLE AT YOUR LOCAL HURST DISTRIBUTOR

hurst MFG. CORP. PRINCETON, INDIANA

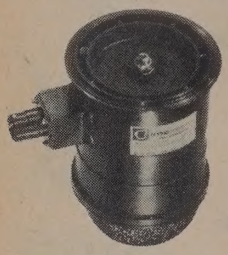


375 to 28,800 rpm in Hysteresis-synchronous, Reluctance-synchronous, Induction and Torque types.

Working, from fleapower to 5 hp levels (0.75 to 5.375-inch OD).

Accepting inputs from 18 to 1000 Hertz, from 6 to 440 Volts.

88 pages of catalog list all parameters and options.



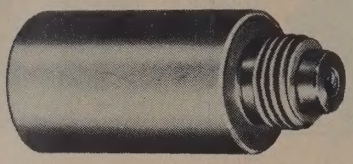
40 vaneaxial fan models, from IMCUBE (1-inch cube) to 14.5-inch diameter, up to 3450 cfm.

Or a tubeaxial or propeller fan, or a centrifugal blower. 147 pages of catalog airmovers can't be listed in this space.

Eastern Division, 570 Main Street, Westbury, N.Y. 11591, Tel. (516) 334-7070, TWX 510-222-4469

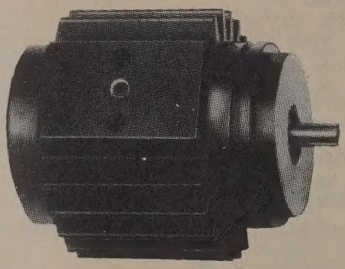
Find your angle with a Size 8 or 11 synchro (CT, CDX, CX, TX &c.) or a Size 15 resolver.

Econosync (low cost) and BUWEPS types are factory stocked for immediate delivery.



24 solenoids that pull up to 32 pounds. hold up to 60 pounds, (0.375 to 2.26-inch OD).

All are immediately available to work with consistent reliability in your system.

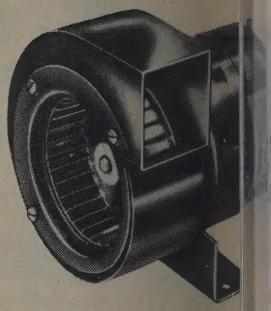


Steppers off the shelf. 26-factory stocked models.

Permanent Magnet and Variable Reluctance types in Sizes 5 to 35.

Controllers & Pulses Sources.

Western Division, 6058 Walker Ave., Maywood, Calif., 90270, Tel. (213) 583-4785, TWX 910-321-3089



Boxer, MiniBoxer, Tan m er, Superboxer, Hi Fi Boe Grand Prix Boxer fans (M Blowers and fans. New Jo fans.

Outputs from 38 to 57 fm

Sizes from less than c inches to the slim 3.5-in de by 10-inch-diameter.

All Distributor stocked

New Hampshire Divisio Ro 16B, Rochester, N.H. 03 (603) 332-5300

Here's a page out of our book.

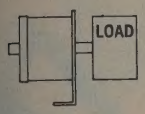
It's called the IMC Master Catalog. They are available only through your IMC sales representative.

imc

DEX EPPING MOTORS, SERIES 50

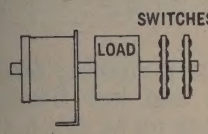
rque to 72 ounce inches

th a uni ectional Series 50 you can . . .

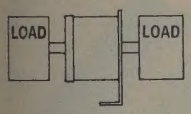


ve your load remotely through a ort steps and stop at any one of or 24 positions.

add a knob for manual reset in ction . . .

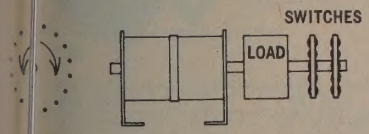


r add rotary switches for a com- ower positioning drive and a step n switch

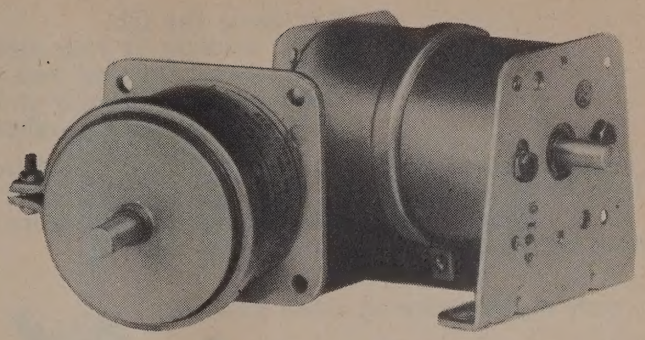


or use shaft extensions on each end -couple two loads and drive them in direction at the same time.

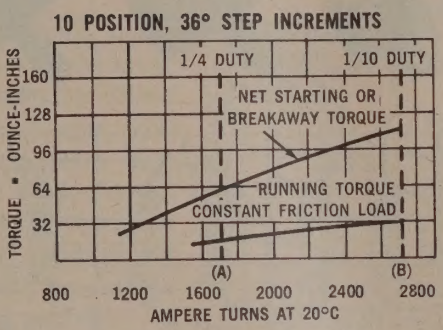
idirectional Series 50 you can do all us **remotely position** loads CW or

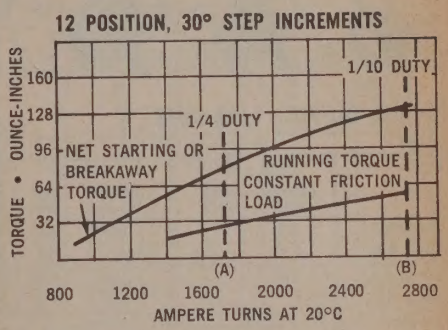


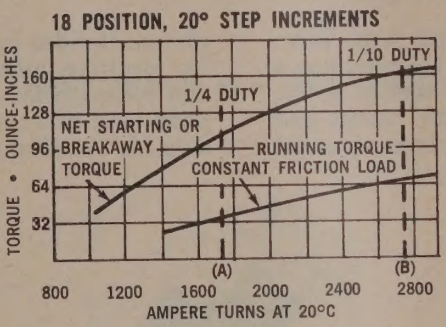
king parts are completely enclosed. n life is 3 million steps. For bidirec- 3 million in each direction. And, the 50 works on simple square wave input . . so you don't need expensive logic .

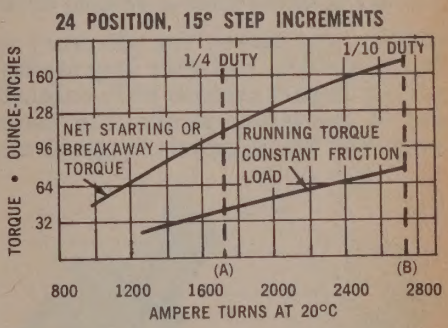


48 stock models for quick prototype starts









Top curve in each graph shows net starting or breakaway torque, typical when friction component of load is high in beginning — as in driving a valve. **Lower** curve applies when friction load is consistent throughout stroke. Dotted lines "A" show output at 1/4 duty, 84 watts; dotted lines "B" 1/10 duty at 210 watts.

Highlights	Unidirectional	Bidirectional
Voltage	6 to 220 VDC	6 to 220 VDC
Length	1.9″	2.5″
Width	2 1/16″ (Dia.)	2.5″
Height	2 1/8″ (Sq. plate)	2 13/32
Weight	14 oz.	24 oz.
Price, 1-9	$23-$24	$37-$39
Price, 1000 up	$10-$12	$16-$18

Ledex Series 50 stepping motors are engineered for high torque-to-size, uniform stepping accuracy, construction simplicity and economy. Newly developed tooth clutch drive gives positive grip stepping action (no slip) and doubles as a built-in electromechanical clutch brake to eliminate the natural tendency of overdriving at the end of a step.

Catalog D-7000 lists complete details on 48 stock models, performance data and engineering considerations. We'll gladly send it to you. If you prefer, send us details of your positioning application and we'll come back with a recommended solution.

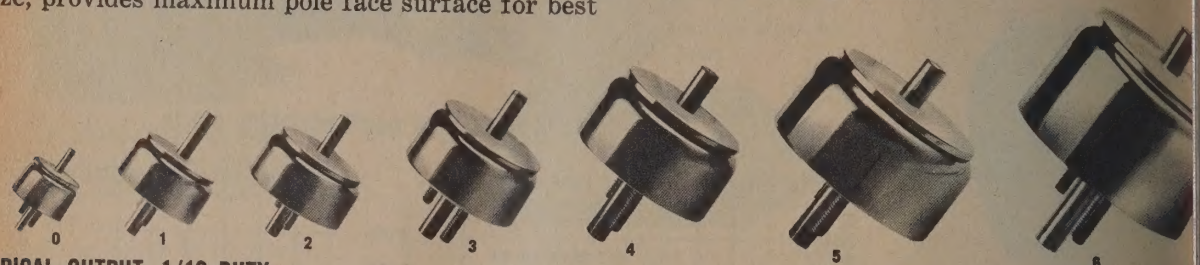
LEDEX

LEDEX DIVISION, LEDEX INC.
126 Webster St., Dayton, Ohio 45401 phone (513) 224-9891

LEDEX STRAIGHT PULL DC SOLENOIDS

You name the job.
Short, medium or long stroke. High speed. Tight space. Unusual load. Ledex has the solenoid for you, usually on the shelf. Expert design assistance for your toughest custom requirements.

Pancake shaped Ledex push/pull solenoids are built for high force to size and fast response. Better than 10ms response. Form factor minimizes size, provides maximum pole face surface for best efficiency. Two types available. Flat face short stroke, rapid response. Conical face more mid-range punch.

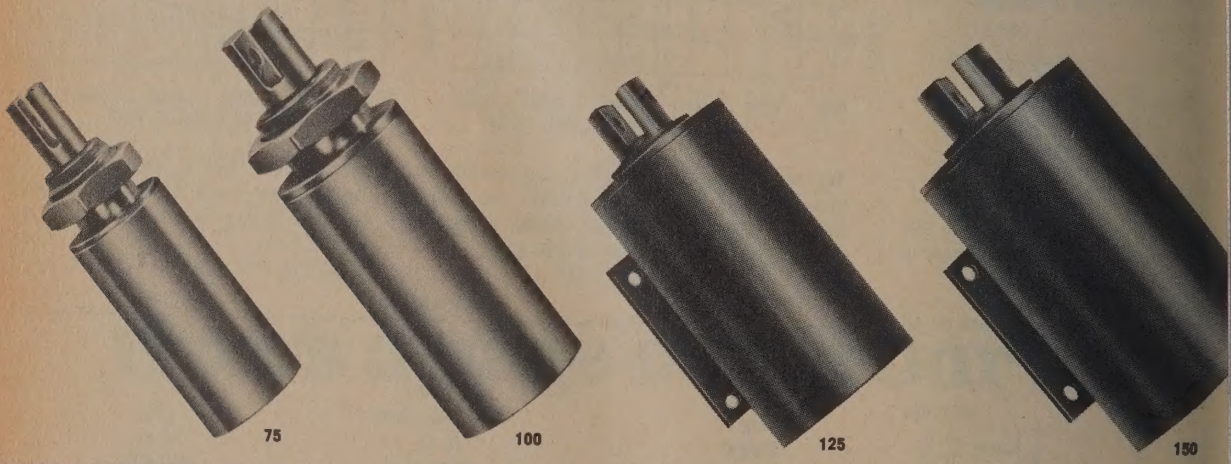


TYPICAL OUTPUT, 1/10 DUTY

Model	0		1		2		3		4		5		6
Size	.75"D x ½"		1"D x 17/32"		1.2"D x 27/64"		1.3"D x 11/16"		1.6"D x 55/64"		1.9"D x 1 1/64"		2.3"D x 1
	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face
Stroke (In.)	.020	—	.020	.010	.020	.010	.020	.010	.020	.010	.020	.010	.020
Force (Lbs.)	4.4	—	7.8	17	11	23	16	35	17	55	35	110	85
Stroke (In.)	.120	—	.120	.060	.120	.060	.120	.060	.200	.100	.250	.100	.250
Force (Lbs.)	1	—	2.4	3.3	3.3	4.5	8	10	6	12	16	20	52
Weight	1½ oz.		1½ oz.		2¼ oz.		3¾ oz.		6 oz.		10 oz.		1 lb. 5½

(For detail performance curves, ask for Catalog C-1100)

Quality engineered for efficiency and long term dependability, the Ledex long stroke solenoid has a built-in impact cushion pad to absorb energy at the end of the power stroke. For smooth travel and long wear, the solenoid plunger is electroless nickel plated. It rides in a smooth bushing track des for positive alignment and low friction. Sl and cross drilled plungers on all stock models plify load attachment. Off-the-shelf models able for 12, 28 and 100 VDC operations.



Model	Size 75	Size 100	Size 125	Size 150
Size	¾"D x 1½"	1"D x 2"	1¼"D x 2¼"	1½"D x 2½"
Force, 1/10 duty, .050 stroke	3 lbs.	7 lbs.	11.5 lbs.	16.5 lbs.
Force, 1/10 duty, .750 stroke	.6 lbs.	2 lbs.	4 lbs.	7 lbs.
Shaft Diameter	.312"	.437"	.500"	.625"
Mounting	Thr'd Bushing	Thr'd Bushing	Saddle	Saddle
Weight	3 oz.	6¾ oz.	9 oz.	1 lb. ½ oz.

When it comes to actuating, Ledex has both the people and products to give you the quickest and best solution. There's a wide choice of stock models for a fast start on your prototype. And our expert application staff is always glad to custom engi to your exact stroke, force, speed and size requ ments.

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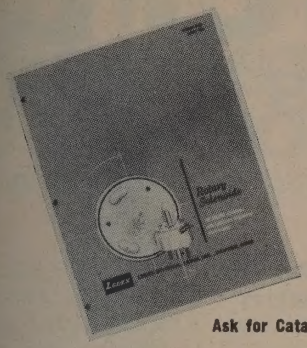
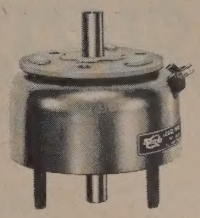
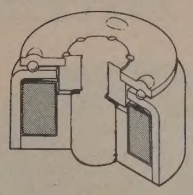
See YELLOW SECTION for Local Offices, Phones

DEX ROTARY SOLENOIDS



Ask for Catalog C-1000





252 stock models for quick prototype starts

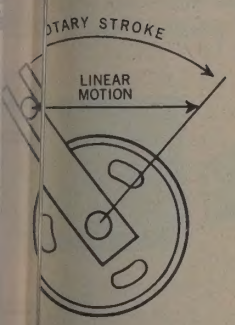
edex Rotary Solenoids step, turn, pull, push, ndex, hammer, punch or trigger — whenever here' a need for fast and dependable direct otary action. Known for high force-to-size, abil- ty to esist shock. Family of 8 basic sizes with ight nd left hand strokes from 25 to 95 de- rees Torque to 117 pound-inches. Wide choice f stck models offer economy and quick starts m p totypes. LIFE: 100,000,000 actuations with pecial endurance engineered models.

GROSS TORQUE IN POUND-INCHES

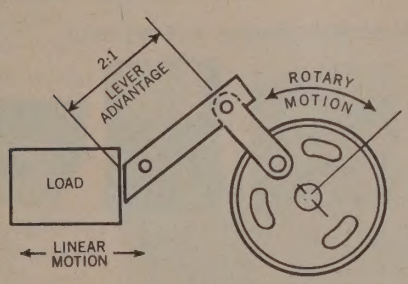
Rotary Stroke			25°		35°		45°		67½°		95°	
Duty Cycle			1/10	1/20	1/10	1/20	1/10	1/20	1/10	1/20	1/10	1/20
Size	Diam. (in.)	Ht. (in.)										
1E	1	5/8	.8	1.1			.43	.62				
2E	1 1/8	21/32	1.4	1.7	1.1	1.3	.72	.89				
3B*	1 5/16	7/8	2.7	3.2	2.0	2.3	1.4	1.7	.65	.8		
3E		51/64	2.7	3.2	2.0	2.3	1.44	1.8	.70	.89		
4E	1 9/16	61/64	4.5	5.2	3.1	3.5	2.6	3.1	1.6	1.9	1.0	1.2
5B*	1 7/8	1 13/64	8.3	10.0	6.9	8.3	5.0	6.0	3.3	4.0	1.6	1.9
5S		1 3/64	12.1	13.2	7.8	9.2	6.3	6.9	3.9	4.9	1.9	2.6
6S	2 1/4	1 27/64	27.8	30.6	18.6	20.5	11.0	12.1	8.8	9.7	5.2	5.7
7S	2 3/4	1 55/64	42.4	46.6	38.0	42.0	29.8	32.8	17.5	19.3	10.5	11.6
8S	3 3/8	2 5/16	98.0	117	64.0	77.0	54.0	65.0	29.0	35.0	17.0	20.0

* 3B and 5B have random wound coils; all other are precision wound.

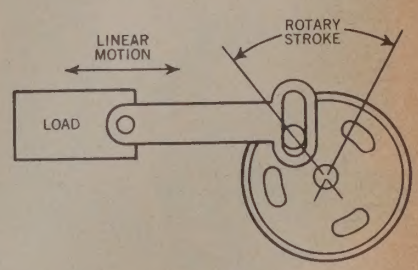
Rotary Solenoid as a Linear Actuator



AFT BAR LINK



ARMATURE LEVER



ARMATURE DRIVE PIN

Wh the stroke length is beyond the range of Ledx straight pull solenoids, a rotary solenoid maybe the best solution.

Ledx rotary solenoids have raceways coined in the rmature and stator. With precision ball bearing riding on inclined raceways, the solenoid provid direct, almost friction-free rotary motion. In the eginning of the stroke, where the output of a liner solenoid is low, the raceways are steep. Toard the closed end, where the magnetic attraction reaches maximum force, the raceways taper off The effect is to evenly distribute the force.

Ledex solenoids can help you get a lot of work done in places where you don't have much room. We make both push/pull and rotary solenoids in a wide variety of shapes and sizes to solve just about any actuating problem you have.

Call Ledex when you need a lot of power in a small space to push, pull, turn, twist, step, index, hammer, punch or trigger. For a quick start on your prototype, choose from 252 different stock model designs. Or, send details and we'll custom design a space-saving solenoid for you.

LEDEX

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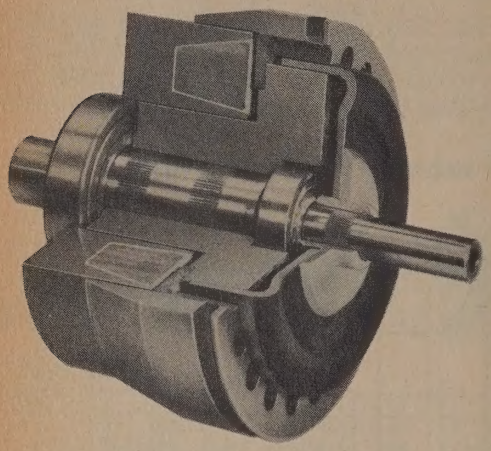
MAGTROL

HYSTERESIS CLUTCHES & BRAK



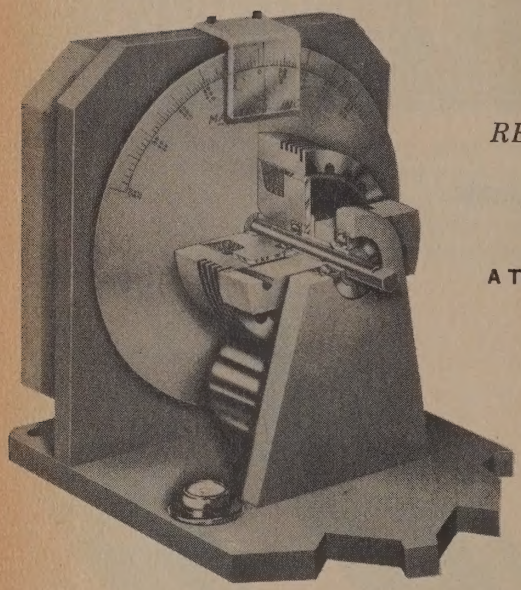
THE MOST PRECISE TORQUE CONTROL K

INFINITELY VARIABLE
HIGHEST REPEATABILITY
LONGEST LIFE

For such precision-demanding applications as tensioning control, load simulation, high-performance servo systems, speed control. Stable in almost any environment. High heat dissipation capability.

Ask for catalog HCB

DYNAMOMETER



REPEATABLE, ACCURATE MOTOR ANALYSIS SYST

Simple and reliable for determining torque—speed characteristics in laboratory, receiving inspection, production testing.

A Torque-Speed Readout for Every Need

Direct Dial

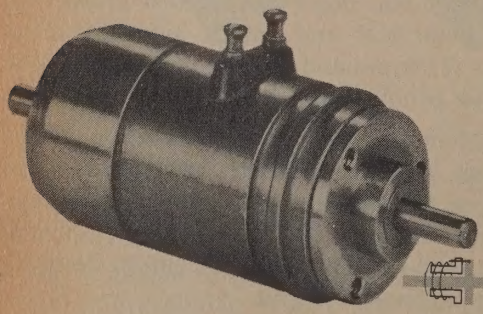
Meter

Digital Tachometer

X-Y Plot

Ask for bulletin 2000D

FRICTION CLUTCHES & BRAK



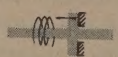
SEVEN STANDARD T
UNLIMITED CUSTOM CONFIGURAT

HIGH TORQUE/LOW WATTAGE RATIO
FAST RESPONSE
MAXIMUM RELIABILITY

Clutch

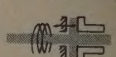
Failsafe Clutch

Brake



Failsafe Brake

Clutch-Brake



Clutch-Brake

Ask for catalog FCB

Write or call

MAGTROL INC.

CABLE: MA

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See YELLOW SECTION for Local Offices, Phones

MAG TECH LOW-COST, DIRECT-DRIVE DC SERVO MOTORS

These direct drive DC servo motors couple directly to the driven load, eliminating the disadvantages of gears and gear trains in servo systems. They provide fast response and precise positioning, as well as high tracking accuracy and smooth, quiet operation.

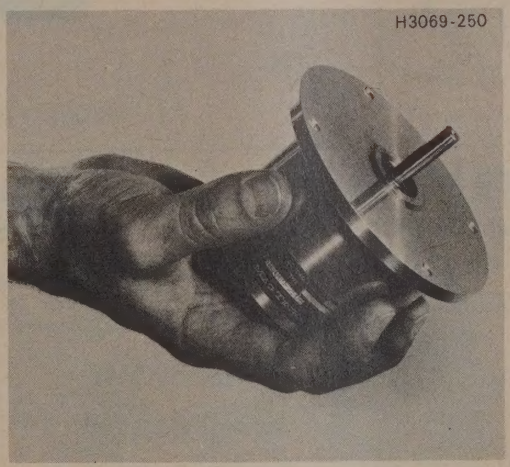
Because no gears are needed, system simplification is possible and excellent system stability results. Permanent magnet fields and moving iron design result in minimum input power and high thermal inertia.

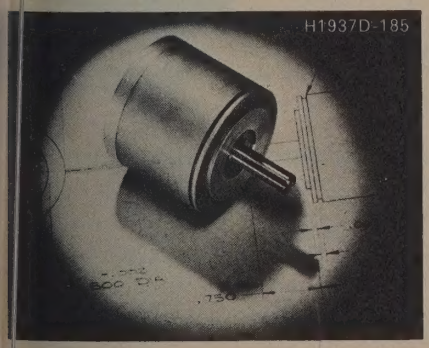
Such features make these motors ideal for use in disc packs, tape transports, card sorters, readers and other computer peripheral equipment, and applications where high torque-to-power ratios and high torque at low speeds with rapid accelerations are important. In these applications, MagTech direct drive DC servo motors provide performance, reliability and packaging advantages unexcelled by other drive units. These motors are furnished with metal housings as shown, but also can be furnished as matched components—armature, field and brush assembly—without housing, shaft or bearings.

Magnetic Technology offers designers the broadest line of high performance DC torque motors and tachometer generators. See page **1993** for information on other standard and custom units.

Specifications	Frameless Model 1937D-100 Housed Model H1937D-185		Frameless Model 1937D-150 Housed Model H1937D-235		Frameless Model 3069-175 Housed Model H3069-250	
Performance	Data		Data		Data	
Peak Torque (oz-in)	20.		50.		75.	
Power at Peak Torque @ 25°C (watts)	33.		50.		52.	
Ripple Torque (%)	5.		5.		6.	
Total Breakaway (oz-in)	1.*		2.*		3.*	
Electrical Time Constant (millisec)	.4		.6		.7	
Damping Factor (oz-in/rad/sec)	.093		.36		.9	
Moment of Inertia (oz-in-sec^2)	.0014		.0026		.012	
No Load Speed (rad/sec)	215.		140.		94.	
Winding Data						
Resistance @ 25°C (ohms)	4.3	16.7	3.9	15.5	3.0	
Volts @ Peak Torque @ 25°C (volts)	12.	24.	14.	28.	12.5	
Amps @ Peak Torque (amps)	2.8	1.4	3.6	1.8	4.16	
Sensitivity K (oz-in/Amp)	7.1	14.3	13.9	27.8	18.	
Back EMF K (volts/rad/sec)	.05	0.10	0.1	0.2	.13	
Inductance (mh)	1.7	7.	2.5	10.	2.0	
Dimensions	Housed	Frame-less	Housed	Frame-less	Housed	Frame-less
Motor Length	1.850	1.000	2.350	1.50	2.50	1.750
Shaft Length	0.750	—	0.750	—	1.00	—
Motor Diameter	2.060	1.937	2.060	1.937	3.50**	3.069
Shaft Diameter	0.312	—	0.312	—	0.312	—

*Add 0.5 oz-in bearing torque for housed models.
**Case has 4.5 O.D. round mounting flange with four .199 holes on 4.000 bolt circle.


H3069-250


H1937D-185

Magnetic Technology

Division of VERNITRON CORPORATION

21001 Kittridge Street, Canoga Park, California 91303 / (213) 887-7700, TWX: 910-494-1217

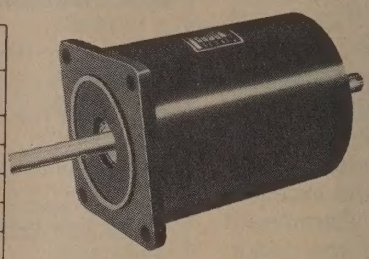
Other Control Components Group products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Motor Products Division, Deer Park, New York - Servo, Synchronous and Stepping Motors, Vernidex* Readouts. *Reg. T.M.

McLEAN COMPUTER DESIGNED PRECISION INSTRUMENT MOTORS

All motors feature: air-cooled bearings to reduce temperature and extend life; dimensionally stable aluminum alloy motor frames; rotors that exceed requirements of MIL-M-17059 to assure extra-smooth running; and other quality features.

HYSTERESIS SYNCHRONOUS MOTORS

OUTPUT PERFORMANCE ON 115 VOLTS, 60 Hz.			
FRAME	RPM	PULL-OUT TORQUE	CAPACITOR
47	1200	15 oz-in.	3 Mfd.
47	1800	14 oz-in.	3 Mfd.
47	3600	12 oz-in.	5 Mfd.
59	1200	55 oz-in.	8 Mfd.
59	1800	60 oz-in.	6 Mfd.
59	1200/3600	45/25 oz-in.	9 Mfd.



REQUEST DATA SHEET

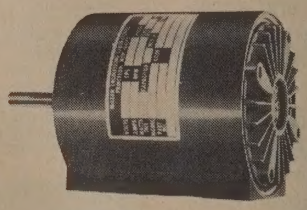
FEATURES

- The starting torque appr mates the running tor Self-starting.
- The motor runs at synch ous speed, but is not ph polarized as are the polari synchronous motors sho elsewhere.
- The direction of rotation the shaft is reversible ex nally.
- Dual voltage and/or d speed motors available.

POLARIZED SYNCHRONOUS MOTORS

PERFORMANCE ON 115 VOLTS, 60 Hz., WITH INTERNAL FAN		
FRAME USED	47 FRAME	59 FRAME
Speed	3600 RPM	3600 RPM
Line current	1.2 amp.	1.5 amp.
Capacitor required	5 Mfd.	8 Mfd.
Stall torque	10-14 oz-in.	27 oz-in. max.
Pull-in torque	15-18 oz-in.	25 oz-in.
Pull-out torque	15 oz-in.*	14 oz-in.*
Reversible	yes	no

*Must not be exceeded for continuous duty.



REQUEST DATA SHEET

FEATURES

- Ideal where repeated ph synchronization is requi between line voltage a shaft position for one more motors.
- Single or dual voltage, only single speed, mot available.
- Currently available for 36 rpm only at 60 Hz. Ot speeds and frequencies av able when the need mater izes.

INDUCTION MOTORS

PSC and 3-PHASE

McLEAN 47 FRAME MOTOR

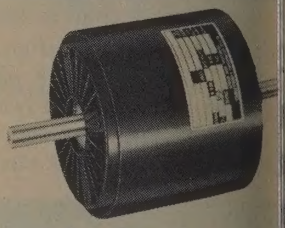
OUTPUT PERFORMANCE ON 115 VOLTS				
RPM	WATTS	HERTZ	VENTILATION	PHASE
1600	30	60	totally enclosed	single
1600	40	60	open, with circulation	single
3200	60	60	totally enclosed	single
3200	80	60	open, with circulation	single
5400	80	400	open, with circulation	single
5400	100	400	open, with circulation	three

McLEAN 59 FRAME MOTOR

OUTPUT PERFORMANCE ON 115 VOLTS					
RPM	WATTS	"B"	HERTZ	VENTILATION	PHASE
1600	20	2⅝	60	open, with circulation	single
3300	20	2⅝	60	open, with circulation	single
1600	100	4⅛	60	totally enclosed	single
1600	165	4⅛	60	open, with circulation	single
3200	250	5⅛	60	open, with circulation	single
3200	525	6⅞	60	open, with circulation	single
3200	100	4⅛	400	open, with circulation	single
3200	130	4⅛	400	open, with circulation	three

FEATURES

Optimum design achieved using McLean high speed electronic digital computer with our internally programmed analysis.



Starting and running torques matched to fan and blower loads, where the motors are so used.

Direction of rotation of the shaft is reversible externally.

Dual voltage and/or dual speed motors available.

Face mount is standard, but base mount is available in 47 Frame Size Motor and flange mount is available in 59 Frame Size Motor.

Available for single-phase use in 2, 4, 6, 8, and 12-pole speeds, and for three-phase use in the same speeds.

REQUEST DATA SHEET

McLEAN ENGINEERING LABORATORIES

Princeton Junction, New Jersey 08550 • Phone 609-799-0100 • TELEX: 84-3422

orthfield
iniature precision
strument bearings-
terchangeable with ball bearings
at only 1/3 the cost!

HER'S HOW DESIGN ENGINEERS CUT BEARING COSTS WITHOUT LOSS OF ACCURACY

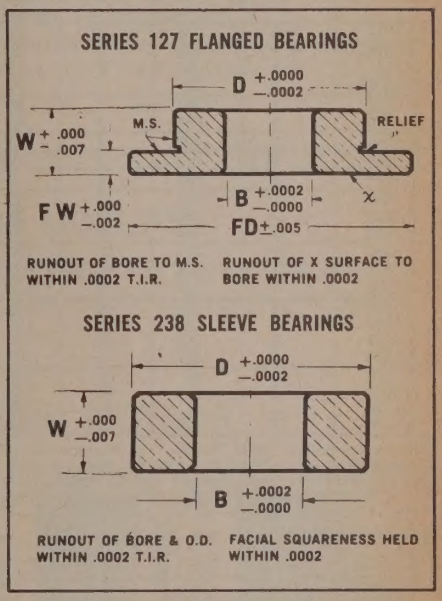
Here are the reasons why:

- 1/3 the cost of miniature precision ball bearings
- I.D., O.D., concentricity and facial squareness held to .0002"
- Precision made of sintered bronze (MIL-B-5687, Type I, Comp. A) with 4% Molybdenum Disulphide added after sintering
- Vacuum impregnated with instrument oil (MIL-L-6085A)
- Low coefficient of friction and excellent resistance to radial loads and impact
- Full range of sizes — flanged and sleeve types
- Immediate delivery from stock
- Used in gyro stabilizers, airborne compasses, analog and digital computers, inertial guidance systems, ground control approach instruments, infrared guidance systems, sound recording equipment, etc.

Write for latest brochure.

Typical Characteristics

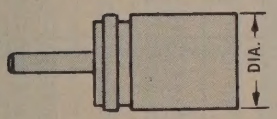
Tensile Strength (psi)	16,000
Compressive Strength (psi)	18,000
Hardness (Rockwell No.)	H45-H54
Coef. of Thermal Expan. per °F (x 10^{-6})	10.5
Coef. of Friction (Break-away)	.07



IN STOCK, AVAILABLE FOR IMMEDIATE DELIVERY OF PRODUCTION QUANTITIES

Specify NORTHFIELD Miniature Precision MICROSPIN Instrument Bearings as direct replacement for miniature precision ball bearings

iniature adjustable echanical mit stops

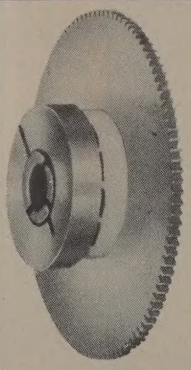


HIGH TORQUE RATINGS AND REPEATABILITY IN SMALLER DIMENSIONS

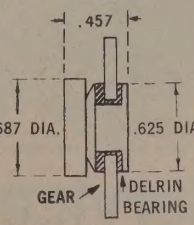
Model	Dia.	Torque Rating
BUORD Size 5	.500 max.	40 OZ. IN.
BUORD Size 8	.753 max.	80 OZ. IN.

Quality Features: Outstanding repeatability • Low start-torque • Long Life—rugged construction • Hardened and ground screw • Precision engineered to MIL-E-5272 C. Immediate delivery from stock.

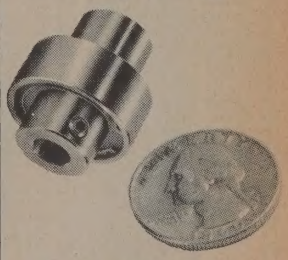
Improved gear type miniature adjustable slip clutch



TOP QUALITY FEATURES:
Delrin bearing and clutch plate achieve smooth torque transmission with minimum charge from pre-set torque • Adjustable from zero to 50 inch ozs. torque • Precision engineered to MIL-E-5272 C • Stainless steel gear. Anodized aluminum hub and clamp • Low cost.



Miniature slip clutch coupling



• Simple interconnection between shafts • Teflon coated clutch faces for overload protection • Range: 0-50 oz. in. slip torque • No lubrication • Spring loaded, friction-type • Self-locking • Slip speeds to 1200 RPM.

Write or call for specifications and prices.

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PRECISION INSTRUMENT CORPORATION

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4400 Austin Blvd., Island Park, N. Y., 11558
(516) 431-1112

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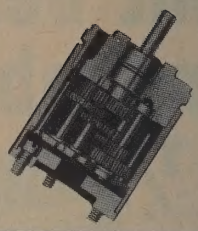
Precision Gearheads

and Speed Reducers



MECHANICAL SPECIFICATIONS								MOTOR PINION DATA			
Model	Size	Starting Torque (in.-oz.)	Max. Oper. Load Torque (in.-oz.)	Momentary Load Torque (in.-oz.)	Moment of Inertia at Input 1 (GM-CM²)	Shaft End Play 2 (in.)	Shaft Radial play 3 (in.)	No. of Teeth	Diametral Pitch	Pitch Diameter	Outside Diameter
A-101A	5	.005	2	10	.0010	.004	.002	13	180	.0722/.0719	.0833/.0830
A-102B	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102C	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-109B	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102E	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102F	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102G	8	.005	3	15	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102H	8	.005	3	15	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102K	8	.005	1	5	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-103A	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-103B	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-110A	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-356	10	.015	25	100	.01	.006	.004	13	120	.1083/.1078	.1247/.1242
A-104A	11	.005	25	100	.02	.004	.002	13	120	.1083/.1078	.1247/.1242
A-111A	11	.005	25	100	.02	.004	.002	13	120	.1083/.1078	.1247/.1242
A-105A	15	.008	35	100	.04	.004	.002	13	120	.1083/.1078	.1247/.1242
A-105B	15	.008	35	100	.04	.004	.002	15	96	.1083/.1078	.1247/.1242
A-112A	15	.008	35	100	.04	.004	.002	13	120	.1083/.1078	.1247/.1242
A-112B	15	.008	35	100	.04	.004	.002	15	96	.1083/.1078	.1247/.1242
A-106A	18	.01	60	165	.15	.004	.002	15	96	.1562./1557	.1771/.1766
A-106B	18	.01	60	165	.15	.004	.002	21	120	.1562./1557	.1771/.1766
A-113A	18	.01	60	165	.15	.004	.002	15	96	.1562./1557	.1771/.1766
A-113B	18	.01	60	165	.15	.004	.002	21	120	.1562./1557	.1771/.1766

Bold Type Indicates: Speed Reducer. 1 Measured at input shaft. 2 Max. with 1 Pound Gage Load. 3 Per Inch Length with 4 oz. Gage Load.
Temperature Range: —55°C to +125°C. Pressure angle of motor pinion should be 20 degrees
Complete dimensional specifications may be obtained thru any of the authorized Planet representatives or write direct to the factory.

		SIZE 5		SIZE 8		SIZE 10		SIZE 11	
Dash No.	Rotation	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)
1	Direct	9.85	75′	7.79	45′	10.23	45′	14.77	45′
2	Reverse	12.53	75′	10.90	45′	12.56	45′	20.25	45′
3	Reverse	14.77	75′	12.53	45′	14.83	45′	23.26	45′
4	Reverse	17.50	75′	14.46	45′	17.62	45′	26.86	45′
5	Reverse	20.92	75′	16.80	45′	21.10	45′	31.21	45′
6	Reverse	25.62	75′	19.70	45′	25.58	45′	36.58	45′
7	Reverse	31.18	75′	23.36	45′	30.70	45′	43.38	45′
8	Reverse	39.38	75′	28.15	45′	39.99	45′	56.62	45′
9	Direct	50.13	60′	39.41	45′	47.71	45′	80.98	30′
10	Direct	70.02	60′	45.29	45′	56.37	45′	93.06	30′
11	Direct	83.69	60′	52.28	45′	66.95	45′	107.43	30′
12	Direct	101.27	60′	60.75	45′	80.18	45′	124.83	30′
13	Direct	124.72	60′	71.21	45′	97.19	45′	146.32	30′
14	Direct	157.54	60′	84.46	45′	116.68	45′	173.54	30′
15	Reverse	200.50	60′	101.78	45′	151.95	45′	226.46	30′
16	Reverse	236.31	60′	142.50	30′	181.31	30′	323.94	30′
17	Reverse	280.07	60′	163.74	30′	214.21	30′	372.23	30′
18	Reverse	334.77	60′	189.03	30′	254.43	30′	429.71	30′
19	Reverse	405.10	60′	219.64	30′	304.70	30′	499.30	30′
20	Reverse	498.87	60′	257.45	30′	369.33	30′	585.27	30′
21	Reverse	630.15	60′	305.35	30′	443.20	30′	694.15	30′
22	Direct	802.01	60′	367.99	30′	577.42	30′	905.85	30′
23	Direct	945.23	60′	515.18	30′	688.97	30′	1295.75	30′
24	Direct	1120.27	60′	591.98	30′	814.00	30′	1488.91	30′
25	Direct	1339.08	60′	683.40	30′	966.83	30′	1718.86	30′
26	Direct	1620.40	60′	794.08	30′	1157.85	30′	1997.21	30′
27	Direct	1995.49	60′	930.79	30′	1403.47	30′	2341.07	30′
28	Direct	2520.62	60′	1103.96	30′	1684.15	30′	2776.62	30′
29	Reverse	3208.06	60′	1330.42	30′	2194.20	30′	3623.38	30′
30	Reverse	3780.92	60′	1862.58	30′	2618.08	30′	5183.01	30′
31	Reverse	4481.09	60′	2140.23	30′	3093.22	30′	5955.64	30′
32	Reverse	5356.31	60′	2470.77	30′	3673.94	30′	6875.43	30′
33	Reverse	6481.58	60′	2870.90	30′	4399.84	30′	7988.85	30′
34	Reverse	7981.95	60′	3365.17	30′	5333.14	30′	9364.27	30′
35	Reverse	10082.46	60′	3991.25	30′	6237.63	30′	11106.46	30′
36				4809.96	30′	8337.98	30′	14493.54	30′

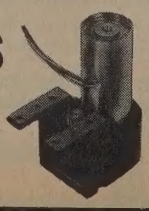
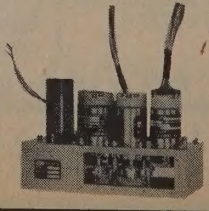
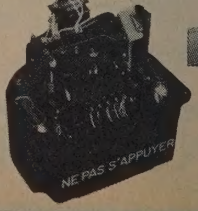
	SIZE 15					SIZE 18				
Dash No.	A-105A Dash No.	A-112A Ratio	A-105B Dash No.	A-112B Ratio	Back-lash (Max.)	A-106A Dash No.	A-113A Ratio	A-106B Dash No.	A-113B Ratio	Back-lash (Max.)
1	1	18.77	42	11.73	45′	1	17.07	42	14.86	45′
2	2	23.64	43	14.76	30′	2	21.49	43	18.71	30′
3	3	27.03	44	16.90	30′	3	24.58	44	21.39	30′
4	4	31.01	45	19.39	30′	4	28.20	45	24.55	30′
5	5	35.75	46	22.35	30′	5	32.51	46	28.30	30′
6	6	41.49	47	25.94	30′	6	37.73	47	32.84	30′
7	7	48.58	48	30.37	30′	7	44.17	48	38.45	30′
8	8	57.56	49	35.98	30′	8	52.34	49	45.56	30′
9	9	75.08	50	46.93	30′	9	68.27	50	59.43	30′
10	10	94.54	51	59.01	30′	10	85.97	51	74.84	30′
11	11	108.11	52	67.94	30′	11	98.30	52	85.58	30′
12	12	124.04	53	77.54	30′	12	112.79	53	98.19	30′
13	13	143.00	54	89.40	30′	13	130.03	54	113.20	30′
14	14	165.96	55	103.75	30′	14	150.91	55	131.37	30′
15	15	194.32	56	121.47	30′	15	176.69	56	153.82	30′
16	16	230.24	57	143.93	30′	16	209.35	57	182.25	30′
17	17	300.31	58	187.73	30′	17	273.07	58	237.71	30′
18	18	378.17	59	236.40	30′	18	343.86	59	299.34	30′
19	19	432.44	60	270.34	30′	19	393.22	60	242.31	30′
20	20	496.16	61	310.17	30′	20	451.15	61	392.75	30′
21	21	572.01	62	357.59	30′	21	520.13	62	452.79	30′
22	22	663.84	63	414.99	30′	22	603.62	63	525.47	30′
23	23	777.27	64	485.90	30′	23	706.76	64	615.26	30′
24	24	920.94	65	575.72	30′	24	837.40	65	728.99	30′
25	25	1201.23	66	750.93	30′	25	1092.27	66	950.86	30′
26	26	1512.66	67	945.62	30′	26	1375.45	67	1197.38	30′
27	27	1729.77	68	1081.34	30′	27	1572.86	68	1369.23	30′
28	28	1984.64	69	1240.67	30′	28	1804.61	69	1570.98	30′
29	29	2288.06	70	1430.35	30′	29	2080.51	70	1811.16	30′
30	30	2655.35	71	1659.96	30′	30	2414.48	71	2101.89	30′
31	31	3109.07	72	1943.59	30′	31	2827.04	72	2461.04	30′
32	32	3683.77	73	2302.86	30′	32	3349.62	73	2915.96	30′
33	33	4804.92	74	3003.73	30′	33	4369.07	74	3803.43	30′
34	34	6050.64	75	3782.48	30′	34	5501.70	75	4789.50	30′
35	35	6919.09	76	4325.38	30′	35	6291.46	76	5476.94	30′
36	36	7938.57	77	4962.69	30′	36	7218.46	77	6283.93	30′
37	37	9152.23	78	5721.40	30′	37	8322.03	78	7244.63	30′
38	38	10621.41	79	6539.83	30′	38	9657.94	79	8407.58	30′
39	39	12486.27	80	7774.37	30′	39	11808.17	80	9844.17	30′
40	40	14735.10	81	9211.45	30′	40	13398.47	81	11663.85	30′
41	41	19219.69	82	12014.93	30′	41	17476.27	82	15213.71	30′

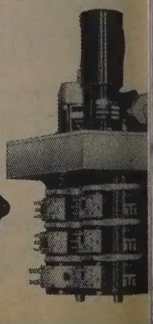
A-356 HIGH TORQUE GEARHEAD		
Dash No.	Ratio	"L" Max.
1	8.08	1.016
2	12.48	1.235
3	17.05	1.235
4	23.30	1.235
5	31.21	1.235
6	42.63	1.235
7	58.25	1.545
8	78.02	1.545
9	106.57	1.545
10	145.62	1.545
11	195.04	1.545
12	266.43	1.545
13	364.04	1.830
15	666.07	1.830
16	910.11	1.830
17	1218.00	1.830
18	1665.16	1.830

Anti-backlash gears may be specified where lower backlash requirements are necessary.

Custom Services

Planet will translate your assembly drawings and specifications into servo systems and sub systems. Where drawings and specifications are lacking, Planet will design and build complete servo packages to your performance requirements. Matching electrical, mechanical and indicating requirements is a Planet specialty.



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AC PRECISION MOTORS

ew for the SEVENTIES...

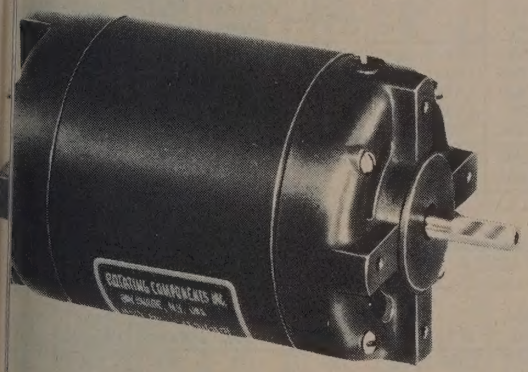
RC'S EXPANDED MOTOR LINE

PRESENTED ON THE FOLLOWING PAGES SHOWING THE LATEST IN AC MOTORS WITH FRAME DIAMETERS OF 1.00 TO 4.38 INCHES

TLIES: VARIABLE FREQUENCIES • DUAL FREQUENCIES • DUAL VOLTAGE • SPECIAL SHAFT CONFIGURATIONS • SELF COOLED • EXPLOSION PROOF • GEAR HEADS AVAILABLE ALL MOTORS • UL AND MIL SPECIFICATIONS • SPECIAL MOUNTINGS • RATINGS FROM 1/2000 TO 1/4 H.P. • POLYPHASE DESIGNS AVAILABLE • CAPACITOR START/RUN OR RELAY START•

HYSTERESIS AND RELUCTANCE SYNC MOTORS

• MINIMUM WOW AND FLUTTER • PULL-IN TORQUE FROM .1 TO 75 oz. in. • MULTIPLE SPEEDS AVAILABLE • PRECISION BALL BEARING OR SLEEVE • 60 Hz SPEEDS FROM 450 TO 3600 RPM • 400 Hz SPEEDS FROM 4000 TO 24000 RPM •



TORQUE MOTORS

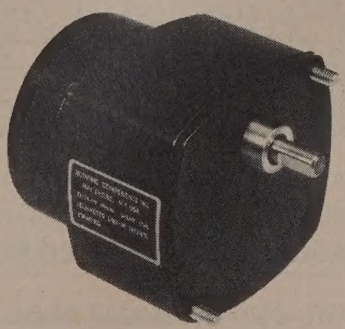
• CONTINUOUS DUTY RATING AT STALL CONDITIONS • STALL TORQUES UP TO 170 oz. in. •

INDUCTION DRIVE MOTORS

• POWERFUL • EXTREMELY RELIABLE • VERSATILE IN APPLICATION • QUIET • LIFE IN EXCESS OF 10,000 HOURS IN MANY APPLICATIONS •

PRECISION GEAR MOTORS

• PRECISION ENGINEERED FOR LONG LIFE • TORQUE UP TO 800 oz. in. • ALL RATIOS • BACKLASH: 30' max. • TEMP RANGE: -55°C TO +150°C • AVAILABLE IN INTEGRAL MOTOR-GEAR-HEAD COMBINATIONS FROM 1.00 TO 4.38 IN DIA •



S) A COMPLETE LINE OF...

RG CUP MOTORS • AC INDUCTION TACHS • AC P.M. TACH GENERATORS AVAILABLE IN MINIATURE T UMENT AND AIRCRAFT INSTRUMENTATION CLASSIFICATIONS • QC PER MIL-Q-9858 • MEET OR EXCEED -9398, MIL-E-5413, MIL-E-5272 • AC SERVO MOTORS • BRUSHLESS DC MOTORS •

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(516) 666-8500 TWX 516-666-7047

AC PRECISION MOTORS

THE FOLLOWING SPECIFICATIONS ARE A TYPICAL SAMPLING OF RC'S "OFF THE SHELF" LINE OF AC MOTORS ... MODELS LISTED ARE SINGLE-PHASE, 115 VAC DESIGN; BUT VARIATIONS ARE AVAILABLE TO SATISFY ALMOST ANY SUB-FRACTIONAL HORSEPOWER REQUIREMENTS.

MEET OUR LIGHTWEIGHTS

DIA.	MOTOR DESIG.	REFER. TABLE
1.00	F FRAME	1
1.25	R FRAME	2
1.75	KB FRAME	3
2.00	KA FRAME	4
2.31	E FRAME	5
2.75	M FRAME	6

TABLE 1. F FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12903	1/2500	1800	.25	.37	0.025	3.5	1.7969	60
12915	1/900	1200	0.6	0.6	0.050	12.0	1.32	60
12904	1/900	8000	.15	.17	0.05	7.0	1.4219	400

TABLE 2. R FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12899	1/240	3600	.60	0.10	10	2.250	60
12898	1/400	1800	.82	0.10	10	2.250	60
12928	1/900	1200	.35	0.10	12	2.000	60
12897	1/100	24000	.77	0.36	17	2.250	400
12900	1/80	12000	.80	0.31	16	2.250	400
12925	1/125	8000	.40	0.40	13	2.250	400

TABLE 3. KB FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12886	1/500	3600	0.5	.75	0.18	16	2.7301	60
12890	1/100	12000	1.0	1.0	0.90	43	2.5781	400
12888	1/200	8000	1.0	0.8	0.30	29	1.9531	400
12887	1/250	8000	0.6	0.5	0.22	20	1.9531	400

TABLE 4. KA FRAME - HYSTERISIS SYNCHRONOUS MOTORS
(SELF-COOLED MOTOR CASE SHROUD)

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12863	1/150	3600	2.5	2.7	0.25	26	3.000	60
12878	1/275	3600	1.0	1.0	0.14	16.4	2.17	60
12862	1/300	1800	2.7	2.4	0.25	24	3.000	60
12875	1/900	600	.64	1.0	0.12		3.000	60
12870	1/55	12000	2.5	2.0	1.70	50	3.000	400
12864	1/250	12000	0.5	0.4	0.35	33	2.250	400
12866	1/125	8000	2.0	1.5	0.45	45	3.000	400

TABLE 5. E FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12854	1/27	3600	12.0	12.0	1.4	80	3.44	60
12855	1/90	3600	3.0	3.0	1.1	30	3.44	60
12856	1/175	3600	1.8	1.8	1.0	18	2.44	60
12857	1/100	1800	5.0	5.0	2.2	30	3.44	60
12858	1/250	1800	2.2	2.2	2.0	23	2.44	60
12859	1/45	12000	2.0	2.0	1.7	40	3.44	400
12861	1/65	8000	2.1	2.1	1.0	35	3.44	400

TABLE 6. M FRAME - INDUCTION DRIVE MOTORS
(SELF-COOLED RIBBED HOUSING)

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13476	1/300	3400	1.00	.110	12.0	1.94	60
13542	1/70	3010	5.00	.310	33.5	2.44	60
13639	1/80	1510	8.00	.410	46.0	2.94	60
13644	1/100	1000	9.60	.285	32.5	3.44	60
13645	1/130	1000	7.50	.220	25.0	2.94	60
13653	1/200	1000	5.00	.210	26.0	2.44	60
13649	1/440	1000	2.30	.150	14.5	1.94	60
13634	1/25	21000	1.70	0.54	45.0	3.44	400
13633	1/40	21000	1.30	0.42	38.0	2.94	400
13631	1/70	21000	0.70	0.30	28.0	2.44	400
13635	1/10	10000	10.0	1.25	140.0	3.44	400
13636	1/20	7000	7.50	0.75	65.0	3.44	400

NOTE: ALL 60 Hz DESIGN MOTORS OPERATE SATISFACTORILY AT 50 Hz WITH A 1/6 REDUCTION IN MOTOR SPEED. 50 Hz WINDINGS AVAILABLE FOR ALL LISTED MOTORS.

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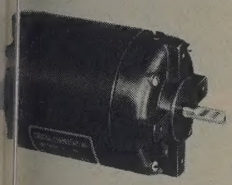

DIA.	MOTOR DESIG.	REFER. TABLE(S)
3.31	L FRAME	7, 8, 9
3.88	P FRAME	10,11,12
4.38	S FRAME	13,14,15

NOTE: For self-cooled version of all models, add .75" to case lengths listed in tables.

TABLE 7. L FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
11988	1/15	3600	20	18	1.42	115	5.05	60
12694	1/20	3600	24	14	1.1	93	4.55	60
12714	1/25	3600	12	12	0.70	77	3.61	60
12745	1/30	3600	13	11	0.95	65	3.61	60
12290	1/35	3600	8	8	0.47	43	4.18	60
12338	1/50	3600	5	7	0.38	40	3.74	60
12693	1/25	1800	27	26	1.15	85	4.55	60
12692	1/35	1800	18	18	0.80	61	4.55	60
12695	1/40	1800	13	14	0.69	55	4.55	60
12337	1/50	1800	14	12	0.63	50	3.74	60
13590	1/60	1800	16	9	0.46	48	3.74	60
12330	1/75	1800	12	9	0.48	38	3.36	60
12329	1/100	1800	7	6	0.48	38	3.36	60
10878	1/160	1800	3	4	0.24	23	3.36	60
12721	1/60	1200	14	13	0.60	65	3.61	60
12738	1/75	1200	15	14	0.43	45	3.11	60
12720	1/100	1200	8	8	0.48	52	2.93	60
12742	1/125	900	10	10	0.52	40	3.61	60
13528	1/200	900	7	6	0.30	24	4.18	60
12328	1/250	900	6	5	0.35	27	3.36	60
11544	1/320	900	5	3	0.17	16.5	3.36	60
12741	1/250	600	11	7	0.60	42	3.61	60
12736	1/300	600	9	4	0.65	45	3.11	60
12325	1/900	600	1	2	0.25	17	3.11	60
12696	1/10	12000	18	8	2.65	240	3.74	400
12724	1/20	12000	7	4	0.82	75	2.93	400
12850	1/72	4000	3	3	1.0	60	3.61	400
12697	1/125	4000	6	2	1.67	100	4.18	400

TABLE 8. L FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13481	3540	16	.65	70	3.50	60
13483	3360	36	1.20	132	5.18	60
13480	3200	7	.26	29	3.94	60
13486	1725	10	.40	35	3.13	60
13489	1700	28	.61	66	3.94	60
13487	1700	13	.28	31	3.94	60
13498	1685	65	1.20	135	5.18	60
13493	1670	39	1.06	95	3.63	60
13488	1650	20	.38	42	4.32	60
13492	1585	32	.80	92	4.32	60
13502	1150	70	1.30	138	5.18	60
13501	1140	36	.70	75	4.32	60
13500	1125	16	.32	32	3.94	60
13506	880	38	.64	72	4.32	60
13507	850	70	1.20	135	5.18	60
13505	825	16	.24	29	3.94	60

TABLE 9. L FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13694	1/10	3400	31	1.65	140	4.94	60
10885	1/25	3400	12.5	.48	50	3.38	60
10873	1/35	3400	8.5	.44	42	3.12	60
10912	1/10	3350	27.5	1.00	111	3.94	60
10898	1/18	3200	18	.63	72	3.62	60
10887	1/20	3200	15	.60	65	3.50	60
13695	1/10	1650	60	1.40	140	4.94	60
13691	1/15	1650	47	.86	93	4.32	60
10855	1/25	1650	2.25	.14	14	2.62	60
10859	1/70	1650	9.0	.23	22	3.12	60
13698	1/40	1600	16.5	.39	38.5	4.94	60

TABLE 10. P FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13550	1/14	3600	28	21	2.0	150	5.19	60
11941	1/40	1200	30	21	1.0	85	4.44	60
13576	1/80	1200	14	12	0.5	55	4.44	60

TABLE 11. P FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13551	1740	42.5	1.5	100	5.19	60
13776	1160	60.0	2.0	125	4.44	60
13776-2	880	64.0	2.0	150	4.44	60

TABLE 12. P FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13838	1/10	3450	30.0	1.0	170	5.19	60
13837	1/20	1700	30.0	0.75	110	5.19	60
13835	1/36	1100	25.0	1.0	120	4.44	60
13836	1/50	850	23.5	1.5	150	4.44	60

TABLE 13. S FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13791	1/5	3600	64	66	3.2	290	5.50	60
13786	1/7	3600	78	46	3.0	225	5.50	60
13783	1/14	3600	35	26	2.4	190	4.50	60
13792	1/10	1800	57	61	2.5	190	5.50	60
13787	1/22	1800	31	31	1.4	100	5.50	60
13781	1/30	1800	3	24	1.0	75	4.50	60
13779	1/40	1800	19	16	0.6	60	3.50	60
13790	1/22	1200	93	45	1.8	150	5.50	60
13782	1/45	1200	24	21	0.9	80	4.50	60
13789	1/65	900	60	20	1.3	100	5.50	60
13784	1/110	600	33	17	0.7	60	4.50	60
13797	1/42	24000	18	14	6.0	360	4.50	400
13798	1/11	6000	14	18	7.8	355	5.50	400
13796	1/35	4000	11	8	1.7	120	5.50	400

TABLE 14. S FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13807	3400	14	3.3	325	3.50	60
13808	1770	45	1.0	115	4.50	60
13812	1670	140	2.3	245	5.50	60
13809	950	40	0.6	60	4.50	60
13810	830	75	1.3	120	4.50	60
13806	800	30	0.5	55	3.50	60
13813	800	140	2.0	200	5.50	60
13815	800	170	2.5	256	5.50	60
13814.	750	140	1.7	175	5.50	60

TABLE 15. S FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13841	1/8	3450	38.0	2.00	170	5.50	60
13840	1/10	3450	30.0	1.70	150	4.50	60
13839	1/20	3400	15.0	1.10	94	3.50	60
13843	1/15	1725	38.0	1.75	140	5.50	60
13842	1/12	810	105.0	1.90	132	5.50	60

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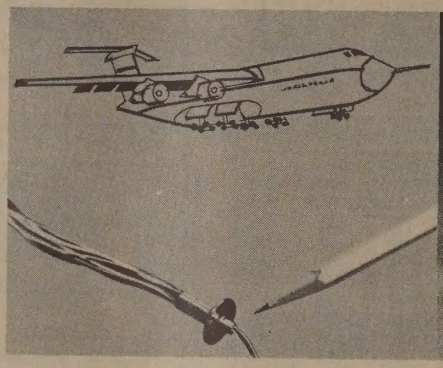

Typical Applications. Military aircraft instrument systems (C5A).

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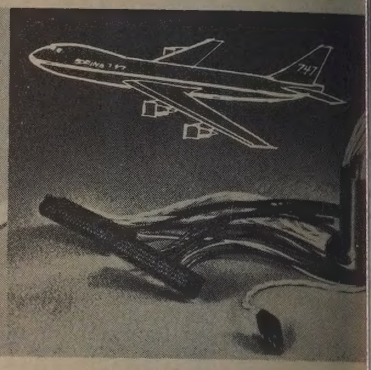
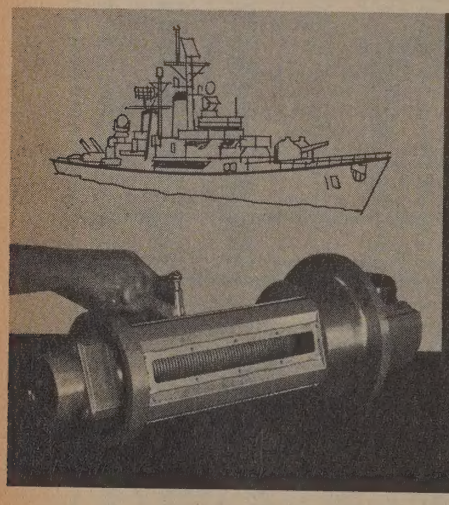


Typical Applications. Commercial ir craft inertial navigation systems. C also be used in military aircraft ap tions. New advanced fighter aircraft

Performance Capability. 2 A. curren ing. 500 V. dielectric strength bet active elements. 15 milliohms noise. Mil-L-6085 — Bearing Oil. 45208 — Inspection System Req ments. Mil-E-5400 — Electronic E Aircraft Mil-Std-810—Shock. Mil-Std —Acceleration.



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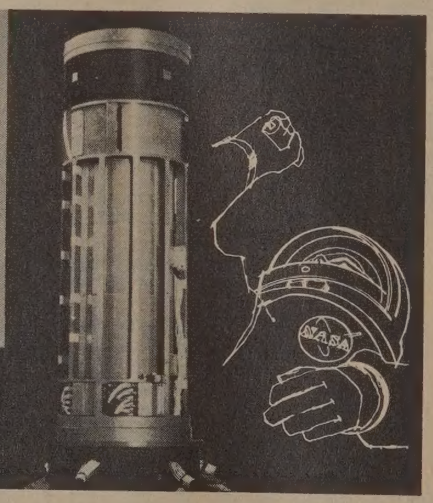

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Performance Capability. D.C. to high frequency Video, I.F., dependent upon size, frequency, and impedance, R.F. frequency; V.S.W.R. less than 1.1 typical, and crosstalk 60 to 80 db down typical, insertion loss less than .5 db. Noise less than 10 milliohms peak-to-peak. Mil-E-5272, Mil-Std-810, Mil-I-16910.

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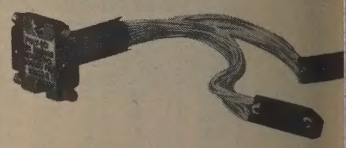

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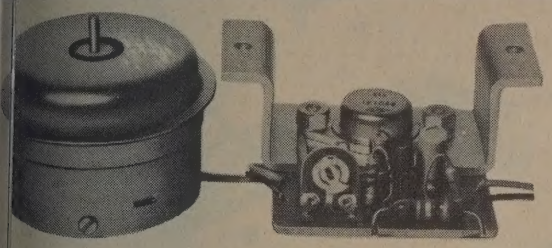
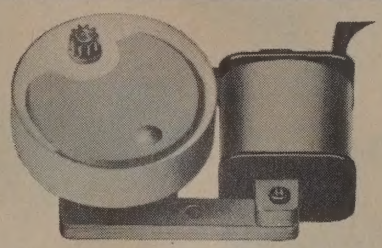
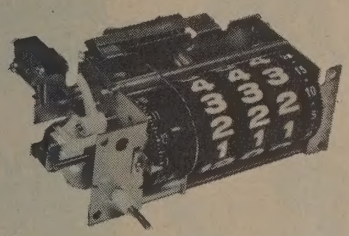


Micro Motor BF203R



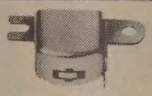
Timing Motor GMD



Digital Clock DT-B

Level Meter 11

Level Meter 15



Magnetic Head 07

Magnetic Head 15

Micro Motors

	Dimensions		Rated Voltage (V)	Range of Voltage (V)	Rated Torque (gr-cm)	Rated Speed (rpm)	Load Current (mA)	Starting Torque (gr-cm)	Life (Hr)	Direction of Revolution	Speciality Use	Remarks
	M (m/m)	Length (m/m)										
F 173L	40	32.4	6	4.5～6	3	2000	80	35	600	L	Record player	
MF 54R-02	38	34.8	6	4.5～6	9	2400	140	30	600	R	Tape recorder	
K 201R	47.9	48	13.2	10～16	30	2400	210	100	1000	R	Car (stereo)	
F 110R	38	30	4.5	3.5～5.7	8	2000	150	30	1500	R	Tape recorder	Electrical Governor Motor
F 203R	38	30	13.2	(5.5～)9～16	15	2200	180	30	1500	L & R	Car cassette	Electrical Governor Motor
F 200	46	50	9	6～9	20	2200	300	45	3000	L & R	High class player, Electronic calculator	Brushless & Transistor Motor
M 250B	25	36.5	7	6.5～7.5	0.4	3600	45	25	600	L & R	Auto tuner	

Timing Motor GMD

Synchronous type timing motor, 100 to 240VAC, 50 or 60Hz, to 3W, 3/550 to 3.6rpm, 0.2 to 3kg-cm torque.
Other model GMC, GME (Synchronous types) and GMA (Inductor type) are available.

Digital Clock DT-B

DIGITAL CLOCK W/SLEEP SWITCH FOR RADIO, TV. ETC.

Level Meters

	Current Sensitivity	Internal Resistance	Pointer Rest	Uses
11B	OVU: 130μA ± 10% FULL: 250μA ± 20%	650Ω ± 10%	Left & Right	Level & Batt
15	OVU: 135μA ± 10% FULL: 250μA ± 20%	650Ω ± 10%	Left & Right	Level & Batt

Magnetic Heads

	Classification	Resistance (Ω)	Z (1KHz)	Tape for Measurement	Tape Speed (cm/sec.)	Bias Frequency	Bias Current (μA)	Signal Current (μA)	Sensitivity of Recording/Playback (dB)	Frequency Characteristics of Recording/Playback (dB)	Tape of Playback	Sensitivity of Playback (dB)	Frequency Characteristics of Playback (dB)	0 dB (V)
7-03	Cassette Recording/Playback	480	1.7KΩ	Basf Reference	4.8	40KHz	500	30	−58.0 / 1KHz	−14.0 / 6.3KHz	Basf Test Tape	−64.0 / 333Hz	+4.0 / 6.3KHz	0.775
5-04	Cartridge Playback	890	2700Ω		9.5						Ampex #01-31331-01	−65.0 / 0.5KHz	+8.0 / 7.5KHz	0.775

Sankyo

EXPORT DEPARTMENT/

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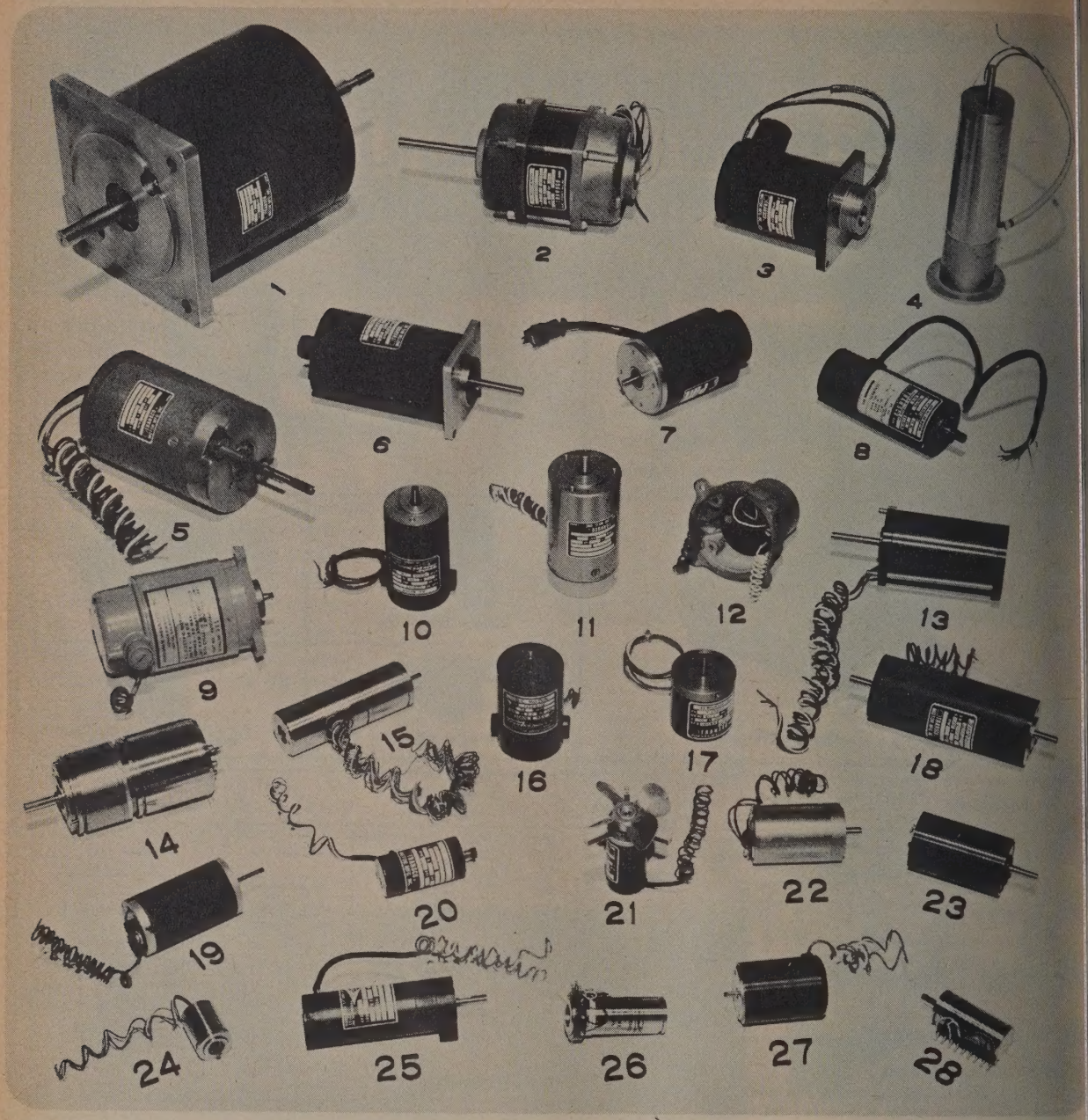
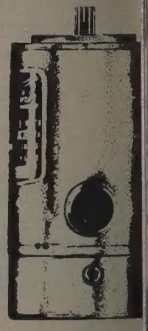


(1) Tape Drive-Computer (2) Audio Recorder Tape Drive (3) Fuel Pump (4) Camera Film Drive (5) Landing Gear (6) Fuel Tran fer Pump (7) Tape Drive, In-Flight Entertainment (8) Camera Film Drive (9) Water Pump (10) Coaxial Switch (11) Seat Actuato (12) Missile Switch Drive (13) Seat Actuator (14) Camera Motor (15) Servo Motor-Tachometer (16) Hot Air Valve (17) Hot A Valve (18) Camera Film Drive (19) Laser Coolant Pump (20) Power Transfer Switch (21) Fan Motor for Clean Room Su (22) Tachometer (23) Blower Motor (24) Servo Motor (25) Camera Film Drive (26) Servo Motor-Tachometer (27) Actuato Drive Motor (28) Servo Motor & Tachometer.

WE DESIGN AND MANUFACTURE SPECIAL PURPOSE MOTORS AC, DC, AND SERVO



Sawyer Industries, Inc.

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RVO-TEK—FOREMOST IN SPEED MEASUREMENT AND CONTROL

Proven Performance, Reliability and Ease of Maintenance for the Most Demanding Industrial Applications

SOLID-STATE

"500" SERIES PRECISION ADJUSTABLE-SPEED DRIVES

ALL MOTORS TOTALLY ENCLOSED, FAN-COOLED

SPEED RANGE Infinitely adjustable from less than 24 rpm to more than 3600 rpm (150:1) while delivering rated torque. Continuous duty rating at all speeds.

REGULATION Temperature-compensated tachometer feed-back provides tight speed load regulation of better than ⅓ of 1% of rated speed.

MAINTENANCE Design eliminates vacuum tubes, selenium rectifiers and time delays. Utilizes silicon diodes, transistors and a magnetic amplifier for exceptionally long service life. Modular plug-in construction requires only a screwdriver for servicing.

REMOTE CONTROL A 10-turn potentiometer provides precise adjustment and can be placed in any convenient location. Meter monitors operation and continuously indicates speed.

GEARED MOTORS Motors are available with integral gear reducers.

BRAKING-REVERSING Relay-controlled braking and reversing models available.

1 HP AS ILLUSTRATED

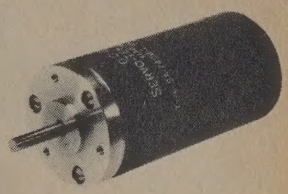
$687.00*

Other Models from ⅛ hp to 1½ hp proportionately priced

D-C PERMANENT-MAGNET

TACHOMETER GENERATORS

TEMPERATURE-COMPENSATED



Applications

SERVOS—The highly linear output and wide speed range are ideal for velocity or integrating servos. Low-driving torque permits its use as a damping or rate signal in all types of servos.

TEMPERATURE-COMPENSATED — The voltage output @ +25°C. will not deviate from this amount by more than 1/100 of 1% per degree of change when operated at any temperature within the designed temperature range of −20°C. to +75°C.

SIZE — Miniature. Approx. Dia. 1⅛".

OUTPUT — Various models with outputs as high as 45v/1000 rpm.

LINEARITY — Linearity from 0 to 12,000 rpm is better than 1/10 of 1% of voltage output at 3600 rpm.

BRUSH LIFE—Better than 100,000 hours (10 years) of continuous operation at 3600 rpm.

BIDIRECTIONAL OPERATION — Output in either direction is held to a ¼ of 1% tolerance.

RIPPLE — The rms value will not exceed 3% of the d-c value at any speed in excess of 100 rpm.

CONSTRUCTION — Aluminum housings with protective treatment; stainless steel shafts; fully-shielded stainless steel ball bearings; Mylar insulation.

SINGLE UNITS PRICED FROM

$25.50

Our Engineering Test Report describing performance characteristics, test procedure and test results, is available at no charge, upon requst.

D-C PERMANENT-MAGNET

SERVO MOTORS

Model SU-680D-29 delivers 12.7 watts of Continuous Power Output at 8600 rpm

Applications:

Chart Recorder Pen Drives, Null-seeking Devices, Capstan Drives for Tape Transports, Proportioning Applications, Prime Mover in Servo-Mechanisms.

Specifications:

DYNAMIC: Maximum No-Load Speed @ 23v D-C — 10,000 ±500 rpm; Full Load Torque @ 8600 rpm—2.0 Oz.-In. (max.); Stall Torque @ 23v D-C (Theo.) — 15.0 Oz.-In. (min.); Frictional Torque — 0.25 Oz.-In. (max.); Acceleration at Stall (Torque/Inertia) — 38,000 RAD/SEC^2 (min.); Case Temperature Rise @ Full Load (Free Air Dissipation) — 55°C. (max.); Case Temperature Rise Per Watt of I^2R loss (Free Air Dissipation)—6°C.

STATIC: D-C Resistance — 4.24 Ohms (typ.); Inductance—1.85 Millihenry (typ.); Rotor Inertia — 30.0 GM-CM^2 (typ.); Total Weight — 8.25 Oz. (max.); Length—3.25 in., excluding shaft; Maximum Ambient Temp. — 40°C.

FUNCTIONAL CONSTANTS: Inertial Time Constant — 30.0 Milliseconds (max.); Electrical Time Constant—0.45 Milliseconds (typ.); Torque Constant—2.8 Oz.-In./Amp. (min.); Voltage Constant (Back E.M.F.)—0.019v @ (1) RAD/SEC. (min.); Viscous Damping Factor—1.25 x 10^{-3} Oz.-In./rpm (min.)

Model SU-680D-29

$44.00

Oher Models Available from $26.00

MINIATURE SOLID-STATE D-C

VELOCITY SERVO

COMPLETELY NEW TOOL FOR AUTOMATION, INSTRUMENTATION

Precision electronic Adjustable-Speed Drive replaces small synchronous motors for chart recorders, sequence switches, programmers, etc. Provides adjustable preselected speeds from 3600 down to less than ½ of 1% minimum (200:1) without loss of torque.

Features

Solid-state — Instant response — Tachometer feed-back — Stability better than ½ of 1% of rated speed—Line or load regulation better than ½ of 1% of rated speed —Visual speed indication—Modular plug-in construction — Input power frequency 50 to 400 cps — Two basic models provide either ¼ or 1.2 in.-oz. @ 3600 rpm — Various geared torque units with ratios as high as 7200:1 provide full speed outputs of as low as 0.5 rpm with torque to 100 in.-oz. — Components separately available for incorporation into your equipment.

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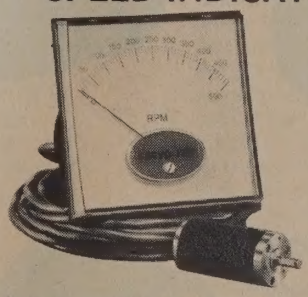
ACCURATE

SPEED INDICATING SYSTEMS



A truly versatile "package" provides accurate speed indication for almost anything that moves. Nearly every industrial process or machine can benefit by the economy and safety of continuous speed indication.

SELF-POWERED—No batteries or external power required.

LOW VOLTAGE—Connecting cable can be as long as 500 ft.

PERMANENTLY LUBRICATED BALL BEARINGS.

EASILY READ 4½" INDICATOR.

TAUT BAND MOVEMENT — Withstands vibration and shock.

STANDARD RANGES — 0 to 100, 250, 500, 1000, 2000, 3000, 4000, 6000, 8000, 10,000 and 12,000 rpm. These speeds can also be provided to read "Percent of Full Speed" or "Percent of Capacity."

0 to 10 rpm available at small additional cost.

Complete System includes Generator, Indicator (specify range), Mounting Base, Coupling and 15 ft. of Connecting Cable.

SINGLE UNITS PRICED FROM

$88.00

PRICES shown are subject to a quantity discount schedule.

*An additional discount is available to resale organizations and original equipment manufacturers using these drives as an integral part of their product.

Prices subject to change without notice.

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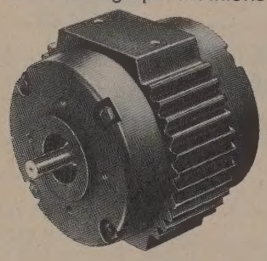
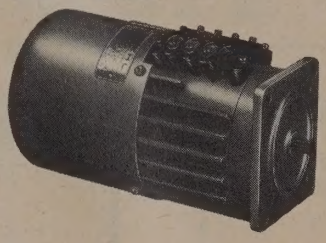
AC Motors

Induction or synchronous motors of the hysteresis or reluctance type. A broad range of power running from sub fractional up to 15 HP. Noise and vibration free with total shaft runout and concentricity error to meet the most exacting specifications.



Servomotors

Complete line of instrument servo components, power servo components, servo amplifiers and commercial instrument motors to fit just about any design. Self-contained, fan cooling for precise control.

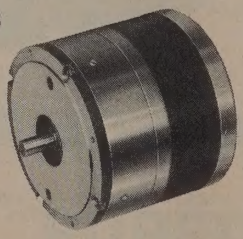


Stepper Motors

Precision control via discrete steps and high slew rates. Typical 15° stepping angle is compatible with all 24 tooth sprockets. High holding torque, high stepping speed and fast response. Ideal for business and office machines and small peripheral devices. Other step angles readily available.

Hi-Accel DC Motors

Low inductance, high response D.C. servo motors ideal for use in high speed printers, capstan motors and wherever high speed response is called for. Smooth and cogging free output torque.



DC Motors-Gears

Permanent magnet and wound field (shunt, series, compound) ¾" to 2½" diameter with wide RPM range, wide ambient temperature range, plus many options such as a variety of gear trains, brakes, etc.

Whatever your problem call your Diehl Representative today—or call us.

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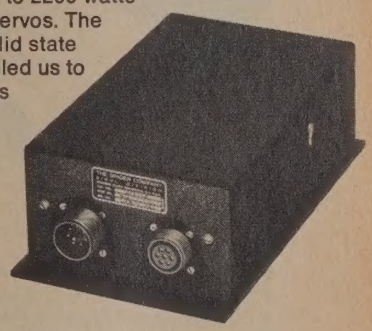
You'll find reliable solutions at Diehl.

With our eighty years of experience, building reliability and performance into our components comes naturally. That's why our motors have high-strength aluminum alloy housings and end bells . . . stainless steel shaft . . . dynamically balanced rotors with spring-loaded precision bearings. Why our spindle drives have pre-loaded ABEC-7 bearings to insure no end play . . . our tachometers, high silver content commutators. These are just a few examples, but enough, we feel, to point out why Diehl components can help you build reliability into your own products.

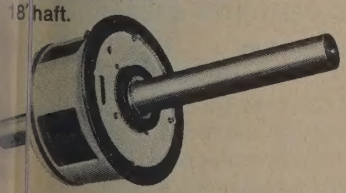
Servo Amplifiers

A full line of servo-amplifiers to fulfill requirements of less than 800 watts with 60 Hz or 400 Hz outputs up to 2200 watts needed for 1 HP servos. The introduction of solid state circuitry has enabled us to produce amplifiers that are lighter, more efficient and more stable.



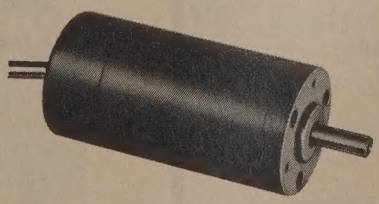
Spindle Drives

Both synchronous and induction types from fractional to 1 Hp. 80% to 95% efficiency for cool running and minimal thermal expansion. Life expectancy, 3 to 30 years depending on specifications and design. Shaft run out of .001 for fractional ratings or .0005 for integral ratings when measured at the end of an 18" shaft.



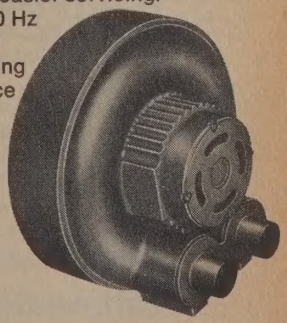
Tachometers

Low ripple. For systems requiring a highly linear (0.1%) speed/voltage relationship and low ripple performance. Life expectancy exceeds 10,000 hours at 3600 RPM and 25°C. Available with servo type mounting, face or flange mounting configurations. Operating temperature —55° to 75°C.



Vortex Blowers

High pressure or vacuum air delivery in single stage blowers at low RPM. Operate on unique principle of regenerative flow. Performance from a single stage means less weight, less bulk, lower cost, lower noise, longer life and easier servicing. Available for 60 Hz or as belt drive design permitting your own choice of drive motor.



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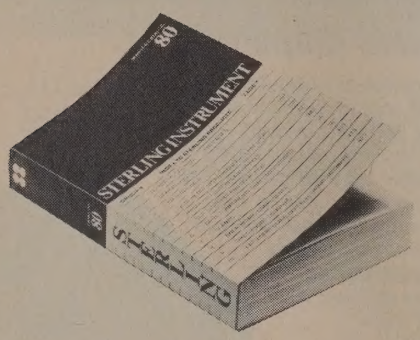
Sterling has 44,000 stock answers in precision electromechanical components



Gear Products

SPUR GEARS
- Pin Type • Pin Type, Miniature Hub
- Clamp Type • Clamp Type, Miniature Hub
- Flange Mounting • Hubless • Non Metallic

ANTI-BACKLASH GEARS
- Spur Gears .104" Face
- Spur Gears "P" Series 1/8" Face • Cluster Gears
- Mini-Lash Gears .104" Face
- Mini-Lash Gears "P" Series 1/8" Face
- Worm Wheels • Miter Gears

OTHER GEARS
- Bevel And Miter Gears
- Worm Gears And Worms
- Worm Wheels Anti-Backlash • Helical Gears
- Pinion Shafts • Internal Gears • Gear Racks

CLUSTER GEARS
- Cluster Gear And Hubs
- Anti-Backlash Cluster Gears

HUBS
- Cluster Gear Type • Pin Type
- Clamp Type • Hub*Lock Gear Hub
- Precision, Removable Gear Type
- Phase Adjustable Hubs

HUB*LOCK
- Spur Gears • Anti-Backlash Gears

NONCIRCULAR GEARS

Differentials

- Hollow Shaft Differential
- Solid Shaft Differential
- Low Backlash Differential
- 1/8" And 3/16" Bore Hollow Shaft Differential
- Standard Differential
- Anti-Backlash Differential
- Single End Differential
- Differential End Gears—Hubless
- Differential End Gears—Clamp Type

Gear Heads, Speed Reducers, Limit Stops

GEAR HEADS
- Special Gearheads • Low Backlash Gea

SPEED REDUCERS
- Special Speed Reducers
- Low Backlash Speed Reducers
- Single End Speed Reducers
- Friction Type Speed Reducers
- Worm Gear Speed Reducers
- Right Angle Ratio Drives

LIMIT STOPS
- Mechanical Limit Stops
- Adjustable Mechanical Limit Stops
- Electro Mechanical Limit Stops
- Adjustable Electrical Stop

Magnetic Clutches and Brakes

MAGNETIC CLUTCHES & BRAKES—SI
- Magnetic Clutches
- Reverse Acting Magnetic Clutches
- Magnetic Clutches With Reverse Acting B
- Reverse Acting Clutches With Magnetic B
- Triplex Clutches • Magnetic Brakes
- Reverse Acting Magnetic Brakes

MAGNETIC CLUTCHES & BRAKES—SI
- Magnetic Clutches
- Reverse Acting Magnetic Clutches
- Magnetic Clutches With Reverse Acting B
- Reverse Acting Clutches With Magnetic B
- Duplex Clutches • Triplex Clutches
- Magnetic Brakes
- Reverse Acting Magnetic Brakes

Clutches Couplings

LUTCES
lard Aemblies • Precision Type
sion Line Type

RUNING CLUTCHES
or Clap Type • Combination Hub/Clamp

INGS
e Anchaft Couplings
Lockouplings
e Adjtable Coupling • Helical
ws • i-Flex
e Adjtable Bellows Couplings
am • exible And Offset Couplings
Jawe Couplings

SIONUNIVERSAL JOINTS

e Cmponents, ft Acessories

ting Oil Impregnated Bearings
eroil Barings • Ball Bearings
Spars • Shaft Spacers, Collars
st Wshers
t Reducers And Extenders
Follers • Adjustable Cam Assemblies
oved Pulleys
ature Sprockets And Chains
trifle Drive Belts
trifle Belt Gear Pulleys

mps

hro ounting Clamps
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hro ocking Clamp • Two Piece Clamps
iced learance Clamps
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alan d Gear Clamps
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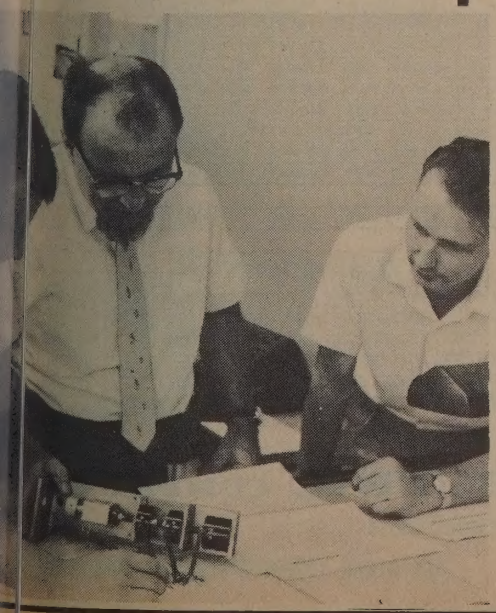
hea Attaching Clamps



Breadboard Components

- Breadboard Kits
- Adjustable Hanger Assembly
- Servo Mounting Plates And Posts
- Component Hangers
- Bearing Adapters And Mounts

Dials, Knobs, Counters

- Counters • Dials • Dial Indexes
- Vernier And Dial Sets • Handcranks And Knobs

Fasteners, Stand-Offs, Electronic Hardware

SCREWS
- Socket Head Set Screws
- Machine (Round, Fillister, Flat) Head Screws
- Shoulder Screws • Captive Screws
- Thumb Screws

NUTS
LOCK AND PLAIN WASHERS
PINS
- Dowel, Roll Pins
- Spiral, Groove, Taper Pins

PRECISION SPACER POSTS
STAND-OFFS
- Round, Threaded Stand-Offs
- Round, Insulated Stand-Offs
- Round, Clearance Stand-Offs
- Hexagonal, Threaded Stand-Offs
- Swage Type, Round Stand-Offs
- Swage Type, Hexagonal Stand-Offs

ELECTRONIC HARDWARE
- Panel Bushings and Bearings
- Chassis Fastener • Potentiometer Shaft Lock
- High Voltage Coupling • Insulating Washers
- Ferrules • Handles

STERLING HAS SOME CUSTOM-MADE ANSWERS, TOO.

The Sterling engineering staff has contributed to many important system and subsystem designs. We are prepared to design from scratch, or work closely with your engineers developing an electro mechanical assembly or system that best serves your needs.

FREE Master Catalog #80 — 44,000 stock parts plus a technical section for application information that is a must for anyone who buys or specifies or designs with electromechanical components.

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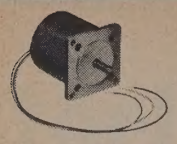
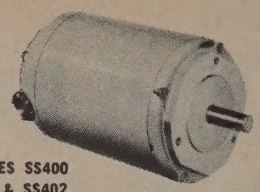
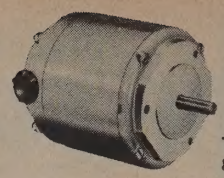
SLO-SYN



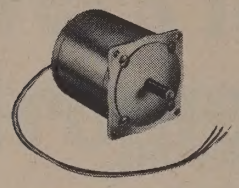
TYPE SS25



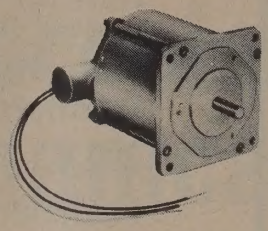
TYPES SS400 & SS402



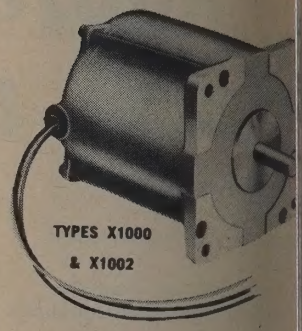
TYPES SS150 & SS152



TYPES HS50 & HS52



TYPES X250 & X252



TYPES X1000 & X1002

A-C OPERATION — Standard SLO-SYN Synchronous/Stepping Motors are permanent magnet a-c motors having extremely rapid starting, stopping and reversing characteristics and a slow basic shaft speed of 72 rpm synchronous with a line frequency of 60 hertz. Three-lead types need only a single-pole, three-position switch for complete forward, reverse and "off" control. No excessive inrush current when energized because starting and operating current are nearly identical. Can be completely stalled without overheating and with no harmful effects on components. Starts or stops in less than 5° of shaft rotation; no need for mechanical or electrical braking. When used with an auxiliary high speed motor, the SLO-SYN motor can remain coupled to the load and safely overdriven. Phase shifting resistor and capacitor must be used when operating from a single-phase source but not from two-phase. All standard motors are rated for continuous duty at maximum ambient temperature of 40°C. Types SS150 and SS152 use Class A insulation; all others have Class B.

D-C STEPPING — When used for phase-switched d-c stepping, the motors can be connected to provide either 100 or 200 steps per revolution. Accuracy of the steps is ±.09° no cumulative. Three-lead types require a center-tapped d-c sup ply and single-pole, double-throw switching; four-lead type require a single-ended power supply and single pole, doubl throw switching. Bifilar motors can also be used with tran sistorized switching circuits. With a suitable control potent ometer instead of switches, a SLO-SYN motor can be mad to rotate steplessly, permitting extremely accurate positionin All motors have lubricated-for-life bearings.

PRECISION STEPPING

For phase-switched d-c stepping, types HS25, HS50, HS50 and HS50L make 200 steps per shaft revolution. Each 1. step is accurate within ±3% (.06°) noncumulative. May operated at speeds greater than 500 steps per second if acce erating and decelerating circuits are used. With proper ci cuitry, the motors may be operated at speeds of 1000 steps p second or higher without missing any steps.

200 RPM

Types TS25, TS50 and TS52 are similar to standard mode but operate at synchronous speeds of 200 rpm and take 36 c 72 steps per revolution when used for d-c stepping.

RATINGS AND SPECIFICATIONS FOR A-C APPLICATIONS

TYPE	MAXIMUM AMPERES	TORQUE (Oz-In)	MAXIMUM MOMENT OF INERTIA OF A RIGIDLY ATTACHED LOAD (Lb-In²)	PHASE-SHIFTING COMPONENTS*				APPROX MOTOR (POU	
				RESISTOR	RESISTOR PART NUMBER	CAPACITOR	CAPACITOR PART NUMBER	NET	S
120 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz									
TS25	0.2	25	0.12	300 ohm, ±5%, 25 watt	R-TS25/50	1.5 mfd ±6%, 330 VAC	C-TS25	2	
TS50	0.3	50	0.25	300 ohm, ±5%, 25 watt	R-TS50	3.75 mfd ±6%, 330 VAC	C-SS150/TS50	4¾	
120 volts, 50/60 hertz, 1 phase, 72 RPM at 60 hertz									
SS25§	0.1	25	0.15	500 ohm ±5%, 5 watt	R-SS25	0.75 mfd ±6%, 330 VAC	C-SS25	1¼	
SS50§	0.3	50	0.5	250 ohm ±5%, 25 watt	R-SS50/150	2.6 mfd ±6%, 330 VAC	C-SS50	3	
SS50M†§	0.3	50	0.5	250 ohm ±5%, 25 watt	R-SS50M/150M	2.6 mfd ±6%, 330 VAC	C-SS50M	3	
SS150	0.4	150	1.5	250 ohm ±5%, 25 watt	R-SS50/150	3.75 mfd ±6%, 330 VAC	C-SS150/TS50	6½	
SS150M†	0.4	150	1.5	250 ohm ±5%, 25 watt	R-SS50M/150M	3.75 mfd ±6%, 330 VAC	C-SS150M	6½	
SS250	0.6	250	3	150 ohm ±5%, 50 watt	R-SS250/400	6.5 mfd ±6%, 330 VAC	C-SS250/400	6½	
SS250M†	0.6	250	3	150 ohm ±5%, 50 watt	R-SS250M	6.5 mfd ±6%, 330 VAC	C-SS250M	6½	
X250‡	0.6	250	3	150 ohm ±5%, 50 watt	R-SS250/400	6.5 mfd ±6%, 330 VAC	C-SS250/400	7¾	
SS400	0.6	400	4.5	150 ohm ±5%, 50 watt	R-SS250/400	6.5 mfd ±6%, 330 VAC	C-SS250/400	12¼	
X1000‡	3.0	1000	9	65 ohm ±5%, 160 watt	R-X1000	30 mfd ±6%, 330 VAC	C-X1000	31	
X1500	3.0	1500	12	50 ohm ±5%, 375 watt	R-X1500	30 mfd ±5%, 330 VAC	C-X1000/1500	38	
SS1800	4.0	1800	16	40 ohm ±5%, 375 watt	R-SS1800	60 mfd ±6%, 330 VAC	C-SS1800	45	
240 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz									
TS52	0.2	50	0.25	1200 ohm ±5%, 25 watt	R-SS152/TS52	1.0 mfd ±6%, 660 VAC	C-SS152/TS52	4¾	
240 Volts, 50/60 hertz, 1 Phase, 72 RPM at 60 hertz									
SS52§	0.2	50	0.5	1000 ohm ±5%, 10 watt	R-SS52	0.67 mfd ±6%, 660 VAC	C-SS52	3	
SS152	0.2	150	1.5	1200 ohm ±5%, 25 watt	R-SS152/TS52	1.0 mfd ±6%, 660 VAC	C-SS152/TS52	6½	
SS252	0.3	250	3	500 ohm ±5%, 50 watt	R-SS252/402	1.75 mfd ±6%, 660 VAC	C-SS252/402	6½	
X252‡	0.3	250	3	500 ohm ±5%, 50 watt	R-SS252/402	1.75 mfd ±6%, 660 VAC	C-SS252/402	7¾	
SS402	0.3	400	4.5	500 ohm ±5%, 50 watt	R-SS252/402	1.75 mfd ±6%, 660 VAC	C-SS252/402	12¼	
X1002‡§	1.5	1000	9	250 ohm ±5%, 200 watt	R-X1002	8 mfd ±6%, 660 VAC	C-X1002	31	
SS1802	2.0	1800	16	130 ohm ±5%, 320 watt	R-SS1802	15 mfd ±6%, 660 VAC	C-SS1802	45	

*External resistor and capacitor must be ordered separately. †Militarized. ‡Explosion-proof. §For 60 hertz. Other phase-shifting components required for 50 he

THE SUPERIOR ELECTRIC COMPANY

1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

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nchronous / Stepping Motors FOR A-C CONSTANT SPEED • FOR D-C STEPPING

THREE-LEAD SLO-SYN SYNCHRONOUS/STEPPING MOTORS — RATINGS FOR STEPPING APPLICATIONS

TOR TYPE	TS25	TS50	TS52	SS25	SS50 SS50M	SS52	SS150 SS150M	SS152	SS250 SS250M X250	SS252 X252	SS400	SS402	X1000	X1002	SS1800	SS1802
E VOLTS	60	50	100	80	50	100	35	70	32	64	30	60	11.5	23	9.5	19
AMPERES R WINDING	0.15	0.25	0.13	0.07	0.15	0.08	0.35	0.18	0.50	0.25	0.60	0.30	3.2	1.6	4.7	2.4

FOUR-LEAD SLO-SYN SYNCHRONOUS/STEPPING MOTORS RATINGS FOR STEPPING APPLICATIONS

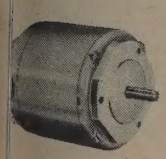
TYPE	D-C INPUT VOLTS PER WINDING	AMPERES PER WINDING
SS25-1004	16	0.35
SS25-1002	40	0.14
SS25-1003	80	0.07
SS50-1002	2.5	3.1
SS50-1001	10	0.75
SS50-1002	25	0.30
SS50-1004	50	0.15
SS150-1007	2	6.3
SS150-1018	7	1.75
SS150-1015	17.5	0.70
SS150-1025	35	0.35
SS250-1010	3	5.3
SS250-1009	8	2.0
SS250-1008	16	1.0
SS250-1007	32	0.50
SS400-1005	15	1.2
SS400-1007	30	0.6
X1000-1005	11.5	3.2
X1000-1008	23	1.6
SS1800-1004	9.5	4.7
SS1800-1005	19	2.4

SLO-SYN PRECISION STEPPING MOTORS RATINGS FOR DC STEPPING APPLICATIONS

TYPE	DC VOLTS	AMPERES PER WINDING
HS	5.4	1.5
HD	3	4
HDL	4.5	3.5

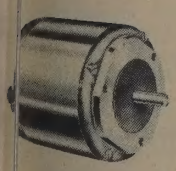
BIFILAR SLO-SYN SYNCHRONOUS/STEPPING MOTORS RATINGS FOR STEPPING APPLICATIONS

TYPE	D-C VOLTS	AMPERES PER WINDING
TS50-1001	3	4.0
SS25-1002	5.9	0.88
SS25-1001	11.8	0.44
SS25-1011	23.6	0.22
SS50-1010	2	3.3
SS50-1009	5.5	1.3
SS50-1008	8	0.85
SS50-1001	14	0.53
SS50-1007	35	0.21
SS150-1023	1.4	8.5
SS150-1009	2.5	4.0
SS150-1010	10	1.25
SS150-1017	25	0.5
SS250-1006	2.5	5.0
SS250-1027	4.6	3.1
SS250-1002	9	1.55
SS250-1004	22.5	0.61
X250-1003	4.6	3.1
X250-1002	9	1.55
SS400-1021	5.3	3.4
SS400-1002	8.3	2.2
SS400-1006	21.2	0.85
X1000-1002	10	3.6
X1000-1007	25.4	1.42
SS1800-1007	11.5	3.9
SS1800-1002	14.4	3.1
SS1800-1006	23	2.0



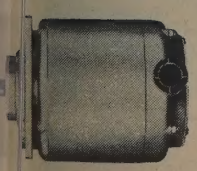
BIFILAR

Used for d-c stepping where use of push-pull circuitry and center-tapped power supply is not possible or where increased torque at high stepping speeds is required.



SPECIAL ENVIRONMENT

High Vacuum types for vacuums to 10^{-6} Torr; High Temperature types for temperatures to 130°C; High Radiation types withstand dosage of 3,000 megarads. All available from 50 to 1800 oz-in; High Vacuum 25 oz-in also.

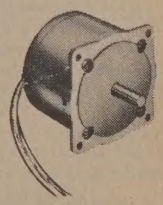


PLANETARY GEAR

Basic 50 and 150 oz-in types and type X250 available with planetary gear assemblies in speeds of 16.6, 3.32, 0.665, 0.133 or 0.027 rpm; 16.6 rpm available in other 250 and on 400 oz-in types.

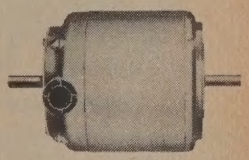
FOUR-LEAD

Designed for d-c stepping to provide the flexibility needed for use with equipment requiring isolated windings with no common connection.



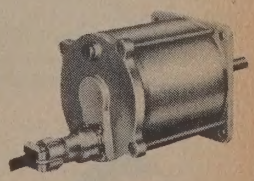
DOUBLE END

Three-lead, bifilar and four-lead types with output shaft at each end of motor available in all listed torque ratings. 50, 150 and 250 oz-in types available also with planetary gear assemblies in 16.6, 3.32, 0.665, 0.133 or 0.027 rpm speeds.



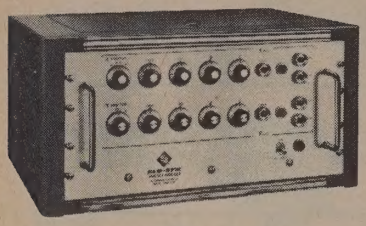
VISCOUS DAMPED

Type HS50D precision stepping motor has a unique fluid system resulting in a step function approaching critical damping. Speed of response and running characteristics are essentially unaffected by the silicone viscous damping fluid. Possesses characteristics of types described under PRECISION STEPPING on facing page.



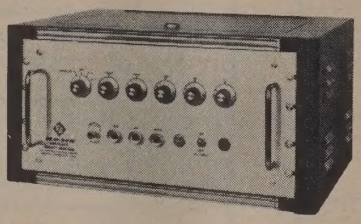
SECTIONS 2100, 4000 AND 5600

SLO-SYN® *Preset Indexers*



TWO-AXIS
TYPE 2SP1800-4

SINGLE-AXIS
TYPE SP1800B-4

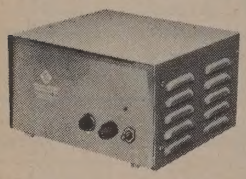


ABSOLUTE
TYPE SA1800-5

Used to control indexing of SLO-SYN bifil motors. The index angle, or position, can preset by dial setting on the control pan the number of 1.8° steps to be driven. Ha provision for actuating any external eq ment needed to perform related operati Index, jog and free run can be initiated m ually from the control panel or from an ternal switch. Can be made to cycle a matically with proper external switch Single- and two-axis models are availa with counting ranges to 99,999 steps. T axis models provide independent contro two SLO-SYN motors. Speed adjusta from 4 steps/second up to maximum poss with motor used. Optional backlash take circuit.

ABSOLUTE PRESET INDEXERS per either absolute or incremental position modes. In the absolute positioning mode, number set on the controls determines final position of the motor relative to starting, or "zero" point. When increme positioning is used, the motor will move preselected number of steps each time INDEX button is pressed. Optional backl take-up circuit.

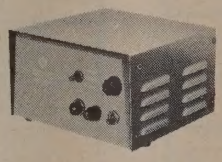
SLO-SYN® *Translator*



TYPE ST1800B

Pulse-to-step converter designed for use with appropriate bifilar SLO-SYN motors converted for incremental stepping. Convert low level signal pulses or square waves into the correct switching sequence needed to step a SLO-SYN motor at 200 steps/revolution (1.8° per step). Input is 105-125 volts a-c, 1 ampere. Signal input impedance is 500 ohms. Used for programmed positioning, indexing and indicating operations.

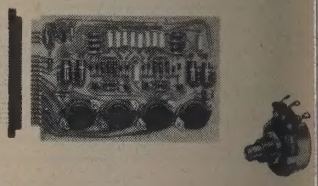
SLO-SYN® *Adjustable Speed Drive*



TYPE ST1800BV

Essentially, SLO-SYN Adjustable Speed Drive type ST1800BV is a translator which includes a built-in oscillator to supply the triggering signals. Oscillator frequency can be adjusted to vary the speed from 4 steps/second up to the maximum permissible with the motor used. Direction of rotation can be controlled either from the front panel or from a remotely located switch.

SLO-SYN *Translator Module*



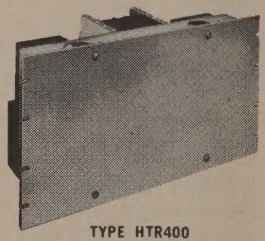
TYPE STM1800V

Plug-in circuit boards with logic ca bilities for stepping a SLO-SYN m in 1.8° increments. Type STM1800 basic translator which will provide directional motor operation. T STM1800V is similar but include built-in oscillator which can be adjus to drive the motor at speeds fron steps/second up to maximum at wh the motor will drive the load.

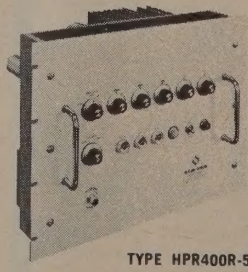
SLO-SYN® *High Speed Drives*

Translator

Drive SLO-SYN Precision Stepping Motors up to 2000 steps per second without losing any steps. Triggering the translator circuits is an internal oscillator which can supply a variable frequency range adjustable from 50 to 2000 steps per second. Triggering pulses can be supplied by tape readers, computers, oscillators, pulse generators and other signal producing equipment.



TYPE HTR400



TYPE HPR400R-5

Preset Indexer

Drive SLO-SYN Precision Stepping Motors in indexing and other positioning operations. Acceleration and deceleration circuits permit driving motors up to 2000 steps per second without missing any steps. Decade counter controls on front panel allow the operator to select any desired positioning increment. Optional backlash take-up circuit.

THE SUPERIOR ELECTRIC COMPANY

1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

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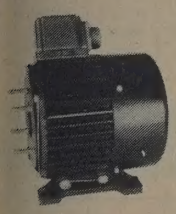
We have the motor or actuator you have in mind.

We have all types of precision motors, precision gears, and gear trains for commercial and government end use in electronics, avionics, and aerospace industries. If you need a particular custom model, our engineering group is backed by a complete manufacturing capability to produce reliable, long-lasting products.

AIRCRAFT MOTORS—AC AND DC

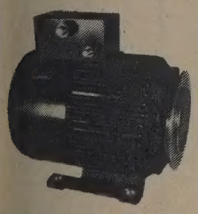
Frames from 2" to 8" diameter. DC and 400 cycle AC. Outputs from 1/8 to 30 hp. Any required speed. Designed to military specifications. Can be equipped with gearheads and brakes, face or foot mounts.

Applications: Pumps, actuators, hoists, radar antennas, vane axial blowers.



AC Aircraft Motors. Diameters from 2" to 8". Outputs to 30 hp.

Model shown: 400 C.P.S. Self cooled, aircraft pump drive. 5" dia. by 6.00 LG, 3.0 hp. @ 5,600 rpm. Weight 12 lbs.

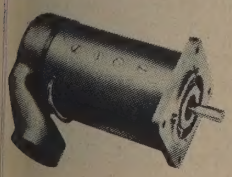


DC Aircraft Motors. Shunt, series or compound. Diameters from 2" to 6.5". Outputs from 1/100 to 10 hp.

Model shown: A 28-volt DC motor with radio noise filter, 6 hp at 6,000 rpm, used to drive a pump on a missile vehicle launcher.

TORQUE MOTORS

Typical Applications: Reel drive motors for magnetic tape transports and other closed servo loop systems such as antenna drives. (1) small time constant (2) fast response (3) high reliability (4) long life. Diameters up to 5⅜". Lock torque up to 2,000 oz-in.



Model shown: 5⅜" dia. by 10½" long, 28 VDC attachment for forced-air cooling, 5 VDC, 1,750 oz-in lock rotor torque.

SMALL MOTORS—AC AND DC

Typical Applications: Aerospace and ground systems equipment; drives for safe-arm devices, blower and fans, small actuators. Diameters as low as ⅞" in DC and 1.0" in AC. Can be equipped with gear reductions, brakes, clutches, governors and radio noise filters.

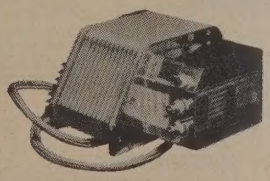
Small 400 cycle AC Motors. Five frames from 1" to 2" diameter. Induction and synchronous types. Any phase, voltage or speed.

Model shown: High-slip fan motor, 1 oz-in @ 10,000 rpm. 1.45" dia. x 1.87" long. Weight 8 oz.

Small Permanent Magnet and Wound Field DC Motors. Seven frames from ⅞" dia. to 2" dia. Outputs up to 1/8 hp. Speeds from 1,000 to 30,000 rpm.

MOTOR CONTROLS, INVERTERS, POWER SUPPLIES

We design electronic packages for optimum performance with drive motors of any voltage or frequency combination. Designed to meet the requirements of MIL-E-5400 and MIL-I-6181.

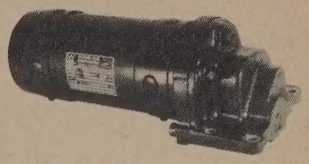


Airborne Inverter: Supplies power to two phase Induction Motor. Supplied as part of a Motor/Inverter package. Input: 28 VDC; MIL-STD-704. Output: 28 VRMS. Two Phase. 400 CPS Nominal Square Wave (Constant volt second output). 11 amps/phase nominal.

GEAR MOTORS—AC

Model shown: A 208-volt, 400 cycle gearmotor, 10.7 hp. @ 2,400 rpm, used on a heat exchanger. 23 lbs. weight.

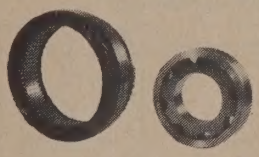
GEAR MOTORS—DC



Model shown: 29 VDC two speed motor. 25 lb/in. @ 3,600 & 1,800 rpm. 6.6 lbs. weight.

HYSPERSYN SYNCHRONOUS MOTORS

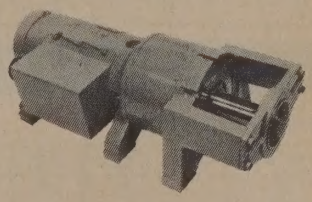
Typical Applications: Computer memory drums; facsimile devices. Patented features offer high torque, efficiency, and power factor; excellent damping. Any frequency. Rotor-Stator sets or complete motors.



Hyspersyn: High starting, synchronizing and pullout torques; no drift. Diameters 2½" to 18". Outputs up to 5 hp.

ACTUATORS

Special actuators, AC or DC, linear or rotary, can be supplied to fit your requirements.



Model shown: A 115-volt DC motor with clutch, brake, noise filter, and gear box; output: 285-lb-ft @ 20 rpm; used on an antenna-drive system.

Model shown: 24 VDC four speed actuator. 1,000 oz-in @ 6,000, 3,000, 1,500, 750 rpm. Capable of reversing & shifting. Utilizes unique two speed motor. Weight 27 lbs.

For more information, write for our catalog and capability brochure.
ELECTRO PRODUCTS DIVISION,
75 West Green Street, Dept. E, Pasadena, California 91101

western GEAR CORPORATION

VERNITRON CATALOG DIGEST

SERVO MOTORS

BULLETIN *M-365-1

CUSTOM DESIGN DEPT. Call: 516-586-5100

VERNITRON TYPE NUMBER	05M4B-AAO-AO	08M4K-AAO-AO	08M4N-ABO-AO	10M4C-AAO-AO	10M4J-AAO-AO	11M4D-ABO-AO	11M6D-AAO-AO	11M4R-AAO-AO	15M6D-AEO-AO	15M4L-ADO-AI	18M4B-AEO-HO	18M4H-ABO-CO	18M6H-ABO-CO	23M6C-ABO-BO	23M4E-AAO-AO
Frame Size	5	8	8	10	10	11	11	11	15	15	18	18	7	23	23
Weight	.6	1.1	.75	1.4	1.7	4.6	4.6	3.3	8.0	8.0	12	14	14	35	30
Stall Torque	.10	.20	.20	.30	.33	1.0	1.0	.70	2.0	1.45	2.3	5.0	8.0	18	6.0
No Load Speed	9500	9500	7000	6500	9700	6200	3450	6700	3200	6500	4800	10,000	3300	3200	10,000
Frequency	400	400	400	400	400	400	60	400	60	400	400	400	60	60	400
Rotor Inertia	.05	.40	.30	.47	.46	1.1	1.1	.65	3.3	1.0	4.0	5.0	5.0	15	10.0
Volts Input (Fixed Phase or Fixed ø)	26	26	26	115	26	115	115	115	115	115	115	115	115	115	115
Volts Input (Control Phase)	36/18	26	26	40CT	40/20	115/57.5	36CT	36CT	230/115	115/57.5	40/20	115/57.5	115/57.5	36/18	115/57.5
Stalled Impedance (F ø)	230+J200	190+J180	200+J175	2300+J3000	140+J115	634+J987	1700+J1700	1160+J1640	1300+J950	390+J670	250+J590	120+J196	325+J390	140+J190	150+J183
Stalled Impedance (Control ø)	440+J380	190+J180	200+J175	210+J270	310+J270	634+J987	221+J221	116+J164	5200+J3800	390+J670	35+J85	120+J196	325+J390	14+J19	150+J183
Power Input (Fixed ø)	1.8	1.9	1.9	2.0	3.0	6.5	4.0	3.7	6.0	8.0	9	30	16	29	36
Power Input (Control ø)	1.8	1.9	1.9	3.0	3.0	6.5	4.0	3.7	6.0	8.0	9	30	16	29	36
Acceleration @ Stall	150,000	40,000	47,500	45,000	50,000	66,000	66,000	80,000	53000	100,000	40,000	70,000	110,000	85,000	50,000
Figure of Merit	15,000	8,000	10,000	13,500	16,000	66,000	66,000	56,000	133,000	145,000	96,000	350,000	900,000	1,500,000	300,000
Motor Torque Constant	200	550	550	525	580	620	2000	1400	760	890	4000	3000	5700	35,000	4200
Motor Damping Factor	6.9	15	20	32	24	108	216	71	550	158	335	300	1800	4000	460
Motor Velocity Constant	29	36	27.5	16	24	5.8	9.3	20	1.4	5.6	12	10	3.0	9.0	9
Motor Corner Frequency	138	37	68	68	52	100	200	110	167	158	83	60	360	265	49
Motor Time Constant	.0072	.027	.015	.014	.019	.010	.005	.010	.006	.006	.012	.017	.028	.003	.022
Reversing Time	.011	.043	.025	.023	.030	.017	.008	.016	.010	.010	.020	.028	.004	.006	.037
		.750"L	.625"L	.625" L	1.000" L	L=1.438" w/leads Lt=1.938	L=1.438" w/leads Lt=1.938"	L=1.050" w/leads	Lt=1.800"	L=1.530"	Lt=2.015"	Lt=2.850"	Lt=2.850"	Lt=3.000"	Lt=2.100"

DAMPING DEVICES

BULLETINS *D-365-1 *G-365-1

MOTOR GENERATOR

VERNITRON TYPE NUMBER	08G4C-AAO-AO	11G4D-AA1-AO	15G6L-AA2-CO	18G4E-AC1-BO	18G6E-AC3-BO	23G6A-AA1-AO	23G4B-AA1-BO
Frame Size	1	5	7	9	9	10	11
Weight	2	3.5	15	29	29	40	40
Frequency	400	400	60	400	60	60	400
Stall Torque	.20	.70	2.0	5.0	8.0	18	6.0
No Load Speed	6500	6500	3000	10,000	3000	3000	9500
Rotor Inertia	.33	1.0	5.3	5.0	10.0	18	18
Motor Fixed ø (volts)	26	115	115	115	115	115	115
Motor Control ø (volts)	26	36CT	36CT	115/57.5	115/57.5	115	115/57.5
Motor Fixed ø Impedance	200+J175	1160+J1640	1300+J950	120+J196	325+J390	140+J190	150+J183
Motor Control ø Impedance	200+J175	116+J164	130+J95	120−J196	325+J390	140+J190	150+J183
Motor Fixed ø Power	1.9	3.7	6.0	30	16	29	36
Motor Control ø Power	1.9	3.7	6.0	30	16	29	36
Generator Input Voltage	26	115	115	115	115	115	115
Generator Output Voltage	.45	1.0	3.0	3.1	3.0	3.2	3.2
Generator Input Power	1.5	2.5	1.5	5.4	1.5	1.5	6.0
Generator Input Impedance	570+J550	2200+J2650	3600+J4200	900+J1200	3600+J4200	3600+J4200	1000+J1100
Null Voltage	.015	.025	.050	.030	.050	.050	.025
Phase Shift	±10°	±10°	+14°	±10°	+14°	+14°	±10°
Length	1.250	1.842	3.258	4.400	4.400	4.625	3.710

INERTIALLY DAMPED

VERNITRON TYPE NUMBER	08D4B-CCO-A1	11D4A-ADO-DO	15D6B-ABO-A3	15D4C-ACO-AO	18D6B-AAO-AO
Frame Size	1	2	3	3	4
Weight	3.0	6.0	12	12	18
Frequency	400	400	60	400	60
Stall Torque	.30	.63	2.0	.7	4.0
No Load Speed	6300	6300	2700	9500	3000
Rotor Inertia	.48	1.5	6.0	6.0	6.5
Motor Fixed ø (volts)	115	115	115	115	115
Motor Control ø (volts)	40/20	40CT	40/20	36/18	40/20
Motor Fixed ø Impedance	1800+J2340	1275+J1800	1450+J1080	600+J800	750+J75
Motor Control ø Impedance	225+J292	150+J210	170+J130	60+J80	87+J86
Motor Fixed ø Power	2.8	3.5	6.0	6.5	9.0
Motor Control ø Power	2.8	3.5	6.0	6.5	9.0
Flywheel Inertia	5	10	100	100	100
Flywheel Damping	200	350	1250	1500	1000
Corner Frequency W1 (RAD SFC)	6	4	4.2	0	4.4
Corner Frequency W2 (RAD SFC)	40	35	12.5	15	10
Corner Frequency W3 (RAD SFC)	500	300	250	250	282
Max. Kv in System (sec⁻¹)	3000	2500	750	∞	670
Length (max.)	1.680	2.125	2.650	2.650	3.310

COMPUTING DEVICES

BULLETIN *I-365-1

RATE GENERATORS

VERNITRON TYPE NUMBER	08C4A-AA1-AO	11C4A-AA1-AO	15C4A-AA1-AO
Frequency (CPS)	400	400	400
Excitation Voltage Generator (volts)	26	115	115
Power Input Generator (watts)	2.2	—	—
Voltage Gradient (volts/1000 RPM)	.63	—	—
Phase Shift (deg.)	5° Lag	5° Lag	5° Lag
Position Error (In Phase) (volts)	—	8	8
Position Error (Quadreture) (volts)	—	15	15
Axis Error In Phase (volts)	—	4	4
Axis Error Quad. (volts)	—	5	5
RMS Null Voltage (volts)	.015	—	—
Temperature Sensitivity	.05%/C°	.05%/C°	.05%/C°
Length (L)	1.0		

INTEGRATORS

VERNITRON TYPE NUMBER	08I4A-AA1-AO	08I4A-AA1-A1	11I4B-AA1-AO	15I4A-AB2-AO	15I4E-AB1-BO	15I4A-AA3-AO	15I4B-AA1-AO
Frequency (CPS)	400	400	400	400	400	400	400
Excitation Voltage Generator (volts)	26	26	115	115	115	115	115
Power Input Generator (watts)	2.5	2.5	5.5	6	5.5	5.5	4
Voltage Gradient (volts/1000 RPM)	.5	.5	2.75	2.75	2.75	2.75	1.0
Phase Shift (deg.)	0°	0°	0°	0°	0°	0°	0°
Position Error (In Phase) (volts)	—	—	7	10	—	8	2
Position Error (Quadreture) (volts)	—	—	11	20	—	15	6
Axis Error In Phase (volts)	—	—	7	5	—	4	5
Axis Error Quad. (volts)	—	—	.10	10	—	5	5
RMS Null Voltage (volts)	.015	.015	—	—	.015	—	—
Temperature Sensitivity	±1% (−55°C to 125°C)	±.5% (−15°C to 75°C)	±.3% (0°C to 85°C)	±.3% (0°C to 85°C)	±5% (−55°C to 100°C)	±.25% (−15°C to 75°C)	±.05% (0° to 125°C)

VERNITRON CORPORATION

*** Motor Products Division**

300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-627-6079

Other Control Components Group Products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Magnetic Technology Division, Canoga Park, California - Torque Motors and Tachometer Generators. *Reg. T.M.

VERNITRON CATALOG DIGEST

HYSTERESIS SYNCHRONOUS MOTORS

BULLETIN *HS-366-1

CUSTOM DESIGN DEPT.
Call: 516-586-5100

VERNITRON TYPE NUMBER	08H6G-AA0-Y0	08H4C-AA0-Y0	08H4C-BB0-Y0	08H8E-AA0-Y0	11H6A-EE0-B4	11H4P-CC0-A0	11H4B-CC0-A0	11H4C-AA0-B0	11H10A-AA0-A0	15H4C-CC0-D0	18H6G-BB0-A0(2)	18H4G-AA0-A0	20H4A-AA0-A0	32H6A-AA0-A0
Frame Size	8	8	8	8	11	11	11	11	11	15	18	18	20	32
Frequency (Hz)	60	400	400	80	60	400	400	400	1000	400	60	400	420	60
Speed (RPM)	1800	8000	12000	1600	1800	4000	6000	12000	20000	6000	900 1800	8000	12,600	900
Poles	4	6	4	6	4	12	8	4	6	8	8 4	6	4	8
Volts	18	26	115	21	26	115	36 CT	26	26	115	115 115	115	120	115
Number of Phases	1	2	2	1	3	1	2	2	1	2	1 1	3	1	1
Power Running (watts)	2.2	3.4	2.6	3.5	1.5	5.5	3.0	4.5	4.8	7.5	12 9	14	20.0	24
TORQUE (oz-in) Pull In	0.10	0.22	0.14	0.05	0.20	0.18	0.09	0.28	0.03	0.80	0.40 0.40	2.25	2.3	4.1
TORQUE (oz-in) Pull Out	0.10	0.27	0.15	0.05	0.25	0.22	0.09	0.28	0.08	0.80	0.50 0.50	2.25	2.3	4.4
TORQUE (oz-in) Start	0.10	0.22	0.13	0.07	0.25	0.27	0.10	0.33	0.03	0.50	0.25 0.25	3.25	2.3	6.8
Capacitor (Mfd.)	2.5	—	—	15.0	—	0.33	—	—	—	—	3.0 1.5	—	0.13	2
L (in)	Spec	1.187	1.187	Spec	1.375	1.375	1.344	1.375 MAX.	1.375	L = 1.435 LT = 1.515	1.860 1.990	L = 1.860 LT = 1.990	Spec	Spec

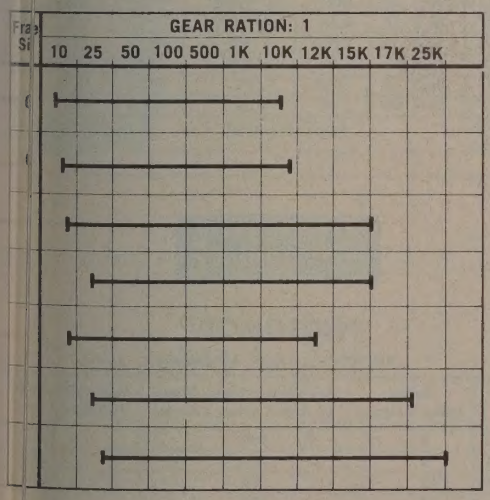
STEPPING MOTORS

BULLETIN *S-367-1

VERNITRON TYPE NUMBER	05MPA-AA0-A0	05MRA-AA0-A0	08MPB-AA4-A0	08MPB-AB4-A0	08MPC-RE4-A0	08MRB-AG3-A0	11MPA-AB2-D0	11MPA-AH4-D0	11 MRA-AC3-D0	11 MRA-AE3-D0	11 MRA-AI3-D0	15 MPA-AD4-A0	15 MRA-AA3-A0	20 MRA-AA3-A0
Frame Size	5	5	8	8	8	8	11	11	11	11	11	15	15	20
Stepping Angle (Degree)	90	15	90	90	90	15	90	45	15	15	15	90	15	15
Maximum Loaded Stepping Rate (PPS)	100	400	240	130	110	800	225	260	1000	600	300	150	725	370
Rotor Inertia (gm-cm²)	.05	.05	.15	.15	.70	.15	1.0	1.0	1.0	1.0	1.0	3.75	1.0	10
Power Input (watts)	4.0	8.0	8.0	2.5	3.0	10.0	7.0	5.0	29.0	10.0	3.0	23.0	15.0	39
Static Torque (oz.-in.)	0.20	0.30	0.45	0.22	0.4	.70	1.5	1.2	4.0	2.0	.50	4.0	4.5	36.0
Maintaining Torque @ 10 PPS (oz.-in.)	0.10	.12	.22	0.1	0.2	.35	0.74	0.70	2.0	.60	.25	2.0	2.4	7.0
Resistance/Phase (ohms)	200	100	100	325	260	78	120	155	30	80	250	35	50	20.6
Current/Phase (ma)	140	28	280	90	109	360	240	180	940	350	110	800	560	1400
Length (in.)	1.000	1.000	1.000	1.000	1.000	1.000	1.310	1.310	1.310	1.310	1.310	1.400	1.400	2.75

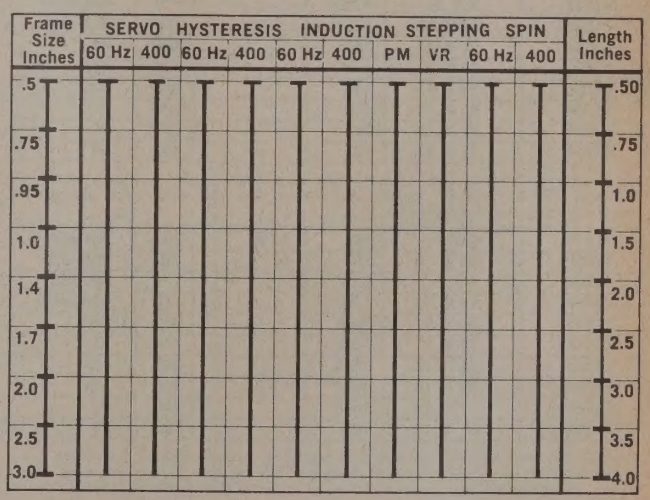
GEARHEADS

BULLETIN *GH-368-1



MOTOR COMPUFACTS

BULLETIN *C369-1



INSTANT TORQUE GUIDE

VERNITRON CORPORATION

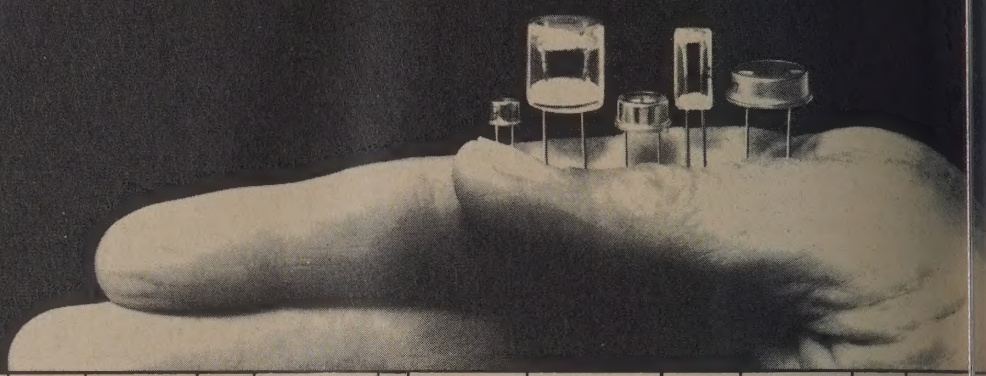
*** Motor Products Division**

300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-627-6079

Other Control Components Group Products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Magnetic Technology Division, Canoga Park, California - Torque Motors and Tachometer Generators. *Reg. T.M.

Photoconductive Cells

This listing represents less than half of the Clairex standard and special photocells available. A 16-page design manual is available on request.



Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL5M2	.55 X .18	55K	1:100	250	2000-500[1]
CL602	.25 X .5	1 meg.		300	75
CL702	.36 X .18	1 meg.		300	125
CL902	.21 X .15	1 meg.		250	50

Type 2 CdS (photosensitive material designated by last number in ordering abbreviation, i.e. CL5M2). Peak spectral response 5150 angstroms, bluest response photosensitive material, high stability, lowest temperature error.

CL503	.5 X .5	7.2K	1:10,000	250	500-250[1]
CL5M3	.55 X .18	7.2K		250	2000-500[1]
CL603	.25 X .5	133K		300	75
CL603A	.25 X .5	75K		300	75
CL603AL	.25 X .5	3.5K		170	75
CL703	.36 X .18	133K		300	125
CL703A	.36 X .18	67K		300	125
CL703L	.36 X .18	2.7K		100	125
CL903	.21 X .15	133K		250	50
CL903A	.21 X .15	67K		250	50
CL903L	.21 X .15	6.0K		100	50

Type 3 CdSe, peak spectral response 7350 angstroms, fast response, and very high light-to-dark resistance ratio. Can be used for high speed switching or counting. Sensitive to near infra red. For use with incandescent or neon lamps.

CL504	.5 X .5	1.5K	1:1000	250	500-250[1]
CL5M4	.55 X .18	1.5K		250	2000-500[1]
CL504L	.5 X .5	0.25K		170	500-250[1]
CL5M4L	.55 X .18	0.25K		170	2000-500[1]
CL604	.25 X .5	30K		300	75
CL604L	.25 X .5	1.5K		170	75
CL704	.36 X .18	30K		300	125
CL704L	.36 X .18	0.6K		100	125
CL904	.21 X .15	30K		250	50
CL904L	.21 X .15	2K		100	50

Type 4 CdSe, peak spectral response 6900 angstroms, lowest resistance photocells available. Can be used for "on-off" applications when low resistance is desired. For use with incandescent or neon lamps.

CL505	.5 X .5	9K	1:100	250	500-250[1]
CL5M5	.55 X .18	9K		250	2000-500[1]
CL505L	.5 X .5	1.5K		170	500-250[1]
CL5M5L	.55 X .18	1.5K		170	2000-500[1]
CL605	.25 X .5	166K		300	75
CL605L	.25 X .5	7.5K		170	75
CL705	.36 X .18	166K		300	125
CL705L	.36 X .18	3.3K		100	125
CL905	.21 X .15	166K		250	50
CL905L	.21 X .15	10K		100	50

Type 5 CdS, peak spectral response 5500 angstroms (closely matches the human eye), most stable, lowest memory photocell available. Can be used in light measuring applications and precision low speed switching. For use with incandescent, fluorescent or neon lamps.

CL705HL	.36 X .18	28K	1:1000	100	125
CL905HL	.21 X .15	100K		100	50
CL905HN	.21 X .15	700K		100	50

Type 5H CdS, peak spectral response 5500 angstroms (closely matches the human eye). Combines high speed, stability, linearity, and uniform color temperature response.

Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL507	.5 X .5	7.2K	1:1000	250	500-25
CL5M7	.55 X .18	7.2K		250	2000-
CL607	.25 X .5	133K		300	75
CL707	.36 X .18	133K		300	125
CL707L	.36 X .18	2.7K		100	125
CL907	.21 X .15	133K		250	50
CL907N	.21 X .15	66K		100	50

Type 7 CdS, peak spectral response 6150 angstroms, moderate speed and ratio. used in general beam breaking applications. For use with incandescent, neon escent lamps.

CL707H	.36 X .18	500K	1:1000	300	125
CL707HM	.36 X .18	100K		250	125
CL707HL	.36 X .18	10K		100	125
CL907H	.21 X .15	600K		250	50
CL907HN	.21 X .15	300K		100	50
CL907HL	.21 X .15	24K		100	50

Type 7H CdS Peak Spectral response 6200 angstroms. Very fast decay time coupl low resistance and high linearity. Ideal for beam breaking applications.

Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL703/2	.36 X .18	50K	1:10,000	300	125
CL703L/2	.36 X .18	6.5K	1:10,000	100	125
CL704/2	.36 X .18	17K	1:1000	300	125
CL704L/2	.36 X .18	1.5K	1:1000	100	125
CL705/2	.36 X .18	166K	1:100	300	125
CL705L/2	.36 X .18	7.5K	1:100	100	125

DUAL ELEMENT

Photocells contain two separate elements with two separate leads and one commo

PHOTOMOD®

PHOTOCELL-LAMP ASSEMBLIES

Part No.	Rated Lamp Voltage	Resistance (Max. Ohms) @ Rated Lamp Voltage	Max. Allowable Voltage @ Peak
CLM3006A	6	160	120V
CLM4006A	6	55	120V
CLM4012A	12	30	120V
CLM3012A	12	160	120V
CLM5H10A	10	3000	120V
CLM7H16A	16	550	170V
CLM3120A	120	1150	120V
CLM4120A	120	160	120V

FOOTNOTE: [1] With and without heat sink.

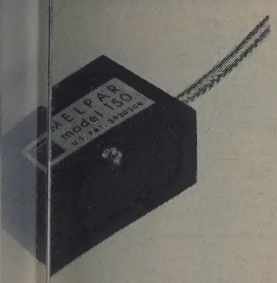
CLAIREX ELECTRONICS®

A DIVISION OF CLAIREX CORPORATION

560 SOUTH THIRD AVE., MOUNT VERNON, N.Y. 10550 • WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBU

MELPAR

Photoelectric Reader MODEL 150



Single Package . . . Miniaturized . . . Alignment Free

The light source, lens and photocell are contained in one highly compact unit that fully utilizes the advantages of detection by reflected light.

The patented lens system requires no alignment or adjustment, permitting delivery of Model 150 ready to use.

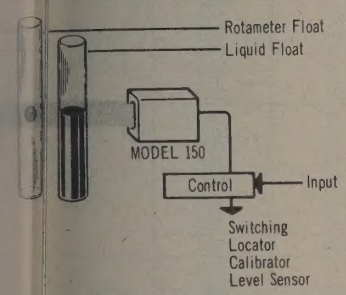
Features:

- Exceptionally small (0.6 cu. in.).
- Case dimensions, Front surface: 17/32" x 7/8" and length 1 11/32".
- Insensitive to ambient light.
- Versatile: Count, cue, sort, inspect.
- Rugged, Easily mounted, Low cost.

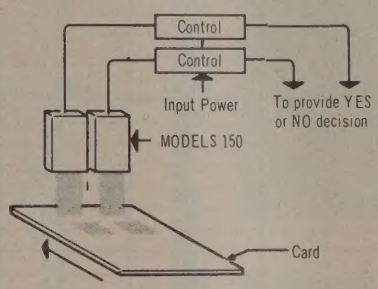
Photoelectric control

MODEL 155A & B

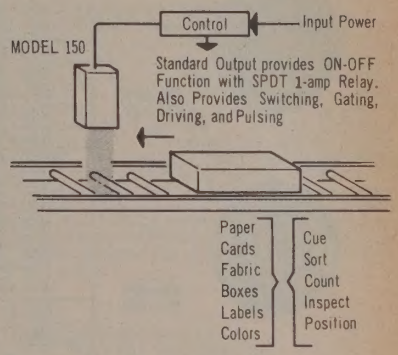
Transistorized Photoelectric Control Units provide high reliability at low cost for automatic control systems using Melpar's companion Photoelectric Readers. Models 155A and 155B are designed to operate with the Model 150 Reader. For most applications, the 155A is suitable, but for high sensitivity resolution or special applications the more sensitive Model 155B is available.



DETECTION OF FLUID LEVEL OR FLOAT LOCATOR

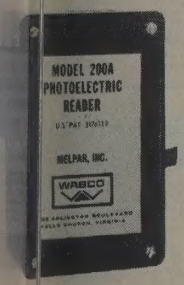


READING BLOCK MARKS ON CARDS



MOTOR AND SPEED CONTROL MONITORING

Photoelectric Reader MODEL 200A



Single Package Versatility . . . Long Distance Detection

MODEL 200A compact Photoelectric Reader, companion to the proven Model 150, is designed for use in automatic control systems where target detection at ranges from 1 inch up to 50 feet is required. Light source, single lens, and photocell are contained in one small unit that fully utilizes the advantages of detection by reflected light.

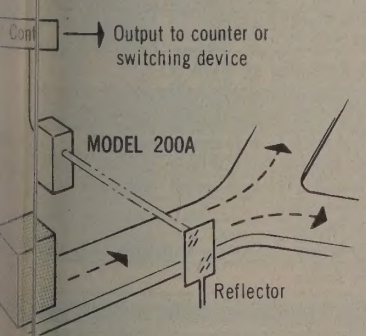
CUE, SORT, COUNT, INSPECT BY NUMBER, COLOR, SHADE, SIZE

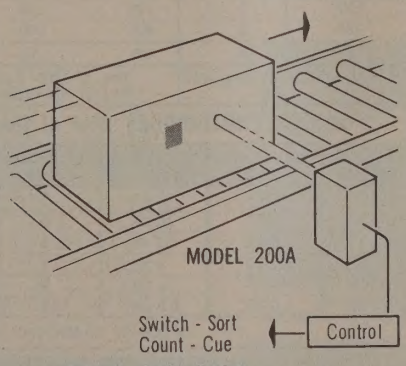
Photoelectric control

MODEL 205A & AS

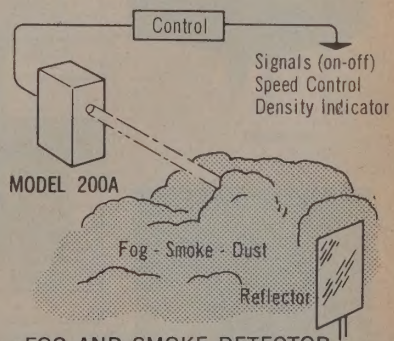
The Model 205A is used to operate the Photoelectric Reader Model 200A. All control units contain a power supply, amplifier and control relay in one compact plastic case.

Model 205AS is available for high speed counting rates and provides a pulse output.





COLOR DETECTOR



FOG AND SMOKE DETECTOR

pplications are limited only by your imagination.

stributor quantities are presently available for immediate delivery from Newark Electronics Corp., 500 N. Pulaski Road, Chicago, Illinois 60624.

FOR PRICE AND DELIVERY INFORMATION CONTACT SPECIAL PRODUCTS DEPARTMENT

MELPAR

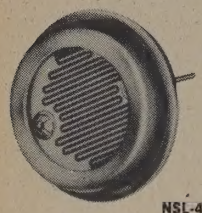
6631 IRON PLACE
SPRINGFIELD, VA. 22150
PHONE: 703-354-4450

NATIONAL SEMICONDUCTORS LTD.

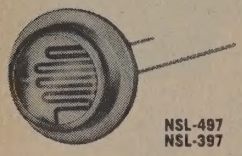
MANUFACTURERS OF PHOTOELECTRIC CELLS

SUMMARY OF STANDARD PHOTOCELLS

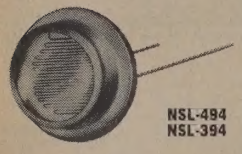
CADMIUM SULPHIDE PHOTOCONDUCTIVE CELLS (Peak of Spectral Response at 5500 Å)



NSL-446



NSL-497
NSL-397



NSL-494
NSL-394

Cell Type No.	1 Ftc Res. Kilohms	Typical 100 Ftc Res. Ohms	Min. Dark Res. Megohms	Max. Voltage Peak	Max. Power MW	Case Typ
NSL-443	200	4500	300	2000	1000	Hermetic Glass and Metal 1.0" Dia.
NSL-444	120	2200	100	2000	1000	
NSL-445	26.0	550	40	420	1000	
NSL-446	11.4	200	12	420	1000	
NSL-447	5.5	140	2.3	420	1000	
NSL-461	65	1500	80	70	100	Hermetic Glass and Metal 0.250" Di
NSL-462	28	600	20	70	100	
NSL-463	12	340	2.7	70	100	
NSL-464	5.2	180	0.7	70	100	
NSL-465	550	12000	160	250	100	
NSL-466	230	6600	20	250	100	
NSL-467	100	2400	4	250	100	
NSL-481	43	1000	65	120	200	Hermetic Glass and Metal TO-5
NSL-482	18.6	400	15	120	200	
NSL-483	8	230	1.8	120	200	
NSL-484	3.5	120	0.25	120	200	
NSL-487	160	4600	130	250	200	
NSL-491	9.3	210	14	70	500	Hermetic Glass and Metal TO-8
NSL-492	4.0	80	3.2	70	500	
NSL-493	1.7	50	0.4	70	500	
NSL-494	0.75	30	0.05	70	500	
NSL-495	40	860	32	350	500	
NSL-496	17	500	4.0	350	500	
NSL-497	7.5	260	0.54	350	500	
NSL-531	1.7	100	0.5	170	200	Epoxy 0.50" Dia
NSL-561	17.0	1000	5.0	420	200	

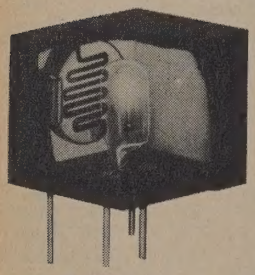
CADMIUM SELENIDE PHOTOCONDUCTIVE CELLS (Peak of Spectral Response at 7200 Å)

NSL-464
NSL-364

NSL-467
NSL-367

Cell Type No.	1 Ftc Res. Kilohms	Typical 100 Ftc Res. Ohms	Min. Dark Res. Megohms	Max. Voltage Peak	Max. Power MW	Case Typ
NSL-364	5.2	125	200	80	100	Hermetic 0.250" Di
NSL-367	100	2400	3000	250	100	
NSL-384	3.5	90	100	80	100	Hermetic TO-5
NSL-387	68	1600	1000	250	100	
NSL-393	1.7	40	10	80	500	Hermetic TO-8
NSL-396	17.0	400	100	320	500	
NSL-3531	1.7	40	2.0	80	200	Epoxy 0.50" Dia
NSL-3561	17.0	400	20.0	400	200	

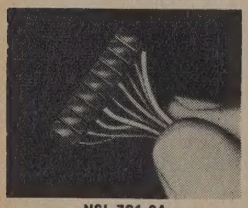
PHOTOCELL-LAMP ASSEMBLIES



PL-1036-1

Type No.	Lamp Volts	Lamp Current MA	Max. ON Res. Ohms	Min. OFF Res. Megohms	Max. Volts	Max. Power MW	Case Typ
PL-1033-1	10	15	100	10	80	250	Phenolic .75" x .75" x . Pin Leads fo P.C. Board Mounting
PL-1036-1	10	15	400	100	320	250	
PL-1033-2	10	15	Dual Photocell Unit 100	10	80	250	
PL-1036-2	10	15	Dual Photocell Unit 400	100	320	250	
PL-2H33-1	120	2	100	10	80	250	
PL-2H36-1	120	2	400	100	320	250	
PLT-10384	10	15	400	10	80	100	Tubular Axial L s
PL-1036-2TR	Special Dual Tracking Unit		Res. at 3.5v - 7-20K Ohms Tracking ±20% Res. at 10v - 1.5K Ohms Max. Off R. 10 Megs				Otherwise sam PL-1036-2

SILICON PHOTODIODES (Peak of Spectral Response at 8600 Å)



NSL-701-9A

Type No.	Min. Short Ckt. Current MA*	Min. Open Ckt. Voltage*	Max. Reverse Dark Current	Max. Reverse Volts	Description
NSL-701-1	0.30	0.35	10 μA	5	Silicon Chip .1" x .2" Coated, wire leads
NSL-701-9A	0.30	0.35	10 μA	5	Nine element cell 0.1" spacing, wire leads
NSL-703	1.5	0.42	50 μA	5	Silicon chip .2" x .4" Coated, wire leads
NSL-710P	0.125	0.40	2 μA	5	TO-18 Package
NSL-720	0.100	0.30	1 μA	5	TO-5 Package
NSL-820	0.125	0.25	0.5 μA	15	TO-5 Package Special Low Capacitance Low Noise

* . . . . at 500 Ftc (25 MW/cm²) 2800°K Source

SILICON PHOTOTRANSISTOR (Peak of Spectral Response at 8600 Å)

Type No.	I_{CEO}* at 15v	Dark I_{CEO} at 25°C	Max. Voltage V_{CEO}	Power Rating MW	Description
PT-701	.5 MA	.05 μA	30	150	NPN Silicon Transistor TO-18 Case

* . . . . at 200 Ftc (10 MW/cm²) 2800°K Source

NATIONAL SEMICONDUCTORS LTD.

331 Cornelia Street, Plattsburgh, N. Y. 12901 • Tel: (518) 561-3160
In Canada 2150 Ward Street, Montreal 378, Quebec • Tel: (514) 744-5507

Source for Optoelectronics—SENSOR TECHNOLOGY

DISCRETE DEVICES

MICROMINIATURE PLASTIC PHOTO-TRANSISTORS

Clear plastic encapsulated photo-transistors for high-density-mounting applications such as: punched card and tape readers; shaft encoders; pattern and character recognition systems; inspection equipment; counters; sorters; switching and logic circuits. Their small size and flat leads afford maximum design flexibility — close spacing. Available with or without external "base" leads, they are sensitive throughout the visible and near-infrared spectrum. Custom arrays can be fabricated to meet most any requirement. And, they can be matched to assure uniform sensitivity and close tracking parameters.

SPECTRA-555 "BLUE" SILICON CELL

Its peak response is at 555mμ (the "blue-region"), which corresponds to that of the human eye and selenium cells. Ideal for color and recognition systems, it does not require bias power for photovoltaic action. Other uses include: colorimetry, flame spectroscopy, spectrometry and light separators. Three times more sensitive than selenium, the Spectra-555 is an optimum choice for illumination and exposure meters as well as optical sound track transducers. Its low noise minimizes spurious signals, and it can be mounted in a multitude of packages to fit specific requirements.

SILICON SOLAR ENERGY CONVERTERS

Excellent photovoltaic components for systems feature high reliability, instant response, and long life characteristics. No other power supplies needed. Amplification of cell output immediately gained with simple transistor circuitry. Normally used in the following categories: A) photo-electric where control mechanisms are activated by light. B) power for converting light directly into DC power or storing in rechargeable batteries. C) read-out when "read-out" information from punched cards and tapes is obtained by cells arranged in mosaic patterns.

ULTRA CELL®

New silicon photovoltaic devices with remarkable reverse leakage and speed of response. Available in all physical geometries presently supplied for devices with normal characteristics. Improves, sometimes even makes practical, applications using single cells, arrays or groups of cells.

Reverse Leakage: 2μA@—5.0VDC Speed of Response: 1—3.5μSec.

EDGE-CONTACT SILICON PHOTOVOLTAIC READOUT CELLS

Electrically identical to common top and bottom contact types, but with new and distinct advantages: smaller size by attaching to side of active area and saving valuable light conversion area, easier to mask, closer positioning to light sources, easier to mount accurately. Flat unobstructed surfaces permit designs previously impossible, with more efficiency and lower cost. Available with any number of segments up to 1.5" total length (nine segments). Ideal for applications such as punched card, punched tape and related readers as well as rotary pulse generators, encoders and the general line of optical transducers where close spacing of the input mechanism is necessary.

ASSEMBLIES AND SYSTEMS

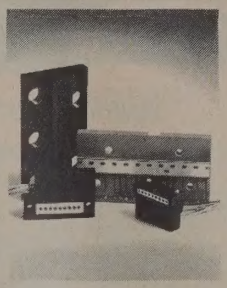
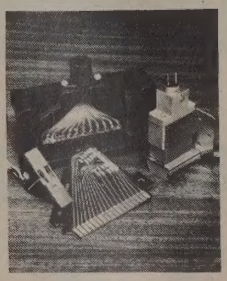


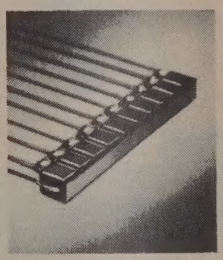
PHOTO-TRANSISTOR CARD AND TAPE READER ASSEMBLIES

Standardized dual-inline packaged photo-transistor arrays developed for economical handling and mounting in computer peripherals and data processing systems as well as industrial production control and switching designs. The transistors are electrically isolated from each other and mounted on 250-mil centers, in the case of the "Card Reader" units (100-mils for the "Tape Readers"). They can directly interface with DTL, RTL or TTL circuits. Sensitive over the visible and near-infrared spectrum, their characteristics remain stable even under high humidity and rugged environmental conditions.



SPECIALIZED SYSTEMS... INCLUDING FIBER-OPTIC SENSORS

Off-the-shelf and custom designed solutions to optoelectronic sensing problems. Small or large quantity requirements — photovoltaic or photoconductive modes — compatibility with high-speed logic ICs, Sensor Technology is geared to provide optimum and economical answers to unique requirements. For example, our capabilities range from fiber-optic interfacing networks to complete readout systems, including amplification and biasing, customized packaging and matched componentry...all assembled and tested under one roof, saving you in-house processing and piece-parts inventory costs.

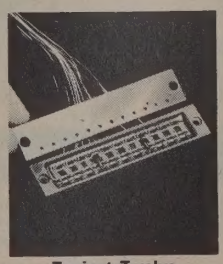


SILICON PHOTOCELLS FOR READOUT ASSEMBLIES

Offer distinct advantages over other photocells because of short transient response time. Function over extreme temperature ranges without affecting built-in characteristics. Feature low impedance output for matching transistor input networks. Also provide excellent speed of response, stable output characteristics and low noise output for application to perforated tape readers, punched card data systems, analog-to-digital encoders, shaft positioning equipment, and industrial control systems. Available in numerous cell forms and specialized packages for any need.

CUSTOM HYBRID CIRCUITS

Sensor Technology can produce thin-film hybrid circuits according to a wide assortment of customer specifications. All phases of production, from thin-film layout to production and testing, are undertaken at our plant by a highly qualified staff. Both epoxy molded and hermetically sealed packages are available.



Typical Twelve Position Card Reader

CUSTOM PHOTOVOLTAIC THIN-FILM READOUT ASSEMBLIES

Provides the system designer with previously unavailable capability in the area of light sensitive arrays. Features small size, modular layout, intimate sensor/amplifier connections and adaptability of the entire unit to most forms of optical housing. Reduces the complexity of final product design. Initial amplifiers are DTL or TTL compatible. Complete opto-hybrid subsystems possible.

Power Requirement: +5V ±.25V @ 5mA/circuit. *Switching Time:* 1μs or less from full off to full on. *Light Level:* 500 foot candles. *Operating Temperatures:* —25°C to +80°C Non-operating temp. —55°C —100°C.

ROAD-RANGE EXPERIENCE AND CAPABILITIES

Sensor Technology's extensive design and engineering staff can meet the most exacting demands for creativity and adaptability. Their know-how spans the entire electromechanical and solid-state technologies. Let them innovate an optimum solution to your optoelectronic problem; whether it be a "special", a variation from our standard lines, or a completely unique development to fit custom requirements.

SENSOR TECHNOLOGY, INC.

7118 GERALD AVE. * VAN NUYS, CALIFORNIA 91406
TELEPHONES: (213) 781-2154 * (213) 873-1533

UNITED DETECTOR TECHNOLOGY

1732 21st Street, Santa Monica, California 90404 • Phone (213) 393-378

STANDARD SERIES PHOTODETECTORS

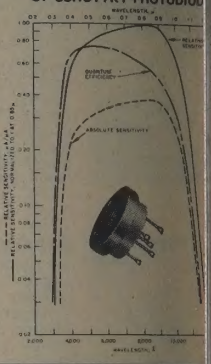
Photodetector Features for all UDT Models

- ☐ SPEED TO 4 NANOSECONDS
- ☐ MAXIMUM SENSITIVITY
- ☐ BROAD SPECTRAL RESPONSE
- ☐ ACTIVE AREAS TO 8 CM²
- ☐ LOW DARK CURRENT

GENERAL NOTE

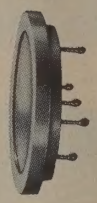
UDT's broad line of high performance PIN photodiodes are constructed with both planar diffused and Schottky barrier technology. A "D" after the model number classifies the detector as diffused. All other types are Schottky barrier. Refer to UDT literature for application areas of these two types. UDT's standard series of detectors are circularly configured and mounted in specially formed anodized aluminum housings terminated to a BNC connector or mounted on JEDEC standard T0-18, T0-5, T0-8 stainless steel headers with hermetically sealed window cans. Ultra low leakage currents and ultra low capacity at full depletion applied voltage are characteristic of UDT PIN Photodiodes. Large area, low capacity, high performance devices are unique with UDT.

SPECTRAL CHARACTERIST
OF SCHOTTKY PHOTODIOD



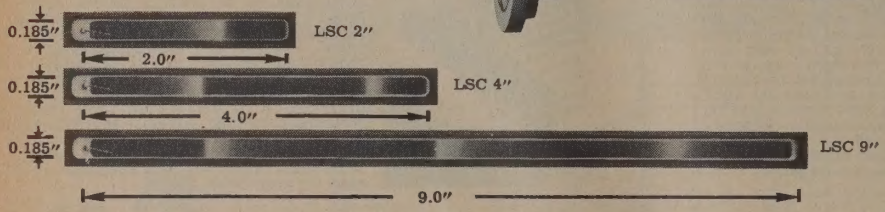
LIGHT POSITION SENSING PHOTODETECTORS

	PIN SC/10	PIN SC/25
Mounting Diameter (O.D.)	.975"	2.225"
Active Area Dimension (L)	.4"	1.25"
Active Area	.16 in.	1.56 in.



SPECIFICATIONS

UDT No.	Area (cm²)
SC/10	1.0
SC/25	15
LSC 2"	3.2
LSC 4"	6.4
LSC 9"	14.5



United Detector Technology light position sensing d sensitive silicon photodetectors that give two electri signals. One corresponds to the position of a light s surface and the other corresponds to the intensity o spot.

The single axis LSC series offers position sensing ove lengths of ½, 2, 4 and 9 inches. Non-standard length able on special order.

The two-axis SC-10 and SC-25 detectors provide positi over a 0.4 and 1.25 inch square area respectively.

Position sensitivity is 0.2 microamperes/milliwatt/mill lution of one millionth of an inch and linearities bette

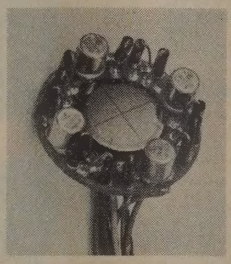
Both single and dual axis models offer all the adv United Detector Technology's high quality line of stand Schottky barrier photodetectors.

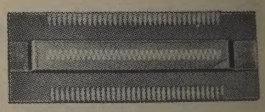
CUSTOM ENGINEERED PHOTODETECTORS

The Schottky and planar diffused technologies employed by United Detector Technology are very readily adaptable to new geometries and to modified characteristics. Many specialized photodetectors have been designed for our military and industrial customers, and in many cases without the high cost of custom engineering. An optimum choice of basic detector design can be made from UDT's broad base.

Geometries possible include lengths to 10 inches, widths to 1 inch, diameters to 2 inches. Linear arrays with densities up to 200 elements per linear inch. Single element size down to 6 mils. A variety of mounted schemes are available.

Special characteristics include U.V. response from 1000Å to 3000Å, greater than 10% of maximum. Capacitance at 90 volts less than 30 pf/cm. Quantum efficiency at 1.06 micron greater than 50%; at 1.15 greater than 10% with I.R. enhancement.

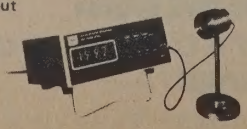




DIGITAL LIGHT MEASURING INSTRUMENTS

LASER POWER METER

- 4-digit readout (microwatts—milliwatts—watts)
- Detects any 3 preselected monochromatic colors or white light 10^{-9} to 10^{2}
- $840. includes detector, bench-mount, filter holder and carrying case
- BCD or analog output



Both the Laser Power Meter and the Photometer feature the following unexcelled characteristics

- 5% calibration accuracy traceable to NBS standard
- 0.1%, 24-hour stability—1% stability for 6 months
- 90% overranging on each of 6 ranges

PHOTOMETER

- 4-digit readout (footcandles, footlamberts, μwatts/cm²)
- 10^{-3} to 10^{4} footcandles range
- BCD or analog output

$925. includes detector, mount, cosine receptor, factory calibration, photopic filter and carrying case

VACTEC

-Form Catalog S-70

Write for Se bulletin SPV4B or CdS & CdSe bulletin PCD5 for complete information.

VACTEC, INC.
2423 Northline Industrial Blvd.
Maryland Heights, Missouri 63042
Phone Area 314, 432-4200

PHOTOCONDUCTIVE CELLS

ht dependent resistors in 5 materials l 5 styles. All ± 33⅓% tolerance for Ft.-C resistance.

HOW TO ORDER (example)

VT-102
series — material — resistance

ERIAL	PEAK SPECTRAL RESPONSE
0 CdS (Broad Spectrum)	5650 A
1 CdSe (High Speed)	7350 A
2 CdS (High Stability)	5150 A
3 CdS (High Speed)	5500 A
4 CdSe (Low Resistance)	6750 A

-1 Series (Plastic)
MW @ 25°C

Part No.	Ft.-C Res. KΩ	Max. Volt.
VT-10L	1.6	200
VT-101	3	200
VT-101H	6	200
VT-101L	9	300
VT-102	16	300
VT-102H	32	300
VT-102L	66	300
VT-103	36	300
VT-103H	2.3	200
VT-103L	4.6	200
VT-104	9.2	300
VT-104H	22	300
VT-104L	44	300
VT-110	60	300
VT-110H	3	200
VT-110L	6	200
VT-111	9	300
VT-111H	16	300
VT-111L	32	300
VT-112	66	300
VT-112H	136	300
VT-112L	10	200
VT-113	14	200
VT-113H	28	200
VT-113L	.6	200
VT-141	1.2	200
VT-141H	2.4	200
VT-142L	4.8	300
VT-142	7	300
VT-143L	14	300
VT-143	28	300

VT-100 (.065" Thickness) (Diam. .368") Plastic

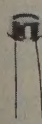
-0 Series (TO-18)
MW @ 25°C

VT-201	4.3	100
VT-202	8	100
VT-202H	15	100
VT-202L	22	300
VT-203	44	300
VT-203H	88	300
VT-203L	110	300
VT-204	1000	300
VT-204L	2.3	100
VT-205	3.5	100
VT-211	6	100
VT-211H	7.8	100
VT-211L	16	100
VT-212	22	300
VT-212L	32	300
VT-213	64	300
VT-213H	140	300
VT-213L	6.8	100
VT-214	10	100
VT-214L	20	100
VT-221	40	300
VT-221H	65	300
VT-221L	80	300
VT-222	500	300
VT-222H	1000	
VT-222L	100	
VT-223	150	
VT-223H	350	
VT-223L	700	
VT-224	1400	
VT-224H	2	
VT-224L	4	
VT-225	8	
VT-225H	15	
VT-225L	30	

VT-200 TO-18 (Diam. .183)

V300 Series (TO-5)
125 MW @ 25°C

VT-30L	1.8	200
VT-301	3	200
VT-301H	6	200
VT-301L	10	300
VT-302	16	300
VT-302H	32	300
VT-302L	70	300
VT-303	144	300
VT-303H	1000	300
VT-303L	2.1	200
VT-304	4.2	200
VT-305	8.4	300



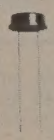
VT-300 TO-5 (Diam. .325)

VT-300 Series (TO-5)
cont.

VT-312	22	300
VT-312H	30	300
VT-313L	60	300
VT-314	140	300
VT-32L	1.95	200
VT-321	3.9	200
VT-321H	7.8	200
VT-322L	15.6	300
VT-322	31.2	300
VT-325	1000	300
VT-333L	14	200
VT-333	28	200
VT-34L	.6	200
VT-341	1.2	200
VT-341H	2.4	300
VT-342L	4.8	300
VT-342	7	300
VT-343L	14	300
VT-343	28	300

VT-500 Series (TO-8)
500 MW @ 25°C

VT-50L	1.3	200
VT-501	2.6	200
VT-501H	4	300
VT-502L	8	300
VT-502	16	300
VT-503L	32	300
VT-503	66	300
VT-51L	.7	200
VT-511L	1.4	200
VT-511	2.3	300
VT-511H	4.6	300
VT-512L	9.2	300
VT-521	2.6	200
VT-521H	5	300
VT-522L	9	300
VT-522	18	300
VT-523L	36	300
VT-533L	12.5	200
VT-533	25	200
VT-54L	.25	200
VT-541	.5	200
VT-541H	1	200
VT-542L	1.5	300
VT-542	2	300



VT-500 TO-8 (Low Profile) (Diam. .490)

VT-700 Series (plastic)
250 MW @ 25°C ¼" diam.

VT721	2.55	300
VT721H	4.8	300
VT732	10	300

VT-700E (Epoxy) Encaps.
250 MW @ 25°C ½ diam.

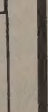
VT701E	3.3	100
VT702E	17.6	300
VT712E	24.2	300
VT721HE	5.5	300
VT732E	11	300
VT741E	1.32	100

VT-800 Series (Plastic)
175 MW @ 25°C ¼" diam.

VT82L	1.9	100
VT833	33	300

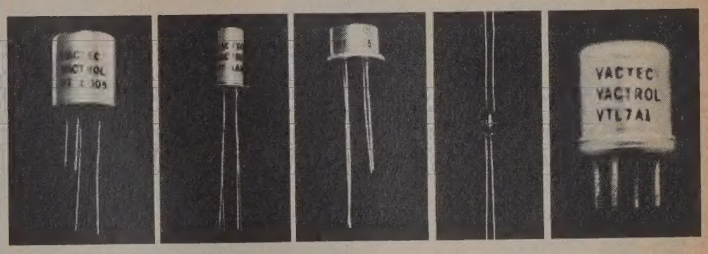
DUAL ELEMENT CELLS
VT-300 Series .325" diam.

VT-302/2	16	200 (ea. ½)
VT-303L	32	200 (ea. ½)
VT-312/2	5	200 (ea. ½)
VT-313L/2	10	200 (ea. ½)
VT-34L/2	1.5	200 (ea. ½)
VT-341/2	3	200 (ea. ½)



VACTROLS

PHOTOCELL-LAMP MODULES
Photon isolators for every requirement.



Case 6 & 8	Case 1	Case 3	Case 5	Case 7
9/16 Diam. Epoxy Seal	Hermetic TO-5	Hermetic TO-8	Epoxy TO-18	9/16 Diam. 7 pin. miniature

Part No.	Max. Lamp V.	Lamp I (ma.)	Max. on OHMS	Case
VT1.5040	1.5	49	400	6
VT6005	6	40	50	6
VT10030	10	22.5	300	6
VT10150	10	22.5	1500	6
VTL1A1	1.5	50	400	1
VTL1A2	6	40	200	1
VTL1A3	10	14	800	1
VTL1A4	12	25	250	1
VTL1B5	150 Neon	1.2	1000	1
VTL1B6	90 Neon	.3	5000	1
VT120020N	150 Neon	1.2	200	8
VT120100N	150 Neon	1.2	1000	8
VT030-18A	1.1 LED	30*	1000	5
VT005-8	1.1 LED	5*	1000	3
VTL7A1**	10	14	2000	7

*LED's can operate to 100 ma. Max.
**Two Cells-One Lamp, Cell match 20% @ 3 & 6 V.
Any Case style available in Special Cell/Lamp combination.

PHOTOVOLTAIC CELLS

Photovoltaic cells start with a layer of selenium onto which a junction of CdSe is formed. A subsequent layer of CdO or Au acts as a current collector. The two types are specified as A for the Au layer and B for the CdO type. B is high output for low light and best for use with amplifier. Specify A or B after part number, e.g. S100 EB.

STANDARD SIZES (Partial List)

UNMOUNTED SIZES

Part Number	Size (Inches)	Minimum Microamp Output
RX5	.250 diameter	12
RX10	.375 diameter	20
RX15	.500 diameter	30
RX80	1.000 diameter	130
R1	1.130 diameter	220
R5	1.375 diameter	305
R10	1.500 diameter	360
R75	1.770 diameter	400
R100	2.000 diameter	750
SX10	.250 x .484	14
S1	.440 x .730	80
S2	.654 x .765	110
S3	.622 x 1.118	150
S8	.875 x .875	220
S13	1.500 x 1.500	650
S17	.281 x .875	75
S100	.886 x 1.689	360
S150	.250 x 6.000	360

MOUNTED SIZES

Part Number	Dimensions (Inches) Thickness	Diameter
R100M	¾	2¼
R10M1	13/32	1¾
R75E	7/16	2
*RX80H	¼	1⅛
R100K	19/32	25/16
Metal — epoxy case octal plug		
S100M	T(¼) x W(13/32) x L(1 29/32)	
Plastic case — acrylic window		
S100E	same as S100M	
Epoxy encapsulated		

*Hermetic cases

NOTE: Unmounted Cells less than .045" thick

NOTE: Microampere output based upon cell temperature of 75°F., color temperature 2850°K, 100 foot candles, 150 ohm load. Bulletin SPV4B shows complete line.

PAM-1 PHOTOCELL AMPLIFIER MODULE
The Vactec Photocell amplifier module (PAM) consists of a matched selenium photocell and a high gain operational amplifier. All solid state unit replacement for phototube and associated amplifier or multiplier.

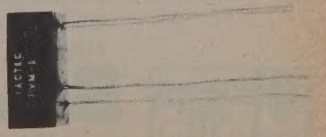
Specifications

Input	± 15 VDC; + 15 ma max.
Output	0-10 VDC; 2 K min. load resistance (1)
Response Time	100 u sec.
Photometric Response (min. with 2850° K Source)	6u V/fc/ohm

(1) Load resistance is the parallel combination of feedback and external load.

PHOTO VOLTAGE MULTIPLIER PVM-1
Converts the selenium photocell to a stiff curren source; load current independent of load resis.

Input	3-15 VDC @ 200 uA Load Current
Output	Input minus 2 V.
Response	As fast as 10 u sec. with small cells.



BULOVA LIGHT CHOPPERS/SCANNERS

APPLICATION AREAS

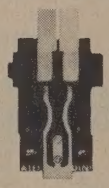
- Bolometers
- Burglar Alarm Systems
- Colorimeters
- Densitometers
- Horizon Sensors
- Information Storage systems
- Intrusion Systems
- Ion Beam Choppers
- IR Detectors
- Mass Spectrometers
- Radiometers
- Spectrophotometers
- Star Trackers
- Telemetry Systems

A NEW CONCEPT OF LIGHT MODULATION THAT OUTMODES MOTOR DRIVEN TYPES

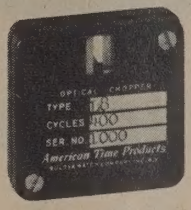
Light choppers and scanners are used to chop light and energy beams, switch a radiation source to two or more s switch two sources alternately to one sensor, scan an area radiation source, and for many other purposes. Based up balanced vibrating members of a tuning fork, optical chopper outstanding advantages over motor driven types. **Features:** • requirements as low as 500 mw • No lubrication needed • No parts • Lightweight—½ to 3 ounces maximum • Reference voltage available • Small size—as small as ⅝" x ⅜" x 1 5/32".

LIGHT CHOPPERS

L40C
⅞" x 3" x ⅝"



L2C
¾" x 1½"



L8C
1½" x 1½" x ⅜"

(Patented and Patent Pending)

STANDARD APERTURES (inch. & m

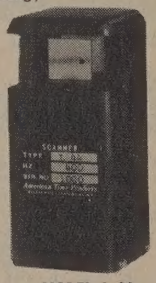
Frequency Hz	L40* in	L40* mm	L2 in	L2 mm	L8C** in
10	.4	10			
30	.4	10			
50	.4	10			
100	.4	10			
150	.4	10			
200	.32	8	.20	5.0	.16
400	.2	5	.12	3.0	.12
800	.08	2	.08	2.0	.04
1000	.05	1.2	.05	1.2	.032
2000			025	.625	.02
2500			015	.375	
3000			012	.300	

*The length of aperture is 10 mm. minimum.
**Length of aperture is a minimum of twice the width.

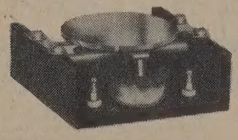
OPTICAL SCANNERS

(Patented and Patent Pending)

MODEL L-45
¾" x 1" x 3 3/16" High



MODEL L-44
1½" x 1½" x Approx. 3" High



MODEL L50
1 7/16" Sq. x ⅝" High

TORSIONAL TYPE

L44 for frequencies 100 to 600 Hz
L45 for frequencies 600 Hz to 10 KHz

A fixed frequency device which can, in its simplest form, be used to cause a light, or energy scan a target in a harmonic manner.

SPECIFICATIONS

Fixed Frequency Hz	Angular Amplitude Peak to Peak*	Maximum Mirror Size MM
100	20°	30 x 30
200	14°	20 x 20
400	10°	15 x 15
800	7°	10 x 10
1000	6°	10 x 10
2000	5°	7 x 7
4000	4°	7 x 7
6000	3°	5 x 5
10000	2°	2 x 3

*Angle is doubled upon reflection.

Maximum angular velocity in degr second is $\pi f \theta$.

ACCURACY: Normally ±2%; better on

REFERENCE SIGNAL: Squared wave; min. into 50K ohms.

OPERATING TEMPERATURE: −5 +85°C. Other ranges available.

INPUT: Approx. 400 mw at 24 to Driver Amplifier for 115V AC also a

TAUT BAND TYPE L-50

A mechanically resonant device in which the restoring a taut ribbon. Power to start and maintain the oscill furnished by a solid state driver powered from d.c., optional 110V AC drivers are also availab

Freq. Range HZ	Mirror Angle Peak to Peak	Stock Mirror Size
5 to 24	30°	25 x 25 MM
25 to 40	25°	15 x 15 MM
41 to 99	20°	15 x 15 MM
100 to 149	15°	10 x 10 MM
150 to 199	10°	10 x 10 MM
200 to 400	5°	10 x 10 MM

ACCURACY: Normally ±2% from 0°C (higher on request).

REFERENCE SIGNAL: 1V p to p m 50K ohms.

OPERATING TEMPERATURE: −40°C to

INPUT: To driver unit 6 to 28V DC.

SIZE: 1½ x 1½ x ¾" high.

WEIGHT: .75 oz. approx.

Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers

BULOVA AMERICAN TIME PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

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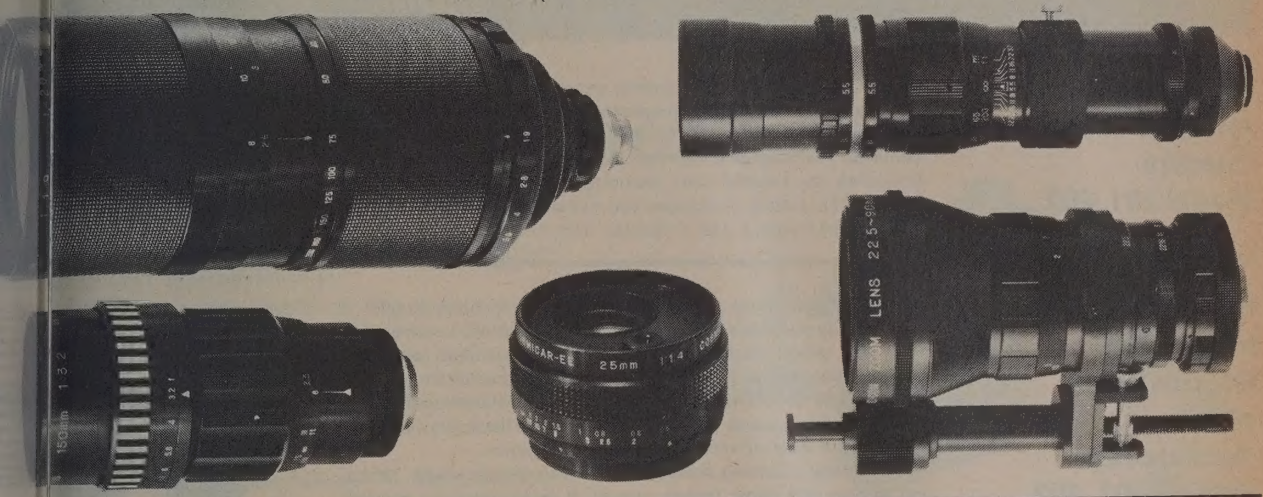
ect your CCTV system with COSMICAR® lenses



Lens description	Focal length	Number of lens element	Maximum image format covered			f-stop aperture engraved	Focusing range	Maximum outside diameter	Overall length*	Mounting type of the lens	Filter size	Net weight
			Total (diagonal) angular coverage	Horizontal	Vertical							
12.5mm 1:1.4	12.5mm	8, hard-coated	64°50′	53°52′	41°43′	1.4~22 with click-stop settings (evenly spaced)	10 inches or 0.3 meters to infinity	48.0mm	64.0mm	C-mount	Filter of 46.0mm dia., P=0.75mm	210 grams
25mm 1:1.4	25mm	6, hard-coated	35°14′	28°30′	21°34′	1.4~22 with click-stop settings (evenly spaced)	2 feet or 0.6 meters to infinity	42.0mm	42.5mm	C-mount	Filter of 35.5mm dia., P=0.5mm	105 grams
50mm 1:1.4	50mm	6, hard-coated	18° 2′	14°29′	10°53′	1.4~22 with click-stop settings (evenly spaced)	3.5 feet or 1 meter to infinity	45.8mm	65.0mm	C-mount	Filter of 40.5mm dia., P=0.5mm	260 grams
75mm 1:1.4	75mm	5, hard-coated	12° 5′	9°41′	7°16′	1.4~22 with click-stop settings (evenly spaced)	4 feet or 1.2 meters to infinity	60.0mm	100.5mm	C-mount	Filter of 58mm dia., P=0.75mm	525 grams
12.5mm 1:1.9	12.5mm	8, hard-coated	64°50′	53°52′	41°43′	1.9~22 with click-stop settings (evenly spaced)	10 inches or 0.3 meters to infinity	45.0mm	64.0mm	C-mount	Filter of 43.0mm dia., P=0.75mm	200 grams
25mm 1:1.9	25mm	4, hard-coated	35°14′	28°30′	21°34′	1.9~22 with click-stop settings (evenly spaced)	2 feet or 0.6 meters to infinity	42.0mm	47.0mm	C-mount	Filter of 40.5mm dia., P=0.5mm	100 grams
50mm 1:1.9	50mm	6, hard-coated	18° 2′	14°29′	10°53′	1.9~22 with click-stop settings (evenly spaced)	3.5 feet or 1 meter to infinity	42.0mm	68.0mm	C-mount	Filter of 40.5mm dia., P=0.5mm	200 grams
75mm 1:1.9	75mm	4, hard-coated	12° 5′	9°41′	7°16′	1.9~22 with click-stop settings (evenly spaced)	4 feet or 1.2 meters to infinity	46.5mm	106.0mm	C-mount	Filter of 43.0mm dia., P=0.75mm	280 grams
75mm 1:1.9	75mm	5, hard-coated	12° 5′	9°41′	7°16′	1.9~22 with click-stop settings (evenly spaced)	4 feet or 1.2 meters to infinity	50.3mm	73.5mm	C-mount	Filter of 46.0mm dia., P=0.75mm	270 grams
150mm 1:3.2	150mm	4, hard-coated	6° 3′	4°50′	3°38′	3.2~22	8 feet or 2.5 meters to infinity	62.0mm	126.0mm	C-mount	Filter of 55.0mm dia., P=0.75mm	660 grams
22~66mm 1:1.8	22~66mm	11, hard-coated	39°41′ ~ 13°43′	32°12′ ~ 11° 0′	24°26′ ~ 8°15′	1.8~16	5 feet or 1.5 meters to infinity	77.0mm	146.0mm	C-mount	Filter of 72.0mm dia., P=0.75mm	1,100 grams
22.5~90mm 1:1.5	22.5~90mm	15, hard-coated	38°18′ ~ 10° 2′	31°12′ ~ 8° 2′	23°19′ ~ 6° 0′	1.5~22 with click-stop settings	5 feet or 1.5 meters to infinity	85.0mm	170.0mm	C-mount	Filter of 82.0mm dia., P=0.75mm	1,280 grams

*Maximum projection of the lens from lens seating face

FOR 2/3″ VIDICON CAMERAS (MINI-COSMICAR)

3.5mm 1:1.5 Element, 8pcs. Coverage angle, 65°48′. Weight, 80g.

16mm 1:1.6 Element, 5pcs. Coverage angle, 37°56′. Weight, 100g.

—ditto— except without Iris Diaphragm.

50mm 1:1.9 Element, 4pcs. Coverage angle, 12°33′. Weight, 200g.

Zoom Lens. 15~45mm 1:1.8 Element, 11pcs. Coverage angle, 40°16′~13°56′. Weight, 520g.

OTHER LENSES & ACCESSORIES

#EX-2035:200mm 1:3.5 Element, 5pcs. Coverage angle, 4°33′. Weight, 700g.
#EX-3056:300mm 1:5.6 Element, 5pcs. Coverage angle, 3°02′. Weight, 1100g.
#EX-4056:400mm 1:5.6 Element, 5pcs. Coverage angle, 2°12′. Weight, 2100g.
#EX-5063:500mm 1:6.3 Element, 4pcs. Coverage angle, 1°49′. Weight, 1700g.

Rear Operated (Gear Drive) Zoom Lenses
Motor Drived Lenses
Filters: UV and infrared types for all COSMICAR lenses
Stand for the vidicon camera: Manually operated and installable on the wall.
Dust caps and flange mounts

COSMICAR

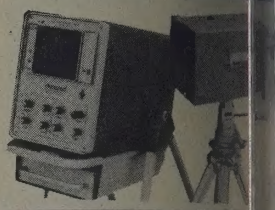
COSMICAR OPTICAL CO., LTD.

568, Shimoochiai, 2-chome, Shinjuku-ku, Tokyo Cable Address: "MOVIEKINO TOKYO"

dynarad INC is first in infrared

Fast-Scan Infrared Camera Model 201, 202

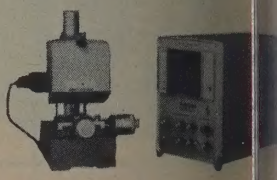
Offers the lightest, highest speed, general purpose infrared system available. The camera measures the temperature of a target within a 10° x 10° field of view and presents these measurements on the face of a cathode ray tube at an effective rate of 60 frames per second, thus providing a real time television-like display. The system comprises two separate packages: a tripod-mounted IR camera and a display unit.



Fast-Scan Infrared Microscopes with Laser Accessories Models 301, 302, 303, 304

The Model 300 series fast-scan infrared microscopes consist of a stand-mounted high-speed, fast-scanning, infrared microscope head and image display unit with laser illumination capability. The microscopes provide an instantaneous resolution of .001" at a line rate of 40 lines per frame and an effective frame rate of 60 frames per second, thus providing a real time television-like display. The field of view is 1 square millimeter.

The optical scanning and detection head weighs under 10 lbs. and is only 180 cubic inches overall. It is mounted on a stand allowing for both coarse and fine focusing adjustments. A coaxial viewing channel is provided within the optical head for focusing and general target observations. An x,y micro-positioner mounted on the base of the stand allows for orientation of the target field.

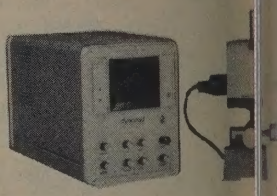


Infrared Line-Scanners and Displays Models 401, 402 and 403

The Model 400 series infrared line-scanners measure the temperature of a target within a field of view and present these measurements as an analog trace on the face of a cathode ray tube at a rate of at least 60 lines per second, thus providing a flicker-free image. The Model 403 provides a very high repetition rate of 3000 lines per second for special applications. Each system is comprised of two separate packages: a tripod-mounted IR scanner and a display unit. The display allows the use of an intensity marker for accurate temperature measurement of the object surface.

Fast-Scan Infrared Microscopes Models 501, 502, and 503

The Model 500 series infrared line-scanning microscopes are the only general purpose devices of their type. The scanners measure the temperature of a target within a scan line and present these measurements as a flicker-free analog trace on the face of a cathode ray tube at a rate of at least 60 lines per second. The difference in the three models lies either in the width of the scan line or the repetition rate. Each system comprising an optical scanning detection head and a display unit, provides a spot size of 0.001 inches and is in two separate packages. The display allows the use of an intensity marker for accurate temperature measurement of the object surface.

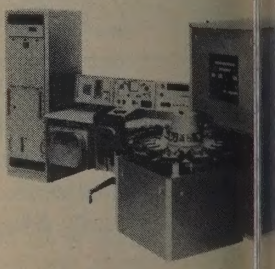


The Compare System

COMPARE (**C**onsole for **O**ptical **M**easurement and **P**recise **A**nalysis of **R**adiation from **E**lectronics) is an infrared detecting system which automates the trouble-shooting process for electronic circuits and assemblies.

The COMPARE SYSTEM scans electronic circuits and other targets, providing a digital readout based on the observed thermal pattern. The radiometer measures the temperature of the individual components, stores the data, and then matches it to previously stored patterns. Testing, trouble-shooting and maintenance are reduced to pattern comparison and recognition.

The basic system consists of an infrared scanning radiometer, rotary feed table, control console, and electronic data processor. Optional electronic data processing equipment is available for specialized applications.



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ENTIFIC

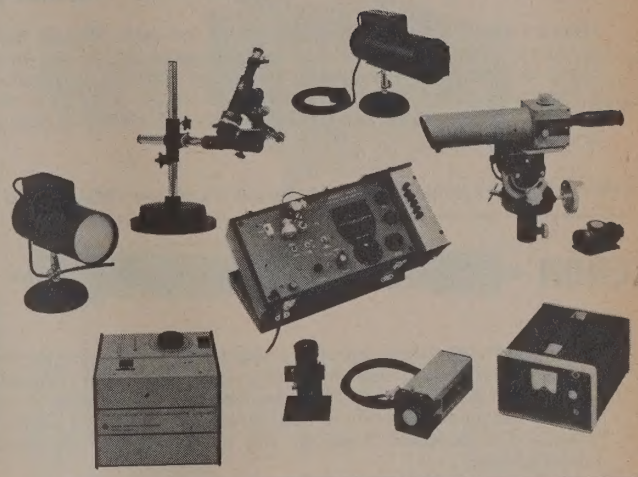
stems to solve
t measurement problems.

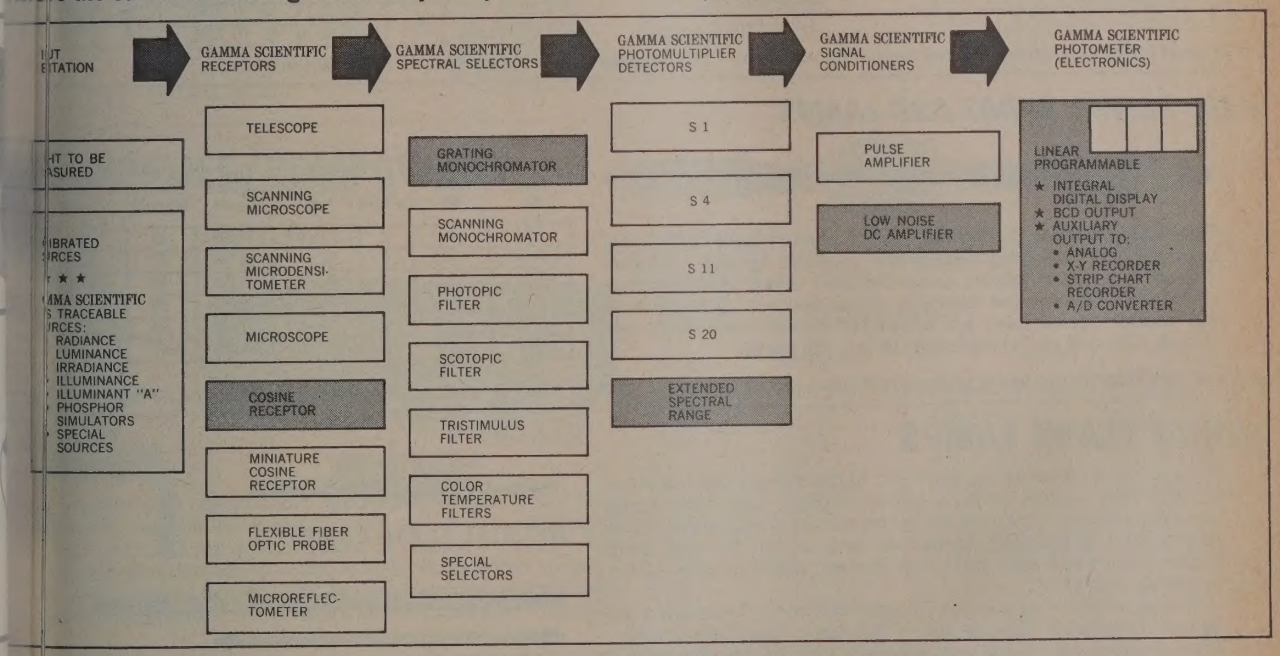
ind two basic differences in Gamma Scientific's surement systems. Differences that let you re time measuring light . . . less time building g up your instrumentation.

e offer a **systems approach.** No special engi- No special adapters to build. No calibration All Gamma Scientific instruments and acces- fully compatible. You can plug together a com- rable **system** in minutes using **standard** mod- those shown on the right. And we'll guarantee rmance from input to output.

cond difference is **flexibility.** We build a com- of fully compatible plug-in heads, accessories hments. You can change from one configura- other quickly . . . meet your various instrumen- eds with **the same basic system.** This flexibility s the limitations of single-purpose equipment.

re the standard building blocks for your system:



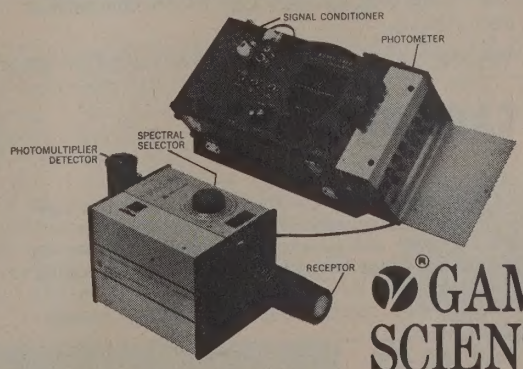


mple:

Sysm 2400SRA, indicated by the shaded blocks nd photo at right, is a picowatt spectroradio- ystem. It provides:

- avelength range 350-750nm.
- rect reading at any 7 selectable wavelengths.
- gh efficiency (f3.5) diffraction grating.
- alf-power bandwidth 4nm.
- aximum sensitivity 0.01nm • cm^{-2} • nm^{-1}.
- avelength accuracy ±2.5nm.
- rice: $3210.00

help you select the light measurement system to ur requirements. Call 714/279-8034 **collect.** Or, Manager of Applications Engineering, Gamma ic, Incorporated, 3777 Ruffin Road, San Diego, ia 92123.

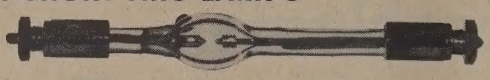


GAMMA SCIENTIFIC Incorporated

PEK HIGH INTENSITY

LOW POWER SHORT ARC LAMPS

MERCURY



Mercury short arc lamps provide one of the most efficient light sources available. Most sizes can be operated on AC or DC input power and can be low-frequency modulated. Spectral distribution is especially useful in the ultra-violet and visible portions of the spectrum. The compact arc size allows more flexibility in optical design.

Lamp No.	Rated Power (W)	No. Electrodes	Arc Size (height x width; 10^{-3} in.)	Avge. Luminance (cd/cm²; x 1000)	Luminous Flux (Lumens)	Luminous Efficiency (lum/watt)	Avge.** Life (hrs.)	List Price
107	100	3	12 x 12	140	2200	22	100	[illegible]
112	100	2	12 x 12	140	2200	22	100	[illegible]
202	200	2	70 x 70	33	9500	47.5	400	[illegible]
203	200	3	70 x 70	33	9500	47.5	400	[illegible]
210A	200	2	70 x 70	33	9500	47.5	400	[illegible]
500-2	500	2	155 x 90	22	22500	45	300	[illegible]
500-3	500	3	155 x 90	22	22500	45	300	[illegible]
500-4	500	3*	155 x 90	22	22500	45	300	[illegible]

APPLICATIONS: Oscillography • Photoresist exposure • Microscope illumination • Diazo exposure

XENON

Xenon short arc lamps provide a spectral distribution approximating that of natural sunlight, with an equivalent color temperature of approximately 6000°K. The lamps feature compact arc size, instantaneous operation, and excellent modulation characteristics. The extremely small arc size allows optimum design of optical systems.

Lamp No.	Rated Power (W)	No. Electrodes	Arc Size (height x width; 10^{-3} in.)	Avge. Luminance (cd/cm²; x 1000)	Luminous Flux (Lumens)	Luminous Efficiency (lum/watt)	Avge. Life (hrs.)	List Price
X-15	15	2	6 x 6	40	250	17	50	[illegible]
X-16	15	3	6 x 6	40	250	17	30	[illegible]
X-35	35	2	12 x 12	40	700	20	200	[illegible]
X-36	35	3	12 x 12	40	700	20	200	[illegible]
X-75	75	2	15 x 15	80	1388	18.5	300	[illegible]
X-76	76	3	15 x 15	80	1388	18.5	300	[illegible]
X-150	150	2	50 x 35	30	3150	21	750	[illegible]
X-151	150	3	50 x 35	30	3150	21	750	[illegible]
X-300	300	2	50 x 50	35	6300	21	500	[illegible]

APPLICATIONS: Searchlights (hand held) • Photography • Oscillography • Guidance control • Projection systems

HIGH POWER SHORT ARC LAMPS

PEK high power xenon short arc lamps feature rugged ribbon-seal construction, providing maximum security against vibration damage and high reliability under the most severe environmental conditions. The spectral radiation of this series is comparable to the smaller xenon short arc lamps but exhibits increased continuum radiation and a broadening of spectral peaks.

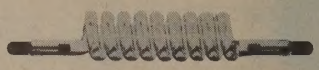
Lamp No.	Rated Power (W)	No. Electrodes	Approx. Arc Size (height x width; mm)	Avge. Luminance (cd/cm²)	Luminous Efficiency (lum/watt)	Luminous Flux (lumens)	List Price
X-500A	500	2	2.7 x 0.9	35,000	30	15,000	[illegible]
X-1000A	1000	2	3.6 x 1.1	52,000	37	37,000	[illegible]
X-1600A	1600	2	4.2 x 1.4	65,000	40	64,000	[illegible]
X-2500A	2500	2	5.8 x 1.5	62,000	40	100,000	[illegible]
X-5000A	5000	2	7.0 x 2.0	72,000	50	250,000	[illegible]
X-20KW	20,000	2	12.5 x 6.0	300,000	57	1,150,000	[illegible]

APPLICATIONS: Searchlights, military/commercial • Illumination systems • Environmental testing • Solar simulation • Projection systems

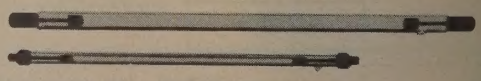
XENON FLASH LAMPS

Recognized experience in short arc high intensity light sources enables PEK to provide the customer with the flash lamp design that best suits his operating requirements and environment. PEK incorporates design and production options into the final lamp construction to provide maximum life and reliability under given operating conditions.

Tubing material/size • Gas fill pressure/mix • Electrode configuration/material • Seal design • Tube shape • Luminous length • Base configuration • Triggering method • KRYPTON fill available for Nd: YAG laser systems.



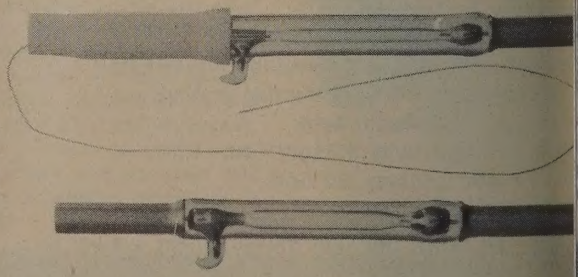
HELICAL FLASH LAMPS



LINEAR FLASH LAMPS

APPLICATIONS: High speed office copiers • Laser pumping • Photography • Flash photolysis • Flashing beacons • Airport systems

MERCURY CAPILLARY LAMPS



PEK Mercury Capillary Lamps provide intense radiant energy which extends from the ultra-violet through the near infra-red wavelengths, with primary energy concentration in U.V. wavelengths. A wide selection of arc size, radiant power, and mounting methods are available. Input power capabilities range from 500 watts through 4 KW, with special lamps available on request. Write for data sheet 301-1.

APPLICATIONS:

Therapy • Photochemistry • Biology • Photoresist Exposure • Medicine • Photo Reproduction • Color TV Tube Production

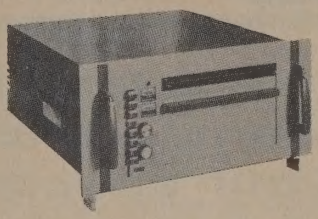
LIGHT SOURCES

VARO

OSCILLOGRAPH REPLACEMENT LAMPS

Designed specifically for oscillograph replacement applications, these lamps combine high arc stability with improved spectral output to provide highest recording speed and minimum trace width distortion. Intended for lab or field lamp replacement.

Bell & Howell/CEC
Hathaway
Century

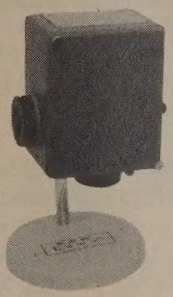


Honeywell
Sanborn
Midwestern

Write or call for convenient cross-reference lamp guide and price list related to these and other oscillographic recorders.

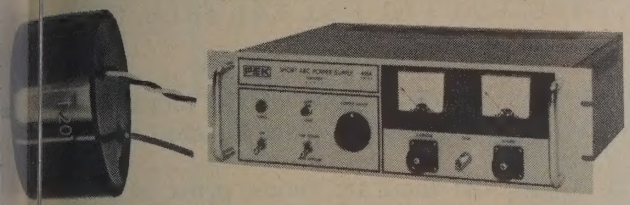
LAMP HOUSINGS

Lamp Housings to accommodate the PEK line of short arc lamps are available. These housings are designed to provide the various lamps with correct operating environment, in conjunction with desirable optical systems.



Model No.	Features	Applicable Lamps	List Price
910	Projection optics; Collimating capability	35w-200w Short Arcs	325.00
911	Same as 910 with spherical reflector	35w-200w Short Arcs	350.00
912	Same as 911 with UV filter	35w-200w Short Arcs	375.00
914	Same as 910	500w Mercury Short Arcs	450.00
915	Same as 911	500w Mercury Short Arcs	475.00
916	Same as 912	500w Mercury Short Arcs	500.00

POWER SUPPLIES/COMPONENTS



Power supplies and components specifically designed for lamp operation are available as standard units and in custom designs. Many standard units are manufactured in volume to provide laboratory and production line systems. In addition to power supplies, the PEK line includes trigger units, pulse generators, starter units, and power components. PEK welcomes all customer inquiries with regard to light source related electronic requirements. We have a well qualified engineering staff available to help solve unique customer problems.

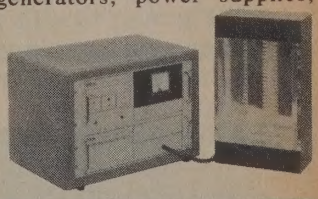
TYPICAL ELECTRONIC UNITS

Model No.	Appl. Lamp Type	Description	List Price
401A	Short Arc	75w Xenon/100w Mercury, DC	345.00
701A	Short Arc	200w Mercury, DC	350.00
704A	Short Arc	150w Xenon, DC	380.00
715	Short Arc	500w Mercury, DC	825.00
501	Capillary	0-2 Kw, DC	1650.00
504	Capillary	0-4 Kw, DC	3725.00
T507	Capillary	1 Kw Transformer, constant wattage	225.00
T508	Capillary	2 Kw Transformer, constant wattage	350.00
201	Flash Lamps	Pulse Generator	220.00
252	Flash Lamps	Pulse Generator	935.00

CUSTOM SYSTEMS

Knowledge of lamp capabilities is essential to good design of lamp driving systems. PEK, Inc. long recognized as a leader in the design of arc lamps, unites its extensive knowledge of lamp design and performance with an imaginative, experienced electronics engineering capability to deliver designs for custom specifications. The unique matching of systems specifications and lamp performance characteristics cannot be attained by isolated design of the system. Only when the electronics are designed with a complete understanding of the lamp design will the final product provide the light output that is required, while assuring the ultimate in reliable operation and long lamp life.

Typical applications include high and low powered laser pulsing systems, single and multiple unit flash lamp systems, short arc continuous and pulsed duty systems, and programmed light systems. PEK utilizes standard electronic products, such as pulse generators, power supplies, and triggering units, as subassemblies, to provide a more reliable system, with less setup, than to design the system and fit a lamp into the completed unit.



For more descriptive literature contact our sales dept.
PEK 825 E. Evelyn Avenue • Sunnyvale, California 94086
(408) 245-4111 TWX 910-339-9214

PEK INC
A Division of VARO, INC.
VARO

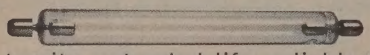
The Symbol of LIGHTPOWER

From the IMAGINATIVE producer and problem-solver in electro-optics:

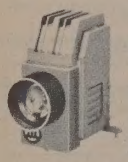
Mercury and xenon lamps, light projection systems, power supplies, advanced exposure systems...and fresh design approaches to your special requirements.

Mercury Short Arc Lamps Outstanding features: extreme arc stability, intense source of ultraviolet and visible radiation, performance proved reliability, constant lumen output throughout lamp life.
Operating characteristics: 100 to 500 watts; 2,000 to 30,000 lumens. Model numbers: iii-107, iii-110, iii-610, iii-660, iii-200-2, iii-200-3, iii-202, iii-203, iii-350, iii-500-2.

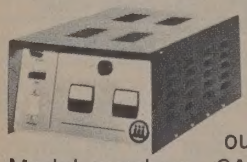
Xenon Short Arc Lamps Outstanding features: ultra arc stability, intense sources of ultraviolet and infrared radiation, history-proven reliability, capable of continuous, modulated or pulsed operation.
Operating characteristics: 35 to 300 watts; 600 to 7,500 lumens.
Model numbers: X-35, X-36, X-50, X-75, X-76, X-150, X-200, X-300, X-80, X-160, X-310.



Xenon Flash & Strobe Lamps Outstanding features: seal integrity, extended life, reliable triggering, high conversion efficiency.
Operating characteristics: 8 to 18,000 joules, glass to metal seals and solder seals; output of 15 to 50 lumen-seconds per joule input.
Model Numbers: F-38, F-38-U, F-42, F-81, F-47, F-47-U, F-70, F-60, F-90, F-91, FRT-6, FFT-6, FRT-76, Mini Strobe.



Lamphousings Outstanding features: 2″ or 3″ optics, positive linkage focusing adjustment in X-Y-Z axis, spherical rear mirror, detachable backplate for ease of lamp installation and prefocusing.
Operating characteristics: will hold 35 to 350 watt short arc lamps, pyrex or quartz optics, collimated light, integral filter sets.
Model numbers: LH-350, LH-350 Quartz, LH-360 W, LH-360 WO, LH-370, LH-370 Quartz.



Power Supplies Outstanding features: constant power to lamp throughout lamp life, solid-state, rugged design, low current ripple, ample starting energy to restart hot lamps.
Operating characteristics: 35 to 500 watts; integrated starter circuits, DC output, 50 or 60 cycle and 117 to 220 volts.
Model numbers: CA-35, CA-75/100, CA-150, CA-200, CA-350, CA-500, CA-610, modulators.

Ultraviolet Exposure Systems A new line of equipment especially engineered for printed circuit production and chemical milling. Advances include faster exposure rate; improved resolution; independent, self-sealed, two-sided vacuum frames; choice of production volume and automation features in three systems packages: **iii Mark I**, **iii Mark II**, and **iii Mark III**.

Custom Design Capability Illumination Industries has assembled an engineering and manufacturing staff with a depth of experience unequalled in the industry. We are anxious to apply their design talent to the solution of your most challenging electro-optical problems.

ILLUMINATION INDUSTRIES INC. **Dept. C, 610 Vaqueros Rd., Sunnyvale, Calif. 94086 Phone (408) 738-2744**

ALA INDUSTRIES INC.
99 CALVERT STREET
HARRISON N. Y. 10528
914-835-0400

COILS — RF ANTENNA AF — PC MINIATURE • PC STANDARD ENCAPSULATED • OPEN FRAME — REED RELAYS

MEMORY COMPONENTS

Readout memory cores wound and encapsulated to customer specifications. Special winding facilities developed to insure accurate winding at high rates of production.

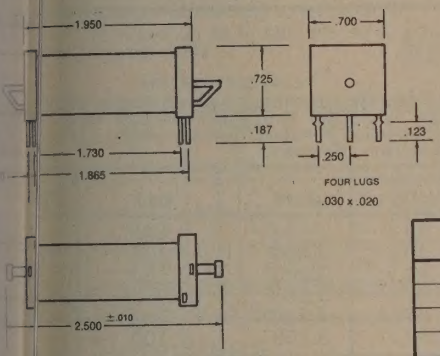
GENERAL INFORMATION

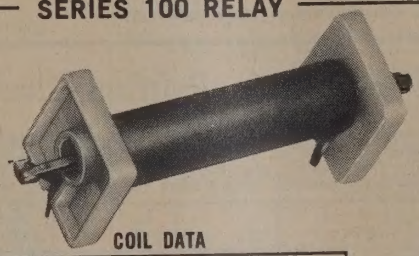
- All switches sealed in inert gas.
- Switching speeds in low millisecond time.
- Contact material Di-Met, DIFFUSED GOLD, RHODIUM and Mercury to Mercury.
- Maximum Initial Contact Resistance .05 to 0.2 ohm Dependent on Selected Contact Material.
- Relays available with magnetic and or electrostatic shielding.
- Special relay assemblies to customer specifications.

For additional specifications or special design applications, contact factory or nearest sales office.

We Manufacture Reed Relays to Customer Specifications.

SERIES 100 RELAY





ORDERING INFORMATION:
A single pole single throw reed relay with a 24 vdc coil and 50 watt contacts would be specified as part number 100F-24.

COIL DATA

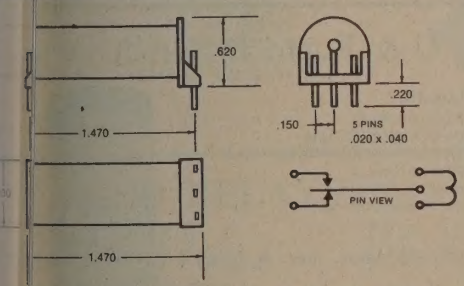
Drive Voltage	D.C. Coil Resistance ±10%
6	120 Ohms
12	450 Ohms
24	1600 Ohms
48	5700 Ohms

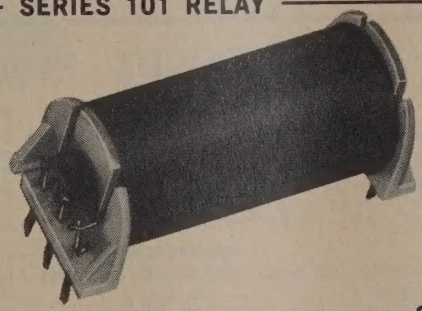
100-101 REED SWITCH SELECTOR CHART

Reed Switch Code	Reed Type	Max. Volts	Max. Current
E	15W. Form A	250	1.0A
F	50W. Form A	250	3.0A
G	100W. Form A	250	3.0A
H*	50W. Form A	500	3.0A
J	3W. Form C	100	0.5A
L	10W. Form C	150	0.5A
M	20W. Form C	200	1.0A
N	50W. Form C	250	3.0A

*Mercury Wetted

SERIES 101 RELAY





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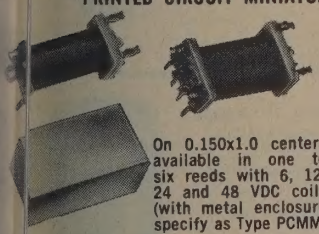
COIL DATA

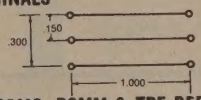
Drive Voltage	D.C. Coil Resistance ±10%
6	120 Ohms
12	450 Ohms
24	1600 Ohms
48	5700 Ohms

SERIES PCMO & PCMM

PRINTED CIRCUIT MINIATURE TERMINALS



On 0.150x1.0 centers available in one to six reeds with 6, 12, 24 and 48 VDC coils (with metal enclosure specify as Type PCMM)

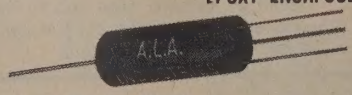


PCMO, PCMM & TPE REED SWITCH SELECTION CHART

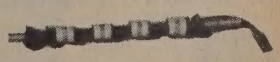
Reed Switch Code	Reed Type	Max. AC Volts	Max. Current
A	10W. Form A	250-1200	.5A
H	50W. Form A	1000	1.0A
C	4W. Form C	200	.1A

SERIES TPE

EPOXY ENCAPSULATED



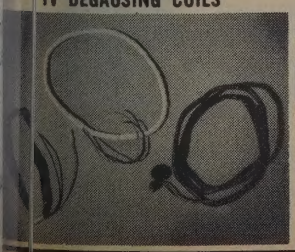
Dim. — 1" L. x 3/8" Dia.
Axial leads variable in length and spacing to order.
Coil Voltage — 6, 12, 24 and 48 VDC.



CUSTOMIZED RELAY ASSEMBLY

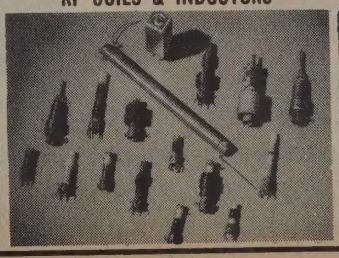
AF • RF • ANTENNA COILS

TV DEGAUSING COILS



AIRLOOP & FERRITE ANTENNAS

RF COILS & INDUCTORS

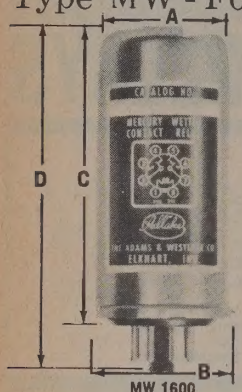


LINE FILTER CHOKES

Adlake SINCE 1857

MERCURY-WETTED CONTACT RELAYS

Type MW - Form D (Make-Before-Break) - Bridging Type



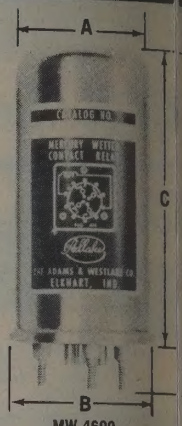
MW 1600
MW 2600
MW 3600

Type	Contacts	Operate Sensitivity Amp/Turns	Operate Time* (ms)	Dimensions A	B	C	D
MW 1600	1 Form D	190	3	1 7/64	1 5/16	2 5/8	3 13/64
MW 2600	2 Form D	250	3.5	1 17/32	1 11/16	3 13/32	3 15/16
MW 3600	3 Form D	250	4	1 17/32	1 11/16	3 13/32	3 15/16
MW 4600	4 Form D	265	4.5	1 11/16	1 27/32	3 3/8	3 9/16

*At Maximum Coil Power

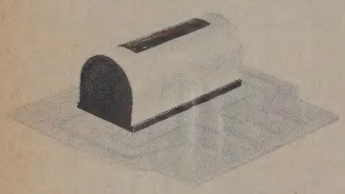
NOTES:

1. **Contact rating:** 5 amps. max. 500 volts max. 250 volts/amps. max.
2. **Temperature range:** —38°F. to +225°F.
3. **Bridging time:** 1 MS max.
4. **Release time:** approx. 3.2 to 4.5 MS
5. May be supplied with electro-static shield.
6. Units may be supplied with 8 or 11 pin tube base, or 14 pin glass-to-metal header. Type MW4600 is also available with a 20 pin header, or AN connector.
7. Units are wired to meet your specifications.



MW 4600

Series AW - High Speed - Sensitive - Printed Circuit



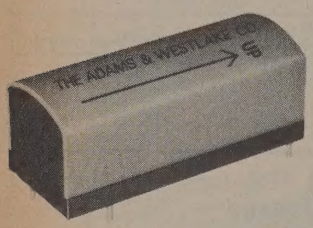
Intended for printed circuit board mounting, relay types AW introduce a new concept in relay de[illegible] Created to serve as alternate for currently available Single and Two Switch mercury wetted co[illegible] relays, this feature, plus the inherent superior characteristics of Adlake mercury wetted contact re[illegible] make these devices sought after by circuit and equipment designers.

Type	Contacts	Sensitivity Ampere/Turns	Length	Width	Heig[illegible]
AWCA-16000	1 Form C	60	1.953"	.625"	.5[illegible]
AWCL-16000	1 Form C	30	2.600"	1.125"	1.0[illegible]
AWCS-26000	2 Form C	90	3.200"	1.100"	.7[illegible]
AWNA-1600	1 Form D	190	3.200"	.750"	.7[illegible]
AWPB-16000	1 Form D	75	3.200"	.750"	.7[illegible]
AWNA-2600	2 Form D	200	3.200"	1.100"	.7[illegible]

Note: Available with Single or Dual Coils

*Above board, Pins 1/8" [illegible]

Series MWCX/MWDX & AWCX/AWDX - Form C & Form D Sensitive



PRINTED CIRCUIT

AWCX-16000: SPDT, Form C, non-bridging (single-side-stable or bi-stable)

AWDX-15000: SPDT, Form D, bridging (single-side-stable or bi-stable)

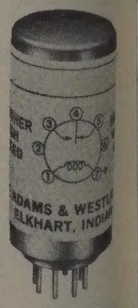
PLUG-IN

MWCX-16000: SPDT, Form C, non-bridging (single-side-stable or bi-stable)

MWDX-15000: SPDT, Form D, bridging (single-side-stable or bi-stable)

CHARACTERISTICS

Contact Rating: 2 amps. max. 500 volts max. 100 volt/amps. max.
Bounce: None
Life: One billion operations with contact protection.
Sensitivity: Single-side-stable: 45 amp. turns. Bi-Stable: 21 amp. turns.
Stand Off Voltage: 1000 VAC 60 cps.
Insulation Resistance: 1000 megohms min. at 500 VDC.
Coils: Single or dual wound.



Type MWP - Polarized

MWP 16000

Contacts: 1 Form D, bridging type.

Permanent Magnet Adjustment: The MWP relay's permanent magnets may be adjusted over a wide range of operating characteristics.

1. Single-side-stable adjustment: Standard operate adjustment — 70 to 110 amp. turns.
2. Bi-stable adjustment: Standard adjustment ±35 amp. turns.
3. Chopper adjustment: Adjusted for equal dwell time when driven by 60 CPS sine wave at specified voltage.

Type MWS - Sensitive

TYPE MWS

MWS-16000: 1 Form C, non-bridging Sensitivity: 9 milliwatts

MWSL-16000: 1 Form C, non-bridging Sensitivity: 5 milliwatts

Available in single-side-stable, bi-stable or chopper forms.

TYPE MWSL

FOR COMPLETE DATA ON ADLAKE RELAYS REQUEST CATALOG #AD70

THE ADAMS & WESTLAKE COMPANY
A SUBSIDIARY OF ALLIED PRODUCTS CORPORATION
1025 NORTH MICHIGAN STREET, ELKHART, INDI[illegible]
PHONE (219) 264-1141

ERCURY DISPLACEMENT RELAYS

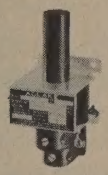
Adlake SINCE 1857

Time Delay Relays

ype 1040
mper Proof)
: operation

Type 1101
AC operation

Type 1200
C operation



Type 1040-M
AC operation

ontact: Single Pole, Single Throw (Normally open or Closed)
iming ange: Preset — 0.5 second to 30 minutes
olts: 40, 1101 & 1040M: AC to 440V (25, 50 & 60 cy.)
00: DC to 230 Volts

CONTACT RATINGS*

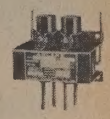
Time Delay Characteristics	Normally Open AC 115 v	Normally Open AC 230 v	Normally Closed AC 115 v	Normally Closed AC 230 v	Normally Open DC 115 v	Normally Open DC 230 v	Normally Closed DC 115 v	Normally Closed DC 230 v
Slow Operate Quick Release	15 amp	5 amp	5 amp	1.5 amp	1.5 amp	.5 amp	.5 amp	.15 amp
Slow Operate Slow Release	5 amp	1.5 amp	5 amp	1.5 amp	.5 amp	.15 amp	.5 amp	.15 amp
Quick Operate Slow Release	5 amp	1.5 amp	15 amp	5 amp	.5 amp	.15 amp	1.5 amp	.5 amp

See Catalog for timing derating factors.

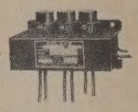
Load Relays

Type 1140
"Mighty Midget"

Type 1141
"Little Giant"



Type 1123
Double-Pole



Type 1133
Triple-Pole

MOLDED HEAD SCREW TERMINALS
Type 1101-M

Type 1155

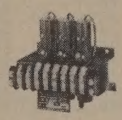
Type 2101
100 Amps

Type	Coils Available AC	Coils Available DC	Contacts	Contact Ratings (Amps) AC 115V	AC 230V	DC 115V	DC 230V	Size Height	Width	Depth
1040 & 1101	to 440V	N/A	Single Pole, Single Throw Normally open or closed	50	30	10	5	5⅝"	2½"	2 19/32"
1200	N/A	to 230V	Single Pole, Single Throw Normally open or closed	50	30	10	5	6 5/32"	2 7/16"	2⅝"
1140 & 1155	to 440V	to 230V	Single Pole, Single Throw Normally open or closed	35	20	5	2.5	4¼"	2 17/32"	2⅜"
1141	to 440V	to 230V	Single Pole, Single Throw Normally open or closed	50	30	10	5	4 23/32"	2 1/16"	2 3/16"
1123	to 440V	to 230V	Double Pole, Single Throw Normally open or closed or Single Pole, Double Throw with Overlap	*35	20	5	2.5	3¾"	3¾"	2⅝"
1133	to 440V	to 230V	Triple Pole, Single Throw (Independent Circuits)	*35	20	5	2.5	3 5/16"	5¼"	3 3/16"
1101-M	to 440V	to 230V	Single Pole, Single Throw Normally open	50 75	30	10	5	5 5/16" 5 21/32"	2½" 2½"	2 19/32" 2 19/32"
2101	to 440V	to 230V	Single Pole, Single Throw Normally open	100				6"	3⅛"	3 3/16"

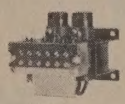
*Also Available with 50 Amp Contacts

Special Mountings

Adlake mercury displacement relays are available with special mounting arrangements. Our engineering department is ready to assist in developing ideas to fit your needs. Shown are just two of the many variations available.



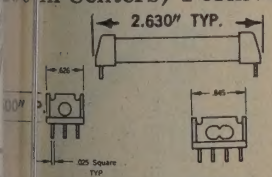
1133-87FB Type Three-pole power relay with terminal block mounted on front of iron circuit. 30 ampere contacts illustrated. Can be equipped with time delay contacts.



1123-100FT Type Two-pole power relay with feed-through type terminal block mounted on front of iron circuit. 30 ampere contacts illustrated. Can be equipped with time delay contacts.

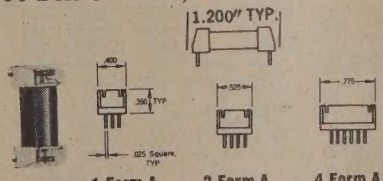
DRY REED RELAYS

Type ARAS (.218 & .200 in Centers) Form A



1 Form A 2 Form A 4 Form A

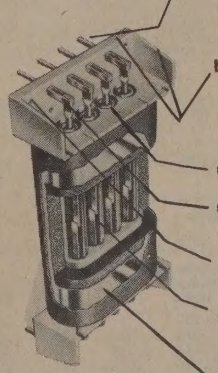
Type ARAM (.100 Pin Centers) Form A



1 Form A 2 Form A 4 Form A

Specifications	Type ARAS (Standard)	Type ARAM (Miniature)
Contact material	Rhodium	Rhodium
Maximum voltage	150 VDC — 250 VAC	50 VDC — 150 VAC
Max. Current, switch carry	1.5 amps 6 amps	.5 amps. 2.5 amps.
Maximum power	25 watts	6 watts
Contact resistance (Max.) Initial After life	50 milliohms 2 ohms	100 milliohms 2 ohms
Voltage breakdown	500 volts rms	300 volts rms
Life At rated load Dry circuit	20 x 10^6 operations 500 x 10^6 operations	20 x 10^6 operations 500 x 10^6 operations
Temperature range	—50°C to +105°C	—50°C to +105°C
Vibration	10 G at 10-55 CPS	10 G at 10-55 CPS
Shock	15 G (min)	15 G (min)

Advantages of Adlake Dry Reed Relays



a. Non-magnetic inter-connecting pins for printed circuit board insertion can be bent, cut, etc. They also relieve stresses and prevent breakage of glass-metal seal if board is flexed. This assures maintenance of operating characteristics.
b. Molded ledge is extra thick with two sides giving additional rigidity for further structural protection of switch seals.
c. Each switch is housed in its own cradle.
d. Standard connection of switch lead to pin is soldered.
e. Bobbin ledge has additional pin holes available for various grid spacings.
f. Contacts are rhodium plated for higher load and longer life characteristics.
g. Magnetic shielding layer prevents interaction from other flux - generating, electrical apparatus.

FOR COMPLETE DATA ON ADLAKE RELAYS REQUEST CATALOG #AD70

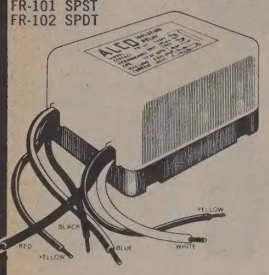
THE ADAMS & WESTLAKE COMPANY
A SUBSIDIARY OF ALLIED PRODUCTS CORPORATION
1025 NORTH MICHIGAN STREET, ELKHART, INDIANA
PHONE (219) 264-1141

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

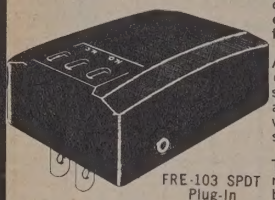
ALCOSWITCH LOW-VOLTAGE RELAY

FR-101 SPST
FR-102 SPDT



For safety's sake, control circuits should be isolated from power lines and operated at low voltages such as those obtained from a battery or from any **ALCOSWITCH RELAY** described on this page. Several case styles are available, each incorporating similar electrical characteristics and they all perform the same function, but vary in shape to fit your particular needs.

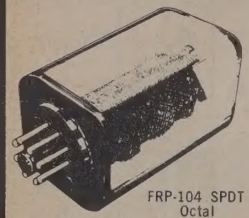
FR-101, FR-102 and FR-105 are permanently wired and occupy a minimum of space in equipment or appliance. **FRE-103** is a self-contained model that readily adapts to a standard AC outlet receptacle for experimental or for quickly assembled remote-control circuit applications. **FRP-104** is the plug-in model which makes use of a standard octal mount and is designed for electronic equipment which requires ready accessibility for ease of maintenance.



FRE-103 SPDT Plug-In

All units are capable of handling up to 7 Amps @ 117 VAC and may be operated from remote switches located up to several hundred feet away. The remote circuit carries a low voltage which is fully isolated to minimize any possibility of shock hazards.

These models illustrated represent "stock relays" available for immediate application, but they may also be supplied with modifications for your special or custom use.



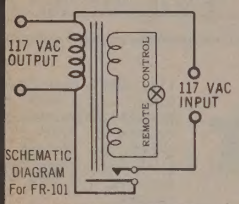
FRP-104 SPDT Octal

SPECIFICATIONS

Operating Voltage:
80-125 VAC 60 Hz
Primary Coil Current:
Below 40 mA
Secondary Voltage (open):
Below 30 volts
Contact Voltage:
95-125 volts
Insulation Resistance:
Over 30 megohms @ 500 VDC
Dielectric Strength:
One minute @ 1200 VAC
Coil Temperature Ascent:
Under 158°F.

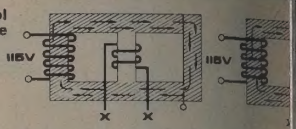
Load —	**FR-101:**	6 amps (pwr Factor 1)
		5 amps (pwr Factor .75)
	FR-102:	7 amps (pwr Factor 1)
		5 amps (pwr Factor .75)
	FRE-103:	7 amps (pwr Factor 1)
		5 amps (pwr Factor .75)
	FRP-104:	7 amps (pwr Factor 1)
		5 amps (pwr Factor .75)
	FRP-105:	7 amps (pwr Factor 1)
		5.5 amps (pwr Factor .75)

FR-101-230, FR-102-230 & FR-105-230 are 230V Types at 50% of rated power



SCHEMATIC DIAGRAM For FR-101

Model	Maximum Control Circuit Resistance
FR-101	1300 ohms
FR-102	300 ohms
FRE-103	400 ohms
FRP-104	150 ohms
FRP-105	280 ohms



FR-101 SPST BASIC relay has a primary and secondary as a step-down transformer, and a third winding acting as a low-voltage relay. 6-inch pigtail leads extend from the inner core to beyond the polypropylene cover. The inner core measures 1¾" long x 1⅛" wide x 1" high. The basic relay is recommended for installations within the equipment housing. Available for 117 VAC or 230 VAC operation.

FR-102 SPDT BASIC relay has a SPDT feature and is similar in appearance to the FR-101, but slightly larger. The main difference is the core construction where the FR-102 has two coils — a primary and secondary. When the secondary is shorted, the primary and associated outer core turns into a relay. Complete with dust-proof case and 6-inch pigtail leads. The FR-102 core assembly is the basic unit for all other relays described below. Available for 117 VAC or 230 VAC operation.

FRE-103 SPDT PLUG-IN relay has a stylized plastic case holds the laminated core inside and also has a patented three-way receptacle on the top portion that allows selection of either a Normally Open or Normally Closed circuit. A side jack serves as a plug-in for a remote switch or sensor. The plug-in capability enables the user to insert the ALCOSWITCH RELAY FRE-103 directly into an AC wall outlet. No other wiring is necessary other than the addition of the remote switch and cord attached to a plug. Complete to operate with plug; less cord and remote switch.

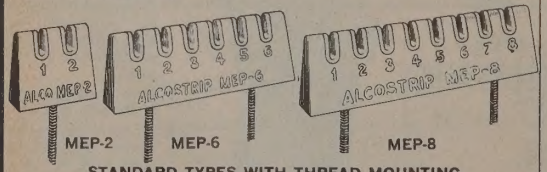
FRP-104 SPDT OCTAL base plug feature is added to the basic ALCOSWITCH RELAY for the industrial user. Wiring is not required for the FRP-104, only for the socket mounted in the panel or equipment. The FRP-104 is protected by a clear-view plastic dust cover. The neat finger-gripping size unit easily plugs into an octal socket for horizontal or vertical installations. The plug-in model makes use of a standard octal mount and is designed for electronic equipment which requires ready accessibility for ease of maintenance.

FR-105 SPST BASIC is similar to the FR-102 in specifications and application, but more compact in width and depth. The black plastic molded case is contoured to conserve space. Equipped with normal 6" leads. This particular unit is generally available from stock and could be tailored to customers' particular needs.

Model	Contacts	Description	One-99	100-499	999-999
FR-101	SPST	Basic Relay for 117 VAC	3.85	3.01	2.62
FR-101-230	SPST	Basic Relay for 230 VAC	4.25	3.32	2.89
FR-102	SPDT	Basic Relay for 117 VAC	4.45	3.47	3.03
FR-102-230	SPDT	Basic Relay for 230 VAC	4.85	3.78	3.30
FRE-103	SPDT	Plug-in	4.95	3.82	3.37
FRP-104	SPDT	Octal	5.45	4.25	3.71
FR-105	SPST	Basic Relay for 117 VAC	3.85	3.01	2.62
FR-105-230	SPST	Basic Relay for 230 VAC	4.25	3.32	2.89

CERAMIC TERMINAL STRIPS

Ceramic-base terminal strips with fired silver, copperplated and tinned terminals to facilitate high-temperature soldering of components and leads. Features permanent bond between metal and ceramic. Standard 2-56 threaded studs are extra long for cutting to any required dimension. Board ht. 0.590" from base. Depth of slots, 0.197". Dielectric Strength: more than 10 seconds at 1500 VDC between terminals. Insulated Resistance: over 1000 megohms at 500 VDC megger. Dip Solder Test: no exfoliation at 250°C for 5 seconds.

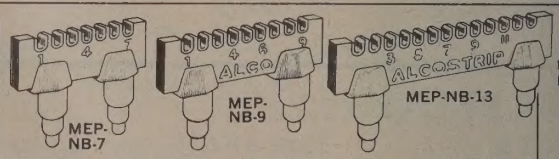


MEP-2 MEP-6 MEP-8

STANDARD TYPES WITH THREAD MOUNTING

Model	No. of Terminal Slots	Size Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEP-2	2	0.650	.....	.36	.24	.216	.198
MEP-4	4	1.161	0.512	.45	.30	.27	.248
MEP-6	6	1.673	1.024	.60	.40	.36	.33
MEP-8	8	2.185	1.535	.75	.50	.45	.413
MEP-10	10	2.697	2.047	.87	.58	.522	.479
MEP-12	12	3.209	2.560	.99	.66	.594	.545

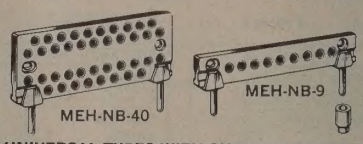
ALCOSTRIPS ARE MANUFACTURED UNDER A LICENSE GRANTED BY TEKTRONIX, INC.



MEP-NB-7 MEP-NB-9 MEP-NB-13

MINIATURE TYPES WITH SNAP MOUNTING

Model	No. of Terminal Slots	Size, Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEP-NB-3	3	0.600	.....	.48	.32	.288	.264
MEP-NB-5	5	0.885	0.490	.66	.44	.396	.363
MEP-NB-7	7	1.165	0.490	.81	.54	.486	.446
MEP-NB-9	9	1.445	0.750	.87	.58	.522	.479
MEP-NB-13	13	2.140	1.500	1.11	.74	.666	.611
MEP-NB-16	16	2.440	1.500	1.35	.90	.81	.743
MEP-NB-20	20	3.020	2.520	1.65	1.10	.99	.908



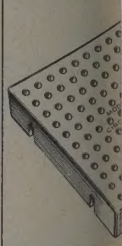
MEH-NB-40 MEH-NB-9

UNIVERSAL TYPES WITH SNAP MOUNTING

ALCO's new concept allows for horizontal or vertical mounting of terminal strips. Each strip is supplied with 2 types of mounting hardware. The selected positioning of the terminals permits the use of more components in a limited space (either singly or in pairs). Silverplated copper eyelets are swedged to the ceramic base.

Model	No. of Terminal Slots	Size Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEH-NB-9	9	3.000	2.500	.80	.53	.48	.44
MEH-NB-18	18	3.000	2.500	1.45	.96	.87	.798
MEH-NB-19	19	3.000	1.750	1.45	.96	.87	.798
MEH-NB-40	40	3.000	2.500	2.20	1.46	1.32	1.21

USE WITH M DESCRIBED



Simplify Circuit DESIGN and Plug-in Te

Ceramic Alc ideal for bre which may b serted or rem sired to sim design. A m board measur 6" is provide base for expe sign work. C ramic kit inclu (8 sizes) and

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AREA 68

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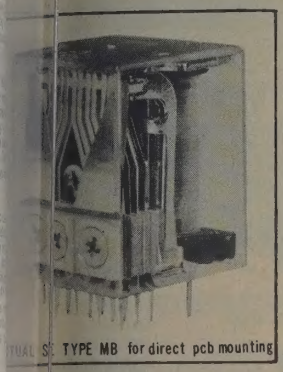
Type MB relay



TYPICAL SHOT: TYPE MB for direct pcb mounting

★Compact size and longevity,
★Excellent switching capacity,
★Mounting flexibility,
★Durability against environment.

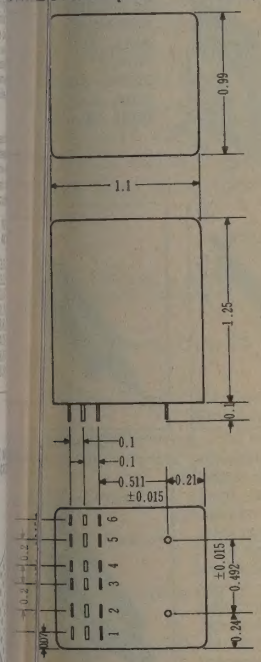
BASIC STRUCTURE

a) Twin contacts
b) End-On armature type
c) Spring assemblies are arranged sideways and card driving lift-off system is adopted

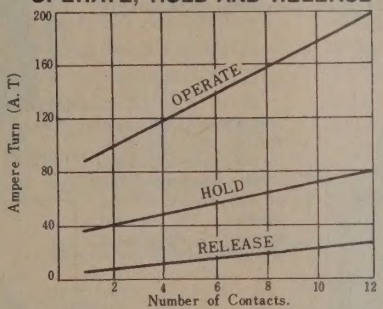
MATERIALS

Enclosure: Clear plastic cover
Terminals: Brass with solder overlay
Contacts:
Moving contact: Alloy of silver and palladium with gold overlay (Ag—40% Pd—60%)
Stationary contact: Alloy of silver and palladium (Ag—40% Pd—60%)

DIMENSIONS (unit: inches)

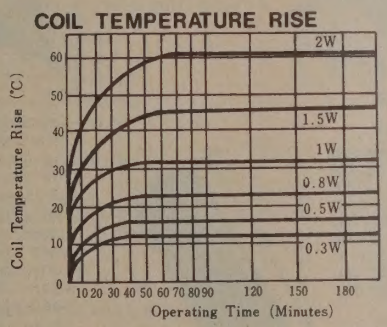


OPERATE, HOLD AND RELEASE



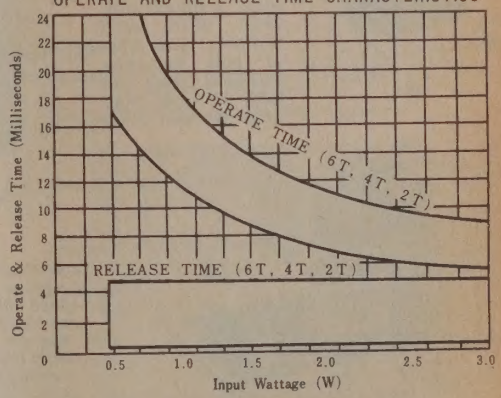
Note—1 transfer is equivalent to 2 contacts.

COIL TEMPERATURE RISE



OPERATING TIME

OPERATE AND RELEASE TIME CHARACTERISTICS



PERFORMANCE TABLE

Item	Value	Note
Standard rated Voltage	12V, 24V, 48V, DC	
Max. contacts	Up to 6 transfers	
Max. contact capacity	Max. non-working current 1A Max. non-working voltage 20 VA Max. switching voltage DC 200 V Max. switching current 0.5 A	Resistive power load
Max. coil dissipation	2 watts	At continuous operation
Breakdown voltage	AC 500 V	
Insulating resistance	More than 100 Megohms	At 20°C, 60% R.H.
Life	100,000,000 operations	

PART NO	COIL RES (OHMS)	DC CURRENT FLOW IN MILLIAMPERES: TEST OPR	TEST NON-OPR	TEST RLSE	TEST HOLD	READJUST OPR	READJUST NON-OPR	READJUST RLSE	READJUST HOLD	SPRING COMBINATION	SPRING SET POSITION 1	2	3	4	5	6
MB-1	915	18.9		2.0		18.0		2.0		4M-2EBM	EBM	M	M	M	M	EBM
MB-2	915	18.9	11.4		5.7	18.0	12.0		5.5	2M-1B-2EBM-1EMB	EMB	EBM	M	M	EBM	B
MB-3	915	18.9				18.0				2M-1EB-2EMB	EMB	M	M	EB	—	EMB
MB-4	915	20.2				19.2				3EBM-3EMB	EMB	EMB	EBM	EBM	EBM	EMB
MB-5	590	25.6				24.4				6EBM	EBM	EBM	EBM	EBM	EBM	EBM
MB-6	915	20.2				19.2				5EBM-1EMB	EMB	EBM	EBM	EBM	EBM	EBM
MB-7	915	20.2				19.2				6EBM	EBM	EBM	EBM	EBM	EBM	EBM
MB-8	750	20.0		2.0		19.0		2.0		4M-2EBM	EBM	M	M	M	M	EBM
MB-9	750	20.5	12.0		7.5	19.5	12.5		7.0	4EBM-2EMB	EMB	EBM	EBM	EBM	EBM	EMB
MB-10	590	25.6								5EBM-1EMB	EMB	EBM	EBM	EBM	EBM	EBM
MB-11	590	25.6								3EBM-3EMB	EMB	EMB	EBM	EBM	EBM	EMB
MB-12	915					17.0		1.1		2M-1EBM-1EMB	—	EMB	M	M	EBM	—
MB-13	590	24.0								4EBM-2EMB	EMB	EBM	EBM	EBM	EBM	EMB
MB-14	590	24.0								3EBM-3EMB	EMB	EBM	EBM	EBM	EMB	EMB
MB-15	590	22.5								4M-2EBM	EBM	M	M	M	M	EBM

Manufacturer
Anritsu Electric Co., Ltd.
Head Office: 12-20, Minami-azabu 4chome, Minato-ku, Tokyo, Japan

Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

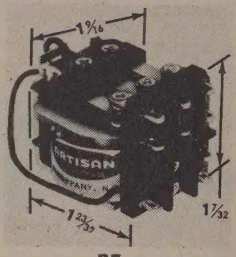
artisan has the missing pieces

RELAYS

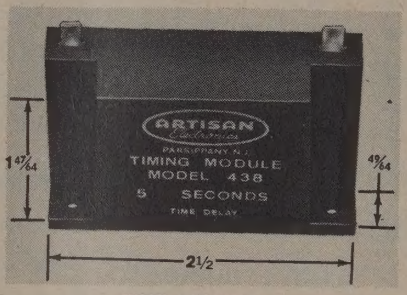
TIMING DEVICES

SOLENOIDS

General purpose relay designed for low cost, dependable switching of control circuits. Small, rugged, highly efficient with switching capacity to 10 amps and 3PDT contacts. Available with hermetically sealed, plastic or metal plug in enclosures; metal dust covers for chassis mounting; solder lug, quick disconnect and pc board terminals. Wide range of coil voltages. Bulletin R 301

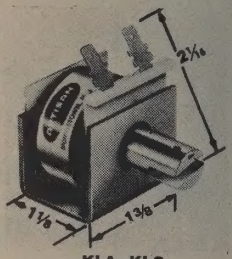


RE



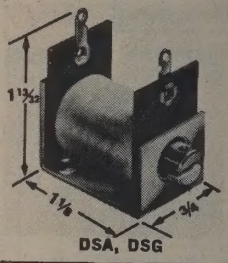
TIME CAPSULE

NEW two terminal solid state AC timer. Economical for many industrial applications. Bulletin T 212

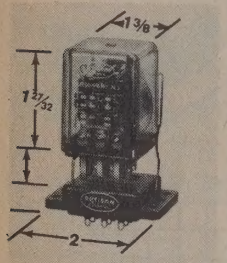


KLA, KLG

Light weight pact solenoids the economi frame desig both contino intermittent They are ide AC (to 220 DC (to 110V) cations in aut equipment re up to twenty force. Applic include: ve machines, re equipment, an ness machine be furnished f temperature ents and in range of pl styles. Suffix A type; Suffix G- type. Bulletin

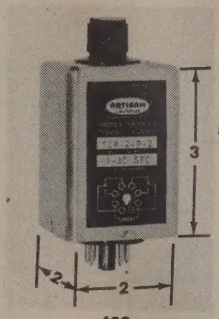


DSA, DSG



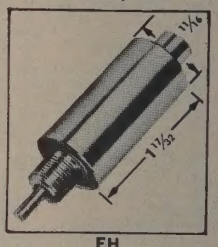
RW

Ruggedized industrial relay, totally enclosed, engineered for long life. Terminals for plug in with socket or printed circuit board connections; bracket mounting for quick disconnect or soldered wire connections. SPDT, DPDT, 3PDT contacts; wide range of coil voltages. Standard 5 amp contact; 10 amp available. Bulletin R 308



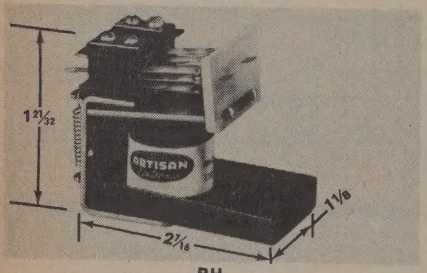
428

Industrial TDR, featuring the optimum in economy and flexibility. Various fixed or adjustable timing ranges. 2% repeat accuracy. Bulletin T 204



EH

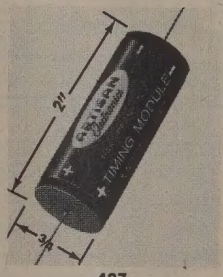
EL, ELA



RH

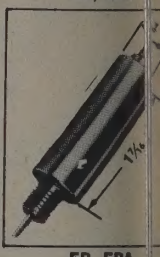
Specifically designed for maximum economy, these units are slightly larger than the RE series. They feature 10 amp standard contacts; 15 amp available. Any combination of contact configurations through 9 PDT. Dependable operation assured by nylon blade lifter. Metal dust covers and hermetically sealed enclosures. Quick disconnect terminations (.110, .187, & .250) available. Bulletin R 302

.025 to 300 second fixed time delay. DC companion to Time Capsule. Full 2 amp solid state output. 3% repeatability; broad operating voltage in one unit, priced under $5.00 in quantity. Bulletin T 211

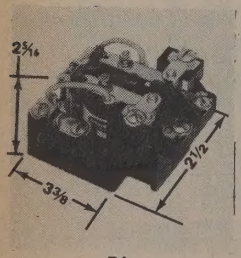


437

Cylindrical solenoids offering close spacing and extra long life for both continuous and intermittent duty, these miniature solenoids are used where forces required are less than 50 ounces. Their applications include data processing equipment, such as tape-fed automatic operation of business machines, pen-lifting duties chart recorders, and flag-raising on in ment panels for warning purposes. O tion to 125 V DC. Available with thre bushing or "C" ring mounting. Bul S 402



EP, EPA

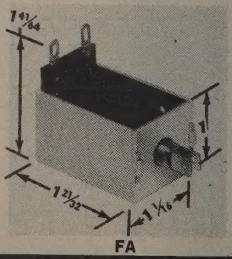


PJ

A Power relay engineered for extra long life at loads to 25 amperes with DPST or DPDT contacts. Operates from any voltage to 240 volts AC or DC. 120 VAC in stock. Auxiliary contacts available. Bulletin R 304

490

Digital Timing Control. 000.1 to 9999 seconds, with extreme accuracies; economical. This is a completely solid state digital timing control capable of delay on pull in or delay on drop out. Operates from 115 VAC Power. Bulletin CC 605



FA

Box frame sole specifically desi for efficient DC eration up to Volts. Actuator fo from 7 oz. at stroke to 125 ou seated intermit Continuous o forces proportio less. Bulletin S

Other timing devices, relays, solenoids, manufactured and available.

If you don't see it here, ask us for it: 201 - 887-7100

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Parsippany, N. J. 07054

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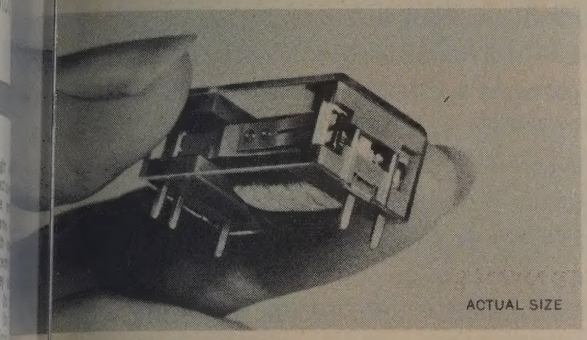
eem

American Zettler, inc.

RELAYS AND SOLENOIDS

ERES AZ 530-THINPAK™ MINIATURE RELAY



FEATURES

- 0.415" high for 0.6" standard pc board spacing
- Up to 2 Amp SPDT contacts
- 0.1" Terminal Grid spacing
- Insulation resistance greater than 10^{10} ohms
- Contact resistance less than 50×10^{-3}
- No phenolic insulation used

GENERAL DESCRIPTION

The AZ miniature THINPAK relay, Model 530, was den designed for applications with either demanding space limitations, such as 0.6" center-to-center PC card mounting, or operating requirements that cannot be met by reed relays or conventional contact type relays. The high pressure SPDT 1 or 2 Amp contacts operating at 26 VDC enables the unit to switch capacitance or lamp loads with current spikes that would normally weld the contacts of reed relays. The high sensitivity of 125 mW pull-in, long life and insulation resistance of more than 10^{10} ohms make it an ideal unit for galvanic separation between electronic circuits. The AZ-530 THINPAK is available in standard coil voltages from 6 to 115 VDC with an operate and release time of less than 2 ms. It has PC terminals in 0.10" grid spacing. A clear plastic dust cover with a mylar bottom plate is provided.

ELECTRICAL SPECIFICATIONS

Contact Rating — noninductive load
Light Duty (Code 1): Fine silver goldplated
1 Amp @ 26 VDC or
0.5 Amp @ 115-VAC
Medium Duty (Code 2): Silver Cadmium-Oxide goldplated
2 Amp @ 26 VDC or
1 Amp @ 115 VAC

Life Expectancy — Mechanical Operations: 10^7
Operations at Rated Load: 10^6

Contact Resistance — 50 milliohms max. initially

Operate Time — < 5 ms at 2 times must operate voltage or current

Release Time — < 2 ms at 2 times must operate voltage or current

Contact Bounce — at 10 mA contact current:
2 ms max. at operate N. O. side
3 ms max. at release N. C. side

Capacity — typical: NC to Movable 0.6 pF
NO to Movable 0.9 pF
contact to coil 12 pF

Dielectric Strength — 500 Vrms across contact gap and contact to coil

Insulation Resistance — 10,000 Megohms min. @ 20° C, 100 VDC, 50% RH

Drop Out — 10% minimum of must operate voltage or current.

Coil Power — Pick UP typical: light duty contact 125 mW
medium duty contact 250 mW
Max. Continuous Dissipation: 1.6 W @ 20° C (68° F)
1.2W @ 40° C (105° F)
Temperature Rise: approx. 55° C per Watt

Coil Temperature — Max. 105° C (220° F)

Ambient Temperature —
Operating: −55° C (−72° F) to 80° C (175°F) @ nominal operating voltage
Storage: −55° C (−72° F) to 105° C (220°F)

Vibration — 0.062 DA @ 10-55 Hz

Shock — 20 g

Enclosure — Clear plastic cover with mylar bottom plate

Terminals — Printed circuit board terminals goldplated in 0.10" standard grid space

Weight — Approx. 10 gr.

Standard Relays with light duty contact

Nom. Coil VDC	Max. Contin. VDC	Resist. OHMS ± 10%	Must Operate* mA	Must Operate* VDC	PART NO.
6	9.7	66	49	3.6	AZ 530-12-1
12	21.8	330	22.5	8.3	AZ 530-08-1
24	37	950	13	13.8	AZ 530-06-1
48	68	4700	6.2	32.6	AZ 530-04-1
60	104	7600	5	42.6	AZ 530-035-1
115	145	14500	3.6	58.6	AZ 530-03-1

Standard Relays with medium duty contact

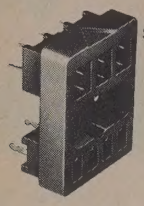
Nom. Coil VDC	Max. Contin. VDC	Resist. OHMS ± 10%	Must Operate* mA	Must Operate* VDC	PART NO.
6	8.2	47	83	4.8	AZ 530-13-2
12	17	200	41	9.2	AZ 530-09-2
24	37	950	18.3	19.5	AZ 530-06-2
48	66	3000	11	37	AZ 530-045-2
60	82	4700	8.7	46	AZ 530-04-2
115	145	14500	5	82	AZ 530-03-2

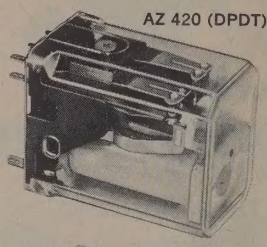
All values at 20° C.
Relays will pull in with less than "must operate" value.
There will be a change of less than 10% in must operate if several relays are mounted close together.
Note: To fasten relay on PC board do not bend contact terminals as this damages adjustment! Use coil terminals only. After soldering relay to board, do not dip the board into a cleaning solution.
Solder temperature: Max. 270° C (500° F)
Solder time: Max. 5 sec.

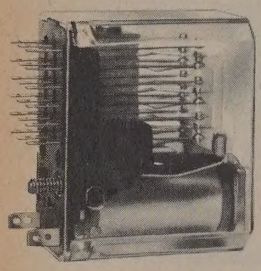
American Zettler, inc.
97 RANDOLPH AVE. • COSTA MESA, CALIF. 92626 • PHONE (714) 540-4190 • TELEX: 67-8472

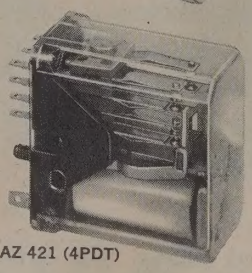
American Zettler, inc.

SERIES AZ 420* – MINIATURE GENERAL PURPOSE RELAYS – UP TO 6 FOR


ST 140-A1

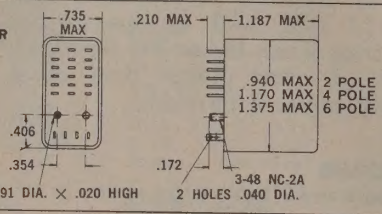
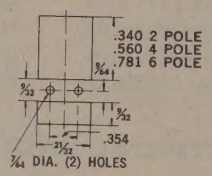
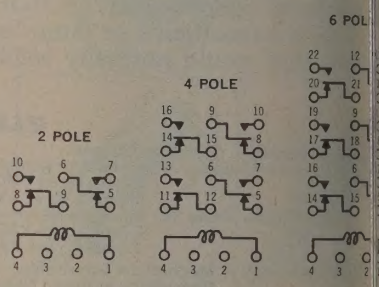
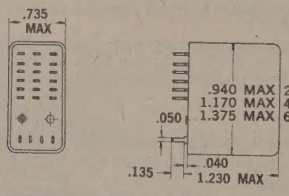
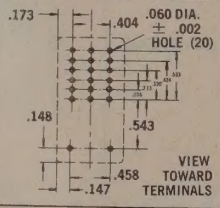

AZ 420 (DPDT)


AZ 431 (6PDT)


AZ 421 (4PDT)

■ International Standard type ■ Combination pl i
wire or PC terminals ■ Low level bifurcated, 2 a p
5 amp contacts ■ Life expectancy more than 100 m li
operations ■ Form A, B, C and D contacts are ava ab
■ Molded cradle eliminates phenolic dust inside the el
■ Balanced, spring-held armature allows deper ab
operation in any position ■ Round core and large co
volume provides more pull force, eliminating expe iv
sensitive version ■ Slim profile mounting with gh
angle socket ■ Sockets are of unbreakable fiber as
filled base and have unique knife-type connector f
dependable contact ■ Prices from $1.70 each in pr lu
tion quantity ■ Available from stock.

MECHANICAL SPECIFICATIONS

DIMENSIONS (inches)	SUGG. PANEL LAYOUT OR P/C BOARD	WIRING DIAGRAM
PLUG IN OR SOLDER  	 	
PRINTED CIRCUIT  	 	

Tolerances ± .010 • Standard relays have gold plated terminals.

ELECTRICAL SPECIFICATIONS

CONTACT RATING — noninductive load
Light Duty (Code L): Fine silver goldplated — low level to 2 amps @ 26 VDC or 1 amp @ 115 VAC
Heavy Duty (Code H): Silver cadmium oxide — 5 amp @ 26 VDC or 3 amp @ 115 VAC (other contact material available)

LIFE EXPECTANCY
Mechanical Operations: 10^8 — Operation at Rated Load: 10^6

CONTACT RESISTANCE
50 milliohms max. initially — 200 milliohms at end of life

OPERATE TIME
at two times "must operate" voltage or current: ≤ 8ms

RELEASE TIME
at two times "must operate" voltage or current: ≤ 3ms

CONTACT BOUNCE
at 10 ma contact current:
2 ms max. at operate, N.O. contacts
3 ms max. at release, N.C. contacts

DIELECTRIC STRENGTH
1000 V rms; 500 V rms across contact gap

INSULATION RESISTANCE
1000 megohms minimum @ 25°C, 100 VDC, 50% H

COIL TEMPERATURE
Max. 105°C (220°F)

AMBIENT TEMPERATURE
Operating: —55°C (—72°F) to 80°C (175°F) @ no n
operating voltage
Storage: —55°C (—72°F) to 105°C (220°F)

VIBRATION
Operating: .062 DA @ 5-55 Hz; 10g @ 55-110 Hz
Non Operating: 10g @ 5-500 Hz

SHOCK
Operating: 20g @ 11 ms
Non Operating: 30g @ 11 ms

WEIGHT
23 to 35 grams (approx. 1 oz.)

Ordering information and operating data on next

American Zettler, inc.
697 RANDOLPH AVE. • COSTA MESA, CALIF. 92626 • PHONE (714) 540-4190 • TELEX: 67-847

See YELLOW SECTION for Local Offices, Phones

American Zettler, inc.

RELAYS AND SOLENOIDS

SERIES AZ 420* – MINIATURE GENERAL PURPOSE RELAYS

AND-POLE TYPE

BLE I BASIC TYPES

Mo ng	2 or 5 amp 2C Contacts	2 or 5 amp 4C, 6A, 6B Contacts	High Voltage Contacts	High Frequency Contacts
Plug-in Solder Mo ting	AZ 420	AZ 421	AZ 421/8	AZ 426 (not plug-in)
C-terminals in Mo ng Stud	AZ 428	AZ 429	AZ 429/8	—

BLE – CONTACT CODE

	Light Duty 2 amps @ 26 vdc 1 amp @ 115 vac Single Button	Light Duty 2 amps @ 26 vdc 1 amp @ 115 vac Bifurcated Button	Heavy Duty 5 amps @ 26 vdc 3 amps @ 115 vac Single Button	High Voltage 2 amps @ 115 vdc 1 amp @ 250 vac Single Button	High Frequency 250 milli amps @ 125 vac 0.6 pf capacity Single Wire
FORM	1L	10L	1H	—	—
FORM	2L	20L	2H	—	—
FORM	3L	30L	3H	—	—
FORM	4L	40L	4H	8L	9L

TABLE II – COIL CODE – STANDARD COILS

COIL DATA				MUST OPERATE (2)			
				2C Contacts		4C, 6A, 6B Contacts	
Coil Code	Nom. Oper. vdc	Max. Cont. vdc	Resistance ohms ±10%	mA	VDC	mA	VDC
2	3	5	14	75	1.2	112	1.8
15	6	10	52	37	2.2	57	3.3
1011	12	19	185	20	4.1	30	6.1
80	18	30	430	14	6.6	22	10.4
08	20	35	600	12	8	18	11.9
70	24	38	700	12	9.1	18	13.8
07	26	45	1 K	9	10	13.5	14.9
56	48	72	2.5 K	5.4	14.8	8.3	22.8
40	72	110	5.8 K	4.2	27	6.3	40
408	90	142	10 K	3.1	34	4.5	50
035	115	175	15 K	2.4	40	3.5	58

For bifurcated and heavy duty contacts add ⅓ of the listed "Must Operate" value.

POLE TYPE

BLE Type	DESCRIPTION
1	Polycarbonate dustcover, combined solder/plug-in terminals
9	Polycarbonate dustcover, printed circuit terminals

BLE – STANDARD CONTACTS

Code	Contact Rating @ 26VDC
1L	2 Amp Single Fine Silver Goldplated
0L	2 Amp Bifurcated Fine Silver Goldplated
1H	5 Amp Single Silver Cadmium Oxide

TABLE II – STANDARD COILS

COIL DATA					MUST OPERATE (2)			
					.2 Amp. Cont. Single		5 Amp. Cont. Single 2 Amp. Cont. Bifur	
Coil Code	Nom. Oper. VDC	Max. Cont. VDC	Resist. Ohms ±10%	Induct. Henrys (1)	mA	VDC	mA	VDC
18	6	7	25	0.4	106	3.2	140	4
13	12	14	90	1.3	59	5.5	78	8
80	24	30	430	5.5	29	14	38	18
07	36	45	1000	15	17	20	24	26
06	48	61	1800	26	13.5	27	18	35
56	60	72	2500	38	11	31	15	41
04	115	138	9000	120	6.5	62	8.5	85

All values at 20°C (1) Inductance for closed armature. For open armature, divide by two. (2) Relay will pull in with less than "must operate" value.

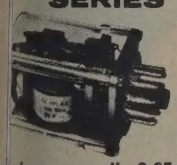
OW T ORDER

sele basic relay type from Table I
add il code from Table II
add ntact code from Table III

For Example: AZ 431 – 07 – 1L
- Plug-in type
- 1000 ohm coil resistance
- 6 PDT contacts single, light duty

Ordering information for sockets and hardware—see next page. For free samples or assistance in specifying your relay, contact our office or your nearest engineering representative listed in the yellow section.

SERIES AZ 480 – GENERAL PURPOSE RELAYS – 10 AMP CONTACTS



- 10 Amp @ 115 VAC silver cadmium oxide contacts
- Up to 3 form C contacts
- DC or AC coils, also sensitive version
- 8 or 11 pin octal socket or PC terminals

Dim sions over all: 2.65 x 1.45 x 1.38 (octal)
1.78 x 1.35 x 1.26 (PC term)

Wei t: 3 oz.

- 10 Amp @ 115 VAC silver cadmium oxide contacts
- Up to 4 form C contacts
- DC or AC coils
- Mounting with base plate, 6-32 stud or one 6-32 screw
- Solder or PC terminals

- Dimensions over all: 1.65 x 1.26 x .95 (up to 3 pole)
1.65 x 1.26 x 1.24 (4 pole)
- Weight: 2.3 oz.

TAN RD RELAYS: (Closed, Octal Socket)

OIL LTAGE	SPDT		DPDT		3 PDT	
	AZ 480		AZ 480		AZ 480	
6 VDC 12 VDC 24 VDC	$5.48	-2-1 -3-1 -4-1	$5.95	-2-2 -3-2 -4-2	$7.45	-2-3 -3-3 -4-3
0 VDC	$5.95	-9-1	$6.45	-9-2	$7.95	-9-3
	AZ 481		AZ 481		AZ 481	
6 VAC 12 VAC 24 VAC	$5.48	-2-1 -3-1 -4-1	$5.95	-2-2 -3-2 -4-2	$7.45	-2-3 -3-3 -4-3
0 VAC	$5.65	-7-1	$6.00	-7-2	$7.60	-7-3

pin ket PN 920733; 11 pin socket PN 920734
etain PN 920735

STANDARD RELAYS: (Open, Solder Lugs)

COIL VOLTAGE	SPDT		DPDT		3PDT		4 PDT	
	AZ 482		AZ 482		AZ 482		AZ 482	
6 VDC 12 VDC 24 VDC	$3.20	-2-1 -3-1 -4-1	$3.55	-2-2 -3-2 -4-2	$4.10	-2-3 -3-3 -4-3	$4.80	-2-8 -3-8 -4-8
110 VDC	$3.78	-9-1	$4.12	-9-2	$4.40	-9-3	$5.40	-9-8
	AZ 483		AZ 483		AZ 483		AZ 483	
6 VAC 12 VAC 24 VAC	$3.21	-2-1 -3-1 -4-1	$3.80	-2-2 -3-2 -4-2	$4.25	-2-3 -3-3 -4-3	$5.35	-2-8 -3-8 -4-8
120 VAC	$3.30	-7-1	$3.90	-7-2	$4.30	-7-3	$5.40	-7-8

Add letter A to Part No. for stud mounting and B for tapped core
Prices for 1-24 pcs.

SERIES AZM 260 – MINIATURE PULL SOLENOIDS FOR DC OPERATION

- Compact design ▪ Rectangular shape for highest space-power efficiency ▪ One hole mounting
- Maximum stroke, 5/16" ▪ Molded bobbin ▪ Brass sleeving ▪ Prices from $1.20 ea. in production quantities
- Available from stock

STANDARD SOLENOIDS

TYPE	DIMENSIONS (Inches)	CONTINUOUS DUTY					10% Duty (½ sec. max. on / 4½ sec. min. off)			
		Pull Force at 1/16" stroke	Coil Resistance for				Pull Force at 1/16" stroke	Coil Resistance for		
			6 vdc	12 vdc	24 vdc	115 vdc		6 vdc	12 vdc	24 vdc	115 vdc
Z 60	15/32x5/16x1 11/16	2¼	10	32	150	3700	10	1.4	4	16	415
Z 61	17/32x13/32x1 11/16	3¼	8.6	30	130	2500	14	—	3.3	13	280
Z 62	5/8x½x1 29/32	6¼	5.7	21	80	2300	20	—	—	10	220
Z 63	7/8x1 11/16x2⅛	12½	4.2	16	73	1450	72	—	—	8	115

Data at 20°C – Other coils for different duty cycles or voltages available – to order add coil resistance to type

*Pat. Pend.

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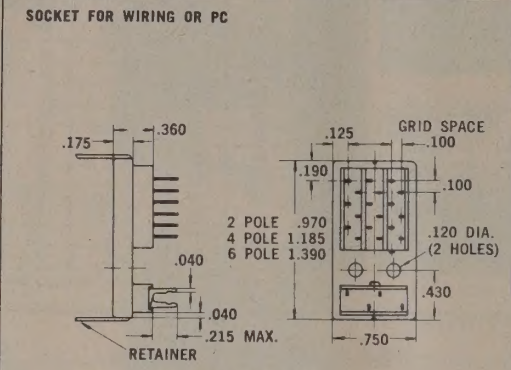
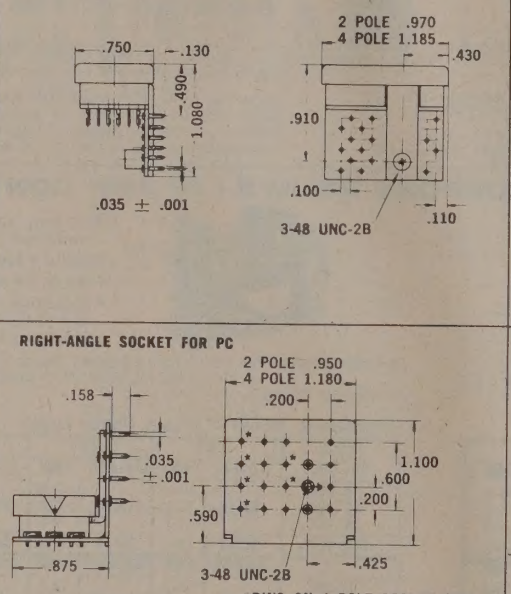
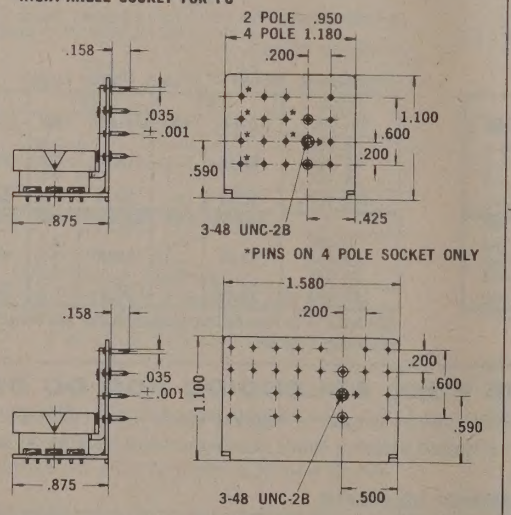
American Zettler, inc.

SOCKETS FOR MINIATURE GENERAL PURPOSE RELAYS—AZ 420, 421, 431

PART NO.	NO. OF POLES	DIMENSIONS (inches)	SUGGESTED PANEL LAYOUT OR P/C BOARD	
ST-140-A1 FOR AZ 420 ST-141-A1 FOR AZ 421 ST-345-A1 FOR AZ 431	2 4 6	SOCKET FOR WIRING OR PC	2 POLE 11/32 4 POLE 9/16 6 POLE 23/32 9/32 7/64 9/32 .354 21/32 7/64 DIA. (2) HOLES 2 POLE .10 GRID SPACING 4 POLE 6 POLE FOR GROUNDING CLIP VIEW TOWARD TERMINALS .054 ± .002 DIA. HOLE	ACTUAL SIZE 4 POLE
ST-342-A1 FOR AZ 420 ST-350-A1 FOR AZ 421 N.A.	2 4 6	RIGHT-ANGLE SOCKET FOR PC		ACTUAL SIZE 4 POLE
ST-349-A1 FOR AZ 420 ST-343-A1 FOR AZ 421 ST-354-A1 FOR AZ 431	2 4 6	RIGHT-ANGLE SOCKET FOR PC	2 POLE GRID SPACING .200 4 POLE 6 POLE .054 ± .002 DIA. HOLE .110 DIA. HOLE FOR GROUND SCREW ONLY VIEW TOWARD TERMINALS	ACTUAL SIZE 4 POLE







TOLERANCES: ±.010 Standard sockets have silver-plated terminals and are dipped in flux for easy machine soldering.

HARDWARE

ST-140-1 ST-141-1 ST-345-1	2 4 6	Retainer (for all socket versions)
ST-140-2	ALL	Grounding Clip

ORDER INFORMATION

Order socket, retainer and grounding clip (if desired) by separ part numbers. To specify sockets with gold plated termina substitute —A2 for —A1.

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

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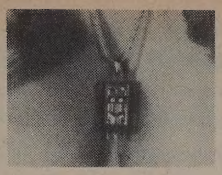
See YELLOW SECTION for Local Offices, Phones

COMAR
ELECTRIC COMPANY



SERIES CR-1800 AND CR-1900

A.C. or D.C. OPERATION
COMPACT
4PDT SWITCHING
4 AMP CONTACT RATING
ALL CR-1800 SERIES (Underwriters Laboratory Component Program Recognized for same polarity). File No. E-29163.
ALL CR-1900 SERIES (Underwriters Laboratory Component Program Recognized for same and opposite polarity). File No. E-29163.

* Component Recognized by Underwriters' Laboratories as an across the line starter for use in industrial applications and similar devices. Tested in accordance with the requirements of U/L 114 and U/L 508.

The CR Series is an extremely compact relay. It is recognized and approved under the U/L Components Program for switching loads of the same or opposite polarity.

Because of the close proximity of adjacent poles in relays of this size, a breakdown phenomenon can occur when switching loads at opposite polarity. For this reason the CR-1900 Series features a special barrier (Pat. Pending) which prevents such a breakdown and the subsequent destruction of the relay and/or equipment.

SERIES CR-2

LIGHT DUTY RELAY
DC OPERATION
COMPACT 1PDT TO 3PDT SWITCHING
4 AMP CONTACT RATING

The Comar CR-2 is available as a SPDT, DPDT, and 3PDT enclosed relay with either solder lugs or printed circuit tabs. Terminals are molded into Diallyl Phthalate 73-01 to form the Terminal board, dust cover is clear Lexan. The CR-2 is also available in open frame construction.

The CR-2 is available for DC operation only with insulated blades.

Socket available.

SERIES Y

MEDIUM DUTY
3PDT RELAY
7½ AMP CONTACTS
RECOGNIZED UNDER U/L COMPONENTS RECOGNITION PROGRAM FILE NO. E-29163 CSA FILE NO. LR-25151

The Y 3PDT relay by Comar incorporates outstanding construction features not available in other relays of this type. They add up to increased reliability with a consequent cost vs value improvement in the products they are used in.

All terminals are molded in place using diallyl phthalate; this assures precision long lasting contact alignment, and a decrease in carbon tracking. Zytel 101 bobbins are used in the coils for improved dielectric characteristics and increased coil stability at operating temperatures.

SERIES A

MEDIUM DUTY
VOLTAGE SWITCHING
RELAY 10 AMP
CONTACT RATING

The Comar type A is a medium duty, multiple contact, applications. The long blade contact arms assure superior wiping action. When necessary, the A relay can be furnished to meet U/L requirements. The type A can also be supplied with up to 6 form C contacts, voltage switching relay designed for industrial control subject to the contact ampere ratings as shown in the specifications.

SERIES G

LIGHT DUTY
VOLTAGE SWITCHING
RELAY 5 AMP
CONTACT RATING

The Comar type G is a general purpose, multiple contact, voltage switching relay suitable for industrial control applications. In addition to the standard assemblies listed, the type G can be furnished to meet U/L requirements. It is also available with octal plug in base and dust cover, or hermetically sealed.

The Comar G2, DC only, is the long frame version which increases the coil area enabling the relay to be adjusted at 120 MW per pole sensitivity. The G2 is also available for use as a time delay relay with pull in delays of 50 milliseconds and drop out delays up to 100 milliseconds depending on switch combinations and coil power.

SERIES Z1 AND Z2

SENSITIVE DC RELAY
SPDT SWITCHING
3 AMP CONTACT RATING
SOLDER LUG TERMINALS
ALL Z1 & Z2 RELAYS (Underwriters Laboratory component program recognized for same & opposite polarity).
File No. E-29163

* Component recognized by underwriters laboratories as an across the line starter for use in office appliances, business equipment, or similar equipment. Tested in accordance with the requirements of U/L 508 and U/L 114.

The Comar Z1 is a U/L component recognized low cost sensitive relay, open construction, tapped holes in frame, armature common to mounting bracket. It also features a two piece blade and coil spring in tension as opposed to the conventional combination blade spring.

The Z1 features solder terminals, while the Z2 features printed circuit terminals.

The Z may be either voltage or current actuated maximum pick-up sensitivity is 50 MW, standard 200 MW. See standard assemblies.

Comar also manufactures a complete line of telephone type, crystal can and other general purpose relays as well as steppers and solenoids.

CR-1800 SERIES

Part No.	Coil - Volts	Coil - Ohms
CRN - 1802A - 1	6V DC	40 OHMS
CRN - 1803A - 1	12V DC	160 OHMS
CRN - 1804A - 1	24V DC	650 OHMS
CRN - 1805A - 1	48V DC	2600 OHMS
CRN - 1806A - 1	110V DC	11000 OHMS
CRN - 1808A - 1	6V AC	9 OHMS
CRN - 1809A - 1	12V AC	36 OHMS
CRN - 1810A - 1	24V AC	140 OHMS
CRN - 1811A - 1	48V AC	580 OHMS
CRN - 1812A - 1	120V AC	3600 OHMS

CR-1900 SERIES

CRN - 1902A - 1	6V DC	40 OHMS
CRN - 1903A - 1	12V DC	160 OHMS
CRN - 1904A - 1	24V DC	650 OHMS
CRN - 1905A - 1	48V DC	2600 OHMS
CRN - 1906A - 1	110V DC	11000 OHMS
CRN - 1908A - 1	6V AC	9 OHMS
CRN - 1909A - 1	12V AC	36 OHMS
CRN - 1210A - 1	24V AC	140 OHMS
CRN - 1911A - 1	48V AC	580 OHMS
CRN - 1912A - 1	120V AC	3600 OHMS

CR-2 SERIES

SPDT	CR2-D-1C-6D-S1	6V DC	40 OHMS
	CR2-D-1C-12D-S1	12V DC	160 OHMS
	CR2-D-1C-24D-S1	24V DC	650 OHMS
	CR2-D-1C-48D-S1	48V DC	2600 OHMS
	CR2-D-1C-110D-S1	110V DC	11000 OHMS
DPDT	CR2-D-2C-6D-S1	6V DC	40 OHMS
	CR2-D-2C-12D-S1	12V DC	160 OHMS
	CR2-D-2C-24D-S1	24V DC	650 OHMS
	CR2-D-2C-48D-S1	48V DC	2600 OHMS
	CR2-D-2C-110D-S1	110V DC	11000 OHMS
3PDT	CR2-D-3C-6D-S1	6V DC	40 OHMS
	CR2-D-3C-12D-S1	12V DC	160 OHMS
	CR2-D-3C-24D-S1	24V DC	650 OHMS
	CR2-D-3C-48D-S1	48V DC	2600 OHMS
	CR2-D-3C-110D-S1	110V DC	11000 OHMS

Y UL SERIES

DPDT	Y2-D-CC-24A-01	24V AC	51 OHMS
	Y2-D-CC-120A-01	120V AC	1175 OHMS
	Y2-D-CC-240A-01	240V AC	5000 OHMS
DPDT	Y2-D-CC-12D-01	12V DC	120 OHMS
	Y2-D-CC-24D-01	24V DC	472 OHMS
	Y2-D-CC-110D-01	110V DC	10000 OHMS
3PDT	Y2-D-CCC-24A-01	24V AC	51 OHMS
	Y2-D-CCC-120A-01	120V AC	1175 OHMS
	Y2-D-CCC-240A-01	240V AC	5000 OHMS
3PDT	Y2-D-CCC-12D-01	12V DC	120 OHMS
	Y2-D-CCC-24D-01	24V DC	472 OHMS
	Y2-D-CCC-110D-01	110V DC	10000 OHMS

A SERIES

DPDT	A-O-2C-6A-S1	6V AC	2 OHMS
	A-O-2C-12A-S1	12V AC	8 OHMS
	A-O-2C-24A-S1	24V AC	29.5 OHMS
	A-O-2C-120A-S1	120V AC	750 OHMS
4PDT	A-O-4C-6A-S1	6V AC	2 OHMS
	A-O-4C-12A-S1	12V AC	8 OHMS
	A-O-4C-24A-S1	24V AC	29.5 OHMS
	A-O-4C-120A-S1	120V AC	750 OHMS
	A-O-4C-240A-S1	240V AC	3000 OHMS
DPDT	A-O-2C-6D-S1	6V DC	12 OHMS
	A-O-2C-12D-S1	12V DC	50 OHMS
	A-O-2C-24D-S1	24V DC	200 OHMS
	A-O-2C-110D-S1	110V DC	5000 OHMS
4PDT	A-O-4C-6D-S1	6V DC	12 OHMS
	A-O-4C-12D-S1	12V DC	50 OHMS
	A-O-4C-24D-S1	24V DC	200 OHMS
	A-O-4C-110D-S1	110V DC	5000 OHMS

G SERIES

DPDT	G-O-2C-6A-S1	6V AC	2 OHMS
	G-O-2C-12A-S1	12V AC	8 OHMS
	G-O-2C-24A-S1	24V AC	29.5 OHMS
	G-O-2C-120A-S1	120V AC	750 OHMS
4PDT	G-O-4C-6A-S1	6V AC	2 OHMS
	G-O-4C-12A-S1	12V AC	8 OHMS
	G-O-4C-24A-S1	24V AC	29.5 OHMS
	G-O-4C-120A-S1	120V AC	750 OHMS
	G-O-4C-240A-S1	240V AC	3000 OHMS
DPDT	G-O-2C-6D-S1	6V DC	12 OHMS
	G-O-2C-12D-S1	12V DC	50 OHMS
	G-O-2C-24D-S1	24V DC	200 OHMS
	G-O-2C-110D-S1	110V DC	5000 OHMS
4PDT	G-O-4C-6D-S1	6V DC	12 OHMS
	G-O-4C-12D-S1	12V DC	50 OHMS
	G-O-4C-24D-S1	24V DC	200 OHMS
	G-O-4C-110D-S1	110V DC	5000 OHMS

Z1 SERIES

Z-1-C-6-2	6V DC	180 OHMS
Z-1-C-12-2	12V DC	720 OHMS
Z-1-C-24-2	24V DC	2880 OHMS
Z-1-C-48-2	48V DC	11520 OHMS

Z2 SERIES

Z-2-C-6-2	6V DC	180 OHMS
Z-2-C-12-2	12V DC	720 OHMS
Z-2-C-24-2	24V DC	2880 OHMS
Z-2-C-48-2	48V DC	11520 OHMS

For other assemblies or for special applications, call your Comar representative.

34 Addison Street / Chicago, Illinois 60618 / Phone: (312) 588-2410 / TWX 910-221-5198

BABCOCK RELAYS

ESTERLINE

Unequalled for accurate, dependable performance under widely varying lo environmental conditions, Babcock hermetically sealed relays are ideally su continuous-duty airborne and ground system applications.

All relays in the Babcock line meet or exceed MIL-R-5757D and applicable of related military specifications. For complete assurance of reliable perform critical applications, each relay series undergoes extensive life testing under a s reliability program. First of its type in the relay industry, the Babcock progr nishes failure rate data guaranteeing miss-free operation within the critical par of missile usage.

DESIGN FEATURES

High-Flux Magnetic Design: High sensitivity with minimum coil power • Constant force across gap • High contact pressure.

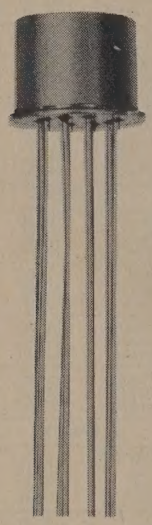
Contaminant-Free Operation: High-reliability series available with all-welded construction and activated porous glass getters.

Hermetically Sealed Construction: with 90% nitrogen, 10% helium, tested to 10^{-8}cc /sec.

Universal Contacts: Exclusive Babc versal contacts" permit relay operat dry circuit to rated load with the sam set.

Vibration and Shock Immunity: Bala mature and low-inertia components.

BR40, CBR40 RELAYS



TO-5 SIZE TRANSISTOR CAN RELAYS — Dry Circuit to 1 Amp. Military & General Purpose Industrial Types

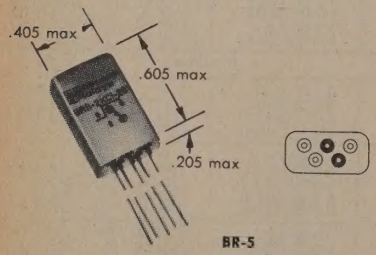
All-Welded

MILITARY MODEL — **Contact:** 1 amp., DPDT • **Mil Spec:** MIL-R-5757 • **Vibration:** 3 Hz • **Shock:** 80g, 11 ms. • **Temp. Range:** —65°C to +125°C • **Life:** 100,000 operations, amp.; 1,000,000 operations, min. @ low level • **Bounce Time:** 1.5 ms, max. • **Mountin** flange • **Terminal Styles:** plug-in, 1½" printed circuit leads.

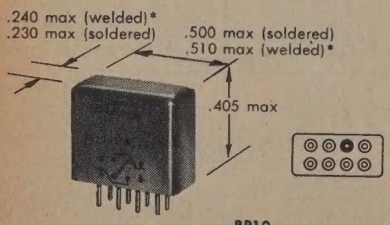
INDUSTRIAL MODEL — **Contact:** 1 amp., DPDT • **Vibration:** 10g, 500 Hz • **Shock:** ms • **Temp. Range:** —55°C to +71°C • **Life:** 100,000 operations, min. @ 1 amp.; operations, min. @ low level • **Bounce Time:** 2 ms, max. • **Mounting Types:** flange • **Styles:** plug-in, 1½ printed circuit leads.

Nominal Coil Voltage		6 VDC	9 VDC	12 VDC	18 VDC	26.
Pull-In Voltage (max.) @ 125°C		4.5 VDC	6.8 VDC	9 VDC	13.5 VDC	1
Type	Oper. & Rel. Time (max.)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Co ± @ (o
BR40	2 ms	98	220	390	880	1
INDUSTRIAL MODEL						
CBR40	4 ms	100	220	390	880	1

BR5, BR10 RELAYS



BR-5



BR10

MICRO/MICROMINIATURE RELAYS — Dry Circuit to 1 Amp. Series

Contacts: 1 amp.; BR5, SPDT; BR10 DPDT • **Mil Spec:** MIL-R-5757 • **Vibration:** 30g, 38-30 **Shock:** BR5 — 125g, 11 ms; BR10 — 150g, 11 ms • **Temp. Range:** —65°C to +125°C • **Life:** operations, min. @ 1 amp., 125°C; 150,000 operations, min. @ 0.5 amp., 125°C (BR10 **Drop Out:** 10% min. of max. pull-in • **Mounting:** BR5 — slip-on tab, flange; BR10 — **Terminal Styles:** plug-in, solder hook, gold-plated plug-in (BR10 only), 1.5" printed circu

Nominal Coil Voltage		12 VDC	18 VDC	26 VDC
Pull-in Voltage (max.) @ 25°C		6.7 VDC	9.5 VDC	13 VDC
Pull-in Voltage (max.) @ 125°C		9.5 VDC	13.5 VDC	18 DC
Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)
BR-5	4 ms	500	1K	2K

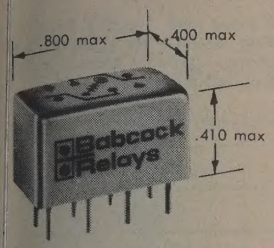
Nominal Coil Voltage		6 VDC	12 VDC	18 VDC	26 VD
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6.0 VDC	9.0 VDC	13.0 VD
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	12.5 VDC	18 VD
Relay Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C	Coil Re ±10% @ 25°
BR10T, 10W	3.5 ms	90 Ω	330Ω	750Ω	1500Ω

NOTE: BR10T Soldered, BR10W Welded

See YELLOW SECTION for Local Offices, Phones

BABCOCK PRECISION RELAYS

BR17 RELAYS



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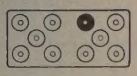


BR17

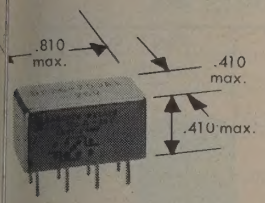
HALF-SIZE CRYSTAL CAN RELAYS — Dry Circuit to 2 Amp. Series
BR17 Latching

Contacts: 2 amp., DPDT • **Dry Circuit:** 1 μa @ 1 mv • **Contact Bounce:** 2 ms max. @ Max. rated load • **Mil Spec:** MIL-R-5757 • **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 11 ms • **Temp. Range:** —65°C to +125°C • **Life:** 100,000 operations, min. @ rated load, 125°C; 1,000,000 operations, min. @ low level, 125°C • **Drop Out:** 10% min. of max. pull-in • **Mounting Types:** flange • **Terminal Styles:** plug-in, solder hook, gold-plated plug-in.

Nominal Coil Voltage		6 VDC	12 VDC	26 VDC	48 VDC
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6 VDC	13 VDC	24 VDC
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	33 VDC
Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)
BR16	4 ms	50	190	900	2.8K
BR17A, C, D, E	3 ms	50	190	900	2.8K
BR17B	3 ms	90	340	1500	5.0K

NOTE: All data for BR17 (except Type B) are for each coil separately.

NEW BR26 RELAY

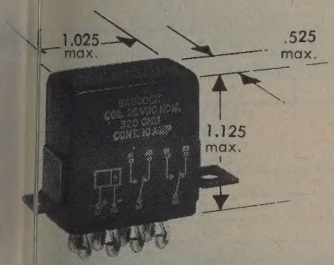


HALF-SIZE CRYSTAL CAN RELAYS — Dry Circuit to 2 Amp. Series
All-Welded Construction

Contacts: 2 amp., DPDT • **Mil Spec:** MIL-R-5757 • **Bounce Time:** 2 ms max. @ rated load • **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 11 ms • **Temp. Range:** —65°C to +125°C • **Life:** 100,000 operations min. @ rated load, 125°C • **Drop Out:** 10% min. of max. pull-in • **Mounting Types:** flange • **Terminal Styles:** plug-in, solder hook, gold-plated plug-in.

Nominal Coil Voltage		6 VDC	12 VDC	26 VDC
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6.0 VDC	13.0 VDC
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC
Type	Oper. & Rel. Time (max.)	Coil Res. ± 10% @ 25°C (ohms)	Coil Res. ± 10% @ 25°C (ohms)	Coil Res. ± 10% @ 25°C (ohms)
BR26	4 ms	37	150	700

NEW BR46 RELAY

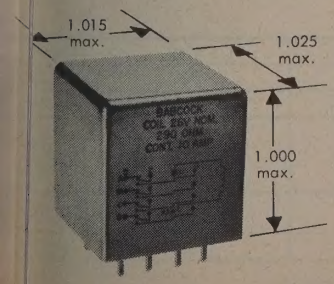


MINIATURE AIRCRAFT RELAYS — 2PDT • MIL-R-6106
All-Welded Construction

Contacts: 10 amp., 2PDT • **MIL Spec:** MIL-R-6106 • **Bounce Time:** 2 ms max. @ 100 ma • **Vibration:** 30g, 10-3000 Hz. • **Shock:** 200g, 6 ms. • **Temp. Range:** —70°C to +125°C • **Life:** 100,000 operations min. • **Mounting Types:** flange • **Terminal Styles:** gold-plated plug-in, solder hook.

Nominal Coil Voltage		6 VDC	12 VDC	28 VDC	115 VAC
Maximum Coil Voltage		8 VDC	15 VDC	29 VDC	122 VAC
Pull-In Voltage (max.) @ 125°C		4.5 VDC	9 VDC	18 VDC	90 VAC
Type	Oper. & Rel. Time (max.)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)
BR46	10 ms	20	80	320	0.04

NEW BR30 RELAY



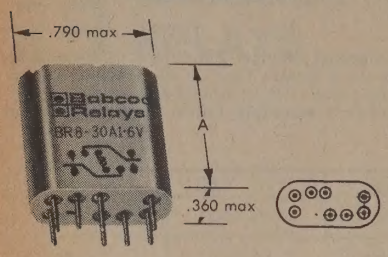
MINIATURE AIRCRAFT RELAYS — 4PDT • MIL-R-6106
All-Welded Construction

Contacts: 10 amp., 4PDT • **Mil Spec:** MIL-R-6106 • **Bounce Time:** 2 ms max. @ not more than 100 ma. • **Vibration:** 30g, 70-3000 Hz • **Shock:** 100g, 10 ms • **Temp. Range:** —65°C to +125°C • **Life:** 100,000 operations min. • **Mounting Types:** flange • **Terminal Styles:** gold-plated plug-in, solder hook.

Nominal Coil Voltage		6 VDC	12 VDC	28 VDC
Maximum Coil Voltage		8 VDC	15 VDC	29 VDC
Pull-in Voltage (max.) @ 125°C		4.5 VDC	9.0 VDC	18.0 VDC
Type	Oper. & Rel. Time (max.)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)
BR30	10 ms	18	72	290

BABCOCK PRECISION RELAYS

BR8 RELAYS



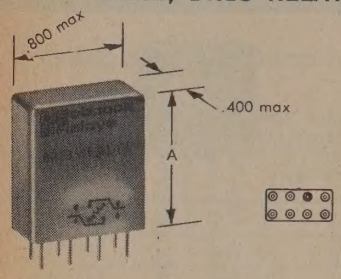
BR8, 8Z: A = .870 max
BR8H: A = 1.190 max

CRYSTAL CAN RELAYS — Dry Circuit to 2 Amp. Series

Contacts: 2 amp., DPDT • **Life:** 100,000 operations min. @ rated load, 125°C • **Bounce Tim** max. @ rated load • **Mil Spec:** MIL-R-5757 • **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 1 **Temp. Range:** —65°C to +125°C • **Drop Out:** 10% min. of max. pull-in • **Mounting Types** bracket • **Terminal Styles:** plug-in, solder hook, 3″ printed circuit leads.

Nominal Coil Voltage		6 VDC	12 VDC	26.5 VDC	115 V
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6 VDC	13 VDC	57.5
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	79 V
Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil R ±10 @ 25 (ohm
BR8	5ms	30	120	600	10K
BR8HZ	7ms	60	240	1K	

BR12, BR13 RELAYS



BR13 A = .900 max
BR12, A = .890 max
BR12H, 12K A = 1.270 max
BR13H, 13K A = 1.290 max

MICROMINIATURE RELAYS — Dry Circuit to 3 Amp. Series

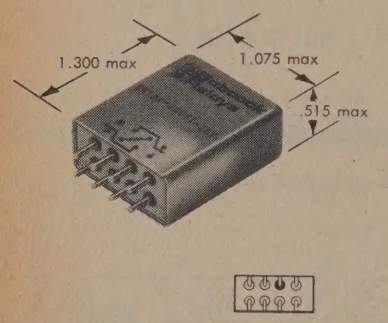
Non-Welded BR12 — Welded BR13

Contacts: 2 and 3 amp., DPDT • **Mil Spec:** MIL-R-5757 • **Bounce Time:** 2 ms max. @ rate **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 11 ms • **Temp. Range:** —65°C to +125°C • **Life:** operations min. @ rated load, 125°C • **Drop Out:** 10% min. of Max. pull-in • **Mounting** flange • **Terminal Styles:** plug-in, solder hook, 3″ printed circuit leads.

Nominal Coil Voltage		6 VDC	12 VDC	26.5 V DC	115 V
Pull-in Voltage (max) @ 25°C		3.0 VDC	6 VDC	13 VDC	57.5
Pull-in Voltage (max) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	79 V
Type	Oper. & Rel. Time (max)	Coil Res. ± 10% @ 25°C	Coil Res. ± 10% @ 25°C	Coil Res. ± 10% @ 25°C	Coil ± 10 @ 25
BR12, 12P/BR13,	5 ms	36	140	675	12K
BR12H/BR13H	6 ms	85	350	1600	28K
BR12K/BR13K	15 ms	220	850	4000	40K

Ultra-Sensitive "Tall Can" Models: BR12H, BR13H, (3 amps), BR12K, BR13K (2 amps)

BR24, BR7, BR19 RELAYS



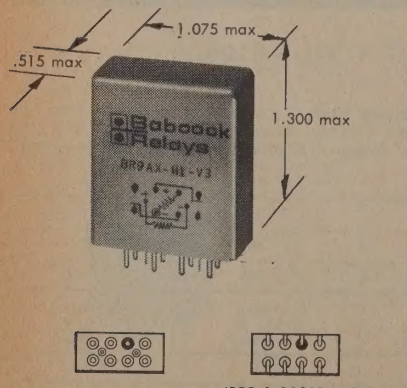
SUBMINIATURE RELAYS — Dry Circuit to 10 Amp. Series

High Reliability — Non-Welded BR7 — Welded BR19, BR24

Contacts: 10 amp., BR7X/BR19X; BR24; 5 amp., BR7Y/BR19Y; DPDT • **Mil Spec:** MIL-R- **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 11 ms • **Temp. Range:** —65°C to +125°C 100,000 operations min. @ rated load, 125°C • **Bounce Time:** 2 ms max. @ rated load **Out:** 10% min. of max. pull-in • **Mounting Types:** flange, bracket • **Terminal Styles:** solder hook, 3″ printed circuit leads.

Nominal Coil Voltage		6 V DC	12 V DC	26.5 V DC	115 V AC,
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6 VDC	13 VDC	57.5 VA
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	79 VD
Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res. ±10% @ 25°C (ohms)	Coil Res ±10% @ 25°C AF (ohm
BR7X/BR19X	7 ms	16	65	300	1.4K
BR7Y/BR19Y	8.5 ms	50	190	900	3.8K
BR24	7 ms	21	85	400	N/A

BR9, BR20 RELAYS



(BR9 & BR20B only)

MAGNETIC LATCHING RELAYS — Dry Circuit to 10 Amp. Series

Non-Welded BR9 — Welded BR20

Contacts: 10 amp., DPDT • **Mil Spec:** MIL-R-5757 • **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, • **Temp. Range:** —65°C to +125°C • **Bounce Time:** 2 ms max. @ rated load • **Life:** 100,000 tions min. @ rated load, 125°C • **Mounting Types:** bracket, flange • **Terminal Styles:** plug-in, hook, 3″ printed circuit leads.

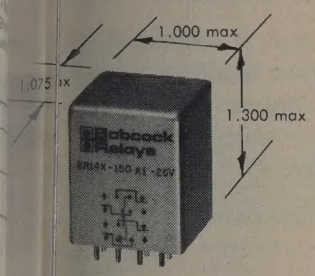
Nominal Coil Voltage		6 V DC	12 V DC	26.5 V DC	115 V D
Latch/Reset Volt.(max.) @ 25°C		3.0 VDC	6 VDC	13 VDC	57.5 VD
Latch/Reset Volt.(max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	79 VD
Type	Oper. Time (max)	Coil Res. ±10% Ω @ 25°C	Coil Res. ±10% Ω @ 25°C	Coil Res. ±10% Ω @ 25°C	Coil Res ±10% @ 25°C
BR9AX BR20AX	10ms *	30	120	600	10,000
BR9BX, BR20BX	10ms	65	250	1200	20,000

Note: All data for BR9 & BR20 (except Type B) are for each coil separately.

See YELLOW SECTION for Local Offices, Phones

BABCOCK PRECISION RELAYS

BR14, BR18 RELAYS



(BR18 only)

(BR14 & BR18B only)

4PDT RELAYS — Dry Circuit to 10 Amp. Series

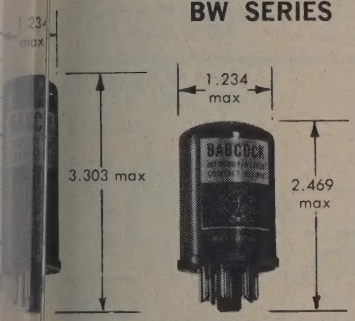
Non-Latching BR14 — Latching BR18

Contacts: 10 amp., 4PDT • **Coil Operations:** DC-60 and 400 Hz; AC—available • **Mil Spec:** MIL-R-5757 • **Vibration:** 30g, 38-2000 Hz • **Shock:** 50g, 11 ms • **Temp. Range:** −65°C to +125°C • **Life:** 100,000 operations min. @ rated load, 125°C • **Bounce Time:** 2 ms max. @ rated load • **Drop Out:** 10% min. of max. pull-in (BR14 only) • **Mounting Types:** 4-hole bracket • **Terminal Styles:** plug-in, solder hook.

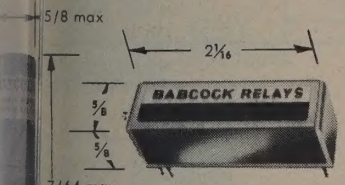
Nominal Coil Voltage		6 VDC	12 VDC	26 VDC	115 VDC	115 VAC, AF
Pull-in Voltage (max.) @ 25°C		3.0 VDC	6 VDC	13 VDC	57.5 VDC	57.5 VAC
Pull-in Voltage (max.) @ 125°C		4.4 VDC	8.4 VDC	18.0 VDC	79 VDC	79 VAC
Type	Oper. & Rel. Time (max)	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C	Coil Res. ±10% @ 25°C
BR14Y	8.5 ms	22	85	400	7000	1500 AC
BR14W	8.5 ms	16	65	300	5500	1300 AC
BR14X	7.5 ms	8	32	150	2750	650 AC
BR18AX,	10ms	15	60	300	5K	—
BR18BX	10ms	37	125	600	10K	—

NOTE: All data for BR18 (except Type A) are for each coil separately.

BW SERIES



BW-3



BW-5

MERCURY-WETTED CONTACT RELAYS

Form "C" Non-Bridging

	BW-2	BW-3	BW-4	BW-5
Coil Resistance (ohms)	2 thru 25K	275 thru 14K	65 thru 24K	115 thru 1950
Maximum power dissipation @ 35°C (watts)	2.0	1.5	1.0	1.7
Contacts	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)
Contact rating				
Amperes (max)	2.0	2.0	2.0	2.0
Volts (max)	500	500	500	500
Va (max) with contact protection	100.0	100.0	100.0	100.0
Adjustment				
Single side stable*				
Must operate power (Max. Sensitivity)	3.7 mW	6.3 mW	20 mW	20 mW
Must release power Bi-stable**	.1 mW	.2 mW	.8 mW	.8 mW
Must release power	±1.2 mW	±2.0 mW	±6 mW	±6 mW
Chopper adjustment	Relays are adjusted to follow 60 Hz sinusoidal AC current with approximately equal dwell on the fixed contacts. Available on models BW-2 and BW-3 only.			
Contact resistance				
Typical (milliohms)	25	25	25	25
Maximum (milliohms)	40	40	40	40
Dielectric strength	1000 volts RMS	1000 volts RMS	1000 volts RMS	1000 volts RMS
Insulation Resistance***	10,000 MΩ min.	10,000 MΩ min.	10,000 MΩ min.	10,000 MΩ min.
Coil temperature rise per watt of power dissipation	15°C	20°C	40°C	40°C

*The permanent magnets are adjusted so that the relay will release (open its front contact) when the current through its coil is reduced to less than the 'must release' value.

**The permanent magnets are adjusted to hold the armature in the position to which it was last operated until sufficient current of opposite polarity is applied.

***Special Order

Write today for detailed information describing Babcock precision relays.

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BOURNS INC TRIMPOT® RELAYS

MAGNETIC LATCHING • AC OPERATED • HIGH PERFORMANCE • INDUS

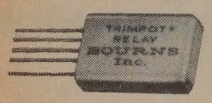
Bourns relays for military, aerospace, ground support and industrial equipment incorporate high reliability and long life for operation in adverse environments. They are available in a variety of size, mounting and performance characteristics and provide consistent, dependable service over wide levels of shock and vibration, and extreme ranges of temperature.

Bourns reliability is a result of stringent quality control, modern, well-equipped laboratory facilities and established testing procedures. These techniques combined with Bourns advanced engineering design produce top-quality relays with outstanding characteristics.

SERIES 3100

TRIMPOT® RELAY, 1.0 AMP., SPDT

ACTUAL SIZE



3100H

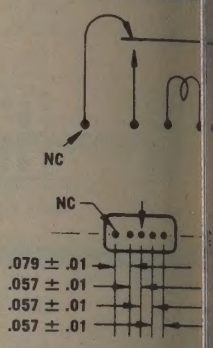
Also Available In
3100L — Long Lead
3100J — "J" Hook
.2" x .4" x .6"

FEATURES

- Operating temperature range −65° to +125°C
- Shock — 100G 11 milliseconds
- Vibration — 20G to 2000 Hz
- Pick-up sensitivity — 100 mw nominal @ +25°C

Standard Coil Resistance	VOLTAGE ADJUSTED* Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
50Ω	4.2	2.2	3.1	0.16
120Ω	6.4	3.4	4.8	0.24
500Ω	13.2	7.0	9.9	0.5
1000Ω	18.8	10.0	14.0	0.7
2000Ω	26.5	14.1	19.8	1.0

WIRING DIAGRAM



SERIES 3101

TRIMPOT® RELAY, 1.0 AMP., DPDT

ACTUAL SIZE

3101H

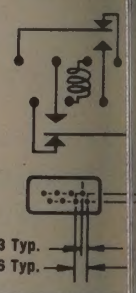
Also Available In
3101L — Long Lead
3101J — "J" Hook
.2" x .4" x .6"

FEATURES

- Pick-up sensitivity — 160 mw nominal @ +25°C
- Operating temperature range −65° to +125°C
- Vibration — 20G to 2000 Hz
- Shock — 100G 11 milliseconds

Standard Coil Resistance	VOLTAGE ADJUSTED* Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
65Ω	6.0	3.2	4.5	0.23
250Ω	12.0	6.3	8.9	0.45
1250Ω	26.5	14.0	19.7	1.00
2000Ω	33.4	17.7	24.5	1.25

WIRING DIAGRA



SERIES 3102

MAGNETIC LATCHING RELAY, 1.0 AMP., DPDT

ACTUAL SIZE

3102H

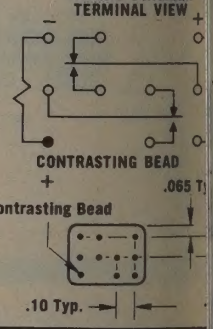
Also Available In
3102L — Long Lead
.40" x .40" x .33"

FEATURES

- Latch and reset sensitivity — 160 mw nominal @ +25°C
- Operating temperature range −65° to +125°C
- Vibration — 50G to 3000 Hz
- Shock — 150G 11 milliseconds
- Available in all welded construction

Standard Coil Resistance	VOLTAGE ADJUSTED* Nominal Operating Voltage	Maximum Latch & Reset at +25°C	Maximum Latch & Reset at +125°
65	6.0	3.2	4.5
250	12.0	6.3	8.8
1250	26.5	14.1	19.8
2000	33.5	17.9	25.1

WIRING DIAGRAM TERMINAL VIEW



SERIES 3104

MAGNETIC LATCHING RELAY, 2.0 AMP., DPDT

ACTUAL SIZE

3104H

Also Available In
3104L — Long Lead
.43" x .40" x .33"

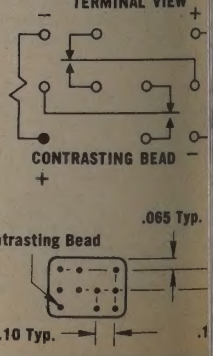
FEATURES

- Latch and reset sensitivity — 160 mw nominal @ +25°C
- Contact Rating — 2.0 ampere resistive at 28.0 volts DC Case grounded
- Operating temperature range −65° to +125°C
- Vibration 50G to 3000 Hz
- Available with all welded construction

Standard Coil Resistance	VOLTAGE ADJUSTED* Nominal Operating Voltage	Maximum Latch & Reset at +25°C	Maximum Latch & Reset at +125°
65	6.0	3.2	4.5
250	12.0	6.3	8.8
1250	26.5	14.1	19.8
2000	33.5	17.9	25.1

*Coil characteristics applicable at +25°C unless otherwise specified.

WIRING DIAGRAM TERMINAL VIEW



BOURNS INC TRIMPOT® RELAYS

MAGNETIC LATCHING • AC OPERATED • HIGH PERFORMANCE • INDUSTRIAL

ES 3105
HL ERATION TRIMPOT®
AMP., DPDT
ACTUAL SIZE

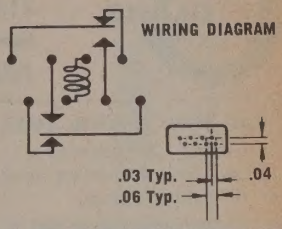
3105H

Available
— Lead
— Hook
.60" x .2"

FEATURES
- Relay has an integral diode bridge for AC coil operation
- Pick-up sensitivity — 180 mva
- Vibration — 20G to 2000 Hz
- Operating temperature range −65° to +85°C

Nominal Operating Voltage*	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +85°C	Drop-out Voltage Maximum	Drop-out Voltage Minimum
400/800 cps 28.0	15.0	18.8	9.0	1.1

WIRING DIAGRAM



RIES 3111
57/ TRIMPOT® RELAY HIGH
RMANCE, 1.0 AMP., DPDT
ACTUAL SIZE

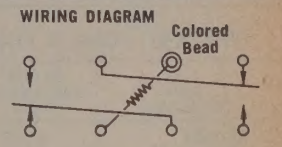
3111H

Available In
— Lead
— Hook
.60" x .40"

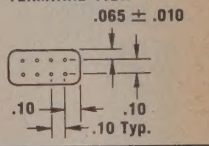
FEATURES
- Pick-up sensitivity — 130 mw maximum
- Operating temperature range −65° to +125°C
- Vibration — 20G to 2000 Hz
- Shock — 50G 11 milliseconds
- Available with all welded construction for Hi-Rel Missile applications
- Contact rating — 1.0 ampere resistive at 28.0 volts C

Standard Coil Resistance*	VOLTAGE ADJUSTED: Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
70	6.0	3.0	3.9	0.3
280	12.0	6.0	7.8	0.6
1500	26.5	14.0	18.0	1.4

WIRING DIAGRAM



TERMINAL VIEW



RIE 3114
MPOT RELAY HIGH
FORMNCE, 2.0 AMP., DPDT
ACTUAL SIZE

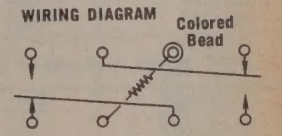
3114H

Available In
— Lead
— Hook
.60" x .40"

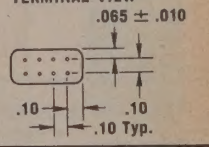
FEATURES
- Pick-up sensitivity — 200 mw maximum
- Contact rating — 2.0 ampere resistive at 28.0 volts DC Case grounded
- Operating temperature range −65° to +125°C
- Vibration — 30G to 2000 Hz
- Available in all welded version for Hi-Rel Missile applications

Standard Coil Resistance*	VOLTAGE ADJUSTED: Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
45	6.0	3.0	3.9	0.3
180	12.0	6.0	7.8	0.6
980	26.5	14.0	18.0	1.4

WIRING DIAGRAM



TERMINAL VIEW



RIES 3115
MPOT INDUSTRIAL RELAY, 1.0
P., DPDT, PLASTIC ENCLOSURE
ACTUAL SIZE

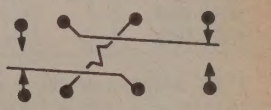
3115H

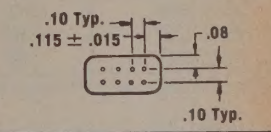
Available In
— Lead
— Hook
.53" x .43"

FEATURES
- Low cost 1/6 crystal Industrial Relay
- Pick-up sensitivity — 200 milliwatts nominal @ +25°C
- Operating temperature range −25° to +85°C
- Balanced armature design (50G shock, 10G vibration)

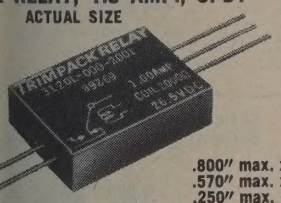
Standard Coil Resistance*	VOLTAGE ADJUSTED: Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
65Ω	6	3.7	4.6	.3
260Ω	12	7.3	9.1	.6
1350Ω	26.5	16.5	21.0	1.4

WIRING DIAGRAM





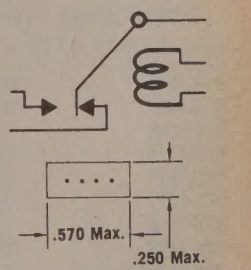
ODEL 3120
IMPAK RELAY, 1.0 AMP., SPDT
ACTUAL SIZE



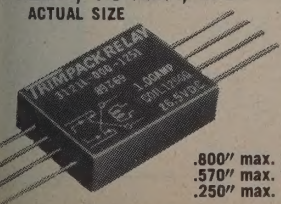
.800" max. x
.570" max. x
.250" max.

FEATURES
- Contact rating — 1 ampere resistive at 26.5 volts DC
- Operating temperature range −65° to +125°C
- Pick-up sensitivity — 10 mw nominal @ +25°C

Standard Coil Resistance*	VOLTAGE ADJUSTED: Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
50Ω	4.2	2.2	3.1	0.16
120Ω	6.4	3.4	4.8	0.24
500Ω	13.2	7.0	9.9	0.5
1000Ω	18.8	10.0	14.0	0.7
2000Ω	26.5	14.1	19.8	1.0



ODEL 3121
IMPCK RELAY, 1.0 AMP., DPDT
ACTUAL SIZE

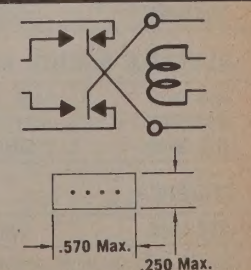


.800" max. x
.570" max. x
.250" max.

FEATURES
- Contact rating — 1 ampere resistive at 26.5 volts DC
- Operating temperature range −65° to +125°C
- Pick-up sensitivity — 160 mw nominal @ +25°C

Standard Coil Resistance*	VOLTAGE ADJUSTED: Nominal Operating Voltage	Maximum Pull-in Voltage at +25°C	Maximum Pull-in Voltage at +125°C	Drop-out Voltage Minimum
65Ω	6.0	3.2	4.5	0.23
250Ω	12.0	6.3	8.9	0.45
1250Ω	26.5	14.0	19.7	1.00
2000Ω	33.4	17.7	24.5	1.25

*Coil characteristics applicable at +25°C unless otherwise specified.



CLARE

C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 26[illegible]

MERCURY-WETTED CONTACT RELAYS

Input analog switching, output power conversion switching, solid state input and output buffering.

- Life: 22 x 10^9 operations.
- Low, constant contact resistance.
- No contact bounce.
- Switching speeds as fast as 1 millisecond.
- Versatile contact load capabilities . . . low level to 250 va.
- High power gain . . . up to 5,000 with no noise sensitivity.
- Wide range of sensitivities: 2.0 mw to 550 mw.

TYPE HG 1-FORM D CONTACT (SPDT BRIDGING) 5A, 500 V. MAX.*

Clare Part Number	Nominal Resistance (Ohms)	Base Figure (Next Page)	Must Opreate Current (ma-dc)	Must Release Current (ma-dc)	Must Operate Voltage (vdc)	Maximum Voltage (vdc)
HG-1001	2500	1	10	4.4	28	87
HG-1002	4000	1	7.5	3.3	33	110
HG-1003 Wdg. 1	700	2	32	14	25	46
HG-1003 Wdg. 2	3300	2	13	4.9	47	99
HG-1004	700	1	19	8.3	15	45
HG-1011	11000	1	5.0	2.2	61	180
HG-1012	130	4	37	16	5.4	20
HG-1017	4000	4	7.5	3.3	33	110
HG-1019	40	4	67	30	2.9	11
HG-1026	500	1	20	8.7	11	39
HG-1043	1000	1	15	6.6	17	55

TYPE HG2A 2-FORM D CONTACTS (DPDT) BRIDGING) 5A., 500 V. MAX.*

HG2A-1001	5000	2A1	11	4.7	62	142
HG2A-1002	700	2A2	31	13	24	53
HGSA-1003	315	2A2	44	19	15	36
HG2A-1004	5000	2A2	11	4.7	62	142
HG2A-1013	10000	2A2	8.6	3.6	94	200
HG2A-1015	1250	2A2	22	9.3	30	71

TYPE HG3A 2-FORM D CONTACTS (3PDT) BRIDGING) 5A., 500 V. MAX.*

HG3A-1003	5000	3A1	11	4.7	62	142
HG3A-1004	315	3A1	44	19	15	36
HG3A-1006	500	3A1	35	15	19	45
HG3A-1008	1250	3A1	22	9.3	30	71

TYPE HG4A 4-FORM D CONTACTS (4PDT BRIDGING) 5A., 500 V. MAX.*

HG4A-1006	10000	4A1	8.6	3.7	94	200
HG4A-1007	1400	4A1	23	9.9	35	75
HG4A-1011	390	4A1	42	18	18	40

* 250 VA max. with required contact protection All values at 25°C. Resistance values ±10%.

TYPE HGS 1-FORM D CONTACT (SPDT BRIDGING) 2A., 500 V. MAX.**
(Higher Speed, Greater Sensitivity than Type HG)

SINGLE SIDE STABLE

HGS-1005	4000	S1	1.25	0.25	5.5	90
HGS-1006	2500	S1	1.4	0.17	3.9	70
HGS-1009	600	S1	2.9	0.69	1.9	34
HGS-1014	1000	S1	2.2	0.38	2.4	44
HGS-1016	7000	S1	0.87	0.14	6.7	118
HGS-1017	11000	S1	0.72	0.12	8.7	148
HGS-1018	500	S1	2.9	0.50	1.6	31
HGS-1048	4000	S4	2.0	1.0	8.8	90
HGS-5015***	1000	S1	2.2	0.38	2.4	44
HGS-5016***	25000	S1	0.52	0.09	14.3	224

BI-STABLE DOUBLE WOUND COIL

HGS-1019	1100/1100	S3	±1.8 - 1.8	—	±2.2 - 2.2	47 - 47
HGS-5002	135/135	S3	±4.5 - 4.5	—	±.67 - .67	47 - 47
HGS-5013	1100/1100	S3	±1.8 - 1.8	—	±2.2 - 2.2	47 - 47

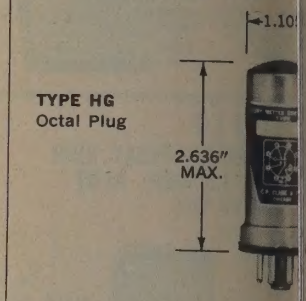
CHOPPER

HGS-1004	600	S1	—	—	6.3 vac-rms	—

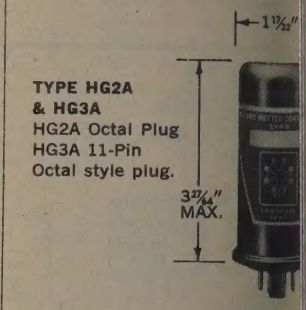
** 100 VA with required contact protect. All values at +25°C. Resistances ±10%.
*** Form C contact action.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

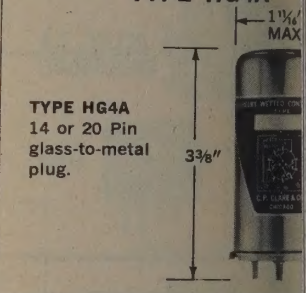
TYPE HG



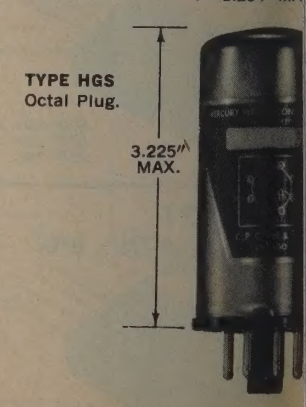
TYPE HG2A & HG



TYPE HG4A



TYPE HGS

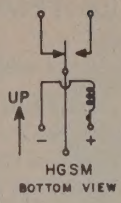


CLARE

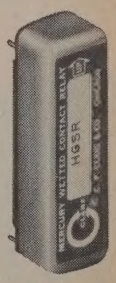
Mercury-Wetted Contact Relays for PC Board

Part Number	Nominal Resistance (ohms)	Schematic	Must Operate Current (ma-dc)	Must Release Current (ma-dc)	Must Operate Voltage (vdc)	Max. Voltage (vdc)
TYPE HGSM: 1-FORM D CONTACT (SPDT BRIDGING) 2A., 500 V. MAX.* IN 1000 SERIES OR 1-FORM C CONTACT (SPDT NON-BRIDGING) 2A., 500 V. MAX.** IN 5000 SERIES.						
SINGLE SIDE STABLE						
HGSM-1001	1425	Single Wound	8.3	1.4	13	53.4
HGSM-1002	940	Single Wound	10.1	1.7	10.5	43.3
HGSM-1003	2400	Single Wound	7.35	1.2	20.6	69.2
HGSM-1005	65	Single Wound	37.4	6.2	2.7	11.4
HGSM-1009	275	Single Wound	17.0	2.8	5.2	23.4
HGSM-1010	450	Single Wound	12.9	2.1	6.4	30.0
HGSM-1011	675	Single Wound	11.6	1.9	8.6	36.7
HGSM-5001	1425	Single Wound	8.3	1.4	13	53.4
HGSM-5002	1950	Single Wound	7.5	1.2	17.6	62.4
HGSM-5010	675	Single Wound	11.6	1.9	8.6	36.7
HGSM-5011	940	Single Wound	10.1	1.7	10.5	43.3
BISTABLE						
HGSM-1016	#1 1100	Double Wound	±7.25	—	±8.77	46.9
	#2 1100		±5.7		±6.9	46.9
HGSM-5003	#1 1100	Double Wound	±7.25	—	±8.77	46.9
	#2 1100		±5.7		±6.9	46.9
HGSM-5020	#1 460	Double Wound	±7.8	—	±3.95	30.3
	#2 460		±7.8		±3.95	30.3
TWO CAPSULE SINGLE SIDE STABLE						
HGSM-5006	500	Single Wound	18.3	1.8	10	38.7
TYPE HGSR: 1-FORM D CONTACT (SPDT BRIDGING) 2A., 500 V. MAX.* IN 10,000** SERIES OR 1-FORM C CONTACT (SPDT NON-BRIDGING) 2A., 500 V. MAX.** IN 50,000 SERIES.						
SINGLE SIDE STABLE						
HGSR-1111L00	185	Single Wound	14	3.24	2.90	18
HGSR-1111P00	680	Single Wound	7.5	1.5	5.7	35
HGSR-1111T00	2650	Single Wound	3.8	.83	11	68
HGSR-1111W00	9850	Single Wound	2.1	.43	21	125
HGSR-1111L00	185	Single Wound	14	3.24	2.90	18
HGSR-1111P00	680	Single Wound	7.5	1.6	5.7	35
HGSR-1111T00	2650	Single Wound	3.8	.83	11	68
HGSR-1111W00	9850	Single Wound	2.1	.43	21	125
BISTABLE						
HGSR-2112P00	340/340	Double Wound	±7.5	—	2.8	24
HGSR-2112W00	4500/4500	Double Wound	±2.1	—	11.0	89
HGSR-2112P00	340/340	Double Wound	±7.5	—	2.8	24
HGSR-2112W00	4500/4500	Double Wound	±2.1	—	11.0	89

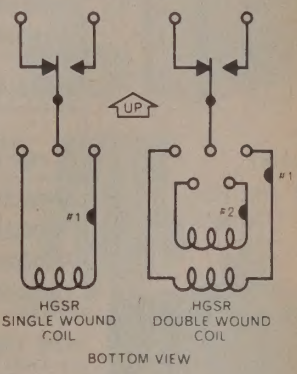
*100 mA max. with required circuit protection. Note: All values at 25°C. Resistances specified are ±10%.



TYPE HGSM
.040" Dia. Pins on
.10" Grid Spacing



TYPE HGSR
.025 D/A. Pins on
.093" Grid Spacing



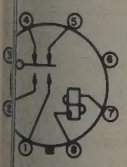


FIG. 1

FIG. 2

FIG. 3

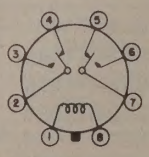


FIG. 2A1

FIG. 2A2

FIG. 3A1

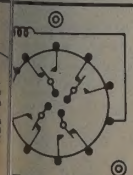


FIG. 4A1

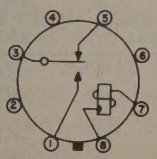


FIG. S1

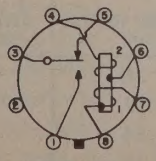


FIG. S3

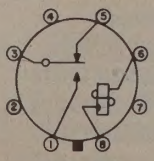


FIG. S4

Positive potential applied to the start of the winding indicated by the symbol ◓ will close the contacts shown open on the electrical schematics.

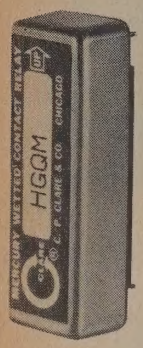
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 26

MERCURY-WETTED CONTACT RELAYS ULTRA HIGH SPEED AND LOW LEVEL

	HGQM / HGQ2MT	HGS2MT
• ULTRA HIGH SPEED	750 μs response time at nom. coil power.	2.1 ms response time at nom power.
• MINIATURE FOR PCB MOUNTING	.4 in. high profile.	.75 in. high profile.
• LOW CONTACT RESISTANCE	10-20 milliohms, ±2 over life.	10-50 milliohms, ±2 over life
• BILLION OPERATION RELIABILITY	1 x 10^9 operations.	20 x 10^9 operations.
• SWITCHES MICROVOLTS OR AMPERES	0 to 1A., 0 to 500V. 100 VA max. w/contact protection.	0 to 2A., 0 to 500V. 100 VA m w/contact protection.
• HIGH SENSITIVITY	Bi-stable: 175 mw. Single-side stable: 325 mw or 85 mw at reduced dynamic performance.	325 mw.
• LOW NOISE & THERMAL EMF	Less than 5 μv contact noise (minimum equipment resolution), dc to 100K Hz, 3 ms after coil energization. Thermal EMF 15 μv less.	Less than 10 μv contact nois to 100 KHz, 10 ms after gization. Thermal EMF 15 μv or less



HGQM
.025" Dia. Pins on .1" Centers.

TYPE HGQM SINGLE-SIDE STABLE: 1-FORM C CONTACT*

CLARE PART NUMBER	RECOMMENDED NOMINAL VOLTAGE (vdc)	COIL RESISTANCE ±10% (ohms)	MUST OPERATE VOLTAGE (vdc)	MUST RELEASE VOLTAGE (vdc)	MAXIM VOLTA (vdc
HGQM5001	6	125	3	0.6	14
HGQM5002	12	435	6	1.25	30
HGQM5003	24	1750	12	2.5	56
HGQM5004	48	6100	24	5.0	110

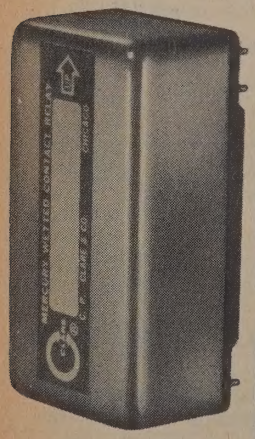
TYPE HGQM BI-STABLE: 1-FORM C CONTACT*

CLARE PART NUMBER	RECOMMENDED NOMINAL VOLTAGE (vdc)	COIL RESISTANCE ±10% (ohms)	MUST OPERATE VOLTAGE (EITHER WINDING) (vdc)	MUST NOT OPERATE VOLTAGE (EITHER WINDING) (vdc)	MAXIMUM (ONE WINDI (vd
HGQM5021	6	205/205	3	1.25	19
HGQM5022	12	875/875	6	2.5	39
HGQM5023	24	3000/3000	12	5.0	73

HGQ2MT
.025" Dia. Pins on .1" Centers.

TYPE HGQ2MT: 2-FORM C CONTACTS*

CLARE PART NUMBER	RECOMMENDED NOMINAL VOLTAGE (vdc)	COIL RESISTANCE ±10% (ohms)	MUST OPERATE VOLTAGE (vdc)	MUST RELEASE VOLTAGE (vdc)	MAXIMUM (vdc)
HGQ2MT5001	6	55.5	3.5	0.6	14
HGQ2MT5002	12	250	7	1.25	30
HGQ2MT5003	24	870	14	2.5	56
HGG2MT5004	48	3500	28	5.0	110



HGS2MT
.040" Dia. Pins

TYPE HGS2MT UNSHIELDED

CLARE PART NUMBER 2 FORM C	CLARE PART NUMBER 2 FORM D	NOMINAL VOLTAGE (dc)	COIL RESISTANCE (ohms ±10%)	MUST OPERATE VOLTAGE (dc)	MUST RELEASE VO (dc)
HGS2MT5001	HGS2MT1001	6	130	3.0	0.5
HGS2MT5002	HGS2MT1002	12	520	6.0	1.0
HGS2MT5003	HGS2MT1006	24	2200	12.0	2.0
HGS2MT5004	HGS2MT1009	48	8000	24.0	4.0

TYPE HGS2MT ELECTROSTATICALLY SHIELDED

CLARE PART NUMBER 2 FORM C	CLARE PART NUMBER 2 FORM D	NOMINAL VOLTAGE (dc)	COIL RESISTANCE (ohms ±10%)	MUST OPERATE VOLTAGE (dc)	MUST RELEASE VO (dc)
HGS2MT5044	HGS2MT1010	6	130	3.0	0.5
HGS2MT5005	HGS2MT1011	12	520	6.0	1.0
HGS2MT5006	HGS2MT1012	24	2200	12.0	2.0
HGS2MT5010	HGS2MT1013	48	8000	24.0	4.0

* FORM C AFTER INITIAL BRIDGING AFTER PHYSICAL INVERSION.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

See YELLOW SECTION for Local Offices, Phones

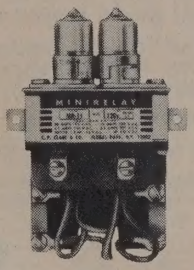
CLARE MERCURY DISPLACEMENT RELAYS

HCALSTOCK RELAYS

ATOI POWER RELAYS — 20 AMPS — 120 VAC
A LISTED)

pact ts capable of handling loads nearly twice that of nary ature type units of equal size. Hermetically sealed, ury-mercury contacts. No contacts to pit, stick or cor- Fu ting with inductive or resistive loads. Coil current, amp ingle pole; .080 amp, 2-pole. MR-1, 3 x 1⅞ x 1½"; 2. 4 ⅞ x 1½"; MR-11, 4½ x 3 x 1⅞". Coils — 120 VAC, Hz. 1 lbs.

Type	Description
MR-1	Normally Open, SPST
MR-2	Normally Closed, SPST
MR-11	2-Pole, Both N.O.
MR-111	3-Pole, All N.O.

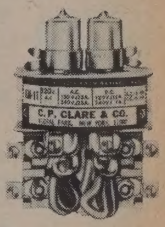


Type MR-11

NDA DUTY — 35 AMPS — 120 VAC
ND SA LISTED)

35 mps (per pole) at 120 VAC. Coil operating current: 05 amp; EM-2, .050 amp; EM-11, .120 amp; EM-111, .220 EM- 4¾ x 2⅝ x 2½"; EM-2, 5⅜ x 3⅜ x 2½"; EM-11, 6¼ ⅜ Coils — 120 VAC, 60 Hz. 2 lbs.

Type	Description
EM-1	Single Pole, N.O.
EM-2	Single Pole, N.C.
EM-11	2-Pole, Both N.O.
EM-111	3-Pole, All N.O.

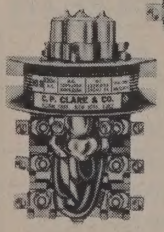


Type EM-11

VY-DTY — 60 AMPS — 120 VAC
ND SA LISTED)

HD-rated 60 amps for 120 V and 35 amps for 230 V, 60 AC. Ty HD-2 2-pole relay; each pole, 60 amps at 115 V, and amps 230 V. Type HD-11 3-pole relay; each pole, 60 amps 120 and 35 amps at 230 V. Coils — 120 VAC, 60 Hz. ⅜ x 5 x3¾"; +2⅜ x 5¾ x 3¾"; § 3⅜ x 6⅝ x 4". 3 lbs.

Type	Description
HD-1	Single Pole, N.O.*
HD-2	Single Pole, N.C.+
HD-11	2-Pole, Both N.O.§
HD-111	3-Pole, All N.O.

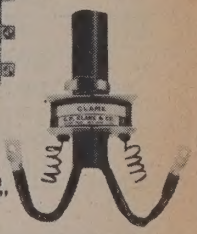


Type HD-111

00" LAY — 100 AMPS — 120 VAC (CSA LISTED)

nt-mo ted load and coil terminals. Rated 100 amps at 120 V, or 1 kW resistive load capacity. Coil operating current, 0 am 7 x 3½ x 3⅜". Coils, 120 VAC, 60 Hz. 4 lbs.

Type	Description
100	Single Pole, N.O.



Type "100"

"H-POWER" ENCAPSULATED RELAYS

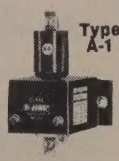
gh pe rmance relays have hermetically sealed steel shells th ceric lined electrode chamber, epoxy insulation. Similar above elays, but with higher current capacity, maximum reli- ility. pervious to physical or thermal shock, moisture and rt Ty s S and T completely encapsulated. Rated to switch ds up o 550 volts AC. Coils — 120 VAC, 60 Hz.

YPE A — MINIATURE POWER

25 Amps/120 VAC 25 Amps/240 VAC

zes: A, 4¼ x 3 x 2¼"; A-11, 4¼ x 4¼ x 2½". 2 lbs.

Type	Description
A-1	Single Pole, N.O.
A-2	Single Pole, N.C.
A-11	2-Pole, Both N.O.
A-111	3-Pole, All N.O.



Type A-1

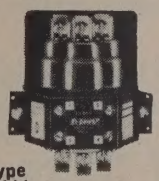
Type A-111

YPE B — STANDARD DUTY

50 Amps/120 VAC 35 Amps/240 VAC

zes: B, 4¾ x 3 x 2¼"; B-11, 4¾ x 4¼ x 2½"; B-111, 4¾ x ¼ x 3". 3 lbs.

Type	Description
B-1	Single Pole, N.O.
B-11	2-Pole, Both N.O.
B-111	3-Pole, All N.O.



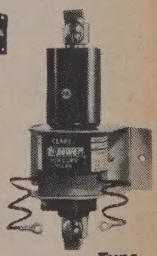
Type B-111

YPE H — HEAVY DUTY

100 Amps/120 VAC 90 Amps/240 VAC

zes: H-1, 7½ x 4 x 3½"; H-11, 7½ x 6½ x 4". 6 lbs.

Type	Description
H-1	Single Pole, N.O.
H-11	2-Pole, Both N.O.
H-111	3-Pole, All N.O.



Type H-1

OMPLETELY ENCAPSULATED

Type S 25 Amp/120 VAC Type T 50 Amp/120 VAC

oxy ce, sealed; molded terminals. Sizes: S-1, 3½ x 1¾ x 1⅝"; 1. 37 x 2 x 1⅞". 1 lb.

Type	Description
S-1	Single Pole, N.O.
T-1	Single Pole, N.O.

Type S-1

D HIGH-POWER TIME DELAY RELAYS

ngle le, N.O. mercury-to-mercury contacts. Delay circuit resets on ompletion of delay. Load contacts are totally isolated from lay rcuit and are capable of switching loads to 550 VAC. angel −10° to +65°C. Repeatability, ±2%. Hermetically aled Sizes: TD-A, 4 3/16 x 3 x 2¼"; TD-B, 4¾ x 3 x 2¼"; TD-H, ¾ x 3⅝". Delay operates from 120 VAC. *Time range in scon Av. shpg. wt. 2 lbs.

25 AMPS AT 120 VAC 15 AMPS AT 550 VAC

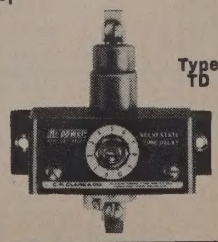
Type
TD-A-1-.5-60S-120 VAC

50 AMPS AT 120 VAC 25 AMPS AT 550 VAC

Type
TD-B-1-.5-60S-120 VAC

100 AMPS AT 120 VAC 70 AMPS AT 550 VAC

Type
TD-H-1-.5-60S-120 VAC



Type TD

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CLARE

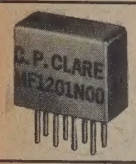
C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-

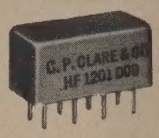
CLARE MILITARY-TYPE (CRYSTAL CAN) RELAYS

Aerospace and ground support equipment, communications, instrumentation, data processing, industrial process cont

- Long electrical and mechanical life, under extreme conditions of temperature, shock, vibration, linear acceleration.
- Sensitivities from 40 mw.
- Wide variety of mounting styles.
- Wide range of relay types in addition to those listed.
- Versatile contact capabilities — low level to 10 amp. Gold-plated contact areas, high contact pressures, positive wiping action.



Type MF
L — .500″
W — .230″
H — .400″
Data Sheet 756



Type HF
L — .810″
W — .410″
H — .410″
Manual 701

Type F
L — .800″
W — .400″
H — .900″
(Standard crystal can size)
Manual 701

Type PF
L — 1.07
W — .51
H — 1.30
Data Sheet 7

TYPICAL STOCK RELAYS

Relay Type	Part Number	Enclosure	Vibration Resistance
MF	MF1201N00	Plain Case	20g
	MF1202N00	Ear Brackets	20g
	MF1105N00	Side Brackets	20g
HF	HF1201D00	Plain Case	30g
F	RP7630G2	Plain Case	30g
	RP7631G12	Side Plate	20g
	RP7632G1	Ear Brackets	20g
	RP7633G4	Stud — top	15g
	RP7640G1	Stud — side	20g

Relay Type	Part Number	Enclosure	Vibratio Resistan
F	RP7641G2	Plain Case	30g
	RP7641G8	Plain Case	30g
	RP9809G1	Ear Brackets	20g
	RP9817G1	Ear Brackets	20g
	RP9895G3	Side Plate	20g
	RP9896G9	Side Plate	20g
PF	PF1101L00	Plain Case	20g
	PF1102L00	Ear Brackets	20g
	PF1203L00	Ear Brackets	20g

Electrical Characteristics	MF	HF	F	PF
Contact Arrangement	2 Form C (dpdt)			
Contact Rating — High Level	0.5 amp. res. @ 30 vdc, +125°C 150,000 miss-free operations.	2.0 amp. res. @ 28 vdc 1.0 amp. res. @ 115 vdc 100,000 miss-free operations, monitored at every operation for a maximum drop of 1.0% of source voltage.		10.0 amp. res. 28 vdc — 100,0 miss-free oper tions.
Contact Rating — Low Level	Note 1	Note 2	Note 2	
Contact Resistance Before Life	50 milliohms max. @ 6v, 100 ma			10 milliohms ma (measured per MIL-R-5757)
Contact Resistance After Life	100 milliohms max @ 6v, 100 ma			20 milliohms ma
Coil Resistance (ohms) Relays Shown	1500	1250	675	300
Available	30-5500	40-3500	35-10,000	16-4800
Must Operate Sensitivity, Nominal (mw) Relays Shown	125	160	250	550
Available	125	160	40	550
Must operate Voltage dc at 25°C Relays Shown	13.0	14.0	13.5	12.5
Available	5.25-45	5.0-48	3.2-51	3.0-54

Note 1: 10 μa @ 10mv; 150,000 miss-free operations monitored at every operation for a maximum drop of 0.5mv.
Note 2: 10 μa @ 10mv; 100,000 miss-free operations monitored at every operation for a maximum drop of 0.5mv.

TYPE TF TRANSISTOR CASE RELAY — MILITARY OR INDUSTRIAL

- Low level to 1 amp. contact rating.
- 2.0 ms max. operate time.
- 80 g ½ sinewave shock, 11 ±1 ms.
- 30 g to 3000 cps vibration.
- Hermetically sealed welded enclosure.
- 100,000 min. operations at 28 vdc lamp. resistive load.
- Temperature ranges:
  Military: −65°C to +125°C
  Industrial: −55°C to +75°C

Type TF Relays combine the advantages of electromechanical performance (immunity to transients, input-ou isolation, positive on-off switching, etc.) with assembly and handling techniques for pcb mounting with transis and other solid state devices. For complete information, call your Clare sales engineer.

	COIL RESISTANCE OHMS	MUST OPERATE SENSITIVITY (NOMINAL)	MUST OPERATE VOLTAGE AT 25°C
1-FORM C CONTACT	98-2000	100 mw	4.5-18 vdc
2-FORM C CONTACTS	98-2000	130 mw	4.5-18 vdc

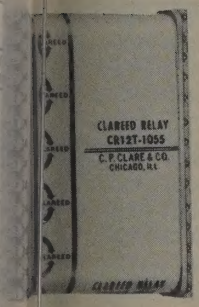
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLAREED® SEALED-CONTACT REED RELAYS

Industrial control, data logging and instrumentation, communication switching, ground control and check-out systems.

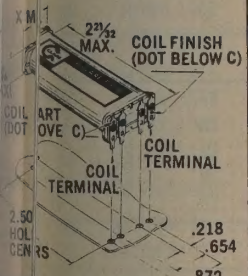
- Inherent reliability with no maintenance (contacts sealed in glass).
- Switching speeds in low millisecond range.
- Immunity to transient electrical noise.
- Contact load versatility . . . low level to 50 va.
- Life: 20 x 10^6 or 100 x 10^6 at full rated load depending on choice of switches.
- One to twelve contacts.
- Packaging for pcb or wired chassis . . . or as functional pcb assemblies.

CLARE TYPE CRT



CONTACT RATING:
1 amp max., 250 volts max., 5 va max.

PACKAGING:
Coils and contacts have fixed terminals for printed circuit board mounting.



TYPICAL CRT RELAY

Clare Part No.	Nominal Operating Voltage dc	Must Operate Voltage dc at +25°C	Coil Resistance	Contact Action	Maximum Voltage at +25°	Must Release Voltage at +25°	X Dimension (inches)
CRT-1007	6	4.4	160	1 Form A	20	0.60	5/8
CR2T-1004	6	4.5	88	2 Form A	18	0.54	27/32
CR3T-1005	6	4.6	70	3 Form A	17	0.54	1 1/16
CR5T-1004	6	4.4	40	5 Form A	16	0.48	1 1/2
CR6T-1003	6	4.3	31	6 Form A	15	0.47	1 49/64
CR8T-1002	6	4.2	25	8 Form A	15	0.46	2 13/64
CR12T-1001	6	3.8	14	12 Form A	13	0.40	3 7/64
CRT-1010	12	8.7	600	1 Form A	38	1.20	5/8
CR2T-1006	12	7.3	235	2 Form A	28	0.88	27/32
CR3T-1007	12	7.4	180	3 Form A	28	0.86	1 1/16
CR5T-1007	12	8.7	155	5 Form A	32	0.95	1 1/2
CR6T-1006	12	8.4	120	6 Form A	29	0.92	1 49/64
CR8T-1005	12	8.4	96	8 Form A	29	0.91	2 13/64
CR12T-1004	12	7.5	53	12 Form A	25	0.79	3 7/64
CRT-1013	24	18.0	2500	1 Form A	78	2.5	5/8
CR2T-1010	24	18.0	1400	2 Form A	68	2.2	27/32
CR3T-1011	24	18.0	1070	3 Form A	67	2.1	1 1/16
CR5T-1010	24	19.0	650	5 Form A	63	2.0	1 1/2
CR6T-1009	24	18.0	510	6 Form A	60	1.9	1 49/64
CR8T-1008	24	17.0	380	8 Form A	58	1.8	2 13/64
CR12T-1007	24	16.0	210	12 Form A	50	1.6	3 7/64
CRT-1016	48	35.0	9450	1 Form A	150	4.8	5/8
CR2T-1013	48	36.0	5400	2 Form A	133	4.4	27/64
CR3T-1014	48	38.0	4450	3 Form A	137	4.4	1 1/16
CR5T-1013	48	37.0	2550	5 Form A	124	3.9	1 1/2
CR6T-1012	48	34.0	1900	6 Form A	117	3.8	1 49/64
CR8T-1011	48	32.0	1450	8 Form A	114	3.5	2 13/64
CR12T-1010	48	32.0	900	12 Form A	107	3.3	3 7/64
CRT-1026	24	18.0	1400	1 Form B	55	2.2	27/32
CR2T-1025	24	17.0	690	2 Form B	37	1.2	1 1/16
CR2T-1041	24	17.0	455	1 Form C	33	1.8	1 1/16
CR4T-1009	24	20.0	410	2 Form C	34	1.0	1 1/2
CR6T-1025	24	17.0	235	3 Form C	32	1.1	2 13/64
CR8T-1025	24	19.0	210	4 Form C	31	0.97	3 7/64
CR2T-1058	24	17.0	455	1A and 1B	33	1.8	1 1/16
CR4T-1027	24	20.0	410	2A and 2B	34	1.0	1 1/2
CR6T-1056	24	17.0	235	3A and 3B	32	1.1	2 13/64
CR8T-1040	24	19.0	210	4A and 4B	31	0.97	3 7/64

BI-STABLE (LATCHING)

CRT-1065	24	17.0/17.0	6400/6400	1 Form A	58	—	27/32
CR2T-1079	24	16.7/16.7	3200/3200	2 Form A	52	—	1 1/16

For detail characteristics see Data Sheet 951.

* Max. voltage based on 2.4 watt.

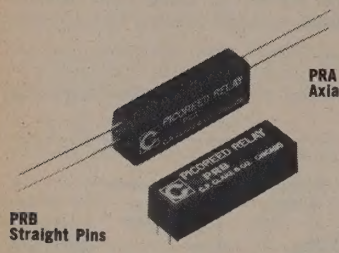
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE

C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 26/7

PICOREED® RELAYS



High-speed subminiature glass-encapsulated reed rela i molded epoxy modules. Response time, size sensitivity ar re liability characteristics provide complete electrical and ck aging compatibility with IC solid-state devices. Econo ca reliable solid-state input-output isolation buffering. Load pa bility: low level to 10 va. Low profile 1 Form A size:

L — .781"; W — .250"; H — .187"

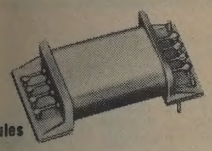
Clare Part No.		Nominal Operating Voltage DC	Must Operate Voltage at +25°C	Coil Resistance Ohms ±10% at +25°C	Contact Action	Maximum Voltage at +25°C	Must Re Voltage at +25
Printed Circuit	Axial Leads						
LOW PROFILE							
PRB-2010	PRA-2010	6	4.50	387	1 Form A	19	.80
PR2B-2007	PR2A-2007	6	4.50	136	2 Form A	19	.80
PR3B-2006	PR3A-2006	6	4.50	117	3 Form A	19	.80
PR4B-2005	PR4A-2005	6	4.50	88	4 Form A	19	.80
PR5B-2005	PR5A-2005	6	4.50	105	5 Form A	19	.80
PRB-2013	PRA-2013	12	9.00	1200	1 Form A	34	2.00
PR2B-2011	PR2A-2011	12	9.00	740	2 Form A	34	2.00
PR3B-2009	PR3A-2009	12	9.00	483	3 Form A	34	2.00
PR4B-2008	PR4A-2008	12	9.00	351	4 Form A	34	2.00
PR5B-2008	PR5A-2008	12	9.00	419	5 Form A	34	2.00
PRB-2016	PRA-2016	24	18.00	5380	1 Form A	73	4.00
PR2B-2014	PR2A-2014	24	18.00	3042	2 Form A	73	4.00
PR3B-2013	PR3A-2013	24	18.00	2254	3 Form A	73	4.00
PR4B-2012	PR4A-2012	24	18.00	1856	4 Form A	73	4.00
PR5B-2011	PR5A-2011	24	18.00	1424	5 Form A	73	4.00
HIGH SENSITIVITY							
PRB-2009H	PRA-2009H	6	4.50	535	1 Form A	19	1.00
PR2B-2007H	PR2A-2007H	6	4.50	295	2 Form A	19	1.00
PR3B-2006H	PR3A-2006H	6	4.50	230	3 Form A	19	1.00
PR4B-2005H	PR4A-2005H	6	4.50	155	4 Form A	19	1.00
PR5B-2005H	PR5A-2005H	6	4.50	180	5 Form A	19	1.00
PRB-2013H	PRA-2013H	12	9.00	2870	1 Form A	34	2.50
PR2B-2010H	PR2A-2010H	12	9.00	1180	2 Form A	34	2.50
PR3B-2009H	PR3A-2009H	12	9.00	877	3 Form A	34	2.50
PR4B-2008H	PR4A-2008H	12	9.00	663	4 Form A	34	2.50
PR5B-2008H	PR5A-2008H	12	9.00	771	5 Form A	34	2.50
PRB-2016H	PRA-2016H	24	18.00	11900	1 Form A	73	4.50
PR2B-2013H	PR2A-2013H	24	18.00	3780	2 Form A	73	4.50
PR3B-2013H	PR3A-2013H	24	18.00	4700	3 Form A	73	4.50
PR4B-2012H	PR4A-2012H	24	18.00	3620	4 Form A	73	4.50
PR5B-2011H	PR5A-2011H	24	18.00	3150	5 Form A	73	4.50
LOW PROFILE							
PRB-3010	PRA-3010	5*	3.75	387	1 Form A	19	.80
PR2B-3007	PR2A-3007	5*	3.75	136	2 Form A	19	.80
PR3B-3006	PR3A-3006	5*	3.75	117	3 Form A	19	.80
PR4B-3005	PR4A-3005	5*	3.75	88	4 Form A	19	.80
PR5B-3005	PR5A-3005	5*	3.75	105	5 Form A	19	.80
HIGH SENSITIVITY							
PRB-3009H	PRA-3009H	5*	3.75	535	1 Form A	19	1.00
PR2B-3007H	PR2A-3007H	5*	3.75	295	2 Form A	19	1.00
PR3B-3006H	PR3A-3006H	5*	3.75	230	3 Form A	19	1.00
PR4B-3005H	PR4A-3005H	5*	3.75	155	4 Form A	19	1.00
PR5B-3005H	PR5A-3005H	5*	3.75	180	5 Form A	19	1.00

* Sensitive relay (available at slight price increase for other voltages).

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE MINIATURE SEALED-CONTACT REED RELAYS

CLARE



MRMC Plan-type Modules

MICROCLAREED® RELAYS

MRME
Molded Epoxy

(Similar metal-covered relays also available with and without polyurethane fill)

Sizes	MRMC Relays	MRME Relays	MRMD, MRMF
L	1 15/64"	1 15/64"	1.266"
H	11/32"	.385"	.316"
W	See W in Table Below		

All the advantages of Clareed Relays in one-fifth the size. Switching speeds as low as 500 microseconds — fully compatible with other process-control equipment. Immune to false operation by transients — insensitive to overload transients which would damage solid-state devices. Load capability: low level to 10 va.

Clare Part Number				Nominal Operating Voltage DC	Must Operate Voltage DC at +25°C	Coil Resistance Ohms ±10% at +25°C	Contact Action	Max. Voltage at +25°C	Must Release Voltage DC at +25°C	"W"
Epoxy Molded	Metal Covered	Metal Covered Polyurethane Filled	Open Type							
MRME-1041	MRMD-1041	MRMF-1041	MRMC-1041	6	4.0	218	1 Form A	14	.29	11/32"
MR2ME-1041	MR2MD-1041	MR2MF-1041	MR2MC-1041	6	4.0	168	2 Form A	14	.36	29/64"
MR3ME-1041	MR3MD-1041	MR3MF-1041	MR3MC-1041	6	4.0	125	3 Form A	14	.37	35/64"
MR4ME-1041	MR4MD-1041	MR4MF-1041	MR4MC-1041	6	4.0	95	4 Form A	13	.35	21/32"
MR5ME-1041	MR5MD-1041	MR5MF-1041	MR5MC-1041	6	4.0	70	5 Form A	12	.49	3/4"
MRME-1042	MRMD-1042	MRMF-1042	MRMC-1042	12	8.0	790	1 Form A	28	.57	11/32"
MR2ME-1042	MR2MD-1042	MR2MF-1042	MR2MC-1042	12	8.0	635	2 Form A	28	.57	29/64"
MR3ME-1042	MR3MD-1042	MR3MF-1042	MR3MC-1042	12	8.0	510	3 Form A	28	.92	35/64"
MR4ME-1042	MR4MD-1042	MR4MF-1042	MR4MC-1042	12	8.0	410	4 Form A	28	.78	21/32"
MR5ME-1042	MR5MD-1042	MR5MF-1042	MR5MC-1042	12	8.0	285	5 Form A	25	1.0	3/4"
MRME-1043	MRMD-1043	MRMF-1043	MRMC-1043	24	16.0	3060	1 Form A	55	1.1	11/32"
MR2ME-1043	MR2MD-1043	MR2MF-1043	MR2MC-1043	24	16.0	2580	2 Form A	56	1.4	29/64"
MR4ME-1043	MR3MD-1043	MR3MF-1043	MR3MC-1043	24	16.0	1950	3 Form A	55	1.6	35/64"
MR4ME-1043	MR4MD-1043	MR4MF-1043	MR4MC-1043	24	16.0	1500	4 Form A	54	1.9	21/32"
MR5ME-1043	MR5MD-1043	MR5MF-1043	MR5MC-1043	24	16.0	1070	5 Form A	49	2.0	3/4"
MRME-1044	MRMD-1044	MRMF-1044	MRMC-1044	48	32.0	12,200	1 Form A	110	2.2	11/32"
MR2ME-1044	MR2MD-1044	MR2MF-1044	MR2MC-1044	48	32.0	9450	2 Form A	106	3.4	29/64"
MR3ME-1044	MR3MD-1044	MR3MF-1044	MR3MC-1044	48	32.0	7450	3 Form A	102	3.3	35/64"
MR4ME-1044	MR4MD-1044	MR4MF-1044	MR4MC-1044	48	32.0	5750	4 Form A	104	3.1	21/32"
MR5ME-1044	MR5MD-1044	MR5MF-1044	MR5MC-1044	48	32.0	4350	5 Form A	98	4.0	3/4"
MRME-1045	MRMD-1045	MRMF-1045	MRMC-1045	6	4.0	280	1 Form B	8.7	.38	29/64"
MR2ME-1045	MR2MD-1045	MR2MF-1045	MR2MC-1045	6	4.0	125	2 Form B	9.4	.40	35/64"
MR3ME-1045	MR3MD-1045	MR3MF-1045	MR3MC-1045	6	4.0	46	3 Form B	8.8	.36	3/4"
MR4ME-1045	MR4MD-1045	MR4MF-1045	MR4MC-1045	6	4.0	46	2A2B	8.8	.36	3/4"
MRME-1046	MRMD-1046	MRMF-1046	MRMC-1046	12	8.0	1030	1 Form B	18	.92	29/64"
MR2ME-1046	MR2MD-1046	MR2MF-1046	MR2MC-1046	12	8.0	510	2 Form B	18	1.5	35/64"
MR3ME-1046	MR3MD-1046	MR3MF-1046	MR3MC-1046	12	8.0	170	3 Form B	17	.76	3/4"
MR4ME-1046	MR4MD-1046	MR4MF-1046	MR4MC-1046	12	8.0	170	2A2B	17	.77	3/4"
MRME-1047	MRMD-1047	MRMF-1047	MRMC-1047	24	16.0	3930	1 Form B	35	1.7	29/64"
MR2ME-1047	MR2MD-1047	MR2MF-1047	MR2MC-1047	24	16.0	1950	2 Form B	38	2.3	35/64"
MR3ME-1047	MR3MD-1047	MR3MF-1047	MR3MC-1047	24	16.0	700	3 Form B	34	1.5	3/4"
MR4ME-1047	MR4MD-1047	MR4MF-1047	MR4MC-1047	24	16.0	700	2A2B	35	1.5	3/4"
MRME-1048	MRMD-1048	MRMF-1048	MRMC-1048	48	32.0	15,800	1 Form B	67	2.9	29/64"
MR2ME-1048	MR2MD-1048	MR2MF-1048	MR2MC-1048	48	32.0	7450	2 Form B	70	4.5	35/64"
MR3ME-1048	MR3MD-1048	MR3MF-1048	MR3MC-1048	48	32.0	2670	3 Form B	68	3.1	3/4"
MR4ME-1048	MR4MD-1048	MR4MF-1048	MR4MC-1048	48	32.0	2670	2A2B	70	2.9	3/4"
MRME-1049	MR2MD-1049	MR2MF-1049	MR2MC-1049	6	4.0	51	1A1B	9.0	.45	35/64"
MRME-1049	MR3MD-1049	MR3MF-1049	MR3MC-1049	6	4.0	40	2A1B	9.5	.39	21/32"
MRME-1050	MR2MD-1050	MR2MF-1050	MR2MC-1050	12	8.0	210	1A1B	18	.76	35/64"
MRME-1050	MR3MD-1050	MR3MF-1050	MR3MC-1050	12	8.0	148	2A1B	17	.66	21/32"
MRME-1051	MR2MD-1051	MR2MF-1050	MR2MC-1050	24	16.0	780	1A1B	35	1.4	35/64"
MRME-1051	MR3MD-1051	MR3MF-1051	MR3MC-1051	24	16.0	600	2A1B	35	1.3	21/32"
MRME-1052	MR2MD-1052	MR2MF-1052	MR2MC-1052	48	32.0	3170	1A1B	70	2.8	35/64"
MRME-1052	MR3MD-1052	MR3MF-1052	MR3MC-1052	48	32.0	2310	2A1B	69	2.7	21/32"

"W" dimension of MRME are 1/16" greater than listed. For MRMD and MRMF, comparable dimensions are: 11/32", .372"; 29/64", .472"; 35/64", .572"; 21/32", .672"; 3/4", .772".

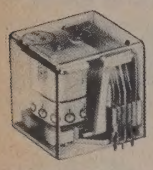
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-0

TELEPHONE-TYPE RELAYS

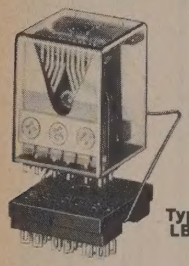
TYPE LB/LA



LB (shown):
Direct PCB Mounting, 6 Form C, with Clear Plastic Cover.
For detail characteristics see Data Sheet 552B.
LA:
Similar to above but 4 Form C — Data Sheet 556.

LB Part No.	LA Part No.	Nominal Operating Voltage	Must Operate Voltage	Max. Coil Voltage
LB-0060B00	LA-0040B00	12	6.9	17.7
LB-0060D00	LA-0040D00	24	14.4	37.6
LB-0060H00	LA-0040H00	14	8.4	21.9
LB-0060J00	LA-0040J00	34	19.0	52.6
LB-0060K00	LA-0040K00	30	17.5	46.9

TYPE LBP/LAP



Type LBP

Plug-in for use with sockets.

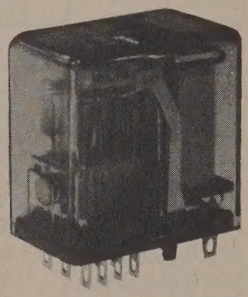
LBP Part No.	LAP Part No.	Nominal Operating Voltage	Must Operate Voltage	Max. Coil Voltage
LBP-0060D00	LAP-0040D00	24	14.4	37.6
LBP-0060K00	LAP-0040K00	30	17.5	46.9

For detail characteristics see Data Sheet 552B (LB) or 556 (LA).

ACCESSORIES

LB/LBP Part No.	LA/LAP Part No.	Description
RP-15450-G5	FV-770	Socket for Wired Assemblies
RP-15450-G6	FV-769	Socket for PCB Mounting
RP-15423	——	14 Relay Mounting Strip—19"
RP-15613	——	13 Relay Mounting Strip—19"

VARLEY



Direct Plug-in Relay with Clear Plastic Dust Cover.

Note 1: 1 amp max., 100 volts max., 30 watts.
Note 2: 5 amps max., 220 volts max., 100 watts.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact Rating
VP2CAB12	12	185	2C	Note
VP2CAB26	26	700	2C	Note
VP2CAB47	47	2500	2C	Note
VP2CAB120	120	15000	2C	Note
VP2CBB12	12	185	2C	Note
VP2CBB26	26	700	2C	Note
VP2CBB47	47	2500	2C	Note
VP2/HDCAB12	12	185	2C	Note
VP2/HDCAB26	26	700	2C	Note
VP2/HDCAB120	120	15000	2C	Note
VP4CAB12	12	185	4C	Note
VP4CAB26	26	700	4C	Note
VP4CAB47	47	2500	4C	Note
VP4CAB120	120	15000	4C	Note
VP4CBB26	26	700	4C	Note
VP4CBB47	47	2500	4C	Note
VP4CBB120	120	15000	4C	Note
VP6MAB12	12	185	6A	Note
VP6MAB26	26	700	6A	Note
VP6MAB120	120	15000	6A	Note
VP6MBB26	26	700	6A	Note

MISCELLANEOUS ITEMS

Clare Part No.	Description
RP-15223-5	SOCKET—Printed Circuit TERMINALS—for VP2C Relay
RP-15223	SOCKET—Printed Circuit TERMINALS—for VP4C, VP6M, VP2/HD Re
RP-15223-1	SOCKET—Solder tab TERMINALS—for VP2C Relay
RP-15223-2	SOCKET—Solder tab TERMINALS—for VP4C, VP6M, VP2/HD Relays

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE GENERAL PURPOSE RELAYS

Series GP1 - 4PDT, 3 AMP, AC or DC

- 10 hp, 250 VAC contact rating.
- Opposite polarity design.
- Choice of six contact types: Gold flashed silver button, silver cadmium oxide button, palladium button, gold alloy button, palladium crossbar, gold alloy crossbar.
- Designed for U/L recognition.
- Interchangeable with existing relays.
- Competitively priced.
- Delivery off-the-shelf in 132 models listed — fast delivery on customized variations.

CLARE GENERAL PURPOSE RELAY

The new general purpose relay from Clare, 30-year-leader in relays and related control components.

Typical applications: Appliances, vending machines, business machines, industrial control systems, communications instrumentation, peripheral EDP equipment.

Height: .281"
Width: .109"
Depth: .859"

Voltage (vdc)	PART NUMBERS: Gold Flashed Silver Button Contacts	PART NUMBERS: Silver Cadmium Oxide Button Contacts	Coil Resistance (ohms)	Average Current (ma)
6	GP1R11D0000	GP1R21D0000	40	150
12	GP1R11D1000	GP1R21D1000	160	75
24	GP1R11D2000	GP1R21D2000	650	37
48	GP1R11D3000	GP1R21D3000	2,600	18
90	GP1R11D4000	GP1R21D4000	9,000	10
110	GP1R11D5000	GP1R21D5000	11,000	10

Voltage (vac)	PART NUMBERS: Gold Flashed Silver Button Contacts	PART NUMBERS: Silver Cadmium Oxide Button Contacts	Coil Resistance (ohms)	Average Current (ma)
6	GP1R11A0000	GP1R21A0000	11	200
12	GP1R11A1000	GP1R21A1000	43	100
24	GP1R11A2000	GP1R11A2000	160	52
48	GP1R11A3000	GP1R21A3000	668	25
120	GP1R11A6000	GP1R21A6000	3,900	11

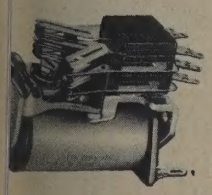
Relays listed above are stock items with same polarity rating and solder lug/plug in terminals. Stock relays with opposite polarity rating may be ordered by changing "R" to "Q". ¾" pcb terminals may be ordered by changing the second digit after the letter "R" from "1" to "2". For taper tabs, change this digit to "3".

TELEPHONE-TYPE RELAYS

Industrial, commercial and military ground systems where cost and life are important considerations.

- Long Life: up to 50 x 10^6 operations.
- Variety of enclosures and contact materials.
- Variety of terminals . . . pcb, direct plug-in, solder, taper tab.
- Highly reliable contacts, with independent twin contact surfaces.
- Stable, adjustment-free operation.
- Consistently reliable performance at low cost.

TYPE J



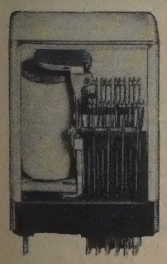
TERMINALS: Solder tabs — slotted.

MOUNTING: Two #6-32 NC tapped holes in relay heelpiece; mounting hardware included in relay price.

For detail characteristics see Manual 501.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact and Rating
J242C24	24	500	2C	Note 1
J244C24	24	500	4C	Note 1
J246C24	24	300	6C	Note 1
J482C24	48	1300	2C	Note 1
J486C24	48	1000	6C	Note 1
J1102C24	110	6500	2C	Note 1
J1104C24	110	6500	4C	Note 1
J1106C24	110	5000	6C	Note 1

TYPE JDP



Direct Plug-in Relay Clear Plastic Dust Cover, Socket and Mounting Screws included in Relay Price.

For detail characteristics see Data Sheet 551.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact and Rating
JDP242C24	24	500	2C	Note 1
JDP244C24	24	500	4C	Note 1
JDP246C24	24	300	6C	Note 1
JDP484C24	48	1300	4C	Note 1
JDP486C24	48	1000	6C	Note 1
JDP1104C24	110	6500	4C	Note 1
JDP1106C24	110	5000	6C	Note 1

Note 1 — Twin Palladium. 4 Amps, 150 Watts, A.C., N.I.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE

C. P. CLARE & CO.

3101 PRATT BOULEVARD, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262 7

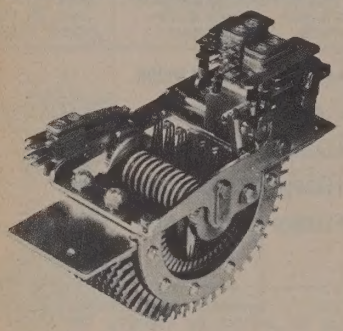
STEPPING SWITCHES

Mass sequential switching — counting, totalizing, scanning, sequence control, circuit monitoring.

- Low cost scanning and counting.
- Maximum switching density.
- Special purpose shorting switches . . . "All But One," "Progressive," "Alternate" operations.
- Long service life and low maintenance.
- Special high voltages are availale.
- Special modifications and functional assemblies handling complex sequential switching operations.

CLARE

For detail characteristics see Manual 601.



CONTACT RATINGS:
Bank and Wiper — Switch 100 ma, 30 vdc resistive . . . Carry 3 amps . . . Interrupter and Off-Normal — 2 amps, 150 watts.

QUICK-MOUNT MODELS AVAILABLE
Fast unit-for-unit replacement — no resoldering — minimum downtime. See Data Sheet 651-3A

	Clare Part No.	Nominal Operating Voltage dc	Coil Resistance	No. of Levels	Interrupter Contacts
TYPE 20	20-2404	24	35	4 of 20 pt.	1C
	20-2408	24	35	8 of 20 pt.	1C
	20-2412	24	20	12 of 20 pt.	1C
	20-2416	24	20	16 of 20 pt.	1C
	20-2428	24	35	8 of 40 pt.	1C
	20-4808	48	100	8 of 20 pt.	1C
TYPE 26	26-2404	24	35	4 of 26 pt.	1C
	26-2408	24	35	8 of 26 pt.	1C
	26-2416	24	20	16 of 26 pt.	1C
	26-2428	24	35	8 of 52 pt.	1C
	26-4812	48	70	12 of 26 pt.	1C
	26-11004	110	600	4 of 26 pt.	1C
	26-11008	110	600	8 of 26 pt.	1C
	26-11012	110	400	12 of 26 pt.	1C
	26-11024	110	600	4 of 52 pt.	1C
TYPE 210	210-2403	24	24	3 of 10 pt.	1C
	210-2406	24	24	6 of 10 pt.	1C
	210-2409	24	20	9 of 10 pt.	1C
	210-2412	24	20	12 of 10 pt.	1C
	210-11003	110	600	3 of 10 pt.	1C
	210-11006	110	600	6 of 10 pt.	1C
	210-11012	110	400	12 of 10 pt.	1C
TYPE 211	211-2403	24	24	3 of 11 pt.	1C
	211-2406	24	24	6 of 11 pt.	1C
	211-2412	24	20	12 of 11 pt.	1C
	211-11003	110	600	3 of 11 pt.	1C
	211-11006	24	24	6 of 11 pt.	1C
	211-11009	110	400	9 of 11 pt.	1C

CLARE

ACCESSORIES

Clare Part No.	Description
RP-2702	Short Bracket } used with Rubber Mounts
RP-2703	Long Bracket } Type 20 and 26
RP-2902	Long Bracket for Type 20 and 26
RP-2903	Short Bracket for Type 20 and 26
RP-3335	Switch Rubber Mounts, Type 26
RP-3336	Switch Rubber Mounts, Type 20
RP-9565	Mounting Stud for Type 11 Switch
RP-11049	Switch Rubber Mounts, Type 210 & 211
RP-11062	Shelf Mtg. Bracket, Type 200

Clare Part No.	Description
RP-11068	Base Mounting Bracket, Type 200
RP-11723-G6	24 VDC Varistors
RP-11723-G14	110 VDC Varistors
RP-8047	Stepping Switch Rectifier Unit for 115 VDC
RP-9466	Lubrication Kit — Standard
RP-9467	Lubrication Kit — Low Temperature
RP-11375	Switch Tool Kits

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

COMPUTER COMPONENTS INC.

REEDLAYS

88-06 Van Wyck Expressway Jamaica 18, New York Tel: AXtel 1-3500

SERIES

CCR SERIES

HVPC SERIES

MW SERIES

MF SERIES

PC SERIES

LO SERIES

SERIES	NUMBER OF POLES AVAILABLE	CONTACT RATING RESISTIVE			MAXIMUM INITIAL CONTACT RES. OHMS	MINIMUN BREAK-DOWN VOLTAGE D. C.	OPERATE TIME NOMINAL MILLISECS	MINIMUM I. R. AT +25°C	LIFE AT RATED LOAD OPER'S
		MAX AMPS D. C.	MAX. VOLTS D. C.	MAX WATTS D. C.					
MP-A	1 TO 6 POLES FORM A	.003 TO .500	28 TO 1000	10	.150 TO .200	400 TO 1200	1.0 TO 1.5	10^9	10^7
MP-C	1 TO 6 POLES FORM C	.250 TO .500	28 TO 150	3 TO 6	.150 TO .200	200 TO 250	1.5 TO 2.0	10^9	10^7
MCA	1 OR 2 POLES FORM A	.250	150	7	.200	250	1.0	10^9	10^7
MCC	1 OR 2 POLES FORM C	.250	150	4	.200	200	1.0	10^9	10^7
PCA	1 TO 6 POLES FORM A	1.0 TO 3.0	250 TO 1000	15 TO 100	.150 TO .500	400 TO 1500	1.0 TO 1.5	10^9	10^7
PCC	1 TO 6 POLES FORM C	.5 TO 1.5	100 TO 500	3 TO 20	.150 TO .500	350 TO 1000	1.5 TO 2.0	10^9	10^7
CR-A	1 TO 4 POLES FORM A	.003 TO .500	28 TO 1000	10	.150 TO .200	400 TO 1200	1.0 TO 1.5	10^9	10^7
CR-C	1 OR 2 POLES FORM C	.250 TO .500	28 TO 150	3 TO 6	.150 TO .200	200 TO 250	1.5 TO 2.0	10^9	10^7
MPC-A	1 TO 6 POLES FORM A	.003 TO .500	28 TO 1000	10	.150 TO .200	400 TO 1200	1.0 TO 1.5	10^9	10^7
OC-A	1 POLE ONLY FORM A	1.0 TO 3.0	250 TO 1000	15 TO 50	.150	500 TO 1500	1.0	10^9	10^7
OC-C	1 POLE ONLY FORM C	.5 TO 1.5	100 TO 500	3 TO 20	.150 TO .500	350 TO 1000	2.5	10^9	10^7
MMPC-A	1 TO 4 POLES FORM A	1.0	100	28 OR 50	.100	1000	1.0	10^9	20×10^6 50×10^6
MPC-A	1 TO 4 POLES FORM A	3.0	400	50	.075	1000	1.0	10^9	20×10^6
X-A	1 TO 4 POLES FORM A	.5	28	10	.200	250	1.0	10^{10}	10^6 AT 12 V $.5 \times 10^6$ AT 28 V
X-C	1 TO 4 POLES FORM C	.5	28	6	.200	250	1.0	10^{10}	

- ALL RELAYS ABOVE ARE AVAILABLE WITH THE FOLLOWING FEATURES:
  - 6, 12, 24 AND 48 V.D.C. COILS.
  - MAGNETIC AND/OR ELECTROSTATIC SHIELDING.
  - HIGHER INSULATION RESISTANCE.
  - AVAILABLE FOR +125°C OPERATION (STANDARD TEMPERATURE -55°C TO +85°C.)
- FOR DETAILED INFORMATION WRITE OR PHONE FOR OUR LATEST CATALOG.

BASIC REED RELAYS

REED COILS

SIZE (End drawings actual size)	CAT. NO. TYPE	VOLTS	TURNS	WIRE SIZE	RESISTANCE OHMS (Nominal)	AMP./TURNS (Nominal)	MILLIWATTS (Nominal)	NUMBER REEDS	REED FIG.	CONTACT FORMS	PRICES COILS ONLY 1-9	10-24	25-99	100-249
2" lg x .562" OD	S	6	4000	34	105						$1.50	$1.27	$1.12	$ .97
		12	7700	37	360			1	3 or 4	1 A	1.65	1.40	1.27	1.07
		24	13500	40	1400	250	400	1	5	1 C	1.80	1.53	1.35	1.17
		32	15000	41	1930			1	6	1 C or 1 D	2.40	2.04	1.80	1.56
		48	24000	43	5150						3.00	2.55	2.25	1.95
SR 2" lg x .500" OD; SF .500"	SR SF	6	4200	34	113						1.50	1.27	1.12	.97
		12	7400	38	450	200	330	1	3 or 4	1 A	1.65	1.40	1.27	1.07
		24	15000	40	1650			1	5	1 C	1.80	1.53	1.35	1.17
		32	18000	42	2840			1	6	1 C or 1 D	2.40	2.04	1.80	1.56
		48	24000	44	5890						3.00	2.55	2.25	1.95
1.450" lg x .470" OD	SP	6	3800	36	150						1.30	1.20	1.05	.95
		12	7300	39	600			1	3 or 7	1 A	1.50	1.35	1.20	1.10
		24	15000	42	2400	150	250				1.75	1.60	1.45	1.25
		32	18750	43	4000			1	5 or 6	1 C	2.00	1.80	1.65	1.45
		48	30000	45	9200						2.65	2.40	2.20	1.95
1.187" lg x .700" OD	SA	6	2300	33	65						1.50	1.27	1.12	.97
		12	4500	36	255			1	8	1 C	1.65	1.40	1.27	1.07
		24	8500	39	965	200	575				1.80	1.53	1.35	1.17
		32	12000	40	1810			1	9	1 C or 1 D	2.40	2.04	1.80	1.56
		48	17000	42	3660						3.00	2.55	2.25	1.95
2" lg x .500" x .720" OS	SD	6	3000	33	90						1.70	1.45	1.28	1.10
		12	5700	36	335			2	3 or 4	2 A	1.90	1.60	1.45	1.25
		24	11000	39	1290	200	430	2	3 & 5	1 A & 1 C	2.10	1.80	1.60	1.40
		32	14000	40	2165			2	6	2 C or 2 D	2.55	2.20	1.95	1.70
		48	24000	42	5700						3.20	2.75	2.40	2.10
2" lg x .843" OD	M	6	2100	31	50			3	3 or 4	3 A	1.60	1.36	1.20	1.04
		12	4000	34	175			3	5	3 C	1.70	1.45	1.27	1.10
		24	9000	37	820	250	700	3	6	3 C or 3 D	2.00	1.70	1.50	1.30
		32	12400	38	1400			3	3 & 5	2 A & 1 C	2.65	2.25	2.00	1.70
		48	17000	40	3120			3	3 & 5	1 A & 2 C	3.00	2.55	2.25	1.95
								3	7	3 A				
U .800" lg x .375" OD; UF .437	U UF	6	3200	38	150						1.20	1.02	.90	.78
		12	5700	42	625						1.30	1.10	.97	.85
		24	12600	44	2500	125	240	1	1 or 2	1 A	1.70	1.45	1.27	1.10
		32	17000	45	4000			1	2	1 C	2.10	1.78	1.57	1.36
		48	25000	47	8600						4.00	3.40	3.00	2.60
.800" lg x .500" x .375" OS	UD	6	2100	36	86			2	2	2 A	1.35	1.15	1.05	.90
		12	4250	39	350			3	1	3 A	1.45	1.25	1.10	.95
		24	8100	42	1320	125	400	2	1	2 B ★	1.80	1.60	1.35	1.20
		32	10500	43	2250			2	1	1 A & 1 B ★	2.05	1.75	1.52	1.30
		48	17500	45	5500			2	1	1 C ★	2.85	2.40	2.15	1.85
								2	2	2 C				
.772" lg x .710" x .340" OS	UT	6	1500	36	85			5	1	5 A	1.28	1.10	.97	.83
		12	3000	39	340			5	1	4 A & 1 B ★	1.30	1.12	1.00	.86
		24	6000	42	1300	105	420	5	1	3 A & 2 B ★	1.70	1.45	1.28	1.12
		32	8500	43	2550			4	1	4 B ★	2.00	1.60	1.42	1.22
		48	12000	45	5300			4	1	2 C ★	2.80	2.38	2.10	1.82
.690" lg x .875" x .500" OS	T	6	2200	35	100			4	2	4 A				
		12	4200	38	400			3	2	1 A & 2 B ★				
		24	8000	41	1600	125	350	3	2	1 B & 1 C ★	1.05	.89	.79	.68
		32	11000	42	2800			3	2	2 A & 1 B ★	1.15	.98	.86	.75
		48	14800	44	5800			3	2	1 A & 1 C ★	1.30	1.10	.97	.85
								6	1	6 A	1.45	1.23	1.09	.94
								5	1	5 A	1.85	1.57	1.39	1.20
								4	1	3 A & 1 B ★				
								4	1	2 A & 1 C ★				
								4	1	2 A & 2 B or 2 C ★				
								3	1	3 B ★				
								5	1	4 A & 1 B ★				
								4	1	1 A & 2 C ★				
								4	2	4 C				

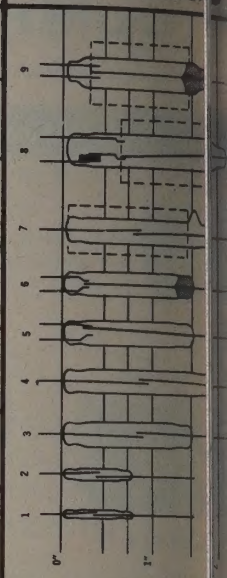
★ Bias Magnet Required

REED COILS

SIZE (End drawings actual size)	CAT. NO TYPE	VOLTS	TURNS	WIRE SIZE	RES. OHMS Nominal	AMP/TURNS Nominal	mW Nominal	NO. REEDS	REED FIG.	CONTACT FORMS	PRICES COILS ONLY 1 - 9	10 - 24	25 - 99	100 - 249
SE .625" x .655" x .812"; SEF LENGTH 1.450". Similar to "SD" for 2 short reeds Fig. 3. LEADS 3" flexible standard. P C pins optional.	SE SEF	6	3200	34	117						1.70	1.45	1.28	1.10
		12	6000	37	433				3	A	1.90	1.60	1.45	1.25
		24	11000	40	1610	160	350	2	5	or	2.10	1.80	1.60	1.40
		32	14500	41	2740				6 /	C	2.55	2.20	1.95	1.70
		48	23500	43	7200						3.20	2.75	2.40	2.10
UH .875" x 1.375"; LENGTH .718". Takes miniature reeds: 12 Fig. 2 up to 23 Fig. 1. LEADS 3/4" =20 T C	UH	12	3300	34	180			12	2	A or C*	1.70	1.45	1.27	1.10
		24	6000	37	720	200	800	or combinations to			2.00	1.70	1.50	1.30
		32	8300	38	1400			23	1	A	2.65	2.25	2.00	1.70
		48	10600	40	2640			*Form C is new. Size same as Fig. 2			3.00	2.55	2.25	1.95
SG 3 (¾" x 1¼")	SG 3	12	4000	34	205						2.60	2.10	1.80	1.60
		24	9000	37	850				3	A	3.00	2.40	2.10	1.80
		32	11290	38	1430	240	700	3	4 5	or	3.40	2.70	2.40	2.10
		48	18000	40	3800				6	C	3.50	2.80	2.50	2.20
		110	32000	43	13000						6.10	5.00	4.30	3.70
SH 4 (¾" x 1¾")	SH 4	12	3600	33	160						2.70	2.20	1.90	1.70
		24	7300	36	650				3	A	3.00	2.40	2.10	1.80
		32	9190	37	1090	260	900	4	4 5	or	3.20	2.60	2.30	1.95
		48	14000	39	2500				6	C	3.70	3.00	2.60	2.20
		110	30675	42	12300						6.50	5.20	4.60	3.90
SJ 5 (¾" x 1½")	SJ 5	12	3100	32	130						2.80	2.30	2.00	1.80
		24	6000	35	520				3	A	3.10	2.50	2.20	1.95
		32	7500	36	830	280	1150	5	4 5	or	3.20	2.60	2.30	2.00
		48	10950	38	1950				6	C	3.60	2.90	2.50	2.15
		110	25176	41	8900						5.20	4.20	3.70	3.20
SK 6 (¾" x 1¾")	SK 6	12	2600	31	100						2.90	2.40	2.10	1.90
		24	5000	34	400				3	A	3.20	2.70	2.30	2.00
		32	6890	35	680	310	1450	6	4 5	or	3.50	2.90	2.50	2.10
		48	10185	37	1575				6	C	3.90	3.20	2.80	2.30
		110	21000	40	7150						5.50	4.40	3.90	3.30

COIL CONNECTIONS BOTH ENDS LEADS =20 T C. All dimensions are nominal. (Drawing reduced)

REED SWITCHES



REED SWITCHES	MINIATURE 1	MINIATURE 2	STANDARD 3	STANDARD 4	STANDARD 5	STANDARD 6	STANDARD 7	JUMBO 8	JUMBO 9
REED FIG.					.220"				.320"
DIAMETER		.125"							
CONTACT FORM	A	A or C	A	A	C	C, D	A	C	C, D
CONTACT FORM with Bias Magnet	B	B	B	B	—	Bistable	B	—	—
MOUNTING PRICE	Avg. (Dry)	Avg. (Dry)	Avg. (Dry)	Avg. (Dry)	Avg. (Dry)	Vert. to	Avg. (Dry)	Avg. (Dry)	Vert. to

PRICES COILS O

Prices for larger quantities upon

PRICES are for coils with 3" lea
$3.00/C for P/C Pin Termination.

TO ORDER: Specify coil type by
plus VOLTAGE desired for flexibl
(example SF-12, UV-32). For prin
cuit pins add suffix P (example: S
T-6-P).

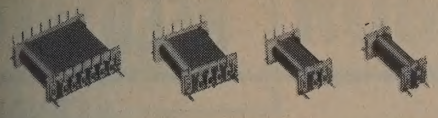
NOTE: We do not catalog c
relays, due to the extensive va
switches and coils available. W
relay prices.

COTO-COIL CO., INC.

57 PAVILION AVE., PROVIDENCE, R. I. 029
Telephone (401) 941-3355

Export Dept.: 13 E. 40th St., N. Y., N. Y. 10016

COTO-COIL MINIATURE REED RELAYS



Series 1000
Dry and Mercury-Wetted

Contact ratings are maximum for resistive loads only and no single parameter should be exceeded.				
TYPE REED	CONTACT (CLOSED) RATING	CONTACT (CLOSED) RES. (OHMS)	CONTACT (OPEN) INS. RES. (OHMS)	CONTACT (OPEN) CAP. (pF)
A-B (DRY)	10W DC/12 VA AC (200V or 500mA)	.10	10^{12} MIN.	.2 NOM.
C (DRY)	3W DC/4 VA AC (50V or 250mA)	.15	10^{9} MIN.	.8 NOM.
A-B (Hg)	28W DC/30VA AC (125V or 1 AMP)	.05	10^{5} MIN.	.3 NOM.

DRY REED TYPES

Contact Form	Nominal Volts	Nominal mW	Res. Ohms	PART NO.	DWG.	Pin Diagram Bottom View
	6		170	CR-1001-6		
	12		680	-12		
	24	210	2730	-24	A	
	32		4800	-32		
	48		10400	-48		
	6		105	CR-1002-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
	6		63	CR-1003-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
	6		63	CR-1004-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
	6		36	CR-1005-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
	6		36	CR-1006-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
	6		105	CR-1021-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
	6		105	CR-1022-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
	6		63	CR-1024-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
	6		160	CR-1041-6		
	12		640	-12		
	24	220	2560	-24	B	
	32		4500	-32		
	48		10240	-48		
	6		100	CR-1042-6		
	12		400	-12		
	24	360	1600	-24	C	
	32		2800	-32		
	48		6400	-48		
3C **	6		55	CR-1043-6		
	12		220	-12		
	24	650	880	-24	D	
	32		1550	-32		
	48		3520	-48		
4C **	6		55	CR-1044-6		
	12		220	-12		
	24	650	880	-24	D	
	32		1550	-32		
	48		3520	-48		
1A-1B *‡	6		105	CR-1060-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
2A-2B *‡	6		63	CR-1061-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
4A-2B *‡	6		36	CR-1062-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
1A-1C **	6		100	CR-1070-6		
	12		400	-12		
	24	360	1600	-24	C	
	32		2800	-32		
	48		6400	-48		
2A-1C **	6		63	CR-1071-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
2A-2C **	6		55	CR-1072-6		
	12		220	-12		
	24	650	880	-24	D	
	32		1550	-32		
	48		3520	-48		
Hybrid 1C (1A-1B) *†‡	6		105	CR-1080-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
Hybrid 2C (2A-2B) *†‡	6		63	CR-1081-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		

*These relays contain bias magnets and correct input polarity must be observed. Red terminal indicates (+) coil input.
**These relays carry true Form C switches.
†Positive break before make for Form C switching when joined as pairs.
‡Break before make not guaranteed.

MERCURY-WETTED TYPES (Must be mounted within 35° of vertical)

Contact Form	Nominal Volts	Nominal mW	Res. Ohms	PART NO.	DWG.	Pin Diagram Bottom View
	6		170	CR-1101-6		
	12		680	-12		
	24	210	2730	-24	A	
	32		4800	-32		
	48		10400	-48		
	6		105	CR-1102-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
	6		63	CR-1103-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
	6		63	CR-1104-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
	6		36	CR-1105-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
	6		36	CR-1106-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
1B *	6		105	CR-1121-6		
	12		420	-12		
	24	340	1680	-24	B	
	32		2950	-32		
	48		6720	-48		
2B *	6		63	CR-1122-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
4B *	6		36	CR-1124-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		
1A-1B *‡	6		63	CR-1160-6		
	12		250	-12		
	24	575	1000	-24	C	
	32		1760	-32		
	48		4000	-48		
2A-2B *‡	6		36	CR-1161-6		
	12		144	-12		
	24	1000	576	-24	D	
	32		1030	-32		
	48		2300	-48		

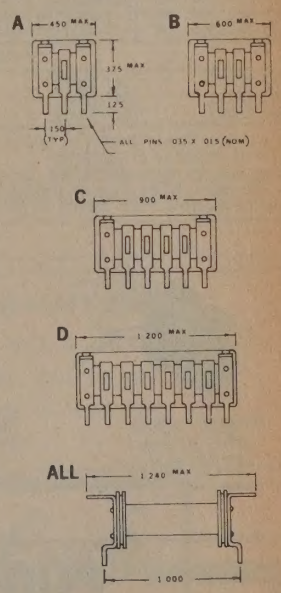
*These relays contain bias magnets and correct input polarity must be observed. Red terminal indicates (+) coil input.

‡Break before make not guaranteed.

The Coto Series 1000 Miniature PCB Reed Relays offer the most comprehensive choice of switching parameters with pin terminations on the popular grid pattern of 1" x .015". Included are 21 contract combinations of Form A, B and C dry reeds and 11 combinations of Form A and B in mercury wetted types. The latter offer greatly expanded switching capability, and eliminate all contact bounce. Up to 6 poles per relay and 5 standard coil voltages are optional. In addition, special purpose reed switches, windings and terminal pin options, electrostatic and magnetic shielding may be specified.

Drive coil windings have been carefully optomized to assure fast contact transfer. This is particularly important in relays carrying several reeds, since the first to close shunts out a disproportionate percent of flux unless adequate overdrive is available. Typical pull-in and drop-out is 1 mil/sec. and .5 mil/sec. respectively, including bounce and coil rise and fall time. Hg wetted reeds are somewhat slower, averaging 2 mil/sec. and 1 mil/sec. Operate times are exclusive of any delay introduced by contact protection devices. Reactive or high inrush loads will require contact protection, as with any type relay if maximum reliability and life are to be realized.

For information on contact protection request Technical Bulletin No. CS-1. For engineering assistance address Sales Engineering Dept. and include full details.



COTO-COIL CO., INC.
57 PAVILION AVE., PROVIDENCE, R. I. 02905
Telephone (401) 941-3355
Export Dept.: 13 E. 40th St., New York, N. Y. 10016

COOK ELECTRIC

REED RELA

MINIATURE

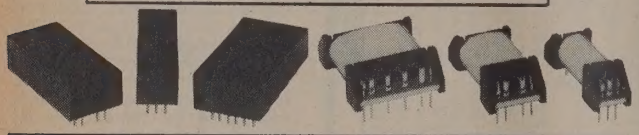
CONTACT RATINGS

	FORM A & B	FORM C
Contact Material	Rhodium	Rhodium
Maximum Voltage (Volts)	50 VDC, 150 VAC	30 VDC
Maximum Current	Switch, .375 amp Carry, 2.5 amps	.100 amp
Maximum Power (Watts, DC)	6 watts	3 watts
Resistive or properly suppressed (VA), AC)	10 VA	
Maximum Resistance		
Initial	100 milliohms	150 milliohms
End-of-life	2 ohms	2 ohms
Peak Breakdown Voltage	300 volts	250 volts
Life & Reliability		
At Rated Load	20 x 10^6 operations	20 x 10^6 operations
Dry Circuit	500 x 10^6 operations	500 x 10^6 operations

More sensitive coils are available — 3v and 48v coils are also available.

OPERATING PARAMETERS

Speed	Depending upon sensitivity selected and number of poles, the speed of miniature size relays is from 1 msec to 2½ msec, including contact bounce and coil time.
Insulation Resistance	
Coil to ground	50 megohms (min)
Coil to contact	500 megohms (min)
Temperature Range	−50°C to +105°C
Vibration	10G @ 2000 cycles/sec (open or closed)
Shock	15G (min)



Part Numbers									
Open		Encapsulated		Rated VDC	Must Operate VDC†	Max. VDC	Must Release VDC†	Nom. MA	Resistance Ohms†
Form A	Form C	Form A	Form C						
1 POLE									
941-0101	941-3101	947-0101	947-3101	6	4.8	12	0.5	11	550
941-0102	941-3101	947-0101	947-3102	12	9.6	24	1.0	5.5	2200
941-0103	941-3103	947-0103	947-3103	24	19.2	48	2.0	2.7	8800
2 POLES									
941-0201	941-3201	947-0201	947-3201	6	4.8	12	0.5	11	550
941-0202	941-3202	947-0202	947-3202	12	9.6	24	1.0	5.5	2200
941-0203	941-3203	947-0203	947-3203	24	19.2	48	2.0	2.7	8800
4 POLES									
941-0401	941-3401	947-0401	947-3401	6	4.8	12	0.5	27	225
941-0402	941-3402	947-0402	947-3402	12	9.6	24	1.0	13	900
941-0403	941-3403	947-0403	947-3403	24	19.2	48	2.0	6.5	3600
1 FORM B **									
941-2201		947-2201		6	4.8	10.5	0.5	18	325
941-2202		947-2202		12	9.6	21.0	1.0	9	1300
941-2203		947-2203		24	19.2	42.0	2.0	4.5	5200

**Caution: Coil voltages in excess of the specified maximum voltages may cause reclosure of contacts.

Many contact combinations are possible combining Form A, B, and C, contacts in one relay. While no such combinations are shown in this bulletin, they are readily available. Your inquiry is welcomed.

STANDARD

Part Numbers		Rated VDC	Must Operate VDC†	Max. VDC	Must Release VDC†	Nom. MA
Open	Encapsulated					
1 POLE — FORM A						
942-0101	948-0101	6	4.8	12	0.5	8
942-0102	948-0102	12	9.6	24	1.0	4
942-0103	948-0103	24	19.2	48	2.0	3
2 POLES — FORM A						
942-0201	948-0201	6	4.8	12	0.5	15
942-0202	948-0202	12	9.6	24	1.0	7.5
942-0203	948-0203	24	19.2	48	2.0	3.7
4 POLES — FORM A						
942-0401	948-0401	6	4.8	12	0.5	24
942-0402	948-0402	12	9.6	24	1.0	12
942-0403	948-0403	24	19.2	48	2.0	6

†Values shown measure at 25°C.

CONTACT RATINGS	FORM A & B	FORM C
Contact Material	Rhodium	Rhodium
Maximum Voltage (Volts)	150 VDC, 250 VAC	250 VDC
Maximum Current	Switch, 1.0 amps Carry, 6 amps	.250 amps 2.5 amps
Maximum Power (Watts, DC)	25 watts	10.0 watts
Resistive or properly suppressed (VA, AC)	40 VA	5.0 VA
Maximum Resistance		
Initial	50 milliohms	200 milliohms
End-of-life	2 ohms	2 ohms
Peak Breakdown Voltage	500 volts	500 ohms
Life & Reliability		
At Rated Load	20 x 10^6 operations	5 x 10^6 oper
Dry Circuit	500 x 10^6 operations	500 x 10^6 op

OPERATING PARAMETERS

Speed	Depending upon sensitivity selected and ber of poles, the speed for standard size lays is from 2½ msec to 6 msec, inclu contact bounce and coil time.
Insulation Resistance	
Coil to ground	100 megohms (min)
Coil to contact	1000 megohms (min)
Temperature Range	−50°C to +105°C
Vibration	10G @ 10-55 cycles/sec (open or closed)
Shock	15G (min)

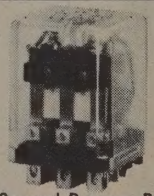
WRITE FOR THE COMPLETE CATALOG ON THE FULL LINE OF REED RELAYS

INDUSTRIAL RELAYS

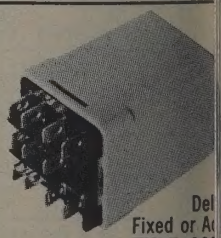
General Purpose
4PDT, 10 Amp
TYPE 811

Mechanical 815 Latch
4PDT, 10 Amp
TYPE 815

Time Delay 818 Adjustable
4PDT, 10 Amp
TYPE 818



General Purpose Relay
3PDT, 10 Amp Contacts
TYPE 880



Del
Fixed or Ad
TYPE 88

WRITE FOR COMPLETE INDUSTRIAL RELAY CATALOG!

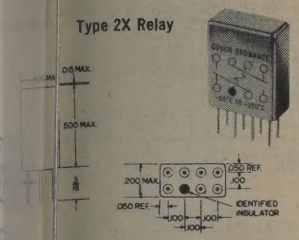
COOK ELECTRIC
AUTOMATIC CONTROLS

6201 OAKTON ST. • MORTON GROVE, ILL. 60053
312/967-6600

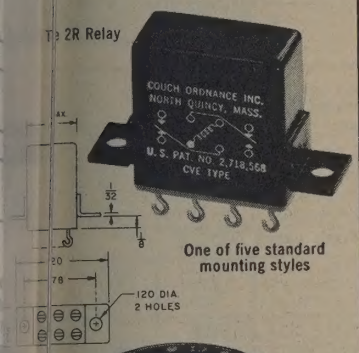
RUGGED ROTARY RELAYS

EXCEPTIONAL RELIABILITY WHERE THE ENVIRONMENT IS EXTREME

Type 2X Relay

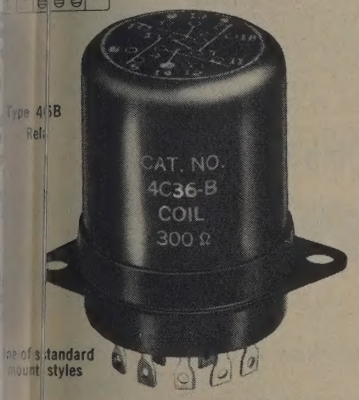


Type 2R Relay

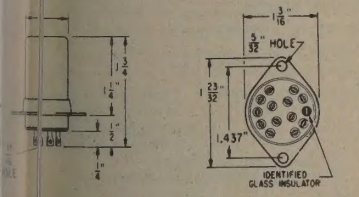


One of five standard mounting styles

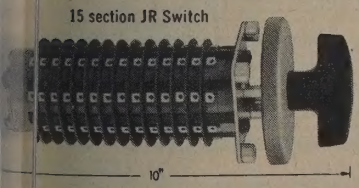
Type 4C36B Relay



One of five standard mounting styles



15 section JR Switch



MICRO MICRO-MINIATURE ROTARY RELAY

Catalog Number	Coil Resistance ±10% @ 25°C	Maximum Pull-In Current	Minimum Drop-Out Current	Nominal Operating Value	Coil Sensitivity	DATA SHEET NO.
	Ohms	MA.		Volts	Milliwatts	
2X15B480-A	1000	12	1.0	26.5	150	9
2X10B490-A	1500	8.0	0.67	26.5	100	9A
1X07B495-A	2000	6.0	0.50	26.5	70	10
1X10B490-A	1500	8.0	0.67	26.5	100	10A

Weight: 0.1 oz. Maximum
Ambient Temperature: —65°C to +125°C
Contacts: 2 Form C (DPDT)
Vibration: 20 G to 2,000 CPS
Shock: 75 G
Dielectric Strength: 500 VAC

MICRO-MINIATURE ROTARY RELAYS

ONE SIZE — 4 DIFFERENT SENSITIVITIES

Catalog Number	Coil Resistance ±10% @ 25°C	Maximum Pull-In Current	Minimum Drop-Out Current	Nominal Operating Value	Coil Sensitivity	DATA SHEET NO.
	Ohms	MA.	MA.	Volts	Milliwatts	
2R25A420-B	625	19	1.9	26.5	250	6
2R10A440-B	1500	8.2	.82	26.5	100	6
2RO4A460-B	4000	3.2	.32	26.5	40	6
2RO2A470-B	6250	2.0	.2	26.5	25	8

Weight: 18 ± 1 Gram
Ambient Temperature: —65°C to +125°C
Contacts: 2PDT (2 Form C) 2A @ 30 VDC
Vibration: 30 G to 2,000 CPS
Shock: 100 G

SUB-MINIATURE ROTARY RELAYS

STANDARD 26.5 VDC RELAYS

Catalog Number	Number Form C Contacts	Contact Rating 100,000 Operations	Coil Resistance ±10% @ 25°C	Maximum Pull-In Current	Nominal Operating Value	Notes	DATA SHEET NO.
			Ohms	MA.	Volts		
2A37-B	2	3 AMPS 30VDC	475	27	26.5	Dry Ckt. Capability	3
4A36-B	4	3 AMPS 30VDC	300	41	26.5	Dry Ckt. Capability	2
4C36-B	4	5 AMPS 30VDC	300	41	26.5	Heavy Duty	1
2B36-B	2	10 AMPS 30VDC	300	41	26.5	Heavy Duty	4
4AP36-AF	4	3 AMPS 30VDC	300	41	26.5	Dry Ckt. Plug-In	5
4D36-L	4	5 AMPS 30VDC	300	41	26.5	50G Vibration	7

Weight: 3.2 oz. Max.
Ambient Temperature: —65° to +125°C
Vibration: 20 G to 2000 CPS
Insulation Resistance: 1000 Megohms Min.
Shock: 75 G Min.

THE JR MULTIPOLE ROTARY SWITCH

The JR Switch is manufactured in accordance with MIL-S-21604 (Ships). It features contact ratings of 10A at 125VAC and 5A at 125VDC. Switches can be assembled with any number of sections up to 25 and can contain any combination of rotor types.

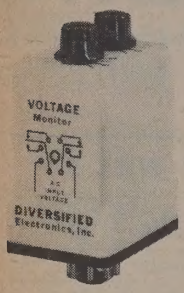
DATA SHEET NO. S-1 S-2

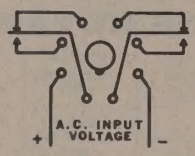
S. H. COUCH DIVISION

ESB INCORPORATED

36 River Street, Boston Massachusetts 02126 • Tel. (617) 298-4147

VB SERIES VOLTAGE BAND MONITOR/RELAY





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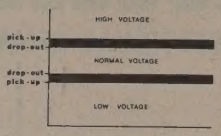


The VB Series offers protection to equipment which is required to operate between two voltage limits. The solid state monitor determines preselected under or over voltage conditions, and de-energizes an internal 10A DPDT control relay if these limits are exceeded. The monitor is equipped with time delay to accommodate start-up transients.

SPECIFICATIONS

RESPONSE TIME: Pickup: 30m. sec. Drop-out: 0.5 sec.
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ 24VDC or 120VAC — 5A @ 240VAC Resistive
POWER REQUIRED: 3 Watts (Approx.)
ENCLOSURE: Plastic dust cover & sealed enclosure available

AC FIXED:

Catalog No.	Nom. Voltage	Lo-Limit Drop-out	Lo-Limit Pick-up	Hi-Limit Pick-up	Hi-Limit Drop-out	Hy Vo ag
VBA-120-AFA	120VAC	98	103	130	135	
VBA-240-AFA	240VAC	215	225	255	265	1

AC KNOB ADJUSTABLE:

Catalog No.	Nom. Voltage	Lo-Limit Pick-up	Hi-Limit Pick-up	Hy Vo ag
VBA-24-AKA	24VAC	19 to 24	24 to 29	
VBA-120-AKA	120VAC	90 to 120	120 to 150	
VBA-240-AKA	240VAC	200 to 240	240 to 270	1

DC KNOB ADJUSTABLE:

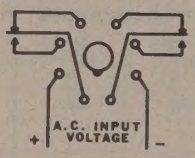
VBA-24-DKA	24VDC	19 to 24	24 to 29	

ORDERING INFORMATION

VBA - XXX - XXX

- Voltage Band Monitor
- Series
- Nominal Voltage
- Type of Voltage
  A - AC — D - DC
- Type of Operation —
  K - Knob Adjustable — R - Resistor A
- Enclosure Style — A - Dust Cov
  B - Sealed Plug-in — C - Sealed Ho
  D - Sealed Bracket Mount — F - Surfa

UO SERIES — OVER VOLT - UNDER VOLT MONITOR/RELAY



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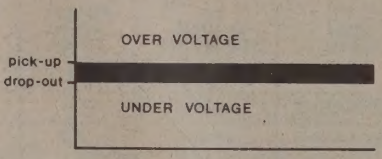


The UO Series consists of a solid state voltage detector that senses a voltage greater than a preset "pick-up voltage" and causes an internal DPDT relay to operate. When the voltage drops to a preset "drop-out" voltage the output relay will de-energize. A hysteresis is set into each standard monitor to allow a differential between pickup and dropout. For specifications, see VB Series.

KNOB ADJUSTABLE:

Catalog No.	Drop-out Voltage	Pull-in Voltage	Hyst Volta
UOA-120-AKA	97-130VAC	102-135VAC	5
UOA-240-AKA	205-250VAC	215-260VAC	10
UOA- 24-DKA	19- 27VDC	21- 29VDC	2

FIXED UNDER VOLTAGE:

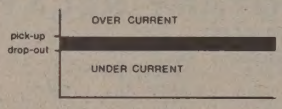
UOA-100-AFA	97VAC	103VAC	6
UOA-220-AFA	215VAC	225VAC	10
UOA- 20-DFA	19VDC	21VDC	2

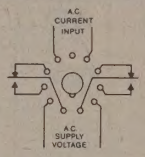
FIXED OVER VOLTAGE:

UOA-133-AFA	130VAC	136VAC	6
UOA-260-AFA	255VAC	265VAC	10
UOA- 28-DFA	27VDC	29VDC	2

FOR ORDERING INFORMATION SEE DIAGRA ON VB SERIES.

CM SERIES CURRENT MONITOR/RELAY • CT SERIES CURRENT TRANSFORMER





The CM Series consists of a Solid State, magnetic, current detector which senses a current level. When the monitored current exceeds the trip point setting for a period greater than the response time, an internal 10 amp. DPDT relay will operate. A current decrease of at least 5% of trip point is required for relay to de-energize. The monitors are equipped with appropriate time delays to accommodate start-up transients and short-time line variations.

AC KNOB ADJUSTABLE — CM SERIES:

Catalog No.	Supply Voltage	Trip Point (Amps.)	Price 1 - 9
CMA-120-AKA- 1	120VAC	0.2 - 1.0	$63.00
CMA-120-AKA- 5	120VAC	1.0 - 5.0	63.00
CMA-120-AKA-10	120VAC	5.0 - 10.0	63.00

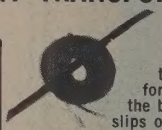
CT SERIES — CURRENT TRANSFORMER

Catalog No.	Current Ratio	Accuracy	Capacity	Max. Dia. of Primary	Price 1 - 9
CT 50/5	50/5	6.0%	2V.A.	1"	$17.00
CT 100/5	100/5	3.0%	2V.A.	1"	17.00

Also available in 25, 500, 1000 and 2500 amps.

SPECIFICATIONS

RESPONSE TIME: Operate: 1 sec. Release: 30m. sec.
CURRENT DIFFERENTIAL: 5% of Trip Point
TRIP POINT (FIXED): ±10% of setting
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay — Resistive
10A @ 28VDC or 120VAC — 5A @ 240VAC
SUPPLY POWER (AUXILIARY): 3 Watts (Approx.)



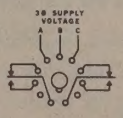
The CT Series design used with the CM Series when AC currents above 5 to be detected. This torroi former is used to extend the the basic current monitor. The tr slips over a conductor and is prov a secondary lead length of 24 inches.

ORDERING INFORMATION

CMA - XXX -

- Current Monitor
- Series
- Supply Voltage
- Type of Current — A - AC
- Type of Operation — F - Fixed
  K - Knob Adjustable — R - Resistor Adjusta
- Enclosure Style — A - Dust Cover
  B - Sealed Plug-in — C - Sealed Hook Sold
  D - Sealed Bracket Mount
  F - Surface Mount (Screw Terminals)
- Trip Point

SL SERIES PHASE SEQUENCE & LOSS MONITOR/RELAY



The SL Series is designed for use in applications where motor rotation or connection to the power line is critical, or where loss of one or more phases may cause damage to electrical equipment. If the phase sequence is correct and full-line voltage is present on all three phases, the internal relay will be energized. If one or more phase is lost or if the phase sequence is reversed, the control relay will de-energize.

SPECIFICATIONS

TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ 24VDC or 120VAC — 5A @ 240VAC Resistive
OPERATING VOLTAGE: 83% of Nominal Voltage @ 25°C
POWER REQUIRED: 3 Watts (Approx.)
OPERATE TIME: 60m. sec.
RELEASE TIME: 0.5m. sec.
ENCLOSURE: Plastic Dust Cover

STANDARD MONITORS:

Catalog No.	3ϕ Supply Voltage	Phase Sequence
SLA-208-AFA-A	208	ABC
SLA-220-AFA-A	220	ABC
SLA-240-AFA-A	240	ABC
SLA-440-AFF-A	440	ABC

ORDERING INFORMATION

SLA - XXX -

- Phase Sequence and Loss Monitor
- Series
- Nominal Voltage
- Type of Voltage — A - AC
- Type of Operation — F - Fixed
- Enclosure Style — A - Dust Cover Plug-in
  B - Sealed Plug-in — C - Sealed Hook Sold
  D - Sealed Bracket Mount — F - Surface Mo
- Phase Sequence — A - ABC

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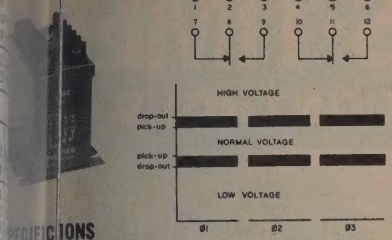
PHONE: AREA CODE 812 - 424-2288

B SERIES 3 PHASE VOLTAGE BAND MONITOR/RELAY



outside of these limits. This device provides both under and over voltage monitoring of each phase of a Delta or Y system in one package. The monitors are equipped with a drop out time delay to accommodate start-up transients. With normal operating voltages on all phases, an internal relay will be energized. If the voltage on any phase goes above or below the drop-out limit, the signal to the time delay will be removed. If this out-of-limit condition exists on any phase, for a period longer than the release time of the time delay, the output relay will de-energize.

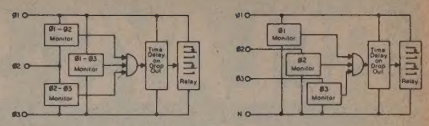
AC FIXED:

Catalog No.	Low-Limit Drop-out	Low-Limit Pick-up	Hi-Limit Pick-up	Hi-Limit Drop-out	Hyst. Voltage
PBA-120-AFF-D	98	103	130	135	5
PBA-208-AFF-D	190	198	222	230	8
PBA-208-AFF-Y	190	208	222	230	8

AC KNOB ADJUSTABLE:

Catalog No.	Low-Limit	Hi-Limit	Hyst. Voltage
PBA-120-AKF-D	90 - 120	120 - 150	5
PBA-208-AKF-D	185 - 208	208 - 240	8
PBA-240-AKF-D	200 - 240	240 - 270	8
PBA-208-AKF-Y	185 - 208	208 - 240	8

All voltages — phase to phase.



ORDERING INFORMATION

PBA - XXX - XXX - X

- Series
- Voltage Band Monitor
- Nominal Voltage
- Type of Voltage — A - AC
- Type of Operation
  - F - Fixed — K - Knob Adjustable
- Enclosure Style
  - F - Surface Mount "Screw Terminals"
- Connection — D - Delta — Y - Wye

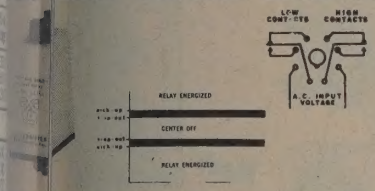
UPA SERIES: 3-PHASE UNDER VOLTAGE MONITOR for under voltage operation. Each phase is monitored for a pre-selected under voltage condition. When the monitored voltage drops below the drop-out voltage set point the internal DPDT 10 amp relay drops out. When it rises above the pick-up voltage set point the relay picks-up. Available in Delta or Wye in fixed or knob adjustable voltages.

SPECIFICATIONS

RESPONSE TIME: Pickup: 30m. sec. Drop-out: 0.5 sec.
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ VDC or 120VAC — 5A @ 240VAC Resistive
POWER REQUIRED: 3 Watts (Approx.)

The PBA series offers protection to three phase equipment which is required to operate between two voltage limits. The three phases are monitored for a pre-selected under or over limit. An internal control relay is de-energized when the voltage goes

VBC SERIES VOLTAGE BAND CONTROL RELAY



The Voltage Band Control Relay is designed for applications where it is required that the voltage be maintained between two specified voltage limits. It is used in applications of differential control, voltage unbalance sensing, servomechanism control, process control, and where voltage regulation is required.

The Voltage Band Control Relay is available in two models: fixed and knob adpustable. The fixed unit has the limits set at the factory. The knob adjustable unit allows the limits to be set according to requirements.

Catalog No.	Nom. Voltage	Low-Limit Drop-out	High-Limit Drop-out	Hyst. Voltage
VBC-120-AKA	120VAC	105 - 120	120 - 135	1VAC
VBC-208-AKA	208VAC	188 - 208	208 - 228	2VAC
VBC-220-AKA	220VAC	200 - 220	220 - 240	2VAC
VBC-240-AKA	240VAC	220 - 240	240 - 260	2VAC

Solid state voltage sensors determine preselected low or high voltage condition and control a center-off or neutral relay. Under normal voltage, the relay remains de-energized in a center-off or neutral position. The control relay energizes and the relay contacts transfer to one side or the other when a high or low voltage limit is exceeded.

SPECIFICATIONS

RESPONSE TIME: 25m. sec. (typical)
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: Relay*
5 Amp @ 120VAC Resistive
2 Amp @ 240VAC Resistive
POWER REQUIREMENT: 3 Watts (Approx.)

* An internal lockout circuit prevents the low voltage relay or the high voltage relay from being energized at the same time.

Special voltage limits and fixed control available from factory. Specify nominal voltage, limits and hysteresis.

TD SERIES SOLID STATE TIME DELAY RELAYS

TDA SERIES — DELAY ON OPERATE

(If voltage is removed before time out, relay contacts may momentarily pick up and drop out)

EXT. RES. ADJUSTABLE — Fig. 2
PRICE: 1 - 9 — $18.50

Catalog No.	Input Voltage	Delay Time (Sec)	Ext. Res. Max. Time
TDA- 24-DRA-010	24VDC	.1 to 10	200K
TDA- 24-ARA-010	24VAC	.1 to 10	200K
TDA-120-ARA-010	120VAC	.1 to 10	200K
TDA-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1
PRICE: 1 - 9 — $19.00

Catalog No.	Input Voltage	Delay Time(Sec)
TDA- 24-DKA-010	24VDC	.1 to 10
TDA- 24-AKA-010	24VAC	.1 to 10
TDA-120-AKA-010	120VAC	.1 to 10
TDA-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1 PRICE: 1 - 9 — $17.50

TDA- 24-DFA-010	24VDC	10
TDA- 24-AFA-010	24VDC	10
TDA-120-AFA-010	120VAC	10

TDB SERIES — INTERVAL ON OPERATE

(If voltage is removed before time out, timer will reset)

EXT. RES. ADJUSTABLE — Fig. 2
PRICE: 1 - 9 — $30.75

Catalog No.	Input Voltage	Delay Time (Sec)	Ext. Res. Max. Time
TDB- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDB- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDB-120-ARA-010	120VAC	.1 to 10	1 Meg
TDB-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1
PRICE: 1 - 9 — $31.25

Catalog No.	Input Voltage	Delay Time(Sec)
TDB- 24-DKA-010	24VDC	.1 to 10
TDB- 24-AKA-010	24VAC	.1 to 10
TDB-120-AKA-010	120VAC	.1 to 10
TDB-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1 PRICE: 1 - 9 — $29.75

TDB- 24-DFA-010	24VDC	10
TDB- 24-AFA-010	24VDC	10
TDB-120-AFA-010	120VAC	10

TDC SERIES — DELAY ON OPERATE

(If voltage is removed before time out, timer will reset and relay contacts will not pick up.)

EXT. RES. ADJUSTABLE — Fig. 2
PRICE: 1 - 9 — $22.00

Catalog No.	Input Voltage	Delay Time (Sec)	Ext. Res. Max. Time
TDC- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDC- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDC-120-ARA-010	120VAC	.1 to 10	1 Meg
TDC-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1
PRICE: 1 - 9 — $22.50

Catalog No.	Input Voltage	Delay Time(Sec)
TDC- 24-DKA-010	24VDC	.1 to 10
TDC- 24-AKA-010	24VAC	.1 to 10
TDC-120-AKA-010	120VAC	.1 to 10
TDC-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1 PRICE: 1 - 9 — $21.00

TDC- 24-DFA-010	24VDC	10
TDC- 24-AFA-010	24VDC	10
TDC-120-AFA-010	120VAC	10

TDD SERIES — DELAY ON RELEASE

(If control switch is re-closed before time out, timer will reset)

EXT. RES. ADJUSTABLE — Fig. 4
PRICE: 1 - 9 — $32.25

Catalog No.	Input Voltage	Delay Time (Sec)	Ext. Res. Max. Time
TDD- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDD- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDD-120-ARA-010	120VAC	.1 to 10	1 Meg
TDD-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 3
PRICE: 1 - 9 — $32.75

Catalog No.	Input Voltage	Delay Time(Sec)
TDD- 24-DKA-010	24VDC	.1 to 10
TDD- 24-AKA-010	24VAC	.1 to 10
TDD-120-AKA-010	120VAC	.1 to 10
TDD-120-AKA-200	120VAC	2 to 200

FIXED — Fig 3 PRICE: 1 - 9 — $31.25

TDD- 24-DFA-010	24VDC	10
TDD- 24-AFA-010	24VDC	10
TDD-120-AFA-010	120VAC	10

TDE SERIES — SINGLE SHOT

(Timer resets automatically at end of delay period)

EXT. RES. ADJUSTABLE — Fig. 4
PRICE: 1 - 9 — $30.75

Catalog No.	Input Voltage	Delay Time (Sec)	Ext. Res. Max. Time
TDE- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDE- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDE-120-ARA-010	120VAC	.1 to 10	1 Meg
TDE-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 3
PRICE: 1 - 9 — $31.25

Catalog No.	Input Voltage	Delay Time(Sec)
TDE- 24-DKA-010	24VDC	.1 to 10
TDE- 24-AKA-010	24VAC	.1 to 10
TDE-120-AKA-010	120VAC	.1 to 10
TDE-120-AKA-200	120VAC	2 to 200

FIXED — Fig 3 PRICE: 1 - 9 — $29.75

TDE- 24-DFA-010	24VDC	10
TDE- 24-AFA-010	24VDC	10
TDE-120-AFA-010	120VAC	10

ORDERING INFORMATION

TDX - XXX - XXX - XXX

- Time Delay
- Series
- Nominal Voltage
- Type of Voltage — A - AC — D - DC
- Type of Operation — F - Fixed
  - K - Knob Adjustable — R - Resistor Adjustable
- Enclosure Style — A - Dust Cover — B - Sealed Plug-In
  - C - Sealed Hooked Solder — D - Sealed Bracket Mount
  - E - Panel Mount — F - Surface Mount
- Time Delay (in seconds) — 001 = 1 sec 010 = 10 sec 100 = 100 sec etc.

GENERAL INFORMATION:

Modifications in time delay, hysteresis, pick up and drop out voltages or current available upon request.

For more detailed information send for Industrial Catalog #100.

Prices subject to change without notice.

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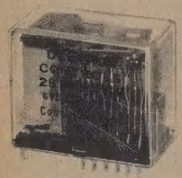
RELAYS·SOLENOIDS·TIMERS

Manufactured by DELTROL CONTROLS

RELAYS



SERIES 25

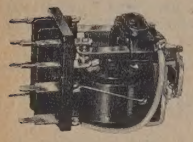
Miniature cradle-type relay with snap-on dust cover. Contacts: gold bonded fine silver, standard; other material available on request. Terminals: gold plated, pierced solter type. Mounting: four No. 3-48 holes on .375" x .375" centers.

SERIES 100

Low cost, general purpose relay designed for light power loads and continuous duty operation. Armature stop maintains adjusted characteristics throughout life of relay. 5 amp contacts: 1/8" silver, gold flashed. 10 amp contacts: 3/16" silver cadmium oxide, gold flashed. Mounting: 6-32 mounting stud and locator tab. Available to 3PDT.

SERIES 100ML

Low cost, multi-pole (up to 6PDT) general purpose magnetic latching relay with long life (minimum of 10,000,000 mechanical operations). Positive snap-action, one-piece armature eliminates interconnections. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Standard solder or 3/16" quick-connect terminals. Dust cover available. Recognized under the Components Program of Underwriters Laboratories, Inc.



100UP/101UP

Printed circuit, mounted relay for light power load applications. Has phenolic insulating barriers. Continuous duty operation. Provided with armature stop to maintain adjusted characteristics. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" silver cadmium oxide, gold flashed. Recognized under the Components Program of Underwriters Laboratories, Inc. Available to 3PDT.

SERIES 105

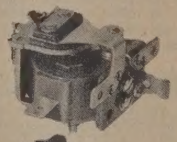
General purpose plug-in relay for light power loads. Continuous duty operation. Blue transparent butyrate dust cover. Standard 8-pin octal-type plug for SPDT and DPDT units, 11-pin for 3PDT units. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Available with B3 hold-down spring. Available to 3PDT.

SERIES 105ML

General purpose magnetic latching plug-in relay. Positive snap-action, one-piece armature eliminates interconnections. Minimum mechanical life: 10,000,000 operations. Up to 5PDT. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Standard 8-pin octal-type plug for 5PDT, 11-pin for DPDT, 20-pin for 3PDT, 4PDT & 5PDT.

SERIES 106/107

Enclosed, plug-in version of 100 Series general purpose relay. Use for light power loads and continuous duty operation. Armature stop maintains adjusted characteristics. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Dust cover: clear, high-impact plastic. Recognized under the Components Program of Underwriters Laboratories, Inc.

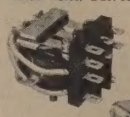


SERIES 120

Rugged, small-size, medium duty power relay for industrial controls applications. Continuous duty operation. 15/20 amp contacts: 1/4" dia. silver cadmium oxide, gold flashed. Mounting: No. 6-32 stud and locating tab. Terminals: .250 quick-connect with solder hole.

SERIES 140ML

15 amp general purpose magnetic latching relay. Positive snap-action, one-piece armature eliminates interconnections. 15 amp contacts: silver cadmium oxide, gold flashed. Continuous or intermittent duty. Up to 6PDT. Terminals: .187 quick-connect with solder holes. Dust cover available.



New!

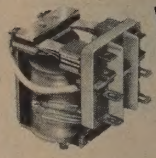
SERIES 140

General purpose medium duty relay. Continuous duty operation. Armature stop. 15 amp contacts: 1/4" dia. silver cadmium oxide, gold flashed. Mounting: No. 6-32 mounting stud and locator tab. Terminals: .187 quick connect with solder holes. Available to 3PDT.

New!

SERIES 145

Plug-in version of 140 Series general purpose medium duty relay. Molded Lexan dust cover.



New!

SERIES 150

1200W tungsten lamp DPD especially suited for high loads. Booster springs on able contact arms. Cont duty operation. 20 amp co 5/16" dia. silver cadmium gold flashed. Mounting 6-32 stud and locator tab minals:, solder and .187 connect with solder holes.

New!

SERIES 155

Plug-in version of 150 1200W tungsten lamp ref Standard 8-pin octal plug. ed Lexan dust cover.

New!

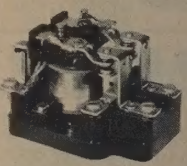
SERIES 160

Low cost, reliable general pose relay for industrial co Available to 3PDT. Molded coil. Blade-type termina higher current-carrying ca Continuous duty operatio 5 amp contacts: 1/8" dia. gold flashed. 10 amp con 3/16" dia. silver cadmium gold flashed. Mounting: 6-32 stud and locator tab. minals: .187 quick-connec solder holes. 10 amp tab mounting socket available.

New!

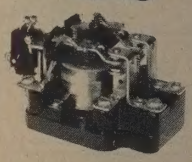
SERIES 165

Plug-in version of 160 relay. Molded Lexan dust reduces dust and contact taminants. 10 amp nylon m ing socket available with quick-connect, solder, or p circuit terminals.



SERIES 900

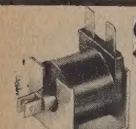
Heavy duty power relay fo acting industrial control ap tions. Particularly suite motor controls, heater and other power switching cations. Long life, rugged struction. 25 amp con 5/16" dia. silver cadmium gold flashed. Heavy duty type terminals. Mounting: 3/16" holes on 1-7/8" ce Recognized under the Co nents Program of Underw Laboratories, Inc.



SERIES 900-1C

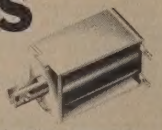
900 Series heavy duty relay with snap-action, 10 1/3 hp, SPDT auxiliary sw Recognized under the Co nents Program of Underw Laboratories, Inc.

SOLENOIDS



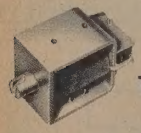
TYPE C-8

Low cost, low and medium power solenoids designed especially for volume applications where low cost is essential.



TYPE D-17

Designed for low and medium power applications. Constructed to provide maximum useful life and efficiency.



TYPE PS-65

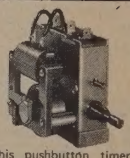
This high power solenoid has coils having two windings: a high-surge current pull-in winding that starts the solenoid plunger in motion, and a low-drain winding for holding the plunger in a seated position. The windings are switched automatically by the motion of the plunger.

New!

TYPE C9R

EXCLUSIVE REINFORCED FRAME remains rigid under intermittent high-impact plunger loads. Longer solenoid life with less metal fatigue. Medium power. Intermittent duty cycle. Push or pull types. Mounting: No. 10-32 tapped holes. Solder terminals or leads available.

TIMERS



MODEL 110

PUSHBUTTON

This pushbutton timer starts by manually depressing push button. Pushing button closes timer switch contacts 1-3, energizing timer load and timer motor. Upon completion of fixed time interval, contacts 1-3 open, shutting off timer load and timer motor.

MODEL 159-D

INTERVAL TIMER W/BUZZER

This interval timer switches contacts 1-4 to and contacts 1-3 to ON at the beginnin each preset timed interval. At the end of preset timed interval, contacts 1-3 switc OFF and contacts 1-4 switch to ON. Near of each preset timed interval, buzzer will so for a short period, then shut off.

MODEL 116-D1

INTERVAL TIMER

This interval timer switches contacts 1-4 OFF and contacts 1-3 ON at the beginning of each preset timer interval. At the end of the preset timed interval, contacts 1-4 switch to ON and contacts 1-3 switch to OFF.

MODEL 135-D1

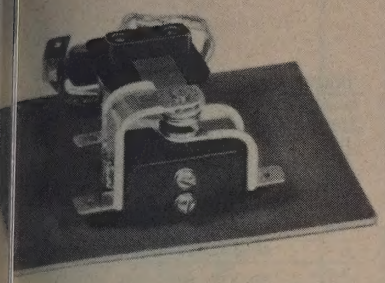
REPEAT CYCLE

This repeat cycle timer switches contacts OFF and 1-3 ON for a fixed time durat during each timing cycle. Timer will contin to repeat the preselected time cycle as long power is applied.

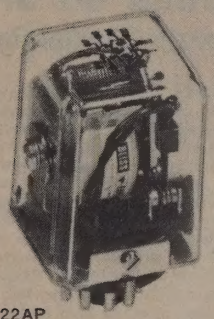
Write for descriptive literatu

DELTROL CONTROLS

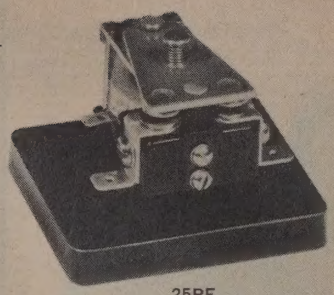
2745 South 19th Street, Milwaukee, Wisconsin 53215, Phone (414) 671-6800, Telex 2-6871



25PS

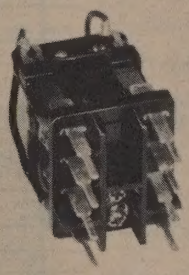


22AP



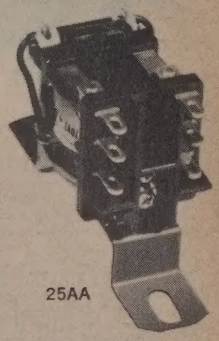
25PE

20BA



25AB

20AA



25AA

agle value-engineered general-purpose and medium-power relays

Ov r 3,000 types available from basic Eagle co ponents. Options available in contact m erials, ratings, coils, and electrical char- ac eristics. Contacts are silver cadmium ox le; 5-amp and 10-amp contacts are gold-finished. We can also fulfill special requirements. Stocked in quantity at 35 major locations throughout the world. For complete data, write Eagle Signal, 736 Federal Street, Davenport, Iowa 52803.

Type and Description	Contact Arrangement	Contact Rating	Size and Weight	Pull-In Speed	Drop-Out Speed
AA Economy Open Type AC, DC, and Plate Circuit	SPDT DPDT 3PDT	5A and 10A @ 115 Vac	1⅞" x 1 7/32" x 1½" 2 ounces	22 ms avr.	12 ms avr.
BA Economy Open Type nsitive Plate Circuit	SPDT	5A @ 115 Vac	1⅞" x 1 5/16" x 1½" 2 ounces		
AP Enclosed Plug-In th 8 and 11 pins for , DC, and Plate Circuit	SPDT 3PDT DPDT (11 pin) (8 pin)	5A and 10A @ 115 Vac	1⅜" x 2⅛" x 1⅜" 3 ounces	22 ms avr.	12 ms avr.
AA Open Type r AC, DC, and Plate Circuit	SPDT DPDT 3PDT	5A and 10A @ 115 Vac 5A-1/10 HP @ 115 VAC 10A-⅛ HP @ 115 Vac ¼ HP @ 230 Vac ½ HP @ 230 Vac	1⅞" x 1 9/32" x 1½" 2 ounces	22 ms avr.	12 ms avr.
AB Open Type inted Circuit for , DC, and Plate Circuit	SPDT DPDT 3PDT	5A and 10A @ 115 Vac 5A-1/10 HP @ 115 Vac 10A-¼ HP @ 115 Vac ¼ HP @ 230 Vac ½ HP @ 230 Vac	2 7/32" x 1 9/32" x 1½" 2 ounces	22 ms avr.	12 ms avr.
PE Medium Power Amp Double Break r AC, DC	SPST-NO-DB	15A @ 115/230 Vac 25A @ 115/230 Vac 1½ HP @ 115/230 Vac	2 3/32" x 1 9/32" x 1 27/32" 2¾ ounces	50 ms max.	30 ms max.
PS Medium Power Amp for AC, DC	SPDT	20A @ 115/230 Vac 1 HP @ 115/230 Vac	2¼" x 1 9/32" x 1 13/16" 3 ounces	50 ms max.	30 ms max.

Eagle Signal
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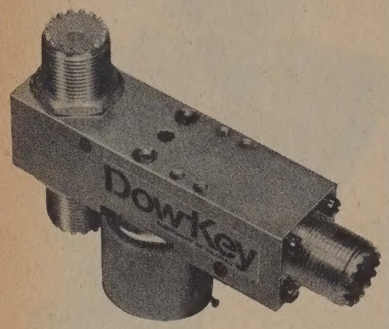
2260 INDUSTRIAL LANE • BOX 348 • BROOMFIELD, COLO.
TELEPHONE (303) 466-7303 TWX 910-32

SERIES 60 SPDT
Remote Coaxial Relay



FEATURES — The Series 60 are remote operation, ruggedly constructed, SPDT coaxial relays designed for operation from low-level to 1 KW. They are offered with or without 2 Form C auxiliary contacts. For transmitter-receive applications they are available with a special high isolation "G" connector at the NC or receive position. This "G" connector increases the isolation to greater than —100 db at frequencies up to 500 MHz, although it reduces the power rating through this connector to 20 watts. "G" connectors will increase the listed VSWR above 400 MHz.

Typical electrical characteristics are shown below when used in a 50 ohm transmission line. UHF connectors and solder terminals are not recommended above 400 MHz.

SPECIFICATIONS
Operating Time . . . . . 25 ms
Auxiliary Contact Rating . . . . . 5 amps 115 Vac

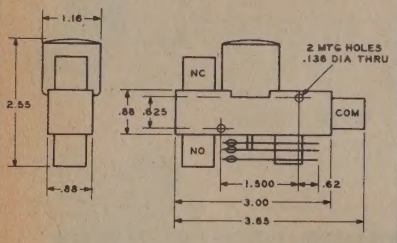
MECHANICAL DATA
Life expectancy . . . . . 1,000,000 cycles
Weight . . . . . 12 oz. approx.
Finish
RF Contacts . . . . . Gold Plate
Auxiliary Contacts . . . . . Gold Plate

ENVIRONMENTAL DATA
(Per MIL-S-3928B)
Temperature . . . . . —55°C to +85°C

MODIFICATIONS
Available on special order:
1. Moisture sealing of all entrances to RF portions. (Call for a special number)
2. Microswitch type auxiliary contacts.

ORDERING INFORMATION
After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *60-260442 is the SPDT relay with UHF connectors for 115V AC operation with 2C auxiliary contacts.*



CONNECTORS AND PART NUMBERS

Connector Type	Std. SPDT	With 2C Aux. Contacts	With NC "G" Conn.	W
UHF	60-XX04	60-XX0442	60-XX28	60-
50 ohm N	60-XX01	60-XX0142	60-XX25	60-
75 ohm N	60-XX14	60-XX1442	60-XX30	60-
BNC	60-XX02	60-XX0242	60-XX26	60-
TNC	60-XX03	60-XX0342	60-XX27	60-
C	60-XX05	60-XX0542	60-XX29	60-
Solder Terminals	60-XX19	60-XX1942	60-XX35	60-

ELECTRICAL CHARACTERISTICS

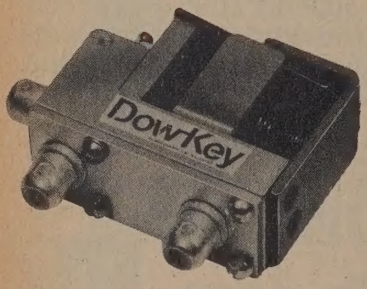
Freq. Mhz	VSWR	Isolation Loss —db.	Insertion Loss —db.	R
0-50	1.05	45	.05	
100	1.06	40	.05	
400	1.12	30	.1	
1000	1.3	25	.15	

COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volts	Voltage Range	Resis Oh
21	6 DC	5-7	
22	12 DC	9.5-14	
23	26 DC	19-31	
24	48 DC	40-54	
25	110 DC	90-125	4
26	115 AC	100-125	*
27	220 AC	200-240	*
28	6 AC	5-7	*
29	24 AC	20-28	*
60	115 AC	100-125	Diod

*Intermittent duty **Continuous duty

SERIES 61 SPDT
Remote Coaxial Relay



FEATURES — The series 61 are small SPDT switches for military and severe environmental applic designed to withstand the applicable requirements of specification MIL-S-3928B. The balanced armatur prevents contact chatter under high frequency vibration and severe shock. They are offered with man connectors and 1 or 2 Form C microswitch auxiliary contacts. Gold finished contacts provide reliable o low levels.

SPECIFICATIONS
Operating Time . . . . . 15 ms. max.
Auxiliary Contact Rating . . . . . 5 amps. 115 Vac

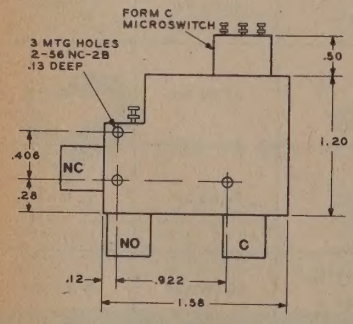
MECHANICAL DATA
Life Expectancy . . . . . 10^6 cycles
Weight . . . . . .3½ — 4½ oz.
Finish
RF Surfaces . . . . . Silver Plate
Magnetic Parts . . . . . Nickel

ENVIRONMENTAL DATA
(Per MIL-S-3928B)
Temperature . . . . . -55°C + 125°C
Salt Spray . . . . . 48 Hrs
Humidity . . . . . 10 days
Vibration (Test condition A) . . . . 10 g's to 2000 Hz
Shock . . . . . 15 g's

MODIFICATIONS
Available on special order:
Combinations of connectors.
Mounting holes on opposite side of block.
add suffix R to part number for this modification.
Attached small cables.

ORDERING INFORMATION
After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *61-240312 is SPDT switch with TNC connectors, 48 DC Coil and 1 Form C microswitch.*



CONNECTORS AND PART NUMBERS

Connector Type	SPDT	With 1C Microswitch	M
BNC	61-XX02	61-XX0212	6
TNC	61-XX03	61-XX0312	6
TM	61-XX07	61-XX0712	6
MIN. S50 SCREW TYPE	61-XX12	61-XX1212	6
MIN. S70 SCREW TYPE	61-XX17	61-XX1712	6
MIL-C-22557 50 ohm	61-XX10	61-XX1012	6
MIL-C-22557 75 ohm	61-XX15	61-XX1512	6
SOLDER TERMINALS	61-XX19	61-XX1912	6
OSM	61-XX08	61-XX0812	6

ELECTRICAL CHARACTERISTICS
Typical high frequency measurements in a 50 ohm t line. (75 ohm line for 75 ohm units.)

Freq. MHz	VSWR	Isolation Loss —db.	Insertion Loss —db.	R
50	1.03	60	.03	
100	1.05	52	.05	
400	1.12	40	.1	
1000	1.18	30	.15	

COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part N

Part No. Digits	Nominal Volts	Voltage Range	Resi Ohm
21	6 DC	4.5-7	
22	12 DC	9-14	
23	26 DC	19-31	
24	48 DC	38-54	1
25	110 DC	90-125	5

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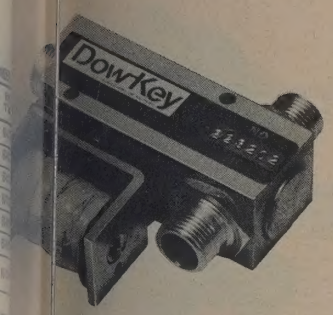
SERIES 77 SPDT
Remote Coaxial Relay



FEATURES — The Series 77 are medium size, light weight, low priced coaxial relays for industrial and less critical military applications. The "T" shaped connector configuration has the common connector at one end and the NO and NC connectors 180° apart at the other end. They are available with or without 1 Form C auxiliary contacts.

SPECIFICATIONS

Operating Time . . . . . 15 ms. max.

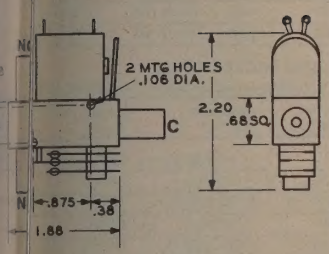
MECHANICAL DATA

Weight . . . . . 3 oz.
Life expectancy . . . . . 10^6 min. cycles

Finish
Connectors . . . . . Silver Plate
Block . . . . . Irridite
Magnetic Parts . . . . . Nickel
RF Contacts . . . . . Gold Plate

ENVIRONMENTAL DATA
(Per MIL-S-3928 B)

Shock . . . . . 15 g's —11 ms
Vibration . . . . . 10 g's to 55 Hz
Temperature . . . . . —55°C to +85°C
Salt Spray . . . . . 48 Hrs.
Humidity . . . . . 10 days



ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *77-230932 is SPDT Relay with phono conns, 1 C aux. contacts and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Standard SPDT	With 1C Aux. Contacts
BNC	77-XX02	77-XX0232
TNC	77-XX03	77-XX0332
Phono	77-XX09	77-XX0932
*"F"	77-XX32	77-XX3232
**RG-58/U Cables	77-XX22	77-XX2232

*Especially suitable for CATV use
**Standard with 2 ft. cable length

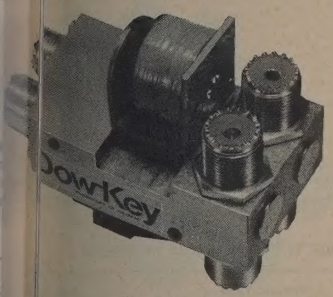
ELECTRICAL CHARACTERISTICS
Typical high frequency measurements in a 50 ohm transmission line (75 ohm for type F).

Freq. MHz	VSWR	Isolation Loss —db	Insertion Loss —db.	RF Power Rating
50	1.03	55	.03	150 W
100	1.05	51	.04	125 W
200	1.07	45	.05	100 W
400	1.1	40	.1	100 W
800	1.2	36	.15	80 W
1200	1.35	31	.2	60 W

COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance Ohms ±10%
21	6 VDC	4.5-7	20
22	12 VDC	9-14	70
23	26 VDC	19-31	290
24	48 VDC	38-54	1000
25	110 VDC	90-125	5000
26	115 VAC	90-130	Diode Rect.

SERIES 260/260B DPDT
Remote Coaxial Relay



FEATURES — These are remote operation, ruggedly constructed, coaxial relays designed for operation from low level to 1 KW. There are two basic types: The 260 is a standard DPDT switch with 6 connectors. The 260B is a similar item, except there is an internal connection between the NC contacts, leaving only 4 connectors. The latter type is widely used for inserting a circuit element, such as a power amplifier, between two normally connected elements, such as an exciter and antenna.

Both types are offered with a wide variety of connectors and coil voltages and with or without auxiliary contacts.

SPECIFICATIONS

Operating Time . . . . . 25 ms
Auxiliary Contact Rating . . . . . 5 amps 115 Vac

MECHANICAL DATA

Life expectancy . . . . . 1,000,000 cycles
Weight . . . . . 12 oz. approx.

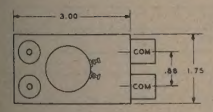
Finish
RF Contacts . . . . . Gold Plate
Auxiliary Contacts . . . . . Gold Plate

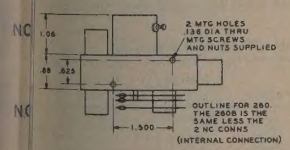
ENVIRONMENTAL DATA
(Per MIL-S-3928B)

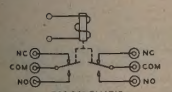
Temperature . . . . . —55°C to +85°C

MODIFICATIONS

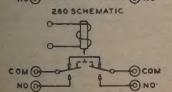
Available on special order:
1. "G" type high isolation connectors on NO or NC.
2. NC connectors on the 260B in place of the standard NO.
3. Microswitch type auxiliary contacts.







260 SCHEMATIC



260B SCHEMATIC

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *260B-260442 is the 260B with UHF connectors, 115 AC Coil and 2 Form C auxiliary contacts.*

CONNECTORS AND PART NUMBERS

Connector Type	Series 260 Standard	Series 260 With 2C Aux. Contacts	Series 260B Standard	Series 260B With 2C Aux. Contacts
UHF	260-XX04	260-XX0442	260B-XX04	260B-XX0442
50 ohm N	260-XX01	260-XX0142	260B-XX01	260B-XX0142
75 ohm N	260-XX14	260-XX1442	260B-XX14	260B-XX1442
BNC	260-XX02	260-XX0242	260B-XX02	260B-XX0242
TNC	260-XX03	260-XX0342	260B-XX03	260B-XX0342
C	260-XX05	260-XX0542	260B-XX05	260B-XX0542

ELECTRICAL CHARACTERISTICS
Typical high frequency measurements are shown below with the switch in a 50 ohm transmission line (75 ohm line for 75 ohm unit) UHF connectors are not recommended above 400 Mhz

Freq Mhz	VSWR	Isolation Loss —db	Insertion Loss —db	RF Power Rating
0-50	1.05	45	.04	1 KW
100	1.06	40	.05	1 KW
400	1.12	30	.1	750 W
1000	1.3	25	.15	500 W

COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volts	Voltage Range	Resistance Ohms ±10
21	6 DC	5-7	12
22	12 DC	9.5-14	48
23	26 DC	19-31	245
24	48 DC	40-54	770
25	110 DC	90-125	4000
26	115 AC	100-125	Diode Rect.
27	220 AC	190-240	Diode Rect.
28	6 AC	5-7	Diode Rect.
29	24 AC	20-28	Diode Rect.

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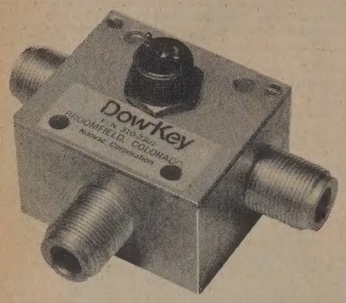
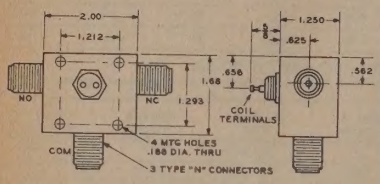
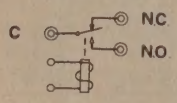
SERIES 310 SPDT
Vacuum Coaxial Relay







FEATURES – Series 310 Relays have high power handling capability in a small package, with contin rating of 3000 watts at frequencies up to 30 MHz. At 400 MHz, the relay will carry 1000 wat vacuum-enclosed contacts minimize losses and noise.

SPECIFICATIONS
Operating Time . . . . . 6 ms max.

ELECTRICAL DATA
Peak Voltage
At 30 MHz . . . . . 1500 V
At 400 MHz . . . . . 1000 V
Peak Current – 1 μ Sec Pulse
At 30 MHz . . . . . 40 amps
At 400 MHz . . . . . 10 amps

MECHANICAL DATA
Weight . . . . . 8 oz
Life expectancy . . . . . 10^6 cycles
Finish
Connectors . . . . . Silver plate
Block . . . . . Silver plate

ENVIRONMENTAL DATA
(Per MIL-S-3928)
Shock . . . . . 50 g's -11 ms
Vibration (Test condition A) . . . . 10 g's to 2000 Hz
Temperature . . . . . -55°C to +85°C
Salt Spray . . . . . 48 Hrs
Humidity . . . . . 10 days

ORDERING INFORMATION
After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *310-2302 is SPDT Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Num
N	310-XX
BNC*	310-XX
TNC*	310-XX
C	310-XX
SC	310-XX
HN	310-XX

*Reduced power limits when using these connectors.

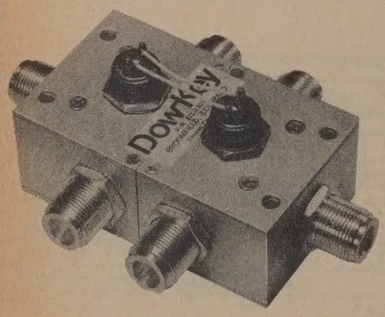
ELECTRICAL CHARACTERISTICS

Freq. MHz	VSWR	Isolation Loss	Insertion Loss
30	1.05	35 db min.	.1 db typ.
400	1.10	20 db typ.	.1 db typ.

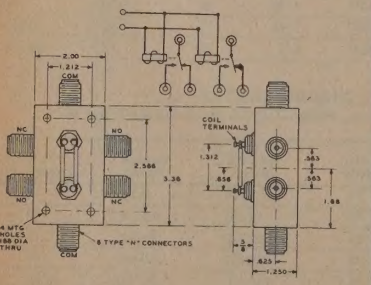
COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part No.

Part No. Digits	Nominal Volt	Voltage Range	R Oh
21	6 VDC	4.5-7	
22	12 VDC	9-14	
23	26 VDC	19-31	
24	48 VDC	38-54	
25	110 VDC	90-125	
26	115 VAC	90-130	

**Divide resistance by 2 on parallel coil u*
***Requires external diode bridge.*



SERIES 311 DPDT
High Power Vacuum Coaxial Relay



FEATURES – Series 311 Vacuum Coaxial Relays are capable of handling 3 KW of RF power at 30 MHz at 400 MHz. The use of vacuum-enclosed contacts provides reliable, low contact resistance operatio applications of the Series 311 Relays include switching RF power and radar pulse-forming networks.

SPECIFICATIONS
Operating Time . . . . . 6 ms. max.

ELECTRICAL DATA
Peak Voltage
At 30 MHz . . . . . 1500 V
At 400 MHz . . . . . 1000 V
Peak Current 1 μ Sec Pulse
At 30 MHz . . . . . 40 amps
At 400 MHz . . . . . 10 amps

MECHANICAL DATA
Weight . . . . . 12 oz.
Life expectancy . . . . . 10^6 cycles
Finish
Connectors . . . . . Silver plate
Block . . . . . Silver plate

ENVIRONMENTAL DATA
(Per MIL-S-3928)
Shock . . . . . 50 g's -11 ms.
Vibration (Test condition A) . . . . 10 g's -5 to 2000 Hz
Temperature . . . . . -55°C to +85°C
Salt Spray . . . . . 48 Hrs.
Humidity . . . . . 10 days

ORDERING INFORMATION
After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *311-2302 is DPDT Coaxial Vacuum Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Nu
N	311-X
BNC*	311-X
TNC*	311-X
C	311-X
SC	311-X
HN	311-X

*Reduced power limits when using these connectors.

ELECTRICAL CHARACTERISTICS

Freq. MHz	VSWR	Isolation Loss	Insertion Loss
30	1.05	35 db min.	.1 db typ.
400	1.10	20 db typ.	.1 db typ.

COIL CHARACTERISTICS
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resi Ohm
21	6 VDC	4.5-7	
22	12 VDC	9-14	1
23	26 VDC	19-31	3
24	48 VDC	38-54	10
25	110 VDC	90-125	60
26	115 VAC	90-130	60

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*

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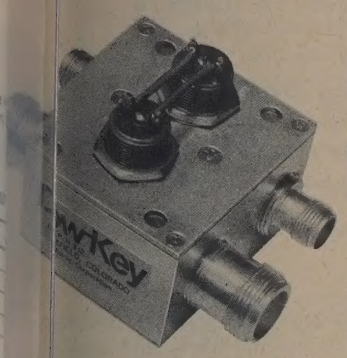
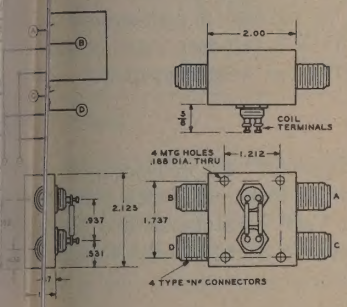




SERIES 312

Vacuum Coaxial By-Pass Relay

FEATURES — Series 312 Vacuum Coaxial Relays are intended for use in circuits where it is desired to by-pass an RF power amplifier and connect the driving source directly to the amplifier's load. The use of vacuum-enclosed contacts provides reliability and repeatable low contact resistance. Mixture of connectors available on special order.

SPECIFICATIONS

Operating Time . . . . . 6 ms max.

ELECTRICAL DATA

Peak Voltage
- *At 30 MHz* . . . . . 1500 V
- *At 400 MHz* . . . . . 1000 V

Peak Current- 1 μ Sec Pulse
- *At 30 MHz* . . . . . 40 amps
- *At 400 MHz* . . . . . 10 amps

MECHANICAL DATA

Weight . . . . . 12 oz.
Life expectancy . . . . . 10^6 min. cycles
Finish
- *Connectors* . . . . . Silver Plate
- *Block* . . . . . Silver Plate

ENVIRONMENTAL DATA

(Per MIL-S-3298)

Shock . . . . . 50 g's -11 ms
Vibration (Test condition A) . . . . 10 g's to 2000 Hz
Temperature . . . . . -55°C to +85°C
Salt Spray . . . . . 48 Hrs.
Humidity . . . . . 10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *312-2201 is DPDT Relay with type N connectors and 12 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	312-XX01
BNC*	312-XX02
TNC*	312-XX03
C	312-XX05
SC	312-XX53
HN	312-XX51

*Reduced power limits when using these connectors.

ELECTRICAL CHARACTERISTICS

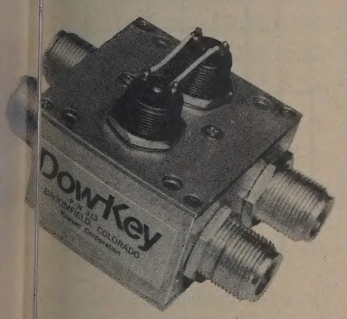
Freq. MHz	VSWR	Isolation Loss	Insertion Loss	RF Power Rating
30	1.05	35 db min.	.1 db typ.	3 KW
400	1.10	20 db typ.	.1 db typ.	1 KW

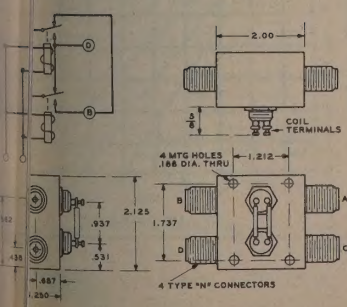
COIL CHARACTERISTICS

(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance * Ohms ±10 %
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000**

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*





SERIES 313 DPDT

Transfer/Crossover Coaxial Vacuum Relay

FEATURES — The Series 313 are remote operation ruggedly constructed Transfer Relays designed for high power—high voltage operation. The Series 313 also features Kilovac vacuum-enclosed contacts for high reliability, low contact resistance and long life. It is intended for interchanging two transmitters between an antenna and a dummy load, reversing feed phase for directional antennas, and similar applications. It is capable of handling 3 KW at 30 MHz.

SPECIFICATIONS

Operating Time . . . . . 6 ms. max.

ELECTRICAL DATA

Impedance . . . . . 50 ohms
VSWR (at 30 MHz) . . . . . 1.1 max.
Insertion Loss . . . . . .2 db max.
Isolation Loss (at 30 MHz) . . . . . 35 db min.
RF Power Rating . . . . . 3 KW
Peak Voltage . . . . . 1500 V
Peak Current 1 μ Sec Pulse . . . . . 40 amp

MECHANICAL DATA

Weight . . . . . 12 oz.
Life expectancy . . . . . 10^6 cycles
Finish
- *Connectors* . . . . . Silver Plate
- *Block* . . . . . Silver Plate

ENVIRONMENTAL DATA

(Per MIL-S-3928)

Shock . . . . . 50 g's 11 ms.
Vibration (Test condition A) . . . 10 g's to 2000 cycles
Temperature . . . . . -55°C to +85°C
Salt Spray . . . . . 48 Hrs.
Humidity . . . . . 10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *313-2302 is a Transfer/Crossover Coaxial Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	313-XX01
BNC*	313-XX02
TNC*	313-XX03
C	313-XX05
SC	313-XX53
HN	313-XX51

*Reduced power limits when using these connectors.

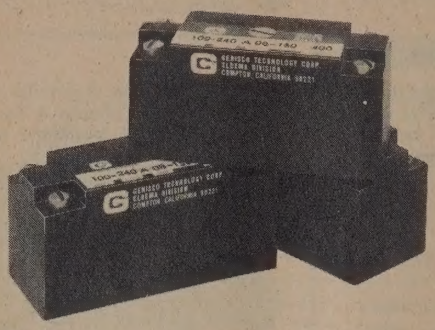
COIL CHARACTERISTICS

(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance * Ohms ±10 %
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000**

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*

GENISCO-ELDEMA SOLID STATE RELAY



A COMPLETE LINE

The Eldema Division offers a complete line of SOLID S TE RELAYS . . . isolated AC relays at any voltage through 10 VAC, up to 40 amperes, SPST and DPST, including models th zero-axis switching for radio interference free operation.

DC models available include 5 through 40 volt models th isolated input.

RELIABILITY

SOLID STATE RELAYS are being used wherever repeated reliable operation is required or wherever maintena e and repair costs for electromechanical relays are high. Through elimination of all moving parts and replacen t of contacts by a switch locked in a crystal structure, full load switching of at least 100 million cycles ma e reasonably expected when the relay is operated within its ratings.

CONSTRUCTION

100 & 200 SERIES RELAYS are fully encapsulated for resistance to severe environments. Contact and coil conn - tions are made through convenient barrier-strip type screw terminals. Mounting is through a countersunk ce r hole requiring only one mounting screw. An aluminum heat sink molded to the base dissipates internal heat. s external dimensions permit mounting on commercially available heat sinks for efficient heat distribution. Te - erature derating curves are provided below.

CONTACT & COILS

SOLID STATE RELAYS (SSR) use the mechanical relay terminology of "coil" and "contact" for convenience. SS s contain no electromechanical elements or moving parts of any type and the "relay" function is achieved tota y through the use of solid state circuitry. Semiconductor contacts have very high "off" resistance and a volt e drop less than one volt in the "on" condition (equivalent to an internal resistance less than 0.1 ohm at ra d voltage and current).

PERFORMANCE

THERMAL CHARACTERISTICS VS CURRENT

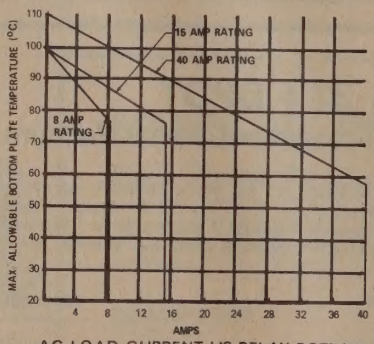


FIG. 1

AC LOAD CURRENT VS RELAY BOTTOM PLATE TEMPERATURE

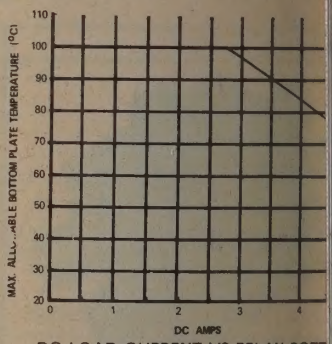


FIG. 2

DC LOAD CURRENT VS RELAY BOTT PLATE TEMPERATURE

HEAT SINK EFFECT ON A.C. RELAYS

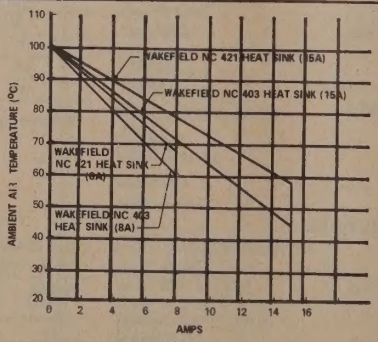


FIG. 3A

8 & 15 AMP RATINGS

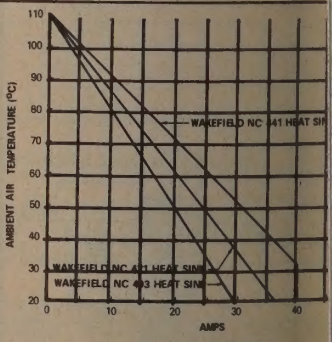


FIG. 3B

40 AMP RATINGS

ELDEMA DIVISION
GENISCO TECHNOLOGY CORPORATION
18435 SUSANA ROAD
COMPTON, CALIFORNIA 90221
(213) 774-1850

GENISCO-ELDEMA SOLID STATE RELAY

SERIES 100 AC RELAY

- 8 AMP RATINGS
- OPERATE AT VOLTAGES UP TO 240 VAC
- SPST OR DPST CONSTRUCTION
- 50/60 Hz or 400 Hz

SERIES 105 AC SYNCHROSWITCH RELAY

- 8, 15 AND 40 AMP RATINGS
- SYNCHRONUS LINE SWITCHING TO ELIMINATE RFI

SERIES 200 DC RELAY

- 5 AMP RATING—SPST
- 5 THROUGH 40 VDC OPERATION

ALL ELDEMA SOLID STATE RELAYS FEATURE:

- 100 MILLION OPERATIONS
- RUGGED FULLY ENCAPSULATED CONSTRUCTION
- CONVENIENT BARRIER-STRIP SCREW-TYPE TERMINALS
- MOUNT ON HIGH EFFICIENCY WAKEFIELD HEAT SINKS

APPLICATIONS

ELDEMA SOLID STATE RELAYS interface directly with integrated circuits and provide isolated power to solenoids, motors, heaters, lamps and other resistive, inductive or capacitive loads under repeated cycling conditions.

SERIES 105 "SYNCHROSWITCH" relays are recommended where contact bounce is a problem or where radio interference free operation is required.

SERIES 200DC RELAYS drive resistive, inductive or capacitive loads from low level logic sources.

OTHER APPLICATIONS INCLUDE:

- MOTOR AND SOLENOID
- LOAD BANKS AND HEATERS
- MACHINE TOOL CONTROL
- COMPUTER – LOAD INTERFACE
- LAMP DRIVERS
- TRAFFIC SIGNAL CONTROL

ORDERING INFORMATION

Formulate the part number using the table at right.

EXAMPLE:
100-240A08-1S1

The above part number breaks down as follows: Series 100 relay that operates at 240 VAC, with a coil that has 5VDC isolated contacts and will switch a load of 8 amps. Further it is designed for 50/60 Hz operation, SPST construction, and mounted on a Wakefield NC403 Heat Sink.

Part marking includes Eldema Division Genisco Technology Corporation complete part number, max. VRI, coil and contact identification.

ELDEMA FEDERAL VENDOR CODE NUMBER IS 03797

SOLID STATE RELAY PART NUMBERING SYSTEM

SERIES	VOLTAGE	COIL	RATING	Hz	CONTACT STRUCTURE	MOUNTING
100 AC	**240** (Up to 240 VAC)	**A** (5V DC isolated contacts)	**08** (8 amps)	**1** (50/60 Hz) **2** (400 Hz)	**S** (SPST) **D** (DPST-only in 8 amps rating)	**0** (STANDARD) **1** (Wakefield NC403 Heat Sink) **2** (Wakefield NC421 Heat Sink)
105 (AC Synchro Switch)	**115** (115 VAC) **240** (240 VAC)	**A** (5V DC isolated contacts)	**08** (8 amps) **15** (15 amps) **40** (40 amps)	**1** (50/60 Hz) **2** (400 Hz)	**S** (SPST)	**0** (STANDARD) **1** (Wakefield NC403 Heat Sink) **2** (Wakefield NC421 Heat Sink)
200 (DC)	**028** (5 thru 40 VDC, 28 Volts nominal)	**A** (5V DC isolated contacts)	**05** (5 amps)	**0** (DC)	**S** (SPST)	**0** (STANDARD) **1** (Wakefield NC403 Heat Sink)

ELDEMA DIVISION
GENISCO TECHNOLOGY CORPORATION
18435 SUSANA ROAD
COMPTON, CALIFORNIA 90221
(213) 774-1850

Electronic Applications Co.

2213 EDWARDS AVE • SO. EL MONTE, CALIF. 91733 • (213) 442-3212

MINIATURE REED RELAYS

- PRINTED CIRCUIT TYPES
- ENCAPSULATED
- HIGH RELIABILITY
- HIGH SENSITIVITY
- COMPETITIVELY PRICED
- FAST DELIVERY
- LARGE STOCK

Contact Ratings	Form A	Form B	Form C
Voltage (Max. Switching)	200 VDC	200 VDC	150 VDC
Voltage (Min. Breakdown)	750 VDC	750 VDC	500 VDC
Current (Max. Switching)	500 ma	500 ma	250 ma
Current (Max. Gating or Carry)	2 Amps	2 Amps	1.5 Amps
Power (Resistive Load)	10 Watts	10 Watts	4 Watts
Capacitance (Typical)	0.2 PF	0.2 PF	0.8 PF
Contact Resistance (Typical)	.100 Ohms	.100 Ohms	.150 Ohms
Operate Time (Typical)	½ ms	½ ms	½ ms
Life (Low Load) Operations	100 x 10^6 Min.	100 x 10^6 Min.	20 x 10^6 Min.
Life (Half Load) Operations	50 x 10^6 Min.	50 x 10^6 Min.	10 x 10^6 Min.
Life (Full Load) Operations	20 x 10^6 Min.	20 x 10^6 Min.	5 x 10^6 Min.

General Specifications

Must Operate Voltage.... — 80% of Rated Voltage (M
Must Release Voltage.... — 10% of Rated Voltage (M
Over Voltage..... —200% of Rated Voltage (M

Operating Parameters

Temperature..... —55°C to +12
Shock..... 200G @ 11ms Durat
Vibration..... 50G @ 0-2000
Insulation Resistance..... 10^9 Ohms M

DC Coil Voltage	Contact Form	Coil Resistance 25°C	Standard Package & Schematic
3V	1A (SPST) N.O.	60	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	45	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	30	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	22.5	X5, Y5, Z4
	5A (5PST) N.O.	20	X6, Y6, Z5
	6A (6PST) N.O.	15	X7, Y7, Z6
	1C (SPDT)	60	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	40	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	60	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	45	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	60	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	30	X13, Y13, A8, B8
6V	1A (SPST) N.O.	250	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	180	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	125	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	90	X5, Y5, Z4
	5A (5PST) N.O.	75	X6, Y6, Z5
	6A (6PST) N.O.	60	X7, Y7, Z6
	1C (SPDT)	250	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	180	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	250	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	180	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	250	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	125	X13, Y13, A8, B8
12V	1A (SPST) N.O.	1000	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	750	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	500	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	375	X5, Y5, Z4
	5A (5PST) N.O.	300	X6, Y6, Z5
	6A (6PST) N.O.	250	X7, Y7, Z6
	1C (SPDT)	1000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	750	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	1000	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	750	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	1000	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	500	X13, Y13, A8, B8

DC Coil Voltage	Contact Form	Coil Resistance 25°C	Standard Package & Schemati
24V	1A (SPST) N.O.	2000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	1500	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	1000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	750	X5, Y5, Z4
	5A (5PST) N.O.	600	X6, Y6, Z5
	6A (6PST) N.O.	500	X7, Y7, Z6
	1C (SPDT)	2000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	1500	X9, Y9, Z9, X10, A5, B5,
	1B (SPST) N.C.	2000	X11, Y11, Z11, A6, B6, C
	2B (2PST) N.C.	1500	X12, Y12, Z12, A7, B7, C
	1AL Latching Single Coil	2000	X11, Y11, Z11, A6, B6, C
	1AL Latching Dual Coil	1000	X13, Y13, A8, B8
48V	1A (SPST) N.O.	6000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	4500	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	3000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	2250	X5, Y5, Z4
	5A (5PST) N.O.	1800	X6, Y6, Z5
	6A (6PST) N.O.	1500	X7, Y7, Z6
	1C (SPDT)	6000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	4500	X9, Y9, Z9, X10, A5, B5,
	1B (SPST) N.C.	6000	X11, Y11, Z11, A6, B6, C
	2B (2PST) N.C.	4500	X12, Y12, Z12, A7, B7, C
	1AL Latching Single Coil	6000	X11, Y11, Z11, A6, B6, C
	1AL Latching Dual Coil	3000	X13, Y13, A8, B8
115V	1A (SPST) N.O.	20000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	15000	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	10000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	7500	X5, Y5, Z4
	5A (5PST) N.O.	6000	X6, Y6, Z5
	6A (6PST) N.O.	5000	X7, Y7, Z6
	1C (SPDT)	20000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	15000	X9, Y9, Z9, X10, A5, B5,
	1B (SPST) N.C.	20000	X11, Y11, Z11, A6, B6, C
	2B (2PST) N.C.	15000	X12, Y12, Z12, A7, B7, C
	1AL Latching Single Coil	20000	X11, Y11, Z11, A6, B6, C
	1AL Latching Dual Coil	10000	X13, Y13, A8, B8

OEM PRICE LIST — 4 THRU 12 VOLT RELAYS

Contact Arrangement	Package	Price
1A	X1, Y1, Z1	$3.60
1A	ALL OTHER	3.20
2A	ALL	4.60
3A	ALL	6.00
4A	ALL	7.00
5A	ALL	8.10
6A	ALL	9.50
1C	ALL	6.40
2C	ALL	9.40
1B	ALL	4.50
2B	ALL	6.00
1A Single Coil Latching	ALL	4.70
1A Dual Coil Latching	ALL	5.70

24 VOLT RELAYS.....ADD 5%
48 VOLT RELAYS.....ADD 10%
115 VOLT RELAYS.....ADD 25%
MAGNETIC SHIELDING .....ADD 25¢
ELECTROSTATIC SHIELDING.....ADD 50¢
SILICONE TREATMENT..... ADD 25¢
FLAT PACK .275" HIGH CONSULT FACTORY
AXIAL LEADS.....CONSULT FACTORY
LOW COST OPEN FRAME CONSULT FACTORY

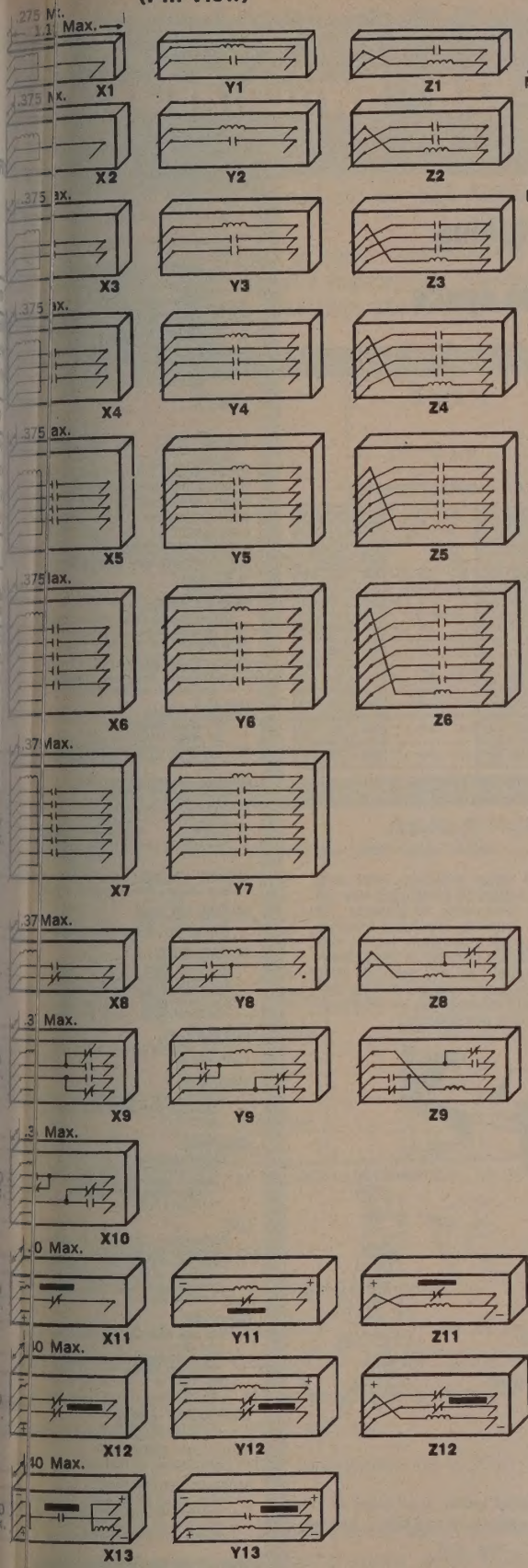
QUANTITY DISCOUNTS

1-24	List
25-49	Less 10%
50-99	Less 20%
100-499	Less 30%
500-999	Less 40%
1000 up	Consult Factory

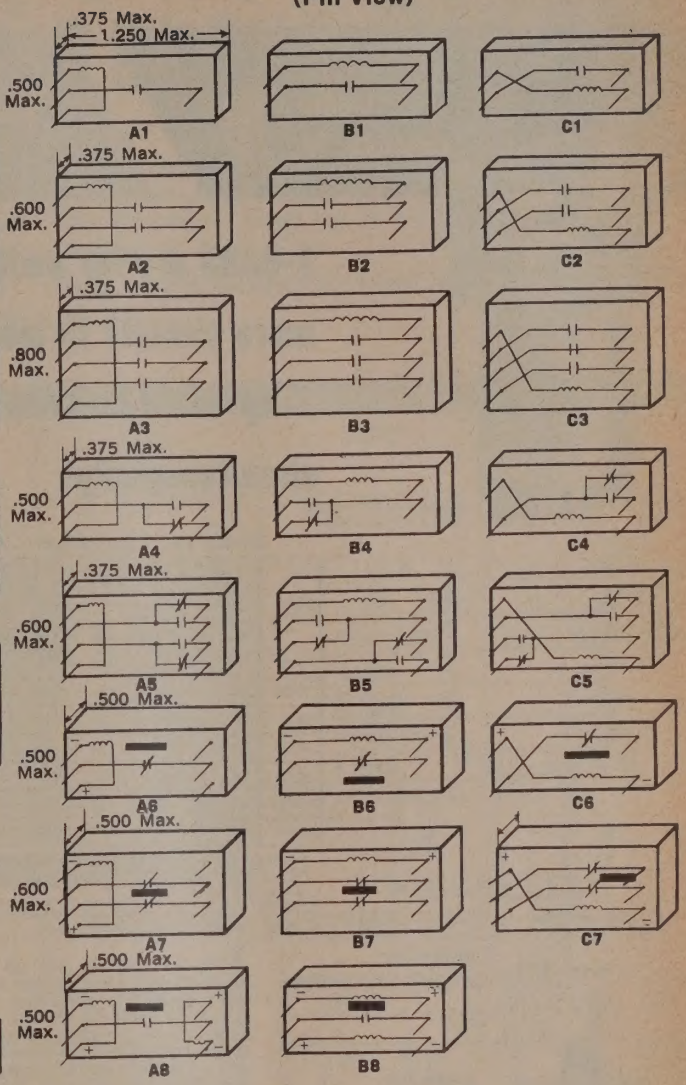
TERMS: 1% — 10, NET 30 DAYS

F.O.B. SO. EL. MONTE, CALIFORNIA

.10 SPACING ON 1" CENTERS
(Pin View)



.150 SPACING ON 1" CENTERS
(Pin View)



SPECIAL ADDITIONS

Symbol	Description
M	**MAGNETIC SHIELDING** (Encapsulated Inside Package) Recommended in high density packaging to reduce relay inter action or in high magnetic field environments.
E	**ELECTROSTATIC SHIELDING** Recommended in high impedance, low level application where low level noise pick-up is undesirable.
S	**SILICONE TREATMENT** Used to improve insulation resistance under severe environment conditions.

ORDERING INFORMATION

Part Number (Example) 12 3A X4 ME

Voltage — Contacts — Package — Special Additions (when required)

SPECIALS

Electronic Applications Company has complete facilities to manufacture special requirements or replacement of existing reed relays at competitive prices — **Consult Factory.**

— ALSO AVAILABLE —

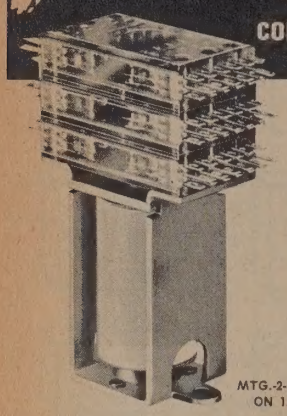
- Mini-Micro
- Compact
- Mercury Contacts
- High Voltage Contacts
- Flat Pack
- Standard
- Axial Leads
- High Current Contacts

Electronic Applications Co.

2213 EDWARDS AVE • SO. EL MONTE, CALIF. 91733 • (213) 442-3212

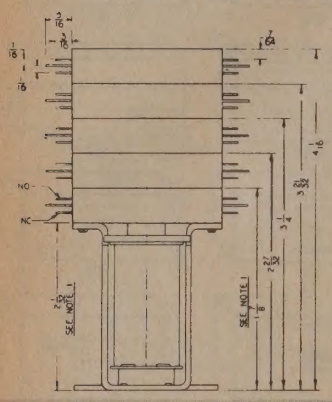
electronic controls, inc.

T-BAR® Switch/Relays



T-BARS are for switching more circuits in less space ...up to 60 circuits simultaneously!

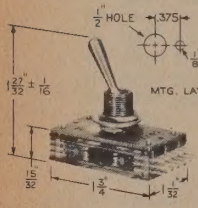
MTG.-2-#6-32 NF HOLES ON 1.375 CENTERS



SERIES 801 T-BAR RELAY COIL CHARACTERISTICS*

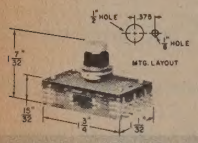
	12 POLES 1 WAFER RELAY Wt: 4.5 oz.			24 POLES 2 WAFER RELAYS Wt: 6.75 oz.			36 POLES 3 WAFER RELAYS Wt: 7.25 oz.			48 POLES*** 4 WAFER RELAYS Wt: 8.5 oz.			60 POLES 5 WAFER RELAYS Wt: 9 oz.		
Voltage	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts
6 VDC	11.9	0.504	3.01	11.09	0.541	3.24	7	0.857	5.06	5.5	1.09	6.54	5.5	1.09	6.54
12 VDC	49.1	0.244	2.96	45	0.267	3.19	28	0.429	5.16	22	.545	6.54	22	.545	6.54
24 VDC	193	0.124	2.98	174	0.138	3.32	111	0.216	5.15	94	.255	6.12	94	.255	6.12
28 VDC	258	0.109	3.03	227	0.123	3.44	150	0.187	5.23	120	.233	6.52	120	.233	6.52
48 VDC	778	0.062	2.98	674	0.071	3.41	438	0.110	5.26	350	.137	6.58	350	.137	6.58
110 VDC	3963	0.028	3.05	3450	0.032	3.54	2355	0.047	5.18	1930	.057	6.27	1930	.057	6.27
115 VAC**	3963	0.024	2.80	3450	0.027	3.10	2355	0.041	4.72	1930	.049	5.62	1930	.049	5.62

*All characteristics are nominal and subject to normal manufacturing tolerances, other voltages available on special order.
**115 VAC units are made with a full wave bridge rectifier and use the same coils as listed under 110 VDC units.
***Four-wafer relays with all "A" form contacts use three-wafer relay coils.
NOTE 1: ONE WAFER RELAYS USE A SHORTER ACTUATOR ASS'Y. — INSTEAD OF 2-1/32 AS SHOWN, THE ACTUATOR IS 1-15/32 HIGH.



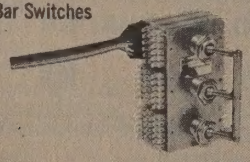
SERIES 802 Bat Handle T-Bar Switches

SERIES 803 Push Button Switch



Series 802 & 803	
No. of Poles	Weights Oz. Approx.
12	2.0
24	2.5
36	3.0

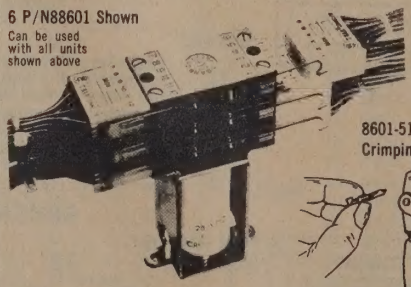
Ganged T-Bar Switches



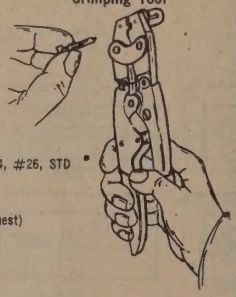
Toggles may be ganged for controlling additional circuits . . . 48, 72, 108, etc. Shown here, 108 poles.

T-BAR Connectors save time and reduce installation costs using individual snap-in crimp terminals crimped to pre-stripped wire and then snapped into a contact block, which forms the connector. The connector is pushed onto the wafer terminals, eliminating soldering. Because we offer a connector, rather than a receptacle, harness work can be completed outside the chassis and therefore no fancy chassis work is required to accept a receptacle. It not only makes the metal work simpler, but it also saves layout engineering and drafting time. Since T-Bar Switch/Relays are so easily mounted, they are often found on the back of meter panels or on their own brackets.

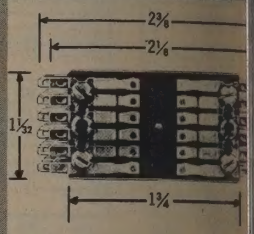
6 P/N88601 Shown
Can be used with all units shown above



8601-51 Crimping Tool



PHYSICAL PROPERTIES:
Wire Accommodated: (1) #18, #20, #22, #24, #26, STD (2) #22, #24, #26 STR
Connector Material: Nylon Zytel or Lexan®
Snap-in Contact Material: Phosphor Bronze
Snap-in Contact Finish: Tin Plated (other on request)
Retaining Clip Material: Stainless Steel
Connector Weight: Approximately 0.3 oz.



GENERAL FEATURES:

The series 801 T-Bar Relays are solen actuated multi-pole relays with a uni design permitting stack-up of enclo contact "wafers." Each wafer ha maximum of 12 pole double throw tacts thereby allowing ECI to supply 801 relay with any combination fro to 60 poles.

CONTACT RATING:
3 amp, resistive load 150 watt maximum make or break;
5 amp, 500 watt maximum carry.

CONTACT MATERIAL:
Gold bonded, fine silver. standard. Oth available on special order.

CONTACT FORMS:
"A" single throw N.O.
"B" single throw N.C.
"C" double throw, break before make
"D" double throw, make before break

NUMBER OF POLES (RELAYS):
One Wafer — 12 poles
Two Wafers — 24 poles
Three Wafers — 36 poles
Four Wafers — 48 poles
Five Wafers — 60 poles ("A" form only)

OPERATE VOLTAGE:
Min. voltage: 80% of nominal at 25°C

RELEASE VOLTAGE:
Max. voltage: 20% of nominal at 25°C

OPERATE TIME:
One Wafer Relay — 15 ms. max.
Two Wafer Relay — 25 ms. max.
Three Wafer Relay — 30 ms. max.
Four Wafer Relay — 35 ms. max.
Five Wafer Relay — 40 ms. max.

RELEASE TIME:
5 ms. max. (36 pole) — 10 ms. max. (12 pole)

TERMINALS:
Solder tab that also mates with T-Bar connector P/N 88601 (two required per wafer)

ENCLOSURE:
Contacts enclosed in dust tight plastic enclosure that is separated from the actuator assembly. Withstands Mil. S — 202 method 106B moisture resistance test.

LIFE:
Mechanical — 20,000,000 operations minimum for relay
Electrical — 20,000,000 operations minimum at 100 milliamps to 100,000 minimum at 5 amps, 150 watts resistive load.

DIELECTRIC:
1000 vrms terminals to case at sea leve and 25°C
1000 vrms terminal to terminal at sea level and 25°C
1000 vrms coil to case at sea level and 25°C

TEMPERATURE RANGE:
—55°C to +85°C

INSULATION RESISTANCE:
5,000 megohms @ 25°C minimum

ORDERING INFORMATION:
Specify Series No. — number of poles contact form letter-coil voltage. For example a 36 pole double throw relay with a 24 VDC coil is: 801-36C-24

MANUFACTURED BY:

electronic controls, inc.
T-Bar Switch/Relay Div. •
Danbury Road, Wilton, Conn. • (203) 762-8351

Manufactured under 1 or more of the following patents: 3,206,990, 3,226,508

® "T-Bar" — Reg. T.M.

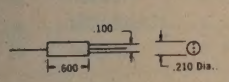
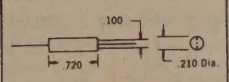
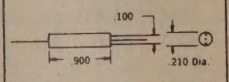
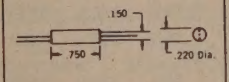
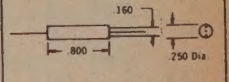
WINCHESTER TINY REED RELAYS

ELECTRONIC INSTRUMENT & SPECIALTY CORP.

Y SHIELDED RELAYS! Micro-sized relays specifically designed nitra gh speed switching systems and requiring minimum l powe Extremely small in physical size for high density cuit ackaging.

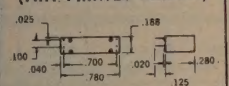
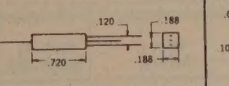
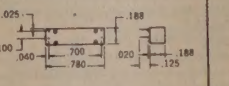
e to rface solid state circuits, to trigger controlled recti- rs, an in computer and telemetry applications. Provides arly co plete circuit isolation—insulation resistance greater than 10^{12} ohms. Metallic case provides shielding and protection. Reed switch contacts are hermetically sealed in glass with an inert atmosphere. Leads can be freely bent without affecting performance.

Highly reliable operation is assured by careful manufacturing control.

	FORM A CONTACTS											FORM C CONTACTS			MERCURY WETTED CONT.		
	2160*					2172**			2190			2275			2580***		
																	
L VOLTAGE		3	6	12	24	6	12	24	6	12	24	6	12	24	6	12	24
L RESISTANCE	2160R	120	500	2100	4800	630	2800	5500	630	2800	5500	325	1200	5000	105	400	1700
NTACTS	Normally Open					Normally Open			Normally Open			Form C SPDT			Form A Mercury Wetted		
CURRENT	10 Ma					¼ amp			½ amp			¼ amp			1 amp		
VOLTAGE	28 Volts					100 Volts			200 Volts			28 Volts			28 Volts		
RESISTICE	.200 ohms					.150 ohms			.100 ohms			.150 ohms			.050 ohms		
POWER	3 Watts					10 Watts			10 Watts			3 Watts			28 Watts		

Availat ¼ amp — 100 Volts.
Availat RF Switch (low resistive losses to 100 MHz).

*** Available: DRY REED Switches for low thermal EMF 5 MV/°C. OR 1000V or 2000V Breakdown.

	FORM B CONTACTS			FORM A CONTACTS			FORM A CONTACTS		
	TP-1B (TINY PRINTED CIRCUIT)			TX-72 (TINY AXIAL LEADS)			TP (TINY PRINTED CIRCUIT)		
									
OIL VOLTAGE	6	12	24	6	12	24	6	12	24
OIL RESISTANCE	225	1125	3800	630	2800	5500	225	1125	3800
ONTACTS	Normally Closed			Normally Open			Normally Open		
CURRENT	¼ amp*			¼ amp			¼ amp*		
VOLTAGE	100 Volts			100 Volts			100 Volts		
RESISTANCE	.150 ohms max.			.150 ohms max.			.150 ohms max.		
POWER	10 Watts			10 Watts			10 Watts		

Choice f switches and coil resistance can optimize fast switching, low RF loss to 100 Hz, or low thermal EMF.

ENERAL INFORMATION

PERATE TIME: In order of .3 to .8 milliseconds

ELEASE TIME: .1 to .2 millisecond.

NSULATION RESISTANCE: Greater than 1 x 10^{12} ohms except Form C (1 x 10^{9}).

IFE: 00 million operations at low level, 5 million at max. load rating.

MBIENT TEMPERATURE: −55°C. to +85°C.

HOCK: To 1500 G's. **VIBRATION:** (energized); 35 G from 50 to 2000 Hz.

EIGHT: 1.1 to 2.2 grams.

hipped Promptly from Stock. TERMS 1%-10 days/net 30 F.O.B. Winchester, Mass.

TANDARD SIZE RELAYS NOT LISTED HERE. ALSO CUSTOM RELAYS TO YOUR SPECIFICATIONS.

WINCHESTER TINY REED RELAYS PRICE LIST

TYPE	QUANTITY 1	10	100	500
TYPE 2160				
3 volt	$5.56	$4.18	$3.33	$2.78
6	5.56	4.18	3.33	2.78
12	6.39	4.80	3.83	3.19
24	8.33	6.22	4.99	4.17
TYPE 2172				
6 volt	5.56	4.18	3.33	2.78
12	6.39	4.80	3.83	3.19
24	8.33	6.22	4.99	4.17
TYPE 2190				
6 volt	5.56	4.18	3.33	2.78
12	6.39	4.80	3.83	3.19
24	8.33	6.22	4.99	4.17
TYPE 2272				
6 volt	8.60	6.44	5.16	4.30
12	9.46	7.10	5.67	4.73
24	9.95	8.40	6.70	5.59
TYPE 2580				
6 volt	6.74	5.05	4.04	3.38
12	7.56	5.68	4.54	3.79
24	9.29	6.96	5.57	4.65
TYPE TP				
6 volt	3.55	2.80	2.24	1.87
12	3.95	3.11	2.49	2.08
24	4.70	3.71	2.97	2.46
TYPE TP-1B				
6 volt	4.77	3.76	3.02	2.51
12	5.15	4.07	3.26	2.71
24	5.93	4.69	3.71	3.12
TYPE TX-72				
6 volt	3.55	2.80	2.24	1.87
12	3.95	3.11	2.49	2.08
24	4.70	3.71	2.97	2.46

LECTRONIC INSTRUMENT & SPECIALTY CORP.
CROSS ST., WINCHESTER, MASS. 01890 • PHONE: (617) 729-1202

ESSEX INTERNATIONAL, INC. CONTROLS DIVISION: 131 GODFREY STREET • LOGANSPORT, INDIANA 46947 • PHONE 219-753-7521

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

A.C. ENGINEERING DESIGN DATA

Type	Magnet Coil Rating (Volt Amperes) Inrush	Sealed Nom.	Sealed Max.	Operation in % of Nom. Coil Rating Pick-up	*Max. Safe Operate	Breakdown Voltage All Terminals - 60 cy. RMS Opposite Polarity	Open Contacts Same Polarity	To Ground	Contact Material Power Rating	Pilot Rating	Electrical Life Oper. At Rated Load	Oper. Per Min.	**Mechanical Life Oper. At No Load	Oper. Per Min.	Maximum Operating Ambient Degrees Fahrenheit
59	No Magnet Coil			85%	110%	1500	1000	1500	—	Fine Silver	100,000	1	1,000,000	1	140
75	16	10	12	85%	110%	1500	1000	1500	Silver Alloy	—	†100,000	6	1,000,000	60	140
80	27	15.6	17	85%	110%	1500	1500	1500	Silver Alloy	—	†100,000	3	1,000,000	60	130
84	4	2.8	3	85%	110%	1500	1000	1500	Silver Alloy	Fine Silver	100,000	6	1,000,000	60	140
84T	9	2.8	3	85%	110%	1500	1000	1500	—	Gold Alloy	100,000	6	1,000,000	60	140
85	90	19	23	85%	110%	2200	2200	2200	Silver Alloy	—	†100,000	6	500,000	10	130
91	22	8	10	85%	110%	1500	1000	1500	Fine Silver	•Gold Alloy	†100,000	6	750,000	60	130
92	24	8.9	12	85%	110%	1500	1000	1500	Fine Silver	•Gold Alloy	†100,000	6	750,000	60	130
93	4.5	3.0	4	85%	110%	1500	1000	1500	Fine Silver	•Gold Alloy	100,000	6	10,000,000	60	160
129	10	4.5	5	85%	110%	1500	1000	1500	Silver Alloy	—	†100,000	3	500,000	60	130
129AR	10	4.5	5	85%	110%	1500	1000	1500	Silver Alloy	—	†100,000	3	500,000	60	130
143	24	8.9	12	85%	110%	1500	1000	1500	Silver Alloy	—	†100,000	6	500,000	30	130
187	1.3	1.3	1.5	85%	110%	1000	1000	1000	—	Silver Alloy	†100,000	6	10,000,000	60	150
189	No Magnet Coil			85%	110%	1500	1000	1500	Silver Alloy	Silver Alloy	100,000	1	200,000	1	140
987	9	5.5	6.5	85%	110%	1500	1000	1500	Fine Silver	•Gold Alloy	100,000	6	1,000,000	60	140
C	90	18	21	85%	110%	2200	2200	2200	Silver Alloy	—	†100,000	6	1,000,000	10	130
CR	90	18	21	85%	110%	2200	2200	2200	Silver Alloy	—	†100,000	6	1,000,000	10	130
S	50	14.5	17	85%	110%	2200	2200	2200	Silver Alloy	—	†100,000	6	500,000	10	130

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

D.C. ENGINEERING DESIGN DATA

Type	Nominal Magnetic Coil Rating (Watts)	Operation in % of Nom. Coil Rating Pick-up	*Max. Safe Operate	Breakdown Voltage All Terminals - 60 cy. RMS Opposite Polarity	Open Contacts Same Polarity	To Ground	Contact Material Power Rating	Pilot Rating	Electrical Life Oper. At Rated Load	Oper. Per Min.	**Mechanical Life Oper. At No. Load	Oper. Per Min.	Maximum Operating Ambient Degrees Fahrenheit
60	2	75%	110%	1000	1000	1000	Fine Silver	—	100,000	4	250,000	4	122
70	9	75%	110%	500	500	500	Copper or Silver	—	100,000	4	250,000	4	122
84D	3	75%	110%	1500	1000	1500	—	Silver Alloy	100,000	6	1,000,000	60	140
91D	6.5	75%	110%	1500	1000	1500	Fine Silver	—	100,000	6	750,000	60	140
92D	7	75%	110%	1500	1000	1500	Fine Silver	—	100,000	6	750,000	60	140
93	1.5	75%	110%	1500	1000	1500	Fine Silver	•Gold Alloy	100,000	6	10,000,000	60	160
150	2	75%	110%	500	500	500	Silver Alloy	—	500,000	12	1,000,000	12	122

* Magnet coils designed for continuous duty. Do not operate at rate higher than indicated under Mechanical Life.
** Based on steady state test under laboratory environmental conditions. Consult factory if application involves unusual load, speed of operation, off-on environmental or operating conditions. Electric life substantially greater when operated below rated load.
† Load tests — making inrush ratings (0.4 to 0.5 P.F.) — breaking 125% continuous rating (0.65 to 0.8 P.F.). • Cross-bar contacts.

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

MINIATURE D.C. SENSITIVE RELAYS

TYPE MS64

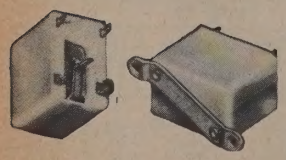


FIG. 1 FIG. 2

SIZE 1 3/16" x 3/4" x 1 1/8"

Printed Circuit Terminals or Bracket Mounting
•
Isolated Contacts
•
Snap-on Cover
•
Molded Construction

SINGLE POLE DOUBLE THROW — ENCLOSED TYP

Contact Rating	Coil Power	
2 Amp. Non-Inductive 28 V.D.C. — 115 V.A.C.	Minimum Required	0.050 Watts
	Maximum Capacity	1.0 Watts

D.C. Magnet At 25°C Nominal Voltage or Current	*Max. Pick-up Voltage or Current	†Resistance in Ohms	Catalog Number Fig. 1	Catalog Number Fig. 2
6 V.	4.5 V.	400	MS64-901	MS64-91
12 V.	9.0 V.	1600	MS64-902	MS64-91
24 V.	18.0 V.	6500	MS64-903	MS64-91
3. MA.	2.3 MA.	10000	MS64-904	MS64-91

*D.O. Approx. 35% of PU. †Nominal ±10%.

Listed here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE

See YELLOW SECTION for Local Offices, Phones

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RBM CONTROLS
ESSEX INTERNATIONAL, INC.

MINIATURE D.C. SENSITIVE RELAYS

TYPE MS40

SIZE 1⅛" x 1⅛" x 15/16"

Solder Terminals
•
4-40 Mounting
•
Armature Common to Frame
•
Long Life
•
Low Cost

SINGLE POLE DOUBLE THROW — OPEN TYPE

Contact Rating	Coil Power	
2 Amp. Non-Inductive 28 V.D.C. — 115 V.A.C.	Minimum Required	0.050 Watts
	Maximum Capacity	1.0 Watts

D.C. Magnet Coil At 25°C			
Nominal Voltage or Current	*Max. Pick-up Voltage or Current	†Resistance in Ohms	Catalog Number
18.7 MA.	14 MA.	250	MS40-901
13.5 MA.	10 MA.	500	MS40-902
11.0 MA.	8.2 MA.	750	MS40-903
9.3 MA.	7 MA.	1000	MS40-904
7.7 MA.	5.8 MA.	1500	MS40-905
6.0 MA.	4.5 MA.	2500	MS40-906
4.3 MA.	3.2 MA.	5000	MS40-907
3.5 MA.	2.6 MA.	7500	MS40-908
2.9 MA.	2.2 MA.	10000	MS40-909

*D.O. Approx. 35% of PU. †Nominal ±10%.

SINGLE POLE DOUBLE THROW — TWO POLE DOUBLE THROW — THREE POLE NORMALLY OPEN

Electrical Life				Mechanical Life	Operate Time (Incl. Bounce)	Vibration	Shock	Operating Ambient
NON-INDUCTIVE LOAD	0.5 Amp.	1.0 Amp.	2.0 Amp.	100,000,000 At 180 Operations Per Minute (No Load)	20 Milliseconds	2G 10-55 Cycles	2G Operate 10G Non-Operate	−55°C to +85°C
NUMBER OPERATIONS	1,000,000	300,000	100,000					

TYPE MS5P

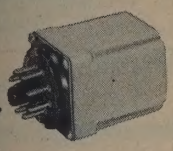

FIG. 2 SIZE 2"x1"x1⅜"

TYPE MS25

FIG. 1 SIZE 1 3/16"x1½"x1 3/16"

OPEN TYPE
Solder Terminals
•
Isolated Contacts
•
Protective Contact Cover

ENCLOSED TYPE
8 or 11 Pin Plug-In
•
Isolated Contacts
•
High Impact Case

SINGLE POLE DOUBLE THROW

Contact Rating	Coil Power	
2 Amp. Non-Inductive 28 V.D.C. — 115 V.A.C.	Minimum Required	0.040 Watts
	Maximum Capacity	1.5 Watts

D.C. Magnet Coil At 25°C				
Nominal Voltage or Current	*Max. Pick-up Voltage or Current	†Resistance in Ohms	Fig. 1 Catalog Number	Fig. 2 Catalog Number
6 V.	4.5 V.	510	MS25-901	MS25P-901
12 V.	9.0 V.	2025	MS25-902	MS25P-902
24 V.	18.0 V.	8100	MS25-903	MS25P-903
3.7 MA.	2.8 MA.	5000	MS25-904	MS25P-904
2.7 MA.	2.0 MA.	10000	MS25-905	MS25P-905
2.1 MA.	1.6 MA.	15000	MS25-906	MS25P-906

*D.O. Approx. 35% of PU. †Nominal ±10%.

TYPE MS50P

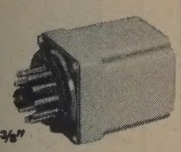

FIG. 2 SIZE 2" x 1⅜" x 1⅜"

TYPE MS50

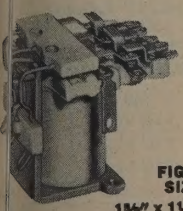

FIG. 1 SIZE 1⅜" x 1½" x 1⅜"

OPEN TYPE
Solder Terminals
•
Isolated Contacts
•
Protective Contact Cover

ENCLOSED TYPE
8 or 11 Pin Plug-In
•
Isolated Contacts
•
High Impact Case

TWO POLE DOUBLE THROW

Contact Rating	Coil Power	
2 Amp. Non-Inductive 28 V.D.C. — 115 V.A.C.	Minimum Required	0.125 Watts
	Maximum Capacity	1.5 Watts

D.C. Magnet Coil At 25°C				
Nominal Voltage or Current	*Max. Pick-up Voltage or Current	†Resistance in Ohms	Fig. 1 Catalog Number	Fig. 2 Catalog Number
6 V.	4.5 V.	160	MS50-901	MS50P-901
12 V.	9.0 V.	650	MS50-902	MS50P-902
24 V.	18.0 V.	2600	MS50-903	MS50P-903
6.7 MA.	5.0 MA.	5000	MS50-904	MS50P-904
4.7 MA.	3.5 MA.	10000	MS50-905	MS50P-905
3.9 MA.	2.9 MA.	15000	MS50-906	MS50P-906

*D.O. Approx. 35% of PU. †Nominal ±10%.
Also available in three pole double throw configuration.

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

COMPUTER RELAYS

TYPE 81

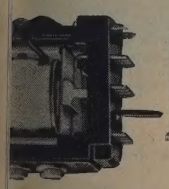

FIG. 1 2" x 5/8" x 2"

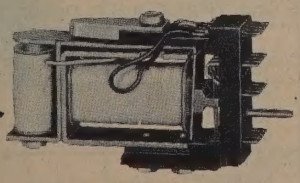

FIG. 2 2" x 5/8" x 2¾"

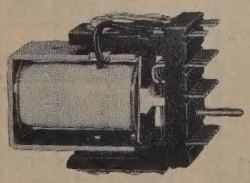

FIG. 3 2" x 15/16" x 2¾"

Part Number	Fig.	Pole Form	D.C. Res.	Rated Voltage ±10%	Operate Time (M.S.)
81-201045-11000	2	4 PDT	720	45	5.5
81-214026-29000	3	4 PDT	500	26	10.0
81-202045-55000	2	4 PDT	395, 332	45	6.6
81-301045-39000	3	6 PDT	216	45	4.5

CONTACT PERFORMANCE GUIDE*
RESISTIVE LOAD — NO ARC SUPPRESSION — 48 VDC

	Electrical Life				
Contact Load Amperes	0.025	0.100	0.500	1.0	3.0
Number of Operations (Million)	200	100	20	5	Carry Only No Make or Break

*Based on tests with relay operating rate 30 per second. Consult factory for life expectancy for inductive loads — with or without arc suppression, giving contact loads, frequency of operation and "on time" ratio.

re Contacts • Plug-in Design • Hardware Available • 4PDT Standard (Fig. 1)
DT Latch (Fig. 2) 6PDT (Fig. 3) • High Speed • Long Life • Single or Double Coil
ndings • Standard or Long Yoke Available • All Coil Voltages Thru 115 VDC Max.

ted here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE 1762

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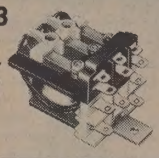
RBM CONTROLS
ESSEX INTERNATIONAL, INC

A.C.-D.C. GENERAL PURPOSE RELAYS

TYPE 93



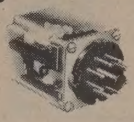
Solder Terminals (Fig. 1a)

Printed Circuit (Fig. 1b)

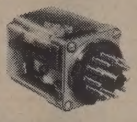
Solder terminal type has combined front, single hole and stud mounting, screw and stud included. All te out front. One piece molded bobbin and terminal boa struction. Highly resistant to arc tracking. Printed type may be controlled by SCR if firing angle, is n than 10 degrees.*

Size: 1 15/16" x 1 5/16" x 1 5/16" U.L. and

TYPE 93P



8 Pin Plug-In (Fig. 2)



11 Pin Plug-In (Fig. 2)

8 pin octal base for single and two pole. 11 pin base for three pole. High impact case. Standard pin connections.

Size: 2 1/8" x 1 7/16" x 1 9/16". U.L. and C.S.A.

TYPE 93Q

Quick Connect (Fig. 3)

Relay Receptacle 93-153-1

Enclosed quick connect type designed for front moun polarized socket mounting. For socket mounting use 93 socket kit. Front mounting relay has .20 x .187 ter High impact case. Size: 2 1/8" x 1 7/16" x 1 9/16". U.L. and

A.C. CONTACT RATINGS

A.C. Voltage	Fine Silver Button		Gold-Alloy Cross Bar	
	Inductive	Resistive	Inductive	Resistive
120	1/6 H.P.	10 Amp.	1/10 H.P.	5 Amp.
240	1/3 H.P.	5 Amp.	1/6 H.P.	3 Amp.

D.C. CONTACT RATIN

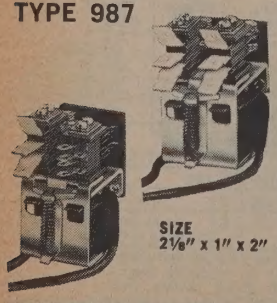
Button @ 28 V.D.C.	Cross B @ 28 V.
5 Amp. Resistive	5 Amp. Res
Consult Factory on U.L. and C	

Coil Voltage	D.C. Resistance in Ohms @ 25°C	Contact Form	Open Type: Solder Terminals (Fig. 1a) 10 Amp. Button Contacts Catalog Number	Open Type: Solder Terminals (Fig. 1a) 5 Amp. Cross-Bar Contacts Catalog Number	Open Type: Printed Circuit (Fig. 1b) 5 Amp. Cross-Bar Contacts Catalog Number	Enclosed Type: Plug-In (Fig. 2) 10 Amp. Button Contacts Catalog Number	Enclosed Type: Plug-In (Fig. 2) 5 Amp. Cross-Bar Contacts Catalog Number	Enclosed Type: Quick Connect Termin (Fig. 3) 10 Amp. Button Contacts Catalog Number	Enclosed Type: Quick Connect Termin (Fig. 3) 5 Amp. C Con Catalog
6 (50/60 CY.)	3.5	1PDT	93-901	93-931	—	93P-901	93P-931	93Q-901	93Q 1
		2PDT	93-902	93-932	—	93P-902	93P-932	93Q-902	93Q 2
		3PDT	93-903	93-933	—	93P-903	93P-933	93Q-903	93Q 3
12 (50/60 CY.)	14	1PDT	93-985	93-988	*93-991	93P-955	93P-958	93Q-955	93Q 8
		2PDT	93-986	93-989	*93-992	93P-956	93P-959	93Q-956	93Q 9
		3PDT	93-987	93-990	*93-993	93P-957	93P-960	93Q-957	93Q 0
24 (50/60 CY.)	55	1PDT	93-904	93-934	*93-964	93P-904	93P-934	93Q-904	93Q 4
		2PDT	93-905	93-935	*93-965	93P-905	93P-935	93Q-905	93Q 5
		3PDT	93-906	93-936	*93-966	93P-906	93P-936	93Q-906	93Q 6
120 (50/60 CY.)	1400	1PDT	93-907	93-937	*93-967	93P-907	93P-937	93Q-907	93Q 7
		2PDT	93-908	93-938	*93-968	93P-908	93P-938	93Q-908	93Q 8
		3PDT	93-909	93-939	*93-969	93P-909	93P-939	93Q-909	93Q 9
208/240 (50/60 CY.)	4850	1PDT	93-910	93-940	—	93P-910	93P-940	93Q-910	93Q 0
		2PDT	93-911	93-941	—	93P-911	93P-941	93Q-911	93Q 1
		3PDT	93-912	93-942	—	93P-912	93P-942	93Q-912	93Q 2
6 D.C.	24	1PDT	93-913	93-943	—	93P-913	93P-943	93Q-913	93Q 3
		2PDT	93-914	93-944	—	93P-914	93P-944	93Q-914	93Q 4
		3PDT	93-915	93-945	—	93P-915	93P-945	93Q-915	93Q 5
12 D.C.	96	1PDT	93-916	93-946	*93-976	93P-916	93P-946	93Q-916	93Q 6
		2PDT	93-917	93-947	*93-977	93P-917	93P-947	93Q-917	93Q 7
		3PDT	93-918	93-948	*93-978	93P-918	93P-948	93Q-918	93Q 8
24 D.C.	384	1PDT	93-919	93-949	*93-979	93P-919	93P-949	93Q-919	93Q 9
		2PDT	93-920	93-950	*93-980	93P-920	93P-950	93Q-920	93Q 0
		3PDT	93-921	93-951	*93-981	93P-921	93P-951	93Q-921	93Q 1
110 D.C.	8000	1PDT	93-922	93-952	—	93P-922	93P-952	93Q-922	93Q 2
		2PDT	93-923	93-953	—	93P-923	93P-953	93Q-923	93Q 3
		3PDT	93-924	93-954	—	93P-924	93P-954	93Q-924	93Q 4

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

A.C. GENERAL PURPOSE RELAYS

TYPE 987



SIZE 2 1/8" x 1" x 2"

9" Lead Wire Coil
•
Front or Rear Mounting
•
Hardware Included
•
Quick Connect Terminals on 15 Amp Poles
•
Solder Terminals on 3 Amp Poles

TWO POLE and THREE POLE DOUBLE THROW

Coil Voltage 60 cy.	Contact Form	Catalog Number	Contact Rating — Nom.-Inductive 125/250 VAC Left Stack	Right Stack
24	2PDT	987-902	SPDT - 15 AMP.	SPDT - 3 AMI
120	2PDT	987-903		
240	2PDT	987-904		
24	2PDT	987-906	SPDT - 15 AMP.	SPDT - 15 AM
120	2PDT	987-907		
240	2PDT	987-908		
24	3PDT	987-910	SPDT - 15 AMP.	2PDT - 3 AMI
120	3PDT	987-911		
240	3PDT	987-912		

Listed here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE

See YELLOW SECTION for Local Offices, Phones

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ESSEX CONTROLS INTERNATIONAL, INC.

A.C.-D.C. GENERAL PURPOSE RELAYS

TYPE 84

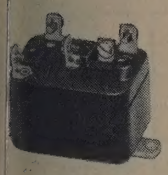


FIGURE 1

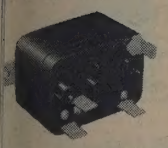


FIGURE 2

SIZE 2⅜" x 1⅝" x 1½"

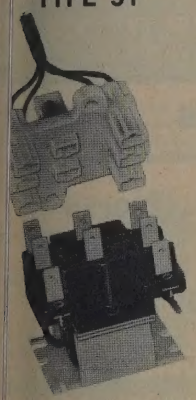
- Totally Enclosed
- Low Cost
- Screw or ¼" Quick Connect Termination
- Hardware Included
- Operates Any Position
- Isolated Coil
- I or T Mounting Brackets
- A.C. Coils Rated 50/60 cy
- U.L. and C.S.A.

SINGLE POLE NORMALLY OPEN and SINGLE POLE DOUBLE THROW

Coil Voltage A.C.	Catalog Number Figure 1		Contact Rating 125/250 V.A.C.	
	1PNO	1PDT	Inductive	Resistive
6	84-901	84-905	N.O. 8 Amps. Continuous 25 Amps. Inrush D.T. 8 Amps. Continuous 18 Amps. Inrush	N.O. 16 Amps. Continuous D.T. 8 Amps. Continuous
24	84-902	84-906		
120	84-903	84-907		
230/240	84-904	84-908		
Coil Voltage A.C.	**Catalog Number Figure 2**			
	1PNO	**1PDT**		
24	84-912	84-916		
120	84-913	84-917		
230/240	84-914	84-918		
24	84-922	84-926	3 Amps. @ 125 V.A.C. or 1.5 Amps. @ 250 V.A.C. Pilot Duty	
120	84-923	84-927		
230/240	84-924	84-928		

Coil Voltage D.C.	Resistance in Ohms @ 25°C	Catalog Number Figure 1	D.C. Contact Rating Inductive	
			Voltage	Current
12	90	84D-902	12	3 Amp.
24	280	84D-903	24	1.5 Amp.

TYPE 91



SEPARATE 91-180-1 SOCKET AND TERMINAL KIT
SIZE 2⅛" x 1⅞" x 2⅜"

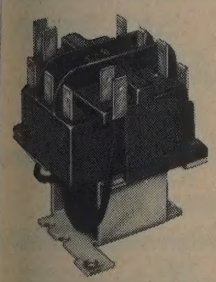
- ¼" Quick Connect Termination
- U.L. and C.S.A.
- Enclosed Contacts
- Operates Any Position
- Solenoid Action
- Wiring Terminals Included
- A.C. Coils Rated 50/60 cy.
- Can Be Panel Mounted

TWO POLE DOUBLE THROW

Coil Voltage A.C.	Catalog Number	Circuit Rating Terminals		Power Rating (A)	
		1-2-3	4-5-6	Inductive	Resistive
24	91-901	(A)	(A)	12 Amp. Cont. 60 Amp. Inrush 125 V.A.C. 6 Amp. Cont. 35 Amp. Inrush 250 V.A.C.	15 Amp. 277 V.A.C. Max.
120	91-902				
230/240	91-903				
24	91-904	(A)	(B)		
120	91-905				
230/240	91-906				
24	91-907	(B)	(B)	**Pilot Rating (B)**	
120	91-908			**Inductive**	**Resistive**
230/240	91-909			125 V.A. 1/10 H.P. 125/250 V.A.C.	3 Amp. 277 V.A.C. Max.

Coil Voltage D.C.	Catalog Number	Resistance in Ohms @ 25°C	D.C. Contact Rating - Resistive
6	91D-911	7	10 Amps. @ 32 V. Max.
12	91D-912	29	
24	91D-913	115	

TYPE 92



SIZE 2⅜" x 2⅜" x 2¾"

- ¼" Quick Connect Termination
- U.L. and C.S.A.
- Enclosed Contacts Operates Any Position
- Solenoid Action
- Wiring Terminals Included
- Manual Operating Button
- A.C. Coils Rated 50/60 cy

THREE POLE DOUBLE THROW

Coil Voltage A.C.	Catalog Number	Circuit Rating			Power Rating (A)	
		X	Y	Z	Inductive	Resistive
24	92-901	(A)	(A)	(A)	12 Amp. Cont. 60 Amp. Inrush 125 V.A.C. 6 Amp. Cont. 35 Amp. Inrush 250 V.A.C.	15 Amp. 277 V.A.C. Max.
120	92-902					
230/240	92-903					
24	92-904	(A)	(B)	(A)		
120	92-905					
230/240	92-906					
24	92-907	(B)	(A)	(B)	**Pilot Rating (B)**	
120	92-908				**Inductive**	**Resistive**
230/240	92-909				120 V.A. 1/10 H.P. 125/250 V.A.C.	3 Amp. 277 V.A.C. Max.
24	92-910	(B)	(B)	(B)		
120	92-911					
230/240	92-912					

Coil Voltage D.C.	Catalog Number	Resistance in Ohms @ 25°C	D.C. Contact Rating - Resistive
6	92D-911	6.5	10 Amps. @ 32 V. Max.
12	92D-912	26	
24	92D-913	104	

Listed here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE 1762

ESSEX INTERNATIONAL, INC. CONTROLS DIVISION. 131 GODFREY STREET • LOGANSPORT, INDIANA 46947 • PHONE 219-753-7521

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

A.C. POWER RELAYS

TYPE 129

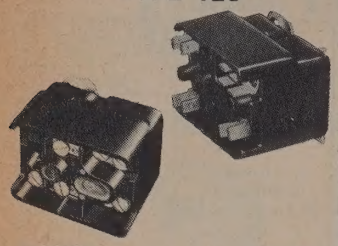


FIGURE 1 FIGURE 2

SIZE 2⅜" x 1⅞" x 1⅞"

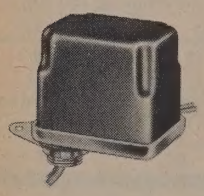
Double-Break Contacts • Totally Enclosed • Hi-Impact Case • Screw or ¼" Quick Connect Termination • Hardware Included • U.L. and C.S.A. • Non-Positional

SINGLE POLE NORMALLY OPEN and SINGLE POLE DOUBLE THROW

Coil Voltage (50/60 cy.)	Catalog Number				Contact Rating 250 V.A.C. Max	
	Figure 1		Figure 2			
	1PNO	†1PDT	1PNO	†1PDT	Inductive	Res
6	129-901	129-905	—	—	18 Amp. Continuous 1 H.P.-125 V. 2 H.P.-250 V.	18 Cont
24	129-902	129-906	129-911	129-914		
120	129-903	129-907	129-912	129-915		
208/230	129-904	129-908	129-913	129-916		

† All contact terminals must be wired same polarity.

TYPE 129AR



SIZE 2¾" x 2 9/16" x 3 1/16"

Totally Enclosed • Hi-Impact Case • Double-Break Contacts • Easy to Mount • U.L. and C.S.A. • Pre-Wired • No Enclosure Required • Low Cost

SINGLE POLE NORMALLY OPEN and SINGLE POLE DOUBLE THROW

Coil Voltage (50/60 cy.)	Catalog Number		Contact Rating — 250 V.A.C.	
	1PNO	†1PDT	Inductive	Resist
—	—	—	18 Amp. Continuous 1 H.P.-120 V. 2 H.P.-250 V.	18 An Contin
24	129AR-901	129AR-904		
120	129AR-902	129AR-905		
208/230	129AR-903	129AR-906		

FITS ANY ½" KNOCK-OUT. MEETS STANDARD CODE REQUIREMENTS. Underwriters Lab. white card listed. File E12139D 184N13.13 7/17/63. Aluminum die-cast base and bushing. High impact phenolic enclosure. Locknuts and position locking washer included. Color coded 8" lead wires.

† All contact terminals must be wired same polarity.

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

A.C. POWER CONTACTORS

TYPE 75

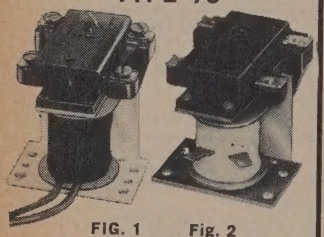


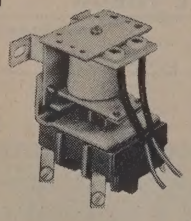
FIG. 1 Fig. 2
SIZE 2½" x 2⅛" x 2¼"

Screw Power Termination #8 Solid Wire Max. • 13" Lead Wire or Quick Connect Coil Terminals • Hardware Included

TWO POLE NORMALLY OPEN

Coil Voltage (60 cy.)	Catalog Number Fig. 1	Catalog Number Fig. 2	Contact Rating (AC)	
			Inductive	Resist
24	75-901	75-904	1 H.P. Per Pole 115/230 V. 2 Pole Rating 2 H.P. — 230 V. or 18 Amp. Cont. 90 Amp. Inrush	25 An 240 Per Pi
115/120	75-902	75-905		
230/240	75-903	75-906		

TYPE 80



SIZE 3⅛" x 2⅝" x 2⅞"

Screw Power Termination #8 Solid Wire Max. • Double-Break Contacts • Hi-Dielectric • 9" Coil Leads • Mount as Shown • Low Cost

TWO POLE NORMALLY OPEN

Coil Voltage (60 cy.)	Catalog Number	Contact Rating (AC) Inductive
24	80-901	25 Amp. Continuous 150 Amp. Inrush 250 V. Max.
120	80-902	
120	80-904	

TYPE 85

SIZE 3½" x 3⅛" x 2⅝"

Screw Terminals • #8 Solid Wire Max. • Double Break Contacts • ¼" Auxiliary Wiring Terminals • Straight-Thru Wiring • Hi-Dielectric Materials

THREE POLE NORMALLY OPEN

Coil Voltage (50/60 cy.)	Catalog Number	Contact Rating(A.C.) — Inducti	
		250 V.	600 V.
24	85-901	25 Amp. Cont. 150 Amp. Inrush	12.5 Amp. C 75 Amp. Inr
120	85-902		
208/240	85-903		

Listed here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE

See YELLOW SECTION for Local Offices, Phones

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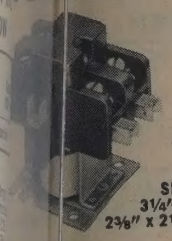
REM CONTROLS ESSEX INTERNATIONAL, INC.

A.C. POWER CONTACTORS
Continued

TYPE 143



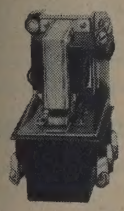
SIZE
3¼" x
2⅜" x 2½"

Straight-Through Wiring • Low Cost
•
Auxiliary Quick-Connect Terminals
•
U.L. and C.S.A. • Hardware Included
•
Screw Power Terminals For #10 Solid Wire Max.
•
25 Amp Unit Has Cover
•
Double-Break Contacts

TWO POLE NORMALLY OPEN

Coil Voltage (50/60 cy.)	Catalog Number	Contact Rating: Inductive	Contact Rating: Resistive
24	143-901	18 Amp. Cont. 90 Amp. Inrush @ 277 VAC Per Pole	25 Amp. @ 277 VAC Per Pole
120	143-902		
208/240	143-903		
24	143-911	25 Amp. Cont. 150 Amp. Inrush @ 277 VAC Per Pole	35 Amp. @ 277 VAC Per Pole
120	143-912		
208/240	143-913		

TYPE S30



TYPE S40

FIG. 2
SIZE
3⅞" x
2¾" x 2½"

Solenoid Action
•
Enclosed Contacts
•
Resilient Mounting
•
Screw Power Termination For #8 Solid Wire Max.
•
Epoxy Coil
•
Hi-Dielectric
•
Double Break Contacts

THREE POLE NORMALLY OPEN 30 AMP. — FIG. 1

Coil Voltage (50/60 cy.)	Catalog Number	Contact Rating (A.C.) — Inductive: Voltage	Continuous	Inrush
24	S30-901	250	30 Amp.	180 Amp.
115	S30-902	600	15 Amp.	90 Amp.
230	S30-903			

THREE POLE NORMALLY OPEN 40 AMP. — FIG. 2

24	S40-901	40 Amp. Continuous 200 Amp. Inrush 250 V. Max.
115	S40-902	
230	S40-903	

REM CONTROLS ESSEX INTERNATIONAL, INC.

A.C. INDUSTRIAL CONTACTORS

Unique Design Permits Common Base, Coil & Magnet for Contactor Ratings from 10 to 50 Amperes • Double Break "No-Kiss" Contact Action • Replaceable Contacts & Coil • Epoxy Sealed Molded Magnet • Coil Housing • Laminated Corrosion Resistant E-Type Magnet & Self-Aligning Armature • Hi-Dielectric Corrosion Resistant Molded Contact Block & Carrier • 50/60 Cycle Magnet Coil • Resilient Mounting

TYPE C10

SIZE
3⅜" x 3⅜"

Pressure Type Power Terminals
#10 Solid Wire Max.
•
All Contacts Convert to N.C.
•
Double Break Contacts

FOUR POLE NORMALLY OPEN

Coil Voltage (50/60 cy.)	Catalog Number	Contact Rating (AC): Voltage	Horsepower: Single Phase	Horsepower: Three Phase
24	C10-901	110	½	¾
		220	¾	1
110	C10-902	600	1	1
			Resistive	
220	C10-903	10 Amp. 600 V. Max. (Per Pole)		

TYPE C15

SIZE
3⅜" x 4" x 3⅜"

Pressure Type Power Terminals
#10 Solid Wire Max.
•
All Contacts Convert to N.C.
•
Double Break Contacts

FOUR POLE NORMALLY OPEN

24	C15-901	110	1	1½
		220	1½	2
110	C15-902	600	1½	2
			Resistive	
220	C15-903	15 Amp. 600 V. Max. (Per Pole)		

TYPE C30

SIZE
3⅜" x 3¾" x 3⅜"

30 Amp. 600 Volts
•
Pressure Type Power Terminals
#6 Solid Wire Max.
•
SPNO Auxiliary Converts to U.C.
•
Double Break Contacts

FOUR POLE NORMALLY OPEN PLUS 15 AMP. AUX.

24	C30-901	110	2	3
		220	3	7½
110	C30-902	600	5	10
			Resistive	
220	C30-903	30 Amp. — 600 V. (Per Pole)		

TYPE C50R

SIZE
3⅜" x 3¾" x 3⅜"

50 Amp. 480 Volts
•
Pressure Type Power Terminals
#6 Stranded Wire Max.
•
Double Break Contacts

FOUR POLE NORMALLY OPEN

Coil Voltage (50/60 cy.)	Catalog Number	Contract Rating (AC)
24	C50R-901	Resistive Only For Electric Heating 50 Amp. — 480 Volt Max.
110	C50R-902	
220	C50R-903	

List here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE 1762

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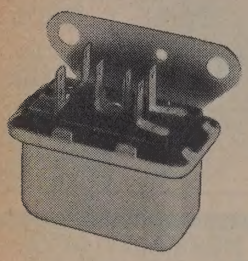
RBM CONTROLS
ESSEX INTERNATIONAL, INC.

TYPE 150 D.C. POWER RELAYS

TYPE 150



SIZE 2¼" x 1½" x 2"

Metal Case
•
Totally Enclosed
•
Isolated Coil
•
Side Bracket
•
¼" Quick-Connect Termination
•
Hardware Included
•
Low Cost

SINGLE POLE NORMALLY OPEN

D.C. Coil Voltage	Resistance in Ohms	Catalog Number	Contact Rating	
			Voltage	Current
6	11	150-901	6	25 Amp
12	44	150-902	12	25 Amp
24	176	150-903	24	12 Amp

SINGLE POLE DOUBLE THROW

D.C. Coil Voltage	Resistance in Ohms	Catalog Number	Contact Rating	
			Voltage	Current
6	11	150-904	6	15 Amp
12	44	150-905	12	15 Amp
24	176	150-906	24	7.5 Amp

RBM CONTROLS
ESSEX INTERNATIONAL, INC.

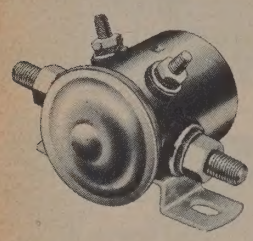
TYPE 70 D.C. POWER CONTACTORS

NON-TURNING STUDS • DRAWN STEEL DUST PROOF ENCLOSURE • COPPER STUD POWER & COIL TERMINALS • DOUBLE BREAK ROTATING DISC MOVABLE CONTACT • SOLENOID ACTUATED • SUGGESTED MOUNTING — CAP DOWN

CONTACT RATING D.C. INDUCTIVE LOAD — 36 V. MAX.

Voltage (D.C.)	Normally Open		Normally Closed	
	Continuous	Inrush	Continuous	Inrush
6	80 Amp.	300 Amp.	60 Amp.	100 Amp
12	80 Amp.	150 Amp.	60 Amp.	60 Amp
24-36	50 Amp.	50 Amp.	30 Amp.	30 Amp

4 TERMINAL



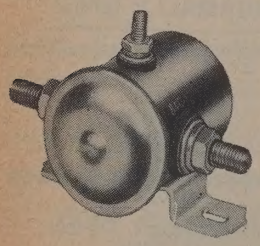
SIZE 2½" x 3½" x 2½"

Four Terminal
•
Isolated Coil
•
Silver or Copper Contacts
•
Hardware Included
•
Continuous Duty Coil
•
Ease In Wiring

SINGLE POLE NORMALLY OPEN

Coil Voltage (D.C.)	Resistance in Ohms @ 25°C	Catalog Number	Contact Material
6	4	70-901	Copper
12	19	70-902	
24	60	70-903	
36	114	70-904	
6	4	70-905	Silver
12	19	70-906	
24	60	70-907	
36	114	70-908	

3 TERMINAL



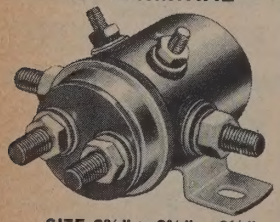
SIZE 2½" x 3½" x 2½"

Three Terminal
•
Continuous Duty Coil
•
Copper Contacts
•
Hardware Included
•
Coil Common to Case or Coil Common to Battery
•
Rugged Construction

SINGLE POLE NORMALLY OPEN

Coil Voltage (D.C.)	Resistance in Ohms @ 25°C	Catalog Number	Contact Material
6	4	70-913	Copper — Coil Grounded to Case
12	19	70-914	
24	60	70-915	
36	114	70-916	
6	4	70-917	Copper — Coil Common to Load
12	19	70-918	
24	60	70-919	
36	114	70-920	

6 TERMINAL



SIZE 3⅜" x 3⁹⁄₁₆" x 2½"

Six Terminal
•
Continuous Duty Coil
•
Isolated Coil
•
Hardware Included
•
Choice of 2 Types Contacts

SINGLE POLE DOUBLE THROW

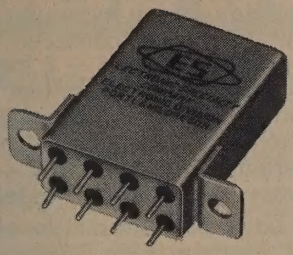
Coil Voltage (D.C.)	Resistance in Ohms @ 25°C	Catalog Number	Contact Material
6	4	70-909	N.O. and N.C. Silver
12	19	70-910	
24	60	70-911	
36	114	70-912	
6	4	70-921	N.O. Copper and N.C. Silver
12	19	70-922	
24	60	70-923	
36	114	70-924	

Listed here are standard controls only — for variations or special designs consult the factory

ENGINEERING DESIGN DATA ON PAGE

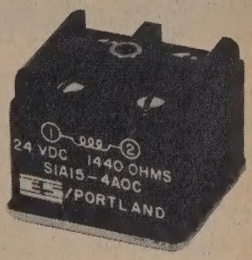
See YELLOW SECTION for Local Offices, Phones

ELECTRONIC SPECIALTY RELAYS

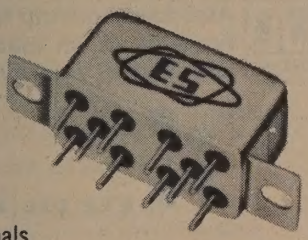


DT Mi
Miniat Sensitive
MW Pl-In
y-Circu to 2 Amp
Loads
n, Holand 3" Wire
Termins
elded aling Available

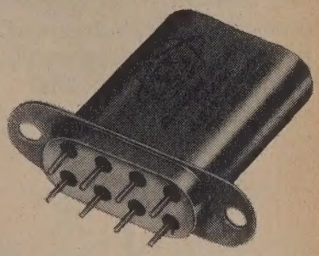
NEW! SIA15 SOLID STATE POWER RELAY
1PST Normally Open
(3PST N.O. also available)
100 MW Pull-In
Switching Load 15 Amp
Inductive/Resistive @
280 V rms
(Also available up to 25 Amps)
Small Size—1½"x1½"x1¼"



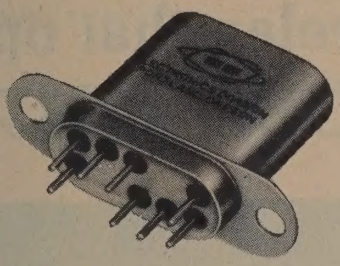
5N 50
PDT Ha Size Crystal Can
55N Liching 90 MW QPL
to NL-R-5757E/76
50N Nn-Latching 250 MW
QPLo MIL-R-5757E/9
ifurcatl Contacts
ry Circt to 2 Amp
switcng
in, Hoand 3" Wire Terminals
oldeealing



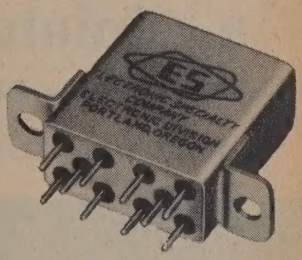
80N
2PDT Micro Miniature
Sensitive
Sealed Coils
Bifurcated Contacts
40 MW Pull-In
Dry Circuit to 3 Amp
Load
Pin, Hook and 3" Wire
Terminals
For Hi Rel Applications



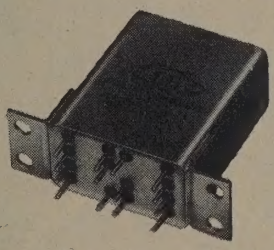
8N
PDT Crstal Can
ifurcd Contacts
00 MPull-In
ry Cinit to 2 Amp Loads
in, Hok and 3" Wire
Termals



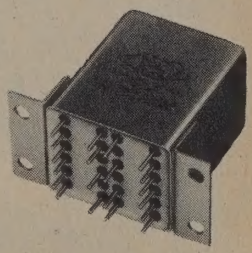
77R 79N
2PDT Crystal Can
77R Sensitive Latching
90 MW Transfer
79N Non-Latching 250 MW
Pull-In, Bifurcated
Contacts QPL to
MIL-R-5757E/10
Dry Circuit to 2 Amp
Loads (79N-3 Amp)
Pin, Hook and 3" Wire
Terminals
Welded Sealing



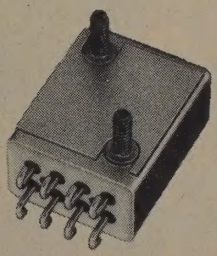
80N 2N
4PDT icro Miniature
Sensite Non-Latching
anLatching
80 M Pull-In/Transfer
Dry Ccuit to 3 Amp
Pin, ok and 3" Wire
Teinals



100N 102N
6PDT Micro Miniature
Sensitive Non-Latching
and Latching
150 MW Pull-In/Transfer
Dry Circuit to 3 Amp
Load
Pin, Hook and 3" Wire
Terminals



93 4
2PD10 Amp Loads
Micr Miniature
Nonatching 500 MW
Pl-In
Latcng 150 MW
Tnsfer
Pin nd Hook Terminals



103 104
4PDT 10 Amp Loads
Micro Miniature
Non-Latching 1000 MW
Pull-In
Latching 300 MW
Transfer
Pin and Hook Terminals

Mounting Arrangements — All Relays come with plain, side bracket, side studs and flanges. All military relays meet or exceed the requirements of MIL-R-5757. **Vibration** — up to 30 G's and 3000 CPS. **Life** — 100,000 minimum up to 5,000,000 on some series at dry circuit. **Coil Resistance** — 10 to 12,000 DC OHMS at +25°C. Additional information is available in ES switching components catalog.

ELECTRONIC SPECIALTY CO./ELECTRONICS DIVISION—PORTLAND

18900 N.E. Sandy Blvd., Portland, Oregon 97220 • Phone (503) 665-0121 • TWX 910-469-8782

Until now, designing with mercury relays meant taking the good with the bad. The trade-off for long life, high-speed closure and no contact bounce has been a bulky package (about ¾ cu. in.) that must be babied in a vertical position.

But not any more! Now Logcell® Mercury Film Relays offer all the advantages of mercury-wetted relays . . . plus miniature size (0.06 cu. in.), operation in **any** mounting position, and shock and vibration resistance suitable for many airborne, marine and other mobile applications.

Whether you require the specific advantages of mercury relays for computer logic circuits, advanced instrumentation or high-speed control systems . . . or just need a tiny rugged relay that will last and last and last, consider Logcells:

- Long life — units tested to billions of cycles
- No contact bounce
- Operation in any mounting plane
- Form "C" SPDT contacts
- Fast operating time — 2 ms
- No measurable AC contact noise
- Thermal noise less than 1.0 microvolt
- Switches dry circuits to 1 amp at 0-6 volts
- Inherent contact memory — requires no hol g current (mono-stable models also available)

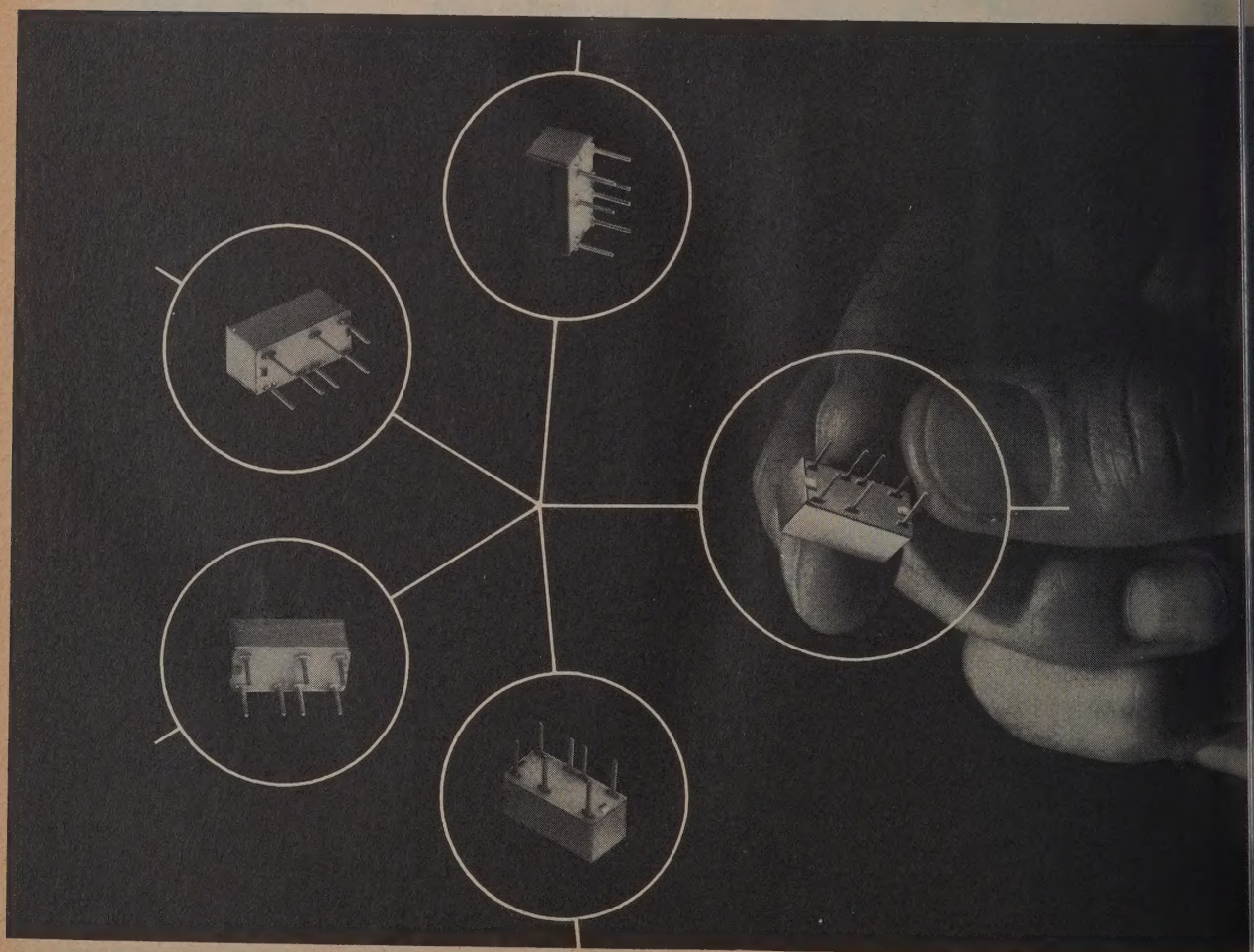
For complete information about revolutionar ne Logcell Mercury Film Relays — and Logcell M cur Film Switches — write Fifth Dimension Inc., Bo 18 Princeton, New Jersey 08540 or call (609) 924-99

RWB SPECS **Also ask about our red, white and blue ec fications which match Logcell perfor nc and cost to your application.**

5-D FIFTH DIMENSION IC

here at last . . .

a miniature mercury relay that operates IN ANY POSITION



SOLID STATE RELAYS

FOR GENERAL PURPOSE AC or DC LOADS

THE STATIC RELAY

The Static Relay is an isolated all-silicon device which performs the switching functions of a conventional relay, but at a substantial increase in speed, reliability and unlimited life. Because of over 50 megohms load-to-control isolation and 50 microsecond actuating and release time, the static relay is ideal for use in a variety of switching applications.

- FAST - 50 Microseconds actuating & release time - Up to 2000 operations per second.
- VERSATILE - Over 50 Megohm Load-to-control & Pole-to-Pole isolation - Can be driven directly from IC's.
- DEPENDABLE - No moving parts - Unlimited Life - Nothing to wear out.
- QUIET - No Bounce - No Arc - No Noise.
- STRONG - Will withstand the most severe shock and vibration.
- SAFE - Will operate in explosive & corrosive atmospheres.
- FLEXIBLE - Controls Resistive, Inductive, Capacitive or Reactive Loads.

SPECIFICATIONS:

Load Voltage (min-max): DC STATIC RELAY: 0 to 60 VDC
AC STATIC RELAY: 0 to 300 VP, 1 to 500 HZ

Load Types: Resistive
Inductive: Max. Transient 1000VP for 10 ms.
Capacitive: Max. Inrush 3.5 times max. Load Current Rating for 1 second
Reactive: Power Factor ≥ .5 Leading or Lagging

Control Voltage: 5 VDC (Other Voltages available at no change in price)

Control Response: On above 3.75V; Off below 2.00V

Actuating Time: 50 microseconds

Release Time: DC Static Relay: 50 microseconds
AC Static Relay: 1/2 cycle at Load Frequency

Operating Temperature Range: —20°C to +71°C

Open Contact Resistance: 50 Megohms

Construction: Potted Module in a Diallyl Phthalate case.

Mounting: Gold Plated Pins for either Direct Solder-in PCB Mounting or Wire Wrap.

Shock/Vibration, Altitude, Humidity: Per Mil-E-5400

CONTACT ARRANGEMENT	MAX LOAD CURRENT	AC MODEL NUMBER	CONTROL I @ 5 VDC	DC MODEL NUMBER	CONTROL I @ 5 VDC Unless Otherwise noted	PRICE—EITHER AC or DC 1-10	11-25	26-50	MAX. SIZE OD LXWXH
SPST	300 ma 1 AMP 2.5 AMPS	11A10X 11A25X	12 ma 20 ma	11D3X 11D10X 11D25X	12 ma 30 ma 50 ma	$27.50 27.85 28.75	$25.20 25.45 26.10	$23.75 23.90 24.35	.688" X 1.125" X .750"
	6 AMPS	11A60X	25 ma	11D60X	100 ma at 12 VDC	29.75	27.50	25.05	1.50" X 1.50" X 1.00"
	10 AMPS	11A100X	35 ma			34.80	33.15	29.90	
DPST	300 ma 1 AMP 2.5 AMPS	21A10X 21A25X	24 ma 40 ma	21D3X 21D10X 21D25X	24 ma 60 ma 100 ma	39.80 41.75 42.00	36.50 38.50 38.75	32.00 34.05 34.30	1.00" x 1.50" X .687"
	6 AMPS	21A60X	50 ma	21D60X	200 ma at 12 VDC	42.30	39.00	34.50	1.25" X 2.50" X 1.00"
	10 AMPS	21A100X	70 ma			47.25	44.10	39.60	
			CONTROL AND BIAS I @ 5 VDC		CONTROL AND BIAS I @ 5 VDC				
SPDT	300 ma 1 AMP 2.5 AMPS	12A10X 12A25X	14 ma 22 ma	12D3X 12D10X 12D25X	14 ma 32 ma 50 ma	39.80 40.30 41.40	36.50 37.00 38.60	32.75 33.20 34.75	1.00" X 1.50" X .687"
	6 AMPS	12A60X	27 ma	12D60X	100 ma at 12 VDC	42.25	39.10	35.45	1.25" X 2.50" X 1.00"
	10 AMPS	12A100X	37 ma			47.15	44.25	41.50	
DPDT	300 ma 1 AMP 2.5 AMPS	22A10X 22A25X	28 ma 44 ma	22D3X 22D10X 22D25X	28 ma 64 ma 100 ma	49.75 50.55 52.15	44.00 48.10 50.50	39.25 45.25 47.15	1.50" X 1.50" X 1.00"
	6 AMPS	22A60X	54 ma	22D60X	200 ma at 12 VDC	54.50	52.05	49.75	2.30" x 2.50" X 1.00"
	10 AMPS	22A100X	74 ma			59.50	56.85	53.20	

FOR COMMUNICATIONS

FEATURES

- **Unlimited Life - COMPLETELY Solid State**
- **Can be mounted in any position**
- **Insensitive to shock & vibration**
- **Distortion Free**
- **Completely Isolated - Can be controlled directly from IC's**
- **Designed to meet MIL-R-2777A**
- **Compatible with MIL-STD-188**

SPECIFICATIONS

Load Voltage (min-max): + and —0 to 130 VDC
Load Current (min-max): 0 to 200 ma POLAR (see chart)
Load Types: Resitive or Inductive
Control Voltage: +4 to 12 VDC
Bias Voltage: +10 to 12 VDC at 40 ma (when req'd.)
Load-Control Isolation: 50 Megohms min.
Operation Rate: 0 to 2400 operations per second (4800 Baud)
Temperature Range: —40°C to +71°C
Closed "Contact" Drop: less than 1V
Open Contact" Resistance: 50 Megohms min.
Mounting: 8 Pin Octal (Other styles available)
Transient Suppression: Al spikes over + and —150 VDC
Shock Vibration, Salt Spray, Humidity & Altitude: per MIL-R-27777A

APPLICATIONS:

- **TELEGRAPH AND TELETYPE CIRCUITS**
- **DATA ACQUISITION**
- **MACHINE CONTROLS**
- **DIFFERENTIAL CIRCUITS**
- **ALARM CIRCUITS**

MODEL NO.	"CONTACT" ARRANGEMENT	STYLE	EQUIVALENT CIRCUIT DIAGRAM	DESCRIPTION	1-10	PRICE 11-25	26-50
11D2-107	SPST N.O.	Form A		Neutral In-Neutral Out	$29.25	$24.10	$20.75
12D2-103	SPDT Center Off	Form K		Polar In-Complementary Out	47.50	43.00	39.75
12D2VP	SPDT	Form C	MARK SPACE	Neutral In-Polar Out	39.50	33.75	29.55
12D2VK	SPDT Center Off	Form K	MARK SPACE	Polar In-Polar Out	47.50	43.00	39.75
12D2-102	SPDT Center Off	Form K	TRUE FALSE	Complementary In Complementary Out	36.35	30.80	26.20

FOR TIMING

The Time Delay Module may be used by itself as a SPST normally open or normally closed switch, dependent upon whether it is specified as delay on open or delay on close.

The output circuit of the Time Delay Module provides a solid state "contact" closure capable of switching from 3.5 VDC to 18 VDC at 150 ma. This will enable the user to select a wide range of devices, including the static relay, which will work in conjunction with the Time Delay Module.

SPECIFICATIONS:

Bias: 10 - 12 VDC at 30 ma
Input (Delay Command) Signal Impedance: 10 K ohms.
Delay Period Repeatability: —2% of V or R level.
Response Time to changing delay command: 10 Milliseconds
Delay Accuracy (real-time): ±2% resolution
Delay period starts when command signal is removed (<1V)
Unit is supplied as delay on "contact" open
Available as delay on "contact" close - Suffix model no. with the letter C (Example VD5C) No change in price
Operating Temperature Range: 0°C to +50°C

TYPE OF COMMAND SIGNAL	DELAY PERIOD	MODEL NO.	UNIT PRICES 1-10	11-25	26-50	51-100
VOLTAGE (△V)	50 to 500 MSEC	VD	$21.85	18.30	15.55	12.00
	1/2 to 5 seconds	VD5				
	10 to 100 seconds	VD100	23.50	19.90	17.15	13.60
	1 to 5 minutes	VD300	34.75	31.15	28.40	24.85
RESISTANCE (△R)	50 to 500 MSEC	RD	$19.50	16.45	12.25	10.25
	1/2 to 5 seconds	RD5				
	10 to 100 seconds	RD100	21.10	18.05	13.85	11.35
	1 to 5 minutes	RD300	32.35	29.30	25.10	22.60

Many More Models Available - Call or Write For Complete Catalog

©Flight Systems, Inc.
P.O. Box 25, MECHANICSBURG, PA. 17055
PHONE (717) 697-0333

HERMETICALLY SEALED RELAYS

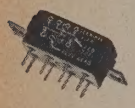
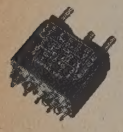
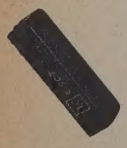
Unmatched for reliability, the light weight, thermal capabilities, and high resistance to shock of these hermetically sealed relays make them ideally suited for military and industrial electronic applications.

The reliability factor stems from exacting assembly (in a "White Room" where necessary), rigid quality control, well-equipped lab facilities and precise testing procedures. These manufacturing techniques, combined with GE's advanced engineering design, produce top-quality relays with dependable characteristics exceeding those of static switching devices.

Contact resistance is held to a minimum by silver conta gold flash) combined with high contact forces.

All high-temperature components allow the operation relays in ambient temperatures between −65°C to + Units are available with studs or brackets for mounting. T line has tab brackets for printed-circuit board ap Headers can be furnished with solder hooks, three-inc plug-in (with socket availability information) and many terminals.

Write for Bulletin G

	Contact Form	Contact Rating	Sensitivity	Size & Weight	Vibration Capabilities	Shock	Operate Time
TRANSISTOR SIZE TO-5² (3SBS) All-welded including coils High contact forces, overtravel Low contact resistance High thermal margin Meets MIL-5757/40	2PDT	1A at 28 Vd-c 0.2A at 28 Vd-c Ind.	120 mw	0.37″x0.37″x0.275″ 0.09 oz.	30 G's to 3000 Hz	100 G's for 11 ms	2 ms max
150 GRID-SPACE (3SBC, 3SBH) New small size Low profile — only 0.32″ high Terminals on 0.150″ centers All-welded construction Meets MIL-5757/37 and 80	1PDT 2PDT 4PDT	2A at 28Vd-c 2A at 28Vd-c ½ at 115Va-c	50 mw 135 mw 250 mw	0.32″x0.61″x0.31″ 0.13 oz. 0.32″x0.61″x0.61″ 0.24 oz.	30G's to 3000 Hz	50 G's for 11 ms	4 ms max
150 GRID MAGNETIC LATCH (3SBM) New small size Low profile All-welded construction Snap action — no hang-up	4PDT	2A at 28 Vd-c 0.5A 115 Va-c	Single coil 100 mw Dual coil 200 mw	0.61″x0.61″x0.32″ 0.28 oz.	30 G's to 3000 Hz	100 G's for 11 ms	4 ms max
 **HALF-SIZE MICRO (3SAV)** Terminals on 0.2″ centers All-welded construction Bifurcated contacts Power or low-level switching Meets MIL-5757/9	2PDT	2A at 28 Vd-c 1A at 115Va-c	260 mw	0.4″x0.8″x0.4″ 0.35 oz.	30 G's to 3000 Hz	50 G's for 11 ms	4 ms max
HALF-SIZE PLASTIC CASE (3SBV) (Not Hermetically Sealed) Low profile — Low cost +85°C operation Bifurcated contacts Rugged construction	2PDT	2A at 30 Vd-c 0.5A 115Va-c	285 mw	0.48″x0.88″x0.49″ 0.3 oz.	—	—	5 ms max
LATCHING MICRO (3SAM) All-welded construction Snap action — no hang-up 50 milliwatt sensitivity Power or low-level switching Grid spaced Meets MIL-5757/21	2PDT	Single coil 2A at 28Vd-c Dual coil 1A at 115Va-c	50 mw 75 mw	0.9″x0.8″x0.4″ 0.75 oz.	30 G's to 3000 Hz	100 G's for 11 ms	5 ms max
 **4-POLE MICRO (3SAH)** All-welded construction No solder, solder flux Power or low-level switching Terminals on 0.2″ centers Meets MIL-5757/12	4PDT	2A at 26.5 Vd-c 1A at 115 Va-c	400 mw	0.81″x1.01″x0.61″ 1.0 oz.	30 G's to 3000 Hz	50 G's for 11 ms	6 ms max
 **DOUBLE HERMETIC SEAL REED (3SBN)** Sealed coils Low profile Low sensitivity Rugged construction Meets MIL-5757/73	1PNO through 6PNO 1PDT through 5PDT	10W to 100V 3W to 100V	40 mw per pole 50 mw per pole	From 0.3″x1.45″x0.35″ to 0.89″x1.45″x0.35″ 0.23 oz. to 0.62 oz.	30 G's to 2000 Hz	50 G's for 11 ms	1 ms max 2 ms max

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

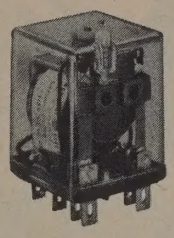
GENERAL ELECT

RELAYS

CR120 TYPE H GENERAL-PURPOSE RELAYS

These compact, economical relays are ideal for the highly repetitive operations required in the output of electronic equipment and in small, built-in chassis-type control panels where space is at a premium.

en, stud-mounting relay



General purpose control socket plug-in form with manual operator

FEATURES

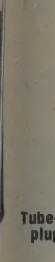
- **Variety of Forms** — 5-amp, 10-amp relays and latch forms and current sensitive relays are available.
- **Mounting Flexibility** — forms available for front- or back-connection, plug-in or channel-mounting. Open relays either stud- or screw-mounted.
- **Small Size** — occupies only 3 to 5 cubic inches.
- **Not Position Sensitive** — relays will operate in any position.
- **Easy Connection** — combination push-on, solder-type terminals (.110 and .205 inch) available for front, back or plug-in connection.
- **Manual Operator, Indicating Light 110-250 V** — available on dust-covered, back-connected and plug-in forms permits check of relay operation.

Write for Bulletin GEA-7882

REED SWITCH RELAYS

CR120 TYPE G

Enclosed printed-circuit



Tube-type plug-in

R12 Type G relays provide extremely ng ectrical and mechanical life.

hey e available in a wide variety of oun g and connection arrangements clud g plug-in; printed-circuit; bracket-oun or stud-mount with solder-tab, ire-vap or quick-connect terminals.

ou n select relays which perform atchi , timing, or current-sensing functions well an ON-OFF switching.

Relay are magnetically shielded. High-delit contacts are hermetically sealed n annert gas to prevent contamination.

Man standard factory modifications are vail le to meet wide application re-quire ents.

Contact Characteristics

Maxi m rating (a-c or d-c):
15 atts, resistive
1.0 mpere maximum
25 volts maximum (60 cycles rms)

Cont t resistance (initial): 30-60 milliohms

Life pectancy (electrical):
20 million operations at maximum rating
10 million operations at ½ max rating
20 million operations at low load

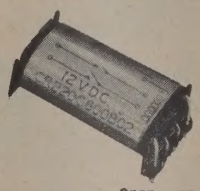
Resn nt frequency (reed): 1080 cps

Operation

Nom al coil power:
SPT 450 mw — SPDT latch 270 mw
DPT 680 mw — DPDT latch 580 mw
3PT 1000 mw

CR220 TYPE G

Plug-in with socket attached



Open printed-circuit

CR220 Type G relays are small, compact units that are ideal for applications where fast operating time and low power are required such as for scanning, instrumentation, counting and data processing.

These small relays are available in a variety of compact housings suitable for multi-relay applications. You can choose forms for timing functions as well as ON-OFF switching. Mounting arrangements include printed-circuit, plug-in, bracket or channel-mounting. Bracket or channel-mounted forms are available with one- or two-level solder/push-on (0.110 x 0.032 in.) or wire-wrap terminals.

Relays are magnetically shielded, contacts are hermetically sealed. A wide variety of factory modifications are offered.

Contact Characteristics

Maximum rating (a-c or d-c):
15 watts, resistive
1.0 ampere maximum
250 volts maximum (60 cycles rms)

Contact resistance (initial): 30-60 milliohms

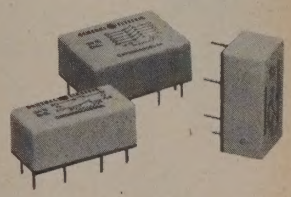
Life expectancy (electrical):
20 million operations at maximum rating
100 million operations at ½ max rating
200 million operations at low load

Resonant frequency (reed): 1100 cps

Operation

Nominal coil power:
Printed circuit: 1P 350 mw, 2P 600 mw, 3P 700 mw, 4P 900 mw, 5P 1200 mw, 6P 1600 mw
Plug-in & bracket: 1P 350 mw, 2P 600 mw, 3P 770 mw, 4P 1000 mw, 5P 1400 mw, 6P 2300 mw, 8P 2300 mw, 12P 4000 mw

CR120 TYPE M



CR120 Type M relays are miniature units that provide fast operating time, long life, and reliability in a minimum amount of space. You can get as many as five circuits in a relay only 0.88 x 1.12 inches. They are available as enclosed printed-circuit forms.

The relays perform ON-OFF switching, and are ideal for scanning, instrumentation, counting and data processing applications.

Enclosed forms assure mechanical protection and may be ordered with or without potting compound. They are not affected by magnetic fields created by adjacent relays. All contacts are hermetically sealed to give the highest possible fidelity. The miniature reed switches are manufactured and tested under clean-room conditions.

Forms with dual winding coils, special coil voltages, alternate pin length, and electrostatic shielding are also offered.

Contact Characteristics

Maximum rating (a-c or d-c):
4 watts, resistive
0.125 ampere maximum
120 volts maximum (60 cycles rms)

Contact resistance (initial): 200 milliohms

Life expectancy (electrical):
5 million operations at maximum rating
15 million operations at ½ max rating

Resonant frequency (reed): 2000 cps

Operation

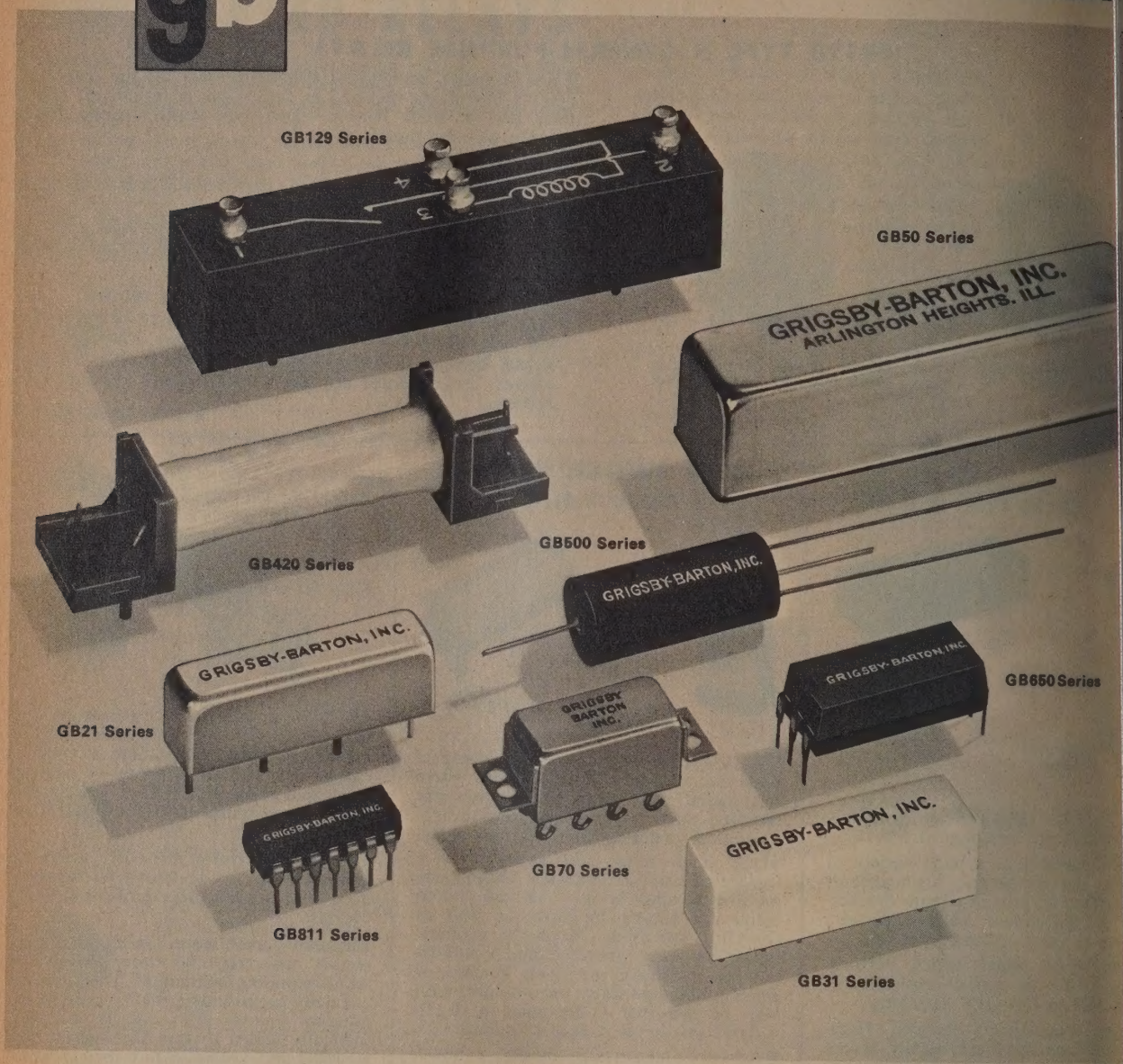
Nominal coil Power:
1P 150 mw — 4P & 5P 800 mw
2P & 3P 500 mw

Write for Bulletin GEA-7396

Fo complete information contact nearest GE Sales Office listed on inside front co r, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

GRIGSBY-BARTON REED RELA



Everything in Reed Relays

GB21 Series. Compact, single-pole relays for PC board applications. Displace less than ½ cu. in. Available in Form A or B, and with a variety of coils to meet special needs.

Unique epoxy-filled interior design provides maximum protection from physical shock. Terminal spacing in multiples of .100 grid pattern.

Choose either nylon or steel case. The steel case provides electromagnetic shielding . . . and is available with cadmium, clear irridite or chrome plated finish.

GB31 Series. Packaged in same cases as GB21 Series. Available in mercury-wetted 1 Form A (SPST) or in dry-reed 1 Form C (SPDT).

The mercury-wetted model combines high-speed switching with low contact resistance and high-power capacity. It's excellent for either dry-ciruit switching or power switching.

GB50 Series. Heavy-duty, standard-size relays. Available in a variety of contact configurations and with multiple reed switches per package.

Chrome-plated steel case gives rugged protection—and provides electromagnetic shielding. Electrostatic shielding is optional.

GB70 Series. A compact, military-type relay in ½-size crystal can. Available in DPDT, DPST or any resulting combination of Forms A and C. Can be ordered with either PC board terminals or with "hook" terminals for solder wiring. Contacts are completely sealed.

GB129 Series. Compact, high-reliability relays for high-voltage switching. Can switch up to 20,000 volts and stand off up to 25,000 volts. Switch contacts are vacuum-sealed in a glass envelope. Nylon screws in phenolic housing permit base mounting. Available in 1 Form A and 1 Form B.

GB420 Series. Low-cost, rugged open-frame design. Choose from single or double-pole models in Form A or Form C. Molded nylon bobbin. Also available with steel jacket for electromagnetic shielding (Series 520).

GB500 Series. Low-cost, cylindrical relays suitable for PC, soldered or welded assembly. Miniature in size. Overall body length is 1 in. Max diameter is .425 in. Epoxy-molded housir Form A (SPST) and Form C (SPDT).

GB650 Series. These new miniature, tran molded reed relays cost no more than most open-frame types they replace. Miniature siz .312 in. high housing permit high-density F sembly. Inline design with exposed term Available in a full selection of Form A, Fo Mercury-Wetted Form A and Hi-voltage Fo models, with from one to six poles.

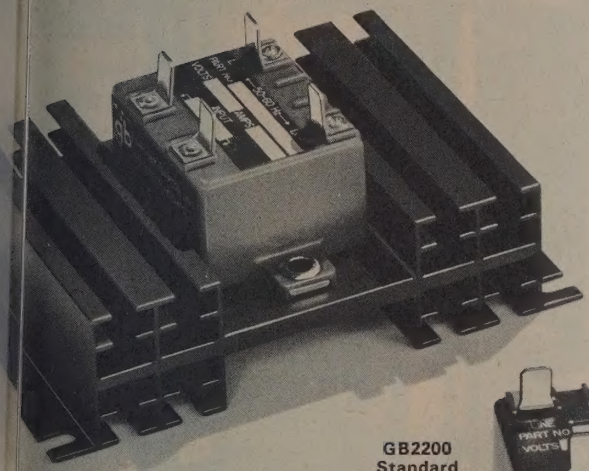
GB811 Series. These micro-miniature, 14-pin inline reed relays conform to JEDEC specifica . . . and are the only DIP-IC relays of their available with electrostatic shields and int clamp diodes. Coils are designed for 10M 40MA 5 VDC drivers. Completely-sealed, tra molded package.

Available in 1 Form A, 2 Form A, Form C and a revolutionary mercury-wetted latching Form C that's completely position insensitive!

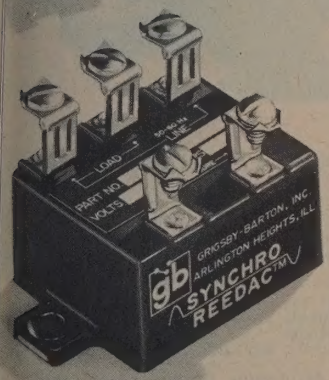
See YELLOW SECTION for Local Offices, Phones

REEDACS · SYSTEMS · LOGIC CARDS

GB7200 Synchro Reedac® shown with external heat sink



GB2200 Standard Reedac



GB200 Phase Control Reedac

GB4200 Miniature Reedac

Reedacs

...When you think Triacs, think Reedacs

Reedacs are semi or purely solid-state, heavy-duty switches with triac capabilities. All (except miniature Reedacs) come in models rated up to 30 amps at 120 or 240V RMS. Inrush load is 10 times rating.

GB2200 Standard Reedacs. Have random, bounceless turn-on; turn-off at current zero. Can switch inductive, tungsten or resistive loads. Input can be any switch closure, DC pulse or 5 VDC logic.

They offer operation in microseconds, 500 million cycles in life, and maximum input-output isolation. Available in nylon case or steel can with octal plug.

GB7200 Synchro Reedacs®. The patented circuitry of these solid-state, synchronous switches handles inductive, capacitive, resistive or tungsten loads—with no minimum load current. It also prevents "half-wave phenomena" and delivers virtually zero RFI. Turn-on occurs no later than 4 volts into the cycle; turn-off at current zero.

Select from 60-hz and 400-hz models. Input can be switch closure, DC pulse or 5 VDC (T^2L, DTL) logic. Available in 3 nylon-case designs and steel can with octal plug.

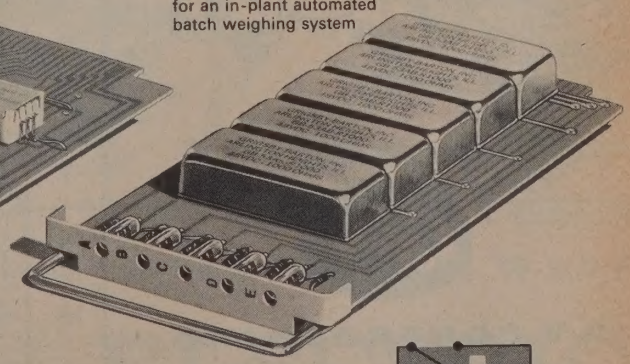
GB4200 Miniature Reedacs. Control resistive, capacitive or inductive loads up to 2 amps, 240 volts AC. Input can be DC logic or external switch. Available in PC, wire-wrap and flying-lead designs.

GB8200 Phase Control Reedac. Designed for high-power, inductive loads providing 1.5° symmetry.

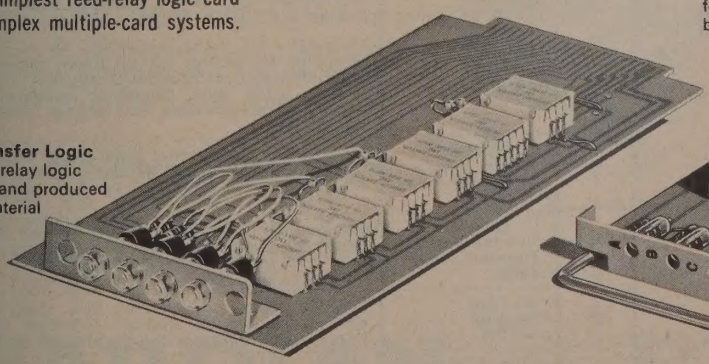
Systems, Sub Systems, Logic Cards

Grigsby-Barton can design and manufacture any type of switching or control system for you—from the simplest reed-relay logic card to the most complex multiple-card systems.

Batch Weight Logic—One of a group of logic cards developed for an in-plant automated batch weighing system



Material Transfer Logic—Typical reed relay logic card designed and produced to control a material transfer system

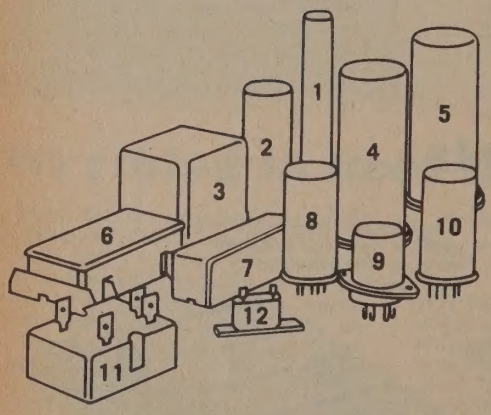


GRIGSBY-BARTON, INC.

07 NORTH HICKORY AVENUE, ARLINGTON HEIGHTS, ILLINOIS 60006 • TELEPHONE, AREA CODE 312/392-5900

G-V

your complete source for timing and temperature control devices



ITEM NO.	PART	DESCRIPTION
1	C8 Series Electrical Thermostat	Hermetically sealed, adjustable, immersion e. Temp. range: −65° to +300°F. Rated 1000 W. D r-ential ±1°F. Vibration, 2000 Hz; Shock, 50g.
2	Series R, T&H Miniature Hermetically Sealed Thermal Time Delay Relay	Sealed, adjustable. Delays: 0.1-240 secs. Opera g voltages: 6.3-230V, AC/DC. Meets MIL-R-19648. 7 n plug-in or flange mountings.
3	900064 Series General Purpose Solid State Time Delay	Solid state timing circuit. Delays: 0.1-30 secs. O ating temp.: −55°C to +85°C. Operating volt e: 18-32 V DC. Vibration: 2000 Hz; Shock, 50g.
4	Red Line (DT) Series. Industrial Timing Relay	Octal size. Steel sheathed heater. Dust-proof, tam r-proof. Delays: 0.5-180 secs. Operating voltages: 1- 230 V, AC/DC.
5	Red Line (DM) Series. Instant Reset Thermal Timing Element	Provides instant reset during and after time d y when used with magnetic relay. Delays: 0.75 0 secs. Operating voltage: 6.3-230 V, AC/DC.
6	PT Series High Precision Thermal Timing Relay	±5% over −55°C to +125°C. Vibration, 20g, 2 0 Hz; Shock, 50g, 11 ms. Delays: 3-180 secs. He r Voltages: 6.3-115 V AC/DC.
7	JT Series Thermal Time Delay	Designed for printed circuit board mounting. St less internal construction. Dust-proof. Tamper-pr Delays: 2-180 secs. Operating voltages: 6.3-230 AC/DC. Also available in Instant Reset versi Series JM.
8	Thermette Series. Commercial Thermal Timer	9 Pin miniature thermal time delay. Metal enclos Dust-proof. Delays: 5-180 secs. Operating volta 6.3-26V, and 115 V, AC/DC.
9	LT Series. Sub-miniature Thermal Time Delay	Flange mounting, hermetically sealed with sea height only 40% of standard miniature timers. lays: 2-75 secs. Operating voltages: 6.3-115 V AC/ Vibration: 1000 Hz.
10	Air Flow Sensing Switch	Positive protection when air flow stops — opera alarm or automatic shut-off. Operates in any po tion. Heater voltages: 6.3, 26 and 115 V AC/DC.
11	Quick Connect Type Industrial Thermal Relay	Surface mounting, dust-proof. Time delays: 5 to seconds. Temperature compensated. Heater voltag 6.3, 26 and 115 AC/DC. Contacts SPST, NO or NC.
12	VE-2 Series Electrical Thermostat	Surface sensing thermostat. Preset or adjustab Low differential. High degree contact force/moti Vibration: 2000 Hz; Shock, 50g.

G-V

G-V CONTROLS INC.
LIVINGSTON, NEW JERSEY 07039
(201) 992-6200

604

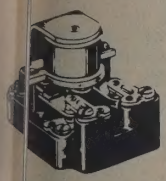
RELAYS AC DC

SERIES 4005 RELAY

The smallest, lightest commercially available 4 PDT relay that will switch a three-phase 10 amp. inductive or resistive load. Weighs only 2½ oz.; measures just .14" x 1.125" x 1.03". Rated 28 VDC or 115 r 115/200 V 400 cycles AC. Meets or exceed MIL-R-6106-D with no restrictions on overload r rupture tests.

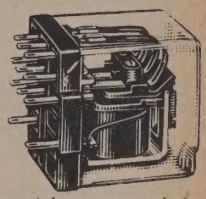
SERIES 1200 RELAY

Small, efficient relay rated at 10 amperes, 115 volts, non-inductive A.C. Heavy solder lug terminals molded in phenolic block, with barriers for over-surface insulation. Up to three pole double throw contacts. Size: 1 11/16" x 1¼" x 1⅜" Approx. wt. 1.9 oz.



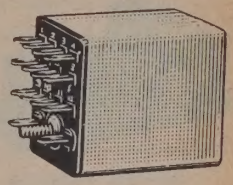
SERIES 2300 POWER RELAY

Has 15 amp. contacts. Inverted coil construction protects armature and contacts. Contacts D.P.D.T. U/L rated for 15 amps at 115 VAC non-inductive, or 1 H.P. at 115/230v., 60 c. Screw type terminals easily accessible. Size: 3 5/16" x 2½" x 2 1/16". Shipping wt. 8 oz.



SERIES 1220 RELAY

10 ampere DPDT or 3PDT relay is designed to reduce both cost and height by eliminating radio-type plug, extra wiring and sub-assembly between relay and plug. Complete with dust cover and mounting bracket. Plug-in, solder or quick-connect terminals. U/L listed. Size: 1 5/32" x 1 11/16" x 1 9/16". Coils available for 6-240 VAC, 6-110 VDC.



SERIES 1310 RELAY

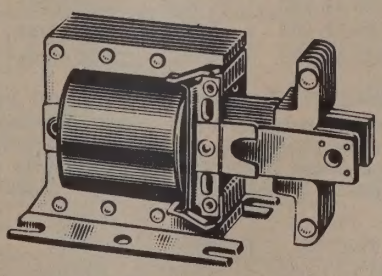
This is Guardian's 4PDT 3 amp plug-in relay. Designed and built for maximum endurance and reliability, it is especially suitable for computers, data processing, logic systems, business machines, or any other application that requires uncompromising quality. The new 1300 Series is available AC or DC, plug-in or quick-disconnect, 6 to 115 VAC and 6 to 110 VDC. Contact rating 3 amps at 30 VDC or 115 VAC resistive.

Get your entire Control Assembly from Guardian, Complete and Ready to Plug in... Anything from a Single Switch to a complete Machine Control. • Write today.

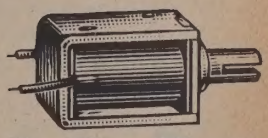
SOLENOIDS

The Guardian solenoid line is the most complete in the industry. It includes intermittent or continuous duty types up to 230V, A.C. or up to 230V, D.C. A new line of tubular solenoids now provides a range from a pull of 50 pounds to a fraction of an ounce.

Guardian's engineering department is ready at all times to assist in modifying standard solenoids or developing custom engineered units to fit your specialized applications.



No. 18 — AC only



No. 22 — DC only

NEW No. T6 — DC Solenoid

Write for free Solenoid Bulletins No. TS and G

GUARDIAN® ELECTRIC

GUARDIAN ELECTRIC MANUFACTURING COMPANY, 1550 West Carroll Avenue, Chicago, Illinois 60607

HAMLIN ELECTRONICS, INC.

CONTROL-PAK®

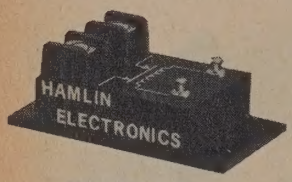
6 Amp Solid State AC Relays and Control rs

• Highly reliable • Excellent shock and vibration immunity • Long life — no contacts to bounce or wear • Excellent surge handling ability • Zero voltage point switching.

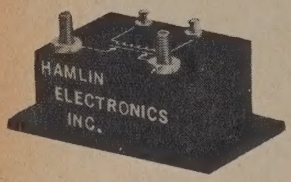
Humidity resistant solid state 6 amp self contained AC controller is small and rugged to withstand any environment. Convenient mounting in any position.

Load circuit connects to rugged brass studs. Circuit withstands 80 amp, 1 cycle inrush currents. Operating temperatures up to 25°C without additional heat sink. Operate time: 1 ms typ. Release time: no longer than ½ cycle. Life expectancy: in excess of 100 million operations.

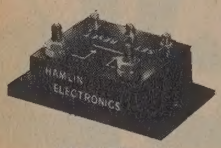
Hamlin Electronics produces a broad line of rapid resp se, rugged, self-contained, solid state A.C. controllers desi ed for switching resistive and inductive loads up to 40 a s. Our engineering personnel, competent in application of id state drivers, will design special solid state switching de es and electro-mechanical (or magnetically activated) ed switch devices to meet your special requirements. Our d- ern, clean, well organized manufacturing facility also rs "contract" capabilities for special packaging and mou ng of reed switches and/or reed switch devices.



SERIES 773



SERIES 723



SERIES 733

SERIES 612

SERIES 773 6 Amp Standard Controller

Available as 120 or 240 volt 50/60 Hz controls resistive, capacitive, inductive or inc descent loads. No open contacts to pit or burn. No arcing, and zero current point turn reduces R.F.I.-E.M.I. Contacts: SPST — normally open. Overall size, 2.5 x 1.25 x 1.1 Average weight, 2¼ oz.

Part Number	Coil Volts	Coil Res.	Coil mA	50/60 Hz Volts	Each 1-9	10-24	25-49	50-9
773-11-030	****	****	****	120	8.95	8.00	7.50	7.2
773-11-130	5 VDC	175 ohms	28	120	10.75	9.75	9.25	8.8
773-11-330	24 VDC	2800 ohms	8	120	10.75	9.75	9.25	8.8
773-12-030	****	****	****	240	10.05	9.50	8.55	8.2
773-12-130	5 VDC	175 ohms	28	240	13.80	12.45	11.75	11.3
773-12-330	24 VDC	2800 ohms	8	240	13.80	12.45	11.75	11.3

SERIES 723 Zero Voltage Point 6 Amp Solid State Switching Controller

R.F.I. and E.M.I. can be reduced to insignificant values by switching "ON" as the A voltage wave goes through zero. Eliminates brute force filtering of transients. Contac SPST — normally open. Overall size, 2.61 x 1.5 x 1.463". Average weight, 3½ oz.

Part Number	Coil Volts	Coil Res.	Coil mA	50/60 Hz Volts	Each 1-9	10-24	25-49	50-9
723-21-000	****	****	****	120	20.50	18.50	17.40	16.4
723-21-100	5 VDC	175 ohms	28	120	23.00	20.70	19.60	18.4
723-21-300	24 VDC	2800 ohms	8	120	23.00	20.70	19.60	18.4
723-22-000	****	****	****	240	23.00	20.70	19.60	18.4
723-22-100	5 VDC	175 ohms	28	240	25.50	23.00	21.75	20.4
723-22-300	25 VDC	2800 ohms	8	240	25.50	23.00	21.75	20.4

SERIES 733 Latching 6 Amp Solid State AC Controller

Heavy A.C. load controlled by pulses. D.C. pulses at rated voltage one millisecond or long will "SET" or "RESET" controller. No need to continually dissipate power to hold "ON Contacts: SPST — normally open. Overall size, 2.61 x 1.5 x 1.15". Average weight, 2½ o

Part Number	Coil Volts	Coil Res.	Coil mA	50/60 Hz Volts	Each 1-9	10-24	25-49	50-99
733-31-100	5 VDC	150 ohms	33	120	10.60	9.55	9.00	8.70
733-31-300	24 VDC	2200 ohms	110	120	10.60	9.55	9.00	8.70
733-32-100	5 VDC	150 ohms	33	240	15.05	13.55	12.80	12.35
733-32-300	24 VDC	2200 ohms	110	240	15.05	13.55	12.80	12.35

SERIES 612 Fractional H.P. 2½ Amp per Phase 3 Phase Solid State Controller

Small dependable three phase controller capable of heavy starting overloads up to 8 amp per phase (one cycle). Quiet operation greatly reduces R.F.I. and E.M.I. Ideal for sma three phase motor control particularly when used in conjunction with low level logi Contacts: 3 PST — normally open. Overall size, 2.61 x 1.5 x 1.82". Average weight, 4¾ o

Part Number	Coil Volts	Coil Res.	Coil mA	50/60 Hz Volts	Each 1-9	10-24	25-49	50-99
612-11-100	5 VDC	100 ohms	50	208/240	37.70	33.90	32.00	30.90
612-11-300	24 VDC	1800 ohms	13	208/240	37.70	33.90	32.00	30.90
612-11-500	24 VDC	1800 ohms	13	208/240	37.70	33.90	32.00	30.90
612-11-600	Line V.	5000 ohms	13	208/240	37.70	33.90	32.00	30.90

**** = External Contact

HAMLIN ELECTRONICS, INC.

3879 NORTH 28TH AVENUE • PHOENIX, ARIZONA 85017 • (602) 277-4834

HATHAWAY
Components
5250 EVANS AVENUE • DENVER, COLORADO 80222
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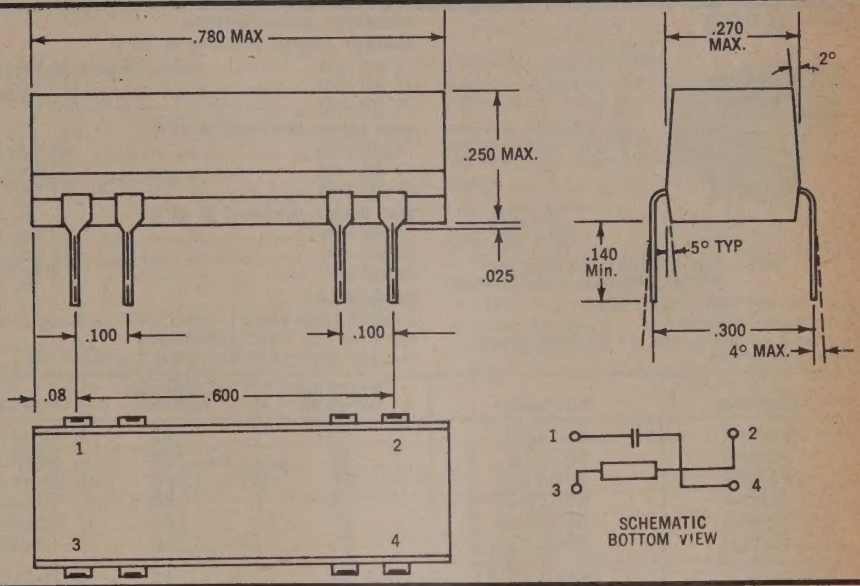
INTEGRATED DRIREED RELAY

"IDR" SERIES



g "IDR" Integrated Drireed Relay is a miniaturized relay for Digital Integrated ckage, DIP), mounting. It can be mount- in the tandard in line, 14 pin, IC layout d operated from standard 5 Volt IC cuitry.

AILABLE IN SPNO CONTACT FORM ONLY.

PERATING SPECIFICATIONS:

ntact ating: Current; 0.5 Amp max.
Voltage; 100 Volts max.
Volt Amperes; 10 max.
Carry Load; 1.0 Amp max. (non-switching)

ntact esistance: Initial; 0.100 Ohms max.
After Life; 1.0 Ohms max.

fe Exictancy: Low Level; 100 x 10^6 Operations.
28 V DC, 0.125 Amps; 5 x 10^6 Operations.

lectr Strength: 300 V AC, rms, 60 Hz.

sulati Resistance: 10^8 Ohms min. @ 25°C.

perat Time (including bounce): 500 microseconds.

elease Time (including bounce): 100 microseconds max.

COIL CHARACTERISTICS @ 25°C:

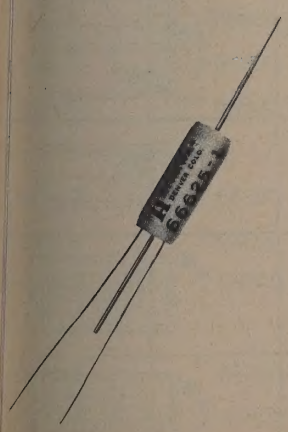
P/N	Nominal V DC	Must Operate	Must Release	Resistance Ω ±10%	Max. V DC
565-0001	3.0	2.0	0.2	24	5.0
565-0002	5.0	4.0	0.4	90	9.0
565-0003	12.0	8.0	0.8	385	19.5
565-0004	24.0	16.0	1.6	1200	34.5

ENVIRONMENTAL:

Temperature Range: −40°C to +85°C.
Vibration: 20 G's @ 0 - 5K Hz.
Shock: 100 G's.

MICRO-MINIATURE DRIREED RELAYS for high density packaging

adaptable for packaging with IC and monolithic solid state devices



SPECIFICATIONS

CONTACT CONFIGURATION: SPST - NO - (one form A)

DIELECTRIC STRENGTH:
200 V a-c rms 60 Hz between open contacts,
500V a-c rms 60 Hz contact to coil.

CONTACT RATING:
Switches up to ¼ Ampere.

INITIAL CONTACT RESISTANCE:
200 milliohms maximum.

MEAN TIME TO FAILURE*		
Load		Operations
.02mA	.012 V d-c	50,000,000
.01A	.05 V d-c	20,000,000
.125A	12 V d-c	10,000,000
.125A	28 V d-c	2,000,000
.250A	12 V d-c	1,000,000

*Failure is defined as 5 misses in 100,000 operations.

SWITCHING SPEED:
1.0 ms maximum including bounce.
Release time .5 ms

ENVIRONMENTAL CHARACTERISTICS:
Shock: 35 g's 11 ±1 ms duration.
Vibration: 15 g's 10 to 2000 Hz
Temperature — Operating: −55° to +75°C.
Storage: −65° to +85°C.

SIZE:
.230" diameter x .600" long.

LEADS:
Weldable, solderable.

CASE:
Polyvinylidene fluoride with nylon end covers.

INSULATION RESISTANCE: 10^{10} ohms at 100 V dc between mutually isolated terminals.

Part Number	66625-1	66625-2	66625-3	66625-4
Nominal rated coil voltage:	3 V d-c	6 V d-c	12 V d-c	26 V d-c
Maximum voltage:	3.8 V d-c	7.5 V d-c	15 V d-c	32 V d-c
Must operate (@ 25°C):	2.1 V d-c	4.2 V d-c	8.3 V d-c	16.5 V d-c
Must release (@ 25°C):	0.2 V d-c	0.4 V d-c	0.8 V d-c	1.5 V d-c
Coil Resistance ±10%:	50 Ohms	200 Ohms	800 Ohms	3750 Ohms

ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
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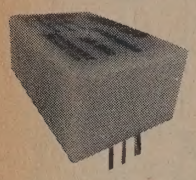
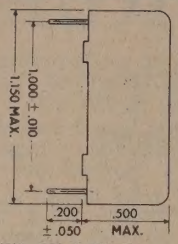
(303) 756-8301 • TWX 910-931-0568

DRIREED RELA'S

"GP" SERIES





NOTE — COIL TERMINALS .028 ±.002 DIA.
SWITCH TERMINALS .018 x .028 MAX.

Nylon Case and Bobbin, Epoxy filled.
Printed Circuit mounting
Less than 1 ms switch time, 5 x 10^8 Ohms minimum insulation resistance.

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE
Operating: 0 to +75C°
Storage: −55 to +85C°

VIBRATION 20 g's to 1000 Hz
SHOCK 35 g's
ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. tial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
200 VRMS 60 Hz Open Contacts (Form C)
500 VRMS 60 Hz Between Mutually Isolated mbers

Contact Life — Up to 5 x 10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 w s max
Gold Alloy Form "C": Dry to 125mA, 2 w s max
Rhodium Form "A": 10mA to 1A, 10 w max

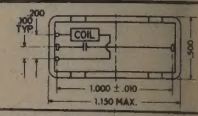
Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance—5 x 10^8 Ohms Minimu @ 25°C

Contact Arrangement
1 Thru 4 ..... orm A
1 Or 2 ..... orm B
1 Thru 3 ..... orm C

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	65630-1	6	180	Gold Alloy
1 Form A	65630-8	12	720	Gold Alloy
1 Form A	65630-15	26	3,300	Gold Alloy
1 Form A	65630-22	6	180	Rhodium
1 Form A	65630-29	12	720	Rhodium
1 Form A	65630-36	26	3,300	Rhodium
2 Form A	65630-2	6	145	Gold Alloy
2 Form A	65630-9	12	575	Gold Alloy
2 Form A	65630-16	26	2,700	Gold Alloy
2 Form A	65630-23	6	145	Rhodium
2 Form A	65630-30	12	575	Rhodium
2 Form A	65630-37	26	2,700	Rhodium
3 Form A	65630-3	6	105	Gold Alloy
3 Form A	65630-10	12	410	Gold Alloy
3 Form A	65630-17	26	1,900	Gold Alloy
3 Form A	65630-24	6	105	Rhodium
3 Form A	65630-31	12	410	Rhodium
3 Form A	65630-38	26	1,900	Rhodium
4 Form A	65630-4	6	80	Gold Alloy
4 Form A	65630-11	12	320	Gold Alloy
4 Form A	65630-18	26	1,500	Gold Alloy
4 Form A	65630-25	6	80	Rhodium
4 Form A	65630-32	12	320	Rhodium
4 Form A	65630-39	26	1,500	Rhodium
1 Form B	65630-5	6	145	Gold Alloy
1 Form B	65630-12	12	575	Gold Alloy
1 Form B	65630-19	26	2,700	Gold Alloy
1 Form B	65630-26	6	145	Rhodium
1 Form B	65630-33	12	575	Rhodium
1 Form B	65630-40	26	2,700	Rhodium
2 Form B	65630-6	6	105	Gold Alloy
2 Form B	65630-13	12	410	Gold Alloy
2 Form B	65630-20	26	1,900	Gold Alloy
2 Form B	65630-27	6	105	Rhodium
2 Form B	65630-34	12	410	Rhodium
2 Form B	65630-41	26	1,900	Rhodium
1A 1B	65630-7	6	80	Gold Alloy
1A 1B	65630-14	12	320	Gold Alloy
1A 1B	65630-21	26	1,500	Gold Alloy
1A 1B	65630-28	6	80	Rhodium
1A 1B	65630-35	12	320	Rhodium
1A 1B	65630-42	26	1,500	Rhodium
1 Form C	65627-1	6	180	Gold Alloy
1 Form C	65627-2	12	720	Gold Alloy
1 Form C	65627-3	26	3,300	Gold Alloy
2 Form C	65627-4	6	145	Gold Alloy
2 Form C	65627-5	12	575	Gold Alloy
2 Form C	65627-6	26	2,700	Gold Alloy
3 Form C	65627-7	6	80	Gold Alloy
3 Form C	65627-8	12	320	Gold Alloy
3 Form C	65627-9	26	1,500	Gold Alloy

Bottom View

1A


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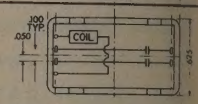

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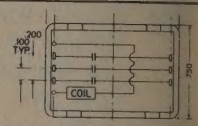

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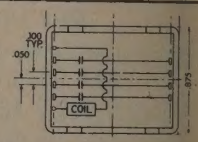

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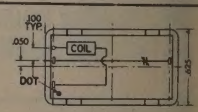

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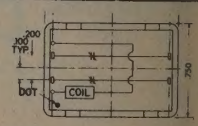

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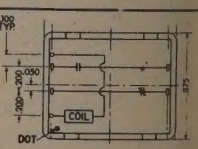

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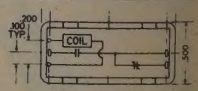

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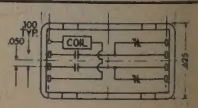

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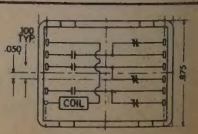

ORDER BY HATHAWAY PART NUMBER

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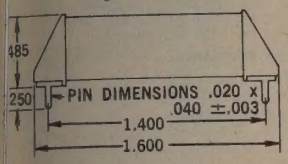
INTERMEDIATE SIZE DRIREED RELAYS

"R" SERIES

OPEN FRAME
Also available with snap-on magnetic shielding case.



OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C
- 6 volt coils ..... 7.5 V d-c
- 12 volt coils ..... 15.0 V d-c
- 26 volt coils ..... 32.5 V d-c

Must Operate (Maximum) @ 25°C
- 6 volt coils ..... 4.2 V d-c
- 12 volt coils ..... 8.3 V d-c
- 26 volt coils ..... 16.5 V d-c

Must Release (Minimum) @ 25°C
- 6 volt coils ..... 0.4 V d-c
- 12 volt coils ..... 0.8 V d-c
- 26 volt coils ..... 1.5 V d-c

Environmental
AMBIENT TEMP. RANGE
Oper.: −55 to +75°C
Storage: −65 to +85°C
VIBRATION 20 g's to 1000 Hz
SHOCK 35 g's
ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 100 Milliohms max. Initial
2 Ohms End of Life

Dielectric Strength
350 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

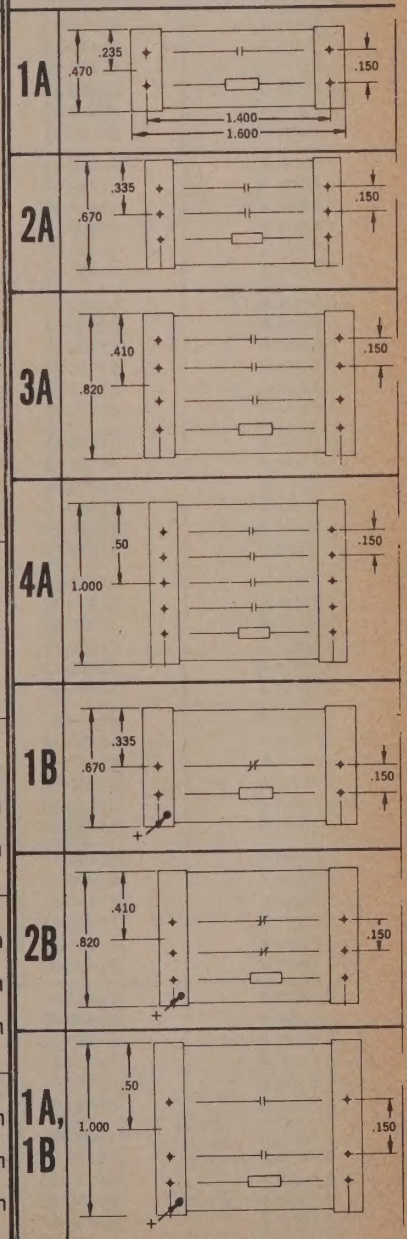
Operate Time (Including Bounce)
One Form A — 1.5 Millisecond

Insulation Resistance — 10^{10} Ohms Minimum @ 25°C

Contact Arrangement
- 1 Thru 4 ..... Form A
- 1 Or 2 ..... Form B
- 1 ..... Form 1A 1B

ntact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
Form A	66800-1	6	145	Rhodium
Form A	66800-13	12	580	Rhodium
Form A	66800-25	26	2,200	Rhodium
Form A	66800-2	6	75	Rhodium
Form A	66800-14	12	280	Rhodium
Form A	66800-26	26	1,500	Rhodium
3 Form A	66800-3	6	55	Rhodium
3 Form A	66800-15	12	220	Rhodium
3 Form A	66800-27	26	900	Rhodium
4 Form A	66800-4	6	42	Rhodium
4 Form A	66800-16	12	150	Rhodium
4 Form A	66800-28	26	700	Rhodium
1 Form B	66800-6	6	75	Rhodium
1 Form B	66800-18	12	280	Rhodium
1 Form B	66800-30	26	1,500	Rhodium
2 Form B	66800-7	6	55	Rhodium
2 Form B	66800-19	12	220	Rhodium
2 Form B	66800-31	26	900	Rhodium
1A 1B	66800-12	6	42	Rhodium
1A 1B	66800-24	12	150	Rhodium
1A 1B	66800-36	26	700	Rhodium

Bottom View



ORDER BY HATHAWAY PART NUMBER **To Order With Magnetic Shielding Case Specify CRM Series**

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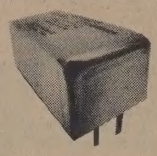
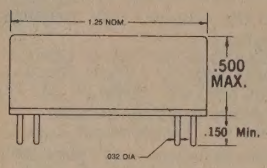
DRIREED RELA'S

"R" SERIES





HEAVY WALL, SEAMLESS CONSTRUCTION
SHIELDED CASE
STRAIN RELIEVED COIL
WELDED TERMINATION

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C
6 volt coils ..... 7.2 V d-c
12 volt coils ..... 15.0 V d-c
26 volt coils ..... 32.0 V d-c

Must Operate (Maximum) @ 25°C
6 volt coils ..... 4.0 V d-c
12 volt coils ..... 8.0 V d-c
26 volt coils ..... 18.0 V d-c

Must Release (Minimum) @ 25°C
6 volt coils ..... 0.2 V d-c
12 volt coils ..... 0.5 V d-c
26 volt coils ..... 1.0 V d-c

Environmental
AMBIENT TEMP. RANGE | VIBRATION 20 g's to 1000 Hz
Operating: 0 to +85C° | SHOCK 35 g's
Storage: −55 to +85C° | ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. ial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated M bers

Contact Life — Up to 5×10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 wa max
Gold Alloy Form "C": Dry to 125mA, 2 wa max
Rhodium Form "A": 10mA to 1A, 10 wa max

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimum 25°C

Capacitance
5PF Max. Between Any Two Switching Elem s

Contact Arrangement
1 Thru 12 ..... orm
1 Or 2 ..... orm E
1 Thru 4 ..... orm C

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice	Bottom View
1 Form A	61450-1	6	300	Gold Alloy	1A
1 Form A	61450-13	12	1,200	Gold Alloy	
1 Form A	61450-25	28	5,000	Gold Alloy	
1 Form A	61450-37	6	300	Rhodium	
1 Form A	61450-49	12	1,200	Rhodium	
1 Form A	61450-61	28	5,000	Rhodium	
2 Form A	61450-2	6	100	Gold Alloy	2A
2 Form A	61450-14	12	400	Gold Alloy	
2 Form A	61450-26	28	2,200	Gold Alloy	
2 Form A	61450-38	6	100	Rhodium	
2 Form A	61450-50	12	400	Rhodium	
2 Form A	61450-62	28	2,200	Rhodium	
3 Form A	61450-3	6	100	Gold Alloy	3A
3 Form A	61450-15	12	400	Gold Alloy	
3 Form A	61450-27	28	2,200	Gold Alloy	
3 Form A	61450-39	6	100	Rhodium	
3 Form A	61450-51	12	400	Rhodium	
3 Form A	61450-63	28	2,200	Rhodium	
4 Form A	61450-4	6	75	Gold Alloy	4A
4 Form A	61450-16	12	300	Gold Alloy	
4 Form A	61450-28	28	1,650	Gold Alloy	
4 Form A	61450-40	6	75	Rhodium	
4 Form A	61450-52	12	300	Rhodium	
4 Form A	61450-63	28	1,650	Rhodium	
5 Form A	61450-5	6	75	Gold Alloy	5A
5 Form A	61450-17	12	300	Gold Alloy	
5 Form A	61450-29	28	1,650	Gold Alloy	
5 Form A	61450-41	6	75	Rhodium	
5 Form A	61450-53	12	300	Rhodium	
5 Form A	61450-65	28	1,650	Rhodium	
6 Form A	61450-6	6	50	Gold Alloy	6A
6 Form A	61450-18	12	200	Gold Alloy	
6 Form A	61450-30	28	1,100	Gold Alloy	
6 Form A	61450-42	6	50	Rhodium	
6 Form A	61450-54	12	200	Rhodium	
6 Form A	61450-66	28	1,100	Rhodium	
7 Form A	61450-7	6	50	Gold Alloy	7A
7 Form A	61450-19	12	200	Gold Alloy	
7 Form A	61450-31	28	1,100	Gold Alloy	
7 Form A	61450-43	6	50	Rhodium	
7 Form A	61450-55	12	200	Rhodium	
7 Form A	61450-67	28	1,100	Rhodium	
8 Form A	61450-8	6	50	Gold Alloy	
8 Form A	61450-20	12	200	Gold Alloy	
8 Form A	61450-32	28	1,100	Gold Alloy	
8 Form A	61450-44	6	50	Rhodium	
8 Form A	61450-56	12	200	Rhodium	
8 Form A	61450-68	28	1,100	Rhodium	
9 Form A	61450-9	6	50	Gold Alloy	
9 Form A	61450-21	12	200	Gold Alloy	
9 Form A	61450-33	28	1,100	Gold Alloy	
9 Form A	61450-45	6	50	Rhodium	
9 Form A	61450-57	12	200	Rhodium	
9 Form A	61450-69	28	1,100	Rhodium	

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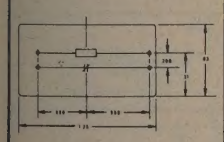
DRIREED RELAYS

SERIES CONTINUED

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice	Bottom View
10 Form A	61450-10	6	25	Gold Alloy	8A
10 Form A	61450-22	12	100	Gold Alloy	
10 Form A	61450-34	28	550	Gold Alloy	
10 Form A	61450-46	6	25	Rhodium	
10 Form A	61450-58	12	100	Rhodium	
10 Form A	61450-70	28	550	Rhodium	
11 Form A	61450-11	6	25	Gold Alloy	
11 Form A	61450-23	12	100	Gold Alloy	
11 Form A	61450-35	28	550	Gold Alloy	
11 Form A	61450-47	6	25	Rhodium	
11 Form A	61450-59	12	100	Rhodium	
11 Form A	61450-71	28	550	Rhodium	
12 Form A	61450-12	6	25	Gold Alloy	9A
12 Form A	61450-24	12	100	Gold Alloy	
12 Form A	61450-36	28	550	Gold Alloy	
12 Form A	61450-48	6	25	Rhodium	
12 Form A	61450-60	12	100	Rhodium	
12 Form A	61450-72	28	550	Rhodium	
1 Form B	61542-1	6	100	Gold Alloy	
1 Form B	61542-3	12	400	Gold Alloy	
1 Form B	61524-5	28	2,200	Gold Alloy	
1 Form B	61542-7	6	100	Rhodium	
1 Form B	61542-9	12	400	Rhodium	
1 Form B	61542-11	28	2,200	Rhodium	
2 Form B	61542-2	6	100	Gold Alloy	10A
2 Form B	61542-4	12	400	Gold Alloy	
2 Form B	61542-6	28	2,200	Gold Alloy	
2 Form B	61542-8	6	100	Rhodium	
2 Form B	61542-10	12	400	Rhodium	
2 Form B	61542-12	28	2,200	Rhodium	
1 1B	61540-1	6	75	Gold Alloy	
1 1B	61540-3	12	300	Gold Alloy	
1 1B	61540-5	28	1,650	Gold Alloy	
1 1B	61540-7	6	75	Rhodium	
1 1B	61540-9	12	300	Rhodium	
1 1B	61540-11	28	1,650	Rhodium	
2B	61540-2	6	50	Gold Alloy	11A
2B	61540-4	12	200	Gold Alloy	
2B	61540-6	28	1,100	Gold Alloy	
2B	61540-8	6	50	Rhodium	
2B	61540-10	12	200	Rhodium	
2B	61540-12	28	1,100	Rhodium	
Form C	63961-1	6	300	Gold Alloy	
Form C	63961-2	12	1,200	Gold Alloy	
Form C	63961-3	28	5,000	Gold Alloy	
Form C	63962-1	6	100	Gold Alloy	12A
Form C	63962-2	12	400	Gold Alloy	
Form C	63962-3	28	2,200	Gold Alloy	
Form C	63963-1	6	100	Gold Alloy	
Form C	63963-2	12	400	Gold Alloy	
Form C	63963-3	28	2,200	Gold Alloy	
Form C	63964-1	6	75	Gold Alloy	
Form C	63964-2	12	300	Gold Alloy	
Form C	63964-3	28	1,650	Gold Alloy	



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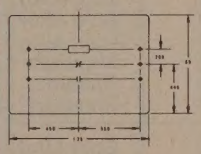

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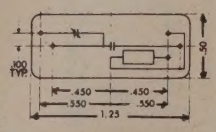

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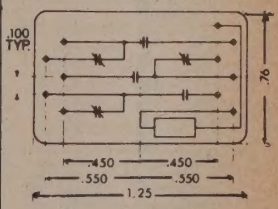

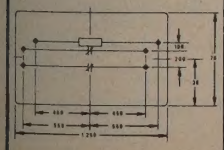

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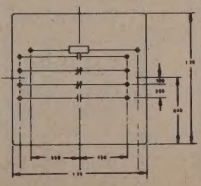

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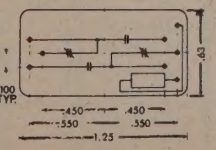

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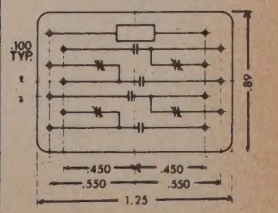

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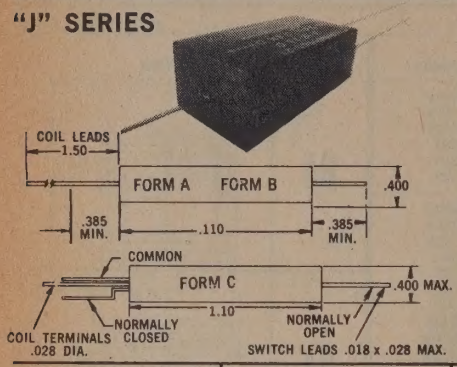
DRIREED RELAYS

"J" SERIES



OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE
Operating: 0 to +75C°
Storage: −55 to +85C°

VIBRATION 20 g's to 1000 Hz
SHOCK 35 g's
ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. 2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated

Contact Life — Up to 5 x 10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 w
Gold Alloy Form "C": Dry to 125mA, 2 w
Rhodium Form "A": 10mA to 1A, 10 w

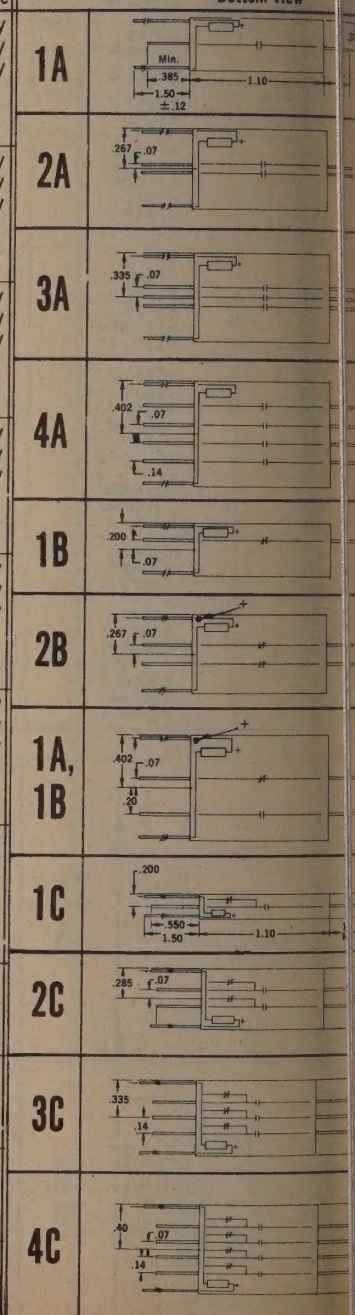
Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimum

Contact Arrangement
1 Thru 4
1 Or 2
1 Thru 4

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	61900-1	6	300	Gold Alloy
1 Form A	61900-9	12	1,200	Gold Alloy
1 Form A	61900-17	26	5,600	Gold Alloy
1 Form A	61900-25	6	300	Rhodium
1 Form A	61900-33	12	1,200	Rhodium
1 Form A	61900-41	26	5,600	Rhodium
2 Form A	61900-2	6	200	Gold Alloy
2 Form A	61900-10	12	800	Gold Alloy
2 Form A	61900-18	26	3,800	Gold Alloy
2 Form A	61900-26	6	200	Rhodium
2 Form A	61900-34	12	800	Rhodium
2 Form A	61900-42	26	3,800	Rhodium
3 Form A	61900-3	6	150	Gold Alloy
3 Form A	61900-11	12	600	Gold Alloy
3 Form A	61900-19	26	2,800	Gold Alloy
3 Form A	61900-27	6	150	Rhodium
3 Form A	61900-35	12	600	Rhodium
3 Form A	61900-43	26	2,800	Rhodium
4 Form A	61900-4	6	125	Gold Alloy
4 Form A	61900-12	12	500	Gold Alloy
4 Form A	61900-20	26	2,300	Gold Alloy
4 Form A	61900-28	6	125	Rhodium
4 Form A	61900-36	12	500	Rhodium
4 Form A	61900-44	26	2,300	Rhodium
1 Form B	61900-5	6	200	Gold Alloy
1 Form B	61900-13	12	800	Gold Alloy
1 Form B	61900-21	26	3,800	Gold Alloy
1 Form B	61900-29	6	200	Rhodium
1 Form B	61900-37	12	800	Rhodium
1 Form B	61900-45	26	3,800	Rhodium
2 Form B	61900-6	6	150	Gold Alloy
2 Form B	61900-14	12	600	Gold Alloy
2 Form B	61900-22	26	2,800	Gold Alloy
2 Form B	61900-30	6	150	Rhodium
2 Form B	61900-38	12	600	Rhodium
2 Form B	61900-46	26	2,800	Rhodium
1A 1B	61900-8	6	125	Gold Alloy
1A 1B	61900-16	12	500	Gold Alloy
1A 1B	61900-24	26	2,300	Gold Alloy
1A 1B	61900-32	6	125	Rhodium
1A 1B	61900-40	12	500	Rhodium
1A 1B	61900-48	26	2,300	Rhodium
1 Form C	0515003	6	300	Gold Alloy
1 Form C	0515004	12	1,200	Gold Alloy
1 Form C	0515005	26	5,600	Gold Alloy
2 Form C	0515006	6	200	Gold Alloy
2 Form C	0515007	12	800	Gold Alloy
2 Form C	0515008	26	3,800	Gold Alloy
3 Form C	0515009	6	150	Gold Alloy
3 Form C	0515010	12	600	Gold Alloy
3 Form C	0515011	26	2,800	Gold Alloy
4 Form C	0515012	6	125	Gold Alloy
4 Form C	0515013	12	600	Gold Alloy
4 Form C	0515014	26	2,300	Gold Alloy

Bottom View



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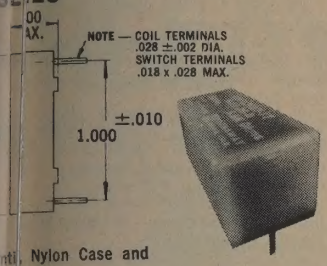
DRIREED RELAYS

"C" SERIES



Mounting, Nylon Case and Bobbin, Epoxy filled.
Excellent c with low power consumption.
High Insulation Resistance

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +75C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5×10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

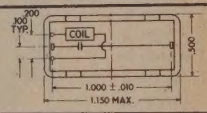
Insulation Resistance—5×10^8 Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1 Thru 3	Form C

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	62057-1	6	300	Gold Alloy
1 Form A	62057-9	12	1,200	Gold Alloy
1 Form A	62057-17	26	5,600	Gold Alloy
1 Form A	62057-25	6	300	Rhodium
1 Form A	62057-33	12	1,200	Rhodium
1 Form A	62057-41	26	5,600	Rhodium
2 Form A	62057-2	6	200	Gold Alloy
2 Form A	62057-10	12	800	Gold Alloy
2 Form A	62057-18	26	3,800	Gold Alloy
2 Form A	62057-26	6	200	Rhodium
2 Form A	62057-34	12	800	Rhodium
2 Form A	62057-42	26	3,800	Rhodium
3 Form A	62057-3	6	150	Gold Alloy
3 Form A	62057-11	12	600	Gold Alloy
3 Form A	62057-19	26	2,800	Gold Alloy
3 Form A	62057-27	6	150	Rhodium
3 Form A	62057-35	12	600	Rhodium
3 Form A	62057-43	26	2,800	Rhodium
4 Form A	62057-4	6	125	Gold Alloy
4 Form A	62057-12	12	500	Gold Alloy
4 Form A	62057-20	26	2,300	Gold Alloy
4 Form A	62057-28	6	125	Rhodium
4 Form A	62057-36	12	500	Rhodium
4 Form A	62057-44	26	2,300	Rhodium
1 Form B	62057-5	6	200	Gold Alloy
1 Form B	62057-13	12	800	Gold Alloy
1 Form B	62057-21	26	3,800	Gold Alloy
1 Form B	62057-29	6	200	Rhodium
1 Form B	62057-37	12	800	Rhodium
1 Form B	62057-45	26	3,800	Rhodium
2 Form B	62057-6	6	150	Gold Alloy
2 Form B	62057-14	12	600	Gold Alloy
2 Form B	62057-22	26	2,800	Gold Alloy
2 Form B	62057-30	6	150	Rhodium
2 Form B	62057-38	12	600	Rhodium
2 Form B	62057-46	26	2,800	Rhodium
1A 1B	62057-8	6	125	Gold Alloy
1A 1B	62057-16	12	500	Gold Alloy
1A 1B	62057-24	26	2,300	Gold Alloy
1A 1B	62057-32	6	125	Rhodium
1A 1B	62057-40	12	500	Rhodium
1A 1B	62057-48	26	2,300	Rhodium
1 Form C	64819-1	6	300	Gold Alloy
1 Form C	64819-2	12	1,200	Gold Alloy
1 Form C	64819-3	26	5,600	Gold Alloy
2 Form C	64819-4	6	200	Gold Alloy
2 Form C	64819-5	12	800	Gold Alloy
2 Form C	64819-6	26	3,800	Gold Alloy
3 Form C	64819-7	6	125	Gold Alloy
3 Form C	64819-8	12	500	Gold Alloy
3 Form C	64819-9	26	2,300	Gold Alloy

Bottom View

1A


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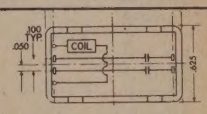

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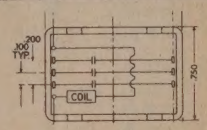

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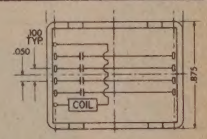

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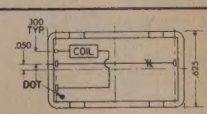

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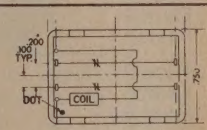

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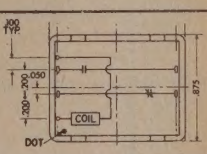

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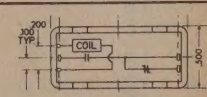

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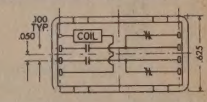

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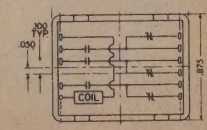

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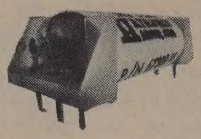
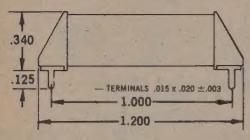
DRIREED RELAYS

"LS" SERIES





LOW SILHOUETTE OPEN FRAME
Low-loss, spot welded reed to pin connection.
Also available with snap-on magnetic shielding case.

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +75C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max.
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated

Contact Life — Up to 5 x 10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 w
Gold Alloy Form "C": Dry to 125mA, 2 w
Rhodium Form "A": 10mA to 1A, 10 w

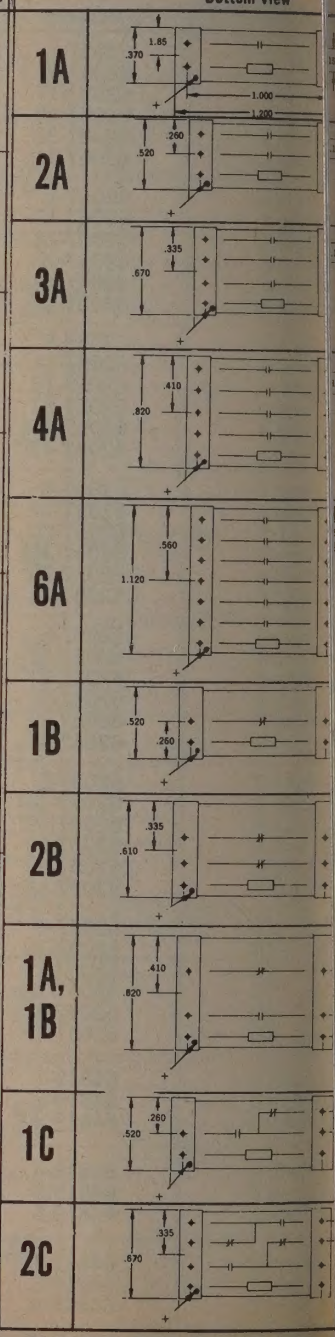
Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimu

Contact Arrangement
1 Thru 4
1 Or 2
1 Thru 2

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	67300-1	6	180	Gold Alloy
1 Form A	67300-6	12	720	Gold Alloy
1 Form A	67300-11	26	3,300	Gold Alloy
1 Form A	67300-31	6	180	Rhodium
1 Form A	67300-36	12	772	Rhodium
1 Form A	67300-41	26	3,300	Rhodium
2 Form A	67300-2	6	145	Gold Alloy
2 Form A	67300-7	12	575	Gold Alloy
2 Form A	67300-12	26	2,700	Gold Alloy
2 Form A	67300-32	6	145	Rhodium
2 Form A	67300-37	12	575	Rhodium
2 Form A	67300-42	26	2,700	Rhodium
3 Form A	67300-3	6	105	Gold Alloy
3 Form A	67300-8	12	410	Gold Alloy
3 Form A	67300-13	26	1,700	Gold Alloy
3 Form A	67300-33	6	105	Rhodium
3 Form A	67300-38	12	410	Rhodium
3 Form A	67300-43	26	1,700	Rhodium
4 Form A	67300-4	6	80	Gold Alloy
4 Form A	67300-9	12	320	Gold Alloy
4 Form A	67300-14	26	1,500	Gold Alloy
4 Form A	67300-34	6	80	Rhodium
4 Form A	67300-39	12	320	Rhodium
4 Form A	67300-44	26	1,500	Rhodium
6 Form A	67300-5	6	55	Gold Alloy
6 Form A	67300-10	12	220	Gold Alloy
6 Form A	67300-15	26	1,040	Gold Alloy
6 Form A	67300-35	6	55	Rhodium
6 Form A	67300-40	12	220	Rhodium
6 Form A	67300-45	26	1,040	Rhodium
1 Form B	67300-16	6	145	Gold Alloy
1 Form B	67300-20	12	575	Gold Alloy
1 Form B	67300-24	26	2,700	Gold Alloy
1 Form B	67300-46	6	145	Rhodium
1 Form B	67300-48	12	575	Rhodium
1 Form B	67300-50	26	2,700	Rhodium
2 Form B	&7300-17	6	105	Gold Alloy
2 Form B	67300-21	12	410	Gold Alloy
2 Form B	67300-25	26	1,700	Gold Alloy
2 Form B	67300-47	6	105	Rhodium
2 Form B	67300-49	12	410	Rhodium
2 Form B	67300-51	26	1,700	Rhodium
1A 1B	67300-28	6	80	Gold Alloy
1A 1B	67300-29	12	320	Gold Alloy
1A 1B	67300-30	26	1,500	Gold Alloy
1A 1B	67300-52	6	80	Rhodium
1A 1B	67300-53	12	320	Rhodium
1A 1B	67300-54	26	1,500	Rhodium
1 Form C	67300-18	6	145	Gold Alloy
1 Form C	67300-22	12	575	Gold Alloy
1 Form C	67300-26	26	2,700	Gold Alloy
2 Form C	67300-19	6	105	Gold Alloy
2 Form C	67300-23	12	410	Gold Alloy
2 Form C	67300-27	26	1,700	Gold Alloy

Bottom View



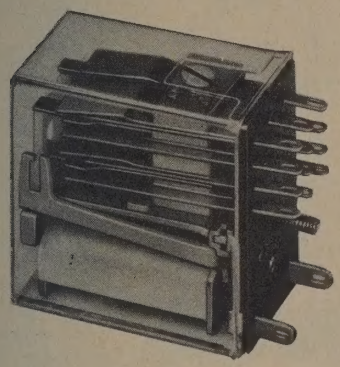
ORDER BY HATHAWAY PART NUMBER To Order With Magnetic Shielding Case Specify LSM Series

See YELLOW SECTION for Local Offices, Phones

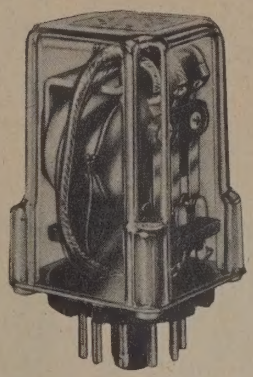
from underwater to aerospace...

HART-ADVANCE RELAYS & SOLENOIDS

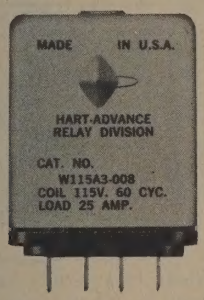
quality products for critical applications



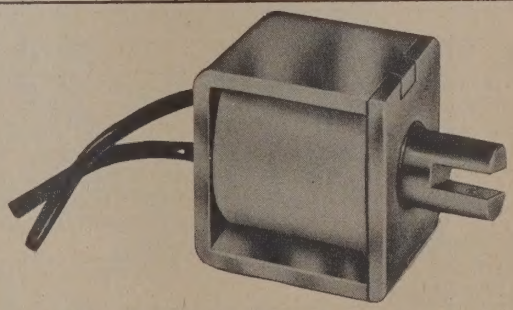
VERSAPAC Our miniature cradle type relay. Designed to provide telephone relay performance at a modest price. Long life with miniature size augmented with 3 and 5 ampere contact ratings. This design is available in standard 2, 4, 6 & 8 pole contact configurations. Printed circuit versions as well as socketed assemblies are standard options.



GH SERIES General purpose, 1, 2 & 3 pole, 5 & 10 ampere contact rating. GHU series U/L recognized for open and enclosed versions for up to 240 volt switching applications. Enclosed versions available with octal and 11 pin plugs.



W SERIES A U/L approved standard enclosed power relay designed especially for single and two phase circuit switching. Contact rating 25 amps at 120 or 240 V AC. Compact design measures 1½" square by 1⅞" high. Standard AMP quick disconnect terminals provide maximum flexibility for wiring ease. Companion socket WPS-C1 likewise U/L recognized for 250 volt usage. Standard AC and DC coils are shelf items at our distributors.



SOLENOIDS Solid frame solenoids, made of high-grade steel in all parts of the magnetic circuit. Frame is dovetailed and staked to the end plate for added mechanical strength and increased performance ability. Solid frame supplemented by type 51 laminated frame unit designed and engineered to meet the most stringent AC requirements. Compact size makes installation easy. Voltages: DC, 6 to 115; AC, 6 to 460. Wide selection of special features available for specific applications.

And there are more!

Hart-Advance has a *broad line* of high quality relays and solenoids for all of your applications in: telephone service; power service; general purpose; antenna; sensitive; time delay; high voltage and micro-miniature applications.

A wide range of crystal can relays for stringent military and industrial relays are also available, including QPL versions.

For full details and valuable engineering data, write for our new OEM data sheets or Distributor Catalog.

HART-ADVANCE RELAY DIVISION
OAK ELECTRO/NETICS CORP • CRYSTAL LAKE, ILL. 60014

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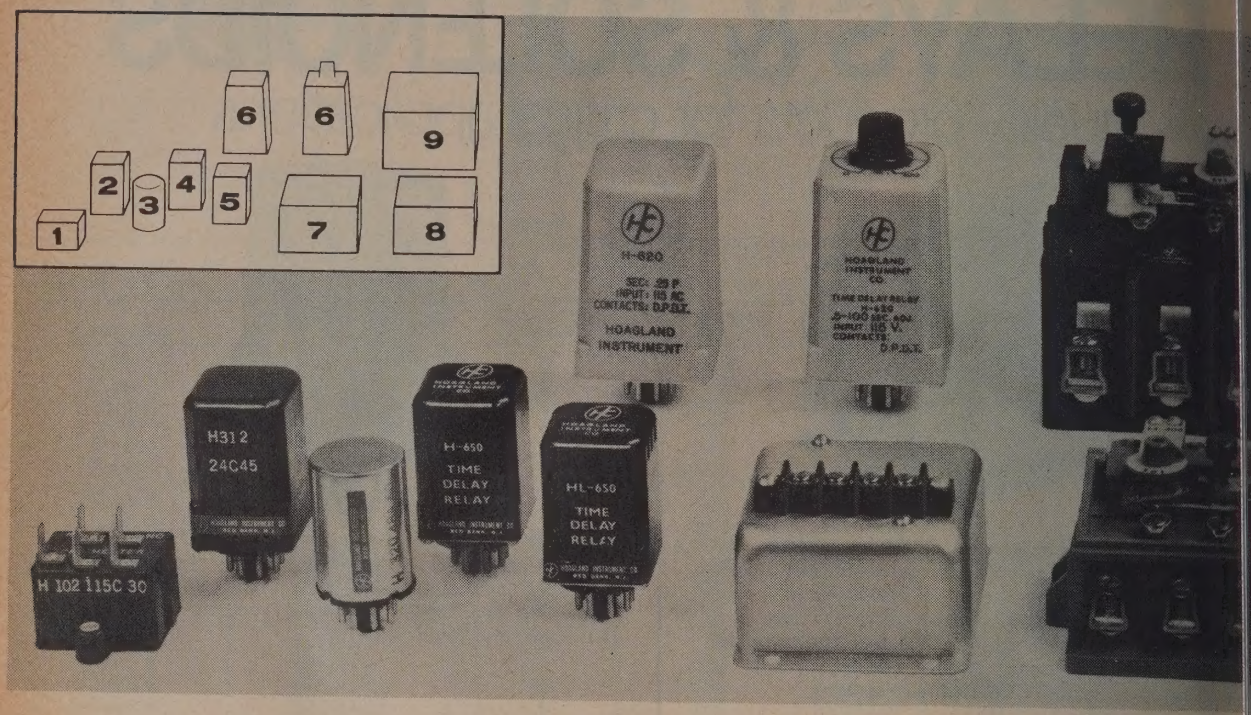
THERMAL TIME DELAY RELAYS
ELECTRONIC TIME DELAY RELAYS
MOTOR OVERLOAD RELAYS



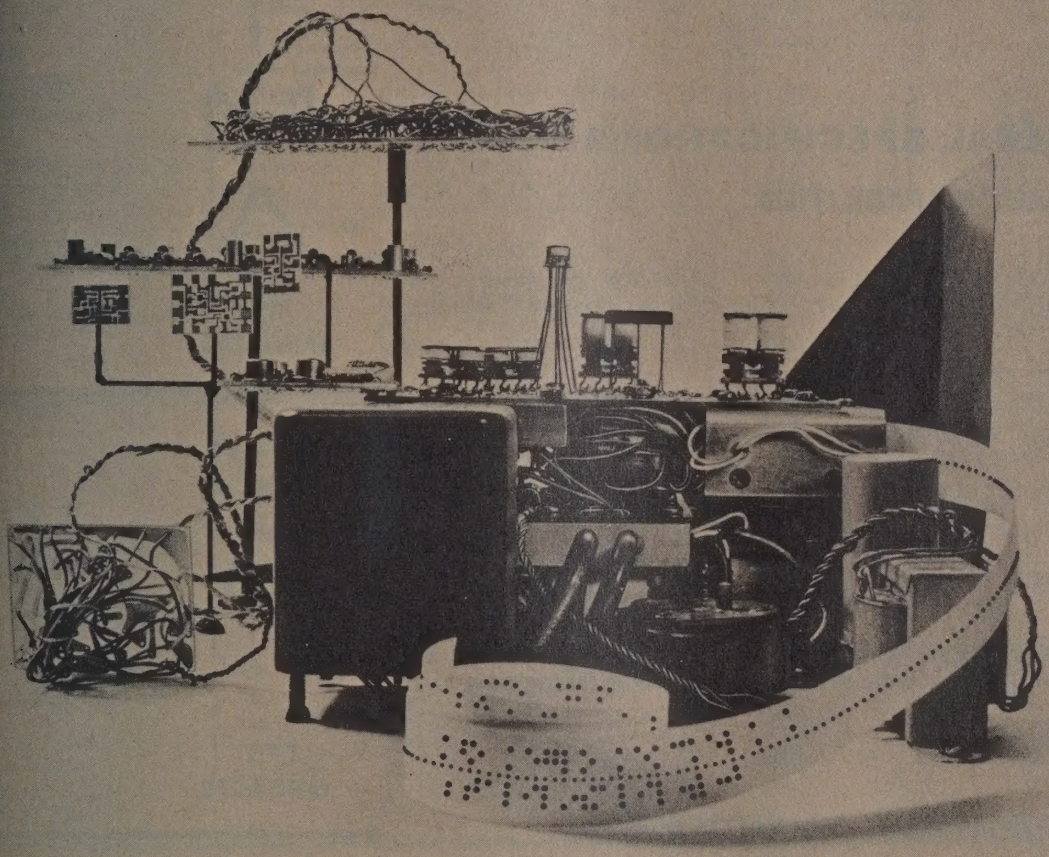
ITEM	DESCRIPTION
THERMAL TIME DELAY RELAYS	
1	**H-101 Series.** Panel mount. Standard time delays available over a range of values from 5 sec. to 180 sec. Other delays available on special request. Standard heater voltages available 6.3, 12, 24, 48, 115 and 230. Other heater voltages available on special request. Contacts, snap action: SPNO, SPNC and SPDT, 2 amp at 115V resistive. Temperature compensated from 0° to 160°F.
2	**H-310 Series.** Plastic, octal plug. Specifications same as H-101 Series.
3	**H-320 Series.** Metal, octal plug. Specifications same as H-101 Series.
ELECTRONIC TIME DELAY RELAYS	
4	**H-650 Series.** Miniature plug-in type. Load capacity 2 amps at 28V DC. Operating voltage 24V AC and 24 and 48V DC. Standard time delays available over a range of values from 0.5 to 100 sec. Other delays available on special request. **General Specifications:** Contact arrangement: SPNO, SPNC, SPDT, DPDT. Repeat accuracy: ±2% timing, ±10% voltage, ±20°F. variation. Life: 1,000,000 cycles (minimum). Adjustments: screwdriver or preset. Also remote potentiometer to customer specifications. Reset time: 0.1 to 0.025 sec. based on initial delay.
5	**HL-650 Series.** Miniature plug-in type. Load capacity 2 amp at 120V AC. Operating voltage 115V AC. Standard time delays available over a range of values from 0.5 to 100 sec. Other delays available on request. Adjustments: screwdriver or preset. Also remote potentiometer to customer specifications. General specifications same as H-650 Series.

ITEM	DESCRIPTION
6	**H-620 Series.** Heavy-duty plug-in type. Load 5 and 10 amps at 115V AC. Operating voltag 115V AC and 24, 30 and 48V DC. Standard tim available over a range of values from 0.5 to Other delays available on request. Availa knob adjust, screwdriver lock, or preset. Also potentiometer to customer specifications. specifications same as H-650 Series except duty.
7	**H-600 Series.** Heavy-duty panel mount type. strip, screw or quick connect terminals. L pacity 5 and 10 amps at 115V AC. Standa delays available from 0.5 to 100 sec. 230 input and other delays available on request. A with knob adjust, screwdriver lock, or prese remote potentiometer to customer specifi General specifications same as H-650 Series heavier duty.
MOTOR OVERLOAD RELAYS	
8	**H-400 Series.** Standard full load current range able in 27 different models from 1.0 to 50 Other non-standard ranges available on r Choice of either automatic or manual reset. F current setting is adjustable over the range relay or may be factory preset. Relays availab trip time characteristics from "super" fast to s match your motor curve. Temperature compen available from −60°F. to 160°F.
9	**H-410 Series.** Same characteristics as H-400 except full load current range is from 25 to 150 in 12 different models.

For additional information on any of the above devices, write for Engineering Data Sheets.

HC HOAGLAND INSTRUMENT COMPANY / 65 CHESTNUT ST. / RED BANK, N.J. 07701 / PH: 201-741-3

we make enough printed circuit boards, transformers, power supplies, thick film ic's, relays, solenoids and timing and sensing devices to build a great computer.



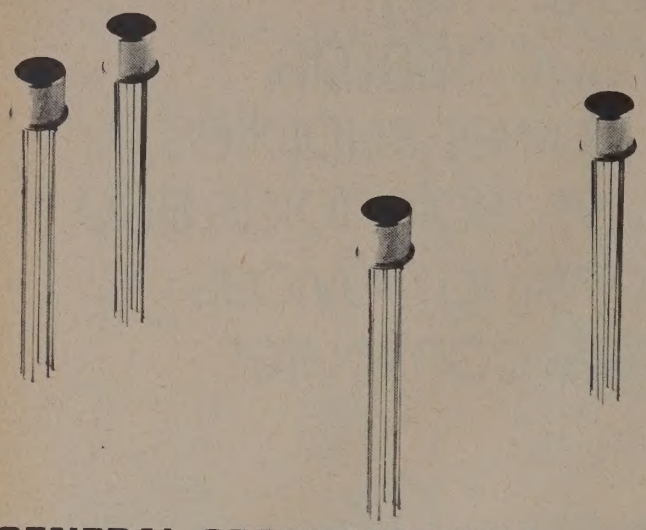
The fact is, whatever type of complex electronics equipment you make, Hi-G can provide you with a unique combination of products and services. The fact is, our engineering staff has the product capability—and the design resources—to answer your toughest component and sub-system electronics questions.

Custom design and manufacture is the name of our game. Competitive pricing is second nature to us. And Quality Control is our way of life.

It all adds up to fewer production problems, better quality, and higher profitability for you and your finished equipment. Why not get in touch with us today? Write Hi-G, Inc., 580 Spring Street, Windsor Locks, Connecticut 06096. (203) 623-2481.

Hi G

MA & MS TO-5 SERIES RELAY



GENERAL SPECIFICATIONS

CONTACT CAPABILITIES

RATING
10,000,000 operations at low level. 1,000,000 operations at 0.5 amp, 28V d-c resistive load. 100,000 operations at 1.0 amp, 28V d-c resistive load.

CONTACT RESISTANCE
0.1 ohm maximum before life (measured 1/8" from header). 0.2 ohm maximum after life at maximum rated current (measured 1/8" from header).

CONTACT BOUNCE
1.5 milliseconds maximum

OVERLOAD
2 amps at 28V d-c for 100 operations minimum

INSULATION RESISTANCE
10,000 megohms minimum between mutually insulated terminals

ENCLOSURE
Hermetically sealed. All welded.

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE RANGE
−65°C to +125°C. (Higher temperature ratings on special order)

VIBRATION
.06" DA or 30G, 10-3000 cps.

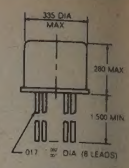
SHOCK
80 G's

MILITARY SPECIFICATIONS

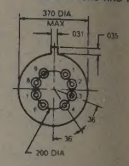
All Hi-G MA and MS Series relays are manufactured in accordance with Military Specification MIL-R-5757 and its applicable detail specification.

MA

DPDT CONTACTS



ENCLOSURE AND HE

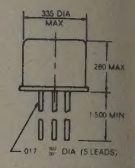


BOTTOM VIEW

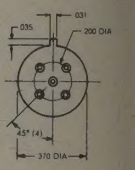
NOTE: TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON PART.

1MA

SPDT CONTACTS

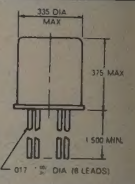


ENCLOSURE AND HEAD

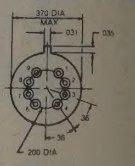


MS

DPDT CONTACTS



ENCLOSURE AND HEADER

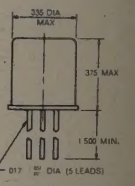


BOTTOM VIEW

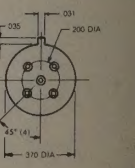
NOTE: TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON PART.

1MS

SPDT CONTACTS



ENCLOSURE AND HEADER



Authorized Hi-G dealers are located throughout the U.S. and Canada

Sensitivity:
0 milliwatts

Operate Time:
milliseconds maximum at nom. coil voltage over temperature range.

Release Time:
5 milliseconds maximum at nom. coil voltage over temperature range.

Dielectric Strength:
0V RMS 60 cycles at sea level
5V RMS 60 cycles at 70,000 feet

Weight:
07 ounce with leads trimmed to ⅛".
d 0.2 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Voltage VDC Max.*	Drop Out Voltage VDC* Max.	Min.
Wire Terminal							
MAW-6	M5757/40-001	6	8	98	4.5	3.2	.18
MAW-9	M5757/40-002	9	12	220	6.8	4.9	.35
MAW-12	M5757/40-003	12	16	390	9.0	6.5	.41
MAW-18	M5757/40-004	18	24	880	13.5	10.0	.59
MAW-26	M5757/40-005	26.5	32	1560	18.0	13.0	.89
Pin Terminal							
MAP-6	M5757/40-006	6	8	98	4.5	3.2	.18
MAP-9	M5757/40-007	9	12	220	6.8	4.9	.35
MAP-12	M5757/40-008	12	16	390	9.0	6.5	.41
MAP-18	M5757/40-009	18	24	880	13.5	10.0	.59
MAP-26	M5757/40-010	26.5	32	1560	18.0	13.0	.89

*Over temperature range

ensitivity:
00 milliwatts

perate Time:
0 milliseconds maximum at nom. coil oltage over temperature range.

elease Time:
0 milliseconds maximum at nom. coil oltage over temperature range.

ielectric Strength:
00V RMS 60 cycles at sea level
00V RMS 60 cycles at 70,000 feet

Weight:
.06 ounce with leads trimmed at ⅛",
dd 0. ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Voltage VDC Max.*	Drop Out Voltage VDC* Max.	Min.
Wire Terminal							
1MAW-6	M5757/38-003	6	8	125	4.5	3.2	.18
1MAW-9	M5757/38-004	9	12	280	6.8	4.9	.35
1MAW-12	M5757/38-002	12	16	500	9.0	6.5	.41
1MAW-18	M5757/38-001	18	24	1130	13.5	10.0	.59
1MAW-26	M5757/38-005	26.5	32	2000	18.0	13.0	.89
Pin Terminal							
1MAP-6	M5757/38-008	6	8	125	4.5	3.2	.18
1MAP-9	M5757/38-009	9	12	280	6.8	4.9	.35
1MAP-12	M5757/38-007	12	16	500	9.0	6.5	.41
1MAP-18	M5757/38-006	18	24	1130	13.5	10.0	.59
1MAP-26	M5757/38-010	26.5	32	2000	18.0	13.0	.89

*Over temperature range

Sensitivity:
50 milliwatts

Operate Time:
4.5 milliseconds maximum at nom. coil voltage over temperature range.

Release Time:
2.5 milliseconds maximum at nom. coil voltage over temperature range.

Dielectric Strength:
500V RMS 60 cycles at sea level
125V RMS 60 cycles at 70,000 feet

Weight:
0.10 ounce with leads trimmed to ⅛",
add 02 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Current (Ma) Max.	Drop Out Current (MA) Max.	Min.
Wire Terminal							
MSW-6	M5757/70-001	6	10	200	17.5	8.7	1.7
MSW-12	M5757/70-002	12	20	850	8.4	4.2	0.8
MSW-26	M5757/70-003	26	40	3300	4.2	2.1	0.4
MSW-36	M5757/70-004	36	57	6500	3.0	1.5	0.3
MSW-48	M5757/70-005	48	75	11000	2.4	1.2	0.2
Pin Terminal							
MSP-6	M5757/70-006	6	10	200	17.5	8.7	1.7
MSP-12	M5757/70-007	12	20	850	8.4	4.2	0.8
MSP-26	M5757/70-008	26	40	3300	4.2	2.1	0.4
MSP-36	M5757/70-009	36	57	6500	3.0	1.5	0.3
MSP-48	M5757/70-010	48	75	11000	2.4	1.2	0.2

Sensitivity:
40 milliwatts

Operate Time:
4.0 milliseconds maximum at nom. coil volta over temperature range

Release Time:
2.5 milliseconds maximum at nom. coil volta over temperature range

Dielectric Strength:
500 RMS 60 cycles at sea level
300 RMS 60 cycles at 70,000 feet

Weight:
.08 ounce with leads trimmed to ⅛",
add 02 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Current (Ma) Max.	Drop Out Current (MA) Max.	Min.
Wire Terminal							
1MSW-6	M5757/69-001	6	11	255	12.5	6.25	1.2
1MSW-12	M5757/69-002	12	22	1025	6.25	3.12	0.6
1MSW-26	M5757/69-003	26	45	4000	3.16	1.58	0.3
1MSW-32	M5757/69-004	32	57	6500	2.47	1.23	0.2
1MSW-40	M5757/69-005	40	75	11000	1.91	0.96	0.15
Pin Terminal							
1MSP-6	M5757/69-006	6	11	255	12.5	6.25	1.2
1MSP-12	M5757/69-007	12	22	1025	6.25	3.12	0.6
1MSP-26	M5757/69-008	26	45	4000	3.16	1.58	0.3
1MSP-32	M5757/69-009	32	57	6500	2.47	1.23	0.2
1MSP-40	M5757/69-010	40	75	11000	1.91	0.96	0.15

Ordering Information: Standard items may be ordered by part number shown. For variation consult factory.

Authorized Hi-G dealers are located throughout the U.S. and Canada

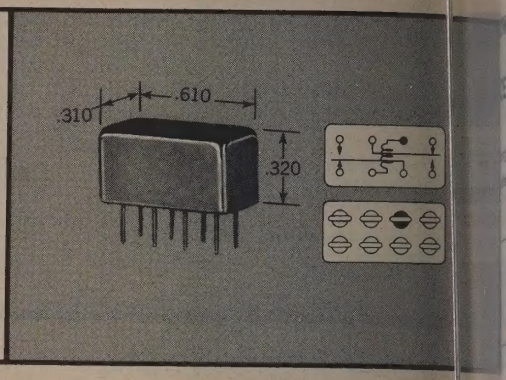
RELAYS WITH EXTRA DIMENSION

NEW

the MINI- G®

.150 GRID RELAY — SERIES G Product Bulletin 95

All welded, DPDT relay manufactured in accordance with MIL-R-5757/37.



SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Sensitivity at 25°C: 135 mW.

Life: 100,000 operations min at rated load and 125°C.

Overload: 2 amps at 30 VDC for 100 operations min.

Contact Resistance:

(a) 50 milliohms initial at rated load.
(b) 150 millichms after rated life.
(c) 3Ω max during min. current life.
(d) 50Ω max at 10 mA and 30 mV rms.

Contact Bounce: 1.2 ms max measured at 100 mA at 6 DVC.

Operate Time: 4.0 ms max at nom coil voltage at 25°C (including bounce)

Release Time: 4.0 ms max at 25°C (including bounce)

Dielectric Strength: 500 V rms between all mutually insulated points at sea level; 750 V rms between contacts and case.

Insulation Resistance: 1000 MΩ min between mutually insulated terminals.

CONTACT RATING

1 ampere resistive at 30 volts DC max, 0.25 ampere resistive at 115 volts rms, 400 Hz, case grounded, low level 0 to 0.1 ampere at 50 mV DC or AC, Minimum Current per MIL-R-5757/37 (100,000 operations min)

2 ampere resistive at 30 volts DC max (50,000 operations min)

ENVIRONMENTAL CHARACTERISTICS

Temperature Range: —65°C to +125°C.

Vibration: 0.5" DA from 5-34 Hz, 30 G from 34-3000 Hz, 10 μs max contact opening.

Shock: 100 G (11 ms duration), saw tooth, 10 μs max contact opening.

Acceleration: 100 G.

Leakage Rate: 1 x10⁻⁸ cc/c max.

WEIGHT

0.13 oz.

VOLTAGE Code	Coil Voltage (Vdc)		DC Coil Resistance (ohms ±10% @ 25°C)	Max Pull In Voltage (Vdc)		Min Drop Out Voltage (Vdc)	
	Max	Nom		25°C	125°C	25°C	−65°C
106	8	6	56	2.7	3.6	0.30	0.17
112	16	12	210	5.4	7.2	0.60	0.35
126	32	26.5	1350	13.5	18.0	1.50	0.88

® *Trademark pending registration*

Authorized Hi-G dealers are located throughout the U.S. and Canada

Hi G

PRODUCTS

The following relays are qualified to the requirements of MIL-R-5757/E.

4A F SIZE CRYSTAL CAN RELAY — SERIES 2K-2299-M5757/9

Temperature range	−65°C to +125°C	Vibration	20G @ 10-2000 Hz
Operate and release time	4 ms max.	Shock	100 G

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2K2299-1	M5757/9-001	2K-2299-20	M5757/9-020	2K-2299-39	M5757/9-039	2K-2299-58	M5757/9-058
2K2299-2	M5757/9-002	2K-2299-21	M5757/9-021	2K-2299-40	M5757/9-040	2K-2299-59	M5757/9-059
2K2299-3	M5757/9-003	2K-2299-22	M5757/9-022	2K-2299-41	M5757/9-041	2K-2299-60	M5757/9-060
2K2299-4	M5757/9-004	2K-2299-23	M5757/9-023	2K-2299-42	M5757/9-042	2K-2299-61	M5757/9-061
2K2299-5	M5757/9-005	2K-2299-24	M5757/9-024	2K-2299-43	M5757/9-043	2K-2299-62	M5757/9-062
2K2299-6	M5757/9-006	2K-2299-25	M5757/9-025	2K-2299-44	M5757/9-044	2K-2299-63	M5757/9-063
2K2299-7	M5757/9-007	2K-2299-26	M5757/9-026	2K-2299-45	M5757/9-045	2K-2299-64	M5757/9-064
2K2299-8	M5757/9-008	2K-2299-27	M5757/9-027	2K-2299-46	M5757/9-046	2K-2299-65	M5757/9-065
2K2299-9	M5757/9-009	2K-2299-28	M5757/9-028	2K-2299-47	M5757/9-047	2K-2299-66	M5757/9-066
2K2299-10	M5757/9-010	2K-2299-29	M5757/9-029	2K-2299-48	M5758/9-048	2K-2299-67	M5757/9-067
2K2299-11	M5757/9-011	2K-2299-30	M5757/9-030	2K-2299-49	M5757/9-049	2K-2299-68	M5757/9-068
2K2299-12	M5757/9-012	2K-2299-31	M5757/9-031	2K-2299-50	M5757/9-050	2K-2299-69	M5757/9-069
2K2299-13	M5757/9-013	2K-2299-32	M5757/9-032	2K-2299-51	M5757/9-051	2K-2299-70	M5757/9-070
2K2299-14	M5757/9-014	2K-2299-33	M5757/9-033	2K-2299-52	M5757/9-052	2K-2299-71	M5757/9-071
2K2299-15	M5757/9-015	2K-2299-34	M5757/9-034	2K-2299-53	M5757/9-053	2K-2299-72	M5757/9-072
2K2299-16	M5757/9-016	2K-2299-35	M5757/9-035	2K-2299-54	M5757/9-054	2K-2299-73	M5757/9-073
2K2299-17	M5757/9-017	2K-2299-36	M5757/9-036	2K-2299-55	M5757/9-055	2K-2299-74	M5757/9-074
2K2299-18	M5757/9-018	2K-2299-37	M5757/9-037	2K-2299-56	M5757/9-056		
2K2299-19	M5757/9-019	2K-2299-38	M5757/9-038	2K-2299-57	M5757/9-057		

CRYSTAL CAN RELAY — SERIES 2B-1506-M5757/10

Temperature range	−65°C to +125°C	Vibration	20 G @ 10-2000 Hz
Operate and release time	6 ms max	Shock	100 G

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2B-1506-1	M5757/10-001	2B-1506-13	M5757/10-013	2B-1506-25	M5757/10-025	2B-1506-37	M5757/10-037
2B-1506-2	M5757/10-002	2B-1506-14	M5757/10-014	2B-1506-26	M5757/10-026	2B-1506-38	M5757/10-038
2B-1506-3	M5757/10-003	2B-1506-15	M5757/10-015	2B-1506-27	M5757/10-027	2B-1506-39	M5757/10-039
2B-1506-4	M5757/10-004	2B-1506-16	M5757/10-016	2B-1506-28	M5757/10-028	2B-1506-40	M5757/10-040
2B-1506-5	M5757/10-005	2B-1506-17	M5757/10-017	2B-1506-29	M5757/10-029	2B-1506-41	M5757/10-041
2B-1506-6	M5757/10-006	2B-1506-18	M5757/10-018	2B-1506-30	M5757/10-030	2B-1506-42	M5757/10-042
2B-1506-7	M5757/10-007	2B-1506-19	M5757/10-019	2B-1506-31	M5757/10-031	2B-1506-43	M5757/10-043
2B-1506-8	M5757/10-008	2B-1506-20	M5757/10-020	2B-1506-32	M5757/10-032	2B-1506-44	M5757/10-044
2B-1506-9	M5757/10-009	2B-1506-21	M5757/10-021	2B-1506-33	M5757/10-033	2B-1506-52	M5757/10-052
2B-1506-10	M5757/10-010	2B-1506-22	M5757/10-022	2B-1506-34	M5757/10-034	2B-1506-53	M5757/10-053
2B-1506-11	M5757/10-011	2B-1506-23	M5757/10-023	2B-1506-35	M5757/10-035	2B-1506-141	M5757/10-141
2B-1506-12	M5757/10-012	2B-1506-24	M5757/10-024	2B-1506-36	M5757/10-036		

Authorized Hi-G dealers are located throughout the U.S. and Canada

QPL PRODUCTS (Cont'd.)

CURRENT SENSITIVE CRYSTAL CAN RELAY — SERIES 2BC-1510-M5757/13

HI-G Part No.	MIL Part No.	DC Coil Resistance Ohms ±10% @ 25°C	Nominal Coil Current mA	Max Pickup Current mA	Dropout Current mA Max	Dropout Current mA Min
2BC-1510-11	M5757/13-011	20	90	45.0	22.5	4.5
2BC-1510-12	M5757/13-012	100	40	20.0	10.0	2.0
2BC-1510-13	M5757/13-013	500	18	9.0	4.5	0.9
2BC-1510-14	M5757/13-014	1,000	13	6.5	3.1	0.65
2BC-1510-15	M5757/13-015	1,500	11	5.2	2.6	0.52
2BC 1510-16	M5757/13-016	2,000	9	4.5	2.2	0.50
2BC-1510-17	M5757/13-017	2,500	8	4.0	2.0	0.40
2BC-1510-18	M5757/13-018	5,000	6	2.8	1.4	0.30
2BC-1510-19	M5757/13-019	8,000	5	2.3	1.1	0.23
2BC-1510-20	M5757/13-020	10,000	4	2.0	1.0	0.20
2BC-1510-31	M5757/13-031	20	90	45.0	22.5	4.5
2BC-1510-32	M5757/13-032	100	40	20.0	10.0	2.0
2BC-1510-33	M5757/13-033	500	18	9.0	4.5	0.9
2BC-1510-34	M5757/13-034	1,000	13	6.5	3.1	0.65
2BC-1510-35	M5757/13-035	1,500	11	5.2	2.6	0.52
2BC-1510-36	M5757/13-036	2,000	9	4.5	2.2	0.50
2BC-1510-37	M5757/13-037	2,500	8	4.0	2.0	0.40
2BC-1510-38	M5757/13-038	5,000	6	2.8	1.4	0.30
2BC-1510-39	M5757/13-039	8,000	5	2.3	1.1	0.23
2BC-1510-40	M5757/13-040	10,000	4	2.0	1.0	0.20
2BC-1510-41	M5757/13-041	20	90	45.0	22.5	4.5
2BC-1510-42	M5757/13-042	100	40	20.0	10.0	2.0
2BC-1510-43	M5757/13-043	500	18	9.0	4.5	0.9
2BC-1510-44	M5757/13-044	1,000	13	6.5	3.1	0.65
2BC-1510-45	M5757/13-045	1,500	11	5.2	2.6	0.52

HI-G Part No.	MIL Part No.	DC Coil Resistance Ohms ±10% @ 25°C	Nominal Coil Current mA	Max Pickup Current mA	Dropout Current mA Max	Dropout Current mA Min
2BC-1510-46	M5757/13-046	2,000	9	4.5	2	0
2BC-1510-47	M5757/13-047	2,500	8	4.0	0	0
2BC-1510-48	M5757/13-048	5,000	6	2.8	4	0
2BC-1510-49	M5757/13-049	8,000	5	2.3	1	0
2BC-1510-50	M5757/13-050	10,000	4	2.0	0	0
2BC-1510-51	M5757/13-051	20	90	45.0	5	4
2BC-1510-52	M5757/13-052	100	40	20.0	0	[illegible]
2BC-1510-53	M5757/13-053	500	18	9.0	5	0
2BC-1510-54	M5757/13-054	1,000	13	6.5	1	0
2BC-1510-55	M5757/13-055	1,500	11	5.2	6	[illegible]
2BC-1510-56	M5757/13-056	2,000	9	4.5	2	[illegible]
2BC-1510-57	M5757/13-057	2,500	8	4.0	0	[illegible]
2BC-1510-58	M5757/13-058	5,000	6	2.8	4	[illegible]
2BC-1510-59	M5757/13-059	8,000	5	2.3	1	[illegible]
2BC-1510-60	M5757/13-060	10,000	4	2.0	0	[illegible]
2BC-1510-61	M5757/13-061	20	90	45.0	5	[illegible]
2BC-1510-62	M5757/13-062	100	40	20.0	0	[illegible]
2BC-1510-63	M5757/13-063	500	18	9.0	5	[illegible]
2BC-1510-64	M5757/13-064	1,000	13	6.5	1	[illegible]
2BC-1510-65	M5757/13-065	1,500	11	5.2	6	[illegible]
2BC-1510-66	M5757/13-066	2,000	9	4.5	2	[illegible]
2BC-1510-67	M5757/13-067	2,500	8	4.0	0	[illegible]
2BC-1510-68	M5757/13-068	5,000	6	2.8	4	[illegible]
2BC-1510-69	M5757/13-069	8,000	5	2.3	1	[illegible]
2BC-1510-70	M5757/13-070	10,000	4	2.0	0	[illegible]

10 AMP CRYSTAL CAN RELAY — SERIES 2T-2911/2T-2994-M5757/23 & /28

Hi-G Part No.	MIL Part No.	Hi-G Part No.	MIL Part No.	Hi-G Part No.	MIL Part No.
2T-2911-1	M5757/23-001	2T-2911-10	M5757/23-010	2T-2911-19	M5757/23-19
2T-2911-2	M5757/23-002	2T-2911-11	M5757/23-011	2T-2911-20	M5757/23-20
2T-2911-3	M5757/23-003	2T-2911-12	M5757/23-012	2T-2911-21	M5757/23-21
2T-2911-4	M5757/23-004	2T-2911-13	M5757/23-013	2T-2911-22	M5757/23-22
2T-2911-5	M5757/23-005	2T-2911-14	M5757/23-014	2T-2911-23	M5757/23-23
2T-2911-6	M5757/23-006	2T-2911-15	M5757/23-015	2T-2911-24	M5757/23-24
2T-2911-7	M5757/23-007	2T-2911-16	M5757/23-016	2T-2911-25	M5757/23-25
2T-2911-8	M5757/23-008	2T-2911-17	M5757/23-017		
2T-2911-9	M5757/23-009	2T-2911-18	M5757/23-018	2T-2994-1	M5757/28-01

Authorized Hi-G dealers are located throughout the U.S. and Canada

YSTAL CAN RELAYS

ENVIRONMENTAL CHARACTERISTICS FOR STANDARD CRYSTAL CAN SERIES

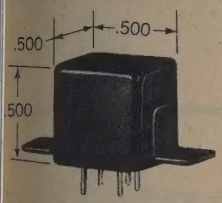
Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.

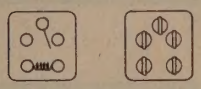
Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

UBE® — MINIATURE RELAY — SERIES C

Product Bulletin 101



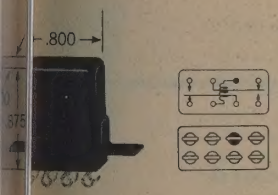
CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere 400 Hz, case grounded and dry circuit.



Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.5	.5	80
112	12	14.4	7	1.0	325
126	26.5	32	15	2	1500

M CRYSTAL CAN RELAY —SERIES 2B

Product Bulletin 120



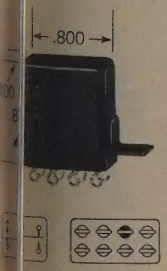
CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded and dry circuit.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
2B (DC only, 2-Pole Only)					
106	6	7.2	3.1	.5	40
112	12	14.4	6.3	.75	160
126	26.5	32	13.0	1.5	675
148	48	58	25.0	2.5	2500
176	76	90	35.0	3.0	5000
2BR (AC Only, 2-Pole Only)					
126	26.5	32	15	2	575
148	48	58	28	3	2000
176	76	90	44	4	3500
215	115	125	66	5	5000

E: types for operation at 60 to 400 Hz with specifications ts may be used at higher frequencies, but individual oltage may change.
only available as standard catalog item.

CRYSTAL CAN RELAY — SERIES 2BN

Product Bulletin 120A



CONTACT RATING
5 amperes resistive at 30 volts DC; 3 ampere resistive at 115 volts rms, 400 Hz, case grounded; 2 ampere resistive at 115 volts rms, 60 Hz, case grounded.

NOTE: For AC operation BNR types are available on request.

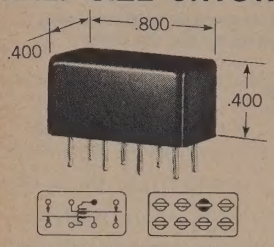
ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.1	.5	35
112	12	14.4	6.3	.75	140
126	26.5	32	13.0	1.5	600
148	48	58	25.0	2.5	2200
176	76	90	35.0	3.0	4400

Authorized Hi-G dealers are located throughout the U.S. and Canada

CRYSTAL CAN RELAYS (Cont'd.)

HALF-SIZE CRYSTAL CAN RELAY — SERIES 2K Product Bulletin 102

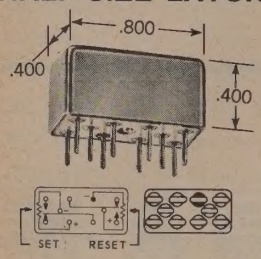


CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded and dry circuit.

ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Co Resistan ms ±1 @ 25°
106	6	7.2	3	.35	40
112	12	14.4	6	.75	150
126	26.5	32	13	1.5	675

HALF-SIZE LATCHING RELAY — DUAL COIL — DPDT — SERIES KL Product Bulletin 10

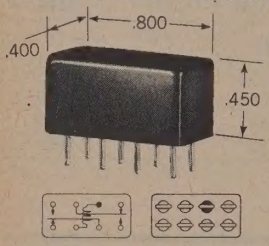


CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz case grounded and dry circuit.

ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Set/Reset Voltage @ + 25°C	DC Coil Resistance Ohms ±1 @ 25°
112	12	14.4	6	250
126	26.5	32	13	000

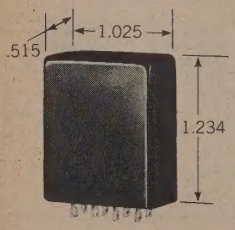
HALF-PINT® MINIATURE 4 AMP RELAY — SERIES 2HA Product Bulletin 100



CONTACT RATING
4 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±1 @ 25°
106	6	7.2	3.4	.35	40
112	12	14.4	6.5	.75	150
126	26.5	32	13.0	1.5	600

10 AMP CRYSTAL CAN RELAY — SERIES T Product Bulletin 150

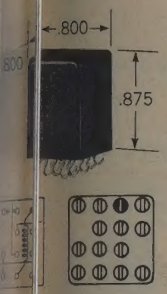


CONTACT RATING
Standard rating 10 amperes resistive at 30 VDC, 5 ampere resistive at 115 V or 115 V, 400 Hz, case grounded.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±1 @ 25°
106	6	7.2	3.3	.5	22
112	12	14.4	6.7	1.0	90
126	26.5	32	13.0	2.0	10
215	115	125	52.0	5	10

YSTAL CAN RELAYS (Cont'd.)

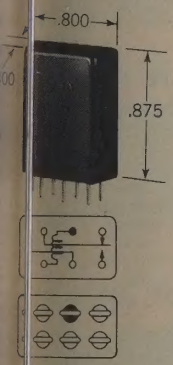
DT RYSTAL CAN RELAY — SERIES 4B Product Bulletin 122



CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.5	.5	30
112	12	14.4	7	1.0	125
126	26.5	32	15	2	570
148	48	58	28	3	2000
176	76	90	44	4	4500
215	115	125	66	5	9500

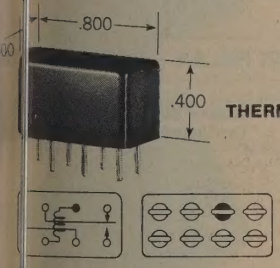
HERMAL EMF RELAYS — SERIES EK-EB Product Bulletin 156



CONTACT RATING
The series EK & EB have been specifically designed to minimize the thermal EMF generation of the relay contacts during low level switching. Although the design is centered around this low level application, the relay is capable of switching signals up to and including 2 amperes at 30 VDC.

Relay Type	Series 2EK	Series 2EB
Rated Contact Current	2 Amperes	2 Amperes
Maximum Weight	0.37 Ounce	0.95 Ounce
Construction	All Welded	All Welded

Type	Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
2EK	106	6	7.2	3.1	.35	40
or	112	12	14.4	6.3	.75	160
2EB	126	26.5	32	13.0	1.5	675



THERMAL EMF: 10 microvolts max. between closed contacts with relay at room ambient and coil energized and stabilized with nominal rated voltage.

The thermal EMF generation is measured on EK and EB relays while enclosed in a chamber that provides a shielded test condition and a still air environment.

All inter-connections are symmetrical to minimize function variations. Measurements are made using a high impedance micro voltmeter.

ENVIRONMENTAL CHARACTERISTICS FOR STANDARD CRYSTAL CAN SERIES

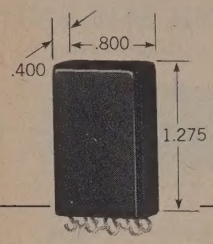
Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.

Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

Authorized Hi-G dealers are located throughout the U.S. and Canada

CRYSTAL CAN RELAYS (Cont'd.)



CURRENT SENSITIVE CRYSTAL CAN RELAY — 40 mW — SERIE

Product B

CONTACT RATING

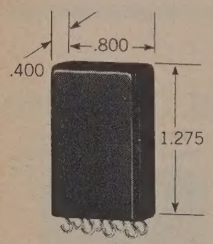
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

	2 BC RELAY — DPDT — 40 mW					1 BC RELAY —SPDT—25 mW			
Voltage Code	Coil Res. at 25°C	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	M Curr
101	20	1.8	89.2	44.6	4.5	1.4	70.6	35.3	
102	30	2.2	73.0	36.5	3.7	1.8	57.6	28.8	
103	50	2.8	56.6	28.3	2.8	2.2	44.6	22.3	
104	75	3.5	46.2	23.1	2.3	2.8	36.6	18.3	
105	100	4.0	40.0	20.0	2.0	3.2	31.6	15.8	
106	200	5.7	28.4	14.2	1.4	4.5	22.4	11.2	
107	300	7.0	23.0	11.5	1.2	5.5	18.2	9.1	
109	500	9.0	17.8	8.9	.90	7.1	14.2	7.1	
112	875	12.0	13.5	6.75	.70	9.4	10.7	5.34	
113	1000	12.6	12.6	6.32	.64	10.0	10.0	5.0	
118	2000	18.0	8.9	4.45	.50	14.2	7.1	3.53	
120	2500	20.0	8.0	4.0	.40	15.8	6.3	3.2	
128	5000	28.0	5.6	2.8	.30	22.5	4.5	2.23	
135	8000	36.0	4.5	2.23	.23	29.0	3.6	1.77	
140	10000	40.0	4.0	2.0	.20	32.0	3.2	1.58	

CURRENT SENSITIVE CRYSTAL CAN RELAY — 5 AMP — SERIES 2BCN

Product Bulleti

ALL WELDED CONSTRUCTION



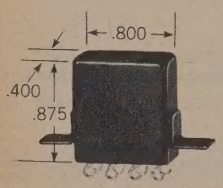
CONTACT RATING

5 amperes resistive at 30 volts DC, 3 ampere resistive at 115 volts rms, 400 Hz, case grounded, 2 amperes resistive at 115 volts rms, 60 Hz, case grounded.

2BCN (DC only, 2 pole only)					
Voltage Code	Nominal DC Coil Voltage	Nominal Coil Current (mA)	Max Pull-in Current (mA)	Min Drop-out Voltage (mA)	DC Resis Ohms @
106	6	54.5	27.3	3.0	1
112	12	26.7	13.4	1.4	4
128	28	11.2	5.6	.6	25
140	40	8.0	4.0	.4	50

CURRENT SENSITIVE CRYSTAL CAN RELAY — 40 mW — SERIES BK

Product Bulletin 13



CONTACT RATING

2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

	2 BK RELAY — DPDT — 40 mW					1 BK RELAY —SPDT—25 m			
Voltage Code	Coil Res. at 25°C	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	M Cur
101	20	1.8	89.2	44.6	4.5	1.4	70.6	35.3	
102	30	2.2	73.0	36.5	3.7	1.8	57.6	28.8	
103	50	2.8	56.6	28.3	2.8	2.2	44.6	22.3	
104	75	3.5	46.2	23.1	2.3	2.8	36.6	18.3	
105	100	4.0	40.0	20.0	2.0	3.2	31.6	15.8	
106	200	5.7	28.4	14.2	1.4	4.5	22.4	11.2	
107	300	7.0	23.0	11.5	1.2	5.5	18.2	9.1	
109	500	9.0	17.8	8.9	.90	7.1	14.2	7.1	
112	875	12.0	13.5	6.75	.70	9.4	10.7	5.34	
113	1000	12.6	12.6	6.32	.64	10.0	10.0	5.0	
118	2000	18.0	8.9	4.45	.50	14.2	7.1	3.53	
120	2500	30.0	8.0	4.0	.40	15.8	6.3	3.2	
128	5000	28.0	5.6	2.8	.30	22.5	4.5	2.23	
135	7000	32.0	4.8	2.4	.24	28.0	3.8	1.88	

Authorized Hi-G dealers are located throughout the U.S. and Canada

YSTAL CAN RELAYS (Cont'd.)

DIO FREQUENCY RELAYS

uct Bulln 155

ndard ut and output connections from RF contacts are 196/U flon insulated coaxial cable, 6″ in length, rmina d. Other lengths, types of cable, or coaxial connector inatio available on special order. These relays meet or eed th pplicable portions of MIL-R-5757/D and MIL-R-3928.

RADIO FREQUENCY CHARACTERISTICS	
Frequency Range	0 - 500 MHz*
Voltage Standing Wave Ratio (VSWR)	<1.1:1 typical
Insertion Loss	0.16db typical
Characteristic Impedance	50 ohms†
Crosstalk	−50db typical

** Usable to 1000 MHz with reduced RF characteristics*
† Other impedances available on special order

CE UBE RADIO FREQUENCY RELAY — SERIES RFC

Operate Power 150 mW

Relay Type	RFC
Size	0.5-inch cube
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.3 ounce (without terminations)

NOTE: Electrical characteristics same as series C

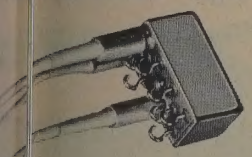
LF IZE CRYSTAL-CAN RADIO FREQUENCY RELAY — SERIES RFK

Operate Power 250 mW

Relay Type	RFK
Size	.4 x .8 x .4 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.37 ounce (without terminations)

NOTE: Electrical characteristics same as series K

TC ING HALF SIZE CRYSTAL-CAN RADIO FREQUENCY RELAY — SERIES RFKL



Operate Power 150 mW

Relay Type	RFKL
Size	.4 x .8 x .4 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.37 ounce (without terminations)

NOTE: Electrical characteristics same as series KL

YS AL-CAN RADIO FREQUENCY RELAY — SERIES RFB

Operate Power 250 mW

Relay Type	RFB
Size	.875 x .800 x .400 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.95 ounce (without terminations)

NOTE: Electrical characteristics same as series B

H ENSITIVITY RADIO FREQUENCY RELAY — SERIES RFBC

Operate Power 40 mW

Relay Type	RFBC
Size	1.275 x .800 x .400 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	1.0 ounce (without terminations)

NOTE: Electrical characteristics same as series BC

VI NMENTAL IA CTERISTICS R ANDARD YS L CAN SERIES

Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.

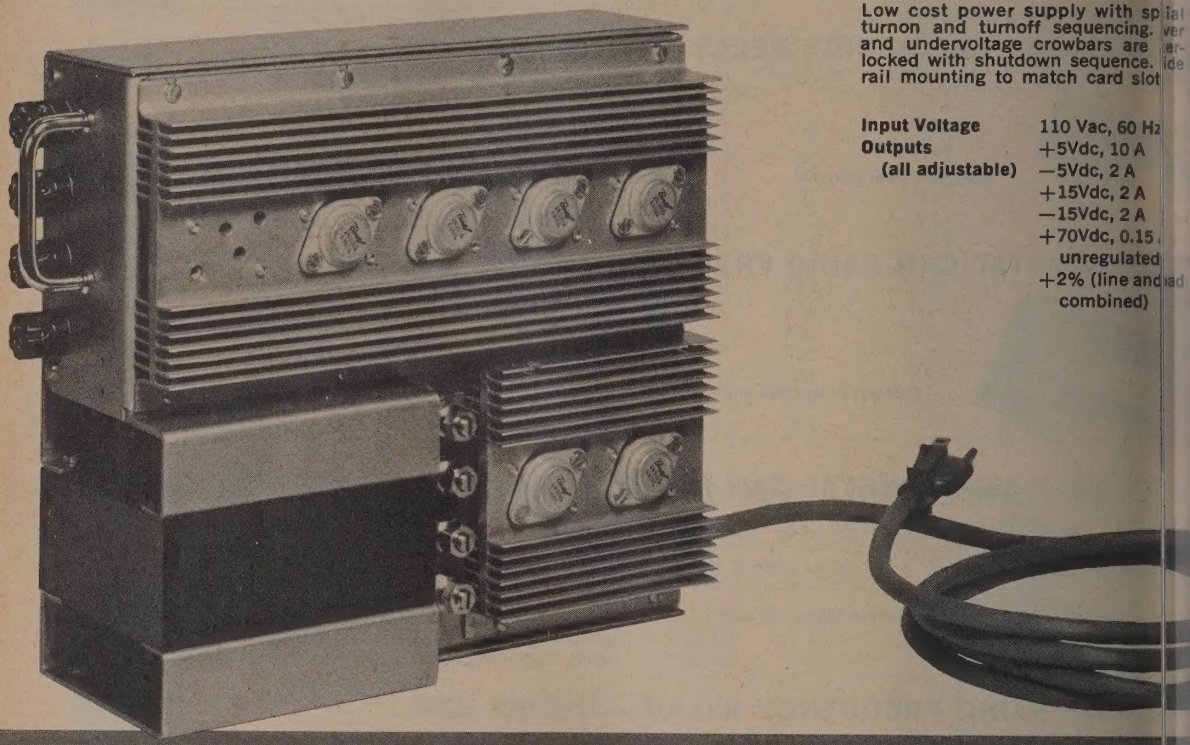
Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

Authorized Hi-G dealers are located throughout the U.S. and Canada

CUSTOM POWER SUPPLIES

AT LESS THAN OFF THE SHELF PRICES
OPTIMUM DESIGNS OFFER GUARANTEED SYSTEM PERFORMANCE

MULTIPLE OUTPUT SUPPLY FOR DESK TOP COMPUT R



Low cost power supply with sp ial turnon and turnoff sequencing. ver and undervoltage crowbars are er- locked with shutdown sequence. ide rail mounting to match card slot

Input Voltage	110 Vac, 60 Hz
Outputs (all adjustable)	+5Vdc, 10 A
	−5Vdc, 2 A
	+15Vdc, 2 A
	−15Vdc, 2 A
	+70Vdc, 0.15 unregulated
	+2% (line and ad combined)

Hi-G, Inc., offers complete in-house capabilities for producing the highest quality power supplies custom designed to offer you optimum performance. This total capability includes the manufacture of transformers printed circuit boards, and we even have our own hybrid thick film facilities to supply all needed integrated circuits. With this complete manufacturing ability, Hi-G is able to supply *fast prototype service.*

For Hi-G POWER SUPPLIES the foremost criterion is QUALITY. High quality is built-in, from the careful design and breadboarding of all circuits, up to the final assembly of computer grade (or MIL) compon nt heavy gauge, plated rack or chassis. Every unit t burned-in for 24 hours, and rechecked. A co final test data is shipped with each power su ly test systems are available to provide backup da MTBF ratings when required.

The Hi-G philosophy is to achieve the opti um formance at LOW COST. We design power su pl perform the specific functions that your appli ti quires. The final product must meet both o ec low cost and the required performance in you sy Let Hi-G help you solve your power supply requ en

- **Multiple outputs**
- **Long term stability**
- **Maximum regulation**
- **A fast acting crowbar**
- **IC regulators for reliability and stability**
- **Undervoltage protection**
- **Special sequencing for turnon (or sh do**

For assistance in specifying your power supply, whatever your requirements, send your drawings and/or spec sheets:

HI-G, INC. ELECTRONIC PRODUCTS DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 60
Attention: Power Supply Sales Engineering...or call us at (203) 623-2481. Your inquiry will receive our prompt atte on

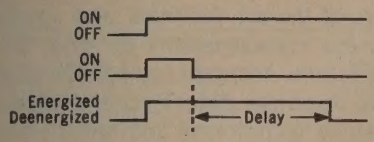
Authorized Hi-G dealers are located throughout the U.S. and Canada

LECTRONIC TIME DELAY RELAYS, VOLTAGE & PHASE SENSORS

SOLID STATE TIMING MODULE - SERIES 1800/1900 (Product Bulletin 168)

The Hi-G Timing Module is an all solid-state timer that offers excellent reliability over a useful life well in excess of one million operations. It has a fast reset time, is remarkably stable over a wide temperature range, and can provide delays as short as 10 milliseconds.

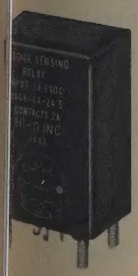
DELAY-ON-RELEASE TIMERS - SERIES 5600/5700/5800 (Product Bulletin 162)



The time period of a delay-on-release timer begins with removal of control power. Prior to this the unit is energized and remains so until control power is removed and the delay period completed.

Hi-G offers the Series 5600 in fixed delay times and the Series 5700 as adjustable with external resistor, both with electromechanical relay output. The Series 5800 is all solid state and capable of driving most crystal can relays.

VOLTAGE SENSING RELAY/DC VOLTAGE LEVEL MONITOR - SERIES 1310 (Product Bulletin 181)



The Hi-G 1310 Series Voltage Sensor is essentially a voltage monitoring circuit operating on a snap-action transistor circuit with low drift and inherent temperature compensation. This device will either open or close a circuit when a predetermined voltage is present at its input.

PHASE SENSING RELAY 3Φ POWER SYSTEM MONITOR - SERIES 1400 (Product Bulletin 180)

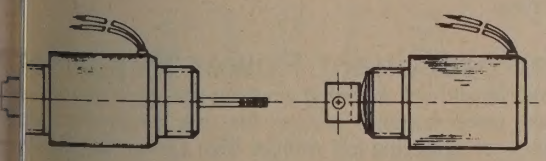
Hi-G Phase Sensors monitor three-phase power systems. Two types of Phase Sensors are available as standard items, the P-type and the Q-type. P-type units will energize only when all three phases are in the proper sequence. They will deenergize only when power is removed. Q-type units perform the same functions as the P-type and, in addition, they will also deenergize if any phase is disconnected or grounded. The voltage of the faulted phase or the regenerated voltage must be below 70 percent of the nominal phase-to-phase voltage.

HI-G, INC. ELECTRONIC PRODUCTS DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096.

CLOSED SOLENOIDS

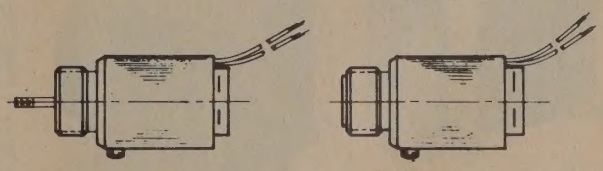
Tec agnetics solenoids offer the widest, most complete line of solenoids ever produced for industrial anc ilitary applications. Tec Magnetics offers in-depth experience and capabilities for custom designing sol oids to meet particular requirements. These include PUSH-PULL pressurized and nonpressurized as vel s PUSH-TYPE manual override.

NON-PRESSURIZED



Push Type **Pull Type**

PRESSURIZED



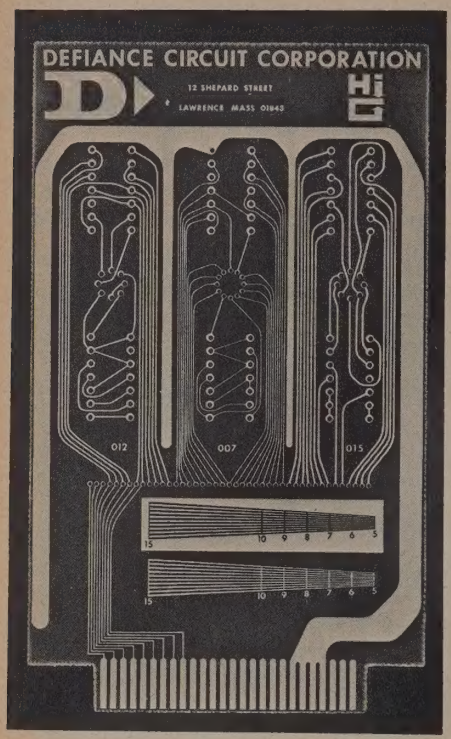
Push Type **Pull Type**

NEW OPEN FRAME SERIES

Te agnetics now has available a new low cost miniature line of TEC-SOL SA series open frame solenoids. Th come in nine different sizes, ranging from ½" w x 9/16" lg. to 1½" w x 2½" lg. Features include lor life, high speed, special captivation feature, vacuum impregnated coil, ARMCO iron frame, universal mo nting, push or pull, clevis or threaded plunger, plunger return spring, plunger vented, intermittent an continuous duty, 12-220VDC, and AC operated. Write for Bulletin SA-1.

TEC-MAGNETICS A subsidiary of **HI-G**, Inc.
12117 Slauson Ave., Santa Fe Springs, Cal. 90670 Tel: (213) 698-0565

Authorized Hi-G dealers are located throughout the U.S. and Canada



PRINTED CIRCUIT BOARDS

Defiance is a pioneer in the art of printed circuitry. We offer our customers state-of-the-art facilities and capabilities which assure them the highest quality for even the most complicated circuit boards. Accurate comparison of artwork and manufacturing drawings detect contradictions and eliminate errors. Skilled technicians and latest equipment assure premium quality photographic documents. Modern chemical process control and advanced experience with precious metals provide consistent plated finishes. Defiance was one of the first independent companies to employ numerical control drilling exclusively. And we deliver on time at competitive prices.

DEFIANCE CIRCUIT CORPORATION

A subsidiary of **HI-G**, Inc.

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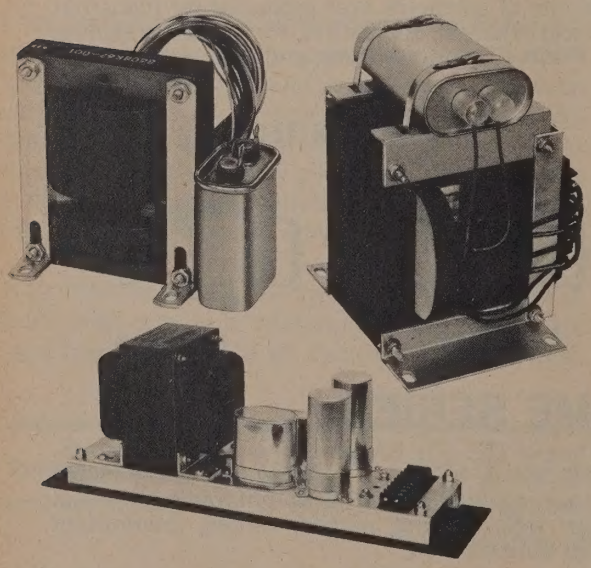
Tel. (617) 688-1856 TWX: 710-342-1246

CALL MERRIMACK FOR ALL YOUR TRANSFORMER REQUIREMENTS



Ferroresonant Transformers – Merrimack ferroresonant (constant voltage) transformers provide reliable and economical circuit protection from wide variations of input voltages. Made to order, they include all types of line and load regulated power transformers.

Ferroresonant Power Supplies – Merrimack rack mounted constant voltage or ferroresonant power supplies provide the user an economical means of supplying low voltage, high current DC power at 50 or 60 cycles.

Linear Transformers and Inductors – Merrimack linear transformers and inductors are built to the customer's specifications. They include power, audio, plate, saturable, interstage, and square wave transformers for military and industrial applications.

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361 Aiken Street, Lowell, Mass. 01850 Tel: (617) 458-1487

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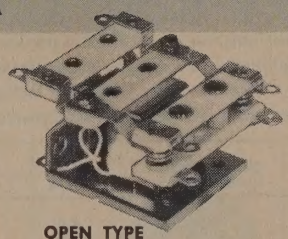
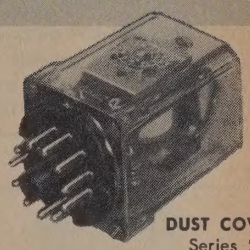
GENERAL PURPOSE RELAYS from KURMAN STOCK

SERIES 26

elays are stocked in dc and ac coil voltages with contacts to 4pdt in the nd to 3pdt in the dust covered type. Standard contact rating at 28 vdc for open type is 20 amps to 3pdt, 10 amps for 4pdt; 10 amps for all d plug in relays. Series 26 relays are rated for 15 g's shock, 10 g's om 10 to 500 Hz. Series 26D relays (dust covered plug in) are available tor lights across the coil.



OPEN TYPE
Series 26



DUST COVERED
Series 26D

DC

	Part Number	Coil Resistance	Operating Specifications: Approx. Pull-In Current In MA	Pull-In Voltage In Volts	Maximum Coil Voltage	Coil Power	Contact Rating at 28VDC or 115VAC (Amps)	List Price
	SP							
	26 6VDC	43	108	4.6	13	½ Watt	20	$6.10
	26 12VDC	170	54	9.2	26	½ Watt	20	6.10
	26 24VDC	680	27	18.4	52	½ Watt	20	6.10
	26 48VDC	2700	14	36.7	108	½ Watt	20	6.10
	26 110VDC	6800	8.6	58.4	165	½ Watt	20	7.35
	D							
	26 6VDC	27	193	5.0	10	1 Watt	20	6.60
	26 12VDC	108	96	9.5	21	1 Watt	20	6.60
	26 24VDC	428	48	18	41	1 Watt	20	6.60
	26 48VDC	1700	24	41	82	1 Watt	20	6.60
	26 110VDC	6800	12	80	165	1 Watt	20	7.35
	M							
	26C-6VDC	27	185	5.0	10	1 Watt	30	8.70
	26C-12VDC	108	88	9.5	21	1 Watt	30	8.70
	26C-24VDC	428	48	20	41	1 Watt	30	8.70
	26C-110VDC	6800	12	80	165	1 Watt	30	9.35
	T							
	26C-6VDC	17	300	5.05	8.2	1.5 Watts	20	8.15
	26C-12VDC	68	148	10	16.5	1.5 Watts	20	8.15
	26C-24VDC	270	75	20	33	1.5 Watts	20	8.15
	26C-48VDC	1080	37	40	66	1.5 Watts	20	8.15
	26C-110VDC	6800	15	100	165	1.5 Watts	20	8.90
	T							
	26C-6VDC	11	430	4.7	6.6	2.0 Watts	10	8.95
	26C-12VDC	43	220	9.3	13	2.0 Watts	10	8.95
	26C-24VDC	170	108	19	26	2.0 Watts	10	8.95
	26C-48VDC	680	54	37	52	2.0 Watts	10	8.95
	26C-110VDC	4280	22	93	130	2.0 Watts	10	9.60
	DT							
	26D1C-6VDC	27	136	3.7	10	1 Watt	10	5.85
	26D1C-12VDC	108	68	7.3	21	1 Watt	10	5.85
	26D1C-24VDC	428	34	14.7	41	1 Watt	10	5.85
	26D1C-48VDC	2700	14	36.7	108	1 Watt	10	5.85
	26D1C-110VDC	6800	8.6	58.4	165	1 Watt	10	6.45
	DT							
	26D2C-6VDC	27	193	5.0	10	1 Watt	10	6.60
	26D2C-12VDC	108	96	9.5	21	1 Watt	10	6.60
	26D2C-24VDC	428	48	20	41	1 Watt	10	6.60
	26D2C-48VDC	1700	24	41	82	1 Watt	10	6.60
	26D2C-110VDC	6800	12	80	165	1 Watt	10	7.25
	PDT							
	26D3C-6VDC	17	300	5.05	8.2	1.5 Watts	10	8.25
	26D3C-12VDC	68	148	10	16.5	1.5 Watts	10	8.25
	26D3C-24VDC	270	75	20	33	1.5 Watts	10	8.25
	26D3C-48VDC	1080	37	40	66	1.5 Watts	10	8.25
	26D3C-110VDC	6800	15	100	165	1.5 Watts	10	8.95

AC

	Part Number	Coil Resistance	Approx. AC Current In MA at Pull-In Voltage	AC Voltage in Volts at 60 Hz: Pull-In Voltage	Nom. Coil Voltage	Max. Coil Voltage	Coil Power	Contact Rating at 28VDC or 115VAC (Amps)	List Price
OPEN	**SPDT**								
	261C-6VAC	2.7	736	5.5	6	7.0	4 VA	20	$6.10
	261C-12VAC	11	368	9.5	12	14	4 VA	20	6.10
	261C-24VAC	43	184	20	24	28	4 VA	20	6.10
	261C-115VAC	1080	36	95	115	140	4 VA	20	6.10
	261C-230VAC	4280	18	190	230	280	4 VA	20	6.95
	DPDT								
	26L2C-6VAC	2.5	675	5.5	6	6.9	4 VA	30	8.70
	26L2C-12VAC	10	335	10	12	14	4 VA	30	8.70
	26L2C-24VAC	39	170	21	24	27	4 VA	30	8.70
	26L2C-115VAC	480	35	95	115	130	4 VA	30	8.70
	26L2C-230VAC	3900	17	190	230	270	4 VA	30	9.35
	DPDT								
	262C-6VAC	2.5	675	5.5	6	6.9	4 VA	20	6.60
	262C-12VAC	10	337	10	12	14.1	4 VA	20	6.60
	262C-24VAC	39	170	21	24	27	4 VA	20	6.60
	262C-115VAC	980	33.7	95	115	140	4 VA	20	6.60
	262C-230VAC	3900	17.0	195	230	270	4 VA	20	7.10
	3PDT								
	263C-6VAC	2.5	675	5.5	6	6.9	4 VA	20	8.35
	263C-12VAC	10	337	10.5	12	14.1	4 VA	20	8.35
	263C-24VAC	39	170	21	24	27	4 VA	20	8.35
	263C-115VAC	980	33.7	95	115	140	4 VA	20	8.35
	263C-230VAC	3900	17.0	190	230	270	4 VA	20	8..
DUST COVERED	**SPDT**								
	26D1C-6VAC	3.0	675	6	6	6.8	4 VA	10	5.90
	26D1C-12VAC	12	337	12	12	13.5	4 VA	10	5.90
	26D1C-24VAC	49	170	24	24	27	4 VA	10	5.90
	26D1C-115VAC	1200	33.7	115	115	130	4 VA	10	5.90
	26D1C-230VAC	4900	17.0	230	230	260	4 VA	10	6.75
	DPDT								
	26D2C-6VAC	3.0	675	5.5	6	6.8	4 VA	10	6.65
	26D2C-12VAC	12	337	9.5	12	13.5	4 VA	10	6.65
	26D2C-24VAC	49	170	20	24	27	4 VA	10	6.65
	26D2C-115VAC	1200	33.7	95	115	130	4 VA	10	6.65
	26D2C-230VAC	4900	17.0	195	230	260	4 VA	10	7.10
	3PDT								
	26D3C-6VAC	3.0	675	6	6	6.8	4 VA	10	8.35
	26D3C-12VAC	12	337	12	12	13.5	4 VA	10	8.35
	26D3C-24VAC	49	170	24	24	27	4 VA	10	8.35
	26D3C-115VAC	1200	33.7	115	115	130	4 VA	10	8.35
	26D3C-230VAC	4900	17.0	230	230	260	4 VA	10	8.75
HERMETICALLY SEALED	**DPDT**								
	26S01	980	35	95	115	130	4 VA	10	15.50
	DPDT								
	26S20	980	35	95	115	130	4 VA	10	16.90

	Part Number	Coil Resistance	Nominal Voltage	Contact Arrangement	List Price
NEON INDICATOR	**DPDT**				
	26D2CN-6VAC	3	6VAC	DPDT	$7.65
	26D2CN-12VAC	12	12VAC	DPDT	7.65
	26D2CN-24VAC	49	24VAC	DPDT	7.65
	26D2CN-115VAC	1200	115VAC	DPDT	7.65
	26D2CN-230VAC	4900	230VAC	DPDT	8.05
	3PDT				
	26D3CN-6VAC	3	6VAC	3PDT	9.35
	26D3CN-12VAC	12	12VAC	3PDT	9.35
	26D3CN-24VAC	49	24VAC	3PDT	9.35
	26D3CN-115VAC	1200	115VAC	3PDT	9.35
	26D3CN-230VAC	4900	230VAC	3PDT	9.80

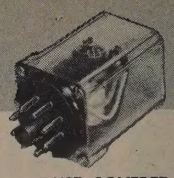
	Part Number	Coil Resistance	Nominal Voltage	Contact Arrangement	List Price
	PDT				
	26D2CN-6VDC	27	6VDC	DPDT	$7.55
	26D2CN-12VDC	108	12VDC	DPDT	7.55
	26D2CN-24VDC	428	24VDC	DPDT	7.55
	26D2CN-110VDC	6800	110VDC	DPDT	8.25
	PDT				
	26D3CN-6VDC	17	6VDC	3PDT	9.35
	26D3CN-12VDC	68	12VAC	3PDT	9.35
	26D3CN-24VDC	270	24VDC	3PDT	9.35
	26D3CN-110VDC	6800	110VDC	3PDT	9.80

URMAN INSTRUMENT CORP. • 15 BURKE LANE / SYOSSET, NEW YORK 11791 • (516) 921-7550

SENSITIVE RELAYS from KURMAN STOCK

SERIES 5

Series 5 Relays are current sensitive with 10 milliwatts sensitivity for the spdt and 100 mw per pole sensitivity for multipole types. Standard contact ratings at 28 vdc or 115 vac are 2 amps for spdt, 5 amps for multipole relays. Series 5 relays are available from stock in open and dust covered plug-in versions.



DUST COVERED
Series 5D

OPEN TYPE
Series 5

DC	Part Number	Coil Resistance In Ohms ±10%	Pull In	Currents In MA Max.	Currents In MA Drop Out	Approx. Voltage in Volts At Pull In I	Approx. Voltage in Volts At Max. I	Sensitivity In Milliwatts Per Pole	List Price
OPEN	**SPDT**								
	51C-A37D	500.	4.5	63	0.45	2.2	31.5	10	$5.70
	51C-A40D	2000.	2.3	32	0.22	4.5	64.0	10	5.70
	51C-A42D	5000.	1.4	20	0.14	7.0	100	10	5.80
	51C-A43D	8000.	1.2	16	0.11	9.6	128	10	6.20
	51C-B44D	13000.	0.6	12	0.06	8.2	156	5	6.20
	DPDT								
	52C-500D	500.	20	63	2	10.0	31	100	6.20
	52C-2500D	2500.	8.8	28	.8	22.0	70	100	6.20
	52C-5000D	5000.	6.3	20	.6	32.0	100	100	6.40
	52C-8000D	8000.	5.0	16	.5	40.0	128	100	6.80
	52C-10000D	10000.	4.4	14	.4	44.0	140	100	6.80
	3PDT								
	53C-500D	500.	24	63	2	12.2	31	100	7.80
	53C-2500D	2500.	11	29	1	27.5	72	100	7.80
	53C-5000D	5000.	7.7	20	.7	38.6	100	100	7.90
	53C-8000D	8000.	6.0	16	.6	49.0	128	100	8.15
	53C-10000D	10000.	5.4	14	.5	54.0	140	100	8.35
	4PDT								
	54C-500D	500.	28.2	63	2	14.2	31	100	8.20
	54C-2500D	2500.	12.7	29	1	31.8	72	100	8.20
	54C-5000D	5000.	8.9	20	.8	44.4	100	100	8.30
	54C-8000D	8000.	7.0	16	.7	57.2	128	100	8.55
	54C-10000D	10000.	6.4	14	.6	64.0	140	100	8.75
DUST COVERED	**SPDT**								
	5D1C-A37D	500.	4.5	63	0.45	2.2	31.5	10	6.80
	5D1C-A40D	2000.	2.3	32	0.22	4.5	64.0	10	6.80
	5D1C-A42D	5000.	1.4	20	0.14	7.0	100	10	6.90
	5D1C-A43D	8000.	1.2	16	0.11	9.6	128	10	7.30
	5D1C-B44D	13000.	0.6	12	0.06	8.2	156	5	7.30
	DPDT								
	5D2C-500D	500.	20	63	2	10.0	31	100	7.30
	5D2C-2500D	2500.	8.8	28	.8	22.0	70	100	7.30
	5D2C-5000D	5000.	6.3	20	.6	32.0	100	100	7.50
	5D2C-8000D	8000.	5.0	16	.5	40.0	128	100	7.90
	5D2C-10000D	10000.	4.4	14	.4	44.0	140	100	7.90
	3PDT								
	5D3C-500D	500.	24	63	2	12.2	31	100	8.90
	5D3C-2500D	2500.	11	29	1	27.5	72	100	8.90
	5D3C-5000D	5000.	7.7	20	.7	38.6	100	100	9.00
	5D3C-8000D	8000.	6.0	16	.6	49.0	128	100	9.25
	5D3C-10000D	10000.	5.4	14	.5	54.0	140	100	9.45
	4PDT								
	5D4C-500D	500.	28.2	63	2	14.2	31	100	9.30
	5D4C-2500D	2500.	12.7	29	1	31.8	72	100	9.30
	5D4C-5000D	5000.	8.9	20	.8	44.4	100	100	9.40
	5D4C-8000D	8000.	7.0	16	.7	57.2	128	100	9.65
	5D4C-10000D	10000.	6.4	14	.6	64.0	140	100	9.85

AC	Part Number	Coil Resistance	Approx. AC Current in MA at Nom. Voltage	AC Voltage in Volts at 60 Hz Pull in	AC Voltage in Volts at 60 Hz Nominal	AC Voltage in Volts at 60 Hz Maximum	List Price
OPEN	**SPDT**						
	51C-83A	32.	64	4.7	6	9.1	$6.75
	51C-86A	125.	32	9.3	12	18	6.75
	51C-89A	500.	16	18.5	24	36	6.75
DUST COVERED	**SPDT**						
	5D1C-83A	32.	64	4.7	6	9.1	7.85
	5D1C-86A	125.	32	9.3	12	18	7.85
	5D1C-89A	500.	16	18.5	24	36	7.85

ULTRA SENSITIVE RELAYS from KURMAN STOCK

SERIES 300

Series 300 Ultra-Sensitive relays operate on only 2 milliwatts of power and yet can switch ½ amp at 28 vdc or 1 amp at 115 vac. They are ideal in low power input circuits where available power is at a minimum. They provide extremely low drain in battery operated equipment.

DUST COVERED

OPEN TYPE

DC	Part Number	Coil Resistance In Ohms ±10%	Operating Characteristics: Currents In MA Pull In	Currents In MA Maximum	Currents In MA Drop Out	Approx. Voltage in Volts At Pull In	Approx. Voltage in Volts At Maximum	Approx. Voltage in Volts At Drop Out	Sensitivity In Milliwatts	List Price
SERIES 300	310DC35	470	2.1	65	0.2	1.0	31	0.09	2	$10.70
	310DC37	1200	1.3	41	0.13	1.56	49	0.15	2	10.70
	310DC40	4680	0.65	20	0.06	3.0	98	0.3	2	10.70
	310DC42	11700	0.41	13	0.04	4.8	152	0.48	2	12.95
	310DC44	29250	0.26	8	0.02	7.6	243	0.7	2	14.95

AC	Part Number	Coil Resistance In Ohms ±10%	Operating Characteristics: Approx. AC Current in MA at Nom. Voltage	AC Voltage in Volts at 60 Hz Minimum	AC Voltage in Volts at 60 Hz Nominal	AC Voltage in Volts at 60 Hz Maximum	List Price
SERIES 300	321DC78	19	59	5.2	6	17	$11.30
	321DC81	73	29	10	12	33	11.30
	321DC84	292	15	20	24	66	11.30
	321DC91	7300	3.2	95	115	300	11.30

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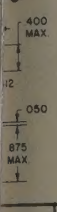
GENERAL PURPOSE CRYSTAL CAN RELAYS from KURMAN STOCK

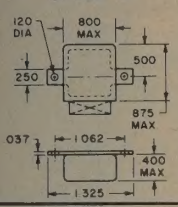
SERIES **KX**

Series KX1 (2pdt) and KX4 (4pdt) Relays feature 2 amp contacts, 50 g's shock, and 20 g's vibration from 10 to 2000 Hz. KX1 relays have pins on 0.2" grid, KX4 on 0.1" grid. Both types available from stock with hook, or pin style headers.

STYLE C



STYLE D



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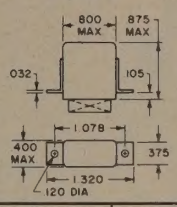

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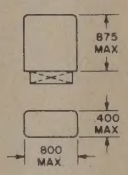
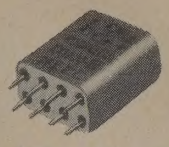
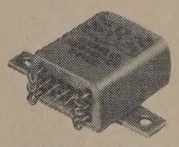




Dpdt General Purpose
150 Milliwatts/pole



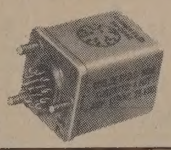
4pdt General Purpose
75 Milliwatts/Pole

Relay Number KX1 Series (DPDT)		Case Style	Terminal	DC Resistance (Ohms)	Nominal Voltage (VDC)	(25°C) (VDC) Pull-In Max.	(VDC) Min Drop-Out	List Price
KX1P20	-6	O	Pin	35	6	3.5	0.3	$11.00
KX1H2C	-6	C	Hook	35	6	3.5	0.3	11.00
KX1H2D	-6	D	Hook	35	6	3.5	0.3	11.00
KX1H2E	-6	E	Hook	35	6	3.5	0.3	11.00
KX1P20	-12	O	Pin	150	12	7	0.7	11.00
KX1H2C	-12	C	Hook	150	12	7	0.7	11.00
KX1H2D	-12	D	Hook	150	12	7	0.7	11.00
KX1H2E	-12	E	Hook	150	12	7	0.7	11.00
KX1P20	-24	O	Pin	600	24	13.5	1.3	11.00
KX1H2C	-24	C	Hook	600	24	13.5	1.3	11.00
KX1H2D	-24	D	Hook	600	24	13.5	1.3	11.00
KX1H2E	-24	E	Hook	600	24	13.5	1.3	11.00
Relay Number KX4 Series (4PDT)								
KX4H4D	-6	D	Hook	35	6	3.5	0.3	26.00
KX4H4E	-6	E	Hook	35	6	3.5	0.3	26.00
KX4H4D	-12	D	Hook	150	12	7	0.7	26.00
KX4H4E	-12	E	Hook	150	12	7	0.7	26.00
KX4H4D	-24	D	Hook	600	24	13.5	1.3	26.00
KX4H4E	-24	E	Hook	600	24	13.5	1.3	26.00

MINIATURE TELEPHONE RELAYS from KURMAN STOCK

SERIES **M**

Stocked only in 4pdt contacts, Kurman Miniature Telephone Relays, Series M, have 3 amp contacts, withstand 15 g's shock and 10 g's vibration from 10 to 500 Hz. Two specific ac models (hermetically-sealed only) and four open dc types, are stocked.



OPEN TYPE

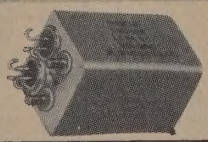
Part Number	Coil Resistance In Ohms	Approx. Current in MA at Nom. Voltage	Voltage in Volts: Pull-In	Voltage in Volts: Nominal	Voltage in Volts: Maximum	List Price
M004-6D	30	200	5	6	11	$6.95
M004-12D	120	100	9.5	12	22	6.95
M004-24D	480	50	20	24	44	6.95
M004-110D	12000	9.2	95	110	220	7.95
Also STOCKED are the following Hermetically Sealed Relays:						
SM004-26D	300	89	18VDC	26VDC	35VDC	14.60
SM004-115A	3000	20	100VAC	115VAC	130VAC	16.75

SENSITIVE MILITARY-TYPE RELAYS from KURMAN STOCK

SERIES **T**

Series T Military-Type Relays are stocked in dpdt with contacts rated at 2 amps resistive at 28 vdc or 115 vac. Type T Relays are rated for 10 g's vibration from 10 to 55 Hz; 15 g's shock.

TWIN HEADER
Series T



Part Number	Coil Resistance in Ohms	Currents in MA: Pull-In	Currents in MA: Maximum	Approximate Voltage: Drop-out	Approximate Voltage: At Pull-In	List Price
T002-2000	2000	4.5	35	1.5	9	$16.00
T002-5000	5000	2.8	22	1.0	14	17.00
T002-8000	8000	2.3	18	.8	18	18.00

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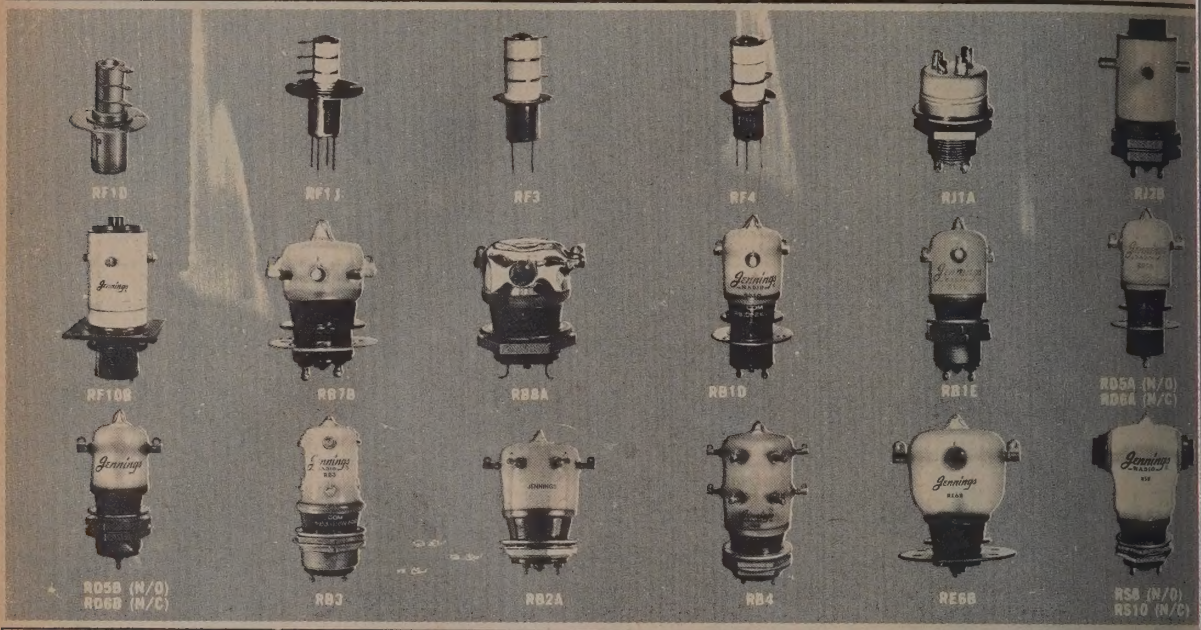
VACUUM RELAYS

Standard DC actuating coils are designed for 125 degrees C. ambient temperature with high temperature coils available for operation at ambients up to 175 degrees C. Coils rated for operation at 110 vdc are also available for most types. These relays can be selected for operation in more difficult vibrati environments than those specified. They are also ava able on request with heavy duty screw connectors f higher voltage and current ratings.



RELAY TYPE	CONTACT ARRANGE-MENT	PEAK TEST VOLTAGE DC or 60 Hz (KV Peak)	RATED OPERATING VOLTAGE DC or 60 Hz (KV Peak)	2.5 MHz (KV Peak)	16 MHz (KV Peak)	CONTINUOUS CURRENT DC or 60 Hz RMS) (Amps.	2.5 MHz RMS) (Amps.	16 MHz RMS) (Amps.	CONTACT CAPACITY Open Contact To Ground (pf)	Between Open Contacts (pf)	CONTACT RESIST-ANCE (Max. Ohms)	OPERATE TIME Max. (MS)	RELEASE TIME Max. (MS)	COIL RESIST-ANCE 6.5 V -10% Ohms
RF1D	SPDT	4	2	2	2	8	6	4	2.0	1.6	.020	10	10	20
RF1J	SPDT Latching	4	2	2	2	8	6	4	2.0	2.0	.020	10	10	18.3
RF3A RF3B	SPDT SPDT Latch	11	10	7	6	N/A	10	15	4.0	4.0	.015	15 10	15 N/A	20 6.7
RF4A RF4B	SPST N/C SPST Latch	11	10	7	6	N/A	25	15	2.5	2.5	.015	15 10	15 N/A	20 6.7
RJ1A	SPDT	5	N/A	2.5	2.0	N/A	14	7	2.5	2.0	.010	8	8	35
RJ2B	SPDT	15	12	10	8	50	30	15	1.0	0.7	.012	18	9	70
RF10B	SPDT	20	15	13	10	75	50	30	1.5	0.5	.012	30	10	25
RB7B	DPDT	9	7	4	3	14	9	4	2.0	1.0	.020	15	5	70
RB8A	SPDT	10	9	7	5	15	10	6	1.0	0.5	.012	18	8	55
RB1D	SPDT	18	12	10	8	15	10	6	1.0	0.5	.012	18	8	65
RB1E	SPDT	18	12	10	8	15	10	6	1.0	0.5	.012	18	8	65
RD5A RD6A	SPST N/O SPST N/C	15	12	10	8	15	10	6	1.0	0.5	.012	18	8	65
RD5B RD6B	SPST N/O SPST N/C	15	12	10	8	15	10	6	1.0	0.5	.012	18	8	55
RB3	DPDT	15	12	10	8	20	10	6	2.5	1.0	.010	20	8	20
RB2A	DPDT	22	20	15	10	20	12	6	2.5	1.0	.010	20	10	25
RB4	4PDT	17	15	12	10	20	10	6	2.5	1.0	.010	45	10	31
RE6B	SPDT	30	25	15	12	25	13	8	2.0	1.0	.010	25	10	20
RS8 RS10	SPST N/O SPST N/C	30	28	25	12	75	35	22	1.5	0.7	.003	30	10	20

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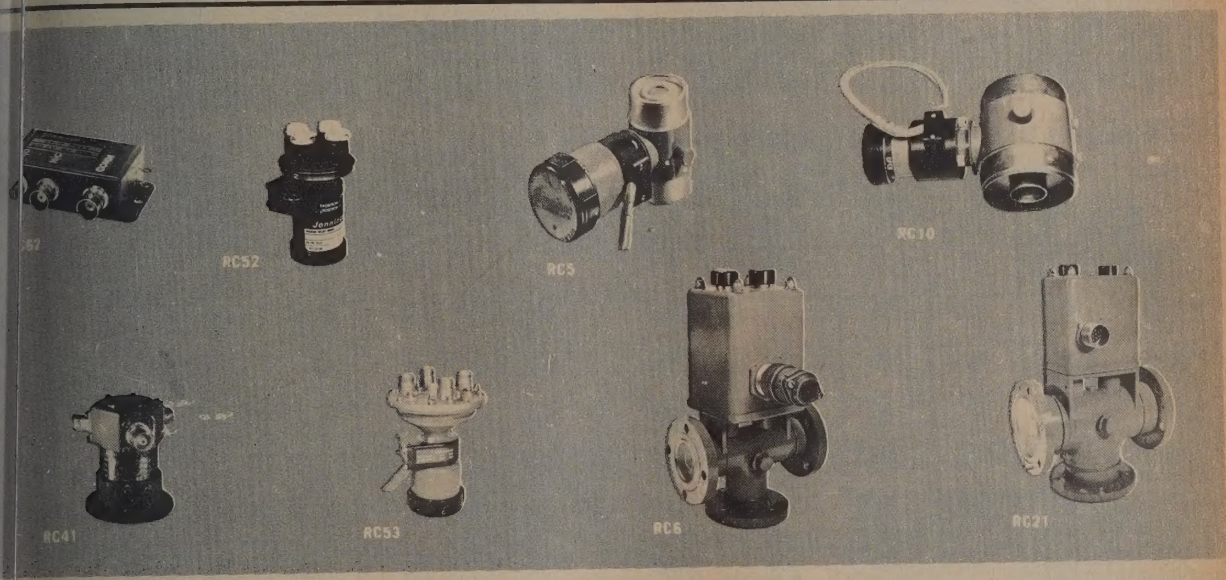
VACUUM COAXIAL RELAYS

Jennings vacuum coaxial relays are available in a wide range of power levels ranging from BNC connectors to 6⅛ inch line. They are all designed to match 50 ohm impedance and all those described here are actuated by 26.5 vdc coils. Matching connectors to fit Jennings low voltage connector receptacle can be obtained at extra cost. The power rating in the specifications table is for the frequency at which the relay is most commonly used. Faster operate times than those listed can be obtained on most units by capacitor discharge actuation.

For further details on Jennings complete line of vacuum coaxial relays, request Catalog No. 103.



MODEL NUMBER	RC62	RC41	RC52	RC53	RC5	RC6	RC10	RC21
POWER RATING	0.5 KW CW at 30 MHz	3 KW CW at 30 MHz	2 KW CW at 25 MHz into 1:1 VSWR	4 KW CW at 30 MHz	25 KW CW at 30 MHz	25 KW CW at 30 MHz	90 KW CW at 30 MHz	90 KW CW at 30 MHz 3 MW Peak Spec. Order
FREQUENCY RANGE	0 to 40 MHz	0 to 500 MHz	DC to 1.7 GHz	0 to 600 MHz	0 to 100 MHz	0 to 400 MHz	0 to 100 MHz	0 to 450 MHz
VSWR	1.1:1 Max.	1.1:1 Max.	1.2:1 Max.	1.1:1 Max.	1.02:1 Max. to 30 MHz 1.05:1 Max. to 60 MHz	1.1:1 Max.	1.02:1 Max. to 30 MHz 1.05:1 Max. to 60 MHz	1.1:1 Max.
CROSSTALK	Greater than 37 db isolation @ 30 MHz	Greater than 30 db isolation @ 300 MHz	At 30 MHz: Pos. 1-84 db Pos. 2-115 db	Greater than 30 db isolation @ 30 MHz	Greater than 70 db isolation @ 30 MHz	Greater than 65 db isolation @ 30 MHz	Greater than 65 db isolation @ 30 MHz	Greater than 60 db isolation @ 30 MHz
INSERTION LOSS	0.1 db Max.	0.1 db Max.	.05 db Max. @ 30 MHz	0.1 db Max.	0.02 db Max.	0.01 db. Max.	0.02 db Max.	0.01 db Max.
COIL RESISTANCE ±10%	920 Ohms	265 Ohms	130 Ohms	18 Ohms	18.8 Ohms	15.4 Ohms	8.3 Ohms	4.8 Ohms
CONTACT CONFIGURATION	SPDT	SPDT	2 pole, 2 position crossover transfer	2 pole, 2 position crossover transfer	SPST	SPDT	SPST	SPDT
LINE CONNECTOR SIZE	BNC Std. (TNC, MB type if requested)	C	N Std. (TNC if requested)	SC	1⅝"	1⅝"	3⅛	3⅛"
ACTION	Non-latching continuous duty coils	Non-latching continuous duty coils	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual
OPERATE TIME	13 Millisecs Max.	25 Millisecs Max.	10 Millisecs Max.	15 Millisecs Typ. 30 Millisecs Max.	15 Millisecs Typ 30 Millisecs Max.	50 Millisecs Max.	15 Millisecs Typ 30 Millisecs Max.	40 Millisecs Max.
WEIGHT	3 oz.	14.5 oz.	15 oz.	2 lbs., 12 oz.	1 lb., 13 oz.	8 lbs.	3 lbs., 12 oz.	14 lbs.

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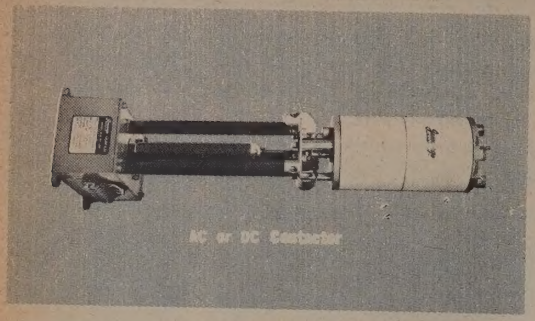
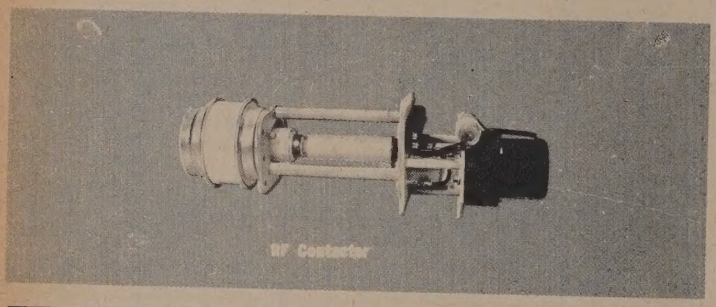
HIGH VOLTAGE VACUUM CONTACTORS



Jennings contactors are used for controlling dc, rf, and 60, and 400 Hz circuits at all voltage levels. Their rinc use is in high power electronic equipment but son of unique advantages of switching in a vacuum make t m u ful in many industrial applications. Vacuum conta rs inherently equipped for such applications as test, pr uct or processing equipment use which require long co act without maintenance, low cost, high voltage control, sea contact use because of the difficult environmental equ ments.

ALTERNATING AND DIRECT CURRENT CONTACTORS

Model Number	Test Voltage (Pk KV)	Operate Voltage (Pk KV)	Continuous Current (Amps)	Max. Interrupt AC Current (Amps RMS)	Max. Interrupt DC Power (KW)	Capacitor Discharge Decaying to 0 in 200 μs	Contact Arrangement	Actuator Voltage (Volts)	Time to Close (Ms)	Break Time (Ms)	Wei (Lb
RP101F4903D21B20 RP101F4904D21B20	50	30	200 DC	N/A	500 (10A Max.)	N/A	N/O N/C	115 60 Hz	60	50	8¾
RP101F4302D26B20 RP101F4304D26B20	50	30	200 DC	N/A	500 (10A Max.)	N/A	N/O N/C	100 DC	75 55	17 42	8¾
RP103F4903D21B20 RP103F4904D21B20	50	30	200 RMS	2000	N/A	50 K Amps	N/O N/C	115 60 Hz	60	50	8¾
RP103F4302D26B20 RP103F4304D26B20	50	30	200 RMS	2000	N/A	50 K Amps	N/O N/C	100 DC	75 55	17 42	8¾
RP901K4903D21B30 RP901K4904D21B30	70	50	400 DC	N/A	500 (10A Max.)	N/A	N/O N/C	115 60 Hz	60	50	15
RP901K4601D26B30 RP901K4602D26B30	70	50	400 DC	N/A	500 (10A Max.)	N/A	N/O N/C	100 DC	34 27	11 17	15
RP900K4903D21B30 RP900K4904D21B30	70	50	400 RMS	4000	N/A	100 K Amps	N/O N/C	115 60 Hz	60	50	15
RP900K4601D26B30 RP900K4602D26B30	70	50	400 RMS	4000	N/A	100 K Amps	N/O N/C	100 DC	34 27	11 17	15



HIGH VOLTAGE RF CONTACTORS

These high current contactors hav bee designed especially for radio frequen cu rents. They are unequaled for RF a plic tions because of the vacuum er ose contacts which offer low, stable ntac resistance.

Solenoid, air, or motor driven mod s ar available. They may also be obtaine with out an actuator.

Unit	Peak Testing Voltage 60 Hz	Peak Operate Voltage 32 MHz	Continuous Current 32 MHz Rms	Contact Resistance Ohms Max.	Contact Capacitance Pf	Contact Inductance Nh	Contact Arrangement	Open Time	Close Time	Pull-in Current Rms	Hold Current Rms	Hold Power Watts	Actuating Voltage	Motor Current 60 Hz	Weight	Life	Cu
RP233X4513006M00	40	25	35	.0005	2	25	N/O SPST	17 Ms.	75 Ms.	.7	.09	10	100 VDC	N/A	3 Lbs.	1×10^5	m C 0/7
RH3C4319D31G00	40	15	55	.0001	4	5	latching	7 Sec.	7 Sec.	N/A	N/A	N/A	115 VAC	.11A	4 Lbs. 10 oz.	1×10^5	m C 0/7
RF20A4319D31G00	40	25	200	.0001	10	2.5	latching	7 Sec.	7 Sec.	N/A	N/A	N/A	115 VAC	.11A	5 Lbs. 6 oz.	1×10^5	m C 0/7

Jennings also offers high voltage overcurrent relays, not shown in this catalog, which detect overcurrents and operate the solenoids of other contactors to remove the overload current. They are available in current ranges from 10 milliamp to 1000 amps.

For more detailed information on an o Jennings vacuum contactors please request ca log No. 104.

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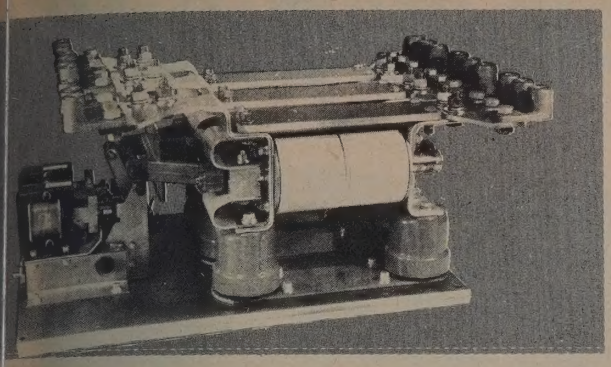
THREE PHASE VACUUM CONTACTORS



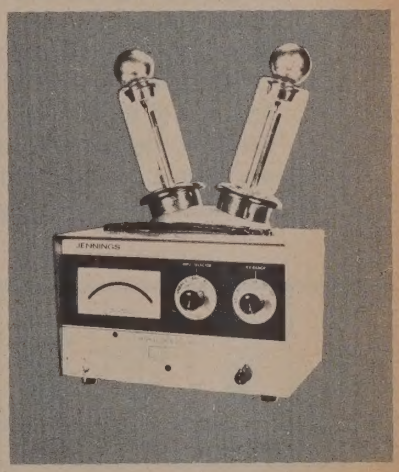
These contactors are the smallest power contactors available at their power level. Their vacuum enclosed contacts require no maintenance, operate at higher speeds (less than 3 cycles), and are longer lasting than other power contactors. They are obtainable at 60 Hz current levels of 250, 300, 600, or 900 amps with operating voltages to 1500 volts. They are also available with other choices of ac or dc actuating voltages than those shown. Major uses include primary control of power supplies in high power transmitters, heating equipment, and industrial controls.

Model Number	Operate Voltage 50/60/400 Hz	Operate Current 60 Hz	Interrupt Current Amps Rms	Mech. Life (Min.)	Actuator Voltage	Approx. Pull-in Current Amps Rms	Approx. Hold Current Amps Rms	Interrupt Time	Auxiliary Contacts	Weight
RP15 4541X24R20	600	250	3000	1 x 10^6	26.5 VDC	2.8	.4	Less than 1 Cycle	2 SPDT 230 VAC/10A	16 lbs.
RP15 4549X41TX0 (60 Hz) RP15 4549X4KTX0 (50 Hz)	1500	300	3000	1 x 10^6	115 VAC	22	1.9	Less than 2 Cycles	4 SPDT 230 VAC/5A	25 lbs.
RP95 4527X41DX0	1500	600	6000	250,000	115 VAC 60 Hz	44.0	3.80	4 Cycles MAX.	4 SPDT	85 lbs.
RP90 4528X41DX0	1500	900	9000	250,000	115 VAC 60 Hz	44.0	3.80	4 Cycles MAX.	4 SPDT	95 lbs.

HIGH VOLTAGE MEASURING EQUIPMENT

MODEL J-1005 HIGH VOLTAGE SOLID STATE VOLTMETER

Compact, portable instrument for the accurate, direct reading of very high voltages at audio and power frequencies . . . determination of the amplitude of pulses with oscilloscope connections for viewing wave shapes . . . removable high voltage input circuit for remote panel mounting of the meter . . . internal battery and ac line operation.



Voltage Ranges:

Pe Kilovolts (single-ended)
2.5, 0-5, 0-10, 0-25, 0-50

Pe Kilovolts (double-ended)
2.5, 0-5, 0-10, 0-25, 0-50, 0-100

Frequency Response: Flat from 10 Hz to 20 kHz at full rated voltage. Internal resonances are above 100 MHz.

Accuracy: ±3% on all voltage ranges.

Oscilloscope Connection: 600 to 1 division ratio (approx.).

Meter Calibration: The meter is calibrated in peak kilovolts with linear voltage scales of 0-2.5, 0-5, 0-10, 0-25 and 0-50.

Input Impedance: Greater than 2 x 10^{12} ohms and approx. 4 pf single-ended to ground, 2 pf double-ended.

Power Supply: 117 volts ±10%, 50/60 Hz, 5 watts, or rechargeable battery.

Dimensions: Height, 16"; width, 10¾"; depth, 8".

Net Weight: 12 pounds (approx.).

Ranges can be doubled by using JCD5 series capacitors.

MODEL JP-325 HIGH VOLTAGE AC PROBES

Voltage: 40, 50, 60 kv peak.

Division Ratio: Approximately 325:1 to termination of 3 ft. of RG-58A/U cable. (Dividing capacities are 2.8 pf at the high voltage end and 890 pf at the low voltage end).

Current: 12.5 amperes rms maximum through the voltage divider.

Input Impedance: Above 10^{12} ohms, 4 pf.

High Frequency Response: 20 MHz at 50 kv peak, 50 MHz at 20 kv peak.

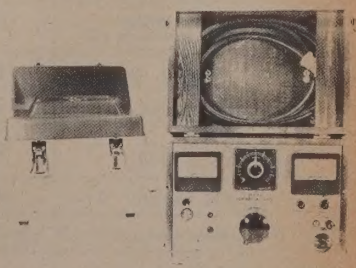
Low Frequency Response: 1000 Hz when operated into 1 megohm shunt resistance; 100 Hz when operated into 10 megohm shunt resistance; internal resonance above 100 MHz.

Weight: 2 lbs. 4 oz.

MODEL JHP-70A HIGH VOLTAGE TESTER

The smallest and lightest instrument available at its power level the JHP70A will generate and measure 70,000 volts peak for on-site testing of high voltage components such as capacitors, switches, transformers, bushings, vacuum tubes, etc.

Maximum Output Voltage ..... 70 KV Peak
Maximum Continuous Current ..... 30 MA RMS
Short Circuit Current (Est.) ..... 100 MA RMS
Power Requirements ..... 105-125 Volts RMS
Frequency ..... 50-60 Hz
Current ..... 8 Amps
Surge Current ..... 16 Amps
Weight:
Control Cabinet ..... 28 lbs.
Transformer ..... 43 lbs.



7010 McLAUGHLIN AVENUE, SAN JOSE, CALIF. 95108 • PHONE: (408) 292-4025 / JENNINGS ITT
DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

Vacuum Relays mean Reliabilit

ki´lo·vac *n.* (F. *kilo*, thousand. L. *vacuus*)
1. That technology which offers reliable performance in high voltage relays resulting from operation at kilovolt levels in a vacuum dielectric.
2. *adj.*, pertaining to short contact travel, low contact mass, contacts free of oxides/pitting, and minimum contact bounce.

KILOVAC vacuum relays (ceramic or glass) are specified by design engineers for performance and reliability not available in conventional relays:

HIGH VOLTAGE ISOLATION: 2000 volts per mil of contact gap with predictable, repeatable isolation well in excess of rated values.

LOW AND STABLE CONTACT RESISTANCE: 0.015 ohms typical, with no contact oxidation or maintenance.

FAST SWITCHING TIME: 10 ms typical, due to small contact gap and short armature travel.

LONG LIFE: Millions of cycles with minimum degradation in electrical performance.

Any one of these standard features will justify your selection of KILOVAC vacuum relays. KILOVAC design and years of production experience permits immediate off-the-shelf delivery from a broad product line with voltages up to 100 KV. Special modifications provided in extremely short order.

KILOVAC TYPE	**HC-1†**	**KC-2†**	**KC-4†**	**HVS-1**	**HVS-10**	**KM-30**	**H-5#**	**H-7**	**H-8**	**-9**
Contact arrangement	SPDT	SPDT	SPST-Latching	SPDT	SPDT	DPDT	SPST N.O.	SPDT	SPDT	SP N.C
Rated operating voltage (KV DC or 60 Hz peak)	2.5	15	10	17	17	18	5	5	15	5
Test voltage (KVDC)	5	18	12	22	25	20	7.5	7.5	20	0
Continuous current, contacts closed, max. (amps DC or 60 Hz RMS)	18	50	28	7	8	20	4	4	15	5
*Max. current at rated voltage switching under load (amps DC)	0.5	0.5	0.5	3.0	4.0	0.5	2.0	2.0	0.5	5
Contact resistance, max. (ohms)	0.010	0.012	0.015	0.015	0.015	0.015	0.035	0.035	0.015	15
Operating time, max. (ms)	6	18	3	20	20	25	10	10	15	5
Coil resistance (ohms ±10% @ 25°C)	335	265	6	128	65	65	250	200	265	5
Coil voltage (VDC, nominal)	26.5	26.5	26.5	26.5	40	40	26.5	26.5	26.5	5
Nominal dimensions (inches)	¾D x 1½H	1⅝D x 2⅜H	¾D x 2¾H	4¾L x 5H	5L x, 3¼H	3D x 3¾H	2L x ¾H	2⅞L x 2H	1D x 3H	1¼L 2¾H
Nominal weight (oz)	1	3	2	15	14	12	1	1	3	
Mounting style**	threaded base	threaded base	flange base	foot bracket	foot bracket	flange base	foot bracket	foot bracket	threaded base	ser fge
Approximate unit price (1-9 pcs)	$54	$98	factory quote	$55	$56	$125	$62	$62	$98	3

*All ratings are for pure resistive circuits. Contact factory for other circuits vs. ratings. **Other styles available †Ceramic envelope
‡H-6, Same Spec as H-5, Except H-6 is SPST, N.C.

..Reliability means KILOVAC

High vacuum technology has made high voltage switching practical with considerable savings in space and weight. KILOVAC uses the latest in vacuum pumping techniques, utilizing the "ion" type pump and achieving, in production, hard vacuums to 10^{-8} mm of mercury or better. Special manufacturing techniques include kovar-to-glass seals, final assembly in a dust and contaminant free area, specially selected glass and specially developed KILOVAC high voltage aging techniques.

KILOVAC relays are widely used in ECM, communications, sonar, radar, pulse-forming networks, medical electronics, and other high voltage equipment, or low voltage equipment where extreme reliability is a must. Many KILOVAC models are interchangeable with other manufacturers' types.

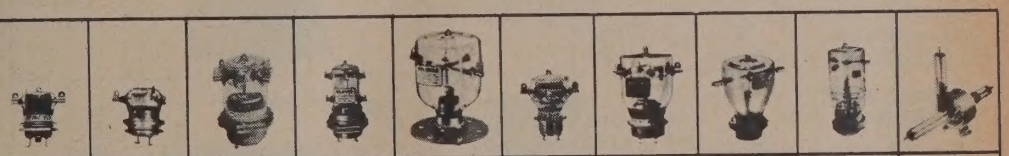
KILOVAC's broad line and "Quick Reaction Time" is geared to your most critical delivery schedule.

For complete technical information call your nearest KILOVAC sales-engineering representative or write directly to us.

KILOVAC, a company small enough to be responsive, large enough to be responsible.

Kilovac® CORPORATION

P. O. Box 4422 / Santa Barbara, California 93103
Telephone (805) 963-4293 TWX 910-334-1178
Cable Address: KILOVAC - SANTA BARBARA
Kilovac Vacuum Relays • **Penta** RF Power Tubes • **Dow-Key** Coaxial Relays



KILOVAC TYPE	H-11/S2	H-12	H-14	H-16	H-17	H-18	H-19	H-23#	H-25	H-35
Cont arrangement	SPST N.O.	SPDT	DPDT	DPDT	SPDT	DPDT	DPDT	SPST-N.C.	SPDT	SPDT
Rate perating voltage (HDC or 60 Hz peak)	12	8	12	12	25	10	20	30	50	35
Test tage (KVDC)	15	12	15	15	30	12	30	35	60	40
Con ous current, contacts closed, m (amps DC or 60 Hz RMS)	15	15	30	30	30	10	30	30	30	10
*Max rrent at rated voltage s hing under load (s DC)	0.1	0.1	0.3	0.5	0.1	0.1	0.1	0.1	0.1	5.0
Con t resistance, max. (ohms)	0.015	0.015	0.015	0.030	0.015	0.020	0.015	0.015	0.015	0.015
Ope ng time, max. (ms)	18	18	20	20	25	15	40	30	60	30
Coi sistance ns ±10% @ 25°C)	250	250	120	120	120	265	225	120	120	50
Coi ltage (VDC, nominal)	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
No al dimensions (inches)	1D x 1⅝H	1D x 1¾H	1¼D x 2¾H	1D x 3¼H	2D x 3½H	1D x 2H	2D x 3¼H	2D x 3¾H	3D x 7½H	8¼L x 5¼H
No al weight (oz)	2	2	8	5	5	4	7	7	30	15
Mo ng style**	threaded base	threaded base	threaded base	threaded base	flange base	threaded base	threaded base	threaded base	threaded base	mounting bracket
Ap imate unit price (1-9-pcs)	$110	$110	$128	$128	$128	$135	$135	$135	factory quote	$110

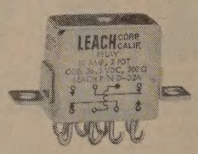
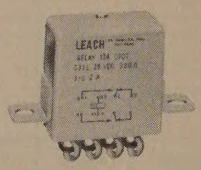
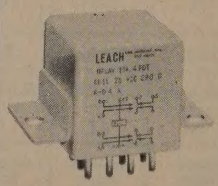
ratings are for pure resistive circuits. Contact factory for other circuits vs. ratings.

er styles available

#H-24, same spec as H-23, except H-24 is SPST, N.O.

Leach Subminiature Relays Dry Circuit to 10 Amps

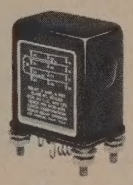
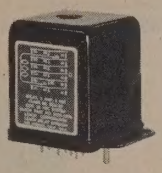
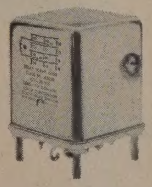
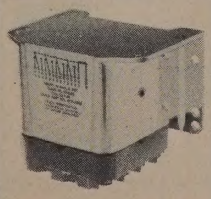
LEACH
CORPORATION
RELAY DIVISION
5915 Avalon Boulevard
Los Angeles, California
Tel: (213) 232-8221

		Contact Rating, Amps–Resistive	Contact Configuration	Nominal Operating Voltages	Resistance, Ohms ± 10% @ 25°C	Bounce Time, Sec. Max. @ 26.5 VDC	Release Time, Sec. Max. Incl. Bounce @ 26.5 VDC	Operate Time, Sec. Max. Incl. Bounce @ 26.5 VDC	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Oz.	
1 Amp, 2PDT **Series T Microminiature** All welded, transistor-size relay for highest performance in smallest space. 2 terminal types available. MIL-R-5757. 0.280″x0.370″ square.		Dry Circuit to 1	2PDT	6 9 12 18 26.5 VDC	98 220 390 880 1560	.0015	.0025	.003	30	75	.09
2 Amp, 2PDT **Series G Microminiature** Only 0.32 inch high, these low level to 2 amp relays save space where it's most needed in electronic circuit packaging. All welded construction assures reliable performance. 150 mil terminal spacing provides ample space for terminal connections, assures good dielectric capability. MIL-R-5757. 0.32″x0.310″x0.610″.		Dry Circuit to 2	2PDT	6 12 26.5 VDC	56 210 1350	.001	.004	.004	30	100	.13
2 Amp, 2PDT **Series E** All welded half size relay for dry circuit/low level to 2 amp switching. Bifilar coil winding available. 6 mounting and 3 terminal types. MIL-R-5757. .800″x.410″x.400″.		Dry Circuit to 2	2PDT	6 12 26.5 VDC	38 150 700	.002	.004	.004	30	100	0
10 Amp, 2PDT **Series D** Most compact, welded relay for use where size and performance are critical. 6 mounting styles and 3 terminal types. MIL-R-5757. 1.015″x.885″x.515″.		10	2PDT	6 12 26.5 VDC	18 70 300	.002	.010	.010	20	50	2
10 Amp, 2PDT **Series J** Balanced-Force* Relay. All welded, hermetically sealed. Special features insure meeting rupture and overload requirements. 3 mounting and 3 terminal types. MIL-R-6106. 1.015″x1.000″x.515″. AC coil and latching models available.		10	2PDT	6 12 28 VDC	20 80 320	.001	DC Coils .010	DC Coils .010	30	100	ls
				28 115 VAC, 400 H	I_{coil} Max. .200 .040		AC Coils .050	AC Coils .015			A C s 1
10 Amp, 4PDT **Series K** Balanced-Force* Relay. All welded, polarized. Special features insure meeting rupture and overload requirements. 3 mounting and 3 terminal types. MIL-R-6106. 1.015″x1.000″x1.015″. AC coil and latching models available.		10	4PDT	6 12 28 VDC	18 70 290	.001	DC Coils .015	DC Coils .015	30	100	D C s 2
				28 115 VAC, 400 Hz	I_{coil} Max. .225 .040		AC Coils .050	AC Coils .020			A C 2.

*Patented and T.M. Leach Corp.

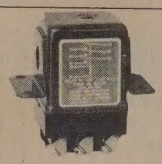
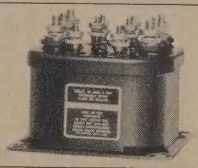
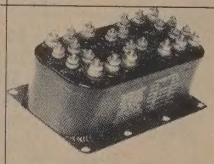
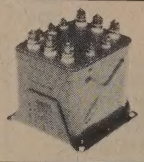
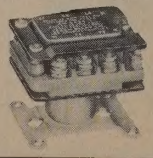
Leach Power and Control Relays 5 to 15 Amps

LEACH
CORPORATION
RELAY DIVISION
915 Avalon Boulevard
Los Angeles, California
Tel: (213) 232-8221

		Contact Rating, Amps – Resistive	Contact Configuration	Nominal Operating Voltages	Resistance, Ohms ± 10% @ 25°C for 28 VDC	Maximum Release Time, Seconds	Maximum Operate Time, Seconds	Bounce Time, Seconds, Maximum	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Lbs.
5 Amp, 2PDT **Series 9229** **Series 9235; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC, 400 Hz. Resistive: 5 amps; Inductive: 3 amps. 1.750″ x 1.531″ x .687″. MIL-R-6106, MIL-R-5757.		5	2PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	9229 248Ω	AC Coils .050 DC Coils .020	AC Coils .020	.002	10	25	.18
					9235 310Ω	N.A.	DC Coils .020				.20
5 Amp, 4PDT **Series 9220** **Series 9228; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC, 400 Hz. Resistive: 5 amps; Inductive: 3 amps. 1.750″ x 1.531″ x 1.032″. MIL-R-6106, MIL-R-5757.		5	4PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	9220 248Ω	AC Coils .050 DC Coils .020	AC Coils .020	.002	10	25	.30
					9228 200Ω	N.A.	DC Coils .020				.30
5 Amp, 6PDT **Series 9226** **Series 9223; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC, 400 Hz. Resistive: 5 amps; Inductive: 3 amps. 1.812″ x 1.531″ x 1.531″. MIL-R-6106, MIL-R-5757.		5	6PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	9226 180Ω	AC Coils .050 DC Coils .020	AC Coils .020	.002	10	25	.40
					9223 200Ω	N.A.	DC Coils .020				.67
10 Amp, 2PDT **Series 9227** **Series 9237; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. Resistive: 10 amps; Inductive: 6 amps DC and 10 amps AC. 1.781″ x 1.531″ x 1.032″. MIL-R-6106, MIL-R-5757.		10	2PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	9227 175Ω	AC Coils .050 DC Coils .020	AC Coils .020	.002	10	25	.30
					9237 200Ω	N.A.	DC Coils .020				.30
10 Amp, 4PDT **Series 9224** **Series 9225; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. Resistive: 10 amps; Inductive: 6 amps DC and 10 amps AC. 1.812″ x 1.531″ x 1.531″. MIL-R-6106, MIL-R-5757.		10	4PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	9224 110Ω	AC Coils .050 DC Coils .020	AC Coils .020	.002	10	25	.43
					9225 200Ω	N.A.	DC Coils .020				.40
15 Amp, 4PDT **Series 9274** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. Resistive: 10 amps DC and 15 amps AC; Inductive: 10 DC and AC. 1.80″ x 2.06″ x 2.06″. MIL-R-6106.		15	4PDT	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	92Ω	AC Coils .050 DC Coils .020	AC Coils .025 DC Coils .025	N.O. .003 N.C. .005	10	25	.80

Leach Power Contactors 20 to 400 Amps

LEACH
CORPORATION
RELAY DIVISION
5915 Avalon Boulevard
Los Angeles, California
Tel: (213) 232-8221

		Contact Ratings, Amps—Resistive	Contact Configuration	Nominal Operating Voltages	Resistance—Ohms ± 10% @ 25°C—26.5 VDC	Bounce Time, Seconds, Maximum	Release Time, Seconds, Maximum	Operate Time, Seconds, Maximum	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Lbs.	Latch Model Available
20 Amp Series 9324 3PST/NO 25g shock, 10g vibration Bifilar coil winding available. MIL-R-6106.		20	3PST/NO	28 VDC; 115 VAC, 400 Hz; 115 VAC, 60 Hz	160	.002	AC Coils .050 DC Coils .010	AC Coils .025 DC Coils .020	10	25	.60	No
20 Amp Series 9325 3PDT/NO Mechanical interlock version of 9324. MIL-R-6106.		20	3PDT/NO	28 VDC; 115 VAC, 400 Hz; 115 VAC, 60 Hz	160	.005	AC Coils .050 DC Coils .010	AC Coils .025 DC Coils .020	10	25	1.4	Me Int ck
25 Amp Series 9123—3PST/NO 50g shock, 15g vibration. Auxiliary 5 amp contacts available. MIL-R-6106. Repairable models available.		25	3PST/NO	28 VDC; 115 VAC, 400/60 Hz	50	.002	AC Coils .050 DC Coils .010	.025	15	50	1.25	No
50 Amp Series 9124—3PST/NO 50g shock, 15g vibration. Auxiliary 5 amp contacts available. MIL-R-6106. Repairable models available.		50	3PST/NO	28 VDC; 115 VAC, 400/60 Hz	50	.002	AC Coils .050 DC Coils .010	.025	15	50	1.25	No
50 Amp Series 9125—6PST/NO Mechanical interlock version of 9124. MIL-R-6106. Aux. 5 amp contacts available.		50	6PST/NO	28 VDC; 115 VAC, 400/60 Hz	50	.002	AC Coils .050 DC Coils .010	.030	10	50	2.90	Mec Inte ck
100 Amp Series 9213 Sealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. MIL-R-6106.		100	3PST/NO 4PST/NO	28 VDC; 115 VAC, 400 Hz; 115 VAC, 60 Hz	44.5	.010	AC Coils .060 DC Coils .020	AC Coils .040 DC Coils .030	10	25	2.7	No
25 to 100 Amp Series 9207 Unsealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. MIL-R-6106.		25-100	3PST/NO 4PST/NO	28 VDC; 115 VAC, 400 Hz; 115 VAC, 60 Hz	44.5	.010	AC Coils .050 DC Coils .020	.030	10	50	1.6	No
25 to 400 Amp Solenoid Type Power Contactors MIL-R-6106.		25-400	1PST/NO 3PST/NO	28 VDC	Varying	N/A	.015	.040	2	25	2.6	No

Leach Electronic Time Delays

LEACH
CORPORATION
RELAY DIVISION
5915 Avalon Boulevard
Los Angeles, California
Tel: (213) 232-8221

	Enclosures	Enclosure Types Available	Timing Range (1)	Contact Rating—Resistive	Contact Configuration	Temperature Range	Accuracy (1)	Input Voltage	Maximum Operating Current @ 25°C	Transient Protection	Weight, Maximum	Dimensions, Maximum by Enclosure Type
Time Delay on Operate, Relay Output Series R300	Type 10	10	100 ms to 300 sec.	2 and 10 amp	2 PDT and 4 PDT	−55° to +125°C	±10%	18 to 32VDC	150 ma	pos. and neg.	8 oz.	1.5″ x 1.5″ x 1.8″
		20	100 ms to 300 sec.	2 and 10 amp	2 PDT				150 ma	pos. and neg.	5 oz.	1.2″ x 1.0″ x 1.8″
Available in enclosure types 10, 20, 30		30	100 ms to 180 sec.	2 amp	2 PDT				60 ma	pos.	3 oz.	1.0″ x 1.0″ x 1.3″
Time Delay on Operate, Solid State Output Series S300	Type 20	20	10 ms to 300 sec.	500 ma max.	1 PNO	−55° to +125°C	±10%	18 to 32VDC	60 ma	pos. and neg.	5 oz.	1.2″ x 1.0″ x 1.8″
		30	10 ms to 180 sec.	500 ma max.	1 PNO				30 ma	pos.	3 oz.	1.0″ x 1.0″ x 1.3″
Available in enclosure types 20, 30, 40		40	10 ms to 20 sec.	250 ma max.	1 PNO				30 ma	pos.	1 oz.	1.0″ x 0.5″ x 1.1″
Time Delay on Release, Relay Output, Positive or Negative Control Series R400	Type 30	10	100 ms to 300 sec.	2 and 10 amp	1 PDT and 3 PDT	−55° to +125°C	±10%	18 to 32VDC	150 ma	pos. and neg.	8 oz.	1.5″ x 1.5″ x 1.8″
		20	100 ms to 300 sec.	2 and 10 amp	1 PDT				150 ma	pos. and neg.	5 oz.	1.2″ x 1.0″ x 1.8″
Available in enclosure types 10, 20, 30		30	100 ms to 180 sec.	2 amp	1 PDT				60 ma	pos.	3 oz.	1.0″ x 1.0″ x 1.3″
Time Delay on Release, Solid State Output, Positive or Negative Control Series S400	Type 40	20	10 ms to 300 sec.	500 ma max.	1 PNO	−55° to +125°C	±10%	18 to 32VDC	60 ma	pos. and neg.	5 oz.	1.2″ x 1.0″ x 1.8″
		30	10 ms to 180 sec.	500 ma max.	1 PNO				60 ma	pos.	3 oz.	1.0″ x 1.0″ x 1.3″
Available in enclosure types 20, 30												
Time Delay on Operate, Solid State Output, Epoxy Case Series S350	Type 50	Epoxy 50	50 ms to 20 sec.	250 ma max.	1 PNO	−55° to +125°C	±10%	18 to 32VDC	15 ma	pos.	1 oz.	0.9″ x 0.9″ x 0.4″
Available in epoxy enclosure type 50												

(1) Units with extended timing ranges and greater accuracy are available on special order.

LIBERTY CONTROLS

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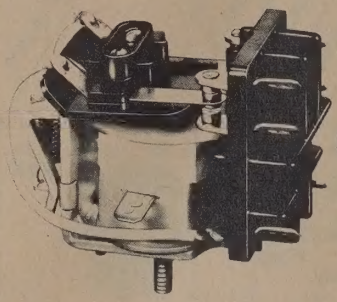
RELAYS, TELEPHONE TYPE • POWER RELAYS • SOLENOIDS • TIMERS • ELECTRO-MECHANICAL DEVICES

SPECIAL CONTACT MATERIAL AVAILABLE

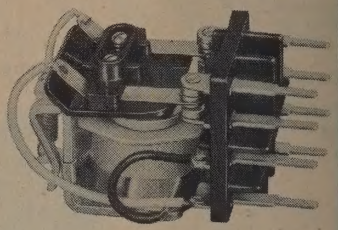
CONSULT US

Standard - Silver Cad Oxide - Gold Flashed



210 215 SERIES

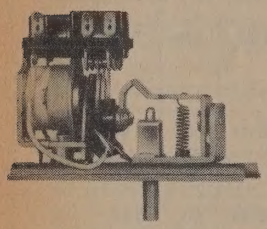
GENERAL PURPOSE RELAY



LISTE BY UNDERV TER LABORA RIE FILE #5253

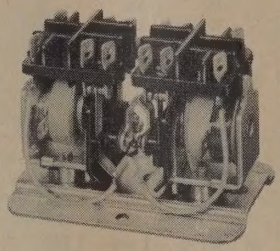
For use when acceptibity the com nati is deter ned U

LATCHING TYPES MANUAL RESET 218 SERIES



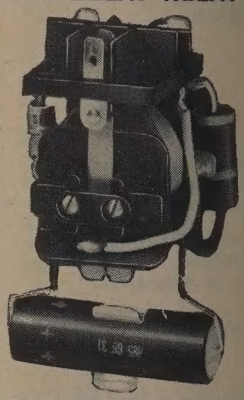
Any Relay up to 3PDT may be used on this unit.

ELECTRICAL SWITCHING OR RESET 214 SERIES



Any combination of Relays up to 6PDT may be used, including 2 different coil voltages or resistances.

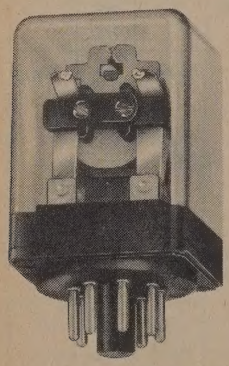
TIME DELAY RELAY



Dela s of .01 18 seco ds Ava ble Con cts 3PD

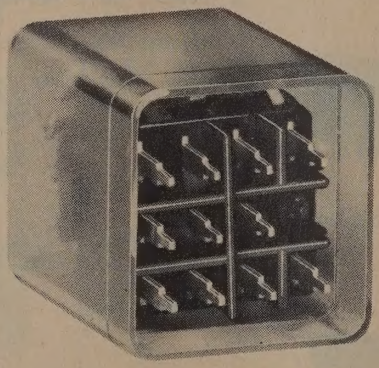
220 & 225 SERIES

GENERAL PURPOSE PLUG-IN



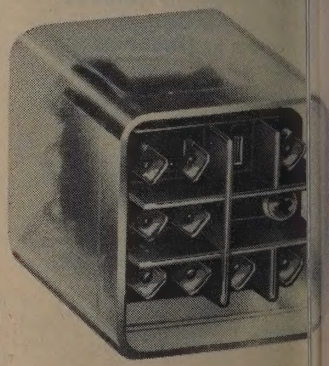
223 & 228 SERIES

Printed Circuit Mount



224 & 229 SERIES

Combination .187" or Solder Lg



HERMETIC SEALING AVAILABLE — CONSULT US

NOTICE: Special Wiring Circuits Contact Arrangements and Coil Voltages are Available.

Consult The Factory

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Phone (815) 725 - 2241

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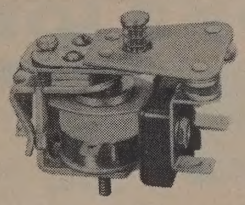
RELAYS, TELEPHONE TYPE • POWER RELAYS • SOLENOIDS • TIMERS • ELECTRO-MECHANICAL DEVICES

NTA
TING
AMPS @ 120
0 V.A.
SISTI
P 12 240
C.



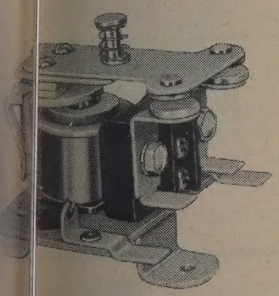
240
250
SERIES

LISTED BY UNDERWRITERS LABORATORIES FILE #35253

For use where acceptability of the combination is determined by U/L

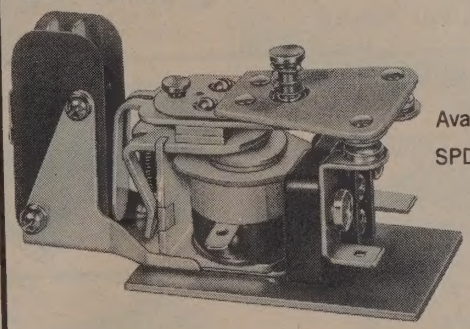
STANDARD CONTACT MATERIAL
SILVER - CAD - OXIDE

0 SERIES



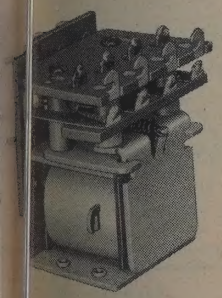
Available with 5 Amp SPDT Auxiliary Switch — 241 Series

251 SERIES



Available with 5 Amp SPDT Auxiliary Switch — 251 Series

6 0 SERIES POWER RELAY



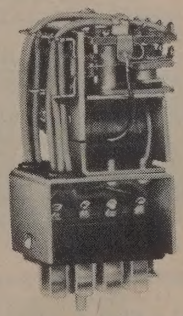
2 - 3 - 4 POLE HEAVY DUTY RELAY

15-AMP CONTACTS

Rated at 15 Amps
120V 60HZ Resistive Gold Plated Silver Contacts

Th 30 relay is a heavy duty multi-purpose, multi-contact relay. Va d contact combinations and high dielectric phenolic insu- iat afford great versatility and utility. The 630 relay is widely us in such applications as industrial controls, elevator con- tro communications equipment and electronic measuring de es. Rugged, heavy duty construction and large gold plated si r contacts make this a relay to provide long trouble free lif Available for AC or DC operation.

PLUG-INS



633 SERIES

633 Series available with 8 Pin, 12 Pin, and 18 Pin Jones Plugs

634 Series available with 8 Pin, 12 Pin, and 20 Pin Octal Type Plugs

IOTICE: Special Contact Ma- erials Available. Special Coil Voltages Available.

Consult The Factory

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LIBERTY CONTROLS

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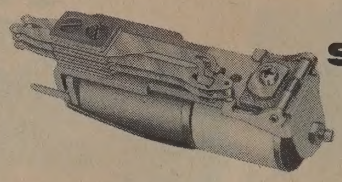
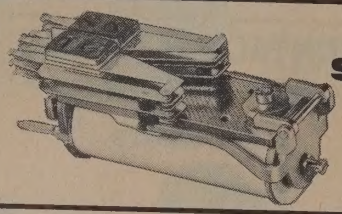
Many Contact Materials Available
Single or Twin Contacts
Contact Forms A to E
24 Springs Max. Per Pile-up



B SERIES
Telephone Type Relay

Types
DC
BQA — (Quick Acting)
BSO — (Slow Operating)
BSR — (Slow Releasing)
AC
BAC — (Quick Acting)

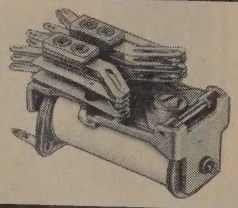
General Purpose Telephone Type Relay
Single or Twin Contacts
Contact Forms A to E
26 Springs Max. Per Pile-up



C SERIES
Telephone Type Relay

Types
DC
CQA — (Quick Acting)
CSO — (Slow Operate)
CSA — (Slow Release)
AC
CAC — (Quick Acting)

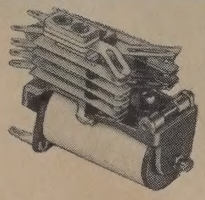
High Sensitivity in Minimum Space
Single or Twin Contacts
Contact Forms A to E
24 Springs Max. Per Pile-up



F SERIES
Telephone Type Relay

Types
FQA — (Quick Acting)
FSO — (Slow Operate)
FSR — (Slow Release)

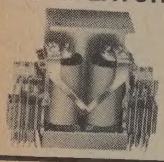
Many Contact Materials Available
Single or Twin Contacts
Available in Open Types, Lexan Cover, Metal Cover & Hermetically Sealed



G SERIES
Telephone Type Relay

Types
DC
GQA — (Quick Acting)
GSO — (Slow Operate)
GSR — (Slow Release)
AC
GAC — (Quick Acting)

SERIES G LATCH RELAY

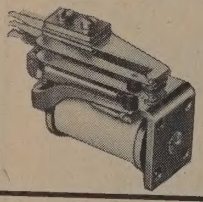


The Series G Latch Relay is made up of two Series G relays with provisions for mechanical interlock.

GQIN PLUG-IN

The GQIN in a Series G relay with a mating flush mounted socket and clear plastic cover which snaps over the socket. The Series GQIN features no internal wiring to improve reliability.

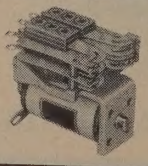
Single Contacts — Single Pile-up
Contact Forms A to E
12 Springs Maximum



M SERIES
Telephone Type Relay

Types
DC
MQA — (Quick Acting)
MSO — (Slow Operate)
MSR — (Slow Release)
AC
MAC — (Quick Acting)

Small — Lightweight
Small or Twin Contacts
Contact Forms A, B, C or D
7 Springs Max. Per Pile-up



S SERIES
Telephone Type Relay

Types
SQA — (Quick Acting)
SKO — (Quick Acting) Oversize Coil

NOTICE: Special Wiring Circuits Contact Arrangements and Coil Voltages are Available.

Consult The Factory

LIBERTY CONTROLS
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Shorewood, Illinois • RFD 5 Joliet, Illinois 60431
Phone (815) 725 - 2241

See YELLOW SECTION for Local Offices, Phones

LIBERTY CONTROLS

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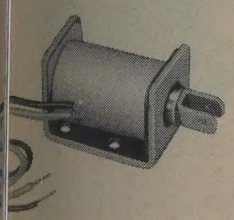
RELAYS, TELEPHONE TYPE • POWER RELAYS • SOLENOIDS • TIMERS • ELECTRO-MECHANICAL DEVICES

SOLENOIDS

useful and simple, Liberty Controls solenoids are with the same thoroughness and manufactured same integrity that characterizes all Liberty Con- ducts.

y one piece U-shaped frame and the end plate are pure magnetic ingot iron — properly annealed to naximum magnetic efficiency. The dove-tailed frame and end plate are securely staked together, forming an assembly that is permanently tight and inherently efficient. Coils of top-grade magnet wire are precision wound on specially treated bobbins. For high temperature applications, special magnetic wire is used and coils are impregnated with a tough, inorganic electrical varnish. Available for either AC or DC

E 61

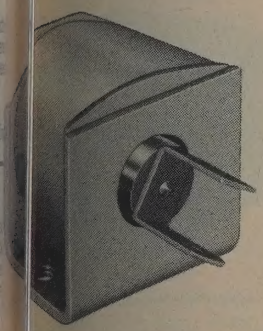


Size: .750″ x .813″ x 1 3/16″ Long

Mounting: 3 — #6-32 Holes

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

PE 62

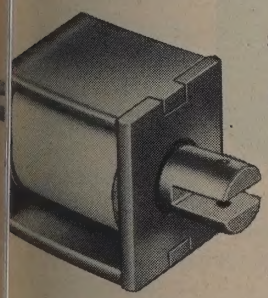


Size: 1.076″ x 1.375″ x 1.156″ Long

Mounting: 2 — #10-32 Holes on 1″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

PE 81

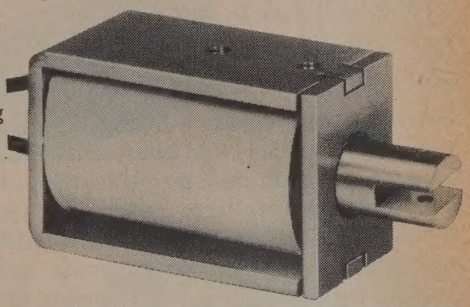


Size: 1″ x 1¼″ x 1 3/32″ Long

Mounting: 4 — #8-32 Holes on 5/8″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 82

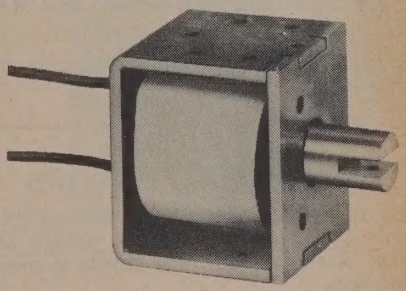


Size: 1″ x 1¼″ x 2″ Long

Mounting: 4 — #8-32 Holes on 5/8″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 88

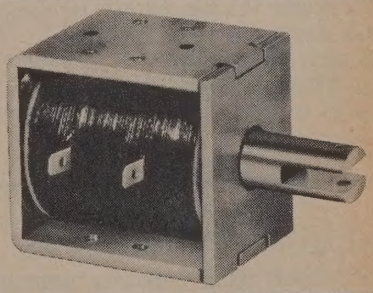


Size: 1.562″ x 1.882″ x 1 5/8″ Long

Mounting: 4 — #8-32 Holes on 1/2″ x 15/16″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 89

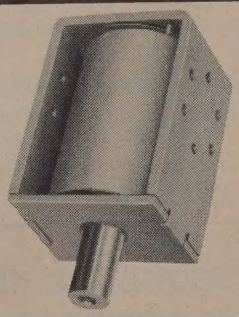


Size: 1 9/16″ x 1¾″ x 2⅛″ Long

Mounting: 4 — #8-32 Holes on 1/2″ x 15/16″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 90



Size: 1.562″ x 1.818″ x 2 5/8″ Long

Mounting: 4 — #8-32 Holes on 1/2″ x 15/16″ Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

OTICE: Special Arrangements f Frame, Mounting & Plunger Styles are Available.

Consult The Factory

LIBERTY CONTROLS

DIV. OF LIBERTY LEASING CO., INC.

Shorewood, Illinois • RFD 5 Joliet, Illinois 60431

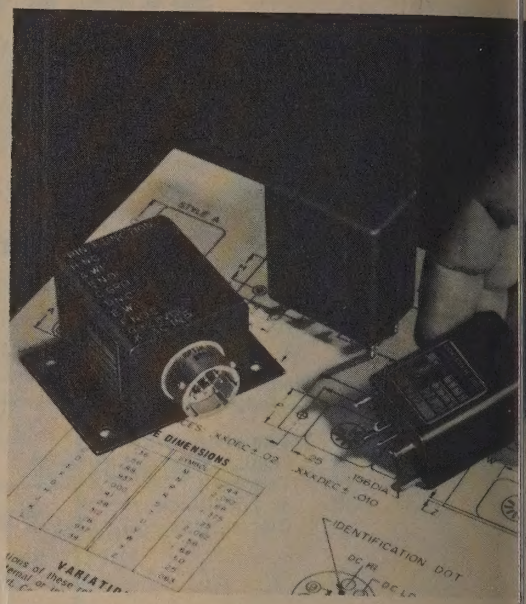
Phone (815) 725 - 2241

LOGITEK, INC.

ELECTRONIC SENSORS & CONTROLS

VOLTAGE SENSORS
FREQUENCY SENSORS
PHASE SEQUENCE SENSORS
CURRENT SENSORS
POWER MONITORS
TIME DELAY RELAYS
AC SOLID STATE RELAYS
SOLID STATE FLASHERS

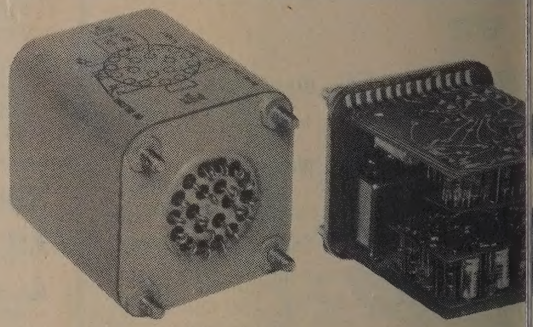
Logitek's comprehensive line of time-delay relays and voltage-, frequency- and phase-sensors utilize the most advanced design and manufacturing techniques for accuracy and long-term reliability — provide uncompromising performance in rigorous military, aerospace and industrial systems. All units are hermetically sealed, meet applicable requirements of MIL-I-6181D, MIL-R-5757D, MIL-R-6106C, and MIL-Std-704A. Contact ratings 2A and 10A resistive, 1A and 5A inductive, operating life 100,000 cycles minimum. MIL-Q-9858 quality control.



AC VOLTAGE SENSORS

Provide alarm, indication or disconnect signals for single — or 3 — phase lines when voltage exceeds high or low limits. Available with time delays to prevent dropout due to transients.

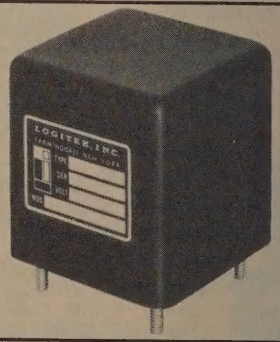
Input Power: 115 vac, 60/400 Hz nominal*
Sense Bands: 96 to 150 vac
Accuracy: ±1%, ±5%
Time Delays: 50 ms to 10 sec.
* Also DC operated



FREQUENCY SENSORS

Time-delayed, band frequency sensing relays, for applications where systems must be de-energized or alarms actuated when line frequency departs from normal.

Line Voltage: 100-130 vrms
Frequency Sense Range: 50/70 or 360/440 Hz*
Accuracy: ±1%
Delay: 50 ms to 10 sec*
* As specified.



PHASE SEQUENCE SENSORS

Protect rotating components and other three-phase loads from damage that could occur from phase reversals or absence of any phase. Contacts may be used to disconnect load or operate alarms.

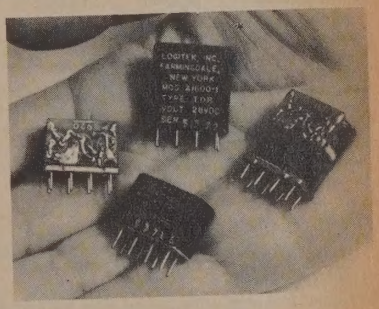
Operating Voltage: 120/208 vac, 60/400 Hz, 3ϕ
Phase Displacement: 120 ±5 degrees max.
Permissible Distortion: total 8%, any harmonic 5%

WER MONITORS

ide me-delayed alarm or shutdown signals when volt-
freqncy or phase sequence characteristics of power
depa from specified limits.
ge: 0/280 vac, single/three phase
ge: se Band: 96-150 vrms
uen Sense Range: 50/70 or 360/440 Hz*
uracy: ±1%
un al Dropout Delay: 50 ms to 10 sec.*
ed.

OLTAGE SENSORS

e larm or disconnect signals when DC line voltage
s om normal. Insensitive to normal transients. Avail-
factory-set or adjustable bandwidth.
nd: 10-200 vdc
(including hysteresis): ±1%



IME DELAY RELAYS

n drop-out, pull-in, true delay on drop-out and con-
elay on drop-out. Timing ranges from 50 msec to
, factory-set or externally adjustable. Standard and
can sizes.
ng Voltage: 18-31 vdcs
y: 10%, 5%, 2%
bility: ±1%, any voltage and temperature
ime: 5 msec max.
tate Outputs available.

ACSOLID STATE RELAYS

Contlless relays for long life and high reliability. Normally-
ope nd normally-closed configurations with complete isola-
tion etween switching and coil terminals.
Ope ing Voltage: 12-32 vdc
Con l Signal: Ground
Sw ed Signal: 2-150 vac, 40-400 Hz
Pul Time: 100 usec max
Dro Out Time: ½ cycle max

SOLID STATE FLASHERS

Up to 10 channels; conform to MIL specs for airborne applications. Cordwood packaging for maximum density, hard mounted and encapsulated.

Input: 18-31 vdc
Load Current: up to 2.5 A
Flash Rate: up to 120 per min
Flash/Off Ratio: up to 2.4:1

GENERAL SPECIFICATIONS

ENRONMENTAL

Temperature:
Operating −55°C to +125°C
Storage −65°C to +150°C
Vibration: 10-80 cps .06" D.A. 80-2000 cps, 20 G's
Shock: 50 G's, 11 ms, any axis
Acceleration: 20 G's steady state, any axis
Altitude: 100,000 ft. hermetically sealed
Humidity: 95% R. H.
General: MIL-R-5757D, MIL-R16106C, MIL-STD-704A

PHYSICAL

Finish: Per MIL-E-5557 Blue Fed. Std. 595, Color 25177
Enclosure: Hermetically Sealed and Encapsulated
Connector: Glass to metal seal, solder hooks or pins
Marking: Per MIL-STD-130 includes model number, serial number, date code, operating parameters and wiring diagram

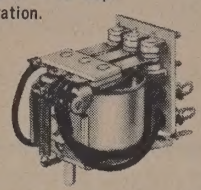
LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

Magnecraft® general purpose relays

IN STOCK FOR IMMEDIATE DELIVERY

class 88 open type

SPDT, DPDT, 3PDT — 10 amps.
AC or DC operation.



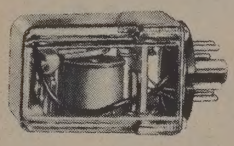
- Small Size: 1 13/16 x 1 3/16 x 1 1/4"
- Silver alloy, gold-flashed, contacts rated at 10 amps at 115 VAC or 32 VDC resistive load.
- Solder terminals for easy wiring.
- Easy mounting: One #6-32 tapped mounting hole with locating boss.
- Rugged hinge-pin armature for long life and stability of operation.
- Weight: 2 oz. approx.

Stock Part No.	Contacts 10 Amps.	COIL †Volt or ††Curr.	*Res. Ohms	Nominal Power	Prices 1-9
Alternating Current Voltage Actuated					
W88AX1	SPDT	6VAC		3 VA	4.02
W88AX2		12VAC			4.02
W88AX3		24VAC			4.02
W88AX4		115VAC			4.02
W88AX34		230VAC			4.54
W88AX5	DPDT	6VAC		3 VA	4.70
W88AX6		12VAC			4.70
W88AX7		24VAC			4.70
W88AX8		115VAC			4.70
W88AX32		230VAC			5.22
W88AX9	3PDT	6VAC		3 VA	5.24
W88AX10		12VAC			5.24
W88AX11		24VAC			5.24
W88AX12		115VAC			5.24
W88AX36		230VAC			5.78
Direct Current Voltage Actuated					
W88X2	SPDT	6VDC	25	1.5W	3.60
W88X3		12VDC	100		3.60
W88X4		24VDC	400		3.60

Stock Part No.	Contacts 10 Amps.	COIL †Volt or ††Curr.	Ohms *Res.	Nominal Power	Prices 1-9
Direct Current Voltage Actuated C					
W88X5	SPDT	110VDC	8000		
W88X6	DPDT	6VDC	25		
W88X7		12VDC	100		
W88X8		24VDC	400		
W88X9		110VDC	8000		
W88X10	3PDT	6VDC	25		
W88X11		12VDC	100		
W88X12		24VDC	400		
W88X13		110VDC	8000		
DC Current Actuated For Plate Circuit					
W88X14	SPDT	7.2 MA	2500		
W88X15		5.0 MA	5000	1	
W88X16		3.6 MA	10000		
W88X17	DPDT	10 MA	2500		
W88X18		7.2 MA	5000	2	
W88X19		5.0 MA	10000		
W88X20	3PDT	12.3 MA	2500		
W88X21		8.7 MA	5000	3	
W88X22		6.1 MA	10000		

class 88CP plug in

AC or DC operation.
Crackproof, see through plastic dust cover.
SPDT, DPDT, 3PDT — 10 amps.



- Size: 2 1/8 x 1 3/8 x 1 3/8"
- Silver alloy, gold-flashed, contacts rated 10 amps at 115 volts AC or 32 volts DC, resistive load.
- Furnished with 8 or 11 pin std. octal plug.
- Rugged hinge-pin armature for long life and stability of operation.
- Weight: 3 oz. approx.

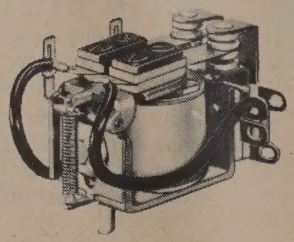
Stock Part No.	Contacts 10 Amps.	COIL †Volt or ††Curr.	*Res. Ohms	Nominal Power	Plug	Prices 1-9
Alternating Current Voltage Actuated						
W88ACPX1	SPDT	6VAC		3 VA	8-pin	6.17
W88ACPX2		12VAC				6.17
W88ACPX3		24VAC				6.17
W88ACPX4		115VAC				6.17
W88ACPX76		230VAC				6.94
W88ACPX5	DPDT	6VAC		3 VA	8-pin	6.91
W88ACPX6		12VAC				6.91
W88ACPX7		24VAC				6.91
W88ACPX8		115VAC				6.91
W88ACPX32		230VAC				7.69
W88ACPX9	3PDT	6VAC		3 VA	11-pin	8.59
W88ACPX10		12VAC				8.59
W88ACPX11		24VAC				8.59
W88ACPX12		115VAC				8.59
W88ACPX39		230VAC				9.36
Direct Current Voltage Actuated						
W88CPX1	SPDT	6VDC	25	1.5W	8-pin	5.94
W88CPX2		12VDC	100			5.94
W88CPX3		24VDC	400			5.94

Stock Part No.	Contacts 10 Amps.	COIL †Volt or ††Curr.	*Res. Ohms	Nominal Power	Plug	Prices 1-9
Direct Current Voltage Actuated C						
W88CPX4		110VDC	8000			
W88CPX5	DPDT	6VDC	25	1.5W		
W88CPX6		12VDC	100			
W88CPX7		24VDC	400			
W88CPX8		110VDC	8000			
W88CPX9	3PDT	6VDC	25	1.5W		
W88CPX10		12VDC	100			
W88CPX11		24VDC	400			
W88CPX12		110VDC	8000			
DC Current Actuated For Plate Circuit						
W88CPX13	SPDT	7.2 MA	2500	125MW		
W88CPX14		5.0 MA	5000			
W88CPX15		3.6 MA	10000			
W88CPX16	DPDT	10 MA	2500	250MW		
W88CPX17		7.2 MA	5000			
W88CPX18		5.0 MA	10000			
W88CPX19	3PDT	12.3 MA	2500	375MW		
W88CPX20		8.7 MA	5000			
W88CPX21		6.1 MA	10000			

class 88R power relays

DPDT 15 amps AC or DC operation.

- Small Size: 1 7/8 x 1 3/16 x 1 5/32"
- Silver alloy, gold-flashed, contacts, rated at 15 amps at 115 volts AC, or 32 volts DC, resistive load.
- Solder terminals for easy wiring.
- Easy mounting: One #6-32 tapped mounting hole with locating boss.
- Designed for high current switching in small space.
- Rugged hinge pin armature for long life and stability of operation.
- Weight: 3 oz. approx.

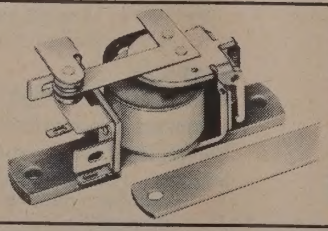


Stock Part No.	Contacts 15 Amps	COIL †Volts	*Ohms	Nominal Power	Prices 1-9
W88ARX-2	DPDT	12VAC	—	3VA	6.87
W88ARX-3		24VAC	—		6.87
W88ARX-4		115VAC	—		7.05
W88RX-2	DPDT	12VDC	100	1.5W	6.80
W88RX-3		24VDC	400		6.80

class 88K low cost relays -

SPDT 15 amps AC or DC operation.

- Size: 2 5/8 x 1 3/16 x 1 1/4"
- Silver alloy, gold-flashed, contacts, SPDT rated at 15 amps, 115 volts AC or 32 VDC, resistive load.
- Mounting base insulator furnished.
- Terminals accept AMP Faston 250 Quick-Disconnect receptacles for contacts, 110 Series for coil, or equivalent, or solder connection can be used.
- Weight: 3 ozs. approx.

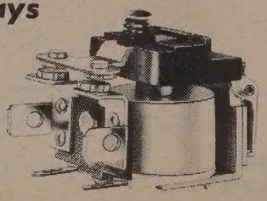


Stock Part No.	Contacts 15 Amps	COIL †Volts	*Ohms	Nominal Power	Prices 1-9
W88AKX-1	SPDT	24VAC	—	3VA	5.12
W88AKX-2		115VAC	—		5.12
W88AKX-3		230VAC	—		5.20
W88KX-1	SPDT	6VDC	25	1.5W	4.90
W88KX-2		12VDC	100		4.90
W88KX-3		24VDC	400		4.90
W88KX-4		110VDC	8000		5.68

class 88KD low cost power relays

50 amps SPST-NO-DM, 1 HP. AC or DC operation.

- Size: 1 13/16 x 1 1/16 x 1 1/2"
- 50 amp resistive, heavy duty silver alloy contacts for power switching.
- Terminals accept AMP Faston 250 Quick-Disconnect receptacles for contacts, 110 Series for coil, or equivalent, or solder connections can be used.
- Easy mounting: One #6-32 tapped mounting hole and locating boss.



Stock Part No.	Contacts 15 Amps	COIL †Volts	*Ohms	Nominal Power	Prices 1-9
W88KDX-1	SPST-NO-DM	6VDC	25	1.5W	4.70
W88KDX-2		12VDC	100		4.70
W88KDX-3		24VDC	400		4.70
W88KDX-4		110VDC	8000		5.58
W88KADX-1	SPST-NO-DM	24VAC	—	3VA	5.50
W88KADX-2		115VAC	—		5.50
W88KADX-3		230VAC	—		5.58

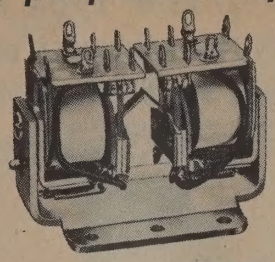
*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or le for relays and 85% of nominal or less for AC relays at 25°
††Current Specified Relays pull in at Specified Value or less.

MAGNECRAFT® ELECTRIC COMPANY • 5575 NORTH LYNCH AVENUE • CHICAGO, ILLINOIS 60630 • (312) 282-5500 • TWX 910-221-5

See YELLOW SECTION for Local Offices, Phones

Magnecraft® general purpose relays

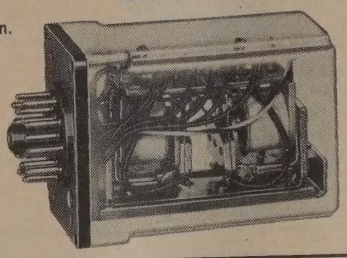
FOR IMMEDIATE DELIVERY



88 latching relay

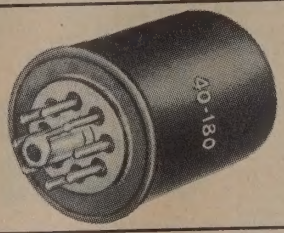
on — 4PDT and 6PDT — 10 amps.

1 1⅝″
f two Class 88 Relays with interlocking latch-in
d on a common base.
latches when pulled in. Energizing one
ses or resets the other.
old-flashed, contacts rated 10 amps at 115 volts
resistive load.
with clearance holes for #6-32 screws.
pin armature for long life and stability of operation.
z. approx.



88.CP enclosed plug-in relays — 4 PDT 10 amp

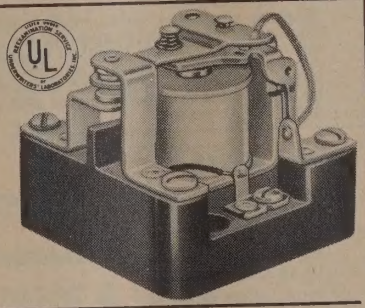
ption.
¾ x 3⅜″
ackproof, see-through plastic dust cover.
-pin octal style plug mates with std.
P-77-20 socket.



88HP hermetically sealed relay

ation — DPDT or 3PDT — 10 amps.

1 7/32 dia.
sealed to afford maximum protection against severe
nditions.
contacts, gold-flashed, rated 10 amps at 115 volts AC or
, resistive load.
tandard 8 or 11-pin octal style plug, style socket.
z. approx.

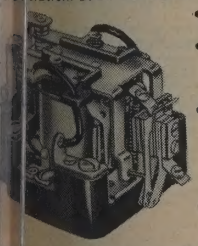


99 heavy duty power relays, listed

ration — 25 amps 1 HP.
0, and DPDT.
— 2½ x 2½ x 2⅜″,
— 2½ x 2½ x 2⅜″,
x 2½ x 2⅜″
ver alloy, gold-flashed contacts, rated at 25 amps
C or 32 VDC, resistive load, or 1 HP. AC.
hinge-pin armature for long life and stability of
Screw type terminals and molded phenolic base.
ting: Two ⅜″ diameter clearance holes on
ers.

99/power relay with aux. contacts

eration. DPDT with SPDT Aux. contacts.

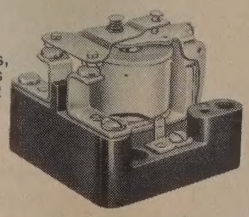


- Size: 4 3/32 x 2½ x 2⅜″
- Basic Class 99 Relay, equipped w/SPDT Auxiliary Contacts.
- DPDT power contacts rated 25 amps or 1 HP, SPDT auxiliary contacts rated 5 amps.
- Screw type terminals.

class 99D power relay

50 amps — SPST-NO-DM — 2 HP.

- Size: 2½ x 2½ x 2 3/32″
- AC or DC operation
- Oversize silver alloy, gold-flashed, contacts, rated at 50 amps at 115 VAC or 32 VDC resistive load, or 2 HP.



99S space saver power relay

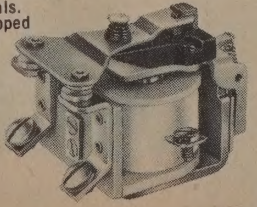
— SPDT — 1 HP.

- Size: 2⅞ x 2 x 1 15/16″
- Power switching in small space.
- One #6-32 tapped mtg. hole and locating boss.
- AC or DC operation.
- Screw terminals.
- SPDT silver alloy, gold-flashed, contacts rated at 25 amps or 1 HP.

class 99SD space saver power relay

50 amps — SPST-NO-DM — 2 HP.

- Size: 2½ x 2 x 1 15/16″
- 50 amp switching in small space.
- Screw terminals.
- One #6-32 tapped mtg. hole and locating boss.
- AC or DC operation.



ance Values ±10% at 25°C.
e Specified Relays pull in at 80% of nominal or less for DC
and 85% of nominal or less for AC relays at 25°C.

Stock Part No.	Contacts 10 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
CLASS 88L					
W88ALX-2	4PDT	6VAC	—	6VA prox.	11.98
W88ALX-3		24VAC	—		11.98
W88ALX-4		115VAC	—		11.98
W88ALX-5	6PDT	6VAC	—	6VA prox.	14.46
W88ALX-6		24VAC	—		14.46
W88ALX-7		115VAC	—		14.46
W88LX-1	4PDT	6VDC	12	3W	10.91
W88LX-2		12VDC	50		10.91
W88LX-3		24VDC	200		10.91
W88LX-4		110VDC	4000		12.26
W88LX-5	6PDT	6VDC	12	3W	13.28
W88LX-6		12VDC	50		13.28
W88LX-7		24VDC	200		13.28
W88LX-8		110VDC	4000		14.63
CLASS 88LCP					
W88ALCPX-10	4PDT (20 Pins)	6VAC	—		17.25
W88ALCPX-11		24VAC	—		17.25
W88ALCPX-12		115VAC	—		17.25
W88LCPX-9	4PDT (20 Pins)	6VDC	12		15.99
W88LCPX-10		12VDC	50		15.99
W88LCPX-11		24VDC	200		15.99
W88LCPX-12		110VDC	4000		16.26
CLASS 88HP					
W88AHPX-21	DPDT	6VAC	—	3VA	11.30
W88AHPX-22		12VAC	—		11.30
W88AHPX-23		24VAC	—		11.30
W88AHPX-24		115VAC	—		11.30
W88HPX-32	DPDT	6VDC	25	1.5W	10.77
W88HPX-33		12VDC	100		10.77
W88HPX-34		24VDC	400		10.77
W88HPX-35		110VDC	8000		11.92
W88AHPX-36	3PDT	115VAC	—	3VA	13.43
W88HPX-51		24VDC	400	1.5W	12.88

Stock Part No.	Contacts 25 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
CLASS 99					
W99AX-1	SPDT	24VAC	—	3VA	5.66
W99AX-2		115VAC	—		5.68
W99AX-3		230VAC	—		5.86
W99X-1	SPDT	6VDC	18	2.0W	5.42
W99X-2		12VDC	70		5.42
W99X-3		24VDC	290		5.44
W99X-4		110VDC	6000		5.83
W99AX-8	DPST-NO	24VAC	—	3VA	6.65
W99AX-9		115VAC	—		6.67
W99AX-10		230VAC	—		6.85
W99X-9	DPST-NO	6VDC	18	2.0W	6.36
W99X-10		12VDC	70		6.36
W99X-11		24VDC	290		6.38
W99X-12		110VDC	6000		6.77
W99AX-4	DPDT	24VAC	—	3VA	8.43
W99AX-5		115VAC	—		8.43
W99AX-6		230VAC	—		8.63
W99AX-7**		440VAC	—		8.68
W99X-5	DPDT	6VDC	18	2.0W	8.12
W99X-6		12VDC	70		8.12
W99X-7		24VDC	290		8.14
W99X-8		110VDC	6000		8.53
W99AX-15‡	DPDT (Relay)	115VAC	—	3VA	10.43
W99AX-16‡		230VAC	—		10.63

**W99AX-7 440VAC relay not UL Listed.
‡With Aux. contacts

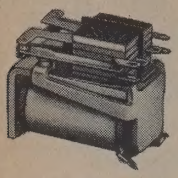
Stock Part No.	Contacts Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
CLASS 99D					
W99ADX-1	SPST-NO-DM 50 Amps	24VAC	—	3VA	5.64
W99ADX-2		115VAC	—		5.64
W99ADX-3		230VAC	—		5.85
W99DX-1	SPST-NO-DM 50 Amps	6VDC	18	2.0W	5.35
W99DX-2		12VDC	70		5.35
W99DX-3		24VDC	290		5.37
W99DX-4		110VDC	6000		5.74
CLASS 99S					
W99SAX-1	SPDT 25 Amps at 115VAC	24VAC	—	3VA	7.35
W99SAX-2		115VAC	—		7.40
W99SAX-3		230VAC	—		7.62
W99SX-1	SPDT 25 Amps at 115VAC	6VDC	18	2.0W	7.11
W99SX-2		12VDC	70		7.13
W99SX-3		24VDC	290		7.15
W99SX-4		110VDC	6000		7.47
CLASS 99SD					
W99SADX-1	SPST-NO-DM 50 Amps at 115VAC	24VAC	—	3VA	6.26
W99SADX-2		115VAC	—		6.34
W99SADX-3		230VAC	—		6.56
W99SDX-1	SPST-NO-DM 50 Amps at 115VAC	6VDC	18	2.0W	6.10
W99SDX-2		12VDC	70		6.10
W99SDX-3		24VDC	290		6.14
W99SDX-4		110VDC	6000		6.44

Magnecraft® telephone type relays

IN STOCK FOR IMMEDIATE DELIVERY

class 33

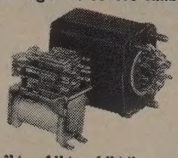
Sub-miniature 1 1/16 x 1 1/4 x 1 1/4"



- DPDT — 4PDT, 3 amp contacts.
- Hinge pin assures long life.
- Telephone type switching versatility.
- Fast operate and release time.
- Rigid mount — Four 4-40 mtg. holes.
- Weight: 1 oz.

class 33HS

Miniature Hermetically Sealed
Hermetically Sealed to Afford Maximum Protection Against Severe Ambient Conditions.

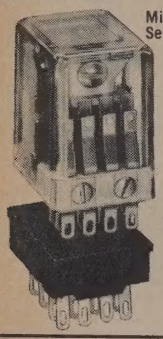


- Size: 3 1/32 x 1 11/32 x 1 41/64"
- DPDT — 4PDT 5 amp contacts.
- Telephone versatility and reliability.
- High resistance to shock and vibration.
- Widely used in military and civilian equipment.
- #4-40 3 stud mtg. — 8 or 14 pin solder terminal header.
- Weight: 3 oz.

Stock Part No.	Contacts Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
CLASS 33					
W33X237	DPDT 3 Amps	6VDC	17	2.0W	4.81
W33X238		12VDC	75		4.81
W33X239		24VDC	280		4.97
W33X240		110VDC	6500		5.56
W33X241	4PDT 3 Amps	6VDC	17	2.0W	6.58
W33X242		12VDC	75		6.58
W33X243		24VDC	280		6.63
W33X244		110VDC	6500		7.23
CLASS 33HS					
W33HSX177	DPDT 5 Amps	6VDC	17	2.0W	13.21
W33HSX178		12VDC	75		13.21
W33HSX179		24VDC	280		13.26
W33HSX180		110VDC	6500		13.87
W33HSX181	4PDT 5 Amps	6VDC	17	2.0W	16.65
W33HSX182		12VDC	75		16.65
W33HSX183		24VDC	280		16.70
W33HSX184		110VDC	6500		17.36

class 77CS

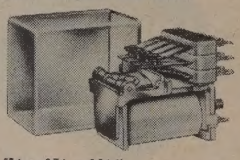
Miniature 5 amp 4PDT
See-thru Dust Cover and Sockets



- Size: 55/64 x 1 7/64 x 1 9/32"
- 70-161-1 solder terminal socket with retainer .58¢.
- 70-161-3 printed circuit terminal socket .58¢.

class 77PC

Miniature Printed Circuit Mtg.
5 amp 4PDT, See-thru Dust Cover



- Size: 55/64 x 1 7/64 x 1 9/32"
- Telephone type relays having greater contact forces, precision hinge-pin armature and unitized design assuring stabilized operation over very long life. Printed circuit type is assembled directly to P.C. board. Solder type can be soldered to directly or used with solder or P.C. socket.

CLASS 77CS

77CS Socket Terminal					
W77CSX-1‡	4PDT 5 Amps	6VDC	40	1.0W	5.30
W77CSX-2‡		12VDC	160		5.30
W77CSX-3‡		24VDC	600		5.40
W77CSX-4‡		48VDC	2500		5.55
W77CSX-5‡		110VDC	10000		5.97
W77ACSX-1‡		115VAC	—	3VA	5.96

CLASS 77PC

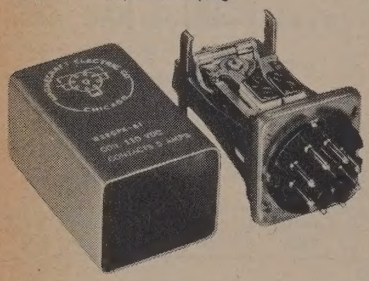
Stock Part No.**	†Nom. Coil Volt.	Coil Ohms	Prices 1-9
W77PCX-12	6VDC	40	5.60
W77PCX-13	12VDC	160	5.60
W77PCX-14	24VDC	600	5.69
W77PCX-15	48VDC	2500	5.84
W77PCX-16	110VDC	10000	5.25

** Do not order this part no. when socket is required.

class 22CP

Plug-in Removable Dust Cover
Hinge Pin Telephone Type Relay

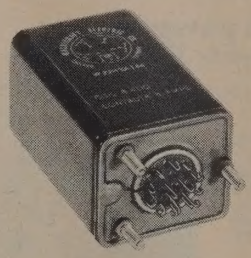
- Small: 1 7/16 x 1 41/64 x 3 3/32"
- 5 amp, DPDT, 3PDT — AC DC types.
- Long life and stable operation.
- Std. 8 or 11 pin octal plug.



class 22HS

Hermetically Sealed 5 amp 4PDT AC DC Types

- Small: 1 7/16 x 1 5/8 x 2 11/16"
- Long life hinge pin construction.
- Herm. sealed against severe ambient cond.
- #6-32 — 3 stud mtg.
- 14 pin solder terminals.



CLASS 22CP

Stock Part No.	Contacts 5 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
Alternating current voltage actuated					
W22ACPX60	DPDT	115VAC	—	5VA	23
Direct current voltage actuated					
W22CPX49	DPDT	12VDC	80	2.0W	85
W22CPX50		24VDC	375	1.5W	90
W22CPX51		110VDC	8000	1.5W	14
W22CPX54	3PDT	24VDC	375	1.5W	92
W22CPX56	DPDT	4.5MA	10000	200MW	14

CLASS 22HS

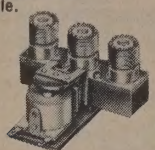
Alternating current voltage actuated					
W22AHSX32	4PDT	115VAC	—	5VA	1.80
Direct current voltage actuated					
W22HSX144	4PDT	6VDC	20	2.0W	1.0
W22HSX145		12VDC	80	2.0W	1.0
W22HSX146		24VDC	375	1.5W	1.5

Magnecraft® coaxial relays

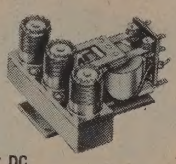
IN STOCK FOR IMMEDIATE DELIVERY

class 128

- Size: 2 7/8 x 2 5/8 x 1 7/16"
- SPDT RF switching silver alloy contacts.
- Rated 100 watts of RF power.
- Impedance matched to 50 ohms cable.
- Equipped with std. UHF connectors.
- VSWR 1.25: 1 max. from 0 to 500 MC.
- Operate Time: 25 ms. max.
- Long life hinge pin construction.
- Coaxial cavity, machined brass, with removable plug, for contact inspection.
- AC or DC operation.
- Release Time: 25 ms. max.
- 4-40 thd. — 4 mtg. holes.



CLASS 128
Coaxial Relay



CLASS 128
Coaxial Relay
with 10 amp DPDT
Aux. Contacts

CLASS 128

Stock Part No.	Coaxial Contacts	COIL †Volts	COIL *Ohms	Nominal Power	Prices
Class 128 Relay					
W128AX-7	SPDT	115VAC	—	—	16.7
W128X-9	SPDT	12VDC	100	—	18.3
W128X-10	SPDT	24VDC	400	—	18.0
Class 128 Relay with DPDT Auxiliary Contacts					
W128AX-11	SPDT	115VAC	—	—	20.0
W128X-14	SPDT	12VDC	100	—	20.0
W128X-15	SPDT	24VDC	400	—	20.0

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays and 85% of nominal or less for AC relays at 25°C.
††Current Specified Relays pull in at Specified Value or less.

Magnecraft® miniature dry reed relays

IN STOCK FOR IMMEDIATE DELIVERY

class 101M & 104M

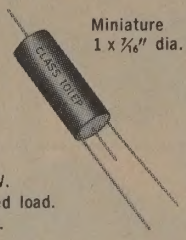
Miniature 1 x ½ x 7/16"

LOW COST

- SPST-NO — .05 amp.
- SPDT — 25 amp.
- Axial lead.
- Bobbin.
- Power: 101M, 600 MW; 104M, 700 MW.
- Life: 10 x 10⁶ at rated load.
- Weight: 1 oz. approx.

class 101EP & 104EP

Miniature 1 x 7/16" dia.



- 101EP — SPST-NO — 10 VA @ .5 amp.
- 104EP — SPDT — 3 VA @ .25 amp.
- In-line axial lead.
- Encapsulated.
- Nom. Power: 600 MW.
- Life: 10 x 10⁶ at rated load.
- Weight: 1 oz. approx.

class 101PC & 104PC

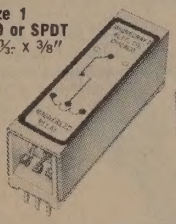
Size 1
SPST-NO or SPDT
1 x ½ x 9/16"

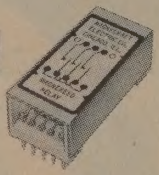
Size 2
DPST-NO or DPDT
1½ x 11/16 x 9/16"

- 101PC — 10 VA @ .5 amp.
- SPST-NO — DPST-NO.
- 104PC — 3 VA @ .25 amp.
- SPDT — DPDT.
- Encapsulated — Printed circuit mtg.
- Nom. Power: Size 1: 600 MW; Size 2: 900 MW.
- Life: 10 x 10⁶ at rated load.
- Weight: Size 1: 1 oz.; Size 2: 1 oz. approx.

class 101MPC & 104MPC

Size 1
SPST-NO or SPDT
1⅛ x 13/32 x ⅜"





Size 2
3PST-NO or DPDT
1⅛ x 39/64 x ⅜"

- 101MPC — 10 VA @ .5 amp.
- SPST-NO or 3PST-NO.
- 104MPC — 3 VA @ .25 amp.
- SPDT or DPDT.
- Printed circuit mtg. — Low profile.
- Nom. Power: Size 1: 500 MW; Size 2: 700MW.
- Life: 10 x 10⁶ at rated load.
- Weight: Size 1: 1 oz.; Size 2: 2 oz. approx.

Stock Part No.	Contacts	COIL — DC ‡MA	†Volts	*Ohms	Prices 1-24
W101MX-1	SPST-NO	—	6	100	2.20
W101MX-2		—	12	250	2.25
W101MX-3		—	24	500	2.25
W101MX-4		9	—	2500	2.43
W104MX-1	SPDT	—	6	100	5.63
W104MX-2		—	12	250	5.68
W104MX-3		—	24	500	5.68
W104MX-4		9	—	2500	5.87
W101EPX-5	SPST-NO	—	6	65	3.62
W101EPX-6		—	12	225	3.62
W101EPX-7		—	24	1000	4.24
W101EPX-8		8	—	5000	4.68
W104EPX-2	SPDT	—	6	65	7.37
W104EPX-3		—	12	225	7.37
W104EPX-4		—	24	1000	8.05
W104EPX-5		8	—	5000	8.55
W101PCX-5	SPST-NO Size 1	—	6	65	5.11
W101PCX-6		—	12	250	5.16
W101PCX-7		—	24	1000	5.26
W101PCX-8		8	—	5000	5.68
W104PCX-7	SPDT Size 1	—	6	65	10.07
W104PCX-8		—	12	225	10.12
W104PCX-9		—	24	1000	10.22
W104PCX-10		8	—	5000	10.64
W101PCX-9	DPST-NO Size 2	—	6	40	7.15
W101PCX-10		—	12	150	7.18
W101PCX-11		—	24	650	7.24
W101PCX-12		8	—	5000	7.69
W104PCX-3	DPDT Size 2	—	6	40	14.59
W104PCX-4		—	12	150	14.62
W104PCX-5		—	24	650	14.68
W104PCX-6		8	—	5000	15.13
W101MPCX-1	SPST-NO	—	6	70	3.60
W101MPCX-2		—	12	300	3.60
W101MPCX-3		—	24	1100	3.63
W101MPCX-4		—	48	4300	3.77
W104MPCX-1	SPDT Size 1	—	6	70	6.82
W104MPCX-2		—	12	300	6.83
W104MPCX-3		—	24	1100	6.85
W104MPCX-4		—	48	4300	6.98
W101MPCX-5	3PST-NO Size 2	—	6	50	6.75
W101MPCX-6		—	12	220	6.75
W101MPCX-7		—	24	850	6.77
W101MPCX-8		—	48	3300	6.85
W104MPCX-5	DPDT Size 2	—	6	50	11.62
W104MPCX-6		—	12	220	11.63
W104MPCX-7		—	24	850	11.65
W104MPCX-8		—	48	3300	11.73

Magnecraft® standard reed relays

IN STOCK FOR IMMEDIATE DELIVERY

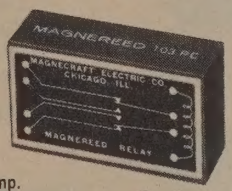
102M & 103M

Size
13/32 x ½"

- SPST-NO, 1 @ 1 amp.
- SPDT, 10 VA @ .5 amp.
- Axial lead.
- Bobbin.
- Power: 300 MW.
- Life: 20 x 10⁶ at rated load.
- Weight: 1 oz. approx.

class 102PC & 103PC

Size 1
SPST-NO or SPDT
2¼ x 21/32 x ⅝"



Size 2
DPST-NO or DPDT
2¼ x 1¼ x ⅝"

- 102PC — 15 VA @ 1 amp.
- SPST-NO or DPST-NO.
- 103PC — 10 VA @ .5 amp.
- SPDT or DPDT.
- Encapsulated — Printed circuit mtg.
- Nom. Power: Size 1: 400 MW. Size 2: 700 MW.

Life: 20 x 10⁶ at rated load.
Weight: Size 1: 1 oz. — Size 2: 2 oz.

class 102MPC & 103MPC

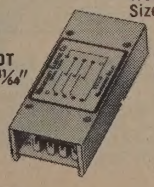
- 102MPC — 15 VA @ 1 amp. Size 1: SPST-NO — Size 2: 3PST-NO — Size 3: 6PST-NO.
- 103MPC — 10 VA @ .5 amp. Size 1: SPDT — Size 2: DPDT — Size 3: 4PDT.
- Printed circuit mtg. — low profile.
- Nom. Power: Size 1: 500 MW — Size 2: 750 MW — Size 3: 1.5 W.

Life: 20 x 10⁶ at rated load.

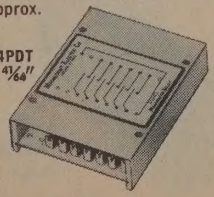
- Weight: Size 1: 1 oz. — Size 2: 2 oz. — Size 3: 3 oz. approx.

Size 1
SPST or SPDT
1 x 41/64"

Size 2
3PST or DPDT
2⅝ x 1 13/16 x 41/64"



Size 3
6PST-NO or 4PDT
3⅝ x 1 31/32 x 41/64"



Stock Part No.	Contacts	COIL — DC ‡MA	†Volts	*Ohms	Prices 1-24
W102MX-1	SPST-NO	40	—	100	2.18
W102MX-2		—	6	200	2.25
W102MX-3		—	12	500	2.25
W102MX-4		—	24	2000	2.47
W102MX-5		5.5	—	5000	2.63
W103MX-1	SPDT	—	6	200	4.23
W103MX-2		—	12	500	4.23
W103MX-3		—	24	2000	4.45
W103MX-4		5.5	—	5000	4.62
W102PCX-1	SPST-NO Size 1	—	6	100	4.77
W102PCX-2		—	12	400	4.83
W102PCX-3		—	24	1500	4.87
W102PCX-4		6.5	—	5000	5.32
W103PCX-1	SPDT Size 1	—	6	100	7.22
W103PCX-2		—	12	400	7.27
W103PCX-3		—	24	1500	7.32
W103PCX-4		6.5	—	5000	7.76
W102PCX-5	DPST-NO Size 2	—	6	50	6.22
W102PCX-6		—	12	200	6.28
W102PCX-7		—	24	800	6.33
W102PCX-8		9	—	5000	6.78
W103PCX-5	DPDT Size 2	—	6	50	10.77
W103PCX-6		—	12	200	10.79
W103PCX-7		—	24	800	10.84
W103PCX-8		9	—	5000	11.31
W102MPCX-5	SPST-NO	140	—	30	3.29
W102MPCX-6		—	6	70	3.29
W102MPCX-7		—	12	250	3.29
W102MPCX-8		—	24	1000	3.29
W102MPCX-9		—	48	4000	3.46
W102MPCX-10		9	—	7000	4.14
W102MPCX-48	3PST-NO	—	6	50	5.62
W102MPCX-49		—	12	175	5.63
W102MPCX-50		—	24	750	5.77
W102MPCX-51		—	48	3000	5.97
W102MPCX-52	6PST-NO	—	6	25	9.18
W102MPCX-53		—	12	100	9.30
W102MPCX-54		—	24	375	9.35
W102MPCX-55		—	48	1500	9.43
W103MPCX-1	SPDT	140	—	30	5.83
W103MPCX-2		—	6	70	5.83
W103MPCX-3		—	12	250	5.83
W103MPCX-4		—	24	1000	5.83
W103MPCX-5		—	48	4000	6.00
W103MPCX-6		9	—	7000	6.68
W103MPCX-30	DPDT	—	6	50	8.33
W103MPCX-31		—	12	175	8.33
W103MPCX-32		—	24	750	8.47
W103MPCX-33		—	48	3000	8.67
W103MPCX-34	4PDT	—	6	25	14.60
W103MPCX-35		—	12	100	14.70
W103MPCX-36		—	24	375	14.77
W103MPCX-37		—	48	1500	14.88

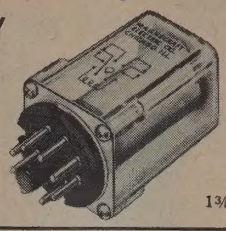
*Resistance Values ±10% at 25°C.
‡Voltage Specified Relays pull in at 80% of nominal or less for DC relays at 25°C.
†Current Specified Relays pull in at Specified Value or less.

Magnecraft® *reed relays*

IN STOCK FOR IMMEDIATE DELIVERY

class 103CP plug-in mtg.

10 VA @ 0.5 amp.
DPDT or 3PDT.
8 or 11 Pin Octal Style Plug.
Nom. Power: DPDT 500 MW — 3PDT 800 MW.
Life: 25 x 10^6 at rated load.
Weight: 5 oz. approx.

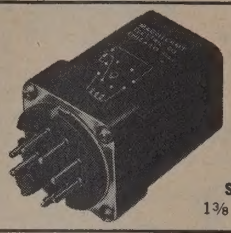


Small Size
1⅜ x 1⅜ x 2⅜"

Stock Part No.	Contacts	COIL — DC ‡MA	†Volts	*Ohms	Prices 1-24
W103CPX-7	DPDT	—	6	75	2.92
W103CPX-8		—	12	300	2.95
W103CPX-9		—	24	1000	3.01
W103CPX-10		8	—	5000	3.57
W103CPX-11	3PDT	—	6	40	6.77
W103CPX-12		—	12	150	6.83
W103CPX-13		—	24	650	6.95
W103CPX-14		10	—	5000	7.50

††class 103LCP plug-in mtg.

Latching-Bi-Stable.
SPDT 10 VA @ 0.2 amp.
Single and Double Wound Coils.
8 or 11 Pin Octal Style Plug.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10 at rated load.
Weight: 5 oz. approx.

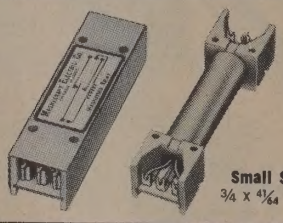


Small Size
1⅜ x 1⅜ x 2 11/16"

Single Wound Coils					
W103LCPX-7	SPDT	—	6	250	1.30
W103LCPX-8		—	12	1000	1.33
W103-LCPX-9		—	24	4000	1.57
W103LCPX-10		4	—	7000	1.80
Double Wound Coils					
W103LCPX-11	SPDT	—	6	120/120	1.87
W103LCPX-12		—	12	460/460	1.97
W103LCPX-13		—	24	1800/1800	2.02
W103LCPX-14		8	—	3000/3000	2.32

††class 103LMPC

Latching-Bi-Stable.
SPDT 10 VA @ 0.2 amp.
Single and Double Wound Coils.
Molded Bobbin and Steel Cover.
Printed Circuit Mtg. — Low Profile.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10^6 at rated load.
Weight: 1 oz. approx.

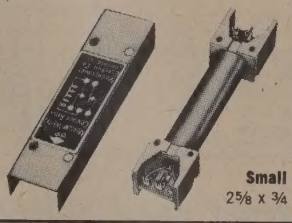


Small Size
¾ x 41/64 x 2⅝"

Single Wound Coils					
W103LMPCX-3	SPDT	40	—	70	1.07
W103LMPCX-4		—	6	250	1.07
W103LMPCX-5		—	12	1000	1.07
W103LMPCX-6		—	24	4000	1.26
W103LMPCX-7		4	—	7000	1.61
Double Wound Coils					
W103LMPCX-8	SPDT	80	—	30/30	1.22
W103LMPCX-9		—	6	120/120	1.33
W103LMPCX-10		—	12	460/460	1.33
W103LMPCX-11		—	24	1800/1800	1.00
W103LMPCX-12		8	—	3000/3000	1.04

††class 133LMPC

Latching-Bi-Stable.
SPDT 50 VA @ 2 amp.
Mercury Wetted Contacts.
Single and Double Wound Coils.
Molded Bobbin — Steel Cover.
Printed Circuit Mtg.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10^6 at rated load.



Small Size
2⅝ x ¾ x 41/64"

Single Wound Coils					
W133LMPCX-17	SPDT	40	—	70	1.37
W133LMPCX-18		—	6	250	1.38
W133LMPCX-19		—	12	1000	1.92
W133LMPCX-20		—	24	4000	1.17
W133LMPCX-21		4	—	7000	1.17
Double Wound Coils					
W133LMPCX-22	SPDT	80	—	30/30	1.23
W133LMPCX-23		—	6	120/120	1.15
W133LMPCX-24		—	12	460/460	1.12
W133LMPCX-25		—	24	1800/1800	1.12
W133LMPCX-26		8	—	3000/3000	1.10

class 105MPC

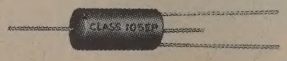
SPST-NO 0.1 VA @ 10 MA.
Printed Circuit Mtg. — Low Profile.
Molded Bobbin — Steel Cover.
Nom. Power: 300 MW.
Life: 25 x 10^6 at rated load.
Weight: 1 oz. approx.

Micro-Miniature
⅝ x 5/16 x 11/32"

W105MPCX-1	SPST-NO	—	6	120	.5
W105MPCX-2		—	12	500	.7
W105MPCX-3		—	24	2000	.8

class 105EP

SPST-NO 0.1 VA @ 10 MA.
Encapsulated-In-Line Axial Leads.
Nom. Power: 400 MW.
Life: 10 x 10^6 at rated load.
Weight: 1 oz. approx.



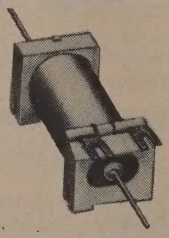
Micro-Miniature
7/16 x ¼" dia.

W105EPX-1	SPST-NO	—	6	90	.63
W105EPX-2		—	12	350	.63
W105EPX-3		—	24	1300	.60

I.C. compatible reed relays

class/101M & 104M

SPST-NO, 101M — 10 VA @ 0.5 amp.
SPDT, 104M — 3 V @ 0.25 amp.
In-Line Axial Lead.
Molded Bobbin.
Nom. Power: 40 MW (Sensitive).
Life: 5 x 10^6 at rated load.
Weight: 1 oz. approx.

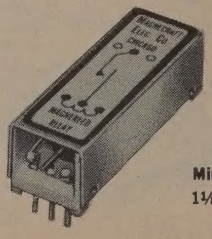


Miniature Size
2¼ x ½ x 7/16"

Stock Part No.	Contacts	Max. Pick-up Voltage	COIL — DC Volts	*Ohms	Prices 1-
CLASS 101M					
W101MX-35	SPST-NO	4VDC	5	500	2.
W101MX-41		2.4VDC	3	250	2.
CLASS 104M					
W104MX-9	SPDT	4VDC	5	500	6.
W104MX-10		2.4VDC	3	250	6.
CLASS 101MPC					
W101MPCX-104	SPST-NO	4VDC	5	450	4.
CLASS 104MPC					
W104MPCX-46	SPDT	4VDC	5	300	7.

class 101MPC & 104MPC

SPST-NO 101MPC — 10 VA @ 0.5 amp.
SPDT 104MPC — 3 VA @ 0.25 amp.
Printed Circuit — Low Profile.
Molded Bobbin and Steel Cover.
Nom. Power: 101MPC 40 MW, 104MPC 50 MW.
Life: 5 x 10^6 at rated load.
Weight: 1 oz. approx.



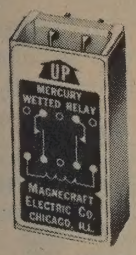
Miniature Size
1⅛ x 11/32 x ⅜"

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nomina
less for DC relays at 25°C.
††Single Wound Coil — Switching by reversing polari
Double Wound Coil — Switching by use of dual inp
‡Current specified relays pull-in at specified values
less.

Magnecraft® mercury wetted relay

IN STOCK FOR IMMEDIATE DELIVERY

class 131MPC



Size 1
SPST-NO
1½ x ½ x 9/16"

Size 2
DPST-NO
1⅛ x 39/64 x ⅜"

28 VA @ 1 amp.
Encapsulated — Miniature.
Mercury Wetted Contacts.
Printed Circuit Mtg. — Low Profile.
Operation Position: Upright.
Nom. Power: Size 1 — 600 MW, Size 2 — 900 MW.
Life: 25 x 10^6 at rated load.
Wt. Size 1: 1 oz. — Size 2: 2 oz.

Stock Part No.	Contacts	COIL—DC †Volts	COIL—DC *Ohms	PRICES 1-24
W131MPCX-2	SPST-NO	6	70	6.40
W131MPCX-3		12	300	6.48
W131MPCX-4		24	1100	6.53
W131MPCX-5		48	4300	6.98
W131MPCX-6	DPST-NO	6	50	11.53
W131MPCX-7		12	220	11.58
W131MPCX-8		24	850	11.65
W131MPCX-9		48	3300	11.93

Stock Part No.	Contacts	COIL—DC ††MA	COIL—DC †Volts	COIL—DC *Ohms	PRICES 1-24
W131PCX-8	SPST-NO	—	6	65	8.38
W131PCX-9		—	12	250	8.44
W131PCX-10		—	24	1000	8.55
W131PCX-11		8	—	5000	9.01
W131PCX-12	DPST-NO	—	6	40	10.62
W131PCX-13		—	12	150	10.66
W131PCX-14		—	24	650	10.71
W131PCX-15		8	—	5000	11.21
W132MPCX-1	SPST-NO	140	—	30	5.83
W132MPCX-2		—	6	70	5.83
W132MPCX-3		—	12	250	5.83
W132MPCX-4		—	24	1000	5.83
W132MPCX-5		—	48	4000	6.00
W132MPCX-6		9	—	7000	6.68
W133MPCX-1	SPDT	140	—	30	8.42
W133MPCX-2		—	6	70	8.42
W133MPCX-3		—	12	250	8.42
W133MPCX-4		—	24	1000	8.42
W133MPCX-5		—	48	4000	8.60
W133MPCX-6		9	—	7000	9.35

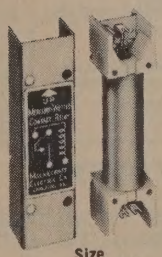
Size 1
ST-NO
1 1/32 x 3/8"

VA @ amp.
Miniature
Mercury tted Contacts.
Printed bin and Steel Cover.
Low Pr uit Mtg. —
Operatin le.
Contact osition: Upright.
Nom. Po : Size 1 — 500 MW,
Size 2 700 MW.
Life: 25 0^6 at rated load.
Wt. Size 1 1 oz. — Size 2: 2 oz.

132MPC & 133MPC

32MPC SPST-NO — 50 VA @ 3 amp.
33MPC SPDT — 50 VA @ 2 amp.
Operatin osition: Upright.
Printed uit Mtg.

Molded Bobbin and Steel Cover.
Nom. Power: 500 MW.
Life: 25 x 10^6 at rated load.
Weight: 2 oz. approx.

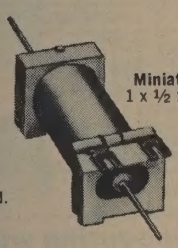


Size
2⅝ x ¾ x 41/64"

Magnecraft® high voltage reed relays

IN STOCK FOR IMMEDIATE DELIVERY

101VM

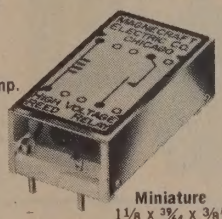


Miniature
1 x ½ x 7/16"

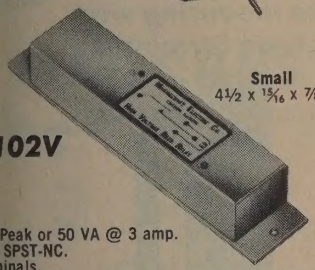
00 Peak @
.001 p.
- Hi-Voltage.
al Leads.
bbin.
er 600 MW.
0^6 at rated load.
oz. approx.

class 101VMPC

1,000 volts Peak @ .001 amp.
SPST-NO — Hi-Voltage.
Printed Circuit Mtg. — Low Profile.
Nom. Power: 700 MW.
Life: 1 x 10^6 at rated load.
Weight: 2 oz. approx.



Miniature
1⅛ x 39/64 x ⅜"



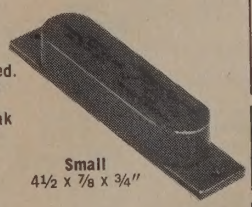
Small
4½ x 15/16 x ⅞"

102V

ts Peak or 50 VA @ 3 amp.
or SPST-NC.
rminals.
ver: SPST-NO — 500 MW, SPST-NC — 225 MW.
x 16^6 at rated load.
3 oz. approx.

class 102HV & 102UHV

Molded Case — Encapsulated.
102HV — 10,000 volts Peak @ .001 amp.
102UHV — 20,000 volts Peak @ .001 amp.
SPST-NO — Hi-Voltage.
102HV Solder Terminals — 102UHV 6" Coil Leads.
Nom. Power: 1.5 W.
Life: 1 x 10^6 at rated load.
Weight: 2 oz. approx.



Small
4½ x ⅞ x ¾"

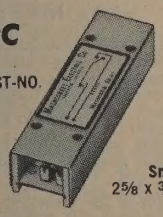
Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W101VMX-1	SPST-NO	—	6	100	10.90
W101VMX-2		—	12	250	10.92
W101VMX-3		—	24	500	10.93
W101VMX-4		9	—	2500	11.12
W101VMPCX-1	SPST-NO	—	6	50	11.90
W101VMPCX-2		—	12	220	11.97
W101VMPCX-3		—	24	850	12.00
W101VMPCX-4		—	48	3300	12.22
W102VX-9	SPST-NO	140	—	30	13.69
W102VX-10		—	6	70	13.69
W102VX-11		—	12	250	13.73
W102VX-12		—	24	1000	13.78
W102VX-13		—	48	4000	14.15
W102VX-14		9	—	7000	14.58

Stock Part No.	Contacts	COIL — DC †Volts	COIL — DC *Ohms	Nominal Power	Prices 1-24
W102VX-26	SPST-NC	24	2900	225mw	16.76

Magnecraft® power reed relays

IN STOCK FOR IMMEDIATE DELIVERY

102RMPC

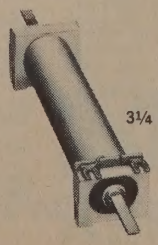


00 1 @ 3 amps — SPST-NO.
rint Circuit Mtg. —
Low rofile.
old Bobbin and
St Cover.
om ower:
50 W.
eig 1 oz.
ap k.

Small
2⅝ x ¾ x 41/64"

class 102RM

100 VA @ 3 amps — SPST-NO.
Molded Bobbin.
In-Line Axial Leads
Nom. Power: 300 MW.
Weight: 1 oz. approx.



Small
3¼ x 19/32 x ½"

Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W102HVX-1	SPST-NO	—	6	25	19.88
W102HVX-2		—	12	100	19.88
W102HVX-3		—	24	400	19.88
W102UHVX-1	SPST-NO	—	6	25	33.62
W102UHVX-2		—	12	100	33.62
W102UHVX-3		—	24	400	33.62
W102RMPCX-1	SPST-NO	—	6	70	7.87
W102RMPCX-2		—	12	250	7.88
W102RMPCX-3		—	24	1000	7.93
W102RMPCX-4		—	48	4000	8.18
W102RMX-5	SPST-NO 3-amps.	—	6	200	4.18
W102RMX-6		—	12	500	4.22
W102RMX-7		—	24	2000	4.33
W102RMX-8		—	48	5000	4.53

tance Values ±10% at 25°C.
ge Specified Relays pull in at 80% of nominal or less for DC
at 25°C.
nt Specified Relays pull in at Specified Value or less.

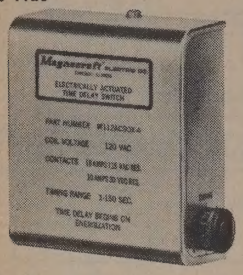
AGNECRAFT® ELECTRIC COMPANY • 5575 NORTH LYNCH AVENUE • CHICAGO, ILLINOIS 60630 • (312) 282-5500 • TWX 910-221-5221

Magnecraft® time delay relays and switches

IN STOCK FOR IMMEDIATE DELIVERY

air dashpot time delay relay

CLASS 112C



Size 3 3/16 x 4 3/16 x 1 3/4"

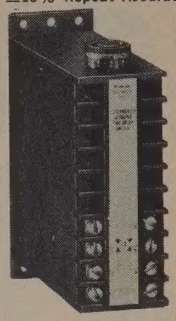
- DPDT 10 amp output contacts.
- ±10% repeat accuracy.
- Adjustable delay 1 to 150 sec.
- Mounting: Two 3/16" holes on 3" centers.
- Air dashpot delay mechanism.
- Weight: 20 oz. approx.

CLASS 113C

Size 3 5/8 x 2 1/16 x 1 3/32"

- SPDT 10 amp output contacts.
- Manually operated.
- Push button . . . release bottom . . . time delay is on adjustable delay 1 to 180 sec.
- Weight: 8 oz. approx.

CLASS 112M
±10% Repeat Accuracy



Size 4 1/2 x 4 1/32 x 1 1/2"

- DPDT 10 amp output contacts.
- ±10% repeat accuracy.
- Adjustable delay 1 to 150 sec.
- Mounting: Six 3/16" holes 1/2" x 4 1/8" centers.
- Air dashpot delay mechanism.
- Weight: 14 oz. approx.

Stock Part No.	Contacts 10 Amps	COIL †Volts	COIL *Ohms	Price 1-9
		SLOW OPERATE		
W112ACSOX-4		120VAC	—	24.3
W112CSOX-3	DPDT	24VDC	80	24.3
		SLOW RELEASE		
W112ACSRX-4		120VAC	—	24.3
W112CSRX-3	DPDT	24VDC	80	24.3

Operate and release delay adjustable 1-150 sec.

Stock Part No.	Contacts 10 Amps	COIL †Volts	COIL *Ohms	Adjustment Type	Price 1
		SLOW OPERATE			
W112MASOX-1		120VAC	—	Knob	28.
W112MASOX-2	DPDT	120VAC	—	Screw	28.
W112MSOX-2		24VDC	80	Knob	28.
W112MSOX-3	DPDT	24VDC	80	Screw	28.
		SLOW RELEASE			
W112MASRX-1		120VAC	—	Knob	28.
W112MASRX-2	DPDT	120VAC	—	Screw	28.
W112MSRX-1		24VDC	80	Knob	28.
W112MSRX-2	DPDT	24VDC	80	Screw	28.

Operate and Release Delay Adjustable 1-150 seconds.

Stock Part No.	Contact Comb.	Contact Rating	Timing Range	Button Diameter	Price 1 —
W113CX-1	SPDT	10 Amps	1-180 Sec.	1/2" Dia.	12.9

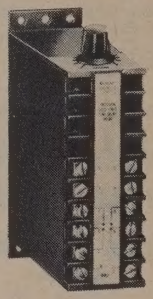
solid state (hybrid) time delay relays

CLASS 211CP

Stock Part No.	Contacts 10 Amps	Coil Voltage	Time Delay	Prices 1-9
		Operate Delay		
W211ACPSOX-18			.2-1 Second	$18.98
W211ACPSOX-5			1-10 Second	18.98
W211ACPSOX-7	DPDT	120 VAC	1-180 Second	18.98
W211ACPSOX-8			2-300 Second	18.98
W211CPSOX-10			.2-1 Second	18.98
W211CPSOX-1			1-10 Second	18.98
W211CPSOX-3	DPDT	24 VDC	1-180 Second	18.98
W211CPSOX-4			2-300 Second	18.98
		Release Delay		
W211ACPSRX-14			.2-1 Second	22.93
W211ACPSRX-5			1-10 Second	22.93
W211ACPSRX-7	DPDT	120 VAC	1-180 Second	22.93
W211ACPSRX-8	WD-12		2-300 Second	22.93
W211CPSRX-9			.2-1 Second	22.93
W211CPSRX-1	DPDT		1-10 Second	22.93
W211CPSRX-3	WD-12	24 VDC	1-180 Second	22.93
W211CPSRX-4			2-300 Second	22.93

- Size 2 7/8 x 2 3/8 x 1 3/4".
- DPDT 10 amp output contacts.
- ±5% repeat accuracy.
- Adjustable delay up to 300 sec.
- 8 or 11 pin octal style plug.
- Solid state timing circuit.
- Weight: 10 oz. approx.

CLASS 211M
±5% Repeat Accuracy

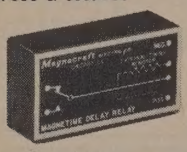


- Size 4 1/2 x 4 1/32 x 1 1/2".
- DPDT 10 amp output contacts.
- ±5% repeat accuracy.
- Adjustable delay up to 300 sec.
- Mounting: Six 3/16" holes 1/2" x 4 1/8" centers.
- Solid state timing circuit.
- Weight: 10 oz. approx.

Stock Part No.	Cont. 10 Amp	Nominal Voltage	Timing Range	Price 1-9
		TIME DELAY ON OPERATE		
W211MASOX-1			.2-1	24.5
W211MASOX-2	DPDT	120 VAC	1.0-10	24.5
W211MASOX-3			1.0-180	24.5
W211MASOX-4			2.0-300	24.5
W211MSOX-1			.2-1	24.5
W211MSOX-2	DPDT	24 VDC	1.0-10	24.5
W211MSOX-3			1.0-180	24.5
W211MSOX-4			2.0-300	24.5
		TIME DELAY ON RELEASE		
W211MASRX-1			.2-1	28.9
W211MASRX-2	DPDT	120 VAC	1.0-10	28.9
W211MASRX-3			1.0-180	28.9
W211MASRX-4			2.0-300	28.9
W211MSRX-1			.1-1	28.9
W211MSRX-2	DPDT	24 VDC	1.0-10	28.9
W211MSRX-3			1.0-180	28.9
W211MSRX-4			2.0-300	28.9

printed circuit mounting

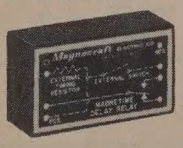
CLASS 502PCSO & 503PCSO



Size 2 1/4 x 1 1/4 x 3/4"

- 15 VA @ 1 amp SPST-NO, 10 VA @ .5 amp SPDT reed output contacts.
- Repeat Accuracy: Slow operate ±5%.
- Adjustable delay up to 5 minutes, using a remote pot, or fixed resistor.
- Printed circuit mtg.
- Encapsulated solid state timing circuit.

CLASS 502PCSR & 503PCSR



Size 2 1/4 x 1 1/4 x 3/4"

- 15 VA @ 1 amp SPST-NO, 10 VA @ .5 amp SPDT reed output contacts.
- Repeat Accuracy: Slow release ±2%.
- Adjustable delay up to 5 minutes, using a remote pot, or fixed resistor.
- Printed circuit mtg.
- Encapsulated solid state timing circuit.

SLOW OPERATE

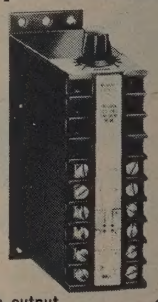
Stock Part No.	Volts DC ± 15%	Timing Range	*External Adjustment	Prices 1-9
		SPST-NO (Form A)		
W502PCSOX-2	12	100 m sec. to 100 sec.	60K ohm/sec.	18.96
W502PCSOX-3	24	100 m sec. to 100 sec.	60K ohm/sec.	18.96
W502PCSOX-5	12	3 sec. to 5 min.	10K ohm/sec.	21.30
W502PCSOX-6	24	3 sec. to 5 min.	10K ohm/sec.	21.30
		SPDT (Form C)		
W503PCSOX-2	12	100 m sec. to 100 sec.	60K ohm/sec.	20.82
W503PCSOX-3	24	100 m sec. to 100 sec.	60K ohm/sec.	20.82
W503PCSOX-5	12	3 sec. to 5 min.	10K ohm/sec.	22.31
W503PCSOX-6	24	3 sec. to 5 min.	10K ohm/sec.	22.31

SLOW RELEASE

Stock Part No.	Volts DC ± 15%	Timing Range	*External Adjustment	Prices 1-9
		SPST-NO (Form A)		
W502PCSRX-2	12	200 m sec. to 100 sec.	25K ohm/sec.	26.73
W502PCSRX-3	24	200 m sec. to 100 sec.	25K ohm/sec.	26.73
W502PCSRX-5	12	1 sec. to 5 min.	6.5K ohm/sec.	29.84
W502PCSRX-6	24	1 sec. to 5 min.	6.5K ohm/sec.	29.84
		SPDT (Form C)		
W503PCSRX-2	12	200 m sec. to 100 sec.	25K ohm/sec.	28.59
W503PCSRX-3	24	200 m sec. to 100 sec.	25K ohm/sec.	28.59
W503PCSRX-5	12	1 sec. to 5 min.	6.5K ohm/sec.	31.70
W503PCSRX-6	24	1 sec. to 5 min.	6.5K ohm/sec.	31.70

*External Resistor and/or switch, not furnished.

surface mounting with screw type terminals



CLASS 212M
±1% Repeat

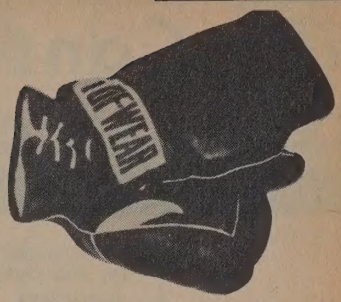
Size 4 1/2 x 4 1/32 x 1 1/2"

- DPDT 10 amp output contacts.
- ±1% repeat accuracy.
- Adjustable delay up to 500 sec.
- Mounting: Six 3/ 1/2" x 4 1/8" cent
- Solid state timi circuit
- Weight: 10 oz. a

Stock Part Number	Input Voltage	Time Delay	Mode Of Operation	Pri
W212MASOX-2	120VAC	.5 - 10 Sec.	Slow Operate	3
W212MASOX-3	120VAC	5 - 100 Sec.	Slow Operate	3
W212MASOX-4	120VAC	50 - 500 Sec.	Slow Operate	4
W212MASRX-2	120VAC	.5 - 10 Sec.	Slow Release	4
W212MASRX-3	120VAC	5 - 100 Sec.	Slow Release	4
W212MASRX-4	120VAC	50 - 500 Sec.	Slow Release	4

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or l DC relays and 85% of nominal or less for AC relays at

OMPETITIVE!



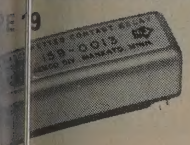
petit e is the word! Midtex/AEMCO is competitive in range of products com itive in price . . . competitive in delivery dates . . . and competitive esign now-how. Get the sort of broad range support you need from a e so ce. We welcome the opportunity to compete "glove-to-nose" any f the giants in the relay and timer business!

INDUSTRIAL

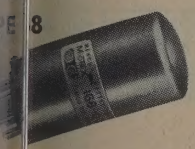
	TYPE 155	TYPE 156	TYPE 157	TYPE 48 *Single Coil Latching Action*
C TACTS	U/L Recognized 1, 2, & 3 PDT 5 & 10 amp	U/L Recognized 1, 2, 3 & 4 PDT Low Level to 3 amp	1, 2 & 3 PDT 5 & 10 amp	1 & 2 PDT 10 amp
C S	6 to 240 VAC 6 to 110 VDC	6 to 240 VAC 6 to 110 VDC	6 to 240 VAC 6 to 110 VDC	6 to 240 VAC 6 to 110 VDC
E LOSURES	Open and Dust Cover	Dust Cover	Open and Dust Cover	Open
T MINALS	Solder, Plug-in, Wire-wrap, 3/16" Quick Disconnect	Solder/Plug-in, Printed Circuit, #78 Taper Tab	Solder/Plug-in/ 3/16" Quick Disconnect	Solder, 3/16" Quick Disconnect

MERCURY WETTED

E 19



E 8



CONTACTS
1 Form C or 1 Form D, Mercury Wetted, Bi-stable or Mono-stable, 2 amp max., 500 V max., 100 VA max.

COILS
Single Wound 0.28 to 120 VDC
0.10 to 220 VDC
Double Wound 1.2 to 86 VDC
0.20 to 150 VDC

TERMINALS
Printed Circuit Octal Plug

ELECTRONIC TIME DELAY

TYPE 615

ADJUSTABLE DELAY FIXED DELAY

IN-PUT VOLTAGES
12, 24, 48 VDC
120 VAC

CONTACTS
1 to 3 PDT, 10 amp, 120/240 VAC

TERMINALS
Plug-in, Solder, Printed Circuit or Screw

DELAY TYPES
Delay on Operate
Delay on Release
Repeat Cycle Timing

DELAY RANGE
0.1 to 1 sec. 1 to 100 sec.
1 to 10 sec. 1 to 300 sec.

REPEAT ACCURACY
2% at nominal voltage and 25°C ambient.
10% over/voltage and temperature range.

TEMPERATURE RANGE
−40°F. to +150°F.

XIAL CRYSTAL CAN

E 53

RF CHARACTERISTICS

Frequency	VSWR	Crosstalk
50 MHz	1.05/1	−62 DB
200 MHz	1.06/1	−50 DB
1000 MHz	1.15/1	−35 DB

Characteristic Impedance 50 ohms

CONTACTS
2C Coaxial or 1C Coaxial 1C Aux.
100 Watts RF, 2 amp 28 VDC

COILS
6 to 48 VDC

ENCLOSURE
Hermetically Sealed

TERMINALS
RG188/AU Cable or ultra-miniature connectors, Solder hook for auxiliary

ENVIRONMENTAL
Mil-R-5757

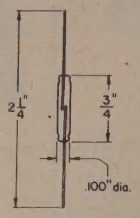
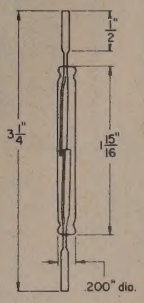
PROGRAMMERS AND ASSEMBLIES

x/AEMCO manufactures a wide variety of circuit and wired assemblies incorporating either solid or synchronous motor time references and relay or switch output which are available to Midtex/AEMCO stomer design.

MIDTEX
INCORPORATED
AEMCO DIVISION
10 STATE STREET, MANKATO, MINNESOTA 56001
PHONE 507-388-6286
TWX 507-890-8129

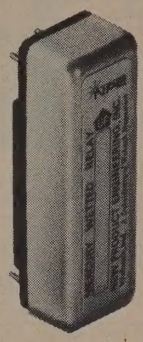
NPE Controls Relay Manufactu e Relay—For Greater Reliability—

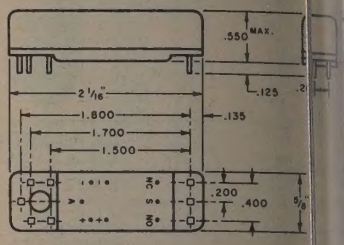
REED SWITCHES

	SUBMINIATURE DRY REED SWITCH 69-2421	STANDARD DRY REED SWITCH 69-4321
		
Physical Characteristics		
Contact arrangement	Form A (SPSTNO)	Form A (SPSTNO)
Contact material	Rhodium	Rhodium
Atmosphere	Dry inert gas	Dry inert gas
Termination	Solderable or weldable	Solderable or weldable
Contact Ratings (max.)		
Voltage	100 v D.C., 150 v A.C.	150 v D.C., 250 v A.C.
Current (switch)	.5 amp	1.5 amps
Current (carry)	3 amps	6 amps
Power (D.C.)	15 watts	25 watts
Power (A.C. suppressed)	25 volt-amperes	40 volt-amperes
Resistance (initial)	200 milliohms	100 milliohms
Peak breakdown voltage	300 volts	500 volts
Operating Parameters		
Pull-in (specify range)	25 to 80 ampere turns	40 to 200 ampere turns
Drop-out (specify range)	approx. ½ of pull-in	approx. ½ of pull-in
Operate speed	1 msec (incl. bounce)	2.5 msec (incl. bounce)
Release speed	.1 msec	1.0 msec
Closure rate (maximum)	2000 hertz	400 hertz
Temperature range	−55°C to +150°C	−55°C to +155°C
Insulation resistance	10^{12} ohms max.	10^{12} ohms max.
Capacitance	.5 picofarad	1.5 picofarads
Shock	200G max., 11 ±1 msec	100G max., 11 ±1 msec
Vibration	30G max. @ 0 to 1700 hertz	30G max. @ 0 to 600 hertz
Life and Reliability (End-of-Life criteria: contact loss of 500 MV max. for Rated and Intermediate Loads, 100 MV max. for Low Level Load, 50 ohms max. for Dry Circuit Loads.)		
Rated Power Load — Life	20×10^6	20×10^6
Intermediate Load — Life	100×10^6	100×10^6
Low Level Load — Life	100×10^6	100×10^6
Dry Circuit Load — Life	500×10^6	500×10^6

MERCURY-WETTED RELAYS

P/C MOUNT



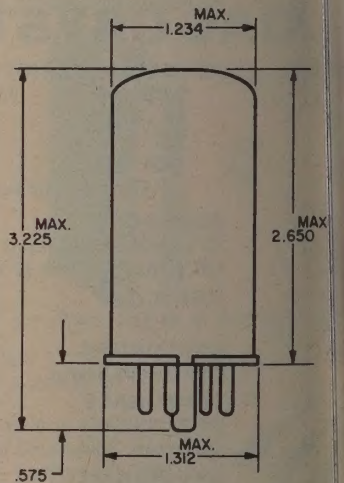


DATA SHEET P/C MOUNT

Coil Resistance Ohms	Must Operate Voltage	Must Release Voltage	Maximum Voltage	Part Number Form C	Part Number Form
SINGLE-SIDE-STABLE, SINGLE WOUND					
385	4.35	.79	27.8	5507-110-0435	5107-11 435
1540	8.70	1.5	55.5	5507-110-0870	5107-11 870
5900	17.3	3.2	109.	5507-110-1730	5107-11 730
SINGLE-SIDE-STABLE, DOUBLE WOUND					
190/190	4.35	.79	19.6	5507-210-0435	5107-21 435
780/780	8.70	1.5	39.	5507-210-0870	5107-21 870
2950/2950	17.3	3.2	77.	5507-210-1730	5107-21 730
BI-STABLE, DOUBLE WOUND					
190/190	±1.71	± .61	19.6	5507-220-0171	5107-22 171
780/780	±3.45	±1.20	39.	5507-220-0345	5107-22 345
2950/2950	±6.90	±2.46	77.	5507-220-0690	5107-22 690

Other standard relays are shown in the complete catalog.
Special relays available upon request.

PLUG-IN MOUNT

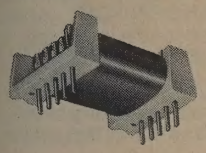
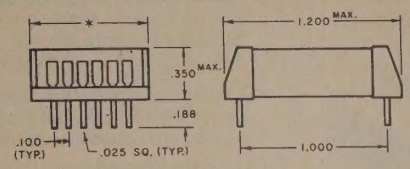
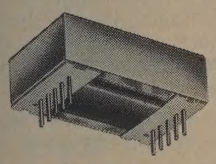
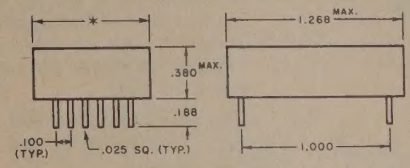
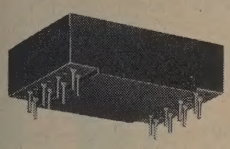
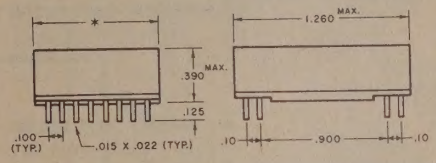
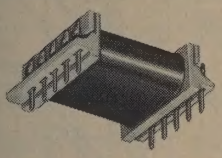
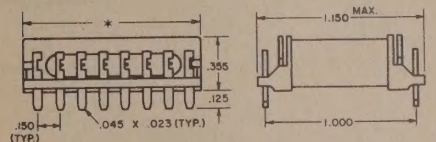
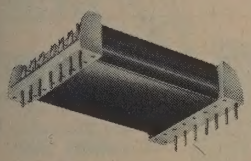
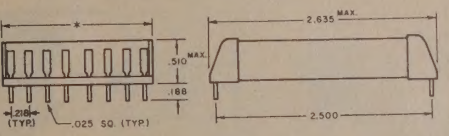
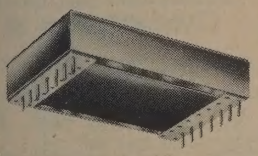
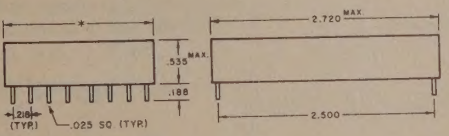
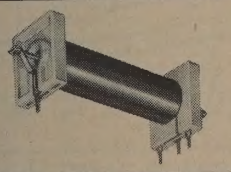
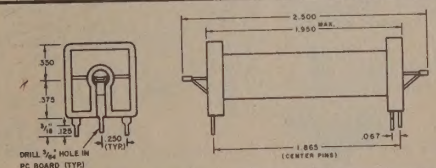


NPE

WRITE FOR DETAILS AND DESIGN ASSISTANCE

from Switch to Finished Better Performance

REED RELAYS

SERIES		END (TYP.) AND SIDE VIEWS	AVAILABLE CONTACT FORMS
832† MINIATURE			1A, 2A, 3A, 4A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 1B1C(1A2B), 1C, 2C, 3C, 1A(mag.latch), 2A(mag.latch)
833 MINIATURE			1A, 2A, 3A, 4A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 1B1C(1A2B), 1C, 2C, 3C, 1A(mag.latch), 2A(mag.latch)
834 MINIATURE			1A, 2A, 3A, 4A, 5A, 6A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 3A1B, 3A2B, 4A1B, 1B1C(1A2B), 1C, 2C, 3C, 4C, 1A(mag.latch), 2A(mag.latch)
822 MINIATURE			1A, 2A, 3A, 4A, 5A, 6A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 2A2B, 3A1B, 3A2B, 4A1B, 4A2B, 1B1C(1A2B), 1C, 2C, 3C, 4C, 1A(mag.latch), 2A(mag.latch)
842† STANDARD			1A, 2A, 3A, 4A, 5A, 6A, 8A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 2A2B, 3A1B, 3A2B, 4A1B, 5A2B, 1B1C(1A2B), 1C, 2C, 1A(mag.latch), 2A(mag.latch)
843 STANDARD			1A, 2A, 3A, 4A, 5A, 6A, 8A, 1B, 2B, 1A1B, 1A2B, 1A1C(2A1B), 2A1B, 2A2B, 3A1B, 3A2B, 4A1B, 5A2B, 1B1C(1A2B), 1C, 2C, 1A(mag.latch), 2A(mag.latch)
852 STANDARD			1A

† UL Listed Series

* Variable dimension depending on series and contact configuration. (Range: 832 Series: .445 to 1.20; 822 Series: .405 to .780; 823 Series: .465 to .855; 824 Series: .382 to .882; 842 Series: .645 to 2.170; 843 Series: .700 to 2.216 inches.)

CONTACT RATINGS For miniatures, see preceding page reed switch part number 69-2421; for standards see reed switch part number 69-4321.

LIFE AND RELIABILITY For miniatures see preceding page reed switch part number 69-2421; for standards see reed switch part number 69-4321.

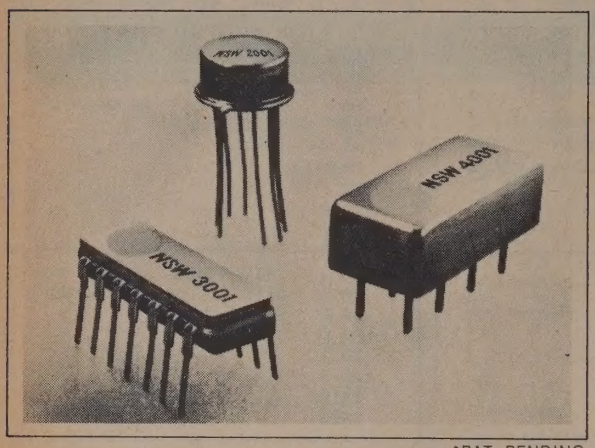
OPERATING PARAMETERS	MINIATURE	STANDARD
Temperature:	−55°C to +105°C	−55°C to +105°C
Shock:	200G max., 11± 1 msec	100G max., 11± 1 msec
Vibration:	30G max. @ 0 to 1700 hertz	30G max. @ 0 to 600 hertz
Insulation resistance:	10^{12} ohms max.	10^{12} ohms min.
Capacitance:	.5 picofarad	1.5 picofarads

NEW PRODUCT ENGINEERING, INC. *A Subsidiary of Wabash Magnetics, Inc.*
Fort and Webster Streets, Wabash, Indiana 46992 Telephone (219) 563-2191 TWX 810-290-2722

NPE

NANOSWITCH™

The First real solid state 2 PDT Relay in small packge



*PAT. PENDING.

INTRODUCTION:

Here is the first true solid-state 2 PDT relay, incorporating nver tional semiconductor devices in a hybrid, micro-electronic ssem bly. A major feature of the NANOSWITCH* is that the n mall closed contacts do not require secondary biasing, excitatio f th driver circuit, nor external circuits for functioning.

There are no exotic semiconductors or magnetic type com nent used. NANOSWITCH can be used as a direct replacemen f a electro-mechanical relay, within the limits specified.

The NANOSWITCH offers the user high speed response pre ous not available in a relay. Other desirable features include no ntac bounce or coil inductance. The homogeneous construction mit usage in high vibration and shock environments. Each relay hig impedance driver circuit will respond to any voltage input b wee 4 and 50 VDC.

Switching features include almost infinite life, regardless load type. Reliability of the NANOSWITCH parallels other soli state components.

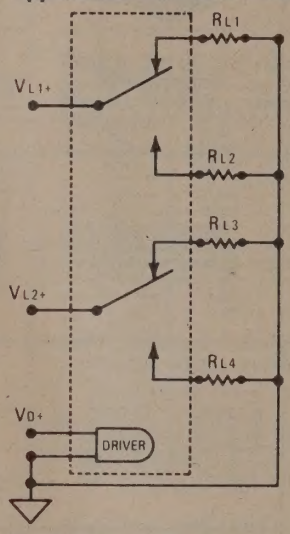
FEATURES:

Life	> 1 Billion at full rated load
Isolation Resistance	> 10,000 megohms at 25°C (between all applicable terminals)
Temperature Range	−55 to +125°C
Duty Cycle	Continuous
Vibration	30G, 50 to 5000 Cycles
Shock	300 G
Sealing	Hermetic
Enclosure Type	TO-5, TO-116, ¼ Xtal Can
Withstanding Voltage, All Terminals to Case	500 VDC
TO-5 and TO-116:	
Operate Speed MAX.	5 Microsec.
Release Speed MAX.	5 Microsec.
¼ Crystal Can:	
Operate Speed MAX.	10 Microsec.
Release Speed MAX.	10 Microsec.
Contact Arrangement	2 PDT
Contact Off Resistance	> 10,000 megohms at 25°C
Max. Contact Rating	TO-5 & TO-116 = .250 A at 32 V Xtal Can = 1.0 A at 32 V
Contact V. Range	4 to 32 DC. See Note 1
Contact V. Drop	See Figure 2 (Characteristics are typical of switching transistors)
Contact Load Type	Resistive, Lamp, Inductive (250 mh max.)
Driver Circuit Resistance	See Figure 3
Driver Circuit V. Range	4.0 to 50 VDC. See Note 2
Pickup MAX.	4.0 VDC
Dropout MIN.	1.0 VDC
Dead Band	3.0 VDC

NOTE 1: AC Voltages can be switched if the zero base V. reference is offset with B+ DC. (Request Nanotron Technical Bulletin #101.)

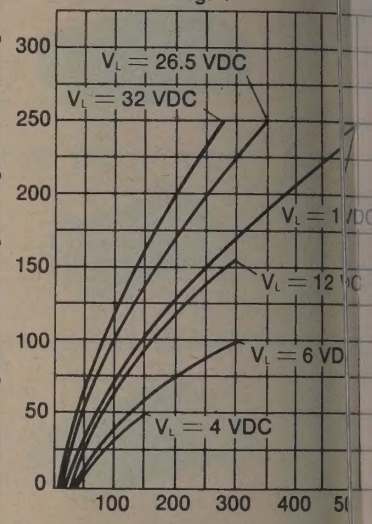
NOTE 2: An individual relay will respond to any driver voltage between 4 and 50 DC. If AC drive used, relay will follow cycle rate. Contact pulse width will be a function of applied AC drive amplitude for a given frequency.

Application Connect in circuit as shown in Fig. 1



V_L and V_D = Load and Driver voltage inputs
R_L = External loads to be switched

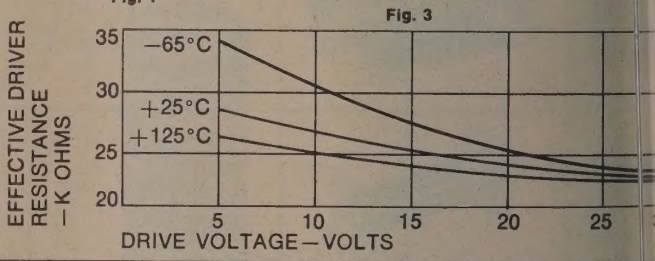
Fig. 1



CONTACT VOLTAGE DROP V
(Typical Values at 25°C)

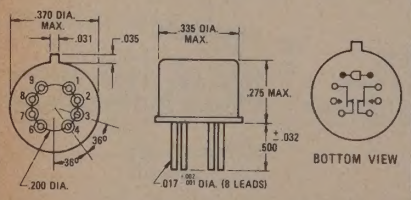
Fig. 2

Fig. 3

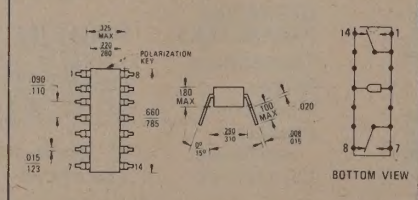


Part Numbers

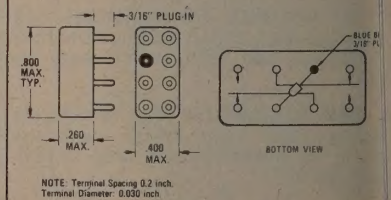
NSW 2001 (TO-5)



NSW 3001 (TO-116)



NSW 4001 (¼ Crystal Can)



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HMITE has the answer in general purpose, latching and solid state relays

ENERAL PURPOSE RELAYS — Includes Indicator, Plate, Thyratron & Latching Versions in Unenclosed & Enclosed Types

Unenclosed (GPR) 3PDT

NEEDS CHASSIS CUTOUT 1-15/32" SQ.
Enclosed Thru-Chassis (GPRTT)

Enclosed for socket mtg. (GPRTS)

Enclosed Plug-Base (GPRTP)
1 & 2 pole A = 2⅞", Octal Plug
3 pole A = 2⅝", 11-Pin Plug

6PDT Latching Relay (GPRLE)

gged, low cost relays handling power for small size. Uncompli- gn provides unusual flexibility for changing connections and mounting. Stock includes relays in versatile , some with indicator light, also plate, thyratron and latching versions. mercial and industrial use where economy and versatility are important. **BASIC d) RELAY:** All connections terminate on barrier-type terminal panel on com- older—quick-connect (push-on) lugs which accept AMP 110 female connectors.

RELAYS (GPRTA-, GPRTT-, GPRTS-, GPRTP-). Four types of clear plastic as follows:

TA" — ("Terminals-Above-Chassis" type).
TT" — ("Terminals-Through-Chassis"type).
TS" — type ("Terminals for Socket Use") for plug-in mounting in Ohmite ocket "SOGPR".
TP" — ("Plug Base" type).

Contact Ratings: Two ratings — fine silver contacts, 5 amps at 115 VAC or 32 VDC; silver-cadmium contacts, 10 amps.

Insulation: Tested at 1500 VAC.

Coil Wattage: 1.4 watts DC operation;; 1.6 watts (2.0 volt-amps) AC except 2.4 watts (3.70 volt-amps) for 4-pole AC and AC latching relays.

Latching Relay: Consists of two GPR relays with armatures linked so that the n.o. contacts of one are mechanically latched in closed position when, and after, this relay is energized. When 2nd relay is energized, first relay restores and latches 2nd. Permits switching of twice the number of circuits and holding without coil current. Unenclosed type "GPRLE". Enclosed type "GPRLETP" in clear plastic case with Jones plug P-324-SB fitting S-324-AB socket.

ERIES ALL PURPOSE RELAYS

DO RELAY AC or DC OPERATION

Ideal for mobile equipment applications where severe shock and vibration are encountered. Coil drain: 3-watts DC, 6 watts 60 cycle AC. Contact ratings: 10 amps. at 115 v. AC; 32 volt DC resistive load. Insulation tested at 1500 v. AC. Size, (4 pole) 2¼ x 2 1/16 x 1 13/16"; (3 pole) 2¼ x 1⅝ x 1 13/16".

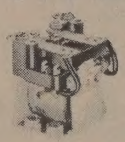
MODEL DOS PLUG-IN & ENCL. TYPES

Model DOS, DPDT relay with standard octal plug base, unenclosed or enclosed types. Enclosed dust-proof type has drawn aluminum cover. Overall dimensions, exclusive of plug: DOSPX-1T — 1⅝ x 2 x 1 15/16"; DOSEPX-5T — 2⅛ x 2½ x 2⅛". Contacts — 15 amps.

DOSPX-1T

DOSEPX-5T

MODEL DOS RELAY
AC or DC OPERATION



Quality, general-purpose relays originally designed to meet rigorous aircraft specs. Extremely compact yet rugged. Coil drain: 2.5 watts DC, 3 watts at 60 cycles AC. ontact ratings: DP, 15 amps. at 115 v. AC or 32 v. DC resistive load; SP, 25 amps. Molded phenolic insulation; tested at 1500 v. AC. 1⅞ x 1⅝ x 1 13/32".

LAYS IN HERMETIC ENCLOSURES

etic Enclosures 8 Terminaals
HX-39T, 115VDC
HX-40T, 115VAC

Hermetic Enclosures with Octal Plugs
DOSHPX-46T, 115VDC
DOSHPX-47T, 115VAC

cally Sealed non-removable enclosures, filled y nitrogen, are also available to provide pro- under adverse ambient conditions. DOS relays 5 volt AC or DC coils are provided in these res with either octal plug (DOSHPX-) or solder- (DOSHX-) connectors as illustarted. **Weights:** ach approx.

MODEL DOSY RELAY
FOR PLATE CIRCUIT OPERATION

The high operating sensitivity makes the DOSY relay adaptable to a wide range of electronic control circuits, such as plate circuit controls,—etc. The insulation is of high grade, molded phenolic material. At 115 v. AC or 32 v. DC, resistive load. Model DOSY relay has a contact rating of 15 amperes.

There are two DPDT types, one having 10,000 ohms coil resistance (maximum pull-in current of 8 ma. DC); the other having 5,000 ohms coil resistance. Dimensions are same as for Model DOS next column.

DO RELAYS IN HERMETIC ENCLOSURES

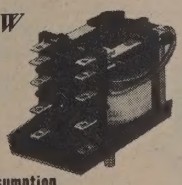
DOHPX-16T, 3PDT, 11 Prongs
DOHPX-15T, 4PDT, 20 Prongs

DOHX-22T, 3PDT 14 Terminals
DOHX-23T, 4PDT 14 Terminals

Stock DO relays with 115 volt coil in hermetically sealed metal enclosures, filled with dry nitrogen. Both 3 and 4-pole DO relays are supplied in these enclosures with plug (DOHPX-) or solder terminal (DOHX-) connectors as illustrated. **Weights:** 3-pole hermetic relay approx. 14 oz.; 4-pole approx. 15 oz.

CHING RELAYS

NEW

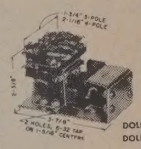


Magnetic Latching Relay

ew Series GPRM tic latching relays o mechanical latch- ers. Unlike conven- latching arrange- , magnetic latching do not have criti- ever adjustments limit mechanical life and are less susceptible to shock ibration.

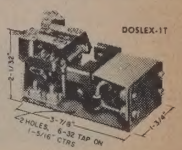
Small Size
Long Life
Reliability
Positive Action
Low Power Consumption
Economical Price

MODEL DO LATCHING RELAY (DOLEX)


DOLEX-3T, 3PDT
DOLEX-5T, 4PDT

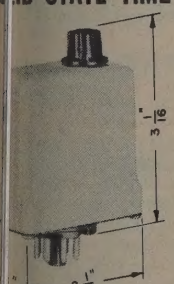
Consists of Model DO relay and a "reset magnet" with both armatures mechanically latched so that the normally open contacts of the relay remain closed when the relay energizing voltage is removed. The relay releases to normal position when the reset coil is pulsed. Permits "holding" of circuits without continuous coil current. Coils of stock units (both relays and reset coils) are 115VAC. Available with 3 or 4-pole relays. **Weights:** 3-pole — 16.5 oz.; 4-pole — 17 oz.

MODEL DOS LATCHING RELAY (DOSLEX-1T)


DOSLEX-1T

Consists of Model DOS relay and a "reset magnet" with both armatures mechanically latched so that the normally open contacts of the relay remain closed when the relay energizing voltage is removed. The relay releases to normal position when the reset coil is pulsed. Permits "holding" of circuits without continuous coil current. Coils of stock units (both relay and reset magnet) are 115VAC. **Weight:** 14.2 oz.

ID STATE TIME DELAY RELAYS



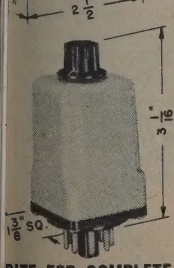
INTERNAL OR EXTERNAL RELAY

Ohmite Time Delay Relays consist of a solid state timing network and an electromechanical relay which is energized by the timing network. For the "Delay on Operate" type of relay, the electro-mechanical relay can be supplied in the same enclosure as the timing network or can be external to it. The internal electro-mechanical relay has DPDT contacts rated at 10 amperes. Where an external relay is required, Ohmite GPR, DOS or DO relays can be used.

DELAY AND DELAY ADJUSTMENTS

Variable — The Variable Ohmite Time Delay Relay offers three variable ranges:

0.1 to 10 seconds
0.6 to 60 seconds
1.8 to 180 seconds

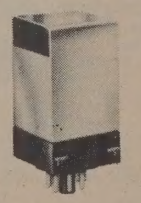


Fixed Maximum and Remote — Is supplied with a factory set time delay. However, incorporates provisions for connecting an external resistor to reduce time delay from the max. A variable resistance may be used to adjust the delay from nearly the max. to the min.

Operating Voltage Ratings:
AC: 24, 115 **DC: 24, 48, 110**

Contacts and Rating of Internal Relay: DPDT, 10 amperes at 115 VA, 32VDC resistive.

MODEL SSA SOLID STATE RELAYS *NEW*



- **No Moving Parts — No Contact Bounce or Wear**
- **Extraordinary Life, Reliability, Sensitivity, Speed**
- **Universal "Coil"**
- **Switches up to 10 amps at 40°C (on metal panel)**
- **Transient Protected — No False Actuation**

Model SSA relays are completely solid state. No moving parts and are not subject to the difficulties as with electro-mechanical relays. Excellent performance under severe shock and vibration.

Provide the ultimate in reliability, long life and trouble free service. They can replace electromechanical relays in critical applications where exceptional life and reliability are paramount or where reduction of maintenance is desired.

The Model SSA relay, a completely solid state device, is a true relay in the functional sense since its input ("coil") is completely isolated from its switching ("contact") elements. In the case of two-pole relays, one pole is isolated from the other.

WIDE RANGE CAPABILITY
Universal "Coil" Input, High Sensitivity
Universal "Coil" Input: Broad capability due to the universal input. Accepts a wide range of both AC and DC voltages to high frequencies:
AC — 3 to 140 volts, (to 25,000 cps) and
DC — 3 to 200 volts
High Sensitivity: Model SSA relays will operate on as little as 6 milliwatts. Capable of operating directly from integrated circuits (IC's) and serve as ideal interface between linear or digital systems and power circuits.

RITE FOR COMPLETE INFORMATION ON ALL OHMITE RELAYS.

HMITE MFG. CO., a NORTH AMERICAN PHILIPS company • 3635 HOWARD STREET, SKOKIE, ILLINOIS 60076 • PHONE (312) 675-2600 • TWX 910-223-0805

Relays? Go no further!

Here, considerably abbreviated, are the Price Electric relays — the most complete line of industrial and military relays available from a single source. Naturally, we show only the most popular types and sizes. You'll find the rest, and all the information you need to select the right relay, in our catalog. Write for your copy.

PRICE ELECTRIC COMPANY

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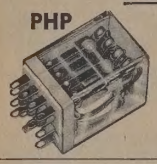
Industrial Relays

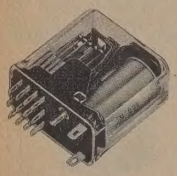
PHP



4PDT—3 amp, 28 VDC/115 VAC res. Coil—up to 115 VAC and DC. Dust cover with plug-in and socket available.

Coil VDC	Part No.	Coil VAC	Part No.
6	PHP-17D- 6	6	PHP-17A- 6
12	PHP-17D-12	24	PHP-17A- 24
24	PHP-17D-24	115	PHP-17A-115

GP

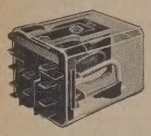


2, 4, and 6 pole, 2 amp, 28 VDC/115 VAC res. Coil—up to 115 VDC, sensitivity as low as 50 mw for DPDT. Dust cover with plug-in and socket available. Also relays with twin contacts.

Some standard relays:

Coil VDC	Part No. DPDT	Part No. 4DPT	Part No. 6PDT
6	GP-2C- 6	GP-4C- 6	GP-6C- 6
12	GP-2C-12	GP-4C-12	GP-6C-12
24	GP-2C-24	GP-4C-24	GP-6C-24
48	GP-2C-48	GP-4C-48	GP-6C-48

VP

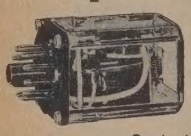


1, 2, 3 pole, 10 amp., 28 VDC/115 VAC res. Coil-up to 115 VAC and DC. Plug-in with dust cover. Available without dust cover as Style V.

Some standard relays:

Contacts	Coil VDC	Part No.	Coil VAC	Part No.
SPDT	12	VP- 5D- 12	12	VP- 5A- 12
DPDT	24	VP-11D- 24	24	VP-11A- 24
3PDT	115	VP-14D-115	115	VP-14A-115

L



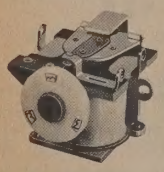
Up to 4PDT 5 or 10 amp, 28 VDC/115 VAC res.

Coil: Typical: 12 VDC 120 ohms
115 VAC 2250 ohms

Open or completely dust covered with 8/11 pin octal plug.

Contact	Coil Volts	Part No. Open Style	Part No. Dust Covered
3 PDT 5 Amp	12 DC	LK-14D- 12	LKP-14D- 12
3 PDT 5 Amp	115 AC	LK-14A-115	LKP-14A-115
3 PDT 10 Amp	12 DC	LH-14D- 12	LHP-14D- 12
3 PDT 10 Amp	115 AC	LH-14A-115	LHP-14A-115

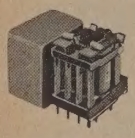
31



SP—3 amp, 28 VDC/115 VAC res. Coil—176 MW. Typical—12 VDC 440 ohms. Stabilized Memory Relay — every other pulse to relay coil closes the contact. Open or completely dust covered with 8 pin octal plug.

Coil VDC	Part No. Solder Terminals	Part No. Printed Circuit Terminals
6	31A112AC	31A111AC
12	31A112AE	31A111AE
24	31A112AG	31A111AG

38



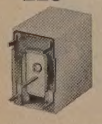
DPDT—3 amp, 28 VDC/115 VAC res. Coil 150 mw. Typical—12 VDC, 410 ohms.

Completely dust covered. PC or hand solder application.

Typical part nos:

Coil VDC	Part No.
6	38A111CS
12	38A111CV
24	38A111CY

228



SPDT—2 amp, 28 VDC/115 VAC res. Coil—50 MW. Typical—12 VDC 1760 ohms. Completely dust covered, for direct PC mount.

Coil VDC	Part No.
6	28A111CE
12	28A111CG
24	28A111CI

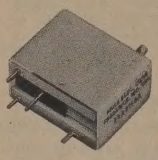
1000

SPDT—3 amp, 28 VDC/115 VAC res Coil—44 MW. Typical—12 VDC 176 ohms. Dust covers for contact are solder or PC terminals.

Coil VDC	Part No. Solder Terminals	Part No. Printed Circuit Terminals
6	10F211CE	10F211CE
12	10F212CG	10F211CG
24	10F212CI	10F211CI

Style 1010 available with 10 amp contact

229



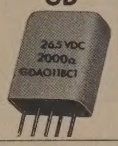
SP—3 amp, 28 VDC/115 VAC res Coil—176 mw. Typical—12 VDC, 440 ohms. Stabilized memory relay—every other pulse to relay coil closes the contact.

Completely dust covered, for direct PC mount.

Coil VDC	Part No.
6	29A111AC
12	29A111AE
24	29A111AG

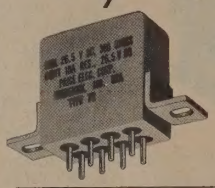
Military Relays

GD



SPDT—.5 amp, 28 VDC res. Coil—100 mw. Typical—26.5 VDC 2000 ohms. Ambient temp. −65 to +125 C. Vibr. −20 G up to 2000 H_z. Shock — 50 G, 11 msec. Mil-Spec.—MIL-R-5757.

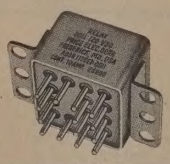
7



DPDT—10 amp, 28 VDC/115 VAC res. Coil—565 MW. Typical—26.5 VDC 300 ohms. Ambient Temp.— −65 to +125° C. Vibr.—20 G up to 2000 H_z. Shock —50 G, 11 msec. Mil-Spec.—MIL-R-5757 & MIL-R-6106.

Coil VDC	Part No. Plug-In Terminals	Part No. Solder Hook Terminals
26.5	BO7D111BC3	BO7D112BC3

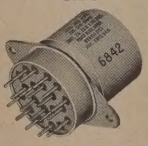
8



4PDT—10 amp, 28 VDC/115 VAC res. Coil—565 MW. Typical—26.5 VDC 300 ohms. Ambient Temp.— −65 to +125° C. Vibr.— 30 G up to 3000 H_z. Shock —100 G, 10 msec. Mil-Spec.—MIL-R-5757 & MIL-R-6106.

Coil VDC	Part No. Plug-In Terminals	Part No. Solder Hook Terminals
26.5	AO8B111CC3	AO8B112CC3

520



6PDT—2 amp, 28 VDC/115 VAC res. Coil—700 MW. Typical—26.5 VDC 240 ohms. Ambient Temp.— −65 to +125° C. Vibr.—15 G up to 2000 H_z. Shock—50 G, 11 msec. Mil-Spec.—MIL-R-5757.

Coil VDC	Part No. Plug-In Terminals	Part No. Solder Hook Terminals
26.5	03C111DC1	03C112DC1

8200

DPNO—100 amp, 28 VDC/115 VAC res. DPNO—25 amp, 28 VDC/115 VAC res. Coil—3 W. Typical—24 VDC 50 ohms. Ambient Temp.— −70 to +125° C. Vibr.—15 G up to 500 H_z. Shock — 70 G. Mil-Spec.—MIL-R-6106.

Coil VDC	Part No. Dust Covered	Part No. Hermetically Sealed
28 VDC	82CO11BD3	82C342DD3

All relays shown here, and more, are available from our local distributor. Ask him for a Price Electric Relay Catalog, or write us: Price Electric Company, Frederick, Maryland 21701

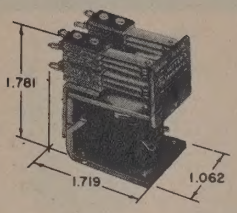
relays and electromechanical devices

AMF | POTTER & BRUMFIELD

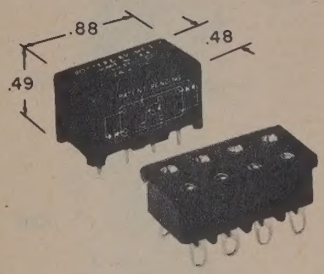
PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

ENERAL PURPOSE RELAYS

N SERI Low cost, all purpose, multiple contact, itching relay. Used for many industrial plications. Tinned, pierced solder type Contacts: 3/16" dia. silver, designed for max- leaning action. Mounting: No. 8-32 tapped locating boss. Weight: 3½ ozs. See GF similar relays having 10 amp ratings.



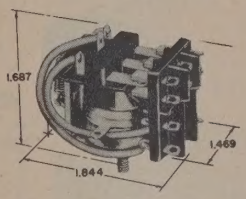
P SERI This commercial microminiature relay is ed for applications requiring high per- in minimum space, such as TV cameras, machines, desk top computers, copying and others. For circuit board or socket and encased in a high impact dust cover, a half crystal case size relay with ter- a .200" grid.



er terminal socket and retainer for HP relay.
NET $4.75

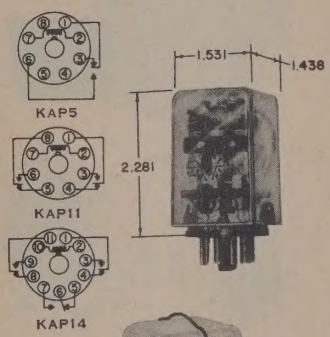
specifications of HP series.

AP SERIES Small, low cost, highly efficient purpose relays for handling light power h as small motors, solenoids and other d general automation work. All KA and KAP th "Y" suffix bear CSA* listing and carry onent recognition (File No. E22575). Mechan- expectancy: 10 million operations. Duty: s. Contacts: Movable, 1/8" dia. gold-flashed ationary, 5/32" dia. wide silver overlay.



the open version of this series. Mounting: 6-32 threaded stud and locating tab on 7/16" Weight: 2 ozs. The KAP is the enclosed model otected by a clear, high impact plastic dust erminals: 8 or 11-pin plug. Weight: 3 ozs.

fix indicates silver-cadmium-oxide contacts bles rated 10 amps.

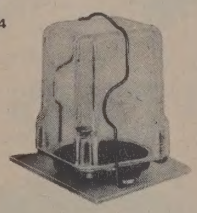


OLD DOWN SPRINGS Designed to insure secure g of relays in any position. Will accommo- chine screws or rivets.

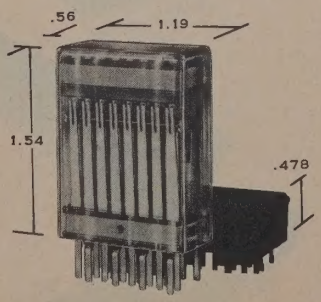
relays: (shown above)
per box **NET $5.80**

and KRP relays (pages 6 and 3)
0 per box **NET $5.80**

plain case relays (page 3)
per box **NET $5.25**



RIES This compact, general purpose DC relay 3 Form C (8PDT) switching with bifurcated er silver contacts rated 1 amp @ 30V DC, e, or 0.5 amp @ 120V AC. Designed for ackaging applications, the KDP provides elec- solation on both the input and switching Operate speed is 15 milliseconds @ nominal @ 25°C. Mechanical life expectancy: in of 10 million operations. Duty: Continuous. re: Clear polycarbonate dust cover. Mounting: terminal sockets with snap-lock spring for nsertion into chassis or panel. Approximate without socket: 1.3 ozs.



Solder terminal sockets
10 **NET $9.50**

Hold down springs
50 **NET $5.50**

ian Standards Assoc. File No. LR-15734

GENERAL PURPOSE RELAYS

TYPE	COILS Voltage or Current	COILS Res. in Ohms	CONTACTS Nom. Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RE-SALE PRICE
GA11A	6V 12V 24V 120V	1.7 6.8 24 690	6VA	DPDT	5	$3.85 3.85 3.85 3.85
GA11D	6V 12V 24V 110V	18 72 288 6,050	2.0W	DPDT	5	3.85 3.85 3.85 4.35
GA14A	24V 120V	24 690	6VA	3PDT	5	4.60 4.60
GA17A	6V 12V 24V 120V 240V	1.7 6.8 24 690 2,950	6VA	4PDT	5	5.55 5.55 5.55 5.55 5.95
GA17D	6V 12V 24V 110V	18 72 288 6,050	2.0W	4PDT	5	5.55 5.55 5.55 6.05
HP11D§	12V 24V	218 870	.662W	DPDT	2	8.35 8.35
KA5AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	SPDT	5	3.70 3.70 3.70 3.70 4.20
KA5AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	SPDT	10	3.75 3.75 3.75 3.75 4.25
KA5DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	5	3.55 3.55 3.55 4.25
KA5DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	10	3.60 3.60 3.60 4.30
KA11AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	5	4.50 4.50 4.50 4.50 4.90
KA11AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	10	4.60 4.60 4.60 4.60 5.00
KA11DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	5	3.95 3.95 3.95 4.65
KA11DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	4.10 4.10 4.10 4.80
KA14AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	5	4.90 4.90 4.90 4.90 5.40
KA14AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	10	5.10 5.10 5.10 5.10 5.60
KA14DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	5	4.45 4.45 4.45 5.15
KA14DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	4.65 4.65 4.65 5.35
KAP5AG§	24V 120V	75 2,250	2VA	SPDT	10	6.40 6.40
KAP5DG§	24V 110V	472 10,000	1.2W	SPDT	10	6.30 7.00
KAP11AY§	24V 120V 240V	75 2,250 9,110	2VA	DPDT	5	7.05 7.05 7.45
KAP11AG§	6V 24V 120V	6 75 2,250	2VA	DPDT	10	7.15 7.15 7.15
KAP11DG§	24V 110V	472 10,000	1.2W	DPDT	10	7.10 7.80
KAP11DY§	12V 24V 110V	120 472 10,000	1.2W	DPDT	5	7.00 7.00 7.70
KAP14AY§	24V 120V 240V	75 2,250 9,110	2VA	3PDT	5	8.70 8.70 9.10
KAP14AG§	24V 120V	75 2,250	1.2W	3PDT	10	8.85 8.85
KAP14DG§	24V 110V	472 10,000	1.2W	3PDT	10	8.80 9.50
KAP14DY§	12V 24V 110V	120 472 10,000	1.2W	3PDT	5	8.60 8.60 9.30
KDP29D11§	24V	580	1W	8PDT	.5	9.35

§ Enclosed Relay
† Sealed Relay

AMF | POTTER & BRUMFIELD

PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

GENERAL PURPOSE RELAYS (CONTINUED)

KL SERIES Multiple contact relay. Varied contact combinations and high dielectric phenolic insulation affords extreme versatility and utility. Widely used in such applications as industrial controls, elevator controls, communications equipment and electronic measuring devices. Mounting: All models — Two No. 6-32 tapped holes on 1 7/16″ centers. Contacts: 1/8″ dia. gold-flashed silver. Weight: 5 ozs.

KHU/KHP/KHS SERIES Small, rugged, 4PDT, available for AC or DC operation. Only KHU relays carry Underwriters' Laboratories component recognition. KHU and KHP have nylon dust covers; KHS is hermetically sealed in metal enclosure. These relays are designed to meet the exacting requirements of data processing, computer and process control applications. Contacts are 3/32″ gold-flashed silver and are rated 3 amps @ 30V DC or 120V AC resistive for 100,000 operations. "12" suffix indicates silver-cadmium-oxide contacts. Mounting: Solder terminals with a No. 3-48 5/16″ long. Adaptable to sockets (below) with printed circuit or solder lug terminals. Weights without sockets; KHU or KHP 1 1/8 ozs. KHS 1 5/8 ozs.

KHU/KHP hold down spring (similar to KCP-KRP, above).

9KH3 50 per box, weight 3 ozs. **NET $5.50**

9KH1 Solder terminal sockets and retainers.
Box of 10 **NET $6.60**

9KH2 Printed circuit terminal sockets.
Box of 10 **NET $6.60**

Weight per box: 4 ozs.

KRP SERIES Versatile, multi-contact arrangement. Enclosed in a clear high impact plastic dust cover. Standard 8-pin octal-type plug for KRP5 and KRP11, 11-pin for KRP-14. Weight: Approx. 3 ozs. Contacts: 5 amp, 3/16″ dia. gold-flashed silver, 10 amp 3/16″ dia. silver cadmium-oxide. See KCP-KRP hold down spring for special mounting applications. See KRP-N indicator lamp relay for current monitoring applications.

KRP-N INDICATOR LAMP RELAY A general purpose relay incorporating a lamp to indicate current or voltage availability in power circuit. Contacts: 3/16″ dia. silver cadmium-oxide. Enclosure: Clear, high impact plastic dust cover. Mounting: Standard octal plug. Weight: Approx. 3 ozs.
Hold down spring (Please see page).

"P" — CASE A clear high impact plastic case for mounting rectifiers, capacitors, resistors or a combination of these. Available with octal-type plug with 8 or 11-pins. Comes complete with four screws. Weight: .5 ozs. each. See KCP-KRP Hold Down Spring for special mounting applications.

35D070 Case (8-pin plug) **NET $ .65**

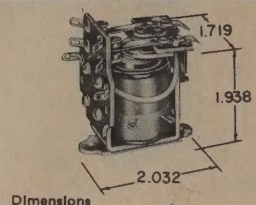
35D072 Case (11-pin plug) **NET $ .80**

R40 SERIES SLIMLINE DC operated 4PDT relays are designed for printed circuit board use. Provide low profile — only .43″ thick. Allows easy PC board layout and .6″ board mounting centers. Switching range is from true dry circuit to 5 amperes in a variety of contact styles. A wide range of coil voltages offered. Pull-in power: 400 mw.

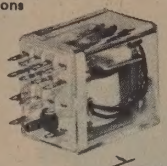
9XR40-1 Right angle sockets with printed circuit pin terminals for R40 Slimline relays, retainers included.
Box of 10 **NET $13.50**

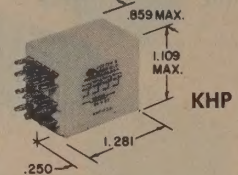
9XR40-2 Vertical socket with printed circuit pin terminals for R40 Slimline relays, retainers included.
Box of 10 **NET $9.50**

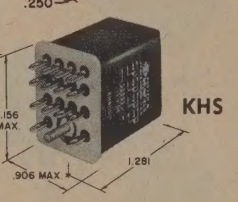
9XR40-3 Chassis mount socket with solder terminals for R40 Slimline relays, retainers and mounting clip included.
Box of 10 **NET $10.00**

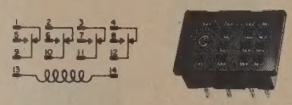


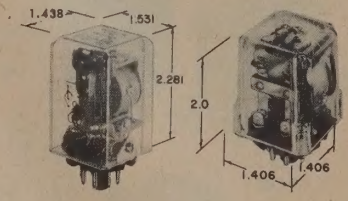
Dimensions same as KHP

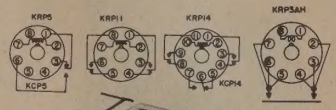


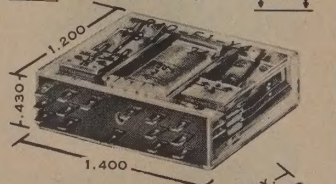


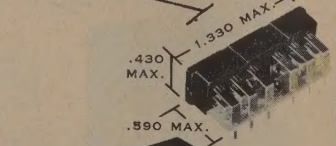


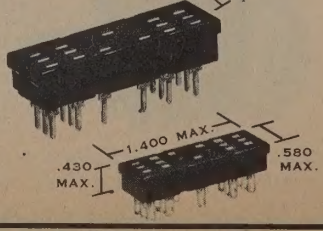












	GENERAL PURPOSE RELAYS					
	COILS			CONTACTS		
TYPE	Voltage or Current	Resistance in Ohms	Nominal Power	Arrangement	Rate in Amps	DISC. RESALE PRICES
KL5A	120V	760	2.9VA	SPDT	5	4.25
KL5D	24V	600	1.1W	SPDT	5	4.00
KL11A	12V 24V 120V	7.8 33 760	2.9VA	DPDT	5	5.50 5.50 5.50
KL14A	24V 120V	33 760	2.9VA	3PDT	5	5.95 5.95
KL14D	24V 110V	600 10,000	1.1W	3PDT	5	5.95 5.95
KL17A	6V 24V 120V	2.25 33 760	2.9VA	4PDT	5	7.15 7.15 7.15
KL17D	12V 24V 110V	140 600 10,000	1.1W	4PDT	5	6.95 6.95 7.45
KHP17A11§	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	5.05 5.05 5.05 5.05
KHU17D11§	6V 12V 24V	40 160 650	900MW	4PDT	3	5.05 5.05 5.05
KHU17D11§	48V 90V 110V	2,600 9,000 11,000	900MW	4PDT	3	5.25 5.50 5.50
KHU17D12§	24V 110V	650 11,000	900MW 900MW	4PDT 4PDT	3 3	5.20 5.05
KHU17A11§	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	5.55 5.55 5.55 5.05
KHP17D11§	6V 12V 24V	40 160 650	900MW	4PDT	3	5.05 5.05 5.05
KHP17D11§	48V 90V 110V	2,600 9,000 11,000	900MW	4PDT	3	5.25 5.50 5.50
KHP17D12§	24V 110V	650 11,000	900MW 900MW	4PDT 4PDT	3 3	5.20 5.05
KHS17A11†	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	9.55 9.55 9.55 9.90
KHS17D11†	6V 12V 24V 110V	40 160 650 11,000	900MW	4PDT	3	8.55 8.55 8.55 9.40
KRP5A§	6V 24V 120V	6 75 2,250	2VA	SPDT	5	6.30 6.30 6.30
KRP5AG§	6V 24V 120V	6 75 2,250	2VA	SPDT	10	6.40 6.40 6.40
KRP5D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	5	6.25 6.25 6.25 6.55
KRP5DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	10	6.40 6.40 6.40 7.10
KRP11A§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	5	7.00 7.00 7.00 7.45
KRP11AG§	6V 12V 24V 120V 240V	6 21 75 2,250 9,100	2VA	DPDT	10	7.25 7.25 7.25 7.25
KRP11D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	5	7.95 7.95 7.95 8.65
KRP11DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	8.20 8.20 8.20 8.90
KRP14A§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	5	7.70 7.70 7.70 8.15
KRP14AG§	6V 12V 24V 120V 240V	6 21 75 2,250 9,100	2VA	3PDT	10	8.05 8.05 8.05 8.50
KRP14D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	5	8.60 8.60 8.60 9.30
KRP14DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	8.95 8.95 8.95 9.65
KRP11AN§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	10	8.30 8.30 8.30 8.75
KRP11DN§	6V 12V 24V 110V	32.1 120 420 10,000	1.2W	DPDT	10	8.80 8.80 8.80 9.95
KRP14AN§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	10	8.60 8.60 8.60 9.15
R40-E1-X4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	5	4.00 4.00
R40-E1-Y4 -V50 -V200 -V800 -V3.2K	6VDC 12VDC 24VDC 48VDC	50 200 800 3.2K	1.6W	4PDT	2	5.00 5.00 5.00 5.00
R40-E1-Z4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	100mA	5.00 5.00
R40-E1-L4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	500μA	5.00 5.00 5.00
R40-E2-X4 -V50 -V200 -V800	6VDC 12VDC 24VDC	50 200 800	1.6W	4PDT	5	4.00 4.00 4.00
R40-E2-Y4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	2	5.00 5.00
R40-E2-Z4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	100mA	5.00 5.00 5.00
R40-E3-X4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	5	4.00 4.00
R40-E3-Y4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	2	5.00 5.00 5.00
R40-E3-Z4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	100mA	5.00 5.00 5.00
R40-E3-L4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	500μA	5.00 5.00 5.00

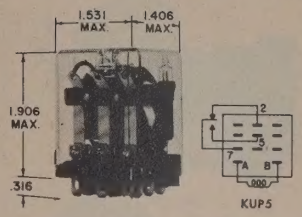
† Sealed Relay
§ Enclosed Relay

AMF | POTTER & BRUMFIELD

PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

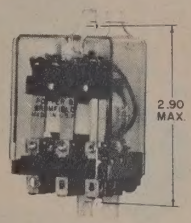
ENERAL PURPOSE RELAYS (CONTINUED)

SERI This reliable 10-ampere relay for indus- cont is available with a socket that is also d 10 peres. The .187" terminals of the relay of t quick-connect/solder type. Sockets are ed rately and their terminals are of the ced ler type. The KUP is enclosed in a clear, n imp plastic dust cover. Silver-cadmium-oxide acts sure long contact life. Operation: Con- ous.



KUP5

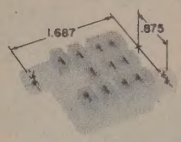
P SERI With slotted flange for direct-to-chassis unting dentical in both electrical and mechani- spec ations as the KUP described above, ex- th ney are not suitable for socket mounting. .187 terminals are of the quick-connect/solder . Sl width: .156". Weight: 3 ozs.



mode carry U/L Component Recognition.

KUP Pced solder terminals sockets for KUP in ca relays. Rated 10 amperes; molded nylon. unti hole .165" dia.

NET $3.95

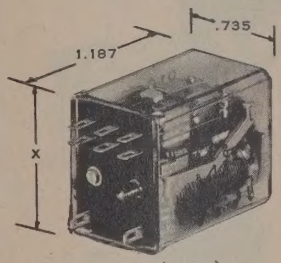


KUP5 Skets with .187" quick-connect terminals. unti hole .165" dia.

NET $6.30

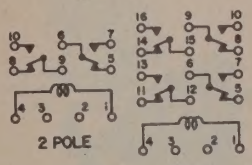
KUP2 Inted circuit pin terminal sockets for KUP ays. ll accept .187" terminals of KUP in plain . Mled nylon. Mounting hole .165" dia.

NET $4.75



X = .950 (2PDT)
1.165 (4PDT)
1.375 (6PDT)

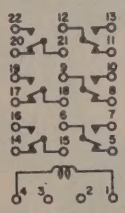
R10-E1 RIES DC operated industrial relays provide sitiv of 125 mw per pole. DPDT to 6PDT con- ct ar gements are available with three contact yles .100 mA 2 amps or 5 amps. Operating mper re is −55°C to +72°C. U/L File No. 2810. older terminals, No. 3-48 stud or plug-in ket re available for relay mounting (see sockets low). Wire retainer and pre-installed grounding rovisi included with sockets. R10-E1-Z SERIES s bi ated low level contacts. "J" Sensitive Cur- nt A stment: 85 mw (DPDT); 175 mw (4PDT).



2 POLE
4 POLE

R10- Solder terminal sockets and retainers for PDT) relays.

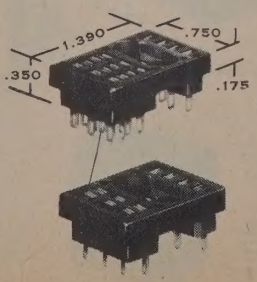
NET $5.50



6 POLE

R10- Solder terminal sockets and retainers for PDT) relays.

NET $7.00



R10- Solder terminal sockets and retainers for PDT 0 relays.

NET $9.00

GENERAL PURPOSE RELAYS						
TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Input	Resistance in Ohms	Nominal Power	Arrange-ment	Amp Rating	
KUP5A15§	6V 12V 24V 120V 240V	5.1 21 75 2,250 9,110	2VA	SPDT	10	$4.10 4.10 4.10 4.10 4.55
KUP5D15§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	10	3.95 3.95 3.95 4.60
KUP11A15§	6V 12V 24V 120V 240V	5.1 21 75 2,250 9,110	2VA	DPDT	10	5.00 5.00 5.00 5.00 5.45
KUP11D15§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	4.50 4.50 4.50 5.20
KUP14A15§	6V 12V 24V 120V 240V	4.2 18 72 1,700 7,200	2.75VA	3PDT	10	5.60 5.60 5.60 5.60 6.05
KUP14D15§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	5.15 5.15 5.15 5.60
KUP5A55§*	120V	2,250	2VA	SPDT	10	4.10
KUP5D55§*	24V	472	1.2W	SPDT	10	3.95
KUP11A55§*	24V 120V	75 2,250	2VA	DPDT	10	5.00 5.00
KUP11D55§*	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	4.50 4.50 4.50 5.20
KUP14A55§*	6V 12V 24V 120V 240V	4.2 18 72 1,700 7,200	2.75VA	3PDT	10	5.60 5.60 5.60 5.60 6.05
KUP14D55§*	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	5.15 5.15 5.15 5.60
R10-E1-Y2 -V52 -V185 -V700 -V2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	2PDT	2	3.25 3.25 3.25 3.25 4.95
R10-E1-Y4 -V52 -V185 -V700 -V2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	4PDT	2	3.60 3.60 3.60 3.60 5.30
R10-E1-Y6 -V25 -V90 -V430 -V1.5K -V9.0K	6VDC 12VDC 24VDC 48VDC 115VDC	25 90 430 1,500 9,000	2.2W	6PDT	2	4.65 4.65 4.65 4.65 5.55
R10-E1-X2 -V52 -V185 -V700 -V2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	2PDT	5	3.35 3.35 3.35 3.35 5.05
R10-E1-X4 -V52 -V185 -V700 -2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	4PDT	5	3.85 3.85 3.85 3.85 5.55
R10-E1-X6 -V25 -V90 -V430 -V.15K -V9.0K	6VDC 12VDC 24VDC 48VDC 115VDC	25 90 430 1,500 9,000	2.2W	6PDT	5	5.05 5.05 5.05 5.05 5.95
R10-E1-X2 -115VAC	115VAC			2PDT	5	4.50
R10-E1-X4 -115VAC	115VAC			4PDT	5	5.40
R10-E1-Z2 -52 -V185 -V700 -V2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	2PDT	100mA	3.65 3.65 3.65 3.65 5.35
R10-E1-Z4 -V52 -V185 -V700 -V2.5K -V15.0K	6VDC 12VDC 24VDC 48VDC 115VDC	52 185 700 2,500 15,000	2.2W	4PDT	100mA	4.10 4.10 4.10 4.10 5.80
R10-E1-Z6 -V25 -V90 -V430 -V1.5K -V9.0K	6VDC 12VDC 24VDC 48VDC 115VDC	25 90 430 1,500 9,000	2.2W	6PDT	100mA	5.30 5.30 5.30 5.30 6.20
R10-E1-Y2 -J2.5K -J5.0K -J10.0K	5.8mA 4.1mA 3.1mA	2,500 5,000 10,000	28.0mA 20.0mA 14.0mA	2PDT	2	3.55 4.05 4.45
R10-E1-Y4 -J2.5K -J5.0K -J10.0K	8.4mA 6.2mA 4.5mA	2,500 5,000 10,000	28.0mA 20.0mA 14.0mA	4PDT	2	3.95 4.45 4.85
R10-E1-Z4 -J1.0K -J2.5K -J5.0K	13.0mA 8.4mA 6.2mA	1,000 2,500 5,000	45.0mA 28.0mA 20.0mA	4PDT	100mA	4.45 4.45 4.95
R10-E2-Y2 -V185 -V700	12VDC 24VDC	185 700	2.2W	2PDT	2	3.25 3.25
R10-E2-Y4 -V185 -V700	12VDC 24VDC	185 700	2.2W	4PDT	2	3.60 3.60
R10-E2-Z4 -V185 -V700	12VDC 24VDC	185 700	2.2W	4PDT	100mA	4.10 4.10

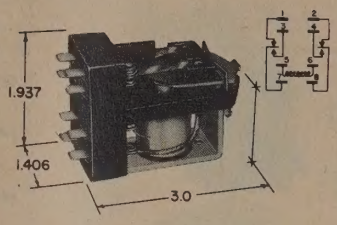
† Sealed Relay
§ Enclosed Relay

AMF | POTTER & BRUMFIELD

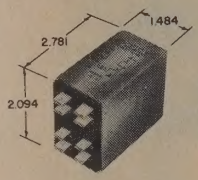
PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

POWER RELAYS

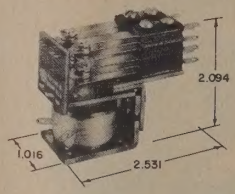
AB SERIES For appliance and general purpose applications where rugged construction, long life and quiet operation are required. All equipped with terminals to fit snap-on connectors and may also be applied to printed circuits using dip soldering. Snap-on screw adaptors packed with each relay. All AC models carry U/L component recognition (File No. E29244) and CSA* listing. Mounting: Two No. 8-32 tapped holes, on 1¼" centers. Silver contacts. Weight: Approx. 5 ozs.



ABC SERIES Medium duty power relay with dust cover. For small motors, industrial control and similar applications. All equipped with terminals to fit snap-on connectors and may also be applied to printed circuits using dip soldering. Snap-on screw adaptors packed with each relay. All AC models carry U/L component recognition (File No. E292-44) and CSA* listing. Mounting: One No. 8-32 threaded stud ⅜" long and locating tab on 9/16" centers. Contacts: ¼" dia. silver. Weight: Approx. 7 ozs.



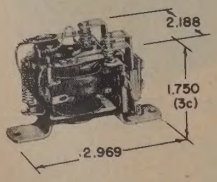
GF SERIES Medium duty power relay for industrial control applications. Long contact arms have ¼" dia. silver contacts rated at 10 amps at 120V AC or 28V DC resistive. Contacts have excellent wipe or self-cleaning action. Tinned, pierced solder terminals. Mounting: 8-32 tapped core with locating boss. Weight: 4.75 ozs. (See GA series, page 1, for similar voltage actuated relays.)



MR SERIES A medium duty power relay that can handle small motors, transmitters, and general purpose applications. Mounting: Two 5/32" dia. holes on 2¼" centers for MR3 and 11, 2⅝" centers for MR2, 5 and 14. Contacts: 7/32" dia. silver. Weight: 4 ozs.

MS/MR Metal dust cover similar to PM/PR shown below. 3⅝" x 2⅜" x 2 19/32". Weight: 7.5 ozs.

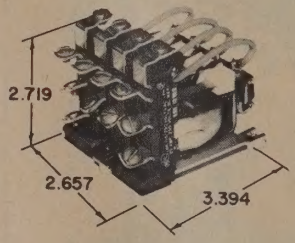
35D130 fits MS/MR **NET $2.20**



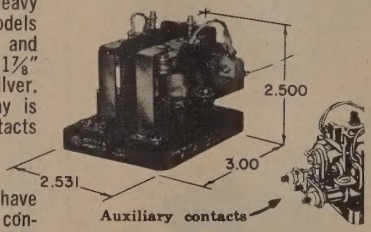
PM SERIES A compact heavy duty 4PDT power relay for polyphase and heavy duty switching applications. Screw terminals. Has ¼" silver-cadmium-oxide contacts rated at 25 amps at 120V., 25 amps at 240V. 50/60 Hz resistive AC, 1HP per movable arm at 120V. or 240V. AC single phase, U/L (File No. E22575) and CSA* listed, except 480V. Mounts by one front keyhole and two rear channel slots for 8-32 screws on 2" x 2½" triangular centers. Weight: 14 ozs.

9PM1 Adaptor plates for mounting PM on PR mounting holes. Box of 10 **NET $1.75**

Enclosures for PM relay — see below.



PR SERIES Heavy duty relay for industrial control applications requiring long life and fast action. Heavy duty screw type terminals. All AC and DC models except PR-11AL5 carry U/L (File No. E22575) and CSA* listing. Mounting: Two 3/16" dia. holes on 1⅞" centers. Weight: 11 ozs. max. Contacts: 5/16" dia. silver. Enclosure: See "PR" cover. The PR11AL5 relay is equipped with 3/16" dia. silver SPDT auxiliary contacts rated at 5 amps.



PM and PR DUST COVERS These dust covers have a sheet metal base with knockouts for ½" dia. conduit and an aluminum cover fitted with two screws. Finished in gray hammertone. Mounting: Three No. 10 holes on 1⅞" x 4⅛" centers. Approx. weight: 1 lb.

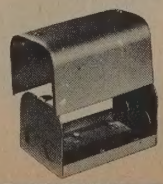
35D227 Metal cover for PM only **NET $3.45**

9PM2 Plastic dust cover for PM only. Box of 4 **NET $1.90**

35D013 Metal cover for PR only **NET $3.45**

PM:
L 5.313
W 3.812
H 3.812

PR:
L 5.312
W 3.375
H 3.125



POWER RELAYS						
	COILS			CONTACTS		
TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp. Rating	LIST PRICE
AB11AY	6V 24V 120V 240V	1.3 23 510 2,050	6.4VA	DPDT	10	6.15 6.15 6.15 6.65
AB11D	12V 24V 110V	72 288 6,050	2W	DPDT	10	6.00 6.00 6.50
ABC11AY	6V 24V 120V 240V	1.3 23 510 2,050	6.4VA	DPDT	10	7.40 7.40 7.40 7.90
ABC11D	6V 12V 24V 110V	18 72 288 6,050	2W	DPDT	10	7.20 7.20 7.20 7.00
GF17A	12V 24V 120V 240V	6.8 24 690 2,950	6VA	4PDT	10	7.60 7.60 7.60 8.05
GF17D	6V 12V 24V 110V	18 72 288 6,050	2W	4PDT	10	7.60 7.60 7.60 8.15
MR3A	6V 24V 120V	2.75 50 1,250	3.25VA	SPST-NO-DM	10	.50 .50 .50
MR3D	6V 12V 24V	24 96 360	1.6W	SPST-NO-DM	10	.10 .10 .10
MR5A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	DPDT	8	.05 .05 .05 .05 .50
MR5D	6V 12V 24V 110V	24 96 360 8,000	1.6W	DPDT	8	.75 .75 .75 .30
MR11A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	DPDT	8	.70 .70 .70 .70 .15
MR11D	6V 12V 24V 110V	24 96 360 8,000	1.6W	DPDT	8	.40 .40 .40 .95
MR14A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	3PDT	8	.80 .80 .80 .80 .25
MR14D	6V 12V 24V 110V	24 96 360 8,000	1.6W	3PDT	8	.40 .40 .40 .35
PM17AY	6V 12V 24V 120V 240V	.37 1.4 5 120 587	14VA	4PDT	25	.30 .30 .30 .30 .85
PM17A	480V	1,790	14VA	4PDT	25	.75
PM17DY	6V 12V 24V 110V	8.2 33 132 2,760	4.4W	4PDT	25	.65 .65 .65 .25
PR1AY	24V	12	9.8VA	SPST-NO	25	.70
PR3AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	SPST-NO-DM	25	.80 .80 .80 .80 .80 .80
PR3DY	6V 12V 24V 110V	18 71 288 6,050	2W	SPST-NO-DM	25	.80 .80 .80 .80
PR5AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	SPDT	25	.55 .55 .55 .55 .55 .55
PR5DY	6V 12V 24V 110V	18 71 288 6,050	2W	SPDT	25	.55 .55 .55 .55
PR7AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	DPST-NO	25	.55 .55 .55 .55 .55 .55
PR7DY	6V 12V 24V 110V	18 71 288 6,050	2W	DPST-NO	25	.50 .50 .50 .50
PR11AY	6V 12V 24V 120V 208V 240V 480V	.86 3.2 12 290 850 1,200 4,500	9.8VA	DPDT	25	.55 .55 .55 .55 .55 .55 .55
PR11AL5	6V 12V 24V 120V 240V	.86 3.2 12 290 1,200	9.8VA	DPDT	20	.55 .55 .55 .55 .55
PR11DY	6V 12V 24V 110V	18 71 288 6,050	2W	DPDT	25	.50 .50 .50 .50

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PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

SPECIAL PURPOSE RELAYS

BUZZER AC operated coil with a spring steel armature which buzzes when coil is energized. Used extensively in test equipment, laboratories and a list of other applications where a small lightweight, pendant buzzer is required. Weight: 1⅝ ozs. Mounting: No. 6-32 tapped core.

SERIES Unusually versatile switching makes this pulse sequencing relay especially suitable for single or latching. The 2 Form C contact arrangement is switched alternately by cam action during on-off of the armature. It can also be furnished with optional 2 Form C auxiliary contacts (designated by "L"). AC version operates on a 50% coil duty cycle (5 Min. max.). Mounting: 8-32 tapped core mounting boss. Weights: With aux. contacts 4¾ ozs. Without aux. contacts 4 ozs.

GM1N10 and GM1N12 AC or DC use the basic structure with uni-directional printed circuit board with 10 or 12-steps, respectively. The board attached to an extension of the ratchet shaft. Movable contact arm advances one position each time the armature **drops out.** Contact rating: 5 amp. Contact arrangement: SP-10 pos. and SP-12 pos. Size: 2.312" x 1.875" x 2".

KB SERIES LATCHING RELAY Both release and trip coils must be for the same voltage. One coil operates only to set latch and other coil releases it. Ideal for memory work and overload applications. Operates on momentary impulse to either coil. Mounting: Two 5/32" dia. holes on 1⅜" centers. Weight: 5 ozs. Contacts: ⅛" dia. silver rated 5 amps; "" suffix indicates silver-cadmium-oxide contacts movables rated 10 amps. AC relays with 5 amp contacts carry U/L component recognition (File No. 29244) and are CSA* listed. AC coil for intermittent duty only.

KBP SERIES LATCHING RELAY Enclosed in a translucent polypropylene dust cover, the KBP is furnished with 8 pin octal type plugs for socket mounting. Contact arrangements of 4PDT and 5PDT are available. Otherwise all specifications are identical to the KB series described above. U/L component recognition does not apply to the KBP series. Weight: 8 ozs.

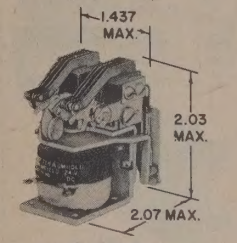
KUL SERIES Small, magnetic latching relay requiring approximately half the space needed for mechanical latching relays. Designed for continuous duty in applications demanding good memory stability, the KUL is ideal for machine tools, process controls and vending machines. SPDT or DPDT silver-cadmium contacts are rated 10 amps @ 28V DC, resistive or 120V AC, 80% PF. All AC DPDT relays include diodes inside the clear polycarbonate dust cover. Mounting: Various 10 amp rated nylon sockets available (see KU sockets page). Weight: 3.4 ozs. KUL hold down springs.

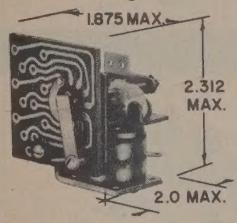
Box of 25 **NET $4.50**

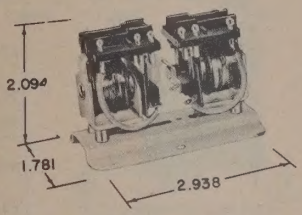
PLATE CIRCUIT AND SENSITIVE RELAYS

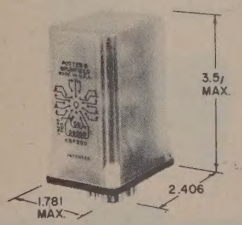
KCP SERIES Low cost plate circuit relay enclosed in a high impact plastic cover. Sensitivity 125 mw single pole; 250 mw double pole; 375 mw three pole. Mounting: Standard octal plug-in type. Eight pin KCP5 and KCP11. Eleven pin for KCP14. Contacts ⅛" dia. gold-flashed silver. Weight: Approximately 3 ozs. Use KCP-KRP hold down spring when vibration is a factor or when using inverted or horizontal mounting.

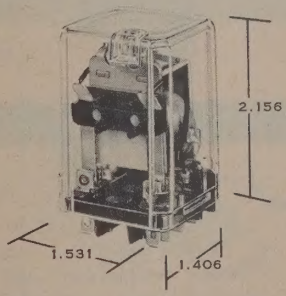
Underwriters Standards Assoc. File No. LR-15734

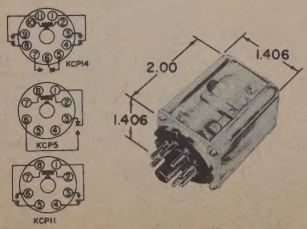












SPECIAL PURPOSE RELAYS						
	COILS		CONTACTS			SUGG. RE-SALE PRICE
TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	
BU	6V 12V 24V 120V	2.7 13.2 50 1,250	4.6VA	—	—	$2.05 2.05 2.05 2.05
GM11A	24V 120V	16 420	9.4VA	DPDT	3	8.40 8.40
GM11AL11	120V	420	9.4VA	DPDT/DPDT	3	11.95
GM11D	12V 24V 110V	36 144 3,050	4W	DPDT	3	8.05 8.05 8.60
GM11DL11	12V 24V	36 144	4W	DPDT/DPDT	3	11.70 11.70
GM1N10A GM1N12A GM1N10D GM1N12D	120V 120V 24V 24V	510 510 144 144	9.4VA 9.4VA 4W 4W	SP-10 pos. SP-12 pos. SP-10 pos. SP-12 pos.	.25	10.35 10.50 10.10 10.25
GPA	6V 12V 24V 120V 240V	1.7 6.8 24 690 2,950	6VA	None	—	1.95 1.95 1.95 1.95 2.40
GPD	— — — 6V 12V 24V 110V	2,500 5,000 10,000 18 72 288 6,050	— — — 2W	None	—	1.80 2.05 2.40 2.40 2.40 2.40 3.60
KB17AY	6V 12V 24V 120V 240V	2.3 10 42 1,030 4,100	5VA	4PDT	5	12.20 12.20 12.20 12.20 13.10
KB17AG	6V 12V 24V 120V 240V	2.3 10 42 1,030 4,100	5VA	4PDT	10	12.30 12.30 12.30 12.30 13.20
KB17D	6V 12V 24V 110V	13.1 52 230 4,560	2.7W	4PDT	5	10.95 10.95 10.95 12.40
KB17DG	6V 12V 24V 110V	13.1 52 230 4,560	2.7W	4PDT	10	11.20 11.20 11.20 12.65
KB23AY	24V 120V	27 700	7.8VA	6PDT	5	14.60 14.60
KB23AG	24V 120V	27 700	7.8VA	6PDT	10	14.80 14.80
KB23D	24V	230	2.7W	6PDT	5	13.25
KB23DG	24V 110V	230 4,560	2.7W	6PDT	10	13.60 15.05
SPECIFY COIL VOLTAGE OR RESISTANCE WHEN ORDERING						
KBP17A§	120V	1,030	5VA	4PDT	5	17.15
KBP17AG§	120V	1,030	5VA	4PDT	10	17.35
KBP17D§	24V	230	2.7W	4PDT	5	15.90
KBP17DG§	12V 24V	52 230	2.7W	4PDT	10	16.20 16.20
KBP20A§	120V	700	7.8VA	5PDT	5	17.65
KBP20AG§	120V	700	7.8VA	5PDT	10	17.90
KBP20DG§	12V 24V	52 230	2.7W	5PDT	10	17.05 17.05
KUL5A15S	120V	3,700	—	SPDT	10	6.30
KUL5D15S	24V	472	1.2W	SPDT	10	5.45
KUL11A15S	12V 24V 120V	37 176 3,700	—	DPDT	10	7.10 7.10 7.10
KUL11D15S	12V 24V	120 472	1.2W	DPDT	10	6.05 6.05
KCP5§	7.2mA 5.0mA 3.6mA	2,500 5,000 10,000	125mW	SPDT	2	6.85 6.95 7.40
KCP11§	10mA 7.2mA 5.0mA	2,500 5,000 10,000	250mW	DPDT	2	7.30 7.40 7.85
KCP14§	12.3mA 8.7mA 6.1mA	2,500 5,000 10,000	375mW	3PDT	2	9.00 9.10 9.55

§ Enclosed Relay † Sealed Relay

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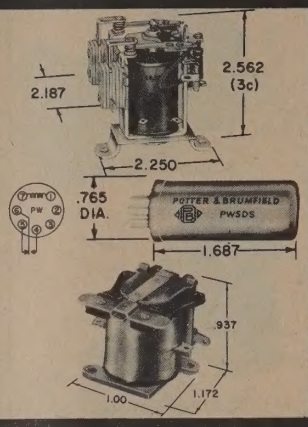
PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

PLATE CIRCUIT RELAYS (CONTINUED)

LM SERIES (See KL page 2 for similar voltage actuated relays.) Sensitivity: 100 milliwatts for single pole and 200 milliwatts for double pole. Medium cost, high quality relay with 7/32" dia. gold-flashed silver contacts. Pick-up adjustable by tail spring adjusting screw. Mounting: Two No. 6-32 tapped holes on 1 13/16" centers. Weight: Approximately 5 ozs. DC Coils only.

PW SERIES (In both voltage and current actuated models.) Sensitivity: 40 mw for current actuated models, 180 mw for voltage actuated models. Precision, light weight, hermetically sealed relay for aircraft and missile applications. Will withstand 10g vibration to 500 Hz. Mounting: Standard 7-pin miniature tube base. Weight: Approx. 1 oz.

RS SERIES (In both voltage and current actuated models.) 60 mw. sensitivity. Low-cost, small, light weight, sensitive relay for radio-sonde, light dimmer and model applications. Mounting: Two No. 4-40 tapped holes on diagonal 3/4" x 5/8" centers. Contacts: Bar palladium. Weight: 1½ ozs.



SENSITIVE RELAYS

TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RETAIL SALE PRICE
LM5	6.3mA 4.5mA 3.2mA	2,500 5,000 10,000	100mW	SPDT	5	$4.55 4.80 5.15
LM11	9.0mA 6.3mA 4.5mA	2,500 5,000 10,000	200mW	DPDT	5	6.50 6.75 7.40
PW5DS†	6V 12V 24V	202 810 3,240	180mW	SPDT	2	12.45 12.45 12.45
PW5LS†	2.8mA 2.0mA	5,000 10,000	40mW	SPDT	2	12.95 13.35
RS5D	6V 12V 5mA 3.5mA 2.5mA	335 1,350 2,500 5,000 10,000	110mW 110mW 60mW 60mW 60mW	SPDT	2	3.05 3.20 3.30 3.60 4.20

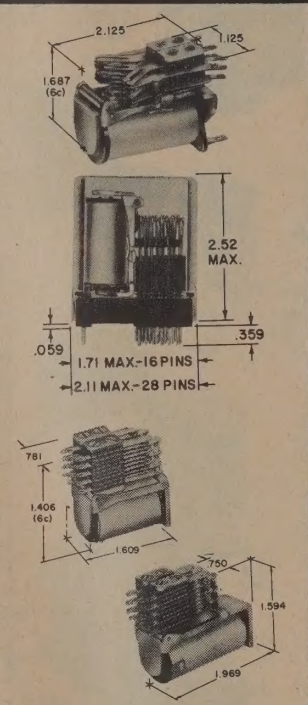
TELEPHONE TYPE RELAYS

LS SERIES Short springs and light weight armature provide fast action without sacrificing reliability and long life. Stainless steel hinge bearing designed to give 100 million operations. Tinned, pierced solder terminals. Mounting: Two No. 6-32 tapped holes on 3/4" centers. Bifurcated contact arms with 1/16" dia. twin palladium contacts. Weight: Approximately 4 ozs.

The LSP version has identical specifications as the LS, except that it is enclosed in a high impact, clear plastic cover and is provided with a rectangular socket with combination taper tab or solder terminations. Enables plug-in like any other plug-in component. Two sizes of sockets and covers are available: 16-pin for 4 Form C (4PDT) or 28-pin for 6 Form C (6PDT). Dimensions: LSP17D: 1.71" x 1.39" x 2.52" seated; weight: 4 ozs. LSP23D: 2.11"x1.39"x2.52" seated; weight: 4½ ozs.

MH SERIES MINIATURE TYPE Ideal for applications where space and weight are factors. Mounting: Open model, MH11L, one No. 6-32 threaded stud 1 7/32" long plus locating boss. All other open models have four No. 3-48 holes on 3/8" x 3/8" centers. Sealed models, M enclosures, three 6-32 NC 2 threaded studs on 1¼" x ½" centers. D enclosures, three 6-32 threaded studs on 1 3/16" x 1 5/16" centers. All sealed models have hook end solder terminals. All models have 1/4" dia. gold-flashed silver contacts. Weight: Open models 2½ oz. max. Sealed models 5 ozs. max.

ML SERIES A small telephone type relay having excellent sensitivity and outstanding switching capabilities. Ideal for transistorized computer networks, telephone systems and battery powered communications equipment. Single contact arms have 1/8" dia. gold-flashed silver contacts rated at 3 amps for 100,000 operations. Pierced solder terminals. Mounting: Four 3-48 holes on 3/8" centers. Weight: 2.5 ozs.



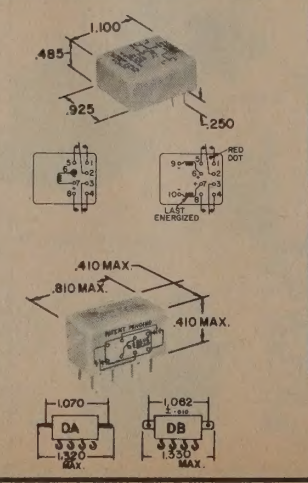
TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	SUGG. RETAIL SALE PRICE
LS17D	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	4PDT	4	6.50 6.70 6.95
LS23D	24V 110V	300 8,000	1.9W 1.5W	6PDT	4	7.85 8.30
LSP17D§	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	4PDT	4	8.45 8.55 8.85
LSP23D§	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	6PDT	4	0.50 0.80 0.90
MH11L	4.5mA	10,000	200mW	DPDT	3	6.90
MH11LM†	4.5mA	10,000	200mW	DPDT	3	1.70
MH17D	6V 12V 24V	23 96 365	1.6W	4PDT	5	5.95 5.95 5.95
MH17DM†	12V 24V	96 365	1.6W	4PDT	5	3.95 3.95
MH17AMR†	120V	6,200	2VA	4PDT	5	2.60
MH23D	6V 12V 24V 110V	13.3 62.3 245 5,000	2.5W	6PDT	5	1.70 1.70 1.70 1.25
MH23DD†	12V 24V	62.3 245	2.5W	6PDT	5	1.55 1.55
ML11D	4.0mA 2.83mA 2.0mA	2,500 5,000 10,000	40mW	DPDT	3	.35 .50 .85
ML17D	5.65mA 4.0mA 2.83mA	2,500 5,000 10,000	80mW	4PDT	3	1.70 1.90 2.25
ML23D	6.93mA 3.4mA	2,500 10,000	120mW	6PDT	3	.85 4.

HIGH PERFORMANCE RELAYS

FC SERIES Conventional micro-miniature relay lies flat on printed circuit board. Withstands 150g shock, 400g linear acceleration, 30g vibration to 2000 Hz. Ambient temperature range: —65° to +125°C. Hermetically welded. Bifurcated contacts. Plugs in on .2" grid. Meets applicable sections of MIL-R-5757D, and MSFC-SPEC-339. Weight: .75 oz.

FL SERIES Dual-coil latching relay has same specs as above, except operates by pulsing each coil alternately (observing coil polarity); or connecting the coils in series from a reversing (polarized) source. Remains latched without coil power.

HC SERIES A micro-miniature, non-polarized, non-latching half-size crystal case relay for high reliability performance. Its high-torque motor structure and bifurcated, gold-plated silver DPDT contacts, rated dry circuit to 2 amps @ 28V DC resistive, provide positive performance in low level applications. Temperature range: —65°C to +125°C. Hermetically welded. HC11D has plug-in, plain case; HC11DA has hook-end solder terminals and shoulder brackets; HC11DB has hook-end solder terminals and flat mounting plate with 2 holes. The HC series meets or exceeds all applicable sections of MIL-R-5757D/9, and complies with MSFC-SPEC-339. Size: Plain case .8" x .4" x .4" (seated). Weight: ¼ oz.



TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	SUGG. RETAIL SALE PRICE
FC11D	6V 12V 24V	60 210 900	.65W	DPDT	3	.4 .4 .4
FL11D	6V 12V 24V	67.5 230 1,000	.65W	DPDT	3	.7 .7 .7

TELEPHONE TYPE RELAYS

TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RETAIL SALE PRICE
HC11D HC11DA HC11DB	24V	814	.72W	DPDT	2	$

SPECIFY COIL VOLTAGE OR RESISTANCE WHEN ORD

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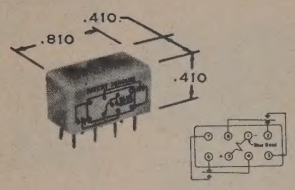
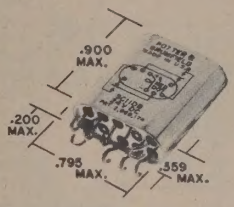
HIGH PERFORMANCE RELAYS (CONTINUED)

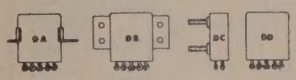
M SERIES Military version of miniature HC relay. Hermetically sealed construction features. Hermetically sealed and vibration tested for use in demanding applications such as aircraft and ground support equipment. Meets or exceeds appropriate sections MIL-R-5757E. Straight pins or hook solder terminals. Solder bracket available. HCM has same mounting as HC Series on previous page. Weight: oz.



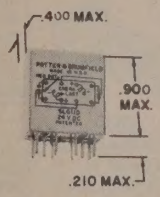
SC SERIES Micro-miniature permanent magnet relay for low power, high shock/vibration applications. 30g shock, 30g vibration to 2000 Hz with no contact chatter. Ambient temperature range: −65°C to +125°C. Features single coil action and contacts of standard micro-miniature coil operation. Polarized connections because of magnetic polarity. Positive terminal marked with red dot. Mounting: SC11D**, —DA, —DB, DC and DD correspond to similarly designed SL mountings. SCG11D has rectangular header with terminals on .2" grid. Weight: oz.



Accessories: No. HRK-1, 8-pin receptacles available from distributors for plug-in applications.



SL SERIES Dual coil micro-miniature magnetic latching relay with same shock/vibration, resistance and ambient temperature range as SC. Coils may be connected in series for polar operation. Mounting: SL11D for plug-in applications: —DA has shoulder bushings with two .104" x .136" holes on a 1.062" center; —DB has a welded bracket with four .125" holes on 1.062" x .281" centers; —DC has two No. 4-40 NC 2A threaded studs on .488" x .220" centers; —DD has plain case with hook and solder terminals. SLG11D has plug-in terminals on .2" grid.



Accessories: No. HRKB-1, 10-pin receptacles available from distributor for plug-in applications.

TELEPHONE TYPE RELAYS

TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RESALE PRICE
HCM11D						$12.90
HCM11DA	24V	814	.72W	DPDT	2	12.90
HCM11DB						12.90
SC11D	6V	35	1W	DPDT	2	19.60
	12V	135				19.60
	24V	550				19.60
SC11DA	12V	135	1W	DPDT	2	19.60
	24V	550				19.60
SC11DB	6V	35	1W	DPDT	2	19.60
	12V	135				19.60
	24V	550				19.60
SC11DC	24V	550	1W	DPDT	2	19.60
SC11DD	24V	550	1W	DPDT	2	19.60
SCG11D	24V	550	1W	DPDT	2	19.60
SC7141	26.5V	MIL-R-1575E/10C-141 or RY4NA3B3L01				19.75
SL11D	6V	40	1W	DPDT	2	21.45
	12V	160				21.45
	24V	630				21.45
SCL11DA	6V	40	1W	DPDT	2	21.45
	12V	160				21.45
	24V	630				21.45
SL11DB	6V	40	1W	DPDT	2	21.45
	12V	160				21.45
	24V	630				21.45
SL11DC	24V	630	1W	DPDT	2	21.45
SL11DD	24V	630	1W	DPDT	2	21.45
SLG11D	24V	630	1W	DPDT	2	21.45

VOLTAGE SENSORS

VS SERIES Two types of accurate, low cost solid state voltage sensors are available. First, an adjustable pick-up and drop-out series for 24V DC and 120V AC voltage sources. Second, a series with fixed pick-up and adjustable drop-out, also for 24V DC and 120V AC voltage sources. All are provided with standard octal plugs for socket mounting and are enclosed in a nylon dust cover. Please see details for ranges of voltage adjustments.

Fixed pick-up and adjustable drop-out. One knob for setting drop-out value.

Adjustable pick-up and drop-out. Two knobs for setting desired values.

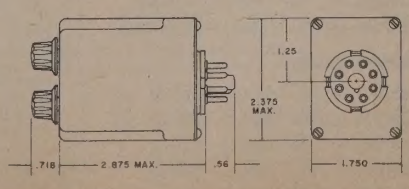
SPECIFICATIONS

Quiescent Current Drain: Maximum of 3 ma.
Maximum Current Drain: After sensing: 30 ma.
Accuracy of Set Point: 1% after initial setting.
Reverse Polarity Protection: Yes, on DC types.
Operating Temperature: −40°C to +55°C.
Switching Relay Contacts: 2 Form C (DPDT). Rating: 3 amps 28V DC resistive; 120V AC resistive.
Expected Life:
Mechanical: 10 million operations.
Electrical: 100,000 operations minimum @ rated load.

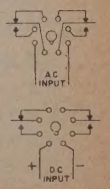
ADJUSTABLE PICK-UP AND DROP-OUT

TYPE	PICK-UP RANGE (VOLTS)	DROP-OUT RANGE (VOLTS)	TYPE OF VOLTAGE	SUGG. RESALE PRICE
CSJ38-30010	20-30	18-28	AC (50/60 Hz)	$30.20
CSJ38-70010	92-140	90-138	AC (50/60 Hz)	32.95
CSL38-30010	20-30	18-28	DC	26.20
FIXED PICK-UP AND ADJUSTABLE DROP-OUT				
CSJ38-71010	105	90-103	AC (50/60 Hz)	$29.20
CSL38-31010	22	16-20	DC	23.15

OUTLINE DIMENSIONS



SCHEMATICS



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DRY REED RELAYS

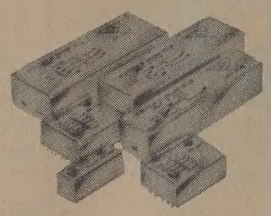
JR (STANDARD) SERIES
JRA LOW COST SERIES

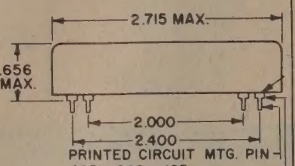
TWO TYPES OF CAPSULES The JRA Series is available only in a Form A (SPST-NO) contact arrangement. Both JR and JRM relays have reed switches with either Form A (SPST-NO) or Form C (SPDT) contact configuration. Biasing with a permanent magnet changes Form A to a Form B (SPST-NC). This arrangement requires that coil polarity be observed. Combining one Form A with one Form B results in a single Form C (SPDT) break-before-make. A "true" Form C (SPDT) uses a reed switch with two stationary and one movable contact. The movable contact is normally closed until the coil is energized.

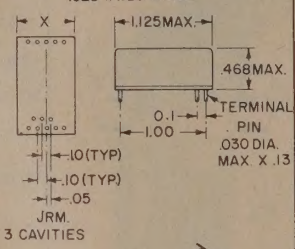
JRM (MINIATURE) SERIES Fast response, reliable performance, high sensitivity, and long life make JR standard and JRM miniature series relays especially suited for data processing applications, computer equipment, logic circuitry and various other sophisticated control circuits.

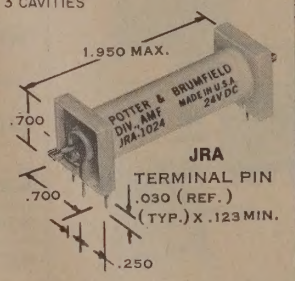
JDT DUAL THIN-LINE The low profile (only 0.275" max. height) JDT Dual Thin-Line reed relays are ideal for high density packaging applications. Hermetically sealed glass capsules are epoxy encapsulated in 4 pole (4100 Series) or 8 pole (8100 Series) configurations. Dual in-line terminals on .100" centers for p.c. board mounting are featured. Operate time is 3.5 milliseconds including bounce. Release time is 3.5 milliseconds maximum. Weight: JDT 4100, ½ oz.; JDT 8100, ¾ oz.

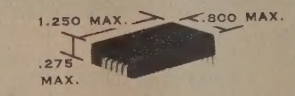
TWO TYPES OF BASIC CAPSULES Both JR and JRM relays employ dry reed glass capsules with two basic types of contact arrangements, Form A (SPST-NO) or Form C (SPDT). Biasing with a permanent magnet changes Form A to a Form B (SPST-NC). This arrangement requires that coil polarity be observed. It uses a two-cavity bobbin. Combining one Form A with one Form B results in a single Form C (SPDT) break-before-make; this uses a three-cavity bobbin. A "true" Form C (SPDT) uses a reed switch with two stationary and one movable contact. The movable contact is normally closed until the coil is energized, causing a "true" Form C (SPDT) break-before-make; it uses a single-cavity bobbin.











JRA LOW COST SERIES

TYPE	COILS: Contact Arrangement	Number of Cavities	Sugg. Nominal Voltage	Resistance in Ohms	Reed Rating Watts	SUGG. SALE PRICE
JRA1006	1A	1	6	74	25VA	1.50*
JRA1012	1A	1	12	290	25VA	1.50*
JRA1024	1A	1	24	1,200	25VA	1.50*

*Quantities over 76 units are $.77 each.

JR STANDARD SERIES

JR1000	1A	1	6	150	50	3.20
JR1001	2A	2	6	100	15	3.30
JR1020	1A	1	6	150	50	3.50
JR1040	1C*	1	6	150	10	3.05
JR1041	2C*	2	6	100	10	3.80
JR1060	1B	2	6	100	15	3.30
JR1005	1A	1	12	600	15	3.20
JR1006	2A	2	12	400	15	3.30
JR1008	4A	4	12	150	15	5.00
JR1025	1A	1	12	600	50	3.50
JR1045	1C*	1	12	600	10	3.05
JR1046	2C*	2	12	400	10	3.80
JR1063	1B	2	12	400	15	3.30
JR1086	1A + 1B	3	12	200	15	5.30
JR1010	1A	1	24	2,400	15	3.75
JR1011	2A	2	24	1,600	15	3.55
JR1013	4A	4	24	600	15	5.30
JR1030	1A	1	24	2,400	50	3.85
JR1031	2A	2	24	1,600	50	3.25
JR1050	1C*	1	24	2,400	10	3.40
JR1051	2C*	2	24	1,600	10	3.90
JR1066	1B	2	24	1,600	15	3.35
JR1088	1A + 1B	3	24	800	15	5.65
JR1089	2A + 2B	5	24	384	15	5.75

JDT DUAL THIN-LINE SERIES

JDT4100	4A	4	6VDC	115	10	1.65
JDT4105	4A	4	12VDC	480	10	1.65
JDT4110	4A	4	24VDC	1,850	10	1.30
JDT8100	8A	8	6VDC	60	10	1.95
JDT8105	8A	8	12VDC	260	10	1.95
JDT8110	8A	8	24VDC	1,050	10	1.70

JRM MINIATURE SERIES

JRM1000	1A	1	6	200	10	1.45
JRM1001	2A	2	6	130	10	1.05
JRM1003	4A	4	6	67	10	1.05
JRM1036	1B	2	6	130	10	1.40
JRM1037	2B	3	6	86	10	1.90
JRM1048	1A + 1B	3	6	86	10	1.90
JRM1049	2A + 2B	5	6	50	10	1.05
JRM1006	1A	1	12	800	10	1.45
JRM1007	2A	2	12	520	10	1.05
JRM1009	4A	4	12	268	10	1.05
JRM1040	1B	2	12	520	10	1.40
JRM1041	2B	3	12	344	10	1.90
JRM1050	1A + 1B	3	12	344	10	1.90
JRM1051	2A + 2B	5	12	200	10	1.05
JRM1012	1A	1	24	3,200	10	1.80
JRM1013	2A	2	24	2,080	10	1.20
JRM1015	4A	4	24	1,072	10	1.15
JRM1044	1B	2	24	2,080	10	1.50
JRM1045	2B	3	24	1,376	10	1.05
JRM1052	1A + 1B	3	24	1,376	10	1.05
JRM1053	2A + 2B	5	24	800	10	2.[illegible]

SPECIFICATIONS

Pick-up: 75% of nominal @ 25°C.

Operate Time: At nom. voltage @ 25°C: JR: 3ms. JRM: 1ms.

Release Time: At 25°C: JR: .5ms. JRM: .05ms.

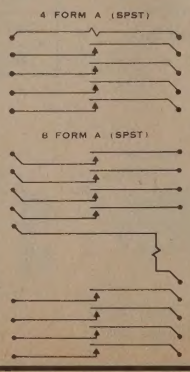
Coil Power: Based upon nom. voltage and resistance. JR: 1 capsule — 240 mw; 2 capsules — 360 mw; 3 capsules — 720 mw; 4 capsules — 960 mw; 5 capsules — 1.5 w.

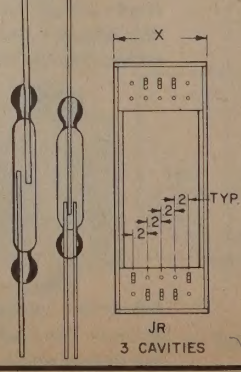
JRM: 1 capsule — 180 mw; 2 capsules — 275 mw; 3 capsules — 420 mw; 4 capsules — 540 mw; 5 capsules — 720 mw.

For additional specifications see columnar listings and drawings.

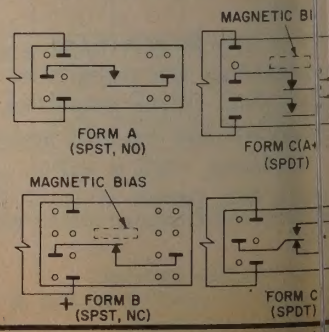
JR Standard Relays	Weights
X = 1 Cavity = .687" max.	— 1.50 ozs.
X = 2 Cavities = .890" max.	— 2.00 ozs.
X = 3 Cavities = 1.094" max.	— 2.50 ozs.
X = 4 Cavities = 1.297" max.	— 3.00 ozs.
X = 5 Cavities = 1.516" max.	— 3.50 ozs.

JRM Miniature Relays	
X = 1 Cavity = .437" max.	— .366 oz.
X = 2 Cavities = .562" max.	— .395 oz.
X = 3 Cavities = .703" max.	— .530 oz.
X = 4 Cavities = .813" max.	— .620 oz.
X = 5 Cavities = .968" max.	— .781 oz.





TYPICAL WIRING DIAGRA



AMF | POTTER & BRUMFIELD

PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

MERCURY-WETTED CONTACT RELAYS

SERIES are long life, high speed, and unvarying dependability — are the result of the basic component of these relays: a hermetically sealed glass capsule. It contains the contact arrangement and small reservoir of mercury sealed in a high pressure hydrogen atmosphere. A film of mercury is renewed for every operation — that's you can think in terms of billions of operations without contact pice, pitting or welds.

TYPES OF CAPSULES The capsules used in JMF and JMF2 (with capsules) modules and JML relays has a SPDT, break-before-make (Form C), non-bridging contact arrangement. Each capsule used in JMP, JMS and JM4 relays has a SPDT, make-before-break (Form D), bridging contact arrangement. JMF, JMF2, JML and JMP series achieve a high sensitivity by factory-adjusted magnet biasing.

MOUNTING POSITION: Upright mounting required, but deviation from upright up to 30° causes only minor deviation in operating characteristics.

CONTACT RATINGS

JMF and JML: 500V max., and 2 amps max., 100 VA max.*

JMS and JM4: 500V max., and 5 amps max., 250 VA max.

Contact protection unless in a low level circuit. Details of a suppression circuit consisting of resistor and capacitor in series packed with each relay.

TERMINATIONS

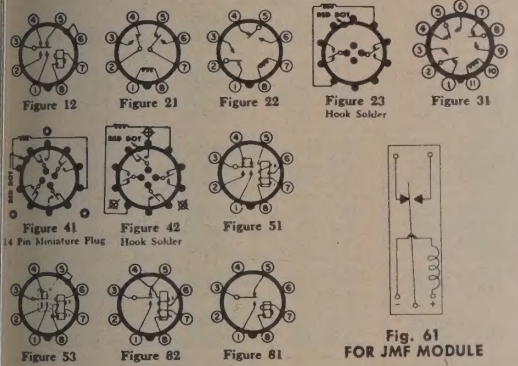
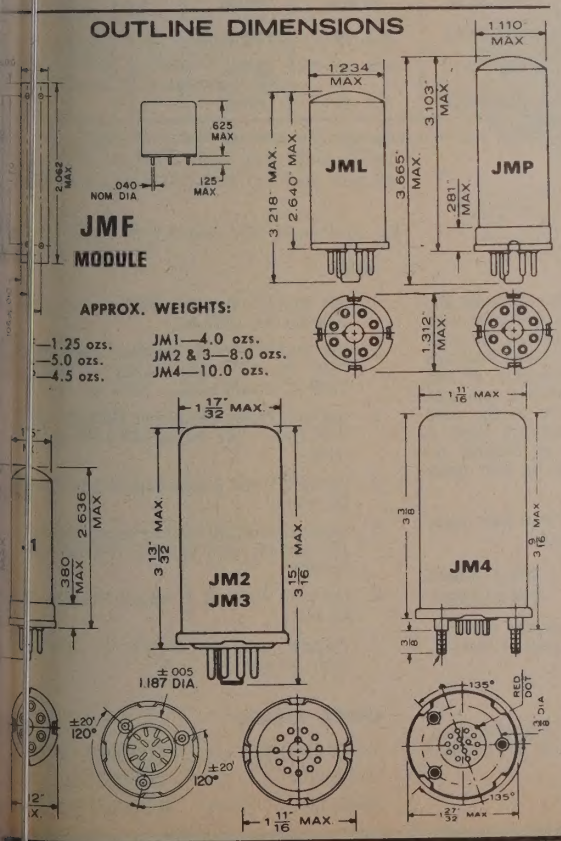


Fig. 61
FOR JMF MODULE

OUTLINE DIMENSIONS



APPROX. WEIGHTS:

—1.25 ozs. JM1—4.0 ozs.
—5.0 ozs. JM2 & 3—8.0 ozs.
—4.5 ozs. JM4—10.0 ozs.

JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES: Capsule	Coil	Term.* Fig. No.	COIL CHARACTERISTICS: Resistance in Ohms ±10% @ 25°C	Sugg. Min. Operate mA DC	Soak † mA DC	Must Operate DC	Must Release DC	SUGG. RESALE PRICE
JMF Printed Circuit Module Sensitive Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JMF	1070	61	450	16.13	—	12.9	2.1	$11.35
	JMF	1080	61	675	14.50	—	11.6	1.9	11.35
	JMF	1120	61	1,425	10.50	—	8.4	1.4	11.35
	JMF	1150	61	2,400	9.75	—	7.8	1.3	11.35
	JMF	1160	61	4,000	5.00	—	4.0	0.67	11.90
	BI-STABLE								
	JMF	5080	61	675	+6.75	—	±5.4	—	11.35
JMF2 Dual Capsule Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JMF2	1000	71	130	6VDC	—	3VDC	0.5VDC	21.75
	JMF2	1001	71	520	12VDC	—	6VDC	1.0VDC	21.75
	JMF2	1002	71	2,200	24VDC	—	12VDC	2.0VDC	22.30

JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES: Capsule	Coil	Term.* Fig. No.	COIL CHARACTERISTICS: Resistance in Ohms ±10% @ 25°C	Must Operate mA DC	Max. Volts DC @ 25°C	SUGG. RESALE PRICE
JMS Sensitive Form D Bridging	20 Milliwatts (per winding), Bi-Stable, Dual-Wound Coil.						
	JMS	5040	62	325/325	±7.0	24	$11.35
	JMS	5070	62	1250/1250	±3.6	47	11.90
	40 Milliwatts, Single-Side-Stable, Single-Wound Coil.						
	JMS	1070	61	34	32	7.7	11.35
	JMS	1130	61	620	7	33	11.35
	JMS	1160	61	2430	3.6	65	11.90
	JMS	1190	61	8600	2.0	122	11.90

JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES: Capsule	Coil	Term.* Fig. No.	COIL CHARACTERISTICS: Resistance in Ohms ±10% @ 25°C	Sugg. Min. Operate mA DC	Soak † mA DC	Must Operate DC	Must Release DC	SUGG. RESALE PRICE
JML Sensitive Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JML	1061	81	40	12.19	36.0	9.75	1.68	$14.00
	JML	1110	81	350	4.45	13.1	3.56	0.61	14.00
	JML	1160	81	1,000	2.76	8.1	2.21	0.38	14.00
	JML	1190	81	2,500	1.79	4.0	1.43	0.17	14.95
	JML	1200	81	4,000	1.56	3.4	1.25	0.25	14.95
	JML	1240	81	11,000	.90	2.6	0.72	0.12	14.95
	JML	1260	81	25,000	.65	1.9	0.52	0.09	14.95
	BI-STABLE								
	JML	5200	81	4,000(1)	+.66	—	±0.53	—	14.95
	JML	5430	82	1,100(2)	+2.20	—	±1.76	—	16.40
				1,100					
	CHOPPER						Voltage RMS 60 Hz		
	JML	8130	81	600	—	—	6.3V	—	14.60
JMP Polarized Form D Bridging	SINGLE-SIDE-STABLE								
	JMP	1160	11	1,000	7.0	16.2	5.60	0.40	18.40
	JMP	1200	11	4,000	3.70	8.55	2.96	0.24	19.70
	BI-STABLE								
	JMP	5200	11	4,000	+1.88	—	±1.5	—	19.70

TYPE	SERIES: Capsule	Coil	Term.* Fig. No.	COIL CHARACTERISTICS: Resistance in Ohms ±10%	Sugg. Min. Operate mA DC	MUST OPERATE: Current mA DC	Voltage DC @ 25°C	Max. Voltage @ 25°C	SUGG. RESALE PRICE
JM1 Form D Bridging 1 capsule SPDT	SPDT SINGLE COIL								
	JM1	106	12	40	83.70	67.7	2.98	9.0	$16.95
	JM1	109	12	130	47.50	38.8	5.55	16.1	16.95
	JM1	112	11	500	25.00	20.1	11.10	31.6	16.95
	JM1	114	11	700	25.00	20.0	15.40	37.4	16.95
	JM1	114	12	700	25.00	20.0	15.40	37.4	16.95
	JM1	118	11	2,500	12.50	10.1	27.80	70.7	17.25
	JM1	119	11	4,000	10.00	8.1	35.60	89.5	8.55
	JM1	120	11	7,000	10.00	6.0	46.20	117.0	17.85
	JM1	121	11	11,000	6.25	5.0	60.50	148.0	17.85
	JM1	123	11	25,000	4.50	3.6	99.00	224.0	17.85
JM2 Form D Bridging 2 capsules DPDT	DPDT SINGLE COIL								
	JM2	104	22	50	137.50	110.0	6.04	12.25	27.50
	JM2	106	21	140	81.25	66.5	10.00	20.5	27.50
	JM2	109	22	315	55.00	44.0	15.30	30.7	27.50
	JM2	110	22	500	42.25	34.8	19.20	38.7	27.50
	JM2	111	22	700	37.30	30.5	23.50	45.8	27.50
	JM2	112	22	1,250	27.50	22.1	30.40	61.2	27.50
	JM2	115	21	5,000	13.75	11.3	62.10	122.0	27.50
	JM2	115	22	5,000	13.75	11.3	62.10	122.0	27.50
JM3 Form D 3 capsules 3PDT	3PDT SINGLE COIL								
	JM3	109	31	315	55.00	44.0	15.30	30.7	35.60
	JM3	110	31	500	42.50	34.8	19.20	38.7	35.60
	JM3	111	31	700	37.30	30.5	23.50	45.8	35.60
	JM3	115	31	5,000	13.75	11.3	62.10	122.0	35.60
JM4 Form D Bridging 4 capsules 4PDT	4PDT SINGLE COIL								
	JM4	106	41	65	125.00	100.0	7.15	15.1	45.90
	JM4	110	41	390	52.50	42.0	18.00	37.0	45.90
	Octal style plugs, except Fig. 41 (14-pin miniature plug).								
JM4 Form D Bridging Module 1 capsule SPDT	SPDT SINGLE COIL								
	JMD	1060	63	150	70.00	55.0	9.1	18	11.45
	JMD	1090	63	450	41.90	33.5	16.6	30	11.45
	JMD	1100	63	750	30.0	24.3	20.0	39	11.45

* See termination figures on this page.

† Current to be applied to the coil winding for at least 2 seconds just prior to current flow tests.

AMF | POTTER & BRUMFIELD

PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

SOLID STATE TIME DELAY RELAYS

A wide selection of three separate series of solid state time delay controls are represented by Potter & Brumfield time delay relays, the CD series, the CH series, and the CU series. The differences between the three types consist in their degree of accuracy, the variety available in each series, and their cost.

BASIC TIMING CIRCUIT The basic timing circuit of all three series consists of a resistor in series with a capacitor. When the input voltage is applied to the resistor-capacitor circuit, the voltage across the capacitor slowly increases. When the firing level is reached a solid state trigger circuit acts to turn on a solid state output switch that energizes a switching relay or external electrical load. The solid state design eliminates cams, clutches and motors. Using no moving parts, the timing circuit can have no mechanical wear, an advantage that is especially desirable when accurate recycling is required.

CU SERIES An outstanding value in a solid state time delay relay at low cost, the CU series is designed for delay on operate applications in machine tool controls, copiers, office equipment, coin-operated machines, process controls and many others. It is available in two types: Fixed time delay that is set at the factory and cannot be modified. Second, adjustable with an external resistor. For minimum time two terminals, 2 and 5, must be shorted; for maximum time the listed external resistor between terminals 2 and 5 must be added. For intermediate times select a lesser value resistor, or a potentiometer. Either model can be furnished in two types of enclosures with the relay in the same enclosure as the solid state unit. The CU series is offered with delay on operate only.

CUA and CUC are fixed time delays. **CUF and CUH** are resistor adjustable delays. All with internal DPDT 10 amp contact relay.

CUA 41-70010	**CUF 41-70010**
CUA 41-70120	**CUF 41-70120**
CUC 41-30010	**CUH 41-30010**
CUC 41-30120	**CUH 41-30120**
CUA 41-30010	**CUF 41-30010**
CUA 42-70010	**CUF 42-70010**
CUA 42-70120	**CUF 42-70120**
CUC 42-30010	**CUH 42-30010**
CUC 42-30120	**CUH 42-30120**
CUA 42-30010	**CUF 42-30010**

CU-41 is a plain case relay, **CU-42** has a slotted flange case. Diagram A is for fixed delays, diagram B for resistor adjustable delays.

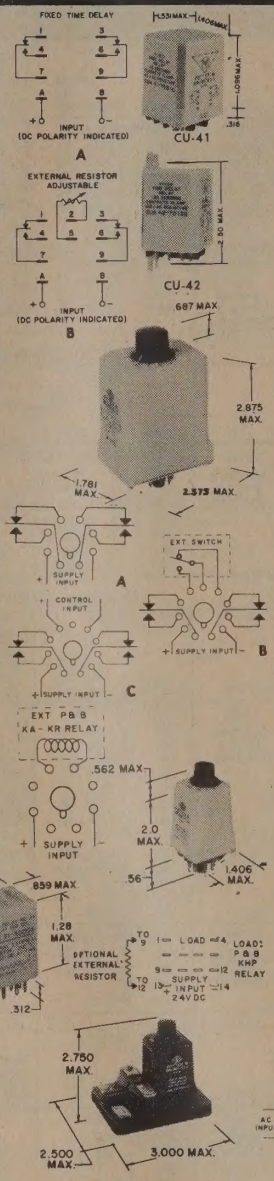
CH SERIES The CH series is intended for a wide range of industrial applications where economy is of greater interest than highly critical performance. It is available in two types: Knob-adjustable with the relay in the same enclosure as the solid state unit. The second type has a fixed time delay period that is set at the factory and cannot be modified; its case has no knob. The CH series is available for time delay on operate and on release.

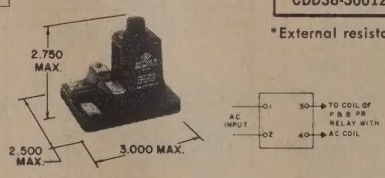
CH-38 and CD-38. Knob-adjustable delay "on operate" wtih internally mounted DP-DT relay. Contacts rated to 10 amps. Diagram A.

CHA-38-70001	**CHD-38-30003**
CHB-38-30001	**CDB-38-70003**
CHB-38-30003	**CDB-38-70004**
CHB-38-70001	**CDB-38-70005**
CHB-38-70003	**CDD-38-30003**
CHB-38-80001	**CDD-38-30004**
CHD-38-30001	**CDD-38-30005**

Delay "on release" CH requires auxiliary SPDT switch or relay contacts: CBH-38-70011, CHB-38-70013, CHD-38-30011, CHD-38-30013: Diagram B. CD "release" occurs when "Control" circuit is de-energized; supply circuit must be on continuously:

CDB-38-70012, CDD-38-30012: Diagram C.





TYPE	TIME DELAY IN SECONDS	INPUT VOLTAGE	NOTES	GG. SALE ICE
CUA41-70010	10	120VAC	1	4.20
CUA41-70120	120	120VAC	1	5.75
CUC41-30010	10	24VDC	1	4.20
CUC41-30120	120	24VDC	1	5.75
CUA41-30010	10	24VAC	1	4.20
CUA42-70010	10	120VAC	1	4.20
CUA42-70120	120	120VAC	1	5.75
CUC42-30010	10	24VDC	1	4.20
CUC42-30120	120	24VDC	1	5.75
CUA42-30010	10	24VAC	1	4.20
CUF41-70010	1.0 - 10	120VAC	200K.*	5.00
CUF41-70120	1.0 - 120	120VAC	2.4 Meg.*	6.20
CUH41-30010	1.0 - 10	24VDC	160K.*	5.00
CUH41-30120	1.0 - 120	24VDC	2 Meg.*	6.30
CUF41-30010	1.0 - 10	24VAC	200K.*	5.00
CUF42-70010	1.0 - 10	120VAC	200K.*	5.00
CUF42-70120	1.0 - 120	120VAC	2.4 Meg.*	6.30
CUH42-30010	1.0 - 10	24VDC	160K.*	5.00
CUH42-30120	1.0 - 120	24VDC	2 Meg.*	6.30
CUF42-30010	1.0 - 10	24VAC	200K.*	5.00
CHA38-70001	10	120VAC	1	3.90
CHB38-30001	1.0 - 10	24VAC	1	3.95
CHB38-30003	1.0 - 180	24VAC	1	3.95
CHB38-70001	1.0 - 10	120VAC	1	3.95
CHB38-70003	1.0 - 180	120VAC	1	3.95
CHB38-80001	1.0 - 10	240VAC	1	3.95
CHD38-30001	1.0 - 10	24VDC	1	3.95
CHD38-30003	1.0 - 180	24VDC	1	3.95
CHB38-70011	1.0 - 10	120VAC	1 & 7	3.95
CHB38-70013	1.0 - 180	120VAC	1 & 7	3.95
CHD38-30011	1.0 - 10	24VDC	1 & 7	3.95
CHD38-30013	1.0 - 180	24VAC	1 & 7	3.95
CDB38-70003	0.1 - 10	120VAC	1	4.25
CDB38-70004	0.6 - 60	120VAC	1	4.25
CDB38-70005	1.8 - 180	120VAC	1	4.25
CDD38-30003	0.1 - 10	24VDC	1	4.00
CDD38-30004	0.6 - 60	24VDC	1	4.00
CDD38-30005	1.8 - 180	24VDC	1	4.00
CDB21-70003	0.1 - 10	120VAC	2	4.15
CDB21-70001	1.8 - 180	120VAC	2	4.15
CDD21-30003	0.1 - 10	24VDC	3	4.80
CDD21-30001	1.8 - 180	24VDC	3	4.80
CDH31-30005	180 Max.	24VDC	4 & 5	4.35
CDB45-70002	0.6 - 60	120VAC	6	4.50
CDB38-70012	0.6 - 60	120VAC	1 & 7	4.90
CDD38-30012	0.6 - 60	24VDC	1 & 7	4.95

*External resistor (not furnished) for maximum time.

CD SERIES Remarkably dependable, accurate and flexible, the CD series offers an unusually wide selection of operational configurations, all with accurate time delay values, fast reset time and excellent repeatability. It is available in two types: Knob-adjustable in two versions, one with the relay in the same enclosure as the solid state unit, the other with an auxiliary relay. A second type is adjustable with an external resistor. The CD series is available for time delay on operate or on release.

CD-21. Knob-adjustable. Use with P&B KRP relays (see page 3) as listed under Note 2.

CDB-21-70003	**CDD-21-30003**
CDB-21-70001	**CDD-21-30001**

CD-31. Adjustable with external resistor (not furnished). Use with KHP relay (see page 2), Note 4.

CDH-31-30005

CD-45. Knob-adjustable. For heavy duty when used with PR power relay (see page 4) as listed under Note 6.

CDB-45-70002

NOTES

1. Has internal relay with DPDT contacts rated at 10 amperes, 120V AC.
2. Use with Potter & Brumfield relay KRP11AG-120V AC, KRP11AG— 120V or KRP11G— 120V AC or KRP14AG— 120V AC.
3. Use with Potter & Brumfield KRP5DG— 24V DC, KRP11DG— 24V DC or KRP-14DG— 24V DC relay.
4. Use with Potter & Brumfield KHP-17D11—24V DC relay.
5. Supplied with 180 seconds delay; adjustable to 1.8 seconds with external resistor (not furnished).
6. Use with Potter & Brumfield PR11AY—120V AC relay.
7. Provides delay on release; all others have delay on operate.

APPROX. WEIGHTS:

SERIES CD-31 2.00 ozs.	SERIES CD-45 6.00 ozs.
SERIES CD-21 4.25 ozs.	SERIES CD-38 8.25 ozs.
SERIES CH-38 4.00 ozs.	ALL SERIES CU 3.25 ozs.

MF | POTTER & BRUMFIELD

PRINCETON, INDIANA 47570 / AREA CODE 812/385-5251

TIME ELAY RELAYS

12 SER The R12 Series time delay relays com- ne the eld proven R10 Series basic relay with a gh qu y delay circuit. The time delay circuit es sil n transistors throughout and the critical ming acitor meets the specifications for mili- ry use hese small DC variable time delay relays not se operate and will time as low as 0.1 econd. ming range of 0.1 to 120 seconds is anned three models: 0.1 to 2, 1.0 to 30 and 0 to 1 seconds. Each time range is varied with high olution 15-turn potentiometer. The inter- ally m ted R10 Series relay is equipped with PDT c acts rated 5 amperes. Solder terminals re prov d and mounting may be accomplished by 3-4 tud or sockets offering solder or printed rcuit rd terminals.

12. V able time delay with high resolution 15- rn p ntiometer. Calibrated timing capacitor eets cifications for military use. Fits sockets elow, notes 9 and 10.

XR12-1 PDT Solder terminal sockets and retainers.

NET $9.00

XR12-2 PDT Printed circuit terminal sockets and etainer

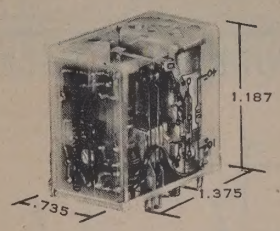
NET $9.00

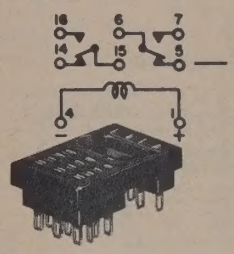
L SER Designed for delay on operate, the CL eries similar to the CU with the exception that hey do false operate† and will time to 0.1 sec- nd. The solid state time delays are ideal for AC r DC plications. A DPDT KU relay rated 10 am- eres mounted in the same enclosure, forming a ompac ssembly. CL relays are enclosed in yellow olycar nate dust covers and are available in three ypes: d, resistor adjustable and knob adjustable. lug-in ick-connect terminals facilitate handling nd ho up.

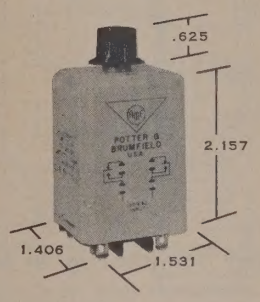
L-41. plain case relay similar to the CU-41 with he e tion that it doesn't false operate. See age for mounting accessories (9KU).

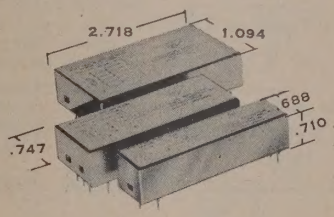
UB/C 51. Knob-adjustable versions of CU en- losed slightly taller 51 style case. Same mount- ng ac sories as CU-41. CLB does not false operate.

IC 'S ES. Fixed time delay that is factory set nd c ot be modified.









CODE: 01 - 1 FORM A
02 - 1 FORM B
03 - 1 FORM C

TYPE	TIME DELAY IN SECONDS	INPUT VOLTAGE	NOTES	SUGG. RESALE PRICE
R12-2-12-X2-E1	0.1-2	12VDC	9 & 10	$18.10
R12-2-24-X2-E1	0.1-2	24VDC	9 & 10	18.10
R12-30-12-X2-E1	1.0-30	12VDC	9 & 10	18.60
R12-30-24-X2-E1	1.0-30	24VDC	9 & 10	18.60
R12-120-12-X2-E1	5.0-120	12VDC	9 & 10	20.10
R12-120-24-X2-E1	5.0-120	24VDC	9 & 10	20.10
CLA41-70010	10	120VAC	1 & 9	17.35
CLC41-30010	10	24VDC	1 & 9	17.35
CLF41-70010	0.1-10	120VAC	200K.*	18.85
CLH41-30010	0.1-10	24VDC	160K.*	18.85
CLB51-30010	0.1-10	24VAC	1 & 9	19.85
CLB51-70010	0.1-10	120VAC	1 & 9	19.85
CLB51-70120	1.2-120	120VAC	1 & 9	21.15
CJC01-20003	3	12VDC	8	19.30
CJC01-30003	3	24VDC	8	19.30
CJC02-20003	3	12VDC	8	19.95
CJC02-30003	3	24VDC	8	19.95
CJC03-20003	3	12VDC	8	21.20
CJC03-30003	3	24VDC	8	21.20

* External resistor (not furnished) for maximum time.

NOTES

1. Has internal relay with DPDT contacts rated at 10 amperes, 120V AC.
2. Use with Potter & Brumfield relay KRP5AG- 120V AC, KRP11AG- 120V or KRP14AG- 120V AC.
3. Use with Potter & Brumfield KRP5DG- 24V DC, KRP11DG- 24V DC or KRP14DG- 24V DC relay.
4. Use with Potter & Brumfield KHP17D11- 24V DC relay.
5. Supplied with 180 seconds delay; adjustable to 1.8 seconds with external resistor (not furnished).
6. Use with Potter & Brumfield PR11AY- 120V AC relay.
7. Provides delay on release; all others have delay on operate.
8. Internal relay contacts rated at 10 VA, other ratings available upon request.
9. Does not false operate.
10. Internal relay has 5 ampere rated contacts.

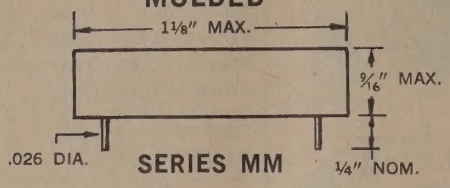
RANDALL inc.

6 PAWCATUCK AVENUE WESTERLY, RHODE ISLAND 02891
Phone: 203-599-1750

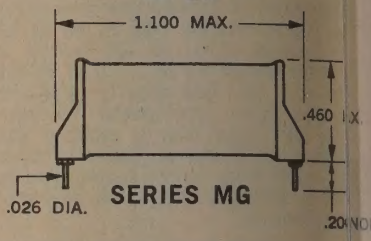
A SUBSIDIARY OF WALTER KIDDE & CO., INC.

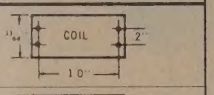
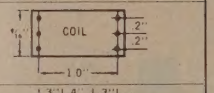
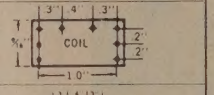
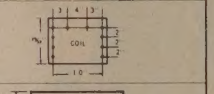
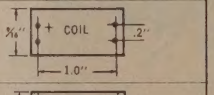
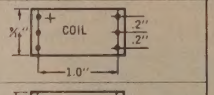
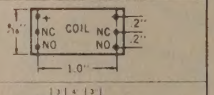
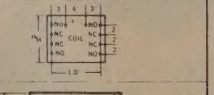
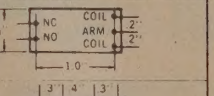
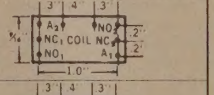
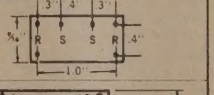
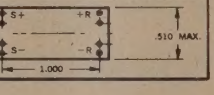
MINIATURE REED RELAYS

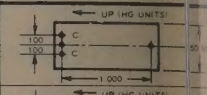
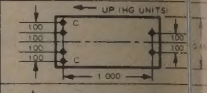
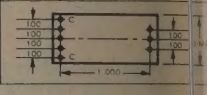
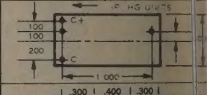
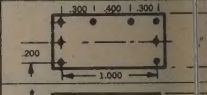
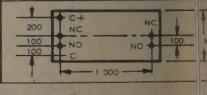
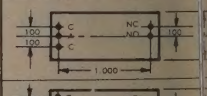
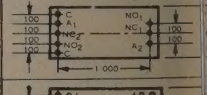
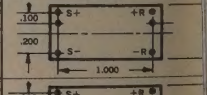
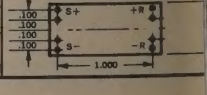
MOLDED



OPEN

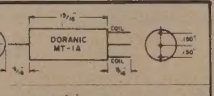
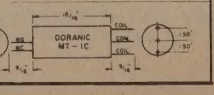


Contact Form	Nominal VDC	Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)
1A*	6 12 24	6MM1A 12MM1A 24MM1A	250 1000 4000	
2A*	6 12 24	6MM2A 12MM2A 24MM2A	170 675 2700	
3A	6 12 24	6MM3A 12MM3A 24MM3A	110 450 1800	
4A*	6 12 24	6MM4A 12MM4A 24MM4A	95 375 1500	
1B*	6 12 24	6MM1B 12MM1B 24MM1B	170 675 2700	
2B	6 12 24	6MM2B 12MM2B 24MM2B	110 450 1800	
1A1B*	6 12 24	6MM1A1B 12MM1A1B 24MM1A1B	110 450 1800	
2A2B	6 12 24	6MM2A2B 12MM2A2B 24MM2A2B	50 200 800	
1C	6 12 24	6MM1C 12MM1C 24MM1C	250 1000 4000	
2C	6 12 24	6MM2C 12MM2C 24MM2C	170 675 2700	
1A (Latching)	6 12 24	6MML1A 12MML1A 24MML1A	85/85 340/340 1350/1350	
2A (Latching)	6 12 24	6MML2A 12MML2A 24MML2A	55/55 225/225 900/900	

Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)
6MG1A 12MG1A 24MG1A	250 1000 4000	
6MG2A 12MG2A 24MG2A	170 675 2700	
6MG3A 12MG3A 24MG3A	110 450 1800	
6MG1B 12MG1B 24MG1B	170 675 2700	
6MG2B 12MG2B 24MG2B	110 450 1800	
6MG1A1B 12MG1A1B 24MG1A1B	110 450 1800	
6MG1C 12MG1C 24MG1C	250 1000 4000	
6MG2C 12MG2C 24MG2C.	170 675 2700	
6MGL1A 12MGL1A 24MGL1A	85/85 340/340 1350/1350	
6MGL2A 12MGL2A 24MGL2A	55/55 225/225 900/900	

SERIES MT

MINIATURE TUBULAR

1A	6 12 24	6MT1A 12MT1A 24MT1A	187 750 3000	
1C	6 12 24	6MT1C 12MT1C 24MT1C	187 750 3000	

CONTACT RATING:
FORM A & B UNITS: 10W or 12VA (500ma or 250V max.)
FORM C UNITS: 3W (250ma or 28V max.).

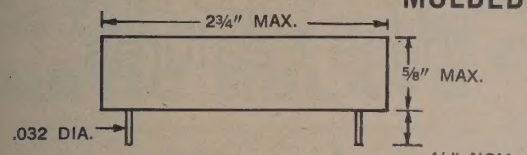
CONTACT RESISTANCE: .150 ohms max. initial.

* Mercury Wetted Contacts are available in these form.
CONTACT RATING: 1A or 28VDC max.
CONTACT RESISTANCE: 50 milliohms max.

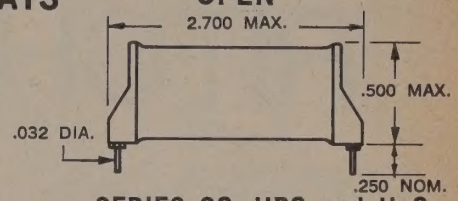
Douglas
RANDALL inc.
6 PAWCATUCK AVENUE WESTERLY, RHODE ISLAND 02891
Phone: 203-599-1750
A SUBSIDIARY OF WALTER KIDDE & CO., INC.
Kidde

STANDARD SIZE REED RELAYS

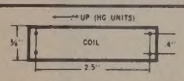
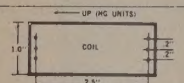
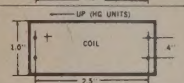
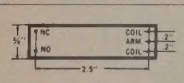
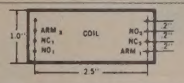
MOLDED



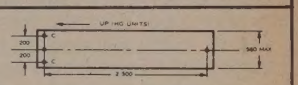
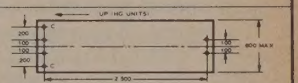
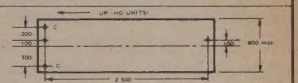
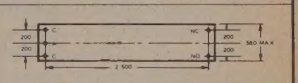
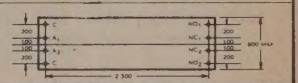
OPEN



SERIES SM, HP and Hg

Contact Form	Nominal VDC	Part Number	D.C.R.Ω ±10% @ 25°C	Terminal Layout (Bottom View)
1*	6 12 24	6SM1A 12SM1A 24SM1A	180 725 2900	
2*	6 12 24	6SM2A 12SM2A 24SM2A	175 700 2750	
*	6 12 24	6SM1B 12SM1B 24SM1B	175 700 2750	
	6 12 24	6SM1C 12SM1C 24SM1C	180 725 2900	
	6 12 24	6SM2C 12SM2C 24SM2C	175 700 2750	

SERIES SG, HPG and HgG

Part Number	D.C.R.Ω ±10% @ 25°C	Terminal Layout (Bottom View)
6SG1A 12SG1A 24SG1A	180 720 2880	
6SG2A 12SG2A 24SG2A	110 440 1760	
6SG1B 12SG1B 24SG1B	110 440 1760	
6SG1C 12SG1C 24SG1C	180 720 2880	
6SG2C 12SG2C 24SG2C	110 440 1760	

SERIES SM AND SG

CONTACT RATING:
FORM A & B UNITS: 15W or 15VA (1 amp. or .2 max.)
FORM C UNITS: 3W (500 ma or 250V max.)

CONTACT RESISTANCE:
FORM A & B UNITS: .075 ohms max. initial.
FORM C UNITS: .100 ohms max. initial.

SERIES HP (MOLDED) AND HPG (OPEN)

Available in the above arrangements:

CONTACT RATING:
FORM A & B UNITS: 50W or 50VA (3 amp. or 1000V max.).
FORM C UNITS: 20W (1 amp. or 300V max.).

CONTACT RESISTANCE:
FORM A & B UNITS: .200 ohms max. initial.
FORM C UNITS: .250 ohms max. initial.

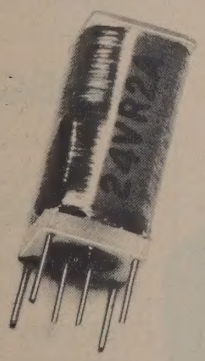
***SERIES Hg AND SERIES HgG**

Standard size mercury wetted contact relay available with following rating:
CONTACT RATING: 3 amp. or 250VDC max.
CONTACT RESISTANCE: 35 milliohms max.

VertiReed RELAYS

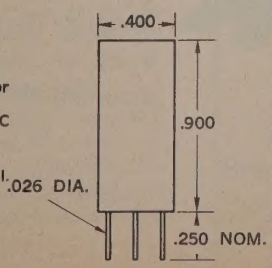
SERIES VR

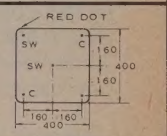
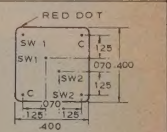
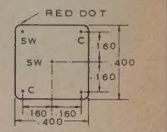
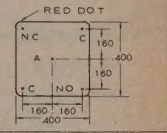
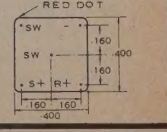
Series VR Reed Relays are designed for applications where printed circuit board area is severely limited. The use of open bobbins provides protection for the reed switches and a rugged mounting support for the printed circuit terminals as well as low cost construction. For additional protection the coil leads and top switch leads are enclosed by the coil wrapper. The relays listed on the reverse side are standard. Other coil voltages, resistances and power requirements are produced on a special basis. Adaptations using small mercury wetted reed relays may also be obtained with a slight increase in height. As is the case with all DORAN Relays, latching versions are also produced to operate on momentary pulses, and both electromagnetic and electrostatic shielding may be included upon request.



CONTACT RATING:
FORM A & B UNITS: 10W or 120VA (.500A or 250V max.).
FORM C UNIT: 3W or V3A (.250A or 28VDC max.).

CONTACT RESISTANCE:
FORM A & B UNITS: .150 ohms max. initial.
FORM C UNIT: .200 ohms max. initial.

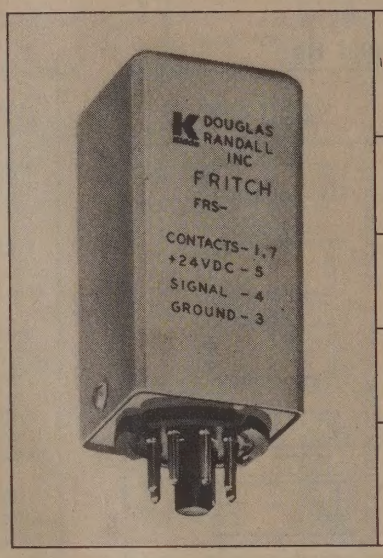


Contact Form	Nominal VDC	Part Number	DCR ±10% @ 25°C	Terminal Layout (Bottom View)
1A	6 12 24	6VR1A 12VR1A 24VR1A	225 900 3600	
2A	6 12 24	6VR2A 12VR2A 24VR2A	145 575 2300	
1B	6 12 24	6VR1B 12VR1B 24VR1B	225 900 3600	
1C	6 12 24	6VR1C 12VR1C 24VR1C	225 900 3600	
1AL (Latching)	6 12 24	6VR1AL 12VR1AL 24VR1AL	105/105 425/425 1700/1700	

Douglas RANDALL inc.
6 PAWCATUCK AVENUE WESTERLY, RHODE ISLAND 02891
Phone: 203-599-1750
A SUBSIDIARY OF WALTER KIDDE & CO., INC.
Kidde

FRITCH: Frequency Responsive Switch Offers these Features

Douglas Randall, Inc., *FRITCH* combines solid state circuitry with reliable reed relay outputs into a component capable of responding to any selected frequency from 25Hz to 100KHz at speeds as fast as 75 operations per second. Bandwidth is ± 2% to ± 5% depending on signal voltage and temperature control. Typical operation is from a 5VRMS ± 10% signal, over a temperature range of −40°C to +65°C using a power supply of 24VDC with only 2MA standby and 25ma operating current. The ability of the FRITCH to function accurately with a relatively uncontrolled signal level and to provide complete isolation of output signal from input signal in addition to the features listed above, make it excellent for telemetry, touch tone decoding, remote selection of several command functions over one pair of lines, central station signaling and many other applications.

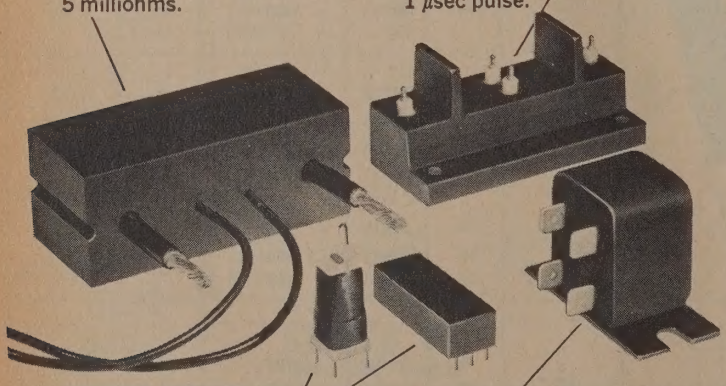


- **Broad Frequency Range—25Hz to 100KHz**
- **Low Signal Power—Only Inv**
- **Fast Response—As low as 5ms**
- **Shock & Vibration Resistan**
- **Plug-in or P. C. Mounting—in any position**

Assemblies are available to decode all touch tone frequency signals or any combination of frequencies between 25Hz and 100KHz. Units can be provided to fit existing hardware. Sensitive versions can be supplied which will respond to signals as low as 0.020 volts.

ULTRA-LOW CONTACT RESISTANCE
Guaranteed maximum: 5 milliohms.

HIGH VOLTAGE
Will break 15,000 volts peak RF and 70 amps for 1 μsec pulse.



VERTICAL MOUNT AND LOW PROFILE
For use where available space is limited. Low profile relay shown is .315" high. Vertical mount relay fits into .4" square.

SPECIAL MOUNTING
An example of one configuration designed to meet special mounting and terminal requirements.

SPECIAL REED RELAYS

In addition to standard relays Douglas-Randall, Inc. has developed many special versions to meet unusual size, terminal layout and electrical requirements. Special molding techniques make this possible without expensive tooling. Douglas Randall also makes special assemblies of reed switches, either molded or mounted on P.C. boards.

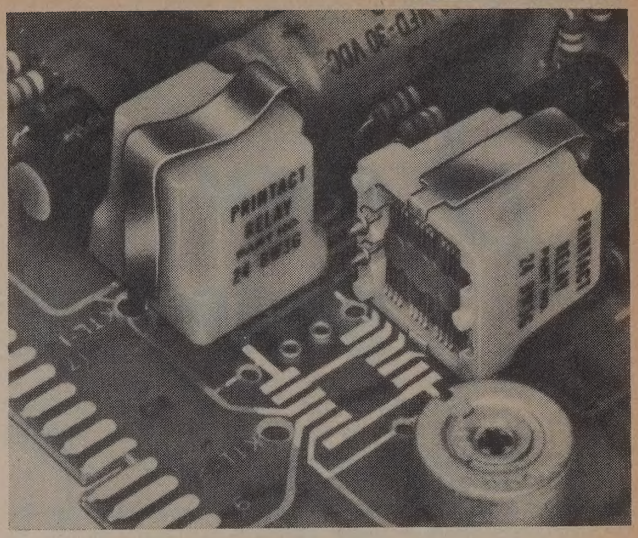
NEW

NO SOCKETS • NO SOLDERING
NO WIRING • NO SPRINGS
NO MECHANICAL LINKAGE

Printact®

LATCHING AND NON-LATCHING MAGNETIC RELAYS

Plugs into your PC board... mates with plated conductors



APPLICATION: In the design of low power switching circuits such as logic, counting, de-coding, gating, high frequency, the use of the Printact relay series "G" non-latching or "LD" and "LS" magnetic latching results in a compact low cost module. Reliability is assured by its unique design, which includes many features not generally available, as standard, in commercial relays.

DESIGN: Encapsulated coil, bifurcated gold alloy or palladium contacts, plug in without sockets or soldering, low bounce and chatter, low thermal E.M.F., series-break switching eliminates pigtail connections, permanent magnet avoids return spring and mechanical linkage, which assures continuous performance for many millions of cycles.

VERSATILITY: In addition, versatility of the series-break switching configuration affords the design engineer an option on etching the conductor patterns which mate with a given swinger blade, as common (Form C) or isolated (Form A and Form B) switching between make and break circuits.

CATALOG NUMBERS

Volts	Res.	2 Blades	3 Blades	4 Blades
Series "G" Standard Non-Latching — Gold Contacts				
6vd-c	75Ω	6-BW2-G	6-BW3-G	6-BW4-G
12vd-c	300Ω	12-BW2-G	12-BW3-G	12-BW4-G
24vd-c	1200Ω	24-BW2-G	24-BW3-G	24-BW4-G
Series "LD" Dual Coil Magnetic Latch — Gold Contacts				
6/6 vd-c	30/30 Ω	6-BW2-LD	6-BW3-LD	6-BW4-LD
12/12vd-c	150/150Ω	12-BW2-LD	12-BW3-LD	12-BW4-LD
24/24vd-c	550/550Ω	24-BW2-LD	24-BW3-LD	24-BW4-LD

For Palladium Contacts Substitute BP for BW

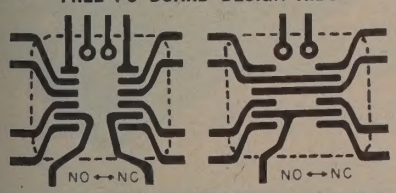
SPECIFICATIONS AT 25°C

Coil Power — 0.5 watt "G" Series, 1.0 watt "LD" Series.
Contact Rating — dry circuit or low level with gold contacts; up to 2 amps 24v d-c res. with palladium contacts.

Cont. Res. — .050 ohm initial
Insulation — 1000 megohms
Operate Time — 10 ms or less
Pick-up max. — 75% of rated
Mech. Life — 100×10^6 cycles
45db Isolation at 220 Mhz
Dielectric — 1000 Vrms
Temp. — 30°C to +50°C
Release Time — 5ms or less
Drop-out min. — 10% of rated
Thermal EMF — 10 microvolts
65db Isolation at 40 Mhz

Conductor layout closely matches 75 ohm line.

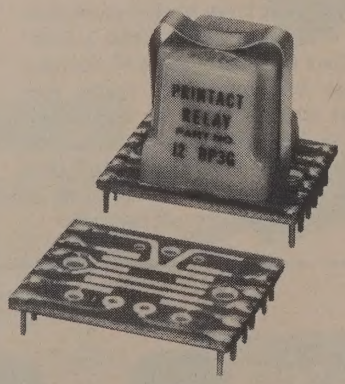
FREE PC BOARD DESIGN AIDS



Send for Technical Notes PR262-D which details artwork, layout and board processing procedures and offers stick-on conductor patterns to overlay on the mylar providing switching configuration layouts for relay areas.

GENERAL PURPOSE MODULES AVAILABLE

Where a custom board is not planned, send for catalog illustrating a variety of general purpose PC boards with etched and plated switching patterns to accommodate single or multiple relays. Can be chassis mounted with standoff bushings. Solder pads for point-to-point wiring or edge-connector terminals are available.



BEAD PIN PC BOARD HEADER

For applications where the conductor pattern is not etched on your custom printed circuit board, the bead pin header has been designed for use as a solder-in socket: P/N 40300-1 (Rhodium), P/N 40300-2 (Gold) list 0.65 each with quantity discounts.

Printact®

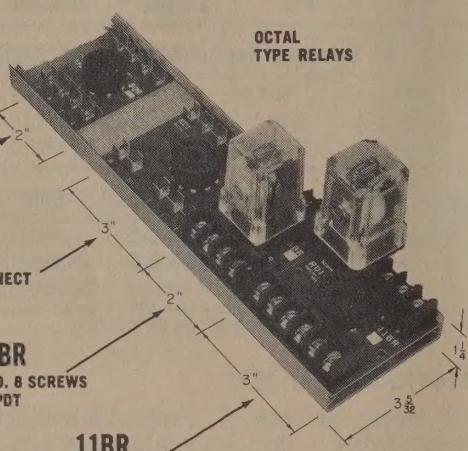
Relay Division of Executone, Inc.
P. O. Box 1430EM • Long Island City, N. Y. 11101
(212) EX 2-4800

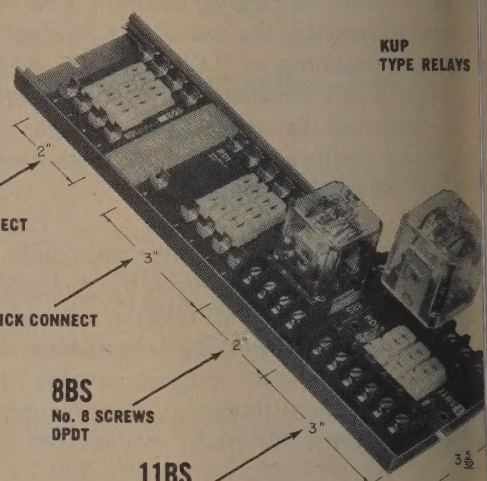
RDI

SNAPTRACK™ RELAY SOCKETS

- CAPTIVE WIRE CLAMPING PLATES
- 8-32 PAN HEAD TERMINAL SCREWS
- WIRE SIZE TO 12 AWG
- NEON LAMP OPTION
- BREAK RESISTANT BARRIERS
- RIGID PVC SNAP-TRACK™

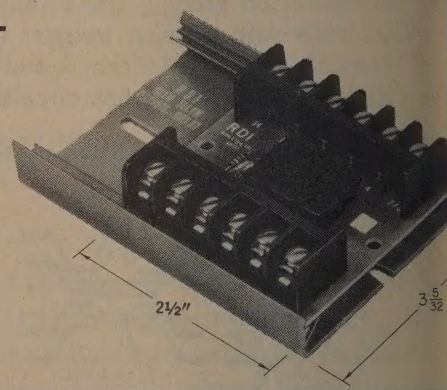
SNAP-TRACK™ relay sockets provide a low cost convenient method for installing plug-in relays in control equipment. Continuous sections of Snap-Track, an extruded PVC, nonconductive mounting track, may be installed with rivets, screws, or adhesive material to accept relay socket assemblies. The sockets snap into position along the track. Snap-Track sockets consist of an assembly of G-10 Epoxy glass PC board a PC type relay socket, and specially designed barrier type terminal ocks. The socket assembly is wave soldered for circuit reliability. T minal points are clearly numbered with epoxy ink to expedite wire insta tion.





SNAPTRACK™ MINIATURE 4PDT RELAY SOCKETS

The 14BS Snap-Track™ relay socket provides screw terminal connections to a socket that accepts miniature 4PDT relays such as Potter & Brumfield KHP, Struthers-Dunn 281XDX, Clare GP-1, Sigma Series 67, Guardian 1300 and others. Number 4-40 pan head screws with captive wire clamping plates are provided. These screw terminals are large enough to accept 2 No. 14 AWG, 2 No. 16 or 4 No. 18 AWG wires without the need for ring or hook terminals on the end of these wires. A neon lamp wired across the coil terminals of the relay socket is offered as an option. The lamp indicates power is available at the coil terminals.



ACCESSORIES

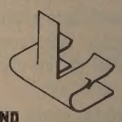
8R and 11R PC board sockets of thermo setting plastic are offered separately. A **plastic drive rivet** provides a simple installation method for mounting Snap-Track™. A 3/16" diameter drill in a panel up to .125" thick with the mounting rivets provides adequate mounting at low cost. Relay and timer bails are offered to prevent relays and timers from vibrating out of the sockets in applications where vibration is present. A Tinnerman end clip is offered to secure the ends of the mounting track. A vertical tab helps prevent movement of the sockets laterally along the board.

8 PIN
$20/C

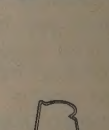
11 PIN
$35/C

SOCKETS FOR PC BOARDS

TRACK
RIVET
$4.00/C



END
CLIP
$3.00/C



RELAY
BAIL
.50 LIST

TIMER
BAIL
.60 LIS

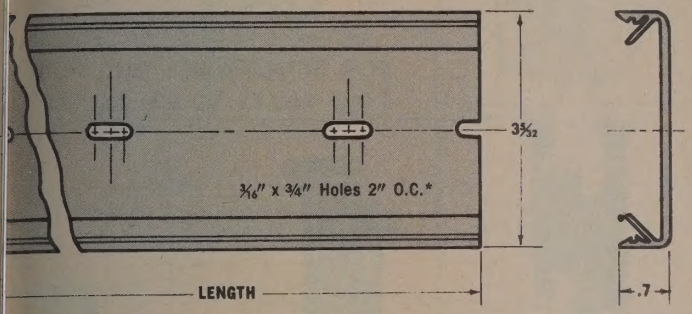
REED DEVICES INC. *21W183 Hill Avenue, Glen Ellyn, Illinois 60137 • 312/858-2050*

RDI

SNAPTRACK™ MOUNTING SYSTEM

e TK2 Series mounting track is designed for maximum utility both socket mounting and as a non-conductive Rigid PVC assis for custom circuits, or for breadboarding new circuits.

TK2 mounting track is cut in standard lengths of 6, 12, 24, and 48 inch lengths. Special lengths can be provided on request. TK2 mounting track accepts a 3″ nominal width card.

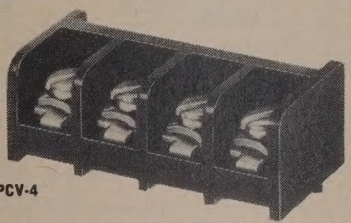


Catalog Number	Length Inches	Net Price
TK2-2	2″	.10
TK3-3	3″	.15
TK2-6	6″	.30
TK2-12	12″	.60
TK2-24	24″	1.20
TK2-48	48″	2.40

*TK3 — holes punched 3″ O.C.

TERMINAL STRIPS FOR PC BOARDS

PC rpe terminal blocks are for direct insertion int rinted circuit boards. PCV blocks may be ha or wave soldered. PCV4 and PCV6 have 8- pan head screws with captive wire clamp- in iates and will accept up to 2 Number 12 AV wires. Spacing between terminals on PCV4 ar CV6 is .4375 inches. 2PCV series are on .3 centers between terminals and will accept 2 nber 14 or 4 Number 18 wires.


PCV-4

PCV-6

Cat. Number	Price Each 1	10	25	50	100	250
V4	.65	.59	.52	.46	.425	.39
V6	.98	.88	.78	.685	.64	.59
V4	.90	.81	.72	.63	.585	.54
V6	1.30	1.17	1.04	.91	.845	.78
V7	1.50	1.35	1.20	1.05	.975	.90
V8	1.70	1.53	1.36	1.19	1.105	1.02
V10	2.10	1.89	1.68	1.47	1.365	1.26

DERING INFORMATION

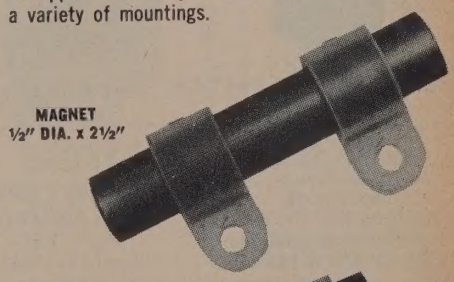
Socket Type and Quantity
Length and number of pieces of Mounting Track
f no length is specified, 48″ lengths will be supplied

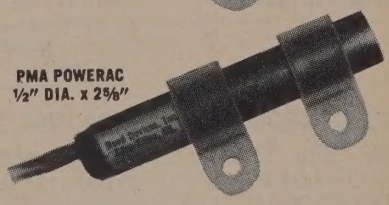
Catalog Number	PRICES 1	10	25	50	100	250
8BR	$2.10	$1.89	$1.68	$1.47	$1.37	$1.26
8BS	2.75	2.48	2.20	1.93	1.79	1.65
8QR	2.00	1.80	1.60	1.40	1.30	1.20
8QS	2.65	2.39	2.12	1.86	1.72	1.59
11BR	3.05	2.75	2.44	2.14	1.98	1.83
11BS	3.50	3.15	2.80	2.45	2.28	2.10
11QR	2.80	2.52	2.24	1.96	1.82	1.68
11QS	3.35	3.02	2.68	2.35	2.18	2.01
12BS	4.05	3.65	3.24	2.84	2.63	2.43
14BS	4.90	4.41	3.92	3.43	3.19	2.94
ADDER FOR NEON LAMP**	**If neon lamp option is required, specify either 120 or 240 volts. 1.00	.90	.80	.70	.65	.60
SNAP-TRACK™ (order separately)						

TE: *Socket prices do not include mounting track. Mounting track is priced separately.

PMA SWITCHES

PMA-Powerak Switch is a permanent magnet actuated solid state proximity switch. Triggered by an internal reed switch which is sensitive to external magnetic fields, the solid state switch controls loads of 1 ampere continuous, up to 10 amperes inrush regardless of type of load; that is inductive, capacitive, or tungsten filament. The switch will operate from 24V thru 120V 60 hz. The reed switch trigger located internally is offset from the center axis to permit both axial and rotational adjustment in application. The Powerak is supplied with 2 nylon mounting straps to permit a variety of mountings.


MAGNET
1/2″ DIA. x 2 1/2″


PMA POWERAC
1/2″ DIA. x 2 5/8″

Catalog No.	Description	List Each
09-1002	48 inch leads, Normally Open	$12.50
09-1004	48 inch leads, Normally Closed	$13.50
04-1011	Magnet	$ 4.00

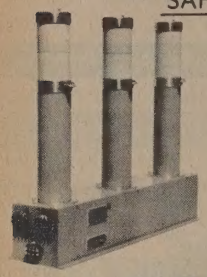
Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

ROSS ENGINEERING CORPORATION

HIGH VOLTAGE DEVICES

SWITCHES, RELAYS, MEASUREMENT, CONTROL, ENERGY STORAGE SYSTEMS, SAFETY, AND ACCESSORIES.

DC, 60 CYCLES, RF, PULSE, FOR ELECTRONIC AND POWER 1,000 VOLTS TO 600,000 VOLTS



VACUUM POWER INTERRUPTING CONTACTORS AND CIRCUIT BREAKERS

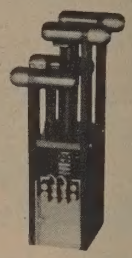
5 to 38 KV RMS operate
50 to 600 amps continuous
2,000 to 12,000 amps interrupt

Hi-Z™ HIGH VOLTAGE VOLTMETER

High Impedance
Portable
Instrumentation
.001V to 120KV

HV RELAYS MODEL E

Open style
50 to 100 amps
12 to 120 KV PK
12 KV $41.00
40 KV $65.00
120 KV $320.00



SPDT RELAYS MODEL E-DT

Economical

Open Style
12 to 70 KV
50 to 100 amps
15 KV $68.00
30 KV $110.00

SPHERE GAP RELAY MODEL EE

Small Size
Gravity operate
12 to 100 KV
15 to 50 amps
Adjustable
Sphere Gap contacts
0-15 KV to 20-120 KV PK
25 KV $69.00

HIGH CURRENT SWITCH MODEL GB

100 to 4,000 amps
Continuous
Small size
to 100 KV, PK test
Air solenoid operated
27 KV 600 A $190.00

HV ROTARY SWITCHES

MODEL R

To 100 KV PK
10 to 100 Amps
Multi-Pole
Multi-Position
25 KV 20 Amp
3 PDT $66.00

GROUNDING RELAYS MODEL D

Gravity operated
to 600 KV, 100 amps
Low corona
50 KV $140.00
120 KV $370.00

VOLTAGE DIVIDERS MODEL VD

Compensated
DC to RF
to 450 KV, PK
30 KV $150.00
120 KV $350.00

SPHERE GAPS MODEL S

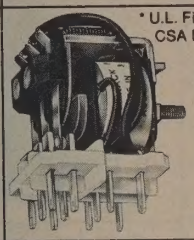
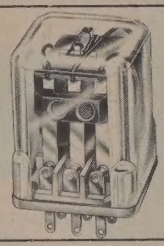
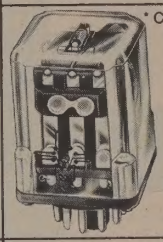
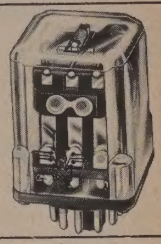
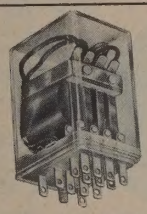
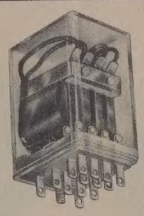
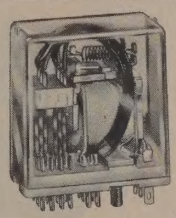
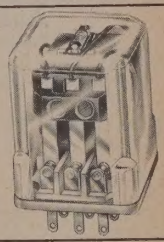
Enclosed
Adjustable
to 600 KV, PK
2 to 40 KV $4[illegible]
6 to 88 KV $9[illegible]

HV SAFETY GROUNDING INTERLOCKS, SAFETY DEVICES, SPECIALTIES. Models pictured are examples of a related series. Currents are RMS continuous ratings. Voltages listed are Peak 60 Cycle Test values. Operating values are generally 1/3 to 2/3 that of peak test values. Spark-over is generally 10% to 30% higher than peak test listed. Let us quote on specific items since most models are available NO, NC, SPDT, and latching, with 115 AC actuators. Many items are not listed and prices and models can change without notice.

WRITE FOR CATALOG EM 70

ROSS ENGINEERING CORPORATION: 11915 Shadybrook, Saratoga, California 9[illegible]
Phone (408) 253-1572

SCHRACK RELAYS

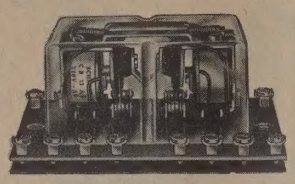
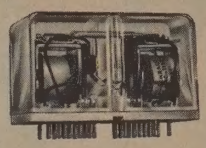
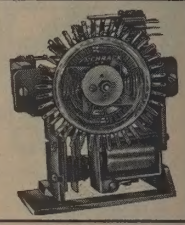
RELAY	GENERAL PURPOSE	GENERAL PURPOSE	GENERAL PURPOSE	SENSITIVE
TYPE	CA*	CAF	CAD*	CMD/CSD
ILLUSTRATION	* U.L. File E38891 CSA File 14385 		* CSA file 14385 	
DESIGN	Open Type	Enclosed with clear Dust Cover or Open Frame	Enclosed with Clear Dust Cover	Enclosed with Clear Dust Cover or Open Frame (CA)
TERMINALS	Pierced terminals soldering or .110 faston or printed circuit	Same as CA terminals also for plug-in socket No. RD78700	8 or 11 Pin Base to mate with standard tube sockets	Same as CA or CAD
CONTACTS Number & Form	1, 2, or 3 form "C" (change over)	1, 2, or 3 form "C" (change over)	1, 2, or 3 form "C" (change over)	1, 2, or 3 form "C" (change over)
Contact Rating	5 or 10 amp.	5 or 10 amp.	5 or 10 amp.	2 amp.
Contact Material	AgCdO, Hard Silver	AgCdO, Hard Silver	AgCdO, Hard Silver	Gold-flashed Silver
OIL Coil Voltage	6-230 VAC 6-110 VDC	6-230 VAC 6-110 VDC	6-230 VAC 6-110 VDC	5-200 VAC 4.9-100 VDC
F more technical data see catalog No.	A69	A69	A69	A69
RELAY	MIDGET RELAY	SINGLE COIL MINI-MAGNETIC LATCHING	MINI-SIX	SINGLE COIL MAGNETIC LATCHING
TYPE	RA	RR	RE	CRD/CRF
ILLUSTRATION	 U.L. File #38891			
DESIGN	Enclosed with dust cover	Plastic dust cover plug in	Enclosed with clear dust cover	Enclosed with clear dust cover
TERMINALS	Plug-in relay Solder lugs Printed circuit	Same as RA	Plug in relay Solder lugs	Plug-in relay CRD for Octal or 11 pin CRF pierced for Solder or .110 Faston or pc board
CONTACTS Number & Form	4 form "C" contacts (change over)	4 form "C"	6 form "C" contacts (change over)	2 or 3 form "C"
Contact Material	Fine silver Gold flashed	Same as RA	Fine silver Gold flashed	—
ı. Rated Cont. Voltage	110 VDC (220 VAC)	Same as RA	60 VAC	250 VAC
ı. Rated Cont. Current	3A	3A	2A	5 amps 10 amps*
ı. Rated Contact Load	350 V. 90 W	Same as RA	120 VA (60 VAC) 90 W (30 VDC)	1250A 2500 VA
cial Contact Materials	AgCdO. AuNi/3 PdAg 60/40 PdAg 30/70	Same as RA	—	—
COIL Coil Voltage	6-110 VDC 6-220 VAC	24-220 VAC 12-110 VDC	6-60 VDC 6-60 VAC	24-220 VAC 12-110 VDC
or more technical data see catalog No.	S404	S404	S408E	S405A

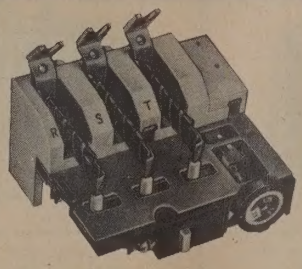
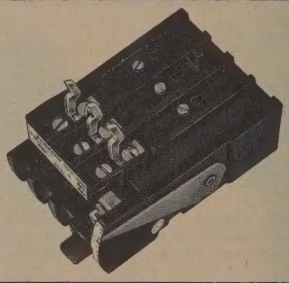
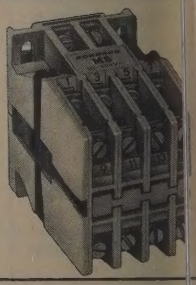
SEND FOR DISCOUNT SCHEDULES

FOR FURTHER INFORMATION ASK FOR CATALOG

SCHRACK ELECTRICAL SALES CORPORATION 1140 BROADWAY, NEW YORK, N.Y. 10001

SCHRACK RELAYS

RELAY	MECHANICAL LATCHING	PLUG-IN MECHANICAL LATCHING	ROTARY STEPPING	MINIATURE ST PING
TYPE	CBT	CBF	RT	RTM
ILLUSTRATION				
DESIGN	Enclosed with clear dust cover	Enclosed with clear dust cover	Plastic dust cover die cast metal frame	Plastic dust ver
TERMINALS	Screw type terminals	Plug in type (in 2 sockets) solder lugs	Pierced terminals suitable for soldering or .110 faston	Complete rela lugs into pc board c ocket
CONTACTS Number & Form	2 x 2 or 2 x 3 form "C" change over	Same as CBT	1 pole – 40 or 48 positions 2 pole – 20 or 24 positions 4 pole – 10 or 12 positions	• 2 pole – 10 p ion 2 pole – 12 p ion
Contact Material	AgCdO, hard silver	Same as CBT	—	Gold plate
Max. Rated Cont. Voltage	250 VAC	250 VAC	110 VDC-115 VAC	60 VDC VAC
Max. Rated Cont. Current	10A	10A	.5A	100 MA 0 MA
COIL Coil Voltage	6-110 VDC 6-220 VAC	6-110 VDC 6-220 VAC	6-110 VDC	12-110 VD
For more technical data see catalog No.	A69	A69	S401A	S413E

TYPE	FA	FK	M
ILLUSTRATION			
DESIGN	Open frame	Open frame	Open frame 2 screw mounting
CONTACTS	3 pole	3 pole	up to 8 pole
Contact Material	—	—	—
Max. Rated Cont. Voltage	500 VAC/220 VDC	230 VAC	500 VAC
Max. Rated Cont. Current	.35 amps-100 amps	.12 amps-9.0 amps	10-15 amps
Max. Rated Contact Load	—	—	1.5-5.0
COIL Coil Voltage	—	—	—
Voltage Range	—	—	48, 110, 220, 440 VDC 110, 220, 380, 500 VAC
For more technical data see catalog No.	HD 70	HD 70	HD 70

SEND FOR DISCOUNT SCHEDULES

FOR FURTHER INFORMATION ASK FOR CATALOG

SCHRACK ELECTRICAL SALES CORPORATION 1140 BROADWAY, NEW YORK, N.Y. 10

SCHRACK RELAYS

SCREW DOWN SOCKET WITH MOLDED TERMINAL STRIPS

No. RN 73301 — 8 Pin

No. RN 73302 — 11 Pin

For surface type installations and proto type work where screw terminals are convenient. Adequate barriers for hi-voltage installations.

STANDARD MOLDED PLUG

No. RN 78600 — 8 Pin

No. RN 78704 — 11 Pin

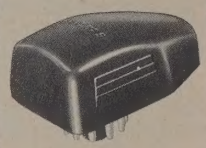
Accommodates RN 16035 or RN 16019 Dust Covers for building plug is modular circuitry.

STANDARD SOLDER LUG SOCKET

No. RN 78710 — 8 Pin

No. RN 78711 — 11 Pin

Conventional type molded socket with numbered pins — screw mounting.



SCHRACK TYPE HOODED PLUG

No. RN 78714 — 8 Pin

No. RN 78715

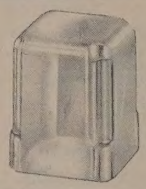
Permits any relay or component to be mounted remotely and to be plugged into standard socket in circuitry.

PRINTED CIRCUIT LUG SOCKET

No. RN 78712 — 8 Pin

No. RN 78713 — 11 Pin

Standard type for conventional circuit board assemblies — black molded with numbered pins.



DUST COVER FOR CAD SERIES

No. RN 16035 POLYSTRENE

with holes in base for screw mounting.

No. RN 16019 — Same as above but molded of Macralone*.

METAL DUST COVER FOR CAF SERIES ONLY

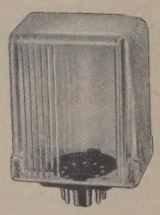
No. RD 10701 on request.

MINIATURE SOCKETS FOR RA RELAYS

No. RA 78700 — for screw mounting, made specially for mounting Schrack RA type relays but may be used for miniature modular circuitry with plug base and dust cover available on request. Precision type with spring-hold grounding terminal.

No. RA 78701 — for spring mounting.

No. RA 78702 — for printed circuit mounting.



PLUG MOUNTED ON METAL PLATE

No. RN 74221 — 8 Pin

No. RN 74104 — 11 Pin

Metal plate provides base for oversize dust cover in order to install components for modular circuitry.

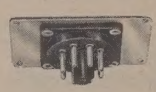
LARGE DUST COVER FOR METAL PLATE

No. RN 16022 Polystyrene

Internal grooves provide means for mounting circuit boards with components.

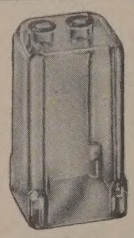
No. RN 16034

Same as No. RN 16022 but made of Macralone*.



SOCKETS AND ACCESSORIES FOR RE RELAYS

No. RE 78700 Standard Socket
RE 78702 Printed Circuit Socket
RE 28800 Hold-down Spring



HIGH POLYSTYRENE DUST COVER

No. RN 16020

May be used with CAD Series.
Two holes in top for ventilation.

SOCKET FOR TYPE RTM

No. RT 28405 for printed circuits
RT 28406 — Screw type term
RT 28487 — solderless term
RT 28408 — w/solder lugs

HOLD DOWN SPRING

No. RN 28623

Provides quick removal of dust cover — fastens to mounting screws of standard type socket.

HOLD DOWN CLIP

No. RN 28611

SPECIAL SOCKET FOR CAF SERIES

No. RD 78700 — 8 or 11 Pin

Exclusive with Schrack. This socket accommodates either 8 or 11 pin base. Its small size and design provides for strip mounting with no loss of space.

BASE FOR SCHRACK CAF SERIES

No. RD 78600 — 11 Pins

May be used with above socket and dust cover for building modular component requiring U. L. specs for spacing.
for 8 or 11 wiring

No. RD 78601 — same as above but with printed circuit pins.

*Macralone is a polycarbonate resistant to high temperatures.

Self tapping screws for dust covers available on order.

SEND FOR DISCOUNT SCHEDULES

FOR FURTHER INFORMATION ASK FOR CATALOG

SCHRACK ELECTRICAL SALES CORPORATION 1140 BROADWAY, NEW YORK, N.Y. 10001

Chemtron* REED RELAYS

Vacuum Encapsulated The "CHEMTRON" relay assembly is vacuum-encapsulated in epoxy to ensure the best possible dynamic characteristics and reliability. The patented encapsulation technique eliminates voids in the epoxy, minimizes relay failure, and absorbs external stresses that would otherwise be transmitted to the relay contacts via the pins.

All Welded Leads "CHEMTRON" circuit pins are welded to the reed contacts. Contacts are not bent to form the circuit pins because of the danger of changing the contact characteristics. Automatic soldering techniques may be used without internal "joint" failures.

Magnetic and Electrostatic Shielding "CHEMTRON" reed relays are enclosed in a housing that serves as a shield preventing magnetic interaction with other magnetic components in high-density packages. An internal electrostatic shield, standard on some "CHEMTRON" units, minimizes coil-to-reed capacitance coupling of AC signals for low-loss switching and maximum input-output isolation making them ideal for multiplexing applications.

The standard "CHEMTRON" line is tabled below. Please call or write for our catalog and complete specifications, or send details of your requirements. Chances are excellent that your application can be met from our stock line or from a relay we have already designed.

SERIES 225•1A 4.5 V COIL 6 V COIL 12 V COIL	<0.5 ms SWITCHING SPEED OPTIONAL SMALLER THAN A DIP IC IC DRIVEN 4.5 V COIL ELECTROSTATIC AND MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: .810" x .210" x .210"
SERIES 226•1A 4.5 V COIL 12 V COIL	<500 μsec. SWITCHING SPEED SMALLER THAN A DIP IC IC DRIVEN 4.5 V COIL ELECTROSTATIC AND MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: .810" x .210" x .210"
SERIES 227•1A 4.5 V COIL (with drive circuit)	<200 μsec. SWITCHING SPEED SMALLER THAN A DIP IC IC DRIVEN 4.5 V COIL ELECTROSTATIC AND MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: .810" x .210" x .210"
SERIES 325•1A 4.5 V COIL 6 V COIL 12 V COIL	<0.5 ms SWITCHING SPEED OPTIONAL IC DRIVEN 4.5 V COIL ELECTROSTATIC AND MAGNETIC SHIELD HIGH-RELIABILITY CONSTRUCTION PATENTED "CHEMTRON" ENCAPSULATION SIZE: 1.410" x .260" x .260"
SERIES 450•1A•1C 4.5 V COIL 12 V COIL 24 V COIL	SMALLEST AVAILABLE FORM C (SPDT) IC DRIVEN 4.5 V COIL MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: 1.080" x .390" x .390"
SERIES 451•1A 4.5 V COIL 12 V COIL 24 V COIL	SMALLEST AVAILABLE 1-AMP MERCURY WET IC DRIVEN 4.5 V COIL LOW CONTACT-NOISE AND RESISTANCE MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: 1.080" x .390" x .390"
SERIES 545•1A•2A•3A 4.5 V COIL 12 V COIL	<3 μV THERMAL emf ACROSS CONTACTS IC DRIVEN 4.5 V COIL ELECTROSTATIC AND MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: (1A) 1.420" x .500" x .500"*
SERIES 550•1A•2A•3A•4A•1B•2B•1C•2C•3C•4C 6 V COIL 12 V COIL 24 V COIL	MULTIPOLE A, B OR C CONTACTS HIGH RELIABILITY, SMALL SIZE MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: (1A) 1.420" x .500" x .500"*
SERIES 551•1A•2A•3A•4A•1B 6 V COIL 12 V COIL 24 V COIL	1 AMP MERCURY WET CONTACTS AVAILABLE IN FORM B (SPNC) LOW CONTACT NOISE AND RESISTANCE MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: (1A) 1.420" x .500" x .500"*
SERIES 650•1A•2A•4A•1C•2C•4C 6 V COIL 12 V COIL 24 V COIL	MULTIPOLE A AND C CONTACTS HIGH RELIABILITY CONSTRUCTION MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: (1A) 2.635" x .615" x .650"*
SERIES 651•1A•2A•4A 6 V COIL 12 V COIL 24 V COIL	3 AMP MERCURY WET CONTACTS LOW CONTACT NOISE AND RESISTANCE MAGNETIC SHIELD PATENTED "CHEMTRON" ENCAPSULATION SIZE: (1A) 2.635" x .615" x .650"*

A few of the modifications that can be obtained on "CHEMTRON" reed relays are: Low-thermal construction ☐ Special coil voltage or resistance ☐ Standoff feet (adds .020" to relay height) ☐ Special pin pattern ☐ RF type construction ☐ High voltage switches. For other modifications and free complete catalog, contact Self-Organizing Systems, Inc.

*Multiple contact configurations slightly wider.

*T.M.

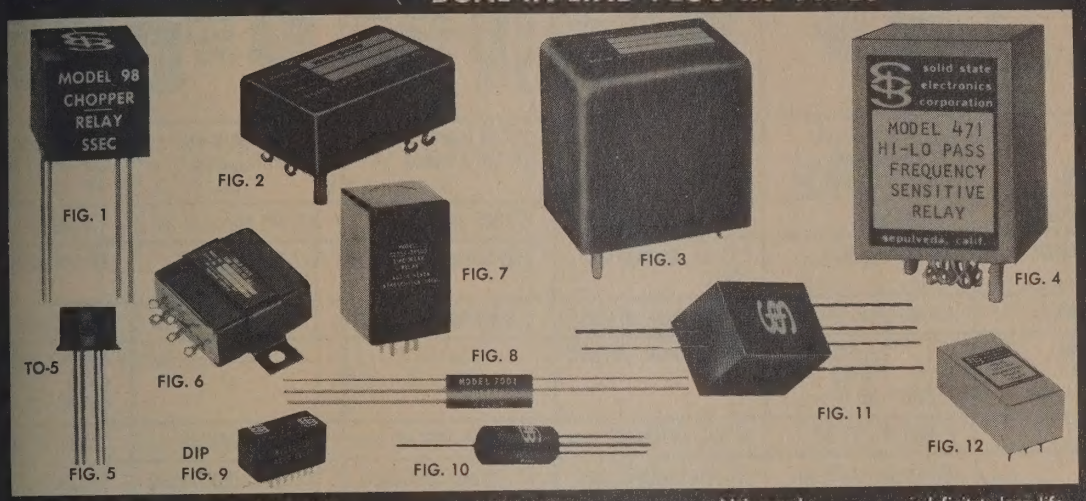
SELF-ORGANIZING SYSTEMS, INC.

P.O. BOX 9918 • DALLAS, TEX., 75214 • (214) 276-9487

SOLID STATE RELAYS AND REED RELAYS

AC, DC, HI, LO POWER TYPES
MICROSECOND SWITCHING
TIME DELAY, FREQUENCY SENSITIVE
LATCHING, LIGHT-CONTROLLED TYPES

SMALLEST, MOST SENSITIVE
HI, LO POWER, BINARY, LO VOLTAGE
TRANSISTOR & INTEGRATED CIRCUIT
DUAL-IN-LINE PLUG-IN TYPES



microminiature | lightweight | low power | high speed | indefinitely long life
rugged | inertialess | low level | high efficiency | temperature stable

SOLID STATE & REED RELAYS

ESCRIPTION

lid state and reed relays provide the most reliable types of isolated itching presently available. Solid state relays are the most rugged and stest (2 microsecond switching through 2000 G's). The Models 98 and 85-5050 are DC contact types (to 50 ma) whereas the 2828-3504 (4 amps) d 2850-40020 (20 amps) are AC types. Reed relays are the fastest, most gged and reliable of the electromechanical types (3 amps within 1 milli-cond through 50 G's). They have very high isolation between drive and ass enclosed contacts. The 7001, 8001, 8021 Microreed Relays are the nallest, lowest drive power units made. The 7031 and 8031 are dual-in-line ug-in units designed for transistors and integrated circuits (3 volts, 25 ma ive). The 7051 and 8051 latching reed relays are logical binary types with n-volatile memory (each contact remembers the last command). Series 10 are power type reed relays. The 651 and 671 types are light actuated relays (high isolation and solid state contacts). The Models 471 and 476 are under/over and bandpass frequency detectors for remote monitoring, control and decoding. The 2825-50200 and the C2835-28500 are time-delay relays having solid state and reed output contacts respectively. These units are now being used for many applications. They are virtually immune to shock and vibration making them ideally suited for aerospace, military, industrial, R & D usage where miniaturization, power conservation and elimination of maintenance are prime requisites. Microfilm data sheets and application notes will be found in VSMF or the Thomas Supplementary File.

Phone, wire or write our engineering department for an immediate reply, recommendation or catalog. Many shipments are same day, if you call early.

COMPARATIVE TABLE OF SPECIFICATIONS FOR SOLID STATE & REED RELAYS

				CONTACTS						ENVIRONMENTAL				MECHANICAL		
Model	Type	Volts DC	Z kΩ	Volts	Current amps	Power watts	Form	On msec	Off msec	Temp. °C	Shock G	Vib. G	Acc. G	Size inches	Wt. grams	Fig.
98	Solid State Chopper-Relay	6-12	0.6	±20	0.02	0.4	SPST	.002	.01	−55 to +100	500	50	800	0.84x0.84x0.75	17	1
1285-5050	Solid State Relay	22-32	5	±50	0.05	1	SPST	.002	.005	−55 to +125	1000	300	2000	1.00x1.59x0.56	25	2
2828-3504	Solid State AC Relay	26-32	1	150rms	4rms	600	SPST	.002	.01	−55 to +125	500	100	1000	1.25x1.25x1.75	84	3
2850-40020	Solid State AC Relay	26-30	0.5	140rms	20rms	2800	SPST	.01	.025	−55 to +75	500	75	500	1.63x1.63x2.38	400	4
471	Hi-Lo Pass Freq Sens Relay	15-30pk	2	28	0.25	3	SPDT	1	1	−30 to +80	50	50	400	1.31x1.31x1.75	115	4
476	Bandpass Freq Sens Relay	15-30pk	2	28	0.25	3	SPDT	1	1	−30 to +80	50	50	400	1.31x1.31x1.75	115	4
651	Raylay (Light Sens)	2-3	0.08	125	0.02	0.25	SPST	20	30	−25 to +75	1000	100	800	0.26x0.36 Dia.	1	5
671-15	Latching Raylay	1-3	0.06	15	0.35	0.25	SPST	10	30	−65 to +125	1000	100	800	0.26x0.36 Dia.	1	5
671-30	Latching Raylay	1-3	0.06	30	0.35	0.25	SPST	10	30	−55 to +100	1000	100	800	0.26x0.36 Dia.	1	5
671-60	Latching Raylay	1-3	0.06	60	0.35	0.25	SPST	10	30	0 to +75	1000	100	800	0.26x0.36 Dia.	1	5
671-100	Latching Raylay	1-3	0.06	100	0.35	0.25	SPST	10	30	−55 to +125	1000	100	800	0.26x0.36 Dia.	1	5
2825-50200	Time Delay Relay	28	0.6	50	0.2	2	SPST	.002	.004	−55 to +100	700	50	800	1.06x1.06x0.50	28	6
C2835-28500	Time Delay Relay	28	0.8	28	0.5	10	SPST	1	1	−55 to +100	100	20	100	0.90x0.90x1.25	28	7
7001	Microreed Relay	3	0.15	28	0.25	3	SPDT	1	0.2	−55 to +125	50	50	400	0.75x0.30 Dia.	2	8
8001	Microreed Relay	3	0.2	250	0.5	10	SPST	0.6	0.1	−55 to+ 125	50	50	400	0.90x0.25 Dia.	2	8
8021	Microreed Relay	9-12	0.15	28	0.25	3	SPST	0.6	0.1	−55 to+ 125	50	50	400	0.60x0.20 Dia.	2	8
7031	Dipreed Relay	3	0.15	28	0.25	3	SPDT	1	0.2	−55 to +125	50	50	400	0.50x0.95x0.46	8	9
8031	Dipreed Relay	3	0.2	250	0.5	10	SPST	0.6	0.1	−55 to+ 125	50	50	400	0.50x0.95x0.46	8	9
7032	Dipreed Relay	3	0.08	28	0.25	3	DPDT	1	0.2	−55 to +125	50	50	400	0.50x0.95x0.46	8	9
8032	Dipreed Relay	3	0.1	250	0. 5	10	DPST	0.6	0.1	−55 to+ 125	50	50	400	0.50x0.95x0.46	8	9
7051	Binary Latching Reed Relay	±6	1	28	0.25	3	SPDT	1.2	1.2	−55 to +100	50	50	400	0.63x0.63x0.86	13	11
8051	Binary Latching Reed Relay	±6	1	250	0.5	10	SPST	1.2	1.2	−55 to +100	50	50	400	0.63x0.63x0.86	13	11
Series 9000	Minireed Relays	6-48	—	250	0.5	10	Multi	0.6	0.1	−55 to+ 125	50	50	400	1.00x0.50 Dia.	10	10
Series 10	Magnereed Power Relays	6-48	—	500	1.5-3	50	Multi	2	2	−55 to +100	25	25	200	1.41x2.89x1.06	125	12

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary)

SOLID STATE ELECTRONICS CORP.
15321 RAYEN STREET
SEPULVEDA, CALIFORNIA 91343
Area Code 213 — 894-2271 • 785-4473

OTHER PRODUCTS — SEE EEM SECTIONS 5200 & 5900

FREQMETERS (MODULAR & VISUAL)
DC DIFFERENTIAL OPERATIONAL AMPLIFIERS
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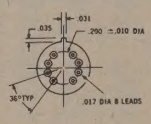
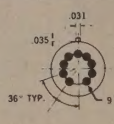
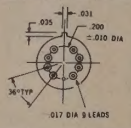
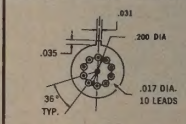
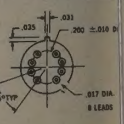
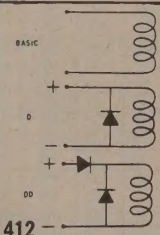
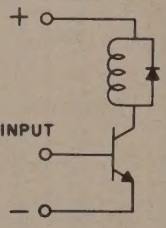
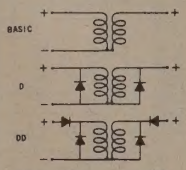
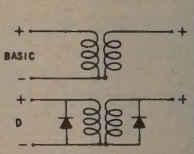
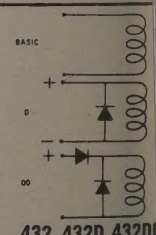
VOLTAGE CONTROLLED OSCILLATORS
TONE OSCILLATORS - TRANSFORMERS
RELAYS (SOLID STATE, TIME DELAY, REED, LIGHT)
MINIATURE TELEMETER SYSTEMS
PRESSURE TRANSDUCERS
DIGITAL LOGIC MODULES
SOLID STATE CHOPPERS

TELEDYNE TRANSISTOR CASE RELAYS

All welded construction
TO-5 transistor type enclosure
Contacts — gold plated for dry circuit requirements
Hermetically sealed
Excellent for high isolation and RF switching
Capable of withstanding high shock and vibration

Insulation Resistance — 10,000 megohms min between mutually insulated terminals
Terminal Strength — Each terminal will withstand a 1 lb. pull in any direction
Temperature Range — −65°C to +125°C (200°C units available)
Enclosure — All welded. Hermetically sealed.
Applicable Specification — Meets or exceeds MIL-R5757E
Rated Duty — Continuous
Contact Resistance — 0.1 ohm max before life 0.2 ohm max after life at max rated current

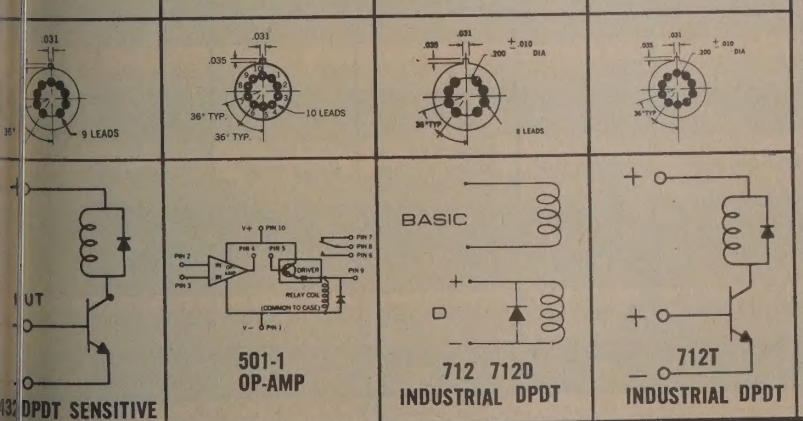
SPDT configurations available for all DPDT models shown

	412 412D 412DD DPDT	412T DPDT	420/422 420D/422D 420DD/ 422DD MAG-LATCH DPDT	424A 424AD MAG-LATCH 4PST	432 432D 432DD SENSITIVE DPDT
CONTACT RATING (OPERATIONS)	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^5 at 0.5 amp	10^7 at low level 10^5 at 0.5 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp
CONTACT BOUNCE	1.5 MS Max.	1.5 MS Max.	2.0 MS Max.	3.0 MS Max.	1.5 MS Max.
OPERATE POWER (TURN ON)	130 MW at 25°C	.15 to .90 MW at 25°C	100 MW at 25°C	125 MW at 25°C	60 MW at 25°C
OPERATE TIME	2.0 MS Max. at 25°C	2.0 MS Max. at 25°C	1.5 MS Max. at 25°C	1.5 MS Max.	4.0 MS Max. at 25°C
RELEASE TIME	412 1.5 MS Max. 412D 4 MS at 412DD 25°C	7.5 MS Max. at 25°C	————	————	432 2 MS Max. 432D 7.5 MS at 432DD 25°C
OVERLOAD	2 amp at 28V DC	2 amp at 28V DC	1 amp at 28V DC	1 amp at 28V DC	2 amp at 28V DC
VIBRATION	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps
SHOCK	80 G's 11 MS	80 G's, 11 MS	80 G's, 11 MS	100 G's, 11 MS	80 G's, 11 MS
DIELECTRIC STRENGTH	500 VRMS 125 VRMS at 1.3" Hg	500 VRMS 125 VRMS at 1.3" Hg	500 VRMS 125 VRMS at 1.3" Hg	350 VRMS 125 VRMS at 1.3" Hg	500 VRMS 350 VRMS NC-NO 125 VRMS at 1.3" Hg
NOM. COIL DATA (V DC)	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5, 36, 48
RESISTANCE — OHMS ±10% at 25°C	412 & 412D — 50, 98, 220, 390, 880, 1560 412DD — 50, 98, 280, 500, 1130, 2000	50, 98, 220, 390, 880, 1560	420/422 & 420D/ 422D — 61, 120, 280, 500, 1130, 2000 420DD/422DD — 48, 97, 280, 500, 1130, 2000	61, 120, 280, 500, 1130, 2000	16 to 11K
H (HEIGHT OF CAN)	.265 Max.	.265 Max.	.275 Max.	.325 Max.	.375 Max.
X (NUMBER OF LEADS)	8 Leads	9 Leads	420 — 9 Leads, 422 — 10 Leads	10 Leads	8 Leads
LEAD LOCATION					
SCHEMATIC	 412 412D 412DD DPDT	 412T DPDT	 420/422 420DD 420D/422D 422DD MAG-LATCH DPDT	 424A 424AD MAG-LATCH 4PST	 432 432D 432DD SENSITIVE DPDT

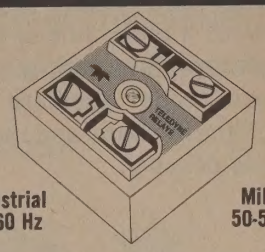
TELEDYNE RELAYS
3155 WEST EL SEGUNDO BLVD
HAWTHORNE, CALIF. 90250
TELEPHONE (213) 679-2205

dyne is currently providing for space flight applications
eened Relays which meet or exceed the following NASA
eening Specifications:
shall Space Flight Center — SPEC.
C — SPEC — 339
C — SPEC — 339A
C — SPEC — 40M37496
dard Space Flight Center — SPEC.
C — SPEC — 601.100, change 2 Paragraph 3.8
Propulsion Laboratory — SPEC.
— SPEC — ZZP — 2073

432T SENSITIVE DPDT	501-1 OP-AMP	712 712D INDUSTRIAL DPDT	712T INDUSTRIAL DPDT
w level 5 amp 0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp
Max.	1.5 MS Max.	———	———
5 MW at	———	185 MW at 25°C	.2 to 1.0 MW at 25°C
Max. at 25°C	2.0 MS Max.	4.0 MS Max. at 25°C	4.0 MS Max.
Max. at 25°C	4.0 MS Max.	712 — 3 MS Max. 712D — 6 MS Max.	6.0 MS Max.
t 28V DC	2 amp at 28V DC	2 amp at 28V DC	2 amp at 28V DC
o 3,000 cps	30 G's to 3,000 cps	10 G's to 500 cps	10 G's to 500 cps
11 MS	80 G's, 11 MS	30 G's, 11 MS	30 G's
MS MS NC-NO MS at 1.3" Hg	500 VRMS 300 VRMS	350 VRMS	350 VRMS
12, 18, 26.5		5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5
0, 400, 850, 300	2K	50, 100, 220, 390, 880, 1560	50, 100, 220, 390, 880, 1560
ax.	.375 Max.	.275 Max.	.275 Max.
s	10 Leads	8 Leads	10 Leads



TELEDYNE SOLID STATE RELAYS

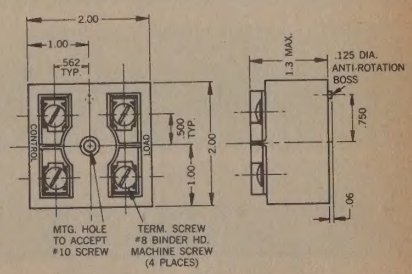


Industrial 50-60 Hz — **Military 50-500 Hz**

Solid state relays that meet or exceed all categories of MIL-STD 704A. Transient protected on input and output. Features include an ultra-sensitive "coil" (compatible with 5 volt logic systems, such as TTL), and a zero-voltage switching option to minimize RFI. They can switch over 5 KW, resistive or inductive loads.

Extremely high reliability and maintenance-free operation make them ideal for aircraft control and power system applications. Three input "coil" ranges are available, 3-8 VDC, 7-85 VDC and 90-230 VAC. Features include low contact resistance (50 milliohms typical) and contacts capable of withstanding overloads 1000% above ratings. Lack of moving contacts prevent arcing, permitting switching in explosive atmospheres, controlling motors, solenoid valves, actuators, transformers, etc.

The high contact surge rating is ideal for lighting control systems (5000 watts of tungsten lamps can be switched.)



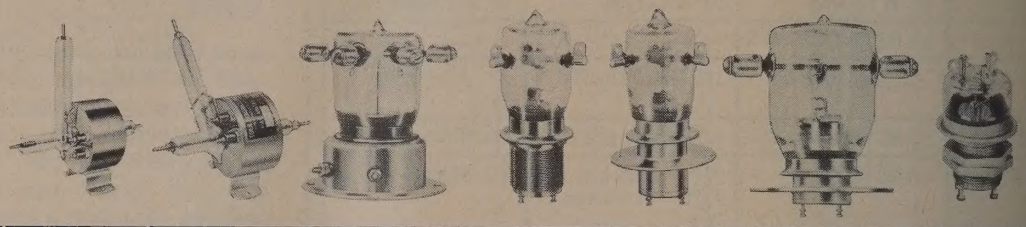
TELEDYNE RELAYS

3155 WEST EL SEGUNDO BLVD.
HAWTHORNE, CALIF. 90250
TELEPHONE (213) 679-2205

VACUUM RELAYS

Torr Laboratories, Inc. is a major manufacturer of high voltage high vacuum relays in America today. Torr* produces a broad line of high voltage relays in a modern electron tube facility from the low power to the megawatt range. Standard relays are available from stock. Special items and modifications are available for rapid delivery.

Torr supplies high voltage, high vacu on an international basis for applications telemetry, radar pulse networks, RF equipment, voltage power supplies, electromedical devices many other systems. Flexible manufacturi search facilities provides quick reaction from development of a special relay design to the



TORR TYPE	TVS-1	TMR-9[5]	TB2A	T8T	T8S	T8R	TCR-1G	T5A[4]
Contact Arrangement	SPDT, Form C	SPDT, Form C	DPDT, Form 2C	SPDT, Form C	SPDT, Form C	SPDT, Form C	SPDT, Form C	SP Fo
Operating Voltage (peak) DC or 60 Hz	17.5 KV	17.5 KV	13.0, air 20 KV, oil	17.0 KV, air 26 KV, oil	17 KV, air 26 KV, oil	26 KV, air 35 KV, oil	5.0 KV, air 15 KV, oil	5. KV
Test Voltage (peak)	22.5 KV	27.0 KV	15.0, air 25.0, oil	18 KV, air 28 KV, oil	18 KV, air 28 KV, oil	30 KV, air	5.0 KV	1
Max. Contact Resistance (ohms)	.012	.012	.010	.010	.010	.012	.010	.0
Total Operate Time (milliseconds)	15	15	15	12	12	12	4	1
Total Release Time (milliseconds)	15	15	10	10	10	10	4	10
Coil Voltages[2] Available	26.5 VDC 117.0 VAC	40.0 VDC	26.5 VDC	26.5 VDC	26.5 VDC	26.5 VDC	26.5 VDC	26 VDC
Coil Resistance (ohms) ± 10% @ 25°C	128.0 (DC) 2000 (AC)	65	225	265	265	120	330	25
Continuous Current (amps) RMS—60 cps	9.0	10.0	25	15	15[1]	25[1]	20.0	5.0
Nominal Weight (oz.)	7.0	7.0	5.0	4.0	4.0	4.0	1.0	1.0
Nominal Size (inches)	4¾ x 3¾	4½ x 3¼	1¼ x 3	1⅛ x 2¾	1⅛ x 2¾	2 x 3½	1 x 1¼	¾
Mounting Style[3]	with or without foot bracket	foot bracket	threaded style	threaded style	flange style with or without mounting holes[6]	flange style[6]	threaded style	foot racke
Typical Application	AC, DC, Pulse	Medical-Defibrillator, AC, DC, Pulse	RF, AC, DC, Pulse	RF, AC, DC, Pulse Airborne	RF, AC, DC Pulse	RF, AC, DC Pulse	RF, AC, DC Pulse Airborne	AC, Pu Airb
Shock	30G — 11 ms	30G — 11 ms	30G — 11 ms	30G — 11 ms	30G — 11 ms	30G — 11 ms	55G — 11 ms	50G 11
Vibration	10G — 55 cps	15G — 55 cps	5G, 55—2000 cps 10G, 55—500 cps	10G—500 cps 5G—2000 cps	10G—500 cps 5G—2000 cps	10G—400 cps	10G—2000 cps	10G 55 G 5G— 00

[1] Consult Torr data sheet for higher frequency values
[2] Any coil voltage available by request
[3] Other mounting styles available
[4] Torr patented design
[5] Model available in smaller size for portable defibrillator use, Specify Model TMR-9A
[6] The style without mounting holes is desirable when the relay is soldered directly into a transformer of a pulse forming network which is oil filled
† Available up to 120 KV in air

Many models available in magnetic latching configurations

...the first name in vacuum

© 1970 Torr Labora

oduct n product.

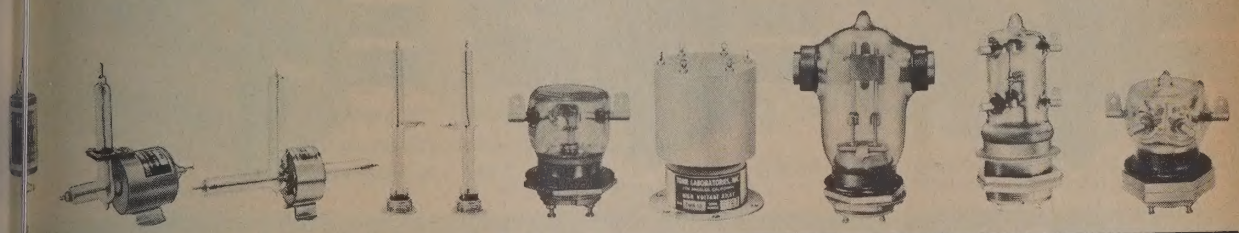
Ce mic relays for very high frequency applica- ns ar also available. Many of the relays shown meet L spe fications. This data is available upon request.

To has 15 issued U.S. Patents on high voltage lays, Ray tubes, lasers and related devices. Advan- s in rnology** and manufacturing skills in elec- n-va um devices makes Torr preeminent in the gh va um relay field.

TORR OLOGY: The science that deals with the develop- ment control and measurement of the vacuum environ- ment he processes and techniques for maintaining this state nd the art of performing useful functions therein.

TORR® HIGH VACUUM RELAY ADVANTAGES:

- ★ LONG LIFE WITHOUT CONTACT DEGRADATION
- ★ HANDLE HIGH PEAK CURRENTS
- ★ FAST RECOVERY FROM OVERLOADS
- ★ IDEAL FOR HIGH DENSITY PACKAGING
- ★ EXCELLENT FOR SEVERE ENVIRONMENTS
- ★ ALL RELAYS VACUUMIZED TO BETTER THAN 10^{-9} TORR
- ★ 24 MONTH WARRANTY!



TS[illegible]	TVS-2	T-35	T-60†	T-11	TMR-10[4]	TS8 TS10	TB-3	T-12
[illegible]m A	SPDT, Form C	SPDT, Form C	SPST Form A or B	SPST, Form A	DPDT, Form 2C	TS8 N/O Form A TS 10 N/C Form B	DPDT, Form 2C	DPDT, Form 2C
4.0 K[illegible]	17.5 KV	35 KV	60 KV, air 80 KV, oil	12.5 KV, air 20.0 KV, oil	8.0 KV, DC	30 KV, air 40 KV, oil	12 KV, air 17 KV, oil	9.0 KV, air 20 KV, oil
[illegible]	22.0 KV	45 KV, air 55 KV, oil	70 KV, air 80 KV, oil	15.0 KV, air 22.0 KV, oil	17.0 KV, DC	35 KV, air 45 KV, oil	15 KV, air 20 KV, oil	12.0 KV, air 22.0 KV, oil
.020	.015	.015	.015	.012	.5 ohms	.003	.010	.010
[illegible] o- [illegible]	13	15	15	13.0	25 MS @ 40 VDC 17 MS @ 40 VDC	20.0	20.0	15.0
500 ro- seco	13	15	15	13.0	20 MS	15.0	8.0	8.0
[illegible]	26.5 VDC	26.5 VDC 117.0 VAC	26.5 VDC	26.5	40 VDC	26.5	26.5	26.5
170	40	50 (DC) 2000 (AC)	120-220	250	65^{-2}	120^{-2}	120	268
[illegible]	9.0[1]	10.0	20	15.0	30 amps	75.0	30.0	15.0
1.0	7.0	10	12	2.0	16.0	9.0	5.0	2.0
[illegible]	4¾ x 3¾	7½ x 5½	3 x 13	1 x 1 13/16	3 x 3.5	2½ x 3¾	1½ x 3 5/16	1.5 x 2.0
with t foot acket	foot bracket	foot bracket	flange base	threaded style	flange style	threaded style	threaded style	threaded style
Vo gh speed pe on— AC, Pulse ac e	RF, DC, Pulse	AC, DC, Pulse	AC, DC, Pulse	RF, DC, Pulse Airborne	Medical- Defibrillator	RF, DC, Pulse	RF, DC, Pulse	RF, Pulse DC, Airborne
10 — 11 ms	10G — 11 ms	10G — 11 ms	10G — 11 ms	30G — 11 ms	30G — 11 ms	30 — 11 ms	30G — 11 ms	30G — 11 ms
30 500 cps 20 2000 cps	10G—55 cps	10G—55 cps	10G—55 cps	10G—500 cps 5G—2000 cps	10G—55 cps	10G—55 cps	10G—500 cps	10G—500 cps 5G—2000 cps

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PHONE (213) 477-1224

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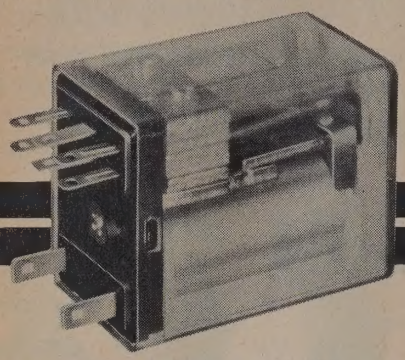
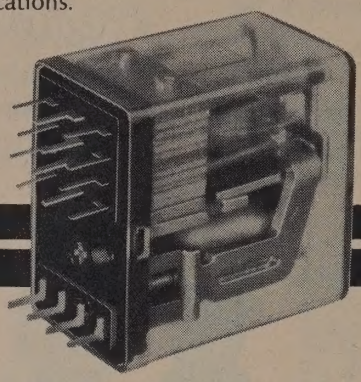
TORR OPTICAL LABORATORIES, INC. — *Optical components and coatings for lasers, microelectronics, infrared and optical applications.*

NEW! HIGH RELIABILITY, LONG-LIFE!! TAKAMISAWA MQR RELAYS

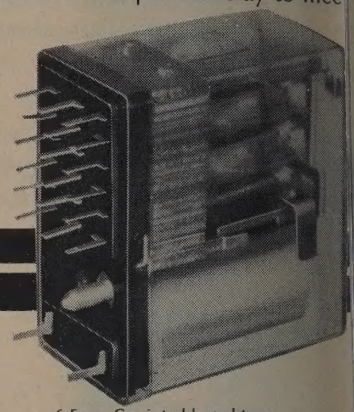
Introducing the small, general purpose relay, another product in the already acclaimed high quality MQ series. The MQR is more reliable and accurate than any other conventional relays and has superb performance and function. The MQR is an all-new general purpose relay which permits selection of the perfect relay to meet your requirement in all types of applications.



2 Form C plug-in use MQR relay



4 Form C Magnetic Latching type printed circuit board MQK



6 Form C printed board type with ground terminal MQF

■ FEATURES

1. International standard type
2. Combination plug-in or PC terminals
3. Bifurcated contact with card lift-off mechanism
4. Mechanical life expectancy more than 100 million operations
5. Form A, B, C, and D contact available
6. Quick operation and release
7. With clear plastic (polycarbonate) dust cover
8. Magnetic latching type available

■ MQR SPECIFICATIONS

1. Allowance for coil resistance ..... ±10% rated value (at 20°C)
2. Min. operating power. 0.05W (2W), 0.25W (4T)
3. Dielectric strength.....500VAC for 1 minute
4. Insulation resistance.....Greater than 100MΩ at 250VDC at normal room temperature (5~35°C)
5. Contact resistance ..... Approx 40mΩ
6. Contact force.....Approx 10gr
7. Contact material.....Gold-plated GS (3μm) .....Gold-plated Ag-Pd (20μm)
8. Mechanical life.....Greater than 10^8 operations
9. Shock resistance ..... 7~15G (depending on direction)

■ Type MQR Standard Coil Table

Name	Coil resistance (Ω)	Operating current (mA)		
		2 Form C [MQR-27-]	4 Form C [MQR-48-]	6 Form C [MQR-69-]
MQ (R)-[27] 03 (*1 *2)	40	56	72	92
[27] 07	150	32	41	52
[27] 09	250	24	35	40
[27] 10	350	20.5	26	34
[27] 12	450	18	23	30
[27] 13	600	16	21	27
[27] 14	700	16	20	26
[27] 15	800	14	18	23
[27] 17	1,100	11.9	15.5	19.5
[27] 19	1,800	9.4	12	15.5
[27] 20	2,300	8.3	10.5	13.8
[27] 22	5,300	5.5	7	9.2
[27] 24	10,000	4.4	5.7	7.3

* 1: Items in ( ) differ depending on the shape of the terminals and installation dimensions given in the separate table.
* 2: The figures in [ ], are as follows in accordance with contact spring combination: 2 Form C 27... 4 Form C 48... 6 Form C 69...

■ CLASSIFICATIONS

The following MQR relays are available in accordance with terminal shapes and installation dimensions.

MQR	General type relay with solder terminals
MQE	General type relay with solder terminals and ground terminal
MQB	General type relay with Printed circuit board terminals
MQF	General type relay with printed circuit board terminals and ground terminal

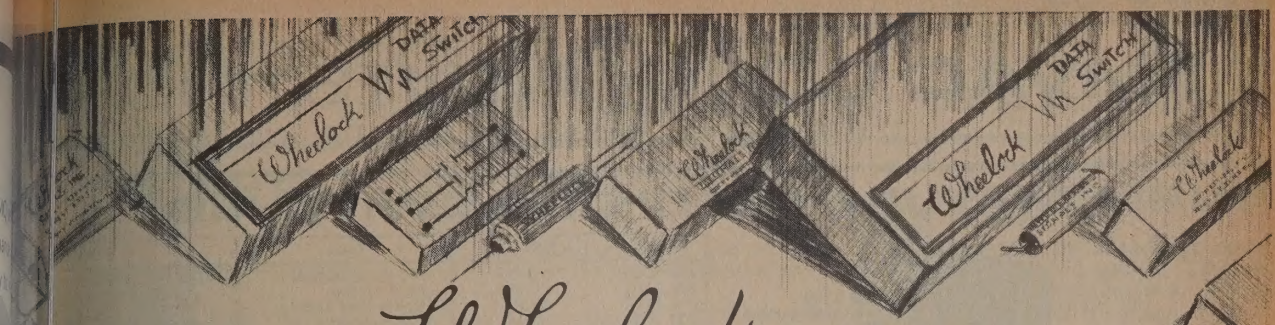
• The following types are also available.

MQH	Magnetic Latching type relay with solder terminals
MQJ	Magnetic Latching type relay with solder terminals and ground terminal
MQK	Magnetic Latching type relay with printed circuit board terminals
MQL	Magnetic Latching type relay with printed circuit board terminals and ground terminal

TAKAMISAWA ELECTRIC CO., LTD.

NO. 35-4, 1-CHOME, KOYAMA, SHINAGAWA-KU, TOKYO
CABLE ADDRESS: TECKRELAY TOKYO TEL: (492) 2131

Main Products: RELAY. KEY
PARTS FOR
TELECOMMUNICATION EQUIPMENT
AUTOMATIC TICKET PRINTING
VENDING MACHINE

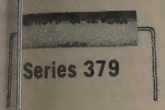


THE Wheelock FAMILY OF REED RELAYS

ULTRA-MINIATURE REED RELAYS

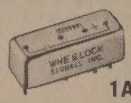
WHEELOCK SIGNALS INC.

Series 372



Series 379

- Occupies only 0.02 cu. in.
- Operates on only 50 mw of power
- Operate time 300 microseconds (typical)
- Insulation resistance as high as 1 x $10^{14}\Omega$
- Contacts rated at a full 7 watts



1A

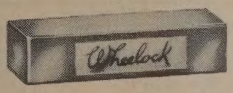
Series 442

- Smallest Multi-Pole Relays in Industry
- Occupies 0.055 cu. in. per pole
- Operates on 90 mw
- P.C. board mount
- Contacts rated at full 7 watts

MICRO-MINIATURE REED RELAYS

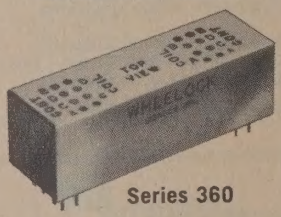
- C tact rating: 1 /, 500 ma
- C voltages: 6 2 or 24 VDC
- ulation resistance: 5 $10^{10}\Omega$

PRINTED CIRCUIT BOARD MODEL



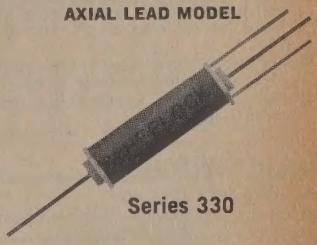
Series 3421

HIGH DENSITY MODEL



Series 360

AXIAL LEAD MODEL

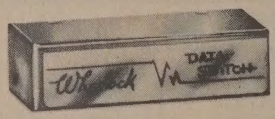


Series 330

MINIATURE REED RELAYS

Series 502

- All contact configurations available
- Coil voltages: 6-48 VDC
- Contact rating: 10 watts
- Standard 1" grid spacing



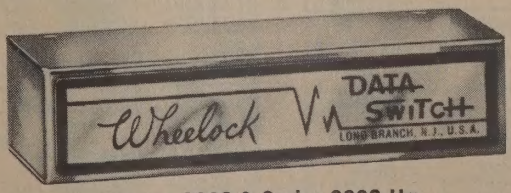
Series 262

- Contact arrangements, single pole to 6 pole models
- Coil voltages: 6 to 48 VDC
- Coil ratings: 125 to 600 mw
- Contact rating: 10W

TANDARD REED RELAYS

- oil ratings: 200 to 1500 mw
- ontact ratings to 50W
- perating time: 2.5 ms (typical)
- oil voltages: 6 to 120 VDC

MERCURY WETTED REED RELAYS



Series 3002 & Series 3002 Hg

- Contacts: 1 to 5 pole
- Coil ratings: 200 mw for 1 pole, to 1500 mw for 5 poles
- Coil voltages: 6 to 120 VDC
- Contact rating: 3 amp up to 50W

Wheelock

For complete details on how Wheelock can help solve problems involving space, weight and environmental limitations, write for the NEW Wheelock Reed Relay Catalog. It features the latest test data on reed relay life and reliability, dynamic characteristics and static characteristics.

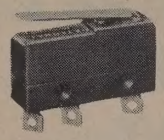
SIGNALS INC. • 273 BRANCHPORT AVENUE • LONG BRANCH, NEW JERSEY 07740 • (201) 222-6880

REMVAC COMPONENTS, INC.

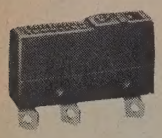
37-55 61st Street Woodside, New York 11377 (212) TW 9-6100

SUBMINIATURE PRECISION SWITCHES

- UL Approved
- Extra long life
- Easy wiring
- High quality



AM 6100
Pin-push button
SPDT
Solder terminal



AM 6101
Leaf spring
SPDT
Solder terminal

Switch	Terminal	Type	Rating
AM 1100	Solder	Pin-push button	AC 250V 10A; AC 1
AM 1101	Solder	Leaf spring	AC 250V 10A; AC 1
AM 1103	Solder	Roller leaf spring	AC 250V 10A; AC 1
AM 1300	Screw	Pin-push button	AC 250V 10A; AC 1
AM 1301	Screw	Leaf spring	AC 250V 10A; AC 1
AM 1303	Screw	Roller leaf spring	AC 250V 10A; AC 1
AM 5100	Solder	SPDT	AC 125V 10A; AC 2
AM 5200	Solder	SPNC	AC 125V 10A; AC 2
AM 5300	Solder	SPNO	AC 125V 10A; AC 2
AM 5600	Screw	SPDT	AC 125V 10A; AC 2
AM 5800	Screw	SPNO	AC 125V 10A; AC 2
AM 7690	Solder	SPDT	AC 125V 5A; AC 2
AM 7790	Solder	SPNC	AC 125V 5A; AC 2
AM 7890	Solder	SPNO	AC 125V 5A; AC 2

APPLIANCE SWITCHES

HIGH SNAP SWITCHES

FEATURES:

- Meets with JIS-C-6571, MIL & JAN standards
- High performance
- Long life
- Unique construction—6 patents

APPLICATIONS:

- High load (especially motor load, 550W 250V) machine tools, industrial machinery, electric tools, projectors, etc.
- High reliability & performance communication equipment, measuring equipment & instruments, medical equipment, electrical equipment for vehicles, ships, and aircraft, computers, office machines, etc.
- Electrical home appliances, optical instruments, lighting, disposal, air-conditioning, acoustical equipment, musical instruments, etc.
- Signal controls, broadcasting equipment, X-ray devices, telephones, radios, etc.

WD 1011
SPST
Solder term.

WD 1121
SPDT
Screw term.

WD 1711
4PDT
Solder term.

PROPERTIES:

Contact resistance ..... less than 10 m ohm
Temp. rise ..... less th 30°C
Ins. Leak-down ..... more than 100 m ohm
Voltage break-down ..... AC 1500 min.

Single Pole	Double Pole	Three Pole	Four Pole	Characteristic
Solder terminal				
WD 1011	WD 1211	WD 1411	WD 1611	ON-OFF
WD 1111	WD 1311	WD 1511	WD 1711	ON-ON
WD 1112	WD 1312	WD 1512	WD 1712	ON-OFF-ON
WD 1113	WD 1313			ON-Mom. ON
WD 1114	WD 1314			ON-OFF-Mom. ON
WD 1115	WD 1315			Mom. ON-OFF-Mom ON
Screw terminal				
WD 1021	WD 1221	WD 1421	WD 1621	ON-OFF
WD 1121	WD 1321	WD 1521	WD 1721	ON-ON
WD 1122	WD 1322	WD 1522	WD 1722	ON-OFF-ON
WD 1123	WD 1323			ON-Mom. ON
WD 1124	WD 1324			Mom. ON-OFF-Mom ON
WD 1125	WD 1325			ON-OFF-Mom. ON

SNAP SWITCHES

- Meets with JIS-C-6571
- Contact resistance—less than 20 megohm

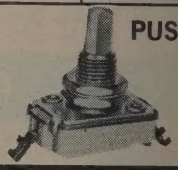
WD 103
SPST

Solder terminal		
Single Pole	Double Pole	Characteristics
WD 1031 WD 1131	WD 1231 WD 1331	ON-OFF ON-ON

SLIDE SWITCH

WD 4099
SPST
AC 1A 250V

PUSH SWITCH



WD 80
SP
AC 1 25V

LIMIT SWITCHES

ENCLOSED GENERAL PURPOSE SWITCHES

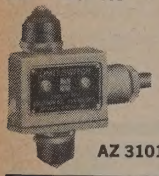
AZ 1102

Capacity/resistive load:
15A 125V AC
10A 250V AC

Switch	Type	Mounting
AZ 1102	Roller, plunger	Side
AZ 1202	Roller, plunger	Bottom
AZ 2101	Sealed plunger, splash-dust proof	Side
AZ 2201	Sealed plunger, splash-dust proof	Bottom
AZ 2104	Sealed roller arm	Side
AZ 2204	Sealed roller arm	Bottom
AZ 2161	Plunger	Right-hand
AZ 2164	Roller arm	Right-hand
AZ 2171	Plunger	Left-hand
AZ 2174	Roller arm	Left-hand

ENCLOSED MAINTAINED CONTACT SWITCHES

Capacity/resistive load:
15A 125V AC
10A 250V AC



AZ 3101

Switch	Type	Mounting
AZ 3101	Sealed plunger, splash-dust proof	Side
AZ 3201	Sealed plunger, splash-dust proof	Bottom
AZ 3104	Sealed roller arm, splash-dust proof	Side
AZ 3204	Sealed roller arm, splash-dust proof	Bottom

ENCLOSED WEATHER-PROOF SWITCH

Capacity/resistive load:
15A 125V AC
10A 250V AC

AZ 4304
Roller arm type

SPLITTED HOUSING GENERAL PURPOSE SWITCHES

Switch	Type	Mounting
AZ 6101	Sealed plunger	Side
AZ 6201	Sealed plunger	Bottom
AZ 6102	Roller plunger	Side
AZ 6202	Roller plunger	Bottom
AZ 6104	Sealed roller arm	Side
AZ 6204	Sealed roller arm	Bottom

Capacity/resi e load:
15A 125V AC
10A 250V AC

AZ 101

SMALL TWO-CIRCUIT LIMIT SWITCHES

Switch	Type
AZ 5101	Plunger
AZ 5102	Roller Plunger
AZ 5104	Roller arm
AZ 5105	Yoke
AZ 5106	Flexible rod
AZ 5107	Adjustable rod
AZ 5108	Adjustable roller arm

Capacity/resi e load:
15A 125V AC
6A 260V AC

AZ 5 1

REMVAC COMPONENTS, INC.
37-55 61st Street Woodside, New York 11377 (212) TW 9-61

Sole agents for components manufactured by Matsushita Electric Works, Lt.

REMVAC COMPONENTS, INC.

37-55 61st Street Woodside, New York 11377 (212) TW 9-6100

HP-RELAYS

- UL Approval
- Two types: solder type (S-terminal) and plug-in (R-terminal).
- Both types available for 6V, 12V, 24V, 48V, and 110V DC applications, and 6V, 12V, 24V, 48V, 115V, 220V, and 240V AC applications.
- Both AC & DC high power applications at all voltage levels.
- Contact arrangements: DPDT, 3PDT, and 4PDT available in all types at all voltages.
- Mech life: over 10,000,000

- Long life, excellent reliability, and superior contact performance up to 10A 250V AC
- Complete standardization and simplification allows minimized sizes and lowest prices.
- Totally interchangeable with U.S. components, including pin configurations.

Max. switch-off current	10A AC
Max. switch-on current	20A AC
Max. contact current	10A
Max. contact voltage	250V AC
Max. contact power	120W
Shock resistance	10G

R-SERIES
Can only be used for plug-in into standard sockets. Panel & surface mounting sockets are available for HP relays.

S-SERIES
Can be used without alteration with direct solder tab connection or with AMP-connectors, type Faston 205. For plug-in or printed circuit applications.

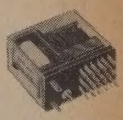
K-RELAYS

- UL Approval
- 10P pin contact force
- Mech life: 10^8
- Low operating force
- Negligible contact bounce
- Interchangeable
- 20 gold-plated mercury contacts
- Long life expectancy
- Low price

Max. switching capacity	2A; for type K2F—5A
Max. switching voltage	220V
Max. switching power	50W (120VA); for type K2F—100W (500VA)
Max. contact current	4A; for K2F—6A
Vibration resistance	10G to 55Hz

Type K2 DPDT

Type K4 4PDT



Type K6 6PDT

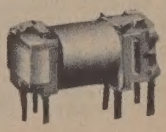
Type	Current	Contacts	Voltages 3	6	12	24	28	42	48	60	110	220
K2	DC	DPDT	x	x	x	x		x	x	x	x	
K2A	50Hz	DPDT		x	x	x			x		x	x
K2A	60Hz	DPDT		x	x	x			x		x	x
K2F	DC with 5A contact	DPDT		x	x	x	x	x		x	x	
K4	DC	4PDT	x	x	x	x			x	x	x	
K6	DC	6PDT		x	x	x			x	x	x	

R-RELAYS

- New type of high speed, SPDT, reed contact relay
- 5P rhodium twin contacts
- 60 megohm contact resistance
- High reliability
- Low operating power
- Up to 500Hz operating frequency
- Temperature compensation
- Mechanical life: 10^9
- Low price

Type RS Shielded Hermetically sealed

Type RH Hermetically sealed



Type RO Unsealed

Max. switching load	1A
Max. switching voltage	110V
Max. switching power	20W
Switch-on/contact current	1.5/1
Shock resistance	30G

TWO BASIC TYPES:
Single side stable SPDT contacts—to be used as a neutral nonpolarized relay.
Bistable (latching) SPDT contacts—to be operated by either single wound coil (chopper) or double wound coil.

NH-RELAYS

- For RF and dry circuit applications
- Suitable for DC operation
- SPDT and DPDT
- High reliability
- Long life expectancy
- Low contact resistance
- NH, NDH, N, and ND types available at following voltages: 3V, 6V, 12V, 24V, 28V, 42V, 60V, 100V

NH and NDH

Hermetically sealed MIL-R-5757D

N and ND

Plastic cover

HM-RELAYS

- SPDT
- Both P and S types available at following voltages: 3V, 6V, 9V, 12V, 18V, 24V, 35V, 42V, and 60V.
- Minimum 15P contact pressure
- High life
- Low price
- Mechanical life: 20,000,000

Max. switch off current	3A
Max. switch on current	10A
Max. contact current	6A
Max. contact voltage	250V
Max. contact power	90W/1 KVA

P TERMINAL

P terminal
Mounting by printed circuit terminals

S TERMINAL

S terminal
Mounting by two mounting screws to an insulating plate.

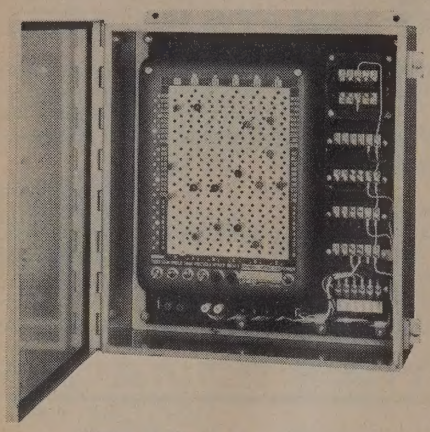
REMVAC COMPONENTS, INC.

37-55 61st Street Woodside, New York 11377 (212) TW 9-6100

Sole agents for components manufactured by Matsushita Electric Works, Ltd.

CONTROLS SYSTEM 32

a job shop mini-computer for repeat cycle operations



SYSTEM 32 SHOWN IN "NEMA 12" ENCLOSURE

FEATURING:

- UP TO 1000 SECONDS PER CYCLE
- SELF TESTING FOR FAST SET-UP
- FRONT ACCESS FOR WALL BOX MOUNTING
- FIVE INDEPENDENT FUNCTIONS — EXPANDABLE
- EXACT TIMING DIVIDES DOWN 50/60 CYCLE LINE
- DIRECT DECIMAL DISPLAY IN SECONDS OR MINUTES
- FAIL SAFE — REMOTE SAFETY AND SET-UP CONTROL
- MULTIPLE FUNCTIONS WITHIN A FUNCTION PER CYCLE
- ALL SILICON SOLID STATE — VERY HIGH NOISE MARGINS
- NO SOFTWARE PROGRAM NEEDED — FOREMAN CAN OPERATE

STYLE 1
STANDARD PANEL MOUNTING
FOR A.C. POWER CONTROL

Designed for repeat cycle operations in the process control industry, this job shop mini-computer can be easily programmed by the foreman to permit automatic to be extended to short runs. Program it as an operation is being set up, without purchasing software or re-punching tapes.

DESCRIPTION

SYSTEM 32 can control the timing and sequence of five sets of solid state relays that may drive directly 3ϕ or single phase motors and solenoids.

The start-stop and recycle times of 5 channels can be plug programmed in the basic mode. Next, some channels can be started subject to others being on or off. Absence of significant plugs permits multiple starting and also channels can be shorted together or gated by limit switches giving further versatility. The time-base can be shortened for any of the three decades to divide by numbers less than ten.

In the TEST mode the indicator lamps instantly show every gated time for setting up. Time can be stopped or reset with or without controls. Manual adjustments such as "switching to final cycle" can be made at remote locations. The versatility and full capabilities of SYSTEM 32 can be quickly appreciated with a demonstration.

MANUAL CONTROLS

PROGRAM PLUGS: Select start-stop and recycle times of 5 channels for up to 1,000 seconds. Select qualified starts.

TEST MODE SWITCH: Disconnects outputs, speeds up and stops timing to display each gated function. Needs to be restarted to the next time selected by the program plugs.

CONTROLS SWITCH: Disconnects outputs to permit timing without activating the relays or outputs.

TIME SWITCH: Permits timing to be stopped while the controls continue in the same state.

RECYCLE SWITCH: For repeat cycle or one time/last time operation.

START BUTTON: For initial or continued timing in one time/last time or interrupted operation and in processing Test Mode outputs.

RESET BUTTON: Restores timer to zero and disconnects all outputs.

POWER SWITCH: Timer and controls switch; activates power on reset.

SPECIFICATIONS

INPUT: 115 (230) ±15% at 50/60 cps, ½ (¼) ampere.

OUTPUTS: Short circuit proof, plus 10 volts, 250 ohms to common.

TIMING: 1,000 seconds standard, decimally displayed.

REPEATABILITY: Accurate to line frequency, ±1 millisec.

TEMPERATURE: Operates over −15 to +60°C.

SIZE: 12¼ x 15 x 4¼" (w x h x d).

WEIGHT: 6 pounds.

HOW TO ORDER

CONTROLS SYSTEM 32: Basic designation is System 32-60-115. The 60 indicates the number of cycles divided down, in this case a 1 second time base for 60 cps line. Divide down values available without extra charge — 5, 6, 10, 12, 20, 24, 25, 30, 40, 48, 50, 60, 80, 96 and 128. The 115 may be replaced with 230 for that line voltage. **PRICE: $600.**

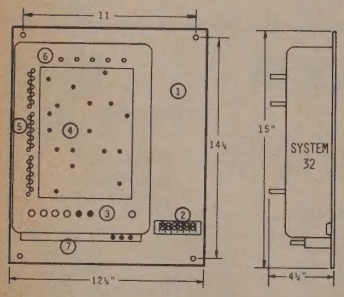
REMOTE CONTROL: Order remote control box separately. It contains all switches except TEST Cable or special connector would be extra. **PRICE: $50.**

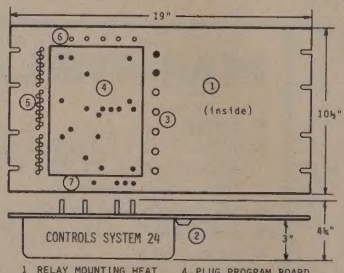
RELAYS: Specify separately. Relays are mounted and wired for front access when ordered with the controls system.

CASE: A factory dustproof enclosure, (NEMA class 12), is available for System 32. Overall size: 15 x 17½ x 6¼ (w x h x d). **PRICE: $50.**

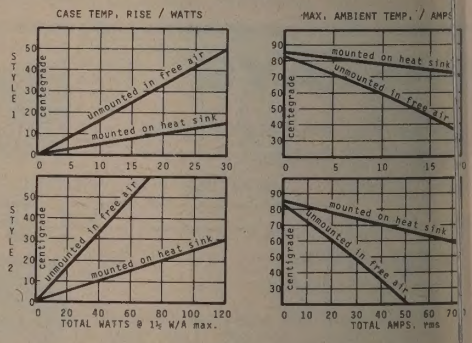
CONTROLS SYSTEM 24

This system is a rack-mounted version with a 24 hour period divided into minutes or sub-multiples of these periods. Very useful for overnight testing, heating cycles or daily routines. Size: 19 x 10½ x 4¼. **PRICE: $600.**





1 RELAY MOUNTING HEAT SINK
2 TERMINAL FOR REMOTE CONTROLS
3 MANUAL CONTROLS
4 PLUG PROGRAM BOARD
5 TIME DISPLAY LAMPS
6 CHANNEL DISPLAY LAMPS
7 SPARE PLUG RECEPTACLE



PRICES, SPECIFICATIONS MAY CHANGE WITHOUT NOTICE. WRITE FOR COMPLETE DATA AND QUANTITY QUOTATIONS.

ZENRAD CONTROLS COMPANY

• 1575 A.P.S., SANTA BARBARA, CALIFORNIA 93103 • PHONE: (805) 965-4996

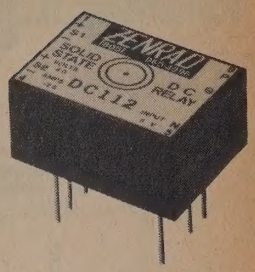
MANUFACTURERS OF COMPONENTS THAT INTERFACE BETWEEN COMPUTER LEVEL SIGNALS AND MECHANICAL OR ELECTRICAL FUNCTIONS

SOLID STATE A.C. and D.C. RELAYS

STYLE 2 — HIGH DISSIPATION CASE FOR MULTI-PHASE POWER CONTROL

FEATURING (A.C. UNITS):

- VOLTAGE RATINGS TO ±600 VOLTS
- CURRENT RATINGS TO 20 AMPERES
- SURGE CURRENT RATINGS OF 1000%
- LINE FREQUENCY, 25 TO 1000 C. P. S.
- ZERO VOLTAGE SWITCHING MINIMIZES NOISE
- RUGGED METAL CASES, EPOXY ENCAPSULATED
- 1, 2, 3 & 4 PHASE CONTROL OF A.C. POWER
- ALL SILICON SOLID STATE—NO MOVING PARTS
- COMPLETE ISOLATION OF CONTROL AND "CONTACTS"
- HIGH INPUT IMPEDANCE COMPATIBLE WITH I.C. LEVELS



STYLE 3 — PRINTED CIRCUIT CARD MOUNTING FOR A.C. AND D.C. CONTROL

Designed for low level control of A.C. powered motors, solenoids, lighting and peripheral equipment, these relays contain no moving parts, contacts or lamps, give maximum reliability without the shock and vibration effects and deterioration of electromechanical devices. Typical short circuit voltage drop is 1 V r.m.s. with open circuit leakage less than 1 m.a. at max. voltage and temperature. Operating temperature is from −15 to 85°C.

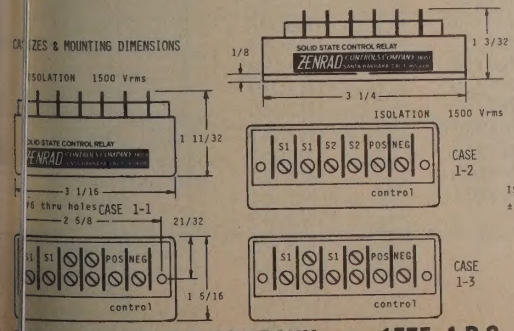
The D.C. RELAYS are isolated solid state switches designed to control small direct current motors, indicators, and numerous devices where absolute reliability, and bounce free, very high speed operation is essential. Normally open circuits will block D.C. of the polarity shown. An A.C./D.C. switch is made by connecting two poles, back to back in series. Parallel connection will double the current rating.

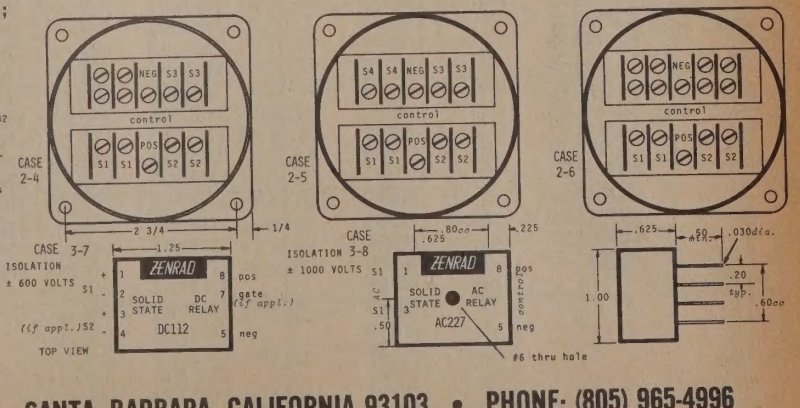
DESCRIPTION A.C. RELAYS	MODEL	NO. OF POLES	AMPS. R.M.S.	CASE STYLE	CASE WATTS	INPUT OHMS	PRICES 1 to 24 ±200v	±400v	±600v	INPUT OR CONTROL
Stand panel mounting A.C. contr for low level d.c. input High current and ex- celle surge rating.	CR211* CR212 CR221	1 2 1	10 6 20	1 - 1 1 - 2 1 - 3	15 18 30	3000 1500 1500	$ 30.00 35.00 47.50	$ 35.00 42.50 55.00	$ 42.50 59.50 70.00	4 to 32 V. d.c. for closed O.C. or less than than 1 volt for open. −15 to 85°C.
An e nomical limited tem- perat version of the CR211	CR231	1	7½	1 - 1	12	1000	25.00	30.00	36.00	5 to 32 V d.c. 0 to 85°C
High voltage, high imped- ance .c. or d.c. input mode for A.C. control.	CR215 CR225	1 1	10 20	1 - 1 1 - 3	15 30	50K 25K	32.50 50.00	37.50 57.50	45.00 72.70	50 to 150 V a.c./d.c. for closure. O.C. or less than 5 volts for open.
High rrent, multiphase con- trol A.C. power from low volta d.c. inputs. Used for ove water heaters and larg motors.	CR213 CR214 CR222 CR223 CR224	3 4 2 3 4	10 10 20 20 20	2 - 4 2 - 5 2 - 6 2 - 4 2 - 5	45 60 60 90 120	1000 750 1000 750 500	58.00 70.00 70.00 95.75 120.00	67.50 85.00 90.25 115.50 145.00	90.75 112.00 115.00 145.50 175.00	4 to 20 V d.c. for closed O.C. or less than 1 volt for open. −15 to 85°C. All phases and control are iso- lated.
Sam as above group but high input impedance for typi y 28 volt circuits. Low cost for aircraft, in- dus and o.e.m. applica- tion	CR213A CR214A CR222A CR223A CR224A	3 4 2 3 4	10 10 20 20 20	2 - 4 2 - 5 2 - 6 2 - 4 2 - 5	45 60 60 90 120	3000 2000 3000 2000 1500	54.00 65.00 65.00 91.75 112.00	63.00 79.50 85.75 111.50 139.00	85.00 99.50 107.00 141.50 170.00	16 to 32 V d.c. for closed O.C. or less than 3 volts for open. −15 to 85°C. All phases and control are iso- lated.
Prin circuit card mount- ing C. control from I.C. con ible inputs.	AC216 AC226	1 1	1½ 4	3 - 7 3 - 8	2½ 6	2000 2000	20.00 25.00	22.50 27.50	— —	4 to 32 V d.c. −15 to 65°C.
Low cost hybrid with reed swi P.C. card mounting.	RC217 RC227	1 1	1½ 4	3 - 7 3 - 8	2½ 6	600 600	12.00 16.00	16.00 20.00	— —	12 to 24 V d.c. −15 to 55°C.

*Rep e first 2 with a 4 for ±400 or with a 6 for ±600 peak voltage designation.

DESCRIPTION D.C. RELAYS	MODEL	NO. OF POLES	AMPS. MAX.	VOLTS PK.	S.C. V.D.	F.L. m.w.	CASE STYLE	INPUT OHMS	PRICE 1 - 24	INPUT OR CONTROL
I.C ompatible D.C. switches ha a third, high imped- an input gate. Operates, − to 65°C.	DC111 DC112	1 2	0.25 0.25	+40 +40	0.3 0.3	100 200	3 - 7 3 - 7	750 500	$20.00 22.50	5 volt supply with gate at 3½ - 5 or no connection for closed and 0 - 1 V for open "contacts."
Hi voltage, medium cur- re D.C. switches, with two le inputs. Operates, −15 to °C.	DC311 DC312	1 2	0.5 0.5	+150 +150	0.6 0.6	550 1000	3 - 7 3 - 7	3000 2000	22.50 25.00	12 - 32 volts, two terminal input. Normally open with- out input.
A her current D. C. switch fo two terminal isolated co ol. Operates, −15° to 65	DC121	1	2.0	+40	0.6	2000	3 - 8	1000	25.00	12 - 32 volts, two terminal, normally open input.

INDIVIDUAL PRICE DISCOUNT SCHEDULE: 25-99, less 10%; 100-9, less 20%; 250-999, less 30%; 1K up, less 35% of 4 piece price.





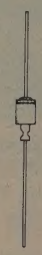
ZENRAD CONTROLS COMPANY • 1575 A.P.S., SANTA BARBARA, CALIFORNIA 93103 • PHONE: (805) 965-4996

A wholly owned subsidiary, MOTOR CONTROL CORP. • SANTA BARBARA PLANT: 232 EAST GUTIERREZ STREET (93101)

COMPONENTS INCORPORATED

BIDDEFORD, MAINE 04005

zener diode selector guide

V_Z	250 Milliwatt Cathode = Polarity Mark	400 Milliwatt Cathode = Polarity Mark	750 Milliwatt Cathode = Polarity Mark	1 Watt Cathode = Polarity Mark	1 Watt Cathode To Case	1.5 Wa Cathode = Polarity Mark
	STUD 7*	STUD 7*				
	Case 12 (DO-7) Glass V_Z Tolerance ±5%	Case 12 (DO-7) Glass V_Z Tolerance See Note 1	Case 11 Molded Plastic V_Z Tolerance See Note 2	Case 11 Molded Plastic V_Z Tolerance See Note 3	Case 16 (DO-13) Metal V_Z Tolerance ±5%	Case 20 Glass DBL STUD V_Z Tolerance ±5%
1.8						
2.0						
2.2						
2.4		1N4370				
2.7		1N4371				
3.0		1N4372				
3.3		1N746		1N4728	1N3821	
3.6		1N747		1N4729	1N3822	
3.9		1N748		1N4730	1N3823	
4.3		1N749		1N4731	1N3824	
4.7		1N750		1N4732	1N3825	
5.1		1N751		1N4733	1N3826	
5.6		1N752		1N4734	1N3827	
6.2		1N753		1N4735	1N3828	
6.8	1N4099	1N754	1N3675	1N4736	1N3016	1N4461
		1N957			1N3829	
7.5	* 1N4100	* 1N755	1N3676	1N4737	1N3017	1N4462
		* 1N958			1N3830	
8.2	* 1N4101	* 1N756	1N3677	1N4738	1N3018	1N4463
		* 1N959				
9.1	* 1N4103	* 1N757	1N3678	1N4739	1N3019	1N4464
		* 1N960				
10	* 1N4104	* 1N758	1N3679	1N4740	1N3020	1N4465
		* 1N961				
11	* 1N4105	* 1N962	1N3680	1N4741	1N3021	1N4466
12	* 1N4106	* 1N759	1N3681	1N4742	1N3022	1N4467
		* 1N963				
13	* 1N4107	* 1N964	1N3682	1N4743	1N3023	1N4468
15	* 1N4109	* 1N965	1N3683	1N4744	1N3024	1N4469
16	* 1N4110	* 1N966	1N3684	1N4745	1N3025	1N4470
18	* 1N4112	* 1N967	1N3685	1N4746	1N3026	1N4471
20	* 1N4114	* 1N968	1N3686	1N4747	1N3027	1N4472
22	* 1N4115	* 1N969	1N3687	1N4748	1N3028	1N4473
24	* 1N4116	* 1N970	1N3688	1N4749	1N3029	1N4474
27	* 1N4118	* 1N971	1N3689	1N4750	1N3030	1N4475
30	* 1N4120	* 1N972	1N3690	1N4751	1N3031	1N4476
33	* 1N4121	* 1N973	1N3691	1N4752	1N3032	1N4477
36	* 1N4122	* 1N974	1N3692	1N4753	1N3033	1N4478
39	* 1N4123	* 1N975	1N3693	1N4754	1N3034	1N4479
43	* 1N4124	* 1N976	1N3694	1N4755	1N3035	1N4480
47	* 1N4125	* 1N977	1N3695	1N4756	1N3036	1N4481
51	* 1N4126	* 1N978	1N3696	1N4757	1N3037	1N4482
56	* 1N4127	* 1N979	1N3697	1N4758	1N3038	1N4483
62	* 1N4129	* 1N980	1N3698	1N4759	1N3039	1N4484
68	* 1N4130	* 1N981	1N3609	1N4760	1N3040	1N4485
75	* 1N4131	* 1N982	1N3700	1N4761	1N3041	1N4486
82	* 1N4132	* 1N983	1N3701	1N4762	1N3042	1N4487
91	* 1N4134	* 1N984	1N3702	1N4763	1N3043	1N4488
100	1N4135	1N985	1N3703	1N4764	1N3044	1N4489
110		1N986	1N3704		1N3045	1N4490
120		1N987	1N3705		1N3046	1N4491
130		1N988	1N3706		1N3047	1N4492
150		1N989	1N3707		1N3048	1N4493
160		1N990	1N3708		1N3049	1N4494
180		1N991	1N3709		1N3050	1N4495
200		1N992	1N3710		1N3051	1N4496

*STUD 7 construction

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

ener diode
ector guide

Vz	3 Watt Cathode = Polarity Mark	5 Watt Cathode = Polarity Mark	5 Watt Cathode = Polarity Mark	5 Watt Polarities: See Note 5	10 Watt Cathode to Case = 1N3993 Series Anode to Case = 1N2970 Series
	Case 20 Glass DBL STUD V_Z Tolerance ±5%	**Case 21** Glass DBL STUD V_Z Tolerance ±5%	**Case 22** Molded Plastic V_Z Tolerance See Note 2	**Case 14** Metal V_Z Tolerance See Note 2	**Case 17 (DO-4)** Metal V_Z Tolerance See Note 6
1.8					
2.0					
2.2					
2.4					
2.7					
3.0					
3.3					
3.6					
3.9					1N3993
4.3					1N3994
4.					1N3995
5.					1N3996
5.					1N3997
6.					1N3998
6.	1N5063	1N4954	1N5342		1N2970
					1N3999
7.	1N5064	1N4955	1N5343		1N2971
					1N4000
8	1N5065	1N4956	1N5344	1N4016	1N2972
9	1N5066	1N4957	1N5346	1N4017	1N2973
1	1N5067	1N4958	1N5347	1N4018	1N2974
1	1N5068	1N4959	1N5348	1N4019	1N2975
1		1N4960	1N5349	1N4020	1N2976
1	1N5069	1N4961	1N5350	1N4021	1N2977
1	1N5071	1N4962	1N5352	1N4022	1N2979
1	1N5072	1N4963	1N5353	1N4023	1N2980
1	1N5073	1N4964	1N5355	1N4024	1N2982
2		1N4965	1N5357	1N4025	1N2984
2	1N5074	1N4966	1N5358	1N4026	1N2985
2	1N5075	1N4967	1N5359	1N4027	1N2986
2	1N5076	1N4968	1N5361	1N4028	1N2988
	1N5077	1N4969	1N5363	1N4029	1N2989
	1N5078	1N4970	1N5364	1N4030	1N2990
	1N5079	1N4971	1N5365	1N4031	1N2991
	1N5080	1N4972	1N5366	1N4032	1N2992
	1N5082	1N4973	1N5367	1N4033	1N2993
	1N5084	1N4974	1N5368	1N4034	1N2995
	1N5086	1N4975	1N5369	1N4035	1N2997
	1N5087	1N4976	1N5370	1N4036	1N2999
	1N5089	1N4977	1N5372	1N4037	1N3000
	1N5090	1N4978	1N5373	1N4038	1N3001
	1N5092	1N4979	1N5374	1N4039	1N3002
	1N5094	1N4980	1N5375	1N4040	1N3003
	1N5095	1N4981	1N5377	1N4041	1N3004
00		1N4982	1N5378	1N4042	1N3005
.0	1N5096	1N4983	1N5379		1N3007
20	1N5097	1N4984	1N5380	1N3102	1N3008
30	1N5098	1N4985	1N5381		1N3009
50		1N4986	1N5383	1N3103	1N3011
50	1N5100	1N4987	1N5384		1N3012
30	1N5102	1N4988	1N5386	1N3104	1N3014
00	1N5104	1N4989	1N5388		1N3015

NOTES:

NOTE 1.
Vz tolerance:
1N746 and 1N4370 series—No suffix ±10%; A ±5%;
1N957 series—No suffix ±20%, A ±10%, B ±5%.

NOTE 2.
Vz tolerance:
No suffix ±20%, A ±10%, B ±5%.

NOTE 3.
Vz tolerance:
No suffix ±10%, A ±5%.

NOTE 4.
Vz tolerance:
1N3821 series—No suffix ±10%, A ±5%,
1N3016 series—No suffix ±20%, A ±10%, B ±5%.

NOTE 5.
1N4016 series Anode to Case, reverse polarities available as "R";
1N3012 series, Cathode to Case, reverse polarities available as "R."

NOTE 6.
Vz tolerance:
1N3993 series—No suffix ±10%, A ±5%,
1N2970 series—No suffix ±20%, A ±10%, B ±5%.

STUD 7* CONSTRUCTION FOR ALL ITEMS 8.2V TO 91V

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

tcle selector guide

V_Z	Case	Material	Package	Temp. Range	Voltage Temperature Coefficient % .01	.005	.002	.001	.0005	.002
6.2 ±5%	Case 12 (DO-7)	Glass		−55 to +100	1N821	1N823	1N825	1N827	1N829	
					1N821A	1N823A	1N825A	1N827A	1N829A	
					1N822	1N824				
				0 to +75	1N3500	1N3496	1N3497	1N3498	1N3499	
	Case 1	Molded		−55 to +100	1N1735	1N1735A				
6.35 ±5%	Case 12 (DO-7)	Glass		+25 to +100				1N4890	1N4891	
								1N4892	1N4893	
								1N4894	1N4895	
								1N4890A	1N4891A	
				−55 to +100				1N4892A	1N4893A	
								1N4894A	1N4895A	
6.5 ±.2V					1N3780	1N3781	1N3782	1N3783	1N3784	
6.55 ±.35V				−50 to +100			1N826	1N828		
6.8 ±5%	Case 5	Molded				1N2765				
8.4 ±5%	Case 12 (DO-7)	Glass		−55 to +100	1N3154	1N3155	1N3156	1N3157		
				−55 to +150	1N3154A	1N3155A	1N3156A	1N3157A		
				0 to +75	1N935	1N936	1N937	1N938	1N939	1N94
9.0 ±5%				−55 to +100	1N935A	1N936A	1N937A	1N938A	1N939A	1N94
				−55 to +150	1N935B	1N936B	1N937B	1N938B	1N939B	1N94
9.3 ±.4V	Case 16 (DO-13)	Metal		0 to +75	1N2620	1N2621	1N2622	1N2623	1N2624	
				−55 to +100	1N2620A	1N2621A	1N2622A	1N2623A	1N2624A	
				−55 to +150	1N2620B	1N2621B	1N2622B	1N2623B	1N2624B	
9.4±5%				0 to +70		1N2163		1N2166	1N2169	
				−55 to +125		1N2164		1N2167	1N2170	
				−55 to +185		1N2165		1N2168	1N2171	
11.7 ±5%	Case 12 (DO-7)	Glass		0 to +75	1N941	1N942	1N943	1N944	1N945	1N946
				−55 to +100	1N941A	1N942A	1N943A	1N944A	1N945A	1N946
				−55 to +150	1N941B	1N942B	1N943B	1N944B	1N945B	1N946
	Case 16 (DO-13)	Metal		0 to +75	1N3580	1N3581	1N3582	1N3583	1N3584	
				−55 to +100	1N3580A	1N3581A	1N3582A	1N3583A	1N3584A	
				−55 to +150	1N3580B	1N3581B	1N3582B	1N3583B	1N3584B	
	Case 2	Molded		−55 to +100	1N1736	1N1736A				
12.4 ±5%	Case 8	Molded				1N4057	1N4057A			
13.6 ±5%	Case 5	Molded				1N2766				
14.6 ±5%	Case 8	Molded				1N4058	1N4058A			
16.8±5%						1N4059	1N4059A			
18.5 ±5%						1N4060	1N4060A			

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

ce
Selector guide

V_z	Case	Material	Package	Temp. Range	Voltage Temp Coefficient %/°C .01	.005	.002
18.6 ±%	Case 3	Molded		−55 to +100	1N1737	1N1737A	
20.4 ±%	Case 6	Molded				1N2767	
21 ±5	Case 8	Molded				1N4061	1N4061A
23 ±5						1N4062	1N4062A
24.8 ±%	Case 3	Molded			1N1738	1N1738A	
27 ±%	Case 8	Molded				1N4063	1N4063A
27.2 ±%	Case 6	Molded				1N2768	
30 ±%	Case 8	Molded				1N4064	1N4064A
31 ±%	Case 4	Molded			1N1739	1N1739A	
33 ±%	Case 8	Molded				1N4065	1N4065A
34 ±%	Case 7	Molded				1N2769	
37 ±%	Case 8	Molded				1N4066	1N4066A
37.2 ±5%	Case 4	Molded			1N1740	1N1740A	
40.8 ±5%	Case 7	Molded				1N2770	
43 ±%	Case 8	Molded				1N4067	1N4067A
43.2 ±5%	Case 4	Molded			1N1741	1N1741A	
47 ±%	Case 8	Molded				1N4068	1N4068A
49.5 ±5%	Case 4	Molded			1N1742	1N1742A	
51 ±%						1N4069	1N4069A
56 ±%						1N4070	1N4070A
62 ±%						1N4071	1N4071A
68 ±5%	Case 9	Molded				1N4072	1N4072A
75 ±5%						1N4073	1N4073A
82 ±5%						1N4074	1N4074A
87 ±5%						1N4075	1N4075A
91 ±5%						1N4076	1N4076A
100 ±5%						1N4077	1N4077A
110 ±5%						1N4078	1N4078A
120 ±5%						1N4079	1N4079A
130 ±5%						1N4080	1N4080A
150 ±5%						1N4081	1N4081A
160 ±5%						1N4082	1N4082A
180 ±5%	Case 10	Molded				1N4083	1N4083A
200 ±5%						1N4084	1N4084A
220 ±5%						1N4085	1N4085A

CASE DIMENSION DATA:

LD = Lead Diameter
BD = Body Diameter
BL = Body Length

NOTE:
All dimensions in inches.

Case 1: LD = .020 nom.
BD = .275 max.
BL = .520 max.

Case 2: LD = .032 nom.
BD = .378 max.
BL = 1.03 max.

Case 3: LD = .032 nom.
BD = .641 max.
BL = .655 max.

Case 4: LD = .032 nom.
BD = .641 max.
BL = 1.22 max.

Case 5: LD = .030 nom.
BD = .375 ±.010
BL = .50 ±.030

Case 6: LD = .030 nom.
BD = .375 ±.010
BL = 1.00 ±.030

Case 7: LD = .030 nom.
BD = .50 ±.010
BL = 1.00 ±.030

Case 8: LD = .030 nom.
BD = .250 ±.010
BL = .500 ±.020

Case 9: LD = .030 nom.
BD = .250 ±.010
BL = .750 ±.030

Case 10: LD = .030 nom.
BD = .313 ±.010
BL = 1.125 ± .030

Case 11: LD = .032 nom.
BD = .100 min., .128 max.
BL = .185 min., 205 max.

Case 12: (Do-7) LD = .018 min., .022 max.
BD = .092 min., .104 max.
BL = .300 max.

Case 13: LD = .026 min., .035 max.
BD = .215 min., .265 max.
BL = .315 max.
+ .175 max. shoulder

Case 14: LD = .057 min.,
.067 max. hole one end
(.165 max. width)
BD = 4.40 UNC 2A
Thread other end
BL = .234 min., .265 max.
.285 min., .313 max.

Case 15: LD = .021 max.
BD = .225 max.
BL = .370 max.

Case 16: (Do-13) LD = .026 min., .035 max.
BD = .225 max.
BL = .350 max.
+ .210 max. shoulder

Case 17: (Do-4) LD = .070 nom. dia. hole
one end (.125 nom. width)
10-32 UNF
Thread other end
BD = .430 + .007 − .006
BL = .375 max.

Case 18: LD = .020 + .001 dia.
BD = .230 max.
BL = .370 max.

Case 19: LD = .035 max. dia.
BD = .265 max.
BL = .630 max.
(+ .175 shoulder both ends)

Case 20: LD = .030 ±.001
BD = .080 ±.005
BL = .130 ±.010

Case 21: LD = .040 ±.001
BD = .135 ±.010
BL = .175 ±.010

Case 22: LD = .040 ±.003
BD = .130 min., .145 max.
BL = .330 min., .350 max.

CODI SEMICONDUCTOR

DIVISION OF COMPUTER DIODE CORPORATION

Pollit Drive, Fair Lawn, New Jersey 07410 • (201) 797-3900 • TWX (710) 988-2241

VOLTAGE VARIABLE CAPACITORS

CODI Semiconductor's voltage variable capacitor (VVC) product line is one of the broadest, high-quality lines in the industry. **CODI** offers VVCs with low leakage, ultra-high Q, high reverse voltage, very high capacitance, high capacitance-to-voltage change ratio, and precise, reproducible tracking of capacitance-to-voltage change.

These characteristics make the CODI line of VVCs ideal for tuning, modulation and harmonic generation, especially when matched characteristics are required to assure tracking, or when matched and graded sets are required — as in voltage variable delay lines.

CODI's BiTaxial® and alloyed VVCs are available with capacitance values as high as 1000 pf; others have Q values as high as 800 at 50 MHz and −4 volts. The high degree of uniformity that results from the special CODI process technology makes tight tolerances and matched characteristics readily available.

To verify compliance with design specifications, **CODI** Semiconductor offers computer-analysis data for any VVC parameter, under varied conditions.

HIGH Q VVCs — IN5461A through IN5476A

ELECTRICAL CHARACTERISTICS: (T_A = 25°C unless otherwise noted)

Characteristic - All Types	Test Conditions	Min.	Typ.	Max.	Unit
Reverse Breakdown Voltage (BV_R)	I_R=10 μAdc	30	—	—	Vdc
Reverse Voltage Leakage Current (I_R)	V_R=25 Vdc, T_A=25°C V_R=25 Vdc, T_A=150°C	— —	— —	0.02 20	μA μA
Series Inductance (L_S)	f=250 MHz, lead length ≈ 1/16"	—	4.0	10	nH
Case Capacitance (C_C)	f=1.0 MHz, lead length ≈ 1/16"	0.1	0.17	0.25	pF
Diode Capacitance Temp. Coefficient (TC_C)	V_R=4.0 Vdc, f=1.0 MHz	—	300	400	ppm/°C

†Types	C_T, Diode Capacitance V_R = 4.0 Vdc, f = 1.0 MHz (pF) Nom.	TR, Tuning Ratio C_2/C_{30} f = 1.0 MHz Min.	Max.	Q, Figure of Merit V_R = 4.0 Vdc f = 50 MHz Min.
1N5461A	6.8	2.7	3.1	600
1N5462A	8.2	2.8	3.1	600
1N5463A	10.0	2.8	3.1	550
1N5464A	12.0	2.8	3.1	550
1N5465A	15.0	2.8	3.1	550
1N5466A	18.0	2.9	3.1	500
1N5467A	20.0	2.9	3.1	500
1N5468A	22.0	2.9	3.2	500
1N5469A	27.0	2.9	3.2	500
1N5470A	33.0	2.9	3.2	500
1N5471A	39.0	2.9	3.2	450
1N5472A	47.0	2.9	3.2	400
1N5473A	56.0	2.9	3.3	300
1N5474A	68.0	2.9	3.3	250
1N5475A	82.0	2.9	3.3	225
1N5476A	100.0	2.9	3.3	200

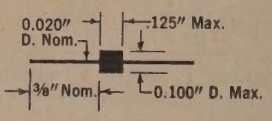
SOME OTHER AVAILABLE POPULAR JEDEC TYPES:

IN950 through IN956
IN3551, IN3552
IN3554 through IN3557
IN4790A through IN4800A
IN5441A through IN5456A

CODI TYPES

HIGH FREQUENCY VVC's FOR 100 MHz to 1000 MHz TUNER AND HARMONIC-GENERATION APPLICATIONS

†Types	*Capacitance @ −4VDC, 1 MHz (pf)	TR, Tuning Ratio C @ 4V/C @ MWV Min.	Q, Figure of Merit @ −4VDC 50 MHz	MWV @ 0.1
VVC 1001	15	3.14	700	5
VVC 1002	15	3.16	500	6
VVC 1003	20	3.14	700	5
VVC 1004	20	3.16	500	6
VVC 1005	27	3.15	600	5
VVC 1006	27	3.17	400	6
VVC 1007	33	3.15	600	5
VVC 1008	33	3.17	400	6



HIGH TUNING RATIO VVCs

HERMETICALLY SEALED GLASS DO-7 PACKAGE.

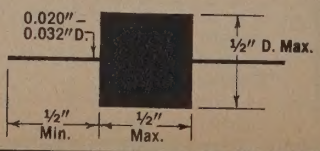
†Types	*Capacitance @ −4VDC, 1 MHz (pf)	TR, Tuning Ratio C @ 4V/C @ MWV Min.	Q, Figure of Merit @ −4VDC 50 MHz	MWV @ 0.1 μ
VVC 1011	22	5.0	10	150
VVC 1012	22	4.4	150	130
VVC 1013	22	5.6	10	200
VVC 1014	27	5.0	10	150
VVC 1015	27	4.4	150	130
VVC 1016	27	5.6	10	200
VVC 1017	33	5.0	7	150
VVC 1018	33	4.4	100	130
VVC 1019	33	5.6	7	200

HIGH CAPACITANCE VVC

†Types	*Capacitance @ 4V, 1 MHz (pf)	n, Exponent Min.	Q, Figure of Merit @ −4VDC 50 MHz	MWV @ 0.1 μa
VVC 1021	330	0.46	50	25
VVC 1022	330	0.46	200	25
VVC 1023	330	0.46	15	100
VVC 1024	330	0.46	200	100
VVC 1025	500	0.46	50	25
VVC 1026	500	0.46	200	25
VVC 1027	500	0.46	15	100
VVC 1028	500	0.46	200	100
VVC 1029	1000	0.46	50	25
VVC 1030	1000	0.46	200	25
VVC 1031	1000	0.46	15	100
VVC 1032	1000	0.46	200	100

* Other capacitance values are available.

† No suffix: 20
"A" suffix: 10
"B" suffix: 5
"C" suffix: 2
"D" suffix: 1



CODI SEMICONDUCTOR

DIVISION OF COMPUTER DIODE CORPORATION

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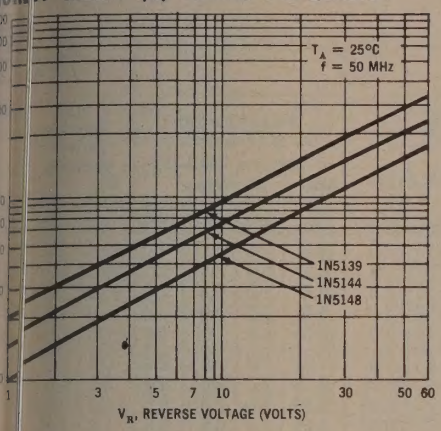
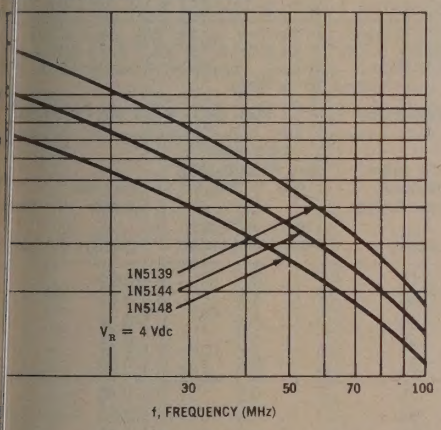
LTAGE VARIABLE CAPACITORS

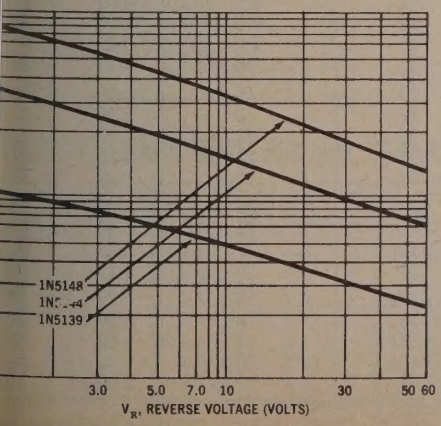
GURE OF MERIT (Q) versus FREQUENCY



GURE OF MERIT (Q) versus REVERSE VOLTAGE



PACITANCE versus VOLTAGE



JEDEC REGISTERED DEVICES

HERMETICALLY SEALED GLASS DO-7 PACKAGE.

LOW LEAKAGE, HIGH VOLTAGE, HIGH Q & PRECISION TRACKING TYPES

Type	C_T, Diode Capac. V_R = 4 Vdc, f = 1 MHz (pF)	Q, Figure of Merit V_R=4 Vdc, f=50 MHz (Min.)	n, Exponent V_R=4 Vdc, f=1 MHz Min.	n, Exponent V_R=4 Vdc, f=1 MHz Typ.	TR, Tuning Ratio C_4/C_{60} f = 1 MHz Min.	TR, Tuning Ratio C_4/C_{60} f = 1 MHz Typ.
IN5139,A	6.8	350	0.41	0.43	2.7	2.9
IN5140,A	10.0	300	0.41	0.43	2.8	3.0
IN5141,A	12.0	300	0.41	0.45	2.8	3.3
IN5142,A	15.0	250	0.41	0.45	2.8	3.3
IN5143,A	18.0	250	0.41	0.47	2.8	3.4
IN5144,A	22.0	200	0.45	0.47	3.2	3.4
IN5145,A	27.0	200	0.45	0.48	3.2	3.4
IN5146,A	33.0	200	0.45	0.48	3.2	3.4
IN5147,A	39.0	200	0.45	0.49	3.2	3.4
IN5148,A	47.0	200	0.45	0.49	3.2	3.4

No suffix is ±10% C_T tolerance. "A" suffix is ±5% C_T tolerance.

ELECTRICAL CHARACTERISTICS: (T_A = 25°C unless otherwise noted)

Characteristic — All Types	Test Conditions	Min.	Typ.	Max.	Unit
Reverse Breakdown Voltage (BV_R)	I_R = 10 μAdc	60	100	—	Vdc
Reverse Voltage Leakage Current (I_R)	V_R = 55 Vdc, T_A = 25°C V_R = 55 Vdc, T_A = 150°C	—	0.0001 0.16	0.02 20	μAdc
Series Inductance (L_S)	f = 250 MHz, L ≈ 1/16"	—	5	—	nH
Case Capacitance (C_C)	f = 1 MHz, L ≈ 1/16"	—	0.25	—	pF
Diode Capacitance (TC_c) Temperature Coefficient	V_R = 4 Vdc, f — 1 MHz	—	200	300	ppm/°C
Figure of Merit (Q)	4 Vdc, 50 MHz	As Specified			

LOW LEAKAGE, HIGH VOLTAGE, LOW Q, & PRECISION TRACKING TYPES

Type	Capacitance @ V_R = 4 Vdc, f = 1 MHz (pF) ±10%	Capacitance Ratio V_R=MWV/V_R=4V Min.	Capacitance Ratio V_R=MWV/V_R=4V Max.	Maximum Working Voltage (MWV) I_R=0.005 Ma (Vdc)	Q, Figure of Merit @ V_R=4Vdc f=50 MHz (Min.)
IN4805A	15.0	0.233	0.247	100	15
IN4806A	18.0	0.242	0.254	90	15
IN4807A	22.0	0.241	0.252	90	15
IN4808A	27.0	0.276	0.287	65	15
IN4809A	33.0	0.285	0.295	60	15
IN4810A	39.0	0.295	0.306	55	15
IN4811A	47.0	0.311	0.320	50	15
IN4812A	56.0	0.345	0.354	40	15
IN4813A	68.0	0.396	0.406	30	15
IN4814A	82.0	0.481	0.491	20	15
IN4815A	100.0	0.480	0.490	20	15

BVR = 110% MWV.

For ±20% tolerance, specify part number without "A" suffix.
For ±5% tolerance, specify part number with "B" suffix.
For ±2% tolerance, specify part number with "C" suffix.
For ±1% tolerance, specify part number with "D" suffix.

CODI SEMICONDUCTOR

DIVISION OF COMPUTER DIODE CORPORATION

Pollit Drive, Fair Lawn, New Jersey 07410 • (201) 797-3900 • TWX (710) 988-2241

600 mW LOW VOLTAGE AVALANCHE ZENER DIODES

CODI Semiconductor's proprietary BiTaxial® process has made possible avalanche diodes with the lowest voltages available today.

The new process yields an end product which is close to the "ideal" diode: sharp breakdown, low zener voltage, low noise density, lower dynamic impedance and low reverse current.

GENERAL PURPOSE, (GLA) • LOW LEAKAGE (LLA) • HIGH TEMPERATURE (HLA)

ELECTRICAL CHARACTERISTICS

CODI Type No. (Note 1)	Zener Voltage (Note 2) Nom. V_z @ I_{zt} (Vdc)	Test Current I_{zt} (mA)	Dynamic Impedance (Note 3) Max. Z_z @ I_{zt} (Ω)	Noise Density @ 250 μA Max. (mV/√Hz) GLA	Noise Density HLA, LLA	Regulation from I_{zt} to I_{zl} Max. GLA △V (Vdc)	GLA I_{zl} (mA)	HLA, LLA △V (Vdc)	HLA, LLA I_{zl} (mA)	Reverse Current @ 25°C Max. GLA Max. I_r (μA)	GLA V_r (Vdc)	HLA, LLA Max. I_r (μA)	HLA, LLA V_r (Vdc)	HLA Reverse Current @ 150°C Max. I_r (μA)	HLA V_r (Vdc)	Temperature Coefficient Max. (%/°C typ.)
GLA28/LLA328/HLA328	2.8	20	50	4	1	1.0	2.0	0.75	2.0	10.0	1.0	5.0	1.0	80.0	1.0	-.065
GLA31/LLA331/HLA331	3.1	20	30	4	1	1.0	2.0	0.75	2.0	5.0	1.0	2.5	1.0	60.0	1.0	-.063
GLA35/LLA335/HLA335	3.5	20	20	4	1	1.0	2.0	0.75	2.0	4.0	1.0	2.0	1.0	40.0	1.0	-.058
GLA39/LLA339/HLA339	3.9	20	15	4	1	1.0	2.0	0.75	2.0	4.0	1.0	2.0	1.0	30.0	1.0	-.050
GLA43/LLA343/HLA343	4.3	20	12	4	1	1.0	2.0	0.75	2.0	4.0	1.5	2.0	1.5	25.0	1.5	-.025
GLA47/LLA347/HLA347	4.7	10	10	4	1	0.75	1.0	0.5	1.0	4.0	2.0	2.0	2.0	10.0	2.0	+.010
GLA51/LLA351/HLA351	5.1	5	10	4	1	0.45	0.25	0.3	0.25	0.10	2.0	2.0	3.0	5.0	2.0	+.025
GLA56/LLA456/HLA356	5.6	1	40	4	1	0.15	0.05	0.1	0.05	0.05	3.0	2.0	4.5	1.0	3.0	+.033
GLA62/LLA362/HLA362	6.2	1	40	4	1	0.15	0.01	0.1	0.01	0.05	4.0	0.5	5.6	1.0	4.0	+.045
GLA68/LLA368/HLA368	6.8	1	50	4	1	0.15	0.01	0.1	0.01	0.05	5.0	0.05	6.2	1.0	5.0	+.050
GLA75/LLA375/HLA375	7.5	1	50	4	1	0.15	0.01	0.1	0.01	0.01	6.0	0.01	6.8	1.0	6.0	+.055
GLA82/LLA382/HLA382	8.2	1	75	4	1	0.15	0.01	0.1	0.01	0.01	6.5	0.01	7.5	1.0	6.5	+.062
GLA91/LLA391/HLA391	9.1	1	75	4	2	0.15	0.01	0.1	0.01	0.01	8.0	0.01	8.2	1.0	8.0	+.066
GLA100/LLA3100/HLA3100	10.0	1	75	4	2	0.15	0.01	0.1	0.01	0.01	9.0	0.01	9.1	1.0	9.0	+.070

Note 1: Case Type — these devices are also available in a micro-axial package. To specify the **micro** package, insert the prefix letter M before the part number, for example, MGLA 28. (See data sheet MGLA 28 to MGLA 100).

Note 2: Tolerance — tolerance is specified by the type number suffix letter. No suffix letter ±10% Suffix letter A ± 5% Suffix letter B ±2%

Note 3: Dynamic Impedance — dynamic impedance is measured at Izt with 10% AC superimposed (60 Hz RMS).

JEDEC TYPES

$T_A = 25°C$ unless otherwise noted. Based on DC measurements at thermal equilibrium $V_F = 1.1$ Max. @ $I_F = 200$ mA for all types

JEDEC Type No.	Nominal Zener Voltage V_Z @ I_{ZT} (Volts)	Test Current I_{ZT} (mAdc)	Max. Zener Impedance B-C-D Suffix Z_{ZT} @ I_{ZT} (Ohms)	Max. Reverse Leakage Current V_R — Volts I_R (μAdc)	Non & A-Suffix	B-C-D Suffix	B-C-D Suffix Maximum DC Zener Current I_{ZM} (mAdc)	B-C-D Suffix Max. Noise Density @ I_Z = 250μA N_D (Micro-volts per square root cycle)	Regulation Factor ΔV_Z (Volts)	Low V_Z Curr I_Z (mA
1N5518	3.3	20	26	5.0	0.90	1.0	115	0.5	0.90	2.0
1N5519	3.6	20	24	3.0	0.90	1.0	105	0.5	0.90	2.0
1N5520	3.9	20	22	1.0	0.90	1.0	98	0.5	0.85	2.0
1N5521	4.3	20	18	3.0	1.0	1.5	88	0.5	0.75	2.0
1N5522	4.7	10	22	2.0	1.5	2.0	81	0.5	0.60	1.0
1N5523	5.1	5.0	26	2.0	2.0	2.5	75	0.5	0.65	0.25
1N5524	5.6	3.0	30	2.0	3.0	3.5	68	1.0	0.30	0.25
1N5525	6.2	1.0	30	1.0	4.5	5.0	61	1.0	0.20	0.01
1N5526	6.8	1.0	30	1.0	5.5	6.2	56	1.0	0.10	0.01
1N5527	7.5	1.0	35	0.5	6.0	6.8	51	2.0	0.05	0.01
1N5528	8.2	1.0	40	0.5	6.5	7.5	46	4.0	0.05	0.01
1N5529	9.1	1.0	45	0.1	7.0	8.2	42	4.0	0.05	0.01
1N5530	10.0	1.0	60	0.05	8.0	9.1	38	4.0	0.10	0.01
1N5531	11.0	1.0	80	0.05	9.0	9.9	35	5.0	0.20	0.01
1N5532	12.0	1.0	90	0.05	9.5	10.8	32	10	0.20	0.01
1N5533	13.0	1.0	90	0.01	10.5	11.7	29	15	0.20	0.01
1N5534	14.0	1.0	100	0.01	11.5	12.6	27	20	0.20	0.01
1N5535	15.0	1.0	100	0.01	12.5	13.5	25	20	0.20	0.01
1N5536	16.0	1.0	100	0.01	13.0	14.4	24	20	0.20	0.01
1N5537	17.0	1.0	100	0.01	14.0	15.3	22	20	0.20	0.01
1N5538	18.0	1.0	100	0.01	15.0	16.2	21	20	0.20	0.01
1N5539	19.0	1.0	100	0.01	16.0	17.1	20	20	0.20	0.01
1N5540	20.0	1.0	100	0.01	17.0	18.0	19	20	0.20	0.01
1N5541	22.0	1.0	100	0.01	18.0	19.8	17	20	0.25	0.01
1N5542	24.0	1.0	100	0.01	20.0	21.6	16	20	0.30	0.01
1N5543	25.0	1.0	100	0.01	21.0	22.4	15	20	0.35	0.01
1N5544	28.0	1.0	100	0.01	23.0	25.2	14	20	0.40	0.01
1N5545	30.0	1.0	100	0.01	24.0	27.0	13	20	0.45	0.01
1N5546	33.0	1.0	100	0.01	28.0	29.7	12	20	0.50	0.01

No suffix = ±20%; "A" suffix = ±10%; "B" suffix = ±5%; "C" suffix = ±2%; "D" suffix = ±1%.

CODI SEMICONDUCTOR

DIVISION OF COMPUTER DIODE CORPORATION

Pollit Drive, Fair Lawn, New Jersey 07410 • (201) 797-3900 • TWX (710) 988-2241

EMPERATURE COMPENSATED ZENER REFERENCE DIODES

ODI Semiconductor's temperature-compensated zener diodes operate under severe environmental conditions. Designed for use as stable DC voltage reference diodes, they meet or exceed all mechanical and environmental requirements for industrial and military applications.

CODI Semiconductor also manufactures a full line of low-voltage, controlled-temperature-coefficient zeners designed to operate at current levels from 0.25 ma to 10.0 ma.

EDEC TYPES

JEDEC No.	TC (%/°C)	Temperature Range (°C)	I_z (mA)	Z_z (Ω)
00 mw - DO-7 PACKAGE (Also available in micro-axial package)				
1N821	.01	−55 to +100	7.5	15
1N821A	.01	−55 to +100	7.5	10
1N822	.01	−55 to +100	7.5	15
1N823	.005	−55 to +100	7.5	15
1N823A	.005	−55 to +100	7.5	10
1N824	.005	−55 to +100	7.5	15
1N825	.002	−55 to +100	7.5	15
1N825A	.002	−55 to +100	7.5	10
1N827	.001	−55 to +100	7.5	15
1N827A	.001	−55 to +100	7.5	10
1N829	.0005	−55 to +100	7.5	15
1N829A	.0005	−55 to +100	7.5	10
6.4 v ±				
1N456	.01	0 to +75	.5	200
1N456A	.01	−55 to +100	.5	200
1N456B	.005	0 to +75	.5	200
1N456C	.005	−55 to +100	.5	200
1N456D	.002	0 to +75	.5	200
1N456E	.002	−55 to +100	.5	200
1N456F	.001	0 to +75	.5	200
1N456G	.001	−55 to +100	.5	200
1N456H	.0005	0 to +75	.5	200
1N456J	.0005	−55 to +100	.5	200
1N45	.01	0 to +75	1	100
1N45 A	.01	−55 to +100	1	100
1N45 B	.005	0 to +75	1	100
1N45 C	.005	−55 to +100	1	100
1N45 D	.002	0 to +75	1	100
1N45 E	.002	−55 to +100	1	100
1N45 F	.001	0 to +75	1	100
1N45 G	.001	−55 to +100	1	100
1N45 H	.0005	0 to +75	1	100
1N45 J	.0005	−55 to +100	1	100
1N45	.01	0 to +75	2	50
1N45 A	.01	−55 to +100	2	50
1N45 B	.005	0 to +75	2	50
1N45 C	.005	−55 to +100	2	50
1N45 D	.002	0 to +75	2	50
1N45 E	.002	−55 to +100	2	50
1N45 F	.001	0 to +75	2	50
1N45 G	.001	−55 to +100	2	50
1N45 H	.0005	0 to +75	2	50
1N45 J	.0005	−55 to +100	2	50
1N4	.01	0 to +75	4	25
1N4 A	.01	−55 to +100	4	25
1N4 B	.005	0 to +75	4	25
1N4 C	.005	−55 to +100	4	25
1N4 D	.002	0 to +75	4	25
1N4 E	.002	−55 to +100	4	25
1N4 F	.001	0 to +75	4	25
1N4 G	.001	−55 to +100	4	25
1N4 H	.0005	0 to +75	4	25
1N4 J	.0005	−55 to +100	4	25

JEDEC No.	V_z (±5%)	TC (%/°C)	Temperature Range (°C)	I_z (mA)	Z_z (Ω)
1.5 WATT: (Figure A)					
1N4057	12.4	.005	−55 to +100	10	25
1N4057A	12.4	.002	−55 to +100	10	25
1N4058	14.6	.005	−55 to +100	10	30
1N4058A	14.6	.002	−55 to +100	10	30
1N4059	16.8	.005	−55 to +100	10	30
1N4059A	16.8	.002	−55 to +100	10	30
1N4060	18.5	.005	−55 to +100	10	30
1N4060A	18.5	.002	−55 to +100	10	30
1N4061	21	.005	−55 to +100	10	35
1N4061A	21	.002	−55 to +100	10	35
1N4062	23	.005	−55 to +100	10	40
1N4062A	23	.002	−55 to +100	10	40
1N4063	27	.005	−55 to +100	10	45
1N4063A	27	.002	−55 to +100	10	45
1N4064	30	.005	−55 to +100	10	50
1N4064A	30	.002	−55 to +100	10	50
1N4065	33	.005	−55 to +100	10	55
1N4065A	33	.002	−55 to +100	10	55
1N4066	37	.005	−55 to +100	7.5	80
1N4066A	37	.002	−55 to +100	7.5	80
1N4067	43	.005	−55 to +100	7.5	90
1N4067A	43	.002	−55 to +100	7.5	90
1N4068	47	.005	−55 to +100	7.5	100
1N4068A	47	.002	−55 to +100	7.5	100

JEDEC No.	V_z (±5%)	TC (%/°C)	Temperature Range (°C)	I_z (mA)	Z_z (Ω)
2.0 WATT: (Figure B)					
1N4069	51	.005	−55 to +100	7.5	110
1N4069A	51	.002	−55 to +100	7.5	110
1N4070	56	.005	−55 to +100	7.5	120
1N4070A	56	.002	−55 to +100	7.5	120
1N4071	62	.005	−55 to +100	7.5	135
1N4071A	62	.002	−55 to +100	7.5	135
1N4072	68	.005	−55 to +100	5	230
1N4072A	68	.002	−55 to +100	5	230
1N4073	75	.005	−55 to +100	5	250
1N4073A	75	.002	−55 to +100	5	250
1N4074	82	.005	−55 to +100	5	270
1N4074A	82	.002	−55 to +100	5	270
1N4075	87	.005	−55 to +100	5	290
1N4075A	87	.002	−55 to +100	5	290
1N4076	91	.005	−55 to +100	5	310
1N4076A	91	.002	−55 to +100	5	310
1N4077	100	.005	−55 to +100	5	340
1N4077A	100	.002	−55 to +100	5	340
1N4078	105	.005	−55 to ±100	2.5	700
1N4078A	105	.002	−55 to +100	2.5	700
1N4079	110	.005	−55 to ±100	2.5	740
1N4079A	110	.002	−55 to +100	2.5	740
1N4080	120	.005	−55 to ±100	2.5	800
1N4080A	120	.002	−55 to +100	2.5	800
2.5 WATT: (Figure C)					
1N4081	130	.005	−55 to +100	2.5	840
1N4081A	130	.002	−55 to ±100	2.5	840
1N4082	140	.005	−55 to +100	2.5	960
1N4082A	140	.002	−55 to ±100	2.5	960
1N4083	150	.005	−55 to +100	2.5	1020
1N4083A	150	.002	−55 to ±100	2.5	1020
1N4084	175	.005	−55 to +100	2.5	1150
1N4084A	175	.002	−55 to ±100	2.5	1150
1N4085	200	.005	−55 to +100	2.5	1350
1N4085A	200	.002	−55 to ±100	2.5	1350

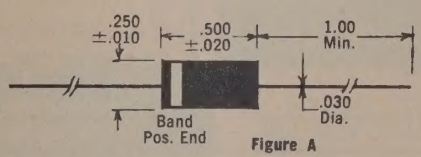


Figure A

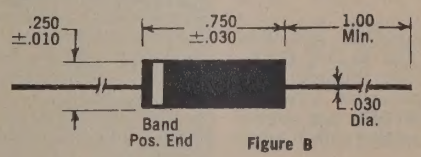


Figure B

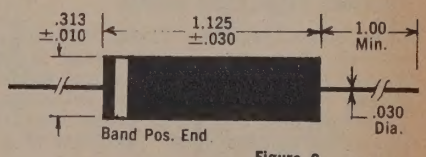


Figure C

VOLTAGE, SHARP KNEE 250 mW ZENERS DO-7 GLASS PACKAGE

Type	V_z @ $I_z = 0.25\ \mu a$	Type	V_z @ $I_z = 0.25\ \mu a$	Type	V_z @ $I_z = 0.25\ \mu a$	Type	V_z @ $I_z = 0.25\ \mu a$	Type	V_z @ $I_z = 0.25\ \mu a$	Type	V_z @ $I_z = 0.25\ \mu a$
614	1.8	1N 4621	3.6	1N 4628	6.8	1N 4678	1.89	1N 4685	3.780	1N 4692	7.140
615	2.0	1N 4622	3.9	1N 4629	7.5	1N 4679	2.10	1N 4686	4.095	1N 4693	7.875
616	2.2	1N 4623	4.3	1N 4630	8.2	1N 4680	2.31	1N 4687	4.515	1N 4694	8.610
617	2.4	1N 4624	4.7	1N 4631	9.1	1N 4681	2.52	1N 4688	4.935	1N 4695	9.135
618	2.7	1N 4625	5.1	1N 4632	10.0	1N 4682	2.835	1N 4689	5.355	1N 4696	9.555
619	3.0	1N 4626	5.6	1N 4633	11.0	1N 4683	3.15	1N 4690	5.880	1N 4697	10.50
620	3.3	1N 4627	6.2	1N 4634	12.0	1N 4684	3.465	1N 4691	6.510	1N 4698	11.55

also supplies the popular 1N746A through 1N759A series.

CODI SEMICONDUCTOR

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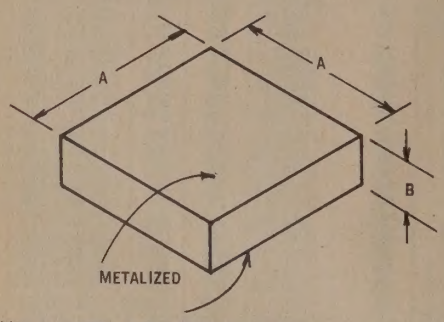
MICROMINIATURE DEVICES

CODI Semiconductor offers many of its devices in packages especially designed for use in microcircuit hybrid assemblies. These include chips, pellets, axial leads and micro strips ("lady bugs"). These package options permit the microcircuit designer to specify high-precision, low-voltage avalanche and temperature-compensated zeners and voltage variable capacitors — devices which have not been available in microminiature packages.

CHIPS

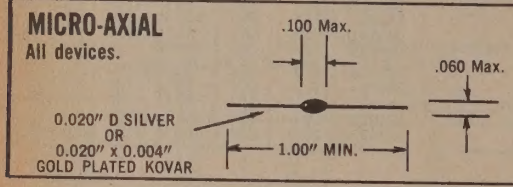
Zeners with V_z up to 7 volts; all CODISTORS.



A = 0.015″ to 0.050″, with 0.005″ increments.
B = 0.012″ for zeners and up to 2-junction CODISTORS.
Add 0.008″ for each additional junction.
Surface Finish: Nickel (white or yellow gold plated) for pasting or soldering; aluminum, gold or silver for lead bonding.

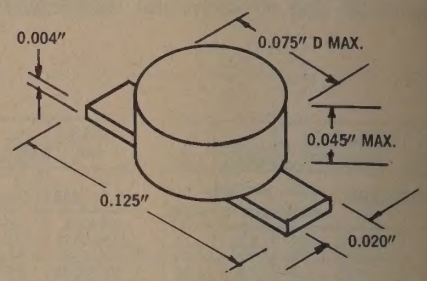
MICRO-AXIAL

All devices.



MICROSTRIPS

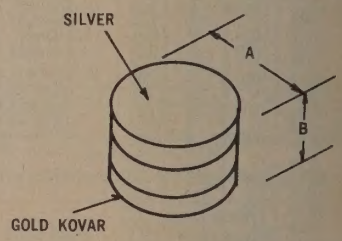
All devices except CODISTORS over 1.5V.



Completely encapsulated and immune to all normal handling haz s. Excellent for hybrid and RF applications, or as substitute for li or channel packages. Suitable for attachment with conductive epoxy, wel g or soldering.

PELLETS

All devices.



A = 0.040″ to 0.060″, with 0.005″ increments.
B = 0.030″ for all devices, including CODISTORS with up to 2 junctio
Add 0.008″ for each additional junction.

CODISTOR®

FORWARD REGULATOR DIODES

CODI forward regulator diodes featuring low voltage and low dynamic impedance. Voltage range is from 0.3 to 3.0 volts, or even higher on request. Typical applications include low-voltage regulators, low-voltage reference, transistor biasing, noise rejection, and meter protection. CODISTORS are available with from one to six junctions in a standard **DO-7** or a **micro-axial** case.

MAXIMUM RATINGS:

POWER DISSIPATION: 250 mW.
POWER DERATING (from 50°C): 2.1 mW/°C.
STORAGE & OPERATING TEMPERATURE: −60°C to 175°C.
SOLDERING TEMPERATURE (10-second immersion): 300°C.

MECHANICAL DATA:

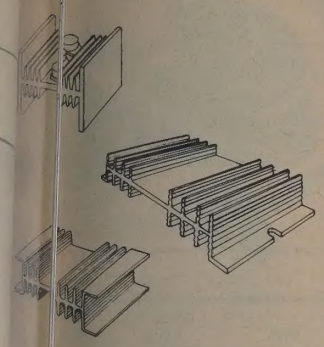
PACKAGE: Standard **DO-7** case; available in other packages as shown above.
FINISH: Leads are gold-plated (weldable and solderable).

ELECTRICAL CHARACTERISTICS (@ 25°C):

Type	Forward Voltage @ .30mA V_{f1} (volts) min.	Forward Voltage @ 3.0mA V_{f2} (volts) min.	max.	Reverse Voltage @ 10μA V_r (volts) min.	Reverse Leakage @ −5V I_r (MA) max.	Stored Charge (2) Q (pq) min.	TC mV/
CODI 6041	.470	NA	.700	NA	NA	NA	−2
CODI 6042	.940	NA	1.40	NA	NA	NA	−4
CODI 6043	1.40	NA	2.10	NA	NA	NA	−6
CODI 6044	1.88	NA	2.80	NA	NA	NA	−8
CODI 6045	.470	.550	.675	10	1.0	NA	−2
CODI 6046	.940	1.10	1.35	10	1.0	NA	−4
CODI 6047	1.40	1.65	2.05	10	1.0	NA	−6
CODI 6048	1.88	2.20	2.70	10	1.0	NA	−8
CODI 6049	.470	NA	.700	10	1.0	100	−2
CODI 6050	.940	NA	1.40	10	1.0	100	−4
CODI 6051	1.40	NA	2.10	10	1.0	100	−6
CODI 6052	1.88	NA	2.80	10	1.0	100	−8

Notes:
(1) All measurements at 25°C unless otherwise specified.
(2) MIL STD 750 Method 4061.
NA Not applicable.

he DI3ERT BLINN COMPANY has for many years designed, fabricated and supplied specialty hardware items r the apidly changing and expanding electronics industry. Our vast experience in plastic and metal fabrica- on g rantees you the best possible service for your particular needs regardless of quantity.



HEAT SINK DISSIPATORS

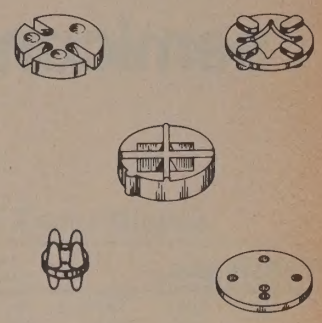
Efficiency, light weight and economy are incorporated in a complete line of professionally engineered heat sinks available in a variety of sizes and shapes. Material: Aluminum 6063-T5 alloy, mill finish. Lengths to 5 ft. available. (Serrations--U.S. Pat. No. 3163207). Can be cut, drilled, anodized or painted to your specifications.

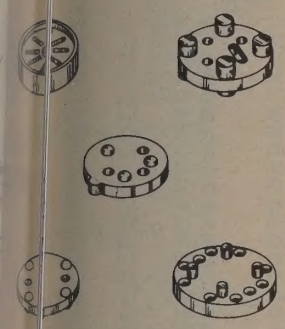
CATALOG SERIES — AHS

NYLON TRANSISTOR PADS

Precision molded from Zytel 101 (MIL-P-20693), these pads provide an economical insulator and thermal barrier with high dielectric strength. Resist continuous exposure to 135° C.

CATALOG SERIES — TPN





DIALLYL PHTHALATE TRANSISTOR PADS

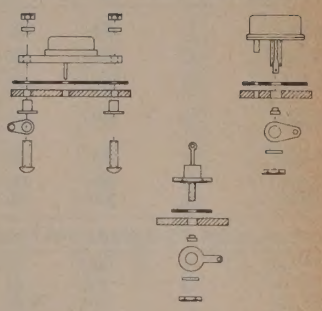
Available with and without stand-offs in configurations for all applications, these pads are molded of glass-filled Diallyl Phthalate (Mil-M-14F SDG) and provide an excellent mounting base. They resist continuous exposure to 400°F. and offer very high dielectric strength.

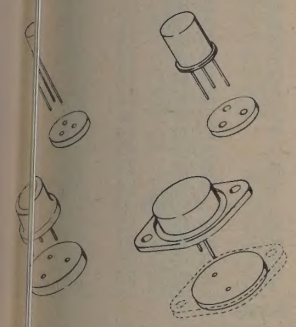
CATALOG SERIES — TPD

MOUNTING KITS

These and other standard kits incorporating mica, beryllium oxide or anodized aluminum insulators provide the parts necessary to mount all semi-conductors. Special materials and configurations can also be furnished to your specifications.

CATALOG SERIES — MK





BERYLLIUM OXIDE TRANSISTOR HEAT SINKS

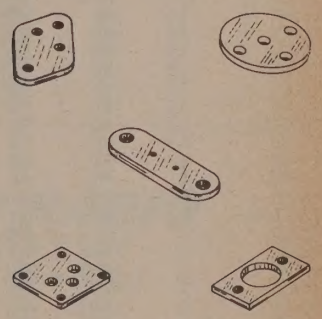
Made of high purity (99+ %) sintered BeO, these sinks provide a satisfactory solution to the design engineer where electronic applications require both dielectric insulation and high heat transfer.

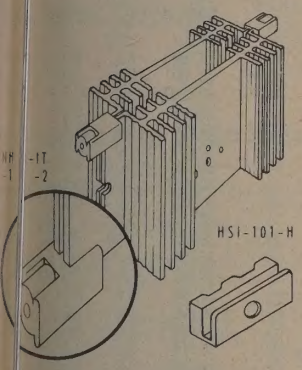
CATALOG SERIES — BOS

MICA INSULATORS

Delbert Blinn mica insulators are precision stamped from quality controlled stock and will withstand temperatures to 1000°F. with negligible dehydration. Standard thickness is .002 ± .001. Other designs, shapes, thicknesses or tolerances are available on special order.

CATALOG SERIES — MI





HEAT SINK MOUNTING INSULATOR

Delbert Blinn mounting insulators are precision molded of Microlon "202" and provide a practical, compact and economical method for mounting and insulating all standard heat sinks.
These insulators are capable of continuous operation to 175° C. and have a dielectric strength of 340 V/MIL.

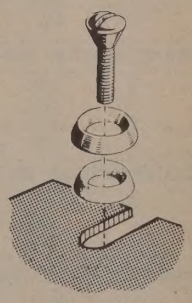
CATALOG SERIES — HSM

NYLON CUP WASHER FILLERS

Employed as insurance against damage, these quality fillers are molded from high strength Polyamide (nylon) and guarantee chip and crack free panel installation.

Available in Nos. 6, 8, 10 and 12 screw sizes.

CATALOG SERIES — NWF



M y other heat sink, trans- ist pad and specialty items ne shown above are avail- al

W e for additional informa- ti

When custom designs or modifications of standard electronic hardware parts are needed, our years of experience in the molding, extruding, stamping and fabrication of metal and plastic parts enables us to supply you with parts unsurpassable in quality.

We can help you successfully meet competition in today's highly competitive market.

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Delbert Blinn

ELECTRONIC SPECIALTIES

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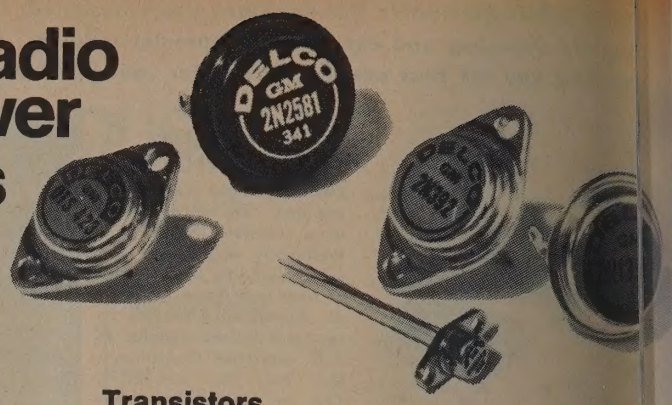
Delco Radio power semiconductors



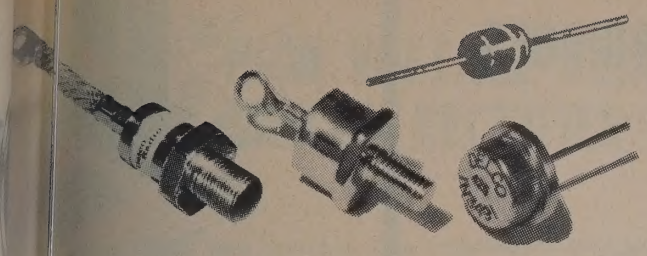
Transistors

Type	Ic	VCBO	VCEO	hFE @ Ic Amps		VCE (sat) @ Ic Volts	@ Amps
NPN SILICON TO-36, HIGH VOLTAGE							
2N2580	10	400	400	10/40	5	0.7	5.0
				4 min	10		
2N2580M†	10	400	400	10/40	5	0.7	5.0
2N2581	10	400	400	25/65	5	1.0	10.0
				10 min	10		
2N2582	10	500	500	10/40	5	0.7	5.0
				4 min	10		
2N2583	10	500	500	25/65	5	1.0	10.0
				10 min	10		
2N3079	10	200	200	10/50	5	0.7	5.0
2N3080	10	300	300	10/50	5	0.7	5.0
NPN SILICON TO-3 HIGH VOLTAGE							
DTS-103	15	80⑥	60	20/55	5.0	1.8	10
DTS-104	15	80⑥	60	50/120	5.0	1.5	10
DTS-105	15	100⑥	80	20/55	5.0	1.8	10
DTS-106	15	110⑥	90	20/55	5.0	1.8	10
DTS-107	15	120⑥	100	20/55	5.0	1.8	10
DTS-108	15	180⑥	100	50/120	5.0	1.5	10
DTS-401	2.0	400	400	20/100	0.5	.8	1.0
DTS-402	3.5	400	400			.8	1.0
DTS-410	3.5	200	200	30/90	1.0	0.8	1.0
DTS-411	3.5	300	300	30/90	1.0	0.8	1.0
DTS-413	2.0	400	400	20/80	0.5	0.8	0.5
DTS-423	3.5	400	400	30/90	1.0	0.8	1.0
DTS-423M†	3.5	400	400	30/90	1.0	0.8	1.0
DTS-424	3.5	500	500	30/90	1.0	.8	1.0
DTS-425	3.5	500	500	30/90	1.0	.8	1.0
DTS-430	5	400	400	15/45	2.5	0.9	2.5
DTS-431	5	400	400	15/35	2.5	0.7	2.5
DTS-431M†	5	400	400	15/35	2.5	0.7	2.5
DTS-701	1	—	800	20/	.15	—	—
DTS-702	3	1200⑥	1000	2.5/	2.0	—	—
DTS-704	3	1400⑥	1000	2.5/	2.0	—	—
DTS-801	2	1000	800	20/	0.2	—	—
DTS-802	5	1200⑥	1000	2.2/	3.5	—	—
DTS-804	5	1400⑥	1000	2.2/	3.5	—	—
2N3902	3.5	400	400	30/90	1.0	.8	1.0
JAN 2N3902	3.5	700⑥	400	30/90	1.0	.8	1.0
2N5157	3.5	700⑥	500	30/90	1.0	.8	1.0
2N5241	5	400	400	15/35	2.5	0.7	2.5
PNP GERMANIUM TO-37 NU-BASE							
2N3212	5	100⑥	80	30/90	3.0	0.5	5.0
2N3213	5	80⑥	60	30/90	3.0	0.5	5.0
2N3214	5	60⑥	40	30/90	3.0	0.5	5.0
2N3215	5	40⑥	30	25/100	3.0	0.5	5.0
PNP GERMANIUM TO-41 NU-BASE							
2N1073	10	40③	40③	20/60	5.0	0.6	5.0
2N1073A	10	80③	80③	20/60	5.0	0.6	5.0
2N1073B	10	120③	120③	20/60	5.0	0.6	5.0
PNP GERMANIUM TO-3 NU-BASE							
2N5155	25	140⑥	120⑦	25/100	8.0	0.9	25.0
DTG-110A	25	110⑥	70	50/300	1.0	0.5	5.0
DTG-110B	25	90⑥	40⑦	65/300	1.0	0.5	5.0
DTG-600	25	90⑥	50⑦	50/115⑥	5.0	0.75	25
DTG-601	25	90⑥	60⑦	50/115⑥	5.0	0.75	25
DTG-602	25	100⑥	70⑦	50/115⑥	5.0	0.75	25
DTG-603	25	90⑥	80⑦	50/	5.0	0.75	25.0
DTG-603M†	25	90⑥	80⑦	50/	5.0	0.75	25.0
DTG-1200	15		120⑦	27.5	8.0	0.5	12
DTG-1010	15	325⑥	110⑦	100⑥	8.0	0.5	12
DTG-1110	15	200⑥	80⑦			0.5	10
DTG-2000	25	60⑥	30⑦	25/	8.0	0.9	25
DTG-2100	25	80⑥	60⑦	25/	8.0	0.9	25
DTG-2200	25	100⑥	80⑦	25/	8.0	0.9	25
DTG-2300	25	120⑥	100⑦	25/	8.0	0.9	25
DTG-2400	25	140⑥	120⑦	25/	8.0	0.9	25
DTG-2400M†	25	140⑥	120	25/125	10.0	0.9	25

Transistors

Type	Ic	VCBO	VCEO	hFE @ Ic Amps		VCE (s Volts	@ Ic Amps
PNP GERMANIUM TO-36 ALLOY BASE							
2N173	15	60	45	35/70	5.0	1.0	12.0
2N174	15	80	55	25/50	5.0	0.9	12.0
JAN 2N174A	15	80	40	40/80	1.2	0.7	12.0
2N277	15	40	25	35/70	5.0	0.3③	12.0
2N278	15	50	30	35/70	5.0	1.0	12.0
2N441	15	40	25	20/40	5.0	0.3③	12.0
2N442	15	50	30	20/40	5.0	0.3③	12.0
2N443	15	60	45	20/40	5.0	1.0	12.0
2N1099	15	80	55	35/70	5.0	0.7	12.0
2N1100	15	100	65	25/50	5.0	0.7	12.0
2N1358	15	80	40	40/80	1.2	0.7	12.0
2N1358A	15	100	60	25/50	5.0	0.7	12.0
JAN 2N1358	15	80	40	25/50	5.0	0.7	12.0
2N1412	15	100	65	25/50	5.0	0.7	12.0
JAN 2N1412A	15	100	70	25/50	5.0	0.6	12.0
2N1518	25	50	40	15/60	15	0.7	25
2N1519	25	80	60	15/60	15	0.7	25
2N1520	35	50	40	17/68	15	0.6	35
2N1521	35	80	60	17/68	15	0.6	35
2N1522	50	50	40	25/100	15	0.5	50
2N1523	50	80	60	25/100	15	0.5	50
2N1970	15	100	50	17/40	5.0	1.0	12.0
2N2075	15	80	65	20/40	5.0	0.7	12.0
2N2076	15	70	55	20/40	5.0	0.7	12.0
2N2077	15	50	45	20/40	5.0	0.9	12.0
2N2078	15	40	25	20/40	5.0	0.9	12.0
2N2079	15	80	65	35/70	5.0	0.7	12.0
2N2080	15	70	55	35/70	5.0	0.7	12.0
2N2081	15	50	45	35/70	5.0	0.9	12.0
2N2082	15	40	25	35/70	5.0	0.9	12.0
JAN 2N2210				use JAN 2N1412A			
2N2490	15	70	50	20/40	5.0	0.7	12.0
2N2491	15	60	40	35/70	5.0	0.7	12.0
2N2492	15	80	65	25/50	5.0	0.5	12.0
2N2493	15	100	75	25/50	5.0	0.5	12.0
PNP GERMANIUM TO-3 ALLOY BASE							
2N255A	5	15	15③	25⑤	.450		
2N301	3	40	32	62.5	.700		
2N301A	3	60	32	62.5	.700		
2N379	7	80⑨	40	20/90	2.0	1.0	12.0
2N380	7	60⑨	30	20/90	2.0	1.0	12.0
2N392	5	60	45	60/150	3.0	0.5	3.0
2N456A	7	40	20	30/90	5.0	0.5	5.0
2N456B	7	40	30	30/90	5.0	0.5	5.0
2N457A	7	60	30	30/90	5.0	0.5	5.0
2N457B	7	60	40	30/90	5.0	0.5	5.0
2N458A	7	80	40	30/90	5.0	0.5	5.0
2N458B	7	80	45	30/90	5.0	0.5	5.0
2N554	5	15	30	30	1.0		
2N669	3	30⑥	30①	250④	.500	0.4⑥	1.0
2N1011	5	80	40	30/75	3.0	1.5	1.0
2N1021	7	100	50	30/90	5.0	0.5	5.0
2N1021A	7	100	50	30/90	5.0	0.5	5.0
2N1022	7	120	50	30/90	5.0	0.5	5.0
2N1022A	7	120	55	30/90	5.0	0.5	5.0
2N1159	5	80	60	30/75	3.0	1.0	1.0
2N1160	7	80	60	20/50	5.0	1.0	1.0
2N1168	5	50	30	60⑥	3.0	.25③	1.0
2N1534	5	40	20	35/70	3.0	1.2	1.0
2N1535	5	60	30	35/70	3.0	1.2	1.0
2N1536	5	80	40	35/75	3.0	1.2	1.0
2N1539	5	25	20	50/100	3.0	0.3	1.0
2N1540	5	40	30	50/100	3.0	0.3	1.0
2N1541	5	55	40	50/100	3.0	0.3	1.0
2N1542	5	65	50	50/100	3.0	0.3	1.0
2N1543	5	80	60	50/100	3.0	0.3	1.0
2N1544	5	25	20	75/150	3.0	0.2	1.0
2N1545	5	40	30	75/150	3.0	0.2	1.0
2N1546	5	55	40	75/150	3.0	0.2	1.0
2N1547	5	65	50	75/150	3.0	0.2	1.0
2N5156	10	100	60⑦	25/60	5.0	1.0	1.0
DTG-110	7	40	40③	74/250	1.0	5.0	1.0

① VCES ③ VCER ⑤ Power gain db ④ Max. ⑥ Typical ⑦ VCEX ⑦ VCE Sus ⑧ @ 90° C-REB = 100 ohm ⑨ VCBX †Military Type Spec.



ilicon Rectifiers

PE	XIMUM RWARD RRENT	PEAK REVERSE VOLTAGE	PEAK TRANSIENT REVERSE VOLTAGE	REVERSE CURRENT	FORWARD VOLTAGE DROP	REPETITIVE PEAK FORWARD CURRENT
5 AMPERE-AXIAL LEAD						
S102	1.5A	200V	—	10 μA	0.9V	10A
S104	1.5A	400V	—	10 μA	0.9V	10A
S106	1.5A	600V	—	10 μA	0.9V	10A
S108	1.5A	800V	—	10 μA	0.9V	10A
S110	1.5A	1000V	—	10 μA	0.9V	10A
S112	1.5A	1200V	—	10 μA	0.9V	10A
5 AMPERE STUD MOUNT						
N3208	15A	50V	—	10 mA	1.5V	70A
N3209	15A	100V	—	10 mA	1.5V	70A
N3210	15A	200V	—	10 mA	1.5V	70A
8 AMPERE PRESS FIT						
N3491	25A	50V	—	10 mA	0.7V	110A
N3492	25A	100V	—	10 mA	0.7V	110A
N3493	25A	200V	—	8 mA	0.7V	110A
60 AMPERE STUD BASE						
DRS163	160A	300V	400V	15 mA	1.45V	2500A ⑳
DRS164	160A	400V	525V	15 mA	1.45V	2500A ⑳
DRS165	160A	500V	650V	15 mA	1.45V	2500A ⑳
DRS166	160A	600V	800V	12 mA	1.45V	2500A ⑳
DRS167	160A	700V	925V	12 mA	1.45V	2500A ⑳
DRS168	160A	800V	1050V	10 mA	1.45V	2500A ⑳
DRS169	160A	900V	1200V	10 mA	1.45V	2500A ⑳
200 AMPERE STUD BASE						
DRS203	200A	300V	400V	15 mA	1.4V	3500A ⑳
DRS204	200A	400V	525V	15 mA	1.4V	3500A ⑳
DRS205	200A	500V	650V	15 mA	1.4V	3500A ⑳
DRS206	200A	600V	800V	12 mA	1.4V	3500A ⑳
DRS207	200A	700V	925V	12 mA	1.4V	3500A ⑳
DRS208	200A	800V	1050V	10 mA	1.4V	3500A ⑳
DRS209	200A	900V	1200V	10 mA	1.4V	3500A ⑳

Silicon Rectifiers and Zener Diodes

TYPE	MAXIMUM FORWARD CURRENT	PEAK REVERSE VOLTAGE	PEAK TRANSIENT REVERSE VOLTAGE	REVERSE CURRENT	FORWARD VOLTAGE DROP	REPETITIVE PEAK FORWARD CURRENT
250 AMPERE STUD BASE						
DRS243	250A	300V	400V	15 mA	1.4V	4500A ⑳
DRS244	250A	400V	525V	15 mA	1.4V	4500A ⑳
DRS245	250A	500V	650V	15 mA	1.4V	4500A ⑳
DRS246	250A	600V	800V	12 mA	1.4V	4500A ⑳
DRS247	250A	700V	925V	12 mA	1.4V	4500A ⑳
DRS248	250A	800V	1050V	10 mA	1.4V	4500A ⑳
DRS249	250A	900V	1200V	10 mA	1.4V	4500A ⑳
DRS250	250A	800V	1050V	10 mA	1.55V	4500A ⑳
DRS251	250A	1000V	1300V	10 mA	1.55V	4500A ⑳
DRS252	250A	1200V	1600V	10 mA	1.55V	4500A ⑳
DRS253	250A	1400V	2000V	10 mA	1.55V	4500A ⑳
DRS254	250A	1600V	2400V	10 mA	1.55V	4500A ⑳

TYPE	MIN. ZENER VOLTAGE Vz @ 0.25 Adc	MAX. ZENER VOLTAGE PULSE WIDTH = 1ms	MAXIMUM CLAMPING FACTOR	MAXIMUM REVERSE CURRENT I_R(mA)
30 KW POWER ZENERS—DO-9 CASE				
DPZ30-30R	30	43 Vdc @ 700 A	1.4	5.0
DPZ30-33R	33	47 Vdc @ 640 A	1.4	5.0
DPZ30-36R	36	52 Vdc @ 580 A	1.4	5.0
DPZ30-39R	39	56 Vdc @ 535 A	1.4	5.0
DPZ30-43R	43	62 Vdc @ 485 A	1.4	5.0
DPZ30-45R	45	65 Vdc @ 460 A	1.4	5.0
DPZ30-47R	47	68 Vdc @ 440 A	1.4	5.0
DPZ30-50R	50	72 Vdc @ 420 A	1.4	5.0

⑳ ½ Cycle non-repetitive

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MO., NO. KANSAS CITY, ECI Semiconductors, Inc. (816)-221-2400
MO., ST. LOUIS, Electronic Components for Industry Co. (314)-647-5505
N.J., CLIFTON, Eastern Radio Corp. (201)-471-6600
N.M., ALBUQUERQUE, Hyer/Cramer Electronics, Inc. (505)-265-5767
Sterling Electronics, Inc. (505)-247-2486
N.Y., BINGHAMTON, Federal Electronics, Inc. (607)-748-8211
N.Y., NEW YORK, Harvey Radio Co., Inc. (212)-582-2590
N.Y., WOODBURY, L.I., Harvey Radio Company, Inc. (516)-921-8700
OHIO, CINCINNATI, United Radio, Inc. (513)-761-4030
OHIO, CLEVELAND, The W. M. Pattison Supply Co., Industrial Electronics Division, (216)-441-3000
OHIO, DAYTON, F-J-R/Ohio, Inc. (513)-278-9411
OKLA., OKLAHOMA CITY, Radio, Inc. (405)-235-1551
OKLA., TULSA, Radio Inc. (918)-587-9123
PENN., PHILADELPHIA, Almo Electronics, Division of Sterling Electronics (215)-676-6000
PENN., PITTSBURGH, RPC Electronics (412)-782-3770
S.C., COLUMBIA, Dixie Radio Supply Co., Inc. (803)-253-5333
TEXAS, DALLAS, Adleta Electronics Company (214)-742-8257
TEXAS, FORT WORTH, Adleta Electronics Co. (817)-336-7446
TEXAS, HOUSTON, Harrison Equipment Co., Inc. (713)-224-9131
UTAH, SALT LAKE CITY, Hyer/Cramer Electronics, Inc. (801)-487-3681
VA., RICHMOND, Meridian Electronics, Inc., a Sterling Electronics Company (703)-353-6648
WASH., SEATTLE, Kierulff Electronics, Inc. (206)-763-1550
WASH., TACOMA, C & G Electronics Co. (206)-272-3181
CANADA, ONT., SCARBOROUGH, Lake Engineering Ltd. (416)-751-5980

SINGLE PHASE BRIDGES

½ Amp to 25 Amp... 50 to 2000 PIV

EDI offers the most complete line of packaged bridges ranging from the encapsulated printed circuit type with current ratings to 2 amperes to the metal case, beam lead power bridges with ratings up to 25 amperes.

The printed circuit types are designed to provide the most compact packaging and are transfer molded epoxy eliminating voids, providing corona protection and the maximum electrical, mechanical, and thermal reliability.

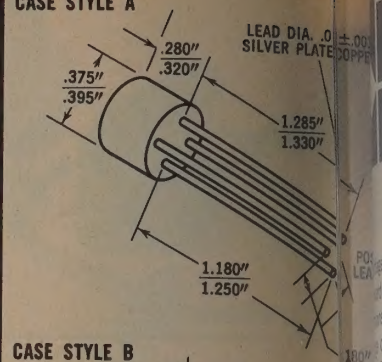
The metal case MINIBRIDGE series has been designed to replace larger bridges and eliminate 4 stud rectifiers in power supplies, converters, inverters, motor control circuits and DC motor starters. Their unique beam lead construction, used instead of discrete rectifiers, allows better heat transfer from junction to case and lower junction operating temperatures. Universal three way terminals (snap on, wrap around or solder) make connections simple and the insulated metal case provides maximum thermal conductivity.

Diffused silicon junctions displaying avalanche characteristics are used and these bridges display high surge capability and low leakage.

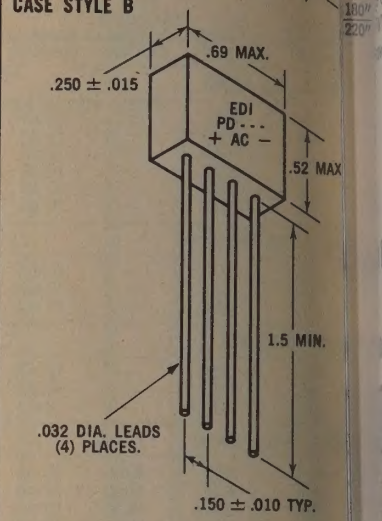
Type Number	Avg. Rect. Current	Peak Voltage Inverse	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop Per Leg	DC Reverse Per Leg	Case Style
PDH100	.50A	1000V	3.0A	30A	2.0V	5μA	B
PDH150	.50A	1500V	3.0A	30A	2.0V	5μA	B
PDH200	.50A	2000A	3.0A	30A	2.0V	5μA	B
PF05	1.5A	50V	4.5A	50A	1.0V	5μA	A
PF10	1.5A	100V	4.5A	50A	1.0V	5μA	A
PF20	1.5A	200V	4.5A	50A	1.0V	5μA	A
PF40	1.5A	400V	4.5A	50A	1.0V	5μA	A
PF60	1.5A	600V	4.5A	50A	1.0V	5μA	A
PD05	2.0A	50V	6.0A	50A	1.0V	5μA	B
PD10	2.0A	100V	6.0A	50A	1.0V	5μA	B
PD20	2.0A	200V	6.0A	50A	1.0V	5μA	B
PD40	2.0A	400V	6.0A	50A	1.0V	5μA	B
PD60	2.0A	600V	6.0A	50A	1.0V	5μA	B
PD80	2.0A	800V	6.0A	50A	1.0V	5μA	B
PD100	2.0A	1000V	6.0A	50A	1.0V	5μA	B
PA05	8.0A	50V	20A	100A	1.0V	10μA	C
PA10	8.0A	100V	20A	100A	1.0V	10μA	C
PA20	8.0A	200V	20A	100A	1.0V	10μA	C
PA40	8.0A	400V	20A	100A	1.0V	10μA	C
PA60	8.0A	600V	20A	100A	1.0V	10μA	C
PA80	8.0A	800V	20A	100A	1.0V	10μA	C
PA100	8.0A	1000V	20A	100A	1.0V	10μA	C
PB05*	25A	50V	75A	300A	1.0V	10μA	C
PB10*	25A	100V	75A	300A	1.0V	10μA	C
PB20*	25A	200V	75A	300A	1.0V	10μA	C
PB40*	25A	400V	75A	300A	1.0V	10μA	C
PB60*	25A	600V	75A	300A	1.0V	10μA	C
PB80	25A	800V	75A	300A	1.0V	10μA	C
PB100	25A	1000V	75A	300A	1.0V	10μA	C

NOTES:
1 — PA & PB Series available in larger case for underwriter applications. Specify Suffix U when ordering; i.e. PAU10, PBU 40 etc. See Case Style "D" for mechanical details.
2 — PA & PB Series available in other configurations; i.e. Center Tap, Doubler & Three Phase.
3 — *Fast recovery available. Contact factory for further information.

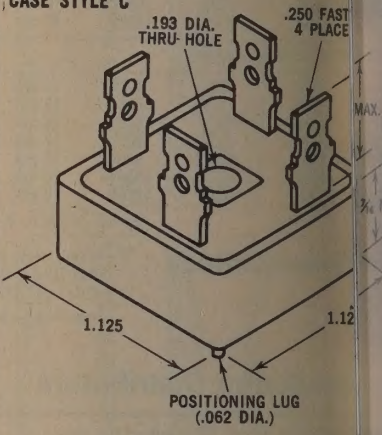
CASE STYLE A

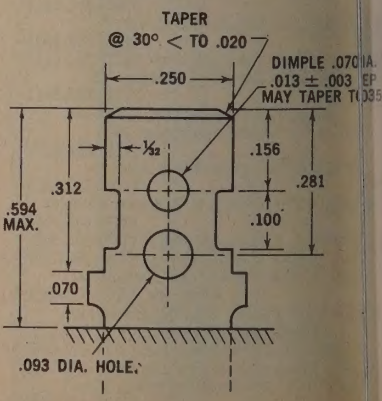


CASE STYLE B



CASE STYLE C





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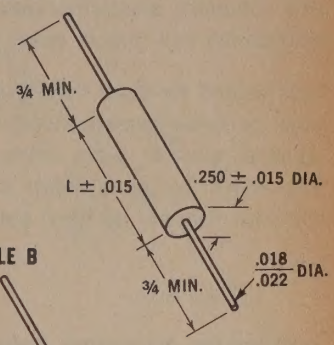
HIGH VOLTAGE AXIAL LEAD SILICON RECTIFIER CARTRIDGES

pi's h voltage, axial lead cartridges offer peak inverse voltages to 50,000 olts a forward current ratings to 500 mA (1 Amp in oil). Constructed with ffused unctions displaying avalanche characteristics, these assemblies dis- ay hig surge capability and low leakage. Applications include CRT display, scillis e, TWT power supplies, electrostatic applications and low power adar. F t recovery versions are available for high frequency and pulse inputs.

CASE STYLES

CASE STYLE A



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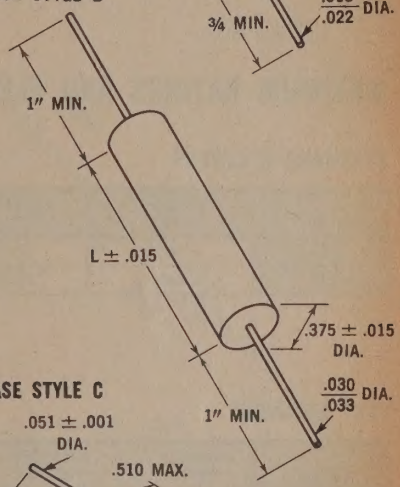
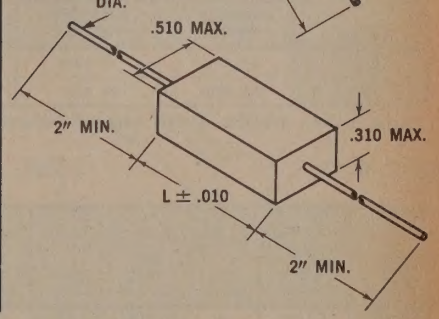


CASE STYLE C



AXIUM RATINGS AND ELECTRICAL CHARACTERISTICS

TANDD RECOVERY

Ser	Avg. Rect. Current	Recurrent Peak Forward	One Cycle Surge	DC Reverse	Case Style
LF	10mA	30mA	.75A	2μA	A
LC	10mA	30mA	.75A	2μA	B
B	100mA	3.0A	10A	2μA	B
R	500mA	2.0A	50A	0.1μA	C

AST COVERY

Se	Avg. Rect. Current	Recurrent Peak Forward	One Cycle Surge	DC Reverse	Reverse Recovery*	Case Style
F	20mA	60mA	1.0A	2μA	300nSec	A
F	20mA	60mA	1.0A	2μA	300nSec	B
F	100mA	3.0A	10A	2μA	200nSec	B

aster covery available. Contact factory for information.

Pea Inve Volta	LFD-LCD RFD-RCD SERIES					BCD — RTD SERIES					Peak Inverse Voltage	KVF SERIES		
	Type Number	Fwd. Drop	Type Number	Fwd. Drop	Dimension "L"	Type Number	Fwd. Drop	Type Number	Fwd. Drop	Dimension "L"		Type Number	Fwd. Drop	Dimension "L"
8,0	LFD8	14V	RFD8	20V	1.000	BCD08	13V	RTD08	20V	1.000	5,000	KVF5	7V	1.000
0,0	LFD10	14V	RFD10	20V	1.000	BCD10	13V	RTD10	20V	1.000	7,500	KVF7.5	10V	1.625
2,0	LCD12	20V	RCD12	24V	1.625	BCD12	20V	RTD12	24V	1.625	10,000	KVF10	14V	2.000
5,0	LCD15	20V	RCD15	30V	1.625	BCD15	20V	RTD15	30V	1.625	12,500	KVF12.5	17V	2.000
0,0	LCD20	24V	RCD20	36V	2.125	BCD20	26V	RTD20	40V	2.125	15,000	KVF15	20V	2.500
5,0	LCD25	30V	RCD25	50V	2.625	BCD25	33V	RTD25	50V	2.625	20,000	KVF20	27V	3.200
0,0	LCD30	36V	RCD30	60V	3.125	BCD30	40V	RTD30	60V	3.125	25,000	KVF25	33V	3.500
5,0	LCD35	42V	RCD35	70V	4.125	BCD35	46V	RTD35	70V	3.625				
0,0	LCD40	48V	RCD40	80V	4.125	BCD40	53V	RTD40	80V	4.125				
5,0	LCD45	54V	RCD45	90V	4.125	BCD45	60V	RTD45	90V	4.625				
0,0	LCD50	60V	RCD50	100V	5.125	BCD50	66V	RTD50	100V	5.125				

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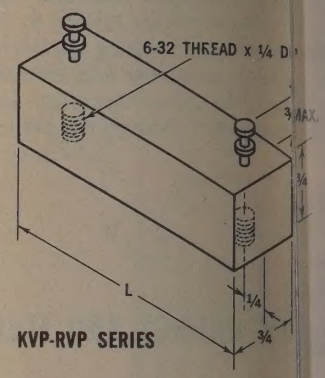
HIGH VOLTAGE SILICON RECTIFIER PACKS

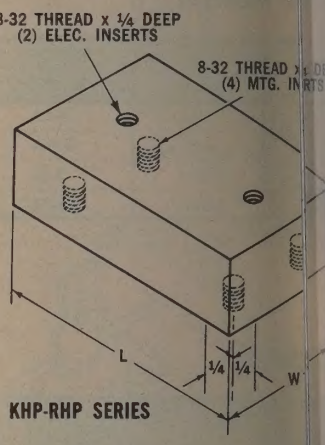
EDI's high voltage rectifier packs, offer peak inverse voltages to 50,000 volts and forward current ratings to 3 amperes. These assemblies are constructed with junctions displaying avalanche characteristics to provide proper voltage distribution and inverse power dissipation.

Applications for these field tested, performance proven units include radar and other pulse equipment, induction heating and forming equipment, laser power supplies, electron beam welders. Fast recovery versions are available for use with higher frequency inputs to reduce size of power sources and for circuits with fast rise and fall time pulses.

CASE STYLES



KVP-RVP SERIES



KHP-RHP SERIES

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

STANDARD RECOVERY

Series	Nominal Current	Recurrent Peak Fwd.	One Cycle Surge	DC Reverse
KVP	1 Amp	10 Amp	50 Amp	5 μAmp
KHP	3 Amp	30 Amp	300 Amp	5 μAmp

FAST RECOVERY

Series	Nominal Current	Recurrent Peak Fwd.	One Cycle Surge	DC Reverse	Reverse Recovery*
RVP	.80 Amp	8 Amp	25 Amp	5 μAmp	300 nSec
RHP	2.5 Amp	25 Amp	150 Amp	5 μAmp	300 nSec

*Faster recovery available. Contact factory for information.

Peak Inverse Voltage	KVP SERIES		RVP SERIES		KHP SERIES		RHP SERIES		DIMENSIONS		
	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	KVP-RVP Dim. "L"	KHP-RHP Dim. "L"	KHP-RHP Dim. "W"
5,000	1.10A	8V	0.80A	10V	3.00A	8V	2.50A	10V	2.5	4.0	1.0
6,000	1.00A	9V	0.80A	11V	2.75A	9V	2.50A	11V	2.5	4.75	1.0
7,000	1.00A	10V	0.80A	12V	2.75A	10V	2.50A	12V	3.0	5.50	1.0
8,000	1.00A	11V	0.80A	13V	2.75A	11V	2.50A	13V	3.0	6.0	1.0
9,000	1.00A	14V	0.80A	16V	2.50A	14V	2.50A	16V	3.0	6.5	1.0
10,000	1.00A	15V	0.80A	17V	2.50A	15V	2.50A	17V	3.5	7.0	1.0
15,000	0.90A	21V	0.80A	25V	2.50A	21V	2.25A	25V	5.0	4.0	2.0
20,000	0.75A	28V	0.60A	33V	2.25A	28V	2.25A	33V	5.5	6.0	2.0
25,000	0.75A	36V	0.60A	42V	2.25A	36V	2.25A	42V	6.0	8.0	2.0
30,000	0.75A	42V	0.60A	50V	2.25A	42V	2.25A	50V	6.0	4.0	3.0
35,000	0.75A	49V	0.60A	58V	2.25A	49V	2.25A	58V	6.5	6.0	3.0
40,000	0.75A	55V	0.60A	65V	2.25A	55V	2.25A	65V	6.5	8.0	3.0
45,000	0.75A	63V	0.60A	75V	2.25A	63V	2.25A	75V	7.0	4.0	4.0
50,000	0.75A	70V	0.60A	82V	2.25A	70V	2.25A	82V	7.0	6.0	4.0

ORDERING INFORMATIO

Use series number a a PIV expressed in kilov s.

EXAMPLE: To order a 8 KVR 1 Amp Block, ec "KVP 8." To order a 25 KV, Amp Block, specify "KH 25

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MINIATURE MOLDED EPOXY, AXIAL LEAD SILICON RECTIFIERS

offer the most complete range of miniature silicon rectifiers ranging from 50-1 0 volt general purpose devices to miniature high voltage devices h 600 volt inverse ratings. Both standard and fast recovery versions are ilable. The current range is from 150 mA to 3 amp dc. Primary features are insu ed body, diffused junctions, avalanche characteristics, high surge pabilit s and low leakage.

AXIM M RATINGS AND ELECTRICAL CHARACTERISTICS

ANDA RECOVERY

Series	Avg. Rect. Current	Peak Inverse Voltages	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop	D.C. Reverse	Case Style
EK	.150A	4,500-6,000	3.0A	15A	6.0V	2μA	B
EH	.250A	3,000-4,000	5.0A	25A	4.0V	2μA	B
BH	.250A	2,000-5,000	2.0A	20A	4.0V	10μA	B
EG	.350A	2,000-3,000	6.0A	30A	3.0V	2μA	B
EF	.500A	1,000-2,000	8.0A	35A	2.0V	2μA	B
1001	1.0A	50-1,000	10A	30A	1.1V	10μA	A
1001	1.0A	50-1,000	10A	50A	1.1V	2μA	A
HAB	3.0A	50-600	25A	300A	1.1V	5μA	C
HB	3.0A	800-1,200	25A	300A	1.2V	5μA	D

ava le as 1N4139 — 1N4146 Series.

ST RCOVERY

Series	Avg. Rect. Current	Peak Inverse Voltages	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop	DC Reverse	Reverse Recovery*	Case Style
K-A	.150A	3,000-6,000	3.0A	10A	7.8V	2μA	200nSec	B
K-B	.150A	3,000-6,000	3.0A	10A	7.8V	2μA	250nSec	B
F-A	.500A	1,600-2,000	8.0A	25A	2.6V	2μA	200nSec	B
F-B	.500A	1,600-2,000	8.0A	25A	2.6V	2μA	250nSec	B
F-F	.750A	50-1,000	6.0A	25A	1.3V	5μA	250nSec	A
	1.0A	50-600	10A	30A	1.3V	2μA	150nSec	B
	1.0A	800-1,000	10A	30A	1.3V	2μA	250nSec	B
B	3.0A	50-600	30A	300A	1.3V	15μA	150nSec	C
B	3.0A	800-1,000	30A	300A	1.3V	15μA	250nSec	D

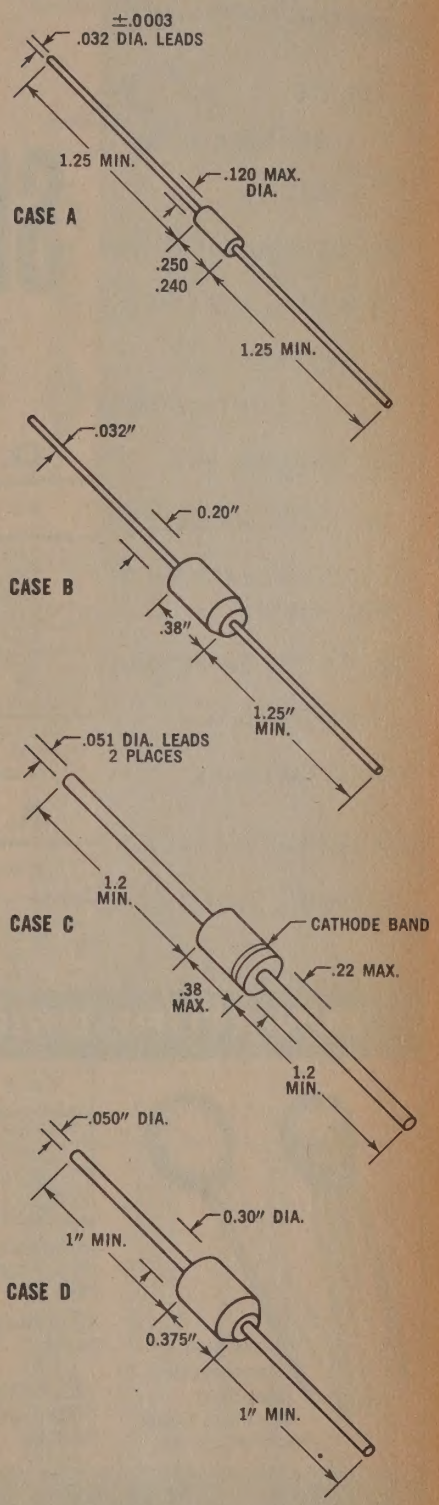
er covery available. Contact factory for information.

E IG INFORMATION

ception of "1N" numbers use series number and insert PIV code which ess the last zero.

E: To order a 50 PIV 1 amp rectifier, specify CB5, for 400 volt CB40. 000 V, 150 mA, 200 nsec rectifier, specify RK600A.

CASE STYLES



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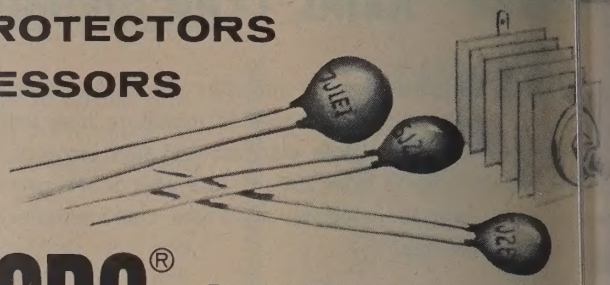
- TELEPHONE SWITCHING
- COMPUTERS
- MICROSWITCHES
- BUSINESS MACHINES
- STEPPING SWITCHES

CONTACT PROTECTORS
ARC SUPPRESSORS



SELISTORS®

...Eastern Delta selenium SELISTORS® for arc suppression and contact protection as well as transient voltage elimination have been in use, literally by the millions for over ten years.

These SELISTORS® and miniature rectifiers are practically monolithic devices due to the total epoxy encapsulation method employed. Their high resistance to humidity, salt spray, shock, vibration and fungus yield an extremely high reliability device.

D. C. TRANSIENT SUPPRESSORS

E.D. #	NOMINAL MIN.	NOMINAL MAX.	MAX. DC COIL CURRENT—MA	E.D. #	NOMINAL MIN.	NOMINAL MAX.	MAX. DC COIL CURRENT—MA
5J1E0	0	25	500*	7J1E0	0	25	100
5J1E1	0	25	350**	7J1E1	0	25	70*
5J2E0	26	50	500*	7J2E0	26	50	100
5J2E1	26	50	350**	7J2E1	26	50	70*
5J2E2	26	50	250***	7J2E2	26	50	50**
5J3E0	51	75	500*	7J3E0	51	75	100
THRU				THRU			
5J10E2	226	250	250***	7J16E2	376	400	50**

We also manufacture an extensive custom line of large, high power, SELISTOR® suppressors for both AC and DC loads to kiloamperes and kilovolts.

*For cont. to 10 pps **10 to 40 pps
***For 40 to 60 pps

A. C. TRANSIENT SUPPRESSORS

E.D. #	NOMINAL MIN.	NOMINAL MAX.	MAX. AC COIL CURRENT—MA	E.D. #	NOMINAL MIN.	NOMINAL MAX.	MAX. AC COIL CURRENT—MA
5J1E1	0	30	250	7J1E1	0	30	500
5J2E2	31	60	250	7J2E2	31	60	500
THRU				THRU			
5J7E7	181	210	250	7J9E9	241	270	500

MINIATURE BRIDGE RECTIFIERS... *at suspiciously low prices!!!*

We also manufacture standard selenium power rectifier stacks.

E.D. #	MAX. VOLTS RMS	MAX. VOLTS PIV	MAX. MA DC RES	MAX. MA DC CAP
SR50B	33	48	80	60
SR51B	33	48	160	120
SR52B	66	96	60	45
SR53B	66	96	120	90

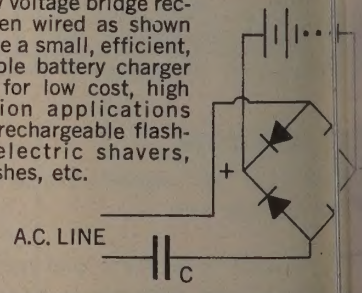
Other rectifier configurations such as doublers, center taps, half wave, etc. are of course available.

All devices can be tailored to fit printed circuit boards.

"SELISTOR"® is a trademark of the Eastern Delta Corporation for its line of arc inhibiting devices.

NICKEL-CADMIUM CHARGER

An inexpensive capacitor, such as a wrap and fill type, and a low voltage bridge rectifier when wired as shown constitute a small, efficient, dependable battery charger suitable for low cost, high production applications such as rechargeable flashlights, electric shavers, toothbrushes, etc.



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SEMICONDUCTORS

MONOLITHIC INTEGRATED CIRCUITS

Monolithic Integrated Circuits offer reduced size and fewer connections with increased reliability. The entire circuit for each product is contained on a silicon substrate packaged in a dual-line configuration having either 8 or 14 leads. Power devices each have a heat sink tab for transferring heat to the PC board heat sink.

GE TYPE	DESCRIPTION
PA189	IF amplifier/discriminator
PA223	Operational amplifier
PA230	Low level amplifier
PA234*	One-watt audio amplifier
PA237*	Two-watt audio amplifier
PA238	Operational amplifier
PA239	Dual preamplifier
PA245*	Five-watt audio amplifier
PA264*	Five-watt voltage regulator
PA265*	Five-watt voltage regulator
PA424	Zero voltage switch
PA436	Phase control
PD455	Six-stage bistable frequency divider (MOSFET)

*With heat sink tab for transferring heat to heat sink

SOLID STATE THYRATRONS

GE Type	Peak Anode Voltage	Cathode Current	May Replace
S26	200 V	1.0 A rms at 30°C	2D21
S27	200 V	1.0 A rms at 30°C	2050

Max. Temp T_A = 125°C.

STANDARD TRIAC CIRCUIT ASSEMBLIES

Components are mounted on a printed circuit board and equipped with an extruded aluminum heatsink. All current carrying components electrically isolated from heatsink. Applications include resistance heat control, shaded pole or permanent-split capacitor type motor speed control, universal type motor speed control, incandescent lamp dimming, etc.

120 V (suffix **1, 3, 5**); 240 V (suffix **2, 4, 6**).

GE Type 6 Amp	GE Type 10 Amp	GE Type 15 Amp	Description
S100A1	S100A3	S100A5	Basic variable voltage control
S100A2	S100A4	S100A6	
S100B1	S100B3	S100B5	Extended range variable voltage circuit
S100B2	S100B4	S100B6	
S100C1	S100C3	S100C5	Extended range variable voltage circuit RFI suppressed
S100C2	S100C4	S100C6	
S100D1	S100D3	S100D5	Variable voltage circuit and static switch RFI suppressed
S100D2	S100D4	S100D6	
S100E1	S100E3	S100E5	Blower motor speed control with set low speed RFI suppressed
S100E2	S100E4	S100E6	
S100F1	S100F3	S100F5	Basic variable voltage circuit with RFI suppression
S100F2	S100F4	S100F6	
S100G1	S100G3	S100G5	AC static switch
S100G2	S100G4	S100G6	

AC POWER CONTROLLERS

Voltage switching provides low RFI levels. Solid state control, including monolithic integrated firing circuit, for long life and high reliability. High input impedance allows use of sensors hookup at any point from 5K to 100K ohms.

GE Type	Line Voltage 60Hz Vrms	Line Voltage Peak V	Max. Cur. A	Max. P_D W	V_1† Max. V	V_1† Typ. V
S300A1	120	200	10	15	10	8
S300A2	240	400	10	16.8	10	8
S300A3	120	200	15	21.8	10	8
S300A4	240	400	15	23.6	10	8
S300A5	277	500	10	17.5	10	8
S300A6	277	500	15	24.2	10	8

Inductive load of at least 4.2 amps rms rating be used at all times. Inductive loads cannot be used with these modules. † Voltages developed between S_1 and S_2. Sensor resistance has one side common with AC line (S_1 is common with L_1).

PHASE CONTROL POWER MODULES

All solid-state control, including a monolithic integrated control circuit and a triac power switching device, controls resistive or induction motor loads up to 3600W. Can operate with a wide variety of variable resistance sensors and d-c tachometer signals. High gain trigger circuitry allows wide range of controlled output with small changes in input signal.

GE Type	Line Volts 50/60 Hz Vrms	Line Volts Peak V	Max. Curr. A	Max. P_D W
S300A1	120	200	6	10.5
S300A2	240	400	6	12.5
S300A3	120	200	10	15.0
S300A4	240	400	10	16.8
S300A5	120	200	15	17.5
S300A6	240	400	15	21.8

Max V_1 = 11.5 V, Typ V_1 = 9.4 V.

SOLID-STATE FAN-MOTOR SPEED CONTROLS

New line of speed controls that consists of a triac a-c power semiconductor and all necessary control circuitry and heatsinking to afford manual speed control of permanent split capacitor and shaded-pole fan motors. All devices are mounted on a printed circuit board and are designed for direct mounting by means of the potentiometer bushing provided.
4A, 120 Vrms

GE Type	Description
S400A1	Basic control circuit
S400A1SC	Basic control circuit plus RFI suppression
S400A1SC1	Basic control circuit plus RFI suppression and automatic line-voltage compensation

SILICON GATE-CONTROLLED AC SWITCHES
BI-DIRECTIONAL TRIODES — TRIAC

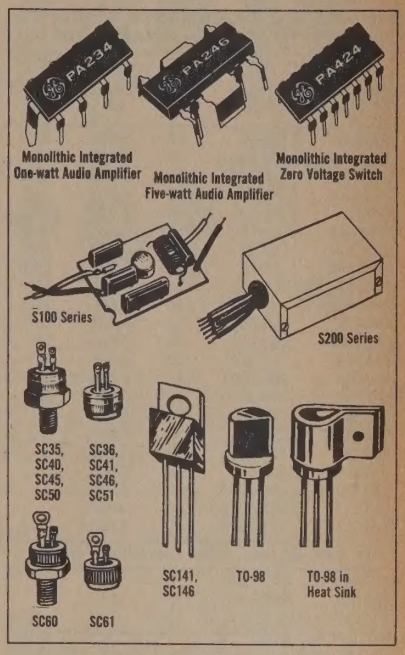
For gate control of AC power. P_{GM} = 10 watts; $P_{G(AV)}$ = 0.5 watt. T_{STG} −40°C to +125°C.

GE Type		rms Current On-State	V_{BV}	I_{FM}† (surge)	Oper. Temp. T_J
SC35F	SC36F	3 Amp	±50 V	30	−40°C to +100°C
SC35A	SC36A		±100 V	30	
SC35B	SC36B		±200 V	30	
SC35D	SC36D		±400 V	30	
SC40F	SC41F	6 Amp	±50 V	50	−40°C to +100°C
SC40A	SC41A		±100 V	50	
SC40B	SC41B		±200 V	50	
SC40D	SC41D		±400 V	50	
SC40E	SC41E		±500 V	50	
SC45F	SC46F	10 Amp	±50 V	80	−40°C to +100°C
SC45A	SC46A		±100 V	80	
SC45B	SC46B		±200 V	80	
SC45D	SC46D		±400 V	80	
SC45E	SC46E		±500 V	80	
SC50F	SC51F	15 Amp	±50 V	100	−40°C to +115°C
SC50A	SC51A		±100 V	100	
SC50B	SC51B		±200 V	100	
SC50D	SC51D		±400 V	100	
SC50E	SC51E		±500 V	100	
SC60B	SC61B	25 Amp	±200 V	250	−40°C to +115°C
SC60D	SC61D		±400 V	250	
SC60E	SC61E		±500 V	250	
SC141B		6 Amp	±200 V	80	−40°C to +100°C
SC141D			±400 V	80	
SC146B		10 Amp	±200 V	80	
SC146D			±400 V	80	

* Values apply for zero gate voltage only. Maximum case-to-ambient thermal resistance equals 18°C/watt.
† One full cycle of a 60 Hz sine wave.

BI-DIRECTIONAL DIODE — DIAC

For gate trigger of TRIAC's or silicon controlled rectifiers. **GE Type ST2** — Breakover Voltage: ±28 V min., ±36 V max. Breakover Current: ±200 μA, max. Pulse Output: ±3 V, peak min., across 20-ohm load resistor when discharging 0.1 μF capacitor, T_A = 50°C. Peak Current: ±2 amps max., 10 μsec duration, 120 Hz repetition rate, T_A = 50°C.



SMALL SIGNAL AMPLIFIERS
AUDIO TO 30 MHz (TO-98)

P_T = 200 mW. Type Cob pF = 7, ft MHz = 120.

JEDEC or GE Type	h_{FE} I_C=2 mA	V_{CEO} V	Typ. $V_{CE(SAT)}$ V	NF dB
2N2711	30-90	18	0.2	2.8
2N2712	75-225	18	0.2	2.8
2N2923	90-180	25	0.2	15†
2N2924	150-300	25	0.2	15†
2N2925	235-470	25	0.2	15†
2N2926*	35-470	18	.0.2	.....
2N3390	400-800	25	0.2	.....
2N3391	250-500	25	0.2	1.9
2N3391A	250-500	25	0.2	5.0
2N3392	150-300	25	0.2	15†
2N3393	90-180	25	0.2	15†
263394	55-110	25	0.2	15†
2N3395*	150-500	25	0.2	.....
2N3396*	90-500	25	0.2	.....
2N3397*	55-500	25	0.2	.....
2N3398*	55-800	25	0.2	.....
2N3721	60-660	18	0.2	.....
2N3900	250-500	18	0.2	1.9
2N3900A	250-500	18	0.2	5.0
2N5172	100-500	25	0.25‡	.....

* Supplied in narrow spread, distinctively color-coded beta groups. † Input impedance, ohms. ‡ Maximum.

LARGE SIGNAL AMPLIFIERS AND MEDIUM SPEED SWITCHES — EPITAXIAL (TO-98)

JEDEC or GE Type	h_{FE} I_C=2 mA	V_{CEO} V	Max. $V_{CE(SAT)}$ V	P_T mW	Typ. C_{cbo} pF
2N2713	30-90	18	0.3	200	6.0
2N2714	75-225	18	0.3	200	6.0
2N3402*	75-225	25	0.3	900	6.0
2N3403*	180-540	25	0.3	900	6.0
2N3404*	75-225	50	0.3	900	6.0
2N3405*	180-540	50	0.3	900	6.0
2N3414	75-225	25	0.3	360	6.0
2N3415	180-540	25	0.3	360	6.0
2N3416	75-225	50	0.3	360	6.0
2N3417	180-540	50	0.3	360	6.0
2N3973	35-100†	30	0.3	360	5.2
2N3974	55-200†	30	0.3	360	5.2
2N3975	35-100†	30	0.3	360	5.2
2N3976	55-200†	30	0.3	360	5.2
2N4256	100-500	30‡	0.25	200	4.0
2N4424	180-540	40	0.3	360	6.0
2N4425*	180-540	40	0.3	900	6.0
2N4951	60-200§	30	0.3	360	8¶
2N4952	100-300§	30	0.3	360	8¶
2N4953	200-600§	30	0.3	360	8¶
2N4954	60-600§	30	0.3	360	8¶

* TO-98 in heat sink. † I_C = 50 mA. ‡ V_{CES} value §I_C = 150 mA. ¶Maximum.

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

SEMICONDUCTORS

HIGH FREQUENCY AMPLIFIERS & OSCILLATORS 262.5 kHz TO 100 MHz EPITAXIAL (TO-98)

JEDEC or GE Type	h_{FE} I_C=2 mA	V_{CEO} V	Typ. $V_{CE(SAT)}$ V	Max. NF dB
2N3843	20-40	30	0.065	10.2
2N3843A	20-40	30	0.065	8.5
2N3844	35-70	30	0.065	10.2
2N3844A	35-70	30	0.065	8.5
2N3845	60-120	30	0.065	10.2
2N3845A	60-120	30	0.065	8.5
2N3854	35-70	18	0.085	16*
2N3854A	35-70	30	0.085	16*
2N3855	60-120	18	0.085	16*
2N3855A	60-120	30	0.085	16*
2N3856	100-200	18	0.085	16*
2N3856A	100-200	30	0.085	16*
2N3858	60-120	30	0.055	10*
2N3859	100-200	30	0.055	10*
2N3860	150-300	30	0.055	10*
2N5232	250-500	50	0.055	.....
2N5232A	250-500	50	0.055	5
2N5249	400-800	50	0.055	.....
2N5249A	400-800	50	0.055	5
2N5209	60-120§	50	0.055	.....
2N5310	100-300§	50	0.055	.....
2N5311	250-500§	50	0.055	.....
100 MHz TO 950 MHz EPITAXIAL (TO-98)				
2N3662	20 min.†	12	0.6‡	4
2N3663	20 min.†	12	0.6‡	4
D16G6	20 min.¶	12	0.6‡	4

* C_{ib}, pF. † I_C = 8 mA, V_{CE} = 10 V. ‡ Maximum. § I_C = 10 μA. ¶ I_C = 5 mA, V_{CE} = 10 V.

HIGH-CURRENT AMPLIFIERS (TO-98)

Typ C_{cbo} pF = 10, f MHz = 2.0.

GE Type	h_{FE} I_C=150 mA V_{CE}=5 V	V_{CEO} V	P_T mW	$V_{CE(SAT)}$ at 150 mA V
D33D1	40-120	30	360	.25
D33D2	100-300	30	360	.25
D33D3	200-600	30	360	.25
D33D4	40-120	60	360	.25
D33D5	100-300	60	360	.25
D33D6	100-300	80	360	.25

HIGH VOLTAGE APPLICATIONS — TO 100 MHz (TO-98)

P_T mW = 200.

JEDEC or GE Type	h_{FE} I_C=2 mA	V_{CEO} V	Max. $V_{CE(SAT)}$ V	Typical C_{cbo} pF	Typical f_t MHz
2N3858A	60-120	60	0.25	2.5	135
2N3859A	100-200	60	0.25	2.5	135
2N3877	20 min.	70	1.0	2.5	135
2N3877A	20 min.	85	1.0	2.5	135
2N5174*	40-600	75	0.95	2.5	135
2N5175*	55-160	100	0.95	2.5	135
2N5176*	140-300	100	0.95	2.5	135

* I_C = 10 mA.

NPN/PNP COMPLEMENTARY PAIRS

P_T mW = 500*. Typ C_{cbo} pF = 9.4.

JEDEC or GE Type PNP	NPN	h_{FE} I_C=2 mA	V_{CEO} V	Max. $V_{CE(SAT)}$ V	Typ. f_t MHz
D29E1	D33D21	60-200	25	0.5	150
D29E2	D33D22	150-500	25	0.5	165
D29E4	D33D24	60-120	40	0.75	120
D29E5	D33D25	100-200	40	0.75	135
D29E6	D33D26	150-300	40	0.75	150
D29E7	D33D27	250-500	40	0.75	165
D29E8	D33D28	100-200	60	0.75	100
D29E9	D33D29	60-120	60	0.75	115
D29E10	D33D30	100-200	60	0.75	135
2N5810	2N5811	60-200	25	0.5	150
2N5812	2N5813	150-500	25	0.5	165
2N5814	2N5815	60-120	40	0.75	120
2N5816	2N5817	100-200	40	0.75	135
2N5818	2N5819	150-300	40	0.75	150
2N5820	2N5821	60-120	60	0.75	100
2N5822	2N5823	100-200	60	0.75	120

* All units are available with heatsink which raises power dissipation to 1000 min. @ 25°C case temperature.

MONOLITHIC DARLINGTON AMPLIFIERS

Ideal for preamplifier input stages requiring high input impedances of several megohms. h_{ie} value at f = 1 kHz. (TO-98).

JEDEC or GE Type	h_{FE} I_C=2 mA V_{CE}=5 V	Max. BV_{CEO} V	Max. h_{ie} I_C=2 mA V_{CE}=5 V	P_T at 25°C mW
D16P1	2,000 min.	12	500 kohms	400
D16P2	7,000-70,000	12	500 kohms	400
2N5305	2,000 min.	25	650 kohms	400
2N5306	7,000-70,000	25	650 kohms	400
2N5307	2,000-20,000	40	800 kohms	400
2N5308	7,000-70,000	40	800 kohms	400

PNP SILICON TRANSISTORS (TO-98)

$V_{CE(SAT)}$ = 0.25 V.

JEDEC or GE Type	h_{FE}	V_{CEO} V	P_T mW	Typical C_{cbo} pF	Typical f_t MHz
2N5354	40-120	25	360	8	340
2N5355	100-300	25	360	8	340
2N5356	250-500	25	360	8	340
2N5365	40-120	40	360	5.5	2.0
2N5366	100-300	40	360	5.5	2.0
2N5367	250-500	40	360	5.5	2.0

HIGH SPEED SWITCHES — LOW STORAGE TIMES — EPITAXIAL GOLD DOPED (TO-98)

Max $V_{CE(SAT)}$ = 0.25 V.

JEDEC or GE Type	h_{FE}	V_{CEO} V	P_T mW	Typical C_{cbo} pF	Typical f_t MHz
2N3605	30 min.	14	200	4	350
2N3605A	30-120	15	330	6	300
2N3606	30 min.	14	200	4	350
2N3606A	30-120	15	330	6	300
2N3607	30 min.	14	200	4	350

NPN HIGH-SPEED SWITCHES — EPITAXIAL

TO-18 plastic package. "GET's" are epoxy substitutes for hermetic transistors.

GE Type	h_{FE} I_C=10 mA	$V_{CE(SAT)}$ Max. V	C_{cbo} Max. pF	t nsec On-Off	Storage t_S nsec
GET706	20 min.	.250	6.0	40-75	35
GET708	30-120	.250	5.5	40-75	25
GET914	30-120	.250	5.5	40-40	20
GET2369	40-120	.250	4.5	15-22	18
GET3013	30-120*	.180	4.5	15-16	18
GET3014	30-120*	.180	4.5	16-25	18
GET3646	30-120*	.200	4.5	18-28	18

Typ. f_t MHz for GET 706, 708, 914 = 350; GET 2369, 3013, 3014, 3646 = 400. V_{CEO} = 15 V for all above GET except 3646 with V_{CEO} = 20 V. P_T = 360 mW @ T_A = 25°C.

* V_{CE} = .4 V, I_C = 30 mA.

SILICON UNILATERAL SWITCHES (SUS) 6-10 VOLT PLANAR TRIGGER DIODE

V_{ACR} = 30 volts maximum. V_F at 200 mA = 1.5 volts.

JEDEC or GE Type	Max. $I_{F(CONT)}$ mA	T_J −55°C to °C	V_S V	Max. I_S μA	I_B at 5 V μA
2N4983*	175	+125	6-10	500	1.0
2N4984*	200	+150	7.5-9	150	0.1
2N4985*	200	+150	7.5-8.2	300	0.005
2N4986*	175	+125	7-9	200	0.1
2N4987†	175	+125	6-10	500	1.0
2N4988†	200	+150	7.5-9	150	0.1
2N4989†	200	+150	7.5-8.2	300	0.005
2N4990†	175	+125	7-9	200	0.1

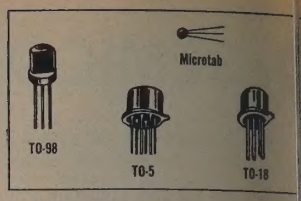
* TO-18. † TO-98.

SILICON BILATERAL SWITCHES (SBS) 6-10 VOLT BIDIRECTIONAL PLANAR TRIGGER DIODE

V_F at 200 mA = 1.7 volts.

2N4991†	175	+125	6-10	500	1.0
2N4992†	200	+150	7.5-9	120	0.1
2N4993*	200	+150	6-10	500	1.0

* TO-18. † TO-98.



All TO-98 devices can be supplied formed to fit either a TO-5 or TO

GENERAL-PURPOSE AMPLIFIERS &

TO-18 plastic package. "GET's" are stitutes for hermetic transistors.

P_T mW = 360.

GE Type	h_{FE} I_C=2 mA	V_{CEO} V	Max. $V_{CE(SAT)}$ V	C
GET929	60-120†	50	.125	
GET930	100-300†	50	.125	
D32D1	40-120	30	.250	
D32D2	100-300	30	.250	
D32D3	200-600	30	.250	
GET2221	40-120	30	.300	
GET2222	100-300	30	.300	
GET3638*	20 min.‡	25	.250	
GET3638A*	100 min.‡	25	.250	

* PNP; all others are NPN. † h_{FE} @ I_C = = −10V, I_C = −10 mA.

SILICON PLANAR CONTROLLED SV

Four-terminal TO-18 package.

JEDEC or GE Type	Anode Blk. V	Cont. DC I_F mA	Peak Recur. I_F A*	Peak Cath. Gate Cur. mA	Dissipation mW
3N81	65	200	1.0	500	400
3N82	100	200	1.0	500	400
3N83	70	50	0.1	50	200
3N84	40	175	0.5	100	320
3N85	100	175	0.5	100	320
3N86	65	200	1.0	500	400

* At 100 μsec. † Measured at 125°C; all 150°C.

PROGRAMMABLE UNIJUNCTION—PU

Passivated PNPN devices with anode, a and cathode terminals. Recommended trigger, pulse and timing circuits, o sensing and sweep circuits. Gate-cathod voltage and gate-anode reverse voltage Anode-cathode voltage = ±40 V.

$I_{F(CONT)}$ = 150 mA. P_T = 300 mW.

GE Type	I_{GAO} V_S=40 V nA	Max. Values at V_S= I_P μA	V_T V
D13T1	10	2	.2-1.6
D13T2	10	0.15	.2-0.6

SILICON PLANAR EPITAXIAL PASSI NPN MICROTAB

D26B and D26C series designed specifi fast switching applications. D26E ser suited for high voltage, high gain ampli switches. P26G1 suitable for use as oscil UHF television tuners, etc. P_T = 90 m value at f = 1 MHz.

GE Type	h_{FE} at I_C Min.-Max.	μA	Maximum V_{CEO} V	V_{EBO} V	V_{CBO} V
D26B1	20-60	10*	15	4.5	40
D26B2	40-120	10*	15	4.5	40
D26C1	30-90	10*	18	5	18
D26C2	60-180	10*	18	5	18
D26C3	140-300	10*	18	5	18
D26C4	250-500	10*	18	5	18
D26C5	400-800	10*	18	5	18
D26E1	100-300	10	45	5	45
D26E2	40-90	100	18	5	18
D26E3	70-145	100	18	5	18
D26E4	115-220	100	18	5	18
D26E5	180-330	100	18	5	18
D26E6	40-330	100	18	5	18
D26G1	20 min.	3*	15	3	30

* mA.

PNP MICROTAB

PNP complement to NPN D26C seri amplifier, driver and general purpose sw applications. P_T = 90 mW.

D30A1	30-90	10	−18	−4	−18
D30A2	60-180	10	−18	−4	−18
D30A3	140-300	10	−18	−4	−18
D30A4	250-500	10	−18	−4	−18
D30A5	400-800	10	−18	−4	−18

SEMICONDUCTORS

WER TAB TRANSISTORS

D41D are complements. D42C and nplements. D40N application: CRT D40C, D; D41D; D42C, D appli- output 3W-20W, regulators, drivers, tor controls, lamp controls, relays.

E Type	h_{FE}	V_{CEO} (Min.)	I_C(A) (Cont/Pk)	$V_{CE(SAT)}$ Max. V	C_{cbo} (pF)
40C1	K-60K*	30	0.5/1.0	1.5†	5
40C2	0K*	30	0.5/1.0	1.5†	5
40C4	K-60K*	40	0.5/1.0	1.5†	5
40C5	0K*	40	0.5/1.0	1.5†	5
40C7	0K-60K	50	0.5/1.0	1.5†	5

MHz = P_T @ 25°C T_{ab} = 6.0. *V_{CE} = 5 V, = 200 . † I_C = 500 mA, I_B = 0.5 mA.

40N1	0-90*	300†	0.1	2.5‡	3
40N3	0-90	250	0.1	2.5	3

MHz = P_T @ 25°C T_{ab} = 6.0. *V_{CE} = 10 V, = 20 † V_{CER}. ‡ I_C = 20 mA, I_B = 2 mA.

40D1	50-150*	30	1.0/1.5	0.5†	8
40D2	20-360*	30	1.0/1.5	0.5†	8
40D3	290*	30	1.0/1.5	0.5†	8
40D4	50-150*	45	1.0/1.5	0.5†	8
40D5	20-360*	45	1.0/1.5	0.5†	8
40D7	50-150*	60	1.0/1.5	0.5†	8
40D8	20-360*	60	1.0/1.5	0.5†	8

MHz = 0. P_T @ 25°C T_{ab} = 6.0. *V_{CE} = 2 V, = 100 A. † I_C = 500 mA, I_B = 50 mA.

41D1	50-150*	30	1.0/1.5	0.5†	8
41D2	20-360*	30	1.0/1.5	0.5†	8
41D3	290*	30	1.0/1.5	0.5†	8
41D4	50-150*	45	1.0/1.5	0.5†	8
41D5	20-360*	45	1.0/1.5	0.5†	8
41D7	50-150*	60	1.0/1.5	0.5†	8
41D8	20-360*	60	1.0/1.5	0.5†	8

MHz = 20. P_T @ 25°C T_{ab} = 6.0. *V_{CE} = 2 V, = 100 A. † I_C = 500 mA, I_B = 50 mA.

42C1	25*	30	3.0/5.0	0.5‡	100
42C2	40-120*	30	3.0/5.0	0.5‡	100
42C3	40-120*†	30	3.0/5.0	0.5‡	100
42C4	25*	45	3.0/5.0	0.5‡	100
42C5	40-120*	45	3.0/5.0	0.5‡	100
42C6	40-120*†	45	3.0/5.0	0.5‡	100
42C7	25*	60	3.0/5.0	0.5‡	100
42C8	40-120*	60	3.0/5.0	0.5‡	100

MHz = 0. P_T @ 25°C T_{ab} = 12.0. *V_{CE} = 1 V, = 20 A. † h_{FE} = 20 min. @ 1V, 2A. ‡ I_C = A, I_B = 100 mA.

43C1	25*	30	3.0/5.0	0.5‡	100
43C2	40-120*	30	3.0/5.0	0.5‡	100
43C3	40-120*†	30	3.0/5.0	0.5‡	100
43C4	25‡	45	3.0/5.0	0.5‡	100
43C5	40-120*	45	3.0/5.0	0.5‡	100
43C6	40-120*†	45	3.0/5.0	0.5‡	100
43C7	25‡	60	3.0/5.0	0.5‡	100
43C8	40-120*	60	3.0/5.0	0.5‡	100

MHz = 40. P_T @ 25°C T_{ab} = 12.0. *V_{CE} = 1 V, = 20 mA. † h_{FE} = 20 min. @ 1V, 2A. ‡ I_C = A, I_B = 100 mA.

POWER PAC TRANSISTORS

C a D45C are complements. Applications: lato drivers, inverters, motor controls, p rols, and relays.

Ty	h_{FE}[1] @ I_C=200mA V_{CE}=1.0V	h_{FE}[2] @ I_C=1A V_{CE}=1.0V	V_{CEO} @ I_C=100mA	$V_{CE(SAT)}$ @ I_C=1.0A I_B=0.1A
4C	25	10	30	0.5
4C	40-120	20	30	0.5
4C	40-120	20+	30	0.5
4C	25	10	45	0.5
4C	40-120	20	45	0.5
4C	40-120	20+	45	0.5
4C	25	10	60	0.5
4C	40-120	20	60	0.5
5C	25	10	30	0.5
5C	40-120	20	30	0.5
5C	40-120	20+	30	0.5
5C	25	10	45	0.5
5C	40-120	20	45	0.5
5C	40-120	20+	45	0.5
5C	25	10	60	0.5
5C	40-120	20	60	0.5

NPN SILICON PLANAR PHOTOTRANSISTOR

Typ switching speed: delay 2 μsec, rise-fall 5 μsec.

GE Type	Maximum Volts V_{CEO}	V_{CBO}	V_{ECO}	V_{EBO}	Typ. Light Cur.*	Max. Dark Cur.†
L14A502	45	45	5	5	7 mA	10 nA

* H = 10 mW/cm²; V_{CE} = 5 V. † V_{CE} = 30 V; I_B = 0.

PNPN SILICON PLANAR PASSIVATED LASCS

Triggering†: Cathode gate cur. to fine = 10 μA, eff. irradiance to fine = 10 mW/cm².

GE Type	Anode to Cathode Fwd. and Reverse	Conducting* V_{FWD} at 175 mA Anode	Holding Current
L1V	40 V	2.3 V	2.0 mA

* Max. Ratings at R_{GKz} = 27,000 ohms.

GERMANIUM TRANSISTORS — PNP ALLOY

BV_{CER} at I_C = 600 μA and R_{BE} = 10K except as otherwise noted.

JEDEC or GE Type	Fig.	h_{FE} V_{CE}=1 V I_C=20 mA	Typ. f_{hfb} MHz	Min. BV_{CER} V	Max. P_T mW
2N43A•*	1	34-65	1.3	30	240
2N44•*	1	18-34	1.0	30	240
2N188A•	1	34-65	1.2	25	200
2N190•	1	34-65	1.0	25	200
2N191•	1	53-121	1.2	25	200
2N241A•	1	50-125	1.3	25	200
2N319	2	25-42	2.0	20	225
2N320	2	34-65	2.5	20	225
2N321	2	53-121	3.0	20	225
2N322	2	34-65	3.0	16	200
2N323	2	53-121	3.5	16	200
2N324	2	72-198	4.0	16	200
2N396A*	2	30-150‡	8.0	20‡	200
2N404	2	.....	8.0	24§	150
2N404A	2	.....	8.0	35§	150
2N413	2	20-100†	6.0	18‡	150
2N414	2	30-120†	7.0	15‡	150
2N508	2	100-200	4.5	16	200
2N508A	2	100-200	4.5	25	200
2N524	2	25-42	2.5	30	225
2N525	2	34-65	3.0	30	225
2N526•*	2	53-90	3.5	30	225
2N527	2	72-121	4.0	30	225
2N1098•	2	25-90	3.0	16	200
2N1175	2	70-140	4.0	25	200
2N1175A	2	70-140	4.0	25	200
2N1303	2	20 min.†	7.0	25§	150
2N1305	2	40-200†	8.0	20§	150
2N1307	2	60-300†	12.0	15§	150
2N1413	2	25-42	3.2	25	200
2N1414	2	34-65	3.6	25	200
2N1415	2	53-90	4.0	25	200
2N1924	2	34-65	3.0	40	225
2N1925	2	53-90	3.5	40	225
2N1926	2	72-121	4.0	40	225

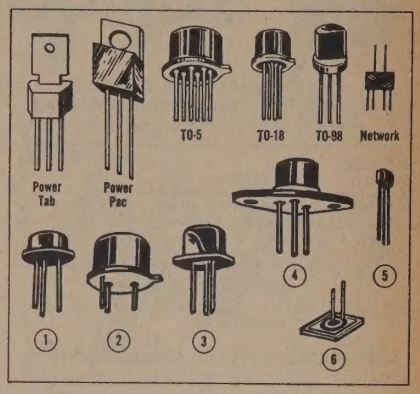
• Not recommended for new designs. † V_{CE} = 1 V, I_C = 10 mA. ‡ BV_{CEO}. § V_{RT}. ¶ V_{CB} = 5 V, I_E = 1 mA, f = 1 kHz. *MIL type available.

GERMANIUM TRANSISTORS NPN RATE GROWN (FIG. 3)

I_{CBO} at I_E = 0 and V_{CB} = 15 V except as otherwise noted. Typ f_{hfb} MHz = 5 for 2N292, 8 for 26293, 9 for all others.

JEDEC or GE Type	h_{FE} V_{CE}=1 V I_C=1 mA	Min. BV_{CER} V	P_G at 455 kHz dB	Max. P_D mW
2N78	45-135	15¶	26.0-31.0	65
2N78A*	45-135	20¶	26.0-31.0	65
2N167A*	17-90†	30¶	.....	75
2N169	34-200	15	23.5	65
2N169A	34-200	25	23.5	65
2N292	8-51	15	21.0-26.0	65
2N293	8-51	15	23.5-28.0	65
2N1086	17-200	9	23.0-29.0§	65
2N1086A	17-200	9	23.0-27.0§	65
2N1694	15-45‡	20¶	.....	75

¶ BV_{CEO} at I_C = 300 μA. † I_C = 8 mA. § Conversion gain at 1600 kHz. ‡ I_C = 2 mA. * MIL type available.



Microminiature package versions of discrete transistors and diodes, including TO-46, TO-50, network packages, ceramic tabs (Fig. 5) and kovar tabs (Fig. 6), are available in most popular types. For microminiature types not listed, write for publication no. 450-40.

SILICON POWER TRANSISTORS NPN PASSIVATED MESA

Typical ft for all types, 15 MHz.

JEDEC or GE Type	Fig.	Maximum V_{CEO} I_C= 250 μA	I_{CBO} V_{CB}= 30 V μA	Pwr. Dissip. Free Air at 25°C Watts	T_C at 25°C Watts	V_{CE} (SAT) Volts
2N497*	2	60	250	0.8	4	5
2N497A	2	60	250	1.0	5	2
2N498*	2	100	250	0.8	4	5
2N498A	2	100	250	1.0	5	2
2N656*	2	60	250	0.8	4	5
2N656A	2	60	250	1.0	5	2
2N657*	2	100	250	0.8	4	5
2N657A	2	100	250	1.0	5	2
2N2017	2	60	250	1.0	5•	2
2N2106	2	60¶	200	1.0	5•	5
2N2107	2	60¶	200	1.0	5•	2
2N2108	2	60¶	200	1.0	5•	2
2N2196	4	60¶	250	2.0	10	2
2N2197	4	60¶	250	2.0	10	2
2N2201	4	100	200	2.0	10	1.7
2N2239	4	50‡	250	1.0	10	3
2N2726	2	200†	100	1.0	5	2
2N2727	2	200†	100	1.0	5	2
2N3589	4	200†	100§	2.0	10	2
2N3590	4	200†	100§	2.0	10	2
D7A30	2	40	10	1.0	5	1■
D7A31	2	30	10	1.0	5	1■
D7A32	2	30	10	1.0	5	1■

* MIL type available. † V_{CER} at I_C = 50 mA, R = 5K. ‡ V_{CER}, R = 5K. ¶ V_{CER} at I_C = 16 mA, R = 1K. ■ Typical. § V_{CB} = 100 V. • 25°C.

SILICON DUAL AND MULTICHIP DEVICES NPN DIFFERENTIAL AMPLIFIERS

Six-terminal packages containing two isolated pellets.

JEDEC or GE Type TO-5	TO-18	Min. V_{CEO} Volts	Min. h_{FE} at 100 μA
2N2060	D12A104	60	30
2N2223, A	.....	60	25
2N2453, A	.....	30	80*
2N2480	.....	40	20
2N2480A	2N3513	40	35
2N2639	.....	45†	50*
2N2640	.....	45†	50*
2N2641	.....	45†	50*
2N2642	.....	45†	100*
2N2643	.....	45†	100*
2N2644	.....	45†	100*
2N2652	.....	60	35
2N2652A	2N3516	60	35
2N2910	.....	25	70
2N2913	.....	45	100
2N2914	.....	45	225
2N2915	.....	45	100
2N2916	.....	45	225
2N2917	.....	45	100
2N2918	.....	45	225
2N2919	.....	60	100
2N2920	.....	60	225
2N3521	2N3522	45	155*
D12A8	D12A108	30	30
D12E026	D12E126	30	60‡
D12E109	.....	30	80

* At I_C = 10 μA. † Maximum. ‡ At I_{CC} = 1 mA.

mplete information contact nearest GE Sales Office listed on inside front or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

SEMICONDUCTORS

SILICON DUAL DIODES (TO-98)
TV HORIZONTAL PHASE DISCRIMINATORS

P_T = 200 m W at 25°C. Typ C_{ob} pF @ 10 V = 1.1.

JEDEC or GE Type	Features	V_F at 1 mA Volt	V_R V
1N4951	Inherent match, static and dynamic. Common cathode.	0.85 max.	20
1N4952		0.85 max.	50
F16U3		0.54-0.66	20
F16U4		0.54-0.66	50

REFERENCE DIODE

GE Type F16H1 — Common anode, Vz = 5.6 to 6.8 V. dVz/dT <.025%/°C.

INTEGRATED VOLTAGE REGULATOR (IVR)

The IVR consists of two NPN transistors, a zener diode, and a resistor on a monolithic chip mounted in a TO-98, three-leaded plastic package. It is designed for use as a shunt voltage regulating element and reference amplifier with simple resistor programming.

Type D13V characteristics

	Min.	Typ.	Max.
Regulated voltage range, volts	10	....	40
Temp. coefficient of regulated voltage, %/C	....	.03	0.1
Thevenin impedance, ohms	....	10	50
Thevenin reference voltage, volts	....	8.5	10
Total average power in watts	....	....	400

SILICON REFERENCE AMPLIFIERS (TO-12)

Reference Voltage 7.0 ±5% except RA1 Series, ±10%.

GE Type	Max. TC %/°C	Temperature Range	Min. GMC µmho	h_{FE} I_C=.5 mA	Min. BV_{CEO} V
RA1	.02	0°C			
RA1A	.005	to	3000	10-120	45
RA1B	.002	+70°C			
RA1C	.001				
RA2	.02	−55°C			
RA2A	.005	to	6000	40-120	45
RA2B	.002	+150°C			
RA3	.02	−55°C			
RA3A	.005	to	2000	30-90	45
RA3B	.002	+150°C			

SILICON UNIJUNCTION TRANSISTORS

Consists of an "N" type silicon bar mounted between two ohmic base contacts with a "P" type emitter near base two. Three-terminal package.

GE Types Bar Structure TO-18	TO-5	R_{BBO} V_{BB}=3 V I_E=0 kohms	Intrin. standoff Ratio†	I_P Max. Emitter µA	I_{EO} Max. V_{B2E}‡ 30V µA
2N2417	2N489			12	2
2N2417A	2N489A*	4.7-6.8	.51-.62	12	2
2N2417B	2N489B			6	0.2
2N2418	2N490			12	2
2N2418A	2N490A*	6.2-9.1	.61-.62	12	2
2N2418B	2N490B			6	0.2
.....	2N490C			2	0.02
2N2419	2N491			12	2
2N2419A	2N491A*	4.7-6.8	.56-.68	12	2
2N2419B	2N491B			6	0.2
2N2420	2N492			12	2
2N2420A	2N492A*	6.2-9.1	.56-.68	12	2
2N2420B	2N492B			6	0.2
.....	2N492C			2	0.02
2N2421	2N493			12	2
2N2421A	2N493A*	4.6-6.8	.62-.75	12	2
2N2421B	2N493B			6	0.2
2N2422	2N494			12	2
2N2422A	2N494A*	6.2-9.1	.62-.75	12	2
2N2422B	2N494B			6	0.2
.....	2N494C			2	0.02
.....	2N1671			25	12
.....	2N1671A	4.7-9.1	.47-.62	25	12
.....	2N1671B			6	0.2
.....	2N1671C			2	0.02
.....	2N2160	4.0-12.0	.47-.80	25	12
2N2646•	.....	4.7-9.1	.56-.75	5	12
2N2647•	.....	4.7-9.1	.68-.82	2	0.2
D5E37•	.....	4.0-12.0	.47-.85	25	12
D5E43•	.....			2	1
D5E44•	.....	4.7-9.1	.68-.82	5	12
D5E45•	.....			2	0.5

• Cube structure. † V_{BB} = 10 V. ‡T_J = 25°C. * MIL type available.

SILICON COMPLEMENTARY UNIJUNCTION TRANSISTORS (TO-18)

Ultra-stable and uniform unijunction devices for low frequency oscillators, timers and frequency dividers.

GE Type	R_{BBO} kohms	Intrinsic Standoff Ratio	I_{EO} at 5 V nA	I_P@10V µA(Max)
D5K1	5.5-8.2	.58-.62	10	5
D5K2	5-15	.58-.62	10	15

NPN SILICON PLANAR ECONOMY PHOTO-DARLINGTON AMPLIFIER (TO-98)

Typ switching†: td 60 µsec, tr 250 µsec, ts 150 µsec.

GE Type	Maximum Ratings at 25°C V_{CEO} V	V_{CBO} V	V_{EBO} V	I_L mA	P_T mW	Typ. I_L* mA	Max. I_D† nA
2N5777	25	25	8	250	200	2	100
2N5778	40	40	12	250	200	2	100
2N5779	25	25	8	250	200	4	100
2N5780	40	40	12	250	200	4	100

* V_{CE} = 5 V; H = 2 mW/cm². † V_{CE} = 5 V; I_B = 0. ‡ V_{CE} = 10 V; I_L = 1 mA; R_L = 1,000 ohms.

NPN CHOPPERS

Five-terminal packages containing two matched pelletts. Max I_{CBO} or I_{CBO2}§ = 10 nA.

GE Type	JEDEC Outline	Maximum V_O* µV	at °C	Min. V_{EEO}† Volts	Max. r_s‡ Ohms
2N2356	TO-5	300	−55 to +125	20	40
2N2356A	TO-5	50	−55 to +125	20	40

* $I_{B1} = I_{B2}$ = 1 mA. $I_{E1} = I_{E2}$ = 0. † I_{E1E2} = 1 mA, $I_{B1} = I_{B2}$. ‡ I_{B1} = 1 mA, I_{EE} = 0.1 mA. § V_{CB1} or V_{CB2} = 25 V.

NPN DARLINGTONS

Four terminal TO-18 package with two pellets connected in Darlington configuration.

JEDEC or GE Type	Minimum V_{CEO} at I_C Volts	mA	h_{FE} at I_C of 100 mA Min.-Max.	10 mA Min.-Max.	1 mA Min.
2N997	40	30	7000-70k	4000 min.	.....
2N998	60	20	2000 min.	1600-8000	800
2N999	60	30	7000-70k	4000 min.	.....
2N2785	40	20	2000-20k	1200 min.	600

MULTIPELLET STABISTORS (FIG. 7)

Power dissipation = 400 mW. Derate 2.67 mW/°C for T_A above 25°C. Capacitance value at f = 1 MHz.

GE Type	Min. B_V V	µA	Max. V_R V	V_F I_F=10 mA V	Max. I_R at 25°C nA	V
1N4156	30	5	20	1.38-1.58	50	20
1N4157	30	5	20	2.12-2.32	50	20
1N4453	30	5	20	.690-.800	50	20
1N4829	30	100	20	1.16-1.61	100	20
1N4830	30	100	20	1.90-2.35	100	20
1N5179	30	5	20	2.60-3.20	50	20
MPD200	30	5	30	1.39-1.54	30	30
MPD300	60	5	60	2.10-2.33	30	30
MPD400	90	5	90	2.80-3.07	30	30
STB567	12	5	12	1.31-1.61	....	....
STB568	12	5	12	2.09-2.31	....	....
STB569	12	5	20	2.72-3.01	....	....

MHD (FIG. 8)

Milli heatsink diodes rated 500 mW at 25°C free air.

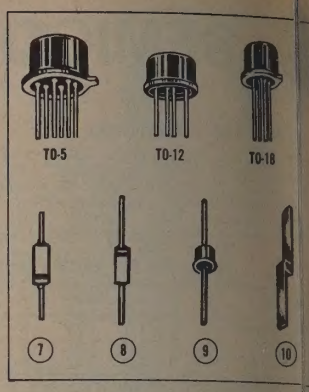
GE Type	DHD Type	Max. I_R*	GE Type	DHD Type	Max. I_R*
1N4531	1N914	25 nA	1N4534	1N4153	50
1N4532	1N4454	100 nA	1N4536	1N4154	100
1N4533	1N4152	50 nA			

* At 25°C.

GERMANIUM BACK DIODES (FIG. 9)

GE Type	Max. I_P mA	Total C, pF	Min. V_{R1}* mV	GE Type	Max. I_P mA	Total C, pF	Min. V_{R1}* mV
BD-1	1.0	20	440	BD-5	0.05	10	350
BD-2	0.5	10	420	BD-6	0.02	10	330
BD-3	0.2	10	400	BD-7	0.01	10	300
BD-4	0.1	10	380	1N4090†	0.2	1.5	430

* $I_R = I_P$ max. † Low noise mixer, Fig. 10; all others general purpose.



SILICON SIGNAL DIODES (F
STANDARD DO-7 (FIG. 11

GE Type	Min. (SAT) Volts	Max. Rev. Cur. µA at V (at 25°C)	Max. Fwd Cur., mA at Volts
1N251	40	0.2 at −10	5 at 1.0
1N252	30	0.1 at −5	10 at 1.0
1N625	30	1.0 at −20	4 at 1.0
1N626	50	1.0 at −35	4 at 1.0
1N814	50	0.1 at −20	2 at 1.0
1N903	40	0.1 at −40	10 at 1.0
1N903A	40	0.1 at −40	20 at 1.0
1N904	30	0.1 at −30	10 at 1.0

DHD (FIG. 7)

Double heatsink diodes. Specify DO-7 g. DHD (Fig. 7) package for 1N914 and 1U t_{rr} value recovery to 1.0 mA rever ing from 10 mA fwd to −6.0 V, R_L = 0

GE Type	Min. B_V V	µA	V_F at I_F V	mA	Max. at 25 nA
1N914	100	100	1.0	10	25
1N914A	100	100	1.0	20	25
1N914B	100	100	1.0	100	25
1N916	100	100	1.0	10	25
1N916A	100	100	1.0	20	25
1N916B	100	100	1.0	30	25
1N4148*	100	100	1.0	10	25
1N4149	100	100	1.0	10	25
1N4150	50	1	1.0	200	100
1N4151	75	5	1.0	50	50
1N4152	40	5	0.88	20	50
1N4153	75	5	0.88	20	50
1N4154	35	5	1.0	30	100
1N4305	75	5	0.85	10	100
1N4444	70	5	1.0	100	50
1N4446	100	100	1.0	20	25
1N4447	100	100	1.0	20	25
1N4448	100	100	1.0	100	25
1N4449	100	100	1.0	30	25
1N4450	40	5	1.0	200	50
1N4451	40	5	1.0	300	50
1N4454*	75	5	1.0	10	100
1N4606	85	100	1.0	200	100
1N4607	85	100	1.0	350	100
1N4608	85	100	1.0	450	100
1N4727	30	5	0.85	10	100
1N4863	70	5	1.2	100	50
1N4864	125	100	1.1	100	100
DHD800	2	5	0.8	10	2¶
DA805	15	5	0.8	10	2¶
DA806	25	5	0.8	10	2¶

* JAN and JANTX type available. † I_F 10 I_R = 1 mA, recovery to 0.1 mA. ‡ $I_F = I_R$ 10 recovery to 1.0 mA. § Q_S = 40 pC. ¶ µA.

GERMANIUM TUNNEL DIODE
GENERAL PURPOSE (FIG. 9)

Series inductance, 0.5 nH. Typical peal olta 65 mV except TD-9, 60 mV typical; " typ 65 mV ±7.

GE Type	Peak Point I_P mA	±%	Max. Valley Point mA	C
1N3712 (TD-1)	1.0	10	0.18	2
1N3713*(TD-1A)	1.0	2.5	0.14	3
1N3714 (TD-2)	2.2	10	0.48	1
1N3715*(TD-2A)	2.2	2.5	0.31	1
1N3716 (TD-3)	4.7	10	1.04	1
1N3717*(TD-3A)	4.7	2.5	0.60	3
1N3718 (TD-4)	10.0	10	2.20	1
1N3719*(TD-4A)	10.0	2.5	1.40	2
1N3720 (TD-5)	22.0	10	4.80	1
1N3721*(TD-5A)	22.0	2.5	3.10	1
TD-9	0.5	10	10.0	1

* MIL type available.

SEMICONDUCTORS

ILICON SIGNAL DIODES

Capacitan — 2 pF at 0 volts. t_{rr} = 2 nsec at = 10 ., V_R = 6 V, R_L = 100 ohms, re- overy to 0 mA. Max V_F* (I_F = 10-50 mA) = 0 mV.

ATCHED PAIRS (FIG. 12)

GE Type	Min. B_V at 5 μA V	V_f at L_f V	mA	Max. I_R at 25°C nA	V
1N4306	75	0.44-0.55	0.10	50	50
MATCHED QUADS					
1N4307	75	0.44-0.55	0.10	50	50

Maximu difference between diodes in pairs and ads at = −55° to +125°C.

TRA-H SPEED SWITCHING DO-17 (FIG. 10)

Nominal e epoxy package with series con- ductance 1.5 nH.

GE Type	Peak Point mA (±10%)	Maximum Valley Point mA	Cap. pF	Voltage, mV Peak Point Typ.	Fwd I_F=I_P
TD-251	2.2	0.31	3.0	70	500-650
TD-251A	2.2	0.31	1.0	110*	500-650
TD-252	4.7	0.60	4.0	80	500-650
TD-252A	4.7	0.60	1.0	120	500-650
TD-253	10.0	1.40	9.0	75	500-650
TD-253A	10.0	1.40	5.0	80	520-650
TD-253B	10.0	1.40	2.0	120*	550-650
TD-254	22.0	3.80	18.0	90	600 typ.
TD-254A	22.0	3.80	4.0	120*	550-650
TD-255	50.0	8.50	25.0	110	625 typ.
TD-255A	50.0	8.50	5.0	130	640 typ.
TD-256	100	17.50	35.0	150	650 typ.
TD-256A	100	17.50	6.0	180	660 typ.

MICROWAVE (FIG. 13)

High p ormance microwave pill package sup- ied w leads when specified. Dimensions are within JEC DO-20 outline with leads (Fig. 14). series uctance of 0.15 nH. Package capaci- nce, 5 pF. Typical peak point current, 1.85 A. N tive resistance, 60-80 ohms.

GE Type	Maximum C_J pF	R_S Ohms	GE Type	Maximum C_J pF	R_S Ohms
TD-405	3.5	3	TD-405	.60	6
TD-406	1.8	4	TD-406	.48	6
TD-407	1.0	5	TD-407	.37	6
TD-408	.75	5	TD-408	.30	6

ERMA UM LOW CURRENT RECTIFIER CELLS

Max. k 1 Hz surge, 25 amps. Max. oper. temp., C.

JEDEC Type	Fig.	PRV Volts	Max. I_{DC} at 55°C$_A$ mA	Max. Rev. Cur., mA•	Max. FL Voltage Drop
1N91	15	100	150	1.35	.22 V
1N92	15	200	100	0.95	.19 V
1N93	15	300	75	0.6	.18 V

Full le avg. * MIL type available.

SILI N LOW CURRENT RECTIFIER CELLS LEAD MOUNTED (FIG. 15)

Max. k 1 Hz surge, 14 amps, 1N599-1N606A; amp 1N1692-1N1697; 15 amps, all others.

JEDEC Type	PRV Volts	Max. I_{DC} mA	T_A°C	Max. I_R• Cur.	at °C	Max. Oper.°C
1N5	50	750	50	.4 mA	150	165
1N5	100	750	50	.4 mA	150	165
1N5	200	750	50	.3 mA	150	165
1N5	300	750	50	.3 mA	150	165
1N5	400	750	50	.3 mA	150	165
1N5	600	750	50	.3 mA	150	165
1N1	500	675	50	.3 mA	150	150
1N1	600	640	50	.3 mA	150	150
1N1	100	750	25	.4 mA	125	140
1N1	200	750	25	.3 mA	125	140
1N1	300	750	25	.3 mA	125	140
1N1	400	750	25	.3 mA	125	140
1N1	500	750	25	.3 mA	125	125
1N1	600	750	25	.3 mA	125	120
1N1	100	600	50	.5 mA	100	115
1N1	200	600	50	.5 mA	100	115
1N1	300	600	50	.5 mA	100	115
1N1	400	600	50	.5 mA	100	115
1N1	500	600	50	.5 mA	100	115
1N1	600	600	50	.5 mA	100	115

Cycle average. † A types for magnetic service. ype available.

SOLID GLASS RECTIFIERS

A14 (FIG. 16)

Max. peak 1 Hz Surge = 50 amp

JEDEC or GE Type	PRV V	Max. I_{DC} at T_A A	°C
1N5059(A14B)	200	1.0	100
1N5060(A14D)	400	1.0	100
1N5061(A14M)	600	1.0	100
1N5062(A14N)	800	1.0	100
A14F	50	1.0	100
A14A	100	1.0	100
A14P	1000	1.0	90

A14 (FIG. 16)

Transient voltage protected.
Max. peak 1 Hz Surge = 25 amp

1N4245	200	1.0	55
1N4246	400	1.0	55
1N4247	600	1.0	55
1N4248	800	1.0	55
1N4249	1000	1.0	55

A15 (FIG. 17)

Max. peak 1 Hz Surge = 125 amp

A15F	50	3.0	70
A15A	100	3.0	70
1N5624(A15B)	200	3.0	70
1N5628(A15D)	400	3.0	70
1N5626(A15M)	600	3.0	70
1N5627(A15N)	800	3.0	70

MPR (2-PELLET A14)

Utilizes Class 14 construction.
Max. peak 1 Hz Surge = 25 amp

MPR-10	1000	0.5	100
MPR-12	1200	0.5	100
MPR-15	1500	0.5	100

A14 MODULES (POTTED BLOCKS)

A1423BB1AB1*	200	1.5	50
A1423MB1AB1*	600	1.5	50
A1423BF1AB1‡	200	1.4	50
A1423MF1AB1‡	600	1.4	50
A1425MH5AB1§	3000	0.5	50
A1425MH10AB1§	6000	0.4	50
A1425PBH5AB1§	6000	0.2	50
A1425PBH10AB1§	12000	0.16	50

Circuit: * Single-phase FW bridge
‡ Three-phase FW bridge
§ Half-wave series string

Note: Many other circuits/voltages also available.

STUD-MOUNTED (FIG. 18)

JEDEC Type	PRV Volts	Max. I_{DC} mA	Case°C	Max. I_R¶ mA	at °C	Max. FL Drop at mA V	at °C
1N1115*	100	1.5 A	85	.04	150	.65	150
1N1116*	200	1.5 A	85	.03	150	.65	150
1N1117*	300	1.5 A	85	.03	150	.65	150
1N1118*	400	1.5 A	85	.03	150	.65	150
1N1119†	500	1.3 A	85	.03	150	.65	150
1N1120†	600	1.3 A	85	.03	150	.65	150

STUD-MOUNTED (FIG. 19)

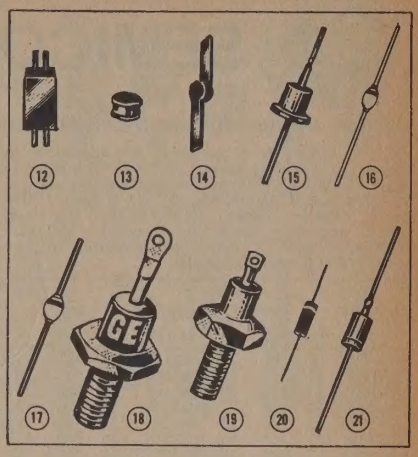
1N1124	200	3.0 A	50‡	0.3	150	1.1	1 A§
1N1124A	200	3.3 A	50‡	0.3	150	1.1	1 A§
1N1125	300	3.0 A	50‡	0.3	150	1.1	1 A§
1N1126	400	3.0 A	50‡	0.3	150	1.1	1 A§
1N1126A	400	3.3 A	50‡	0.3	150	0.5	1 A§
1N1127	500	3.0 A	50‡	0.3	150	1.1	1 A§
1N1128	600	3.0 A	50‡	0.3	150	1.1	1 A§
1N1128A	600	3.3 A	50‡	0.3	150	1.1	1 A§

Max. operating temperature, 150°C except: * 170°C; † 155°C. ‡ Ambient. § At 25°C. ¶ Full cycle average.

RECTIFIER DIODE ASSEMBLIES (FIG. 20)

GE Type	PRV	Max. I_{DC} mA T_A=25°C	T_A=100°C
1N1730	1000	200	100
1N1731	1500	200	100
1N1732	2000	200	100
1N1733	3000	150	75
1N2382	4000	150	75
1N1734	5000	100	50
1N2383	6000	100	50
1N2384	8000	70	35
1N2385	10000	70	35

All information JEDEC registration data.



THYRECTOR DIODES

Use as transient voltage suppressors for connection across a-c input of rectifiers. Gives instant response and high dissipation. Temperature stable. Max. operating temp., 100°C. Sizes: 6RS21 1" sq., 6RS20 37/64" dia.

GE Type	RMS Input V	GE Type	RMS Input V
6RS21SA1D1	25	6RS21SA18D18	450
6RS21SA2D2	50	6RS21SA19D19	475
6RS21SA3D3	75	6RS21SA20D20	500
6RS21SA4D4	100	6RS20SP1B1	30
6RS21SA5D5	125	6RS20SP2B2	60
6RS21SA6D6	150	6RS20SP3B3	90
6RS21SA7D7	175	6RS20SP4B4	120
6RS21SA8D8	200	6RS20SP5B5	150
6RS21SA9D9	225	6RS20SP6B6	180
6RS21SA10D10	250	6RS20SP7B7	210
6RS21SA11D11	275	6RS20SP8B8	240
6RS21SA12D12	300	6RS20SP9B9	270
6RS21SA14D14	350	6RS20SP10B10	300
6RS21SA16D16	400		

1 WATT SILICON ZENER DIODES (FIG. 21)

Tolerance ±10%; Z4X5.1B-1N1776 available ±5% (add suffix A); Z4XL6.2B-Z4XL22B available ±20% (no suffix, Z4XL6.2).

JEDEC or GE Type	Nominal V_{ZT} at I_{ZT} Volts	I_{ZT} mA	Max. Z_{ZT} at I_{ZT} Ohms	Typ. TC %/°C	I_{ZM} T_A= 50°C mA
Z4X5.1B	5.1	100	7.0	0.013	160
1N1765	5.6	100	1.2	0.021	150
1N1766	6.2	100	1.5	0.030	130
1N1767	6.8	100	1.7	0.037	120
1N1768	7.5	100	2.1	0.044	109
1N1769	8.2	100	2.4	0.050	100
1N1770	9.1	50	3.0	0.056	90
1N1771	10.0	50	3.5	0.062	82
1N1772	11.0	50	4.2	0.067	74
1N1773	12.0	50	5.0	0.071	68
1N1774	13.0	50	5.8	0.074	63
Z4X14B	14.0	50	6.6	0.077	58
1N1775	15.0	50	7.6	0.080	54
1N1776	16.0	50	8.6	0.082	51
Z4XL6.2B	6.2	20	9.0	0.030	123
Z4XL7.5B	7.5	20	12.0	0.044	101
Z4XL9.1B	9.1	20	15.0	0.056	83
Z4XL12B	12.0	20	24.0	0.071	63
Z4XL14B	14.0	20	3.0	0.077	54
Z4XL16B	16.0	20	40.0	0.082	47
Z4XL18B	18.0	20	50.0	0.085	43
Z4XL20B	20.0	20	60.0	0.088	38
Z4XL22B	22.0	20	72.0	0.090	34

LIGHT ACTIVATED SILICON SCR'S

Effective irradiance (mW/cm²) to trigger at 25°C T_J, 6 VDC, 0.68-10.0 (L9 and L911 Series, 0.68-4.2). L8, L9, TO-5 outline; others same except diamond base heatsink.

PRV/V_{BO}	(Max. I_{DC}= .44 A, 25°C) Type	Type	(Max. I_{DC}= .77 A, 25°C) Type	Type
25	L8U	L9U	L811U	L911U
50	L8F	L9F	.....	L911F
100	L8A	L9A	L811A	L911A
150	L8G	L9G	L811G	L911G
200	L8B	L9B	L811B	L911B

Complete information contact nearest GE Sales Office listed on inside front or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

SEMICONDUCTORS

SILICON MEDIUM CURRENT RECTIFIER CELLS

Mount directly to a chassis or fin; insulation kit supplied. All units except 1N3569, 1N3670A-73A and 1N3765-1N3768 are also available with reverse polarity. Series 1N248, A, B thru 1N250, A, B, JAN and Series 1N1191-1N1206 also available; complete specs on request. 1N1202A, 1N1204A and 1N1206A also available to JAN and JANTX specifications.

JEDEC or GE Type	Fig.	PRV V★	Max. I_{DC}* A	JEDEC or GE Type	Fig.	PRV V★	Max. I_{DC}* A
1N248C	22	55	20■	1N2158	22	400	25†
1N249C	22	110	20■	1N2159	22	500	25†
1N250C	22	220	20■	1N2160	22	600	25†
1N1183	22	50	35•	1N3208	25	50	15♦
1N1184π	22	100	35•	1N3209	25	100	15♦
1N1185	22	150	35•	1N3210	25	200	15♦
1N1186π	22	200	35•	1N3211	25	300	15♦
1N1187	22	300	35•	1N3212	25	400	15♦
1N1188π	22	400	35•	1N3213	25	500	15♦
1N1189	22	500	35•	1N3214	25	600	15♦
1N1190	22	600	35•	1N3569	19	100	3.5‡
1N1195A	22	300	20■	1N3570	19	200	3.5‡
1N1196A	22	400	20■	1N3571	19	300	3.5‡
1N1197A	22	500	20■	1N3572	19	400	3.5‡
1N1198A	22	600	20■	1N3573	19	500	3.5‡
1N1199A	19	50	12■	1N3574	19	600	3.5‡
1N1200A	19	100	12■	1N3670A	23	700	12■
1N1201A	19	150	12■	1N3671A	23	800	12■
1N1202A	19	200	12■	1N3672A	23	900	12■
1N1203A	19	300	12■	1N3673A	23	1000	12■
1N1204A	19	400	12■	1N3765	24	700	35•
1N1205A	19	500	12■	1N3766	24	800	35•
1N1206A	19	600	12■	1N3767	24	900	35•
1N1341A	19	50	6■	1N3768	24	1000	35•
1N1342A	19	100	6■	1N5331	23	1200	12■
1N1343A	19	150	6■	1N5332	24	1200	35•
1N1344A	19	200	6■	A40A▲	25	100	20§
1N1345A	19	300	6■	A40B▲	25	200	20§
1N1346A	19	400	6■	A40C▲	25	300	20§
1N1347A	19	500	6■	A40D▲	25	400	20§
1N1348A	19	600	6■	A40E▲	25	500	20§
1N1612	19	50	5■	A40F▲	25	50	20§
1N1613	19	100	5■	A40M▲	25	600	20§
1N1614π	19	200	5■	A44A#	26	100	20§
1N1615π	19	400	5■	A44B#	26	200	20§
1N1616π	19	600	5■	A44C#	26	300	20§
1N2154	22	50	25†	A44D#	26	400	20§
1N2155	22	100	25†	A44E#	26	500	20§
1N2156	22	200	25†	A44F#	26	50	20§
1N2157	22	300	25†	A44M#	26	600	20§

π MIL type available.

FAST RECOVERY TYPES

Max. recovery time, 200 nsec except A28 Series, 100 nsec. For reverse polarity add suffix **R** (1N3879**R**, A28A**R**).

1N3879	19	50	6	1N3902	22	300	20
1N3880π	19	100	6	1N3903	22	400	20
1N3881	19	200	6	1N3909π	22	50	30
1N3882	19	300	6	1N3910π	22	100	30
1N3883π	19	400	6	1N3911π	22	200	30
1N3889π	19	50	12	1N3912π	22	300	30
1N3890π	19	100	12	1N3913π	22	400	30
1N3891π	19	200	12	A28A	19	100	12¶
1N3892π	19	300	12	A28B	19	200	12¶
1N3893π	19	400	12	A28C	19	300	12¶
1N3899	22	50	20	A28D	19	400	12¶
1N3900	22	100	20	A28F	19	50	12¶
1N3901	22	200	20				

★ Repetitive. * Stud single phase at 100°C except: ‡ 85°C; § 110°C; ¶ 135°C; • 140°C; † 145°C; ■ 150°C; ♦ 150°C Tc. For reverse polarity, change to: ▲ A41; # A45. π MIL type available.

RECTIFIER DIODES (FIG. 27)

JEDEC Number 160A Avg, 1Hz Surge of 4500A	275A Avg, 1Hz Surge of 5000A	PRV Volts Repetitive	Transient	1ϕ I_R
1N3260	1N4044	50	100	16.0
1N3261	1N4045	100	200	16.0
1N3262	1N4046	150	250	16.0
1N3263	1N4047	200	300	16.0
1N3264	1N4048	250	350	16.0
1N3265	1N4049	300	400	16.0
1N3266	.....	350	450	16.0
1N3267	1N4050	400	525	16.0
1N3268	1N4051	500	650	13.0
1N3269	1N4052	600	800	12.0
1N3270	1N4053	700	925	11.0
1N3271	1N4054	800	1050	9.0
1N3272	1N4055	900	1175	8.0
1N3273	1N4056	1000	1300	7.0

Note: Available also in reverse polarity.

SILICON HIGH CURRENT RECTIFIER CELLS

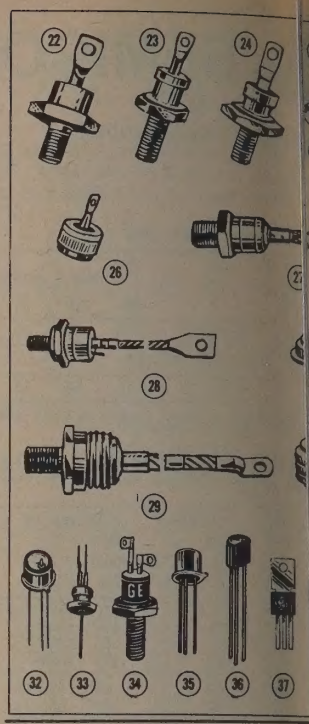
Also available in forward or reverse polarity: Use **A71, A91** or add suffix **R** to JEDEC no. A291 and A295 reverse polarity only.

GE Type	JEDEC No.	Fig.	PRV Volts Repetitive	Transient	Max. I_{DC} A
A70A	.....	28	100	200	100
A70B	1N3289*	28	200	300	100
A70C	1N3290	28	300	400	100
A70D	1N3291*	28	400	525	100
A70E	1N3292	28	500	650	100
A70M	1N3293*	28	600	800	100
A70N	1N3294*	28	800	1050	100
A70P	1N3295*	28	1000	1300	100
A70PA	.....	28	1100	1400	100
A70PB	1N3296	28	1200	1500	100
A70S	.....	28	700	900	100
A70T	.....	28	900	1100	100
A90A	1N3735	27	100	200	250
A90B	1N3736	27	200	300	250
A90C	1N3737	27	300	400	250
A90D	1N3738	27	400	525	250
A90E	1N3739	27	500	650	250
A90M	1N3740	27	600	800	250
A90N	1N3741	27	800	1050	250
A90P	1N3742	27	1000	1300	250
A90PA	.....	27	1100	1400	250
A90PB	.....	27	1200	1500	250
A90S	.....	27	700	925	250
A90T	.....	27	900	1125	250
A291PC	.....	29	1300	1500	250
A291PD	.....	29	1400	1600	250
A291PE	.....	29	1500	1700	250
A291PM	.....	29	1600	1800	250
A291PN	.....	29	1800	2000	250
A291PS	.....	29	1700	1900	250
A295A	.....	29	100	200	500
A295B	.....	29	200	400	500
A295C	.....	29	300	500	500
A295D	.....	29	400	600	500
A295E	.....	29	500	700	500
A295M	.....	29	600	800	500
A295N	.....	29	800	1000	500
A295P	.....	29	1000	1200	500
A295S	.....	29	700	900	500
A295T	.....	29	900	1100	500
A295PA	.....	29	1100	1300	500
A295PB	.....	29	1200	1400	500
A295PC	.....	29	1300	1500	500
A295PD	.....	29	1400	1600	500
A295PE	.....	29	1500	1700	500
A295PM	.....	29	1600	1800	500
A295PS	.....	29	1700	1900	500
A295PN	.....	29	1800	2000	500

* MIL type available.

PRESSURE MOUNTED PACKAGES

GE Type	PRV Volts Rep	Tran	1ϕ I_R	GE Type	PRV Volts Rep	Tran	1ϕ I_R
1ϕ avg = 400 A. 1 Hz surge = 4500 A. (Fig. 30)							
A390A	100	200	16	A390S	700	925	12.5
A390B	200	300	16	A396N	800	1050	10
A390C	300	400	16	A390T	900	1175	10
A390D	400	525	16	A390P	1000	1300	8
A390E	500	650	15	A390PA	1100	1400	8
A390M	600	800	12.5	A390PB	1200	1500	8
1ϕ avg = 400 A. 1 Hz surge = 3300 A. (Fig. 30)							
A396A	100	200	16	A396M	600	720	12.5
A396B	200	300	16	A396S	700	840	12.5
A396C	300	400	16	A396N	800	950	10
A396D	400	500	16	A396T	900	1075	10
A396E	500	600	15	A396P	1000	1200	10
1ϕ avg = 740 A. 1 Hz surge = 8400 A. (Fig. 31)							
A500P	1000	1100	30	A500LA	2100	2200	30
A500PA	1100	1200	30	A500LB	2200	2300	30
A500PB	1200	1300	30	A500LC	2300	2400	30
A500PC	1300	1400	30	A500LD	2400	2500	30
A500PD	1400	1500	30	A500LE	2500	2600	30
A500PE	1500	1600	30	A500LM	2600	2700	30
A500PM	1600	1700	30	A500LS	2700	2800	30
A500PS	1700	1800	30	A500LN	2800	2900	30
A500PN	1800	1900	30	A500LT	2900	3000	30
A500PT	1900	2000	30	A500LP	3000	3100	30
A500L	2000	2100	30				
1ϕ avg = 1000 A. 1 Hz surge = 10,000 A. (Fig. 31)							
A540A	100	200	20	A540PA	1100	1200	20
A540B	200	300	20	A540PB	1200	1350	20
A540C	300	400	20	A540PC	1300	1450	20
A540D	400	500	20	A540PD	1400	1600	20
A540E	500	600	20	A540PE	1500	1700	20
A540M	600	700	20	A540PM	1600	1800	20
A540N	700	800	20	A540PN	1700	1900	20
A540S	800	900	20	A540PS	1900	2000	20
A540T	900	1000	20	A540PT	1900	2100	20
A540P	1000	1100	20	A540L	2000	2200	20



GE Type	PRV Volts Rep	Tran	1ϕ I_R	GE Type	PRV V Rep	
1ϕ avg = 1500 A. 1 Hz surge = 15,000 A. Fig.						
A570F	50	100	20	A570D	400	
A570A	100	200	20	A570E	500	
A570B	200	300	20	A570M	600	
A570C	300	400	20			

SILICON LOW CURRENT SCR

GE or JEDEC No.	Fig.	PRV and V_{BO}	Max. I_{DC} A	GE or JEDEC No.	Fig.
2N1595	32	50	1.6	2N877	35
2N1596	32	100	1.6	2N878	35
2N1597	32	200	1.6	2N879	35
2N1598	32	300	1.6	2N880	35
2N1599	32	400	1.6	2N881	35
2N2322	32	25	1.6	2N885	35
2N2323*	32	50	1.6	2N886	35
2N2324*	32	100	1.6	2N887	35
2N2325	32	150	1.6	2N888	35
2N2326*	32	200	1.6	2N899	35
2N2327	32	250	1.6	C6U‡	32
2N2328	32	300	1.6	C6F‡	32
2N2329	32	400	1.6	C6A‡	32
2N2322A	32	25	1.6	C6G‡	32
2N2323A*	32	50	1.6	C6B‡	32
2N2324A*	32	100	1.6	C12U†	34
2N2325A	32	150	1.6	C12F†	34
2N2326A*	32	200	1.6	C12A†	34
2N2327A	32	250	1.6	C12G†	34
2N2328A	32	300	1.6	C12B†	34
2N2344	32	25	.6	C12H†	34
2N2345	32	50	.6	C12C†	34
2N2346	32	100	.6	C15U	34
2N2347	32	150	.6	C15F	34
2N2348	32	200	.6	C15A	34
2N1949	33	25	1.1	C15G	34
2N1930	33	50	1.1	C15B	34
2N1931	33	100	1.1	C15C	34
2N1932	33	150	1.1	C15D	34
2N1933	33	200	1.1	C15E	34
2N1934	33	250	1.1	C15M	34
2N1935	33	300	1.1	C103Y	36
2N1770A	34	25	7.4	C103YY	36
2N1771A*	34	50	7.4	C103A	36
2N1772A*	34	100	7.4	C103B	36
2N1773A	34	150	7.4	C106Q1	37
2N1774A*	34	200	7.4	C106Y1	37
2N1775A	34	250	7.4	C106F1	37
2N1776A*	34	300	7.4	C106A1	37
2N1777A*	34	400	7.4	C106B1	37
2N1770	34	25	6	C106C1•	37
2N1771	34	50	6	C106Q2	38
2N1772	34	100	6	C106Y2	38
2N1773	34	150	6	C106F2	38
2N1774	34	200	6	C106A2	38
2N1775	34	250	6	C106B2	38
2N1776	34	300	6	C106C2•	38
2N1777	34	400	6	C103Q3	39
2N1778	34	500	6	C106Y3	39
2N2619	34	600	6		

Continued on ne

SEMICONDUCTORS

LOW CURRENT SCR'S (Cont'd)

GE No.	PRV and V_{BO}	Max. I_{DC} A	GE No.	Fig.	PRV and V_{BO}	Max. I_{DC} A
106F3	50	2.0	C107B1	37	200	2.0
106A3	100	2.0	C107Y2	38	30	2.0
106B3	200	2.0	C107F2	38	50	2.0
106C3•	300	2.0	C107A2	38	100	2.0
			C107B2	38	200	2.0
106Q4	15	2.0				
106Y4	30	2.0	C107Y3	39	30	2.0
106F4	50	2.0	C107F3	39	50	2.0
106A4	100	2.0	C107A3	39	100	2.0
106B4	200	2.0	C107B3	39	200	2.0
106C4•	300	2.0				
			C107Y4	40	30	2.0
107Y1	30	2.0	C107F4	40	50	2.0
107F1	50	2.0	C107A4	40	100	2.0
107A1	100	2.0	C107B4	40	200	2.0

Turn-off ...e guaranteed at 12 μsec max. Designed ...invert... applications. ‡For diamond base heat-...versio... Fig. 30) of C6 Series use **C611-**. • X100 ...ies, fo... only. *MIL type available.

...IM CURRENT SCR'S (FIG. 41)

...ies C2... C30, C31, and C34-2 Fig. 42; Series ...C2... and C34-1 Fig. 43; Series C122 Fig. 44.

GE or JEDEC No.	PRV and V_{BO}	Max. I_{DC} A	GE or JEDEC No.	PRV and V_{BO}	Max. I_{DC} A
20U	25	7.4	2N1842	25	16
20F	50	7.4	2N1843	50	16
20A	100	7.4	2N1844	100	16
20B	200	7.4	2N1845	150	16
20C	300	7.4	2N1846	200	16
20D	400	7.4	2N1847	250	16
			2N1848	300	16
22U	25	7.4	2N1849	400	16
22F	50	7.4	2N1850	500	16
22A	100	7.4	C36M	600	16
22B	200	7.4	C36S	700	16
22C	300	7.4	C36N	800	16
22D	400	7.4			
30U*	25	25	2N1842A	25	25
30F*	50	25	2N1843A	50	25
30A*	100	25	2N1844A	100	25
30B*	200	25	2N1845A	150	25
30C*	300	25	2N1846A	200	25
30D*	400	25	2N1847A	250	25
			2N1848A	300	25
32U†	25	25	2N1849A	400	25
32F†	50	25	2N1850A	500	25
32A†	100	25			
38B†	200	25	C37U	25	25
32C†	300	25	C37F	50	25
32D†	400	25	C37A	100	25
			C37B	200	25
34U1	25	25	C37C	300	25
34F1	50	25	C37D	400	25
34A1	100	25	C37E	500	25
34B1	200	25	C37M	600	25
34C1	300	25	C37S	700	25
34D1	400	25	C37N	800	25
34E1	500	25			
			2N5204	600	25
34U	25	25	2N5205	800	25
34F2	50	25	2N5206	1000	25
34A2	100	25	2N5207	1200	25
34B2	200	25	C38U	25	35
34C2	300	25	C38F	50	35
34D2	400	25	C38A	100	35
34E2	500	25	C38G	150	35
			C38B	200	35
35U	25	35	C38H	250	35
35F	50	35	C38C	300	35
35A	100	35	C38D	400	35
35C	150	35	C38E	500	35
35E	200	35			
35B	250	35	C122F	50	8.0
35D	300	35	C122B	200	8.0
35H	400	35	C122D	400	8.0
35J	500	35			
35P	600	35	C137E	500	35
35M	700	35	C137M	600	35
35N	800	35	C137N	800	35
			C137P	1000	35
N6	25	25	C137PB	1200	35
N6	50	25			
N6	100	25	2N3649	50	25
N6	150	25	2N3650	100	25
N6	200	25	2N3651	200	25
N6	250	25	2N3652	300	25
N6	300	25	2N3653	400	25
N6	400	25	2N3654‡	50	25
N6	500	25	2N3655‡	100	25
N6	600	25	2N3656‡	200	25
N6	700	25	2N3657‡	300	25
N6	800	25	2N3658‡	400	25

...required gate signal to 9 mA change no. ...11-; † **C33-**. ‡ Inverter type; turn-off time ...ed at 10 μsec max. § Inverter type; turn-off ...ranteed at 20 μsec max. * Mil type available.

HIGH CURRENT SCR'S

Maximum I_{RMS} 55 amps.

GE Type Fig. 45	GE Type Fig. 46	PRV and V_{BO}	GE Type Fig. 45	GE Type Fig. 46	GE Type Fig. 47	PRV and V_{BO}
C45U	C46U	25	C45E	C46E	C145E	500
C45F	C46F	50	C45M	C46M	C145M	600
C45A	C46A	100	C45S	C46S	C145S	700
C45G	C46G	150	C45N	C46N	C145N	800
C45B	C46B	200	C45T	C46T	C145T	900
C45H	C46H	250	.....	.....	C146P	1000
C45C	C46C	300	.....	.....	C145PA	1100
C45D	C46D	400	.....	.....	C145PB	1200

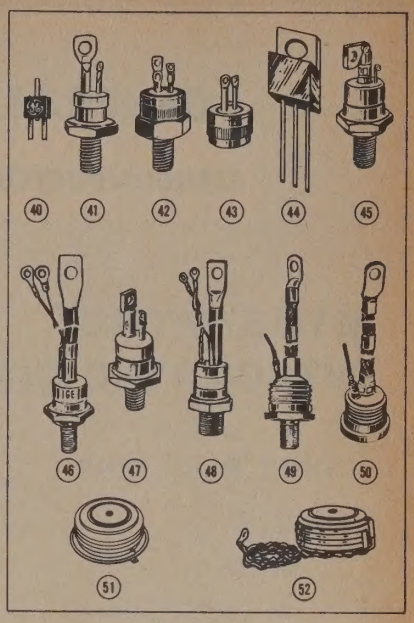
Max. I_{RMS} 110 amps. Guaranteed Turn-Off Time: C55, C56 and inverter type C155 and C157 Series, less than 20 μsec; inverter type C154 and 156 Series, less than 10 μsec.

GE Type Fig. 46	GE Type Fig. 45	PRV and V_{BO}	GE Type Fig. 46	GE Type Fig. 45	PRV and V_{BO}
C55U	C56U	25	C150PA	C152PA	1100
C55F	C56F	50	C150PB	C152PB	1200
C55A	C56A	100	C150PC	C152PC	1300
C55G	C56G	150			
C55B	C56B	200	C154A	C156A	100
C55H	C56H	250	C154B	C156B	200
C55C	C56C	300	C154C	C156C	300
C55D	C56D	400	C154D	C156D	400
C55E	C56E	500	C154E	C156E	500
C55M	C56M	600	C154M	C156M	600
C150E	C152E	500	C155A	C157A	100
C150M	C152M	600	C155B	C157B	200
C150S	C152S	700	C155C	C157C	300
C150N	C152N	800	C155D	C157D	400
C150T	C152T	900	C155E	C157E	500
C150P	C152P	1000	C155M	C157M	600

Max. I_{DC} = 235A except C50, C52 and C60 Series, 110A; C290 Series, 470A; C60 Series T_J = 150°C max.

GE Type Fig. 45	GE Type Fig. 46	JEDEC No. Fig. 46	PRV and V_{BO}	GE Type Fig. 48		PRV and V_{BO}
.....	C50U	2N1909	25	C180A	.....	100
C52F	C50F	2N1910*	50	C180B	.....	200
C52A	C50A	2N1911*	100	C180C	.....	300
C52G	C50G	2N1912	150	C180D	.....	400
C52B	C50B	2N1913*	200	C180M	.....	600
C52H	C50H	2N1914	250	C180E	.....	500
C52C	C50C	2N1915*	300	C180S	.....	700
C52D	C50D	2N1916*	400	C180N	.....	800
C52E	C50E	.....	500	C180T	.....	900
C52M	C50M	.....	600	C180P	.....	1000
C52S	C50S	.....	700	C180PA	.....	1100
C52N	C50N	.....	800	C180PB	.....	1200
C52T	C50T	.....	900	C180PC	.....	1300
.....	C60U	2N2023	25	C185A‡	.....	100
C62F	C60F	2N2024	50	C185B‡	.....	200
C62A	C60A	2N2025	100	C185C‡	.....	300
C62G	C60G	2N2026	150	C185D‡	.....	400
C62B	C60B	2N2027	200	C185E‡	.....	500
C62H	C60H	2N2028	250	C185M‡	.....	600
C62C	C60C	2N2029	300	Fig. 49	Fig. 50	
C62D	C60D	2N2030	400	C280S	C281S	700
C62E	C60E	.....	500	C280N	C281N	800
.....	.....	2N2031	50	C280T	C281T	900
C159A	C158A	.....	100	C280P	C281P	1000
C159B	C158B	.....	200	C280PA	C281PA	1100
C159C	C158C	.....	300	C280PB	C281PB	1200
C159D	C158D	.....	400	C280PC	C281PC	1300
C159E	C158E	.....	500	C280PD	C281PD	1400
C159M	C158M	.....	600	C280PE	C281PE	1500
C159S	C158S	.....	700	C280PM	C281PM	1600
C159N	C158N	.....	800	C280PS	C281PS	1700
C159T	C158T	.....	900	C280PN	C281PN	1800
C159P	C158P	.....	1000	C290A	C291A	100
C159PA	C158PA	.....	1100	C290B	C291B	200
C159PB	C158PB	.....	1200	C290C	C291C	300
				C290D	C291D	400
		Fig. 45		C290E	C291E	500
.....	.....	2N1792†	50	C290M	C291M	600
.....	.....	2N1793†	100	C290S	C291S	700
.....	.....	2N1794†	150	C290N	C291N	800
.....	.....	2N1795†	200	C290T	C291T	900
.....	.....	2N1796†	250	C290P	C291P	1000
.....	.....	2N1797†	300	C290PA	C291PA	1100
.....	.....	2N1798†	400	C290PB	C291PB	1200

* MIL type available. † PRV rating shown is 20% higher than V_{BO} rating. ‡ Inverter type.



PRESS PAK SCR'S (FIG. 51)

General Electric Type I_{AVG} = 115A	115A *	115A †	110A ‡	235A	250A †	PRV and V_{BO}
C350A	C354A	C355A	C358A	C380A	C385A	100
C350B	C354B	C355B	C358B	C380B	C385B	200
C350C	C354C	C355C	C358C	C380C	C385C	300
C350D	C354D	C355D	C358D	C380D	C385D	400
C350E	C354E	C355E	C358E	C380E	C385E	500
C350M	C354M	C355M	C358M	C380M	C385M	600
C350S	.....	.....	C358S	C380S	.....	700
C350N	.....	.....	C358N	C380N	.....	800
C350T	.....	.....	C358T	C380T	.....	900
C350P	.....	.....	C358P	C380P	.....	1000
C350PA	.....	.....	C358PA	C380PA	.....	1100
C350PB	.....	.....	C358PB	C380PB	.....	1200
C350PC	.....	.....	C358PC	C380PC	.....	1300

Tg min = *10 μs, †20 μs, ‡40 μs.

PRESSURE MOUNTED SCR'S (FIG. 52)

General Electric Type I_{RMS} = 550A *	850A †	625A ‡	625A §	PRV and V_{BO}
.....	.....	C506A	C507A	100
.....	.....	C506B	C507B	200
.....	.....	C506C	C507C	300
.....	.....	C506D	C507D	400
C398E	.....	C506E	C507E	500
C398M	.....	C506M	C507M	600
C398S	C501S	.....	C507S	700
C398N	C501N	.....	C507N	800
C398T	C501T	.....	C507T	900
C398P	C501P	.....	C507P	1000
C398PA	C501PA	.....	C507PA	1100
C398PB	C501PB	.....	C507PB	1200
.....	C501PC	.....	C507PC	1300
.....	C501PD	.....	C507PD	1400
.....	C501PE	.....	.....	1500
.....	C501PM	.....	.....	1600
.....	C501PS	.....	.....	1700

Tg min = *30 μs, †300 μs, ‡40 μs, §100 μs, ¶60

General Electric Type I_{RMS} = 625A ¶	450A π	1125A △	1000A △	PRV and V_{BO}
.....	.....	C520F	C530F	50
C508A	C510A	C520A	C530A	100
.....	.....	C520G	.....	150
C508B	C510B	C520B	C530B	200
.....	.....	C520H	.....	250
C508C	C510C	C520C	C530C	300
C508D	C510D	C520D	C530D	400
C508E	C510E	.....	C530E	500
C508M	C510M	.....	C530M	600
C508S	C510S	.....	.....	700
C508N	.....	.....	.....	800
C508T	.....	.....	.....	900
C508P	.....	.....	.....	1000
C508PA	.....	.....	.....	1100
C508PB	.....	.....	.....	1200

Tg min = ¶60 μs, π15 μs, △150 μs,

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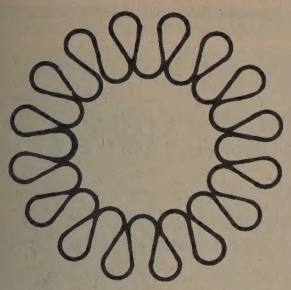

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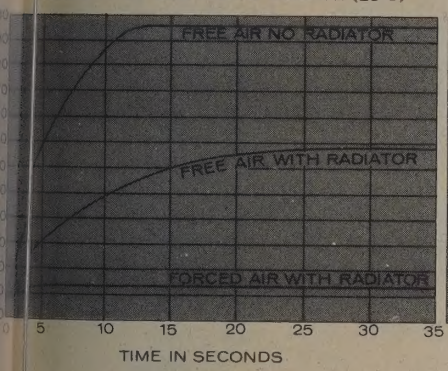

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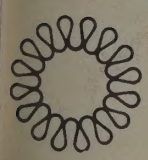

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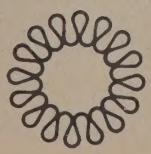

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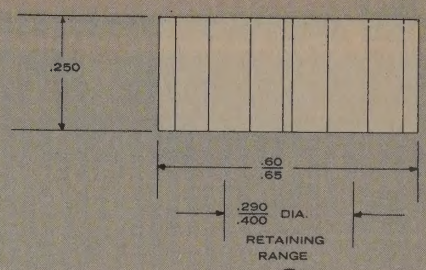
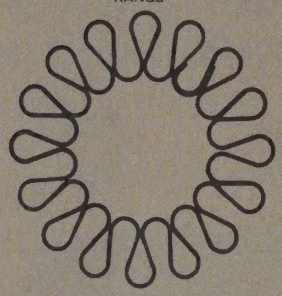
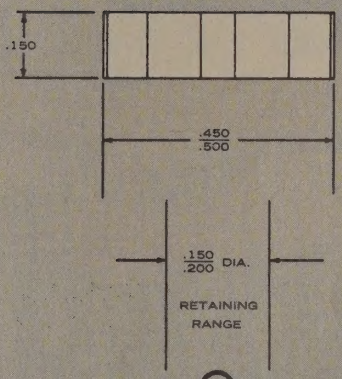
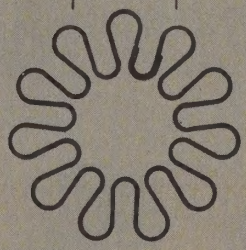


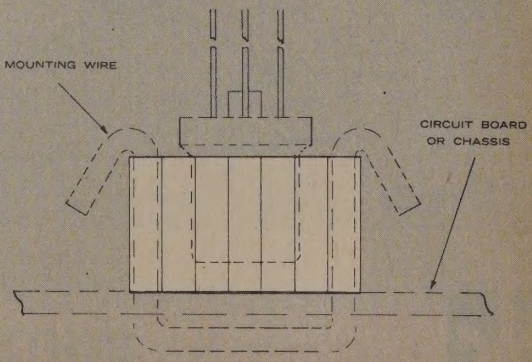
TR 101





TR 118





TYPICAL INSTALLATION FOR COOLING AND RETAINING TRANSISTOR

THE ADVANCED LINE OF HALL EFFECT DEVICES AND MAGNETORESISTORS FOR

DETECTION
MEASUREMENT
COMPUTATION
CONTROL
PROBES
MULTIPLIERS
MODULATORS
TAPE HEADS
CURRENT MEASURING RINGS
PICK-UPS
WATTMETERS
TRANSDUCERS

ISC MAGNETICS DIVISION products are the result of over fifteen years research, development and application engineering on Hall Effect components and magneto-resistors for a broad range of detection, measurement, computation and control applications.

More than 30 different Hall generators and 15 different magnetoresistors, all in stock for immediate delivery, are available as standard catalog items.

Our applications engineering staff is at your disposal to discuss requirements for "black boxes" and complete systems involving processing, material handling, current regulation, and other automatic controls for military, space, and industrial applications.

COMPLETE GALVANOMAGNETIC DEVICE CATALOG AVAILABLE.

PARTIAL LIST OF HALL GENERATORS

Nomenclature		Type	Sens. V/AKG	Control Current (MA)	Input/Ouput Resistance	Size L/W/T (D)	Price
Transverse Field Probes	Flexible	FA-22e	0.063	150	2	4.00/.120/.032	$ 33.00
	General	EA-218	0.085	100	3	.280/.128/.020	19.00
	Precision	FC-33	0.145	100	5	.600/.320/0.060	91.44
	Thin	SBV-525	0.097	100	2.5	.800/.080/.012	79.00
	Ultrathin	RHY-19	0.150	100	3.5	.880/.088/.006	198.00
Axial Field Probes	General	RHY-11	0.07	150	3	0.180	28.34
	Small	SBV-552	0.04	100	1.5	0.148	71.46
	Ultra small	RHY-10	0.07	100	2	0.150	66.50

Nomenclature		Type	Sens. V/AKG	Control Current (MA)	Input/Output Resistance	Size L/W/T (D)	Price
Special Environment Field Probes	−269 to +80°C Axial	RHY-18	0.6	35	30	0.160	$33.25
	−269 to +80°C Transverse	RHY-17	0.6	60	30	0.360 x 0.172 x 0.020	30.25
	−70 to +230°C Transverse	SV-210X	0.6	60	30	0.320 x 0.140 x 0.020	47.25

Numerous other probes, including thin film and ferrite embedded types are described in our catalog and all are stocked for immediate delivery.

Multiplers and current sensing yoke assemblies using Hall Generators or Magnetoresistors can be designed to OEM requirements.

MAGNETORESISTORS

More than 15 different magnetoresistors are stocked covering a wide range of zero field resistances (47 to 5,000 ohms), units with resistance changes of from 1.5 to 3.2 and temperature coefficients of from −0.05 to −0.40%/°C.

ISC * MAGNETICS

Division of INSTRUMENT SYSTEMS CORPORATION

770 Park Avenue, Huntington, N. Y. 11743

Telephone: (516) 423-6200 / TWX: 510-226-6983 / Cable Address: INSSYSTHTGN

IERC

Heat Sinks/Dissipators and Retainers

for semiconductors, integrated circuits and microcircuits

INTERNATIONAL ELECTRONIC RESEARCH CORPORATION
a corporate division of DYNAMICS CORPORATION OF AMERICA
135 West Magnolia Blvd. Burbank, California 91508 213/849-2481

Dissipation capabilities from milliwatts to kilowatts in natural convection and forced air environments

IERC pioneered development of semiconductor heat dissipators and continues to design and produce the most efficient and economical cooling devices available. Because of space considerations, this Short Form Catalog lists only the most popular models of these devices. If you don't see a device which precisely meets your requirements, get in touch with your local IERC Technical Sales Representative (see back cover) or contact the factory. Chances are excellent that we have exactly the device you need in stock.

CUSTOM DESIGNS — Tooling is already available for hundreds of variations of the standard products listed in this catalog. From this reservoir most special requirements can be met without additional tooling charges. In addition, IERC has a large staff of design and application engineers to serve you in developing special products to meet your individual needs. Consult your IERC Technical Sales Representative or the factory for assistance on modified or custom products.

HOW TO ORDER FROM THIS CATALOG — The heat sinks/dissipators and retainers listed in this catalog are standard products designed to meet the requirements of most semiconductor case types. Concise instructions for ordering these products have been included in the product listings.

VARIOUS STANDARD MATERIALS AND FINISHES — IERC products are available in a variety of hole patterns, mounting configurations, materials and finishes for all commercial and military applications. For example, Thermal Link retainers are available in beryllium copper for use when a constant retaining force is required for severe shock and vibration environments, or where the semiconductor must be inserted and removed from the retainer numerous times. They are also available as unplated brass parts, at a considerable cost savings, for use when functional requirements are less stringent. Various finishes are also available, including IERC's electrically insulating finish, *Insulube 448* (See below), for isolating semiconductors with electrically hot cases. As space allowed, instructions for ordering these variations have been included; however, for further assistance contact your local IERC Technical Sales Representative or the factory.

IMMEDIATE DELIVERY — Authorized industrial distributors throughout the U.S. and Canada provide immediate availability from local stock of the broad IERC standard product line.

INSULUBE 448® FINISH FOR HEAT DISSIPATORS

Insulube 448 is the only proven finish for positive electrical insulation (up to 500 volts DC) in electronic equipment that meets the most stringent environmental requirements. Non-hygroscopic. High emissivity surface. Salt spray resistant. Low thermal resistance. Unaffected by elevated temperature. High dielectric strength. High insulation resistance. Write for Bulletin 123.

MOST PARTS IN THIS CATALOG MAY BE COVERED BY ONE OR MORE OF THESE U. S. PATENTS: 3,195,628; 3,277,346; RE25,184; 3,213,336; 3,212,569; 3,208,511; 3,213,324 AND/OR PATENTS PENDING.

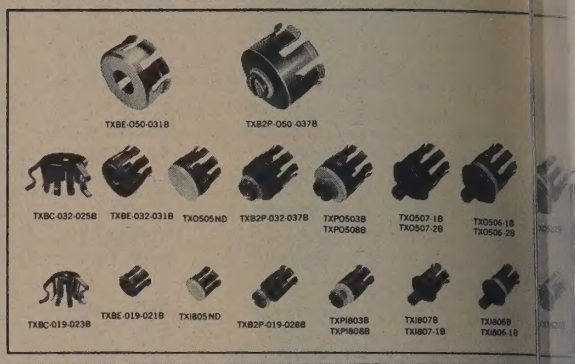
INSULUBE 448 IS A REGISTERED TRADE MARK OF INTERNATIONAL ELECTRONIC RESEARCH CORPORATION.

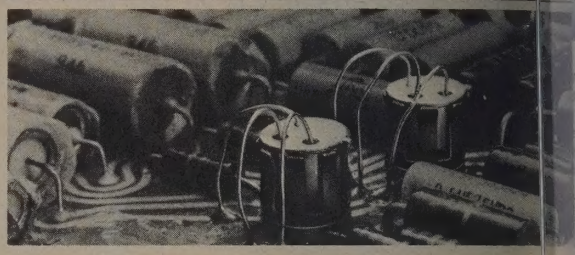
Lead-Mounted metal case semiconductors

TO-5, TO-8, TO-18 case size transistors and IC

For additional dissipators for TO-8 case size transistors and IC's, see pages 1 and 1901. For additional dissipators for TO-5 IC's, see page 1900.

THERMAL LINK SERIES





Thermal Links are excellent thermal links between semiconductor and chassis heat sink and are also efficient retainers and heat sinks when mounted to boards because of their excellent conductivity and extra mass. Beryllium copper fingers under spring tension firmly retain the semiconductor, permit wide diameter variations, and simplify transistor insertion and removal. Available beryllium oxide (BeO) washer for high frequency applications. Write for Bulletins 141 and 144.

STANDARD THERMAL LINK SERIES

IERC PART NO.	DIMENSIONS		SEMICONDUCTOR	MOUNTING METHOD
	DIA.	HEIGHT		
TXBC-019-023B	.43"	.23"	1 TO-18	SPRING CLIP
TXBC-032-025B	.56"	.25"	1 TO-5	SPRING CLIP
TXBE-019-021B	.22"	.21"	1 TO-18	RIVET, SOLD
TXBE-032-031B	.37"	.31"	1 TO-5	RIVET, SOLD
TXBE-050-028B	.54"	.28"	1 TO-8	RIVET, SOLD
TXB2P-019-028B	.22"	.28"	1 TO-18	2-56 SCREW
TXB2P-032-037B	.37"	.37"	1 TO-5	4-40 SCREW
TXB2P-050-037B	.54"	.37"	1 TO-8	4-40 SCREW
TX1807B	.25"	.50"	1 TO-18	4-40 S
TX1807-1B	.25"	.50"	1 TO-18	6-32 S
TX0507-1B	.37"	.59"	1 TO-5	6-32 S
TX0507-2B	.37"	.59"	1 TO-5	10-32 D
TX1847B	.25"	.28"	1 TO-18	2-56 HEX NUT
TX0547B	.37"	.41"	1 TO-5	4-40 HEX NUT

THERMAL LINK SERIES WITH BeO WASHER

IERC PART NO.	SEMICONDUCTOR	MOUNTING METHOD
TXP1803B*	1 TO-18	2-56 SCRE
TXP1808B**	1 TO-18	2-56 SCRE
TXP0503B*	1 TO-5	4-40 SCRE
TXP0508B**	1 TO-5	4-40 SCRE
TX1805ND**	1 TO-18	SOLDER
TX0505ND**	1 TO-5	SOLDER
TX1806B***	1 TO-18	4-40 STUD
TX1806-1B***	1 TO-18	6-32 STUD
TX0506-1B***	1 TO-5	6-32 STUD
TX0506-2B***	1 TO-5	10-32 STUD
TX1822B***	1 TO-18	2-56 HEX N
TX0522B***	1 TO-5	4-40 HEX N

Letter "B" at end of part number denotes black cadmium finish; delete letter "B" for Insulube 448 finish; for dull nickel substitute letters "ND".

BeO Washer adds .06" to the height dimension of a standard Thermal Link Retainer.

*Separate BeO washer.

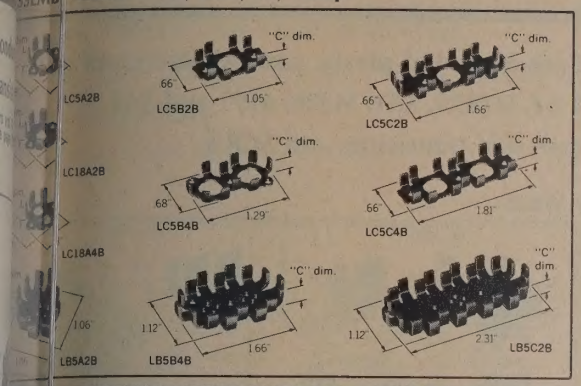
**BeO washer brazed to dissipator.

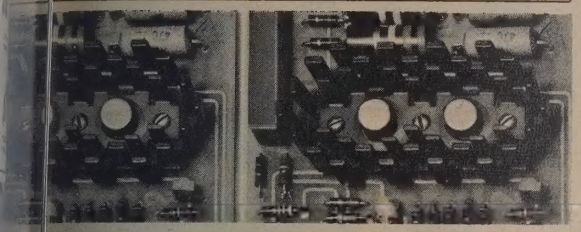
***BeO washer brazed between stud, or hex nut, and dissipator. †Screw and nut and nylon washer included. Contact your IERC Technical Sales Representative, or factory regarding dissipator/retainers for other semiconductor case sizes, or finishes. Insulube finish is a 500 volt dielectric coating.

IERC

INTERNATIONAL ELECTRONIC RESEARCH CORPORATION
a corporate division of DYNAMICS CORPORATION OF AMERICA

SSEMB SERIES — (LB, base; LC, clamp)





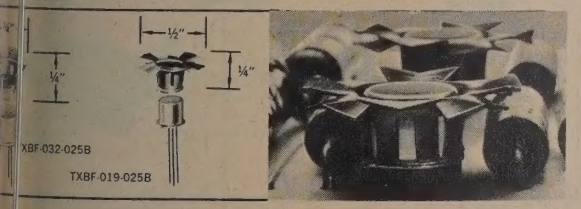
aluminum devices provide excellent heat dissipation for low, gh power semiconductors in TO-18 and TO-5 case sizes and IC's case size. IERC's patented staggered-finger configuration opti- on currents and radiating surface areas; requires minimum board nting area. Both single and dual assemblies (for thermal mating of onductors). Write for Bulletin 135.

IERC ASSEMBLY PART NO. (BASE AND CLAMP)					SEMI-CONDUCTOR
COM'L. BLACK* ANODIZE	MIL. BLACK** ANODIZE	INSULUBE** 448	DIMENSION "C" ASSY. OR BASE	DIMENSION "C" CLAMP	
LP5A1WCB	LP5A1B	LP5A1	1/2"	7/16"	1 TO-5
LP5A2WCB	LP5A2B	LP5A2	5/16"	1/4"	1 TO-5
LP18A1WCB	LP18A1B	LP18A1	1/2"	7/16"	1 TO-18
LP18A2WCB	LP18A2B	LP18A2	5/16"	1/4"	1 TO-18
LP18A3WCB	LP18A3B	LP18A3	1/2"	7/16"	2 TO-18
LP18A4WCB	LP18A4B	LP18A4	5/16"	1/4"	2 TO-18
LP5B1WCB	LP5B1B	LP5B1	1/2"	7/16"	1 TO-5
LP5B2WCB	LP5B2B	LP5B2	5/16"	1/4"	1 TO-5
LP5B3WCB	LP5B3B	LP5B3	1/2"	7/16"	2 TO-5
LP5B4WCB	LP5B4B	LP5B4	5/16"	1/4"	2 TO-5
LP5C1WCB	LP5C1B	LP5C1	1/2"	7/16"	1 TO-5
LP5C2WCB	LP5C2B	LP5C2	5/16"	1/4"	1 TO-5
LP5C3WCB	LP5C3B	LP5C3	1/2"	7/16"	2 TO-5
LP5C4WCB	LP5C4B	LP5C4	5/16"	1/4"	2 TO-5

holes base uninsulated. **Lead holes in base are insulated.

clamp may be used separately as retaining devices. To order, change first two letters assembly part number to "LC". Bases may also be ordered separately by changing s of the assembly part number to "LB". For example, LB5A1 or LB5A2 may for -37 transistors such as 2N1172 and 2N1609. Standard brass or nylon hardware able, mounting an LP assembly to 1/16" P-C board or chassis. Consult your IERC at S Representative for ordering information.

TO SERIES



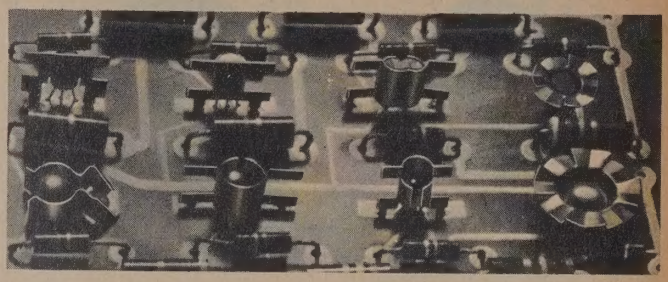
ent devices give excellent case temperature reductions in either rced convection, yet cost only pennies. Design adds virtually nothing ight or area. Beryllium copper fingers under spring tension firmly emiconductor; accommodate a wide range of case diameters. Fast, ss-on installation; no tools needed. Write for Bulletin 131.

	SEMICONDUCTOR
B	1 TO-5 or any .305" to .335" dia. case
B	1 TO-18 or any .178" to .196" dia. case

end of part number cadmium finish.

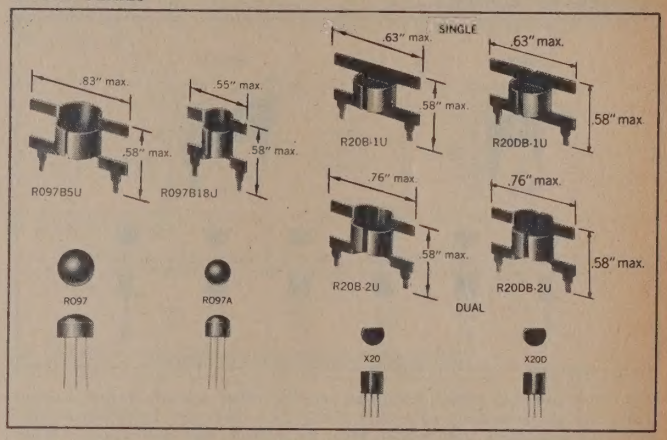
Note: For large quantity commercial applications both parts may be ordered in brass, unplated or with a black oxide finish, at considerable cost savings. Change model number to TXCF-032-025CB and TXCF-019-025CB for brass, black oxide; and TXCF-032-025U and TXCF-019-025U for brass, unplated.

Lead-Mounted plastic case semiconductors R097, R097A and D-type case size transistors



Low cost IERC dissipators/retainers help you get maximum efficiency from lead-mounted plastic case semiconductors. All series provide increased power capabilities (from 10% to 30%), additional operating and safety margins, reduction of failure due to solder heat, and excellent retention in shock and vibration environments. All models available in brass or beryllium copper. Write for Bulletin 148.

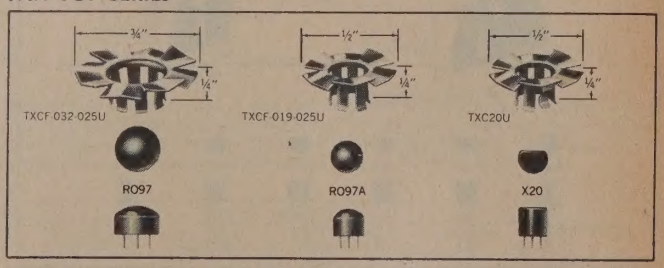
SPADE SERIES



Excellent dissipators and retainers. "Stand off" legs provide positive 0.1" grid location for automatic insertion in P-C board; hold transistor above solder, eliminating possible thermal damage. Also provide RF shielding.

IERC BRASS PART NO		IERC BERYLLIUM COPPER PART NO.			SEMI-CONDUCTOR
UNPLATED (STANDARD)	BLACK OXIDE	UNPLATED	BLACK OXIDE	BLACK CADMIUM PLATE	
R097B5U	R097B5CB	R0975U	R0975CB	R0975B	1 R097
R097B18U	R097B18CB	R09718U	R09718CB	R09718B	1 R097A
R20B-1U	R20B-1CB	R20-1U	R20-1CB	R20-1B	1 X-20
R20B-2U	R20B-2CB	R20-2U	R20-2CB	R20-2B	2 X-20
R20DB-1U	R20DB-1CB	R20D-1U	R20D-1CB	R20D-1B	1 X-20D
R20DB-2U	R20DB-2CB	R20D-2U	R20D-2CB	R20D-2B	2 X-20D

FAN TOP SERIES



Cost only pennies, yet provide excellent heat dissipation. Add virtually nothing to board area or height. Smooth, press-on installation; no tools needed.

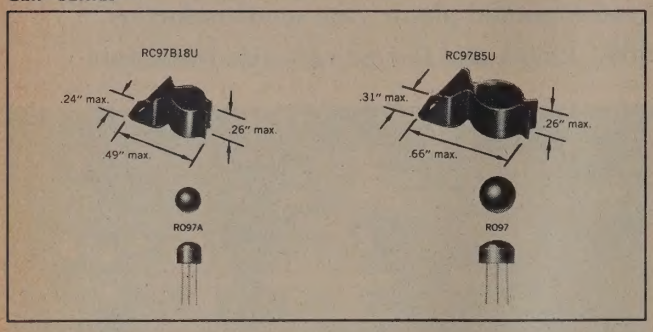
IERC BRASS PART NO.		IERC BERYLLIUM COPPER PART NO.			SEMI-CONDUCTOR
UNPLATED (STANDARD)	BLACK OXIDE	UNPLATED	BLACK OXIDE	BLACK CADMIUM PLATE	
TXCF-019-025U	TXCF-019-025CB	TXBF-019-025U	TXBF-019-025CB	TXBF-019-025B	1 R097
TXCF-032-025U	TXCF-032-025CB	TXBF-032-025U	TXBF-032-025CB	TXBF-032-025B	1 R097A
TXC20U	TXC20CB	TX20U	TX20CB	TX20B	1 X-20, or X-20D

IERC

Heat Sinks/Dissipators and Retainers

for semiconductors, integrated circuits and microcircuits

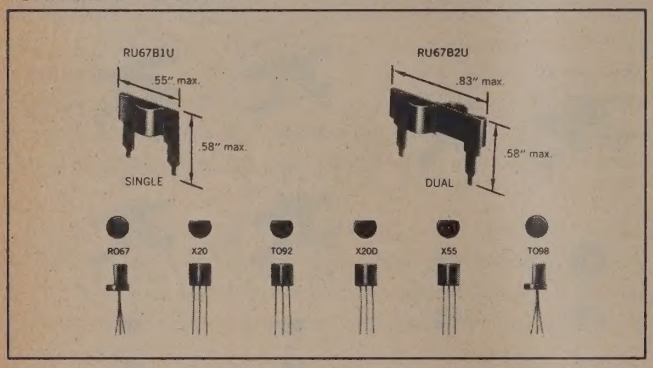
CLIP SERIES



Highly efficient dissipator/retainer; also used as a thermal link or radiating device. Also provides RF shielding.

IERC BRASS PART NO.		IERC BERYLLIUM COPPER PART NO.			SEMI-CONDUCTOR
UNPLATED (STANDARD)	BLACK OXIDE	UNPLATED	BLACK OXIDE	BLACK CADMIUM PLATE	
RC97B5U RC97B18U	RC97B5CB RC97B18CB	RC975U RC9718U	RC975CB RC9718CB	RC975B RC9718B	1 RO97 1 RO97A

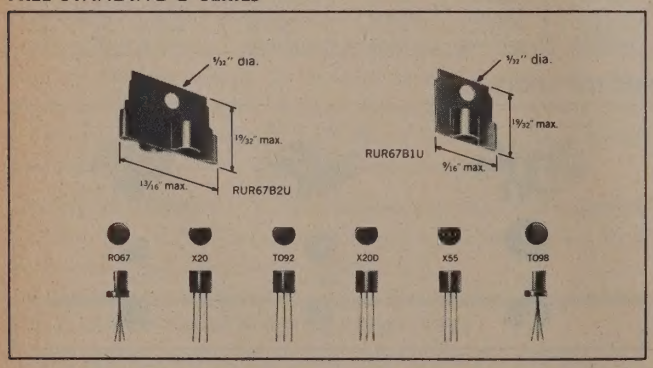
"UNIVERSAL" D-SERIES



Both single and dual models accept *all* popular D-case semiconductors. Unique spring clip accommodates wide variations in case diameters. Exceptionally efficient heat dissipators. Dual models ideal for matched-pair applications. "Stand off" legs provide 0.1" grid location: keep transistor away from solder heat.

IERC BRASS PART NO.		IERC BERYLLIUM COPPER PART NO.			SEMI-CONDUCTOR
UNPLATED (STANDARD)	BLACK OXIDE	UNPLATED	BLACK OXIDE	BLACK CADMIUM PLATE	
RU67B1U RU67B2U	RU67B1CB RU67B2CB	RU671U RU672U	RU671CB RU672CB	RU671B RU672B	1 D-case 2 D-case

FREE STANDING D-SERIES

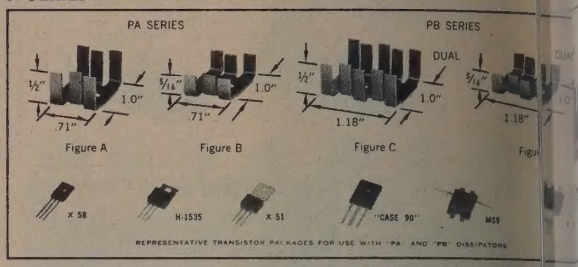


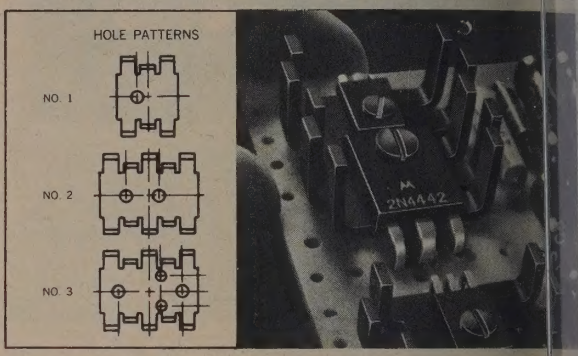
Unique spring clip accepts all popular D-case plastic transistors. Hole facilitates grounding for RF shielding, or attachment to a heat sink.

IERC BRASS PART NO.		IERC BERYLLIUM COPPER PART NO.			SEMI-CONDUCTOR
UNPLATED (STANDARD)	BLACK OXIDE	UNPLATED	BLACK OXIDE	BLACK CADMIUM PLATE	
RUR67B1U RUR67B2U	RUR67B1CB RUR67B2CB	RUR671U RUR672U	RUR671CB RUR672CB	RUR671B RUR672B	1 D-case 2 D-case

Case-Mounted plastic case semiconductors X-58, H1535, X51, M386, M59 and X43 case size transistors and SCR's

P SERIES

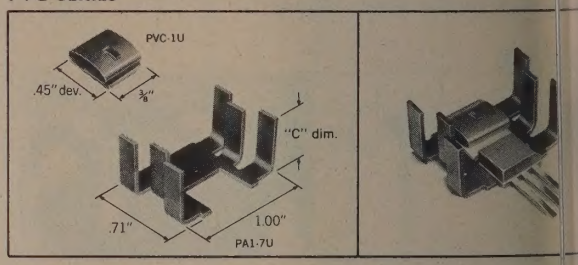




Accommodate flat, rectangular, medium power thyristors, transistors and SCR's. Patented staggered fingered design and aluminum construction maximize dissipation. In natural convection a PA will allow a single X58-type device to be operated with 80% more power. Write for Bulletin 149.

IERC PART NO.					SEMICONDUCTOR
FIGURE	UNPLATED	COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	
A	PA1U	PA1CB	PA1B	—	UNDRILLED
A	PA1-1U	PA1-1CB	PA1-1B	PA1-1	HOLE PATTERN NO. 1
B	PA2U	PA2CB	PA2B	—	UNDRILLED
B	PA2-1U	PA2-1CB	PA2-1B	PA2-1	HOLE PATTERN NO. 1
C	PB1U	PB1CB	PC1B	—	UNDRILLED
C	PB1-2U	PB1-2CB	PB1-2B	PB1-2	HOLE PATTERN NO. 2
C	PB1-3U	PB1-3CB	PB1-3B	PB1-3	HOLE PATTERN NO. 3
D	PB2U	PB2CB	PB2B	—	UNDRILLED
D	PB2-2U	PB2-2CB	PB2-2B	PB2-2	HOLE PATTERN NO. 2
D	PB2-3U	PB2-3CB	PB2-3B	PB2-3	HOLE PATTERN NO. 3

PVC SERIES



The PVC-1 Clip attaches, without any hardware, a tab-type semiconductor to a PA1-7 or PA2-7 dissipator. Power increases of 300% are possible in free standing mode in natural convection. The free-standing assembly may be mounted vertically or horizontally without significant changes in dissipation characteristics. The clip may be used to attach the semiconductor to any conduction plane approximately .040" thick. The clip is made of beryllium copper. Dissipators are made of aluminum. Write for Bulletin 159

IERC RETAINER CLIP		IERC DISSIPATORS			
UNPLATED	BLACK CADMIUM	UNPLATED	COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE
PVC-1U	PVC-1B	PA1-7U PA2-7U	PA1-7CB PA2-7CB	PA1-7B PA2-7B	

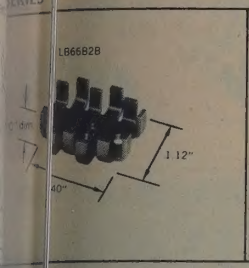
IERC

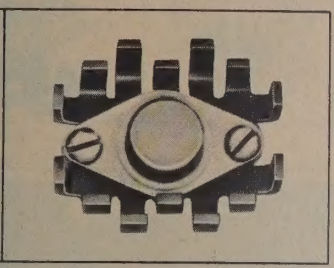
INTERNATIONAL ELECTRONIC RESEARCH CORPORATION
a corporate division of DYNAMICS CORPORATION OF AMERICA

e-Mounted metal case semiconductors
3, TO6, TO-8*, TO-15, TO-36, TO-66 and other
ver semiconductors

clamp for mounting. For other TO-8 dissipators, see Page 1.

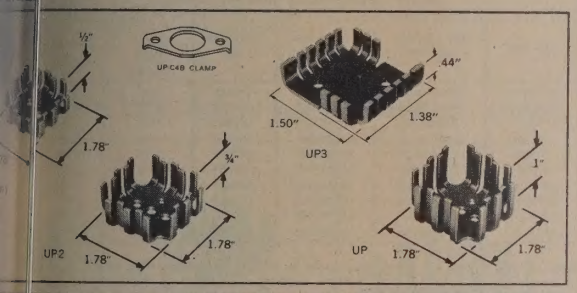
SERIES

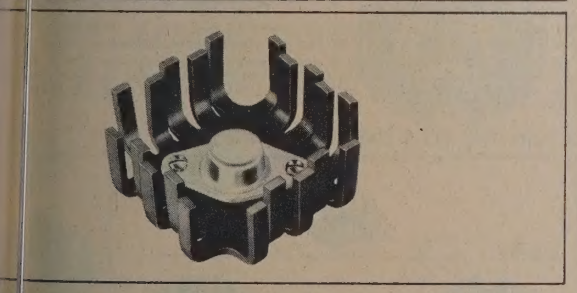




ical convection, the LB's efficient staggered finger design dissipates 9 watts ite temperature held to less than 150°C. In forced air (1,000 FPM) the LB 19 watts with case temperature maintained at 90°C. Requires only of mounting area. Write for Bulletin 164.

IERC PART NO.				SEMICONDUCTOR
COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	DIMENSION "C"	
LB66B1CB LB66B2CB	LB66B1B LB66B2B	LB66B1 LB66B2	1/2" H 5/16" H	1 TO-66 1 TO-66





ger design and aluminum construction gives excellent dissipation power applications. For example, a silicon power transistor mounted dissipate 14 watts in natural convection with a maximum case rise forced air (1,000 FPM), the UP dissipates 50 watts with the same ture rise. The UP requires only 3 cu. in. of space and weighs less Write for Bulletin 164.

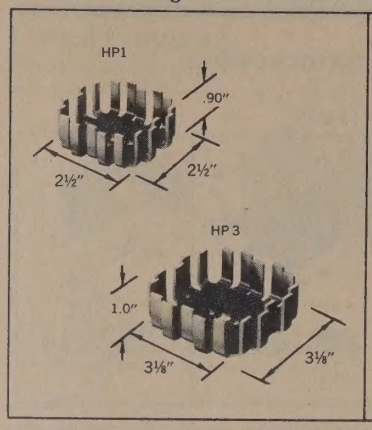
IERC PART NO.			SEMICONDUCTOR
COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	
UP-000-CB UP1-000-CB UP2-000-CB UP3-000-CB	UP-000-B UP1-000-B UP2-000-B UP3-000-B	UP-000 UP1-000 UP2-000 UP3-000	UNDRILLED UNDRILLED UNDRILLED UNDRILLED

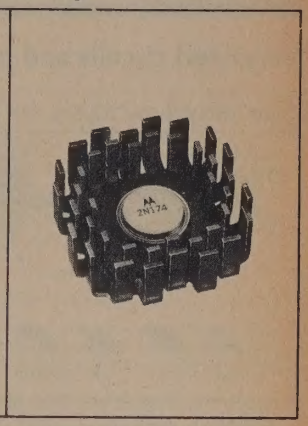
transistor hole pattern, replace the "000" with the transistor designation. UP-TO3-U.

al hole pattern, replace the "000" with "TOV-7". For example: UP-TOV-7U. accommodates TO-3, TO-6, TO-36 and other stud mounted transistors up to

sipators will accommodate TO-8 case size semiconductors when a UP-C4U, -C4B or UP-C4 clamp is used.

HP SERIES — Single semiconductor mounting





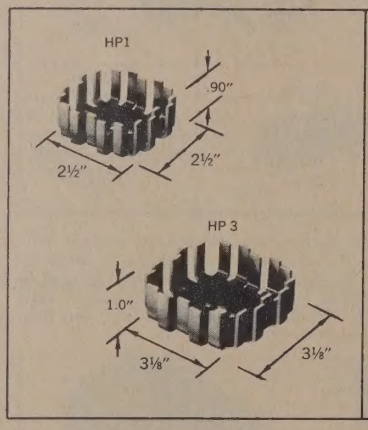
The heat dissipating performance of the HP's patented staggered-finger design and aluminum construction is comparable to conventional finned extrusions up to 3 times heavier and 30% larger. For example, the HP1 dissipates 23 watts in natural convection with a maximum case temperature rise of 100°C. The HP3 dissipates 28 watts with the same case temperature rise. In a forced air mode (1,000 FPM), the HP1 dissipates 65 watts; the HP3, 74 watts, with a 100°C case temperature rise. When nested together in a forced air mode (1,000 FPM), more than 100 watts can be dissipated at the same 100°C case temperature rise. Write for Bulletin 164.

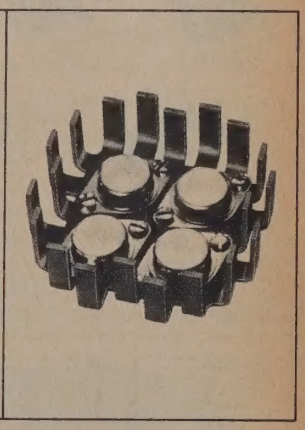
IERC PART NO				SEMICONDUCTOR
UNPLATED	COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	
HP1-000-U HP3-000-U	HP1-000-CB HP3-000-CB	HP1-000-B HP3-000-B	HP1-000 HP3-000	UNDRILLED UNDRILLED

For a specific transistor hole pattern, replace the "000" with the transistor designation. For example: HP-TO3-U.

For a universal hole pattern, replace the "000" with "TOV-2". For example: UP-TOV-2U. Hole pattern accommodates TO-3, TO-6, TO-36 and other stud mounted transistors up to ¼" diameter.

HP SERIES — Multiple semiconductor mounting





The HP1 is only 2½" square and .90" high but will accommodate three TO-66 case size semiconductors. The HP3 is 3⅛" square and 1" high, yet accommodates four TO-3 or TO-66 semiconductors. Use of these compact, lightweight dissipators eliminates heavy, bulky finned extrusions. Write for Bulletin 164.

IERC PART NO				SEMICONDUCTOR
UNPLATED	COM'L. BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	
HP1-TO66-4U HP1-TO66-8U	HP1-TO66-4CB HP1-TO66-8CB	HP1-TO66-4B HP1-TO66-8B	HP1-TO66-4 HP1-TO66-8	2 TO-66 3 TO-66
HP3-TO3-4U HP3-TO3-8U HP3-TO3-11U	HP3-TO3-4CB HP3-TO3-8CB HP3-TO3-11CB	HP3-TO3-4B HP3-TO3-8B HP3-TO3-11B	HP3-TO3-4 HP3-TO3-8 HP3-TO3-11	2 TO-3 3 TO-3 4 TO-3
HP3-TO66-4U HP3-TO66-8U HP3-TO66-11U	HP3-TO66-4CB HP3-TO66-8CB HP3-TO66-11CB	HP3-TO66-4B HP3-TO66-8B HF3-TO66-11B	HP3-TO66-4 HP3-TO66-8 HP3-TO66-11	2 TO-66 3 TO-66 4 TO-66

Hole pattern for multiple mounting of other high power semiconductors can be provided.

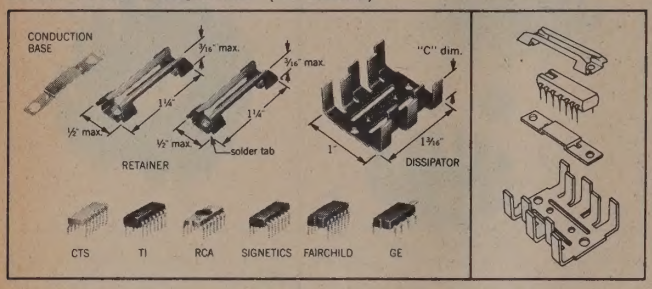
IERC

Heat Sinks/Dissipators and Retainers

for semiconductors, integrated circuits and microcircuits

Integrated circuits and microcircuits

DUAL IN-LINE PACKAGES (14 LEADS)

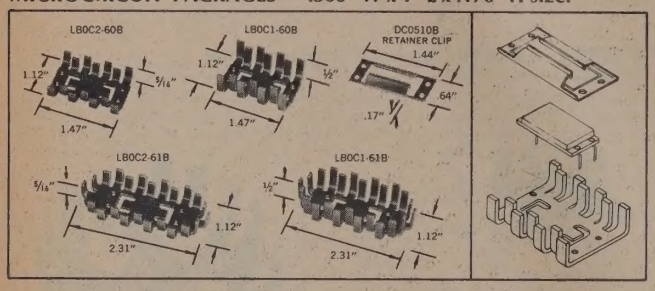


Used to retain DIP's when sockets are used in the assembly, or when the IC's are soldered directly into the board. The Conduction Base fits between the circuit board and the bottom of the DIP case, closing the air gap and making positive thermal contact to the bottom of the DIP case. The Retainer Clip is then inserted over the IC case and the hardware secured, or the assembly soldered in. With Retainer Clip and Conduction Base, a temperature reduction of 16°C at a dissipation level of 700 milliwatts is obtained. When the dissipator is added, dissipation can be increased to 1.2 watts with no rise in substrate temperature. Retainer Clip and Conduction Base are made of beryllium copper. The heat dissipator is aluminum. Write for Bulletin 154.

IERC PART NO.		BLACK CADMIUM	SOLDER PLATE	
RETAINER CLIP RETAINER CLIP WITH SOLDER TABS CONDUCTION BASE		DCO00080B	DCO00080-1TL DCB018050TL	
IERC PART NO. – DISSIPATOR				
UNPLATED	COM'L BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448*	DIM. "C"
PB1-10U PB2-10U	PB1-10CB PB2-10CB	PB1-10B PB2-10B	PB1-10 PB2-10	1/2" H 5/16" H

*Provides 500 volt insulation and 50,000 megohms insulation resistance, allows the DIP assembly to be used over printed lines on P-C board.

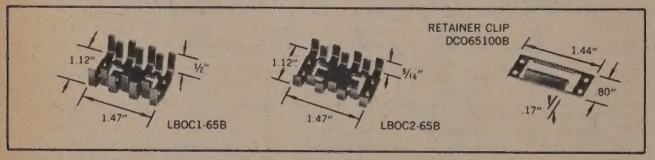
MICROCIRCUIT PACKAGES — .500" W x 1" L x .170" H size.



The Retainer Clip may be used alone to mount a microcircuit package to a conduction plate, or used with one of four different dissipators in radiation/convection modes. When Retainer Clip and LBOC2-61B dissipator are used in natural convection, the microcircuit device (voltage regulator) dissipates 5 watts with a case temperature rise of 103°C. The Retainer Clip is made of beryllium copper; heat sink/dissipator, aluminum. Write for Bulletin 151.

IERC PART NO.	STANDARD MATERIAL	STANDARD FINISH
DCO510B	BERYLLIUM COPPER	BLACK CADMIUM PLATE
LBOC1-60B	ALUMINUM	BLACK ANODIZE
LBOC1-61B	ALUMINUM	BLACK ANODIZE
LBOC2-60B	ALUMINUM	BLACK ANODIZE
LBOC2-61B	ALUMINUM	BLACK ANODIZE

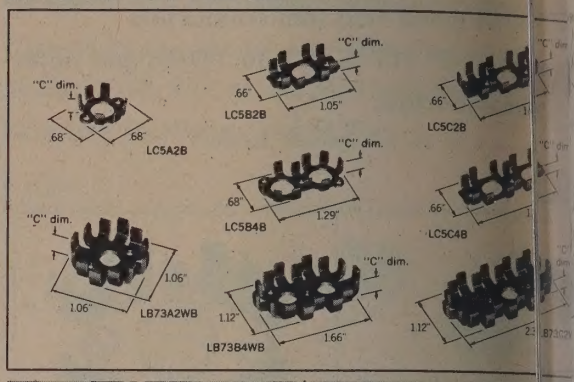
MICROCIRCUIT PACKAGES — .650" W x 1" L x .170" H size.

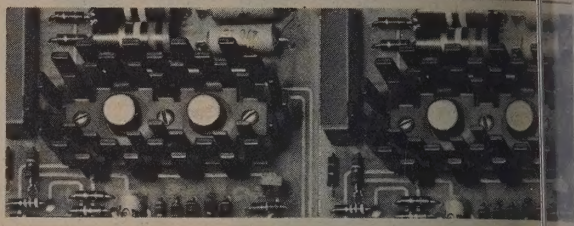


Write for Bulletin 151.

IERC PART NO.	STANDARD MATERIAL	STANDARD FINISH
DCO65100B	BERYLLIUM COPPER	BLACK CADMIUM PLATE
LBOC1-65B	ALUMINUM	BLACK ANODIZE
LBOC2-65B	ALUMINUM	BLACK ANODIZE

IC'S IN THE TO-5 CASE SIZE*





Compact, highly efficient dissipators for controlling the temperature sensitive parameters of TO-5 IC's. Their use minimizes the spread of electrical characteristics and, because they limit an increase in junction temperature, allows significant increases in the power level. Both retainers and bases are made of aluminum. Write for Bulletin 158.

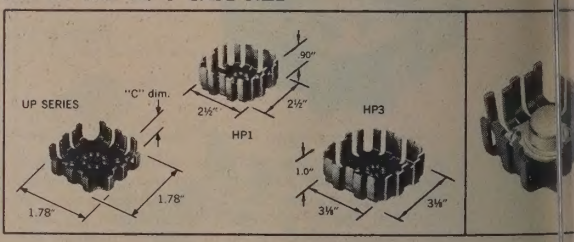
IERC ASSEMBLY PART NO. (BASE AND CLAMP)					
UNPLATED	COM'L BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	DIMENSION "C" ASSY OR BASE	DIMENSION "C" CLAMP
LP73A1U	LP73A1WCB	LP73A1WB	LP73A1	1/2"	7/16"
LP73A2U	LP73A2WCB	LP73A2WB	LP73A2	5/16"	1/4"
LP73B1U	LP73B1WCB	LP73B1WB	LP73B1	1/2"	7/16"
LP73B2U	LP73B2WCB	LP73B2WB	LP73B2	5/16"	1/4"
LP73B3U	LP73B3WCB	LP73B3WB	LP73B3	1/2"	7/16"
LP73B4U	LP73B4WCB	LP73B4WB	LP73B4	5/16"	1/4"
LP73C1U	LP73C1WCB	LP73C1WB	LP73C1	1/2"	7/16"
LP73C2U	LP73C2WCB	LP73C2WB	LP73C2	5/16"	1/4"
LP73C3U	LP73C3WCB	LP73C3WB	LP73C3	1/2"	7/16"
LP73C4U	LP73C4WCB	LP73C4WB	LP73C4	5/16"	1/4"

Note: Clamps may be used separately as retaining devices. To order, change the number from LP73 to LC5. Bases may also be ordered separately by changing first two letters of assembly part number to "LB".

Standard brass or nylon hardware is available for mounting an LP assembly to a 1/16" board or chassis. Consult your IERC Technical Sales Representative for ordering information.

*Other IERC heat sink/dissipators and retainers are available for IC's in the TO-5 size. These include Thermal Links (page 2) and Fan Tops (page 3). IC's in the TO-18 size can be accommodated by Thermal Links, Fan Tops and LP Series dissipators (pages 2 and 3).

IC'S IN THE TO-3 CASE SIZE



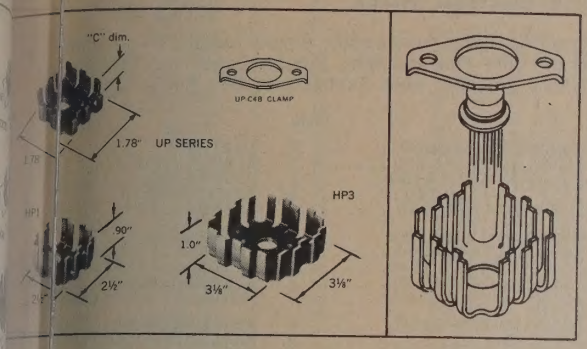
Without a dissipator the TO-3 IC has a case temperature rise of 80°C when 10 watts is dissipated. But, when the IC is mounted in IERC's UP dissipator in natural convection, the 80°C case temperature rise is not reached until 30 watts is dissipated. In forced air environments the efficiency is even higher. At 1000 FPM, the case temperature rise at 10 watts is only 30°C. And, the HP Series which also features IERC's patented, staggered finger design and aluminum construction, provides even greater dissipation. Write for Bulletin 161.

IERC PART NO.				
UNPLATED	COM'L BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	"C" DIMENSIONS
UP-TO3-46U	UP-TO3-46CB	UP-TO3-46B	UP-TO3-46	1"
UP1-TO3-46U	UP1-TO3-46CB	UP1-TO3-46B	UP1-TO3-46	1/2"
UP2-TO3-46U	UP2-TO3-46CB	UP2-TO3-46B	UP2-TO3-46	3/4"
HP1-TO3-33U	HP1-TO3-33CB	HP1-TO3-33B	HP1-TO3-33	
HP3-TO3-33U	HP3-TO3-33CB	HP3-TO3-33B	HP3-TO3-33	

IERC

INTERNATIONAL ELECTRONIC RESEARCH CORPORATION
a corporate division of DYNAMICS CORPORATION OF AMERICA

IN TH TO-8 CASE SIZE*



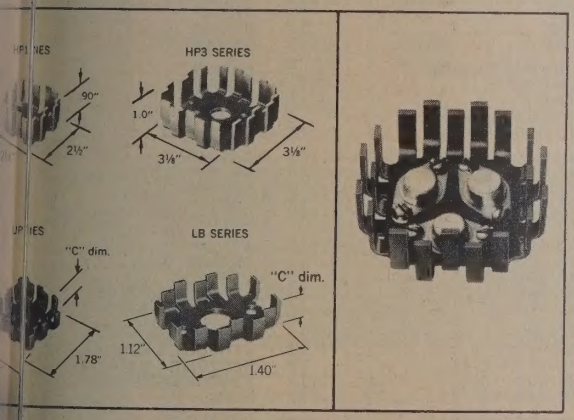
s are the highly efficient, staggered fingered UP and HP Series with hole configurations to accommodate the many leads of the IC. The clamp shown presses the IC flange to the dissipator and is most effective in transferring the heat from the metal case to the dissipator with very minimal resistance. Dissipators and clamps are made of aluminum. Write for Bulletin 143.

Thermalloy heatsinks will also accommodate IC's in the TO-8 case (see page 2).

IERC PART NO.				INTEGRATED CIRCUIT
COM'L BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	"C" DIMENSION	
UP1-TO8-48CB	UP1-TO8-48B	UP1-TO8-48	1/2"	1 TO-8
UP2-TO8-48CB	UP2-TO8-48B	UP2-TO8-48	3/4"	1 TO-8
UP-TO8-48CB	UP-TO8-48B	UP-TO8-48	1"	1 TO-8
HP1-TO8-38CB	HP1-TO8-38CB	HP1-TO8-38		1 TO-8
HP3-TO8-38CB	HP3-TO8-38B	HP3-TO8-38		1 TO-8
IERC PART NO. – CLAMP				
UP-C4CB	UP-C4B	UP-C4		1 TO-8

The clamp is required for all UP and HP Series heat sinks/dissipators used with the IC and must be ordered as a separate item.

IN TE TO-66 CASE SIZE — Single and multiple IC mounting

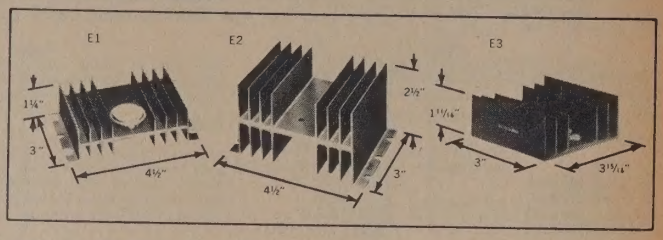


Most, aluminum dissipators effectively increase the power handling of TO-66 case size IC's, yet require only a small amount of additional area. For example, in natural convection, the LB66B1-67B (single IC) mounted on an epoxy board will dissipate up to 8 watts with case temp of the IC maintained at less than 140° C. The HP3-TO66-40B (4 TO-66 mounted on an epoxy board, will dissipate up to 32 watts with case temperature maintained at less than 140°C. Write for Bulletin 162.

IERC PART NO.				INTEGRATED CIRCUIT
COM'L BLACK ANODIZE	MIL. BLACK ANODIZE	INSULUBE 448	"C" DIMENSION	
LB66B1-67CB	LB66B1-67B	LB66B1-67	1/2"	1 TO-66
LB66B2-67CB	LB66B2-67B	LB66B2-67	5/16"	1 TO-66
UP-TO66-47CB	UP-TO66-47B	UP-TO66-47	1"	1 TO-66
UP1-TO66-47CB	UP1-TO66-47B	UP1-TO66-47	1/2"	1 TO-66
UP2-TO66-47CB	UP2-TO66-47B	UP2-TO66-47	3/4"	1 TO-66
HP1-TO66-35CB	HP1-TO66-35B	HP1-TO66-35	.90"	1 TO-66
HP3-TO66-35CB	HP3-TO66-35B	HP3-TO66-35	1"	1 TO-66
HP1-TO66-36CB	HP1-TO66-36B	HP1-TO66-36	.90"	2 TO-66
HP3-TO66-36CB	HP3-TO66-36B	HP3-TO66-36	1"	2 TO-66
HP1-TO66-39CB	HP1-TO66-39B	HP1-TO66-39	.90"	3 TO-66
HP3-TO66-39CB	HP3-TO66-39B	HP3-TO66-39	1"	3 TO-66
HP3-TO66-40CB	HP3-TO66-40B	HP3-TO66-40	1"	4 TO-66

Finned Extrusions

E1, E2 AND E3 SERIES



Optimized fin design gives the most power dissipation for volume and weight. Standard units supplied with mounting notches and choice of six popular semiconductor mounting hole patterns. Write for Bulletins 142 (E1 and E2) and 145 (E3).

EXTRUSION TYPE	IERC PART NO.	SEMI-CONDUCTOR	EXTRUSION TYPE	IERC PART NO.	SEMI-CONDUCTOR
E1 AND E2*	E1003-0600U	TO-3	E3	E3003-0600U	TO-3
	E1006-0600U	TO-6		E3006-0600U	TO-6
	E1015-0600U	TO-15		E3015-0600U	TO-15
	E100V-0600U	UNIVERSAL**		E3066-0600U	TO-66
	E1066-0600U	TO-66		E300V-0600U	UNIVERSAL**
	E1000-0600U	BLANK		E3000-0600U	BLANK

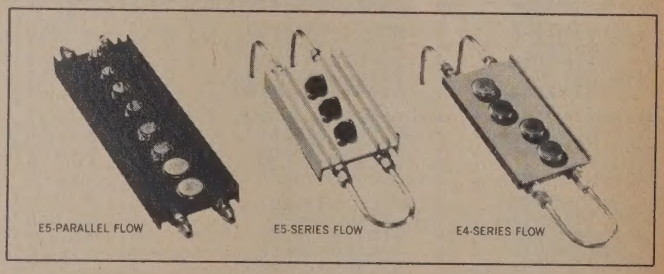
Note: Other lengths in ½" increments are available. Various hole patterns available. Consult your IERC Technical Sales Representative for ordering information.

*For E2 configuration change first numeral of part no. to 2. For example E2000-0600B.

**Combination hole pattern for TO-3, TO-6, TO-36 or studs up to ¼" dia.

"U" at end of part number denotes unplated. For Insulube 448 delete the letter "U". For commercial black anodize, delete letter "U" and add "CB"; for military black anodize, delete letter "U" and add "B".

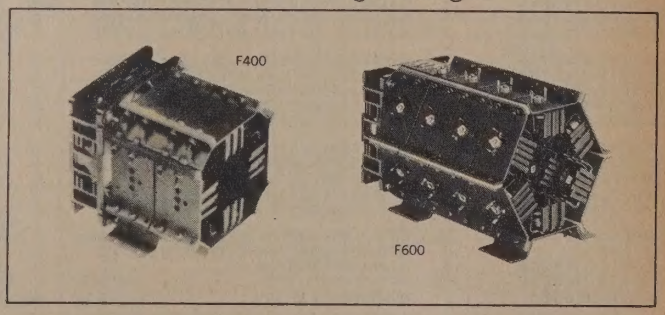
Fluid Cooled Heat Sinks



Compact, highly efficient aluminum heat sinks for power transistors and diodes. 1000 watts dissipation in less than 45 cu. in. Parallel or series flow; open or closed loop systems. Standard lengths from 6" to 4' in ½" increments. All standard transistor hole patterns available. Standard ¼" tube fittings. Various finishes. Write for Bulletin 147.

Consult your IERC Technical Sales Representative or the factory regarding your specific requirements.

Modular Forced Air Cooling Packages



IERC's design provides the best use of the output of most available fan types for economical thermal control in multiple semiconductor installations. Each of the two types, F400 and F600 Series, has performance comparable to an extrusion type assembly. *F600 Series* units are available with one to four hexagonal banks with six modules each. Cools up to 24 semiconductors with one muffin fan. *F-400 Series* units have one to four banks of four modules each to cool up to 16 semiconductors with one fan. Both Series are available assembled, or in kit form. Order through IERC Technical Sales Representative or direct from factory. Write for Bulletins 136, 137.

IOR INTERNATIONAL RECTIFIER
SEMICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 674-81

ALPHA-NUMERIC CROSS-REFERENCE INDEX

International Rectifier devices and corresponding page numbers are arranged alpha-numerically. Simply identify part number pick out specific page. Represented is a complete listing of the International Rectifier line including Silicon Controlled Rectifiers, Triacs, Rectifiers. Zener Regulators, Voltage References, Light Sensitive Devices, Heat Exchangers and Firing Circuits.

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INTERNATIONAL RECTIFIER IOR

SICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 678-6281

SILCON CONTROLLED RECTIFIERS, POWER LOGIC-TRIACS, AND FIRING CIRCUITS

INVER R SCRs

Pa umber	Voltage Rating Range	Max. Turn-off Time (μsec)
1 -AS24	100-600V	20
1 -AS24	100-600V	20
3 -S66	800-1000V	30
3 T60	1200V	50
5 G	50-600V	20
5 G-S53	50-600V	15
7 -S68	800-1000V	40
7 -T62	1200V	60
7 G-S54	50-600V	20
7 G	50-600V	15
8 LB	500-1200V	40
1 PA-S64	400-600V	20
1 PA-S66	800-1000V	30
1 PA-S69	1200V	45
1 RB-S64	400-600V	20
1 RB-S67	800-1000V	35
1 RB-T62	1200V	60
1 PA-S64	400-600V	20
1 PA-S67	800-1000V	35
1 PA-T62	1200V	60
2 RA-S55	400-600V	25
2 RA-S58	800-1000V	40
2 RA-T50	1200V	50
2 RB-S57	400-600V	35
2 RB-T50	800-1000V	50
2 RB-T52	1200V	60
4 PA-S55	400-600V	25
4 PA-S58	800-1000V	40
PA-T50	1200V	50
PB-S57	400-600V	35
PB-T50	800-1000V	50
PB-T52	1200V	60

ACE SCRs
IR's exclusive Accelerated Cathode Excitation construction offers unique characteristics including faster, cooler turn-on and faster turn-off.

EPITAXIAL SCRs
Still another IR exclusive, the epitaxial process offers precise control of various manufacturing values and therefore precise control of specific characteristics.

HOCKEY-PUK SCRs
IR's Hockey-Puk configuration allows double side cooling to offer higher current ratings than available in similar stud-mounted devices. Note the configurations A-3 and A-4 shown on page 13.

POWER LOGIC TRIACS
IR also offers the highest rated, most powerful triacs in the industry, the 2N5257 series of 200 ampere Logic-Triacs. 60 and 100 ampere Logic-Triacs offer completely different packaging and junctions to extend the range of power triac applications.

SCR FIRING CIRCUITS
To complete the application of SCRs and Triacs, IR lists a comprehensive series of SCR Firing Circuits.

HOW TO USE THIS SECTION
SILICON CONTROLLED RECTIFIERS
Data is listed by current rating on pages 1 and 2. FOR EXAMPLE: For an SCR with an RMS current of 6 amperes, you can choose any of the three series listed below under the 7.4A current rating beginning with "5RC10A." IR's popular 5RC series would offer you:

RMS current rating of 7.4 amperes
Average current rating of 4.7 amperes at a case temperature of 80°C
Typical gate characteristics of 10mA and 1.2V
It is available in the TO-64 case outline and with IR's alloyed-diffused construction.

For a 250 Volt unit, you should select IR's 5RC30A, 300 Volt, 7.4 ampere SCR.

PARAMETERS		RATING	
Symbol	Definition	Symbol	Definition
I_T(RSM)	Max. RMS on-state current	—	Amperes
I_T(AV)	Max. average forward current @ 180° conduction	—	Amperes
	And at the maximum case temperature listed	(°C)	Degrees Celsius
I_{GT}	Typical gate current to trigger @ 25°C	(mA)	Milliamperes
V_{GT}	Typical gate voltage to trigger @ 25°C	(V)	Voltage
Case	Case outline (see pp. 13-15)		
Type	Indicates manufacturing method		

SILCON CONTROLLED RECTIFIERS

T AS) (AMPS)	4.0	4.7	4.7	7.4	7.4	7.4	16	16	25	25
T) (AMPS) @ a Tcase = (°C)	2.55 @ 30°	3.0 @ 105°	3.0 @ 80°	4.7 @ 80°	4.7 @ 60°	4.7 @ 105°	10 @ 35°	10 @ 80°	16 @ 45°	16 @ 65°
T @ 25°C (mA)	0.2	8	8	10	10	10	30	30	30	30
V @ 25°C (V)	1.0	1.0	1.0	1.2	1.2	1.2	1.7	1.7	1.7	1.7
C (pp. 13-15)	A-2(1)	T0-64	T0-64	T0-64	T0-64	T0-64	T0-48	T0-48	T0-48	T0-48
T	Planar	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.
	PART NUMBERS									
				(2)	(2)	(2)			(3)	
25 Volts	—	—	—	—	2N1770	2N1770A	2N1842	2N1842A	—	2N681
30 Volts	IR106Y1	—	—	—	—	—	—	—	—	—
50 Volts	IR106F1	—	2N1600	—	2N1771	2N1771A	2N1843	2N1843A	—	2N682
100 Volts	IR106A1	3RC10A	2N1601	5RC10A	2N1772	2N1772A	2N1844	2N1844A	10RC10A	2N683
150 Volts	—	—	—	—	2N1773	2N1773A	2N1845	2N1845A	—	2N684
200 Volts	IR106B1	3RC20A	2N1602	5RC20A	2N1774	2N1774A	2N1846	2N1846A	10RC20A	2N685
250 Volts	—	—	—	—	2N1775	2N1775A	2N1847	2N1847A	—	2N686
300 Volts	IR106C1	3RC30A	2N1603	5RC30A	2N1776	2N1776A	2N1848	2N1848A	10RC30A	2N687
400 Volts	—	3RC40A	2N1604	5RC40A	2N1777	2N1777A	2N1849	2N1849A	10RC40A	2N688
500 Volts	—	3RC50A	—	5RC50A	2N1778	—	2N1850	2N1850A	10RC50A	2N689
600 Volts	—	3RC60A	—	5RC60A	2N2619	—	—	—	10RC60A	2N690
700 Volts	—	—	—	—	—	—	—	—	—	2N691
800 Volts	—	—	—	—	—	—	—	—	—	2N692

T AS) (AMPS)	35	35	63	80	80	80	80	110	110	110	110
T V) (AMPS) @ Tcase = (°C)	22.3 @ 35°	22.3 @ 70°	40 @ 87°	50 @ 75°	50 @ 75°	50 @ 100°	50 @ 75°	70 @ 62°	70 @ 62°	70 @ 85°	70 @ 80°
T @ 25°C (mA)	30	30	110 Max.	35	35	35	150	35	35	35	35
V @ 25°C (V)	1.5	1.5	3.0 Max.	2.0	1.0	1.0	2.5	1.2	1.2	1.2	1.0
C (pp. 13-15)	T0-48	T0-48	(4)	T0-94 (5)	T0-94 (5)	T0-94 (5)	T0-94 (6)	T0-49	T0-94 (8)	T0-49	T0-94 (8)
T	Al. Diff.	Al. Diff.	Al. Diff.	Al. Diff.	Epitaxial	Epitaxial	Al. Diff. Multi-Gate	Al. Diff.	Al. Diff.	Al. Diff.	Epitaxial
	PART NUMBERS										
	(3)		(4)	(5)	(5) (7)	(5)	(6)(7)		(8)		(8)
25 Volts	—	—	—	—	—	—	—	2N1909	—	2N2023	—
50 Volts	—	—	40RCS5	—	—	—	51RCG5	2N1910	—	2N2024	—
100 Volts	16RC10A	22RC10	40RCS10	36RC10A	—	—	51RCG10	2N1911	71RC10A	2N2025	—
150 Volts	—	—	—	—	—	—	51RCG15	2N1912	—	2N2026	—
200 Volts	16RC20A	22RC20	40RCS20	36RC20A	—	—	51RCG20	2N1913	71RC20A	2N2027	—
250 Volts	—	—	—	—	—	—	51RCG25	2N1914	—	2N2028	—
300 Volts	16RC30A	22RC30	40RCS30	36RC30A	—	—	51RCG30	2N1915	71RC30A	2N2029	—
400 Volts	16RC40A	22RC40	40RCS40	36RC40A	—	—	51RCG40	2N1916	71RC40A	2N2030	—
500 Volts	16RC50A	22RC50	40RCS50	36RC50A	36RA50	—	51RCG50	2N1805	71RC50A	—	71RA50
600 Volts	16RC60A	22RC60	40RCS60	36RC60A	36RA60	36REH60	51RCG60	2N1806	71RC60A	—	71RA60
700 Volts	—	—	40RCS70	—	—	—	—	2N1807	—	—	—
800 Volts	16RC80A	—	40RCS80	36RC80A	36RA80	36REH80	—	—	71RC80A	—	71RA80
1000 Volts	16RC100A	—	40RCS100	—	36RA100	36REH100	—	—	—	—	71RA100
1100 Volts	—	—	40RCS110	—	36RA110	36REH110	—	—	—	—	71RA110
1200 Volts	—	—	40RCS120	—	36RA120	36REH120	—	—	—	—	71RA120
1300 Volts	—	—	—	—	36RA130	36REH130	—	—	—	—	71RA130

Other case styles available, see page 13 for Case
A-2 (2) Change Last digit to "2"; IR106Y2
For Case A-2 (3) change to "3"; IR106Y3
For Case A-2 (4) change to "4"; IR106Y4
t_{off}—Typical Turn-off time:
5RC-A & 2N1770 series = 30 μsec
2N1770A series = 50 μsec

(3) Inverter types available. Add 554 to basic part number. See Inverter SCRs table above.
(4) 50 thru 600 Volts available only in A-1 case style: 700 thru 1200 Volts available only in A-5 case.
(5) 36 are flexible lead devices TO-94 Replace with 37 for flag terminal devices TO-83.
(6) 51 types are flexible lead TO-94. Replace with 52 for flag terminal TO-83.
(7) For inverter types see Inverter SCRs table above.
(8) 71 types are flexible lead TO-94. Replace with 72 for flag terminal TO-83.

IOR INTERNATIONAL RECTIFIER
SEMICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 678-31

SILICON CONTROLLED RECTIFIERS

I_T (RMS) (AMPS)	110	110	110	110	110	125	125	160	160	180	235	235
I_T (AV) (AMPS) @ T_C = (C°)	70 @ 65°	70 @ 62°	70 @ 105°	70 @ 65°	70 @ 75°	80 @ 85°	80 @ 70°	100 @ 80°	100 @ 80°	115 @ 85°	150 @ 70°	150 @ 80°
I_{GT} @ 25°C (mA)	35	25	35	100	150	100	100	50	35	35	50	50
V_{GT} @ 25°C (V)	1.0	1.0	1.0	2.0	2.5	2.5	2.5	1.3	1.2	1.2	1.3	1.3
Case	TO-94	TO-94	TO-94	TO-83	TO-94	TO-94	TO-94	TO-93	TO-93	A-3	TO-93	TO-93
Type	Epitaxial	Epitaxial	Epitaxial	Al. Diff.	Al. Diff. Multi-Gate	Epitaxial	ACE	Al.Diff.	Epitaxial	Epitaxial	Al. Diff.	Al. Diff.
	PART NUMBERS											
	(1) (2)	(2)	(1)		(2) (3)	(4)	(2) (4)			(2)		(5)
50 Volts	—	—	—	2N1792	71RCG5	—	—	—	—	—	—	—
100 Volts	—	—	—	2N1793	71RCG10	—	—	101RC10	—	—	151RC10	151RC10A
150 Volts	—	—	—	2N1794	71RCG15	—	—	—	—	—	—	—
200 Volts	—	—	—	2N1795	71RCG20	—	—	101RC20	—	—	151RC20	151RC20A
250 Volts	—	—	—	2N1796	71RCG25	—	—	—	—	—	—	—
300 Volts	—	—	—	2N1797	71RCG30	—	—	101RC30	—	—	151RC30	151RC30A
400 Volts	—	—	—	2N1798	71RCG40	—	—	101RC40	—	—	151RC40	151RC40A
500 Volts	71RB50	—	—	2N1799	71RCG50	81RLA50	81RLB50	101RC50	101RA50	115PA50	151RC50	151RC50A
600 Volts	71RB60	2N3091	71REH60	2N1800	71RCG60	81RLA60	81RLB60	101RC60	101RA60	115PA60	151RC60	151RC60A
700 Volts	—	2N3092	—	2N1801	—	—	—	—	—	—	—	—
800 Volts	71RB80	2N3093	71REH80	2N1802	—	81RLA80	81RLB80	101RC80	101RA80	115PA80	151RC80	151RC80A
900 Volts	—	2N3094	—	2N1803	—	—	—	—	—	—	—	—
1000 Volts	71RB100	2N3095	71REH100	2N1804	—	81RLA100	81RLB100	—	101RA100	115PA100	—	—
1100 Volts	71RB110	2N3096	71REH110	—	—	81RLA110	81RLB110	—	101RA110	—	—	—
1200 Volts	71RB120	2N3097	71REH120	—	—	81RLA120	81RLB120	—	101RA120	115PA120	—	—
1300 Volts	71RB130	2N3098	71REH130	—	—	—	—	—	101RA130	115PA130	—	—

I_T (RMS) (AMPS)	235	235	275	400	400	470	470	550	740	740	60	100
I_T (AV) (AMPS) @ T_C = (°C)	150 @ 85°	150 @ 85°	175 @ 75°	250 @ 85°	250 @ 70°	300 @ 75°	300 @ 75°	350 @ 75°	470 @ 75°	470 @ 67°	— @ 85°	— @ 75°
I_{GT} @ 25°C (mA)	35	35	35	35	40	40	40	40	40	40	200	200
V_{GT} @ 25°C (V)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.5	1.5	1.5
Case	TO-93	TO-93	A-3	A-3	TO-118	TO-118	TO-118	TO-118	A-4	A-4	TO-94	TO-94
Type	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial	Epitaxial		
	PART NUMBERS										POWER LOGIC-TRIACS	
400 Volts	—	(2)	(2)	—	(2)	—	(2)	—	—	(2)	60AC40	100AC40
500 Volts	151RA50	151RB50	175PA50	250PA50	250RA50	300RA50	300RB50	350RA50	470PA50	470PB50	—	—
600-Volts	151RA60	151RB60	175PA60	250PA60	250RA60	300RA60	300RB60	350RA60	470PA60	470PB60	60AC60	100AC60
800 Volts	151RA80	151RB80	175PA80	250PA80	250RA80	300RA80	300RB80	350RA80	470PA80	470PB80	60AC80	100AC80
1000 Volts	151RA100	151RB100	175PA100	250PA100	250RA100	300RA100	300RB100	350RA100	470PA100	470PB100	60AC100	100AC100
1100 Volts	151RA110	151RB110	175PA110	250PA110	250RA110	300RA110	300RB110	350RA110	470PA110	470PB110	—	—
1200 Volts	151RA120	151RB120	175PA120	250PA120	250RA120	300RA120	300RB120	350RA120	470PA120	470PB120	—	—
1300 Volts	151RA130	151RB130	175PA130	250PA130	250RA130	300RA130	300RB130	350RA130	470PA130	470PB130	—	—
1400 Volts	—	—	—	—	250RA140	—	300RB140	—	—	470PB140	—	—
1500 Volts	—	—	—	—	250RA150	—	300RB150	—	—	470PB150	—	—

(1) 71 types are flexible lead (TO-94). Replace with 72 for flag terminal TO-83
(2) See Inverter table SCRs table, page 1
(3) di/dt = 800 A/μsec
(4) Accelerated Cathode Excitation type for fast turn-on,
(5) I_{TSM} = 3,500 A
(6) Fast turn-off capability

IR FIRING CIRCUITS

IR'S series of Firing Circuits offers the advantages of "Hard Firing" gate signals, a good "back porch" to eliminate "starved gate" conditions, signal isolation, and negative biasing.

SPECIAL ORDER

Many other connections are available. Direct inquiries to your local IR Field Office.

Standard units are available off the shelf. Special order devices will be quoted in quantity shipments.

Firing Circuits for IR's Logic Triacs are available on special order.

STANDARD FIRING CIRCUITS

Part Number	Connection	Voltage	No. of SCR's
FC-100	Single phase	120/240V	1 or 2
FC-200	Three phase, three wire	240/480V	3
FC-300	Three phase, three wire	240/480V	6

POWER LOGIC-TRIACS

IR's three LOGIC-TRIAC series fer circuit designers a wide arr of specification advantages in igh current and voltage ratings. he "logic" capability allows the ec- tion of the conduction direction s a function of the gate voltage pol ty.

UNIJUNCTION TRANSISTOR—IR 0 For timing Circuits and firing Rs case (pp 13-15)TO-92.

Max. Voltage	—V_{B2E} = 30V V_{B2B1} = 35
Emitter Current	—I_E = 50 mA
Valley Current	—I_V = 5 mA m
Max. Power	—P_D = 300 m
Max. Temperature	—125°

INTERNATIONAL RECTIFIER IOR

MICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 678-6281

HIGH POWER SILICON RECTIFIERS

A complete selection of high current, high voltage, high power rectifiers, including popular stud types and the new, double side cooled hockey-puck styles.

SILICON POWER RECTIFIERS—Devices are listed by current rating below. Look for these specifications.

	PARAMETER	RATINGS	
Symbol	Definition	Symbol	Definition
I_F(AV)	Max. average forward current at listed Tc	—	Amperes
I_F(surge)	Max. peak one cycle, non-repetitive surge current	—	Amperes
I^2t	Max. I^2t rating (non-repetitive, for 5 to 8.3 milliseconds)	(A^2sec)	Amperes squared seconds
Case	Case outline (See pp. 13-15)	—	—

Then check for the part number of the voltage required.

FOR EXAMPLE:

For a rectifier with a current rating of 65 amperes and a surge rating of 1,000 amperes, you would locate these parameters under the 70 ampere current rating below.

This Series offers you:
- 70 ampere current rating at 125° case temperature
- 1,200 ampere surge current rating
- 6,000 I^2t rating
- Available in IR's DO-5/B-4 case.

For a rectifier with a 500 Volt rating, you would order IR's part number "70H50A."

I_F(AV)(AMPS) @ T_{case} = (°C)	15 @ 150°	20 @ 130°(1)	35 @ 140°	40 @ 150°	40 @ 140°	60 @ 115°	60 @ 140°	70 @ 125°	100 @ 130°
I_F(surge)(AMPS)	250	300	500	800	500	700	900	1,200	1,600
I^2t (A^2sec)	260	500	510	2,650	510	2,000	3,400	6,000	10,500
Case (pp. 13-15)	DO-5/B-1	B-10	DO-5/B-1	DO-5/B-4	DO-5/B-1	DO-5/B-1	DO-5/B-4	DO-5/B-4	DO-8
	PART NUMBERS								
50 Volts	1N3208	21PT5	1N1183	1N1183A	40HF5	1N2128	1N2128A	—	—
100 Volts	1N3209	21PT10	1N1184	1N1184A	40HF10	1N2129	1N2129A	70H10A	1N3288
150 Volts	—	—	1N1185	1N1185A	40HF15	1N2130	1N2130A	70H15A	—
200 Volts	1N3210	21PT20	1N1186	1N1186A	40HF20	1N2131	1N2131A	70H20A	1N3289
250 Volts	—	—	—	—	—	1N2132	1N2132A	70H25A	—
300 Volts	1N3211	—	1N1187	1N1187A	40HF30	1N2133	1N2133A	70H30A	1N3290
350 Volts	—	—	—	—	—	1N2134	1N2134A	—	—
400 Volts	1N3212	21PT40	1N1188	1N1188A	40HF40	1N2135	1N2135A	70H40A	1N3291
450 Volts	—	—	—	—	—	1N2136	1N2136A	—	—
500 Volts	1N3213	—	1N1189	1N1189A	40HF50	1N2137	1N2137A	70H50A	1N3292
600 Volts	1N3214	21PT60	1N1190	1N1190A	40HF60	1N2138	1N2138A	70H60A	1N3293
700 Volts	—	—	—	—	40HF70	—	—	70H70A	—
800 Volts	—	—	—	—	40HF80	—	—	70H80A	1N3294
900 Volts	—	—	—	—	40HF90	—	—	70H90A	—
1000 Volts	—	—	—	—	40HF100	—	—	70H100A	1N3295
1200 Volts	—	—	—	—	—	—	—	—	1N3296

I_F(AV)(AMPS) @ T_{case} = (°C)	100 @ 130°	100 @ 110°	150 @ 150°	150 @ 150°	150 @ 150°	250 @ 135°	250 @ 130°	250 @ 105°	275 @ 120°
I_F(surge)(AMPS)	2,300	25,000	3,000	3,000	3,000	4,500	4,500	3,500	5,000
I^2t (A^2sec)	22,000	26,000	36,000	36,000	36,000	80,000	80,000	50,000	10,000
Case (pp.13-15)	DO-8	DO-8	DO-30	DO-8	DO-30	DO-9	DO-9	B-6	DO-9
	PART NUMBERS								
50 Volts	—	(2)(3) —	1N3111	—	—	1N2054	—	(2)(3) —	1N4044
100 Volts	1N3288A	—	1N3085	150K10A	150L10A	1N2055	1N3735	—	1N4045
150 Volts	—	—	—	150K15A	150L15A	1N2056	—	—	1N4046
200 Volts	1N3289A	—	1N3086	150K20A	150L20A	1N2057	1N3736	—	1N4047
250 Volts	—	—	—	150K25A	150L25A	1N2058	—	—	1N4048
300 Volts	1N3290A	—	1N3087	150K30A	150L30A	1N2059	1N3737	—	1N4049
350 Volts	—	—	—	—	—	1N2060	—	—	—
400 Volts	1N3291A	101KL40	1N3088	150K40A	150L40A	1N2061	1N3738	251UL40S	1N4050
450 Volts	—	—	—	—	—	1N2062	—	—	—
500 Volts	1N3292B	—	1N3089	150K50A	150L50A	1N2063	1N3739	—	1N4051
600 Volts	1N3293A	101KL60	1N3000	150K60A	150L60A	1N2064	1N3740	251UL60S	1N4052
700 Volts	—	—	—	150K70A	150L70A	1N2065	—	—	1N4053
800 Volts	1N3294A	101KL80	1N3091	150K80A	150L80A	1N2066	1N3741	251UL80S	1N4054
900 Volts	—	—	—	150K90A	150L90A	1N2067	—	—	1N4055
1000 Volts	1N3295A	101KL100	1N3092	150K100A	150L100A	1N2068	1N3742	251UL100S	1N4056
1200 Volts	1N3296A	101KL120	1N5162	150K120A	150L120A	—	1N3743(4)	251UL120S	—
1300 Volts	—	101KL130	—	—	—	—	—	251UL130S	—
1400 Volts	—	—	—	—	—	—	1N3744(4)	—	—

I_F(AV)(AMPS) @ T_{case} = (°C)	300 @ 120°	300 @ 120°	330 @	400 @ 95°	470 @ 105°	500 @ 105°	500 @ 120°	500 @ 130°	800 @ 120°	800 @ 135°
I_{FM}(surge)(AMPS)	5,000	6,500	6,500	3,500	6,250	8,000	10,000	9,000	8,000	10,000
I^2t (A^2sec)	100,000	160,000	175,000	50,000	150,000	200,000	400,000	320,000	260,000	400,000
Case (pp. 13-15)	DO-9	B-6	B-7	B-11	B-11	B-8	B-8	B-9	B-12	B-12
	PART NUMBERS									
50 Volts	300U5A	(3) —	(3) —	(2) —	—	(3) —	(3) —	500UDF5A	—	—
100 Volts	300U10A	—	—	—	—	—	—	500UDF10A	—	—
150 Volts	300U15A	—	—	—	—	—	—	—	—	—
200 Volts	300U20A	—	—	—	—	—	—	500UDF20A	—	—
250 Volts	300U25A	—	—	—	—	—	—	—	—	—
300 Volts	300U30A	—	—	—	—	—	—	500UDF30A	—	—
400 Volts	300U40A	—	—	401PDL40S	—	—	—	500UDF40A	—	—
500 Volts	300U50A	—	—	—	—	—	—	500UDF50A	—	—
600 Volts	300U60A	—	—	401PDL60S	—	—	501V60B	500UDF60A	—	801PD60B
700 Volts	300U70A	—	—	—	—	—	—	500UDF70A	—	—
800 Volts	300U80A	301U80	—	401PDL80S	—	—	501V80B	500UDF80A	—	801PD80B
900 Volts	300U90A	—	—	—	—	—	—	500UDF90A	—	—
1000 Volts	300U100A	301U100	—	401PDU100S	—	—	501V100B	500UDF100A	—	801PD100B
1200 Volts	300U120A	301U120	331VF120	401PDL120S	471PD120	501V120	501V120B	500UDF120A	801PD120	801PD120B
1300 Volts	—	—	—	401PDL130S	—	—	—	—	—	—
1400 Volts	—	301U140	331VF140	—	471PD140	501V140	501V140B	—	801PD140	801PD140B
1600 Volts	—	301U160	331VF160	—	471PD160	501V160	—	—	801PD160	—
1800 Volts	—	301U180	331VF180	—	471PD180	501V180	—	—	801PD180	—
2000 Volts	—	301U200	331VF200	—	471PD200	501V200	—	—	801PD200	—
2100 Volts	—	301U210	—	—	—	501V210	—	—	—	—
2200 Volts	—	301U220	—	—	—	501V220	—	—	—	—
2300 Volts	—	301U230	—	—	—	501V230	—	—	—	—
2400 Volts	—	301U240	—	—	—	501V240	—	—	—	—
2500 Volts	—	301U250	—	—	—	—	—	—	—	—

(2) Fast Recovery Rectifier—add suffix to part number for Max. reverse recovery time:
S20 = 2.0 μsec.
S15 = 1.5 μsec.
Refer to Engineering Catalog.

(3) Ratings for reverse polarity units differ from basic units. Refer to Engineering Catalog.

(4) Available in B-6 case only.

IOR INTERNATIONAL RECTIFIER
SEMICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 6281

SELENIUM RECTIFIERS

Listed are the basic specifications for IR's selenium rectifiers. IR offers an extensive selection of standard and special order selenium devices including: power stacks, multi-circuit stacks, cartridges, miniature stacks, diodes, loose cell kits, voltage suppressors (Klip-Sels) and contact protectors. These items are listed in IR's Engineering Brochure B-107.

Your local IR Industrial Distributor or IR Field Office will gladly supply you with complete specifications, ordering assistance, and price and delivery quotations.

KLIP-SELS

Device Voltage Rating (V)	Max. RMS Operating Volts (V)	Max. Clamping Volts @ Peak Current	For Individual Rectifier Rated Thru 3 Amp	For Individual Rectifier Rated Thru 16 Amp	For Individual Rectifier Rated Thru 60 Amp	For Individual Rectifier Rated Thru 250 Amp
			Peak Current			
			0.25A	1.0A	3.0A	15A
50	26	70	KY1DPF	KZ1DPF	KSA1DAF	KSL1DAF
100	52	140	KY2DPF	KZ2DPF	KSA2DAF	KSL2DAF
150	78	210	KY3DPF	KZ3DPF	KSA3DAF	KSL3DAF
200	104	280	KY4DPF	KZ4DPF	KSA4DAF	KSL4DAF
250	130	350	KY5DPF	KZ5DPF	KSA5DAF	KSL5DAF
300	156	420	KY6DPF	KZ6DPF	KSA6DBF	KSL6DBF
500	234	630	KY9DPF	KZ9DPF	KSA9DBF	KSL9DBF
—	260	700	KY10DPF	KZ10DPF	KSA10DBF	KSL10DBF
600	286	770	KY11DPF	KZ11DPF	KSA11DBF	KSL11DBF
800	364	980	KY14DPF	KZ14DPF	KSA14DBF	KSL14DBF
900	416	1120	KY16DPF	KZ16DPF	KSA16DBF	KSL16DBF

STANDARD SELENIUM STACKS

Type	Output DC Volts	Output DC Amp	Max. Input AC Volts
J14C04	0	0.5	36
J14C1		1.5	36
J14C5	to	5.0	36
J14C8		10.0	36
J14C17	14	20.0	36
J29B04	0	0.5	36
J29B1		1.5	36
J29B5	to	5.0	36
J29B8		10.0	36
J29B17	29	20.0	36
J58B04	0	0.5	72
J58B1		1.5	72
J58B5	to	5.0	72
J58B8		10.0	72
J58B17	58	20.0	72
J116B04	0	0.5	144
J116B1		1.5	144
J116B5	to	5.0	144
J116B8		10.0	144
J116B17	116	20.0	144
J135B04	0	0.5	180
J135B1		1.5	180
J135B5	to	5.0	180
J135B8		10.0	180
J135B17	135	20.0	180

CONTACT PROTECTORS

AC Types IR No.	Max. Working Volts ac	Max. Coil Current (Amp)
S1V1P	26	.20
S2V2P	52	.20
S3V3P	78	.20
S4V4P	104	.20
S5V5P	130	.20
S6V6P	156	.20

CONTACT PROTECTORS (Continued)

AC Types IR No.	Max. Working Volts ac	Max. Coil Current (Amp)
S1Z1P	26	.60
S2Z2P	52	.60
S3Z3P	78	.60
S4Z4P	104	.60
S5Z5P	130	.60
S6Z6P	156	.60
S1W1P	26	1.2
S2W2P	52	1.2
S3W3P	78	1.2
S4W4P	104	1.2
S5W5P	130	1.2
S6W6P	156	1.2
DC Types IR No.	**Max. Working Volts dc**	**Max. Coil Current (Amp)**
S1V1P	22	.25
S2V1P	44	.25
S3V2P	66	.25
S4V2P	88	.25
S5V2P	110	.25
S6V2P	132	.25
S7V2P	154	.25
S1Z1P	22	.90
S2Z1P	44	.90
S3Z2P	66	.90
S4Z2P	88	.90
S5Z2P	110	.90
S6Z2P	132	.90
S7Z2P	154	.90
S1W1P	22	1.0
S2W1P	42	1.0
S3W2P	66	1.0
S4W2P	88	1.0
S5W2P	110	1.0
S6W2P	132	1.0
S7W2P	154	1.0

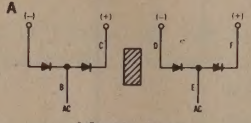
MULTI-CIRCUIT SELENIUM STACKS

IR Number	Output ④ D.C. Volt	Output ④ D.C. Amp	Input A.C. V RMS	IR Number	Output ④ D.C. Volt	Output ④ D.C. Amp	Input A.C. V RMS
J29D2(1)	29	2.0	36	J29D13(2)	29	13.0	36
J58D2	58	2.0	72	J58D13	58	13.0	72
J135D2	135	2.0	180	J135D13	135	13.0	180
J29D7(2)	29	7.0	36	J29D25(2)	29	25.0	36
J58D7	58	7.0	72	J58D25	58	25.0	72
J135D7	135	7.0	180	J135D25(3)	135	25.0	180

(1) Supplied with No. 20 copper wire for bussing.
(2) Supplied with hardware as needed for bussing.
(3) Replaces J280D25. May be marked with both numbers.
(4) Connected as 1ϕ bridge. Circuit detail E.

For forced cooling @ 800 LFM, multiply rating by 3.

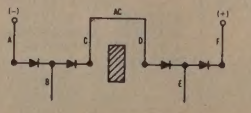
A



2 Doubler Stacks

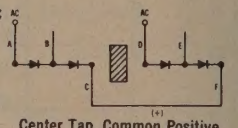
NOTE: Supplied configuration—for indicated circuits, add connections.

B



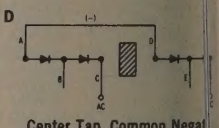
Half Wave or Doubler Type With Center Link

C



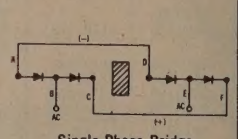
Center Tap, Common Positive

D



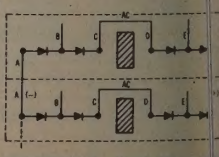
Center Tap, Common Negat

E



Single Phase Bridge

F



Multiple Stack—Single Phase B
Use additional units as requir

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ZENER REGULATORS, VOLTAGE REFERENCES & LOW POWER SILICON RECTIFIERS

This section lists basic parameters to give quick, easy reference to Zener Regulators, Voltage Reference Diodes, and Low Power Silicon Rectifiers.

HOW TO USE THIS SECTION

Zener Regulators

Devices are listed by power rating on pages 5 and 6.
Look for these specifications.
Power rating
Maximum operating temperature
Standard tolerance range. (Other tolerances are specified in the Notes section.)
Notes (which are defined on page 5.)
Case style (See pp. 13-15.)
Then check for the part number of the voltage required.

Voltage Reference Diodes

Devices are listed on page 6. They are listed by power rating.
Look for these specifications.
Power rating.
Zener voltage (V_Z)
Zener test Current (I_{ZT})
Zener impedance (Z_Z)
Temperature ranges over which the delta ΔBV rating is measured
Case style (pp. 13-15)
The part numbers are listed opposite the nominal temperature coefficient.

Low Power Rectifiers

Devices are listed by current ratings on page 7.
Look for these specifications.
Current rating.
Maximum Peak One Cycle Surge Current (I_{FSM}[surge]).
Case connection to the stud or case.
Case style. (see pp. 13-15)
Then check for the part number of the voltage required.

Your local IR Industrial Distributor or IR Field Office will gladly supply you with complete specifications, ordering assistance, and price and delivery quotations.

Power Rating	150mW		250mW		200mW		
Max. Temp. (°C)	200°		200°		150°		
Tolerance	—		—		10%		
Notes	1		2		3		
Case (P. 13-15)	C-1		DO-7		DO-7		
Vz	Part No.	Izt (mA)	Part No.	Izt	Vz	Part No.	Izt (mA)
2.0-3	1N465	5	1N702	5	—	—	—
3.0-3	1N466	5	1N703	5	—	—	—
3.7-4	1N467	5	1N704	5	—	—	—
4.3-5	1N468	5	1N705	5	4.8	1N761	10
5.2-6	1N469	5	1N706	5	5.8	1N762	10
6.2-8	1N470	5	1N707	5	7.1	1N763	10
7.5-9	1N1313	0.20	—	—	8.7	1N764	10
9.0-1	1N1314	0.20	—	—	10.5	1N765	5
11-1	1N1315	0.20	—	—	12.7	1N766	5
13.5	1N1316	0.20	—	—	15.7	1N767	5
17-2	1N1317	0.20	—	—	19.0	1N768	5
20-2	1N1318	0.20	—	—	23.5	1N769	5
25-3	1N1319	0.20	—	—	—	—	—
30-3	1N1320	0.20	—	—	—	—	—

Power Rating	1W		1W		1W		1W	
Max. Temp.	175°		175°		200°		200°	
Tolerance	10%		20%		10%		10%	
Notes	3		7		3		3	
Case (P. 13)	DO-13		DO-13		C-9		C-9	
Vz	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)
3.0	—	—	—	—	—	—	—	—
3.3	—	—	—	—	1N4728	76	1ZS3.3	76
3.6	—	—	—	—	1N4729	69	1ZS3.6	69
3.9	—	—	—	—	1N4730	64	1ZS3.9	64
4.3	—	—	—	—	1N4731	58	1ZS4.3	58
4.7	—	—	—	—	1N4732	53	1ZS4.7	53
5.1	—	—	—	—	1N4733	49	1ZS5.1	49
5.6	1N1765	100	—	—	1N4734	45	1ZS5.6	45
6.2	1N1766	100	—	—	1N4735	41	1ZS6.2	41
6.8	1N1767	100	1N3016	37	1N4736	37	1ZS6.8	37
7.5	1N1768	100	1N3017	34	1N4737	34	1ZS7.5	34
8.2	1N1769	100	1N3018	31	1N4738	31	1ZS8.2	31
9.1	1N1770	50	1N3019	28	1N4739	28	1ZS9.1	28
10	1N1771	50	1N3020	25	1N4740	25	1ZS10	25
11	1N1772	50	1N3021	23	1N4741	23	1ZS11	23
12	1N1773	50	1N3022	21	1N4742	21	1ZS12	21
13	1N1774	50	1N3023	19	1N4743	19	1ZS13	19
15	1N1775	50	1N3024	17	1N4744	17	1ZS15	17
16	1N1776	50	1N3025	15.5	1N4745	15.5	1ZS16	15.5
18	1N1777	50	1N3026	14.0	1N4746	14.0	1ZS18	14.0
20	1N1778	15	1N9027	12.5	1N4747	12.5	1ZS20	12.5
22	1N1779	15	1N3028	11.5	1N4748	11.5	1ZS22	11.5
24	1N1780	15	1N3029	10.5	1N4749	10.5	1ZS24	10.5
27	1N1781	15	1N3030	9.5	1N4750	9.5	1ZS27	9.5
30	1N1782	15	1N3031	8.5	1N4751	8.5	1ZS30	8.5
33	1N1783	15	1N3032	7.5	1N4752	7.5	1ZS33	7.5
36	1N1784	15	1N3033	7.0	1N4753	7.0	1ZS36	7.0
39	1N1785	15	1N3034	6.5	1N4754	6.5	1ZS39	6.5
43	1N1786	15	1N3035	6.0	1N4755	6.0	1ZS43	6.0
47	1N1787	15	1N3036	5.5	1N4756	5.5	1ZS47	5.5
51	1N1788	15	1N3037	5.0	1N4757	5.0	1ZS51	5.0
56	1N1789	15	1N3038	4.5	1N4758	4.5	1ZS56	4.5
62	1N1790	5	1N3039	4.0	1N4759	4.0	1ZS62	4.0
68	1N1791	5	1N3040	3.7	1N4760	3.7	1ZS68	3.7
75	1N1792	5	1N3041	3.3	1N4761	3.3	1ZS75	3.3
82	1N1793	5	1N3042	3.0	1N4762	3.0	1ZS82	3.0
91	1N1794	5	1N3043	2.8	1N4763	2.8	1ZS91	2.8
100	1N1795	5	1N3044	2.5	1N4764	2.5	1ZS100	2.5
110	1N1796	5	1N3045	2.3	—	—	—	—
120	1N1797	5	1N3046	2.0	—	—	—	—
130	1N1798	5	1N3047	1.9	—	—	—	—
150	1N1799	5	1N3048	1.7	—	—	—	—
160	1N1800	5	1N3049	1.6	—	—	—	—
180	1N1801	5	1N3050	1.4	—	—	—	—
200	1N1802	5	1N3051	1.2	—	—	—	—

Power Rating	250mW		400mW		400mW		400mW		400mW		1W		1W		1W	
Max. Temp. (°C)	200°		175°		175°		150°		200°		165°		165°		175°	
Tolerance (%)	10%		10%		20%		10%		5%		10%		20%		20%	
Notes	3		3		7		3		—		3		6		3	
Case (P. 13-15)	DO-7		DO-7		DO-7		DO-7		DO-7		C-3		C-3		DO-13	
	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	(mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)
[illegible]	—	—	1N4370	20	—	—	—	—	—	—	—	—	—	—	—	—
[illegible]	—	—	1N4371	20	—	—	—	—	—	—	—	—	—	—	—	—
[illegible]	—	—	1N4372	20	—	—	—	—	—	—	—	—	—	—	—	—
[illegible]	—	—	1N746	20	—	—	—	—	—	—	—	—	—	—	1N3821	76
[illegible]	—	—	1N747	20	—	—	—	—	—	—	—	—	—	—	1N3822	69
[illegible]	—	—	1N748	20	—	—	—	—	—	—	1N1518	50	1Z3.9	50	1N3823	64
[illegible]	—	—	1N749	20	—	—	—	—	—	—	—	—	1Z4.3	50	1N3824	58
[illegible]	—	—	1N750	20	—	—	—	—	1N3510	20	1N1519	40	1Z4.7	40	1N3825	53
[illegible]	—	—	1N751	20	—	—	—	—	1N3511	20	—	—	1Z5.1	40	1N3826	49
[illegible]	1N708	25	1N752	20	—	—	1N1956	5	1N3512	20	1N1520	35	1Z5.6	35	1N3827	45
[illegible]	1N709	25	1N753	20	—	—	—	—	1N3513	20	—	—	1Z6.2	35	1N3828	41
[illegible]	1N710	25	1N754	20	1N957	18.5	1N1957	5	1N3514	20	1N1521	30	1Z6.8	30	1N3829	37
[illegible]	1N711	25	1N755	20	1N958	16.5	—	—	1N3515	10	—	—	1Z7.5	30	—	—
[illegible]	1N712	25	1N756	20	1N959	15.0	1N1958	5	1N3516	10	1N1522	25	1Z8.2	25	—	—
[illegible]	1N713	12	1N757	20	1N960	14.0	—	—	1N3517	10	—	—	1Z9.1	25	—	—
[illegible]	1N714	12	1N758	20	1N961	12.5	1N1959	5	1N3518	10	1N1523	20	1Z10	20	—	—
[illegible]	1N715	12	—	20	1N962	11.5	—	—	1N3519	10	—	—	1Z11	20	—	—
[illegible]	1N716	12	1N759	20	1N963	10.5	1N1960	1	1N3520	10	1N1524	15	1Z12	15	—	—
[illegible]	1N717	12	—	—	1N964	9.5	—	—	1N3521	5	—	—	1Z13	15	—	—
[illegible]	—	—	—	—	—	—	1N1961(5)	1	—	—	1N1525	13	1Z15	13	—	—
[illegible]	1N718	12	—	—	1N965	8.5	—	—	1N3522	5	—	—	1Z16	13	—	—
[illegible]	1N719	12	—	—	1N966	7.8	—	—	1N3523	5	1N1526	10	1Z18	10	—	—
[illegible]	1N720	12	—	—	1N967	7.0	1N1962	1	1N3524	5	—	—	1Z20	10	—	—
[illegible]	1N721	4	—	—	1N968	6.2	—	—	1N3525	5	1N1527	9	1Z22	9	—	—
[illegible]	1N722	4	—	—	1N969	5.6	1N1963	1	1N3526	5	—	—	1Z24	9	—	—
[illegible]	1N723	4	—	—	1N970	5.2	—	—	1N3527	5	1N1528	7	1Z27	7	—	—
[illegible]	1N724	4	—	—	1N971	4.6	1N1964	1	1N3528	4	—	—	1Z30	7	—	—
[illegible]	1N725	4	—	—	1N972	4.2	—	—	1N3529	4	—	—	—	—	—	—
[illegible]	—	—	—	—	1N973	3.8	1N1965	0.2	1N3530	3						

NOTES: For Pages 5 & 6

1. for 1N1313 thru 1N1320 max. temp. = 150°C
2. Part No. / Vz
   - 1N702A 2.3-2.9
   - 1N703A 3.23-3.67
   - 1N704A 3.9-4.3
   - 1N705A 4.58-5.12
   - 1N706A 5.5-6.1
   - 1N707A 6.65-7.55
3. Add 'A' for 5% tolerance
4. Add 'A' for 10% tolerance
5. 1N1961: Vz = 14.5
6. Add 'T5' for 5% tolerance; 'T10' for 10% 'T20' for 20%
7. Add 'A' for 10% tolerance; 'B' for 5%
8. Polarity—Cathode to Stud only.
9. Polarity—Anode to Stud; add 'R' for Cathode to Stud.

IOR INTERNATIONAL RECTIFIER
SEMICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 678-6

ZENER REGULATORS

Power Rating	3.5W		3.5W		5W		5W		10W		10W		10W		10W		10W	
Max. Temp.	165°		165°		200°		200°		165°		165°		175°		175°		175°	
Standard Tolerance	10%		20%		20%		20%		10%		20%		10%		10%		20%	
Notes (p. 5)	3, 8		6, 8		7		7		3, 8		6		3, 8		3, 9		7, 9	
Case (p. 13)	DO-4		DO-4		C-12		C-12		DO-4		DO-4		DO-4		DO-4		DO-4	
Vz (V)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)
3.3	—	—	—	—	1N5333	380	5ZS3.3	380	—	—	—	—	—	—	—	—	—	—
3.6	—	—	—	—	1N5334	350	5ZS3.6	350	—	—	—	—	—	—	—	—	—	—
3.9	1N1588	150	3Z3.9	150	1N5335	320	5ZS3.9	320	1N1599	500	10Z3.9	500	1N3993	640	—	—	—	—
4.3	—	—	3Z4.3	150	1N5336	290	5ZS4.3	290	—	—	10Z4.3	500	1N3994	580	—	—	—	—
4.7	1N1589	125	3Z4.7	125	1N5337	260	5ZS4.7	260	1N1600	400	10Z4.7	400	1N3995	530	—	—	—	—
5.1	—	—	3Z5.1	125	1N5338	240	5ZS5.1	240	—	—	10Z5.1	400	1N3996	490	—	—	—	—
5.6	1N1590	110	3Z5.6	110	1N5339	220	5ZS5.6	220	1N1601	350	10Z5.6	350	1N3997	445	—	—	—	—
6.0	—	—	—	—	1N5340	200	5ZS6.0	200	—	—	—	—	—	—	—	—	—	—
6.2	—	—	3Z6.2	110	1N5341	200	5ZS6.2	200	—	—	10Z6.2	350	1N3998	405	—	—	—	—
6.8	1N1591	100	3Z6.8	100	1N5342	175	5ZS6.8	175	1N1602	300	10Z6.8	300	1N3999	370	1N1805	1000	1N2970	370
7.5	—	—	3Z7.5	100	1N5343	175	5ZS7.5	175	—	—	10Z7.5	300	1N4000	335	1N1806	1000	1N2971	335
8.2	1N1592	80	3Z8.2	80	1N5344	150	5ZS8.2	150	1N1603	250	10Z8.2	250	—	—	1N1807	1000	1N2972	305
8.7	—	—	—	—	1N5345	150	5ZS8.7	150	—	—	—	—	—	—	—	—	—	—
9.1	—	—	3Z9.1	80	1N5346	150	5ZS9.1	150	—	—	10Z9.1	250	(3)	(9)	1N1808	500	1N2973	275
10	1N1593	70	3Z10	70	1N5347	125	5ZS10	125	1N1604	200	10Z10	200	1N2498	500	1N1351	500	1N2974	250
11	—	—	3Z11	70	1N5348	125	5ZS11	125	—	—	10Z11	200	1N2499	500	1N1352	500	1N2975	230
12	1N1594	50	3Z12	50	1N5349	100	5ZS12	100	1N1605	170	10Z12	170	1N2500	500	1N1353	500	1N2976	210
13	—	—	3Z13	50	1N5350	100	5ZS13	100	—	—	10Z13	170	1N1816(3)	500(9)	1N1354	500	1N2977	190
14	—	—	—	—	1N5351	100	5ZS14	100	—	—	—	—	—	—	—	—	1N2978	180
15	1N1595	40	3Z15	40	1N5352	75	5ZS15	75	1N1606	140	10Z15	140	1N1817	500	1N1355	500	1N2979	170
16	—	—	3Z16	40	1N5353	75	5ZS16	75	—	—	10Z16	140	1N1818	500	1N1356	500	1N2980	155
17	—	—	—	—	1N5354	70	5ZS17	70	—	—	—	—	—	—	—	—	1N2981	145
18	1N1596	35	3Z18	35	1N5355	65	5ZS18	65	1N1607	110	10Z18	110	1N1819	500	1N1357	150	1N2982	140
19	—	—	—	—	1N5356	65	5ZS19	65	—	—	—	—	—	—	—	—	1N2983	130
20	—	—	3Z20	35	1N5357	65	5ZS20	65	—	—	10Z20	110	1N1820	250	1N1358	150	1N2984	125
22	1N1597	30	3Z22	30	1N5358	50	5ZS22	50	1N1608	90	10Z22	90	1N1821	250	1N1359	150	1N2985	115
24	—	—	3Z24	30	1N5359	50	5ZS24	50	—	—	10Z24	90	1N1822	250	1N1360	150	1N2986	105
25	—	—	—	—	1N5360	50	5ZS25	50	—	—	—	—	—	—	—	—	1N2987	100
27	1N1598	25	3Z27	25	1N5361	50	5ZS27	50	1N1609	70	10Z27	70	1N1823	250	1N1361	150	1N2988	95
28	—	—	—	—	1N5362	50	5ZS28	50	—	—	—	—	—	—	—	—	—	—
30	—	—	3Z30	25	1N5363	40	5ZS30	40	—	—	10Z30	70	1N1824	250	1N1362	150	1N2989	85
33	—	—	—	—	1N5364	40	5ZS33	40	—	—	—	—	1N1825	150	1N1363	150	1N2990	75
36	—	—	—	—	1N5365	30	5ZS36	30	—	—	—	—	1N1826	150	1N1364	150	1N2991	70
39	—	—	—	—	1N5366	30	5ZS39	30	—	—	—	—	1N1827	150	1N1365	150	1N2992	65
43	—	—	—	—	1N5367	30	5ZS43	30	—	—	—	—	1N1828	150	1N1366	150	1N2993	60
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N2994	55
47	—	—	—	—	1N5368	25	5ZS47	25	—	—	—	—	1N1829	150	1N1367	150	1N2995	55
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N2996	50
51	—	—	—	—	1N5369	25	5ZS51	25	—	—	—	—	1N1830	150	1N1368	150	1N2997	50
52	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N2998	50
56	—	—	—	—	1N5370	20	5ZS56	20	—	—	—	—	1N1831	150	1N1369	150	1N2999	45
60	—	—	—	—	1N5371	20	5ZS60	20	—	—	—	—	—	—	—	—	—	—
62	—	—	—	—	1N5372	20	5ZS62	20	—	—	—	—	1N1832	50	1N1370	50	1N3000	40
68	—	—	—	—	1N5373	20	5ZS68	20	—	—	—	—	1N1833	50	1N1371	50	1N3001	37
75	—	—	—	—	1N5374	20	5ZS75	20	—	—	—	—	1N1834	50	1N1372	50	1N3002	33
82	—	—	—	—	1N5375	15	5ZS82	15	—	—	—	—	1N1835	50	1N1373	50	1N3003	30
87	—	—	—	—	1N5376	15	5ZS87	15	—	—	—	—	—	—	—	—	—	—
91	—	—	—	—	1N5377	15	5ZS91	15	—	—	—	—	1N1836	50	1N1374	50	1N3004	28
100	—	—	—	—	1N5378	12	5ZS100	12	—	—	—	—	1N2008(3)	50(9)	1N1375	50	1N3005	25
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N3006	25
110	—	—	—	—	—	—	—	—	—	—	—	—	1N2009	50	1N1809	50	1N3007	23
120	—	—	—	—	—	—	—	—	—	—	—	—	1N2010	50	1N1810	50	1N3008	20
130	—	—	—	—	—	—	—	—	—	—	—	—	1N2011	50	1N1811	50	1N3009	19
140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N3010	18
150	—	—	—	—	—	—	—	—	—	—	—	—	1N2012	50	1N1812	50	1N3011	17
160	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N1813	50	1N3012	16
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N3013	14
180	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N1814	50	1N3014	14
200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1N1815	50	1N3015	12

Case	DO-4		DO-4		C-12		C-12		DO-4		DO-4		DO-4		DO-4		DO-4	
Vz (V)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)	Part No.	Izt (mA)

VOLTAGE REFERENCES (see notes to right)

Power Rating	250mW	250mW	400mW	400mW	400mW	400mW	400mW	400mW	400mW	400mW	400mW	400mW	500mW
V_Z Zener Voltage (V)	5.9 to 6.5	8.0 to 8.8	5.9 to 6.5	6.2 to 6.9	6.3 to 6.7	6.4, ±5%	6.4, ±5%	6.4, ±5%	6.4, ±5%	8.0 to 8.8	5.9 to 6.5	8.0 to 8.8	8.55 to 9.45
I_{ZT} test current (A)	7.5	10	7.5	7.5	7.5	0.5	1.0	2.0	4.0	10	7.5	10	7.5
Z_Z Zener impedance (Ω)	15	15	15(2)	15	10	200	100	50	25	15	20	15	20
Temperature ranges for ΔBV values (1) (°C)	0° to 25°	—55° to 25°	—55° to 25°	—55° to 25°	—55° to 25°	0° to 75° (3)	0° to 75° (3)	0° to 75° (3)	0° to 75° (3)	—55° to 25° (4)	—55° to 25°	—55° to 25°	0° to 75°(6)
	25° to 75°	25° to 100°	25° to 100°	25° to 100°						25° to 100°	25° to 100°	25° to 100°	
Case pp.13-15	DO-7	C-5	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	C-1	C-4	DO-7
Nom. temp. Coeff.(%/°C)						(3)	(3)	(3)	(3)	(4)		(5)	(6)
	PART NUMBERS												
0.015 Volts	—	—	—	—	1N3779	—	—	—	—	—	—	—	—
0.01 Volts	—	—	1N821	—	1N3780	1N4565	1N4570	1N4575	1N4580	1N3154	1N429	—	1N935
0.005 Volts	1N3496	—	1N823	—	1N3781	1N4566	1N4571	1N4576	1N4581	1N3155	—	—	1N936
0.002 Volts	1N3497	1N1530	1N825	1N826	1N3782	—	1N4572	1N4577	1N4582	1N3156	—	—	1N937
0.001 Volts	1N3498	1N1530A	1N827	1N828	1N3783	—	1N4573	1N4578	1N4583	1N3157	—	—	1N938
0.005 Volts	1N3499	—	1N829	—	1N3784	—	1N4574	1N4579	1N4584	—	—	1N430	1N939

SPECIAL OUTLINE SERIE

Power Rating (mW)	V_Z Zener Voltage (V, ±5%)	Z_Z Zener Impedance	Part No. (7)
200	6.2	20	1N173
400	12.4	40	1N173
600	18.6	60	1N173
800	24.8	80	1N173
1000	31.0	100	1N173
1200	37.2	120	1N174
1400	43.4	140	1N174
1600	49.6	160	1N174

NOTES: For Voltage References

(1) ΔBV measured at following temp ranges.
(2) For Z_Z = 10Ω add "A"
(3) "A" suffix type temp. range of ΔBV= —55° to 25°, 25° to 100°
(4) "A" suffix type temp range of ΔBV= —55° to 25°, 25° to 150°
(5) "A" suffix offers lower ΔBV
(6) "A" suffix temp. range ΔBV= —55° to 25°, 25° to 100°
"B" suffix temp. range ΔBV= —55° to °25, 25° to 150°
(7) A version: nom. temp. coeff. = 0.005
Z_Z = twice rating of basic version
Nom. temp. coeff. = 0.01
I_{ZT} = 7.5
ΔBV temp. range= —55° to 25°, 25° to 1

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LOW POWER SILICON RECTIFIERS

Current Rating @ Max. Temp °C)	400mA @ 50°(2)	750mA @ 25°(2)	750mA @ 25°(2)	750mA @ 75°(2)	800mA @ 50°(2)	10A @ 75°(2)	1.0A @ 75°(2)	1.0A @ 75°(2)	1.3A @ 50°(2)	2.0A @ 100°(1)	3.0A @ 125°(1)	3.0A @ 50°(3)
Max. Surge (AMPS)	20	25	10	35	40	50	40	50	40	50	170	25
Case Connection (Stud)	—	—	—	—	—	—	—	—	—	—	—	Cathode
Case (JEDEC 15)	DO-39	C-11	C-10	C-10	DO-39	C-11	C-10	DO-39	C-3	C-11	C-11	DO-4
	PART NUMBERS											
50 Volts	—	—	1N2103	—	—	—	—	—	—	20A05	—	—
100 Volts	—	—	1N2104	—	—	5A1	10C1	10D1	10B1	20A1	30S1	—
200 Volts	—	1N2069	1N2105	1N3193	—	5A2	10C2	10D2	10B2	20A2	30S2	1N1124
300 Volts	—	—	1N2106	—	—	5A3	10C3	10D3	10B3	20A3	30S3	1N1125
400 Volts	4D4	1N2070	1N2107	1N3194	8D4	5A4	10C4	10D4	10B4	20A4	30S4	1N1126
500 Volts	—	—	1N2108	—	—	5A5	10C5	10D5	10B5	20A5	30S5	1N1127
600 Volts	4D6	1N2071	—	1N3195	8D6	5A6	10C6	10D6	10B6	20A6	30S6	1N1128
800 Volts	—	—	—	1N3196	—	5A8	10C8	10D8	10B8	20A8	30S8	—
1000 Volts	—	—	—	1N3563	—	5A10	10C10	10D10	10B10	20A10	30S10	—

Current Rating @ Max. Temp (°C)	3.0A @ 140°	3.0A @ 140°(3)	3.3A @ 50°(3)	3.5A @ 85°(3)	6.0A @ 150°(3)	6.0A @ 150°(3)	6.0A @ 150°(3)	12.0A @ 150°(3)	12.0A @ 180°(3)	12.0A @ 180°(3)	16.0A @ 185°
Max. Surge (AMPS)	15	40	25	35	150	150	150	200	240	250	300
Case Connection (Stud)	Cathode	Cathode(4)	Cathode	Cathode	Cathode(4)	Cathode(4)	Cathode(4)	Cathode(4)	Cathode(4)	Cathode(4)	Cathode(4)
Case (JEDEC 13)	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4	DO-4
	PART NUMBERS										
50 Volts	1N2348	—	—	—	1N1341	1N1341A	1N1341B	1N1199	1N1199A	1N1199B	1N3615
100 Volts	1N2349	3F10	—	1N3569	1N1342	1N1342A	1N1342B	1N1200	1N1200A	1N1200B	1N3616
150 Volts	1N2350	—	—	—	1N1343	1N1343A	1N1343B	1N1201	1N1201A	1N1201B	1N3617
200 Volts	—	3F20	1N1124A	1N3570	1N1344	1N1344A	1N1344B	1N1202	1N1202A	1N1202B	1N3618
300 Volts	—	3F30	1N1125A	1N3571	1N1345	1N1345A	1N1345B	1N1203	1N1203A	1N1203B	1N3619
400 Volts	—	3F40	1N1126A	1N3572	1N1346	1N1346A	1N1346B	1N1204	1N1204A	1N1204B	1N3620
500 Volts	—	3F50	1N1127A	1N3573	1N1347	1N1347A	1N1347B	1N1205	1N1205A	1N1205B	1N3621
600 Volts	—	3F60	1N1128A	1N3574	1N1348	1N1348A	1N1348B	1N1206	1N1206A	1N1206B	1N3622
700 Volts	—	—	1N3649	—	6F70A	1N3987	6F70B	1N3670	1N3670A	—	—
800 Volts	—	3F80	1N3650	—	6F80A	1N3988	6F80B	1N3671	1N3617A	12F80B	1N3623
900 Volts	—	—	—	—	6F90A	1N3989	6F90B	1N3672	1N3672A	—	—
1000 Volts	—	3F100	—	—	6F100A	1N3990	6F100B	1N3673	1N3673A	12F100B	1N3624

(1) Lead temperature measured 3/8 inch from body. (2) Ambient Temperature. (3) Case Temperature. (4) For anode-to-stud, add "R" to basic number

REPLACEMENT GUIDE

	10C1	10C2	10C3	10C4	10C5	10C6	10C8	10C10
Electri Equivalent	1N2610	1N2611	1N2612	1N2613	1N2614	1N2615	1N2616	1N2617
JEDEC Series	—	1N3639	—	1N3640	—	1N3641	1N3642	—
Replaced	—	1N5211	—	1N5212	—	1N5213	1N5214	—

GERMANIUM DIODES —Popular devices for low power control and rectification.

IR Part Number	1N34A	1N48	1N60	1N67A	1N82A	1N87A	1N294	1N295	1N541	1N542	1N636A
Reverse Voltage (V)	60	70	30	80	5	30	60	40	45	(1)	60
Forward Current (mA)	50	50	50	30	25	50	60	35	35	—	10μA

(1) Matched pair of 1N541s

SILICON ASSEMBLIES

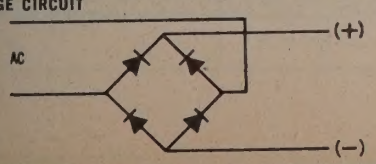
Listing includes selected pre-engineered molded and open tack assemblies.
IR has proven record of supplying new and unusual designs to meet stringent or short box parameters.
For further assistance in ordering, or detailed information for designing, call your local Distributor, or your local IR Field Office, or IR's El Segundo offices.

BRIDGE CIRCUIT ASSEMBLIES RATINGS AND CHARACTERISTICS

Part Number(1)	18DB	30DB	50FB	60FB	100PB	B6F	B12F	B70H
Average—Max. Rectifier Output Current (1)	1.8	3.0	3.75	6.0	10.0	12	24	35
Surge—Max. Peak One Cycle Surge Current)	40	70	200	150	300	—	—	—
Max. Repetitive peak (A)	5	5	20	—	60	—	—	—
Ambient Operating Temp °C)	—40° to 140°	—40° to 140°	—20° to 140°	—65° to 150°	—65° to 150°	—	—65° to 180°	—65° to 180°
Case (JEDEC 13-15)	D-2	D-12	D-13	D-14	(2)	D-10	D-10	D-10

(1) Suitable safety factors — both voltage and current — commensurate with individual application conditions must be applied to the absolute maximum ratings to safeguard against voltage transients and current surges.
(2) For D-4 Case, use "P" suffix. For D-5 Case, change suffix to "L".

RECTIFIER BRIDGE CIRCUIT



RATINGS—ABSOLUTE MAXIMUMS

Part Number (1)	V_{RM} (non-rep)—Max. non-repetitive peak reverse	V_{RM} (rep)—Max. repetitive peak reverse voltage (V)
1.8 Amp Bridge		
18DB2A	350	200
18DB4A	600	400
18DB6A	800	600
18DB8A	1000	800
18DB10A	1250	1000
3.0 Amp Bridge		
30DB2T	350	200
30DB4T	600	400
30DB6T	800	600
30DB8T	1000	800
30DB10T	1250	1000
3.75 Amp Bridge		
50FB1L	125	100
50FB2L	250	200
50FB3L	375	300
50DB4L	500	400

Part Number (1)	V_{RRM}—Max. Peak reverse voltage (V)	V_{RMS}—Max. RMS input (V)
6 Amp Bridge		
60FB05L	50	35
60FB1L	100	70
60FB2L	200	140
60FB3L	300	210
60FB4L	400	280
60FB6L	600	420
10 Amp Bridge (2)		
100PB05P	50	35
100PB1P	100	70
100PB2P	200	140
100PB3P	300	210
100PB4P	400	280
100PB6P	600	420
12 Amp Bridge		
B6F5	50	35
B6F10	100	70
B6F20	200	140
B6F30	300	210
B6F40	400	280
B6F60	600	420
B6F80	800	560
B6F100	1000	700

Part Number (1)	V_{RRM}—Max. Peak reverse voltage (V)	V_{RMS}—Max. RMS input (V)
24 Amp Bridge		
B12F5	50	35
B12F10	100	70
B12F20	200	140
B12F30	300	210
B12F40	400	280
B12F60	600	420
B12F80	800	560
B12F100	1000	700
35 Amp Bridge		
B70H5	50	35
B70H10	100	70
B70H20	200	140
B70H30	300	210
B70H40	400	280
B70H60	600	420
B70H80	800	560
B70H100	1000	700

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FUSE-CLIP MOUNT RECTIFIERS

MAXIMUM CONDITIONS:

T_J—Operating Temperature (°C): −60° to 170°
T_{stg}—Storage Temperature (°C): −60° to 170°
Weight: 1/3 oz.
Case: D-3 (Page 13)

FUSE-CLIP HOLDERS

Cat. No.	Description (All are 11/16" high)
25-2003	Single Type 1/2" x 1 3/8"
25-2004	Dual type 1 3/16" x 1 7/16"
25-2005	Quad type 1 15/16" sq.

MAXIMUM RATINGS

Part Number	1N1081	1N1082	1N1083	1N1084	5MA1	5MA2	5MA3	5MA4	5MA5	5MA6	5M	5MA1
V_{RM}—Max. Peak Reverse Voltage V_R—Max. Continuous Reverse d.c. Voltage (Volts)	100*	200*	300*	400*	100	200	300	400	500	600	80	1000
I_F (AV)—Max. Avge Rect'd Output Current @ 75°C (A)	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.	1.0

*JEDEC Registe Value

SOLID STATE TUBE REPLACEMENTS

IR Part Number	Replaces Tubes
1N570 (ST-1A)	MIL-6X4, MIL-12X4
1N1150A	5Z3, 80, 82, 83, 83V
1N1237	0Z4, 5X4, 5Y4, 6AX5, 6X5
1N1238	5AV4, 5AW4, 5AZ4, 5T4, 5U4, 5V4, 5W4, 5Y3, 5Z4
1N1239	5R4
1N1262 (ST-7)	6AU4, 6AX4, 6BL4. 6W4, 12AX4, 17AX4, 25W4
1N2389	5AV4, 5AW4, 5AX4, 5T4, 5U4, 5V4, 5W4, 5Y3, 5Z4, 6004
1N2490	6X4
1N2630 (ST-1)	6X4, 12X4
1N2631 (ST-2)	5AW4. 5AX4, 5AZ4, 5T4, 5U4, 5Y4, 6004
1N2632 (ST-2A)	5R4, 5R4W
1N2633 (ST-3)	0Z4, 5X4, 6AX5, 6W5, 6X5, 6ZY5, 5839, 5852

IR Part Number	Replaces Tubes
1N2634 (ST-4)	5Z3, 80, 82, 83, 83V
1N2635 (ST-5)	High Altitude 6X4 & 12X4
1N2636 (ST-6)	84/6Z4
1N2637 (ST-7A)	3B28, 249B, 866, 866A
ST-8	0Z4, 6X5
ST-9	8008
ST-10	872A
ST-11	816
ST-12	8020
ST-13	6BW4, 12BW4
ST-14	5AV4, 5AW4, 5AX4, 5T4, 5U4, 5V4, 5W4, 5Y3, 5Z4, 04
ST-15	673
ST-16	575A

HIGH VOLTAGE MOLDED RECTIFIERS

Listed below are 3 series of half-wave assemblies. Doubler assemblies are also available from International Rectifier.

RATINGS—ABSOLUTE MAXIMUM OPERATING RANGE

IR Number	JEDEC No.	$V_{RM\,(rep)}$—Max. rep. peak reverse volt. per leg (KV) (1)	* I_F (AV) @ 50°C	$I_{FM\,(surge)}$—Max. peak one-cycle, non-repetitive surge current (Amps)	I_R (AV)—Max. average reverse current (μA)	Operating Temperature (°C)	Storage Temperature (°C)	Case (Page 14)
Avalanche Type 67D—N Series								
67D050H04TNN	—	5.0	0.25	35	1	−65° to 140°	−65° to 150°	D-7
67D075H04TNN	—	7.5	0.25					
67D100H04TNN	—	10.0	0.25					
67D120H04TNN	—	12.0	0.25					
67D150H04TNN	—	15.0	0.25					
67D200H04TNN	—	20.0	0.25					
67D300H04TNN	—	30.0	0.25					
67D400H04TNN	—	40.0	0.25					
RC Compensated Type 67D—S Series (2)								
67D050H20TTS	—	5.0	0.35	35	270	−65° to 140°	−65° to 150°	D-8
67D075H20TTS	—	7.5	0.35					
67D100H20TTS	—	10.0	0.35					
67D120H20TTS	—	12.0	0.35					
67D150H20TTS	—	15.0	0.35					
67D200H20TTS	—	20.0	0.35					
67D250H20TTS	—	25.0	0.35					
67D300H20TTS	—	30.0	0.35					
67D400H20TTS	—	40.0	0.35					
67D500H20TTS	—	50.0	0.35					
67D600H20TTS	—	60.0	0.35					
67D750H20TTS	—	75.0	0.35					

RATINGS—ABSOLUTE MAXIMUM OPERATING RANGE

IR Number	JEDEC No.	$V_{RM\,(rep)}$—Max. rep. peak reverse volt. per leg (KV) (1)	* I_F (AV) @ 50°C	$I_{FM\,(surge)}$—Max. peak one-cycle, non-repetitive surge current (Amps)	I_R (AV)—Max. average reverse current (μA)	Operating Temperature (°C)	Storage Temperature (°C)	Case (Page 14)
RC Compensated Type 67C—S Series (2)								
67C015H20LSS	1N4865	1.5	1.25	50	270	−65° to 175°	−65° to 175°	D-8
67C024H20LSS	1N4866	2.4	1.25					
67C030H20LSS	1N4867	3.0	1.25					
67C050H20LSS	1N4868	5.0	1.25					
67C075H20LSS	1N4869	7.5	1.25					
67C100H20LSS	1N4870	10.0	1.25					
67C120H20LSS	1N4871	12.0	1.25					
67C150H20LSS	1N4872	15.0	1.25					
67C200H20LSS	1N4873	20.0	1.25					
67C250H20LSS	1N4874	25.0	1.25					
67C300H20LSS	1N4875	30.0	1.25					
67C400H20LSS	1N4876	40.0	1.25					
67C500H20LSS	1N4877	50.0	1.25					
67C750H20LSS	1N4878	75.0	1.25					

* I_F (AV)—Max. average forward current (A) with resistive load @ 180° conduction
(1) This value is absolute maximum value. Derate by 50% for a standard safety fac
(2) Also available with turret lugs, or pigtail leads, and threaded studs.
For 67C-S and 67D-S series, optional electrical connections and mounting fac es are available.

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HIGH POWER CARTRIDGE RECTIFIERS

practical series of rectifiers, molded to minimize flash-over and corona at high altitudes. Special ratings are listed for forced air cooling. Case Outline: D-9 Page 14.

Peak reverse voltage (PIV)	MINIATURE AXIAL LEAD CARTRIDGES						STANDARD SERIES, FERRULE MOUNTED CARTRIDGES				HIGH CURRENT SERIES, FERRULE MOUNTED CARTRIDGES				
	JEDEC Number	(JEDEC) I_F (AV)—Max. average forward current (mA) @ 25°C	(JEDEC) I_F (AV)—Max. average forward current (mA) @ 100°C	IR Number (1)	(IR) I_F (AV)—Max. average forward current (mA) @ 50°C	(IR) I_F (AV)—Max. average forward current (mA) @ 100°C	JEDEC Number	(JEDEC) I_F (AV)—Max. average forward current @ 75°C (mA)	IR Number (1)	(IR) I_F (AV)—Max. average forward current @ 50°C (mA)	JEDEC Number	(JEDEC) I_F (AV)—Max. average forward current (mA) Oil Immersed—oil temp. @ 75°C	(JEDEC) I_F (AV)—Max. average forward current (mA) Forced convection—Air Temp. @ 75°C (1)	IR Number (1)	I_F (AV)—Max. avge forward current @ 50°C (mA) Forced air & oil immersed (1)
0.5	1373	250	100	67D006H53PNN	250	100	—	—	—	—	—	—	—	—	—
1.0	1374	250	100	67D010H53PNN	250	100	—	—	—	—	—	—	—	—	—
1.5	1375	200	100	67D015H53PNN	250	100	1N1133	75	67D015H55FNN	250	1N1745	380	300	67D015H55FNN	500
1.8	—	—	—	—	—	—	1N1134	100	—	—	1N1746	440	360	—	—
2.0	—	—	—	—	—	—	1N1135	65	67D018H55FNN	250	1N1747	360	270	67D018H55FNN	500
2.2	—	—	—	—	—	—	1N1136	85	—	—	1N1748	420	330	—	—
2.5	2376	200	100	—	—	—	—	—	—	—	—	—	—	—	—
3.0	—	—	—	67D020H53PNN	250	100	—	—	—	—	—	—	—	—	—
3.5	2377	150	75	—	—	—	1N1137	50	67D024H55FNN	250	1N1749	320	220	67D024H55FNN	500
3.8	—	—	—	—	—	—	1N1138	60	—	—	1N1750	380	270	—	—
4.0	2378	150	75	—	—	—	—	—	—	—	—	—	—	—	—
4.3	—	—	—	67D030H53PNN	250	100	—	—	—	—	—	—	—	—	—
4.8	—	—	—	—	—	—	1N1139	65	—	—	1N1751	370	290	—	—
5.0	—	—	—	—	—	—	1N1140	65	67D036H55FNN	250	1N1752	360	280	67D036H55FNN	500
6.0	2379	100	50	—	—	—	—	—	—	—	—	—	—	—	—
6.5	—	—	—	—	—	—	1N1141	60	—	—	1N1753	330	230	—	—
7.2	—	—	—	—	—	—	1N1142	50	67D048H55FNN	250	1N1754	320	220	67D048H55FNN	430
7.5	—	—	—	67D050H53PNN	250	100	—	—	67D050H55FNN	250	—	—	—	67D050H55FNN	430
8.0	12380	100	50	—	—	—	1N1143	50	—	—	1N1755	290	210	—	—
10.0	—	—	—	—	—	—	1N1143A	65	—	—	1N1756	360	280	—	—
12.0	—	—	—	—	—	—	1N1144	50	—	—	1N1757	290	240	—	—
14.0	—	—	—	—	—	—	1N1145	60	—	—	1N1758	330	230	—	—
15.0	—	—	—	—	—	—	—	—	67D075H55FNN	250	—	—	—	67D075H55FNN	375
16.0	—	—	—	67D080H53PNN	250	100	1N1146	45	—	—	1N1759	250	220	—	—
20.0	N2381	75	25	—	—	—	—	—	67D100H55FNN	250	—	—	—	67D100H55FNN	375
25.0	—	—	—	67D100H53PNN	250	100	—	—	—	—	—	—	—	—	—
30.0	—	—	—	67D120H53PNN	250	100	1N1147	45	—	—	1N1760	250	220	—	—
40.0	—	—	—	—	—	—	—	—	67D120H55FNN	250	—	—	—	67D120H55FNN	375
50.0	—	—	—	—	—	—	1N1148	50	—	—	1N1761	300	240	—	—
	—	—	—	67D150H53PNN	250	100	—	—	67D150H55FNN	250	—	—	—	67D150H55FNN	375
	—	—	—	—	—	—	1N1149	45	—	—	1N1762	250	220	—	—
	—	—	—	67D200H53PNN	250	100	—	—	67D200H55FNN	250	—	—	—	67D200H55FNN	375
	—	—	—	67D250H53PNN	250	100	—	—	67D250H55FNN	250	—	—	—	67D250H55FNN	375
	—	—	—	67D300H53PNN	250	100	—	—	67D300H55FNN	250	—	—	—	67D300H55FNN	375
	—	—	—	—	—	—	—	—	67D400H55FNN	250	—	—	—	67D400H55FNN	375
	—	—	—	—	—	—	—	—	67D500H55FNN	250	—	—	—	67D500H55FNN	375

(1) At 2000 LFM Air Velocity

200IR70 IGNITRON REPLACEMENT

REPLACES THESE IGNITRONS:

1138B	AY5555/653B
653B	WL5555/653B
55	GL5555/FG238B
5555	

CHARACTERISTICS: For use in power rectification applications where phase control is not required.

THERMAL-MECHANICAL	IR No. 200IR70
Temperature Storage	—40° to +120°C
Temperature Operating	—40° to +65°C
Operating Frequency	50 to 400 Hz

ELECTRICAL RATINGS		IR No. 200IR70
V_{RM} (non-rep)	Maximum Transient Peak Reverse Voltage Non-Repetitive .005 sec. max.	1600V
V_{RM} (rep)	Maximum Repetitive Peak Reverse Voltage	1200V
	Built-in Peak Transient Suppression Module Limits Repetitive Peak Reverse Voltage to	1040V RMS
I_F (AV)	Forward Current (180° Cond. Period) @ 50°C Max. Amb. Temp. Natural Convection Cooled	225A
	Forced Air Cooled @ 1000 L FM	475A

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LIGHT SENSITIVE DEVICES

IR offers both Silicon and Selenium photovoltaic cells for convenient design and product selection.

Complete specifications and detailed application data are availab For o ing and pricing information, contact your local IR Industrial D ibuto your local IR Field Office, or IR's El Segundo Offices.

SILICON PHOTOVOLTAIC CELLS

Silicon Cells are commonly used for light sensing and power generation because of their high efficiency.

A normal response time for Silicon Cells is 2 microseconds. The cells respond well to the longer wavelength (red) light and poorly to the shorter wavelength (blue) light.

SELENIUM PHOTOVOLTAIC CELLS

Selenium Cells offer color response similar to human vision and are especially useful in ultraviolet range applications. Due to a slightly higher internal impedance, selenium has a slower frequency response than silicon.

SOLAR CELL STANDARD

Precisely calibrated to provide accurate radiation measurement. T stan is the solid-state analog to the pyroheliometer standard. Each cell calib against primary standard cells which were calibrated at Tab Moun California.

This cell is used to check the efficiencies of production silicon sc cells to calibrate artificial light sources in terms of solar energy radiat

Each cell is supplied with an 8½" X 11" curve of the cell output ch cteri Each cell comes in a special carrying case, and the device incorpor s the couple lead and plug-in output terminals.

IR Solar Cell Standard. . . . Part Number SC-9

SILICON READOUT ARRAYS

Designed for perforated tape and punched card data reading systems, analog-to-digital encoders, and shaft positioning systems, these readout photocells provide high speed response to light passing through punched cards or tape.

Typical current generated is 175 μA for 0.01 square inch of active area with load impedance of 1,000Ω and 500 FC illumination.

ELECTRICAL CHARACTERISTICS @ 500 FC, Color Temp. 2800°K Tungsten, 26°C Ambient

Parameter	—08 Series		—10 Series	
	Typical	Minimum	Typical	Minimum
Short Circuit Current (μA) (1)	250	225	315	250
Load Current (μA) (1)	180	145	270	200
Load Voltage (mV) (1)	180	145	270	200
Open Circuit Voltage (mV) (1)	325	—	325	—
Response Time (μsec) (2)	2.0		2.0	

MECHANICAL CHARACTERISTICS

Center to Center Spacing (inch)	0.087	0.100
Active Area (inch)		
width	0.077	0.90
length	0.160	0.160

Cell listed is P-on-N. For N-on-P, use "A" in place of "P" (SAR-2-08 for N-on-P). For leads, add "PL" to code (SPR-2-08PL for leads). For baseplate, add "B" to code (SPR-2-08B, SAR-2-08BPL).

Part Number	Number of Segments	Overall Length (inches)	Part Number	Number of Segments	Overall Length (inches)
SPR-1-08	1	0.160	SPR-1-10	1	0.160
SPR-2-08	2	0.174	SPR-2-10	2	0.200
SPR-3-08	3	0.261	SPR-3-10	3	0.300
SPR-4-08	4	0.348	SPR-4-10	4	0.400
SPR-5-08	5	0.435	SPR-5-10	5	0.500
SPR-6-08	6	0.522	SPR-6-10	6	0.600
SPR-7-08	7	0.609	SPR-7-10	7	0.700
SPR-8-08	8	0.696	SPR-8-10	8	0.800
SPR-9-08	9	0.783	SPR-9-10	9	0.900
SPR-10-08	10	0.870	SPR-10-10	10	1.000

STANDARD INDIVIDUAL SILICON CELLS

This is a listing of popular silicon cells offered by IR. Thes ells excellent characteristics and high reliability in an inexpensive fo

Electrical Characteristics @ 100 mW/cm², M = 1

Part Number	Minimum Conversion Efficiency	Minimum Power Output (mW)	Mi Curr
(1) SPR-1-08E7	7%	0.55	25
SPR-1-08E10	10%	0.78	35
SPR-1-10E7	7%	0.64	50
SPR-1-10E10	10%	0.92	30
(2) S0505E6	6%	1.2	
S0505E7	7%	1.4	
S0505E8	8%	1.6	
S0505E9	9%	1.8	
S0505E10	10%	2.0	
S0505E11	11%	2.2	
S0505E12	12%	2.4	
S0510E6	6%	2.4	
S0510E7	7%	2.8	
S0510E8	8%	3.2	
S0510E9	9%	3.6	
S0510E10	10%	4.0	1
S0510E11	11%	4.4	1
S0510E12	12%	4.8	1
S0520E6	6%	4.8	1
S0520E7	7%	5.6	1
S0520E8	8%	6.4	1
S0520E9	9%	7.2	1
S0520E10	10%	8.0	2
S0520E11	11%	8.8	2
S0520E12	12%	9.6	2
S1010E4	4%	3.6	9
S1010E5	5%	4.5	11
S1010E6	6%	5.4	13
S1010E7	7%	6.3	15
S1010E8	8%	7.2	18
S1020E4	4%	7.2	18
S1020E5	5%	9.0	22
S1020E6	6%	10.8	28
S1020E7	7%	12.6	31
S1020E8	8%	14.4	36
S1010GE6	6%	5.4	11
S1010GE7	7%	6.3	13
S1010GE8	8%	7.2	15
S1010GE9	9%	8.1	17
S1010GE10	10%	9.0	19
S1010GE11	11%	9.9	21
S1010GE12	12%	10.8	23

(1) Cells listed are P-on-N. For N-on-P, use "A" in place of "P" (SAR-1-08E7 fo
(2) All cells listed are P-on-N. For N-on-P, use "A" in place of "E" (S0505A6 fo
Listing

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ARD INDIVIDUAL SILICON CELLS—Continued

Part Number	Minimum Conversion Efficiency	Minimum Power Output (mW)	Minimum Output Current (mA)
(2)			
20GE6	6%	10.8	23.5
20GE7	7%	12.6	27.2
20GE8	8%	14.4	31.3
20GE9	9%	16.2	35.3
20GE10	10%	18.0	39.2
20GE11	11%	19.8	43.0
20GE12	12%	21.6	47.0
20GE6	6%	22.8	49.5
20GE7	7%	26.6	57.8
20GE8	8%	30.4	66.0
20GE9	9%	34.2	74.5
20GE10	10%	38.0	82.6
20GE11	11%	41.8	91.0
20GE12	12%	45.6	99.3
00E5	5%	28.5	68.0
00E6	6%	34.2	82.0
00E7	7%	39.9	95.0
00E8	8%	46.3	109.0
00GE9	9%	51.3	120.0
00GE10	10%	57.0	136.0

listed are P-on-N. For N-on-P, use "A" in place of "P" (SAR-1-08E7 for N-on-P).
listed are P-on-N. For N-on-P, use "A" in place of "E" (S0505A6 for N-on-P).

POWER MODULES

listed are designed for solar power conversion. They are suited to stations. Three types are listed below.

Power Modules: Individual modules of single cells connected

Modules: Individual cells imbedded in an epoxy resin providing shockproof, weatherproof housing.

Sealed Solar Power Converters: Cells mounted on hard aluminum base with an O-ring seal and replaceable plexiglass cover.

ND POWER MODULES

number in the part number code indicates the number of cells in last number indicates the conversion efficiency rating. That is, E as 2 cells in series and a conversion efficiency rating of 4%.

Characteristics @ 100 mW/cm², M = 1

Part Number	Minimum Output Power (mW)	Minimum Output Voltage (Volts)	Minimum Output Current (mA)
4	14.4	0.8	18.0
5	18.0	0.8	21.5
6	21.6	0.8	27.0
7	25.2	0.8	31.6
E8	28.8	0.8	36.0
GE9	32.4	0.8	40.5
GE10	36.0	0.8	45.0
E4	21.6	1.2	18.0
E5	27.0	1.2	21.5
E6	32.4	1.2	27.0
E7	37.8	1.2	31.6
GE8	43.2	1.2	36.0
GE9	48.6	1.2	40.5
GE10	54.0	1.2	45.0
E4	36.0	2.0	18.0
E5	45.0	2.0	21.5
E6	54.0	2.0	27.0
E7	63.0	2.0	31.6
GE8	72.0	2.0	36.0
GE9	81.0	2.0	40.5
GE10	90.0	2.0	45.0

listed are P-on-N. For N-on-P use "A" in place of "E".
leads add "PL" at end of code.
leads add "T" at end of code.

WEATHERPROOF MODULES
ELECTRICAL CHARACTERISTICS @ 100 mW/cm², M = 1

Part Number	Minimum Output Voltage (Volts)	Minimum Load Current (mA)	Minimum Power (mW)
SP2A40B	1.6	36	58
SP2B48B	1.6	40	64
SP4C40B	3.2	36	115
SP2C80B	1.6	72	115
SP4D48B	3.2	40	128
SP2D96B	1.6	80	128

SOLAR POWER CONVERTERS

Electrical Characteristics @ 100 mW/cm², M = 1

Each unit has an overall diameter of 12 inches and a bolt circle of 11.25 inches.

Part Number	Minimum Load Voltage (Volts)	Minimum Load Current (mA)	Power Output (W)
SP14H52D	14.4	52	0.75
SP14J69E	14.4	69	1.0
SP14K104F	14.4	104	1.5

SELENIUM PHOTOCELLS

Selenium photocells are popular for light meters, as well as many other light-sensing applications. Many special parameters may be selected to meet specific requirements. Complete specifications for these standard series devices are included in IR's Engineering Catalog.

RECTANGULAR TYPES			ROUND TYPES		
Cell Type	Output Current 100fc 100 Ohms (Microamperes)	Size (in.) L x W	Cell Type	Output Current 100fc 100 Ohms (Microamperes)	Diameter (in.)
B1	32	0.59 x 0.24	A2	12	0.25
B2	77	0.72 x 0.44	A3	20	0.38
B4	120	0.88 x 0.54	A5	250	1.13
B5	250	1.44 x 0.64	A7	440	1.50
B10	380	1.69 x 0.88	A10	600	1.75
B15	640	1.69 x 1.69	A15	770	2.0
B17	710	6.0 x 0.50	A30	1400	2.75
B20	900	2.0 x 2.0	PC103	600	OD-2.0
B30	2200	3.25 x 3.25			ID-0.69

MOUNTED CELLS

Mounted Cell Type	Typical Output Current 100 fc 100 Ohms (Microamps)	Size (in.)
B10-M	320	1.1 x 0.3
A5-M	220	1.2 Diameter
A7-M	350	1.7 Diameter
A10-M	550	1.9 Diameter
A15-M	700	2.1 Diameter

For pigtail leads, add "PL" at end of code.

MOISTURE RESISTANT CELLS

Hermetic Sealed Cell Type	Typical Output Current 100fc 100 Ohms (Microamps)	Size (in.)
DP-5	600	2.0 square
DP-3	66	.925 x .750 (1)
DP-2	24	.360 x .750 (2)

(1) Crystal case; window in side
(2) Crystal case; window in top

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HEAT EXCHANGERS

You look to IR for quality devices. Now you can look to IR for total system design, development, and components

For further data, call your local IR Industrial Distributor, or local IR sd offic or IR's El Segundo Offices.

IR Part No.	Remarks—Hole Patterns	Dimensions (Pgs. 14 & 15)	Dimension L	Dimension A	Dimens B
HE-030	3′ Undrilled	F-1	3′	—	—
HE-032	"	F-2	3′	—	—
HE-034	"	F-3	3′	—	—
HE-040	"	F-4	3′	—	—
HE-050	"	F-5	3′	—	—
HE-052	"	F-6	3′	—	—
HE-053	"	F-6	3′	—	—
HE-061	"	F-8	3′	—	—
HE-080	'H', up to 120 in.	F-9	Up to 120″	—	—
HE-085	'I', up to 120 in.	F-10	Up to 120″	—	—
HE-101	TO-18, 24, 28, 40, 44	F-11	—	.150	.64
HE-102	TO-5, 9, 11, 12, 16, 26, 29, 33, 39, 42, 43, 45	F-11	—	.255	.72
HE-103	TO-8, 38, 48	F-12	—	—	—
HE-200	Undrilled	F-13	.50	—	—
HE-201	TO-3	F-13	.50	—	—
HE-202	TO-36	F-13	.50	—	—
HE-210	Undrilled	F-13	.75	—	—
HE-211	TO-3	F-13	.75	—	—
HE-212	TO-36	F-13	.75	—	—
HE-220	Undrilled	F-13	1.00	—	—
HE-221	TO-3	F-13	1.00	—	—
HE-222	TO-36	F-13	1.00	—	—
HE-230	Undrilled	F-13	1.25	—	—
HE-231	TO-3	F-13	1.25	—	—
HE-232	TO-36	F-13	1.25	—	—
HE-300	Undrilled	F-1	1.25	—	—
HE-310	Undrilled	F-1	2.00	—	—
HE-320	Undrilled	F-2	1.50	—	—
HE-321	TO-3	F-2	1.50	—	—
HE-322	TO-36	F-2	1.50	—	—
HE-330	Undrilled	F-2	3.00	—	—
HE-331	TO-3	F-2	3.00	—	—
HE-340	Undrilled	F-3	3.00	—	—
HE-341	TO-3	F-3	3.00	—	—
HE-400	Undrilled	F-4	.75	—	—
HE-403	TO-64, DO-4, 10-32 Stud	F-4	.75	—	—
HE-410	Undrilled	F-4	1.50	—	—
HE-414	TO-48, TO-65, DO-5, 1/4-28 Stud	F-4	1.50	—	—
HE-415	For 2 TO-48, TO-65, DO-5, 1/4-28 Studs	F-4	1.50	—	—
HE-416	For 2 TO-64, DO-4, 10-32 Studs	F-4	1.50	—	—
HE-417	DO-21, 24, Press Fit	F-4	1.50	—	—
HE-420	Undrilled	F-4	3.00	—	—
HE-424	TO-48, TO-65, DO-5, 1/4-28 Stud	F-4	3.00	—	—
HE-425	For 2 TO-48, TO-65, DO-5, 1/4-28 Studs	F-4	3.00	—	—
HE-500	Undrilled	F-5	1.50	—	—
HE-501	TO-3	F-5	1.50	—	—
HE-502	TO-36	F-5	1.50	—	—
HE-503	TO-64, DO-4, 10-32 Stud	F-5	1.50	—	—
HE-504	TO-48, TO-65, DO-5, 1/4-28 Stud	F-5	1.50	—	—
HE-510	Undrilled	F-5	3.00	—	—
HE-511	TO-3	F-5	3.00	—	—
HE-512	TO-36	F-5	3.00	—	—
HE-520	Undrilled	F-6	3.00	1.88	.200
HE-530	Undrilled	F-6	3.00	2.63	.190
HE-531	TO-3	F-6	3.00	2.63	.190
HE-532	TO-36	F-6	3.00	2.63	.190
HE-540	Undrilled	F-7	5.50	—	—
HE-600	Undrilled	F-14	5.00	—	—
HE-610	Undrilled	F-8	5.50	—	—
HE-620	Undrilled	F-15	6.00	—	—
HE-630	Undrilled	F-16	6.00	—	—
HE-638	DO-9, TO-93, 3/4-16 Stud	F-16	6.00	—	—
HE-640	Undrilled	F-16	9.00	—	—
HE-650	Undrilled	F-17	3.50	—	—
HE-660	Undrilled	F-17	6.00	—	—
HE-670	Undrilled	F-17	12.00	—	—
HE-800	'H', 4″ Long	F-9	4.00	—	—
HE-810	'H', 5″ Long	F-9	5.00	—	—
HE-820	'H', 6″ Long	F-9	6.00	—	—
HE-850	'I', 3″ Long	F-10	3.00	—	—
HE-860	'I', 4″ Long	F-10	4.00	—	—
HE-870	'I', 5″ Long	F-10	5.00	—	—
HE-900	Epoxy	200 gm resin, 14 gms catalyst		—	—
HE-910	Thermal Joint Compound	2 oz.		—	—
HE-911	Thermal Joint Compound	8 oz.		—	—
HE-920	Mounting Bracket	For HE-500 & HE-510		—	—
HE-921	Mounting Bracket	For HE-530 & HE-540		—	—
HE-930	Insulating Washer	For HE-300, 400, & 500 Series		—	—
HE-931	Insulating Washer	For HE-600 Series		—	—

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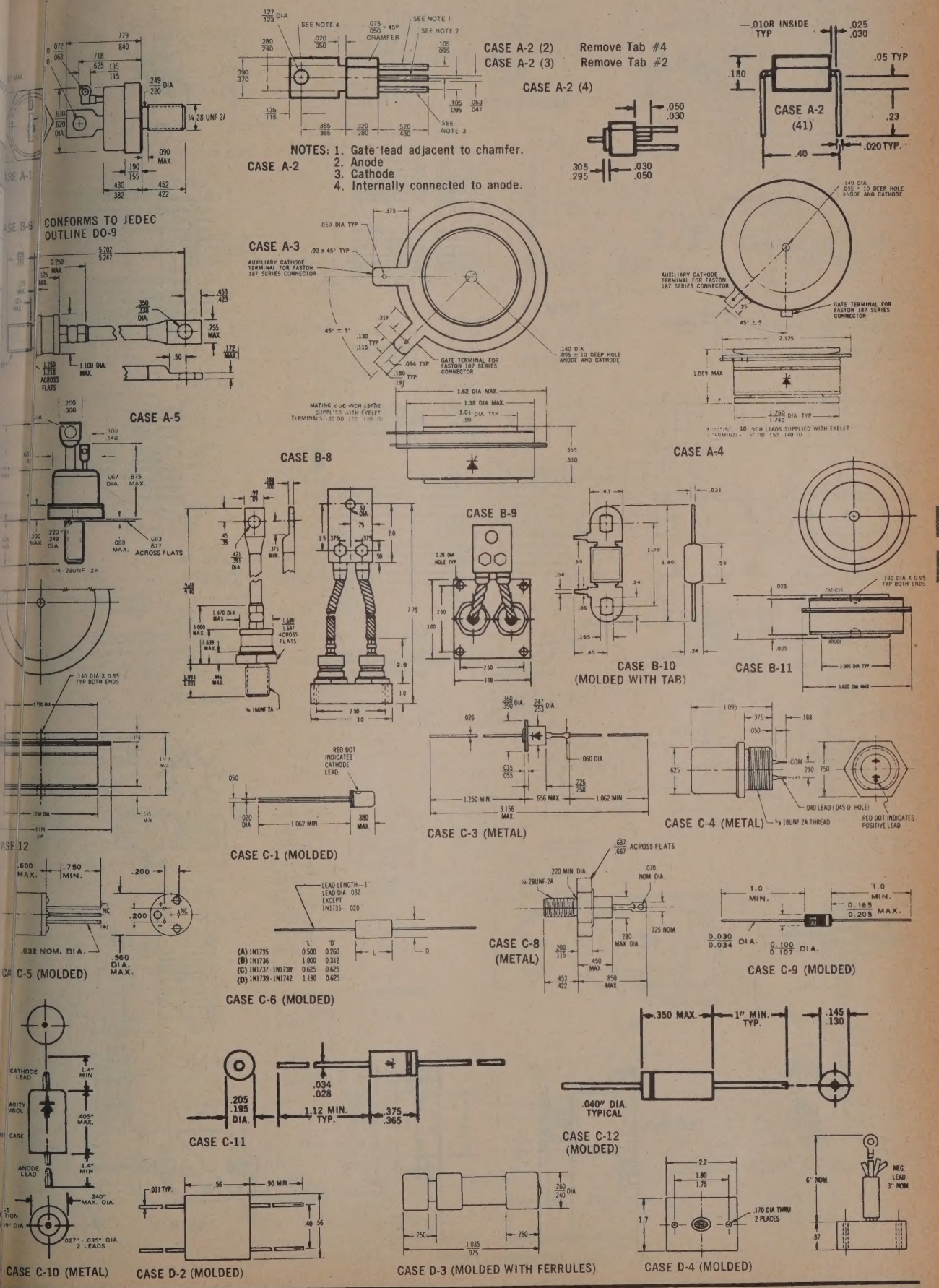

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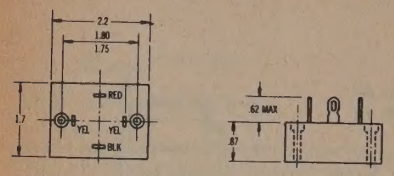

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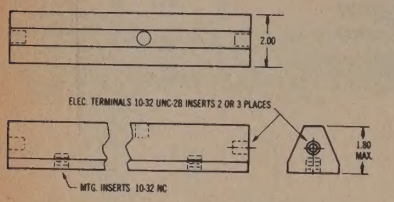

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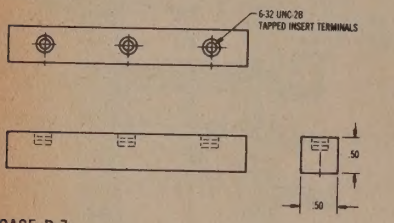

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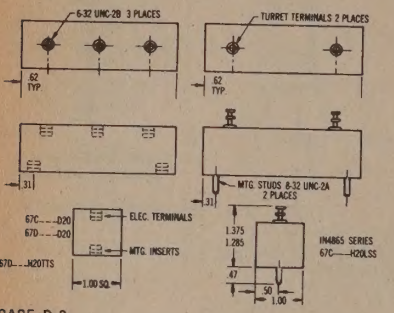

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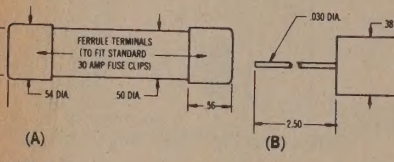
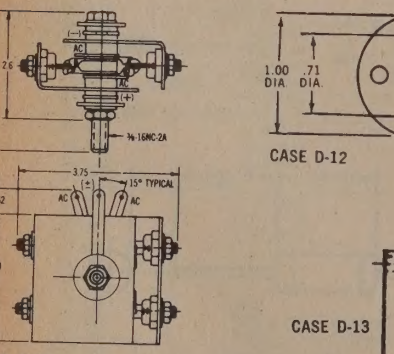


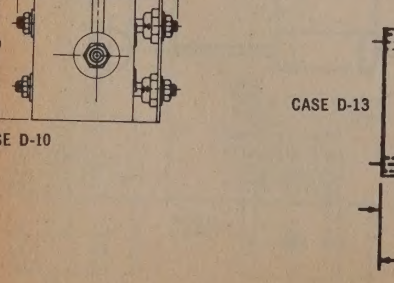
(A) (B)

CASE D-9



CASE D-10

CASE D-12



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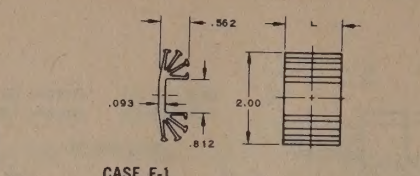
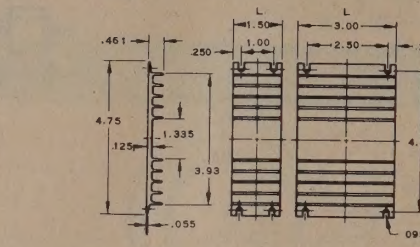


CASE F-1



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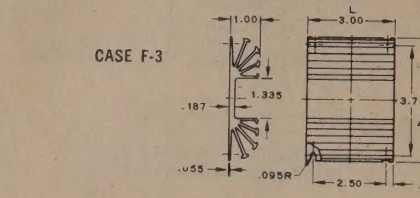

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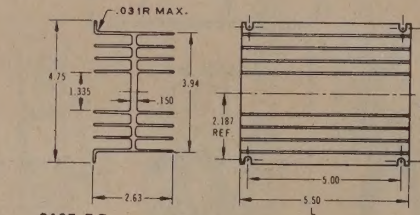
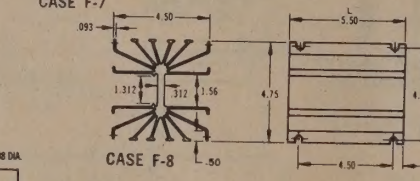


CASE F-7



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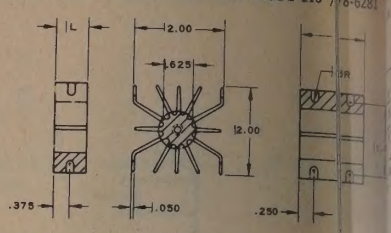

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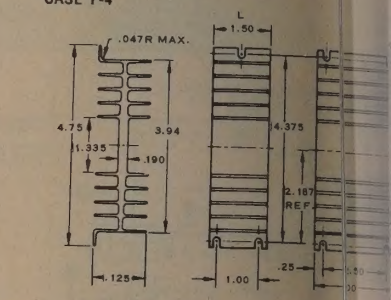

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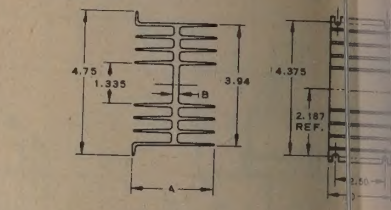

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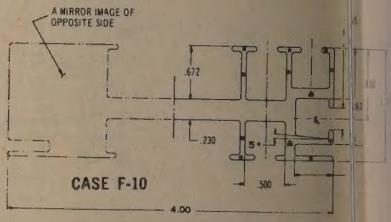

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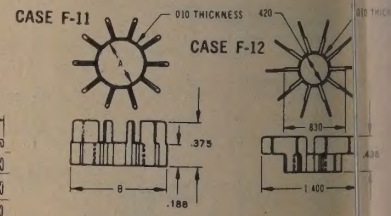
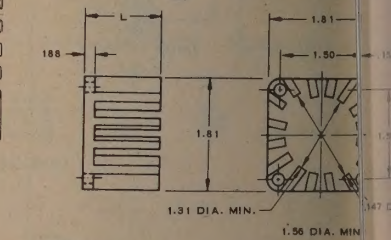
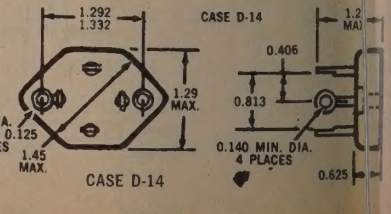


CASE F-11 CASE F-12



CASE F-13

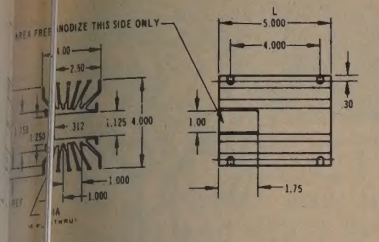
CASE F-9

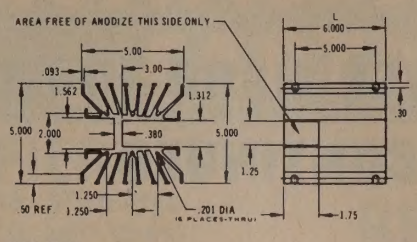


CASE D-14

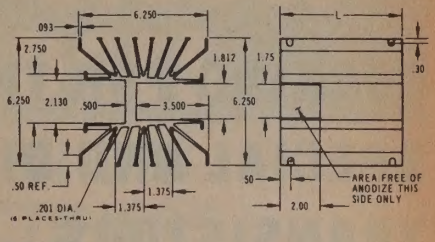
ALL DIMENSIONS IN INCHES

INTERNATIONAL RECTIFIER IOR
SEMICONDUCTOR DIVISION / 233 KANSAS STREET / EL SEGUNDO / CALIFORNIA 90245 / CABLE RECTUSA / TELEPHONE AREA CODE 213 / 678-6281





CASE F-15



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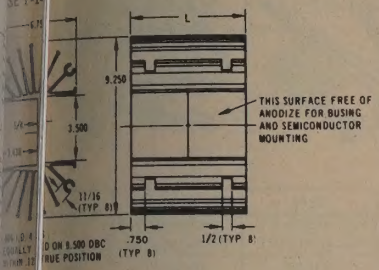

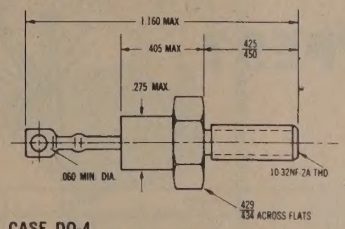

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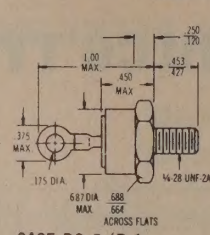
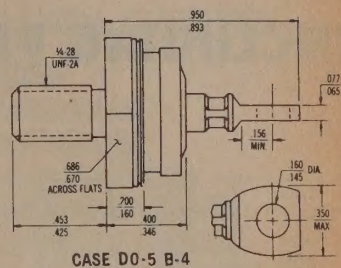
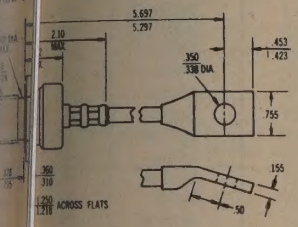
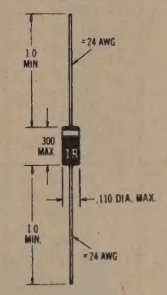


CASE DO-5/B-1



CASE DO-5 B-4





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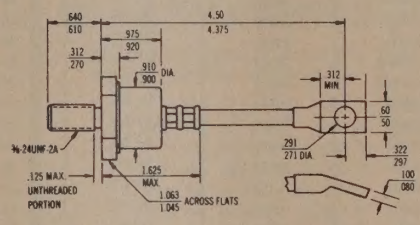

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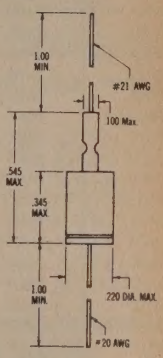

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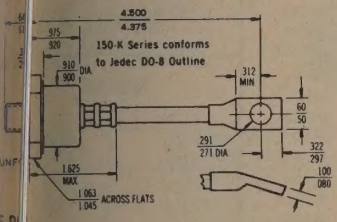
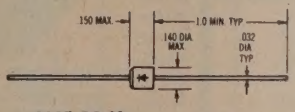
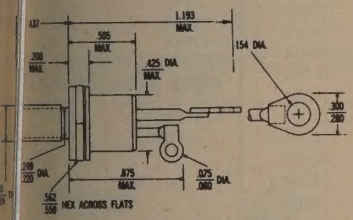
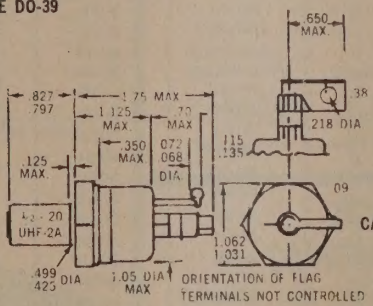




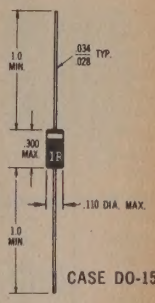
CASE DO-39

CASE TO-92





CASE TO-83



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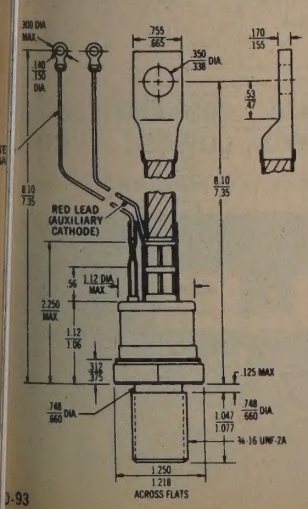
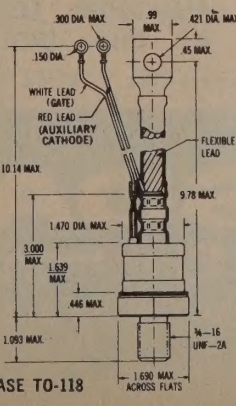
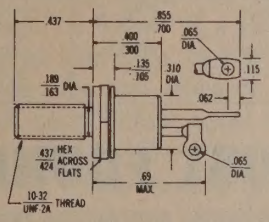


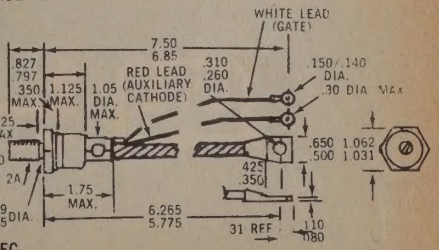


CASE TO-118



CASE TO-64

CASE TO-94



CONFORMS TO JEDEC OUTLINE TO-49 WHEN AUXILIARY CATHODE LEAD IS REMOVED.

LOOKING FOR THOSE HARD-TO-GET SPECIAL AND DISCONTINUED TRANSISTORS... INCLUDING PHILCO TYPES?

TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TY
2N128	2N535B	2N795	2N965	2N1200	2N1655	2N1986	2N2221	2N2539	2N2
2N207	2N536	2N796	2N966	2N1201	2N1656	2N1987	2N2221A	2N2540	2N3
2N207A	2N588	2N785	2N967	2N1204	2N1663	2N1988	2N2222	2N2651	2N3
2N207B	2N589	2N828	2N976	2N1204A	2N1676	2N1989	2N2222A	2N2699	2N3
2N223	2N597	2N834	2N977	2N1219	2N1677	2N1990	2N2274	2N2710	2N3
2N224	2N598	2N835	2N979	2N1220	2N1683	2N2048	2N2275	2N2795	2N3
2N225	2N599	2N846	2N980	2N1221	2N1711	2N2086	2N2276	2N2796	2N3
2N226	2N600	2N846A	2N982	2N1222	2N1726	2N2087	2N2277	2N2904	2N3
2N227	2N601	2N846B	2N983	2N1223	2N1727	2N2088	2N2278	2N2904A	2N3
2N231	2N670	2N858	2N984	2N1267	2N1728	2N2147	2N2279	2N2905	2N3
2N232	2N671	2N859	2N1024	2N1268	2N1742	2N2148	2N2280	2N2905A	2N3
2N240	2N672	2N860	2N1025	2N1269	2N1743	2N2162	2N2281	2N2906	2N3
2N317A	2N673	2N861	2N1026	2N1270	2N1744	2N2163	2N2282	2N2906A	2N3
2N344	2N674	2N862	2N1027	2N1271	2N1745	2N2164	2N2360	2N2907	2N3
2N345	2N675	2N863	2N1028	2N1272	2N1746	2N2165	2N2361	2N2907A	2N3
2N346	2N696	2N864	2N1034	2N1300	2N1747	2N2166	2N2362	2N2954	2N3
2N352	2N697	2N865	2N1035	2N1301	2N1748	2N2167	2N2368	2N2966	2N3
2N353	2N698	2N924	2N1036	2N1411	2N1748A	2N2168	2N2369		2N3
2N355	2N699	2N926	2N1037	2N1416	2N1749	2N2169	2N2369A		
2N386	2N699A	2N927	2N1118	2N1427	2N1750	2N2170	2N2374		
2N387	2N706	2N928	2N1118A	2N1428	2N1752	2N2175	2N2375		
2N393	2N706A	2N929	2N1119	2N1429	2N1753	2N2176	2N2376		
2N395	2N706B	2N930	2N1122	2N1436	2N1754	2N2177	2N2377		
2N396	2N708	2N935	2N1122A	2N1467	2N1785	2N2178	2N2378		
2N396A	2N709	2N936	2N1123	2N1472	2N1786	2N2180	2N2380		
2N408	2N768	2N937	2N1124	2N1478	2N1787	2N2181	2N2380A		
2N428	2N769	2N938	2N1125	2N1494	2N1788	2N2182	2N2398		
2N495	2N770	2N939	2N1128	2N1494A	2N1789	2N2183	2N2399		
2N496	2N771	2N940	2N1129	2N1495	2N1790	2N2184	2N2400		
2N499	2N772	2N941	2N1130	2N1496	2N1864	2N2185	2N2401		
2N499A	2N773	2N942	2N1131	2N1499	2N1865	2N2186	2N2402		
2N501	2N774	2N943	2N1132	2N1499A	2N1866	2N2187	2N2410		
2N501A	2N775	2N944	2N1135	2N1499B	2N1867	2N2199	2N2451		
2N502	2N776	2N945	2N1135A	2N1500	2N1868	2N2200	2N2478		
2N502A	2N777	2N946	2N1158	2N1606	2N1893	2N2217	2N2479		
2N502B	2N778	2N947	2N1158A	2N1607	2N1905	2N2218	2N2487		
2N503	2N779	2N960	2N1177	2N1608	2N1917	2N2218A	2N2488		
2N504	2N779A	2N961	2N1178	2N1613	2N1918	2N2219	2N2489		
2N534	2N779B	2N962	2N1179	2N1623	2N1983	2N2219A	2N2537		
2N535	2N784A	2N963	2N1199	2N1643	2N1984	2N2220	2N2538		
2N535A	2N794	2N964	2N1199A	2N1654	2N1985				

SPECIALS

T1750	T203
T1872	T204
T1905	T204
T1943	T204
T2028	T209
T2029	T211
T2030	T212
T2038	T234

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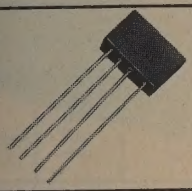
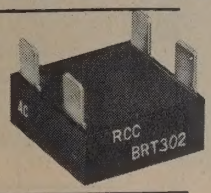
3 & AMPERE BRIDGES

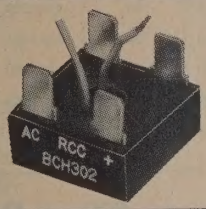




VOLTAGE RATING	2 AMPS/50°C (50A Peak Surge)	3 AMPS/55°C (50A Peak Surge)	6 AMPS/55°C (125A Peak Surge)
	501-363-05	BRH/T300.5	BRH/T600.5
2	501-363-2	BRH/T302	BRH/T602
4	501-363-4	BRH/T304	BRH/T604
6	501-363-6	BRH/T306	BRH/T606
	—	BRH/T308	BRH/T608
1	—	BRH/T310	BRH/T610
1	—	BRH/T315	BRH/T615

NOTE: 6 AMP SERIES: 'H' denotes thru mounting hole. 'T' denotes 6-32 threaded insert

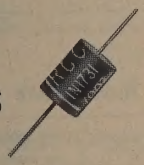
3, 6 AMPERE CONTROLLED BRIDGES



VOLTAGE RATING	3 AMPS/55°C (20A Peak Surge)	6 AMPS/55°C (90A Peak Surge)
50	BCH/T300.5	BCH/T600.5
100	BCH/T301	BCH/T601
200	BCH/T302	BCH/T602
300	BSH/T303	BCH/T603
400	BCH/T304	BCH/T604

NOTE: 'H' denotes thru mounting hole; 'T' denotes 6-32 threaded insert.

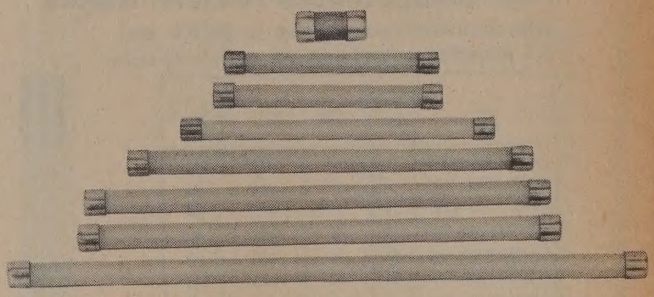
STANDARD VOLTAGE TYPES



VOLTAGE RATING	0.2 AMPS/25°C (2.5A Peak Surge)	1.0 AMPS/55°C (80A Peak Surge)	1.0 AMPS/25°C (80A Peak Surge)
1500	1N1731	—	—
2000	1N1732	1N5482	—
3000	1N1733	1N5483	—
4000	—	1N5484	—
5000	1N1734	1N5485	1N5477
6000	—	—	1N5478
7000	—	—	1N5479
8000	—	—	1N5480
10,000	—	—	1N5481

SELENIUM RECTIFIERS

HIGH VOLTAGE SELENIUM CARTRIDGES

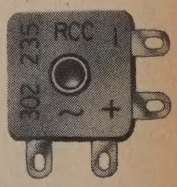


High Voltage Selenium Cartridges, which feature low leakage, high conductivity, stability and reliability.

Part No. 303-59	800 PIV "Boost"	1 1/16" L x 9/32" Dia.
Part No. 303-248	6500 V "Focus"	2 1/16" L x 9/32" Dia.
Part No. 303-351	7500 V	2 3/16" L x 9/32" Dia.
Part No. 303-352	10,000 V	2 15/16" L x 9/32" Dia.
Part No. 303-353	11,000 V	3 3/16" L x 9/32" Dia.
Part No. 303-354	12,000 V	3 5/8" L x 9/32" Dia.
Part No. 303-355	18,000 V	4 5/16" L x 9/32" Dia.
Part No. 303-356	20,000 V	5 5/8" L x 9/32" Dia.

BRIDGE RECTIFIERS FOR SOLENOID, MOTOR AND RELAY OPERATION

A completely wired, single phase bridge rectifier, in a Lexan case, with center mounting and eyelet completely insulated.



Part No. 302-137
130 VAC RMS 100 MA DC 5/8" x 5/8" x 5/16"

Part No. 302-235
250 VAC RMS 80 MA DC 5/8" x 5/8" x 5/16"

Other ratings available upon request.

POWER RECTIFIERS — CONVENTIONAL CONSTRUCTION!

Rectifier cells from 0.7" x 0.7" to 8" x 16" are available as cells or stacks for convection cooling, fan-cooled or oil-cooled applications. The high efficiency, and long life expectancy (100,000 hours without aging) plus transient-free characteristics make this new selenium an economic device to be used in critical applications. The forward voltage drop at rated loads is less than silicon. Therefore, on all low voltage applications, the low voltage drop, high efficiency, long, non-aging life, and freedom from the need for transient suppressors or special mounting hardware, make the Rect-A-Cell rectifiers the most economical device for your applications.

RECTIFIER COMPONENTS CORPORATION

124 ALBANY AVENUE, FREEPORT, N.Y. 11520

SEMIKRON
INTERNATIONAL·INC.
P.O.B. 323, Scarsdale, N. Y. 10583
CABLE: SEMIKRON SCARSDALE, N. Y.
TELEPHONE: (914) 725 - 2529

WORLD WIDE APPROVED SELENIUM & SILICON COMPONENTS

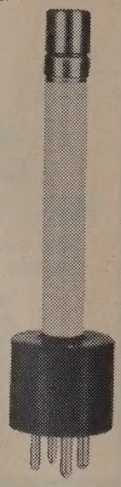
SEMIKRON

High Voltage Silicon Rectifier Stacks

with controlled avalanche up to 50 KV and 3,5 amperes output current (hermetically sealed)

Type HSK	Rated PIV (KV)	Min. aval. voltage (KV)	Max. aver. current*) (A)	Max. 1/2**) cycle surge (A)
E 5000/2200—0,25	8	15	0,35	55
E 3500/1550—0,3	5	10	0,40	55
E 2500/1100—0,3	4	7,5	0,45	55
E 17000/7600—0,3	25	50	0,45	55
E 14000/6300—0,4	20	40	0,50	55
E 10000/4500—0,4	15	30	0,50	55
E 7500/3300—0,4	11	20	0,55	55
E 5000/2200—0,5	8	15	0,60	55
E 3500/1550—0,5	5	10	0,65	55
E 7500/3300—1,2	11	20	1,40	90
E 10000/4500—1,2	15	30	1,40	90
E 5000/2200—1,2	8	15	1,45	90
E 3500/1550—1,2	5	10	1,50	90
E 3500/1550—2,0	5	10	2,50	90
869 B	15	30	3,50	200
872 A, 8008	11	20	1,4	90

*) at T_A max. = 45°C **) at max. rated load



Silicon Controlled Rectifiers

inverter types up to 1200 volts

Types	Max. average forward current (A)	Min. forward and reverse blocking voltage (V)	Max. peak surge current (≤ 8 msec) for all types (A)	I^2t (A^2sec)
SKT 45, 46	45	200—1600	800	2 600
SKT 70, 71	70	200—1600	1700	11 000
SKT 90, 91	90	200—1600	2200	20 000
SKT 110,111	110	200—1600	2800	30 000
SKT 140,141	140	200—1600	3900	60 000
SKT 170,171	170	200—1600	6600	180 000
SKT 220,221	220	200—1600	7800	250 000

- dV/dt up to > 1000 V/µsec
- Max. operating junction temperature up to 150° C
- Case temperature up to 105° C

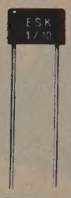
Selenium Transient Voltage Suppressors

- 30 or 60 volts clamping voltage per cell
- Up to 800 A single pulse at 1 millisec
- High stability — no aging
- 550 volts max. RMS-input/stack
- Δ-and Y-connected devices for 3-phase applications
- Highly reliable epoxy version up to 15 A single pulse at 1 millisec

Selenium High Density Cells, Type Z,

are available in voltage ratings from 26 to 36 Volts RMS in numerous sizes from 0.7" x 0.7" to 4" x 20" with only 1 volt RMS forward voltage drop at 1000 mA/inch² which makes the cells extremely competitive. For low voltage applications Selenium rectifier assemblies are available up to several thousand of amperes.

High Voltage Epoxy Silicon Diodes



Type	Max. aver. outp. curr. (A)	Max rep. peak rev. voltage (V)	Max. peak surge curr. (≤ 8 millisec) (A)	Ma (≤ 8 sec) (A^2
ESK 1/06	1,4	600	55	1
ESK 1/10	1,4	1000	55	1
ESK 1/12	1,4	1200	55	1
ESK 1/16	1,4	1600	55	1

Silicon Rectifier Diodes

Type	Max. av. output current at T_c = 125°C (A)	PIV Range (V)	Peak surge current*) (≤ 8 msec) (A)	I^2t (A^2sec)	Mo
SKR 2,5	2,5	400-1600	130	70	k
SKR 5	5,0	400-1600	180	130	k
SKR 20	20	400-1600	300	360	st
SKR 45	45	400-1600	650	1 800	st
SKR 100	100	400-1600	1650	11 000	st
SKR 130	130	400-1600	2200	20 000	st
SKR 170	170	400-1600	3300	45 000	st
SKR 240	240	400-1600	5500	125 000	st
SKR 320	320	400-1600	8800	300 000	st

Silicon Diodes

with controlled avalanche characteristics

Type	Max. average output current (A)	Range of controlled avalanche*) ...../10 ...../12 (V)
SKa 1	1,5	≧ 1300 ≧ 1700
SKa 2,5	4,0	≧ 1300 ≧ 1700
SKa 5	10,0	≧ 1300 ≧ 1700
SKEa 1 plastic	1,4	≧ 1300 ≧ 1700

*) Min. aval. at 20°C, increasing voltage with increasing temperature

Compact Bridge Rectifiers

Bridge Type	Max. average output current (A)	Max. repetitive peak reverse voltage and transient voltage (V)	Max. amb. temperature (°C)
BSK B 80 C 600	1,4	300 — 1200	45
MSKa —E 500/220—0,75+0	1,5	≧ 1300 avalanche	45
—B 500/445—1,5	2,5	≧ 1300 avalanche	45
SKVB3000/2700—1.2	1.6	≧ 9000 avalanche	45

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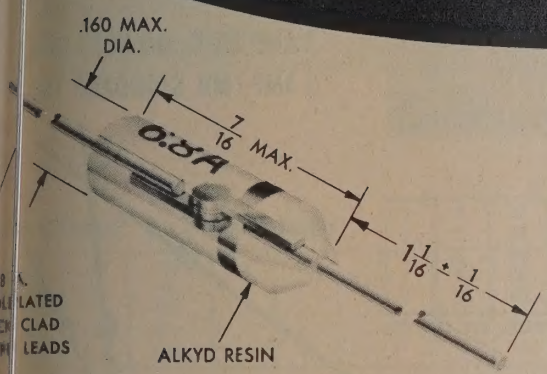
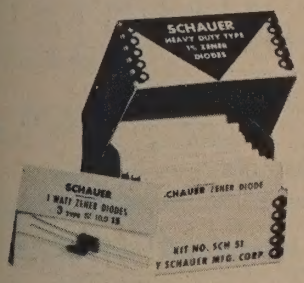
INTERNATIONAL·INC.
P. O. B. 323, Scarsdale, N. Y. 10583
Phone (914) 725-2529

UNSURPASSED!

The Reliable SCHAUER® 1-Watt Zener is available at the Industry's lowest prices!



N ragile nail heads.
S on junction aligned between two parallel, offset ta alum heat sinks . . . great lead tension strength.
A velded and brazed assembly.
H pressure molded package.
B ded and tapered cathode.



Schauer Type Note 1	Nominal V_{ZT} Volts	Typical Z_{ZT} Ohms at I_{ZT} = 20 ma T_a = 25°C	Temp. Coeff. % per °C
SZ2.4	2.4	14	−.054
SZ2.7	2.7	16	−.055
SZ3.0	3.0	17	−.055
SZ3.3	3.3	17	−.054
SZ3.6	3.6	17	−.050
SZ3.9	3.9	17	−.045
SZ4.3	4.3	17	−.037
SZ4.7	4.7	12	−.029
SZ5.1	5.1	10	−.019
SZ5.6	5.6	6.0	−.009
SZ6.2	6.2	2.0	+.018
SZ6.8	6.8	1.5	+.035
SZ7.5	7.5	1.5	+.044
SZ8.2	8.2	2.0	+.049
SZ9.1	9.1	4.0	+.053
SZ10.0	10.0	5.0	+.055
SZ11.0	11.0	6.0	+.057
SZ12.0	12.0	7.0	+.059
SZ13.0	13.0	7.0	+.061
SZ15.0	15.0	8.0	+.065
SZ16.0	16.0	8.0	+.066

PRICES—Mixed types receive total quantity price break.

1-99	100-499	500-999	1000-4999	5000 Up
		10% TOLERANCE		
.49	.38	.33	.29	.27
		OTHER TOLERANCES Note 1		
		5%		
.59	.47	.41	.37	.34
		2%		
.89	.81	.76	.72	.69
		1%		
1.07	.97	.91	.86	.82

Note 1: Type shown are 10% tolerances, add suffix "A" for 5% and suffix 20%, 2%, 1% for other tolerances. For intermediate voltages, insert voltage and tolerances, i.e.: SZ6.3 (1%).

CHAUER 1% tolerance zener diode kit SH51. A $54.57 value for only $24.50!

piece assortment of 1% tolerance, 1 watt reliable er zener diodes covering the voltage range of 2.7 to 6 Three diodes of each voltage are contained in re- e poly bags which are stored in a handy kit. Data included.

be used over and over in laboratory prototypes as as in precision test equipment. Close tolerances mean impedances and temperature coefficients and per- oltage range tests for optimum design.

HAUER silicon varistors

ists of two matched silicon junctions connected in llel and oppositely poled. The junctions are molded one small package with axial gold plated nickel leads. e: 25 amps peak ½ cycle; dissipation: ¾ watt at 25°C.; TC of 2mv/°C. All have closely controlled forward conductance with log current characteristics.

Schauer Type	Uses	Forward Voltage Both Directions	PRICES 1-99	100-499	500-999	1000-4999	5000 Up
SV1	General purpose limiters, regulates above 100ua	.20 - .50 @ 10ua .78 - .90 @ 100ma	.41	.35	.29	.24	.20
SV1-LR	Log I extended down to 5ua osc. control, limiters	.35 - .50 @ 10ua .78 - .90 @ 100ma	.43	.37	.31	.26	.22
V64	Protection of 150-300mv meter movements. Max. surge, min. shunt error	.10 - .25 @ 0.1ua .78 - .90 @ 100ma	.45	.39	.33	.28	.24

SCHAUER stabistor forward reference diodes

One and two junction diodes with closely controlled forward conductance for low voltage regulation, non-linear bias, limiter and DC coupling applications. Surge: 20 amps peak ½ cycle; dissipation: ¾ watt at 25°C.

Schauer Type	Forward Voltage Drop 10ua	10ma	100ma	Minimum Rev. Voltage @ 10ua	PRICES 1-99	100-499	500-999	1000-4999	5000 Up
SS1	.2 - .5	.64- .72	.90 max.	3.0	.23	.18	.16	.14	.12
SS1-2	.70-1.0	1.30-1.40	1.75 max.	20.0	.50	.39	.35	.32	.29

iconductor Division

SCHAUER MANUFACTURING CORP.

4516 Alpine Ave., Cincinnati, Ohio 45242 Telephone (513) 791-3030

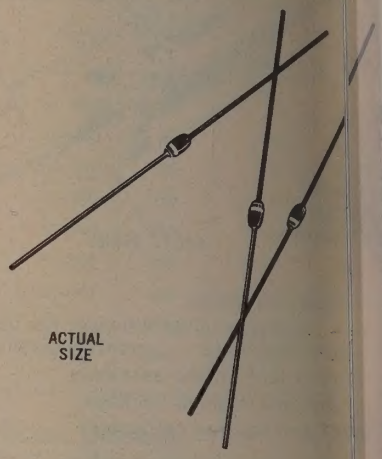
SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 91[illegible]36-12[illegible]

"METOXILITE" SILICON RECTIFIERS — ALSO AVAILABLE TO NEW MSFC/NASA AND MILITARY SPECIFICATIONS (JAN & TX)

200 TO 1000 VOLTS
LOW REVERSE LEAKAGE
SOLID INTERNAL CONSTRUCTION
SUPERIOR THERMAL SHOCK RESISTANCE
FOR NEW PACKAGING DESIGN

A multi-purpose, high current axial lead silicon rectifier, ideally suited to maximize small electronic package designs. "Metoxilite" (fused metal oxides) is fused to the metallurgically bonded junction/tungsten-pin assembly forming a "tough" subminiature package. Hermetically sealed and designed to meet stringent tempratu[illegible] cycling, humidity and other environment[illegible] requirements per MIL-STD-750A. A gener[illegible] purpose rectifier for use in military, spac[illegible] industrial and consumer product applic[illegible]tions, such as: power supplies, A to D converters and control circuits.

1 AMP 55°C/NO HEAT SINK
3 AMP/MIL STANDARD 750



ACTUAL SIZE

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

Type No.	Peak Inverse Voltage	RMS Voltage	DC Blocking Voltage	Average Rectified Current 55°C	Average Rectified Current 100°C	Max. Static Forward Volt @ 1A 25°C	Max. Static Reverse Current 25°C	Max. Static Reverse Current 100°C	Recurrent Surge	One Cycle Surge	Recovery Time ① Max.	Recovery Time ① Typ.
	Volts	Volts	Volts	MA	MA	Volts	UA	UA	Amps	Amps	Usec	Usec
S2M	200	140	200	1000	750	1.2	1	25	10	50	2	1
S4M	400	280	400	1000	750	1.2	1	25	10	50	2	1
S6M	600	420	600	1000	750	1.2	1	25	10	50	2	1
S8M	800	560	800	1000	750	1.2	1	25	10	50	2	1
S0M	1000	770	1000	1000	750	1.2	1	25	10	50	2	1

TECHNICAL BULLETIN R69

FAST RECOVERY NANOSECOND REVERSE RECOVERY

S2F	200	140	200	1000	750	1.2	1	25	6	25	.150	100
S4F	400	280	400	1000	750	1.2	1	25	6	25	.150	100
S6F	600	420	600	1000	750	1.2	1	25	6	25	.250	175
S8F	800	560	800	1000	750	1.2	1	25	6	25	.300	200
S0F	1000	770	1000	1000	750	1.2	1	25	6	25	.500	250

TECHNICAL BULLETIN R68

Operating and storage temperature —65°C to +200°C

① Recovery conditions: 0.5 amp forward current to 1.0 amp reverse current. Recovery time measured when rectifier recovers to .25 amp.

For all types on this page: THERMAL RESISTANCE from junction to heat sink $\theta JS = 30°C/W$ with (d) length of lead from body to heat sink .375 inches.

(1N) TYPE

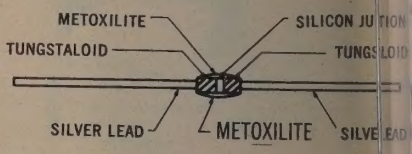
Device Type ①	Reverse Voltage V_R	Reverse Voltage V_{RM}(wkg)	Forward Current ② Free Air 55°C	Reverse Current (Max.) I_R UAdc 25°C	Reverse Current (Max.) I_R UAdc 100°C	Instantaneous Forward Voltage V_F @ I_F = 1.0Adc	Repetitive Surge Current	1 Cycle Surge Current tp = 8.3m Sec.	Reverse Recovery Time ③ Trr		Thermal Impedance θJ—L °C/Watt	
	Vdc	V(pk)	A			Vdc	A(pk)	A(pk) I_F(surge)	μSec Max.	μSec Typ.	d=0	d=.37
1N5614	200	200	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5616	400	400	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5618	600	600	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5620	800	800	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5622	1000	1000	1.0	0.5	25	1.2	10	50	2	1	21	38

TECHNICAL BULLETIN R76

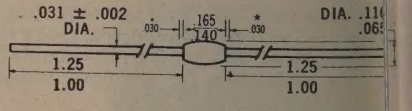
FAST RECOVERY NANOSECOND REVERSE RECOVERY

1N5615	200	200	1.0	0.5	25	1.2	6	25	.150	.100	21	38
1N5617	400	400	1.0	0.5	25	1.2	6	25	.150	.100	21	38
1N5619	600	600	1.0	0.5	25	1.2	6	25	.250	.175	21	38
1N5621	800	800	1.0	0.5	25	1.2	6	25	.300	.200	21	38
1N5623	1000	1000	1.0	0.5	25	1.2	6	25	.500	.250	21	38

TECHNICAL BULLETIN R77



LEAD MATERIAL: 99.9% PURE SILVER IN ACCORDANCE WITH MIL-S-13282A, GRADE[illegible]
THERMAL IMPEDANCE = 133°C/W/IN.



*LEAD DIAMETER UNCONTROLLED IN THIS AREA

All temperatures are local ambient, 25°C unless otherwise specified.

NOTES: ① Types 1N5614, 16, 18, 20, 22 available in accordance with MIL-S-19500/427 (EL).
Types 1N5615, 17, 19, 21, 23 available in accordance with MIL-S-19500/429 (EL).
② The 1.0 amp rating @ 55°C requires no heat sinking, special mounting, or forced air across the body of the device.
③ Recovery conditions: 0.5 amp forward current to —1.0 amp reverse current recovery time measured when rectifier recovers to —.25 amp. See Semtech Applications note and test procedure for details.

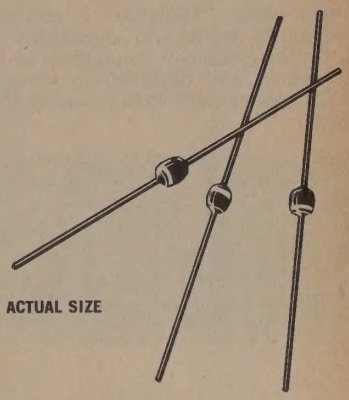
Operating and Storage Temperature —193.8°C to +200°C

Semtech reserves the right to change specifications without notice.

"METOLITE" SILICON RECTIFIERS CONTINUED

HIGH CURRENT AXIAL LEADS

3 AMP 55°C/NO HEAT SINK
6 AMP/MIL STANDARD 750



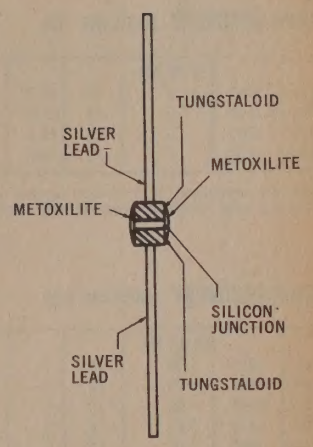
ACTUAL SIZE

Type ①	Peak Reverse Voltage	RMS Voltage	DC Blocking Voltage	Average Rectified Current 55°C	Average Rectified Current 100°C	Max. Static Forward Volt @ 3A 25°C	Max. Static Reverse Current 25°C	Max. Static Reverse Current 100°C	Recurrent Surge	One Cycle Surge	Recovery Time ② Max.	Recovery Time ② Typ.
	Volts	Volts	Volts	Amps	Amps	Volts	μA	μA	Amps	Amps	μsec	μsec

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

3SM	200	140	200	3	2	1.0	1	25	25	150	2	1
3SM	400	280	400	3	2	1.0	1	25	25	150	2	1
3SM	600	420	600	3	2	1.0	1	25	25	150	2	1
3SM	800	560	800	3	2	1.1	1	25	25	150	2	1
3SM	1000	770	1000	3	2	1.1	1	25	25	150	2	1

TECHNICAL BULLETIN R67



FAST RECOVERY NANOSECOND REVERSE RECOVERY

3S	100	70	100	3	2	1.1	1	25	25	150	.150	.100
3S	200	140	200	3	2	1.1	1	25	25	150	.150	.100
3S	400	280	400	3	2	1.1	1	25	25	150	.150	.100

TECHNICAL BULLETIN R66

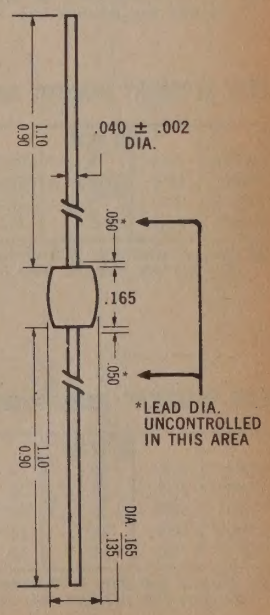
For types on this page: THERMAL RESISTANCE from junction to heat sink θjS=21°C/W with (d) length of lead from body to heat sink .375 inches.

(①) TYPE

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

5550	200	140	200	3	2	1.0	1	20	25	150	2	1
5551	400	280	400	3	2	1.0	1	20	25	150	2	1
5552	600	420	600	3	2	1.0	1	20	25	150	2	1
5553	800	560	800	3	2	1.1	1	20	25	150	2	1
5554	1000	770	1000	3	2	1.1	1	20	25	150	2	1

TECHNICAL BULLETIN R78



FAST RECOVERY NANOSECOND REVERSE RECOVERY

15415	50	35	50	3	2	1.1	1	20	25	150	.150	.100
15416	100	70	100	3	2	1.1	1	20	25	150	.150	.100
15417	200	140	200	3	2	1.1	1	20	25	150	.150	.100
15418	400	280	400	3	2	1.1	1	20	25	150	.150	.100
15419	500	350	500	3	2	1.1	1	20	25	150	.250	.200

temperatures are local ambient, 25°C unless otherwise specified. TECHNICAL BULLETIN R79

NOTES: ① Types 1N5550-54 available in accordance with MIL-S-19500/420 (USAF).
Types 1N5415-19 available in accordance with MIL-S-19500/411 (EL).

② The 3 amp rating @ 55°C requires no heat sinking, special mounting, or forced air across the body of the device.

③ Recovery conditions: 0.5 amp forward current to 1.0 amp reverse current.
Recovery time measured when rectifier recovers to .25 amp.

Operating and storage temperature —65°C to +200°C.

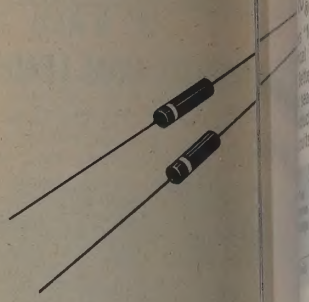
Semtech reserves the right to change specifications without notice.

SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 9 336-12

"MINISTAC"® HIGH VOLTAGE SILICON RECTIFIERS

RUGGED HERMETIC SEAL • OPERATING AND STORAGE TEMPERATURE –55°C TO +150°C

Semtech offers "Ministac" a sub-miniature multipurpose high voltage silicon rectifier. Cylindrical in design with insulated case and silver leads for simple handling and installation. Better electrical characteristics obtained by Semtech's unique construction. Hermetically sealed and designed to meet requirements of military, industrial and consumer-product applications. Ideally suited for low current high voltage applications and multiplier circuits.

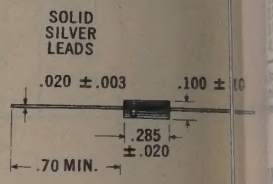


Type No.	Peak Inverse Voltage	Max. Static Fwd. Voltage	Average Rectified Current (Milliamps)			Max. Static Reverse Current @ PIV (μAdc)		One Cycle Surge	Recurrent Surge	Max. Recovery Time ① t_{rr}	Max. Junction Capacitance @ 100 Volts	Data Sheet No.
	Volts	Volts	55°C	100°C	150°C	25°C	100°C	Amps	Amps	Nsec.	Picofarads	

MEDIUM RECOVERY (OUTLINE 01)

		@ 25 MA										
SCM10	1000	5	25	12.5	0	.100	2.0	5	.250	500	2.0	R70
SCM15	1500	5	25	12.5	0	.100	2.0	5	.250	500	2.0	R70
SCM20	2000	5	25	12.5	0	.100	2.0	5	.250	500	2.0	R70
SCM25	2500	5	25	12.5	0	.100	2.0	5	.250	500	2.0	R70

① Recovery conditions: 12.5 forward current to 25 MA reverse current.
Recovery time measured when rectifier recovers to 6.25 MA.

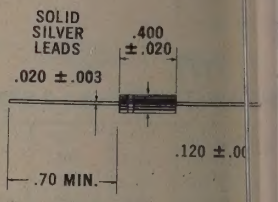


OUTLINE 01

MEDIUM RECOVERY (OUTLINE 02)

		@ 10 MA										
SCM30	3000	15	10	5	0	.100	2.0	2	.100	500	1.0	R62
SCM40	4000	15	10	5	0	.100	2.0	2	.100	500	1.0	R62
SCM50	5000	15	10	5	0	.100	2.0	2	.100	500	1.0	R62
SCM60	6000	15	10	5	0	.100	2.0	2	.100	500	1.0	R62
SCM70	7000	15	10	5	0	.100	2.0	2	.100	500	1.0	R62

① Recovery conditions: 5 MA forward current to 10 MA reverse current.
Recovery time measured when rectifier recovers to 2.5 MA.



OUTLINE 02

FAST RECOVERY NANOSEC. REVERSE RECOVERY (OUTLINE 01)

		@ 25 MA										
SFM10	1000	5	25	12.5	0	.100	2.0	5	.250	100	2.0	R71
SFM15	1500	5	25	12.5	0	.100	2.0	5	.250	100	2.0	R71
SFM20	2000	5	25	12.5	0	.100	2.0	5	.250	100	2.0	R71
SFM25	2500	5	25	12.5	0	.100	2.0	5	.250	250	2.0	R71

① Recovery conditions: 12.5 MA forward current to 25 MA reverse current.
Recovery time measured when rectifier recovers to 6.25 MA.

FAST RECOVERY (OUTLINE 02)

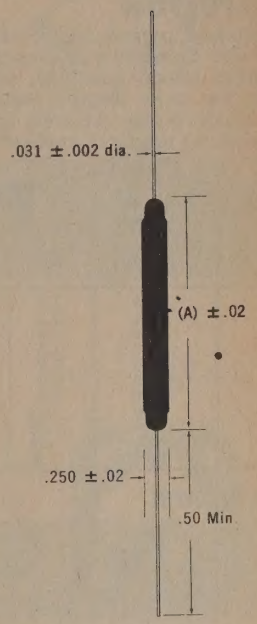
		@ 10 MA										
SFM30	3000	15	10	5	0	.100	2.0	2	.100	100	1.0	R61
SFM40	4000	15	10	5	0	.100	2.0	2	.100	100	1.0	R61
SFM50	5000	15	10	5	0	.100	2.0	2	.100	100	1.0	R61
SFM60	6000	15	10	5	0	.100	2.0	2	.100	250	1.0	R61
SFM70	7000	15	10	5	0	.100	2.0	2	.100	250	1.0	R61

① Recovery conditions: 5 MA forward current to 10 MA reverse current.
Recovery time measured when rectifier recovers to 2.5 MA.

Semtech reserves the right to change specifications without noti

"MINISTIC"® HIGH VOLTAGE SILICON RECTIFIERS

Semtech offers "Ministic", sub-miniature multipurpose high voltage silicon rectifier assemblies. Cylindrical in design with insulated case and axial leads for simple handling and installation. Hermetically sealed and designed to meet requirements of military, industrial and consumer-product applications. Ideally suited for low current high voltage applications and multiplier circuits.

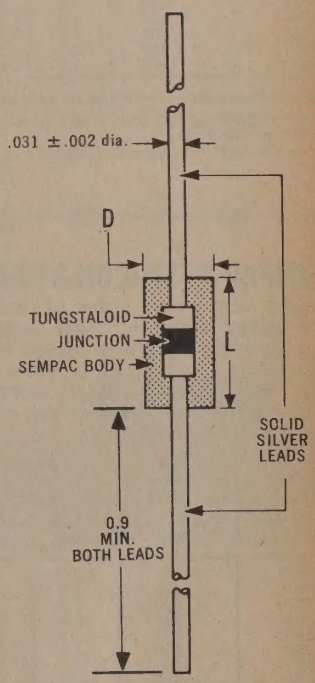


Type No.	Peak Inverse Voltage	Average Rectified Current 55°C	Average Rectified Current 100°C	One Cycle Surge Current 25°C	One Cycle Surge Current 100°C	Reverse Current @ PIV 25°C	Reverse Current @ PIV 100°C	Max. Fwd. Voltage @ 10 mA 25°C	Reverse Recovery Time ① Max.	Case Length Inches	Data Sheet No.
	Volts	mA	mA	Amps	Amps	μA	μA	Volts	Nsec	A	
SCM 0K	10,000	10.0	2.5	2.0	1.0	.100	2.0	30	500	1.375	H52
SCM 5K	15,000	10.0	2.5	2.0	1.0	.100	2.0	45	500	1.750	H52
SCM 0K	20,000	10.0	2.5	2.0	1.0	.100	2.0	60	500	2.250	H52
SCM 0K	30,000	10.0	2.5	2.0	1.0	.100	2.0	90	500	3.250	H52
SCM 0K	40,000	10.0	2.5	2.0	1.0	.100	2.0	120	500	4.250	H52
FAST RECOVERY											
SFM 0K	10,000	10.0	2.5	2.0	1.0	.100	2.0	30	100	1.375	H53
SFM 5K	15,000	10.0	2.5	2.0	1.0	.100	2.0	45	100	1.750	H53
SFM 0K	20,000	10.0	2.5	2.0	1.0	.100	2.0	60	100	2.250	H53
SFM 0K	30,000	10.0	2.5	2.0	1.0	.100	2.0	90	100	3.250	H53
SFM 0K	40,000	10.0	2.5	2.0	1.0	.100	2.0	120	100	4.250	H53

Operating and Storage Temperature —55°C to +150°C.
① Recovery conditions: 5 mA forward current to 10 mA reverse current.
Recovery time measured when rectifier recovers to 2.5 MA.

"SEMPAC"® SUB-MINIATURE

Semtech Corporation offers a complete line of Subminiature High Voltage Silicon Rectifiers incorporating advanced design and engineering techniques never before available to the electronic industry. Standard package units are designed for low altitude applications. This new rectifier utilizes a solid internal construction with a package combining high mechanical strength, superior thermal shock resistance, rugged hermetic seal, high dielectric strength and excellent thermal conductivity properties.



Type No.	Peak Inverse Voltage	RMS (Sine Wave) Voltage	DC Blocking Voltage	Average Rectified Current 55°C	Average Rectified Current 100°C	Average Rectified Current 150°C	Max. Static Forward Voltage 100MA 25°C	Max. Static Reverse Current @ PIV 25°C	Max. Static Reverse Current @ PIV 100°C	Recurrent Surge	One Cycle Surge	Dimensions Inches D	Dimensions Inches L	Data Sheet No.
	Volts	Volts	Volts	MA	MA	MA	Volts	μA	μA	Amps	Amps			
Operating and Storage Temperature —55°C to +175°C.														
15	1500	1050	1500	250	150	50	3.5	1	20	2.5	10	.125±.005	.235±.005	R52
20	2000	1400	2000	250	150	50	3.5	1	20	2.5	10	.125±.005	.235±.005	R52
25	2500	1750	2500	250	150	50	3.5	1	20	2.5	10	.125±.005	.235±.005	R52
30	3000	2100	3000	250	150	50	3.5	1	20	2.5	10	.125±.005	.235±.005	R52
40	4000	2800	4000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R52
50	5000	3500	5000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R52
75	7500	5250	7500	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R52
100	10000	7000	10000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R52
( ) TYPE														
Operating and Storage Temperature —65°C to +175°C.														
3643	1000	700	1000	250	150	50	3.5	1	20	2.5	14	.125±.005	.235±.005	R55
3644	1500	1050	1500	250	150	50	3.5	1	20	2.5	14	.125±.005	.235±.005	R55
3645	2000	1400	2000	250	150	50	3.5	1	20	2.5	14	.125±.005	.235±.005	R55
3646	2500	1750	2500	250	150	50	3.5	1	20	2.5	14	.125±.005	.235±.005	R55
3647	3000	2100	3000	250	150	50	3.5	1	20	2.5	14	.125±.005	.235±.005	R55
Operating and Storage Temperature —55°C to +175°C.														
5181	4000	2800	4000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R54
5182	5000	3500	5000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R54
5183	7500	5250	7500	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R54
5184	10000	7000	10000	100	60	20	10.0	1	20	1.0	4	.140±.005	.410±.005	R54

Semtech reserves the right to change specifications without notice.

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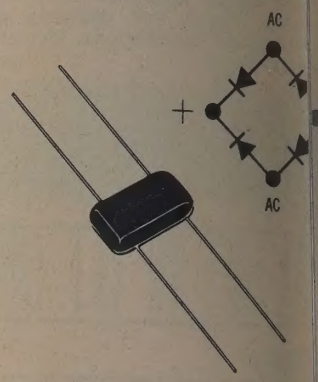
"COMPAC" BRIDGE RECTIFIERS

MULTI-PURPOSE

SOLID SILVER LEADS: DIAMETER .031 ±.002"; LENGTH ⅞" MINIMUM
OPERATING AND STORAGE TEMPERATURE —55°C TO +150°C

Sub-miniature, rugged, highly-reliable and economical, are the only adjectives necessary to describe Semtech's "Compac" silicon bridge rectifiers. Incorporating Semtech's Suprataxial silicon junctions, solid silver leads and high-temperature molding compounds, the units provide maximum mechanical, thermal and electrical reliability. These silicon bridge rectifiers will meet stringent requirements of military, industrial and consumer products applications.

SINGLE PHASE FULL WAVE BRIDGE



Type No.	Peak Inverse Voltage	Average Rectified Current		Max. Reverse Current @ PIV		Max. Fwd. Volts/Leg @ 1A DC (**100 mA DC)	Recurrent Surge	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	25°C	
	Volts	Amps	Amps	μA	μA	Volts	Amps	
SBR05	50	1.5	1.00	2	40	1.2	10	MB8
SBR1	100	1.5	1.00	2	40	1.2	10	MB8
SBR2	200	1.5	1.00	2	40	1.2	10	MB8
SBR4	400	1.5	1.00	2	40	1.2	10	MB8
SBR6	600	1.5	1.00	2	40	1.2	10	MB8
SBR8	800	1.5	1.00	2	40	1.2	10	MB8
SBR10	1000	1.5	1.00	2	40	1.2	10	MB8
SBR15	1500	.36	.24	2	40	**3.5	2.5	MB8
SBR20	2000	.36	.24	2	40	**3.5	2.5	MB8
SBR25	2500	.36	.24	2	40	**3.5	2.5	MB8
SBR30	3000	.36	.24	2	40	**3.5	2.5	MB8

MEDIUM RECOVERY

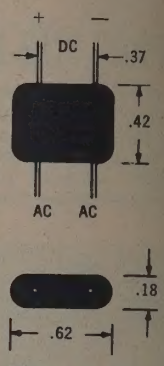
Type No.	Peak Inverse Voltage	Average Rectified Current		Max. Reverse Current @ PIV		Max. Fwd. Volts/Leg @ 1A DC	Recurrent Surge	*Reverse Recovery	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	25°C	t_{rr}	
	Volts	Amps	Amps	μA	μA	Volts	Amps	μ sec	
SBR05M	50	1.5	1.00	2	40	1.2	10	1	MB9
SBR1M	100	1.5	1.00	2	40	1.2	10	1	MB9
SBR2M	200	1.5	1.00	2	40	1.2	10	1	MB9
SBR4M	400	1.5	1.00	2	40	1.2	10	1	MB9
SBR6M	600	1.5	1.00	2	40	1.2	10	1	MB9
SBR8M	800	1.5	1.00	2	40	1.2	10	1	MB9
SBR10M	1000	1.5	1.00	2	40	1.2	10	1	MB9

FAST RECOVERY

SBR05F	50	1.0	0.65	2	40	1.3	6	.150	MB9
SBR1F	100	1.0	0.65	2	40	1.3	6	.150	MB9
SBR2F	200	1.0	0.65	2	40	1.3	6	.150	MB9
SBR4F	400	1.0	0.65	2	40	1.3	6	.150	MB9
SBR6F	600	1.0	0.65	2	40	1.3	6	.150	MB9
SBR8F	800	1.0	0.65	2	40	1.3	6	.250	MB9
SBR10F	1000	1.0	0.65	2	40	1.3	6	.300	MB9
								.500	MB9

Reverse Recovery time is measured on each junction prior to manufacture of assembly.

*Recovery Conditions: 0.5 amp forward current to 1.0 amp reverse current. Recovery time is measured when rectifier recovers to .25 Amps.



Tolerance ±.030

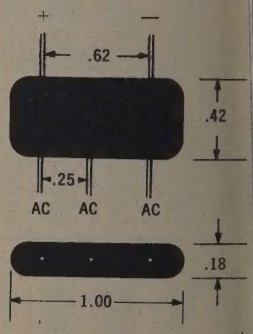
Lead Spacing Measured Center to Center

"COMPAC-3" SILICON 3 PHASE

Semtech now offers a line of "Compac" sub-miniature medium power, 3-phase full wave bridge rectifiers. These units utilize Semtech's unique Suprataxial silicon junctions. Sub-miniature size makes these bridge rectifiers easy to package. Use of high temperature compounds provides excellent mechanical, thermal and electrical reliability. These silicon bridge rectifiers easily satisfy the stringent requirements of military and industrial as well as consumer applications.

Type No.	Peak Inverse Voltage	Average Rectified Current		Max. Reverse Current @ PIV		Max. Fwd. Volts/Leg @ 1A DC (**100 mA DC)	Recurrent Surge	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	25°C	
	Volts	Amps	Amps	μA	μA	Volts	Amps	
S3BR05	50	2.0	1.2	3	60	1.2	10	MB11
S3BR1	100	2.0	1.2	3	60	1.2	10	MB11
S3BR2	200	2.0	1.2	3	60	1.2	10	MB11
S3BR4	400	2.0	1.2	3	60	1.2	10	MB11
S3BR6	600	2.0	1.2	3	60	1.2	10	MB11
S3BR8	800	2.0	1.2	3	60	1.2	10	MB11
S3BR10	1000	2.0	1.2	3	60	1.2	10	MB11
S3BR15	1500	0.5	0.3	3	60	**3.5	2.5	MB11
S3BR20	2000	0.5	0.3	3	60	**3.5	2.5	MB11
S3BR25	2500	0.5	0.3	3	60	**3.5	2.5	MB11
S3BR30	3000	0.5	0.3	3	60	**3.5	2.5	MB11

Can also be obtained with "Medium" and "Fast" reverse recovery characteristics up to 1000 volts. Add Suffix "M" or "F"



Tolerance ±.03
Lead Spacing Measured Center to Center

Semtech reserves the right to change specifications without notice.

ALPAC® JR." SILICON BRIDGE RECTIFIERS

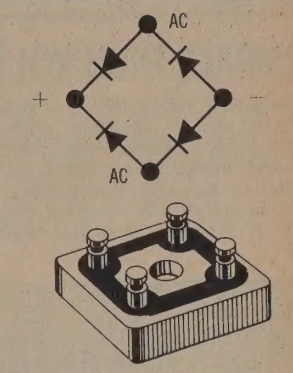
mtech ffers "Alpac Jr." Designed in aluminum cases (turret terminals, insulated from se) to provide maximum thermal conductivity and simple installation. Internally the lpac Jr." utilizes the Semtech high performance solid double heat sink junctions. The idges are designed for utilization in power supplies, AC to DC converters, motor control rcuits, etc.

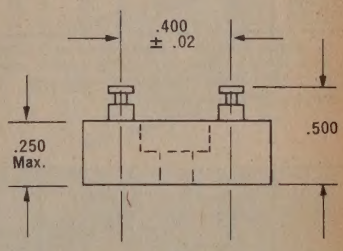
Type	PIV per leg	Sine Wave RMS input Volt. Max.	Average DC Output Amps TC=(case temp.) (°C)		Average DC Output Amps TA=Amb. Temp. (No seat Sink) (°C)			Peak 1 Cycle Forward Surge	Peak DC Output (1 sec. max.)	Peak Recurrent Surge	VF Max. per leg @ 1ADC	Reverse Current (I_R Max. @PIV)		Recovery Time ①	Data Sheet No.
			55	100	25	55	100		55°C		25°C	25°C	100°C	trr	
	Volts	Volts	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Volts	μA	μA	μ sec.	
AMP MULTI-PURPOSE															
05	50	35	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
1	100	70	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
2	200	140	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
3	300	210	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
4	400	280	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
6	600	420	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50		MB12
AMP MEDIUM RECOVERY (t_{rr}) 1 MICROSECOND															
05M	50	35	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
1M	100	70	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
2M	200	140	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
3M	300	210	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
4M	400	280	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
6M	600	420	5	3	2.0	1.5	1.05	50	10	15	1.2	2	50	1	MB13
FAST RECOVERY (t_{rr}) 150 NANOSECONDS															
05	50	35	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14
1F	100	70	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14
2F	200	140	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14
3F	300	210	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14
4F	400	280	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14
6F	600	420	3.5	2	1.5	1.05	.7	25		9	1.3	2	50	.150	MB14

① Recovery Conditions: 0.5 amp forward current to 1.0 amp reverse current. Recovery time is measured when rectifier recovers to .25 Amps.

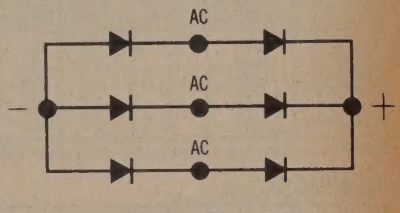
Operating and Storage Temperature, —55°C to +150°.

Maximum THERMAL IMPEDANCE junction to mounting surface 5°C/Watt.





ALPAC®-3" 3-PHASE SILICON BRIDGE RECTIFIERS



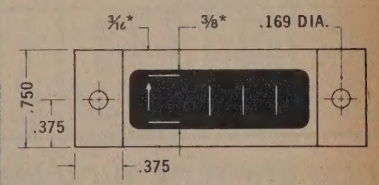
Alpac-3," a complete line of 3-phase silicon bridge rectifiers and a natural extension to our existing line of "Alpac" single-phase bridges. Design of "Alpac-3" incorporates much the original "Alpac"... aluminum case for maximum thermal conductivity, light weight, and simple installation. "Alpac's" universal terminals provide three ways for electrical connection: fast disconnect, wire wrap around, and hole wire insert for soldering. Internally "Alpac-3" utilizes the Semtech high-performance silicon junctions bonded between solid double tungstaloid pins. "Alpac-3" is especially well suited for utilization in power supplies, AC to DC converters and motor control circuits.

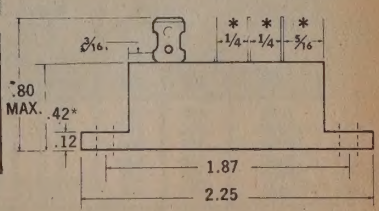
Type	PIV per leg	Sine Wave RMS input Volt. Max.	Average DC Output Amps TC=(case temp.) (°C)			Average DC Output Amps TA=(Amb. Temp.) (No heat Sink) (°C)			Peak 1 Cycle Forward Surge	Peak Recurrent Forward Surge	VF Max. per leg @ 3ADC	Reverse Current (I_R Max. @ PIV)		Data Sheet No.
			55	100	125	25	55	100			25°C	25°C	100°C	
	Volts	Volts	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Volts	μA	μA	
05	50	35	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7
1	100	70	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7
2	200	140	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7
3	300	210	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7
4	400	280	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7
6	600	420	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB7

Operating and Storage temperature, —55°C to +150°C.

Maximum thermal impedance junction to mounting surface 1.5°C/WATT

Semtech reserves the right to change specifications without notice.



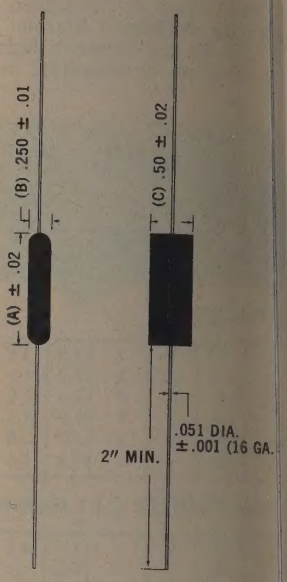


*Nominal tolerance ±.030

SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 91(96-126

"SLIMPAC"® HIGH VOLTAGE - HIGH CURRENT SILICON RECTIFIERS

The Semtech's "Slimpac" is a new high density high voltage high current silicon rectifier for use in industrial and military applications which require small, lightweight rectifiers without compromise on the required high reliability criteria. Designed and tooled to be efficiently mass produced, "Slimpac" can be used economically in existing applications. The rectifier can be utilized in all standard, single and polyphase rectifier circuits. Designed to be corona free, the unit is capable of meeting stringent electrical, mechanical, and environmental specifications.



Type No.	Peak Inverse Voltage	① Average Rectified Current		One Cycle Surge Current		Reverse Current @ PIV		Max. Forward Voltage	Max. Case Size	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	100°C	25°C	(A)	
	Volts	Amps	Amps	Amps	Amps	μA	μA	500 MA	Inches	
SCH5000	5000	.5	.33	50	25	0.1	15	7	1.125	H46
SCH7500	7500	.5	.33	50	25	0.1	15	10	1.625	H46
SCH10000	10000	.5	.33	50	25	0.1	15	14	2.000	H46
SCH12500	12500	.5	.33	50	25	0.1	15	17	2.375	H46
SCH15000	15000	.5	.33	50	25	0.1	15	20	2.750	H46
SCH20000	20000	.5	.33	50	25	0.1	15	27	3.500	H46
SCH25000	25000	.5	.33	50	25	0.1	15	33	4.250	H46

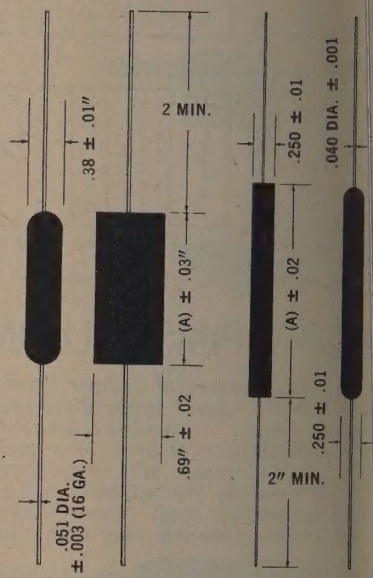
MEDIUM RECOVERY **(t_{rr}) 1 MICROSECOND

SCH5000	5000	.5	.33	50	25	0.1	15	7	1.125	H47
SCHF7500	7500	.5	.33	50	25	0.1	15	10	1.625	H47
SCHF10000	10000	.5	.33	50	25	0.1	15	14	2.000	H47
SCHF12500	12500	.5	.33	50	25	0.1	15	17	2.375	H47
SCHF15000	15000	.5	.33	50	25	0.1	15	20	2.750	H47
SCHF20000	20000	.5	.33	50	25	0.1	15	27	3.500	H47
SCHF25000	25000	.5	.33	50	25	0.1	15	33	4.250	H47

FAST RECOVERY **(t_{rr}) 150 NANOSECONDS

SCF2500	2500	.5	.33	25	12.5	0.1	15	6	1.125	H47
SCF5000	5000	.5	.33	25	12.5	0.1	15	12	2.000	H47
SCF7500	7500	.5	.33	25	12.5	0.1	15	18	2.750	H47
SCF10000	10000	.5	.33	25	12.5	0.1	15	24	3.500	H47
SCF12500	12500	.5	.33	25	12.5	0.1	15	30	4.250	H47

**T_{RR} Reverse Recovery is measured on each junction prior to manufacture of assembly.
0.5 Amp forward current to 1.0 Amp reverse current. Recovery time measured when rectifier recovers to .25 Amp.
Operating and storage temperature —55°C to +150°C
① Multiply by 2 when used in oil.



ALSO AVAILABLE IN FAST RECOVERY

Type No.	Peak Inverse Voltage	Average Rectified Current		One Cycle Surge Current		Reverse Current @ PIV		Max. Forward Voltage	Case Size	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	100°C	25°C	Inches	
	Volts	Amps	Amps	Amps	Amps	μA	μA	@ 1 Amp	A	
SCHS2500	2500	2	1.2	150		10	120	5	1.5	H48
SCHS5000	5000	2	1.2	150		10	120	10	2.5	H48
SCHS7500	7500	2	1.2	150		10	120	15	3.5	H48
SCHS10000	10000	2	1.2	150		10	120	20	4.5	H48
SCHS12500	12500	2	1.2	150		10	120	25	5.5	H48
SCHS15000	15000	2	1.2	150		10	120	30	6.5	H48

Operating and storage temperature —55°C to +150°C

"SLIMPAC JR."

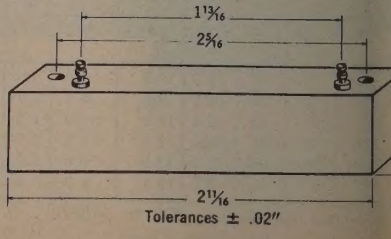
SCHJ15K	15000	50	30	4	2	0.1	25	20	1.5	H49
SCHJ22.5K	22500	50	30	4	2	0.1	25	30	2	H49
SCHJ30K	30000	50	30	4	2	0.1	25	40	2.5	H49
SCHJ37.5K	37500	50	30	4	2	0.1	25	50	3	H49
SCHJ45K	45000	50	30	4	2	0.1	25	60	3.5	H49

Operating and storage temperature —55°C to +150°C

HIGH VOLTAGE HIGH CURRENT SILICON RECTIFIERS

Type No.	Peak Inverse Voltage	Average Rectified Current		Recurrent Surge Current		One Cycle Surge Current		Reverse Leakage Current		Forward Voltage		Data Sheet No.
		40°C	100°C	40°C	100°C	40°C	100°C	25°C	100°C			
	Volts	MA	MA	Amps	Amps	Amps	Amps	μA	μA	Volts	MA	
SC575	7500	600	300	10	5	40	20	1	15	10	600	H43
SC5100	10000	500	250	10	5	40	20	1	15	13	500	H43
SC5125	12500	400	200	8	4	40	20	1	15	16	400	H43
SC5150	15000	300	150	6	3	40	20	1	15	19	300	H43
SC5200	20000	250	125	5	2.5	40	20	1	15	25	250	H43
SC5250	25000	200	100	4	2	40	20	1	15	30	200	H43

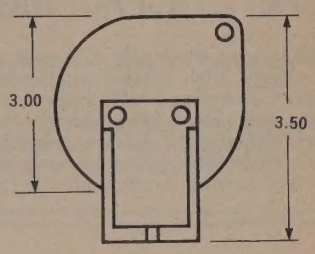
Maximum operating and storage temperature —55°C to +150°C



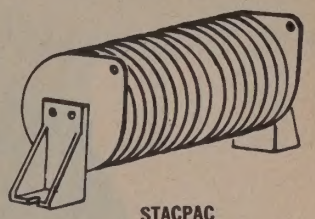
Semtech reserves the right to change specifications without notice.

"STACPAC"

"Stacpac", a new concept in power rectifier stacks for use in high voltage, high current applications. Unique in design, "Stacpac" completely eliminates all the external component parts and solder joints usually found in devices of this type. All components are encapsulated and connected to aluminum discs, that in turn serve as compensation, cooling fins and corona protection. Internally, "Stacpac" utilizes the Semtech solid construction, double tungstaloid, silicon rectifiers. "Stacpac" was designed specifically to streamline packaging, replace multiple stud rectifiers and auxiliary compensation in high voltage, high current applications.



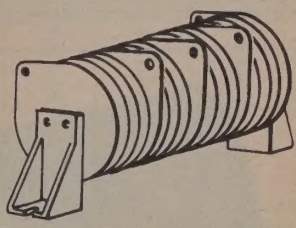
Type No.	Peak Inverse Voltage Per Leg	RMS Voltage Per Leg	Average Rectified Current		Reverse Current Per Leg @ PIV		One Cycle Surge Current	Max. Fwd. Voltage @ 3 ADC	Max. Length[1] of Ass'y.	Data Sheet No.
	KV	KV	Amps		μA		Amps	Volts		
	25°C	25°C	55°C	100°C	25°C	100°C	25°C	25°C	Inches	
HIGH POWER SILICON RECTIFIERS										
SCPH2	1.0	0.7	5.5	3.0	110	200	300	2	2.74	H50
SCPH4	2.0	1.4	5.5	3.0	110	200	300	4	3.40	H50
SCPH6	3.0	2.10	5.5	3.0	110	200	300	6	4.07	H50
SCPH8	4.0	2.80	5.5	3.0	110	200	300	8	4.73	H50
SCPH10	5.0	3.50	5.5	3.0	110	200	300	10	5.39	H50
SCPH12	6.0	4.20	5.5	3.0	110	200	300	12	6.05	H50
SCPH14	7.0	4.90	5.5	3.0	110	200	300	14	6.71	H50
SCPH16	8.0	5.60	5.5	3.0	110	200	300	16	7.38	H50
SCPH18	9.0	6.30	5.5	3.0	110	200	300	18	8.04	H50
SCPH20	10.0	7.00	5.5	3.0	110	200	300	20	8.70	H50
SCPH22	11.0	7.70	5.5	3.0	110	200	300	22	9.36	H50
SCPH24	12.0	8.40	5.5	3.0	110	200	300	24	10.02	H50
SCPH26	13.0	9.10	5.5	3.0	110	200	300	26	10.69	H50
SCPH28	14.0	9.80	5.5	3.0	110	200	300	28	11.35	H50
SCPH30	15.0	10.50	5.5	3.0	110	200	300	30	12.01	H50
SCPH32	16.0	11.20	5.5	3.0	110	200	300	32	12.67	H50
SCPH34	17.0	11.90	5.5	3.0	110	200	300	34	13.33	H50
SCPH36	18.0	12.60	5.5	3.0	110	200	300	36	14.00	H50
SCPH38	19.0	13.30	5.5	3.0	110	200	300	38	14.66	H50
SCPH40	20.0	14.00	5.5	3.0	110	200	300	40	15.32	H50
SCPH42	21.0	14.70	5.5	3.0	110	200	300	42	15.98	H50
SCPH44	22.0	15.40	5.5	3.0	110	200	300	44	16.64	H50
SCPH46	23.0	16.10	5.5	3.0	110	200	300	46	17.31	H50
SCPH48	24.0	16.80	5.5	3.0	110	200	300	48	17.97	H50
SCPH50	25.0	17.50	5.5	3.0	110	200	300	50	18.63	H50
HIGH POWER BRIDGE RECTIFIERS										
SCPB	0.5	0.35	11	6.0	110	200	300	1	3.41	B43
SCPB	1.0	0.70	11	6.0	110	200	300	2	4.73	B43
SCPB	1.5	1.05	11	6.0	110	200	300	3	6.05	B43
SCPB	2.0	1.40	11	6.0	110	200	300	4	7.38	B43
SCPB	2.5	1.75	11	6.0	110	200	300	5	8.70	B43
SCPB	3.0	2.10	11	6.0	110	200	300	6	10.03	B43
SCPB	4.0	2.80	11	6.0	110	200	300	8	12.67	B43
SCPB	5.0	3.50	11	6.0	110	200	300	10	15.32	B43
SCPB	6.0	4.20	11	6.0	110	200	300	12	17.97	B43
DOUBLERS AND CENTER TAPS										
SCP	0.5	0.35	5.5	3.0	110	200	300	1	2.74	B44
SCP	0.5	0.35	11	6.0	110	200	300	1	2.74	B44
SCP	0.5	0.35	11	6.0	110	200	300	1	2.74	B44
SCP	1.0	0.70	5.5	3.0	110	200	300	2	3.40	B44
SCP	1.0	0.70	11	6.0	110	200	300	2	3.40	B44
SCP	1.0	0.70	11	6.0	110	200	300	2	3.40	B44
SCP	1.5	1.05	5.5	3.0	110	200	300	3	4.07	B44
SCP	1.5	1.05	11	6.0	110	200	300	3	4.07	B44
SCP	1.5	1.05	11	6.0	110	200	300	3	4.07	B44
SCP	2.0	1.40	5.5	3.0	110	200	300	4	4.73	B44
SCP	2.0	1.40	11	6.0	110	200	300	4	4.73	B44
SCP	2.0	1.40	11	6.0	110	200	300	4	4.73	B44
SCP0	2.5	1.75	5.5	3.0	110	200	300	5	5.39	B44
SCP0	2.5	1.75	11	6.0	110	200	300	5	5.39	B44
SCP0	2.5	1.75	11	6.0	110	200	300	5	5.39	B44
SCP2	3.0	2.10	5.5	3.0	110	200	300	6	6.05	B44
SCP2	3.0	2.10	11	6.0	110	200	300	6	6.05	B44
SCP2	3.0	2.10	11	6.0	110	200	300	6	6.05	B44
SCP6	4.0	2.80	5.5	3.0	110	200	300	8	7.38	B44
SCP6	4.0	2.80	11	6.0	110	200	300	8	7.38	B44
SCP6	4.0	2.80	11	6.0	110	200	300	8	7.38	B44
SCP0	5.0	3.50	5.5	3.0	110	200	300	10	8.70	B44
SCP0	5.0	3.50	11	6.0	110	200	300	10	8.70	B44
SCP0	5.0	3.50	11	6.0	110	200	300	10	8.70	B44
SCP4	6.0	4.20	5.5	3.0	110	200	300	12	10.03	B44
SCP4	6.0	4.20	11	6.0	110	200	300	12	10.03	B44
SCP4	6.0	4.20	11	6.0	110	200	300	12	10.03	B44
SCP30	7.5	5.25	5.5	3.0	110	200	300	15	12.01	B44
SCP30	7.5	5.25	11	6.0	110	200	300	15	12.01	B44
SCP30	7.5	5.25	11	6.0	110	200	300	15	12.01	B44
SCP40	10.0	7.00	5.5	3.0	110	200	300	20	15.32	B44
SCP40	10.0	7.00	11	6.0	110	200	300	20	15.32	B44
SCP40	10.0	7.00	11	6.0	110	200	300	20	15.32	B44
SCP5	12.5	8.75	5.5	3.0	110	200	300	25	18.63	B44
SCP50	12.5	8.75	11	6.0	110	200	300	25	18.63	B44
SCP50	12.5	8.75	11	6.0	110	200	300	25	18.63	B44



STACPAC

Mechanical Dimensions:
Width, 3 inches;
1 length includes two insulated mounting legs.

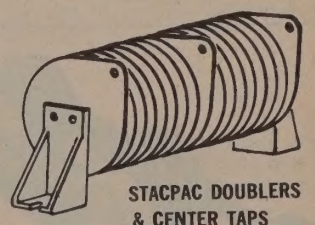
Operating and Storage Temperature, —55°C to +150°C
Note: Although mounting brackets are insulated, care must be taken to assure proper distance to ground planes.



STACPAC HIGH POWER BRIDGE

Operating and Storage Temperature, —55°C to +150°C
Mechanical dimensions: Height 3.5 inches; Width, 3.0 inches; Tolerances, ±.03 inch.
Note: Although mounting brackets are insulated, care must be taken to assure proper distance to ground planes.

*Io Rating Increased:
X2 In Oil Environment
X1.5 With cooling air velocity 500 CFM
X2 With cooling air velocity 1000 CFM



STACPAC DOUBLERS & CENTER TAPS

Operating and Storage Temperature, —55°C to +150°C

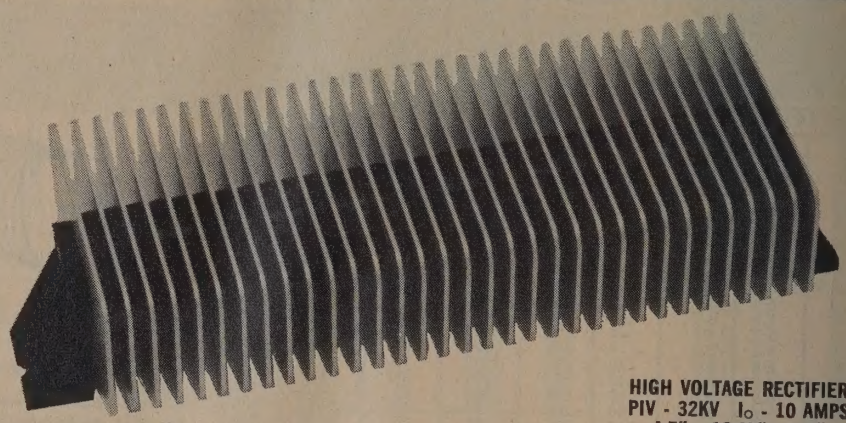
ALSO AVAILABLE IN FAST RECOVERY

Semtech reserves the right to change specifications without notice.

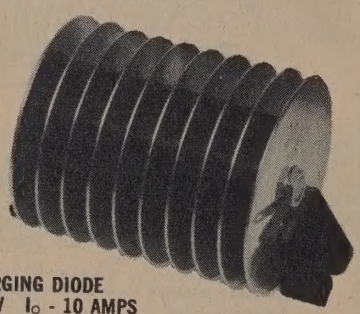
SEMTECH CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 9-336-1

SPECIAL "STACPAC" HIGH POWER SILICON RECTIFIERS

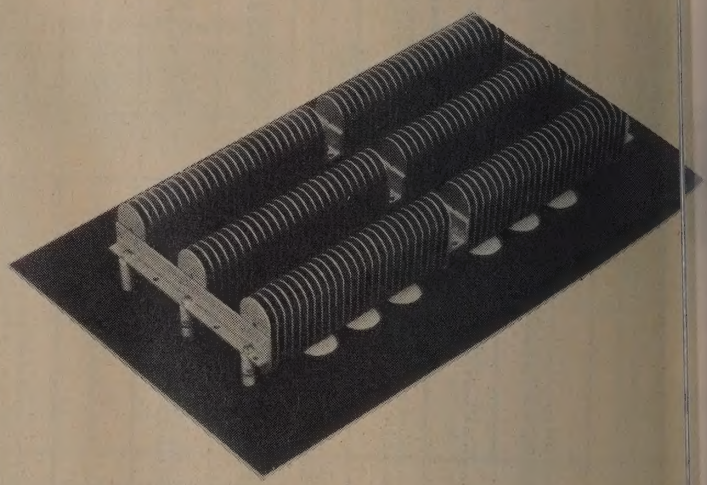
"STACPAC", a new concept in power rectifier stacks for use in high voltage, high current applications. Unique in design, "STACPAC" completely eliminates all the external component parts and solder joints usually found in devices of this type. All components are encapsulated and connected to aluminum discs, that in turn, serve as compensation, cooling fins and corona protection. Internally, "STACPAC" utilizes the Semtech "METOXILITE" Silicon Rectifiers. "STACPAC" was designed specifically to streamline packaging, replace multiple stud rectifiers and auxiliary components in high voltage, high current applications. Semtech has immediate capability to produce special high current — high voltage assemblies up to and exceeding 500K volts. Please contact our representatives for further details.



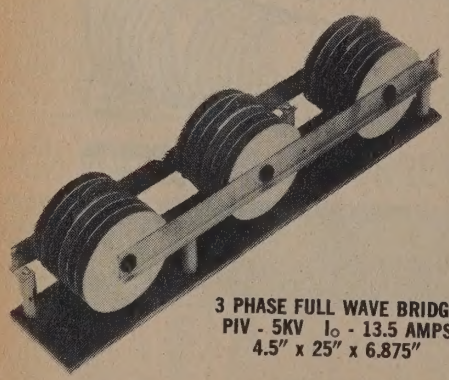
HIGH VOLTAGE RECTIFIER
PIV - 32KV I_o - 10 AMPS
4.5" x 12.67" x 2.5"



CHARGING DIODE
PIV - 7KV I_o - 10 AMPS
4.5" DIA. 7.25" LONG



3 PHASE FULL WAVE BRIDGE
PIV - 25KV I_o - 9 AMPS
14" x 23.18" x 3.75"



3 PHASE FULL WAVE BRIDGE
PIV - 5KV I_o - 13.5 AMPS
4.5" x 25" x 6.875"

JAN TYPE SILICON RECTIFIERS

emtech Corporation provides a multipurpose Hermetic Seal silicon ctifier incorporating advance design and engineering techniques never before available to the electronics industry at a nominal cost. This new rectifier utilizes solid internal onstruction with a package combining high mechanical strength, superior thermal shock resistance, rugged hermetic seal, high dielectric strength and excellent thermal conductivity properties.

REFER TO INFORMATION ON "METOXILITE" SILICON RECTIFIERS FOR DEVICES THAT ARE AVAILABLE TO NEW MSFC/NASA AND MILITARY SPECIFICATIONS.

GENERAL PURPOSE MIL-S-19500/286B including TX

Type No.	Peak Inverse Voltage	RMS (Sine Wave) Voltage	DC Blocking Voltage	Average Rectified Current		Static Forward Voltage @ 1A		Max. Static Reverse Current @ PIV		If (Surge)* (at 1/120 Second)	One Cycle Surge	Approx. Max. Altitude (Without Derating)	Data Sheet No.
				100°C	150°C	Max.	Typ.	25°C	150°C				
	Amps	Volts	Volts	MA	MA	Volts	Volts	μA	μA	Amps	Amps	Feet	
JAN 1N5	200	140	200	1000	300	1.2	1	1	150	25	50	100,000	R56
JAN 1N6	400	280	400	1000	300	1.2	1	1	150	25	50	100,000	R56
JAN 1N7	600	420	600	1000	300	1.2	1	1	150	25	50	100,000	R56
JAN 1N8	800	560	800	1000	300	1.2	1	1	150	25	50	70,000	R56
JAN 1N9	1000	700	1000	1000	300	1.2	1	1	150	25	50	70,000	R56

A = 150°C if (surge = 10 Adc) 10 surges of 8.0 msec duration each, at intervals of 1 minute. Io = 300 MADC.

JAN & IN3611, IN3612, IN3613, IN3614 and IN3957 can be supplied to MIL-S-19500/228E.

HIGH CURRENT AXIAL LEAD MIL-S-19500/367(USAF)

Type No.	Peak Inverse Voltage V_{RM} (wkg)	RMS Voltage	DC Blocking Voltage V_R	Average Rectified Current		Static Forward Voltage @ 3A DC	Max. Static Reverse Current		Max. Recurrent Peak Current	① If (surge) 1/120 SEC 1 Cycle	If (surge) 1/120 SEC 1 Cycle 25°C	Data Sheet No.
				55°C	150°C	Max	25°C	100°C	25°C	100°C		
	Volts	Volts	Volts	Amps	Amps	Volts	μAdc	μAdc	Amps	Amps	Amps	
JAN 5197	50	35	50	3	.625	1	5	120	30	50	300	E45
JAN 5198	100	70	100	3	.625	1	5	120	30	50	300	E45
JAN 5199	200	140	200	3	.625	1	5	120	30	50	300	E45
JAN 5200	400	280	400	3	.625	1	5	120	30	50	300	E45
JAN 5201	600	420	600	3	.625	1	5	120	30	50	300	E45

① Surges, 1 Surge/minute Superimposed on Io=1.0 Adc Operating and storage temperature —65°C to +175°C

FAST RECOVERY MIL-S-19500/359A(USAF) including TX

Type No.	Rated PIV & DC Blkg. Volt. Vr/Vrm (wkg)	Avalanche Breakdown Volt. @ 50 VA	*Max. Average Rectified Current		Static Forward Volt. @ 1 ADC	Max. Static Reverse Current		Max. Junction Capacitance	Max. Recurrent Peak Current	If surge tp = 8.3 mSec ②	Recovery Time ①	Data Sheet No.
		25°C	55°C	150°C	Max	25°C	150°C	12V DC	55°C	100°C	Max.	
	Volts dc/pk	Volts Min.	Amps	Amps	Volts	μAdc	μAdc	Pico-farads	Amps	Amps	Nsec.	
JAN 4942	200	220	1.0	.250	1.3	1.0	200	45	6	15	150	R59A
JAN 4944	400	440	1.0	.250	1.3	1.0	200	35	6	15	150	R59A
JAN 4946	600	660	1.0	.250	1.3	1.0	200	25	6	15	150	R59A
JAN 4947	800	880	1.0	.250	1.3	1.0	200	20	6	15	250	R59A
JAN 4948	1000	1100	1.0	.250	1.3	1.0	200	15	6	15	500	R59A

① Recovery conditions: 0.5 amp forward current to 1.0 amp reverse current
Recovery time measured when rectifier recovers to .25 amps.
② 0 surges, 1 surge/minute superimposed on Io = 750mA.

Semtech's miniature nanosecond recovery high current silicon rectifiers offer improved rectification efficiency for higher frequency applications. The unit's faster recovery characteristics offer the designer new capabilities for advanced design in reducing mechanical package configurations with improved performance and higher reliability. The rectifier utilizes solid internal construction with a package combining high mechanical strength, superior thermal shock resistance, rugged hermetic seal, high dielectric strength and excellent thermal conductivity. Designed for use in critical industrial and military applications.

"SEMPAC" SUB-MINIATURE HIGH VOLTAGE MIL-S-19500/279(NAVY)

Semtech offers "Sempac" a sub-miniature multipurpose high current silicon rectifier. Cylindrical in design with insulated case and axial leads for simple handling and installation. Better electrical characteristics obtained by the excellent thermal conductivity provided by Semtech's solid internal construction and pure silver leads. Hermetically sealed and designed to meet stringent temperature-cycling and humidity requirements of critical military, industrial and consumer-product applications.

Type No.	Peak Inverse Voltage	RMS (Sine Wave) Voltage	DC Blocking Voltage VA	Average Rectified Current		Maximum Forward Voltage	Maximum Static Reverse Current @ PIV		Recurrent Surge	I(Surge)	Data Sheet No.
				25°C	100°C	25°C	25°C	100°C			
	Volts	Volts	Volts	MA	MA	Volts dc	μA	μA	Amps	Amps	
N 1N3644	1500	1050	1500	250	100	5	5	20	2.5	14	R64
N 1N3645	2000	1400	2000	250	100	5	5	20	2.5	14	R64
N 1N3646	2500	1750	2500	250	100	5	5	20	2.5	14	R64
N 1N3647	3000	2100	3000	250	100	5	5	20	2.5	14	R64

ing & Storage Temperature —65°C to +175°C Altitude Operation (Barometric Pressure Reduced) 40,000 ft.

ch reserves the right to change specifications without notice.

State of The Art Power Devices

HIGH RELIABILITY

Plannar construction 2 amps to 100 amps
NPN, PNP complements

70-100 amps
NPN
SDT8920
SDT8921
SDT8922
SDT8923

40-60 amps
NPN
SDT8951
SDT8952
SDT8953
SDT8954
SDT8955

20-30 amps
NPN
SDT8100
SDT8002
SDT8301

20 amps
NPN
SDT8801
SDT8802
SDT8803
SDT8804
SDT8805

10 amps
NPN
SDT3201
SDT3202
SDT3203
SDT3204

10 amps
NPN
SDT3225
SDT3226
SDT3227
SDT3228
SDT3229

5 amps
NPN
SDT3401
SDT3409

5 amps
NPN
SDT3421
SDT3429

300 watts
PNP
SDT3901
SDT3902
SDT3903
SDT3904

High Volt.
V_{CEO}
200 V
225 V
250 V
275 V
300 V

175 watts
V_{CEO}
40-100 V
40-80 V
60-80 V

High Volt.
V_{CEO}
200 V
225 V
250 V
275 V
300 V

90 watts
PNP
SDT3101
SDT3102
SDT3103
SDT3104

50 watts
PNP
SDT3125
STD3126
SDT3127
SDT3128
SDT3129

50 watts
PNP
SDT3301
SDT3309

10 watts
PNP
SDT3321
SDT3329

INDUSTRIAL LINES

Popular prices
High voltage, up to 1000 volts
PNP, NPN complements

NPN (25 AMPS)

TO-66 (85 watts)
SDT7741—SDT7746

TO-111 (85 watts)
SDT7711—SDT7716

TO-61 (175 watts)
SDT7761—SDT7766

TO-3 (175 watts)
SDT7731—SDT7736

PNP (20 AMPS)

TO-3 (90 watts)
SDT3875—SDT3877

TO-66 (50 watts)
SDT3850—SDT3852

PNP (10 AMPS)

TO-3 (80 watts)
SDT3825—SDT3827

TO-66 (40 watts)
SDT3801—SDT3807

PNP (5 AMPS)

TO-3 (45 watts)
2N3021—2N3026

TO-66 (30 watts)
SDT3706—SDT3711

TO-5 (10 watts)
SDT3775—SDT3778

PNP (2 AMPS)

TO-66 (25 watts)
SDT3575—SDT3577

TO-5 (5 watts)
SDT3552—SDT3554

HIGH VOLTAGE PLANNAR (up to 500 volts)

TO-3
TO-61
TO-66
TO-111

Dial 1-800-327-3243
for a *"No Charge"* telephone call
and further information

Solitron DEVICES, INC.

1177 BLUE HERON BLVD.
RIVIERA BEACH, FLORIDA
(305) 848-4311 / TWX: (510) 952-6676

State of The Art Power Devices

COMMERCIAL

High Volume capacity
100% power pulse tested
Germanium power up to 70 amps

NPN POWER

15 AMPS	V_{CEO}
2773	(140)
ST9703	(120)
ST9706	(120)
ST9702	(100)
ST9705	(100)
ST9701	(80)
ST9704	(80)
2N3772	(60)
2N3771	(40)

10 AMPS	V_{CEO}
DT9204	(120)
DT9209	(120)
DT9203	(100)
DT9208	(100)
DT9202	(80)
DT9207	(80)
2N3055	(60)
DT9206	(60)
DT9201	(45)
DT9205	(45)
DT9210	(30)

5 AMP High Voltage

20 V — 700 V

1 AMP h_{FE}

TO-3	TO-66
DT1050—SDT1054	SDT1150—SDT1154

2 AMP h_{FE}

TO-3	TO-66
DT1055—SDT1059	SDT1155—SDT1159

3 AMP h_{FE}

TO-3	TO-66
DT1060—SDT1064	SDT1160—SDT1164
2N5466—2N5467	2N5468—2N5469

Dial 1-800-327-3243
for a *"No Charge"* telephone call
and further information

Solitron DEVICES, INC.

1177 BLUE HERON BLVD.
RIVIERA BEACH, FLORIDA
(305) 848-4311 / TWX: (510) 952-6676

SPECIAL PRODUCTS

RF Power Transistor 50 MH_z to 2 GH_z
- Amplifier Kits
- 28 volt and 12 volt families
- Stripline packaging and high freq. studs

Thick film Hybrids
- Series regulators, negative and positive
- From 3 amps to 50 amps

Power Transistor Chips
- Mounted on moly tabs with or without leads attached

Switching Transistors
- Less than 100 nano seconds total time

RF POWER

Amplifier Kits 12.5 volt

Kit	Pin	Pout	Fo
SRK2009	0.18	12.0	175MH_z
SRK2010	0.28	24.0	175MH_z
SRK2011	0.30	20.0	175MH_z
SRK2012	0.45	35.0	175MH_z

Amplifier Kits 28 volt

Kit	Pin	Pout	Fo
SRK2002	.015	25.0	175MH_z
SRK2004	0.050	10.0	400MH_z
SRK2006	.0150	10.0	400MH_z
SRK2008	0.050	12.0	400MH_z

DISCRETE DEVICES 28 VOLTS

	Pkg.	Pout
2N5070	TO-60	30w @ 100 MH_z
2N4429-31	SL	5w @ 1 GH_z

DISCRETE DEVICES 12 VOLT

SRD54216	SL	45w @ 150 MH_z
SRF52214	TO66	12w @ 225 MH_z
SRF53215	SL	15w @ 250 MH_z

Many other devices available for any power vs. freq. requirements.

THICK FILM HYBRID

Series regulator
Vout 8 V to 56 volt
Up to 3 amps output
0.5% regulation

Positive regulators
HCCA100 Base Unit
HCCA103 With current limiter
HCCA105 Fet current source and current limiter

Negative regulators
HCCA102 Base Unit
HCCA104 With current source and current limiter

POWER CHIPS

NPN, PNP complements
Gold Backing Available

Plannar Chip

2 AMP FAMILY

65 x 70 mils	V_{CEO}	V_{CBO}
NPN 91XC001-4	40-150	60-175
PNP 69XC001-4	40-100	60-140

5 AMP FAMILY

90 x 100 mils	V_{CEO}	V_{CBO}
NPN 84XC001-4	40-150	60-170
PNP 71XC001-4	40-100	60-140

10 AMP FAMILY

145 x 145 mils	V_{CEO}	V_{CBO}
NPN 85XC001-4	40-150	60-170
PNP 67XC001-4	40-100	60-140

20 AMP FAMILY

210 x 250 mils	V_{CEO}	V_{CBO}
NPN 86XC001-4	40-130	60-150
PNP 63XC001-4	40-100	60-140

Many combinations are available for higher currents and higher voltage.

Solitron DEVICES, INC.

FIELD EFFECT TRANSISTORS

General Purpose Junction FET/N-Channel, Single

TYPE	PACKAGE	BVgss *BVpgo Volts Min.	Igss nA Max.	Ipss mA Min.	Ipss mA Max.	yfs umho Min.	yfs umho Max.	Vp Volts Min.	Vp Volts Max.	Ciss pf Max.	Crss pf Max.	NF in db *en in uV Max.
2N3069	TO-18	*50	1	2	10	1000	2500		10	15		4
2N3070	TO-18	*50	1	0.5	2.5	750	2500		5	15		4
2N3071	TO-18	*50	1	0.1	0.6	500	2500		2.5	15		4
2N3365	TO-18	*40	5	0.8	4	400	2000		12	15		
2N3368	TO-18	*40	5	2	12	1000	4000		12	20		
2N3369	TO-18	*40	5	0.5	2.5	600	2500		7	20		
2N3370	TO-18	*40	5	0.1	0.6	300	2500		3.5	20		
2N3436	TO-18	*50	0.5	3	15	2500	10,000		10	18		2
2N3437	TO-18	*50	0.5	0.8	4	1500	6,000		4	18		2
2N3438	TO-18	*50	0.5	0.2	1	800	4,500		2.5	18		2
2N3458	TO-18	*50	0.2		15	2500	10000		8	5		6
2N3459	TO-18	*50	0.25	0.8		1500	6000		4	5		1
2N3460	TO-18	*50	0.25	0.2	1.0	800	4500		2	5		1
2N3821	†TO-72	50	0.1	1	2.5	1500	4500		4	6	3	*0.2
2N3822	†TO-72	50	0.1	2.0	10	3000	6500		6	6	3	*0.2
2N4220	TO-72	30	0.1	0.5	3	1000	4000		4	6	2	
2N4220A	TO-72	30	0.1	0.5	3	1000	4000		4	6	2	2.5
2N4221	TO-72	30	0.1	0.2	6	2000	5000		6	6	2	
2N4221A	TO-72	30	0.1	0.2	6	2000	5000		6	6	2	2.5
2N4222	TO-72	30	0.1	0.5	15	2500	6000		8	6	2	
2N4222A	TO-72	30	0.1	5	15	2500	6000		8	6	2	2.5
2N4224	TO-72	30	0.5	2	20	2000	7500		8	6	2	
2N4338	TO-18	50	0.1	0.2	0.6	600	1800	0.3	1.2	6	2	1
2N4339	TO-18	50	0.1	0.5	1.5	800	2400	0.6	1.8	6	2	1
2N4340	TO-18	50	0.1	1.2	3.6	1300	3000	1	3	6	2	1
2N4341	TO-18	50	0.1	3	9	2000	4000	2	6	6	2	1
2N5103	TO-72	25	0.1	1	8	2000	8000	0.5	4	5	1	1.5
2N5104	TO-72	25	0.1	2	6	3500	7500	0.5	4	5	1	1.5
2N5105	TO-72	25	0.1	5	15	5000	10000	0.5	4	5	1	1.5
UC703	TO-72	40	0.5	0.1	10	500	5000		6	6		2
UC704	TO-72	40	0.5	0.2	24	1000	10000		8	8		2
UC705	TO-72	40	1.0	0.5	50	2000	20000		8	12		2
UC707	TO-18	20	2.0	2.5	250	5000	50000		12	30		
UC714	TO-72	30	1.0	2.0	20	2000	6500		8	8	4	2
UC714E	TO-106	30	1.0	2.0	20	2000	6500		8	8	4	2
UC751	TO-18	30	2.0	0.1		350			6	10		
UC752	TO-18	30	6.0	0.3		1000			6	17		
UC753	TO-18	30	10	0.9		2500			6	25		
UC754	TO-18	30	1	0.5		1000			4	6	3	2
UC755	TO-18	30	1	4	10	2000			6	6	3	2
UC756	TO-18	30	1	0.5	15	1000			10	6	3	3

† Available in Solitron Micro-Package CC-3

General Purpose Junction FET/P-Channel, Single

TYPE	PACKAGE	BVgss *BVpgo Volts Min.	Igss nA Max.	Ipss mA Min.	Ipss mA Max.	yfs umho Min.	yfs umho Max.	Vp Volts Min.	Vp Volts Max.	Ciss pf Max.	Crss pf Max.	NF in db *en in uV Max.
2N2386	TO-5	*20	10	0.9	9	1000			8	50		2
2N2497	TO-5	20	10	1	3	1000	2000		5	32		3
2N2498	TO-5	20	10	2	6	1500	3000		6	32		3
2N2499	TO-5	20	10	5	15	2000	4000		8	32		4
2N2500	TO-5	20	10	1	6	1000	2200		6	32		1

8808 BALBOA AVENUE, SAN DIEGO, CALIFORNIA

See YELLOW SECTION for Local Offices, Phones

Solitron DEVICES, INC.

FET Continued

General Purpose Junction FET/P-Channel, Single

TYPE	PACKAGE	BV gss *BVpgo Volts Min.	Igss nA Max.	Ipss mA Min.	Ipss mA Max.	yfs umho Min.	yfs umho Max.	Vp Volts Min.	Vp Volts Max.	Ciss pf Max.	Crss pf Max.	NF in db *en in uV Max.
2N2607	TO-18	30	3	0.3	1.5	330		1	4	10		3
2N2608	TO-18	30	10	0.9	4.5	1000		1	4	17		3
2N2609	TO-18	30	30	2	10	2500		1	4	25		3
2N2843	TO-18	30	10	0.2	1	540			1.7	17		3
2N2844	TO-18	30	30	0.44	2.2	1800			1.7	30		3
2N3329	TO-72	20	10	1	3	1000	2000		5	20		3
2N3330	TO-72	20	10	2	6	1500	3000		6	20		3
2N3331	TO-72	20	10	5	15	2000	4000		8	20		4
2N3332	TO-72	20	10	1	6	1000	2200		6	20		1
2N3380	TO-72	30	3	3.0	20	1500	3000	4.0	9.5	5		
2N3909	TO-72	20	10	0.3	15	1000	5000		8	32	16	
UC400	TO-72	30	0.1	5	15	3000			6	8		0.5
UC410	TO-72	30	0.1	2	6	2250			4	8		0.5
UC420	TO-72	30	0.1	0.5	2.3	1500			2.5	8		0.5
UC805	TO-72	25	1	0.3	25	1000	10000		8	12		2
UC814	TO-72	25	2	0.3	15	800	5000		8	16	8	2
UC851	TO-18	20	4	0.9	9.0	1000			6	17		
UC854	TO-18	25	15	0.2		540			6	17		
UC855	TO-18	25	25	0.44		1400			6	25		

Amplifiers VHF/UHF Junction FET/N-Channel, Single

TYPE	PACKAGE	*BV gss Volts Min.	Igss nA Max.	Ipss mA Min.	Ipss mA Max.	yfs umho Min.	Vp Volts Max.	Ciss pf Max.	Crss pf Max.	Coss pf Max.	Gp db Min.	NF in db Max.
2N3821	TO-72	50	0.1	0.5	2.5	1500(1)	4	6	3			
2N3822	TO-72	50	0.1	2	10	3000(1)	6	6	3			
2N3823	†TO-72	30	0.5	4	20	3200(2)	8	6	2			2.5 @ 100 MHz
2N4223	†TO-72	30	0.25	3	18	2700(2)	8	6	2		10 @ 200 MHz	5 @ 200 MHz
2N4224	†TO-72	30	0.5	2	20	1700(2)	8	6	2			
2N4416	TO-72	30	0.1	5	15	4000(3)	6	4	0.8	2	10 @ 400 MHz	4 @ 400 MHz
2N4416A	TO-72	35	0.1	5	15	4000(3)	6	4	0.8	2	10 @ 400 MHz	4 @ 400 MHz
2N4417	CC-3	30	0.1	5	15	4000(3)	6	3.5	0.8	1.3	10 @ 400 MHz	4 @ 400 MHz
2N5103	TO-72	25	0.1	1	8	2000	4	5	1			
2N5104	TO-72	25	0.1	2	6	3500	4	5	1			
2N5105	TO-72	25	0.1	5	15	5000	4	5	1			
KE4416	TO-106	30	0.1	5	15	4000(3)	6	4	0.8	2	10 @ 400 MHz	4 @ 400 MHz
UC734	TO-72	30	5	4	20	3000(2)	8	4	0.8			
UC734E	TO-106	30	5	4	20	3000(2)	8	4.5	1.0			

(1) at 100 MHz (3) at 400 MHz
(2) at 200 MHz †Available in Solitron Micro-Package CC-3

Switching Junction FET/N-Channel, Single

TYPE	PACKAGE	BV gss Min. Volts	Igss *Ipgo Max. nA	Ip off Max. nA	Idss mA Min.	Idss mA Max.	Vp Volts Max.	Ciss Max. pf	Crss Max. pf	Ron Max. Ohms	ton nSec Max.	toff nSec Max.
2N3824	TO-72	50	0.1	0.1	—	—	8	6	3	250	—	—
2N3970	TO-18	40	0.25	0.25	50	150	10	25	6	30	20	30
2N3971	TO-18	40	0.25	0.25	25	75	5	25	6	60	30	60
2N3972	TO-18	40	0.25	0.25	5	30	3	25	6	100	80	100
2N4091	†TO-18	40	0.2	0.2	30	—	10	16	5	30	25	40
2N4092	†TO-18	40	0.2	0.2	15	—	7	16	5	50	35	60
2N4093	†TO-18	40	0.2	0.2	8	—	5	16	5	80	60	80
2N4391	†TO-18	40	0.1	0.1	50	150	10	14	3.5	30	20	35
2N4392	†TO-18	40	0.1	0.1	25	75	5	14	3.5	60	20	55

Solitron DEVICES, INC.

FET Continued

Switching Junction FET/N-Channel, Single

TYPE	PACKAGE	BV_{GSS} Min. Volts	I_{GSS} *I_{DGO} Max. nA	$I_{D[off]}$ Max. nA	I_{DSS} mA Min.	I_{DSS} mA Max.	V_P Volts Max.	C_{iss} Max. pf	C_{rss} Max. pf	R_{on} Max. Ohms	t_{on} nSec Max.	t_{off} nSec Max.
2N4393	†TO-18	40	0.1	0.1	5	30	3	14	3.5	100	20	80
2N4856	TO-18	40	0.25	0.25	50	—	10	18	8	25	9	25
2N4857	TO-18	40	0.25	0.25	20	100	6	18	8	40	10	50
2N4858	TO-18	40	0.25	0.25	8	80	4	18	8	60	20	100
2N4859	TO-18	30	0.25	0.25	50	—	10	18	8	25	9	25
2N4860	TO-18	30	0.25	0.25	20	100	6	18	8	40	10	50
2N4861	TO-18	30	0.25	0.25	8	80	4	18	8	60	20	100
UC155	TO-72	30	0.1	0.1	10	—	10	4	1	125	—	—
UC155E	TO-106	30	0.1	0.1	10	—	10	4	1	125	—	—
UC155W	CC-3	30	0.1	0.1	10	—	10	3.5	1	125	—	—
UC201	†TO-72	50	0.1	0.1	15	—	8	7	4	125	—	—
UC250	TO-18	30	1	1	50	150	10	25	6	30	—	—
UC251	TO-18	30	1	1	7.5	75	6	25	6	75	—	—

Switching Junction FET/P-Channel, Single

TYPE	PACKAGE	BV_{GSS} Min. Volts	I_{GSS} *I_{DGO} Max. nA	$I_{D[off]}$ Max. nA	I_{DSS} mA Min.	I_{DSS} mA Max.	V_P Volts Max.	C_{iss} Max. pf	C_{rss} Max. pf	R_{on} Max. Ohms	t_{on} nSec Max.	t_{off} nSec Max.
2N5114	TO-18	30	0.5	0.5	30	90	—	25	7	75	16	21
2N5115	TO-18	30	0.5	0.5	15	60	—	25	7	100	30	38
2N5116	TO-18	30	0.5	0.5	5	25	—	25	7	150	42	60
UC401	†TO-72	30	0.1	0.1	8	—	8	8	4	250	—	—
UC807	TO-18	20	2	—	1	125	12	30	—	400	—	—

Low Noise Junction FET/N-Channel, Single

TYPE	PACKAGE	BV_{GSS} *BV_{DSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA Min.	I_{DSS} mA Max.	y_{fs} umho Min.	y_{fs} umho Max.	V_P Volts Min.	V_P Volts Max.	C_{iss} pf Max.	C_{rss} pf Max.	NF in db *en in uV Max.
2N3684	†TO-72	50	0.1	2.5	7.5	2000	3000	2	5	4	1.2	*0.15
2N3685	†TO-72	50	0.1	1	3.5	1500	2500	1	3.5	4	1.2	*0.15
2N3686	†TO-72	50	0.1	0.4	1.2	1000	2000	0.6	2	4	1.2	*0.15
2N3687	†TO-72	50	0.1	0.1	0.5	500	1500	0.3	1.2	4	1.2	*0.15
2N5105	TO-72	25	0.1	5	15	5000	10000	—	4	5	1	1.5
UC200	TO-72	50	0.1	10	30	6000	—	—	6	7	—	0.5
UC210	TO-72	50	0.1	4	12	4500	—	—	4	7	—	0.5
UC220	TO-72	50	0.1	1	5	3000	—	—	2.5	7	—	0.5
UC241	TO-72	50	0.25	1	10	2000	—	—	5	20	—	*0.02

Low Noise Junction FET/P-Channel, Single

TYPE	PACKAGE	BV_{GSS} *BV_{DSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA Min.	I_{DSS} mA Max.	y_{fs} umho Min.	y_{fs} umho Max.	V_P Volts Min.	V_P Volts Max.	C_{iss} pf Max.	C_{rss} pf Max.	NF in db *en in uV Max.
2N2500	TO-5	*20	10	1	6	1000	2200	—	6	32	—	1
2N3332	TO-72	*20	10	1	6	1000	2200	—	6	20	—	1
UC400	TO-72	30	0.1	5	15	3000	—	—	6	8	—	0.5
UC410	TO-72	30	0.1	2	6	2250	—	—	4	8	—	0.5
UC420	TO-72	30	0.1	0.5	2.5	1500	—	—	2.5	8	—	0.5

†Available in Solitron Micro-Package CC-3

Solitron DEVICES, INC.

FET Continued

MOS/FET/P-Channel, Enhancement, Single

TYPE	PACKAGE	BV_{DSS} Volts Min.	I_{GSS} Max.	I_{DSS} nA Max.	BV_{GSS} Transient	$V_{gs(TH)}$ Volts Min.	$V_{gs(TH)}$ Volts Max.	$r_{ds(on)}$ Ohms Max.(2)	y_{fs} umho Min.	y_{fs} umho Max.	C_{iss} pf Max.	C_{rss} pf Max.	NF Typ. dB
3N163	TO-72	—40	(1)	0.2	±125	—2.0	—5.0	250	2000	4000	2.5	0.7	1.0
3N164	TO-72	—30	(1)	0.4	±125	—2.0	—5.0	300	1000	4000	2.5	0.7	1.0
3N172	TO-72	—40	0.2nA	0.4	—40(3)	—2.0	—5.0	250	1500	4000	3.5	1.0	1.0
3N173	TO-72	—30	0.5nA	10.0	—30(3)	—2.0	—5.0	350	1000	4000	3.5	1.0	1.0
UC1764	TO-72	—30	(1)	10.0	±125	—2.0	—5.0	300	1000	4000	3.0	1.0	2.0

(1) Dependent upon package leakage which is guaranteed to be below 10pA.
(2) Measured at V = — 20V.
(3) Integrated zener protected gates.

DUAL MOS/FET/P-Channel, Enhancement

TYPE	PACKAGE	V mV Max.	ΔV_{GS} uV/°C Max.	BV_{DSS} Volts Min.	I_{DSS} nA Max.	C_{rss} pf Max.	$r_{ds(on)}$ Max. Ohms	I_{GSS}
3N165	TO-99	100	100	—40	0.2	0.7	300(2)	(1)
3N166	TO-99	—	—	—40	0.2	0.7	300(2)	(1)
UC2766	TO-99	—	—	—30	10.0	1.0	300(2)	(1)

(1) Dependent upon package leakage which is guaranteed to be below 10 pA.
(2) Measured @ V = —20V.

Dual FET/Junction N.Channel

TYPE	PACKAGE	ΔV_{GS} uV/°C Max.	BV_{GSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA Min.	I_{DSS} mA Max.	V = 0 $*I_{fs}$ = 700 uA y umho Min.	V_{GS} mV Max.	y_{fs} match % Max.	I_{DSS} match % Max.	V_P Volts Max.	y_{os} umho Max.	y_{os} umho Max.	NF db
2N3921	TO-71	10	50	0.25	1	10	*1500	5	5		2.7	35	—	2
2N3922	TO-71	25	50	0.25	1	10	*1500	5	5		2.7	35	—	2
2N3954	TO-71	10	50	0.1	0.5	5	1000	5	3	5	4.5	35	—	0.5
2N3954A	TO-71	5	50	0.1	0.5	5	1000	5	3	5	4.5	35	—	0.5
2N3955	TO-71	25	50	0.1	0.5	5	1000	10	5	5	4.5	35	—	0.5
2N3955A	TO-71	15	50	0.1	0.5	5	1000	10	3	5	4.5	35	—	0.5
2N3956	TO-71	50	50	0.1	0.5	5	1000	15	5	5	4.5	35	—	0.5
2N3957	TO-71	75	50	0.1	0.5	5	1000	20	10	10	4.5	35	—	0.5
2N3958	TO-71	100	50	0.1	0.5	5	1000	25	15	15	4.5	35	—	0.5
2N4084	TO-71	10	50	0.25	1	10	*1500	15	5		2.7	35	—	2
2N4085	TO-71	25	50	0.25	1	10	*1500	15	5		2.7	35	—	2
2N5452	TO-71	5	50	0.1	0.5	5	1000	5	3	5	4.5	1	.25	0.5
2N5453	TO-71	10	50	0.1	0.5	5	1000	10	3	5	4.5	1	.25	0.5
2N5454	TO-71	25	50	0.1	0.5	5	1000	15	5	5	4.5	1	.25	0.5
UC-2130	TO-71	10	50	0.1	0.5	4.5	1000	5	5	5	5	40	—	0.5
UC-2132	TO-71	20	50	0.1	0.5	4.5	1000	20	5	5	5	40	—	0.5
UC-2134	TO-71	50	50	0.1	0.5	4.5	1000	30	10	10	5	40	—	0.5
UC-2136	TO-71	100	50	0.1	0.5	4.5	1000	50	10	10	5	40	—	0.5
UC-2138	TO-71	200	50	0.1	0.5	4.5	1000	100	20	20	5	40	—	0.5
UC-2139	TO-71		30	0.2	0.2	6	750				6	40	—	2
UC-2147	TO-71		30	0.2	0.5		1000				5	50	—	2.0
UC-2149	TO-71		30	0.2	0.5	15	1000				6	40	—	2

8808 BALBOA AVENUE, SAN DIEGO, CALIFORNIA

Solitron DEVICES, INC.

LINEAR INTEGRATED CIRCUITS

Linear Integrated Circuits (Operational Amplifiers)

MODEL	Package	Operating Temperature Range Min. °C	Operating Temperature Range Max. °C	Open Loop DC Voltage Gain Min. db	Open Loop DC Voltage Gain Typ. db	Bandwidth Small Signal Typ. MHz	Bandwidth Full Output Typ. kHz	Input Impedance Open Loop Diff. Typ. MΩ	Input Impedance Open Loop CM Typ. MΩ	Input Voltage Offset Max. mV	Input Voltage Drift Max. uV/°C	Input Current Bias Max. nA	Input Current Offset Max. nA	Input Current Drift Max. nA/°C	Input Noise Voltage Typ. uV/ —	Common Mode Voltage Range Min. Volts	Rated DC Output Min. Volts	Rated DC Output Min. mA	Power Requirement Nom. Volts	Power Requirement Max mA	Slew Rate Typ. usec
UC4000	TO-101	—55	+125	86	98	2.0	15	3.0	400	(6) Zero ±5	±10	50	±15	(2) ±0.107	0.2	±10	(3) ±10	(4) ±2.0	±15	±7	3.0
UC4001	TO-101	—55	+125	86	98	2.0	15	3.0	400	(6) Zero ±10	±20	100	±30	(2) ±0.214	0.2	±10	(3) ±10	(4) ±2.0	±15	±7	3.0
UC4002	TO-101	—55	+125	86	98	2.0	15	3.0	400	(6) Zero ±10	±40	150	±50	(2) ±0.428	0.2	±10	(3) ±10	(4) ±2.0	±15	±7	.0
UC4000C	TO-101	0	+70	86	98	2.0	15	3.0	400	(6) Zero ±5	(1) ±10	50	±15	(7) ±0.107	0.2	±10	(3) ±10	(4) ±2.0	±15	±10	.0
UC4001C	TO-101	0	+70	86	98	2.0	15	3.0	400	(6) Zero ±10	(1) ±20	100	±30	(7) ±0.214	0.2	±10	(3) ±10	(4) ±2.0	±15	±10	0
UC4002C	TO-101	0	+70	86	98	2.0	15	3.0	400	(6) Zero ±10	(1) ±40	150	±50	(7) ±0.428	0.2	±10	(3) ±10	(4) ±2.0	±15	±10	0
UC4100C2	DIP	0	+70	86	—	2.0	15	1.0	—	(7) Zero ±10	—	200	±75	(7) ±2.2	—	±10	(3) ±10	(5) ±2.0	±15	±10	
UC4200	TO-99	—55	+125	97	—	1.0	10	3.0	—	(2) ±10	—	100	±35	—	—	±15	(4) ±20	(4) ±4.0	±24	±3.5	5
UC4200C	TO-99	0	+70	89	—	1.0	10	3.0	—	(7) ±15	—	250	±100	—	—	±15	(4) ±20	(4) ±4.0	±24	±5.0	
UC4200C2	DIP	0	+70	89	—	1.0	10	3.0	—	(7) ±15	—	250	±100	—	—	±15	(4) ±20	(4) ±4.0	±24	±5.0	
UC4101	TO-99	—55	+125	94	102	0.5	10	0.3	—	(6) Zero ±6.0	±6.0	500	±200	±0.2	0.022	±12	(5) ±10	±5	±20	±8	
UC4101A	TO-99	—55	+125	94	102	0.5	10	1.5	—	(6) Zero ±3.0	±15	100	±10	±0.3	0.022	±15	(5) ±10	±5	±20	±8	
UC4201	TO-99	0	+70	86	102	0.5	10	0.15	—	(6) Zero ±10	±8.0	1500	±500	±0.33	0.022	±12	(5) ±10	±5	±20	±8	0
UC4201A	TO-99	0	+70	86	102	0.5	10	0.5	—	(6) Zero ±6.0	±20	300	±20	±0.3	0.022	±15	(5) ±10	±5	±20	±8	0.
UC4301A	TO-99	0	+70	88	104	0.5	10	0.5	—	(6) Zero ±10	±30	250	±50	±0.3	0.022	±12	(5) ±10	±5	±20	±8	0.
UC4741	TO-99	—55	+125	94	100	0.7	10	0.3	—	(6) Zero ±6.0	±3.0	500	±200	±0.375	0.030	±12	(5) ±10	±5	±15	±10	0.
UC4741C	TO-99	0	+70	86	100	0.7	10	0.3	—	(6) Zero ±7.5	±3.0	500	±200	±0.375	0.030	±12	(5) ±10	±5	±15	±10	0.

DUAL TRANSISTORS

Dual Bipolar/NPN Monolithic

TYPE	PACKAGE	ΔVbe uV/°C Max.	BVcbo Volts Min.	Icbo nA Max.	hfe match %	Vbe1-2 mV Max.	hfe @ 10 uA Min.	hfe @ 10 uA Max.	ft MHz Min.	hfe @ —55°C 10 uA Min.	NF in db Max.	Vcesust Min.	Cob pf Max.
2N2913	TO-78	—	45	10	—	—	60	240	60	15	4	45	6
2N2914	TO-78	—	45	10	—	—	150	600	60	30	3	45	6
2N2915	TO-78	10	45	10	10	5	60	240	60	15	4	45	6
2N2916	TO-78	10	45	10	10	5	150	600	60	30	3	45	6
2N2917	TO-78	20	45	10	20	10	60	240	60	15	4	45	6
2N2918	TO-78	20	45	10	20	5	150	600	60	30	3	45	6
2N2919	TO-78	10	60	2	10	5	60	240	60	15	4	60	6
2N2920	TO-78	10	60	2	10	5	150	600	60	40	3	60	6
2N4044	TO-78	3	60	0.1	10	3	200	600	200	75	2	60	0.8
2N4045	TO-78	10	45	0.1	20	5	80	800	150	30	3	45	0.8
2N4100	TO-78	5	55	0.1	15	5	150	600	150	50	3	55	0.8
2N4878	TO-71	3	60	0.1	10	3	200	600	200	75	2	60	0.8
2N4879	TO-71	5	55	0.1	15	5	150	600	150	50	3	55	0.8
2N4880	TO-71	10	45	0.1	20	5	80	800	150	30	3	45	0.8

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See YELLOW SECTION for Local Offices, Phones

Solitron DEVICES, INC.

DUAL TRANSISTORS

VHF/UHF NPN Monolithic

TYPE	PACKAGE	BVcbo Volts Min.	Icbo nA Max.	hfe Min.	Cib pf Max.	Gp db Min.	NF db Max.	hfe @ —55°C Min.	Vce sust Min.
UCX2910	TO-78	30	0.1	6(1)	1.3	15(2)	6(3)	15	15

(1) at 100 MHz (2) at 200 MHz (3) at 60 MHz

MOS INTEGRATED CIRCUITS

TYPE	MODEL	PACKAGE	OPERATING TEMPERATURE RANGE Min.°C	Max.°C	DESCRIPTION		
D ONLY - MORY	UC6500	24 Lead	—55	+125	1024 Bit STATIC Read Only	Four memory organizations — 1024 words X 1 bit — 512 words X 2 bits	V_{dd} = —12V
	UC7500	Dual Inline or Flat Pack	0	+70	Memory, 1.0 μsec Access Time	Bipolar Compatible Outputs — 256 words X 4 bits — 128 words X 8 bits	V_{gg} = —25V
D ONLY MORY	UC6510	24 Lead	—55	+125	1024 Bit STATIC Read Only	Four memory organizations — 1024 words X 1 bit — 512 words X 2 bits	V_{dd} = —12V
	UC7510	Dual Inline or Flat Pack	0	+70	Memory, 1.0 μsec Access Time	Bipolar Compatible Outputs — 256 words X 4 bits — 128 words X 8 bits	V_{gg} = —25V
D ONLY MORY	UC6525	24 Lead	—55	+125	1024 bit Static Read Only Memory. That is completely bipolar compatable. Typical access time of 500 μsecs. Four memory organization 1024 words X 1 bit; 512 words X 2 bits; 256 words X 4 bits, and 128 words X 8 bits. Through use of programmable chip select UC 6525/7525 can be used in word organized systems.		
	UC7525	Dual Inline or Flat Pack	—25	+70			
FT REGISTER	UC7330	TO-99	0	+85	Dual 25 Bit Dynamic Shift Register. Low Power 0.4 mW/bit	Frequency Range 10KHz to 1MHz Bipolar Compatible (Input and Output)	V_{dd} = —10V V_{Clock} = —16V
LTIPLEXER	UC6410	14 Lead	—55	+125	Six Channel MOS FET	Low $C_{ds(on)}$ 1.0pF 40 Volt Breakdown Voltages	
	UC7410	Flat Pack	0	+70	Switch Low r_{rss} 180Ω	Integrated Zener Gate Protection	
NDOM ACCESS EMORY	UC6550	24 Lead	—55	+125	64 word X 4 bit Random access memory .9 μsec max. access time	Single phase dynamic operation — 25 KHz — 1 MHz	V_{ss} = —15
	UC7550	Dual Inline or Flat Pack	0	+70		Bipolar Compatible (Input and Output) (to work case bipolar levels)	V_{dd} = +5 V_{gg} = —5

SOLITRON DEVICES MOS CAPABILITIES

At the present time Solitron Devices is shipping, producing and developing a variety of MOS Integrated Circuits. The advanced state of technology and engineering at Solitron has developed a completely bi-polar compatible technology. The complexity of circuits using this technology shall be readily seen in that announcements will be made shortly on Read Only Memories with capacities up to 4,000 bits of storage on a single chip with decoding. Additional standard product circuits are now in design and will increase our base of shift register and random access memory business.

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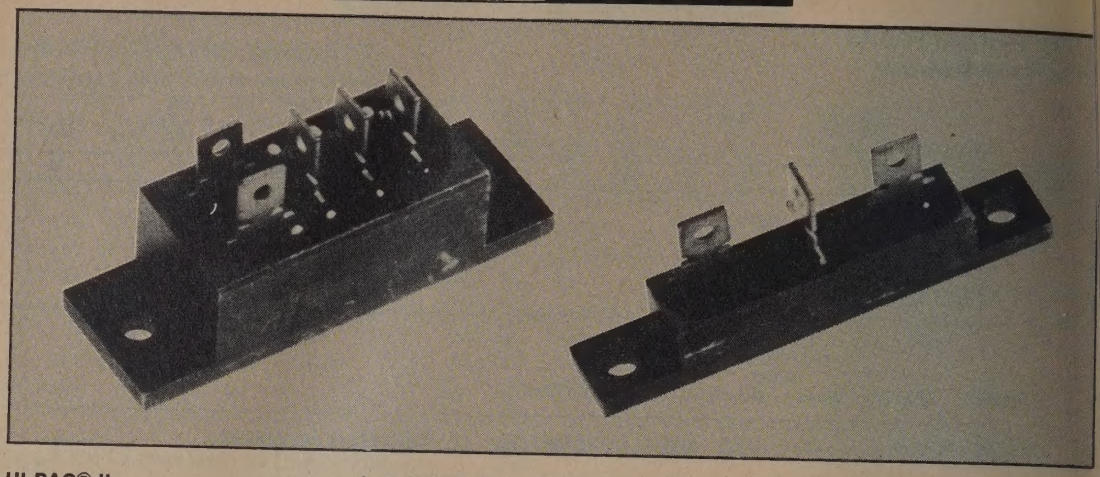
Solitron DEVICES, INC.



HI-PAC® II 3-PHASE FULL WAVE BRIDGE

Solitron Devices, Inc. introduces the "**Hi-Pac II**" 3 phase full wave bridge and doublers and center tap units. Design features of this unit is, the aluminum case to provide low thermal resistance from junction to mounting surface, and ease of installation.

Internal construction utilizes Solitron's large area junction high current rectifier chips for optimum performance. The device is designed for applications having current requirements of stud rectifiers and where ease of mounting and reliable packaging are of prime importance.

Features

PIV—50 to 1000 volts
Average output current to 25 amperes (Type H, 768) and 35 amperes (Type J27-OC, A)
Aluminum case
Maximum thermal resistance 1.5°C/Watt
Insulated electrical connections
Center tap units output capability to 35A at Tc of 100°C. Doublers output capability to 17.5A at Tc of 100°C. All devices in the **Hi-Pac II** series are available in the fast switch version to PIV's of 600 V. Rating based on a heat sink of approximately 190 sq. inches of radiating surface in still air with a radiating capability of 1°C/Watt.

TYPE NO.	PIV Per leg DC or Recurrent (Volts)
H768-0	50
H768-1	100
H768-2	200
H768-3	300
H768-4	400
H768-5	500
H768-6	600
H768-7	700
H768-8	800
H768-9	900
H768-10	1000

Average DC Output Io Tc = Case Temp. 100°C Amps/25,
Average DC Output Io @ T (No Heat Sink) 25°C Amps/5,
Peak 1 Cycle Foreward Surge Amps/300,
Peak Recurrent Foreward Surge Amps/75,
V Max. per leg @ 3A DC 25°C Volts/25,
I Max. per leg @ PIV 100°C uA/250.

TYPE NO.	PIV Per leg DC or Recurrent (Volts)
J527-0C, A	50
J527-1C, A	100
J527-2C, A	200
J527-3C, A	300
J527-4C, A	400
J527-5C, A	500
J527-6C, A	600
J527-7C, A	700
J527-8C, A	800
J527-9C, A	900
J527-10C, A	1000

Average DC Output Io Tc = Case Temp. 100°C Amps/35,
Average DC Output Io @ T (No Heat Sink) 25°C Amps/5,
Peak 1 Cycle Foreward Surge Amps/300,
Peak Recurrent Foreward Surge Amps/75,
V Max. per leg @ 3A DC 25°C Volts/25,
I Max. per leg @ PIV 100°C uA/250.

Maximum thermal impedance juction to mounting surface 1.5°C/Watt
Maximum operating and storage temperature —55°C to +175°C
All ratings based on the use of a 1°C/Watt heat sink of approx. 190 sq. inch of radiating surface in still air.

VACUUM TUBE RECTIFIERS

Direct replacement of most vacuum tube rectifiers are available as off-the-shelf items. These devices are inexpensive and reliable, usually outlasting the life of the equipment.

SILICON RECTIFIERS

The Solitrode diode is a Hyper-pure hard glass passivated silicon rectifier, manufactured with materials having matched coefficient of expansion. The void free monolithic structure of this device is unique, offering a DOUBLE glass-to-metal hermetically sealed silicon junction. The glass passivated chip is subject to temperatures in excess of 700 deg. C at various processing stages in addition to a final 24-hour high temperature bake. The glass passivated junction is bonded to the terminal stud across the full face of the rectifier chip, enabling the device to handle high current surges. The Solitrode is available with silver leads, in the stud package, and in chip form for hybrid packaging.

SOLITRODE

The Solitron series of epoxy-encapsulated silicon rectifiers, double diffused, replaces the selenium and top hat rectifiers. Since the birth of this family of devices, Solitron has manufactured and supplied to industry over 500 million rectifiers. Their reliability is unquestionable, and they are used widely in many military applications.

To supplement the epoxy rectifier line, a standard stud series is also available covering a wide voltage and current range.

ZENERS

A complete line of devices to 50 watts is available off the shelf from Solitron's zener department. These devices are used for regulating DC voltages, low impedance DC level clamping, clipping, limiting and surge protection within the region of their maximum ratings. For applications where the Delta zener voltage is critical, the TC series (temperature compensated) is available from 10 to 200 volts, Jedec type 1N4057 thru 1N4085.

Solitron Semi Marketing 'In-House' Analyzer Tri-A In order to assure reliable operation when evaluating maximum power dissipation in a semiconductor device, you have to include the important parameter of thermal resistance, junction-to-case. However, we have found that accurate measurement of this parameter has generally been tedious and unstandardized.

The design and development of the TRI-A Thermal Resistance Analyzer has solved this testing problem. Starting with pnp transistor types and then npn, this equipment is now capable of handling 100 percent thermal resistance testing of diodes, transistors, and rectifiers.

The advantages of this method include:
1. It is reliable, accurate, and fast, leading to greater efficiency and reduction of testing time. (The test time is in the order of ¼ sec to 2 sec, 3 sec being a conservative operating level.)
2. It eliminates the liquid used in some liquid-to-liquid methods which are generally time consuming and messy.
3. In some cases the emitter base junction is used; however, the collector-base junction is more standardized regarding gradient and diffusion than the base-emitter junction. This leads to a more linear relationship between voltage drop and junction temperature.
4. The proposed test circuit is universal in that it will measure the thermal resistance of diodes and transistors and their associated thermal time constant.
5. In this method, the thermal resistance of transistors is read directly rather than requiring pencil and paper calculations.

JAN NUMBERS AVAILABLE:
1N1124A & RA
1N1126A & RA
1N1128A & RA

1N1202A & RA
1N1204A & RA
1N1206A & RA

1N748A thru 1N759A

1N3649 & R
1N3650 & R

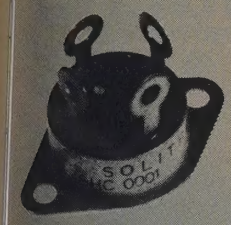
1N3671A & RA
1N3673A & RA

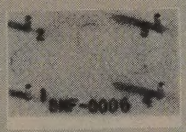
1N4459 & R

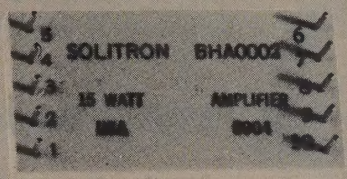
1N4245 thru 1N4249

256 OAK TREE ROAD/TAPPAN, N.Y. 10983/ PHONE (914) 359-5050/ TWX 710-576-2654/TELEX 13-7346

Solitron DEVICES, INC.







FULL WAVE BRIDGE RECTIFIERS

The Solitron 10 Amp Integrated Bridge Rectifier offers a new circuit component for the design engineer. Its versatile package and functional specifications, coupled with a desirable 70 to 420 volt RMS voltage range, makes it ideally suitable for present and future circuit designs.

The BHC series provides the mounting versatility of a TO-3 with the savings of a plastic encapsulant. This results in an inexpensive universal design to meet most of your requirements.

TYPE	I_O (A)	I_{FM}(Surge) (A)	V_{RM}(Rep)	T_J (°C)
BHC0001	10	100	100	-65 to +125
BHC0002	10	100	200	-65 to +125
BHC0003	10	100	300	-65 to +125
BHC0004	10	100	400	-65 to +125
BHC0005	10	100	600	-65 to +125
BHC0006	10	200	100	-65 to +150
BHC0007	10	200	200	-65 to +150
BHC0008	10	200	300	-65 to +150
BHC0009	10	200	400	-65 to +150
BHC0010	10	200	600	-65 to +150

POWER DARLINGTONS

Solitron Darlington Modules represent a unique combination of power semiconductor and power microcircuit technologies. These low cost hybrids offer exceptionally high current gain at high current and high power dissipation levels. Treated as transistors, these modules are applicable in a wide range of amplifier and power switching functions, where current gains much higher than those normally associated with a single conventional device are required.

POWER DRIVER MODULES

Solitron Power Driver Modules are microelectronic functional elements designed to drive loads with high power requirements from low level digital signals. The output circuits can switch power as high as 300 W and voltages to 60 V. A clamp diode is provided for switching inductive loads.

These modules consist of a high power, high gain amplifier, coupled to the output of 3 input expandable logic gate. Full power may be obtained by signals from most monolithic digital logic.

POWER AUDIO AMPLIFIERS

2 Watt—Design of the Solitron 2 Watt class A Audio Amplifier has been optimized for applications with battery voltages of 14 volts. Rated output will be sustained even under elevated temperatures and power supply ranges from 11 to 16 volts.

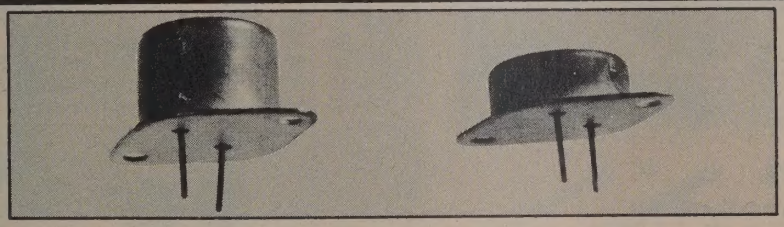
Operation with inputs of 5mV eliminate the need for preamplifiers. Fewer external components are required than with monolithic amplifiers.

5 Watt & 15 Watt—Solitron Class B Quasi-complementary Audio Amplifiers will produce full output from 350 mV input signals. This makes them compatible with most existing preamplifier designs. Useful feedback compensation can be achieved with no external components. External terminals are provided to permit optional trimming of idle current and crossover characteristics.

These amplifiers are capable of continuous operation at output powers as high as 15 Watts (RMS) operating into conventional speaker loads.

TYPE	P_O (Max) (W)	Voltage Range (V)	Input Voltage @ P_O (Max) (mV)	Frequency Response (Hz)	THD (%)
BHA0001	2	11 to 16	5	40 to 10K	5
BHA0004	5	11 to 20	20	25 to 20K	1
BHA0002	15	14 to 40	350	25 to 20K	1

Power Gain (db)/55
Tc (°C)/—30 to +100



SERIES REGULATORS

The Solitron Series and Shunt Type Voltage Regulators are modules comprised of a voltage reference source, a comparator-amplifier and power control gate.

Both series and shunt modules are hermetically sealed in a TO-3 package. Types BN4000 through BN4009 have a higher dome

TYPE	P_T @ 25°C (W)	No Load to Full Load (%)	20% Change in Input V. (%)	Nominal Output Voltage @ 0.5A (V)	Max. Output Current (A)	Input Voltage Range (V)
BN4000	25	1	2	6	1	10-31
BN4001	25	1	1	12	1	16-37
BN4002	25	1	1	18	1	22-40
BN4003	25	1	1	24	1	28-40
BN4008	25	1	2	5	1	9-30
BN4010	25	1	1	28	1	32-40
BN4014	25	1	1	15	1	19-40
BN4016	25	1	1	9	1	13-34
BN4100	15	2	2.5	5	1	9-20
BN4101	15	2	2.5	6	1	10-21
BN4102	15	2	2	12	1	16-27
BN4103	15	2	1.5	18	1	22-33
BN4104	15	2	1.5	25	1	29-40

Max. Input Current (A)/1, Min. Input Current (mA)/31, P @ T = 25°C (W)/25, Load Regulation No Load to Full Load %/1;

SHUNT REGULATORS

Types BN4004, 5, 6, 9, 18 and 22 are shunt regulators that are externally trimmable over a range of ±10% of nominal output voltage. Solitron will normally provide units set for any voltage from 5 to 30 volts. They are normally set under conditions of ½ rated load current, 25°C case, to 5, 6, 9, or 12 volts with a ±3% setting tolerance.

Additional information may be found in a Solitron application note entitled: "DC Voltage Regulator Modules." Available upon request.

TYPE	Nominal Output Voltage @ 50% Load (V)
BN4004	6
BN4005	9
BN4006	12
BN4009	5
BN4018	30
BN4022	26

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Sensitron Semiconductor

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Silicon Rectifier Devices

RECTIFIERS

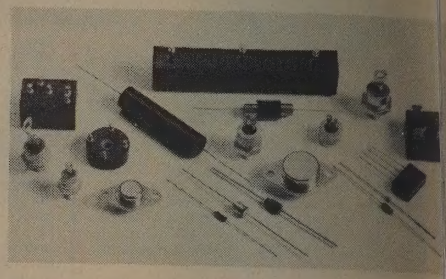
Flangeless Top Hat .....to 3 amperes, 2000 volts
1N3938 to 1N3940 1N3189 to 1N3191

Epoxy .....to 3 amperes, 1500 volts
1N4001 to 1N4007 1N5391 to 1N5399
1N4245 to 1N4249 1N5170 to 1N5178
1N5197 to 1N5201 1N5400 to 1N5408

Stud Package .....to 40 amperes, 1000 volts

DO-4	DO-5
1N1199A to 1N1206A	1N1191A to 1N1198A
1N1341A to 1N1348A	1N1183A to 1N1190A

Fast Recovery .....to 3 amperes, 100 nanoseconds
1N4823 to 1N4826 1N4942 to 1N4948



ZENER AND REFERENCE DIODES

1N225 to 1N235 1N957 to 1N992
1N429 to 1N430 1N2804 to 1N2846
1N821 to 1N829 1N2970 to 1N3015
1N935 to 1N946 1N4736 to 1N4764

HIGH VOLTAGE RECTIFIERS

Sticks .....to 100 KV and 3 amperes
Doublers .....to 100 KV and 3 amperes

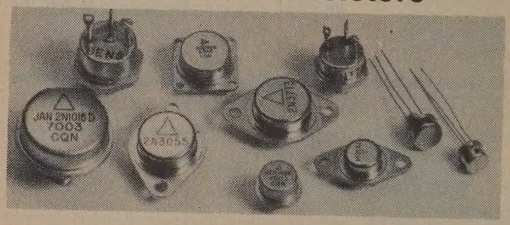
THYRISTORS

Triacs .....to 25 amperes, 1000 volts
SCRs .....to 25 amperes RMS, 1000 volts
2N681 to 2N692 2N1842A to 2N1850

CIRCUIT ASSEMBLIES

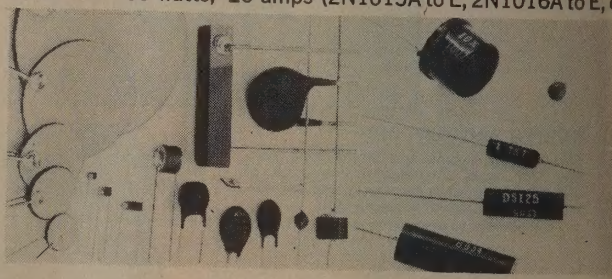
Bridges .....to 25 amperes, single phase
to 50 amperes, three phase
Voltage Multipliers .....to 150

Silicon Power Transistors



Voltages to 400 volts available in all packages

To-3 ....to 150 watts, 30 amps (2N3055, 2N3442, 2N3773, etc)
To-5 ....to 10 watts, .5 amps (2N1116, 2N2034, 2N2911, etc)
To-53....to 85 watts, 3 amps (2N389, 2N424, 2N1722, etc.)
To-57....to 40 watts, .8 amps (2N1047A, 2N1050A, etc.)
To-61....to 85 watts, 7.5 amps (2N1724, 2N1209, etc.)
To-66....to 30 watts, 4 amps (2N3054, 2N3441, etc.)
To-82....to 150 watts, 20 amps (2N1015A to E, 2N1016A to E, etc)



Thermistors

Positive Temperature Coefficient
Silicon Resistors to MIL-T-23648A
⅛, ¼ watt to 1%

Negative Temperature Coefficient
Disc, Chip, Probe and Bead types to 1%

JAN Approvals

1N3189 to 1N3191 JAN AND JAN TX
1N5197 to 1N5201 JAN
2N389, 2N424 JAN
2N1047A to 2N1050A JAN
2N1016B to 2N1016D JAN
2N1483 to 2N1486 JAN AND JAN TX

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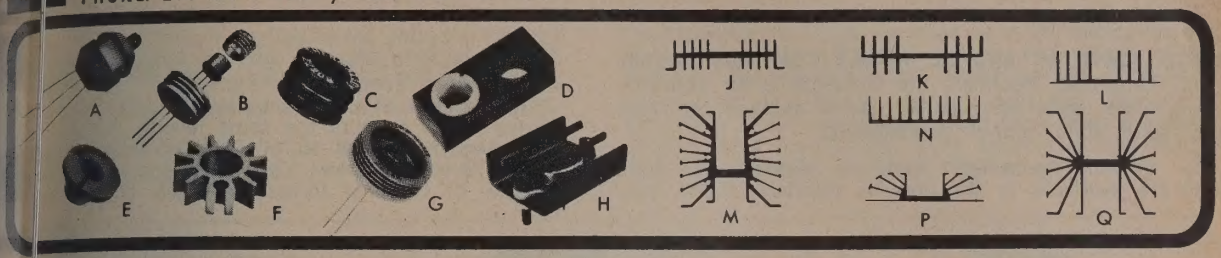
SEMICONDUCTOR ACCESSORIES



SMA HEAT SINKS

High formance heat sinks. Finish denoted by manufacturer's number (A) Hard Anod per Mil-F-14072, 400 volts insulation (B) Black Anodize per Mil-A-8625 Type (C) Gold Chromate finish per Mil-C-5541.

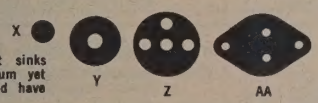
M	Fig.	Fits Case Type	Size, Inches L	W	H	Typ. RT Natural Convection °C/w
1	A	TO-5	.5	.5	.88	10
2 /PR11	B	TO-5	.81	.81	.34	26
2	C	TO-5	.750	.750	.375	39
3 B	D	TO-5	1.25	.5	.5	30
2 C	E	TO-5	.75	.75	.40	46
2 C-5	F	TO-5	.75	.75	.25	55
6	H	TO-66	1.31	.87	.61	11
6	H	TO-3	1.53	1.25	.516	7

POWER HEAT SINKS

Flat ed as well as multi-finned offer a variety in convection cooling Heat Sinks. Hav ack Anodized finish per Mil-A-8625 Type II.

M	Fig.	Size Inches L	W	H	Type RT Natural Convection °C/W
5B	J	3	4.75	1.25	1.6
7B	K	3	3.91	1.12	2.3
5B	L	3	6.75	2	1.2
0B	M	5	4	4	.68
3B	N	3	8.3	2.0	.95
1	Q	5.50	4.75	4.50	
1	P	1.50	2.00	.562	
5	P	3.00	4.12	1.00	

BERYLLIUM OXIDE HEAT SINKS & INSULATORS



High purity beryllium oxide heat sinks conduct heat better than aluminum yet insulate better than porcelain and have low capacitance.

Mfr's Type	Fig.	For Case	Rated Volts	Size, Inches L	W	H
4018	X	TO-18	700	.22	.22	.03
4005	X	TO-5	700	.36	.36	.03
4003	AA	TO 3	800	1.56	1.05	.06
4066	AA	TO-66	800	1.25	.70	.06
4036	Z	TO-36	800	1.06	1.06	.06
-470-235-40	Y	10-32 Stud	700	.47	.47	.04
-800-260-62	Y	5/16" Stud	800	.80	.80	.06
-800-320-62	Y	1/4" Stud	800	.80	.80	.06

THERMAFILM INSULATORS

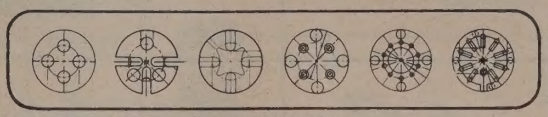
Improved replacment for mica washers. Homogeneous film will not chip, fracture, or break. Has dielectric strength of 7000 volts/mil with a useful temperature of —260°C to +400°C.

Mfr's Type	Fig.	For Case	Size, Inches L	W	H
3-18-1	X	TO-18	.25	.25	.002
3-5-1	X	TO-5	.39	.39	.002
3-03-3	AA	TO-3	1.65	1.06	.002
3-66-1	AA	TO-66	1.31	.76	.002
3-36	Z	TO-36	1.06	1.06	.002
3-02-10	Y	10-32 Stud	.562	.562	.002
3-02-25	Y	1/4" Stud	.812	.812	.002
3-02-50	Y	1/2" Stud	1.38	1.38	.002

HARD-ANODIZED INSULATORS

61-T4 Aluminum, hardcoated per Mil-A-8625 type III. Thermal resistance is 16 °C/watt per square inch of area.

Mfr's Type	Fig.	For Case	Size, Inches L	W	H
766A	AA	TO-66	1.32	.71	.02
703A	AA	TO-3	1.80	1.06	.02
710A	Y	#10 Stud	.56	.56	.02
725A	Y	1/4" Stud	.81	.81	.02
736A	Z	TO-36	1.09	1.09	.02
778A	Not Shown	Plastic Power	.75	.50	.02



SEMICONDUCTOR MOUNTING PADS

Low cost Thermalloy color-coded mounting pads provide an economical way to protect transistors and integrated circuits from shock and vibration. Achieve uniform spacing above printed circuit boards. Available in Nylon per Mil-20693, Diallyl Phthalate per Mil-M-14F, Type SDG. N denotes Nylon; DAP denotes Diallyl Phthalate.

Mfg. Type	For Case	No. of Leads	Size Inches OD	Max. Thick.
7717-16	TO-18	4	.200	.020
7717-18	TO-18	3 or 4	.200	.060
7717-46	TO-18	4	.200	.060
7717-81	TO-18	6	.290	.125
7717-123	TO-18	4	.340	.120
7717-3	TO-5	3 or 4	.344	.075
7717-4	TO-5	4	.375	.075
7717-5	TO-5	3 or 4	.350	.125
7717-15	TO-5	3 or 4	.350	.020
7717-22	TO-5	3 or 4	.350	.125
7717-79	TO-5	3	.355	.038
7717-8	I/C	8 Lead TO5	.375	.075
7717-10	I/C	10 Lead TO5	.375	.075
7717-12	I/C	12 Lead TO5	.375	.075

SEMICONDUCTOR LEAD CONVERSION PADS

Mfr's No. 7717-	Converts Lead Spacing From	To	No. of Leads	Size Inches OD	Max. Thick.
7717-7	TO-18	TO-5	3 or 4	.250	.125
7717-26	TO-18	TO-5	3	.343	.120
7717-43	TO-18	TO-5	3 or 4	.275	.050
7717-44	TO-18	TO-5	3 or 4	.305	.125
7717-93	TO-18	.150 Circle	3 or 4	.195	.065
7717-106	Dual To-5	.050 Grid	6	.450	.160
7717-2	.100 Circle	.200 Circle	2	.305	.125
7717-19	.200 Circle	.400 Circle	8	.500	.275
7717-20	.200 Circle	.400 Circle	12	.500	.275
7717-21	.200 Circle	.400 Circle	10	.500	.275
7717-119	.200 Circle	.400 Circle	10	.500	.275
7717-120	.200 Circle	.400 Circle	8	.500	.275

CARD GUIDES

Precision circuit board card guides made from nylon per MIL-M-20693 snap into place with snap rivets or rods to provide easy spacing and flexibility in assembling Therma-Pak modules. Available in a variety of stock sizes or manufactured to specification.

Mfr's Type	Fig.	Fits System Number	Inches L	W	H
5005-01	DD	5005-102 5005-121	2.651	.375	.262
5005-02	DD	5005-106 5005-125	4.151	.375	.262
5005-03	DD	5005-110 5005-129	5.651	.375	.262
5005-04	DD	5005-114 5005-133	6.651	.375	.262
8701	CC		6.250	.670	.360
8702	CC		6.250	.670	.580
8825-2	BB		2.00	.230	.210
8825-3	BB		3.50	.230	.210
8825-5	BB		5.00	.230	.210
8828-3	EE		3.50	.230	.210
5008-08 card ejector	Not Shown				
5005-09 card puller	Not Shown				

CUSTOM HEAT SINKS® Let Thermalloy's wide experience help you in your custom heat sink requirements. Thermalloy will evaluate your thermal and mechanical requirements and custom engineer a product to meet your special needs. Our model shop specializes in meeting your prototype needs fast. Thermalloy's specialized production equipment designed for these products — results in high quality at a price normally below the cost of in-house fabrications. Contact Thermalloy for a no-obligation estimate.

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313-358-2020
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315-454-0761
317-359-5374
319-366-1591
404-451-3529
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312-421-6800
313-272-4200
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315-437-2641
404-355-2223
412-782-2684
412-361-7881
414-964-4321
415-321-5373
416-742-6871
513-298-0191
514-384-1420
516-221-1441
516-249-7262
602-944-1551
604-253-6396
607-723-6326
609-662-9337
612-332-1325
614-866-3493
614-299-4161
617-969-6100
617-329-2400
617-787-1200
704-372-3630
713-224-9131
714-278-7400
716-633-9110
716-884-3450
717-843-7881
801-363-5821
815-963-6445
915-566-2936
918-437-4555

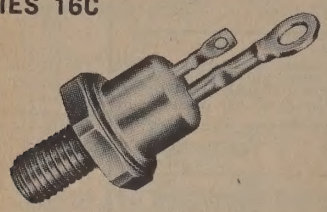
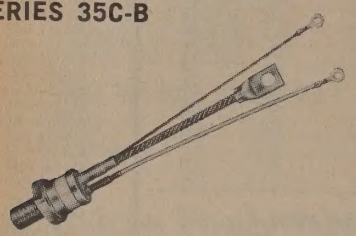
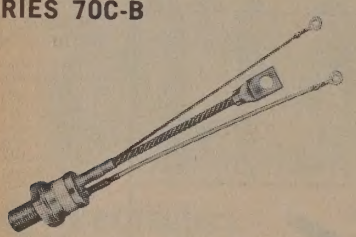
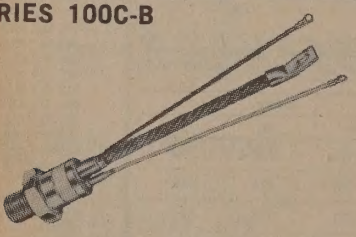
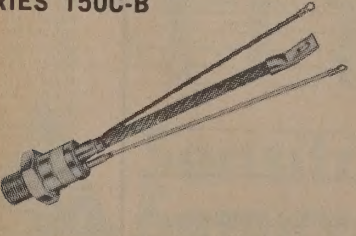
SYNTRON

SILICON CONTROLL

SOLID STATE AC AND DC POWER CONTROL. Syntron Silicon Controlled Rectifiers are diffused, three junction, semiconductor units designed for use in medium and high power solid state control applications.

The Silicon Controlled Rectifiers shown on these pages are available in the popular standard JEDEC configurations from 25 amp rms to 235 amp rm with ratings to 1200 PRV repetitive, 1300 PRV transi t.

The Syntron Silicon Controlled Rectifier is a ectif device which exhibits the same reverse voltage valar characteristics found in all Syntron silicon d des. forward direction shows high resistance in the f sta capable of blocking forward voltages. With a ry s

	Catalog Numbers	PEAK VOLTAGE Forward & Reverse		ELECTRICAL CHARACTERISTICS
		Recurrent	Transient*	
SERIES 16C 	16C025 16C050 16C10 16C15 16C20 16C25 16C30 16C35 16C40 16C45 16C50 16C60 16C70 16C80	25 50 100 150 200 250 300 350 400 450 500 600 700 800	50 75 150 225 300 350 400 450 500 550 600 700 800 900	It avg — Average Forward Current ..... 16 A Vtm — Maximum Peak Forward Voltage Drop at °C, a 50 A. Peak, 180° Conduction Angle ..... 2.0 V Itsm — Maximum Peak One Cycle Surge Curren 150 A Idm — Maximum Forward Leakage Current at 12 C., Through 300 V. ..... 10 M Peak 350 V. Through 1000 V. ..... 5 M Peak t off — Typical Off Time at 125°C ..... µSec dv/dt — Minimum Critical Exponential Rate of R of Forward Blocking Voltage ..... 25 µSec Vgt — Typical Gate Voltage to Trigger at 25°C. .. 0.9 V Igt — Typical Gate Current to Trigger at 25°C. . 9 MA Vgm — Maximum Peak Vate Voltage (Forward) .. 0.0 V Maximum Peak Gate Voltage (Reverse) .. 5.0 V
SERIES 35C-B 	35C025B 35C050B 35C10B 35C15B 35C20B 35C25B 35C30B 35C40B 35C50B 35C60B 35C70B 35C80B 35C90B 35C100B 35C110B 35C120B	25 50 100 150 200 250 300 400 500 600 700 800 900 1000 1100 1200	50 75 150 225 300 350 400 500 600 700 800 900 1000 1100 1200 1300	It avg — Average Forward Current ..... 35 A Vtm — Maximum Peak Forward Voltage Drop at 2 C., a 220 A. Peak, 180° Conduction Angle ..... 1.5 V Itsm — Maximum Peak One Cycle Surge Current. 00 A Idm — Maximum Forward Leakage Current at 125 and Recurrent Peak Voltage ..... MA t off — Typical Off Time at 125°C. ..... 4 Sec. dv/dt — Minimum Critical Exponential Rate of Ris of Forward Blocking Voltage ..... 100 V Sec. Vgt — Typical Gate Voltage to Trigger at 25°C. .. .5 V Igt — Typical Gate Current to Trigger at 25°C. ..1 MA Vgm — Maximum Peak Vate Voltage (Forward) .... 0 V Maximum Peak Gate Voltage (Reverse) .... 0 V
SERIES 70C-B 	70C025B 70C050B 70C10B 70C15B 70C20B 70C25B 70C30B 70C40B 70C50B 70C60B 70C70B 70C80B 70C90B 70C100B 70C110B 70C120B	25 50 100 150 200 250 300 400 500 600 700 800 900 1000 1100 1200	50 75 150 225 300 350 400 500 600 700 800 900 1000 1100 1200 1300	It avg — Average Forward Current ..... 0 A Vtm — Maximum Peak Forward Voltage Drop at 25 , a 220 A. Peak, 180° Conduction Angle ..... 5 V Itsm — Maximum Peak One Cycle Surge Current..1 0 A Idm — Maximum Forward Leakage Current at 125° and Recurrent Peak Voltage ..... MA t off — Typical Off Time at 125°C. ..... 40 ec. dv/dt — Minimum Critical Exponential Rate of Rise Forward Blocking Voltage ..... 100 V./ ec. Vgt — Typical Gate Voltage to Trigger at 25°C..... V. Igt — Typical Gate Current to Trigger at 25°C. ....7 MA Vgm — Maximum Peak Vate Voltage (Forward) ....1 V Maximum Peak Gate Voltage (Reverse) .... V.
SERIES 100C-B 	100C025B 100C050B 100C10B 100C15B 100C20B 100C25B 100C30B 100C40B 100C50B 100C60B 100C70B 100C80B 100C90B 100C100B 100C110B 100C120B	25 50 100 150 200 250 300 400 500 600 700 800 900 1000 1100 1200	50 75 150 225 300 350 400 500 600 700 800 900 1000 1100 1200 1300	It avg — Average Forward Current ..... 1 A Vtm — Maximum Peak Forward Voltage Drop at 25° a 500 A. Peak, 180° Conduction Angle ..... V. Itsm — Maximum Peak One Cycle Surge Current..20 A. Idm — Maximum Forward Leakage Current at 125°C. and Recurrent Peak Voltage ..... 25 A. t off — Typical Off Time at 125°C. ..... 40 µ dv/dt — Minimum Critical Exponential Rate of Rise Forward Blocking Voltage ..... 100 V./µ Vgt — Typical Gate Voltage to Trigger at 25°C. ....2 V. Igt — Typical Gate Current to Trigger at 25°C. ..100 Vgm — Maximum Peak Vate Voltage (Forward) ....10. Maximum Peak Gate Voltage (Reverse) .... 5.
SERIES 150C-B 	150C025B 150C050B 150C10B 150C15B 150C20B 150C25B 150C30B 150C40B 150C50B 150C60B 150C70B 150C80B 150C90B 150C100B 150C110B 150C120B	25 50 100 150 200 250 300 400 500 600 700 800 900 1000 1100 1200	50 75 150 225 300 350 400 500 600 700 800 900 1000 1100 1200 1300	It avg — Average Forward Current ..... 15 . Vtm — Maximum Peak Forward Voltage Drop at 25°C. t 500 A. Peak, 180° Conduction Angle ..... 1. . Itsm — Maximum Peak One Cycle Surge Current..300 Idm — Maximum Forward Leakage Current at 125°C., and Recurrent Peak Voltage ..... 25 M t off — Typical Off Time at 125°C. ..... 40 µS dv/dt — Minimum Critical Exponential Rate of Rise of Forward Blocking Voltage ..... 100 V./µS Vgt — Typical Gate Voltage to Trigger at 25°C.....2.0 Igt — Typical Gate Current to Trigger at 25°C. ..100 M Vgm — Maximum Peak Vate Voltage (Forward) ....10.0 Maximum Peak Gate Voltage (Reverse) 5.0

* Maximum non-recurrent.

SYNTRON DIVISION, FMC CORPORATION • 264 Lexington, Homer City, Pa. 15

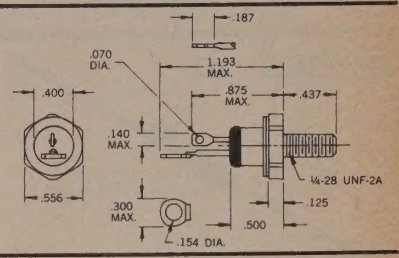
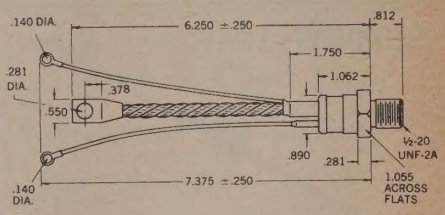
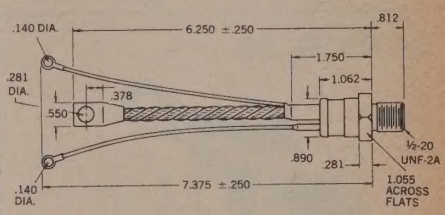
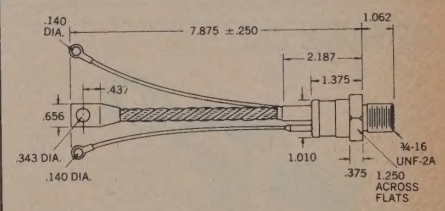
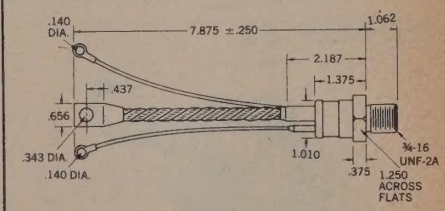
RECTIFIER DATA

SYNTRON DIVISION
FMC Corporation
264 Lexington
Homer City, Pa. 15748
Cable Address: SYNTRON, HOMER CITY

ue of ltage and current applied to the gate, the forward rection changes to a very low resistance allowing high rents to be conducted. This change, termed "turn on," is a t switching function occurring in only a few microseconds.

In a single element application, this device can be used for rect conversion and continuous control of AC to DC power requirements or it can be used as a DC switch to initiate current flow. For AC power control, two silicon controlled rectifiers are required in an inverse parallel connection.

Syntron's rigid quality control, developed through strict avalanche diode requirements and more than 5 years field testing, have yielded the most reliable silicon controlled rectifiers available for solid state power control.

MECHANICAL CHARACTERISTICS	THERMAL CHARACTERISTICS	DIMENSIONS
Base...Hi Strength, Nickel Plated Copper with ¼-28 UNF 2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header.....Glass to metal construction, hermetically sealed to base. Weight.....Approximately .385 ounces. Mounting Torque.....30 in. lbs. maximum	θ J-C — Maximum Thermal Resistance, Junction to Case (DC)....1.7°C./W. Tj — Operating Junction Temperature 125°C. Tstg — Storage Temperature −65°C. to 150°C.	
Base...Hi Strength, Nickel Plated Copper with ½-20 UNF 2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header.....Ceramic to metal construction, hermetically sealed to base. Weight.....Approximately 3.6 ounces (lead type); 3.24 ounces (flag type). Mounting Torque.....150 in. lbs. maximum Note: All Series 35 Silicon Controlled Rectifiers are available with either a lead terminal or flag terminal. When ordering a flag terminal device, add the suffix "F" to the catalog number.	θ J-C — Maximum Thermal Resistance, junction to Case (DC)..0.32°C./W. Tj — Operating Junction Temperature 125°C. Tstg — Storage Temperature −40°C. to 150°C.	
Base...Hi Strength, Nickel Plated Copper with ½-20 UNF 2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header.....Ceramic to metal construction, hermetically sealed to base. Weight.....Approximately 3.6 ounces (lead type); 3.24 ounces (flag type). Mounting Torque.....150 in. lbs. maximum Note: All Series 70 Silicon Controlled Rectifiers are available with either a lead terminal or flag terminal. When ordering a flag terminal device, add the suffix "F" to the catalog number.	θ J-C — Maximum Thermal Resistance, junction to Case (DC)..0.28°C./W. Tj — Operating Junction Temperature 125°C. Tstg — Storage Temperature −40°C. to 150°C.	
Base.....Hi Strength, Nickel Plated Copper with ¾-16 UNF 2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header.....Ceramic to metal construction, hermetically sealed to base. Weight.....Approximately 7.44 ounces. Mounting Torque.....300 in. lbs. maximum	θ J-C — Maximum Thermal Resistance, junction to Case (DC)....0.2°C./W. Tj — Operating Junction Temperature 125°C. Tstg — Storage Temperature −40°C. to 150°C.	
Base.....Hi Strength, Nickel Plated Copper with ¾-16 UNF 2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header.....Ceramic to metal construction, hermetically sealed to base. Weight.....Approximately 7.44 ounces. Mounting Torque.....300 in. lbs. maximum	θ J-C — Maximum Thermal Resistance, junction to Case (DC)....0.2°C./W. Tj — Operating Junction Temperature 125°C. Tstg — Storage Temperature −40°C. to 150°C.	

SYNTRON

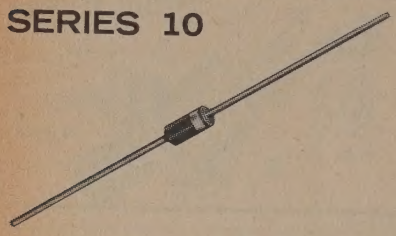
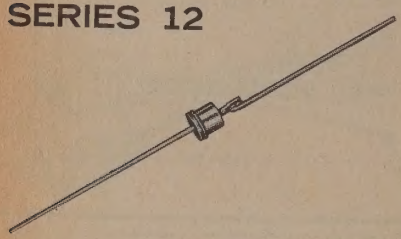
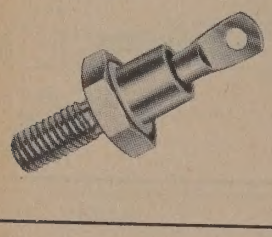
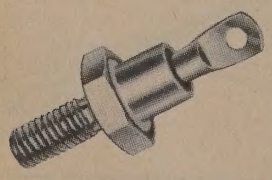
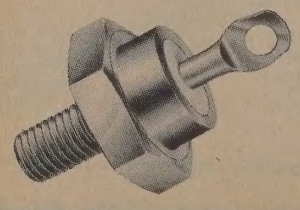
AVALANCHE SILICO

Inherent protection against voltage transients. All Syntron silicon diodes are manufactured using a unique diffusion process that takes full advantage of the avalanche characteristics inherent in silicon.

The avalanche characteristics provide built-in protection against voltage transients by limiting the voltage across the rectifying junction. This reduces the electrical stress which normally results in the surface breakdown pical non-avalanche diodes.

The diodes are manufactured in either standard (reve polarity with a rated peak reverse voltage range 50 1600 volts. The current rating is determined by the mbi condition in which the diode operates. **All Syntron Allanc**

RATINGS

	Catalog Number Standard Polarity	Catalog Number Reverse Polarity	Peak Reverse Voltage*	ELECTRICAL CHARACTERISTICS
SERIES 10 	S1010 S1020 S1030 S1040 S1050 S1060 S1070 S1080 S1090 S10100 S10110 S10120		100 200 300 400 500 600 700 800 900 1000 1100 1200	Maximum Allowable DC Output Current: at 25°C Ambient Temperature ..... 1 Amp at 100°C Ambient Temperature ..... MA at 150°C Ambient Temperature ..... MA Maximum Allowable One Cycle Surge Current: (60 CPS Single Phase Non-Recurrent at Rated PRV and No Load) ..... 6 mps At Rated Load ..... 3 mps Maximum Full Load Forward Voltage Drop: (150°C Full Cycle Average) ..... olts Maximum Reverse Current at Rated PRV: (25°C Full Cycle Average) ..... μA (150°C Full Cycle Average) ..... MA Maximum Operating Frequency ..... KC
SERIES 12 	S1210 S1220 S1230 S1240 S1250 S1260 S1270 S1280 S1290 S12100 S12110 S12120 S12130 S12140 S12150		100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500	Maximum Average Forward Current, Single Phase H Wave DC Rating at 120°C. Case Temp. .... 1.6 am res Maximum Surge Current (one cycle of 60 CPS sine wave) ..... 35 am res Maximum Forward Voltage at 1.0 Amps (25°C. Case Temp.) .... 1.0 Volts Maxi m Rated Peak Reverse Voltage Range ..... 100 to 1500 lts Maximum *FCA Reverse Current at 100°C. Case Temperature ..... 100 micro am es Maximum Operating Frequency ..... 100,00 PS Maximum I^2t (less than 8 ms) ..... 5.0 Amp.² - Se nd Reverse Power Rating ..... 0.05 J es *FCA = Full Cycle Average (measured with a DC me)
SERIES 20 	S2005 S2010 S2015 S2020 S2025 S2030 S2035 S2040 S2045 S2050 S2060 S2070 S2080 S2090 S20100	R2005 R2010 R2015 R2020 R2025 R2030 R2035 R2040 R2045 R2050 R2060 R2070 R2080 R2090 R20100	50 100 150 200 250 300 350 400 450 500 600 700 800 900 1000	Maximum Average Forward Current, Single Phase Ha Wave DC Rating at 120°C. Case Temp. .... 16 amp s Maximum Surge Current (one cycle of 60 CPS sine wave) ..... 200 amp s Peak Forward Voltage at 30 Amps (25°C. Case Temp.) .... 1.3 Volts Maxi m Rated Peak Reverse Voltage Range ..... 50 to 1600 V s Maximum *FCA Reverse Current at 150°C. Case Temperature ..... 1.0 Milli a s Maximum Operating Frequency ..... 100,000 S Maximum I^2t (less than 8 ms) ..... 165 Amps² - Sec d Reverse Power Rating ..... 0.16 Jo s *FCA = Full Cycle Average (measured with a DC mete
SERIES 21 	S2105 S2110 S2115 S2120 S2125 S2130 S2135 S2140 S2145 S2150 S2160 S2170 S2180 S2190 S21100	R2105 R2110 R2115 R2120 R2125 R2130 R2135 R2140 R2145 R2150 R2160 R2170 R2180 R2190 R21100	50 100 150 200 250 300 350 400 450 500 600 700 800 900 1000	Maximum Average Forward Current, Single Phase Half Wave DC Rating at 120°C. Case Temp. .... 22 ampe Maximum Surge Current (one cycle of 60 CPS sine wave) ..... 200 ampe Peak Forward Voltage at 30 Amps (25°C. Case Temp.) .... 1.3 Volts Maxim Rated Peak Reverse Voltage Range ..... 50 to 1600 Vo Maximum *FCA Reverse Current at 150°C. Case Temperature ..... 1.0 Milliam Maximum Operating Frequency ..... 100,000 C Maximum I^2t (less than 8 ms) ..... 165 Amps² - Seco Reverse Power Rating ..... 0.16 Joul *FCA = Full Cycle Average (measured with a DC meter
SERIES 31 	S3105 S3110 S3115 S3120 S3125 S3130 S3135 S3140 S3145 S3150 S3160 S3170 S3180 S3190 S31100	R3105 R3110 R3115 R3120 R3125 R3130 R3135 R3140 R3145 R3150 R3160 R3170 R3180 R3190 R31100	50 100 150 200 250 300 350 400 450 500 600 700 800 900 1000	Maximum Average Forward Current, Single Phase Half Wave DC Rating at 120°C. Case Temp. .... 30 ampere Maximum Surge Current (one cycle of 60 CPS sine wave) ..... 200 ampere Peak Forward Voltage at 30 Amps (25°C. Case Temp.) .... 1.3 Volts Maximur Rated Peak Reverse Voltage Range ..... 50 to 1600 Volt Maximum *FCA Reverse Current at 150°C. Case Temperature ..... 1.0 Milliamp Maximum Operating Frequency ..... 100,000 CP Maximum I^2t (less than 8 ms) ..... 165 Amps² - Second Reverse Power Rating ..... 0.60 Joules *FCA = Full Cycle Average (measured with a DC meter)

*Diodes available with voltage ratings to 1600 PRV, except for Series 10 and 12 as lis

See YELLOW SECTION for Local Offices, Phones

OWER RECTIFIERS

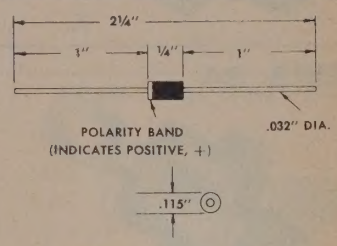
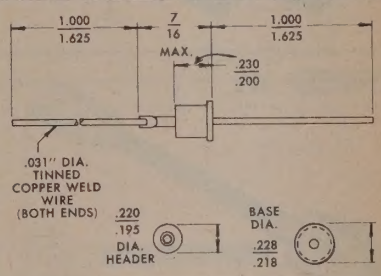
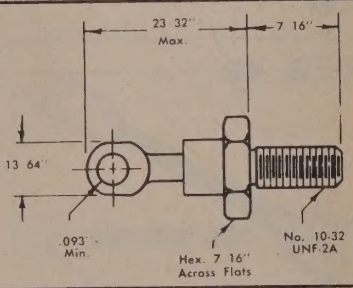
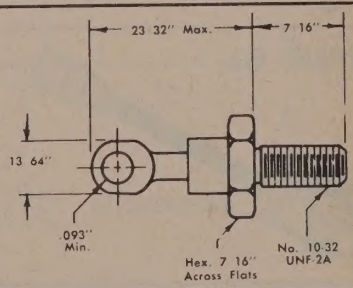
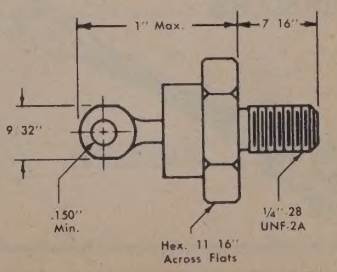
SYNTRON DIVISION
FMC Corporation
264 Lexington
Homer City, Pa. 15748
Cable Address: SYNTRON, HOMER CITY

on rectifiers will meet JEDEC specifications, yet all es that comply with the JEDEC specifications do not ssarily meet the capabilities of the Syntron Avalanche fiers.

e curves submitted include reverse power capabilities, al sine phase and three phase current ratings as as the over-all surge current capabilities of the diodes.

If the transient peak power exceeds the reverse power capabilities level, additional protection is required.

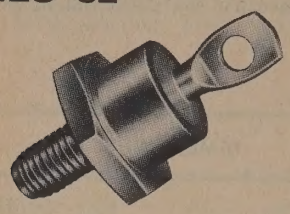
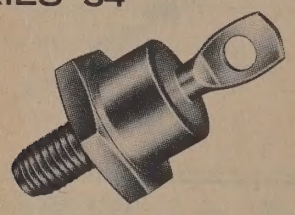
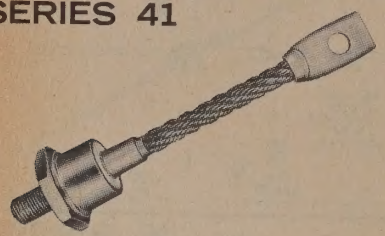
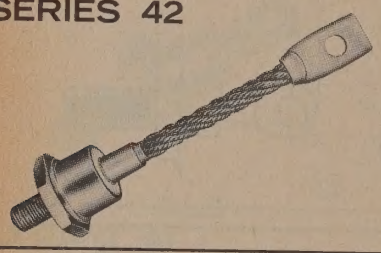
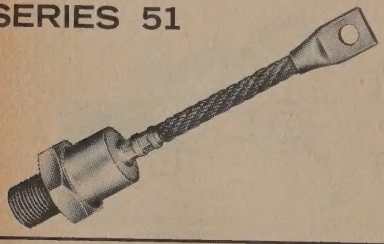
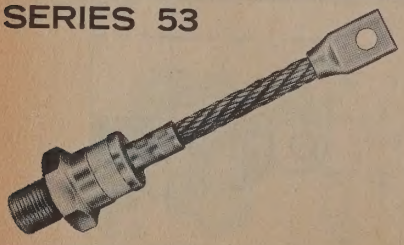
The quality is built in these devices and is controlled by rigid test procedures applied to each device before shipment. These test procedures are applied to the diode at a level that will insure its meeting the particular application for which it is intended.

MECHANICAL CHARACTERISTICS	THERMAL CHARACTERISTICS	DIMENSIONS
onstruction: Epoxy Body; Silver Leads. Mounting Position — Any	Storage Temperature: −65°C to +185°C Ambient Operating Temperature: −65°C to +175°C	
Case — Hermetically sealed with axial leads. Weight - Approximately 1.0 gram. Mounting position — Any.	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 5.0 Maximum	
Base - Steel stud and base with a #10-32 UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 0.16 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 30 inch pounds maximum Dimensions .. In accordance with JEDEC DO-4 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 3.0 Maximum	
Base - Steel stud and base with a #10-32 UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 0.16 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 30 inch pounds maximum Dimensions .. In accordance with JEDEC DO-4 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 3.0 Maximum	
Base - Steel stud and base with a ¼"-28 UNF-2A thread for through mounting on a heat sink. Nickel plating of base produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 0.5 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 75 inch pounds maximum Dimensions .. In accordance with JEDEC DO-5 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 3.0 Maximum	

SYNTRON

AVALANCHE SILICO

RATINGS

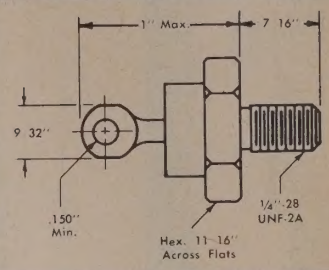
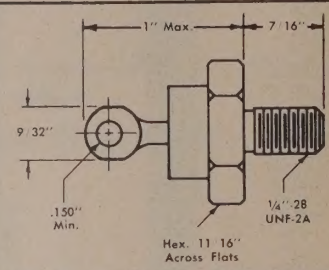
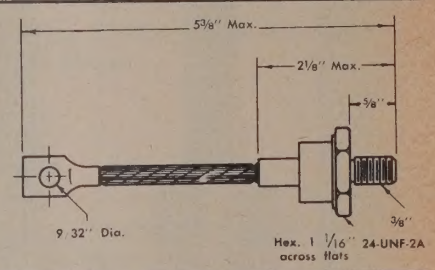
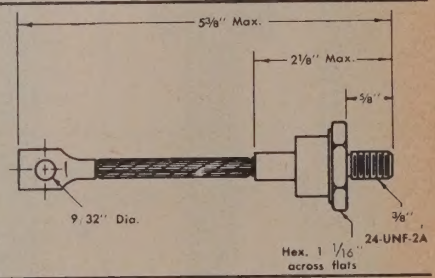
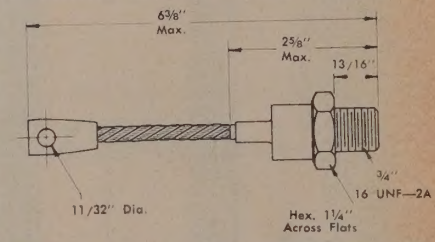
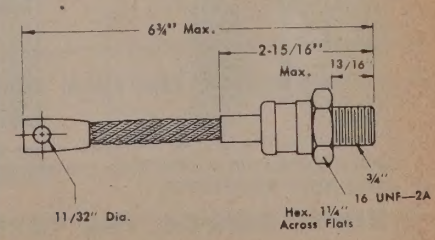
	Catalog Number Standard Polarity	Catalog Number Reverse Polarity	Peak Reverse Voltage *	ELECTRICAL CHARACTERISTIC
SERIES 32 	S3205	R3205	50	Maximum Average Forward Current, Single Phase Hf Wave DC Rating at 120°C. Case Temp. .... 37 a eres
	S3210	R3210	100	Maximum Surge Current
	S3215	R3215	150	(one cycle of 60 CPS sine wave) ..... 600 a eres
	S3220	R3220	200	Peak Forward Voltage
	S3225	R3225	250	at 90 Amps (25°C. Case Temp.) .... 1.3 Volts M mum
	S3230	R3230	300	Rated Peak Reverse Voltage Range ..... 50 to 160 olts
	S3235	R3235	350	Maximum *FCA Reverse Current
	S3240	R3240	400	at 150°C. Case Temperature ..... 2.0 Mi mps
	S3245	R3245	450	Maximum Operating Frequency ..... 10,0 CPS
	S3250	R3250	500	Maximum I²t (less than 8 ms) ..... 1500 Amps² - Sond
	S3260	R3260	600	Reverse Power Rating ..... 0.60 ules
	S3270	R3270	700	*FCA = Full Cycle Average (measured with a DC m er)
	S3280	R3280	800	
	S3290	R3290	900	
	S32100	R32100	1000	
SERIES 34 	S3405	R3405	50	Maximum Average Forward Current, Single Phase H Wave DC Rating at 120°C. Case Temp. .... 50 a eres
	S3410	R3410	100	Maximum Surge Current
	S3415	R3415	150	(one cycle of 60 CPS sine wave) ..... 600 a eres
	S3420	R3420	200	Peak Forward Voltage
	S3425	R3425	250	at 90 Amps (25°C. Case Temp.) .... 1.3 Volts Ma um
	S3430	R3430	300	Rated Peak Reverse Voltage Range ..... 50 to 1600 olts
	S3435	R3435	350	Maximum *FCA Reverse Current
	S3440	R3440	400	at 150°C. Case Temperature ..... 2.0 Mil mps
	S3445	R3445	450	Maximum Operating Frequency ..... 10,0 CPS
	S3450	R3450	500	Maximum I²t (less than 8 ms) ..... 1500 Amps² - Sond
	S3460	R3460	600	Reverse Power Rating ..... 0.60 les
	S3470	R3470	700	*FCA = Full Cycle Average (measured with a DC m r)
	S3480	R3480	800	
	S3490	R3490	900	
	S34100	R34100	1000	
SERIES 41 	S4105	R4105	50	Maximum Average Forward Current, Single Phase Ha Wave DC Rating at 120°C. Case Temp. .... 104 am es
	S4110	R4110	100	Maximum Surge Current
	S4115	R4115	150	(one cycle of 60 CPS sine wave) ..... 1500 am es
	S4120	R4120	200	Peak Forward Voltage
	S4125	R4125	250	at 200 Amps (25°C. Case Temp.) .. 1.3 Volts Max m
	S4130	R4130	300	Rated Peak Reverse Voltage Range ..... 50 to 1600 ts
	S4135	R4135	350	Maximum *FCA Reverse Current
	S4140	R4140	400	at 150°C. Case Temperature ..... 5.0 Milli ps
	S4145	R4145	450	Maximum Operating Frequency ..... 7,500 PS
	S4150	R4150	500	Maximum I²t (less than 8 ms) ..... 9000 Amps² - Se d
	S4160	R4160	600	Reverse Power Rating ..... 1.0 Jules
	S4170	R4170	700	*FCA = Full Cycle Average (measured with a DC me
	S4180	R4180	800	
	S4190	R4190	900	
	S41100	R41100	1000	
SERIES 42 	S4205	R4205	50	Maximum Average Forward Current, Single Phase Hal Wave DC Rating at 120°C. Case Temp. .... 104 amp s
	S4210	R4210	100	Maximum Surge Current
	S4215	R4215	150	(one cycle of 60 CPS sine wave) ..... 1500 amp s
	S4220	R4220	200	Peak Forward Voltage
	S4225	R4225	250	at 200 Amps (25°C. Case Temp.) .. 1.3 Volts Maxi n
	S4230	R4230	300	Rated Peak Reverse Voltage Range ..... 50 to 1600 V s
	S4235	R4235	350	Maximum *FCA Reverse Current
	S4240	R4240	400	at 150°C. Case Temperature ..... 5.0 Milli s
	S4245	R4245	450	Maximum Operating Frequency ..... 7,500 S
	S4250	R4250	500	Maximum I²t (less than 8 ms) ..... 9000 Amps² - Sec d
	S4260	R4260	600	Reverse Power Rating ..... 1.0 Jo s
	S4270	R4270	700	*FCA = Full Cycle Average (measured with a DC mete
	S4280	R4280	800	
	S4290	R4290	900	
	S42100	R42100	1000	
SERIES 51 	S5105	R5105	50	Maximum Average Forward Current, Single Phase Half Wave DC Rating at 120°C. Case Temp. .... 160 ampe
	S5110	R5110	100	Maximum Surge Current
	S5115	R5115	150	(one cycle of 60 CPS sine wave) ..... 2,200 ampe
	S5120	R5120	200	Peak Forward Voltage
	S5125	R5125	250	at 300 Amps (25°C. Case Temp.) .. 1.3 Volts Maxim
	S5130	R5130	300	Rated Peak Reverse Voltage Range ..... 50 to 1600 Vo
	S5135	R5135	350	Maximum *FCA Reverse Current
	S5140	R5140	400	at 150°C. Case Temperature ..... 10 Millian
	S5150	R5150	500	Maximum I²t (less than 8 ms) ..... 20,000 Amps² - Seco
	S5160	R5160	600	Reverse Power Rating ..... 2.0 Jou
	S5170	R5170	700	*FCA = Full Cycle Average (measured with a DC meter
	S5180	R5180	800	
	S5190	R5190	900	
	S51100	R51100	1000	
SERIES 53 	S5305	R5305	50	Maximum Average Forward Current, Single Phase Half Wave DC Rating at 120°C. Case Temp. .... 250 amper
	S5310	R5310	100	Maximum Surge Current
	S5315	R5315	150	(one cycle of 60 CPS sine wave) ..... 4,500 amper
	S5320	R5320	200	Peak Forward Voltage
	S5325	R5325	250	at 300 Amps (25°C. Case Temp.) .. 1.2 Volts Maximu
	S5330	R5330	300	Rated Peak Reverse Voltage Range ..... 50 to 1600 Vol
	S5335	R5335	350	Maximum *FCA Reverse Current
	S5340	R5340	400	at 150°C. Case Temperature ..... 10 Milliamp
	S5350	R5350	500	Maximum I²t (less than 8 ms) ..... 85,000 Amps² - Secon
	S5360	R5360	600	Reverse Power Rating ..... 2.0 Joule
	S5370	R5370	700	*FCA = Full Cycle Average (measured with a DC meter)
	S5380	R5380	800	
	S5390	R5390	900	
	S53100	R53100	1000	

*Diodes available with voltage ratings to 1600 F

See YELLOW SECTION for Local Offices, Phones

POWER RECTIFIERS

SYNTRON DIVISION
FMC Corporation
264 Lexington
Homer City, Pa. 15748
Cable Address: SYNTRON, HOMER CITY

MECHANICAL CHARACTERISTICS	THERMAL CHARACTERISTICS	DIMENSIONS
Base ... Steel stud and base with a 1/4"-28 UNF-2A thread for through mounting on a heat sink. Nickel plating of base produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 0.5 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 75 inch pounds maximum Dimensions .. In accordance with JEDEC DO-5 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 1.25 Maximum	
Base ... Steel stud and base with a 1/4"-28 UNF-2A thread for through mounting on a heat sink. Nickel plating of base produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 0.5 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 75 inch pounds maximum Dimensions .. In accordance with JEDEC DO-5 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 1.25 Maximum	
Base ... Hi Strength Copper Stud and Base with a 3/8-24-UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 2.75 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 200 inch pounds maximum Dimensions .. In accordance with JEDEC DO-8 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 0.5 Maximum	
Base ... Hi Strength Copper Stud and Base with a 3/8-24-UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Glass to metal construction. Hermetically sealed to base. Weight ..... Approximately 2.75 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 200 inch pounds maximum Dimensions .. In accordance with JEDEC DO-8 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 0.5 Maximum	
Base ... Solid Copper Nickel Plated with 3/4"-16 UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Ceramic header hermetically sealed to base. Weight ..... Approximately 8.5 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 600 inch pounds maximum 300 inch pounds minimum Dimensions .. In accordance with JEDEC DO-9 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 0.3 Maximum	
Base ... Solid Copper Nickel Plated with 3/4"-16 UNF-2A thread for through mounting on a heat sink. Nickel plating produces low contact resistance and prevents corrosion. Header ..... Ceramic header hermetically sealed to base. Weight ..... Approximately 8.5 ounces Mounting Position .. May be mounted in any position Mounting Torque ..... 600 inch pounds maximum 300 inch pounds minimum Dimensions .. In accordance with JEDEC DO-9 Outline	Storage Temperature Range: −65°C. to +200°C. Operating Temperature Range: Junction .....−65°C. to +175°C. Impedance (°C/W), Junction to Case 0.25 Maximum	

SYNTRON

SILICON RECTIFIER DIODE AND SILICON CONTROLLED RECTIFIER CROSS REFERENCE OF JEDEC NUMBERS WITH SYNTRON NUMBER

JEDEC NO.	SYNTRON NO.
1N248	S3105
1N249	S3110
1N250	S3120
1N248 A, B, C	S3205
1N249 A, B, C	S3210
1N250 A, B, C	S3220
1N411B	S4105
1N412B	S4110
1N413B	S4120
*1N440, B	S1210
*1N441, B	S1220
*1N442, B	S1230
*1N443, B	S1240
*1N444, B	S1250
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*1N536	S1205
*1N537	S1210
*1N538	S1220
*1N539	S1230
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*1N547	S1260
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*1N1101	S1220
*1N1102	S1230
*1N1103	S1240
1N1124	S2020
1N1125	S2030
1N1126	S2040
1N1127	S2050
1N1128	S2060
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1N1184	S3310, *S3410
1N1185	S3315, *S3415
1N1186	S3320, *S3420
1N1187	S3330, *S3430
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1N1197	S3150
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JEDEC NO.	SYNTRON NO.
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JEDEC NO.	SYNTRON NO.
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1N2236	S2050
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1N2430	S4125
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1N2432	S4135
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1N2800	S3140
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1N3141	S4115, S4215
1N3142	S4120, S4220
1N3161	S5305
1N3162	S5310
1N3163	S5315
1N3164	S5320
1N3165	S5325
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1N3169	S5350

JEDEC NO.	SYNTRON NO.
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1N3736	[illegible]
1N3737	[illegible]
1N3738	[illegible]
1N3739	[illegible]
1N3741	[illegible]
1N3740	[illegible]
1N3742	[illegible]
**1N3964	[illegible]
**1N3965	[illegible]
**1N3966	[illegible]
**1N3967	[illegible]
**1N3968	[illegible]
**1N3969	[illegible]
**1N3970	[illegible]
**1N3971	[illegible]
**1N3972	[illegible]
**1N3973	[illegible]
**1N3974	[illegible]
**1N3975	[illegible]
**1N3976	[illegible]
**1N3977	[illegible]
**1N3978	[illegible]
**1N3979	[illegible]
1N4044	[illegible]
1N4045	[illegible]
1N4046	[illegible]
1N4047	[illegible]
1N4048	[illegible]
1N4049	[illegible]
1N4050	[illegible]
1N4051	[illegible]
1N4052	[illegible]
1N4053	[illegible]
1N4054	[illegible]
1N4055	[illegible]
1N4056	[illegible]
**1N4878	S4110, [illegible]
**1N4879	[illegible]
**1N4880	[illegible]
2N685	[illegible]
2N686	[illegible]
2N687	[illegible]
2N688	[illegible]
2N689	[illegible]
2N1846	[illegible]
2N1847	[illegible]
2N1848	[illegible]
2N1849	[illegible]
2N1850	[illegible]
2N1911	[illegible]
2N1912	[illegible]
2N1913	[illegible]
2N1914	[illegible]
2N1915	[illegible]
2N1916	[illegible]
2N2504	[illegible]
2N2505	[illegible]
2N2506	[illegible]
2N2507	[illegible]
2N2508	[illegible]

* Syntron Diodes not mechanically interchangeable with the JEDEC types.
** AVALANCHE REGISTERED.

SYNTRON DIVISION, FMC CORPORATION • 264 Lexington, Homer City, Pa. 15[illegible]

See YELLOW SECTION for Local Offices, Phones

Transitron electronic corporation 168 ALBION STREET, WAKEFIELD, MASSACHUSETTS 01880

GERMANIUM DIODES

Case Style DO-7

Type				
1N34	1N75	1N139	1N310	1N771	T18
1N34A	1N81	1N140	1N312	1N771A	T20
1N36	1N81A	1N144	1N313	1N771B	T21
1N38	1N84	1N145	1N314	1N772	T22
1N38A	1N86	1N175	1N355	1N773	T23
1N38B	1N87	1N191	1N417	1N773A	T26
1N44	1N87A	1N192	1N418	1N774	T27
1N45	1N88	1N198	1N419	1N775	T1G
1N46	1N89	1N198A	1N447	1N776	T2G
1N48	1N90	1N198B	1N448	1N777	T3G
1N49	1N95	1N270	1N449	1N781	T4G
1N50	1N96	JAN/1N270	1N450	1N805	T5G
1N51	1N96A	1N273	1N451	1N911	T6G/1N279
1N52	1N97	1N276	1N452	1N949	T7G/1N270
1N52	1N97A	JAN/1N276	1N453	1N994	T8G
1N54	1N98	1N277	1N454	1N995	T9G
1N54	1N98A	JAN/1N277	1N455	JAN/1N995	T11G/1N273
1N56	1N99	1N278	1N476	1N996	T12G
1N56	1N99A	1N279	1N478	1N3287	T13G
1N57	1N100	2N281	1N479	JAN/1N3287	T14G
1N57	1N100A	1N282	1N497	1N3466	T15G
1N58	1N103	1N283	1N498	1N3467	T16G/1N276
1N58	1N104	1N287	1N499	1N3468	T17G/1N277
1N60	1N107	1N288	1N500	1N3469	T18G/1N278
1N60	1N108	1N289	1N501	1N3470	T19G
1N61	1N111	1N290	1N502	1N3666-1	T20G
1N62	1N112	1N291	1N527	JAN/1N3666-1	T21G
1N62	1N113	1N294	1N571	JAN/1N3666-2	T22G
1N63	1N114	1N294A	1N616	T1/1N139	T23G
1N63	1N115	1N295	1N617	T2/1N140	T24G
1N64	1N116	1N297	1N618	T6/1N144	T25G/1N283
1N64	1N117	1N297A	1N631	T7	T26G
1N65	1N118	1N298	1N632	T9	T27G
1N65	1N118A	1N298A	1N633	T11	
1N66	1N119	1N304	1N634	T12	
1N66	1N120	1N305	1N636	T13	
1N66	1N126	1N306	1N695	T14	
1N66	1N127	1N307	1N695A	T15	
1N70	1N127A	1N308	1N699	T16	
1N70	1N135	1N309	1N770	T17	

Note:
*Also available in mil. version

SILICON DIODES

Case Style DO-7

Type					
1N[illegible]1*	1N488A	1N807	1N875	1N925	1N5317
1N[illegible]2	1N625	1N811	1N876	1N926	1N5318
1N[illegible]2	1N626	1N812	1N877	1N927	1N5319
1N[illegible]4	1N627	1N813	1N878	1N928	SG22
1N[illegible]6	1N628	1N814	1N879	1N948	SG211
1N[illegible]6A	1N629	1N815	1N880	1N993	SG212
1N[illegible]7*	1N643*	1N816*	1N881	1N3062	SG213
1N[illegible]7A	1N645	1N846	1N882	1N3063	SG215
1N[illegible]8*	1N645*	1N847	1N883	1N3064*	SG216
1N[illegible]8A	1N646	1N848	1N884	1N3065	SG217
1N[illegible]9*	1N647	1N849	1N885	1N3066	SG218
1N[illegible]9A	1N648	1N850	1N886	1N3067	SG221
1N[illegible]61	1N649	1N851	1N887	1N3068	SG222
1N[illegible]61A	1N658*	1N852	1N888	1N3069	SG223
1N[illegible]62	1N659	1N853	1N889	1N3070	SG225
1N[illegible]62A	1N660*	1N854	1N891	1N3071	SG226
1N[illegible]63	1N661*	1N855	1N903	1N3257	SG227
1N[illegible]63A	1N662*	1N856	1N903A	1N3258	SG228
1N[illegible]64	1N663*	1N857	1N904	1N3600*	SG5000
1N[illegible]64A	1N673	1N858	1N904A	1N3604	SG5100
1N[illegible]482	1N676	1N859	1N905	1N3605	SG5200
1N[illegible]482A	1N677	1N860	1N905A	1N3606	SG5250
1N[illegible]482B	1N678	1N861	1N906	1N3653	SG5260
1N[illegible]483	1N679	1N862	1N906A	1N3731	SG5270
1N[illegible]483A	1N681	1N863	1N907	1N4009	SG5300
1N[illegible]483B*	1N682	1N864	1N907A	1N4087	SG5400
1N[illegible]484	1N683	1N865	1N908	1N4092	SG5800
1N[illegible]484A	1N684	1N866	1N908A	1N4148*	SG9200
1N[illegible]484B	1N685	1N867	1N914	1N4454*	SG9210
1N[illegible]485	1N686	1N868	1N914A	1N4531	SG9220
1N[illegible]485A	1N687	1N869	1N914B	1N4532	SG9230
1N[illegible]485B*	1N689	1N870	1N916	1N4533	SG9240
1N[illegible]487	1N696	1N872	1N916A	1N4534	
1N[illegible]487A	1N697	1N873	1N916B	1N4535	
1N[illegible]488	1N806	1N874	1N919	1N4536	

Note:
*Also available in mil. version

SILICON DIODES

Case Style DO-35 Whiskerless

Type
1N4148
1N4149
1N4150
1N4151
1N4152
1N4153
1N4154
1N4305
1N4446
1N4447
1N4448
1N4449
1N4454
1N4606

DIODE ARRAYS

Case Style TO-86 (14 leads)

Type
SDP-1070
SDP-1080
SDP-1090

Case Style 1G-103 (10 lead flat pack)
8 Diode Arrays

Type
SDP1040
SDP1050
SDP1060

Case Style 1G-65C (14 lead flat pack)
16 Diode Arrays

Type
SDP1070
SDP1080
SDP1090

MICRO MINIATURE FAST SWITCHING SILICON DIODES

Case 1G-59

Type
TMD24
TMD25
TMD27

MICRO MINIATURE HIGH CONDUCTANCE DIODES

Type
TMD41
TMD42
TMD45

MICRO MINIATURE SILICON STABISTORS

Type
TMD20
TMD40

NPN SILICON PLANAR POWER TRANSISTORS

Transitron

COLLECTOR TO EMITTER VOLTAGE (VOLTS)	80 to 100 Amp		60 Amp	40 Amp	30 Amp		20 Amp		10 Amp				5 Amp			2 Amp			1 Amp			
	TO-63	TO-114	TO-63	TO-63	TO-3	TO-63	TO-3	TO-63	TO-3	TO-5	TO-59†	TO-61	TO-5	TO-59†	TO-61	TO-5	TO-59†	TO-66	TO-5	TO-46	TO-66	MD-14
60V					ST28136		ST28139	2N3598	2N3713 2N3715 ST28142				2N3418 2N2657 2N3420	2N3745 2N3748 2N3751 2N2877 2N2878			2N3852 2N3853	2N3766		2N3056 2N3057	2N3878 2N3054	
80V	ST14026	2N3149 2N4865	ST14030	ST15043	ST28137	ST17060	ST28140	2N5313‡ 2N3599	2N3714 2N3716 ST28143		ST91057	2N5317*	2N2658 ST91054 2N3419 2N3421	2N3746 2N3749 2N3752 2N3850 2N2879 2N2880 2N3996 2N3997 2N3998 2N3999 ST91085	ST86020 2N1724 2N1725	ST74049	2N2150 2N2151 2N3851 2N2892 ST92006	2N3767	2N2890 2N2891 2N3019 2N3020 2N4000			
100V	ST14027	2N3150 2N5250	ST14031	ST15044		2N4002 ST17061		2N5315‡		2N4150	ST91058	2N4301 2N5319*	ST91055	ST91086	ST86021	ST74050	ST92007		2N3498 2N3499 2N4001			
120V	ST14028	2N4866	ST14032	ST15045		2N4003 ST17062					ST91059		ST91056	ST91087	2N1724A 2N1725A ST86022	ST74051	ST92008	2N4864	ST84027			
150V																			2N3500 2N3501 ST84028			
200V								ST18009				ST18013		ST18017					2N2727 2N2729 ST84029			2N3589 2N3590
300V						2N3846 2N3848		ST18008				ST18012		ST18016								
400V						2N3847 2N3849		ST18007				ST18011		ST18015								

* Isolated † Also available in isolated TO-111 package ‡ TO-61 package

See YELLOW SECTION for Local Offices, Phones

Transitron electronic corporation
168 ALBION STREET, WAKEFIELD, MASSACHUSETTS 01

NPN & PNP COMPLEMENTARY SILICON PLANAR POWER TRANSISTORS

COLLECTOR TO EMITTER VOLTAGE (VOLTS)	60 Amp		40 Amp		30 Amp				20 Amp				10 Amp						5 Amp			
	TO-63		TO-63		TO-3		TO-63		TO-3		TO-61		TO-3		TO-59†		TO-61 ISOLATED		TO-5		TO-59†	
	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
60V					ST28136	ST29046			ST28139	ST29049			2N3713 2N3715	2N3789 2N3791							2N2878	
80V	ST14030	ST40002	ST15043	ST54004	ST28137	ST29047	ST17060	ST10007	ST28140	ST29050	2N5313	2N5312*	2N3714 2N3716	2N3790 2N3792	ST91057	ST76018	2N5317	2N5316	ST91054	ST72039	2N2880 ST91085	ST72036
100V	ST14031	ST40003	ST15044	ST54005			ST17061	ST10008			2N5315	2N5314*			ST91058	ST76019	2N5319	2N5318	ST91055	ST72040	ST91086	ST72037
120V	ST14032	ST40004	ST15045	ST54006			ST17062	ST10009							ST91059	ST76020			ST91056	ST72041	ST91087	ST72038

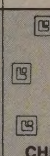
PNP SILICON PLANAR POWER TRANSISTORS

COLLECTOR TO EMITTER VOLTAGE (VOLTS)	60 Amp	40 Amp	30 Amp		20 Amp		10 Amp			5 Amp		3 Amp	2 Amp		1 Amp
	TO-63	TO-63	TO-3	TO-63	TO-3	TO-61	TO-3	TO-59†	TO-61	TO-5	TO-59†	TO-5	TO-5	TO-66	TO-5
60V			ST29046		ST29049		ST29052 2N3789 2N3791				2N2875	2N3719 2N3867 2N3720 2N3868		2N3740 2N4387	2N4235
80V	ST40002	ST54004	ST29047	ST10007	ST29050	2N5312*	2N3790 2N3792 ST29053	ST76018	2N5316*	2N5404 2N5406 ST72039	2N5408* 2N5410* ST72036		ST75004	2N3741 2N4388	2N4236
100V	ST40003	ST54005		ST10008		2N5314*		ST76019	2N5318*	2N5405 2N5407 ST72040	2N5409* 2N5411* ST72037		ST75005		
120V	ST40004	ST54006		ST10009				ST76020		ST72041	ST72038		ST75006		2N3634 (140V) 2N3635 (140V) 2N3636 (175V) 2N3637 (175V)

* Isolated † Also available in isolated TO-111 package

THYRISTORS

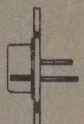
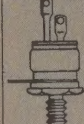
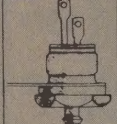
SILICON CONTROLLED RECTIFIERS (SCRs)

CURRENT RATING (RMS)	800 mA	400 mA			1.6 Amp	1.6 Amp	0.4-8 Amp	8.0 Amp		8-25 Amp		16-35 Amp
	TO-92	TO-46	TO-52	TO-18	TO-5	TO-5 ISOLATED	 CHIP	TO-64	TO-66	IG-111	TO-48	IG-1
BLOCKING VOLTAGE (V_{DRM}, V_{RRM})												
15V	RTJ-0201 RTJ-0501	2N3254 2N3257	2N4144	2N876 2N884		2N1869 2N1869A 2N1875						
30V	2N5060 RTJ-0203 RTJ-0503	2N3255 2N3258 RTA-0103	2N4145 2N4332 RTB-0103 RTB-0403	2N877 2N3001 2N885 2N3005 2N948 RTC-0103 2N2679 RTC-0403 2N2683 2N2687	2N2322, 22A (1) 2N2344 (1) 2N3555 2N3559 2N4212 (1)	2N1870 2N1870A* 2N1876 2N1881 2N2009 (1)	RTZ-0103 RTZ-0203 RTZ-0303	2N1770 (1) 2N1770A		RTS-0502 RTS-0602	2N681 (1) 2N1842 (1) 2N1842A	
50V			2N4096	2N4108	2N1595, 95A 2N2323*, 23A* 2N2345 2N4213	2N2010		2N1600 2N1771 2N1771A*	RTR-0105 RTR-0205 RTR-0505	2N5164 RTS-0205 RTS-0505 RTS-0605 RTS-0705	2N682 2N1843 2N1843A	RTU-0105 (A) 2N5768 (2 RTU-0205 (A) RTU-0605 (A) RTU-0705 (A)
60V	2N5061 RTJ-0206 RTJ-0506	2N3256 2N3259 RTA-0106	2N4146 2N4333 RTB-0106 RTB-0406	2N878 2N2688 2N886 2N3002 2N949 2N3006 2N2680 RTC-0106 2N2684 RTC-0406	2N3556 2N3560 RTD-0106 RTD-0406	2N1871 2N1871A* 2N1877 2N1882	RTZ-0106 RTZ-0206 RTZ-0306					
100V	2N5062 RTJ-0210 RTJ-0510	RTA-0110	2N4097 2N4147 2N4334 RTB-0110 RTB-0410	2N879 2N3003 2N887 2N3007 2N950 2N4109 2N2681 RTC-0110 2N2685 RTC-0410 2N2689	2N1596, 96A 2N2324*, 24A* 2N3273 RTD-0110 2N3557 RTD-0410 2N3561 2N4214	2N1872 2N1872A* 2N1878 2N1883 2N2011	RTZ-0110 RTZ-0210 RTZ-0310	2N1601 2N1772 2N1772A* 2N3936 (2)	RTR-0110 RTR-0210 RTR-0510	RTS-0210 RTS-0510 RTS-0610 RTS-0710	2N683 2N1844 2N1844A	RTU-011 (6A) RTU-021 (5A) RTU-061 (5A) RTU-071 (5A)
150V	2N5063 RTJ-0215 RTJ-0515		2N4148 2N4335 RTB-0115 RTB-0415	2N880 2N888	2N2325, 25A 2N2347 2N4215	2N1873 2N1873A 2N1879 2N1884		2N1773 2N1773A			2N684 2N1845 2N1845A	
200V	2N5064 RTJ-0220 RTJ-0520		2N4098 2N4149 2N4336 RTB-0120 RTB-0420	2N881 2N3004 2N889 2N3008 2N951 2N4110 2N2682 RTC-0120 2N2686 RTC-0420 2N2690	2N1597, 97A 2N2326*, 26A* 2N2348 RTD-0120 2N3274 RTD-0420 2N3558 2N3562 2N4216	2N1874 2N1874A* 2N1880 2N1885 2N2012	RTZ-0120 RTZ-0220 RTZ-0320	2N1602 2N1774 2N1774A* 2N3937 (2)	2N3228 (5A) RTR-0120 RTR-0220 RTR-0520	2N5165 RTS-0220 RTS-0520 RTS-0620 RTS-0720	2N685 2N1846 2N1846A	RTU-012 (6A) 2N5169 (A) RTU-022 (5A) RTU-062 (5A) RTU-072 (5A)
300V	RTJ-0230 RTJ-0530		RTB-0130 RTB-0430	RTC-0130 RTC-0430	2N1598, 98A 2N2328, 28A 2N3275 2N4218	2N2013		2N1603 2N1776 2N1776A* 2N3938 (2) 2N4199 (2)	RTR-0130 RTR-0230 RTR-0530	RTS-0230 RTS-0530 RTS-0630	2N687 2N1848 2N1848A	RTU-01 (16A) RTU-02 (25A) RTU-06 (25A) RTU-07 (35A)
400V					2N1599, 99A 2N2329, 29A 2N3276 2N4219 RTD-0140 RTD-0440	2N2014	RTZ-0240 RTZ-0340	2N1604 2N1777 2N1777A* 2N3939 (2) 2N4200 (2)	2N3525 (5A) RTR-0140 RTR-0240 RTR-0540	2N5166 RTS-0240 RTS-0540 RTS-0640 RTS-0740	2N688 2N1849 2N1849A	RTU-01 (16A) 2N5170 (A) RTU-02 (25A) RTU-06 (25A) RTU-07 (35A)
500V								RTN-0150 RTN-0250 2N3940 (2) 2N4201 (2)	RTR-0150 RTR-0250 RTR-0550	RTS-0250 RTS-0550 RTS-0650 RTS-0750	2N689 2N1850 2N1850A	RTU-01 (16A) RTU-02 (25A) RTU-06 (25A) RTU-07 (35A)
600V								RTN-0160 RTN-0260 2N4202 (2)	RTR-0160 RTR-0260 RTR-0560	2N5167 RTS-0260 RTS-0560 RTS-0660 RTS-0760		RTU-01 (16A) 2N5171 (A) RTU-02 (25A) RTU-06 (25A) RTU-07 (35A)

(1) V_{DRM} & V_{RRM} = 25V *JAN AND/OR TX-JAN PARTS AVAILABLE (2) FAST-SWITCHING TYPES (3) HI-REL, 60-400 HZ TYPES

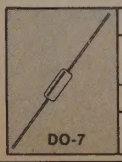
Transitron electronic corporation 168 ALBION STREET, WAKEFIELD, MASSACHUSETTS 01880

THYRISTORS (continued)

BLOCKING VOLTAGE (V_{DRM}, V_{RRM})	GTOs 400 mA	GTOs 0.5-5.0 Amp	PHOTO SCRs 400 mA	TRIACs 1-6 Amp	TRIACs 6.0 Amp	TRIACs 3-10 Amp	TRIACs 10 Amp	TRIACs 15-25 Amp	TRIACs 3-25 Amp	TRIACs 6-25 Amp
	TO-18	TO-5	TO-18	TO-5	TO-64 (3)	 TO-66	 IG-121**	 IG-128**	IG-111	IG-114
15V	2N892 2N893		RTPC-0101 RTPC-0201 RTPC-0301 RTPC-0401 RTPC-0501							
30V	2N764 2N894 2N895 2N4320 2N4326	2N1686 RTGD-0103 RTGD-0203	RTPC-0103 RTPC-0203 RTPC-0303 RTPC-0403 RTPC-0503							
50V				BTD-0105 (1A) BTD-0205 (3A) BTD-0305 (6A)		BTR-0205 (3A) BTR-0305 (6A) BTR-0405 (10A)			BTS-0205 (3A) BTS-0305 (6A) BTS-0405 (10A) BTS-0505 (15A) BTS-0605 (25A)	BTU-0405 (10A) BTV-0405 (10A)** BTU-0505 (15A) BTX-0505 (15A)** BTU-0605 (25A) BTX-0605 (25A)**
60V	2N765 2N896 2N897 2N4321 2N4327	2N1687 RTGD-0106 RTGD-0206	RTPC-0106 RTPC-0206 RTPC-0306 RTPC-0406 RTPC-0506							
100V	2N766 2N898 2N899 2N4322 2N4328	2N1688 RTGD-0110 RTGD-0210	RTPC-0110 RTPC-0210 RTPC-0310 RTPC-0410 RTPC-0510	BTD-0110 (1A) 2N5754 (2.5A) BTD-0210 (3A) BTD-0310 (6A)	BTN-0110 (3)	BTR-0210 (3A) BTR-0310 (6A) BTR-0410 (10A)	BTV-0410	BTX-0510 (15A) BTX-0610 (25A)	BTS-0210 (3A) BTS-0310 (6A) BTS-0410 (10A) BTS-0510 (15A) BTS-0610 (25A)	BTU-0410 (10A) BTV-0410 (10A)** BTU-0510 (15A) BTX-0510 (15A)** BTU-0610 (25A) BTX-0610 (25A)**
150V	2N4323 2N4329		RTPC-0115 RTPC-0215 RTPC-0315 RTPC-0415 RTPC-0515							
200V	2N767 2N900 2N901 2N4324 2N4330	2N1689 RTGD-0120 RTGD-0220	RTPC-0120 RTPC-0220 RTPC-0320 RTPC-0420 RTPC-0520	BTD-0120 (1A) 2N5755 (2.5A) BTD-0220 (3A) BTD-0320 (6A)	BTN-0120 (3)	BTR-0220 (3A) BTR-0320 (6A) BTR-0420 (10A)	BTV-0420	BTX-0520 (15A) BTX-0620 (25A)	BTS-0220 (3A) BTS-0320 (6A) 2N5567 (10A) BTS-0420 (10A) 2N5571 (15A) BTS-0520 (15A) BTS-0620 (25A)	2N5569 2N5573 BTV-0420 (10A) BTU-0520 (15A) BTX-0520 (15A)** BTU-0620 (25A) BTX-0620 (25A)**
300V	RTGC-0130	RTGD-0130 RTGD-0230		BTD-0130 (1A) BTD-0230 (3A) BTD-0330 (6A)		BTR-0230 (3A) BTR-0330 (6A) BTR-0430 (10A)	BTV-0430	BTX-0530 (15A) BTX-0630 (25A)	BTS-0230 (3A) BTS-0330 (6A) BTS-0430 (10A) BTS-0530 (15A) BTS-0630 (25A)	BTU-0430 (10A) BTU-0530 (15A) BTU-0630 (25A)
400V		RTGD-0140 RTGD-0240		BTD-0140 (1A) 2N5756 (2.5A) BTD-0240 (3A) BTD-0340 (6A)	BTN-0140 (3)	BTR-0240 (3A) BTR-0340 (6A) BTR-0440 (10A)	BTV-0440	BTX-0540 (15A) BTX-0640 (25A)	BTS-0240 (3A) BTS-0240 (6A) 2N5568 (10A) BTS-0440 (10A) 2N5572 (15A) BTS-0540 (15A)	2N5570 2N5574 BTV-0440 (10A)** BTU-0540 (15A) BTX-0540 (15A)** BTU-0640 (25A) BTX-0640 (25A)**
500V				BTD-0150 (1A) BTD-0250 (3A) BTD-0350 (6A)		BTR-0250 (3A) BTR-0350 (6A) BTR-0450 (10A)			BTS-0250 (3A) BTS-0350 (6A) BTS-0450 (10A) BTS-0550 (15A) BTS-0650 (25A)	BTU-0450 (10A) BTU-0550 (15A) BTU-0650 (25A)
600V				BTD-0160 (1A) BTD-0260 (3A) BTD-0360 (6A)		BTR-0260 (3A) BTR-0360 (6A) BTR-0460 (10A)	BTV-0460	BTX-0560 (15A) BTX-0660 (25A)	BTS-0260 (3A) BTS-0360 (6A) BTS-0460 (10A) BTS-0560 (15A) BTS-0660 (25A)	BTU-0460 (10A) BTV-0460 (10A)** BTU-0560 (15A) BTX-0560 (15A)** BTU-0660 (25A) BTX-0660 (25A)**

**ISOLATED CASE

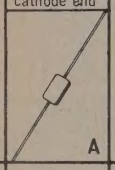
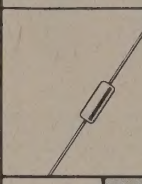
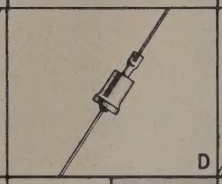
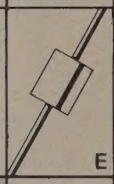
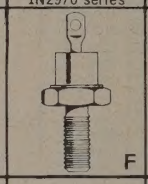
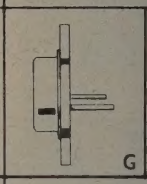
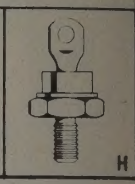
BIDIRECTIONAL TRIGGER DIODE (DIAC)



		$V_{(BO)+}$ & $V_{(BO)-}$			I_{BO}	ΔV @ ΔV		V_{SYM}	P_{AVG}
		MIN VOLTS	TYP VOLTS	MAX VOLTS	MAX μA	MIN VOLTS	MIN MA	MIN VOLTS	PAX mW
		28 TO 36 VOLT DIAC IN DO-7 PACKAGE							
DO-7	ER 900	28	32	36	250	5.0	10	5.0	400

Transitron electronic corporation 168 ALBION STREET, WAKEFIELD, MASSACHUSETTS

ZENER & REFERENCE DIODES

Nominal Zener Voltage	125 MILLIWATT Cathode-red dot on lead nearest cathode end	250 MILLIWATT and 400 MILLIWATT Cathode = Color band		1 WATT Cathode = pointed end	1 WATT Cathode to Case		3 WATT Cathode = polarity mark	10 WATT Cathode to case for 1N3994 series anode to case for 1N2970 series	50 WATT Anode to Case	
	 A	 B		C	 D		 E	 F	 G	 H
	Industrial (Note 1)	Industrial (Notes 1&2)	Meets Mil Std 19500/127 (1N746A–1N759A, 1N4372A) Mil Std 19500/117(1N962B–1N973B)	Industrial (Note 2)	Industrial (Notes 1&2)	Meets Mil Std 19500/115	Industrial (Note 2)	Industrial (Notes 1,2,3)	Industrial (Notes 2,3)	
2.4		1N4370								
2.7		1N4371								
3.0		1N4372	1N4372A							
3.3		1N746	1N746A							
3.6		1N747	1N747A							
3.9		1N748	1N748A							
4.3		1N749	1N749A		1N3824			1N3994		
4.7		1N750	1N750A		1N3825			1N3995		
5.1	TMD 01	1N751	1N751A		1N3826			1N3996		
5.6	TMD 02	1N752	1N752A		1N3827			1N3997		
6.2	TMD 03	1N753	1N753A		1N3828			1N3998		
6.8	TMD 04	1N754	1N754A	EVR6	1N3016	1N3016B	3VR6	1N2970&R	1N2804&R	1N3305&R
7.5	TMD 05	1N755	1N755A	EVR7	1N3017	1N3017B	3VR7	1N2971&R	1N2805&R	1N3306&R
8.2	TMD 06	1N756	1N756A	EVR8	1N3018	1N3018B	3VR8	1N2972&R	1N2806&R	1N3307&R
9.1	TMD 07	1N757	1N757A	EVR9	1N3019	1N3019B	3VR9	1N2973&R	1N2807&R	1N3308&R
10	TMD 08	1N758	1N758A	EVR10	1N3020	1N3020B	3VR10	1N2974&R	1N2808&R	1N3309&R
11	TMD 09	1N962	1N962B	EVR11	1N3021	1N3021B	3VR11	1N2975&R	1N2809&R	1N3310&R
12	TMD 10	1N759	1N759A	EVR12	1N3022	1N3022B	3VR12	1N2976&R	1N2810&R	1N3311&R
13	TMD 11	1N964	1N964B	EVR13	1N3023	1N3023B	3VR13	1N2977&R	1N2811&R	1N3312&R
15	TMD 12	1N965	1N965B	EVR15	1N3024	1N3024B	3VR15	1N2979&R	1N2813&R	1N3314&R
16	TMD 13	1N966	1N966B	EVR16	1N3025	1N3025B	3VR16	1N2980&R	1N2814&R	1N3315&R
18	TMD 14	1N967	1N967B	EVR18	1N3026	1N3026B	3VR18	1N2982&R	1N2816&R	1N3317&R
20	TMD 15	1N968	1N968B	EVR20	1N3027	1N3027B	3VR20	1N2984&R	1N2818&R	1N3319&R
22	TMD 16	1N969	1N969B	EVR22	1N3028	1N3028B	3VR22	1N2985&R	1N2819&R	1N3320&R
24	TMD 17	1N970	1N970B	EVR24	1N3029	1N3029B	3VR24	1N2986&R	1N2820&R	1N3321&R
27	TMD 18	1N971	1N971B	EVR27	1N3030	1N3030B	3VR27	1N2988&R	1N2822&R	1N3323&R
30	TMD 19	1N972	1N972B	EVR30	1N3031	1N3031B	3VR30	1N2989&R	1N2823&R	1N3324&R
33	TMD 20	1N973	1N973B	EVR33	1N3032	1N3032B	3VR33	1N2990&R	1N2824&R	1N3325&R
36	TMD 21			EVR36	1N3033		3VR36	1N2991&R	1N2825&R	1N3326&R
39	TMD 22			EVR39	1N3034		3VR39	1N2992&R	1N2826&R	1N3327&R
43	TMD 23			EVR43	1N3035		3VR43	1N2993&R	1N2827&R	1N3328&R
47				EVR47	1N3036		3VR47	1N2995&R	1N2829&R	1N3330&R
51				EVR51	1N3037		3VR51	1N2997&R	1N2831&R	1N3332&R
56				EVR56	1N3038		3VR56	1N2999&R	1N2832&R	1N3334&R
62				EVR62	1N3039		3VR62	1N3000&R	1N2833&R	1N3335&R
68				EVR68	1N3040		3VR68	1N3001&R	1N2834&R	1N3336&R
75				EVR75	1N3041		3VR75	1N3002&R	1N2835&R	1N3337&R
82				EVR82	1N3042		3VR82	1N3003&R	1N2836&R	1N3338&R
91				EVR91	1N3043		3VR91	1N3004&R	1N2837&R	1N3339&R
100				EVR100	1N3044		3VR100	1N3005&R	1N2838&R	1N3340&R
110				EVR110	1N3045		3VR110	1N3007&R	1N2840&R	1N3342&R
120				EVR120	1N3046		3VR120	1N3008&R	1N2841&R	1N3343&R
130				EVR130	1N3047		3VR130	1N3009&R	1N2842&R	1N3344&R
150				EVR150	1N3048		3VR150	1N3011&R	1N2843&R	1N3346&R
160					1N3049			1N3012&R	1N2844&R	1N3347&R
180					1N3050			1N3014&R	1N2845&R	1N3349&R
200					1N3051			1N3015&R	1N2846&R	1N3350&R

Military types

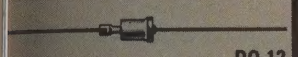
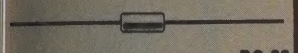
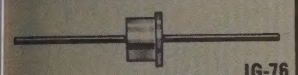
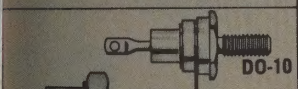
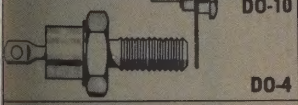
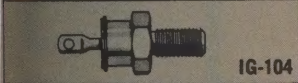
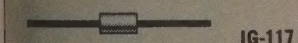
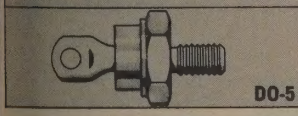
NOTES:

1. No suffix equals 10% tolerance, suffix "A" equals 5% tolerance (TMD01 – TMD23, 1N4370 – 1N4372, 1N746 – 1N759, 1N3824 – 1N3828 and 1N3994 – 1N3998)
2. No suffix equals 20% tolerance, suffix "A" equals 10% tolerance, suffix "B" equals 5% tolerance (1N962 – 1N984, EVR3 – EVR150, 3VR3 – 3VR150, 1N3016 – 1N3051, 1N2970 & R – 1N3015 & R, 1N2804 & R – 1N2846 & R, 1N3305 & R – 1N3350 & R)
3. Suffix "R" equals reverse polarity

Transitron electronic corporation 168 ALBION STREET, WAKEFIELD, MASSACHUSETTS 01880

SILICON RECTIFIERS

0.200 to 60 Amps Ratings

	Average Forward Current (Amps)	Temp. °C*	50V	100V	150V	200V	300V	400V	500V	600V	800V	1000V
 DO-12	.200	150A	1N3072	1N3073	1N3074	1N3075	1N3077	1N3079	1N3080	1N3081		
DO-1	.250	150A	1N536	1N537		1N538†	1N539	1N540†	1N1095	1N547†	1N1108	
DO-27	.750 1.0	25A 25A	ER181	ER182		1N2069 ER183		1N2070 ER184		1N2071 ER185	ER186	ER187
 DO-29	1.0 1.0	75A 25A		SGR100		1N4383		1N4384		1N4385	1N4585	1N4586
IG-133	1.0	75	1N4001	1N4002		1N4003		1N4004		1N4005	1N4006	1N4007
 IG-76	3.0	75A	1N4719	1N4720		1N4721		1N4722		1N4723	1N4724	1N4725
IG-106	3.0	75A	1N4139	1N4140		1N4141		1N4142		1N4143	1N4144	1N4145
 DO-10	5.0	150C	1N1612	1N1613		1N1614		1N1615		1N1616		
 DO-4	12.0	150C	1N1199	1N1200	1N1201	1N1202	1N1203	1N1204	1N1205	1N1206		
 IG-104	12.0	150C	SMB4719	SMB4720		SMB4721						
 IG-117	3.0	50C	ER2000	ER2001		ER2002		ER2003		ER2004	ER2005	ER2006
 DO-5	20.0 35.0 60.0	150C 150C 125C	1N248A 1N1183,A 1N2128A	1N249A 1N1184,A 1N2129A	TR152 1N1185 1N2130A	1N250A 1N1186 1N2131A	TR302 1N1187 1N2133A	TR402 1N1188 1N2135A	TR502 1N1189	TR602 1N1190	TR802	

*Temperature at which forward current rating applies:
"A" indicates ambient temperature rating of a lead mounted rectifier
"C" indicates maximum allowable case or stud temperature at the rated current for stud mounted units.
†Military types

Transitron also manufactures a complete line of silicon rectifier stack assemblies ranging from 0.200 amperes (for half-wave and doubler circuits) to 100 amperes (for three phase bridges). Write for Bulletins.

FAST RECOVERY RECTIFIERS

Average Forward Current (Amps)	Temp. °C*	Pkg.	Recovery Time hs (NSEC)	Peak Rev. Recovery Current (AMPS)	50V	100V	200V	400V
.500	100C	DO-12	200		TKF5	TKF10	TKF20	TKF40
1.0	150C	DO-4	200		TFR105	TFR110	TFR120	TFR140
3.0	150C	DO-4	200		TFR305	TFR310	TFR320	TFR340
6.0	100C	DO-4	200	2	1N3879	1N3880	1N3881	1N3883
6.0	100C	DO-10	200	2	1N3874	1N3875	1N3876	1N3878
12.0	100C	DO-4	200	2	1N3889	1N3890	1N3891	1N3893
12.0	100C	DO-10	200	2	1N3884	1N3885	1N3886	1N3888
20.0	100C	DO-5	200	3	1N3899	1N3900	1N3901	1N3903
30.0	100C	DO-5	200	3	1N3909	1N3910	1N3911	1N3913

CONTROLLED AVALANCHE TYPES

Average Forward Current (Amps)	Temp. °C*	Pkg.	Avalanche Voltage Min.	Avalanche Voltage Max.	Rated PRV (Volts)	Type
1.0	75A	DO-29	250	500	200	SGR200A
1.0	75A	DO-29	475	775	400	SGR400A
1.0	75A	DO-29	675	900	600	SGR600A
1.0	25A	DO-29	875	1200	800	SGR800A
1.0	25A	DO-29	1100	1300	1000	SGR1000A

Note: Use Suffix "C" When Insulated Base Pkg. F is Required In TFR Series.

Transitron also manufactures the following series or their essential equivalents. See selection charts for closest Transitron standard type, or write for details.

SERIES	PACKAGE	PIV RANGE	CURRENT RATING (NOM.)
1N316 thru 1N329A	DO-1	50V to 1000V	200 mA @ 100°C (Amb.)
1N359 thru 1N365A	DO-1	50V to 1000V	100 mA @ 100°C (Amb.)
1N550 thru 1N555	DO-4	100V to 600V	500 mA @ 100°C (Case)
1N562 thru 1N563	DO-4	800V to 1000V	500 mA @ 100°C (Case)
1N1034 thru 1N1044	DO-4	50V to 400V	500 mA @ 150°C (Case)
1N1100 thru 1N1105	DO-1	100V to 600V	250 mA @ 150°C (Amb.)
1N1217 thru 1N1226	DO-1	50V to 800V	250 mA @ 130°C (Amb.)
1N1227 thru 1N1236	DO-4	50V to 800V	250 mA @ 130°C (Case)
1N1434 thru 1N1438	DO-5	50V to 600V	30 Amp @ 25°C (Case)
1N1487 thru 1N1492	DO-1	100V to 600V	750 mA @ 25°C (Amb.)
1N1551 thru 1N1560	DO-4	100V to 500V	250 mA @ 150°C (Amb.)
1N1692 thru 1N1695	DO-1	100V to 400V	250 mA @ 100°C (Amb.)
1N2128 thru 1N2137	DO-5	50V to 500V	35 Amp @ 100°C (Case)
1N2147 thru 1N2153	DO-10	50V to 600V	6 Amp @ 150°C (Case)
1N2154 thru 1N2160	DO-5	50V to 600V	25 Amp @ 150°C (Case)

Mounting and insulating hardware furnished on request at slight additional cost.

Many Transitron stud mounted rectifiers are available in reverse polarity or ceramic base versions on a special basis.

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

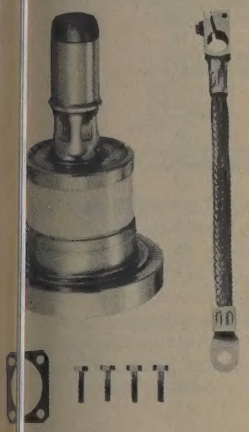
Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

TUNG-SOL® CONTROLLED AVALANCHE SILICON POWER RECTIFIERS

NEW—HIGH VOLTAGE/HIGH CURRENT TYPES

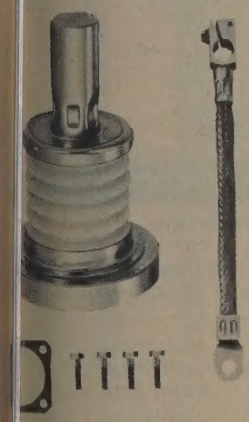
Controlled avalanche characteristic provides transient handling capability that results in increased reliability.



CH-1621 SERIES, 500 AMPERES, FLAT BASE OUTLINE*

* For complete information, write for Bulletin CT-45

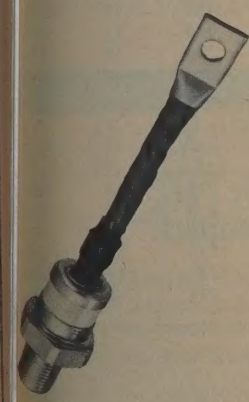
Type	B_{VR} (min.) V	V_{RM} V	V_R V	I_R (av.) mA	I_O @ 120° C (case) A	I_{FM} (surge) A
CH-1621	1100	900	635	15	500	8500
CH-1622	1400	1150	810	15	500	8500
CH-1623	1700	1400	990	15	500	8500
CH-1624	2000	1650	1170	15	500	8500
CH-1625	2300	1900	1340	15	500	8500



CH-1611 SERIES, 370 TO 470 AMPERES, FLAT BASE OUTLINE**

** For complete information, write for Bulletin CT-46

CH-1611	2600	2100	1470	20	470	5200
CH-1612	2900	2300	1600	20	450	5200
CH-1613	3200	2500	1750	20	430	5200
CH-1614	3800	3000	2100	20	410	5200
CH-1615	4400	3500	2450	20	390	5200
CH-1616	5000	4000	2800	20	370	5200



CH-1511 SERIES, 300 TO 420 AMPERES, JEDEC DO-9 OUTLINE*

*** For complete information, write for Bulletin CT-44

CH-1511	1250	1000	700	10	420	6000
CH-1512	1500	1200	840	10	375	5300
CH-1513	1750	1400	980	10	340	4500
CH-1514	2000	1600	1130	10	340	4500
CH-1515	2250	1800	1270	10	320	3500
CH-1516	2500	2000	1400	10	320	3500
CH-1517	3000	2400	1700	10	300	3500
CH-1518	3500	3000	2100	10	300	3500

TUNG-SOL DIVISION/Wagner Electric Corporation
W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

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TUNG-SOL® SILICON POWER RECTIFIERS

Tung-Sol silicon power rectifiers offer distinct advantages over similar competitive types. Exclusive design features combine with Tung-Sol's historically rigid quality control to assure designers unmatched operational reliability. Wide interchangeability permits specification of these outstanding components for most commercial and military applications.

■ All the types shown are available in reverse polarity which may be ordered by the addition of the suffix 'R' to the indicated type number.

LOW CURRENT TYPES JEDEC DO-4 OUTLINE

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1199A	50	12.0	3.0	240
1N1200A	100	12.0	2.5	240
1N1201A	150	12.0	2.25	240
1N1202A	200	12.0	2.0	240
1N1203A	300	12.0	1.75	240
1N1204A	400	12.0	1.5	240
1N1205A	500	12.0	1.25	240
1N1206A	600	12.0	1.0	240
1N3670A	700	12.0	0.9	240
1N3671A	800	12.0	0.8	240
1N3672A	900	12.0	0.7	240
1N3673A	1000	12.0	0.6	240

CONTROLLED AVALANCHE

Type	V_{RM} (wkg) V	I_o @ 135°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N4506	200	12.0	2.5	240
1N4507	400	12.0	2.5	240
1N4508	600	12.0	2.5	240
1N4509	800	12.0	2.0	240
1N4510	1000	12.0	1.75	240
1N4511	1200	12.0	1.5	240

MEDIUM CURRENT TYPES JEDEC DO-5 OUTLINE

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1183A	50	40	10	500
1N1184A	100	40	10	500
1N1185A	150	40	10	500
1N1186A	200	40	10	500
1N1187A	300	40	10	500
1N1188A	400	40	10	500
1N1189A	500	40	10	500
1N1190A	600	40	10	500
1N1191	50	18	5	250
1N1192	100	18	5	250
1N1193	150	18	5	250
1N1194	200	18	5	250
1N1195	300	18	5	250
1N1196	400	18	5	250
1N1197	500	18	5	250
1N1198	600	18	5	250
1N2154	50	25	5.0	350
1N2155	100	25	4.5	350
1N2156	200	25	4.0	350
1N2157	300	25	3.5	350
1N2158	400	25	3.0	350
1N2159	500	25	2.5	350
1N2160	600	25	2.0	350
1N3208	50	15	10	250
1N3209	100	15	10	250
1N3210	200	15	10	250
1N3211	300	15	10	250
1N3212	400	15	10	250
1N3213	500	15	10	250
1N3214	600	15	10	250

Type	V_{RM} (wkg) V	I_o @ 140°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N4136	200	50	16	750
1N4137	400	50	12	750
1N4138	600	50	8	750

MEDIUM CURRENT TYPES JEDEC DO-21-OUTLINE

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N3491	50	18	10	30
1N3492	100	18	10	30
1N3493	200	18	8	30
1N3494	300	18	6	30
1N3495	400	18	4	30
1N3659	50	25	5	40
1N3660	100	25	4.5	40
1N3661	200	25	4.0	40
1N3662	300	25	3.5	40
1N3663	400	25	3.0	40
1N3664	500	25	2.5	40
1N3665	600	25	2.0	40

CONTROLLED AVALANCHE

Type	V_{RM} (wkg) V	I_o @ 140°C. case A	I_R (AV) mA	I_{FM} (surge) A
PZ140B	200	25	4.0	40
PZ140D	400	25	3.0	40
PZ140F	600	25	2.0	40
PZ140H	800	25	2.0	40

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
127350Z	50	35.0	2.0	40
127350A	100	35.0	2.0	40
127351Z	50	44.0	2.0	40
127351A	100	44.0	2.0	40

HIGH CURRENT TYPES JEDEC DO-8 OUTLINE

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1396	50	70	15	150
1N1397	100	70	15	150
1N1398	150	70	15	150
1N1399	200	70	15	150
1N1400	300	70	15	150
1N1401	400	70	15	150
CH119Z	50	150	15	400
CH119A	100	150	15	400
CH119AZ	150	150	15	400
CH119B	200	150	15	400
CH119C	300	150	15	400
CH119D	400	150	15	400

HIGH CURRENT TYPES JEDEC DO-9 OUTLINE

Type	V_{RM} (wkg) V	I_o @ 120°C. case A	I_R (AV) mA	I_{FM} (surge) A
CS131Z	50	275	16	400
CS131A	100	275	16	400
CS131AZ	150	275	16	400
CS131B	200	275	16	400
CS131C	300	275	16	400
CS131D	400	275	16	400

I_{FM} (surge)—Peak one-cycle surge current, under same conditions as I_o rating (μA—Microamperes).
I_o—Max. rectified avg. DC output current, resistive or inductive load, 60 cps sine wave input.
I_R(AV)—Max. avg. reverse current measured over full sine wave cycle with max. rated reverse voltage and forward current applied.

Full field technical consultation or complete up-to-date listings on all Tung-Sol products are available through: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Detroit, Mich.; Melrose Park, Ill.; Newark, N. J.; Seattle, Wash. IN CANADA: Abbey Electronics, Toronto, Ont., Canadian Electronics Ltd., Edmonton, Alta.

TUNG-SOL DIVISION/Wagner Electric Corporation

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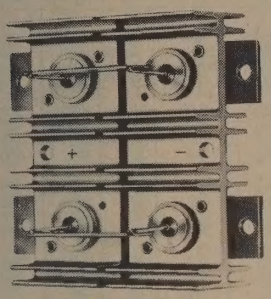
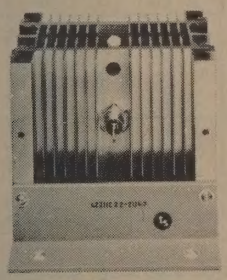
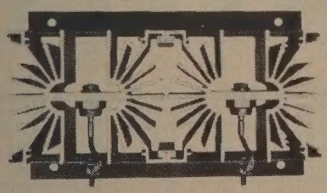
TUNG-SOL SILICON RECTIFIER STACKS AND ASSEMBLIES



OW CURRENT STACKS—Simplicity, economy and iciency are derived from the use of pressure-fit di- les. Units of both polarities are pressed directly into e heat sinks. Washers, spacers and other hardware mmon to stud-mounted units are eliminated. Supplied compact modular assemblies for such standard rec- ier circuits as: Single phase center tap; single phase idge and three phase bridge. New designs utilizing igh current" pressfit rectifiers available.



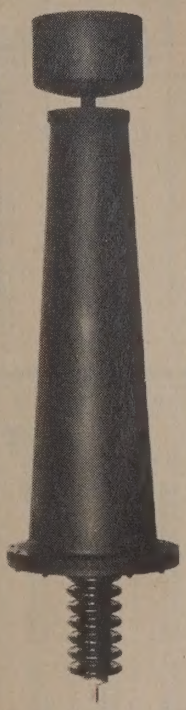
MEDIUM CURRENT STACKS—A newly designed extruded aluminum heat radiator is combined with sili- con rectifiers of low thermal impedance to achieve new efficiencies in size, weight and power output. Flexibil- ity of installation is enhanced by incorporating bolt grooves and interlock channels in the radiators. As- sembly operation is simplified and the stack may be mounted in any desired plane. Made in such assemblies as: Single phase center tap; single phase bridge; three phase bridge and six phase star.

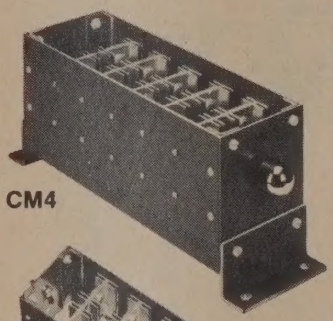


HIGH CURRENT STACKS—Improvements in size, weight and power output factors are achieved through the use of low impedance silicon rectifiers with a spe- cial extruded aluminum heat radiator having serrated fins. These have the same assembly and mounting fea- tures as the medium power stacks. Likewise made as single phase center tap; single phase bridge; three phase bridge and six phase star assemblies, as well as in non-standard configurations.

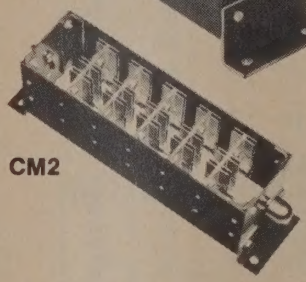
HIGH VOLTAGE ASSEMBLIES

VSC90—A 90 kv assembly designed for use in all high voltage diode applications including clipper, charging, inverse, or rectifier. Utilizes controlled avalanche di- odes. Oil-sealed construc- tion is of advanced design that provides both increased reliability and operational economy.





CM4



CM2

CM2, CM4 and CM5—Open lattice type assembly permits optimum cooling. Current ratings to 30 amperes half wave. For rectifier, clipper and charging diode appli- cations at 5 kv and higher.

TM2—Controlled avalanche sil- icon diodes in low cost assem- blies for high voltage service as rectifiers, clipping and charg- ing. For use at current ratings to 5.5 amperes half wave.

TUNG-SOL®

TUNG-SOL DIVISION

Wagner Electric Corporation

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UNITRODE

FUSED-IN-GLASS CONTROLLED AVALANCHE RECTIFIERS, ZENER DIODES and HIGH VOLTAGE ASSEMBLIES

Rectifiers-12 amp. Series (Body C)

Type	PIV	Max. Av. D.C. Current Output 100°C Case Temp.	Min. Forward Current at 1.0V 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Max. Peak One Cycle Surge Sinusoidal 8.3 msec
UT 8105	50V	12.0A	8.0A	10μA	300μA	200A
UT 8110	100	12.0	8.0	10	300	200
UT 8120	200	12.0	8.0	10	300	200
UT 8140	400	12.0	8.0	10	300	200
UT 8160	600	12.0	8.0	10	300	200
UT 6105	50	9.0	6.0	10	300	175
UT 6110	100	9.0	6.0	10	300	175
UT 6120	200	9.0	6.0	10	300	175
UT 6140	400	9.0	6.0	10	300	175
UT 6160	600	9.0	6.0	10	300	175
UT 5105	50	7.5	5.0	10	300	150
UT 5110	100	7.5	5.0	10	300	150
UT 5120	200	7.5	5.0	10	300	150
UT 5140	400	7.5	5.0	10	300	150
UT 5160	600	7.5	5.0	10	300	150

Rectifiers-4 amp. Series (Body B)

Type	PIV	Max. Av. DC Output Current 25°C	Max. Av. DC Output Current 100°C	Max. Av. DC Output Current Fan Cooled 250 LFM 25°C	Min. Forward Current at 1.0V 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Max. Peak One Cycle Surge Sinusoidal 8.3 msec
UT 4005	50V	4.0A	2.0A	6.0A	3A	5μA	100μA	100A
UT 4010	100	4.0	2.0	6.0	3	5	100	100
UT 4020	200	4.0	2.0	6.0	3	5	100	100
UT 4040	400	4.0	2.0	6.0	3	5	100	100
UT 4060	600	4.0	2.0	6.0	3	5	100	100
UT 3005	50	3.0	1.5	4.5	2	5	100	80
UT 3010	100	3.0	1.5	4.5	2	5	100	80
UT 3020	200	3.0	1.5	4.5	2	5	100	80
UT 3040	400	3.0	1.5	4.5	2	5	100	80
UT 3060	600	3.0	1.5	4.5	2	5	100	80
UT 2005	50	2.0	1.0	3.0	1	5	100	60
UT 2010	100	2.0	1.0	3.0	1	5	100	60
UT 2020	200	2.0	1.0	3.0	1	5	100	60
UT 2040	400	2.0	1.0	3.0	1	5	100	60
UT 2060	600	2.0	1.0	3.0	1	5	100	60

Rectifiers-2 amp. Series (Body A)

UT 261	100V	2.0A	1.0A	3.0A	900mA	2μA	75μA	30A
UT 262	200	2.0	1.0	3.0	900	2	75	30
UT 264	400	2.0	1.0	3.0	900	2	75	30
UT 265	500	2.0	1.0	3.0	900	2	75	30
UT 267	600	2.0	1.0	3.0	900	2	75	30
UT 268	800	2.0	1.0	3.0	900	2	75	30
UT 251	100	1.5	0.75	2.0	750	2	75	25
UT 252	200	1.5	0.75	2.0	750	2	75	25
UT 254	400	1.5	0.75	2.0	750	2	75	25
UT 255	500	1.5	0.75	2.0	750	2	75	25
UT 257	600	1.5	0.75	2.0	750	2	75	25
UT 258	800	1.5	0.75	2.0	750	2	75	25
UT 364	1000	1.5	0.75	2.0	750	2	75	25
UT 249	100	1.25	0.65	1.5	500	2	75	20
UT 242	200	1.25	0.65	1.5	500	2	75	20
UT 244	400	1.25	0.65	1.5	500	2	75	20
UT 245	500	1.25	0.65	1.5	500	2	75	20
UT 247	600	1.25	0.65	1.5	500	2	75	20
UT 362	800	1.25	0.65	1.5	500	2	75	20
UT 363	1000	1.25	0.65	1.5	500	2	75	20
UT 236	100	1.0	0.5	1.25	400	2	75	20
UT 234	200	1.0	0.5	1.25	400	2	75	20
UT 235	400	1.0	0.5	1.25	400	2	75	20
UT 237	500	1.0	0.5	1.25	400	2	75	20
UT 238	600	1.0	0.5	1.25	400	2	75	20
UT 361	800	1.0	0.5	1.25	400	2	75	20
UT 347	1000	1.0	0.5	1.25	400	2	75	20

Low Leakage — ¾ Amp (Body A)

Type	PIV	Max. Av. D.C. Output Current 25°C	Max. Av. D.C. Output Current 100°C	Min. Forward Current at 1.0V 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Max. Peak One Cycle Surge Sinusoidal 8.3 msec
UT 211	225V	750mA	375mA	400mA	0.2μA	15μA	15A
UT 212	300	750	375	400	0.2	15	15
UT 213	400	750	375	400	0.2	15	15
UT 214	500	750	375	400	0.2	15	15
UT 215	600	750	375	400	0.2	15	15

General Purpose — ¾ Amp (Body A)

UT 111	50V	750mA	375mA	500 @ 1.2V	2μA	75μA	15A
UT 112	100	750	375	500	2	75	15
UT 113	200	750	375	500	2	75	15
UT 114	300	750	375	500	2	75	15
UT 115	400	750	375	500	2	75	15
UT 117	500	750	375	500	2	75	15
UT 118	600	750	375	500	2	75	15
UT 119	800	750	375	500	2	75	15
UT 120	1000	750	375	500	2	75	15

Fast Recovery Rectifiers-9 amp. Series (Body C)

Type	PIV	Max. Av D.C. Current Output 100°C Case Temp.	Min. Forward Current at 1.1V 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Max. Reverse Recovery Time	Max. Peak One Cycle Surge Sinusoidal 8.3 msec.
UTR 6405	50V	9.0A	6.0A	10μA	300μA	300nsec	150A
UTR 6410	100	9.0	6.0	10	300	300	150
UTR 6420	200	9.0	6.0	10	300	400	150
UTR 6440	400	9.0	6.0	10	300	500	150
UTR 5405	50	7.5	5.0	10	300	300	135
UTR 5410	100	7.5	5.0	10	300	300	135
UTR 5420	200	7.5	5.0	10	300	400	135
UTR 5440	400	7.5	5.0	10	300	500	135
UTR 4405	50	6.0	4.0	10	300	300	120
UTR 4410	100	6.0	4.0	10	300	300	120
UTR 4420	200	6.0	4.0	10	300	400	120
UTR 4440	400	6.0	4.0	10	300	500	120

Fast Recovery Rectifiers-4 amp. Series (Body B)

TYPE	PIV	Max. Av. D.C. Output Current 25°C	Max. Av. D.C. Output Current 100°C	Min. Forward Current @ 1.1V 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Max. Reverse Recovery Time	Max. Peak One Cycle Surge Sinusoidal 8.3 msec
UTR 4305	50V	4.0A	2.0A	4A	5μA	100μA	250nsec	100A
UTR 4310	100	4.0	2.0	4	5	100	250	100
UTR 4320	200	4.0	2.0	4	5	100	250	100
UTR 4340	400	4.0	2.0	4	5	100	400	100
UTR 4350	500	4.0	2.0	4	5	100	400	100
UTR 4360	600	4.0	2.0	4	5	100	400	100
UTR 3305	50	3.0	1.5	3	5	100	250	80
UTR 3310	100	3.0	1.5	3	5	100	250	80
UTR 3320	200	3.0	1.5	3	5	100	250	80
UTR 3340	400	3.0	1.5	3	5	100	300	80
UTR 3350	500	3.0	1.5	3	5	100	350	80
UTR 3360	600	3.0	1.5	3	5	100	400	80
UTR 2305	50	2.0	1.0	2	5	100	250	60
UTR 2310	100	2.0	1.0	2	5	100	250	60
UTR 2320	200	2.0	1.0	2	5	100	250	60
UTR 2340	400	2.0	1.0	2	5	100	300	60
UTR 2350	500	2.0	1.0	2	5	100	350	60
UTR 2360	600	2.0	1.0	2	5	100	400	60

Fast Recovery Rectifiers-2 amp. Series (Body A)

UTR 02	50V	2.0A	1.0A	1000mA	3μA	100μA	250nsec	25A
UTR 12	100	2.0	1.0	1000	3	100	250	25
UTR 22	200	2.0	1.0	1000	3	100	250	25
UTR 32	300	2.0	1.0	1000	3	100	300	25
UTR 42	400	2.0	1.0	1000	3	100	350	25
UTR 52	500	2.0	1.0	1000	3	100	400	25
UTR 62	600	2.0	1.0	1000	3	100	400	25
UTR 01	50	1.0	0.5	500	3	100	250	20
UTR 11	100	1.0	0.5	500	3	100	250	20
UTR 21	200	1.0	0.5	500	3	100	250	20
UTR 31	300	1.0	0.5	500	3	100	300	20
UTR 41	400	1.0	0.5	500	3	100	350	20
UTR 51	500	1.0	0.5	500	3	100	400	20
UTR 61	600	1.0	0.5	500	3	100	400	20
UTR 10	100	0.5	0.25	200	3	100	250	15
UTR 20	200	0.5	0.25	200	3	100	250	15
UTR 30	300	0.5	0.25	200	3	100	300	15
UTR 40	400	0.5	0.25	200	3	100	350	15
UTR 50	500	0.5	0.25	200	3	100	400	15
UTR 60	600	0.5	0.25	200	3	100	400	15

Ultra Fast Recovery Rectifiers-4 amp. series (Body B

UTX 4105	50V	4.0	2.0	3.0A @ 1.0V	5μA	75μA	100nsec	80A
UTX 4110	100	4.0	2.0	3.0	5	75	100	80
UTX 4115	150	4.0	2.0	3.0	5	75	100	80
UTX 4120	200	4.0	2.0	3.0	5	75	100	80
UTX 3105	50	3.0	1.5	2.0	5	75	100	60
UTX 3110	100	3.0	1.5	2.0	5	75	100	60
UTX 3115	150	3.0	1.5	2.0	5	75	100	60
UTX 3120	200	3.0	1.5	2.0	5	75	100	60

Ultra Fast Recovery Rectifiers-2 amp. Series (Body A

UTX 205	50V	2.0A	1.0A	1.0A @ 1.0V	3μA	50μA	75nsec	25A
UTX 210	100	2.0	1.0	1.0	3	50	75	25
UTX 215	150	2.0	1.0	1.0	3	50	75	25
UTX 220	200	2.0	1.0	1.0	3	50	75	25
UTX 225	250	2.0	1.0	1.0	3	50	75	25
UTX 105	50	1.0	0.5	0.5	3	50	75	20
UTX 110	100	1.0	0.5	0.5	3	50	75	20
UTX 115	150	1.0	0.5	0.5	3	50	75	20
UTX 120	200	1.0	0.5	0.5	3	50	75	20
UTX 125	250	1.0	0.5	0.5	3	50	75	20

UNITRODE CORPORATION
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UNITRODE

Zener Diodes-10 Watt (Body C)

Type ±10% Tolerance	Nominal Voltage Vz @ Iz @ 2500 mw V nom.	Max. Cont. Current I Max.	Max. Surge Current Is	Max. Leakage Current Ir @ 25°C	Test Current Iz	Max. Zener Imped. Zz @ Iz	Typical Temp. Coeff. Tz @ Iz
UZ 7806	6.8V	1350mA	50A	1000μA	350mA	0.6 ohm	.04%/°C
UZ 7807	7.5	1250	41	800	325	0.7	.04
UZ 7808	8.2	1150	31	200	300	0.8	.05
UZ 7809	9.1	1020	29	150	275	1.0	.05
UZ 7810	10	950	26	100	250	1.0	.06
UZ 7812	12	770	23	75	200	1.3	.07
UZ 7813	13	700	21	50	200	1.5	.07
UZ 7814	14	640	20	40	175	1.5	.07
UZ 7815	15	600	17	30	150	2.0	.07
UZ 7816	16	550	15	20	150	2.5	.07
UZ 7818	18	500	13	20	130	3.5	.08
UZ 7820	20	440	12	20	120	4.0	.08
UZ 7822	22	390	11	20	100	4.5	.08
UZ 7824	24	360	10	20	100	5.0	.08
UZ 7827	27	310	9	20	90	6.0	.09
UZ 7830	30	280	8.5	20	80	8.0	.09
UZ 7833	33	260	7.5	10	70	10	.09
UZ 7836	36	240	7	10	60	12	.09
UZ 7840	40	210	6.4	10	60	15	.095
UZ 7845	45	180	5.5	10	50	20	.095
UZ 7850	50	170	4.6	10	50	22	.095
UZ 7856	56	160	4.15	10	40	30	.095
UZ 7860	60	150	3.7	10	40	35	.095
UZ 7870	70	130	3.3	10	35	40	.095
UZ 7875	75	120	3.1	10	30	45	.095
UZ 7880	80	110	2.9	10	30	60	.095
UZ 7890	90	100	2.6	10	25	75	.095
UZ 7210	100	90	2.3	10	20	90	.100

Zener Diode-5 Watt (Body B)

Part No. ±10% Tol.	VOLTAGE Vnom at Iz 1250 mW	Vz at 2 Iz 2500 mW	Vz at I max. 5000 mW	Max. Cont. Current	Max. Surge Current	Max. Leakage Current at 25°C	Test Current Iz	Max. Zener Imped. Zz at Iz	Typical Temp. Coeff. Tz at Iz
UZ 5806	6.8V	7.0V	7.4V	675mA	40A	500μA	175mA	1 ohms	.05%/°C
UZ 5807	7.5	7.7	8.1	620	32	400	175	1.5	.06
UZ 5808	8.2	8.4	8.8	570	24	200	150	1.5	.06
UZ 5809	9.1	9.4	9.8	510	22	100	150	2	.06
UZ 5810	10	10.3	10.8	470	20	75	125	2	.07
UZ 5812	12	12.4	13.0	385	18	50	100	2.5	.07
UZ 5813	13	13.4	14.2	350	16	25	100	3	.08
UZ 5814	14	14.5	15.5	320	14	20	100	3	.08
UZ 5815	15	15.5	16.8	300	12	15	75	3.5	.08
UZ 5816	16	16.5	18.0	275	10	10	75	3.5	.08
UZ 5818	18	18.8	19.5	255	9.0	10	65	4	.085
UZ 5820	20	21.2	23.0	220	8.0	10	65	4.5	.085
UZ 5822	22	23.5	25.5	195	7.0	10	50	5	.085
UZ 5824	24	25.5	28.0	180	6.5	10	50	5	.09
UZ 5827	27	28.5	32.0	155	6.0	10	50	6	.09
UZ 5830	30	32.0	35.0	140	5.5	10	40	8	.09
UZ 5833	33	35.0	38.0	130	5.0	5	40	10	.095
UZ 5836	36	38.0	42.0	120	4.5	5	30	11	.095
UZ 5840	40	42.5	47.0	105	4.0	5	30	14	.095
UZ 5845	45	47.5	52.5	95	3.5	5	30	20	.095
UZ 5850	50	52.5	58.0	85	3.0	5	25	25	.095
UZ 5856	56	59.0	64.5	80	2.8	5	20	35	.095
UZ 5860	60	63.0	68.5	75	2.5	5	20	40	.100
UZ 5870	70	73.5	79.0	65	2.3	5	20	50	.100
UZ 5875	75	78.5	84.0	60	2.0	5	15	55	.100
UZ 5880	80	83.5	89.0	55	1.8	5	15	80	.100
UZ 5890	90	93.5	99.5	50	1.6	5	15	90	.100
UZ 5210	100	104	110	45	1.4	5	10	90	.100
UZ 5211	110	114	120	40	1.2	5	10	125	.100
UZ 5212	120	124	131	38	1.0	5	10	170	.100
UZ 5213	130	134	142	35	.80	5	10	190	.105
UZ 5214	140	145	153	33	.80	5	8	230	.105
UZ 5215	150	156	164	31	.75	5	8	330	.105
UZ 5216	160	167	175	30	.70	5	8	350	.105
UZ 5217	170	177	186	27	.65	5	8	380	.105
UZ 5218	180	188	198	25	.60	5	5	450	.110
UZ 5219	190	198	210	24	.55	5	5	470	.110
UZ 5220	200	210	223	22	.50	5	5	500	.110
UZ 5222	220	231	247	20	.45	5	5	550	.115
UZ 5224	240	252	270	18	.40	5	5	650	.115
UZ 5226	260	272	292	17	.35	5	5	750	.120
UZ 5228	280	292	314	16	.30	5	4	850	.120
UZ 5230	300	313	336	15	.25	5	4	950	.120
UZ 5232	320	333	358	14	.24	5	4	1100	.120
UZ 5234	340	354	380	13	.23	5	4	1200	.120
UZ 5236	360	374	403	12	.22	5	3	1400	.120
UZ 5238	380	395	427	12	.21	5	3	1500	.120
UZ 5240	400	415	450	11	.20	5	3	1800	.120

Zener Diodes-3 Watt (Body A)

Part No ±10% Tolerance	Nominal Voltage at Test Current	Max. Cont. Current	Max. Surge Current	Max. Leakage Current at 25°C	Test Current	Max. Zener Impedance	Typical Temp. Coeff.
UZ 806	6.8V	440mA	10.0A	500μA	75mA	2 ohms	.04%/°C
UZ 807	7.5	400	8.0	300	75	2	.04
UZ 808	8.2	360	7.0	200	75	3	.05
UZ 809	9.1	330	6.0	100	75	3	.05
UZ 810	10	300	5.0	40	75	4	.06
UZ 812	12	250	4.0	10	65	5	.07
UZ 813	13	230	4.0	10	50	6	.07
UZ 814	14	210	4.0	10	50	6	.07
UZ 815	15	200	3.0	10	50	6	.07
UZ 816	16	185	3.0	5	50	7	.07
UZ 818	18	170	2.0	5	40	8	.08
UZ 820	20	150	2.0	5	40	9	.08
UZ 822	22	135	2.0	5	30	10	.08
UZ 824	24	125	1.5	5	30	10	.08
UZ 827	27	110	1.5	1	25	12	.09
UZ 830	30	100	1.5	1	25	15	.09
UZ 833	33	90	1.2	1	20	21	.09
UZ 836	36	85	1.0	1	20	21	.09
UZ 840	40	75	1.0	1	20	27	.095
UZ 845	45	65	0.8	1	15	37	.095
UZ 850	50	60	0.8	1	15	50	.095
UZ 856	56	55	.70	1	10	70	.095
UZ 860	60	50	.60	1	10	70	.095
UZ 870	70	45	.60	1	10	90	.095
UZ 875	75	40	.50	1	10	100	.095
UZ 880	80	35	.40	1	10	115	.095
UZ 890	90	30	.40	1	8.0	150	.095
UZ 210	100	30	.40	1	5.0	175	.100
UZ 211	110	25	.30	1	5.0	250	.100
UZ 212	120	25	.20	1	5.0	325	.100
UZ 213	130	20	.20	1	5.0	375	.100
UZ 214	140	20	.20	1	5.0	550	.100
UZ 215	150	20	.20	1	5.0	650	.100
UZ 216	160	20	.15	1	4.0	700	.100
UZ 217	170	18	.15	1	4.0	750	.100
UZ 218	180	18	.10	1	4.0	850	.100

Zener Diodes-3 Watt (Body A) (Cont.)

Part No. ±10% Tolerance	Nominal Voltage at Test Current	Max. Cont. Current	Max. Surge Current	Max. Leakage Current at 25°C	Test Current	Max. Zener Impedance	Typical Temp. Coeff.
UZ 219	190V	15mA	.10A	1μA	4.0mA	900ohms	.100%/°C
UZ 220	200	15	.10	1	4.0	950	.100
UZ 222	220	15	.09	1	3.0	1100	.100
UZ 224	240	12	.09	1	3.0	1300	.105
UZ 226	260	12	.08	1	3.0	1500	.105
UZ 228	280	10	.08	1	3.0	1700	.105
UZ 230	300	10	.07	1	3.0	1900	.105
UZ 232	320	9	.07	1	2.0	2100	.105
UZ 234	340	9	.06	1	2.0	2400	.110
UZ 236	360	8	.06	1	2.0	2700	.110
UZ 238	380	8	.06	1	2.0	3000	.110
UZ 240	400	7	.06	1	2.0	3500	.110

Zener Diodes-1 Watt (Body B1)

Part No. ±10% Tolerance*	Nominal Voltage at Test Current	Max. Cont. Current	Max. Surge Current	Max. Leakage Current at 25°C	Test Current	Max. Zener Impedance**	Typical Temp. Coeff.
UZ 8806	6.8V	140mA	5.00A	50μA	37mA	3.5ohms	0.04%/°C
UZ 8807	7.5	125	4.50	30	34	4.0	0.04
UZ 8808	8.2	115	3.90	10	31	4.5	0.05
UZ 8809	9.1	105	3.37	3.0	28	5.0	0.05
UZ 8810	10	95	2.77	2.0	25	7.0	0.06
UZ 8812	12	85	2.25	1.0	23	9.0	0.07
UZ 8813	13	80	2.25	0.5	21	10	0.07
UZ 8814	14	74	2.25	0.5	19	12	0.07
UZ 8815	15	63	1.65	0.5	17	14	0.07
UZ 8816	16	60	1.65	0.5	15.5	16	0.07
UZ 8818	18	52	1.12	0.5	14.0	20	0.08
UZ 8820	20	47	1.12	0.5	12.5	22	0.08
UZ 8822	22	43	1.12	0.5	11.5	23	0.08
UZ 8824	24	40	0.825	0.5	10.5	25	0.08
UZ 8827	27	35	0.825	0.5	9.5	35	0.09
UZ 8830	30	31	0.825	0.5	8.5	40	0.09
UZ 8833	33	28	0.675	0.5	7.5	45	0.09
UZ 8836	36	26	0.562	0.5	7.0	50	0.09
UZ 8840	40	24	0.562	0.5	6.5	62	0.095
UZ 8845	45	22	0.450	0.5	6.0	75	0.095
UZ 8850	50	20	0.450	0.5	5.0	85	0.095
UZ 8856	56	17	0.390	0.5	4.5	110	0.095
UZ 8860	60	15	0.337	0.5	4.0	125	0.095
UZ 8870	70	14	0.337	0.5	3.7	150	0.095
UZ 8875	75	12	0.277	0.5	3.3	175	0.095
UZ 8880	80	11	0.225	0.5	3.0	200	0.095
UZ 8890	90	10	0.225	0.5	2.8	250	0.095
UZ 8210	100	9.5	0.225	0.5	2.5	350	0.10
UZ 8211	110	8.5	0.165	0.5	2.3	450	0.10
UZ 8212	120	8.0	0.112	0.5	2.0	550	0.10
UZ 8213	130	7.2	0.112	0.5	1.9	700	0.10
UZ 8214	140	6.8	0.112	0.5	1.8	850	0.10
UZ 8215	150	6.3	0.112	0.5	1.7	1000	0.10
UZ 8216	160	5.9	0.082	0.5	1.6	1100	0.10
UZ 8217	170	5.6	0.082	0.5	1.5	1200	0.10
UZ 8218	180	5.2	0.056	0.5	1.4	1300	0.10
UZ 8219	190	5.0	0.056	0.5	1.3	1400	0.10
UZ 8220	200	4.7	0.056	0.5	1.2	1500	0.10

MILITARY TYPE RECTIFIERS AND ZENER DIODES

JAN & JAN TX Rectifiers-2 amp. Meets MIL-S-19500/228 (Body A)

TYPE	PIV	Max. Av. D.C. Output Current TA	100°C	Min. Forward Current at 25°C	Max. Reverse Current at PIV 25°C	100°C	Max. Peak One Cycle Surge Sinusoidal 8.3 msec
JAN 1N3611	200V	2.0A @ 25°C	1.0A	1.0A @ 1.2V	1μA	75μA	20A
JAN 1N3612	400	2.0	1.0	1.0	1	75	20
JAN 1N3613	600	2.0	1.0	1.0	1	75	20
JAN 1N3614	800	2.0	1.0	1.0	1	75	20

JAN & JAN TX Fast Recovery Rectifiers - 1 amp. Meets MIL-S-19500/359A (Body A)

150nsec max. recovery time

JAN & JAN TX 1N4942	200	1.0 @ 55°C	.75	1.0 @ 1.3V	1	200	15
JAN & JAN TX 1N4944	400	1.0	.75	1.0	1	200	15
JAN & JAN TX 1N4946	600	1.0	.75	1.0	1	200	15

JAN Zener Diodes-5 Watts 5% Tolerance Meets MIL-S-19500/356 (Body B)

Part No.	Voltage Vnom at Iz 1250 mW	Vz at 2 Iz 2500 mW	Vz at I max. 5000 mW	Max. Cont. Current	Max. Surge Current	Max. Leakage Current at 25°C	Test Current Iz	Max. Zener Imped. Zz at Iz	Typical Temp. Coeff. Tz at Iz
JAN 1N4958	10V	10.3V	10.8V	475mA	20A	25μA	125mA	2 ohms	.07%/°C
JAN 1N4959	11	11.4	12.0	430	19	10	125	2.5	.07
JAN 1N4960	12	12.4	13.0	395	18	10	100	2.5	.07
JAN 1N4961	13	13.4	15.5	365	16	10	100	3	.08
JAN 1N4962	15	15.5	16.8	315	12	5	75	3.5	.08
JAN 1N4963	16	16.5	18.0	294	10	5	75	3.5	.08
JAN 1N4964	18	18.8	19.5	264	9.0	5	65	4	.085
JAN 1N4965	20	21.2	23.0	237	8.0	2	65	4.5	.085
JAN 1N4966	22	23.5	25.5	216	7.0	2	50	5	.085
JAN 1N4967	24	25.5	28.0	198	6.5	2	50	5	.09
JAN 1N4968	27	28.5	32.0	176	6.0	2	50	6	.09
JAN 1N4969	30	32.0	35.0	158	5.5	2	40	8	.09
JAN 1N4970	33	35.0	38.0	144	5.0	2	40	10	.095
JAN 1N4971	36	38.0	42.0	132	4.5	2	30	11	.095
JAN 1N4972	39	41.5	46.0	122	4.0	2	30	14	.095
JAN 1N4973	43	45.5	50.5	110	3.5	2	30	20	.095
JAN 1N4974	47	49.5	54.5	100	3.2	2	25	25	.095
JAN 1N4975	51	53.5	59.0	92	3.0	2	25	27	.095
JAN 1N4976	56	59.0	64.5	84	2.8	2	20	35	.095
JAN 1N4977	62	65.0	70.5	76	2.5	2	20	42	.100
JAN 1N4978	68	71.5	77.0	70	2.2	2	20	50	.100
JAN 1N4979	75	78.5	84.0	63	2.0	2	20	55	.100
JAN 1N4980	82	85.5	91.0	58	1.8	2	15	80	.100
JAN 1N4981	91	94.5	100.5	52.5	1.6	2	15	90	.100
JAN 1N4982	100	104	110	47.5	1.4	2	12	110	.100
JAN 1N4983	110	114	120	43.0	1.2	2	12	125	.100
JAN 1N4984	120	124	131	39.5	1.0	2	10	170	.100
JAN 1N4985	130	134	142	36.5	.80	2	10	190	.105
JAN 1N4986	150	156	164	31.6	.75	2	8	330	.105
JAN 1N4987	160	167	165	29.4	.70	2	8	350	.105
JAN 1N4988	180	188	198	26.4	.60	2	5	430	.110
JAN 1N4989	200	210	223	23.6	.50	2	5	480	.110
JAN 1N4990	220	231	247	21.6	.50	2	5	550	.115

UNITRODE

High Voltage Stacks

TYPE	PIV	Max. Av. DC Output Current 25°C—Air	Max. Av. DC Output Current 50°C—Oil	Max. Forward Voltage Drop at 25°C	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Peak Surge Sinusoidal 8.3 msec	Body Size
US 12	1200V	1000mA	2500mA	2.0V @ 400mA	2μA	100μA	20A	A
US 15	1500	800	2000	3.0V @ 400	2	100	20	A
US 18	1800	700	1750	3.0V @ 400	2	100	20	A
US 20	2000	600	1500	4.0V @ 400	2	100	20	A
US 25	2500	600	1500	5.0V @ 400	2	100	20	B
US 30	3000	500	1250	6.0V @ 400	2	100	20	B
US 35	3500	400	1000	7.0V @ 200	2	100	15	C
US 40	4000	350	850	7.0V @ 200	2	100	15	C
US 45	4500	300	750	8.0V @ 200	2	100	15	D
US 50	5000	300	750	9.0V @ 200	2	100	15	D
US 60	6000	200	500	10.0V @ 200	2	100	15	D
US 70	7000	200	500	12.0V @ 200	2	100	15	D
US 80	8000	150	375	14.0V @ 100	2	100	10	E
US 100	10000	150	375	17.0V @ 100	2	100	10	E
US 120	12000	150	375	21.0V @ 100	2	100	10	E
US 150	15000	100	250	26.0V @ 100	2	100	10	E
US 180	18000	80	200	31.0V @ 100	2	100	10	E
US 200	20000	80	200	34.0V @ 100	2	100	10	E

Fast Recovery Stacks

TYPE	PIV	Max. Av. DC Output Current 25°C—Air	Max. Av. DC Output Current 50°C—Oil	Max. Forward Voltage Drop at 25°C	Max. Reverse Recovery Time	Max. Reverse Current at PIV 25°C	Max. Reverse Current at PIV 100°C	Peak Surge Sinusoidal 8.3 msec	Body Size
USR 12	1200V	750mA	1850mA	3.3V @ 400mA	500nsec	5μA	150μA	15A	A
USR 15	1500	600	1500	4.0V @ 400	500	5	150	15	A
USR 20	2000	500	1250	5.5V @ 400	500	5	150	15	B
USR 25	2500	400	1000	6.6V @ 400	500	5	150	15	B
USR 30	3000	400	1000	7.7V @ 400	500	5	150	15	C
USR 35	3500	350	850	8.8V @ 200	500	5	150	10	C
USR 40	4000	300	750	9.9V @ 200	500	5	150	10	D
USR 45	4500	250	625	11.0V @ 100	500	5	150	10	D
USR 50	5000	250	625	13.0V @ 100	500	5	150	10	D
USR 60	6000	150	375	15.4V @ 100	500	5	150	10	D
USR 70	7000	150	375	17.6V @ 100	500	5	150	10	E
USR 80	8000	125	300	20.0V @ 100	500	5	150	10	E
USR 100	10000	125	300	24.0V @ 100	500	5	150	10	E
USR 120	12000	100	250	31.0V @ 100	500	5	150	10	E
USR 150	15000	80	200	33.0V @ 100	500	5	150	10	E
USR 180	18000	75	175	35.0V @ 100	500	5	150	10	E

High Voltage Bridges - Single Phase

TYPE	PIV Per Leg	Max. Av. DC Output Current 25°C—Air	Max. Av. DC Output Current 50°C—Oil	Max. Forward Voltage Drop Per Leg at 25°C	Max. Reverse Current Per Leg at PIV 25°C	Max. Reverse Current Per Leg at PIV 100°C	Peak Surge Sinusoidal 8.3 msec	Body Size
673-1	100V	1.5A	2.5A	1.1V @ 500mA	2μA	100μA	25A	G & S
673-2	200	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-3	300	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-4	400	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-5	500	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-6	600	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-7	1200	.600	1.5	2.2V @ 400	2	100	15	H
673-75	1800	.500	1.25	3.3V @ 400	2	100	15	J
673-8	2400	.400	1.0	4.4V @ 400	2	100	15	K
673-85	3000	.300	.75	5.5V @ 300	2	100	15	L
673-9	3600	.200	.5	6.6V @ 200	2	100	15	M
673-10	4200	.180	.45	7.7V @ 200	2	100	15	N
673-11	4800	.160	.40	8.8V @ 150	2	100	15	O
673-12	5000	.160	.40	9.0V @ 150	2	100	15	O

Fast Recovery Bridges - Single Phase

TYPE	PIV Per Leg	Max. Av. DC Output Current 25°C—Air	Max. Av. DC Output Current 50°C—Oil	Max. Forward Voltage Drop Per Leg at 25°C	Max. Reverse Recovery Time nano-sec.	Max. Reverse Current Per Leg at PIV 25°C	Max. Reverse Current Per Leg at PIV 100°C	Peak Surge Sinusoidal 8.3 msec	Body Size
676-1	100V	1.0A	1.8A	1.1V @ 500mA	500	5μA	150μA	20A	G & S
676-2	200	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-3	300	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-4	400	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-5	500	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-6	600	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-12	1200	.400	1.0	3.3V @ 300	500	5	150	10	J
676-18	1800	.350	.850	4.4V @ 200	500	5	150	10	K
676-24	2400	.325	.800	5.5V @ 200	500	5	150	10	L
676-30	3000	.250	.625	7.7V @ 200	500	5	150	10	M
676-36	3600	.175	.425	8.8V @ 150	500	5	150	10	N
676-42	4200	.150	.375	9.9V @ 150	500	5	150	10	O
676-48	4800	.135	.325	11.0V @ 150	500	5	150	10	P
676-50	5000	.125	.300	11.0V @ 150	500	5	150	10	P

Ultra Fast Recovery Bridges - Single Phase

677-1	50	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-2	100	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-3	150	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-4	200	1.0	1.8	1.1V @ 500	75	2	100	20	G & S

High Voltage Doorbell® Rectifier Mod

Standard Modules

Type	Max. Av. D.C. Current Output 75°C Case Air	Max. Av. D.C. Current Output 60°C Case with Extender Plate-Air	Max. Av. D.C. Current Output 50°C Oil	PIV	Max. Rev. Current at PIV	Max. Forward Voltage Drop	Max. Rev. Recovery Time	Max. F Trans Ener Absorp
200 amp. surge								
UGE 2.5	6.6A	8.25A	10.0A	2.5KV	10μA	5V @ 3.3A	—	8 jo
UDE 2.5††	6.0	7.0	7.7	2.5	10	5 3.0	—	8
UGE 5	5.0	6.25	7.5	5	15	10 2.5	—	14
UDE 5††	4.5	5.0	5.5	5	10	10 2.2	—	14
UGE 7.5	3.3	4.1	5.0	7.5	10	13 1.6	—	20
100 amp. surge								
UGB 5	4.4	5.5	6.6	5	5	9 2.2	—	7
UGB 7.5	3.0	3.75	5.0	7.5	5	13 1.5	—	10
UDB 2.5	3.0	3.75	5.0	2.5	5	4 1.5	—	4
UGB 10	2.3	2.85	3.5	10	5	17 1.1	—	14
UDB 5	2.0	2.5	2.75	5	5	8 1.0	—	8
UDB 7.5	1.33	1.65	2.0	7.5	5	12 0.7	—	12
30 amp. surge								
UDA 5	1.65	2.0	2.2	5	2	8 .82	—	1.5
UDA 7.5	1.25	1.55	1.75	7.5	2	12 .60	—	2.5
UDA 10	1.0	1.25	1.40	10	2	16 .50	—	3
UDA 15	0.67	0.8	0.90	15	2	25 .33	—	5

Fast Recovery Modules

150 amp. surge									
UGF 2.5	5.0	6.25	8.0	2.5	10	6	2.5	500nsec	8
UDF 2.5††	4.5	5.0	5.3	2.5	10	6	2.2	500	8
UGF 5	3.75	4.7	6.0	5	10	11	1.8	500	14
UDF 5††	3.3	4.0	4.4	5	10	11	1.6	500	14
UGF 7.5	2.5	3.1	4.0	7.5	10	17	1.2	500	20
80 amp. surge									
UGD 5	3.3	4.1	4.8	5	5	11	1.6	500	7
UGD 7.5	2.25	2.8	3.5	7.5	5	17	1.1	500	10
UDD 2.5	2.25	2.8	3.3	2.5	5	6	1.2	500	4
UGD 10	1.75	2.2	2.5	10	5	22	.85	500	14
UDD 5	1.5	1.85	2.0	5	5	11	.75	500	8
UDD 7.5	1.0	1.25	1.5	7.5	5	17	.50	500	12
25 amp. surge									
UDC 5	1.2	1.5	1.7	5	2	10	.70	500	1.5
UDC 7.5	0.9	1.1	1.25	7.5	2	15	.50	500	2.5
UDC 10	0.75	0.9	1.0	10	2	20	.37	500	3
UDC 15	0.5	0.6	0.7	15	2	30	.25	500	5

MAGNUM™ HIGH-CURREN RECTIFIER ASSEMBLIES

Standard Recovery Types

Part No.	PIV Per leg	Average D.C. Output Current Io 55°C case temp.	Average D.C. Output Current Io 100°C case temp.	Max. Forward Voltage Drop Per Leg at 25°C V_F	Max. Reverse Leakage Current Per Leg at PIV Ir 25°C	Max. Reverse Leakage Current Per Leg at PIV Ir 100°C	Non-Repetitive Sinusoidal Surge, 8.3 Msec Is @ 100°C	Max Reser Recov Tim
25 Amp. Three Phase Bridges								
678-1	100V	25A	18.5A	1.2V @ 10A	10μA	200μA	150A	—
678-2	200	25	18.5	1.2	10	200	150	—
678-3	300	25	18.5	1.2	10	200	150	—
678-4	400	25	18.5	1.2	10	200	150	—
678-5	500	25	18.5	1.2	10	200	150	—
678-6	600	25	18.5	1.2	10	200	150	—
25 Amp. Single Phase Bridges								
679-1	100V	25A	18.5A	1.2V @ 10A	10μA	200μA	150A	—
679-2	200	25	18.8	1.2	10	200	150	—
679-3	300	25	18.5	1.2	10	200	150	—
679-4	400	25	18.5	1.2	10	200	150	—
679-5	500	25	18.5	1.2	10	200	150	—
679-6	600	25	18.5	1.2	10	200	150	—
10 Amp. Single Phase Bridges								
680-1	100V	10A	6A	1.2V @ 2A	2μA	50μA	50A	—
680-2	200	10	6	1.2	2	50	50	—
680-3	300	10	6	1.2	2	50	50	—
680-4	400	10	6	1.2	2	50	50	—
680-5	500	10	6	1.2	2	50	50	—
680-6	600	10	6	1.2	2	50	50	—

Fast Recovery Types

20 Amp. Three Phase Bridges								
682-1	100V	20A	14A	1.2V @ 6A	10μA	200μA	150A	00 ns
682-2	200	20	14	1.2	10	200	150	00
682-3	300	20	14	1.2	10	200	150	00
682-4	400	20	14	1.2	10	200	150	00
682-5	500	20	14	1.2	10	200	150	00
682-6	600	20	14	1.2	10	200	150	00
20 Amp. Single Phase Bridges								
683-1	100V	20A	14A	1.2V @ 6A	10μA	200μA	150A	00 ns
683-2	200	20	14	1.2	10	200	150	00
683-3	300	20	14	1.2	10	200	150	00
683-4	400	20	14	1.2	10	200	150	00
683-5	500	20	14	1.2	10	200	150	00
683-6	600	20	14	1.2	10	200	150	00
10 Amp. Single Phase Bridges								
684-1	100V	10A	6A	1.2V @ 2A	5μA	100μA	50A	00 ns
684-2	200	10	6	1.2	5	100	50	00
584-3	300	10	6	1.2	5	100	50	00
684-4	400	10	6	1.2	5	100	50	00
684-5	500	10	6	1.2	5	100	50	00
684-6	600	10	6	1.2	5	100	50	00

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UNITRODE

-High Rel

Vfx, Vrx Volts	Ifx, Irx max µA	Igt max µA	Vgt max Volts	Ih max mA	V @ I max V	A	I max	pkg
30 60 100 200	100, 100 @ 125°C	200	0.8	5	2.5	2	1.25 A @ 100°C Case	TO-9
50 50 100 100 200 200 300 300 400	100, 100 @ 125°C	200 20 200 20 200 20 200 20 200	0.8 0.6 0.8 0.6 0.8 0.6 0.8 0.6 0.8	2	2.2	4	1.6 A @ 85°C Case	TO-5
30 60 100	20, 50 @ 150°C	200	0.8	5	1.5	1	250 mA @ 75°C Ambient	TO-18
30 60 100	20, 50 @ 150°C	20	0.6	4	1.5	1	250 mA @ 75°C Ambient	TO-18

available

ilitary Aerospace

60 100 200 300 400	50, 100 @ 150°C	20	0.6	2.0	1.5	1	250 mA @ 75°C Ambient	TO-18
60 100 200 300 400	100, 200 @ 150°C	20	0.6	2.0	2.5	5	1.6 A @ 85°C Case	TO-5
30 30 60 60 100 100	20, 50 @ 150°C	200	0.8	5.0	1.5	1	250 mA @ 75°C Ambient 200 mA TO-46	TO-18 TO-46 TO-18 TO-46 TO-18 TO-46
30 30 60 60 100 100	20, 50 @ 150°C	20	0.6	4.0	1.5	1	250 mA @ 75°C Ambient 200 mA TO-46	TO-18 TO-46 TO-18 TO-46 TO-18 TO-46
60 100 200 300 400	200, 300 @ 150°C	200	0.8	3.0	2.5	5	5 A @ 100°C Case	TO-59

High Speed

Vfx Volts	Ifx max µA	Igt max µA	Vgt max Volts	td @ If =1A nsec Typ	tr @ If =1A nsec Typ	tbr µsec max	If Peak	Pkg
60 60 100 100	100 @ 150°C	200	0.75	20	15 15 10 10	2.0 0.5 2.0 0.5	50 A for 10µsec	TO-18
60 60 100 100	100 @ 150°C	200	0.75	20	15 15 10 10	2.0 0.5 2.0 0.5	50 A for 10µsec	TO-59
30 60 100	20, 50 @ 150°C	200	0.8	100	80	3.0	30 A for 10µsec	TO-59
30 60 100	20, 50 @ 150°C	200	0.8	100	50	2.0	30 A for 10µsec	TO-18
30 60 100	20, 50 @ 150°C	20	0.6	100	50	2.0	30 A for 10µsec	TO-18

Radiation Hard Post Radiation Limits (3x10¹⁴ NVT)

Vfx Volts	Ifx max µA	Ig(tot) mA	Vgt Volts	Ihx mA	Vf @ If A	A	If max	Pkg
30 60 80	100 µA @ 125°C	20	1.5	30	3.0	1	200 mA @ 75°C Ambient	TO-18
30 60 80	100 µA @ 125°C	20	1.5	30	3.0	1	3 A @ 100°C Case	TO-59

Industrial — Commercial Grade

Vfx Vrx min Volts	Ifx Irx max µA	Igt max µA	Vgt max Volts	Ihx max mA	Vf @ If max V	A	If max A	Pkg
30 60 100 150 200	50,50 @ 125°C	200	0.8	5.0 @ Rgk=1K	1.7 @ 1.0		0.5 @ 100°C Case	TO-18
50 100 150 200	100, 100 @ 110°C	200	0.8	3.0 @ Rgk=1K	2.2 @ 4.0		1.6 @ 70°C Case	TO-5

SCR's Industrial — Standard Grade

Type	Vfx Vrx min Volts	Ifx Irx max µA	Igt max µA	Vgt max Volts	Ihx max mA	Vf @ If max V	A	If max A	Pkg
B 150 B 151 B 152	30 60 100	20, 50 @ 150°C	200	0.8	5.0 @ Rgk=1K	1.5 @ 1.0		0.20 @ 75°C Ambient	TO-46
BA 150 BA 151 BA 152	30 60 100	20, 50 @ 150°C	200	0.8	5.0 @ Rgk=1K	1.5 @ 1.0		0.25 @ 75°C Ambient	TO-18
CB 200 CB 201 CB 202 CB 203	30 60 100 200	100, 100 @ 150°C	400	0.8	3.0 @ Rgk=1K	1.5 @ 0.5		0.5 @ 100°C Case	TO-18
CD 200 CD 201 CD 202 CD 203	30 60 100 200	100, 100 @ 150°C	400	0.8	3.0 @ Rgk@1K	1.4 @ 1.0		1.6 @ 85°C Case	TO-5
ID 300 ID 301	300 400	100, 100 @ 110°C	200	0.8	3.0 @ Rgk=1K	2.2 @ 4.0		1.6 @ 70°C Case	TO-5

SCR's Industrial — Premium Grade

AA 100 AA 101 AA 102 AA 103 AA 104	60 100 200 300 400	100,100 @ 150°C	2.0	0.6	2.0 @ Rgk=1K	1.5 @ 0.5	0.5 @ 100°C Case	TO-18
AD 100 AD 101 AD 102 AD 103 AD 104	60 100 200 300 400	100, 100 @ 150°C	2.0	0.6	2.0 @ Rgk=1K	1.5 @ 1.0	1.6 @ 85°C Case	TO-5
AA 107 AA 108 AA 109 AA 110 AA 111	60 100 200 300 400	100, 100 @ 150°C	20	0.6	2.0 @ Rgk=1K	1.5 @ 0.5	0.5 @ 100°C Case	TO-18
AD 107 AD 108 AD 109 AD 110 AD 111	60 100 200 300 400	100, 100 @ 150°C	20	0.6	2.0 @ Rgk=1K	1.5 @ 1.0	1.6 @ 85°C Case	TO-5
AA 117 AA 118	300 400	100, 100 @ 150°C	200	0.6	2.0 @ Rgk=1K	1.5 @ 0.5	0.5 @ 100°C Case	TO-18
AD 117 AD 118	300 400	100, 100 @ 150°C	200	0.6	2.0 @ Rgk=1K	1.5 @ 1.0	1.6 @ 85°C Case	TO-5
CM 106 CM 107 CM 108 CM 109 CM 110	60 100 200 300 400	250, 500 @ 150°C	200	0.8	3.0 @ Rgk=1K	3.0 @ 5.0	5.0 @ 100°C Case	TO-59

Photo SCR's

Type	Vfx Crk min Volts	Ifx Irx max µA	Light trigger intensity min f-c	max f-c	Ihx max mA	Vf @If max V	A	Pkg
PR 30 PR 60 PR 100 PR 200	30 60 100 200	25, 25 @ 125°C	2	10	1.0 @ Rgk=4.7K	1.5 @ 0.3		ROUND LENS TO-18
PR 30A PR 60A PR 100A PR 200A	30 60 100 200	25, 25 @ 125°C	4	10	1.0 @ Rgk=4.7K	1.5 @ 0.3		
PF 30 PF 60 PF 100 PF 200	30 60 100 200	25, 25 @ 125°C	10	50	1.0 @ Rgk=4.7K	1.5 @ 0.3		FLAT LENS TO-18
PF 30A PF 60A PF 100A PF 200A	30 60 100 200	25, 25 @ 125°C	20	50	1.0 @ Rgk=4.7K	1.5 @ 0.3		
PM 30 PM 60 PM 100 PM 200	30 60 100 200	25, 25 @ 125°C	10	50	1.0 @ Rgk=4.7K	1.5 @ 0.3		MICRO PACKAGE
PM 30A PM 60A PM 100A PM 200A	30 60 100 200	25, 25 @ 125°C	20	50	1.0 @ Rgk=4.7K	1.5 @ 0.3		

SCR's Electroluminescent Drivers

Type	Vfx Vrx Volts	Reverse Gain Cath drive	Gate drive	Capacitance max Pf	Ifx Irx @ 80°C µA max	Pkg
EL 20 EL 25 EL 30 EL 35 EL 40	200 250 300 350 400	0.8	0.4	6	10	TO-18
EL 20A EL 25A EL 30A EL 35A EL 40A	200 250 300 350 400	0.8	0.4	6	10	TO-46
EL 200 EL 250 EL 300 EL 350 EL 400	200 250 300 350 400	0.8	0.4	6	10	TO-10
EL 200G EL 250G EL 300G EL 350G EL 400G	200 250 300 350 400	0.8	0.4	6	10	TO-100

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SSPI PRODUCT GROUP

UNITRODE

Transistors

Power Switching

Type	Voltage ratings (Volts) Vces	Vceo (sust)	Vebo	Hfe min	Vce(sat) max Volts	Ft Typ	Switching Times Saturated Typ Ton nsec	Toff nsec	Package
2 Amp 5 Watt High Speed Switching				0.5A	2A	@ Ic = 2.0A			
2N 4863	140	120	8	50	15	1.5	85	—	—	TO-5 (Standard)
SSP 3020	140	120	8	60	20	1.0	85	125	500	Options: TO-5 Low Profile, TO-5 Low Profile 7/16 Stud, TO-5 7/16 Stud
3 Amp 15 Watt High Voltage Switching				50mA	0.5A	1A	@ Ic = 1A			
2N 5662	250	200	6	40	40	15	0.4	40	125	600	TO-5
2N 5663	400	300	6	40	40	15	0.4	40	125	600	Option: TO-5 7/16 Stud
5 Amp 5 Watt Medium Speed Drivers				50mA	1A		@ Ic = 1A			
SSP 2848	120	80	5	80	100		.25	60	120	600	Pancake TO-5
SSP 2849	150	100	5	35	40		.25	40	110	700	Options:
SSP 2850	100	80	5	25	40		.25	40	110	700	TO-5 Pancake 7/16 Stud
SSP 2851	100	80	5	25	40		.40	40	110	700	TO-5
SSP 2852	100	80	5	15	20		.40	35	110	800	TO-5 7/16 Stud
SSP 2853	60	40	5	25	40		.40	40	110	700	
SSP 2854	60	40	5	50	100		.40	60	120	600	
SSP 2855	60	40	5	25	40		.40	40	110	700	
SSP 2856	60	40	5	15	20		.40	35	110	800	
5 Amp 15 Watt High Speed Switching				50mA	1A	5A	@ Ic = 1A 5A			
2N 5487	120	80	8	80	100	25	0.25 1.0	80	60	200	Low Profile TO-5
2N 5488	150	100	8	35	40	15	0.25 1.0	60	70	250	
2N 2850	100	80	5	25	40	—	0.25 —	60	70	250	Options:
2N 2851	100	80	5	25	40	—	0.40 —	60	70	250	Low Profile TO-5 7/16 Stud
2N 2852	100	80	5	15	20	—	0.40 —	40	80	250	TO-5
2N 2853	60	40	5	—	40	20	— 1.5	60	70	250	TO-5 7/16 Stud
2N 2854	60	40	5	50	100	—	0.40 —	80	60	200	
2N 2855	60	40	5	25	40	—	0.40 —	60	70	250	
2N 2856	60	40	5	15	20	—	0.40 —	40	80	250	
10 Amp 15 Watt Switching				1A	5A	10A	@ Ic = 10A			
2N 4150*	100	70	5	50	40	10	2.5	15	200	2000	TO-5
2N 5552	120	80	7	70	50	30	1.0	40	100	700	Option: TO-5 7/16 Stud
* This device has 15 Watt capability when packaged in SSPI exclusive RWTO5 package.											
High Voltage: 10 Amp 15 Watt Switching				0.5A	1A	3A	@ Ic= 3A			
2N 5666	250	200	6	40	40	15	0.4	40	150	800	TO-5
2N 5667	400	300	6	40	40	15	0.4	40	150	800	Option: TO-5 7/16 Stud
20 Amp High Power 30 Watt Type				0.5A	5A	10A	@ Ic = 10A			
2N 5658	120	80	7	40	50	30	1.0	40	150	700	TO-59
20 Amp High Power 30 Watt Type (Isolated Collector)				0.5A	5A	10A	@ Ic = 10A			
2N 5659	120	80	7	40	50	30	1.0	40	150	700	TO-111

Power

Type	Voltage ratings (Volts) Vces	Vceo (sust)	Vebo	Hfe min	Vce(sat) max Volts	Ft Typ	Switching Times Saturated Typ Ton nsec	Toff nsec	Package
5 Amp 20 Watt Power				0.5A	4A	5A	@ Ic = 4A		
2N 3878	120	50	7	50	20	—	2.0	60	—	—	TO-66
2N 3879	120	75	7	40	20	—	1.2	60	400	1200
SSP 3050	100	60	8	40	—	20	1.2	60	200	600
SSP 3051	120	80	8	40	—	20	1.0	60	150	400
5 Amp 30 Watt Power				1A	2A	5A	@ Ic = 2A	Td Tr	Ts Tf	
2N 3850	100	80	8	50	30	15	0.5	40	20 60	400 80	TO-59
2N 3851	100	80	8	30	20	12	0.5	30	20 60	400 80
2N 3852	60	40	8	50	30	15	0.5	40	20 60	400 80
2N 3853	60	40	8	30	20	12	0.5	30	20 60	400 80
5 Amp 30 Watt Power (Isolated Collector)				1A	2A	5A	@ Ic = 2A	Td Tr	Ts Tf	
SSP 3850	100	80	8	50	30	15	0.5	40	20 60	400 80	TO-111
SSP 3851	100	80	8	30	20	12	0.5	30	20 60	400 80
SSP 3852	60	40	8	50	30	15	0.5	40	20 60	400 80
SSP 3853	60	40	8	30	20	12	0.5	30	20 60	400 80
20 Amp High Power 30 Watt Type				0.5A	5A	10A	@ Ic = 10A			
2N 5658	120	80	7	40	50	30	1.0	40	150	700	TO-59
20 Amp 30 Watt Type (Isolated Collector)				0.5A	5A	10A	@ Ic = 10			
2N 5659	120	80	7	40	50	30	1.0	40	150	700	TO-111
20 Amp High Power 50 Watt Types				1A	5A	10A	@ Ic = 10A			
SSP 3200	120	80	7	40	45	25	1.0	60	150	900	TO-61 (11/16 Stud
SSP 3201	120	80	7	40	45	25	1.0	60	150	900	TO-61 Isolated Collector

Power (Cont.)

Type	Voltage ratings (Volts) Vces	Vceo (sust)	Vebo	Hfe min	Vce(sat) max Volts	Ft Typ	Switching Times Saturated Typ Ton nsec	Toff nsec	Package
30 Amp High Power 100 Watt Types				2A	10A	20A	@ Ic = 10A		
SSP 3300	100	80	8	40	40	20	0.5	50	400	1200	TO-63
SSP 3301	80	60	8	40	40	20	0.5	50	400	1200
30 Amp 150 Watt Power Type				2A	10A	20A	@ Ic = 10A			
SSP 3302	120	80	7	30	30	15	0.7	50	400	1200	TO-3
SSP 3303	100	60	7	30	30	15	0.7	50	400	1200

High Voltage Power and Power-Switching

Type	Voltage ratings (Volts) Vces	Vceo (sust)	Vebo	Hfe min	Vce(sat) max Volts	Ft Typ	Switching Times Saturated Typ Ton nsec	Toff nsec	Package
High Voltage 3 Amp 15 Watt Switching				50mA	0.5A	1A	@ Ic = 1A		
2N 5662	250	200	6	40	40	15	0.4	40	125	600	TO-5
2N 5663	400	300	6	40	40	15	0.4	40	125	600	Option: TO-5 7/16 S
High Voltage 3 Amp 20 Watt Power				50mA	0.5A	1A	@ Ic = 1A			
2N 5660	275	200	6	40	40	15	0.4	40	125	600	TO-66
2N 5661	400	300	6	40	40	15	0.4	40	125	600
High Voltage 10 Amp 15 Watt Switching				0.5A	1A	3A	@ Ic = 3A			
2N 5666	250	200	6	40	40	15	0.4	40	150	800	TO-5
2N 5667	400	300	6	40	40	15	0.4	40	150	800	Option: TO-5 7/16 S
High Voltage 10 Amp 30 Watt Power				0.5A	1A	3A	@ Ic = 3A			
2N 5664	250	200	6	40	40	15	0.4	40	150	800	TO-66
2N 5665	400	300	6	40	40	15	0.4	40	150	800

Special Purpose Devices

SCR's Gate Turn-off

Type	Vfx min Volts	Ifxm max µA	Igt max µA	Vgt max Volts	If max mA	Vf @ If max V A	Igq @ If max mA mA	
2N 892,3 2N 894,5 2N 896,7 2N 898,9 2N 890,1	15 30 60 100 200	100 @ 125°C	50	0.7	150 @ 75°C Ambient	1.2 @ 0.5	2.0 @ 4.0	T 8
CB 5020 CB 5021 CB 5022 CB 5023	30 60 100 200	100 @ 125°C	500	1.0	250 @ 75°C Ambient	2.0 @ 0.25	50 @ 250	T 8
CD 5000 CD 5001 CD 5002 CD 5003	30 60 100 200	50 @ 125°C	1000	1.0	1000 @ 25°C Ambient	2.0 @ 0.5	100 @ 500	T

Solid State AC Switch

Type	Vd min Volts	Idm max µA	Igt max mA	Vgt max Volts	Ihd max mA	Vt @ It max V A	It max RMS A	
PIC 100 PIC 102	200 400	200 @ 150°C	2.0	1.0	1.5	2.5 @ 1	0.8 @ 100°C Case	T
PIC 101 PIC 103	200 400	200 @ 150°C	5.0	1.0	2.0	2.5 @ 1		
PIC 110 PIC 111	175 350	200 @ 100°C	5.0	1.0	3.0	3.0 @ 1		
PIC 120 PIC 122	200 400	200 @ 150°C	2.0	1.0	1.5	2.5 @ 1	4.0 @ 100°C Case	T 11
PIC 121 PIC 123	200 400	200 @ 150°C	5.0	1.0	3.0	2.5 @ 1		
PIC 130 PIC 131	175 350	200 @ 100°C	5.0	1.0	3.0	3.0 @ 1		

Pulse Modulator Switches

Type	Vorm Vrrm Volts	Idrm Irrm max mA	Igt max mA	Ton @ If = 30A nsec. max	Tfbr nsec max	Packa
UCR 10	100	1, 2 @ 105°C	50	500	15	Miniat stud m or le mou
UCR 20	200			500		
UCR 30	300			500		
UCR 40	400			450		
UCR 50	500			450		
UCR 60	600			400		
UCR 70	700			350		
UCR 80	800			350		

Programmable Unijunction Transistors

Type	Vak, Vka Volts	Igao nA	Ip, Rg = 10K µA max	Vt, Rg = 10K Volts	Vf @ If = 50mA Volts max	Packa
ZC 1001	40	100 @ 75°C	5	0.2 — 0.6	1.5	Modif TO-1
ZC 1002			1	0.2 — 0.6		

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NITRODE

Zener Diode Replacement List of Popular Jedec Types

Unitrode zener diodes have electrical characteristics equal to or superior to industry 1N types they replace. Generally, Unitrode types are much smaller in size and have a greater capacity than industry 1N types.

INDUSTRY TYPE		UNITRODE TYPE
500 mw		
1N5235 thru 1N5281		UZ3235 thru UZ3281
1 watt		
1N3016 thru 1N3051		UZ3016 thru UZ3051
1N4736 thru 1N4764		1N4736 thru 1N4764

NOTES

Voltage Tolerance

Category 1 — No suffix = ± 10%
Suffix A = ± 5%

Category 2 — No suffix = ± 20%
Suffix A = ± 10%
Suffix B = ± 5%

INDUSTRY TYPE		UNITRODE TYPE
5 watt		
1N5342 thru 1N5389		UZ3342 thru UZ3389
10 watt		
1N2970 thru 1N3015		UZ3470 thru UZ3515
	Category 1 Types: 1N4736 — 1N4764 Category 2 Types: 1N5235 — 1N5281 UZ3235 — UZ3281	
	1N3016 — 1N3051 UZ3016 — UZ3051	
	1N5342 — 1N5389 UZ3342 — UZ3389	
	1N2970 — 1N3015 UZ3470 — UZ3515	

ADDITIONAL THYRISTOR & TRANSISTOR PRODUCT LISTING

(for types not recommended for new design)

SCR's

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 2876 2N 2877 2N 2878 2N 2879 2N 2880 2N 2881 2N 2882 2N 2883	15 30 60 100 150 200 300 400	200	TO-18
2N 2884 2N 2885 2N 2886 2N 2887 2N 2888 2N 2889 2N 2890 2N 2891	15 30 60 100 150 200 300 400	20	TO-18
2N 2946 2N 2947 2N 2954 2N 2955	30 60 100 200	20	TO-18
2N 2154 2N 2156 2N 2158 2N 2159 2N 2160	50 100 200 300 400	10mA	TO-5
2N 2160 2N 2161 2N 2162 2N 2163 2N 2164 2N 2165 2N 2166 2N 2167	15 30 60 100 150 200	20	TO-9
2N 2168 2N 2169 2N 2170 2N 2171 2N 2172 2N 2173 2N 2174 2N 2175	30 60 100 150 200	2mA	TO-9
2N 2176 2N 2177 2N 2178 2N 2179 2N 2180 2N 2181 2N 2182 2N 2183	25 60 100 200 300 400	200	TO-5
2N 2184 2N 2185 2N 2186 2N 2187 2N 2188 2N 2189	25 50 100 150 200	20	TO-5

SCR's cont.

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 2679 2N 2680 2N 2681 2N 2682	30 60 100 200	20	TO-18
2N 2683 2N 2684 2N 2685 2N 2686	30 60 100 200	20	TO-18
2N 2687 2N 2688 2N 2689 2N 2690	30 60 100 200	200	TO-18
2N 3001 2N 3002 2N 3003 2N 3004	30 60 100 200	20	TO-18
2N 3005 2N 3006 2N 3007 2N 3008	30 60 100 200	200	TO-18
2N 3254 2N 3255 2N 3256	15 30 60	20	TO-46
2N 3257 2N 3258 2N 3259	15 30 60	200	TO-46
2N 3273 2N 3274 2N 3275 2N 3276	100 200 300 400	200	TO-5
2N 3555 2N 3556 2N 3557 2N 3558	30 60 100 200	20	TO-5
2N 3559 2N 3560 2N 3561 2N 3562	30 60 100 200	200	TO-5
2N 4096 2N 4097	60 100	200	TO-46
2N 4108 2N 4109 2N 4110	50 100 200	200	TO-18
2N 4144 2N 4145	15 30		

SCR's cont.

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 4146 2N 4147 2N 4148 2N 4149	60 100 150 200	200	TO-52
2N 4212 2N 4213 2N 4214 2N 4215 2N 4216 2N 4217 2N 4218 2N 4219	25 50 100 150 200 250 300 400	50	TO-5

Transistors

Type No	BVceo	Ic	Package
2N 1208 2N 1209 2N 1212	60 45 60	2	TO-61
2N 1647 2N 1648 2N 1649 2N 1650	60 80 60 80	5	TO-59
2N 1714 2N 1715 2N 1716 2N 1717	60 100 60 100	2	TO-5
2N 1718 2N 1719 2N 1720 2N 1721	60 100 60 100	2	TO-5
2N 1724 2N 1724A 2N 1725	80 120 80	5	TO-61
2N 1886 2N 2150 2N 2151	60 80 80	5	TO-59
2N 2657 2N 2658	50 70	5	TO-5
2N 2811 2N 2812 2N 2813 2N 2814	50 50 70 70	20	TO-61
2N 2828 2N 2829	60 60	5	TO-59

Transistors cont.

Type No	BVceo	Ic	Package
2N 2858 2N 2859	80 100	5	TO-5
2N 2877 2N 2878 2N 2879 2N 2880	50 50 70 70	5	TO-59
2N 2890 2N 2891	80 80	5	TO-5
2N 2892 2N 2893	80 80	5	TO-59
2N 2995	50	5	TO-5
2N 3418 2N 3419 2N 3420 2N 3421 2N 3469	60 80 60 80 20	5	TO-5
2N 3487 2N 3488 2N 3489	60 80 100	10	TO-61
2N 3490 2N 3491 2N 3492	60 80 100	15	TO-61
2N 3744	30	5	TO-111
2N 3745 2N 3746 2N 3747 2N 3748 2N 3749 2N 3750 2N 3751 2N 3752	50 70 30 50 70 30 50 70	5	TO-111
2N 3996 2N 3997	90 80	5	TO-111
2N 3998 2N 3999	80 80	5	TO-59
2N 4000 2N 4001	80 100	3	TO-5
2N 4002 2N 4003	80 100	30	TO-63
2N 4075 2N 4076	80 80	5	TO-111
2N 4300	80	2	TO-5
2N 4301	80	10	TO-61
2N 5038 2N 5039	90 75	30 30	TO-3 TO-3
2N 5085	80	10	TO-111

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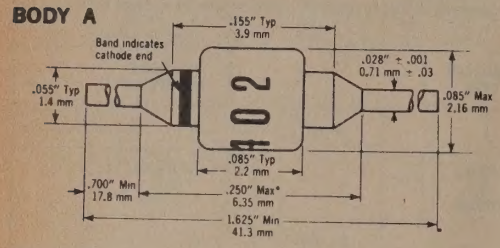
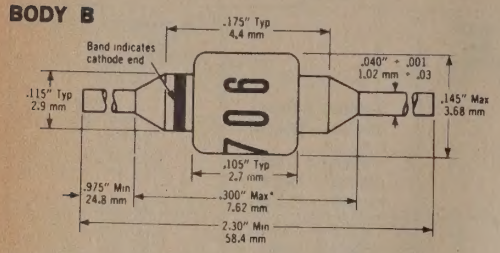
UNITRODE

Rectifier, Zener Diode & Assembly Outline Drawings

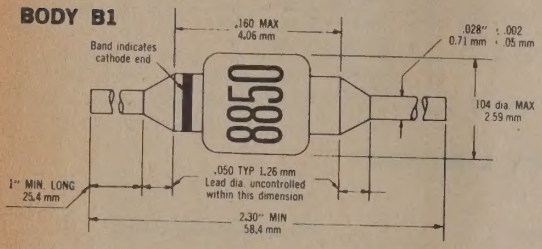
BODY A



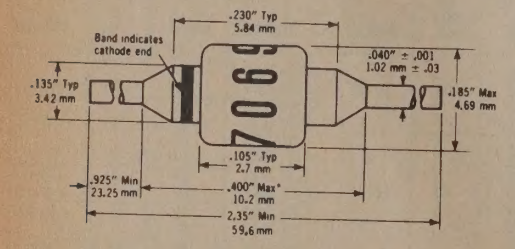
BODY B

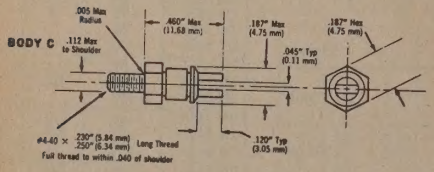


BODY B1

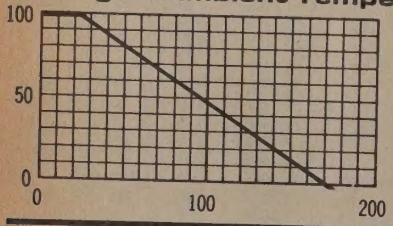


BODY C — Leaded Mount





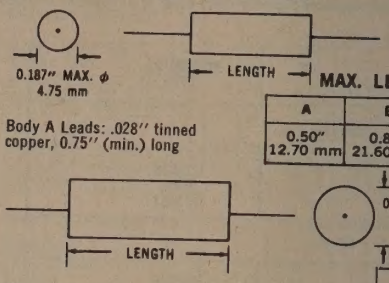
Rating vs Ambient Temperature



Lead Information

Standard diodes are supplied with "Fine" grade solid silver leads for maximum solderability. For welding or other applications, consult your Unitrode representative for optimum lead material. Tinned copper, nickel clad silver (gold plated), and nickel (gold plated) are denoted by the following suffix letters:

High Voltage Stacks



Body A Leads: .028" tinned copper, 0.75" (min.) long

MAX. LENGTHS

A	B	C
0.50" 12.70 mm	0.85" 21.60 mm	1.125" 28.60 mm

Body B three E leads: .028" tinned copper, 1.25" (min.) long.

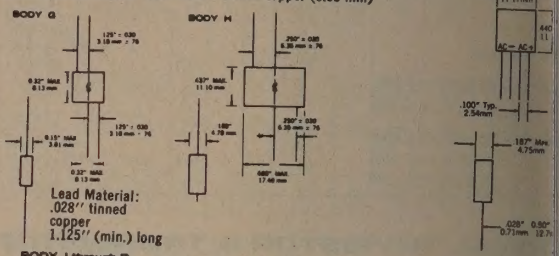
MAX. LENGTHS

D	E
0.625" 18.88 mm	1.0" 25.40 mm

High Voltage Bridges

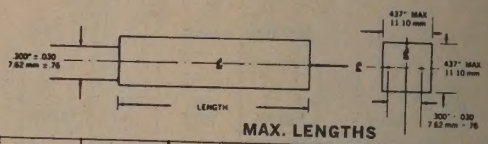
Lead Material Body G .028" diam. tinned copper (0.58 mm)

Lead Length 1.25" min. (31.



BODY J through P

Body H through P .032" diam. tinned copper (0.81 mm)



MAX. LENGTHS

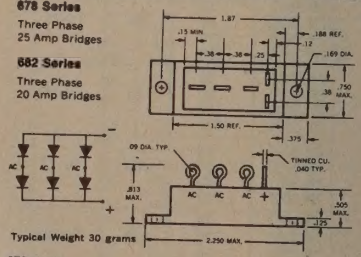
J	K	L	M	N	O
.562" 14.27 mm	.688" 17.48 mm	.875" 22.23 mm	1.125" 28.58 mm	1.25" 31.75 mm	1.375" 34.92 mm

Magnum High Current Rectifier Assemb

TERMINALS — Wire-loop terminals are standard. Turret terminals available on special order.

678 Series
Three Phase
25 Amp Bridges

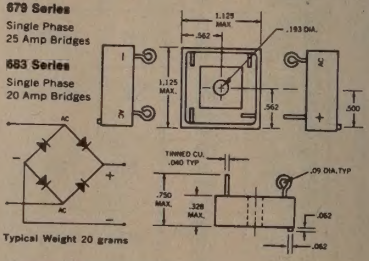
682 Series
Three Phase
20 Amp Bridges



Typical Weight 30 grams

679 Series
Single Phase
25 Amp Bridges

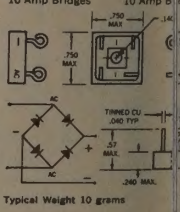
683 Series
Single Phase
20 Amp Bridges



Typical Weight 20 grams

680 Series
Single Phase
10 Amp Bridges

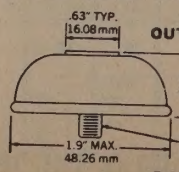
684 Serie
Single Pha
10 Amp B



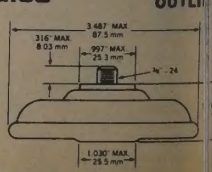
Typical Weight 10 grams

Doorbell® Rectifier Modules

OUTLINE D



OUTLI



Polarity — Cathode connected to base

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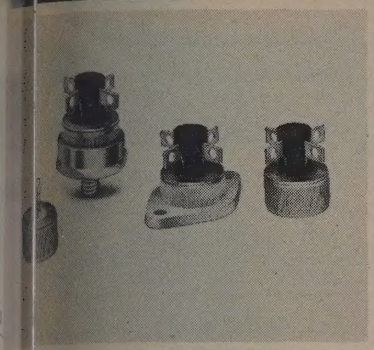
IBR® SILICON AVALANCHE INTEGRATED RECTIFIERS

FOR 140 V., 280 V. AND 400 V. RMS OPERATION. 250, 450 AND 650 V. MINIMUM AVALANCHE VOLTAGE



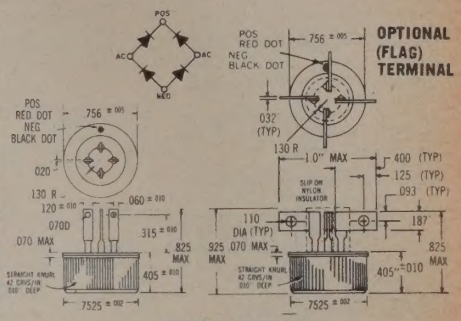
The 1N4436 series Integrated Bridge Rectifiers offer single-phase full-wave rectification* in rigidly constructed, welded packages. The electrically insulated grooved packages offer minimum size and maximum ease in mounting installation.

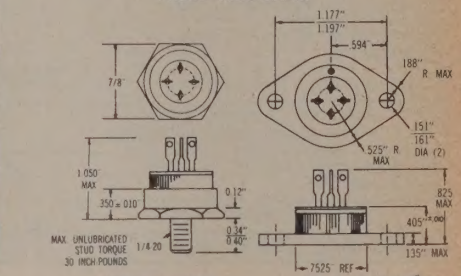
The specified minimum and maximum avalanche voltage characteristics of the devices permit selection of decreased PRV safety factors in equipment design without greatly reduced transient voltage vulnerability. The Controlled Avalanche characteristic insures that the avalanche voltage occurs below the point where in conventional rectifiers the junction perimeter is degraded or destroyed under transient overvoltage conditions. The avalanche of the internal junction occurs across the entire junction area rather than at the edge of the rectifier die.

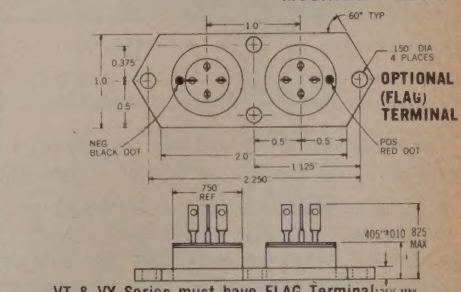
Proper heat sinking of the 1N4436 series allows great flexibility in DC output current range. This feature, coupled with the electrically insulated case (insulation strength of 2000 volts minimum) allows the IBR® to be used in many applications where space, current, and cost requirements have not allowed the application of semiconductors. *Also available in all common rectifier circuits.

MAXIMUM RATINGS t Case Temperatures	Symbol	Unit	Device Types (See Pt. Nos. Page 1970)							
			10 AMP				10 AMP — Fast Recovery Time			
			200V	400V	600V	Circuit	100V	200V	400V	Circuit
ng Peak Reverse Voltage Receptive Voltage cking Voltage*	V_{RM} (wkg) V_{RM} (rep) V_R	Volt	200 250	400 450	600 650	All	100	200	400	All
petitive Peak Reverse e (Single Phase 60Hz half wave)	V_{RM} (nonrep)	Volt				All	120	240	480	All
everse Voltage	$V_{R(RMS)}$	Volt	140	280	400	All	·70	140	280	All
e Rectified Output t (Single Phase Resistive 60Hz at $T_c = -65°$ to °C)*	I_O	Amps	10(Full Wave)				10 (Full Wave)			
		Amps/Leg	5 (Half Wave)				5 (Half Wave)			
petitive Peak Surge t	I_{FM} (surge)	Amps/Leg		100		All	75			All
Surge Current, 1 Sec at and $T_C = 50°C$ (Nonrep).	$I_{F(RMS)}$	Amps/Leg		21		All	18			All
ting and Storage Junction rature Range	T_J T_{STG}	°C	−65 to +160			All	−65 to +150			All
Dissipation in $V_{(BR)}$ for 100μsec., Square at $T_C = 25°C$	P_{RM}	Watt	600			All	NA			
uous Power Dissipation (R) Region at $T_C = 50°C$	P_R	Watt	4			All	NA			
TRICAL CHARACTERISTICS at $T_C = 25°C$ (Unless Otherwise Specified)										
um Avalanche Voltage	$V_{(BR)}$	Volt	250	450	650	All				
um Avalanche Voltage	$V_{(BR)}$	Volt	500	700	900	All				
um Reverse Current ted V_{RM} (wkg) and T_c 100°C	I_R	mA	0.2	0.2	0.2	All	5			All
um Forward Voltage Amps (Instantaneous)	V_{FM}	Volts/Leg	1.2			All	1.5			ALL
tion Strength from t-to-Case		VDC	2000 (Min.)			All	2000 (Min.)			All
CHING CHARACTERISTICS at $T_C = 25°C$ (Unless Otherwise Specified)										
se Recovery Time at 1 Amp, I_R = 2 Amps um	t_{rr}	Nanosec	NA			NA	200 Max.			All
MAL CHARACTERISTICS										
al Resistance, on to Case	θ_{J-C}	°C/Watt	3 (Full Wave Bridge)			All	3 (Full Wave Bridge)			

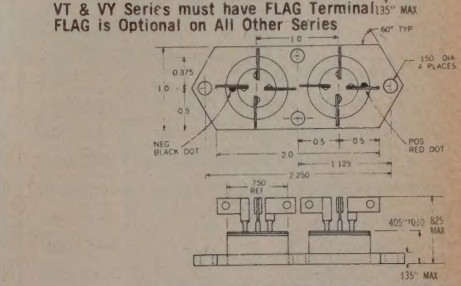
Temperature (T_C) is measured on the bottom of the case within 0.125″ of center.







VT & VY Series must have FLAG Terminal
FLAG is Optional on All Other Series



THREE PHASE FULL WAVE BRIDGE

All Dimensions in Inches

VARO

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IBR® SILICON AVALANCHE INTEGRATED RECTIFIE

FOR 140 V., 280 V. AND 400 V. RMS OPERATION. 250, 450 AND 650 V. MINIMUM AVALANCHE VOLTA

MAXIMUM RATINGS at Case Temperatures	Symbol	SERIES VT 25 Amp Silicon Avalanche Integrated Rectifiers					SERIES VY 25 Amp Fast Recovery Time Integrated			
		Unit	200V	400V	600V	Circuit	100V	200V	400V	C
Working Peak Reverse Voltage Peak Receptive Voltage DC Blocking Voltage	$V_{RM}^{(wkg)}$ $V_{RM}^{(rep)}$ V_R	Volt	200	400	600	All	100	200	400	
Nonrepetitive Peak Reverse Voltage (Single Phase 60Hz Peak, half wave)	$V_{RM}^{(nonrep)}$	Volt	240	480	720	All	120	240	480	
RMS Reverse Voltage	$V_{R(RMS)}$	Volt	140	280	400	All	70	140	280	
Average Rectified Output Current (Single Phase, Resistive Load 60Hz at $T_C = -65°C$ to $+100°C$)	I_O	Amps	25 (Full Wave)			See Circuit Diagrams	25 (Full Wave)			
		Amps	12.5 (Half Wave)				12.5 (Half Wave)			
Nonrepetitive Peak Surge Current	$I_{FM}^{(surge)}$	Amp/Leg	250			All	(½ Cycle) 150			
Operating and Storage Junction Temperature Range	T_J T_{STG}	°C	−65 to +180			All	−65 to +150			
Power Dissipation in $V_{(BR)}$ Region for 100μsec., Square Wave	P_{RM}	Watt	1500			All	N/A			
Continuous Power Dissipation in $V_{(BR)}$ Region at $T_C = 50°C$	P_R	Watt	4			All	N/A			
ELECTRICAL CHARACTERISTICS at $T_C = 25°C$ (Unless Otherwise Specified)										
Minimum Avalanche Voltage	$V_{(BR)}$	Volt	250	450	650	All	N/A			
Maximum Avalanche Voltage	$V_{(BR)}$	Volt	700	900	1100	All	N/A			
Reverse Current at Rated $V_{RM}^{(wkg)}$	I_R	mA/Leg	5 ($T_C = 180°C$)				5 ($T_C = 100°C$)			
Forward Voltage Drop at 25 Amps (Instantaneous)	V_{FM}	Volts/Leg	1.5				1.8			
Insulation Strength from Circuit-to-Case		VDC	2000 (Min.)				2000 (Min.)			
SWITCHING CHARACTERISTICS at $T_C = 25°C$ (Unless Otherwise Specified)										
Reverse Recovery Time at $I_F = 1$ Amp, $I_R = 2$ Amps Max.	t_{rr}	Nanosec	N/A				200			
THERMAL CHARACTERISTICS										
Thermal Resistance, Junction-to-Case	θ_{J-C}	°C/W	1 (Full Wave Bridge)				1 (Full Wave Bridge)			

PART NUMBER SELECTION CHARTS

10 Amp Full Wave Bridge Series	Voltage
1N4436	200 Volts
1N4437	400 Volts
1N4438	600 Volts

10 Amp Series	Type	200V	400
45527	Center Tap Common Cathode	45527-200	45527-0
45528	Center Tap Common Anode	45528-200	45528-0
45536	Doubler	45536-200	45536-0
45520	Three Phase Common Cathode	45520-200	45520-0
45521	Three Phase Common Anode	45521-200	45521-0
45524	Three Phase* Full Wave Bridge	45524-200	45524-0

DEVICES HAVE STANDARD TERMINALS AS SHOWN ON PAGE 1. TO ORDER OPTIONAL TERMINALS OR MOUNTS:

- FLAG TERMINALS: ADD /F TO PART NO.
- TO-3 MOUNT: ADD /T TO PART NO.
- SINGLE STUD MOUNT: ADD /S TO PART NO.

Fig*	Type	10 AMP. Fast Recovery			25 AMP.			25 AMP. Fast Recover		
		100V	200V	400V	200V	400V	600V	100V	200V	4 V
—	Full Wave Bridge	VR 100X	VR 200X	VR 400X	VT 200	VT 400	VT 600	VY 100X	VY 200X	VY
A	Center Tap Common Cathode	VRA100X	VRA200X	VRA400X	VTA200	VTA400	VTA600	VYA100X	VYA200X	VY
B	Center Tap Common Anode	VRB100X	VRB200X	VRB400X	VTB200	VTB400	VTB600	VYB100X	VYB200X	VYE
C	Three Phase Common Cathode	VRC100X	VRC200X	VRC400X	VTC200	VTC400	VTC600	VYC100X	VYC200X	VYC
D	Three Phase Common Anode	VRD100X	VRD200X	VRD400X	VTD200	VTD400	VTD600	VYD100X	VYD200X	VYD
E	Doubler	VRE100X	VRE200X	VRE400X	VTE200	VTE400	VTE600	VYE100X	VYE200X	VYE
F	Tripler	VRF100X	VRF200X	VRF400X	VTF200	VTF400	VTF600	VYF100X	VYF200X	VYF
G	Quadrupler	VRG100X	VRG200X	VRG400X	VTG200	VTG400	VTG600	VYG100X	VYG200X	VYG
H	Three Phase, Full Wave Bridge	VRH100X	VRH200X	VRH400X	VTH200	VTH400	VTH600	VYH100X	VYH200X	VYH

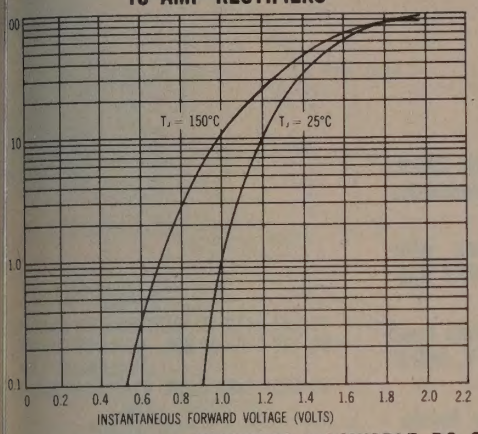
See Circuit Diagrams, Page 1971

BR® SILICON AVALANCHE INTEGRATED RECTIFIERS

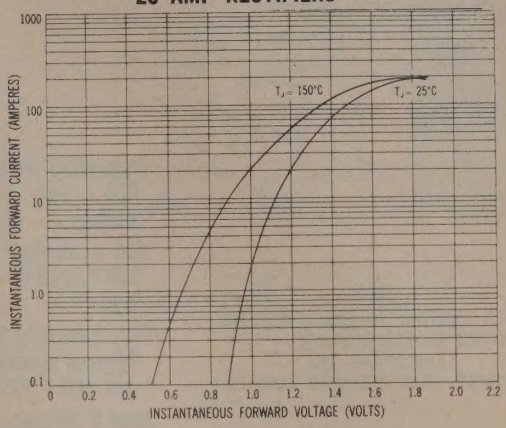
FOR 140 V., 280 V. AND 400 V. RMS OPERATION. 250, 450 AND 650 V. MINIMUM AVALANCHE VOLTAGE

TYPICAL FORWARD VOLTAGE DROP VS FORWARD CURRENT AT VARIOUS TEMPERATURES (PER LEG OF BRIDGE)

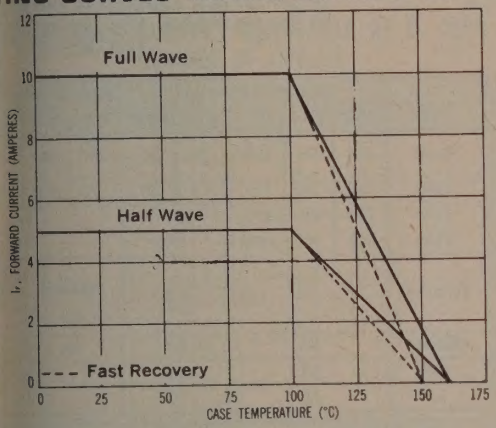
10 AMP RECTIFIERS

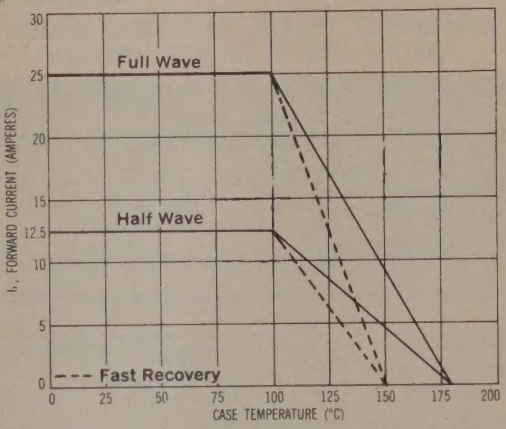


25 AMP RECTIFIERS



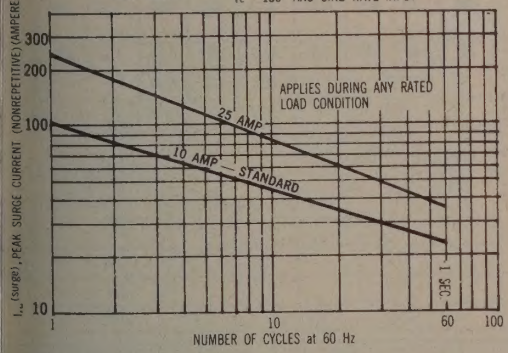
DERATING CURVES MAXIMUM ALLOWABLE DC OUTPUT CURRENT



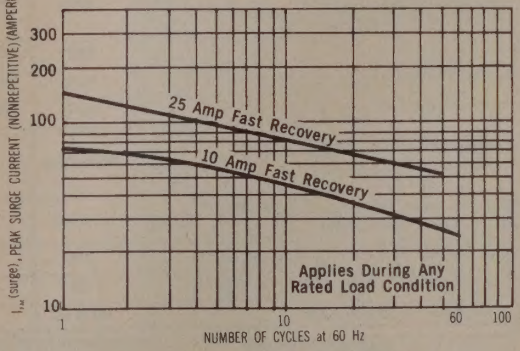


PEAK SURGE CURRENT (PER LEG)

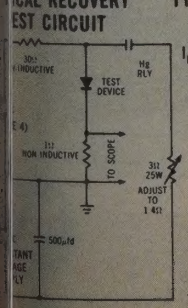
10 AMP PEAK FORWARD CURRENT VS NUMBER OF CYCLES T_C = 100° AND SINE WAVE INPUT



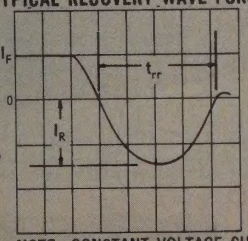
25 AMP



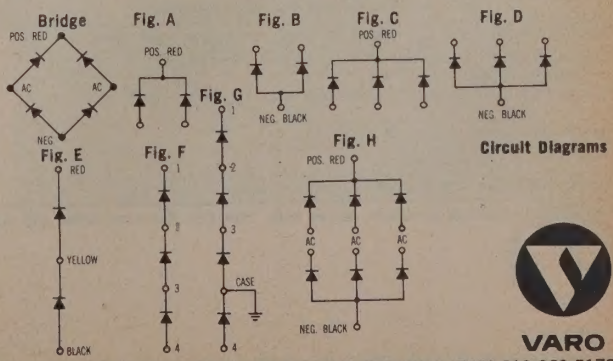
TYPICAL RECOVERY TEST CIRCUIT



TYPICAL RECOVERY WAVE FORM



NOTE: CONSTANT VOLTAGE SUPPLY. HAS OUTPUT IMPEDANCE (Z_{out}) ≤½Ω MAX. DC TO 2KC, AND IS ADJUSTED FOR I_F = 1 AMP



Circuit Diagrams

VARO

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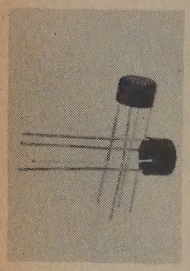
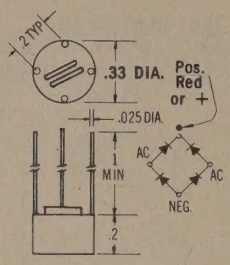
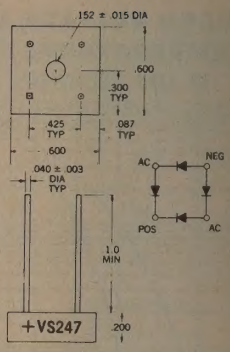
EBR EPOXY BRIDGE RECTIFIERS

1 AMP, 2 AMP, 6 AMP







Controlled Avalanche Series with 250 V, 450 V and 650 V Minimum Avalanche Ratings.

Non-controlled Avalanche Series with 100 V, 200 V, 400 V and 600 V PRV Ratings.

Fast Recovery Series with 200 Nano Sec. Reverse Recovery Time in 100 V, 200 V and 400 V PRV Ratings.

2000 V Minimum Circuit to Case Insulation. (2 Amp. & 6 Amp Only)

1 AMP

VE 27-47-67: CONTROLLED AVALANCHE EBR
VE 18-28-48-68: NON-CONTROLLED AVALANCHE EBR
VE 18X-28X-48X: FAST RECOVERY TIME EBR

2 AMP

VS 247-447-647: CONTROLLED AVALANC
VS 148-248-448-648: NON-CONTROLLED AVALANCHE EBR
VS 148X-248X-448X: FAST CONTROLLED EBR

6 AMP

VH 247-447-647: CONTROLLED AVALANC
VH 148-248-448-648: NON-CONTROLLED AVALANCHE EBR

ELECTRICAL CHARACTERISTICS at T_A = 25°C (Unless Otherwise Specified)		Controlled Avalanche					Non-Controlled A		
Series Number	Units	VE27	VE47	VE67	W110	W111	VE18	VE28	VE
DC Blocking Voltage, V_R — Working Peak Reverse Voltage, $V_{RM}^{(wkg)}$ Peak Repetitive Reverse Voltage, $V_{RM}^{(rep)}$	Volts	200	400	600	25	50	100	200	40
Working Voltage, $V_{R(RMS)}$ Max.	Volts	140	280	420	17	35	70	140	28
Minimum Avalanche Voltage, $V_{(BR)}$	Volts	250	450	650	NA		NA		
Maximum Avalanche Voltage, $V_{(BR)}$	Volts	700	900	1100	NA		NA		
Maximum Instantaneous Forward Voltage Drop (per diode) at 1 Amp (INST.) V_{FM}	Volts/Leg	1.2			1.2		Standard		R
							1.2		5
Maximum Reverse Recovery Time, t_{rr} at I_F = 1A, $I_{(RM)}$ = 2A (See circuit, reverse side)	nano sec.	NA			NA		NA		0
Maximum Reverse Current at Rated V_R at T_A = 150°C, $I_{R(AV)}$	mA	10			10		10		
Maximum DC Reverse Current at V_R and T_A = 40°C, I_R	μA	10			10		10		

ELECTRICAL CHARACTERISTICS at T_A = 25°C (Unless Otherwise Specified)		Controlled Avalanche			Non-Controlled Avalanche				Controlled Avalanche			Non-Contro Avalanch		
Series Number	Units	VS247	VS447	VS647	VS148	VS248	VS448	VS648	VH247	VH447	VH647	VH148	VH248	VH4
DC Blocking Voltage, V_R Working Peak Reverse Voltage, $V_{RM}^{(wkg)}$ Peak Repetitive Reverse Voltage, $V_{RM}^{(rep)}$	Volts	200	400	600	100	200	400	600	200	400	600	100	200	40
Working Voltage, $V_{R(RMS)}$ Max.	Volts	140	280	420	70	140	280	420	140	280	420	70	140	28
Minimum Avalanche Voltage, $V_{(BR)}$	Volts	250	450	650	NA				250	450	650	NA		
Maximum Avalanche Voltage, $V_{(BR)}$	Volts	700	900	1100	NA				700	900	1100	NA		
Maximum Instantaneous Forward Voltage Drop (per diode) at 2 Amps (INST.) V_{FM}	Volts/Leg	1.2			Standard		Fast Recovery		1.2					
					1.2		1.5*							
Maximum Reverse Recovery Time, t_{rr} at I_F = 1A, $I_{(RM)}$ = 2A (See circuit, reverse side)	nano sec.	NA			NA		200*		NA					
Maximum Reverse Current at Rated V_R at T_A = 150°C, $I_{R(AV)}$	mA	10			10				10					
Maximum DC Reverse Current at V_R and T_A = 40°C, I_R	μA	10			10				10					
Insulation Strength from Circuit to Case	Volts DC	2000			2000				2000					

MAXIMUM RATINGS (at T_A = 25°C (Unless Otherwise Specified)	Units	Series VE & W	VS247-447 VS647	VS148-248 VS448-648	VH247-447 647	VH1 44
Power Dissipation in $V_{(BR)}$ Region for 100μsec., Square Wave (Note 1)	Watts	200 Max.	300	NA	400	
Continuous Power Dissipation in $V_{(BR)}$ Region (Note 1)	Watts	1	1	NA	2	
Peak One-Cycle Surge Current (Non-recurrent), $I_{FM}^{(surge)}$ @ 60 Hz	Amps	25	Standard	Fast Recovery	100	
			50	35*		
Peak Surge Current, 1 sec. @ 60 Hz	Amps	4	8	6*	25	
Average DC Forward Current, I_O	Amps DC	1	2		6	
Junction Operating and Storage Temperature Range, T_J and T_{STG}	°C	−50 to +150	−50 to +150		−50 to +15	

Note 1: For Controlled Avalanche Series Only. *For Fast Recovery Series add Suffix "X" (Example — VS148X) Fast Recovery 600V Not Available.

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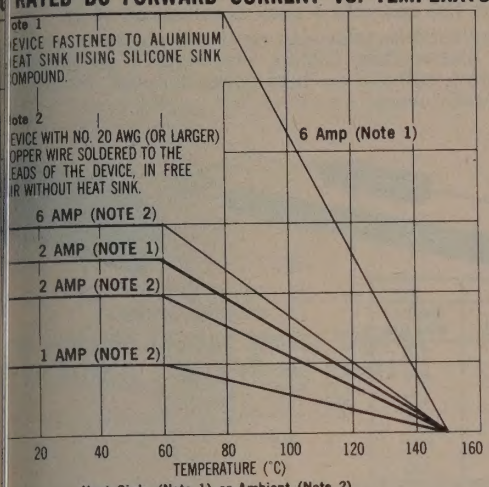
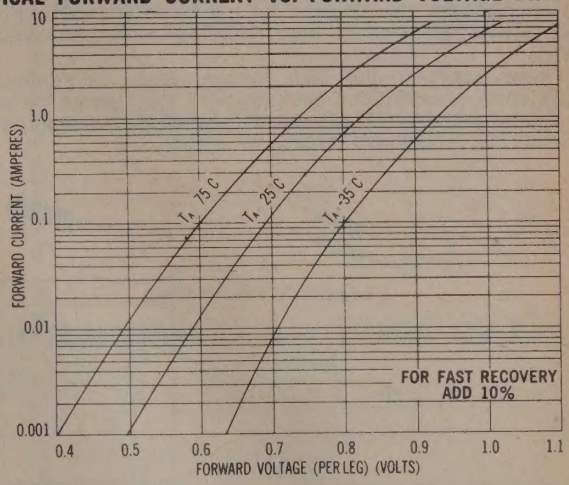
BR EPOXY BRIDGE RECTIFIERS

1 AMP, 2 AMP, 6 AMP

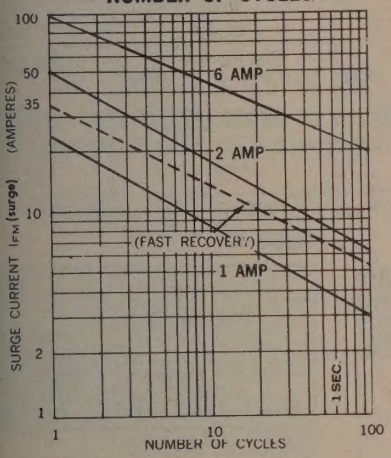
RATED DC FORWARD CURRENT VS. TEMPERATURE



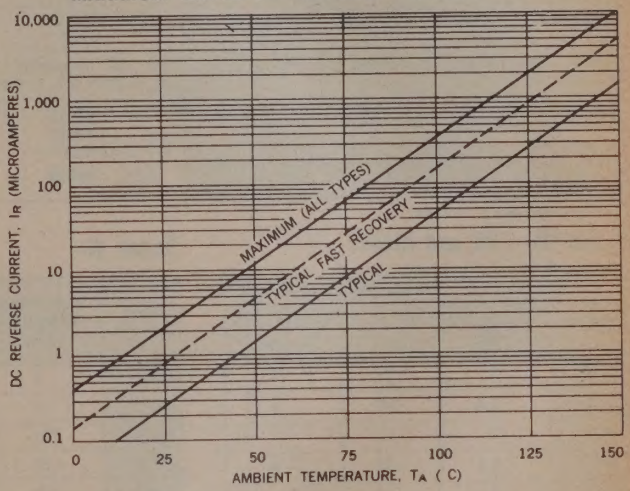
TYPICAL FORWARD CURRENT VS. FORWARD VOLTAGE DROP

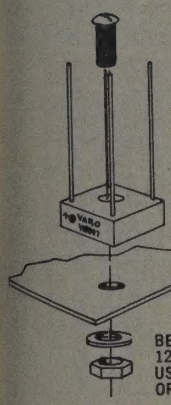


MUM SURGE CURRENT ALLOWABLE AT T_A 25°C VS. NUMBER OF CYCLES



DC REVERSE CURRENT VS. AMBIENT TEMPERATURE AT MAXIMUM RATED DC REVERSE VOLTAGE



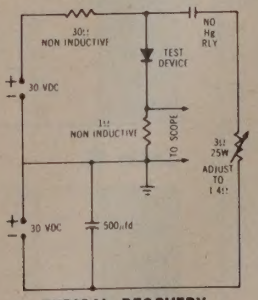


FOR 6 AMP ONLY

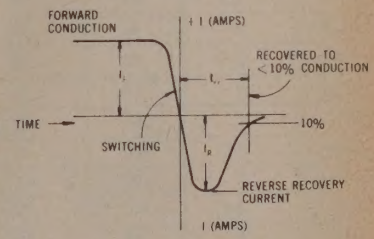
TYPICAL MOUNTING DEVICE FASTENED TO ALUMINUM HEAT SINK

SILICONE GREASE

BELLEVILLE SPRING WASHER 12-15 INCH-POUND TORQUE USING 6-32 UNC-2A THREAD OR EQUIVALENT



TYPICAL RECOVERY TEST CIRCUIT



RECOVERY WAVE FORM

VARO

SEMICONDUCTOR DIVISION, VARO INC. P.O. BOX 676, 1000 NORTH SHILOH, GARLAND, TEXAS 75040, (214) 272-4551, TWX 910-860-5178

HIGH VOLTAGE DIFFUSED SILICON POWER RECTIFIERS

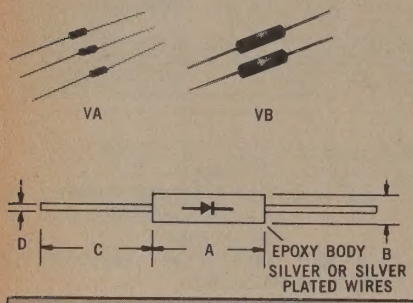
SERIES VA • VB • IN4441 • VC • VF • VG

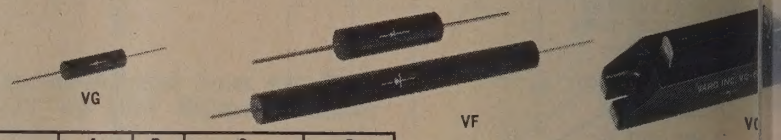
Varo high voltage and high voltage fast recovery time diffused silicon rectifiers are designed for industrial and commercial applications that require high reliability at an economical cost.

These rectifiers offer high voltage ranges in minimum-sized, epoxy-encapsulated packages with low leakage current. All ratings are obtained without the use of special heat sinks or mounting techniques (except VC Series).

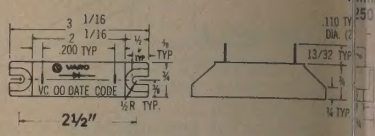
They are designed to withstand 500 G's shock and vibration of 100 cps with a peak acceleration of 10 G's.

Applications: television receivers, electrostatic power supplies, electrostatic copiers, electrostatic air filters and precipitators, cathode ray tube power supplies, transmitters, microwave ovens.





Case Style	A Pkg. Length	B Dia.	C Min. Wire Length	D Nominal Wire Dia.
VA	.150	.060	.400	.010
VB	.400	.100	.400	.020
VF (A)	1.000	.250	1.500	.032
(B)	2.000	.300	1.500	.032
(C)	3.000	.300	1.500	.032
VG	.600	.160	.400	.020



ELECTRICAL CHARACTERISTICS (at T_A = 25°C Unless Otherwise Specified)	Series VA & VB and 1N4441	Series VF	Series VG	Series VC & VC*
Max. DC Reverse Current @ PIV and 25°C, I_R	.05μA / 0.3μA*	1μA	1μA	1μA / 2μA*
Max. DC Reverse Current @ PIV and 100°C / 85°C*, I_R	5.0μA / 60μA*	40μA / 60μA*	40μA / 60μA*	10μA / 20μA*
Max. Reverse Recovery Time, t_{rr}, Recovery to 1.0mA	250 nanosec* (I_F = 2mA & I_R = 4mA)	250 nanosec* (I_F = 2mA & I_R = 4mA)	250 nanosec* (I_F = 2mA & I_R = 4mA)	300 nanosec (I_F = 1A & I_R = A)
Ambient Operating Temperature Range, T_A	+150°C / +85°C*	−55°C to +150°C / +85°C*	−55°C to +150°C / +85°C*	−50°C to +125°C
Max. One-Half Cycle Surge Current, I_{FM} (Surge) @ 60 Hz	3 Amps	3 Amps	3 Amps	50 Amps / 35 Amps*

*Fast Recovery Series

VC Series Insulation Strength, Terminal to Heat Sink = 10.00

Series VA • VB and IN4441

VARO Type No.	Peak Inverse Voltage PIV (KV)	Avg. Fwd. Current I_O at 40°C (mA)	Max. Fwd. Voltage Drop at 25°C and I_O V_F (volts)
VA10	1	50	4
VA15	1.5	50	4
VA20	2	50	4
VA25	2.5	50	4
VA30	3	25	6
VA35	3.5	25	6
VA10X	1	40	6
VA15X	1.5	40	6
VA20X	2	40	6
VA25X	2.5	20	8
VA30X	3	20	8
VB10	1	100	5
VB15	1.5	100	5
VB20	2	100	5
VB25	2.5	100	5
VB30	3	50	10
VB40	4	50	10
VB50	5	50	10
VB60	6	50	10
VB10X	1	50	6
VB15X	1.5	50	6
VB20X	2	50	6
VB25X	2.5	25	12
VB30X	3	25	12
VB40X	4	25	12
VB50X	5	25	12
1N4441*	1.5	25	4

Series VG

VARO Type No.	Peak Inverse Voltage PIV (KV)	Avg. Fwd. Current I_O at 40°C (mA)	Max. Fwd. Voltage Drop at 25°C and I_O V_F (volts)
VG5	5	15mA	12
VG7	7	15	14
VG10	10	15	20
VG12	12	10	24
VG15	15	10	30
VG20	20	10	40
VG5X	5	10	14
VG7X	7	10	16
VG10X	10	10	24
VG12X	12	5	30
VG15X	15	5	36
VG20X	20	5	50

Series VC

VC20	2	2A	4
VC30	3	2	4
VC40	4	2	4
VC50	5	1.5	6
VC60	6	1.5	6
VC70	7	1.5	8
VC80	8	1	8
VC20X	2	2	4.8
VC30X	3	2	7.2
VC40X	4	2	9.6
VC50X	5	1.5	12.0
VC60X	6	1.5	14.4
VC70X	7	1.5	14.4
VC80X	8	1	16.8

Series VF

VARO Type No.			Peak Inverse Voltage, PIV (KV)	Max. Fwd. Voltage Drop at 25° and I_O V_F (Volts)
Avg. Fwd. Current, I_O at 40°C				
5mA	10mA	25mA		
VF5- 5	VF10-5	VF25-5	5	12
VF5- 7	VF10-7	VF25-7	7	12
VF5-10	VF10-10	VF25-10	10	18
VF5-12	VF10-12	VF25-12	12	18
VF5-15	VF10-15	VF25-15	15	35
VF5-20	VF10-20	VF25-20	20	35
VF5-25	VF10-25	VF25-25	25	35
VF5-30	VF10-30	VF25-30	30	50
VF5-40	VF10-40	VF25-40	40	50
VF5- 5X	VF10- 5X	VF25- 5X	5	15
VF5- 7X	VF10- 7X	VF25- 7X	7	15
VF5-10X	VF10-10X	VF25-10X	10	30
VF5-12X	VF10-12X	VF25-12X	12	30
VF5-15X	VF10-15X	VF25-15X	15	60
VF5-20X	VF10-20X	VF25-20X	20	60
VF5-25X	VF10-25X	VF25-25X	25	60
VF5-30X	VF10-30X	VF25-30X	30	90
VF5-40X	VF10-40X	VF25-40X	40	90

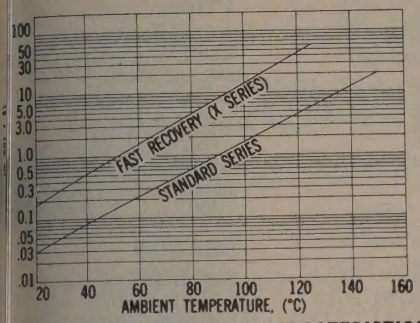
NOTES:

1. Suffix (X) denotes Fast Recovery Series.
2. Maximum lead and terminal temperature for soldering, ⅜ inch from case, 5 seconds at 250°C.
3. If operated over 10,000 v/inch in length, devices should be immersed in oil or re-encapsulated.

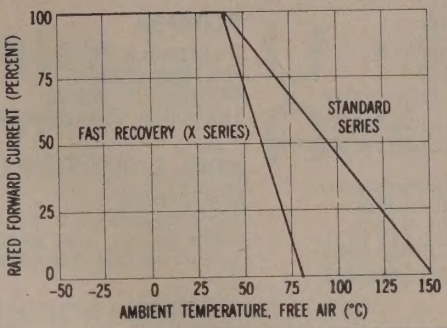
SEMICONDUCTOR DIVISION, VARO INC. P.O. BOX 676, 1000 NORTH SHILOH, GARLAND, TEXAS 75040, (214) 272-4551, TWX 910-86

GI VOLTAGE DIFFUSED SILICON POWER RECTIFIERS

TICAL REVERSE CURRENT CHARACTERISTICS TANDARD AND FAST RECOVERY (X SERIES)

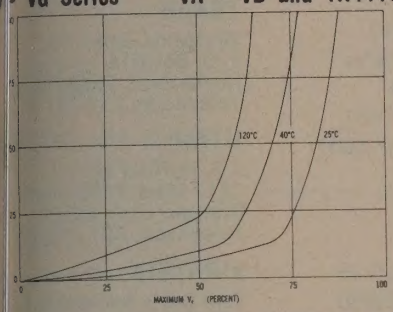


RECTIFIER DERATING CURVE

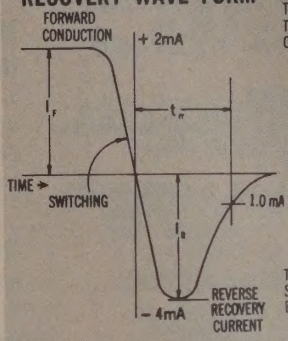


TYICAL FORWARD VOLTAGE CHARACTERISTICS

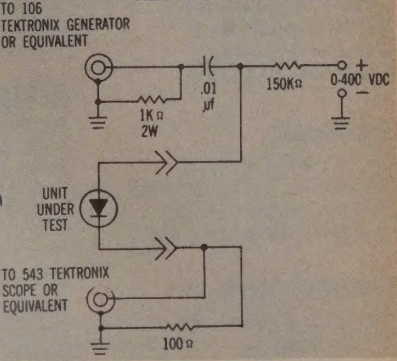
V • VG Series VA • VB and 1N4441



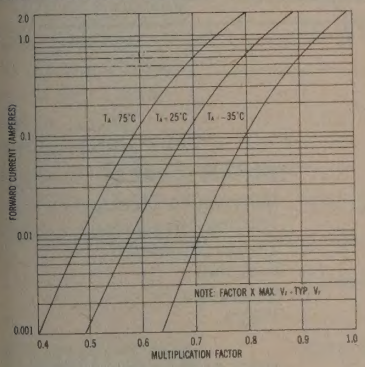
RECOVERY WAVE FORM



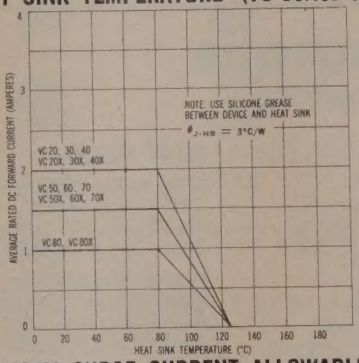
RECOVERY TEST CIRCUIT



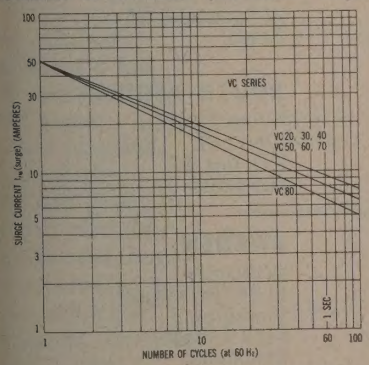
PICAL FORWARD CURRENT VS. FORWARD VOLTAGE DROP MULTIPLICATION FACTOR (VC Series Only)



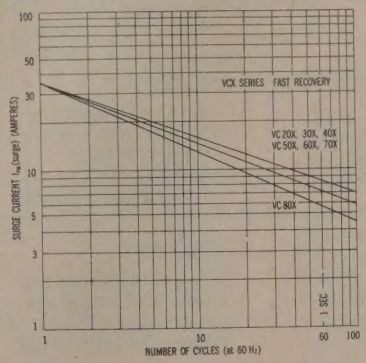
AVERAGE RATED DC FORWARD CURRENT VS. HEAT SINK TEMPERATURE (VC Series Only)



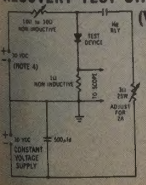
MAXIMUM SURGE CURRENT ALLOWABLE VS. NUMBER OF CYCLES (VC Series Only)



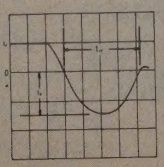
MAXIMUM SURGE CURRENT ALLOWABLE VS. NUMBER OF CYCLES (VC Series Only)



RECOVERY TEST CIRCUIT (VC Series Only)



TYPICAL RECOVERY WAVE FORM



CONSTANT VOLTAGE SUPPLY. HAS OUTPUT IMPEDANCE (Z_{out}) ≤½Ω MAX. DC TO 2KC.

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678 Pirmasens
Postfach 104
Fabrikstr 5

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20149 Milano, Italy

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Higashi-ku
Osaka 541

JAPAN (cont'd)
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Trading Co.
17-15, Shinbashi
6-chome
Minato-ku
Tokyo

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INGENIEURSBUREAU
ARQUATRON N. V.
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Dunswart

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NORDISK
ELEKTRONIK AB
Stureplan 3
Fack 10380
Stockholm

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W. MOOR AG
8105 Regensdorf
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APPLICATION

POWER AMPLIFIERS—9-15 VOLT OPERATION

POWER (Watts)	FREQUENCY AND APPLICATIONS			
	108-156 MHz Avionics	148-175 MHz Sonobuoy VHF Mobile Marine	224-400 MHz VHF Mobile Beacons	1680MHz Radiosonde
0.5 to 1.0	S3036 S3059	2N3553 S3059	2N5635 S3059	S3059
1.0 to 5.0	2N5641	2N5641 S3036 S3060	2N5636 S3036 S3060	
5.0 to 10.0	2N5589 2N5642	2N5589 2N6542	2N5637	
10.0 to 20.0	2N5590 2N5643	2N5590 2N5643		
20.0 to 40.0	2N5591	2N5591		

POWER AMPLIFIERS—21-28 VOLT OPERATION

POWER (Watts)	FREQUENCY & APPLICATIONS						
	2-30MHz Military Amateur AM/FM/SSB	30-76MHz Military SSB Mobile CATV	76-150MHz Avionics CATV	150-225MHz Mobile CATV Marine ECM Sono Buoy	225-400MHz Communication Telemetry	400-1000MHz ECM Telemetry Driver DME	1000-1500MHz DME Telemetry
1.0 to 5.0	2N2631	2N2631 2N3553 S3006 S3010 S3041	2N2631 2N3866 S3006 S3010 S3041	2N3553 2N3866 2N5641 S3006 S3010 S3041	2N3375 2N3866 2N4428 2N4440 2N5090 S2002	2N3866 2N4428 2N4429 2N4430 S1007/8 S1009/10 S2002 S3003	2N4430 S2002 S3003
5.0 to 10.0	2N2631	2N2631 2N2876 2N5641	2N2876 2N5641	2N3375 2N4440 2N5642	2N3733	2N4431 S3042/3	S1051 2N4431
10.0 to 20.0	2N2876	2N3375 2N3632 2N5642	2N3375 2N3632 2N5642	2N3632 2N3733 2N5016	2N5016 S3500 S3511/12		S1050
20.0 to 40.0				2N5643			
40.0 to 80.0		2N5643	2N5643				

VARADYNE
SEMICONDUCTOR
A DIVISION OF VARADYNE, INC.

2330 MICHIGAN AVENUE, SANTA MONICA, CALIFORNIA 90404
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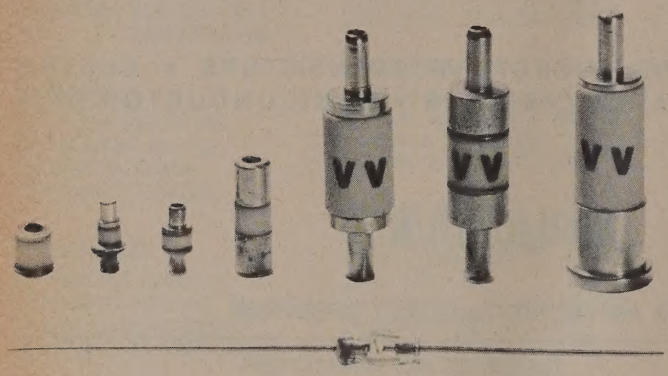
VV410 SERIES HIGH Q VARACTOR



FEATURES

- Silicon diffused junction type
- Controlled voltage variable capacitance
- High Q — 90 GHz at 0 volts bias
- Low noise — 1.5 db at X Band
- Quality with long life operation
- Low inductance, hermetically sealed package
- Custom packaging and design
- Designed to meet applicable military specifications

DESCRIPTION

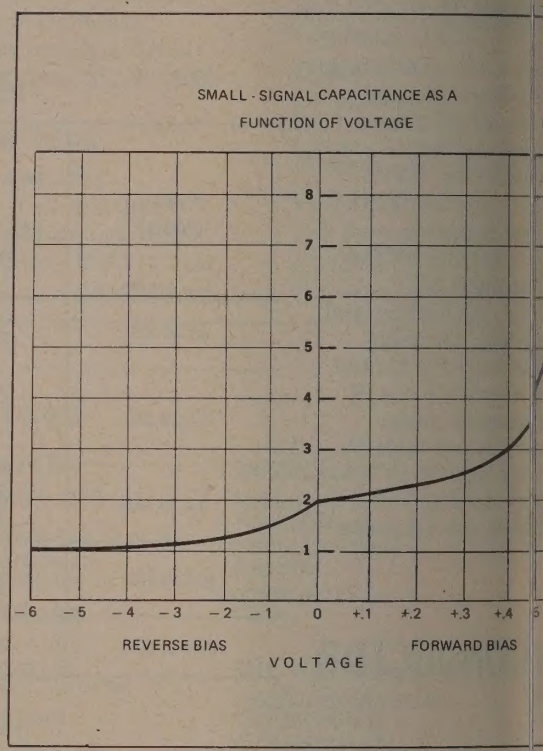
Varadyne 410 Series Varactor Diodes are high Q, low noise, mesa type, silicon varactors recommended primarily for low noise, non-degenerate parametric amplifiers and up-converters with signal frequencies in various microwave bands. These units are extremely stable over a wide temperature range (normally, as low as −79°C). Varactors that are mechanically stable at liquid nitrogen temperature (−196°C) can also be supplied on special order. Capacity is normally controlled within ±33%. However, capacity can be controlled to ±.05 pf if necessary. All varactors shipped from Varadyne are serialized before shipment. Complete manufacturing and test records are maintained in plant to insure repeatability of customer requirements.

APPLICATIONS

The Varadyne VV410 Series of Silicon Parametric Amplifier Varactor Diodes are designed to meet the most severe environmental conditions as required by military specifications. The VV410 Varactor is recommended for low noise, non-degenerate parametric amplifiers and up-converters with signal frequencies in various microwave bands. Low noise g operation has been achieved in the frequency range or to 13.2 GHz.

Higher capacitance types should be chosen if a large ly range is required; lower capacitance types may be os minimum pump power is desired.

The VV410 Series of Varactor Diodes can also be u ze modulators, demodulators, reactance tuners, etc.



HOW TO ORDER

VV	410	3	
VARADYNE VARACTOR	HIGH Q SERIES	PACKAGE TYPE	CU FF FREC NC

SYMBOL	CUT-OFF FREQUENCY						
	1	2	3	4	5	6	7
GHz @ 0 Volts	10	20	30	40	50	60	70
GHz @ −4 Volts	22	44	70	92	115	140	160

CUT-OFF FREQ. SYM.	CRYSTAL CAPACITY SPECIFICATIONS						
	1	2	3	4	5	6	7
Min. Cap @ 0 Volts	2.0	2.0	0.5	0.5	0.3	0.3	0.3
Max. Cap. @ 0 Volts	16	4.0	3.5	3.0	2.0	2.0	2.0

IMPORTANT: Please specify capacity with order. Varadyne standard c ici erance is ±33%. Closed tolerances are available on spec re

20 SERIES HIGH VOLTAGE VARACTOR

- **silicon diffused junction type**
- **requency up to 150 GHz at**
- **uctance, hermetically sealed**
- **and operating temperatures 65°C to +175°C**
- **d to meet applicable military ations**
- **120 volt breakdown**
- **long life operation**
- **packaging and design**

RIPTION

420 Series Varactor Diodes are low leakage, silicon epitaxial recommended for harmonic s, switches, limiters, etc. All kdown voltage types are avail- ne single ended, double ended ype package in a graduated capacitances.

HOW TO ORDER

VV	420	5	G	18	B
VARADYNE VARACTOR	HIGH VOLTAGE SERIES	PACKAGE TYPE	CAPACITANCE RANGE	VOLTAGE BREAKDOWN	CUT-OFF FREQUENCY (Q)

CAPACITANCE RANGE

SYMBOL	A	B	C	D	E	F	G	H	J
μμf @ 0 Volt	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6	1.6 to 3.0	3.0 to 6.0	6.0 to 12	12 to 25	25 to 50	50 and Up

VOLTAGE BREAKDOWN

V @ 5 μ Amp.	6	12	18	24	36	48	60	80	100	120

CUT-OFF FREQUENCY (Q)

SYMBOL	A	B	C	D	E	F	G	H	J	K
GHz @ 0 Volts	5	10	15	20	25	30	35	40	45	50
GHz @ −6 Volts	15	30	45	60	75	90	105	120	135	150

APPLICATIONS

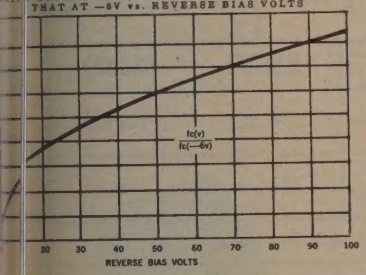
The following table shows the recommended Varadyne Varactor Diode for application in doublers, triplers and quadruplers.

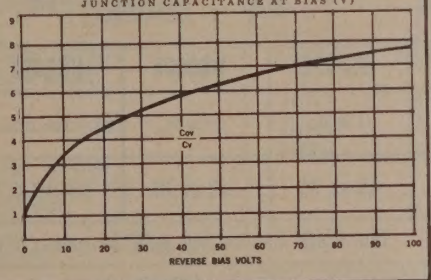
DOUBLERS, TRIPLERS & QUADRUPLERS

POWER INPUT — WATTS

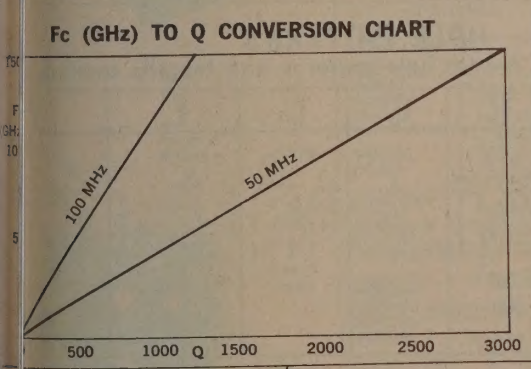
Freq. Input	10	5	2	1	0.5	0.2	0.1
150 MHz							
80% eff. D	H120A	H80A	H60A	H48A	H36A	H24A	H18A
60% eff. T	H120A	H80A	H60A	H48A	H36A	H24A	H18A
50% eff. Q	H120A	H80A	H60A	H48A	H36A	H24A	H18A
300 MHz							
80% eff. D	G120B	G80B	G60B	G48B	G36B	G24B	G18B
50% eff. T	G120B	G80B	G60B	G48B	G36B	G24B	G18B
45% eff. Q	G120B	G80B	G60C	G48C	G36C	G24C	G18D
600 MHz							
60% eff. D	F120B	F80B	F60B	F48B	F36B	F24B	F18B
45% eff. T	F120B	F80B	F60C	F48C	F36C	F24C	F18C
40% eff. Q		F80C	F60C	F48D	F36D	F24D	F18D
930 MHz							
60% eff. D	E120C	E80C	E60C	E48C	E36C	E24C	E18C
40% eff. T	E120C	E80C	E60D	E48D	E36D	E24D	E18D
35% eff. Q		E80D	E60E	E48E	E36E	E24F	D18F
1.5 GHz							
50% eff. D	E120D	E80D	E60D	E48D	D36D	D24D	D18D
40% eff. T		D80E	D60E	D48F	D36F	D24F	D18F
20% eff. Q			D60F	D48F	D36F	D24G	D18H
3.0 GHz							
50% eff. D			E60F	D48F	D36F	D24F	D18F
40% eff. T			D60F	D48G	D36G	C24G	C18G
20% eff. Q				D48G	D36G	D24H	D18J
6.0 GHz							
40% eff. D			C60F	C48G	B36G	B24H	B18H
15% eff. T				B48H	B36H	B24H	B18H
5% eff. Q					D36H	D24J	D18K
9.0 GHz							
20% eff. D				B48H	B36H	B24H	B18K
10% eff. T						B24H	B18K
15.0 GHz							
20% eff. D						B24H	B18K

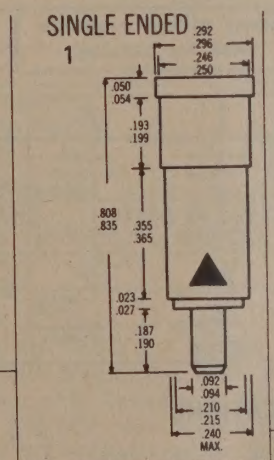
D — Doublers T — Triplers Q — Quadruplers

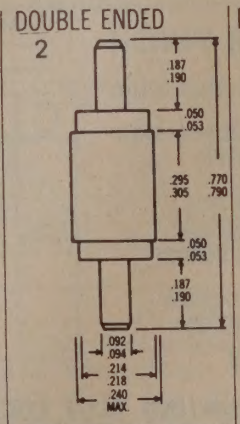


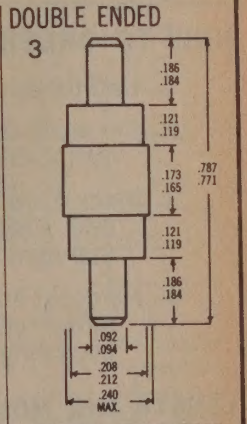


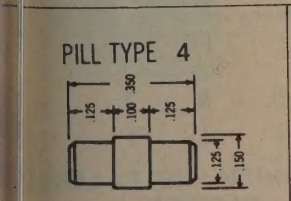
OUTLINES OF VV410 SERIES AND VV420 SERIES

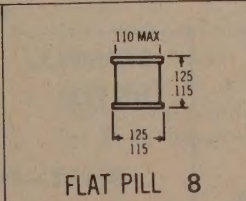


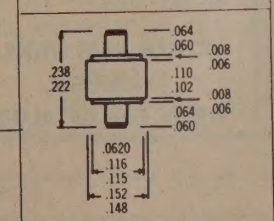


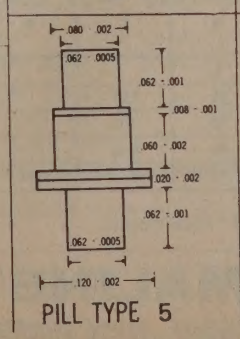


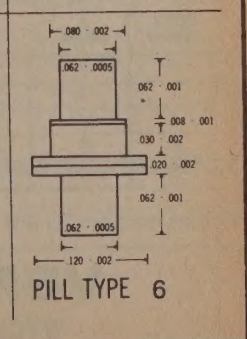


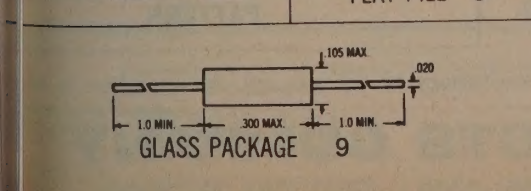












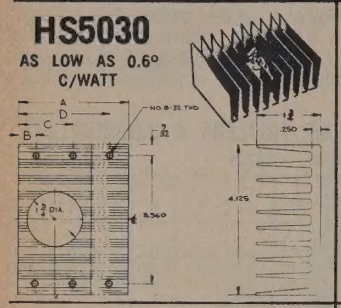
HEAT SINKS

FOR HIGH POWER SEMICONDUCTORS

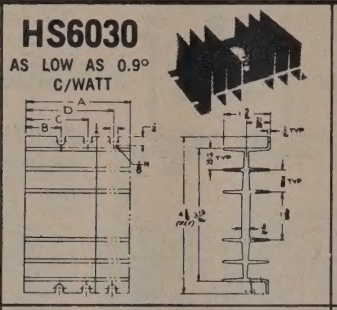
VEMALIN

For E. I. A. Jedec Outlines TO-3, TO-6, TO-10, TO-14, TO-15, TO-26, TO-27, TO-31, TO-32, TO-36, Special Hole Patterns Available

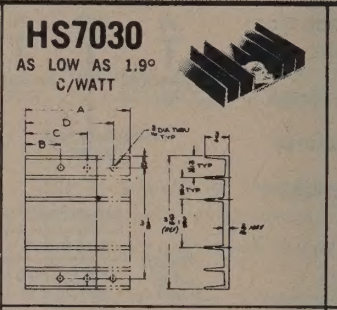
HS5030
AS LOW AS 0.6° C/WATT



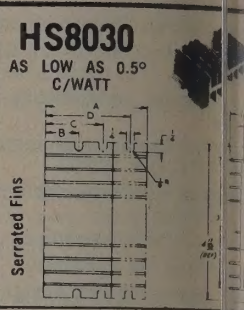
HS6030
AS LOW AS 0.9° C/WATT



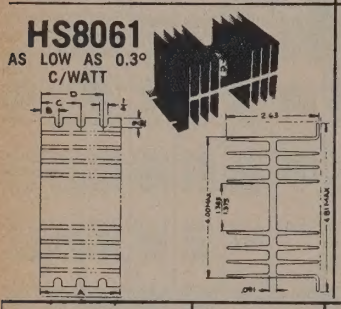
HS7030
AS LOW AS 1.9° C/WATT



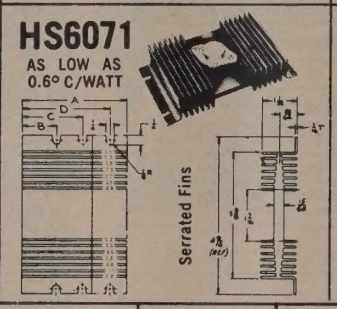
HS8030
AS LOW AS 0.5° C/WATT



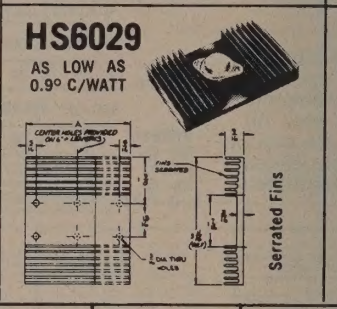
HS8061
AS LOW AS 0.3° C/WATT



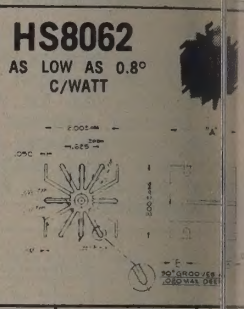
HS6071
AS LOW AS 0.6° C/WATT



HS6029
AS LOW AS 0.9° C/WATT



HS8062
AS LOW AS 0.8° C/WATT



	HS5030	HS6030	HS7030	HS8030	HS8061	HS6071	HS6029	S
WEIGHT (per inch of length)	5 oz.	2 oz.	1¼ oz.	2¼ oz.	3¼ oz.	2¼ oz.	1¼ oz.	2
SURFACE AREA (per inch of length)	35 sq. in.	28 sq. in	15 sq. in.	32 sq. in.	55 sq. in.	50 sq. in.	28 sq. in.	5 s
FINISH	Dull Black Anodize (MIL-A-8625a) unless otherwise specified.							
MATERIAL	6061-T6 Aluminum							
MOUNTING	SEE ORDERING INFORMATION BELOW							

HOW TO ORDER FINISH

1—Unfinished Aluminum

2—Chromate Conversion (MIL-C-5541)

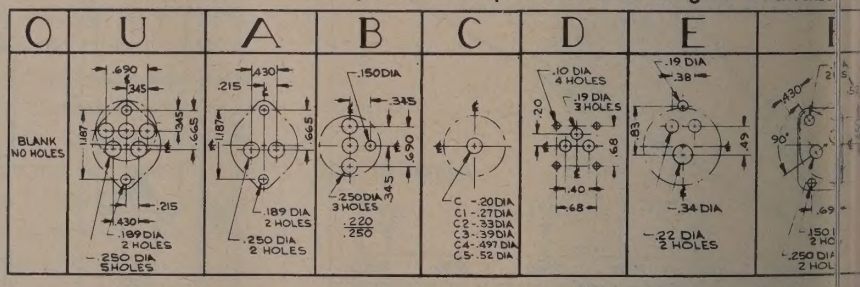
3—Black Anodize (MIL-A-8625a) Standard Finish

4—Hardcoat Anodize (MIL-F-14072) Insulating

Many others available. Ask for catalog.

HOLE PATTERNS

Special hole patterns and lengths availabl



Many others available.

LENGTH AND MOUNTING SLOT LOCATIONS

Suffix Number	A Length	B	C	D
2	2	1		
3	3	½	2½	
4	4	½	3½	
5	5	½	4½	
6	6	¾	3	5¼

OTHER HEATSINKS AVAILABLE. WRITE FOR CATALOG.

EXAMPLE:

HS 7030 - 3 - B - 3

STYLE—FINISH—HOLE—LENG PATTERN

All tests made with 30 CFM measurements.

All specifications for reference only, and are subject to m

VEMALINE PRODUCTS COMPANY

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200 / (201) TWX 337-4500

BULOVA SERVO PRODUCTS

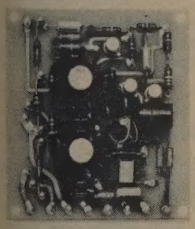
Miniature Solid State, 400 Hz, Servo Amplifiers for Military and Industry

***All units available in 90° phase shift.**

POWER OUTPUT		2 WATT	3.5 WATT	6 WATT	
PHASE SHIFT		0°	0°	0°	
MODEL NUMBER		S412108 S413108 S414108 S416108	S422108 S423108 S424108 S426108	S432108 S433108 S434108 S435108	S432203 S433203 S434203
INPUT SIGNAL (vrms max. at max. gain)		26	26	26	26
VOLTAGE OUTPUT (vrms nominal)	(linear region)	0-25	0-25	0-25	0-18
	(at rated power)	40	40	40	26
VOLTAGE GAIN ±1db (v/v max. adjustable down)		Model # Gain S4121 1000 S4131 2500 S4141 5000 S4161 25000	Model # Gain S4221 1000 S4231 2500 S4241 5000 S4261 25000	Model # Gain S4321 1000 S4331 2500 S4341 5000 S4351 10000	Model # Gain S4322 1000 S4332 2500 S4342 5000
OUT IMPEDANCE (ohms typical)		100	100	100	10
POWER SUPPLY (voltage ±10%)		28 V DC	28 V DC	28 V DC	26 VRMS
INPUT POWER (watts)	(at zero signal)	1	1	2	2
	(at rated load)	5	7	12	12
MOTOR LOAD	winding	TCT**	TCT**	TCT**	USE***
	voltage	33-40	33-40	33-40	26
	effec. resistance	800 ±25%	460 ±25%	270 ±25%	100-350
AMBIENT TEMP. RANGE	operating	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C
	storage	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C
CONFIGURATION		I	I	I	III
WEIGHT (ounces, approximate)		1.5	1.5	1.5	2

***All units available in 90° phase shift.**

POWER OUTPUT		9 WATT	16 WATT	25 WATT	40 WATT	
PHASE SHIFT		0°	0°	0°	0°	
MODEL NUMBER		S442101 S443101 S444101 S446101	S452101 S453101 S454101 S455101	S462101 S463101 S464101 S465101	S472101 S473101 S474101 S475101	S472201 S473201 S474201
INPUT SIGNAL (vrms max. at max. gain)		26	26	26	26	26
VOLTAGE OUTPUT (vrms nominal)	(linear region)	0-25	0-25	0-25	0-25	0-18
	(at rated power)	40	40	40	40	26
VOLTAGE GAIN ±1db (v/v max. adjustable down)		Model # Gain S4421 1000 S4431 2500 S4441 5000 S4461 25000	Model # Gain S4521 1000 S4531 2500 S4541 5000 S4551 10000	Model # Gain S4621 1000 S4631 2500 S4641 5000 S4651 10000	Model # Gain S4721 1000 S4731 2500 S4741 5000 S4751 10000	Model # Gain S4722 1000 S4732 2500 S4742 5000
OUT IMPEDANCE (ohms typical)		50	50	40	25	2
POWER SUPPLY (voltage ±10%)		28 V DC	28 V DC	28 V DC	28 V DC	26 VRMS
INPUT POWER (watts)	(at zero signal)	3	3	3	3	3
	(at rated load)	20	32	50	100	100
MOTOR LOAD	winding	TCT**	TCT**	TCT**	TCT**	USE***
	voltage	33-40	33-40	33-40	33-40	26
	effec. resistance	177 ±25%	100 ±25%	60 ±25%	40 ±20%	20-100
AMBIENT TEMP. RANGE	operating	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C
	storage	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C
CONFIGURATION		IV	IV	V	V	V
WEIGHT (ounces, approximate)		8	8	12	12	12



Notes: 1. Operating frequency: 400Hz ±20. 60Hz available. **2.** Input Signal (Max): 26V. **3.** Gain Stability: ±2 db over environment. **4.** Input Impedance: 10K ohms minimum. **5.** Deadband: 500/V. Gain. [mv, no output referred to input.] **6.** Noise: 250 MV, max, output with input shorted. **7.** Bandwidth: 200Hz minimum. **8.** **TCT - Tuned center tap; ***USE - untuned single ended. **9.** Mechanical Configuration: Consult factory over 25 Standard Packages available for units shown:

Typical Dimensions:
- **I** .81 x .43 x 1.1
- **II** 1 x 1 x 1.5
- **III** 1.2 x 1.2 x 1.3
- **IV** 1.43 x 1.87 x 2.03
- **V** 2.21 x 2.51 x 2.37

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA sp

BULOVA SERVO PRODUCTS

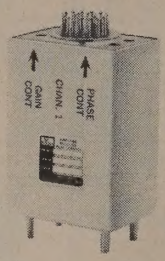
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

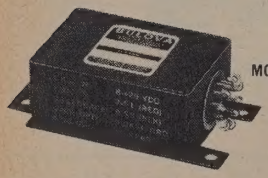
BULOVA SERVO PRODUCTS

RESOLVER AMPLIFIERS

MODEL 310



MODEL 315

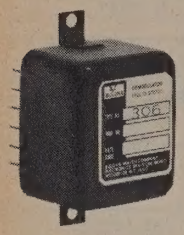


MODEL B61320104

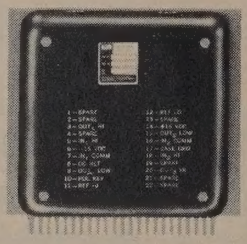
	Model 310	Model 315	Model 366	Model B61320104	Model B81320
Number of Channels:	2	2	2	1	2
Inputs/Channel:	1	1–3	1	2	2
Voltage Gain: (Comp. Out/Signal In)	1.0000	1.0000	1.0000	.4995	.4995
Gain Stability:	±.1%	±.025%	±.1%	±.02%	±.02%
Phase Shift: (Degrees)	.0 ±.1	.0 ±.1	.0 ±.1	180 ±.1	180 ±.
Max. Linear Output: (Volts RMS)	0–10	0–10	0–20	0–10	0–10
Summing Accuracy:	.03%	.025%	.03%	.03%	.03%
Input Impedance (ohms)	1 meg	200k	1 meg	200k	200k
Input Voltage (DC)	28	28	50	28	28
Type:	Series Summing	Parallel Summing	Series Summing	Universal	Univers
Load:	AEL 8RP6	Vernitron VRE23/41	AEL 8RP6	Size 8, 11 & 15	Size 8, 11 &
Package Size:	.938 diam. x 1.22	1.76 x 1.26 x 2.5	.938 diam. x 1.22	1.25 x 1.75 x .76	1.25 x 1. x.

NOTE: Operating Frequency, all units 400 Hz.

MODULATORS/DEMODULATORS—400 Hz—800



MODEL 306



MODEL 468

	Model 307 Modulator	Model 306 Demodulator	Model 468 (Dual Channel) Demodulator*
Ref. Voltage:	26V RMS	26V RMS	10 Vrms
Input Signal:	±15V DC	0.30V RMS	0–1 Vrms
Output Voltage:	0–7V RMS	±7V DC	±5V DC
Gain:	.9 ±10%	1.0 ±10%	1 ±0.5%
Null:	30mV rms max.	30mV rms max.	.003%/C°
Freq. Response:	Flat +1 −3dB from DC to 200 Hz	Flat +1 −3dB from DC to 200 Hz	0–30 Hz
Linearity:	±10%	±10%	±.5%
Output Impedance:	4000 ohns	2000 ohms	500 ohms
Input Impedance:	—	6000 ohms min	500 K ohms
Package Size:	—	—	4.5 x 4.5 x 1.0 Card Pl

*Has common mode rejection of 60 db or greater at 800 and 60 Hz.

AC Summing (Operational) Amplifiers

Gains up to 10. Summing inputs matched to .02%. Up to 4 inputs. Single or dual channel units available.

Quadrature Rejection Amplifiers

Available with gains of up to 10 and rejection ratios of up to 150:1. Units may be supplied with up to 3 summing inputs. Units operate from 28 or 40V DC.

DC Power Supplies

Up to K W Range. Current limit, voltage limit, filtered, highly regulated.

Error Signal Detectors

These solid state circuits are designed to drive external or built-in relays. Time delays built in to avoid tripping due to pickup signals, low hysteresis. Wide magnitude of voltage ranges available.

Gain Control Amplifiers

Automatic gain control for 400 Hz servo ste with transfer function of 26 divided by t co trol voltage. Other transfer functions av ab on request.

Gyro Wheel Supplies

Gyro Wheel Supplies can be provided t dri gyro-motors ranging in frequency from 0 3200 Hz. Units are specifically desig d drive 2 phase gyro motors and their res ct pick-off windings.

Phase shift between outputs are held to 9 ± degree. Oscillator stability is better than ' p degree C.

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks Fo Oscillators ● Ovens ● Coils ● Servo Amplifiers

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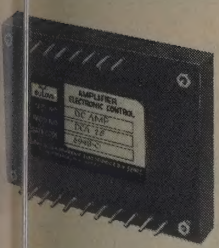
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA SERVO PRODUCTS

DC SERVO AMPS...2.5w to 2,500w



RIES

DCAM SERIES

DCAR SERIES

Here's a line of servo amps packaged for flexibility and priced for system saving. It's another example of Bulova's unique capability in producing quality servo products at a price lower than you can make or buy.

Available from 2.5w to 2.5 Kw — Styled in flat pack, modular or rack mount — to meet industrial or mil-spec — able to operate from AC or DC — to include power supply when required.

FEATURES:

- Adjustable Gain
- Current Limiting
- Voltage or Current Feedback
- Wide Bandwidth
- Low Cost

DESIGNED TO DRIVE:

- DC Torque Motors
- Low Inertia Motors
- DC Servo Motors
- Servo Valves
- Deflection Coils

Bulova also offers a complete line of AC servo products, including servo amplifiers, modulators and demodulators, plus a line of power supplies.

DCA SERIES

ECIFICATIONS (Nominal)	DCA 25 Driving Load Directly	DCA 25 Driving External Bridge (Using [4] 2N3502 Transistors)	DCA 200	DCA 300
t Power Max.				
se at 25°C	25 watts	200 watts	200 watts	300 watts
se at 90°C	15 watts	100 watts	100 watts	200 watts
t Voltage (B+ at 28 volts)	±20 volts DC	±20 volts DC	±20 volts DC	±20 volts DC
t Current Max. se at 90°C)	±0.75 amp	±5 amps	±5 amps	±10 amps
t Current Limit Adj. Range	0.2 amp to 1.25 amps	1 amp to 10 amps	1 amp to 10 amps	1 amp to 15 amps
nic Output Impedance	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm
Impedance	10,000 ohms	10,000 ohms	10,000 ohms	10,000 ohms
ency Response:				
nall Signal	10,000 Hz	10,000 Hz	10,000 Hz	10,000 Hz
ll Output	1,000 Hz	1,000 Hz	1,000 Hz	1,000 Hz
(Adjustable):	20 v/v	20 v/v	20 v/v	20 v/v
oltage Amplifier	0.5 a/v	0.5 a/v	0.5 a/v	0.5 a/v
rrent Amplifier	10 μv/°C	10 μv/°C	10 μv/°C	10 μv/°C
(reference to input)	±50 μv	±50 μv	±50 μv	±50 μv
ead Band (reference to input)	+20 to +32 vdc	+20 to +32 vdc	+20 to +32 vdc	+20 to +32 vdc
ve Supply Voltage	(MIL-STD-704 applies)		(MIL-STD-704 applies)	
ve Supply Quiescent Current	0.05 amp	0.05 amp	0.05 amp	0.05 amp
tive Bias Supply Voltage	−15 ±2 volts	−15 ±2 volts	−15 ±2 volts	−15 ±2 volts
tive Bias Supply Current	0.03 amp	0.03 amp	0.03 amp	0.03 amp
ht	4 oz	4 oz (not including external transistors)	10 oz	10 oz

Specifications valid for case temp range −55°C to +90°C.

BULOVA sp

BULOVA SERVO PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

SERVO ELECTRONICS

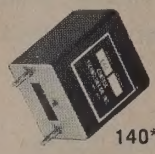
STANDARD AND CUSTOM DESIGNED

A.C. Servo Amplifiers · Demodulators
D.C. Servo Amplifiers · Modulators · Clutch Control Amplifiers · Resolver Booster Amplifi
D.C. Torquer Amplifiers · Servo Valve Amplifiers · Relay Control Amplifiers · Isolation Amplifiers

- Standard units available which will meet applicable MIL Specs.
- Amplifiers available which utilize state of the art Integrated Circuits, Chips and Hybrids.
- Units for industrial applications available
- SPECIAL electronics designed to your detailed specificati

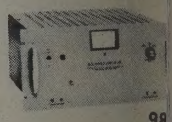
200 HP*

141*


140*

416-3

901 (Flat Pack)


98

*STOCK ITEMS Immediate Delivery

AMPLIFIERS FOR A.C. SERVO MOTORS

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
*200-HP	3.5 W	40 VCT	400 CPS	400 CPS	10K	2,500	28 VDC	—55°C +125
*200-5	3.5 W	40 VCT	400 CPS	400 CPS	10K	5,000	28 VDC	—55°C +125
930	3.5 W	40 VCT	400 CPS	400 CPS	250K	2,000	28 VDC	—55°C +125
*200-8	3.5 W	40 VCT	400 CPS	400 CPS	10K	2,500	115 V 400 CPS	—55°C +125
216B	6 W	40 VCT	60 CPS	60 CPS	10K	1,000	28 VDC	—55°C +85°
*140	6 W	40 VCT	400 CPS	400 CPS	50K	1,000	28 VDC	—55°C +125
141	6 W (90°)	40 VCT	400 CPS	400 CPS	30K	1,000	28 VDC	—55°C +125
416-3	16 W	40 VCT	400 CPS	400 CPS	10K	1,000	28 VDC	—55°C +71°
*416A/D	16 W (0°/90°)	40 VCT	400 CPS	400 CPS (2)	10K	1,000	28 VDC	—55°C +100
416E	16 W (90°)	40 VCT	400 CPS	DC (2)	50K	1000	28 VDC 115V 400 CPS	−55°C +125
*159	16 W	40 VCT	60 CPS	60 CPS	10K	1,000	28 VDC	—55°C +100
159A	16 W	40 VCT	60 CPS	DC	100K	1000	28 VDC 26V 60 CPS	−55°C +100
*956B	40 W (90°)	40 VCT	400 CPS	400 CPS	10K	1,000	28 VDC	—55°C +100
956C	40 W (90°)	40 VCT	400 CPS	DC	10K	500	28 VDC 115 V 400 CPS	—55°C +100
157-2	100 W (90°)	40 VCT	400 CPS	400 CPS	10K	800	28 VDC	—55C° +85°

MODIFICATIONS to gain, input impedance, signal frequency, and power level are available. Matching transform for driving motors at other voltages in stock.

AMPLIFIERS FOR D.C. TORQUERS

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
901	6W/200W (Flat Pack - Short Circuit Proof)	20 V	DC	DC (2)	10K	10	28 VDC	−55°C +100°
995-2	10 W	22V	DC	DC (2)	10K	50	28 VDC	—55°C +85°
996-3	20 W	22V	DC	DC (2)	10K	50	28 VDC	—55°C +85°
998-6	40 W (Short Proof)	22V	DC	DC (2)	10K	500	28 VDC	—55°C +85°
912-6	125 W (Short Proof)	20V	DC	DC (2)	100K	200	28 VDC	—55°C +71°
914-3	220 W (Short Proof)	20V	DC	DC (2)	25K	200	28 VDC	—55°C +71°
980-1	500 W (Short Proof)	50V	DC	DC	10K	100	50-400 CPS 3 Phase (1 Phase Available.)	—55°C +71°
912-3	800 W	50V	DC	DC	10K	100	50-400 CPS 3 Phase (1 Phase Available.)	—55°C +71°

MODIFICATIONS to gain, input impedance, signal frequency, power level and operating temperature available.

AMPLIFIERS FOR SERVO VALVES AND CLUTCHES

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
985	6.5 W	23 VDC	DC	DC	10K	20	28 VDC 115V 400 CPS	—55°C +71°

Provisions for Balance and Null current adjustment. Will drive either a single center tapped coil or two separate coi

MODULATORS AND DEMODULATORS

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
312	Full Wave	10V	DC	60/400 CPS	10K	10	28VDC 115V Reference	—55°C +125
334-1	Full Wave	50V	DC	400 CPS	10K	180	28VDC 115V 400 CPS	—55°C +125
312B	Full Wave	10V	DC	.4 to 4KC	10K	10	28 VDC 115 V Reference	—55°C +125
324	Full Wave	20V	DC	400 CPS	10K	30	28 VDC 6.3 V 400 CPS	—55°C +125

MODIFICATIONS to gain, output voltage and input impedance available.

RESOLVER BOOSTER & ISOLATION AMPLIFIER

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
328	0.1% Accuracy	10V	400 CPS	400 CPS	200K	1 ±.1%	28 VDC	—55°C +125

Available as single channel or dual channel unit. Will operate size 8 or size 11 resolvers. Amplifiers with modific tions to above parameters available.

TEMPERATURE CONTROLLERS

703 Will drive heaters with power ranges up to 500 watt. Operates directly from 115 volt power line. Noise fr switching with built in over current protection.

MODIFICATIONS to sensing circuit, accuracy and power output available.

CONTROL TECHNOLOGY CO., inc., 41-16 29th Street, Long Island City, N.Y. 11101 • 212 EMpire 1-2133

SERVO MECHANISMS

STANDARD AND CUSTOM DESIGNED

CTC — SERVO ELECTRONICS — ACTUATORS — INDICATORS — SPECIAL SYSTEMS

- Indicators
- Actuators
- Repeaters
- Two Speed Servos
- Servo Computers
- Data Transmission Systems
- Analogue to Digital Converters
- Nuclear Control Rod Indicators
- Process Controllers
- Special Control Systems

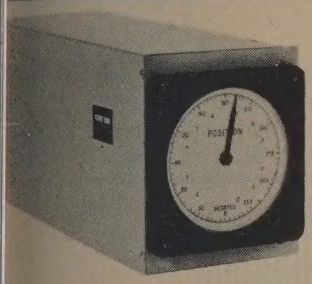
Units available which will meet applicable MIL Specifications

Devices designed to operate with A.C., D.C., synchro or resolver command signals.

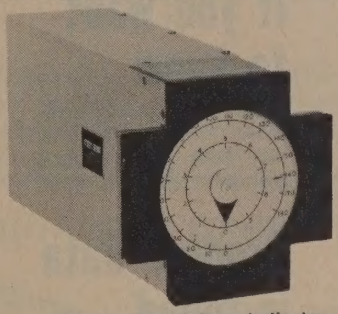
All units feature self-contained transistorized high reliability electronics and power supplies.

- Units now in use on numerous systems involving:
  Simulators, Ground Support, Aircraft instrumentation, Fire Control, Missile Tracking, Missile instrumentation, ASW, High Accuracy Positioning, Stable Platforms
- Special systems can be designed in accordance to your detailed specifications. CTC will also design **"Interface"** equipment to integrate major control systems.

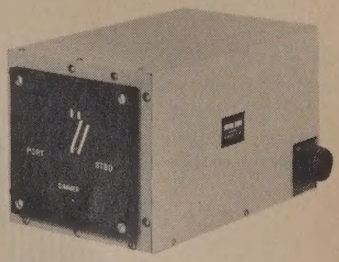
INDICATORS



CS-106 Single Pointer Indicator

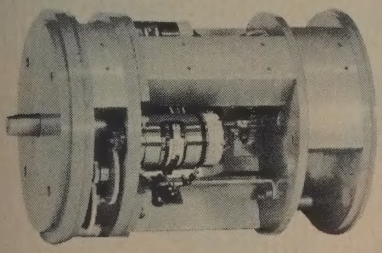


CS-109 Dual Pointer Indicator

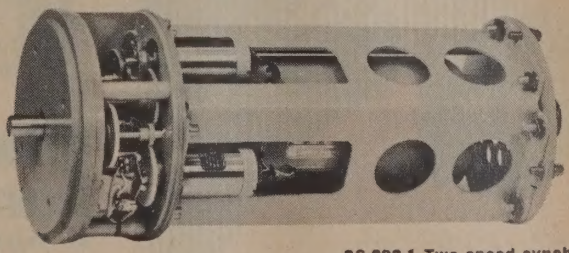


CS-211 Shipboard Indicator

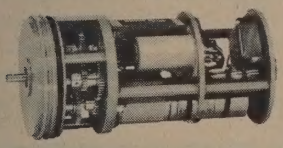
ACTUATORS



CS-202-2 300 lb. in. actuator



CS-202-1 Two speed synchro high accuracy actuator

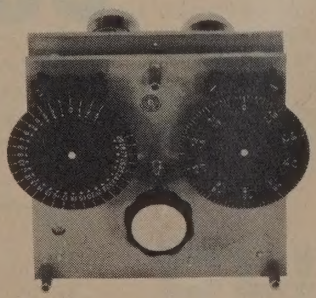


CS-198 250 oz. in. 0.1% accuracy actuator

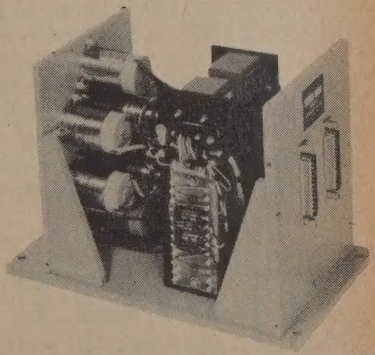
CS-133 0.25% accuracy actuator

SPECIAL SYSTEMS

Control System used in ASW



Fine and Coarse data transmitter assembly



Dual Channel Resolver Angle Computer

CONTROL TECHNOLOGY CO., inc., 41-16 29th Street, Long Island City, N.Y. 11101 • 212 EMpire 1-2133

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

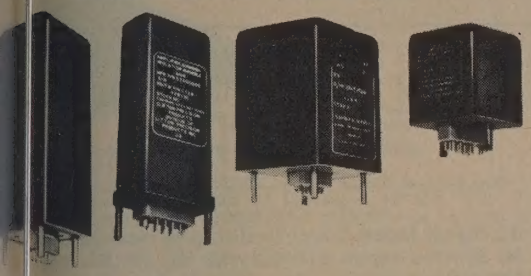
in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

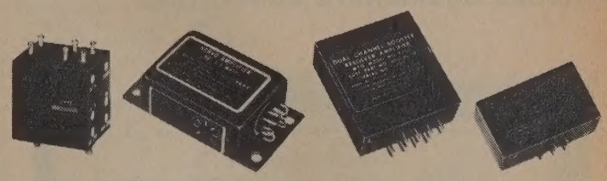
Buy CLIFTON QUALITY

ELECTRONIC MODULES



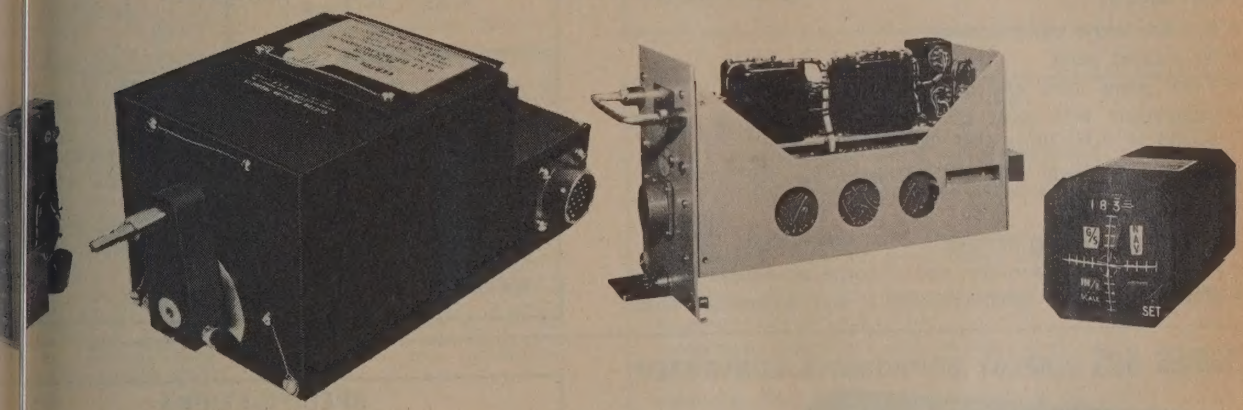
ion signs and manufactures power supplies (regulated and un-
lat), signal comparators, summing and isolation amplifiers,
le dual channel amplifiers, amplifiers and resolvers chains,
a w e variety of similar items. Call Clifton for quality electronics.

SERVO AMPLIFIERS



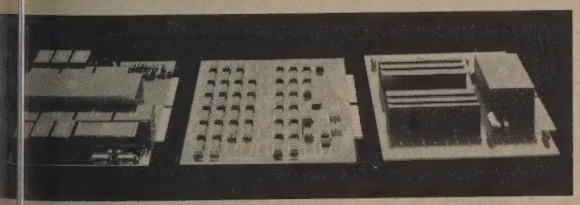
Clifton amplifiers include a wide variety of 0°-180° and 90° units, summing, isolation and booster amplifiers. Many of these have been especially designed to work compatibly with Clifton motors or resolvers. Call Clifton for sophisticated amplifier-resolver chains.

FLIGHT INSTRUMENTATION & CONTROL SUB-ASSEMBLIES



Clif can custom design and build flight instrumentation and serv packages to meet your special needs. As examples of our com tence, shown above are (left to right): Dual Vertical Scale DC Torquer Type Indicator, Automatic Stabilization Actuator, Dual-Channel Synchro Transmitter Amplifier, Symbolic Pictorial Indicator for Area Navigation Systems. What's your special need?

S/D, D/S CONVERTERS



Com sed of reliable, all solid state circuitry mounted on easily in-
ere ngeable printed circuit boards, these low cost converters can be
use o interface any type of synchro outputs to digital computers,
ea ts, displays or printers. Or, conversely, they can convert a
sig computer output to 3 or 4 wire synchro signals. Although de-
sig especially for the process control and machine tool fields, this
sys n can easily be modified for military applications.

DIGITAL INDICATORS

Using a serial BCD input signal, these indicators are designed to be used in conjunction with Air Transport Inertial Navigation System (INS) or Distance Measuring Equipment (DME) type equipment. All are fully compatible with the requirements of ARINC Specifications 561-2, 568 and those covering Air Transport Indicators.

In operation, each indicator recognizes the address of a specific function parameter, decodes the serial BCD data, and provides a digital display of the information. Important design advances in the areas of fault monitoring and detect circuitry plus central dimming capabilities are incorporated into the basic indicator design philosophy.

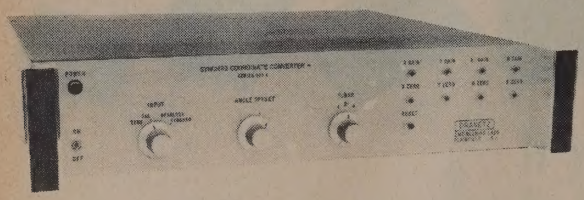
SEE SECTION 3500, page 1640 for a description of our wide line of Synchros, Servo Motors and Torquers.

CLIFTON
DIVISION OF LITTON INDUSTRIES

GENERAL SALES OFFICE: 5050 State Rd., Drexel Hill, Pa.
215 622-1000 **TWX: 510 669-8217**

DRANETZ
ENGINEERING LABORATORIES INCORPORATED
PLAINFIELD, NEW JERSEY 07062 • TEL. (201) 755-7080

SERIES 506, 506A
SYNCHRO COORDINATE CONVERTERS



Series 506 and 506A Synchro Coordinate Converters, through the use of coordinate transformation techniques, convert an X-Y recorder into a synchro recorder for plotting polar and rectangular beam patterns (signal levels vs. synchro shaft angle).

FEATURES:

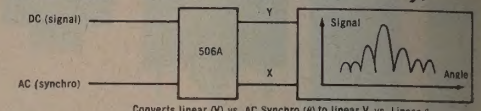
- Synchro angle offset control
- No moving parts
- Front panel zero and calibrate controls
- Compatible with most 60 Hz synchros such as 15CX6, 23TX6 (400 Hz units also available)

APPLICATIONS:

- Antenna testing
- Range and bearing plotting
- Calibration of underwater and airborne acoustical devices
- Measurements of electromagnetic and acoustical fields

SPECIFICATIONS

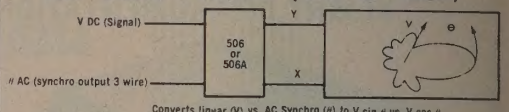
Rectilinear Beam Plots (506A only)



Converts linear (V) vs. AC Synchro (θ) to linear V vs. Linear θ

DC Signal Input: Direct feed thru to recorder
AC Synchro Input: 115/90 v 60 Hz, 1X (36x usable for highest accuracy)
X Output: 0 to +4.5 vdc
Full Scales: 18° and 36° with 36X synchro; 90°, 180° and 360° with 1X synchro.
Acuracy: ±0.02° for 18° and 36° scales; 0.15° for 90° and 180° scales; ±0.3° for 360° scale.

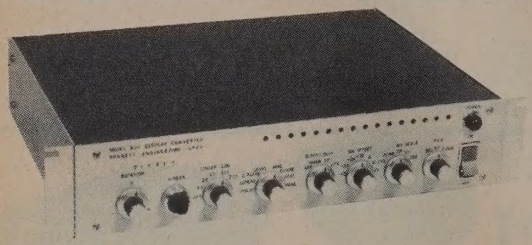
Polar Beam Patterns (506 or 506A)



Converts linear (V) vs. AC Synchro (θ) to V sin θ vs. V cos θ

DC Signal Input*: 0 to +5 vdc
AC Synchro Input: 115/90 v 60 Hz, 1X
Y Output: ±(0 to 2.2 v) from origin of +1.4 v
X Output: ±(0 to 2.2 v) from origin of +2.2 v
Accuracy: ±1% fs Radius; ±1° in angle
AC Power Input: 115 v, 60-400 Hz, 0.1 amps rms approx.
Mechanical — Size: 3½" high x 17" deep x 19" wide for rack mounting
Weight: 18 pounds; shipping, 27 pounds

SERIES 505 DISPLAY COORDINATE CONVERTER



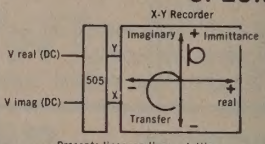
Series 505 Display Coordinate Converter is an interface device which provides coordinate transformation of inputs for plotting on X-Y recorders. It performs an integrated series of functions, selectable by a front panel mode switch. Depending on the recording mode chosen, the 505 selects the proper coordinate system, sets the gains, and injects the proper axes offsets in accordance with preset controls. In addition, the operator may select special conditions for his application, such as scale expansion of signal level or synchro angle, or axis offset of the signal input.

The Series 505 Display Coordinate Converter performs all of the functions of the Series 506 and 506A. In addition the 505 has provisions for plotting one function against the log of a second function (e.g.: output vs log frequency), as well as plotting x-y data.

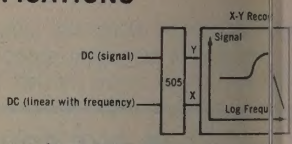
APPLICATIONS:

- Complex plane or other X-Y plots, imaginary vs. real, or other DC vs. DC signals.
- Response
  Level, phase or immitance vs. frequency, log frequency or other functions
- Response Reference Comparison
  Provision for subtraction of curve follower output from input signal for recording deviation from precalibrated standard.

SPECIFICATIONS



Presents linear vs linear plotting with preset gain and offset



Converts linear vs. linear to: linear vs. linear, linear vs. one decade log, linear vs. two decade

Rectilinear Beam Plots (Same as for 506A)
Polar Beam Patterns (Same as for 506 & 506A)
Linear vs. log
DC Signal Input*: 0 to +5 vdc**
DC (Frequency) Input*: 0 to +10 vdc; +1 to +10 v for one decade log; +0.1 to +10 v for two decade log
Y Output: 0 to +2.5 vdc, adjustable
X Output: 0 to +5 vdc, adjustable
Accuracy: Linear ±0.1% fs; Log ±1% of reading. Calibrated offsets from −40 db to +20 db in steps of 10 db, and selection of 20, 50 and 100 db full scale on the Y axis when using dc logarithmic input signal (e.g. from Dranetz Model 220 Log Sampling Voltmeter).

Linear X-Y Plotting
DC Inputs*: Two - each ±5.0 vdc
X & Y Outputs: each 0 to +2.5 vdc, adjustable
Accuracy: ±0.1% fs
Suitable for use with Dranetz 202 or 202A Vector Component Computer
AC Power Input: 115 v, 60-400 Hz, 0.1 amps rms
Size: 3½" high x 17" deep x 19" wide for rack mounting
Weight: 18 pounds; shipping, 27 pounds

* Suggested levels — will accommodate ±25% gain and offset variation
** Additional input for subtraction of curve follower output. −5 vdc (relative) available for connection across curve follower potentiometer.

See Section 2900 for our pages on Test Instruments.

RANETZ
INEERING LABORATORIES INCORPORATED
PLAINFIELD, NEW JERSEY 07062 • TEL. (201) 755-7080

TING MODULES

Series CM Computing modules consists of the CM-1000 DC Log Amplifier; CM-1100 Phase Generator; CM-1200 Phase to DC Converter and CM-1300 Phase Sensitive Detector. All are packaged in low-profile, flat package for printed circuit mounting.

-40, CM-1000-60 DC LOG AMPLIFIERS

1000 Log Amplifier transforms DC signals to an output volt- rtional to the logarithm of the input voltage. With input to 10 volts (40 db range), the output error is less than from the specified equation $V_{out} = 5 + 5 \log V_{in}$ volts. From volts (60 db), the error is less than ±0.2 db. The unit is r an 80 db range at slightly reduced accuracy by the use of rimming. Internal temperature regulation provides tight con- e log characteristic over the specified temperature range. and offset are also externally programmable.

ES:

- nmable gain and offset
- roseconds response time
- 80 db dynamic range

TIONS:

- Conditioning
- nversion — db output
- Spectrum Analysis
- Useful for scaling DVM's

AND CM-1110 SYNCHRO TO PHASE CONVERTERS

odel CM-1100 converts the output of a 3-wire or 4-wire to variable phase square waves. This module, using an AC , produces three square wave outputs: a reference signal, a re signal (a signal shifted 90° from reference) and a signal y an angle equal to the shaft angle. The CM-1110 is similar -1100 except that it does not produce reference outputs and ed for systems where the reference is already available. ting of one side of a 4-wire synchro resolver is permissible, e Generator will operate from the 4-wire resolver through an network (see data sheet). When used with a 3-wire or torque transmitter, a Scott-T transformer must be em- Used with a CM-1200 or CM-1300 module, the phase gen- ll convert a synchro signal to a DC analog, or to sin and cos s for rectangular coordinates. Its new conversion method matched phase shift networks for variable and reference to assure an accurate output. Matched filters for the ref- nd variable channels makes the phase generator insensitive or distortion. High input and low output impedances e system loading effects.

RES

- and waveform filtering
- es with and w/o reference phase
- atible with CM-1200 and CM-1300

ATIONS:

- Conditioning
- to Rectangular Conversion
- Synchro to Analog Conversion
- Synchro to Digital Conversion

00 AND CM-1210 PHASE TO DC CONVERTERS

M-1200 series module converts an input of two square waves same frequency to a DC output proportional to the phase the signals. The Model CM-1200 produces full scale output °, 720°, to 1440°, selectable by means of external jumpers, luding provision for externally resetting the output to corre- o less than 360°. The CM-1210 produces a single full scale for 360°. When used with a CM-1100 module, the two combine ert a synchro output to a DC signal proportional to shaft angle. ut drive is compatible with CM-1100 or TTL logic levels.

RES

- rammable Ranges 360°, 720°, 1440°
- patible with CM-1100

ATIONS:

- al Conditioning
- hro to Digital Conversion
- Synchro to Analog Conversion

00 PHASE SENSITIVE DETECTOR

CM-1300 series Phase Sensitive Detector produces DC outputs onding to real and imaginary components of an AC signal, as inputs, three phase related square waves and a DC level. tputs from the CM-1300 are equivalent to E cos θ and E sin θ. al gain and offset adjustments for each output channel are at the factory. Provisions are made for external changes of settings. Internal filters provide maximum harmonic rejection.

URES

- patible with CM-1100
- ules available for 60 or 400 Hz operation
- Harmonic Rejection

ICATIONS:

- al Conditioning
- gation Plotting
- sducer Pattern Measurement
- Antenna Pattern Recording
- Polar to Rectangular Conversion

pplication information on any of the CM MODULES, request c bulletins.

FEATURES:

- Temperature stabilized
- Integrated circuit design
- Reverse voltage protection
- Printed circuit mounting
- 32-125°F operating temperature range
- Meet MIL-E-16400
- Input Power: ±15 Vdc ±2%

SPECIFICATIONS

Input Signal (DC): CM-1000-40 - +0.1 to +10 v
CM-1000-60 - +0.01 to +10 v
Input Impedance: 50 K ohms
Output Signal (DC): Single Ended (0.25 V/DB)
CM-1000-40 — 0 to +10 v and 0 to −10 v
CM-1000-60 — −5 to +10 v and +5 to −10 v
Push Pull: Center tapped at ground
CM-1000-40 — 0 to +20 v, or 0 to −20 v (0.5 v per db)
CM-1000-60 — −10 v to +20 v, or +10 v to −20 v (0.5 v per db)
Output Impedances: 75 ohms approx
Output Loads: 10 K ohms and higher
Accuracy: CM-1000-40 — ±.15 db referred to input
CM-1000-60 — +.2 db referred to input
Response time for 20 db step: 25 microseconds (slew rate of 200 v/ms)
Temperature Coefficient: <.006DB/°F
Package Size: 3″ x 2.5″ x 0.625″
Weight: 4 ounces

SPECIFICATIONS

Signal Input Levels (Simultaneous):
#1, 3 v ±10% AC (representing sine of shaft angle)
#2, 3 v ±10% AC (representing cosine of shaft angle)
#3, 3 v ±10% AC Reference (CM-1100 only)

Output:
#1, 20 v p-to-p square wave (phase variable with shaft angle)
#2, (CM-1100 only) 20 v p-to-p square wave locked in phase with reference signal
#3, (CM-1100 only)20 v p-to-p in quadrature with output #2

Accuracy: ±12 minutes of arc

Temperature Coefficient: ±0.01 minutes of arc per °F

Slew Rate: 1000°/second at 60 Hz — 7000°/second at 400 Hz

Frequency: CM-1100-60 and CM-1110-60, 60 Hz, ±5%
CM-1100-400 and CM-1110-400, 400 Hz, ±5%

Output Load: 2KΩ or higher (DC coupled)

Size & Weight: 3″ x 4.5″ x 0.625″; 7 oz.

SPECIFICATIONS

Input Signals: Reference & Variable Phase
A. Direct Coupled from CM-1100 or any phase related pair of square wave signals 15 v p-p to 25 v p-p
B. TTL logic levels (+4 and 0 v, 4 ma sinking logic)
Input Impedance: A. 2K; B. 4 ma sinking logic at 0 v.
DC Output Signal: +3.6 volts full scale (provisions for external adjustment of offset and gain)
Output Impedance: 50 ohms maximum
Range: CM-1200: 0 - 360°, 0 - 720°, or 0 - 1440° CM-1210: 0 - 360°
Temperature Coefficient: ±0.005% FS per °F
Frequency: CM-1200-60 and CM-1210-60: 60 Hz ±5%
CM-1200-400 and CM-1210-400: 400 Hz ±5%
Rise/Fall Time (10% - 90% points): CM-1200-60: 200 ms
CM-1200-400: 30 ms
Accuracy: ±12 minutes of arc per 360 degree cycle
Size and Weight: 3″ x 4.5″ x .625″ — 7 oz.

SPECIFICATIONS

Input: #1, 20 v p-to-p square wave variable phase
#2, 20 v p-to-p square wave reference phase
#3, 20 v p-to-p square wave in quadrature with #2
#4, 0 to +5 v dc

Output: E Cos θ, 0 to ±10 vdc; E Sin θ, 0 to ±10 vdc

Frequency: CM-1300-60: 60 Hz ±5%; CM-1300-400: 400 Hz ±5%

Accuracy (at 25°C): ±1 degree (angle); ±2% fs (Magnitude)

Temperature Coefficient: Magnitude: ±0.05% fs per °F

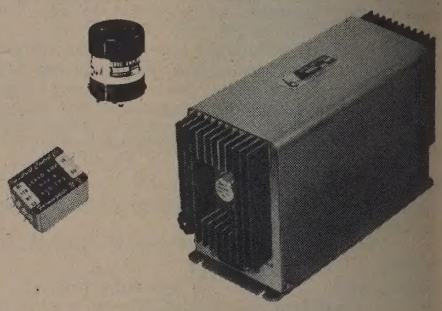
Size & Weight: 3″ x 4.5″ x 0.625″; 7 oz.

See Section 2900 for our pages on Test Instruments.

SERVO COMPONENTS

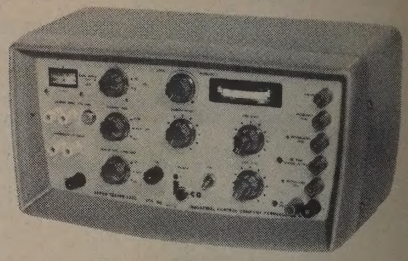
INSTRUMENTS, AMPLIFIERS and ACCESSORIES

FOR MILITARY AND INDUSTRIAL CONTROL SYSTEMS



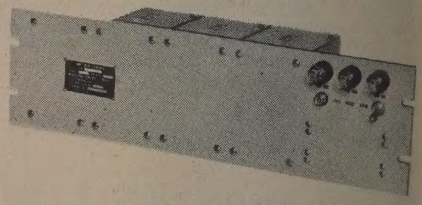
SERVO AMPLIFIERS

- *DC, pot and synchro inputs*
- *60 and 400 ∿ outputs*
- *Hybrid 972A (.5 cu in, 9 watts) to Triac 893A (800 watts)*
- *160 different models*



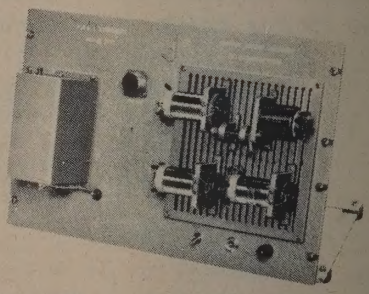
SERVO TESTERS

- *100C, general purpose use*
- *103A, prod and field test*
- *Frequency and transient response*
- *For DC and AC servos*



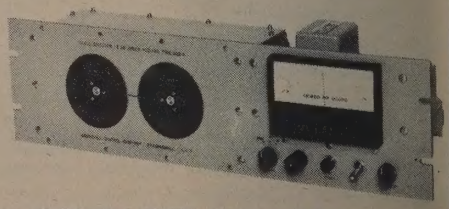
SYNCHRO AMPLIFIERS

- *929R, 90V./line, 400 ∿ stators*
- *820A, 90V./line, 60 ∿ stators*
- *Buffer CX's from CT and TR loads*
- *High accuracy and fast response*



SERVO DEMONSTRATORS

- *Laboratory experiments*
- *Industrial training*
- *Synchro and pot data*
- *60 and 400 ∿ models*



SYNCHRO DIRECTORS

- *Generate 1 and 36 speed stator voltages*
- *Constant velocity and harmonic motion modes*
- *Computer programmed*
- *60 and 400 ∿ stator outputs.*

Write for Catalog of our COMPLETE Servo Line.

INDUSTRIAL CONTROL COMPANY

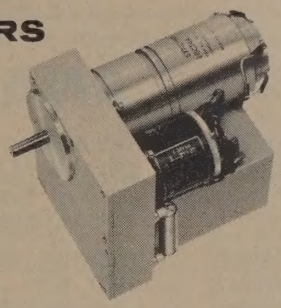
CENTRAL AVENUE AT PINELAWN ▪ FARMINGDALE, L.I., N.Y. 11735 ▪ 516-694-3000

SERVO SYSTEMS

STANDARD MODULES *or* SPECIALS

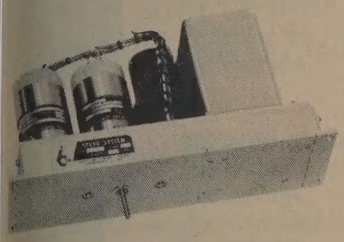
MIL-GRADE AND FAST DELIVERY

High Torque SYNCHRO REPEATERS



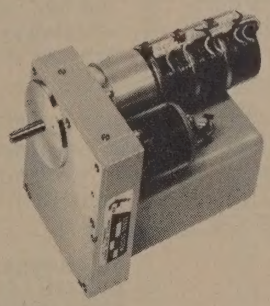
- *770 Series for 400∼*
- *847 Series for 60∼*
- *8′ error*
- *300 oz in shaft torque*
- *117V. line power*

Two Speed SYNCHRO REPEATERS



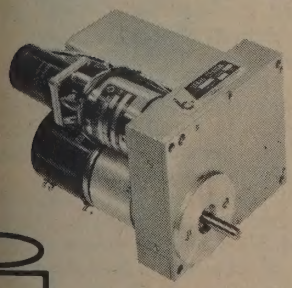
- *771 Series for 400∼*
- *921 Series for 60∼*
- *16, 25 and 36 speed*
- *Shaft at hi speed*
- *117V. line power*

DC and AC POT FOLLOWERS



- *900 Series*
- *DC, 60 or 400 ∼ inputs*
- *1, 3 or 10 turn pots*
- *Torques to 300 oz in*
- *117V. 60 or 400 ∼ power*

Precision DC VELOCITY SERVOS



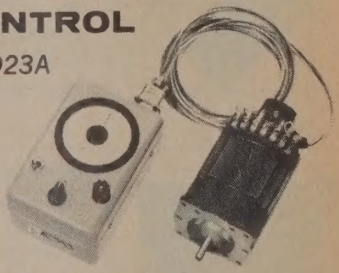
- *982 Series for 60∼*
- *983 Series for 400∼*
- *±10V. DC command*
- *117V. line power*
- *Wide range of torques and speed.*

3 Axis SERVO INDICATOR

- *type 909A*

Bi-Directional PRECISION SPEED CONTROL

- *type 923A*

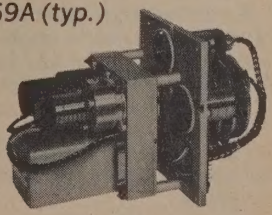


Process Control DELAYED SIGNAL GENERATOR

- *type 849B*

Custom Assemblies TO CUSTOMER SPECS.

- *type 869A (typ.)*



Modifications from Standards readily available.

INDUSTRIAL CONTROL COMPANY

CENTRAL AVENUE AT PINELAWN ▪ FARMINGDALE, L.I., N.Y. 11735 ▪ 516-694-3000

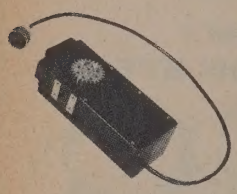
GAP
INSTRUMENT CORP.

COMPLETE SYSTEM CAPABILITY

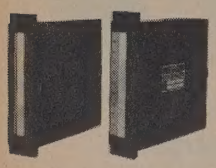
☐ SOLID STATE ☐ ELECTRO-MECHANIC

SERVO

Pre-engineered Servo-Pax miniaturized modules which provide highly reliable, transistorized, high density servos for military and industrial systems.



ACTUATORS — A servo Rotary Actuator System for aircraft camera positioning that combines high torque and accuracy in its output. High density package with digital circuits capable of providing an increase in discrete output positions.



INDICATORS — A compact analog servo unit, providing a visual readout of electrical input data. A wide selection of these units is available to meet many variations of military and commercial specifications.

ANALOG

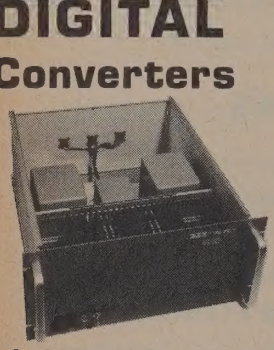
Generation of complete systems to meet a a plicable M16 specifications for • Navigati ASW • Fire Control • Missile Tracking • S • Computers • Simulators • Nuclear Co

RELATIVE VELOCITY COMPUTER TEST SET — A ground support equipment for testing a variety of inertial alignment computer systems with capability of complete self-test. A hybrid system employing analog and digital electro-mechanical and solid state circuitry.

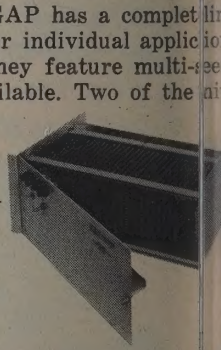
OWN SHIPS MOTION SIMULATOR A shipboard navigation and fire control training equipment using electro-mechanical computing techniques capable of simulating all surface maneuvers of ships of the fleet.

DIGITAL Converters

A to D . . . D to A To meet your interface requirements, GAP has a complet of prototype converters which can be custom-designed for your individual applic Available as both solid state and electro-mechanical units, they feature multi- multi-channel operation with a variety of visual displays available. Two of the are the Model S3289 and Model S3290.



DIGITAL CONTROL TRANSFORMER MODEL S3290
Containing 4 independent and multiplexed channels with data storage, each channel performs the exact function of an 11CT4 synchro with the mechanical shaft angular position replaced by a 13 bit binary word. By retaining the 3 wire stator angle input and providing a difference angle output voltage, all electrical parameters of the 11CT4 synchro have been maintained to permit direct replacements of 11CT4 synchros for direct digital control of servo systems, where a control transmitter (11CX4 or equivalent) is the driven element. Units are available with different channel specifications to meet military and commercial requirements.



48 CHANNEL SYNCHRO/ DIGITAL CONVERTER SOLID STATE/MODEL S3289
Model S3289 is a high speed all solid state synchro to digital converter using medium scale integrated circuits and precision etched resistors. A 48 channel multiplexer switches any one of the input channels in synchro to digital converter where a ratio mea ment is made between Sine θ and Cosine θ to ob as a 12 bit parallel binary output. All signal and ence inputs are transformer isolated.

The S3280 series of converters can accommoda to 64 synchro or revolver input channels. The ser designed using a modular-function concept which mits a wide variety of customer modifications easily incorporated.

GAP
INSTRUMENT CORP.

110 Marcus Boulevard
Hauppauge, L.I., New York 11787
516/273-0909

GAP INSTRUMENT CORP. is a designer/producer of precis electro-mechanical components, servo/digital/analog systems a remote-positioning devices for control, computation, display a simulation.

MAG TECH DC TORQUE MOTORS, TACH GENERATORS

Direct Drive

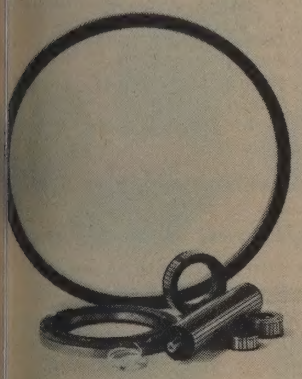
Magnetic Technology DC torque motors are designed to produce high torque at low speeds, making them ideal for direct coupling to the driven load. Elimination of gearing and associated backlash results in maximum servo coupling stiffness, increased torque to inertia ratio at the load shaft and precise positioning resolution.

Fast Response

High flux density in the magnetic circuit results in low armature inductance and low electrical time constant.

Permanent Magnet Field

Maximum torque with minimum input power and weight results from the PM field. It also enables motors to be maintained under standby conditions without dissipation of power or generation of heat.



Specifications for typical models

MODEL †		MOTOR PERFORMANCE					MECHANICAL DATA						TACH. PERFORMANCE	
		Peak Torque (oz.-in.)	Power * @ Peak Torque (watts)	No. Load Speed (rad/sec)	L/R (sec)	K_{m*} (T/√watts)	O.D. (inches)	I.D. (inches)	WA (inches)	Weight (ounces)	Inertia (oz.-in.-sec²)	Total Breakaway (oz.-in.)	K_E (volts/rad/sec)	Γ* (ohms)
1500C	—038	9	70	890	.0002	1.07	1.500	.625	.375	1.6	.0004	.4	.04	21
	—050	15	75	740	.0002	1.73	1.500	.625	.500	2.2	.0005	.5	.06	25
1700	—040	15	65	470	.0002	1.86	1.700	.700	.400	2.3	.0007	.6	.09	41
1937	—050	20	57	290	.0002	2.92	1.937	.625	.500	4.2	.00094	.75	.14	42
	—088	45	80	240	.0004	5.03	1.937	.625	.875	7.8	.0018	1.0	.26	56
	—130	75	150	220	.0004	6.11	1.937	.625	1.300	12.4	.003	1.0	.44	69
	—173	100	175	210	.0005	7.56	1.937	.625	1.730	16.7	.004	1.3	.55	90
1937B	—063	40	100	310	.0005	4.00	1.937	.625	.625	5.1	.0019	1.2	.24	71
	—088	55	90	220	.0006	5.80	1.937	.625	.875	7.6	.0029	1.5	.39	97
1937E	—040	15	40	320	.0003	2.38	1.937	.700	.400	2.7	.001	.8	.12	52
2070	—800	480	380	110	.001	24.6	2.070	.250	8.00	92.0	.018	8.0	3.9	500
2125	—038	20	60	350	.0002	2.58	2.125	1.250	.375	2.4	.002	.9	.11	32
2375	—038	20	50	370	.00025	2.83	2.375	1.250	.380	3.5	.0022	.6	.15	58
	—050	35	75	250	.0003	4.04	2.375	1.250	.500	4.4	.0034	.8	.24	69
	—063	45	55	180	.0005	6.06	2.375	1.250	.625	6.0	.0042	1.2	.43	91
2625B	—040	30	50	200	.0003	4.24	2.625	1.500	.400	3.8	.005	1.1	.29	92
2813	—063	45	38	110	.0007	7.42	2.813	1.000	.625	9.2	.008	1.8	.70	180
	—088	75	43	72	.001	11.40	2.813	1.000	.875	15.5	.011	2.0	1.24	220
	—100	90	47	67	.0011	13.20	2.813	1.000	1.000	18.0	.013	2.6	1.48	230
	—133	170	110	88	.0013	16.20	2.813	1.000	1.325	25.0	.018	3.5	1.99	286
2910	—054	50	45	98	.0005	7.46	2.910	1.600	.540	6.3	.009	1.0	.98	200
	—064	90	75	86	.0006	10.40	2.910	1.600	.640	9.2	.012	1.2	1.11	210
	—100	145	80	60	.001	16.20	2.910	1.600	1.000	15.2	.019	2.0	2.14	300
3000B	—055	60	50	100	.0005	8.45	3.000	1.750	.550	6.8	.011	1.3	.85	180
	—065	90	75	110	.0005	10.40	3.000	1.750	.650	8.7	.013	1.5	1.05	190
3375	—057	80	100	160	.0002	8.00	3.375	2.250	.570	8.5	.017	2.0	.53	81
3375B	—076	100	35	45	.0007	16.9	3.375	1.688	.760	14.6	.028	2.8	2.7	460
3620	—042	80	70	100	.0003	9.57	3.620	2.180	.410	7.8	.017	1.7	.87	150
3625	—040	60	110	210	.0003	5.72	3.625	2.500	.400	5.4	.014	1.4	.50	120
	—080	180	150	100	.0005	14.70	3.625	2.500	.800	14.0	.034	3.0	1.39	160
3730B	—134	250	75	40	.0013	28.9	3.730	1.640	1.340	33.0	.06	5.0	5.4	700
4090B	—100	300	70	33	.0015	35.8	4.090	2.000	1.000	30.7	.094	7.0	7.30	720
4590	—043	95	90	100	.0002	10.0	4.589	3.325	.420	9.4	.047	3.7	.90	160
4590B	—056	130	55	49	.0009	17.5	4.590	3.000	.560	14.3	.08	3.8	2.66	370
	—063	170	75	45	.001	19.6	4.590	3.000	.625	17.0	.09	4.5	3.00	390
4698	—030	60	100	160	.00013	6.00	4.698	3.800	.300	4.8	.027	3.0	.40	69
5125	—110	400	110	37	.002	38.1	5.125	2.390	1.100	48.0	.16	7	9.84	1240
	—160	700	160	31	.005	552	5.125	2.390	1.600	83.0	.25	10	14.60	1310
	—220	1000	170	20	.003	76.6	5.125	2.390	2.200	122.0	.36	20	27.20	2160
	—286	1500	180	15	.005	112	5.125	2.390	2.860	159.0	.48	24	37.5	2640
5125B	—058	115	105	130	.0003	11.2	5.125	4.000	.575	12.0	.08	2.0	1.10	200
	—072	200	120	84	.0004	18.2	5.125	4.000	.720	17.0	.11	3.0	1.87	240
5125C	—057	190	90	50	.0006	20.0	5.125	3.500	.562	15.5	.09	4.0	2.72	380
	—062	225	95	47	.0007	23.0	5.125	3.500	.610	18.0	.10	4.4	3.22	400
	—065	250	95	45	.0007	25.6	5.125	3.500	.650	19.0	.10	4.5	3.58	400
	—075	300	150	67	.0008	24.5	5.125	3.500	.750	24.0	.12	5.0	3.2	350
5125D	—078	300	130	58	.0012	26.3	5.125	2.000	.780	33.0	.08	6.0	4.7	640
6980	—110	1000	105	14	.002	104	6.980	4.500	1.100	75.0	.89	18	33.50	2120
	—130	1200	100	11	.0025	120	6.980	4.500	1.300	92.0	1.10	25	43.00	2300
	—195	2000	125	8	.003	178	6.980	4.500	1.950	145.0	1.70	36	70.60	3300
	—290	3000	160	7	.0035	237	6.980	4.500	2.900	220.0	2.55	60	117.0	4900
7000	—065	300	75	31	.0006	34.6	7.000	5.380	.650	24.0	.30	8.5	7.50	860
	—130	800	75	13	.001	92.5	7.000	5.380	1.300	65.0	.72	20	24.0	1300
8420	—610	7700	370	6.5	.0033	400	8.420	3.500	6.100	650.0	7.00	145	—	—
11968	—060	1150	220	21	.0007	77.5	11.968	10.250	.600	45.0	2.00	25	23.30	1580
	—093	2050	270	15	.0008	125	11.968	10.250	.930	85.0	3.7	43	46.6	1940
12250	—160	4200	350	11	.002	224	12.250	10.300	1.600	182.0	6.8	90	85.0	2500
140000	—300	24000	1350	7.5	.003	650	14.00	10.500	3.00	650.0	31	250	—	—
15600	—800	19200	370	2.6	.009	1000	15.60	5.380	8.00	2100.0	42	255	—	—

Modifications to mechanical configuration or electrical operating characteristics can be provided to satisfy specific application requirements. Additional data is available upon request for torque motor ratings from six inch-ounces to 150 foot pounds peak torque.

Magnetic Technology

Division of VERNITRON CORPORATION

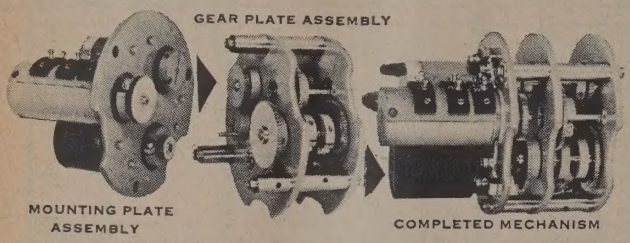
21001 Kittridge Street, Canoga Park, California 91303 / (213) 887-7700, TWX: 910-494-1217

Other Control Components Group products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Motor Products Division, Deer Park, New York - Servo, Synchronous and Stepping Motors, Vernidex* Readouts. *Reg. T.M.

PMC SERVO MECHANISMS & COMPONENTS

PREDESIGNED MECHANISMS

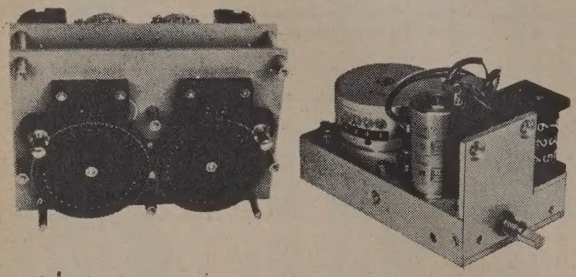
A complete line of off-the-shelf components for assembling an unlimited variety of geared mechanisms. Gear ratios to 78,125:1, zero-backlash spring-loaded gears and torque-limiting slip clutches are featured. Assembled units meet design and materials requirements of MIL-E-5400 and MIL-E-16400.



For complete data and catalog of stocked components, request Bulletin 102.

CUSTOM DESIGNS

PMC specializes in design and manufacture servo mechanisms and mechanical modules to user requirements for airborne, ground support, communications, fire control and other critical applications. The units shown below are typical of the mechanisms designed and manufactured for military and industrial equipments.



Short lead time delivery on both prototypes and production quantities.

ADJUSTABLE LIMIT SWITCHES & STOPS

0-10, -20, -40 revolutions without snap action switch, 0-25 revolutions with snap action switches actuated just before mechanical stops. All models infinitely adjustable with single external screw. SPDT snap action switch rated 7A, 250V.

Limit Stop
Series LS 100
5/8 and 7/8" dia.

Limit Stop And Switch
Series LS 300
15/16" dia.

For complete data, request Bulletins 103 and 104

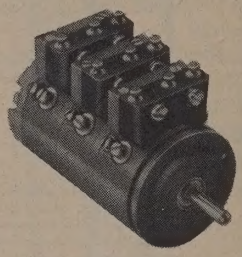
CAM SWITCHES

Adjustable-In-Motion

PMC's patented cam switch design incorporates in a single component all the functions of a conventional plate cam, cam follower and snap-action switch, eliminating the need for separately-mounted cam mechanisms and switches and their associated hardware. Externally-adjustable dwell angles can be set to any position with respect to the shaft. All models available as single- or multi-switch types, with ganged switches independently adjustable.

Model CS 402 Miniature Cam Switches

Miniature units designed and manufactured to military and aerospace specifications.

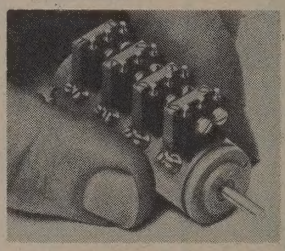


Diameter: 1-1/16", equivalent to to BuOrd Size 11
Length: 0.8", one switch, plus 5" per switch
Dwell Angle: 3° to 357°
Switch: SPDT
Rating: 5A, 250VAC, 30VDC
Multi-Switch Models: up to 10 switches
Shaft: 0.125" dia.

For complete data, request Bulletin 106

Model CS 601 Subminiature Cam Switches

Subminiature units for airborne, space vehicle and other applications where size and weight are critical.

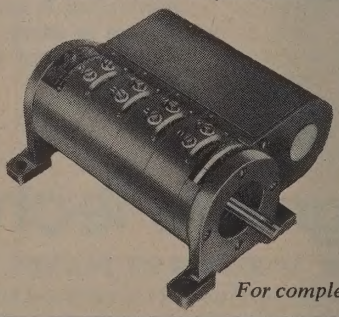


Diameter: 0.75", equivalent to BuOrd Size 8
Length: 0.730" one switch, plus 0.437" per switch
Dwell Angle: 3° to 357°
Switch: SPDT
Rating: 7A, 250VAC, 30VDC
Shaft: 0.125" dia.
Multi-Switch Models: up to 8 switches

For complete data, request Bulletin 09

Model CS 501 High-Power Cam Switches

Industrial types for control, cycling and sequencing of machine operations. End- or side-mounting, with or without switch covers. Dials permit visual adjustment of switching points and dwell angles.



Dwell Angle: 5° to 355
Diameter: 3.5"
Length: 3" one switch, plus 1.5" per switch
Shaft: 0.5" dia.
Switches: SPDT, DPDT. Special types to requirements
Ratings: to 25A and 60 V inrush current to 75A.

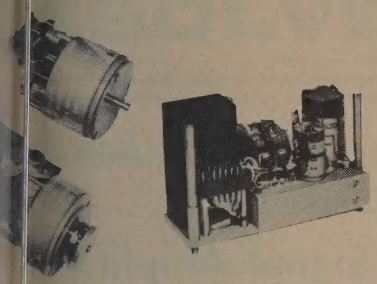
For complete data, request Bulletin 08

PMC PRECISION MECHANISMS CORPORATION
44 BROOKLYN AVENUE, WESTBURY, L.I., NEW YORK 11590 • (516) ED 3-5955

Servo Development Corp.

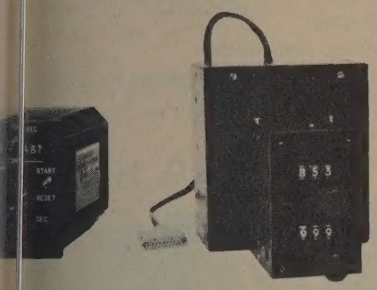
SYSTEMS

ELECTROMECHANICAL • SOLID STATE
COUNTERS • SERVOMECHANISMS
AIRCRAFT INSTRUMENTS • TIMERS



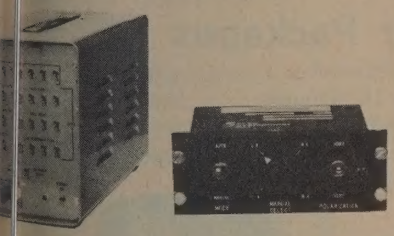
SERVO & ELECTROMECHANICAL DEVICES

Devices include display and positioning servos with output shaft torques up to 200 oz-inches, signal conversion servos providing electrical outputs with stringent static and dynamic requirements for use in special purpose airborne analog computers. These systems have been produced using DC torquers, stepper motors and AC servo motors.



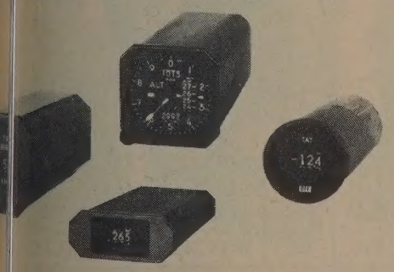
TIMERS & INTERVALOMETERS

This line of sophisticated digital, solid state and electromechanical timers, intervalometers, programmers and clocks are used for navigational aids, fire control and weapon release systems. Outputs vary from switch closures to complex pulse trains. Timing cycles from milliseconds through hours with accuracies better than .005% are available. Manual or remote programming can be provided.



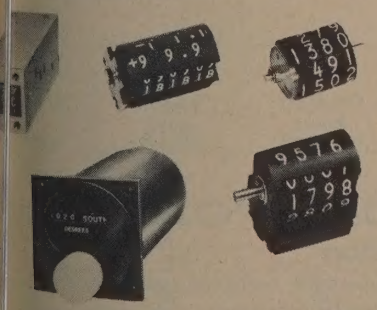
DIGITAL DEVICES

Solid state pulse generators, comparators and programmers are custom designed to commercial and military specs. These devices can accept analog, digital or pulse signals and process these depending upon application. Pulse outputs are available to the multi-ampere range with rise and fall times down to the nanosecond region.



AIRCRAFT INSTRUMENTS

SDC produces a line of air data, temperature and engine instruments for both military aircraft and commercial jet transports. The air data indicators are designed to operate from Air Data Computer outputs and temperature instruments from resistance probes. These indicators are supplied with DC Torquer drives as well as conventional AC servo motors.



COUNTERS MECHANICAL & ELECTROMECHANICAL

SDC offers a catalog line of low torque, high-speed mechanical instrument counters. These counters are used in our Microjuster® series, which is an accurate manual input device that generates electrical signals proportional to a digital counter display. These signals can be synchro or analog output.

Automatic and manual resettable pulse counters are available.

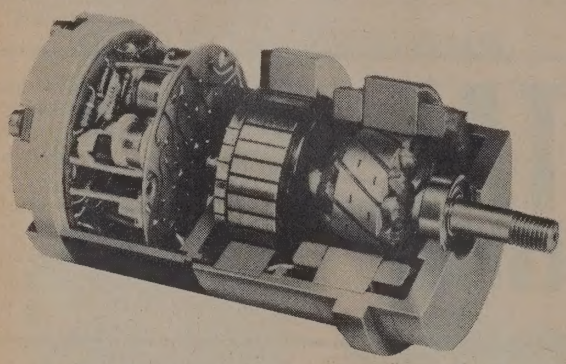
Servo Development Corp. 2 Willis Court ▪ Hicksville, N.Y. 11802 ▪ (516) 681-4343
TWX: 510-221-1844
A Subsidiary of Ragen Precision Industries

VERNITRON TORQSYN® REMOTE POSITIONERS

The complete gearless servo system in one small package

The Torqsyn Remote Positioner is an integrated system that combines a synchro transformer, torque motor, amplifier, stabilization network in a single package. The Torqsyn thus can simplify design, procurement, assembly and maintenance and improve reliability. Size 23 and size 16 and housings are available. Torqsyn converts input synchro data into accurate shaft position. High input impedance allows it to be driven by low power signal sources.

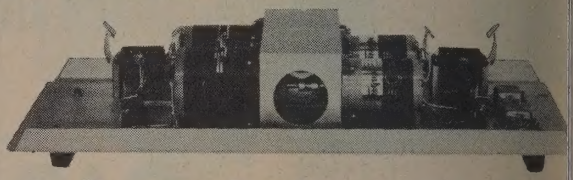
The Torqsyn Remote Positioner may be used to drive potentiometers, encoders, resolvers, indicators, etc. In several models, either 60 Hz or 400 Hz signals may be accepted.



Complete subsystems and assemblies incorporating Torqsyn units

Synchro Signal Amplifiers

- ☐ Accepts synchro signal from any transmitter
- ☐ High impedance input
- ☐ Drives large synchro transmitter
- ☐ Frequency change possible from driving to driven transmitter
- ☐ Can drive multiple receivers
- ☐ Single or multiple channels



Indicator Packages

- ☐ High impedance input
- ☐ High accuracy (10 minutes)
- ☐ No current feedback to source
- ☐ May be driven by low power source such as digital to synchro outputs

Typical Torqsyn Performance Characteristics @ 25°C

MODEL	DIAM. (In)	LENGTH (In)	VOLTS Primary	VOLTS Signal	FREQ. (Hz)	STATIC Acc. (±Min.)	STALL Torque (Oz-In)	TORQUE Gradient (Oz-In)	POWER Stall (Watts)	POWER Quiescent (Watts)	NO LOAD Speed (Rpm)	INPUT Impedance (Ohms)	VELOCITY Constant (1/Sec)
VTSN16-4A2	1.600	3.478	26.0	11.8	400	10	2.7	10.0	4.0	2.0	650	550	12,000
VTSN23-4A2	2.250	3.445	26.0	11.8	400	15	3.0	10.0	3.5	2.0	400	2200	6000
VTSN23-64E2	2.250	3.445	115	90	60/400	10	4.0	15/25	11.0	5.0	500	4600/24,500	10,000/15,0

NOTE: Length is from front face to terminal block not including terminal screws.

VERNITRON CORPORATION
Control Components Division
2440 West Carson Boulevard, Torrance, California 90501 / (213) 328-2504, TWX: 910-349-50
Other Control Components Group products: Magnetic Technology Division, Canoga Park, Califo - Torque Motors and Tachometer Generators; Motor Products Division, Deer Park, New York - S o, Synchronous and Stepping Motors, Vernidex* Readouts. *Reg. T.M.

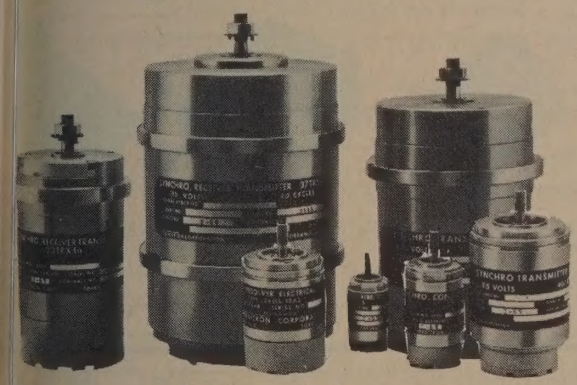
ERNITRON YNCHROS AND ESOLVERS

ndard Synchros

- ne sizes 8 thru 45
- est Mil-Spec designs (modifications as you require)
- uracies down to 3 minutes
- gle and double ended shafts
- nless steel or aluminum housings
- minal block or lead types
- shless units
- dem units
- nsmitters, receivers, differentials, receiver/ nsmitters, linear synchros (induction pots)

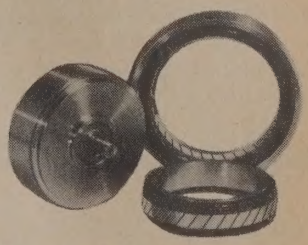
ndard Resolvers

- Weps frame sizes 8, 11, 15 and 23
- uracies to .05% on computing types and 20 seconds
- data transmission units
- est Mil-Spec designs (modifications as you require)
- ying voltage, frequency and impedance levels
- mmed and Tuned Resolvers
- ase shifters
- eep resolvers
- mperature compensated units
- ushless resolvers
- solver chains (booster and boosterless)



Pancake Synchros and Resolvers

- ☐ Single speed — Accuracies to 10 seconds, Sizes 1.2″ to 13.4″ O.D.
- ☐ Multi-speed — Accuracies to 3 seconds, Sizes 1.5″ to 13.4″ O.D., Speeds — 2X to 72X
- ☐ Dual, triple combinations of speeds, in wide range of sizes and speeds. Also available with brushless torque motors
- ☐ True brushless or flex lead designs, single or multi-speeds
- ☐ Cartridge assemblies in stainless steel, aluminum, beryllium or titanium to meet unique requirements
- ☐ Temperatures from −65°F to +500°F. Space applications — hard vacuum — 10^{-14}Torr



20 SECOND ACCURACY IN SIZE 23 HOUSING
Typical Performance characteristics

	RESOLVERS		
Model Designation	VRR23-4AD13	VRR23-4AJ13	VRR23-4AC13
Operation	Control Transmitter	Control Differential	Control Transformer
Primary	rotor	stator	stator
Input (volts)	115	57.5	57.5
Output (volts)	57.5	57.5	57.5
Frequency (Hz)	400	400	400
Null (mv/v)	1.0	1.0	1.0
*Error (max.) (seconds)	20	20	20
Phase Shift (S/R) or (R/S)	3.5°	2.4°	2.2°
Zso	113 / 24°	1,200 / 84°	10,000 / 84°
Zss	13 / 32°	156 / 30°	1,200 / 32°
Zro	410 / 84°	1,260 / 84°	10,600 / 82°
Zrs	51 / 32°	163 / 30°	1,230 / 32°

	SYNCHROS					
Model signation	VCX23-4V13	VCX23-4S13	VCDX23-4S13	VCDX23-4T13	VCDX23-4T13	VCT23-4S13
eration	Control Transmitter	Control Transmitter	Control Differential	Control Differential	Control Transformer	Control Transformer
nary	rotor	rotor	stator	stator	rotor	rotor
ut (volts)	115	26	90	20.4	90	20.4
put (volts)	90	20.4	90	20.4	57.5	12.94
quency (Hz)	400	400	400	400	400	400
l (mv/v)	1.0	1.0	1.0	1.0	1.0	1.0
or (max.) conds)	20	20	20	20	20	20
se Shift R) or (R/S)	2.8°	2.8°	2.0°	2.0°	2.0°	2.0°
Zso	270 / 82°	270 / 82°	1,750 / 84°	1,750 / 84°	17,500 / 84°	17,500 / 84°
Zss	33 / 31°	33 / 31°	187 / 36°	187 / 36°	1,830 / 33°	1,830 / 33°
Zro	410 / 84°	410 / 84°	1,840 / 84°	1,840 / 84°	7,480 / 84°	7,480 / 84°
Zrs	49 / 32°	49 / 32°	210 / 35°	210 / 35°	800 / 35°	800 / 35°

*10 second accuracy also available. Other parameters as specified above.

NOTES:

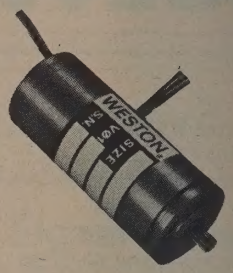
1. For 3 phase windings, impedance is given as line to line.
2. All synchros designed to meet environmental requirements of MIL-R-20708.
3. All resolvers designed to meet environmental requirements of MIL-R-23417.

WESTON-TRANSICOIL

servo motors, generators, amplifiers & servo assemblies

MOTORS *Sizes 5 thru 23, 60 & 400 cycles for military, commercial and industrial applications. Servo, synchronous, stepper, viscous or inertially damped. High temperature and high-torque types available. Versions to meet ARP 497 and MIL-S-22432 including QPL types. Integral gear heads, optional slip clutches. All units have vacuum impregnated windings, stainless steel shafts and bearings.*

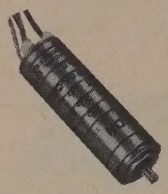
Size 8
Servo Motor



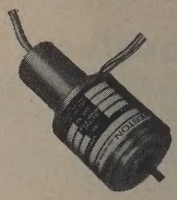
Size 8
Inertially-
Damped Servo Motor

Industr
Servo M or
with Gear ead

MOTOR—GENERATORS & TACHOMETERS *Sizes 5 thru 23, 60 & 400 cycles. Damping, rate and integrating (temperature compensated). Available in combination with servo motors or as separate units. Options include a range of short-housing, high-temperature and high-torque types. Low inertia motor tachometers have outputs up to 3.5 v/1000 rpm. Output voltage per 1000 rpm on temperature-compensated units within ± 0.5% from — 55C to 125C.*



Size 5
Motor-Generator

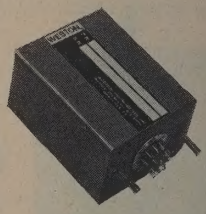


Size 18
Motor Tachometer

Size 11
Low-Null Motor-Gen era

AMPLIFIERS & SPECIAL ELECTRONICS *Transistorized servo amplifiers designed to provide high linearity signal amplification to voltage and power levels required for driving motors up to and including size 23. Special features and extra inputs available on request. Stepper logic-driver programs field excitation to stepper motor windings for maximum response.*

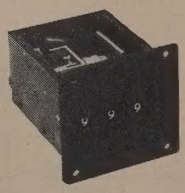
Size 11
Servo Amplifier



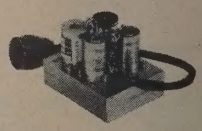
Stepper
Logic Driver

Plate
Amplifie

COMPLETE PACKAGES *Complete servo assemblies and sub-assemblies are designed, manufactured and tested by Weston-Transicoil to meet specific military, commercial and industrial application requirements. Included are data converters, incremental servos, indicators & display devices, function generators & computing servos.*



Stepper
Counter Assembly

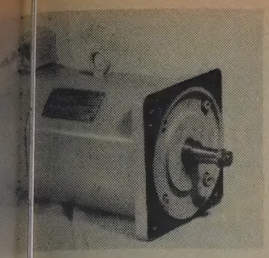


Two Speed
Simulator

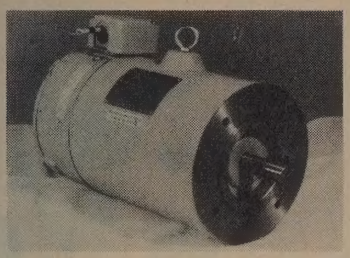
Tacan
Combined Coupl r

Contact Weston Components Division, Worcester, Pennsylvania. Telephone (215) 277-1300.

WESTON®-TRANSICOIL



rtia Motor Standard Series
JKMM-25EM



(B). Minertia Motor Junior Series
JKCM-150EM

Minertia Motor®

HIGH PERFORMANCE D-C SERVOMOTOR

"Slotless Armature"

CHARACTERISTICS:

1. Low armature inertia
2. High maximum torque
3. High torque to inertia ratio
4. High power rate
5. Short Mech. time constant
6. Short Elect. time constant
7. Smooth operation in wide speed range
8. Superior commutation performance
9. Superior linearity of torque vs. speed performance

APPLICATIONS:

1. Machine Tools
   - N/C servo drive in milling machines, Lathes and drilling machines
   - Tracer system in milling machines, Lathes and drilling machines
2. General industrial machines
   - Radar and antenna drives
   - Edge position control for steel mill and textile
   - Electrode positioners
3. Computer peripheral equipment
   - Magnetic tape transports capstan drive
   - Line printer paper feed
   - Card sorters

Jan. 29, 1970

cteristics & Ratings of *Minertia Motor*

MM Minertia Motor Standard Series — Mech. time constant s about 3 to 4 millisecond.

CM Minertia Motor Junior Series — Moderate performance for general servo application.

SM Minertia Motor Super Series — Mech. time constant is around one millisecond.

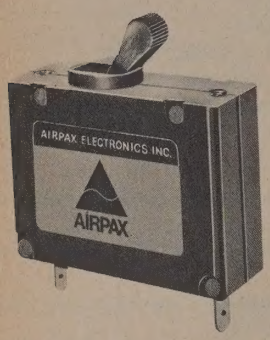
	MINERTIA MOTOR STANDARD SERIES						LARGE MINERTIA MOTOR			MINERTIA MOTOR JUNIOR SERIES					MINERTIA MOTOR SUPER SERIES			
stics	JKMM-6EM	JKMM-13EM	JKMM-25EM	JKMM-50SR	JKMM-100SR	JKMM-200SR	JKMM-500SR	JKMM-1000SR	JKMM-2000SR	JKCM-037EM	JKCM-075EM	JKCM-150EM	JKCM-220EM	JKCM-370EM	JKSM-10SM (10EM)	JKSM-15SM (15EM)	JKSM-20SM (20EM)	JKSM-25SM (25EM)
ue	83	180	350	695	1390	2780	453	870 lb-in	1740	286	580	1160	1710	2860	148 (70)	208 (96)	268 (130)	340 (150)
Tor e	← 1,000% of Rated Torque within one second →									1430	2890	5800	8550	1430	445	625	805	1000
										500% of Rated Torque within one second					300% Rated Torque within 1 sec.			
ent	6.1	7.4	13.1	13.2	32.6	53.5	74	113	112	6.8	6.6	12.6	18.4	30	15.4 (7.6)	15.8 (7.7)	14.9 (7.4)	16.1 (7.5)
nt	← 1,000% of Rated Current within one second →									34	33	63	92	150	45	47	44	48
										500% of Rated Current within one second					300% Rated Current within 1 sec.			
age	40	68	71	39	110	130	148	150	203	70	140	140	140	140	23 (17)	29 (21)	38 (27)	49 (37)
ed s)	← 3000 (5000) →						2000	1500	1000	←	—	1750 (2900)	—	→	1020 3000	1200 3000	1180 3000	1500 3000
out	180	390	750	1500	3000	6000	10kw	15kw	20kw	370	750	1500	2200	3700	110 (50)	180 (85)	230 (115)	375 (170)
J	0.00780	0.0203	0.0403	0.0850	0.210	0.750	0.175	0.54 lb-in-s²	1.41	0.345	0.81	2.22	3.45	9.07	0.00256	0.00302	0.00362	0.00406
nst. p.	14.3	25.3	27.4	54.2	43.7	54.2	5.85	7.82 lb-in/A	16.2	44.2	92.3	97.5	98.5	102	10.1	13.5	18.8	21.7
t.	0.101	0.179	0.193	0.382	0.310	0.382	0.66	0.885	1.83	0.312	0.652	0.69	0.698	0.722	0.0708	0.0905	0.132	0.153
Const.	4.5	4.6	3.6	3.3	3.1	3.3	4.0	5.3	4.4	31	29	25	23	19	2.2	1.6	1.3	1.2
R °C)	0.84	1.03	0.47	0.81	0.20	0.090	0.0913	0.0687	0.0944	1.3	2.4	0.76	0.47	0.15	0.61	0.66	0.87	0.97
L	0.90	1.5	0.63	1.4	0.48	0.29	0.76	0.90	1.8	0.16	0.70	0.44	0.24	0.23	0.40	0.54	0.65	0.75
Const.	1.1	1.5	1.4	1.7	2.4	3.2.	8.3	13	19	0.12	0.29	0.58	0.51	1.5	0.65	0.82	0.75	0.77
orq.	2.2	4.3	6.5	14	16.6	51.3	—	—	—	13	21	24	27	61	2.8	3.1	3.3	3.3
amp. C M	0.00042	0.00083	0.0013	0.0025	0.0087	0.019	—	—	—	0.0054	0.0079	0.022	0.038	0.074	0.0024	0.0031	0.0046	0.0053
1/s²	10.7	8.9	8.7	8.2	6.6	3.7	2.6	1.6	1.25	0.83	0.72	0.53	0.50	0.32	58 (27)	69 (32)	74 (36)	84 (38)
te	6.3	11	21	40	65	73	133	160	224	1.7	2.9	4.3	6.0	6.4	60 (13)	100 (22)	140 (33)	200 (40)
ding m20°C	PM	PM	PM	3.0/30	3.4/31	4.2/26	10/7.5	12.3/7.3	16/4	PM	PM	PM	PM	PM	PM	PM	PM	PM
Needed Aq	TENV	TENV	TENV	← External Blower Mounted on Motor →						TENV	TENV	TENV	TENV	TENV	19/13	42/11	26/13	45/31
ze	7/5	9.5/5.5	11.5/6.5	12.5/7.5	14.5/8.5	18/9.5	25/12.5	35/15	41/17	10/6.5	11.5/7	13/7.5	14.5/9	18/10	7/5	7.5/5.5	9/5.5	10/5.5
eight	17.5	28	55	95	143	200	795	1550	2210	33	51	73	110	199	18	22	29	33

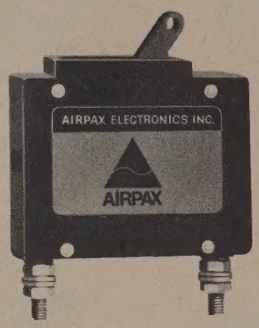
Figures in brackets show the Ratings under TENV.

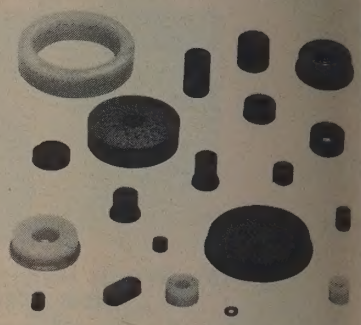
YASKAWA ELECTRIC AMERICA, INC.
100 BLISS DRIVE, OAK BROOK, ILLINOIS 60521
Telephone: (312) 654-3950

AIRPAX

CIRCUIT PROTECTORS & GLASS-TO-METAL SEALS







TYPE APG CIRCUIT PROTECTORS

Airpax APG type protectors provide reliable, low cost circuit protection for industrial applications and ground support military equipment. Combining the mechanism of the military approved Airpax AP protector with the delay system and coil structure of the larger APL type, these devices have all of the plus features which characterize Airpax circuit protectors. Toggle action is trip free, making it impossible to hold the circuit closed against a fault.

The APG line offers series, shunt and relay configurations with a choice of delays and ratings. Delay is magnetic-hydraulic by using an iron slug that moves in an oil-filled cylinder. Ratings are from 20 milliamperes to 30 amperes, 250 volts maximum at 60 or 400 Hz and 50 volts DC maximum. A SPDT auxiliary switch, for remote signaling or alarm, rated at 5 amperes up to 30 volts DC and 10 amperes, 250 VAC maximum, can be supplied with series trip types.

APG two and three pole assemblies have single toggle handles, a unique feature which simplifies mounting. These assemblies can be furnished with a mix of ratings, delays and internal circuit configurations, providing maximum versatility.

UPG types have UL listings as recognized components.

TYPE APL CIRCUIT PROTECTORS

Ruggedly constructed to provide dependable protection under the most severe conditions of use, the Airpax type APL circuit protector has its actuating mechanism housed in a molded phenolic case.

The handle opens and closes a circuit, under normal load conditions, similar to an ON-OFF switch. On overload the internal mechanism trips and forcibly returns the handle to the OFF position. The internal contacts will not remain closed in the presence of an overload, even though the handle is held in the ON position since the protector is "trip free."

Variants of the APL type are the UPL and MPL. Both are available with extended delay times to accommodate high inrush or motor starting currents without tripping. They are listed by the Underwriters' Laboratories as recognized components.

APL protectors have full load current ratings from .050 to 50 amperes. They operate up to 50 VDC or 250 VAC maximum, 60 or 400 Hz. The trip current rating is unchanged over the rated operating temperature span.

The hydraulic dash-pot, included in the trip mechanism, provides a wide choice of delays to meet various circuit requirements. An inertia trip type is also available for delaying the protector armature movement on short time transients.

GLASS-TO-METAL SEALS AND PREFORMS

Exacting customer specifications are met with quality, glass insulated terminals manufactured by Airpax. A wide variety of terminals are producible and glass can be color coded for identification. Leads can be kovar, sleeved solid copper or tubular. A large choice of standardized pins, lugs, and in-house manufactured preforms permits quick delivery to your specific needs. All glass preforms and ceramic filled glasses are available to seal-manufacturing companies. Our engineering department will assure a seal to meet your requirement with a detailed analysis of your seal problem.

Catalogs are available on circuit protectors and glass seals. Please contact Airpax Electronics, Cambridge Division, Cambridge, Maryland 21613. Phone: (301) 228-4600. Telex: 8-7715. TWX: (710) 865-9655.

AIRPAX . . . components of confidence

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

MST SERIES MINIATURE TOGGLE SWITCHES

he original Alcoswitch Series of high quality ultra-miniature ggle switches combines high current capacity and long life in ½" case. Slim, bat handle or optional plastic caps(*) are proded. Terminals and contacts are solid silver. Case material is ack phenolic resin; 1/4-40 threaded bushing. Rated 5 amps at 5 VAC. SPDT and DPDT types have life cycle of over 80,000 n-off operations. High voltage barriers between terminals and ontacts. Rated 5 amps @ 115 VAC.

Model	Contacts	Description	One-24	25-99	100-499	500-999
ST-115D*	SPDT	On-None-On	1.70	1.16	1.02	.85
ST-105D	SPDT	On-None-On	1.65	1.12	.99	.83
ST-105E	SPDT	On-Off-On	1.95	1.33	1.17	.975
ST-105F	SPDT	None-On-(On)	1.95	1.33	1.17	.975
ST-105G	SPDT	(On)-Off-(On)	1.95	1.33	1.17	.975
ST-105H	SPDT	On-Off-(On)	1.95	1.33	1.17	.975
ST-215N*	DPDT	On-None-On	2.20	1.47	1.32	1.10
ST-205N	DPDT	On-None-On	2.15	1.43	1.29	1.08
ST-205P	DPDT	On-Off-On	2.55	1.72	1.53	1.28
ST-205R	DPDT	None-On-(On)	2.55	1.72	1.53	1.28
ST-205S	DPDT	(On)-Off-(On)	2.55	1.72	1.53	1.28
ST-205T	DPDT	On-Off-(On)	2.55	1.72	1.53	1.28
ST-205PA	DP3T	On-On-On	2.85	1.90	1.71	1.42
ST-205SA	DP3T	(On)-On-(On)	3.15	2.14	1.89	1.58
ST-205TA	DP3T	On-On-(On)	3.15	2.14	1.89	1.58
ST-315D*	3PDT	On-None-On	3.90	2.61	2.34	1.95
ST-305D	3PDT	On-None-On	3.85	2.57	2.31	1.925
ST-305E	3PDT	On-Off-On	4.15	2.82	2.49	2.075
ST-305F	3PDT	None-On(On)	4.15	2.82	2.49	2.075
ST-305H	3PDT	On-Off-(On)	4.15	2.82	2.49	2.075
ST-415N*	4PDT	On-None-On	4.90	3.33	2.94	2.45
ST-405N	4PDT	On-None-On	4.85	3.29	2.91	2.43
ST-405P	4PDT	On-Off-On	5.35	3.64	3.21	2.68

Hardware supplied mounted. (On) Indicates momentary positions.

MSTA SERIES MINIATURE TOGGLE SWITCHES

This new Alcoswitch "MSTA" Series fills a need for those who want the best product possible at an optimum price. Similar in appearance and specs to the Alco "E" Series but without the waterproof feature. Has the important features wanted in a good miniature: turret terminals, extra-wide contacts, heavier current capabilities, low-loss, high heat and high impact case construction. "No Tear" shoulder on bushing. 6A 125V/3A 280 VAC.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTA-106D	SPDT	On-None-On	1.80	1.23	1.08	.90
MSTA-106E	SPDT	On-Off-On	2.25	1.53	1.35	1.125
MSTA-106F	SPDT	(On)-On-None	†	†	†	†
MSTA-106G	SPDT	(On)-Off-(On)	†	†	†	†
MSTA-106H	SPDT	(On)-Off-On	†	†	†	†
MSTA-206N	DPDT	On-None-On	2.35	1.60	1.41	1.18
MSTA-206P	DPDT	On-Off-On	2.85	1.90	1.71	1.42
MSTA-206R	DPDT	(On)-On-None	†	†	†	†
MSTA-206S	DPDT	(On)-Off-(On)	†	†	†	†
MSTA-206T	DPDT	(On)-Off-On	†	†	†	†
MSTA-206PA	DP3T	On-On-On	3.15	2.14	1.89	1.58
MSTA-206TA	DP3T	(On)-On-On	†	†	†	†
MSTA-206SA	DP3T	(On)-On-(On)	†	†	†	†
MSTA-306D	3PDT	On-None-On	4.05	2.75	2.43	2.03
MSTA-306E	3PDT	On-Off-On	4.45	3.03	2.67	2.23
MSTA-306F	3PDT	(On)-On-None	†	†	†	†
MSTA-306H	3PDT	(On)-Off-On	†	†	†	†
MSTA-406N	4PDT	On-None-On	5.10	3.47	3.06	2.55
MSTA-406P	4PDT	On-Off-On	5.65	3.84	3.39	2.83
MSTA-406PA	4P3T	On-On-On	6.15	4.18	3.69	3.08
C-10*°		Plastic cap for MST, A, E	.04	.028	.025	.022
C-17*°		Flat top cap for MST, A, E	.04	.028	.025	.022

* Packages of 25; ° Specify red, white, black, blue, gray, green, yellow, pink. (On) Indicates momentary positions. † Prices upon request.

MSTE SERIES MINIATURE TOGGLE SWITCHES

E SERIES

The new "E" Series has the most-wanted features in miniature switches. Waterproof 'O' rings are located inside the toggle and on the shoulder. A mechanical shoulder on the bottom of the bushing prevents "tear-offs" when a single mounting nut is employed. High voltage barriers between terminals inside as well as outside. Case has a new, superior plastic material capable of withstanding a higher impact; guards against accidental damage. Low-loss case has extremely high resistance between terminals and case ground, and its high temperature coefficient is ideally suited for prolonged soldering and printed circuits. Turret type terminals are used for simplified wiring or for P.C. Extra-wide, solid silver contacts are bonded, not riveted, on copper-silver plated terminals. Long-life cycle over 100,000 On-Off operations at operating conditions (SPDT). Rated 6 amps @ 125 VAC.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTE-106D	SPDT	On-None-On	1.95	1.33	1.17	.975
MSTE-106E	SPDT	On-Off-On	2.55	1.72	1.53	1.28
MSTE-206N	DPDT	On-None-On	2.55	1.72	1.53	1.28
MSTE-206P	DPDT	On-Off-On	3.15	2.14	1.89	1.58
MSTE-206PA	DP3T	On-On-On	3.45	2.35	2.07	1.73
MSTE-306D	3PDT	On-None-On	4.25	2.89	2.55	2.13
MSTE-306E	3PDT	On-Off-On	4.75	3.23	2.85	2.38
MSTE-406N	4PDT	On-None-On	5.35	3.64	3.21	2.68
MSTE-406P	4PDT	On-Off-On	5.95	4.05	3.57	2.98

Hardware supplied mounted. Color-coded caps: see "A" Series story above

MSTG SERIES MINIATURE TOGGLE SWITCHES

Mustang

The Mustang Series is for designers who prefer the feel of a larger toggle switch but have space limitations behind today's compact panel. The familiar ultra-miniature Alcoswitch ½" case is utilized, however the Mustang mounting requirements are the same as the larger switches with 15/32" bushings. This new Alcoswitch concept is a behind-the-panel space-saver in all Mustang models and it is especially true in the 3 Pole and 4 Pole Series where non-miniature switches are bulky in size. The Mustang switches have the most-wanted features as itemized in the "E" Series story (at left) with the exception of the waterproof 'O' rings. The case construction is of low-loss, high impact and high temperature materials with turret terminals and silver contacts. 6 amps @ 125 VAC.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTG-106D	SPDT	On-None-On	2.15	1.43	1.29	1.08
MSTG-106E	SPDT	On-Off-On	2.75	1.87	1.65	1.38
MSTG-206N	DPDT	On-None-On	2.75	1.87	1.65	1.38
MSTG-206P	DPDT	On-Off-On	3.35	2.28	2.01	1.68
MSTG-206PA	DP3T	On-On-On	3.65	2.48	2.19	1.83
MSTG-306D	3PDT	On-None-On	4.45	3.03	2.67	2.23
MSTG-306E	3PDT	On-Off-On	4.95	3.37	2.97	2.48
MSTG-406N	4PDT	On-None-On	5.55	3.77	3.33	2.78
MSTG-406P	4PDT	On-Off-On	6.15	4.18	3.69	3.08
C-15*		Plastic cap for Mustang Series	.06	.04	.036	.033
N-1B*		15/32" "Perfect Fit" Nut	.08	.056	.05	.044

*Packaged in multiples of 25; when ordering caps specify, red, white, black, blue or gray.

MSTL SERIES LOCKING TOGGLE SWITCHES

Lever-Lock Alcoswitch is the world's first "pull-to-unlock" toggle switch for use in hazardous applications. The toggle locks in position to safeguard against accidents. Optional interchangeable color-coded toggle tips available. Rated 6 amps @ 125 VAC.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTL-106D	SPDT	On-None-On	3.15	2.14	1.89	1.58
MSTL-106E	SPDT	On-Off-On	3.85	2.57	2.31	1.925
MSTL-206N	DPDT	On-None-On	3.85	2.57	2.31	1.925
MSTL-206P	DPDT	On-Off-On	4.45	3.03	2.67	2.23
MSTL-206PA	DP3T	On-On-On	4.75	3.23	2.85	2.38
MSTL-306D	3PDT	On-None-On	5.65	3.84	3.39	2.83
MSTL-306E	3PDT	On-Off-On	6.25	4.24	3.75	3.13
MSTL-406N	4PDT	On-None-On	6.95	4.73	4.17	3.48
MSTL-406P	4PDT	On-Off-On	7.45	5.06	4.47	3.73
MSTL-406PA	4P3T	On-On-On	7.95	5.40	4.77	3.98
C-16*		Color-Coded Caps	.18	.12	.11	.10

* Lever-lock switches are stocked with natural aluminum caps only. Extra caps available in anodized Red, Blue, Green, and Black, (specify color).

MINIATURE CYLINDRICAL TOGGLE SWITCHES

New design cylindrical case for miniature toggle switches when a positive feel and reliability are prerequisite in the smallest size possible. All metal construction and high impact terminal insulator allows use under all environmental conditions. Rated 10 amps @ 125 VAC. Internal contact resistance; under 20 milliohms @ 2-4 VDC, 1 amp. Life 40,000 on-off operations. Contact material, silver on copper. U/L Approval available on special order.

Model	Contacts	Description	One-24	25-99	100-499	500-999
*MCT-110D	SPDT	On-None-On	1.95	1.33	1.17	.975
*MCT-220N	DPDT	On-None-On	2.55	1.72	1.53	1.28
**MCTG-110D	SPDT	On-None-On	1.95	1.33	1.17	.975
**MCTG-220N	DPDT	On-None-On	2.55	1.72	1.53	1.28

*With miniature bushings. **With standard size 15/32" bushings.

C-10*°		Plastic cap for MST, A, E	.04	.028	.025	.022
C-17*°		Flat top cap for MST, A, E	.04	.028	.025	.022

* Packages of 25; ° Specify red, white, black, blue, gray, green, yellow, pink. (On) Indicates momentary positions.

MSH LEVER AND MSL ROCKER SWITCHES

Versatile DPDT action switches have choice of actuators, long lever or rocker. Rated 3 amps @ 125 VAC; 25,000 life cycle; contacts silverplated.

Model	Description	One-24	25-99	100-499	500-999
MSH-203N	Lever-Switch DPDT	1.25	.85	.75	.63
MSL-203N	Rocker Switch DPDT	1.15	.78	.69	.58

MSS SERIES MINIATURE SLIDE SWITCHES

MSS-22 Miniature Slide Switch with unusual two-circuit N.O.-N.C. (useable as SPDT) anti-tease design. Rated 2 amps @ 120 VAC. Compact ½" case has corrosion-proof metal case and phenolic slide block. Gold on nickel on silver-plated brass contacts. Life cycle, 250,000 operations. Case size, .500" x .305" x .257"; mounts .687" centers.

Model	Description	One-24	25-99	100-499	500-999
MSS-22	SPDT, 2 circuit	1.75	1.17	.88	.73
MSS-44	DPDT	3.15	2.11	1.58	1.31

MINIATURE PROXIMITY MAGNETIC SWITCH ASSEMBLIES

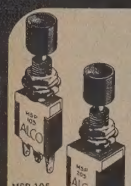
Includes a basic dry reed switch and encased Alnico-5 magnet that actuates the reed switch within distance of .39". Current rating @ 50 VDC: .15 amps break, .5 amps carry. 200 VDC breakdown. Life: 10-million cycles. 8" leads. Size: 1.102" x .335".

Model	Description	One-24	25-99	100-499	500-999
RS-11-NO	N.O. (Apart) Pair	2.75	1.87	1.65	1.38
RS-11-NC	N.C. (Apart) Pair	3.05	2.08	1.83	1.53

ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842
AREA CODE 617
686-3887

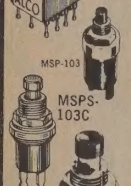
ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.


MSP-105

MSPE-106

MSPE-206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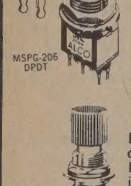
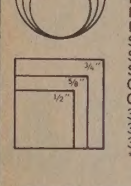

MSP-103

MSPS-103C


MSPG-206 DPDT

MINIATURE PUSH BUTTON SWITCHES

MSP Miniature Pushbutton Switches, snap-action, 5 amps @ 115VAC. Solid silver contacts, terminals. Bushing size, ¼-40 with keyway. Black phenolic case. 20,000 life cycle.

MSPE Waterproof Pushbutton Switches, 6 amps resistive, 2 amps inductive @ 125VAC. Double "O" waterseals, low-loss "E" Series case; turret terminals. Versatile "double-throw".

MSP-103 Economy Pushbutton Switches, 3 amps @ 125VAC. Low-pressure. Silverplated brass contacts, terminals. Plunger travels .098". Depth behind panel, ¾". 1-pc. ¼-40 bushing.

MSPS-103C is similar to MSP-103C except smaller diameter .310 Rated 0.5 amps @ 125 VAC.

Model	Contacts	Application	One-24	25-99	100-499	500-999
MSP-105D*	SPDT	Push on-off	2.15	1.46	1.29	1.08
MSP-105F*	SPDT	Momentary	2.15	1.46	1.29	1.08
MSP-205N*	DPDT	Push on-off	2.95	2.01	1.77	1.48
MSP-205R*	DPDT	Momentary	2.95	2.01	1.77	1.48
MSPE-106D*	SPDT	Push on-off	2.55	1.72	1.53	1.28
MSPE-106F*	SPDT	Momentary	2.55	1.72	1.53	1.28
MSPE-206N*	DPDT	Push on-off	3.45	2.35	2.07	1.73
MSPE-206R*	DPDT	Momentary	3.45	2.35	2.07	1.73
MSPE-406N*	4PDT	Push on-off	5.95	4.05	3.57	2.98
MSPE-406R*	4PDT	Momentary	5.95	4.05	3.57	2.98
C-12		Extra plastic button*	.05	.036	.032	.03
C-13		Large Button**	.09	.06	.054	.05
C-14		Chrome button (thin)	.06	.04	.036	.033
C-14L		Chrome button	.09	.06	.054	.05
G-12- (‡)		Plain guard, use with C-12	.25	.17	.15	.13
G-12-K (‡)		Knurl guard, use with C-12	.30	.20	.18	.15
G-13- (‡)		Plain guard, use with C-13	.25	.17	.15	.13
G-13-K (‡)		Knurl guard, use with C-13	.30	.20	.18	.15
MSP-103B†	SPST	Normally closed	.65	.44	.39	.33
MSP-103C°	SPST	Normally open	.65	.44	.39	.33
MSP-103C-B†	SPST	Normally open	.65	.44	.39	.33
MSPS-103C°	SPST	Normally open	.50	.34	.30	.25

*Supplied with one red, green, or black plastic button; specify color.
**Specify red, green or black. † With black button. °With red button.
‡Specify finish: add suffix **C** for chrome, **A** for nat'l alum., **B** for black.

MSPG Mustang Push Button Switches rated 6 amps @ 125 VAC (Specs same as MSPE series, less waterproof). 15/32" bushings.

Model	Contacts	Application	One-24	25-99	100-499	500-999
MSPG-206N°	DPDT	Push on-off	3.15	2.14	1.89	1.58
MSPG-206R°	DPDT	Momentary	3.15	2.14	1.89	1.58

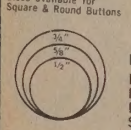
*Supplied with one red or black plastic button; specify color.

ILLUMINATED PUSH BUTTON SWITCHES

MSPN-206 DPDT

MSPN Illuminated Push Button Switches are snap-action types capable of handling a high current rating for its small size. DPDT action in a miniature case with separate connections to its replaceable T-1¾ grooved base lamps. Side terminals for simplified wiring or P.C. use. Metal construction, phenolic case, solid silver contacts. 6 amps @ 125 VAC. Mounts in 15/32" dia. hole. Wide choice of plastic buttons. **TRANSPARENT** colors: Red, Amber, Blue, Green, Clear. **TRANSLUCENT:** Red, Yellow, Green, White. Uses grooved base lamps.

Sizes available for Square & Round Buttons



Model	Contacts	Application	One-24	25-99	100-499	500-999
MSPN-206N	DPDT	Push on-off	4.80	3.26	2.88	2.40
MSPN-206R	DPDT	Momentary	4.80	3.26	2.88	2.40
Note: supplied less colored button and lamps, see listing below.						
RS°		½" Round Button	.10	.068	.06	.05
RM°		⅝" Round Button	.12	.082	.072	.06
RL°		¾" Round Button	.15	.102	.09	.075
SS°		½" Square Button	.10	.068	.06	.05
SM°		⅝" Square Button	.12	.082	.072	.06
SL°		¾" Square Button	.15	.102	.09	.075
CGR-½		½" Chrome Guard, Round	.30	.204	.18	.15
CGS-½		½" Chrome Guard, Square	.30	.204	.18	.15
379		6.3V @ 0.2A Lamps	.85	.57	.51	.43
386		14.0V @ 0.08A Lamps	.90	.60	.54	.45
388		28.0V @ 0.04A Lamps	.95	.63	.57	.47

*Specify Transparent or Translucent Type and Color.

KEYBOARD MAGNETIC REPULSION PUSH BUTTON SWITCHES

Momentary push button switches designed for data entry in modern electronic equipment. Ceramic magnets eliminate springs and allow for a very unusual touch that is light and snappy with little change in pressure over very long periods of service. Contacts are glass-encapsulated reeds for long-life. Plunger is keyed and non-rotating. Metal case withstands abuse and serves as a shield. Rated 100 mA @ 50 VDC, resistance 100 milliohms. Contact bounce 1 millisecond. Plunger travel 5/64". Operating force, under 2 ozs. Life, 10 million.

Model	Contacts	Description	One-24	25 99	100-499	500-999
MSPM-101B†	SPST	N.C., Solder Lug	4.25	3.40	2.98	2.76
MSPM-101C°	SPST	N.O., Solder Lug	3.90	3.12	2.73	2.54
MSPM-101B-1†	SPST	N.C., .110" Terminal	4.25	3.40	2.98	2.76
MSPM-101C-1°	SPST	N.O., .110" Terminal	3.90	3.12	2.73	2.54
C-12°		Extra button for MSPM	.05	.036	.032	.03

†Supplied with black button. °Supplied with red button
°Packages of 25; specify red, black or green.

MINIATURE ROTARY SWITCHES

MRA Adjustable-Stop Rotary Switches are miniature types rat 500 mA @ 125 VAC. Features: adjustable-stop; non-shorting; 3 spacing; up to 4 poles on single deck; solid silver termin and contacts. Types with suffix **S,** ⅛", dia. shaft less kno Bushing, ¼-40.

MRA 12-Position Rotary Switches are slightly larger than sta dard MRA Series has ⅛" shaft and 30° spacing. Other spe similar to MRA Series. Knobs not included. Type MRA-1-12S c be converted to an adjustable-stop switch when used wi KCVS-500 knob (see Alco knob listings).

MSRE Waterproof Rotary Switches are non-adjustable. Simil to MRA Series but feature internal and external 'O' rings. Or piece metal case construction, and terminals are epoxy seale ⅛" shaft. Ideal for printed circuits. Supplied less knob. Rat 500 mA @ 125 VAC. Can be converted to an adjustable-st switch when used with KCVS-500 knob (see knob listings).

MODEL	Pole	Positions	Knob Supplied	One-24	25-99	100-499	50 99
MRA-1-10	1	2-10	Yes	4.35	2.96	2.61	2.1
MRA-2-5	2	2-5	Yes	4.35	2.96	2.61	2.1
MRA-3-3	3	2-3	Yes	4.35	2.96	2.61	2.1
MSRA-4-2*	4	2	Yes	4.35	2.96	2.61	2.1
MRA-1-10S	1	2-10	No	4.25	2.89	2.55	2.1
MRA-1-10SC°°	1	10	No	4.25	2.89	2.55	2.1
MRA-2-5S	2	2-5	No	4.25	2.89	2.55	2.1
MRA-3-3S	3	2-3	No	4.25	2.89	2.55	2.1
MSRA-4-2S*	4	2	No	4.25	2.89	2.55	2.1
MRA-1-12S	1	12	No	4.75	3.23	2.85	2.3
MRA-1-12SC**	1	12	No	4.75	3.23	2.85	2.3
MRA-4-3	4	3	No	4.75	3.23	2.85	2.3
MSRE-1-10°	1	10	No	5.35	3.64	3.21	2.6
MSRE-2-5*	2	5	No	5.35	3.64	3.21	2.6
MSRE-3-3*	3	3	No	5.35	3.64	3.21	2.6
MSRE-4-2*	4	2	No	5.35	3.64	3.21	2.6

**Continuous rotation. * Switches are non-adjustable.

SP1, SP2 Aluminum Foil, pressure-sensitive "ON-OFF" plate for ALCOSWITCH and other miniature switches which have ¼" bushing; and for standard switches requiring 15/32" hole. Eac card has 12 plates.

SP3, SP4 Stamped Aluminum Plates for use with miniature an standard toggle switches. Black anodized, raised letters. Eac card has 5 plates: 3 ON-OFF, 1 ON-ON, 1 PWR-OFF.

SLP4 Stamped Aluminum Plates for ¼" dia. switch bushing and ⅜" pilot lights. Each card has 5 plates: 3 ON-OFF, 1 O ON, 1 PWR-OFF. ⅜" hole accepts our BND series pilots.

Model	Hole Size	No. Plates	One-24	25-99	100 499
SP-1	¼" Dia.	12	.25	.18	.17
SP-2	15/32" Dia.	12	.25	.18	.17
SP-3	¼" Dia.	5°	.75	.55	.50
SP-4	15/32" Dia.	5°	.75	.55	.50
SLP-4	¼" Dia. and ⅜" pilot	5°	.90	.65	.61

°3 ON-OFF, 1 ON-ON, 1 PWR-OFF.

Decorative Mounting Nuts — 4 styles are available for use wit ALCOSWITCH and other miniature switches. Packaged in mult ples of 25. **STANDARD** double chamfered knurled nuts for ¼-4 threaded bushings only. **"PERFECT FIT"** round bevel top wit lip for automatic stop ¼-40, ⅜, and 15/32" bushings. Decorativ is conical shape; ¼-40.

Model	Description	One-24	25-99	100-499	500-999
N-1	¼-40 Standard Knurl Nut	.04	.028	.025	.022
N-1A	¼-40 "Perfect Fit" Knurl Nut	.06	.04	.036	.033
N-1B	15/32" "Perfect Fit" Knurl Nut	.08	.056	.05	.044
N-1C	⅜" "Perfect Fit" Knurl Nut	.08	.056	.05	.044
N-2	¼-40 Standard Hex Nut	.03	.022	.02	.018
N-3	¼-40 Decorative Mounting Nut	.06	.04	.036	.033

Color-Coded Caps for miniature and standard toggle switches The MST-115D, 215N, 315N, 415N switches are stocked wit white caps only. Colored caps may be purchased separately fo use on all ALCO bat handle switches for color identificatior When ordering — specify color. Packaged in multiples of 2 (minimum).

Model	Description	25-99	100-499	500-999
C-10°	Plastic caps for "MST", "A" & "E" Series	.028	.025	.022
C-15°	Plastic caps for Mustang Series	.04	.036	.033
C-17°	Flat top caps for "MST", "A" & "E" Series	.028	.025	.022

*Specify: Red, White, Black, Blue, Gray, Green, Yellow or Pink.
°Specify: Red, White, Black, Blue, or Green

A Spanner Wrench designed expressly to expedite the prope installation of ALCOSWITCH. A long, tapered arm extends at slight angle allowing the user to tighten the lower mounting nu **Model No. W-1** ..... **Net 25¢ ea**

Conversion Unit For Rotary Switch Operation. Gangs miniatur toggle switches (with ¼" bushings) for controlling multiple ci cuits simultaneously. Operating as a 2- or 3-position rotar switch, this unit is capable of ganging from 1 to as many as toggle switch combinations that total up to 10 poles. Allows yo to have enclosed contacts, and heavier current capabilities. Us with various types of switches to act as a 3-position rotar switch when used with CENTER-OFF or ON-ON-ON type toggl switches, or becomes a 2-position rotary with switches having no center position.

Model	Description	One-24	25-99	100-499	500-999
CNV-1	Conversion Unit	.95	.63	.57	.48

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

BASE MOUNTED KEYBOARD PUSH BUTTON SWITCH

Reed actuated low profile, single pole Normally Open unit provides the low operating force and high reliability required in keyboards. RSM-41 is suitable for an 0.75 inch matrix, and is free from interaction between units. The switch is molded in high quality glass filled nylon and acetal resin, and is an FR Hamlin reed switch actuated by a permanent magnet.

Model	Description	One-24	25-99	100-499
RSM-41	Keyboard Push Button Switch	2.55	1.90	1.79
RSB-1	Blank Key	.15	.12	.105
RSB-1N	Two Shot Molded Keys 0 to 9 (specify)	.20	.16	.14

Data

	0.140"
Travel:	0.060"
Overtravel:	0.030"
Travel	
Release:	0.032"
Operating Force:	1.2 ozs.

Electrical Ratings

Voltage:	50 volts
Current:	500 mA
Power:	10 watts
Initial Contact Res:	150 milliohms
Life:	10,000,000 operations

REED PROXIMITY MAGNETIC SWITCH ASSEMBLIES

Proximity Switch and Magnet Assembly features the inherent simplicity of a basic dry reed switch to provide long life and reliability. Alnico-5 magnet is the force used to actuate the reed switch within distance of 1" centers. Reed switch provided is replaceable. Rated 0.5 amps break, 1.0 amps carry. Life cycle over 5-million operations.

Model	Description	One-24	25-99	100-499	500-999
RS-24-NO	N.O. (Apart) Pair	2.85	1.90	1.71	1.42
RS-24-NC	N.C. (Apart) Pair	3.15	2.14	1.89	1.58

MINIATURE PUSH BUTTON MOTOR START SWITCHES

Alco Miniature Power Switches combine a compact size, modern appearance and functional flexibility to meet today's control needs and mount in a 1" hole. Rated to carry to carry 6 amps @ 230 VAC. These switches may be used to control circuits independently or with optional relays. All models supplied with a single (N.O.-N.C.) contact block but have provisions for additional (SU) blocks thereby converting to DPDT, 3PDT, 4PDT.

3-Way Selector Power Switch is the same basic model as above but instead has a bar knob with pointer. Electrical and physical specifications are the same. Available in black only.

Key-Lock Push Button type is an accident-proof power switch that has its own key lock to prevent unwanted operations of machines and controls. The switch functions only when the key disengages the lock. Same specs as the series described above.

*Push button models are equipped with spare (snap-on) colored buttons offering a choice of use in red, black, or green.

Model	Description	Action	One-24	25-99	100-499	500-999
SW-251*	Standard Button	Mom. ON	2.95	1.97	1.77	
SW-251D*	Mushroom Button	Mom. ON	3.35	2.23	2.01	
SW-251L*	Long Button	Mom. ON	3.10	2.07	1.86	
SW-251S	Selector	ON-OFF-ON	3.35	2.23	2.01	
SWK-1	Key/Lock Switch	ON-OFF-ON	7.95	5.30	4.77	
SU-251	N.O.-N.C. Block		1.85	1.23	1.11	
C-251-00†	ON-OFF Buttons (pr.)		.35	.23	.21	.18
C-251-SS†	STOP-START BUTTONS (pr.)		.35	.23	.21	.18

† Standard snap-on buttons with legend for SW-251 switches

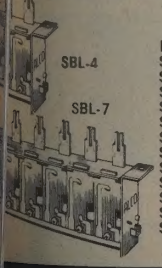
COMPACT FOOT SWITCH FOR RELIABLE OPERATION

SPDT momentary-contact switch has spring return and non-skid base. Size: 3¼"x3¼" x1".

Model	Supplied	One-24	25-99	100-499
SKF	Less Cable	4.65	3.16	2.79
SKF-6	With 6-ft. Cable	5.85	3.98	3.51

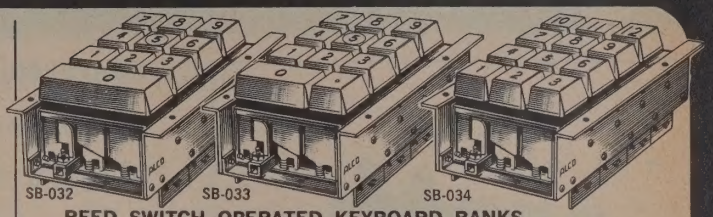
LOCKING — MODULAR SECTIONS

This series is similar in appearance and specifications to the SB series described to the right. This group differs because a bar is installed that provides a single locking operation. Overall length varies depending on the number of switches involved, each spaced 0.700" apart. Same SBB type keys are used (not supplied) and may be ordered separately. Note, removal of locking bar converts this switch into a momentary model.



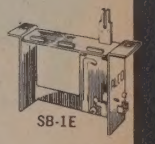
Model	Number Positions	Description	One-24	25-99	100-499
SB-1	1	Momentary	2.70	2.16	—
SBL-1	1	Locking	2.95	2.36	—
SBL-2	2	Locking	4.95	3.96	—
SBL-3	3	Locking	6.90	5.52	—
SBL-4	4	Locking	8.90	7.12	—
SBL-5	5	Locking	10.85	8.68	—
SBL-6	6	Locking	12.85	10.28	—
SBL-7	7	Locking	14.80	11.84	—
SBL-8	8	Locking	16.80	13.44	—
SBL-9	9	Locking	18.75	15.00	—
SBL-10	10	Locking	20.75	16.60	—
SBL-12	12	Locking	24.70	19.76	—

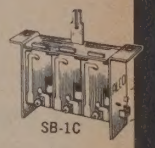
Above switches are supplied less keys; order from listing at right.



REED SWITCH OPERATED KEYBOARD BANKS

Now designers can be assured of highest reliability in data processing equipment. Short strokes provide a smooth operation of the switch plunger resulting in one of the finest keyboard actions obtainable. It is also suitable for test equipment, communication gear, and many other applications. All details of this switch line are designed for light pressure (5 ounces), operator's convenience, and positive input of data with long life under heavy office type of usage. Highly efficient "single-pole open circuit' reed switches are used assuring reliability and extremely long life expectancy. Square light grey keys (19/32") have an industry standard 0-9 marking and format. All switch positions contain a "positive lockout" between sections and rows. This feature prevents more than one position from operating at the same time. This basic keyboard system is designed for flexibility and can be customized to meet the special needs of quantity users. Up to 12 switches may be installed in the basic module in any combination including momentary, or lockout design.


SB-1E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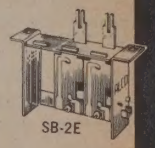
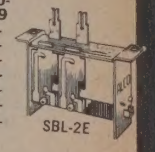

SB-2E

SB-3C

SBL-1C


SBL-2E

SPECIFICATIONS

Dimensions:	2.81" W. x 3.62" L. x 2.25" D.		
Depth:	1⅝"	**Full Stroke Travel:**	7/32"
Switch Contact:	Normally Open	**Travel to Contact:**	3/32"
Rating:	100 ma @ 48V	**Symbols (black):**	3/16" h.
Operating Force:	5 Ounces	**Key Color:**	Grey
Mechanical Life:	1,000,000 Cycles		
Reed Switch Life:	10,000,000 Cycles		

(Colored blank keys available separately; see below.)

Model	Description	One-24
SB-032	Lockout 0-9 ("O" Triple Bar)	28.50
SB-033	Lockout 0-9 and Period	28.50
SB-034	Lockout 1-12 Numerals	29.95
SB-035	Momentary 1-12 Numerals	28.50
*SB-032PC	Lockout 0-9 ("O" Triple Bar)	29.50
*SB-033PC	Lockout 0-9 and Period	29.50
*SB-034PC	Lockout 1-12 Numerals	30.95
*SB-035PC	Momentary 1-12 Numerals	29.50

*With printed circuit connectors

MOMENTARY MODULAR SECTIONS

This modular idea is a simple concept, which allows the design engineer to create his own custom push button layouts. Highly efficient single pole "normally-open" reed switches aer used throughout thus assuring reliability and an extremely long life expectancy. Light pressure (5 ounces) and short strokes result in optimum operators' convenience and positive input of data. The basic module allows use of one to three switches in either momentary or alternate "push-ON-push-OFF" action. Stacking allows any number of these switch sections to be used in a group by themselves or with our matching keyboard assemblies SB-032, SB-033, SB-034, SB-035. Standard size switch Keys are available separately in various colors, either single or extended Keys which span 2 or 3 switches. Note: that by use of wider keys it is also possible to form 2 or 3 pole switch functions.

SPECIFICATIONS

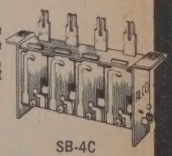
Switch Contact:	Normally Open	**Full Travel:**	7/32"
Rating:	100 ma @ 48V	**Travel to Contact:**	5/32"
Life Expectancy:	1,000,000 cycles	**Depth Requirements:**	1-5/8"

Model	Description	One-24	25-99	100-499
SB-1E	Mod-Segment, 1 pole, end, mom.	2.90	2.32	—
SB-1C	Mod-Segment, 1 pole, center, mom.	2.90	2.32	—
SB-2E	Mod-Segment, 2 pole, end, mom.	4.80	3.84	—
SB-3C	Mod-Seg. 3 pole, ctr. & ends, mom.	6.70	5.36	—
SB-4C	Mod-Segment, 4 pole, momentary	8.60	6.88	—
SBL-1C	Mod-Segment, 1 pole, locking	3.90	3.12	—
SBL-2E	Mod-Segment, 2 pole, lock & mom.	5.80	4.64	—

Above switches are supplied less keys; order below.

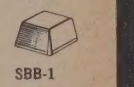
INDEPENDENT LOCKING — MODULAR SECTIONS

New series of inline keyboard switch modules are similar to the SB Series described above except these switches have alternate action, independent of each other. When one switch is depressed, it remains that way regardless of the switching action of the rest of the module. Same SBB type keys are used.

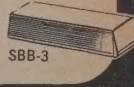

SB-4C

Model	Number Positions	Description	One-24	25-99	100-499
SBL-1	1	Independent Locking	2.95	2.36	2.07
SBLR-2	2	Independent Locking	5.35	4.28	3.75
SBLR-3	3	Independent Locking	7.50	6.00	5.25
SBLR-4	4	Independent Locking	9.70	7.76	6.79
SBLR-5	5	Independent Locking	11.85	9.48	8.30
SBLR-6	6	Independent Locking	14.10	11.28	9.87
SBLR-7	7	Independent Locking	16.20	12.96	11.34
SBLR-8	8	Independent Locking	18.40	14.72	12.88
SBLR-9	9	Independent Locking	20.55	16.44	14.39
SBLR-10	10	Independent Locking	22.75	18.20	15.93
SBLR-12	12	Independent Locking	27.10	21.68	18.97

Above switches are supplied less keys; order below.


SBB-1

SBB-2


SBB-3

SBB-1*	Key only Single	.15	.12	.105
SBB-2*	Key only Double	.25	.20	.175
SBB-3*	Key only Triple	.35	.28	.245
SB-BKT	Mounting Brackets (pr.)	1.95	1.56	1.37

*Specify Color: Light Grey, Dark Grey, White, Blue, Red, Black.

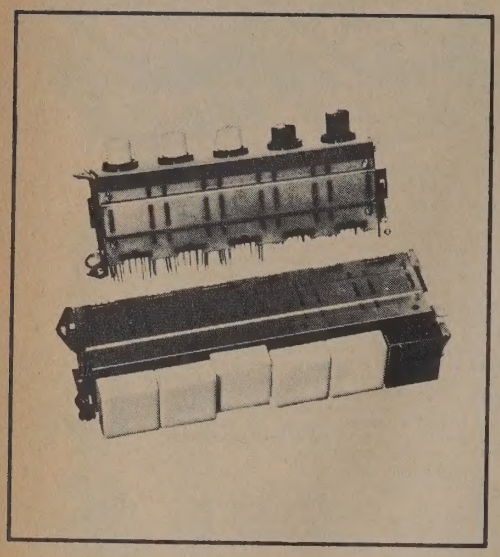
ALCO® ELECTRONIC PRODUCTS, INC.

MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

American Zettler, inc.

MULTIPLE SWITCHES T 596

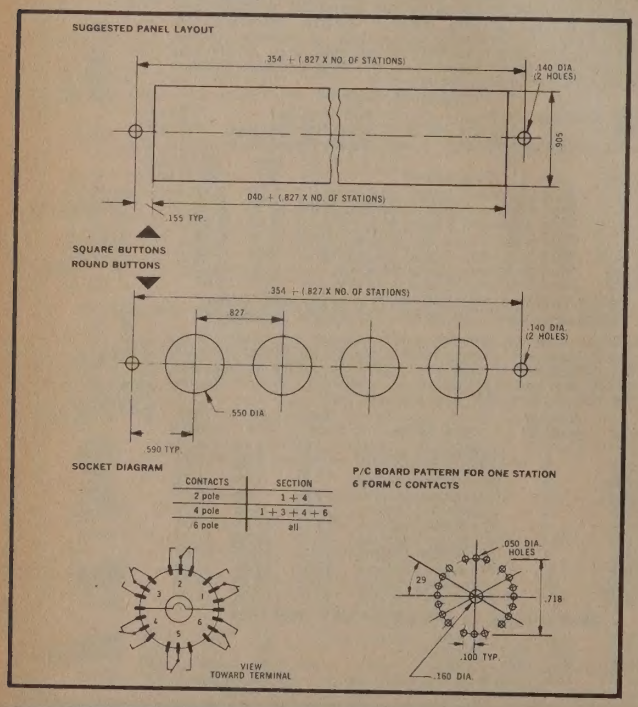


FEATURES:

- Illuminated or non-illuminated
- Up to 6 PDT contacts per station
- All contacts are inside of switch
- Self-cleaning slide action contacts
- From 2 to 11 stations in one frame
- Easy front or back panel mounting
- PC or solder lug terminals
- Square buttons can be mounted in tight parallel rows to form a

SERIES T-596 MULTIPLE SWITCHES

For front panel, chassis, or PC board mounting using 4-40 screws. Up to 6 PDT silver-nickel self-cleaning slide-action contacts. Occupies less than one square inch of panel space. Only 1½" depth behind panel. Long-life special nylon parts used throughout. Pushbutton switches can be furnished with round ⅜" diameter or square ⅞" x 13/16" with 0.827" center-to-center spacing, in white, black, red, yellow, green, or blue buttons. Square buttons may be engraved or hot stamped. Illuminated pushbutton switches are available using lamps, which are accessible from front. Special unbased lamps in 6, 12, 24 v 1 watt are available all over the world. Prices per station approximately $2.50 for non-illuminated; $4.50 for illuminated (1-9 pcs).



SPECIFICATIONS

Contact Rating: 1 amp at 30 vdc or 0.2 amp at 11
Contact Arrangement: Two, four, and six form C conta
Life Expectancy: 10^5 mechanical; 5 x 10^4 at rated loa
Ambient Temperature Range: −20°C to +60°C.
Dielectric Strength: Under room conditions, 500v rms.
Insulation Resistance: Under room conditions, 10^9 ohr
Terminals: Solder lugs or PC terminals.

SWITCH CHARACTERISTICS

Switch Function	Frame Part N
Non-lock (momentary) Push lock, push release	T 596.
Interlock	T 596.
Interlock with one non-locking reset button	T 596.

STATION PART NUMBERS

Function	Non-Illuminated Round	Non-Illuminated Square	Illuminat Round	Illuminat S
Non-lock (momentary)	500.1	520.1	600.1	6
Interlock	500.2	520.2	600.2	6
Push lock, push release	540.4	560.4	640.4	6
Reset	500.0	520.0	600.0	6

FOR EXAMPLE, TO ORDER:

A multiple-station pushbutton switch with: Ten inte non-illuminated stations with white round buttons, form C contacts, and printed circuit terminals, the foll part number would be developed: (See example belov

T 596.20-10 / 500.2W / 4C

- Frame #
- Number of stations
- Station part #
- Color of buttons
- Contacts on each station
- PC pins

American Zettler, inc.
697 RANDOLPH AVE. • COSTA MESA, CALIF. 92626 • PHONE (714) 540-4190 • TELEX: 67-84

See YELLOW SECTION for Local Offices, Phones

ANALOG DIGITAL DATA SYSTEMS, INC.

830 LINDEN AVENUE • ROCHESTER, N. Y. 14625 • PHONE 716 - 381-2370

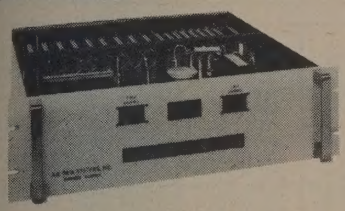
SWITCHING SYSTEMS

ANNRS AND MULTIPLEXERS

re a rge number of analog signals are to be measured they be nned or multiplexed into one common output device, h as igital Voltmeter. A.D.D.S. supply a complete range of s, ding switches for low level signals, such as thermo- ples, wire strain gain, bridge measurements, high frequency coaxial switching, guarded switching and many others from stock and will build to special requirements.

The units are designed with a unique modular construction enabling the basic unit to be expanded in groups of 10 channels by an extensive selection of switching modules.

ANER CONTROLS



el 1 — 100 Channel Control to accept 100 switches of 1, 2, 3 or 4 poles in modules of 10 channels.

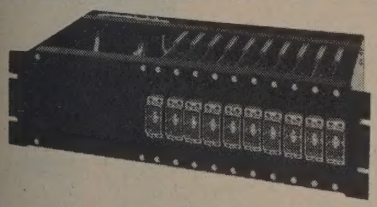
el 1 — 1000 Channel Control to accept 1000 switches of 1, 2, 3 or 4 poles in modules of 10 channels.

el 5 — 1000 Channel Control to accept 1000 single pole switches in compact modules of 50 channels.

el 15 — Duo Control to accept 50 channels of analog switches and 50 channels of programming by plug-in pin boards.

el 2 — 1024 Channel Binary Control to accept 1024 switches of 1, 2, 3 or 4 poles in modules of 8 channels.

PASION MODULE CHASSIS



se its are rack mounted and wired to accept standard modules ex ding the basic control unit.

el 52 — Front panel mounted with connectors in rear to accept 10 modules each of 10 channels.

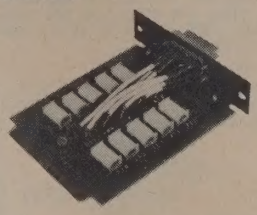
el 34 — Rear panel mounted with connectors in rear to accept 10 modules each of 10 channels.

el 83 — Front panel mounted with connectors in rear to accept 16 modules each of 8 channels for use with binary control unit.

L) STATE SWITCH MODULES

le 00 — 10 Channel FET solid state module for 10 Kc switching rate.

SCANNER MODULES



Model 605 — 10 Channel Single wire reed switching.

Model 485 — 10 Channel two wire reed switching.

Model 483 — 10 Channel three wire reed switching

Model 484 — 10 Channel four wire reed switching.

Model 476 — 10 Channel two wire plus guard switching. 120 dvb common mode rejection and less than 1 microvolt noise for low level signals.

Model 518 — Same as Model 476 plus control wire for programming.

Model 624 — 10 Channel, 2 wire, plus guard with flying capacitor filtering.

Model 559 — 50 Channel single wire reed switching.

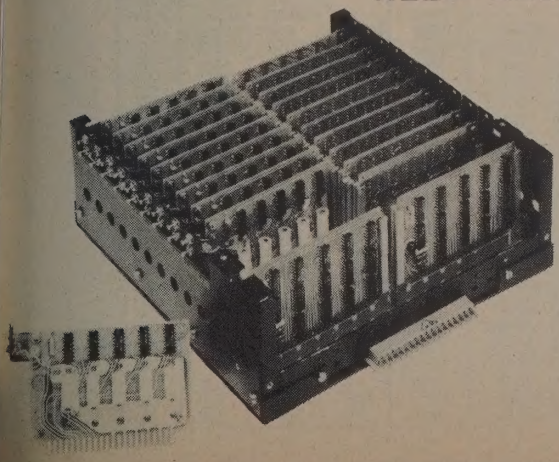
The above modules are also available with mercury wetted reed relays.

SCANNER/A.D. CONVERTER COMBINATIONS

Model 022 — This combination of Scanner and A/D Converter has capacity for 10 channels of switching using reed relays up to 500 samples/second or solid state multiplexing up to 10 Kc. The A/D Converter has 3 digit plus sign resolution at 10 Kc.

Model 032 — This has the features of the Model 022 but the A/D Converter has 4 digit plus sign resolution at 10 Kc.

REED RELAY MATRICES



REED RELAY MATRICES

For switching multiple path signals, using reed relays for signal switching and TTL compatible logic for controls.

Each path can be selected in nanoseconds from X, Y and select pulses which latch the control logic and the reed relay switch.

The switched path simulates a 50 ohm impedance coaxial line, terminated in 50 ohm connectors to give minimum signal distortion and crosstalk at frequencies exceeding 10 MHz.

Options include electrical readout of crosspoint selected.

TYPICAL APPLICATIONS

Controlled switching in automatic testing of integrated circuits, printed circuit modules, logic modules.

Routing of R.F. signals, telemetry signals.
Programming video signals.
Computer interface to automatic equipment.

Model 056-003 — 10 x 10 x 1 Matrix with Coax signal connectors.

Model 056-103 — 10 x 10 x 1 Matrix with Coax signal connectors and electrical readout of crosspoint selected.

Model 056-006 — 10 x 10 x 2 Matrix.

Model 056-106 — 10 x 10 x 2 Matrix with crosspoint readout.

Model 056-009 — 10 x 10 x 3 Matrix.

Model 056-109 — 10 x 10 x 3 Matrix with crosspoint readout.

RF SWITCHES

AMPHENOL
THE BUNKER-RAMO CORPORATION

Series 303 High Isolation Microwave Switches

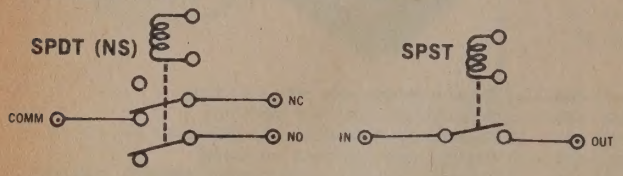
Compact coaxial switches, with superior isolation characteristics over entire operating range, particularly suitable where crosstalk interference must be minimized. Other units are also available, please request additional information and specifications.

CHARACTERISTICS

ELECTRICAL: Frequency Range: standard size and economy 0-12.4 GHz, miniature (303-10179-00) 0-18 GHz. **Characteristic Impedance:** 50 ohms. **Crosstalk (isolation):** 60 db at 12.4 GHz (standard) and at 18 GHz (miniature). **SWR:** 1.5:1 at 12.4 and 18 GHz respectively. **Insertion loss:** 0.5 db maximum. **Contact resistance:** 60.0 milliohms. **RF Power rating:** 100 watts at 1 GHz (power off during switching). **High RF Voltage rating:** 1000 V peak at 60 Hz. **Switching time:** operate 15 ms maximum: release: 10 ms maximum.

MECHANICAL: Minimum life: 1,000,000 cycles.

ENVIRONMENTAL: Temperature range: —55°C to 55°C. **Moisture resistance:** 10 day cycle. **Shock:** operating: 10 g's; non-operating: 100 g's. **Vibration:** operating: Test Cond. B, 10 to 55 cps; non-operating: 20 g's, 10 to 2000 cps. **Altitude and cold:** 0 to 70,000 ft.

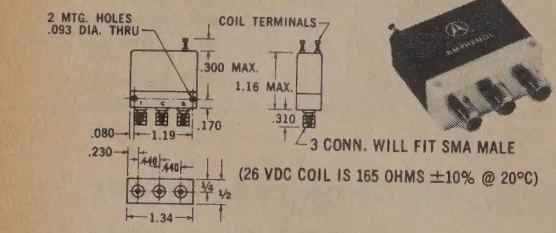


FUNCTIONS AND PART NUMBERS

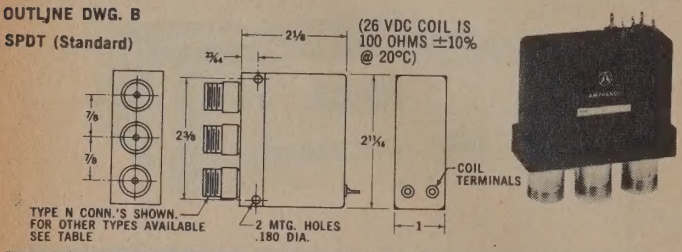
Connector	Coil Volts	SPDT (with cover) Outline Dwg. A Non-Latching	SPDT (with cover) Outline Dwg. A Latching	SPDT (Economy Ver Outline Dw
SMA	6 DC	303-10179-1	303-10179-21	303-1011
	12 DC	303-10179-2	303-10179-22	303-1011
	26 DC	303-10179-3	303-10179-23	303-1011
	48 DC	303-10179-4	303-10179-24	
	120 DC	303-10179-5	303-10179-25	
	115 AC	303-10179-6	303-10179-26	303-1011

Connector	Coil Volts	SPDT (with cover) Outline Dwg. B Non-Latching	SPDT (with cover) Outline Dwg. B Latching	SPST (Shutter Outline Dw
TNC	6 DC	303-10168-1	303-10168-21	
	12 DC	303-10168-2	303-10168-22	
	26 DC	303-10168-3	303-10168-23	303-1096
	48 DC	303-10168-4	303-10168-24	
	120 DC	303-10168-5	303-10168-25	
	115 AC	303-10168-6	303-10168-26	
N	6 DC	303-10167-1	303-10167-21	
	12 DC	303-10167-2	303-10167-22	
	26 DC	303-10167-3	303-10167-23	
	48 DC	303-10167-4	303-10167-24	
	120 DC	303-10167-5	303-10167-25	
	115 AC	303-10167-6	303-10167-26	

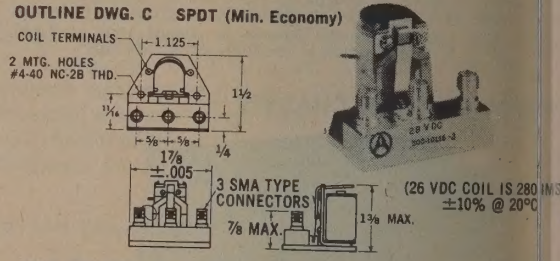
OUTLINE DWG. A SPDT (Miniature)



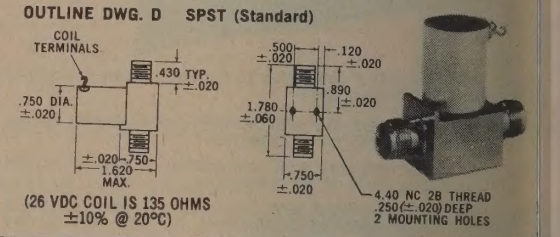
OUTLINE DWG. B SPDT (Standard)



OUTLINE DWG. C SPDT (Min. Economy)



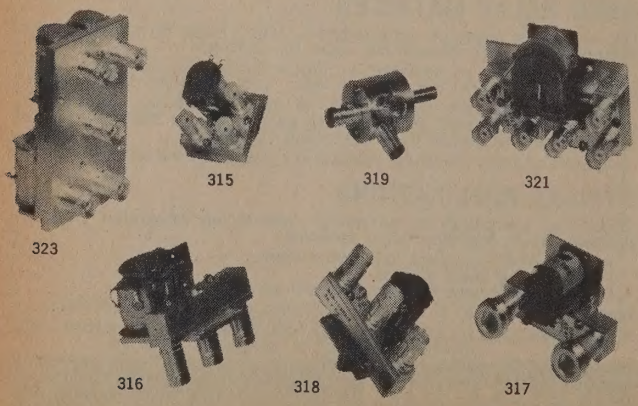
OUTLINE DWG. D SPST (Standard)



Coaxial Relays

Precision coax units. Maximum time to operate and release is 20 milliseconds. Gold-plated, fine silver contacts assure reliable low-level operation. Minimum life expectancy is 1,000,000 cycles, when switch is operated at speeds of less than 10 Hz. Switches are impedance matched to 50-ohm cable, though loss is negligible with 75-ohm cable. Operation is break-before-make. All materials are corrosion resistant.

Units meet applicable portions of military connector specifications as follows: BNC — Mil-C-3608 and N — Mil-C-71.



Part No.	Termination	Function	Connectors	Frequency (MHz)	RF Power (W)	Coil Volts	Coil ms
315-10002-3	Open	SPDT	BNC	1000	100	26 DC	30
316-10082-3	Short	SPDT	BNC	2000	100	26 DC	30
316-10082-6	Short	SPDT	BNC	2000	100	120 DC	90
316-10102-8	Short	SPDT	BNC	2000	100	115 AC	90
317-10202-3	Short	SPDT	BNC	2000	100	26 DC	30
317-10215-8	Short	SPDT	BNC	2000	100	115 AC	90
317-10242-3	Short	SPDT	N	2000	100	26 DC	90
317-10255-8	Short	SPDT	N	2000	100	115 AC	90
318-10407-3	Open	SPDT	BNC	2000	100	26 DC	30
318-10381	Short	SPDT	BNC	2000	100	lever manual	—
318-10382-3	Short	SPDT	BNC	2000	100	26 DC	30
318-11165-3	Res.	SPDT	BNC	2000	100	26 DC	30
318-11576-8	Res.	SPDT	BNC	2000	100	115 AC	90
319-11141	Open	SPDT	BNC	2000	100	rotary manual	—
320-10931-3	Open	SPDT	N	3000	1000	26 DC	30
321-11062	Open	DPDT	BNC	1000	100	lever manual	—
321-11064-3	Open	DPDT	BNC	1000	100	26 DC	30
322-11431	Open	1P4T	BNC	3000	100	rotary manual	—
323-11651-3	Open	1P4T	BNC	1000	100	26 DC	30
322-11442	Open	1P6T	BNC	3000	100	rotary manual	—
325-11635-3	Short	1P6T	BNC	400	100	26 DC	30
325-11641-3	Open	1P6T	BNC	400	100	26 DC	30

RF SWITCHES

AMPHENOL
THE BUNKER-RAMO CORPORATION

ries 360 DYNAFORM FUNCTIONS AND PART NUMBERS

rm.	Schematic	Coil Volts	SPDT Outline Dwg. A	SPDT Outline Dwg. B	DPDT Outline Dwg. C	DPDT Outline Dwg. D	Transfer Outline Dwg. E
SH	1	26 DC 110 DC 115 AC	360-11891-12 360-11891-34 360-11891-45	360-11891-13 360-11891-35 360-11891-46	360-11896-12 360-11896-34 360-11896-45	360-11896-13 360-11896-35 360-11896-46	
NS	2	26 DC 110 DC 115 AC	360-11891-14 360-11891-36 360-11891-47	360-11891-15 360-11891-37 360-11891-48	360-11896-14 360-11896-36 360-11896-47	360-11896-15 360-11896-37 360-11896-48	
Ω RT	3	26 DC 110 DC 115 AC	360-11891-16 360-11891-38 360-11891-49	360-11891-17 360-11891-39 360-11891-50	360-11896-16 360-11896-38 360-11896-49	360-11896-17 360-11896-39 360-11896-50	
Ω RT	3	26 DC 110 DC 115 AC	360-11891-18 360-11891-40 360-11891-51	360-11891-19 360-11891-41 360-11891-52	360-11896-18 360-11896-40 360-11896-51	360-11896-19 360-11896-41 360-11896-52	
Ω RT	3	26 DC 110 DC 115 AC	360-11891-20 360-11891-42 360-11891-53	360-11891-21 360-11891-43 360-11891-54	360-11896-20 360-11896-42 360-11896-53	360-11896-21 360-11896-43 360-11896-54	
RANS	4	26 DC 110 DC 115 AC					360-11891-22 360-11891-44 360-11891-55
SH	1	26 DC 110 DC 115 AC	360-11892-12 360-11892-34 360-11892-45	360-11892-13 360-11892-35 360-11892-46	360-11897-12 360-11897-34 360-11897-45	360-11897-13 360-11897-35 360-11897-46	
NS	2	26 DC 110 DC 115 AC	360-11892-14 360-11892-36 360-11892-47	360-11892-15 360-11892-37 360-11892-48	360-11897-14 360-11897-36 360-11897-47	360-11897-15 360-11897-37 360-11897-48	
Ω RT	3	26 DC 110 DC 115 AC	360-11892-16 360-11892-38 360-11892-49	360-11892-17 360-11892-39 360-11892-50	360-11897-16 360-11897-38 360-11897-49	360-11897-17 360-11897-39 360-11897-50	
Ω RT	3	26 DC 110 DC 115 AC	360-11892-18 360-11892-40 360-11892-51	360-11892-19 360-11892-41 360-11892-52	360-11897-18 360-11897-40 360-11897-51	360-11897-19 360-11897-41 360-11897-52	
Ω RT	3	26 DC 110 DC 115 AC	360-11892-20 360-11892-42 360-11892-53	360-11892-21 360-11892-43 360-11892-54	360-11897-20 360-11897-42 360-11897-53	360-11897-21 360-11897-43 360-11897-54	
RANS	4	26 DC 110 DC 115 AC					360-11892-22 360-11892-44 360-11892-55
SH	1	26 DC 110 DC 115 AC	360-11890-12 360-11890-34 360-11890-45	360-11890-13 360-11890-35 360-11890-46	360-11895-12 360-11895-34 360-11895-45	360-11895-13 360-11895-35 360-11895-46	
NS	2	26 DC 110 DC 115 AC	360-11890-14 360-11890-36 360-11890-47	360-11890-15 360-11890-37 360-11890-48	360-11895-14 360-11895-36 360-11895-47	360-11895-15 360-11895-37 360-11895-48	
0 Ω RT	3	26 DC 110 DC 115 AC	360-11890-16 360-11890-38 360-11890-49	360-11890-17 360-11890-39 360-11890-50	360-11895-16 360-11895-38 360-11895-49	360-11895-17 360-11895-39 360-11895-50	
75 Ω RT	3	26 DC 110 DC 115 AC	360-11890-18 360-11890-40 360-11890-51	360-11890-19 360-11890-41 360-11890-52	360-11895-18 360-11895-40 360-11895-51	360-11895-19 360-11895-41 360-11895-52	
5 Ω RT	3	26 DC 110 DC 115 AC	360-11890-20 360-11890-42 360-11890-53	360-11890-21 360-11890-43 360-11890-54	360-11895-20 360-11895-42 360-11895-53	360-11895-21 360-11895-43 360-11895-54	
TRANS	4	26 DC 110 DC 115 AC					360-11890-22 360-11890-44 360-11890-55

CTERISTICS

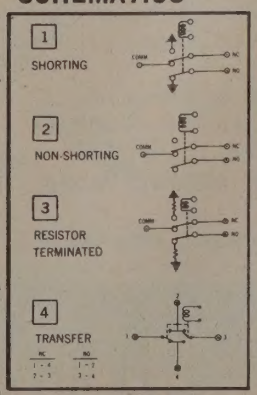
Nominal Voltage	Operating Range	Resistance, ohms ±10%
26 DC	20 - 32	260 ohms
110 DC	85 - 130	5100 ohms
115 AC (50 - 400 Hz)	90- 130	1500 ohms thru diodes

RICAL CHARACTERISTICS

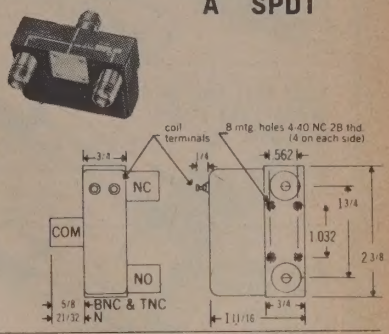
Term.	Typical VSWR (Frequency GHz) .03	0.2	0.4	1.0	2.0	4.0	6.0	Typical Crosstalk - db (Frequency GHz) .03	0.2	0.4	1.0	2.0	4.0	6.0
SH	1.03	1.06	1.08	1.10	1.20	1.25	1.35	70	66	60	53	42	30	20
NS	1.03	1.06	1.08	1.10	1.21	1.27	1.40	50	45	41	30	27	24	18
0 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
5 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
5 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
TRANS	1.05	1.08	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—
SH	1.03	1.06	1.08	1.10	1.20	1.25	1.35	70	66	60	53	42	35	25
NS	1.03	1.06	1.08	1.10	1.21	1.27	1.40	51	43	41	30	27	26	21
0 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
75 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
5 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
TRANS	1.05	1.08	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—
SH	1.03	1.04	1.07	1.10	1.15	1.18	1.30	70	66	60	53	42	35	25
NS	1.03	1.04	1.07	1.10	1.17	1.20	1.35	51	43	41	30	27	26	21
50 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	41	35	31	24	17	14	—
75 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	39	32	30	23	16	14	—
95 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	37	31	29	22	15	14	—
TRANS	1.05	1.10	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—

gh frequency electrical characteristics are typical values (not maximum) as measured in a 50 ohm and may be used for most design analyses. For more exacting applications, maximum values in the range may be obtained upon request. SWR measured to common with a matched 50 ohm termina-
additional specifications request Amphenol RF Switches Catalog SS-1.

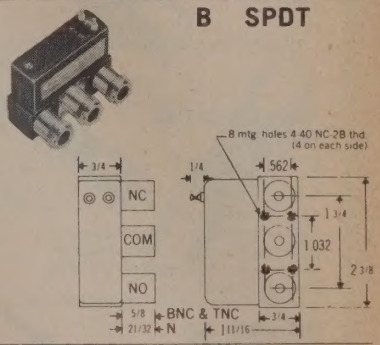
SCHEMATICS



A SPDT



B SPDT



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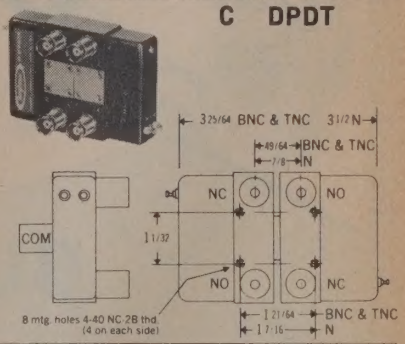

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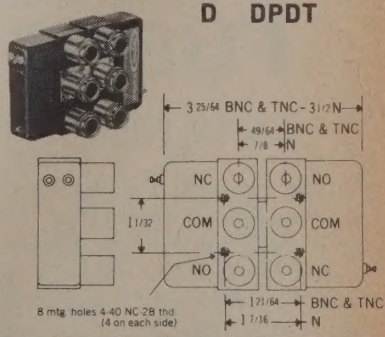

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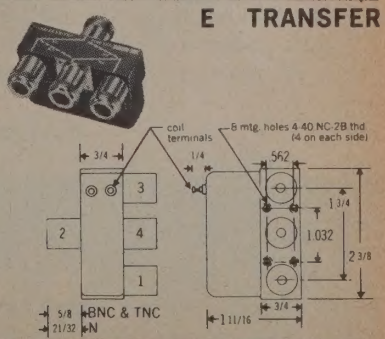


BUSS AGX FAST ACTING FUSES
¼ x 1 inch, glass tube, "quick-acting" type, 1/500 to 2 amp.

BUSS AGC AND MTH GLASS TUBE FUSES
¼ x 1¼ inch. AGC: 2½, 3 amps. MTH: 4, 5 or 6 amp.

BUSS AGC GLASS TUBE FUSES
¼ x 1¼ inch. 4 to 30 amp.

BUSS INDICATING FUSES
¼ x 1¼ inch, ¾ to 30 amp., and 1³⁄₃₂ x 1½ inch, 1/10 to 30 amp. Silverplated pin pops out when fuse is blown and provides quick, positive identification of faulted circuit . . . by visual signal, by activating an alarm, or both.

FUSETRON MDL DUAL-ELEMENT FUSES
¼ x 1¼ inch, glass tube "slow-blowing" 1/100 to 30 amp.

BUSS ABC CERAMIC TUBE FUSES
¼ x 1¼ inch, ¼ to 30 amp. For circuits having fault current capacity up to 25,000 amp. at 125 volts or 10,000 amps. at 250 volts

BUSS GJV PIGTAIL FUSES
¼ x 1½ inch, glass tube, with 1¼ inch leads of No. 20 tinned wire. ¹⁄₁₆ to 6 amp.

BUSS SFE STANDARD FUSES
⅝ to 1⁷⁄₁₆ inches in length, glass tube, 4 to 30 amp. Fuses of different amperages are of different lengths—to make it impossible to insert too large a size.

FUSETRON FNM FIBRE TUBE FUSES
1³⁄₃₂ x 1½ inch, dual-element "slow-blowing" 1/10 to 30 amp.

FUSETRON FNA SIGNAL OR VISUAL INDICATING FUSES
1/10 to 10 amp. Silver-plated pin pops out when fuse is blown and provides quick, positive identification of faulted circuit . . . by visual signal, by activating an alarm, or both.

BUSS SUB-MINIATURE GMW FUSE AND HWA FUSEHOLDER
Fuse size only .270 x .250 inches. Fuse has window for visual inspection of element. Fuse may be used with or without holder. 1/200 to 5 amps. Fuses and holders available to meet military specifications.

GFA TRON SUB-MINIATURE PIGTAIL FUSES
Body size only .145 x .300 inches. Glass tube construction permits visual inspection of element. Hermetically sealed. Twenty-three ampere sizes from 1/100 thru 15 amps.

BUSS GMT FUSES—HLT FUSEHOLDERS
Signal Indicating, Alarm Activating. For multiple circuit apparatus where space is at a premium. Holders take panel mounting space of only ¼ inch horizontal by 1¹⁵⁄₃₂ inches vertical. 18/100 to 10 amp.

BUSS HIGH VOLTAGE FUSES
For protection of circuits up to 20 KW on d.c. and 30KVA on a.c. 1/16 to 2 amp.

BUSS QUALITY
SMALL DIMENSION
FUSES and FUSEHOLDERS

FOR THE PROTECTION OF ALL TYPES OF ELECTRONIC & ELECTRICAL CIRCUITS & DEVICES

The complete BUSS line of fuses includes dual-element "slow-blowing," single-element "quick-acting" and signal or visual indicating types . . . in sizes from 1/500 amp. up—plus a companion line of fuse clips, blocks and holders.

Only a representative listing is shown here of the thousands of different types and sizes of fuses and holders available from BUSS.

All standard items are easily obtained through your BUSS distributor—but if you don't find what you want, get in touch with us.

When special fuses, fuse clips, fuse blocks or fuseholders are required, our staff of fuse engineers is at your service to help in selecting or designing the fuse or fuse mounting best suited to your requirements.

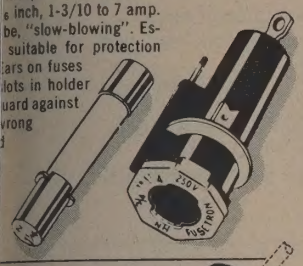
For detailed information on the complete BUSS line write for BUSS bulletin SFB.

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.,* **St. Louis, Mo. 63107**

For fuses and fuseholders of unquestioned high quality

FUS RON TYPE N FUS AND FUS OLDERS

¼ x inch, 0 to 1¼ amps. and ⅛ x ⅛ inch, 1-3/10 to 7 amp. Glass be, "slow-blowing". Especi suitable for protection of T ars on fuses mat lots in holder to sa uard against use wrong size type fuse



BU IN-THE-LINE FU HOLDERS

For inch fuses, ¼ ¼ inches long.

BS IN-THE-LINE PL EL MOUNTED FE & HOLDER CO BINATIONS

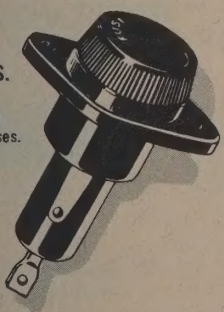
H older makes it si e to protect w variety of de es or equipment, in ing fluorescent fu es. Should fu open, entire fu knob a bly is re ed.

SS PANEL MOUNTED SEHOLDERS

Indicating Series HJ, and HCM. For ¼ x 1, 1¼ and 9/32 x inch fuses.

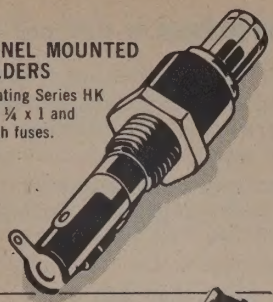
SS PANEL OUNTED SEHOLDERS. RIES HPC

13/32 x 1⅜ and x 1½ inch fuses. o available in tary type.



BUSS PANEL MOUNTED FUSEHOLDERS

Lamp Indicating Series HK and HJ. For ¼ x 1 and ¼ x 1¼ inch fuses.



BUSS SPACE SAVER PANEL MOUNTED FUSEHOLDERS

Fuseholder only 1⅝ inches long . . . extends just 29/32 inch behind front of panel. Takes ¼ x 1¼ inch fuses. Holder rated at 15 ampere for any voltage up to 250.

BUSS SHIELDED PANEL MOUNTED FUSEHOLDERS

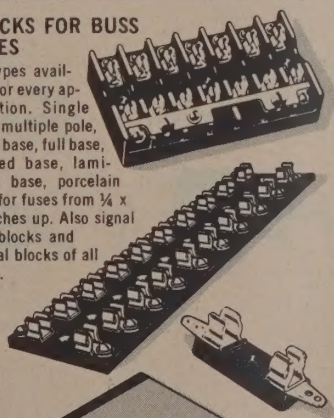
Prevent radio frequency interference. Available to take two size fuses ¼ x 1¼ inch and ¼ x 1 inch fuses. Meet performance specs of both MIL-I-6181D and MIL-F-19207B.

BUSS PANEL MOUNTED FUSEHOLDERS. VISUAL INDICATING SERIES HLD.

For ¼ x 1¼ inch BUSS GBA fuses (or GLD fuses) ¾ to 5 amps. Transparent knob permits visual indicating pin on open fuse to be seen.

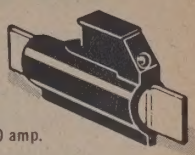
BLOCKS FOR BUSS FUSES

All types available for every application. Single pole, multiple pole, small base, full base, molded base, laminated base, porcelain base for fuses from ¼ x ⅝ inches up. Also signal fuse blocks and special blocks of all types.



BUSS AIRCRAFT FUSES

Mechanical Indicating —Limiter type. Meet rigorous requirement of high speed, high performance aircraft. 1 to 60 amp.

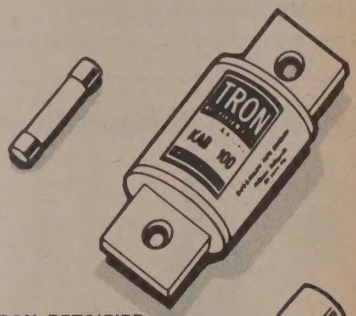


FUSETRON ACK STUD MOUNTED FUSES

1 to 300 amp., dual-element type.

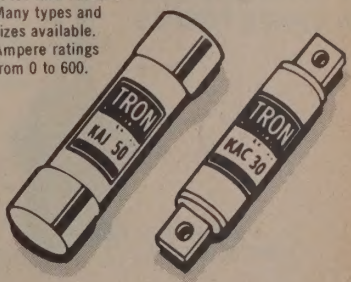
LIMITRON KTK HIGH INTERRUPTING CAPACITY FUSES

1 3/32 x 1½ inch, 1/10 to 30 amp. For circuits having fault current capacity up to 100,000 amps. AC only.



TRON RETCIFIER FUSES. For protection of Semi-Conductor Rectifiers and like applications.

Provide extremely fast opening on overload and fault currents, with a high degree of restriction of let-thru current. Many types and sizes available. Ampere ratings from 0 to 600.



SUPPLIED THE ECONOMICAL WAY ...THRU DISTRIBUTORS

every protection need, insist on **BUSS QUALITY**

C&K Subminiature Switches

C&K Components manufactures the most complete line of subminiature switches in the world. The "Specialty of the House" — and what this catalog is all about — is our diversified line of subminiature toggle and pushbutton switches. We make them in just about every shape, size, and configuration imaginable, so they're readily adaptable to a multitude of uses.

C&K high-quality, reliable switches combine maximum performance with minimum weight and size, and are available in one, two, three and four pole models. All of our switches feature rugged construction and simple mounting. This adds up to long-term, trouble-free operation.

Now, more than ever, when you want dependable, top-quality switches at a low price, specify C&K. We're the people who would rather switch than fight.

Toggle Switches

General Specifications

Contact Ratings:

Coin Silver Contacts — 5 amps resistive load @ 115 VAC or 28 VDC, or 2 amps @ 250 VAC.

Brass Contacts with gold over nickel plate — 0.4 volt-amps max @ 20V MAX (AC or DC).

Coin Silver Contacts with gold over nickel plate — 5 amps resistive load @ 115 VAC or 28 VDC, or 2 amps @ 250 VAC — and 0.4 volt-amps MAX @ 20V MAX (AC or DC).

Insulation Resistance: 1000 megohms minimum. **Dielectric Strength:** 1000 volts rms at sea level.

Electric Life: 100,000 make-and-break cycles minimum on all models ending in 01 only; all other models 40,000 cycles

Initial Contact Resistance: 10 milliohms maximum at 2-4 VDC, 1 amp.

Operating Lever: Bright chrome-plated brass. **Mounting Bushing:** Cadmium w/clear chromate over brass.

Housing: Stainless steel. **Case Material:** General purpose phenolic.

Standard Hardware Supplied :

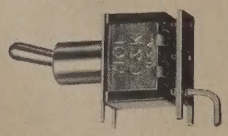
2 Hex mounting nuts 1 Internal tooth lockwasher 1 Locking ring

Standard Configurations

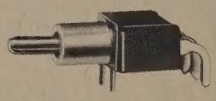
SPDT
DPDT
3PDT
4PDT

Special Configurations

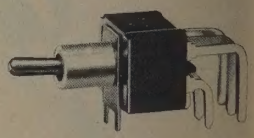
VW RIGHT ANGLE MOUNTING, P.C. SPDT



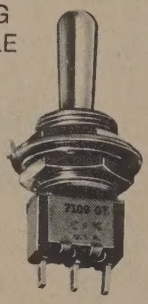
A RIGHT ANGLE MOUNTING SPDT



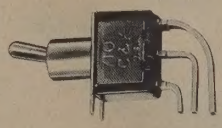
A RIGHT ANGLE MOUNTING DPDT



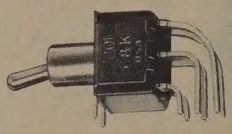
T 15/32 BUSHING W/LARGE TOGGLE



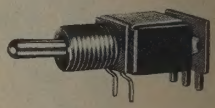
AV VERTICAL MOUNTING SPDT



AV VERTICAL MOUNTING DPDT



R RIGHT ANGLE MOUNTING, P.C. SPDT



C&K COMPONENTS, INC.

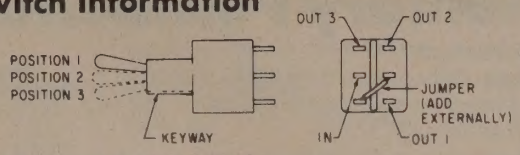
103 MORSE STREET/WATERTOWN, MASSACHUSETTS 02172 TEL: (617) 926-0800

Miscellaneous Toggle Switch Information

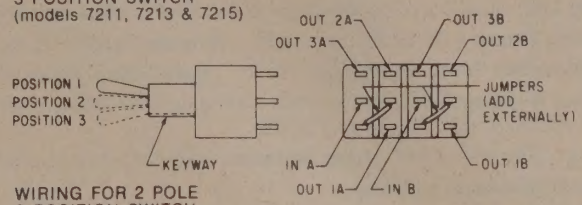
Color Caps

Color-Caps (Vinyl Plastisol) available for standard and long toggles at no extra cost.

A7062 or A7637	COLOR
—1	BLACK
—2	BROWN
—3	RED
—4	ORANGE
—5	YELLOW
—6	GREEN
—7	BLUE
—9	GRAY
—10	WHITE



WIRING FOR SINGLE POLE 3 POSITION SWITCH (models 7211, 7213 & 7215)



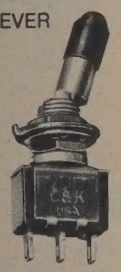
WIRING FOR 2 POLE 3 POSITION SWITCH (models 7411, 7413, 7415)

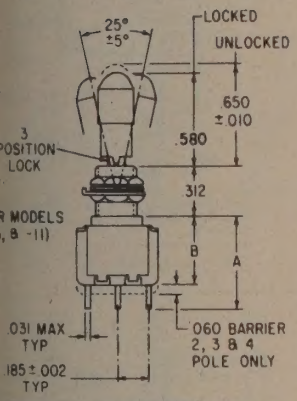
Panel Seals

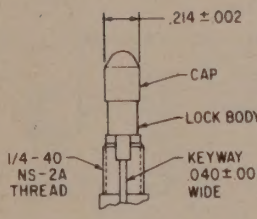
Flexible Rubber Seal Boots are available from APM-Hexseal Corp. 41 Honeck St., Englewood, New Jersey, and Multi-Flex Seals, Inc., 1811 First Ave., New York, N. Y.

These boots come in various styles and meet a number of MIL Specs for front panel switch seals.

LOCKING LEVER







	A ±.015	B ±.015
SPDT	.580	.425
DPDT	.580	.425
3PDT	.645	.490
4PDT	.645	.490

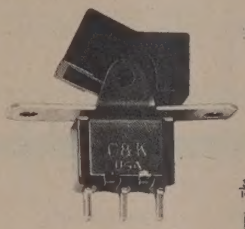
FIG. 1
2 POS. LOCK
FOR MODEL -01

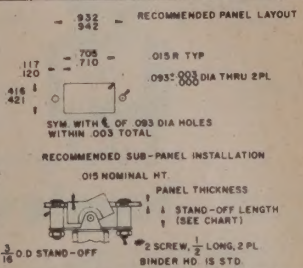
FIG. 2
2 POS. LOCK
FOR MODELS -07 & -13

FIG. 3
1 POS. LOCK
FOR MODELS -05 & -15

NOTES:
1. 3 position lock detail shown. See fig's 1 thru 3 for other lock details.
2. Available all models except -08 and -09.
3. Other dimensions, hardware & mounting — same as std'd
4. Available with options 5, 6, & 7.
5. Caps are normally supplied natural aluminum. Anodized red, blue, or black caps are available on request — specify color if desired.
6. Lock body is nickel plated brass.

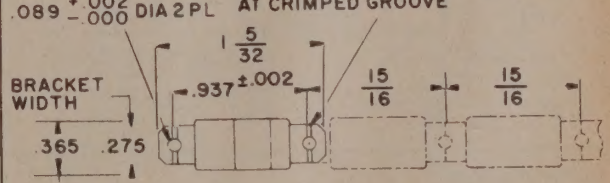
J-1 ROCKER SWITCH

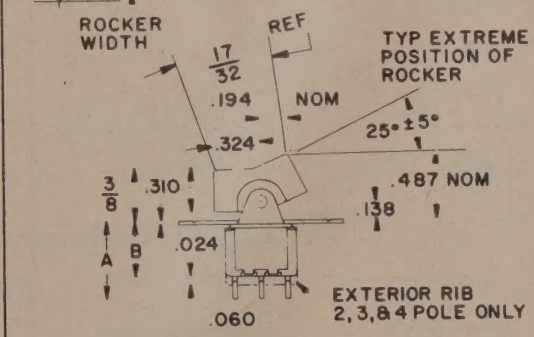


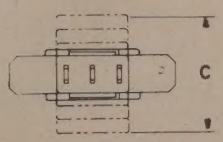


PANEL THICKNESS	STAND-OFF LENGTH	STAND-OFF P/N
1/16	.295	7611-1
3/32	.264	7611-2
1/8	.233	7611-3

CLOSE MOUNTING PITCH POSSIBLE BY BREAKING OFF BRACKET END AT CRIMPED GROOVE







	A ±.015	B ±.015	C ±.010
SPDT	.550	.395	.270
DPDT	.550	.395	.450
3PDT	.615	.460	.650
4PDT	.615	.460	.850

C&K COMPONENTS, INC.
103 MORSE STREET/WATERTOWN, MASSACHUSETTS 02172 TEL: (617) 926-0800

Momentary Pushbutton Switches

General Specifications

Contact Ratings: Gold contact surfaces on copper alloy terminals (epoxy sealed terminals are standard). 1 Ampere resistive load @ 115 VAC — 28 VDC. Designed for use in dry (very low energy) circuits

Insulation Resistance: 1000 megohms minimum. **Dielectric Strength:** 1000 volts rms at sea level.

Electric Life: 60,000 cycles minimum at full load. **Mechanical Life:** 100,000 make-and-break cycles minimum.

Operating Force: 1.76 oz min per pole. **Release Force:** 1.0 oz min per pole.

Max. Allowable Force on Plunger: 10 lb. **Pushbutton:** Nylon Plunger and cap.

Mounting Bushing: Cadmium w/ clear chromate over brass. High torque to withstand 12 in-lb with no distortion or loosening of parts.

Housing: Stainless steel. **Case Material:** General purpose phenolic.

Standard Hardware Supplied :

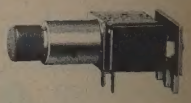
2 Hex mounting nuts 1 Internal lockwasher 1 Locking ring

Standard Configurations

SPDT
DPDT
3 PDT
4 PDT

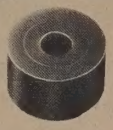
Special Configuration

R RIGHT ANGLE MOUNTING, P.C. CONFIGURATION



Press Fit Caps for Pushbutton Switches

Unless otherwise specified .200 dia. white cap is supplied.



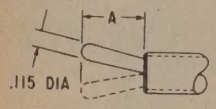
P/N A7527
.375 Dia.

P/N A7089
.200 Dia.

Toggle and Pushbutton Basic Options

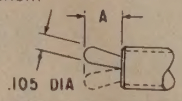
Toggle
Note: Pinning option for anti-rotation of toggle is available for all toggle-bushing combinations (normally supplied as a standard only on (P) flatted toggle). To specify, add suffix **P** to toggle suffix.

S STANDARD



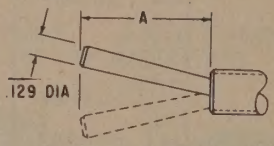
BUSHING	"A" ±.015
Y or **H**	.410
D	.480

M SHORT



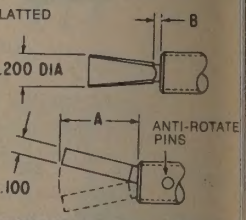
BUSHING	"A" ±.015
Y or **H**	.200
D	.270

L LONG



BUSHING	"A" ±.015
Y or **H**	.840
D	.910

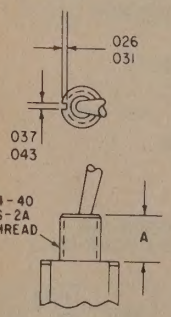
P FLATTED



BUSHING	"A" ±.015	"B" REF
Y or **H**	.450	.034
D	.520	.104

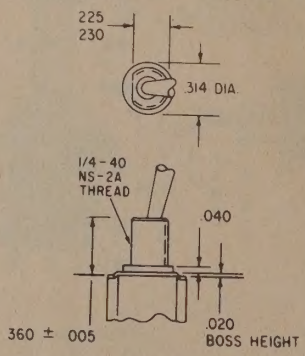
Bushings (Toggle only)

Y STANDARD AND **D** SHORT



BUSHING	A ±.005
Y	.360
D	.290

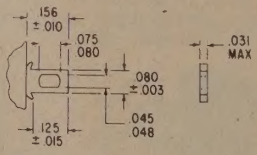
H HI-TORQUE



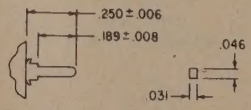
Bushing will withstand torque of 12 in-lb with no distortion or loosening of parts.

Terminals

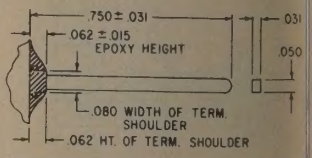
Z STANDARD



C PRINTED CIRCUIT



WB WIREWRAP
(toggle only)



Sealing

E TERMINAL SEAL
(standard for pushbutton)

C&K COMPONENTS, INC.
103 MORSE STREET/WATERTOWN, MASSACHUSETTS 02172 TEL: (617) 926-0800

Ordering Guide—Toggle & Pushbutton Switches with Options

Toggle Switches

() Parenthesis Indicates Momentary Position

Toggle Lever Positions and Circuits

Poles & Throw	#1 Model No.			KEYWAY	Industrial Net Price Schedule: Less Than 25 (each)	25 to 99 (each)
SP	7101	ON	NONE	ON	$1.50	$1.00
	7103	ON	OFF	ON	1.77	1.18
	7105	(ON)	OFF	(ON)	1.77	1.18
	7107	ON	OFF	(ON)	1.77	1.18
	7108	ON	NONE	(ON)	1.77	1.18
	7109	NONE	ON	(ON)	1.77	1.18
DPDT	7201	ON	NONE	ON	1.95	1.30
	7203	ON	OFF	ON	2.32	1.55
	7205	(ON)	OFF	(ON)	2.32	1.55
	7207	ON	OFF	(ON)	2.32	1.55
	7208	ON	NONE	(ON)	2.32	1.55
	7209	NONE	ON	(ON)	2.32	1.55
	7211	ON	ON	ON	2.60	1.73
	7213	ON	ON	(ON)	2.87	1.92
	7215	(ON)	ON	(ON)	2.87	1.92
	Terminals Connected	2-3	2-3	1-2		
		5-6	4-5	4-5		
3PDT	7301	ON	NONE	ON	3.50	2.34
	7303	ON	OFF	ON	3.78	2.52
	7305	(ON)	OFF	(ON)	3.78	2.52
	7307	ON	OFF	(ON)	3.78	2.52
	7308	ON	NONE	(ON)	3.78	2.52
	7309	NONE	ON	(ON)	3.78	2.52
4PDT	7401	ON	NONE	ON	4.41	2.88
	7403	ON	OFF	ON	4.86	3.29
	7405	(ON)	OFF	(ON)	4.86	3.29
	7407	ON	OFF	(ON)	4.86	3.29
	7408	ON	NONE	(ON)	4.86	3.29
	7409	NONE	ON	(ON)	4.86	3.29
	7411	ON	ON	ON	6.27	3.92
	7413	ON	ON	(ON)	6.27	3.92
	7415	(ON)	ON	(ON)	6.27	3.92
	Terminals Connected	2-3	2-3	1-2		
		5-6	4-5	4-5		
		8-9	8-9	7-8		
		11-12	10-11	10-11		

Contacts make opposite toggle thrown.

Basic Toggle Options

Specifying Suffix for Basic Options
(See Basic Option Section for Suffix Explanation)

Add Price Indicated (To Model Price)

Option No.	Description	Suffix	1 to 99 (each)
#2 TOGGLES	STD'D	S	N/C (no charge)
	SHORT	M	N/C
	LONG	L	N/C
	FLATTED	P	.50
#3 BUSHINGS	STD'D	Y	N/C
	SHORT	D	N/C
	HIGH TORQUE	H	N/C
#4 TOGGLE PINNING	(note-standard for P Toggle.)	P	.50
#5 CONTACTS & TERMINALS: CONFIGURATIONS. MAT'LS, PLATING	STD'D	Z	N/C
		ZB	N/C
		ZG	.25 Per Pole
	PRT'D CKT:	C	.10 Per Pole
		CB	.10 Per Pole
		CG	.35 Per Pole
	WIRE WRAP:	WB	.10 Per Pole
Available only for A & AV OPTIONS		WQ	.50 Per Pole
		WG	.75 Per Pole
#6 TERMINAL SEAL	EPOXY	E	.10 Per Pole
#7 POTTED BASE	EPOXY	I	.25 Per Pole

Special Toggle Configurations

Specifying Suffix for Special Configurations
(See Spec. Config. Section for Suffix Explanation)

Add Price Indicated (To Model Price)

Description	Models Available	Suffix	1 to 24 (ea.)	25 to 99 (ea.)
RIGHT ANGLE MOUNTING P. C. Available w/ options 2, 3 (except H), & 4.	7101	R or VW	1.20	1.15
	7103 thru 7109	R or VW	1.33	1.27
RIGHT ANGLE MOUNTING Available w/ options 2, 3 (except H), 4, 5 (W options only) & 6.	All Single and Dble Pole Models only.	A	.35	.35
	ALL	AV	.35	.35
15/32 BUSHING W/ LARGE TOGGLE Available w/ options 4, 5, 6, & 7.	ALL	T	.75	.75
LEVER LOCK Available w/ options 5, 6, & 7.	All models except 08 and 09	K	1.25	1.00
ROCKER SWITCH Available w/ options 5, 6, & 7.	ALL	J	.35	.35

Note — See listing of basic options for description & additional cost

Pushbutton Switches

Poles & Throw	Model No.	Industrial Net Price Schedule: Less Than 25 (each)	25 to 99 (each)
SPDT	P8121	2.55	1.70
DPDT	P8221	3.45	2.30
3 PDT	P8321	4.80	3.20
4 PDT	P8421	6.05	4.10
SPDT	P8121R	3.05	2.20

Pushbutton Options

Add Price Indicated (To Model Price)

Description	Suffix	1 to 99 (each)
Printed ck't terminals	C	10¢ per pole
Epoxy Base potted	I	25¢ per pole

(See Basic Option Section for Suffix Explanation)

C&K COMPONENTS, INC.
103 MORSE STREET/WATERTOWN, MASSACHUSETTS 02172 TEL: (617) 926-0800

CTS CORPORATION ELKHART, INDIANA

Rotary Selector Switch

WHY ENGINEERS SPECIFY CTS ROTARY SWITCHES

CTS Reliability. The heart of selector switch reliability is the wafer. CTS offers two wafers with uniquely reliable characteristics. The CTS selector switch 212 wafer is of a molded, glass alkyd, rivet-free construction which will not break if dropped or jarred. It eliminates mechanical shifting of stator circuitry and terminals and allows the construction of more compact switches. Automated manufacture provides unprecedented uniformity. In each production run, all switches are identical, terminal placement is exact and permanent—the result is trouble-free assembly into your circuit. The CTS 216 wafer employs the more conventional "clip" terminals but utilizes unbreakable glass reinforced alkyd for both the rotor and stator. The precision molded stator incorporates strut spacers to evenly space the contacts and eliminate radial shifting as well as a rib design to increase insulation resistance. Tight quality control on both wafers and detents from the raw material stage through final assembly and packaging assures you of the fine quality and reliability associated with all CTS products.

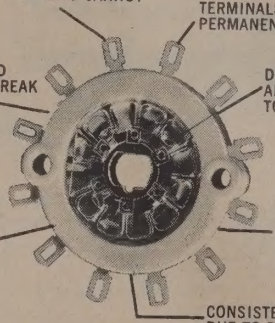
CTS Design Flexibility. CTS selector switches provi sands of variations of shorting and non-shorting including mixed shorting and non-shorting circuit com within the same pole. Design flexibility's further enha a wide selection of index assemblies, two wafer cons which can be intermixed on the same switch and attac manufactured power switches and variable resistors. C offers a one-source supply for the complete switch

CTS Military Switches. CTS types 211, 212 and 215 a able to meet the requirements of MIL-S-3786C, type S

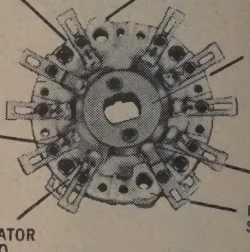
CTS Switches are Made to Your Exact Specificati orders received for CTS selector switches are hand vidually and are custom manufactured to your exact s tions. The majority of applications can be met with which are custom designed from parts shown in this giving you the advantages of lower cost and faster

On special applications our engineering staff is at posal for designing the best and most economical s meet your exact requirements.

WAFERS



212 WAFER



216 WAFER

DETENTS

STAR WHEEL DETENT
Type 211

HIGHEST QUALITY • POSITIVE FEEL • 250,000 CYCLE LIFE • FREE FROM END AND SIDE THRUST • HIGH SWITCHING TORQUE 15—60" OZ.

DIE CAST DETENT
Type 222

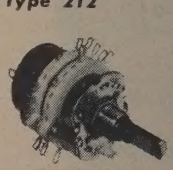
LOWEST COST OF ALL DETENTS • LOW COST STAKED CONSTRUCTION • AVAILABLE FOR 1 AND 2 WAFER SWITCHES • 20,000 CYCLE LIFE • SWITCHING TORQUE 18 — 40" OZ.

Adjustable stops available on all detents except Type 222.

Description	Series	Data Sheet	Order Form
1⅛" diameter rotary wafer switch with star wheel detent	211	4001	Keene
1⅛" diameter rotary wafer switch with hill and valley detent	212	4001	Elkhart*
1⅛" diameter rotary wafer switch with double ball detent	215	4001	Elkhart*
1¼" diameter rotary wafer switch with hill and valley detent	216	4001	Elkhart*
1¼" diameter rotary wafer switch with star wheel index	217	4001	Keene
1¼" diameter rotary wafer switch with double ball detent	218	4001	Elkhart*
1⅛" diameter rotary wafer switch with die cast detent	222	4001	Elkhart
1" diameter rotary wafer switch with double ball detent	223	4223	Keene
1¼" diameter rotary wafer switch with die cast detent	226	4001	Elkhart

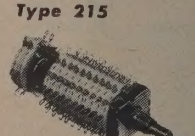
*West of the Mississippi River, excluding Minnesota, order from CTS Keene

HILL AND VALLEY DETENT
Type 212



LOW COST • DES FOR HOME E TAINMENT AND COST INSTRU APPLICATIONS 000 CYCLE L SWITCHING TO 20—48" OZ.

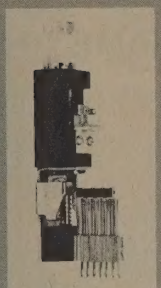
DOUBLE BALL DETENT
Type 215



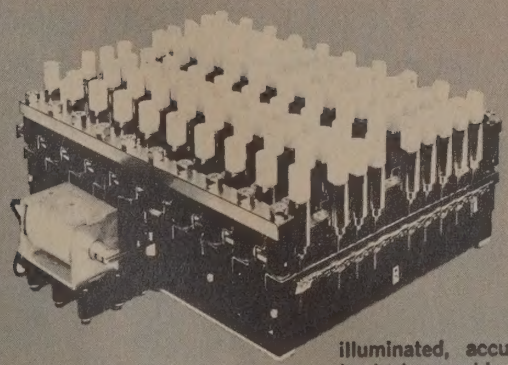
DESIGNED PRIM FOR INSTRU MARKET • HIGH ITY • CRISP F 25,000 CYCLE L SWITCHING TOR —35" OZ.

ORDERING INFORMATION: Place orders at locations shown above, using the following addresses:
CTS of Elkhart, Div., 1142 W. Beardsley Ave., Elkhart, Indiana 46514 • Telephone 219-523-0210 • TWX 810-294-225
CTS Keene, Inc., P.O. Box 1977, Paso Robles, Calif. 93446 • Telephone 805-238-0350

one button... or many

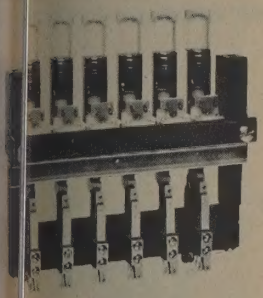


Model PLS-IA



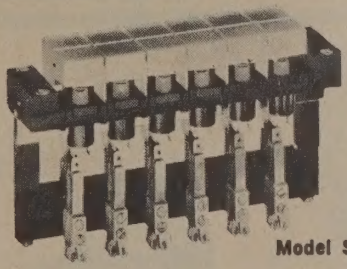
illuminated, accumulative banked assembly with solenoid release.

CAPITOL offers standard and special combinations of illuminated and non-illuminated pushbutton and lever switches TO SUIT YOUR NEEDS

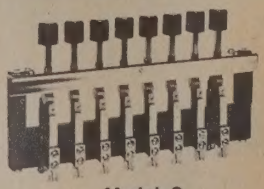


Model S-IA

Model PLH



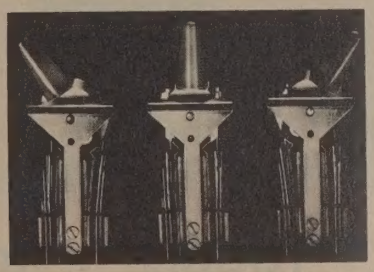
Model S-IC



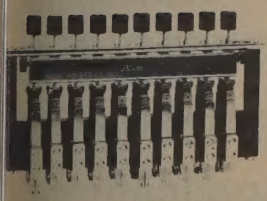
Model S

Model HLB

Model PLS-IC

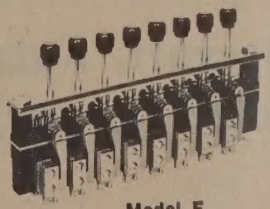


Model HLL illuminated multi-color coded lever switch



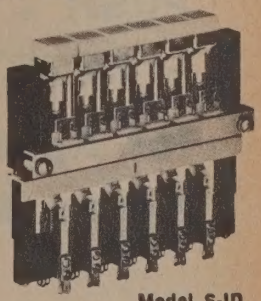
Model D

Model HLB-S



Model E

Model HPC



Model S-ID features New illuminated square button

CAPITOL SWITCHES are rated at 3 amps, 110 v. AC, non inductive.

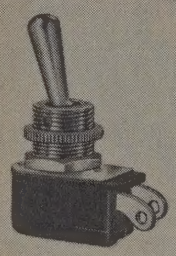
apitol manufactures many standard and special switches in addition to those shown.

CAPITOL

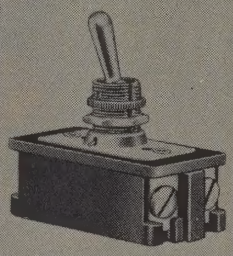
THE CAPITOL MACHINE AND SWITCH CO.
87 Newtown Road, Danbury, Conn. 06810
Representatives in principal cities Tel: 203-744-3300 TWX:710-456-0365

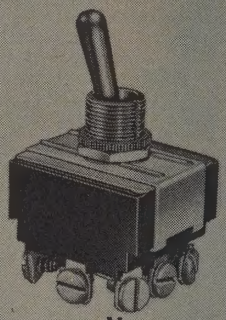
CARLINGSWITCH

THE BIGGEST SINGLE NAME IN SWITCHE

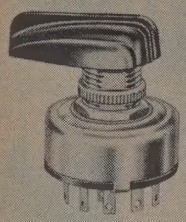

110 SERIES

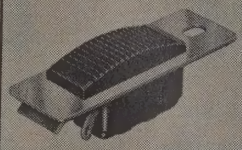
F SERIES

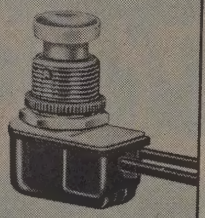

D & E SERIES

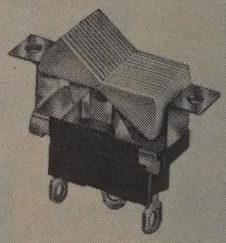

H SERIES

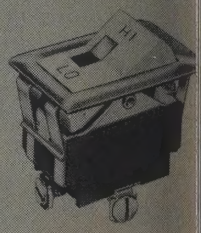
215 SERIES


800 SERIES


SL-110 SERIES


P-27 SERIES


TIPPETTE SERIES


LIGHTED TIPPETTE SERIES

PUSH • SLIDE • TOGGLE • ROTARY • TRIGGER • TIPPETTE and LIGHTED TIPPETTE SWITCHES

for Appliance, Aircraft, Automotive, Electronic, Marine, Military, Motor Control, Special Applications

In addition to the items shown above are thousands of variations and adaptations designed for our customers' specific needs. We are constantly engaged in the development of new products and welcome the opportunity to serve your needs. Please contact one of our distributors to discuss your requirements in detail or write for our latest catalog.

Carling
ELECTRIC, INC.

505 New Park Avenue, West Hartford, Conn. 06110. Telephone: (203) 233-5551 TWX 710-425-0034

Switches, switches, and more Switches from Centralab!

Centralab has the industry's broadest line of rotary and special switches. A summary of the basic types is given below.

For complete design data, request your copy from Centralab's advertising department.

ROTA SWITCHES	Diameter	Maximum No. of Positions	Minimum Index Life (cycles)	Insulation	Current Rating (make & break)	MIL-S-3786 SR Number
Min ure Series 0-090	1-1/2"	6 x 60° 12 x 30°	25,000	Phenolic Ceramic Glass Silicone	2.6 A. @ 28 VDC; 450 ma @ 115 VAC	SR 02
Su niniature Sies 160	1"	4 x 90° 6 x 60° 8 x 45° 12 x 30°	25,000	Phenolic Glass Silicone Ceramic	335 ma @ 115 VAC; 1.1 A. @ 28 VDC	SR 05
Su niniature Sies 140	1-1/2"	18 x 20°	25,000	Phenolic Silicone Glass	335 ma @ 115 VAC; 1.1 A. @ 28 VDC	—
Min ure Series 600	1-9/32"	6 x 60° 12 x 30°	25,000	Ceramic Mycalex Phenolic Glass Silicone	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	SR 03
Serie 240-290 and Sies 010 Sing return	1-7/8"	2 x 180° 4 x 90° 6 x 60° 8 x 45° 12 x 30°	175,000 20,000 or 10,000	Ceramic Phenolic KEL-F	3.9 A. @ 28 VDC; 675 ma @ 115 VAC	SR 01
ries 300	1-7/8"		25,000	Ceramic Phenolic KEL-F	675 ma @ 115 VAC; 3.9 A. @ 28 VDC	SR 01
ries 650	2-5/16"	18 x 20°	25,000	Phenolic Glass Silicone	675 ma @ 115 VAC; 3.9 A. @ 28 VDC	SR 10
ries 670	2-5/16"	24 x 15°	25,000	Phenolic Glass Silicone	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	SR 09
ries 230	2-13/16"	9 x 40° 18 x 20° 24 x 15°	25,000	Ceramic Durez	11 A. @ 28 VDC; 9 A. @ 115 VAC	—
CONMY SWITCHES eries 200	1-1/32"	2, 3, 4 x 30° 9 clips max.	10,000	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	—
LIER ACTION WITCHES eries 222	1-1/2"	2, 3 x 30° 12 clips max.	25,000 Pos. or Spring return	Phenolic	450 ma @ 155 VAC; 2.6 A. @ 28 VDC	—

US BUTTON SWITCHES*
BRAN NEW!

Ask for Centralab's all new 22 page catalog on this completely new product line.

SLE SWITCHES	Approximate Length (2 positions)	No. of Positions	Maximum No. of Clips	Index	Insulation	Current Rating (make & break)
Sies 001, 002	1.4 to 5.7"	2, 3 or 4	3-20/side	Positive or none	Phenolic	675 ma @ 115 VAC; 3.9 A. @ 28 VDC
eries 003	1.3"	2	6/side	Spring return or none	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC
Series 005	1.4 to 5.8"	2	22	Spring return or none	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC
Series 125	3.6"	2	7/side	Spring return or none	Phenolic	335 ma @ 115 VAC; 1.1 A. @ 28 VDC

PRINTED CIRCUIT SWITCH
ries 020-090
ries 001, 002, 003, 005

Eliminate expensive wiring and possibility of wiring error; these switches are designed for printed circuit board insertion. Electrical and mechanical characteristics similar to 1-1/2" switches (Series 020, etc. above).
Slide switches above available for printed circuits.

IMMEDIATE DELIVERY
Any types are available from stock from Centralab Industrial Distributors.

CENTRALAB Electronics Division • GLOBE-UNION INC.
5757 NORTH GREEN BAY AVENUE • MILWAUKEE, WISCONSIN 53201

ELIMINATE DOWN-TIME ON ROTARY & THUMBWHEEL SWITCH

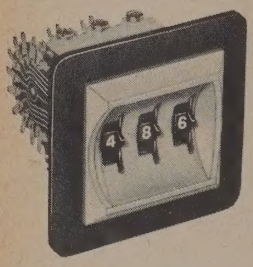
and also get accurate, precise control

UNLIMITED APPLICATIONS CDI switches offer fast sure settings and quick read-out for computer, automated and control equipment, and for test and programming applications, etc.

QUICK SERVICEABILITY Unique 5-second wafer replacement obsoletes other switches. Simply lift out old wafer, slip in new wafer. No unsoldering . . . no disassembling . . . no wire removing.

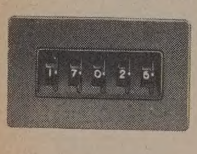
EXTREME VERSATILITY Regardless of size or shape needed CDI is well prepared to meet your every switch requirement.

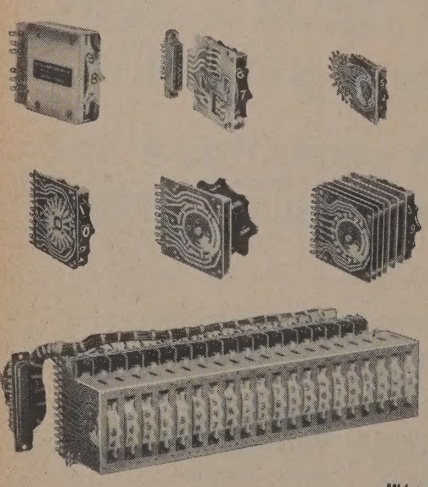
THUMBWHEEL SWITCHES



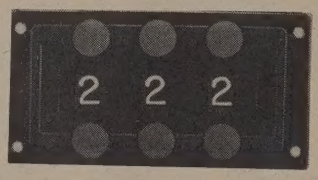
C•D•I

Digital and Binary. Meet MIL-S-22710. For critical reliability applications. Available with internal lighting MIL-L-25467A. Switch modules with panel and switching elements separately sealed for complete protection are available. Bezel types have no visible screws when rear mounted.





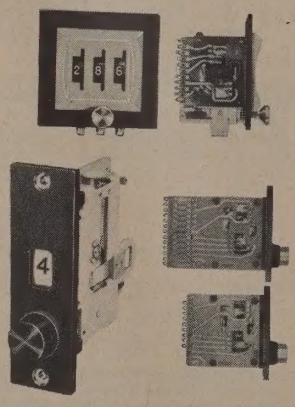
PUSHBUTTON SWITCHES



NEW MINI 10-POSITION ADD/SUBTRACT

Retrofits most miniature thumbwheel switch panel openings. 8 & 12 positions available. Simply push one button to add, the other to subtract. Each decade mounts on ½" centers. Over 1,000,000-operation service life.

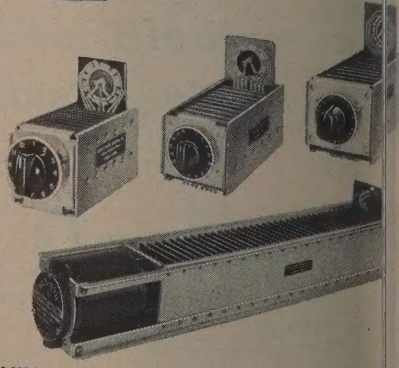
C•D•I



ROTARY SWITCHES

C•D•I

For critical reliability applications. Meet MIL-S-22710. Removable wafers permit quick changing of programs, configurations, circuits. CDI patented switches with dust covers available in sizes 2" x 2", 3" x 3" and 4" x 4" with lengths to accommodate up to 36 wafers. Operation may be manual, motor or solenoid.



Mfd. under Tabet U. S. Patents 2,841,660, 2,971,066, 3,015,000, 2,956,131, 2,988,607

C•D•I

CHICAGO DYNAMIC INDUSTRIES, INC

PRECISION PRODUCTS DIVISION 1725 Diversey Blvd., Chicago, Illinois 60614. Phone 312, 935-46

CHERRY

THE LONG LIFE LINE OF PRECISION SWITCHES

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Whether you need a simple modification of an existing switch or an entirely new design, Cherry's staff of competent engineers, are ready to give prompt, professional assistance with your switch problems.

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Our modern plant is equipped with tool room, including die and model shops; punch press department using advanced, progressive die techniques; plastic molding of both thermosetting and thermoplastic materials; Swiss-type screw machines; printed circuit and precision metal plating departments for expanded capabilities in manufacture of high density switching devices; a complete laboratory with extensive capabilities in electrical and mechanical endurance testing.

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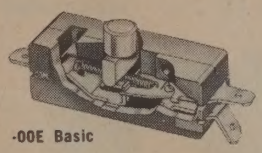
CHERRY

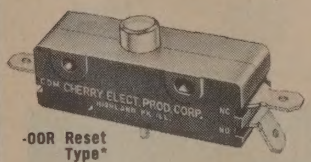
CHERRY ELECTRICAL PRODUCTS CORP.
1650 OLD DEERFIELD ROAD • HIGHLAND PARK, ILLINOIS 60035

GENERAL PURPOSE SERIES

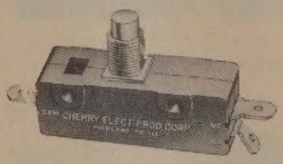
A rugged switch with large overtravel, wear resistant nylon button and integral hinged actuators.
Switch Body — 1 13/16" x 41/64" x 41/64".


-00E Basic

-00M Overtravel Pushbutton*


-00R Reset Type*

-00H Level Actuator


-00J Pushbutton*

-00K Roller Actuator

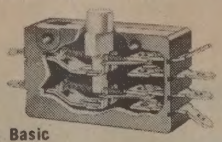
E13 SERIES
15 Amp. 125-250 VAC
3/4 HP 125 VAC
1 1/2 HP 250 VAC

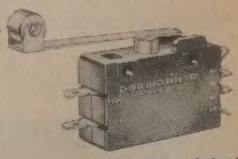
E14 SERIES
25 Amp. 125-250 VAC
1 HP 125 VAC
2 HP 250 VAC

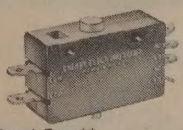
*Not available in 25 amp.

DOUBLE POLE SERIES

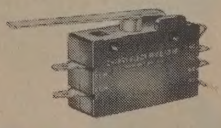
Sturdy, compact, double pole switch with large overtravel and integral hinged actuators.
Switch Body — 1 13/16" x 1 1/8" x 41/64".

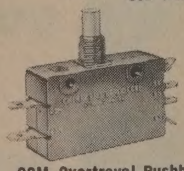

-00A Basic


-00K Roller Actuator


-00R Reset Type**

-00J Pushbutton


-00H Lever Actuator


-00M Overtravel Pushbutton**

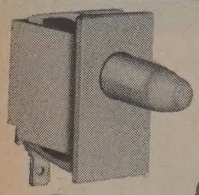
E19 SERIES
15 Amp. 125-250 VAC
3/4 HP 125 VAC
1 1/2 HP 250 VAC

E20 SERIES
20 Amp. 125-250 VAC
1 HP 125 VAC
2 HP 250 VAC

** Not available in 20 amp.

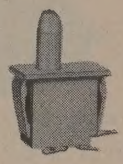
CHERRY Precision Switches

PANEL MOUNT PUSHBUTTON



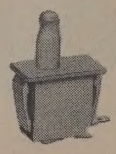
Snap in mounting in choice of momentary, reset or "cheat" interlock action. Also available with special actuator to accept auxiliary push buttons.
Switch Body — 1¼" x 1" x 1/16".
Electrical Rating — 10 Amps., ¾ H.P., 125/250 VAC.

E69-10A Auxiliary Push Button



E69-00A Basic Momentary Action

E69-20A Push-Pull (Reset)



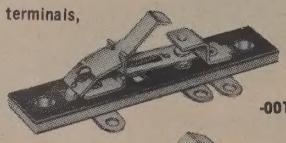
E69-30A Momentary & "Cheat" Interlock

*Also available with gold crosspoints contacts for low energy circuits (E68 series).

OPEN SWITCHES

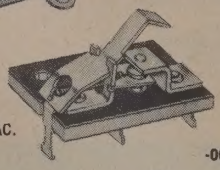
Many variations in actuators, panels, terminals, circuitry, forces and electrical ratings.

Basic Open — Panel 2⅛" x 7/16" x 3/32".
S23 Ligh Force Series
5 Amp. 125 VAC.
S25 Standard Force Series
10 Amp. 12 VAC, 5 Amp.
250 VAC — ¼ H.P. 125-250 VAC.



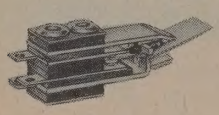
-00T

Miniature Open — Panel 1 1/16" x ¾" x 3/32".
S30 Series — 10 Amp. 125 VAC, 5 Amp.
250 VAC, 1/6 H.P. 125-250 VAC.

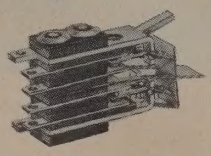


-00W

Stack Type — Rating 7½ Amp. 125 VAC, 5 Amp. 250 VAC



S37 Series — Single Pole
Body — 1 41/64" x 57/64" x 3/16".

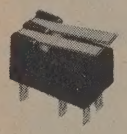


S36 Series — Double Pole
Body — 1 41/64" x 53/64" x 3/16".

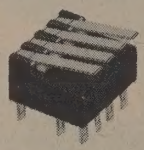
Stock Switches are available in momentary or maintained contact action.

SUBMINIATURE MODULES

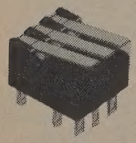
Special molded case design provides 2, 3, 4 and 5 circuit control in less space than individual ¼" thick switches fastened side-by-side.



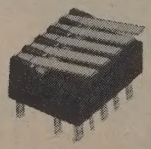
E62-02HM 13/32" thick



E62-04HM ⅞" thick



E62-03HM 43/64" thick

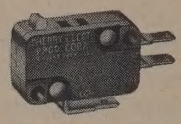


E62-05HM 1 5/64" thick

Rating: 10.1 Amp. 125/250 VAC, ¼ H.P. 125 VAC.

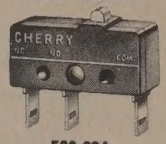
GOLD CROSSPOINT CONTACT SWITCHES

Gold Crosspoint Contact Switches are availabl in these 5 types.

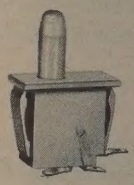


E21-00A Light Force Miniature

E53-00B Low Torque Coil



E63-00A Subminiature



E68-00A Panel Mount Pushbutton

S31-20P Miniature Open

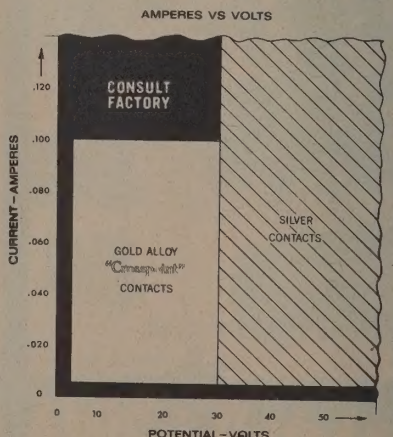
Electrical Rating — 0.1 Amp., 125 VAC.

CONTACT DESIGN INNOVATION

FOR POS SWITCHING ENERGY SOL CIRCU

The Cherry point" conta uration . . . contact pr right angles other) provid mum contact and minimu of contact c terference.

- Solid state compatibility... high reliability in lo switching applications from 5 to 100 milliamperes 30 volts.
- Long life... measured in millions of operations.
- Extremely low insertion resistance... far below 50 ohms.
- Very high force per unit area contact pressure.
- Reduced susceptibility to contact closure interf from foreign particles.
- Reed switch reliability with snap-action switch uti



Cross Section of Cont

W/E Alloy #1
Gold — 69%
Silver — 25%
Platinum — 6%

This chart is intended a general guide based u tensive laboratory tests bient Temperature o ±50°F under normal home or clean factory ment.

CHERRY ELECTRICAL PRODUCTS CORP. • 1650 OLD DEERFIELD ROAD • HIGHLAND PARK, ILLINOIS 6

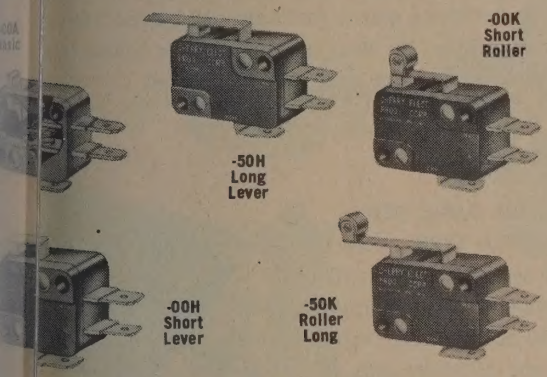
CHERRY Precision Switches

MINIATURE

ifecoil spring mechanism. Many variations in term-
actators, forces, and ratings.

10 Amps.
½ H.P.
125-250 VAC

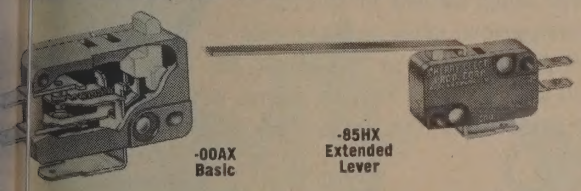
15 Amps.
½ H.P.
125-250 VAC



Switch Body — 1 3/32" x 5/8" x 13/32".

LIGHT FORCE MINIATURES

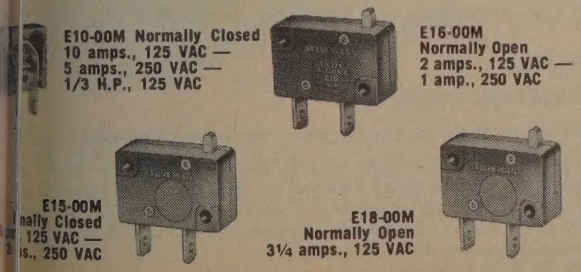
ilable in E22-3 Amp.; E23-5 Amp.; E33-10 Amp.; E34-15 Amp.



qu internal actuator reduces operating forces of stan-
rd pes, while maintaining high contact pressure and
bity.

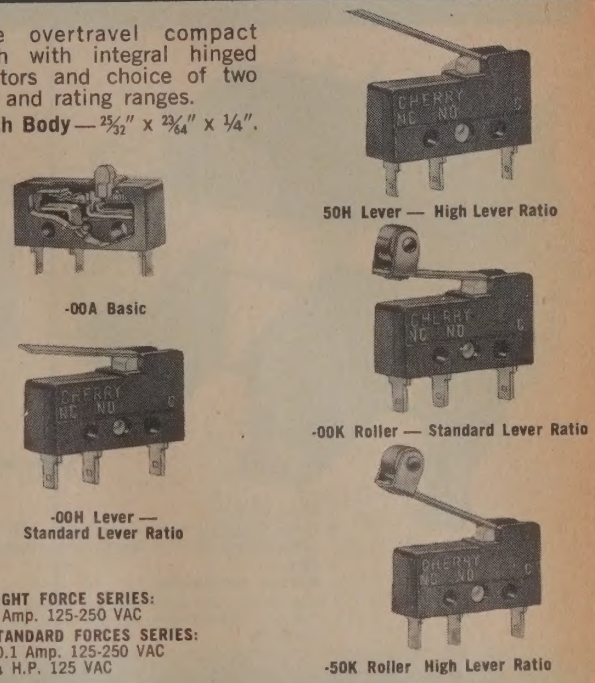
ENCLOSED SINGLE THROW

e pole, single throw switch with light force and large
vel. Solderable QC ¼" terminals.
Body — 1⅛" x 47/64" x 7/16".



SUBMINIATURE

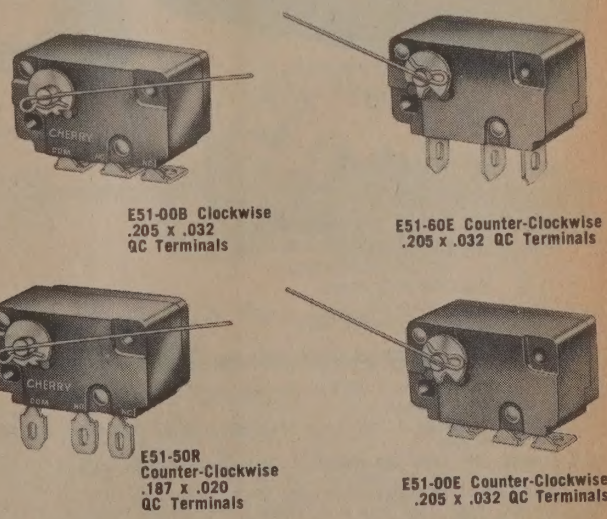
Large overtravel compact switch with integral hinged actuators and choice of two force and rating ranges.
Switch Body — 25/32" x 23/64" x ¼".



E61 LIGHT FORCE SERIES:
5 Amp. 125-250 VAC
E62 STANDARD FORCES SERIES:
10.1 Amp. 125-250 VAC
¼ H.P. 125 VAC

LOW TORQUE

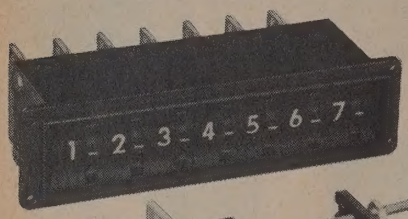
Rotary action long life switch with sensitive feather touch operation.
Electrical Rating — 5 amps., 125-250 VAC.
Switch Body — 1 7/32" x 11/16" x 9/16".



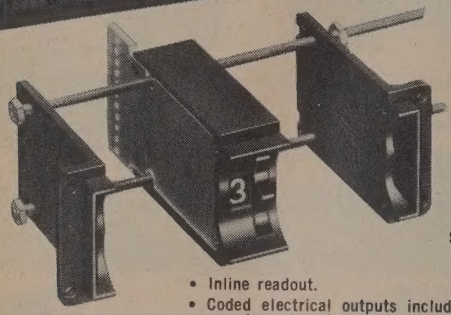
RRY ELECTRICAL PRODUCTS CORP. • 1650 OLD DEERFIELD ROAD • HIGHLAND PARK, ILLINOIS 60035

CHERRY Precision Switches

THUMBWHEEL ROTARY SWITCH



7 Digit Assembly with End Caps

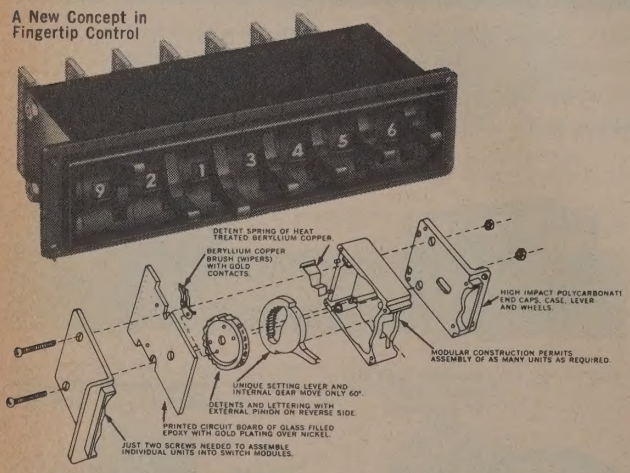


Single Module

- Inline readout.
- Coded electrical outputs including BCD with complement and 2 commons in subminiature size.
- Modular construction.
- Choice of color combinations, coding, termination, readout symbols and front or back mounting.

LEVERWHEEL ROTARY SWITCH

A New Concept in Fingertip Control



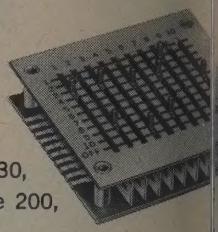
All the advantages of a thumbwheel plus:
- Instant manual reset.
- Minimized decision time.
- Reduced operator fatigue.

CONTACTS — WE Alloy No. 1 (69% gold, 25% silver, 6% platinum).
WIPERS — Beryllium copper.
PRINTED CIRCUIT BOARD — G10 Glass filled epoxy plated with nickel and 100 millionths gold.
CASE, LEVERS, END CAPS AND WHEELS — Polycarbonate high impact.

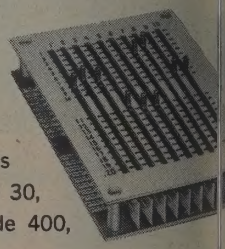
MINIATURE SIZE: 1.865″ high x ½″ wide x 2⅞″ long.
SUBMINIATURE SIZE: 1⅛″ high x ½″ wide x 2¼″ long.
ELECTRICAL RATING: 115 V AC or DC at .125 Amp., Current carrying only 3 Amp., AC or DC.

MATRIX SELECTOR SWITCHES

MANUAL SWITCHING SIMPLIFIED
Presentation of the switching function in rectangular c nates provides the operator with a complete, panorami of the switching grid to facilitate rapid circuit selecti minimize error. No need for pins, clips or cumbersome as required in most programming devices.



C10-20A BASIC TEN POSITION TYPE . . . offers 100 select stations in 10 x 10 arrangement. Other arrangements of 10 position type includes 20, 30, 40 and 50 slider rails to provide 200, 300, 400 and 500 crosspoints.



C10-01A BASIC TWENTY POSITION TYPE . . . offers 200 select stations in 20 x 10 arrangement. Other arrangements of 20 position type include 20, 30, 40 and 50 slider rails to provide 400, 600, 800 and 1000 crosspoints.

ELEVEN STANDARD UNITS include one 48 position slider rails (2784 crosspoints), five 10 position types an 20 position types. In addition many custom designs c furnished with reasonable artwork and tooling set-up ch

ELECTRICAL CAPACITY

1. Make and break 48 Volts DC at 0.50 Amp. 125 Vol at 0.15 Amp.
2. Current carrying only (no make and break) 2 Amp. AC or

INSERTION RESISTANCE

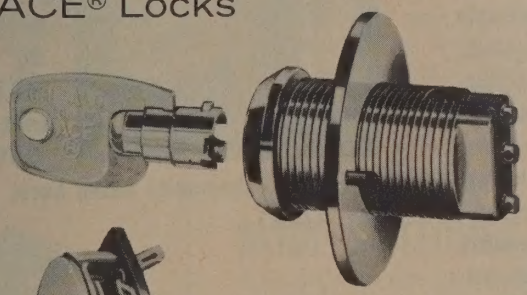
50 milliohms plus 6 milliohms per inch of printed circu

Note: Overall width of basic 10 x 10 and 20 x 10 Selector Switch inches. For each 10 sliders added to the basic unit add 3 inches to width. A 20 slider unit measures 6½ inches wide; a 30 slider unit m 9½ inches wide; a 40 slider unit measures 12½ inches wide and a 5 unit measures 15½ inches wide.

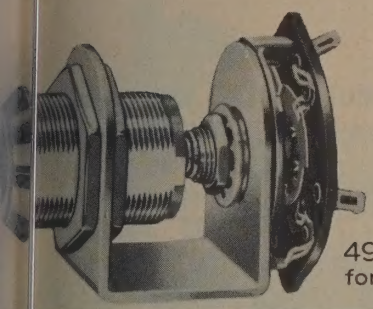
CHERRY ELECTRICAL PRODUCTS CORP. • 1650 OLD DEERFIELD ROAD • HIGHLAND PARK, ILLINOIS 6

CHICAGO LOCK...
Your Complete Source For Switch Locks

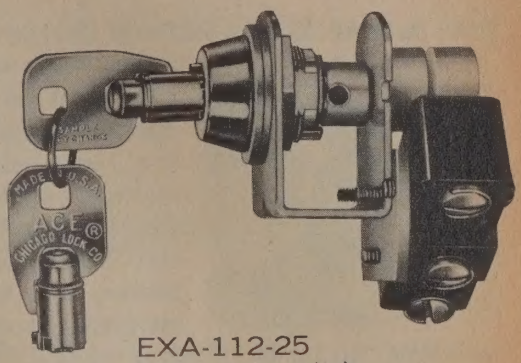
4900 SERIES Underwriters Listed ACE® Locks



No. 901
SPDT Switch Lock

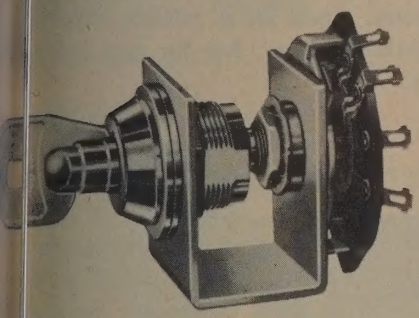


4903 Wafer switch lock for complex circuits



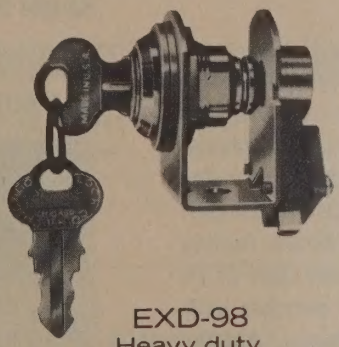
EXA-112-25
Heavy duty switch lock
Switch SPDT; 25 amps; 125, 250 or 480 VAC; UL and CSA listed.

icago ACE® Locks provide maximum security with registered key series if desired.

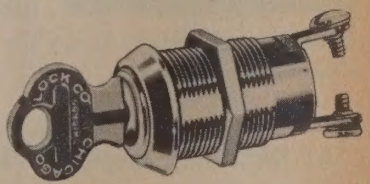


88 ACE® lock and wafer switch, c be furnished with d ble bitted lock Spec. 2242

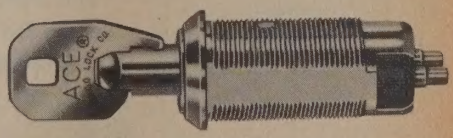
*Wafer switches will permit various circuit combinations



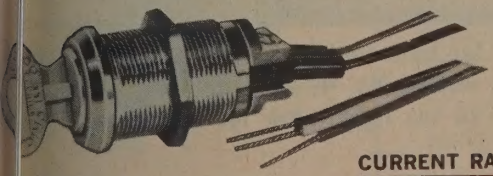
EXD-98
Heavy duty switch lock



2174 (SPST)
Double bitted lock with screw terminals
For momentary contact, spring return, specify 2174-70



4073 Basic ACE® (SPST) switch lock



35 Double bitted lock w UL listed SPDT switch
A o furnish with ACE CK–Part No. 4235

SWITCH CONTACT RATINGS

CURRENT RATINGS		LOCK NUMBER
125-250V AC— 5 AMP	30V DC— 3 AMP	4901—4902
125-250V AC— 7 AMP	28V DC— 7 AMP	3535—3535A—4235
110-120V AC—10 AMP	10V DC—10 AMP	2174—2174-70—3039—4101—4073—4079
125-250V AC—10 AMP	125V DC—½ AMP	EXD-98—EXA-112

ineering counsel is avail- upon request.

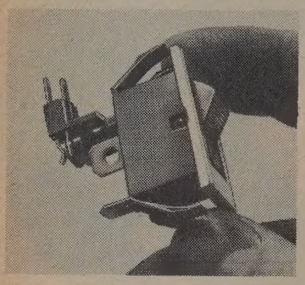
CHICAGO LOCK CO.
4275 W. Belmont Ave • Chicago, Ill. 60641

For further data on the above locks, write for catalog.

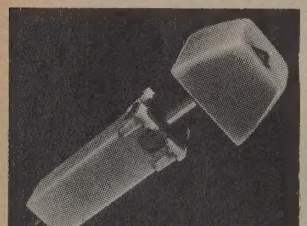
CHICAGO SWITCH, INC. 2035 WABANSIA CHICAGO, ILLINOIS 60647 312-489-55

SWITCHES THAT MASTER JOB REQUIREMENTS STANDARDS OR SPECIALS – YOUR DESIGN OR OURS

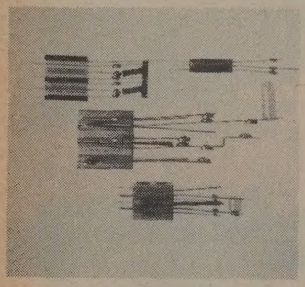
SNAP-IN SNAP ACTION ROCKER SWITCHES. Available in single and double pole, lighted and unlighted, maintained and momentary, 2 and 3-position. The momentary-lighted versions are the industry's lowest cost "lighted pushbutton" switches. Snap-in assembly saves labor, as well as material costs. Ask for data sheets on the 26 & 27 Series.



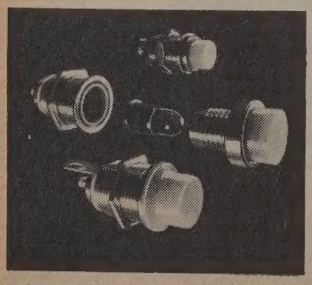
HALF-BY-HALF KEYBOARD SWITCHES. For printed circuit mounting. Available in SPST-NO, SPST-NC, SPDT and alternate circuit variations. Low bounce, low cost, and in the two-terminal versions, bifurcation provides extra high reliability. A variety of standard pushbuttons fit on the plunger. Ask for data sheets on the 34-Series.



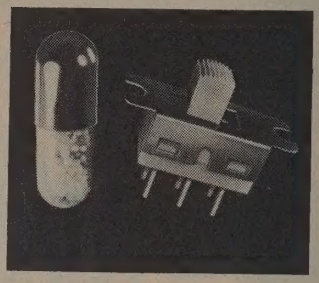
LEAF SWITCHES designed to customer specs if desired, or quoted on existing customer design. Reliable delivery dates (customer references supplied on request). Versatile in-house tooling – will produce 90% of all existing leaf switches with no tooling charge. Ask for the "Leaf Switch Design Guide."



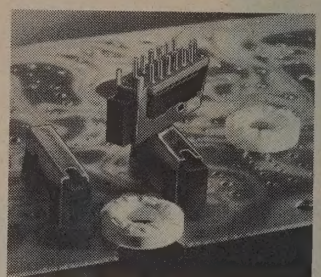
DELUXE INDICATOR LIGHTS. Lamp and lens replaceable from panel front. Two-terminal versions are standard. Midget and submidget flange-based lamps used. Many options, lens shapes, colors, and variations available. Ask for data sheets on the 33 Series.



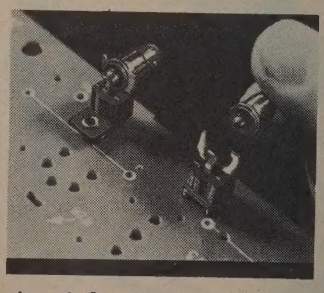
SUBMINIATURE SLIDE SWITCHES. World's n life slide switches w snap action in som SPDT and DPDT . . . in switch measuring only .25' .50" long x .30" wi SPST versions han amp inductive l 120V 60 Hz. N brids are continually being born. Ask for data No. 23-021.



HI-DENSITY MULTI-POLE MODULAR SWITCHES can be p.c. boards as is combination; e.g., t 3P3T 3-position s 4PDT and 6PDT s are available in p push-off versions, n tary versions, push half-rocker button, of any make-before-break or break-before-mak bination of poles. These are so reliable, they're the latest fighter-bombers. Ask for data sheets 23-004 Series.



KLIPSOCKET™ FOR MIDGET-FLANGE LAMPS. Finally– commercial connec the T-1 3/4 M.F. b candescent lamp a NE2J neon lamp. socket™ (pat. pe engages and dis from the lamp bas a snap. Terminals signed for both soldering and quick-connectors newest version No. 40-000-005, for p.c. moun shown on the right. Ask for data on the 40



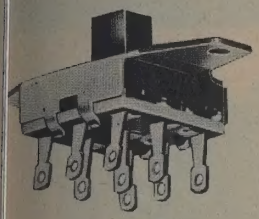
CHICAGO SWITCH, INC
2035 Wabansia Avenue
Chicago, Illinois 60647 • (312) 489-5500

SLIDE SWITCHES

QUALITY PRODUCTS THROUGH CREATIVE ENGINEERING

STANDARD SLIDE SWITCHES

Wide Range of Basic Types Available

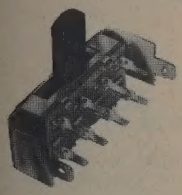


TOP ACTUATED SLIDE SWITCHES

Available from current rating of 3.0 amps AC 0.5 amps DC at 125 volts to 11.0 amps AC at 125 volts, and 8.0 amps DC at 12 volts.

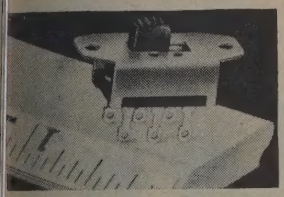
Types include 1 pole, 2 pole, 3 pole and 4 pole in two positions, three positions and four positions. Detent or spring return action.

Variety of mounting options, terminal choice and supplemental features available. Request bulletin 2085-68.



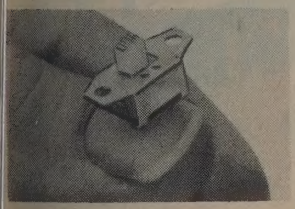
"SYDEWYNDER®" SIDE-ACTUATED SLIDE SWITCHES

Available as single and double pole in 2 positions or 3 positions. Current rating 3.0 amps AC 0.5 amp DC at 125 volts. Mount with two mounting holes on 1⅛" centers or snap into printed circuit board. Variety of knob lengths and colors available. Particularly suitable for applications where switch actuation from side of switch saves extra mechanical assembly. Request bulletin 2085-68.



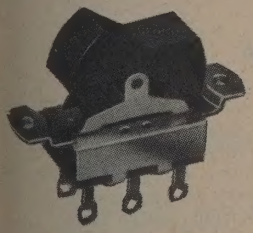
SWIDGET® MINIATURE SLIDE SWITCHES

Available in types having up to 3 poles and 4 positions. 2-position switches mount on .812" centers; other switches have slightly longer mounting centers. Side or top actuated. Detent or spring return. Variety of terminals and knob sizes. Rated at 0.5 amp AC/DC at 125 volts. Request bulletin 2093-70.



"SWIDGET® JR." SUB-MINIATURE SLIDE SWITCHES

Available as SPDT and DPDT. Mount on 0.562" centers. Overall length .762". Rated 0.5 amp AC/DC at 125 volts. Request bulletin 2093-70.



ROCKER SWITCHES

Dress up your unit with handsome CW rocker switches. Four basic rocker superstructures can be added to most CW models. Types include 2-position switches with one, two, three or four poles, in a variety of mountings, rocker knobs and features. Rated from 3.0 amps AC 0.5 amp DC at 125 volts, to 11.0 amps AC at 125 volts and 8.0 amps DC at 12 volts. Request bulletin 2085-68.

C-W products assure high reliability at reasonable prices. Full cooperation on custom engineering, field service, emergency stocking and special models.

See Sec. 4700 for complete line of C-W-Resistors, Wire Wound, Potentiometers, and Specialties.

CONTINENTAL-WIRT ELECTRONICS CORP.
26 W. QUEEN LANE, PHILADELPHIA, PA. 19144
(AREA CODE 215) VI 8-7700
TWX 710-670-1230

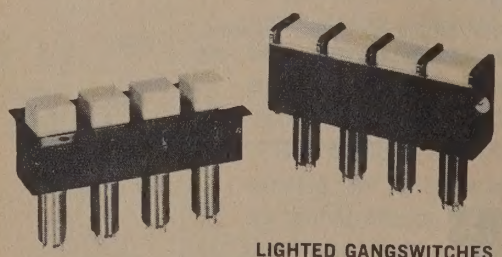
CLARE-PENDAR™ KEYBOARDS

THE FIRST LSI/MOS KEYBOARD

A single MOS package contains all of the encoding circuitry for this simple and reliable new keyboard. Two-key-rollover, delayed strobe, even or odd parity, positive or negative logic are all standard features. DTL and TTL compatible, most applications require only 200 mw total power. Dual and Tri-function ASCII keyboards are available from stock.

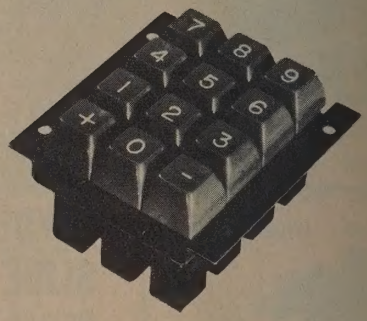
KEYBOARD SWITCHES

The S-820 Keylogic switch is a new generation in reliable reed keyboard switches. Unique square design and frame mounting assures precise keytop alignment and easy switch replacement from front of panel. Lighted versions, five keytops shapes and seven colors make the Keylogic series the most versatile keyboard switch family available.



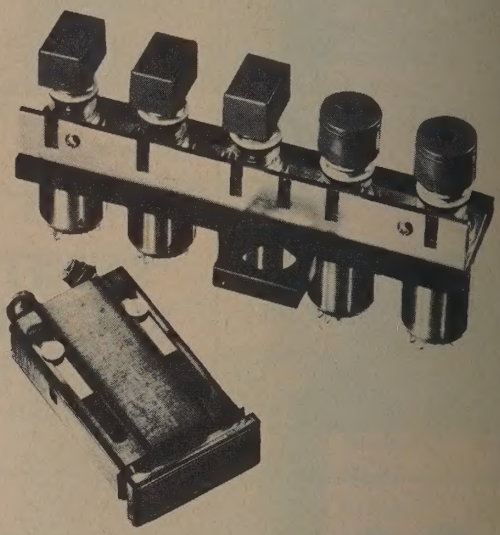
LIGHTED GANGSWITCHES

Clare-Pendar is the worldwide leader in quality lighted gangswitch assemblies. Choose from wiping action or snap action switch types, up to six poles, and single-light or multi-light lenses. A wide variety of mechanical interlocking and solenoid-held actions are available. Call your Clare-Pendar sales engineer for a demonstration and design assistance.



DATA ENTRY AND CALCULATOR KEYBOARDS

Small keyboards with any key layout are a Clare-Pendar specialty. A wide range of standard components permit custom designs to meet your needs: lighted switches, up to two N.O. reed contacts, five button shapes and seven colors, hard contact or BCD output. Several 10 and 12 key types available from stock.

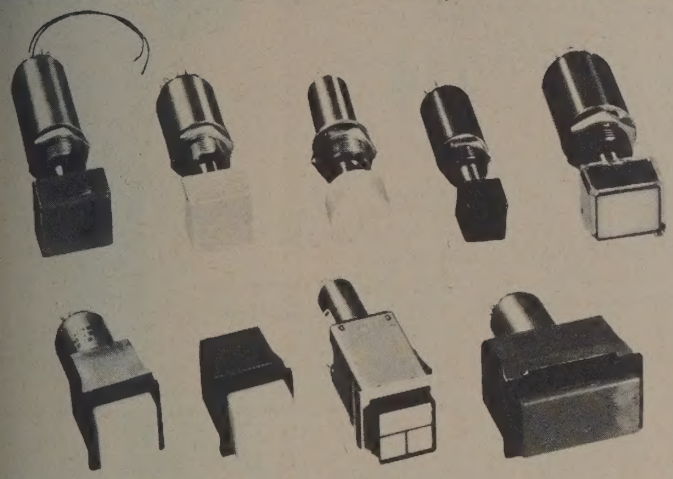


CUSTOM SWITCH AND LIGHTED DISPLAY ASSEMBLIES

Custom gangswitch assemblies for large volume use are a specialty, of Clare-Pendar. Inter-locking assemblies using standard switches often can solve a tough control problem. Our military approved light and optics lab can obtain solutions for your display problems. For practical and responsible design assistance, call on Clare-Pendar.

SWITCHLIGHTS

CLARE-PENDAR™



SWITCHLIGHTS

Clare-Pendar is the **full line** switchlight supplier. Two pole and six pole wiping action switches feature 100,000 cycle life and low contact bounce for logic level applications. Two snap action models cover the higher current ranges. Three solenoid assist models offer added flexibility. All of these switches can be used in Clare-Pendar standard gang-switch frames or in custom frames for your special requirements. A wide variety of lens shapes, styles, colors, and display modes is available.

SNAP-IN PANEL MOUNT SWITCHLIGHTS

Adapters in several sizes permit economical snap-in panel mounting of all Clare-Pendar switchlights. A series of snap-in (integral switch) single-lights offers an unusual combination of economy and low bounce performance for computer and peripheral equipment applications.

MINIATURE SWITCHES

This peanut size switch comes in three models: lighted, unlighted, or industrial and military approved (QPL 8805/64). The momentary snap action mechanism assures positive action. Your choice of button color and mounting bezel.

WORLD WIDE

Central Sales and applications engineering offices:

Box 785,
Post Falls, Idaho 83854;
(208) 773-4541

Toronto 15, Canada;
61 Industry Street,
(416) 762-8154

102, rue General Gratry,
Brussels, Belgium.
Tel: 36-01-97

Sales offices in principal cities world-wide. Manufacturing plants in the United States, Canada, United Kingdom, Belgium and Mexico.

COOK ELECTRIC PRESSURE SWITCH

The bellows sensor, providing fine control of field adjustments, is designed for long life capability. The open construction provides for economy while still maintaining Cook Electric quality.

Rugged construction is offered with the integral welding switch bracket to the pressure sensor housing.

Materials: Nickel plated brass housing and bracket. Phosphur bronze or berylium copper bellows.

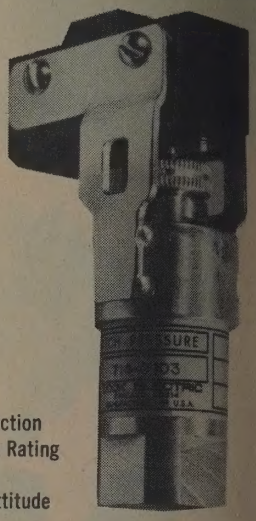
Switch Output: UL rating, 15 amp, 125, 250 or 480 VAC screw terminals.

PART NUMBERS

Internal Thread Inlet ¼-18 NPT	External Thread Inlet ¼-18 NPT	Pressure Range Adjustment
714-0101	714-0201	Vac. Gage to 15 PSIG
714-0102	714-0202	5 to 25 PSIG
714-0103	714-0203	15 to 50 PSIG
714-0104	714-0204	30 to 125 PSIG
714-0105	714-0205	50 to 300 PSIG
714-0106	714-0206	100 to 500 PSIG

• ⅛-27 NPT Inlet Available • Other Pressure Ranges Available

NEW PRESSURE CONTROL TYPE 714



FEATURES

- Field Adjustability
- Economy
- Rugged Open Construction
- 15 ampere UL Switch Rating
- Long Life
- Inlet mounting any attitude

DIAPHRAGM PRESSURE SWITCHES FOR ECONOMY AND FASTER DELIVERY

CUSTOM SET FOR PNEUMATIC AND HYDRAULIC APPLICATION

ENCLOSURES SOLVE ENVIRONMENT REQUIREMENTS

For absolute pressure requirement . . .
Cover is hermetically sealed and evacuated.

For gage pressure requirement in degrading environment . . .
Cover is hermetically sealed with standard atmosphere.

For differential pressure requirement . . .
Cover is vented to reference port.

All covers are drawn non-corrosive stainless steel. On hermetically sealed units integrity is assured by glass-to-metal sealing of the connector.

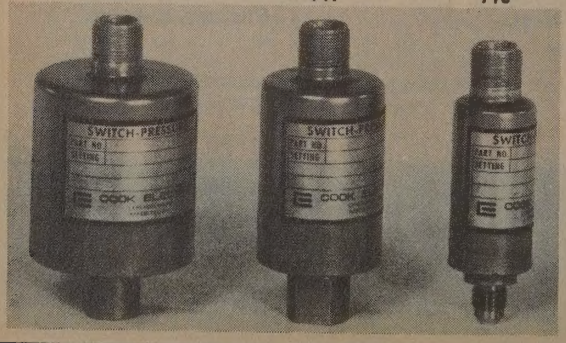
10SL-3P connectors are normally furnished. Other connectors can be provided on special order. A "commercial" protective cover is also available for even greater savings when the advantages of a sealed, stainless steel cover are not required.

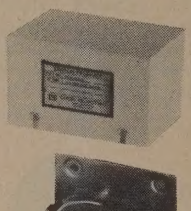
	TYPE 716	TYPE 717	TYPE 718
Pressure Range of Setting	100 To 3000 PSIA	3 To 10 PSIA 20 To 500 PSIA	10 To 100 PSIA
Setting Tolerance	±3% at a specific temperature ±10% over ambient temperature range		
Dead Band Average	20% of setting		
Proof Pressure	4500 PSIA	2.5 x setting minimum	2.5 x setting minimum
Burst Pressure	7500 PSIA	5 x setting minimum	5 x setting minimum
Ambient Temperature	−65°F To 275°F		
Switch Contact Form	SPDT		
Current Rating	5 amp resistative at 28 VDC or 115 VAC		
Vibration	10G at 55 to 2000 CPS		
Shock	15G—11 MS MIL-E-5272C Procedure V		
Cycling Life	50,000 cycles minimum at .25 amp 25,000 cycles minimum at 5 amp.		
Weight	0.3 lb.	0.3 lb.	0.5 lb.

FEATURES

- Military reliability in accuracy and repeatability of setting.
- Zero leakage.
- Corrosion protection.
- Long system life.
- Versatility in your system design.
- New economy.
- Fast delivery.

718 717 716





TYPE 719 ADJUSTABE PRESSURE SWITCH for INDUSTRIA APPLICATIONS

A field proven pressure capsule has bee to a fully adjustable pressure switch.

Three pressure ranges are available all requirements.

Adjusting the pressure setting can with a spin tight wrench, box wrench tools. Settings in a range of 25:1 are with the lower range switch.

The sheet metal cover is held in pla screws and is readily removed for eith ing the pressure setting or connecting the screw terminals on the snap switc ber grommet is provided for open can be removed to accept ½" condui

Nothing interferes with the easy installation of the wiring to the pressu

This compact switch may be panel mounted or mounted directly on Standard fittings are ¼" NPT, male or female as desired.

Part Numbers Female Thread ¼"-18 NPT	Mate Thread ¼"-18 NPT	Nominal Setting PSIG	Setting Range - PSIG Minimum Act	Minimum Deact	Maximum Act	Maximum Deact	Dead Band Max. PSIG
719-0001	719-0011	10	3.5	0.5	25.0	22.0	6
719-0002	719-0012	60	21.0	1.0	125.0	105.0	30
719-0003	719-0013	250	120.0	70.0	500.0	450.0	50

FEATURES

Wide Range of Adjustment: 25:1 in lower press. **Ease of Wiring. Ease ing. Adjustment:** With spinner wrench with cover removed. **All Wel struction:** (Pressure capsule). **Stainless Steel:** Pressure parts — accept **and liquids. Repeatability. Compact.**

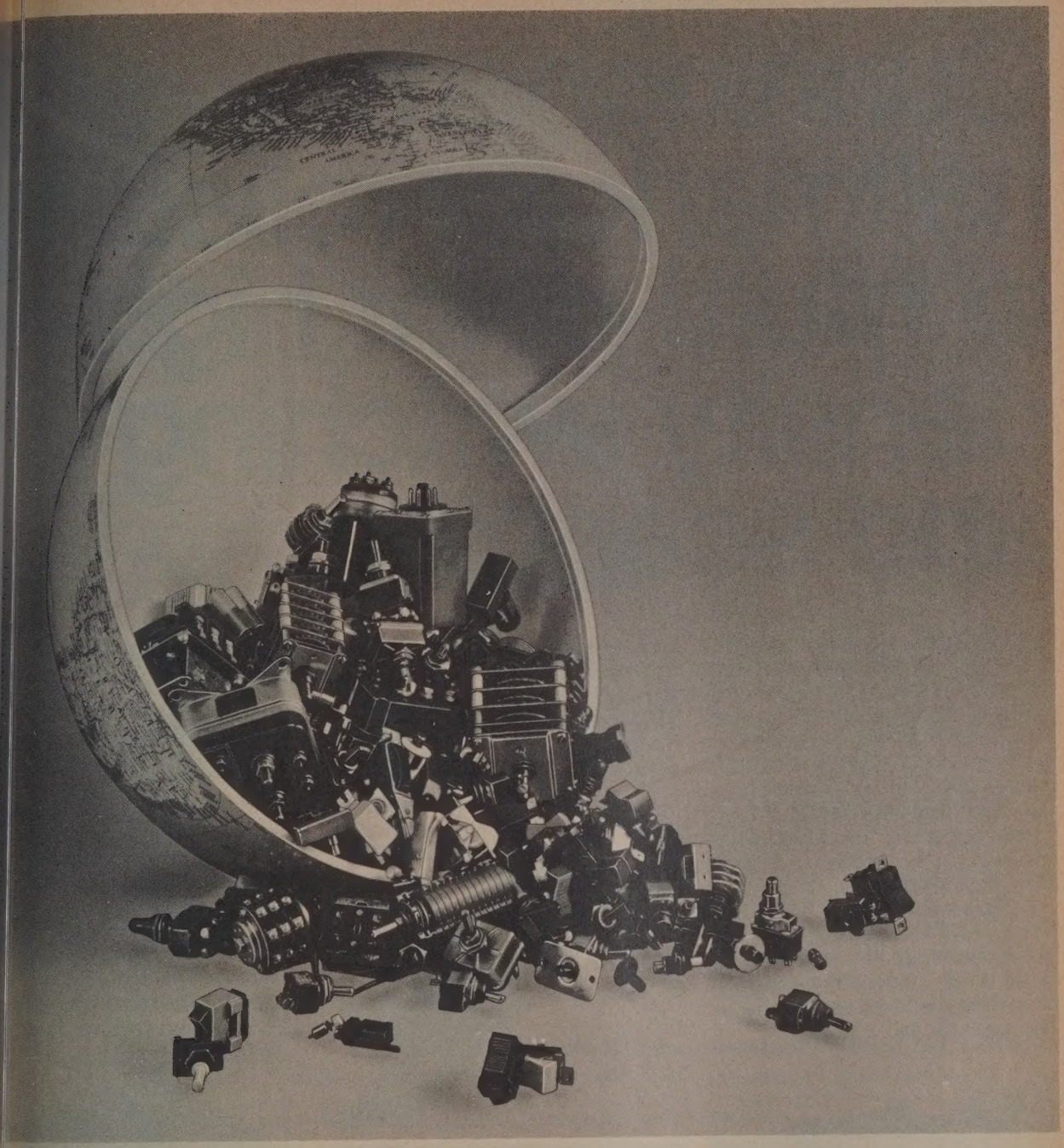
STANDARD SPECIFICATIONS

Life: 50,000 cycles minimum at rated load. **Electrical Rating:** 15 amps 250 or 480V AC; ⅛ HP @ 125V AC, ¼ HP @ 250V AC; ½ amp @ ¼ amp 250V DC. **Dielectric:** 1500 v RMS 60 Hz. **Ambient:** −65°F **Repeatability:** ±5% at fixed temperature. **Mounting:** Direct to pipe holes on 2¾" centers. **Size:** 4" wide, 2 19/32" high excluding pipe fitt deep. **Pressure Port:** ¼" NPT male or female.

For further Information, please write COOK ELECTRI contact your local representative.

COOK ELECTI AUTOMATIC CONTR

6201 OAKTON ST. • MORTON GROVE, ILL. 60053 • 312/9



Population Explosion

this case, the "explosion" represents the largest array f-the-shelf" switches and relays in the industry . . . with bility measured in hours — rather than weeks or months.

name it . . . standard or special. Toggle or rocker. utton or slide. Rotary or snap-acting. Illuminated or luminated. Avocado green or harvest gold. Military or ercial. Electro-mechanical or solid state.

usands of "in-stock" devices . . . a nationwide network of authorized distributors . . . 48-hour availability on popular, standard items . . . field help from 90-plus field offices . . . design innovation. That's our world. And only some of the reasons why Cutler-Hammer should be your No. 1 source for switches and relays — if we aren't already.

For more information, contact our nearest sales office or stocking distributor. For a complete line catalog — a big 104-pages — write Cutler-Hammer, Dept. EEM, 4201 North 27th Street, Milwaukee, Wisconsin 53201.

witch No.1 More than just switches: prompt availability, field help, innovation, quality assurance too.

CUTLER-HAMMER

SPECIALTY PRODUCTS DIVISION, Milwaukee, Wis. 53201

Cunningham: hallmark for reliabilit in multi-point, high-density switching and scanning.

Cunningham's 16-year experience in switching can help you solve problems in high-frequency communications, data acquisition, logic control, computer-controlled telemetry, audio, antenna, radar, component test equipment, and low-level instrumentation.

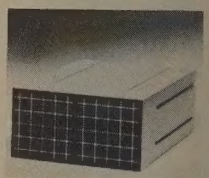
Our complete line of crossbar and reed matrix switches makes it easy to tailor units to your specific requirements. We can also produce scanners, subassemblies, packaged switch modules and components for switching systems—using latest modern techniques for compactness and reliability.

Cunningham Hystareed™ Magnetic Latching Relay

Operates without permanent magnets or holding current. Latches and stays latched as required. Will not change programmed state due to vibration, shock or power interruption. Not affected by shunting. Needs no adjustment or calibration. Greater transient rejection and isolation. Proved reliability up to 30 million operations. Adapts to matrix for multiple switching—also operates as standard relay for scanning. Optional suppression diodes can be factory-installed.

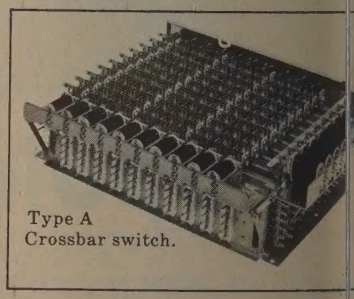
Cunningham Reed Switch Matrix

Unique design shields and separates switches from controls—gives maximum high-frequency signal isolation. Negligible crosstalk. Low induced and thermal noise. Can be directly addressed by all computers using +5-volt logic. 100% random access—any number or combination of crosspoints can be set, any place, any direction, without affecting other crosspoints. Reliability proven to 100-million operations per crosspoint. Includes all signal switching and integrated circuit logic required to interface directly with computer. Separate control and signal sections for easy inspection and maintenance.



GLO-CAT R

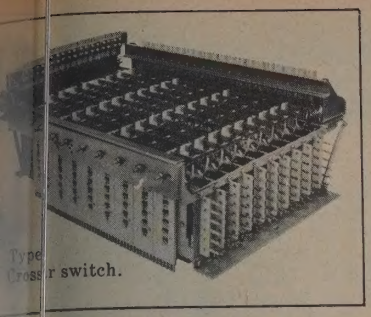
(glow-lam dicator), a cessory w takes 1½ less panel s than a calling card, yet ca displays action, pattern or p gram in a 5x10 matrix or c bar. Shows condition of as a as 50 switches, crosspoins other devices in a pattern f clear dots of light. Operates r standard 5-volt logic. Can be ily multiplied to match any n size or configuration.



Type A
Crossbar switch.

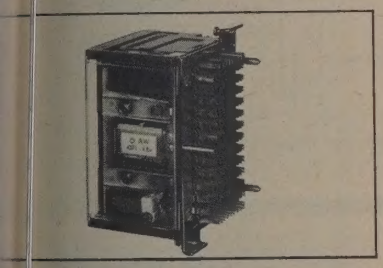
Cunningham Crossbar Switc Matrices

Ultra-reliable, versatile. Ide wideband, high-frequency sw ing. Two patterns: Type A group-to-group switching; Ty for group-to-one switching. E



Type
Cross r switch.

ay b controlled by coordinate or irect lectromagnetic actuation. Both ver the full range of data equi ion requirements, and han- le v ages from 1 microvolt to 000 lts—usable up to 30 MHz, 0-m ion operations per cross- oint ssured—up to 100-million re mmon. Excellent low-level nd d circuit performance. Both and signals dc to 10 megacycles with igh isolation. Speeds to 65 losu s per second. Readily pro- ram able by every control de- ice om tape to direct computer npu



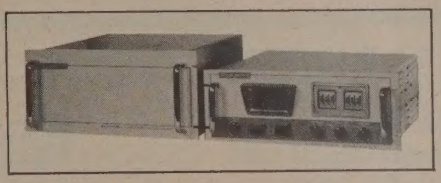
OH (Ordinate Holding Switch)

A ole, 12-position magnetic ato ng relay with random access ap ility. Has high switching pe , low power requirements, and compactness well suited for ap cations where several switch- es ust be used in matrix config- ur ons, and controlled by digital cir its. Magnetic latching gives ai afe protection against power ai re. Plug-in modular units are ea y replaceable—simplify main- en nce, reduce downtime. Com- pa design (3½"x2½"x3½") and ef ent manufacture contribute to w OHS switch cost.

D a Acquisition

C ningham Crossbar Scanners of efficient data acquisition in co pact space, at competitive prices. They are small switching systems, capable of connecting many signal circuits to one circuit. Or distributing one signal circuit to many—sequentially or in accordance with BCD program signals from peripheral equipment.

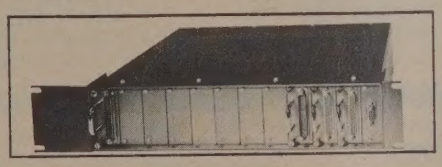
These scanners are excellent for handling low-level signals (less than 1 microvolt). Their careful design permits accurate routing and excellent fidelity in transmitting analog or digital data. Also used for data logging, signal distribution systems, and automatic cable harness and printed circuit card continuity measuring systems.



Cunningham Model 309-G Scanner.

A 600-point guarded scanner used in low-level test and measurement systems, and computer-programmed data acquisition. The 309-G provides capability of connecting many signal points to one point or distributing one signal to many points, sequentially or individually and in any order—by front panel control or a signal from peripheral equipment. Channel capacity of the scanner is from one hundred 6-wire to six hundred 1-wire channels.

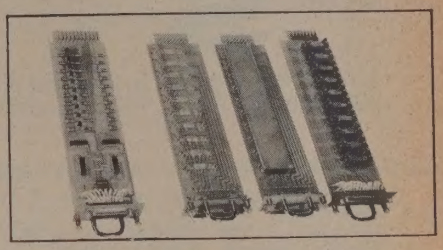
The 309-G is particularly suitable for switching low level signals in the order of 1 to 100 microvolts.



Cunningham Reed Scanner Module.

A 3½"x19" panel, standard rack-mounted scanner module. Fits EIA/WE panel hole spacings. Supplied with all mating connectors, both signal and control.

Has plug-in capacity for 10 scanning-type switching cards, each of 10 channel capacity. Expandable in 10-channel increments of 1, 2 or 3 poles per channel. 3-pole card is especially designed for low thermal type scanning.



Reed Scanner module Card—left to right: Control card; reeds exposed; reeds covered; operating coils on reverse side.

Cunningham Reed Scanner Module Card.

Due to unique design, the scanner switching card is suitable for instrumentation-type switching where guarded measurements are required. It is designed to interface easily to measuring equipment. Several readily available modular-design control cards offer great flexibility for interfacing to most modern computers and/or peripheral equipment. Power requirement: +5 volts, 100 milliamps.

Cards may be purchased separately and are available for parallel or serial loading. Control cards are available for interfacing with binary, binary coded decimal and straight decimal instructions.

Descriptive Literature Available

Crossbar Fundamentals	#130
Crossbar Applications	#131
Scanners	#309 & #315
Reed Matrix	#505
Hystareed	#600
Reed Scanner Module	#700
OHS Data	#604
Cunningham Type A Crossbar	#200
Cunningham Type F Crossbar	#101
Cunningham Type P Crossbar	#202
Cunningham Type T Crossbar	#203

For technical applications assistance, consult your nearest Cunningham representative. He is listed in the yellow section of this catalog.

Cunningham Corporation

SUBSIDIARY OF GLEASON WORKS

HONEOYE FALLS, NEW YORK 14472

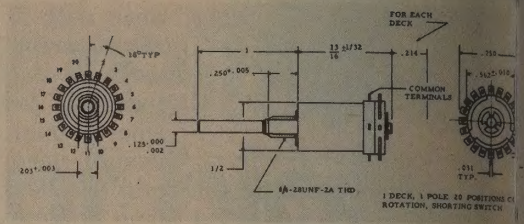
DAVEN SUB-MINIATURE ROTARY

Newest & Smallest 20 Position Rotary Switch

SERIES S 9/16" DIAMETER

Bulletin SS88

Available in 1 pole 2 to 20 pos/4 pole 2 to 5 pos. Up to 10 decks. 18°, 22½°, 36°, 45°, shorting & non shorting



MECHANICAL:

Rotational life: B 25,000 cycles min. @ .150 amps 28V. DC @ 85°C
Stop torque 5 in. lbs.
Mounting Double flatted bushing ¼-28 UNF-2A Thread
Moulded parts: P Diallyl phthalate
Metal parts except contacts Stainless steel
Contact Material Copper, silver plated, gold overplate
Wiper Beryllium copper, gold plated

ELECTRICAL:

Current carrying capacity	3 amps.
Current switching capacity	.500 amp.
Contact resistance, after life, max.	.020 ohms
Contact resistance, initial ave.	.004 ohms
Contact resistance, initial max.	.010 ohms
Insulation resistance	50,000 me
Dielectric withstanding voltage	600 vrms

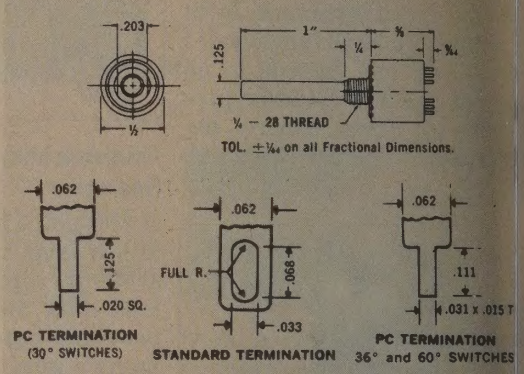
SERIES G & K ½" DIAMETER

MIL-S-3786C/20
Bulletin SSG79
Bulletin #SK79

Available in one pole 2 to 12 position through 4 pole 2 to 3 position types. 30°, 36°, 60° shorting & non shorting

Series G is a true ½" diameter switch, designed to meet military standards. It is completely sealed with double "O" ring shaft seals and an epoxy sealed contact panel. Hub and shaft are corrosion resistant stainless steel. Contacts may be flatted and pierced or pin type for PC board mounting.

Series K provides instrument and commercial users a ½" diameter switch with all the electrical characteristics and mechanical life expectancy of the Series G switch at more economical prices. Contacts may be flatted and pierced or pin type for PC board mounting.

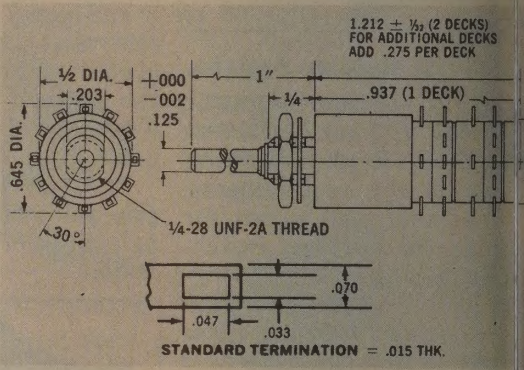


SERIES X ½" DIAMETER

MIL-S-3786C/30
Bulletin SX89

Available in one pole 2 to 12 position through 4 pole 2 to 3 position types. 30° shorting & non shorting, 60° non shorting

Series X switches with radial contacts meet both military and instrument needs for a stackable ½" diameter switch, available up to 5 decks. Special silver alloy contacts permit these sub-miniature units to switch currents up to 2 amperes.

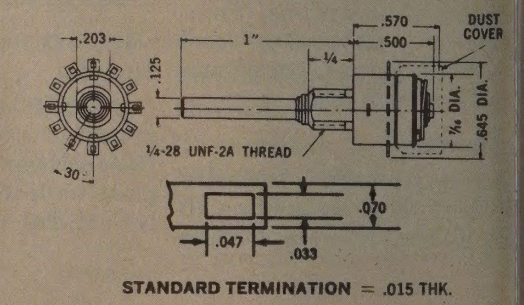


SERIES L 7/16" DIAMETER

MIL-S-3786C/29
Bulletin SL87

Available in one pole 2 to 12 position through 4 pole 2 to 3 position types. 30° shorting & non shorting, 60° non shorting

Series L switches, 7/16" in diameter, are available in single or double deck models. They feature a simplified, rear-mounted detent. Like Series X, they are capable of switching up to 2 amperes and carrying up to 5 amperes.

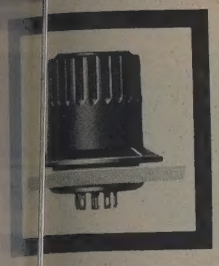


SPECIAL SWITCHES

Solenoid-operated switches
Pre-wired switch assemblies
Spring return switches
Hermetically sealed switches
Terminal board switches
Progressive shorting swi

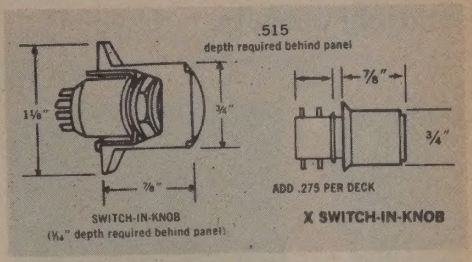
See YELLOW SECTION for Local Offices, Phones

ELECTOR SWITCHES DAVEN



SWITCH-IN-KNOB MOUNTING

Where space behind the panel is limited, Series S, G, K, and X switches can be furnished with Switch-in-knob mountings. With this mounting, G and K switches require only 3/16" space behind the panel for the terminals. Radial lug Series X switches need a minimum of 7/16" for single deck models and .275" for each additional deck.



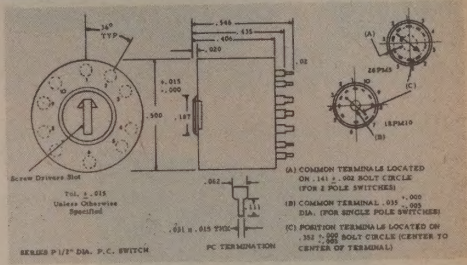
SERIES P ½" DIAMETER

Bulletin SP90

36° shorting and non shorting. 1 pole 2 through 10 pos. 2 pole 2 through 5 pos.

LOW PROFILE P.C. SWITCH

Low profile printed circuit switch with all the reliability and internal features of the Daven Series G switch repackaged for use in printed circuit applications. Bulletin SL90.

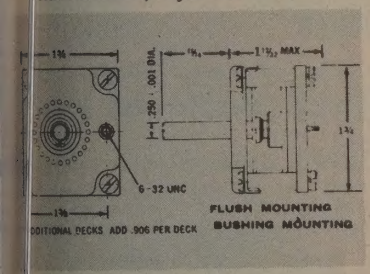


STANDARD SWITCHES

SERIES C 1¾" SQ.

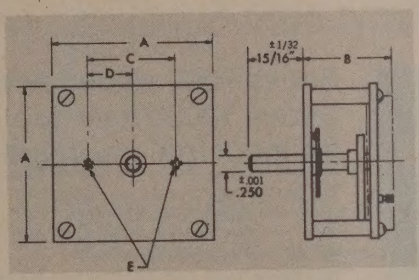
Bulletin SC108

MIL-S-3786, Style SR-14



SERIES D 2¼" SQ.

Bulletin SD109



SERIES E 2¾" SQ.

Bulletin SE119

DIMENSION A 1¾" square for B panel size
1¾" square for C panel size
2¼" square for D panel size
2¾" square for E panel size
2 15/16" square for F panel size
Tol. ± 1/64

DIMENSION B 1 5/16" for B panel size
1 7/16" for C, D, E and F panel sizes
Tol: 1/32

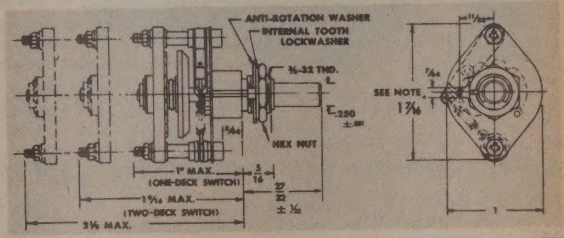
DIMENSION C 1" for B panel size
1 3/8" for C panel size
1½" for D, E and F panel sizes
Tol: ± .005

DIMENSION D ½" for B panel size
11/16" for C panel size
¾" for D, E and F panel size
Tol: ± .005

DIMENSION E #6-32NC-2B for B and C panel sizes
#8-32NC-2B for D, E and F panel sizes

SERIES M CERAMIC SWITCHES

Bulletin SM107.



...th increases 9/16" per deck for each additional deck ...ve those listed. Tol: ±.015 unless otherwise specified.
...TE: Dimensions shown are for switches up through 4 ...cks. For switches 5 decks and up, 1-7/16" dimension is ...reased to 1-19/16" and length increased ¼".

...OW TO ORDER

Order by using a six-place "shorthand" description

example: | 2 | 1 | 5 | X | M | 12 |

| 2 | | | | | |

...LACE I
...dicates number of decks:
... = One Deck 2 = Two Decks
... = Three Decks, etc.
...ample indicates Two Decks

| 2 | 1 | | | | |

...LACE II
...dicates number of poles per deck:
... = One Pole 2 = Two Poles
... = Three Poles 4 = Four Poles
...xample indicates 1 Pole per deck

| 2 | 1 | 5 | | | |

...LACE III
...dicates degrees of spacing between ...ositions:

	Shorting		Non-Shorting	
	1-15°	6-18°	1-30°	6-36°
	2-11¼°	7-60°	2-22½°	
	3-7½°	8-36°	3-15°	8-60°
	4-6°	9-20°	4-12°	9-40°
	5-30°		5-18°	

Example indicates 30°

| 2 | 1 | 5 | X | | |

PLACE IV
indicates series of switch:
X = X series

| 2 | 1 | 5 | X | M | |

PLACE V
indicates Shorting or Non-Shorting:
M = Shorting (make before break)
B = Non-Shorting (break before make)
Example indicates a Shorting Switch

PLACE VI
indicates number of positions per Pole
1 = 1 position 2 = 2 positions
3 = 3 positions 4 = 4 positions etc.
Example indicates 12 positions

The Suffix KN after the position number indicates Switch-In-Knob mounting.
The Suffix CR after the position number indicates continuous rotation.

*The letter "T" after the type number indicates terminal board(s) mounted on the side(s). In such cases the dimensions of the contact panels are different from those listed in the standard switch section. All other switch dimensions of depth, spacing and electrical characteristics are the same.

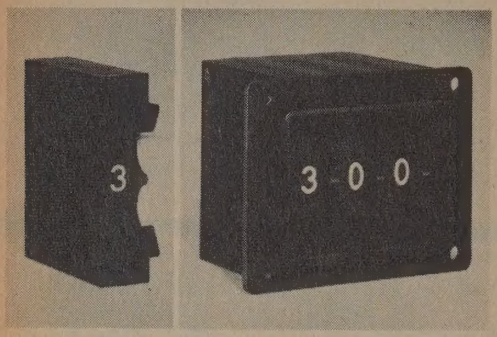
The letter "S" after the type number indicates Solenoid Operating switches. All switches are supplied with detents for all "Live" contacts unless other requirements are specified.

DAVEN McGRAW EDISON

Dept. EEM-70, Manchester, N.H. 03101 (603) 669-0940
TWX 710-220-1747

DIGISWITCH®

Converts directly from dial setting to coded electrical outputs.

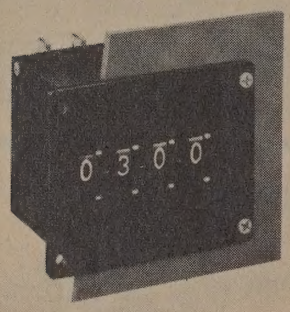


Series 300 general purpose DIGISWITCH

This is a compact, finger-actuated module only ½" wide, with 8, 10, 12 or 16 dial positions. Stops may be specified to limit rotation. More than 200 standard types of are available, covering a wide range of capabilities such as the following:

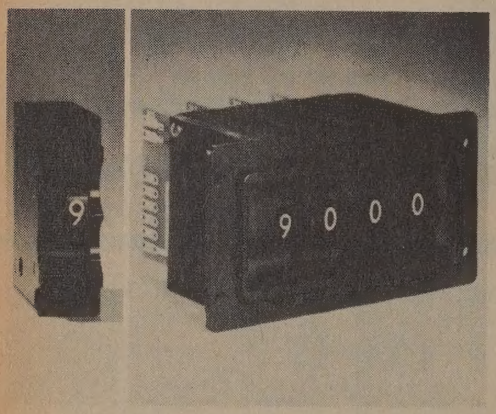
- ☐ Octal-to-binary conversion
- ☐ Decimal-to-binary conversion
- ☐ Conversion to binary with complement and provision for diodes
- ☐ Voltage divider
- ☐ Capacitance decade
- ☐ Resistance decade
- ☐ 8, 10, 12, 16 position switches
- ☐ Shorting and non-shorting

As many individual switch modules as required may be grouped into a single asse for simplicity of mounting. No separate escutcheon plate, secondary brackets or ot special hardware is required—only four screws.



Series 13000 front-mounted DIGISWITCH

The Series 13000 DIGISWITCH is identical in every way to the Series 300 except the case is designed so that an entire assembly can be mounted from the front of t completely covering the panel cut-out. No separate escutcheon plate or other har is required for mounting. The same codes, dial positions and other features availa standard Series 300 Back-Mounted configuration are also available in the Series 0 DIGISWITCH.



Series 9000 sealed and Series 19000 dust-sealed DIGISWITCHES for industrial environments

The Series 9000 and Series 19000 DIGISWITCHES are designed for trouble-free ope in severe environment. The Series 9000 is sealed per MIL-S-22710, Method I for operation near heavy cutting oil or water concentrations, airborne contaminants and salt spray and extreme humidity.

The Series 9000 DIGISWITCH has the switch elements contained in a separate cha within the switch case. An "O" Ring around the drive shaft and potting around the printed circuit board in the rear of the switch case completes the seal.

Output terminals can be directly soldered or will mate with standard printed circui board connectors. Some modules in the Series 9000 and 19000 are available with wi or other special terminals.

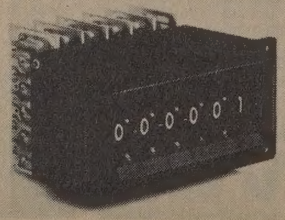
The construction of the Series 19000 is exactly the same except the potting of the printed circuit board at the rear of the case and in the "O" Ring seal are left out Series 19000 provides an excellent dust seal in applications where total sealing is not important. Most of the codes available in the Series 300 are also available in the Series 9000 and 19000.

Series	Dial Character Height
300, 13000	0.235 (8, 10, or 12 position)
9000, 19000	0.160 (16 position)

Life: Over 1,000,000 detent operations—all switches.

DIGIVIDERS/DIGIDECADES

Thumbwheel operated voltage dividers and resistance decades.



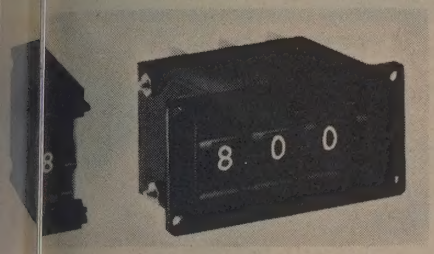
Digividers and Digidecades are specifically designed for applications where precise digital setting of resistance or voltages are required. They are easy-to-read and op require little panel space, and give 10 times more accuracy than a potentiometer— at little added cost. In addition, the new units provide reliability, low contact resista repeatability of setting. For example, a change from 13 ohms to 913 ohms is made one flick of a finger. Digividers are available with either Kelvin-Varley or Poggendorf circuits, a wide range of input impedances, and an accuracy of 0.1% of full scale. Dig resistance decades provide an accuracy at 25°C of 1% of setting.

All DIGISWITCHES and MINISWITCHES conform to the requirements of MIL-S-22710

MINISWITCH®

When limited space presents a problem.

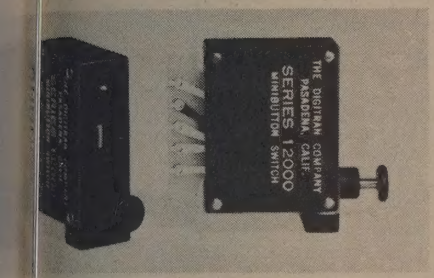
* MINISWITCH dial character height: 0.200 (8 or 10 position)
0.150 (12 position)



Series 8000 MINISWITCH*—Miniature, non-sealed

Compact and versatile, the Series 8000 provides substantial savings in panel space. Each switch module requires a panel cut-out only 0.96" high x 0.5" wide. Modular construction permits the grouping of any combination of switch modules into a single assembly. No separate escutcheon plates, special mounting brackets, or other hardware is required to mount an entire assembly.

All Miniswitches are available in eight or ten dial positions—decimal or coded electrical output. Dial stops can be provided to limit the number of dial positions. Internal replaceable lighting is also available as an option in all MINISWITCH Series. Some models in the Series 8000 MINISWITCH have provisions for mounting components directly onto the printed circuit board.

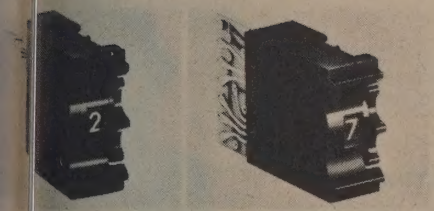


Series 12000 Miniature Pushbutton rotary switch

Series 12000 is a miniature pushbutton rotary switch which permits panel sealing to prevent contamination of switch and panel interior. Individual modules can be sealed from dust and moisture. Recommended for military communications and to meet requirements of MIL-S-22710A.

The case is metal. When properly grounded to the panel, this feature provides effective shielding against radiated electromagnetic interference.

Series 12000 is available in all 8- and 10-position standard Octal and BCD Codes including complement and "true, not-true" functions. Width: .480 inch. Height: 1.30 inch. Weight: less than 0.4 oz. Low profile; button extends only 3/16" beyond the panel. Modules can be mounted on 0.5 inch centers. Metal case, sealed glass window, optional replaceable internal lighting, diodes may be mounted on PCB.



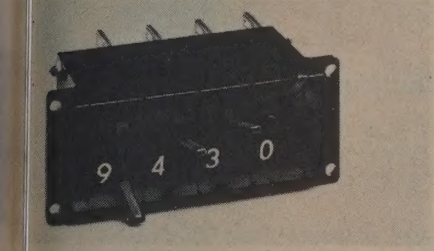
Series 200 and 700 MINISWITCH*—Miniature sealed

The Series 200 and 700 are the same miniature size and mounting conformity as the Series 8000 MINISWITCH but are specifically designed for use in equipment which must operate in severe environments (sands, dust, salt spray, high humidity, temperature extremes, explosive atmosphere, etc.). All switching elements are enclosed in a sealed chamber within the switch case. Sealing is per MIL-S-22710, Method I.

Series 200 contains wire leads as output terminals and no part of the printed circuit board is exposed. Series 700 has printed circuit board output terminations potted at the entry point of the case.

MINILEVER®

New Lever-Actuated Rotary Switch



Series 28000—Rapid Setting

The Series 28000 MINILEVER® rapid setting, lever switch is an innovation in thumbwheel type switches. It is designed to increase operator efficiency where frequent, rapid switch settings are required.

By employing a setting lever which actuates an internal gear, the operator can rotate the dial a complete revolution by moving the lever in an arc of only 90 degrees. The operator has the advantage of being able to make up or down decisions quickly in applications that require frequent, rapid changes of switch settings.

The MINILEVER assembly is interchangeable with other assemblies of Digitran's miniature, thumbwheel switches. MINILEVER is available in 8, 10 and 12 positions with dial characters .200" high.

Features and options available in the various series.

Description / Series	300	13000	200	700	8000	9000	19000	12000	28000
Dial Positions (without stops)									
8, or 10	*	*	*	*	*	*	*	*	*
● 12, or 16 *	*	*	●	●		*	*		●
Up to 40									
Dial Stops to Limit Dial Positions	*	*	*	*	*	*	*		*
Assembly Spacers (Width)									
.400"						*	*		
.500"	*	*			*				*
.250"	*		*	*	*				
Marking of Symbols, Letter or Line on Spacer or Switch	*	*	*	*	*	*	*		*
Special Dial Characters	*	*	*	*	*	*	*	*	*
Sealed			*	*		*		*	
R.F.I. Shielding	*		*	*	*	*	*	*	
Double Modules (One Thumbwheel)	*	*	*	*					
Message Units	*	*	*	*	*	*	*		
Replaceable Lighting (For standard MS-lamps)	*		*	*	*	*		*	
Lighted Decimal Point on Case	*	*			*				
Lighted Decimal Point on Spacer	*	*	*	*	*	*	*		*
Provision for Mounting Components in Output Terminals	*	*		*	*	*	*	*	*
Wire-Wrap Terminals	*	*			*	*	*		*
Taper-Tab Terminals	*	*				*	*		
Back Mounting (No separate Escutcheon Plate)	*		*	*	*	*	*	*	*
Front Mounting (No separate Escutcheon Plate)		*							

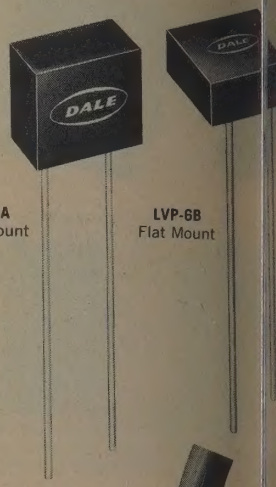
new DIGISWITCH-MINISWITCH Catalog

THE DIGITRAN COMPANY
Division of Becton, Dickinson and Co. B-D
Arroyo Pkwy., Pasadena, Calif. 91105
(213) 449-3110 TWX 910-588-3794

DALE® for Optimum Value in Surge Arrestors

■ SERIES LVP-6 *Low Voltage Protector*

Designed to mount on printed circuit boards to protect solid state circuitry from transients appearing on low voltage DC circuits. Nanosecond response. Automatically restores circuit to normal when transient has passed. Transients substantially above rated surge current would cause failure of the LVP-6 in a shorted condition—still safeguarding the valuable circuit components.



LVP-6A Edge Mount

LVP-6B Flat Mount

PROTECTIVE CAPABILITIES

Clamping Voltage: 6.2, 6.8, 7.5, 8.2, 9.1, 10, 11, 12, 13, 15 volts.

Shunt Capacity: 15 μf.

Operating Temperature: −55° C to 85° C

Storage Temperature: −55° C to 125° C

PHYSICAL SPECIFICATIONS

Designed for edge or base mounting. Body Dimensions = .500″ L x .500″ W x .312 H. Lead Dimensions = 1″ ± 1/32″ L x .032″ dia.

■ SERIES SPA *Secondary Power Arrester*

Designed for fuse or junction box mounting to protect against direct or indirect lightning and other transient voltages. Unit has hermetically sealed pre-ionized spark gap for increased sensitivity and stable breakdown voltage level. Exceeds all applicable NEMA, USAS, and IEEE standards.

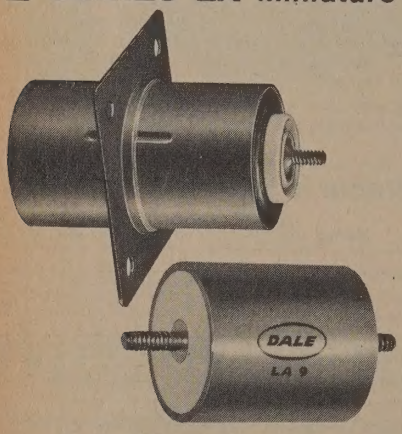
PROTECTIVE CAPABILITIES

DC Arc-Over Voltage: SPA-100 (120 VAC) 500-700 volts; SPA-200 (277 VAC) 600-900 volts. **Fast Rise Arc-Over Characteristics:** Typically 1500 volts with 10KV μsec. pulse applied; **Bypass Capability:** Will withstand repeated 10KA (10x20 μsec.) current surges. Power follow current extinguished in 1/2 cycle or less. Voltage between terminals less than 2000 volts when conducting 10,000 amps of surge current. **Insulation Resistance:** Greater than 100 megohms. **Shunt Capacity:** Less than 25 pf.

PHYSICAL SPECIFICATIONS

Spark gap hermetically sealed with soft solder. Overall dimensions: 1-3/4″Dx3″L. Two 18″ leads provided for circuit connection. Has 1/2″-14 NPSL conduit fitting with nut for mounting in any position indoors or outdoors.

■ SERIES LA *Miniature Size—Maximum Circuit Protection*



Patented design insures much greater reliability and repeatability than stand gap designs. Widely used to protect communications equipment from lightnir guard industrial controls and radios from heavy transient spikes.

PROTECTIVE CAPABILITIES

Spark-Gap Arc-Over Voltage: LA20 = Factory adjustable from 500 to 6000 VDC ± 2 10%; LA9 = Factory adjustable from 500 to 5000 VDC ± 20% (10% available **Capability:** LA20 = 10 current surges each rising to 15,000 amps peak in 5 μsec. and o ing total charge of 20 coulombs. Derate to 50% below 1500 V. LA9 = 100 current r 300 amps peak with 2x4 millisecond wave shape. Derate to 10% when set below 75 V. types will perform as stated without damage to arrester or equipment attached and it than 20% change in original DC breakdown voltage. **Insulation Resistance:** Greater t n megohms initially and greater than 10 megohms after rated current surges. **Shunt** LA20 = 8 mmfd, LA9 = 3.5 mmfd.

PHYSICAL SPECIFICATIONS

LA20 = 3-3/8″ outside length. Body 2-1/16″ L x 1-1/4″ D. Weight: 5 oz. LA9 = 1-3 side length. Body: 1″ L x 3/4″ D. Weight: 2 oz. **Mounting:** Clip, stud or flange. LA20 = 6-32, 8-32, 10-32 stud or wire; LA9 = 4-40 stud or wire. **Seal:** LA20 and LA9 h

■ ADDITIONAL MODELS

- Aircraft lightning arresters of all types
- Arresters for high voltage circuits
- Miniature transient suppressors for circuit board mounting.

Submit your specifications to

DALE ELECTRONICS, INC.

Box 180, Yankton, South Dakota 57078 • Phone: 605—665-9301

Complete lightning laboratory facil and engineering assistance availab to develop your applications.

STATE CURRENT LIMITING FUSES

The Current Limiting Fuse provides unexcelled performance for critical circuit protection by opening at extremely fast, predictable current-time overloads. It offers timed protection required in circuits with predictable starting and load surge currents yet require fast protection against damaging spikes or overloads.

This is a one-shot device employing a low resistance Electra cermet fired junction on a non-conducting glass subtrate. No arc, plasma, or vapor may escape the package.

TYPES	S100-32 S125-32 P200L-32	P800L-32	P500L-32	P500L-50	P600L-32	P600L-50	S100-115 S125-115
ne at nds ad	(Min.) Max. (−) .004 @ 316%	(Min.) Max. (.010) 2.000 @ 200% (.00025) .010 @ 400% (.00012) .004 @ 500%	(Min.) Max. (−) .1 @ 316%		(Min.) Max. (.4) 10.000 @ 200% (.0015) .018 @ 400% (.00025) .003 @ 600%		(Min.) Max. (−) .075 @ 316%
rating	32 Vrms 45 Vpeak	32 Vrms 45 Vpeak	32 Vrms 45 Vpeak	50 Vrms 75 Vpeak	32 Vrms 45 Vpeak	50 Vrms 75 Vpeak	115 Vrms 160 Vpeak
gs in Amps	Resistance in Ohms ±50% @ 25°C Junction Temperature						
1/16	13.500	13.500	25.000	40.000	25.000	40.000	77.00
1/8	4.200	4.200	7.500	13.000	7.500	13.000	25.00
1/4	1.400	1.400	2.500	3.500	2.500	3.500	8.00
3/8	0.600	0.600	1.000	1.500	1.000	1.500	4.00
1/2	0.450	0.450	0.650	0.900	0.650	0.900	2.80
3/4	0.300	0.300	0.300	0.430	0.300	0.430	1.30
1	0.160	0.160	0.200	0.280	0.200	0.280	0.77
1.5	0.110	0.110	0.100	0.140	0.100	0.140	not available
2	0.075	0.075	0.070	0.087	0.010	0.087	not available
3	0.050	0.050	0.046	0.046	0.046	0.046	not available
5	0.022	0.022	0.022	0.022	0.022	0.022	not available

ER-1) Specify one of these package types: P200L-32, P500L-32, P600L-32, P800L-32, S125-32, S125-115, S100-32, S100-115, P500L-50, P600L-50 then: (2) Add current rating.
Example:
P200L-32-⅛

CRETE MICRO RESISTOR CHIP...TF50P

This discrete micro resistor chip, 50 mils by 50 mils, offers versatility for micro circuit designers. Electra cermet is used with glass as a passivation material. It has gold terminations for mounting. The back of the chip is gold screened to provide substrate mounting (heat sink.)

- Resistance range . . . . . 10 ohms to 1 Megohm in standard decade values.
- Tolerance . . . . . ±5% standard (J); ±1% available (F).
- TC of R . . . . . ±100 PPM/°C maximum.
- Matching . . . . . to ±0.25% available.
- Power rating . . . . . 0.01 watt @ 125°C ambient, chip mounted in free air. Gold backing is provided for heat sinking.

ELECTRA/MIDLAND CORPORATION
CERMETRIK DIVISION • 3347 Industrial Ct. • San Diego, California 92121 • (714) 453-0353
A TRANSITRON COMPANY

electro-mech

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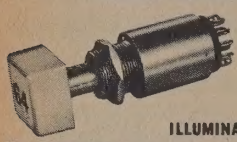
illuminat

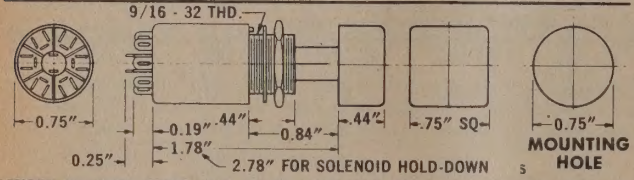
PUSHBUTTON SWITCH

"switchline" STANDARD 6-POLE DOUBLE THROW



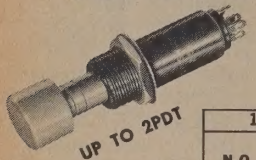
- **Ratings:** 30 volts DC or 115 volts AC 2 amps resistive; 1 amp inductive
- **Weight:** 0.8 oz. (approx.)
- **Operating Pressure:** 2 lbs. ±1 lb.
- **Plunger Travel:** 3/16" (approx.)
- **Actuations:** 100,000
- Accommodates all **"switchline"** standard lenses
- Uses one T1¾, AN3140-327, 328, 330 bulb or neon lamp. 3 actuation modes standard also in 2, 3, 4 and 5-pole configuration.

	ILLUMINATED				NONILLUMINATED			
	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.
2 PDT	2650	2750	2850	2550	1650	1750	1850	1550
3 PDT	2651	2751	2851	2551	1651	1751	1851	1551
4 PDT	2652	2752	2852	2552	1652	1752	1852	1552
5 PDT	2653	2753	2853	2553	1653	1753	1853	1553
6 PDT	2654	2754	2854	2554	1654	1754	1854	1554



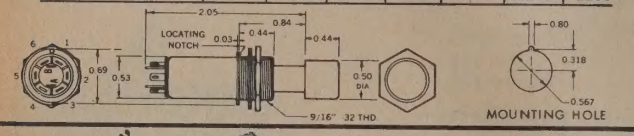
LENSES: Available in ½", ¾", 1" dia., ½", ⅜", ¾" square. Translucent Lexan in white, red, green, blue and yellow.

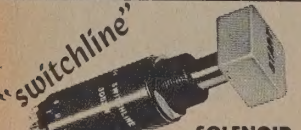
NEW Slimline by "switchline"



A new 2100 series Slimline version of our standard Illuminated Pushbutton Switch featuring silver slide bar action. Add BR after part number for mounting on ⅝" centers. Utilizes AN3140-T 1-¾ or ALC-100 bulb. All other specifications same as standard.

	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	2128	2129	2130	2131	2132	2149	2150
PUSH ON/PUSH OFF	2228	2229	2230	2231	2232	2249	2250





SOLENOID HOLD-DOWN

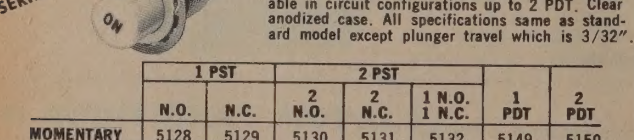
Switchline Illuminated Pushbutton switches with an integral hold-down coil which is activated with switch. Holds the pushbutton in the depressed position until coil is de-energized returning it to relaxed position. Available in all circuit configurations up to 6 PDT. Same specifications as standard model.

NEW SERIES 5000

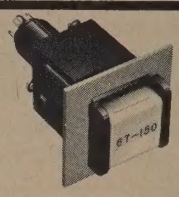
FRONT PANEL MOUNT MINIATURE MOMENTARY SWITCHES

An exceptionally short momentary switch available in circuit configurations up to 2 PDT. Clear anodized case. All specifications same as standard model except plunger travel which is 3/32".

	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	5128	5129	5130	5131	5132	5149	5150



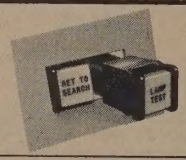
NEW



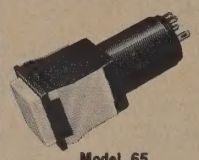
60 SERIES LOW COST SELF MOUNTING SWITCH ASSEMBLY

This series features our 2100 switch rated as an integral part of the mounting hardware. All plastic, front mounting seal barriers. "U" shaped channel bracket attached to back of panel and switch with two screws. Same circuitry and functions as 2100 series.

"switchline" MOUNTING ADAPTER

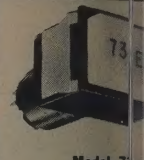


- Snaps in from front panel
- Mounts in panel thickness up to ⅛"; for thicker panel mounting add "Z" to
- Fingernail groove in lens for easy remo
- Bezel available in white, gray or black



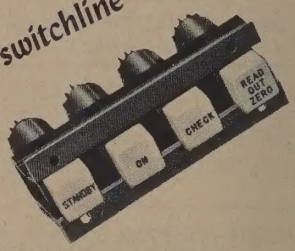
Model 65
0.94" sq. flange
0.75" sq. Lens

Model 72
0.75" dia.
Lens



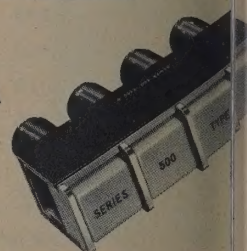
Model 7
0.75" x 1.
Lens

"switchline" MULTI-STATION ASSEMBLIES



SERIES 400

Multi-station switch assemblies designed for sub-panel mounting by means of a flanged "U" channel. All standard Switchline switches can be incorporated with several types of mechanical interlocking/lockout actions between stations. Up to 12 stations in one or two row configurations.



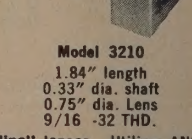
SERIES 500

A new line of front panel m semblies featuring long-lastin barriers between each switch dard Switchline switches in t tracking action and switching Up to 12 switches in single on ⅞" or 1" centers.

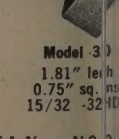
- **TYPE I** — Mounting frame only.
- **TYPE II** — Momentary and lockout.
- **TYPE III** — Independently maintain and locked out.
- **TYPE IV** — Interlock and lockout.
- **TYPE V** — Maintained with master release.
- **TYPE VI** — Maintained with remote master release.
- **TYPE VII** — Maintained with master release release lockout.
- **TYPE VIII** — Interlock and master release.
- **TYPE IX** — Interlock and remote master
- **TYPE X** — Interlock and remote master master release

"switchline" INDICATOR LIGHTS

60 SERIES-210
1.57" length
0.75" sq. Lens
Channel mount



Model 3210
1.84" length
0.33" dia. shaft
0.75" dia. Lens
9/16 -32 THD.



Model 3
1.81" le
0.75" sq.
15/32 -32

Accommodates all **"switchline"** lenses. Utilizes AN3140-T 1-¾ or ALC-

Write, wire or phone for complete literature. We invite your inquiries regarding our capabilities in custom switch design and production.

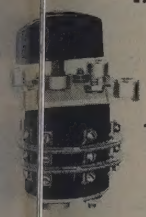
Also send for literature describing our complete line of encapsulated precision wire-wound resistors and custom networks capabilities.

electro-me
5639 NORTH ROSEMEAD BLVD. • TEMPLE CITY, CAL
TELEPHONE (213) 287-0781

MULTIPOLE ROTARY SWITCHES

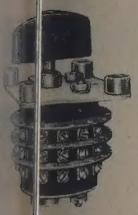
5 amperes to 200 amperes • 4, 8, 12, and 16 positions

INDUSTRIAL TYPES



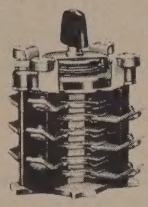
Type JR–10 amperes
Two to eight positions;
up to 30 sections.
Catalog E-1000.

Type JM–7½ amperes
Two to twelve positions;
up to 25 sections.
Catalog E-1000.



Type JK–5 amperes
Two to sixteen positions;
up to 15 sections.
Catalog E-1000.

Type P–10 to 200 amp.
Two to four positions;
up to 13 sections.
Catalog E-5000.

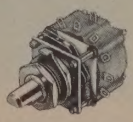


Type JD–30 amperes
Two to eight positions;
up to six sections.
Catalog E-7000.

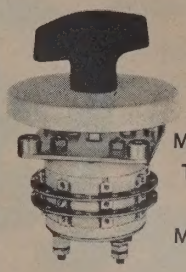
Type JS–30 amperes
Two to eight positions;
up to five sections.
Catalog E-7000.

Type A–5 amperes
Two to eight positions;
up to 10 sections.
Catalog E-3000.

Series 38 – ½ ampere
Two to twelve positions;
up to five sections.
Catalog E-4000.

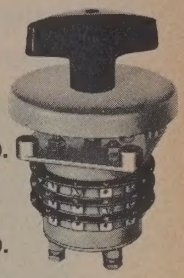


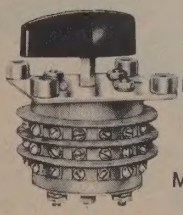
MILITARY TYPES



Type SJR–10 amperes
Two to eight positions;
up to 30 sections.
MIL-S-21604 • **Cat. E-2000.**

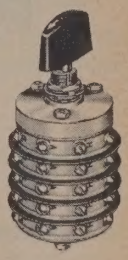
Type SJM–7½ amperes
Two to twelve positions;
up to 25 sections.
MIL-S-21604 • **Cat. E-2000.**





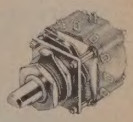
Type SJK–5 amperes
Two to sixteen positions;
up to 15 sections.
MIL-S-21604 • **Cat. E-2000.**

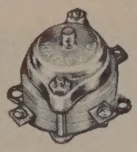
Type SJL–5 amperes
Two to eight positions;
up to 10 sections.
MIL-S-21604 • **Cat. E-3000.**



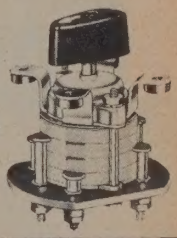
Type AF–5 amperes
Two to eight positions;
up to ten sections.
MIL-S-6807 • **Cat. E-3000.**

Series 38 – ½ ampere
Two to twelve positions;
up to five sections.
MIL-S-3786 • **Cat. E-4000.**

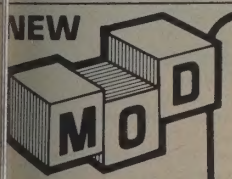




Type SR–10 to 200 amp.
Two to four positions;
up to twelve sections.
MIL-S-15291 • **Cat. E-6000.**



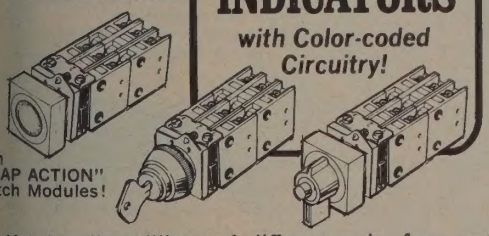
NEW



OIL TIGHTS

MODULAR SWITCHES and INDICATORS

with Color-coded Circuitry!

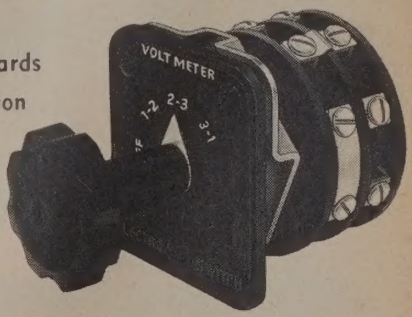


ith
SNAP ACTION"
vitch Modules!

ecify literally millions of different units from a few parts! Up to six color-coded modules per component. es may be activated by pushbuttons (flush or mushroom or by selectors (knobs, levers, wings or keys) . . . with hout indicator light or auxiliary pushbutton for test ons. Ratings: 10A-300V continuous . . . 6A-300VAC in- . . . ½A-125VDC resistive interrupt. Max. making cur- 0A . . . dielectric withstanding voltage 2500VAC. Mech. ver 1,000,000 operations. Available as finished com- s or modules or sub-assemblies. Write for Bulletin 32.

INSTRUMENT and CONTROL SWITCHES

- pre-wired
- for switchboards
- for distribution panels
- for engine-generator sets
- for machine controls



Pre-wired for easiest installation—you connect only the instrument and line wires—these dependable switches meet highest public-utility and military standards, yet cost far less than you'd expect.

Fit standard three-point panel-drilling for replacement service and original-equipment uses. Furnished with escutcheon plate, mounting hardware, wiring diagram, and round, oval, or pistol-grip handle.

Series 24 includes voltmeter, ammeter, ammeter-voltmeter, wattmeter, synchroscope, power-factor meter, circuit-breaker, motor-control, and special transfer switches. Write for catalog.

LECTRO SWITCH CORP.

VEYMOUTH (Boston), MASSACHUSETTS 02188

Tel: 617-335-5200 TWX: 710-388-0377

EECoSWITCH Thumbwheel Switches

Revolutionary 1776 Switch Series

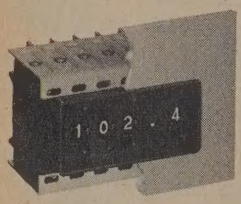
Widest Line — Lowest Cost

- **$3.00 IN SINGLE QUANTITIES**
- Less than $2.00 in large quantities
- Large, easily read, dial characters
- Plastic window readout protection
- Sealed against dust
- Back of panel mounting
- Up to 34 station assemblies
- Solder tab termination
- Diode provisions
- Double width switches — triple legend area
- Current Carrying Capacity 10 microamps to 3 amps
- Operating Range −20°C to +75°C
- Two Year Warranty

PARTIAL LIST OF CODES AVAILABLE

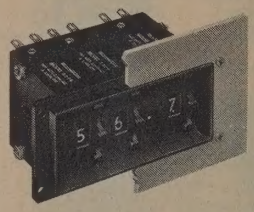
- Decimal • BCD • BCO with complement
- 9's complement with complement
- Excess 3 • BCD with complement
- 7 bar indicator • 12 position BCD
- 12 position BCD with complement
- 2 pole, double throw

200 SERIES
GENERAL PURPOSE



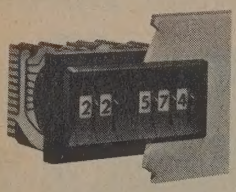
- Universal dimensions
- Wide selection of codes
- Large, easily read dial characters
- 2, 8, 10, 12 or 16 positions
- Switches individually replaceable in mounted assemblies
- Positive detent action
- 1-34 station assemblies

5000/6000 SERIES
MINIATURE, SEALED AND LIGHTED



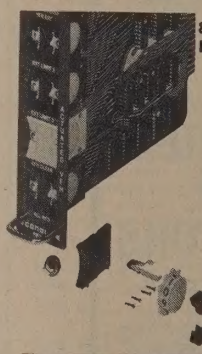
- Sealed — 6000 Series
- Unsealed — 5000 Series
- Replaceable lamp
- Cable, circuit board or wire loop terminations
- Plastic window readout protection
- Numerous codes/options

300 SERIES
GENERAL PURPOSE, SEALED AND LIGHTED



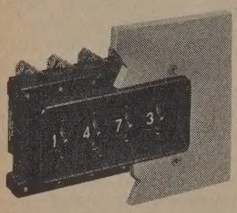
- Large, easily read dial characters
- Replaceable lamp
- Double width switches — triple legend area
- Switches individually replaceable in mounted assemblies
- Reverse field lighting option

8000 SERIES FOR DIRECT MOUNTING ON PRINTED CIRCUIT CARDS



- **Mounts directly on user's motherboard**
- Reduces wiring costs
- Eliminates switch mounting hardware
- Provides for fast replaceability of both switch and PC card
- Sealed against dust
- Service life of over 1,000,000 detent operations
- 6 optional colors for coding switch functions

700/800 SERIES
MINIATURE, SEALED AND LIGHTED



- Sealed — 700 Series
- Unsealed — 800 Series
- Unlighted or lighted with long life permanent lamp
- Double width switches —triple legend area
- Switches individually replaceable in mounted assemblies
- Circuit board terminations

SPECIFICATIONS

General	EECO Switches are certifiable to MIL-S-22710
Plastic Parts	Polycarbonate per Federal Specifications LP-393A Low moisture absorption nylon per MIL-P-17091
Metal Parts	Current carrying — heat treated beryllium copper Structural — corrosion resistant metals
Contacts	Rotor — corrosion resistant precious metal alloy Stator — .000080 (min.) gold per MIL-G-45204, Type II, over low stress nickel per QQ-N-290, Class 2 over copper
Printed Circuit Board	Laminated glass epoxy, copper clad one or two sides with 2 oz. copper per specification MIL-P-13949 Type GE

All switches are offered as complete assemblies or as individua switch modules with a TWO YEAR warranty.

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA
1441 East Chestnut Avenue • Santa Ana, California 92701 • Phone: 714 - 547-5651
Distributors: Hall-Mark Electronics • G. S. Marshall Company • Schweber Electronics

ntil now, choosing between mercury or reed switches eant a compromise. Mercury switches offer long life d no contact bounce, but they are bulky and limited one mounting position. Reed switches are smaller d mount in any position, but have a shorter life, riable contact resistance, plus significant contact unce and noise.

But **there is no need to compromise any more.** Now gcell Mercury Film Switches combine the advanges of mercury and reed switches. Magnetically tuate Logcell Switches are half the size of miniare reels switches — occupy only 1% of the volume conventional mercury switches. They operate in y position, have no contact bounce or AC noise, d withstand moderate shock and vibration. Wherer precise limit, proximity or pushbutton switching required, consider Logcell Switches:

- Long life — tested to billions of cycles
- Operation in any mounting plane
- No contact bounce
- Form "C" SPDT contacts
- No measurable AC contact noise
- Thermal noise less than 1.0 microvolt
- Linear repeatability to 0.005 in.
- Inherent memory — switch latches in either position until reactuated

Get complete information about revolutionary new Logcell Mercury Film Switches—and Logcell Mercury Film Relays. Write to Fifth Dimension Inc., Box 483, Princeton, N.J. 08540 or call (609) 924-5990.

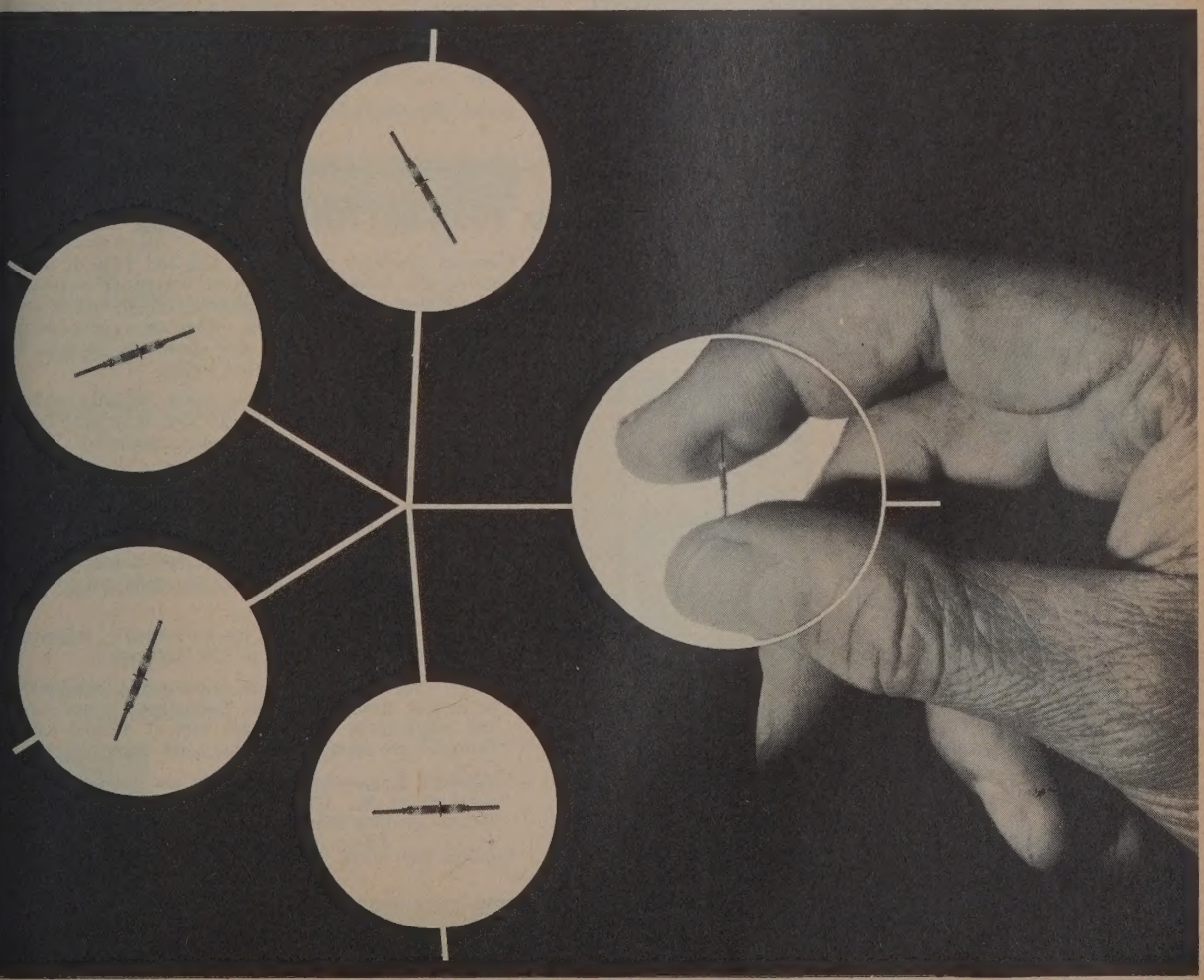
RWB SPECS **Also ask about our red, white and blue specifications which match Logcell performance and cost to your application.**

5-D FIFTH DIMENSION INC.

Magnetically actuated . . .

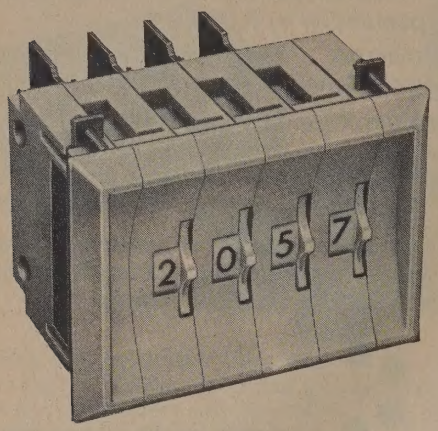
his mercury switch occupies 99% less space and operates

IN ANY POSITION



SWITCHES

CR103 TYPE F THUMBWHEEL SWITCHES



General Electric's CR103 Type F Thumbwheel Switch can save you panel space by replacing old "wafer"-type switches. It can be used wherever data are manually inserted into a machine or process — such as welding control, computer systems, and numerical control.

Each switch module is only ½-inch wide, 1¾-inches deep and 2-inches high. An assembly with 24 switch modules takes up only 12 13/16-inches in panel width.

The Switch is rated 3-amperes carrry, 150-volt a-c/d-c and is available in standard-duty and oiltight forms. Phenolic printed circuit boards are available in decimal, binary coded decimal, binary with complement, binary with oddbit parity and binary complement forms. Switch assemblies can be factory-assembled with up to 24 modules — up to 7 modules for oiltight forms.

FEATURES

- **True Oiltightness** — both for switch **and** for panel integrity Never before offered in the industry!
- **Ordering Flexibility** — order the switches factory-assemble chase modules as individual units to be mounted and separately. If you want to make up your own Standard-duty you can order end blocks, spacers, shafts, and switch mod choice of termination — plug-in, wire wrap, or taper t Oiltight forms are available factory-assembled only.
- **Appearance Flexibility** — G.E. Thumbwheel Switches offe selection of numeral color combinations. Wheels are also with plus-minus coding. Housings ar offered in grey, bla or beige.
- **Durable Construction** — tough, unbrekable Lexan® switc wear-resistant Delrin* wheel and Fairprene* gaskets (o forms) give this switch maximum operating life with low mai The switch is easy to operate, even with a gloved hand.
- **Easy Mounting and Installation** — entire unit is assembled mounting shafts and eight screws at end of shafts — no m many switches in line. The Assembly is held snug to panel a simple bracket-screw design and can be mounted on a thickness up to ⅜-inch.
- **Neat Appearance** — large, easy-to-read numerals or symbol in-line visual readout of switch position. Modern switc presents clean panel face — no screw heads on outside Spacers with solid front can be inserted to permit easy n symbol series separation.

* Reg. trademark of Du Pont Company

CONTACT RATINGS

Carry continuously .....3 ampere max

Voltage .....150 volts max

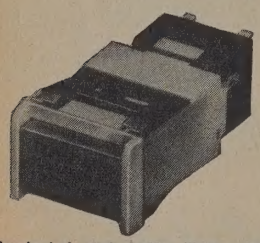
Make .....30 va a-c inductive 7.5 va d-c inductive 30 va a-c/d-c

Break .....15 va a-c inductive 7.5 va d-c inductive 30 va a-c/d-c

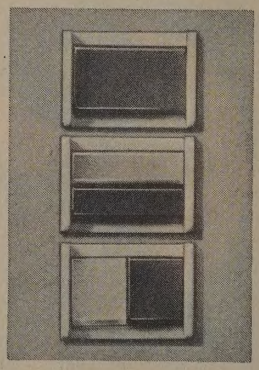
Contact Resistance .....100 milli-o

Write for Bulletin

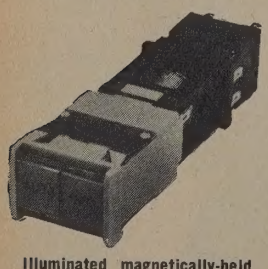
CR103 TYPE D ILLUMINATED PUSH-BUTTON SWITCHES



Illuminated push button/light with horizontal lens caps installed



Solid or split color fields give added flexibility. Colors can be mixed in the split field forms for even more combinations.



Illuminated magnetically-held push button with vertical lens caps installed

General Electric's new line of CR-103 Type D illuminat buttons are designed for a wide variety of applications control and instrument panels, office machines, la instruments, computers and other data processing eq Matching indicating lights are shown in Section 3900 of General Electric indicating lights.

Push buttons are rated 5 amp carry, 30 amp make at 1 a-c; 3 amp inductive at 30 volts d-c; 0.55 amp inductiv volts d-c. Lamps are rated 28 volts maximum.

FEATURES

- Units snap into panels from front without tools, and can mounted horizontally to save space or for group functions.
- Convenient slide-on lens caps in five colors; four housin Units are single button only, and have solid, horizontally- or split color fields.
- Legend inserts for all forms can be printed or engraved on a similar material of 10 mils or less thickness.
- Three types of contact action are available: momentary con or without audible indication, maintained contact (push-on, and magnetically held contact with or without audible in Terminals are designed for either quick-connect or solder con
- Miniature flange-base incandescent lamps such as GE No. volts) or GE No. 328 (6 volts) are easily replaced witho without removing housing from panel. Lamps are supplied by c
- 2-lamp and 4-lamp forms are available.

Write for Bulletin A

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELEC

SWITCHES

Excellence in Miniaturized Push-Button Switches—Rotary Switches—Electronic Hardware

Excellence in Push Button Switches

Action Switches (Momentary Contact)

	Series No.
10 Amp., SPST and SPDT	2000

Contact Switches (Momentary Contact)

1 Amp., SPST	4000
½ Amp., DPST	35
¼ Amp., SPST	23
¼ Amp., SPDT and DPDT	46

Contact Switches (Momentary or Push-Pull Contacts)

Lighted Push Button Switch — 1 Amp., SPST	40
1 Amp., SPST	30
Push-Pull — 1 Amp., SPST	30
½ Amp., SPST	39
Printed Circuit — SPDT (2 Circuit)	39

Excellence in Electronic Hardware

Binding Posts	29
"Push-Post® Terminals"	29
Test Jacks	31
Stand-Off Insulators	18
Test Clips	2
Sockets — Transistor, Pencil Tube, Bi-Pin Lamp, and Printed Circuit	22
Module Cases, Headers and Terminal Boards	3

Excellence in Rotary Switches

Standard Switches

	Series No.
.500" Dia. O.D.—36°, 45° or 60° angles of throw—1 or 2 poles—1 deck	50
.562" Dia. O.D.—30° angle of throw—1, 2, 3, or 4 poles—1 deck	51
.687" Dia. O.D.—36° angle of throw—1 or 2 poles—1-12 decks	8
.750" Dia. O.D.—30°, 45°, or 60° angles of throw—1-6 poles—1-12 decks	9
1.01" Dia. O.D.—36° angle of throw—1 or 2 poles—1-10 decks	24
1.015" Dia. O.D.—36° angle of throw—1 or 2 poles—1-12 decks	42
1.170" Dia. O.D.—30°, 45°, 60°, or 90° angles of throw—1-6 poles—1-12 decks	44
2.280" Dia. O.D.—30° angle of throw—rated at 15 Amps. at 125 VAC Resistive	19

The above standard switches are available with the following features:

	Series No.
Spring Return—a rotational force is required to maintain contact at one or more switch positions	8, 9, 24, 42 or 44
Isolated Position—one or more switch positions can be isolated from contact by normal rotation of shaft	9, 42 or 44
Printed Circuit Terminals—switch positions have printed circuit terminal for PC board mounting	8, 9, 24, 50 or 51
Concentric Shafts—two switches in one: both rotary; one rotary and one push button; or one rotary and an add-a-pot adapter	43 and 54
Panel Sealed—switches have shaft seals and panel seals to prevent moisture reaching behind panel	8, 9, 42, 44, 50 or 51
Military Type—switches have been tested and meet MIL-S-3786/4, and MIL-S-3786/20	42, 44, 50
Adjustable Stop—switches have stops which can be set and reset for any number of active positions	42, 44, 50 or 51
Keylock—using adapter switches can only be operated with key acting as shaft knob	42 or 44
Coded—switches convert decimal (10) inputs to computer codes	42
Homing Rotor—switch positions are all shorted except one	44
Progressively Shorting—each additional switch position is shorted as shaft is rotated 1 thru 6 positions	44
Unidirectional—switch shafts may be rotated in one direction only	24, 42, 44
Tap—30° angle rated at 15 amps. at 125 VAC resistive	19

Full details are given in the Grayhill Engineering Catalog G-304-A.

WRITE **Grayhill** INC

569 Hillgrove Avenue
La Grange, Illinois 60525
Area Code 312, Phone 354-1040

...the Difference Between Excellent and Adequate

GORDOS CORPORATION 250 GLENWOOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-74

REPRESENTATIVES THROUGHOUT THE

SUB-MINIATURE AND MINIATURE REED SWITCHES

• GENERAL SPECIFICATIONS

MOUNTING POSITION: Any Plane (WR-126 mercury wetted contacts limited to ±30° from vertical)

INTERNAL ATMOSPHERE: Inert gas (WR-126, MR-138 pressurized)

OPERATING TEMPERATURE RANGE: SPST — Form A −55°C to +150°C
SPDT — Form C −55°C to +125°C
Mercury Wetted — Form A −35°C to +125°C

INSULATION RESISTANCE: (Higher values attained by special treatment)
SPST Form A — 1 x 10^{12} ohms Typical
SPDT Form C — 1 x 10^{9} ohms Typical
Mercury Wetted Form A — 1 x 10^{10} ohms Typical

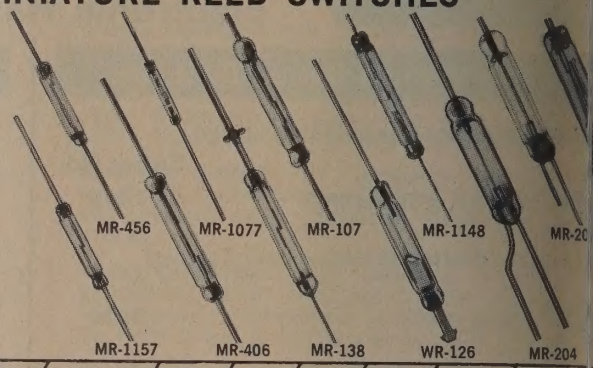
CAPACITANCE: SPST Form A — 0.2 picofarad Typical
SPDT Form C — 1.2 picofarad Typical

SHOCK: 50 g's @ 11ms

VIBRATION: 35 g's from 50 to 2000 Hz

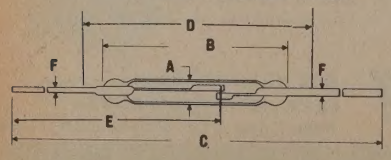
STANDARD TEST COIL: R — 5105

AVAILABLE SENSITIVITY: 15/70 ampere turns
40/80 ampere turns (WR-126, MR-205)

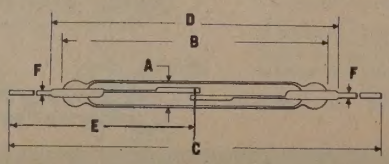


Part #	A — Maximum Glass Diameter (Inches)	B — Maximum Glass Length (Inches)	C — Nominal Uncut Switch Length (Inches)	D — Minimum Trim Length (Inches) (1)	E — Nominal Uncut Armature Length (Inches)	F — Lead Configuration (Inches)	Maximum Current (Amps)	Maximum Switching Voltage (VDC)	Maximum Contact Rating (Watts)	Minimum Breakdown Voltage (VRMS)	Maximum Initial Contact Resistance (Ohms)	Typical Operate Time Including Bounce (Milliseconds)	Contact Ma
SUB-MINIATURE SPST — FORM A OFFSET GAP													
*MR-456	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	D
MR-450	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	G
MR-458	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	R
CENTER GAP													
*MR-1157 (Modern Milli)	.100	.673	1.98	.923	.992	.023 Dia.	.125	28	3	100	.150	0.75	D
*MR-1077 (Tiny Tina)	.070	.455	1.71	.705	.855	.020 Dia.	.250	28	3	200	.150	0.25	D
MINIATURE SPST — FORM A OFFSET GAP													
						Pole							
*MR-406	.105	.885	2.75	1.13	1.238	.028 Dia.	.500	200	10	250	.100	1.0	D
MR-400	.105	.885	2.75	1.13	1.238	Arm.	.500	200	10	250	.100	1.0	G
MR-408	.105	.885	2.75	1.13	1.238	.015 x .030	.500	200	10	250	.100	1.0	R
CENTER GAP													
*MR-087	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
MR-081	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-086	.090	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
MR-088	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
*MR-107	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
*MR-108	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
MR-101	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-106	.105	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
MR-117	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.150	0.75	P
MR-138	.105	.785	2.10	1.25	1.043	.023 Dia. (3)	.500 (4)	1000	10	1200	.100	0.75	R
*MR-306	.125	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
*MR-307	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
MR-301	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-308	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
*MR-1148 } Tiny	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MR-1048 } Twisters	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MR-1348 }	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MERCURY WETTED						Pole						No Bounce	
*WR-126	.125	.690	2.10	.915	1.828	.023 Dia.	1.0	50	50	1000	.050	1.75	Hg
WR-126-20	.125	.690	2.10	.915	1.828	Arm. (3)	1.0	50	50	1000	.050	1.75	Hg
SPDT — FORM C (5)											N.O./N.C.	N.O./N.C.	N.O./ARM
*MR-203	.125	.600	2.10	.850	1.048	.023 Dia.	.100	28	4	200	.15/.2	1.0/1.5	R/D/
*MR-204	.125	.600	2.10	.850	1.048	.023 Dia.	.100	28	4	200	.15/.2	1.0/1.5	R/D/
MR-205 (C Snapper)	.135	.640	1.38	.900	.771	.027 Max.	.500	28	10	250	.1/.1	0.7/1.0	G/R/
MR-2203	.125	.600	2.10	.850	1.048	.023 Dia.	.100	28	4	200	.15/.1	0.5/0.4	R/R/

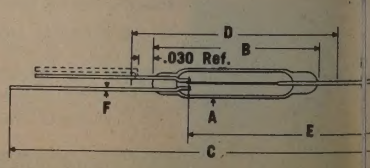
(*) Design Standard: The high volume, readily available, lowest priced switch(es) of any series.
(1) Consult factory before exceeding minimum.
(2) D-Dimet — dropout normal; G-Diffused Gold — dropout low; R-Rhodium — dropout normal; Hg-Mercury — dropout normal; P-Precious Metal — dropout high.
(3) WR-126 Hollow Tube: .040" Dia.; WR-126-20 Solid Lead: .3 Dia.; MR-138 Hollow Tube: .040" Dia.
(4) Derate to .010 amp. @ 1000 VDC.
(5) N.C. contact designated by shorter lead on MR-203 and n lead on MR-204.



SPST — Form A Offset Gap
SPST — Form A Mercury Wetted



SPST — Form A
Center Gap



SPDT — Form C

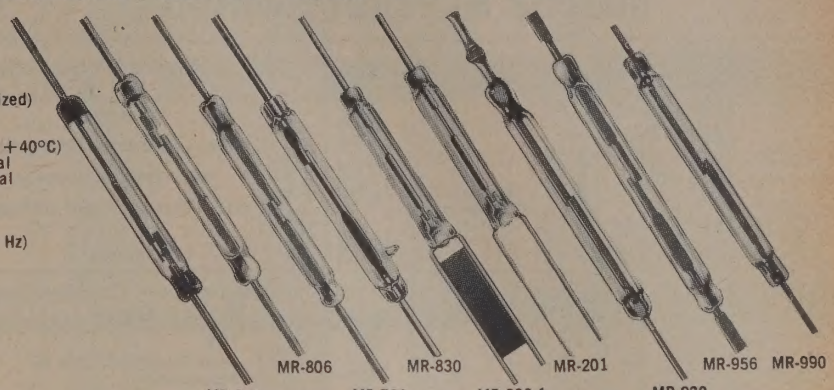
GORDOS CORPORATION
OOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-743-6800

COMPACT/STANDARD/LARGE REED SWITCHES

SPECIFICATIONS

ITION: Any Plane
SPHERE: Inert Gas (MR-207, 893, 938: Pressurized)
(MR-830: Vacuum)
PERATURE RANGE: −55°C to +150°C
(MR-200-1, 200-2: −20° to +40°C)
SISTANCE: SPST Form A — 1 x 10^{12} ohms Typical
SPDT Form C — 1 x 10^{10} ohms Typical
SPST Form A — 0.8 picofarad Typical
SPDT Form C — 4.0 picofarad Typical
@ 11ms (MR-990: 30 g's @ 11ms)
g's 50 to 2000 Hz (MR-990: 20 g's 50 to 2000 Hz)
COIL: COMPACT — R-580
STANDARD — R-580
LARGE — R-584
ISITIVITY:

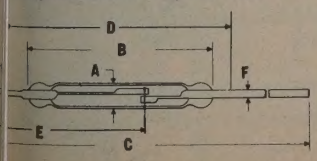
COMPACT	30/80
STANDARD	30/80
(Except MR-890, 830, 893,	60/100
MR-200-1, 200-2)	20/50
LARGE	40/100



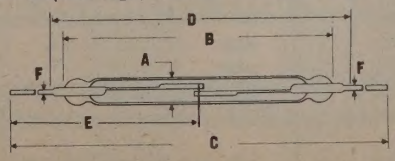
	A — Maximum Glass Diameter (Inches)	B — Maximum Glass Length (Inches)	C — Nominal Uncut Switch Length (Inches)	D — Minimum Trim Length (Inches)(1)	E — Nominal Uncut Armature Length (Inches)	F — Lead Configuration (Inches)	Maximum Current (Amps)	Maximum Switching Voltage (VDC)	Maximum Contact Rating (Watts)	Minimum Breakdown Voltage (VRMS)	Maximum Initial Contact Resistance (Ohms)	Typical Operate Time Including Bounce (Milliseconds)	Contact Material (2)
M A P													
						Pole							
	.190	1.45	3.20	1.70	1.79	.055 Dia.	1.0	250	15	300	.050	2.0	D
	.190	1.45	3.20	1.70	1.79	Arm.	1.0	250	15	300	.050	2.0	G
	.190	1.45	3.20	1.70	1.79	.035 x .061	1.0	250	15	300	.050	2.0	R
P													
	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	D
	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	G
	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	R
M A P													
	.195	1.70	3.20	1.95	1.79	Pole	1.0	250	15	500	.050	2.0	D
	.195	1.70	3.20	1.95	1.79	.055 Dia.	1.0	250	15	500	.050	2.0	G
	.195	1.70	3.20	1.95	1.79	Arm.	1.0	250	15	500	.050	2.0	R
	.195	1.70	3.20	1.95	1.79	.035 x .061	3.0	200	100	400	.500	2.5	W
	.215	1.70	3.20	1.95	1.79		3.0(3)	3500	50	5000	.500	2.5	M
	.195	1.70	3.20	2.50	1.79	(4)	3.0(3)	1500	100	1500	.500	2.5	W
AP													
	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	D
	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	G
	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	R
	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.100	2.0	P
												N.O./N.C.	N.O./ARM./N.C.
RM C (5)													
	.230	1.50	3.50	2.10	2.093	.045 Dia.(4)	.500	250	10	1000	.100	2.5/3.5	R/R/P
	.190	1.20	3.15	1.45	1.923	Pole	.250	100	10	250	.200	2.5/3.5	G/D/P
	.190	1.20	3.15	1.45	1.923	.030 x .055	.250	100	10	250	.200	3.5/2.5	G/D/G
	.190	1.20	3.15	1.45	1.923	Arm.	.250	100	10	250	.200	3.5/3.5	G/D/G
						.045 Dia.							
	.190	1.20	3.15	1.90	1.923	(4)	.250	250	10	1000	.200	2.5/3.5	G/D/P
RM A GAP													
	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	G
	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	D
	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	R
	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	D
	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	G
	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	R
	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	25	500	.035	2.5	S
	.210	2.07	3.20	2.50	1.60	.021 x .100(4)	1.0(3)	1200	25	1200	.050	2.5	R
	.210	2.07	3.20	2.32	1.60	.021 x .100	3.0	250	100	250	.050	3.0	D-W

sign Standard: The high volume, readily available, lowest
ced switch(es) of any series.
nsult factory before exceeding minimum.
Dimet — dropout normal; G-Diffused Gold — dropout low;
Rhodium—dropout normal; P-Precious Metal—dropout high;
Molybdenum — dropout high; W-Tungsten — dropout high; S-Silver — dropout high.

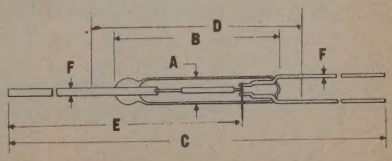
(3) Derate to .010 amp. @ 1000 VDC.
(4) Hollow Tube: .075" Dia.
(5) N.C. contact designated by color dot. MR-200-1, 200-2 are magnet biased and polarity sensitive.



SPST — Form A
Offset Gap



SPST — Form A
Center Gap



SPDT — Form C

GORDOS CORPORATION 250 GLENWOOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-74

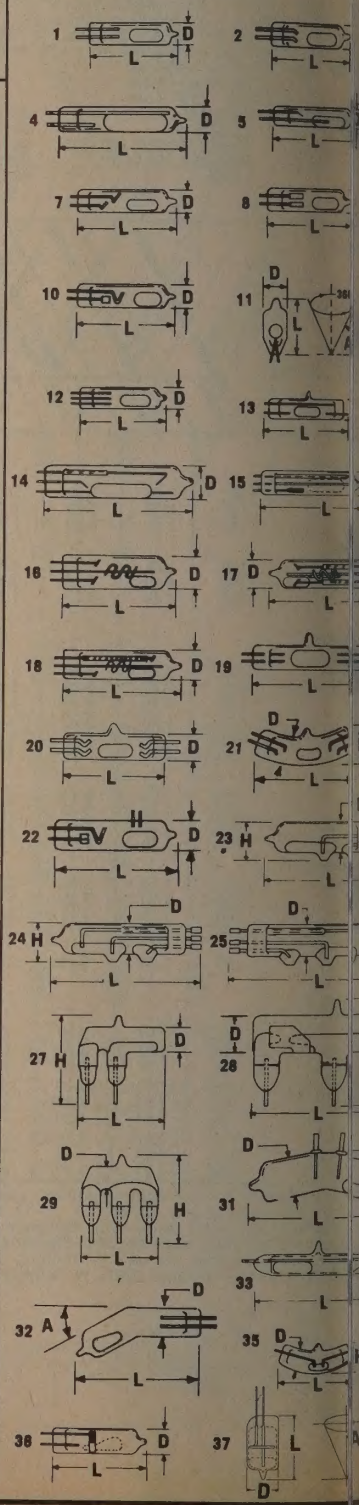
Representatives Throughout The

GORDOS MERCURY SWITCHES

- SEALED CONTACTS
- RELIABLE OPERATION
- ANY OPERATING ANGLE
- POSITION SENSING
- LOW CONTACT RESISTANCE
- HEAVY OVERLOAD
- LONG LIFE
- MINIATURIZATION

Abbreviations:
MBB — Make Before Break Action
PtE — Platinum Electrodes
PtTE — Platinum Tipped Electrodes

Switch Part No. Without Lead Wire	Nominal Load Current Amps At 115 V AC Resistive	Differential Angle (Degrees) Max.	Differential Angle (Degrees) Min.	Sketch Number	Nominal Dimensions (Inches) D	Nominal Dimensions (Inches) L	Nominal Dimensions (Inches) H	Type of Contact: MM — Mercury to Mercury MWM — Merc. to Wet Metal MDM — Merc. to Dry Metal	Suitable for Low Voltage Application	NOTES
SPST										
HG 325 LO	mA	12	8	35	.495	1¾	11/16	MWM	√	PtTE, N.C. Contacts
HG 414 LO	0.1	5	—	8	.350	1 3/16	—	MWM	√	PtTE
HG 220 LO	0.1	10	—	4	.155	½	—	MDM	—	Under 6 volts HG 520LO is Recommended.
HG 520 LO	0.1	10	—	4	.155	½	—	MDM	√	—
HG 221 LO	0.1	15	—	4	.155	⅞	—	MWM	√	PtTE
HG 242 LO	0.1	25	15	11	.275	⅞	—	MDM	—	N.C. Conical Tipover Series. Angles are Measured from Horizontal (A° on Sketch No. 11) Contact is Open at Min. Degree Angle and Closed at Max. Degree Angle Shown in Table.
HG 245 LO	0.3	50	10	11	.275	¾	—	MDM	—	
HG 244 LO	0.5	See Note	See Note	37	.495	1½	—	MDM	√	N.O. Conical Tipover Series. Angles are Measured from Vertical (A° on Sketch No. 37) Min. Angle: 20° ±5°, Max. Angle: 65° ±5°.
HG 253 LO	0.3	3	—	8	.325	1 5/16	—	MWM	√	PtTE
HG 260 LO	0.3	180	—	1	.325	2¾	—	MWM	√	PtE. Nonmagnetic
HG 261 LO	0.3	15	—	1	.325	1¼	—	MWM	√	PtE. Nonmagnetic
HG 402 LO	0.3	.25	—	2	.400	1¼	—	MDM	—	Slow Tilting Action
HG 251 LO	1	2	—	1	.325	1	—	MDM	—	—
HG 252 LO	2	14	—	1	.325	1	—	MWM	√	General Purpose Switch
HG 407 LO	2	5	—	1	.325	1½	—	MDM	—	—
HG 256 LO	2	15	—	12	.325	1	—	MWM	—	Make 2 Ckts. to Common
HG 217 LO	3	10	—	8	.325	1⅜	—	MDM	√	—
HG 707 LO	3	40	30	36	.495	2	—	MDM	√	Time Delay 6-12 Seconds N.C.
HG 566 LO	4	10	—	16	.495	2	—	MDM	—	N.C. 2 Ckts. to Common Lead End Down
HG 567 LO	4	10	—	17	.495	2	—	MDM	—	N.C. 2 Ckts. to Common Lead End Up
HG 431 LO	5	4	—	7	.495	2	—	MDM	√	—
HG 447 LO	7	1.5	—	10	.600	2⅝	—	MDM	√	Slow Tilting Action
HG 457 LO	10	See Note	—	32	.435	See Note	—	MDM	—	High Diff. Angle Switch Make to Customer Specifications
HG 445 LO	10	8	—	10	.600	2	—	MDM	√	—
HG 455 LO	10	5	—	1	.435	1 11/16	—	MDM	√	General Purpose Switch
HG 454 LO	10	5	—	10	.600	2¼	—	MDM	√	—
HG 412 LO	15	8	—	23	.520	2¼	—	MM	√	—
HG 421 LO	15	10	—	27	.450	1⅜	1½	MM	√	High Load Reliability
HG 721 LO	25	8	—	27	.520	2⅛	1 11/16	MM	√	—
HG 482 LO	45	5	—	28	.675	2⅛	2	MM	√	—
HG 803 LO	0.2	1.4	—	5	.325	1⅜	—	MWM	√	PtTE. Thermostat Control Switch
SPDT										
HG 804 LO	0.2	2	—	14	.350	1 3/16	—	MWM	√	PtTE. Thermostat Control Switch
HG 564 LO	1.5	12	—	15	.325	1⅜	—	MDM	—	MBBr
HG 569 LO	4	10	—	18	.495	2	—	MDM	—	—
HG 621 LO	8	7	—	13	.435	2¼	—	MDM	√	—
HG 427 LO	10	14	—	25	.520	2¼	—	MM	√	MBBr
HG 420 LO	15	10	—	24	.520	2	⅝	MM MDM	√	MBBr, MDM Contact Rating 5 Amp at 115 VAC
HG 461 LO	15	14	9	29	.450	1⅜	1½	MM	√	Momentary MBBr
HG 719 LO	25	15	—	29	.520	2⅜	1 11/16	MM	√	MBBr
TWO CKT.										
HG 209 LO	1	6	—	19	.230	1	—	MDM	—	—
HG 628 LO	5	6	—	20	.530	2⅝	—	MDM	√	MBBr
HG 322 LO	5	13	7	21	.495	2¼	1/16	MDM	√	MBBr
HG 638 LO	10	10	—	22	.600	2¼	—	MDM	—	Pilot Ckt. 2 Amp 115V Overlap Angle 3° to 6°
PULSE										
HG 381 LO	1	—	8	33	.225	1	—	MDM	—	Duty Cycle 20 to 50 Milliseconds
HG 702 LO	3	20	15	31	.495	1½	⅝	MDM	—	Duty Cycle 30 to 70 Milliseconds



See YELLOW SECTION for Local Offices, Phones

HAMLIN INC

MAGNETIC REED SWITCHES • ASSOCIATED SWITCH PRODUCTS

670 LAKE STREET
LAKE MILLS, WISCONSIN 53551
Phone Sales: 414/648-2361 • TWX: 910-260-3740

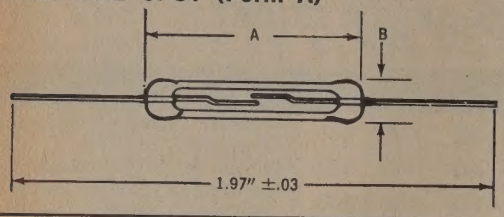
SWITCH PART NO.	FORM	MAX. D. C. CONTACT RATING	MAXIMUM AMPS	MAXIMUM D. C. VOLTS	MAX. INITIAL CONTACT RESISTANCE	MIN. D. C. BREAKDOWN VOLTAGE	STOCK AMPERE-TURN PULL-IN RANGE	NORMAL STOCKING TOLERANCE — A.T.	OVERALL LENGTH NOMINAL	GLASS LENGTH MAXIMUM	GLASS DIAMETER MAXIMUM	ACTUATING MAGNET	SPECIAL FEATURES
HAMLIN MINIATURE MAGNETIC REED SWITCHES													
MRH-2	A	10W	.500	28	.100	300	17.5-52.5	±7.5	2.230	.800	.130	H-33	Instrument Grade — Premium Performance
MRR-2	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.230	.800	.130	H-33	Moderate Current and Voltage
MRL-2	A	10W	.500	100	.250	300	20-50	±10	2.230	.800	.130	H-33	Broad Tolerance — Low Cost — Commercial Grade
MRH-15	A	10W	.500	50	.150	300	17.5-52.5	±7.5	2.230	.800	.130	H-33	10^{15} Insulation Resistance
MRMF-1	A	3W	.010	28	.100	250	27.5-62.5	±10	2.230	.830	.130	H-33	Low Thermal EMF 5uv/°C.
MRR-5	A	10W	.500	500	.100	1000	27.5-62.5	±7.5	2.230	.800	.130	H-33	Breakdown Voltage to 1,000VDC
HAMLIN SUB-MINIATURE MAGNETIC REED SWITCHES													
MSRH-	A	10W	.500	28	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Instrument Grade — Premium Performance
MSRR-	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Moderate Current and Voltage
MSRR-D	A	3W	.500	200	.200	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Close Differential
MSRR-D	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Width Differential
MSRL-	A	10W	.500	100	.250	300	20-50	±10	2.250	.800	.090	H-33	Broad Tolerance — Low Cost — Commercial Grade
HAMLIN TINY MAGNETIC REED SWITCHES													
MTRR	A	10W	.250	100	.150	300	17.5-52.5	±7.5	2.125	.560	.092	H-33	Moderate Current and Voltage
MTRF	A	3W	.010	28	.150	250	27.5-62.5	±10	2.125	.635	.092	H-33	Low Resistive Losses to 100Mc.
MRH-	C	3W	.250	28	.150	250	20-60	±7.5	2.125	.610	.130	H-33	Instrument Grade — Premium Performance
MRG-	C	3W	.250	28	.150	250	20-60	±7.5	2.125	610	.130	H-33	Moderate Current and Voltage
MRL-	C	3W	.250	28	.500	250	20-60	±7.5	2.125	.610	.130	H-33	Broad Tolerance — Low Cost — Commercial Grade
HAMLIN MICRO and MINI MAGNETIC REED SWITCHES													
MMR	A	.3W	.010	28	.200	250	17.5-52.5	±7.5	2.000	.375	.090	H-31	"Grain of Wheat"
MINI	A	3W	.110	28	.200	200	7.5-32.5	±7.5	2.000	.500	.070	H-31	The MINI-REED
MINI	C	3W	.010	10	.200	200	25	±10	2.010	.475	*	H-31	Low Profile
HAMLIN STANDARD MAGNETIC REED SWITCHES													
DRG	A	15W	1.0	250	.075	500	42.5-132.5	±7.5	3.250	2.100	.215	H-34	Low Cost Standard
DRR	A	15W	1.0	400	.060	500	42.5-132.5	±7.5	3.250	2.100	.215	H-34	Moderate Current and Voltage
DRS	A	25W	1.0	250	.050	500	52.5-132.5	±7.5	3.250	1.950	.207	H-34	Hi Inrush Type Contacts
DRR	A	25W	1.0	1,000	.060	1,500	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Breakdown Voltage to 1,500VDC
DRT	A	50W	3.0	1,000	.100	1,500	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Inductive Load Type Contacts
DRS	A	50W	3.0	500	.035	1,200	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Hi Inrush and Hi Breakdown Voltage
HAMLIN COMPACT MAGNETIC REED SWITCHES													
SRF	A	15W	1.0	400	.060	500	35-115	±7.5	3.375	1.425	.210	H-32	Moderate Current and Voltage
SRT	A	100W	3.0	250	.500	300	57.5-130.5	±7.5	3.375	1.610	.195	H-32	Hi-Power — Inductive Loads
SRW	A	10W	.5	250	.075	1000	110 Max.	—	3.185	1.562	.218	H-34	Hi Impedance
DRT	C	3W	.5	100	.075	350	55-100	±7.5	3.375	1.562	.218	H-32	Low Cost Form C
DRTH	C	10W	.5	250	.075	1,000	55-100	±7.5	3.375	1.562	.218	H-32	Hi Breakdown Form C
DRTH	C	20W	1.5	500	.150	1,000	55-100	±7.5	3.375	1.562	.218	H-32	Inductive Load Type Contacts
HAMLIN HIGH VOLTAGE MAGNETIC REED SWITCHES													
MR2	A	1W	.001	1,000	.100	2,000	32.5-62.5	±10	2.250	.850	.130	H-33	Breakdown Voltage to 2,000VDC
DR5	A	50W	3.0	3,500	.080	5,000	90-150	±10	3.250	1.950	.218	H-34	Breakdown Voltage to 5,000VDC
DR10	A	50W	3.0	7,500	.080	10,000	90-150	±10	3.250	1.950	.218	H-34	Breakdown Voltage to 10,000VDC
DR15	A	50W	3.0	12,500	.100	15,000	200 Max.	—	3.195	1.950	.218	H-34	Breakdown Voltage to 15,000VDC
DR20	A	50W	3.0	17,500	.100	20,000	200 Max.	—	3.195	1.950	.218	H-34	Breakdown Voltage to 20,000VDC
DR25	A	50W	3.0	20,000	.100	25,000	200 Max.	—	3.195	1.950	.218	H-34	Breakdown Voltage to 25,000VDC
HAMLIN MERCURY-WETTED MAGNETIC REED SWITCHES													
M3	A	28W	1.0	100	.050	1,000	65 ± 15	—	2.250	.710	.130	H-33	Miniature Size Mercury Wetted
H1	A	50W	3.0	400	.050	1,000	57.5-132.5	±7.5	3.250	1.950	.218	H-34	Standard Size Mercury Wetted
HAMLIN HIGH CURRENT MAGNETIC REED SWITCHES													
D-5**	A	700	3.0	240	—	700	250 Max.	—	3.465	1.640	.212	H-34	3 Amp AC Power Switch
D-6***	A	100	3.0	110	—	3,000	250 Max.	—	3.465	1.640	.212	H-34	3 Amp DC Power Switch

* ENVELOPE .110 x .072 ** AC ONLY *** DC ONLY

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED SWITCHE

MINIATURE SPST (Form A)



Hathaway Part No.		
Gold	Rhodium	A B
68262	330-0007	.800 x .090 Inches Max.
59128	65375	.800 x .135 Inches Max.
59636	64668	.850 x .106 Inches Max.

Standard Magnet: P/N 62139

0.125 AMPERES — GOLD AL
1.0 AMPERES RHOD

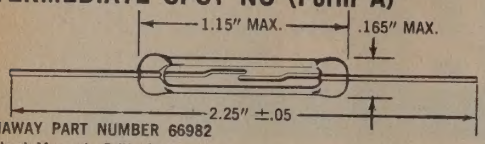
GUARANTEED LIFE — Rhodium

Volts	6 V d-c	12 V d-c	12 V d-c
Amps	0.5	0.125	1.00
Miss Level (Dynamic)**	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	5.0 x 10^6 Min.	100 x 10^6 Min.	1.0 x 10^6 M
Mean Time to Failure***	10.0 x 10^6 Min.	200 x 10^6 Min.	2.0 x 10^6 M
Rate of Drive	100 Hz	100 Hz	100 Hz

GUARANTEED LIFE — Gold Alloy

Volts	.012 V d-c	.05 V d-c	12 V d-c	28 V d-
Amps	.00002	.01	.125	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohr
Mean Time to First Miss	500 x 10^6 Min.	50 x 10^6 Min.	5.0 x 10^6 Min.	2.5 x 10^6
Mean Time to Failure***	750 x 10^6 Min.	100 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6
Rate of Drive	100 Hz	100 Hz	100 Hz	100 H

INTERMEDIATE SPST NO (Form A)



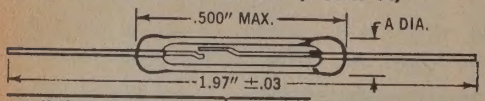
HATHAWAY PART NUMBER 66982
Standard Magnet: P/N 61007

2.0 AMPERES — RHOD

GUARANTEED LIFE

Volts	150 V d-c	12 V d-c	28 V d-c	12 V d-
Amps	.100	.125	1.0	2.0
Miss Level (Dynamic)**	2.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohr
Mean Time to First Miss	2.5 x 10^6 Min.	50.0 x 10^6 Min.	10.0 x 10^6 Min.	.5 x 10^6
Mean Time to Failure****	5.0 x 10^6 Min.	80.0 x 10^6 Min.	20.0 x 10^6 Min.	1.0 x 10^6
Rate of Drive	50 Hz	50 Hz	50 Hz	50 Hz

SUB MINIATURE SPST (Form A)



Hathaway Part No.		
Gold	Rhodium	A (Max.)
63300	0330005	.106"
0330001	0330015	.090"

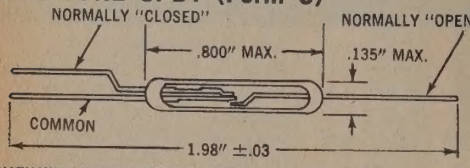
Standard Magnet: P/N 62139

DRY CIRCUIT SWITCHING — GOLD AL
SUSTAINED HIGH LEVEL — RHOD

GUARANTEED LIFE

Volts	.012 V d-c	.05 V d-c	12 V d-c	28 V d-
Amps	.00002	.01	.125	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohr
Mean Time to First Miss	20 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6 Min.	2.0 x 10^6
Mean Time to Failure***	50 x 10^6 Min.	20 x 10^6 Min.	10.0 x 10^6 Min.	4.0 x 10^6
Rate of Drive	100 Hz	100 Hz	100 Hz	100 H

MINIATURE SPDT (Form C)



HATHAWAY PART NUMBER 64068 Standard Magnet: P/N 62139

0.125 AMPERES RATING — GOLD AL

GUARANTEED LIFE

Volts	.012 V d-c	.05 V d-c	12 V d-c	12 V d
Amps	.00002	.01	.01	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohr
Mean Time to First Miss	20 x 10^6 Min.	10 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6 n.
Mean Time to Failure***	50 x 10^6 Min.	20 x 10^6 Min.	20 x 10^6 Min.	10.0 x 10^6 n.
Rate of Drive	100 Hz	100 Hz	100 Hz	100 H

ELECTRICAL & ENVIRONMENTAL CHARACTERISTICS

OPERATING TEMPERATURE RANGE (ALL SWITCHES): −65°C TO +150°C

Characteristic		Max. DC Current Switching	Max. DC Current Carry Only	Initial Contact Resistance‡	Dielectric Strength	Insulation Resistance	Operate Time	Release Time	Shock	Vib
Unit		Amperes, Watts	Amperes	Milliohms, Max.	Volts, 60 Hz RMS	Megohms, Min. @ 85°C	Milliseconds Max. (Inc. Bounce)	Milliseconds Max. (Inc. Bounce)	G Duration of 11 ±1 ms	Sec
Miniature SPST (Form A)	Gold	.125A, 4W	1.5	200	250 (P/N0330022-600 VDC)	10,000	1.0	0.5	50	
	Rhodium	1.0A, 10W	1.5							
Intermediate SPST (Form A)		2.0A, 25W	3.0	100	350	10,000	1.5	0.5	35	
Subminiature SPST (Form A)		.125A, 2W	1.0	200	200	5000	1.0	0.5	50	
Miniature SPDT (Form C)		.125A, 2W	1.0	200	200	500	1.0	1.5	35	

‡ Measured with 10 mA d-c thru contact

Note 1 — "A" Designates: Meets MIL-STD-202C, Method 204A, Test Condition A. (10G, 10-500 Hz)

"B" Designates: Meets MIL-STD-202C, Method 204A, Test Condition B. (15G, 10-2000 Hz)

GENERAL CHARACTERISTICS

TERMINAL FINISH (ALL SWITCHES): TIN PLATE

	Terminal Cross Section Inches Max.	Pull-In Ampere-Turns (AT) Standard	Drop Out Ampere-Turns (AT) % of Pull-In
Miniature SPST (Form A)	.028" x .018"	41 ±14	Rhodium 30 to 95%
			Gold 30 to 75%
Intermediate SPST (Form A)	.045" x .025"	65 ±15	30 to 75%
Subminiature SPST (Form A)	.028" x .018"	30 ±10	30 to 75%
Miniature SPST (Form C)	.028" x .018"	41 ±14	10% Min.

* **MEASURED** in a coil of 10,000 turns of #48 AWG magnet wire w length of .76 ±.01 and an ID of .170 maximum.

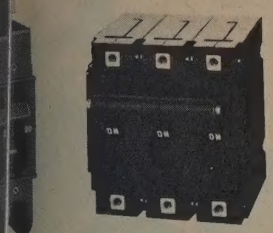
** **MISS LEVEL** is defined as a contact resistance greater than specifi fo any closure, or failure to open after any closure.

*** **FAILURE** is defined as five (5) or more misses in 100,000 conse iv operations.

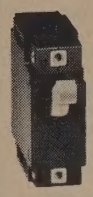
**** **MEASURED** in a coil of 10,000 turns of #41 AWG magnet wire v length of 1.03 ±.01 and an ID of .210 maximum.

HEINEMANN

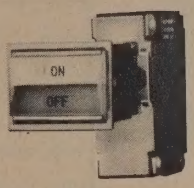
HYDRAULIC-MAGNETIC CIRCUIT BREAKERS



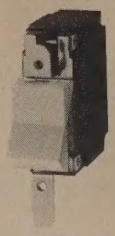
SERIES AM1



SERIES JA



SERIES JL



SERIES JC

n breakers offer almost unlimited integral or fractional ratings from 10 o 100 amp, and in steps to 225 amp; multipole models; breakers for 60 or C, or DC service; breakers that meet); and models with special internal ke relay-trip and calibrating-tap for nctions. Hydraulic-magnetic actuaes that ratings and trip points are l by ambient temperature changes. election of time-delay characteristics lose match of breaker to equipment ents. Request the Heinemann Engiuide (Bulletin 202), or the Condensed 303), or contact your Heinemann ative. Individual product bulletins ow.

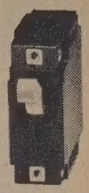
E-FRAME: Smaller than other E-Frame breakers, competitively priced. Approx. 5¾h x 2w x 2⅝"d (2-pole). Available in 1 to 4 poles.

SERIES AM1: 1, 2, 3 poles. UL-component-recognized. Special circuits available. Approx. 2.5h x 2.5d, .75w per pole.

SERIES JA: Compact OEM breaker. Only 2.5 oz/pole. 1, 2, or 3 pole. Approx. 2h x 1.875d, .75w per pole.

JA VARIANTS: Series JC (1, 2, 3 poles—single-pole shown) substitutes attractive white or gray rocker handle for standard toggle (Bull. 3381). Single-pole Series JL has pushbutton actuator that lights in both "on" and "off" modes (Bull. 3351). Snap-In Model JB1 installs in rectangular panel cutout without screws (Bull. 3360).

CROWBAR IN A CIRCUIT-BREAKER PACKAGE



SERIES JA/Q

The newest **Heinemann JA/Q™ Electronics Protector** is nearly all-encompassing in its ability to prevent damage to solid-state components. In one standard Series JA package it provides:

- transient/overvoltage crowbar protection, response time 500 nanoseconds;
- electromechanical equipment disconnect (protection for the crowbar) in 10 milliseconds;
- normal overcurrent protection

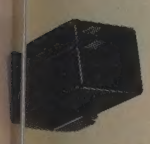
A thick-film hybrid SCR crowbar microcircuit is packaged into the rear of a Series JA hydraulic-magnetic circuit breaker. A transient or overvoltage on the AC or DC supply line will cause the SCR to fire, placing a dead short across the load to common. The short opens the breaker, removing the equipment from the line. Current ratings 0.020-20 amp DC, 0.020-10 amp AC, firing voltages 4.5-38 volts DC, 28 and 200 peak volts AC. Undervoltage models available. 2h x .75w x 1.8d. Bulletin 3371.

CONDENSED GUIDE TO HEINEMANN CIRCUIT BREAKERS

Type	Series	Bulletin	Poles	Maximum* Voltages	Interrupting Cap. (amp)	Current (amp)
PANEL MOUNTING	E-Frame	3104	1,2,3,4	240 AC 480 AC 240 AC (400~) 125 DC	5,000 5,000 5,000 5,000	0.01 to 100 0.01 to 100 0.15 to 100 0.05 to 50
	EH-Frame	3441	2,3	480 AC	15,000	0.5 to 100
	CJ	3111	2	120/240 AC	10,000	125 to 200
			3	240 AC	10.000	100 to 225
GENERAL PURPOSE	1163	3412	1,2,3	250 AC 125 DC	5,000 5,000	0.01 to 100 0.016 to 100
AUXILIARY	0111	3201	1	250 AC	1,500	0.01 to 50
AM SERIES	AM1,2,3	3306	1,2,3	250 AC 250 AC (400~) 65 DC	1,000 1,000 1,000	0.02 to 50 0.02 to 50 0.02 to 30
	AM1000	3305	1,2,3	250 AC 250 AC (400~) 125 DC	1,500 1,500 2,000	0.01 to 70 0.15 to 65 0.015 to 100
MINIATURE	JA	3350	1,2,3	250 AC 250 AC (400~) 65 DC	1,000 1,000 1,000	0.020 to 30 0.100 to 30 0.020 to 20
UBMINIATURE	SM	3504	1,2,3	250 AC 250 AC (400~) 50 DC	300 300 500	0.05 to 20 0.05 to 20 0.05 to 20

*AC voltages are 60 Hz unless marked with (400~).

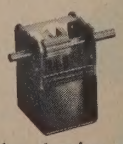
IME-DELAY AND OVERLOAD RELAYS

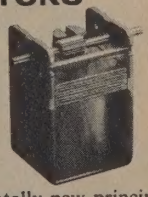


O-Netic® overload relays: close-tolerance overload protection. Al- carry 100% of rated current, trip as low as 115% of load. Up to 70 Bulletins 5103 and 5104.

O-Netic time-delay relays: dependable, economical, for delays from 120 seconds. Five models: open or enclosed contacts, dust-proof rs, hermetic, or trip-indication. Continuous-duty coils, DPDT con- eliminate slave circuits, reduce equipment costs. Bulletin 5006.

STEPPING MOTORS





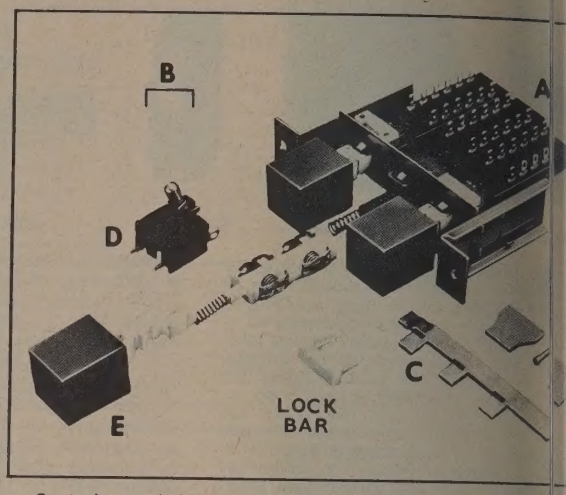
Roto-Netic® stepping motors operate on a totally new principle: simple linear force (solenoid-actuated) converted to discrete rotary motion. Starting torque from 1.4 to 25 oz-in. with avg. power consumption less than 12 watts. Eight, ten, or twelve steps per shaft revolution with no cumulative error. Minimum life 10 million steps, typical life 30 million steps. Priced substantially below motors of comparable performance. Bulletin 702.

HEINEMANN ELECTRIC COMPANY 2636 Brunswick Pike, Trenton, N.J. 08602 4685

New BUILDING BLOCK UNITIZED MODULAR PUSH BUTTON SWITCH SERIES C, CL

Completely New and Revolutionary Unitized Construction

A Start with basic momentary switch.
B Add wire staple to convert to push-push action.
C Add release bar unit for interlocking action.
D Add lamp contact unit for illumination.
E Choice of four different snap fit buttons.
F Add blocking discs and pins for blocking action.



STANDARD FEATURES

Disengage plastic lock bar to remove plunger and bridging contacts from front for servicing or replacing, without disturbing position or connections. Solder lugs on top — PC terminals on bottom (2 amp. rating). Two, coil spring load, center pivoting, contact bridges for each PDT.

Non shorting contacts.

OPTIONAL FEATURES

Blocking action—no 2 buttons depressed at the same time.
Shorting contacts.
Timing contacts either leading or lagging.
Gold plated contacts.
Auxiliary solder lug switching contacts on top of switch module (1 amp.).

CONTACT SURFACES

Standard = Hard silver plating .0004 inches.
Special = Silver plated .0004 inches plus hard gold covering .00012 inches.

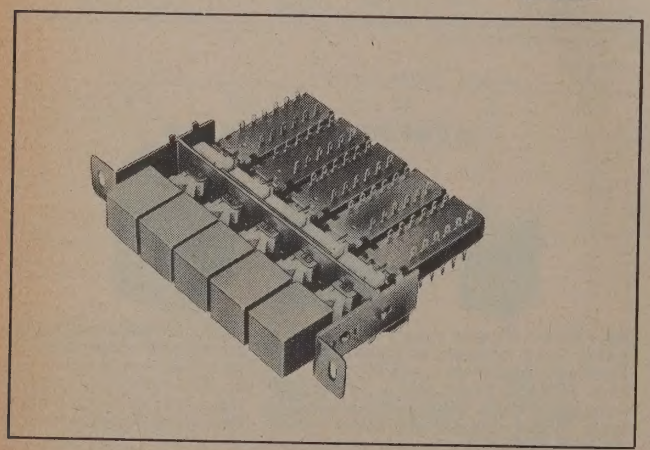
CONTACT SWITCHING

Standard = Non shorting
Shorting = ks
Leading V
Lagging N

CHASSIS AND STATION DATA

Model number				17.5	22.5
Center to center spacing				.690	.886
Number of stations				1-15	2-12
Standard buttons	CB	CJ	CQ*	CR*	CH
					CT

*Can also be used as illuminated buttons.



Switch modules in 3 different lengths

2PDT 4PDT 8PDT

.197" solder lugs — top, .197" PC term. bottom

+ Ino +1PDT/Ino +3PDT/Ino

.197" auxiliary contacts — top side only.

MECHANICAL ACTION

Gr = Interlocking.
Gr_1 Gr_2 = Two or more independent interlocking groups.
oA = Momentary.
AoR = Central release key Momentary action.
EE = Push to make push to break.
Z = Central release for independent inte ing groups, or individual latching.
Sp = Blocking action only one key down. Sw ing is delayed to increase margin of sa

Tableau or stacked switches available either C Series 15 per chassis x 10 high.

Series CL is illuminated. Slip on lamp holder illus. above) uses Type 4622 or 5522 lamp. Se Lamp Table.

ELECTRICAL DATA

Max. voltage 1000V
Max. current 2 A cos ϕ = 0.8 Aux. contacts 1A
Max. rating 250W AC
Max. rating 100W DC
Test voltage between contacts and chassis 1500V
Insulation resistance $10^{10}\ \Omega$
Contact resistance 6m Ω

MECHANICAL DATA

Key travel = .315"
Contact travel = .197"
Life cycles = 500,000 cycles under load.

Key Pressure —
2 & 4PDT = 35 oz
8PDT = 49 oz

IEE® WELCOMES YOUR INQUIRIES. Dimensional drawings and quotes on request.

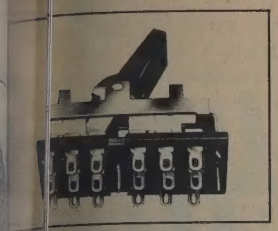
INTERNATIONAL ELECTRO EXCHANGE CORP. 6851 Oxford St., Minneapolis, Minn. 55426 PHONE: (612) 929-7875 TWX: 910-576-2469

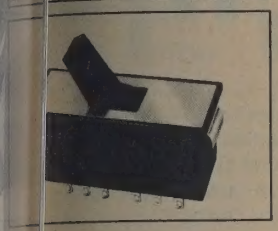
New

SPECIAL LEVER SWITCH SERIES Y

With two independent two or three P.D.T. contacts and three lever positions.

SCHADOW





Type of Contacts

- Standard: Non-shorting.
- ks — Shorting.
- V — Timing contacts, leading.
- N — Timing contacts, lagging.

Contact Arrangements

- 2u — Two independent DPDT.
- 3u — Two independent 3 PDT.

Contact Material

Standard: Fixed terminals .0004". Silver-coated bridging contacts .0004". Solid silver plated.

- 3Au — Additional SELREX with gold plating .00012".

Mounting Facilities

- YA — For twist — tab mounting.
- YB — For screw mounting.
- YC — Multiple sets (standard for screw mounting).
- YD — Flush fitting switch for quick mounting in high impact — 1/8" thick panel plastic case hole size 1.582" x .578".

Level-stop Positions

- 3R — Maintaining Zero, left and right.
- 1R — Zero, momentary left and right.
- 2R — Zero, combination of maintaining one side, momentary other side.

Terminals

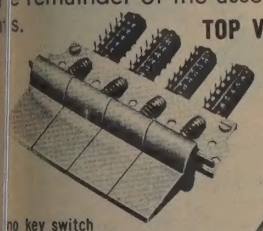
- L — Soldering lugs.
- S — PC terminals.

Technical Data

Max. current 1A.
Max. voltage 300V.
Max. rating 100W.
Test voltage 1500V RMS.
Standard insulation resistance 5×10^{11} ohms (after 96 hrs. 70°F. 100% RH).
Contact resistance 10m ohms.

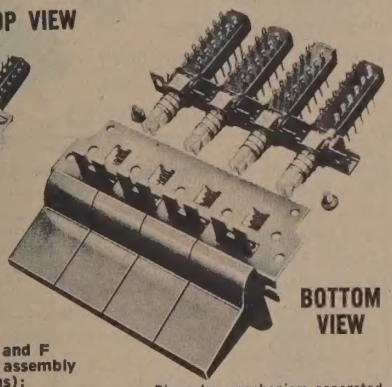
PIANO KEY SWITCHES SERIES KD AND KF

Features: Retains all the advantages of Series D&F switches. Key switch mechanism secures to switch chassis with only 2 screws. Switch terminals may be flow soldered to PC Board prior to assembly. Easy to service since the key can be withdrawn by simply disengaging a catch. The switch contact plungers are then removable from the front without disturbing the remainder of the assembly. Available .689" and .787 centers.



TOP VIEW

Piano key switch KD 20 DKB—4PDT consisting of mechanism with button type DKB and push button switch 4 x D 20—4PDT

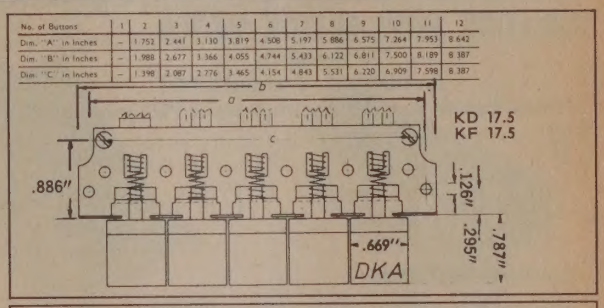


BOTTOM VIEW

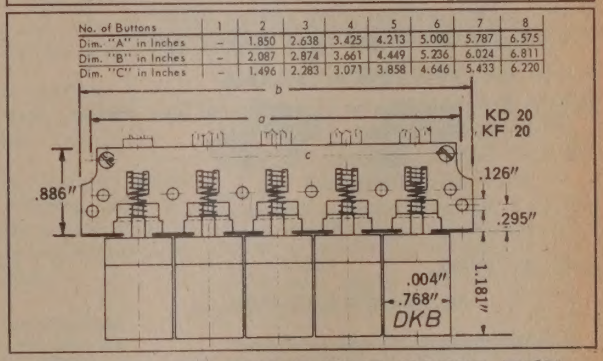
Piano key mechanism separated from push button switch.

Additional cost to D and F prices for piano key assembly are (including buttons):
KD-KF 17.5 17¢ per station
KD-KF 20 21¢ per station

No. of Buttons	1	2	3	4	5	6	7	8	9	10	11	12
Dim. "A" in Inches	–	1.752	2.441	3.130	3.819	4.508	5.197	5.886	6.575	7.264	7.953	8.642
Dim. "B" in Inches	–	1.988	2.677	3.366	4.055	4.744	5.433	6.122	6.811	7.500	8.189	8.387
Dim. "C" in Inches	–	1.398	2.087	2.776	3.465	4.154	4.843	5.531	6.220	6.909	7.598	8.387

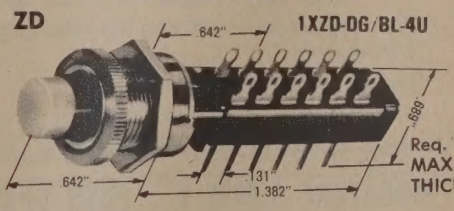


No. of Buttons	1	2	3	4	5	6	7	8
Dim. "A" in Inches	–	1.850	2.638	3.425	4.213	5.000	5.787	6.575
Dim. "B" in Inches	–	2.087	2.874	3.661	4.449	5.236	6.024	6.811
Dim. "C" in Inches	–	1.496	2.283	3.071	3.858	4.646	5.433	6.220



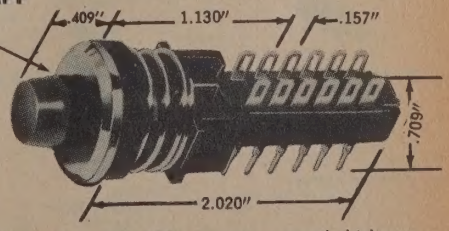
SERIES ZD, ZPF SINGLE HOLE MOUNT PUSH BUTTON SWITCHES

ZD



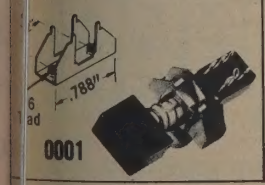
ZPF

"VISI-STRIPE" tells at a glance if the switch is on or off.

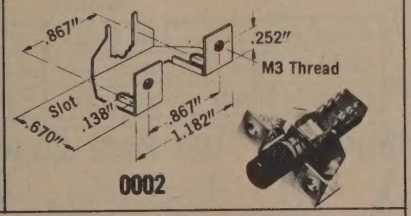


- Mount in .600" dia. hole
- .197" maximum panel thickness

SINGLE STATION CHASSIS



0001



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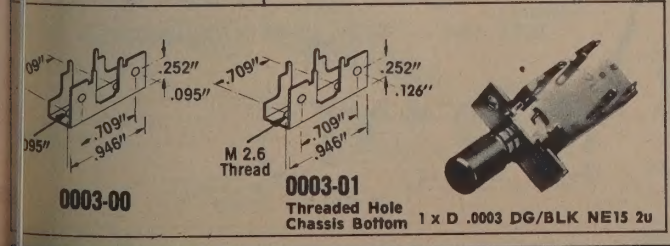


0003-00

0003-01
Threaded Hole Chassis Bottom

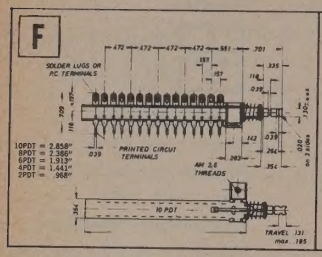
1 x D .0003 DG/BLK NE15 2u

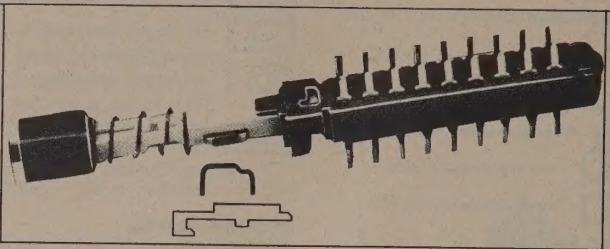
INTERNATIONAL ELECTRO EXCHANGE CORP. 6851 Oxford St., Minneapolis, Minn. 55426 PHONE: (612) 929-7875 TWX: 910-576-2469

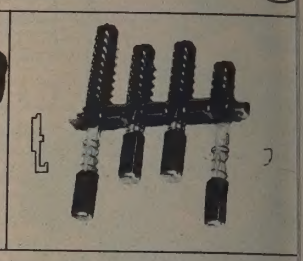
New

MINIATURE MODULAR PUSH BUTTON SWITCH SERIES F

Uniquely designed to improve versatility and serviceability.







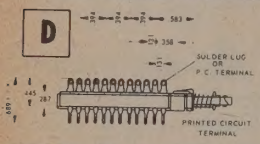
Compress return spring and lift out locking staple or plastic bar to remove plunger and bridging contacts from front of switch without disturbing switch position or electrical connections. Replacing the wire staple with a plastic bar converts switch from push-push to momentary action.

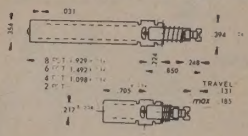
Features: Inexpensive. Proven dependability. Modular design. Versatile. Completely enclosed. Up to 10 PDT. Infinite combinations. Solder lugs or PC terminals. Smooth slide action. Largest selection of chassis spacing, button styles and colors. UL and CSA approved 4A 250 VAC power switch. Positive action coil spring loaded bridging contacts. Flat stator contacts. Stand-off molded on bottom to hold switch parallel to PC board.

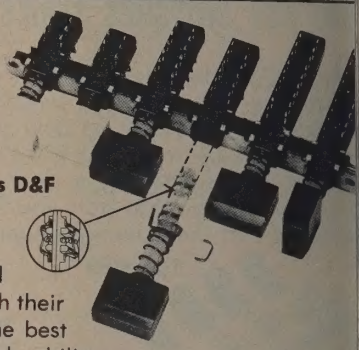
Available 2, 4, 6, 8 and 10 PDT
Power Switch Available with 2 and 4 PDT Integrated

MINIATURE PUSH BUTTON SWITCH

Series D
Available 2, 4, 6 and 8 PDT
Power Switch Available with 2 and 4 PDT Integrated







Series D&F

Enlarged view showing silver plated bridging contacts with their spring balance for the best contact pressure and durability.

CONTACT MATERIAL:

Fixed contact surfaces silver coated .0002"
Moving contact surfaces silver coated .0004"

TYPES OF CONTACTS AVAILABLE:

SERIES D Solder lugs or PC terminals; top, .197 — PC terminals bottom, .256
SERIES F Solder lugs; top .197 — PC terminals bottom .264
SERIES F PC terminals top .197 — PC terminals bottom .291

SPECIAL TYPES:

- oA = Momentary (spring return).
- Gr = Interlocking.
- Gr_1 Gr_2 = Divided into independent interlocking groups.
- AoR = Operation without latching but releasing interlocking.
- EE = Push to make — push to break.
- NE15/ = Power switch 4A/250VAC DPDT (D Series)
- NE15/F = Power switch 4A/250VAC DPDT (F Series)

TECHNICAL DATA:	Series D	Series F
Max. current	1A	1A
Max. voltage	250V	300V
Max. rating	50W	50W
Contact resistance	4-10mΩ	4-10mΩ
Key pressure with 2 PDT	28 oz.	28 oz.
Key pressure with 4 PDT	28 oz.	32 oz.
Key pressure with 6 PDT	42 oz.	35 oz.
Key pressure with 8 PDT	53 oz.	42 oz.
Key pressure with 10 PDT		46 oz.
Key pressure with Power Switch	42 oz.	42 oz.
Cap. between contacts of a row	<0.7pF	<0.6pF
Cap. between moving contacts of adjacent rows	<0.9pF	<0.9pF

CHASSIS

Chassis model	10	12.5	15	17.5	¾"	20
Center to Center	.394"	.492"	.591"	.689"	.750"	.787"
Number of Stations	2-18	2-11	2-12	2-12	2-12	2-10

MINIATURE SERIES F PUSH BUTTON SWITCH KIT LIST PRICE $22.94

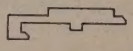
KIT CONTENTS

23 Switches
Non-shorting contacts
16 - 2PDT
4 - 4PDT
2 - 6PDT
1 - 8PDT

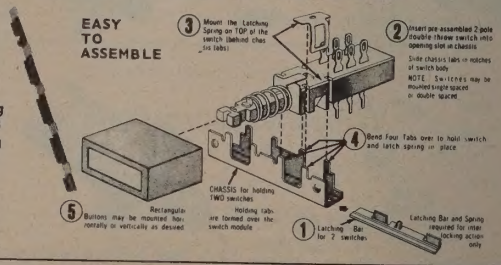
40 Assorted Buttons

12 Chassis
2 - Single Station
2 - 2 Station
2 - 4 Station
2 - 6 Station
2 - 8 Station
2 - 10 Station

23 Plastic Bars to convert push-push to momentary



10 Assorted Latching and Release Bars
10 Latching Springs



IEE® WELCOMES YOUR INQUIRIES. Dimensional drawings and quotes on request.

INTERNATIONAL ELECTRO EXCHANGE CORP. 6851 Oxford St., Minneapolis, Minn. 55426 PHONE: (612) 929-7875 TWX: 910-576-2469

STANDARD PUSH BUTTON SWITCHES TYPE M, MM, ML

SCHADOW

es: Novel patented design sliding con- ct Contacts silver plated. Unique design e action. Small dimension 500V rating. andard action operations. Up to 4 PDT fer .79" deep. Up to 8 PDT on wafer deep. Use double button to double ca- of contact per station. 15 stations max- in one row. IEE fluorescent type button vailable. Series MM provides double deck up to 30 stations. Wide selection of buttons. ML Series provides illumination.

Floating Contact Principle—Use short double sided solid contact plates with balanced steel spring. Guarantees: equal pressure at all contact points, extremely low resistance and self inductance plus smooth movement of keys.

Available 2, 4, 6 and 8 PDT

ANICAL ACTION

ntary (oA). Push push (EE). Interlocking (Gr). dual latching with central release key or solenoid). Blocking (SP) delayed switching to provide margin. Power switch* N 10/2a 2A/250VAC. r switch available with 2 PDT integrated.

NSIONS

t (without contacts) .472". Depth 2 & 4 PDT in- s travel 1.063". Depth 6 & 8 PDT includes travel ".

CHASSIS GROUPING DATA

Model 17.5. Center to center .689. No. of stations 1-15. MM Series up to 30 stations.

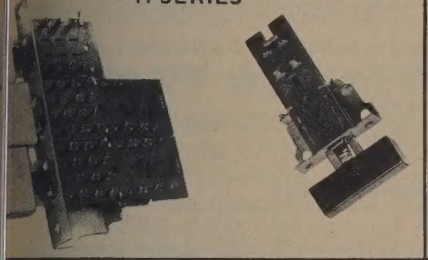
TYPES OF CONTACTS (STANDARD)

Solder lugs (non shorting). PC Terminals (non shorting). Short types available on request. Rhodinated and gold plated also available.

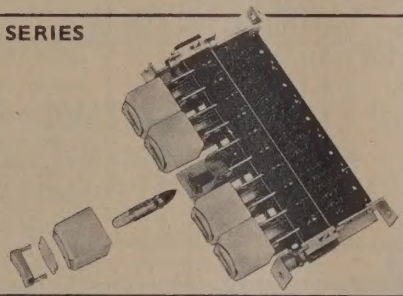
TECHNICAL DATA

Max. current 1A. Max. voltage 500VAC. Max. rating 100W. Contact resistance 3-6MΩ.

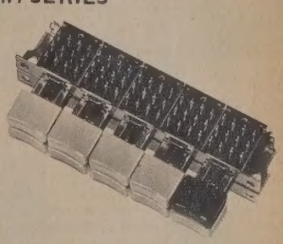
M SERIES



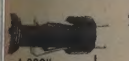
ML SERIES



MM SERIES

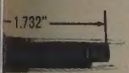


OT LAMP SOCKETS AND LENS



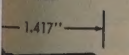
288.1 Single round pilot lamp socket uses #288-4 lens.

288.4 Round flat top plastic lens.



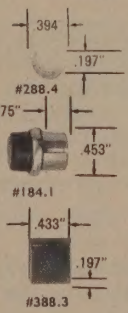
188.2 Single round pilot lamp socket uses #184.1.1, #79.2 or #288.4 lens.

184.1 Round flat top glass lens.



79.2 Same as above but convex top. (Both with plated metal ferrule).

389.1 Single square pilot lamp socket uses 388.3 lens.



388.3 Square flat top, plastic lens.

All lens available in red, green, blue, yellow, clear and white.

All lamp sockets require .402" mounting hole. Use Type 5530 lamps as shown in miniature switchboard lamps table below.

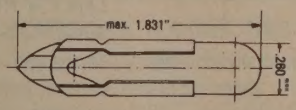
LAMP EXTRACTORS
#110 for Type 5530, 5522 & 4622 lamps
#153 for Type 6844 lamps

PANEL LAMP INDICATOR ASSEMBLY MODEL 388

Features:
- Modernistic building block design.
- Removable colored lenses, square or round.
- Up to 10 modules may be locked together into one bank.
- Small space requires only 7/16" x 5" x 1½" (depth) for 10 lamp bank.

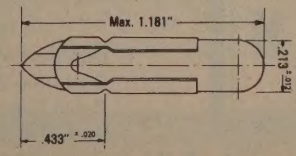
ARD SWITCHBOARD (TELECOMMUNICATION) LAMPS — 6844

0, 40, 80, 200 ..... mA
0, 40, 50, 120 ..... mA
0, 40, 100 ..... mA
5, 40, 50, 60, 80, 100 ..... mA
0, 50 ..... mA
0, 50, 60 ..... mA
0, 40, 50, 60 ..... mA
0, 50, 60 ..... mA
0, 40, 50, 60 ..... mA



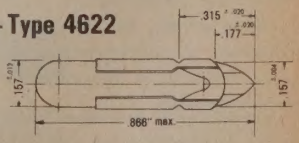
TURE TELECOMMUNICATION "LILIPUT" — Type 5530

0, 40, 200 ..... mA
0, 50, 100 ..... mA
5 ..... mA
0, 30, 50 ..... mA
0, 40 ..... mA
0 ..... mA
0, 30 ..... mA
0 ..... mA



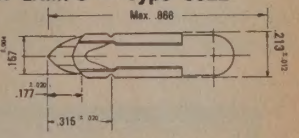
MINIATURE "LILIPUT" LAMPS — Type 4622

6V - 20, 50 ..... mA
12V - 20, 40 ..... mA
24V - 20 ..... mA



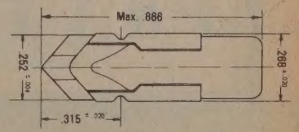
MINIATURE TELECOMMUNICATION LAMPS — Type 5522

6V - 40 ..... mA
12V - 20, 50 ..... mA
24V - 20 ..... mA
30V - 20 ..... mA



STANDARD SWITCHBOARD LAMPS — Type 6822

6V - 20, 40 ..... mA
12V - 20, 40, 50 ..... mA
24V - 25, 40, 50, 60 ..... mA
36V - 20, 50 ..... mA
48V - 20, 40, 50 ..... mA
60V - 20, 40 ..... mA



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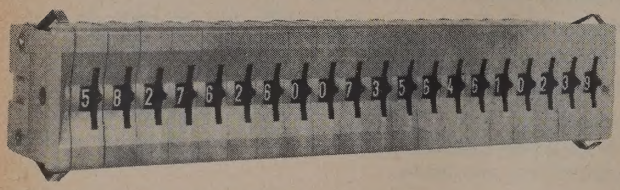
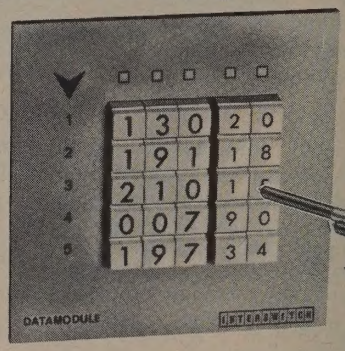
INTERSWITCH

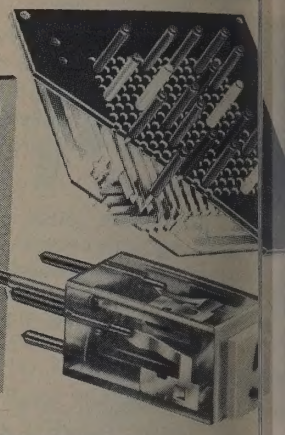
THUMBWHEEL SWITCHES-PROGRAMMING MODULES & MATRICES

THUMBWHEEL SWITCHES

- SMALLEST PANEL AREA
- SIMPLEST MOUNTING — Snaps into Single Rectangular Cutout!
- WIDEST RANGE OF CODES, STYLES, OPTIONS.







STANDARD TYPES AND CHARACTERISTICS

Type	NOMINAL DIMENSIONS (PER MODULE) Width	Height	Depth*	NO. OF POLES & POSITIONS	TERMINALS** WW	PCP	PCC	SSL	CMC	NOTES
B	1/2"	$2^1/_4$"	$2^5/_8$"	2/2, 1/8, 1/11, 1/16	X	0	√	0	√	Largest numerals and widest choice of poles/position formats.
C	3/8"	$1^5/_{16}$"	$3^1/_4$"	2/2, 1/10, 1/11	X	X	0	√	0	Integral circuit board for logic elements to create active code outputs, etc.
F	3/8"	$1^5/_{16}$"	$2^1/_{16}$"	2/10, 4/2	X	X	0	√	0	Two independent P. C. boards (e.g., for dual binary codes).
H	3/8"	$1^5/_{16}$"	$1^9/_{16}$"	2/2, 1/10, 1/11	0	0	√	0	√	Largest numeral in a 3/8" switch.
K	3/8"	$1^5/_{16}$"	$2^3/_{16}$"	2/2, 1/10, 1/11	X	X	0	√	0	Largest numeral in a 3/8" switch.
S	3/8"	$1^5/_{16}$"	$1^9/_{16}$"	2/2, 1/10, 1/11	0	0	√	0	√	Sealed circuitry.
M	5/16"	$1^5/_{16}$"	$1^1/_2$"	2/2, 1/10, 1/11	0	0	√	0	√	Thinnest thumbwheel switch made.

* Depth of switch body, including longest terminals.
**TERMINAL CODES: WW = Wire Wrap; PCP = Printed-Circuit Pins; PCC = Printed-Circuit Connector; SSL = Short Solder-Lug; CMC = Component-mounting Connector
TERMINAL AVAILABILITY: √ = STOCK STANDARD, X = SPECIAL ORDER ONLY, 0 = NOT AVAILABLE.

STANDARD OPTIONS AND ACCESSORIES

- DIAL STOPS
- DIVISION PLATES
- SPACER PLATES
- BLIND SLAVE MODULES
- DIAL-ONLY MODULES
- MAKE-BEFORE-BREAK CONTACTS
- PROV. FOR ILLUMINATING DIAL
- DECIMAL POINT ON MODULE
- DECIMAL POINT ON SPACER
- DECIMAL POINT ON THUMBWHEEL
- ILLUMINATED DECIMAL POINT
- COLORED THUMBWHEELS
- TRANSLUCENT THUMBWHEELS
- DOUBLE CHARACTERS
- UP TO 7 CHARACTERS/POSITION
- SPECIAL COLORED CHARACTERS
- MATING P. C. CONNECTORS
- COMPATIBLE GLOW-NUMERIC DISPLAY

MATRIX BOARDS

Interswitch Matrix Boards are available in nine standard 2-level models. Larger switching arrays can be readily built up from them. Appropriate nomenclature, symbols, programming stripes, can be applied. Durable multi-color or monochromatic markings can also be engraved or imprinted on the panel.

Three-level and four-level matrix boards are also available, as are special boards with split busses to accept program input at two board edges and deliver outputs from two board edges.

Standard Hole Patterns:
6mm spacing:

10 x 10	10 x 15	15 x 15	15 x 31
20 x 20	25 x 50	31 x 31	50 x 50

3mm spacing: 20 x 20

Terminal Types: solder, wire-wrap, PCB insertion pin.

Working Voltage: 220 VDC or AC RMS.

Current Rating (per contact bar): 6mm: 10A
3mm: 5A

Contact Resistance: 7 milliohms with short-circuit pin installed.

PROGRAMMING ELEMENTS

Standard elements available for use with above Matrix Boards are:

- Shorting Pins
- Plug-In Lamps
- Diode Plugs
- Cable Plugs
- Dummy Plugs
- Programming Templates
- Dual and Triple Shorting Pins

DATA PROGRAMMING MODULES

These are data-input logic elements (programming plug and switch body) for programming by 4-bit binary codes. They are mounted on either a matrix program board or a printed circuit board. Numerals are available in both horizontal and vertical reading orientation.

Codes: BCD 8-4-2-1
Excess 3
Aiken 2-4-2-1
Operating Voltage: 50V maximum.
Operating Current: 500 mA maximum
Rated Thermal Current: 1A
Switching Cycles (min.): 10^4
Contact Resistance: 5mΩ
Test Voltage: 1000V
Colors: Plugs — 7
Inscriptions — 9

INTERSWITCH

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J-B-T 31 Year

SWITCHES*

J-B-T INSTRUMENTS, INC.

J-B-T 31st Year

TOGGLE SWITCHES

HEAV DUTY TYPES, INCLUDING MS25068, MS35058, MS35059, ST40, 42, 50, 52 SERIES
NOM L RATINGS — 20 Amp. at 125 VAC, 10 Amp. at 250 VAC . . . **MIL-S-3950C** — MS35 8 models with suffix -21 and above, similar MS35059 types, and the out-stand g **4-POLE SERIES** exceed the rigorous electrical requirements of MIL-S-3950C, and recommended for maximum performance. All MS models have bushing seal to m t sand and dust test and latest toggle seal splash test, also former MIL-S-3950 5-foot head of water submersion test . . . **Bulletin TS-966A.**

M DUTY TYPES, INCLUDING MS25098 AND MS25100 SERIES
NOM L RATINGS: 6 Amp. at 125 VAC, 3 Amp. at 250 VAC . . . Popular for communi-catio circuits and many other uses. All MS medium-duty models use bushing seal plus se-to-terminal seal in meeting sand, dust, splash and submersion tests de-scrib above . . . **Bulletin TS-966A.**

NEW UBMINIATURE TYPES, SINGLE, DOUBLE, 3-POLE AND 4-POLE
NOM AL RATINGS: 5 Amp. resistive load at 125 VAC, 24VDC. Series JMT, with dis-tinct **Green** body, is manufactured by J-B-T in Connecticut. JMT series combines trou -free construction of standard size J-B-T switches with drastic reduction in s and weight. Single pole types are ¼″ thin and weigh only 0.19 oz. Other mod are correspondingly compact and light . . . **Catalog MT-40.**

ROTARY AND LEVER SWITCHES

STA ARD 14- AND 20-POSITION, AND A REMARKABLE NEW 12-POSITION
For pendable performance in instruments and test equipment, J-B-T makes space savi 14- and 20-position switches in both laminated and molded constructions. **NOM AL RATING:** 1 Amp. inductive load at 125 VAC, 5 Amp. momentary (not make and eak) **MULTIPOLE SERIES 20M** increases circuit versatility with up to 4 poles per ck. **MOLDED LEVER SWITCHES** in this series provide up to 5 live positions, 2 circ s per deck . . . **Catalog 170A.**

NEW /M SERIES fully enclosed 1¹³⁄₁₆″ dia. switches, 12-position, carries 5 Amp. and brea 2 Amp. at 115 VAC. Features of this remarkable switch include adjustable torq, initial contact resistance under .002 ohms, and parasitic thermal emf under one icrovolt . . . **Catalog VM-68.**

SUB NIATURE, MIL-S-3786C, TYPE SR05 AND SR31
Mac to many performance levels of MIL-S-3786C, the 1″ dia. Style SR05 switches are ecision built for low-current usage where size, weight and reliability are imp ant. With patented wafer design, Series 7000, 1-6 decks can have full 12 live swit ing positions per deck; Series 5000, 1-4 decks, can have up to 11 live switch-ing ntacts on each side of each dual duty deck with a maximum of 8 poles per dec Lever types, panel sealed, and general purpose variations available . . . Cat g **SM-33.**

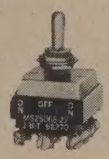
QUICK GUIDE TO TYPICAL J-B-T PRODUCTS

To supplement the J-B-T catalogs listed below, typical prices, mechanical and electrical characteristics and other data have been included for your convenience, in Sections 2900 and 5100 of the Radio-Electronic MASTER. To save time . . .

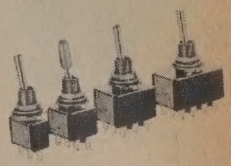
See J-B-T Catalog Pages in The Radio-Electronic MASTER

ST42D
SPDT Heavy-Duty

MS25100-23
Lever Seal Medium Duty



MS25068-27
4-Pole DT Heavy-Duty



Series JMT
Sub-Miniature

Series 20M
Enclosed, Ruggedized

MS-20-1L5A
5-Position Lever

Series 7000, 6 Deck
Sub-Miniature

VL Lever
Sub-Miniature

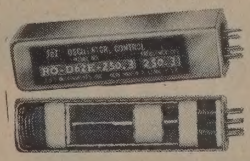
*J-B-T ALSO MANUFACTURES

VIB TING REED FREQUENCY METERS AND ELAPSED TIME METERS
J-B Vibrating Reed Frequency Meters are made in a wide variety of case styles and siz standard and sealed, panel and portable; in many frequency ranges and reed gro ings. Permanently accurate within ±0.3%, or better if required. Elapsed Time Me s are made in case styles compatible with other panel instruments, in 5- or 6-dig models, reading in hours and tenths at 60 cps. 110-125 volts. Variations for oth frequencies and voltages available . . . **Catalog 170A.**

Model 34-FG
9-Reeds, 60 cps.

Model 31-EGW-5
0-9,999.9 hours

REL RELAYS AND OSCILLATOR CONTROLS
For elective calling mobile communication equipment, remote data transmission, or sim taneous sequential coding, the J-B-T D type illustrated has its operating mecha-nis isolated in all planes, and is designed for fast starting and excellent response-tim factor . . . **Bulletin D-664A.**



RO-D Type
Oscillator Control

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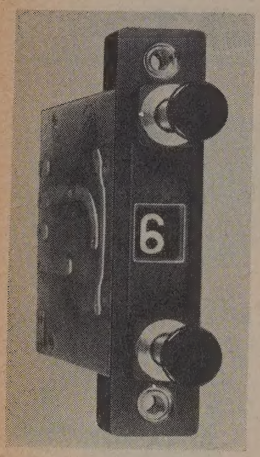
Vol. 2 ACTIVE COMPONENTS/CIRCUIT ASSEMBLIES/CONTROLS & DRIVES

JANCO

DESIGN VERSATILITY SOLVES APPLICATIONS PROBLEM

SPACE-SAVER PUSH-BUTTON ROTARY SWITCH



Series 2800B

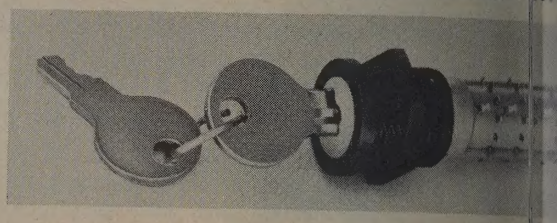
This new Push-Button Rotary Switch is available as BI-DIRECTIONAL (Series 2800B) and UNI-DIRECTIONAL (Series 2800U).

SPECIFICATIONS:

- Totally enclosed explosion-proof construction.
- Designed to meet the requirements of MIL-S-22710.
- Printed circuit construction.
- Available in 8, 10, or 12 positions and in all standard codes.
- Electrical rating: make and break .125 amp. res. at 28 VDC and 115 AC .05 amp. ind. at 28 VDC.
- Life characteristics: 50,000 cycles.
- Weight 1 oz. approx.

WRITE FOR COMPLETE TECHNICAL DATA

KEY OPERATED MICRO-MINIATURE ROTARY SWIT



This new Key Operated Micro-Miniature Rotary Switch is available with 30° (7-2511), 36° (1-2543), and 45° (2-2251) indexing. Totally enclosed design provides high security. A variety of lock-safe combinations are available. A single key can operate several switches, allowing one person to control a multiple switch installation. Broad selection of positions, and indexing, affords a flexibility that meets your security switching requirements.

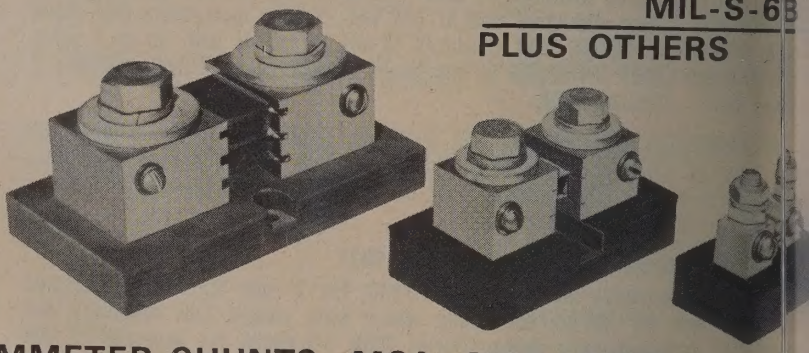
For complete technical data, see Micro-Miniature Rotary Switches 2500 Series on opposite page

OTHER JANCO PRODUCTS

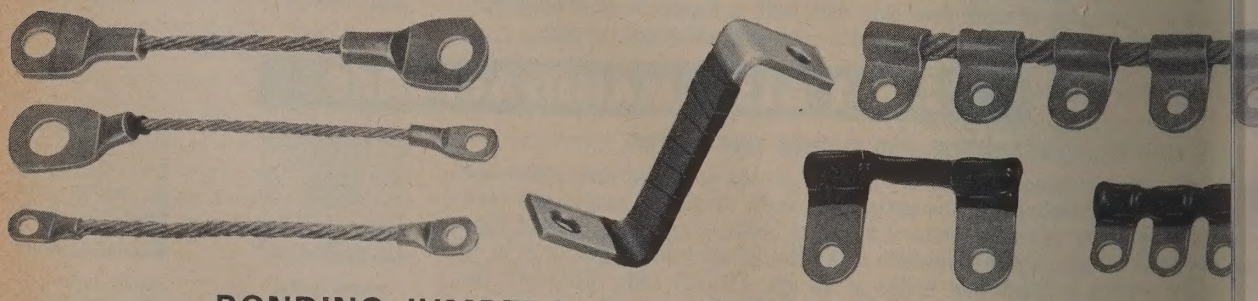
FOR AIRCRAFT AND MISSILE INDUSTRY

MIL-S-6B

PLUS OTHERS



EXTERNAL AMMETER SHUNTS • MSA • MSB • MSC



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ROTARY SELECTOR SWITCHES BY JANCO

ROTARY SELECTOR SWITCHES MIL-S-6807B / MIL-S-3786B

SERIES 1211

Max. Pos.: 16
Body Dia.: 3"
Electrical Rating:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available in single pole per deck construction.
Solder lugs only.

SERIES 1272

Max. Pos.: 16
Body Dia.: 3"
Electrical Rating:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available in single pole only per deck construction.
Screw terminals only.

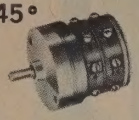
SERIES 1315

Max. Pos.: 12
Body Dia.: 2.180"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 3 poles per deck construction.

SERIES 1246 36°

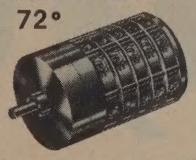
Max. Pos.: 10
Body Dia.: 2.375"
Electrical Rating:
6 amps 115 v ac Res.
6 amps 28 v dc Res.
3 amps 28 v dc Ind.
Available in single pole only per deck construction.

SERIES 1262 45°



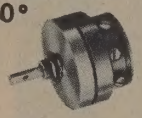
Max. Pos.: 8
Body Dia.: 1.93"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1244 72°



Max. Pos.: 5
Body Dia.: 2.125"
Electrical Rating:
15 amps 115 v ac Res.
15 amps 28 v dc Res.
10 amps 28 v dc Ind.
Available in single pole only per deck construction.

SERIES 1302 90°



Max. Pos.: 4
Body Dia.: 2.125"
Electrical Rating:
15 amps Ind. 30 v dc
Available in 1 and 2 poles per deck construction.

MODIFICATIONS AVAILABLE

The following modifications can be supplied on any of the basic switches shown on this page.

(1) Shorting or non-shorting contacts
(2) Bridging of contacts (miniature only)
(3) Momentary positions, whereby, the rotor contact, when released, returns to a predetermined position
(4) Isolated or guarded positions, whereby, the knob must be depressed or pulled out to enter or leave a particular position or positions
(5) Single or multi-pole construction
(6) Continuous rotation or the use of stops
(7) The use of a solenoid for remote switching applications
(8) The use of a key-lock feature
(9) The possibility of ganging various switches to be gear driven for an application requiring an unusual number of poles

MINIATURE ROTARY SELECTOR·SWITCHES / 1900 SERIES

SERIES 6-1900

Max. Pos.: 24
Body Dia.: 2"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1, 2, 3, 4 and 6 poles per deck construction.

SERIES 12-1900

Max. Pos.: 18
Body Dia.: 2"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole per deck construction.

SERIES 3-1900

Max. Pos.: 16
Body Dia.: 1.5"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1, 2 and 4 poles per deck construction.

SERIES 1905

Max. Pos.: 12
Body Dia.: 1.036"
Electrical Rating:
2 amps 115 v ac Res.
1 amp 28 v dc Res.
0.5 amp 28 v dc Ind.
Available in 1, 2, 3, 4 and 6 poles per deck construction.

SERIES 1900 36°

Max. Pos.: 10
Body Dia.: 1.036"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1906 45°

Max. Pos.: 8
Body Dia.: 1.036"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1-1957 60°

Max. Pos.: 6
Body Dia.: 1.13"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole only per deck construction.

SERIES 1-1966 90°

Max. Pos.: 4
Body Dia.: 1.13"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole only per deck construction.

GENERAL SPECIFICATIONS/1900 series

ELECTRIC RATING: carry 10 amps continuous. Make & Break—see individual switch data

VOLTAGE DROP: 0.1 volt or less at rated amperage. Initial Contact Resistance .003 OHM

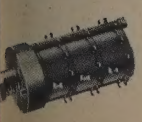
LIFE: 10,000 double cycles make and break rated amperage

TORQUE: 1 to 3 inch lbs.

SWITCHES DESIGNED AND BUILT IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
MIL-S-6807B (rotary switches enclosed)
MIL-S-3786B (rotary switches)
MIL-E-5272C (environmental testing)

MICRO-MINIATURE ROTARY SELECTOR SWITCH / 2500 SERIES

With unitized construction



Available in 30°, 36° and 45° indexing, with 12—10 and 8 pos. max.
Body Diameter: .623 inch.
Electrical rating continuous: 8 amps at 28 v dc.
Switching rate:
0 to 0.25 amp resistive 0 to 28 v dc.
0 to 0.25 amp resistive 0 to 115 v ac.
0 to 0.12 amp inductive 0 to 28 v dc.

Available in 1, 2, and 3 pole construction.
TORQUE: 5 to 9 inch ounces.
CONTACT RESISTANCE: .005 ohms average.
INSULATION RESISTANCE:
100,000 megohms minimum at 100 volts.
10,000 megohms minimum at 500 volts.
DESIGNED AND BUILT to meet the environmental and functional requirements of MIL-S-3786B.

JANCO CORPORATION
Phones: (213) 845-7473 • (213) 849-2107
3111 Winona Ave. • P.O. Box 3036 • Glenoaks Station
Burbank, California 91504 • TWX 910-498-2701

805 96

8-3551*

It would take nearly all the pages in this catalog to list all of our surge protectors . . . and it would take more than all of the research shelves in a library to contain all our knowledge about surges and how to protect against them. Obviously, then, two little pages in this catalog probably won't provide the *right* solution for *your* particular surge protection problem. But you can get the right solution by calling us collect. Do it now. We'll give complete, authoritative, courteous help in less time than it takes you to determine whether some catalog listing really does fit your particular situation.

When you can't afford a failure . . .

JOSLYN
ELECTRONIC SYSTEMS

SANTA BARBARA RESEARCH PARK / P. O. BOX 817 / GOLETA, CAL. 93017

*(collect, of course)

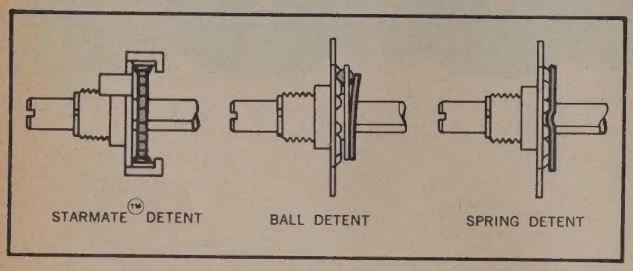
LEDEX

WILMINGTON CONTROLS DIVISION, LEDEX INC.
111 South Nelson Road, Wilmington, Ohio 45177 · phone (513) 38-0

ROTARY SWITCHES

When it comes to selecting a source for rotary switches, you'll find Wilmington Controls fully equipped to service you in these important areas: (1) quick, competent response to engineering requirements, (2) fast prototype delivery, (3) dependable production scheduling, and (4) consistent quality levels.

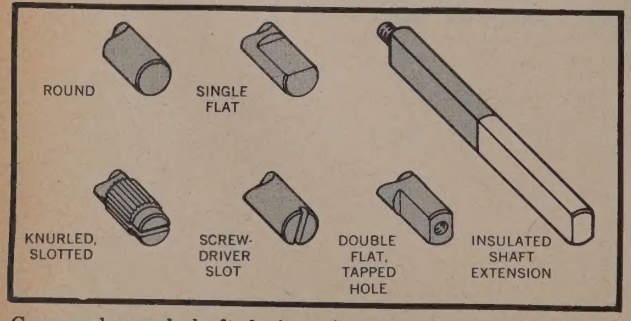
Our switch engineering experience dates back to 1947, when rotary switches were first applied with Ledex rotary solenoids to perform remote stepping and complex circuit programming functions. Over the years we have helped many customers to simplify their circuitry, reduce wiring requirements, and cut system costs. This experience we gladly share with you.



1. *Starmate detent:* Two bearing balls are spring loaded to operate against a precision indexing cam. The balls oppose each other with balanced pressure to eliminate side loading and extend switch life. This superior detenting concept is time-proven in Ledex long-life stepping motors.

2. *Ball detent:* A spring loaded ball bearing rides in and out of the "hill and valley" positions in the front plate. The ball detent has a crisp detenting feel even more positive than that of the spring detent.

3. *Spring detent:* a formed stainless steel spring with a coined spherical surface rides in and out of "hill and valley" positions in the front plate. It combines a positive index feel with economy.



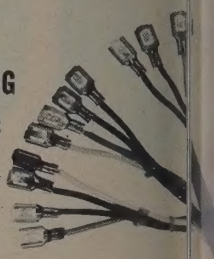
Commonly used shaft designs for commercial and military applications. Others made to specifications.

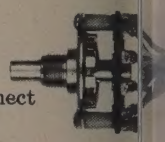
To meet your requirements for rapid deliv service, we stock a wide variety of standard pa which can be quickly modified. Our tooling designed for quick setup and fast change-o to further add to our ability to give you sh delivery cycles. And to assure consistent qual random production samples are regularly sou to automated test instrumentation for vibr life and other quality verification tests.

From the early design stages on through p duction runs we are geared to produce qua switches . . . fast. Whether you're concerned w new switching applications, or investigating sources for existing ones, we welcome the op tunity to work with you.

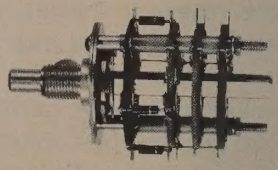
IDEAS IN SWITCH ENGINEERING

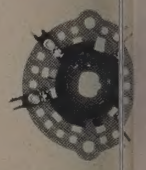
Supplying quality switch hardware is just one phase of our business. We take a special pride in our time-proven ability to simplify circuitry, upgrade the switch, and hold costs down. In most cases we can supply pre-wired assemblies with external components installed for less than it might cost you to purchase parts and assemble them in your plant.



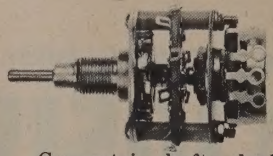


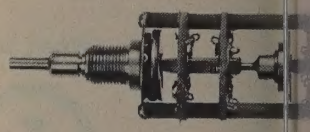
Switch pre-wired with quick connect terminals for simplified installation.



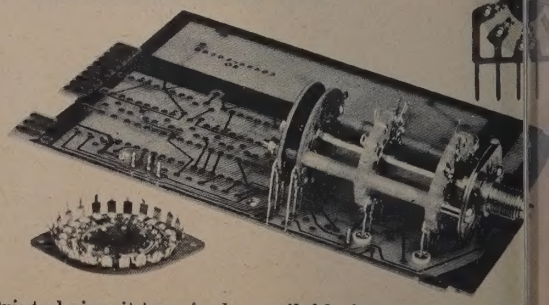


Slotted terminals permit resistors and other com to be inserted in place. They eliminate need for wires, reduce soldering time, keep size down.





Concentric shafts, dual index mechanisms to drive ometers, snap switches and other loads. Special b shields, brackets also engineered to solve unusual environmental problems.



Printed circuit terminals, available for perpendicular allel mounting (to PC board) expand switching ver

LEDEX

WILMINGTON CONTROLS DIVISION, LEDEX INC.
111 South Nelson Road, Wilmington, Ohio 45177 phone (513) 382-0987

ROTARY SWITCHES

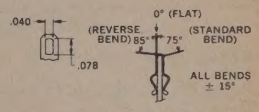
STANDARD SPECIFICATIONS

208, 212	306, 312	406, 412	506, 512	524
CONSTRUCTION				
Throughbolts				
SHAFT				
Military*	¼″ steel, cadmium plated, chromated per QQ-P-416, class 2, type II (50 hour salt spray).			
Commercial	¼″ steel, cadmium plated.			
MOUNTING				
Steel bushing, ⅜-32 thread, optional ¼ or ⅜ inch, standard length.				
SPACERS				
Ceramic, Grade L-5	Glass filled nylon, grade G 1/30.			
LOCKING LUG				
Standard fixed at 1⁷⁄₃₂″ radius; or can be deleted.	Variable at 15° increments except 75°, 90°, 105°, 255°, 270°, 285°.	Standard fixed at 1⁷⁄₃₂″ radius; or can be deleted.	Variable at any angle ±2° at 1⁷⁄₃₂″ radius, or can be deleted.	
METAL PARTS				
All metal parts cold rolled steel with cadmium plating for commercial applications. Chromate dip for 50 to 100 hour salt spray per MIL-S-3786 for military applications. Special materials such as passivated stainless steel or nickel plated brass parts are also available.				
DETENT MECHANISM				
Double ball Starmate detent or single ball (Hand valley.	Spring or single ball detent		Single ball detent.	Single or dual ball detent.
STOPS				
Fixed or adjustable.	Fixed at positions specified. Adjustment possible by removing stop lugs, at specific and intermediate positions.			Fixed at positions specified
INSULATION MATERIALS				
Stator: Phenolic, Glass, or Glass. Rotor: Kel-F.	Stator and rotor: Phenolic, Kel-F, Epoxy Glass, Ceramic, Mycalex†	Stator and rotor: Phenolic, Epoxy glass.	Stator and rotor: Phenolic, Kel-F Epoxy glass.	Stator and rotor: Phenolic, Epoxy Glass.
CONTACT RATINGS				
Make/Break				
Brass—Silver plated 1 ampere at 28 VDC, resistive; .25 ampere at 110 VAC, resistive.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.
Solid Silver 1 ampere at 28 VDC, resistive; .5 ampere. at 110 VAC, resistive.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.
Carry—5 amperes.	Carry—5 amperes.	Carry—5 amperes.	Carry—10 amperes.	Carry—5 amperes.
Dielectric—750 volts, contact to contact.	Dielectric—1,000 volts, contact to contact; 500 volts when contacts are insulated back to back.			
Contact resistance, in accordance with MIL-S-3786, will not exceed .010 ohms initially nor .020 ohms after rotational life tests.				

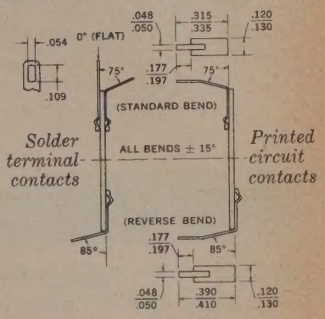
†Mycalex sections supplied with Kel-F rotors.

contacts

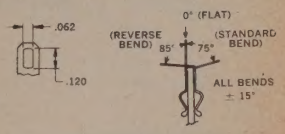
series 206 208 212



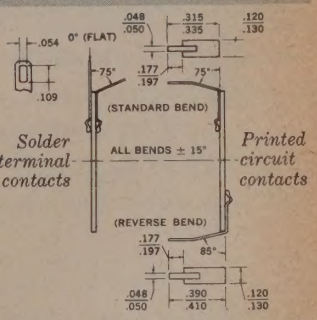
series 306 312 524



series 506 512

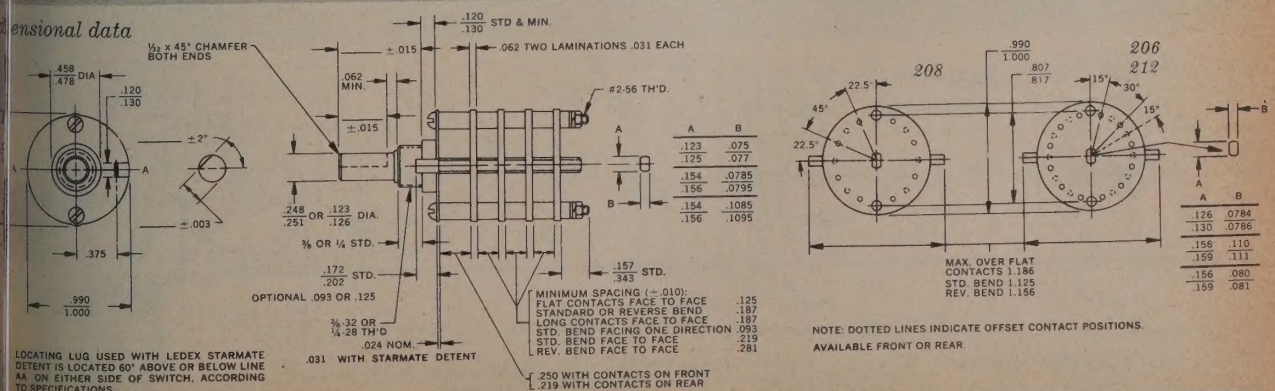


series 406 412



series 206 / 6 POSITION 60° THROW *208* / 8 POSITION 45 THROW *212* / 12 POSITION 30° THROW

dimensional data



LEDEX

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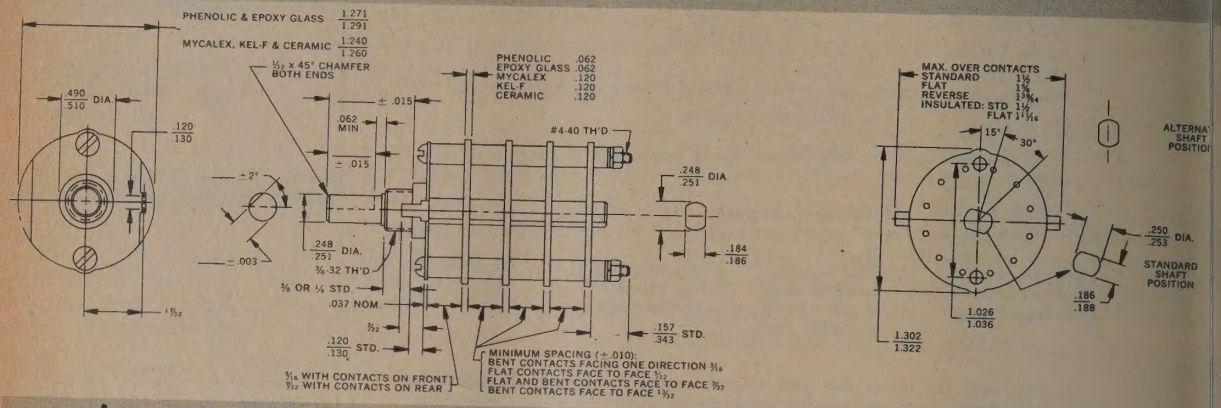
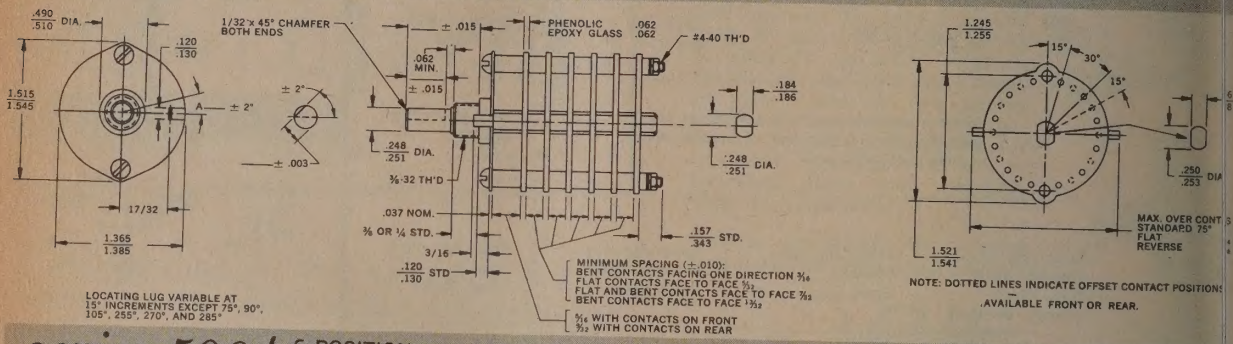
111 South Nelson Road, Wilmington, Ohio 45177 phone (513) 382-98

ROTARY SWITCHES *dimensional data*

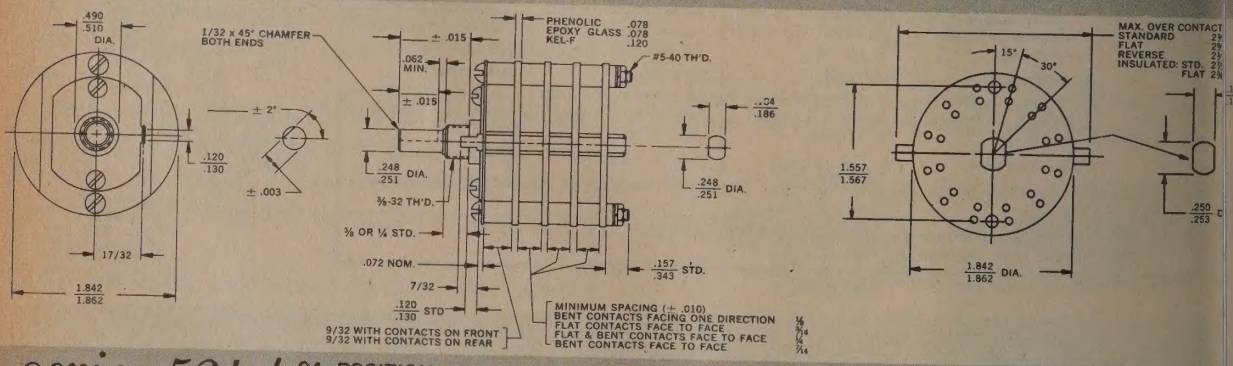
series 306 / 6 POSITION 60° THROW — *312* / 12 POSITION 30° THROW



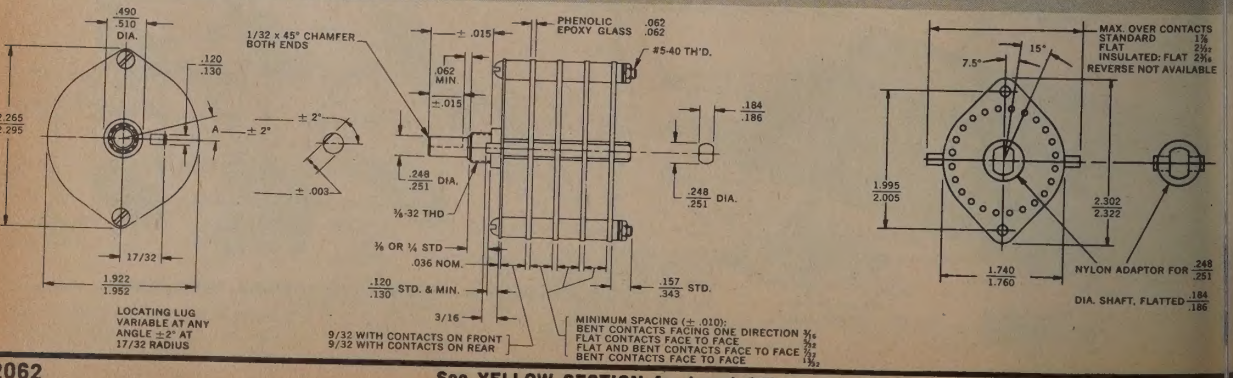
series 406 / 6 POSITION 60° THROW — *412* / 12 POSITION 30° THROW



series 506 / 6 POSITION 60° THROW — *512* / 12 POSITION 30° THROW



series 524 / 24 POSITION 15° THROW



See YELLOW SECTION for Local Offices, Phones

SWITCH SECTION HIGHLIGHTS

contact and rotor blade materials

silver plated brass

Most economical. Has .0001″ minimum silver to assure silver-to-silver contact (low contact resistance) throughout life of most application.

silver alloy

Use when consistent low contact resistance is required for minimum life expectancy of 200,000 contact flexures.

gold plated silver alloy

(a) .00003″ minimum gold; an economical way to assure positive solder contacts and prevent tarnish during long storage life.

(b) .0002″ minimum hard gold; assures gold-to-gold contact for over 50,000 contact flexures and then silver-to-silver contact for 150,000 additional contact flexures.

SILVER PROTECTION PROCESS	WHERE APPLIED	COMMENTS
Wear Dip Lacquer	*On Contacts*	*Applied as standard on all silver alloy and silver plated brass contacts to retard tarnishing for soldering ease.*
.0003″ Gold Plate	*a) On Contacts and Rotors*	*An economical means to assure positive circuit make after extended shelf life; also offers soldering ease. Meets MIL specs.*
	b) On Contacts only	*Primarily used for soldering ease after extended shelf life. Meets MIL specs.*
Hot Tin Dip	*On terminal end of contacts only*	*Primarily to assure good contact solderability after extended shelf life. Meets MIL specs.*

STATOR INSULATION GUIDE

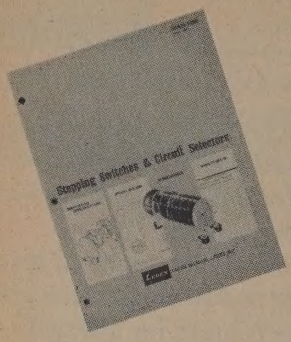
STATOR INSULATION	MIL SPEC.	USABLE TEMPERATURE LIMIT (°C)	MINIMUM INSULATION RESISTANCE (MEGOHMS)	
Phenolic	*MIL-P-3115, type PBE-P*	*100*	*1,000*	*Most economical, most commonly used. Though non-nutrient to fungi, varnish impregnation per MIL-V-173 is available. Meets most military and commercial application requirements.*
Epoxy-Glass	*MIL-P-18177, type GEB*	*125*	*10,000*	*Economical, excellent structural and dielectric strength. Lower moisture absorption rate than phenolic.*
Silicone Glass	*MIL-P-997C, type GSG*	*125*	*10,000*	*Good RF characteristics. Lower structural strength than epoxy glass, and slightly higher in cost.*
*Mycalex**	*MIL-I-10A, Grade L-411*	*150*	*10,000*	*Good structural and dielectric strength, lowest moisture absorption.*
Kel-F	*MIL-M-55028-A, Grade 3*	*125*	*20,000*	*Excellent structural and dielectric strength. Low moisture absorption.*
Ceramic	*MIL-I-10A, Grade L-422*	*150*	*10,000*	*Very low dielectric loss and moisture absorption.*

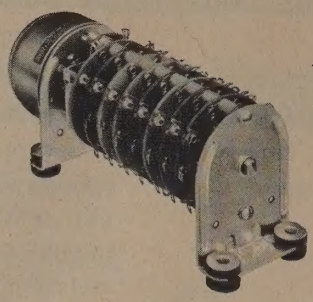
*Mycalex sections supplied with Kel-F rotors.

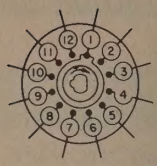
LEDEX

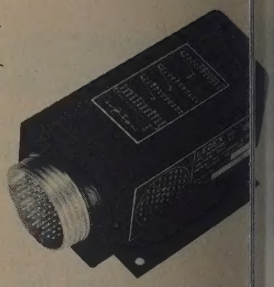
WILMINGTON CONTROLS DIVISION, LEDEX INC.
111 South Nelson Road, Wilmington, Ohio 45177 phone (513) 382-0987

STEPPING SWITCHES/CIRCUIT SELECTORS









Thirty Six Stock Models
Choose from 36 stock models, 2, 4, 6, 8, 10, 12, 18, 20 and 24 positions; 28 and 100 VDC. "Stepping Switches and Circuit Selector" catalog lists complete specs on stock models plus useful engineering information on basic control switching and application of basics to solve complex problems. Also includes simplified building block approach to specifying pre-engineered stepping switches and circuit selectors.

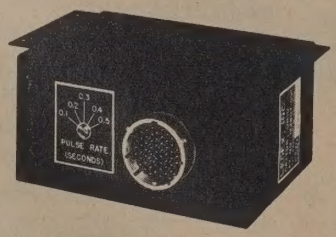
Ledex Stepping Switches are used for transfer switching, remote control of predetermined circuit patterns, remote sequencing of complex switching arrangements, or in programming checkout and sequential operations. They are known best for their ability to perform multiple switching functions reliably, in limited space, and under severe operating and environmental conditions. Available in open construction, pre-wired modules or as packaged control solutions.

Ledex Hermetically Sealed Swch are engineered to withstand ve shock and vibration, such as e ou tered in aircraft, missile and m ta applications, and to provide dd switching reliability in adver e vironments. Used extensively in er space and underwater guidanc co trols, as mode selectors, in rock ing devices, and in a variety o mi tary control functions that dem nd high degree of reliability.

PACKAGED CONTROL SOLUTIONS

Here are examples of Ledex Stepping Switches designed into compact, reliable armament control packages, either solid state or electromechanical, or combining the best characteristics of both.

Whether your problem involves armament controls or commercial control functions, there's a good chance Ledex has already solved a similar problem.



Miniaturized Armament Control Intervalometer
A flat disc-shaped solenoid is used in the 12-position stepping switch. It is used to fire 19 rockets in pairs sequentially, in speeds ranging from 10 to 20 ms intervals.

40-position Intervalometer with single or optional 5-speed ripple fire control
40-position intervalometer has 5 adjustable control speeds for rocket firing at intervals of 100, 200, 300, 400 or 500 milliseconds. Hybrid design combines best characteristics of solid state and electromechanical products for optimum performance, minimum weight, maximum reliability and lowest cost. Firing time intervals are maintained at ±5% through a voltage range of 22 to 31 vdc.

Universal Stores Dispenser Intervals Variable on Digital Ba s

All solid state and among the os flexible of Ledex intervalometer de signs, this one permits the pilo to vary release intervals to any ate ranging from 30 ms to 9.99 sec ds in increments of 10 ms. It includ a stepping switch to distribute seq n tial fire commands. Timing toler ce is ±10% over a voltage range o 22 to 32 volts and temperature to —5°C to +85°C. The package includes b lt-in suppression to protect solid st te circuitry when switching indu ve loads.

For engineering assistance and technical literature, write or phone:

LEDEX

LEDEX DIVISION, LEDEX INC.
126 Webster St., Dayton, Ohio 45401 phone (513) 224-9891

See YELLOW SECTION for Local Offices, Phones

Would you rather light...or switch?

Marco-Oak has them both.

Either way, your single source of supply is Marco-Oak, manufacturers of indicator lights and illuminated pushbutton switches featuring quality, reliability, and service for over 20 years and the original designers and patent holders of the indicator-light Press-to-Test feature.

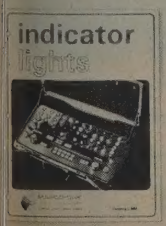
Say you're looking for a comprehensive selection of indicator lights to create an information display second-to-none. Look to Marco-Oak. We offer lights with many lens colors, body sizes, and shapes.

And if you want illuminated pushbutton switches with long life, crisp appearance, and vital design features, choose Marco-Oak Presslites. Available in a multitude of styles and mountings.

And, of course, Marco-Oak Presslites and indicator lights are easy-to-install, and, if required, are protected against severe operating conditions and shielded against EMI/RFI transients.

Something special on your mind? We're ready for that, too. Tell us your application and we'll work up a custom design.

Now's the time to write for our *Presslite* catalog or our *Indicator Light* catalog—or both.



Catalog L-68

Catalog S-68

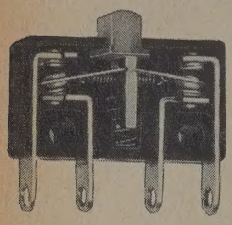
MARCO-OAK
P. O. Box 4011
207 S. Helena Street
Anaheim, California 92803

LICON

DIVISION ILLINOIS TOOL WORKS INC.

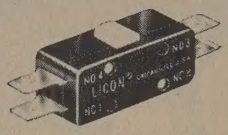
6615 WEST IRVING PARK ROAD • CHICAGO, ILLINOIS 60634
Phone (312) 282-4040 • TWX: 910-221-0275

LOOK TO LICON FOR A COMPLETE, QUALITY SWITCH IN



BUTTERFLY® DOUBLE-BREAK SWITCHES

The unique Licon® Butterfly double-break switch design is built around two blades that move simultaneously, then actuate with a positive snap. A full line of 2, 4 and 6-circuit miniature, subminiature and heavy-duty Butterfly switches meet every basic switch need.



TYPE II

High electrical rating and long mechanical life in one compact package. Ideal for a wide range of applications.

ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps
125 v AC: ½ HP
250 v AC: ¾ HP Sea Level
28 v DC: Form X or Y—15 Amps Res.
Form X or Y—10 Amps Ind.
Meets MIL-S-8805/11

TYPE 16

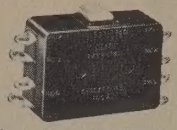
Features two circuit control, plus high shock and vibration resistance. Meets MIL-S-8805/7.

ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps Sea Level
28 v DC:
Form X or Y—10 Amps Res.
Form X or Y—7.5 Amps Ind.
Form Z— 10 Amps Res.
Form Z— 5 Amps Ind.

TYPE 18

Big switch rating in the smallest double-break switch—.200" x .500" x .350". Meets MIL-S-8805/76

ELECTRICAL RATING
125/250 v. AC: 7 Amps U.L. Listed
28 v DC: U.L. Listed
Form X or Y—8 Amps Res.
Form X or Y—5 Amps Ind. Sea Level



TYPE 22

Reliable double pole double break switch permitting simplified control of multiple circuit applications. Meets MIL-S-8805/15

ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps
125 v AC: ½ HP
250 v AC: ¾ HP
30 v DC: Form XX or YY—15 Amps Res.
Form XX or YY—10 Amps Ind.
Form ZZ— 10 Amps Res.
Form ZZ— 7 Amps Ind.

TYPE 26

U.L. Listed

Provides simultaneous operation of two Licon Butterfly double-break mechanisms in one case. Eliminates the need for dual components and complicated actuators.

ELECTRICAL RATING Meets
125/250 v AC: 8 Amps MIL-S-8805/77
28 v DC: Form XX or YY—10 Amps Res.
Form XX or YY—7.5 Amps Ind.
Form ZZ— 10 Amps Res.
Form ZZ— 5 Amps Ind.

TYPE 36

Subminiature triple pole switch which can eliminate the need for three independent switches and complimenting actuators.

ELECTRICAL RATING
125/250 v AC: 8 Amps Res.
28 v DC: Form XXX or YYY—10 Amps Res.
Form XXX or YYY—7.5 Amps Ind.
Form ZZZ— 10 Amps Res.
Form ZZZ— 5 Amps Ind.

TYPE 23

High capacity, low cost, miniature snap action switch.
U.L. Listed

TYPE 73 ACTUATOR

Low cost momentary push-button series utilizing the Type 23 basic switch. Available in 1, 2, or 3 poles.

TYPE 25 THIN SWITCH

The thin switch is designed for commercial applications which require utmost reliability at low price. Typical applications include coin and vending machines, timers and counters.

ELECTRICAL RATING
On-Center 12 Amps Res. 7 Amps Ind.
Off-Center 6 Amps Res. 3 Amps Ind.

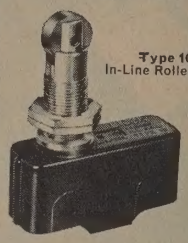
U.L. Listed

LICON TYPE 10 BASIC SWITCHES

Type 10-122
Basic Switch

Type 10-7
Roller Lever A

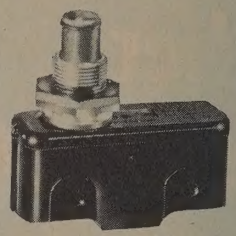
Type 10-522
Roller Leaf Actuator



Type 10-922
In-Line Roller Actuator

Type 10-
Cam Actu

Type
Hinge-T



Type 10-322
Panel Mounting

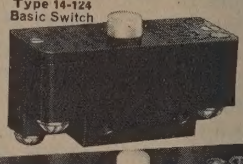
Type 10-72207
One Way Actuator

CHARACTERISTIC

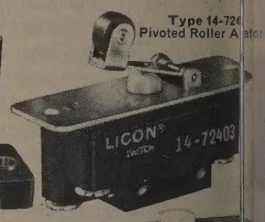
Electrical Rating 15A, 125/2
460 V a-c
15A Res 5A Ind. 5A motor,
UL APPROVED CSA AP
Splash-proof sealing agains
ture, dirt, dust and other har
ments can be provided for m
els. Preloaded reverse action
available.

TYPE 14 HEAVY DUTY BASIC SWITCHES

The LICON Type 14 series has been tested to over 20
cycles of mechanical life. The Type 14 is specially desig
heavy duty use on high current applications. Now reliable
performance is available in a compact unit rated at 20 amps, 2



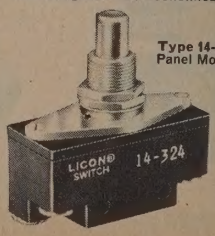
Type 14-124
Basic Switch



Type 14-72
Pivoted Roller A

Type 14-128040
Interchangeable and economical

Type 14-1241 Mai
tained Contact, Re



Type 14-324
Panel Mount

ELECTRICAL RATIN

Volts	A.C. Steady	A.C. In-Rush	D.C. D.T.
28	20	80	10
125	20	80	.5
250	20	80	.2
480	15	50	
600	5	10	

U.L. & CSA L

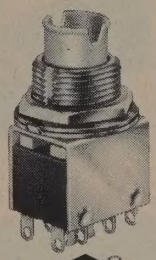
See YELLOW SECTION for Local Offices, Phones

GHTED SWITCHES

ely sed on computers, machine tools, ce achines, guidance control and a e variety of applications. Heart of Licon ted witches are the ultra-reliable But- ty® ouble-breaks for long life and de- da e performance. Wide selection of ors izes, mounts and actuators.

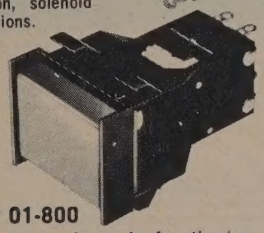
PUSHBUTTON SWITCHES →

light series combines the Licon Type 16 Double- ch with a lamp assembly and removable lens ning lighting and switching functions in one ckage, conserves panel space and cuts installa- The 01 series is designed to meet the require- IL-S-22885-27, and provides up to 10 Amp switching r commercial use. The series includes four different stationary lamp base styles, a wide choice of lens cap sizes, shapes and colors, servicing without tools from front of panel and a choice of projected color or colored lens illumination. Available in momentary alternate action, solenoid held and indicator versions.



-700

momentary al- indicator action stationary bulb ce molded hous- drical, square or s caps. Front-of- b servicing.

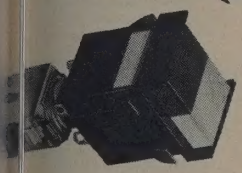


TYPE 01-800

Styled for maximum in function/appearance criteria. Has integral plastic housing that snaps in from front panel. Available in one thru six pole, momentary and alternate action.

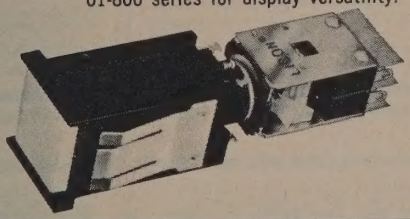
← TYPE 02-800

For two-light, two-circuit, split-screen indication and the same fine appearance as the 01-800, this series features snap-on switch modules containing sub-miniature Type 16 double break switches. Gives the designer that much more switching flexibility. With all the same wide range of features to meet your specific application. This series combines nicely with 01-800 series for display versatility.

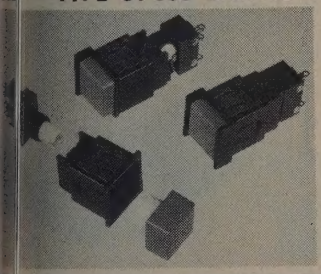


4-590

panel appearance bulb illumination. snap-on switch front-of-panel bulb Standard in black anodizing.



— TYPE 01-600 LIGHTED PUSHBUTTON SWITCHES



An attractive new snap-in one light switch offering bezel, single barrier, or double barrier housing. Employs the 01-748 series basic unit and mounts in a .875″ square panel cutout, panel thickness 1/16-1/8″. Momentary, alterate & indicator versions available.

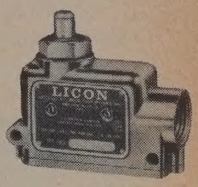
INDUSTRIAL SWITCHES

TYPE 30

Rugged diecast endorsed limit switch for industrial applications. Available in wide variety of actuators, sealed or unsealed. U.L. Listed

30-100 OVERTRAVEL PLUNGER SWITCH

General purpose limit or push button switch for circuit controls of heavy duty applications. The overtravel plunger provides added switch protection and also permits greater flexibility of application. Since these switches are not sealed, it is recommended they be used for applications where environment is not a troublesome factor.

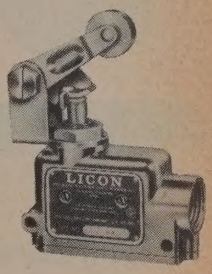


Uses Basic Switch 10-322

Operating Force	10 oz. ±4 oz
Release Force	3 oz. min.
Pretravel	.030 max.
Overtravel	.219 min.
Movement Differential	.002 max.

30-300 ROLLER ARM SWITCH

Identical to the dependable performance of the 30-400 switch. These switches are not sealed, however, and must be used in applications where environment is not a factor. Excellent for both slow and fast moving cams and slides. It is horizontally adjusted, in the field, to accept actuation from eight positions. It is vertically set for desired actuating thru 225°.



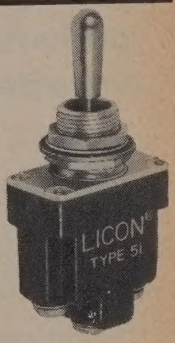
Uses Basic Switch 10-322

Operating Force	10-18 oz.
Release Force	6 oz. min.
Pretravel	.141 max.
Overtravel	.219 min.
Movement Differential	.006 max.

AIRCRAFT TOGGLE SWITCHES

TYPE 51

Heavy duty sealed toggle switch designed to meet the requirements of MIL-S-3950, MS24523, MS24524 and MS24525. 1, 2, and 4 pole versions. Also available: Lift lock versions. MS24658, 59, 60 and solder terminal MS27734, 35, 36.



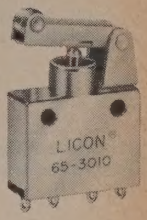
SEALED SWITCHES

TYPE 63

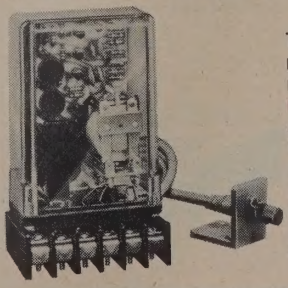
Environment free sealed limit switch. Meets MIL-S-8805.

TYPE 65

Subminiature environment free snap-action switching.



TYPE 70-700 PROXIMITY SWITCH



The 70-700 consists of two basic modules, a control module and a remote potted sensor. The control module contains a 10 amp relay and a transistor oscillator, both housing in a plastic plug-in case which mates with a 12 terminal heavy duty JIC style socket (supplied). A NEMA Class 1 metal enclosure is also available for housing both the control module and heavy duty socket.

For complete information about the full line of Licon switches, write for G106 catalog.

For information on the Licon® Series 550 Solid State Electronic Keyboard see EEM P. 571

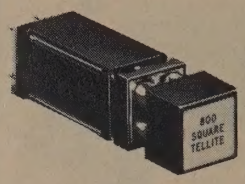
LICON
DIVISION ILLINOIS TOOL WORKS INC.
6615 WEST IRVING PARK ROAD • CHICAGO, ILLINOIS 60634
Phone (312) 282-4040 • TWX: 910-221-0275

MSC Master Specialties Company

For more than a quarter of a century, Master Specialties Company has specialized in the development and production of warning and display systems, word indicator lights, and illuminated pushbutton switches. Today, the company produces a broad line of information display and control devices for the nation's military and space programs and for commercial aviation, industrial process control, public utilities and commercial equipment of all types.

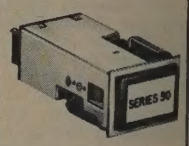
Series 800 Square Tellite® Switch

Miniature pushbutton switch with modular design and outstanding plug-in features. Reduces wiring installation time by 71% while increasing reliability. Available in standard matrices containing up to 144 channels.



Miniature Tellite® Series 90E S tch, Series 90K Pilot Lite

Companion pushbutton switches and ind ors with matching panel cutout and front-o nel appearance. Flush mount design, with p ive hard mount from front of panel. Provide oad capabilities in minimum space. Half the s of equivalent competitive units. Provide tw m reliability, or separate lighted indication one unit.



Comparative design and performance characteristics

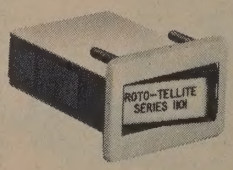
This tabulation of outstanding characteristics permits you to select quickly and easily the MSC product most suitable to your requirement. Once you have made your choice, we invite you to write for complete catalog information. Or, if you prefer, contact the nearest regional sales office or distributor where you will receive prompt attention to your request.

Characteristics	Series 800 Square Tellite® Switch	Series 90E Switch	Series 90K Pilot L
Basic Unit Types Available	Indicator Lite, Switch Lite, Switch Lite with Holding Coil	Switch Lite, Switch Lite with Holding Coil	Pilot L
Switch Configurations and Actions	2PDT or 4PDT, momentary or alternate action	2PDT or 4PDT, momentary or alternate action	N.A
Overall Unit Size, H x W x L	.750" x .750" x 3-1/8" max.	1.000" x .750" x 3.093"(max)	1.000" x .750" x .20"
Lamp Type / Number of Lamps / Voltage	Four T-1-3/4 incandescent 6, 12, or 28 volt based lamps (115 VAC neon lamps available)	Two T-1-3/4 incandescent 6, 12, or 28 v based lamps (115 VAC neon lamps ava le)	
Lamp Circuits Available	Common ground, vertical or horizontal split	Common ground	
Wiring Terminations	Crimp type (soldering possible)	Solder type only	Solder-lug type rew connector type
Switch Contact Ratings	5 amps resistive @ 115 to 250 VAC, 5 amps resistive, 2.5 amps inductive @ 30 VDC	3-Amps resistive, 1-1/2-Amps inductive, 1-Amp lamp load	N.A.
Relamping	Front of panel without tools	Front of panel without tools	
Display Screen Arrangements	Full display, vertical or horizontal split display, 3 and 4-way split display	Full display, 2-way horizontal or vertical split, two-color	
Color Control Method	Silicone rubber slab filters in amber, blue, green, red, white. Projected color also available	Silicone rubber slab filter in amber, blue, gree d a white. Projected color also available.	
Lens Types Available	Lighted letters or lighted background, letters either legible or not when unit is unlighted	Lighted letters or lighted background, le rs either legible or not when unit is unligh	
Mounting Method	Units plug and lock into pre-fabricated mounted racks	Hard mount from front of panel wi integral mounting sleeves	
Unit Weight, Nominal	1 oz. (module); .7 oz. (mounting rack)	2 oz.	1-1/4 o
Optional Features Available	RFI screens, two-color full display, panel plugs	RFI Screen, drip-proof seal, spacer barriers, sw gu (connector block available for 90K indicator).	
Price, Basic Unit with 2-Pole Momentary Switch, 500 Pieces	$12.25	$6.30	$1.90

OTHER MSC INFORMATION DISPLAY AND CONTROL DEVICES

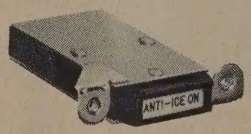
Series 100/1100 Roto-Tellite®

Flush mounted model available with two standard lens sizes (narrow 100, wider 1100) and a wide variety of matrix configurations. Ideal when application calls for rugged, dependable performance in environmental extremes.



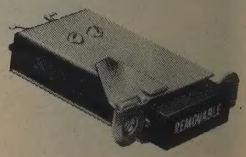
Series 6000/7000 Roto-Tellite®

Available in two sizes, the narrow 6000 and wider 7000 — mounts flush with front panel. Small size, low cost, high quality features are ideal for cockpit applications and numerous industrial, commercial and military requirements.



Series 4000/5000 Tellite®

Push-to-relamp indicator offered in two sizes, the Series 4000 and the larger Series 5000. Both are ideal for numerous industrial, commercial and military applications. Relamping accomplished simply by depressing display face then pulling face forward on captive runners.



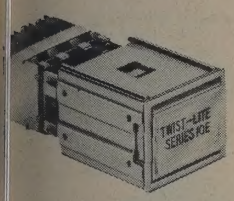
Price, Basic Unit with 2-Pole Momentary Switch, 500 Pieces	$7.74 (Series 100) $8.82 (Series 1100)	$3.90 (both Series)	$4.28 (both Series)

See YELLOW SECTION for Local Offices, Phones

...ited Pushbutton Switches, Word Indicators, Display Devices

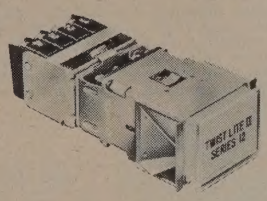
...s 10E Twist-Lite®

...s positive hard mount sleeve, individual ...lor control and four-way split display. ...ctions as word indicator for design com... ...y. Withstands extremes of shock and ...n due to hard mount feature. Available ...S-22885 requirements as Series 10H.



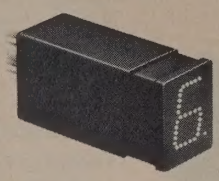
Series 12 Twist-Lite®

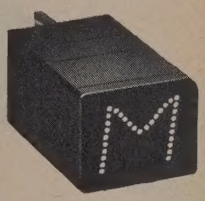
Versatile switch with simplified spring-clip mounting and numerous mounting configurations. Twelve different styling options available. Combination of features makes unit ideal for industrial, commercial and military control panels. Approved by Underwriters Laboratories.



Series 900 Fiber-Optic Readouts

Setting new standards of optimum brightness and legibility, MSC Fiber-Optic Readouts provide much higher visibility at far lower power levels than required by conventional tube or bar-segment readout units. They are available in both 7-segment numeric and 16-segment alpha-numeric versions.

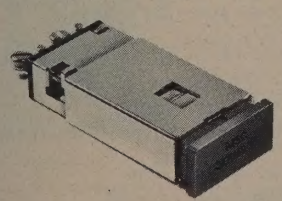




...s 10E Twist-Lite®	Series 12 Twist-Lite®	Model 901	Model 902
...r Lite, Switch Lite, ...Lite with Holding Coil	Indicator Lite, Switch Lite, Switch Lite with Holding Coil	7-Segment Numeric	16-Segment Alpha-Numeric
...r 4-DT, momentary or alternate action	2PDT or 4PDT, momentary or alternate action	No switching action (readout only)	
1.200" x 2.790" maximum (momentary)	.860" x 1.250" x 1.950" max.	.620" x .500" x 1.57" max.	.620" x .750" x 1.57" max.
...1-3/4 incandescent 6, 12, or 28 volt ...amps (115 VAC neon lamp available)	Four T-1-3/4 incandescent 6, 12, or 28 volt based lamp (115 VAC neon lamps available)	Seven T-1 incandescent/5.0V — 20mA	Sixteen T-1 incandescent/5.0V — 20mA
...on ground, full display, vertical split or ...ntal split; or each lamp separately grounded	Common ground, full display, vertical split or horizontal split; or each lamp separately grounded	Four-line 8-4-2-1 BCD, with driver (consult factory for special circuits).	
...type	Solder type	Circuit card plug-in to connector.	
5 amps @ 125 to 250 VAC, 5 amps ...resistive, 3 amps inductive @ 30 VDC ...1 amp resistive, 1/2 amp inductive @ 30 VDC	Silver: 5 amps @ 125 to 250 VAC, 5 amps resistive, 3 amps inductive @ 30 VDC Gold: 1 amp resistive, 1/2 amp inductive @ 30 VDC	(Readout only)	
...of panel without tools	Front of panel without tools	Lamps can be replaced from front of panel.	
...isplay, vertical or horizontal ...display, 3 and 4-way split display	Full display, vertical or horizontal split display, 3 and 4-way split display	Character size: .420" x .220"	Character size: .420" x .420"
...ne rubber bulb filters in amber, blue, green, ...white, yellow. Colored lenses also available	Silicone rubber bulb filters in amber, blue, green, red, white, yellow. Colored lenses also available	Characters in white, red, amber, yellow, blue and green.	
...ed letters or lighted background, letters ...legible or not when unit is unlighted	Lighted letters or lighted background, letters either legible or not when unit is unlighted	(Readout only)	
...mount from front of panel with ...al mounting sleeves	Spring clip, mounting barrier or spring clip with spacer barrier	Units plug into standard connectors mounted on .750" centers. Can be mounted by the factory in groups.	
...z.	3.1 oz.	0.31 oz.	
...h guard, drip proof seal, RFI screen, ...er test control capsule, four color "Full" ...ay, quick connect and wire wrap terminals, ...-on circuit breaker (see back cover)	Meets applicable requirements of MIL-S-22885 and CSA.	Custom mounted in groups ready to install as one sub-assembly.	
...5	$5.00	$12.00 (incl. lamps)	$25.00 (incl. lamps)

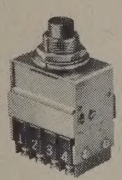
...RIES 35 HIGH-RELIABILITY INDICATOR LIGHT

...al for use in stringent military and industrial designs. ...mple to operate as well as easy to install and maintain. ...lamping is easily accomplished without any tools. It ...atures a wide choice of solid-state circuits which can be ...erchanged to adapt to a variety of on-the-spot require... ...ents. They can be quickly replaced without having to remove ...e basic indicator unit from its mounting panel. The unit ...eets the requirements of MIL-STD-202.



UNLIGHTED SWITCH ASSEMBLIES

Series 14. 2PDT or 4PDT unit with momentary or alternate action. Positive snap-action design assures instantaneous contact transfer. Also available for MIL-S-8805 applications as Series 14H. **Series 19.** Building block pushbutton switch. Removable color pushbuttons, facing nuts and switch modules provide design flexibility. **Series 16.** Precision two position toggle switch assembly. 2PDT or 4PDT maintained/maintained. Simultaneous transfer of all switch contacts. Also available for MIL-S-8805 applications as Series 16H. **Series 21.** three position toggle switch with three separate lever actions for positive contact transfer. **Series 22.** Precision sequence actuator. Programs four miniature SPDT switch modules for any combination of switching modes in up to twelve sequential steps.



MSC Master Specialties Company

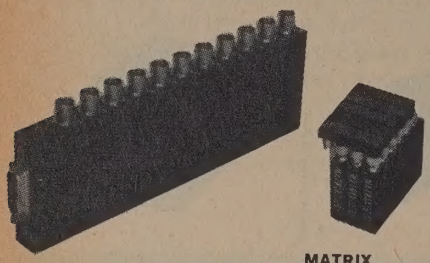
1640 MONROVIA, COSTA MESA, CALIFORNIA 92627 (714) 642-2427, TELEX 678-433

REGIONAL OFFICES AND DISTRIBUTORS CONVENIENTLY LOCATED THROUGHOUT THE UNITED STATES, CANADA AND EUROPE.

MATRIX SYSTEMS CORPORATION

9201 Gazette St., Chatsworth, Calif. 91311 • 213-88-20

MATRIX 7000 SERIES • COAXIAL RELAY MODULES



MATRIX CONFIGURATION

MATRIX 7000 Series Relay Modules are designed to maintain coaxial switching continu ovi a wide range of critical and high environmental applications. The relay housings a co structed of precision machined aluminum alloy for structural integrity and hard anodi d f durability. All signal shield paths are silver plated with covers gasketed for maximum E pr tection. The basic reed switch elements are hermetically sealed in nitrogen filled gas en lope and employ rhodium plated contacts to insure non-stick operation.

FEATURES

- Continuous shield continuity
- Rugged machined aluminum housing
- Crosstalk always less than isolation
- Switchpoints individually field replaceable
- Extremely low EMI
- Low VSWR
- Matrix configuration easily assembled using 9000 series cross straps
- Signal circuits isolated from control circuitry

SPECIFICATIONS

FREQUENCY RANGE:	0 - 300 MHz
CHARACTERISTIC IMPEDANCE:	50 ohms, std; 75 ohms, optional
SWITCHING CONFIGURATION:	Single pole, two thru twenty throws
SWITCHING SPEED:	Less than one millisecond
CONTROL-CONNECTOR:	28 Vdc, 30 ma Amphenol MiniRac 17 Series
SIGNAL CONNECTOR:	BNC - UG 1094/U, TNC optional
OPERATING TEMPERATURE AND HUMIDITY RANGE:	−30°F to +150°F, 0 to 98 percent R.H.
OPERATING SHOCK AND VIBRATION:	50 G's - 1 ms, 2 G's p-p 20-2000 Hz
DIMENSIONS:	.625″ W x 3.25″ H x 1.75″ L + 625″ x number of t ws
MOUNTING:	Three 6-32 tapped holes in base

	7100	7200	7300	7400	7500	7600	7 0
CONTACT RATING:	100 Vdc .250 amp 10 W	28 Vdc .250 amp 3 W	100 Vdc .250 amp 10 W	28 Vdc .250 amp 3 W	400 Vdc 1 amp 15 W	28 Vdc .250 amp 3 W	10(dc .25(mp 1 W
CONTACT RESISTANT:	.150 ohm	.300 ohm	.300 ohm	.300 ohm	.060 ohm	.300 ohm	.05 hm
ISOLATION: (@ 100MHz)	46 dB	50 dB	66 dB	106 dB	44 dB (10MHz)	106 dB	5 B

Matrix and hybrid switching systems are easily constructed by using Series 9000 (no output), 9100 (one output) or 9200 (two output) push-on cross straps which mate with the BNC connectors on the switch modules. The cross strap output connectors are BNC female type UG 1094/U. The model number of the cross strap is as gne by replacing the two zeros of the series number with the n be of inputs desired. For example, a Model 9108 has eight inpu an one output.

7100 — STANDARD
7200 — SELF-TERMINATING
7300 — HIGH ISOLATION
7400 — HIGHEST ISOLATION
7500 — HIGH POWER
7600 — HIGHEST ISOLATION SELF-TERMINATING
7700 — MERCURY WETTED CONTACTS

MODEL NUMBER ASSIGNMENT

7X XX — X

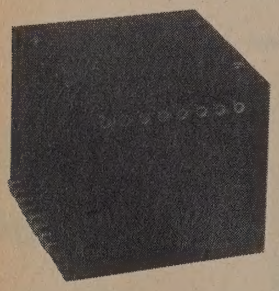
Series

Number of throws

Coil suppression diodes.....D
TNC connectors.....T
Self-terminating resistance.....ms
Insulated shield.....I
Insulated and switched shield....IS
Expander output.....E

Any of the above options may be comb d.

MATRIX MODEL 6048 • WIDE BANDWIDTH RF RELAY MATRIX



MATRIX Model 6048 offers exceptionally low return loss in a compact 8x8 MATRIX configu ion Each switchpoint may be actuated individually or simultaneously. Any output may be con cte to any input with return loss virtually independent of the path selected. A unique reed itc arrangement with a high degree of shielding continuity affords high open circuit isolation ve at VHF with negligible crosstalk. Applications for Model 6048 include VHF and IF swi hin where high isolation and return loss are required and pulse circuits or baseband video her pulse fidelity requirements demand extremely low phase distortion.

FEATURES

- Switchpoints individually field replaceable
- Rugged machined aluminum housing
- Crosstalk always less than isolation
- Control lines independently connected
- Bi-directional operation without specification degradation
- 8 by 8 switching configuration

SPECIFICATIONS

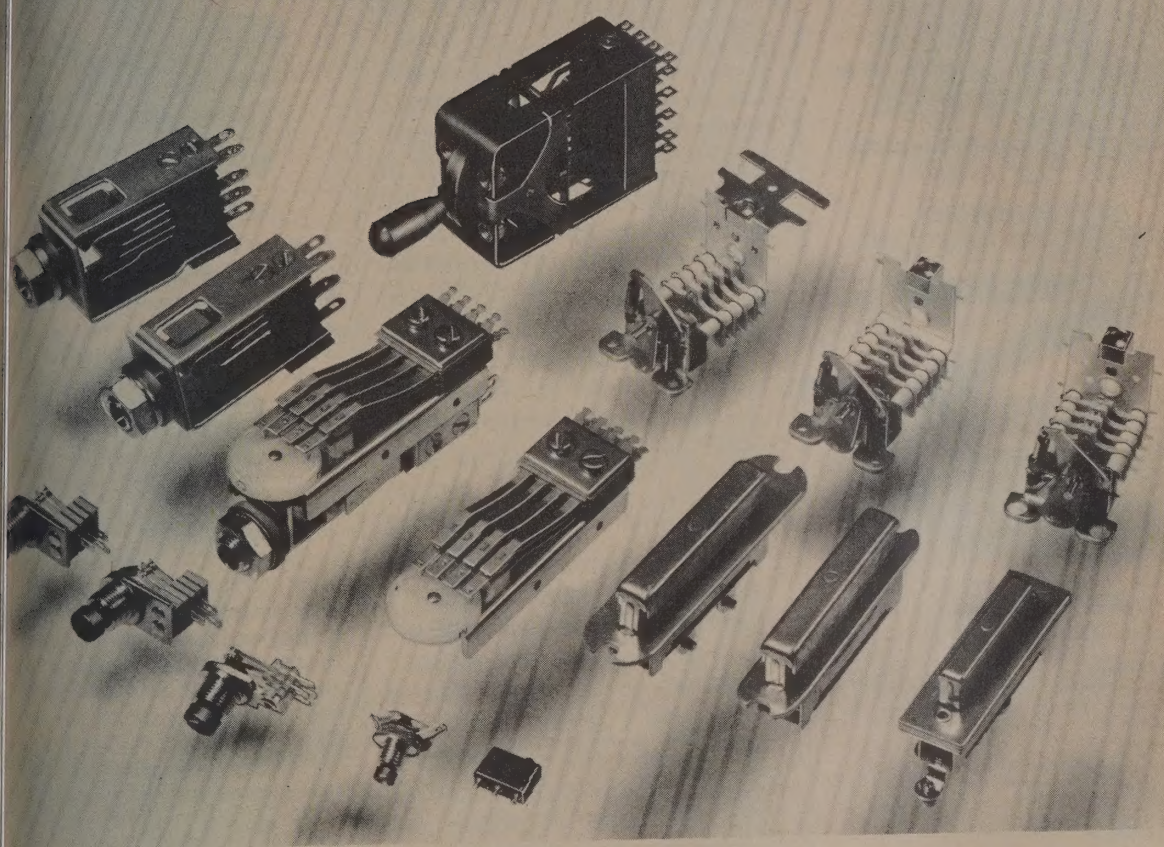
FREQUENCY RANGE:	0 - 300 MHz
CHARACTERISTIC IMPEDANCE:	75 ohms, std; 50 ohms, optional
OPEN CIRCUIT ISOLATION:	−90 dB @ 90 MHz
RETURN LOSS:	28 dB @ 90 MHz (1.08 VSWR)
SWITCHING CONFIGURATION:	8 input by 8 output (Any input may be switched to any output)
CONTACT RATING:	100 Vdc/0.25 amperes—10 Watts/Switchpoint max um
SWITCHING SPEED:	Less than one millisecond
SWITCHING CONNECTOR:	Amphenol subminax Type 27-15 — mates with Amphenol Type 27-13
SWITCHPOINT CONTROL:	17-32 VDC @ 1000 ohms
CONTROL CONNECTORS:	Amphenol MinRac 17 series
OPERATING TEMPERATURE RANGE:	−30°F to +150°F
OPERATING HUMIDITY RANGE:	0 to 98% R.H.
OPERATING VIBRATION RANGE:	2 Gs p-p. 20-2000 Hz
OPERATING SHOCK:	50 Gs - 1 millisecond
DIMENSIONS — OVERALL:	4.5″ x 4.5″ x 3.5″ high
MOUNTING:	Four 6-32 tapped holes

Latching and XY selection logic available for all models.

See YELLOW SECTION for Local Offices, Phones

Nanasi CUSTOM PRECISION SWITCHES

LEVER ▪ PUSH BUTTON ▪ PUSH-TO-TALK ▪ MICRO ▪ ROTARY



TELEPHONE and ELECTRONIC SWITCHES

made to order for the specific application—made to order for the rigid budget

Nanasi customers include many of the most prominent manufacturers of telephone and electronic systems. From their revolutionary new designs to the everyday bread-and-butter types, they rely heavily on our unique capabilities for rapid turn-around and high output production for custom precision switches. Any configuration, any size, any complexity—Nanasi can respond quickly with a prototype or a million run to keep pace with prescribed schedules. The happy results are job fitted switches to meet all applicable MIL specs or commercial requirements—at off-the-shelf speed and economy.

Typical samplings are shown here of Nanasi custom made lever, push button, push-to-talk, micro and rotary switches. They represent many refinements contributed by our own specialist technology...every part meticulously fabricated and assembled like a fine watch...and each switch tested like the entire system depended on it. If you want reliability to the nth degree–try Nanasi.

Write or call for Complete Capability Brochure on our Switches and Other Products

Nanasi

DIVISION OF ELECTROSPACE CORPORATION

6308 Jackson St. ▪ West New York, N. J. 07093

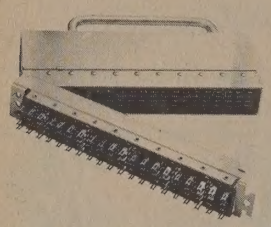
Tel: 212-564-0948 (N. Y.) *201-868-9100 (N. J. direct)*

BUILT SWITCHES ▪ PRECISION MECHANICAL ASSEMBLIES ▪ TELEPHONE SYSTEM MODULES ▪ SPECIALIZED JOB & MEASURING TOOLS

No one does more switching and connecting than the telephone industry.

Ever wonder why they almost always specify "electro-mechanical" equipment?

The answer is simple: Telephone-type components offer virtually total reliability at a fraction of the cost. And North Electric offers the finest line of telephone-type components available.



North Electric multi-purpose, multi-contact connectors are both rugged and reliable. Unique tortion blade design assures positive contact. Perfect for rack and fixture cabling. You can order Standard 40, 60, 80 and 100-pin assemblies with metal covers from stock . . . or North's versatile 300-pin Program Plug, designed for interconnection of pre-wired logic, programs or systems.

SPECIFICATIONS:

Dielectric Strength—Measured between conducting parts and frame, breakdown to voltage is in excess of 2000 volts R.M.S. when measured for one minute at sea level.

Contact Resistance—Measured between soldering points, average resistance is 14 milliohms (silver) 7 milliohms (gold), measured with an open circuit voltage of .100 volts and a short circuit current of .100 amperes D.C.

Contact Rating—The current rate is three (3) amperes. When several adjacent contacts are required to carry the same maximum load, current rating should be reduced two (2) amperes per contact.

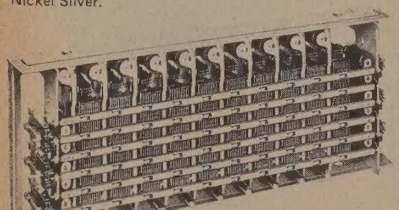
Mechanical Life—Standard connector unit withstands 4000 plug-in operations with negligible mechanical wear.

Finish—Where practical, zinc plate, chromate treated to MIL-F-14072, is used to ensure maximum resistance to corrosion.

Contact Pressure—250 grams (average).

Retention Force—50 grams per individual contact (approx.).

Terminals—Available with solder to taper tab terminals in mill-tinned Nickel Silver or Gold Plated Nickel Silver.



North Electric manufactures 600 point and 1200 point crossbar switches which provide today's most economical approach to maximum range switching. The North Standard Crossbar Switch features telephone-type reliability and your cost is less than 35 cents per contact. These modular components can be ganged or configured in a matrix for special applications, including pre-wiring (if ordered in quantity). Standard 24, 48 and 100 VDC operating voltages. Exceeds 1200 VRMS breakdown to frame or between contacts. Bifurcated springs with silver or gold contacts. Up to ten Form A contacts at each crosspoint. Contact life in excess of 50 million operations. North's famous crossbar switch is ideal for applications in:

- Digital switching with solid state control of crossbar switches
- Data and storage and reduction
- Memory device programming and sequencing
- Digital to analog conversion
- Automatic DC test programming
- Machine tool control and programming
- Voice and broadband communications switching

SPECIFICATIONS:

Size—1200 point crossbar switch measures 1067 cubic inches. **length** 23 inches. **height** 8.674 inches. **width** 5.350 inches. **weight** 29 lbs.

600 point crossbar switch is 14.3 inches long. **width** 5.350 inches. **height** 8.674 inches. **weight** 18 lbs.

Contact Rating—Bank contacts are bifurcated silver or gold which with adequate spark protection, are rated at 100 MA at 48 VDC or 110 VAC. They will provide a life in excess of 50 x 10^6 operations. Off normal contacts are bifurcated silver, rated at 0.4 amperes at 48 VDC or 110 VAC with proper contact protection.

Contact Resistance—Resistance of typical path is less than 50 milliohms for silver or gold contacts.

Mechanical Life—Greater than 25 million on each of the select units, and in excess of 10 million on each hold armature.

Terminals—Can accommodate 2 No. A.W.G. or. 4 No. 24 A.W.G. on spring sets and 4 No. 24 A.W.G. on off-normal. Terminals will also accept AMP Faston No. 110 connector or equivalent.

Timing—Typical operate and release times.

operate of select bar	—15 MS
delay required for damping	—15 MS
operate of hold bar	—15 MS
total operate time is	—45 MS
release time of select bar is	— 8 MS

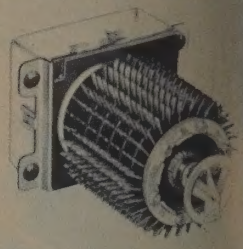
delay time required before operation of new cycle is 30 MS, therefore, a complete typical cycle time is approximately 83 MS.

Dielectric Strength—Form A contacts 1200 V RMS conductor to frame and between conductors.

Form B and C contacts 1000 V RMS conductor to frame and between conductors.

Measured for one minute at sea level.

Coil Data—Select and hold magnet coils are available for operation on 24, 48 and 100 volts D.C. Hold magnets require approximately 12 watts to operate and 1.5 watts per coil to hold.



North engineering has developed a R ary Stepping Switch that has virtually eli nat wear-out. New, longer wearing prec s metal parts and bifurcated contact w r blades minimize wear and adjustmer problems. You can expect a minimu of 30 million operations.

Should service ever be necessary, rota assembly is removable by hand (no to s necessary). Choice of 2, 4 or 6 levels 30 points per level with single wiper 4, 8 or 12 levels, 15 points per level with ubl wiper. All coil resistances available. on-bridging contacts rated at 1 amp at re .2 amp non-inductive load when step g. Gold or silver contacts, solder or tape ab terminals. Off-normal contacts and s pin mechanism are enclosed for environm tal protection. Contact Position Indicat at both front and rear of switch. The pe ect switch for wire and circuit testing, sca ing communications switching, programm g and numerical control sequencing.

SPECIFICATIONS:

Dielectric Strength—Measured for one minute sea level between conducting parts and ground frame breakdown voltage is in excess of 750 v R.M.S.

Contact Resistance—Measured between termin with a short circuit current of 1 amp and open cuit voltage of 6 volts is less than 50 milliohms

Contact Rating—standard—silver plated bank c tacts with nickel silver wipers, rated one amp a rest; .05 amp non-inductive load when stepping .05 inductive load with adequate spark suppres n. **optional**—gold plated bank contacts and wipers which should be specified for low level switchi **Off**—normal contacts—bifurcated springs with g alloy contacts rated at .4 amp non-inductive. **interrupter contacts**—(Form B only) tungsten c tacts rated at 2.5 amps non-inductive.

Mechanical Life—Is greater than 3 million opera tions between lubrication and maintenance per s.

Finish—Where practical, zinc plate, chromate treated to MIL-F-14072, is used to ensure maxi mum resistance to corrosion.

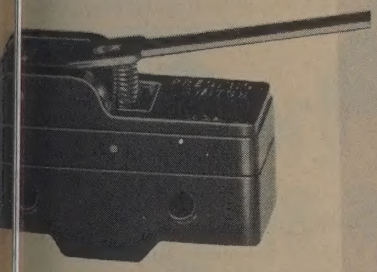
As is true with all North components, ou get maximum performance at minimu cos Write or call North for complete data engineering assistance on Relays, Switc s, Connectors, Magnetic Components, Cus m Engineered and Standard Power Conve on Systems. Call direct **419/468-8279.**

NORTH ELECTRIC Electronetics Division / Galion, Ohio 44833 / A subsidiary of United Utilities Inc

NAP ACTION - PRECISION SWITCHES

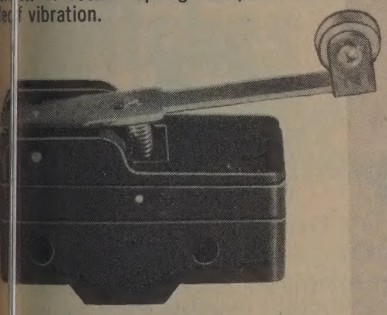
T ROLLER LEVER A-25LR6-1

sir r to A-25LR5. The actuator is rte r more compact design and faster ea lity.



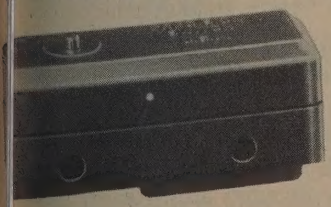
RIGID LEVER A-25L2-1

a low operating force and long el. A return spring dampens the f vibration.



ROLLER LEVER A-25LR5-1

gned for operations requiring rolling t with the actuating means, as well ng overtravel and low operating . A return spring is provided to n the effect of vibration.



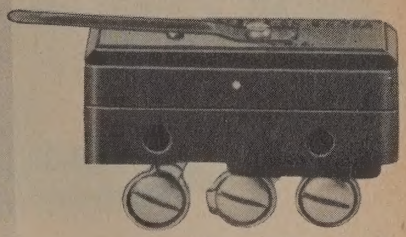
PIN PLUNGER A-2

signed for applications involving limit- notion and very accurate operating cteristics.

The Basic Switches are a precision snap-acting mechanism enclosed in an accurately molded plastic case. Switches are carefully manufactured and quality tested to exacting tolerances. They are known for their compactness, light-weight, excellent repeatability, long life and sensitivity. Precision Switch offers a complete selection of standard size basic switches for general and special applications with a wide choice of circuitry, terminals, electrical ratings, actuators and operating characteristics.

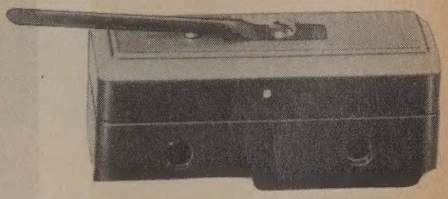
Featuring closely held tolerances between cover and case, molded terminals, enclosed mounting holes and moisture resisting plastics all protect the Precision Switching Mechanism. Sealed Switches can be provided for applications where switches are exposed to excessive moisture, oil and dust conditions. Contact our Engineering Department for special configurations to meet your special requirements.

ALL (6) SWITCHES HERE ARE UL + CSA LISTED @ 15 AMPS, 125, 250 or 480 VAC.



FLEXIBLE LEAF WITH SIDE FACING TERMINALS A-2L-4

permits lower operating forces and greater actuating movement than plunger actuated switches. Overtravel is limited to 1/16".



FLEXIBLE LEAF A-2L

permits low operating forces and greater actuating movement than plunger actuated switches. Overtravel is limited to 1/16".

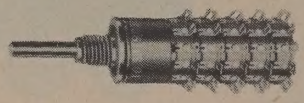
CATALOG ON REQUEST.

Precision Switch Corporation

181 Westchester Avenue, Port Chester, New York 10573 • Tel: 914-937-5247

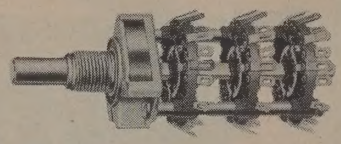
OAK'S TINY .300" DIAM. TEN POSITION SWITCH

. . . this microminiature performs like a giant, at 23,000 G's with vibration conforming to MIL-S-3786.



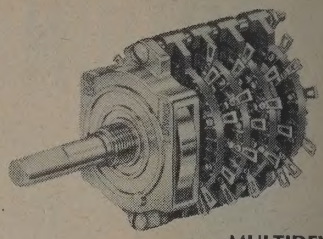
SUBMINIATURE ½" SWITCH

. . . also provides superior insulation and dimensional stability—even under severe environments, where small size is essential.



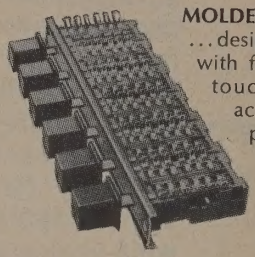
AND THE 1" ACORN SWITCH

. . . an engineered combination of molded diallyl phthalate stators and Oak's exclusive Unidex™ indexing.



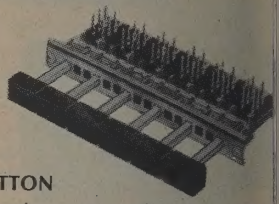
MULTIDEX® ROTARIE

. . . these universal rotary switches will put a lot of th older and bigger ones out of business. They're smalle more economical and still offer all of the features an options of expensive custom-made OEM switche What's more, they cut engineering design expenses.



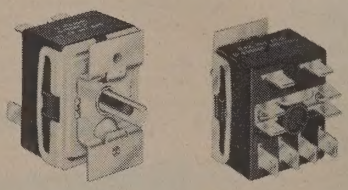
MOLDED PB'S

. . . designed especially for compute with fast response, short stroke, ligh touch. High reliability, optiona actions, individual lighting option pre-wired assemblies.



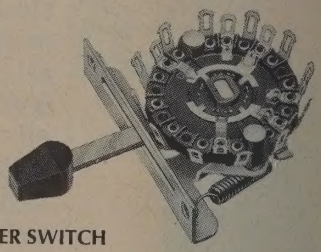
ECONO-LINE™ PUSHBUTTON

. . . less than 25¢ a button for most applications. More switching and contacts in less space. Direct pane mounting; rugged "U" shaped frame.



HEAVY-DUTY SWITCHES

. . . U.L. approved. For appliances, air conditioners, ranges, medical and lab equipment, ovens, etc. Three-wire or two, up to 35 amps., 240 volts and 250°F. Many positions, SP or DP.



NEW LEVER SWITCH

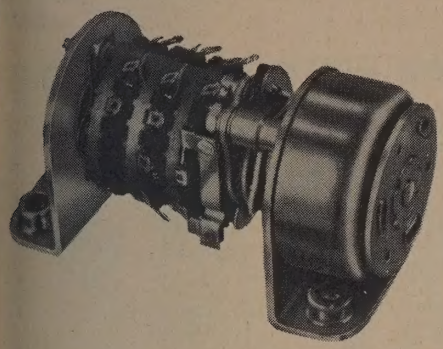
Oak's #184 lever switch gives you versatile miniaturization, with molded diallyl phthalate stator for improved dielectric properties and more clips. Many options available.

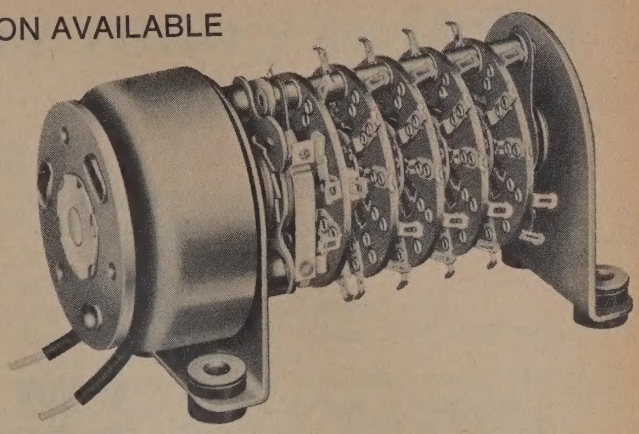
Oak Engineered Custom OEM Switches

Oak offers you the broadest line of custom OEM switches available . . . engineered to give you the best switch that can be assembled to meet your design problems. Here are the customized variables—tailored to your needs: Insulations include phenolic, silicone-glass, ceramic, Mycalex, Kel-F and diallyl phthalate. Temperature ranges from Standard Commercial (−25° to +85°C.) to Military (−65° to +85°C.) Contacts are Oak-pioneered double-wiping to provide self-cleaning, long life. Five choices fit each application best, shorting and non-shorting, rated from 10,000 to 200,000 cycles. Finishes are Standard Commercial, 50- or 200-hour salt spray. Electrically, these switches break 1 amp. @ 28 vdc or 0.5 amp. @ 110 vac.

OAK HAS MORE SWITCHES THAT MEET MIL-S-3786 (latest issue) THAN ALL OTHERS COMBINED

WIDE SELECTION AVAILABLE





SUBMINIATURE TO **EXTRA HEAVY-DUTY**

for use where space and weight of components are prime importance such as aerospace use. Small, but gged and dependable at only 3.8 oz. weight. (as own)

. . . produces high torque capable of driving standard switch sections (stepping switches) plus other external loads. Available in foot or flange mounting.

Oak Rotary Solenoids and Stepping Switches

Compact, rugged, reliable for remote actuation

Oak Solenoids are compact and lightweight as compared to the high actuating torques and flexibility they provide for remote switching. Virtually solid metal, their low residual flux means fast response and most efficient conversion of electrical to mechanical energy. Armature is supported by three ball bearings in inclined races to provide stable mechanical balance. Thus axial thrust from the energized solenoid coil is converted into rotary thrust with negligible friction.

Typical uses: master-slave circuits, sequential timing circuits, counting applications.

Our engineers will help you design them into missiles, satellites, machine tools, scoreboards, computers, communications equipment and many other applications. Hermetically-sealed assemblies made to order for service in extremely adverse environments.

SUB-ASSEMBLY SERVICE . . .
time-saving, money-saving

Ease the load on your production facilities by letting Oak fabricate your rotary solenoid and switch subassemblies. These can be completely mounted and/or pre-wired. Components or leads can be added, plugs and sockets incorporated . . . all to your specs. These package units simplify assembly and maintenance. Let Oak engineers smooth out your production operations and save you time and money at the same time.

Immediate action

Oak distributors stock the broadest switch line available. Hundreds of rotary, pushbutton, lever and slide switches! All immediately available from your closest Oak distributor. Every switch has Oak-pioneered double-wiping contacts—self-cleaning, longer lasting; brass, silver-plated with additional gold plating. Widest choice of insulations. Electrical rating: break 1 amp. at 28 vdc, or 0.5 amp. at 110 vac, resistive; carry 5 amps; slide switches rated 3 amps. Write for catalog for complete information, then get your choice fast from your Oak Distributor.

OAK MANUFACTURING CO.
A Division of OAK ELECTRO/NETICS CORP
Dept. EL, Crystal Lake, Illinois 60014
PHONE: 815-459-5000 TWX: 910-634-3353

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

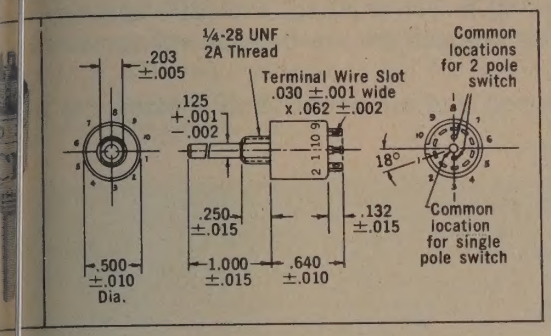
in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

RCL *miniature rotary switches*

ERIES "F" 10-POSITION SWITCHES



½" MAXIMUM DIAMETER

This new subminiature rotary switch has been designed to offer the features of larger switches in a fraction of the space formerly required.

SPECIFICATIONS:

Contact Resistance: 10 milliohms maximum initial.

Insulation Resistance: 50,000 megohms initial; 10,000 megohms min. between mutually insulated parts.

Voltage Breakdown: 600 VAC min. between mutually insulated parts.

Electrical Rating: Will make and break 50 milliamperes: 115 VAC for 25,000 cycles or 200 milliamperes 115 VAC for 10,000 cycles.

Contacts: Shorting or non-shorting contacts.

Deck and Terminal Arrangement: Available only in one deck with terminals projecting from rear of switch.

Shaft Length, Flat and Orientation: Available in accordance with individual requirements.

Materials and Finishes: In accordance with applicable MIL specs.

Contact Terminals: Solid silver alloy gold plated. Will accept Two #22 AWG wires.

Common: Terminal brass gold plated.

Wipers: Solid silver alloy.

Environmental requirements: Meets or exceeds MIL-S-3786-C. Explosion proof per paragraph 4.8.12 of MIL-S-3786C.

DUCT NOTE

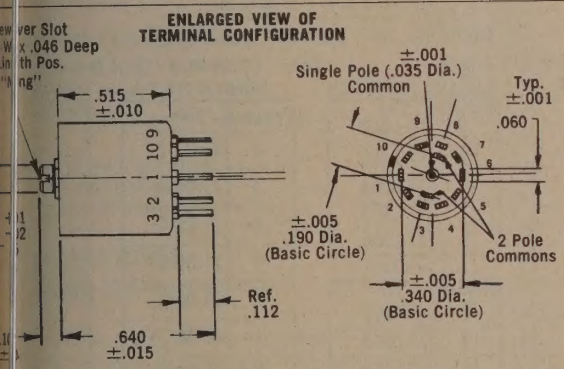
NOW AVAILABLE

SERIES "G" 6-POSITION SWITCHES

ns are the same as RCL's "F" series, but with 60° throw orting only. Up to 1 pole-6 position, or 2 pole-3 position.

e with standard solder lugs or printed circuit terminals.

ERIES "F" SWITCH WITH PRINTED CIRCUIT TERMINALS



IDEAL FOR PRINTED CIRCUIT MOUNTING

- **P.C. CONTACT TERMINAL .020 (±.001) WIDE x .020 (±.001) THICK.**
- **SINGLE POLE P.C. COMMON TERMINAL .035 ±.001 DIA.**
- **BASIC CONTACT CIRCLE .340 DIA. ±.005.**
- **BASIC COMMON CIRCLE .190 DIA. ±.005 (for multi-pole).**

△ **Shortened bushing and shaft stick out for low profile printed circuit board mounting as shown is standard. This will be automatically supplied when "PCA" is specified.**

△ **All terminals will remain uncut regardless of switch positions ordered, to facilitate firm anchoring to P.C. board.**

ES "F" SINGLE DECK — 36° BETWEEN POSITIONS

SHORTING

NGLE POLE

ns	Type
	11-FM-2
	11-FM-3
	11-FM-4
	11-FM-5
	11-FM-6
	11-FM-7
	11-FM-8
	11-FM-9
	11-FM-10
	11-FM-10-CR

2 POLES

Positions	Type
2	12-FM-2
3	12-FM-3
4	12-FM-4
5	12-FM-5

(*continuous rotation)

NON-SHORTING

SINGLE POLE

Positions	Type
2	11-FB-2
3	11-FB-3
4	11-FB-4
5	11-FB-5
6	11-FB-6
7	11-FB-7
8	11-FB-8
9	11-FB-9
10	11-FB-10
*10	11-FB-10-CR

2 POLES

Positions	Type
2	12-FB-2
3	12-FB-3
4	12-FB-4
5	12-FB-5

(*continuous rotation)

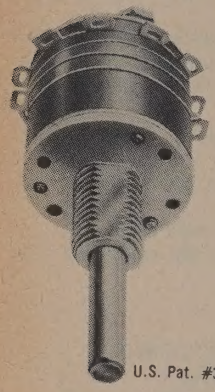
NG INFORMATION:
△ To indicate printed circuit terminals with shortened bushing and shaft stick-out as above, use suffix "PCA."
△ To indicate printed circuit terminals with long shaft and bushing as shown on preceding pages, use suffix "PC."
△ Shaft and panel seals may be specified by using Prefix "S."

RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-999-5511

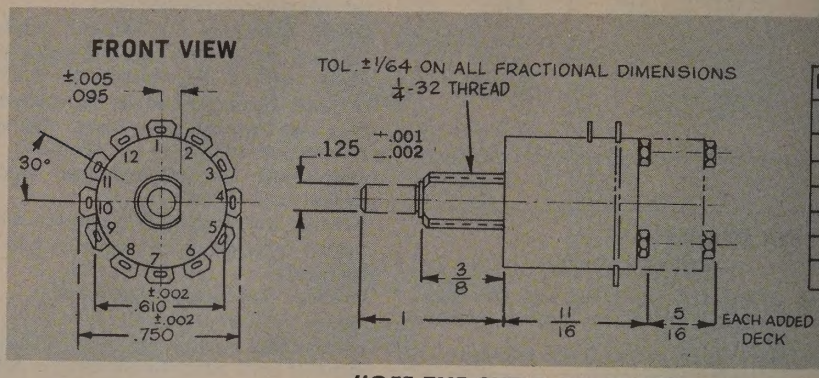
RCL *miniature rotary switches*

SERIES "C"

- Up to 12 active positions per deck shorting **or** non-shorting, with 30° spacing.
- Shorting **AND** non-shorting poles may be grouped on one deck in any combinatio
- As many as 6 poles per deck.
- All individual deck parts are self-contained, and are permanently molded into pla
- Available with adjustable stops.



U.S. Pat. #3352979



POLE (Common) L	AT
POLES	AT TE
1	1
2	1,
3	1, 5
4	1, 4, 7
5	1, 3, 5
6	1, 3, 5, 7,

"OFF-THE-SHELF DELIVERY"

ELECTRICAL FEATURES

1. Initial contact resistance — .010Ω max.
2. Current carrying capacity — 5.5 amps.
3. Current breaking capacities
   ¼ amp — 115 V.A.C. resistive
   ¼ amp — 28 V.D.C. resistive
   ⅛ amp — 28 V.D.C. inductive.
4. Dielectric strength (voltage breakdown) —
   a. between any two adjacent positions — 800 v RMs (60 cycles).
   b. between any active position to ground 1500 V (60 cycles).
5. Insulation resistance (measured at 25°C, 50% RH at sea level) — 10^5 megohms.
6. Thermal EMF — 1 microvolt/°C maximum.
7. Capacitance — between adjacent active contacts .5 MMFD Max.
8. Capacitance — between contact and common terminal .9 PFD Max.

MECHANICAL FEATURES

1. Life expectancy — 200,000 mechanical operations.
2. Detent — positive stainless steel roller-type detent snaps from position to position. Detent housing made of special high-strength plastic, providing positive action and minimal wear.
3. Stop strength — Designed to withstand 10 inch-lbs. rotational force.
4. "Molded in" terminals give exceptional terminal strength.
5. Terminal locations clearly marked on rear cover plate.
6. "Wrap-around" turret-type solder lugs are integral with individual contacts.
7. On any one deck of a multi-pole switch, a variety of combinations of shorting (MBB) and non-shorting (BBM) actions may be obtained.
8. Materials and finishes:
   Rotor — Lexan
   Rotor blade — Beryllium copper (gold plated)
   Contacts & solder terminals — solid silver alloy
   Housing — Diallyl Phthalate
   Stator — Diallyl Phthalate
   Shaft — stainless steel
   All brass parts nickel plated
9. One piece contact terminal construction has holes large enough to accept two #22 AWG wires.
10. Shaft and panel seal may be specified by using prefix "S" before switch type numbers.
11. Explosion proof per paragraph 4, p. 12 of MIL-S-3786C.

SINGLE DECK

Spacing: 30° between positions

SHORTING

SINGLE POLE

Positions	Type
2	11-CM-2
3	11-CM-3
4	11-CM-4
5	11-CM-5
6	11-CM-6
7	11-CM-7
8	11-CM-8
9	11-CM-9
10	11-CM-10
11	11-CM-11
12	11-CM-12 (with stops)

2 POLES PER DECK

Positions	Type
2	12-CM-2
3	12-CM-3
4	12-CM-4
5	12-CM-5
6	12-CM-6

3 POLES

Positions	Type
2	13-CM-2
3	13-CM-3
4	13-CM-4

4 POLES

Positions	Type
2	14-CM-2
3	14-CM-3

5 POLES

Positions	Type
2	15-CM-2

6 POLES

Positions	Type
2	16-CM-2

NON-SHORTIN

SINGLE POLE

Positions	Type
2	11-CB-2
3	11-CB-3
4	11-CB-4
5	11-CB-5
6	11-CB-6
7	11-CB-7
8	11-CB-8
9	11-CB-9
10	11-CB-10
11	11-CB-11
12	11-CB-12 (with stops)

2 POLES ER

Positions	ype
2	1CB-
3	1CB-
4	1CB-
5	1CB-
6	1CB-

3 POLES ER

Positions	ype
2	1CB-
3	1CB-
4	1CB-

4 POLES R

Positions	ype
2	1CB-
3	1CB-

5 POLES ER

Positions	pe
2	15B-2

6 POLES R

Positions	e
2	16B-2

MULTI-DECK SWITCHES UP TO 9 DECKS AVAI

For multi-deck version of these switches, indicate number of decks as follows. Merely change first number of coding as shown:

Number of decks	
One deck	1 1-CB-4
Two decks	2 1-CB-4
Three decks	3 1-CB-4

*"M" = Shorting action (MBB)
"B" = Non-shorting action (BBM)
* Supplied unless otherwise specified.

Code: 2 6—CM—2

- Pos pol
- sho
- Series
- poles pe
- number of

e.g. this is 2 decks, 6 poles per de, S "C" shorting action, 2 positions pe pol

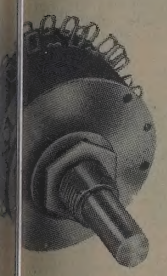
RCL ELECTRONICS, INC.

General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-99

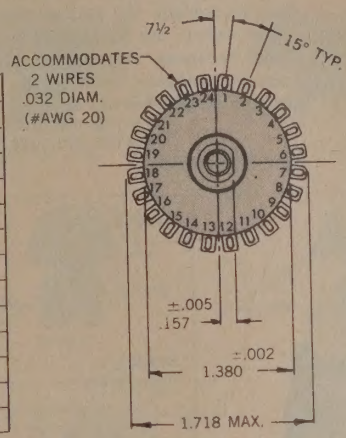
RCL *miniature rotary switches*

SERIES "E" 1⅜" BODY DIAMETER

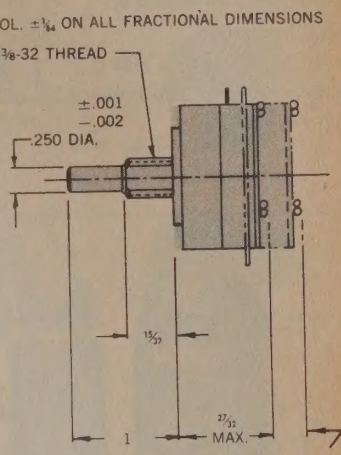
- t the same level as open frame or wafer switches
- the exacting specifications of most "instrument type" switches
- cost ($1.96 each in quantities of 1,000)
- 4 active positions per deck, **shorting or non-shorting**, and up to 12 poles per deck
- ll applicable requirements of Mil S-3786-C
- le with concentric shaft
- le with adjustable stops



Poles	Pole (Common) Location At Term. #
1	1
2	1, 13
3	1, 9, 17
4	1, 7, 13, 19
5	1, 5, 9, 13, 17
6	1, 5, 9, 13, 17, 21
7	1, 3, 5, 7, 9, 11
8	1, 3, 5, 7, 9, 11, 13
9	1, 3, 5, 7, 9, 11, 13, 15
10	1, 3, 5, 7, 9, 11, 13, 15, 17
11	1, 3, 5, 7, 9, 11, 13, 15, 17, 19
12	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21



FRONT VIEW



CAL FEATURES

- resistance: .010 ohms max. initial
- carrying capacity: 10 amps
- breaking capacity (rated load at
  - ps — 115 VAC Resistive
  - p — 28 VDC Resistive
  - ps — 28 VDC Inductive

ICAL FEATURES

- pectancy: 200,000 mechanical ons.
- nal Torque: 20 to 80 ounce-inches ing on number of poles per deck and r of decks.
- trength: 15 pound-inches.
- terminals will accept two .032 diam. #20) wires.
- ed-in" terminals result in exceptionally ontact stability, completely eliminating nent.
- and Panel Seals may be specified by Prefix "S" before Switch Type Numbers.
- sion Proof per paragraph 4.8.12 of 3786B.
- t: 1 Deck Switch 1.75 oz. For each onal deck add .500 oz.

SINGLE DECK

SINGLE POLE

Positions	Shorting Type	Non-Shorting Type
2	11-EM-2	11-EB-2
3	11-EM-3	11-EB-3
4	11-EM-4	11-EB-4
5	11-EM-5	11-EB-5
6	11-EM-6	11-EB-6
7	11-EM-7	11-EB-7
8	11-EM-8	11-EB-8
9	11-EM-9	11-EB-9
10	11-EM-10	11-EB-10
11	11-EM-11	11-EB-11
12	11-EM-12	11-EB-12
13	11-EM-13	11-EB-13
14	11-EM-14	11-EB-14
15	11-EM-15	11-EB-15
16	11-EM-16	11-EB-16
17	11-EM-17	11-EB-17
18	11-EM-18	11-EB-18
19	11-EM-19	11-EB-19
20	11-EM-20	11-EB-20
21	11-EM-21	11-EB-21
22	11-EM-22	11-EB-22
23	11-EM-23	11-EB-23
24	11-EM-24	11-EB-24
*24	11-EM-24CR Continuous Rotation	11-EB-24CR Continuous Rotation

SPACING 15° BETWEEN POSITIONS

2 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	12-EM-2	12-EB-2
3	12-EM-3	12-EB-3
4	12-EM-4	12-EB-4
5	12-EM-5	12-EB-5
6	12-EM-6	12-EB-6
7	12-EM-7	12-EB-7
8	12-EM-8	12-EB-8
9	12-EM-9	12-EB-9
10	12-EM-10	12-EB-10
11	12-EM-11	12-EB-11
12	12-EM-12	12-EB-12

3 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	13-EM-2	13-EB-2
3	13-EM-3	13-EB-3
4	13-EM-4	13-EB-4
5	13-EM-5	13-EB-5
6	13-EM-6	13-EB-6
7	13-EM-7	13-EB-7
8	13-EM-8	13-EB-8

4 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	14-EM-2	14-EB-2
3	14-EM-3	14-EB-3
4	14-EM-4	14-EB-4
5	14-EM-5	14-EB-5
6	14-EM-6	14-EB-6

5 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	15-EM-2	15-EB-2
3	15-EM-3	15-EB-3
4	15-EM-4	15-EB-4

6 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	16-EM-2	16-EB-2
3	16-EM-3	16-EB-3
4	16-EM-4	16-EB-4

7 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	17-EM-2	17-EB-2
3	17-EM-3	17-EB-3

8 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	18-EM-2	18-EB-2
3	18-EM-3	18-EB-3

9 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	19-EM-2	19-EB-2

10 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	1-10-EM-2	1-10-EB-2

11 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	1-11-EM-2	1-11-EB-2

12 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	1-12-EM-2	1-12-EB-2

ALTHOUGH ONLY 1 DECK IS SHOWN FOR ILLUSTRATIVE PURPOSES, UP TO 9 DECKS ARE AVAILABLE.

RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 TWX 710-999-5511

GEORGE RISK INDUSTRIES

Dry Reed Type PUSH BUTTON SWITCHES

FEATURES

- Magnetic dry reed type
- Hermetically sealed contacts
- P.C. board mount
- Dry circuits through .5 amps
- High reliability through millions of operations

ELECTRICAL SPECIFICATIONS

Contact Rating:
— Non-illuminated .5 amps, 125 volts, 10 watts; illuminated .250 amps, 125 volts, 3 watts

Dielectric Strength: 500 VAC, terminals to case

Contact Bounce: 500 microseconds max.

Contact Resistance: 200 milliohms max.

Insulation Resistance: 100 Megohms

Life Expectancy: 20 million operations at full load
50 million operations at half load
(Resistive load at 28 VDC)

Each Pole Isolated

MECHANICAL SPECIFICATIONS

Internal Atmosphere: Inert gas

Mounting Position: Any plane

Internal Terminal Construction: Welded

Terminal to Case Insulation: Noryl

Switch Case: Noryl

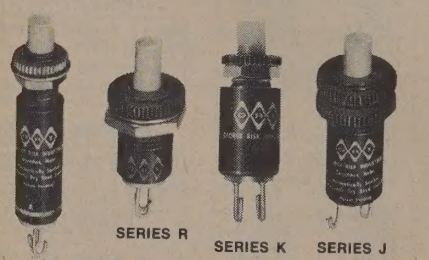
External Switch Terminals: "A" Nickel All weldable or solderable

Mounting Stud: 2-56 stainless steel (base switc

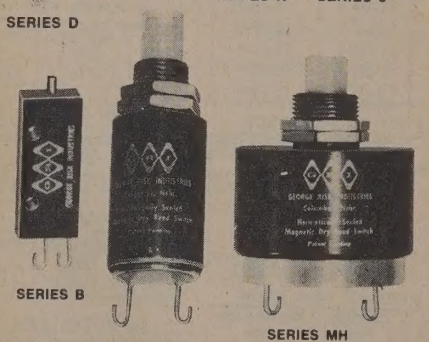
Identification: Switches printed with mode umb contact rating, schematic diagram, swi fo

Pre-Travel ..... .062 min. (.157)
Differential Travel ..... .062 max. (.157)
Total Travel ..... .187 ±.010 (.47 ±.02

SERIES T SERIES W SERIES G



SERIES D SERIES R SERIES K SERIES J



SERIES B SERIES MV SERIES MH

LENGTH OF ALL TERMINALS .300" MAX.

SERIES	Mfg. Type*	Switch Form	Resistive Current	Resistive Watts	Volts	Dimensions L D
SERIES T Momentary Action	TI-HA4	4PST-NO	3	50	125	1.75 390
	TI-HB4	4PST-NC	3	50	125	
	TI-HA3	3PST-NO	3	50	125	
	TI-HB3	3PST-NC	3	50	125	
	TI HA2	2PST-NO	3	50	125	
	TI-HB2	2PST-NC	3	50	125	
	TE-HA4	4PST-NO	1	15	125	
	TE-HB4	4PST-NC	1	15	125	
	TE-HA3	3PST-NO	1	15	125	
	TE-HB3	3PST-NC	1	15	125	
	TE-HA2	2PST-NO	1	15	125	
	TE-HB2	2PST-NC	1	15	125	
	TB-HC4	4PDT Break-Make	.250	10	125	
	TB-HC3	3PDT Break-Make	.250	10	125	
	TB-HC2	2PDT Break-Make	.250	10	125	
SERIES W Momentary Action	WI-HA	SPST-NO	3	50	125	1.75 125
	WI-HB	SPST-NC	3	50	125	
	WE-HA	SPST-NO	1	15	125	
	WE-HB	SPST-NC	1	15	125	
	WB-HC	SPDT Break-Make	.250	10	125	
SERIES G Momentary Action	GC-HA4	4PST-NO	.5	12	125	.975 25
	GC-HB4	4PST-NC	.5	12	125	
	GC-HA3	3PST-NO	.5	12	125	
	GC-HB3	3PST-NC	.5	12	125	
	GC-HA2	DPST-NO	.5	12	125	
	GC-HB2	DPST-NC	.5	12	125	
	GC-HA	SPST-NO	.5	12	125	
	GC-HB	SPST-NC	.5	12	125	
	GB-HC2	DPDT Break-Make	.250	4	125	
	GB-HC	SPDT Break-Make	.250	4	125	
SERIES D Momentary Action	DC-HA	SPST-NO	.5	12	125	.850 30
	DC-HB	SPST-NC	.5	12	125	
	DB-HC	SPDT Break-Make	.250	3	125	
SERIES R Momentary Action	RB-HA	SPST-NO	.250	3	125	.625 75
	RB-HB	SPST-NC	.250	3	125	
	RB-HC	SPDT Break-Make	.250	3	125	
SERIES K Momentary Action	KB-HA	SPST-NO	.250	3	125	.750 00
	KB-HB	SPST-NC	.250	3	125	
	KB-HC	SPDT Break-Make	.250	3	125	
SERIES J Momentary Action	JC-HA	SPST-NO	.5	12	125	1.0 x 75
	JC-HB	SPST-NC	.5	12	125	
	JB-HC	SPDT Break-Make	.250	3	125	
SERIES B Momentary Action	BC-HA	SPST-NO	.5	12	125	1" L x W .170 ck
	BC-HB	SPST-NC	.5	12	125	
SERIES MV Mercury-Wetted Reed Momentary Action	MVI-HA	SPST-NO	3	50	125	.975 x 25
	MVI-HB	SPST-NC	3	50	125	
SERIES MH Mercury-Wetted Reed Momentary Action	MHI-HA	SPST-NO	3	50	125	.750 x 25

***NOTE:** Series R, K, J, available with 15 oz. operating force only. All other Manufacturing Types listed are for 8 oz. Button operating force of 17 grams can be supplied, if needed. To specify, change letter "H" in "Mfg. Type" to "F". (Example: TI-HA4 to TI-FA4.)

BUTTONS & ACCESSORIES

Information on a complete range of button accessories (Delrin and Aluminum) can be obtained by contacting the factory. Colors available for standard buttons and accessories include: white, red, black, green, blue. Illuminated buttons also available.

NO-BOUNCE SWITCHES

GRI now offers mercury-wetted reed switches no- mentary). Contact Bounce—none. Maximum co act resistance 50 milliohms after 10 million opera ns at full load. Mounting Position — 30° out of ne (horizontal or vertical). Write for full inform on

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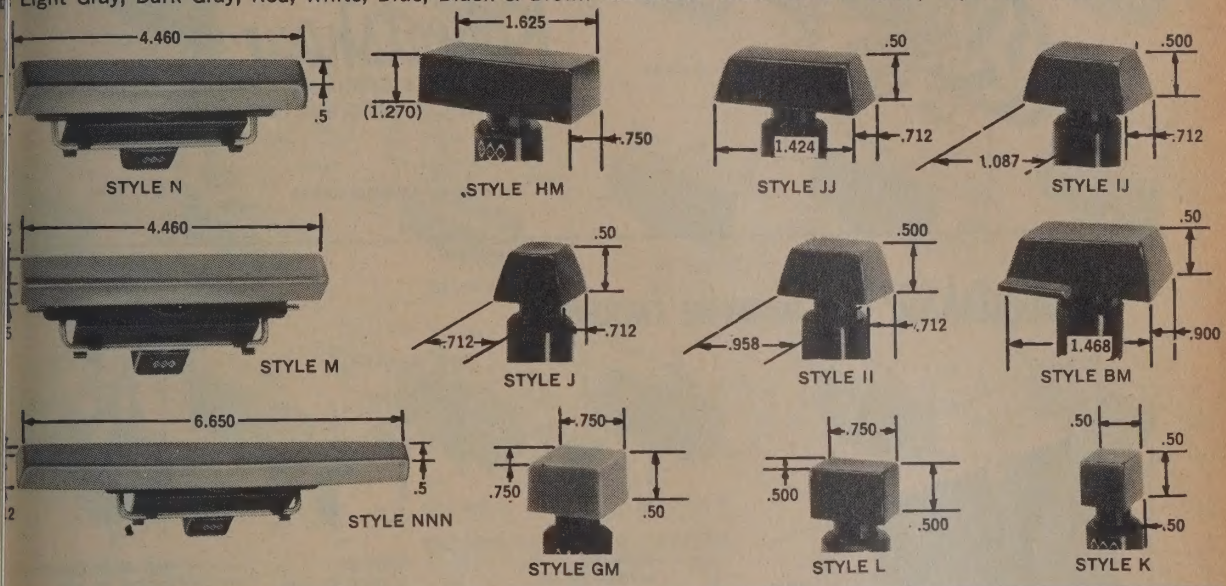
Phone 308-235-4645 • TWX 910-620-9040

GEORGE RISK INDUSTRIES

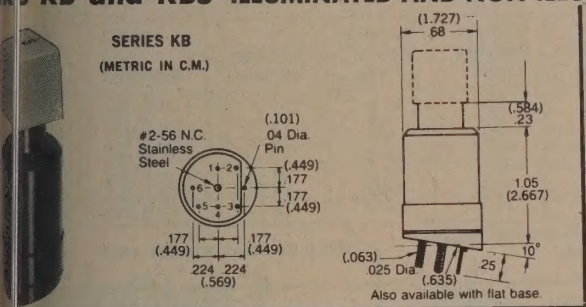
Dry Reed Type PUSH BUTTON SWITCHES

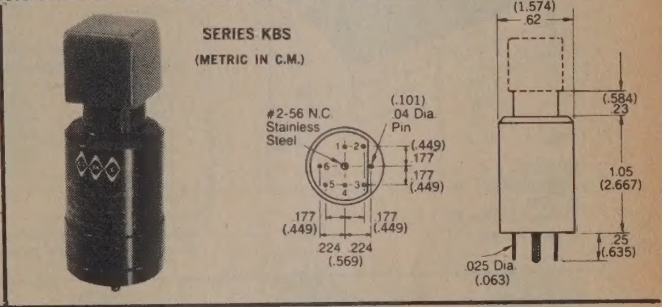
DARD KEY TOP SPECIFICATIONS

Colo Light Gray, Dark Gray, Red, White, Blue, Black & Brown **Materials:** Illuminated = lexan; non-illuminated = ABS



S KB and KBS ILLUMINATED AND NON-ILLUMINATED • HERMETICALLY SEALED





TYPICAL ORDERING PATTERN

(with switch form, key top and lamp specifications)

For Mechanical Specifications, See Top of Facing Page

KB or KBS — XX—XXX—XX.X

or KBS
SPST-NO
SPST-NC
DPST-NO
DPST-NC
SPDT-BM
DPST-NO-NC

KEYTOPS KB	
II	1.960 x .71 x .50
IJ	1.08 x .71 x .50
J	.71 x .71 x .50
JJ	1.460 x .71 x .50
GM	.750 x .750 x .50
HM	1.625 x .75 x .50
K	.50 x .50 x .50
L	.75 x .50 x .50
M	4.50 x .50 x .50
N	4.50 x .71 x .50
NNN	6.650 x .71 x .50
BM	1.460 x 1.087 x .50

Lamp	Voltage
1.35	10.0
2.5	14.0
2.7	18.0
3.0	24.0
6.0	28.0
6.3	—

dering KB series specify whether "flat base" or "slant base" is desired.

Illumination is not evenly dispersed over entire key top due to length. If full illumination is required on BM, HM, and JJ, auxiliary external lamps would be required.

der non-illuminated switches, indicators and key tops, use applicable of the above ordering pattern. For example: KB-01-GM-01. (Non-illum- Series) KB; .75" x .75" x .50" key top.

SERIES 500 KEYBOARDS

Standard Model 573—73 keys
Standard Model 556—56 keys
Standard Model 547—47 keys

O.E.M.'s—Do you need a special keyboard to mount in your own cabinet? If you need only one or thousands, we will customize them for you at low cost. Fast service, too!

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BEE-LINE S.O.S.*

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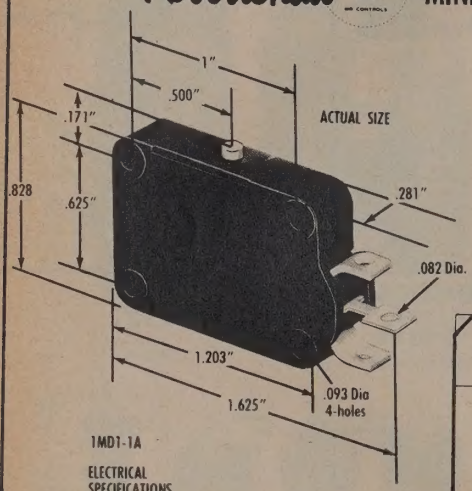
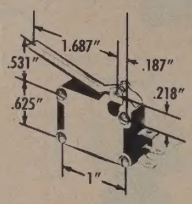
MINIATURE SWITCHES

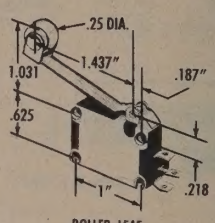


1MD1-1A

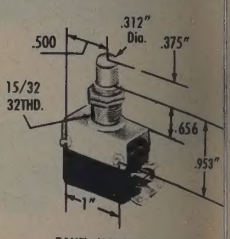
ELECTRICAL SPECIFICATIONS
UL LISTED
10 Amps. 125-250 VAC
5 AMPS 250 VAC



HINGED LEAF ACTUATOR NO. A18



ROLLER LEAF ACTUATOR NO. A18M



PANEL MOUNT PLUNGER ACTUATOR NO. A14

MECHANICAL SPECIFICATIONS

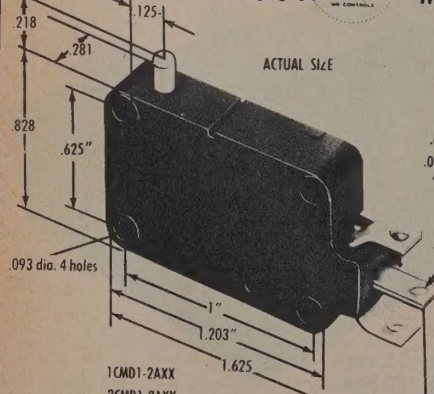
Model No.	Actuator Kit Model No.*	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Overtravel	Maximum Movement Differential
1MD1-1A	—	6 oz.	1.5 oz.	1/32 in.	.025 in. Max.	.007
1MD1-1A	A18	2 oz.	.5 oz.	5/32 in.	1/16 in. Min.	.050
1MD1-1A	A18M	2 oz.	.5 oz.	5/32 in.	1/16 in. Min.	.050
1MD1-1A	A14	12 oz.	3.0 oz.	1/32 in.	7/32 in. Min.	.050
2MD1-1A	—	10 oz.	3.0 oz.	1/32 in.	.025 in. Max.	.007
2MD3-1A	—	10 oz.	3.0 oz.	1/32 in.	.025 in. Max.	.015
3MD3-1A	—	16 oz.	4.0 oz.	1/32 in.	.025 in. Max.	.015

* Switch and actuator are ordered and shipped separately.
All switches have solder terminals.

ORDER BY MODEL NUMBER ONLY

Robertshaw

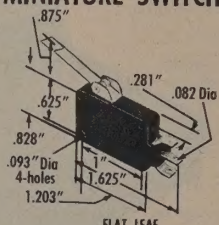
MINIATURE SWITCHES (LIGHT OPERATING FORCE)



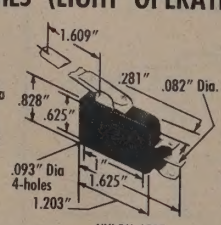
1CMD1-2AXX
2CMD1-2AXX
3CMD1-2AXX

ELECTRICAL SPECIFICATIONS
3 Amp. 125-250 VAC
3 Amp. 28VDC

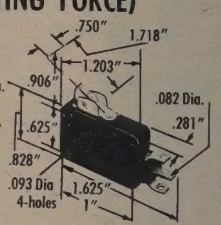
U.L. LISTING
3 Amp. 125-250 VAC



FLAT LEAF ACTUATOR
1CMD1-2AXX-A24
2CMD1-2AXX-A24



NYLON LEAF ACTUATOR
1CMD1-18AXX-A27



WIRE LEAF ACTUATOR
1CMD1-2AXX-A22
2CMD1-2AXX-A22

ROLLER LEAF ACTUATOR
1CMD1-1AXX-A

MECHANICAL SPECIFICATIONS

Model No.	Actuator	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Maximum Overtravel	Maximum Movement Differential
1CMD1-2AXX	—	20-27 gms.	12 gms.	.040 in.	.062 in.	.030 i
2CMD1-2AXX	—	33-44 gms.	15 gms.	.040 in.	.062 in.	.030 i
3CMD1-2AXX	—	45-60 gms.	20 gms.	.040 in.	.062 in.	.030 i
1CMD1-1AXX-A23M	Roller Leaf	5-8 ozs.	2 ozs.	.040 in.	.050 in.	.030 i
1CMD1-2AXX-A22	Wire Leaf	2.5 gms.	Above characteristics are not applicable to these switches			.500 i
2CMD1-2AXX-A22	Wire Leaf	4 gms.				.500 i
1CMD1-2AXX-A24	Flat Leaf	2.5 gms.				.500 i
2CMD1-2AXX-A24	Flat Leaf	4 gms.				.500 i
1CMD1-18AXX-A27	Nylon Leaf	6 gms.				.233 i

All switches have solder terminals.

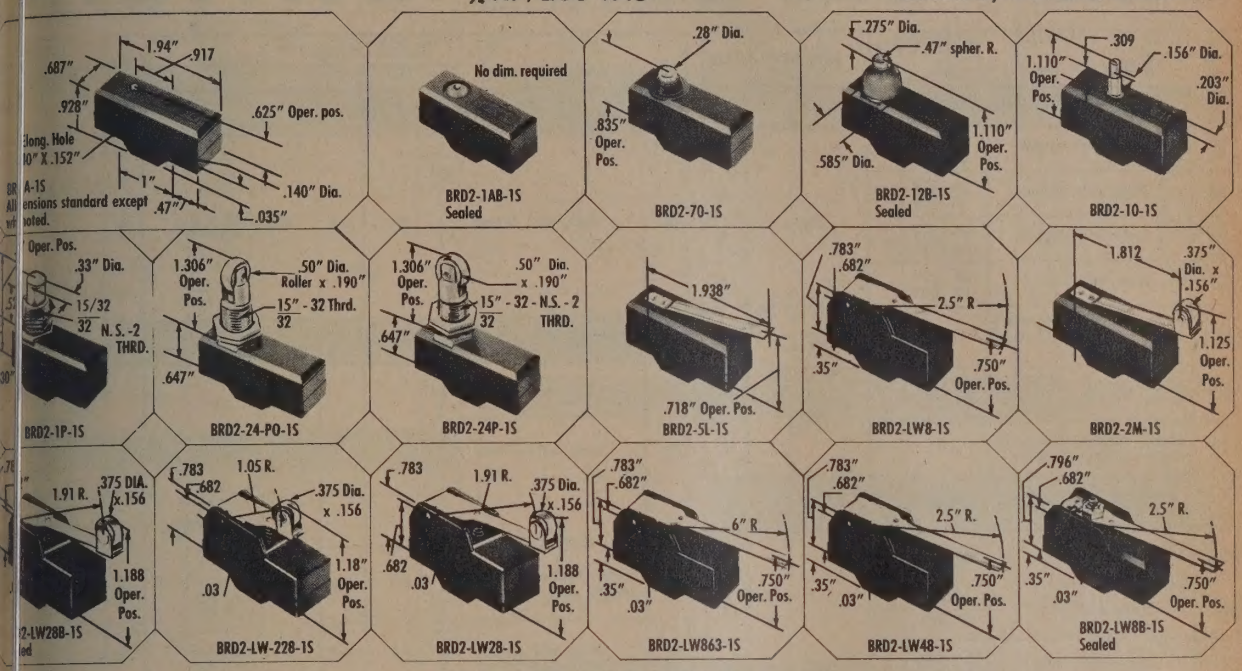
ORDER BY MODEL NUMBER ONLY

Robertshaw BASIC GENERAL PURPOSE SWITCHES

LECTRICAL SPECIFICATIONS

15 Amps, 120-240-480 volts A.C.
⅛ HP, 120 VAC
¼ HP, 250 VAC

½ Amp, 120 VDC
¼ Amp, 240 VDC
Listed by U.L. and C.S.A.



MECHANICAL SPECIFICATIONS

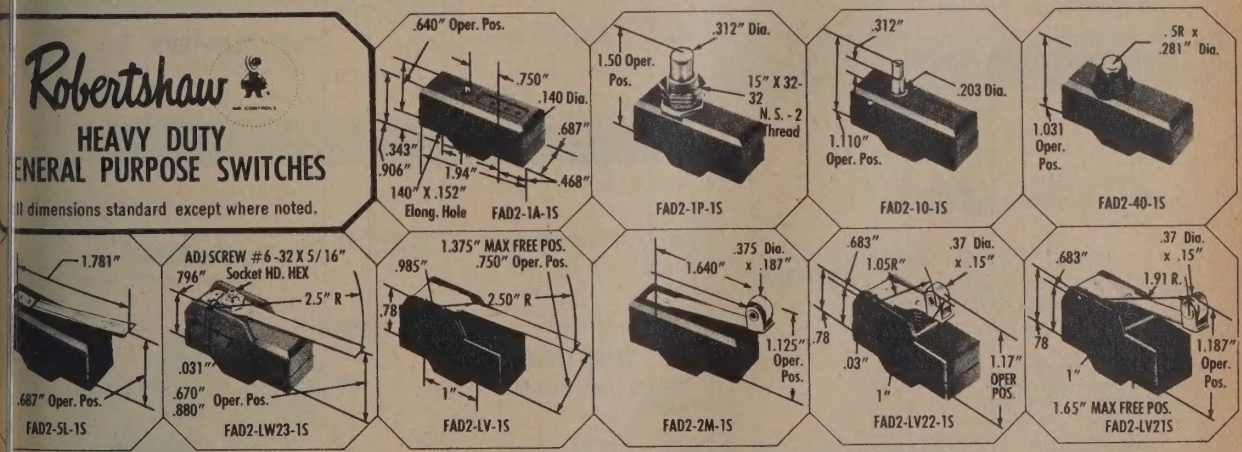
*del No.	Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Movement Differential
1A-1S	9-13 oz.	4 oz.	.020 in. Max.	.005 in.	.0004 to .002 in.
1AB-1S	9-15 oz.	4 oz.	.090 in. Max.	.005 in.	.0004 to .002 in.
1P-1S	9-13 oz.	4 oz.	.010-.025 in.	7/32 in.	.0004 to .002 in.
2M-1S	5 oz. Max.	½ oz.	.156 in. Max.	1/32 in.	.050 in. Max.
5L-1S	5 oz. Max.	½ oz.	.156 in. Max.	1/32 in.	.050 in. Max.
10-1S	9-13 oz.	4 oz.	.010-.025 in.	1/16 in.	.003 in. Max.
12B-1S	13-19 oz.	4 oz.	.005-.095 in.	.062 in.	.003 in. Max.
24P-1S	9-13 oz.	4 oz.	.010-.025 in.	.140 in.	.0004 to .002 in.
24PO-1S	9-13 oz.	4 oz.	.010-.025 in.	.140 in.	.003 in. Max.

*Model No.	Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Movement Differential
BRD2-70-1S	9-13 oz.	4 oz.	.010-.025 in.	1/16 in.	.003 in. Max.
BRD2-LW8-1S	2½ oz. Max.	½ oz.	9/32-13/32 in.	.187 in.	.016-.078 in.
BRD2-LW8B-1S	2½ oz. Max.	½ oz.	.156 in. Max.	.187 in.	.016-.078 in.
BRD2-LW28-1S	3½ oz. Max.	¾ oz.	.125-.281 in.	.156 in.	.012-.062 in.
BRD2-LW28B-1S	3½ oz. Max.	¾ oz.	.125-.281 in.	.156 in.	.012-.062 in.
BRD2-LW48-1S	1 oz. Max.	⅛ oz.	.156-.328 in.	.187 in.	.016-.078 in.
BRD2-LW228-1S	6 oz. Max.	1½ oz.	.045-.140 Min.	.080 in.	.006-.031 in.
BRD2-LW863-1S	1 oz. Max.	⅛ oz.	½-1 in.	½ in.	.187 in. Max.

hes listed have 6-32 x 7/32 Binder Hd. Screw w/cup washer. Switches are also available with solder, or quick disconnect or side facing terminals. **ORDER BY MODEL NUMBER ONLY**

Robertshaw HEAVY DUTY ENERAL PURPOSE SWITCHES

ll dimensions standard except where noted.



MECHANICAL SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

21 Amps 120-240-480 VAC
1 HP, 120 VAC
2 HP, 240 VAC
Listed by U.L. and C.S.A.

Model No.*	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Maximum Movement Differential
FAD2-1A-1S	14-22 oz.	10 oz.	.050 in.	.005 in.	.0075 in.
FAD2-1P-1S	14-22 oz.	10 oz.	.050 in.	.219 in.	.0075 in.
FAD2-10-1S	14-22 oz.	10 oz.	.050 in.	1/16 in.	.0075 in.
FAD2-40-1S	14-22 oz.	10 oz.	.050 in.	3/32 in.	.0075 in.
FAD2-5L-1S	9 oz.	1 oz.	11/32 in.	1/32 in.	.065 in.
FAD2-LW23-1S	2½ oz.	½ oz.	.375 in.	.093 in.	.007-.050 in.
FAD2-LV-1S	2½ oz.	½ oz.	⅝ in.	.078 in.	.109 in.
FAD2-2M-1S	9 oz.	1 oz.	11/32 in.	1/32 in.	.065 in.
FAD2-LV 22-1S	6 oz.	1 oz.	¼ in.	1/32 in.	3/64 in.
FAD2-LV2-1S	2½ oz.	½ oz.	15/32 in.	1/16 in.	.085 in.

ORDER BY MODEL NUMBER ONLY * Switches listed have 6-32 x 7/32 Binder Hd. Screw w/cup washer. Switches are also available with solder or quick disconnect terminals.

STACKPOLE SLIDE SWITCHE

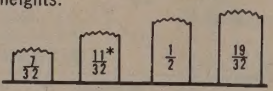
SS-	Action	UL-CSA Listings AC	DC	Schematic	Case
SINGLE POLE-SINGLE THROW					
26	Slide, with detent	4A 125V 2A 250V	1.0		A
36	Slide, with detent	6A 125V 3A 250V	1.0		A
37 *	Slide, with detent	10A 125V 5A 250V			A
47	Slide, with detent	10A 125V 5A 250V			A
15-1	Push button, momentary contact, normally open, no detent	3.0	0.5		A
9-2	Slide, spring return, no detent, normally open	6A 125V 3A 250V	1.0		A
40 *	Slide, spring return, no detent, normally open	3.0			A
SINGLE POLE-DOUBLE THROW					
26-1	Slide, with detent	4A 125V 2A 250V	1.0		A
36-1	Slide, with detent	6A 125V 3A 250V	1.0		A
37-1 *	Slide, with detent	10A 125V 5A 250V			A
40-1 *	Slide, spring return, no detent	3.0			A
9-3	Slide, spring return, no detent	6A 125V 3A 250V	1.0		A
SINGLE POLE-THREE POSITION					
31	Slide, with detent	6A 125V 3A 250V	1.0		A
43	Slide, with "skid proof" center detent	6A 125V 3A 250V	1.0		A
44 *	Slide, with detent	6.0			A
DOUBLE POLE-DOUBLE THROW					
50	Slide, with detent	3A 125V 1.5A 250V	0.5		A
20	Slide, plunger, spring return, with latch	6.0	0.5		B
5	Slide, momentary contact, spring return, no detent	6.0	0.5		B
33	Slide, with detent	6A 125V 3A 250V	0.5		B
DOUBLE POLE-THREE POSITION					
16	Slide, with detent	6.0	0.5		B
38	Slide, with "skid proof" center detent	6.0	0.5		B
42	Slide, maintained in two position, spring return to center from third	6.0	0.5		B

*SS-37 Series available with special quick-connect terminal horizontal to base only.

SS-	Action	UL-CSA Listings AC	DC	Schematic	Case
DOUBLE POLE-FOUR POSITION					
18	Slide, with detent	3.0	0.5		B
TRIPLE POLE-DOUBLE THROW					
76	Slide, with detent				D
6	Slide, spring return, no detent	6.0	0.5		B
34	Slide, with detent	6.0	0.5		B
DOUBLE POLE-THREE POSITION					
54	Slide, with detent	3.0	0.5		C
TRIPLE POLE-THREE POSITION					
74	Slide, with detent				D
FOUR POLE-DOUBLE THROW					
12	Slide, with detent	6A 125V 3A 250V	1.0		B

SLIDE TRIGGERS

Triggers are available in four heights.

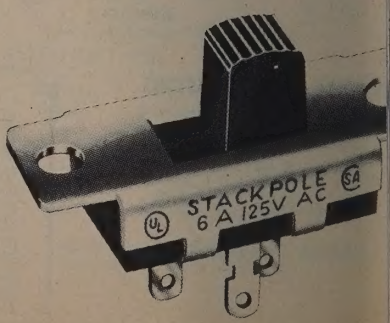


*Standard

NOTE: Types SS-74, SS-76 supplied with special 5/16", 1/2" or 3/4" trigger heights only.

MOUNTING HOLES

.136/.140" clearance holes. Extruded or extruded and tapped mounting holes (4-40 or 6-32) also available.



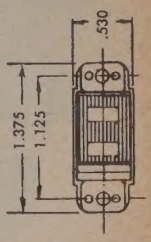
ROCKER SWITCHES

Action	UL-CSA Listings AC	DC	Schematic	Case
NGLE POLE-SINGLE THROW				
ng return, no detent, rmally open	6A 125V 3A 250V	1.0		1 or 2
With detent	4A 125V 2A 250V	1.0		1 or 2
With detent	6A 125V 3A 250V	1.0		1 or 2
With detent	10A 125V 5A 250V			1 or 2
With detent	10A 125V 5A 250V			1 or 2
ing return, no detent, rmally open	3.0			1 or 2
NGLE POLE-DOUBLE THROW				
pring return, no detent	6A 125V 3A 250V	1.0		1 or 2
With detent	4A 125V 2A 250V	1.0		1 or 2
With detent	6A 125V 3A 250V	1.0		1 or 2
With detent	10A 125V 5A 250V			1 or 2
pring return, no detent	3.0			1 or 2
INGLE POLE-THREE POSITION				
With detent	6A 125V 3A 250V	1.0		1 or 2
ith "skid proof" center etent	6A 125V 3A 250V	1.0		1 or 2
OUBLE POLE-DOUBLE THROW				
With detent	3A 125V 1.5A 250V	0.5		1 or 2
Spring return, no detent	6.0	0.5		3
With detent	6A 125V 3A 250V	1.0		3

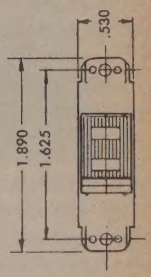
Series available with special quick-t terminal horizontal to base only.

RS-	Action	UL-CSA Listings AC	DC	Schematic	Case
DOUBLE POLE-THREE POSITION					
16	With detent	6.0	0.5		3
38	With detent	6.0	0.5		3
42	With detent in two positions. Spring return to center from third position. (Flat bracket only)	6.0	0.5		3
TRIPLE POLE-DOUBLE THROW					
34	With detent	6.0	0.5		3
6	Spring return, no detent	6.0	0.5		3
FOUR POLE-DOUBLE THROW					
12	With detent	6A 125V 3A 250V	1.0		3

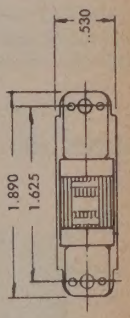
CASE 1
Small Case Flat Bracket



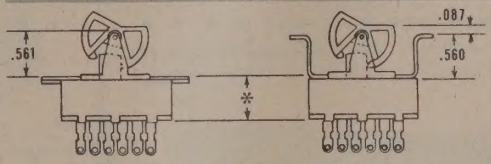
CASE 2
Small Case Offset Bracket



CASE 3
Large Case Flat Bracket and Offset Bracket



ROCKER SWITCH MOUNTING BRACKETS

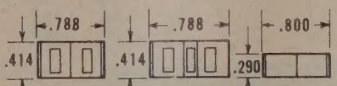


FLAT BRACKET OFFSET BRACKET

*For case dimension see comparable slide switch. (i.e., SP-ST rocker switch case depth, see SP-ST side switch drawing under Case Dimensions column)

ROCKER KNOBS

Knobs are available in three styles.



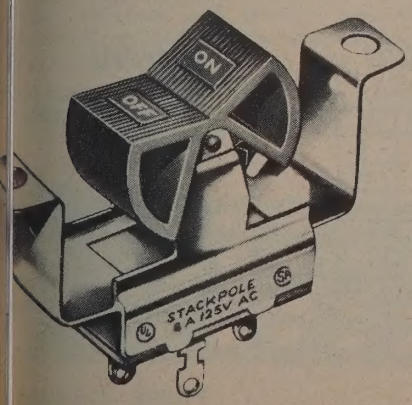
Style A Regular 2 Position — Style B Regular 3 Position — Style C Slim Line 2 Position

PANEL PIERCING

Dimensional details on recommended panel piercing supplied upon request.

MOUNTING HOLES

.136/.140" clearance holes supplied unless other mounting arrangement specified.



STACKPOLE
COMPONENTS COMPANY
A Subsidiary of Stackpole Carbon Company
P. O. Box 14466, Raleigh, North Carolina 27610
Phone: 919-828-6201, TWX: 510-928-0520

STACKPOLE ROTARY SWITCHES

SPECIALLY DESIGNED TO GUARD AGAINST EXPOSURE—CONTACT CONTAMINATION—PRODUCTION DAMAGE

-FEATURES-

COMPLETELY ENCLOSED — Both index mechanism and electrical sections are completely enclosed, providing an environment proof assembly.

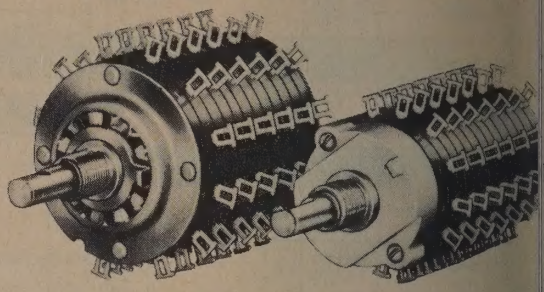
EXPOSURE AND CONTAMINATION PROOF — Corrosive atmospheres, dust, dirt and moisture are permanently sealed out, while lubricants are sealed in.

PRODUCTION DAMAGE ELIMINATED — Solder and flux cannot get into vital switch parts. Rugged integral terminals and contacts are permanently molded in position and will not loosen or move even under extreme soldering heat. Accidental production damage is eliminated.

FIELD PERFORMANCE ASSURED — Switch assemblies are torsionally rigid and rugged to withstand rough usage. Field tampering is abolished.

UNIQUE MODE OF SWITCHING — Reliable and long life switching, with low and consistent contact resistance, is assured under extremes of shock and vibration by a self-centering, spring loaded, silver alloy wiper. Complex switching arrangements, with intermixed shorting and non-shorting functions, are attainable not only on single sections, but also between sections. Standard index angles include 15°, 30°, 36°, 60° and 90°. Special angles available on request.

VERSATILITY — Enclosure maintaining spacers may be incorporated between sections to facilitate hardware mounting and special space requirements. Additional standard variations include electrostatic shields, dual concentric switches with attached line switches or potentiometers, gasket seal construction, coded output and hi-voltage applications.



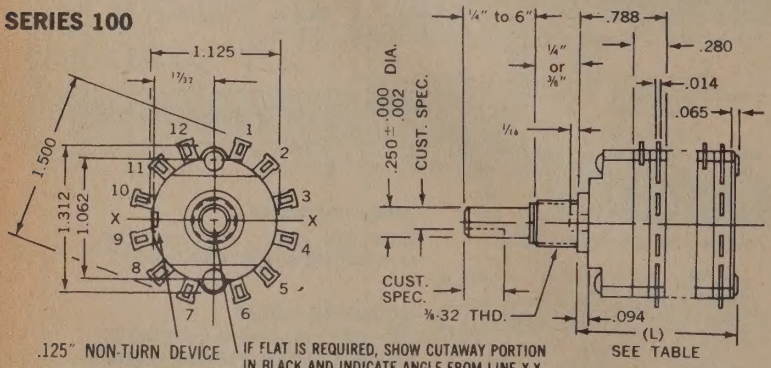
Series 600 1⅝" Dia. and Series 100 1⅛" Dia. Environment Proof Rotary Switches

EXPLOSION PROOF — Standard enclosed construction is inherently explosion proof in accordance with Mil-S-3786B, paragraph 4.8.12.

VIBRATION — Conforms to low frequency vibration test Mil-S-3786B, paragraph 4.8.4.

SHOCK — Conforms to shock test type M, Mil-S-3786B, paragraph 4.8.

SERIES 100



MAXIMUM LENGTH (L) INCHES	
DECKS	(L)
1	.853
2	1.133
3	1.413
4	1.693
5	1.973
6	2.253

Add 0.28 per additional deck

materials

Terminals (Stationary Contacts)—Brass, Silver Pl. (Standard) or Silver Alloy

Wiper—Silver Alloy

Insulation—Phenolic (Standard) or Diallyl Phthalate

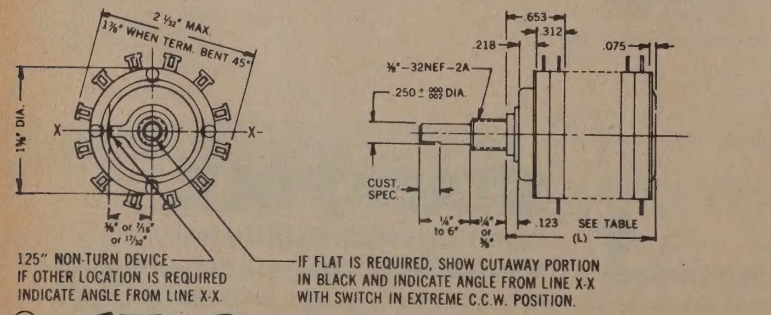
Front Plate—Delrin

Rear Plate—Steel, Ni. [illegible]

Bushing—Brass, Unplated (Standard) or Brass, Plated

Shaft—Brass, Unplated (Standard) or Brass, Plated

SERIES 600



MAXIMUM LENGTH (L) INCHES	
DECKS	(L)
1	.728
2	1.040
3	1.352
4	1.664
5	1.976
6	2.288

Add .312" per additional deck

materials

Terminals (Stationary Contacts)—Brass, Silver Pl. (Standard) or Silver Alloy

Wiper—Silver Alloy

Insulation—Phenolic (Standard) or Diallyl Phthalate

End Plates—Steel, Cad. Plated, Chromate Fin.

Bushing—Brass, Unplated (Standard) or Brass, Plated

Shaft—Brass, Unplated (Standard) or Brass, Plated

STACKPOLE COMPONENTS COMPANY
P. O. BOX 14466
RALEIGH, N. C. 27610
PHONE: 919-828-[illegible]
TWX: 510-928-[illegible]

Precision components for the electronic industry

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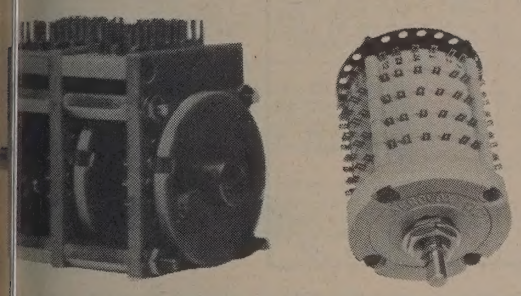
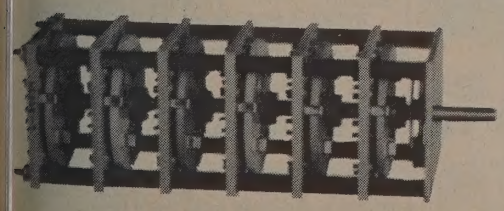
SWITCHES



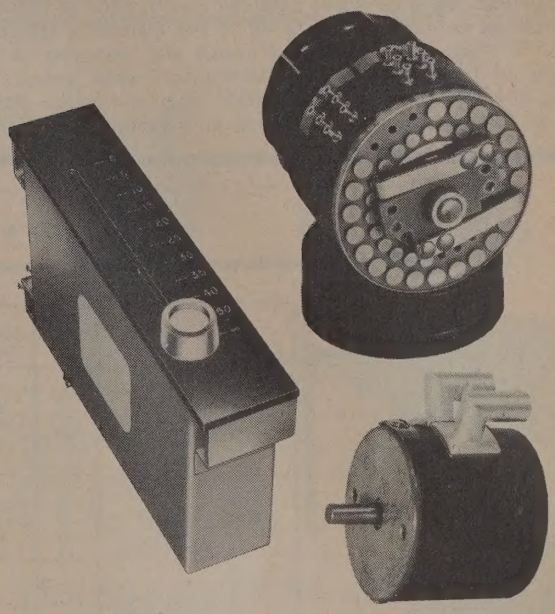
Formerly manufactured by Aerovox Corporation and ema Engineering these rotary tap switches are now ilable from Shallco. Sales, engineering and production vices are available immediately from our Smithfield, . plant for Series CES (all types) and the new 14, 18 22 Series.

This broad line of precision rotary tap switches tures: rugged construction, long-life operation, low ntact resistance, and premium materials. Standard igns offer up to 48 positions per pole, 1 to 8 poles per k, and up to 10 decks.

Special designs include high voltage r.f. switches with lectric withstanding voltage to 7000 volts (rms).



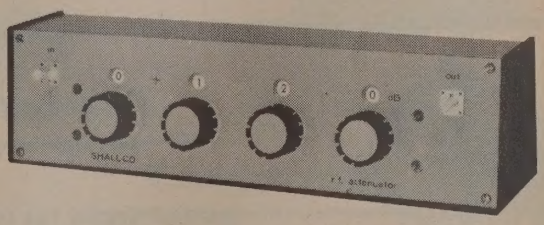
ATTENUATORS



Audio Attenuators. Shallco audio attenuators provide varied electrical characteristics and mechanical features. All materials are of premium quality and our designs provide years of trouble-free service. Circuit types include ladders, potentiometers and T's for balanced and unbalanced lines. Cueing available.

Video Attenuators. These rotary devices are designed to produce accurate increments of loss into the low r.f. range. Low reactive components assure a flat response in a T circuit.

R. F. Attenuators. Shallco rotary types are available in both 50 and 75 ohm impedance. They are available in unmounted, bench, and rack models.



DELAY LINES

Shallco offers custom design of fixed and variable electromagnetic delay lines. Hermetically sealed or encapsulated enclosures. Low-loss toroidal types feature fast rise time. Transponder lines available.

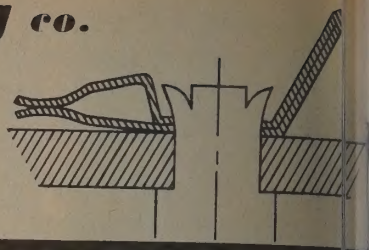
NETWORKS

Fixed attenuation pads, mixer modules, minimum loss pads, high and low-pass filters and other special networks. Standard impedances range 50 to 600 ohms.

end to Dept. EEM-70 for illustrated catalogs listing performance and mechanical specifications

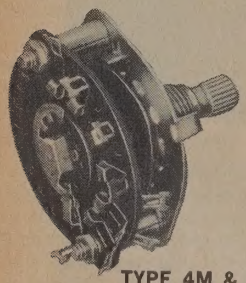
standard grigsby co.

*"Wedgelock" is the exclusive patented construction of Standard Grigsby Switches. All electrical contacts are fastened to the insulating stators or wafers by means of the "T" slug. This forced fit prevents any loosening of the contacts as often happens in conventional rivet construction when solder heat is applied. The unique shape of the "T" slug design also eliminates rotation and twisting of contacts thus assuring maintenance of accurate timing throughout switch life.

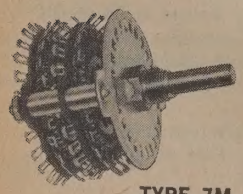


Rotary Switches

TYPE SM

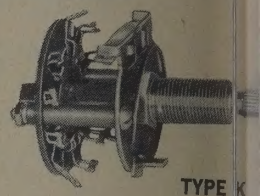


TYPE 4M & 42LR

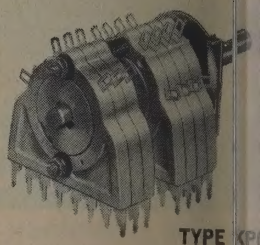


TYPE 7M

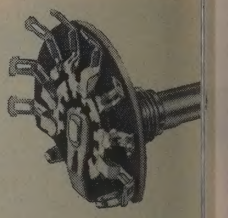
Type	Size	Max. Positions	Detent Angle	Insulation	Mil Designation	Additional Data
SM	15/16 x 7/8" — 3/4" Strut Centers	8 10 12	45° 36° 30°	Phenolic and Glass Epoxy	SRO 5	150 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
SK	1 1/4 x 1 7/8" 1 1/32" Strut Centers	4 6 8 12	90° 60° 45° 30°	Phenolic and Glass Epoxy	SRO 3	500 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
SKPC	1 17/32 Ht. Above P.C. Boards 1 41/64" Wide 1 1/32" Strut Centers	12	30°	Glass Alkyd	None	900 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
4M/42 LR	1 3/16 x 1 1/4" 1 1/4" Strut Centers	6 8 10 12 14	60° 45° 36° 30° 25° 42′	Phenolic — Glass Epoxy — Ceramic	SRO 2	500 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
7M	2 5/16 x 1 3/4" 2" Strut Centers — 2 17/32 x 1 5/8" 2 7/32" Strut Centers	14 18 20 24 28	25° 42′ 20° 18° 15° 12° 51′	Phenolic — Glass Epoxy — Ceramic	SRO 9	500 ma @ 125 VAC Dual concentric shafts. Rear mounted AC switch or potentiometer.
5M	Varied Irregular Shapes From 13/16" To 1 3/8"	3	30°	Phenolic	None	500 ma @ 125 VAC Spring return available. 2 and 3 post only. Maximum 9 stationary clips.



TYPE K

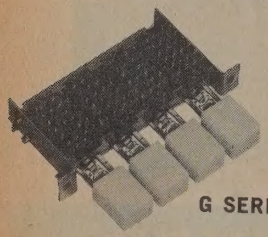


TYPE KP



TYPE M

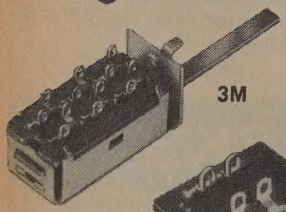
Pushbutton Switches



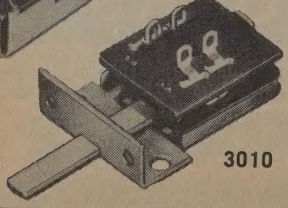
G SERIES

Standard Grigsby has the linear action answer to your switching needs. A complete ng of push button switches designed to meet a variety of performance requirements, ro single button switches to multi-button modular assemblies.

PBPC 400



3M

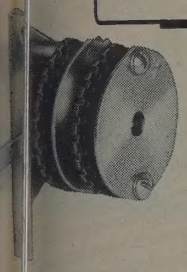


3010

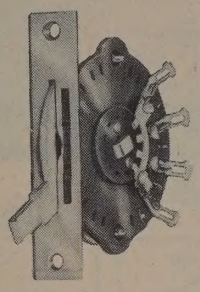
Type	Poles Per Button	Button Spacing	Terminal Type	Contact Type	Insulation	Life Expectancy To	Electrical Rating	Mechanical A on
G Series 1 to 20 Buttons	2 to 12	15mm .590") 18mm (.708") 20mm (.787")	Printed Circuit or Solder Lug	High Reliability Double Wiping	Best Grade Phenolic	500,000 Cycles	.5 Amp @ 125 VAC	Spring-return, ush push and inte ock ing action in vious combinations, w o without block-o
PBPC 400 1 to 10 Buttons	2, 4, 6 or 8 Poles, Double Throw, Per Button	10mm 12.5mm 15mm 17.5mm 20mm	Printed Circuit	Single Wiping	Glass Filled Alkyd Stator	25,000 Cycles Minimum	.4 Amp @ 125 VAC	Spring-return, ush push and inte ock ing action.
3010 and 3M	Switching From 1 Pole, On-Off to 4 Pole, 2 Position	Designed Primarily for Single Button Applications	Printed Circuit or Solder Lug	Single Wiping	Best Grade Phenolic	25,000 Cycles Minimum	1 Amp @ 125 VAC	Normally spring- urn action; push-pus op- tional.

standard grigsby co.

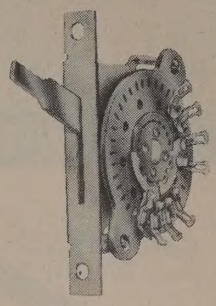
Lever Switches



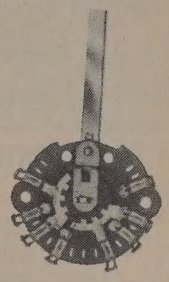
E SLR
- ting Centers
- — phenolic or epoxy
- sitions With 30° throw (pos.) or 22½° throw s.)
- urn available from either center position. Elec- shields are available
- Switch available in 30°
- Rating (Resistive) .150 5 Volts; Maximum volt- Volts; Maximum Current s @ 6 V RMS



TYPE 6MLR
- 1⅝" Mtg. Centers
- Insulation—phenolic
- 3 positions
- 30° throw
- Electrical Rating (Resistive) .5 Amps at 125 Volts; Maximum Voltage—450 Volts; Maximum Current —3.5 Amps @ 6 V RMS

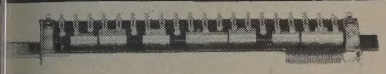


TYPE 6050LR
- 2⅝" Mounting Centers
- Insulation—phenolic or epoxy glass
- 5 positions
- 20° Throw
- Electrical Rating (Resistive) .5 Amps @ 125 Volts; Maximum Voltage—450 Volts; Maximum Current —3.5 Amps @ 6 V RMS

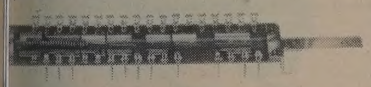


TYPE 612LR
- Economical lever switch where detent is incorporated as part of a single wafer
- Available with or without mounting bracket
- Insulation—phenolic
- Available in 25.7 or 30° throw
- Electrical Rating (Resistive) .5 Amps at 125 Volts; Maximum Voltage—450 Volts; Maximum Current —3.5 Amps at 6 V RMS

Slide Switches

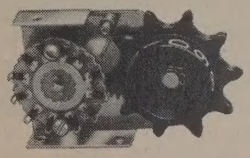


E 0SL
- n with 2 to 12 poles
- with 9 to 21 contacts
- n—phenolic
- g or printed circuit terminals
- hrow—manual or spring return
- staked to base with "Wedgelock" construction
- l Ratings (Resistive) .5 Amps at 125 Volts; m Voltage—450 Volts RMS; Maximum Current ps @ 6 V RMS



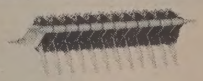
E 0SL
- ition with 3 to 18 contacts on each side
- on—phenolic
- ug or printed circuit terminals
- throw—either manual or spring return
- s staked to stator with "Wedgelock" ction
- al Ratings (Resistive) .5 Amps at 125 Volts
- m Voltage—450 Volts RMS
- m Current—3.5 Amps @ 6 V RMS

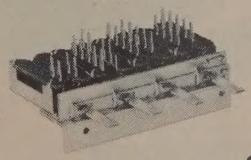
Thumbwheel Switches

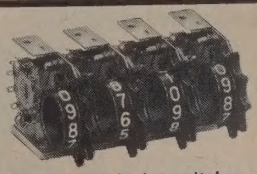


SMT switches are the latest of the Standard Grigsby thumbwheel family and are in keeping with the trend towards sub-miniaturization. These switches utiliz. the sub-miniature SM type stators and may be produced with either one or multi-wafer assemblies driven by a common thumbwheel. T-101 thumbwheel switches are available with either single or double wafer sections, and utilize a stator equivalent in size to the 4M series.

Ganged Switches



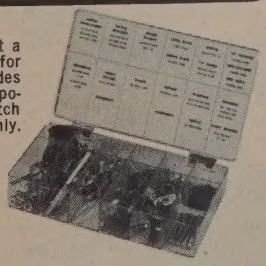


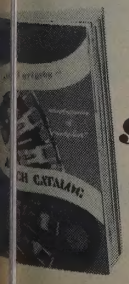


Most Standard Grigsby switches may be supplied ganged. Standard and custom made brackets are available. Write or phone for details.

Sample Switch Kit

Grigsby Switch Kits are available for most types at a harge for use by laboratories and Design Engineers for assembly. The basic kit for each switch type includes emblies, wafers, clips, strut-screws, and other compo- ired to produce a minimum of (25) switches. The switch tended to be used in making prototype assemblies only.





LET US SAMPLE YOUR SPECIFIC REQUIREMENTS

Comparative Data

STANDARD GRIGSBY				OAK	CENTRALAB	MILITARY
	ENVELOPE SIZE					
SWITCH TYPE	Hgt.	W.	Strut Centers	Switch Type	Switch Type	SRO Types
SM	1 5/16"	7/8"	3/4"	A	100	SR05
SK	1 9/32"	1 3/32"	1 1/32"	F	PA-600	SR03
42LR	1 23/64"	1 3/8"		N, J, K (STAKED)	PA-1000, PA-2000 (STAKED)	
2M	1 5/16"	1 3/32"		50		
4MLR	1 9/16"	1 3/8"	1 1/4"	N, J, K	PA-1000, PA-2000	SR02
700 2"	2 5/16"	1 5/8"	2"	L, MF, GK	PA650 PA670	SR09
700	2 17/32"	1 5/8"	2 7/32"	RH, CH, GK	SERIES 230	SR10 SR12
5M			Varies	50, 20	SERIES 200	
6MLR	1 7/8"	1 27/64"		187, 189	SERIES 700	
6050LR	2 1/16"	1 13/16"		185		
6100				188		
612-614LR	1 9/16"	1 3/4"	1 1/4"	189		
SMT	1 1/4"	1 35/64"				
3010				80, 170		
3M				130, 131		
150SL 300SL				150	001, 002, 003 & 125 SERIES	
SMLR	1 15/32"	1 3/64"	3/4"			

LET US SAMPLE YOUR SPECIFIC REQUIREMENTS

standard grigsby co.

A DIVISION OF STANDARD KOLLSMAN INDUSTRIES INC.

920 Rathbone Ave. • Aurora, Ill. 60507 Dept A
Telephone 312-897-8417 • TWX 910-232-3138

TAPESWITCH®

PRESS-AT-ANY-POINT RIBBON type & MAT type SENSING SWITCHES

BUY THE RIBBON SWITCH IN THE SIZE YOU NEED!

SUCCESSFULLY PROVEN IN ALL INDUSTRIES. PATENTED CONSTRUCTION WITHSTANDS MANY TONS OF FORCE YET CLOSES ON LIGHT FINGER PRESSURE. TAPESWITCHES ARE UNEXCELLED FOR—SAFETY . . . AUTOMATION . . . ANTIBURGLAR SYSTEMS . . . COUNTING . . . TIMING . . . DOOR CONTROL . . . LIGHT SWITCHING . . . MACHINE CONTROL . . . MATERIAL HANDLING INSTRUMENTATION . . . COMPUTER AND CONSOLE SWITCHING . . . AND MANY OTHER APPLICATIONS.

These versatile sensing switches may be used directly with **electro-mechanical devices** and **solid state devices.**

Pressure at any point from hand, foot, or vehicle will cause contact. These are ideal for instrumentation and control tasks because of their **flat configuration, "Press-at-any-Point" operation,** and **sealed** qualities.

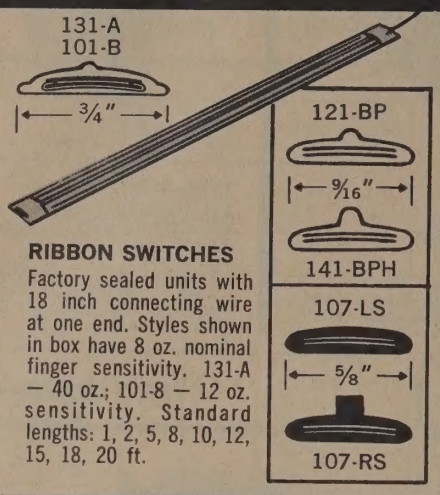
TAPESWITCHES are designed in accordance with the best principles of switch and cable design, with jacketing and insulation meeting the requirements of MIL-C-9154 and MIL-I-631C respectively. Results are exceptional stand-by reliability (required in alarms) as well as excellent contact performance.

Typical life tests with repeated impacts at ONE POINT on a Tapeswitch have given over three million operations without failure. (24 Volt AC relay coil 0.3 Amperes)

RATINGS: All Tapeswitch products are rated 117 VAC, at 1 Ampere. However for floor switching, 30 VAC or less is recommended.

NOTE: U.L. classification for Ribbon Switches does not presently exist.

A FEW TAPESWITCH CONTROL SWITCHES



RIBBON SWITCHES

Factory sealed units with 18 inch connecting wire at one end. Styles shown in box have 8 oz. nominal finger sensitivity. 131-A — 40 oz.; 101-8 — 12 oz. sensitivity. Standard lengths: 1, 2, 5, 8, 10, 12, 15, 18, 20 ft.

PE-30 UNDER CARPET SWITCHING RUNNER

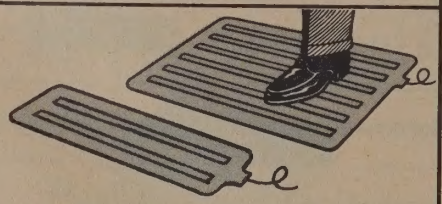
30 inches wide x 3/32 inches thick ar ca be cut to any length from 25 ft. or 5 f ol For indoor use under carpeting. pe switches in parallel between Polyeth en sheets. Tinned wires for easy twisti o soldering connections.

TAPESWITCH RELAY R-1

FOR NORMALLY CLOSED OR NORMALLY OPEN OPERATION OF ANY TAPESWITCH. Plug-in unit gives NC or NO control of 117 Volts AC, 5 Amperes. Built-in low voltage transformer.

108 ASTR AL SAFETY E GE

Unique patented design universal s ety cushion switch for leading edge of rs machinery, etc. Responds to side thrus an head-on thrust. Std. lengths: 6, 8, 1 12, 15, 20, 25, 30 ft. OTHER STYLES SO AVAILABLE. Mounts on edges 1" to ½" wide. Cushion depth 1⅞".

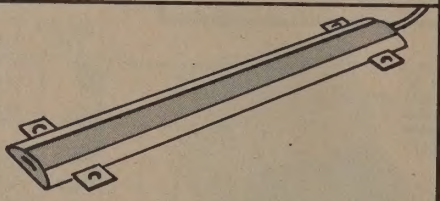


CVP SWITCHING MATS

CVP style mats are durable yet flexible, and only ⅛ inch thick (approx.). Available in sizes 20 x 32 inches, 17 x 23 inches and 6 x 23 inches. Very popular items.

NC-3 NO-1 FOOTSWITCH 11

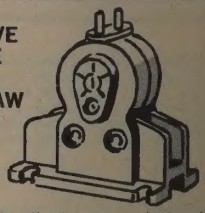
NC-3 is a unique normally closed fer style switch 1⅛" diameter, by 3/16" ck Designed to sound alarm when obje is lifted off switch. NO-1 similar form ut normally open. 20 oz. nominal sensit ty. Footswitch 111 normally open flat ru ed sealed switch, 2" x 5" x ¼" thick.



RBMA ROAD SWITCH

Successful, rugged roadway switch for counting, timing, controlling by vehicles. Replaceable sealed switch element. 2" wide, 7/16" thick. Std. lengths: 2, 3, 5, 8, 10 ft. Cast iron end protectors available.

SENSITIVE AIRWAVE SWITCH MODEL AW



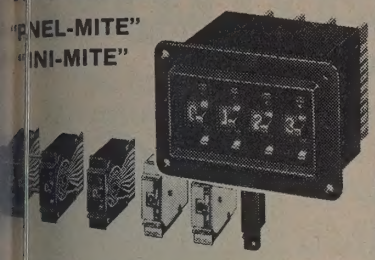
Pn m pu s but n

High quality diaphragm switch with ad st able sensitivity. For operation by t ng **squeeze**/impact, air motion, vacuum. Re mote push-buttons for explosive env n ments, etc. Silver contacts operate nor ly open or normally closed.

TAPESWITCH CORPORATION OF AMERIC
320 BROAD HOLLOW RD., FARMINGDALE, N.Y. 11735 • (516) 694-6312—(212) 895-871

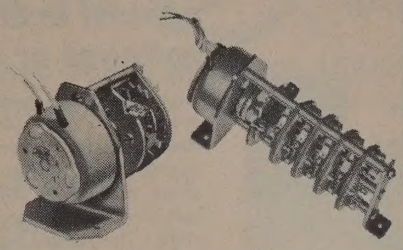
TUMBWHEEL SWITCHES

"PANEL-MITE"
"MINI-MITE"



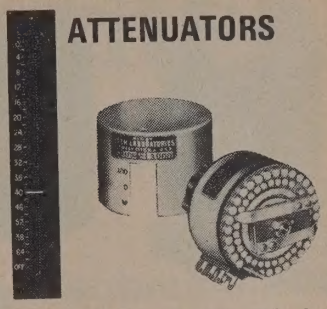
Compact, molded printed-circuit switches for limited space and in-line readout. Modular type for front or back panel mounting. ½" between center lines, 1" or 2" height binary or decimal codes with adjustable stops available.

STEPPING SWITCHES



TECH LABS switches are now standard equipment in missiles as well as in ground controls. Furnished sealed to meet all specs. Solenoid and motor driven models.

ATTENUATORS



A complete line of audio and r.f. attenuators with both manual and REMOTE CONTROL. We will design components to meet your specific requirements, if standard units are inadequate. Please write for catalogue and send us your specs for estimate.

Switch to TECH LABS INC.

FOUNDED 1935

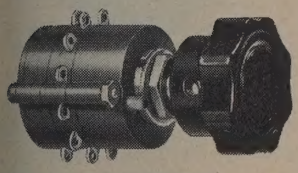
For the most versatile line of precision switches & attenuators

WRITE FOR NEW BULLETINS ON SWITCHES • DECADE RESISTORS • POTENTIOMETERS

Palisades Park, New Jersey

These switches are representative of the many types produced by TECH LABS meeting applicable Government Specs. Wire or teletype for further information.
TEL.: 201-944-2221 TWX: 201-947-4730

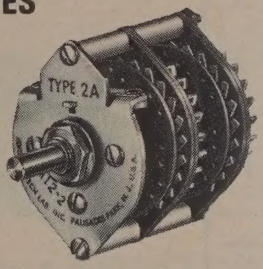
TAP SWITCHES



TYPE 3A MINIATURE TAP SWITCH

Molded from Diallyl Phthalate
Has adjustable stop

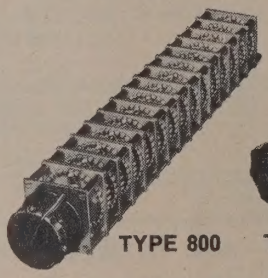
Specifications
Size: 1" diameter. 1¼" with terminals. 1 deck, 1-1/16" long. ½" for each additional deck.
Rating: 1200 volts rms, 2000 VDC, 5 amps. (carrying) 115 V.
Insulating resistance: 100 megohms minimum at 500 volts DC.
Life: 1.5—2 million revolutions.
Temperature range: —65°C to 100°C.
Mounting: single hole.

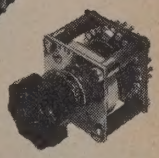


TYPE 2A & 2M

The Type 2A, a standard control switch for precision instruments and equipments, comes in 2-24 positions and 1-4 poles per deck, with phenolic insulation. The 2M is identical except for Melamine insulation. Both are rated for 3 AMP and have adjustable stops. Code "S" denotes "shorting" and "N" "non-shorting".

SQUARE SWITCHES

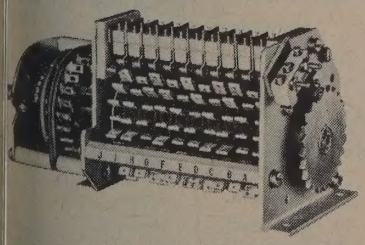




TYPE 800 TYPE 10A

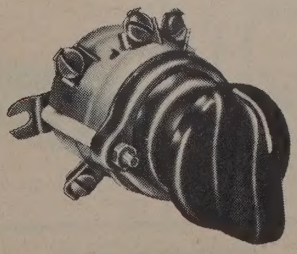
Square switches from 1 5/16" to 15" available from stock parts, as standards or assembled to your specifications. Adjustable stops available. Will meet all applicable government specs.

PROGRAMMING SWITCHES

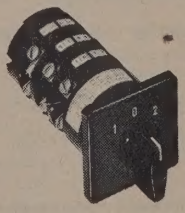


Adjustable programming switches, 24 or more positions. Available in MBB and BBM; manual, motor or solenoid driven. Contact ratings from dry circuit to 20 amps.

POWER CONTROL AND PACKET SWITCHES MILITARY & INDUSTRIAL TYPES



Heavy duty rotary snap-action switches from 10 to 200 amps. Built to withstand severe shocks without momentary interruption.

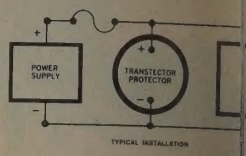


Power control switches for circuit breaking, motor control and transfer application. Current ratings of 10, 16, and 25 amps.

TRANSTECTOR. PROTECTOR

protect IC's, equipment, systems . . . against accidental shorting, excessive voltages or currents!

Now you can have absolute protection in ≤50 nanosec. Standard unit operates like typical SCR crowbar circuit, but gives higher reliability, accuracy and surge capacity. Solid state. Fail/Safe. Inexpensive. Can meet Mil. Specs. Select from the most complete line of models, trip points and optional features.



VOLTAGE PROTECTORS (Pat. Pend.)

1 MODELS	2 STANDARD TRIP POINT VOLTAGES	3 TYPE	4 OPERATING CURRENT LEVELS	5 OPTIONAL FEATURES	6 CONTINUOUS POWER DISSIPATION	7 STANDBY POWER LOSS
V OVERVOLTAGE	AVAILABLE ALL MODELS ±5% tolerance, standard; ±1% available	AC or DC	0 - 5 amps 5 Series 5 - 10 amps 10 Series	A AUTO-SWITCH	1 watt 5 Series 2.5 watts 10 Series	1 mw/volt across Protector terminals
UV UNDERVOLTAGE Typical time delay: 30 millisec from power turn-on.	3 5 6.5 7 11 12 14 22 26 30 32 38 50 60 70	DC only	10 - 20 amps 20 Series 20 - 50 amps 50 Series	R MULTI-SENSE	5 watts 20 Series 15 watts 50 Series	
UOV UNDER/OVERVOLTAGE Typical time delay: 30 millisec from power turn-on. Two trip points.	80 90 125 160 200 Non-standard and trip points over 200 V available on request.	DC only	50 - 100 amps 100 Series 100 - 150 amps 150 Series	E VARI-ADJUST	30 watts 100 Series 30 watts 150 Series	
HV HIGHVOLTAGE Specific specifications on request.	600-10,000 VDC 300-800 VAC	AC or DC	1-10 amps 1-100 amps	L LIGHT INDICATING		

CASES *Sizes and Weights*

CASE 1 .88" x .63" dia. weight: 11 gms.	CASE 2 1.25" x 1.0" dia. weight: 40 gms.	CASE 3 1.5" x 1.5" dia. weight: 100 gms.	CASE 4 2.5" x 2.17" dia. weight: 400 gms.	CASE 5 2.5" x 2.5" dia. weight: 500 gms.

MODELS	SERIES						
FROM 0-200V	5	10	20	50	100	150	
OVERVOLTAGE	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 5	DC UNITS
UNDERVOLTAGE	CASE 3	CASE 3	CASE 4	CASE 4	CASE 5	CASE 5	DC UNITS
UNDER/OVERVOLTAGE	CASE 3	CASE 3	CASE 4	CASE 4	CASE 5	CASE 5	DC UNITS
MULTI-SENSE	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 5	DC UNITS
VARI-ADJUST	CASE 3	CASE 3	CASE 3	CASE 4	CASE 5	CASE 5	DC UNITS
AUTO-SWITCH	CASE 3	*	*	*	*	*	DC UNITS
AC UNITS	CASE 3	CASE 4	CASE 5	*	*	*	
HIGHVOLTAGE	Available on request						

* For case dimensions not specified and for custom units, contact factory.

HOW TO SELECT

1 SELECT MODEL REQUIRED — MODEL ( )

2 SELECT TRIP POINT VOLTAGE — VOLTAGE ( )

TRIP POINT should be at maximum "safe" voltage level your circuit can handle without damage, and should be as close to your regulated voltage as possible, yet high enough to prevent nuisance tripping. Be certain to allow for regulation tolerance of power supply and nominal trip tolerance of Protector.

AC trip points are selected by choosing a point between *peak* voltage (not RMS) and circuit failure level.

3 SPECIFY AC OR DC — TYPE ( )

4 SELECT OPERATING CURRENT LEVEL — SERIES ( )

Choose SERIES within which circuit's nominal current range falls.

5 SELECT OPTIONAL FEATURES — OPTIONS ( )

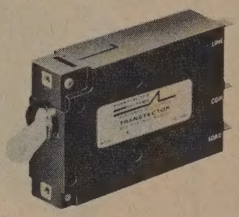
6 IF USING CURRENT LIMITING POWER SUPPLY

Verify the maximum CONTINUOUS POWER DISSIPATION of the Series selected. If power to be dissipated exceeds specified wattage, select next higher Series. Assume maximum voltage drop across protector to be 1.25VDC at rated temperature.

PART NUMBER ( ) ( ) ( ) ( ) ( )
1 2 3 4 5

COMBINATION CIRCUIT PROTECTORS

Protect against transient voltages, currents and shorts with or without Overvoltage, undervoltage, under/overvoltage, multi-sense, variable adjust options. Operating temperature −55° to +85° C. Complete unit dimensions: 3.25" L x .75" W x 2.0" H. Custom trip points available.



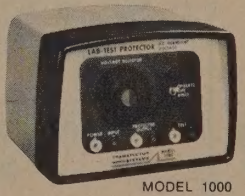
CURRENT TRIP POINTS
Instantaneous trip breaker is standard. Time delay available

VDC MODELS (50 VDC Max.)	VAC MODELS (250 VAC Max.)
AMPS 1, 2, 3, 5, 7, 10, 15, 20	AMPS (60 cps operation) 0.5, 1, 2, 3, 5, 7, 10, 15, 20 (400 cps operation) 2, 5, 10, 15, 20

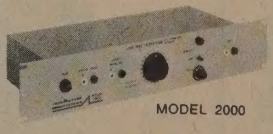
VOLTAGE TRIP POINTS

VDC MODELS	VAC MODELS
VOLTS 3, 5, 7, 11, 12, 14, 22, 26, 30, 32, 38, 50	VOLTS Up to 400 VAC on request

LAB-TEST PROTECTORS



MODEL 1000



MODEL 2000

Protect against accidental shorting, application of excessive voltages, or product wiring errors when testing. Gives transient voltage and reverse polarity protection. Protects in ≤50 nanosec. 23 easily selected voltage protection levels.

	MODEL 1000	MODEL 2000
PROTECTION VOLTAGE RANGE (23 steps)	5-50 VDC 5-12, 1 volt steps 12-40, 2 volt steps 45 and 50 volts	
OPERATING CURRENT LEVEL	10 amps	
MALFUNCTION INDICATION	Panel Lights	Flashing Light
MOUNTING	Bench	Std. 19" Panel 3-1/2" high
LIST PRICE	$165.00	$135.00

You name the protection problem . . . we'll provide the answer!

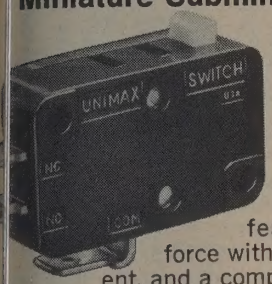
TRANSTECTOR. SYSTEMS — ABSOLUTE TRANSIENT PROTECTION

a division of M & T Chemicals Inc., subsidiary of American Can Company

1161 Monterey Pass Road
Monterey Park, Calif. 91754
(213) 264-0800 or (213) 264-0801

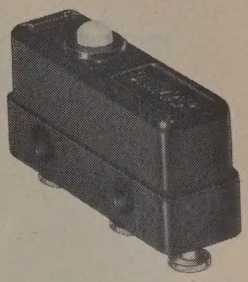
Unimax Switch®

The complete line of snap-acting Standard, Miniature, Subminiature and Miniature Subminiature switches for commercial and military applications.



Low-Force switches
TM Series

17 standard models feature low operating force with negative force gradient, and a complete line of lever and lever actuators. Four terminal styles include uick-connect. Molded-in overtravel stop limits n movement, preventing overstress and shock ng of blade. Mounting holes are independent ver for improved electrical insulation and high strength. Two lever pivot locations provide r low actuating motion or forces as low as 8 grams. Ratings up to 15 amps. **Detailed specifications in our Catalog 60.**



Basic subminiature switches
Type LM

Long life subminiature switches provide reliable switching in limited space. Variations available include integral or auxiliary actuators, ratings to 10 amperes, silver or gold contacts and choice of four terminal styles. **Detailed specifications in our Catalog 60.**

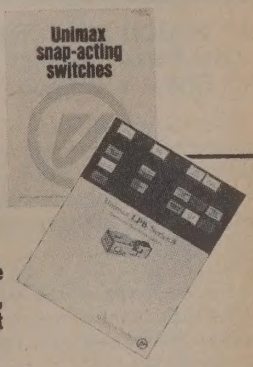
Basic precision switches
Type 2HB

The basic switch for close control of electrical its requiring combinations of small motions, repeatability and long life. Switches can be ed or unsealed and all types of actuators are lable. Ratings start at 20 amps to 480 VAC. UL CSA listed. **Detailed specifications in our Cata- 60.**

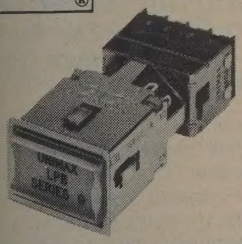
General purpose switches
Type A

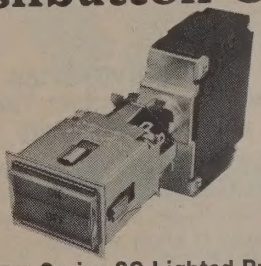
Designed for applications that require fully enclosed, high performance, low-cost, snap-acting switches with quick-connect terminals. Stall free, with high repeatability. Single or double pole, sealed or unsealed with a full range of actuators. Rated 15 or 25 amps at 125/250 VAC. **Detailed specifications in our Catalog 60.**

Complete 48 page catalog #60, at your request

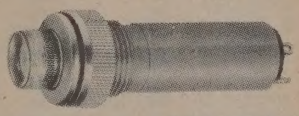


LPB® Lighted Pushbutton Controls





Complete 12 page catalog #50, at your request



LPB Series 9 Lighted Push-Button Switches

imax LPB **Series 9** are four lamp nted pushbutton panel controls de- ned to meet the requirements of L-S-22885/9-12 (for QPL approved ntrols designate series 9M). They offered in a wide range of display les, color coding and customized ssages can be easily changed or dified in the field. **For more tech- al information request our Cata- 50.**

LPB Series 9C Lighted Push-Button Circuit Breakers

Unimax LPB **Series 9C** are lighted pushbutton circuit breakers with a unique combination of four lamp lighted panel controls and snap-on hydraulic-magnetic circuit breakers. The time delay inherent in this line permits relatively high inrush current (common in starting motors, lamps, etc.) without tripping. But it provides full protection from sustained overloads and short circuits. **For more technical information request our Bulletin 511.**

LPB Series 2 Lighted Push-Button Switches

Unimax LPB **Series 2** is a snap-acting pushbutton switch combining the functions of circuit control and pilot light indication in one compact, low-cost unit. It is easy to install, available in alternate or momentary action with red, yellow, green white or clear lenses. Subsequent lamp or lens replacement being accomplished quickly, without special tools from the front of the panel. **For more technical information request our Bulletin 512.**

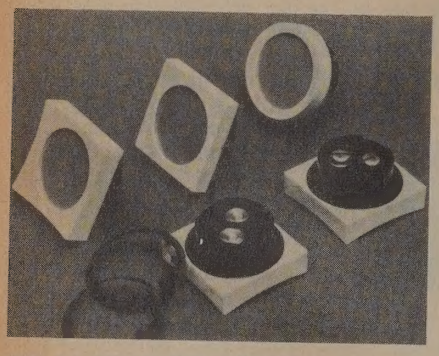
Unimax Switch® CORPORATION

A Riker-Maxson Subsidiary Ives Road, Wallingford, Connecticut 06492
Phone (203) 269-8701 TWX (710) 476-1397

WILD ROVER CORP. TOUCH SWITCHES AND KEYBOARDS

THE TOUCH INTERFACE Momentary-Contact Touch Switches, Keyboards and Switch Arrays

The Wild Rover Corporation, pioneers in touch switch technology, now offer a complete line of products — from economical units that require only a low-force touch contact — to units that operate with no contact at all. And, the new monolithic keyboard, a **flat surface** that delivers keyboard function with touch action. The selection and versatility of these products makes it possible to bring "touch" to almost any control need.



TC-1™ TOUCH SWITCHES For Low-Force Contact Touch Effect and Economy

The TC-1 touch units are a true retrofit for almost any momentary switch. They are available in three styles with or without illumination — and are **expressly designed for driving low level logic.**

SPECIFICATIONS:

RATING: 120 VAC, 200 W.; 24 VDC, 1 amp. For inductive loads divide rating by half.

RESISTANCE: 20 milliohms nominal. Same impedence maintained after 100,000 cycles at full rated load.

BOUNCE SUPPRESSED: Extremely low noise—suitable for driving low-level logic directly.

LIFE: In excess of 1,000,000 cycles.

WIDE OPERATING TEMPERATURES: —65° F. to 150° F.

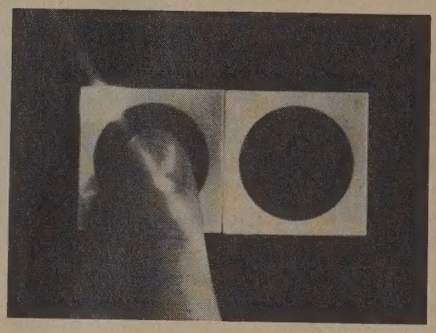
RUGGED CONSTRUCTION: Unbreakable Lexan® case. Units are dustproof, oil and water resistant. All seams welded.

SLIGHT WEIGHT AND COMPACT SIZE: 0.3 oz. nominal weight: 1″ x 1″ x ½″ max.

TERMINAL TYPE: Screw-type, recessed 4-40 screw (screw in solder lug available).

COLORS: Frames — red, black, blue, white are standard and other colors on special order. Touch Plate — any color, design or wood grain can be obtained. Any legend.

STYLES: (1) Sq. frame contour-face; (2) Sq. frame flat-face; (3) Round frame flat-face. Styles 1 and 2 are available with illumination.

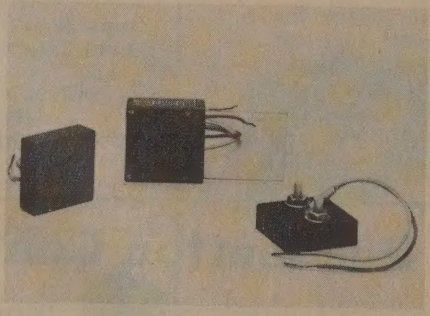


TC-1 ILLUMINATION

TC-1 Touch Switches are available with two illumination options:

Bright-Spot: a distinct "soft light" feedback that is ideal for business and office machines. Visible in a well-lighted room, but not apparent in the **off** stage, thus assuring optimum dead panel effect.

Bright-Point: a sharp, pinpointed star of light that is clearly visible even in direct sunlight. It provides positive feedback without exceeding thresholds for visual irritability. Perfect for aircraft.



TC-2™ TOUCH SWITCHES For Null Force Contact Touch Effect and Ultrasensitivity

The TC-2 touch units are **solid state** and provide the maximum in touch sensitivity. Units operate on contact alone without any "force" or effort whatever.

SPECIFICATIONS:

RATING: 120 VAC, 200 W.; 24 VDC, 1 amp.

RESISTANCE: .25 ohm nominal.

LIFE: Indefinite.

OPERATING TEMPERATURE RANGE: 25°F. to 150°F.

SOLID STATE CONSTRUCTION: Epoxy casting.

PRACTICAL SIZE AND WEIGHT: 1½″ x 1½″ x ½″ D.; 58 Gm. nominal weight.

TERMINAL TYPE: Pigtails.

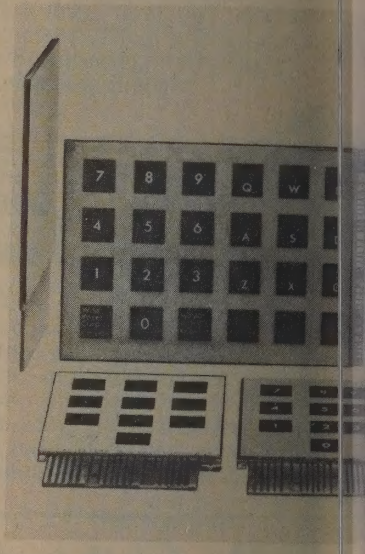
COLOR: All bases are black with stainless steel touch surface. Also, touch surfaces can be supplied in transparent glass or plastic suitable for shadow-box illumination, rear projection or window. Touch surfaces may also be remotely located. Flexible legendizing capability.

TC-3™ TOUCH SWITCHES For the No-Contact Effect And True Proximity Action

The TC-3 touch units are solid state deliver proximity-controlled switching operations where this unique quality desirable.

SPECIFICATIONS:

Characteristics for the TC-3 are identical to the solid state TC-2 switch — except for its property of proximity activation. TC-3 unit has a proximity-field adjustment for maximum flexibility.



NEW TC-KEY™ MONOLITHIC KEYBOARD The One-Piece, Flat Surface That Provides Touch Control . . . At Every Key

The new TC-KEY Monolithic Keyboard is the latest development in touch technology applied to the needs of keyed functions. Form and shape are unlimited. Send us a picture of the keyboard you need and **we'll produce a picture that works!**

- Extremely economical — a fraction of cost of other electronic keyboards available today.
- Unique flat surface design offers unprecedented flexibility — units may be as thin as ⅛″ and can be simply glued in position.
- Bounce suppressed.
- Compatible with low-level logic.
- Life in excess of 10^7.
- High speed operation with microsecond ON and microsecond OFF.

WILD ROVER CORP.
Herbert Avenue, Closter, N.J. 07624

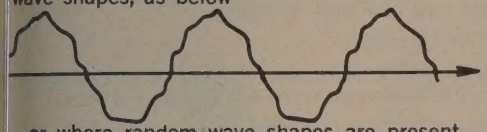
See YELLOW SECTION for Local Offices, Phones

ide to types, models and applications of BEST vacuo-junction THERMOCOUPLES

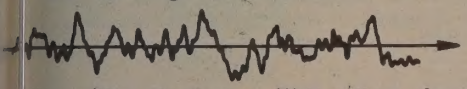
a used by leading instrument manufacturers for:

TRUE RMS MEASUREMENT

where the signal is periodic with distorted wave shapes, as below



—or where random wave shapes are present, even with high crest factors



STANDARD PATTERN

TRUE RMS = DC

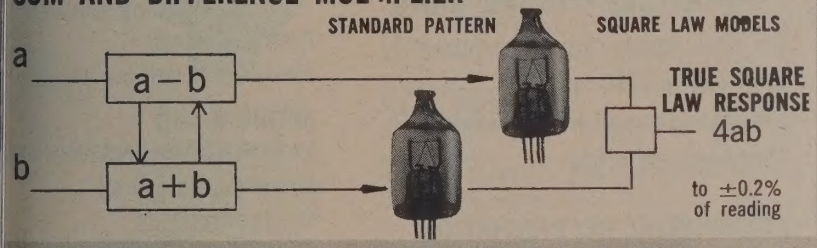
OR

UHF PATTERN

TRUE RMS = DC

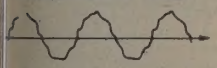
(Use either standard or UHF pattern, depending upon frequency)

SUM AND DIFFERENCE MULTIPLIER

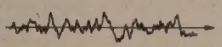


LINEAR TRUE RMS MEASUREMENT

Tracking errors are in percent of reading over a 10:1 current range, including a ±20°C temperature range.

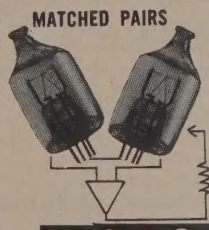


OR



Matched pairs available from stock:

	MODEL MP1S7	MODEL MP219	MODEL MP219-1
Tracking accuracy	0.5%	0.5%	0.2%
Time constant	1 sec.	200ms	200ms
Nominal current	5mA	6.67mA	6.67mA



MATCHED PAIRS

LINEAR TRUE RMS = DC

+010.957

Fast response models minimize flicker in last digit

patterns for 5mA and higher, usable to Mc/s; for less than 5mA, usable to 10 Mc/s pes usable to 500 Mc/s

ure coefficient of output available from % per °C down to 0.005% per °C in some s

error, standard, 0.2%. All models available /E down to 0.01%, some models to 0.005%

Optional special features: short time constants to 50 ms; double heater devices, ultra miniature sizes

To be available soon: true RMS-DC linear converters

Accuracy — 1% and 0.1% of reading

Frequency — to 50 KHz

Write on company letterhead for application notes and full line catalog

EST ELECTRICS DIVISION
IARRY LEVINSON COMPANY
11 E. Denny Way, Seattle, Wash. 98122 • Tel. (206) 323-5100 • TWX 910-444-2154

Partial list of BEST STANDARD PATTERNS, INSULATED

*Preferred units, available from stock.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
Following models have O/C E.M.F. of 7mV ±12%. Maximum permissible load, 250% of nominal.			
*S1	1.0	1750	13
S2	1.25	1600	13
S3	1.5	1000	13
*S4	2.0	800	12
*S5	2.5	400	8
S6	3.0	200	8
*S7	5.0	90	8
*S8	7.5	45	8
*S9	10.0	25	8
S10	15.0	20	4
S11	20.0	15	4
S12 thru S23	25.0 thru 1000.0	10.0 thru 0.15	4
Following have O/C E.M.F. of 20mV ±12%. Maximum permissible load, 200% of nominal.			
S45	2.0	2000	13
S46	2.5	1600	13
S47	3.0	800	13
*S48	5.0	250	8
S49	7.5	180	8
*S50	10.0	125	8
S51	15.0	50	4
S52	20.0	30	4
S53 thru S64	25.0 thru 1000.0	25.0 thru 0.25	4
Following models have O/C E.M.F. of 10mV ±12%. Maximum permissible load, 200% of nominal.			
S98	1.25	1600	13
S99	2.0	800	13
S100	2.5	400	8
S101	3.0	300	8
*S102	5.0	125	8
S103	7.5	70	8
*S104	10.0	40	8
S105	15.0	25	4
S106	20.0	20	4
S107 thru S118	25.0 thru 1000.0	15.0 thru 0.15	4

BEST U.H.F. UNITS, INSULATED

*Preferred units, available from stock.

Capacitance	0.3 mfd
Inductance, approx.	0.02 uH

Following models have O/C E.M.F. of 7 mv ±12%. Maximum permissible load, 250% of nominal.			
*U1	5	90	8
*U2	10	25	8
U3	15	20	4
U4	20	15	4
U5	25	10	4
U6	50	3	4
U7	100	1.5	4
U8	150	1.0	4
U9	200	0.7	4
U10	250	0.6	4
U11	500	0.3	4
U12	1000	0.15	4
U27	2.5	200	8

(Max. Perm. Load, Model U27, 150% of nominal)

PHYSICAL DATA, STANDARD PATTERNS

Height of envelope	0.900 inch
Diameter of envelope	0.437
Length of lead from envelope	2 ± ¼ inches
Length of sleeve from envelope	1¾ ± ¼ inches
Heater leads:	
Up to 400 milliamps	0.012 ± 0.002 inch diameter
500 milliamps and over	0.020 ± 0.002 inch diameter
Couple leads—all ranges	0.012 ± 0.002 inch diameter

PHYSICAL DATA, U.H.F. PATTERNS

Height of envelopes	0.750 inch
Diameter of envelope	0.800 inch
Width across heater leads	1.500 inches
Diameter of heater and couple wires	0.020 inch

Positive indicated by spot of red lacquer.

Specifications subject to change without notice.

BORG WARNER
Borg-Warner Thermoelectrics
DEPARTMENT OF BORG-WARNER CORPORATION
WOLF AND ALGONQUIN ROADS, DES PLAINES, ILLINOIS 60018, PHONE 312/827-3131

THERMOELECTRIC COOLI

INTRODUCTION TO THERMOELECTRIC PRODUCTS

Thermoelectric cooling units have many unique advantages over other types of coolers in their application area.

SIZE

They can be tailored to fit the application by easy addition or subtraction of modules to fill the need accurately and avoid waste.

POWER INPUT

Due to tailored modular construction, power requirements can be reduced to a minimum. Power is provided through a single pair of leads.

RELIABILITY

There are no parts that wear or clog, and no delicate moving parts. Gases, corrosive liquids or chemicals that will leak or dissipate with age are also eliminated. These features result in greatly reduced maintenance requirements.

LOGISTICS

There are no requirements at the load for pumping refrera or for a source of coolant such as liquid nitrogen to be ddd during operation of the system.

REMOTE CONTROL

The unit and heat sink are required in the cooling ar; t power supply and most other control equipment c mounted and operated remotely.

COOLING RANGE

Thermoelectric coolers are capable of operating fro ar heat-sink temperature from +100°C to —100°C.

TEMPERATURE CONTROL

Simple electronic control schemes allow control wi in fraction of a degree of desired load temperatures ab e below ambient.

APPLICATION OF THERMOELECTRIC PRODUCTS

ELECTRONIC COMPONENTS

Cold traps for vacuum chambers
Crystals
Discrete silicon components
Inertial guidance systems
Infrared detectors
Integrated circuits
Lasers
Masers
Nuclear radiation detectors
Parametric amplifiers
Photomultiplier tubes
Vidicon tubes

TEMPERATURE CONTROL UNITS

Constant temperature chambers
Environment chambers
Integrated circuit test chambers
Temperature baths

COMMERCIAL REFRIGERATION

Aircraft water coolers
Cream coolers
Display cabinets
Ice cube makers
Photo developing solution co er
Picnic baskets
Restaurant service-stand co ers

MEDICAL AID LABORATORY INSTRUMEN S

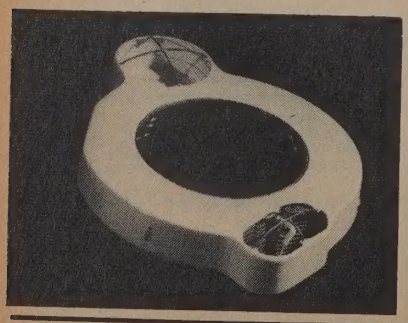
Blood coagulators
Cold probes
Dew point hygrometers
Microscope cold plates
Mobile drug coolers
Surgical instrument-coolers
Test tube coolers

CUSTOM DESIGN

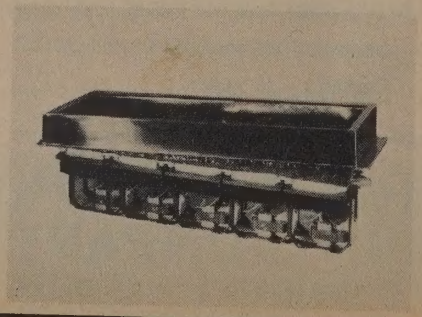
Engineering back-up is available for designs to meet customer specifications

SPECIAL ASSEMBLY

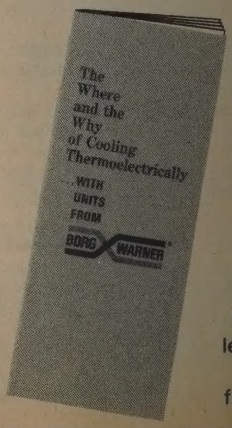
Ring type cooler to stabilize the inertial navigation system at 40°C and pump 280 watts with an input power of 338 watts.



This system cools one gallon of chemical solution to 40°F below ambient with 850 watts of input power. Load capability 450 watts to 0 △T.



The principles, applications, and d ign possibilities of thermoelectric co ing are discussed in this booklet.



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See YELLOW SECTION for Local Offices, Phones

NDARD THERMOELECTRIC DEVICES

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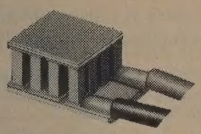
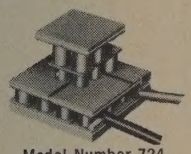


Model Number 837

umber 840

Model Number 920

umber 447
Stage)



Model Number 724
(3 Stage)

Number 670
Stage)

Model Number 1010
Heat Pump

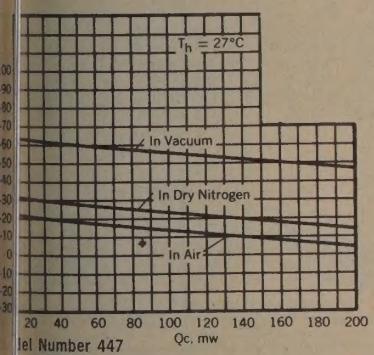
Borg-Warner Model 1010. Power requirements are 115 volts AC for the fan and 25 volts, 6.5 amperes DC for the thermoelectric assembly.

SPECIFICATION CHART— DATA TAKEN AT TH-27C° IN VACUUM

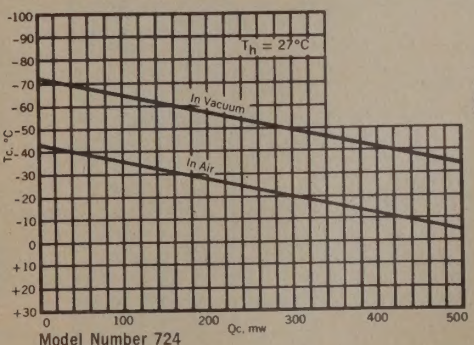
Cooler Model #	Max. ΔT $Q_c=0$	Max Q_c $\Delta T=0$	Max. Voltage	Max. Current	Coldplate Size	Hotplate Size	Height
SINGLE STAGE							
492	69°C	2.6w	.8v	3.5a	.500″	.500″	.347″
837	69°C	1.2w	1.0v	1.75a	.250x.250″	.350x250″	.160″
838	69°C	1.5w	1.0v	2.75a	.250x.250″	.350x.250″	.120″
840	69°C	3.3w	3.5v	1.0a	.528″	.528x.600″	.188″
920	69°C	19w	3.5v	8.5a	15/32″	15/32″	7/32″
930	69°C	19w	8.5v	3.7a	15/32″	15/32″	13/64″
940	69°C	30w	3.6v	14a	15/32″	15/32″	11/64″
950	69°C	30w	9.2v	6a	15/32″	15/32″	5/32″
CASCADE							
2 Stage							
447	90°C	200mw	1.1v	3.5a	½″	½x⅝″	.562″
618	88°C	150mw	.2v	9a	.222x.12″	½x½″	.484″
638	90°C	800mw	1v	6a	.200x.200″	⅝x⅝″	.440″
922-4	86°C	90w	37.5v	7a	2.25″	5x4.125″	1.250″
932-1	92°C	4.0w	9.0v	3.5a	0.5x0.5″	1.17x1.17″	.375″
3 Stage							
623	117°C	140mw	.94v	8a	.22x.12″	.600x.600″	.672″
724	100°C	900mw	1v	12a	.500 Dia.	1x1″	.800″
4 Stage							
670	119°C	200mw	1.4v	4.5a	.250x.250″	½x⅝″	1.085″
HEAT PUMP							
1010	45°C	100w	25v	6.5a	5⅞x4″	4x8″	5⅜″

CONTACT FACTORY FOR VARIATIONS OF THE ABOVE DEVICES

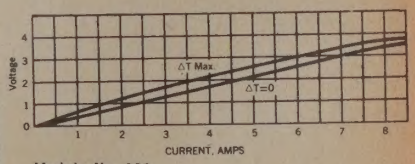
OPERATING CONDITIONS The above data was taken in a vacuum with thermocouples placed on the cold plate and on the heat sink immediately adjacent to the hot plate.



el Number 447
(2 Stage)

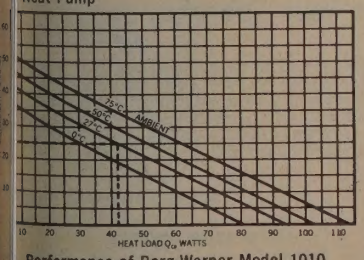


Model Number 724
(3 Stage)



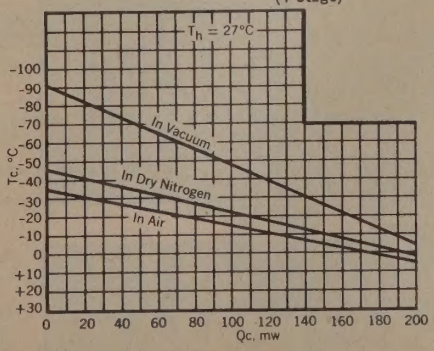
Module No. 920
Module Voltage

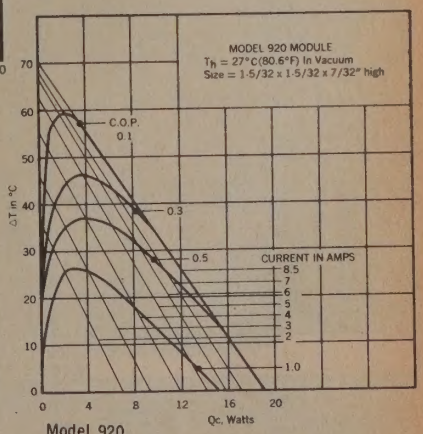
el Number 1010
Heat Pump



Performance of Borg-Warner Model 1010 Heat Pump.

Model Number 670
(4 Stage)





Model 920
Module ΔT vs. Module Heat Pumping Capacity for Various COP and Current Values.

WARNER

-Warner Thermoelectrics

TMENT OF BORG-WARNER CORPORATION

WOLF AND ALGONQUIN ROADS, DES PLAINES, ILLINOIS 60018, PHONE 312/827-3131

CAL-R® INC. THERMONETICS DIVISION

a subsidiary of CapTech, Inc.

GENERAL NOTES All thermistor components conform to AQL and confidence levels as specified in MIL-T-23648 as outlined by Tables V and VI.
Coatings, encapsulations, markings, probes and resistor/thermistor networks . . . are also available to meet specific requirements b ont our Applications Engineering Department.
Resistance tolerances of ±1% through ±20% are available and may be specified at 25°C or any temperature within the operati ran
Maximum operating temperature with leads 150°C. Contact factory when application temperature exceeds 150°C.
Special lead materials, standard leads, and other variations are available to meet your design requirements.

THERMISTORS

MASTER CHART OF "SPECIFICATIONS"

R @ 25°C Ω ±10%	Part Number	Negative Temperature Coeff. %/°C @ 25°C	NOMINAL D.C.* M.W./°C	NOMINAL T.C.** SECS.	DIMENSIONS ±10% A	B	L	Leads AWG #	TYPE
100,000	2J05	—4.4	3	10	.055	.262	.055	30	Bar
75,000	2J06	—4.4	3	8	.055	.200	.055	30	Bar
50,000	2J07	—4.4	3	7	.055	.130	.055	30	Bar
30,000	2J08	—4.4	2	6	.055	.075	.055	30	Bar
25,000	2J09	—4.4	2	5	.055	.065	.055	30	Bar
20,000	2J10	—4.4	2	5	.055	.055	.055	30	Cube
15,000	2J11	—4.4	2	4	.055	.045	.055	30	Cube
10,000	2J12	—4.4	2	4	.055	.035	.055	30	Cube
10,000	1J112	—4.4	2	4	.07	.05		30	Disc
10,000	1J13	—4.4	4	12	.10	.10		28	Disc
8,000	1J14	—4.4	4	10	.10	.08		28	Disc
7,000	1J145	—4.4	4	10	.10	.07		28	Disc
6,000	1J147	—4.4	3	9	.10	.06		28	Disc
5,000	1J15	—4.4	3	8	.10	.05		28	Disc
4,000	1J154	—4.4	5	23	.15	.09		24	Disc
3,000	3J16	—4.4	2	3	.06	.013	.06	30	Wafer
3,000	1J155	—4.4	6	20	.15	.07		24	Disc
2,500	1J158	—4.4	5	19	.15	.06		24	Disc
2,000	3J20	—4.4	2	4	.08	.013	.08	28	Wafer
2,000	1J20	—4.4	7	25	.20	.08		24	Disc
2,000	1D10	—3.9	2	3	.05	.03		30	Disc
2,000	2D10	—3.9	2	4	.055	.055	.055	30	Cube
1,500	1J205	—4.4	7	23	.20	.06		24	Disc
1,000	1J21	—4.4	7	18	.20	.04		24	Disc
1,000	1J24	—4.4	9	48	.30	.086		24	Disc
1,000	3J24	—4.4	2.6	5	.10	.013	.10	28	Wafer
1,000	1D112	—3.9	2	4	.07	.03		30	Disc
1,000	1D13	—3.9	4	10	.10	.07		28	Disc
1,000	2D13	—3.9	2	4	.055	.035	.055	30	Cube
800	1D14	—3.9	3	8	.10	.05		28	Disc
750	1J245	—4.4	8	46	.30	.07		24	Disc
700	1D145	—3.9	3	7	.10	.045		28	Disc
600	1D147	—3.9	3	7	.10	.04		28	Disc
500	1J119	—4.4	8	35	.30	.045		24	Disc
500	1D15	—3.9	3	6	.10	.03		28	Disc
500	3D15	—3.9	2	3	.06	.013	.06	30	Wafer
500	1D153	—3.9	7	20	.15	.075		24	Disc
500	1J28	—4.4	9	65	.40	.08		22	Disc
300	1D19	—3.9	7	25	.20	.08		24	Disc
300	3D19	—3.9	2	4	.08	.013	.08	28	Wafer
300	3J30	—4.4	3	11	.19	.013	.19	24	Wafer
200	1J35	—4.4	14	60	.50	.05		22	Disc
200	1D20	—3.9	7	20	.20	.05		24	Disc
200	3D20	—3.9	2	5	.09	.014	.09	28	Wafer
100	1D21	—3.9	7	18	.20	.03		24	Disc
100	3D21	—3.9	2.5	7	.14	.013	.14	28	Wafer
100	1B13	—3.3	3	10	.10	.07		28	Disc
100	2B13	—3.3	2	4	.055	.035	.055	30	Cube
50	1D30	—3.9	14	80	.50	.09		22	Disc
50	3D30	—3.9	3.2	11	.19	.013	.19	28	Wafer
50	1B15	—3.3	3	6	.10	.03		28	Disc
30	1B19	—3.3	7	25	.20	.08		24	Disc
25	1D33	—3.9	14	60	.50	.04		22	Disc
20	1B20	—3.3	7	20	.20	.05		24	Disc
10	1B23	—3.3	8	48	.30	.06		24	Disc
5	1B32	—3.3	14	80	.50	.08		22	Disc
2.5	1B33	—3.3	14	60	.50	.04		22	Disc

"INTERCHANGEABLE (±0.2°C 0° To 100°C) THERMISTORS"***
EPOXY COATED

2,000	5J102	—4.4	3	10	.125	.125		30	Spherical
3,000	5J103	—4.4	3	10	.125	.125		30	Spherical
5,000	5J105	—4.4	2	8	.100	.100		30	Spherical
10,000	5J110	—4.4	2	8	.100	.100		30	Spherical
20,000	5J120	—4.4	2	8	.100	.100		30	Spherical

***** INTERCHANGEABLE THERMISTORS**

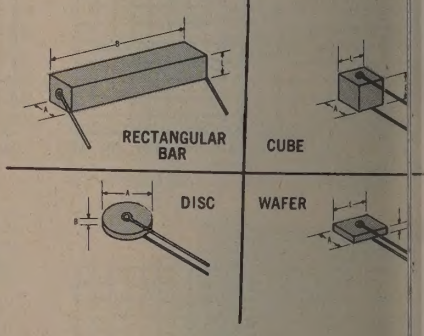
"Interchangeable Thermistor Series," designed for interchangeability over narrower temperature range are available to your specifications. This series is supplied in an epoxy coated spherical shape as a standard.

R/T CONVERSION TABLE

TEMPERATURE °C	°F	CURVE B R_t/R_{25}	CURVE D R_t/R_{25}	CURVE J R_t/R_{25}
—60	—76	43.0	73.04	1[illegible]
—50	—58	24.3	38.95	[illegible]
—40	—40	14.4	21.51	[illegible]
—30	—22	8.93	12.33	[illegible]
—21.5	—6.7	6.09	—	[illegible]
—20	— 4	5.69	7.307	[illegible]
—10	+14	3.68	4.476	[illegible]
0	32	2.45	2.825	[illegible]
10	50	1.68	1.830	[illegible]
20	68	1.18	1.216	[illegible]
25	77	1.00	1.000	[illegible]
30	86	.854	.8267	[illegible]
37.8	100	.671	—	[illegible]
40	104	.628	.5742	[illegible]
50	122	.464	.4067	[illegible]
60	140	.350	.2937	[illegible]
70	158	.267	.2160	[illegible]
75	167	.236	—	[illegible]
80	176	.208	.1615	[illegible]
90	194	.163	.1229	[illegible]
100	212	.130	.0946	[illegible]
104.4	220	.118	—	[illegible]
110	230	.105	.0739	[illegible]
120	248	.0852	.0584	[illegible]
125	257	.0771	—	[illegible]
130	266	.0700	.0470	[illegible]
140	284	.0579	.0382	[illegible]
150	302	.0483	.0313	[illegible]

To determine the resistance of a thermistor at a ec temperature, multiply the thermistor resistance by the factor opposite the desired temperature.

CURVE B	CURVE D	CUR J
B (25°/75°C) = 3000°K ±80°K	B (25°/75°C) 3450°K ±80°K	B (25°/ °C) = 3965°K
0°/50°C Ratio = 5.3 ±4%	0°/50°C Ratio = 6.9 ±4%	0°/50°C 9.1 ±
25°/125°C Ratio = 12.95 ±10%	25°/125°C Ratio = 19.8 ±10%	25°/125°C 29.85 ± %



***DISSIPATION CONSTANT**

Dissipation Constant, expressed in mw/°C, represe th amount of power required to raise the temperatur of thermistor 1°C.

****TIME CONSTANT**

Time Constant, expressed in seconds, is the time re ire for a thermistor dissipating zero power to change 63 % of the difference between its initial temperature val an that of a new temperature environment.

See YELLOW SECTION for Local Offices, Phones

POSITIVE TEMPERATURE COEFFICIENT THERMISTORS

Molded Case
etic Seal Case
h Positive Temperature Coefficient, +0.7%/°C Typical
uirements of MIL-T-23648

Power Ratings ⅛ and ¼ WATT

Resistance Values 10 OHMS to 10,000 OHMS

Temperature Range — 65°CT. + 175°C Max. (7200 PPM/°C)

GENERAL SPECIFICATIONS

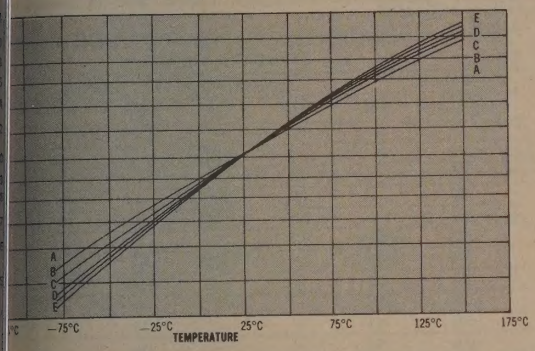
Style	CM ⅛	CM ¼	CG ⅛
ion Constant	.8 MW/°C	1.6 MW°C	.8 MW/°C
Time Constant	35 Sec.	54 Sec.	60 Sec.
ng Temperature	—65°CTo+150°C	—65°CTo+150°C	—65°CTo+175°C
nce Range Ohms	10 To 10,000	10 To 10,000	10 To 10,000
pe	Molded	Molded	Glass
	Axial	Axial	Axial

Voltage rating @ 100°C. 2. Resistance Measurements @ 25°C ±0.20°C.

STANDARD RESISTANCE VALUES IN OHMS

10	27	56	150	390	820	2200	5000
12	33	68	180	470	1000	2700	5600
15	39	82	220	500	1200	3300	6800
18	47	100	270	560	1500	3900	8200
22	50	120	330	680	1800	4700	10,000

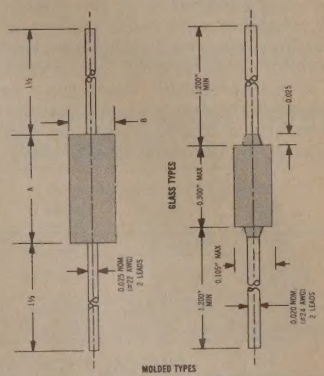
Standard Resistance Tolerance ±5% and ±10% when measured at 25°C and . . . more to come



A	10 — 68Ω
B	82 — 150Ω
C	180 — 560Ω
D	680 — 1.5KΩ
E	1.8 — 10KΩ

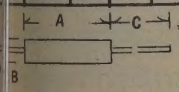
R_t/R_{225C} vs. Temp °C

Curves depicted above are nominal curves:
Tolerance limits may be computed using the following formula:
$R_L = R_N \pm 0.15\,(R_N - 1)$
Where R_L = Resistance Ratio Limit
R_N = Resistance Ratio Nominal



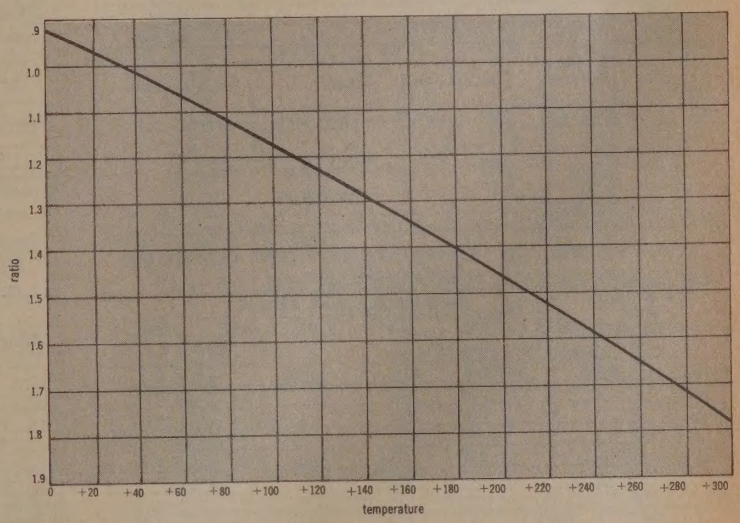
Type	A	B
CM⅛	0.405 ± 0.015"	0.140 ± 0.015"
CM¼	0.585 ± 0.015"	0.200 ± 0.015"

Nominal Dimension A	B	C	D	Max. Res Ω	Nominal *Dissipation Constant (MW/°C)	Max. Watts	Meets the Requirements of Mil Spec. #
.312	.094	1.5"	.020	300	7.7	.5	MIL-R-26D
.344	.094	1.5"	.020	500	6.6	1	MIL-R-26D
.406	.094	1.5"	.020	700	5.7	1.5	MIL-R-26D
.531	.094	1.5"	.020	1.2K	7.5	1.7	MIL-R-26D
.500	.156	1.5"	.032	2.5K	9.0	2	MIL-R-26D
.500	.188	2"	.032	3K	13.3	3	MIL-R-26D
.562	.188	2"	.032	4K	13.0	3.1	MIL-R-26D
.812	.188	2"	.032	4K	14.3	3.2	MIL-R-26D
.625	.250	2"	.040	5K	16.6	3.5	MIL-R-26D
.875	.312	2"	.040	7K	20.0	5	MIL-R-26D
1.000	.312	2"	.040	8K	21.0	5.5	MIL-R-26D
1.219	.312	2"	.040	10K	23.0	7	MIL-R-26D
1.375	.415	2"	.040	16K	28.3	9.5	MIL-R-26D
1.781	.375	2"	.040	20K	30.0	10	MIL-R-26D
1.969	.415	2"	.040	25K	40.0	12.5	MIL-R-26D
.200	.100	1.5"	.016	5K	4.0	.06	MIL-R-93D
.250	.125	1.5"	.020	10K	5.3	.08	MIL-R-93D
.375	.125	1.5"	.020	40K	6.6	.1	MIL-R-93D
.250	.250	2"	.032	60K	13.0	.2	MIL-R-93D
.375	.250	2"	.032	100K	16.0	.25	MIL-R-93D
.500	.250	2"	.032	200K	17.0	.25	MIL-R-93D
.750	.250	2"	.032	300K	23.0	.35	MIL-R-93D
1.000	.250	2"	.032	350K	26.0	.4	MIL-R-93D



*Dissipation Constant: The amount of power required to raise the temperature of the device 1°C above ambient.

RESISTANCE RATIO vs TEMPERATURE CURVE



TEMPERATURE SENSITIVE RESISTORS

SILICONE COATED AXIAL POWER RESISTORS

ERIES/FEATURES:

perweld leads standard, hot tin dipped for maximum solderability. Nickel Alloy 180 available where maximum weldability is required.
pletely welded construction terminal to terminal.
e-alumina and steatite ceramics, centerless ground for uniformity, chemic- treated for utmost purity of winding surface.
gh silicon coating, to give maximum wire protection and extra high resist- e to moisture.

RICAL CHARACTERISTICS

ANCES: 10, 5, 3 and 1%.
RATURE COEFFICIENT: +.45%/°C ±.02%/°C.
CTRIC STRENGTH: greater than 1000 V.A.C.

ONMENTAL Meet or exceed applicable paragraphs of MIL-R-26D.

MINIATURE WIRE WOUND BOBBIN STYLE

MB and AB SERIES/FEATURES

1. Terminals welded to end cap for maximum strength — will withstand 15 lbs. linear pull.
2. Double slots tangent to mandrel to prevent shorting between pie windings.
3. Protective overcoating covering entire resistor before molding insures maximum moisture protection and secures winding without introducing stress.
4. Resistor element encased in non-burning epoxy by transfer molding techniques.
5. Standard leads tinned copperweld Nickel or Dumet available.

ELECTRICAL CHARACTERISTICS

TOLERANCE: 10, 5, 3 and 1%.
TEMPERATURE COEFFICIENT: +.45%/°C ±.02%/°C.
Windings: M
WINDINGS: Multiple pie reversed type to minimize inductance (except on Miniature Series).

ENVIRONMENTAL Meet or exceed applicable paragraphs of MIL-R-93D.

SALR® INC. / CAPACITOR DIVISION · RESISTOR DIVISION · THERMONETICS DIVISION
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 451-9761 • TWX 910-343-6966
subsidiary of CapTech, Inc.

CARBORUNDUM® THERMISTORS

MEDIUM SENSITIVITY, NTC RODS

Carborundum thermistors are non-linear (pos. or neg. temperature coefficient) resistors which offer a wide range of temperature-coefficient characteristics. The coefficients available are approximately .3% per degree C to 10% per degree C at 25°C. Carborundum thermistors are bonded ceramically through a high-temperature firing process into disc and rod-shaped bodies in a wide range of sizes to provide the desired resistance values, thermal time and dissipation constants, and temperature coefficients for a wide variety of electrical and electronic circuits.

Our long experience in the design of special resistance devices, together with wide experience in the field of ceramic technology, assures a stable and uniform product to meet your thermistor requirements. All materials used in the manufacture of Carborundum thermistors are of the highest quality. Strict quality control is maintained over all stages of manufacture and a minimum of two calibrations at the specified reference temperature and/or load current is standard.

SPECIFICATIONS	F-1	F-2	F-3	F-4	F-5	F-6	F-7
Ratio $\frac{R @ 25°C}{R @ 125°C}$, nominal	2.82	3.26	3.64	4.37	5.00	5.95	6.84
"B" value (37.8°C–73.5°C) ±10%	1250	1400	1550	1750	1900	2100	2250
Temperature coefficient @ 25°C, per °C	1.40%	1.56%	1.72%	1.97%	2.11%	2.40%	2.50%

PHYSICAL SPECIFICATIONS

Type	Fig.	Dimensions A	Dimensions B	Dimensions C	Lead Wire Ga.	Dissipation Constant MW°/C	Time Constant Seconds	Remarks
0325F	I	.12	.30	1	24	6.0	10	Coated
0525F	I	.22	.375	1⅛	24	8.0	22	Coated
0550F	I	.22	.63	1⅜	20	11.0	25	Coated
0599F	I	.22	1.125	1⅜	20	15.0	50	Coated
1099F	I	.375	1.125	1⅜	20	24.0	90	Coated
0650F	II	.20	.50	1⅜	20	11.0	27	Uncoated

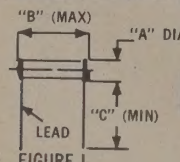


FIGURE I

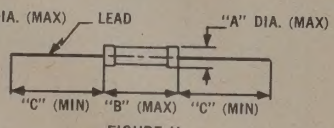


FIGURE II

TYPE "F-1" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
2.0	—	100	—	—	—	—
2.5	—	101	—	—	—	—
3.0	—	102	—	—	—	—
3.5	—	103	—	—	—	—
4.0	—	104	—	—	—	—
4.5	—	105	100	—	—	—
5.0	—	—	101	—	—	—
7.5	100	—	—	100	—	—
10.0	101	—	—	101	—	—
15.0	102	—	—	102	—	—

Order by Type number and subdesignation. Example: 0550F-100 identifies the 4.5-ohm version of Type 0550F.

TYPE "F-2" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
5.0	—	106	—	—	—	100
7.5	—	107	102	—	—	101
10.0	—	108	103	—	100	102
15.0	—	109	104	—	101	—
20.0	103	—	105	103	—	—
25.0	104	—	—	104	—	—
30.0	105	—	—	105	—	—

Order by Type number and subdesignation. Example: 0550F-102 identifies the 7.5-ohm version of Type 0550F.

TYPE "F-3" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F
25	—	110	106	—	102
50	—	111	107	—	103
75	106	—	108	106	—
100	107	—	—	107	—
125	108	—	—	108	—
150	109	—	—	109	—
200	110	—	—	110	—

Order by Type number and subdesignation. Example: 0599F-106 identifies the version of Type 0599F.

TYPE "F-4" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F
75	—	112	—	—	104
100	—	113	109	—	105
125	—	114	110	—	106
150	—	115	111	—	107
200	—	116	112	—	108
250	111	117	113	111	109
500	112	118	114	112	110
750	113	—	115	113	—
1,000	114	—	—	114	—
1,500	115	—	—	115	—
2,000	116	—	—	116	—

Order by Type number and subdesignation. Example: 0525F-117 identifies the version of Type 0525F.

TYPE "F-5" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F
750	—	119	—	—	111
1,000	—	120	116	—	112
1,500	—	121	117	—	113
2,000	—	122	118	—	114
2,500	117	123	119	117	115
5,000	118	124	120	118	116
7,500	119	—	121	119	—
10,000	120	—	—	120	—

Order by Type number and subdesignation. Example: 0525F-123 identifies the 2- version of Type 0525F.

TYPE "F-6" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F
7,500	—	125	—	—	117
10,000	—	126	122	—	118
25,000	121	127	123	121	119
50,000	122	128	124	122	120
75,000	123	—	125	123	—
100,000	124	—	—	124	—
125,000	125	—	—	125	—
150,000	126	—	—	126	—
200,000	127	—	—	127	—

Order by Type number and subdesignation. Example: 0599F-122 identifies the 50,0 version of Type 0599F.

TYPE "F-7" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F
75,000	—	129	—	—	121
100,000	—	130	126	—	122
150,000	—	131	127	—	123
200,000	—	132	128	—	124
250,000	128	133	129	128	125
500,000	129	134	130	129	126
750,000	130	135	131	130	127
1,000,000	131	—	132	131	128
1,500,000	132	—	133	132	—
2,000,000	133	—	—	133	—

Order by Type number and subdesignation. Example: 0650F-121 identifies the 75,00 version of Type 0650F.

Stock Item

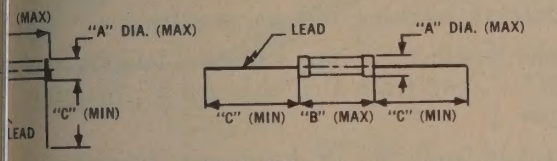
CARBORUNDUM® THERMISTORS

HIGH SENSITIVITY, NTC RODS

Specifications	H-1	H-2	H-3	H-4	H-5	H-6	H-7	H-8
25°C 125°C	11.5	13.5	18.0	23.0	30.0	36.0	44.0	52
(37.8°—73.5°C ±5%	2800	3000	3400	3700	4000	4200	4400	4600
re coefficient @ 25°C per °C	3.1%	3.4%	3.8%	4.1%	4.4%	4.7%	4.9%	5.1%

PHYSICAL SPECIFICATIONS

Dimensions A	Dimensions B	Dimensions C	Lead Wire Gauge	Dissipation Constant MW/°C	Time Constant Seconds	Remarks
.12	.30	1	24	6.0	10	Coated
.22	.375	1⅛	24	8.0	22	Coated
.22	.63	1⅜	20	11.0	25	Coated
.22	1.125	1⅜	20	15.0	50	Coated
.20	.50	1⅜	20	11.0	27	Uncoated



0650H ONLY

E "H-1" NEGATIVE TEMPERATURE COEFFICIENT THEMISTORS STANDARD VALUES

tance at 25°C 10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
750	—	100	—	—	100
000	—	101	100	—	101
500	—	102	101	—	102
000	—	—	102	—	—
500	100	—	103	100	—
750	101	—	—	101	—
000	102	—	—	102	—

y Type number and sub-designation. Example: 0650H-101 identifies the 1,000 sion of Type 0650H.

PE "H-2" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

istance at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
2000	—	103	—	—	103
2500	—	104	—	—	104
3750	—	105	104	—	105
5000	—	—	105	—	—
7500	103	—	—	103	—
10000	104	—	—	104	—
12500	105	—	—	105	—

by Type number and sub-designation. Example: 0650H-104 identifies the 2,500 ersion of Type 0650H.

PE "H-3" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

sistance ns at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
7500	—	106	—	—	106
10000	—	107	106	—	107
12500	—	108	107	—	108
15000	—	—	108	—	—
25000	106	—	—	106	—
35000	107	—	—	107	—
45000	108	—	—	108	—

by Type number and sub-designation. Example: 0650H-107 identifies the 10,000 version of Type 0650H.

TYPE "H-4" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
12500	—	—	—	—	—
15000	—	109	—	—	109
25000	—	110	109	—	110
35000	—	—	110	—	—
45000	—	—	—	—	—
60000	109	—	—	109	—
75000	110	—	—	110	—

Order by Type number and sub-designation. Example: 0650H-110 identifies the 35,000 ohm version of Type 0650H.

TYPE "H-5" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
25000	—	—	—	—	—
35000	—	114	—	—	114
45000	—	115	111	—	115
60000	—	116	112	—	116
75000	—	—	113	—	—
100000	111	—	—	111	—
150000	112	—	—	112	—
200000	113	—	—	113	—

Order by Type number and sub-designation. Example: 0650H-113 identifies the 25,000 ohm version of Type 0650H.

TYPE "H-6" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
60000	—	—	—	—	—
75000	—	117	—	—	117
100000	—	118	114	—	118
150000	—	119	115	—	119
200000	—	—	116	—	—
250000	114	—	117	114	—
500000	115	—	—	115	—

Order by Type number and sub-designation. Example: 0650H-119 identifies the 100,000 ohm version of Type 0650H.

TYPE "H-7" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
200000	—	120	—	—	120
250000	—	121	—	—	121
500000	—	—	—	—	—
750000	116	—	—	116	—
1000000	117	—	—	117	—

Order by Type number and sub-designation. Example: 0650H-121 identifies the 250,000 ohm version of Type 0650H.

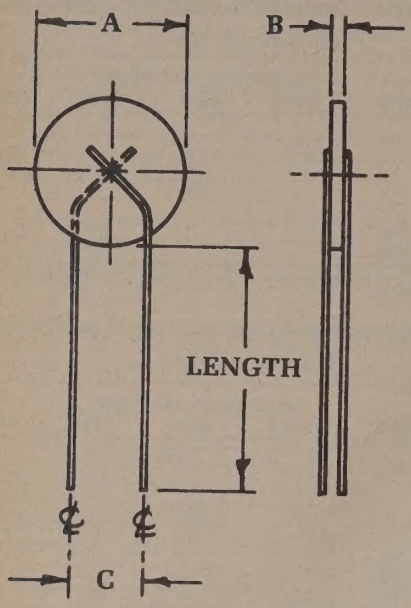
TYPE "H-8" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
200000	—	122	—	—	122
250000	—	123	—	—	123
500000	—	124	119	—	124
750000	118	125	120	118	125
1000000	119	126	121	119	126
1500000	120	—	—	120	—
2000000	121	—	—	121	—

Order by Type number and sub-designation. Example: 0650H-122 identifies the 200,000 ohm version of Type 0650H.

Stock Item

CARBORUNDUM® THERMISTORS
HIGH SENSITIVITY, NTC DISCS



Specifications	Type A	Type B	Type C
$\frac{R @ 25°C}{R @ 125°C} \pm 10\%$	28.5	14.2	18.7
β (°K) between 37.8°C-73.5°C	3980	3070	3415
Temp. Coef. (α) %/°C @ 25°C	—4.4%	—3.4%	—3.8%

Notes:

1. Dielectric coating, marking optional at extra cost.
2. Standard lead length 1½″. Non-standard lengths avail 1/4″ through 5/8″, and from 1½″ through 2″. Standard tinned copper.
3. Standard kinked leads (for PC board use) furnished or

TYPE "A" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
50	.82	.08	.375	18	29.0	150	A3308J
75	.82	.11	.375	18	29.0	150	A3311J
100	.40	.03	.250	22	9.0	35	A1603J
125	.40	.04	.250	22	9.0	35	A1604J
150	.30	.03	.250	24	8.0	35	A1203J
175	.30	.03	.250	24	8.0	35	A1203J
200	.30	.03	.250	24	8.0	35	A1203J
250	.30	.05	.250	24	8.0	40	A1205J
300	.30	.06	.250	24	8.0	40	A1206J
500	.20	.04	.125	24	6.5	12	A0804J
600	.20	.04	.125	24	6.5	12	A0804J
750	.20	.05	.125	24	6.5	12	A0805J
900	.20	.06	.125	24	7.0	24	A0806J
1000	.20	.07	.125	24	7.0	24	A0807J
1250	.20	.08	.125	24	7.5	30	A0808J
1500	.20	.10	.125	24	7.5	30	A0810J

TYPE "B" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
2.0	.65	.05	.375	22	17.0	90	B2605J
2.5	.65	.06	.375	22	17.0	90	B2606J
3.0	.65	.07	.375	22	17.0	90	B2607J
5.0	.40	.04	.250	22	9.0	35	B1604J
7.0	.40	.06	.250	22	9.0	35	B1606J
10.0	.30	.05	.125	24	8.5	38	B1205J
15.0	.30	.06	.125	24	8.5	43	B1206J
20.0	.20	.04	.125	24	7.0	22	B0804J
25.0	.20	.04	.125	24	7.0	22	B0804J
50.0	.20	.08	.125	24	7.5	22	B0808J

TYPE "C" HIGH NEGATIVE TEMPERATURE COEFFICIENT TERM STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carb Part
10	.65	.045	.350	22	15.0	90	C2
15	.45	.03	.250	22	9.0	35	C1
25	.40	.04	.250	22	9.0	35	C1
50	.30	.04	.250	24	8.5	40	C1
75	.30	.05	.250	24	8.5	40	C1
100	.20	.03	.125	24	6.5	12	C0
125	.20	.03	.125	24	6.5	12	C0
150	.20	.06	.125	24	7.0	22	C0
175	.20	.04	.125	24	6.5	12	C0
200	.20	.06	.125	24	7.0	22	C0
225	.20	.05	.125	24	6.5	12	C0
250	.20	.04	.125	24	6.5	12	C0
300	.20	.05	.125	24	6.5	12	C0

TYPE "D" HIGH NEGATIVE TEMPERATURE COEFFICIENT TH STANDARD VALUES

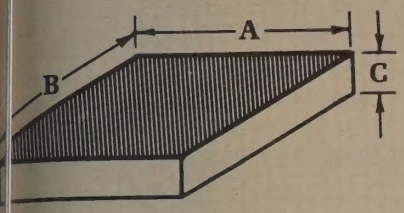
Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	rbor rt N
125	.82	.08	.375	18	26.0	135	D3
150	.82	.09	.375	18	26.0	135	D33
200	.40	.03	.250	22	9.0	35	D1
250	.40	.03	.250	22	9.0	35	D1
300	.40	.04	.250	22	9.0	35	D1
500	.30	.04	.250	24	8.0	38	D12
750	.30	.05	.250	24	5.0	38	D12
1000	.20	.03	.125	24	7.0	18	D08
1250	.20	.03	.125	24	7.0	18	D08
1500	.20	.03	.125	24	7.0	18	D08
2000	.20	.04	.125	24	7.0	18	D08
2500	.20	.05	.125	24	7.0	18	D08
3000	.20	.06	.125	24	7.0	18	D08

CARBORUNDUM The Carborundum Company, Electronics Plant, Niagara Falls, N.Y. 14302, 716-78

See YELLOW SECTION for Local Offices, Phones

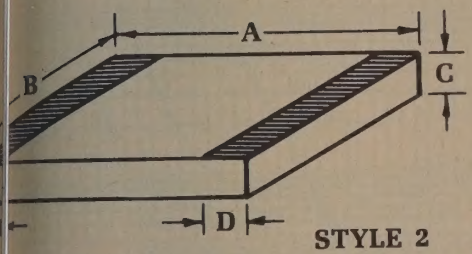
CARBORUNDUM® THERMISTORS

HIGH SENSITIVITY, NTC CHIPS



STYLE 1

Specifications	Type A	Type B	Type C	Type D
R @ 25°C / R @ 125°C ±10%	28.5	14.2	18.7	35.3
β (°K) between 37.8°C-73.5°C	3980	3070	3415	4200
Temp. Coef. (α) %/°C @ 25°C	−4.4%	−3.4%	−3.8%	−4.7%



STYLE 2

Notes:

1. Time & dissipation constants measured using 26 ga. tinned copper leads attached with solder.
2. Standard parts furnished without leads. Leads optional at extra cost.
3. Contacts—8032 DuPont conductive silver.

A Negative Temperature Coefficient Chip Thermistors

Resistance @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
300	.15	.15	.015		1	4.5	8.5	A1515C-1
680	.10	.10	.015		1	3.0	6.0	A1010C-1
800	.05	.05	.015		1	1.5	4.0	A0505C-1
000	.10	.05	.015	.015	2	2.5	5.0	A1005C-1
000	.20	.10	.015	.03	2	6.0	18.0	A2010C-1

B Negative Temperature Coefficient Chip Thermistors

Resistance @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
26	.15	.15	.015		1	4.5	8.5	B1515C-1
60	.10	.10	.015		1	3.0	6.0	B1010C-1
240	.05	.05	.015		1	1.5	4.0	B0505C-1
000	.10	.05	.015	.015	2	2.5	5.0	B1005C-1
000	.20	.10	.015	.03	2	6.0	18.0	B2010C-1

C Negative Temperature Coefficient Chip Thermistors

Resistance 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
55	.15	.15	.015		1	4.5	8.5	C1515C-1
130	.10	.10	.015		1	3.0	6.0	C1010C-1
520	.05	.05	.015		1	1.5	4.0	C0505C-1
9200	.10	.05	.015	.015	2	2.5	5.0	C1005C-1
9200	.20	.10	.015	.03	2	6.0	18.0	C2010C-1

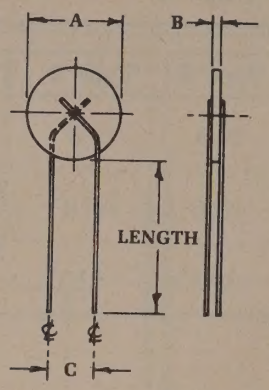
D Negative Temperature Coefficient Chip Thermistors

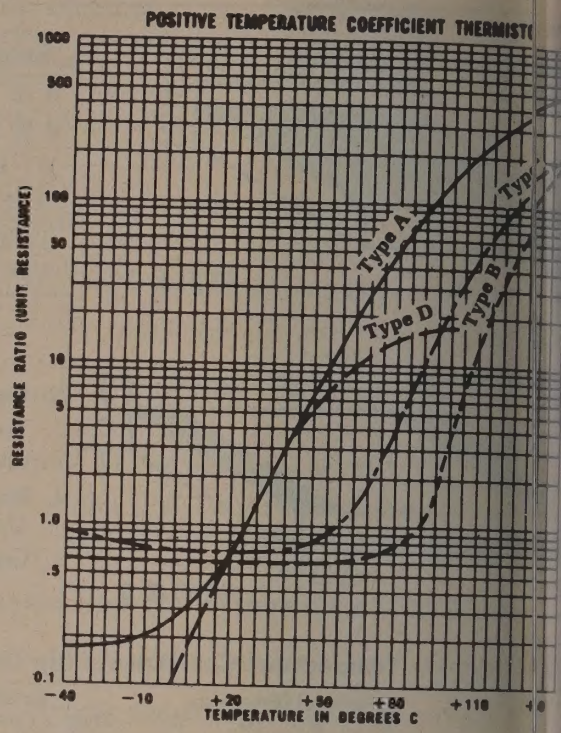
Resistance 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
500	.15	.15	.015		1	4.5	8.5	D1515C-1
1100	.10	.10	.015		1	3.0	6.0	D1010C-1
4400	.05	.05	.015		1	1.5	4.0	D0505C-1
88000	.10	.05	.015	.015	2	2.5	5.0	D1005C-1
88000	.20	.10	.015	.03	2	6.0	18.0	D2010C-1

RBORUNDUM The Carborundum Company, Electronics Plant, Niagara Falls, N. Y. 14302, 716—278-2521

CARBORUNDUM® THERMISTORS

POSITIVE TEMPERATURE COEFFICIENT UNITS





Notes:

1. Dielectric coating, marking optional at extra cost.
2. Standard lead length 1½". Non-standard length available from ¼" through ⅝", and from 1½" through 2". Standard leads are tinned copper.
3. Standard kinked leads (for PC board use) furnished on request.
4. Also available in chip form, and in rod and tubular forms for self-limit heater applications.

Specifications	Type A	Type B	Type D	Type E
Ratio:	R60°C/ R25°C= 14 ±6	R125°C/ R90°C= 45 ±15	R25°C/ R0°C= 7.2 ±2.5	R90°C/ R60°C= 14 ±6
Temp. Coeff.:	8%/°C @37.8°C	10%/°C @125°C	8%/°C @25°C	8.5%/°C @90°C

Type "A" Positive Temperature Coefficient Thermistors

Resistance Ω @ 25°C ±10%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number	Resistance Ω @ 25°C ±10%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number
190	.350	.06	.250	24	12	75	A1406P-11	625	.225	.10	.125	24	12	75	A0910P2
250	.350	.06	.250	24	12	75	A1406P-12	850	.225	.10	.125	24	12	75	A0910P3
325	.350	.06	.250	24	12	75	A1406P-14	1150	.225	.10	.125	24	12	75	A0910P5
330	.225	.05	.125	24	10	60	A0905P- 8	1450	.150	.10	.125	24	8	45	A0610P1
450	.225	.05	.125	24	10	60	A0905P- 9	2000	.150	.10	.125	24	8	45	A0610P2
600	.225	.05	.125	24	10	60	A0905P-11	2650	.150	.10	.125	24	8	45	A0610P4

Type "B" Positive Temperature Coefficient Thermistors

Resistance Ω @ 90°C ±20%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number	Resistance Ω @ 90°C ±20%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number
12.5	.350	.06	.250	24	12	75	B1406P- 8	27.5	.225	.06	.125	24	10	60	B0906P
20	.350	.06	.250	24	12	75	B1406P-10	47.5	.225	.06	.125	24	10	60	B0906P

Type "D" Positive Temperature Coefficient Thermistors

Resistance Ω @ 25°C ±10%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number	Resistance Ω @ 25°C ±10%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number
5,900	.350	.06	.250	24	12	75	D1406P- 8	36,500	.225	.10	.125	24	12	75	D0910P-
8,000	.350	.06	.250	24	12	75	D1406P- 9	50,000	.225	.10	.125	24	12	75	D0910P-
10,700	.350	.06	.250	24	12	75	D1406P-11	66,500	.225	.10	.125	24	12	75	D0910P-
17,500	.225	.04	.125	24	10	60	D0904P-10	100,000	.150	.10	.125	24	8	45	D0610P-
24,000	.225	.04	.125	24	10	60	D0904P-11	125,000	.150	.10	.125	24	8	45	D0610P-
32,000	.225	.04	.125	24	10	60	D0904P-13								

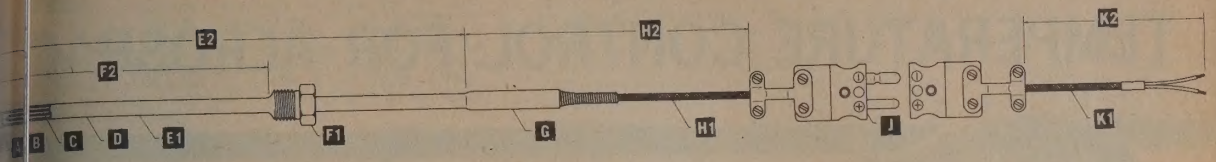
Type "E" Positive Temperature Coefficient Thermistors

Resistance Ω @ 60°C ±20%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number	Resistance Ω @ 60°C ±20%	Dimensions Less Coating A	B	C	Standard Values Lead Wire Gage	Dissipation Constant MW/°C	Time Constant Seconds	CARBORUNDUM Part Number
27.5	.350	.06	.250	24	12	75	E1406P- 8	80	.150	.06	.125	24	7	40	E0606P-
37.5	.350	.06	.250	24	12	75	E1406P- 9	115	.150	.06	.125	24	7	40	E0606P-
52.5	.350	.06	.250	24	12	75	E1406P-10	160	.150	.06	.125	24	7	40	E0606P-1

CARBORUNDUM

The Carborundum Company, Electronics Plant, Niagara Falls, N.Y. 14302, 716–278-2

THERMOCOUPLES



ete line of Thermocouples and other Temperature Sensing Devices, Associated re, Heating Elements and Metal Sheath Mineral Insulated Conductors.

Purpose Instrumentation includes el Sensors, Neutron Detectors, Co-axial and other Cables. Our QC is t of extensive research that makes products of fine quality and top y. The special knowledge gained in turing instrumentation for nuclear has given rise to a modern pro- facility. Here, moisture and other nation is prevented. Moreover, as- s are completed using the most reli- ving, swaging, heat-treating, welding ting equipment.

ineering department is especially adept in solving problems concerned with heating or temperature sensing. Among the many facilities available are non-destructive test and calibration techniques including radiograph, dye penetrant and helium leak testing. These are used to monitor our standard products and to handle special testing requirements.

Replacement Thermocouples and Hardware Components are interchangeable. Prompt attention to customers' need keep down time to an absolute minimum. Product reliability and immediate availability make it a first choice for many.

Our complete catalog lists thousands of combinations in an easy step-by-step procedure.

to order specify . . .

- A — Junction
- B — Thermocouple Wire
- C — Insulation Material
- D — Sheath Material
- E1 — Sheath O.D.
- E2 — Sheath Length Specify in. or ft.
- F1 — Mounting Fitting Code
- F2 — Immersion Depth Specify in. or ft.
- G — Transition or Termination Code
- H1 — Wire Code
- H2 — Wire Length Specify in. or ft.
- J — Wire Termination Code
- K1 — Wire Code
- K2 — Length Specify in. or ft.

LACEMENT THERMOCOUPLE COMPONENTS

ERMOCOUPLE WIRE A wide of bare and insulated thermo- wire available from stock for r delivery, in matched pairs to ndard Limits of Error.

SULATORS Made of high qual- amic and available in many and sizes, may be used with ermocouple wires to 2500°F.

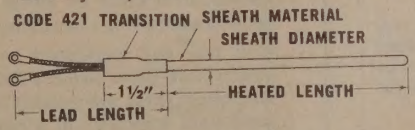
S AND JACKS Available to every thermocouple wire.

TTINGS Fixed and Adjustable s are available in stainless steel ass. Consult factory for special ements.

AVAILABLE: Variety of Thermo- and Industrial Heads.

HEATING ELEMENT ASSEMBLIES

QC MAX TEMP heaters are manufactured with the highest quality material and techniques producing elements that have long, dependable operating life with more heat in less space. The densely compacted assembly offers the most efficient heat transfer with the lowest possible temperature gradient between wire and sheath. QC heaters are available in virtually unlimited lengths, in a variety of diameters from .040 up to .430 and in any watt-density required.



APPLICATIONS:

- Heat tracing of pipe lines
- Heating valve mechanisms and other flow controls
- Heating vessels—interior and exterior
- Heating extrusion molding nozzles
- Heating plastic forming machinery
- De-icing of weather instruments
- De-icing of weather-exposed surfaces including sidewalks, roadways and bridges.

SHEATH CONDUCTOR

QC SHEATH CONDUCTOR consists of metal conductors surrounded by mineral insulation and covered by a metal sheath. QC is drawn to size and annealed producing an assembly with circular cross-section wires, hard packed high resistance insulation with maximum di-electric strength, high thermal conductivity and an outer metal sheath with the heaviest wall thickness available. Only the finest quality materials are used in making QC SHEATH CONDUCTOR to ensure long service life.

QC SHEATH CONDUCTOR is available in an almost infinite number of combinations of materials and conductor configurations.

EASILY USED

- QC can be formed about a minimum radius twice its sheath diameter
- Brazed or welded
- With standard tube or compression fittings
- Held to specific wire diameters or resistance
- Flattened without impairing electrical qualities
- Spliced for longer lengths
- At temperatures above 1000°F

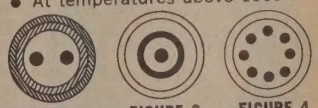


FIGURE 1 FIGURE 2 FIGURE 4

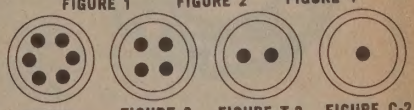
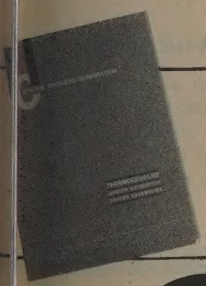


FIGURE 6 FIGURE 8 FIGURE T-3 FIGURE C-2



This catalog is the most complete guide and reference available on:

- * THERMOCOUPLES
- * HEATER ASSEMBLIES
- * SHEATH CONDUCTORS
- * REPLACEMENT COMPONENTS

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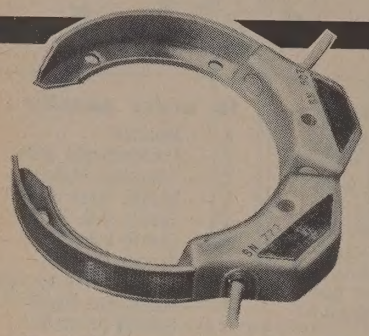
CONTROL PRODUCTS CORPORATION • *(312) 235-2340*

4427 West Division Street • Chicago, Illinois 60651

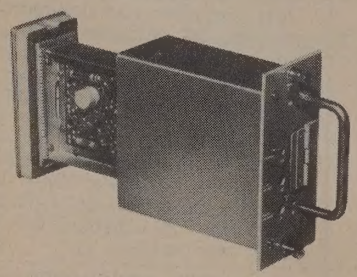
* Also manufacturers of AC Motor Drives and Control Panels

TEMPERATURE CONTROL FOR AEROSPACE

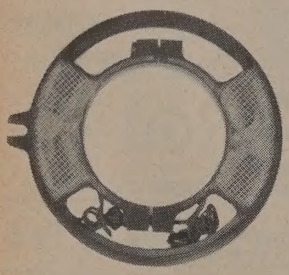


Temperature control system for LM rocket motors: Heater plus solid-state controller built to function over a 365°F. range.

Molded air-inlet duct with integral electrical heaters that provide anti-icing for helicopter engine.



Special oven to hold 60° ± 2°C in any ambient from −5 to +55°C. Warm-up time 20 minutes max. Designed for plug-in service and immediate access to circuit board for repairs.



Gyro supports, mass produced for a critical missile program. The metalwork is also supplied by Cox & Company, Inc. Heater resistance tolerance ±3%. Temperature sensor resistance tolerance ±.064% at 133°F.

In 1947 Cox & Company, Inc. pioneered in producing custom-made electrical heating elements and temperature control systems. In the middle fifties we began to supply electrical ice-protection equipment for aircraft. Today, having produced military and space qualified hardware in over 9,000 different designs, we remain a leader in the aerospace temperature control field. Our design, testing and manufacturing facilities, all devoted exclusively to thermal engineering, are in many respects unequaled in the aerospace industry. We believe that our products have records of performance and reliability that are unrivaled. There have been no reported failures of any of the more than two-and-a-half million Cox Thermopatch ® heating circuits in service, for example, except when there has been mechanical damage.

HEATING ELEMENTS

Cox-designed heating elements can be made to fit virtually any surface, including surfaces with compound curvature; they can be supplied in any suitable watt density distribution, with densities as high as heat transfer conditions permit. Cox heaters are made with a wide variety of materials and processes, the choices depending on the characteristics of the parts to which they will be mounted, environmental requirements and such customer specifications as flammability, toxicity and outgassing.

TEMPERATURE SENSORS AND CONTROLLERS

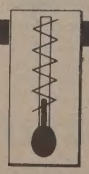
Cox produces surface-mounting resistance-element temperature sensors that combine mechanical flexibility and unusual ruggedness with high accuracy and stability. They are made flat but can be cemented in place on either flat or curved surfaces; if desired, a sensing element can be combined integrally with a heating element.

Cox has also developed precision mercury-in-glass thermostats which have been tested exhaustively for both durability and performance. These thermostats have been used in series with miniature solid-state amplifiers in a number of temperature control systems that have been qualified for manned space flight.

Solid-state controllers, using either resistance-wire sensors or thermistors as feedback elements, have been designed for many military and aerospace applications.

OVENS FOR CRYSTALS AND COMPONENTS

Cox is a major source for special production-run ovens and frequency standards custom-designed to meet previously unobtainable performance requirements; fast warm-up, with times under 2 minutes for temperature excursions exceeding 150°C and stability within ±.003°C over an ambient range of −65°C to +60°C.



COX & COMPANY, INC.

TEMPERATURE CONTROL FOR AEROSPACE

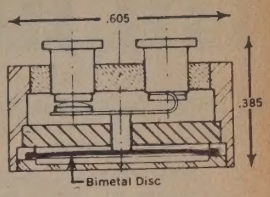
215 Park Avenue South, New York, N.Y. 10003 • (212) 674-4727

ELMWOOD® SUB-MINIATURE SNAP-ACTION THERMOSTATS

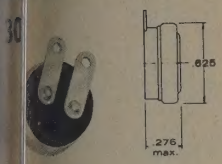
Elmwood thermostats are engineered for quick thermal response. Their heart is the bimetallic snap-acting disc which has proven highly reliable and serviceable over hundreds of thousands of cycles. Elmwood precision thermostats are manufactured and tested to conform to military specifications MIL-E-5272. Nickel plating is standard; other plating available. A variety of brackets and studs, as shown, are standard.

- Many mounting arrangements
- Exposure from —65°F to +550°F
- Proven Military and Civilian Performance Record
- Narrow or Wide Differential
- Rated to 15 Amps.
- Immediate Delivery from Stock
- Custom Packaging

When contacts are closed, current passes from terminal to terminal through the stationary contact to the movable contact, which is actuated by the snap movement of bimetal disc. This disc, which is fully insulated from the switch chamber by the pin and disc retainer, is affected by surface or ambient temperature changes only. Upon reaching the opening temperature, the disc snaps from a concave to a convex shape, releasing the pin which opens the contacts. The open circuit allows the temperature to drop and causes the disc to snap to its original position, closing the contacts. A thermostat which closes on a rise in temperature operates in a similar manner, but in reverse action.



ELMWOOD #3100

DESCRIPTION	ELECTRICAL RESISTIVE VOLTS	AMPS	THERMAL RANGE	DIFFERENTIAL	TOLERANCE
 Precise, reliable unit for electronic communications, missile and aircraft controls, heater blanket controls and crystal ovens. This inexpensive unit is factory-calibrated, has the highest quality operating parts, a phenolic base and metal closure. These assure maximum dust protection and high thermal and electrical dependability. It is available with a variety of mountings and terminals.	30 AC/DC	6	+0°F to +350°F	Wide 12°F or more STD	Wide ±5°F STD
	125 AC	6		Narrow 6°F Max. Avail. 80 to 200°F	Narrow ±3°F Min.
	250 AC	3			
This thermostat is hermetically sealed with high compression glass and heliarc welded steel case. It is so constructed as to withstand the severest environmental conditions such as altitude, shock, vibration and corrosive atmosphere. It has been extensively tested by government agencies, and has been used for many government and civilian purposes, such as aircraft warning controls, de-icing equipment, etc. Ideal for packaging in special enclosures.	30 AC/DC	6	—10°F to +500°F	Wide 12°F or more STD	Wide ±5°F STD
	125 AC	6		Narrow 6°F Max. Avail. 80 to 200°F	Narrow ±3°F Min.
	250 AC	3			
Low silhouette SPST switch, hermetically sealed, available narrow or wide differential as standard. Temperature calibrations pre-set at factory, 100% inspected. Open or close on temperature rise. Heliarc welded in steel housing, glass-to-metal seal at terminal junction. Maximum resistance to shock and vibration. Ideal for use in heater blankets, computers, crystal ovens, electronic and radar equipment, gyros, airborne de-icers, etc.	30 AC/DC	4	—10°F to +350°F	Narrow 6°F Max. Avail. 50 to 225°F	Narrow ±3°F STD
	125 AC	4		Wide 12°F or more STD	Wide ±5°F STD
This inexpensive control unit is designed with either phenolic (up to 300°F) or ceramic base, and has a tight-fitting dust-proof metal closure. It is recommended for applications where its heavy electric construction makes it ideal to control high amperage uses.	30 AC/DC	15	+0°F to +350°F	10°F Min.	±5°F STD
	125 AC	15			
	250 AC	8			
A precision, single-pole double-throw, hermetically glass sealed, heliarc welded thermostat that is engineered to instantaneously reverse a signal from one circuit to another. Airborne and ground control equipment are ideal uses for this highly reliable thermal switch.	30 AC/DC	2	+0°F to +350°F	12°F Min.	±5°F Min.
	125 AC	3			
	250 AC	2			
Sub-miniature SPST, snap-action switch measuring only .426" in diameter, with narrow (±3°F) tolerance and narrow (6°F) differential. Hermetically sealed steel housing, glass-to-metal seal, all welded construction. Fast, reliable, excellent for crystal ovens, gyro platforms, heater blankets, computers, test equipment, etc. Three terminals and two brackets available. Temperature calibrations are factory preset, 100% thermally and mechanically inspected.	30 AC/DC	2	+90°F to +250°F	Wide 20°F Max.	Wide ±8°F
	125 AC	2		Narrow 6°F Max.	Narrow ±3°F

Terminal T-123

Terminal T-116

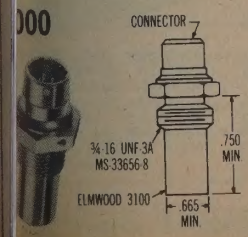
Terminal T-109

Terminal T-101

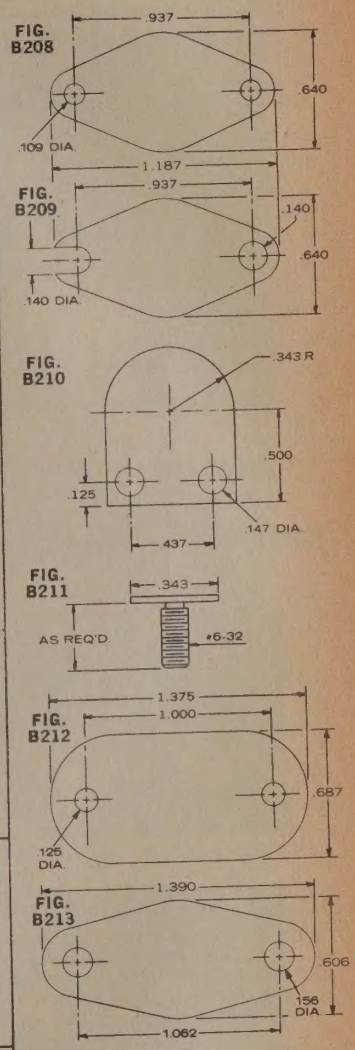
Terminal T-130

Terminal T-133

Custom designed package houses a non-adjustable, snap action Elmwood Sensors #3100 single-pole single-throw or #3700 single-pole double-throw thermostat. Performance characteristics are outlined in #3100 and #3700 information above. Housing material is stainless steel, all-welded construction. Customized connectors, size, and threads may be designed to suit requirements. Qualified by many military and aircraft applications; complete proposals are available upon request.



AVAILABLE MOUNTING BRACKETS



SOME PROTOTYPES AVAILABLE FROM STOCK

Elmwood also features a U.L. approved line of low-cost thermostats for Commercial Applications. Ask for Folder.

SAMPLES AND ORDERING In order to facilitate the furnishing of proper samples, the following information should be included in RFQ's.

APPLICATION Description — military, industrial, other
Function — limit or control
Environmental exposure — dust, moisture, oil spray, other

AMBIENT TEMPERATURE EXPOSURE
Maximum, minimum

ELECTRICAL REQUIREMENTS
Resistive or Inductive
Amperage and Voltage

PHYSICAL REQUIREMENTS
Brackets (Stainless Steel only). If required, specify Fig. No. shown
Terminals — Specify No. shown

CALIBRATION
Opening temperature and tolerance
Closing temperature and tolerance

QUANTITY

ELMWOOD SENSORS, INC.
1653 ELMWOOD AVENUE • CRANSTON, RHODE ISLAND 02907
PHONE (401) 781-6500 • TWX 710-381-6413

THERMISTORS from FENWAL ELECTRONICS

1. **Glass Coated Beads** — used where small size, fast response, high precision, stability, and temperatures to 600°F are required.

2. **Glass Probes** — medium-small in size. Many of the advantages of beads but rugged, more easily mounted, useful in liquid media.

3. **Iso-Curve*Interchangeable Thermistors** — these units available in bead or glass probe configurations, follow standard curves over wide temperature range, and are completely interchangeable. Units match standard curves as close as ±¼% of resistance or as required.
*R.T.M.

4. **Discs** — used where medium power dissipation is a requirement and space not a problem. Useful to 300°F.

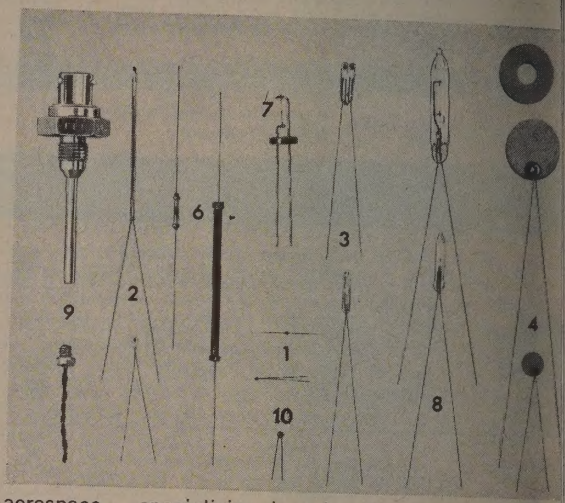
5. **Washers** — used where high power dissipation is a prime requirement.

6. **Rods** — these units have power dissipation intermediate between discs and washers and are also used where their physical shape is an asset.

7. **Mounted Beads** — provide ease in using glass beads in such applications as gas chromatography, flow and vacuum measurement, etc.

8. **Vacuum and Gas Filled Assemblies** — high power sensitivity for specialized circuit applications.

9. **Probe Assemblies** — standard catalog types or built to specific military or commercial requirements. We are experienced in design of probe assemblies for all fields of application including industrial control and indication,



aerospace — specializing in telemetry applications, ar oceanographic — featuring fast response, very high pre sure, and interchangeability using our Iso-Curve Thermi tors.

10. **NEW "LOW COST" Uni-Curve* Interchangeable Thermistors** — completely i terchangeable units having an accuracy of ±0.2°C over temperature range of 0°C to 70°C and available on specia order to other tolerances and ranges.
*TM

ISO-CURVE® Interchangeable Thermistors

F.E.I. Iso-curve* thermistors are special bead and glass probe thermistors that have been precision matched at the factory to standardized resistance-temperature curves. They have the unique and valuable characteristic of complete electrical interchangeability. In addition they offer all of the functional advantages associated with standard thermistors, including large resistance change per degree of temperature change which provides high accuracy and resolution.

Thermistors are normally rated by the value of their resistance at 77°F Standard units having the same rated resistance, however, will not exhibit identical resistance-versus-temperature characteristics over their full temperature range. Iso-curve thermistors, on the other hand, will match a specified R-T curve over full temperature range required. Iso-curve thermistors are available at the present time in seven standardized R-T curve values: 500, 1K, 2K, 4K, 15K, 25K and 100K. These standard curves represent permanent specifications and an F.E.I. Iso-curve thermistor purchased five years from now will be perfectly interchangeable with one of the same value purchased today.

*MADE UNDER PAT. 3109227 AND OTHERS. ISO-CURVE IS A TRADEMARK OF F.E.I.

Thermistor Probe Assemblies

Standardized thermistor assemblies, provided in complet ready-to-mount housings, enable you to take advantage the precision and interchangeability of Fenwal Electronic thermistors. A complete line of thermistor probes is avai able for a variety of missile, aircraft, and industrial appl cations, including liquid level indication and contro temperature measurement and control of fluids and gase and many other applications. Precise calibration can b supplied with individual probes at all desired tempera tures. Completely interchangeable probes with identica resistance-temperature curves are available to any desire tolerance down to 0.1°C over the full temperature range Most of these housings can be made to meet militar specifications if required.

Here's help in applying F.E.I. Thermistors . . .

Fenwal Electronics

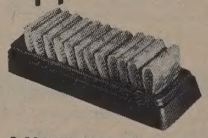
"Thermistors: Their Characteristics and Uses." Detailed bulletin gives basic information and many applications. Bulletin 1-1.

Thermistor Housing Manual (L-5). Detailed information on how Fenwal Electronics, Inc. can build thermistor sensor assemblies to fit your requirements.

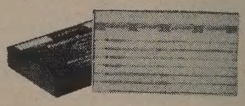
Iso-Curve Thermistors (L-2). Complete data on patented interchangeable units with identical resistance/temperature curves.

Thermistor Manual (EMC-5). Most complete up-to-date listing of thermistors available. Theory, engineering data, complete specifications.

New 24-page Capsule Thermistor Course Book. A complete primer on thermistors, their characteristics and uses.



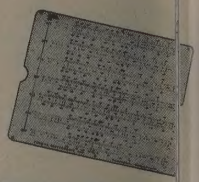
G-200. Kit contains 12 different thermistors with complete specs. PRICE $19.95.



THERMISTOR EXPERIMENTAL KITS

G-700. (Above) Kit contains 4 thermistors. PRICE $4.95.

Now available . . . UNI-CURVE G-500 KIT containing 6 completely interchangeable thermistors ranging from 3K to 100K ohms. PRICE $19.95.



Thermistor Data & Cu Computer—(G300A) Provi resistance temperature c acteristics for all F.I Thermistors. Simplifies lection of the right th mistor for every applicati PRICE $1.

FENWAL ELECTRONICS, INC. 63 FOUNTAIN STREET, FRAMINGHAM, MASS. 01701 • (617) 872-8

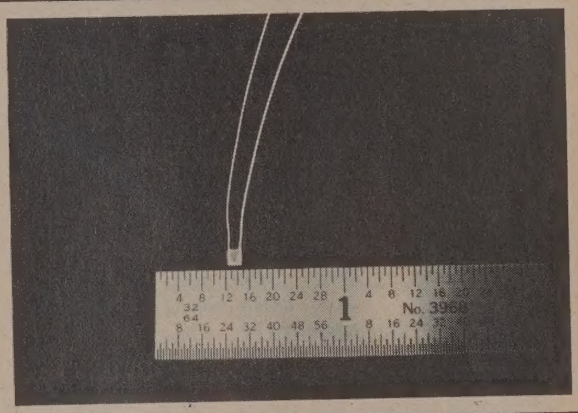
See YELLOW SECTION for Local Offices, Phones

Gulton THERMISTORS

3 good reasons to look to Gulton for Thermistors

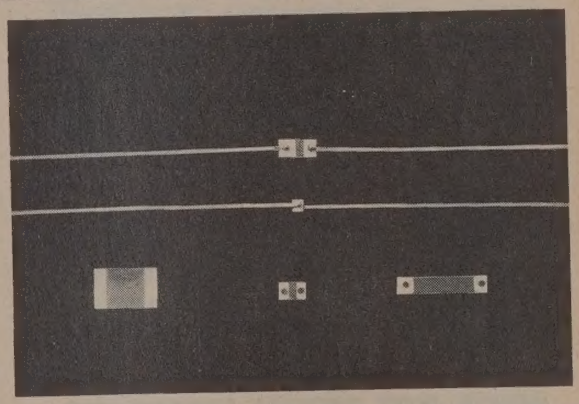
he broadest line of terchangeable Thermistors

Values from 1 through 100 K yield precision tracking from -55°C to +150°C



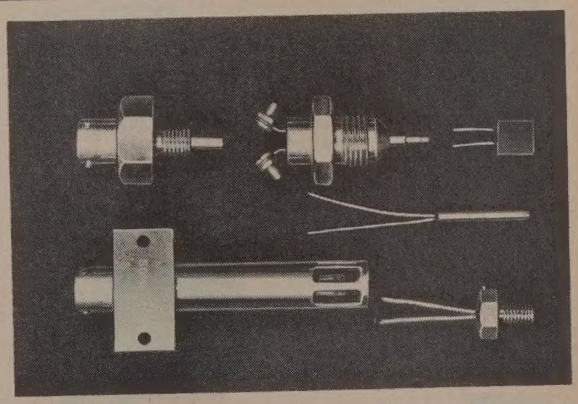
he only manufacturer of hip Thermistors

- Small in size . . . ideal for tomorrow's microcircuits
- Values from 10 ohms to 10 megohms
- Terminations. . . Kovar tabs, gold plated nickel ribbon or silver



he greatest variety of hermistor Probe Assemblies

- Standard or custom designed to your specifications
- For aerospace to medical applications
- From oceanography to lunar landings



Gulton manufactures a complete line of thermistors. . . beads, beads-in-bulbs, beads-in-probes, discs, rods and wafers. For information on Gulton thermistors, write to the Thermistor Department at the address below. In addition, Gulton engineers are available to discuss your thermistor requirements, and when necessary, to custom design thermistors and probes for your unique application.

Gulton Industries, Inc. **Microceramics Division**

Metuchen, New Jersey 08840
Phone: 201-548-2800 • TWX-710-998-0592

HARREL PRECISION TEMPERATURE CONTROLS

PROPORTIONAL TEMPERATURE CONTROLLERS

★ **RELIABLE:** Completely solid state. No tubes, moving parts, or relays to wear out.
★ **TRUE PROPORTIONAL CONTROL:** Steady flow of power to heater. True stepless control.
★ **HIGH EFFICIENCY:** Efficiency in excess of 96% at full load.
★ **THERMAL LOOP COMPENSATION:** High sensitivity and proportional-plus-automatic-reset, or proportional-plus-rate-plus-reset action eliminates "droop" and permits closer temperature control.
★ **HIGH POWER:** From a few watts to 300 KW; single phase or three phase; 115, 230, or 480 volts.
★ **ANY TEMPERATURE RANGE:** Control either heaters or coolers from −200° to +1100°C.

PANEL MOUNT CONTROLLERS

General purpose controllers arranged for easy front panel mounting in packaging machinery, plastics machinery, test fixtures, environmental test equipment, etc.

SINGLE TURN DIAL: Convenient direct reading dial for general purpose use.

TEN-TURN, DIRECT READING DIAL: Higher sensitivity than above plus 10-turn setting potentiometer for even closer temperature control. Direct read-out of temperature on large, 4½" dial.

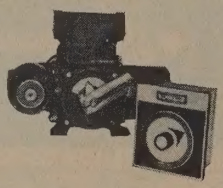
DIGITAL DIAL: Ten-turn potentiometer plus digital dial with 15/32" high numerals readable from 30 ft. away! Includes front panel on-off switch, pilot light and power output meter.

HEAVY DUTY PROCESS CONTROLLERS

Heavy duty, three mode controllers offering proportional-plus-rate-plus-reset action. For chemical processing, large furnaces, etc., where long time lags are involved.

PROPORTIONAL VALVE CONTROLS

For process control applications where temperature is varied by means of motor-driven proportional valves. Three mode, heavy duty construction.

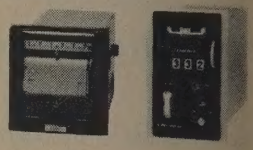


INFRARED SENSING

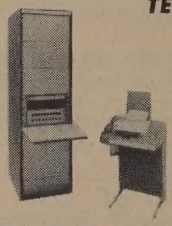
Where temperature must be controlled without touching the controlled body. Temperature ranges 25°C to 3000°C.

RECORDING CONTROLLERS

Provide permanent record of controlled temperature.



PROGRAMMABLE TEMPERATURE CONTROLLERS



COMPUTER CONTROLLED SYSTEMS

Complete computer control and monitoring systems of temperature, pressure, time sequencing, etc. in an entire plant full of extruders, injection molding machines, environmental test equipment, etc.

TAPE PROGRAMMED CONTROLLERS

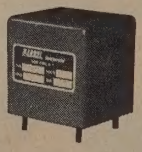
Temperature stored on punched tape. May follow any arbitrary program.

ARBITRARY FUNCTION PROGRAMMER

Program set on front panel dials.

Plus Cam Programmers, Switching Type Programmers, and Slope Generator Type Programmers.

FIXED TEMPERATURE CONTROLLERS HIGH RELIABILITY MILITARY TYPES



A-C OPERATED: Precision temperature control to a single selected temperature. Ideal for close temperature control of floated gyros, delay lines, or other military or industrial applications.

D-C OPERATED: For aircraft or missile operation, where the primary power source is d-c.

D-C OUTPUT: Output is pure d-c for applications such as gyro test tables where noise output of relay or standard proportional controller is objectionable.

RFI-FREE CONTROLLERS

Entirely solid state. Unique circuitry ensures freedom from radio frequency interference.

ADJUSTABLE, INDICATING: For use wherever nearby communications and low-level measuring equipment makes elimination of conducted and radiated interference essential.

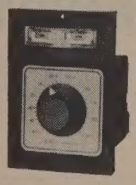
FIXED TEMPERATURE: For military applications where elimination of RFI is required.

SPECIAL PURPOSE CONTROLLERS

HEATING AND COOLING CONTROLLERS: Bidirectional, time proportioning for control of both heating and cooling by use of solenoid valves or mechanical refrigeration. Entirely solid state.

CONTROLLERS FOR THERMOELECTRIC COOLING: Bidirectional controllers for control of heating and cooling using thermoelectric elements.

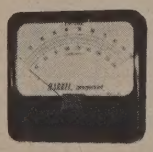
HUMIDITY CONTROLS: Precision control of humidity in test chambers, environmental equipment, etc.



RELAY STYLE CONTROLLERS: Completely solid state except for output relay. Off-on or time proportioning. For minimum initial cost.

TEMPERATURE INDICATORS

PANEL STYLE INDICATORS: Available either as temperature indicator or temperature deviation indicator.



DIGITAL STYLE:
Direct digital read-out of temperature in large, 9/16" numerals. Automatic polarity change. BCD electrical output optional.

TEMPERATURE ALARMS

Continuous monitoring of temperature at a remote point. Initiates high or low alarm whenever temperature deviates more than a prescribed amount.

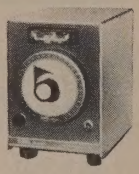
TEMPERATURE RECORDERS

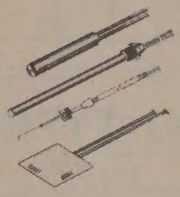
LABORATORY TYPE: Expanded scale readout spreads ranges as small as 2/3°C over entire scale. Eleven ranges give 0.02% accuracy.

PANEL MOUNT, STRIP CHART TYPE: For continuous indication and recording of temperature at remote points.

CABINET STYLE CONTROLLERS

All Harrel controllers are available in an attractive, two-tone gray cabinet, complete with pilot light, on-off switch, & fuse. Convenient tilting bail for easy bench viewing.

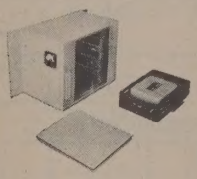




TEMPERATURE SENSORS

Wire type resistance sensors provide maximum sensitivity, linearity, & long term stability. Available in patch type for surface measurement, tubular styles, bayonet mount styles, or for air sensing.

TEMPERATURE CONTROLLED ENCLOSURES



Complete oven systems including controller, sensor, heaters, and enclosure. Ideal for maintaining constant temperature of filters, crystals, delay lines, transistor amplifiers, or other critical electronic equipment.

OIL BATHS

Highest precision, reference grade oil baths for calibration or for maintaining temperature of standard cells, zener references, etc.

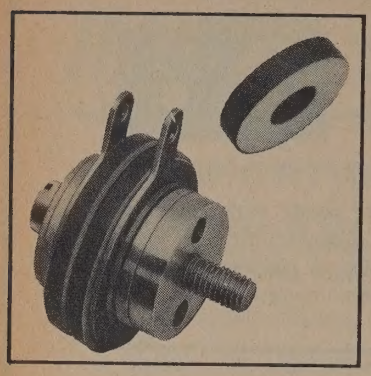
PRESSURE INSTRUMENTATION

A complete line of pressure indicators, pressure recorders, pressure alarms, and pressure sensors.

PLUS . . . complete temperature control systems and consoles. SEND US YOUR REQUIREMENTS.

ALL UNITS COMPLETELY SOLID STATE

HARREL, *incorporated* 16 Fitch Street, East Norwalk, Connecticut; Phone: (203) 866-2573



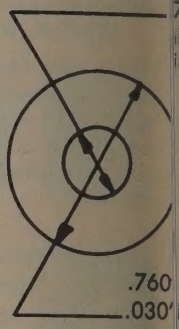
Keystone
CARBON COMPANY

WASHER THERMISTORS

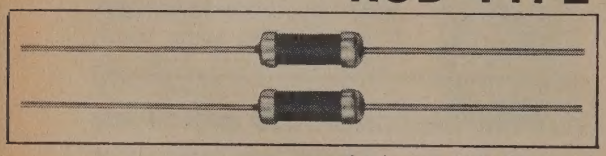
In situations where a thermistor is required to handle a relatively ar amount of power, Keystone washer type thermistors provide a mea obtaining high power handling capability in a small, economical packa addition, washer type thermistors are also very useful where mountin co ditions do not permit the use of conventional component mounting me od

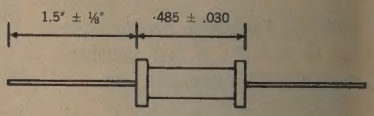
Maximum operating temperature 150°C. Standard units are supplied wit out leads. Units are uninsulated.

KCC PART NUMBER	Resistance @ 25°C ±10%	Temp. Coef. %/°C @ 25°C	Ratio R @ 37.8°C / R @ 104.4°C	Beta °K R @ 37.8°C / R @ 104.4°C	Dimension "T"
7604-W28-6.24-73-S1	10	−3.83	7.3	3505	0.040"
7611-W28-19.65-73-S1	31.5	−3.83	7.3	3505	0.110"
7605-W28-58.2-97-S1	100	−4.40	9.7	4005	0.050"
7615-W28-183.2-97-S1	315	−4.40	9.7	4005	0.150"
7611-W28-1K-131-S1	1850	−4.98	13.1	4535	0.110"
7611-W28-2580-141-S1	4840	−5.09	14.1	4665	0.110"
7611-W28-5230-155-S1	10K	−5.22	15.5	4830	0.110"



ROD TYPE THERMISTORS





Leads: T.C. AWG #20 Dissipation Constant: 9MW/°C Approx. Time Constant: 45 seconds prox
Tolerance: ±10% at 25°C Max. Operating Temperature: 125°C

TYPE	RESISTANCE AT °C 0	25	37.8	50	75	104.4	125	BETA ±10% (37.8-104.4°C)	R @ 25°C / R @ 125°C	Neg emp Coef 25°
LOW/MEDIUM TEMPERATURE COEFFICIENT										
15-20-35-S1	30.6	20	16.4	13.8	9.90	7.01	5.65	1500	3.5	19
15-50-42-S1	80.6	50	40.1	32.9	22.6	15.3	11.9	1700	4.2	18
15-100-42-S1	161	100	80.2	65.8	45.3	30.6	23.8	1700	4.2	18
15-200-42-S1	322	200	160	132	90.6	61.2	47.7	1700	4.2	18
15-500-50-S1	847	500	391	314	206	133	100	1900	5.0	18
15-1K-50-S1	1690	1K	782	628	413	266	201	1900	5.0	18
15-2K-52-S1	3430	2K	1560	1240	808	515	387	1950	5.2	23
15-5K-54-S1	8680	5K	3860	3060	1980	1240	924	2000	5.4	27
15-10K-54-S1	17.4K	10K	7730	6130	3950	2480	1850	2000	5.4	27
15-20K-59-S1	35.6K	20K	15.3K	12K	7560	4640	3400	2100	5.9	27
15-50K-62-S1	90K	50K	37.9K	29.5K	18.5K	11.2K	8120	2150	6.2	22
HIGH TEMPERATURE COEFFICIENT										
15-1K-139-S1*	2500	1K	656	451	227	111	71.9	3150	13.9	3
15-2K-139-S1*	4990	2K	1310	902	454	222	144	3150	13.9	3
15-5K-181-S1	13.7K	5K	3150	2100	979	450	276	3425	18.1	3
15-10K-192-S1	28.2K	10K	6240	4100	1890	855	520	3500	19.2	3
15-20K-292-S1	67.2K	20K	11.6K	7140	2920	1190	685	4000	29.2	4
15-50K-292-S1	168K	50K	28.9K	17.8K	7320	2980	1710	4000	29.2	4
15-100K-404-S1	372K	100K	55K	32.4K	12.2K	4540	2080	4400	40.4	4
15-200K-424-S1	753K	200K	109K	63.9K	23.9K	8740	4720	4450	42.4	4
15-500K-482-S1	1.95meg	500K	268K	154K	55.6K	19.7K	10.4K	4600	48.2	5
15-1meg-583-S1	4.06meg	1meg	523K	294K	100K	33.7K	17.1K	4830	58.3	5

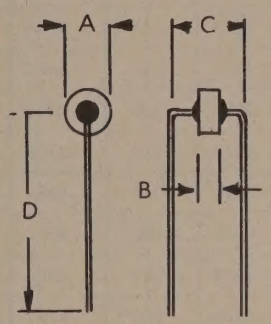
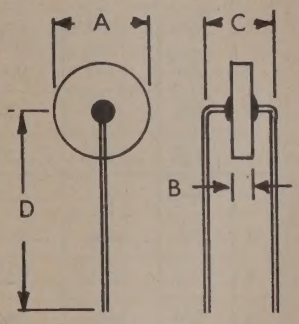
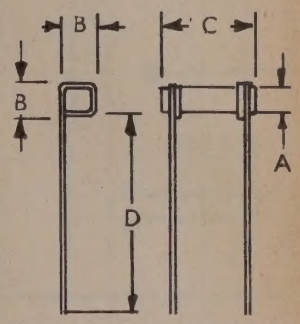
*Supplied with ±20% tolerance at 25°C only.

Keystone CARBON COMPANY • Thermistor Division • St. Marys, Pa. 15
814-834-1591 • Telex No. 91-

Keystone
CARBON COMPANY

KEYSTONE LOW-COEFFICIENT THERMISTORS

For applications such as coil compensation which require a low temperature coefficient thermistor Keystone offers the low coefficient, series 2 group of thermistors listed below. To specify a unit on this list, specify the code number followed by the resistance at 25°C. For example, a 1RS1-100 is a disc, .2″ diameter, and .1″ thick having a resistance of 100 ohms ±10% at 25°C. Various coatings, tolerance patterns and lead configurations are available on request.

CODE NUMBER		1RS1	2RS1	3RS1
TYPE		DISC	DISC	RECT. ROD
STANDARD LEAD CONFIGURATION				
Leads		AWG 20 (.032 Dia.)	AWG 20 (.032 Dia.)	AWG 24 (.020 Dia.)
Material		Tinned Copper	Tinned Copper	Tinned Copper
Diss. Constant		10 mw/°C	16 mw/°C	10 mw/°C
Time Constant		55 Sec.	85 Sec.	75 Sec.
Max. Watt Rating		1¼ Watts	2 Watts	1¼ Watts
Dimensions Inches	A	.200 ± .020	.500 ± .025	.150 ± .025
	B	.100 ± .020	.100 ± .020	.260 Maximum
	C	.375 ± Nominal	.375 ± Nominal	.500 ± .050
	D	1½ Minimum	1½ Minimum	1½ Minimum

BETA* Degrees Kelvin	Negative Temperature Coefficient %/°C @ 25°C	1RS1 R @ 25°C	2RS1 R @ 25°C	3RS1 R @ 25°C
1000	1.14	5	.75	20
1050	1.18	10	1.5	45
1100	1.23	15	2.5	70
1600	1.69	275	45	1200
1700	1.78	425	70	1900
1800	1.88	650	100	2900
1900	1.98	1000	150	4200
2000	2.07	1400	220	6000
2100	2.17	2000	330	9000

*BETA is calculated between the temperatures of 37.8 and 104.4°C. Tolerance on Beta is ±15% for Betas of 1000°K to 1100°K and ±10% for Betas of 1600°K to 2100°K.

Standard Resistance Tolerance is ±10% @ 25°C. Other Tolerances are available upon request.

Standard Thermistors are supplied without coating.

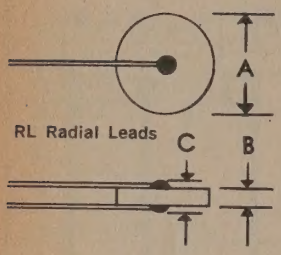
Maximum Operating Temperature: 150°C.

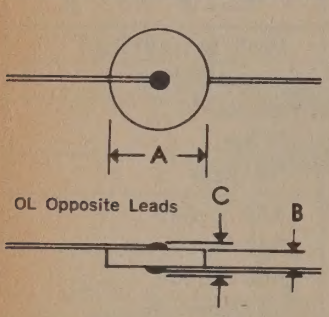
Lead Lengths conforming to printed circuit requirements are available on request.

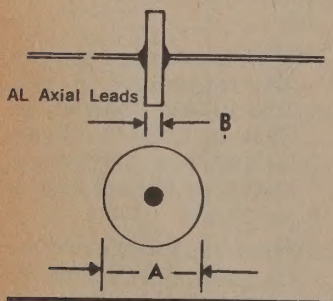
Keystone CARBON COMPANY • Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

Keystone CARBON COMPANY Disc Type THERMISTORS SERIES N

TYPE	E		S		F		B		
MAX. WATTAGE RATING (WATTS)	0.36		0.82		0.88		1.00		1.
DISSIPATION CONSTANT (MW/°C)	2.9		6.6		7.0		8.0		10
TIME CONSTANT (SECONDS)	10		45		50		60		70
THERMISTOR DIA. (IN.) A	.10 ±.010		.12 ±.010		.20 ±.020		.30 ±.020		±.0
THERMISTOR THK. (IN.) B	.03 ±.010		.15 ±.025		.06 ±.015		.06 ±.015		±.5
MAX. THK. OVER LEADS (IN.) C	.100		.260		.150		.150		.0
LEAD SIZE (A.W.G.)	30		24		24		24		24
TEMPERATURE °C	37.8	25	37.8	25	37.8	25	37.8	25	37.8 25
ROW NUMBER									
1	196	311.0	682	1082	98.0	155.4	43.6	69.1	20.4 32.3
2	248	397.5	862	1382	124	198.8	55.0	88.2	25.8 41.
3	304	492	1060	1717	152	246.0	67.5	109.4	31.6 51.2
4	356	581	1240	2020	178	290.5	79.0	128.8	37.0 60.5
5	432	712	1500	2470	216	356.0	95.9	158.0	45.0 74.
6	489	811	1700	2820	244	405	109	180.8	50.9 84.4
7	600	1006	2090	3500	300	503	133	223.0	62.5 04.
8	718	1215	2500	4230	359	607	160	270.5	74.8 26.6
9	860	1469	2990	5110	430	734	191	326.0	89.6 3.0
10	993	1712	3460	5970	497	857	221	381.0	103 7.6
11	1070	1850	3720	6430	535	925	238	412	111 1.9
12	1340	2330	4650	8100	668	1163	297	517	139 2.0
13	1550	2710	5390	9430	774	1354	344	602	161 1.5
14	1930	3400	6730	11850	966	1701	429	755	201 4.0
15	2240	3960	7800	13800	1120	1981	498	881	233 2
16	2600	4620	9040	16060	1300	2310	577	1025	271 4
17	3010	5370	10500	18730	1510	2695	669	1193	314 0
18	3490	6250	12200	21850	1740	3115	776	1390	364 6
19	4050	7280	14100	25350	2020	3630	899	1616	421 7
20	5050	9140	17600	31850	2520	4560	1120	2025	526 9
21	5860	10640	20400	37050	2930	5320	1300	2360	610 11
22	7310	13350	25500	46600	3660	6680	1620	2960	762 13
23	8470	15520	29500	54000	4240	7770	1880	3445	883 16
24	10600	19510	36800	67700	5290	9740	2350	4330	1100 20
25	13200	24400	46000	85100	6600	12210	2940	5440	1380 25
26	16500	30650	57400	106700	8240	15320	3660	6800	1720 31
27	20600	38450	71600	133700	10300	19230	4570	8530	2140 39
28	25700	48200	89400	167600	12800	24000	5710	10710	2680 50
29	32100	60400	112000	211000	16000	30100	7130	13420	3340 629
30	40000	75600	139000	263000	20000	37800	8900	16830	4170 788
31	46400	88000	162000	307000	23200	44000	10300	19530	4840 918
32	53800	102300	187000	355500	26900	51100	12000	22800	5600 1064
33	62300	118700	217000	414000	31200	59500	13900	26500	6500 1239
34	77900	149000	271000	518000	38900	74400	17300	33100	8110 1551







Units on this list are available in the three lead configurations shown above. Standard tolerance is ±10% at 37.8°C, with ±10% @ 25°C also available. Tolerance on resistance ratio is ±.3. Maximum operation temperature is 150°C. To specify a unit on this list, first indicate RL, OL or AL for lead configuration. Next list the row number, the column number and the number 1 for series "1". If the tolerance is to be at 25 rather than 37.8, add a "T". For example, an RL23SIT is a unit having radial leads and a resistance of 54000 ohms ±10% at 25°C.

See YELLOW SECTION for Local Offices, Phones

Disc Type THERMISTORS SERIES NO. 1

Keystone CARBON COMPANY

D		J		M		R		H		RESISTANCE RATIO	NEGATIVE TEMPERATURE COEFFICIENT
1.75		2.00		2.50		2.75		4.00			
14		16		20		22		32			
85		110		115		190		215			
.45 ±.025		.47 ±.025		.66 ±.030		.82 ±.035		1.00 ±.035			
.07 ±.020		.15 ±.025		.06 ±.015		.12 ±.025		.12 ±.025			
.180		.265		.190		.285		.295			
20		20		20		20		18			
37.8	25	37.8	25	37.8	25	37.8	25	37.8	25	37.8°C/ 104.4°C	%/°C @25°C
22.6	35.85	44.4	70.4	8.05	12.77	10.4	16.49	7.04	11.16	7.0	3.74
28.5	45.7	56.0	89.8	9.59	15.37	12.4	19.88	8.38	13.43	7.3	3.83
35.0	56.7	68.8	111.5	11.4	18.47	14.8	24.00	9.96	16.14	7.6	3.92
41.0	66.9	80.5	131.3	12.8	20.90	16.6	27.05	11.2	18.27	7.8	3.98
49.7	81.9	97.7	161.0	15.1	24.90	19.6	32.30	13.2	21.75	8.1	4.06
56.3	93.4	111	184.1	17.0	28.20	22.0	36.50	14.8	24.55	8.3	4.12
69.1	115.8	136	228.0	20.0	33.50	25.9	43.40	17.4	29.15	8.6	4.20
82.7	139.9	163	276.0	23.4	39.60	30.4	51.40	20.5	34.70	8.9	4.28
99.0	169.1	195	333.0	27.5	47.0	35.6	60.8	24.0	41.0	9.2	4.35
114	196.5	225	388.0	31.5	54.3	40.9	70.5	27.5	47.4	9.5	4.43
123	212.5	242	418	35.0	60.5	45.4	78.5	30.6	52.9	9.7	4.46
154	268.0	302	526	44.4	77.3	57.6	100.3	38.8	67.6	10.0	4.51
178	311.5	350	612	52.0	90.9	67.5	118.0	45.5	79.6	10.2	4.55
223	392.5	438	771	66.0	116.2	85.6	150.7	57.7	101.6	10.5	4.60
258	456	507	897	77.4	136.9	100	176.9	67.7	119.8	10.7	4.63
299	531	588	1044	90.7	161.1	118	209.5	79.3	140.8	10.9	4.67
347	619	682	1217	106	189.1	138	246.0	92.9	165.7	11.1	4.70
402	720	790	1415	125	224.0	162	290.0	109	195.2	11.3	4.73
466	838	916	1647	146	262.5	189	340.0	128	230.0	11.5	4.76
582	1053	1140	2060	185	334.5	240	434	162	293.0	11.8	4.81
675	1226	1330	2415	217	394.0	281	510	188	341.5	12.0	4.84
842	1537	1660	3030	275	502	357	652	241	440	12.3	4.88
976	1788	1920	3515	323	592	419	768	282	517	12.5	4.91
1220	2245	2400	4420	410	755	531	978	358	659	12.8	4.94
1520	2810	2990	5530	520	962	674	1247	454	840	13.1	4.98
1900	3530	3730	6930	659	1225	855	1589	576	1071	13.4	5.01
2370	4420	4660	8700	836	1561	1080	2015	731	1365	13.7	5.05
2960	5550	5820	10910	1060	1988	1380	2585	928	1740	14.0	5.08
3690	6950	7260	13670	1350	2540	1750	3295	1180	2220	14.3	5.11
4610	8720	9060	17130	1710	3235	2220	4200	1490	2820	14.6	5.14
5350	10140	10500	19910	2000	3790	2600	4930	1750	3320	14.8	5.16
6200	11790	12200	23200	2350	4470	3040	5780	2050	3895	15.0	5.18
7180	13680	14100	26850	2750	5240	3570	6800	2400	4570	15.2	5.20
8970	17160	17600	33650	3490	6680	4520	8650	3050	5830	15.5	5.22

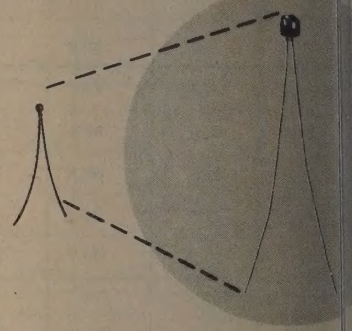
Keystone
CARBON COMPANY

MOLDED-IN-LEAD BEAD AND ROD THERMISTORS

Using a technique developed at Keystone, these units feature leads which are molded directly into the body of thermistor. This technique yields a more reliable thermistor and by eliminating several operations permits lower pr These units are particularly intended for applications where small size and fast response are major requirem

TYPE	RESISTANCE AT °C:						
	0	25	37.8	75	104.4	150	260
L0504-329-59-M2	1245	500	329	114	56	22.4	*
L0504-550-71-M2	2480	878	550	169	77	29	5.5
L0504-1220-81-M2	6210	2000	1220	344	151	53	9
L0504-1248-73-M2	5520	1984	1248	376	171	62	*
L0504-1500-85-M2	8010	2515	1500	409	176	61	10.5
L0504-5000-95-M2	27.7K	8560	5000	1290	526	168	23.4
L0504-33.3K-125-M2	221K	60.4K	33.3K	7380	2665	711	70.6
L0504-55K-120-M2	360K	100K	55K	12.5K	4.58K	1246	127.6

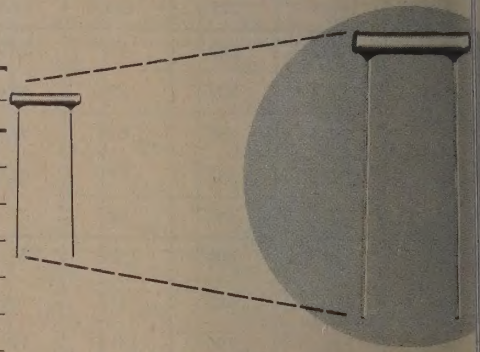
* These units processed for operation to 150°C maximum; All others, to 260°C Max.
"M2" in the above type numbers designates ±10% tolerance on resistance at 25°C.



Physical size: .065" dia. max., .085" long max
Leads: .004"platinum, ½" long
Dissipation Constant: 0.6 MW/°C Approx.
Time Constant: 7.5 seconds Approx.
All units are coated with a protective green gla

TYPE	RESISTANCE AT °C:						
	0	25	37.8	75	104.4	150	260
L060637-6K-85-M2	31.8K	10.1K	6000	1640	706	242	40.7
L060637-10K-85-M2	52.2K	16.7K	10K	2750	1175	403	67.8
L060637-22K-95-M2	122K	37.5K	22K	5700	2315	739	104
L060637-45K-103-M2	266K	78.2K	45K	11.1K	4370	1314	166
L060637-60K-103-M2	355K	104K	60K	14.8K	5830	1750	222
L060637-200K-120-M2	1.3 meg	363K	200K	45K	16.7K	4520	520
L060637-350K-125-M2	2.35 meg	637K	350K	76.5K	28K	7630	793
L060637-1.4 meg-145-M2	10.2 meg	2.62 meg	1.4 meg	284K	96.6K	23.8K	2070

"M2" in the above type numbers designates ±10% tolerance on resistance at 25°C.



Physical size: .120" dia. max. .420" long max.
Leads: .010" platinum, ¾" long
Dissipation Constant: 2.8 MW/°C Approx.
Time Constant: 35 seconds Approx.
Maximum Operating Temperature: 260°C.
All units are coated with a protective green gla

CRYOGENIC THERMISTORS

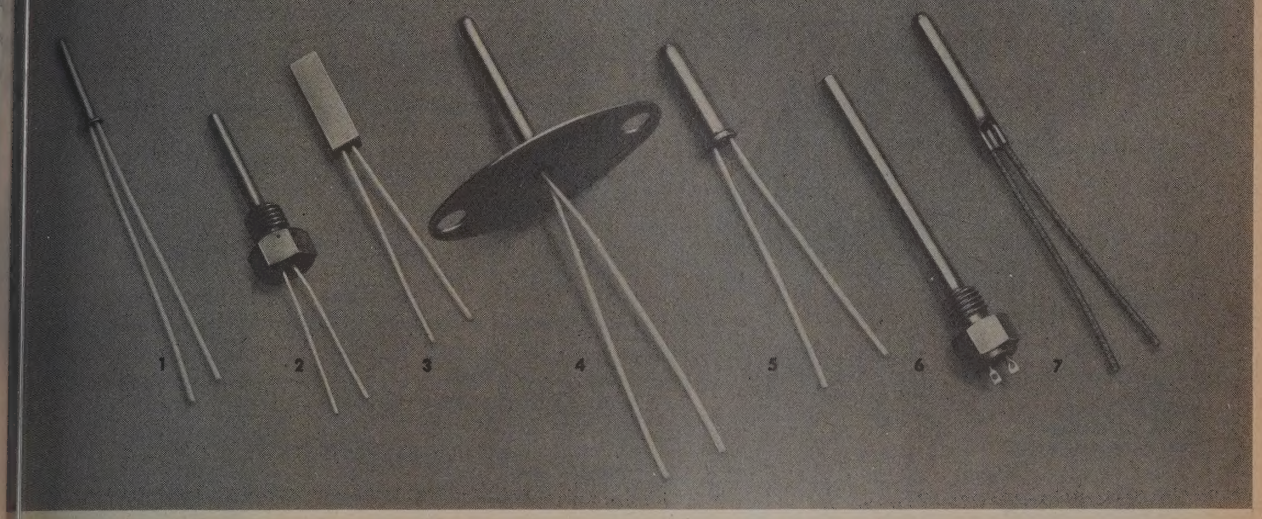
TYPE	For Operation In Liquids	Resistance	Temperature Coefficient
RL10X04-10K-315-S5	Oxygen	10K	− 8.4%/°C
	Nitrogen	31.5K	−10.4%/°C
RL06X0628-31.7K-315-S5	Oxygen	31.7K	− 8.4%/°C
	Nitrogen	100K	−10.4%/°C
L0904-6.6K-H-T2	Hydrogen	6.6K	−13.0%/°C
L0904-125K-H-T2	Hydrogen	125K	−17.0%/°C
L0904-180K-H-T2	Hydrogen	180K	−18.0%/°C
L0904-100K-HE-T2	Helium	100K	−275 %/°C
L0904-3meg-HE-T2	Helium	3 meg.	−300 %/°C

Physical size of these units is approximately .1" diameter, and .04" thick, except the RL06X0628, which is a rod, .06" square and .28" long.

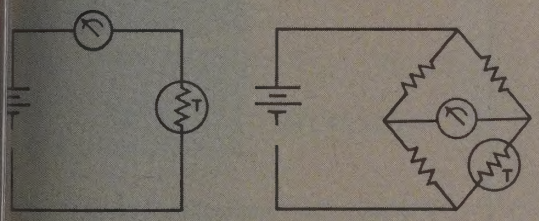
Low Temperature Types — Designed for operation various cryogenic liquids these units are especially u for liquid level detection. In this type of application thermistor is slightly self heated by passing current through the unit. The heat developed in the is dissipated more rapidly in the liquid than when thermistor is above the liquid. The resulting cha body temperature results in a change in resistance is easily detected because of the high temper coefficient of the thermistor. The units listed in are standard low temperature thermistors.

Keystone CARBON COMPANY • Thermistor Division • St. Marys, Pa. 15
814-834-1591 • Telex No. 9

Versatility you can use in THERMISTOR PROBES



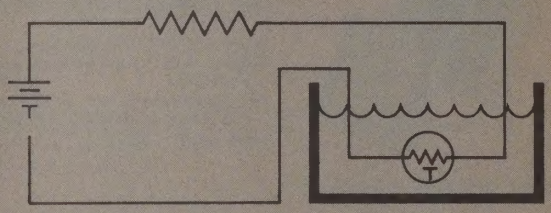
for temperature measurement



Circuit A Circuit B

Combining high temperature sensitivity with high signal level, thermistors are ideally suited for temperature sensing. In circuit A, as the temperature of the thermistor increases, its resistance decreases, allowing more current to flow. If additional sensitivity is required, a bridge circuit like that shown at B may be used.

for liquid level detection



The thermistor is slightly self heated by passing a small current through the unit. The heat developed in the unit is dissipated more rapidly in the liquid than when the thermistor is above the liquid. The resulting change in body temperature results in a change in resistance. This in turn causes a change in the current in the circuit which can be detected by a relay or other means.

YSTONE TYPE	THERMISTOR RESISTANCE					
	0°C	25°C	37.8°C	104.4°C	150°C	232°C
03-62.66-71-S	282.6	100	62.66	8.825	3.308	.8910
03-119.1-85-S	631.2	200	119.1	14.01	4.800	1.174
03-375.3-95-S	2132	650	375.3	39.48	12.76	2.826
-630-71-S	2750	1K	630.0	88.80	33.26	8.800
03-1145-103-S	6733	2K	1145	111.1	33.78	6.607
03-2801-120-S	18.23K	5K	2801	233.6	64.42	11.18
03-4452-125-S	29.74K	8K	4452	356.2	96.61	16.29
37-6266-71-S	28.26K	10K	6266	882.5	330.8	89.10
37-11910-85-S	63.12K	20K	11.91K	1401	480.0	117.4
-16920-112-S	105.3K	30K	16.92K	1511	426.4	83.20
37-37.53K-95-S	213.2K	65K	37.53K	3948	1276	282.6
-55.3K-125-S	361.0K	100K	55.30K	4420	1153	189.6
37-114.5K-103-S	673.3K	200K	114.5K	11.11K	3378	660.7
37-280.1K-120-S	1.823 meg	500K	280.1K	23.36K	6442	1118
37-445.2K-125-S	2.974 meg	800K	445.2K	35.62K	9661	1629
46-556.5K-125-S	3.717 meg	1 meg	556.5K	44.52K	12.08K	2037

arts 260°C Max. operating temperature.

The probes illustrated above include stainless steel, aluminum, and chrome plated materials in a variety of configurations. Any thermistor listed at the left can be provided in one or all of the above illustrations. In addition, a variety of other designs are available. These probes are used in conjunction with solid state circuitry for liquid level measurement, and for use as sensors to measure temperature of liquids or surface temperatures. For full particulars, write, detailing your proposed application. Keystone Carbon Company, St. Marys, Pa. 15857.

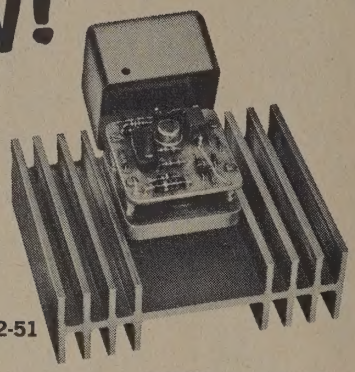
Keystone

First

IN CREATIVE THERMISTOR TECHNOLOGY

PROPORTIONAL TEMPERATURE CONTROLLERS

NEW!



Model 3C2-51

Supplied w/o heat sink
Model 3C2-51 Price
1—9 Units $141.35
Heat Sink 1—9 $7.50

Industrial Version
Model O.I. 3C2-50
Price 1—9 Units $79.50

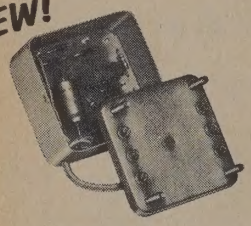
MILITARY SPECIFICATION TEMPERATURE CONTROLLER

Input: 26 to 30 VDC (withstand overvoltage of 60 volts for
Output: 24 V to 28 VDC (min) 50 Watt resistance load.
Proportioning Bandwidth: ⩽1°C with a TP Series Probe ⩾5
point.
Set Temperature: Will accept any temperature probe in the
Series.
Ambient Temperature: −54°C to +85°C (operating case te
−65°C to +125°C storage.
Hermetic Seal:
M.T.B.F.: 50,000 Hrs. w/internal adj. pot & high Vac Sea
150,000 Hrs. w/factory set cal. Resistor & Hermet
(Ground K factor).

Constructed in accordance with the following military specifi

Material MIL-Std-454
Finish MIL-E-15090
Temp Extremes MIL-Std-810
Humidity MIL-Std-202
Corrosion Resistance MIL-Std-810
Vibration MIL-Std-202
Shock MIL-Std-202
Workmanship MIL-E-
R. F. Interference MI
Resistors MIL-R-11
MIL-R-1050
Potentiometer MIL-R-

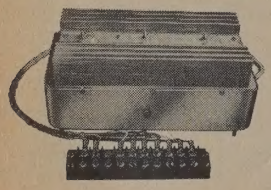
NEW!



Model 5C1-100 (Digi-Prop)

LOW COST A.C. CONTROLLER

Input: 115 VAC 25—450 Hz.
Output: A.C. synchronously switched 100 Watt load.
Set Temperature: will accept any temperature probe in the O.I. TP Series.
Price 1—9 $53.00



Model 2ZC3—3000-3

3KW 3 Phase

Input: 100—130 VRMS, 3—Phase—WYE
Output: 95—125 VRMS, 3—Phase into a max. resistive load of 1 KW per phase
Type Of Control: Digi-Prop Circuit
Proportioning Bandwidth: 1°C
Set Temperature: Adjustable +20°C to +60°C
Price: 1—3 units $210.00 each

NEW!

Model 7C9-175

Precision Lab Temperature Controller

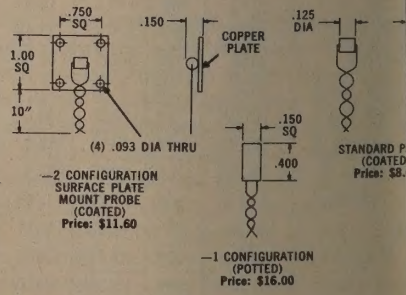
Each controller is supplied with a calibration chart for the particular probe furnished with the controller.

Input: 115 VAC 25—400 Hz.
Output: Full Wave rectified 175 Watt Resistive load.
Proportioning Bandwidth: ⩽1°C with any O.I. TP Series probe ⩾5K at the temperature set point
Temperature Setting Resolution: ±0.1°C.
Temperature Control at End Item: ⩾*±.005°C at fixed ambient.
Price 1—9 Units $174.00

* dependent upon customer packaging and temperature probe

STANDARD TEMPERATURE PROBES

PROBE #	SUGGESTED TEMPERATURE RANGE °C	NOMINAL RESISTANCE AT INDICATED TEMPERATURE			
TP10	−20 to +10	9,200 ohms/−20°C	7,900 ohms/−10°C	4,725 ohms/0°C	2,840 ohms/+10°C
TP20	0 to +30	9,300 ohms/0°C	5,420 ohms/+10°C	4,350 ohms/+20°C	2,250 ohms/+30°C
TP30	+20 to +50	9,700 ohms/+20°C	5,680 ohms/+30°C	3,650 ohms/+40°C	2,310 ohms/+50°C
TP40	+40 to +70	9,550 ohms/+40°C	5,720 ohms/+50°C	3,940 ohms/+60°C	2,650 ohms/+70°C
TP50	+60 to +90	9,525 ohms/+60°C	6,170 ohms/+70°C	4,370 ohms/+80°C	3,080 ohms/+90°C
TP60	+80 to +110	9,950 ohms/+80°C	6,850 ohms/+90°C	4,600 ohms/+100°C	3,360 ohms/+110°C



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WEED INSTRUMENT CO., INC.

PANEL MOUNTED DIGITAL
TEMPERATURE INDICATORS With
WEED Platinum Resistance Sensors

L 2200
E: 0° to +199° or 0° to -199°, °F or °C POWER: 120 V, 60 Hz
LUTION: 1° ACCURACY: 1% of Full Scale SIZE: 4"W x 2"H x 7"D
tandard 3/16" Dia. X 8" L. Sensor PRICE EACH $475.00

EL 2400
E: -199.9° to +199.9°, °F or °C POWER: 120 V, 60 Hz
LUTION: .1° ACCURACY: .1% of Full Scale SIZE: 4"W x 2"H x 7"D
tandard 3/16" Dia. X 8" L. Sensor PRICE EACH $775.00

EL 2700
E: -199.99° to +199.99°, °F or °C POWER: 120 V, 60 Hz
LUTION: .01° ACCURACY: .055% of Full Scale SIZE: 4"W x 2"H x 7"D
tandard 3/16" Dia. X 8" L. Sensor PRICE EACH $1175.00
NS AVAILABLE: Other Ranges, BCD Output, Special Sensors, Switching Assemblies, Complete Systems

DIGITAL THERMOMETERS
With WEED Platinum Resistance Sensor

MODEL 3200
RANGE: -199.9° to +199.9°, Selectable °F or °C
RESOLUTION: .1° ACCURACY: .1% of Full Scale
CABINET: 9"W x 6"H x 15"D POWER: 120 V, 60 Hz
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $925.00

MODEL 3400
RANGE: -199.99° to +199.99°, Selectable °F or °C
RESOLUTION: .01° ACCURACY: .055% of Full Scale
CABINET: 9"W x 6"H x 15"D POWER: 120 V, 60 Hz
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $1325.00

OPTIONS AVAILABLE: Additional Selectable Sensors, Special Sensors, Differential Measurement, BCD Output, Other Ranges, Rack Mounted or Other Cabinet, Battery Powered.

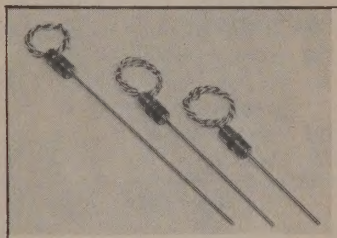
Model 3400 is also available with resetable Max-Min Memory. Both maximum and minimum temperature values since last reset can be readout.
Model 3400 With Max-Min Memory Option PRICE EACH $1685.00

WEED SPECIAL PLATINUM
RESISTANCE SENSORS
FROM CRYOGENIC (-435°F)
THROUGH HOT GAS (+2000°F)

ED Can Build The Platinum Resistance Sensor
Will Do The Job Best, Accurately And Reliably

pical Price For 50 Ohms @ 0°C Hot Gas Sensor To +1850°F Is $50.00 Each.
pical Price For 1380 Ohms @ 0°C Cryogenic Sensor To -435°F Is $75.00 Each.
me Other Special Requirements That WEED Has Built For Are: High Pressure, clear Radiation Environment, Very Small Size, Area Sensing, Shaped Sensors, rectional Sensing, Special Time Constant, Very High Resistance.

WEED Consider Your Special Requirement
For Our Special Sensor Specification Sheet



HOW TO ORDER WEED STANDARD PLATINUM RESISTANCE TEMPERATURE SENSORS

Series	Temperature Range	Sheath Diameter	Fitting
101 - General Purpose	A - 320°F to +500°F	A - 1/8 inch	0 - None
201 - Variable Immersion	B - 320°F to +1700°F	B - 3/16 inch	1 - 1/4" NPT
202 - Fixed Mounting		C - 1/4 inch	2 - 1/2" NPT
301 - Spring Loaded			3 - 1/8" NPT

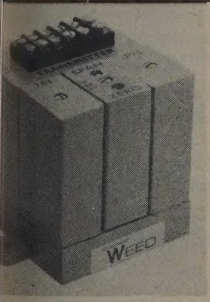
MODEL 101-1-A-3-B-5-2-0

Resistance at 32°F	Number of Lead Wires	Sheath Length	Head
1 - 100 Ohms	2 - Short Runs	Minimum - 2"	0 - None
2 - 200 Ohms	3 - Recommended	Maximum - 24"	1 - General Purpose
5 - 500 Ohms	4 - Precision	Increments - 1/4"	2 - Watertight
6 - 1000 Ohms			3 - Explosion Proof

For more detailed information about WEED Standard Platinum Sensors, ask for WEED's catalogue brochure and data sheets.

TYPICAL SENSOR PRICES:	List Price Each
Model 101-1-A-3-B-8-0-0	$27.75
Model 101-1-B-3-B-8-0-0	$37.75
Model 201-1-A-3-B-5-2-0	$35.50
Model 301-1-A-3-B-12-0-0	$34.75

All prices on this page are FOB Elgin, Texas.



TEMPERATURE TRANSMITTERS

IES 1000 TEMPERATURE TRANSMITTERS furnish a linear current output ctly proportional to input temperature change when used with a Platinum stance Sensor. Output is insensitive to load changes from 0 to 10,000 ohms tive, and can be voltage output to 10 volts by proper choice of load resistance.

UT: Platinum Resistance Sensor, 1000 Ohms ±.1% @ 32°F
VER: 120 V, 60 Hz LOAD: 0 to 10,000 Ohms Resistive
EARITY: .1% For Linear Input ADJUSTMENTS: Span & Zero
NGES: 0° to 150°C for 0 to 1 Milliampere Output
Model 1000-0-150C PRICE EACH $250.00
0° to 150°F for 0 to 1 Miliampere Output
Model 1000-0-150F PRICE EACH $250.00
Platinum Resistance Sensor for Above PRICE EACH $48.00
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OR SENSING TEMPERATURE, SWITCH TO PLATINUM ECAUSE: GREATEST ACCURACY---WIDE RANGE INEARITY---HIGH SENSITIVITY---EXCEPTIONAL TABILITY---INTERCHANGEABILITY. FOR THE BEST IN LATINUM RESISTANCE SENSORS SPECIFY WEED.

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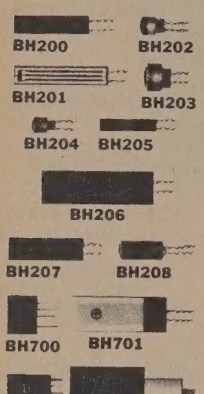
HALL GENERATORS, WATTMETER TRANSDUCERS

"Hall-Pak" HALL GENERATORS

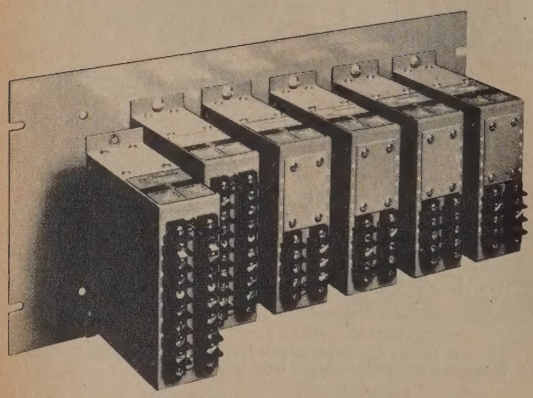


		OPEN CIRCUIT HALL VOLTAGE V_{HOC}, mV ±25% (AT NOMINAL I_C, B=10kG)	RESISTIVE NULL VOLTAGE V_M, μV MAX (B=0, I_C=100mA)	INPUT RESISTANCE R_{IN}, Ω (INCLUDING LEADS)	OUTPUT RESISTANCE R_{OUT}, Ω (INCLUDING LEADS)	NOMINAL CONTROL CURRENT I_C, mA	LENGTH/WIDTH/TH OR DIAM./LENGT (inch)
BH-200	General Purpose Transverse	150	100	1.5	1.0	150	.500/.130/.01
BH-201	Ultra-Thin Transverse	120	250	2.3	1.8	100	.625/.135/.00
BH-202	Small Axial	100	100	2.6	1.8	100	.130 diam./.15
BH-203	General Purpose Axial	100	100	1.9	1.3	100	.195 diam./.17
BH-204	Midget Axial	110	200	2.3	1.9	100	.100 diam./.15
BH-205	Midget Transverse	130	100	2.1	1.4	125	.375/.080/.015
BH-206	High Sensitivity Transverse	550	500	5	3.5	200	.750/.225/.030
BH-207	High Resolution Tangential	160	200	2	1.5	150	.500/.145/.045
BH-208	Ultra Midget Axial	100	250	2.7	1.9	100	.063 diam./.17
BH-700	Low Cost Transverse	500	750	5	4	200	.200/.250/.023
BH-701	High Linearity Transverse (Note 1)	75	75	2	1.5	100	.625/.230/.040
BH-702	Ferrite Imbedded	(Note 2)	250	3.5	3	200	.300/.200/.083
BH-703	3-Axis	75	100	1.5	1.5	100	.285 diam./.750

Note 1: Hall voltage (V_H) vs. B field. { ±.25% of reading from −10 kG to +10kG; ±1% of reading from −30 kG to +30kG } Linearity curves furnished for −10 kG to +10kG and −30 kG to +30kG. Optimized curves for other ranges available on special order.

Note 2: In a free field of 100 gauss the open circuit Hall voltage is 9 mV min. In a closed magnetic circuit, minimum sensitivity is 3.2 mV/ampere-turn.

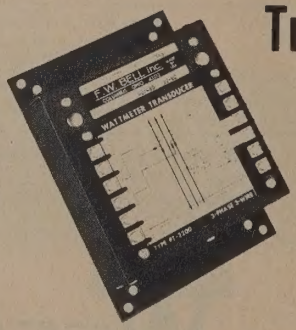
Power System Transducers



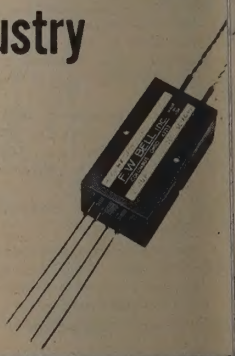
- *A complete line of utility tested and approved transducers to measure all ac power quantities: power, reactive power, voltage, current, frequency and power factor.*
- *Accurate and reliable long-life operation enhanced by: use of high grade solid-state components, epoxy encapsulated, conservative rating and substantial overload capability.*
- *Interfacing with panel meters, recorders, telemetry systems and computers is facilitated by a choice of output options: 50mV, 1mA or 10 V dc full scale.*
- *Sturdy steel case of the same size for all transducer models: easy wiring and neat appearance of group installations.*
- *Case dimensions compatible with standard racks and panel Width only 2": permits maximum number of units per panel space.*

Transducers For Industry

- Single and 3-phase Watt Transducers for industrial applications.
- Motor power models for 240 V and 480 V operation at up to 6, 12 or 24 A load currents.
- Sturdy steel case, designed to fit in standard NEMA and JIC enclosures, providing protection in industrial environments.



- High accuracy, low cost modules for measurement of single phase power and 3-phase motor power.
- Models for standard line, audio and ultrasonic frequencies and for variable frequency operation.
- Small epoxied nylon box with input and output leads, easy to incorporate into customer designs.



Complete specifications on multipliers and transducers available on request.

Specifications subject to change without notice.

Leaders in Hall Effect Components, Instruments and Systems

F.W. BELL INC.

4949 Freeway Drive East Columbus, Ohio 43229
614-888-7501 TWX: 810-337-2851

ELECTRO MAGNETIC PICKUPS

a new approach to TACHOMETRY, POSITIONING, CONTROL, COUNTING, TRIGGERING, TELEMETERING, SYNCHRONIZATION and other actuation.

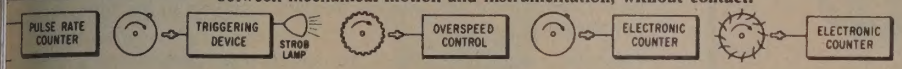
3080 Magnetic Pickup smallest–weighs only 10 volt output is higher many larger models.

MAGNETIC PICKUPS SOLVE SPEED MEASUREMENT AND CONTROL PROBLEMS

What They Do . . . generate voltage/frequency from mechanical motion (without contact) in proportion to speed of ferrous metal objects interrupting their magnetic fields. They require no external power supplies, and additional amplification is usually not required.

When a gear tooth, blade or any other magnetic metal projection interrupts the external magnetic field surrounding the sensing head, a voltage and frequency are generated that may be used to: indicate, actuate instruments, synchronize, control, provide accurate data for telemetering.

What They Are . . . a self-generating input device providing the connecting link between mechanical motion and instrumentation, **without contact.**



g rate of flow — For motion study — Safety device — Counting revolutions — Measuring turbine speed

MAGNETIC PICKUP REFERENCE TABLE

No.	Temp. Range	Test Voltage Volts-Peak To Peak Limits	Resistance Ohms Limits	Inductance Millihenrys Limits	Output Connection	EPL Mating Cable	Pickup Net Weight
	−100°F +225°F	40-70 Note 2	114-140	30-43	Mates with MS3106A-10SL-4S	30N	1.66 Oz. Avg.
TB	−100°F +450°F	30-50 Note 2	125-160	27-45	Mates with Amphenol 97-3106A-10SL-4S (496) or Cannon CA 3106HR-10SL-4S	30HTN	1.85 Oz. Avg.
	−100°F +225°F	17-30	90-110	26-40	Supplied with Two 6″ Vinyl Insulated Flexible Leads	NONE	0.35 Oz. Avg.
	−100°F +225°F	18-32 Note 4	90-110	26-40	Supplied with Two 6″ Vinyl Insulated Flexible Leads	NONE	0.35 Oz. Avg.
TB	−100°F +450°F	15-26 Note 4	90-110	22-31	Supplied with Two 6″ Teflon Insulated Flexible Leads	NONE	0.43 Oz. Avg.
	−100°F +225°F	20-34 Note 5	90-110	26-40	Mates with Microdot Group "A" Series S-50	MD	0.56 Oz. Avg.
	−100°F +225°F	55-85 Note 4	575-660	165-225	Supplied with Two 6″ Vinyl Insulated Flexible Leads	NONE	0.35 Oz. Avg.
	−100°F +225°F	50-75	575-660	165-225	Supplied with Two 6″ Vinyl Insulated Flexible Leads	NONE	0.35 Oz. Avg.
	−100°F +225°F	150-240	1190-1450	380-540	Mates with MS 3106A-10SL-4S	30N	1.69 Oz. Avg.
N	−100°F +225°F	190-290 Note 2	1190-1450	380-540	Mates with MS3106A-10SL-4S	30N	1.69 Oz. Avg.
TB	−100°F +450°F	125-195 Note 2	1150-1400	350-470	Mates with Amphenol 97-3106A-10SL-4S (496) or Cannon CA 3106HR-10SL-4S	30HTN	1.74 Oz. Avg.
	−100°F +225°F	70-110 Note 3	170-200	65-85	Mates with MS3106A-10SL-4S	30N	1.73 Oz. Avg.
	−100°F +225°F	400-600 Note 2	1100-1280	380-460	Mates with MS3106A-10SL-4S	30N	2.10 Oz. Avg.
	−100°F +450°F	4.7-9 Note 4	105-130	6.5-9	Supplied with Two 6″ Teflon Insulated Flexible Leads	NONE	.123 Oz. Avg.
	−100°F +225°F	4.7-9 Note 5	105-125	6-8	Mates with Microdot Group "A" Series S-50	MD	.177 Oz. Avg.
	−100°F +200°F	60-100 Note 1	195-215	70-80	UL listed. Supplied with two 18″ AWG #18 flexible leads.	NONE	5 Oz. Avg.
	−65°F +225°F	10-16	134-145	11-16	Supplied with Two 6″ Teflon Insulated Flexible Leads	NONE	0.05 Oz. Avg.
	−300°F +800°F	35-52 Note 4	170-200	32-52	Mates with Cannon CAO Series, 10-SL-4S	NONE	1.75 Oz. Avg.

1—Tested at 1,000 inches/sec. with 8-pitch, 12-tooth gear at 0.005 inch clearance and a load of 100,000 ohms.

2—Tested at 1,000 inches/sec. with 20-pitch, 30-tooth gear at 0.005 inch clearance and a load of 100,000 ohms shunted by 250 mmf cable capacity.

3—Tested at 1,000 inches/sec. with 8-pitch, 12-tooth gear at 0.005 inch clearance and a load of 1250 ohms shunted by 250 mmf cable capacity.

4—Tested at 1,000 inches/sec. with 20-pitch, 30-tooth gear at 0.005 inch clearance and a load of 100,000 ohms.

5—Tested at 1,000 inches/sec. with 20-pitch, 30-tooth gear at 0.005 inch clearance and a load of 100,000 ohms shunted by 290 mmf cable capacity.

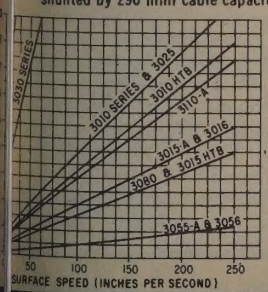
GENERAL NOTES:

Material of shell and pole piece, type 416 stainless steel, except for shell material of models 3040-A, 3045-A and 3070 which are 303 stainless steel.

Insulation resistance to shell 100 megohms minimum, dielectric strength to shell 500 volts rms minimum for 1 minute. These specifications reflect design at revision date and may be changed to incorporate improvements without prior notice.

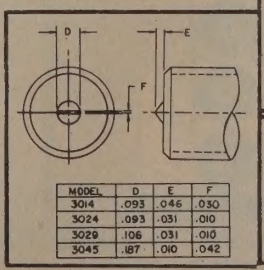
*Listed with Underwriters' Laboratories.

† Indicates chisel-type pole to provide high resolution sensing for high speed, small toothed gear detection.

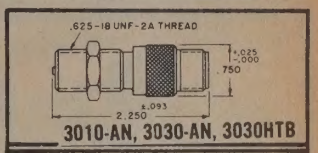


TYPICAL VOLTAGE OUTPUT CURVES

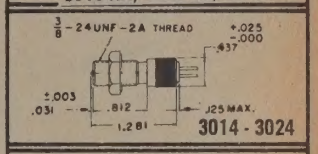
Typical voltage output curves of standard magnetic pickups show relative outputs under identical conditions. All pickups connected by 10′ Belden #8401 cable to a 100,000 ohm load with clearance between pole-piece and a 20-pitch, 30-tooth ferro-magnetic gear. Changes in load, clearance, cable length, gear teeth size, or gear material will produce different results. Measurements are in peak-to-peak volts rather than rms.



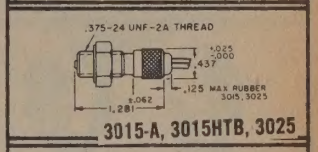
MODEL	D	E	F
3014	.093	.046	.030
3024	.093	.031	.010
3029	.106	.031	.010
3045	.187	.010	.042



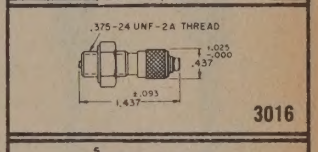
3010-AN, 3030-AN, 3030HTB



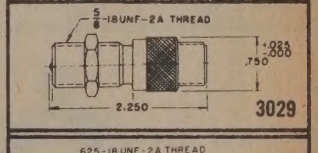
3014 - 3024



3015-A, 3015HTB, 3025



3016



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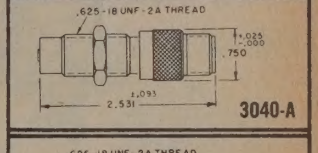
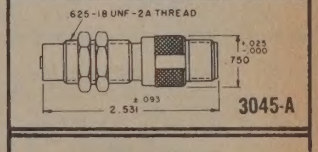


3040-A



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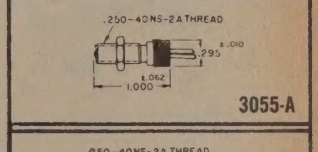

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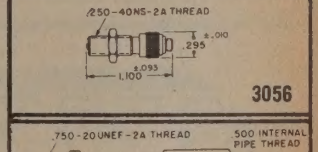

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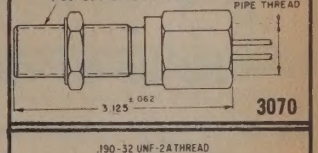

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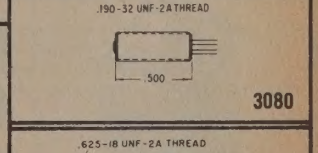

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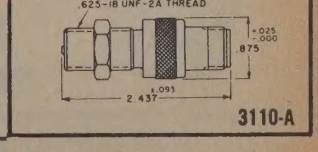

3110-A

ECTRO PRODUCTS LABORATORIES, INC.

• Proximity Switches • Magnetic Pickups
• Pres-Con Controls • Tachometers • DC Power Supplies
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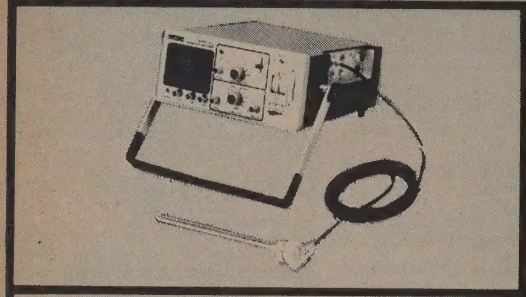
METRIX

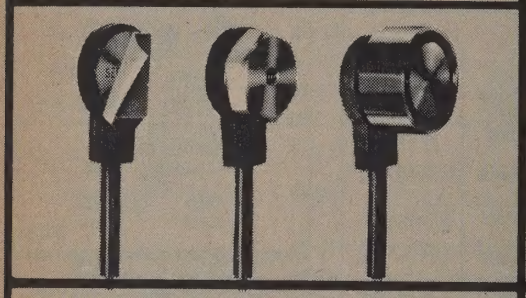
VIBRATION/PRESSU INSTRUMENTATIO



Model 5115 Vibration Analyzer

Consists of a vibration pickup and a portable battery operate indicator unit, complete with integral oscilloscope. Measures ampl tude and frequency of vibration displacement, velocity or accelera tion in the frequency band 5Hz to 1,600Hz. A continuous variable narrow band pass filter provides means for spectral analysi With filter out the oscilloscope displays vibration in the time domai (amplitude vs. time).

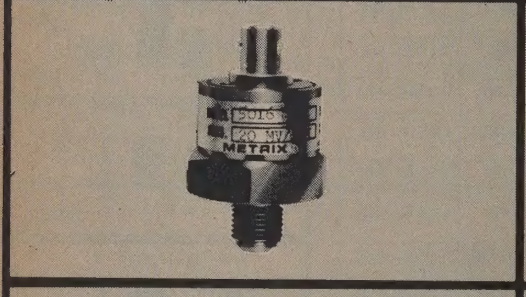
Optional accessories include an oscilloscope camera and a strobo scope for stop motion studies.



Series 500 Accelerometers

Piezoelectric sensing element mounted in lightweight (6 gms.) case provides high output for driving an oscilloscope or VTVM directly in many applications. Including an integral low noise cable, units may be mounted with cement, transfer tape or with optional magnetic or threaded adapters.

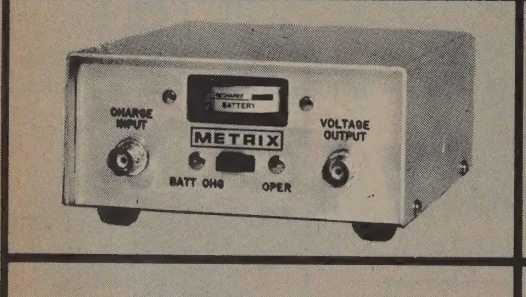
Model	502	51
Voltage Sens. (mv/g)	25	
Charge Sens. (pcmb/g)	150	2
Capacitance (pf)	6,000	3,30
Resonance (Hz)	3,000	10,00



Model 5016 Dynamic Pressure Transduce

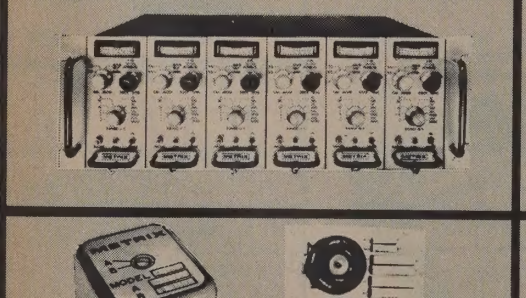
A high output piezoelectric transducer, this unit is ideal for measuring dynamic pressures in liquids and gases. Stainless steel pressure chamber, entirely sealed from the sensing element, allows use with corrosive fluids. Signal is taken out through a standard BNC coax connector.

Voltage Sens. ....20 mv/ps
Charge Sens....120 pcmb/ps
Pressure Range....0-3000 ps
Mech. Resonance.30,000 Hz
Temp. Range ...−40° to +300°F



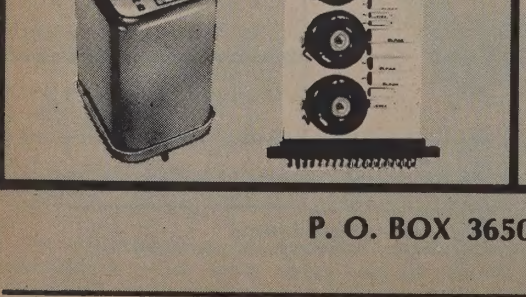
Model 5080 Charge Amplifier

Portable rechargeable battery operated unit is used to condition signals from piezoelectric transducers to obtain good low frequency response and a high level low impedance output. Accepts full scale inputs from 100 to 10^6 pcmb in four ranges. Band width 0.1Hz. to 10KHz. Calibration input allows precise gain adjustment. Full scale output is ±1 volt from 20 ohms.



Model 5072 Charge Amplifier

Conditions signals from piezoelectric transducers and provides direct meter readout of forcing function (g's, psi, etc.). Stable high gain circuit accepts full scale inputs from 1 to 50,000 pcmb over band width 2Hz to 20 KHz. Front panel control normalizes gain to match transducer. Plug in filters. Internal oscillator for calibration. Operates from 115 VAC. Rack accommodates six channels.



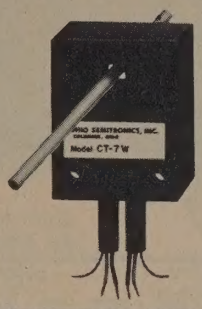
Series AF Low Pass Filters

Employing extremely sharp cutoff characteristics together with linear phase shift in the pass band, Series AF Low Pass Filters provide maximum attenuation of signals above the cutoff frequency. Units are passive and flat to DC. Toroidal inductors insure low distortion and pickup. Cutoff frequencies from 60Hz to 100KHz. Stop band attenuation 60 to 72 db. Available mounted on cards or in cans. Many standard models available from stock. Short delivery on special units.

P. O. BOX 36501—HOUSTON, TEXAS 77036
TEL.: (713) 668-2386
METRIX INSTRUMENT C

Monitoring, measuring and control materials, devices and equipment utilizing Hall effect-magnetic structures and thermoelectric modules . . .

ND d.c. to Megahertz T TRANSDUCERS



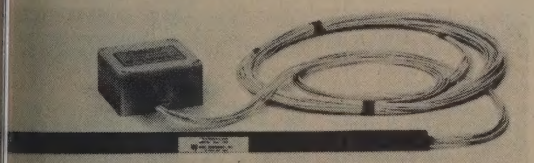
Series current transducers provide t voltage which is independent of from d.c. to the Megahertz range. output isolation is provided since al or electrical connection is neces- he conductor threaded through the Monitoring, sampling, or analysis teady-state, or transient currents, se times of 1 microsecond or less, asible using the CT units.

ODEL	PEAK CURRENT AMPERES	BIAS CURRENT MILLIAMPERES	FULL SCALE OUTPUT MILLIVOLTS
7W	30	100	60
100W	100	100	60
200W	200	100	100
600W	600	100	60
1000W	1000	100	60

AND ON CLAMP-ON NT TRANSDUCERS

ew unique wide-band clamp-on current transducers provide ut signal proportional to enclosed current in the d.c. to z range. The less than 1 microsecond rise time makes its ideally suited for motor testing, inverter testing, power monitoring, automotive applications or other areas where ion of high current lines is undesirable.

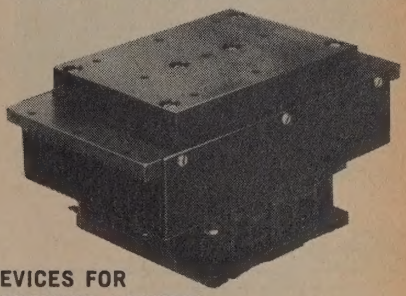
TIC DISPLACEMENT AND PROXIMITY OR MODEL MS-1100/MA-1100



/MA-1100 Magnetic Displacement and Proximity monitors non-contacting measurement of displacement over a 20 inch The amplifier-power supply unit (MA-1100) can be remotely and provides a 0-5 volt output for telemetry or control ions.

BAND R.F.I. AND E.M.C. MAGNETIC NAS AND MAGNETOMETERS

as designed the MS-1000 magnetic antenna for application rference reduction, testing and measurement of magnetic the d.c. to Megahertz range. Sensitivities of 100 millivolts ss, unamplified, from the basic antenna with output in- ent of frequency, illustrates performance. Vector Magne- units, providing an output of 10 volts in the earth's field, provided for particular applicational requirements.



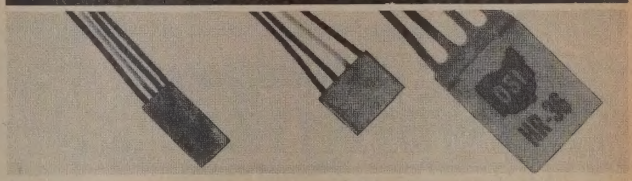
THERMOELECTRIC DEVICES FOR COOLING AND TEMPERATURE CONTROL

O.S.I. offers a variety of thermoelectric cooling units ranging from the TC Series, used in spot-cooling applications where up to 115 degree Centigrade temperature depression is needed, to the TA Series which can remove up to 85 watts from chemical bath, electronic package, or enclosure. The controllable, reversible heat pumping properties of thermoelectric devices make them ideally suited for temperature control.

MODEL	ΔT DEG. C.	HEAT PUMP WATTS	INPUT CURRENT AMPERES
TM-12	65	3	30
TM-20	65	20	30
TM-20M	65	20	30
TC-44	90	6	30
TC-1851	115	3	25
TA-6F	55*	85	30

* Specified as cold plate temperature depression from ambient air temperature.

HALLTRON, MAGNETIC FIELD SENSORS



A wide variety of Hall effect probes for use in magnetic sensing or measuring applications are maintained in stock. Units feature high-linearity, low-noise, excellent stability and ruggedness. Physical size/device characteristic combinations permit optimum use of O.S.I. sensors in critical applications.

MODEL	TYPE	CONTROL CURRENT MILLI-AMPERES	OUTPUT IN 10 Kg. MILLIVOLTS	DIMENSIONS INCHES
HP-325	Miniature	25	200	.187/.075/.015
HP-330	Micro	25	150	.040/.040/.012
HP-340	Gaussmeter	100	100	.280/.125/.020
HR-36	High-linearity	350	350	.500/.375/.025
HR-38	High-sensitivity	25	200	.500/.375/.025
HR-66	Low-cost	200	500	.200/.250/.028
HS-84	Low Temperature*	350	30,000	.500/.375/.015

* The HS-84 is designed for high sensitivity at −196°C.

ENERGY CONVERSION MATERIALS

Optimized energy conversion materials and elements of the following types are available:

- Indium arsenide and indium antimonide for magnetic sensors and infrared filters.
- Bismuth telluride alloys; N & P type, for thermoelectric cooling and specialized power generation modules.
- Lead telluride for high quality optical infrared coatings.
- High purity arsenic trichloride for exceptional growth of inter-metallic arsenides.
- Research grade bismuth, indium, arsenic, tellurium and antimony.

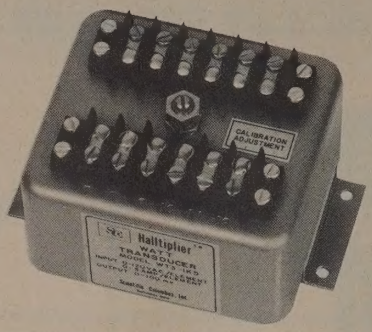
OHIO SEMITRONICS, INC.

1205 CHESAPEAKE AVENUE • COLUMBUS, OHIO 43212 • PHONE: 614-486-9561

PIONEER IN SOLID STATE ENERGY CONVERSION MATERIALS, DEVICES and SYSTEMS

SCIENTIFIC COLUMBUS instrumentation to measure all electric power parameters

Scientific Columbus Halltiplier (TM) Transducers are the most complete selection of Hall Effect Watt Transducers available. Known for sturdiness and high reliability, Halltiplier (TM) transducers also feature such advantages as calibration adjustment, choice of filtered or unfiltered outputs and measurement of forward or reverse power flow.



Halltiplier (TM) Watt Transducers

- Utility Tested and Approved
- Voltage or Current Outputs
- Minimal Space Requirements
- Calibrated Output

(Calibration instructions, typical characteristic curves and application assistance are available on request)

WATT TRANSDUCERS

	Full Scale	Nominal Voltage Input	Voltage Range	Voltage Overload	Voltage Burden	Nominal Current Input	Current Overload	Current Burden	Frequency Range (HZ)	Power Factor Range	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/Linearity @ 25°C (% of F.S.)	Output at Full Scale (d.c.)	Output Load Required	A.C. Component (peak)	Response Time (to 99%)	Calibrate Adjustment	Zero Adjustment	External Amplifier Power Required	Dielectric Test
6512	500/1000/2000 W	120/240V	135/270V	50%	1VA	5/10A	100A/1 Sec.	3VA	60	.0-1.7	− 0°/+50°	±1%	±1%	110 MV	100 Ω	100%	<5 MS	NONE	NONE	NONE	1500 V
WT5C5	500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	100 Ω	100%	<5 MS	±10%	NONE	NONE	1500 V
WT5C5A1	500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 V
WT5C5A2	500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 V
WT5C5A3	500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 V
WT5C5A4	500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 V
WT5C5A5	500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 V
WT3-1K5	1000 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 V
WT3-1K5A1	1000 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 V
WT3-1K5A2	1000 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 V
WT3-1K5A3	1000 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 V
WT3-1K5A4	1000 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 V
WT3-1K5A5	1000 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 V
WT3-1K5 2½	1000/1500 W	120V	0-135V	150V	3VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	66.7/100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 V
WT3-1K5 2½A1	1000/1500 W	120V	0-135V	150V	3VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	66.7/100 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 V
WT3-1K5 2½A2	1000/1500 W	120V	0-135V	150V	3VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 V
WT3-1K5 2½A3	1000/1500 W	120V	0-135V	150V	3VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 V
WT3-1K5 2½A4	1000/1500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 V
WT3-1K5 2½A5	1000/1500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 V
WT34-2K5	1500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 V
WT34-2K5A1	1500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 V
WT34-2K5A2	1500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 V
WT34-2K5A3	1500 W	120V	0-135V	150V	2VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 V
WT34-2K5A4	1500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 V
WT34-2K5A5	1500 W	120V	85-135V	150V	4VA	5A	100A/1 Sec.	2VA	50-60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 V

VAR TRANSDUCERS

	Full Scale	Nominal Voltage Input	Voltage Range	Voltage Overload	Voltage Burden	Nominal Current Input	Current Overload	Current Burden	Frequency HZ	Power Factor Range	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/Linearity @ 25°C (% of F.S.)	Output at Full Scale (d.c.)	Output Load Required	A.C. Component (peak)	Response Time	Calibrate Adjustment	Zero Adjustment	External Amplifier Power Required	Dielectric Test
VT5C5	500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	100 Ω	100%	<5 MS	±10%	NONE	NONE	1500V
VT5C5A1	500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500V
VT5C5A2	500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500V
VT5C5A3	500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500V
VT5C5A4	500 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500V
VT5C5A5	500 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500V
VT3-1K5	1000 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500V
VT3-1K5A1	1000 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500V
VT3-1K5A2	1000 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500V
VT3-1K5A3	1000 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500V
VT3-1K5A4	1000 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500V
VT3-1K5A5	1000 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500V
VT34-2K5	1500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500V
VT34-2K5A1	1500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500V
VT34-2K5A2	1500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500V
VT34-2K5A3	1500 VARS	120V	0-135V	150V	2 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500V
VT43-2K5A4	1500 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500V
VT34-2K5A5	1500 VARS	120V	85-135V	150V	4 VA	5A	100 A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500V

CURRENT AND VOLTAGE TRANSDUCERS

	Full Scale	Nominal Voltage	Overload	Burden @ 120 v	Frequency Range HZ	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/Linearity @ 25°C	Output at Full Scale (D.C.)	Output Load Required	A.C. Component	Response Time	Calibration Adjustment	Dielectric Test
CT-510	5a	—	100A/1 Sec.	1 va	50-500	−20°/+60°	±1% of F.S.	±0.5%	10 volts	1 K Ω	48%	5 ms	NONE	1500 rms
CT-510A2	5a	—	100A/1 Sec.	1 va	50-500	−20°/+60°	±1% of F.S.	±0.5%	1 ma	0 to 10 K Ω	<1%	400 ms	±10%	1500 rms
CT-510A3	5a	—	100A/1 Sec.	1 va	50-500	−20°/+60°	—	±0.5%	3 ma	0 to 10 K Ω	<1%	400 ms	±10%	1500 vrms
VT-110	150 v	120 v	180 v	4 va	50-500	−20°/+60°	±1%	±0.5%	10 volts	1 K Ω	48%	5 ms	NONE	1500 vrms
VT-110A2	150 v	120 v	180 v	2.5 va	50-500	−20°/+60°	±1%	±0.5%	1 ma	0 to 10 K Ω	<1%	400 ms	±10%	1500 vrms
VT-110A3	150 v	120 v	180 v	2.5 va	50-500	−20°/+60°	±1%	±0.5%	3 ma	0 to 10K Ω	<1%	400 ms	±10%	1500 vrms

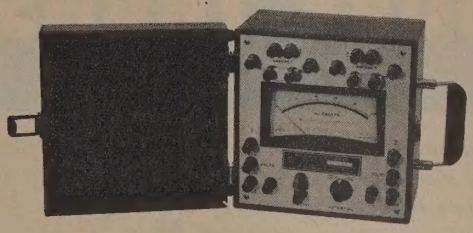
FREQUENCY TRANSDUCERS

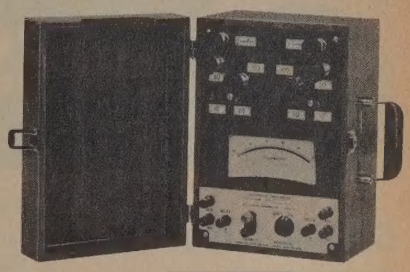
	Full Scale	Nominal Voltage	Voltage Range	Voltage Overload	Voltage Burden	Nominal Current	Current Overload	Current Burden	Freq. Range (HZ)	Temp. Range (°C)	Max. Temp. Effects on Accuracy	Accuracy/Linearity @ 25°	Output @ Full Scale (D.C.)	Output Load Required	A.C. Component (peak)	Response Time (to 99%)	Calibration Adj.	Zero Adj
FT-50B	47-50-53 HZ	115 v	104-127	150	<2 watts				47-53	0°-50°		±0.12 HZ	−0.50/+0.5 ma	100 Ω	6 mv	300 ms	Yes	47-53 HZ
FT-60B	56-60-64 HZ	115 v	104-127	150	<2 watts				56-64	0°-50°		±0.16 HZ	−0.50/+0.5 ma	100 Ω	6 mv	308 ms	Yes	56-64 HZ
FT-60-1B	55-60-65 HZ	115 v	104-127	150	<2 watts				55-65	0°-50°		±0.20 HZ	−0.50/+0.5 ma	100 Ω	6 mv	300 ms	Yes	55-65 HZ
FT-400B	380-400-420 HZ	115 v	104-127	150	<2 watts				380-420	0°-50°		±0.80 HZ	−0.50/+0.5 ma	100 Ω	6 mv	300 ms	Yes	380-420

POWER FACTOR/PHASE ANGLE (1φ) TRANSDUCER

PF-1/PF-2/PF-3	±0.3/0.5/0.7P.F.	115 v	85-130v RMS	150 v	<2 va	0.25-5 RMS	7 amps RMS cont.	2v,0 to peak sq. wave, drop	60	−20°C to +60°C	±0.5% of span	±2% of span	0 to ±0.5 mav d.c.	100 Ω	Maximum deviation from D.C. level is 100 mv	<10 ms	Yes	Yes

SCIENTIFIC COLUMBUS power instruments





RAL DESCRIPTION
ATTMETERS
meters with ANALOG OUTPUT to

tal voltmeters or printer
illoscopes
p chart or tape recorders
plotters
Acquisition systems

attmeters with intelligence have in consisting of two Halltiplier solid state watt transducers. instruments compute real power 6) and furnish a 0-50 mv d-c ana- utput signal (intelligence) with aneous display of watts on the The wattmeter is ±0.5% ac- and, the output signal features % accuracy, except for model 05-P.

NO EXTERNAL POWER SOURCE REQUIRED —

NDARD MODIFICATIONS
SULT FACTORY)
AY RACK PANEL MOUNT
TAL READOUT
HZ MODELS AND OTHER QUENCIES
E POWER FACTOR RANGE

WATTMETER SPECIFICATIONS

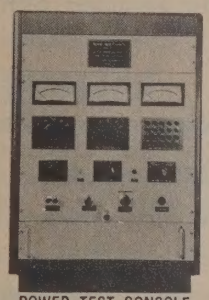
	Model 310K605-P SPECIFICATIONS	Model 5000-P SPECIFICATIONS	Model 325K605-P SPECIFICATIONS
POWER RANGES:			For measurement of single phase two wire, single phase three wire and polyphase three wire loads
Single phase	0-0.5, 1, 2, 4, 5, 10 Kilowatts	500/1000/2000/2500/5000 watts	1.5/3.0/6.0/7.5/15.0/30.0 kilowatts
Polyphase	0-1, 2, 4, 5, 10 Kilowatts		3.0/6.0/12.0/15.0/30.0/60.0 kilowatts
Potential inputs, Nominal	0-100, 200, 500 Volts, RMS	0-100/200/500 volts	0-150/300 volts
Current inputs, Nominal	0-5, 10 amperes, RMS	0-5/10 amps	0-10/20/50/100 amperes
ACCURACY:			
Overall instrument including meter	±0.5% of full scale on each range	±0.5% of f.s.	±1% of full scale
Output signal	±0.25% of full scale on each range	±0.25% of f.s.	±0.5% of full scale
Transducer Output signal	0-50 MV D.C. on each range	0-25 mv d.c.	0-50 mv d.c.
Load Power Factor Range (For No Decrease in Accuracy)	Unity to lead or lag 0.5	Unity to lead or lag 0.5	Unity to lead or lag 0.5 (50%)
Compensated Fundamental frequency range (For stated accuracies at all power factors)	50-70 CRS	50-70 Hz	50-70 Hz
Current overload	100% continuous, 1000% for 3 seconds without damage	100% continuous, 1000% for 3 seconds	50% continuous; 100% for 3 sec.
Enclosure	19" relay rack panel 7" high—8¼" deep with dust cover, or wood formica case 7" x 9" x 9¼"		Portable formica cabinet with binding post terminations. Lid has clearance port for leads when locked.

POWER TEST CONSOLES

r test consoles are used to measure watts, and amperes simultaneously during tests ngle and three phase 3 wire loads such as rs, transformers, appliances, etc.

ese units feature range switching of cur- voltage. The resultant wattmeter ranges utomatically displayed on an annunciator. instrument and the load being measured rotected from overload damage by an auto- built-in current overload circuit.

parameters are displayed on taut band rs with linear scales. The unit is available digital meters. A d.c. analog output signal ach parameter can be supplied for auxil- r control circuits.



POWER TEST CONSOLE
MODEL 1027A

TYPICAL SPECIFICATIONS

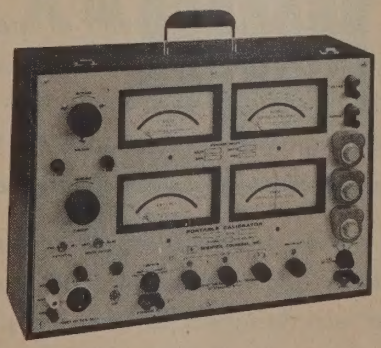
Function—Power test console to measure watts, volts and amperes simultaneously during electric motor tests.

Full Scale Power—25 watts to 40 kilowatts. **Full Scale Potential**—50/100/200/400 volts RMS nominal, 75/150/300/600 volts RMS maximum. **Full Scale Current**—0.5/1/2/5/10/20/50 amperes RMS. **Analog Output Signals, Watts, Volts and Amperes**—0.50 mv d.c. for full scale on each range into 10K ohms. Termination on rear panel. **Accuracy**—±1% of full scale for meters. ±0.5% of full scale for analog output signals.

TRANSDUCER CALIBRATOR

instrument is designed for easy field king of calibration of watt, volt and amp ducers. It may also be used for incoming ction. The Model 1369 is completely self ined and requires no external loads. It res only 120 v 60 Hz power.

calibrator compares the output signal the transducer being tested with the out- rom a standard in the instrument. The per- deviation from the standard output is read tly on a % error meter. Independent cur- and voltage linearities can be determined. calibrator will test transducers with full outputs ranging from 25 mv to 10 v d.c. pecified load resistance up to 100 K ohms.



Model 1369

SPECIFICATIONS

Ranges—0-150 volts, 0-5 amperes, 0-500 watts/element, 0-500 vars/element

Power Factor—Unity and 0.5 lag

Metering and Accuracy—Volt and amp indicator ±0.75% of f.s., Percent of full scale output ±0.5% of f.s., Percent of full scale error ±0.25% of f.s.

Transducer Load Resistance—0 to 100 K ohm

Transducer Output Level—25 mv d.c. to 10 v d.c.

SCIENTIFIC COLUMBUS
Division of Esterline Corporation
1035 West Third Avenue
Columbus, Ohio 43212 (614) 291-4681

The Power Instrumentation People

Standard Controls

PRESSURE TRANSDUCERS

SAME-DAY SERVICE FROM LARGE INVENTORY

The following typical specifications demonstrate the capabilities of these transducers.

1. Combined nonlinearity and hysteresis .25% F.S.
2. Thermal zero drift less than .01% FS/°F.
3. Thermal sensitivity drift less than .005% FS/°F.

Also available custom designed for your application.

TRANSDUCERS
ELECTRONICS
THERMAL SWITCHES
DYNAMIC PRESSURE SOURCE

AEROSPACE TELEMETRY
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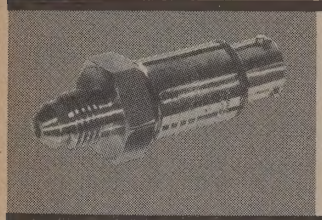
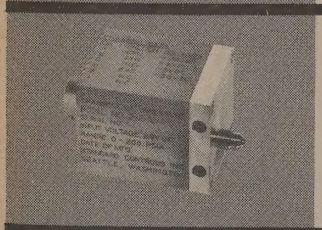
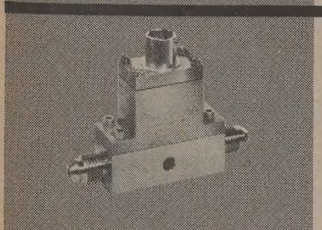
MARINE RESEARCH



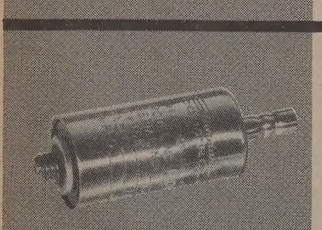
210-30 series transducers cover the pressure range from 0-500 thru 0 100,000 PSI available in absolute, or sealed reference calibration. This transducer concept features no moving parts, small cavity volume, excellent resistance to shock and vibration.



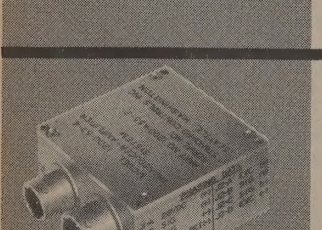
212-00 Series—Provides a full scale output of 5 Volts DC by using an ultra-reliable miniature amplifier with the rugged bonded strain gage pressure transducer. This system available for measuring absolute, gage and differential pressure.



210-60 series differential transducers provide an output proportional to the pressure difference between the two ports. They are "bi-directional" and are commonly used to indicate actuator position, provide feedback signals from servo valves, etc. Differential ranges from + 500 thru ± 5000 PSID. Line pressure at either port may be as high as the differential rating.



210-10 series pressure transducers are recommended for applications requiring accurate measurements of pressures taken in a small space under industrial environmental conditions. Small size and an 8-32 stud-type pressure fitting facilitate mounting the 210-10 in tight locations. The small volume of the sensing element is responsive to high frequency pulsations.



216-01 series general purpose strain gage amplifier provides a low cost approach to high level signal from a standard strain gage transducer. This amplifier was designed for laboratory and industrial application. Power required is unregulated 28 Volts DC (18-32). Will accept full bridge transducer with impedance of 350 ohms or more.

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UNITED TECHNICAL PUBLICATIONS

Amperex Industrial, Communicati

TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE
OA2	3MP26	5J6	6BF5	6DL4/EC88	6HF8	6SQ7
OB2	3NP4/MW6-2	5J26	6BF6	6DL5/EL95	6HG8/ELF86	6T8A
OE3	3Q4/DL95	5JK6	6BF8	6DL5/EL95MP	6HJ8	6T9
OG3	3S4/DL92	5KE8	6BF11	6DN7	6HK5	6T10
OZ4/OZ4A	3V4/DL94	5KZ8	6BG6GA	6DQ5	6HQ5	6U8A
1A3/DA90	4-65A	5LJ8	6BH6	6DQ6B/6GW6	6HR5	6U9/E
1AD2	4-125A	5MHH3	6BH8	6DR7	6HS5	6U10
1AY2	4-250A	5MK9	6BH11	6DS4	6HS6	6V3A
1BC2	4-400A	5R4GY	6BJ3	6DS8/ECH83	6HS8	6V4/E
1BG2	4AU6	5R4GYB	6BJ6	6DT5	6HU6/EM87	6V6
1BH2	4B32	5RK16	6BJ7	6DT6A	6HU8/ELL80	6V6G
1BL2	4BC8	5T8	6BJ8	6DT8	6HW8	6V9/E
1BQ2/DY802	4BL8/XCF80	5U4GB/5AS4A	6BK4C/6EL4A	6DV4	6HZ8	6W4G
1DK29	4BN6	5U8	6BK5	6DX8/ECL84	6J5	6W6G
1G3GT/1B3GT	4BQ7A/4BZ7	5U9/LCF201	6BK7B	6DZ7	6J6A	6X4/E
1K3/1J3	4BS8	5V3/5AU4	6BL7GTA	6EA8	6J7	6X5G
1L4/DF92	4BZ6	5V4GA	6BL8/ECF80	6EC4	6J11	6X8A
1M3/DM70	4C35/6268	5V6GT	6BM8/ECL82	6ED4	6JB6A	6X9/E
1N3/DM71	4CB6	5X8	6BN4A	6EH4A	6JC6A	6Y6G
1R5	4CS6	5X9/LCF200	6BN6/6KS6	6EH5	6JC8	6Y9/E
1S5	4CX250B	5Y3GT	6BN8	6EH7/EF183	6JD6	6Z10/
1T4	4CX250B/7203 JAN	5Z4/GZ30	6BN11	6EH8	6JE6C/6LQ6	7AU7
1U4/DF904	4CX250BNL	6AB4	6BQ5/EL84	6EJ4A	6JE8	7C24
1U5	4CX250F	6AC7	6BQ5/EL84MP	6EJ7/EF184	6JH6	7C34
1V2	4CX250F/7204 JAN	6AC10	6BQ6GA/6CU6	6EM5	6JH8	7EY6
1X2A/1X2B	4CX250FG/8621	6AD10	6BQ6GTB	6EM7/6EA7	6JK8	7GS7
2AF4	4CX250R	6AF3	6BQ7A/6BZ7	6EQ7	6JM6	7GV7
2AF4B/2DZ4	4CX250R/7580W JAN	6AF4	6BR5/EM80	6ER5	6JN6	7HG8/
2AH2	4CX350A/8321	6AF4A/6DZ4	6BR8A/6FV8A	6ES5	6JN8	7MP18
2AS2	4CX350F/8322	6AF9	6BS8	6ES8/ECC189	6JS6C	7XQ
2AV2	4CX1000A/8168	6AF11	6BU8	6EU7	6JT8	8AR11
2BN4A	4CX1500B/8660	6AG5	6BV8	6EU8	6JU8A	8AU8
2C39A	4DE6	6AG7	6BV11	6EV5	6JV8	8AW8
2C39BA	4DK6	6AG9	6BW8	6EV7	6JW8/ECF802	8B8
2CN3A	4DT6A	6AG11	6BW11	6EW6	6JX8/ECH84	8B10
2CW4	4EH7	6AH4GT	6BX6/EF80	6EW7	6JY8	8BA11
2CY5	4EJ7	6AH6	6BX7GT	6EY6	6JZ6	8BM11
2D21	4ES8/XCC189	6AJ8/ECH81	6BY5GA	6EZ5	6JZ8	8BN11
2D21W	4EW6	6AK5/EF95	6BY6	6EZ8	6K6GT	8BQ5
2ER5/XC95	4GK5	6AK5W	6BY8	6FD7	6K7	8BQ11
2FH5	4GS7	6AK5W/5654/E95F	6BZ3	6FG5	6K11/6Q11	8BU11
2FS5	4GS8/4BU8	6AL3	6BZ6	6FG6/EM84	6KA8	8CM7
2FY5/XC97	4GZ5	6AL5/EAA91	6C4	6FG7	6KD6	8CS7
2GK5/2FQ5A	4HA5/PC900	6AL5W	6C9	6FH5	6KG6A	8CW5/
2GU5	4HA7/4HC7	6AL5W/5726/E91AA	6C10	6FJ7	6KR8	8CX8
2HA5	4HQ5	6AL7GT	6CA4	6FM7	6KT8	8EM5
2J42	4HS8	6AL11	6CA5	6FM8	6KZ8	8ET7
2J51A	4J50(A)	6AM4	6CA7/EL34	6FQ7/6CG7	6L6GC	8FQ7/
2J55	4J52A	6AM5	6CA7/EL34MP	6FS5	6LB6	8GJ7/P
2K25	4JC6A	6AM6	6CB5A	6FV6	6LE8	8GN8/
3-400Z/8163	4JD6	6AM8A	6CB6A/6CF6	6FW5	6LF6	8JU8A
3A2	4LJ8	6AN8A	6CD6GA	6FY5	6LF8	8JV8
3A3	4MP12	6AQ5A/6HG5	6CD7/EM34	6FY7	6LH6A	8KR8
3A3B	4MP26	6AQ5A/EL90MP	6CE5/6BC5	6G11	6LJ6	8LT8
3A4/DL93	4RHH2	6AQ6	6CG3/6CE3/6CD3	6GB3	6LJ8	8MB6
3A5/DCC90	4X150A	6AQ7GT	6CG8A	6GB5/EL500	6LM8	8MG6
3AF4B/3DZ4	4X150A/7034 JAN	6AQ8/ECC85	6CH8	6GB6	6LN8/LCF80	8MY6
3AL5	4X150D	6AR5	6CJ3/6DW4B	6GB7	6LT8	8U9/PC
3AT2	4X150D/7035 JAN	6AR8	6CK4	6GC5	6LU8	8X9/PC
3AU6	4X500A	6AR11	6CL6	6GE5	6LX8/LCF802	9A8/PC
3AV6	5AM8	6AS5	6CL8A	6GF5	6LY8	9AQ8/P
3AW2	5AN8	6AS8	6CM4/EC86	6GF7A	6M11	9AU7
3B28	5AQ5	6AS11	6CM6	6GH8A	6ME8	9BJ11
3BH2	5AR4/GZ34	6AT6/EBC90	6CM7	6GJ7/ECF801	6MHH3	9ED4
3BN2	5AS8	6AT8A	6CN7	6GK5/6FQ5A	6MJ8	9GV8/X
3BN4A	5AT8	6AU4GTA	6CQ8	6GK6	6MP17	9JW8/P
3BN6	5AV8	6AU5GT	6CS6	6GK17	6MP18	9KZ8
3BS2A	5B8	6AU6A	6CS7	6GL7	6N7	9MHH3
3BSA	5BC3A	6AU8A	6CU5	6GM6	6Q4	9MP12
3BZ6	5BK7A	6AV5GA	6CU8	6GM8/ECC86	6Q4/EC80	9RA6
3C4/DL96	5BQ7A	6AV6A	6CW4	6GN8/6EB8	6R3/ET81	9RAL1
3CB/3CF6	5BR8/5FU8	6AV11	6CW5/EL86	6GS7	6R4	9U8/PC
3CE5/3BC5	5BT8	6AW8A	6CX8	6GT5A	6R4/EC22	9U8A
3CN3A	5BW8	6AX3	6CY5	6GU5	6R4/EC81	9V9/PC
3CS6	5C22/6279	6AX4GTB	6CY7	6GU7	6RA6	10AL11
3CX3	5CG8	6AX5GT	6CZ5	6GV5	6RA9	10BQ5
3CY5	5CL8A	6AX8	6D10	6GV8/ECL85	6RB11	10C8
3DG4	5CQ8	6AY3B/6BS2A	6DA4A/6DM4A	6GW8/ECL86	6RHH2	10CW5/
3DHH12	5DH8	6AY11	6DA5/EM81	6GX7	6RK19	10DE7
3DHH13	5DJ4	6AZ8	6DA6/EF89	6GY5	6RP15	10DX8/
3DK6	5EA8	6B10	6DB5	6GY6/6GX6/6HZ6	6RP22	10EG7
3DT6A	5EU8	6BA6/EF93	6DC8/EBF89	6GY8	6S4A	10EW7
3EH7/XF183	5EW6	6BA8A	6DE4/6CQ4	6GZ5	6SA7	10GK6
3EJ7/XF184	5FG7	6BA11	6DE6	6H6	6SC7	10HF8
3ER5	5GH8A	6BC7	6DE7	6HA5/EC900	6SG7	10JY8
3FS5	5GJ7/LCF801	6BC8/6BZ8	6DG6GT	6HB5	6SH7	10KR8
3GK5	5GS7	6BD6	6DHH12	6HB6/6HA6	6SJ7	10LD6
3GS8/3BU8	5GX7	6BD11	6DHH13	6HB7	6SK7	10LE8
3HA5/LC900	5HA7	6BE3	6DJ8/ECC88	6HE5	6SL7GT	10LW8
3HQ5	5HG8/LCF86	6BE6	6DK6	6HF5	6SN7GTB	10LZ8/1

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YPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE
	12SN7GTA	22BH3A	85A1/OE3	1875	6084/E80F	7204/4CX250F JAN
	12SQ7	22BW3	85A2/OG3	1908	6085/E80CC	7237A
	12T10	22DE4	85NB3	1913	6146	7247
	12V6GT	22JG6A	90AG	1941A	6146A	7308
	12W6GT	23JS6A	90AV	2050	6146B/8298A	7308 JAN
	12X4	23Z9	90C1	2050A	6155	7316
	13DE7	24BF11	90CG	3200	6155U	7320/E84L
	13DR7	24JZ8	90CV	3533A	6156	7355
	13EM7/15EA7	25AV5GA	90NB3	3538	6159	7377
	13FD7	25AX4GT	90NB4	3545	6159B	7378
L200	13GB5/XL500	25BB14	92AV	3546PW	6189/E82CC	7408
	13GF7A	25BQ6GA/25CU6	100LB	3554	6189/12AU7WA	7459A
	13V10	25BQ6GTB	120NB	4065	6201/E81CC	7527
	13Z10/13J10	25C5	117Z3	4152	6211	7527A
	14BL11	25CD6GB	150A1	4349	6211A	7534/E130L
	14BR11	25DN6	150AVP	4369	6218/E80T	7537
	14GT8	25EC6	150B2/6354	4370	6227/E80L	7580
	14JG8	25EH5	150C1P	4371	6252	7580W/4CX250R
	15AF11	25F5A	150CVP	4372	6252 JAN	7580W/4CX250R JAN
	15BD11A	25L6GT/25W6GT	150N	4379	6267/EF86	7581A
	15CW5/PL84	25W4GT	150UVP	4383	6268/4C35	7591A
ECC81	15DQ8/PCL84	25Z6GT	153AVP	4390	6279/5C22	7609
	15FM7/13FM7	27GB5/PL500	153C	4397	6293	7609 JAN
ECC82	15FY7	30A5	155N	4654	6339	7643/E80CF
	15LE8	30AG11	160G	4662	6354/150B2	7645
A/6189	16A8/PCL82	30KD6	161G	4699	6360 COMM	7650
A	16AQ3/XY88	30MP23	163G	5544	6360 JAN	7693/E90F
HBC91	16CB28	30MP27	200CB	5545	6360	7694/E99F
	16GK6	31AL10	200HB	5551A	6360A	7695
	16GY5	31JS6C	200LB	5552A	6370/E1T	7699
TB	16KA6	32ET5A	200N	5553B	6375	7709/Z70W
/6681	16XQB	33GT7	200NB	5555	6463	7710/Z70U
/ECC83	16XQG	33GY7A	300PC-452	5557/FG17	6508	7711/Z71U
/12BS3A	16XQL	33JV6	303PC-321	5559	6589	7714/Z805U
	16XQR	34GD5A	303PC-331	5560/FG95	6617	7721/D3A
	16XQBIG	35C5	303PC-421	5586	6618	7722/E280E
	16XQGIG	35EH5	303PC-431	5586 JAN	6661	7737/E186F
	16XQLIG	35L6GT	310PC-310	5604	6662	7737 JAN
	16XQRIG	35W4	312PC-310	5632/C31	6681/E83CC	7753
	16Y9/PFL200	35Z5GT	356	5651	6686/E81L	7788
HK90	17AX3	36AM3B	367	5654/6AK5W	6687/E91H	7788 JAN
	17AX4GTA	38HE7	404A	5654/6AK5W/E95F	6688/E180F	7800
	17AY3A/17BS3A	38HK7	417A	5657	6688A	7804
A	17BB14	40KD6	500N	5658	6688B	7805
	17BE3	40KG6	501RA	5666	6688 JAN	7806
	17BF11	42EC4	504R	5667	6689/E83F	7807
	17BR3	45B5/UL84	554N	5678	6693	7843
A/12CU6	17BZ3	45B5/UL84MP	560N	5684/C3JA	6756	7844
TB	17C5/17CU5	50B5	575A	5685/C6JA	6757	7854
	17C9	50BM8/UCL82	632B	5718	6759	7899
	17D4/17DM4A	50BM8/UCL82MP	651	5726/6AL5W	6779	7900
	17DE4	50C5	652	5726/6AL5W/E91AA	6786	7983
A	17DQ6B/17GW6	50DC4	653B	5727/E91N	6800A	7984
	17DW4A	50EH5	655	5727/2D21W	6801	7986/5866A
	17EW8/HCC85	50HC6	673	5759	6816	8008AX
12C5	17GV5	50HK6	725A	5762	6883	8020AX
	17H3	50HN5	805	5771	6883B/8032A/8552	8032
	17HB25	50L6GT	807	5822A	6884	8032A
B/12GW6	17JB6A	52AVP	810	5823/Z900T	6907	8042
A	17JM6	53AVP	811A	5842	6907 JAN	8078
	17JN6A	53CG	812A	5842 JAN	6922/E88CC	8108/EC157
	17JZ8	53HK7	813	5847/E182F	6922/E88CC JAN	8116 JAN
A	17X10/17AB10	53UVP	828	5847 JAN	6923/EA52	8116A
	18A5	54AVP	829B	5861/EC55	6939	8117A
/12DZ6/12EA6	18FW6	54UVP	832A	5866	6939 JAN	8118
	18FX6A	55HK7	833A	5866A/7986	6960A	8119/TBL2/400
	18FY6A	56AVP	833A JAN	5867A	6961A	8120/TBL2/500
A	18GB5/LL500	56CVP	838	5868	6972/JP9-75	8136
	18RAL1	56DUVP	845	5869	6975	8163/3-400Z
	19AU4GTA	56DVP	849	5870	6977	8165
	19BG6GA	56DVP-03	857B	5894 JAN	6979	8168/4CX1000A
	19CG3	56P17/2	857B JAN	5894 COMM	7025	8177
7	19EA8	56P17/3	866A	5894A	7034	8179
A	19EZ8	56TUVP	866AX	5894B/8737	7034/4X150A	8223/E288CC
5	19GQ7	56TVP	869B	5895	7034/4X150A JAN	8228
	19HV8	56UVP	869B JAN	5911	7035	8233/E55L
	19JN8/19CL8A	57AVP	869BL	5913	7035/4X150D	8233 JAN
	19KF6	58AVP	872A	5920/E90CC	7035/4X150D JAN	8254/EC1000
	19KG8	58CG	872AX	5923A	7062	8255/E88C
	19MR9	58CV	880	5924B	7090	8268
	19T8	58DVP	892	5924A	7092	8269
	20AQ3/LY88	58UVP	892R	6007	7093	8270
T	20EZ7	60AVP	912NB3	6008	7119/E182CC	8278/EL503
	21GY5	60FX5	912NB4	6075A	7136	8298A/6146B
9	21HB5A	75C1	967	6076A	7189	8300
A	21JS6A	75NB3	1164	6076/QY5-300A	7189A	8321/4CX350A
	21JV6	76NB6	1561	6077	7189MP	8322/4CX350F
	21JZ6	78L	1805	6078	7203	8322 JAN
	21KA6	79L	1838	6079	7203/4CX250B JAN	8348
GT	21LU8	80	1849	6083	7204	8408

(continued)

IPEREX ELECTRONIC CORPORATION
A NORTH AMERICAN PHILIPS COMPANY
ksville, Long Island, New York 11802

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

Amperex Industrial, Communication and Receiving Tubes....

TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE	TUBE TYPE
8416	55032 thru 55092	DF22	EBF32	EY82	SD647	XP1210
8425A/6AU6A	55309	DF96	EBF80	EY86	SD648	XQ1020
8426A/12AU6	55310	DF97	EBF83	EY87	TBH6/14/8591	XQ1020A
8436/EC158	55335/DX184	DCG4/1000G	EBL1	EZ2	TBH7/8000/8592	XQ1020A
8438A	55340	DCG5/5000EG	EBL21	EZ40	TBH7/9000/8593	XQ1020B
8453/Z550M	55875	DG7-32	EC50	EZ41	TBL2/400/8119	XQ1020G
8457	55875B	DH3-91	EC55/5861	FG17/5557	TBL2/500/8120	XQ1020L
8458	55875G	DK21	EC91	FG95	TY4-400C	XQ1020R
8463	55875L	DK40	EC92	FG105/AX105	U30	XQ1021
8482	55875R	DK92	EC157/8108	GZ32	UABC80	XQ1023L
8505A	55876	DK96	EC158/8436	GZ33	UAF42	XQ1023R
8509	56001	DL41	EC1000/8254	HCH81	UB41	XQ1024
8552	56021	DLL21	EC8010	HF200	UBC41	XQ1025L
8556	AB2	DM70/1M3	ECC33	HF300	UBC81	XQ1025R
8560A	ABC1	DM71/1N3	ECC34	HL94	UBF80	YD1202
8577	AF3	DX206	ECC35	JP9-2.5B	UBF89	YD1240
8579	AF7	DX247	ECC40	JP9-2.5D	UBL21	YD1342/C168
8580	AGR9950	DX249/YJ1170	ECC84	JP9-7B	UC92	YJ1010/7 8
8591/TBH6/14	AGR9951	DX260	ECC88/6DJ8	JP9-7D	UCC85	YJ1020
8592/TBH7/8000	AK2	DX267	ECC2000	JP9-15	UCH4	YJ1110
8593/TBH7/9000	AL4	DX276	ECF1	JPT9-01	UCH21	YJ1120
8594	AT1113/01	DX278	ECF82	K81A	UCH41	YJ1160
8595	AT1132/01	DX285/YJ1180	ECH3	KS7-85	UCH42	YJ1162
8603	AX50	DX287	ECH4	KS7-85A	UCH81	YJ1191
8608	AX105/FG105	DX345	ECH21	KS9-20D	UCL11	YK1000
8621/4CX250FG	AX126B	DY87/1S2A	ECH35	KS9-40D	UCL83	YK1001
8621 JAN	AX260	E1T/6370	ECH42	LB6-40	UF41	YK1002
8624	AX9900	E10-12GH	ECL80	M17-140W	UF42	YK1003
8637	AX9901	E55L/8233	ECL83	M17-141W	UF80	YK1010/C151
8639	AX9902	E80CC/6085	EEP1	OA2	UF85	YK1090
8639 JAN	AX9903	E80CF/7643	EF6(N)	OB2	UF86	YK1091
8643	AX9907	E80F/6084	EF9	OE3	UF89	Z70
8647	AX9907R	E80L/6227	EF22	OGE	UL41	Z70U/771
8654	AX9908	E80T/6218	EF37A	ORP30	UM4	Z70W/770
8660/4CX1500B	AX9909	E81CC/6201	EF39	ORP50	UM80	Z71U/771
8666	AX9910	E81L/6686	EF40	ORP60	UY1(N)	Z300T
8667	AX9911	E82CC/6189	EF41	ORP61	UY11	Z303C
8668	AX9912	E83CC/6681	EF42	ORP62	UY41	Z502S
8669A	AZ1	E83F/6689	EF43	ORP63	UY42	Z504S
8670A	AZ4	E84L/7320	EF50	OZ168/YD1342	UY82	Z505S
8679	AZ11	E86C	EF55	PABC80	UY85	Z550M/84
8680	AZ12	E88C/8255	EF83	PCC84	UY89	Z803U/67
8683	AZ31	E88CC/6922	EF85	PCC88	XL7900	Z805U/77
8731	AZ41	E88CC/6922 JAN	EF91	PCC189	XP1000	Z900T/582
8732	C3JA/5684	E90CC/5920	EF92	PCL85	XP1001	ZB3200
8733	C3M	E90F/7693	EF97	PCL86	XP1002	ZC1050
8734	C6JA	E91AA/5726/6AL5W	EF98	PE05/25	XP1003	ZC1060
8735	C8	E91H/6687	EFF51	PE06/40E	XP1004	ZM1000
8736	CCTV101	E91N/5727	EFP60	PE06/40N	XP1005	ZM1001
8737/5894B	CCTV111	E92CC	EK2	PE06/40P	XP1010	ZM1020
8744	CF3	E95F/5654/6AK5W	EL2	PF86	XP1011	ZM1021
8752	CF50	E99F/7694	EL3(N)	PL36	XP1015	ZM1022
8753	CK1	E130L/7534	EL11	PL81	XP1016	ZM1023
8801	CL4	E180CC/7062	EL12	PL82	XP1021	ZM1024
8802	CY2	E108F/6688	EL33	PL83	XP1023	ZM1025
8812	D3A/7721	E182CC/7119	EL36	PL150	XP1030	ZM1030
8813	D7-11GH	E182F/5847	EL37	PL6574	XP1031	ZM1031
8814	D7-190GH	E186F/7737	EL37MP	PL6755	XP1032	ZM1032
8867	D10-11GH	E188CC	EL38	PY80	XP1040	ZM1033
13201AE	D10-12GH	E280F/7722	EL41	PY81	XP1110	ZZ1000/82
18042	D10-160GH	E288CC/8223	EL42	PY82	XP1111	
18045	D10-170GH	EA52/6923	EL50	PY88	XP1113	
18503	D13-24GH	EA53	EL51	QY5/3000A	XP1114	
18504	D13-26GH	EA76	EL60	RPY13	XP1115A, B, C	
18505	D13-27GH	EAA91	EL81	RPY17	XP1116	
18506	D13-450GH	EABC80	EL83	RPY18	XP1117	
18509	D13-480GH	EAF42	EL85	RPY19	XP1118	
18515	D13-500GH	EB34	EL91	RPY20	XP1120	
18526	D14-120GH	EB41	EL360	RPY27	XP1121	
18529	DAF40	EB91	EL821	RPY41	XP1122	
18536	DAF41	EBC3	EL822	SD513	XP1123	
18545	DAF96	EBC33	EM4	SD560	XP1130	
18546	DC70/6375	EBC41	EQ80	SD612	XP1131	
18550	DC90	EBC81	EY51	SD613	XP1143	
18552	DF21	EBF2	EY80	SD646	XP1180	

AMPEREX ELECTRONIC CORPORATION
A NORTH AMERICAN PHILIPS COMPANY
Hicksville, Long Island, New York 11802

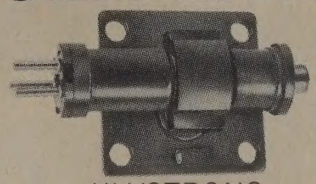
Amperex

TOMORROW'S THINKING IN TODAY'S PRODUCTS

CEI has it.

RF TRANSISTORS

CEI has it.



KLYSTRONS

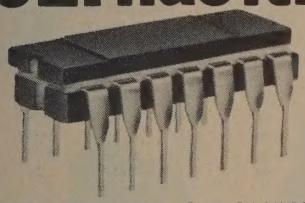
CEI has it.

RECEIVING TUBES

CEI has it.

GUNN DIODES

CEI has it.

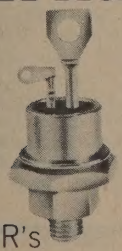


INTEGRATED CIRCUITS

CEI has it.

HYDROGEN THYRATRONS

CEI has it.



SCR's

CEI has it.

MAGNETRONS

SEMICONDUCTORS, LTD. • CEI SEMICONDUCTORS • ENGLISH ELECTRIC VALVE CO., LTD. • CEI TUBES

CALVERT PRODUCTS: KLYSTRONS, MAGNETRONS, GAS FLASH TUBES, THYRATRONS, SEMICONDUCTORS, RF TRANSISTORS, GUNN DIODES, SCR'S

CALVERT
ELECTRONICS INTERNATIONAL, INC.
220 E. 23rd St., New York, N. Y. 10010
Western Regional Div.: 871 E. Hamilton Ave., Campbell, Calif. 95008

CUSTOM ENGINEERED

High Quality Tubes

• *Ceramic Thyratrons*

- High Vacuum Rectifiers — Clipper Diodes
- High Vacuum Amplifiers
- Gas & Mercury Vapor Thyratrons
- Gas & Mercury Vapor Rectifiers
- Hydrogen Thyratrons

HIGH VACUUM RECTIFIERS—CLIPPER DIODES

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	MAX. ANODE RATINGS PEAK INV. K-VOLTS	PEAK AMPS	AVE. AMPS	MAX. OVERALL HEIGHT	MAX. DIAM.
3B24WB-A	5.0	3.0	20	.30	.060	3½	1½
	2.5			.15	.030		
3B29W	2.5	5.0	16	.25	.065	5⅜	1⅜
4B31	5.0	5.0	16	10	.150	7.0	2⅜
250R	5.0	10.0	60	1.0	.250	10¼	3
371-B	5.0	10.3	25	1.5	.300	8¾	2 17/32
576-A	5.0	14.0	25	2.5	.500	7¾	2 17/32
577	5.0	10.3	25	1.5	.300	7½	2 1/16
577W	5.0	10.3	25	1.5	.300	7½	2 1/16
578	5.0	6.0	40	.75	.100	6½	2 1/16
705WA	5.0	5.0	30	.40	.100	5 1/16	2 5/16
719A*	7.0	7.0	25	10	.150	5⅞	2¼
836	2.5	5.0	5	1.0	.250	6 9/16	2 7/16
8020	5.0	6.0	40	.60	.100	8.0	2 17/32
8020W	5.0	6.0	40	.60	.100	8.0	2 17/32

* RECOMMENDED FOR CLIPPER SERVICE ONLY.

HIGH VACUUM AMPLIFIERS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	MAX. PLATE RATINGS C.C.S. CLASS C VOLTS	INPUT WATTS	DISSIPATION WATTS	AMP FACTOR	MAX. OPERATING FREQ. (MC)	MAX. OVERALL HEIGHT
3C24	6.3	3.0	2000	100	25	21	100	4⅜
100TH	5.0	6.3	3000	600	100	37	40	7¼
572-B	6.3	4.0	2000	300	75	170	30	6 9/16
250TH	5.0	10.5	4000	800	250	36	40	10⅛
250TL	5.0	10.5	4000	800	250	14	40	10⅛
809	6.3	4.0	1500	100	30	50	40	6 9/16
811A	6.3	4.0	1500	260	65	160	60	6 9/16
811AW	6.3	4.0	1500	260	65	160	60	6 9/16
812	6.3	4.0	1500	260	65	29	60	6 9/16
812AW	6.3	4.0	1500	260	65	29	60	6 9/16
812HD	6.3	4.0	2000	300	75	30	60	6 9/16
826	7.5	4.0	1250	175	75	31	250	3 11/16
E.E. 300	11.0	4.0	3000	800	200	23	30	10¼

GAS & MERCURY VAPOR THYRATRONS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	TYPE FILL	MAX. ANODE RATINGS PEAK INV. VOLTS	PEAK AMPS	AVE. AMPS	TUBE DROP	MAX. OVERALL HEIGHT
3C23*	2.5	7.0	GAS & HG	1250	6.0	1.5	12	6⅝
FG-17	2.5	5.0	HG	5000	2.0	0.5	12	6⅝
393-A*	2.5	7.0	GAS & HG	1250	6.0	1.5	15	6⅝
323-B*	2.5	7.0	GAS & HG	1250	6.0	1.5	15	6⅝
394-A	2.5	4.0	GAS & HG	1250	2.5	0.64	15	5¾
873*	5.0	7.0	HG	10,000	5.0	1.25	15	8¾
7410	5.0	7.0	GAS	1700	6.0	1.5	15	6⅝

GAS & MERCURY VAPOR RECTIFIERS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	TYPE FILL	MAX. ANODE RATINGS PEAK INV. VOLTS	PEAK AMPS	AVE. AMPS	TUBE DROP	MAX. OVERALL HEIGHT
3B28	2.5	5.0	GAS	10 KV	1.0	0.25	10	6 5/32
4B32	5.0	7.0	GAS	10 KV	5.0	1.25	15	8¾
816	2.5	2.0	HG	7.5 KV	0.5	0.125	15	4 11/16
866A	2.5	5.0	HG	10 KV	1.0	0.25	10	6¾
872A	5.0	7.0	HG	10 KV	5.0	1.25	15	8½
8008	5.0	7.0	HG	10 KV	5.0	1.25	15	8¾
8008XE	5.0	7.0	GAS	10 KV	5.0	1.25	15	8¾

HYDROGEN THYRATRONS

E.E. TYPE NUMBER	HEATER* AMPS	MAX. RATINGS P.O. M.W.	Pb ×10⁶	epy KV	Ebb KV DC (MIN)	ib Aa	Ib Adc	MAX. OVERALL LENGTH
3C45	2.5	0.52	0.3	3.0	.80	35	.045	5 13/16
3C45W	2.7	0.52	0.3	3.0	.80	35	.045	3⅞
4C35A	6.7	.350	2.0	8.0	1.5	90	.100	6⅞
5C22	11.6	2.00	3.2	16.0	4.5	325	.200	8¾
KU-17	6.7	.330	2.5	8.0	1.5	83	.100	4⅞
KU-25	11.6	1.5	3.8	12.0	3.5	300	.200	8¾
5956	6.7	.330	2.5	8.0	1.5	83	.100	4¾
5957	6.7	.330	2.5	8.0	1.5	83	.100	4⅞
6130	2.5	0.52	0.3	3.0	.80	35	.045	5 3/16
8370	6.7	.330	2.5	5.0	.30	83	.100	4⅞

* ALL EEI THYRATRONS HAVE 6.3 VOLT HEATERS.

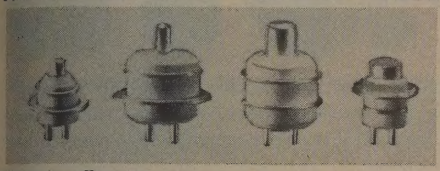
1970 CATALOG

ELECTRONIC ENTERPRISES INC.

ELECTRONIC ENTERPRISES INC.
65 SEVENTH AVENUE, NEWARK, N.J. 07104 / (201) 485-8500
ORIGINAL TUBE MANUFACTURER

ELECTRON TUBES AND DEVICES

METAL-CERAMIC PLANAR TUBES

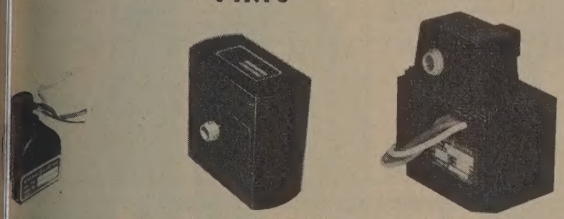


l Electric offers an extensive line of planar tubes in diode ode designs for oscillators, amplifiers, mixers, detectors, ny other high-reliability applications from d-c to 10 gc. assed tolerance to environment as adverse as 3000 G's at 3-5 ms, 30,000 G's centrifuge, up to 48 G's RMS n (100-2000 cps, 3 min each plane) and −55 C to C temperature. Have also withstood 10^{18} NVT and 10^{7} nuclear radiation. Minimum noise, in fractions of a db. outputs from low mw to 8kw peak. Tailored for CW, alsed, and grid-pulsed applications. Highest available f power, efficiency, and gain-bandwidth to size and

METAL-CERAMIC COAXIAL TUBES

GE has the exact coaxial triodes and tetrodes for advanced VHF-UHF, RF power amplifiers, oscillators, or broad varieties of transmitter equipments to meet your most demanding application requirements. Advantages: high power gain, efficiency, voltage hold-off, duty factor; broad electronic bandwidth; long pulse-width life; reliable grid-pulsed amplifier or oscillator service.

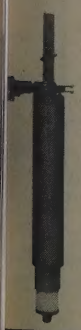
VTM's



niaturized hielded — Magnetic and RFI shielded — Magnetic shielding and integral isolator

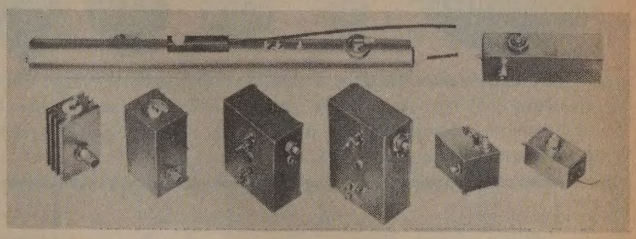
e Tunable Magnetrons (VTM's) are high frequency, ous wave oscillators operating in the microwave re- GE VTM's cover a wide range of frequencies — from over 5600 megacycles, with feasibility existing in X- nd down to 100 mc. Low power (up to 1 watt) for low- ocal oscillators, signal generators. Medium power (1-10 for altimetry, telemetry. High power (over 10 watts up 's of watts) for broadband transmitters, barrage jamming, ne applications. Also magnetically shielded VTM's at 000 mc and 2000 to 4000 mc (1 watt) for driver ap- ons.

KLYSTRONS



GE has over 10 years experience in custom design, manufacture and repair of high-power, multiple resonator, amplifier klystrons and capability to produce klystrons for **specific** applications. The units, constructed of metal and ceramic, use ion pumps to maintain excellent vacuum conditions. Tunable types are designed so each cavity tunes at the same rate for perfect gang-tune tracking across frequency band. Broadband types are tunerless; flat freqency responses are rigidly, permanently determined during manufacture. Tunable and broadband pulsed ampilfier klystrons available in L, S bands.

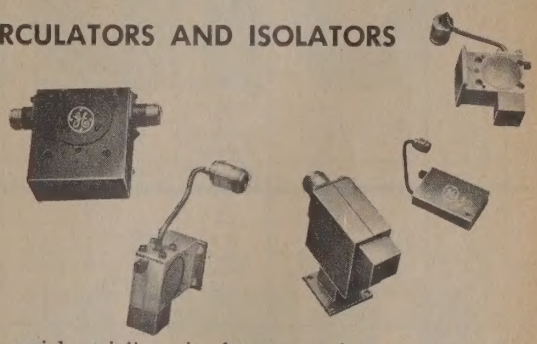
MCM's*



***Microwave Circuit Modules for use as: Oscillators, Amplifiers, Multipliers, Detectors, Mixers, Integrated Isolators and Circulators.**

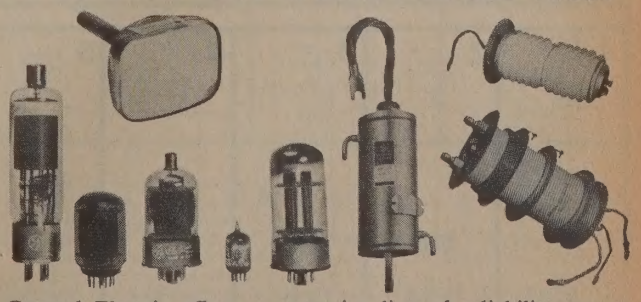
General Electric puts nearly 3 decades of commercial and military microwave component experience into the MCM. Designers can benefit from an unequalled output of highest performance active components including coaxial and planar gridded tubes. One source provides "in-house" ferrite know-how, critical testing experience and facilities, and full R&D back-up. Now, optimum integration of active devices in packaged circuits can help reduce design cycles, provide retrofit capabilities and lead to improved system performance with lower over-all cost.

CIRCULATORS AND ISOLATORS



GE coaxial, stripline circulators and isolators offer the systems manufacturer maximum design flexibility and assurance of systems-component compatibility and performance . . . in radar, electronic countermeasures, communications, aircraft control, fusing systems, signal generators, test equipment, and many other modern microwave systems. These small size units can typically handle 100 to 500 watts CW and more, and are capable of operating under severe environmental conditions. And continuing developments have produced units that will operate at peak powers of 5 kw in L and S Band. All frequencies from 0.3 to 5.5 GHz are covered, and typical bandwidth in these frequency ranges is approximately 20 percent with greater bandwidth available. Magnetically shielded and miniaturized units are available, with unique terminations and connections a specialty.

INDUSTRIAL AND SPECIAL-PURPOSE TUBES

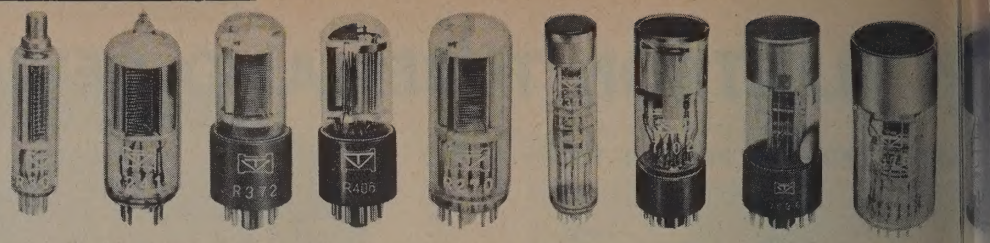


General Electric offers an extensive line of reliability-proven industrial and special-purpose tubes including the following popular types: camera, ceramic, industrial and military cathode ray, communication, Five-Star, glow tubes, ignitrons, industrial receiving, rectifier, thyratrons, transmitting tubes and triggered vacuum gaps.

omplete information contact nearest GE Sales Office listed on inside front cover, te to General Electric Co., Section 998-88, 316 E. 9th St., Owensboro, Ky. 42301.

GENERAL ELECTRIC

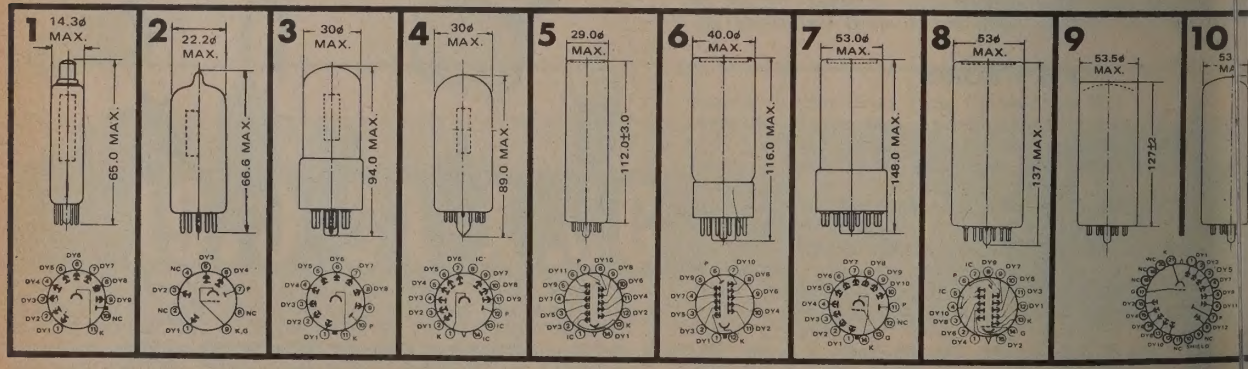
HTV PHOTOMULTIPLIER TUBE



HTV Photomultiplier tubes are designed expressly for high current amplification of extra low levels of radiation in spectru ran from ultraviolet to near infrared regions. HTV Photomultiplier tubes feature the high sensitive measurement of low dark cu ent rapid response to pulsed light where high instrumentation performance is required. HTV provides incomparable wide-choice spe response, tube type, tube size and tube construction.

Type	Nominal Diameter	Dimension and Basing Diagram	Number of Stage	Spectral Response	Wavelength of Maximum Response (angstroms)	Window Material	Photo-Cathode Material	Maximum Ratings (Absolute Values): Anode to Cathode Voltage (dc only)	Average Anode Current (mA)	Anode to Last Dynode Voltage (dc volts)	Characteristics at 25°C and Specified Volta: Anode to Cathode Voltage (dc volts)	Cathode Sensitivity: Cathode Luminous (μA/lumen) Median	Anode Sensitivity: Anode Luminous at 0 cps (A/lumen) Median	Anode Sensitivity: Anode Radiant (A/W)	Maxim Anode Curre (μA)
R300	1/2	1	9	S–5	3400	U.V.glass	Sb-Cs	1000	0.01	150	1000	30	30	3.4×10^4	0.001
R303			"	1850–8000	4300	"	Ag-Bi-o-Cs	"	"	"	"	"	"	1.6×10^4	0.2
R306			"	S–19	3300	Quartz	Sb-Cs	"	"	"	"	"	"	3.7×10^4	0.001
R427			"	1600–3200	2200	"	Cs-Te	"	"	"	"	—	4000 (μA/μW)	5.6×10	0.000
R241	7/8	2	4	"	"	"	"	500	"	"	400	40	0.01	9.8	0.001
R252			"	S–10	4300	"	Ag-Bi-o-Cs	"	"	"	"	"	"	5.2	
931A	1 1/8	3	9	S–4	4000	Lime soda	Sb-Cs	1250	0.1	250	1000	30	100	9.8×10^4	0.5
1P21			"	"	"	"	"	"	"	"	"	40	150	1.6×10^5	0.01
1P28			"	S–5	3400	U.V.glass	"	"	"	"	"	"	100	1.1×10^5	0.1
R212			"	"	"	"	"	"	"	"	"	"	120	1.4×10^5	0.01
R372			"	1850–7300	"	"	Bialkali	"	"	"	"	"	"	"	0.05
R106			"	S–19	3300	Quartz	Sb-Cs	"	"	"	"	"	"	1.5×10^5	0.01
R132			"	S–10	4300	Lime soda	Ag-Bi-o-Cs	"	"	"	"	"	80	4.2×10^4	0.2
R213			"	1850–8000	"	U.V.glass	"	"	"	"	"	"	"	"	"
R136			"	1600–8000	"	Quartz	"	"	"	"	"	"	"	"	"
R197			"	—	—	(Quartz)	Au, Cu Be	2500	0.05	"	2300	—	—	—	0.01
R166			"	1600–3200	2200	Quartz	Cs-Te	1250	0.01	"	1000	—	4000 (μA/μW)	5.6×10^3	0.000
R406			"	Similar to S–1	7300	Lime soda	Ag-o-Cs	1500	"	"	1250	20	4	3.8×10^3	0.1
R446			"	1850–8200	3500	U.V.glass	Multi Alkali	1250	0.1	"	1000	30	80	—	0.05
R456			"	1600-8200		Quartz	"	"	"	"	"	"	"	—	"
R270			4	"	1850–8000	4300	U.V.glass	Ag-Bi-o-Cs	"	"	"	40	"	4.2×10^4	0.2

Type	Nominal Diameter	Dimension and Basing Diagram	Number of Stage	Spectral Response	Wavelength of Maximum Response (angstroms)	Window Material	Photo-Cathode Material	Maximum Ratings (Absolute Values): Anode to Cathode Voltage (dc only)	Average Anode Current (mA)	Anode to Last Dynode Voltage (dc volts)	Characteristics at 25°C and Specified Voltage: Anode to Cathode Voltage (dc volts)	Cathode Sensitivity: Cathode Luminous (μA/lumen) Median	Anode Sensitivity: Anode Luminous at 0 cps (A/lumen) Median	Anode Sensitivity: Anode Radiant (A/W)	Maxim Anode Curre (μA)
R268	1 1/8	5	11	S–11	4400	Lime soda	Sb-Cs	1500	0.01	250	1000	60	150	1.2×10^5	0.03
R269			"	S–21	"	U.V.glass	"	"	"	"	"	"	"	"	"
R292			"	S–13	"	Quartz	"	"	"	"	"	"	"	"	"
R396			"	1850–7300	4700	U.V.glass	Bialkali	"	"	"	"	50	100	—	0.5
R430			"	1850–6500	4500	"	"	"	"	"	"	70	"	1×10^5	0.02
R374			"	1850–8500	4200	"	Multialkali	"	"	"	"	120	50	2×10^4	0.05
R453			"	"	"	"	"	"	"	"	"	"	"	"	"
R376			"	1600–8500	"	Quartz	"	"	"	"	"	120	50	2×10^4	0.05
R457			"	"	"	"	"	"	"	"	"	"	"	"	"
R316			"	S–1	8000	Lime soda	Ag-o-Cs	"	"	"	"	20	5	4.7×10^3	
R431			"	1600–3200	2200	Quartz	Cs-Te	"	"	"	"	—	"	"	
6199	1 1/2	6	10	S–11	4400	Lime soda	Sb-Cs	1250	0.1	"	"	40	30	2.4×10^4	0.5
R189			"	S–13	"	Quartz	"	"	"	"	"	"	"	"	"
R192			"	S–10	4500	Lime soda	Ag-Bi-o-Cs	"	"	"	"	"	40	2×10^4	
R207			"	1600–8000	"	Quartz	"	"	"	"	"	"	"	"	
7102			"	S–1	8000	Lime soda	Ag-o-Cs	1500	0.01	"	1250	30	4.5	4.2×10^3	
R190			"	1600–3200	2200	Quartz	Cs-Te	1250	"	"	1000	—	400 (μA/μW)	5.6×10^4	0.1
7696	2	7	"	S–11	4400	Lime soda	Sb-Cs	1500	0.1	"	1250	60	50	2×10^4	
R236		8	"	1600–8000	4500	Quartz	Ag-Bi-o-Cs	1250	0.01	"	1000	40	40	"	
R375			"	1600–8500	4200	"	Multialkali	1500	"	"	"	120	50	"	0.2
R329		9	12	2800–6500	4500	Special	Bialkali	2700	0.02	500	1500	90	160	1.6×10^5	0.02
R464		10	"	3000–6500	"	Lime-soda	"	2250	"	250	"	50	50	4.7×10^4	0.005



A detailed technical bulletin on each photomultiplier tube and complete descriptive brochure of HTV product line are availa

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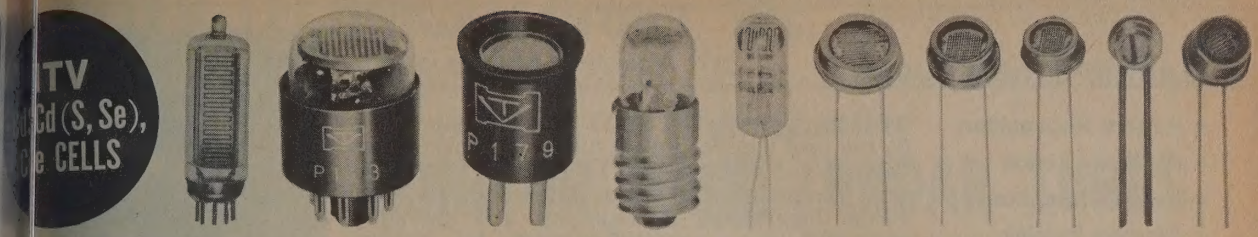
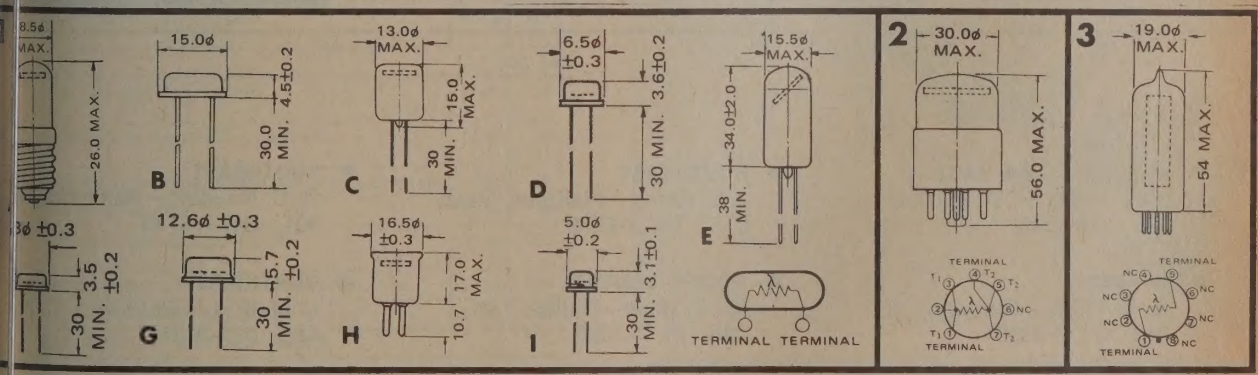


Dimension and Basing Diagram	Envelope	Wavelength of Maximum Response (angstroms)	Maximum Ratings Absolute Values ⑥		Characteristics at 25°C ②					γ (1 to 100 Lux) ⑤
			Voltage between Terminals (dc volts)	Power Dissipation at 25°C (Watt) ①	Cell Resistance			Time Response at 10 Lux ④		
					O Lux (MΩ) ③	10 Lux (KΩ)	100 Lux (KΩ)	Rise (m sec)	Decay (m sec)	
1 – F	Glass Metal	5500±200	100	0.1	1	2.6 ~ 7.8	0.5 ~ 1.5	170	130	0.6 ~ 0.75
1 – G			100	0.2	0.5	0.9 0.7	0.2 0.7	170	130	0.6 0.75
1 – D			100	0.05	1	4.2 ~ 12.8	0.7 ~ 2.3	170	130	0.6 ~ 0.75
1 – F			200	0.1	10	22.5 ~ 67.5	2.9 ~ 8.7	25	20	0.9 ~ 1
1 – G			200	0.1	5	17.5 ~ 52.5	2.2 ~ 6.8	25	20	0.9 ~ 1
1 – D			200	0.05	10	50 ~ 150	7 ~ 21	25	20	0.9 ~ 1
1 – F		6000±300	100	0.1	1	1.5 ~ 4.5	0.25 ~ 0.75	35	20	0.75 ~ 0.9
1 – G			100	0.2	1	2.5 ~ 7.5	0.35 ~ 1.05	35	20	0.75 ~ 0.9
1 – D			100	0.01	1	3.5 ~ 10.5	0.5 ~ 1.5	35	20	0.75 ~ 0.9
1 – F			300	0.05	300	250 ~ 1000	40 ~ 120	15	10	0.8 ~ 0.95
			200	0.05	200	10 ~ 30	1.2 ~ 3.8	15	10	0.8 ~ 0.95
			300	0.05	200	27.5 ~ 82.5	3.9 ~ 11.7	20	10	0.8 ~ 0.95
			300	0.05	200	14.1 ~ 42.4	2.2 ~ 6.8	35	20	0.75 ~ 0.9
			200	0.05	200	4.4 ~ 13.2	0.7 ~ 2.1	35	20	0.75 ~ 0.9
1 – D			100	0.1	10	2.5 ~ 7.5	0.3 ~ 1	35	20	0.75 ~ 0.9
1 – I			100	0.05	10	40 ~ 120	5 ~ 15	35	20	0.8 ~ 0.95
			100	0.03	300	200 ~ 600	25 ~ 75	15	10	0.8 ~ 0.95
			100	0.03	10	9 ~ 50	1 ~ 6	35	20	0.8 ~ 0.95
1 – F		5500±200	200	0.1	10	25 ~ 75	2 ~ 6	30	15	0.85 ~ 0.95
1 – D			200	0.05	10	75 ~ 225	6 ~ 18	30	15	0.85 ~ 0.95
			200	0.1	10	2.5 ~ 7.5	1 ~ 3	150	120	0.6 ~ 0.7
			200	0.05	10	35 ~ 105	5 ~ 15	15	10	0.8 ~ 0.9
1 – B			200	0.3	10	2.2 ~ 6.6	0.35 ~ 1.05	60	40	0.7 ~ 0.8
1 – D		7200±400	200	0.05	500	1000 ~ 10000	50 ~ 500	5	5	1.3
1 – F			200	0.05	500	100 ~ 1000	5 ~ 50	5	5	1.3
1 – C	All Glass	5600±600	150	0.3	5	0.7 ~ 8	0.17 ~ 1.5	80	40	0.7 ~ 0.85
1 – A	Grass with Screw Base		200	0.1	300	300 ~ 10000	70 ~ 2000	80	40	0.7 ~ 0.85
			200	0.1	100	45 ~ 350	10 ~ 75	80	40	0.7 ~ 0.85
1 – E	All Glass		300	0.4	10	6 ~ 50	1 ~ 8	80	40	0.7 ~ 0.85
1 – H	Glass with 2 Pin Base		150	0.3	5	0.6 ~ 8	0.17 ~ 1.5	80	40	0.7 ~ 0.85
1 – G	Glass Metal		150	0.3	5	0.6 ~ 8	0.17 ~ 1.5	80	40	0.7 ~ 0.85
2	Glass with Octal Base		300	0.6	10	5 ~ 30	0.9 ~ 5	80	40	0.7 ~ 0.85
3	All Glass		300	0.6	10	3.3 ~ 33	0.6 ~ 6	80	40	0.7 ~ 0.85



In continuous service with sensitive surface of cell fully illuminated. The dissipation allowed for cell is decreased with elevated ambient temperature, therefore, must not exceed one-fourth of its value of maximum rating at 60°C.

② At 25°C and specified voltage for each type. For continuous where the light source is a tungsten filament lamp operated at a color temperature of 2854°K. This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to about 500 lux illumination (white fluorescent light).

③..... Minimum values. Measured 60 seconds after removal of incident illumination level.

④..... The time required for the conductance to rise to 63.2 per cent of the maximum value or to fall from the peak to 36.8 per cent of the maximum value.

⑤..... γ is the slope of conductance as a function of illumination.

⑥..... Ambient temperature of all the types is ranged from -30°C to 60°C.

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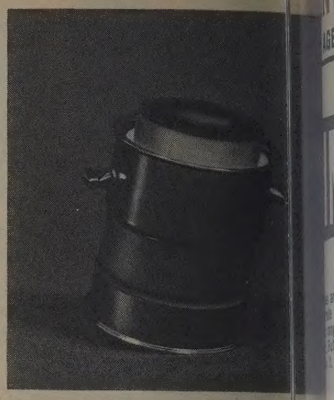

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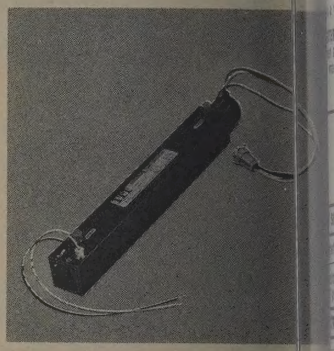
- **Navigation**
- **Broadcast**
- **Radar**

ITT Electron Tube Division is a foremost designer and manufacturer of broadcast and communications power tubes, and the world's largest supplier of hydrogen thyratrons. We invite you to follow the lead of the most demanding buyers of super-power triodes and tetrodes (to 40 megawatts peak), hydrogen thyratrons (to 125 megawatts peak), microwave TWT's (all power ranges plus a 2-second warmup cathode), and many more.



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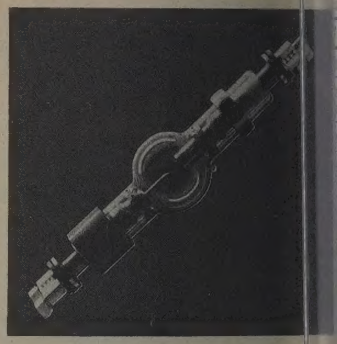
- **Military Searchlights**
- **Theatre Projection**
- **Stadium Lighting**
- **Solar Simulation**

ITT Electron Tube Division boasts of the finest facility in the U.S. for the design, production and testing of xenon lamps. These short-arc lamps, in power ranges of 1, 2.2, 20 and 30 KW, are now replacing the carbon-arc for many applications including theatre film projection and night-time illumination of large sports arenas. Close to daylight in color temperature, these extremely long-lived xenon lamps exhibit no shift in spectral or luminous output with aging.



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CAPABILITIES

S — Fifteen different phosphors, from a very short persistence blue 2μs) to a very long persistence orange (25s).

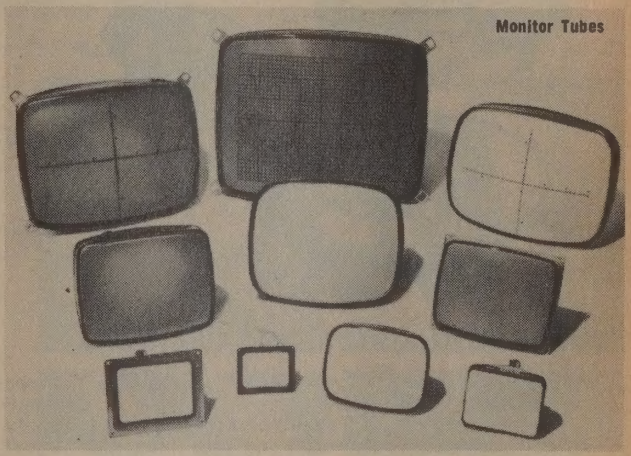
AND EXTERNAL GRATICULES — Graticules applied to the inside surface ss screen are standard on all compass tubes. They can be supplied to ler on most other tubes. Advantages are the complete elimination of parallax error and protection from abrasive damage to the graticule. A less costly alternative, often used on large screen demonstration tubes, is the external graticule baked on the outside of the screen glass.

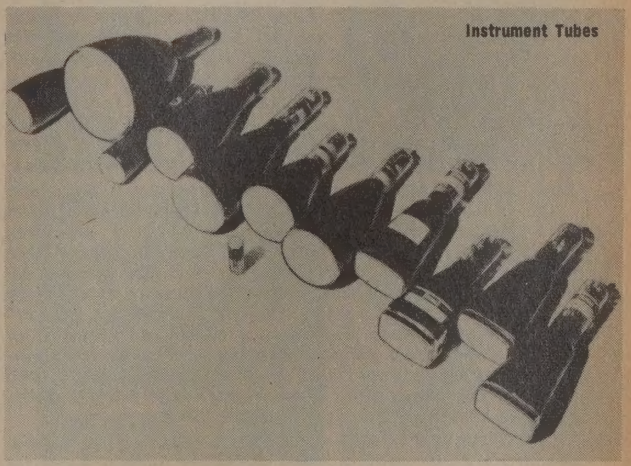
FLASHOVER PROTECTION — All tubes using a B8H base are fitted with the BRIMAR Sparkguard 'S' base which offers inexpensive circuit protection against flashover.

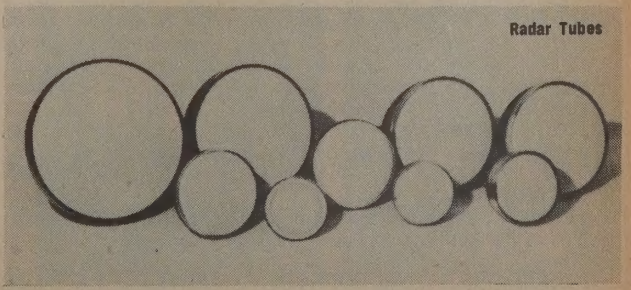
IMPLOSION PROTECTION — BRIMAR are Britain's leaders in CRT protection. Five different constructions are used on Industrial Cathode Ray Tubes.

Accessories offered for Brimar cathode ray tubes include sockets, connectors, yokes, focusing coils and twist coils. Substantial savings can be offered when Magnetic Shields and Tubes are purchased as assemblies. Also see EEM page 2600.

Application and Description	Face Shape & Dia. (Min.)	Useful Min. Screen Area (inch)
SPOT SCANNER TUBES		
Magnetic focus. Educational EVR video reproducers	3 ●	2.1x1.5
Electrostatic focus. Document readers or telecine. EHT connection by CT8 socket	5 ●	3.5x2.7
ELECTROSTATIC DISPLAY TUBES		
General purpose indicating device	1 ●	1.1
Indicators. Oscilloscopes. CCTV. Alpha-numerical readout	3 ■	2x1.6
MENT TUBES — SINGLE GUN		
Medium bandwidth. Spiral p.d.a.	4 ●	3.1x2
Battery oscilloscopes. Heater 11V, 68mA. Mesh p.d.a. Aluminized	4 ■	2.8x2
Transistor scan circuit oscilloscopes. Spiral p.d.a.	5 ■	4x2.4
Medium bandwidth. For transistor scan circuits. Spiral p.d.a.	5 ■	4x2.4
High bandwidth. Mesh p.d.a. Transistor scan. Aluminized screen	5 ■	4x2.4
General purpose. Short length. Large screen area. Spiral p.d.a.	5 ●	4x3.1
High bandwidth. Mesh p.d.a. Very high brightness. Aluminized	5½ ■	4x3.1
General purpose. Short length.	5½ ■	4x3.1
TUBES		**Defl. Angle**
Small boat radar. American type	7 ●	50
General marine use. American equivalent	10 ●	50
Rimguard III 'push-through' protection. Private yacht radar	11 ■	90
General marine use	12 ●	40
Wider scan angle version of F31-10	12 ●	50
Rimband protected. Private yacht transportable radar	12 ■	110
Major radars for ships, port, and aircraft control	16 ●	50
LY AND PICTURE MONITOR TUBES		
Mobile or military monitors. Fully ruggedized construction. Encapsulated flexible leads to base and anode button	6 ■	70
Medical waveform display. Television camera viewfinder	7 ■	70
Implosion-protected version of M17-10 Bonded face-plate	7 ■	70
Alpha-numerical or graphical, computer read-out Bonded face-plate	12 ■	70
Television studio monitor	14 ■	70
Television studio monitor. Protected version of M36-141 Bonded face-plate	14 ■	70
Industrial monitors. Data displays. Rimguard III	15 ■	90
Alpha-numerical or graphical, computer readout	17 ■	70
Industrial monitors. Rimguard III, 72% trans	17 ■	70
Industrial monitors. Data displays. Squared up screen Rimguard III	24 ■	110


Monitor Tubes


Instrument Tubes


Radar Tubes

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KEL-F SERIES—Molded of low dielectric loss-factor Kel-F plastic—designed for use with a wide selection of high power transmitting tubes such as: 4X150A; 4X150D; 4X250B; 4CX250B; 4X250F,7034; 7035. Basic sockets are available in several designs—with or without screen grid by-pass capacitors, mounting saddles, or steatite chimney to direct air flow through tube cooling fins. Control grid contact "guide" is machined for greater alignment accuracy, and tapped for 6-32 machine screw. All contacts are low resistance silver-plated beryllium copper. Tube pin contacts are heat treated to provide positive contact pressure as well as extended life. Annealed soldering tabs may be easily bent or formed.

STEATITE WAFER TYPES—Available in 4, 5, 6, 7, and 8-pin standard socket types, as well as Super Jumbo 4-pin for tubes with E.I.A. Base Nos. A4-15, A4-16, and A4-18. Giant 5 and 7-pin models for tubes with E.I.A. Base Nos. A5-19 and A7-17. Septar Sockets for tubes such as the 7094 with E.I.A. Base No. E7-2; and VHF Septar Sockets for tubes such as 5894, 6524, 6252, with E.I.A. Base No. E7-20; and 826, 832, 4D32 and E.I.A. Base No. E7-2.

SPECIAL PURPOSE TYPES—Includes sockets for special purpose tubes such as the: 204A and 849; the 833 and 833A; 152TL; 304TL; 750TL; 1500T; 2-2000A; 5D21; 705A and others.

Note: For detailed specifications, request Socket Standardization Booklet 536 on your company letterhead.

Manufacturer of more than 5,000 items for all segments of the electronic industry, in addition to a wide line of connectors, tube sockets, and air variable capacitors, Johnson offers the hardware items described below: In addition a complete line of heavy-duty RF components is available for broadcast transmitting, RF heating, antenna phasing, and other commercial applications.

Equipment in this line includes: fixed and variable inductors; antenna phase sampling loops, isolation filter inductors; feed-thru bowl insulators; static drain chokes; RF contactors; and heavy-duty make-before-break switches. For information on the Johnson RF component line, write for Catalog 560a.

INSULATORS—Low loss, high-voltage breakdown in either steatite or porcelain. High quality with heavy nickel-plated brass hardware—suitable for exposed applications. A complete line for immediate delivery from stock includes: Thru-panel Bushings and Insulators; Antenna Strain and Feeder Types; Cone and Stand-off Insulators; Lead-in Bushings; and Feed-Thru Bowl Assemblies.

PILOT LIGHTS—Over 47 separate assemblies immediately available from parts distributors throughout the country for original equipment or in-the-field replacement. Continuous indication neon types; models for high and low voltage incandescent bulbs; standard or wide angle glass; and lucite jewels. New RIB-LOC pilot light offers convenient press mounting. Specials, including types meeting military specifications, also available in production quantities. Detailed specifications available on request.

PC SPACERS—Snap-in polyamide spacers provide rapid mounting of PC boards with choice of stand-off heights. **COAXIAL RECEPTACLES**—Convenient panel mounting. **PANEL BEARINGS**—For use on ¼" shafts and panels up to ⅜" thick. **CRYSTAL SOCKETS**—For low capacity, high voltage and high temperature operation. Glazed steatite. Grade L-423 or better. DC-200 impregnated. **RF CHOKES**—High quality construction. For 1.7 to 30 mc range and VHF.

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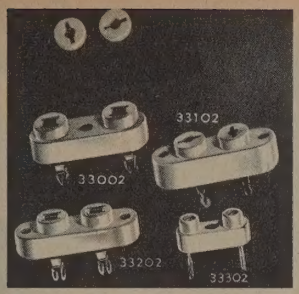
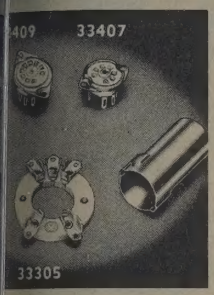
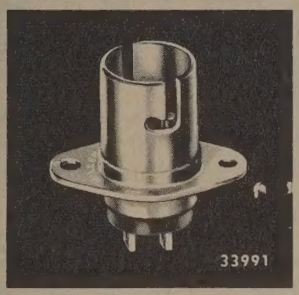






MILLEN TUBE SOCKETS DESIGNED FOR APPLICATION

Long Flashover path to chassis permits use with transmitting tubes, 866 rectifiers, etc. Long leakage path between contacts. Contacts are type proven by hundreds of millions already in government, commercial and broadcast service, to be extremely dependable. Sockets may be mounted either with or without metal flange. Mounts in standard size chassis hole. All types have barrier between contacts and chassis. All but octal and crystal sockets also have barriers between individual contacts in addition.

Voltage regulator dual contact bayonet socket, 33991 black phenolic insulation and 33992 with low loss mica filled phenolic insulation.

MILLEN TUBE SOCKETS

No.	Description	No.	Description
33002	Crystal Socket ¾" x .125"	33004	4 Pin Tube Socket
33102	Crystal Socket .487" x .095"	33005	5 Pin Tube Socket
33202	Crystal Socket ½" x .125"		
33302	Crystal Socket .487" x .050"	33008	8 Pin Tube Socket
33407	Miniature Socket only, ceramic	33991	Socket for 991
33409	Noval Socket only, ceramic	33992	Socket for 991
33307	Miniature Socket, Shield, ceramic	33207	829 Socket
33309	Noval Socket, Shield, ceramic	33305	Acorn Socket

LE COUPLINGS — The No. 39000 series of Millen "De- for Application" flexible coupling units include, in addition to ed versions of the conventional types, also such exclusive l designs as the No. 39001 insulated universal joint and the 006 "slide-action" coupling (in both steatite and bakelite on). The No. 39006 "slide-action" coupling permits longi- shaft motion, eccentric shaft motion and out-of-line opera- s well as angular drive.

. 39005 and 39005-B (high torque) are similar to the No. but are not insulated. The steatite insulated No. 39001 has ial anti-backlash pivot and socket grip feature. All of the illustrated units are for ¼" shaft and are standard produc- pe units.

. 39016 incorporates features which have long been desired exible coupling. No Backlash — High Flexibility — Higher own Voltage — Smaller Diameter — Shorter Length —

IC PLATE OR GRID CAPS — Soldering lugs and contact one- Lug ears annealed and solder dipped to facilitate "mechanical oldered" connection of cable.

001—9/16" ..... No. 36002—⅜" ..... No. 36004—¼" .....

Y TERMINAL — Combination high voltage terminal and ushing. Tapered contact pin fits firmly into conical socket pro- large area, low resistance connection. Pin is swivel mounted to prevent twisting of lead wire.

001, Black or Red ..... No. 37501, Low loss .....

ITE TERMINAL STRIPS — Terminal and lug are one piece. re turret type and are free floating so as not to strain L522 ic on wide temperature variations. Easy to mount with series nd holes. 1400 volt and 3500 volt series.

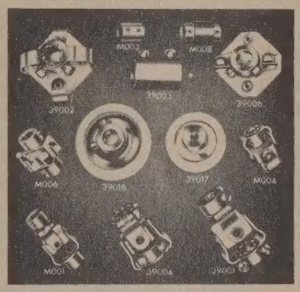
, PLATES, AND PLUGS — The No. 37200 series, including insulated and non-insulated binding posts with associated and plugs, provide various combinations to meet most ements. The posts have captive heads and keyed mounting. o. 37291 on No. 37223 are standard in black or red with colors on special order. No. 37201, No. 37202, and No. are available in black, red, or low loss. The No. 37202 is vailable in steatite.

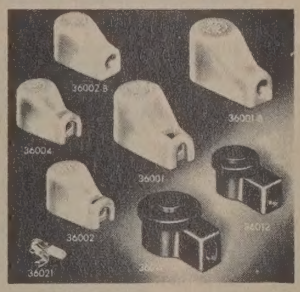
Description	No.	Description
—Single plates, pr.	37204	Double dual plates, pr.
—Single plates (tapered), pr.	37212	Dual plug
	37222	Non-insulated binding post
2—Dual plates, pr.	37223	Insulated binding post

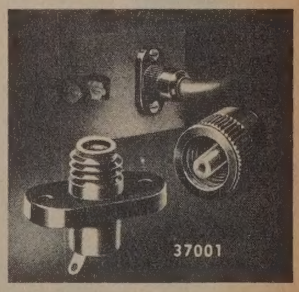
LOCK — Compact, easy to mount, positive in action, does ter dial setting in operation! Rotation of knob "A" depresses "B" and "C" without imparting any rotary motion to Dial. hole mounted.

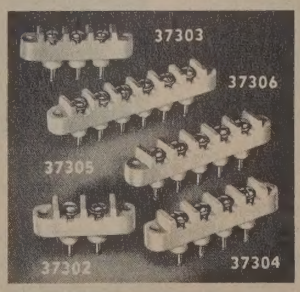
0050 .....

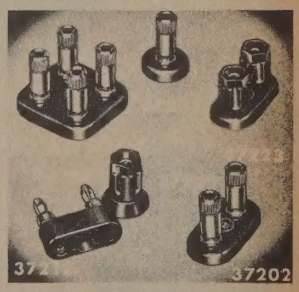
CLAMP — No. 33087 is easy to use, easy to install, effective ction. Available in special sizes for all types of tubes. Single nounting. Spring steel, cadmium plated.

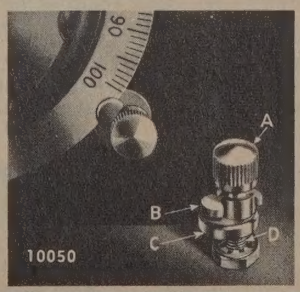


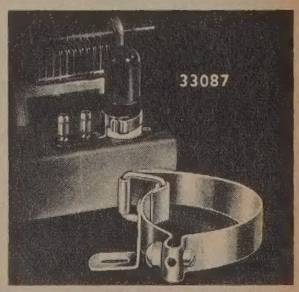












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IN OFFICE AND FACTORY 150 EXCHANGE ST., MALDEN, MASSACHUSETTS, U. S. A.

Penta LABORATORIES DIVISION OF KILOVAC

HIGH EFFICIENCY POWER TUBES

Because of their proven reliability, long life and high efficiency, Penta power tubes are specified by an ever increasing number of equipment manufacturers. More and more power tube users, too, now specify Penta tubes for replacements. Extra care in every step of production and test sures you of top performance and quality in each Penta power tube you buy.

ELECTRICAL SPECIFICATIONS

PL-5D22 (4-250A) Power Tetrode

Fil. Volts	Fil. Current Amps.	Plate Diss. Max. W.	Plate Volt. Max.	Plate Current Ma., Max.	Screen Voltage Max.	List Price
5.0	14.5	250	4,000	350	800	$ 4.50

Power tetrode, used in communications and amateur equipment. Can be used at full ratings up to 75 Mc. and with reduced ratings to 120 Mc. Unusually small amount of driving power normally required for specified value of power output. Useful as r-f power amplifier, or a-f amplifier and modulator.

PL-6775 Power Tetrode

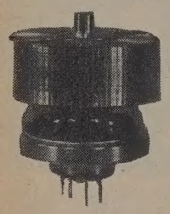
Fil. Volts	Fil. Current Amps.	Plate Diss. Max. W.	Plate Volt. Max.	Plate Current Ma., Max.	Screen Voltage Max.	List Price
5.0	14.5	400	4,000	350	800	$ 5.00

Ruggedized power tetrode, unilaterally interchangeable with 4-400A. Can be mounted in any position, will withstand high levels of shock and vibration. Design minimizes possibility of inter-electrode shorts. One-piece plate seal and cap can't loosen, fall off, or easily break. Excellent in applications where high level of reliability is required.

PL-8438/4-400A Power Tetrode

Fil. Volts	Fil. Current Amps.	Plate Diss. Max. W.	Plate Volt. Max.	Plate Current Ma., Max.	Screen Voltage Max.	List Price
5.0	14.5	400	4,000	350	800	$ 4.00

Widly used power tetrode. Excellent as r-f amplifier and a-f amplifier and modulator. Penta unique ribbed-anode construction provides large effective plate radiating area, with minimum plate, screen-grid and control-grid temperatures.

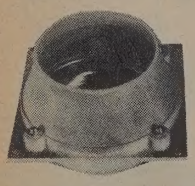


PL-8295/172 Beam Pentode

Fil. Volts	Fil. Current Amps.	Plate Diss. Max. W.	Plate Volt. Max.	Plate Current Ma., Max.	Screen Voltage Max.	List Price
6.0	8.2	1000	3,000	1000	600	$15.00

1000-watt beam pentode. Provides high power gain and good efficiency at relatively low plate voltages. Cooled by forced air. Widely used as Class-AB_1 linear amplifier, delivering over 1500 watts useful power output. Also excellent for Class-AB_2, Class-B, and Class-C service.

Accessories



Type	Description	List Price
PL-184A	Socket for PL-8295/172 and PL-8295A, including the chimney. Suppressor-grid contacts are grounded.	$49.00
PL-265A	Sockets for PL-264. Includes chimney, screen-grid by-pass capacitors. Provides for correct distribution of air for proper tube cooling at full rated plate dissipation.	$53.00

Penta Laboratories, a name well known in the electronics industry for over 17 years, is now a division of KILOVAC, leading manufacturer of high voltage vacuum relays and capacitors.

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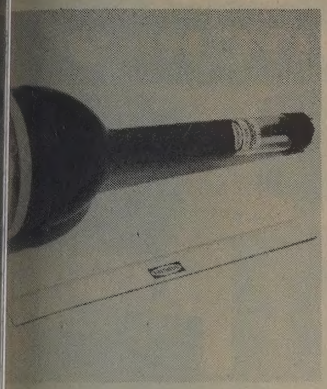
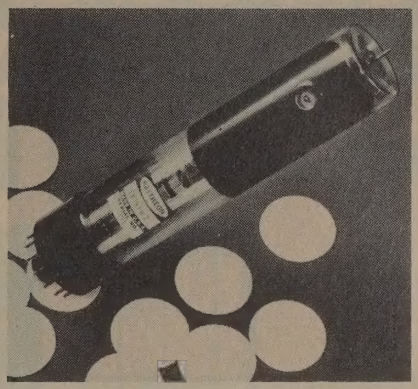
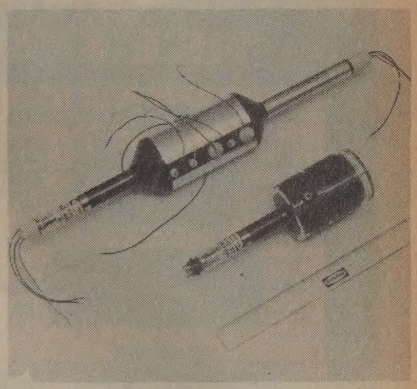
Data Display Devices from Raytheon



ojectoray* CRT brings large-size s with up to 1,000 line resolu- hether they're systems with TV mats or any type of CRT display dar to oscilloscope to alphanu- Projectoray offers high bright- ng life — lasting hundreds of – at 15 foot-lambert light on a screen of unity gain. Projectoray clear face-plate material that conducts heat **away** from the or and an efficient heat ex- r. Refractive optical lens design variable throw distance for large ll theaters. **Write for Projectoray eets.**



Symbolray* Monoscope can generate almost any presentation you can think of — from ASCII to custom data displays and even hieroglyphics. We can meet your requirements with only an inexpensive change in target font design. A more economical method of generating displays than using circuit cards, Symbolray monoscopes cost less than $100 in quantities of 1,000. Only 2″ x 12″, Symbolray uses electrostatic deflection and focus. Full messages can be displayed when Symbolray method is used with buffer memory techniques. Monoscope is currently available with 64 and 96 character matrices. **Write for Bulletin SP-1178.**



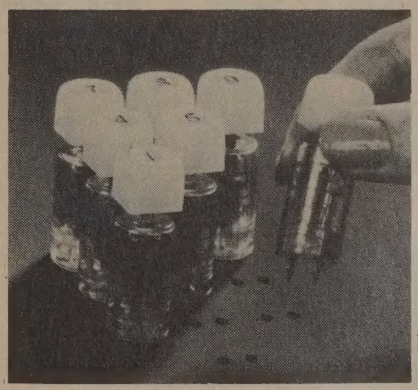
More Than 2000 Optoelectronic Devices are available from Raytheon to improve your product, cut its cost. RAYSISTORS® operate on the principle of controlled light acting on a photo-resistive element — provide a variety of control functions as variable resistors, solid-state switches, relays, voltage or signal isolators. Standard And Special Raytheon Photocells feature rugged mechanical construction, small size, lightweight, low noise. They're available with cadmium sulfide or selenide sensors, TO-5 case or glass vial packaging. **Write for data and circuit applications brochure SP-1149 and SP-1150.**

e* Indicator Tubes — made in . S. A. — at lowest prices. For le: our CK 8754 costs less than in 1,000 lot quantities.

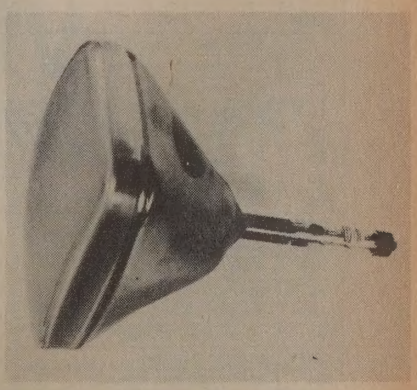
heon offers a complete line of nd end-view indicator tubes in a ange of alphanumerics, decimals, pecial characters. Turn-around e on all custom designs is fast eliable.

Datavue Indicator Tubes are EIA produced for 200,000 hours of ion, highly dependable tubes with brightness, in-line characters. **for Bulletin SP-1114.**

emark of Raytheon Company



New Keyboard Switches — an original Raytheon design — are low cost yet extremely reliable. Just a feather-light (2½-oz.) touch activates the switch which is designed for switching at logic levels. Life expectancy of the dry reed type is more than 800 million cycles. Bounce is less than 250 microseconds. Costs as low as $1.00 in production quantities. **Write for Bulletin MC182B.**



Complete, custom-made keyboards — using the switches described above — are also available from Raytheon. These keyboards can be designed, built and shipped to you in minimum lead time. All assemblies are supplied with alphanumerics, symbols and coding to your specifications. They are also available with data lines, electronic interlock, connector to external power sources and with or without case. **Write, describing your application, for data and assistance.**

For data sheets, application notes, price information, call your Raytheon regional sales office. Or write: Raytheon Company, Industrial Components Operation, 465 Centre Street, Quincy, Massachusetts 02169.

RAYTHEON

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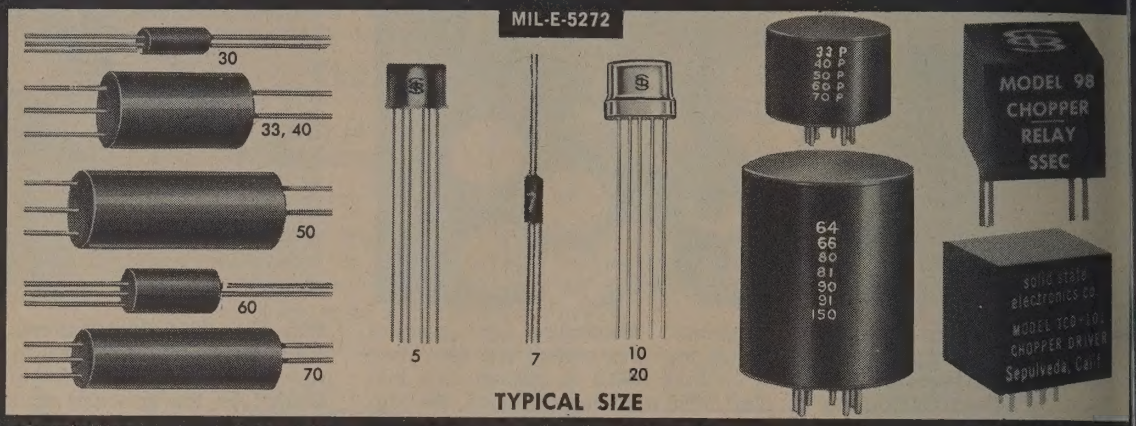
THE MOST COMPREHENSIVE LINE OF SOLID STATE CHOPPERS, RELAYS & ANALOG SWITCHES

MIL-E-5272



TYPICAL SIZE

microminiature	lightweight	low power	high speed	rugged	indefinitely long life
non-mechanical	inertialess	low level	high efficiency	linear	temperature stable

The transistor chopper (or modulator) is a solidly encapsulated unit designed to alternately connect and disconnect a load from a signal source. It may also be used as a demodulator to convert an a.c. signal to d.c It is capable of linearly switching or chopping voltages over a wide dynamic range which extends down to a fraction of a millivolt and up to 150 volts or more. Unlike mechanical choppers which can only be designed to operate over a narrow and comparatively low frequency range due to mechanical limitations, the transistorized chopper is an inertialess device that can be driven from d.c. to hundreds of kilocycles.

The switching circuitry used operates the transistors in a manner which provides stability and freedom from drift over a wide temperature range. Only carefully selected and matched transistors are utilized.

The Models 5, 6, 10, 20, 30, 33, 33P, 40, 40P, 50, 50P, 60, 60P, 70 and 70P are direct-coupled so as to provide the circuit designer with the most basic chopper from which to synthesize solutions to special circuit problems. The Models 33 and 33P are basic field-effect chopper-relays providing exceptional linearity, stability, low noise and offset. The Models 64, 65, 66, 75 and 150 are transformer-coupled for isolation purposes. The Model 50 is for high-level signals. The Models 64 and 66 are for operation from 400 cps and 60 cps sine wave drive at 115 volts a.c. The Models 80, 81, 90 and 91 VIBRACHOPPERS are unique since they require d.c. rather than a.c. contacts, even with d.c. drive. The Model TCD-101 Transistor Chopper Driver drive. The Model 98 has complete isolation and insulation between drive and provides suitable square wave drive voltages for transistorized choppers and synchronous demodulators.

These units are immune to the effects of shock and vibration making them ideal for military, space vehicle and portable applications; or where power conservation, miniaturization and elimination of maintenance are a necessity. Shipments can be same day if you call early.

CHOPPER MODEL SPECIFICATIONS

Model	Type	Max. Signal Voltage (Volts)	Max. Signal Current (MA)	Drive Frequency Range	Max. Drive Voltage (600Ω Source) (AC Volts)	Drive Input Impedance (Ohms)	Ambient Temp. Range (°C)	Size (Inches)	Weight (Grams)
5	Shielded Micro-Min	±5	±10	DC to 100 kcps	25 pk-pk	600	−55 to +150	.260 x .362 Dia.	1
6	Hi-Temp Micro-Min	±5	±10	DC to 100 kcps	25 pk-pk	600	−55 to +150	.2 x 2 x .1 Dia.	0.5
7	Hi-Temp Micro Hi-Freq.	±40	±10	DC to 250 kcps	25 pk-pk	600	−65 to +125	.25 x .1 Dia.	0.5
10	Shielded Micro-Min	±5	±10	DC to 100 kcps	25 pk-pk	600	−55 to +150	.210 x .315 x .405	1
20	Shielded Micro-Min	±10	±10	DC to 100 kcps	25 pk-pk	200	−55 to +90	.210 x .315 x .405	1
26	RF Micro-Min	±5	±3	400 kc to 5 mc	25 pk-pk	400	−55 to +130	.88 x .32 Dia.	2
30	Micro-Min Hi-Freq	±10	±10	DC to 100 kcps	25 pk-pk	200	−55 to +90	.38 x .16 Dia.	½
33	FET, Lo-Offset Hi-Temp	±7	±5	DC to 500 kcps	30 pk-pk	10M	−55 to +175	.7 x .44 Dia.	2
33P	FET, Lo-Offset Hi-Temp	±7	±5	DC to 500 kcps	30 pk-pk	10M	−55 to +175	.5 x .75 Dia.	8
40	Sub-Min Hi-Temp	±15	±40	DC to 50 kcps	40 pk-pk	600	−55 to +150	.7 x .44 Dia.	2
40P	Plug-in Hi-Temp	±15	±40	DC to 50 kcps	40 pk-pk	600	−55 to +150	½ x ¾ Dia.	8
50	Sub-Min Hi-Freq	±10	±10	DC to 100 kcps	25 pk-pk	600	−55 to +90	1¼ x .44 Dia.	3
50P	Plug-in Hi-Freq	±10	±10	DC to 100 kcps	25 pk-pk	600	−55 to +90	½ x ¾ Dia.	8
60	Micro-Min Hi-Freq	±10	±50	DC to 100 kcps	50 pk-pk	600	−55 to +90	½ x ¼ Dia.	1
60P	Plug-in Hi-Freq	±10	±50	DC to 100 kcps	50 pk-pk	600	−55 to +90	½ x ¾ Dia.	8
64	115V/400 cps Xfmr-in	±10	±50	.04 to 12 kcps	300 pk-pk	10K	−55 to +90	1¼ x 1 Dia.	44
65	Xfmr-in Plug-in	±2	±50	0.27 to 30 kcps	50 pk-pk	100	−55 to +90	¾ x ¾ Dia.	12
66	115V/60 cps Xfmr-in	±5	±50	.02 to 12 kcps	300 pk-pk	7K	−55 to +90	1¼ x 1 Dia.	44
70	Hi-Freq Hi-Temp	±10	±40	DC to 100 kcps	4 pk-pk	600	−55 to +150	1⅛ x 5/16 Dia.	2
70P	Plug-in Hi-Freq	±10	±40	DC to 100 kcps	4 pk-pk	600	−55 to +150	½ x ¾ Dia.	8
71	Xfmr-in Plug-in	±10	±5	.04 to 70 kcps	10 pk-pk	300	−55 to +150	.84 x .84 x .75	30
75	Xfmr-in Hi-Temp	±2	±30	0.27 to 100 kcps	10 pk-pk	100	−55 to +150	¾ x ¾ Dia.	12
80	DC-Drive Plug-in	±15	±50	1.5 to 6.5 kcps	6 to 32 DC	2K	−55 to +90	1¼ x 1 Dia.	32
81	DC-Drive DPDT	±15	±50	1.5 to 6.5 kcps	6 to 32 DC	2K	−55 to +90	1¼ x 1 Dia.	32
90	DC-Drice Plug-in	±6	±50	1.2 to 3.0 kcps	12 to 32 DC	2K	−55 to +150	½ x 1 Dia.	40
91	DC-Drive Hi-Temp DPDT	±6	±50	1.2 to 3.0 kcps	12 to 32 DC	2K	−55 to +150	1¾ x 1 Dia.	40
98	DC or AC Isolated Drive	±20	±2	DC to 5.0 kcps	6 to 12 pk-pk	850	−55 to +100	.75 x .75 x .84	16
150	Hi-Volt Hi-Temp Xfmr-in	±150	±40	0.27 to 30 kcps	20 pk-pk	100	−55 to +150	1¼ x 1 Dia.	30
171	Full-Wave Xfmr In-out	±1	±5	.2 to 50 kcps	10 pk-pk	100	−55 to +150	.9 x 9 x 1.25 Dia.	30
TCD-101	Sq Wave Chopper Driver	—	—	2 to 10 kcps	20 pk-pk	—	−55 to +100	.84 x .84 x .75	25

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary)

OTHER PRODUCTS—SEE EEM SECTIONS 4500 & 5200

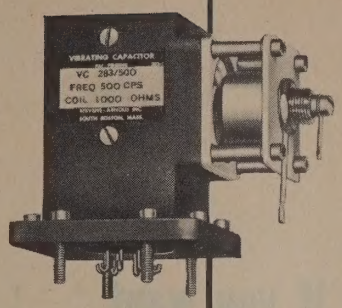
SOLID STATE ELECTRONICS CORP.
15321 RAYEN STREET
SEPULVEDA, CALIFORNIA 91343
Area Code 213 — 894-2271 • 785-4473

FREQMETERS (MODULAR & VISUAL)
DC DIFFERENTIAL OPERATIONAL AMPLIFIERS
XTAL PULSE GENERATORS
VOLTAGE CONTROLLED OSCILLATORS
TONE OSCILLATORS - TRANSFORMERS
RELAYS (SOLID STATE, TIME DELAY, REED, LIGHT)
MINIATURE TELEMETER SYSTEMS
PRESSURE TRANSDUCERS
DIGITAL LOGIC MODULES

VIBRATING CAPACITORS

A vibrating-reed type capacitance modulator used to measure currents as low as 10^{-16} amperes. Drift never exceeds ±0.2 millivolts per day, noncumulative. Thus it is ideal where stable performance without recalibration is required for periods of a month or more.

Please write for Catalog 523.



STEVENS
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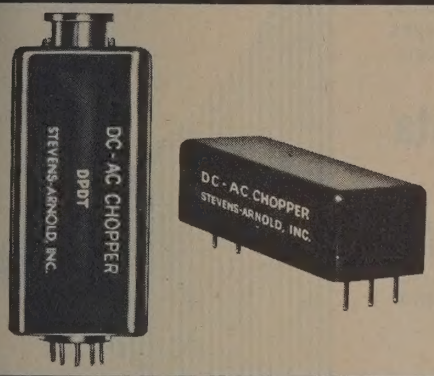
ARNOLD

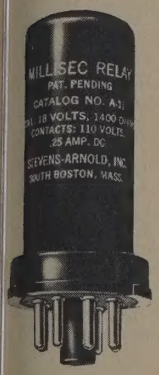
QUALITY SINCE 1943

7 ELKINS ST., SO. BOSTON 27, MASS.



DC-AC CHOPPERS For 50/60/94/120 CPS

These miniature Choppers are outstanding. Long life is assured by our exclusive twin-contact construction. Noise level is less than 1 microvolt into 100,000 ohms with circuit capabilities of .01 microvolt. Packaged two ways, as shown. Built to rigid commercial specifications, there is a selection of types for all applications. Single pole, double pole, make-before-break, break-before-make, AC or DC drive.



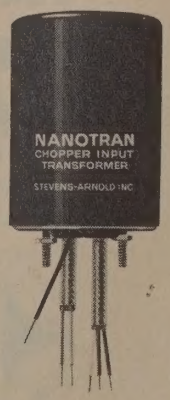
MILLISEC RELAYS

Amazingly fast, from 200 microseconds to 1 millisecond. Available in both commercial and military models, single-pole and double-pole, with shielded or unshielded coils. They are factory sealed and may be mounted in any position.

Please write for Catalog 337

NEW

GETTING THE MOST FOR YOUR MONEY IN INSTRUMENT TRANSFORMERS



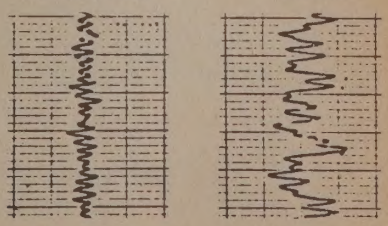
NANOTRAN ISOLATION TRANSFORMERS are different. They have 200 dB common mode rejection plus all features needed to minimize thermal noise and microphonics:

Frequently cut costs, say, 10%.
Frequently cut size, say, 30%.
Eliminate microphonics:

Please write for Catalog 589.

(Microphonics Test)

NANOTRAN OTHER



NEW

MICROLEVEL RELAYS

A new relay with exceptional characteristics for use where thermals, high speed, and long life are required. Offset 40 millivolts. Operating speed 250 microseconds. No bounce. Life 2 billion operations and up. Isolation 10^{11} ohms. Form C with electrical latching capabilities. Operates in any position; printed circuit board, socket, or flange mounting. Please write for Catalog 593.

S/A-43

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what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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Passive Components / Materials / Hardware

Product Section	Products
1400	Cabinets, Chassis, Containers, Racks, Boxes, etc.
1500	Capacitors (All Types)
1600	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
1800	Coils (Inductors, Chokes), Assemblies, Forms
2100	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2350	Delay Lines (All Types)
2500	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
2600	Fans, Blowers & Cooling Equipment
2800	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
3100	Insulators, Insulating Materials & Parts
3150	Manufacturing, Subcontracting, Custom Fabrication
3200	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
4200	Engineering Aids (Books, Drafting Equipment, Whiteprinters)
4600	Research, Development, Engineering Services
4700	Resistors, Fixed
4750	Resistors, Variable (Potentiometers & Rheostats)
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Amalco multi-purpose aluminum carrying cases protect against dust, sprays, rust and vibration

Economical, light in weight, rugged, AMALCO Deep Drawn Aluminum Carrying Cases are ideal for hundreds of industrial uses including electronic instrument cases, precious mechanical instrument cases, scientific instruments, photographic equipment and more. Their sturdy seamless construction includes a tight neoprene gasket, protective chromate treatment inside, plated hinges and others. Eleven standard sizes available for immediate delivery. Special sizes to comply with MIL-C-4150F can be produced to your specifications.

Part No.	W	L	H1	H2	ICR	Gauge
727-40	5	7	5	3 13/32	7/16	064
727-50	5 1/2	7 3/4	5 1/2	3 29/32	7/16	064
727-60	6	8 1/2	6	4 5/32	7/16	064
727-70	6 1/2	9 1/4	6 1/2	4 21/32	7/16	064
727-80	7	10	7	4 29/32	9/16	064
727-90	7 1/2	10 5/8	7 1/2	5 5/32	9/16	064
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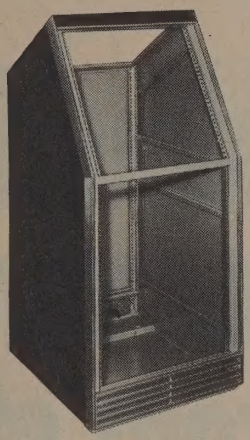
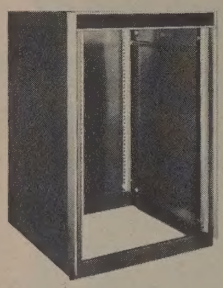
"C" SERIES CABINETS
ONE OF SIX STYLES

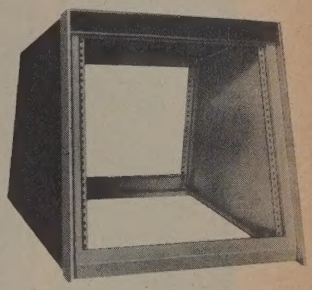
FCB RACK



FCC. CONSOLE

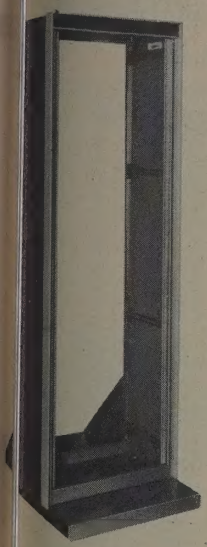


FCA BENCH



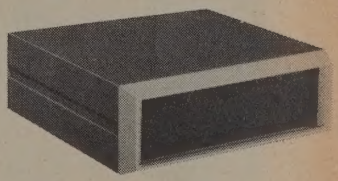
FCT TURRET

SIX STYLES						
	C series	**SQUARE ALUM. TRIM**	**S** series	**SQUARE**	**R** series	**BALL CORNERED**
	HC series	**SQUARE/HEAVY-DUTY ALUM. TRIM**	**H** series	**SQUARE HEAVY-DUTY**	**RF** series	**RFI SHIELDED**

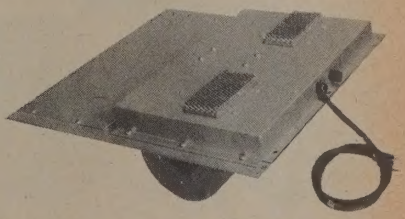


RRCB OPEN RACK

FCD DESK



XA INSTRUMENT CABINETS



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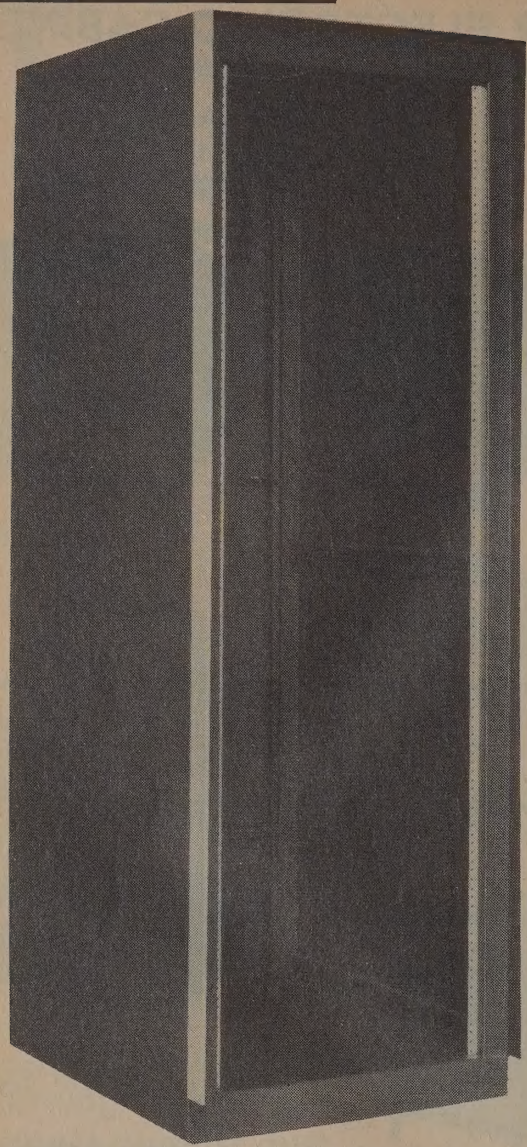

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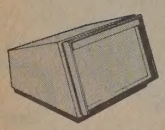
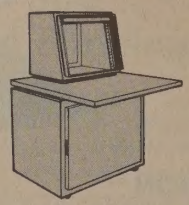
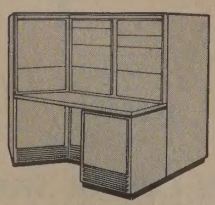


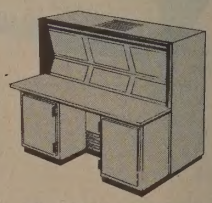
TURRET/30257



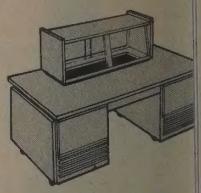
CONSOLE/01-601



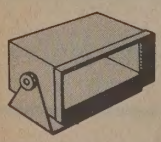
3 BAY CONSOLE/01-580



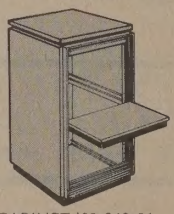
RFI CONSOLE/02-519



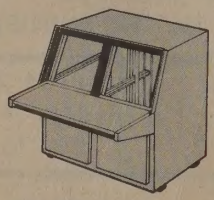
CONSOLE/01-491



TILTING CASE/02-209



CABINET/02-349-01



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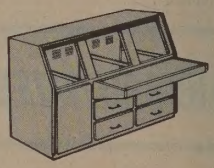

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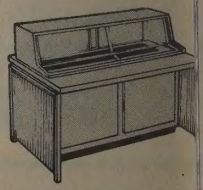

CONTROL CONSOLE/01-

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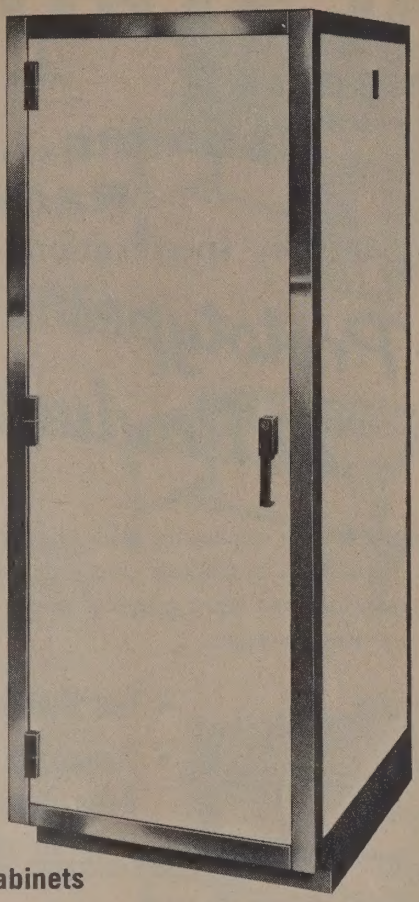
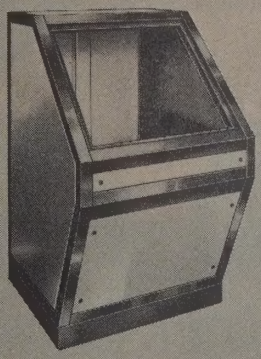
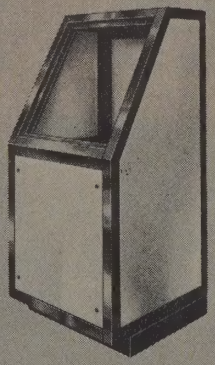


Vertical Rack Cabinets

Sloped Front Vertical Racks



Machine Control Consoles



Sloped Front Consoles

VERTICAL RACK CABINETS ARE DESCRIBED IN CATALOG SECTION 170-70; SLOPED FRONT CABINETS IN CATALOG SECTION 180-70

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EQUIPTO ENCLOSURE SYSTEMS

DIVISION OF **EQUIPTO** ELECTRONICS CORPORATION
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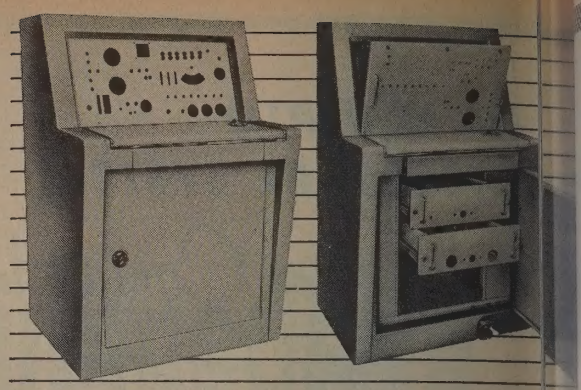
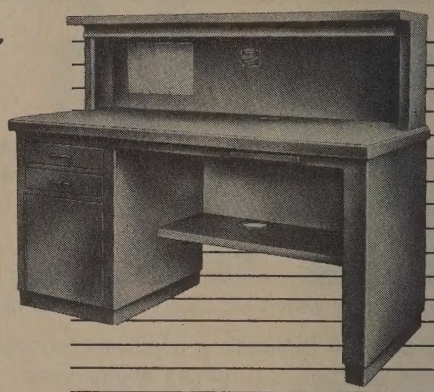
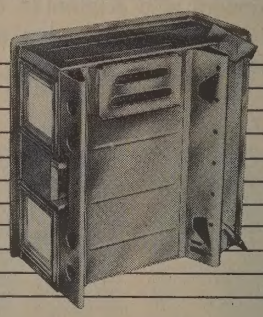
for Prototypes or Production







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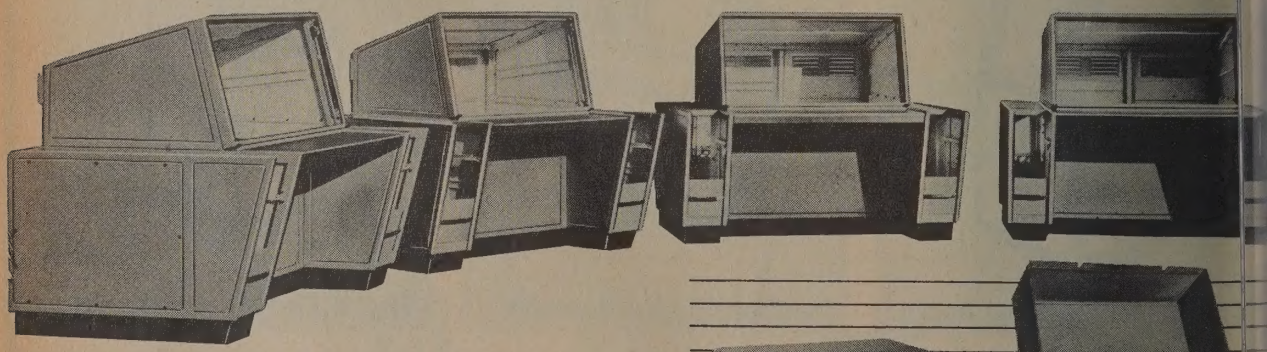

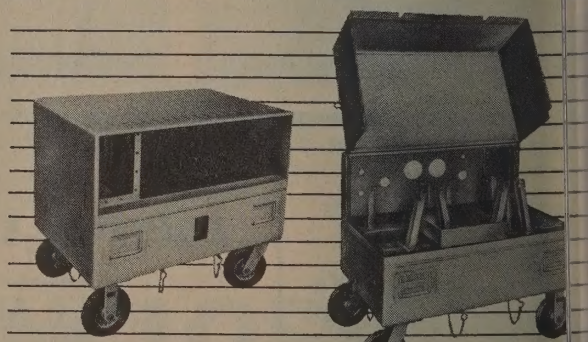

Standard Units or to Your Specifications

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A Century of Custom Metal Fabrication

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SECTIONAL

Electronic

LABORATORY TEST FURNITURE

FOR

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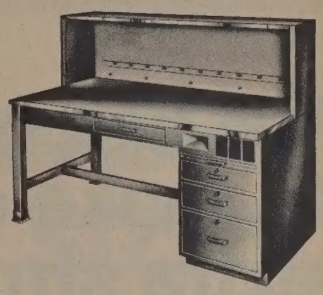
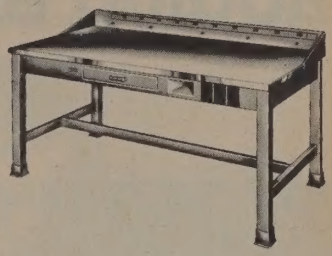
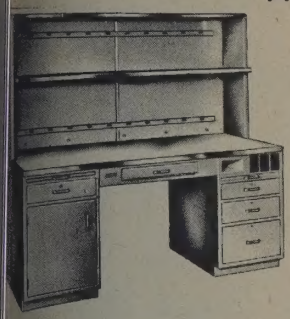
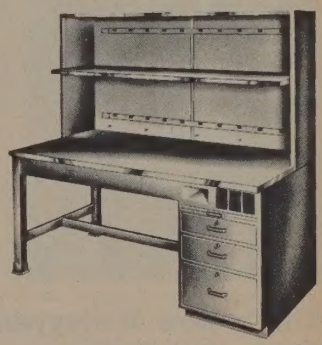
APPLICATIONS

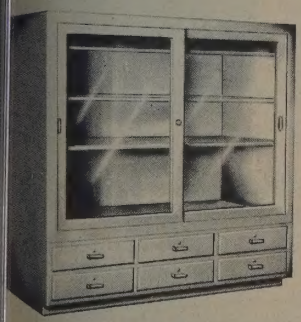






Formica's sectional electronic test furniture is designed *by* engineers *for* engineers to provide the utmost in serviceability. Individual prefabricated sections are constructed to afford the greatest possible number of combinations, then factory assembled to suit the exact requirements of your laboratory or classroom. Design features also provide at least 50% more available working area over other types now in use. Made of heavy gauge furniture steel, Formica's rugged construction means many extra years of service even in hard use.





r school purposes, the usual adaptability of mica's many specialized rets and pedestals — ether for single or uble set-ups — is own in part.

Write for brochures and further specifications.

FORMICA METAL PRODUCTS COMPANY, INC.

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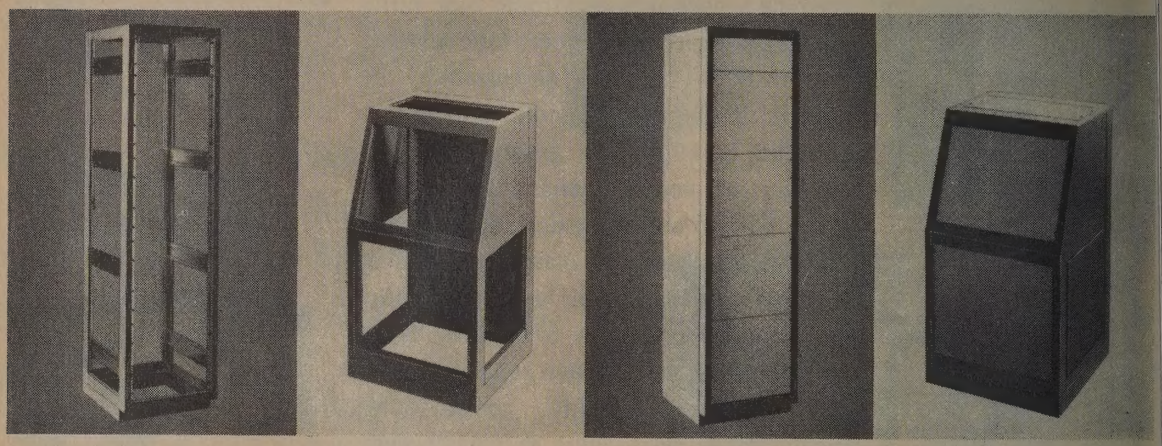
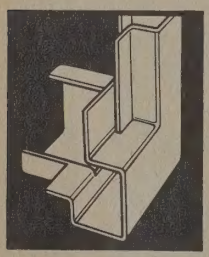
We discovered how to make our cabinets extra strong without adding extra weight.



That's how Honeywell helps you build extra value into packaged systems.



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Beyond strength, these MODU-MOUNT cabinets offer other attractive features. Increased interior widths and depths for easier installation. Thorough corrosion protection. Acid and scuff resistant finish of textured vinyl polyester enamel. All in a complete range of frames, panels, drawers and accessories.

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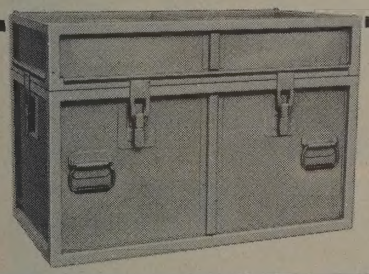
FINISHING: Painting, iriditing, anodizing, plating, etc.



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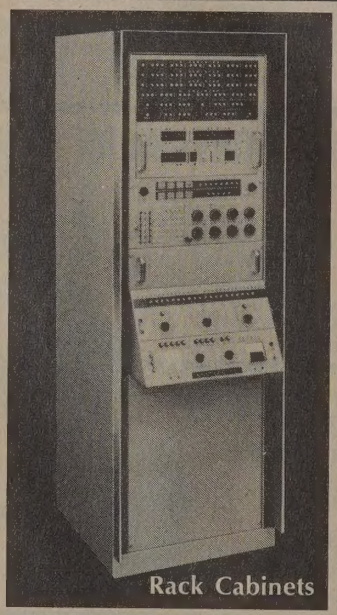

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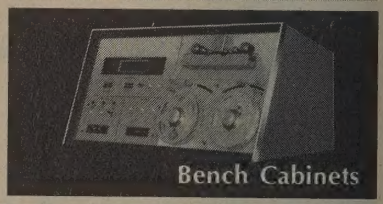

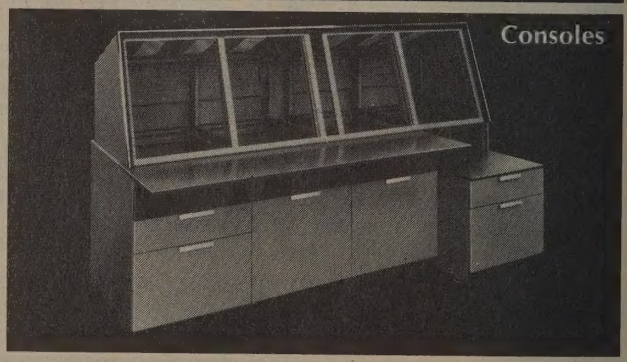

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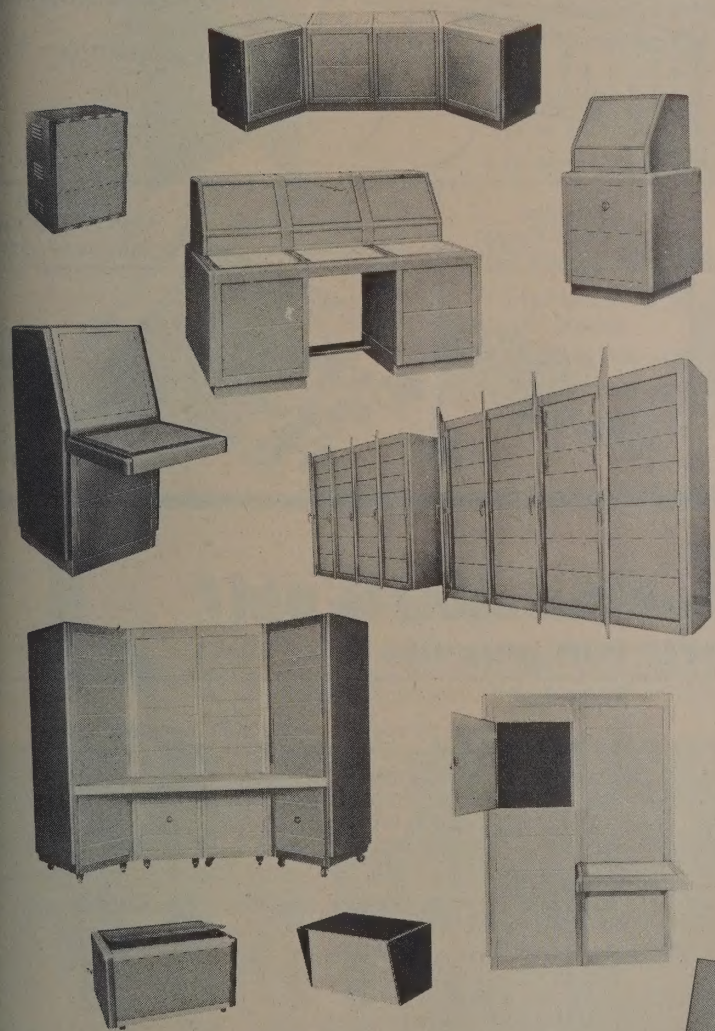
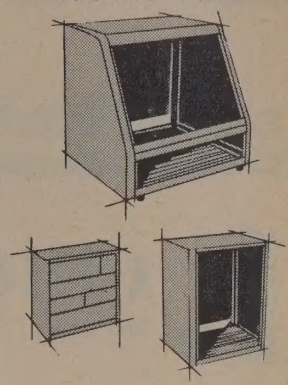
The typical assemblies shown are but a few of an extensive variety of combinations which may be planned to suit your own individual requirements.

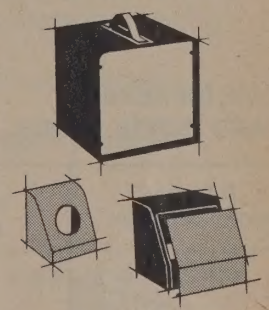
PREMIER features a wide selection of standard contemporary colors available for coordinating, contrasting or harmonizing complete assemblies.



cabinet racks

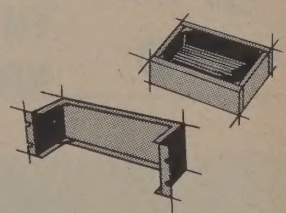


cases

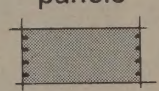


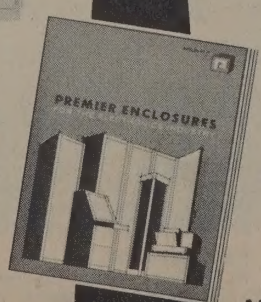
p c card files

chassis



panels





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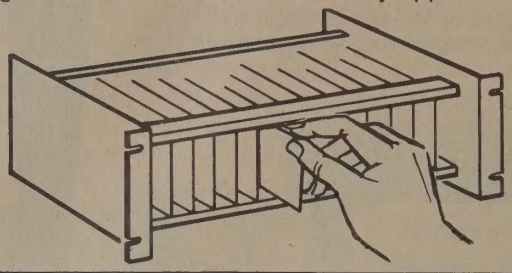

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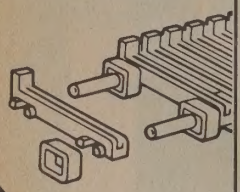
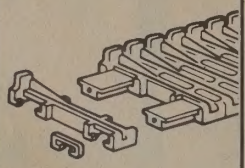
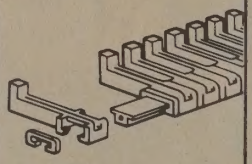
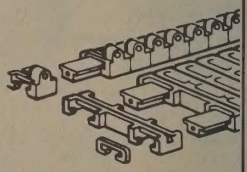
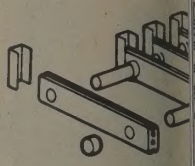
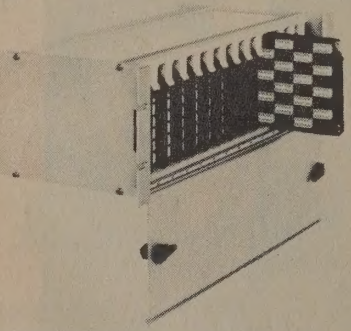
				

2. *"Wrap Rack"* DI PAK™ Card Packaging for DIP and Discrete components



"Wrap Rack"

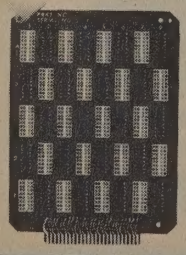
Card Rack having 50 contact connectors, compatible with DIP Card No. 10685 and Connector No. 10689.

With cover . . . . . 10680 — XX — XX
Without cover . . . . . 10681 — XX — XX
No. of cards (max. 14)
No. of connectors (max. 14)

"Wrap Rack"

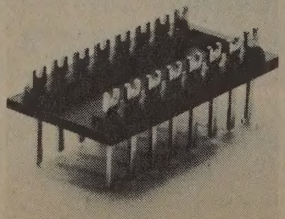
Card Rack having 70 contact connectors, compatible with DIP Card No. 10695 and Connector No. 10699.

With cover . . . . . 10690 — XX — XX
Without cover . . . . . 10691 — XX — XX
No. of cards (max. 14)
No. of connectors (max. 14)



Cards For Solderless Wrap
Each card contains 40 16-pin DIP sockets. Cards also have ejectors, power and ground planes, position identification and wrappable in/out pins.

Part Numbers:
40 socket card for 50 contact connector: P/N 10685.
40 socket card for 70 contact connector: P/N 10695.



Plug-In Discrete Carrier
Inexpensive carriers for Discrete components for combinations of DIP's and discretes. Carriers plug into DIP sockets and components are soldered to slotted terminals in cordwood fashion Part No. 10701.

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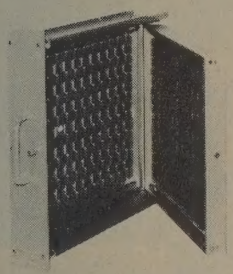
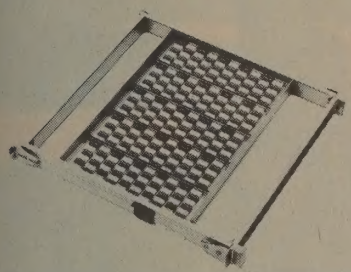
3. DI PAK™
Dual Inline drawer packaging



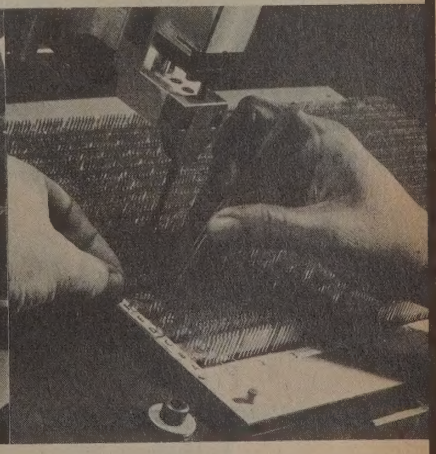
"THE SWINGER"
- Drawer can be mounted vertically or horizontally
- Swing-out feature permits convenient servicing to either wired or DIP areas
- Up to 600, 14 pin or 16 pin DIP color coded wire wrappable sockets
- In and Out interconnection system provided



STANDARD FRAME
- Frames with 30, 60, or 90 DIP wrappable sockets per frame
- Up to 5 frames per drawer
- Power and ground plane incorporated on frames
- In and Out interconnection system provided

4. MICROMATICS™

A sophisticated system that generates complete software from your logic diagrams, wiring program, and/or wire wraps your Scanbe package by semi-automatic, programmed, wire terminating machines.



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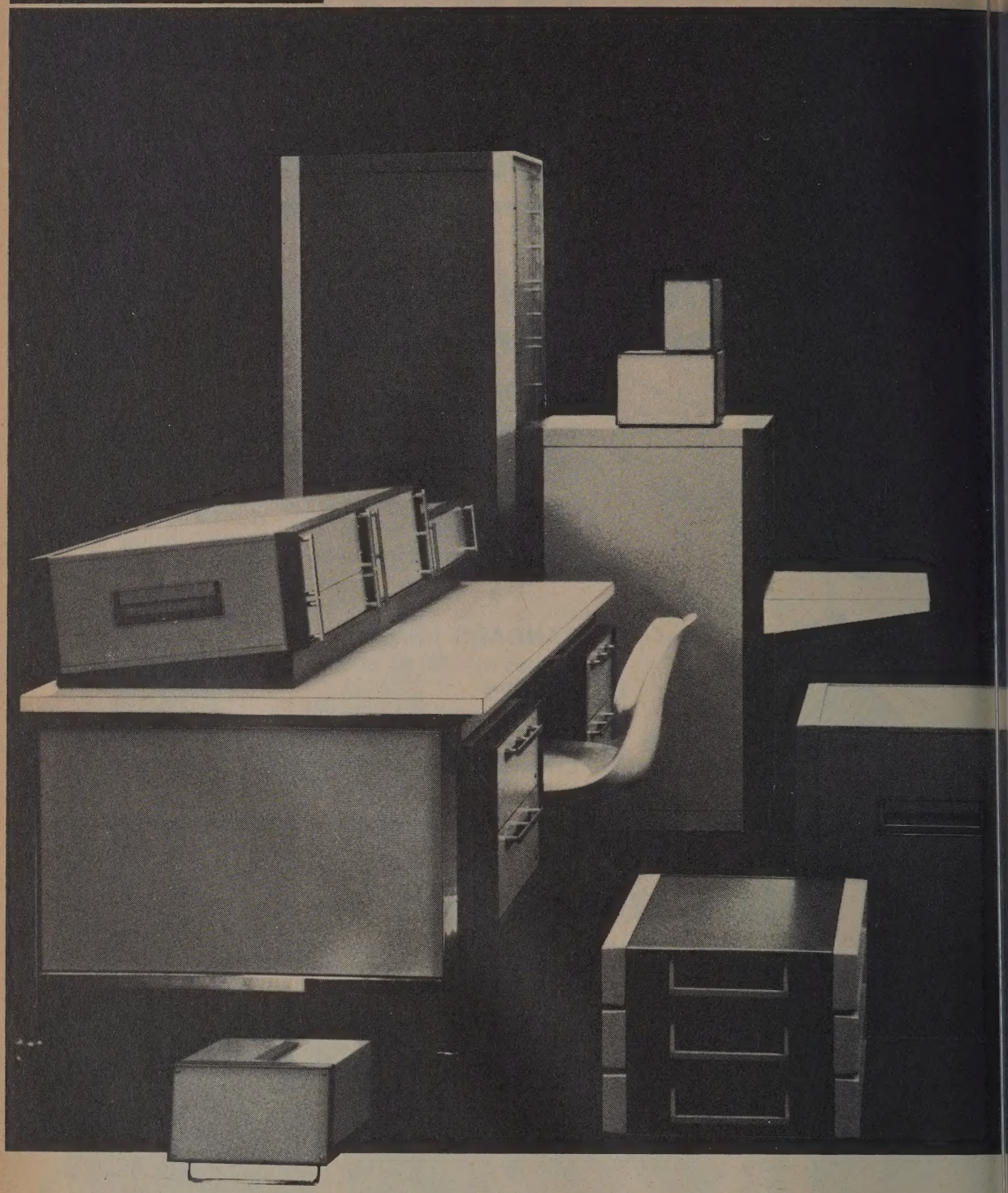

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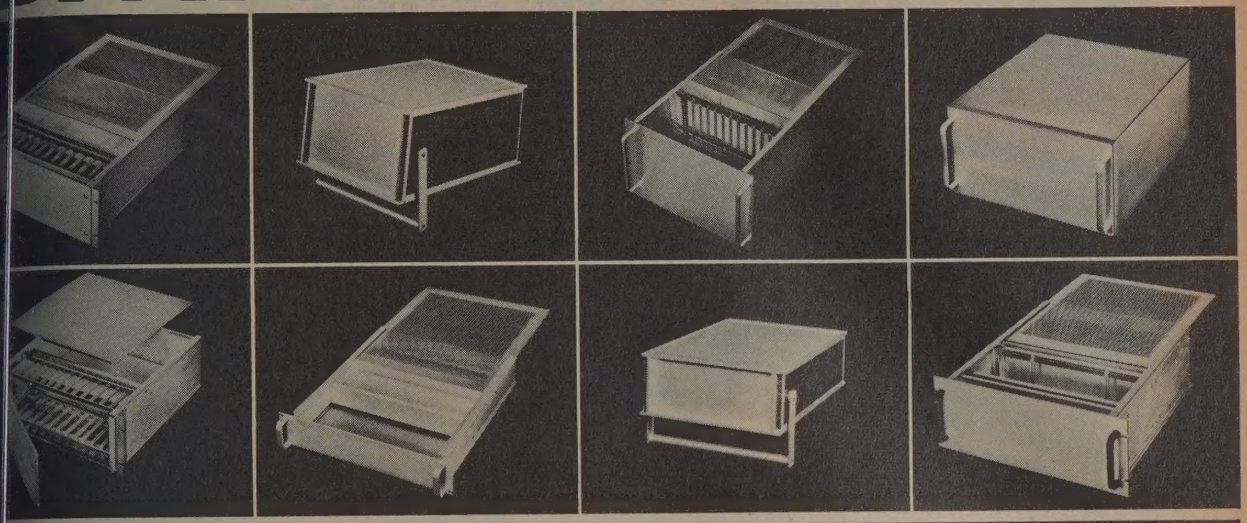

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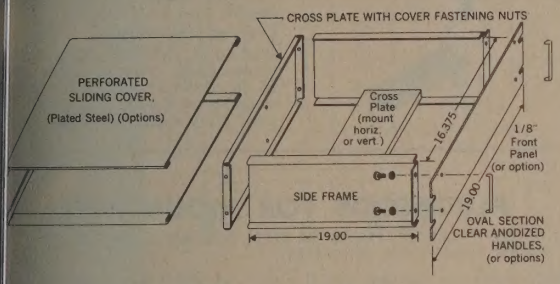
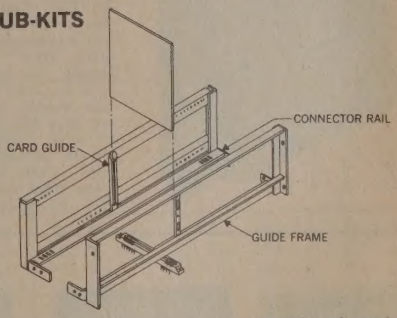
FAB RACK-MOUNTING CHASSIS KITS AND PARTS



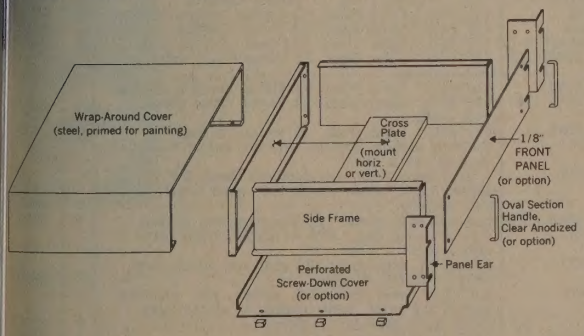
he original prefabricated chassis system. Combines bread-oard flexibility, finished-product appearance, moderate rices, and immediate availability. Kits and parts stocked six EIA heights. Features include choice of sliding or crew-down cover, and the Erector Set concept, which per-its parts to be assembled in hundreds of different ways.

CARD CAGE SUB-KITS



Omniclosure rack-mounting and convertible chassis kits may be ordered with one, two or three row card cage sub-kits included. They assemble for top, front or rear access. Plastic snap-in guides eliminate time-consuming threading of guides and spacers, and permit changes to be made without disassembling the cage.

NVERTIBLE BENCH/RACK KITS AND PARTS



imilar to rack-mount units but self-enclosed and furnished ith panel ears which detach for bench use and wrap-round cover which is removed when chassis is to be rack-nounted. Available with many options.

PORTABLE INSTRUMENT CABINET

Designed by Milton Sol Weiss — IDSA

CLEAN, MODERN LOOK—Precision-framed front panel; no visible hardware on top, sides or front; choice of wood-grained vinyl trim; all aluminum clear anodized. BROAD RANGE OF SIZES—Eighteen stock sizes immediately available. ALL-ALUMINUM MODULAR CONSTRUCTION—Front, rear and sides are heavy extrusions. Sides grooved internally to accept printed circuit boards.

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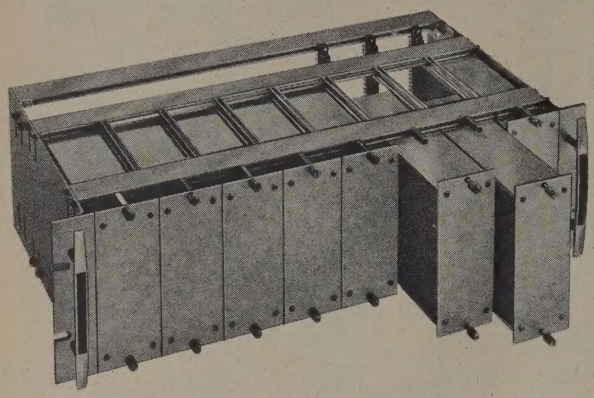
Vector PACKAGING SYSTEM FOR CARDS AND MODULES



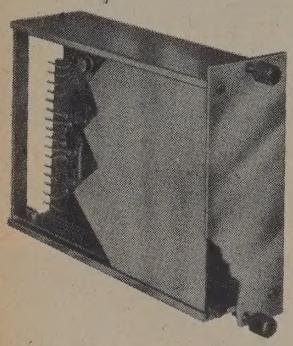
VECTOR STRUT CAGES

Vector Strut Cages are uniquely adjustable aluminum frames des for mounting in 19" equipment racks which accommodate "EFP" ules shown below, or cards. Vector Strut Cages are sold in kit fo three heights, 3-15/32", 5-7/32", 8-23/32", and three depths, 8.9 11.975", and 15.725". Kits consist of the side walls, cross me (Triple T Struts) and brackets, plus necessary assembly hardware truded aluminum card and case guides, EFP Modules, and handle ordered separately as required.

Ordering Information
CMK-3 General Purpose Module Cage Kit 5-1/4" high with 9" long walls for 19" rack mounting.
Sub-Kit No. 7—Kit of case guides and mounting hardware to moun 2" wide EFP Modules in CMK-3 Cage above.
Sub-Kit No. 4—Kit of case guides and mounting hardware to mount ten 1.6" EFP Modules in CMK-3 Cage above.

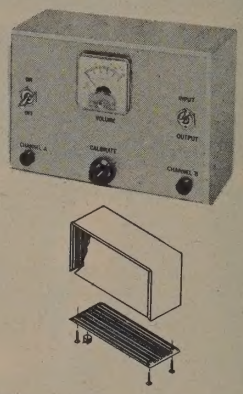
Completely Assembled Module Cages
CMA-3-20 completely assembled cage consisting of all parts supplied in CM and Sub-Kit 7 above. (Modules must be ordered separately.)
CMA-3-16 completely assembled cage with guides installed for ten 1.6" wi EFP modules. (Modules must be ordered separately.)

Many other sizes and types available from stock. Contact factory.



VECTOR "EFP" (EXTENDED FRONT PANEL) CASES

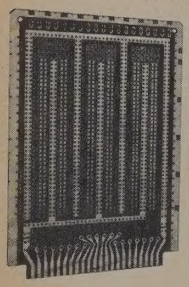
Vector "EFP" aluminum module cases are made in many sizes to accommodate circuit boards from 2.7" to 7.9" wide and 4.6" to 14" long. All EFP cases will fit Vector Strut Cages. EFP cases have identical top and bottom extruded rails with parallel .062" longitudinal grooves spaced for holding circuit boards, slide out .062" side covers front and rear panels. Captive thumb screws are provided. Order EFP204-6.6 for 2" wide completely enclosed module to accommodate 4.5" x 6.5" Card sizes. Contact factory for many other sizes and also types for H. F. shielding available from stock.



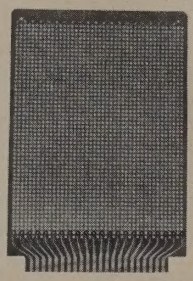
MULTI-MOD CASES

Versatile Multi-Mod Cases can used for small instruments and cuit packaging where appeara and utility are important. Slo inner surfaces on four sides h circuit cards or mounting pla eliminating unsightly screws in c exterior. Access is easy by rem ing base plate. Available in ext sion widths of 1", 1.6", 2", and 4.5" lengths from 3.1" to 1 heights from 3.1" to 8".

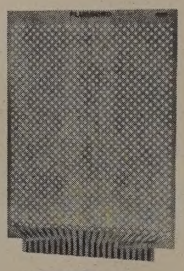
Ordering Information
W20-46-31, 2"x4.6"x3.1" case accommodate 3"x4.5" cards. W 66-46, 3"x6.6"x4.5" case acco modates 4.5"x6.5" cards. Mo other sizes available in stock.



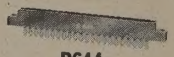
3677



3662



838WE-1GN



R644

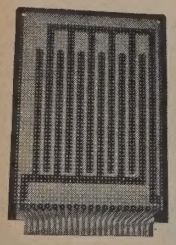
PLUGBORDS FOR MOUNTING

DUAL-IN-LINE PACKAGES, ROUND OR RECT. INTEGRATED CIRCUIT PACKAG FLAT PACKS, TRANSISTORS, DISCRETES.

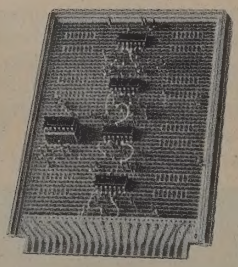
Plugbords listed are provided with G pattern of .062" dia. pre-punched ho on alternate .1" centers or in P pattern grid of .042" dia. holes on .1" c ters. Use Vector T28 push-in Mini-Klip terminals with the G pattern and Ve T42-1 Micro-Klip Terminals with P pattern (see Vector page in Section 2100).

All Plugbords are 1/16" thick and are available with Elco Varicon or 2 copper etched contacts. Epoxy paper boards meet requirements MIL-P-22322 Epoxy glass per MIL-P-18177. Copper clad Epoxy paper meets MIL-P-139 and copper clad Epoxy glass meets MIL-P-13949B. Receptacle castings list are glass filled diallyl phthalate.

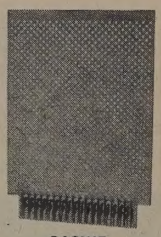
Catalog Number	Description	Grid Pattern	Mating Receptac
812	4½"x6½" Epoxy Paper, 16 Varicon Contacts	G	R616-
812WE	4½"x6½" Epoxy Glass, 16 Varicon Contacts	G	R616-
837	3"x4½" Epoxy Paper, 12 Varicon Contacts	G	R612-
837WE	3"x4½" Epoxy Glass, 12 Varicon Contacts	G	R612-
838	4½"x6½" Epoxy Paper, 43 Etched Contacts, 2 sides	G	R644
838A	4½"x6½" Epoxy Paper, 22 Etched Contacts, 1 side	G	R644
838AWE	4½"x6½" Epoxy Glass, 22 Etched Contacts, 1 side	G	R644
838AWE-1GN	4½"x6½" Epoxy Glass, 22 Etched nickel plated, gold contacts.	G	R544
838WE	4½"x6½" Epoxy Glass, 43 Etched Contacts, 2 sides	G	R644
838WE-1GN	4½"x6½" Epoxy Glass, 22 Etched nickel plated, gold contacts	G	R644
848WE	4½"x6½" Epoxy Glass, 35 Varicon Contacts	G	R635
T28	Miniature push-in terminal, beryllium copper fused tin. Bags of 100 & 1000.		
3474	4.5x6.5 epoxy paper with aluminum frame, X-Y copper matrix, solder coated, 44 etched nickel plate, gold contacts.	G	R644
3477-7	Same as 3474 except 72.1" contact tabs, 2 sides.	P	R636
3662	4.5x6.5 epoxy glass, with 44 etched nickel plate, gold contacts, 2 sides.		
3673	9.6"x7.9", glass epoxy, 80 gold over nickel plate etched contacts, 2 sides.	P	R644
3677	9.6"x4.5" epoxy glass, P.C. pattern, with mounting pads & bus strips, solder coated, 44 etched nickel plated gold contacts, 2 sides.	P	R644
3677-2	Same as 3677 except 4.5"x6.5"	P	R644
3682	9.6"x4.5", epoxy glass, etched, solder coated, power and ground strips for wire wrapping, 44 etched nickel plated, gold contacts, 2 sides.	P	R644
3682-2	Same as 3682 except 4.5"x6.5"	P	R644
3682-4	Same as 3682 except copper ground plane on rear	P	R644



3682



3474



848WE

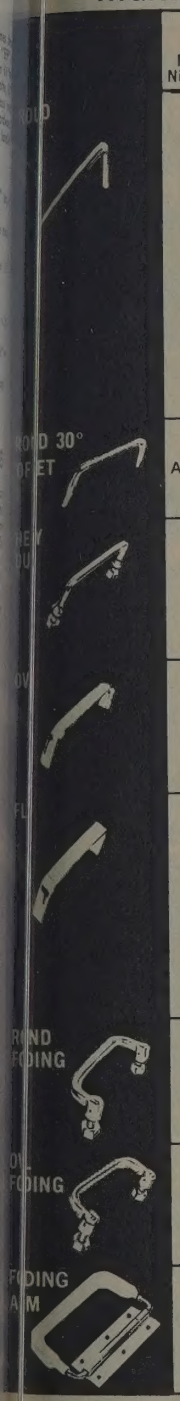
R635

VECTOR ELECTRONIC CO., INC., 12460 Gladstone Ave., Sylmar, Calif. 91342 Phone (231) 365-9661

MANY OTHER HANDLES AVAILABLE. WRITE FOR CATALOG.

VEMALINE STANDARD RACK HANDLES

HIGHEST QUALITY—AVAILABLE FROM STOCK—MODERN RUGGED DESIGN



Brass Polished Nickleplate	Brass Polished Chrome	Brass Black Oxide	Aluminum Black Alumilite	Aluminum Clear Satin Anodize	Alum. Black Satin Anodize	Alum. Black Vinyl Coated	Alum. Gray Vinyl Coated	Alum. Yellow Vinyl Coated	Stainless Steel	A	B	C	D	E	R
NP00	CP00	BO00	ABA00						SS00	8	1½	5/16	5/8	10-32	3/16
NP 0	CP 0	BO 0	ABA 0						SS 0	9	1¾	5/16	5/8	10-32	3/16
NP 1	CP 1	BO 1	ABA 1						SS 1	6½	1¾	5/16	5/8	10-32	3/16
•NP 2	CP 2	BO 2	ABA 2						SS 2	6 7/16	1¾	5/16	5/8	10-32	3/16
NP 3	CP 3	BO 3	ABA 3						SS 3	6	1½	5/16	5/8	10-32	3/16
NP 4	CP 4	BO 4	ABA 4						SS 4	5½	1½	5/16	5/8	10-32	3/16
•NP 5	CP 5	BO 5	ABA 5						SS 5	4 9/16	1½	5/16	5/8	10-32	3/16
NP 6	CP 6	BO 6	ABA 6						SS 6	4½	1½	5/16	5/8	10-32	3/16
NP 7	CP 7	BO 7	ABA 7						SS 7	4¼	1½	5/16	5/8	10-32	3/16
NP 8	CP 8	BO 8	ABA 8						SS 8	4	1½	5/16	5/8	10-32	3/16
•NP 9	CP 9	BO 9	ABA 9						SS 9	3	1½	5/16	½	10-32	3/16
NP 10	CP 10	BO 10	ABA 10						SS 10	2	1 5/16	5/16	7/16	8-32	3/16
NP 11	CP 11	BO 11	ABA 11						SS 11	2	5/8	3/16	¼	6-32	1/8
			ABA 12							4	1 7/8	3/8	5/8	10-32	3/8
			ABA 13							6½	1¾	3/8	5/8	10-32	3/8

SPECIFY WITH FERRULES ON ORDER IF REQUIRED

AVAILABLE IN SAME SIZES AND MATERIALS AS THE STRAIGHT ROUND ABOVE. SUFFIX ROUND PART NO. WITH "-30".

(½" (D) THD. DEPTH)

14-1	Brass	N.P.								4¼	4 9/16	3/16	13/16	3/16-18	3/16
14-2	Brass	N.P.								6	6 5/16	3/16	13/16	3/16-18	3/16
14-3	Brass	N.P.								9	9 5/16	3/16	13/16	3/16-18	3/16
14-4	Aluminum Black Anodize									4¼	4 9/16	3/16	13/16	3/16-18	3/16
14-5										6	6 5/16	3/16	13/16	3/16-18	3/16
14-6										9	9 5/16	3/16	13/16	3/16-18	3/16
NP 12	CP 12	BO 12	OBA 12	OCA 12						3	1 3/32	5/8	3/8	10-32	½
NP 13	CP 13	BO 13	OBA 13	OCA 13						4	1¾	5/8	½	10-32	½
NP 14	CP 14	BO 14	OBA 14	OCA 14						4 9/16	1½	5/8	½	10-32	½
NP 15	CP 15	BO 15	CBA 15	OCA 15						6 7/16	1¾	5/8	½	10-32	½
NP 16	CP 16	BO 16	OBA 16	OCA 16						9	1¾	5/8	½	10-32	½
				FCA 0	FBA 0	BV0	GV0	YV0		9	1¾	5/8	½	8-32	½
				FCA 1	FBA 1	BV1	GV1	YV1		6½	1¾	5/8	½	8-32	½
				FCA 2	FBA 2	BV2	GV2	YV2		6 7/16	1¾	5/8	½	8-32	½
				FCA 3	FBA 3	BV3	GV3	YV3		6	1½	5/8	½	8-32	½
				FCA 4	FBA 4	BV4	GV4	YV4		4 9/16	1½	5/8	½	8-32	½
				FCA 5	FBA 5	BV5	GV5	YV5		4½	1½	5/8	½	8-32	½
				FCA 6	FBA 6	BV6	GV6	YV6		4¼	1½	5/8	½	8-32	½
				FCA 7	FBA 7	BV7	GV7	YV7		4	1½	5/8	½	8-32	½
				FCA 8	FBA 8	BV8	GV8	YV8		3	1½	5/8	½	8-32	½
				FCA 9	FBA 9	BV9	GV9	YV9		2	1½	5/8	½	8-32	½
76-1 —FOLDS TO ONE SIDE (90°)										4	1 27/32	5/8	5/8	3/8-24	3/8
76-2 —FOLDS TO ONE SIDE (90°)										4	1 27/32	5/8	5/8	3/8-24	3/8
77-1 —FOLDS TO BOTH SIDES (180°)										4	1 27/32	5/8	5/8	3/8-24	3/8
77-2 —FOLDS TO BOTH SIDES (180°)										4	1 27/32	5/8	5/8	3/8-24	3/8
ALSO AVAILABLE IN ALUMINUM															
78-1 —FOLDS TO ONE SIDE (90°)										4	1 27/32	5/8	5/8	3/8-24	½
78-2 —FOLDS TO ONE SIDE (90°)										4	1 27/32	5/8	5/8	3/8-24	½
79-1 —FOLDS TO BOTH SIDES (180°)										4	1 27/32	5/8	5/8	3/8-24	½
79-2 —FOLDS TO BOTH SIDES (180°)										4	1 27/32	5/8	5/8	3/8-24	½
80-1 Blk. Vinyl										5¼	2 5/8	¾			
80-2*2 Grey Vinyl										5¼	2 5/8	¾			
80-3*2 Yel. Vinyl										5¼	2 5/8	¾			

*1 MIL TYPE MS 39087 *2 Clear Anodized Mounting Plate

SIZES OTHER THAN LISTED ABOVE AVAILABLE ON SHORT NOTICE

MATERIALS

BRASS—HALF HARD PER QQ-B-626A COMP 22

ALUMINUM—PER QQ-A-325 TEMP T6 (6061-T6)

STAINLESS STEEL PER QQ-S-763A CLASS 7 TYPE A

FINISHES

POLISHED NICKLEPLATE—PER QQ-N-290 CLASS 1
BLACK OXIDE—PER MIL-F-495a
POLISHED CHROMIUM PLATE

BLACK ANODIZE (ALUMILITE) MIL-A-8625a
CLEAR ANODIZE PER MIL-A-8625a

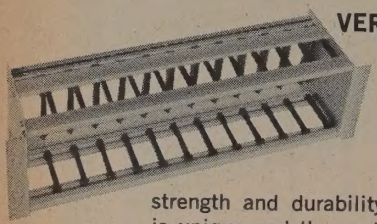
PASSIVATE PER MIL-F-14072

VEMALINE PRODUCTS COMPANY

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200 / (201) TWX 337-4500

NEW *Fast, Simple and Economical* COMPLETE PACKAGING SYSTEMS *From* VERO

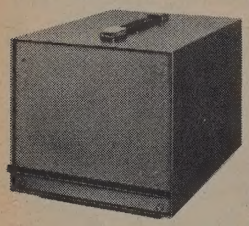
VERO INTRODUCES THE ULTIMATE PC CARD FRAMES • VERORACK SYSTEM 3



VERORACK SYSTEM 3

The ultimate PC card frame featuring variable card spacing from .4" up. This rack combines beauty, strength and durability. Connector mounting is unique and the cost is low.

VERO MODULE CASES



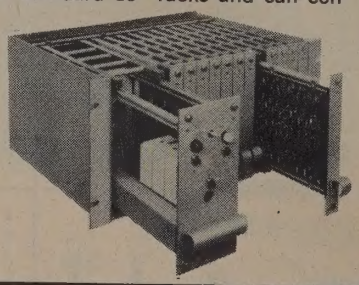
A line of Portable Module Cases has been designed for use in conjunction with standard modules from the Vero Module Rack. The cases are available in three heights, 5¼", 7" and 8¾" and in four standard widths, 4", 6", 8" and 16". Guides are included for Single or Multiple Module Mounting.

VERO MODULE RACK

OVER 450 ASSEMBLY COMBINATIONS — DELIVERY FROM STOCK — GREATEST FLEXIBILITY AT LOWEST COST

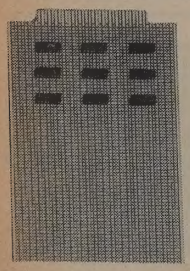
The Vero Module Assembly — another phase of the Vero circuit concept — provides a fast, simple and inexpensive method of circuit packaging.

The Vero principle of versatile standardization has produced a module which fits standard 19" racks and can contain any combinations of 1", 2", 4", 8" or 16" pull out modules. It is available in 5¼", 7" or 8¾" heights and 11" or 14" depths.



This rugged ⅛" aluminum units is also available as a composite of modules and printed circuit cards for the ultimate in flexible circuit assembly.

VEROBOARD*



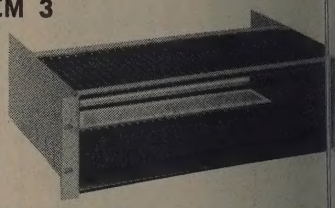
Hole Patterns — .050 x .050, .1 x .1, .150 x .150, .156 x .1, .2 x .2, .2 x .1.

Over 200 Standard Sizes — Single and Double Sided x-y pattern.

Material — XXXP and FR-4 Epoxy Glass.

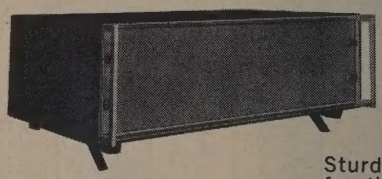
*Patented.

VERORACK SYSTEM 3



Features standard .5" card spacing with noryl guide slabs that slide with precision extrusions. This rack is versatile, rigid and low in assembly cost. It accepts cards any length and up to 4½" high in 5¼" frame. Other frame heights are also available.

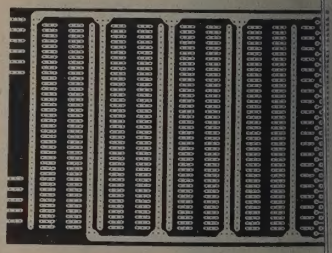
VERO INSTRUMENT CASE



An attractive new range of instrument cases available in heights from 3½" to 1[illegible]" to accept 9" wide racks. Sturdy construction and functional design are featured.

VERO D.I.P. BOARD

FOR DUAL IN-LINE I.C. PACKAGES



- .1 x .1 hole pattern with .041 dia. holes
- Accepts D.I.P. socket or direct I.C. plug in
- Gold plated contacts with connectors to match
- Boards available in epoxy glass 1/16 thick or low cost paper
- Complete versatility with continuous isolated pads on [illegible] centers holds 20 D.I.P.s on 4.5 x 6.5 board
- Power and ground buss plus test points all on one side [illegible] board
- Reverse side printed with grid to ease component locati[illegible]
- Vero handle location indicated

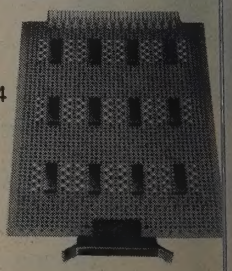
VERO "FINGER BOARDS"

Hole Patterns — .1 x .1, .052 dia.

Material — 1/16 Epoxy Glass, FR-4.

Connector Fingers — 22 x .156, 44 x .156, 40 x .1, 32 x .1, 80 x .1.

OFF THE SHELF IN SIZES TO FIT ALL CARD FILE SYSTEMS



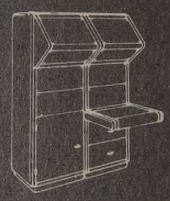
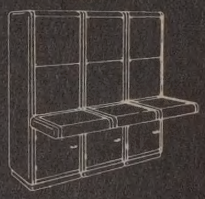
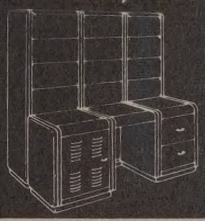
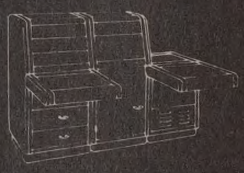
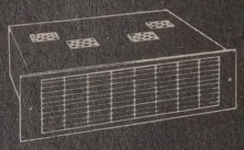
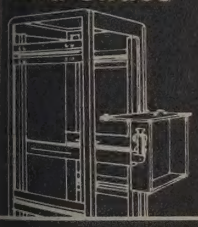
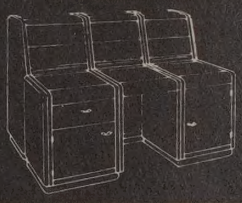
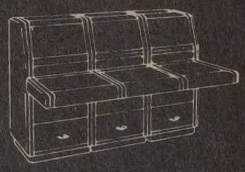
COMPLETE RANGE OF CONNECTORS, TERMINAL PINS, MODULE CASES AND ACCESSORIES. BASIC VERO SYSTEMS CAN BE QUICKLY MODIFIED TO MEET CUSTOMER REQUIREMENTS.

vero

VERO ELECTRONICS INC.

176 Central Ave., Farmingdale, N. Y. • Tel.: 516 MY 4-6550 • TWX: 510-224-6425

STANTRON® MODULAR ELECTRONIC HOUSING SYSTEM

Modular Electronic Cabinets	Ball Corner Design	Square Corner Design	or Square Corner Design with Shadow Box Trim
Hundreds of Combinations	For Example:	Like this 	or 
or This	or This, too 	You can Design Your Own Enclosure Package	Like This 
or	Similar to This	Also Blowers 	or Fans
and Slides 	To go with 	or	or This 
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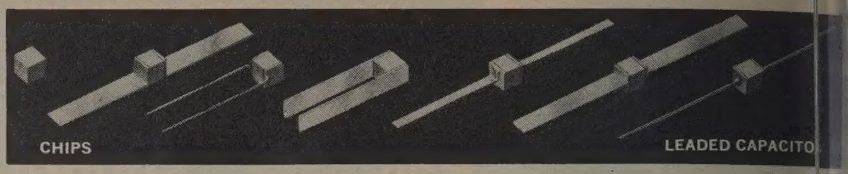
ATC UHF/MICROWAVE PORCELAIN



ATC UHF/MICROWAVE CHIP CAPACITORS

ATC-100 UHF/MICROWAVE PORCELAIN CHIP CAPACITORS

ATC Microwave Porcelain Capacitors are designed to advance the state-of-the-art in broadband, high power and low noise applications. Unique construction techniques provide ultra-high unloaded-Q (10,000 at 100 MHz in a 10 PF unit), with loss tangents lower than 0.0001, and self-resonance up to 15 GHz depending upon capacitor value and case type.

ATC 100 porcelain material exhibits no instability with voltage, time or frequency, contrary to common NPO and high dielectric-constant ceramics. There is no measurable piezoelectric effect, no aging, and no retrace hysteresis, or drift. Close tolerances of 1%, or better, are available, and unlike NPO's ATC Microwave porcelain retains a high insulation resistance at high temperatures. This material is specifically designed for use at high RF voltage and current all the way up through microwave frequencies. ATC-100 Case B is recommended for use up to 1 GHz, above which ATC-100 Case A is recommended.

Superior metallization, which prevents leaching off by soft or solders, or epoxies, provides durable terminations under adverse soldering conditions. Other noble metals also available for special mounting, are with eutectics, or wire bonding. Special construction techniques provide extremely high packaging density with high reliability and high working voltage. Units are completely hermetically sealed by virtue of their basic construction, thus eliminating need for any encapsulant. Microwave porcelain is an extremely dense, low-loss material, impervious to penetration by atmospheric conditions or solvents. Exceptionally low inductance gives reliable wideband operation as a capacitor up to X-Band in capacitance values as large as 20 pF. Exceptionally close control over physical construction makes possible very high RF or DC voltage levels, plus low-loss, high power capability.

CHARACTERISTICS

UHF/MICROWAVE

INSERTION LOSS: Less than 0.03 dB @ 10 watts @ 1 GHz
QUALITY FACTORS: (Qu) Greater than 10,000 @ 100 MHz (10 PF)
GUARANTEED MINIMUM QUALITY FACTOR: @ 1 MHz = 10,000
SELF-RESONANT FREQUENCY: DC up to 20 GHz
VSWR: CASE B — 1.05:1 for typical non-ceramic substrate
CASE A — 1.1:1 for 25 Mil thick alumina substrates

S-PARAMETERS
Complete S-Parameter, VSWR, and Insertion Loss data is available, upon request, from 100 MHz through 1 GHz. Test data provided by a Hewlett Packard 8542A, computer controlled, synthesizer-referenced, phased-locked, network analyzer.

ELECTRICAL

TEMPERATURE RANGE: From —55°C to 125°C (no derating of working voltages)
From 125°C to 200°C derate linearly to 50% @ 200°C
TEMPERATURE COEFFICIENT OF CAPACITY: + 90 ± 20 PPM/°C (—55°C to 125°C) @ 1 MHz
CAPACITY RANGE, INSULATION RESISTANCE, AND OPERATING VOLTAGE (WVDC) BY CASE SIZE
CASE A: .1 PF to 100 PF (50 WVDC);
10^6 Megohms Min @ 25°C, 10^5 Megohms Min @ 125°C
CASE B: .1 PF to 47 PF (1000 WVDC)*;
10^6 Megohms Min @ 25°C, 10^5 Megohms Min @ 125°C
.1 PF to 100 PF (500 WVDC);
10^6 Megohms Min @ 25°C, 10^5 Megohms Min @ 125°C
110 PF to 200 PF (300 WVDC);
10^6 Megohms Min @ 25°C, 10^5 Megohms Min @ 125°C
220 PF to 470 PF (200 WVDC);
10^6 Megohms Min @ 25°C, 10^5 Megohms Min @ 125°C
510 PF to 1000 PF (100 WVDC)
10^5 Megohms Min @ 25°C, 10^4 Megohms Min @ 125°C
*Special Order
DIELECTRIC TEST VOLTAGE: All units tested at 250% of WVDC for 5 secs.
RETRACE: Less than 0.1%
PIEZO ELECTRIC EFFECTS: None

ATC-700 ULTRA-STABLE CERAMIC CHIP CAPACITORS

ATC ultra-stable NPO ceramic is rated for extremely high stability with temperature (TC = 0 ± 30 PPM/°C). Environmental resistance approaches that of porcelain types, even without encapsulation. Composition and construction techniques provide moderately high Q at moderate cost. Especially useful for low frequency tuned circuits where high stability with temperature is required. Practical for low power handling (less than 2 watts) where X°c is less than 1. Ohm max. ATC-700 is 1/10 the size of conventional NPO capacitors of equivalent capacitance and voltage ratings.

ELECTRICAL

CAPACITY RANGE BY CASE SIZE: CASE A, 47 PF to 470 PF; **CASE B,** 200 PF to 4700 PF
TEMPERATURE COEFFICIENT OF CAPACITY: 0 ± 30 PPM/°C (—55°C to 125°C)
QUALITY FACTOR: 2000 @ 1 KHz
INSULATION RESISTANCE: 10^5 megohms min @ 25°C

ATC-200 HIGH PACKAGING DENSITY CERAMIC CHIP CAPACITORS

ATC-200 UHF ceramic is designed for by-passing applications where high packaging density is required with good insulation resistance, environmental resistance, and moderate temperature stability. Suitable for use through UHF frequencies in low power, DC block, applications.

ELECTRICAL

CAPACITY RANGE BY CASE SIZE: CASE A, 470 PF to .01 MF
CASE B, 4700 PF to .1 MF
TEMPERATURE COEFFICIENT OF CAPACITY: (BX) ± 15% max. (—55°C to 125°C)
DISSIPATION FACTOR: 2.5% max @ 1 KHz
INSULATION RESISTANCE: 10,000 Megohms min
DIELECTRIC TEST VOLTAGE: 3 x Rated for 5 secs.

ATC-300 ULTRA-HIGH PACKAGING DENSITY CERAMIC CHIP CAPACITORS

The ATC-300 Series is designed to attain extremely high values of capacity in a minimal case size for use over a moderate temperature range. Values to .1 MF in a 50 Mil square (CASE A), and 1 MF in a 110 Mil square (CASE B) are standard.

ELECTRICAL

CAPACITY RANGE BY CASE SIZE: CASE A, .012 MF to .1 MF
CASE B, .1 MF to 1.0 MF
TEMPERATURE COEFFICIENT OF CAPACITY: Room temperature peak
DISSIPATION FACTOR: 4% max @ 1 KHz
INSULATION RESISTANCE: 1000 megohms min
DIELECTRIC TEST VOLTAGE: 3 x Rated for 5 secs.

FOR COMPLETE DATA FOR ALL SERIES SEE ATC 69/70 CATALOG

ND CERAMIC CHIP CAPACITORS

ERING CODE

ATC-100 B 10 1 J C

- C — Chip
- J — Tolerance
- 1 — Number of Zeros Following Digits Of Capacitance
- 10 — o Digits Of Capacitance
- B — Type
- ATC-100 — Series

THE ABOVE EXAMPLE DESIGNATES ATC-100 SERIES CASE B CHIP CAPACITOR OF 100 PF WITH A 5% TOLERANCE.

POWER HANDLING

/ at 3 GHz in an ATC-100 CASE B 62 PF.

res CW at 25 MHz in an ATC-100 CASE B 1000 PF.

n an ATC-100 CASE B, 30 PF unit @ 170 MHz.

res of pulsed RF at 500 MHz.

ften less than 1.1:1 and Insertion Loss .05 dB up to GHz in an ATC-100 CASE A 33 PF capacitor on 25 mil mina substrate with a 25 mil wide line.

series RF resistance of .05 ohms (compared to Barium types which may have up to 2.0 ohms for the same nce value).

ESULTS IN EXTRAORDINARILY LOW INSERTION LOSS, IS ESPECIALLY CRITICAL WHERE IMPEDANCES TO BE D ARE LOW, SUCH AS THE BASE-TO-EMITTER JUNCTION FREQUENCIES WHERE TRANSISTOR GAINS ARE LOW SS CANNOT BE TOLERATED.

ICAL

Y SPECIFICATION: All ATC-100 capacitors meet MIL-C-272B (Complete independent Test Data sent upon quest.)

TANCE DRIFT: 0.05% or 0.05 PF, whichever is greater None

ICAL CHARACTERISTICS AFTER LIFE TEST

E IN CAPACITANCE: At 25°C —0.1% max

Y FACTOR: Greater than 10,000 @ 1 MHz

TION RESISTANCE: 1,000,000 megohms min @ 25°C, 0,000 megohms min @ 125°C (for 100 WVDC units, 10^5 eg Ω @ 25°C, and 10^4 Meg Ω @ 125°C)

ANCES AVAILABLE:

(± .1 PF) from .1 PF to 9.1 PF,
(± .25 PF) from .3 PF to
(± .5 PF) from .5 PF to 5.1 PF,
(± 1%) from 10 PF to 1000 PF,
(± 2%) from 10 PF to 1000 PF,
± 5%) and K (± 10%) from 5.6 PF to 1000 PF,
(± 20%) from 6.8 PF to 1000 PF

APPLICATIONS

PRODUCT

Phased-array radar, wide-band amplifiers, low noise circuits, receiver RF-IF stages, proximity fuses, radiosonde, microwave power sources, UHF converters, military communications, telemetry, UHF mobile, ECM, DME, microwave power amplifiers, troposcatter communications; commercial aircraft communications; military, marine, and amateur AM/FM/SSB, military hand-held survival radios.

CIRCUIT

Constant-capacitance matching and coupling in octave bandwidth microstrip and stripline L and S-Band amplifiers, swept L.O.'s, mixers, synthesizers, and switches.

Low-loss signal paths for low noise receivers.

Coupling and by-passing for low and high power UHF transmitters.

Excellent first base-shunt elements in low-pass Matthaei wideband interstages.

Utilization in base and emitter by-passing, as well as coupling applications, where extremely low inductance is required.

Applications in ultra-stable oscillator sources where absolute retrace and minimal drift (less than .1%), as well as low inductance, are an important factor, particularly over environmental extremes.

Use in RF tank circuits where high circulating currents or where stability and Q are important factors. Use in timing and control circuits demanding high stability under extreme environmental conditions.

High Q DC blocks in wideband varactor-tuned sweepers.

Compact stable elements for use in low-distortion and narrow pulse width, high PRF delay lines.

Low and high values of capacity where close tolerances and high stability are required in HF and VHF filter design. (See ATC-100 Capacity Values)

Single-replacement for multiple-capacitor collector and base by-passes.

Pellet styles for input-matching and pseudo-idler circuits of high-ratio step-recovery multipliers.

Where state-of-the-art high Q capacity -vs-size microminiaturization is required.

CTRIC TEST VOLTAGE: 3 x Rated 5 secs.

ING VOLTAGE: 50 WVDC

RANCES AVAILABLE: F (± 1%), G (± 2%), J (± 5%), K (±10%), M (± 20%)

GENERAL

Similar to ATC-100, except for restriction to power levels and lower frequency applications where higher loss can be tolerated. Not to be used at low impedance levels having high current, or where low noise, low loss, or low power dissipation is required.

KING VOLTAGE: 50 WVDC

METRIC EFFICIENCY: 100 MFDS/Cu. inch

RANCES AVAILABLE: K (10%), M (20%), N (30%), GMV (—20%, +80%)

MMENDED TESTING SEQUENCE: CAP., DF., IR., V.D.C.

TARY SPECIFICATION: Meets applicable portions of MIL-C-11015D

GENERAL

Coupling and by-passing for low power, UHF transmitters and receivers. Applications requiring low inductance, high capacity per unit volume with moderate temperature stability, such as tantalum replacements and emitter by-passes.

CIRCUIT

RF by-pass for C_{ob} cancelling inductor.

KING VOLTAGE: 25 WVDC

MMENDED OPERATING RANGE: 10°C to 60°C

METRIC EFFICIENCY: 1000 MFDS/Cu. inch

RANCES AVAILABLE: M (± 20%), N (± 30%), GMV (—20%, +80%

MMENDED TESTING SEQUENCE: CAP., DF., IR., V.D.C.

GENERAL

Similar to ATC-200, except for use over a moderate temperature range such as encountered in computers, heart pacers, medical electronics, etc.

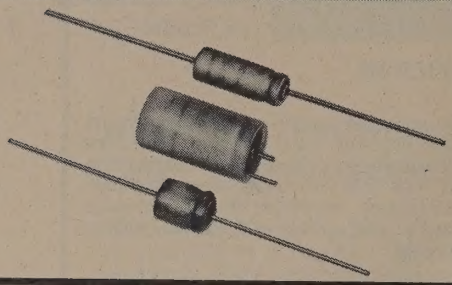
ATC STANDARD CAPACITY VALUES

0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.7, 3.0, 3.3, 3.6, 3.9, 4.3, 4.7, 5.1, 5.6, 6.2, 6.8, 7.5, 8.2, 9.1, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91, 100, 110, 120, 130, 150, 160, 180, 200, 220, 240, 270, 300, 330, 360, 390, 430, 470, 510, 560, 620, 680, 750, 820, 910, 1000, 1,200, 1,500, 1,800, 2,000, 2,200, 2,700, 3,300, 3,900, 4,700, 5,000, 5,600, 6,800, 8,200, 10,000, 12,000, 15,000, 18,000, 20,000, 22,000, 27,000, 33,000, 39,000, 47,000, 50,000, 56,000, 68,000, 82,000, 100,000, 120,000, 150,000, 180,000, 200,000, 220,000, 270,000, 330,000, 390,000, 470,000, 500,000, 560,000, 680,000, 820,000, 1,000,000

merican technical ceramics

ORDEN LANE, HUNTINGTON STATION, N.Y. 11746 • 516/271-9600 • TWX-510-226-6993

Amperex ELECTROLYTIC Capacitors



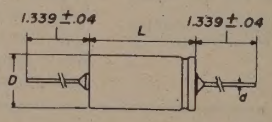
Amperex high quality, low cost electrolytic capacitors e small size, high capacitance and long service life. Lo leakage currents are achieved through the use of hi purified materials and carefully controlled manufacti processes. They are the "dry" type with the liquid electrolyte absorbed into a layer of paper between ca and anode foils. Winding is sealed in an aluminum ca

They are designed to operate at varied efficiencies ove temperature range of −40°C to +85°C. The minim maximum temperatures depend on the application . . increase of impedance and losses are the limiting fac

C426 SERIES (Miniature)

Can Size	Working Voltage (volt)	Capacity (µf)	Insulated	Voltage and Capacitance
1	2.5	10	AS	A10
2	2.5	40	AR	A40
3	2.5	80	AR	A80
4	2.5	160	AR	A160
5	2.5	320	AR	A320
6	2.5	500	AR	A500
1	4	8	AS	B8
4	4	8	AR	B8
2	4	32	AR	B32
3	4	64	AR	B64
4	4	125	AR	B125
5	4	250	AR	B250
6	4	400	AR	B400
1	6.4	6.4	AS	C6.4
2	6.4	25	AR	C25
4	6.4	32	AR	C32
3	6.4	50	AR	C50
4	6.4	100	AR	C100
5	6.4	200	AR	C200
6	6.4	320	AR	C320
1	10	4	AS	D4
2	10	16	AR	D16
3	10	32	AR	D32
4	10	64	AR	D64
5	10	125	AR	D125
6	10	200	AR	D200
1	16	2.5	AS	E2.5
4	16	2.5	AR	E2.5
2	16	10	AR	E10
4	16	16	AR	E16
3	16	20	AR	E20
4	16	40	AR	E40
5	16	80	AR	E80
6	16	125	AR	E125

Can Size	Working Voltage (volt)	Capacity (µf)	Insulated	Voltage and Capacitance
1	25	1.6	AS	F1.6
4	25	1.6	AR	F1.6
2	25	6.4	AR	F6.4
4	25	10	AR	F10
3	25	12.5	AR	F12.5
4	25	25	AR	F25
5	25	50	AR	F50
6	25	80	AR	F80
1	40	1	AS	G1
4	40	1	AR	G1
2	40	4	AR	G4
4	40	6.4	AR	G6.4
3	40	8	AR	G8
4	40	16	AR	G16
5	40	32	AR	G32
6	40	50	AR	G50
4	64	0.32	AR	H0.32
1	64	0.64	AS	H0.64
4	64	0.64	AR	H0.64
2	64	2.5	AR	H2.5
4	64	4	AR	H4
3	64	5	AR	H5
4	64	10	AR	H10
5	64	20	AR	H20
6	64	32	AR	H32



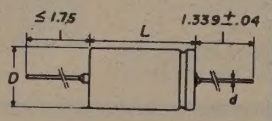
DIMENSIONS (inches)

Can Size	d diam.	INSULATED D	INSULATED L
1	.023	.122 + .012	.394 ± .0
2	.023	.173 + .012	.394 ± .0
3	.023	.228 + .008	.394 ± .0
4	.031	.248 + .008	.709 ± .0
5	.031	.315 + .008	.709 ± .0
6	.031	.394 + .008	.709 ± .0

C437 SERIES (Small)

Can Size	Working Voltage (volt)	Capacity (µf)	Voltage and Capacitance
00	2.5	1000	A1000
01	2.5	1600	A1600
02	2.5	2500	A2500
03	2.5	4000	A4000
00	4	800	B800
01	4	1250	B1250
02	4	2000	B2000
03	4	3200	B3200
*00	6.4	640	C640
*01	6.4	1000	C1000
02	6.4	1600	C1600
03	6.4	2500	C2500
*00	10	400	D400
*01	10	640	D640
*02	10	1000	D1000
03	10	1600	D1600
*00	16	250	E250
*01	16	400	E400
*02	16	640	E640
*03	16	1000	E1000

Can Size	Working Voltage (volt)	Capacity (µf)	Voltage and Capacitance
*00	25	160	F160
01	25	250	F250
02	25	250	F400
03	25	640	F640
00	40	100	G100
01	40	160	G160
02	40	250	G250
03	40	400	G400
*00	64	64	H64
01	64	100	H100
02	64	160	H160
03	64	250	H250



DIMENSIONS (Inches)

Can Size	d (dia)	D	L
00	.031	.394 + .008	1.18 ± .02
01	.031	.492 + .008	1.18 ± .02
02	.031	.591 + .008	1.18 ± .02
03	.031	.709 + .008	1.18 ± .02

AMPEREX ELECTRONIC CORPORATION
Component Division: 35 Hoffman Ave., Hauppauge, N.Y.
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Amperex FIXED-FILM DIELECTRIC Capacitors

LIZED POLYCARBONATE

lic polycarbonate capacitors offer 125°C operation no oltage de-rating, extreme capacitance stability with ere, and low dissipation factor. High insulation lar coupled with small physical size make these oit ideally suited for the most critical applications. ab in 100 VDC, 400 VDC, and 630 VDC.

METALLIZED POLYESTER

Available in 250 VDC rating from .001 mfd to 2.2 mfd. Offer small size and cost advantages and are suitable for all general purpose applications.

C280 SERIES

The mperex C280 Series Flat Film Capacitors are intended for e with printed circuit wiring and are suitable for ub s well as transistorized circuitry. These capacitors re ailable in three voltage ratings: 250 VDC, 400 VDC, nd 30 VDC. Short-time overloading is permited with these co nents. Cap. Tol. ±10% or ±20%.

Die trics used with each voltage series are: 25 — metallized polyester; 400V — metallized po rbonate; 630V — metallized polycarbonate.

ype	Voltage	Dielectric	Capacitance Range	Thickness	Width	Height
80AE	250V	metallized polyester	0.01 μf to 2.2 μf	0.157 to 0.512	0.492 to 1.18	0.443 to 0.886
80CF	400V	metallized polycarbonate	0.01 μf to 1.0 μf	0.157 to 0.512	0.492 to 1.18	0.433 to 0.906
80CG	630V	metallized polycarbonate	0.01 μf to 0.47 μf	0.177 to 0.532	0.492 to 1.18	0.453 to 0.925

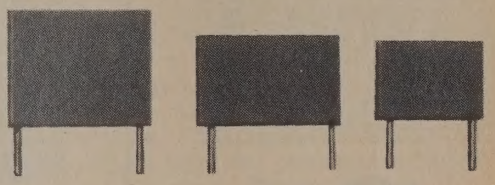
C280M SERIES

Am erex metallized film capacitors are designed for tube or tra istor printed circuit applications. Their flat rectangular sh e ensures stable mounting on printed circuit boards. Th size of these capacitors makes them extremely us l in the miniaturized components field.

Th e capacitors are available in four voltage ratings: 10 VDC, 250 VDC, 400 VDC, and 630 VDC.

M llized polyester is the dielectric used with the 250 volt se s, while metallized polycarbonate is used in the 1 400, and 630 volt series.

Th r technical characteristics are visibly marked on top of th capacitor's body in durable embossed printing.

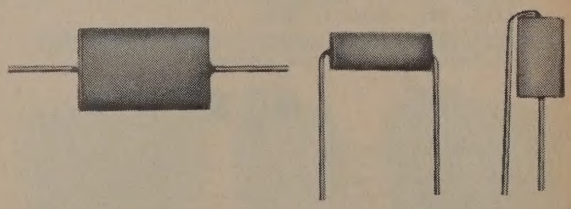


ype	Voltage (VDC)	Dielectric	Capacitance Range (μf)	DIMENSIONS IN INCHES				
				Length	Width	Height	Lead Span	Lead Diam.
0MCH	100	metallized polycarbonate	0.047 to 3.3	0.512 to 1.024	0.177 to 0.374	0.394 to 0.748	0.394 to 0.886	0.024 to 0.031
0MAE	250	metallized polyester	0.01 to 2.2	0.512 to 1.181	0.177 to 0.512	0.394 to 0.925	0.394 to 1.083	0.024 to 0.031
0MCF	400	metallized polycarbonate	0.01 to 1.0	0.512 to 1.181	0.177 to 0.512	0.394 to 0.925	0.394 to 1.083	0.024 to 0.031
0MCG	630	metallized polycarbonate	0.01 to 0.47	0.512 to 1.181	0.177 to 0.512	0.394 to 0.925	0.394 to 1.083	0.024 to 0.031

C281 SERIES

Th s new compact capacitor offers a superior film quality in very respect and is used to replace paper capacitors in qu lity equipment. They can withstand overload and are in ensitive to adverse environmental conditions.

Th Amperex C281 series was designed primarily for use as ge eral purpose capacitors in the entertainment and in ustrial field. In addition, their high permissible AC vo tages make them ideally suitable as an anti-interference ca acitor in small electrical appliances. Their rectangular sh pe ensures wobble-free mounting on PC boards in ei her the vertical or horizontal position.



AILABLE TYPES

Type No.	Voltage	Dielectric	Capacitance Range	Cap. Tol.	DIMENSIONS IN INCHES		
					Length	Width	Height
C281CH	100V	metallized polycarbonate	0.068 μf to 5.6 μf	±10%	0.55 to 1.18	0.34 to 0.86	0.18 to 0.59
C281AB	250V	metallized polyester	0.033 μf to 2.2 μf	±10%	0.55 to 1.18	0.34 to 0.86	0.18 to 0.59
C281CD	400V	metallized polycarbonate	0.01 μf to 1 μf	±10%	0.55 to 1.18	0.34 to 0.86	0.18 to 0.59
C281CG	630V	metallized polycarbonate	0.01 μf to 0.47 μf	±10%	0.55 to 1.18	0.34 to 0.86	0.18 to 0.59

AMPEREX ELECTRONIC CORPORATION
Component Division: 35 Hoffman Ave., Hauppauge, N.Y.
Telephone: 516-234-7000 TWX 510-227-8552

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A NORTH AMERICAN PHILIPS COMPANY

Amperex Variable Capacitors

FILM DIELECTRIC TRIMMERS

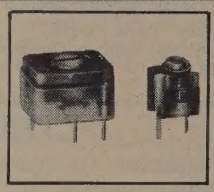
CO10 and HT10 Series

Amperex Film Dielectric Trimmers are state-of-the-art with regard to dielectrics used and construction. The excellent characteristics of polyethylene and PTFE films now also are available for trimmer applications. A few advantages of Film Dielectric Trimmers are:

- excellent adjustment accuracy
- limited program covers wide trimming range
- new constructional concept achieves attractive dimensions with corresponding space savings
- reduced cost

Technical Specifications

STYLE CO10 — POLYETHYLENE DIELECTRIC			
Description	CO10KA/10E	CO10KA/20E	CO10MA/60E
Capacitance swing	>10pf	>20pf	>60pf
Zero capacitance	<2pf	<2pf	<5.5pf
Temp. coefficient/deg C	(−200 ± 300) .10-6	(−350 ± 250) .10-6	(−200 ± 300) .10-6
Temperature range	−40 to +70°C		
Working voltage	100 VDC		
STYLE HT10 — PTFE DIELECTRIC			
Description	HT10KA/29	HT10KA/218	HT10MA/550
Capacitance swing	>9pf	>18pf	>50pf
Zero capacitance	<2pf	<2pf	<5pf
Temp. coefficient/deg C	(−400 ± 300) .10-6	(−400 ± 300) .10-6	(−500 ± 200) .10-6
Temperature range	−40 to +125°C		
Working voltage	100 VDC		



2222 — 809 — 050/070 Series

These capacitors have been designed for us in miniaturized measuring and telecommun cation equipment. Four types are available single-stator (6 x 8 mm), single-stator (11 x 1 mm), split-stator (11 x 14 mm), and differentia trimmers (11 x 14 mm). Single-stator trimmer are suitable for fine adjustment of h.f. tune circuits, split-stator trimmers for symmetri cally built h.f. circuits, and differential type for capacitive volume or voltage control.

Technical Specifications

Catalogue Number 2222 809 . . .	Cap. Swing (pF)	Zero Cap. (pF)	Accuracy of Adjustment (pF)	Working Voltage	Temp. Coefficient/°C
05001	≥ 3	≤1	<0.01	500 VDC	(−200 ± 150) 10-6
05002	≥ 9	≤1.8	<0.02	500 VDC	(−250 ± 75) 10-6
05003	≥ 18	≤2	<0.03	500 VDC	(−250 ± 75) 10-6
07004	≥ 20	≤2	<0.03	350 VDC	(−150 ± 150) 10-6
07008	≥ 40	≤4	<0.03	350 VDC	(−150 ± 150) 10-6
07011	≥ 60	≤4	<0.05	350 VDC	(−150 ± 150) 10-6
07013	≥ 80	≤4	<0.05	350 VDC	(−150 ± 150) 10-6
07015	≥100	≤4	<0.605	350 VDC	(−150 ± 150) 10-6

TUBULAR CERAMIC TRIMMERS

2222 — 802 — 20011/15 Series

These capacitors have been designed for the precision trimming of industrial equipment which operates at the higher frequencies. Their simple form of construction guarantees high reliability and facilitates, moreover, a high breakdown voltage, good stability and high adjustment accuracy. For many applications the negative temperature coefficient characteristics results in adequate compensation at various temperatures. The small dimensions contribute to the miniaturization of electronic equipment.

Technical Specifications

Catalog Number 2222 802	Capacitance Swing (pF)	Zero Capacitance (pF)	Temp. Coeff. (10-6/°C)	Working Voltage
20011	≥ 3	≤0.5	− 10 ± 60	500 VDC
20012	≥4.5	≤0.6	− 10 ± 60	500 VDC
20013	≥ 6	≤0.7	− 10 ± 60	500 VDC
20014	≥ 9	≤0.9	−250 ± 250	500 VDC
20015	≥ 12	≤1.0	−250 ± 250	500 VDC

C004 Series

Specifically designed for UHF applications in radio and TV receivers. Their negative temperature coefficient provides a favorable compensation at varying temperature conditions. Excellent quality level is maintained by a high degree of production mechanization. Available in three standard and one miniature dimension style which provide economical means of meeting the most accepted mounting techniques used in the radio and TV industry. The basic trimmer design consists of an internally-ground ceramic tube matched to a threaded invar rotor spindle; both ends are slotted for screwdriver adjustment.

Technical Specifications

1. Standard Dimension Styles
   Capacitance Range: 3 pf to 12 pf
   Temp. Coef.: −200 ± 200 PPM/deeC
   Working Voltage: 500 VDC
2. Miniature Dimension Style
   Capacitance Range: 3 pf and 6 pf
   Temp. Coef.: −200 ± 200 PPM/°C (3pf) to −300 ± 200 PPM/°C (6pf)
   Working Voltage: 400 VDC

2222 — 802 — 20001/5 Series

These capacitors have been designed fo the precision trimming of industrial equip ment which operate at the higher frequen cies. Their simple form of constructio guarantees high reliability and facilitates moreover, a high breakdown voltage, goo stability and high adjustment accuracy. Fo many applications the negative tempera ture coefficient characteristic results in adequate compensation of various temperatures. The small dimensions contribute to the miniaturization of electronic equipment.

Technical Specifications

Cat. No. 2222 802...	Capacitance Swing (pF)	Zero Capacitance (pF)	Working Voltage	Temp. Coefficient/°C
20001	≥ 3	≤0.8	500 VDC	(−200 ± 200)10-6
20002	≥ 6	≤0.8	500 VDC	(−200 ± 200)10-6
20003	≥ 9	≤0.9	500 VDC	(−200 ± 200)10-6
20004	≥12	≤1.0	500 VDC	(−200 ± 200)10-6
20005	≥18	≤1.7	500 VDC	(−200 ± 200)10-6

HIGH STABILITY TUBULAR CERAMIC TRIMMERS

2222 — 802 — 96044/72 Series

These trimmers have been designed for u.h.f. applications, where high stability has to be maintained even under severe mechanical conditions, e.g., television aerial amplifiers.

Technical Specifications

Catalog Number 2222 802 960					
Screw Mounting Type	Solder Mounting Type	Cap. Swing (pF)	Zero Cap. (pF)	Temperature Coefficient/°C	Working Voltage
44	51	≥ 3	≤0.8	(−200 ± 150) 10-6	400 VDC
45	52	≥ 6	≤0.8	(−200 ± 150) 10-6	400 VDC
46	53	≥ 9	≤0.9	(−200 ± 150) 10-6	400 VDC
47	54	≥12	≤1.0	(−200 ± 150) 10-6	400 VDC
66	69	≥ 3	≤0.5	(−10 ± 60 10)-6	630 VDC
67	71	≥ 4.5	≤0.6	(−10 ± 60 10)-6	630 VDC
68	72	≥ 6	≤0.7	(−10 ± 60 10)-6	630 VDC
55	57	≥ 3	≤0.8	(−200 ± 150) 10-6	400 VDC
56	58	≥ 6	≤0.8	(−200 ± 150) 10-6	400 VDC

MIDGET TUBULAR CERAMIC TRIMMERS

2222 — 802 — 96035/36 Series

Designed for professional electronic applications, particularly in the domain of miniaturized industrial equipment. Reliability is ensured by the simple construction and good stability.

Technical Specifications

Capacitance Range: 3 pf and 6 pf
Temperature Coefficient: −200 ± 200 PPM/°C (3 pf)
−300 ± 200 PPM/°C (6 pf)
Working Voltage: 400 VDC

AMPEREX ELECTRONIC CORPORATION
Component Division: 35 Hoffman Ave., Hauppauge, N.Y.
Telephone: 516-234-7000 TWX 510-227-8552

Amperex
TOMORROW'S THINKING IN TODAY'S PRODUCTS
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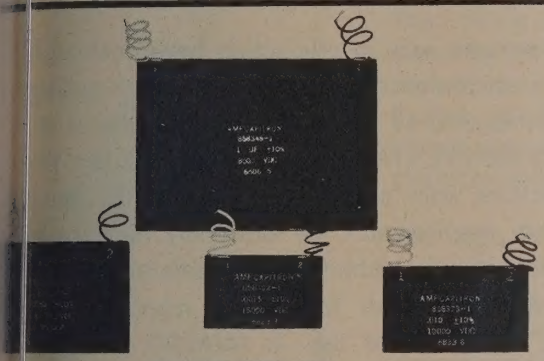
AMPLIFILM★ HIGH VOLTAGE CAPACITORS 2,500 to 60,000 VDC

IDUSTRIAL•MILITARY•COMMERCIAL

e CAPITRON★ Division of AMP Incorporated s specialized in the development of a diversified e of high voltage capacitors that provide out- anding performance characteristics. AMPLI- LM dielectric capacitors feature monolithic con- ruction which results in substantial size and weight reduction, making them particularly suitable for use in high voltage power supplies, modulators, pulse forming networks, etc. AMPLIFILM capacitors, custom or stock, are designed to your exacting requirements as to size, shape and performance.

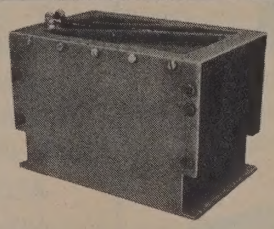


AMPLIFILM★

ER CAPACITORS FOR TEMPERATURES TO 125° C

he basic element in these capacitors is AMP's AM IFILM dielectric, interleaved with copper foils and bo d with a non-polar thermoplastic resin specially se ed for its excellent dielectric qualities. Heavy gage fo nd molded construction combine to make these co onents ideal for rugged high voltage oil-filled or en sulated assemblies.

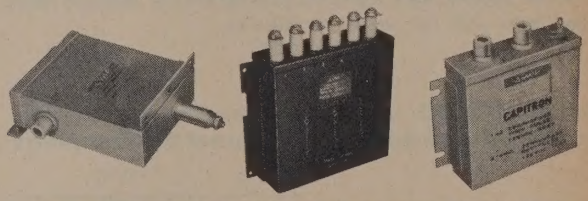
- erating temperature: −55° C to +125° C
- pacitance range: 100 μμf to 1.0 μf
- tage range: 2,500 to 60,000 volts DC
- wer factor: 0.5% max.
- gh insulation resistance
- nforms to MIL-C-19978 where applicable
- isture resistant
- ry low dielectric absorption: less than 0.2%
- fer sizes from 1 sq. in. to 36 sq. in.
- ny configurations available



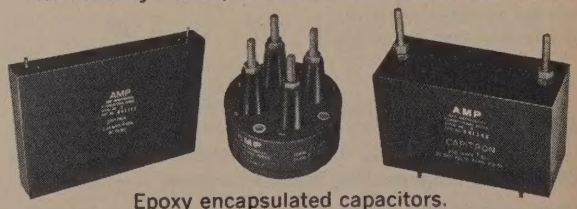
A typical AMPLIFILM capacitor assembly. Even **before encapsulation,** the exclusive dielectric construction provides moisture resistance meeting MIL-STD-202 (Method 106), making possible an energy efficiency greater than 0.6 joules per cubic inch without the encumbrance of a metal case.

- Capacitance: 0.1 μf ± 5%
- Voltage rating: 40,000 volts DC
- Power factor: 0.5% max.
- Temperature Range: −55° C to +100° C
- Size: 4½" x 4½" x 6½" max. (exclusive of frame)
- Weight: 9½ lbs. (exclusive of frame)

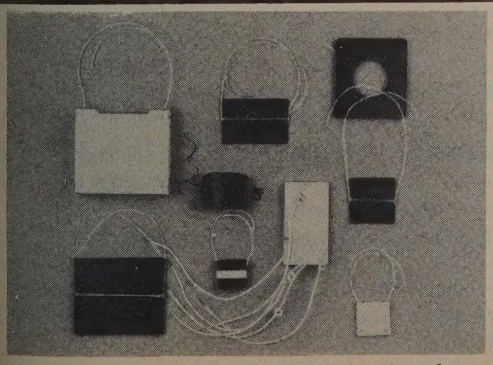
CUSTOM-PACKAGED AMPLIFILM HIGH VOLTAGE CAPACITORS



Hermetically sealed, oil-filled, metal cased capacitors.



Epoxy encapsulated capacitors.



Configuration variety of AMPLIFILM ★ wafers.

omplete information write for 858 Series AMPLIFILM capacitor catalog.

CAPITRON DIVISION, AMP INCORPORATED
155 PARK STREET, ELIZABETHTOWN, PA. 17022.
TWX: 510-657-4561 • PHONE: 717-367-1105.

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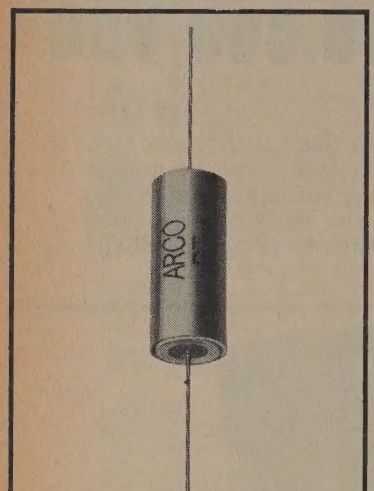
INCORPORATED

NOTE: See other CAPITRON High Voltage products under Catalog Sections 2100 and 4000.

PFC
Manufacturing Division
ARCO ELECTRONICS

precision polystyrene capacitors



for military applications and hostile environments

type PT, CT and ST tubular

type PB, CB and SB rectangular bathtub cans

hermetically-sealed — metal case

Design innovations and extreme care in production have enabled ARCO to approach the optimum performance characteristics of the polystyrene film. These capacitors will exceed all performance requirements of MIL-C-19978 under ALL ENVIRONMENTAL CONDITIONS specified therein. ARCO polystyrene capacitors were specifically designed for the most critical applications where requirements for extremely high insulation resistance, high Q, extraordinary stability, close tolerance, and low dielectric absorption and dissipation factor are mandatory. These capacitors are intended primarily for use in ANALOG and DIGITAL COMPUTERS, CALCULATORS, HIGH Q TUNED CIRCUITS, INTEGRATORS, PRECISION FILTER CIRCUITS, PULSE NETWORKS, SERVO SYSTEMS, and as REFERENCE CAPACITORS.

specifications

DISSIPATION FACTOR: When measured at or referred to 1kHz the dissipation factor shall not exceed the following
.0001 at 23°C
.0002 at 85°C

INSULATION RESISTANCE: Insulation resistance when measured at the applicable test temperature, shall equal or exceed the following values

	23°C	*85°C
megohm x mfd	10^6	1.5×10^5
except the insulation resistance in megohms need not exceed	10^8	10^6

*NOTE: verified on 100% of production

DIELECTRIC ABSORPTION: When tested in accordance with paragraph 4.6.15 of MIL-C-19978, the dielectric absorption shall not exceed 0.05% over the entire operating temperature range.

OPERATING TEMPERATURE RANGE: The ARCO capacitor types listed can be used for continuous operation from −55°C to +85°C without derating. Transient exposure to +95°C will have NO DELETERIOUS effect.

TEMPERATURE COEFFICIENT: The following temperature coefficient variants are available—
Type PT & PB negative 120 ±15 PPM/°C
Type ST & SB negative 120 ±15 PPM/°C
Type CT & CB negative 175 ±15 PPM/°C

STABILITY: Long term (1 year) capacitance drift under maximum operating conditions shall not exceed the following limits for the types listed.
Type PT & PB ±0.1%
Type CT & CB ±0.1%
Type ST & SB ±0.05%

VOLTAGE RATING: All ARCO capacitors are available in 100, 200, 300, 600 and 1,000 Volts DC ratings. Special voltages can be supplied upon request or to specification.

CAPACITANCE TOLERANCE: ARCO specializes in precision capacitors. Available from standard production are tolerances of ±10%, ±5%, ±3%, ±2%, ±1%, ±½%, ±¼%, ±0.1%.

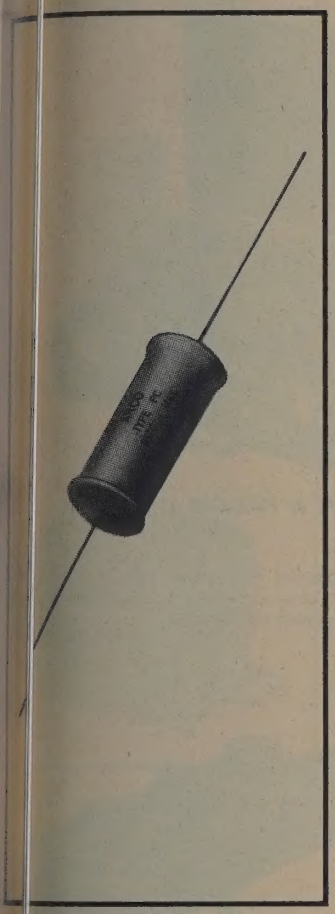
BURN-IN: All ARCO capacitors are subjected to a minimum of two 16 hour burn-in periods with 300% of rated voltage applied at 85°C.

CONSTRUCTION: All ARCO precision polystyrene capacitor types here listed are hermetically sealed in metal cases with compression glass-to-metal, solder-sealed terminals. They are wound with a SOLID CORE in the center for optimum stability, and are terminated with a disc lead assembly soldered directly to the extended foil for a completely NON-INDUCTIVE construction resulting in the lowest possible contact resistance and exhibiting complete FREEDOM FROM MICROPHONISM.

PFC Manufacturing Division • ARCO ELECTRONICS INC • Community Drive, Great Neck, N. Y. 11022 • (516) 487-0500—Ext. 717 or 7

PFC
Manufacturing Division
ARCO ELECTRONICS

precision polystyrene capacitors



superior environmental protection at low cost—smallest size

type PC & PJ tubular
type SC & SJ tubular

The unique design of Arco Type PC capacitors provides physical and electrical stability, ruggedness and strength of termination, and excellent uniformity in production. All these features enable tight control of the narrow specification limits published. Type PC offers the smallest, lowest cost construction available, while retaining optimum performance characteristics.

The Type PC enclosure provides unusual protection against moisture, solvents and inadvertent contact with a soldering iron. The rugged, heat resistant jacket material makes Type PC particularly suited to printed circuit dip-solder assemblies subject to solvent cleaning and also to densely packed component structures where there is danger of damage to adjacent units while making solder connections.

Extensive evaluation has confirmed the excellent moisture resistance of the type PC (surpassed only by metal cased enclosures) and its conformance to the most stringent shock and vibration specifications. Type PC capacitors are exceptionally well suited for PRECISION FILTERS, DELAY LINES, and PRECISION TIMING CIRCUITS, where small size and excellence of performance are mandatory at LOW COST.

specifications (See Page 2170 for Electrical Characteristics)

CONSTRUCTION: The ARCO precision polystyrene capacitors types PC & PJ are encased in an irradiated polyolefin jacket sealed with bonded silicone rubber. Types PJ & SJ are encased in a silicone treated fused polystyrene jacket. This unique construction economically protects the excellent electrical characteristics exhibited in types PC and SC and is primarily intended for use where they will not be subjected to the following hazards:

1. Physical damage due to excessive heat during dip or flow solder assembly.
2. Solvent damage during cleaning operations
3. Exposure to excessive humidity for prolonged periods of time.

All types herein listed are wound with a SOLID CORE in the center for optimum stability, and are terminated with a disc lead assembly soldered directly to the extended foil for a completely NON-INDUCTIVE construction resulting in the lowest possible contact resistance and exhibiting complete FREEDOM FROM MICROPHONISM.

PFC
Manufacturing Division
ARCO ELECTRONICS

precision standards Continued

specifications:

TEMPERATURE COEFFICIENT

.0001 to .1 mfd. +40 ±15 ppm/°C.
0.2 to 1.0 mfd. −120 ±15 ppm/°C.

MAXIMUM VOLTAGE

.0001 to 0.04 mfd. 500 volts peak.
.05 to 1.0 mfd. 300 volts peak.

ACCURACY OF CALIBRATION

±0.1% +0.5 mmf. of nominal printed on capacitor at 1000 cycles frequency and 23°C.

LONG TERM STABILITY

±0.05% +0.1 mmf.

INSULATION RESISTANCE

5000 megohm-microfarads or 50,000 megohms, whichever is the lesser.

DISSIPATION FACTOR

.0001 to .0004 mfd. — 0.15%
.0005 to .001 mfd. — 0.1%
.002 to 1.0 mfd. — 0.05%

CASE SIZE

All standards up to 0.5 mfd. have mounting base 1 9/16″ long by 15/16″ wide. .001 to 0.1 mfd. is 1 5/16″ high. 0.2 to 0.5 mfd. is 2 7/32″ high. 0.6 to 1.0 mfd. is 2 15/16″ high, 1 9/16″ wide, 1 11/16″ deep. Height dimension excludes banana plugs. Plug spacing ¾″.

Part No.	Cap. Mfd.	Max. Diss. Factor	Min. Leak. Resist. Megohms
SS-101	.0001	.0015	50,000
SS-201	.0002	.0015	50,000
SS-301	.0003	.0015	50,000
SS-401	.0004	.0015	50,000
SS-501	.0005	.001	50,000
SS-601	.0006	.001	50,000
SS-701	.0007	.001	50,000
SS-801	.0008	.001	50,000
SS-901	.0009	.001	50,000
SS-102	.001	.001	50,000
SS-202	.002	.0005	50,000
SS-302	.003	.0005	50,000
SS-402	.004	.0005	50,000
SS-502	.005	.0005	50,000
SS-602	.006	.0005	50,000
SS-702	.007	.0005	50,000
CC-802	.008	.0005	50,000
SS-902	.009	.0005	50,000
SS-103	.01	.0005	50,000
SS-203	.02	.0005	50,000
SS-303	.03	.0005	50,000
SS-403	.04	.0005	50,000
SS-503	.05	.0005	50,000
SS-603	.06	.0005	50,000
SS-703	.07	.0005	50,000
SS-803	.08	.0005	50,000
SS-903	.09	.0005	50,000
SS-104	.1	.0005	50,000
SS-204	.2	.0005	100,000
SS-304	.3	.0005	100,000
SS-404	.4	.0005	100,000
SS-504	.5	.0005	100,000
SS-604	.6	.0005	100,000
SS-704	.7	.0005	100,000
SS-804	.8	.0005	100,000
SS-904	.9	.0005	100,000
SS-105	1.0	.0005	100,000

NOTE: Peak voltage for capacity values from .0001 mfd. to .04 mfd. is 500 volts. From .05 mfd. to 1.0 mfd. is 300 volts.

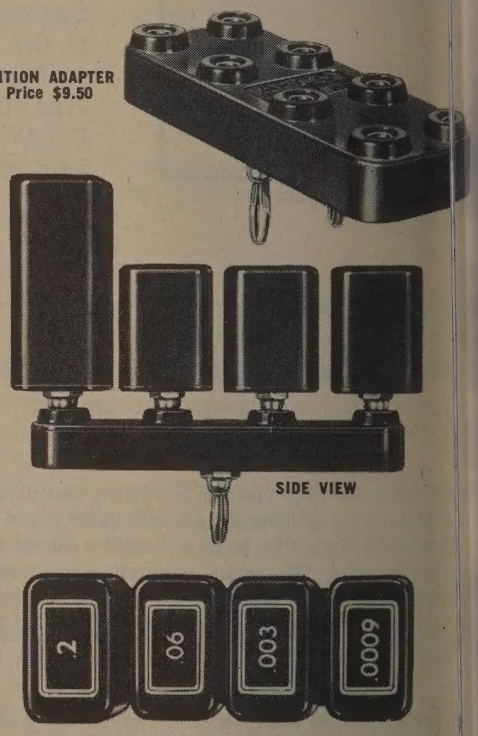
COMPLETE SETS OF PRECISION STANDARDS

KIT #SS-32

Complete Set of 32 Precision Standards ranging from .0001 to .5 mfd. as listed on opposite page. (Dimensions: 11⅜ w x 9⅜ h x 3⅝ d) plus 4 POSITION ADAPTER. Including handsome, durable carrying case.

NET PRICE $

4 POSITION ADAPTER
Net Price $9.50

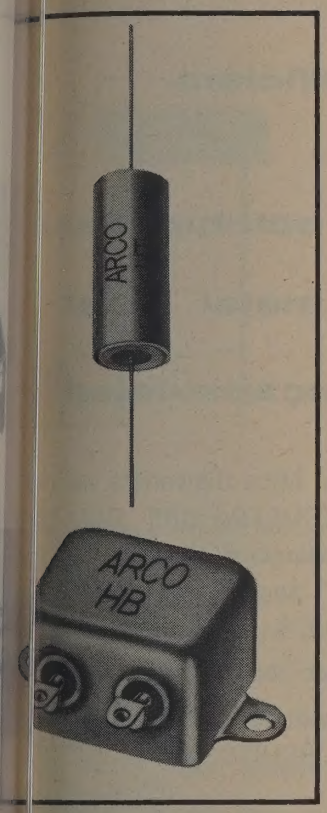


TOP VIEW .2639 mfd. ±0.1%

By quick and easy insertion of ARCO Standard Capacitors into the adapter jig capacitance value of four significant figures with an accuracy of 0.1% is obtained.

FC
ing Division
TRONICS

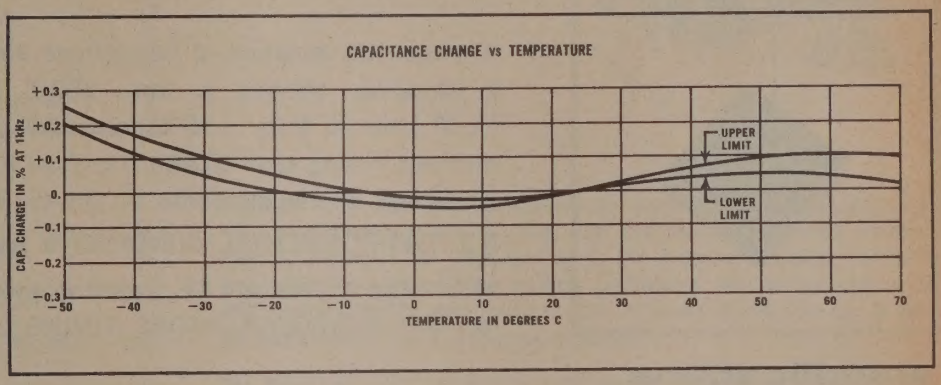
modified polystyrene capacitors



temperature-stable
small size
type HT tubular
type HB rectangular bathtub cans
hermetically sealed — metal case

An exclusive ARCO design modifying the temperature characteristics of the dielectric film to provide capacitors insensitive to temperature changes (±0.1% change to 85°C). Type HT and HB capacitors will meet ALL ENVIRONMENTAL REQUIREMENTS OF MIL-C-19978.

ARCO Type HT and HB capacitors are specifically designed for INTEGRATORS, PRECISION TIMING CIRCUITS, and PRECISION RC NETWORKS.



pecifications

ION FACTOR: When measured at or referred to 1kHz the dissipat factor shall not exceed 0.002 at 23°C

ION RESISTANCE: Insulation resistance when measured at the app able test temperature, shall equal or exceed the following values

	23°C	*85°C
megohm x mfd	10^6	1.5×10^5
ext the insulation resistance megohms need not exceed	10^8	10^6

*NOTE: verified on 100% of production

PER NG TEMPERATURE RANGE: The ARCO capacitor types listed can be ed for continuous operation from −55°C to +85°C without de ng. Transient exposure to +95°C will have NO DELETERIOUS eff .

EM ATURE COEFFICIENT: The temperature coefficient of ARCO type HT d HB capacitors is controlled so that the variation of capacitance fr room temperature to 85°C. is less than ±0.1%; from room te erature to −55°C. variation is less than ±0.25%. Tighter contr s available to special order (±0.05% from 10°C to 50°C).

DIELECTRIC ABSORPTION: When tested in accordance with paragraph 4.6.15 of MIL-C-19978, the dielectric absorption shall not exceed 0.05% over the entire operating temperature range.

STABILITY: Long term (1 year) capacitance drift under maximum operating conditions shall not exceed ±0.1%.

VOLTAGE RATING: ARCO type HT and HB capacitors are produced in 100 Volt DC rating. Other voltages to 1,000 volts can be supplied upon request.

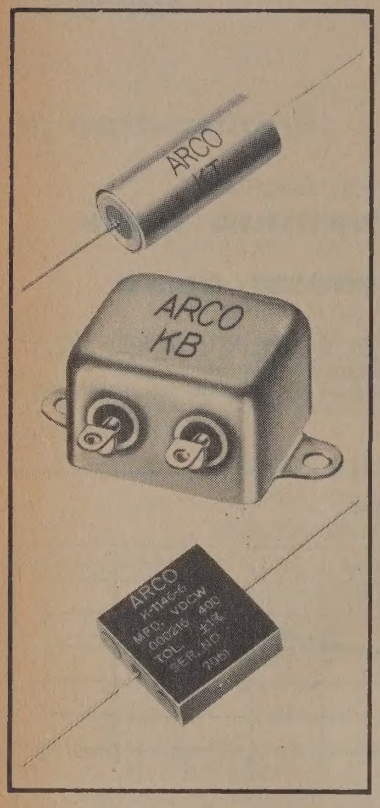
CAPACITANCE TOLERANCE: ARCO specializes in precision capacitors. Available from standard production are tolerances of ±10%, ±5%, ±3%, ±2%, ±1%, ±½%, ±¼%, ±0.1%.

BURN-IN: All ARCO capacitors are subjected to a minimum of two 16 hour burn-in periods with 300% of rated voltage applied at 85°C.

CONSTRUCTION: ARCO type HT and HB capacitors are hermetically sealed in metal cases with compression glass-to-metal, solder-sealed terminals. They are wound with a SOLID CORE in the center for optimum stability, and are terminated with a disc lead assembly soldered directly to the extended foil for a completely NON-INDUCTIVE construction resulting in the lowest possible contact resistance and exhibiting complete FREEDOM FROM MICROPHONISM.

PFC
Manufacturing Division
ARCO ELECTRONICS

polystyrene and mica precision capacitors



zero temperature coefficient

type KT tubular

type KB rectangular bathtub cans

hermetically sealed — metal case

type KE flat epoxy encapsulated

A unique combination of Polystyrene and Mica dielectrics resulting a capacitor offering a truly ZERO TEMPERATURE COEFFICIENT (±10 ppm/°C from −55°C to +85°C standard production) with the ultimate in long term STABILITY. Type KT and KB capacitors will meet or exceed all requirements of MIL-C-19978, where applicable, under ALL ENVIRONMENTAL CONDITIONS specified therein.

ARCO Type KT, KB, and KE capacitors provide the utmost in performance for PRECISION-OSCILLATORS, TIMING CIRCUITS, and RC NETWORKS.

specifications

DISSIPATION FACTOR: When measured at or referred to 1kHz the dissipation factor shall not exceed the following
.001 @ 23°C

INSULATION RESISTANCE: Insulation resistance when measured at the applicable test temperature, shall equal or exceed the following values

	23°C	*85°C
megohm x mfd	10^5	10^3
except the insulation resistance in megohms need not exceed	10^6	10^4

***NOTE:** verified on 100% of production

OPERATING TEMPERATURE RANGE: The ARCO capacitor types listed can be used for continuous operation from −55°C to +85°C without derating. Transient exposure to +95°C will have NO DELETERIOUS effect.

TEMPERATURE COEFFICIENT: The temperature coefficient of Arco Type KT, KB, and KE capacitors is truly zero, they are usually produced to a tolerance of ±10 ppm/°C. They can also be produced to zero ±5 ppm°/C. The linearity of the temperature coefficient regardless of tolerance is ±1 ppm/°C. Other temperature coefficient centers may be supplied within the range of −100 to +20 ppm/°C THE TEMPERATURE COEFFICIENT OF THESE CAPACITORS **is tested on a 100% basis.** Data verifying these tests can be supplied at NO EXTRA COST as requested.

DIELECTRIC ABSORPTION: When tested in accordance with paragraph 4.6.15 of MIL-C-19978, the dielectric absorption shall not exceed 1.0% over the entire operating temperature range.

STABILITY: Long term (1 year) capacitance drift under maximum operating conditions shall not exceed ±0.05%.

VOLTAGE RATING: Arco Type KT, KB, and KE capacitors are available 100, 200, and 400 volts DC ratings (all supplied in the same case size). Other voltages up to 1,000 volts can be supplied upon request.

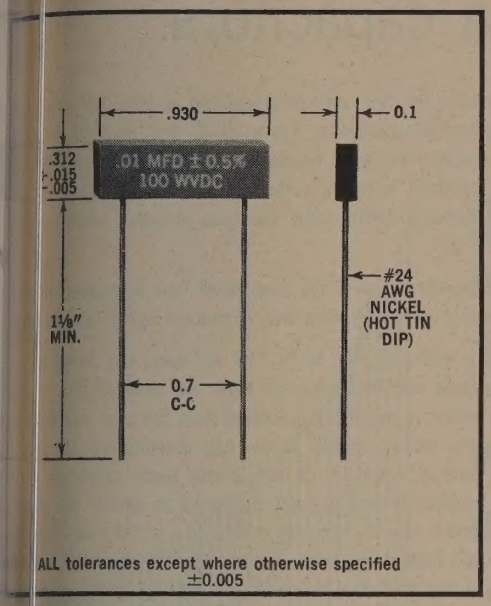
CAPACITANCE TOLERANCE: ARCO specializes in precision capacitors. Available from standard production are tolerances of ±10%, ±5%, ±3%, ±2%, ±1%, ±½%, ±¼%, ±0.1%.

BURN-IN: All ARCO capacitors are subjected to a minimum of two 16 hour burn-in periods with 300% of rated voltage applied at 85°C.

CONSTRUCTION: The Arco Type KT, KB, and KE capacitors are constructed by a unique combination of polystyrene dielectric section with a linear negative temperature coefficient cross compensating a mica dielectric capacitor section with a linear positive. The polystyrene capacitor section is wound with a SOLID CORE in the center for optimum stability, and is terminated with a dual lead assembly soldered directly to the extended foil for a completely NON-INDUCTIVE construction resulting in the lowest possible internal resistance. The mica capacitor section is the well known Arco-Elmenite capacitor exhibiting highest reliability and performance characteristics. The individual capacitor sections as well as their combination have been constructed so as to guarantee all performance characteristics listed as well as complete FREEDOM FROM MICROPHONICS.

PFC
Manufacturing Division
ARCO ELECTRONICS

polystyrene capacitors

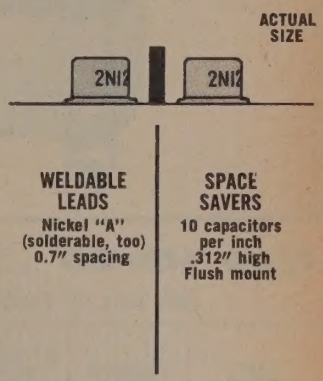


type PE

Arco PFC Division announces availability of a new polystyrene dielectric capacitor with a thin configuration specifically designed for conservation of space in printed circuits and in filters. Flat polystyrene sections are encapsulated in uniform epoxy preforms to provide the following features:

0.1" thickness

Uniform lead spacing for p-c use.
Uniform size and flush mounting.
Both weldable and solderable leads.
Rugged, moisture proof construction.



specifications

CAPACITANCE RANGE: .001 to .01 mfd
TOLERANCE: ±5%, ±2%, ±1%, ±½%, ±¼%, ±0.1%.
VOLTAGE RATING: 100VDCW
INSULATION RESISTANCE: 10^{13} ohms minimum at 25°C — 10^{12} ohms at 85°C.
DISSIPATION FACTOR: 0.01% maximum at 25°C, — 0.02 maximum at 85°C.
DIELECTRIC ABSORPTION: 0.05% maximum at all temperatures.
TEMPERATURE COEFFICIENT: Negative 190 ±30 ppm/°C
LONG TERM OPERATING STABILITY: ±0.1% maximum drift under fixed or variable operating conditions within specified maximum limits.

All the above design advantages are accompanied by modest prices and quick delivery. Any value within the standard range (.001 mfd. to .01 mfd.) is in stock in all tolerances for immediate delivery (72 hours).

In addition to the physical advantages of this design, the electrical excellence of ARCO polystyrenes has been retained. High long term stability under maximum operating conditions, low dissipation factor and dielectric absorption, extremely high insulation resistance, close tolerance are featured. And also important is the ARCO control of quality which results in close uniformity not only from unit to unit, but from production lot to production lot as well.

The Nickel "A" leads of ARCO Type PE capacitors are welded directly to the capacitor section. The strength and permanence of electrical contact is thereby entirely independent of encapsulation.

All Arco Type PE capacitors are "debugged" 100% prior to shipment by accelerated life test at stress levels exceeding ratings to eliminate potential early failures. Extensive data on reliability of Arco polystyrene capacitors is available for documentation

precision RC networks

The ultimate in temperature coefficient control of RC product.

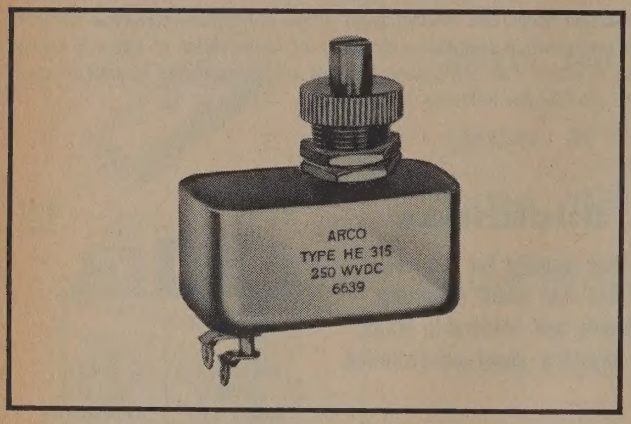
Linear TC of ±5 ppm/°C over temperature range of −55°C to +85°C.

ARCO's ability to produce capacitors with adjustable and closely uniform characteristics has facilitated the design of highly precise RC networks. By matching zero temperature coefficient resistors and capacitors, or by balancing temperature coefficients to obtain a zero (or other specified) T.C. on the RC product, networks which have long term stability independent of temperature are obtained. At the same time, RC products of better than ±0.05% accuracy can be supplied. Testing is performed on a 100% basis on both resistors and capacitors with temperature coefficient data recorded at the temperature extremes.

PFC variable compression-type mica capacitors

Manufacturing Division
ARCO ELECTRONICS

hermetically sealed



ARCO introduces the first hermetically-sealed variable compre ion-t mica capacitor. Designated as Types HE-30 and HE-30M, th e u employ a specially designed enclosure that protects them a nst effects of moisture, pressure variation, fungus, salt spray, st, mechanical damage. Additionally, the case provides effectiv elect static shielding.

The basic capacitor design is the time-tested Type 30 padder w est lished reliability verified by more than 25 years of operational e rien

The enclosure measures 1 9/16″ by 15/16″ by 3/4″ deep. The drawn ss is hot tin dipped and all mechanical parts are nickel-plated b s. T capacitor element is completely insulated from the case and c nect is made at the rear by means of two lugs mounted on glass-me seals. The unit is designed for single-hole panel mounting sing 15/32″ — 32 bushing. A bushing nut is furnished as part of the a emb Rotational control can be either by means of a screwdriver sl at end of the 1/4″ shaft or by means of a standard knob of the us's o choice. The rotary shaft seal enhances the stability of the shaf setti under conditions of shock and vibration. For complete lockin of shaft after adjustment, an accessory shaft lock is available. T sha lock also provides redundant humidity protection where the tima in reliability is needed.

The HE-30 is a 250VDC rated series in 14 discreet capacitanc ang from 15-130 PF to 1400-3055 PF. The HE-30M is a 500VDC rate serie also in 14 similar ranges from 15-120 PF to 1200-2525 PF. Th e a guaranteed minimum ranges in three turns of adjustment. Dis atio factor at 1MC is better than .001. Insulation resistance is bet th 100,000 megohms.

Stability of the capacitance varies with the particular setting, ever a conservative design limit is a maximum of ±3% change cause by combinations of temperature cycling, vibration, shock, hystere , et As the extremes of environment are reduced toward laborator cond tions, the stability will be improved at least ten-fold or to ±0.3% Operating temperature range is −55°C. to +85°C.

type HE-30

500 Volts DC Flash-Test — 250 WVDC

PART NUMBER	NUMBER OF PLATES	GUARANTEED RANGE: At 3 Inch Pounds Cap. Will Be More Than MMF.	GUARANTEED RANGE: At 3 Turns Open Cap. Will Be Less Than MMF.
HE-302	2 Pl.	130	15
HE-303	3 Pl.	340	65
HE-304	4 Pl.	550	100
HE-305	5 Pl.	760	190
HE-306	6 Pl.	970	275
HE-307	7 Pl.	1180	350
HE-308	8 Pl.	1390	450
HE-309	9 Pl.	1600	550
HE-310	10 Pl.	1890	650
HE-311	11 Pl.	2110	780
HE-312	12 Pl.	2330	880
HE-313	13 Pl.	2605	1150
HE-314	14 Pl.	2830	1300
HE-315	15 Pl.	3055	1400

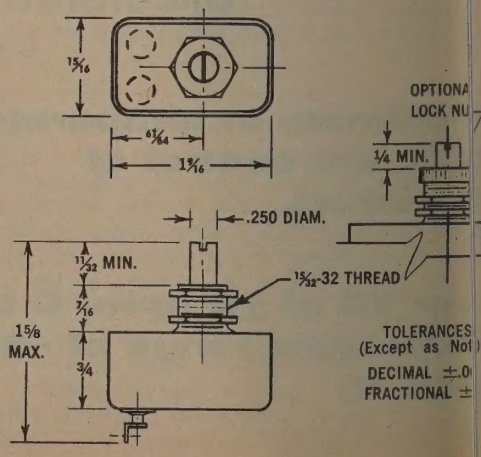
Screw is insulated from capacitor element by mica washer. Above maximum capacity values are based on using 1½ to 1¾ Mil Mica films.

type HE-30M

1000 Volts DC Flash-Test — 500 WVDC

PART NUMBER	NUMBER OF PLATES	GUARANTEED RANGE: At 3 Inch Pounds Cap. Will Be More Than MMF.	GUARANTEED RANGE: At 3 Turns Open Cap. Will Be Less Than MMF.
HE-302-M	2 Pl.	120	15
HE-303-M	3 Pl.	320	65
HE-304-M	4 Pl.	500	100
HE-305-M	5 Pl.	690	180
HE-306-M	6 Pl.	880	265
HE-307-M	7 Pl.	1070	340
HE-308-M	8 Pl.	1260	425
HE-309-M	9 Pl.	1415	525
HE-310-M	10 Pl.	1600	615
HE-311-M	11 Pl.	1785	730
HE-312-M	12 Pl.	1970	800
HE-313-M	13 Pl.	2155	1000
HE-314-M	14 Pl.	2340	1100
HE-315-M	15 Pl.	2525	1200

Screw is insulated from capacitor element by mica washer. Above capacity values are based on using 2 to 2¼ Mil Mica.



If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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UNITED TECHNICAL PUBLICATIONS

Balco marstan
BALCO ELECTRONICS, INCORPORATED
307 Washington Street, Orange, N.J. 07050 · (201) 677-1200

PRECISION FIL CAPACITOR

Balco/Marstan brings together the precision capacitor experience of Balco Capacitors and the precision resistor capability of Marstan Electronics. Balco/Marstan specializes in the design of ultraprecision film capacitors, wirewound resistors, and networks — resistive, capacitive, or RC. The product line — special or standard — is designed for the user who needs a combination of demanding performance parameters such as high stability, low temperature coefficient, and tight tolerance over a wide range of environmental extremes.

BALCO/MARSTAN PLASTIC FILM CAPAC
Feature:

- Accuracy Tolerances to 0.1%
- Dielectric Absorption lower than 0.03%
- Dissipation Factors to 0.008%
- Insulation Resistance greater than 10^{14} ohr
- Retrace Stability lower than 0.02%

DIELECTRIC SELECTOR GUIDE

The following chart lists typical specifications:
Precision and stability factors can be improved by special processing of materials before assembly.

PARAMETER	TEFLON		POLYCARBONATE	POLYSTYRENE	MYLAR	
	Extended Foil	Metalized Film	Metalized Film	Extended Foil	Extended Foil	Metalize Film
Capacitance Range (μF)	0.0005 to 2.0	0.05 to 4.0	0.03 to 20.0	0.001 to 5.0	0.0047 to 2.0	0.0068 to 2
Working Voltage (Vdc)	50 to 600	50 to 600	200 to 600	100 to 600	100 to 600	200 to 60
Stability (retrace after temperature cycling, %)	<0.2	<0.02	<0.10	<0.05	<0.5	<0.3
Temperature Coefficient	−100 ±100 PPM/°C	−90 ±30 PPM/°C	<±100 PPM/°C	−120 ±30 PPM/°C	+3% to 85°C +15% to 125°C	+3% to 8 +15% to 1
Min. Insulation Resistance at 25°C (ohms to 1.0 μF, ohms x μM above 1.0 μF)	$>10^{14}$	$>10^{12}$	$>10^{10}$	$>5x10^{11}$	$>10^{11}$	$>3x10^{1}$
Dissipation Factor at 25°C and 1 kHz (%)	<0.02	<0.05	<0.5	<0.05	<.6	<1
Dielectric Absorption at 25°C (%)	<0.03	<0.03	<0.5	<0.05	<0.5	<0.5
Operating Temperature Range (°C)	−55 to +200	−55 to +200	−55 to +125**	−55 to +85	−55 to +125*	−55 to +
Tolerances (%)						
Standard	1	1	1	5	5	5
Precision	1/4	1/10	1/4	0.5	1	1

* 50% derating above 85°C ** 50% derating above 100°C

TERM	DEFINITION
Dielectric Absorption	Property of dielectric materials, sometimes called dielectric hysteresis, causing current to continue flowing a capacitor is theoretically charged and charge to remain after capacitor is theoretically discharged.
Dissipation Factor	Ratio of the equivalent series resistance to reactance of a capacitor at a given frequency.
Retrace Stability	Measure of the difference in capacitance value at a specific temperature after the capacitor has been exposed t temperature excursion.
Temperature Coefficient	Change in capacitance as a function of temperature, resulting from variations in dielectric constant, capaci geometry, and mechanical stresses.

AP CITOR TYPES

Balco/Marstan uses six different dielectrics to assure you precision capacitors to meet a variety of specifications:

Mylar – ultrastable, low loss, low temperature coefficient material, ideally suited for high insulation resistance requirements at temperatures up to 200°C. Available in extended foil and metalized film.

Polystyrene — ultrastable, very low loss material with a negative temperature coefficient that favors its use in applications at temperatures up to 85°C, where optimum electrical performance is essential. Available in extended foil only.

Polycarbonate — ultrastable material with a low temperature coefficient, for use at temperatures up to 125°C. Available in metalized film only.

Kraft – suggested for temperatures up to 125°C in applications where extreme precision is not required, but size and cost are important factors. Available in extended foil and metalized film.

Two different internal construction styles are offered as options to the circuit design engineer:

Extended Foil — Low dissipation factors and high circulating current capabilities favor its selection for use in high power resonant and pulse circuits.

Metalized Film — Self healing in the event of voltage breakdown, its more uniform temperature coefficient and low volume per microfarad make it ideal for resistor efficient matching and for use in subminiature capacitors.

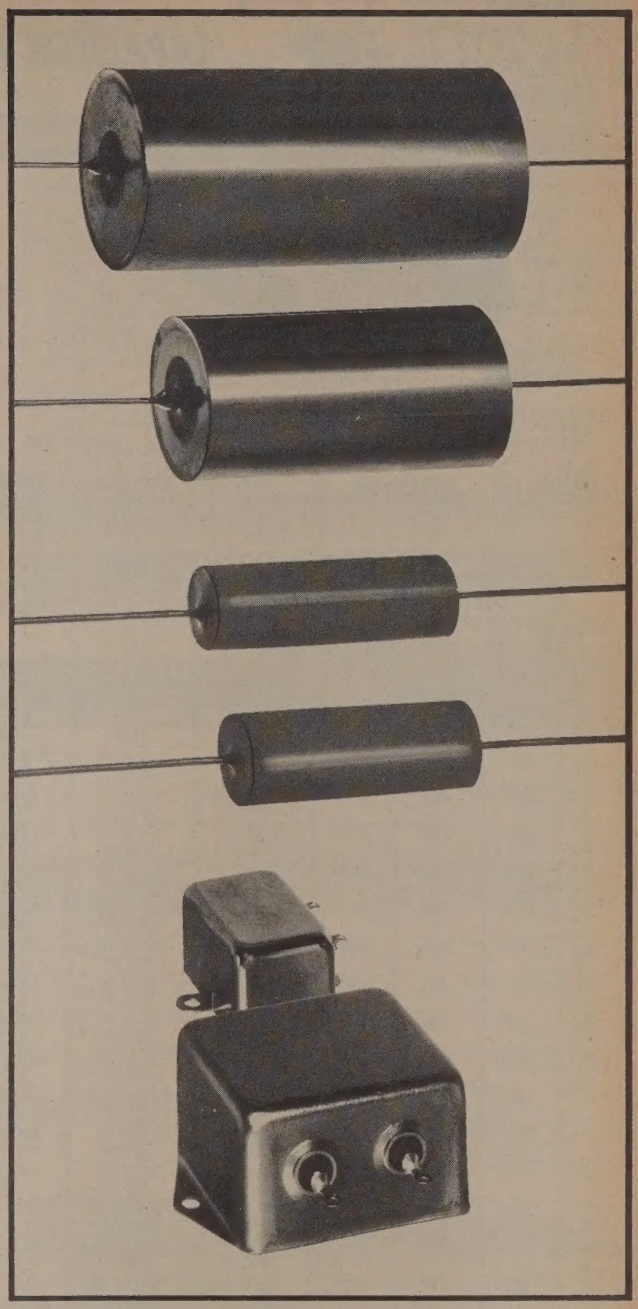
Capacitors can be provided in any of the following packages:

Hermetically Sealed for maximum environmental protection to insure high precision and stability.

Tape Wrap primarily for economy in price and size where severe environments are not involved.

Plastic Encased to provide mechanical ruggedness and moderate environmental protection.

Specials, including plastic and metallic enclosures, designed for custom packaging requirements.

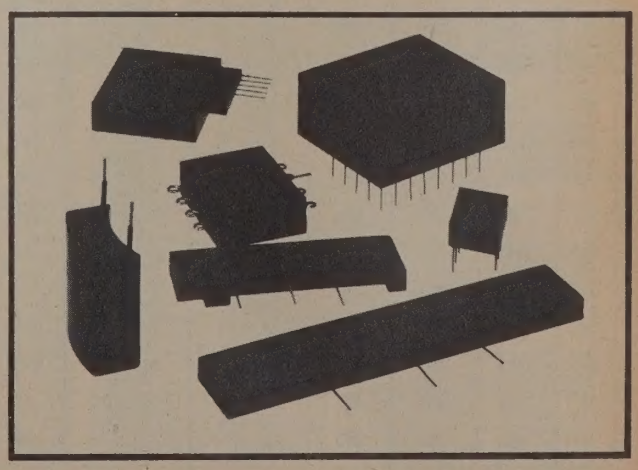


PRECISION NETWORKS

Our unique side by side resistor and capacitor processing insures the ultimate in component compatibility and overall network performance. Resistors and capacitors can be precisely matched to track over wide temperature ranges.

Typical Networks Manufactured by Balco/Marstan:

- Matched impedance Attenuators
- Summing Networks
- Integrators
- Voltage Dividers
- Phase Shifters
- Binary Resistance Networks
- Twin T Networks
- Bridges
- A/D and D/A Converters
- Timing Networks



Balco Marstan

BALCO ELECTRONICS, INCORPORATED **307 Washington Street, Orange, N.J. 07050 • (201) 677-1200**

CAL-R® INC. / CAPACITOR DIVISION

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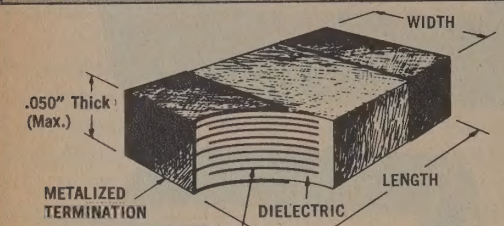
S-CAP 100 SERIES



CRC	I	A	D	121	K
CHIP CAPACITOR STYLE	SIZE	TEMPERATURE CHARACTERISTIC	VOLTAGE C = 25VDC D = 50VDC E = 100VDC F = 200VDC*		TOLERANCE F = ± 1% G = ± 2% J = ± 5% K = ±10% M = ±20%

Capacitance in Pico-farads (pf). The first two digits represent significant figures; the last digit specifies the number of zeros to follow. (120 pf is illustrated.)

*Special quote for 200VDC or higher voltage rating

GENERAL SPECIFICATIONS

1. Capacitance: Capacitance range 1 pf through 3.9 mfd. When measu as lis below at 25°C (Reference MIL-STD 202 Method 305).
2. Capacitance Tolerance: Standard tolerance ±10%, ±20%, and G.M. (G tolerances available on special order.)
3. Dissipation Factor: Measured as listed below at 25°C (Referen MIL 202 Method 305).
4. Insulation Resistance: Greater than 50,000 megohms or 1,000 m hm whichever is less when tested at a minimum of twice rated volt e an accordance with Method 302, of MIL-STD 202.
5. Voltage Rating: See chart (Other voltage ratings available so applications.)
6. Temperature Range: —55°C to +125°C, operating for all valu with voltage derating required.
7. Dielectric Withstanding Voltage: A test potential of 2.5 times ra volt applied between the capacitor terminals for a period of 5±1 seco s wi limiting surge current of 50 m a maximum, in accordance w mat 301 of MIL-STD 202.

Characteristic	Maximum DF @ 25°C	Temperature Charac	
		Zero Volts	Rat Vo
A	.1% when measured @ 1 KHz @ 1 VRMS	± .5%	± .5
B	2.5% when measured @ 1 KHz @ 1 VRMS	±10%	+10 —25
C	2.5% when measured @ 1 KHz @ 1 VRMS	+ 8% —17%	+ 8 —30
D	3.0% when measured @ 1 KHz @ .5 VRMS	+15% —30%*	+15 —50

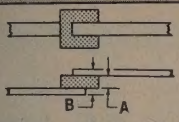
*Over Temp. Range —15° to +85°C

CAL-R 100 SERIES CHIP CAPACITOR GUIDE

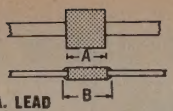
	DIMENSIONS			CAPACITANCE RANGE TEMPERATURE CHARACTERISTICS							
SIZE	L(±.010)	W(±.010)	T(MAX.)	A		B		C		D	
				50V	100V	50V	100V	50V	100V	25V	5V
1	.050	.050	.055	1.0 pf.TO 120 pf	1.0 pf TO 82 pf	100 pf TO 4700 pf	100 pf TO 3300 pf	300 pf TO 6800 pf	300 pf TO 3900 pf	560 pf TO .015 uf	56 pf TO uf
2	.080	.050	.050	1.0 pf TO 180 pf	1.0 pf TO 120 pf	100 pf TO 7200 pf	100 pf TO 4700 pf	300 pf TO .01 pf	300 pf TO 6800 pf	560 pf TO .022 uf	56 pf TO 8 uf
3	.090	.060	.050	1.0 pf TO 220 pf	1.0 pf TO 150 pf	100 pf TO 7000 pf	100 pf TO 5000 pf	300 pf TO .013 uf	300 pf TO 9000 pf	560 pf TO .03 uf	56 pf TO uf
4	.115	.070	.050	1.0 pf TO 370 pf	1.0 pf TO 250 pf	100 pf TO .015 uf	100 pf TO .01 uf	300 pf TO .023 uf	300 pf TO .015 uf	560 pf TO .05 uf	56 pf TO .8 uf
5	.125	.080	.050	1.0 pf TO 470 pf	1.0 pf TO 300 pf	100 pf TO .018 uf	100 pf TO .012 uf	300 pf TO .028 uf	300 pf TO .018 uf	560 pf TO .063 uf	56 pf TO .2 uf
6	.130	.070	.050	10 pf TO 500 pf	10 pf TO 320 pf	100 pf TO .02 uf	100 pf TO .013 uf	300 pf TO .03 uf	300 pf TO .02 uf	560 pf TO .066 uf	56 pf TO .8 uf
7	.170	.055	.050	10 pf TO 560 pf	10 pf TO 390 pf	820 pf TO .022 uf	820 pf TO .015 uf	1000 pf TO .03 uf	1000 pf TO .022 uf	4700 pf TO .077 uf	47 pf TO uf
8	.190	.060	.050	10 pf TO 680 pf	10 pf TO 470 pf	820 pf TO .027 uf	820 pf TO .018 uf	1000 pf TO .042 uf	1000 pf TO .027 uf	4700 pf TO .092 up	47 pf TO uf
9	.200	.080	.050	10 pf TO 1100 pf	10 pf TO 750 pf	820 pf TO .047 uf	820 pf TO .03 uf	1000 pf TO .068 uf	1000 pf TO .047 uf	4700 pf TO .15 uf	47 pf TO uf
10	.085	.080	.050	10 pf TO 330 pf	10 pf TO 270 pf	820 pf TO .013 uf	820 pf TO 8600 pf	1000 pf TO .02 uf	1000 pf TO .013 uf	4700 pf TO .043 uf	47 pf TO .3 uf
11	.110	.120	.050	10 pf TO 450 pf	10 pf TO 300 pf	820 pf TO .018 uf	820 pf TO .012 uf	1000 pf TO .027 uf	1000 pf TO .018 uf	4700 pf TO .06 uf	47 pf TO uf
12	.120	.120	.050	10 pf TO 820 pf	10 pf TO 500 pf	820 pf TO .03 uf	820 pf TO .02 uf	1000 pf TO .045 uf	1000 pf TO .03 uf	4700 pf TO .1 uf	47 pf TO .1 uf
13	.190	.190	.050	150 pf TO 3500 pf	150 pf TO 2300 pf	4700 pf TO .14 uf	4700 pf TO .09 uf	6800 pf TO .21 uf	6800 pf TO .14 uf	.068 uf TO .47 uf	.06 uf TO uf
14	.220	.230	.050	150 pf TO 6500 pf	150 pf TO 4400 pf	6800 pf TO .26 uf	6800 pf TO .18 uf	.01 uf TO .39 uf	.01 uf TO .26 uf	.02 uf TO .9 uf	.0 uf TO uf
15	.250	.165	.050	150 pf TO 4400 pf	150 pf TO 3000 pf	4700 pf TO .18 uf	4700 pf TO .12 uf	6800 pf TO .27 uf	6800 pf TO .18 uf	.012 uf TO .6 uf	.01 uf TO uf
16	.145	.160	.050	50 pf TO 2100 pf	50 pf TO 1400 pf	1800 pf TO .085 uf	1800 pf TO .056 uf	3000 pf TO .12 uf	3000 pf TO .082 uf	6800 pf TO .28 uf	680 pf TO uf
17	.245	.255	.050	220 pf TO 8200 pf	220 pf TO 5000 pf	8200 pf TO .33 uf	8200 pf TO .22 uf	.01 uf TO .49 uf	.01 uf TO .3 uf	.024 uf TO 1.0 uf	.02 uf TO uf
18	.200	.150	.050	68 pf TO 2800 pf	68 pf TO 1800 pf	2500 pf TO .11 uf	2500 pf TO .075 uf	4000 pf TO .17 uf	4000 pf TO .12 uf	.01 uf TO .36 uf	.0 uf TO uf
19	.270	.130	.050	100 pf TO 3400 pf	100 pf TO 2200 pf	3300 pf TO .13 uf	3300 pf TO .09 uf	5000 pf TO .2 uf	5000 pf TO .13 uf	.012 uf TO .44 uf	.01 uf TO uf
20	.290	.140	.050	100 pf TO 4200 pf	100 pf TO 2800 pf	3300 pf TO .17 uf	3300 pf TO .11 uf	5000 pf TO .25 uf	5000 pf TO .17 uf	.012 uf TO .56 uf	.01 uf TO uf
21	.310	.170	.050	150 pf TO 6200 pf	150 pf TO 4000 pf	5600 pf TO .25 uf	5600 pf TO .16 uf	.01 uf TO .36 uf	.01 uf TO .25 uf	.02 uf TO .82 uf	.02 uf TO uf
22	.290	.240	.050	220 pf TO 8500 pf	220 pf TO 5600 pf	8200 pf TO .33 uf	8200 pf TO .22 uf	.012 uf TO .5 uf	.012 uf TO .3 uf	.027 uf TO 1.1 uf	.02 uf TO uf
23	.390	.220	.050	270 pf TO .01 uf	270 pf TO 7500 pf	.01 uf TO .43 uf	.01 uf TO .3 uf	.018 uf TO .68 uf	.018 uf TO .43 uf	.033 uf TO 1.5 uf	.03 uf TO 1 uf
24	.360	.200	.050	270 pf TO 9200 pf	270 pf TO 6000 pf	.01 uf TO .36 uf	.01 uf TO .25 uf	.018 uf TO .54 uf	.018 uf TO .35 uf	.033 uf TO 1.2 uf	.03 uf TO .1 uf
25	.315	.090	.050	68 pf TO 2600 pf	68 pf TO 1800 pf	2700 pf TO .1 uf	2700 pf TO .068 uf	3900 pf TO .15 uf	3900 pf TO .1 uf	8200 pf TO .35 uf	820 pf TO .2 uf
26	.400	.175	.050	220 pf TO 8800 pf	220 pf TO 7500 pf	8200 pf TO .35 uf	8200 pf TO .22 uf	.012 uf TO .5 uf	.012 uf TO .33 uf	.033 uf TO 1.1 uf	.03 uf TO .7 uf
27	.565	.295	.050	680 pf TO .025 uf	680 pf TO .016 uf	.022 uf TO 1.0 uf	.022 uf TO .68 uf	.047 uf TO 1.5 uf	.047 uf TO 1.0 uf	.1 uf TO 3.3 uf	.1 TO 2 uf
28	.625	.325	.050	820 pf TO .03 uf	820 pf TO .02 uf	.027 uf TO 1.2 uf	.027 uf TO .82 uf	.047 uf TO 1.8 uf	.047 uf TO 1.2 uf	.1 uf TO 3.9 uf	.1 TO 2 uf

CAL-R® INC. / CAPACITOR DIVISION · RESISTOR DIVISION · THERMONETICS DIVISION
a subsidiary of CapTech, Inc.
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 451-9761 • TWX 910-3-65

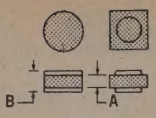
PELLET SERIES



RIBBON OR 30 GA. LEAD
— .003 thk. × .020 wide
× .750 min. length
Alloy 180 Gold plated



30 GA. LEAD
30 ga. 1¼" min. length
Alloy 180 Gold plated



DISC. TERMINATION
.050 Dia. and .100 Dia.
A = Thickness of basic element
B = Total Thickness with termination attached

...TIONS

...L SPECIFICATIONS: SCP PELLET SERIES

...e Rating: 50 WVDC from —55°C +85°C; 25WVDC +85°C to ±150°C.
...um capacitance change with temperature: ±10% of R.T. value @ 1 ...om —15°C to +85°C; +15% —20% from —55°C to +150°C.
...oltage: 2.5 × rated voltage.
...itance: Measured at 25°C ±2°C, 1 KC and .5VRMS.
...itance Tolerance: Available in ±10% and ±20% (±5% tolerance ...).
...ation Factor: 2.5% maximum @ 1 KC 25°C ±2°C and .5VRMS.
...ition Resistance: Greater than 1000 megohm microfarads or 25,000 ...ms @ 25°C.
...nce: For tolerance add the following letter to end of part number: ...5%, K = ±10%, M = ±20%.

...UMBERING GUIDE

	3	A	D	101	J
...yle	Termination Type	Case Size	Voltage	Value	Tolerance

...asic Element	With Disc. Term.	With Ribbon Lead	With 30 Ga. Lead
Diameter dimensions ±.005, thickness dimensions maximum.			
...010 X .050 dia. 47 pf-270 pf	.020 X .050 dia. 47 pf-270 pf	.030 X .050 dia. 22 pf-270 pf	.040 X .050 dia. 22 pf-270 pf
.010 X .1 dia. ...20 pf-1000 pf	.020 X .1 dia. 220 pf-1000 pf	.030 X .1 dia. 100 pf-1000 pf	.040 X .1 dia. 100 pf-1000 pf
...GULAR. All dimensions maximum.			
	.030 X .1 X .1 1200 pf-5600 pf	.045 X .1 X .1 1200 pf-5600 pf	.055 X .1 X .1 1200 pf-5600 pf
	.030 X .125 X .125 6800 pf-12000 pf	.045 X .125 X .125 6800 pf-12000 pf	.055 X .125 X .125 6800 pf-12000 pf
	.030 X .175 X .175 12000 pf-27000 pf	.045 X .175 X .175 12000 pf-27000 pf	.055 X .175 X .175 12000 pf-27000 pf
	.062 X .125 X .125 15000 pf-22000 pf	.075 X .125 X .125 15000 pf-22000 pf	.085 X .125 X .125 15000 pf-22000 pf
	.062 X .2 X .2 33000 pf-100000 pf	.075 X .2 X .2 33000 pf-100000 pf	.085 X .2 X .2 33000 pf-100000 pf

GENERAL SPECIFICATIONS: CNP PELLET SERIES

1. Capacitance Tolerance: Available in F = ±1%; G = ±2%; J = ±5%; K = ±10%; M = ±20%; Z = GMV.
2. Dissipation Factor (DF): 0.1% maximum for values of 10 pf through 3300 pf.
3. Voltage Rating: D = 50 VDC; E = 100 VDC.
4. Capacitance and DF Measurements: Tested IAW with Method 305 of MIL-STD 202. Values of 1000 pf or less: 1 MHz ± 1 KHz. Values over 1000 pf: 1 KHz ± 100 Hz. Test Voltage: 1.0 ±0.2 Volts rms.
5. Insulation Resistance (IR): When tested IAW Method 302 of MIL-STD 202, 50 Volts DC applied, the insulation resistance shall be 100,000 megohms minimum or 1000 megohm microfarads, whichever is less.
6. Dielectric Withstanding Voltage: A test voltage equal to 250% of rated DC voltage current limited to 50 MA.

SCP SERIES and CNP SERIES

1. Protective Coating: Thin film resin impregnated to withstand normal handling and storage.
2. Maximum allowable lead run-up: .025" unless otherwise specified.
3. Terminations: Solderable and weldable ribbon leads, disc terminations, or 30 gauge wire leads.

PART NUMBERING SYSTEM

CNP	3	D	D	151	J
NPO Style	Termination Type	Case Size	Voltage	Value	Tolerance

Case Size	Basic Element (1)	With Disc Term. (2)	With Ribbon Lead (3)	With 30 Ga. Lead (4)
ROUND. Diameter dimensions ±.005, thickness dimensions maximum.				
A	.010 X .050 dia. 1 pf-3.3 pf	.020 X .050 dia. 1 pf-3.3 pf	.030 X .050 dia. 1 pf-3.3 pf	.040 X .050 dia. 1 pf-3.3 pf
B	.010 X .1 dia. 3.9 pf-10 pf	.020 X .1 dia. 3.9 pf-10 pf	.030 X .1 dia. 3.9 pf-10 pf	.040 X .1 dia. 3.9 pf-10 pf
RECTANGULAR. All dimensions maximum.				
C		.030 X .1 X .1 11 pf-140 pf	.045 X .1 X .1 11 pf-140 pf	.055 X .1 X .1 11 pf-140 pf
D		.062 X .1 X .1 150 pf-330 pf	.075 X .1 X .1 150 pf-330 pf	.085 X .1 X .1 150 pf-330 pf
E		.062 X .125 X .125 340 pf-820 pf	.075 X .125 X .125 340 pf-820 pf	.085 X .125 X .125 340 pf-820 pf
F		.062 X .2 X .2 830 pf-3300 pf	.075 X .2 X .2 830 pf-3300 pf	.085 X .2 X .2 830 pf-3300 pf

CAL-R 20B SERIES

...AL SPECIFICATIONS/20B SERIES

...AS TYPE
...epoxy, tubular axial leads.

...EAD
...coated oxygen free copper. No. 26 AWG .016 +.004 —.001 for CK12 & CK...styles and No. 22 AWG .026 +.004, —.001 for CK14, CK15, CK16 Styles.

...ARKING
...acturers Symbol, Date Code, Part Number, Tolerance and Voltage Rating.

...RICAL

...ATION FACTOR (DF)
...maximum.

...ATION RESISTANCE (IR)
...0 megohms minimum or 1,000 megohm microfarad minimum, whichever is ...

...TRIC WITHSTANDING VOLTAGE
...of rated voltage, current limited to 50 mA, applied between the capacitor ...als.

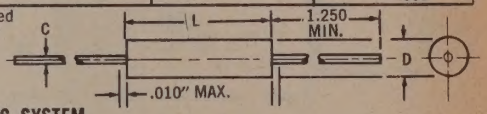
...ONMENTAL

...TING TEMPERATURE RANGE
...C to +125°C operating for all values with no voltage derating.

...RATURE CHARACTERISTICS
...15% at zero volts, +15% —25% at rated volts for all values —55°C ...25°C.
...15% at 0 volts, +15% —40% at rated volts for all values.
...C to +125°C.

Dimensions		
Style	(L) Length	(D) Dia.	(C) Leads Dia.
CK12	.160±.010	.090±.010	.016+.004 —.001
CK13	.250±.010	.090±.010	.016+.004 —.001
CK14	.390±.010	.140±.010	.025+.004 —.001
CK15	.500±.020	.250±.015	.025+.004 —.001
CK16	.690±.030	.350±.020	.025+.004 —.001

Leads: Solder coated oxygen free copper



PART NUMBERING SYSTEM

Type	Style	Characteristics Temperature	Capacitance Value	Capacitance Tolerance
MIL	CK12	BX	472	K
Cal-R	SCM12	BX	472	K

TOLERANCE K = ±10% M = ±20%

ORDERING INFORMATION

...city ...e	Cal-R P/N	MIL P/N	WVDC Volt-age	Cal-R P/N	MIL P/N	WVDC Volt-age
...0pF	SCM12BX100K	CK12BX100K	100			
...2pF	SCM12BX120K	CK12BX120K	100			
...5pF	SCM12BX150K	CK12BX150K	100			
...3pF	SCM12BX180K	CK12BX180K	100			
...2pF	SCM12BX220K	CK12BX220K	100			
...7pF	SCM12BX270K	CK12BX270K	100			
...3pF	SCM12BX330K	CK12BX330K	100			
...9pF	SCM12BX390K	CK12BX390K	100			
...7pF	SCM12BX470K	CK12BX470K	100			
...6pF	SCM12BX560K	CK12BX560K	100			
...8pF	SCM12BX680K	CK12BX680K	100			
...2pF	SCM12BX820K	CK12BX820K	100			
...0pF	SCM12BX101K	CK12BX101K	100			
...0pF	SCM12BX121K	CK12BX121K	100			
...0pF	SCM12BX151K	CK12BX151K	100			
...0pF	SCM12BX181K	CK12BX181K	100			
...0pF	SCM12BX221K	CK12BX221K	100			
...0pF	SCM12BX271K	CK12BX271K	100			
...0pF	SCM12BX331K	CK12BX331K	100			
...0pF	SCM12BX391K	CK12BX391K	100			
...0pF	SCM12BX471K	CK12BX471K	100			
...0pF	SCM12BX561K	CK12BX561K	100			
...0pF	SCM12BX681K	CK12BX681K	100			
...0pF	SCM12BX821K	CK12BX821K	100			
...0pF	SCM12BX102K	CK12BX102K	100			
...0pF	SCM12BX122K	CK12BX122K	100			
...0pF	SCM12BX152K	CK12BX152K	100			
...0pF	SCM12BX182K	CK12BX182K	100			
...0pF	SCM12BX222K	CK12BX222K	100			
...0pF	SCM12BX272K	CK12BX272K	100			

Capacity Value	Cal-R P/N	MIL P/N	WVDC Volt-age	Cal-R P/N	MIL P/N	WVDC Volt-age
3300pF	SCM12BX332K	CK12BX332K	100			
3900pF	SCM12BX392K	CK12BX392K	100			
4700pF	SCM12BX472K	CK12BX472K	100			
5600pF	SCM12BX562K		50	SCM13BX562K	CK13BX562K	100
6800pF	SCM12BX682K		50	SCM13BX682K	CK13BX682K	100
8200pF	SCM12BX822K		50	SCM13BX822K	CK13BX822K	100
.01mF	SCM12BX103K		50	SCM13BX103K	CK13BX103K	100
.012mF	SCM14BX123K	CK14BX123K	100	SCM13BX123K		50
.015mF	SCM14BX153K	CK14BX153K	100	SCM13BX153K		50
.018mF	SCM14BX183K	CK14BX183K	100	SCM13BX183K		50
.022mF	SCM14BX223K	CK14BX223K	100	SCM13BX223K		50
.027mF	SCM14BX273K	CK14BX273K	100	SCM13BR272K	CK13BR273K	50
.033mF	SCM14BX333K	CK14BX333K	100	SCM13BR333K	CK13BR333K	50
.039mF	SCM14BX393K	CK14BX393K	100	SCM13BR393K	CK13BR393K	50
.047mF	SCM14BX473K	CK14BX473K	100	SCM13BR473K	CK13BR473K	50
.056mF	SCM14BR563K	CK14BR563K	100			
.068mF	SCM14BR683K	CK14BR683K	100			
.082mF	SCM14BR823K	CK14BR823K	100			
.10mF	SCM14BR104K	CK14BR104K	100	SCM15BX104K	CK15BX104K	100
.12mF	SCM14BR124K	CK14BR124K	50	SCM15BR124K	CK15BR124K	100
.15mF	SCM14BR154K	CK14BR154K	50	SCM15BR154K	CK15BR154K	100
.18mF	SCM14BR184K	CK14BR184K	50	SCM15BR184K	CK15BR184K	100
.22mF	SCM14BR224K	CK14BR224K	50	SCM15BR224K	CK15BR224K	100
.27mF	SCM14BR274K	CK14BR274K	50	SCM15BR274K	CK15BR274K	100
.33mF				SCM15BR334K	CK15BR334K	100
.47mF	SCM16BR474K		100	SCM15BR474K	CK15BR474K	50
1.00mF	SCM16BR105K		100	SCM15BR105K	CK15BR105K	50
2.20mF	SCM16BR225K		50			
3.30mF	SCM16BR335K		50			

CAL-R® INC. CAPACITOR DIVISION

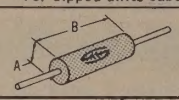
CAL-R 200, 250, 300 SERIES

GENERAL SPECIFICATIONS

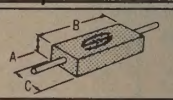
1. Test Voltage: 2.5X rated voltage.
2. Lead Strength: 5 lb. maximum pull on molded units. 2 lb. maximum pull on dipped units.
3. Maximum Capacitance Change With Temperature: ±10% of R.T. value @ 1 KC from —15°C to +85°C; +15%, —20% of R.T. value @ 1 KC from —55°C to +150°C.
4. Insulation Resistance: Greater than 1000 megohm microfarads or 25,000 megohm @ 25°C.
5. Dissipation Factor: 2.5% maximum @ 1 KC, 25°C ±2°C and .5VRMS.
6. Capacitance: Measured at 25°C ±2°C, 1 KC and .5VRMS.
7. Capacitance Tolerance: Available in ±5%, ±10% and ±20%.
8. Case: Available in either molded epoxy or resin dip coat.
9. Dip coated units protected with thin film resin impregnated for normal handling and storage. Maximum allowable lead run-up, .025 unless otherwise specified.

*Note: For tolerance add the following letter to end of part number: J = ±5%, K = ±10%, M = ±20%
For dipped units substitute SCD for SCM on all part numbers

P/N	Capacitance pf	P/N	Capacitance pf	P/N	Capacitance pf
		SCM20F472*	4700	SCM30D333*	3300
200 Volt Units (F)		SCM20F562*	5600	SCM30D393*	3900
		SCM20F682*	6800	SCM30D473*	4700
SCM10F470*	47	SCM20F822*	8200	SCM30D563*	5600
SCM10F560*	56	SCM20F103*	10000	SCM30D683*	6800
SCM10F680*	68	**100 Volt Units (E)**		SCM30D823*	8200
SCM10F820*	82	**50 Volt Units (D)**		SCM30D104*	10000
SCM10F101*	100	SCM10D821*	820	SCM30D124*	12000
SCM10F121*	120	SCM10D102*	1000	SCM40D154*	15000
SCM10F151*	150	SCM10D122*	1200	SCM40D184*	18000
SCM10F181*	180	SCM10D152*	1500	SCM40D224*	22000
SCM10F221*	220	SCM10D182*	1800	SCM40D254*	25000
SCM10F271*	270	SCM10D222*	2200	SCM40D274*	27000
SCM10F331*	330	SCM10D272*	2700	SCM50D334*	33000
SCM10F391*	390	SCM10D332*	3300	SCM50D394*	39000
SCM10F471*	470	SCM10D392*	3900	SCM50D474*	47000
SCM10F561*	560	SCM10D472*	4700	SCM50D504*	50000
SCM10F681*	680	SCM20D562*	5600	SCM50D564*	56000
SCM20F821*	820	SCM20D682*	6800	SCM60D684*	68000
SCM20F102*	1000	SCM20D822*	8200	SCM60D754*	75000
SCM20F122*	1200	SCM20D103*	10000	SCM60D824*	82000
SCM20F152*	1500	SCM20D123*	12000	SCM60D105*	100000
SCM20F182*	1800	SCM20D153*	15000	SCM70D334*	300000
SCM20F222*	2200	SCM20D183*	18000	SCM70D394*	390000
SCM20F272*	2700	SCM20D203*	20000	SCM70D474*	470000
SCM20F332*	3300	SCM20D223*	22000	SCM70D564*	560000
SCM20F392*	3900	SCM30D273*	27000	SCM70D684*	680000



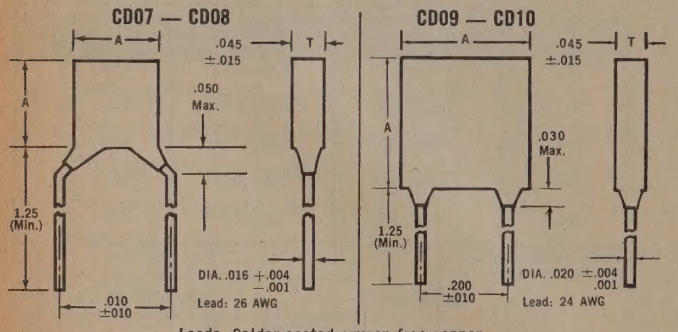
Case Type:	10		20	
Cap. Range:	47 pf to 4700 pf		82 pf to .022 mfd	
Case Style:	molded	dipped	molded	dipped
A (in.)	.1	.075	.130	.105
B (in.)	.2	.190	.255	.250
Lead AWG	26	30	24	30



Case Type:	30		40		50		60		70	
Cap. Range:	.027 to .12 mfd		.15 to .27 mfd		.33 to .56 mf		.68 to 1.0 mfd		.33 to .[illegible] mfd	
Case Style:	molded	dipped	molded	dipped	molded	dipped	molded	dipped	molded	[illegible]pped
A (in.)	.130	.100	.155	.125	.155	.125	.300	.250	.500	[illegible]500
B (in.)	.380	.375	.380	.375	.505	.500	.562	.500	.275	[illegible]50
C (in.)	.192	.187	.355	.300	.355	.300	.300	.250	.155	[illegible]25
Lead AWG	22	24	22	22	22	22	22	22	22	[illegible]22

All dimensions are m[illegible]mum

CAL-R 710 SERIES



Leads: Solder coated oxygen free copper

Capacity Value	Tolerance	Characteristic N 50 volt	Characteristic N Dimension Max. A	Characteristic K 25 Volt	Characteristic K Dimension Max. A	Characteristic K 50 volt	[illegible]mension Max. A
10pF	K—M	CD07ND100	.100	CD07KC100	.100	CD07KD100	[illegible]100
12	K	CD07ND120	.100	CD07KC120	.100	CD07KD120	[illegible]100
15	K—M	CD07ND150	.100	CD07KC150	.100	CD07KD150	[illegible]100
18	K	CD07ND180	.100	CD07KC180	.100	CD07KD180	[illegible]100
22	K—M	CD07ND220	.100	CD07KC220	.100	CD07KD220	[illegible]100
27	K	CD07ND270	.100	CD07KC270	.100	CD07KD270	[illegible]100
33	K—M	CD07ND330	.100	CD07KC330	.100	CD07KD330	[illegible]100
39	K	CD07ND390	.100	CD07KC390	.100	CD07KD390	[illegible]100
47	K—M	CD07ND470	.100	CD07KC470	.100	CD07KD470	[illegible]100
56	K	CD07ND560	.100	CD07KC560	.100	CD07KD560	[illegible]100
68	K—M	CD07ND680	.100	CD07KC680	.100	CD07KD680	[illegible]100
82	K	CD07ND820	.100	CD07KC820	.100	CD07KD820	[illegible]100
100	K—M	CD07ND101	.100	CD07KC101	.100	CD07KD101	[illegible]100
120	K	CD07ND121	.100	CD07KC121	.100	CD07KD121	[illegible]100
150	K—M	CD07ND151	.100	CD07KC151	.100	CD07KD151	[illegible]100
180	K	CD07ND181	.100	CD07KC181	.100	CD07KD181	[illegible]100
220	K—M	CD07ND221	.100	CD07KC221	.100	CD07KD221	[illegible]100
270	K	CD07ND271	.100	CD07KC271	.100	CD07KD271	[illegible]100
330	K—M	CD07ND331	.100	CD07KC331	.100	CD07KD331	[illegible]100
390	K	CD08ND391	.130	CD07KC391	.100	CD07KD391	[illegible]100
470	K—M	CD08ND471	.130	CD07KC471	.100	CD07KD471	[illegible]100
560	K	CD08ND561	.130	CD07KC561	.100	CD07KD561	[illegible]100
680	K—M	CD08ND681	.130	CD07KC681	.100	CD07KD681	[illegible]100
820	K	CD08ND821	.130	CD07KC821	.100	CD07KD821	[illegible]100
1000	K—M	CD09ND102	.230	CD07KC102	.100	CD07KD102	[illegible]100
1200	K	CD09ND122	.230	CD07KC122	.100	CD07KD122	[illegible]100
1500	K—M	CD09ND152	.230	CD07KC152	.100	CD07KD152	[illegible]100
1800	K	CD09ND182	.230	CD07KC182	.100	CD07KD182	[illegible]100
2200	K—M	CD09ND222	.230	CD07KC222	.100	CD07KD222	[illegible]100
2700	K	CD09ND272	.230	CD07KC272	.100	CD07KD272	[illegible]100
3300	K—M	CD09ND332	.230	CD07KC332	.100	CD07KD332	[illegible]100
3900	K	CD10ND392	.330	CD07KC392	.100	CD07KD392	[illegible]100
4700	K—M	CD10ND472	.330	CD07KC472	.100	CD07KD472	[illegible]100
5600	K	CD10ND562	.330	CD07KC562	.100	CD07KD562	[illegible]100
6800	K—M	CD10ND682	.330	CD07KC682	.100	CD07KD682	[illegible]100
8200	K	CD10ND822	.330	CD07KC822	.100	CD07KD822	[illegible]100
.01mF	K—M	CD10ND103	.330	CD07KC103	.100	CD07KD103	[illegible]100
.012	K			CD07KC123	.100	CD07KD123	[illegible]100
.015	K—M			CD07KC153	.100	CD08KD153	[illegible]100
.018	K			CD07KC183	.100	CD08KD183	[illegible]100
.022	K—M			CD07KC223	.100	CD08KD223	[illegible]100
.027	K			CD07KC273	.100	CD08KD273	[illegible]100
.033	K—M			CD08KC333	.130	CD09KD333	[illegible]100
.039	K			CD08KC393	.130	CD09KD393	[illegible]100
.047	K—M			CD08KC473	.130	CD09KD473	[illegible]100
.056	K			CD08KC563	.130	CD09KD563	[illegible]100
.068	K—M			CD09KC683	.230	CD09KD683	[illegible]100
.082	K			CD09KC823	.230	CD09KD823	[illegible]100
.10	K—M			CD09KC104	.230	CD09KD104	[illegible]100
.12	K			CD09KC124	.230	CD09KD124	[illegible]100
.15	K—M			CD09KC154	.230	CD09KD154	[illegible]100
.18	K			CD09KC184	.230	CD09KD184	[illegible]100
.22	K—M			CD09KC224	.230	CD09KD224	[illegible]100
.27	K			CD09KC274	.230	CD09KD274	[illegible]100
.33	K—M			CD09KC334	.230	CD10KD334	[illegible]100
.39	K			CD10KC394	.330	CD10KD394	[illegible]100
.47	K—M			CD10KC474	.330	CD10KD474	[illegible]100
.56	K			CD10KC564	.330		
.68	K—M			CD10KC684	.330		
.82	K			CD10KC824	.330		
1.00	K—M			CD10KC105	.330		

GENERAL SPECIFICATIONS/710 SERIES

CASE TYPE
Dipped resin.
LEADS
Solder coated oxygen free copper. No. 26 AWG (CD07/08). No. 24 AWG (CD09/10).
PART MARKING
Where space permits. Manufacturing Symbol, Capacitance Value, Capacitance Tolerance (K or M) and Voltage Rating.

ELECTRICAL

DISSIPATION FACTOR (DF)
Characteristic K: 2.5% maximum for values of 10 pF through 1.00 microfarad
Characteristic N: 0.1% maximum for values of 10 pF through 0.01 microfarad
CAPACITANCE AND DF MEASUREMENTS
Test Frequency for characteristic K in values of 100 pF or less: 1 MHz ±1 kHz and values over 100 PF: 1 kHz ±100Hz Characteristic N in values of 1000 pF or less: 1 MHz ±1 kHz. Values over 1000 pF: 1 kHz ±100 Hz. Test Voltage: 1.0 ±0.2 volts rms.
INSULATION RESISTANCE (IR)
50 volts DC applied the insulation resistance shall be 100,000 megohms Minimum or 1000 megohm microfarad, whichever is less.
DIELECTRIC WITHSTANDING VOLTAGE
A test voltage equal to 250% of rated DC voltage current limited to 50 MA.

ENVIRONMENTAL

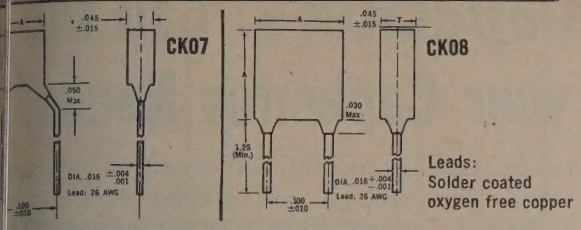
OPERATING TEMPERATURE RANGE
—55°C to +125°C operating for all values with no voltage derating required.
TEMPERATURE CHARACTERISTICS
Characteristic K: ±15% at zero volts DC, from —55°C to +125°C. Characteristic N: 0 ±30 PPM/°C at zero volts DC from —55°C to +125°C.

PART NUMBERING SYSTEM

Type	Style	Temperature Characteristics	Volts	Capacitance Value	Capacitance Tolerance
Cal-R	CD07	N	D	101	M

VOLTS: D = 50V C = 25V
TEMPERATURE CHARACTERISTICS: N = 0±30 PPM K = ±15%

CAL-R 24B SERIES



GENERAL SPECIFICATIONS/24B SERIES

in

ed, oxygen free copper. No. 26 AWG (CK07 and CK08).

KING

ce permits Manufacturing Symbol, Capacitance Value, Capacitance K or M), and Voltage Rating.

AL

IN FACTOR (DF)

mum

CE AND DF MEASUREMENTS

less: 1 mHz ±1 kHz. Values over 100 pF: 1 kHz ±100 Hz. Test Voltage olts rms.

N RESISTANCE (IR)

C applied the insulation resistance shall be 100,000 megohms Min.

ATING

or all values to 125°C. Refer to Part Number Table on front of data

C WITHSTANDING VOLTAGE

tage of 400 volts DC current limited to 50 mA applied between the erminals.

MENTAL

TEMPERATURE RANGE

+125°C operating for all values with no voltage derating required.

URE CHARACTERISTICS

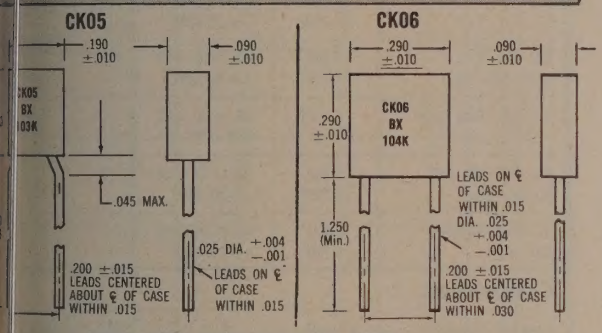
at zero volts, +15% —22% at rated voltage from —55°C to +125°C.

Capacity Value	Cal-R P/N	MIL P/N	WVDC Voltage	Size (tol. ±.020) A	Lead Spacing (±.010)
27pF	SC07BX270K	CK07BX270K	50	.080	.100
33	SC07BX330K	CK07BX330K	50	.080	.100
39	SC07BX390K	CK07BX390K	50	.080	.100
47	SC07BX470K	CK07BX470K	50	.080	.100
56	SC07BX560K	CK07BX560K	50	.080	.100
68	SC07BX680K	CK07BX680K	50	.080	.100
82	SC07BX820K	CK07BX820K	50	.080	.100
100	SC07BX101K	CK07BX101K	50	.080	.100
120	SC07BX121K	CK07BX121K	50	.080	.100
150	SC07BX151K	CK07BX151K	50	.080	.100
180	SC07BX181K	CK07BX181K	50	.080	.100
220	SC07BX221K	CK07BX221K	50	.080	.100
270	SC07BX271K	CK07BX271K	50	.080	.100
330	SC07BX331K	CK07BX331K	50	.080	.100
390	SC07BX391K	CK07BX391K	50	.080	.100
470	SC07BX471K	CK07BX471K	50	.080	.100
560	SC07BX561K	CK07BX561K	50	.080	.100
680	SC07BX681M	CK07BX681M	50	.080	.100
1000	SC07BX102M	CK07BX102M	50	.080	.100
1500	SC08BX152M	CK08BX152M	50	.130	.100
2200	SC08BX222M	CK08BX222M	50	.130	.100
3300	SC08BX332M	CK08BX332M	50	.130	.100
3900	SC08BX392M	CK08BX392M	50	.130	.100
4700	SC08BX472M	CK08BX472M	50	.130	.100
5600	SC08BX562M	CK08BX562M	50	.130	.100
6800	SC08BX682M	CK08BX682M	50	.130	.100
8200	SC08BX822M	CK08BX822M	50	.130	.100
10000	SC08BX100M	CK08BX103M	50	.130	.100

PART NUMBERING SYSTEM

Type	Style	Temperature Characteristics	Capacitance Value	Capacitance Tolerance
MIL	CK07	Bx	101	M
Cal-R	SC07	Bx	101	M

CAL-R 819 SERIES



Leads: Solder coated oxygen free copper.

GENERAL SPECIFICATIONS/819 SERIES

E

oxy

ated oxygen free copper suitable for soldering or welding No. 22 AWG 04, —.001

RKING

urers Symbol, Data Code, Part Number, Tolerance and Voltage Rating.

AL

ON FACTOR (DF)

timum

NCE AND DF MEASUREMENTS

uency, 100 pF or less: 1 mHz ±1 kHz. Values over 100 pF: 1 kHz ±100 oltage 1.0 ±0.2 volts rms.

ON RESISTANCE (IR)

tage applied, the insulation resistance shall be 100,000 megohms min- 000 megohm microfarad, whichever is less.

IC WITHSTANDING VOLTAGE

rated voltage, current limited to 50 mA, applied between the capacitor

MENTAL

G TEMPERATURE RANGE

+125°C operating for all values with no voltage derating.

+150°C operating for values 10 pF thru 1000 pF (CK05 style) and 1200 n .01 μF (CK06 style).

TURE CHARACTERISTICS

% at zero volts, +15% —25% at rated volts for all values 125°C.

% —56% at zero volts, +22% —66% at rated volts for values 10 pF 000 pF (CK05 style) and 1200 pF thru .01 μF (CK06 style) —55% to

PART NUMBERING SYSTEM

e	Style	Temperature Characteristics	Capacitance Value	Capacitance Tolerance
L	CK05	BX	103	K
R	SCM05	BX	103	K

CE: K = ±10% M = ±20%

Capacity Value	Cal-R P/N	MIL P/N	WVDC Voltage	Cal-R P/N	MIL P/N	WVDC Voltage
10pF	SCM05BX100K	CK05BX100K	200			
12pF	SCM05BX120K	CK05BX120K	200			
15pF	SCM05BX150K	CK05BX150K	200			
18pF	SCM05BX180K	CK05BX180K	200			
22pF	SCM05BX220K	CK05BX220K	200			
27pF	SCM05BX270K	CK05BX270K	200			
33pF	SCM05BX330K	CK05BX330K	200			
39pF	SCM05BX390K	CK05BX390K	200			
47pF	SCM05BX470K	CK05BX470K	200			
56pF	SCM05BX560K	CK05BX560K	200			
68pF	SCM05BX680K	CK05BX680K	200			
82pF	SCM05BX820K	CK05BX820K	200			
100pF	SCM05BX101K	CK05BX101K	200			
120pF	SCM05BX121K	CK05BX121K	200			
150pF	SCM05BX151K	CK05BX151K	200			
180pF	SCM05BX181K	CK05BX181K	200			
220pF	SCM05BX221K	CK05BX221K	200			
270pF	SCM05BX271K	CK05BX271K	200			
330pF	SCM05BX331K	CK05BX331K	200			
390pF	SCM05BX391K	CK05BX391K	200			
470pF	SCM05BX471K	CK05BX471K	200			
560pF	SCM05BX561K	CK05BX561K	200			
680pF	SCM05BX681K	CK05BX681K	200			
820pF	SCM05BX821K	CK05BX821K	200			
1000pF	SCM05BX102K	CK05BX102K	200			
1200pF	SCM05BX122K	CK05BX122K	100	SCM06BX122K	CK06BX122K	200
1500pF	SCM05BX152K	CK05BX152K	100	SCM06BX152K	CK06BX152K	200
1800pF	SCM05BX182K	CK05BX182K	100	SCM06BX182K	CK06BX182K	200
2200pF	SCM05BX222K	CK05BX222K	100	SCM06BX222K	CK06BX222K	200
2700pF	SCM05BX272K	CK05BX272K	100	SCM06BX272K	CK06BX272K	200
3300pF	SCM05BX332K	CK05BX332K	100	SCM06BX332K	CK06BX332K	200
3900pF	SCM05BX392K	CK05BX392K	100	SCM06BX392K	CK06BX392K	200
4700pF	SCM05BX472K	CK05BX472K	100	SCM06BX472K	CK06BX472K	200
5600pF	SCM05BX562K	CK05BX562K	100	SCM06BX562K	CK06BX562K	200
6800pF	SCM05BX682K	CK05BX682K	100	SCM06BX682K	CK06BX682K	200
8200pF	SCM05BX822K	CK05BX822K	100	SCM06BX822K	CK06BX822K	200
.01mF	SCM05BX103K	CK05BX103K	100	SCM06BX103K	CK06BX103K	200
.012mF	SCM05BX123K	CK05BX123K	50	SCM06BX123K	CK06BX123K	100
.015mF	SCM05BX153K	CK05BX153K	50	SCM06BX153K	CK06BX153K	100
.018mF	SCM05BX183K	CK05BX183K	50	SCM06BX183K	CK06BX183K	100
.022mF	SCM05BX223K	CK05BX223K	50	SCM06BX223K	CK06BX223K	100
.027mF	SCM05BX273K	CK05BX273K	50	SCM06BX273K	CK06BX273K	100
.033mF	SCM05BX333K	CK05BX333K	50	SCM06BX333K	CK06BX333K	100
.039mF	SCM05BX393K	CK05BX393K	50	SCM06BX393K	CK06BX393K	100
.047mF	SCM05BX473K	CK05BX473K	50	SCM06BX473K	CK06BX473K	100
.056mF	SCM05BX563K	CK05BX563K	50	SCM06BX563K	CK06BX563K	100
.068mF	SCM05BX683K	CK05BX683K	50	SCM06BX683K	CK06BX683K	100
.082mF	SCM05BX823K	CK05BX823K	50	SCM06BX823K	CK06BX823K	100
.10mF	SCM05BX104K	CK05BX104K	50	SCM06BX104K	CK06BX104K	100
.12mF				SCM06BX124K		50
.15mF				SCM06BX154K		50
.18mF				SCM06BX184K		50
.22mF				SCM06BX224K		50
.27mF				SCM06BX274K		50
.33mF				SCM06BX334K		50
.39mF				SCM06BX394K		50
.47mF				SCM06BX474K		50
.56mF				SCM06BX564K		50
.68mF				SCM06BX684K		50
.82mF				SCM06BX824K		50
1.00mF				SCM06BX105K		50

CAL-R® INC.
a Subsidiary of CapTech, Inc.
CAPACITOR DIVISION · RESISTOR DIVISION · THERMONETICS DIVISION
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 451-9761 • TWX 910-343-6966

Centralab Ceramic Capacitors Can fill your Capacitor Needs!

Centralab disc and tubular capacitor catalogs as well as the special purpose catalogs cover hundreds of types of ceramic capacitors for military, industrial and commercial applications.

Request your copy through Centralab's advertising department.

Here are typical Centralab Capacitors. Types listed here are not necessarily available, in all extremes of temperature coefficients, capacitance ranges, and tolerances.

Temperature Compensating Discs

WORKING VOLTAGE	TEMPERATURE COEFFICIENTS	CAPACITANCE RANGE pf	CAPACITANCE TOLERANCES
DISCS			
500V	NPO to N5250	1.1-3100	±.25 pf and ±.5 pf when nominal capacitance is 10 pf or less. Over 10 pf ±5%, ±10% or ±20%
1KV	NPO to N5250	2.5-2150	
2KV	N750, N1500, N2200*	17-450	
3KV	N750, N1500, N2200*	12-310	
4KV	N750, N1500, N2200*	12-210	
5KV	N750, N1500, N2200*	18-165	
6KV	N750, N1500, N2200*	17-135	

*Available in all standard TC's in other capacitance ranges.

General Purpose Discs

EIA FORMULATION & T. C. TOLERANCE		CAPACITANCE TOLERANCE	CAPACITANCE RANGE IN pf	WORKING VOLTAGE
Y5D	±3.3%	±10%, ±20%, GMV	150 to 9700	150, 500V
X5F	±7.5%	±10%, ±20%, +80 −20% GMV	70-6100	150V-6KV
X5P	±10%	±10%, ±20%, +80 −20%	.45-3000	150V-6KV
Z5P	±10%	±10%, ±20%, +80 −20%	175-14,650	150V-6KV
X5S	±22%	±10%, ±20%, +80 −20%	150-11,000	150V-6KV
X5U	+22 −56%	±20%, +80 −20%, GMV	375-20,000	150V-6KV
Z5U	+22 −56%	±20%, +80 −20%, GMV	650-34,800	150V-6KV
Z5V	+22 −82%	±20%, +80 −20%	.005MFD-.1MFD	100V

Not all capacitance values at all voltages: maximum capacitance shown available in 500V rated units.

Low Voltage General Purpose Discs (Ultra Kaps)

DC WORKING VOLTAGE	APPROX. DIAMETER	CAPACITANCE TOLERANCE	MAXIMUM DISSIPATION FACTOR	CAPACITANCE RANGE MFD
3	.3 to .9"	+100 −0%	5%	.22 to 2.2
10	.3 to .9"	+80 −20%	10%	.05 to .47
16	.6 to .9"	+80 −20%	10%	.05 to .2
20	.6 to .9"	+80 −20%	10%	.05 to .2
25	.3 to 1.0"	±30% or ±20%	5%	.015 to .2

High Temperature

Wide range of capacities, tolerances, TC & Hi-K bodies for operation at 125°C. Exceptionally stable Hi-K bodies with maximum change in capacity of ±15% from −55°C to +125°C are available.

Polystyrene Capacitors are also available in the Centralab line. These long life, low cost units are the ideal replacements for paper, mica, and Mylar capacitors.

FOR IMMEDIATE DELIVERY — many of these are available through Centralab Industrial Distributors.

TYPE	CAP. RANGE pF.	TOLERANCES % @ 25°C	TEMP. CO-EFFICIENT	WORKING VOLTAGE DC
Feed-Thrus				
DA—717 series (Bushing types)	10-500 10-4000	±5, ±10, ±20 ±20, GMV		500 500
DA—720 series (Bushing types)	10-820 10-820 10-400 10-5000 10-3000 10-2500	±5, ±10, ±20 ±5, ±10, ±20 ±5, ±10, ±20 ±20, GMV ±20, GMV ±20, GMV		500 500 500 500 500 500
DA—721-722 (High Reliability)	5-400 5-1000	±5, ±10, ±20 ±20, GMV		500 500
DA—740 (Ring Type)	5-1000	±5, ±10, ±20 +80, −20, GMV		500
DA—784, 785, 787 (Eyelet Type)	5-400 5-2000	±5, ±10, ±20 ±20 GMV		500 500
DA—742 (Eyelet) (MIL Type)	5-400 5-2000	±5, ±10, ±20 ±20, GMV		500 500
Trimmers				
Type 829 (Tubular)	.5-3/3-20		NPO, 220, 660	500
Type 820 (Rotary)	1-3.5/70-90			500
Type 821 (Rotary)	3-12/7-35		NPO, 750	500
Type 822 (Rotary)	1.5-3/8.0-50		NPO, 650	500
Type 823 (Rotary)	5-12/20-125		NPO, 650	500
Type 824 (Rotary)	1.5-3/7-45		NPO, 650	500
Type 826 (Rotary)	10-30/225-400		NPO, 650	500
Transmitting Capacitors				
Type 850	25-1000	±5, ±10, ±20	NPO, 750	5[illegible]5K
Type 851, 857	25-200	±5, ±10	NPO, 750	7.5[illegible]5K
Type 853, 854, 855	3-40	±5, ±10	NPO, 750	
Type 858, (Hi-K)	500-1000	±20, GMV		
Type 859	50-500	±10	NPO, 750	[illegible]
Discoidal				
	5-1000	±10, ±20, GMV		[illegible]

Antenna Coupling & Line Bypass Components UL Yellow card listed

DISC-R-CAP & TUBE-R-CAP®: parallel resistor, capacitor, and spark gap available with 50 to 2500 pf capacitance, 1.4 KVDC, 1 KVDC, 150 VAC, 60 HZ voltage rating.

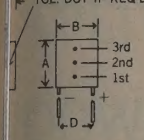
AC LINE DISC CAPACITORS 380-10,000 pf.

CENTRALAB Electronics Division • GLOBE-UNION INC.
5757 NORTH GREEN BAY AVENUE • MILWAUKEE, WISCONSIN 5320[illegible]

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

MINITAN® MODULAR microminiature solid tantalum capacitors

TABLE A



Case Size	A Max.	B Max.	C Max.	D
	DIMENSIONS — INCHES			
U	.125	.070	.040	.050 ± .015
F	.165	.120	.070	.100 ± .020
M	.225	.185	.075	.150 ± .020
L	.290	.220	.110	.180 ± .025
S	.310	.230	.130	.200 ± .025
J	.475	.375	.150	.300 ± .025

TABLE B

PART NUMBER AL	PART NUMBER RADIAL	CAP IN MFD @ 25°C AND 120Hz	WVDC @ 85°C	MAX DF % @ 25°C AND 120Hz	MAX DCL IN μA @ 25°C
U SE SIZE			STD. TOLERANCE +40% —20%		
2A	U102R	.0010	20	6	0.5
2A	U152R	.0015	20	6	0.5
2A	U222R	.0022	20	6	0.5
2A	U332R	.0033	20	6	0.5
2A	U472R	.0047	20	6	0.5
2A	U682R	.0068	20	6	0.5
3A	U103R	.010	20	6	0.5
3A	U153R	.015	20	6	0.5
3A	U223R	.022	20	6	0.5
3A	U333R	.033	20	6	0.5
3A	U473R	.047	20	6	0.5
3A	U683R	.068	20	6	0.5
4A	U104R	.10	20	6	0.5
4A	U154R	.15	20	6	0.5
4A	U224R	.22	20	6	0.5
4A	U334R	.33	15	6	0.5
4A	U474R	.47	10	6	0.5
4A	U684R	.68	6	6	0.5
5A	U105R	1.0	4	8	0.5
5A	U155R	1.5	3	10	0.5
F SE SIZE			STD. TOLERANCE ±20%		
2A	F472R	.0047	35	6	0.5
2A	F682R	.0068	35	6	0.5
3A	F103R	.010	35	6	0.5
3A	F153R	.015	35	6	0.5
3A	F223R	.022	35	6	0.5
3A	F333R	.033	35	6	0.5
3A	F473R	.047	35	6	0.5
3A	F683R	.068	35	6	0.5
04A	F104R	.10	35	6	0.5
54A	F154R	.15	35	6	0.5
24A	F224R	.22	35	6	0.5
34A	F334R	.33	35	6	0.5
74A	F474R	.47	35	6	0.5
84A	F684R	.68	25	6	0.5
05A	F105R	1.0	20	6	0.5
55A	F155R	1.5	15	6	0.5
25A	F225R	2.2	10	6	0.5
35A	F335R	3.3	6	6	0.5
75A	F475R	4.7	4	8	0.5
85A	F685R	6.8	3	10	0.5
06A	F106R	10.	2	10	0.5
ASE SIZE			STD. TOLERANCE ±20%		
84A	M684R	.68	35	6	1.0
05A	M105R	1.0	35	6	1.0
55A	M155R	1.5	35	6	1.0
25A	M225R	2.2	25	6	1.0
35A	M335R	3.3	20	6	1.0
75A	M475R	4.7	20	6	1.0
85A	M685R	6.8	10	6	1.0
06A	M106R	10.	6	6	1.0
56A	M156R	15.	4	8	1.0
26A	M226R	22.	3	10	1.0
ASE SIZE			STD. TOLERANCE ±20%		
25A	L225R	2.2	35	6	2.0
35A	L335R	3.3	35	6	2.0
75A	L475R	4.7	35	6	2.0
85A	L685R	6.8	25	6	2.0
06A	L106R	10.	20	6	2.0
56A	L156R	15.	15	6	2.0
26A	L226R	22.	10	6	2.0
36A	L336R	33.	6	6	2.0
76A	L476R	47.	4	8	2.0
			STD. TOLERANCE ±20%		
85A	S685R	6.8	35	6	3.0
06A	S106R	10.	25	6	3.0
56A	S156R	15.	20	6	3.0
26A	S226R	22.	15	6	3.0
36A	S336R	33.	10	6	3.0
76A	S476R	47.	6	6	3.0
86A	S686R	68.	4	8	3.0
ASE SIZE			STD. TOLERANCE ±20%		
06A	J106R	10.	35	8	9.0
56A	J156R	15.	35	8	9.0
26A	J226R	22.	35	8	9.0
36A	J336R	33.	25	8	9.0
76A	J476R	47.	20	8	9.0
86A	J686R	68.	15	8	9.0
07A	J107R	100.	10	8	9.0
57A	J157R	150.	6	10	9.0
27A	J227R	220.	3	15	9.0

For: Filtering — Coupling — By-passing — Timing

- POLAR TYPE
- MICROMINIATURE SIZE
- MYLAR CASED, RESIN SEALED
- COMPLETELY DRY ELECTROLYTE
- INDEFINITE SHELF/OPERATING LIFE
- AXIAL OR RADIAL LEAD STYLES
- TINNED, WELDABLE/SOLDERABLE LEADS
- TOLERANCES TO ±5%
- .001 TO 220 MFD
- 35 TO 3 WVDC
- −55°C TO +125°C
- .01 uA/MFD — VOLT DC LEAKAGE
- 130% SURGE VOLTAGE RATING
- ½ VOLT REVERSE DC BIAS AT 85°C
- 1 TO 10 OHM IMPEDANCE AT 1MHz
- RELIABILITY DOCUMENTATION AVAILABLE

ELECTRICAL AND PERFORMANCE

CAPACITANCE — Measured on a polarized capacitance bridge with a maximum polarizing voltage of 2.2 VDC and a maximum AC signal of 1.0 volts RMS. See Table B for available ratings.

TOLERANCE — Except for the U case size, standard tolerance is ±20% with ±10% or ±5% tolerance available in all case sizes. 10% decade values are offered in ±10% or ±5% tolerance.

DISSIPATION FACTOR — Measured simultaneously with capacitance as above. See Table B for maximum 25°C values.

DC LEAKAGE CURRENT — With rated WVDC applied through a 1000 ohm resistor for 5 minutes maximum, DCL values will not exceed 10 times Table B values. At 125°C with 2/3 rated WVDC applied, DCL values will not exceed 15 times Table B values.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVDC at 85°C and to 125°C with linear derating to 2/3 WVDC. Capacitors will withstand up to ½ volt reverse DC bias at 85°C. AC ripple voltage should be limited so that the forward DC voltage plus peak AC voltage does not exceed rated WVDC.

SURGE VOLTAGE — At 85°C and at 60-second intervals, capacitors withstand 1000 30-second applications of 130% rated WVDC.

TEMPERATURE: — No derating is required between −55°C and +85°C. Between 85°C and 125°C, derate linearly to 2/3 WVDC.

MOISTURE RESISTANCE — Following Method 106, MIL-STD-202 testing, capacitors will meet initial DC leakage requirements. Capacitance will be within ±10% of initial values.

LIFE TEST — After 2000 hours at 85°C with rated WVDC applied, capacitors will meet initial DC leakage and DF requirements. Capacitance will not change more than ±10% from original values.

MECHANICAL AND PART NUMBERS

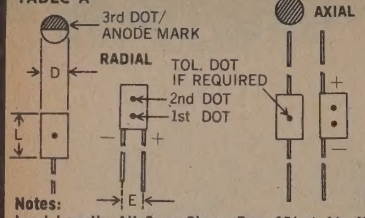
CONSTRUCTION — Tantalum pellets are encased in Mylar sleeves and sealed with a special moisture resistant epoxy resin. This rugged, fully insulated package withstands a one minute application of a 100 volt potential applied between the leads shorted together and an encircling metal foil envelope.

LEADS — Leads are solder coated pure nickel wire suitable for soldering or welding. Tested in accordance with MIL-C-39003, .010 diameter leads withstand a 1 lb. pull and .016 diameter leads a 3 lb. pull. All lead diameters withstand 5 rotations twist.

MARKING — Capacitance value is shown by means of standard EIA color code dots except for the J case size where all data is printed. Because the Mylar cases are black, black dots are omitted. ±10% tolerance is indicated by a silver dot, ±5% tolerance by a gold dot.

PART NUMBERS — When specifying, include Suffix "A" for axial leads or "R" for radial leads as shown in Table B. Tolerance is indicated by adding "—40", "—20", "—10", or "—5" to all part numbers as appropriate, i.e., M475A-20, J157R-5, etc.

TABLE A



DIMENSIONS — INCHES			
Case Size	L Max.	D Max.	E
Y	.125	.070	.050±.015
P	.160	.070	.050±.015
B	.200	.080	.050±.015
A	.225	.100	.070±.020
G	.250	.150	.120±.025

Notes:
Lead Length, All Case Sizes: Pos. 1⅝ ± ⅛, Neg. 1⅜ ± ⅛
Lead Diameter: Y, P, B, A = .010 ± .001, G = .016 ± .001

TABLE B

PART NUMBER AXIAL	PART NUMBER RADIAL	CAP. IN MFD @ 25°C 120 Hz	WVDC @ 85°C	MAX DF % @ 25°C 120 Hz	MAX. DCL IN μA @ 25°C
Y CASE SIZE				STD. CAP. TOL.	+40% —20%
Y102A	Y102R	.0010	20	6	0.5
Y152A	Y152R	.0015	20	6	0.5
Y222A	Y222R	.0022	20	6	0.5
Y332A	Y332R	.0033	20	6	0.5
Y472A	Y472R	.0047	20	6	0.5
Y682A	Y682R	.0068	20	6	0.5
Y103A	Y103R	.010	20	6	0.5
Y153A	Y153R	.015	20	6	0.5
Y223A	Y223R	.022	20	6	0.5
Y333A	Y333R	.033	20	6	0.5
Y473A	Y473R	.047	20	6	0.5
Y683A	Y683R	.068	20	6	0.5
Y104A	Y104R	.10	20	6	0.5
Y154A	Y154R	.15	20	6	0.5
Y224A	Y224R	.22	20	6	0.5
Y334A	Y334R	.33	15	6	0.5
Y474A	Y474R	.47	10	6	0.5
Y684A	Y684R	.68	6	6	0.5
Y105A	Y105R	1.0	4	8	0.5
Y155A	Y155R	1.5	3	10	0.5
Y225A	Y225R	2.2	2	10	0.5
P CASE SIZE				STD. CAP. TOL.	+40% —20%
P102A	P102R	.0010	50	6	0.5
P152A	P152R	.0015	50	6	0.5
P222A	P222R	.0022	50	6	0.5
P332A	P332R	.0033	50	6	0.5
P472A	P472R	.0047	50	6	0.5
P682A	P682R	.0068	50	6	0.5
P103A	P103R	.010	50	6	0.5
P153A	P153R	.015	35	6	0.5
P223A	P223R	.022	35	6	0.5
P333A	P333R	.033	35	6	0.5
P473A	P473R	.047	35	6	0.5
P683A	P683R	.068	35	6	0.5
P104A	P104R	.10	35	6	0.5
P154A	P154R	.15	35	6	0.5
P224A	P224R	.22	35	6	0.5
P334A	P334R	.33	20	6	0.5
P474A	P474R	.47	20	6	0.5
P684A	P684R	.68	15	6	0.5
P105A	P105R	1.0	10	6	0.5
P155A	P155R	1.5	6	6	0.5
P225A	P225R	2.2	4	8	0.5
P335A	P335R	3.3	3	10	0.5
P475A	P475R	4.7	2	10	0.5
B CASE SIZE				STD. CAP. TOL.	±20%
B334A	B334R	.33	35	6	0.5
B474A	B474R	.47	35	6	0.5
B684A	B684R	.68	20	6	0.5
B105A	B105R	1.0	20	6	0.5
B155A	B155R	1.5	15	6	0.5
B225A	B225R	2.2	10	6	0.5
B335A	B335R	3.3	6	6	0.5
B475A	B475R	4.7	4	8	0.5
B685A	B685R	6.8	3	10	0.5
B106A	B106R	10.	2	10	0.5
A CASE SIZE				STD. CAP. TOL.	±20%
A684A	A684R	.68	35	6	1.0
A105A	A105R	1.0	35	6	1.0
A155A	A155R	1.5	20	6	1.0
A225A	A225R	2.2	20	6	1.0
A335A	A335R	3.3	15	6	1.0
A475A	A475R	4.7	10	6	1.0
A685A	A685R	6.8	6	6	1.0
A106A	A106R	10.	4	8	1.0
A156A	A156R	15.	3	10	1.0
A226A	A226R	22.	2	10	1.0
G CASE SIZE				STD. CAP. TOL.	±20%
G155A	G155R	1.5	35	6	1.5
G225A	G225R	2.2	35	6	1.5
G335A	G335R	3.3	20	6	1.5
G475A	G475R	4.7	20	6	1.5
G685A	G685R	6.8	20	6	1.5
G106A	G106R	10.	15	6	1.5
G156A	G156R	15.	10	6	1.5
G226A	G226R	22.	6	6	1.5
G336A	G336R	33.	4	8	1.5
G476A	G476R	47.	3	10	1.5

COMPONENTS INCORPORATED
BIDDEFORD, MAINE

MINITAN® CORDWOOD microminiature solid tantalum capacitors

For: Filtering — Coupling — By-passing — Timing

- POLAR TYPE
- MICROMINIATURE SIZE
- MYLAR CASED, RESIN SEALED
- COMPLETELY DRY ELECTROLYTE
- INDEFINITE SHELF/OPERATING LIFE
- AXIAL OR RADIAL LEAD STYLES
- TINNED, WELDABLE/SOLDERABLE LEADS
- TOLERANCES TO ±5%
- .001 TO 47 MFD
- 50 TO 3 WVDC
- −55°C TO +125°C
- .01 uA/MFD-VOLT DC LEAKAGE
- 130% SURGE VOLTAGE RATING
- ½ VOLT REVERSE DC BIAS AT 85°C
- 1 TO 10 OHM IMPEDANCE AT 1 MHz
- RELIABILITY DOCUMENTATION AVAILABLE

GENERAL

These precision, subminiature polar capacitors are suitable for general filtering, coupling, by-passing, and RC timing applications to 85°C without derating and to 125°C with derating to 2/3 WVDC. Very favorable capacitance to volume ratios make them especially well suited to high density applications such as found in avionics systems, subminiature communications equipment, and thick film circuitry.

ELECTRICAL AND PERFORMANCE

TOLERANCE — Except for the Y and P case sizes, standard tolerance is ±20% with ±10% or ±5% tolerance available in all case sizes. 10% decade values are offered in ±10% or ±5% tolerance.

CAPACITANCE — Measured on a polarized capacitance bridge with a maximum polarizing voltage of 2.2 VDC and a maximum AC signal of 1.0 volts RMS. See Table B for available ratings.

DISSIPATION FACTOR — Measured simultaneously with capacitance as above. See Table B for maximum 25°C values.

DC LEAKAGE CURRENT — With rated WVDC applied through a 1000 ohm resistor for 5 minutes maximum, DCL values will not exceed those shown in Table B. At 85°C, DCL values will not exceed 10 times Table B values. At 125°C with 2/3 rated WVDC applied, DCL values will not exceed 15 times Table B values.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVDC at 85°C and to 125°C with linear derating to 2/3 WVDC. Capacitors will withstand up to ½ volt reverse DC bias at 85°C. AC ripple voltage should be limited so that the forward DC voltage plus peak AC voltage does not exceed rated WVDC.

SURGE VOLTAGE — At 85°C and at 60-second intervals, capacitors will withstand 1000 30-second applications of 130% rated WVDC.

TEMPERATURE — No derating is required between −55°C and +85°C. Between 85°C and 125°C, derate linearly to 2/3 WVDC.

MOISTURE RESISTANCE — Following Method 106, MIL-STD-202 testing, capacitors will meet initial DC leakage requirements. Capacitance will be within ±5% of initial values.

LIFE TEST — After 2000 hours at 85°C with rated WVDC applied, capacitors will meet initial DC leakage and DF requirements. Capacitance will not change more than ±10% from initial values.

MECHANICAL AND PART NUMBERS

CONSTRUCTION — Tantalum pellets are encased in Mylar sleeves and sealed with a special moisture resistant epoxy resin. This rugged, fully insulated package withstands a one minute application of a 100 volt potential applied between the leads shorted together and an encircling metal foil envelope.

LEADS — Leads are solder coated pure nickel wire suitable for soldering or welding. Tested in accordance with MIL-C-39003, .010 diameter leads withstand a 1 lb. pull and .016 diameter leads a 3 lb. pull. All lead diameters withstand 5 rotations twist.

MARKING — Capacitance value is shown by means of standard EIA color code dots. The anode indicator dot also serves as the third color dot. Because the Mylar cases are black, black dots are omitted. ±10% tolerance is indicated by a silver dot, ±5% tolerance by a gold dot.

PART NUMBERS — When specifying, include Suffix "A" for axial leads or "R" for radial leads as shown in Table B. Tolerance is indicated by adding "—", "—20", "—10", or "—5" to all part numbers as appropriate, i.e., A106A-20, Y225R-10, etc.

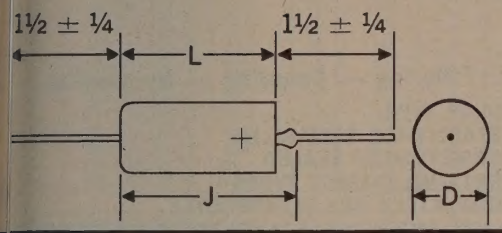
COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

MILITAN® TS1-TS4 hermetic solid tantalum capacitors

For: Filtering — Coupling — By-passing — Timing

- CS12/13 POLAR TYPE
- GLASS TO METAL HERMETIC SEAL
- COMPLETELY DRY ELECTROLYTE
- −80°C TO +125°C OPERATING RANGE
- ±20%, ±10%, ±5% TOLERANCES
- .0047 MFD TO 330 MFD
- 100 TO 6 WVDC
- .01 uA/MFD-VOLT DC LEAKAGE
- 5% MAX. DF MOST RATINGS
- 130% SURGE VOLTAGE RATING
- TINNED SOLID NICKEL WIRE LEADS
- REEL PACKAGING AVAILABLE

TABLE A



DIMENSIONS — INCHES

INSULATED					UNINSULATED				
Case Size	L ±.031	D +.016 −.010	J Max.	Lead Dia. ±.002	Case Size	L ±.031	D +.016 −.010	J Max.	Lead Dia. ±.002
TS1	.286	.135	.422	.020	TS1	.250	.125	.422	.020
TS2	.474	.185	.610	.020	TS2	.438	.175	.610	.020
TS3	.686	.289	.822	.025	TS3	.650	.279	.822	.025
TS4	.786	.351	.922	.025	TS4	.750	.341	.922	.025

TABLE B

CAPACITANCE MFD	DC RATED VOLTAGE 6V	10V	15V	20V	35V	50V	75V	100V
.0047					TS1-035-472	TS1-050-472	TS1-075-472	TS1-100-472
.0056					TS1-035-562	TS1-050-562	TS1-075-562	TS1-100-562
.0068					TS1-035-682	TS1-050-682	TS1-075-682	TS1-100-682
.0082					TS1-035-822	TS1-050-822	TS1-075-822	TS1-100-822
.010					TS1-035-103	TS1-050-103	TS1-075-103	TS1-100-103
.012					TS1-035-123	TS1-050-123	TS1-075-123	TS1-100-123
.015					TS1-035-153	TS1-050-153	TS1-075-153	TS1-100-153
.018					TS1-035-183	TS1-050-183	TS1-075-183	TS1-100-183
.022					TS1-035-223	TS1-050-223	TS1-075-223	TS1-100-223
.027					TS1-035-273	TS1-050-273	TS1-075-273	TS1-100-273
.033					TS1-035-333	TS1-050-333	TS1-075-333	TS1-100-333
.039					TS1-035-393	TS1-050-393	TS1-075-393	TS1-100-393
.047					TS1-035-473	TS1-050-473	TS1-075-473	TS1-100-473
.056					TS1-035-563	TS1-050-563	TS1-075-563	TS1-100-563
.068					TS1-035-683	TS1-050-683	TS1-075-683	TS1-100-683
.082					TS1-035-823	TS1-050-823	TS1-075-823	TS1-100-823
.10					TS1-035-104	TS1-050-104	TS1-075-104	TS1-100-104
.12					TS1-035-124	TS1-050-124	TS1-075-124	TS1-100-124
.15					TS1-035-154	TS1-050-154	TS1-075-154	TS1-100-154
.18					TS1-035-184	TS1-050-184	TS1-075-184	TS1-100-184
.22					TS1-035-224	TS1-050-224	TS1-075-224	TS1-100-224
.27					TS1-035-274	TS1-050-274	TS1-075-274	TS1-100-274
.33					TS1-035-334	TS1-050-334	TS1-075-334	TS1-100-334
.39					TS1-035-394	TS1-050-394	TS1-075-394	TS1-100-394
.47					★ TS1-035-474	★ TS1-050-474	★ TS1-075-474	★ TS1-100-474
.56					★ TS1-035-564	★ TS1-050-564	★ TS1-075-564	★ TS1-100-564
.68					★ TS1-035-684	★ TS1-050-684	★ TS1-075-684	★ TS2-100-684
.82					★ TS1-035-824	★ TS1-050-824	★ TS2-075-824	★ TS2-100-824
1.0					★ TS1-035-105	★ TS1-050-105	★ TS2-075-105	★ TS2-100-105
1.2				★ TS1-020-125	★ TS2-035-125	★ TS2-050-125	★ TS2-075-125	★ TS2-100-125
1.5				★ TS1-020-155	★ TS2-035-155	★ TS2-050-155	★ TS2-075-155	★ TS2-100-155
1.8				★ TS1-020-185	★ TS2-035-185	★ TS2-050-185	★ TS2-075-185	★ TS2-100-185
2.2				★ TS1-020-225	★ TS2-035-225	★ TS2-050-225	★ TS2-075-225	★ TS2-100-225
2.7			★ TS1-015-275	TS2-020-275	★ TS2-035-275	★ TS2-050-275	★ TS2-075-275	★ TS2-100-275
3.3			★ TS1-015-335	TS2-020-335	★ TS2-035-335	★ TS2-050-335	★ TS2-075-335	
3.9		★ TS1-010-395	TS2-015-395	TS2-020-395	★ TS2-035-395	★ TS2-050-395	★ TS2-075-395	
4.7		★ TS1-010-475	TS2-015-475	TS2-020-475	★ TS2-035-475	★ TS2-050-475	★ TS3-075-475	
5.6	★ TS1-006-565	TS2-010-565	TS2-015-565	TS2-020-565	★ TS2-035-565	★ TS3-050-565	★ TS3-075-565	
6.8	★ TS1-006-685	TS2-010-685	TS2-015-685	TS2-020-685	★ TS2-035-685	★ TS3-050-685	★ TS3-075-685	
8.2	TS2-006-825	TS2-010-825	TS2-015-825	★ TS2-020-825	★ TS3-035-825	★ TS3-050-825	★ TS3-075-825	
10.	TS2-006-106	TS2-010-106	TS2-015-106	★ TS2-020-106	★ TS3-035-106	★ TS3-050-106	★ TS3-075-106	
12.	TS2-006-126	TS2-010-126	TS2-015-126	★ TS2-020-126	★ TS3-035-126	★ TS3-050-126	★ TS4-075-126	
15.	TS2-006-156	TS2-010-156	TS2-015-156	★ TS2-020-156	★ TS3-035-156	★ TS3-050-156	★ TS4-075-156	
18.	TS2-006-186	TS2-010-186	★ TS2-015-186	TS3-020-186	★ TS3-035-186	★ TS3-050-186		
22.	TS2-006-226	TS2-010-226	★ TS2-015-226	TS3-020-226	★ TS3-035-226	★ TS4-050-226		
27.	TS2-006-276	★ TS2-010-276	TS3-015-276	★ TS3-020-276	★ TS4-035-276			
33.	TS2-006-336	★ TS2-010-336	TS3-015-336	★ TS3-020-336	★ TS4-035-336			
39.	TS2-006-396	★ TS2-010-396	TS3-015-396	★ TS3-020-396	★ TS4-035-396			
47.	★ TS2-006-476	TS3-010-476	TS3-015-476	★ TS3-020-476	★ TS4-035-476			
56.	★ TS2-006-566	TS3-010-566	★ TS3-015-566	★ TS4-020-566				
68.	TS3-006-686	TS3-010-686	★ TS3-015-686	★ TS4-020-686				
82.	TS3-006-826	★ TS3-010-826	TS4-015-826	★ TS4-020-826				
100.	TS3-006-107	★ TS3-010-107	TS4-015-107	★ TS4-020-107				
120.	TS3-006-127	★ TS3-010-127	★ TS4-015-127					
150.	★ TS3-006-157	TS4-010-157	★ TS4-015-157					
180.	★ TS3-006-187	★ TS4-010-187						
220.	TS4-006-227	★ TS4-010-227						
270.	★ TS4-006-277							
330.	★ TS4-006-337							

★ Distributor items

GENERAL

The Militan® TR Series is designed to equal or exceed applicable requirements of MIL-C-39003, case styles CSR13. Along with the Militan TM Series (sub-miniature CSR09 styles), the TR Series is intended for general energy storage, filtering, coupling, by-passing, and noncritical RC timing applications over the temperature range −55°C to +125°C. Miniature size, established reliability, and excellent electrical characteristics make these units the most widely applied of all solid tantalums for computers, communications equipment, avionics gear, and high quality government and industrial instrumentation.

ELECTRICAL CHARACTERISTICS

CAPACITANCE — See Table B for available ratings — Capacitance is measured in accordance with MIL-C-39003 on a polarized capacitance bridge at 120 ±5Hz with a polarizing voltage of 1.0 volts minimum and 2.2 volts maximum and an AC signal of 1.0 volts RMS maximum. When testing these capacitors, it is important that the combined AC and DC voltage not exceed the DC rated voltage.

CAPACITANCE TOLERANCE — See Table B. Standard capacitance tolerance are ±20% and ±10% with ±5% available on special order in all case sizes and ratings.

Note that MIL-C-39003 does not provide for ±5% tolerance ratings — although the latter are available on special order with appropriate certification indicating compliance with CSR13 requirements.

DISSIPATION FACTOR — See Table B. Dissipation factor (DF) is measured in accordance with MIL-C-39003 simultaneously with capacitance as described above. DF is a figure of merit and is defined by the formula $DF = \frac{Rs}{Xc} = 2\pi fCRs$ where Rs is the Equivalent Series Resistance (ESR).

OPERATING TEMPERATURE — −55°C to +125°C. Above 85°C, derate linearly to 2/3 rated DC voltage at 125°C.

DC LEAKAGE CURRENT — DC leadage (DCL) is measured in accordance with MIL-C-39003 with rated voltage applied through a 1000 ohm resistor in series with the capacitor for 5 minutes maximum. 25°C DCL values are specified in Table B. At 85°C, DCL will not exceed .1 uA/mfd-volt or 5.0 uA whichever is greater. At 125°C, DCL will not exceed .15 uA/mfd-volt or 7.5 uA, whichever is greater.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVDC at 85°C and to 125°C with linear derating to 2/3 WVDC.

SURGE VOLTAGE — Surge voltage is the maximum allowable short term voltage including transients and peak ripple voltage. Tested in accordance with MIL-C-39003, units withstand 1000 surges of 130% DC rated voltage at 85°C. The duration of each surge cycle is 30 seconds on, 30 seconds off.

REVERSE DC VOLTAGE — Militan® TR Series capacitors will withstand a continuous reverse DC bias of ½ volt at 85°C. Excessive reverse biasing should be avoided for greatest reliability and operating life.

TEST AND PERFORMANCE REQUIREMENTS

Test methods, procedures, and performance criteria are as specified in MIL-C-39003 for the CSR13 case styles.

TEMPERATURE CYCLING AND VOLTAGE AGING — Method 102, Condition C of MIL-STD-202 followed by exposure at 85°C for 40 hours minimum.

RADIOGRAPHIC INSPECTION — In accordance with MIL-C-39003.

SEAL TEST — Method 112, Condition A of MIL-STD-202.

SHOCK, MEDIUM IMPACT — Method 205, Condition C of MIL-STD-202.

VIBRATION, HIGH FREQUENCY — Method 204, Condition D of MIL-STD-202.

SALT SPRAY (Corrosion) — Method 101, Condition B of MIL-STD-202.

TEMPERATURE CYCLING AND IMMERSION — Temperature cycling: Method 102, Condition C of MIL-STD-202. Immersion: Method 104, Condition B of MIL-STD-202.

SOLDERABILITY — Method 208 of MIL-STD-202.

TERMINAL STRENGTH — Method 211 of MIL-STD-202.
Pull Test: 3 lbs. for 3 seconds (Condition A)
Twist Test: 5 bends (Condition D)

MOISTURE RESISTANCE — Method 106 of MIL-STD-202.

SLEEVING — In accordance with MIL-C-39003.

STABILITY AT LOW AND HIGH TEMPERATURE — In accordance with MIL-C-39003.

SURGE VOLTAGE — In accordance with MIL-C-39003.

LIFE — Method 108 of MIL-STD-202.

FUNGUS — Method 508, of MIL-STD-810.

RESISTANCE TO SOLVENTS — In accordance with MIL-C-39003.

MECHANICAL AND PART NUMBERS

GENERAL — All styles are characterized by metal cases axial leads, glass to metal hermetic seals, and polyester insulating sleeves.

LEADS — Leads are solder coated pure nickel wire (Type N3, MIL-STD-1276) suitable for either soldering or welding. See Table A for wire diameters.

MARKING — Units are marked in accordance with MIL-C-39003.

PART NUMBERS — See Table B for available ratings. To designate failure rate, add suffix "L" (2.0%/1,000 hrs.), "M" (1%/1,000 hrs.), or "P" (0.1%/1,000 hrs.).

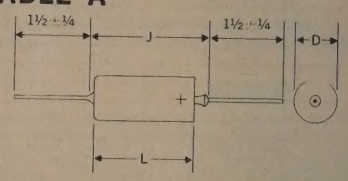
COMPONENTS INCORPORATED
BIDDEFORD, MAI

MILITAN® TR (CSR13) hermetic solid tantalum capacitors

For: Filtering — Coupling — By-passing —

- POLAR TYPE
- ESTABLISHED RELIABILITY
- HERMETICALLY SEALED
- CSR13/MIL-C-39003 TYPES
- COMPLETELY DRY ELECTROLYTE
- ±20% AND ±10% STANDARD TOLERANCES
- −55°C TO +125°C OPERATING TEMPERATURE
- .0047 TO 330 MFD
- 100 TO 6 WVDC
- .01 uA/MFD-VOLT DC LEAKAGE
- 130% SURGE VOLTAGE RATING
- ½ VOLT AT 85°C REVERSE DC VOLTAGE
- TINNED, WELDABLE/SOLDERABLE LEADS

TABLE A



DIMENSIONS - CH

Case Size	L Max.	J Max.	M
TR1	.286	.422	.1
TR2	.474	.610	.1
TR3	.686	.822	.2
TR4	.786	.922	.3

TABLE B

Type Designation*	Components Part Number*	Cap. UF	Cap. Tol.	DC Leakage @ 25°C	% DF @ 25°C	Case Size
6 VOLTS						
CSR13B565K-	TR1-006-565-10	5.6	10	.5	4	A
B685K-	TR1-006-685-10	6.8	10	.5	6	A
B685M-	TR1-006-685-20	6.8	20	.5	6	A
B476K-	TR2-006-476-10	47.0	10	3.0	6	B
B476M-	TR2-006-476-20	47.0	20	3.0	6	B
B566K-	TR2-006-566-10	56.0	10	3.0	6	B
B157K-	TR3-006-157-10	150.0	10	9.0	8	C
B157M-	TR3-006-157-20	150.0	20	9.0	8	C
B187K-	TR3-006-187-10	180.0	10	11.0	8	C
B277K-	TR4-006-277-10	270.0	10	13.0	8	D
B337K-	TR4-006-337-10	330.0	10	15.0	8	D
B337M-	TR4-006-337-20	330.0	20	15.0	8	D
10 VOLTS						
C395K-	TR1-010-395-10	3.9	10	.6	4	A
C475K-	TR1-010-475-10	4.7	10	.7	4	A
C475M-	TR1-010-475-20	4.7	20	.7	4	A
C276K-	TR2-010-276-10	27.0	10	4.0	6	B
C336K-	TR2-010-336-10	33.0	10	5.0	6	B
C336M-	TR2-010-336-20	33.0	20	5.0	6	B
C396K-	TR2-010-396-10	39.0	10	5.0	6	B
C826K-	TR3-010-826-10	82.0	10	8.0	6	C
C107K-	TR3-010-107-10	100.0	10	10.0	8	C
C107M-	TR3-010-107-20	100.0	20	10.0	8	C
C127K-	TR3-010-127-10	120.0	10	12.0	8	C
C187K-	TR4-010-187-10	180.0	10	18.0	8	D
C227K-	TR4-010-227-10	220.0	10	20.0	8	D
C227M-	TR4-010-227-20	220.0	20	20.0	8	D
15 VOLTS						
D275K-	TR1-015-275-10	2.7	10	.6	4	A
D335K-	TR1-015-335-10	3.3	10	.8	4	A
D335M-	TR1-015-335-20	3.3	20	.8	4	A
D186K-	TR2-015-186-10	18.0	10	3.5	6	B
D226K-	TR2-015-226-10	22.0	10	4.0	6	B
C226M-	TR2-015-226-20	22.0	20	4.0	6	B
D566K-	TR3-015-566-10	56.0	10	8.0	6	C
D686K-	TR3-015-686-10	68.0	10	10.0	6	C

*Add suffix L for 2%/1000 hr. failure rate, M for 1%/1000 hr. rate, fo 0.1%/1000 hr. rate.

See YELLOW SECTION for Local Offices, Phones

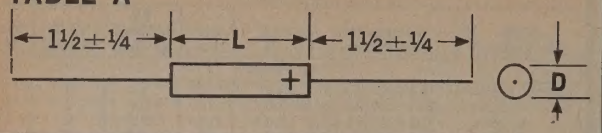
TABLE B (Continued)

Type Designation*	Components Part Number*	Cap. UF	Cap. Tol.	DC Leakage @ 25°C	% DF @ 25°C	Case Size
	15 VOLTS					
CSR13G686M-	TR3-015-686-20	68.0	20	10.0	6	C
127K-	TR4-015-127-10	120.0	10	18.0	8	D
157K-	TR4-015-157-10	150.0	10	20.0	8	D
157M-	TR4-015-157-20	150.0	20	20.0	8	D
	20 VOLTS					
125K-	TR1-020-125-10	1.2	10	.6	4	A
155K-	TR1-020-155-10	1.5	10	.6	4	A
155M-	TR1-020-155-20	1.5	20	.6	4	A
185K-	TR1-020-185-10	1.8	10	.6	4	A
225K-	TR1-020-225-10	2.2	10	.8	4	A
225M-	TR1-020-225-20	2.2	20	.8	4	A
825K-	TR2-020-825-10	8.2	10	2.0	6	B
106K-	TR2-020-106-10	10.0	10	3.0	6	B
106M-	TR2-020-106-20	10.0	20	3.0	6	B
126K-	TR2-020-126-10	12.0	10	3.5	6	B
156K	TR2-020-156-10	15.0	10	4.0	6	B
156M-	TR2-020-156-20	15.0	20	4.0	6	B
276K-	TR3-020-276-10	27.0	10	5.0	6	C
336K-	TR3-020-336-10	33.0	10	7.0	6	C
336M-	TR3-020-336-20	33.0	20	7.0	6	C
396K-	TR3-020-396-10	39.0	10	8.0	6	C
476K-	TR3-020-476-10	47.0	10	9.0	6	C
476M-	TR3-020-476-20	47.0	20	9.0	6	C
566K-	TR4-020-566-10	56.0	10	11.0	6	D
686K-	TR4-020-686-10	68.0	10	14.0	6	D
686M-	TR4-020-686-20	68.0	20	14.0	6	D
826K-	TR4-020-826-10	82.0	10	16.0	6	D
107K-	TR4-020-107-10	100.0	10	20.0	8	D
107M-	TR4-020-107-20	100.0	20	20.0	8	D
	35 VOLTS					
565K-	TR2-035-565-10	5.6	10	2.5	4	B
685K-	TR2-035-685-10	6.8	10	3.0	6	B
685M-	TR2-035-685-20	6.8	20	3.0	6	B
226K-	TR3-035-226-10	22.0	10	8.0	6	C
226M-	TR3-035-226-20	22.0	20	8.0	6	C
276K-	TR4-035-276-10	27.0	10	9.0	6	D
336K-	TR4-035-336-10	33.0	10	11.0	6	D
336M-	TR4-035-336-20	33.0	20	11.0	6	D
396K-	TR4-035-396-10	39.0	10	14.0	6	D
476K-	TR4-035-476-10	47.0	10	16.0	6	D
476M-	TR4-035-476-20	47.0	20	16.0	6	D
	50 VOLTS					
472K-	TR1-050-472-10	.0047	10	.5	2	A
472M-	TR1-050-472-20	.0047	20	.5	2	A
562K-	TR1-050-562-10	.0056	10	.5	2	A
682K-	TR1-050-682-10	.0068	10	.5	2	A
682M-	TR1-050-682-20	.0068	20	.5	2	A
822K-	TR1-050-822-10	.0082	10	.5	2	A
103K-	TR1-050-103-10	.01	10	.5	2	A
103M-	TR1-050-103-20	.01	20	.5	2	A
123K-	TR1-050-123-10	.012	10	.5	2	A
153K-	TR1-050-153-10	.015	10	.5	2	A
153M-	TR1-050-153-20	.015	20	.5	2	A
183K-	TR1-050-183-10	.018	10	.5	2	A
223K-	TR1-050-223-10	.022	10	.5	2	A
223M-	TR1-050-223-20	.022	20	.5	2	A
273K-	TR1-050-275-10	.027	10	.5	2	A
333K-	TR1-050-333-10	.033	10	.5	2	A
333M-	TR1-050-333-20	.033	20	.5	2	A
393K-	TR1-050-393-10	.039	10	.5	2	A
473K-	TR1-050-473-10	.047	10	.5	2	A
473M-	TR1-050-473-20	.047	20	.5	2	A
563K-	TR1-050-563-10	.056	10	.5	2	A
683K-	TR1-050-683-10	.068	10	.5	2	A
683M-	TR1-050-683-20	.068	20	.5	2	A
823K-	TR1-050-823-10	.082	10	.5	2	A
104K-	TR1-050-104-10	.1	10	.5	2	A
104M-	TR1-050-104-20	.1	20	.5	2	A
124K-	TR1-050-124-10	.12	10	.5	2	A
154K-	TR1-050-154-10	.15	10	.5	2	A
154M-	TR1-050-154-20	.15	20	.5	2	A
184K-	TR1-050-184-10	.18	10	.5	2	A
224K-	TR1-050-224-10	.22	10	.5	2	A
224M-	TR1-050-224-20	.22	20	.5	2	A
274K-	TR1-050-274-10	.27	10	.5	2	A
334K-	TR1-050-334-10	.33	10	.5	2	A
334M-	TR1-050-334-20	.33	20	.5	2	A
394K-	TR1-050-394-10	.39	10	.5	2	A
474K-	TR1-050-474-10	.47	10	.5	2	A
474M-	TR1-050-474-20	.47	20	.5	2	A
564K-	TR1-050-564-10	.56	10	.5	2	A
684K-	TR1-050-684-10	.68	10	.5	2	A
684M-	TR1-050-684-20	.68	20	.5	2	A
824K-	TR1-050-824-10	.82	10	.5	2	A
105K-	TR1-050-105-10	1.0	10	.8	2	A
105M-	TR1-050-105-20	1.0	20	.8	2	A
125K-	TR2-050-125-10	1.2	10	.9	4	B
155K-	TR2-050-155-10	1.5	10	1.2	4	B
155M-	TR2-050-155-20	1.5	20	1.2	4	B
185K-	TR2-050-185-10	1.8	10	1.4	4	B
225K-	TR2-050-225-10	2.2	10	1.7	4	B
225M-	TR2-050-225-20	2.2	20	1.7	4	B
275K-	TR2-050-275-10	2.7	10	2.0	4	B
335K-	TR2-050-335-10	3.3	10	2.5	4	B
335M-	TR2-050-335-20	3.3	20	2.5	4	B
395K-	TR2-050-395-10	3.9	10	3.0	4	B
475K-	TR2-050-475-10	4.7	10	3.5	4	B
475M-	TR2-050-475-20	4.7	20	3.5	4	B
565K-	TR3-050-565-10	5.6	10	4.5	4	C
685K-	TR3-050-685-10	6.8	10	4.5	6	C
685M-	TR3-050-685-20	6.8	20	4.5	6	C
825K-	TR3-050-825-10	8.2	10	5.0	6	C

Type Designation*	Components Part Number*	Cap. UF	Cap. Tol.	DC Leakage @ 25°C	% DF @ 25°C	Case Size
	50 VOLTS					
CSR13G106K-	TR3-050-106-10	10.0	10	5.0	6	C
G106M-	TR3-050-106-20	10.0	20	5.0	6	C
G126K-	TR3-050-126-10	12.0	10	6.0	6	C
G156K-	TR3-050-156-10	15.0	10	8.0	6	C
G156M-	TR3-050-156-20	15.0	20	8.0	6	C
G186K-	TR3-050-186-10	18.0	10	9.0	6	C
G226K-	TR4-050-226-10	22.0	10	11.0	6	D
G226M-	TR4-050-226-20	22.0	20	11.0	6	D
	75 VOLTS					
H104K-	TR1-075-104-10	.1	10	.5	2	A
H104M-	TR1-075-104-20	.1	20	.5	2	A
H124K-	TR1-075-124-10	.12	10	.5	2	A
H154K-	TR1-075-154-10	.15	10	.5	2	A
H154M-	TR1-075-154-20	.15	20	.5	2	A
H184K-	TR1-075-184-10	.18	10	.5	2	A
H224K-	TR1-075-224-10	.22	10	.5	2	A
H224M-	TR1-075-224-20	.22	20	.5	2	A
H274K-	TR1-075-274-10	.27	10	.5	2	A
H334K-	TR1-075-334-10	.33	10	.5	2	A
H334M-	TR1-075-334-20	.33	20	.5	2	A
H394K-	TR1-075-394-10	.39	10	.5	2	A
H474K-	TR1-075-474-10	.47	10	.5	2	A
H474M-	TR1-075-474-20	.47	20	.5	2	A
H564K-	TR1-075-564-10	.56	10	.5	2	A
H684K-	TR1-075-684-10	.68	10	.5	2	A
H684M-	TR1-075-684-20	.68	20	.5	2	A
H824K-	TR2-075-824-10	.82	10	.5	2	B
H105K-	TR2-075-105-10	1.0	10	.5	2	B
H105M-	TR2-075-105-20	1.0	20	.5	2	B
H125K-	TR2-075-125-10	1.2	10	.5	4	B
H155K-	TR2-075-155-10	1.5	10	1.0	4	B
H155M-	TR2-075-155-20	1.5	20	1.0	4	B
H185K-	TR2-075-185-10	1.8	10	1.0	4	B
H225K-	TR2-075-225-10	2.2	10	1.5	4	B
H225M-	TR2-075-225-20	2.2	20	1.5	4	B
H275K-	TR2-075-275-10	2.7	10	1.5	4	B
H335K-	TR2-075-335-10	3.3	10	2.0	4	B
H335M-	TR2-075-335-20	3.3	20	2.0	4	B
H395K-	TR2-075-395-10	3.9	10	2.0	4	B
H475K-	TR3-075-475-10	4.7	10	6.0	4	C
H475M-	TR3-075-475-20	4.7	20	6.0	4	C
H565K-	TR3-075-565-10	5.6	10	6.0	4	C
H685K-	TR3-075-685-10	6.8	10	10.0	6	C
H685M-	TR3-075-685-20	6.8	20	10.0	6	C
H825K-	TR3-075-825-10	8.2	10	10.0	6	C
H106K-	TR3-075-106-10	10.0	10	10.0	6	C
H106M-	TR3-075-106-20	10.0	20	10.0	6	C
H126K-	TR4-075-126-10	12.0	10	10.0	6	D
H-156K-	TR4-075-156-10	15.0	10	14.0	6	D
H156M-	TR4-075-156-20	15.0	20	14.0	6	D
	100 VOLTS					
J472K-	TR1-100-472-10	.0047	10	.5	2	A
J472M-	TR1-100-472-20	.0047	20	.5	2	A
J562K-	TR1-100-562-10	.0056	10	.5	2	A
J682K-	TR1-100-682-10	.0068	10	.5	2	A
J682M-	TR1-100-682-20	.0068	20	.5	2	A
J822K-	TR1-100-822-10	.0082	10	.5	2	A
J103K-	TR1-100-103-10	.01	10	.5	2	A
J103M-	TR1-100-103-20	.01	20	.5	2	A
J123K-	TR1-100-123-10	.012	10	.5	2	A
J153K-	TR1-100-153-10	.015	10	.5	2	A
J153M-	TR1-100-153-20	.015	20	.5	2	A
J183K-	TR1-100-183-10	.018	10	.5	2	A
J223K-	TR1-100-223-10	.022	10	.5	2	A
J223M-	TR1-100-223-20	.022	20	.5	2	A
J273K-	TR1-100-273-10	.027	10	.5	2	A
J333K-	TR1-100-333-10	.033	10	.5	2	A
J333M-	TR1-100-333-20	.033	20	.5	2	A
J393K-	TR1-100-393-10	.039	10	.5	2	A
J473K-	TR1-100-473-10	.047	10	.5	2	A
J473M-	TR1-100-473-20	.047	20	.5	2	A
J563K-	TR1-100-563-10	.056	10	.5	2	A
J683K-	TR1-100-683-10	.068	10	.5	2	A
J683M-	TR1-100-683-20	.068	20	.5	2	A
J823K-	TR1-100-823-10	.082	10	.5	2	A
J104K-	TR1-100-104-10	.1	10	.5	2	A
J104M-	TR1-100-104-20	.1	20	.5	2	A
J124K-	TR1-100-124-10	.12	10	.5	2	A
J154K-	TR1-100-154-10	.15	10	.5	2	A
J154M-	TR1-100-154-20	.15	20	.5	2	A
J184K-	TR1-100-184-10	.18	10	.5	2	A
J224K-	TR1-100-224-10	.22	10	.5	2	A
J224M-	TR1-100-224-20	.22	20	.5	2	A
J274K-	TR1-100-274-10	.27	10	.5	2	A
J334K-	TR1-100-334-10	.33	10	.5	2	A
J334M-	TR1-100-334-20	.33	20	.5	2	A
J394K-	TR1-100-394-10	.39	10	.5	2	A
J474K-	TR1-100-474-10	.47	10	.5	2	A
J474M-	TR1-100-474-20	.47	20	.5	2	A
J564K-	TR1-100-564-10	.56	10	.5	2	A
J684K-	TR2-100-684-10	.68	10	.5	2	B
J684M-	TR2-100-684-20	.68	20	.5	2	B
J824K-	TR2-100-824-10	.82	10	.5	2	B
J105K-	TR2-100-105-10	1.0	10	.5	2	B
J105M-	TR2-100-105-20	1.0	20	.5	2	B
J125K-	TR2-100-125-10	1.2	10	.5	4	B
J155K-	TR2-100-155-10	1.5	10	1.0	4	B
J155M-	TR2-100-155-20	1.5	20	1.0	4	B
J185K-	TR2-100-185-10	1.8	10	1.0	4	B
J225K-	TR2-100-225-10	2.2	10	1.5	4	B
J225M-	TR2-100-225-20	2.2	20	1.5	4	B
J275K-	TR2-100-275-10	2.7	10	1.5	4	B

*Suffix L for 2%/1000 hr. failure rate, M for 1%/1000 hr. rate, P for 0.1%/1000 hr. rate.

TABLE A



DIMENSIONS — INCHES

INSULATED				UNINSULATED
Case Size	L Max.	D Max.	Lead Dia. ±.001	Uninsulated styles are not provided under government specification.
TM1	.281	.096	.016	
TM3	.405	.135	.020	

MARKING In accordance with MIL-C-39003.

LEADS Anode lead — solder coated nickel-iron alloy 52. Cathode lead — solder coated pure nickel wire. (Both leads may optionally be gold plated — see "Leads" paragraph on page 2.)

TABLE B

±10 CAPACITANCE TOLERANCE					
CSR09 TYPE DESIGNATION*	TM SERIES PART NUMBERS*	CASE SIZE	CAP IN MFD @ 25°C 120 Hz	MAX DCL IN uA @ 25°C	MAX DF % @ 25°C 120 Hz
6 VOLTS					
CSR09B275K-	TM1-006-275-10-	A1	2.7	0.6	6
CSR09B186K-	TM3-006-186-10-	B1	18.	1.4	6
10 VOLTS					
CSR09C224K-	TM1-010-224-10-	A1	.22	0.6	6
CSR09C274K-	TM1-010-274-10-	A1	.27	0.6	6
CSR09C334K-	TM1-010-334-10-	A1	.33	0.6	6
CSR09C394K-	TM1-010-394-10-	A1	.39	0.6	6
CSR09C185K-	TM1-010-185-10-	A1	1.8	0.6	6
CSR09C225K-	TM1-010-225-10-	A1	2.2	0.6	6
CSR09C106K-	TM3-010-106-10-	B1	10.	2.5	6
CSR09C126K-	TM3-010-126-10-	B1	12.	2.5	6
CSR09C156K-	TM3-010-156-10-	B1	15.	2.5	6
15 VOLTS					
CSR09D105K-	TM1-015-105-10-	A1	1.0	0.6	6
CSR09D125K-	TM1-015-125-10-	A1	1.2	0.6	6
CSR09D155K-	TM1-015-155-10-	A1	1.5	0.6	6
CSR09D825K-	TM3-015-825-10-	B1	8.2	1.8	6
20 VOLTS					
CSR09E564K-	TM1-020-564-10-	A1	.56	0.6	3
CSR09E684K-	TM1-020-684-10-	A1	.68	0.6	3
CSR09E824K-	TM1-020-824-10-	A1	.82	0.6	3
CSR09E105K-	TM1-020-105-10-	A1	1.0	0.6	3
CSR09E335K-	TM3-020-335-10-	B1	3.3	1.0	3
CSR09E395K-	TM3-020-395-10-	B1	3.9	2.0	3
CSR09E475K-	TM3-020-475-10-	B1	4.7	2.0	3
CSR09E565K-	TM3-020-565-10-	B1	5.6	2.0	3
CSR09E685K-	TM3-020-685-10-	B1	6.8	2.0	3
35 VOLTS					
CSR09F334K-	TM1-035-334-10-	A1	.33	0.6	3
CSR09F394K-	TM1-035-394-10-	A1	.39	0.6	3
CSR09F474K-	TM1-035-474-10-	A1	.47	0.6	3
CSR09F225K-	TM3-035-225-10-	B1	2.2	1.4	3
CSR09F275K-	TM3-035-275-10-	B1	2.7	1.4	3
50 VOLTS					
CSR09G224K-	TM1-050-224-10-	A1	.22	0.6	3
CSR09G274K-	TM1-050-274-10-	A1	.27	0.6	3
CSR09G155K-	TM3-050-155-10-	B1	1.5	1.4	3
CSR09G185K-	TM3-050-185-10-	B1	1.8	1.4	3
75 VOLTS					
CSR09H473K-	TM1-075-473-10-	A1	.047	0.6	3
CSR09H563K-	TM1-075-563-10-	A1	.056	0.6	3
CSR09H683K-	TM1-075-683-10-	A1	.068	0.6	3
CSR09H823K-	TM1-075-823-10-	A1	.082	0.6	3
CSR09H104K-	TM1-075-104-10-	A1	.10	0.6	3
CSR09H124K-	TM1-075-124-10-	A1	.12	0.6	3
CSR09H154K-	TM1-075-154-10-	A1	.15	0.6	3
CSR09H184K-	TM1-075-184-10-	A1	.18	0.6	3
CSR09H224K-	TM3-075-224-10-	B1	.22	0.6	3
CSR09H274K-	TM3-075-274-10-	B1	.27	0.6	3
CSR09H334K-	TM3-075-334-10-	B1	.33	0.6	3
CSR09H394K-	TM3-075-394-10-	B1	.39	0.6	3
CSR09H474K-	TM3-075-474-10-	B1	.47	0.6	3
CSR09H564K-	TM3-075-564-10-	B1	.56	0.6	3
CSR09H684K-	TM3-075-684-10-	B1	.68	0.6	3
CSR09H824K-	TM3-075-824-10-	B1	.82	0.7	3
CSR09H105K-	TM3-075-105-10-	B1	1.0	0.9	3
CSR09H125K-	TM3-075-125-10-	B1	1.2	0.9	3

*Add suffix M for 1.0% failure rate, P for 0.1% failure rate, etc.

COMPONENTS INCORPORATED
BIDDEFORD, MAIN 04

MILITAN® TM hermetic subminiature solid tantalum capacitors

For: Filtering — Coupling — By-passing — Ti

- CSR09
- POLAR TYPE
- SUBMINIATURE SIZE
- GLASS TO METAL HERMETIC SEAL
- COMPLETELY DRY ELECTROLYTE
- ±10% STANDARD TOLERANCE
- −80°C TO +125°C OPERATING RANGE
- .047 TO 18 MFD
- 75 TO 6 WVDC
- .01 uA/MFD-VOLT DC LEAKAGE
- 130% SURGE VOLTAGE RATING
- TINNED OR GOLD PLATED LEADS
- EYELETLESS CONSTRUCTION
- REEL PACKAGING AVAILABLE

GENERAL

These precision subminiature polar capacitors are intended for general ne storage, filtering, coupling, by-passing, and noncritical RC timing appli to 85°C without derating and to 125°C with appropriate derating. Series is designed to meet or exceed applicable requirements of MIL-3900 (style CSR09). Subminiature size, eyeletless construction, and overall p ance and reliability characteristics make these units well suited for se airborne computers, space vehicles, subminiature communications equ thick film circuitry, and similar applications.

ELECTRICAL AND PERFORMANCE

CAPACITANCE — Capacitance is measured in accordance with MIL-C-3900 on polarized capacitance bridge at 120 ±5 Hz with a porarizing voltage volts minimum and 2.2 volts maximum and an AC signal of 1.0 volt RMS ma

CAPACITANCE TOLERANCE — Standard tolerance is ±10%.

DISSIPATION FACTOR — DF is measured simultaneously with capacita above. At 25°C, DF will not exceed 3% (20 through 75 WVDC) or through 15 WVDC). At −55°C, DF will not exceed 4% (20 through 75 or 8% (6 through 15 WVDC).

DC LEAKAGE CURRENT — DC leakage (DCL) is measured in accordanc MIL-C-39003 with rated voltage applied through a 1000 ohm resistor in with the capacitor for 5 minutes maximum. 25°C DCL values are speci Table B.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated W 85°C and to 125°C with linear derating to 2/3 WVDC. Capacitors will stand up to ½ volt reverse DC bias at 85°C. AC ripple voltage sho limited so that the forward DC voltage plus peak AC voltage does not rated WVDC.

SURGE VOLTAGE — At 85°C and at 60-second intervals, capacitors wit 1000 30-second applications of 130% rated WVDC.

MECHANICAL AND PART NUMBERS

OPERATING TEMPERATURE — No derating is required between −80°C +85°C. Between 85°C and 125°C, derate linearly to 2/3 rated WVDC.

LIFE TEST — After 2000 hours at 85°C with rated WVDC applied, DC le and DF will not exceed Table B values and capacitance will be within of the values initially measured.

TEST PROCEDURES — Test methods and procedures are in accordance MIL-C-39003.

CONSTRUCTION — Tubular metal case, axially located leads, glass to hermetic seal, eyeletless construction (positive lead embedment in glass area), polyester insulating sleeve.

LEADS — Anode leads are solder coated nickel-iron alloy 52. Cathode are solder coated pure nickel wire (Type N3 of MIL-STD-1276). Both leads optionally be gold plated. See below under PART NUMBERS.

MARKING — Units are marked in accordance with MIL-C-39003.

PART NUMBERS — Both government and Components part numbers are s in Table B. The government nomenclature system does not provide for optional gold plated leads permitted under Amendment 2 of the CSR09 s sheet. Under the Components numbering system for the TM Series, gold p leads are denoted by adding suffix G, i.e. TM1-035-474-10-MG.

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

ECONOTAN® C subminiature solid tantalum capacitors

For: Filtering — Coupling — By-passing — Timing

- POLAR TYPE
- SUBMINIATURE SIZE
- METAL CASED, EPOXY SEALED
- REEL PACKAGING AVAILABLE
- COMPLETELY DRY ELECTROLYTE
- INDEFINITE SHELF/OPERATING LIFE
- TINNED, WELDABLE/SOLDERABLE LEADS
- ±20% AND ±10% TOLERANCES
- .0047 TO 68 MFD
- 35 TO 4 WVDC
- −55°C TO +85°C
- .02 uA/MFD-VOLT DC LEAKAGE
- 130% SURGE VOLTAGE RATING
- ½ VOLT REVERSE DC BIAS AT 85°C
- 1 TO 10 OHM IMPEDANCE AT 1MHz
- RELIABILITY DOCUMENTATION AVAILABLE

ELECTRICAL AND PERFORMANCE

CAPACITANCE — Measured on a polarized capacitance bridge with a maximum polarizing voltage of 2.2 VDC and a maximum AC signal of 1.0 volts RMC. See Table B for available ratings.

TOLERANCE — Standard tolerance is ±20% with ±10% tolerance available in all case sizes. 10% decade values are offered in ±10% tolerance.

DISSIPATION FACTOR — Measured simultaneously with capacitance as above. See Table B for maximum 25°C values.

DC LEAKAGE CURRENT — With rated WVDC applied through a 1000 ohm resistor for 5 minutes maximum, DCL values will not exceed those shown in Table B. At 85°C, DCL values will not exceed 10 times Table B values.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVDC at 85°C. Capacitors will withstand up to 1/2 volt reverse DC bias at 85°C. AC ripple voltage should be limited so that the forward DC voltage plus peak AC voltage does not exceed rated WVDC.

SURGE VOLTAGE — At 85°C and at 60-second intervals, capacitors withstand 1000 30-second applications of 130% rated WVDC.

TEMPERATURE — No derating is required between −55°C and +85°C.

MOISTURE RESISTANCE — Within 6 hours of the completion of Method 106, MIL-STD-202 testing, DC leakage current will not exceed initial limits. Capacitance will not change more than ±5% from initial values. Dissipation factor will not exceed twice initial limits.

MECHANICAL AND PART NUMBERS

CONSTRUCTION — Econotan® C Series models feature Mylar sleeve, metal case construction and are sealed with a special high stability, moisture resistant epoxy resin.

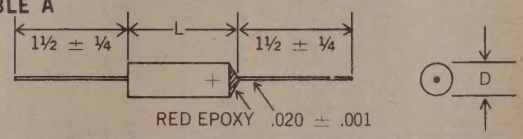
INSULATING SLEEVE — All units are supplied as standard with Mylar insulating sleeves. Units can also be supplied without sleeves. See below under PART NUMBERS.

PART NUMBERS — Part numbers are shown in Table B. For unsleeved units, add suffix "U" to all part numbers, i.e., CT35-224-20U, CM06-156-10U, etc.

TABLE B

PART NUMBER		CAP. IN MFD @ 25 C 120 Hz	WVDC @ 85 C	MAX. DF % @ 25 C 120 Hz	MAX. DCL IN μA @ 25 C
20% TOL.	± 10% TOL.				
CASE SIZE					
35-472-20	CT35-472-10	.0047	35	6	0.5
	CT35-562-10	.0056	35	6	0.5
35-682-20	CT35-682-10	.0068	35	6	0.5
	CT35-822-10	.0082	35	6	0.5
35-103-20	CT35-103-10	.010	35	6	0.5
	CT35-123-10	.012	35	6	0.5
35-153-20	CT35-153-10	.015	35	6	0.5
	CT35-183-10	.018	35	6	0.5
35-223-20	CT35-223-10	.022	35	6	0.5
	CT35-273-10	.027	35	6	0.5
35-333-20	CT35-333-10	.033	35	6	0.5
	CT35-393-10	.039	35	6	0.5
35-473-20	CT35-473-10	.047	35	6	0.5
	CT35-563-10	.056	35	6	0.5
35-683-20	CT35-683-10	.068	35	6	0.5
	CT35-823-10	.082	35	6	0.5
35-104-20	CT35-104-10	.10	35	6	0.5
	CT35-124-10	.12	35	6	0.5
35-154-20	CT35-154-10	.15	35	6	0.5
	CT35-184-10	.18	35	6	0.5
35-224-20U	CT35-224-10	.22	35	6	0.5
	CT35-274-10	.27	35	6	0.5
35-334-20	CT35-334-10	.33	35	6	0.5
	CT35-394-10	.39	35	6	0.5
35-474-20	CT35-474-10	.47	35	6	0.5
	CT25-564-10	.56	25	6	0.5
25-684-20	CT25-684-10	.68	25	6	0.5
	CT25-824-10	.82	25	6	0.5
25-105-20	CT25-105-10	1.0	25	6	0.5
	CT20-125-10	1.2	20	6	0.5
20-155-20	CT20-155-10	1.5	20	6	0.5
	CT15-185-10	1.8	15	6	0.5
15-225-20	CT15-225-10	2.2	15	6	0.5
	CT10-275-10	2.7	10	6	0.5
10-335-20	CT10-335-10	3.3	10	6	0.5
	CT06-395-10	3.9	6	6	0.5
06-475-20	CT05-475-10	4.7	6	6	0.5
	CT04-565-10	5.6	4	8	0.5
04-685-20	CT04-685-10	6.8	4	8	0.5
	CT02-825-10	8.2	2	10	0.5
02-106-20	CT02-106-10	10.	2	10	0.5
CASE SIZE					
M35-684-20	CM35-684-10	.68	35	6	1.0
	CM35-824-10	.82	35	6	1.0
M35-105-20	CM35-105-10	1.0	35	6	1.0
	CM35-125-10	1.2	35	6	1.0
M35-155-20	CM35-155-10	1.5	35	6	1.0
	CM25-185-10	1.8	25	6	1.0
M25-225-20	CM25-225-10	2.2	25	6	1.0
	CM25-275-10	2.7	25	6	1.0
M25-335-20	CM25-335-10	3.3	25	6	1.0
	CM20-395-10	3.9	20	6	1.0
M20-475-20	CM20-475-10	4.7	20	6	1.0
	CM15-565-10	5.6	15	6	1.0
M15-685-20	CM15-685-10	6.8	15	6	1.0
	CM10-825-10	8.2	10	6	1.0
M10-106-20	CM10-106-10	10.	10	6	1.0
	CM06-126-10	12.	6	6	1.0
M06-156-10U	CM06-156-10	15.	6	6	1.0
	CM04-186-10	18.	4	8	1.0
M04-226-20	CM04-226-10	22.	4	8	1.0
	CM02-276-10	27.	2	10	1.0
M02-336-20	CM02-336-10	33.	2	10	1.0
L CASE SIZE					
L35-225-20	CL35-225-10	2.2	35	6	2.0
	CL35-275-10	2.7	35	6	2.0
L35-335-20	CL35-335-10	3.3	35	6	2.0
	CL25-395-10	3.9	25	6	2.0
L25-475-20	CL25-475-10	4.7	25	6	2.0
	CL25-565-10	5.6	25	6	2.0
L25-685-20	CL25-685-10	6.8	25	6	2.0
	CL20-825-10	8.2	20	6	2.0
L20-106-20	CL20-106-10	10.	20	6	2.0
	CL15-126-10	12.	15	6	2.0
L15-156-20	CL15-156-10	15.	15	6	2.0
	CL10-186-10	18.	10	6	2.0
L10-226-20	CL10-226-10	22.	10	6	2.0
	CL06-276-10	27.	6	6	2.0
L06-336-20	CL06-336-10	33.	6	6	2.0
	CL04-396-10	39.	4	8	2.0
L04-476-20	CL04-476-10	47.	4	8	2.0
	CL02-566-10	56.	2	10	2.0
L02-686-20	CL02-686-10	68.	2	10	2.0
B CASE SIZE					
B35-475-20	CB35-475-10	4.7	35	6	3.0
	CB35-565-10	5.6	35	6	3.0
B35-685-20	CB35-685-10	6.8	35	6	3.0
	CB25-825-10	8.2	25	6	3.0
B25-106-20	CB25-106-10	10.	25	6	3.0
	CB20-126-10	12.	20	6	3.0
B20-156-20	CB20-156-10	15.	20	6	3.0
	CB15-186-10	18.	15	6	3.0
B15-226-20	CB15-226-10	22.	15	6	3.0
	CB10-276-10	27.	10	6	3.0
B10-336-20	CB10-336-10	33.	10	6	3.0
	CB06-396-10	39.	6	6	3.0
B06-476-20	CB06-476-10	47.	6	6	3.0
	CB01-566-10	56.	4	8	3.0
B04-686-20	CB04-686-10	68.	4	8	3.0

TABLE A



DIMENSIONS — INCHES

INSULATED				UNINSULATED			
Case Size	L Max.	D Max.	Vol. Cu. In.	Case Size	L Max.	D Max.	Vol. Cu. In.
CT	.260	.095	.0018	CT	.250	.090	.0015
CM	.320	.133	.0044	CM	.300	.128	.0039
CL	.345	.180	.0088	CL	.325	.175	.0078
CB	.420	.183	.0110	CB	.400	.178	.0100

MARKING

CT CASE SIZE:
Vendor, polarity, capacitance, WVDC, tolerance*

CM, CL, CB CASE SIZES:
Vendor, polarity, capacitance, WVDC, tolerance, date code.

*Tolerance Symbols: M (±20%), K (±10%).

TABLE B

PART NUMBER ±20% TOL.	PART NUMBER ±10% TOL.	CASE SIZE	CAP IN MFD @ 25°C 120 Hz	MAX DCL IN uA @ 25°C	MAX DF % @ 25°C 120 Hz
6 VOLTS					
TD1-006-156-20	TD1-006-156-10	TD1	15.	1.8	6
TD1-006-186-20	TD1-006-186-10	TD1	18.	2.2	6
TD2-006-276-20	TD2-006-276-10	TD2	27.	3.2	6
TD2-006-336-20	TD2-006-336-10	TD2	33.	4.0	6
TD2-006-396-20	TD2-006-396-10	TD2	39.	4.6	6
TD3-006-476-20	TD3-006-476-10	TD3	47.	5.6	6
TD3-006-566-20	TD3-006-566-10	TD3	56.	6.7	6
TD3-006-686-20	TD3-006-686-10	TD3	68.	8.1	8
TD4-006-826-20	TD4-006-826-10	TD4	82.	10.	8
TD4-006-107-20	TD4-006-107-10	TD4	100.	12.	8
TD5-006-187-20	TD5-006-187-10	TD5	180.	22.	10
TD5-006-227-20	TD5-006-227-10	TD5	220.	26.	10
TD5-006-277-20	TD5-006-277-10	TD5	270.	32.	10
10 VOLTS					
TD1-010-106-20	TD1-010-106-10	TD1	10.	2.0	6
TD1-010-126-20	TD1-010-126-10	TD1	12.	2.4	6
TD2-010-186-20	TD2-010-186-10	TD2	18.	3.6	6
TD2-010-226-20	TD2-010-226-10	TD2	22.	4.4	6
TD3-010-336-20	TD3-010-336-10	TD3	33.	6.6	6
TD3-010-396-20	TD3-010-396-10	TD3	39.	7.8	6
TD4-010-566-20	TD4-010-566-10	TD4	56.	11.	6
TD4-010-686-20	TD4-010-686-10	TD4	68.	14.	8
TD5-010-127-20	TD5-010-127-10	TD5	120.	24.	10
TD5-010-157-20	TD5-010-157-10	TD5	150.	30.	10
15 VOLTS					
TD1-015-685-20	TD1-015-685-10	TD1	6.8	2.0	6
TD1-015-825-20	TD1-015-825-10	TD1	8.2	2.5	6
TD2-015-126-20	TD2-015-126-10	TD2	12.	3.6	6
TD2-015-156-20	TD2-015-156-10	TD2	15.	4.5	6
TD3-015-226-20	TD3-015-226-10	TD3	22.	6.6	6
TD3-015-276-20	TD3-015-276-10	TD3	27.	8.1	6
TD4-015-336-20	TD4-015-336-10	TD4	33.	9.9	6
TD4-015-396-20	TD4-015-396-10	TD4	39.	12.	6
TD4-015-476-20	TD4-015-476-10	TD4	47.	14.	6
TD5-015-826-20	TD5-015-826-10	TD5	82.	25.	8
TD5-015-107-20	TD5-015-107-10	TD5	100.	30.	8
20 VOLTS					
TD1-020-475-20	TD1-020-475-10	TD1	4.7	1.9	6
TD1-020-565-20	TD1-020-565-10	TD1	5.6	2.2	6
TD2-020-685-20	TD2-020-685-10	TD2	6.8	2.7	6
TD2-020-825-20	TD2-020-825-10	TD2	8.2	3.3	6
TD2-020-106-20	TD2-020-106-10	TD2	10.	4.0	6
TD3-020-126-20	TD3-020-126-10	TD3	12.	4.8	6
TD3-020-156-20	TD3-020-156-10	TD3	15.	6.0	6
TD3-020-186-20	TD3-020-186-10	TD3	18.	7.2	6
TD4-020-226-20	TD4-020-226-10	TD4	22.	8.8	6
TD4-020-276-20	TD4-020-276-10	TD4	27.	11.	6
TD5-020-396-20	TD5-020-396-10	TD5	39.	16.	6
TD5-020-476-20	TD5-020-476-10	TD5	47.	19.	6
TD5-020-566-20	TD5-020-566-10	TD5	56.	22.	6
TD5-020-686-20	TD5-020-686-10	TD5	68.	27.	8
25 VOLTS					
TD1-025-275-20	TD1-025-275-10	TD1	2.7	1.3	6
TD1-025-335-20	TD1-025-335-10	TD1	3.3	1.6	6
TD1-025-395-20	TD1-025-395-10	TD1	3.9	2.0	6
TD2-025-475-20	TD2-025-475-10	TD2	4.7	2.3	6
TD2-025-565-20	TD2-025-565-10	TD2	5.6	2.8	6
TD3-025-825-20	TD3-025-825-10	TD3	8.2	4.1	6
TD3-025-106-20	TD3-025-106-10	TD3	10.	5.0	6
TD4-025-126-20	TD4-025-126-10	TD4	12.	6.0	6
TD4-025-156-20	TD4-025-156-10	TD4	15.	7.5	6
TD4-025-186-20	TD4-025-186-10	TD4	18.	9.0	6
TD5-025-226-20	TD5-025-226-10	TD5	22.	11.	6
TD5-025-276-20	TD5-025-276-10	TD5	27.	13.	6
TD5-025-336-20	TD5-025-336-10	TD5	33.	16.	6
35 VOLTS					
TD1-035-104-20	TD1-035-104-10	TD1	.10	1.0	6
TD1-035-124-20	TD1-035-124-10	TD1	.12	1.0	6
TD1-035-154-20	TD1-035-154-10	TD1	.15	1.0	6
TD1-035-184-20	TD1-035-184-10	TD1	.18	1.0	6
TD1-035-224-20	TD1-035-224-10	TD1	.22	1.0	6
TD1-035-274-20	TD1-035-274-10	TD1	.27	1.0	6
TD1-035-334-20	TD1-035-334-10	TD1	.33	1.0	6
TD1-035-394-20	TD1-035-394-10	TD1	.39	1.0	6
TD1-035-474-20	TD1-035-474-10	TD1	.47	1.0	6
TD1-035-564-20	TD1-035-564-10	TD1	.56	1.0	6
TD1-035-684-20	TD1-035-684-10	TD1	.68	1.0	6
TD1-035-824-20	TD1-035-824-10	TD1	.82	1.0	6
TD1-035-105-20	TD1-035-105-10	TD1	1.0	1.0	6
TD1-035-125-20	TD1-035-125-10	TD1	1.2	1.0	6
TD1-035-155-20	TD1-035-155-10	TD1	1.5	1.0	6
TD1-035-185-20	TD1-035-185-10	TD1	1.8	1.3	6
TD1-035-225-20	TD1-035-225-10	TD1	2.2	1.5	6
TD2-035-275-20	TD2-035-275-10	TD2	2.7	1.9	6
TD2-035-335-20	TD2-035-335-10	TD2	3.3	2.3	6
TD2-035-395-20	TD2-035-395-10	TD2	3.9	2.7	6
TD3-035-475-20	TD3-035-475-10	TD3	4.7	3.3	6
TD3-035-565-20	TD3-035-565-10	TD3	5.6	3.9	6
TD3-035-685-20	TD3-035-685-10	TD3	6.8	4.8	6
TD4-035-825-20	TD4-035-825-10	TD4	8.2	5.7	6
TD4-035-106-20	TD4-035-106-10	TD4	10.	7.0	6
TD5-035-126-20	TD5-035-126-10	TD5	12.	8.4	6
TD5-035-156-20	TD5-035-156-10	TD5	15.	10.	6
TD5-035-186-20	TD5-035-186-10	TD5	18.	13.	6
TD5-035-226-20	TD5-035-226-10	TD5	22.	15.	6

COMPONENTS INCORPORATED

BIDDEFORD, MAINE

DIPITAN® TD dipped epoxy solid tantalum capacitors

For: Filtering — Coupling — By-passing — Tinning

- POLAR TYPE
- DIPPED EPOXY CONSTRUCTION
- COMPLETELY DRY ELECTROLYTE
- SOLDER COATED PURE NICKEL LEADS
- ±20% AND ±10% TOLERANCES
- −55°C TO +85°C
- .10 TO 270 MFD
- 35 TO 6 WVDC
- 130% SURGE VOLTAGE RATING
- ½ VOLT REVERSE DC BIAS AT 85°C
- .02 uA/MFD-VOLT DC LEAKAGE
- RADIAL LEADS

GENERAL

These miniature polar solid tantalum capacitors are suitable for general filtering, coupling, bypassing, and non-critical RC timing applications to 85° without derating. Intended specifically for commercial and industrial applications the Dipatan® Series features long shelf life, superior electrical performance and radial lead construction for use in miniature printed circuit applications.

ELECTRICAL AND PERFORMANCE

CAPACITANCE — Measured on a polarized capacitance bridge with a maximum polarizing voltage of 2.2 VDC and a maximum AC signal of 1.0 volts RC. See Table B for available ratings.

TOLERANCE — Standard tolerance is ±20% with ±10% tolerance available in all case sizes.

DISSIPATION FACTOR — Dissipation factor (DF) is measured simultaneously with capacitance as described above. At 25°C and 120 Hz DF will not exceed % for values through 56 MFD, 8% for values through 120 MFD, and 10% for values over 120 MFD.

DC LEAKAGE CURRENT — DC leakage (DCL) is measured by applying rated DC voltage through a 1000 ohm resistor in series with the capacitor for 5 minutes maximum. At 25°C, DCL will not exceed .02 uA/mfd-volt or 1.0 uA, whichever is greater. At 85°C DCL will not exceed .2 uA/mfd-volt or 10 uA, whichever is greater.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVD at 85°C. Capacitors will withstand up to 1/2 volt reverse DC bias at 85°C. AC ripple voltage should be limited so that the forward DC voltage plus peak AC voltage does not exceed rated WVDC.

SURGE VOLTAGE — At 85°C and at 60-second intervals, capacitors withstand 1000 30-second applications of 130% rated WVDC.

TEMPERATURE — No derating is required between −55°C and +85°C.

MECHANICAL AND PART NUMBERS

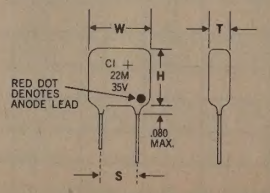
CONSTRUCTION — Dipatan® Series capacitors feature rectangular anode construction sealed with a special high stability epoxy resin.

LEADS — Leads are solder coated high purity nickel wire suitable for either soldering or welding. They will withstand a 3 lb. axial pull test.

MARKING — All units are marked with capacitance, working voltage, polarity dot, and tolerance symbol (M = ±20%, K = ±10%).

PART NUMBERS — Basic part numbers are shown in Table B. Tolerances are indicated by adding suffix "—20" for ±20% tolerance and "—10" for ±10% tolerance, i.e. TD1-015-685-20.

TABLE A



Case Size	H Max.	W Max.	T Max.	S ±.0
TD1	.235	.275	.180	.125
TD2	.310	.325	.200	.200
TD3	.360	.400	.200	.250
TD4	.360	.400	.250	.250
TD5	.435	.450	.325	.250

DIMENSIONS — INCHES

Leads are .020 ± .002 Diameter, 1¼ ± ¼ Long.
*.125 x .020 Leads Available on Special Order.
**.200 x .025 Leads Available on Special Order.

LTAN® TA (CL66/67)
led electrolyte
talum capacitors

COMPONENTS INCORPORATED
BIDDEFORD, MAINE 04005

For: ltering — Coupling — By-passing — Timing
6, CL67 • POLAR TYPE
LED ELECTROLYTE
METICALLY SEALED
IRONMENTALLY RESISTANT
IATURE SIZE
–5°C TO +125°C
.56 TO 3.6 MFD • 6 TO 125 WVDC
±20% STANDARD TOLERANCE
15% SURGE VOLTAGE RATING
2 A/MAX. DC LEAKAGE AT 25°C
WELDABLE/SOLDERABLE LEADS
POLYESTER INSULATING SLEEVE (CL67)

GENERAL

The miniature gelled electrolyte Weltan® TA Series combines ultra-low DC leakage with true glass-to-metal seal hermetic construction. As compared with equivalent solid electrolyte tantalum capacitors. Weltan TA units are approximately 50% smaller and offer order of magnitude lower DC leakage values at elevated temperatures. Weltan® TA units are particularly well suited to high packaging density applications requiring low DC leakage combined with long-term stability and high reliability.

ELECTRICAL AND PERFORMANCE

CAPACITANCE — Measured on a polarized capacitance bridge with a maximum polarizing voltage of 2.2 volts DC and a maximum AC signal of 1.0 volts RMS. See Table B for available ratings.

TOLERANCE — Standard tolerances are ±20%, ±10%, and ±5%.

POWER FACTOR — Measured simultaneously with capacitance as above. See Table B for maximum 25°C values.

DC LEAKAGE CURRENT — With rated voltage applied through a 1000 ohm resistor for 5 minutes maximum, DCL values at 25°C and 125°C will not exceed those shown in Table B.

IMPEDANCE — At −55°C and 120 Hz, impedance values will not exceed those shown in Table B.

OPERATING VOLTAGE — Capacitors will operate reliably up to rated WVDC at 85°C and to 125°C with linear derating to 2/3 WVDC. AC ripple voltage should be limited so that the DC voltage plus peak AC ripple voltage does not exceed rated WVDC. The DC component of the applied voltage should be large enough to prevent polarity reversal.

SURGE VOLTAGE — At 85°C and at 5½ minute intervals, capacitors will withstand 1000 30-second applications of 115% WVDC. Following testing and at 25°C, capacitance will not have changed by more than ±10%. ESR and DCL will not exceed the values specified in Table B.

TEMPERATURE — No derating is required between −55°C and +85°C. Between 85°C and 125°C, derate linearly to 2/3 WVDC.

LIFE TEST — After 2000 hours at 85°C with rated WVDC applied, DCL and ESR values will not exceed those shown in Table B. Capacitance will not have changed by more than ±10% of the Table B values.

MILITARY SPECIFICATIONS — The TA Series is designed to meet or exceed the performance and test requirements of MIL-C-3965D, case styles CL66 and CL67.

MECHANICAL AND PART NUMBERS

CONSTRUCTION — Metal case, polyester sleeve (CL67), gelled electrolyte, glass-to-metal hermetic seal, solder coated nickel leads.

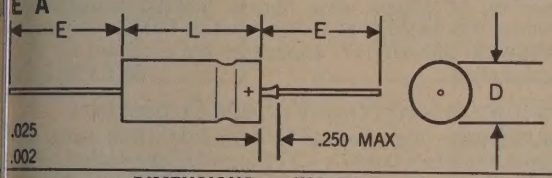
INSULATING SLEEVE — Polyester. Sleeves withstand the insulation resistance and dielectric withstanding tests specified in MIL-C-3965D.

LEADS — Leads are solder coated pure nickel wire suitable for soldering or welding. They withstand the pull and bend tests specified in MIL-C-3965D.

MARKING — All units are marked in accordance with MIL-C-3965D with the type designation, date code, source code, and polarity mark.

PART NUMBERS — Part numbers are shown in Table B for ±20% insulated styles. For ±10% or ±5% tolerance, substitute "K" or "J" for "M" in military type designations and "10" or "05" for "20" in Components part numbers, i.e. CL67BB680KPG and TA1-006-686-10. For uninsulated styles, substitute "66" for "67" in the military designation and add suffix "U" to the Components part number, i.e. CL66BN430JPG and TA3-100-436-05-U.

TABLE A



DIMENSIONS — INCHES

INSULATED				UNINSULATED			
Case Size	L +.031 −.016	D Max.	E ±.250	Case Size	L +.031 −.016	D Max.	E ±.250
TA1	.484	.219	1.500	TA1	.453	.188	1.500
TA2	.672	.312	2.250	TA2	.641	.281	2.250
TA3	.797	.406	2.250	TA3	.766	.375	2.250

MARKING: In accordance with MIL-C-3965 with type designation, data code, source code, and polarity syymbols.

LEADS: Solder coated pure nickel wire (type N3 MIL-STD-1276) .025 ± .002 dia.

TABLE B

±20% CAPACITANCE TOLERANCE		CAP IN MFD 25°C	WVDC AT 25°C	MAX PF IN % 25°C	Z IN OHMS −55°C	MAX DC LEAK. IN uA		CAP. CHANGE IN PERCENT	
CL67 TYPE DESIGNATION	COMPONENTS PART NUMBER					25°C	125°C	−55°C	+125°C
TA1 CASE SIZE									
CL67BP3R6MPG	TA1-125-365-20	3.6	125	4.1	600	1	2	−16	+ 8
CL67BN4R7MPG	TA1-100-475-20	4.7	100	3.6	500	1	2	−16	+ 8
CL67BL6R8MPG	TA1-075-685-20	6.8	75	4.1	300	1	2	−20	+ 9
CL67BK8R2MPG	TA1-060-825-20	8.2	60	5.0	275	1	2	−24	+ 9
CL67BJ100MPG	TA1-050-106-20	10.	50	6.0	250	1	2	−24	+ 9
CL67BH150MPG	TA1-030-156-20	15.	30	9.1	175	1	2	−20	+12
CL67BG220MPG	TA1-025-226-20	22.	25	8.3	140	1	2	−20	+12
CL67BE330MPG	TA1-015-336-20	33.	15	12.4	90	1	2	−28	+16
CL67BD470MPG	TA1-010-476-20	47.	10	17.8	100	1	2	−36	+16
CL67BC560MPG	TA1-008-566-20	56.	8	16.8	59	1	2	−40	+16
CL67BB680MPG	TA1-006-686-20	68.	6	20.0	60	1	2	−40	+16
TA2 CASE SIZE									
CL67BP140MPG	TA2-125-146-20	14.	125	12.6	167	1	7	−16	+ 8
CL67BN220MPG	TA2-100-226-20	22.	100	11.7	100	1	9	−16	+ 8
CL67BL330MPG	TA2-075-336-20	33.	75	17.2	90	1	10	−24	+15
CL67BK390MPG	TA2-060-396-20	39.	60	20.3	90	1	9	−28	+12
CL67BJ470MPG	TA2-050-476-20	47.	50	20.9	70	1	9	−28	+15
CL67BH680MPG	TA2-030-686-20	68.	30	29.6	60	1	8	−24	+15
CL67BG101MPG	TA2-025-107-20	100.	25	30.0	50	1	10	−28	+15
CL67BE121MPG	TA2-015-127-20	120.	15	34.5	50	1	7	−28	+20
CL67BD181MPG	TA2-010-187-20	180.	10	47.8	40	1	7	−36	+16
CL67BC221MPG	TA2-008-227-20	220.	8	55.3	30	1	7	−44	+20
CL67BB271MPG	TA2-006-277-20	270.	6	63.3	25	1	7	−44	+20
TA3 CASE SIZE									
CL67BP250MPG	TA3-125-256-20	25.	125	18.7	93	2	13	−16	+ 8
CL67BN430MPG	TA3-100-436-20	43.	100	19.3	70	2	17	−20	+ 8
CL67BL560MPG	TA3-075-566-20	56.	75	24.9	60	2	17	−28	+15
CL67BK680MPG	TA3-060-686-20	68.	60	29.3	50	2	16	−32	+12
CL67BJ820MPG	TA3-050-826-20	82.	50	24.2	45	2	16	−32	+15
CL67BH151MPG	TA3-030-157-20	150.	30	41.5	35	2	18	−48	+15
CL67BG181MPG	TA3-025-187-20	180.	25	47.7	32	2	18	−48	+15
CL67BE271MPG	TA3-015-277-20	270.	15	52.0	30	2	16	−56	+20
CL67BD391MPG	TA3-010-397-20	390.	10	65.9	25	2	16	−64	+20
CL67BC431MPG	TA3-008-437-20	430.	8	67.5	25	2	14	−64	+20
CL67BB561MPG	TA3-006-567-20	560.	6	78.8	25	2	13	−64	+20

NEW DEVELOPMENTS IN FILM CAPACITORS *from*

COMPONENT RESEARCH COMPANY, INC.

PAGE Catalog

The 1970's will be marked by the advent of newer dielectric films with remarkable electrical properties of interest to circuit and network design engineers.

Using a unique lot-controlled manufacturing and test plan for capacitor evaluation, a comprehensive study of both older and newer film dielectrics for wound capacitors was started in 1969 and is continuing into the 70's.

This plan consists of carefully controlling a test lot of capacitors, from raw materials through final test, by unique lot numbers assigned to all materials used, and unique serial numbers for every capacitor made from these materials. The lot begins by selecting a set of dielectric rolls, and using all the capacitors manufactured from this set as a unique lot. The lot quantity may vary from 20 to 400 capacitors, depending on the value of the capacitors and the material used.

All lots of capacitors are subjected to temperature cycling and helium leak tests and given various levels of burn-in. Temperature cycling is repeated and temperature coefficient performed at as many as 10 temperature points. All capacitors are measured for % tolerance, % dissipation factor at 1 KHz and 10 KHz, and leakage current after each stress sequence. Using extremely stable and sensitive measurement equipment, observations of changes in parameters are recorded both numerically and graphically.

A variety of burn-in tests consisting of matrix plans with DC step voltages and step temperatures, are used to determine the point at which parameters change with time.

AC burn-in is also performed using sine wave stress from 60 Hz to 400 Hz, with additional tests planned to 25,000 Hz. Specially designed power supplies generating short-rise-time square waves are also used to subject the capacitors to frequencies from 100 Hz to 10 KHz, while current and voltage wave forms are monitored to study rise-time effects.

As a result of testing thousands of capacitors in this manner, Component Research Company has been able to observe and analyze mechanisms of capacitor change and degradation which normally escape attention.

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CAPACITOR APPLICATIONS

QUESTION & ANSWER COLUMN

Miniature AC Capacitors

QUESTION: "I need a 3 mfd capacitor that will take a 300 volt peak-to-peak square wave at 400 Hz with less than 10°C heat rise. What is the smallest size hermetically sealed unit you have?"

ANSWER: Metallized polysulfone in 0.562 x 1.125 case. **SEE PAGES 21, 22**

High Reliability Teflon Capacitors

QUESTION: "I need small teflon capacitors, the size of your 05TJ, that can handle short-rise-time pulses which usually damage metallized teflon capacitors. After DC burn-in, AC square wave burn-in and 20 temperature cycles, the dissipation factor must be 0.03% or less."

ANSWER: Special 05TJ capacitors are excellent for this application. **SEE PAGE 20**

Miniaturized High Voltage Capacitors

QUESTION: "Can you fit a 0.25 mfd 1500 volts DC capacitor into a 0.670 x 1.875 hermetically sealed case? It must pass 250 hours at 85°C and 2400 VDC without failure and must exceed 250,000 megohms after test."

ANSWER: Yes, we believe these units can take even higher voltages. **SEE PAGE 20**

Zero Temperature Coefficient ±25 PPM/°C

QUESTION: "I would like to match a resistor and capacitor so that the RC product is ±0.25% maximum from —55°C to 125°C."

ANSWER: We can supply capacitors as close as ±0.1% from —55°C to 125°C. **SEE PAGE 21**

High Temperature Polystyrene

QUESTION: "Do you have special miniature polystyrene capacitors that can be operated to 105°C and withstand storage at 115°C?"

ANSWER: Yes we can, and in addition are testing at 125°C. **SEE PAGES 21, 22**

High Insulation Resistance

QUESTION: "Can you meet 250,000 megohms minimum at 85°C for low voltage polycarbonate capacitors and over 1,000,000 megohms for small teflon capacitors at 85°C?"

ANSWER: Yes, we can even go higher! **SEE PAGE 22**

Polysulfone and Polypropylene Capacitors

QUESTION: "Have you any test data that indicates these films can offer any improvements over conventional films?"

ANSWER: Yes, and we are accumulating much more. **SEE PAGES 20, 21, 22**

Availability

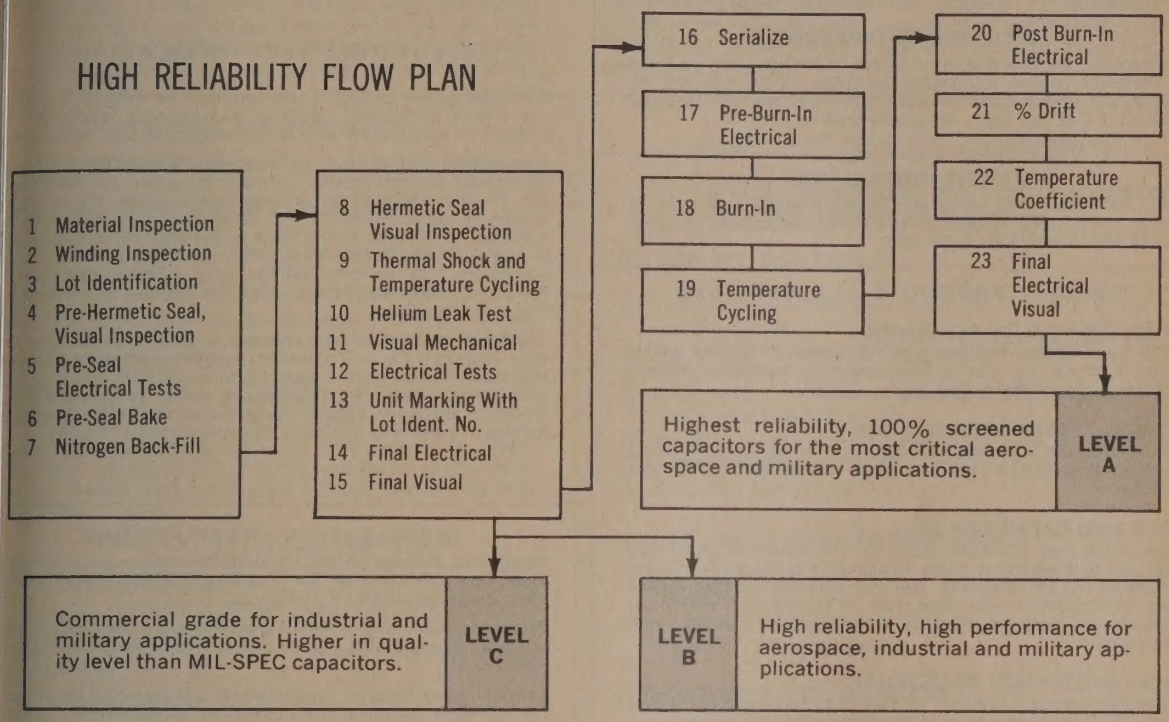
QUESTION: "I need odd-valued capacitors in close tolerances, such as 0.1103 ±0.25% 50 volts, and 0.3966 ±0.25% 100 volts. If I need about ten such values, how long will it take to get a dozen of each? These capacitors must be stable and capable of meeting any MIL-Spec."

ANSWER: Most orders of this type can be filled from stock within a few days, or custom-made within four weeks.

COMPONENT RESEARCH CO., INC. 1717 19th Street, Santa Monica, Calif. 90404 • Phone: (213) 393-3755 • TWX: (910) 343-6864

COMPARISON OF CAPACITOR TYPES

HIGH RELIABILITY FLOW PLAN



COMPARISON TABLE

A "quality level" column in the comparison table below is set up as a quick guide for the reliability engineer. Quality levels A, B, and C as shown in flow plan above, indicate where capacitor types are primarily used and applications for which they are recommended.

Dielectric	Type	Volts DC	Quality Level	Typical Temperature Coefficient Limits Max. % Capacitance Change Relative to 25°C							Maximum Leakage Current in Picoamps at Rated Voltage For 0.1 MFD Capacitors				% Max Drift 5 cycles −10°C to 85°C	% Max Diel. Absorption at 25°C	% Max Dissipation factor at 1 KHz
				−55°C	−25°C	−10°C	0°C	55°C	85°C	125°C	25°C	55°C	85°C	125°C			
TI LON	05TA	50	B	+0.6	+0.4	+0.3	+0.2	−0.25	−0.5	−0.6	10	10	25	200	0.02	0.02	0.03
	1TA	100	B	+0.6	+0.4	+0.3	+0.2	−0.25	−0.5	−0.6	20	20	50	400	0.02	0.02	0.03
	2TA	200	B	+0.6	+0.4	+0.3	+0.2	−0.25	−0.5	−0.6	40	40	100	800	0.02	0.02	0.03
	05TJ	50	A	+0.4	+0.25	+0.2	+0.1	−0.15	−0.25	−0.35	10	10	25	200	0.01	0.02	0.03
	05TC	50	A	+0.7	+0.5	+0.3	+0.25	−0.25	−0.5	−0.6	10	10	25	200	0.02	0.02	0.05
	05TL	50	C	+1.0	+0.7	+0.5	+0.3	−0.4	−0.7	−1.0	50	50	100	500	0.05	0.05	0.15
	05TQ	50	B	+0.8	+0.6	+0.5	+0.3	−0.3	−0.6	−0.9	10	10	25	200	0.05	0.05	0.10
	1TU	100	B	+0.8	+0.6	+0.3	+0.2	−0.2	−0.5	−0.8	10	20	33	333	0.05	0.01	0.005
	2TU	200	B	+1.0	+0.6	+0.4	+0.3	−0.3	−0.6	−1.0	20	40	66	666	0.05	0.01	0.005
	1TF	100	C	+1.2	+0.8	+0.6	+0.4	−0.4	−0.7	−1.2	33	50	100	1,000	0.1	0.03	0.02
P Y- RBON- A	03PV	30	A	−1.0	−0.4	−0.2	−0.1	±0.1	±0.25	±0.5	7	15	30	600	0.03	0.15	0.20
	05PK	50	A	−1.0	−0.4	−0.2	−0.1	±0.1	±0.25	±0.5	16	25	50	2,500	0.03	0.15	0.20
	05PQ	50	B	−2.0	−0.8	−0.5	−0.3	±0.3	±0.8	±1.5	50	100	500	5,000	0.05	0.20	0.20
	03PL	30	B	−1.5	−0.5	−0.3	−0.2	±0.2	±0.5	±1.0	10	15	30	3,000	0.05	0.20	0.20
	05PL	50	B	−1.5	−0.5	−0.3	−0.2	±0.2	±0.5	±1.0	16	25	50	5,000	0.05	0.20	0.20
	1PL	100	B	−1.5	−0.5	−0.3	−0.2	±0.2	±0.5	±1.0	33	50	100	10,000	0.05	0.20	0.20
	2PL	200	B	−1.5	−0.5	−0.3	−0.2	±0.2	±0.5	±1.0	66	100	200	20,000	0.05	0.20	0.20
	4PL	400	B	−1.5	−0.5	−0.3	−0.2	±0.2	±0.5	±1.0	132	200	400	40,000	0.05	0.20	0.20
	03PG	30	C	−2.0	−0.8	−0.5	−0.3	±0.5	±1.0	±2.0	30	60	300	3,000	0.10	0.20	0.30
	05PG	50	C	−2.0	−0.8	−0.5	−0.3	±0.5	±1.0	±2.0	50	100	500	5,000	0.10	0.20	0.30
	1PG	100	C	−2.0	−0.8	−0.5	−0.3	±0.5	±1.0	±2.0	100	200	1,000	10,000	0.10	0.20	0.30
	2PG	200	C	−2.0	−0.8	−0.5	−0.3	±0.5	±1.0	±2.0	200	400	2,000	20,000	0.10	0.20	0.30
	4PG	400	C	−2.0	−0.8	−0.5	−0.3	±0.5	±1.0	±2.0	400	800	4,000	40,000	0.10	0.20	0.30
M LAR	1MA	100	B	−5.0	−3.0	−2.0	−1.0	+1.0	+2.0	+14	200	600	5,000	50,000	0.10	0.50	0.8
	2MM	200	B	−5.0	−3.5	−2.5	−1.5	+1.0	+3.0	+15	200	600	5,000	50,000	0.10	0.50	0.8
P Y- S RENE	05PA	50	B	+1.0	+0.55	+0.4	+0.3	−0.3	−0.6	—	10	20	100	—	0.05	0.02	0.02
	1PA	100	B	+1.0	+0.55	+0.4	+0.3	−0.3	−0.6	—	20	40	200	—	0.05	0.02	0.02

GENERAL INFORMATION

ORDERING INFORMATION

To expedite the ordering of prototype quantities we have listed 1-6 quantity prices. Immediate quotation for any quantity required will be given upon request. Our terms are ½% 10 days, Net 30, F.O.B. our plant. Minimum order is $10.00.

PATENT INFORMATION

CRC capacitors are exclusively manufactured under one or more of the following patents and additional patents pending: 3,238,428; 3,260,906; 3,292,063.

SPECIAL PRODUCTS AND SERVICES

HIGH RELIABILITY SCREENING

Your most critical requirements for Space or Missile quality capacitors can be met by following a standard or custom CRC-engineered quality test plan.

STRESS TESTED STERILIZATION

CRC capacitors are being supplied high temperature screened to meet long-voyage space requirements of the 1970's and 1980's.

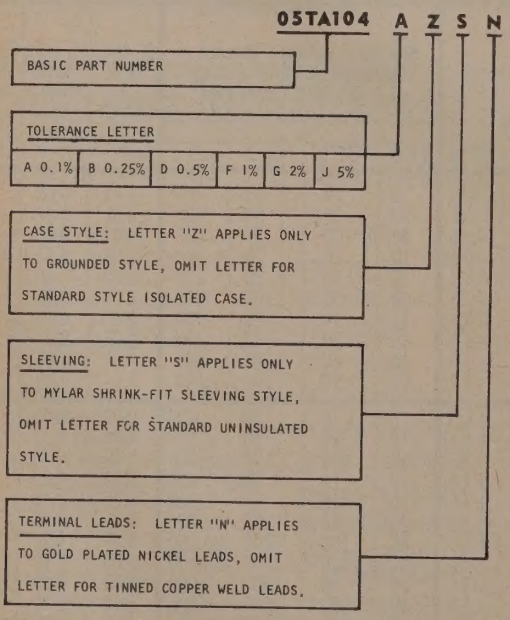
MATCHED CAPACITOR SETS

Customers may purchase 0.5% or 1% tolerance capacitors and ask that we match them in sets of the same or different values to ±0.1% accuracy. You may also require that capacitors be supplied in pairs that track in temperature coefficient linearity as close as ±0.01% for capacitance change with temperature.

HIGH INSULATION RESISTANCE

Capacitors can be supplied measured at temperatures higher than 25°C to meet a special requirement. As an example, we make 30 volt Polycarbonate Capacitors which must exceed 250,000 megohms at 85°C. We can also supply capacitors that can exceed 1,000,000 megohms at 85°C and higher.

HOW TO SPECIFY COMPLETE PART NUMBER



Example 1—Part 05TA104AZSN shown above is a 50 volt, "TA" Teflon capacitor, 0.1mfd, ± 0.1% tolerance, with a grounded case, mylar sleeving, and gold-plated nickel leads.

Example 2—Part 1PL106F would be a 100 volt, "PL" Polycarbonate capacitor, 10mfd, ± 1% tolerance, standard isolated case, and tinned copperweld leads.

Example 3—Part 05PL1354DS would be a 50 volt polycarbonate capacitor, 1.35 mfd, ± 0.5%, standard case, sleeving, and tinned copperweld leads.

Note: 1354 represents 1,350,000 picofarads. The last digit, 4, indicates the number of zeros.

ELECTRICAL TEST INFORMATION

The high quality of CRC capacitors may be difficult to eval ate unless sufficiently sensitive and accurate equipment utilized in conjunction with proper measurement technique

Capacitance bridges equal to the General Radio 1620A are re ommended for best accuracy of capacitance and dissipation fa tor. The dissipation factor of capacitors in values above 1 m should be measured at 0.1 KHz rather than at 1 KHz which standard for smaller values, due to the high series resistanc of presently available bridges. When performing remote me surements in a test chamber the same problem, due to lea resistance, may also cause an apparent increase in the dissip tion factor readings.

Insulation resistance measurement is performed by Compo nent Research Co. using leakage current methods which ar repeatable to less than 1 picoamp for capacitors less than 0. mfd. Larger values require adequate charge time to minimiz dielectric absoption effects. Guard boxes are used to perforn leakage current and dielectric absorption measurements.

INSTALLATION INSTRUCTIONS

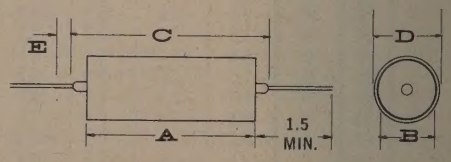
To prevent damage to the hermetic seal joint, use a tweeze type heat sink between the soldering iron and solder bead when soldering within ¼" of beads.

Prior to lead bending or twisting, protect glass seals and solde joints by gripping with a small pliers, area of leads near solde beads.

Contaminating films on the glass seal surfaces may occur during customer handling and installation of capacitors. To preserve the high insulation resistance inherent in CRC capacitors, clean the glass seal surfaces thoroughly with acetone or a chlorinated hydrocarbon fluid.

CAPACITOR CONSTRUCTION INFORMATION

- All standard types in Catalog "E" are hermetically sealed in metal tubular cases with both terminals electrically isolated from the case. Capacitors are 100% helium leak tested for true hermetic seal.
- #22 AWG wire leads are used for .312 and smaller case diameters.
  #20 AWG wire leads are used for .400 and larger diameters.
- Lead material may be gold plated nickel per MIL-STD-1276, Type N2 or tinned copper clad steel wire as noted in the capacitor specifications.
- When mylar shrinkfit sleeving is desired, add "S" to the basic part number as shown to the left.



MECHANICAL TOLERANCES AND NOTES

A Length "A" is ± .03" max.

B Diameter "B" is ± .01" max. (without mylar sleeving)

C Length "C" is 0.2" max. greater than "A"

D Diameter "D" is .01" max. greater than "B" (when sleeving is put on case)

E Length "E" is maximum of .062" that solder wick may run up gold plated leads from solder bead.

TJ TEFLON CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

Teflon capacitors meet the highest quality standards the industry. TJ capacitors are power aged, stabilized, 0% reliability screened per Level "A" shown on Flow in page 2 and certified for performance. Superior ctrical characteristics plus thorough screening, make these capacitors especially useful for Space and high reliability Military applications. Special TJ capacitors can be supplied with zero temperature coefficient ±10 PPM/°C to ±100 PPM/°C for a limited or wide temperature range.

TJ SPECIFICATIONS

ERATING TEMPERATURE —62°C to 125°C at full rated age

MPERATURE COEFFICIENT OF CAPACITANCE

.4% max at —55°C	0.0% ref. at 25°C
.25% max at —25°C	—0.15% max at 55°C
.2% max at —10°C	—0.25% max at 85°C
.1% max at 0°C	—0.4% max at 125°C

ABILITY—Capacitance values measured at any two corresnding temperature points taken in five successive tempera- e cycles shall be as follows:

Range	Retrace
—10°C to 85°C	0.01% max
—62°C to 125°C	0.05% max

SULATION RESISTANCE measured from terminal to termi- at rated voltage, and 5 minutes, maximum charge time. values greater than 1 mfd, allow an additional minute/mfd erge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
01 to 0.1 mfd n megohms)	5,000,000	5,000,000	2,000,000	1,000,000	250,000
reater than 1 mfd (in egohms ÷ mfd)	500,000	500,000	200,000	100,000	25,000

ELECTRIC ABSORPTION—0.02% max at 25°C.

SSIPATION FACTOR—0.03% max at 1 KHz and 25°C. Values eater than 1 mfd measure at 0.1 KHz.

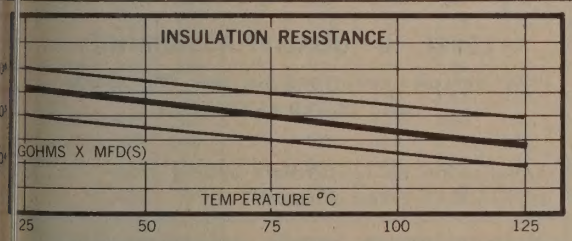
ELECTRIC STRENGTH—200% of rated volts.

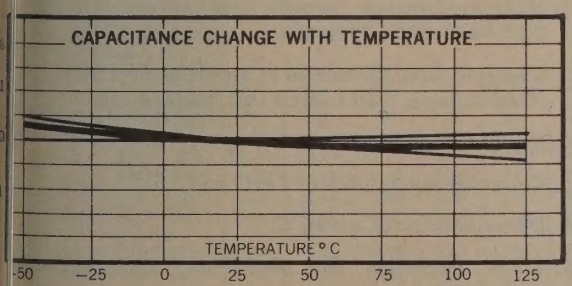
NSTRUCTION—Hermetically sealed, extended metal film ctrodes, leads isolated from case. Lead material is nickel, ld-plated, per Mil-Std-1276, Type N2.

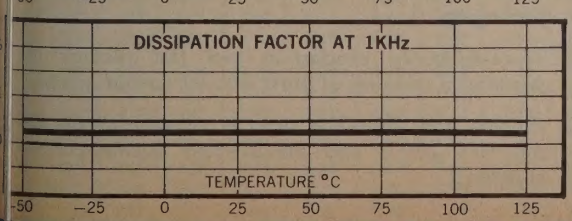
AL TEST—1 x 10^{-6} ATM-CC/SEC max leak rate.

IVIRONMENTAL—Capacitors shall meet all applicable reirements of Mil-C-19978, including Grade 3 vibration.

R ADDITIONAL DETAILS, SEE GENERAL INFORMATION, PAGE 3







LEVEL "A" QUALITY ASSURANCE

"TJ" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

RELIABILITY SCREENING

1. *Stabilization by temperature cycling from —62°C to 125°C, 5 cycles minimum.*
2. *Mass spectrometer hermetic seal test per MIL-STD-202, Method 112, condition C, procedure III A.*
3. *Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.*
4. *Insulation resistance at rated voltage and 25°C.*
5. *Capacitance tolerance at 1KHz and 25°C.*
6. *Dissipation factor at 25°C.*

POWER AGING AND STABILIZATION

7. *Burn-in at 125°C and 140% of rated voltage for a minimum of 48 hours.*
8. *Verification of stability by temperature cycling from —62°C to 125°C, 20 cycles minimum.*

PERFORMANCE CERTIFICATION

9. *Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.*
10. *Insulation resistance at rated voltage and 25°C.*
11. *Capacitance tolerance at 1KHz and 25°C.*
12. *Dissipation factor at 25°C.*
13. *Temperature coefficient measured from —55°C to 125°C at a minimum of 5 temperature points.*
14. *Visual inspection for dimensions, marking, and packaging.*
15. *Traceability to production and test records by permanent marking of parts with lot control number.*
16. *Process and inspection data is maintained on file per NPC-200-3 and Mil-Q-9858 quality control standards.*
17. *Capacitors are serialized and packaged with certified test data to accompany each shipment.*

50 VOLT TJ TEFLON

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	± .01 Diam.	± .03 Length	PRICES 1-6 2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
05TJ102	.001	.235	.687	$19.90	$22.89	$25.87	$29.85
05TJ202	.002	.235	.687	19.90	22.89	25.87	29.85
05TJ502	.005	.235	.687	19.90	22.89	25.87	29.85
05TJ103	.01	.235	.687	19.90	22.89	25.87	29.85
05TJ123	.012	.235	.687	19.90	22.89	25.87	29.85
05TJ153	.015	.312	.687	19.90	22.89	25.87	29.85
05TJ203	.02	.312	.687	19.90	22.89	25.87	29.85
05TJ223	.022	.312	.687	19.90	22.89	25.87	29.85
05TJ333	.033	.312	.687	19.90	22.89	25.87	29.85
05TJ473	.047	.312	.687	19.90	22.89	25.87	29.85
05TJ503	.05	.312	.687	19.90	22.89	25.87	29.85
05TJ683	.068	.312	.813	21.89	25.17	28.46	32.84
05TJ823	.082	.312	.937	21.89	25.17	28.46	32.84
05TJ104	.1	.312	.937	21.89	25.17	28.46	32.84
05TJ154	.15	.312	1.063	23.88	26.27	28.66	33.43
05TJ204	.2	.400	1.063	24.88	27.37	29.86	34.83
05TJ224	.22	.400	1.063	24.88	27.37	29.86	34.83
05TJ334	.33	.500	1.125	25.87	28.46	31.04	36.22
05TJ474	.47	.562	1.125	27.86	30.65	33.43	39.00
05TJ504	.5	.562	1.125	27.86	30.65	33.43	39.00
05TJ105	1.0	.67	1.375	37.81	41.59	45.37	49.15
05TJ205	2.0	.67	1.875	57.71	63.48	69.25	75.02

TA TEFLON CAPACITORS

TA teflon capacitors are used in aircraft and space guidance applications which require low loss, low temperature coefficient, excellent stability and reliability. The temperature coefficient slope from —55°C to +125°C is approximately —50 PPM/°C ±50 PPM. The TA capacitors are reliability screened per code **LEVEL B** shown on Flow Plan Page 2. See types TC and TJ teflon for higher reliability and performance.

TA SPECIFICATIONS

OPERATING TEMPERATURE

—62°C to 125°C at full rated voltage

TEMPERATURE COEFFICIENT OF CAPACITANCE

+0.6%	Max at	—55°C
+0.4%	Max at	—25°C
+0.3%	Max at	—10°C
+0.2%	Max at	0°C
0.0%	Reference	25°C
—0.25%	Max at	55°C
—0.5%	Max at	85°C
—0.6%	Max at	125°C

STABILITY

When temperature cycled from —62°C to 125°C for 5 temperature cycles, capacitance drift measured after stabilization shall not exceed:

Range	Retrace
—10°C to 85°C	0.02% Max
—62°C to 125°C	0.1% Max

INSULATION RESISTANCE measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	5,000,000	5,000,000	2,000,000	1,000,000	250,000
Greater than 0.1 mfd (in megohms ÷ mfd)	500,000	500,000	200,000	100,000	25,000

DIELECTRIC ABSORPTION—0.02% maximum at 25°C.

DIELECTRIC STRENGTH—200% of rated voltage.

DISSIPATION FACTOR 0.03% max at 1 KHz and 25°C. Values greater than 1 mfd measure at 0.1 KHz.

CONSTRUCTION

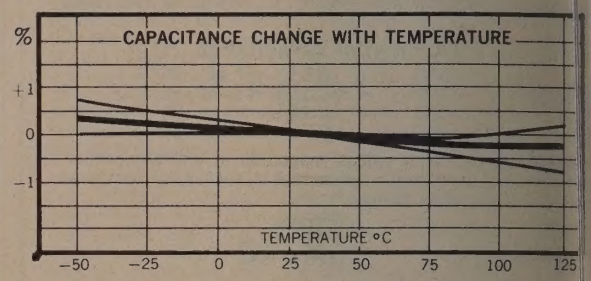
Teflon dielectric, hermetically sealed, extended metal film electrodes, leads isolated from case. Lead material is nickel, gold-plated, per Mil-Std-1276, Type N2.

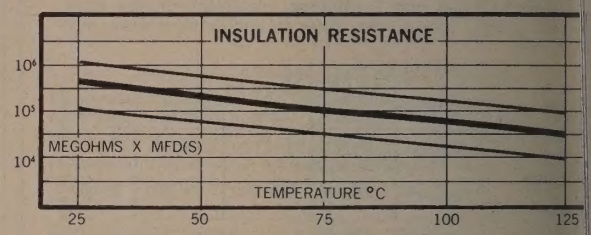
SEAL TEST — 1 x 10^{-6} ATM-CC/SEC max leak rate.

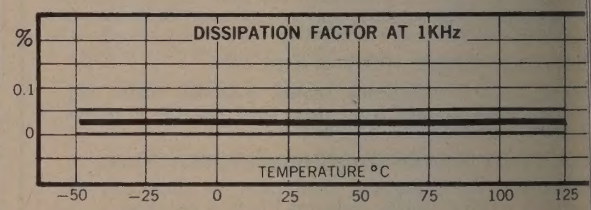
ENVIRONMENTAL

Capacitors shall meet all applicable requirements of Mil-C-19978, including Grade 3 vibration.

FOR ADDITIONAL DETAILS,
SEE GENERAL INFORMATION SECTION, PAGE 3







LEVEL "B" QUALITY ASSURANCE

"TA" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

1. *Stabilization by temperature cycling from —62°C to 125°C, 5 cycles minimum.*
2. *Mass spectrometer hermetic seal test per MIL-STD-202, Method 112, condition C. procedure III A.*
3. *Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.*
4. *Insulation resistance at rated voltage and 25°C.*
5. *Capacitance tolerance at 1KHz and 25°C.*
6. *Dissipation factor at 25°C.*
7. *Visual inspection for dimensions, marking and packaging.*
8. *Traceability to production and test records by permanent marking of parts with lot control number.*
9. *Process and inspection data is maintained on file per NPC-200-3 and Mil-Q-9858 quality control standards.*

TA TEFLON CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

50V TA
D TOLERANCE LETTER AFTER PART No.

MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
.001	.235	.687	$3.75	$4.15	$4.90	$5.85	$7.50	$9.95
.0012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0015	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0018	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.002	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0022	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0027	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0033	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0047	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.005	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0068	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0082	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.01	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.015	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.018	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.02	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.022	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.027	.312	.687	4.05	4.37	5.05	6.00	7.80	10.85
.033	.312	.687	4.05	4.37	5.05	6.00	7.80	10.85

50V TA
*ADD TOLERANCE LETTER AFTER PART No.

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
05TA393	.039	.312	.687	$4.15	$4.66	$5.35	$6.35	$8.25	$10.95
05TA473	.047	.312	.687	4.36	4.92	5.75	6.75	8.55	11.05
05TA503	.05	.312	.687	4.36	4.92	5.75	6.75	8.55	11.05
05TA563	.056	.312	.813	4.56	5.29	6.95	7.90	9.10	11.15
05TA683	.068	.312	.813	4.69	5.78	7.40	8.40	10.30	11.80
05TA823	.082	.312	.937	5.95	6.90	7.95	8.95	10.95	13.10
05TA104	.1	.312	.937	5.95	6.90	7.95	8.95	10.95	13.10
05TA124	.12	.312	1.063	6.54	7.43	8.60	9.60	11.65	14.50
05TA154	.15	.312	1.063	6.54	7.43	8.60	9.60	11.65	14.50
05TA204	.2	.400	1.063	8.58	9.75	10.80	11.80	13.85	16.00
05TA224	.22	.400	1.063	8.58	9.75	10.80	11.80	13.85	16.00
05TA274	.27	.400	1.063	9.64	10.95	12.50	13.50	15.55	18.10
05TA334	.33	.500	1.125	9.64	10.95	12.50	13.50	15.55	18.10
05TA394	.39	.500	1.125	10.64	11.95	13.85	14.80	17.10	19.30
05TA474	.47	.562	1.125	11.88	13.50	15.60	16.85	18.25	21.60
05TA504	.5	.562	1.125	11.88	13.50	15.60	16.85	18.25	21.60
05TA684	.68	.562	1.125	14.88	17.50	19.60	20.85	22.25	25.40
05TA105	1.0	.67	1.375	17.16	19.50	21.60	23.60	27.70	31.10
05TA205	2.0	.67	1.875	29.66	33.70	37.90	39.90	42.10	47.90

100V TA
D TOLERANCE LETTER AFTER PART No.

MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
.001	.235	.687	$3.75	$4.15	$4.90	$5.85	$7.50	$9.95
.0012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0015	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0018	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.002	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0022	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0027	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0022	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0047	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.005	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0068	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.0082	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.01	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
.015	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.018	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
.02	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95

100V TA
*ADD TOLERANCE LETTER AFTER PART No.

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
1TA223	.022	.312	.687	$3.75	$4.15	$4.90	$5.85	$7.50	$9.95
1TA273	.027	.312	.813	4.05	4.37	5.05	6.00	7.80	10.85
1TA333	.033	.312	.813	4.05	4.37	5.05	6.00	7.80	10.85
1TA393	.039	.400	.813	4.36	4.92	5.75	6.75	8.55	11.05
1TA473	.047	.400	.813	4.36	4.92	5.75	6.75	8.55	11.05
1TA503	.05	.400	.813	4.36	4.92	5.75	6.75	8.55	11.05
1TA683	.068	.400	.813	4.69	5.78	7.40	8.40	10.30	11.80
1TA104	.1	.400	1.063	5.95	6.90	7.95	8.95	10.95	13.10
1TA154	.15	.500	1.125	6.54	7.43	8.60	9.60	11.65	14.50
1TA224	.22	.562	1.125	8.58	9.75	10.80	11.80	13.85	16.00
1TA334	.33	.562	1.125	9.64	10.95	12.50	13.50	15.55	18.10
1TA474	.47	.670	1.375	11.88	13.50	15.60	16.85	18.25	21.60
1TA504	.5	.670	1.375	11.88	13.50	15.60	16.85	18.25	21.60
1TA684	.68	.670	1.875	14.88	17.50	19.60	20.85	22.25	25.40
1TA105	1.0	.670	1.875	17.16	19.50	21.60	23.60	27.70	31.10
1TA205	2.0	1.0	1.875	29.66	33.70	37.90	39.90	42.10	47.90

200V TA
DD TOLERANCE LETTER AFTER PART No.

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
2TA2	.001	.235	.687	$3.75	$4.15	$4.90	$5.85	$7.50	$9.95
2TA2	.0012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0015	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0018	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.002	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0022	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0027	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0033	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0047	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0068	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA2	.0082	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA3	.01	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA3	.012	.235	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA3	.015	.312	.687	3.75	4.15	4.90	5.85	7.50	9.95
2TA3	.018	.312	.813	3.75	4.15	4.90	5.85	7.50	9.95

200V TA
*ADD TOLERANCE LETTER AFTER PART No.

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
2TA203	.020	.312	.813	$3.75	$4.15	$4.90	$5.85	$7.50	$9.95
2TA223	.022	.312	.813	3.75	4.15	4.90	5.85	7.50	9.95
2TA273	.027	.312	.813	4.05	4.37	5.05	6.00	7.80	10.85
2TA333	.033	.400	.813	4.05	4.37	5.05	6.00	7.80	10.85
2TA473	.047	.400	1.063	4.36	4.92	5.75	6.75	8.55	11.05
2TA503	.05	.400	1.063	4.36	4.92	5.75	6.75	8.55	11.05
2TA683	.068	.400	1.063	4.69	5.78	7.40	8.40	10.30	11.80
2TA104	.1	.500	1.125	5.95	6.90	7.95	8.95	10.95	13.10
2TA154	.15	.562	1.375	6.54	7.43	8.60	9.60	11.65	14.50
2TA224	.22	.562	1.375	8.58	9.75	10.80	11.80	13.85	16.00
2TA334	.33	.670	1.375	9.64	10.95	12.50	13.50	15.55	18.10
2TA474	.47	.670	1.875	11.88	13.50	15.60	16.85	18.25	21.60
2TA504	.5	.670	1.875	11.88	13.50	15.60	16.85	18.25	21.60
2TA105	1.0	.750	1.875	17.16	19.50	21.60	23.60	27.70	31.10

TC TEFLON CAPACITORS

Type TC teflon capacitors are high reliability screened per **LEVEL "A"** shown on Flow Plan page 2 and are qualified to meet the most stringent specifications. Each capacitor bears a unique serial number and is shipped with data certifying to 0.1% maximum capacitance drift after exposure to 5 temperature shock cycles from −62°C to +125°C. The TC capacitors are available in the same voltage ratings and case sizes as type "TA," level B capacitors. For increased screening and lower temperature coefficient see type TJ, level A capacitors.

TC SPECIFICATIONS

OPERATING TEMPERATURE −62°C to 125°C at full rated Voltage.

TEMPERATURE COEFFICIENT OF CAPACITANCE

+0.7% max at −55°C	0.0% ref. at 25°C
+0.5% max at −25°C	−0.25% max at 55°C
+0.3% max at −10°C	−0.50% max at 85°C
+0.25% max at 0°C	−0.60% max at 125°C

STABILITY — Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
0°C to 50°C	0.02% max
−10°C to 85°C	0.05% max
−62°C to 125°C	0.1% max

INSULATION RESISTANCE measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	5,000,000	5,000,000	2,000,000	1,000,000	250,000
Greater than 0.1 mfd (in megohms ÷ mfd)	500,000	500,000	200,000	100,000	25,000

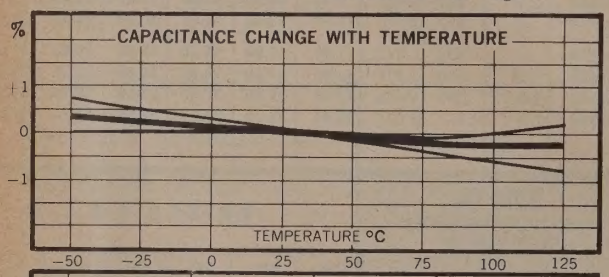
DIELECTRIC ABSORPTION — 0.02% max at 25°C.

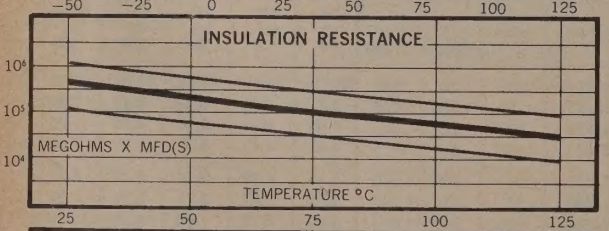
DISSIPATION FACTOR — 0.03% max at 1 KHz and 25°C. Values greater than 1 mfd measure at 0.1 KHz.

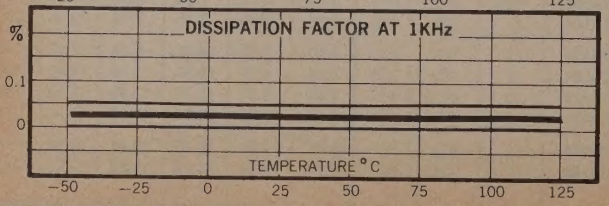
CONSTRUCTION — Teflon dielectric, hermetically sealed, extended metal film electrodes, leads isolated from case. Lead material is nickel, gold-plated, per Mil-Std-1276, Type N2.

SEAL TEST — 1 x 10^{-6} ATM-CC/SEC max leak rate.

ENVIRONMENTAL — Capacitors shall meet all applicable requirements of Mil-C-19978, including Grade 3 vibration. For additional details, see General Information Section, Page 3.







LEVEL "A" QUALITY ASSURANCE

"TC" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

RELIABILITY SCREENING

1. Stabilization by temperature cycling from —62°C to 125°C, cycles minimum.

2. Mass spectrometer hermetic seal test per MIL-STD-202, Meth 112, condition C. procedure III A.

3. Dielectric strength test at a minimum of 200% of rated voltag lead to lead and leads to case.

4. Insulation resistance at rated voltage and 25°C.

5. Capacitance tolerance at 1KHz and 25°C.

6. Dissipation factor at 25°C.

POWER AGING

7. Burn-in at 125°C and 140% of rated voltage for a minimum 48 hours.

8. Verification of stability by temperature cycling from —62°C 125°C, 5 cycles minimum.

PERFORMANCE CERTIFICATION

9. Dielectric strength test at a minimum of 200% of rated voltag lead to lead and leads to case.

10. Insulation resistance at rated voltage and 25°C.

11. Capacitance tolerance at 1KHz and 25°C.

12. Dissipation factor at 25°C.

13. Capacitors are 100% tested for 0.1% maximum drift wit cycling from —62°C to 125°C.

14. Visual inspection for dimensions, marking, and packaging.

15. Traceability to production and test records by permaner marking of parts with lot control number.

16. Process and inspection data is maintained on file per NPC-200- and Mil-Q-9858 quality control standards.

17. Capacitors are serialized and packaged with certified test dat to accompany each shipment.

50 VOLT TC *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part No.	MFD	±.01 Diam.	±.03 Length	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN	0.5 t *[illegible]
05TC102	.001	.235	.687	$6.23	$7.35	$8.78	$11.25	$14.93	$2[illegible]
05TC122	.0012	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC152	.0015	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC182	.0018	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC202	.002	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC222	.0022	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC272	.0027	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC332	.0033	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC472	.0047	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC682	.0068	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC822	.0082	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC103	.01	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC123	.012	.235	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC153	.015	.312	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC183	.018	.312	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC203	.02	.312	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC223	.022	.312	.687	6.23	7.35	8.78	11.25	14.93	2[illegible]
05TC273	.027	.312	.687	6.56	7.58	9.00	11.70	16.28	24[illegible]
05TC333	.033	.312	.687	6.56	7.58	9.00	11.70	16.28	24[illegible]
05TC393	.039	.312	.687	6.99	8.03	9.53	12.38	16.43	24[illegible]
05TC473	.047	.312	.687	7.38	8.63	10.13	12.83	16.58	24[illegible]
05TC503	.05	.312	.687	7.38	8.63	10.13	12.83	16.58	24[illegible]
05TC563	.056	.312	.813	7.94	10.43	11.85	13.65	16.73	25[illegible]
05TC683	.068	.312	.813	8.67	11.10	12.60	15.45	17.70	26[illegible]
05TC823	.082	.312	.937	10.35	11.93	13.43	16.43	19.65	29[illegible]
05TC104	.1	.312	.937	10.35	11.93	13.43	16.43	19.65	29[illegible]
05TC124	.12	.312	1.063	11.44	13.24	14.78	17.94	22.33	33[illegible]
05TC154	.15	.312	1.063	11.44	13.24	14.78	17.94	22.33	33[illegible]
05TC204	.2	.400	1.063	13.65	15.12	16.52	19.39	22.40	33[illegible]
05TC224	.22	.400	1.063	13.65	15.12	16.52	19.39	22.40	33[illegible]
05TC274	.27	.400	1.063	14.24	16.25	17.55	20.22	23.53	35[illegible]
05TC334	.33	.500	1.125	14.24	16.25	17.55	20.22	23.53	35[illegible]
05TC394	.39	.500	1.125	15.54	18.01	19.24	21.23	25.09	37[illegible]
05TC474	.47	.562	1.125	16.20	18.72	20.22	21.90	25.92	38[illegible]
05TC504	.5	.562	1.125	16.20	18.72	20.22	21.90	25.92	38[illegible]
05TC684	.68	.562	1.125	21.00	23.52	25.02	26.70	30.48	45[illegible]
05TC105	1.0	.67	1.375	23.40	25.92	28.32	33.24	37.32	55[illegible]
05TC205	2.0	.67	1.875	40.44	45.48	47.88	50.52	57.48	86[illegible]

See YELLOW SECTION for Local Offices, Phones

TL TEFLON CAPACITORS

Teflon capacitors are used in many military and industrial nputer applications where the temperature range is beyond capability of polystyrene and a relatively low loss capacitor needed. Type TL teflon capacitors are screened to **LEVEL C** ecifications shown on Flow Plan Page 2. For higher reliability type TA teflon.

TL SPECIFICATIONS

ERATING TEMPERATURE —62°C to 125°C at full rated tage.

MPERATURE COEFFICIENT OF CAPACITANCE ± 1% Max 5°C to 125°C

ABILITY — Capacitance values measured at any two corre- onding temperature points taken in five successive tempera- e cycles shall be as follows:

Range	Retrace
—10°C to 85°C	0.05% Max
—62°C to 125°C	0.25% Max

SULATION RESISTANCE measured from terminal to terminal rated voltage, and 5 minutes maximum charge time. For lues greater than 1 mfd, allow an additional minute/mfd arge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
001 to 0.1 mfd in megohms)	1,000,000	1,000,000	500,000	250,000	100,000
Greater than .1 mfd (in negohms ÷ mfd)	100,000	100,000	50,000	25,000	10,000

IELECTRIC ABSORPTION 0.1% Max at 25°C

ISSIPATION FACTOR 0.15% Max at 1KHz and 25°C

IELECTRIC STRENGTH 200% of rated voltage

ONSTRUCTION — Teflon dielectric, hermetically sealed, ex- nded metal film electrodes, leads isolated from case. Leads re solderable gold-plated nickel or tinned copper-weld as vailable from stock at time of shipment.

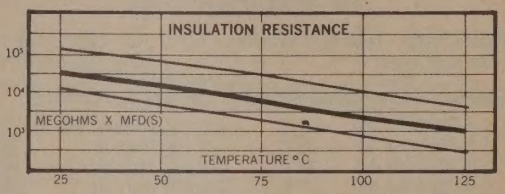
EAL TEST — 1 x 10^{-5} ATM-CC/SEC max leak rate.

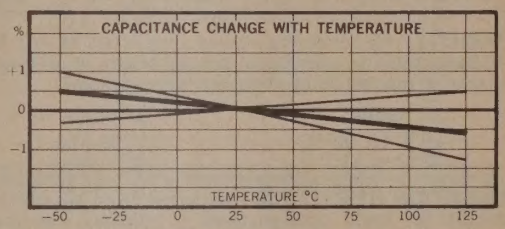
OR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3

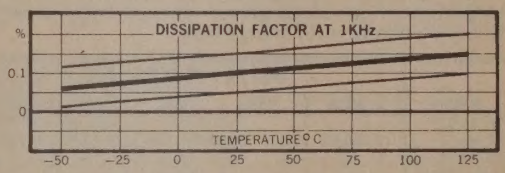
LEVEL "C" QUALITY ASSURANCE

"TL" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

1. Mass spectrometer hermetic seal test per MIL-STD-202, Method 112, condition C, procedure III A.
2. Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.
3. Insulation resistance at rated voltage and 25°C.
4. Capacitance tolerance at 1 KHz and 25°C.
5. Dissipation factor at 1 KHz and 25°C.
6. Visual inspection for dimensions, marking, and packaging.







50V TL *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
05T2	.001	.235	.687	$3.00	$3.32	$3.92	$4.68	$6.00	$7.96
05T2	.0012	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
05T2	.0015	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
05T2	.0018	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
05T2	.002	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
05T2	.0022	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.0027	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.0033	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.0047	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.005	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.0068	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T2	.0082	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.01	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.012	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.015	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.018	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.02	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.022	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
05T3	.027	.312	.687	3.24	3.50	4.04	4.80	6.24	8.68
05T3	.033	.312	.687	3.24	3.50	4.04	4.80	6.24	8.68
05T3	.039	.312	.687	3.32	3.73	4.28	5.08	6.60	8.76
05T3	.047	.312	.687	3.49	3.94	4.60	5.40	6.84	8.84
05T3	.05	.312	.687	3.49	3.94	4.60	5.40	6.84	8.84
05T3	.056	.312	.813	3.65	4.23	5.56	6.32	7.28	8.92
05T3	.068	.312	.813	3.75	4.62	5.92	6.72	8.24	9.44
05T3	.082	.312	.937	4.76	5.52	6.36	7.16	8.76	10.48
05T4	.1	.312	.937	4.76	5.52	6.36	7.16	8.76	10.48
05T4	.12	.312	1.063	5.23	5.94	6.88	7.68	9.32	11.60
05T4	.15	.312	1.063	5.23	5.94	6.88	7.68	9.32	11.60
05T4	.2	.400	1.063	6.86	7.80	8.64	9.44	11.08	12.80
05T4	.22	.400	1.063	6.86	7.80	8.64	9.44	11.08	12.80
05T4	.27	.400	1.063	7.71	8.76	10.00	10.80	12.44	14.48
05T4	.33	.500	1.125	7.71	8.76	10.00	10.80	12.44	14.48
05T4	.39	.500	1.125	8.51	9.56	11.08	11.84	13.68	15.44
05T4	.47	.562	1.125	9.50	10.80	12.48	13.48	14.60	17.28
05T4	.5	.562	1.125	9.50	10.80	12.48	13.48	14.60	17.28
05T4	.68	.562	1.125	11.90	14.00	15.68	16.68	17.80	20.32
05T5	1.0	.67	1.375	13.73	15.60	17.28	18.88	22.16	24.88
05T5	2.0	.67	1.875	23.73	26.96	30.32	31.92	33.68	38.32

100V TL *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
1TL102	.001	.235	.687	$3.00	$3.32	$3.92	$4.68	$6.00	$7.96
1TL122	.0012	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
1TL152	.0015	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
1TL182	.0018	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
1TL202	.002	.235	.687	3.00	3.32	3.92	4.68	6.00	7.96
1TL222	.0022	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL272	.0027	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL332	.0033	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL472	.0047	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL502	.005	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL682	.0068	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL822	.0082	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL103	.01	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL123	.012	.235	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL153	.015	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL183	.018	.312	.687	3.00	3.32	3.92	4.68	8.00	7.97
1TL203	.02	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL223	.022	.312	.687	3.00	3.32	3.92	4.68	6.00	7.97
1TL273	.027	.312	.813	3.24	3.50	4.04	4.80	6.24	8.68
1TL333	.033	.312	.813	3.24	3.50	4.04	4.80	6.24	8.68
1TL393	.039	.312	.813	3.32	3.73	4.28	5.08	6.60	8.76
1TL473	.047	.400	.813	3.49	3.94	4.60	5.40	6.84	8.84
1TL503	.05	.400	.813	3.49	3.94	4.60	5.40	6.84	8.84
1TL563	.056	.400	.813	3.65	4.23	5.56	6.32	7.28	8.92
1TL683	.068	.400	.813	3.75	4.62	5.92	6.72	8.24	9.44
1TL823	.082	.400	1.063	4.76	5.52	6.36	7.16	8.76	10.48
1TL104	.1	.400	1.063	4.76	5.52	6.36	7.16	8.76	10.48
1TL124	.12	.400	1.063	5.23	5.94	6.88	7.68	9.32	11.60
1TL154	.15	.500	1.125	5.23	5.94	6.88	7.68	9.32	11.60
1TL204	.2	.562	1.125	6.86	7.80	8.64	9.44	11.08	12.80
1TL224	.22	.562	1.125	6.86	7.80	8.64	9.44	11.08	12.80
1TL274	.27	.562	1.125	7.71	8.76	10.00	10.80	12.44	14.48
1TL334	.33	.562	1.125	7.71	8.76	10.00	10.80	12.44	14.48
1TL394	.39	.562	1.125	8.51	9.56	11.08	11.84	13.68	15.44
1TL474	.47	.670	1.375	9.50	10.80	12.48	13.48	14.60	17.28
1TL504	.5	.670	1.375	9.50	10.80	12.48	13.48	14.60	17.28
1TL684	.68	.670	1.875	11.90	14.00	15.68	16.68	17.80	20.32
1TL105	1.0	.670	1.875	13.73	15.60	17.28	18.88	22.16	24.88
1TL205	2.0	1.0	1.875	23.73	26.96	30.32	31.92	33.68	38.32

TU TEFLON CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

TU Teflon foil capacitors are unexcelled for high insulation resistance, low dielectric absorption and low dissipation factor over a wide temperature range. The TU capacitors are reliability screened per **LEVEL "B"** shown on Flow Plan Page 2; however, specials are available with Level "A" screening. We can also supply very high quality custom capacitors in any value from 100 Pf to 100 MFD and at higher voltages for research or production applications.

TU SPECIFICATIONS

OPERATING TEMPERATURE—62°C to 125°C at full rated voltage.

TEMPERATURE COEFFICIENT OF CAPACITANCE

+0.8% Max at	−55°C	0.0% Reference at	25°C
+0.6% Max at	−25°C	−0.2% Max at	55°C
+0.3% Max at	−10°C	−0.5% Max at	85°C
+0.2% Max at	0°C	−0.8% Max at	125°C

STABILITY—Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
−10°C to 85°C	0.05% Max
−62°C to 125°C	.25% Max

INSULATION RESISTANCE measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	10,000,000	5,000,000	3,000,000	1,500,000	300,000
Greater than 0.1 mfd (in megohms ÷ mfd)	1,000,000	500,000	300,000	150,000	30,000

DIELECTRIC ABSORPTION—0.01% Max at 25°C.

DISSIPATION FACTOR—0.005% Max as 1KHz and 25°C

DIELECTRIC STRENGTH—200% of rated volts.

CONSTRUCTION—Teflon dielectric, extended foil electrodes, hermetically sealed, leads isolated from case, leads are nickel, gold-plated, per Mil Std 1276 Type N2.

SEAL TEST—1 x 10^{-6} ATM-CC/SEC Max leak rate.

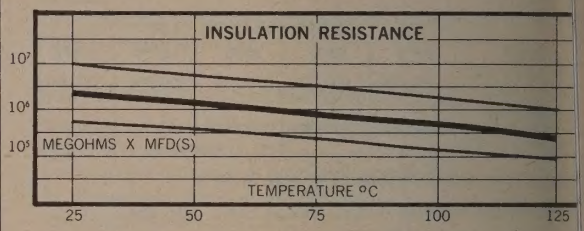
ENVIRONMENTAL—Capacitors shall meet all applicable requirements of Mil-C-19978 including Grade 3 vibration.

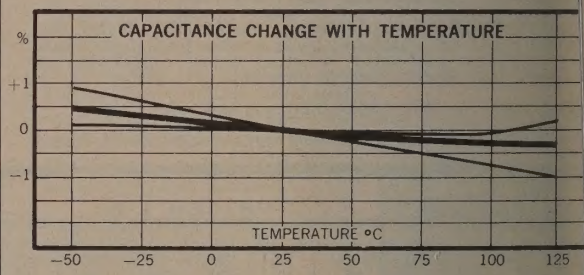
FOR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3

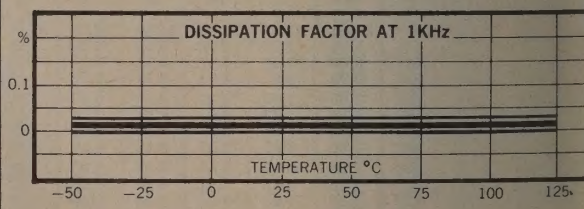
LEVEL "B" QUALITY ASSURANCE

"TU" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

1. Stabilization by temperature cycling from −62°C to 125°C 5 cycles minimum.
2. Mass spectrometer hermetic seal test per MIL-STD-202 Method 112, condition C. procedure III A.
3. Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.
4. Insulation resistance at rated voltage and 25°C.
5. Capacitance tolerance at 1KHz and 25°C.
6. Dissipation factor at 1KHz and 25°C.
7. Visual inspection for dimensions, marking, and packaging.
8. Traceability to production and test records by permanent marking of parts with lot control number.
9. Process and inspection data is maintained on file per NPC 200-3 and Mil-Q-9858 quality control standards.







100V TU *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part No.	MFD	±.01 Diam.	±.03 Length	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN	0.1% tol. *AN
1TU102	.001	.235	.813	$4.59	$5.10	$5.70	$7.50	$9.95	$15.00
1TU202	.002	.235	.813	4.59	5.10	5.70	7.50	9.95	15.00
1TU502	.005	.235	.813	4.59	5.10	5.70	7.50	9.95	15.00
1TU103	.01	.235	.813	4.59	5.10	5.70	7.50	9.95	15.00
1TU153	.015	.312	.813	4.86	5.40	6.00	7.75	9.95	15.50
1TU223	.022	.312	.813	5.13	5.70	6.30	8.35	9.95	16.70
1TU333	.033	.400	.813	5.61	6.23	7.20	8.95	10.85	17.90
1TU393	.039	.400	1.063	5.94	6.60	7.50	9.60	11.80	19.20
1TU473	.047	.400	1.063	5.94	6.60	7.50	9.60	11.80	19.20
1TU503	.05	.400	1.063	6.21	6.90	7.80	9.90	12.10	19.80
1TU683	.068	.400	1.063	7.52	8.35	9.50	11.50	13.10	23.00
1TU104	.1	.562	1.125	8.91	9.90	10.75	12.75	14.95	25.50
1TU154	.15	.562	1.375	9.99	11.10	12.00	14.00	16.00	28.00
1TU224	.22	.562	1.875	12.51	13.90	14.90	16.85	18.80	33.70
1TU334	.33	.670	1.875	15.08	16.75	17.75	19.75	21.60	39.50
1TU474	.47	.750	1.875	18.75	20.83	21.95	23.95	25.85	47.90
1TU504	.5	.750	1.875	18.75	20.83	21.95	23.95	25.85	47.90
1TU105	1.0	1.00	2.250	28.13	31.25	32.93	35.93	38.78	71.86

200V TU *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part No.	MFD	±.01 Diam.	±.03 Length	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN	0.1% tol. *AN
2TU102	.001	.235	.813	$4.59	$5.10	$5.70	$7.50	$9.95	$15.0
2TU202	.002	.235	.813	4.59	5.10	5.70	7.50	9.95	15.0
2TU502	.005	.235	.813	4.59	5.10	5.70	7.50	9.95	15.0
2TU103	.01	.312	.813	4.59	5.10	5.70	7.50	9.95	15.0
2TU153	.015	.312	.813	4.86	5.40	6.00	7.75	9.95	15.5
2TU223	.022	.400	.813	5.13	5.70	6.30	8.35	9.95	16.7
2TU333	.033	.400	1.063	5.61	6.23	7.20	8.95	10.85	17.9
2TU393	.039	.400	1.063	5.94	6.60	7.50	9.60	11.80	19.2
2TU473	.047	.400	1.063	5.94	6.60	7.50	9.60	11.80	19.2
2TU503	.05	.400	1.063	6.21	6.90	7.80	9.90	12.10	19.8
2TU683	.068	.562	1.125	7.52	8.35	9.50	11.50	13.10	23.0
2TU104	.1	.562	1.375	8.91	9.90	10.75	12.75	14.95	25.5
2TU154	.15	.562	1.875	9.99	11.10	12.00	14.00	16.00	28.0
2TU224	.22	.670	1.875	12.51	13.90	14.90	16.85	18.80	33.7
2TU334	.33	.75	1.875	15.08	16.75	17.75	19.75	21.60	39.5
2TU474	.47	1.00	2.250	18.75	20.83	21.95	23.95	25.85	47.9
2TU504	.5	1.00	2.250	18.75	20.83	21.95	23.95	25.85	47.9

TF TEFLON CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

TF flon foil capacitors are extremely low loss capacitor or use over a wide temperature range. The TF capitors are reliability screened per **LEVEL "C"** shown on ow Plan Page 2. Custom capacitors can be furnis d with special values, higher voltage ratings and spe al case configuration. See Type TU for higher, Lev "B" reliability.

TF SPECIFICATIONS

OP ATING TEMPERATURE
–C to 125°C at full rated voltage.

TE PERATURE COEFFICIENT OF CAPACITANCE
25 reference ± 1.2% maximum from –62°C to 125°C.

ST ILITY — Capacitance values measured at any two co sponding temperature points taken in five succe ve temperature cycles shall be as follows:

Range	Retrace
—10°C to 85°C	0.1% Max
—62°C to 125°C	0.25% Max

I ULATION RESISTANCE measured from terminal to t inal at rated voltage, and 5 minutes maximum c ge time. For values greater than 1 mfd, allow an a tional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
L to 0.1 mfd (megohms)	3,000,000	2,000,000	1,000,000	500,000	100,000
ater than mfd (in ohms ÷ mfd)	300,000	200,000	100,000	50,000	10,000

D LECTRIC ABSORPTION — 0.03% at 25°C

D SIPATION FACTOR — 0.02% Max at 1KHz and 25°C

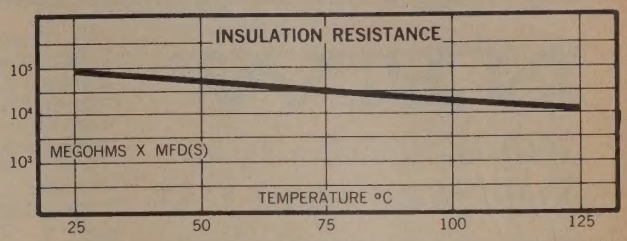
D LECTRIC STRENGTH — 200% of rated volts

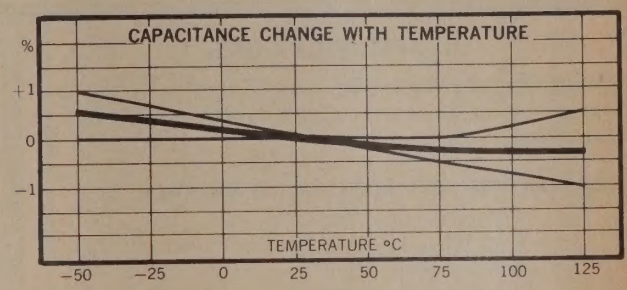
C NSTRUCTION— "FEP" teflon dielectric film, extended f electrodes, hermetically sealed with leads isolated f n case, leads are tinned copperweld.

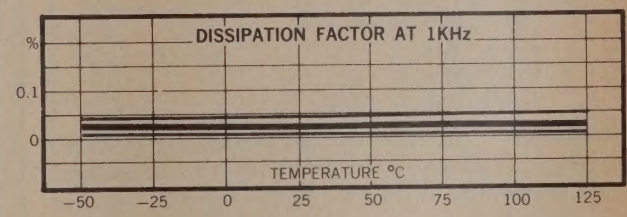
S L TEST — 1 x 10^{-5} ATM-CC/SEC max leak rate.

E IRONMENTAL — Capacitors shall meet all applicable r uirements of Mil-C-19978.

ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3







100 VOLT TF TEFLON *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6					
Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
1TF102	.001	.235	.813	$2.99	$3.32	$3.92	$4.68	$6.00	$9.36
1TF202	.002	.235	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF502	.005	.235	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF682	.0068	.235	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF103	.01	.312	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF153	.015	.312	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF203	.02	.312	.813	2.99	3.32	3.92	4.68	6.00	9.36
1TF223	.022	.312	1.063	2.99	3.32	3.92	4.68	6.00	9.36
1TF303	.03	.400	1.063	2.99	3.32	3.92	4.68	6.00	9.36
1TF333	.033	.400	1.063	3.15	3.50	4.50	5.50	6.90	11.00
1TF393	.039	.400	1.063	3.15	3.50	4.50	5.50	6.90	11.00
1TF473	.047	.400	1.063	3.38	3.75	4.75	5.75	7.15	11.50
1TF503	.05	.400	1.063	3.38	3.75	4.75	5.75	7.15	11.50
1TF683	.068	.562	1.125	3.60	4.00	5.00	6.00	7.40	12.00
1TF104	.1	.562	1.375	3.83	4.25	5.28	6.25	7.65	12.50
1TF154	.15	.562	1.875	4.28	4.75	5.55	6.45	8.25	12.90
1TF204	.2	.670	1.875	4.91	5.45	6.10	6.60	8.80	13.20
1TF224	.22	.670	1.875	5.00	5.55	6.20	6.75	9.05	13.50
1TF334	.33	.750	1.875	5.49	6.10	6.75	7.41	9.65	14.82
1TF474	.47	.750	1.875	6.48	7.20	8.10	8.75	11.30	17.50
1TF504	.5	.750	1.875	6.48	7.20	8.10	8.75	11.30	17.50
1TF105	1.0	1.0	2.25	9.09	10.10	11.11	12.22	14.85	24.44
1TF205	2.0	Bathtub Case 2x2x	1.125	18.00	19.00	20.80	22.50	26.00	45.00

LEVEL "C" QUALITY ASSURANCE

"TF" TEFLON CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

. *Stabilization by temperature cycling from —62°C to 125°C, 5 cycles minimum.*
. *Mass spectrometer hermetic seal per MIL-STD-202, Method 112, condition C, procedure III A.*
. *Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.*
. *Insulation resistance at rated voltage and 25°C.*
. *Capacitance tolerance at 1KHz and 25°C.*
6. *Dissipation factor at 1KHz and 25°C.*
7. *Visual inspection for dimensions, marking, and packaging.*
8. *Traceability to production and test records by permanent marking of parts with lot control number.*
9. *Process and inspection data is maintained on file per NPC-200-3 and Mil-Q-9858 quality control standards.*

PL POLYCARBONATE
AC TESTED CAPACITORS

NEW

100% SCREENED BY AC SQUARE WAVE HIPOT TEST

PL Polycarbonate Capacitors are reliability screened per **LEVE "B"** shown on Page 2. In addition, all capacitors are subjected to special high stress AC square wave voltage which has a peak-to peak level 300% higher than the rated DC working voltage of th capacitor. As an example, 03PL capacitors receive about 200 volt peak-to-peak at 100 Hz and 4PL capacitors receive approximatel 1200 volts peak-to-peak. The purpose of this test is to furthe enhance Polycarbonate Capacitor reliability and assure that th capacitors can withstand AC stresses.

PL SPECIFICATIONS

OPERATING TEMPERATURE —62°C to 100°C at full rated voltage. Derate linearly from 100°C to 50% of rated voltage at 125°C.

TEMPERATURE COEFFICIENT OF CAPACITANCE

−1.5% Max. at −55°C
−0.5% Max. at −25°C
−0.35% Max. at −10°C
−0.25% Max. at 0°C
0.0% Reference at 25°C
+0.2% Max. at 55°C
+0.5% Max. at 85°C
+1.0% Max. at 125°C

STABILITY — Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
—10°C to 85°C	0.05% Max.
—62°C to 125°C	0.25% Max.

INSULATION RESISTANCE measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR TYPE 03PL, 05PL, 1PL				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	3,000,000	2,000,000	1,000,000	300,000	10,000
Greater than 0.1 mfd (in megohms ÷ mfd)	300,000	200,000	100,000	30,000	1,000

	MINIMUM IR TYPE 2PL, 4PL				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	4,000,000	2,500,000	500,000	200,000	10,000
Greater than 0.1 mfd (in megohms ÷ mfd)	400,000	250,000	50,000	20,000	1,000

DIELECTRIC ABSORPTION — 0.2% Max. at 25°C

DISSIPATION FACTOR — 0.2% max at .1 KHz and 25°C. Values greater than 1 mfd measure at 0.1 KHz.

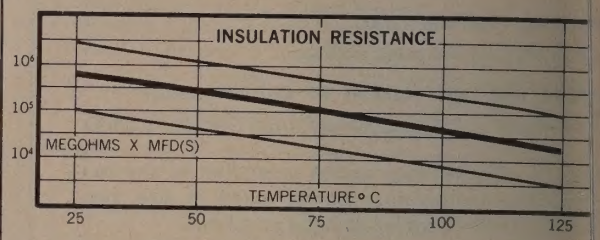
DIELECTRIC STRENGTH — 200% of rated volts.

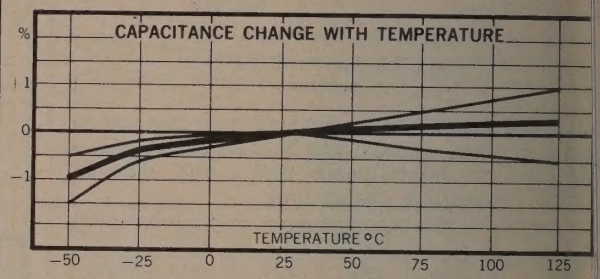
CONSTRUCTION — Polycarbonate dielectric, extended metal film electrodes, hermetically sealed, leads isolated from case. Leads may be tinned copperweld or gold-plated nickel per Mil Std 1276 type N2.

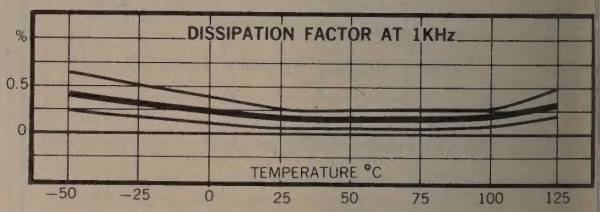
SEAL TEST — 1 x 10^{-6} ATM-CC/SEC Max leak rate.

ENVIRONMENTAL — Capacitors shall meet all applicable requirements of Mil-C-19978 including grade 3 vibration.

FOR ADDITIONAL DETAILS SEE GENERAL INFORMATION SECTION, PAGE 3







LEVEL "B" QUALITY ASSURANCE

"PL" Polycarbonate Capacitors are 100% processed and tested as follows:

1. Stabilization by temperature cycling from —62°C to 125°C, 5 cycles minimum.
2. Mass spectrometer hermetic seal test per MIL-STD-202, Method 112, condition C, procedure IIIA.
3. DC Dielectric Strength—apply 200% of rated DC from lead to lead and leads to case for one minute.

3A. AC Dielectric Strength—apply 100 Hz square wave from lead to lead at a minimum peak to peak voltage of 3 x rated DC voltage for one minute.

4. Insulation resistance at rated voltage and 25°C.
5. Capacitance tolerance at 1 KHz and 25°C.
6. Dissipation factor at 25°C.
7. Visual inspection for dimensions, marking, and packaging.
8. Traceability to production and test records by permanent marking of parts with lot control number.
9. Process and inspection data is maintained on file per NPC-200-3 and MIL-Q-9858 quality control standards.

PL POLYCARBONATE
AC TESTED CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

30 VOLT PL
*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *KN	5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
03PL102	.001	.170	.500	$3.74	$4.15	$4.90	$5.85	$7.50	$9.80
03PL122	.0012	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL152	.0015	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL182	.0018	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL202	.002	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL222	.0022	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL272	.0027	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL332	.0033	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL472	.0047	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL502	.005	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL682	.0068	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL822	.0082	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL103	.01	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL123	.012	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL153	.015	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL183	.018	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL203	.02	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL223	.022	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
03PL273	.027	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL333	.033	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL393	.039	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL473	.047	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL503	.05	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL563	.056	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
03PL683	.068	.170	.687	3.74	4.15	4.90	5.85	7.50	9.80
03PL823	.082	.170	.687	3.74	4.15	4.90	5.85	7.50	9.80
03PL104	.1	.193	.687	3.83	4.25	4.95	5.90	7.60	9.90
03PL124	.12	.193	.687	3.93	4.37	5.05	6.00	7.80	10.10
03PL154	.15	.235	.562	3.93	4.37	5.05	6.00	7.80	10.10
03PL204	.2	.235	.687	4.01	4.46	5.15	6.15	8.05	10.30
03PL224	.22	.235	.687	4.01	4.46	5.15	6.15	8.05	10.30
03PL274	.27	.235	.687	4.32	4.80	5.60	6.60	8.40	11.20
03PL334	.33	.235	.687	4.43	4.92	5.75	6.75	8.55	11.50
03PL394	.39	.235	.687	4.76	5.29	6.20	7.20	9.10	12.40
03PL474	.47	.312	.687	4.76	5.29	6.20	7.20	9.10	12.40
03PL504	.5	.312	.687	4.76	5.29	6.20	7.20	9.10	12.40
03PL684	.68	.312	.687	4.94	5.49	6.50	7.50	9.40	13.00
03PL824	.82	.312	.813	5.09	5.65	6.80	7.80	9.75	13.60
03PL105	1.0	.312	.813	5.20	5.78	7.40	8.40	10.30	14.80
03PL155	1.5	.400	.813	6.21	6.90	7.95	8.95	10.95	15.90
03PL205	2.0	.400	.813	6.69	7.43	8.60	9.60	11.65	17.20
03PL305	3.0	.400	1.063	7.74	8.60	9.65	10.65	12.70	19.30
03PL405	4.0	.400	1.375	8.78	9.75	10.80	11.80	13.85	21.60
03PL505	5.0	.500	1.375	9.85	10.95	12.50	13.50	15.55	24.48
03PL805	8.0	.562	1.375	12.15	13.50	15.60	16.85	18.25	28.19
03PL106	10.0	.562	1.375	15.17	16.85	18.95	19.95	21.05	31.10
03PL156	15.0	.562	1.875	17.55	19.50	21.60	23.60	27.70	34.82
03PL206	20.0	.670	1.875	19.71	21.90	25.00	27.00	31.10	42.10

50 VOLT PL
*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
05PL102	.001	.170	.500	$3.74	$4.15	$4.90	$5.85	$7.50	$9.80
05PL122	.0012	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL152	.0015	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL182	.0018	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL202	.002	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL222	.0022	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL272	.0027	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL332	.0033	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL472	.0047	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL502	.005	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL682	.0068	.170	.500	3.74	4.15	4.90	5.85	7.50	9.80
05PL822	.0082	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL103	.01	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL123	.012	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL153	.015	.170	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL183	.018	.193	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL203	.02	.193	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL223	.022	.193	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL273	.027	.193	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL333	.033	.193	.562	3.74	4.15	4.90	5.85	7.50	9.80
05PL393	.039	.170	.687	3.74	4.15	4.90	5.85	7.50	9.80
05PL473	.047	.170	.687	3.74	4.15	4.90	5.85	7.50	9.80
05PL503	.05	.170	.687	3.74	4.15	4.90	5.85	7.50	9.80
05PL563	.056	.193	.687	3.74	4.15	4.90	5.85	7.50	9.80
05PL683	.068	.193	.687	3.74	4.15	4.90	5.85	7.50	9.80
05PL823	.082	.193	.813	3.74	4.15	4.90	5.85	7.50	9.80
05PL104	.1	.193	.813	3.83	4.25	4.95	5.90	7.60	9.90
05PL124	.12	.235	.687	3.93	4.37	5.05	6.00	7.80	10.10
05PL154	.15	.235	.687	3.93	4.37	5.05	6.00	7.80	10.10
05PL204	.2	.235	.813	4.01	4.46	5.15	6.15	8.05	10.30
05PL224	.22	.235	.813	4.01	4.46	5.15	6.15	8.05	10.30
05PL274	.27	.312	.687	4.32	4.80	5.60	6.60	8.40	11.20
05PL334	.33	.312	.687	4.43	4.92	5.75	6.75	8.55	11.50
05PL394	.39	.312	.813	4.76	5.29	6.20	7.20	9.10	12.40
05PL474	.47	.312	.813	4.76	5.29	6.20	7.20	9.10	12.40
05PL504	.5	.400	.813	4.76	5.29	6.20	7.20	9.10	12.40
05PL684	.68	.400	.813	4.94	5.49	6.50	7.50	9.40	13.00
05PL824	.82	.400	1.063	5.09	5.65	6.80	7.80	9.75	13.60
05PL105	1.0	.400	1.063	5.20	5.78	7.40	8.40	10.30	14.80
05PL155	1.5	.400	1.063	6.21	6.90	7.95	8.95	10.95	15.90
05PL205	2.0	.500	1.125	6.69	7.43	8.60	9.60	11.65	17.20
05PL305	3.0	.500	1.375	7.74	8.60	9.65	10.65	12.70	19.30
05PL405	4.0	.562	1.375	8.78	9.75	10.80	11.80	13.85	21.60
05PL505	5.0	.670	1.375	9.85	10.95	12.50	13.50	15.55	25.00
05PL805	8.0	.670	1.875	12.15	13.50	15.60	16.85	18.25	31.20
05PL106	10.0	.670	1.875	15.17	16.85	18.95	19.95	21.05	37.90

100 VOLT PL
*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
1PL102	.001	.170	.500	$3.38	$3.75	$4.50	$5.50	$6.90	$9.00
1PL122	.0012	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL152	.0015	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL182	.0018	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL202	.002	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL222	.0022	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL272	.0027	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL332	.0033	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL472	.0047	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL502	.005	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
1PL682	.0068	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL822	.0082	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL103	.01	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL123	.012	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL153	.015	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL183	.018	.193	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL203	.02	.193	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL223	.022	.193	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL273	.027	.193	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL333	.033	.193	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL393	.039	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL473	.047	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL503	.05	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL563	.056	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
1PL683	.068	.235	.813	3.38	3.75	4.50	5.50	6.90	9.00
1PL823	.082	.312	.687	3.51	3.90	4.60	5.60	7.10	9.20
1PL104	.1	.312	.687	3.51	3.90	4.60	5.60	7.10	9.20
1PL124	.12	.312	.687	3.65	4.05	4.70	5.70	7.15	9.40
1PL154	.15	.312	.813	3.65	4.05	4.70	5.70	7.15	9.40
1PL204	.2	.312	.813	3.69	4.10	4.75	5.75	7.15	9.50
1PL224	.22	.312	.813	3.69	4.10	4.75	5.75	7.15	9.50
1PL274	.27	.312	1.063	3.74	4.15	4.75	5.75	7.15	9.50
1PL334	.33	.312	1.063	3.92	4.36	4.90	5.90	7.20	9.60
1PL394	.39	.400	1.063	3.92	4.39	5.10	5.95	7.40	10.20
1PL474	.47	.400	1.063	3.95	4.39	5.10	5.95	7.40	10.20
1PL504	.5	.400	1.063	3.95	4.39	5.10	5.95	7.40	10.20
1PL684	.68	.500	1.125	4.07	4.52	5.25	6.13	7.50	10.51
1PL824	.82	.500	1.125	4.22	4.69	5.32	6.32	7.60	10.64
1PL105	1.0	.562	1.125	4.22	4.69	5.32	6.32	7.60	10.64
1PL155	1.5	.562	1.375	4.67	5.19	5.95	6.95	8.05	11.90
1PL205	2.0	.670	1.375	4.91	5.45	6.50	7.50	8.50	13.00
1PL305	3.0	.670	1.875	5.36	5.95	6.98	7.98	8.98	13.96
1PL405	4.0	.75	1.875	5.90	6.55	7.65	8.25	9.35	15.30
1PL505	5.0	.75	1.875	6.32	7.02	8.12	9.20	10.30	16.24
1PL805	8.0	1.0	2.375	8.26	9.18	10.50	11.85	12.95	21.00
1PL106	10.0	1.0	2.375	8.26	9.18	10.50	11.85	12.95	21.00

200 VOLT PL
*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
2PL102	.001	.170	.562	$3.38	$3.75	$4.50	$5.50	$6.90	$9.00
2PL202	.002	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
2PL502	.005	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
2PL103	.01	.193	.562	3.38	3.75	4.50	5.50	6.90	9.00
2PL153	.015	.235	.562	3.38	3.75	4.50	5.50	6.90	9.00
2PL223	.022	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
2PL333	.033	.312	.687	3.38	3.75	4.50	5.50	6.90	9.00
2PL473	.047	.312	.687	3.38	3.75	4.50	5.50	6.90	9.00
2PL503	.05	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
2PL683	.068	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
2PL104	.10	.312	.813	3.51	3.90	4.60	5.60	7.10	9.20
2PL154	.15	.400	1.063	3.65	4.05	4.70	5.70	7.15	9.40
2PL224	.22	.400	1.375	3.69	4.10	4.75	5.75	7.15	9.50
2PL334	.33	.500	1.375	3.92	4.36	4.90	5.90	7.20	9.60
2PL474	.47	.500	1.375	3.95	4.39	5.10	5.95	7.40	10.20
2PL504	.50	.500	1.375	3.95	4.39	5.10	5.95	7.40	10.20
2PL105	1.0	.562	1.875	4.22	4.69	5.32	6.32	7.60	10.64
2PL155	1.5	.670	1.875	4.67	5.19	5.95	6.95	8.05	11.90
2PL205	2.0	.750	1.875	4.91	5.45	6.50	7.50	8.50	13.00
2PL255	2.5	.750	1.875	5.16	5.72	6.83	7.88	8.93	13.65
2PL305	3.0	1.00	1.875	5.36	5.95	6.98	7.98	8.98	13.96
2PL405	4.0	1.00	2.375	5.90	6.55	7.65	8.25	9.35	15.30

400 VOLT PL
*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
4PL102	.001	.193	.562	$3.38	$3.75	$4.50	$5.50	$6.90	$9.00
4PL202	.002	.193	.562	3.38	3.75	4.50	5.50	6.90	9.00
4PL502	.005	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
4PL103	.01	.235	.687	3.38	3.75	4.50	5.50	6.90	9.00
4PL153	.015	.235	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL223	.022	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL273	.027	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL333	.033	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL393	.039	.312	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL473	.047	.400	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL503	.05	.400	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL683	.068	.400	.813	3.38	3.75	4.50	5.50	6.90	9.00
4PL823	.082	.400	1.063	3.51	3.90	4.60	5.60	7.10	9.20
4PL104	.10	.400	1.063	3.51	3.90	4.60	5.60	7.10	9.20
4PL154	.15	.400	1.375	3.65	4.05	4.70	5.70	7.15	9.40
4PL224	.22	.500	1.375	3.69	4.10	4.75	5.75	7.15	9.50
4PL334	.33	.562	1.375	3.92	4.36	4.90	5.90	7.20	9.60
4PL474	.47	.562	1.875	3.95	4.39	5.10	5.95	7.40	10.20
4PL504	.50	.562	1.875	3.95	4.39	5.10	5.95	7.40	10.20
4PL105	1.0	.750	1.875	4.91	5.45	6.29	7.22	8.01	12.58
4PL205	2.0	1.00	2.375	5.86	6.51	7.48	8.18	9.15	14.96

See YELLOW SECTION for Local Offices, Phones

PK POLYCARBONATE
AC TESTED CAPACITORS

PK Polycarbonate Capacitors are high reliability screened per **LEVEL "A"** shown on Flow Plan Page 2 and are in widespread use in space and other critical applications. All capacitors receive a high stress AC square wave voltage of approximately 300% higher peak to peak voltage than their DC ratings for additional screening purposes. The PK capacitors are available in all the voltage ratings and case sizes listed for Type PL Polycarbonate Capacitors on Page 12. Contact us for special capacitors selected for zero TC ±30 PPM from −10°C to 125°C in these same case sizes.

PK SPECIFICATIONS

OPERATING TEMPERATURE
−62°C to 100°C at full rated voltage. Derate linearly from 100°C to 50% of rated voltage at 125°C.

TEMPERATURE COEFFICIENT OF CAPACITANCE — 25°C Reference

−0.75% ±0.25% at −55°C
−0.35% ±0.15% at −25°C
−0.25% ±0.15% at −10°C
−0.15% ±0.1% at 0°C
+0.05% ±0.1% at 55°C
+0.15% ±0.15% at 85°C
+0.25% ±0.25% at 125°C

STABILITY
Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
−10°C to 85°C	0.03% Max
−62°C to 125°C	0.2% Max

INSULATION RESISTANCE — measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	3,000,000	2,000,000	1,000,000	300,000	20,000
Greater than 1 mfd (in megohms ÷ mfd)	300,000	200,000	100,000	30,000	2,000

DIELECTRIC ABSORPTION — 0.2% Max at 25°C.

DISSIPATION FACTOR — 0.2% max at 1 KHz and 25°C. Values greater than 1 mfd measure at 0.1 KHz.

DIELECTRIC STRENGTH — 200% of rated voltage.

CONSTRUCTION — Polycarbonate dielectric, hermetically sealed, extended metal film electrodes, leads isolated from case, leads may be tinned copperweld or nickel, gold plated per Mil-Std 1276, Type N2.

SEAL TEST — 1 x 10^{-6} ATM-CC/SEC Max leak rate.

ENVIRONMENTAL — Capacitors shall meet all applicable requirements of Mil-C-19978, including grade 3 vibration.

FOR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3

LEVEL "A" QUALITY ASSURANCE

PK Polycarbonate Capacitors are 100% processed and tested as follows:

RELIABILITY SCREENING

1. Stabilization by temperature cycling from −62°C to 125 5 cycles minimum.
2. Mass spectrometer hermetic seal test per MIL-STD-2 Method 112, condition C. procedure 111A.
3. DC dielectric strength—apply 200% of rated DC from le to lead and from leads to case for one minute.

3A. AC dielectric strength—apply 100 Hz square wave from le to lead at a minimum peak to peak voltage of 3 x rat DC voltage for one minute.

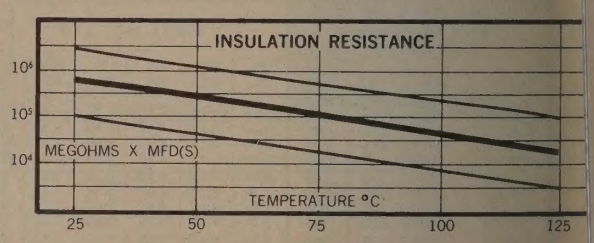
4. Insulation resistance at rated voltage and 25°C.
5. Capacitance tolerance at 1 KHz and 25°C.
6. Dissipation factor at 25°C.

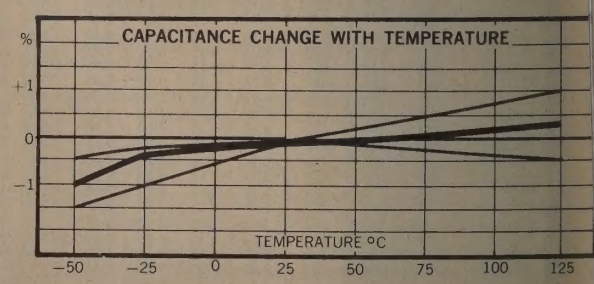
POWER AGING AND STABILIZATION

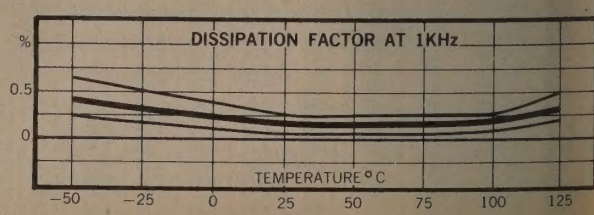
7. Burn-in at 125°C and 140% of rated voltage for a minimu of 48 hours.
8. Verification of stability by temperature cycling from −62° to 125°C, 5 cycles minimum.

PERFORMANCE CERTIFICATION

9. Dielectric strength test at a minimum of 200% of rated vol tage, lead to lead and leads to case.
10. Insulation resistance at rated voltage and 25°C.
11. Capacitance tolerance at 1 KHz and 25°C.
12. Dissipation factor at 25°C.
13. Temperature coefficient measured from −55°C to 125°C a a minimum of 5 temperature points. (Performed on lo sampling basis, minimum 10 pieces per lot.)
14. Visual inspection for dimensions, marking, and packaging
15. Traceability to production and test records by permanen marking of parts with lot control number.
16. Process and inspection data is maintained on file pe NPC-200-3 and Mil-Q-9858 quality control standards.
17. Capacitors are serialized and packaged with certified tes data to accompany each shipment.







50 VOLT PK *ADD TOLERANCE LETTER AFTER PART NO.				PRICES 1-6				
Part No.	MFD	±.01 Diam.	±.03 Length	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
05PK103	.01	.170	.562	$7.47	$8.82	$10.53	$13.50	$17.64
05PK153	.015	.170	.562	7.47	8.82	10.53	13.50	17.64
05PK223	.022	.193	.562	7.47	8.82	10.53	13.50	17.64
05PK273	.027	.193	.562	7.47	8.82	10.53	13.50	17.64
05PK333	.033	.193	.562	7.47	8.82	10.53	13.50	17.64
05PK393	.039	.170	.687	7.47	8.82	10.53	13.50	17.64
05PK473	.047	.170	.687	7.47	8.82	10.53	13.50	17.64
05PK503	.05	.170	.687	7.47	8.82	10.53	13.50	17.64
05PK683	.068	.193	.687	7.47	8.82	10.53	13.50	17.64
05PK823	.082	.193	.813	7.47	8.82	10.53	13.50	17.64
05PK104	.10	.193	.813	7.65	8.91	10.62	13.68	17.82
05PK154	.15	.235	.687	7.87	9.09	10.80	14.06	18.18
05PK224	.22	.235	.813	8.03	9.27	11.07	14.49	18.54
05PK274	.27	.312	.687	8.64	10.08	11.88	15.12	20.16
05PK334	.33	.312	.687	8.86	10.35	12.15	15.39	20.70
05PK474	.47	.312	.813	9.52	11.16	12.96	16.38	22.32
05PK504	.50	.400	.813	9.52	11.16	12.96	16.38	22.32
05PK105	1.0	.400	1.063	10.40	13.32	15.12	18.54	26.64
05PK155	1.5	.400	1.063	12.42	14.31	16.11	19.71	28.62
05PK205	2.0	.500	1.125	13.37	15.48	17.28	20.97	30.96
05PK305	3.0	.500	1.375	15.48	17.37	19.17	22.86	34.74
05PK405	4.0	.562	1.375	17.55	19.44	21.24	24.93	36.88
05PK505	5.0	.670	1.375	19.71	22.50	24.30	27.99	39.90
05PK106	10.0	.670	1.875	30.33	34.11	35.91	37.89	48.86

PV POLYCARBONATE
AC TESTED CAPACITORS

ype 03PV Polycarbonate Film Capacitors are high reliability creened in accordance with the Level "A" flow plan shown n Page 2. In addition, we have added a special AC square ave stress test, shown in the Quality Assurance section, to nprove the 03PV capacitor reliability for pulsating voltage pplications.

he 03PV capacitors are the highest performance, highest reliability film capacitors available in subminiature size and are in idespread use in space, aircraft, and missile systems.

ustom capacitors can be provided with selected temperature oefficient, higher insulation resistance and special case styles. ee Type PK for higher voltage rated types.

PV SPECIFICATIONS

PERATING TEMPERATURE —55°C to 100°C at 30VDC. Derate nearly by 50% to 125°C.

EMPERATURE COEFFICIENT OF CAPACITANCE

—1.2% Max. at —55°C	±.15% Max. at 55°C
—0.25% Max. at —10°C	±.25% Max. at 85°C
0% Ref. at 25°C	±.50% Max. at 125°C

TABILITY—Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
—10°C to 85°C	0.03% Max.
—62°C to 125°C	0.2% Max.

NSULATION RESISTANCE—measured from terminal to terminal t rated voltage, and 5 minutes maximum charge time. For alues greater than 1 mfd, allow an additional minute/mfd harge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
01 to 0.1 mfd n megohms)	4,000,000	2,000,000	1,000,000	500,000	50,000
reater than .1 mfd n megohms F mfd)	‡ 1,000,000	‡ 400,000	100,000	50,000	5,000

‡ Need not exceed IR values for 0.1 mfd or less.

DIELECTRIC ABSORPTION—0.2% Max. at 25°C.

DISSIPATION FACTOR—0.2% max at 1 KHz and 25°C. Values reater than 1 mfd measure at 0.1 KHz.

DIELECTRIC STRENGTH—400% of rated voltage.

ONSTRUCTION—Polycarbonate dielectric, extended metal film lectrodes, hermetically sealed, leads isolated from case. Leads re gold plated nickel per Mil Std 1276 type N2.

EAL TEST—1 x 10^{-6} ATM-CC/SEC Max leak rate.

ENVIRONMENTAL—Capacitors shall meet all applicable requirements of Mil-C-19978 including grade 3 vibration.

OR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3

LEVEL "A" QUALITY ASSURANCE

"PV" POLYCARBONATE CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

RELIABILITY SCREENING

1. Stabilization by temperature cycling from —62°C to 125°C, 5 cycles minimum.
2. Mass spectrometer hermetic seal test per MIL-STD-202, method 112, condition C, procedure 111A.
3. DC Dielectric strength test—apply 300% of rated DC volts from lead to lead and leads to case.

3A. AC Dielectric strength test—apply 100 Hz square wave from lead to lead at a minimum peak to peak voltage of 400% of rated DC voltage for one minute.

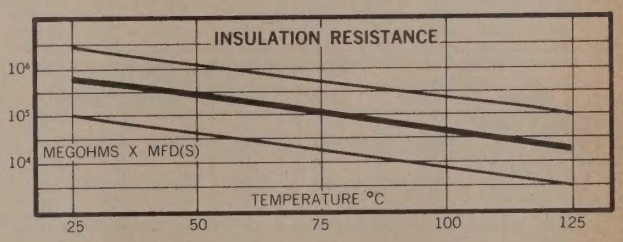
4. Insulation resistance at rated voltage and 25°C.
5. Capacitance tolerance at 1 KHz and 25°C.
6. Dissipation factor at 25°C.

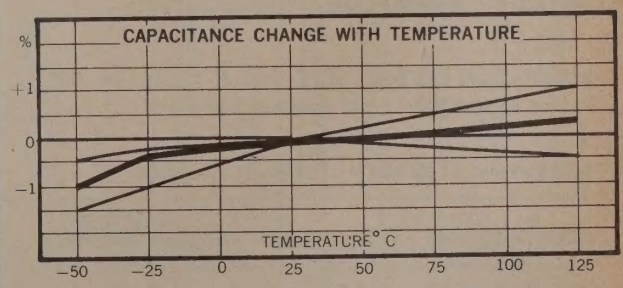
POWER AGING AND STABILIZATION

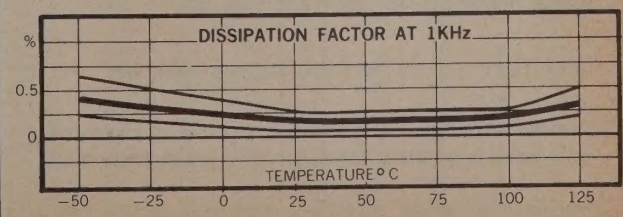
7. Burn-in at 125°C and 140% of rated voltage for a minimum of 48 hours.
8. Verification of stability by temperature cycling from —62°C to 125°C, 5 cycles minimum.

PERFORMANCE CERTIFICATION

9. Dielectric strength test at a minimum of 400% of rated voltage lead to lead and leads to case.
10. Insulation resistance at rated voltage and 25°C.
11. Capacitance tolerance at 1 KHz and 25°C.
12. Dissipation factor at 25°C.
13. Temperature coefficient measured from —55°C to 125°C at a minimum of 5 temperature points. (Performed on lot sampling basis, minimum 10 pieces per lot.)
14. Visual inspection for dimensions, marking, and packaging.
15. Traceability to production and test records by permanent marking of parts with lot control number.
16. Process and inspection data is maintained on file per NPC-200-3 and Mil-Q-9858 quality control standards.
17. Capacitors are serialized and packaged with certified test data to accompany each shipment.







30 VOLT PV

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	PRICES 1-6 5% tol. *JN	2% tol. *GN	1% tol. *FN	½% tol. *DN	¼% tol. *BN
03PV103	.01	.170	.500	$7.47	$8.82	$10.53	$13.50	$17.64
03PV153	.015	.170	.500	7.47	8.82	10.53	13.50	17.64
03PV223	.022	.170	.500	7.47	8.82	10.53	13.50	17.64
03PV273	.027	.170	.562	7.47	8.82	10.53	13.50	17.64
03PV333	.033	.170	.562	7.47	8.82	10.53	13.50	17.64
03PV393	.039	.170	.562	7.47	8.82	10.53	13.50	17.64
03PV473	.047	.170	.562	7.47	8.82	10.53	13.50	17.64
03PV503	.05	.170	.562	7.47	8.82	10.53	13.50	17.64
03PV683	.068	.170	.687	7.47	8.82	10.53	13.50	17.64
03PV823	.082	.170	.687	7.47	8.82	10.53	13.50	17.64
03PV104	.1	.193	.687	7.65	8.91	10.62	13.68	17.82
03PV154	.15	.235	.562	7.87	9.09	10.80	14.06	18.18
03PV224	.22	.235	.687	8.03	9.27	11.07	14.49	18.54
03PV274	.27	.235	.687	8.64	10.08	11.88	15.12	20.16
03PV334	.33	.235	.687	8.86	10.35	12.15	15.39	20.70
03PV474	.47	.312	.687	9.52	11.16	12.96	16.38	22.32
03PV504	.5	.312	.687	9.52	11.16	12.96	16.38	22.32
03PV105	1.0	.312	.813	10.40	13.32	15.12	18.54	26.64
03PV155	1.5	.400	.813	12.42	14.31	16.11	19.71	28.62
03PV205	2.0	.400	.813	13.37	15.48	17.28	20.97	30.96
03PV305	3.0	.400	1.063	15.48	17.37	19.17	22.86	34.74
03PV405	4.0	.400	1.375	17.55	19.44	21.24	24.93	36.88
03PV505	5.0	.500	1.375	19.71	22.50	24.30	27.99	39.90
03PV805	8.0	.562	1.375	27.21	30.53	32.46	34.82	46.33
03PV106	10.0	.562	1.375	30.33	34.11	35.91	37.89	48.86
03PV156	15.0	.562	1.875	33.70	37.90	39.90	42.10	51.84
03PV206	20.0	.670	1.875	39.00	43.20	45.76	47.20	56.40

PG POLYCARBONATE CAPACITORS

PG Polycarbonate Capacitors exceed MIL-Specification quality capacitors and are widely used for industrial and military applications. The PG capacitors utilize the patented CRC supported winding and stress-free lead design which has been fully qualified in many extensive test programs. The PG capacitors are reliability screened per **LEVEL "C"** shown on Flow Plan Page 2. See Types PL, PK and PV for higher reliability level.

PG SPECIFICATIONS

OPERATING TEMPERATURE — −62°C to 100°C at full rated voltage, derate linearly from 100°C to 50% of rated voltage at 125°C.

TEMPERATURE COEFFICIENT OF CAPACITANCE —

± 2% max −55°C to 125°C
± 1% max −25°C to 85°C
±0.5% max 0°C to 55°C

STABILITY — Capacitance values measured at any two corresponding temperature points taken in five successive temperature cycles shall be as follows:

Range	Retrace
−10°C to 85°C	0.25% max
−62°C to 125°C	0.50% max

INSULATION RESISTANCE—measured from terminal to terminal at rated voltage, and 5 minutes maximum charge time. For values greater than 1 mfd, allow an additional minute/mfd charge time.

	MINIMUM IR				
Range	25°C	55°C	85°C	105°C	125°C
.001 to 0.1 mfd (in megohms)	1,000,000	500,000	100,000	50,000	10,000
Greater than 0.1 mfd (in megohms ÷ mfd)	100,000	50,000	10,000	5,000	1,000

DIELECTRIC ABSORPTION — 0.2% max at 25°C.

DISSIPATION FACTOR — 0.3% max at 1 KHz and 25°C. Values greater than 1 mfd measure at 0.1 KHz.

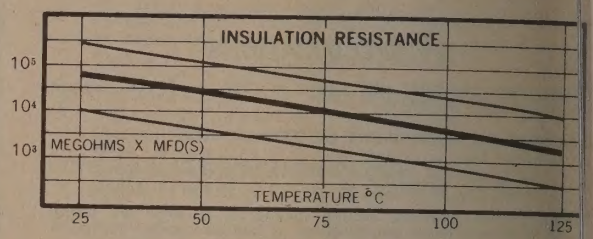
DIELECTRIC STRENGTH — 200% of rated volts.

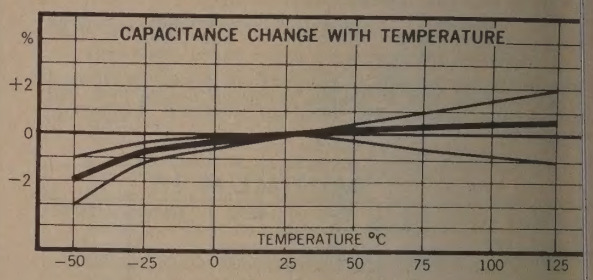
CONSTRUCTION — Polycarbonate dielectric, extended metal film electrodes, hermetically sealed, leads isolated from case. Leads may be tinned copperweld or gold-plated nickel per Mil Std 1276 type N2.

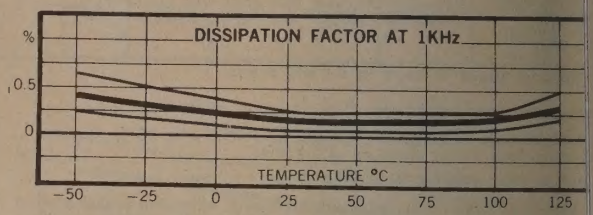
SEAL TEST — 1×10^{-5} ATM-CC/SEC max leak rate.

ENVIRONMENTAL — Capacitors shall meet all applicable requirements of MIL-C-19978 including grade 3 vibration.

FOR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3







LEVEL "C" QUALITY ASSURANCE

"PG" POLYCARBONATE CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

1. *Stabilization by temperature cycling from −62°C to 125°C, 2 cycles minimum.*
2. *Mass spectrometer hermetic seal test per MIL-STD-202, method 112, condition C, procedure III A.*
3. *Dielectric strength test at a minimum of 200% of rated voltage, lead to lead, leads to case.*
4. *Insulation resistance at rated voltage and 25°C.*
5. *Capacitance tolerance at 1 KHz and 25°C.*
6. *Dissipation factor at 25°C.*
7. *Visual inspection for dimensions, marking and packaging.*

PG POLYCARBONATE CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

30V PG

ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
0302	.001	.170	.500	$3.38	$3.75	$4.50	$5.50	$6.90	$9.00
0322	.0012	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0352	.0015	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0382	.0018	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0402	.002	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0422	.0022	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0472	.0027	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0332	.0033	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0472	.0047	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0502	.005	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0682	.0068	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0822	.0082	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0103	.01	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0123	.012	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0153	.015	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0183	.018	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0203	.02	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0223	.022	.170	.500	3.38	3.75	4.50	5.50	6.90	9.00
0273	.027	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0333	.033	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0393	.039	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0473	.047	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0503	.05	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0563	.056	.170	.562	3.38	3.75	4.50	5.50	6.90	9.00
0683	.068	.170	.687	3.38	3.75	4.50	5.50	6.90	9.00
0823	.082	.170	.687	3.42	3.80	4.55	5.55	6.90	9.10
0104	.10	.193	.687	3.51	3.90	4.60	5.60	6.95	9.20
0124	.12	.193	.687	3.65	4.05	4.65	5.65	7.00	9.30
0154	.15	.235	.562	3.65	4.05	4.65	5.65	7.00	9.30
0204	.20	.235	.687	3.69	4.10	4.70	5.70	7.10	9.40
0224	.22	.235	.687	3.69	4.10	4.70	5.70	7.10	9.40
0274	.27	.235	.687	3.92	4.36	4.80	5.90	7.20	9.60
0334	.33	.235	.687	3.92	4.36	4.80	5.90	7.20	9.60
0394	.39	.235	.687	3.95	4.39	5.20	5.95	7.40	10.40
0474	.47	.312	.687	3.95	4.39	5.20	5.95	7.40	10.40
0504	.50	.312	.687	3.95	4.39	5.20	5.95	7.40	10.40
0684	.68	.312	.687	4.03	4.48	5.30	6.07	7.55	10.61
0824	.82	.312	.813	4.22	4.69	5.32	6.32	7.60	11.30
0105	1.0	.312	.813	4.22	4.69	5.32	6.32	7.60	11.30
0155	1.5	.400	.813	4.67	5.19	5.95	6.95	8.35	11.90
0205	2.0	.400	.813	4.91	5.45	6.50	7.50	8.50	13.00
0305	3.0	.400	1.063	5.36	5.95	6.98	7.98	8.98	13.96
0405	4.0	.400	1.375	5.90	6.55	7.65	8.25	9.35	15.30
0505	5.0	.500	1.375	6.32	7.02	8.12	9.20	10.30	16.24
0805	8.0	.562	1.375	7.74	8.60	9.65	10.70	12.40	19.30
0106	10.0	.562	1.375	8.26	9.18	10.90	12.15	13.95	21.00
0156	15.0	.562	1.875	10.71	11.90	13.96	15.96	17.96	27.92
0206	20.0	.670	1.875	12.64	14.04	16.24	18.40	20.60	32.48

50V PG

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
0102	.001	.170	.500	$2.99	$3.32	$3.92	$4.68	$6.00	$7.84
0122	.0012	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0152	.0015	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0182	.0018	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0202	.002	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0222	.0022	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0272	.0027	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0332	.0033	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0472	.0047	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0502	.005	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0682	.0068	.170	.500	2.99	3.32	3.92	4.68	6.00	7.84
0822	.0082	.170	.562	2.99	3.32	3.92	4.68	6.00	7.84
0103	.01	.170	.562	2.99	3.32	3.92	4.68	6.00	7.84
0123	.012	.170	.562	2.99	3.32	3.92	4.68	6.00	7.84
0153	.015	.170	.562	2.99	3.32	3.92	4.68	6.00	7.84
0183	.018	.193	.562	2.99	3.32	3.92	4.68	6.00	7.84
0203	.02	.193	.562	2.99	3.32	3.92	4.68	6.00	7.84
0223	.022	.193	.562	2.99	3.32	3.92	4.68	6.00	7.84
0273	.027	.193	.562	2.99	3.32	3.92	4.68	6.00	7.84
0333	.033	.193	.562	2.99	3.32	3.92	4.68	6.00	7.84
0393	.039	.170	.687	2.99	3.32	3.92	4.68	6.00	7.84
0473	.047	.170	.687	2.99	3.32	3.92	4.68	6.00	7.84
0503	.05	.170	.687	2.99	3.32	3.92	4.68	6.00	7.84
0563	.056	.193	.687	2.99	3.32	3.92	4.68	6.00	7.84
0683	.068	.193	.687	2.99	3.32	3.92	4.68	6.00	7.84
0823	.082	.193	.813	2.99	3.32	3.92	4.68	6.00	7.84
0104	.1	.193	.813	3.06	3.40	3.96	4.72	6.08	7.92
0124	.12	.235	.687	3.15	3.50	4.04	4.80	6.24	8.08
0154	.15	.235	.687	3.15	3.50	4.04	4.80	6.24	8.08
0204	.2	.235	.813	3.21	3.57	4.12	4.92	6.44	8.24
0224	.22	.235	.813	3.21	3.57	4.12	4.92	6.44	8.24
0274	.27	.312	.687	3.36	3.73	4.28	5.08	6.60	8.56
0334	.33	.312	.687	3.55	3.94	4.60	5.40	6.84	9.20
0394	.39	.312	.813	3.81	4.23	4.96	5.76	7.28	9.92
0474	.47	.312	.813	3.81	4.23	4.96	5.76	7.28	9.92
0504	.5	.400	.813	3.81	4.23	4.96	5.76	7.28	9.92
0684	.68	.400	.813	4.01	4.45	5.25	6.05	7.60	10.50
0824	.82	.400	1.063	4.13	4.59	5.85	6.61	8.09	11.70
0105	1.0	.400	1.063	4.16	4.62	5.92	6.72	8.24	11.84
0155	1.5	.400	1.063	4.67	5.19	5.95	6.95	8.05	11.90
0205	2.0	.500	1.125	4.91	5.45	6.50	7.50	8.50	13.00
0305	3.0	.500	1.375	5.36	5.95	6.98	7.98	8.98	13.96
0405	4.0	.562	1.375	5.90	6.55	7.65	8.25	9.35	15.30
0505	5.0	.670	1.375	6.32	7.02	8.12	9.20	10.30	16.24
0805	8.0	.670	1.875	7.74	8.60	9.65	10.70	12.40	19.30
0106	10.0	.670	1.875	8.26	9.18	10.50	11.85	12.95	21.00

100V PG

*ADD TOLERANCE LETTER AFTER PART NO.

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
1PG102	.001	.170	.500	$2.70	$3.00	$3.60	$4.40	$6.00	$7.20
1PG122	.0012	.170	.500	2.70	3.00	3.60	4.40	6.00	7.20
1PG152	.0015	.170	.500	2.70	3.00	3.60	4.40	6.00	7.20
1PG182	.0018	.170	.500	2.70	3.00	3.60	4.40	6.00	7.20
1PG202	.002	.170	.500	2.70	3.00	3.60	4.40	5.76	7.20
1PG222	.0022	.170	.500	2.70	3.00	3.60	4.40	5.76	7.20
1PG272	.0027	.170	.500	2.70	3.00	3.60	4.40	5.76	7.20
1PG332	.0033	.170	.500	2.70	3.00	3.60	4.40	5.76	7.20
1PG472	.0047	.170	.500	2.70	3.00	3.60	4.40	5.76	7.20
1PG502	.005	.170	.500	2.70	3.00	3.60	4.40	5.60	7.20
1PG682	.0068	.170	.687	2.70	3.00	3.60	4.40	5.60	7.20
1PG822	.0082	.170	.687	2.70	3.00	3.60	4.40	5.60	7.20
1PG103	.01	.170	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG123	.012	.170	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG153	.015	.170	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG183	.018	.193	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG203	.02	.193	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG223	.022	.193	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG273	.027	.193	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG333	.033	.193	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG393	.039	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG473	.047	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG503	.05	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG563	.056	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
1PG683	.068	.235	.813	2.70	3.00	3.60	4.40	5.52	7.20
1PG823	.082	.312	.687	2.74	3.04	3.60	4.40	5.52	7.20
1PG104	.1	.312	.687	2.81	3.12	3.68	4.48	5.56	7.36
1PG124	.12	.312	.687	2.92	3.24	3.72	4.52	5.60	7.44
1PG154	.15	.312	.813	2.92	3.24	3.72	4.52	5.60	7.44
1PG204	.2	.312	.813	2.95	3.28	3.76	4.56	5.68	7.52
1PG224	.22	.312	.813	2.95	3.28	3.76	4.56	5.68	7.52
1PG274	.27	.312	1.063	2.99	3.32	3.80	4.60	5.68	7.60
1PG334	.33	.312	1.063	3.14	3.49	3.84	4.72	5.76	7.68
1PG394	.39	.400	1.063	3.16	3.51	4.16	4.76	5.92	8.32
1PG474	.47	.400	1.063	3.16	3.51	4.16	4.76	5.92	8.32
1PG504	.5	.400	1.063	3.16	3.51	4.16	4.76	5.92	8.32
1PG684	.68	.500	1.125	3.38	3.75	4.26	5.06	6.08	8.52
1PG824	.82	.500	1.125	3.38	3.75	4.26	5.06	6.08	8.52
1PG105	1.0	.562	1.125	3.38	3.75	4.26	5.06	6.08	8.52
1PG155	1.5	.562	1.375	3.74	4.15	4.76	5.56	6.44	9.52
1PG205	2.0	.670	1.375	3.92	4.36	5.20	6.00	6.44	10.40
1PG305	3.0	.670	1.875	4.28	4.76	5.58	6.38	7.18	11.16
1PG405	4.0	.75	1.875	4.72	5.24	6.12	6.60	7.48	12.24
1PG505	5.0	.75	1.875	5.06	5.62	6.50	7.36	8.24	13.00
1PG805	8.0	1.0	2.375	6.61	7.34	8.40	9.48	10.36	16.80
1PG106	10.0	1.0	2.375	6.61	7.34	8.40	9.48	10.36	16.80

200V PG

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
2PG102	.001	.170	.562	$2.70	$3.00	$3.60	$4.40	$5.52	$7.20
2PG202	.002	.170	.562	2.70	3.00	3.60	4.40	5.52	7.20
2PG502	.005	.170	.562	2.70	3.00	3.60	4.40	5.52	7.20
2PG103	.01	.193	.562	2.70	3.00	3.60	4.40	5.52	7.20
2PG153	.015	.235	.562	2.70	3.00	3.60	4.40	5.52	7.20
2PG223	.022	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
2PG333	.033	.312	.687	2.70	3.00	3.60	4.40	5.52	7.20
2PG473	.047	.312	.687	2.70	3.00	3.60	4.40	5.52	7.20
2PG503	.05	.312	.813	2.70	3.00	3.60	4.40	5.52	7.20
2PG683	.068	.312	.813	2.74	3.04	3.60	4.40	5.52	7.20
2PG104	.1	.312	.813	2.81	3.12	3.68	4.48	5.56	7.36
2PG154	.15	.400	1.063	2.92	3.24	3.72	4.52	5.60	7.44
2PG224	.22	.400	1.375	2.95	3.28	3.76	4.56	5.68	7.52
2PG334	.33	.500	1.375	3.14	3.49	3.84	4.72	5.76	7.68
2PG474	.47	.500	1.375	3.30	3.67	4.24	5.00	6.08	8.48
2PG504	.5	.500	1.375	3.30	3.67	4.24	5.00	6.08	8.48
2PG105	1.0	.562	1.875	3.45	3.83	4.39	5.27	6.32	8.78
2PG155	1.5	.670	1.875	3.81	4.23	4.84	5.64	6.56	9.68
2PG205	2.0	.750	1.875	4.10	4.55	5.32	6.11	6.96	10.64
2PG255	2.5	.750	1.875	4.46	4.95	5.72	6.56	7.28	11.44
2PG305	3.0	1.00	1.875	4.90	5.44	6.28	6.76	7.64	12.56
2PG405	4.0	1.00	2.375	5.33	5.92	6.80	7.44	8.32	13.60

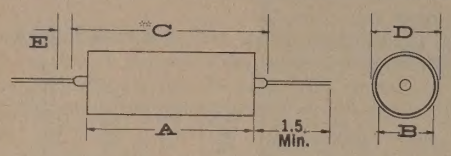
400V PG

PRICES 1-6

Part No.	MFD	±.01 Diam.	±.03 Length	10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	¼% tol. *B
4PG102	.001	.193	.562	$2.70	$3.00	$3.60	$4.40	$5.52	$7.20
4PG202	.002	.193	.562	2.70	3.00	3.60	4.40	5.52	7.20
4PG502	.005	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
4PG103	.01	.235	.687	2.70	3.00	3.60	4.40	5.52	7.20
4PG153	.015	.235	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG223	.022	.312	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG273	.027	.312	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG333	.033	.312	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG393	.039	.312	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG473	.047	.400	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG503	.05	.400	.813	2.70	3.00	3.60	4.40	5.52	7.20
4PG683	.068	.400	.813	2.74	3.04	3.60	4.40	5.52	7.20
4PG823	.082	.400	1.063	2.74	3.04	3.60	4.40	5.52	7.20
4PG104	.10	.400	1.063	2.92	3.24	3.72	4.52	5.60	7.44
4PG154	.15	.400	1.375	2.95	3.28	3.76	4.56	5.68	7.52
4PG224	.22	.500	1.375	3.14	3.49	3.84	4.72	5.76	7.68
4PG334	.33	.562	1.375	3.30	3.67	4.24	5.00	6.08	8.48
4PG474	.47	.562	1.875	3.45	3.83	4.39	5.27	6.32	8.78
4PG504	.50	.562	1.875	3.45	3.83	4.39	5.27	6.32	8.78
4PG105	1.0	.750	1.875	4.46	4.95	5.72	6.56	7.28	11.44
4PG205	2.0	1.00	2.375	5.33	5.92	6.80	7.44	8.32	13.60

PQ POLYCARBONATE • CORDWOOD CAPACITORS • TQ TEFLON

HERMETICALLY SEALED



MECHANICAL TOLERANCES AND NOTES

- **A** Length "A" is ±.03" max.
- **B** Diameter "B" is ±.01" max. (without mylar sleeving)
- ****C** Length "C" is 0.2" max. greater than "A"
- **D** Diameter "D" is .01" max. greater than "B" (when sleeving is put on case)
- **E** Length "E" is maximum of .062" that solder wick may run up gold plated leads from solder bead.

PQ POLYCARBONATE

Type PQ Polycarbonate Capacitors, the most compact high reliability film capacitors available, have a reduced bead to bead length for cordwood applications.

PQ SPECIFICATIONS—Same as for Type PG, see Page 15.

RELIABILITY—Level "C," see Flow Plan Page 2.

LEAD MATERIAL—Tinned copper clad steel is standard. Also available with gold plated nickel. See Page 3.

SPECIALS—Higher reliability screening including AC HiPot testing can be supplied.

TQ TEFLON

Type 05TQ Teflon Capacitors, the smallest high quality teflon film capacitors available, have a reduced bead to bead length for cordwood applications.

05TQ SPECIFICATIONS—Same as 05TA, see Page 5, except for slightly higher temperature coefficient and a maximum dissipation factor of 0.05%. Specials are also available at higher voltage ratings.

RELIABILITY—Level "B." See Flow Plan Page 2.

LEAD MATERIAL—Gold plated nickel is standard. Also available with tinned copper-clad steel leads. See Page 3.

30V PQ POLYCARBONATE

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	**Max. Cordwood Length	PRICES 1-6 10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D
03PQ102	.001	.170	.500	.600	$3.74	$4.15	$4.90	$5.85	$7.50
03PQ122	.0012	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ152	.0015	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ182	.0018	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ202	.002	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ222	.0022	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ272	.0027	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ332	.0033	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ472	.0047	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ502	.005	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ682	.0068	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ822	.0082	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ103	.01	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ123	.012	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ153	.015	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ183	.018	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ203	.02	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ223	.022	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ273	.027	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ333	.033	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ393	.039	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ473	.047	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ503	.05	.170	.500	.600	3.74	4.15	4.90	5.85	7.50
03PQ563	.056	.170	.562	.600	3.74	4.15	4.90	5.85	7.50
03PQ683	.068	.170	.562	.670	3.74	4.15	4.90	5.85	7.50
03PQ823	.082	.193	.562	.670	3.74	4.15	4.90	5.85	7.50
03PQ104	.1	.193	.562	.670	3.83	4.25	4.95	5.90	7.60
03PQ124	.12	.193	.687	.750	3.93	4.37	5.05	6.00	7.80
03PQ154	.15	.193	.687	.750	3.93	4.37	5.05	6.00	7.80
03PQ184	.18	.193	.687	.750	4.01	4.46	5.15	6.15	8.05
03PQ204	.2	.193	.687	.750	4.01	4.46	5.15	6.15	8.05
03PQ224	.22	.193	.687	.750	4.01	4.46	5.15	6.15	8.05
03PQ274	.27	.235	.687	.750	4.32	4.80	5.60	6.60	8.40
03PQ334	.33	.235	.687	.750	4.43	4.92	5.75	6.75	8.55
03PQ394	.39	.235	.687	.750	4.76	5.29	6.20	7.20	9.10
03PQ474	.47	.235	.687	.750	4.76	5.29	6.20	7.20	9.10
03PQ504	.5	.235	.687	.750	4.76	5.29	6.20	7.20	9.10
03PQ564	.56	.312	.687	.750	4.94	5.49	6.50	7.50	9.40
03PQ684	.68	.312	.687	.750	4.94	5.49	6.50	7.50	9.40
03PQ824	.82	.312	.687	.750	5.09	5.65	6.80	7.80	9.75
03PQ105	1.0	.312	.687	.750	5.20	5.78	7.40	8.40	10.30
03PQ155	1.5	.312	.937	1.00	6.21	6.90	7.95	8.95	10.95
03PQ205	2.0	.312	1.063	1.10	6.69	7.43	8.60	9.60	11.65
03PQ305	3.0	.400	.937	1.00	7.74	8.60	9.65	10.65	12.70
03PQ405	4.0	.400	1.063	1.10	8.78	9.75	10.80	11.80	13.85
03PQ505	5.0	.400	1.375	1.45	9.85	10.95	12.50	13.50	15.55
03PQ805	8.0	.500	1.375	1.45	12.15	13.50	15.60	16.85	18.25
03PQ106	10.0	.500	1.375	1.45	15.17	16.85	18.95	19.95	21.05

50V TQ TEFLON

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	**Max. Cordwood Length	PRICES 1-6 5% tol. *JN	2% tol. *GN	1% tol. *FN	% tol. *N
05TQ102	.001	.193	.562	.600	$4.59	$5.10	$5.70	$
05TQ152	.0015	.193	.562	.600	4.59	5.10	5.70	
05TQ202	.002	.193	.562	.600	4.59	5.10	5.70	
05TQ222	.0022	.193	.562	.600	4.59	5.10	5.70	
05TQ332	.0033	.193	.562	.600	4.59	5.10	5.70	
05TQ392	.0039	.235	.562	.600	4.59	5.10	5.70	
05TQ472	.0047	.235	.562	.600	4.59	5.10	5.70	
05TQ502	.005	.235	.562	.600	4.59	5.10	5.70	
05TQ682	.0068	.235	.562	.600	4.59	5.10	5.70	
05TQ822	.0082	.235	.562	.600	4.59	5.10	5.70	
05TQ103	.01	.235	.562	.600	4.59	5.10	5.70	
05TQ123	.012	.235	.562	.600	4.66	5.35	6.35	
05TQ153	.015	.235	.625	.670	4.86	5.40	6.00	
05TQ223	.022	.235	.625	.670	5.13	5.70	6.30	
05TQ333	.033	.312	.625	.670	5.61	6.23	7.20	11
05TQ393	.039	.312	.625	.670	5.94	6.60	7.50	11
05TQ473	.047	.312	.625	.670	5.94	6.60	7.50	11
05TQ503	.05	.312	.625	.670	5.94	6.60	7.50	11
05TQ683	.068	.312	.625	.670	7.52	8.35	9.50	13
05TQ823	.082	.312	.625	.670	8.28	9.20	10.35	14
05TQ104	.1	.312	.625	.670	8.91	9.90	10.75	14
05TQ154	.15	.312	.937	1.00	9.99	11.10	12.00	16
05TQ204	.2	.400	.937	1.00	12.02	13.35	14.25	18
05TQ224	.22	.400	.937	1.00	12.51	13.90	14.90	18

50V PQ POLYCARBONATE

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	**Max. Cordwood Length	PRICES 1-6 10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½
05PQ102	.001	.170	.500	.600	$3.74	$4.15	$4.90	$5.85	$7.
05PQ122	.0012	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ152	.0015	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ182	.0018	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ202	.002	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ222	.0022	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ272	.0027	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ332	.0033	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ472	.0047	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ502	.005	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ682	.0068	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ822	.0082	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ103	.01	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ123	.012	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ153	.015	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ183	.018	.170	.500	.600	3.74	4.15	4.90	5.85	7.
05PQ203	.02	.193	.562	.600	3.74	4.15	4.90	5.85	7.
05PQ223	.022	.193	.562	.600	3.74	4.15	4.90	5.85	7.
05PQ273	.027	.193	.562	.600	3.74	4.15	4.90	5.85	7.
05PQ333	.033	.193	.562	.600	3.74	4.15	4.90	5.85	7.
05PQ393	.039	.193	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ473	.047	.193	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ503	.05	.193	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ563	.056	.193	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ683	.068	.235	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ823	.082	.235	.625	.670	3.74	4.15	4.90	5.85	7.
05PQ104	.1	.235	.625	.670	3.83	4.25	4.95	5.90	7.
05PQ124	.12	.235	.625	.670	3.93	4.37	5.05	6.00	7.
05PQ154	.15	.312	.625	.670	3.93	4.37	5.05	6.00	7.
05PQ184	.18	.312	.625	.670	4.01	4.46	5.15	6.15	8.
05PQ224	.22	.312	.625	.670	4.01	4.46	5.15	6.15	8.
05PQ274	.27	.312	.625	.670	4.01	4.46	5.15	6.15	8.
05PQ334	.33	.312	.687	.750	4.43	4.92	5.75	6.75	8.
05PQ394	.39	.312	.687	.750	4.76	5.29	6.20	7.20	9.
05PQ474	.47	.312	.687	.750	4.76	5.29	6.20	7.20	9.
05PQ504	.50	.312	.687	.750	4.76	5.29	6.20	7.20	9.
05PQ684	.68	.400	.687	.750	4.94	5.49	6.50	7.50	9.
05PQ824	.82	.400	.687	.750	5.09	5.65	6.80	7.80	9.
05PQ105	1.0	.400	.687	.750	5.20	5.78	7.40	8.40	10.

PA POLYSTYRENE CAPACITORS

P Polystyrene capacitors reliability screened per Level "B" F Plan shown on Page 2, are used in operational amplifiers a networks because of their high insulation resistance, low dielectric absorption and long term stability. These PA capacitors are available at higher working voltages and in special case sizes as required by the customer. Banks of precision capacitors, up to 100 MFD in value, have been supplied for space instrumentation applications.

Level "A" capacitors with burn-in and high reliability screening also be supplied. For advance information on a new high temperature polystyrene capacitor see Pages 21 and 22.

PA SPECIFICATIONS

ERATING TEMPERATURE: —55°C to 85°C at full rated volts.

MPERATURE COEFFICIENT: (See special notes below)
Values 0.001 MFD to 0.0082 MFD —80 ±50 PPM/°C
0.01 MFD to 2.0 MFD —60 ±50 PPM/°C

ABILITY: 0.1% maximum drift with 5 cycles from —62°C to °C.

SULATION RESISTANCE: Measured from terminal to terminal rated voltage, and 5 minutes maximum charge time. For ues greater than 1 MFD, allow an additional minute/MFD arge time.

MINIMUM IR			
Range	25°C	55°C	85°C
0.001 to 0.1 MFD (in megohms)	5,000,000	2,500,000	500,000
Greater than 0.1 MFD (in megohms ÷ MFD)	‡ 1,000,000	‡ 500,000	‡ 100,000

ed not exceed IR values for 0.1 mfd or less

ELECTRIC ABSORPTION: 0.02% maximum at 25°C.

ISSIPATION FACTOR: 0.02% maximum at 25°C. alues to 1 MFD at 1 KHz, above 1 MFD at 0.1 KHz.

ELECTRIC STRENGTH: 200% of rated voltage.

ONSTRUCTION: Polystyrene dielectric, extended foil electrodes, hermetically sealed. Leads isolated from case. Leads are nned copperweld.

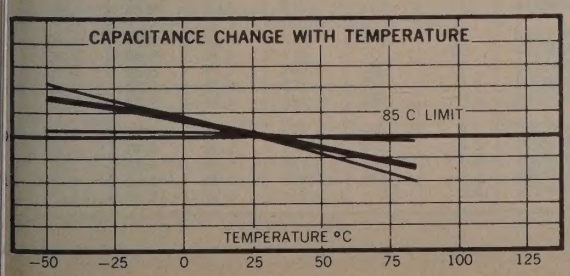
EAL TEST: 1 x 10^{-6} ATM-CC/SEC. maximum leak rate.

NVIRONMENTAL: Shall meet all applicable requirements of IL-C-19978, including Grade 3 vibration.

OR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3.

OTES:

PECIAL PA CAPACITORS can be supplied with a negative coefficient of —20 to —100 PPM/°C that is linear to ±30 PPM/°C, ±20 PPM/°C and ±10 PPM/°C. **A WIDE SELECTION** is available of larger MFD values in bathtub and custom cases. **A PECIAL HIGH TEMPERATURE**, high reliability type polystyrene apacitor is currently available and under test, see Pages 21 nd 22.



LEVEL "B" QUALITY ASSURANCE

"PA" POLYSTYRENE CAPACITORS ARE 100% PROCESSED AND TESTED AS FOLLOWS:

1. Temperature cycling from —62°C to 85°C, 5 cycles minimum.
2. Mass spectrometer hermetic seal test per MIL-STD-202, Method 112, condition C. Procedure IIIA.
3. Dielectric strength test at a minimum of 200% of rated voltage, lead to lead and leads to case.
4. Insulation resistance at rated voltage and 25°C.
5. Capacitance tolerance at 1 KHz and 25°C.
6. Dissipation factor at 1 KHz and 25°C.
7. Visual inspection for dimensions, marking, and packaging.
8. Traceability to production and test records by permanent marking of parts with lot control number.
9. Process and inspection data is maintained on file per NPC-200-3 and MIL-Q-9858 Quality Control Standards.

50 VOLT PA
*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	PRICES 1-6 10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	0.1% tol. *A
05PA102	.001	.193	.687	$3.37	$3.75	$4.50	$5.50	$6.90	$13.80
05PA182	.0018	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA222	.0022	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA332	.0033	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA472	.0047	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA502	.005	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA682	.0068	.193	.687	3.37	3.75	4.50	5.50	6.90	13.80
05PA822	.0082	.193	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA103	.01	.193	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA153	.015	.235	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA223	.022	.312	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA333	.033	.312	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA393	.039	.312	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA473	.047	.312	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA503	.05	.312	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA683	.068	.400	.813	3.37	3.75	4.50	5.50	6.90	13.80
05PA823	.082	.400	1.063	3.37	3.75	4.50	5.50	6.90	13.80
05PA104	.10	.400	1.063	3.37	3.75	4.50	5.50	6.90	13.80
05PA154	.15	.400	1.375	3.46	3.85	4.60	5.60	7.00	14.00
05PA224	.22	.500	1.375	3.51	3.90	4.65	5.65	7.05	14.10
05PA334	.33	.562	1.375	3.55	3.95	4.70	5.70	7.10	14.20
05PA474	.47	.562	1.875	3.69	4.10	4.85	5.85	7.25	14.50
05PA504	.50	.562	1.875	3.69	4.10	4.85	5.85	7.25	14.50
05PA105	1.0	.750	1.875	4.68	5.20	6.10	7.15	9.10	18.20
05PA205	2.0	1.0	2.250	7.06	7.85	8.30	9.10	11.40	22.80

100 VOLT PA
*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	±.01 Diam.	±.03 Length	PRICES 1-6 10% tol. *K	5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D	0.1% tol. *A
1PA102	.001	.193	.687	$3.75	$4.13	$4.95	$6.05	$7.59	$15.18
1PA182	.0018	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA222	.0022	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA332	.0033	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA472	.0047	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA502	.005	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA682	.0068	.193	.687	3.75	4.13	4.95	6.05	7.59	15.18
1PA822	.0082	.193	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA103	.01	.193	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA153	.015	.235	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA223	.022	.312	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA333	.033	.312	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA393	.039	.400	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA473	.047	.400	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA503	.05	.400	.813	3.75	4.13	4.95	6.05	7.59	15.18
1PA683	.068	.400	1.063	3.75	4.13	4.95	6.05	7.59	15.18
1PA823	.082	.400	1.063	3.75	4.13	4.95	6.05	7.59	15.18
1PA104	.10	.400	1.375	3.75	4.13	4.95	6.05	7.59	15.18
1PA154	.15	.400	1.375	3.85	4.24	5.06	6.16	7.70	15.40
1PA224	.22	.562	1.375	3.90	4.29	5.12	6.22	7.76	15.51
1PA334	.33	.562	1.875	3.95	4.35	5.17	6.27	7.81	15.62
1PA474	.47	.670	1.875	4.10	4.51	5.34	6.44	7.98	15.95
1PA504	.50	.670	1.875	4.10	4.51	5.34	6.44	7.98	15.95
1PA105	1.0	1.0	1.875	5.20	5.72	6.71	7.87	10.01	20.02

MA MYLAR AND MM MYLAR CAPACITORS

COMPONENT RESEARCH COMPANY, INC.

MA miniature metallized mylar capacitors are extremely compact and rugged. 1MA capacitors are available in 100V in tolerances of 0.5% to 5% and values from .001 mfd to 10 mfd

MM metallized mylar capacitors are reliable, accurate an rugged. Many thousands are used in military equipment wher an extra measure of dependability is needed. MM capacitor are available in 200V, 400V, and 600V in tolerances of 0.5% t 5% and values from .001 mfd. to 10 mfd.

FOR ADDITIONAL DETAILS SEE GENERAL INFORMATION SECTION

SPECIFICATIONS

SPECIFICATIONS	MA	MM
OPERATING TEMPERATURE —62°C to 85°C at full rated voltage. Derate linearly to 50% of rated volts at 125°C	100 Volt MA	200 Volt MM
TEMPERATURE COEFFICIENT OF CAPACITANCE 25°C reference — 62°C	−5% Max	−5% Max
— 25°C	−3% Max	−3.5% Max
— 10°C	−2% Max	−2.5% Max
0°C	−1% Max	−1.5% Max
55°C	+1% Max	+1% Max
85°C	+2% Max	+3% Max
125°C	+14% Max	+15% Max
STABILITY — Capacitance values measured at any two corresponding temperature points taken in any two successive temperature cycles from —10°C to 85°C shall differ a maximum of:	0.1%	0.1%
INSULATION RESISTANCE Min at 25°C Values 1 mfd or more	25,000 meg ÷ mfd	50,000 meg ÷ mfd
85°C	1,000	5,000
125°C	100	100
Values less than 1 mfd Min at 25°C	50,000 meg	100,000 meg
85°C	2,000	4,000
125°C	200	400
DIELECTRIC ABSORPTION at 25°C	0.5% Max	0.5% Max
***DISSIPATION FACTOR AT 1KHz** 25°C	0.8% Max	0.8% Max

CONSTRUCTION — Mylar dielectric, hermetically sealed, extended metal film electrodes, leads isolated from case, leads are tinned copperweld.

SEAL TEST — 1 x 10^{-6} ATM-CC/SEC Max leak rate.

ENVIRONMENTAL — Capacitors shall meet all applicable requirements of Mil-C-19978, including grade 3 vibration.

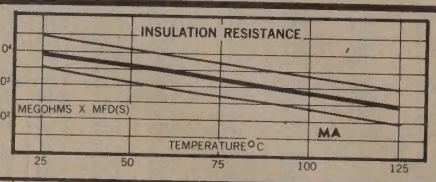
FOR ADDITIONAL DETAILS, SEE GENERAL INFORMATION SECTION, PAGE 3.

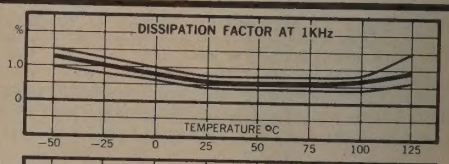
LEVEL "B" QUALITY ASSURANCE

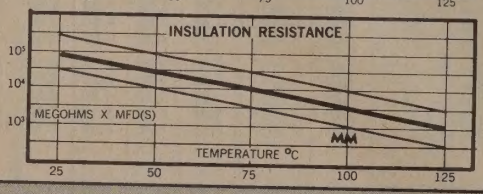
"MM" AND "MA" MYLAR CAPACITO ARE 100% PROCESSED AND TESTED AS FOLLOWS:

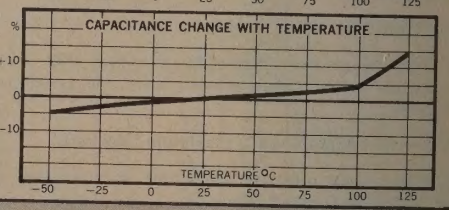
1. Stabilization by temperature cy from .62°C to 125°C, 5 cycles minin
2. Mass spectrometer hermetic seal per MIL-STD-202, Method 112, condi C. procedure III A.
3. Dielectric strength test at a minin of 200% of rated voltage, lead to and leads to case.
4. Insulation resistance of rated volt and 25°C.
5. Capacitance tolerance at 1KHz 25°C.
6. Dissipation factor at 25°C.
7. Visual inspection for dimensio marking, and packaging.
8. Traceability to production and t records by permanent marking of pa with lot control number.
9. Process and inspection data is ma tained on file per NPC-200-3 and Mi 9858 quality control standards.

*VALUES GREATER THAN 1 MFD AT 0.1KHz









100 VOLT MA MYLAR

*ADD TOLERANCE LETTER AFTER PART NO.

Part No.	MFD	± .01 Diam.	± .03 Length	PRICES 1-6 5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *D
1MA103	.01	.170	.562	$4.15	$4.90	$5.85	$7.50
1MA153	.015	.170	.562	4.15	4.90	5.85	7.50
1MA223	.022	.170	.562	4.15	4.90	5.85	7.50
1MA333	.033	.193	.562	4.15	4.90	5.85	7.50
1MA393	.039	.193	.562	4.15	4.90	5.85	7.50
1MA473	.047	.193	.687	4.15	4.90	5.85	7.50
1MA503	.05	.193	.687	4.15	4.90	5.85	7.50
1MA683	.068	.193	.687	4.15	4.90	5.85	7.50
1MA104	.1	.235	.687	4.25	4.95	5.90	7.60
1MA154	.15	.312	.687	4.37	5.05	6.00	7.80
1MA224	.22	.312	.687	4.46	5.15	6.15	8.05
1MA334	.33	.312	.813	4.92	5.75	6.75	8.55
1MA474	.47	.400	.813	5.29	6.20	7.20	9.10
1MA504	.5	.400	.813	5.29	6.20	7.20	9.10
1MA105	1.0	.400	1.063	5.78	7.40	8.40	10.30
1MA155	1.5	.500	1.125	6.90	7.95	8.95	10.95
1MA205	2.0	.500	1.125	7.43	8.60	9.60	11.65
1MA305	3.0	.562	1.125	8.60	9.65	10.65	12.70
1MA505	5.0	.670	1.375	10.95	12.50	13.50	15.55
1MA106	10.0	.670	1.875	16.85	18.95	19.95	21.05

200 VOLT MM MYLAR

Part No.	MFD	± .01 Diam.	± .03 Length	PRICES 1-6 5% tol. *J	2% tol. *G	1% tol. *F	½% tol. *
2MM103	.01	.193	.562	$3.75	$4.50	$5.50	$6
2MM153	.015	.193	.562	3 75	4 50	5 50	6
2MM223	.022	.235	.562	3.75	4.50	5.50	6
2MM333	.033	.235	.562	3.75	4.50	5.50	6
2MM393	.039	.235	.687	3.75	4.50	5.50	6
2MM473	.047	.235	.687	3.75	4.50	5.50	6
2MM503	.05	.235	.813	3.75	4.50	5.50	6
2MM683	.068	.235	.813	3.75	4.50	5.50	6
2MM104	.1	.312	.687	3.90	4.60	5.60	6
2MM154	.15	.312	.813	4.05	4.65	5.65	7
2MM224	.22	.312	.813	4.10	4.70	5.70	7.
2MM334	.33	.312	.813	4.36	4.80	5.90	7.
2MM474	.47	.400	1.063	4.39	5.20	5.95	7.
2MM504	.5	.500	1.125	4.39	5.20	5.95	7.
2MM105	1.0	.562	1.125	4.69	5.32	6.32	7.
2MM155	1.5	.562	1.375	5.19	5.95	6.95	8.
2MM205	2.0	.670	1.375	5.45	6.50	7.50	8.
2MM305	3.0	.670	1.625	5.95	6.98	7.98	8.
2MM505	5.0	.750	1.875	7.02	8.12	9.20	10.
2MM106	10.0	1.0	2.375	9.18	10.50	11.85	12.

COMPONENT RESEARCH CO., INC. 1717 19th Street, Santa Monica, Calif. 90404 • Phone: (213) 393-3755 • TWX: (910) 343-68

ELIABILITY INFORMATION

LURE ANALYSIS • LIFE TESTING • SIMULATION TESTING

COMPONENT RESEARCH COMPANY, INC.

CASE HISTORY RN-042

EN CIRCUIT CONDITION OF 100 VDC RATED CAPACITOR LOW VOLTAGE APPLICATION.

AILS: Customer discovered that existing voltage transients eeding 100 volts, ultimately damaged several capacitors ing system environmental checkout. No room was available a larger size capacitor without costly re-tooling.

RRECTIVE ACTION: A series of screening tests was conducted CRC on both capacitors from the same lot, and a newer CRC e with the same characteristics but capable of withstanding re severe current surges. These tests were designed, in a p-by-step method to induce failure modes, under the cus- ner's worst case conditions. Capacitance, IR and DF measure- nts taken after each step served to monitor all possible radation trends. Following are the screening tests:

EST TEP	TEST CONDITIONS
1	48 hours Burn-In @ 125°C/140 VDC.
2	20 Cycles from —62°C/125°C.
3	62 hours Burn-In @ 85°C/400 Hz/100 VRMS Sine Wave.
4	HiPot Test @ 600 VDC for 1 minute and @ 600 volts peak-to-peak @ 60 Hz square wave for 1 minute.
5	24 hours Burn-In @ 85°C/400 Hz/100 VRMS Sine Wave.
6	5.5 hours @ 85°C/60 Hz/400V peak-to-peak square wave.
7	23 hours Burn-In @ 125°C/300 VDC.
8	3 Cycles from —62°C/125°C.
9	23 hours Burn-In @ 125°C/400 VDC.
10	3 Cycles from —62°C/125°C.
11	37.5 hours Burn-In @ 85°C/60 Hz/300V peak-to-peak.

TEST DATA

AMPLE NO.	TOTAL % CAPAC. DRIFT	FINAL % DF @ 1 KHz	FINAL % DF @ 10 KHz	FINAL LEAKAGE CURRENT IN PICO-AMPS @ 90 VDC
1	—.14%	<.01%	<.01%	1
2	—.19%	<.01%	<.01%	2
3	—.05%	<.01%	<.01%	2
4	—.06%	<.01%	<.09%	2
5	—.01%	<.01%	<.01%	1
6	+.01%	<.01%	<.10%	1
7	—.01%	<.01%	<.01%	1
8	—.08%	<.01%	<.01%	1
9	0.0%	<.01%	<.01%	5
10	—.09%	<.01%	<.01%	1

TEST CONCLUSIONS

Original capacitors used passed Step 3, but with significant ncreases of dissipation factor, then opened after Step 4. CRC eplacement capacitors made with special electrodes (patent pending) survived all tests. Results for 10 samples are shown above.

CRC test capacitors are extremely stable with the major capaci- tance shift occurring after the conditioning of Step 1.

ADDITIONAL INFORMATION—5 Picoamperes leakage current at 90 volts is equivalent to 18,000,000 megohms insulation re- sistance. CRC capacitors are therefore, remarkably high in insulation resistance after all screening tests.

CRC capacitors tested above were a special 1TJ103 Teflon type similar to those listed on Page 4 of our catalog. Larger values were also tested with equivalent results.

For AC applications, it is imperative that the customer conduct reliability screening tests utilizing pulsed voltages to avoid failures. Contact our Reliability Department for assistance in this matter.

RELIABILITY STUDY XT-294

HIGH VOLTAGE CAPACITORS

Customers have requested that CRC supply high reliability capacitors of both light-weight construction and minimum size. These units must withstand the most rigorous environmental conditions and yet perform electrically as precision capacitors. The following typical life test is only one of many conducted constantly to verify the outstanding performance of CRC capacitors, regardless of specialized application.

APPLICATION: A capacitor 0.25 MFD ±5% is required in a .670 x 1.875 hermetically sealed case to operate at 1500 VDC.

TEST PLAN: To determine whether the CRC type and size capacitor could be considered reliable for a long term space flight application, CRC decided to life test 26 samples at 2300 volts DC and 85°C. In order to study any possible failure modes, readings with extremely accurate measurement equipment were taken of capacitance, DF and IR, initially and at periodic intervals. The following data was available on 3-18-70, at the time of catalog preparation. Continued testing is planned to 10,000 hours.

TEST DATA XT-294		% Dissipation Factor @ 1 KHz		Insulation Resistance in Megohms @ 500 Volts and 25°C	
Sample No.	% Capac. Change After 1500 Hours	Initial	After 1500 Hours	Initial	After 1500 Hours
1	—.14	.06%	.07%	2,800,000	2,700,000
2	—.14	.05%	.07%	2,600,000	2,700,000
3	—.07	.06%	.07%	2,700,000	2,700,000
4	+.69	.06%	.07%	2,600,000	2,600,000
5	—.31	.06%	.06%	2,800,000	2.700,000
6	—.35	.06%	.08%	2,700,000	2,600,000
7	—.10	.04%	.09%	2,900,000	2,800,000
8	—.10	.06%	.08%	2,700,000	2,700,000
9	—.35	.06%	.08%	2,700,000	2,700,000
10	+.02	.06%	.08%	2,600,000	2,500,000
11	—.60	.05%	.12%	2,700,000	2,600,000
12	—.10	.05%	.08%	2,500,000	2,500,000
13	—.04	.06%	.08%	2,600,000	2,500,000
14	—.03	.05%	.07%	2,700,000	2,500,000
15	—.50	.05%	.08%	2,600,000	2,500,000
16	—.39	.06%	.08%	2,900,000	2,800,000
17	—.38	.06%	.08%	2,700,000	2,500,000
18	—.54	.05%	.12%	2,500,000	2,600,000
19	—.55	.06%	.08%	2,300,000	2,200,000
20	—.43	.06%	.07%	2,300,000	2,200,000
21	—.24	.06%	.07%	2,000,000	2,200,000
22	—.22	.05%	.08%	2,200,000	2,300,000
23	—.40	.05%	.10%	2,200,000	2,300,000
24	—.22	.06%	.08%	2,300,000	2,300,000
25	—.41	.07%	.09%	700,000	400,000
26	—.55	.05%	.07%	2,200,000	2,300,000

TEST CONCLUSIONS

1. In order to establish failure criteria more severe and sophisticated than existing high reliability military specifications, CRC decided to establish the following as failures during or at end of test:
   A) An open or short circuit condition.
   B) Capacitance shift exceeding ±2%.
   C) % Dissipation factor must not exceed 0.2%.
   D) Insulation resistance must not fall below 100,000 megohms.
2. At the end of 1500 hours of test, results were as follows:
   CONDITION:
   A) No failures.
   B) Maximum capacitance shift was +.69%
   C) Maximum dissipation factor was .12%
   D) Minimum insulation resistance was 400,000 megohms.
3. By means of extrapolation based on the test data above, the failure rate is $0.0005\%/10^3$ hours at a 95% LCL confidence level.

ADDITIONAL INFORMATION—The capacitor described above is a specially modified polycarbonate extended metal film electrode capacitor and is capable of operation from —55°C to 125°C. It is also excellent for sinusoidal AC applications. Larger test batches will be tested at various stress levels and temperatures to study the unusual performance of these remarkable capacitors.

SPECIAL PRODUCTS SECTION
TEMPERATURE COEFFICIENT DATA

HIGH TEMPERATURE POLYSTYRENE CAPACITORS

CRC has developed miniature polystyrene capacitors that can safely be operated above 85°C. This has been made possible by the use of a combination of the CRC patented winding and termination construction, and special metal film electrodes (patent applied for), which support the polystyrene dielectric in a stress-free manner at temperatures above 85°C.

As of January 1970, 100 capacitors ranging from 0.001 to 0.1 MFD and rated at 50 volts were burned-in at 105°C and 140% of rated voltage for 72 hours, without failure. Some of the capacitors were also tested for insulation resistance at 45 volts from 25°C to 125°C without any shorts or opens occurring. CRC will conduct life tests at 85°C, 105°C and 125°C to determine the proper ratings for these unusual capacitors.

TC TRACKING OF MATCHED SETS

Recently a customer requested that we supply our 30 volt "PL" Polycarbonate capacitors in five values from .0022 MFD to 1 MFD so that the TC slopes track within ±0.25% of each other from —55°C to 125°C. We tested on a sample basis and found that our standard catalog type met this requirement. In addition, the customer requested the five capacitors to be 1% in tolerance but to be assorted and packaged in groups of five matched to 0.1%. We have been supplying thousands of such sets on a routine basis ever since.

In a more extreme example, a customer requested 0.1 MFD capacitors supplied in pairs so that they track within 0.01% from —10°C to 85°C. We found that our best polystyrene units in stock were limited to 0.02% and that selected "1TJ" Teflon capacitors met the 0.01% maximum requirement.

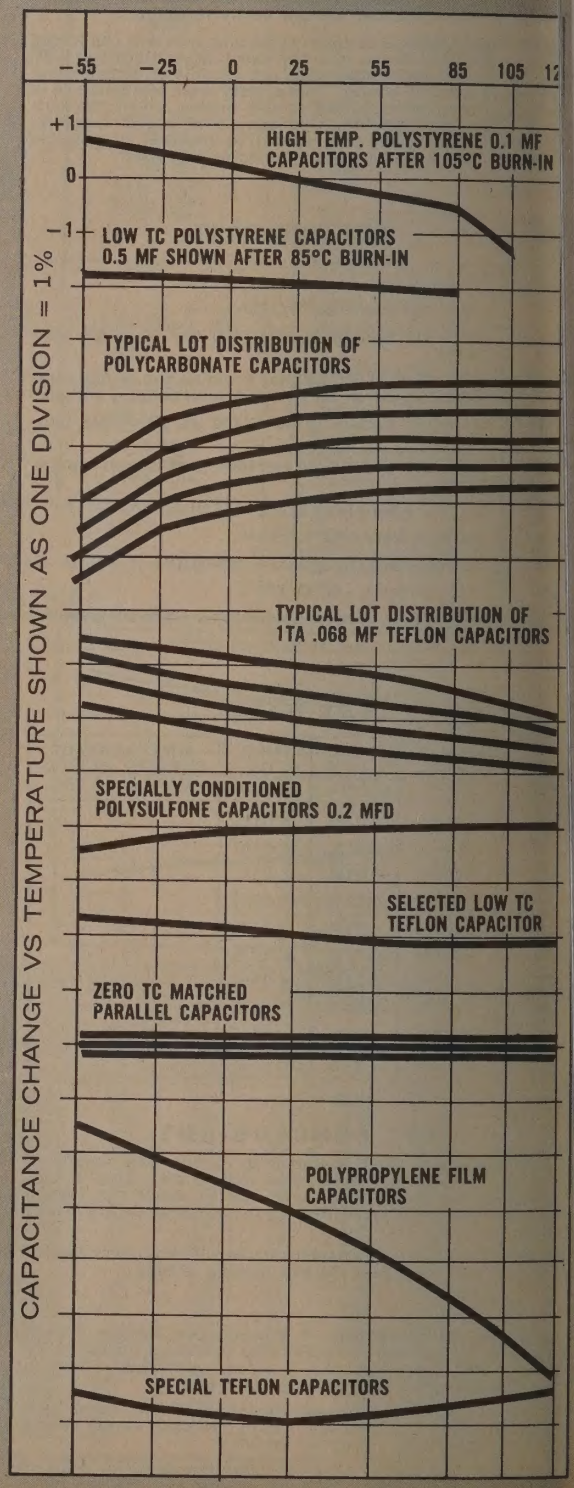
ZERO TC

We can match opposing coefficients of capacitors, such as polysulfone and teflon, to ±0.25% maximum from —55°C to +125°C. It is possible to match to ±0.1% for more limited temperature ranges. With the state of our art growing so rapidly, we may be able to guarantee closer limits on a production basis soon.

HIGH NEGATIVE TEMPERATURE COEFFICIENT

Our new "MP" extended metal film electrode polypropylene capacitors have a linear TC of —250 to —350 PPM/°C. The capacitors can be operated from —55°C to 125°C. The capacitors can be supplied in approximately the same case sizes as Type "05PA" Polystyrene, shown on Page 18 of the catalog. This new addition to our family of TC curves will provide design engineers with circuit capabilities not previously possible.

% CAPACITANCE VS TEMPERATURE



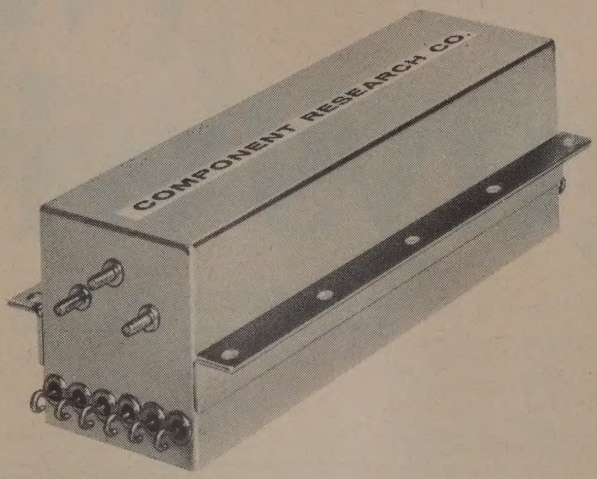
CR COMMUTATION AND SPECIAL AC CAPACITOR APPLICATIONS

COMPONENT RESEARCH COMPANY, INC.

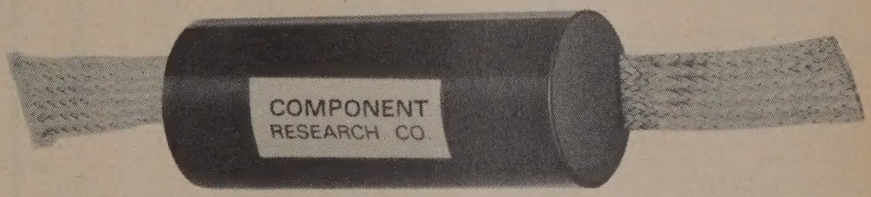
PAGE 22
Catalog E

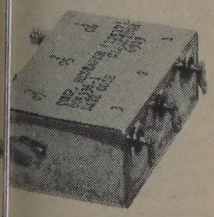
Capacitors designed for AC applications by CRC have very low equivalent series resistance and are remarkably cool and efficient for their size. The capacitor shown contains eight 1.2 MFD sections that operate up to 25 KHz at 170 volts AC RMS maximum with 25 amps at 25% duty cycle for each capacitor.

CRC was selected as the manufacturer to produce this special capacitor because of the extreme reliability required for a weapons program.

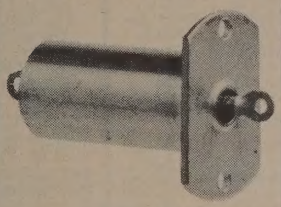


is epoxy cased capacitor is pro-
ded with heavy copper braided
ads to handle the high peak and
MS currents when operated in
CR commutation circuits. Capaci-
rs of polycarbonate, polypropy-
ne and polysulfone have been
sed in applications from 400 Hz
15 KHz.

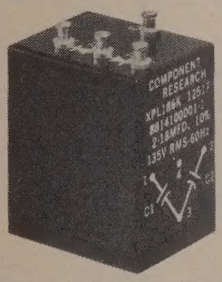




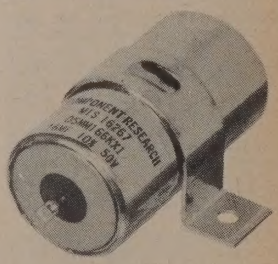
high temperature filter
ains two standard teflon
acitors and one feed-
ugh teflon capacitor in a
pact, efficient, case con-
ration.



A space application required high quality, small size, feed-through capacitors to handle 50 amps RMS. CRC designed solid copper terminations which provide lowest possible loss and excellent filter characteristics.



An airborne navigation system needed an extremely compact filter to replace a tantalum capacitor without increase in size. Specially processed polycarbonate capacitors that are 100% tested with square wave power supplies and then burned-in with sine wave voltages, provide the answer to a difficult problem.



Our customer required a capacitor capable of withstanding extreme shock and vibration without impairing high quality performance. Special potting techniques were used to maintain the capacitor characteristics, which was proven after extensive screening and qualification testing.

LECTED CAPACITORS FOR HIGH INSULATION RESISTANCE & LOW DIELECTRIC ABSORPTION

RC receives inquiries for capacitors
at have a higher insulation resis-
nce or a lower dielectric absorption
an listed in the catalog specifications
r our standard types. By means of
00% test and selection, capacitors
unusual performance can be sup-
ied to meet your most exacting re-
uirements.

e readings shown are typical of the
lue ribbon" quality capacitors of
very lot. Up to 30% of the capacitors
a lot generally meet these "blue
ibbon" specifications.

"BLUE RIBBON" SELECTED

Insulation Resistance in Megohms for 0.1 MFD Capacitors at 30 VDC using a 5 minute charge time.

TYPE	SIZE	25°C	55°C	85°C	105°C	125°C
50V TEFLON	.312 x .937	15,000,000	15,000,000	15,000,000	6,000,000	3,000,000
30V POLYCARBONATE	.193 x .687	6,000,000	3,000,000	1,000,000	100,000	30,000
100V POLYSULFONE	.312 x .687	5,000,000	2,000,000	500,000	100,000	30,000
50V POLYSTYRENE (Standard)	.400 x 1.063	15,000,000	7,000,000	1,000,000	—	—
50V POLYSTYRENE (High Temp.)	.400 x 1.063	15,000,000	7,000,000	3,000,000	500,000	50,000
50V POLYPROPYLENE	.400 x 1.063	15,000,000	5,000,000	3,000,000	1,000,000	30,000
200V TEFLON	.500 x 1.125	15,000,000	15,000,000	15,000,000	6,000,000	3,000,000
400V POLYCARBONATE	.400 x 1.063	10,000,000	5,000,000	4,000,000	500,000	250,000

MPONENT RESEARCH CO., INC. 1717 19th Street, Santa Monica, Calif. 90404 • Phone: (213) 393-3755 • TWX: (910) 343-6864

We make guys who can't

CORNING® CYFM Capacitors give you environment-proof performance at substantial savings. They provide economical stability and reliability in coupling, decoupling, filtering, timing, switching, and many other critical circuits. The CYFM's are electrically and environmentally interchangeable with the CYFR type. We have boiled them in salt water, immersed them in saturated steam and subjected them to 96-hour salt spray and 1200 hours of moisture resistance tests without failure or degradation.

CORNING® CYFR Capacitors give you guaranteed reliability. They have contributed, and continue to contribute to marked improvement in MTBF in many military and space programs such as Titan, Surveyor, Syncom, Mariner, Apollo, and Gemini. Over 64-million unit-hours from lot acceptance tests over a five year period for Minuteman have demonstrated the reliability and reproducibility of the CYFR capacitor from a process under control.

CORNING® TYO Capacitors are ideal for printed circuit applications because of their miniaturization and radial lead configuration. Their design permits upright, flush mounting on circuit boards. Standard gold plated Dumet leads give reliable soldering or welding, and are spaced symmetrically with the case on .1″ grids for fast installation on printed circuit boards. The lower prices of CORNING TYO Capacitors now provide a glass capacitor at comparable ceramic prices.

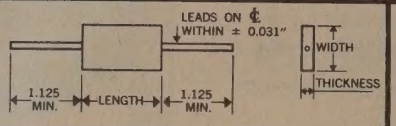
CORNING® CY60 and CY70 Capacitors are excellent for a large variety of radio frequency applications. They are used for power amplifiers, low power transmitters, and many electronic devices in grid, plate coupling, tank, and bypass functions. Because of their small size and minimum weight, these CORNING Capacitors are also suited for airborne equipment and all types of mobile transmitters.

The Glass-K is a miniature stable capacitor that exhibits a high capacitance-to-volume ratio. It offers the size advantages of ceramic types and the consistent performance associated with glass dielectrics.

The Glass-K's physical size and values of capacitance meet the requirements of both military and commercial applications. The larger capacitance values are suitable for point-of-use filtering in computers, and for bypassing and coupling elements in miniaturized circuitry. The smaller capacitance values are suitable for more critical circuit functions.

The Glass-K is designed for general purpose use in bypass, coupling, and filtering applications where the miniature size of ceramics is required and where **better performance** characteristics are desired at **competitive prices.**

CHARACTERISTICS



	CYFM10	CYFM25	CYFM20	CYFM30	CYFR10	CYFR15	CYFR20	CYF[illegible]0
	Meets or exceeds electrical and environmental requirements of MIL-C-1127[illegible]							
LENGTH	.2969″-.3906″	.4219″-.5156″	.6719″-.7968″	.7032″-.8281″	.2969″-.3906″	.4219″-.5156″	.6719″-.7968″	.703[illegible]-.828[illegible]
WIDTH	.1406″-.2031″	.2344″-.2968″	.3750″-.4687″	.6719″-.8281″	.1406″-.2031″	.2344″-.2968″	.3750″-.4687″	.671[illegible]-.828[illegible]
THICKNESS (DIA.)	.0469″-.1093″	.0625″-.1562″	.0938″-.1875″	.0938″-.1875″	.0469″-.1093″	.0625″-.1562″	.0938″-.1875″	.093[illegible]-.187[illegible]
WEIGHT (GRAMS)	0.25-0.50	0.75-1.25	2.50-4.00	5.00-7.00	0.25-0.50	0.75-1.25	2.50-4.00	5.00-[illegible]0
TERMINALS (INCHES)	0.020 #24AWG	0.020 #24AWG	0.025 #22AWG	0.025 #22AWG	0.020 #24AWG	0.020 #24AWG	0.025 #22AWG	0.0[illegible] #22[illegible]G
VOLTAGE RATING	500v from 0.5 to 200 pf; 300v from 220 to 300 pf	500v from 220 to 510 pf; 300v from 560 to 1200 pf	500v from 560 to 3300 pf; 300v from 3600 to 5100 pf	500v from 3600 to 6200 pf; 300v from 6800 to 10,000 pf	500v from 0.5 to 200 pf; 300v from 160 to 240 pf	500v from 220 to 510 pf; 300v from 560 to 1200 pf	500v from 560 to 3300 pf; 300v from 3600 to 5100 pf	500v [illegible]n 3600 [illegible] 6200 [illegible] 300v [illegible]n 6800 [illegible] 10,00[illegible]f
CAPACITANCE RANGE	0.5 pf to 300 pf	220 pf to 1200 pf	560 pf to 5100 pf	3600 pf to 10,000 pf	0.5 pf to 240 pf	220 pf to 1200 pf	560 pf to 5100 pf	3600 [illegible]o 10,00[illegible]f
CAPACITANCE TOLERANCE	Standard tolerance is ±5% or ±0.25% pf, whichever is greater. Also available ±10%, ±2%, ±1%, but in no case less than ±.25 pf.				Capacitance tolerances available are ±.2[illegible]pf, ±.50 pf, ±1%, ±2%, ±5%. Specific tolera[illegible]es available for specific values are shown on [illegible]ning Reference File CE-1.01.			
TEMPERATURE COEFFICIENT	Temperature coefficient is +140 ±25 ppm/°C at 100 KC. At any given temperature T. C. will not deviate from the curve by more than 5 ppm. Capacitance drift is less than 0.1% or 0.1 pf, whichever is greater.				Temperature coefficient is +140 ±225 ppm/°C at 100 KC. At any given temperature T. C. [illegible] not deviate from the curve by more than 5 [illegible]n. Capacitance drift is less than 0.1% or 0.1[illegible]f, whichever is greater.			
INSULATION RESISTANCE	High I. R. over entire operating temperature range; at 25°C, I. R. is greater than 100,000 megohms; at 125°C, I. R. is greater than 10,000 megohms.				High I. R. over entire operating tempera[illegible]e range; at 25°C, I. R. is greater than 100[illegible]0 megohms; at 125°C, I. R. is greater than 10[illegible]0 megohms.			
DISSIPATION FACTOR	Losses are extremely low and remain relatively low at elevated temperatures and high frequencies. D.F. less than 0.001 at 1 KC and 25°C.				Losses are extremely low and remain relati[illegible]y low at elevated temperatures and high freq[illegible]cies. D. F. less than 0.001 at 1 KC and 2[illegible].			
LIFE	After 2000 hrs. at 125°C with 150% of full rated voltage, capacitance change is less than 0.5%.				After 2000 hrs. at 125°C with 150% of [illegible] rated voltage, capacitance change is less t[illegible] 0.5%.			
MOISTURE RESISTANCE	Exceeds all requirements of Mil-C-11272B and Mil-Std 202 Method 106. Corning CYFM capacitors are guaranteed to withstand Mil-Std 202 (Method 106) conditions for over 1200 hours. They have been immersed in boiling salt water for 450 hours and saturated in steam at 15 pounds gauge pressure for 150 hours without altering their performance.				Exceeds all requirements of Mil-C-11272B [illegible] Mil-Std 202 Method 106. Corning CYFR capacit[illegible] are guaranteed to withstand Mil-Std-202 (Met[illegible] 106) conditions for over 1200 hours. They h[illegible] been immersed in boiling salt water for [illegible] hours and saturated in steam at 15 pounds ga[illegible] pressure for 150 hours without altering t[illegible] performance.			
VOLTAGE COEFFICIENT	Zero.				Zero.			

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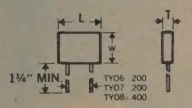
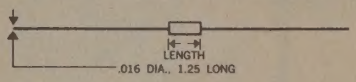
capacitors for stand failures.





	TY06	TY07	TY08	CYK01-BT	CYK02-BT	CYK01-BU	CYK02-BU	CYK01-BV	CYK02-BV
	parametric as detailed.			Meets or exceeds environmental requirements MIL-C-11015.					
LENGTH	.295"-.305"	.295"-.305"	.495"-.505"	.250"	.250"	.250"	.250"	.250"	.250"
WIDTH	.190"-.210"	.290"-.310"	.290"-.310"	N/A	N/A	N/A	N/A	N/A	N/A
THICKNESS (DIA.)	.110"-.120"	.110"-.120"	.110"-.120"	.100"	.140"	.100"	.140"	.100"	.140"
WEIGHT (GRAMS)	0.3-0.4	0.4-0.5	0.7-0.8	0.2 Max.	0.3 Max.	0.2 Max.	0.3 Max.	0.2 Max.	0.3 Max.
TERMINALS (INCHES)	0.020 #24AWG	0.020 #24AWG	0.020 #24AWG	0.016	0.016	0.016	0.016	0.016	0.016
VOLTAGE RATING	300v	300v	300v	50VDC	50VDC	50VDC	50VDC	50VDC	50VDC
CAPACITANCE RANGE	1.0 pf to 560 pf	561 pf to 1000 pf	1001 pf to 2400 pf	270 pf to 10,000 pf	12,000 pf to 20,000 pf	12,000 pf to 20,000 pf	22,000 pf to 39,000 pf	22,000 pf to 51,000 pf	56,000 pf to 100,000 pf
CAPACITANCE TOLERANCE	Standard tolerance is ±5% or ±0.25 pf, whichever is greater. Available as ±20%, ±10%, ±15%, ±2%, ±1%, but in no case less than ±.25 pf.			Standard tolerances are ±10% and ±20%		Standard tolerances are ±10% and ±20%		Standard tolerances are ±10% and ±20%	
TEMPERATURE COEFFICIENT	Temperature coefficient is +140 ±25 ppm/°C at 100 KC. At any given temperature T. C. will not deviate from the curve by more than 5 ppm. Capacitance drift is less than 0.1% or 0.1 pf, whichever is greater.			Temperature coefficient is +2, −10%		Temperature coefficient is +2, −15%		Temperature coefficient is +10, −40%	
INSULATION RESISTANCE	High I. R. over entire operating temperature range; at 25°C, I.R. is greater than 100,000 megohms; at 125°C, I. R. is greater than 10,000 megohms.			Insulation resistance is greater than 100,000 megohms with 50VDC and 25°C.		Insulation resistance is greater than 100,000 megohms with 50VDC and 25°C.		Insulation resistance is greater than 10,000 megohms with 50VDC and 25°C.	
DISSIPATION FACTOR	Losses are extremely low and remain relatively low at elevated temperatures. D.F. less than 0.001 for values greater than 100 pf; 0.002 for values of 100 pf and below at 1 KC and 25°C.			D. F. Max is 1.0%		D. F. Max is 1.5%		D. F. Max is 3.0%	
LIFE	After 2000 hrs. at 125°C with 150% of full rated voltage, capacitance change is less than 0.5%.			When tested per Mil Std. 202, Method 108 at 200% rated voltage, 125°C for 1000 hours; maximum change in capacitance is less than 2%.		When tested per Mil Std. 202, Method 108 at 200% rated voltage, 125°C for 1000 hours; maximum change in capacitance is less than 5%.		When tested per Mil Std. 202, Method 108 at 200% rated voltage, 125°C for 1000 hours; maximum change in capacitance is less than 20%.	
MOISTURE RESISTANCE	I. R. exceeds 10,000 megohms after moisture resistance test per Mil-Std 202, Method 106 when measured at 25°C and 50% rh.			Meets requirements of 20 day moisture test per Mil-Std-202, Method 106. Delta C is less than 2%.		Meets requirements of 20 day moisture test per Mil-Std-202, Method 106. Delta C is less than 2%.		Meets requirements of 20 day moisture test per Mil-Std-202, Method 106. Delta C ±5%.	
VOLTAGE COEFFICIENT	Zero.			Zero.		Zero.		Less than 10% to 50 volts.	

Radiation: The completely inorganic materials used make them highly resistant to nuclear radiation. Exposures to levels of 10^{16} NVTth result in no significant change in properties.

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CONDENSER PRODUCTS CORPORATION

for all your high voltage component needs

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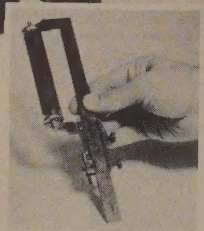
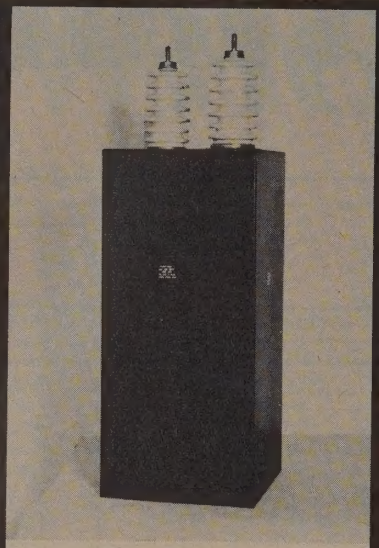
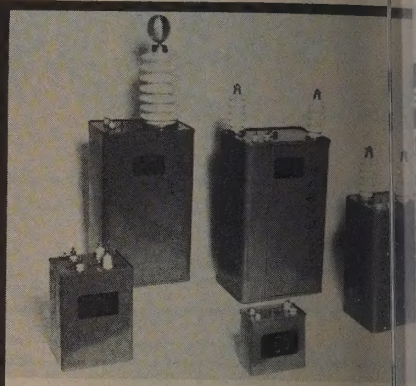


Condenser Products designed and supplied this 250 KV (at 0.5 mfd) DC filter to NASA.

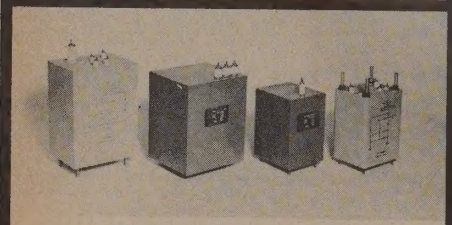
DC FILTER CAPACITORS
60 KV unit shown
Miniature glass — 1 to 60 KV standard; CP70 type — 600 V to 50 KV standard; rugged bakelite — 40 to 150 KV standard.



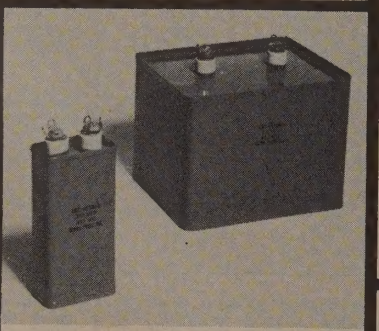
PULSE CAPACITORS
Suitable for RF series — 1 to 60 KV standard; temperature ranges up to 210°C without derating.



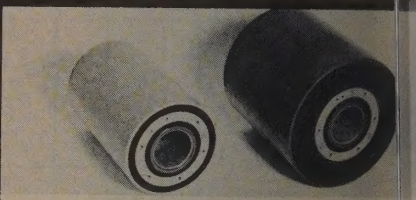
HIGH VOLTAGE POWER SUPPLIES
Modular compact and capacitor charg Output from 1 to 75 KV standard. Th hermetically-sealed, self-contained po supplies are designed for high-volt low-current DC for many applicati OEM specials promptly quoted.



SPECIAL OEM DESIGN
Special OEM designs to suit customer applications and space limitations. A wide range of voltages, capacities and constructional styles available to meet your specifications.



LABORATORY AND INSTRUMENTATION CAPACITORS
Glass or CP70 containers.



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SCR COMMUTATING & SNUBBING CAPACITORS
Both standard replacements and for your circuit specifications and applications.

WE DESIGN AND MANUFACTURE CAPACITORS TO SPECIFICATIONS FOR MANY APPLICATIONS, SUCH AS:

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- RF power capacitors for transmitters, dielectric and induction heaters
- Energy storage capacitors for sonar, welding and photolysis
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- Laboratory grade capacitors for computers, integrators and bridge standards
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ly 1 Failure Per 43,000,000 Unit-Hours!

en computed that "debugged" DM30, 10,000 MMF en subjected to 257,000 hours of life at 85°C % of the rated DC voltage applied, will yield only E PER 43,000,000 UNIT-HOURS!

M16, DM19, DM20 . . . perfect for miniaturization new designs using printed wiring circuits. Also in DM30, DM42 and DM43.

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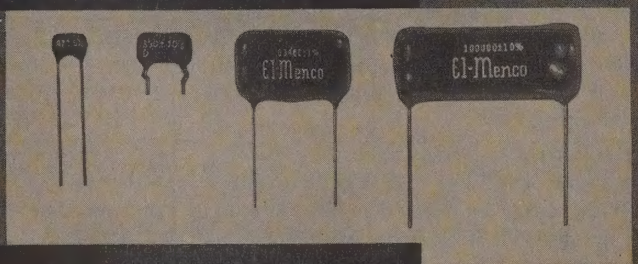

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e in 350 VDC and 500 VDC as well as other test

s are of low-loss steatite.

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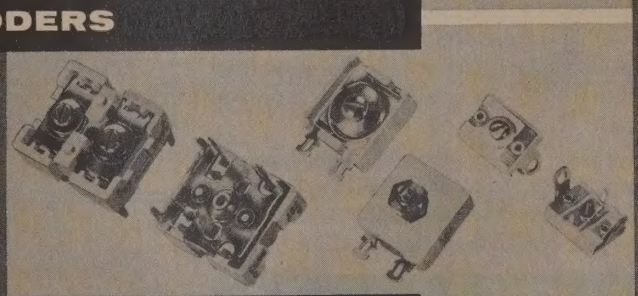


MENCO *MYLAR-PAPER DIPPED CAPACITORS

1 Failure in 14,336,000 Unit-Hours!

s at 105°C with rated voltage applied have yielded only RE PER 1,433,600 UNIT-HOURS for 1 MFD. Since the of unit-hours for these capacitors is inversely propor- the capacitance, 0.1 MFD Mylar-Paper Dipped capacitors d only 1 FAILURE PER 14,336,000 UNIT-HOURS!

volts DC: 200, 400, 600, 1000 and 1600.

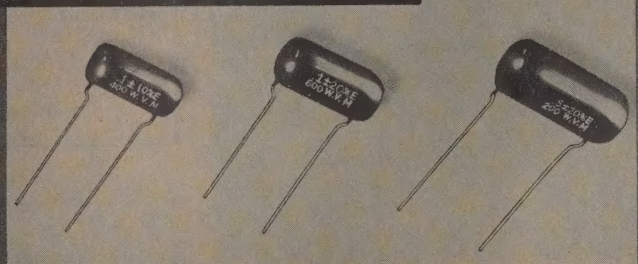
enolic resin impregnated.

es: ± 10% and ± 20% (closer tolerances available).

c strength: 2 or 2½ times rated voltage, depending upon voltage.

all electrical requirements of E.I.A. specification RS-164 tary specifications MIL-C-91A and MIL-C-25A.

*Registered Trademark of DuPont Co.



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Superior Performance!

hed for excellent stability, dielectric strength, high on resistance, extremely high "Q" and correspond- w power factor.

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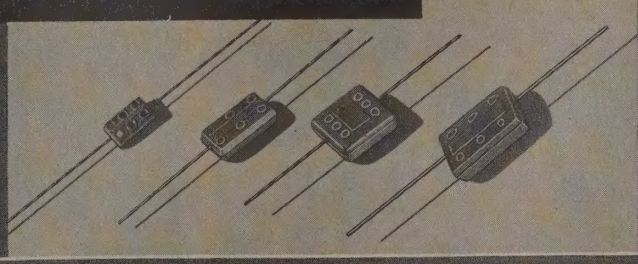
Write for Free Samples and Booklets on Any of The Above Capacitors



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Electro Cube Capacitors

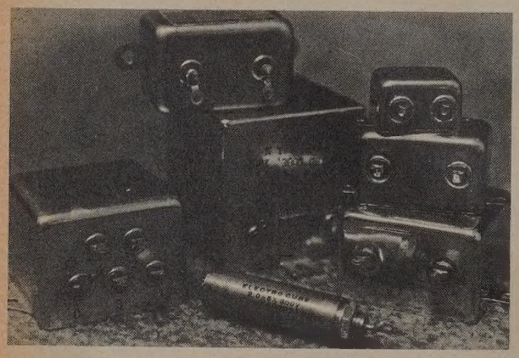
Special service on non-standard ratings, sizes or packages

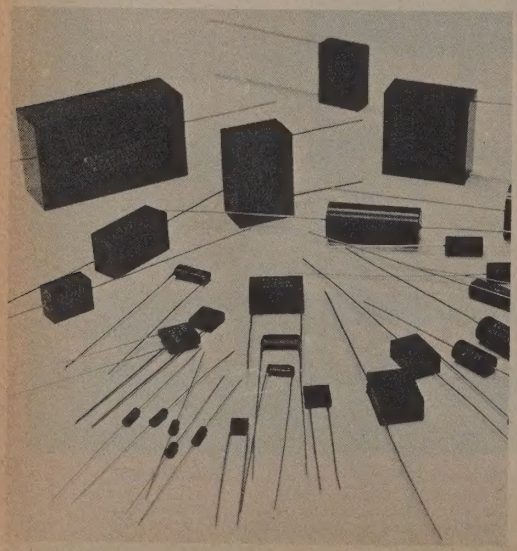
Capacitors, in nearly any value, type, case configuration or size can be furnished by Electro Cube, on special order with short delivery. We'll design them to a particular requirement or make them to your specifications. We'll supply metal cases including bath tubs, tubular and rectangular hermetically sealed units, as well as epoxy, and wrap and fill types. More than 4,000 standard units are also available. Representative dielectrics and specifications are presented in the table to the right.

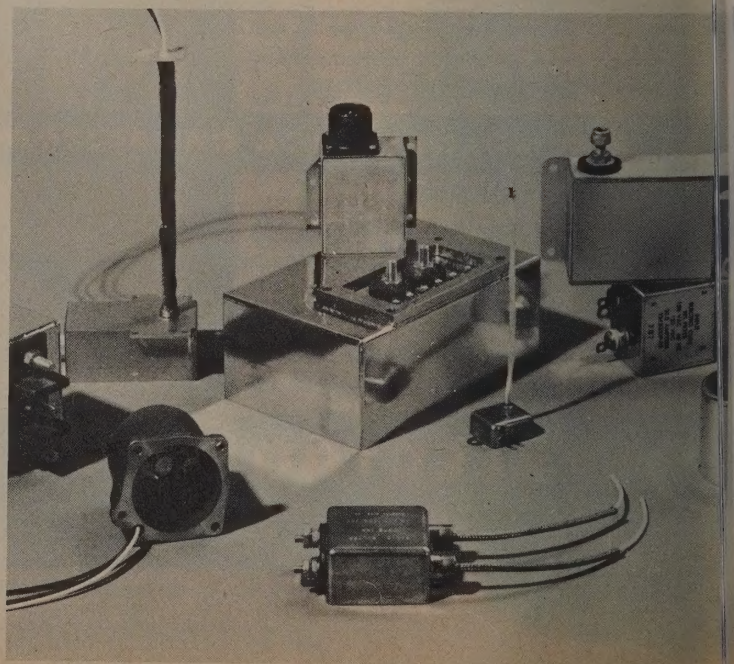
For substantial package size reductions, Electro Cube can supply a full line of 50VDC capacitors using .00008 gauge metallized polycarbonate. Specially designed manufacturing equipment and rigid controls give these units reliability equivalent to heavier gauge 100 volt metallized polycarbonate capacitors. Capacitance ratings from .001 mfd to 50 mfd are available in a variety of case styles.

We also design and produce RC networks and RFI filters for a wide range of applications. Electro Cube filters have been used in such projects as Apollo, Minuteman and the C-5A.

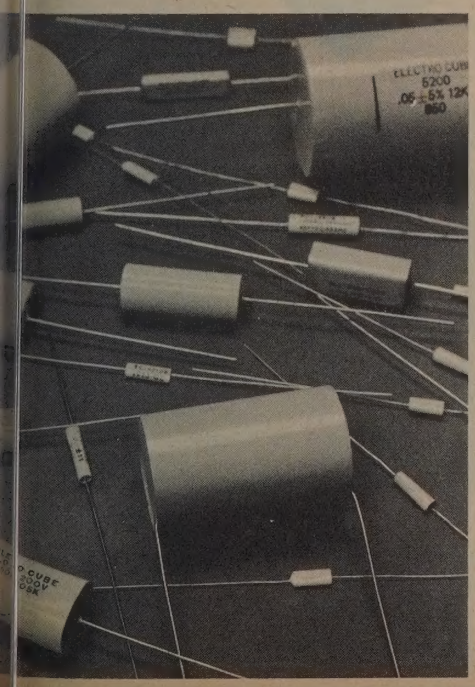
	METALLIZED POLYCARBONATE	MINIATURE HIGH VOL
Capacitor (mfd) Range (Average)	.001μf to 50.0μf	.001μf to .2μf
Tolerances	20%, 10%, 5%, 2%, 1%	20%, 10%, 5%, 2%, 1%
Voltages (DC)	50, 100, 200, 300, 400, 600	1KV, 2KV, 3KV, 5KV, 8KV, 10K 12K 15KV, 20KV, 25KV, 30KV
Temperature Range	—55°C to +85°C, to +125°C with 50% voltage derating	—55°C to +85°C, to +125 with 60% voltage derating
Dissipation Factor	0.5% at 25°C	1.0% at 25°C
Insulation Resistance	Temp. / Meg x Mfd / Need Not Exceed 25°C / 50,000 / 100,000 megohms 85°C / 5,000 / 10,000 megohms 125°C / 100 / 200 megohms	Temp. / Meg x Mfd / Need N Excee at 25°C / 20,000 / 100,000 me
Dielectric Strength (not to exceed 1 min. at 25°C)	200% of rated voltage	200% of rated voltage
Available as Wrap and fill	Oval AXIAL 625B / Flat AXIAL 625C / Round AXIAL 625D	Oval AXIAL 520B / Ro AX 52
Epoxy Encapsulated	Rectnglr RADIAL 636A / Rectnglr AXIAL 627A / Round AXIAL 627D	Ro AX 52
Hermetically Sealed	Rectnglr AXIAL 632A / Round AXIAL 628D	
Typical sizes (Nominal) (Wrap & fill, oval)	.001 mfd, 50VDC – .09 x .18 x .40 .01 mfd, 50VDC – .09 x .18 x .40 .1 mfd, 50VDC – .12 x .21 x .40 1.0 mfd, 50VDC – .22 x .31 x .68 10.0 mfd, 50VDC – .42 x .59 x 1.17 50.0 mfd, 50VDC – .87 x 1.08 x 1.70	.001 mfd, 1000VDC – .12 x .32 .0 .01 mfd, 1000VDC – .30 x .50 .0 .1 mfd, 1000VDC – .60 x .80 .5 .2 mfd, 1000VDC – .75 x .95 .8

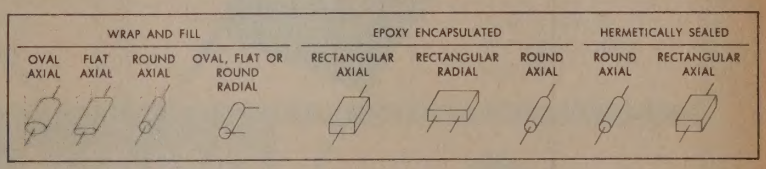






POLYSTYRENE	MYLAR* AND FOIL	METALLIZED MYLAR	METALLIZED PAPER RESIN IMPREGNATED	METALLIZED PAPER WAX IMPREGNATED
0μf	.001μf to 5.0μf	.001μf to 20.0μf	.001μf to 20.0μf	.001μf to 20.0μf
5%, 2%, 1%	20%, 10%, 5%, 2%, 1%	20%, 10%, 5%, 2%, 1%	20%, 10%, 5%	20%, 10%, 5%
00, 600	200, 300, 400, 600	100, 200, 300, 400, 600	50, 100, 200, 400, 600	50, 100, 200, 400, 600
+85°C	—55°C to +100°C, to +125°C with 50% voltage derating	—55°C to +100°C, to +125°C with 50% voltage derating	—55°C to +100°C, to +125°C with 50% voltage derating	—55°C to +85°C
°C	0.5% at 25°C	1.0% at 25°C	1.5% at 25°C	1.5% at 25°C
x Mfd / Need Not Exceed 0,000 / 100,000 megohms 0,000 / 50,000 megohms	Temp. / Meg x Mfd / Need Not Exceed 25°C / 50,000 / 100,000 megohms 85°C / 5,000 / 10,000 megohms 125°C / 100 / 200 megohms	Temp. / Meg x Mfd / Need Not Exceed 25°C / 50,000 / 100,000 megohms 85°C / 5,000 / 10,000 megohms 125°C / 100 / 200 megohms	Voltage Rating / Meg x Mfd / Need Not Exceed 50-200 @ 25°C / 500 / 1,500 megohms 400-600 / 1,500 / 3,000 megohms	Voltage Rating / Meg x Mfd / Need Not Exceed 50-200 @ 25°C / 500 / 1,500 megohms 400-600 / 1,500 / 3,000 megohms
ted voltage	200% of rated voltage	200% of rated voltage	150% of rated voltage	150% of rated voltage
Flat / Round AXIAL / AXIAL 410C / 410D	Oval / Flat / Round AXIAL / AXIAL / AXIAL 250B / 250C / 250D	Oval / Flat / Round AXIAL / AXIAL / AXIAL 210B / 210C / 210D	Oval / Round AXIAL / AXIAL 112A / 112D	Oval / Round AXIAL / AXIAL 141A / 141D
Rectnglr / Round RADIAL / AXIAL 414A / 412D	Rectnglr / Rectnglr / Round RADIAL / AXIAL / AXIAL 258A / 254A / 252D	Flat / Rectnglr / Round RADIAL / AXIAL / AXIAL 217A / 212A / 212D	Rectnglr / Rectnglr / Round RADIAL / AXIAL / AXIAL 116A / 110A / 110D	Rectnglr / Round AXIAL / AXIAL 140A / 140D
Round AXIAL 411D	Rectnglr / Round AXIAL / AXIAL 260A / 251D	Rectnglr / Round AXIAL / AXIAL 201A / 211D	Round AXIAL 114D	Round AXIAL 142D
100VDC – .13 x .20 x .68 100VDC – .14 x .22 x .68 100VDC – .21 x .38 x 1.18 100VDC – .45 x .60 x 1.68 100VDC – .63 x .80 x 1.68	.01 mfd, 100VDC – .11 x .20 x .53 .1 mfd, 100VDC – .21 x .31 x .81 1.0 mfd, 100VDC – .4[illegible] x .57 x 1.45 2.0 mfd, 100VDC – .59 x .75 x 1.68	.001 mfd, 100VDC – .09 x .18 x .40 .01 mfd, 100VDC – .09 x .18 x .40 .1 mfd, 100VDC – .11 x .24 x .53 1.0 mfd, 100VDC – .23 x .34 x .95 10.0 mfd, 100VDC – .49 x .65 x 1.70 * DuPont Trade Name	.001 mfd, 50VDC – .09 x .18 x .40 .01 mfd, 50VDC – .09 x .18 x .40 1.0 mfd, 50VDC – .28 x .40 x .90 10.0 mfd, 50VDC – .63 x .74 x 1.45	.001 mfd, 50VDC – .09 x .18 x .40 .01 mfd, 50VDC – .09 x .18 x .40 1.0 mfd, 50VDC – .28 x .40 x .90 10.0 mfd, 50VDC – .63 x .74 x 1.45





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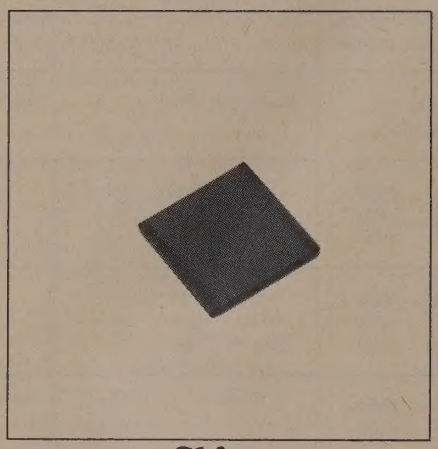
Electro Materials
Monolithic-layer ceramic capacitors



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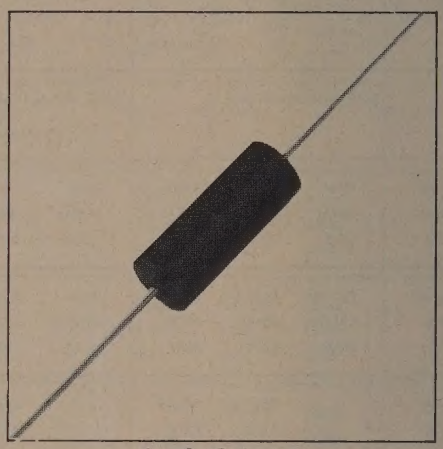
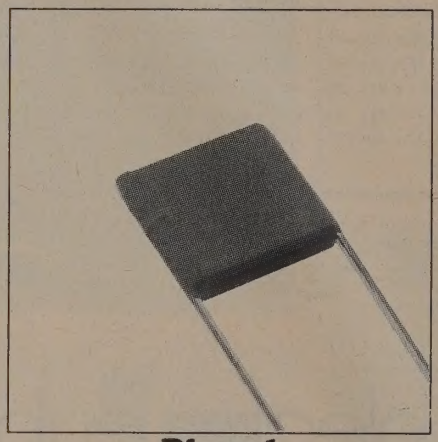
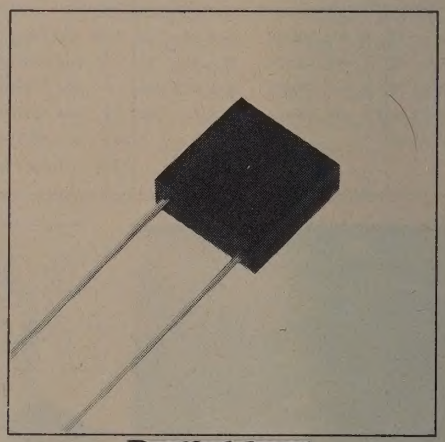


Axial lead



Dipped



Radial lead

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GENERAL PURPOSE

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EAI® Precision Hermetically Sealed CAPACITORS

	Type M Precision Mylar	Type ps Polystyrene Fixed or Adjustable	Type MM Metallized Mylar	Type PSTZ zero TC Pure Polystyrene
Capacitance Range	.001 to 10 ufd	.001 to 1.5 ufd	.001 to 15 ufd	.001 to 1 ufd
Temperature Range	−60 to +150°C	−70 to +95°C	−55 to +125°C	−55 to +85°C
Insulation Resistance	10^{11} ohms/ufd min.	10^{12} ohms/ufd min.	5 X 10^{10} ohms/ufd min.	10^{12} ohms/ufd min.
Tolerance	Std: ±5% ±0.25% Available	Std: ±5% ±0.05% available	Std: ±5% ±0.25% available	Std: ±5% ±.05 available
Dissipation Factor	Less than 1.0%	Less than 0.05%	Less than 1.0%	Less than 0.05%
Voltage Ratings	200VDC, 400VDC, 600VDC	50VDC, 100VDC, 200VDC, 400VDC, 600VDC	100VDC, 200VDC, 400VDC, 600VDC	50VDC, 100VDC, 200VDC, 400VDC, 600VDC
Construction/ Housing	Non-inductive construction. Units available in bathtub, tubular and rectangular design.			Non-inductive construction, tubular

EAI® Wrap and Fill CAPACITORS

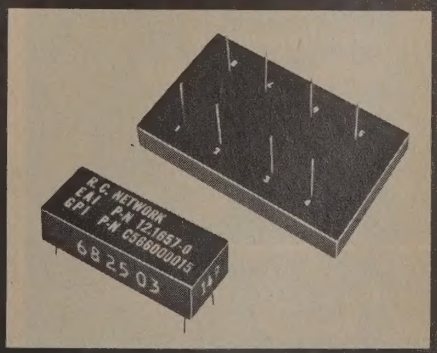
	Mylar	Polystyrene	Metallized Mylar
Capacitance Range	.001 to 2.00 ufd	.001 to 1.0 ufd	.01 to 10.0 ufd
Temperature Range	−55 to +125°C	−55 to +85°C	−55 to +125°C
Insulation Resistance	min. 7^{10} ohms/ufd	min. 3^{11} ohm/ufd	min. 3^{10} ohms/ufd
Tolerance	Std: 5% 1% available	Std: 5% 0.5% available	Std: 5% 1% available
Dissipation Factor	Less than 1.0%	Less than 1.0%	Less than 1.0%
Voltage Ratings	100VDC, 200VDC, 400VDC, 600VDC, 1,000VDC	100VDC, 200VDC, 400VDC, 600VDC	50VDC, 100VDC, 200VDC, 400VDC, 600VDC

EAI® CUSTOM R-C NETWORKS

Designed to user specifications . . . precision matched by computer

acking Accuracy: Less than 10 PPM/°C
etrace Stability: Less than 0.05%
C, Products Deviation: Within 0 ± 5 PPM/°C
istom Packaging: Hermetically sealed or epoxy case

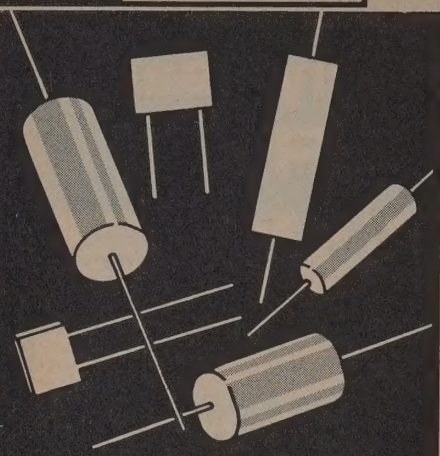
e components listed are only representative of the Components epartment of EAI, write for complete technical literature.



EAI®

ELECTRONIC ASSOCIATES, INC. *West Long Branch, New Jersey 07764*

SYSTEMS ANALYSIS AND COMPUTATION SERVICES ANALOG COMPUTERS/DIGITAL COMPUTERS/HYBRID ANALOG-DIGITAL COMPUTATION EQUIPMENT/ANALOG AND DIGITAL SIMULATION SYSTEMS/SCIENTIFIC AND LABORATORY INSTRUMENTS INDUSTRIAL PROCESS CONTROL SYSTEMS/PHOTOGRAMMETRIC EQUIPMENT/RANGE INSTRUMENTATIONS/TEST AND CHECK-OUT SYSTEMS/MILITARY AND INDUSTRIAL RESEARCH AND DEVELOPMENT SERVICES/FIELD ENGINEERING AND EQUIPMENT MAINTENANCE SERVICES.



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EATONTOWN, NEW JERSEY 07724
TEL. (201) 542-7880

PLASTIC DIELECTRIC CAPACITORS

ANALOG #200 POLYSTYRENE

TYPE 222 & 222S — Stable-K Wrap-and-Fill Round Construction, Axial or Radial Lead
TYPE 224 — Flat-Subminiature Wrap-and-Fill Oval Construction, Axial or Radial Leads.
TYPE 220 & 220S — Round Hermetically Sealed, Axial Lead.

Specifications:
- Temp. −55°C to 85°C, Full Rated Voltage
- I.R. 500,000 Megohm-Microfarads @ 25°C (Typical)
- D.F. Less than .05%
- Temp. Coef. −110±30 PPM/°C

ENVIRONMENTAL #500 POLYESTER

TYPE 508 & 508S
Microminiature Wrap-and-Fill Round Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to +125°C, Full Rated Voltage • I.R. 50,000 Megohm-Microfarads @ 25°C • D.F. Less than .7% • Temp. Coef. +200 PPM/°C

TYPE 555
Epoxy Encased Wrap-and-Fill Round Construction, Axial Leads.
Specifications: Temp. −55°C to +125°C, Full Rated Voltage • I.R. 10,000 Megohm-Microfarads @ 25°C • D.F. Less than 1%

TYPE 563
Subminiature Wrap-and-Fill Round Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to +125°C, Full Rated Voltage • I.R. 70,000 Megohm-Microfarads @ 25°C • D.F. Less than .7%

TYPE 564 & 564R
Flat Subminiature Wrap-and-Fill Oval Construction, Axial or Radial Leads.
Specifications: Same as Type 563

TYPE 543 or CTM to MIL-C-55514
Wrap-and-Fill Round Construction, Axial Leads.
Specifications: Will Meet or Exceed Requirements of MIL-C-55514 Specifications.

TYPE 502
Epoxy Case Rectangular Construction Radial Leads.
Specifications: Temp. −55°C to 12C • I.R. 100,000 Megohm-Microfarads @ 25°C • D.F. Less than 1%

TYPE 517
R-Graded Hermetically Sealed Round Construction, Axial Leads. Both Leads Insulated or One Lead Grounded To Case.
Specifications: Temp. −55°C to 125°C, Full Rated Voltage • I.R. 50,000 Megohm-Microfarads @ 25°C • D.F. Less than

TYPE 592 & 593 or CQ to MIL-C-19978
Hermetically Sealed Round Construction, Axial Leads. Both Leads Insulated or One Lead Grounded To Case.
Specifications: Will Meet or Exceed Requirements of MIL-C-19976 Specifications.

METALLIZED #500 POLYESTER

TYPE X563
Subminiature Wrap-and-Fill Round Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to 125°C, Full Rated Voltage • I.R. 30,000 Megohm-Microfarads @ 25°C (Typical) • D.F. Less than .7%

TYPE X564 & X564R
Flat Subminiature Wrap-and-Fill Oval Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to 125°C, Full Rated Voltage • I.R. 30,000 Megohm-Microfarads @ 25°C • D.F. Less than 1%

TYPE X502
Epoxy Case Rectangular Construction Radial Leads.
Specifications: Temp. −55°C to 125 • I.R. 50,000 Megohm-Microfarads @ 25 • D.F. Less than 1%

TYPE X517
R-Graded Hermetically Sealed Round Construction, Axial Leads. Both Leads Insulated or One Lead Grounded To Case
Specifications: Temp. −55°C to 125°C Full Rated Voltage • I.R. 25,000 Megohm-Microfarads @ 25°C • D.F. Less than 1

EXCEL #700 POLYCARBONATE

TYPE 777
Subminiature Wrap-and-Fill Round Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to 125°C • I.R. 75,000 Megohm-Microfarads @ 25°C • D.F. Less than .2% • Temp. Coef. +80 PPM/°C

TYPE 778
Flat Subminiature Wrap-and-Fill Oval Construction, Axial or Radial Leads.
Specifications: Same as Type 777

TYPE 773
Epoxy Encased Rectangular Construction Radial Leads.
Specifications: Same as Type 777

TYPE 783
R-Graded Hermetically Sealed Round Construction, Axial Leads. Both Leads Insulated or One Lead Grounded To Case
Specifications: Same as Type 777

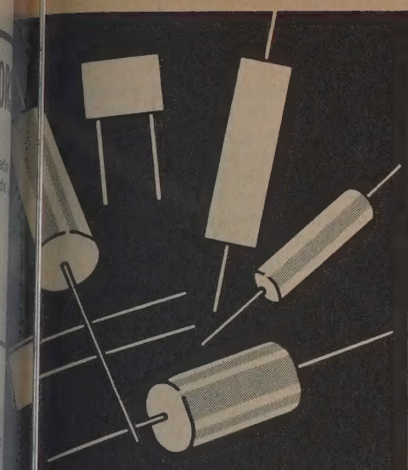
METALLIZED #700 POLYCARBONATE

TYPE X777
Subminiature Wrap-and-Fill Round Construction, Axial or Radial Leads.
Specifications: Temp. −55°C to 125°C • I.R. 100,000 Megohm-Microfarads @ 25°C • D.F. Less than .3% • Temp. Coef. +80 PPM/°C

TYPE X778
Flat-Subminiature Wrap-and-Fill Oval Construction, Axial or Radial Leads
Specifications: Same as Type X777

TYPE X773
Epoxy Encased Rectangular Construction Radial Leads.
Specifications: Same as Type X777

TYPE X783
R-Graded Hermetically Sealed Round Construction, Axial Leads. Both Leads Insulated or One Lead Grounded To Case
Specifications: Same as Type X777



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TEL. (201) 542-7880

POLYPROPYLENE SERIES 400

TYPE 440

Hermetically Sealed Axial or Radial Leads. Featuring Extreme Stability, Without Voltage Derating.

Specifications:

- Temp. −55°C to +125°C
- I.R. 2.5 x 10^5 Megohms-Microfarads @ 25°C (Typical)
- D.F. Less than .05%
- Temp. Coef. −125±30 PPM/°C
- Voltage 150 V.D.C. and 400 V.D.C.

150 V.D.C.			400 V.D.C.		
Mfd.	Dia.	Lgth.	Mfd.	Dia.	Lgth.
.0047	—	—	.0047	.235	¾
.0056	—	—	.0056	.312	¾
.0068	—	—	.0068	.312	¾
.0082	—	—	.0082	.312	¾
.01	.235	¾	.01	.400	¾
.012	.235	¾	.012	.400	¾
.015	.312	¾	.015	.400	⅞
.018	.312	¾	.018	.400	⅞
.022	.312	¾	.022	.400	⅞
.027	.400	¾	.027	.500	⅞
.033	.312	⅞	.033	.500	⅞
.039	.312	⅞	.039	.500	⅞
.047	.400	⅞	.047	.500	1
.05	.400	⅞	.05	.500	1
.056	.312	1	.056	.500	1
.068	.400	1	.068	.562	1
.082	.400	1	.082	.670	1
.1	.400	1⅛	.1	.670	1⅛
.12	.400	1⅛	.12	.670	1⅛
.15	.500	1⅛	.15	.750	1⅛
.18	.500	1¼	.18	.750	1¼
.22	.500	1¼	.22	.750	1¼
.27	.562	1¼	.27	.750	1⅝
.33	.562	1¼	.33	.750	1⅝
.39	.562	1⅝	.39	1.00	1⅝
.47	.562	1⅝	.47	1.00	1⅝
.56	.562	1⅞	.56	1.00	2¼
.68	.670	1⅞	.68	1.00	2¼
.82	.670	2¼	.82	—	—
1.0	.670	2¼	1.0	—	—

TYPE 444

Wrap-and-Fill Round or Oval Construction, Axial or Radial Leads. Extremely Stable Without Voltage Derating.

Specifications:

- Temp. −55°C to +125°C
- I.R. 5 x 10^5 Megohm-Microfarads @ 250°C (Typical)
- D.F. Less than .05%
- Temp. Coef. −110±30 PPM/°C
- Voltage 150 V.D.C. and 400 V.D.C.

150 V.D.C.			400 V.D.C.		
Mfd.	Dia.	Lgth.	Mfd.	Dia.	Lgth.
.012	.227	⅝	.0047	.235	⅝
.015	.242	⅝	.0056	.253	⅝
.018	.262	⅝	.0068	.271	⅝
.022	.282	⅝	.0082	.293	⅝
.027	.308	⅝	.01	.317	⅝
.033	.269	¾	.012	.343	⅝
.039	.288	¾	.015	.304	¾
.047	.313	¾	.018	.329	¾
.05	.322	¾	.022	.357	¾
.056	.291	⅞	.027	.388	¾
.068	.316	⅞	.033	.422	¾
.082	.345	⅞	.039	.459	¾
.1	.336	1	.047	.440	⅞
.12	.364	1	.056	.462	⅞
.15	.404	1	.068	.500	⅞
.18	.397	1⅛	.082	.546	⅞
.22	.432	1⅛	.1	.539	1
.27	.467	1⅛	.12	.588	1
.33	.520	1⅛	.15	.642	1
.39	.462	1½	.18	.642	1⅛
.47	.500	1½	.22	.703	1⅛
.50	.514	1½	.27	.623	1½
.56	.492	1¾	.33	.681	1½
.68	.534	1¾	.39	.745	1½
.82	.532	2⅛	.47	.822	1½
1.0	.572	2⅛	.56	.712	2⅛
			.68	.785	2⅛

TYPE X440

Hermetically Sealed Axial or Radial Leads. Featuring Extreme Stability Without Voltage Derating.

Specifications:

- Temp. −55°C to +125°C
- I.R. 2 x 10^5 Megohm-Microfarads @ 25°C (Typical)
- D.F. Less than .05%
- Cap. Change — 3% max. @ 85°C
- Voltage 200 V.D.C.

200 V.D.C.					
Mfd.	Dia.	Lgth.	Mfd.	Dia.	Lgth.
.0068	.235	⅝	.33	.400	1⅛
.0082	.235	⅝	.39	.500	1⅛
.01	.235	11/16	.47	.500	1⅛
.012	.235	11/16	.56	.500	1⅛
.015	.235	11/16	.68	.562	1⅛
.018	.235	11/16	.82	.670	1⅛
.022	.235	11/16	1.0	.562	1⅜
.027	.312	11/16	1.2	.670	1⅜
.033	.312	11/16	1.5	.670	1⅜
.039	.312	11/16	1.8	.750	1⅜
.047	.312	¾	2.2	1.00	1⅜
.056	.312	¾	2.7	.750	1¾
.068	.312	¾	3.3	1.00	1¾
.082	.400	¾	3.9	.750	2⅛
.1	.400	¾	4.7	1.00	2⅛
.12	.400	¾	5.6	1.00	2⅛
.15	.400	⅞	6.8	1.00	2⅛
.18	.400	⅞	8.2	1.00	2½

TYPE X444

Wrap-and-Fill Round or Oval Construction, Axial or Radial Leads. Extremely Stable With Maximum Reliability, Without Voltage Derating.

Specifications:

- Temp. −55°C to +125°C
- I.R. 1 x 10^5 Megohm-Microfarads @ 25°C (Typical)
- D.F. Less than .1%
- Cap. Change — 3% max. @ 85°C
- Voltage 200 V.D.C.

200 V.D.C.					
Mfd.	Dia.	Lgth.	Mfd.	Dia.	Lgth.
.018	.197	9/16	.47	.430	1
.022	.214	9/16	.56	.465	1
.027	.230	9/16	.68	.408	1
.033	.253	9/16	.82	.558	1
.039	.255	9/16	1.0	.510	1¼
.047	.242	⅝	1.2	.560	1¼
.056	.262	⅝	1.5	.625	1¼
.068	.284	⅝	1.8	.679	1¼
.082	.310	⅝	2.2	.742	1¼
.1	.339	⅝	2.7	.700	1⅝
.12	.37	⅝	3.3	.770	1⅝
.15	.324	¾	3.9	.725	2
.18	.353	¾	4.7	.795	2
.22	.386	¾	5.6	.865	2
.27	.430	¾	6.8	.95	2
.33	.361	1	8.2	.95	2⅜
.39	.390	1	10.	1.04	2⅜

FILM CAPACITORS

F-DYNE quality film capacitors are designed and manufactured to provide optimum electrical characteristics with reliable performance.

The smallest housing that has been developed to date, providing superior performance, is the thermo Mylar® tape wrap. It adds approximately .010″ to the diameter of the winding and is capable of meeting all MIL-C-27287 requirements including moisture resistance, vibration, insulation resistance, etc.

F-DYNE capacitors are made with copperweld leads electrically welded to aluminum foil. No high series resistance or high power factor problems are ever encountered with this construction. Even if the leads are cut very short and then soldered into your application with an extra hot soldering iron, the lead connection to the foil will not be affected. In fact, the end of th le can be burned off with a gas torch flame without Fe ing the power factor or series resistance. Met iz Mylar, Metallized Polycarbonate and tin lead foil Po styrene capacitors are the only F-Dyne Capacitor th are made in the conventional manner with leads sc er to the foil. Normal care should be taken when sol ri these capacitors into your circuits.

THREE BASIC FILMS ARE USED IN F-DYNE CAPACITORS:

- MYLAR
- POLYCARBONATE
- POLYSTYRENE

ELECTRICAL & MECHANICAL CHARACTERISTICS

All F-Dyne capacitors pass the following requirements.

A. **Dielectric Strength**
F-Dyne quality capacitors will pass a life test at 140% of their DC rated voltage. In addition, they are designed to withstand a voltage of 200% of their rated DC voltage for one minute without any interruption or damage.

B. **Capacitance Tolerance**
When measured at a frequency of 1000 cps at 25°C, capacity will be within the specified tolerance. See charts for variation with temperature and frequency. The standard tolerances are ±½%, 1%, 2%, 5%, 10%. Other tolerances, closer and wider, are available.

C. **Lead Strength**
F-Dyne capacitor leads withstand a five pound pull for a full minute.

D. **Lead Flexibility**
Leads are designed to have full flexibility to insure maximum use without danger of damage or fatigue failure.

E. **% Dissipation factor @ 1000 cps and 25°C**

	FOIL		METALLIZED	
Type	Typical	Spec. limit	Typical	Spec. limit
Mylar	.45	1%	.55	1%
Polycarbonate	.05	.3	.15	.3
Polystyrene	.03	.1	—	—

Note: Capacitors over 5mfd. are tested at 60 cycles.

F. **Insulation Resistance (Megohms x Microfarads)**

		FOIL	NEED NOT EXCEED		METALLIZED	NEED NOT EXCEED
Type	Typical	Spec. limit	Megohms	Typical	Spec. limit	Megohms
Mylar	100,000	50,000	100,000	50,000	25,000	50,000
Polycarbonate	400,000	75,000	500,000	80,000	30,000	150,000
Polystyrene	800,000	100,000	500,000	—	—	—

The above values are read after a two-minute charge at rated voltage at 25°C.

G. **Humidity Resistance**
All foil capacitors meet requirements of MIL-C-27287. Metallized capacitors will exceed requirements of E.I.A. specifications RS-164.

H. **Voltage temperature derating**
All Mylar and Polycarbonate capacitors are rated at 85°C for continuous operation. If ambient temperatures higher than 85°C are encountered, in order to realize the normal life expectancy of the capacitor, the voltage must be derated as follows:

85°C	95°C	105°C	115°C	125°C
80	68	58	48	40
100	88	75	62	50
200	170	140	120	100
400	335	285	240	200

POLYSTYRENE
Standard—Type T

Capacitance	100 Volts Dimensions	Lead AWG	200 Volts Dimensions	Lead AWG	400 Volts Dimensions	ea AWG
.001	.187 x ½	24	.187 x ½	24	.187 x ½	24
.0015	.187 x ½	24	.187 x ½	24	.187 x ½	24
.0022	.187 x ½	24	.187 x ½	24	.187 x ½	24
.0027	.187 x ½	24	.187 x ½	24	.187 x ½	24
.0033	.187 x ½	24	.187 x ½	24	.203 x ½	24
.0039	.187 x ½	24	.187 x ½	24	.219 x ⅝	24
.0047	.187 x ½	24	.187 x ½	24	.234 x ⅝	24
.0056	.187 x ½	24	.187 x ½	24	.250 x ⅝	24
.0068	.187 x ½	24	.203 x ⅝	24	.234 x ¾	24
.0087	.203 x ½	24	.219 x ⅝	24	.250 x ¾	24
.01	.219 x ½	24	.234 x ⅝	24	.281 x ¾	22
.015	.250 x ½	24	.250 x ¾	24	.328 x ¾	22
.022	.219 x ⅝	24	.281 x ¾	22	.343 x ⅞	22
.027	.250 x ⅝	24	.312 x ¾	22	.375 x ⅞	22
.033	.265 x ⅝	22	.343 x ¾	22	.406 x ⅞	22
.039	.296 x ⅝	22	.375 x ¾	22	.453 x ⅞	20
.047	.296 x ¾	22	.359 x ⅞	22	.453 x 1⅛	20
.056	.343 x ¾	22	.390 x ⅞	22	.484 x 1⅛	20
.068	.296 x ⅞	22	.421 x ⅞	22	.484 x 1¼	20
.082	.343 x ⅛	22	.421 x 1	22	.531 x 1¼	20
.1	.406 x ⅞	22	.468 x 1	20	.578 x 1¼	20
.12	.437 x ⅞	22	.515 x 1	20	.625 x 1¼	20
.15	.437 x 1	22	.531 x 1¼	20		
.18	.468 x 1	20	.578 x 1¼	20		
.27	.500 x 1¼	20	.625 x 1¼	20		
.33	.562 x 1¼	20	.671 x 1½	20		
.39	.625 x 1¼	20	.718 x 1½	20		
.47	.687 x 1¼	20	.750 x 1 3/16	20		
.68	.750 x 1½	20				
1.00	.875 x 1½	18				

LENGTH TOLERANCE	DIAMETER TOLERANCE	LEAD
+.046 −.094	.249 & under ±.032 .250 to .500 ±.046 .501 & over ±.062	Copperweld 100% tin co ng Length 2.000 ±.125

GENERAL APPLICATION INFORMATION

SIZE AND PRICES of the three dielectrics vary in the following order.

1. Mylar least expensive and smallest.
2. Polycarbonate approximately 12% larger than mylar and more expensive.
3. Polystyrene approximately three times as large as Mylar and most expensive of the three dielectrics.

COST AND SIZE

For each of the three dielectrics there are size and price variati s.
Standard — least expensive Small — more expensive
Miniature — most expensive

In applications where none of the above types can be used beca e space is limited, F-Dyne supplies metallized foil capacitors for t the Mylar and Polycarbonate dielectrics. These again vary as follo :
Standard — least expensive Small — more expensive
Miniature — most expensive

FOR APPLICATION ASSISTANCE CALL US COLLEC

F-DYNE

F-DYNE ELECTRONICS CO.
449 HOWARD AVE., BRIDGEPORT, CONN. 06605 203 367-4442

AR DIMENSIONS

Aluminum Foil, Standard Size
Type A*

0 V Lgth.	Lead AWG	200 V Dia.-Lgth.	Lead AWG	400 V Dia.-Lgth.	Lead AWG
x ½	24	.187x ½	24	.187x ½	24
x ½	24	.187x ½	24	.218x ½	24
x ½	24	.203x ½	24	.250x ¾	24
x ½	24	.218x ½	24	.296x ¾	22
x ⅝	24	.218x ⅝	24	.265x ⅞	22
x ⅝	24	.234x ⅝	24	.281x ⅞	22
x ⅝	24	.250x ⅝	24	.312x ⅞	22
x ⅝	22	.265x ⅝	22	.328x ⅞	22
x ⅝	22	.296x ⅝	22	.359x1	22
x ¾	22	.281x ¾	22	.390x1	22
x ¾	22	.296x ¾	22	.343x1¼	22
x ¾	22	.328x ¾	22	.375x1¼	22
x1	22	.375x1	22	.406x1¼	22
x1	22	.406x1	22	.437x1¼	22
x1⅛	22	.453x1⅛	20	.468x1 11/16	20
x1⅛	22	.484x1⅛	20	.500x1 11/16	20
x1⅛	22	.437x1¼	20	.546x1 11/16	20
x1¼	22	.484x1¼	20	.609x1 11/16	20
3x1¼	20	.531x1¼	20		
4x1¼	20	.453x1 11/16	20		
5x1¼	20	.500x1 11/16	20		
5x1½	20	.562x1 11/16	20		
2x1½	20	.625x1 11/16	20		
3x1 11/16	20	.671x1 11/16	20		
6x1 11/16	20	.734x1 11/16	20		
7x1 11/16	20	.750x1 11/16	20		

s to 1000V available.

DIAMETER TOLERANCE	LEAD
.249 & under ±0.32	Copperweld 100%
.250 to .500 ±.046	tin coating
.501 & over ±.062	Length 2.000 ±.125

-Aluminum Foil

Capacitance	Type B SMALL 100 Volts Dia.-Length	Lead AWG	Type C MINIATURE 80 & 50 Volts Dia.-Length	Lead AWG
to	.187 x ⅜	24	.156 x ⅜	24
.012	.187 x 7/16	24	.156 x ⅜	24
.015	.187 x 7/16	24	.171 x ⅜	24
.022	.187 x ½	24	.187 x ⅜	24
.033	.203 x ½	24	.187 x 7/16	24
.039	.218 x ½	24	.203 x 7/16	24
.047	.234 x ½	24	.203 x ½	24
.056	.250 x ½	24	.218 x ½	24
.068	.265 x ½	22	.218 x ½	24
.082	.281 x ½	22	.250 x ½	24
.1	.281 x ½	22	.265 x ½	22
.12	.312 x ⅝	22	.281 x ½	22
.15	.343 x ⅝	22	.281 x ⅝	22
.18	.296 x ⅞	22	.296 x ⅝	22
.22	.312 x ⅞	22	.296 x ⅞	22
.27	.375 x ⅞	22	.312 x ⅞	22
.33	.343 x 1⅛	22	.265 x 1⅛	22
.39	.375 x 1⅛	22	.296 x 1⅛	22
.47	.406 x 1⅛	22		
.56	.453 x 1⅛	20		
.68	.500 x 1⅛	20		
.82	.562 x 1⅛	20		

DIAMETER TOLERANCE	LEAD
.249 & under ±.032	Copperweld 100%
.250 to .500 ±.046	tin coating
.501 & over ±.062	Length 2.000 ±.125

METALLIZED MYLAR—Standard Size
Type D

Capacitance	100 & 200 Volts Dia.-Length	Lead AWG	400 Volts Dia.-Length	Lead AWG
.033			.250 x .687	22
.039			.281 x .687	22
.047			.296 x .687	22
.056			.312 x .687	22
.068			.343 x .687	20
.082			.343 x .812	20
.1	.265 x .500	22	.375 x .812	20
.12	.281 x .500	22	.406 x .812	20
.15	.312 x .500	22	.375 x 1.062	20
.18	.296 x .625	22	.406 x 1.062	20
.22	.312 x .625	22	.437 x 1.062	20
.27	.359 x .625	22	.437 x 1.187	20
.33	.281 x .875	22	.484 x 1.187	20
.39	.312 x .875	22	.531 x 1.187	20
.47	.343 x .875	20	.468 x 1.562	20
.56	.375 x .875	20	.500 x 1.562	20
.68	.421 x .875	20	.562 x 1.562	20
.82	.390 x 1.187	20	.625 x 1.562	20
1.00	.421 x 1.187	20	.687 x 1.562	20
1.50	.500 x 1.187	20	.750 x 1.875	20
2.00	.578 x 1.187	20	.875 x 1.875	18
3.00	.593 x 1.562	20		
4.00	.687 x 1.562	20		
5.00	.750 x 1.562	20		
6.00	.750 x 1.875	20		
8.00	.875 x 1.875	18		
10.00	1.000 x 1.875	18		

LENGTH TOLERANCE	DIAMETER TOLERANCE	LEAD
+.046	.249 & under ±.032	Copperweld solder
−.094	.250 to .50 ±.046	coating
	.501 & over ±.062	Length 2.000 ±.125

METALLIZED MYLAR

Capacitance	Type E SMALL 100-150 Volts Dia.-Length	Lead AWG	Type F MINIATURE 50-80 Volts Dia.-Length	Lead AWG
.1	.218 x .500	22	.218 x .437	22
.12	.234 x .500	22	.234 x .437	22
.15	.250 x .500	22	.250 x .437	22
.18	.281 x .500	22	.234 x .500	22
.22	.250 x .625	22	.250 x .500	22
.27	.281 x .625	22	.281 x .500	22
.33	.312 x .625	22	.312 x .500	22
.39	.328 x .625	20	.328 x .500	20
.47	.375 x .625	20	.312 x .625	20
.56	.343 x .750	20	.328 x .625	20
.68	.390 x .750	20	.343 x .625	20
.82	.406 x .875	20	.343 x .750	20
1.00	.421 x .875	20	.375 x .750	20
1.50	.406 x 1.125	20	.453 x .750	20
2.00	.468 x 1.125	20	.406 x 1.125	20
3.00	.562 x 1.312	20	.484 x 1.125	20
4.00	.687 x 1.312	20	.515 x 1.312	20
5.00	.687 x 1.562	20	.562 x 1.312	20
6.00	.718 x 1.562	18	.625 x 1.312	20
8.00	.781 x 1.812	18	.656 x 1.562	20
10.00	.843 x 1.812	18	.750 x 1.562	20

LENGTH TOLERANCE	DIAMETER TOLERANCE	LEAD
+.046	.249 & under ±.032	Copperweld solder
−.046	.250 to .500 ±.046	coating
	.501 & cover ±.062	Length 2.000 ±.125

METALLIZED MYLAR FLAT—Standard
Type G

Capacitance	100 & 200 Volts T X W X L	Lead AWG	400 Volts T X W X L	Lead AWG
.033			.203 x .312 x .687	22
.039			.218 x .327 x .687	22
.047			.234 x .343 x .687	22
.056			.250 x .359 x .687	20
.068			.265 x .374 x .687	20
.082			.265 x .406 x .812	20
.1	.203 x .312 x .500	22	.312 x .453 x .812	20
.12	.218 x .328 x .500	22	.328 x .470 x .812	20
.15	.250 x .359 x .500	22	.312 x .453 x 1.062	20
.18	.234 x .343 x .625	22	.328 x .470 x 1.062	20
.22	.250 x .359 x .625	20	.328 x .470 x 1.188	20
.27	.281 x .390 x .625	20	.359 x .500 x 1.188	20
.33	.218 x .359 x .875	20	.406 x .547 x 1.188	20
.39	.250 x .390 x .875	20	.328 x .470 x 1.562	20
.47	.281 x .421 x .875	20	.359 x .500 x 1.562	20
.56	.312 x .453 x .875	20	.422 x .562 x 1.562	20
.68	.343 x .484 x .875	20	.469 x .609 x 1.562	20
.82	.312 x .453 x 1.125	20	.531 x .671 x 1.562	20
1.00	.328 x .470 x 1.125	20	.562 x .703 x 1.562	20
1.50	.390 x .531 x 1.125	20		
2.00	.359 x .500 x 1.500	20		
3.00	.453 x .593 x 1.500	20		
4.00	.562 x .703 x 1.500	20		
5.00	.578 x .718 x 1.812	20		

LENGTH TOLERANCE	T & W TOLERANCE	LEAD
+.046	.249 & under ±.032	Copperweld solder
−.046	.250 to .500 ±.046	coating
	.501 & over ±.062	Length 2.000 ±.125

METALLIZED MYLAR FLAT

Capacitance	Type H SMALL 100-150 Volts T X W x L	Lead AWG	Type I MINIATURE 50-80 Volts T X W X L	Lead AWG
*.1	.140 x .250 x .500	22	.140 x .234 x .437	22
*.12	.156 x .265 x .500	22	.156 x .250 x .437	22
*.15	.171 x .281 x .500	22	.187 x .296 x .437	22
.18	.187 x .296 x .625	22	.156 x .250 x .500	22
.22	.171 x .281 x .625	22	.171 x .281 x .500	22
.27	.203 x .312 x .625	22	.203 x .312 x .500	22
.33	.234 x .343 x .625	22	.234 x .343 x .500	22
.39	.250 x .359 x .625	20	.250 x .359 x .500	20
.47	.281 x .421 x .625	20	.234 x .343 x .625	20
.56	.250 x .390 x .750	20	.250 x .359 x .625	20
.68	.296 x .437 x .750	20	.250 x .390 x .625	20
.82	.312 x .453 x .875	20	.250 x .390 x .750	20
1.00	.328 x .468 x .875	20	.281 x .421 x .750	20
1.50	.343 x .484 x 1.125	20	.359 x .500 x .750	20
2.00	.406 x .564 x 1.125	20	.312 x .453 x 1.125	20
3.00	.468 x .609 x 1.250	20	.390 x .531 x 1.125	20
4.00	.578 x .718 x 1.250	20	.421 x .562 x 1.250	20
5.00	.578 x .718 x 1.500	20	.484 x .625 x 1.250	20
6.00	.593 x .734 x 1.500	20	.531 x .671 x 1.250	20
8.00	.671 x .812 x 1.781	18	.546 x .687 x 1.500	20
10.00	.734 x .875 x 1.781	18	.625 x .765 x 1.500	20

* Values .15 and lower refer to section "Ultra Miniature Flat Mylar Foil Capacitors".

LENGTH TOLERANCE	T & W TOLERANCE	LEAD
+.046	.249 & under ±.032	Copperweld solder
−.046	.250 to .500 ±.046	coating
	.501 & over ±.062	Length 2.000 ±.125

FOR APPLICATION ASSISTANCE CALL US COLLECT

F-DYNE

F-DYNE ELECTRONICS CO.

449 HOWARD AVE., BRIDGEPORT, CONN. 06605 203 367-4442

POLYCARBONATE DIMENSIONS

POLYCARBONATE ALUMINUM FOIL

CAPACITANCE	Type K STANDARD 100 VOLTS DIA.-LENGTH	LEAD AWG	200 VOLTS DIA.-LENGTH	LEAD AWG	Type L SMALL 50-100 VOLTS DIA.-LENGTH	LEAD AWG
.001 to .010	.187 x ½	24	.187 x ½	24	.187 x ⅜	4
.015	.187 x ½	24	.234 x ½	24	.187 x 7/16	4
.022	.203 x ½	24	.250 x ½	24	.187 x ½	4
.033	.218 x ½	24	.234 x ¾	24	.203 x ½	4
.039	.218 x ⅝	24	.265 x ¾	22	.234 x ½	4
.047	.234 x ⅝	24	.296 x ¾	22	.250 x ½	4
.056	.250 x ⅝	24	.312 x ¾	22	.265 x ½	2
.068	.265 x ⅝	22	.281 x 1	22	.281 x ½	2
.082	.296 x ⅝	22	.312 x 1	22	.296 x ½	2
.10	.281 x ¾	22	.343 x 1	22	.296 x ½	2
.12	.296 x ¾	22	.375 x 1	22	.312 x ⅝	2
.15	.343 x ¾	22	.359 x 1¼	22	.329 x ⅝	2
.18	.312 x 1	22	.390 x 1¼	22		
.22	.343 x 1	22	.437 x 1¼	22		
.27	.484 x 1¼	22				
.33	.531 x 1¼	22				

LENGTH TOLERANCE
+.046
−.094

DIAMETER TOLERANCE
.249 & under ±.032
.250 to .500 ±.046
.501 & over ±.062

LEAD
Copperweld 100% tin coating
Length 2.000 ±.125

METALLIZED POLYCARBONATE ROUND

Capacitance	Type M STANDARD 100 & 200 Volts Dia.-Length	Lead AWG	Type N SMALL 100-150 Volts Dia.-Length	Lead AWG	Type O MINIATURES 50-80 Volts Dia.-Length	Lead AWG
.1	.265 x .500	22	.218 x .500	22	.218 x .437	22
.12	.296 x .500	22	.250 x .500	22	.234 x .437	22
.15	.328 x .500	22	.265 x .500	22	.265 x .437	22
.18	.296 x .625	22	.281 x .500	22	.234 x .500	22
.22	.328 x .625	20	.265 x .625	22	.250 x .500	22
.27	.375 x .625	20	.296 x .625	22	.281 x .500	22
.33	.296 x .875	20	.328 x .625	20	.312 x .500	22
.39	.328 x .875	20	.343 x .625	20	.328 x .500	20
.47	.359 x .875	20	.390 x .625	20	.312 x .625	20
.56	.390 x .875	20	.359 x .750	20	.328 x .625	20
.68	.437 x .875	20	.406 x .750	20	.343 x .625	20
.82	.421 x 1.187	20	.421 x .875	20	.343 x .750	20
1.00	.437 x 1.187	20	.437 x .875	20	.375 x .750	20
1.25	.453 x 1.187	20	.390 x 1.25	20	.421 x .750	20
1.50	.531 x 1.187	20	.421 x 1.25	20	.453 x .750	20
2.00	.609 x 1.187	20	.484 x 1.25	20	.406 x 1.125	20
3.00	.625 x 1.562	20	.593 x 1.312	20	.484 x 1.125	20
4.00	.718 x 1.562	20	.718 x 1.312	20	.515 x 1.312	20
5.00	.781 x 1.562	18	.718 x 1.562	20	.578 x 1.312	20
6.00	.781 x 1.812	18	.750 x 1.562	20	.625 x 1.312	20
8.00	.875 x 1.812	18	.812 x 1.812	18	.656 x 1.562	20
10.00			.875 x 1.812	18	.750 x 1.562	20

METALLIZED POLYCARBONATE FLAT

Capacitance	Type P STANDARD 100 & 200 Volts T X W X L	Lead AWG	Type Q SMALL 100-150 Volts T X W X L	Lead AWG	Type MINIATURE 50-80 Volts T X W X L	Lead AWG
*.1	.156 x .265 x .500	22	.140 x .250 x .500	22	.140 x .234 x .4	22
*.12	.234 x .343 x .500	22	.171 x .281 x .500	22	.156 x .250 x .4	22
*.15	.265 x .375 x .500	20	.187 x .281 x .500	22	.187 x .296 x .4	22
.18	.234 x .343 x .625	20	.203 x .312 x .500	22	.156 x .250 x .5	22
.22	.265 x .375 x .625	20	.187 x .296 x .625	22	.171 x .281 x .5	22
.27	.296 x .437 x .625	20	.219 x .328 x .625	22	.203 x .312 x .5	22
.33	.218 x .359 x .875	20	.250 x .359 x .625	22	.234 x .343 x .5	22
.39	.250 x .390 x .875	20	.250 x .390 x .625	20	.250 x .359 x .5	20
.47	.281 x .421 x .875	20	.296 x .437 x .625	20	.234 x .343 x .6	20
.56	.312 x .453 x .875	20	.265 x .406 x .750	20	.250 x .359 x .6	20
.68	.359 x .500 x .875	20	.312 x .453 x .750	20	.250 x .390 x .6	20
.82	.343 x .484 x 1.125	20	.328 x .468 x .875	20	.250 x .390 x .7	20
1.00	.359 x .500 x 1.125	20	.343 x .484 x .875	20	.281 x .421 x .7	20
1.50	.453 x .593 x 1.125	20	.359 x .500 x 1.25	20	.359 x .500 x .7	20
2.00	.531 x .671 x 1.125	20	.421 x .562 x 1.25	20	.312 x .453 x 1.1	20
3.00	.531 x .671 x 1.562	20	.500 x .640 x 1.250	20	.390 x .531 x 1.1	20
4.00	.625 x .765 x 1.562	20	.609 x .750 x 1.250	20	.421 x .562 x 1.2	20
5.00	.687 x .828 x 1.562	20	.609 x .750 x 1.500	20	.484 x .625 x 1.2	20
6.00			.640 x .781 x 1.500	20	.531 x .671 x 1.2	20
8.00			.703 x .843 x 1.781	18	.546 x .687 x 1.50	20
10.00			.750 x .890 x 1.781	18	.625 x .765 x 1.50	20

* Values .15 and lower refer to section "Ultra Miniature Flat Polycarbonate Aluminum Foil Capacitors".

LENGTH TOLERANCE
+.046
−.094

DIAMETER TOLERANCE
.249 & under ±.032
.250 to .500 ±.046
.501 & over ±.062

LEAD
Copperweld solder coating
Length 2.000 ±.125

FOR APPLICATION ASSISTANCE CALL US COLLECT

F-DYNE

F-DYNE ELECTRONICS CO.
449 HOWARD AVE., BRIDGEPORT, CONN. 06605 203 367-4442

RA MINIATURE FLAT

MINIATURE FLAT MYLAR AND FLAT POLYCARBONATE ALUMINUM FOIL

o or smaller in size than conventional miniature ed mylar and metallized polycarbonate capacitors, apacitors are superior to metallized capacitors they have a solid aluminum foil conductor ap- tely .00025 in thickness. Each foil extends beyond the dielectric and the leads are electrically welded to the aluminum foil extensions. Because of this construction these capacitors have the following advantages over comparable sized metallized mylar and metallized polycarbonate capacitors.

	Mylar Foil	Metallized Mylar
ion factor	less than .5% @ 25°C measured at 1000CPS.	less than 1% @ 25°C measured at 1000CPS.
on* ce	50,000 megohm micro farads at 25°C rated voltage after 2 min. charging time I.R. need not exceed 100,000 megohms.	25,000 megohm microfarads at 25°C at rated voltage after 2 min. charging time. I.R. need not exceed 50,000 megohms.
y Resistance	meets or exceeds requirements of MIL-C-27287	Exceeds requirements of E.I.A. Spec. 164 para. 2, 3, 8.
of Connections	Welded connection of lead to aluminum foil cannot be disturbed when the capacitor leads are soldered into the circuit regardless of how much they are overheated.	All metallized capacitors are terminated with a metallic spray on the ends and a lead attached with solder. If the lead is overheated when being soldered into the application, the internal connection may be unsoldered causing high series resistance and subsequent failure.

Other characteristics same as standard mylar capacitors.

ER ADVANTAGES

tion to the above advantages the foil type capacitors give more dependable stable equipment functioning. On are occasions, metallized capacitors have been known to short and clear in application. As a result the equipment ctions and the cause of malfunctioning cannot be traced. This cannot happen with foil type capacitors listed on 22 and 23.

E

ice of the foil type is lower than the price of metallized capacitors because of the less expensive straight d simpler construction.

haracteristics are the same for polycarbonate flat capacitors, except for insulation resistance see page 1.

YLAR ALUMINUM FOIL ULTRA MINIATURE

	Type W STANDARD		Type X SMALL	
	100 & 200 Volts T X W X L	Lead AWG	50 & 80 Volts T X W X L	Lead AWG
01	.109 x .218 x .375	24		
01	.109 x .218 x .375	24		
02	.109 x .218 x .375	24		
03	.109 x .218 x .375	24		
04	.109 x .218 x .375	24		
06	.109 x .218 x .375	24		
08	.109 x .218 x .375	24		
1	.109 x .218 x .375	24		
15	.109 x .218 x .375	24		
22	.125 x .234 x .375	24	.109 x .218 x .375	24
33	.109 x .218 x .500	24	.125 x .234 x .375	24
47	.125 x .234 x .500	24	.109 x .218 x .500	24
56	.140 x .250 x .500	24	.125 x .234 x .500	24
68	.156 x .265 x .500	24	.140 x .250 x .500	24
82	.187 x .266 x .500	22	.156 x .265 x .500	24
2	.203 x .312 x .500	22	.171 x .281 x .500	22
4	.234 x .343 x .500	22	.203 x .312 x .500	22
5	.203 x .312 x .625	22	.234 x .343 x .500	22

FLAT POLYCARBONATE FOIL ULTRA MINIATURE Standard—Type Y

Capacitors	50 & 100 Volts T X W X L	Lead AWG
.001	.109 x .218 x .375	24
.0015	.109 x .218 x .375	24
.022	.109 x .218 x .375	24
.0033	.109 x .218 x .375	24
.0047	.109 x .218 x .375	24
.0068	.109 x .218 x .375	24
.0082	.109 x .218 x .375	24
.01	.109 x .218 x .375	24
.015	.109 x .218 x .375	24
.022	.125 x .218 x .375	24
.033	.125 x .234 x .500	24
.047	.108 x .218 x .625	24
.056	.125 x .234 x .625	24
.068	.140 x .250 x .625	24
.082	.156 x .265 x .625	22
.1	.171 x .281 x .625	22
.12	.203 x .312 x .625	22
.15	.234 x .343 x .625	22

TYPE AND ORDERING DESIGNATION

A -2.621 -200 -1

- % Tolerance
- D.C. Voltage Rating
- Capacitance in Micro-Farads (Use as many digits as required)
- Type

CE	DIAMETER TOLERANCE	LEAD
	218 & under ±.032	Copperweld 100% tin coating
	219 & over ±.046	Leads Length 2" ±⅛"

FOR APPLICATION ASSISTANCE CALL US COLLECT

F-DYNE ELECTRONICS CO.
449 HOWARD AVE., BRIDGEPORT, CONN. 06605 203 367-4442

CAPACITORS

29F

29F

6K, 16K

69F

6

62F, 69F900

43F

43F

86F, 88F

76F, 77F

7

Application	Catalog Type	Description	Voltage Range	UF Range	Temperature Range	Bulletin Reference	
For polar and nonpolar coupling, filtering, decoupling, bypass, energy storage and timing in military and high-performance industrial amplifiers, transmitters, receivers, servo systems, and navigation systems. Hermetic seal available.	29F	Standard and high-voltage tantalum foil; MIL-C-3965: CL20, CL21, CL22, CL23, CL24, CL25, CL26, CL27, CL30, CL31, CL32, CL33, CL34, CL35, CL36, CL37 CL51, CL52, CL53, CL54 Tubular and rectangular	Up to 450 VDC	0.15 to 3500 μf	−55C to 85C or 125C	GET-2997	
High-reliability type for military or aerospace use where hermetic seal and extreme reliability are prime factors.	16K	Hermetic seal available	Up to 150 VDC	0.75 to 580 μf	−55C to 125C	Consult GE Sales Engineer	
For polar only — where no reverse voltage is expected — coupling, decoupling, filtering, bypass, energy storage and timing in military and high-performance industrial amplifiers, transmitters, receivers, servo systems, and navigation systems.	69F	Tantalum porous anode; MIL-C-3965: CL64, CL65, CL55 Tubular and rectangular	Up to 150 VDC	1.7 to 2400 μf	−55C to 85C or 125C	GET-2997	
	69F900	Subminiature tantalum porous anode	Up to 60 VDC	3.3 to 450 μf	−55C to 85C	GEC-1798	
For polar only—where no reverse voltage is expected—coupling, filtering, decoupling, bypass, energy storage and timing in standard and high-performance industrial and entertainment amplifiers, transmitters, receivers, servo systems, and navigation systems, within temperature capabilities.	62F	Porous anode tantalum electrolytic Subminiature Lightest weight Highest volumetric efficiency	Up to 60 VDC	0.01 to 325 μf	−55C to 85C	GEC-1798	
For bulk filtering and energy storage in military and high-performance or standard industrial power supplies, including computer usage and welding equipment.	86F	High performance, high volumetric efficiency	Up to 450 VDC	75 to 540,000 μf	−40C to 65C, 85C	GEC-1798	
	88F	Long life, high ripple current	Up to 150 VDC	170 to 150,000 μf	−40C to 85C	Consult GE Sales Engineer	
For polar coupling, filtering, decoupling, bypass, energy storage and timing in standard and high-performance industrial and entertainment amplifiers, transmitters, receivers, servo systems, and navigation systems, within temperature capabilities.	76F 77F	Miniature aluminum electrolytic	Up to 150 VDC	1 to 790 μf	−20C/ −40C to 85C	GEC-1798	
For filtering, bypass, decoupling, and coupling in entertainment-type radio, TV, high-fidelity systems, and in industrial instruments and test equipment.	43F 87F	Can style and Tubular Aluminum electrolytics for radio, TV, and other communications equipment	Up to 450 VDC	5 to 15,000 μf	−20C to 85C	GEC-1798	
For circuits in test, measurement, control, and communications equipment of all types, where high-quality film-foil units are an economic choice.	75F	Polyester film-foil roll is epoxy-encapsulated. Welded radial leads. Units have mounting feet and precise dimensions, for high-density packaging.	50 to 600V	.0010 to 1 μf	−55C to 125C	GEC-1798	

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECT

CAPACITORS

5F

61F, 63F, 64F, 74F51

BA, 74F01

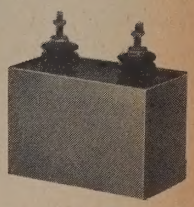
23F

3F

28F

45F

14F



14F

Application	Catalog Type	Description	Voltage Range	UF Range	Temperature Range	Bulletin Reference	Market Usage
inted-circuit board circuitry where eight, cost, and reliability give ad- e over metallized film capacitors.	65F	Polyester film and aluminum foil roll, compressed and packaged in a regular epoxy case with radial leads.	50V only	.0010 to 1.5 μf	−55C to 85C	GEC-1798	Industrial
e where size, weight, cost, and ity give advantage over metal-clad s, molded, or ceramic case units.	61F 63F 64F	Polyester film-foil roll, wrap and-pot, with axial leads. 63F only meets performance requirements of MIL-C-27287.	Up to 300V	.0010 to 2 μf	−55C to 125C	GEC-1798	Industrial, Military
	74F51	Same as 61F except with polycarbonate film dielectric	100 or 200V	0010 to 1 μf	−55C to 125C	GEC-1798	Industrial
anufacturing and test equipment, nic timers and control, communi- equipment, and other forms of ial electronic equipment.	BA	Metallized polyester film roll, wrap-and-pot, with axial leads.	100 or 200V	.010 to 10 μf	−55C to 125C	GEA-8577	Industrial
	74F01	Same as BA except with metallized polycarbonate film.	200V	.010 to 10 μf	−55C to 125C	GEC-1798	Industrial
rgy storage for gas discharge tubes, s camera attachments.	85F	Aluminum electrolytic photoflash energy-storage capacitors to provide low d-c leakage current and low ESR.	300 to 550 VDC	5 to 700 μf	−20C to 45C	Consult GE Sales Engineer	Industrial, Entertainment
l-purpose d-c capacitors for filter- ocking, bypass, and arc-suppression er supplies, control circuits, and d-c circuit functions.	23F	Paper/Pyranol® in drawn steel cases.	400 to 12,500 VDC, 236 to 1900 VAC	0.05 to 35 μf	−55C to 85C	GEC-1798	Industrial
ly designed for such SCR applica- s phase control, frequency multi- and changers, power supply filters, atio controls, inverters, and recti- ike suppression.	28F	Paper, metallized paper, and polycarnate film dielectrics with very low internal losses and high peak current carrying capability.	200 to 2000 VDC, 115 to 700 VAC	0.25 to 150 μf	−55C to 80C	GEA-8688	Industrial
l-purpose a-c capacitors for motor nsformer applications. New Pyranol egnant multiplies life and increases ity.	45F	Paper/Pyranol II in drawn oval cases.	200 to 720 VDC	0.5 to 55 μf	−30C to 70C	GEA-8691	Industrial
gh-voltage d-c rectifier power sup- ers, and high-voltage blocking and in communications, radar and other ltage circuits.	14F	Paper/Mylar* oil impregnated in all-welded steel rectangular case of leak-proof construction.	5000 to 20,000 VDC	0.67 to 150 μf	−40C to 105C	GEC-1798	Industrial
ght-duty energy storage-discharge uch as photoflash applications.	14F	Paper/Pyranol in fabricated steel cases.	1000 to 10,000 VDC	12.5 to 640 μf	0 to 40C	GEC-1798	Industrial

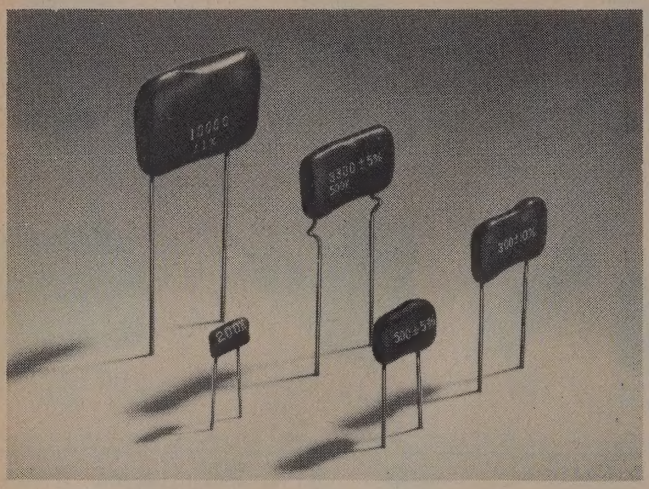
mark of DuPont Co.

mplete information contact nearest GE Sales Office listed on inside front or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

GENERAL INSTRUMENT

DIPPED SILVER-MICA CAPACITORS MIL-C-5D AND COMMERCIAL GRADES



General Instrument dipped silver-mica capacitors meet or exceed MIL-C-5D and EIA-RS153 requirements. MIL types and RDM types have multiple epoxy-resin coatings for maximum environmental protection. The single dip SRDM type may be used where size is critical and subsequent encapsulation of the circuit will be applied.

The range of standard types and ratings is shown in the table below. Complete technical details appear in Bulletin MC-2.

Production quantities are available from General Instrument Corporation, Capacitor Group, Walnut St., Tazewell, Va. 24651 (Phone 703-988-5551). Contact Miconic Industries, Inc., 35 Eileen Way, Syosett, N.Y. 11791, for the name of the G.I.-Miconics distributor nearest you.

HOW TO SPECIFY:

Commercial / MIL-C-5D	*RDM 10 / CMO4	B		D	121	K	O	3
	STYLE	CHARACTERISTIC		VDC	CAP pF	TOL.	TEMP °C	VI
	See Standard Ratings	Temp. Coeff. (PPM) B Not Specified C −200 to +200 D −100 to +100 E −20 to +100 F 0 to +70	% Capacitance Drift Not Specified ±.5 + .1 pF ±.3 + .1 pF ±.1 to .1 pF ±.05 + .1 pF	A = 100 C = 300 D = 500	First 2 digits significant 3rd digit indicates zeroes	D = ±½ pF E = ±0.5% F = ±1% G = ±2% H = ±3% J = ±5% K = ±10% M = ±20%	M = −55 + 70 N = −55 + 85 O = −55 + 125 P = −55 + 150	(Her 1 = 105 3 = 10000

STANDARD RATINGS: MIL-C-5, RDM, SRDM

Cap. pF	RDM/SRDM 10 CMO4/09			RDM/SRDM 15 CMO5/10			RDM/SRDM 19 CMO6/11			RDM/SRDM 20 No MIL			RDM/ SRDM 30 CMO7/1	
	100 VDC	300 VDC	500 VDC	100 VDC	300 VDC	500 VDC	100 VDC	300 VDC	500 VDC	100 VDC	300 VDC	500 VDC	300 VDC	50 VD
1-9			■			■								
10			■			■			■			■		
12-36			■			■			■			■		
39-250	■	■				■			■			■		
270-300	■					■			■			■		
330-390	■					■			■			■		
400	■					■			■			■		
430-510					■	■			■			■		
560-820					■				■			■		
910				■					■			■		
1000				■					■			■		■
1100-3000									■			■		■
3300								■				■		■
3600								■				■		■
3900								■				■		■
4300-5100								■			■	■		■
5600								■			■			■
6200							■	■		■	■			■
6800							■	■		■				■
7500							■			■			■	■
8200							■			■			■	■
10K-18K										■			■	■
20,000										■			■	■

*For crimped leads, add prefix "1" to RDM and SRDM. CMO9, 10, 11 and 12 have crimped leads.

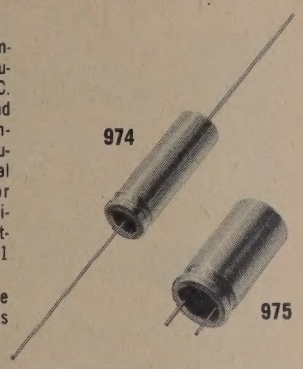
GENERAL INSTRUMENT

ALUMINUM ELECTROLYTIC CAPACITORS

b-miniature tubular +85°C

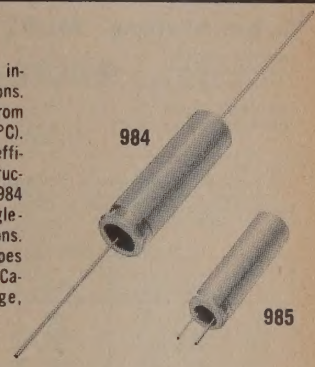
Type 974 and 975 capacitors are in-strial quality units rated for continu-s operation from −30°C to +85°C. ey feature exceptionally low DCL and R. All-welded construction is com-ed with high purity foils in an insu-ed metal case. The 974 has axial ds. The 975 is single-ended for nted circuit applications. Capaci-ce range, 1-1800 μF, working volt-e, 3-150 VDC. See bulletins EL-101 4) and EL-105 (975).

Type 974 and 975 capacitors are ailable from Authorized Miconics tributors.



Sub-miniature tubular +65°C

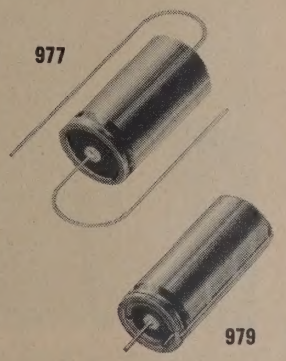
Type 984 and 985 capacitors are intended for entertainment applications. They are rated for continuous duty from −20° C to +65°C (500 hours at +85°C). Both types have high volumetric efficiency and feature all-welded construction in insulated metal cases. The 984 has axial leads while the 985 is single-ended for printed circuit applications. DCL and ESR are very low and all types have extended surge voltage ability. Capacitance range, 1-2500 μF, voltage, 3-150 WVDC. See Bulletin EL-102.



andard tubular +85°C

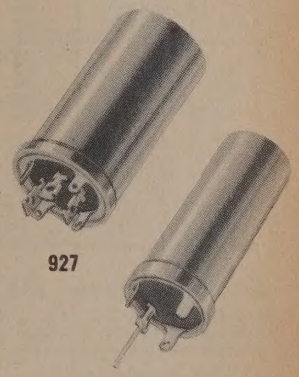
Type 977 capacitors are intended for dustrial and entertainment applica-ns and are rated for continuous op-ation from −20°C to +85°C. A wide nge of values are available from 1 to ,000 μF and 3-450 WVDC in 72 case zes. Construction is all-welded with sulated (PVC) metal cases standard. ardboard sleeves and/or mounting raps are available. For printed circuit plications, Type 979 is available with special mounting wafer. See Bulletin -111.

Type 977 capacitors are available om Authorized Miconics Distributors.



Metal case, Twist-mount +85°C

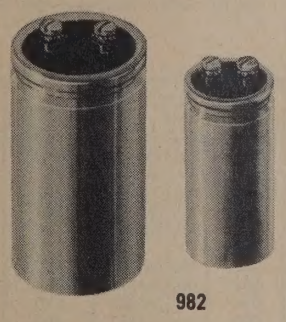
A broad range of metal case electrolytics in twist-mount, printed circuit or special mounting is available in the Type 927 series. Capacitances range from 1 to 30,000 μF and voltages from 3 to 475 WVDC. Operating temperature is −30°C to +85°C. These capacitors conform to EIA Standard RS-154B. Units are supplied in single, dual, triple or quad configuration. For details, see Bulletin EL-109.



gh-capacitance omputer Grade) +85°C

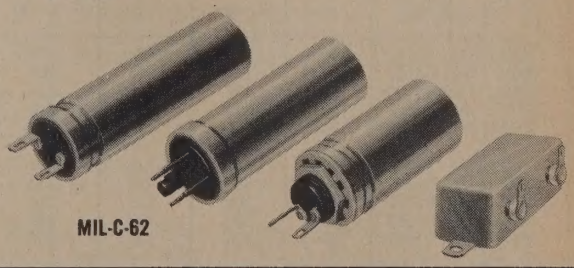
Type 982 capacitors feature very eat (up to 300,000 μF) capacitances compact insulated metal cans. Stand-d configuration is screw terminals th PVC sleeves. Mylar and acetate eeves are also available. The standard e of eight cases covers most popular plications. Other cases are available. pacitance ranges from 95μF-2,200 μF 450 WVDC, to 300,000 μF at 3 WVDC. e 982 is intended for continuous op-ation in power supply filters at tem-ratures up to +85°C. See Bulletin -107.

Type 982 capacitors are available om Authorized Miconics Distributors.



Military Grade (MIL-C-62)

General Instrument supplies capacitors to MIL-C-62 in standard metal can and "bathtub" configurations. Extreme manufacturing care is exercised to ensure adherence to specifications. For details, see Bulletin EL-108. Rated for operation from −40°C to +85°C. MIL-C-62 capacitors are available from Authorized Miconics Distributors.



"CRYSTAL-CAP"™ MYLAR* CAPACITORS (Patent applied for)

The Type 165 "Crystal-Cap" capacitor is a revolutionary new form of Mylar capacitor. The Mylar dielectric is fused into an integral unit with high purity aluminum foil to achieve unparalleled performance. Insulation resistance is extremely high with DF very low. Capacitance retrace characteristics are excellent. Terminal wires are imbedded into the sealed ends of the capacitors in a unique manner (Patent applied for) to provide a very strong bond.

The "Crystal-Cap" outperforms all typical Mylar "Wrap-and-fill" types in electrical or physical comparisons. Capacitance range, .001-.47μF, 50 to 600 WVDC. Operating temperature: −55°C to +125°C. See Bulletin FC-101.

Type 165 "Crystal-Cap" capacitors are available from Authorized Miconics Distributors.

*Mylar is an E.I. DuPont de Nemours trademark for polyester film.

LNUT ST., TAZEWELL, VA. 24651 • PHONE (703) 988-5551 • TWX: 710 938-1580

Gulton

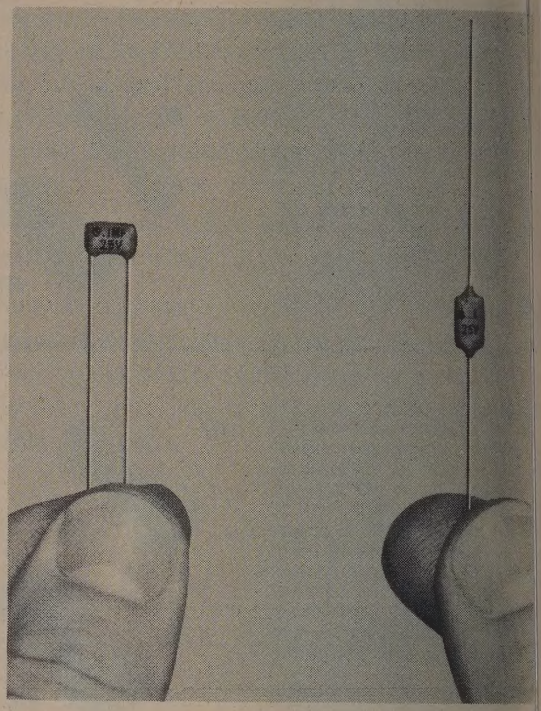
CERAMIC CAPACITORS

Subminiature ML02 and ML03 Series

WORKING VOLTAGE: 25 VDC
TEMPERATURE RANGE: -55°C to +85°C
INSULATION RESISTANCE: 2500 megohms-microfarads or 5000 megohms, whichever is less
DISSIPATION FACTOR: 4% at 1 KC and +25°C (measured at 0.5 VRMS)
TEMPERATURE CHARACTERISTICS: Maximum capacitance change -55°C to +85°C, +22%, -56% with zero applied voltage
LIFE TEST: 2 x WVDC at +85°C for 1000 hours
LEAD SIZE
Radial Leads: #24 AWG tinned copper
Axial Leads: #22 AWG tinned copper
ENCAPSULATION: Wax impregnated phenolic
MILITARY SPECIFICATIONS: Meet or exceed requirements of MIL-C-11015 (latest revision), where applicable

CAP. µf	GULTON PART NO.	L. max.	W. max.	T. max.	S. ±.030
.01	ML02N103	.300	.300	.125	.200
.015	ML02N153	.300	.300	.125	.200
.022	ML02N223	.300	.300	.125	.200
.033	ML02N333	.300	.300	.125	.200
.047	ML02N473	.300	.300	.125	.200
.068	ML02N683	.300	.300	.125	.200
.1	ML02N104	.300	.300	.125	.200
.15	ML02N154	.300	.300	.125	.200
.01	ML03N103	.390	.202	.125	.250
.015	ML03N153	.390	.202	.125	.250
.022	ML03N223	.390	.202	.125	.250
.033	ML03N333	.390	.202	.125	.250
.047	ML03N473	.390	.202	.125	.250
.068	ML03N683	.390	.202	.125	.250
.1	ML03N104	.390	.202	.125	.250
.15	ML03N154	.390	.202	.156	.250

NOTE
Tolerance: Add suffix "M" for ±20%; "Z" for -20%, +80%.
For axial leads, add suffix "A" after tolerance designation.



The two capacitor series listed are but a small segme of Gulton's total capacitor line. Special capacito such as dual inline networks are available on speci order. Gulton engineers are available to discuss yo capacitor requirements, and when necessary, to custo design units for your special application.

Subminiature ML12 and ML13 Series

WORKING VOLTAGE: 100 VDC
TEMPERATURE RANGE: -55°C to +125°C
INSULATION RESISTANCE: 2500 megohm-microfarads or 100,000 meg., whichever is less
DISSIPATION FACTOR: 2.0% at 1 KC and +25°C (at 0.5 V rms)
TEMPERATURE CHARACTERISTICS: Maximum capacitance change -55°C to +125°C, +10%, -15% with zero applied voltage
LIFE TEST: 2 x WVDC at +125°C for 1000 hours
LEAD SIZE
Radial Leads: #24 AWG tinned copper
Axial Leads: #22 AWG tinned copper
ENCAPSULATION: Wax impregnated phenolic
MILITARY SPECIFICATIONS: Meet or exceed requirements of MIL-C-11015 (latest revision), where applicable

CAP. µf	GULTON PART NO.	L. max.	W. max.	T. max.	S. ±.030
.0012	ML12M122	.300	.300	.125	.200
.0015	ML12M152	.300	.300	.125	.200
.0018	ML12M182	.300	.300	.125	.200
.0022	ML12M222	.300	.300	.125	.200
.0027	ML12M272	.300	.300	.125	.200
.0033	ML12M332	.300	.300	.125	.200
.0039	ML12M392	.300	.300	.125	.200
.0047	ML12M472	.300	.300	.125	.200
.0056	ML12M562	.300	.300	.125	.200
.0068	ML12M682	.300	.300	.125	.200
.0082	ML12M822	.300	.300	.125	.200
.01	ML12M103	.300	.300	.125	.200
.015	ML12M153	.300	.300	.125	.200
.018	ML12M183	.300	.300	.125	.200
.022	ML12M223	.300	.300	.125	.200
.027	ML12M273	.300	.300	.125	.200
.033	ML12M333	.300	.300	.125	.200
.039	ML12M393	.300	.300	.125	.200
.047	ML12M473	.300	.300	.125	.200
.056	ML12M563	.300	.300	.135	.200
.068	ML12M683	.300	.300	.135	.200
.082	ML12M823	.300	.300	.135	.200
.1	ML12M104	.300	.300	.135	.200

CAP. µf	GULTON PART NO.	L. max.	W. max.	T. max.	S. ±.030
.0012	ML13M122	.390	.202	.125	.250
.0015	ML13M152	.390	.202	.125	.250
.0018	ML13M182	.390	.202	.125	.250
.0022	ML13M222	.390	.202	.125	.250
.0027	ML13M272	.390	.202	.125	.250
.0033	ML13M332	.390	.202	.125	.250
.0039	ML13M392	.390	.202	.125	.250
.0047	ML13M472	.390	.202	.125	.250
.0056	ML13M562	.390	.202	.125	.250
.0068	ML13M682	.390	.202	.125	.250
.0082	ML13M822	.390	.202	.125	.250
.01	ML13M103	.390	.202	.125	.250
.015	ML13M153	.390	.202	.125	.250
.018	ML13M183	.390	.202	.125	.250
.022	ML13M223	.390	.202	.140	.250
.027	ML13M273	.390	.202	.140	.250
.033	ML13M333	.390	.202	.150	.250
.039	ML13M393	.390	.202	.150	.250
.047	ML13M473	.390	.202	.150	.250
.056	ML13M563	.390	.202	.170	.250
.068	ML13M683	.390	.202	.170	.250
.082	ML13M823	.390	.202	.170	.250
.1	ML13M104	.390	.202	.170	.250

NOTE: Tolerance; add suffix "M" for ±20%, "K" for ±10%. For axial leads, add suffix "A" after tolerance designation.

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DR Series

- **ULTRA STABLE**
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featuring . . .

- **Revolutionary NPO Ceramic Dielectric**
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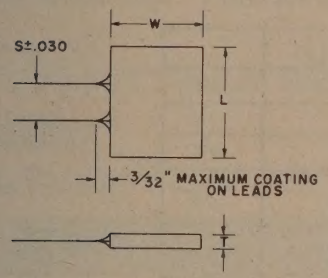

SPECIFICATIONS

WORKING VOLTAGE:	100 DC
TEMPERATURE RANGE:	-55°C to +125°C (without derating)
INSULATION RESISTANCE:	100,000 megohms at +25°C initial 1000 megohms at +125°C
DISSIPATION FACTOR:	Per MIL-C-20 (latest revision)
TEMPERATURE COEFFICIENT:	NPO ±30 ppm/°C
LIFE TEST:	2 x WVDC at +125°C for 1000 hours
LEAD SIZE:	#26 AWG tinned copper
COATING:	Dipped plastic
MILITARY SPECIFICATIONS:	Meet or exceed the requirements of MIL-C-20 (latest revision)

CAP (pf)	PART NUMBER	L max.	W max.	T max.	S
1	DR10DCG109*	.120	.120	.080	.100
1.5	DR10DCG159*	.120	.120	.080	.100
1.8	DR10DCG189*	.120	.120	.080	.100
2.2	DR10DCG229*	.120	.120	.080	.100
2.7	DR10DCG279*	.120	.120	.080	.100
3.3	DR10DCG339*	.120	.120	.080	.100
3.9	DR10DCG399*	.120	.120	.080	.100
4.3	DR10DCG439*	.120	.120	.080	.100
5.6	DR10DCG569*	.120	.120	.080	.100
6.8	DR10DCG689*	.120	.120	.080	.100
7.5	DR10DCG759*	.120	.120	.080	.100
8.2	DR10DCG829*	.120	.120	.080	.100
9.1	DR10DCG919*	.120	.120	.080	.100
10	DR10DCG100*	.120	.120	.080	.100
12	DR10DCG120*	.120	.120	.080	.100
15	DR10DCG150*	.120	.120	.080	.100
18	DR20DCG180*	.125	.125	.080	.100
20	DR20DCG200*	.125	.125	.080	.100
22	DR20DCG220*	.130	.130	.080	.100
24	DR20DCG240*	.135	.135	.080	.100
27	DR20DCG270*	.140	.140	.080	.100
30	DR20DCG300*	.145	.145	.080	.100
33	DR20DCG330*	.150	.150	.080	.100
36	DR30DCG360*	.155	.155	.080	.100
39	DR30DCG390*	.160	.160	.080	.100

CAP (pf)	PART NUMBER	L max.	W max.	T max.	S
43	DR30DCG430*	.165	.165	.080	.100
47	DR30DCG470*	.170	.170	.080	.100
51	DR30DCG510*	.185	.185	.080	.100
56	DR30DCG560*	.190	.190	.080	.100
62	DR30DCG620*	.195	.195	.080	.100
68	DR40DCG680*	.205	.205	.080	.100
75	DR40DCG750*	.215	.215	.080	.100
82	DR40DCG820*	.225	.225	.080	.100
91	DR40DCG910*	.230	.230	.080	.100
100	DR40DCG101*	.235	.235	.080	.100
110	DR40DCG111*	.245	.245	.080	.100
120	DR50DCG121*	.255	.255	.080	.100
130	DR50DCG131*	.265	.265	.100	.200
150	DR50DCG151*	.280	.280	.100	.200
160	DR50DCG161*	.285	.285	.100	.200
180	DR50DCG181*	.300	.300	.100	.200
200	DR60DCG201*	.315	.315	.100	.200
220	DR60DCG221*	.330	.330	.100	.200
240	DR60DCG241*	.340	.340	.100	.200
270	DR60DCG271*	.360	.360	.100	.200
300	DR60DCG301*	.375	.375	.125	.200
330	DR60DCG331*	.390	.390	.125	.200
360	DR70DCG361*	.405	.405	.125	.200
390	DR70DCG391*	.420	.420	.125	.200
470	DR70DCG471*	.455	.455	.125	.200

*Add appropriate letter to designate tolerance as follows: Less than 10 pf; C = ±0.25 pf, D = ±0.5 pf; 10 pf and above; J = ±5%, K = ±10%, M = ±20%

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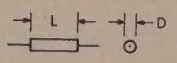
CERAMIC CAPACITORS

CT10, CT14, CK05, CK06 Series

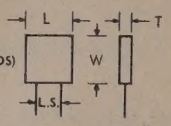
A NEW NPO CERAMIC CAPACITOR

featuring significantly increased volumetric efficiency

CT STYLE: (AXIAL LEADS)



CK STYLE: (RADIAL LEADS)



Dimensional Tolerances: D, L, W, and T ±.010
Lead Spacing (L.S.) ±.015

SPECIFICATIONS

TEMPERATURE RANGE:	-55°C to +125°C
TEMPERATURE COEFFICIENT:	< 30 ppm/°C from -55 to +1 °C
DISSIPATION FACTOR:	0.1% at 1 VAC, 1 MHz
INSULATION RESISTANCE:	1000 megohms - microfarads it need not exceed 100,000 me ohms at +25°C
FLASH TEST VOLTAGE:	3 times WVDC
LIFE TEST:	2 times WVDC at +125 °C for 1000 hours
LEAD SIZE:	#22 AWG
CAPACITANCE TOLERANCE:	F, G, J, and K
MILITARY SPECIFICATIONS:	Will meet or exceed latest revision MIL-C-20
ENCAPSULATION:	Epoxy molded case

D	.090			
L	.250	.190		
W		.190		
T		.090		
Lead Spacing		.100		
Style and Size Code	CT10		CK05	
Capacitance Value	WVDC 50	WVDC 100	WVDC 50	WVDC 100
10 pF				
12				
15				
18				
22				
24				
27				
30				
33				
36				
39				
43				
47				
51				
56				
62				
68				
75				
82				
91				
100				
110				
120				
130				
150				
160				
180				
200				
220				
240				
270				
300				
330				
360				
390				

D	.090		.130	
L	.250	.190	.390	.290
W		.190		.290
T		.090		.090
Lead Spacing		.100		.200
Style and Size Code	CT10	CK05	CT14	CK06
Capacitance Value	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100
430 pF				
470				
510				
560				
620				
680				
750				
820				
910				
1000				
1200				
1500				
1800				
2000				
2200				
2400				
2700				
3000				
3300				
3600				
3900				
4300				
4700				
5100				
5600				
6200				
6800				
7500				
8200				
9100				
.010 µF				
.012				
.015				
.018				
.020				

HOW TO ORDER NUMBERING CODE

Typical

1. CK06
2. B
3. CG
4. 153
5. J
6. 1

Code

1. Style/Size: CT10, CT1 CK05, CK6
2. WVDC: 50 V - 100 V -
3. Dielectric: CG
4. Capacitance: EIA Code
5. Tolerance: ± 1% - ± 2% - ± 5% - ±10% - 1
6. Lead Type: Tinned Copper - blank; Gold Dumet -; Nickel Lead - 2

Gulton Industries, Inc. Microceramics Division
Metuchen, New Jersey 08840
Phone: 201-548-2800 • TWX-710-998-059

GUDEMAN a division of Gulton Industries, Inc.
, HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-3863

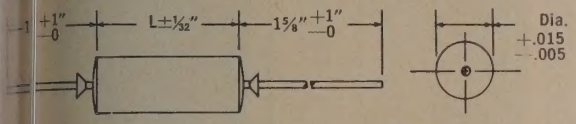
ature polycarbonate-foil dielectric

401

ICALLY SEALED (GLASS-TO-METAL)
R METALLIC CASES
TO +125°C WITHOUT DERATING
THRU 600 VDC

e drawing

leads consist of solid, bare, tinned wire. Special nickel leads are for applications requiring a high degree of weldability.



4 gauge: .175 and .195 Dia.; 22 gauge: .235 and .312 Dia.; 20 gauge: and larger case sizes.
ing add .020 max. to Dia. and 1/16 to nominal case length.

ications

NCE AND TOLERANCE
citance limits at +25°C are determined by the specified tolerance. s are measured at or referred to a frequency of 1000 cps.

ION FACTOR
.15% at 1000 cps. at +25°C.

ON RESISTANCE
ging potential is equal to the specified operating voltage for a given ure. The minimum electrification time is two minutes. Listed below mum values:

ature	Nominal Capacitance Mfd.	R X C Megohms X mfd.	R Megohms
5°C	Greater than .5	50,000	
	Smaller than .5		100,000
5°C	Greater than .5	5,000	
	Smaller than .5		10,000
5°C	Greater than .5	500	
	Smaller than .5		1,000

LTAGE
thstand a DC voltage equal to 200% of the rated voltage for one t a temperature of +25°C, ±5°C.

ATED LIFE TEST
thstand an accelerated life test of 250 hours with 140% of applied tage at applicable high test temperature. Only one failure in 12 s tested shall be allowed. A failure is defined as the following:
he capacitor has a short or open circuit.
the capacitance has changed more than 5% from its original value.
he insulation resistance is less than 50% of the specified value above.
the DF is greater than 20% of its initial specified value.

TURE AND IMMERSION CYCLING
et all requirements of the applicable paragraph of the latest issue -19978.

E RESISTANCE
to meet all requirements of the applicable paragraph of the latest MIL-C-19978.

ON
to withstand the Grade 3 vibration tests of the applicable paragraph test issue of MIL-C19978.

TAGE RATING:
°C to +85°C Ambient)

D-C Voltage Rating	400 cps
100	65
200	120
300	200
400	240
600	250

LL TEST
thstand a steady pull force of 5 lbs. applied axially to a capacitor one minute.

NDING TEST
ds shall withstand without breakage the following stresses performed point of egress: bend 90 degrees in one direction, then back to the position and 90 degrees in the opposite direction.

ANCE CHANGE WITH TEMPERATURE
nge of capacitance with reference to the actual value at +25°C does ed the following limits.

TEMPERATURE	CHANGE OF CAPACITANCE
−55°C to +125°C	2%

100 V.D.C.

Part No.	Capacitance Mfd.	Diameter Inches	Length Inches
F401B102	.001	.195	3/4
F401B122	.0012	.195	3/4
F401B152	.0015	.195	3/4
F401B182	.0018	.195	3/4
F401B222	.0022	.195	3/4
F401B272	.0027	.195	3/4
F401B332	.0033	.195	3/4
F401B392	.0039	.195	3/4
F401B472	.0047	.195	3/4
F401B562	.0056	.235	3/4
F401B682	.0068	.235	3/4
F401B822	.0082	.312	7/8
F401B103	.01	.312	7/8
F401B123	.012	.312	7/8
F401B153	.015	.312	7/8
F401B183	.018	.312	7/8
F401B223	.022	.312	7/8
F401B273	.027	.312	7/8
F401B333	.033	.312	7/8
F401B393	.039	.400	7/8
F401B473	.047	.400	7/8
F401B563	.056	.400	7/8
F401B683	.068	.400	7/8
F401B823	.082	.400	7/8
F401B104	0.1	.400	7/8
F401B124	.12	.400	1.0
F401B154	.15	.400	1.0
F401B185	.18	.400	1 1/4
F401B224	.22	.400	1 1/4
F401B274	.27	.500	1 1/8
F401B334	.33	.500	1 1/8
F401B394	.39	.562	1 1/4
F401B474	.47	.562	1 1/4
F401B564	.56	.562	1 5/8
F401B684	.68	.562	1 5/8
F401B824	.82	.670	1 5/8
F401B105	1.00	.670	1 5/8

200 V.D.C.

Part No.	Capacitance Mfd.	Diameter Inches	Length Inches
F401C102	.001	.195	3/4
F401C122	.0012	.195	3/4
F401C152	.0015	.195	3/4
F401C182	.0018	.195	3/4
F401C222	.0022	.195	3/4
F401C272	.0027	.235	3/4
F401C332	.0033	.235	3/4
F401C392	.0039	.312	7/8
F401C472	.0047	.312	7/8
F401C562	.0056	.312	7/8
F401C682	.0068	.312	7/8
F401C822	.0082	.312	7/8
F401C103	.01	.312	7/8
F401C123	.012	.312	7/8
F401C153	.015	.312	7/8
F401C183	.018	.400	7/8
F401C223	.022	.400	7/8
F401C273	.027	.400	7/8
F401C333	.033	.400	7/8
F401C393	.039	.400	7/8
F401C473	.047	.400	7/8
F401C563	.056	.400	1.0
F401C683	.068	.400	1.0
F401C823	.082	.400	1 1/4
F401C104	.01	.400	1 1/4
F401C124	.12	.500	1 1/8
F401C154	.15	.500	1 1/8
F401C184	.18	.562	1 1/4
F401C224	.22	.562	1 1/4
F401C274	.27	.562	1 5/8
F401C334	.33	.562	1 5/8
F401C394	.39	.670	1 5/8
F401C474	.47	.670	1 5/8
F401C564	.56	.750	1 3/4
F401C684	.68	.750	1 3/4
F401C824	.82	.750	2 1/4
F401C105	1.0	.750	2 1/4

400 V.D.C.

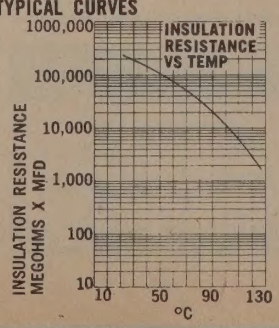
Part No.	Capacitance Mfd.	Diameter Inches	±.032 Length Inches
F401E102	.001	.235	3/4
F401E122	.0012	.235	3/4
F401E152	.0015	.235	3/4
F401E182	.0018	.235	3/4
F401E222	.0022	.235	3/4
F401E272	.0027	.312	7/8
F401E332	.0033	.312	7/8
F401E392	.0039	.312	7/8
F401E472	.0047	.312	7/8
F401E562	.0056	.312	7/8
F401E682	.0068	.312	7/8
F401E822	.0082	.312	7/8
F401E103	.01	.312	7/8
F401E123	.012	.400	7/8
F401E153	.015	.400	7/8
F401E183	.018	.400	1.0
F401E223	.022	.400	1.0
F401E273	.027	.400	1 1/4
F401E333	.033	.400	1 1/4
F401E393	.039	.400	1 3/8
F401E473	.047	.400	1 3/8
F401E563	.056	.562	1 1/8
F401E683	.068	.562	1 1/8
F401E823	.082	.562	1 3/8
F401E104	0.1	.562	1 3/8
F401E124	.12	.562	1 3/4
F401E154	.15	.562	1 3/4
F401E184	.18	.670	1 7/8
F401E224	.22	.670	1 7/8
F401E274	.27	.750	1 7/8
F401E334	.33	.750	1 7/8
F401E394	.39	.750	2 3/8
F401E474	.47	.750	2 3/8
F401E564	.56	1.00	2 1/8
F401E684	.68	1.00	2 1/8

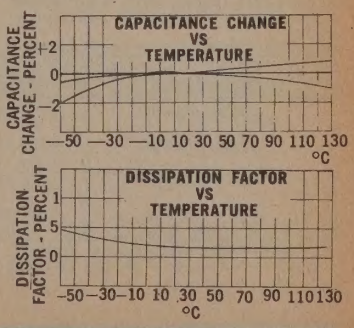
600 V.D.C.

Part No.	Capacitance Mfd.	Diameter Inches	±.032 Length Inches
F401F102	.001	.312	7/8
F401F122	.0012	.312	7/8
F401F152	.0015	.312	7/8
F401F182	.0018	.312	7/8
F401F222	.0022	.312	7/8
F401F272	.0027	.400	7/8
F401F332	.0033	.400	7/8
F401F392	.0039	.400	7/8
F401F472	.0047	.400	7/8
F401F562	.0056	.400	7/8
F401F682	.0068	.400	7/8
F401F822	.0082	.400	7/8
F401F103	.01	.400	7/8
F401F123	.012	.400	1.0
F401F153	.015	.400	1.0
F401F183	.018	.400	1 1/8
F401F223	.022	.400	1 1/8
F401F273	.027	.400	1 3/8
F401F333	.033	.400	1 3/8
F401F393	.039	.562	1 1/8
F401F473	.047	.562	1 1/8
F401F563	.056	.562	1 3/8
F401F683	.068	.562	1 3/8
F401F823	.082	.670	1 5/8
F401F104	0.1	.670	1 5/8
F401F124	.12	.670	1 7/8
F401F154	.15	.670	1 7/8
F401F184	.18	.750	1 7/8
F401F224	.22	.750	1 7/8
F401F274	.27	1.00	1 5/8
F401F334	.33	1.00	1 5/8
F401F394	.39	1.00	2 1/8
F401F474	.47	1.00	2 1/8
F401F564	.56	1.00	2 1/2
F401F684	.68	1.00	2 1/2

"F" indicates "Floating." Substitute "G" for "Grounded." Add following to Part No. for Tolerance: —20 = ±20%; —10 = ±10%; —5 = ±5%.

TYPICAL CURVES





GUDEMAN a division of Gulton Industries, Inc
340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-86

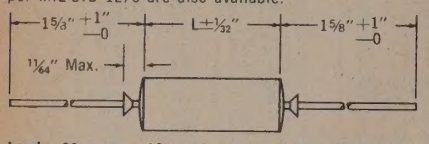
balanced polycarbonate film-foil dielectric

series 466

HERMETICALLY SEALED (GLASS-TO-METAL)
MINIATURE METAL CASE
—55°C TO +125°C WITHOUT DERATING
100 VDC THRU 600 VDC

outline drawing

Standard leads consist of solid, bare, tinned wire. Nickel or gold plated leads per MIL-STD 1276 are also available.



Leads: 22 gauge: .235 and .312 Dia.; 20 gauge: .400 and larger
For sleeving add .032 to dia. and 1/16 to the nominal case length.

specifications

CAPACITANCE AND TOLERANCE
The capacitance limits at +25°C are determined by the specified tolerance. Capacitors are measured or referred to a frequency of 1000 CPS.

DISSIPATION FACTOR
Less than .3% from +25°C to +125°C at 1000 CPS.

INSULATION RESISTANCE
The charging potential is equal to the specified operating voltage for a given temperature. The electrification time is two minutes. Minimum values are:

Temperature	Nominal Capacitance MFD	R X C Megohms X MFD	R Megohms
+25°C	Greater than .5	25,000	
	Smaller than .5		50,000
+125°C	Greater than .5	200	
	Smaller than .5		500

TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25°C.

ACCELERATED LIFE TEST
Shall withstand an accelerated life test of 1000 hours with 140% of applied rated voltage at +125°C with one failure allowed in 18 capacitors tested. A failure is defined as:
A. If the capacitor has a short or open circuit
B. If the capacitance has changed more than 1.5% from its original measured value
C. If the insulation resistance is less than 50% of the specified value at +25°C
D. If the DF is greater than .5% at +25°C

TEMPERATURE AND IMMERSION CYCLING
Meets the requirements of the applicable paragraph of MIL-C-19978.

MOISTURE RESISTANCE
Meets the requirements of the applicable paragraph of MIL-C-19978.

VIBRATION
Shall withstand Grade 3 vibration tests of the applicable paragraph of MIL-C-19978.

AC VOLTAGE RATING (—55°C to +105°C Ambient)

DV VOLTAGE RATING	AC VOLTAGE RATING @400 CPS
100	70
200	140
400	240
600	330

LEAD PULL TEST
Shall withstand a steady pull force of 5 lbs. applied axially for one minute.

LEAD BENDING TEST
The leads shall withstand without breakage the following stresses performed near the point of egress: bend 90 degrees in one direction, then back to the original position and 90 degrees in the opposite direction.

CAPACITANCE CHANGE WITH TEMPERATURE
Values below are guaranteed performance. Typical values are lower than those stated.

Rated Voltage	Temperature	Maximum Capacitance Change*
100VDC - 200VDC	+25°C to +125°C	+ .5 % — .75%
100VDC - 200VDC	+25°C to —55°C	— .25% —1.5 %
400VDC - 600VDC	+25°C to +125°C	+1.5 % — .75%
400VDC - 600VDC	+25°C to — 55°C	—1.0 % —1.5 %

*For capacitance values greater than .01 mfd. Values of .01 mfd. and less exhibit same change as 400-600 VDC units.

100 VOLTS D.C.

Capacitance Mfd.	Part No.	Diameter Inches	Length Inches
.001	F466B102	.235	¾
.0012	F466B122	.235	¾
.0015	F466B152	.235	¾
.0018	F466B182	.235	¾
.0022	F466B222	.235	¾
.0027	F466B272	.235	¾
.0033	F466B332	.235	¾
.0039	F466B392	.235	¾
.0047	F466B472	.235	¾
.0056	F466B562	.235	¾
.0068	F466B682	.235	¾
.0082	F466B822	.312	⅞
.01	F466B103	.312	⅞
.012	F466B123	.312	⅞
.015	F466B153	.312	⅞
.018	F466B183	.312	⅞
.022	F466B223	.312	⅞
.027	F466B273	.312	⅞
.033	F466B333	.312	⅞
.039	F466B393	.312	⅞
.047	F466B473	.400	⅞
.056	F466B563	.400	⅞
.068	F466B683	.400	⅞
.082	F466B823	.400	1⅛
.10	F466B104	.400	1⅛
.12	F466B124	.400	1⅜
.15	F466B154	.400	1⅜
.18	F466B184	.562	1⅛
.22	F466B224	.562	1⅛
.27	F466B274	.562	1⅜
.33	F466B334	.562	1⅜
.39	F466B394	.562	1⅝
.47	F466B474	.562	1⅝
.56	F466B564	.670	1⅝
.68	F466B684	.670	1⅝
.82	F466B824	.750	1⅞
1.0	F466B105	.750	1⅞

200 VOLTS D.C.

Capacitance Mfd.	Part No.	Diameter Inches	Length Inches
.001	F466C102	.235	¾
.0012	F466C122	.235	¾
.0015	F466C152	.235	¾
.0018	F466C182	.235	¾
.0022	F466C222	.235	¾
.0027	F466C272	.235	¾
.0033	F466C332	.235	¾
.0039	F466C392	.235	¾
.0047	F466C472	.235	¾
.0056	F466C562	.312	⅞
.0068	F466C682	.312	⅞
.0082	F466C822	.312	⅞
.01	F466C103	.312	⅞
.012	F466C123	.312	⅞
.015	F466C153	.312	⅞
.018	F466C183	.312	⅞
.022	F466C223	.312	⅞
.027	F466C273	.400	⅞
.033	F466C333	.400	⅞
.039	F466C393	.400	⅞
.047	F466C473	.400	1⅛
.056	F466C563	.400	1⅛
.068	F466C683	.400	1⅛
.082	F466C823	.400	1⅜
.10	F466C104	.400	1⅜
.12	F466C124	.562	1⅛
.15	F466C154	.562	1⅛
.18	F466C184	.562	1⅜
.22	F466C224	.562	1⅜
.27	F466C274	.562	⅞
.33	F466C334	.562	⅞
.39	F466C394	.670	1⅜
.47	F466C474	.670	1⅜
.56	F466C564	.750	1⅛
.68	F466C684	.750	1⅛
.82	F466C824	1.0	1⅛
1.0	F466C105	1.0	1⅛

400 VOLTS D.C.

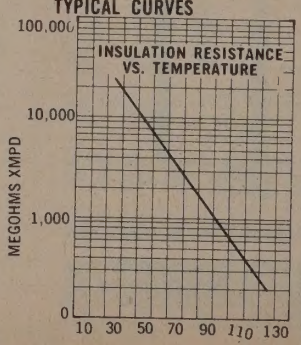
.001	F466E102	.235	¾
.0012	F466E122	.235	¾
.0015	F466E152	.235	¾
.0018	F466E182	.235	¾
.0022	F466E222	.235	¾
.0027	F466E272	.235	¾
.0033	F466E332	.235	¾
.0039	F466E392	.312	⅞
.0047	F466E472	.312	⅞
.0056	F466E562	.312	⅞
.0068	F466E682	.312	⅞
.0082	F466E822	.312	⅞
.01	F466E103	.400	⅞
.012	F466E123	.400	⅞
.015	F466E153	.400	⅞
.018	F466E183	.400	⅞
.022	F466E223	.400	1⅛
.027	F466E273	.400	1⅛
.033	F466E333	.400	1⅜
.039	F466E393	.400	1⅜
.047	F466E473	.400	1⅜
.056	F466E563	.562	1⅛
.068	F466E683	.562	1⅛
.082	F466E823	.562	1⅜
.10	F466E104	.562	1⅜
.12	F466E124	.670	1⅝
.15	F466E154	.670	1⅝
.18	F466E184	.670	1⅞
.22	F466E224	.670	1⅞
.27	F466E274	.750	2⅛
.33	F466E334	.750	2⅛
.39	F466E394	1.0	2⅛
.47	F466E474	1.0	2⅛
.56	F466E564	1.0	2⅛
.68	F466E684	1.0	2⅛
.82	F466E824	1.0	2⅝

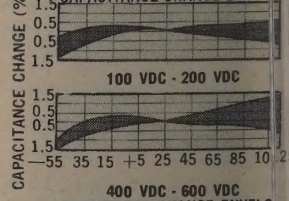
600 VOLTS D.C.

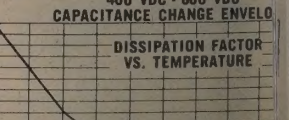
.001	F466F102	.312	¾
.0012	F466F122	.312	¾
.0015	F466F152	.312	¾
.0018	F466F182	.312	¾
.0022	F466F222	.312	⅞
.0027	F466F272	.312	⅞
.0033	F466F332	.312	⅞
.0039	F466F392	.400	⅞
.0047	F466F472	.400	⅞
.0056	F466F562	.400	⅞
.0068	F466F682	.400	⅞
.0082	F466F822	.400	⅞
.01	F466F103	.400	
.012	F466F123	.400	
.015	F466F153	.400	
.018	F466F183	.400	
.022	F466F223	.400	
.027	F466F273	.500	
.033	F466F333	.500	
.039	F466F393	.562	
.047	F466F473	.562	
.056	F466F563	.562	
.068	F466F683	.562	
.082	F466F823	.670	
.10	F466F104	.670	
.12	F466F124	.670	
.15	F466F154	.670	
.18	F466F184	.750	
.22	F466F224	.750	
.27	F466F274	1	
.33	F466F334	1	
.39	F466F394	1	
.47	F466F474	1.0	
.56	F466F564	1.0	

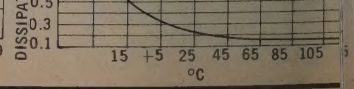
"F" indicates "floating", for grounded substitute "G"
Add following to Part No. for tolerance: —20 = ±20%; —10 = ±10%
—5 = ±5%

TYPICAL CURVES









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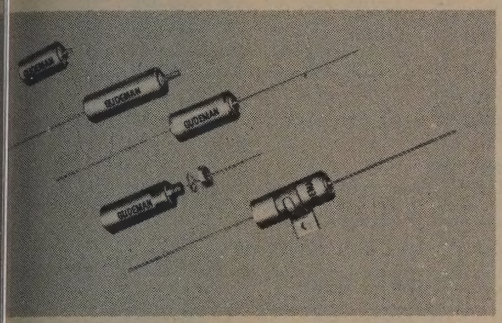
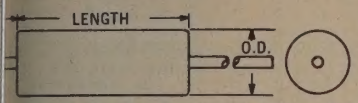
plastic film dielectric

XC203 & XC204—

ICALLY SEALED (GLASS-TO-METAL)
R CASED
TO +165° WITHOUT DERATING
ED FOIL CONSTRUCTION
THRU 600 VDC



e drawing



Leads:
Ga.
24 .187 Dia.
22 .235 to .312
20 .400 and larger

ns shown are for uninsulated types. When insulating sleeving is quir the diameter shall be increased by a maximum of .04" and the ngth all be increased by 1/8" ± 1/32".
means of lead wires is not recommended for units larger than 62 x 1/4" Lg.

ications

ION RESISTANCE

imum insulation resistance when measured with an applied of 100 volts and an electrification time of two minutes shall llows:

—75,000 megohm-mfds. minimum, but need not exceed 200,- megohms

—4000 megohm-mfds. minimum, but need not exceed 8000 gohms.

C—250 megohm-mfds. minimum, but need not exceed 500 gohms.

C—50 megohm-mfds. minimum, but need not exceed 100 gohms.

The above IR characteristics are very conservative and it can rally expected that they will be much higher than specified. eman engineering dept. believes that in introducing a new line citors a conservative view point be maintained, thereby prof- component which will offer the greatest degree of reliability.

FACTOR

er factor of these capacitors shall be no greater than .5 per- en measured at 1000 cps at 25°C.

ATED LIFE TEST

apacitors shall withstand an accelerated life test of 250 hours C with an applied voltage of 140 percent of rated voltage on t exceeding .05 watt seconds.

ure in 12 samples permitted.

LTAGE

apacitors shall withstand a DC voltage equal to 200 percent ated voltage for one minute at a temperature of 25°C.

RE RESISTANCE AND VIBRATION

apacitors shall meet the requirements for Moisture Resistance ation of Specification MIL-C-25A.

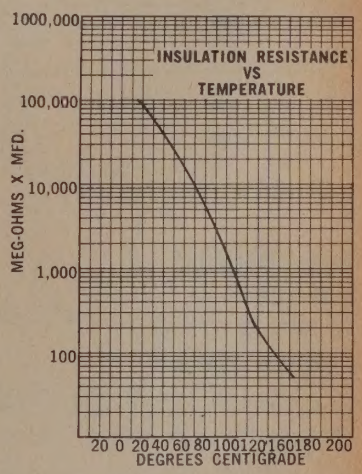
ANCE CHANGE

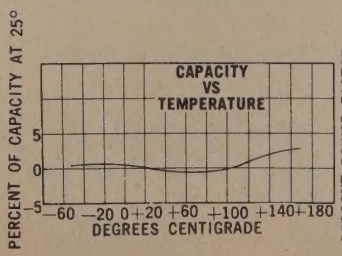
acitance change shall not be greater than —2 percent to +6 from —65°C to +165°C when compared to the nominal value d at +25°C.

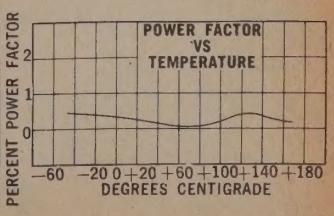
Part No.	Voltage WVDC	CAP. Mfd.	Circuit 203 L.± 1/32	Circuit 203 D.±.015	Circuit 204 L.± 1/32	Circuit 204 D.±.015
XC204C102-	200	.001	11/16	.187	3/4	.187
XC204C152-	200	.0015	11/16	.187	3/4	.187
XC204C222-	200	.0022	13/16	.235	7/8	.235
XC204C332-	200	.0033	13/16	.235	7/8	.235
XC204C472-	200	.0047	13/16	.235	7/8	.235
XC204C682-	200	.0068	13/16	.312	7/8	.312
XC204C103-	200	.010	13/16	.312	7/8	.312
XC204C153-	200	.015	15/16	.312	1	.312
XC204C223-	200	.022	13/16	.400	7/8	.400
XC204C333-	200	.033	13/16	.400	1	.400
XC204C473-	200	.047	1 1/16	.400	1 1/8	.400
XC204C683-	200	.068	1 5/16	.400	1 3/8	.400
XC204C104-	200	.10	1 1/16	.562	1 1/8	.562
XC204C154-	200	.15	1 5/16	.562	1 3/8	.562
XC204C224-	200	.22	1 9/16	.562	1 5/8	.562
XC204C334-	200	.33	1 11/16	.670	1 3/4	.670
XC204C474-	200	.47	1 13/16	.750	1 7/8	.750
XC204E102-	400	.001	13/16	.235	7/8	.235
XC204E152-	400	.0015	13/16	.235	7/8	.235
XC204E222-	400	.0022	13/16	.235	7/8	.235
XC204E332-	400	.0033	13/16	.312	7/8	.312
XC204E472-	400	.0047	13/16	.312	7/8	.312
XC204E682-	400	.0068	15/16	.312	1	.312
XC204E103-	400	.010	13/16	.400	7/8	.400
XC204E153-	400	.015	13/16	.400	7/8	.400
XC204E223-	400	.022	1 1/16	.400	1 1/8	.400
XC204E333-	400	.033	1 5/16	.400	1 3/8	.400
XC204E473-	400	.047	1 1/16	.562	1 1/8	.562
XC204E683-	400	.068	1 3/16	.562	1 1/4	.562
XC204E104-	400	.10	1 9/16	.562	1 5/8	.562
XC204E154-	400	.15	1 3/16	.670	1 5/8	.670
XC204E224-	400	.22	1 11/16	.750	1 3/4	.750
XC204E334-	400	.33	2 3/16	.750	2 1/4	.750
XC204F102-	600	.001	13/16	.235	7/8	.235
XC204F152-	600	.0015	13/16	.235	1	.235
XC204F222-	600	.0022	13/16	.312	7/8	.312
XC204F332-	600	.0033	13/16	.312	7/8	.312
XC204F472-	600	.0047	15/16	.312	1	.312
XC204F682-	600	.0068	13/16	.400	7/8	.400
XC204F103-	600	.010	15/16	.400	1	.400
XC204F153-	600	.015	1 1/16	.400	1 1/8	.400
XC204F223-	600	.022	1 7/16	.400	1 1/2	.400
XC204F333-	600	.033	1 3/16	.562	1 1/4	.562
XC204F473-	600	.047	1 5/16	.562	1 3/8	.562
XC204F683-	600	.068	1 7/16	.670	1 1/2	.670
XC204F104-	600	.10	1 13/16	.670	1 7/8	.670
XC204F154-	600	.15	1 13/16	.750	1 7/8	.750

"204" indicates "floating." Substitute "203" for "Grounded."
Add following to Part No. for tolerance: —20 = ±20% (Std.); —10 = ±10%; —5 = ±5%.

TYPICAL CURVES







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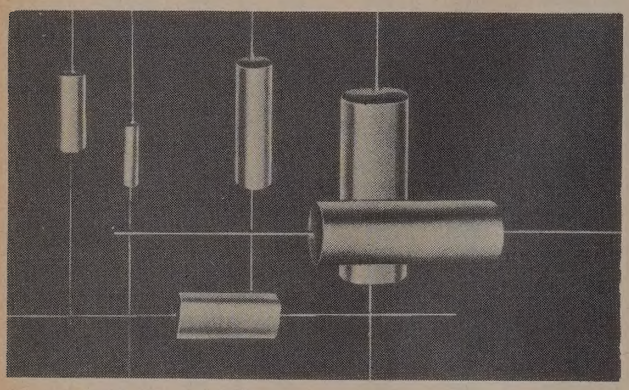
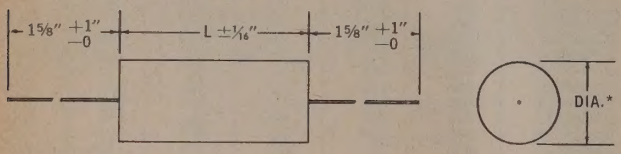
miniature "mylar"* dielectric

series 338 & 355

SEALED IN NON-METALLIC CASES with PLASTIC RESIN END SEALS
—55°C TO +125°C WITHOUT DERATING
50 VDC TO 600 VDC
FLAT (series 338) AND TUBULAR (series 355)

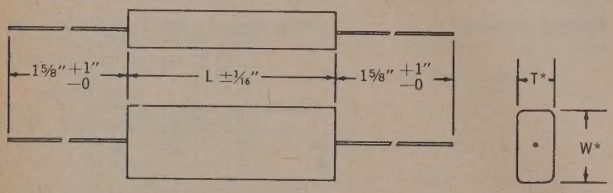


series 355 case outline



* UNDER .250" DIA. ±.031"
.250" THRU .499" DIA. ±.046"
.500" DIA. & OVER ±.062"

series 338 case outline



* UNDER .250" ±.031"
.250" THRU .499" ±.046"
.500" & OVER ±.062"

specifications

DISSIPATION FACTOR

Less than 1.0% when measured at or referred to a frequency of 1000 CPS at +25°C, per MIL-C-25C.

INSULATION RESISTANCE

The minimum insulation resistance when measured with an applied potential of 50 to 500 volts, but not to exceed the rated voltage, shall be as follows:

At + 25°C 50,000 megohm-mfds minimum but need not exceed 150,000 megohms.
At + 85°C 1000 megohm-mfds minimum but need not exceed 6000 ohms.
At + 125°C 50 megohm-mfds minimum but need not exceed 300 megohms.

TEST VOLTAGE

Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25°C, ±5°C.

ACCELERATED LIFE TEST

Shall withstand an accelerated life test of 250 hours with 140% of the voltage rating, applied at the applicable high ambient temperature, per MIL-C-25C.

The 355, and 338 series capacitors are furnished with high strength leads coated with a solderable alloy in the sizes shown below:

355 SERIES	GAUGE	338 SERIES
Up to .156 Dia.	#24 AWG	"T" Dim. up to .156
.156 Dia. to .375 Dia.	#22 AWG	"T" Dim. .156 to .375
.375 to .750 Dia.	#20 AWG	"T" Dim. .375 to .750
Greater than .750 Dia.	#18 AWG	"T" Dim. Over .750

MOISTURE RESISTANCE

Shall withstand the moisture resistance requirements as specified in military specification MIL-C-25C.

VIBRATION-ACCELERATION

Shall withstand the Grade 3 vibration-acceleration requirements of MIL-C-25C.

VOLTAGE RATINGS

Designed to operate over the temperature range of —55°C to +85°C at full rated DC voltage and up to +125°C with working voltages as follows:

+85°C	+125°C
600 VDC	300 VDC
400 VDC	200 VDC
200 VDC	150 VDC
150 VDC	100 VDC
50 VDC	50 VDC

LEAD PULL TEST

Shall withstand a five (5) pound pull applied axially for one minute per MIL-C-25C.

LEAD BEND TEST

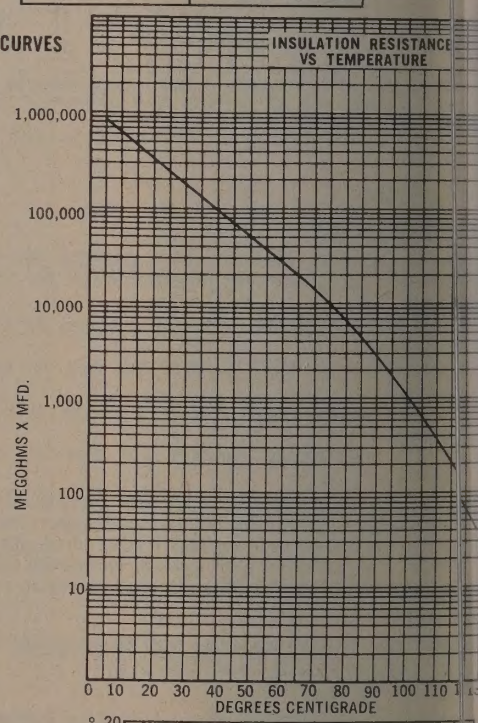
Shall be bent without breakage about the point of egress from the capacitor. First 90 degrees in one direction then back to the original position, and then 90 degrees in the opposite direction, per MIL-C-25C.

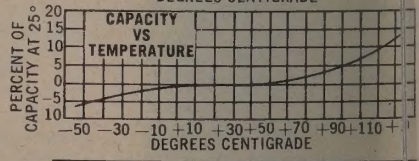
CAPACITANCE CHANGE WITH TEMPERATURE

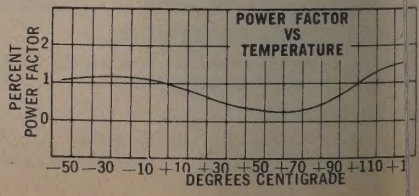
The capacitance change shall not exceed the following values with reference to the +25°C capacitance value:

TEMPERATURE	% CAP. CHANGE
— 55°C	—10% Maximum
+ 85°C	+ 5% Maximum
+125°C	+16% Maximum

TYPICAL CURVES







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355

50 VDC.			150 VDC.			200 VDC.			400 VDC.			600 VDC.		
Part No.	Dia.	L.	Part No.	Dia.	L.	Part No.	Dia.	L.	Part No.	Dia.	L.	Part No.	Dia.	L.
			355Y102	.156"	½"	355C102	.156"	½"	355E102	.156"	⅝"	355F102	.156"	11/16"
			355Y152	.156"	½"	355C152	.156"	½"	355E152	.156"	⅝"	355F152	.171"	11/16"
			355Y222	.156"	½"	355C222	.156"	½"	355E222	.156"	⅝"	355F222	.187"	11/16"
			355Y332	.156"	½"	355C332	.156"	½"	355E332	.156"	⅝"	355F332	.218"	11/16"
			355Y472	.156"	½"	355C472	.156"	½"	355E472	.156"	11/16"	355F472	.218"	¾"
			355Y682	.156"	½"	355C682	.156"	½"	355E682	.171"	11/16"	355F682	.250"	¾"
			355Y822	.156"	½"	355C822	.156"	½"	355E822	.187"	11/16"	355F822	.265"	¾"
			355Y103	.156"	½"	355C103	.171"	½"	355E103	.203"	11/16"	355F103	.281"	¾"
			355Y123	.171"	½"	355C123	.187"	½"	355E123	.218"	11/16"	355F123	.281"	13/16"
			355Y153	.187"	½"	355C153	.203"	½"	355E153	.234"	11/16"	355F153	.312"	13/16"
			355Y183	.187"	9/16"	355C183	.203"	11/16"	355E183	.250"	11/16"	355F183	.328"	13/16"
			355Y223	.203"	9/16"	355C223	.218"	11/16"	355E223	.265"	11/16"	355F223	.359"	13/16"
			355Y273	.203"	11/16"	355C273	.218"	11/16"	355E273	.250"	13/16"	355F273	.328"	1 1/16"
			355Y333	.203"	11/16"	355C333	.250"	11/16"	355E333	.281"	13/16"	355F333	.375"	1 1/16"
			355Y393	.234"	11/16"	355C393	.281"	11/16"	355E393	.296"	13/16"	355F393	.390"	1 1/16"
			355Y473	.234"	11/16"	355C473	.250"	13/16"	355E473	.328"	13/16"	355F473	.421"	1 1/16"
			355Y563	.234"	13/16"	355C563	.281"	13/16"	355E563	.296"	1 1/16"	355F563	.453"	1 1/16"
			355Y683	.250"	13/16"	355C683	.312"	13/16"	355E683	.328"	1 1/16"	355F683	.453"	1 3/16"
			355Y823	.265"	13/16"	355C823	.328"	13/16"	355E823	.343"	1 1/16"	355F823	.484"	1 3/16"
355A104	.250"	13/16"	355Y104	.296"	13/16"	355C104	.359"	13/16"	355E104	.375"	1 1/16"	355F104	.453"	1 7/16"
355A124	.265"	13/16"	355Y124	.328"	13/16"	355C124	.390"	13/16"	355E124	.359"	1 5/16"	355F124	.453"	1 9/16"
355A154	.281"	13/16"	355Y154	.359"	13/16"	355C154	.421"	13/16"	355E154	.390"	1 3/16"	355F154	.500"	1 11/16"
355A184	.312"	13/16"	355Y184	.343"	1 1/16"	355C184	.406"	1 1/16"	355E184	.375"	1 9/16"	355F184	.562"	1 11/16"
355A224	.328"	13/16"	355Y224	.359"	1 1/16"	355C224	.437"	1 1/16"	355E224	.421"	1 9/16"	355F224	.609"	1 11/16"
355A274	.359"	13/16"	355Y274	.359"	1 3/16"	355C274	.437"	1 3/16"	355E274	.468"	1 9/16"	355F274	.609"	2 1/16"
355A334	.406"	13/16"	355Y334	.390"	1 3/16"	355C334	.484"	1 3/16"	355E334	.500"	1 9/16"	355F334	.640"	2 1/16"
355A394	.359"	1 1/16"	355Y394	.406"	1 3/16"	355C394	.531"	1 3/16"	355E394	.546"	1 9/16"	355F394	.687"	2 1/16"
355A474	.375"	1 1/16"	355Y474	.453"	1 3/16"	355C474	.546"	1 5/16"	355E474	.593"	1 9/16"	355F474	.765"	2 1/16"
355A564	.406"	1 1/16"	355Y564	.421"	1 9/16"	355C564	.531"	1 9/16"	355E564	.593"	1 13/16"	355F564	.750"	2 1/4"
355A684	.437"	1 1/16"	355Y684	.453"	1 9/16"	355C684	.578"	1 9/16"	355E684	.640"	1 15/16"	355F684	.828"	2 1/4"
355A824	.484"	1 1/16"	355Y824	.500"	1 9/16"	355C824	.531"	1 13/16"	355E824	.687"	2 3/16"	355F824	.921"	2 1/4"
355A105	.468"	1 5/16"	355Y105	.531"	1 9/16"	355C105	.609"	1 13/16"	355E105	.750"	2 3/16"	355F105	.906"	2 7/8"
355A155	.578"	1 5/16"	355Y155	.718"	1 13/16"	355C155	.750"	1 15/16"	355E155	.828"	2 7/16"	355F155	1.109"	2 7/8"
355A205	.609"	1 5/8"	355Y205	.812"	1 13/16"	355C205	.906"	2 3/16"	355E205	.953"	2 7/16"	355F205	1.265"	2 7/8"
355A305	.734"	1 5/8"												
355A405	.765"	1 7/8"												
355A505	.859"	1 7/8"												

338

50 VDC.				150 VDC.				200 VDC.				400 VDC.				600 VDC.			
Part No.	T.	W.	L.	Part No.	T.	W.	L.	Part No.	T.	W.	L.	Part No.	T.	W.	L.	Part No.	T.	W.	L.
				338Y102	.125"	.234"	½"	338C102	.125"	.250"	½"	338E102	.125"	.250"	⅝"	338F102	.125"	.250"	11/16"
				338Y154	.125"	.234"	½"	338C154	.125"	.250"	½"	338E154	.125"	.250"	⅝"	338F154	.125"	.250"	11/16"
				338Y222	.125"	.234"	½"	338C222	.125"	.250"	½"	338E222	.125"	.250"	⅝"	338F222	.125"	.250"	11/16"
				338Y332	.125"	.234"	½"	338C332	.125"	.250"	½"	338E332	.125"	.250"	⅝"	338F332	.140"	.250"	11/16"
				338Y472	.125"	.234"	½"	338C472	.125"	.250"	½"	338E472	.125"	.250"	11/16"	338F472	.140"	.250"	¾"
				338Y682	.125"	.234"	½"	338C682	.125"	.250"	½"	338E682	.125"	.250"	11/16"	338F682	.171"	.281"	¾"
				338Y822	.125"	.234"	½"	338C822	.125"	.250"	½"	338E822	.125"	.250"	11/16"	338F822	.187"	.312"	¾"
				338Y103	.125"	.234"	½"	338C103	.125"	.250"	½"	338E103	.125"	.250"	11/16"	338F103	.203"	.328"	¾"
				338Y123	.125"	.234"	½"	338C123	.125"	.250"	½"	338E123	.140"	.250"	11/16"	338F123	.203"	.328"	13/16"
				338Y153	.125"	.234"	½"	338C153	.125"	.250"	½"	338E153	.156"	.265"	11/16"	338F153	.234"	.343"	13/16"
				338Y183	.125"	.234"	9/16"	338C183	.125"	.250"	11/16"	338E183	.171"	.281"	11/16"	338F183	.265"	.375"	13/16"
				338Y223	.125"	.234"	9/16"	338C223	.140"	.250"	11/16"	338E223	.187"	.312"	11/16"	338F223	.281"	.406"	13/16"
				338Y273	.125"	.234"	11/16"	338C273	.140"	.250"	11/16"	338E273	.171"	.281"	13/16"	338F273	.218"	.375"	1 1/16"
				338Y333	.125"	.234"	11/16"	338C333	.171"	.281"	11/16"	338E333	.171"	.328"	13/16"	338F333	.250"	.453"	1 1/16"
				338Y393	.156"	.265"	11/16"	338C393	.203"	.328"	11/16"	338E393	.218"	.343"	13/16"	338F393	.281"	.437"	1 1/16"
				338Y473	.156"	.265"	11/16"	338C473	.171"	.281"	13/16"	338E473	.218"	.390"	13/16"	338F473	.281"	.500"	1 1/16"
				338Y563	.156"	.265"	13/16"	338C563	.187"	.312"	13/16"	338E563	.187"	.343"	1 1/16"	338F563	.312"	.546"	1 1/16"
				338Y683	.171"	.281"	13/16"	338C683	.234"	.343"	13/16"	338E683	.234"	.375"	1 1/16"	338F683	.296"	.531"	1 3/16"
				338Y823	.187"	.312"	13/16"	338C823	.250"	.375"	13/16"	338E823	.250"	.406"	1 1/16"	338F823	.343"	.562"	1 3/16"
338A104	.171"	.296"	13/16"	338Y104	.203"	.375"	13/16"	338C104	.281"	.406"	13/16"	338E104	.281"	.437"	1 1/16"	338F104	.312"	.531"	1 7/16"
338A124	.187"	.312"	13/16"	338Y124	.218"	.390"	13/16"	338C124	.312"	.437"	13/16"	338E124	.250"	.406"	1 5/16"	338F124	.312"	.531"	1 9/16"
338A154	.203"	.329"	13/16"	338Y154	.218"	.421"	13/16"	338C154	.343"	.500"	13/16"	338E154	.281"	.437"	1 1/16"	338F154	.328"	.546"	1 11/16"
338A184	.234"	.359"	13/16"	338Y184	.218"	.390"	1 1/16"	338C184	.281"	.437"	1 1/16"	338E184	.281"	.437"	1 9/16"	338F184	.375"	.687"	1 11/16"
338A224	.250"	.375"	13/16"	338Y224	.218"	.468"	1 1/16"	338C224	.343"	.500"	1 1/16"	338E224	.312"	.468"	1 9/16"	338F224	.421"	.718"	1 11/16"
338A274	.281"	.406"	13/16"	338Y274	.250"	.406"	1 3/16"	338C274	.328"	.500"	1 3/16"	338E274	.359"	.515"	1 9/16"	338F274	.421"	.718"	2 1/16"
338A334	.328"	.453"	13/16"	338Y334	.281"	.437"	1 3/16"	338C334	.359"	.531"	1 3/16"	338E334	.406"	.562"	1 9/16"	338F334	.421"	.843"	2 1/16"
338A394	.265"	.406"	1 1/16"	338Y394	.312"	.468"	1 3/16"	338C394	.421"	.593"	1 3/16"	338E394	.437"	.593"	1 9/16"	338F394	.468"	.875"	2 1/16"
338A474	.281"	.421"	1 1/16"	338Y474	.359"	.515"	1 3/16"	338C474	.437"	.609"	1 5/16"	338E474	.437"	.671"	1 9/16"	338F474	.578"	.984"	2 1/16"
338A564	.312"	.453"	1 1/16"	338Y564	.312"	.468"	1 9/16"	338C564	.421"	.593"	1 9/16"	338E564	.437"	.671"	1 15/16"	338F564	.531"	.906"	2 1/4"
338A684	.343"	.484"	1 1/16"	338Y684	.343"	.515"	1 9/16"	338C684	.468"	.625"	1 9/16"	338E684	.484"	.718"	1 13/16"	338F684	.625"	1.015"	2 1/4"
338A824	.390"	.531"	1 1/16"	338Y824	.406"	.562"	1 9/16"	338C824	.421"	.593"	1 13/16"	338E824	.468"	.859"	2 3/16"	338F824	.718"	1.437"	2 1/4"
338A105	.343"	.531"	1 5/16"	338Y105	.375"	.687"	1 9/16"	338C105	.468"	.625"	1 13/16"	338E105	.531"	.921"	2 3/16"	338F105	.656"	1.093"	2 7/8"
338A155	.453"	.640"	1 5/16"	338Y155	.562"	.796"	1 13/16"	338C155	.671"	.906"	1 13/16"	338E155	.671"	.906"	2 7/16"	338F155	.843"	1.265"	2 7/8"
338A205	.484"	.671"	1 5/8"	338Y205	.656"	.890"	1 13/16"	338C205	.625"	.953"	2 3/16"	338E205	.765"	1.046"	2 7/16"	338F205	1.000"	1.437"	2 7/8"
338A305	.609"	.796"	1 5/8"																
338A405	.609"	.843"	1 7/8"																
338A505	.703"	.937"	1 7/8"																

OLERANCES:
following to Part No. for tolerance: —M = ±20%; —K = ±10%; —J = ±5%; —B = ±2%.
prefix "F" to specify outer fibreglas wrap in lieu of Mylar.

GUDEMAN

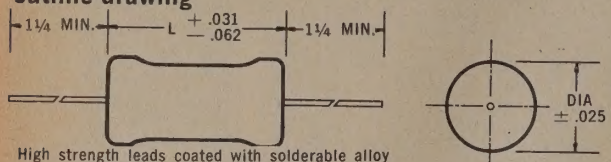
a division of
Gulton Industries, Inc
340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-22-3886

miniature "mylar"* dielectric

series 356

"BLUE-R"® TUBULAR
SEALED IN NON-METALLIC CASES
—55°C TO +125°C
80 VDC TO 600 VDC

outline drawing



High strength leads coated with solderable alloy
LEAD DIAMETERS: .138 and .170 Diameters: 22 AWG
.204 Diameter and larger: 20 AWG

specifications

DISSIPATION FACTOR
The dissipation factor shall not exceed 1.0% when measured at or referred to a frequency of 1,000 CPS at +25°C.

INSULATION RESISTANCE
The minimum insulation resistance when measured with an applied potential of 80 to 500 volts, but not to exceed the rated voltage, shall be as follows:

At + 25°C 50,000 megohm-mfds minimum but need not exceed 150,000 megohms.
At + 85°C 5,000 megohms-mfds minimum but need not exceed 15,000 ohms.
At + 125°C 50 megohms-mfds minimum but need not exceed 300 megohms.

TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25%, ±5°C.

ACCELERATED LIFE TEST
Shall withstand an accelerated life test of 250 hours with 140% of the voltage rating, applied at the applicable high ambient temperature, per MIL-C-25C. Not more than one failure in 18 pieces tested shall be allowed.

VOLTAGE RATINGS
These capacitors are designed to operate over the temperature range of —55°C to +85°C at full rated DC voltage and up to +125°C with working voltages as follows:

+85°C	+125°C
600 VDC	300 VDC
400 VDC	200 VDC
200 VDC	150 VDC
80 VDC	50 VDC

MOISTURE ASSISTANCE
Capacitors shall withstand 500 hours of 95% relative humidity at 40°C. Voltage will not be applied. Upon completion of test, units will be dried for four hours. Minimum insulation resistance at 25°C. will be 25,000 megohm-mfds but need not exceed 75,000 megohms. Not more than one failure in 12 shall be permitted.

MARKING
Small size of units limits marking information to the following: capacity, voltage, series prefix (356), Gudeman or trademark.

LEAD PULL TEST
Shall withstand a five (5) pound pull applied axially for one minute.

LEAD BENDING TEST
Leads shall be bent without breakage about the point of egress from the capacitor. First 90 degrees in one direction then back to the original position, and then 90 degrees in the opposite direction.

CAPACITANCE CHANGE WITH TEMPERATURE
The capacitance change shall not exceed the following values with reference to the +25°C capacitance value:

TEMPERATURE	% CAP. CHANGE
— 55°C	—10% Maximum
+ 85°C	+ 5% Maximum
+125°C	+16% Maximum

80 VDC

CAP. IN MFDS.	Part No.	Dia.	L.
.001			
.0015			
.0022	356AZ222	.138"	5/16"
.0033	356AZ332	.138"	5/16"
.0047	356AZ472	.138"	5/16"
.0068	356AZ682	.170"	3/8"
.0082	356AZ822	.170"	3/8"
.01	356AZ103	.170"	3/8"
.012	356AZ123	.170"	7/16"
.015	356AZ153	.170"	7/16"
.018	356AZ183	.170"	1/2"
.022	356AZ223	.170"	1/2"
.027	356AZ273	.204"	7/16"
.033	356AZ333	.204"	7/16"
.039	356AZ393	.204"	9/16"
.047	356AZ473	.204"	9/16"
.056	356AZ563	.225"	9/16"
.068	356AZ683	.225"	9/16"
.082	356AZ823	.290"	1/2"
.1	356AZ104	.290"	1/2"
.12	356AZ124	.290"	5/8"
.15	356AZ154	.290"	5/8"
.18	356AZ184	.318"	5/8"
.22	356AZ224	.318"	5/8"
.27	356AZ274	.318"	7/8"
.33	356AZ334	.318"	7/8"
.39	356AZ394	.318"	1 3/16"
.47	356AZ474	.318"	1 3/16"

200 VDC

CAP. IN MFDS.	Part No.	Dia.	L.
.001	356C102	.138	[illegible]
.0015	356C152	.138	[illegible]
.0022	356C222	.170	[illegible]
.0033	356C332	.170	[illegible]
.0047	356C472	.170	[illegible]
.0068	356C682	.170	[illegible]
.0082	356C822	.170	[illegible]
.01	356C103	.170	[illegible]
.012	356C123	.204	[illegible]
.015	356C153	.204	[illegible]
.018	356C183	.204	[illegible]
.022	356C223	.204	[illegible]
.027	356C273	.225	[illegible]
.033	356C333	.225	[illegible]
.039	356C393	.290	[illegible]
.047	356C473	.290	[illegible]
.056	356C563	.290	[illegible]
.068	356C683	.290	[illegible]
.082	356C823	.318	[illegible]
.1	356C104	.318	[illegible]
.12	356C124	.318	[illegible]
.15	356C154	.318	[illegible]
.18	356C184	.318	[illegible]
.22	356C224	.318	[illegible]

400 VDC

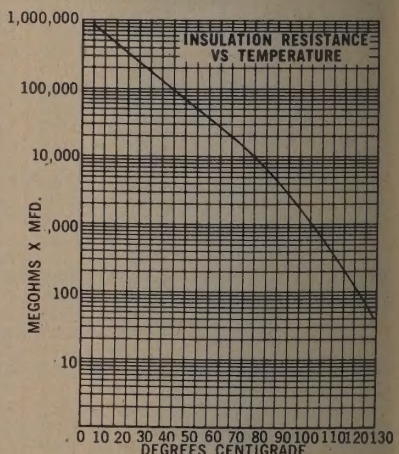
CAP. IN MFDS.	Part No.	Dia.	L.
.001	356E102	.170"	3/8"
.0015	356E152	.170"	3/8"
.0022	356E222	.170"	7/16"
.0033	356E332	.204"	7/16"
.0047	356E472	.204"	7/16"
.0068	356E682	.225"	9/16"
.0082	356E822	.225"	9/16"
.01	356E103	.225"	9/16"
.012	356E123	.290"	1/2"
.015	356E153	.290"	1/2"
.018	356E183	.290"	5/8"
.022	356E223	.290"	5/8"
.027	356E273	.318"	5/8"
.033	356E333	.318"	5/8"
.039	356E393	.318"	7/8"
.047	356E473	.318"	7/8"
.056	356E563	.318"	1 3/16"
.068	356E683	.318"	1 3/16"

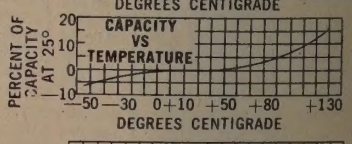
600 VDC

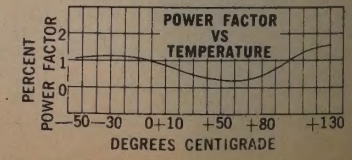
CAP. IN MFDS.	Part No.	Dia.	L.
.001	356F102	.170"	[illegible]
.0015	356F152	.204"	[illegible]
.0022	356F222	.204"	[illegible]
.0033	356F332	.225"	[illegible]
.0047	356F472	.290"	[illegible]
.0068	356F682	.290"	[illegible]
.0082	356F822	.318"	[illegible]
.01	356F103	.318"	[illegible]
.012	356F123	.318"	[illegible]
.015	356F153	.318"	[illegible]
.018	356F183	.318"	[illegible]
.022	356F223	.318"	[illegible]

add following to part no. for tol[illegible]nce
—M = ±20%; —K = ±10%;
—J = ±5%

TYPICAL CURVES





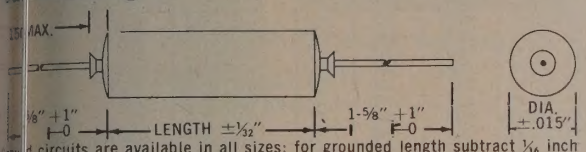


iature "mylar*"—foil (extended foil) ectric

s 383

TICALLY SEALED (GLASS-TO-METAL)
AR METALLIC CASES
C TO +85°C WITHOUT DERATING
C THRU 600 VDC

e drawing



d circuits are available in all sizes: for grounded length subtract 1/16 inch alog length.

Case Diameter (Inches)	Lead Gauge (AWG)
.175 and .195	24
.235 and .312	22
.400 and up	20

leads consist of solid, bare, tinned wire. Special nickel leads are avail- applications requiring a higher degree of weldability.

fications

ANCE AND TOLERANCE
acitance limits at ±25°C are determined by the specified tolerance. rs which have a nominal value of 1 MFD or less are measured or referred quency of 1000 cps. Nominal capacitances above 1 MFD are measured at red to a frequency of 60 cps.

TION FACTOR
n 0.6% at +25°C.

ION RESISTANCE
rging potential is equal to the specified operating voltage for a given ture. The minimum electrification time is two minutes. Listed below imum values:

perature	Nominal Capacitance Mfd	R X C Megohms X Mfd	R Megohms
25°C	Greater than .5 Smaller than .5	50,000	100,000
85°C	Greater than .1 Smaller than .1	5,000	50,000
125°C	Greater than .02 Smaller than .02	100	5,000
150°C	Greater than .01 Smaller than .01	10	1,000

TES OLTAGE
Des ed to withstand a test potential equal to 200% of the rated voltage for two utes at 25°C.
The t voltage must be applied and discharged through a current limiting re- sist e of approximately 1000 ohms.

VOL E RATING ABOVE 85°C
Der above +85°C at a rate of 1.2% of rated voltage per degree C.

ACC RATED LIFE TEST
Cap ors are designed to withstand a test potential equal to 140% of the rate oltage at the test temperature used for a period of 250 hours. One failure in 2 amples tested is permitted. The life test voltage must be applied and dis- cha d through a current limiting resistance of approximately 1,000 ohms.

TEM RATURE AND IMMERSION CYCLING
Des ed to meet all requirements of the applicable paragraph of the latest iss f MIL-C-25.

MO RE RESISTANCE
Des ed to meet all requirements of the applicable paragraph of the latest issue of C-25.

VIB ION
Des ed to withstand the Grade 3 vibration tests of the applicable paragraph of latest issue of MIL-C-25.

AC LTAGE RATING
Des ed to operate safely up to the following AV voltages at 85°C.

NOMINAL VOLTAGE VDC	AC — VOLTAGES AT 85°C (rms)	
	Up to 120 cps	Up to 400 cps
100	70	56
200	140	70
400	280	110
600	420	160

For 85°C operation the listed AC voltages should be derated to 60% of the 85° alues.
If AC and DC voltages are present the sum of the DC voltage and the ampli- tude of the AC voltage must not exceed the specified DC-rating at a given tem- pe re.

LEA PULL TEST
Des ed to withstand a steady pull force of 5 lbs. applied axially to a capacitor ea r one minute.

LEA BENDING TEST
The ads withstand without breakage the following stresses performed near the po of egress: bend 90 degrees in one direction, then back to the original po n and 90 degrees in the opposite direction.

*T ont Trademark

30 VOLTS

Part No.	Cap MFD	Dia. In.	Length In.
F383Z155	1.5	.562	1⅝
F383Z225	2.2	.670	1⅞
F383Z335	3.3	.750	1⅞
F383Z475	4.7	.750	2⅝

50 VOLTS

Part No.	Cap MFD	Dia. In.	Length In.
F383A562	.0056	.175	¾
F383A682	.0068	.175	¾
F383A822	.0082	.175	¾
F383A103	.01	.175	¾
F383A123	.012	.175	¾
F383A153	.015	.175	¾
F383A183	.018	.195	¾
F383A223	.022	.195	¾
F383A273	.027	.195	¾
F383A333	.033	.195	¾
F383A393	.039	.235	¾
F383A473	.047	.235	¾
F383A563	.056	.312	⅞
F383A683	.068	.312	⅞
F383A823	.082	.312	⅞
F383A104	.1	.312	⅞
F383A124	.12	.312	⅞
F383A154	.15	.312	⅞
F383A184	.18	.400	⅞
F383A224	.22	.400	⅞
F383A274	.27	.400	⅞
F383A334	.33	.400	⅞
F383A394	.39	.400	1⅛
F383A474	.47	.400	1⅛
F383A564	.56	.400	1⅜
F383A684	.68	.400	1⅜
F383A824	.82	.562	1⅛
F383A105	1.0	.562	1⅛

100 VOLTS

Part No.	Cap MFD	Dia. In.	Length In.
F383B102	.001	.175	¾
F383B122	.0012	.175	¾
F383B152	.0015	.175	¾
F383B182	.0018	.175	¾
F383B222	.0022	.175	¾
F383B272	.0027	.175	¾
F383B332	.0033	.175	¾
F383B392	.0039	.175	¾
F383B472	.0047	.175	¾
F383B562	.0056	.195	¾
F383B682	.0068	.195	¾
F383B822	.0082	.235	¾
F383B103	.01	.235	¾
F383B123	.012	.235	¾
F383B153	.015	.235	¾
F383B183	.018	.235	¾
F383B223	.022	.235	¾
F383B273	.027	.312	⅞
F383B333	.033	.312	⅞
F383B393	.039	.312	⅞
F383B473	.047	.312	⅞
F383B563	.056	.312	⅞
F383B683	.068	.312	⅞
F383B823	.082	.400	⅞
F383B104	.1	.400	⅞
F383B124	.12	.400	⅞
F383B154	.15	.400	⅞
F383B184	.18	.400	1⅛
F383B224	.22	.400	1⅛
F383B274	.27	.400	1⅜
F383B334	.33	.400	1⅜
F383B394	.39	.562	1⅛
F383B474	.47	.562	1⅛
F383B564	.56	.562	1⅜
F383B684	.68	.562	1⅜
F383B824	.82	.562	1⅞
F383B105	1.0	.562	1⅞
F383B155	1.5	.670	1⅞
F383B205	2.0	.750	1⅞

200 VOLTS

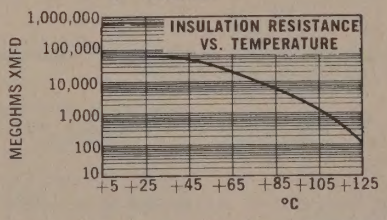
Part No.	Cap MFD	Dia. In.	Length In.
F383C562	.0056	.235	¾
F383C682	.0068	.235	¾
F383C822	.0082	.235	¾
F383C103	.01	.235	¾
F383C123	.012	.235	¾
F383C153	.015	.235	¾
F383C183	.018	.235	¾
F383C223	.022	.235	¾
F383C273	.027	.312	⅞
F383C333	.033	.312	⅞
F383C393	.039	.312	⅞
F383C473	.047	.312	⅞
F383C563	.056	.312	⅞
F383C683	.068	.312	⅞
F383C823	.082	.400	⅞
F383C104	.1	.400	⅞
F383C124	.12	.400	⅞
F383C154	.15	.400	⅞
F383C184	.18	.400	1⅛
F383C224	.22	.400	1⅛
F383C274	.27	.400	1⅜
F383C334	.33	.400	1⅜
F383C394	.39	.562	1⅛
F383C474	.47	.562	1⅛
F383C564	.56	.562	1⅜
F383C684	.68	.562	1⅜
F383C824	.82	.562	1⅞
F383C105	1.0	.562	1⅞

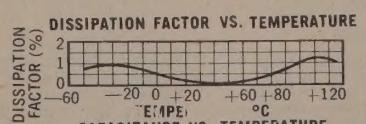
400 VOLTS

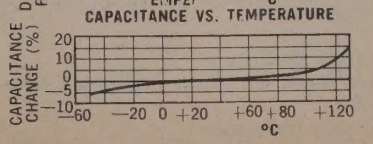
Part No.	Cap MFD	Dia. In.	Length In.
F383E272	.0027	.235	¾
F383E332	.0033	.235	¾
F383E392	.0039	.235	¾
F383E472	.0047	.235	¾
F383E822	.0082	.312	⅞
F383E103	.01	.312	⅞
F383E123	.012	.312	⅞
F383E153	.015	.312	⅞
F383E183	.018	.312	1
F383E223	.022	.312	1
F383E273	.027	.400	⅞
F383E333	.033	.400	⅞
F383E393	.039	.400	1
F383E473	.047	.400	1
F383E563	.056	.400	1¼
F383E683	.068	.400	1¼
F383E823	.082	.400	1½
F383E104	.1	.400	1½
F383E124	.12	.562	1⅛
F383E154	.15	.562	1⅛
F383E184	.18	.562	1½
F383E224	.22	.562	1½
F383E274	.27	.562	1⅞
F383E334	.33	.562	1⅞
F383E394	.39	.670	1⅞
E383E474	.47	.670	1⅞
F383E564	.56	.750	2⅛
F383E684	.68	.750	2⅛
F383E824	.82	.750	2⅝
F383E105	1.0	.750	2⅝

Add following to part no. to indicate tolerance: —20 = ±20%; —10 = ±10%; —5 = ±5%

"F" Indicates "Floating", Substitute "G" for "Grounded"





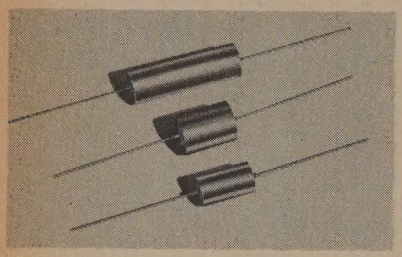


GUDEMAN a division of Gulton Industries, Inc.
340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-86

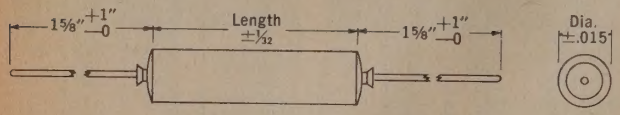
extended foil teflon dielectric

series 371

HERMETICALLY SEALED (GLASS TO METAL)
TUBULAR METAL CASE
—55°C TO +200°C WITHOUT DERATING
200 VDC THRU 600 VDC



outline drawing



LEAD SPECIFICATIONS: Solid tinned leads 1⅝" long +1" —0 tolerance. No. 22 AWG for .235" and .312" Dia. cans. No. 20 AWG for larger case diameters. For Series F371 (Both Terminals Insulated From Case) add 1/16" to above case length for diameters larger than .400". For diameters .400 and smaller add 3/32" to above case length.

specifications

DISSIPATION FACTOR
Maximum dissipation factor shall be 0.1% at +25°C when measured at a frequency of 1000 CPS. Maximum dissipation factor shall be 0.2% at +200°C.

INSULATION RESISTANCE
The minimum insulation resistance when measured with an applied potential of between 200 and 500 volts and an electrification time of 2 minutes, but never greater than rated voltage shall be as follows:

At + 25°C 125,000 megohm-mfds capacitance values .5 MFD and greater.
250,000 megohms for cap. values below .5 MFDS.
+ 85°C 40,000 meg-mfds for cap. values 1. MFD and greater.
40,000 megohms for cap. values below 1. MFD.
+ 125°C 5,000 meg x mfds for cap. values .25 MFD and greater.

TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated voltage for 2 minutes. Test voltage will be applied and discharged through a current limiting resistor of one Ohm per volt.

LIFE TEST VOLTAGE
Shall withstand an accelerated life test of 250 hours at +200°C and 140% of rated voltage. One failure in 12 samples permitted.

CAPACITANCE DRIFT
Capacitance will drift less than 2% from its initial value at 25°C after being temperature cycled from —55°C to 200°C.

CAPACITANCE "Q"
The "Q" of Gudeman Series 371 will average 5000 up to +125°C and will exceed 500 at +200°C.

DIELECTRIC ABSORPTION
At +25°C less than .05% of the initial 100 volts charging voltage shall reappear after charging for ½ hour and immediately discharging for 10 seconds through a one ohm resistor. Absorption voltage should be read 5 minutes, but not later than 10 minutes, after removing shorting bar. Percent dielectric absorption = V absorption / V charge x 100.

MOISTURE RESISTANCE AND VIBRATION
Shall meet the requirements for moisture resistance and vibration of Specification MIL-C-25A.

CAPACITANCE CHANGE WITH TEMPERATURE
Capacitance change shall not be greater than —4% at 200°C or +2.5% at —55°C relative to the nominal value at +25°C.

SERIES 371 TEFLON DIELECTRIC

200 VDC

Part No.	Capacity	Dia. ±.015"	Length ±1/32"
G371C152	.0015	.235	23/32"
G371C392	.0039	.312	27/32"
G371C472	.0047	.312	27/32"
G371C822	.0082	.400	27/32"
G371C103	.01	.400	27/32"
G371C123	.012	.400	1 3/32"
G371C153	.015	.400	1 3/32"
G371C183	.018	.400	1 7/32"
G371C223	.022	.400	1 7/32"
G371C273	.027	.562	1 1/16"
G371C333	.033	.562	1 1/16"
G371C393	.039	.562	1 3/16"
G371F473	.047	.562	1 3/16"
G371F563	.056	.562	1 7/16"
G371F683	.068	.562	1 7/16"
G371F823	.082	.562	1 13/16"
G371F104	.1	.562	1 13/16"
G371F124	.12	.562	1 13/16"
G371F154	.15	.562	1 13/16"
G371F184	.18	.750	1 13/16"
G371F224	.22	.750	1 15/16"
G371F274	.27	1.00	1 11/16"
G371F394	.39	1.00	1 13/16"
G371F474	.47	1.00	2 3/16"

400 VDC

Part No.	Capacity	Dia. ±.015"	Length ±1/32"
G371E822	.0082	.400	[illegible]
G371E103	.01	.400	[illegible]
G371E153	.015	.400	[illegible]
G371E183	.018	.562	[illegible]
G371E223	.022	.562	[illegible]
G371E273	.027	.562	[illegible]
G371E333	.033	.562	[illegible]
G371E393	.039	.562	[illegible]
G371E473	.047	.562	[illegible]
G371E563	.056	.562	[illegible]
G371E683	.068	.562	[illegible]
G371E823	.082	.670	[illegible]
G371E104	.1	.670	[illegible]
G471E124	.12	.750	[illegible]
G371E154	.15	.750	[illegible]
G371E184	.18	1.000	[illegible]
G371E224	.22	1.000	[illegible]
G371E274	.27	1.000	[illegible]
G371E334	.33	1.000	[illegible]

600 VDC

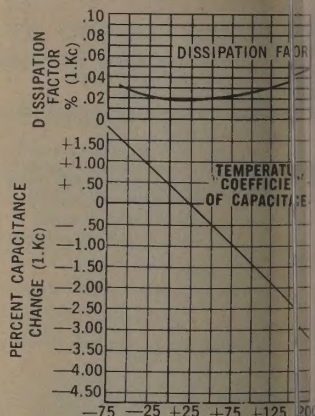
Part No.	Capacity	Dia. ±.015"	Length ±1/32"
G371F102	.001	.235	23/32"
G371F122	.0012	.312	27/32"
G371F152	.0015	.312	27/32"
G371F182	.0018	.312	27/32"
G371F222	.0022	.312	27/32"
G371F272	.0027	.312	27/32"
G371F332	.0033	.312	27/32"
G371F392	.0039	.400	27/32"
G371F472	.0047	.400	27/32"
G371F562	.0056	.400	27/32"
G371F682	.0068	.400	27/32"

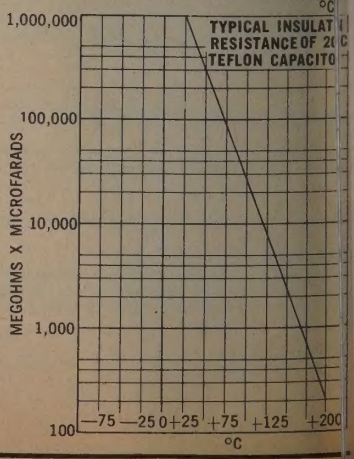
600 VDC continued

Part No.	Capacity	Dia. ±.015"	[illegible]
G371F822	.0082	.400	[illegible]
G371F103	.01	.400	[illegible]
G371F123	.012	.400	[illegible]
G371F153	.015	.400	[illegible]
G371F183	.018	.562	[illegible]
G371F223	.022	.562	[illegible]
G371F273	.027	.562	[illegible]
G371F333	.033	.562	[illegible]
G371F393	.039	.562	[illegible]
G371F473	.047	.562	[illegible]
G371F563	.056	.562	[illegible]
G371F683	.068	.562	[illegible]
G371F823	.082	1.000	[illegible]
G371F104	.1	1.000	[illegible]
G371F124	.12	1.000	[illegible]
G371F154	.15	1.000	[illegible]

"G" indicates "Grounded". Substitute "F" for "Floating"
Add following to part no. for tolerance: —20 = ±20%; —10= ±1[illegible]%; —5 = ±5%; —2 = ±2%; —1 = ±1%

TYPICAL CURVES





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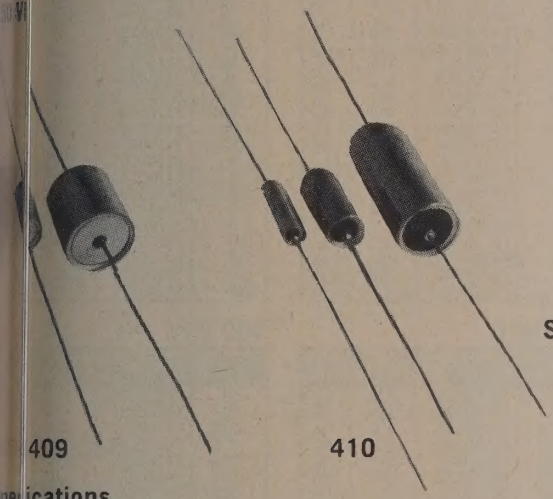
llized polycarbonate dielectric

409 & 410

IES — HERMETICALLY SEALED (Ceramic End Seals)
IES — MINIATURE TUBULAR TYPES
l Case — Glass to Metal Seals)
THICK FILM
TO +125°C WITHOUT DERATING



409 410

ications

ANCE AND TOLERANCE

acitance limits at +25°C are determined by the specified erance.

ance is measured at or referred to a frequency of 1000 Hz.

ATION FACTOR

sipation factor at +25°C is less than 0.3% at 1000 Hz.

ION RESISTANCE

rging potential is equal to the specified operating voltage for temperature. The electrification time is two minutes. Listed e minimum values:

RATURE	CAPACITANCE (mfd.)	RXC (megohms x mfd.)	R (megohms)
5°C	>.5	100,000	
	<.5		200,000
5°C	>.5	1000	
	<.5		2000

RATED LIFE TEST

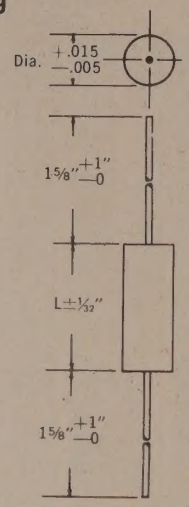
rs shall withstand an accelerated life test of 250 hours with f applied rated voltage at applicable high test temperature. e failure in 18 capacitors tested shall be allowed. A failure is as the following:

capacitor has "opened."

e capacitance has changed more than 5% from its original va .

e insulation resistance is less than 50% of its original value.

Series 409



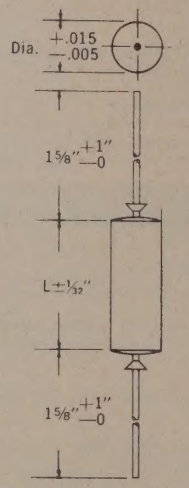
Dim. Include Solder Eyelet

LEADS: 24 gauge: .175 and .195 Dia.; 22 gauge: .235 and .312 Dia.; 20 gauge: .400 Dia. and larger case sizes.

Part No.	Cap in MFDS.	Dia.	L
F409A103	.01	.175	15/32
F409A123	.012	.175	15/32
F409A153	.015	.175	15/32
F409A183	.018	.175	15/32
F409A223	.022	.175	15/32
F409A273	.027	.175	15/32
F409A333	.033	.175	15/32
F409A473	.047	.175	15/32
F409A563	.056	.175	15/32
F409A683	.068	.195	15/32
F409A823	.082	.195	15/32
F409A104	.1	.195	15/32
F409A124	.12	.235	15/32
F409A154	.15	.235	15/32
F409A184	.18	.312	15/32
F409A224	.22	.312	15/32
F409A274	.27	.312	15/32
F409A334	.33	.312	15/32
F409A474	.47	.400	15/32
*F409-001	.56	.400	15/32
F409A564	.56	.312	19/32
*F409-002	.68	.500	15/32
F409A684	.68	.400	19/32
*F409-003	.82	.500	15/32
F409A824	.82	.400	19/32
*F409-004	1.0	.562	15/32
F409A105	1.0	.400	19/32
*F409-005	1.2	.562	15/32
F409A125	1.2	.500	19/32
F409A155	1.5	.500	19/32
F409A205	2.0	.562	19/32
F409A305	3.0	.670	19/32

*Special No. assigned to alternate sizes for same cap. valves.

Series 410



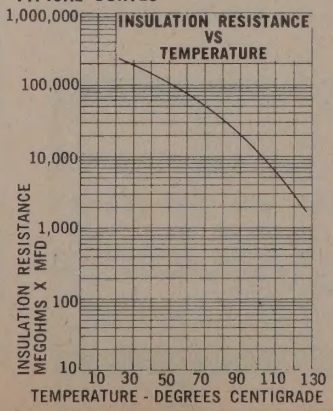
LEADS: 24 gauge: .175 and .195 Dia.; 22 gauge: .235 and .312 Dia.; 20 gauge: .400 Dia. and larger case sizes.

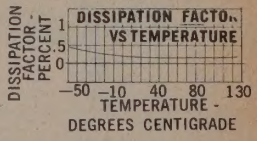
For Sleeving Add .020 max to Dia. and 1/32 ± 1/32 to length

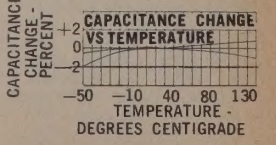
Part No.	Cap in MFDS.	Dia.	L
F410A103	.01	.175	17/32
F410A123	.012	.175	17/32
F410A153	.015	.175	17/32
F410A183	.018	.175	17/32
F410A223	.022	.175	17/32
F410A273	.027	.175	17/32
F410A333	.033	.175	17/32
F410A473	.047	.175	17/32
F410A563	.056	.175	17/32
F410A683	.068	.175	5/8
F410A823	.082	.175	5/8
F410A104	.1	.175	5/8
F410A124	.12	.175	5/8
F410A154	.15	.195	5/8
F410A184	.18	.195	5/8
F410A224	.22	.235	5/8
F410A274	.27	.235	5/8
F410A334	.33	.312	5/8
F410A474	.47	.312	5/8
F410A564	.56	.312	5/8
F410A684	.68	.312	27/32
F410A824	.82	.312	27/32
F410A105	1.0	.312	27/32
F410A125	1.2	.400	27/32
F410A155	1.5	.400	27/32
F410A185	1.8	.400	27/32
F410A205	2.0	.400	27/32
F410A225	2.2	.400	1 1/8
F410A275	2.7	.400	1 1/8
F410A305	3.0	.400	1 1/8
F410A335	3.3	.400	1 1/8
F410A395	3.9	.500	1 1/8
F410A475	4.7	.500	1 1/8
F410A505	5.0	.500	1 1/8
F410A565	5.6	.500	1 1/8
F410A685	6.8	.562	1 5/16
F410A825	8.2	.562	1 5/16
F410A106	10.0	.670	1 5/16
F410A156	15.0	.750	1 3/8

"F" indicates "Floating". Substitute "G" for "Grounded"
Add following to part no. for tolerance: —20 = ±20%; —10 = ±10%; —5 = ±5%; —1 = ±1%.

TYPICAL CURVES







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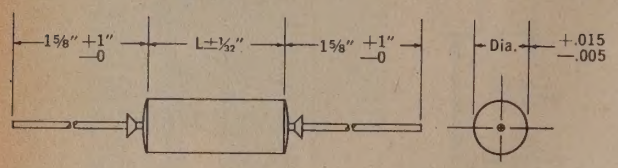
miniature metallized polycarbonate dielectric

series 410

HERMETICALLY SEALED (GLASS-TO-METAL) TUBULAR METALLIC CASES
—55°C TO +125°C WITHOUT DERATING
100 TO 400 VDC

outline drawing



Standard leads consist of solid, bare, tinned wire. Special nickel leads are available for applications requiring a higher degree of weldability.

LEADS: 24 gauge: .175 and .195 Dia.; 22 gauge: .235 and .312 Dia.; 20 gauge: .400 Dia. and larger case sizes.

For sleeving add .020 max. to Dia. and .032 $^{+.032}_{-.015}$ extension to each end of capacitor.

specifications

CAPACITANCE AND TOLERANCE
The capacitance limits at +25°C are determined by the specified tolerance. Capacitors are measured or referred to a frequency of 1000 cps.

DISSIPATION FACTOR
The dissipation factor at +25°C is less than 0.3% at 1000 cps.

INSULATION RESISTANCE
The charging potential is equal to the specified operating voltage for a given temperature. The minimum electrification time is two minutes. Listed below are minimum values:

Temperature	Nominal Capacitance Mfd	R X C Megohms X mfd	R Megohms
25°C	Greater than .5	100,000	
	Smaller than .5		200,000
125°C	Greater than .5	1,000	
	Smaller than .5		2,000

TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25°C, ±5°C. Test will be applied through resistor of 1 ohm per volt.

TEMPERATURE AND IMMERSION CYCLING
Designed to meet all requirements of the applicable paragraph of the latest issue of MIL-C-18312.

ACCELERATED LIFE TEST
Shall withstand an accelerated life test of 250 hours with 140% of applied rated voltage at applicable high test temperature. Only one failure in 18 capacitors tested shall be allowed. A failure is defined as the following.
A) If the capacitor has "opened."
B) If the capacitance has changed more than 5% from its original value.
C) If the insulation resistance is less than 50% of its original value.
(D) If the DF is greater than 1%.

MOISTURE RESISTANCE
Designed to meet all requirements of the applicable paragraph of the latest issue of MIL-C-18312.

VIBRATION
Designed to withstand the Grade 3 vibration tests of the applicable paragraph of the latest issue of MIL-C-18312.

A-C VOLTAGE RATING:
(—55C to +85C Ambient)

D-C Voltage Rating	400 cps
100	65
200	120
300	200
400	240

LEAD PULL TEST
Designed to withstand a steady pull force of 5 lbs. applied axially to a capacitor lead for one minute.

LEAD BENDING TEST
The leads shall withstand without breakage the following stresses performed near the point of egress: bend 90 degrees in one direction, then back to the original position and 90 degrees in the opposite direction.

CAPACITANCE CHANGE WITH TEMPERATURE
The change of capacitance with reference to the actual value at +25°C does not exceed the following limits:

TEMPERATURE	CHANGE OF CAPACITANCE
—55°C	2%
+125°C	1%

100 VDC

Cap In MFDS.	Part No.	Dia.*	L.*
.01	F410B103	.175	9/16"
.012	F410B123	.175	9/16"
.015	F410B153	.175	9/16"
.018	F410B183	.195	9/16"
.022	F410B223	.195	9/16"
.027	F410B273	.195	9/16"
.033	F410B333	.195	9/16"
.039	F410B393	.195	9/16"
.047	F410B473	.195	5/8"
.056	F410B563	.195	5/8"
.068	F410B683	.235	5/8"
.082	F410B823	.235	5/8"
.1	F410B104	.235	11/16"
.12	F410B124	.235	11/16"
.15	F410B154	.312	5/8"
.18	F410B184	.312	5/8"
.22	F410B224	.312	11/16"
.27	F410B274	.312	11/16"
.33	F410B334	.312	13/16"
.39	F410B394	.312	13/16"
.47	F410B474	.400	11/16"
.56	F410B564	.400	13/16"
.68	F410B684	.400	13/16"
.82	F410B824	.400	15/16"
1.0	F410B105	.400	1"
1.5	F410B155	.500	1 1/8"
2.0	F410B205	.500	1 5/16"
3.0	F410B305	.562	1 5/16"
4.0	F410B405	.670	1 5/16"
5.0	F410B505	.670	1 9/16"
7.0	F410B705	.750	1 7/8"
8.0	F410B805	.750	2 1/8"
10.0	F410B106	1.00	2 1/8"

200 VDC

Cap In MFDS.	Part No.	Dia.*	L.*
.01	F410C103	.175	11/16"
.012	F410C123	.195	11/16"
.015	F410C153	.195	11/16"
.018	F410C183	.235	11/16"
.022	F410C223	.235	11/16"
.027	F410C273	.235	11/16"
.033	F410C333	.235	13/16"
.039	F410C393	.235	13/16"
.047	F410C473	.235	13/16"
.056	F410C563	.235	13/16"
.068	F410C683	.312	13/16"
.082	F410C823	.312	13/16"
.1	F410C104	.312	13/16"
.12	F410C124	.312	13/16"
.15	F410C154	.312	15/16"
.18	F410C184	.400	15/16"
.22	F410C224	.400	15/16"
.27	F410C274	.400	15/16"
.33	F410C334	.400	1 1/16"
.39	F410C394	.400	1 5/16"
.47	F410C474	.400	1 5/16"
.56	F410C564	.562	1 1/16"
.68	F410C684	.562	1 1/16"
.82	F410C824	.562	1 5/16"
1.0	F410C105	.562	1 5/16"
1.5	F410C155	.670	1 5/16"
2.0	F410C205	.670	1 9/16"
3.0	F410C305	.750	1 7/8"
4.0	F410C405	.750	1 7/8"
5.0	F410C505	.750	1 7/8"
7.0	F410C705	1.00	1 7/8"
8.0	F410C805	1.00	1 7/8"
10.0	F410C106	1.00	1 7/8"

300 VDC

Cap In MFDS.	Part No.	Dia.*	L.*
.01	F410D103	.235	11/16"
.012	F410D123	.312	13/16"
.015	F410D153	.312	13/16"
.018	F410D183	.312	13/16"
.022	F410D223	.312	13/16"
.027	F410D273	.312	13/16"
.033	F410D333	.312	13/16"
.039	F410D393	.312	13/16"
.047	F410D473	.312	13/16"
.056	F410D563	.312	1 1/16"
.068	F410D683	.312	1 1/16"
.082	F410D823	.400	1 1/16"
.1	F410D104	.400	1 1/16"
.12	F410D124	.400	1 5/16"
.15	F410D154	.400	1 5/16"
.18	F410D184	.500	1 11/16"
.22	F410D224	.500	1 11/16"
.27	F410D274	.562	1 11/16"
.33	F410D334	.562	1 11/16"
.39	F410D394	.562	1 5/16"
.47	F410D474	.562	1 5/16"
.56	F410D564	.562	1 13/16"
.68	F410D684	.562	1 13/16"
.82	F410D824	.670	1 13/16"
1.0	F410D105	.670	1 13/16"
1.5	F410D155	.750	2 1/8"
2.0	F410D205	.750	2 3/8"
3.0	F410D305	1.00	1 7/8"
4.0	F410D405	1.00	2 3/8"

400 VDC

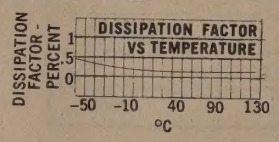
Cap In MFDS.	Part No.	Dia.*	L.*
.01	F410E103	.312	1/16"
.012	F410E123	.312	1/16"
.015	F410E153	.312	1/16"
.018	F410E183	.312	1/16"
.022	F410E223	.312	1/16"
.027	F410E273	.312	1/16"
.033	F410E333	.312	1/16"
.039	F410E393	.312	1/16"
.047	F410E473	.312	1/16"
.056	F410E563	.400	1/16"
.068	F410E683	.400	1/16"
.082	F410E823	.400	1/16"
.1	F410E104	.400	1/16"
.12	F410E124	.500	1"
.15	F410E154	.500	1"
.18	F410E184	.562	1"
.22	F410E224	.562	1"
.27	F410E274	.562	1"
.33	F410E334	.562	1"
.39	F410E394	.670	1"
.47	F410E474	.670	1"
.56	F410E564	.670	1"
.68	F410E684	.670	1"
.82	F410E824	.750	2"
1.0	F410E105	.750	2"
1.5	F410E155	1.00	2"
2.0	F410E205	1.00	2"

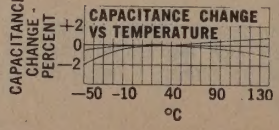
*Sizes shown are for floating circuit. Subtract 1/16" from length for grounded circuit.

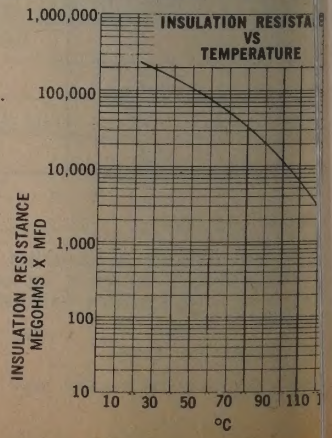
"F" indicates "Floating". Substitute "G" for Grounded.

Add following to part no. for tolerance: —20 = ±20%; —10 = ±10%; —5 = ±5%; —1 = ±1%.

TYPICAL CURVES







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"infilm" metallized polycarbonate dielectric

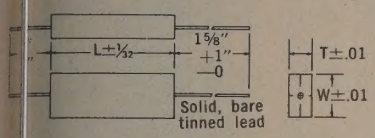
Series 317 & 318

- ULTRAMINIATURE
- SEALED IN RECTANGULAR EPOXY CASES
- –55°C TO +125°C WITHOUT DERATING
- SERIES 317 AXIAL LEADS
- SERIES 318 RADIAL LEADS

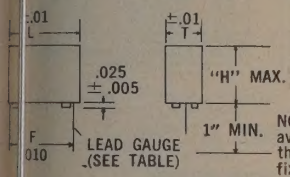
Outline drawings

Series 317

See Part No. Table for Lead Gauge.
Dimensions noted in inches.



Series 318



NOTE: .42x.31x18 cases have one round standoff between leads.
.55 x .31 x 18 has two standoffs between leads.

NOTE: Nickel "A" weldable leads are available with capacitors specified in this bulletin, add letter "W" as a suffix on the part number.

Specifications

CAPACITANCE AND TOLERANCE
The capacitance limits at +25°C are determined by the specified tolerance. Capacitance is measured at or referred to a frequency of 1000 cps.

DISSIPATION FACTOR
The dissipation factor at +25°C is less than 0.5% at 1000 cps.

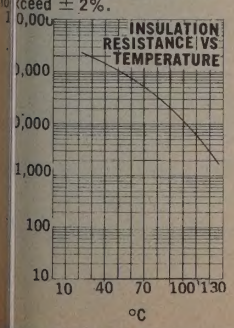
INSULATION RESISTANCE
The minimum insulation resistance when measured at rated voltage but not to exceed 500 VDC shall be as follows:
At 25°C 100,000 megohm-mfds minimum but need not exceed 200,000 megohms.
At 125°C 100 megohm-mfds minimum but need not exceed 2000 megohms.

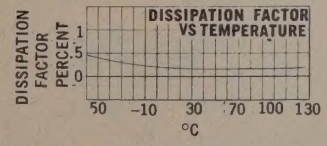
TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25°C, ±5°C. Test will be applied through resistor of 1 ohm per volt.

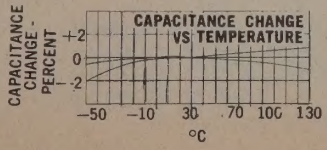
ACCELERATED LIFE TEST
Shall withstand an accelerated life test of 250 hours with 140% of applied rated voltage at applicable high test temperature. Only one failure in 12 capacitors tested shall be allowed. A failure is defined as the following:
If the capacitor has "opened".
If the capacitance has changed more than 5% from its original value.
If the insulation resistance is less than 30% of its original specified value.
If the dissipation factor is greater than 1%.

HUMIDITY TEST
Capacitors shall withstand 250 hours of 95% relative humidity at 40°C. Voltage will not be applied. Upon completion of test, units will be dried for 24 hours.
Minimum product of insulation resistance @ 25°C shall be 33% of the original specified value.
The capacitance is not to change more than 5% of its original value.
The dissipation factor shall not exceed 1.5%.

CAPACITANCE CHANGE WITH TEMPERATURE
The change of capacitance with reference to the actual value at +25°C shall not exceed ±2%.







317 SERIES

100 VDC Part No.	Cap.	L	W	T	Lead Gauge	200 VDC Part No.	Cap.	L	W	T	Lead Gauge
317B102	.001	.42	.29	.17	24	317C102	.001	.42	.29	.17	24
317B122	.0012	.42	.29	.17	24	317C122	.0012	.42	.29	.17	24
317B152	.0015	.42	.28	.17	24	317C152	.0015	.42	.29	.17	24
317B182	.0018	.42	.29	.17	24	317C182	.0018	.42	.29	.17	24
317B222	.0022	.42	.29	.17	24	317C222	.0022	.42	.29	.17	24
317B272	.0027	.42	.29	.17	24	317C272	.0027	.42	.29	.17	24
317B332	.0033	.42	.29	.17	24	317C332	.0033	.42	.29	.17	24
317B392	.0039	.42	.29	.17	24	317C392	.0039	.42	.29	.17	24
317B472	.0047	.42	.29	.17	24	317C472	.0047	.42	.29	.17	24
317B562	.0056	.42	.29	.17	24	317C562	.0056	.42	.29	.17	24
317B682	.0068	.42	.29	.17	24	317C682	.0068	.42	.29	.17	24
317B822	.0082	.42	.29	.17	24	317C822	.0082	.42	.29	.17	24
317B103	.01	.42	.29	.17	24	317C103	.01	.42	.29	.17	24
317B123	.012	.42	.29	.17	24	317C123	.012	.42	.29	.17	24
317B153	.015	.42	.29	.17	24	317C153	.015	.42	.29	.17	24
317B183	.018	.42	.29	.17	24	317C183	.018	.42	.29	.17	24
317B223	.022	.42	.29	.17	24	317C223	.022	.57	.29	.17	24
317G273	.027	.42	.29	.17	24	317C273	.027	.57	.29	.17	24
317B333	.033	.42	.29	.17	24	317C333	.033	.57	.29	.17	24
317B393	.039	.42	.29	.17	24	317C393	.039	.57	.29	.17	24
317B473	.047	.57	.29	.17	24	317C473	.047	.55	.36	.23	24
317B563	.056	.57	.29	.17	24	317C563	.056	.55	.36	.23	24
317B683	.068	.57	.29	.17	24	317C683	.068	.55	.36	.23	24
317B823	.082	.55	.36	.23	24	317C823	.082	.57	.42	.29	24
317B104	.10	.55	.36	.23	24	317C104	.10	.57	.42	.29	24
317B124	.12	.55	.36	.23	24	317C124	.12	.57	.42	.29	24
317B154	.15	.55	.36	.23	24	317C154	.15	.67	.42	.29	24
317B184	.18	.57	.42	.29	24	317C184	.18	.67	.42	.29	24
317B224	.22	.57	.42	.29	24	317C224	.22	.82	.42	.29	22
317B254	.25	.67	.42	.29	24	317C254	.25	.82	.42	.29	22
317B274	.27	.67	.42	.29	24	317C274	.27	.82	.42	.29	22
317B334	.33	.67	.42	.29	24	317C334	.33	.82	.54	.39	22
317B394	.39	.67	.42	.29	24	317C394	.39	.82	.54	.39	22
317B474	.47	.82	.42	.29	22	317C474	.47	.82	.54	.39	22
317B504	.50	.82	.42	.29	22	317C504	.50	.82	.54	.39	22
317B564	.56	.82	.54	.39	22	317C564	.56	1.04	.54	.39	22
317B684	.68	.82	.54	.39	22	317C684	.68	1.04	.54	.39	20
317B754	.75	.82	.54	.39	22	317C754	.75	1.19	.54	.39	20
317B824	.82	.82	.54	.39	22	317C824	.82	1.19	.54	.39	20
317B105	1.0	1.04	.54	.39	22	317C105	1.0	1.24	.72	.56	20
317B155	1.5	1.19	.54	.39	20	317C155	1.5	1.24	.72	.56	20
317B205	2.0	1.24	.72	.56	20	317C205	2.0	1.75	.72	.56	20
317B305	3.0	1.24	.72	.56	20	317C305	3.0	1.75	.72	.56	20
317B505	5.0	1.75	.72	.56	20						

318 SERIES

100 VDC Part No.	Cap.	L	H	T	F	Lead Ga.	200 VDC Part No.	Cap.	L	H	T	F	Lead Ga.
318B102	.001	.42	.31	.18	.300	20	318C102	.001	.42	.31	.18	.300	22
318B122	.0012	.42	.31	.18	.300	22	318C122	.0012	.42	.31	.18	.300	22
318B152	.0015	.42	.31	.18	.300	22	318C152	.0015	.42	.31	.18	.300	22
318B182	.0018	.42	.31	.18	.300	22	318C182	.0018	.42	.31	.18	.300	22
318B222	.0022	.42	.31	.18	.300	22	318C222	.0022	.42	.31	.18	.300	22
318B272	.0027	.42	.31	.18	.300	22	318C272	.0027	.42	.31	.18	.300	22
318B332	.0033	.42	.31	.18	.300	22	318C332	.0033	.42	.31	.18	.300	22
318B392	.0039	.42	.31	.18	.300	22	318C392	.0039	.42	.31	.18	.300	22
318B472	.0047	.42	.31	.18	.300	22	318C472	.0047	.42	.31	.18	.300	22
318B562	.0056	.42	.31	.18	.300	22	318C562	.0056	.42	.31	.18	.300	22
318B822	.0082	.42	.31	.18	.300	22	318C822	.0082	.42	.31	.18	.300	22
318B103	.01	.42	.31	.18	.300	22	318C103	.01	.42	.31	.18	.300	22
318B123	.012	.42	.31	.18	.300	22	318C123	.012	.42	.31	.18	.300	22
318B153	.015	.42	.31	.18	.300	22	318C153	.015	.42	.31	.18	.300	22
318B183	.018	.42	.31	.18	.300	22	318C183	.018	.42	.31	.18	.300	22
318B223	.022	.42	.31	.18	.300	22	318C223	.022	.55	.31	.18	.400	22
318B273	.027	.42	.31	.18	.300	22	318C273	.027	.55	.31	.18	.400	22
318B333	.033	.42	.31	.18	.300	22	318C333	.033	.55	.31	.18	.400	22
318B393	.039	.42	.31	.18	.300	22	318C393	.039	.55	.31	.18	.400	22
318B473	.047	.55	.31	.18	.400	22	318C473	.047	.55	.38	.24	.400	22
318B563	.056	.55	.31	.18	.400	22	318C563	.056	.55	.38	.24	.400	22
318B683	.068	.55	.31	.18	.400	22	318C683	.068	.55	.38	.24	.400	22
318B823	.082	.55	.38	.24	.400	22	318C823	.082	.55	.44	.30	.400	22
318B104	.10	.55	.38	.24	.400	22	318C104	.10	.55	.44	.30	.400	22
318B124	.12	.55	.38	.24	.400	22	318C124	.12	.55	.44	.30	.400	22
318B154	.15	.55	.38	.24	.400	22	318C154	.15	.67	.44	.30	.500	22
318B184	.18	.55	.38	.24	.400	22	318C184	.18	.67	.44	.30	.500	22
318B224	.22	.55	.44	.30	.400	22	318C224	.22	.82	.44	.30	.600	22
318B274	.27	.67	.44	.30	.500	22	318C274	.27	.82	.44	.30	.600	22
318B334	.33	.67	.44	.30	.500	22	318C334	.33	.82	.56	.40	.600	22
318B394	.39	.67	.44	.30	.500	22	318C394	.39	.82	.56	.40	.600	22
318B474	.47	.82	.44	.30	.600	22	318C474	.47	.82	.56	.40	.600	22
318B564	.56	.82	.56	.40	.600	22	318C564	.56	1.04	.56	.40	.800	22
318B684	.68	.82	.56	.40	.600	22	318C684	.68	1.04	.56	.40	.800	22
318B824	.82	.82	.56	.40	.600	22	318C824	.82	1.24	.56	.40	1.100	20
318B105	1.0	1.04	.56	.40	.800	22	318C105	1.0	1.24	.74	.57	1.100	20
318B125	1.2	1.24	.56	.40	1.100	20	318C125	1.2	1.24	.74	.57	1.100	20
318B155	1.5	1.24	.56	.40	1.100	22	318C155	1.5	1.24	.74	.57	1.100	20
318B185	1.8	1.24	.74	.57	1.100	20	318C185	1.8	1.75	.74	.57	1.600	20
318B205	2.0	1.24	.74	.57	1.100	20	318C205	2.0	1.75	.74	.57	1.600	20
318B225	2.2	1.24	.74	.57	1.100	20	318C225	2.2	1.75	.74	.57	1.600	20
318B275	2.7	1.24	.74	.57	1.100	20	318C275	2.7	1.75	.74	.57	1.600	20
318B305	3.0	1.24	.74	.57	1.100	20	318C305	3.0	1.75	.74	.57	1.600	20
318B335	3.3	1.75	.74	.57	1.600	20							
318B395	3.9	1.75	.74	.57	1.600	20							
318B475	4.7	1.75	.74	.57	1.600	20							
318B505	5.0	1.75	.74	.57	1.600	20							
318B565	5.6	1.75	.74	.57	1.600	20							

Add following to Part No. for tolerance: —M = ±20%; —K = ±10%; —J = ±5%; —B = ±2%.

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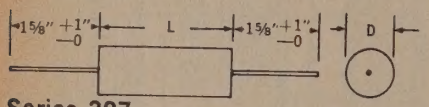
"thinfilm" metallized polycarbonate dielectric

series 396 & 397

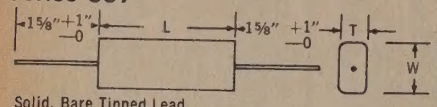
ULTRAMINIATURE TUBULAR (Series 396) AND FLAT CAPACITORS (Series 397)
SEALED IN NON-METALLIC CASES WITH PLASTIC RESIN END SEALS
—55°C TO +125°C WITHOUT DERATING
100 VDC TO 200 VDC

outline drawings

Series 396



Series 397



Solid, Bare Tinned Lead
See Part No. Table for Lead Gauge
NOTE: Nickel "A" weldable leads are available!
Add suffix "W" to Part No. for nickel lead.

SERIES 396

50 VOLTS

Cap. In Mfds.	Part No.	Dia. Max.	L ±1/16	Ld. Ga.
.01	396A103	.171	½"	24
.012	396A123	.171	½"	24
.015	396A153	.171	½"	24
.018	396A183	.171	½"	24
.022	396A223	.171	½"	24
.027	396A273	.171	½"	24
.033	396A333	.171	½"	24
.047	396A473	.171	½"	24
.056	396A563	.171	½"	24
.068	396A683	.171	⅝"	24
.082	396A823	.171	⅝"	24
.1	396A104	.171	⅝"	24
.12	396A124	.171	⅝"	24
.15	396A154	.187	⅝"	24
.18	396A184	.187	⅝"	24
.22	396A224	.234	⅝"	22
.27	396A274	.234	⅝"	22
.33	396A334	.312	⅝"	22
.47	396A474	.312	⅝"	22
.56	396A564	.312	⅝"	22
.68	396A684	.312	13/16"	22
.82	396A824	.312	13/16"	22
1.0	396A105	.312	13/16"	22
1.2	396A125	.390	13/16"	20
1.5	396A155	.390	13/16"	20
1.8	396A185	.390	13/16"	20
2.0	396A205	.390	13/16"	20
2.2	396A225	.390	1 1/8"	20
2.7	396A275	.390	1 1/8"	20
3.0	396A305	.390	1 1/8"	20
3.3	396A335	.390	1 1/8"	20
3.9	396A395	.500	1 1/8"	20
4.7	396A475	.500	1 1/8"	20
5.0	396A505	.500	1 1/8"	20
5.6	396A565	.500	1 1/8"	20
6.8	396A685	.562	1 3/16"	20
8.2	396A825	.562	1 3/16"	20
10.0	396A106	.671	1 3/16"	20
15.0	396A156	.750	1 3/8"	20

100 VOLTS

Cap. In Mfds.	Part No.	Dia. Max.	L ±1/16	Ld. Ga.
.01	396B103	.203	9/16"	24
.012	396B123	.203	9/16"	24
.015	396B153	.203	9/16"	24
.018	396B183	.218	9/16"	24
.022	396B223	.218	9/16"	24
.027	396B273	.218	9/16"	24
.033	396B333	.218	9/16"	24
.039	396B393	.218	9/16"	24
.047	396B473	.218	⅝"	24
.056	396B563	.218	⅝"	24
.068	396B683	.250	⅝"	22
.075	396B753	.250	⅝"	22
.082	396B823	.250	⅝"	22
.1	396B104	.250	11/16"	22
.12	396B124	.250	11/16"	22
.15	396B154	.343	⅝"	22
.18	396B184	.343	⅝"	22
.22	396B224	.343	11/16"	22
.27	396B274	.343	11/16"	22
.33	396B334	.343	13/16"	22
.39	396B394	.343	13/16"	22
.47	396B474	.421	11/16"	20
.56	396B564	.421	13/16"	20
.68	396B684	.421	13/16"	20
.82	396B824	.421	13/16"	20
1.0	396B105	.421	1"	20
1.5	396B155	.531	1 1/8"	20
2.0	396B205	.531	1 5/16"	20
3.0	396B305	.593	1 5/16"	20
4.0	396B405	.703	1 5/16"	20
5.0	396B505	.703	1 5/16"	20
7.0	396B705	.781	1 7/8"	20
8.0	396B805	.781	1 7/8"	20
10.0	396B106	1.031	2 1/8"	20

200 VOLTS

Cap. In Mfds.	Part No.	Dia. Max.	L ±1/16	Ld. Ga.
.01	396C103	.203	11/16	24
.012	396C123	.218	11/16	24
.015	396C153	.218	11/16	24
.018	396C183	.250	11/16	22
.022	396C223	.250	11/16	22
.027	396C273	.250	11/16	22
.033	396C333	.250	13/16	22
.039	396C393	.250	13/16	22
.047	396C473	.250	13/16	22
.056	396C563	.250	13/16	22
.068	396C683	.343	13/16	22
.082	396C823	.343	13/16	22
.1	396C104	.343	13/16	22
.12	396C124	.343	13/16	22
.15	396C154	.343	13/16	22
.18	396C184	.421	13/16	20
.22	396C224	.421	13/16	20
.27	396C274	.421	1 1/16	20
.33	396C334	.421	1 1/16	20
.39	396C394	.421	1 3/16	20
.47	396C474	.421	1 3/16	20
.56	396C564	.593	1 1/16	20
.68	396C684	.593	1 1/16	20
.82	396C824	.593	1 5/16	20
1.0	396C105	.593	1 5/16	20
1.5	396C155	.703	1 5/16	20
2.0	396C205	.703	1 5/16	20
3.0	396C305	.781	1 7/8	20
4.0	396C405	.781	2 1/8	20
5.0	396C505	.781	2 3/8	20
7.0	396C705	1.031	1 7/8	20
8.0	396C805	1.031	2 1/8	20
10.0	396C106	1.031	2 5/8	20

SERIES 397

100 VOLTS

Cap. In Mfds.	Part No.	T Max.	W Max.	L ±1/16	Ld. Ga.
.01	397B103	.156	.250	9/16"	24
.012	397B123	.156	.250	9/16"	24
.015	397B153	.156	.250	9/16"	24
.018	397B183	.156	.250	9/16"	24
.022	397B223	.156	.250	9/16"	24
.027	397B273	.156	.250	9/16"	24
.033	397B333	.156	.250	9/16"	24
.039	397B393	.156	.250	9/16"	24
.047	397B473	.156	.250	⅝"	24
.056	397B563	.156	.250	⅝"	24
.068	397B683	.171	.296	⅝"	22
.075	397B753	.171	.296	⅝"	22
.082	397B823	.171	.296	⅝"	22
.1	397B104	.171	.296	11/16"	22
.12	397B124	.171	.296	11/16"	22
.15	397B154	.265	.390	⅝"	22
.18	397B184	.265	.390	⅝"	22
.22	397B224	.265	.390	11/16"	22
.27	397B274	.265	.390	11/16"	22
.33	397B334	.265	.390	13/16"	22
.39	397B394	.265	.390	13/16"	22
.47	397B474	.343	.453	11/16"	20
.56	397B564	.343	.453	13/16"	20
.68	397B684	.343	.453	13/16"	20
.82	397B824	.343	.453	15/16"	20
1.0	397B105	.343	.453	1"	20
1.5	397B155	.421	.578	1 1/8"	20
2.0	397B205	.421	.578	1 5/16"	20
3.0	397B305	.484	.640	1 5/16"	20
4.0	397B405	.578	.765	1 5/16"	20
5.0	397B505	.578	.765	1 5/16"	20
7.0	397B705	.656	.859	1 7/8"	20
8.0	397B805	.656	.859	1 7/8"	20
10.0	397B106	.906	1.109	2 1/8"	20

200 VOLTS

Cap. In Mfds.	Part No.	T Max.	W Max.	L ±1/16	Ld. Ga.
.01	397C103	.156	.250	11/16"	2
.012	397C123	.156	.250	11/16"	2
.015	397C153	.156	.250	11/16"	2
.018	397C183	.171	.211	11/16"	2
.022	397C223	.171	.211	11/16"	2
.027	397C273	.171	.211	11/16"	2
.033	397C333	.171	.211	13/16"	2
.039	397C393	.171	.211	13/16"	2
.047	397C473	.171	.211	13/16"	2
.056	397C563	.171	.211	13/16"	2
.068	397C683	.265	.390	13/16"	2
.082	397C823	.265	.390	13/16"	2
.1	397C104	.265	.390	13/16"	2
.12	397C124	.265	.390	13/16"	2
.15	397C154	.265	.390	13/16"	2
.18	397C184	.343	.453	13/16"	2
.22	397C224	.343	.453	13/16"	2
.27	397C274	.343	.453	1 1/16"	2
.33	397C334	.343	.453	1 1/16"	2
.39	397C394	.343	.453	1 3/16"	2
.47	397C474	.343	.453	1 5/16"	2
.56	397C564	.484	.640	1 1/16"	2
.68	397C684	.484	.640	1 1/16"	2
.82	397C824	.484	.640	1 5/16"	2
1.0	397C105	.484	.640	1 5/16"	2
1.5	397C155	.593	.750	1 5/16"	2
2.0	397C205	.593	.750	1 9/16"	2
3.0	397C305	.656	.859	1 7/8"	2
4.0	397C405	.656	.859	2 1/8"	2
5.0	397C505	.656	.859	2 3/8"	2
7.0	397C705	.906	1.109	1 7/8"	2
8.0	397C805	.906	1.109	2 1/8"	2
10.0	397C106	.906	1.109	2 5/8"	2

specifications

CAPACITANCE AND TOLERANCE

The capacitance limits at +25°C are determined by the specified tolerance.
Capacitors are measured or referred to a frequency of 1000 cps.

DISSIPATION FACTOR

The dissipation factor at +25°C shall be less than 0.5% at 1000 cps.

INSULATION RESISTANCE

The charging potential is equal to the specified operating voltage for a given temperature. The minimum electrification time is two minutes. Listed below are minimum values:

Temperature	Nominal Capacitance Mfd.	R X C Megohms X mfd.	R Megohms
25°C	Greater than .5	50,000	
	Smaller than .5		100,000
125°C	Greater than .5	500	
	Smaller than .5		1,000

TEST VOLTAGE

Shall withstand a DC voltage equal to 200% of the rated voltage for one minute at a temperature of +25°C, ±5°C. Test voltage will be applied through resistor of 1 ohm per volt.

ACCELERATED LIFE TEST

Shall withstand an accelerated life test of 250 hours with 140% of applied rated voltage at applicable high test temperature. Only one failure in 12 capacitors tested shall be allowed. A failure is defined as the following:

A) If the capacitor has "opened."
B) If the capacitance has changed more than 5% from its original value.
C) If the insulation resistance is less than 50% of the original specified value.
D) If the DF is greater than 1%.

HUMIDITY

Not intended to be operated where humidity is a problem. This series is intended for use in circuits which are encapsulated or hermetically sealed.

LEAD PULL TEST

These capacitors shall withstand a five (5) pound pull applied axially for one minute, per MIL-C-25.

LEAD BEND TEST

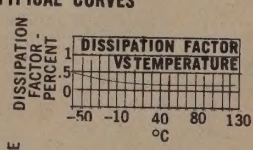
Leads shall be bent without breakage about the point of egress from the capacitor. First 90 degrees in one direction then back to the original position and then 90 degrees in the opposite direction.

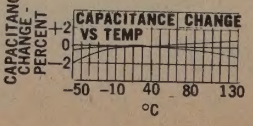
CAPACITANCE CHANGE WITH TEMP.

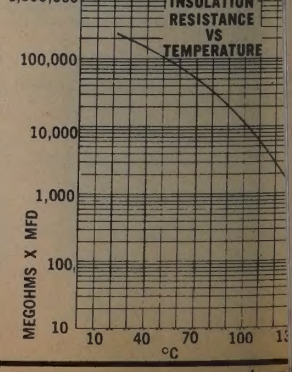
The change of capacitance with reference to the actual value at 25°C will not exceed the following limits:

TEMPERATURE	CHANGE OF CAPACITANCE
— 55°C	—2%
+125°C	±1%

TYPICAL CURVES







See YELLOW SECTION for Local Offices, Phones

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hinfilm" metallized mylar* dielectric

ries 322 & 323

TRA MINIATURE CAPACITORS
ALED IN RECTANGULAR EPOXY CASES WITH RESIN END SEAL
VDC TO 200 VDC
RIES 322 — RADIAL LEADS
RIES 323 — AXIAL LEADS

ecifications

SIPATION FACTOR
dissipation factor shall not exceed 1.0% when measured at or referred to a uency of 1,000 CPS at +25°C. Nominal capacitance values above 1.0 mfd. measured at or referred to a frequency of 60 cps.

ULATION RESISTANCE
minimum insulation resistance when measured with an applied potential of o 200 volts, but not to exceed the rated voltage, shall be as follows:
-25°C 10,000 megohm-mfds. minimum but need not exceed 30,000 megohms.
-85°C 500 megohm-mfds. minimum but need not exceed 3000 megohms.
+125°C 10 megohm-mfds. minimum but need not exceed 150 megohms.

ELERATED LIFE TEST
ll withstand an accelerated life test of 250 hours with 140% of applied rated age at applicable high test temperature. Only one failure in 12 capacitors ed shall be allowed.
ilure is defined as the following:
f the capacitor has "opened" or short circuited.
f the capacitance has changed more than 10% from its original value.
f the insulation resistance is less than 30% of its specified value.

T VOLTAGE
ll withstand a DC voltage equal to 200% of the rated voltage for one minute temperature of +25°C±5°C.

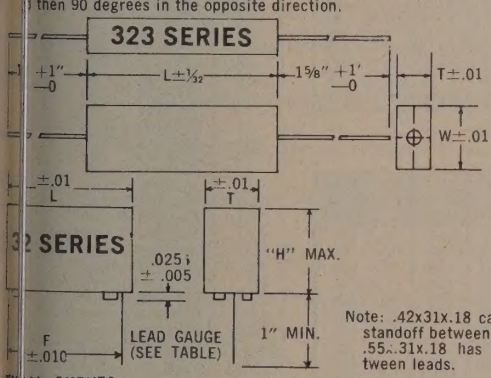
TAGE RATINGS
igned to operate over the temperature range of —55°C to +85°C at full rated voltage and up to +125°C with working voltages as follows:

+85°C	+125°C
200VDC	100VDC
100VDC	50VDC

MIDITY TEST
acitors shall withstand 250 hours of 95% relative humidity at 40°C. Voltage not be applied. Upon completion of test, units will be dried for four hours. imum product of insulation resistance shall be 5000 megohm-mfd but need exceed 15,000 megohms.
capacitance will change not more than 10% of its original value. The dissi- ion factor shall not increase over 1.5%.

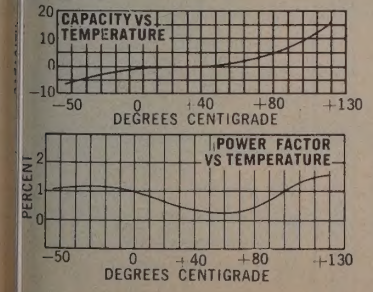
D PULL TEST
ll withstand a five (5) pound pull applied axially for one minute.

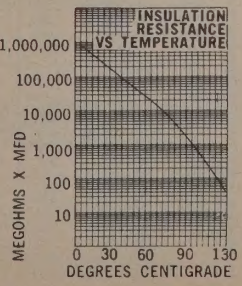
D BEND TEST
ds shall be bent without breakage about the point of the egress from the acitor. First 90 degrees in one direction then back to the original position, then 90 degrees in the opposite direction.



Note: .42x31x.18 case have one round standoff between leads. .55x.31x.18 has two standoffs between leads.

TYPICAL CURVES





*Pont trademark

SERIES 323

100 VDC

MFD	100 VDC L	W	T	Part No.	Lead Gauge
.001	.42	.29	.17	323B102	24
.0012	.42	.29	.17	323B122	24
.0015	.42	.29	.17	323B152	24
.0018	.42	.29	.17	323B182	24
.0022	.42	.29	.17	323B222	24
.0027	.42	.29	.17	323B272	24
.0033	.42	.29	.17	323B332	24
.0039	.42	.29	.17	323B392	24
.0047	.42	.29	.17	323B472	24
.0056	.42	.29	.17	323B562	24
.0068	.42	.29	.17	323B682	24
.0082	.42	.29	.17	323B822	24
.01	.42	.29	.17	323B103	24
.012	.42	.29	.17	323B123	24
.015	.42	.29	.17	323B153	24
.018	.42	.29	.17	323B183	24
.022	.42	.29	.17	323B223	24
.027	.42	.29	.17	323B273	24
.033	.42	.29	.17	323B333	24
.039	.42	.29	.17	323B393	24
.047	.42	.29	.17	323B473	24
.056	.57	.29	.17	323B563	24
.068	.57	.29	.17	323B683	24
.082	.57	.29	.17	323B823	24
.10	.57	.29	.17	323B104	24
.12	.57	.29	.17	323B124	24
.15	.55	.36	.23	323B154	24
.18	.55	.36	.23	323B184	24
.22	.55	.36	.23	323B224	24
.25	.55	.36	.23	323B254	24
.27	.55	.36	.23	323B274	24
.33	.57	.42	.29	323B334	24
.39	.57	.42	.29	323B394	24
.47	.67	.42	.29	323B474	24
.50	.67	.42	.29	323B504	24
.56	.67	.42	.29	323B564	24
.68	.67	.42	.29	323B684	24
.75	.82	.42	.29	323B754	24
.82	.82	.42	.29	323B824	22
1.0	.82	.54	.39	323B105	22
1.5	.82	.54	.39	323B155	22
2.0	1.04	.54	.39	323B205	22
3.0	1.24	.54	.39	323B305	22
5.0	1.75	.72	.56	323B505	20
8.0	1.75	.72	.56	323B805	20
10.0	1.92	.72	.56	323B106	20

200 VDC

MFD	200 VDC L	W	T	Part No.	Lead Gauge
.001	.42	.29	.17	323C102	24
.0012	.42	.29	.17	323C122	24
.0015	.42	.29	.17	323C152	24
.0018	.42	.29	.17	323C182	24
.0022	.42	.29	.17	323C222	24
.0027	.42	.29	.17	323C272	24
.0033	.42	.29	.17	323C332	24
.0039	.42	.29	.17	323C392	24
.0047	.42	.29	.17	323C472	24
.0056	.42	.29	.17	323C562	24
.0068	.42	.29	.17	323C682	24
.0082	.42	.29	.17	323C822	24
.01	.42	.29	.17	323C103	24
.012	.42	.29	.17	323C123	24
.015	.42	.29	.17	323C153	24
.018	.42	.29	.17	323C183	24
.022	.42	.29	.17	323C223	24
.027	.57	.29	.17	323C273	24
.033	.57	.29	.17	323C333	24
.039	.57	.29	.17	323C393	24
.047	.55	.36	.23	323C473	24
.056	.55	.36	.23	323C563	24
.068	.55	.36	.23	323C683	24
.082	.55	.36	.23	323C823	24
.1	.57	.42	.29	323C104	24
.12	.57	.42	.29	323C124	24
.15	.67	.42	.29	323C154	24
.18	.67	.42	.29	323C184	24
.22	.67	.42	.29	323C224	24
.25	.82	.42	.29	323C254	22
.27	.82	.42	.29	323C274	22
.33	82	.54	.39	323C334	22
.39	.82	.54	.39	323C394	22
.47	.82	.54	.39	323C474	22
.50	.82	.54	.39	323C504	22
.56	1.04	.54	.39	323C564	22
.68	1.04	.54	.39	323C684	22
.75	1.04	.54	.39	323C754	22
.82	1.19	.54	.39	323C824	22
1.0	1.19	.54	.39	323C105	22
1.5	1.75	.72	.56	323C155	20
2.0	1.75	.72	.56	323C205	20
3.0	1.75	.72	.56	323C305	20

SERIES 322

100 VDC

MFD	100 VDC L	H	T	F	Part No.	Ld. Ga.
.001	.42	.31	.18	.300	322B102	22
.0012	.42	.31	.18	.300	322B122	22
.0015	.42	.31	.18	.300	322B152	22
.0018	.42	.31	.18	.300	322B182	22
.0022	.42	.31	.18	.300	322B222	22
.0027	.42	.31	.18	.300	322B272	22
.0033	.42	.31	.18	.300	322B332	22
.0039	.42	.31	.18	.300	322B392	22
.0047	.42	.31	.18	.300	322B472	22
.0056	.42	.31	.18	.300	322B562	22
.0068	.42	.31	.18	.300	322B682	22
.0082	.42	.31	.18	.300	322B822	22
.01	.42	.31	.18	.300	322B103	22
.012	.42	.31	.18	.300	322B123	22
.015	.42	.31	.18	.300	322B153	22
.018	.42	.31	.18	.300	322B183	22
.022	.42	.31	.18	.300	322B223	22
.027	.42	.31	.18	.300	322B273	22
.033	.42	.31	.18	.300	322B333	22
.039	.42	.31	.18	.300	322B393	22
.047	.42	.31	.18	.300	322B473	22
.056	.55	.31	.18	.400	322B563	22
.068	.55	.31	.18	.400	322B683	22
.082	.55	.31	.18	.400	322B823	22
.1	.55	.31	.18	.400	322B104	22
.12	.55	.31	.18	.400	322B124	22
.15	.55	.38	.24	.400	322B154	22
.18	.55	.38	.24	.400	322B184	22
.22	.55	.38	.24	.400	322B224	22
.25	.55	.38	.24	.400	322B254	22
.27	.55	.38	.24	.400	322B274	22
.33	.55	.44	.30	.400	322B334	22
.39	.55	.44	.30	.400	322B394	22
.47	.67	.44	.30	.500	322B474	22
.50	.67	.44	.30	.500	322B504	22
.56	.67	.44	.30	.500	322B564	22
.68	.67	.44	.30	.500	322B684	22
.75	.82	.44	.30	.600	322B754	22
.82	.82	.44	.30	.600	322B824	22
1.0	.82	.56	.40	.600	322B105	22
1.5	.82	.56	.40	.600	322B155	22
2.0	1.04	.56	.40	.800	322B205	22
3.0	1.24	.56	.40	1.100	322B305	20
5.0	1.75	.74	.57	1.600	322B505	20
8.0	1.75	.74	.57	1.600	322B805	20

200 VDC

MFD	200 VDC L	H	T	F	Part No.	Ld. Ga.
.001	.42	.31	.18	.300	322C102	22
.0012	.42	.31	.18	.300	322C122	22
.0015	.42	.31	.18	.300	322C152	22
.0018	.42	.31	.18	.300	322C182	22
.0022	.42	.31	.18	.300	322C222	22
.0027	.42	.31	.18	.300	322C272	22
.0033	.42	.31	.18	.300	322C332	22
.0039	.42	.31	.18	.300	322C392	22
.0047	.42	.31	.18	.300	322C472	22
.0056	.42	.31	.18	.300	322C562	22
.0068	.42	.31	.18	.300	322C682	22
.0082	.42	.31	.18	.300	322C822	22
.01	.42	.31	.18	.300	322C103	22
.012	.42	.31	.18	.300	322C123	22
.015	.42	.31	.18	.300	322C153	22
.018	.42	.31	.18	.300	322C183	22
.022	.42	.31	.18	.300	322C223	22
.027	.55	.31	.18	.400	322C273	22
.033	.55	.31	.18	.400	322C333	22
.039	.55	.31	.18	.400	322C393	22
.047	.55	.38	.24	.400	322C473	22
.056	.55	.38	.24	.400	322C563	22
.068	.55	.38	.24	.400	322C683	22
.082	.55	.38	.24	.400	322C823	22
.1	.55	.44	.30	.400	322C104	22
.12	.55	.44	.30	.400	322C124	22
.15	.67	.44	.30	.500	322C154	22
.18	.67	.44	.30	.500	322C184	22
.22	.67	.44	.30	.500	322C224	22
.25	.82	.44	.30	.600	322C254	22
.27	.82	.44	.30	.600	322C274	22
.33	.82	.56	.40	.600	322C334	22
.39	.82	.56	.40	.600	322C394	22
.47	.82	.56	.40	.600	322C474	22
.50	.82	.56	.40	.600	322C504	22
.56	1.04	.56	.40	.800	322C564	22
.68	1.04	.56	.40	.800	322C684	22
.75	1.04	.56	.40	.800	322C754	22
.82	1.24	.56	.40	1.100	322C824	20
1.0	1.24	.56	.40	1.100	322C105	20
1.5	1.75	.74	.57	1.600	322C155	20
2.0	1.75	.74	.57	1.600	322C205	20
3.0	1.75	.74	.57	1.600	322C305	20

NOTE: Nickel "A" weldable leads are available, simply add the letter "W" as a suffix on the part number.

Note: Larger case sizes may be supplied in plastic case material other than epoxy. Add following to part no. for tolerance: —M = ±20%; —K = ±10%; —J = ±5%; —B = ±2%.

GUDEMAN

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340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-86

"thinfilm" metallized mylar* dielectric

series 363 & 364

ULTRA MINIATURE FLAT AND TUBULAR CAPACITORS
SEALED IN NON-METALLIC CASES with PLASTIC RESIN END SEALS
—55°C TO +125°C
100 VDC TO 600 VDC

specifications

DISSIPATION FACTOR
The dissipation factor shall not exceed 1.0% when measured at or referred to a frequency of 1,000 CPS at +25°C per MIL-C-25C. Nominal capacitance values above 1.0 mfd. are measured at or referred to a frequency of 60 cps.

INSULATION RESISTANCE
The minimum insulation resistance when measured with an applied potential of 50 to 500 volts, but not to exceed the rated voltage, shall be as follows:
At + 25°C 50,000 megohm-mfds minimum but need not exceed 150,000 megohms
At + 85°C 500 megohm-mfds minimum but need not exceed 3000 megohms
At + 125°C 10 megohm-mfds minimum but need not exceed 150 megohms

TEST VOLTAGE
Shall withstand a DC voltage equal to 200% of the rated vol age for one minute at a temperature of +25°C, ± 5°C.

ACCELERATED LIFE TEST
Shall withstand an accelerated life test of 250 hours with 140% of applied rated voltage at applicable high test temperature. Only one failure in 12 capacitors tested shall be allowed. A failure is defined as the following:
A) If the capacitor has "opened" or short circuited.
B) If the capacitance has changed more than 10% from its original value.
C) If the insulation resistance is less than 30% of its original value.

VOLTAGE RATINGS
Designed to operate over the temperature range of —55°C to +85°C at full rated DC voltage and up to +125°C with working voltages as follows:

+85°C	+125°C
400 VDC	200 VDC
200 VDC	100 VDC
100 VDC	50 VDC

MOISTURE RESISTANCE
Shall withstand the moisture resistance requirements as specified in military specification MIL-C-25C.

VIBRATION-ACCELERATION
These capacitors shall withstand the Grade 3 vibration-acceleration requirements of MIL-C-25C.

LEAD PULL TEST
Shall withstand a five (5) pound pull applied axially for one minute, per MIL-C-25C.

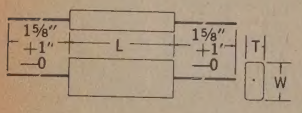
LEAD BEND TEST
Leads shall be bent without breakage about the point of egress from the capacitor. First 90 degrees in one direction then back to the original position, and then 90 degrees in the opposite direction, per MIL-C-25C.

CAPACITANCE TEST WITH TEMPERATURE
The capacitance change shall not exceed the following values with reference to the +25°C capacitance value:

TEMPERATURE	% CAP CHANGE
— 55°C	—10% Maximum
+ 85°C	+ 5% Maximum
+125°C	+16% Maximum

outline drawings

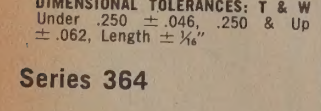
Series 363



NOTE: Nickel "A" weldable leads are available with the capacitors specified in this bulletin, simply add the letter "W" as a suffix on the part number.

DIMENSIONAL TOLERANCES: T & W Under .250 ± .046, .250 & Up ± .062, Length ± 1/16"

Series 364



DIMENSIONAL TOLERANCES: Under .250 dia. ± .046, .250 dia and up ± .062, length ± 1/16"

363 SERIES

100 VDC

Cap. in Mfds.	Part No.	T.	W.	L.	Lead Gau. AWG
.015	363B153	.125"	.250"	11/16"	24
.018	363B183	.125"	.250"	11/16"	24
.022	363B223	.125"	.250"	11/16"	24
.027	363B273	.125"	.250"	11/16"	24
.033	363B333	.125"	.250"	11/16"	24
.039	363B393	.125"	.250"	11/16"	24
.047	363B473	.125"	.250"	11/16"	24
.056	363B563	.125"	.250"	11/16"	24
.068	363B683	.125"	.250"	11/16"	24
.082	363B823	.125"	.250"	11/16"	24
.10	363B104	.125"	.250"	11/16"	24
.12	363B124	.125"	.250"	11/16"	24
.15	363B154	.125"	.250"	11/16"	24
.18	363B184	.125"	.250"	11/16"	24
.22	363B224	.140"	.250"	11/16"	22
.27	363B274	.156"	.281"	11/16"	22
.33	363B334	.171"	.296"	11/16"	22
.39	363B394	.187"	.312"	11/16"	22
.47	363B474	.218"	.343"	13/16"	22
.56	363B564	.250"	.375"	13/16"	22
.68	363B684	.187"	.312"	15/16"	22
.82	363B824	.218"	.343"	15/16"	22
1.0	363B105	.218"	.359"	1 1/16"	22
1.5	363B155	.250"	.421"	1 1/16"	22
2.0	*363W205	.296"	.468"	1 1/16"	20
3.0	*363W305	.312"	.500"	1 3/16"	20
4.0	*363W405	.375"	.562"	1 3/8"	20
5.0	*363W505	.437"	.625"	1 3/8"	20
6.0	*363W605	.500"	.687"	1 5/8"	20
7.0	*363W705	.546"	.734"	1 5/8"	20
8.0	*363W805	.500"	.734"	1 7/8"	20
9.0	*363W905	.562"	.796"	1 7/8"	20
10.0	*363W106	.578"	.812"	1 7/8"	20

200 VDC

Cap. in Mfds.	Part No.	T.	W.	L.	Lead Gau. AWG
.015	363C153	.125"	.250"	11/16"	24
.018	363C183	.125"	.250"	11/16"	24
.022	363C223	.125"	.250"	11/16"	24
.027	363C273	.125"	.250"	11/16"	24
.033	363C333	.125"	.250"	11/16"	24
.039	363C393	.125"	.250"	11/16"	24
.047	363C473	.125"	.250"	11/16"	24
.056	363C563	.125"	.250"	11/16"	24
.068	363C683	.140"	.265"	11/16"	22
.082	363C823	.171"	.281"	11/16"	22
.10	363C104	.187"	.296"	11/16"	22
.12	363C124	.140"	.265"	13/16"	22
.15	363C154	.171"	.281"	13/16"	22
.18	363C184	.187"	.296"	13/16"	22
.22	363C224	.218"	.329"	13/16"	22
.27	363C274	.250"	.359"	13/16"	22
.33	363C334	.281"	.390"	13/16"	22
.39	363C394	.265"	.375"	15/16"	22
.47	363C474	.296"	.406"	15/16"	20
.56	363C564	.296"	.421"	1 1/16"	20
.68	363C684	.343"	.468"	1 1/16"	20
.82	363C824	.375"	.500"	1 1/16"	20
1.0	363C105	.312"	.468"	1 5/16"	20
1.5	363C155	.406"	.562"	1 3/8"	20
2.0	363C205	.468"	.640"	1 3/8"	20
3.0	363C305	.468"	.640"	1 5/8"	20
4.0	363C405	.500"	.703"	1 7/8"	20
5.0	363C505	.562"	.781"	1 7/8"	20
6.0	363C605	.656"	.875"	1 7/8"	20

400 VDC

Cap. in Mfds.	Part No.	T.	W.	L.	Lead Gau. AWG
.015	363E153	.125"	.250"	11/16"	24
.018	363E183	.125"	.250"	11/16"	24
.022	363E223	.125"	.250"	11/16"	24
.027	363E273	.140"	.250"	11/16"	22
.033	363E333	.156"	.265"	11/16"	22
.039	363E393	.187"	.281"	11/16"	22
.047	363E473	.203"	.312"	11/16"	22
.056	363E563	.140"	.250"	13/16"	22
.068	363E683	.156"	.265"	13/16"	22
.082	363E823	.171"	.281"	13/16"	22
.10	363E104	.187"	.296"	13/16"	22
.12	363E124	.218"	.328"	13/16"	22
.15	363E154	.250"	.359"	13/16"	22
.18	363E184	.234"	.343"	15/16"	22
.22	363E224	.265"	.375"	15/16"	22
.27	363E274	.281"	.406"	15/16"	20
.33	363E334	.281"	.437"	1 1/16"	20
.39	363E394	.312"	.468"	1 1/16"	20
.47	363E474	.343"	.500"	1 1/16"	20
.56	363E564	.312"	.468"	1 5/16"	20
.68	363E684	.359"	.515"	1 5/16"	20
.82	363E824	.406"	.546"	1 3/8"	20
1.0	363E105	.375"	.562"	1 5/8"	20
1.5	363E155	.453"	.640"	1 5/8"	20
2.0	363E205	.546"	.734"	1 5/8"	20
3.0	363E305	.609"	.843"	1 7/8"	20
4.0	363E405	.718"	.953"	1 7/8"	20
5.0	363E505	.828"	1.062"	1 7/8"	20

364 SERIES

100 VDC

Cap in Mfds.	Part No.	Dia.	L.	Lead Gau. AWG.
.0068	364B682	.156"	11/16"	24
.0082	364B822	.156"	11/16"	24
.010	364B103	.156"	11/16"	24
.012	364B123	.156"	11/16"	24
.015	365B153	.156"	11/16"	24
.018	364B183	.156"	11/16"	24
.022	364B223	.156"	11/16"	24
.027	364B273	.156"	11/16"	24
.033	364B333	.156"	11/16"	24
.039	364B393	.156"	11/16"	24
.047	364B473	.156"	11/16"	24
.056	364B563	.156"	11/16"	24
.068	364B683	.156"	11/16"	24
.082	364B823	.156"	11/16"	24
.10	364B104	.171"	11/16"	24
.12	364B124	.171"	11/16"	24
.15	364B154	.187"	11/16"	24
.18	364B184	.203"	11/16"	24
.22	364B224	.218"	11/16"	22
.27	364B274	.234"	11/16"	22
.33	364B334	.250"	11/16"	22
.39	364B394	.265"	11/16"	22
.47	364B474	.296"	13/16"	22
.56	364B564	.328"	13/16"	22
.68	364B684	.281"	15/16"	22
.82	364B824	.296"	15/16"	22
1.0	364B105	.312"	1 1/16"	22
1.5	364B155	.359"	1 1/16"	22
2.0	*364W205	.406"	1 1/16"	20
3.0	*364W305	.421"	1 3/16"	20
4.0	*364W405	.500"	1 3/8"	20
5.0	*364W505	.562"	1 3/8"	20
6.0	*364W605	.625"	1 5/8"	20
7.0	*364W705	.671"	1 5/8"	20
8.0	*364W805	.656"	1 7/8"	20
9.0	*364W905	.718"	1 7/8"	20
10.0	*364W106	.734"	1 7/8"	20

*60VDC @ +85°C
*30VDC @ +125°C

200 VDC

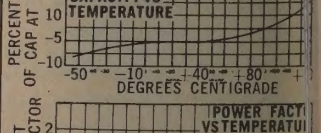
Cap. in Mfds.	Part No.	Dia.	L.	Lead Gau. AWG
.0068	364C682	.156"	11/16"	24
.0082	364C822	.156"	11/16"	24
.010	364C103	.156"	11/16"	24
.012	364C123	.156"	11/16"	24
.015	364C153	.156"	11/16"	24
.018	364C183	.156"	11/16"	24
.022	364C223	.156"	11/16"	24
.027	364C273	.156"	11/16"	24
.033	364C333	.171"	11/16"	24
.039	364C393	.187"	11/16"	24
.047	364C473	.203"	11/16"	24
.056	364C563	.203"	11/16"	24
.068	364C683	.218"	11/16"	24
.082	364C823	.250"	11/16"	22
.10	364C104	.265"	11/16"	22
.12	364C124	.218"	13/16"	22
.15	364C154	.250"	13/16"	22
.18	364C184	.265"	13/16"	22
.22	364C224	.296"	13/16"	22
.27	364C274	.328"	13/16"	22
.33	364C334	.343"	13/16"	22
.39	364C394	.343"	15/16"	22
.47	364C474	.375"	15/16"	20
.56	364C564	.390"	1 1/16"	20
.68	364C684	.421"	1 1/16"	20
.82	364C824	.468"	1 1/16"	20
1.0	364C105	.421"	1 3/16"	20
1.5	364C155	.500"	1 3/8"	20
2.0	364C205	.593"	1 3/8"	20
3.0	364C305	.578"	1 5/8"	20
4.0	364C405	.640"	1 7/8"	20
5.0	364C505	.703"	1 7/8"	20
6.0	364C605	.781"	1 7/8"	20

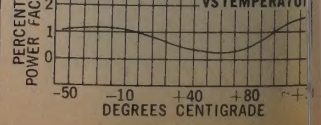
400 VDC

Cap. in Mfds.	Part No.	Dia.	L.	Lead Gau. AWG
.0068	364E682	.156"	11/16"	24
.0082	364E822	.156"	11/16"	24
.010	364E103	.156"	11/16"	24
.012	364E123	.171"	11/16"	24
.015	364E153	.187"	11/16"	24
.018	364E183	.187"	11/16"	24
.022	364E223	.203"	11/16"	24
.027	364E273	.218"	11/16"	22
.033	364E333	.234"	11/16"	22
.039	364E393	.250"	11/16"	22
.047	364E473	.265"	11/16"	22
.056	364E563	.203"	13/16"	22
.068	364E683	.218"	13/16"	22
.082	364E823	.250"	13/16"	22
.10	364E104	.265"	13/16"	22
.12	364E124	.296"	13/16"	22
.15	364E154	.328"	13/16"	22
.18	364E184	.296"	15/16"	22
.22	364E224	.343"	15/16"	22
.27	364E274	.375"	15/16"	22
.33	364E334	.390"	1 1/16"	22
.39	364E394	.421"	1 1/16"	22
.47	364E474	.453"	1 1/16"	22
.56	364E564	.421"	1 3/16"	22
.68	364E684	.453"	1 3/16"	22
.82	364E824	.500"	1 3/8"	22
1.0	364E105	.500"	1 5/8"	22
1.5	364E155	.578"	1 5/8"	22
2.0	364E205	.671"	1 5/8"	22
3.0	364E305	.765"	1 7/8"	22
4.0	364E405	.875"	1 7/8"	22
5.0	364E505	.984"	1 7/8"	22

*60VDC RATING @ +85°C
*30VDC RATING @ +125°C

Add following to Part No. for Tolerance: —M = ±20%; —K = ±10%; —J = ±5%; —B = ±2%.
Add Prefix "F" for fiberglass or wrap in lieu of Mylar tape.





See YELLOW SECTION for Local Offices, Phones

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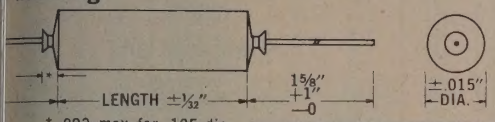
ıture metallized mylar* dielectric
68

CALLY SEALED (GLASS-TO-METAL)
R METALLIC CASES
TO +125°C WITHOUT DERATING
THRU 600 VDC

drawing



* .093 max for .125 dia otherwise .156 max
leads consist of solid, bare, re. Special nickel leads are for applications requiring degree of weldability.

Case Diameter (Inches)	Lead Gauge (AWG)
.125 thru .187	24
.235 and .312	22
.400 and up	20

cations

NCE AND TOLERANCE
itance limits at 25°C are determined by the specified tolerance.
which have a nominal valu of 1 MFD or less are measured or re- a frequency of 1000 cps. Nominal capacitances above 1 MFD are mea- r referred to a frequency of 60 cps.

ON FACTOR
ation factor at 25°C is less than 1.0%. Reference frequencies are as above.

N RESISTANCE
ing potential is equal to the specified operating voltage for a given re. The minimum electrification time is two minutes. Listed below um values:

ure	Nominal Capacitance MFD	R x C Megohms x MFD	R Megohms
	Greater than .333	50,000	
	Smaller than .333		150,000
	Greater than .167	500	
	Smaller than .167		3,000
	Greater than .067	10	
	Smaller than .067		150

TAGE
to withstand a test potential equal to 200% of the rated voltage for es at 25°C.
voltage must be applied and discharged through a current limiting re- f approximately 1000 ohms.

RATING ABOVE 85°
ng of the voltage is required for nominal ratings of 200, 400 and 600 00 VDC capacitors, however, are to be derated above 85°C at the rate per degree C.

TED LIFE TEST — AT 125°C
s are designed to withstand a test potential equal to 140% of the 125°C for a period of 250 hours.
est voltage must be applied and discharged through a current limiting e of approximately 1000 ohms.

TURE AND IMMERSION CYCLING
to meet all requirements of the applicable paragraph of the latest MIL-C-25.

E RESISTANCE
to meet all requirements of the applicable paragraph of the latest issue 25.

N
to withstand the vibration tests of the applicable paragraph of the ue of MIL-C-25.

LL TEST
's of this series are designed to withstand a steady pull force of 5 lbs. xially to a capacitor lead for one minute.

NDING TEST
s withstand without breakage the following stresses performed near the egress: bend 90 degrees in one direction, then back to the original posi- 90 degrees in the opposite direction.

NCE CHANGE WITH TEMPERATURE
ge of capacitance with reference to the actual value at 25°C does not e following limits:

TEMPERATURE	CHANGE OF CAPACITANCE
— 55°C	— 8%
+ 85°C	+ 5%
+125°C	+18%

AGE RATING
to operate safely up to the following AC voltages at 85°C.

DC VOLTAGE RATING	AC — VOLTAGES AT 85°C (rms) Up to 120 cps	Up to 400 cps
100	70	56
200	140	70
400	280	110
600	420	160

°C operation the listed AC voltages should be derated to 60% of the ues.
C and DC voltages are present, the sum of the DC voltage and the amp- f the AC voltage must not exceed the specified DC-rating at a given ure.

100 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F68B102	.0010	.125	7/16
F68B122	.0012	.125	7/16
F68B152	.0015	.125	7/16
F68B182	.0018	.125	7/16
F68B222	.0022	.125	7/16
F68B272	.0027	.125	7/16
F68B332	.0033	.125	7/16
F68B392	.0039	.125	7/16
F68B472	.0047	.125	7/16
F68B562	.0056	.125	7/16
F68B682	.0068	.125	7/16
F68B822	.0082	.125	7/16
F68B103	.010	.125	7/16
F68B123	.012	.125	7/16
F68B153	.015	.125	7/16
F68B183	.018	.125	9/16
F68B223	.022	.125	9/16
F68B273	.027	.125	9/16
F68B333	.033	.125	11/16
F68B393	.039	.125	11/16
F68B473	.047	.175	5/8
F68B563	.056	.175	5/8
F68B683	.068	.175	5/8
F68B823	.082	.175	5/8
F68B104	.10	.235	5/8
F68B124	.12	.235	5/8
F68B154	.15	.235	13/16
F68B184	.18	.235	13/16
F68B224	.22	.235	15/16
F68B274	.27	.312	13/16
F68B334	.33	.312	13/16
F68B394	.39	.312	13/16
F68B474	.47	.312	15/16
F68B564	.56	.400	13/16
F68B684	.68	.400	13/16
F68B824	.82	.400	15/16
F68B105	1.0	.400	15/16
F68B155	1.5	.500	15/16
F68B205	2.0	.562	15/16
F68B305	3.0	.562	1 1/8
F68B405	4.0	.670	1 1/8
F68B505	5.0	.670	1 3/8
F68B605	6.0	.670	1 7/8
F68B805	8.0	.670	1 7/8
F68B106	10.0	.750	1 7/8
F68B126	12.0	.750	2 1/8
F68B146	14.0	.750	2 1/8
F68B166	16.0	1.000	2 1/8
F68B206	20.0	1.000	2 1/8

grounded circuit available in diameters of .175 in. and up.

200 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F68C103	.010	.175	5/8
F68C123	.012	.175	5/8
F68C153	.015	.175	5/8
F68C183	.018	.175	5/8
F68C223	.022	.187	5/8
F68C273	.027	.187	5/8
F68C333	.033	.235	5/8
F68C393	.039	.235	5/8
F68C473	.047	.235	5/8
F68C563	.056	.235	13/16
F68C683	.068	.235	13/16
F68C823	.082	.235	13/16
F68C104	.10	.312	13/16
F68C124	.12	.312	13/16
F68C154	.15	.312	13/16
F68C184	.18	.312	13/16
F68C224	.22	.400	13/16
F68C274	.27	.400	13/16
F68C334	.33	.400	13/16
F68C394	.39	.400	13/16
F68C474	.47	.400	1 1/8
F68C564	.56	.400	1 1/8
F68C684	.68	.562	1 1/8
F68C824	.82	.562	1 1/8
F68C105	1.0	.562	1 1/8
F68C155	1.5	.562	1 5/16
F68C205	2.0	.670	1 5/16
F68C305	3.0	.670	1 9/16
F68C405	4.0	.670	1 13/16
F68C505	5.0	.750	1 13/16
F68C805	8.0	1.000	1 13/16
F68C106	10.0	1.000	2 5/16

400 VOLTS

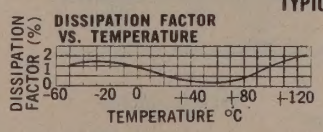
Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F68E103	.010	.235	13/16
F68E123	.012	.235	13/16
F86E153	.015	.235	13/16
F68E183	.018	.235	13/16
F68E223	.022	.312	13/16
F68E273	.027	.312	13/16
F68E333	.033	.312	13/16
F68E393	.039	.312	13/16
F68E473	.047	.400	13/16
F68E563	.056	.400	13/16
F68E683	.068	.400	13/16
F68E823	.082	.400	13/16
F68E104	.10	.400	1 1/8
F68E124	.12	.400	1 1/8
F68E154	.15	.400	1 1/8
F68E184	.18	.400	1 5/16
F68E224	.22	.400	1 5/16
F68E274	.27	.562	1 1/8
F68E334	.33	.562	1 1/8
F68E394	.39	.562	1 5/16
F68E474	.47	.562	1 5/16
F68E564	.56	.670	1 5/16
F68E684	.68	.670	1 5/16
F68E824	.82	.750	1 5/16
F68E105	1.0	.750	1 7/16
F68E155	1.5	1.000	1 5/16
F68E205	2.0	1.000	1 13/16
F68E305	3.0	1.000	2 5/16
F68E405	4.0	1.000	2 9/16

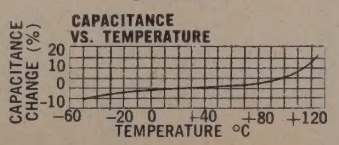
600 VOLTS

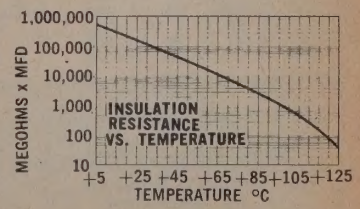
Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F68F103	.010	.312	13/16
F68F123	.012	.312	13/16
F68F153	.015	.312	1 1/8
F68F183	.018	.312	1 1/8
F68F223	.022	.400	1 1/8
F68F273	.027	.400	1 1/8
F68F333	.033	.400	1 1/8
F68F393	.039	.400	1 1/8
F68F473	.047	.400	1 1/8
F68F563	.056	.562	1 1/8
F68F683	.068	.562	1 1/8
F68F823	.082	.562	1 1/8
F68F104	.10	.562	1 1/8
F68F124	.12	.562	1 1/8
F68F154	.15	.562	1 5/16
F68F184	.18	.562	1 7/16
F68F224	.22	.670	1 5/16
F68F274	.27	.670	1 7/16
F68F334	.33	.750	1 7/16
F68F394	.39	.750	1 13/16
F68F474	.47	.750	1 13/16
F68F564	.56	.750	2 5/16
F68F684	.68	.750	2 5/16
F68F824	.82	1.000	1 13/16
F68F105	1.00	1.000	2 1/16

F indicates "Floating". Substitute "G" for "Grounded".
Add following to Part No. for Tolerance: —20 = ±20%; —10 = ±10%; —5 = ±5%.

TYPICAL CURVES





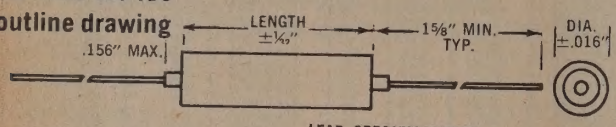


polyester & kraft capacitor tissue dielectric

series 51

WAX IMPREGNATED — METALLIZED DIELECTRIC
HERMETICALLY SEALED (GLASS TO METAL)
TUBULAR METAL CASE
—55°C TO +125°C WITHOUT DERATING
100 THRU 600 VDC

outline drawing



Standard leads consist of solid, bare, tined wire. Special Nickel leads are available for applications requiring a higher degree of weldability.

LEAD SPECIFICATIONS

Case Diameter (inches)	Lead Gauge (AWG)
.187	24
.235 and .312	22
.400 and up	20

specifications

CAPACITANCE AND TOLERANCE
The capacitance limits at +25°C are determined by the specified tolerance. Capacitors which have a nominal value of 1 MFD or less are measured at or referred to a frequency of 1000 cps. Nominal capacitances above 1 MFD are measured at or referred to a frequency of 60 cps.

DISSIPATION FACTOR
The dissipation factor at +25°C is less than 1.0%. Reference frequencies are as specified above.

INSULATION RESISTANCE
The charging potential is equal to the specified operating voltage for a given temperature. The minimum electrification time is two minutes.

TEMPERATURE	Nominal Capacitance MFD	Voltage VDC	R x C Megohms x MFD	R Megohms
+ 25°C	Greater than .167	ALL	2,000	
	Smaller than .167			12,000
+ 125°C	Greater than .067	100 thru 300 VDC	10	
	Smaller than .067			150
	Greater than .067	400 and 600 VDC	40	
	Smaller than .067			600

TEST VOLTAGE
Designed to withstand a test potential equal to 200% of the rated voltage for two minutes at + 25°C.
The test voltage must be applied and discharged through a current limiting resistance of approximately 1,000 ohms.

VOLTAGE RATING ABOVE 85°C.
No derating of the voltage is required for nominal ratings of 200 through 600 VDC. All 100 VDC capacitors, however, are to be derated above + 85°C at the rate of 1 VDC per degree C.

ACCELERATED LIFE TEST — AT 125°C
Designed to withstand a test potential equal to 140% of the rated voltage at + 125°C for a period of 250 hours.
The life test voltage must be applied and discharged through a current limiting resistance of approximately 1,000 ohms.

TEMPERATURE AND IMMERSION CYCLING
Designed to meet all requirements of the applicable paragraph of the latest issue of MIL-C-25.

MOISTURE RESISTANCE
Designed to meet all requirements of the applicable paragraph of the latest issue of MIL-C-25.

VIBRATION
Designed to withstand the vibration tests of the applicable paragraph of the latest issue of MIL-C-25.

AC OPERATION
51 Series capacitors are designed to operate up to the following AC voltages.

NOMINAL VOLTAGE VDC	AC VOLTAGES AT + 85°C (rms) Up to 120 cps	Up to 400 cps
100	70	56
200	140	70
300	220	96
400	280	110
600	420	160

For + 105°C operation the listed AC voltages should be derated to 60% of the + 85°C values.
If both AC and DC voltages are present, the sum of the DC voltage and the amplitude of the AC voltage must not exceed the specified DC rating at a given temperature.

LEAD PULL TEST
Capacitors of this series are designed to withstand a steady pull force of 5 lbs. applied axially to a capacitor lead for one minute.

LEAD BENDING TEST
The leads withstand without breakage the following stresses performed near the point of egress: bend 90 degrees in one direction, then back to the original position and 90 degrees in the opposite direction.

CAPACITANCE CHANGE WITH TEMPERATURE
The change of capacitance with reference to the actual value at 25°C does not exceed the following limits.

TEMPERATURE	CHANGE OF CAPACITANCE
— 55°C	— 10%
+ 85°C	+ 4%
+ 125°C	+ 13%

100 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F51B102	.0010	.175	5/8
F51B122	.0012	.175	5/8
F51B152	.0015	.175	5/8
F51B182	.0018	.175	5/8
F51B222	.0022	.175	5/8
F51B272	.0027	.175	5/8
F51B332	.0033	.175	5/8
F51B392	.0039	.175	5/8
F51B472	.0047	.175	5/8
F51B562	.0056	.175	5/8
F51B682	.0068	.175	5/8
F51B822	.0082	.175	5/8
F51B103	.010	.175	5/8
F51B123	.012	.175	5/8
F51B153	.015	.175	5/8
F51B183	.018	.175	5/8
F51B223	.022	.175	5/8
F51B273	.027	.175	5/8
F51B333	.033	.175	5/8
F51B393	.039	.175	5/8
F51B473	.047	.175	5/8
F51B563	.056	.175	5/8
F51B683	.068	.235	5/8
F51B823	.082	.235	5/8
F51B104	.10	.235	5/8
F51B124	.12	.235	13/16
F51B154	.15	.235	13/16
F51B184	.18	.235	13/16
F51B224	.22	.312	13/16
F51B274	.27	.312	13/16
F51B334	.33	.312	13/16
F51B394	.39	.312	13/16
F51B474	.47	.400	13/16
F51B564	.56	.400	13/16
F51B684	.68	.400	15/16
F51B824	.82	.400	15/16
F51B105	1.0	.500	15/16
F51B155	1.5	.562	15/16
F51B205	2.0	.562	1 1/8
F51B305	3.0	.670	1 1/8
F51B405	4.0	.670	1 3/8
F51B505	5.0	.670	1 7/8
F51B605	6.0	.670	1 7/8
F51B805	8.0	.750	1 7/8
F51B106	10.0	.750	2 7/8

200 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F51C103	.010	.235	3/4
F51C123	.012	.235	3/4
F51C153	.015	.235	3/4
F51C183	.018	.235	3/4
F51C223	.022	.235	3/4
F51C273	.027	.235	3/4
F51C333	.033	.235	3/4
F51C393	.039	.312	7/8
F51C473	.047	.312	7/8
F51C563	.056	.312	7/8
F51C683	.068	.312	7/8
F51C823	.082	.312	7/8
F51C104	.10	.312	7/8
F51C124	.12	.312	1 1/8
F51C154	.15	.312	1 1/8
F51C184	.18	.400	7/8
F51C224	.22	.400	7/8
F51C274	.27	.400	1 1/8
F51C334	.33	.400	1 1/8
F51C394	.39	.500	1 1/8
F51C474	.47	.500	1 1/8
F51C564	.56	.500	1 1/8
F51C684	.68	.500	1 1/8
F51C824	.82	.562	1 1/8
F51C105	1.0	.562	1 1/8
F51C155	1.5	.562	1 5/8
F51C205	2.0	.670	1 5/8
F51C305	3.0	.670	1 7/8
F51C405	4.0	.750	1 7/8
F51C505	5.0	1.000	1 7/8
F51C605	6.0	1.000	1 7/8
F51C805	8.0	1.000	1 7/8
F51C106	10.0	1.000	2 3/8
F51C126	12.0	1.000	2 5/8

300 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F51D103	.010	.312	7/8
F51D123	.012	.312	7/8
F51D153	.015	.312	7/8
F51D183	.018	.312	7/8
F51D223	.022	.312	7/8
F51D273	.027	.312	7/8
F51D333	.033	.312	1 1/8
F51D393	.039	.312	1 1/8
F51D473	.047	.312	1 1/8
F51D563	.056	.400	7/8
F51D683	.068	.400	7/8
F51D823	.082	.400	1 1/8
F51D104	.10	.400	1 1/8
F51D124	.12	.400	1 1/8
F51D154	.15	.400	3/8
F51D184	.18	.400	3/8
F51D224	.22	.500	3/8
F51D274	.27	.500	3/8
F51D334	.33	.562	3/8
F51D394	.39	.562	3/8
F51D474	.47	.562	5/8
F51D564	.56	.562	5/8
F51D684	.68	.670	7/8
F51D824	.82	.670	7/8
F51D105	1.0	.750	7/8
F51D155	1.5	.750	7/8
F51D205	2.0	1.00	7/8
F51D255	2.5	1.00	7/8
F51D305	3.0	1.00	7/8

400 VOLTS

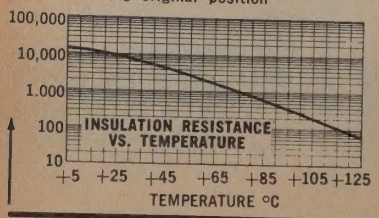
Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F51E103	.010	.312	[illegible]
F51E123	.012	.312	[illegible]
F51E153	.015	.312	[illegible]
F51E183	.018	.312	[illegible]
F51E223	.022	.312	[illegible]
F51E273	.027	.312	[illegible]
F51E333	.033	.312	[illegible]
F51E393	.039	.400	[illegible]
F51E473	.047	.400	[illegible]
F51E563	.056	.400	[illegible]
F51E683	.068	.400	[illegible]
F51E823	.082	.500	[illegible]
F51E104	.10	.500	[illegible]
F51E124	.12	.500	[illegible]
F51E154	.15	.500	[illegible]
F51E184	.18	.562	[illegible]
F51E224	.22	.562	[illegible]
F51E274	.27	.562	[illegible]
F51E334	.33	.562	[illegible]
F51E394	.39	.670	1 [illegible]
F51E474	.47	.670	1 [illegible]
F51E564	.56	.670	1 [illegible]
F51E684	.68	.670	1 [illegible]
F51E824	.82	.750	1 [illegible]
F51E105	1.0	.750	1 [illegible]
F51E155	1.5	1.000	1 [illegible]
F51E205	2.0	1.000	1 [illegible]
F51E305	3.0	1.000	2 [illegible]

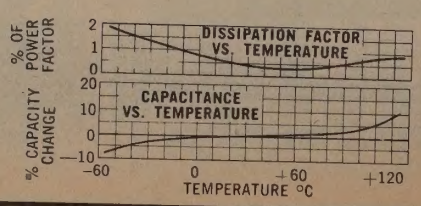
600 VOLTS

Part No.	Capacitance MFD.	Diameter Inches	Length Inches
F51F103	.010	.312	[illegible]
F51F123	.012	.312	[illegible]
F51F153	.015	.312	[illegible]
F51F183	.018	.312	1 [illegible]
F51F223	.022	.312	1 [illegible]
F51F273	.027	.312	1 [illegible]
F51F333	.033	.312	1 [illegible]
F51F393	.039	.400	1 [illegible]
F51F473	.047	.400	1 [illegible]
F51F563	.056	.400	1 [illegible]
F51F683	.068	.400	1 [illegible]
F51F823	.082	.500	1 [illegible]
F51F104	.10	.500	1 [illegible]
F51F124	.12	.562	1 [illegible]
F51F154	.15	.562	1 [illegible]
F51F184	.18	.562	1 [illegible]
F51F224	.22	.562	1 [illegible]
F51F274	.27	.562	1 [illegible]
F51F334	.33	.562	1 [illegible]
F51F394	.39	.670	1 [illegible]
F51F474	.47	.670	1 [illegible]
F51F564	.56	.670	1 [illegible]
F51F684	.68	.670	1 [illegible]
F51F824	.82	1.000	1 [illegible]
F51F105	1.0	1.000	1 [illegible]
F51F155	1.5	1.000	2 [illegible]
F51F205	2.0	1.000	2 [illegible]
F51F255	2.5	1.000	2 [illegible]

Add following to Part No. for tol[illegible] ance: —20 = ±20%; —10 = ±10[illegible] —5 = ±5%.
"F" indicatts Floating. Substitute "[illegible] for grounded. Subtract 1/16" from leng[illegible] for grounded types.

TYPICAL CURVES





See YELLOW SECTION for Local Offices, Phones

GUDEMAN

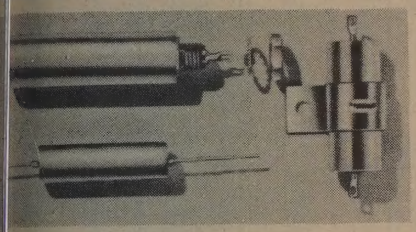
a division of
Gulton Industries, Inc.

40 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-3863

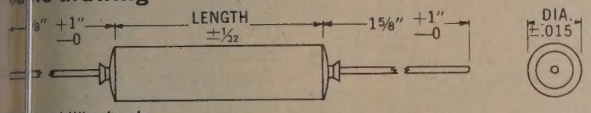
metalized paper dielectric

series 88

HERMETICALLY SEALED (GLASS TO METAL)
TUBULAR METAL CASE
−55°C TO +125°C WITHOUT DERATING
50 V.
WIRE LEADS OR LUG TERMINALS



outline drawing



Solder Tinned Wire Leads.
The following lead sizes will apply:
.195 and .312 diameter #22 AWG
.500 diameter and up #20 AWG
NOTE: Mounting by means of lead wires is not recommended for units larger than .562 x 1 13/16" long
NOTE: LE WILL BE FURNISHED WITH #22 AWG LEADS.

specifications

CAPACITANCE AND TOLERANCE
The capacitance shall be within the specified tolerance limits of the nominal rat
Capacitors of 1.0 MFD or less shall be measured at, or referred to, a frequency of 1000 cycles per second at 25°C. Capacitors greater than 1.0 MFD shall be measured at, or referred to, a frequency of 60 cycles per second at 25°C.

DISSIPATION FACTOR
The dissipation factor shall be a maximum of 1.0% at 25°C.
Capacitors of 1.0 MFD or less shall be measured at, or referred to, a frequency of 1000 cycle per second. Capacitors above 1.0 MFD shall be measured at, or referred to, a frequency of 60 cycles per second.

INSULATION RESISTANCE
The insulation resistance shall be measured at a charging potential of 50 VDC.
The insulation resistance shall equal or exceed the following for capacitance values up to and including 4.0 MFD.

Temperature	Tolerance
25°C	4000 megohms X mfd or 12,000 megohms, whichever is less
85°C	100 megohms X mfd or 300 megohms, whichever is less
125°C	10 megohms X mfd or 150 megohms, whichever is less

For values above 4.0 MFD, the insulation resistance shall equal or exceed the following:

Temperature	Tolerance
25°C	2000 megohms X mfd
85°C	50 megohms X mfd
125°C	5 megohms X mfd

TEST VOLTAGE
Shall withstand a D.C. potential of 200% of rated D.C. voltage at a temperature of 25°C applied for a period not to exceed two minutes, without permanent breakdown.
When the case is not a terminal, they shall withstand a D.C. potential of 200% of rated voltage between the case and the terminals.

LIFE TEST
Shall withstand a test potential of 140% of the rated D.C. voltage at 125°C for 250 hours.
One failure out of twelve (12) samples tested is allowed. A capacitor will be considered to have failed when:
1. The capacitance has changed more than 10% from its original value.
2. The insulation resistance is less than 50% of its original requirements.
3. It exhibits a permanent open or short circuit.

TEMPERATURE & IMMERSION CYCLING
The capacitors shall meet the temperature and immersion cycling test of Military Specification MIL-C-25C.

MOISTURE RESISTANCE
Shall meet the moisture resistance requirements of Military Specification MIL-C-25C.

VIBRATION
Shall withstand the Grade 3 vibration as specified in Military Specification MIL-C-25C.

CORROSION RESISTANCE
The capacitors shall meet the corrosion test of Military Specification MIL-C-25C.

specifications (continued)

LEAD PULL TEST
Shall withstand a pull of 5 lbs. applied axially to the lead for a period of one minute.

LEAD BEND TEST
The leads shall withstand without breakage, a bend at the point of egress from the capacitor first 90° in one direction, back to the original position and then 90° in the opposite direction.

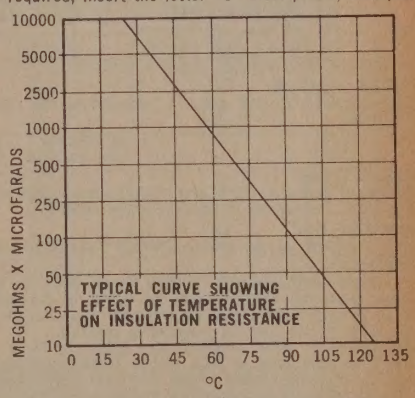
SHOCK
When securely mounted by their normal mounting means, the capacitors shall withstand 3 impact shocks of 50G intensity (18 shocks total) in each direction of each of the three major axis. The time duration of each impulse shock shall be 11 ±1 milli-seconds.
There shall be no intermittent or permanent open or short circuit as a result of this test.

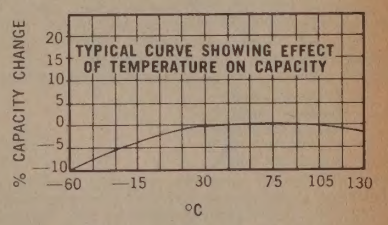
CAPACITANCE CHANGE WITH TEMPERATURE
The Capacitance change at 125°C shall not be greater than 5% of the measured capacitance value at +25°C.
The capacitance change at −55°C shall not be greater than 10% of the measured capacitance value at +25°C.

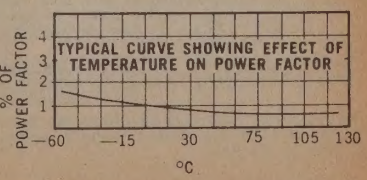
Part No.	Capacity	Voltage	O.D.	XMG Length	XMF Length
	Under .1 MFD	50 VDC	.235	5/8"	1 1/16"
XMF-88A104	.1	50 VDC	.235	5/8"	1 1/16"
XMF-88A124	.12	50 VDC	.235	3/4"	1 3/16"
XMF-88A154	.15	50 VDC	.235	3/4"	1 3/16"
XMF-88A184	.18	50 VDC	.235	15/16"	1"
XMF-88A224	.22	50 VDC	.235	15/16"	1"
XMF-88A274	.27	50 VDC	.312	15/16"	1"
XMF-88A334	.33	50 VDC	.312	15/16"	1"
XMF-88A394	.39	50 VDC	.312	15/16"	1"
XMF-88A474	.47	50 VDC	.312	15/16"	1"
XMF-88A564	.56	50 VDC	.400	15/16"	1"
XMF-88A684	.68	50 VDC	.400	15/16"	1"
XMF-88A824	.82	50 VDC	.400	15/16"	1"
XMF-88A105	1.00	50 VDC	.400	1 1/16"	1 1/8"
XMF-88A155	1.50	50 VDC	.500	1 1/16"	1 1/8"
XMF-88A205	2.00	50 VDC	.562	1 1/16"	1 1/8"
XMF-88A305	3.00	50 VDC	.562	1 1/4"	1 5/16"
XMF-88A405	4.00	50 VDC	.670	1 1/4"	1 5/16"
XMF-88A505	5.00	50 VDC	.670	1 1/2"	1 9/16"
XMF-88A605	6.00	50 VDC	.750	1 3/4"	1 13/16"
XMF-88A805	8.00	50 VDC	.750	2"	2 1/16"
XMF-88A106	10.00	50 VDC	.750	2"	2 1/16"
XMF-88A126	12.00	50 VDC	1.000	1 3/4"	1 13/16"
XMF-88A146	14.00	50 VDC	1.000	2"	2 1/16"
XMF-88A166	16.00	50 VDC	1.000	2"	2 1/16"
XMF-88A206	20.00	50 VDC	1.000	2 5/8"	2 11/16"

"F" Indicates "Floating". Substitute "G" for "Grounded".
NOTE: 1—When sleeving is required, insert the letter "S" after prefix, example: XMFS — XMGS.

TYPICAL CURVES







GUDEMAN

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340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-3663

paper dielectric — inserted tab construction

series GC245 & 246

HERMETICALLY SEALED IN GLASS CASES
HIGH VOLTAGE — 1000 VDC THRU 10,000 VDC
—55°C TO +85°C WITHOUT DERATING
75% RATING TO 105°C

specifications

HIGH ALTITUDE APPLICATION:
The DC Voltage ratings listed are primarily for application at a barometric pressure between 28 and 32 inches. For high altitude application the permissible DC voltage should never exceed the rated DC voltage and shall be equal to or less than the maximum permissible operating voltage per length of glass tubing as follows:

PERMISSIBLE VOLTAGE RATING FOR HIGH ALTITUDE

Tube Length (in.)	1 3/16	1 5/16	1 3/4	2 1/4	2 3/4	3 1/2	4 1/4
Max. Volt. at 50,000 ft.	4500	5000	5300	5500	6000	7000	8000
Max. Volt. at 60,000 ft.	2400	2800	3500	4000	4300	4500	4700

RIPPLE VOLTAGE:
The ratings given are the steady-state DC voltage, or the DC voltage plus the permissible ripple voltage wherein the peak value of the permissible ripple voltage shall not exceed:

20% of the rating at 60 cps.
15% of the rating at 120 cps.
8% of the rating at 400 cps.
5% of the rating at 1000 cps.

INSULATION RESISTANCE:
The minimum insulation resistance when measured with an applied potential of 100 to 500 volts shall be as follows:
At 25°C—10,000 megohm-mfds. minimum but need not exceed 20,000 megohms.
At 85°C—100 megohm-mfds. minimum but need not exceed 1000 megohms.
At 105°C—30 megohm-mfds. minimum but need not exceed 300 megohms.

TEST VOLTAGE:
Shall withstand a DC voltage equal to 200% of the rated voltage for five seconds at a temperature of 25°C.

LIFE TEST:
Shall withstand an accelerated life test of 250 hours at 85°C with an applied voltage as follows:

Watt-Second Group	% of Rated Voltage for life test
0. to 0.49 watt-seconds	140
0.5 to 4.9 watt-seconds	130

One failure in 12 samples tested is permitted.

VOLTAGE DERATING:
When operated at high ambient temperature the capacitors shall be derated as follows:
At 85°C ..... No derating
At 105°C ..... 25% derating

POWER FACTOR:
The power factor at 25°C shall not be more than 1% when measured at or referred to a frequency of 1000 cycles per second.

LEAD PULL TEST
Shall withstand for one minute a steady 5 pound pull applied axially.

VIBRATION:
The GC246 Series capacitors (wire leads) shall be mounted and soldered to rigidly supported terminals and the length of the lead shall be approximately 5/8 of an inch when measured from the capacitor to the supporting terminal. The GC245 Series shall be mounted to brackets.
The capacitors when mounted and subjected to a simple harmonic motion having an amplitude of 0.03 inches (Total excursion 0.06 inches maximum), and the frequency being varied uniformly between 10 to 55 cycles per second and return in approximately one minute. This motion shall be applied for a period of three hours in any direction. During the last 1/2 hour of vibration measurement shall be made for intermittent contacts, open circuits or short circuits. One failure in six samples tested is permitted.

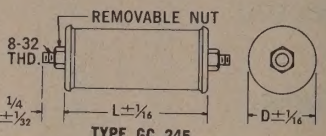
TEMPERATURE AND IMMERSION CYCLING:
These capacitors shall be subjected to five thermal cycles as follows:

Start at +25°C
Raise to +105°C
Return to +25°C
Reduce to —55°C
Return to +25°C

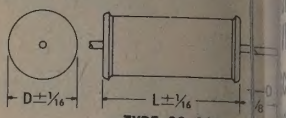
After the thermal cycle the capacitors shall be subjected to five successive immersion cycles in two tanks of saturated solutions of sodium chloride and water, one at 65°C and the other at 0°C. The period of each cycle shall consist of 60 minutes immersion in each tank. After immersion cycling, the capacitors shall be washed in tap water, surface dried with a clean cloth and dried from 4 to 6 rours at room temperature. Tre capacitor srall meet the following requirements:

Dielectric Strength ..... 125% Rated Voltage
Insulation Resistance ..... 4000 megohms-mfds. minimum but need not exceed 8000 megohms.

In addition, the capacitors shall show no harmful or extensive corrosion and at least 90% of the exposed metallic surfaces of the capacitors shall be protected by the finish.



TYPE GC 245



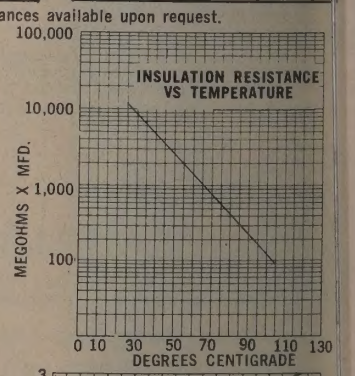
TYPE GC 246

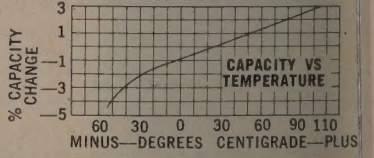
Catalog Number	CAP. MFD.	Dimensions L.	D.
1000 WVDC at 85°C			
GC246G102	.001	1 3/16	17/32
GC246G202	.002	1 3/16	17/32
GC246G502	.005	1 3/16	17/32
GC246G103	.01	1 3/16	17/32
GC246G203	.02	1 3/16	17/32
GC246G503	.05	1 5/16	17/32
GC246G104	.1	1 3/4	5/8
GC245G254	.25	2 1/4	3/4
GC245G504	.5	2 3/4	7/8
GC245G105	1.0	2 3/4	1 1/4
2000 WVDC at 85°C			
GC246J102	.001	1 3/16	17/32
GC246J202	.002	1 3/16	17/32
GC246J502	.005	1 3/16	17/32
GC246J103	.01	1 3/16	17/32
GC246J203	.02	1 5/16	17/32
GC245J503	.05	1 1/2	3/4
GC245J104	.1	2 1/4	3/4
GC245J254	.25	2 3/4	1
GC245J504	.5	2 3/4	1 3/8
3000 WVDC at 85°C			
GC246L102	.001	1 3/16	17/32
GC246L202	.002	1 3/16	17/32
GC246L502	.005	1 3/16	17/32
GC246L103	.01	1 5/16	17/32
GC245L203	.02	1 1/2	3/4
GC245L503	.05	2 1/4	3/4
GC245L104	.1	2 3/4	7/8
GC245L254	.25	2 3/4	1 3/8
5000 WVDC at 85°C			
GC246N102	.001	1 5/16	17/32
GC246N202	.002	1 5/16	17/32
GC246N502	.005	1 3/4	5/8
GC245N103	.01	1 3/4	7/8
GC245N203	.02	2 1/4	7/8
GC245N503	.05	2 3/4	1 1/8
GC245N104	.1	2 3/4	1 5/16
7500 WVDC at 85°C			
GC245R102	.001	1 3/4	3/4
GC245R202	.002	2	3/4
GC245R502	.005	2 1/4	3/4
GC245R103	.01	2 3/4	7/8
GC245R203	.02	2 3/4	1 1/8
GC245R503	.05	2 3/4	1 5/16
GC245R104	.1	4 1/4	1 5/16

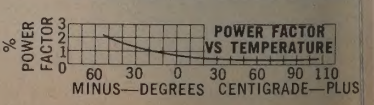
Catalog Number	CAP. MFD.	Dimensions L.	D.
1500 WVDC at 85°C			
GC246H102	.001	1 3/16	17/32
GC246H202	.002	1 3/16	17/32
GC246H502	.005	1 3/16	17/32
GC246H103	.01	1 3/16	17/32
GC246H203	.02	1 3/16	17/32
GC246H503	.05	1 3/4	5/8
GC245H104	.1	2	3/4
GC245H254	.25	2 3/4	7/8
GC245H504	.5	2 3/4	1 1/4
GC245H105	1.0	3 1/2	1 5/16
2500 WVDC at 85°C			
GC246K102	.001	1 3/16	17/32
GC246K202	.002	1 3/16	17/32
GC246K502	.005	1 3/16	17/32
GC246K103	.01	1 5/16	17/32
GC246K203	.02	1 5/16	17/32
GC245K503	.05	2	3/4
GC245K104	.1	2 1/4	7/8
GC245K254	.25	2 3/4	7/8
GC245K504	.5	3 1/2	7/8
4000 WVDC at 85°C			
GC246M102	.001	1 3/16	17/32
GC246M202	.002	1 3/16	17/32
GC246M502	.005	1 5/16	5/8
GC245M103	.01	1 3/4	7/8
GC245M203	.02	2	7/8
GC245M503	.05	2 1/4	1
GC245M104	.1	2 3/4	1 1/8
GC245M254	.25	4 1/4	1 1/8
6000 WVDC at 85°C			
GC246P102	.001	1 5/16	5/8
GC246P202	.002	1 3/4	7/8
GC245P502	.005	2	7/8
GC245P103	.01	2	1
GC245P203	.02	2 3/4	1 1/8
GC245P503	.05	2 3/4	1 1/8
GC245P104	.1	4 1/4	1 5/16
10,000 WVDC at 85°C			
GC245S102	.001	2 1/4	7/8
GC245S202	.002	2 3/4	7/8
GC245S502	.005	2 3/4	1
GC245S103	.01	2 3/4	1 1/8
GC245S203	.02	3 1/2	1 1/8
GC245S503	.05	4 1/4	1 5/16

Tolerance = ±20%. Closer tolerances available upon request.

TYPICAL CURVES







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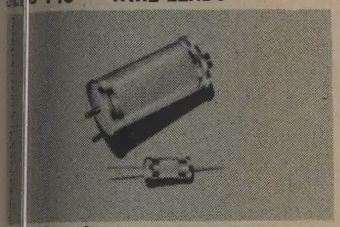
hi voltage capacitors — 20 0 VDC thru 10,000 VDC

es GC145 & GC146

- PA PLASTIC FILM DIELECTRIC — ERTED TAB CONSTRUCTION
- HE ETICALLY SEALED IN GLASS CASE
- C TO +125°C WITHOUT DERATING
- SE S 145 — SCREW STUD TERMINALS
- SE S 146 — WIRE LEADS



ifications

HI ALTITUDE APPLICATION:
Th C Voltage ratings listed are primarily for application at a baro- m c pressure between 28 and 32 inches. For high altitude application th ermissible DC voltage should never exceed the rated DC voltage an hall be equal to or less than the maximum permissible operating vo e per length of glass tubing as follows:

PERMISSIBLE VOLTAGE RATING FOR HIGH ALTITUDE							
Tu Length (in.)	1 3/16	1 9/16	1 3/4	2 1/4	2 3/4	3 1/2	4 1/4
M Volt at 50,000 Ft.	4500	5000	5300	5500	6000	7000	8000
M Volt at 60,000 Ft.	2400	2800	3500	4000	4300	4500	4700

R E VOLTAGE:
Th atings given are the steady-state DC voltage, or the DC voltage p the permissible ripple voltage wherein ahe peak value of the permis- si ripple voltage shall not exceed:
20% of the rating at 60 cps.
15% of the rating at 120 cps.
8% of the rating at 400 cps.
5% of the rating at 1000 cps.
1% of the rating at 10,000 cps.

IN LATION RESISTANCE:
Th minimum insulation resistance when measured with an applied p tial of 500 volts shall be as follows:
+ 25°C—20,000 megohm-mfds. minimum but need not exceed 100,000 megohms.
+125°C—20 megohm-mfds. minimum but need not exceed 250 megohms.

T VOLTAGE:
S l withstand a DC Voltage equal to 200% of the rated voltage for f seconds at a temperature of +25°C.

A ELERATED LIFE TEST:
Th e capacitors shall withstand an accelerated life test at 250 hours a -125°C with an applied voltage as follows:

Watt-Second Group	% of Rated Voltage for Life Test
0. to 0.49 Watt-Seconds	140
0.5 to 4.9 Watt-Seconds	130

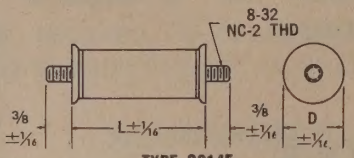
C failure in 12 samples tested is permitted.

T PERATURE AND IMMERSION CYCLING:
S l meet the temperature and immersion cycling tests of military s cification MIL-C-25C.

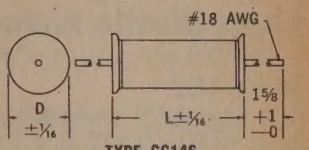
P ER FACTOR:
T power factor of the capacitors at +25°C shall not be more than 1 when measured at or referred to a frequency of 1000 cycles per s ond.

M STURE RESISTANCE:
S ll meet the moisture resistance tests of the military specification M -C-25C.

V RATION:
S ll meet the high frequency vibration requirements of MIL-C-25C.



TYPE GC145
(For Case Diameters Larger Than 5/8")

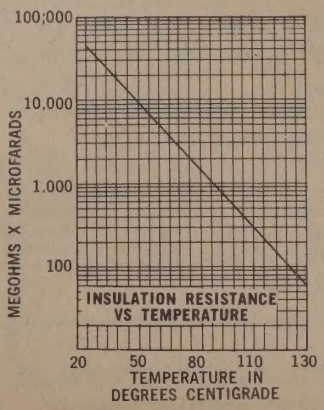


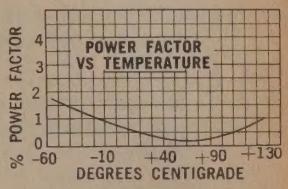
TYPE GC146
(For Case Diameters of 5/8" or Under)

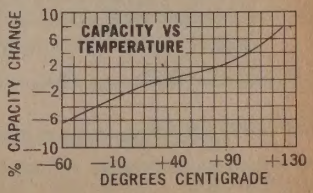
Part No.	CAP. MFD	DIMENSIONS D	L
2000 VOLTS DC			
GC146J102	.001	17/32"	1 3/16"
GC146J202	.002	17/32"	1 3/16"
GC146J502	.005	17/32"	1 3/16"
GC146J103	.01	17/32"	1 3/16"
GC146J203	.02	5/8"	1 9/16"
GC145J503	.05	3/4"	2 1/4"
GC145J104	.1	1"	2 1/4"
GC145J254	.25	1 3/8"	2 3/4"
3000 VOLTS DC			
GC146L102	.001	17/32"	1 3/16"
GC146L202	.002	17/32"	1 3/16"
GC146L502	.005	17/32"	1 9/16"
GC146L103	.01	5/8"	1 9/16"
GC145L203	.02	3/4"	1 3/4"
GC145L503	.05	1"	2 1/4"
GC145L104	.1	1 3/8"	2 3/4"
4000 VOLTS DC			
GC146M102	.001	17/32"	1 9/16"
GC146M202	.002	17/32"	1 9/16"
GC146M502	.005	5/8"	1 9/16"
GC145M103	.01	3/4"	1 3/4"
GC145M203	.02	3/4"	2 1/4"
GC145M503	.05	1 1/8"	2 3/4"
GC145M104	.1	1 3/8"	2 3/4"
5000 VOLTS DC			
GC146N102	.001	17/32"	1 9/16"
GC146N202	.002	5/8"	1 9/16"
GC145N502	.005	3/4"	1 9/16"
GC145N103	.01	1"	1 3/4"
GC145N203	.02	1"	2 1/4"
GC145N503	.05	1 3/8"	2 3/4"
GC145N104	.1	1 3/8"	3 1/2"
7500 VOLTS DC			
GC146R102	.001	5/8"	2 1/4"
GC145R202	.002	3/4"	1 3/4"
GC145R502	.005	3/4"	2 1/4"
GC145R103	.01	1"	2 1/4"
GC145R203	.02	1 3/8"	2 3/4"
GC145R503	.05	1 3/8"	4 1/4"
10,000 VOLTS DC			
GC145S102	.001	3/4"	2 1/4"
GC145S202	.002	1"	2 1/4"
GC145S502	.005	1"	2 3/4"
GC145S103	.01	1 3/8"	2 3/4"
GC145S203	.02	1 3/8"	4 1/4"

Add following to Part No. for tolerance: —M = ±20%; —K = ±10%; —J = ±5%.

TYPICAL CURVES







GUDEMAN

a division of
Gulton Industries, Inc.
340 W. HURON STREET, CHICAGO, ILLINOIS 60610 • AREA CODE 312 337-7400 • TWX 910-221-3634

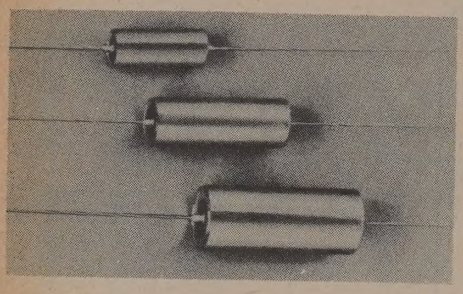
paper plastic dielectric

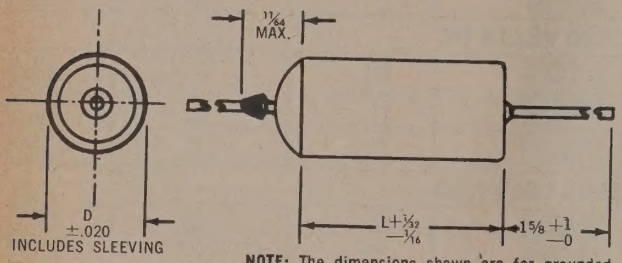
series 462

HIGH RELIABILITY CAPACITORS
HERMETICALLY SEALED (GLASS TO METAL)

TUBULAR METALLIC CASE

—65°C TO +125°C WITHOUT DERATING





NOTE: The dimensions shown are for grounded (XRGS) units. For floating (XRFS) units add 3/32" to length for diameters of .255, .332 and .420. Above .420 diameter, add 1/16" to length.

Furnished with "copper-clad" steel wire leads.

Case Diameter (In.)	AWG Size
.235 to .312	22
.400 to 1.00	20

Cap.	Dia.	Length	Part and No.	MIL-C-14157 Designation
200 VOLTS D.C.				
.0068	.255	23/32	XRGS462C682	CPV09A3C[illegible]2
.022	.332	27/32	XRGS462C223	CPV09A3C[illegible]3
.033	.332	31/32	XRGS462C333	CPV09A3C[illegible]3
.047	.420	27/32	XRGS462C473	CPV09A3C[illegible]3
.068	.420	1 3/32	XRGS462C683	CPV09A3C[illegible]3
.1	.420	1 11/32	XRGS462C104	CPV09A3C[illegible]4
.15	.582	1 1/16	XRGS462C154	CPV09A3C[illegible]4
.22	.582	1 5/16	XRGS462C224	CPV09A3C[illegible]4
.33	.582	1 9/16	XRGS462C334	CPV09A3C[illegible]4
.47	.690	1 9/16	XRGS462C474	CPV09A3C[illegible]4
.68	.770	1 13/16	XRGS462C684	CPV09A3C[illegible]4
1.0	.770	2 5/16	XRGS462C105	CPV09A3C[illegible]5
300 VOLTS D.C.				
.0047	.255	23/32	XRGS462Z472	CPV09A3D[illegible]
.015	.332	27/32	XRGS462Z153	CPV09A3D[illegible]
.022	.332	31/32	XRGS462Z223	CPV09A3D[illegible]
.033	.420	27/32	XRGS462Z333	CPV09A3D[illegible]
.047	.420	1 3/32	XRGS462Z473	CPV09A3D[illegible]
.068	.420	1 7/32	XRGS462Z683	CPV09A3D[illegible]
.1	.582	1 1/16	XRGS462Z104	CPV09A3D[illegible]
.15	.582	1 5/16	XRGS462Z154	CPV09A3D[illegible]
.22	.582	1 9/16	XRGS462Z224	CPV09A3D[illegible]
.33	.690	1 11/16	XRGS462Z334	CPV09A3D[illegible]
.47	.770	1 13/16	XRGS462Z474	CPV09A3D[illegible]
.68	.770	2 3/16	XRGS462Z684	CPV09A3D[illegible]
1.0	1.020	2 1/16	XRGS462Z105	CPV09A3D[illegible]
400 VOLTS D.C.				
.0022	.255	23/32	XRGS462E222	CPV09A3E[illegible]
.0033	.255	23/32	XRGS462E332	CPV09A3E[illegible]
.0068	.332	27/32	XRGS462E682	CPV09A3E[illegible]
.01	.332	27/32	XRGS462E103	CPV09A3E[illegible]
.015	.332	31/32	XRGS462E153	CPV09A3E[illegible]
.022	.420	27/32	XRGS462E223	CPV09A3E[illegible]
.033	.420	31/32	XRGS462E333	CPV09A3E[illegible]
.047	.420	1 7/32	XRGS462E473	CPV09A3E[illegible]
.068	.420	1 15/32	XRGS462E683	CPV09A3E[illegible]
.1	.582	1 3/16	XRGS462E104	CPV09A3E[illegible]
.15	.582	1 7/16	XRGS462E154	CPV09A3E[illegible]
.22	.690	1 7/16	XRGS462E224	CPV09A3E[illegible]
.33	.690	1 13/16	XRGS462E334	CPV09A3E[illegible]
.47	.770	2 1/16	XRGS462E474	CPV09A3E[illegible]
.68	.770	2 9/16	XRGS462E684	CPV09A3E[illegible]
1.0	1.020	2 3/16	XRGS462E105	CPV09A3E[illegible]
600 VOLTS D.C.				
.001	.255	23/32	XRGS462F102	CPV09A3F[illegible]
.0015	.255	23/32	XRGS462F152	CPV09A3F[illegible]
.0022	.332	27/32	XRGS462F222	CPV09A3F[illegible]
.0033	.332	27/32	XRGS462F332	CPV09A3F[illegible]
.0047	.332	27/32	XRGS462F472	CPV09A3F[illegible]
.0068	.332	31/32	XRGS462F682	CPV09A3F[illegible]
.01	.420	27/32	XRGS462F103	CPV09A3F[illegible]
.015	.420	31/32	XRGS462F153	CPV09A3F[illegible]
.022	.420	1 3/32	XRGS462F223	CPV09A3F[illegible]
.033	.420	1 15/32	XRGS462F333	CPV09A3F[illegible]
.047	.582	1 1/16	XRGS462F473	CPV09A3F[illegible]
.068	.582	1 5/16	XRGS462F683	CPV09A3F[illegible]
.1	.582	1 11/16	XRGS462F104	CPV09A3F[illegible]
.15	.690	1 11/16	XRGS462F154	CPV09A3F[illegible]
.22	.770	1 13/16	XRGS462F224	CPV09A3F[illegible]
.33	.770	2 9/16	XRGS462F334	CPV09A3F[illegible]
.47	1.020	2 1/16	XRGS462F474	CPV09A3F[illegible]

"G" in Part No. indicates "Grounded". Substitute "F" for "Floating". Add following to part no. for tolerance: —K = ±10%; —J = ±5%.

specifications

XRFS462 units meet all electrical environmental requirements of MIL-C-14157.

INSULATION RESISTANCE

The minimum insulation resistance when measured in accordance with Specification MIL-C-14157 shall be as follows:

At 25°C—15,000 megohm-mfds. for capacitance values .6MFD and greater. 25,000 megohms for capacitance values below .6 MFD.

AT 125°C—20 megohm-mfds. for capacitance values .08 MFD and greater. 250 megohms for capacitance values below .08 MFD.

CAPACITANCE CHANGE FROM +25°C ±5°C.

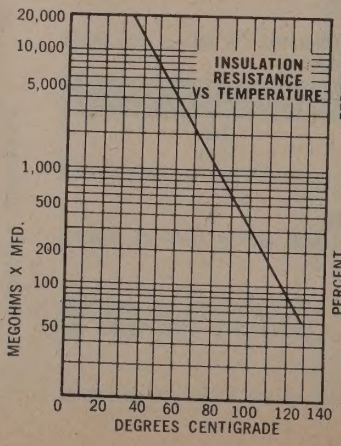
The maximum capacitance change shall be as follows:

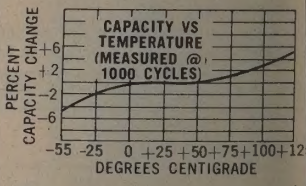
At — 65°C ±3°C . . . + 2%, —10%
At +125°C ±3°C . . . +10%, — 3%

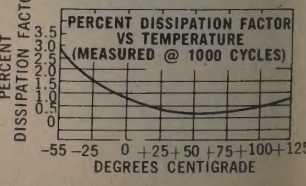
DISSIPATION FACTOR

The dissipation factor when measured at room temperature shall not be more than 0.6%.

TYPICAL CURVES



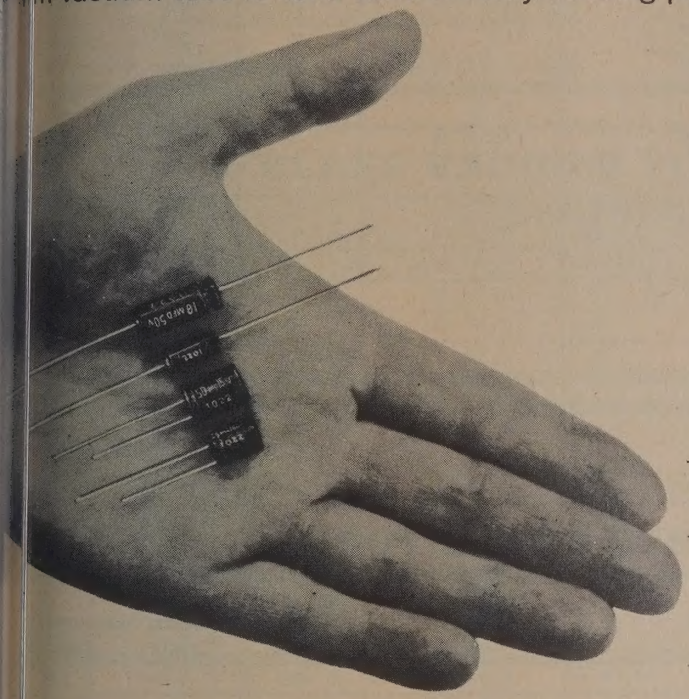




Miniature Aluminum Electrolytic, Polyester Film & Metalized Polyester

IEC CAPACITORS

al where any high quality capacitors are required. Dependable in every application m vacuum tube to solid state circuitry utilizing point-to-point or printed circuit mounting.

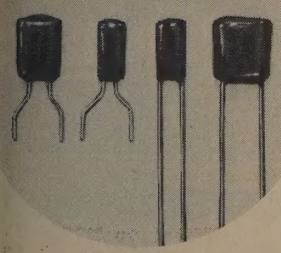


ALUMINUM ELECTROLYTICS

- Vinyl covered aluminum case, axial and radial leads
- Moisture tight end seal
- Welded construction
- Extremely low leakage characteristics
- High purity etched foil
- Excellent performance and long life over specified ranges

	Miniature Low Voltage	General Purpose	Non-Polarized
Voltage Range	3 to 50 volts d.c.	100 to 500 volts d.c.	3 to 50 volts d.c.
Capacitance	0.5 to 3000 uf.	1.0 to 1000 uf.	1.0 to 500 uf.
Operating Temp.	−25°C to +70°C −10°C to +85°C	−25°C to +70°C −10°C to +85°C	−10°C to +70°C −10°C to +85°C

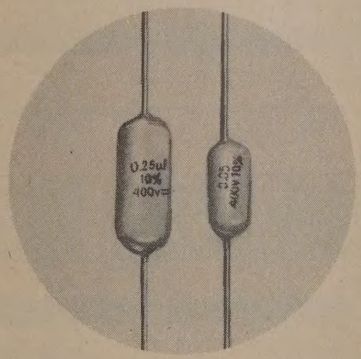
POLYESTER FILM



broad range of miniature poly- ster film capacitors, with radial eads. Voltage ranges: 100, 200, 00, 600 volts d.c. Capacitance ange: .001 μf. to 0.5 μf. Operat- ng temperature from −40°C to +85°C with no derating. Stan- lard tolerances of ±20%, ±10%; closer tolerances available.

• Temperature stable, low dissi- pation factor, low leakage, high nsulation resistance.

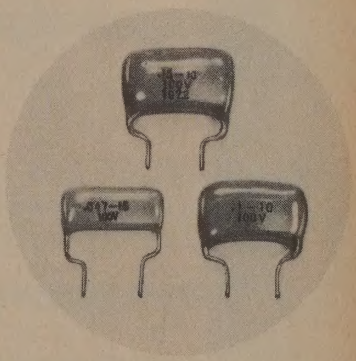
METALIZED POLYESTER



A complete line of sub-miniature metalized polyester film capacitors with axial leads. Wide temperature range, temperature stable, long life. These capacitors have a high dielectric strength, low dissipation factor, and a high insulation resistance. Highly reliable, non-inductive self-healing characteristics.

In voltage ranges of 250, 400, and 600 volts d.c. Tolerances of ±20%, 10% and 5% available. Capacitors will withstand, without injury, flash voltages 1½ times the working voltage, for as long as 5 seconds. Temperature stability of less than ±5% deviation from the 25°C value in the range of −20°C to +85°C.

POLYESTER FILM



A complete line on non-inductively wound polyester film capacitors. These capacitors have uniformly cut and crimped leads which are ideally suited for printed circuit applications. Available in voltages of 100, 200, 400 and 600 Volts "DC" with capacitor tolerance ±20%, ±10%, and ±5%. Operating temperature range −40+85% without derating. They are temperature stable and highly reliable.

IEC CAPACITOR DIVISION

INTERNATIONAL ELECTRONICS CORPORATION

316 SOUTH SERVICE ROAD, HUNTINGTON STA., MELVILLE L. I., N. Y., 11749
TWX 212-479-9410 • CABLE: INCORTEL, NEW YORK • TEL. 516-694-7700

GLASS VACUUM VARIABLE CAPACITORS

Type USLS 1-465 pf 5 kv

Type UCSF 12-500 pf 15 kv

UCSXF 50-2000 pf 12 kv

	TYPE	CAPACITY PF	PEAK MOMENTARY RF AND 60 CYCLE VOLTAGE (3) KILOVOLTS	CONTINUOUS RMS AMPERES (1) (3) (16 MHz)	NOMINAL DIMENSIONS (2) LENGTH	DIAMETER
2 to 5 kv	UCSL	4-250	3, 5	30	4⅛	2⅛
	UCSL	5-750, 7-1000, 10-1500, 20-2000	3, 5	42	8¼	3⅛
	UCSL	50-3000, 100-5000	2, 3	42	8¾	4⅛
	USL	5-500	3, 5	40	5¾	2⅜
	USLS	5-465 Shorting	5	40	5⅝	2⅜
7.5 to 15 kv	ECS	2-8, 3-30	10, 15	20	4⅛	1 5/16
	UCS	5-200, 10-300, 10-400	7.5, 10, 15	42	9	3⅛
	UCSB	5-100	7.5, 10, 15	40	4⅞	2⅜
	UCSF	5-250, 12-500	7.5, 10, 15	45	7⅞	3 7/16
	UCSF	50-1700	7.5, 10, 12	45	8	6
	UCSX	25-700, 25-1000	7.5, 10, 15	45	9⅞	3¾
	UCSXF	12-1000, 15-1200, 20-1500	7.5, 10, 15	50	10 1/16	5⅛
	UCSXF	50-2000, 50-2300	7.5, 10, 12	50	10 1/16	5⅛
	VMMC	50-1000, 100-2000	10, 15	90	15⅞	6⅛
	VMMC	100-5000	7.5, 10, 15	125	21⅜	9¼
25 to 60 kv	UCSVH	8-35	25, 35	35	4¾	3
	UHC	10-75	35, 45, 55, 60	60	12	5
	VMMHC	10-250, 25-450, 30-650	35, 45, 55	90	17	8¼

CERAMIC VACUUM VARIABLE CAPACITORS

Type CVQA 8-1000 pf

Type VCDD 10-1000 pf

Type CVEP 100-2000 pf

	TYPE	CAPACITY PF	PEAK MOMENTARY RF AND 60 CYCLE VOLTAGE (3) KILOVOLTS	CONTINUOUS RMS AMPERES (1) (3) (16 MHz)	NOMINAL DIMENSIONS (2) LENGTH	DIAMETER
3 to 5 kv	CVCC	25-2000, 25-2500	3, 5	60	5.25	3.75
	CVCD	5-250, 5-500	3, 5	70	6.0	2.75
	CVCD	10-1000, 10-1500, 20-2000, 50-3000	3, 5	80	8.25	4.88
	CVCE	10-750	3, 5	80	7.1	3.75
	CVQA	8-1000	3	25	4.33	1.78
7.5 to 20 kv	CADA	40-600	10, 15	65	5.8	3.41
	CADC	3-30	7.5, 10, 15	36	4.62	1.31
	CVDD	6.5-50, 10-100	7.5, 10, 15	70	6.62	2.75
	CVDD	10-300, 20-500	7.5, 10, 15	80	7.5	3.75
	CVDD	25-750, 25-1000	7.5, 10, 15	105	8.0	4.88
	CVDP	35-1500, 50-2300	7.5, 10, 15	105	9.8	5.61
	CVEP	25-500, 50-750, 50-1000, 100-1500	10, 15, 20	140	10.2	7.2
	CVEP	100-2000	10, 15	150	10.2	7.2
25 to 55 kv	CVFP	15-250, 25-450	30, 35, 40	140	9.6	5.61
	CVFP	20-750, 35-1000	30, 35, 40	150	11.7	7.2
	CVFP	100-1500	30, 35	150	13.6	7.2
	CVFP	100-2000	25, 30, 35	150	14.5	8.2
	CVHC	100-1200 (Air Cooled)	45	250	17.8	8.0
	CVHC	100-1600 (Air Cooled)	40	250	17.8	8.0
	CVHE	25-650 (Air Cooled)	45, 50, 55	250	12.5	7.2
	CVHP	10-250, 25-450, 30-650	45, 50, 55	170	11.9	7.2
	CVHP	60-1000	40, 45, 50	170	14.5	8.16
	CVHW	20-250, 25-450 (Water Cooled)	40, 45, 50	700	13.5	7.56
55 to 65 kv	CVTW	100-1600 (Water Cooled)	55, 60, 65	750	23.0	12.5

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DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

As a result of vacuum capacitors, modern transmitters are smaller in size, offer superior, more reliable performance and are far easier to tune and keep tuned. In the high voltage situation common to high powered transmitters, greater capacitance is achieved in a smaller space with vacuum capacitors. Breakdown leading to expensive and critical downtime is far less likely because vacuum offers no dielectric to puncture and is self healing after moderate overloads.

(1) Current ratings can usually be increased by 50% with proper forced air cooling, and up to 400% with water cooling.

(2) Nominal dimensions are for the largest unit of each type.

(3) Voltage and current limitation are dependent upon capacity and frequency. Specific voltage and current information at all frequencies is available upon request. Current rating is for largest capacity unit of each type.

Jennings application engineers are available to discuss special application problems. If necessary we will run special tests in the Jennings Radio Frequency Testing Laboratory, where equipment is available with frequencies up to 600 MHz, and power ratings up to 100 kw.

NOTE: For further details on any of ITT Jennings vacum capacitors request Catalog No. 101.

GLASS VACUUM FIXED CAPACITORS

	TYPE	CAPACITY PF	PEAK MOMENTARY RF AND 60 CYCLE VOLTAGE (3) KILOVOLTS	CONTINUOUS RMS AMPERES (1) (3) (16 MHz)	NOMINAL DIMENSIONS (2) LENGTH	DIAMETER
2 to 5 kv	JSLF	1000	3, 5	30	1⅝	3⅛
	JSLF	5000	3, 5	100	2⅞	4¼
	JCSL	1000, 1500, 2000	3, 5	50	4	2⅞
7.5 to 15 kv	JCSF	25, 40, 50, 80, 120, 150	7.5, 10, 15	30	2 1/16	1⅞
	JCS	250, 400, 500	7.5, 10, 15	65	4	3
	JCS	1000	7.5, 10, 12	65	4⅝	3⅝
	MC1	500, 750, 1000	10, 15	80	4⅛	4⅛
	MMC1	2000	10, 15	125	5	6⅛
	MMC	1500, 2000	10, 15	140	9¼	6⅛
10 to 20 kv	MC	500, 750, 1000	10, 15, 20	120	8⅜	5
20 to 35 kv	VC	6, 12, 25, 50, 75, 100	20, 30, 35	70	6½	2¼
	VC	150	20, 30	70	6½	2¼
	VCCE	200, 250	20, 30	70	6½	2⅝
	JMF	50, 100	25, 30	50	2¾	2⅛
	MLC	500, 750, 1000	25, 30	125	9⅛	4½
35 to 60 kv	MMHC	450	35, 45, 55	145	9¼	6⅛
	MMHC	1000	35, 40, 45	200	13	9¼

Type JMF 100 pf 30 kv

Type MMHC 1000 pf 45 kv

	TYPE	CAPACITY • PF	PEAK MOMENTARY RF AND 60 CYCLE VOLTAGE (3) KILOVOLTS	CONTINUOUS RMS AMPERES (1) (3) (16 MHz)	NOMINAL DIMENSIONS (2) LENGTH	DIAMETER
3 to 5 kv	CFCD	500, 1000, 2000	3, 5	85	2.62	3.75
7.5 to 15 kv	CFDP	2000	7.5, 10, 15	125	3.3	5.61
10 to 35 kv	CY	1, 2, 3, 4, 5	25, 30	8	3.25	.77
	CFED	150, 300	20, 25, 30	100	3.62	3.75
	CFED	500, 750, 1000	10, 15, 20, 25	125	3.81	4.88
	CFFP	2000	25, 30, 35	215	5.8	8.2
35 to 70 kv	CFHD	12, 25, 50, 100	45, 50, 55, 60	130	5.12	3.75
	CFHD	200, 300	45, 50, 55, 60	180	5.38	4.85
	CFHP	450	45, 50, 55	215	5.5	5.61
	CFHP	1000	40, 45, 50	215	6.2	7.2
	CFTB	1000	55, 60	270	6.5	10.2

Type CFED 500

Type CFHP 450

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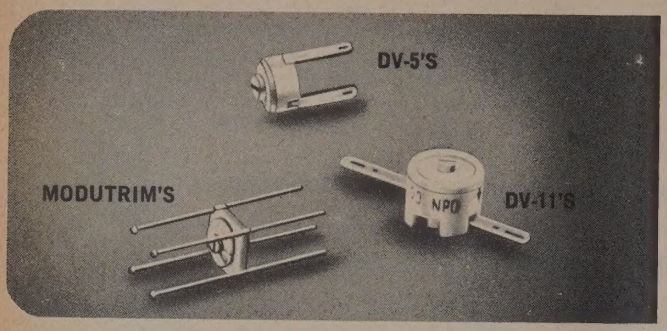
JFD

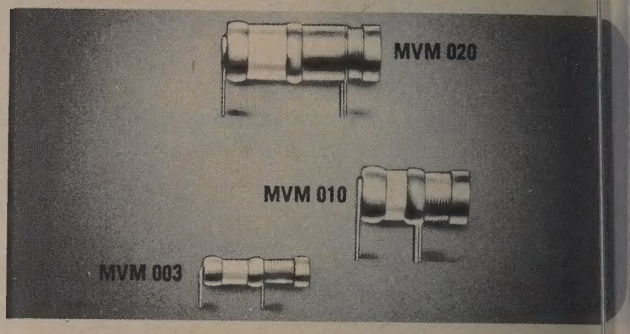
FIXED AND VARIABLE CAPACITORS

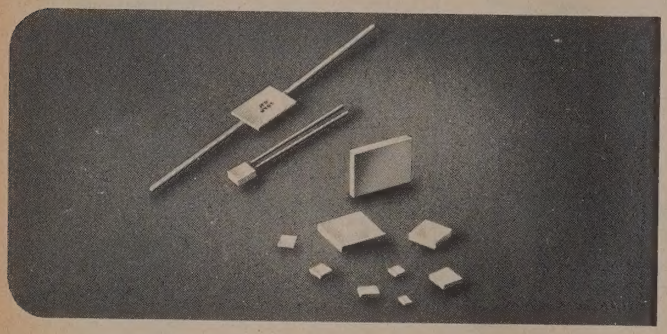


CERAMIC VARIABLES offer a wide choice of mountin con figurations and capacitance values for use in the lo cos commercial thru high grade Military markets. Meet a fica ble Mil-C-81A requirements.
Modutrims—especially designed for micromodule and hybri circuit applications. MT's are available in 5 basic mo ting configurations. Capacitance range 5 to 60 pf. max.
DV-5's—5 mm's in diameter, these microminiature u s o cupy less than .050 square inches of printed circuit oar space. Capacitance range 9 to 30 pf. max.
DV-11's—9.5 mm's in diameter, these low cost capacito wer designed for TV, AM, FM receivers, test equipment, c mu nication equipment, low power transmitters, filters and ela line applications. 4 mounting configurations are av able Capacitance range 8 to 60 pf. max.
Write for Ceramic Variable catalogs.

AIR VARIABLES—designed for high frequency requirements. JFD air variables are rugged, small in size and offer many unique advantages over competitive units. These are: a metal rotor that provides more constant torque during and beyond torque life (600 turns), increased electrical contact assuring lower noise levels and a unique internal guiding element that keeps the rotor centered under the severest environmental conditions. Conforms to applicable portions of Mil-C-14409. Five series comprise this line.

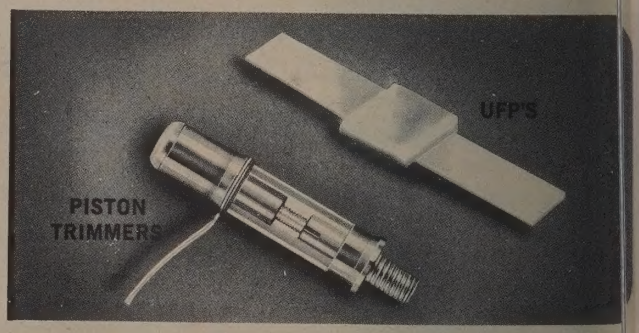
MVM 003—Microminiature in size. Capacitance range is 0.35 pf to 3.5 pf.
MVM 006—Microminiature in size. Capacitance range 0.40—6.0 pf (not shown).
MVM 010—Capacitance range 0.8—10 pf.
MVM 020—Capacitance range 1.0—20 pf.
VAM 010—Capacitance range 0.8—10 pf (not shown).
All MVM's are completely interchangeable with competitive units. Write for Air Variable Catalogs.





UNICERAM HI Q & K CHIPS—Monolithic Hi Q chips fer the ultimate in stability and small size for high frequ cy applications. With typical Q values of 10,000 and more; t se units offer a high ratio of capacity per unit volume. ail able in 5 case sizes from .109" to .406" and in capaci ce ranges of .5 pf to 3000 pf. Meet or exceed portion of MIL-C-11272B.
Uniceram Hi Q capacitors are also available in leaded in figurations. 5 case sizes are included with capacitance al ues of 0.5 pf to 3000 pf.
Hi K chips are ideal for high density packaging in d wood, hybrid and thick film circuits. Manufactured i 18 case sizes. Capacitance range 5 pf to 1.5 mfd. Meet o x ceed portions of MIL-C-11015 and MIL-C-39014.
Hi Q and K chips are available with silver leads and gl s encapsulation for difficult applications.
Write for Uniceram catalogs.

HI RF POWER CAPACITORS—FIXED AND VARIABLE were designed for communication applications.
Piston Trimmers—units feature a unique fused quartz cylinder that yields an extremely low dissipation factor and temperature coefficient. Piston Trimmers operate over a frequency range of from 1 to 30 MHz. Two models comprise this series: VCJ1616M—operates on an RF voltage level of 3100 V peak at +25°C derated to 2500 V peak at +200°C (superimposed on 2500 V DC). Capacitance range 0.5 to 5 pf. VCJ1616E—operates on an RF voltage level of 4,000 V peak at +25°C derated to 3500 V peak at +200°C (superimposed on 2,500 V DC). Capacitance range: 0.9 to 5 pf.—These units can be used at much higher frequencies with proper RF voltage derating.
UFP-Fixed Ceramics—UFP's are the smallest RF power capacitors made. Offered in three standard sizes, these highly stable and reliable fixed ceramics have been used in frequencies as high as 200 MHz. Capacitance values from 10 to 3,000 pf (±.5 for low capacitance values; ±5% and ±10% for higher values).
Write for Hi RF Voltage Piston Trimmer and Uniceram High RF Current Fixed Ceramic Catalogs.



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Solid Dielectric Q1000. SD2 2 Gang as
2 x 192pF. Trimmers 20pF 500v test.
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.55" x .81". Solid brass silver-plated
s, 500v test. 14pF per section.
ear Drive.
pe 0, 1 or 2 Gang Largest Pack 410pF
ection. Trimmers 15pF.
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r 7:1 Internal Geared Drive available.
area 1 3/8" x 1 11/16".
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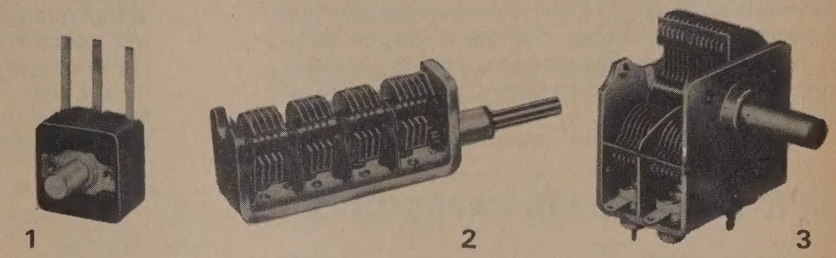
st Pack 528pF per section.
nic Insulation.
pe E front area 2 3/4" x 2 1/32", 1, 2, 3 or
ngs. Largest Pack 532pF.
LE 1, 2, 3 or 4 Gangs. Largest Pack 532pF
2 + 133 per section rigid bar frame.
aring. G2S = 33.18. G3S = 3:1.
= 8:1 Pulley Drive. Available on 0, 00,
LE or as kit of parts.
pe P Largest Packs 2 x 510 + 10pF AM
:1 Gear front area 1 11/16" wide.
P203 Largest Packs 2 x 510 AM 3:1 Gear.
P303 Largest Packs 3 x 320 AM or
0pF FM. 3:1 Gear.
pe IR Professional 1, 2, 3, 4 or 5 Gang.
st Pack 532pF. Front area 2 7/8" x 2 1/2".
rs and Stators independently insulated.
expansion alloy frame bars.
pe C8 Ceramic End Plate 1 5/16" x 1 1/4".
st Pack 150pF. One hole or three hole
750v test.
C808 Split Stator 2 x 10 or 2 x 25 or
3 or 2 x 63pF. Front area 1 1/4" x 1 1/4"
test.
C7 Differential Largest Pack 2 x 150pF
test.
C7 Butterfly Largest Pack 2 x 70pF
test.
C73 Split Stator Largest Pack 2 x 100pF
test. Front area of ceramic plate
x 1 3/16".
ype C16 Ceramic Plate 3/8" x 3/8". Largest
20pF. 2 hole or 1 hole or P.C. fixing
test. Adjustable both ends.
Type Tetfer Ceramic Base 3/8" square
high 10pF (2 min.) 1500v test.
F.E. Fluorocarbon dielectric 2 hole or P.C.
g, low loss, precision multiturn
stment. Adjustable both ends.
Type U HF or VHF Tuning 1 to 3 Gangs:—
1, U102, U103. Largest Packs 100pF.
x SS with screen 2 to 6 Gangs, Largest
s 43pF. Front area 1 17/32" x 1 3/64".
Type C603 Split Stator front area 2" x 2 3/8".
th 3 5/16" low loss ceramic base. Soldered
silver-plated brass vanes. Largest Pack 2 x
pF. For receiving and transmitting.
C604 Single Stator similar to C603.
est Pack 500pF.
Type C9 Ceramic End Plates 2 1/8" x 2 1/8".
spindle both ends. Largest Packs 1,000pF
AG; 500pF .024 AG; 450pF .030 AG; 250pF
AG. Soldered silver-plated brass vanes.
e C10 As above differential construction.
e C9SS As above, split stator, balanced
embly. Largest Packs 2 x 750 .019 AG;
500pF .024 AG; 2 x 250pF .048 AG.
e C12 As above but ball bearing spindle.
e C11 Similar to above. Front area 1 5/16"
are, double end Plate and single end Plate
sions, single, split stators and differential.
gest Packs 550pF .012 AG; 186pF .023 AG;
pF .030 AG; 34pF .070 AG; 30pF .084 AG;
F .120 AG; 9.5pF .138 AG.
Ceramic End Plates 2 3/4" square.
minum Vanes. Fully radiused polished edges.
Gaps .036, .064, .128. Largest Pack
0pF. Power capability about double that of
Split stator and differential available.
Air Gaps up to .344". Largest Pack 500pF
AG, Micalex End Plates 5 1/8" x 4 1/2".
Wavemaster A range of S.W. capacitors
h precision single bearings on ceramic end
te. Brass vanes, spindles extended for
ging. Front area 1 15/16" x 1 7/8". Largest
ks 300pF .017 AG; 30pF .064 AG.
P.T.F.E. Trimmers Precision fitted piston
e using P.T.F.E. Dielectric. Q exceeds 1000.
king or non-locking. Smallest Pack .25
8pF .2 diameter. Largest 2-30. .41 diameter.
fessional quality; screwed bush or P.C. fixing.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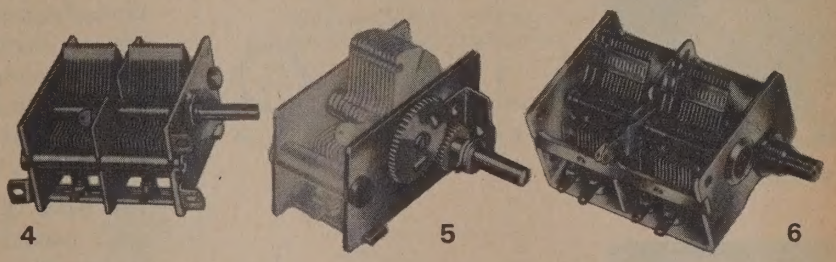
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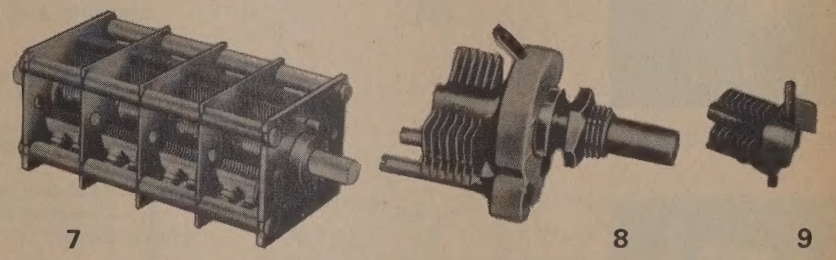
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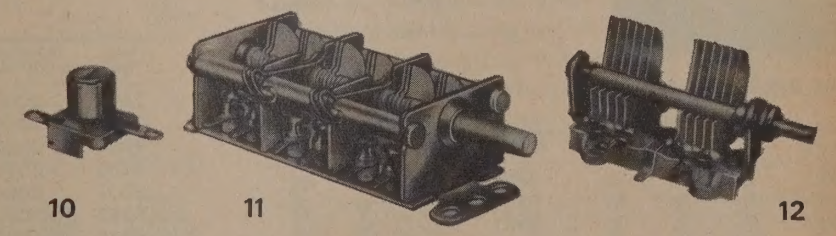
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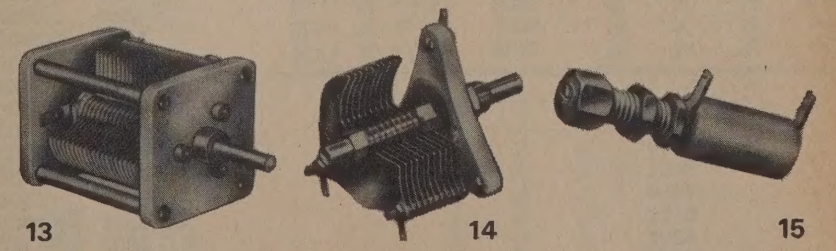
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variable capacitors

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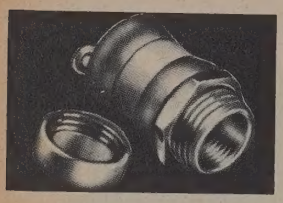
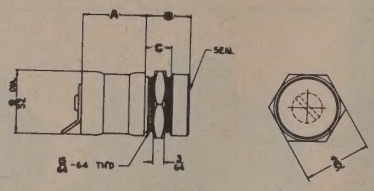
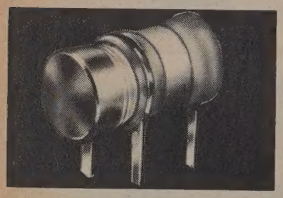
We build quality into our capacitors from design through manufacture . . . our "old world" craftsmanship, coupled with sophisticated equipment and control procedures, along with the manufacturing experience gained by producing millions of capacitors insure that when you specify Johanson—you are specifying the finest capacitors made . . . "the industry standard for excellence."

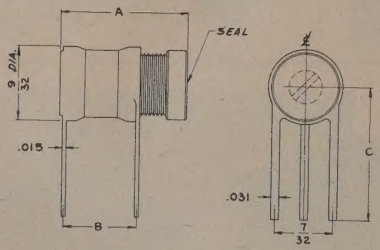
HIGH Q VARIABLE AIR CAPACITORS



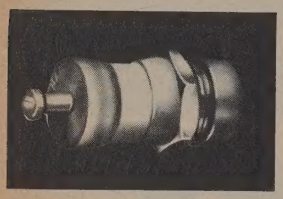


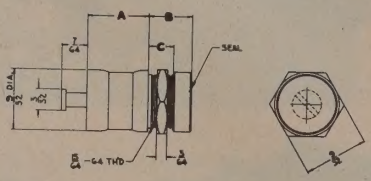
Model 2950—5500





Model 2951—5501





Model 2954—5502

These variable air capacitors offer the user an extended capacitance range with exceptionally high Q yet in a miniature size. They are ruggedly designed for protection against shock, vibration, fungus, salt spray and humidity . . . plus all the other contribution features that have made Johanson capacitors the industry standard of excellence.

The 5200, 5400 and 5500 series features Johanson's patented one piece integral contact mechanism which provides Q's previously unavailable in trimmer capacitors as well as critical thermal stability and extremely low dynamic noise.

GENERAL SPECIFICATIONS

Working Voltage	250 VDC (Test Voltage 500 VDC)
Insulation Resistance	10^6 Megohms
Operating Temperature Range	—65°C to +125°C

Part No.	A	B	C
2950	9/32	3/16	7/64
5200	9/32	7/32	9/64
4880	9/32	3/16	7/64
5400	9/32	7/32	9/64
4690	1/2	1/4	11/64
5500	1/2	1/4	11/64
4551	11/16	1/4	11/64

Part No.	A	B	C
2951	31/64	19/64	5/16
5201	33/64	19/64	5/16
3901	15/32	9/32	1/2
5401	1/2	9/32	1/2
3906	3/4	9/16	1/2
5501	3/4	9/16	1/2
3908	15/16	3/4	1/2

Part No.	A	B	C
2954	9/32	3/16	7/64
5202	9/32	7/32	9/64
4480	9/32	3/16	7/64
5402	9/32	7/32	9/64
4802	1/2	1/4	11/64
5502	1/2	1/4	11/64
4803	11/16	1/4	11/64

Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient
2950	>2000	0.8 pf - 10.0 pf	0±20 ppm/°C
2951	>2000	0.8 pf - 10.0 pf	0±20 ppm/°C
2954	>2000	0.8 pf - 10.0 pf	0±20 ppm/°C
5200	>5000	0.8 pf - 10.0 pf	0±15 ppm/°C
5201	>5000	0.8 pf - 10.0 pf	0±15 ppm/°C
5202	>5000	0.8 pf - 10.0 pf	0±15 ppm/°C
3901	>1500	1.0 pf - 14.0 pf	0±50 ppm/°C
4480	>1500	1.0 pf - 14.0 pf	0±50 ppm/°C
4880	>1500	1.0 pf - 14.0 pf	0±50 ppm/°C
5400	>3000	1.0 pf - 14.0 pf	0±30 ppm/°C
5401	>3000	1.0 pf - 14.0 pf	0±30 ppm/°C
5402	>3000	1.0 pf - 14.0 pf	0±30 ppm/°C
3906	>1200	1.0 pf - 20.0 pf	0±50 ppm/°C
4690	>1200	1.0 pf - 20.0 pf	0±50 ppm/°C
4802	>1200	1.0 pf - 20.0 pf	0±50 ppm/°C
5500	>1500	1.0 pf - 20.0 pf	0±30 ppm/°C
5501	>1500	1.0 pf - 20.0 pf	0±30 ppm/°C
5502	>1500	1.0 pf - 20.0 pf	0±30 ppm/°C
3908	>750	1.0 pf - 30.0 pf	0±50 ppm/°C
4551	>750	1.0 pf - 30.0 pf	0±50 ppm/°C
4803	>750	1.0 pf - 30.0 pf	0±50 ppm/°C

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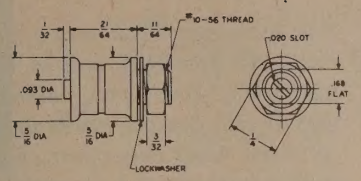
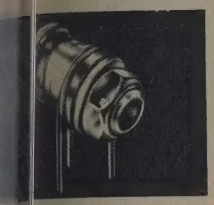
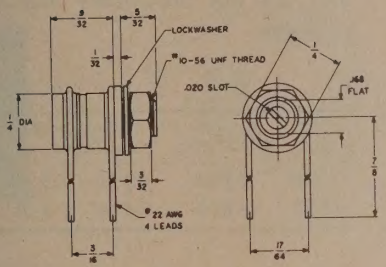
GENERAL PURPOSE PISTON TRIMMER CAPACITORS

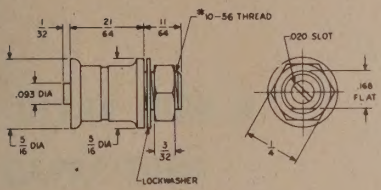


Model 7330





Model 7331



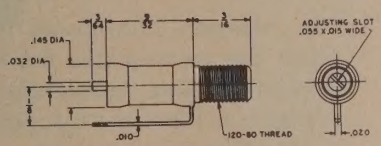
Model 7332

The Johanson 7330 series of variable capacitors is ideally suited for both commercial and military applications. The unique solid metal band design assures electrical and mechanical reliability far in excess of conventional trimmers. The three mounting configurations available in this series affords the circuit designer wide latitude in mechanical layout.

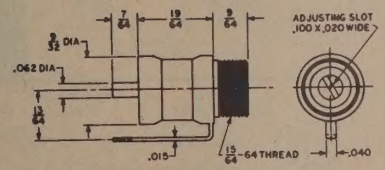
Working Voltage 500 VDC (Test 1000 VDC)

Part No.	Q Factor @ 1 MHz	Capacitance Range	Temperature Coefficient	List Price
7330	>900	1.0 pf - 10.0 pf	0±50 ppm/°C	3.55
7331	>900	1.5 pf - 10.0 pf	0±50 ppm/°C	3.75
7332	>900	1.0 pf - 10.0 pf	0±50 ppm/°C	3.95

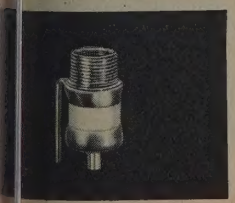
VERTICAL MOUNT AIR CAPACITORS FOR PRINTED CIRCUIT APPLICATIONS

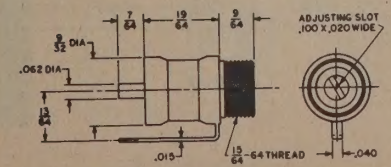


Model 8051



Model 8052





Model 8053

The Johanson 8050 series is a unique design concept of vertical mounting of variable air capacitors. They offer space saving advantages over the standard printed circuit units. The capacitors can be adjusted through the circuit board eliminating approach channels required in the standard type units. The overall height of the mounted unit allows this series of capacitor to be used on printed circuit boards mounted on half inch centers.

Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Price
8051	>5000	.5 pf - 3.5 pf	0±50 ppm/°C	6.60
8052	>2000	1.0 pf - 10.0 pf	0±20 ppm/°C	4.60
8053	>1500	1.0 pf - 14.0 pf	0±50 ppm/°C	5.30

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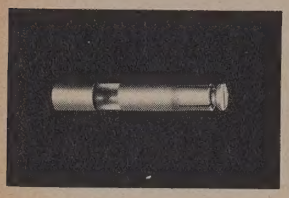
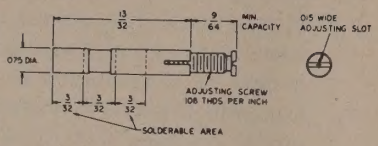
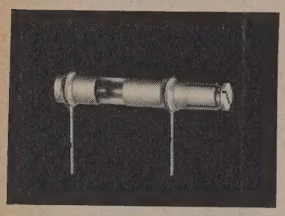
MICROCIRCUIT TRIMMER CAPACITORS

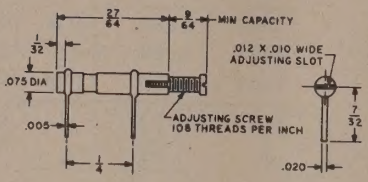




Model 7200

The Johanson 7200 series is the smallest device of this type available and is ideally suited for HF oscillators, *strip lines,* balancing of semiconductors and microwave components as well as for trimming of small fixed capacitors. Electrically, they have a tuning ratio of 10:1 as well as high working voltage and Q's not previously available in such a small package.

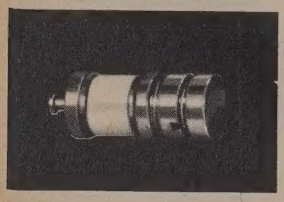


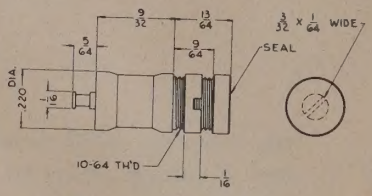


Model 7201

Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Price
7200	>500	0.1 pf - 1.3 pf	50±50 ppm/°C	4.5
7201	>500	0.1 pf - 1.3 pf	50±50 ppm/°C	5.5

MINIATURE HIGH Q VARIABLE AIR CAPACITORS

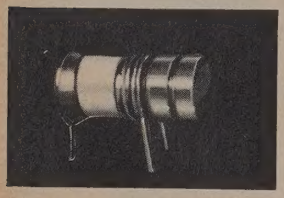


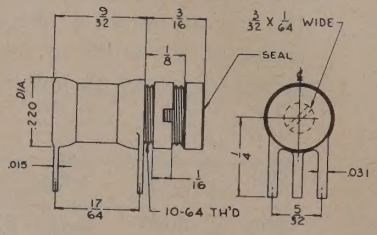


Models 4640 & 5702

The Johanson 4600 series features in a miniature size high Q, rugged construction, high selectivity and high sensitivity. This series is ideal for both military and commercial applications where reliability and performance are critical.

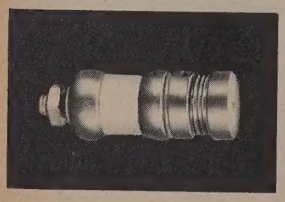
The Johanson 5700 series is similar to the 4600 series but incorporates the new patented contact mechanism. This design affords Q's previously unavailable in trimmer capacitors as well as providing outstanding tuning stability and extremely low dynamic noise.

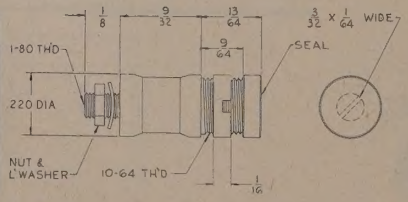




Models 4642 & 5701

Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Price
4640	>5000	.4 pf - 6.0 pf	0±50 ppm/°C	6.8
4642	>5000	.4 pf - 6.0 pf	0±50 ppm/°C	6.8
4643	>5000	.4 pf - 6.0 pf	0±50 ppm/°C	6.8
5701	>10000	.4 pf - 6.0 pf	0±15 ppm/°C	7.1
5702	>10000	.4 pf - 6.0 pf	0±15 ppm/°C	7.1
5703	>10000	.4 pf - 6.0 pf	0±15 ppm/°C	7.1



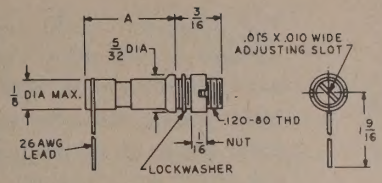


Models 4643 & 5703

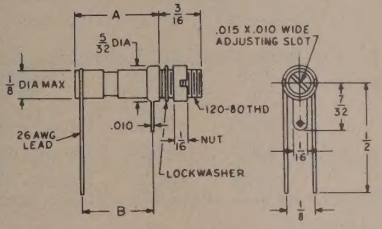
Johanson MANUFACTURING CORPORATION
400 Rockaway Valley Road, Boonton, N. J. • Phone (201) 334-2676

MINIATURE PISTON TRIMMER CAPACITORS

Models 7209 & 7210



Models 7211 & 7213



Part No.	Dim. A
7209	21/32"
7210	3/8"

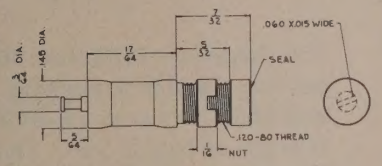
Part No.	Dim. A	Dim. B
7211	21/32"	21/64"
7213	3/8"	5/16"

This series of capacitors are miniature versions of glass dielectric trimmers and are suited for a wide variety of industrial and military applications. The unique drive mechanism affords precision tuning and electrical stability. The two mounting styles and the exclusive round nut design aid the designer in high component packaging density.

Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Price
7209	>500	.5 pf - 7.5 pf	0±100 ppm/°C	4.35
7210	>500	.3 pf - 3.0 pf	0±100 ppm/°C	4.15
7211	>500	.5 pf - 7.5 pf	0±100 ppm/°C	4.45
7213	>500	.3 pf - 3.0 pf	0±100 ppm/°C	4.25

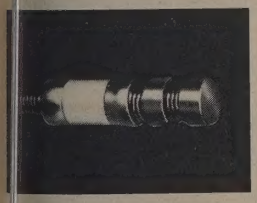
SUBMINIATURE ULTRA HIGH Q VARIABLE AIR CAPACITORS

Models 4700 & 5802

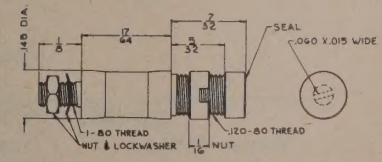


The Johanson 4700 series provides 10:1 capacitance ratio in microminiature size, extra fine tuning of <.35 pf per turn as well as high Q (>1500 @ 500 MHz). Their ultra rugged construction and fine tuning resolution assures reliability in the most critical applications.

The 5800 series incorporates the new patented contact mechanism which affords extremely high Q's, outstanding tuning stability and low dynamic noise.

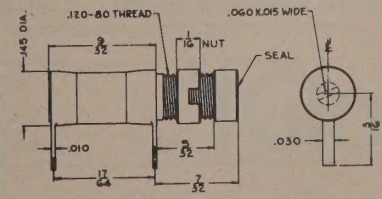


Models 4701 & 5800



Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Price
4700	>5000	0.35 pf - 3.5 pf	0±50 ppm/°C	6.15
4701	>5000	0.35 pf - 3.5 pf	0±50 ppm/°C	6.15
4702	>5000	0.35 pf - 3.5 pf	0±50 ppm/°C	6.15
5800	>10000	0.35 pf - 3.5 pf	0±15 ppm/°C	6.35
5801	>10000	0.35 pf - 3.5 pf	0±15 ppm/°C	6.35
5802	>10000	0.35 pf - 3.5 pf	0±15 ppm/°C	6.35

Models 4702 & 5801



Johanson MANUFACTURING CORPORATION
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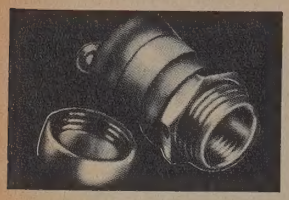
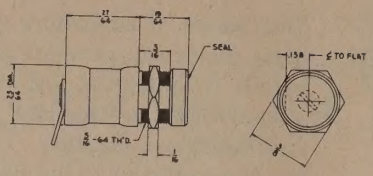
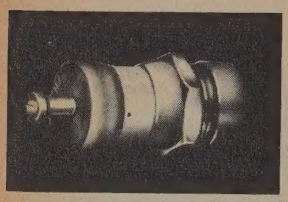
HIGH VOLTAGE VARIABLE AIR CAPACITORS

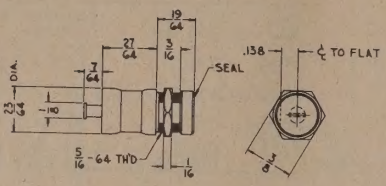


Model 2901

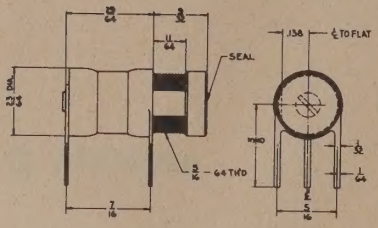




Model 2902



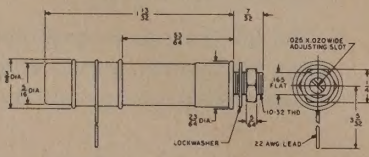
Model 2903

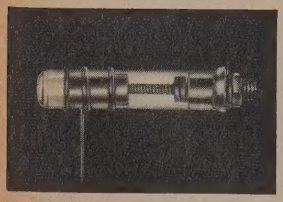


The Johanson 2900 series is rated at *twi* t *voltage* of standard variable air capacitors. working voltage is 500 VDC and test volt 1000 VDC. Because of their unique desi 2900 series provides greater reliability unde age stress and vibration. This series is ideally to applications where small size and high w voltages are a design criteria.

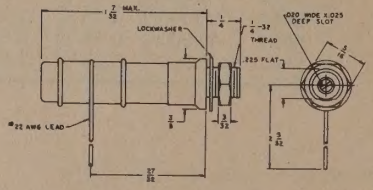
Part No.	Q Factor @ 100 MHz	Capacitance Range	Temperature Coefficient	List Pric
2901	>3000	1.0 pf - 10.0 pf	0±20 ppm/°C	3.85
2902	>3000	1.0 pf - 10.0 pf	0±20 ppm/°C	3.85
2903	>3000	1.0 pf - 10.0 pf	0±20 ppm/°C	4.85

HIGH RF VOLTAGE QUARTZ TRIMMER CAPACITORS





Models 7168 & 7585



The Johanson 7168 and 7585 quartz trimmer c pacitors feature a working voltage of 2500 VD and 2500 volt peak RF at 30 mc with a dielectr strength of 10,000 VDC. This series bridges the ga between the low power handling capabilities conventional piston trimmer capacitors and th extremely high power capabilities of vacuu capacitors.

GENERAL SPECIFICATIONS

Voltage Rating	2500 VDC & 2500v peak RF @ 30 mc applied simultaneously.
Dielectric Strength	10,000 VDC
Insulation Resistance @ 25°C	10^6 megohms
Temperature Coefficient	0 ± 100 ppm/°C
Current at 30 mc	2 Amps

Part No.	Q Factor @ 1 MHz	Capacitance Rating	List Price
7168	>2000	0.5 pf - 5.0 pf	8.65
7585	>2000	0.8 pf - 10.0 pf	8.95

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HIGH VACUUM VARIABLE CAPACITORS

Kilovac® CORPORATION

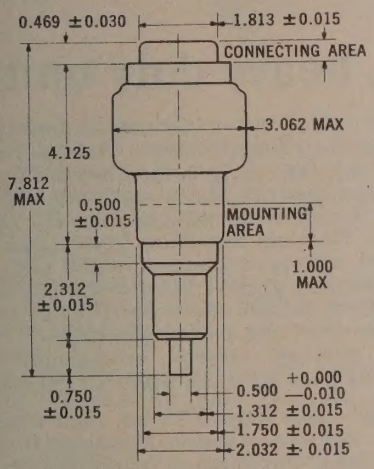
KILOVAC, leading manufacturer of high voltage vacuum relays, PENTA power tubes and DOW-KEY coaxial relays, now offers a line of high voltage vacuum variable capacitors for the most demanding applications. The use of a high vacuum as dielectric in variable capacitors results in a component with unique characteristics, particularly suited to application in high power oscillator and amplifier circuits. The maximum capacitance that can be provided in a single unit is normally a few thousand picofarads, but the high dielectric strength and freedom from dust contamination, humidity, etc. give the vacuum capacitor a far higher voltage capability than air dielectric capacitors of similar size. Vacuum capacitors have frequently been used to replace existing air dielectric capacitors many times their size, with the additional benefits of greater reliability and easier resetting.

The KVC-1 Series is a high voltage high vacuum variable capacitor line with a capacitance range of 7.0 to 1000pF. The capacitance is varied by rotating a 0.500 inch diameter shaft and the specified range is covered by 18 turns. After the first six turns from the minimum capacitance position, the variation of capacitance with tuner turns is approximately linear.

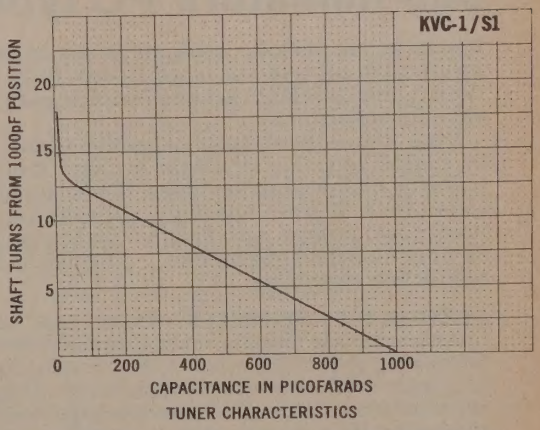
Capacitors may be supplied with a suitable mounting flange. Where other means of mounting are employed, care must be taken to avoid distortion of the metal and consequent damage to the glass seals.

Natural cooling is adequate for operation within the maximum ratings at ambient temperatures up to 55°C.

TYPICAL MODEL



KVC-1/S1 OUTLINE



TUNER CHARACTERISTICS

(Manufactured under the license from E.E.V. Co. Ltd.)

IF YOU HAVE AN APPLICATION PROBLEM, WE WOULD LIKE TO DISCUSS IT WITH YOU.

Kilovac® CORPORATION

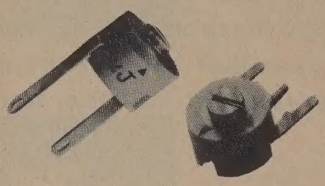
P. O. Box 4422 / Santa Barbara, California 93103

Telephone (805) 963-4293 TWX 910-334-1178

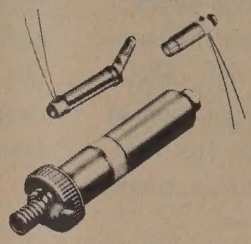
Kilovac Vacuum Relays • **Penta** Power Tubes • **Dow-Key** Coaxial Relays

E. F. JOHNSON COMPANY
1923 Tenth Ave. S.W., Waseca, Minnesota 56093

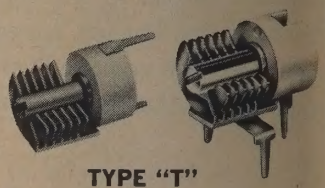
Variable capacitors



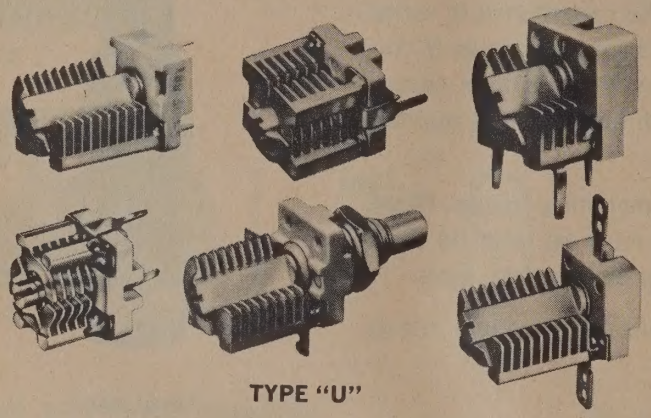
CERAMIC DISC TRIMMERS



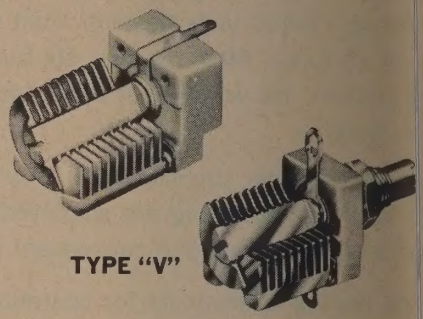
TEFLON TRIMMER



TYPE "T"



TYPE "U"



TYPE "V"

Sub-miniature PC types to large, heavy duty units

Whatever the choice . . . sub-miniature capacitors for printed circuit use—or large heavy duty types . . . design and development engineers specify Johnson variable capacitors.

More than eleven basic capacitor series available in a wide selection of single section, dual section, butterfly and differential types. Stock capacitors in a wide range of plate spacings, capacity per section, breakdown ratings, and finishes meet many military and commercial applications . . . specials available in production quantities.

CERAMIC DISC TRIMMERS—These new sub-miniature ceramic disc trimmers exhibit extreme environmental stability and long life due to the encapsulation of the rotor plate in titinate. Diameter only 0.218". Stator is high alumina for lower loss and higher strength. Smooth, linear tuning due to precision lapped bearing surfaces. Designed to meet or exceed performance criteria of MIL-C-81B. Operating range is —55° to 125°C. NPO temperature characteristics. Type A. Working voltage 100 VDC up to 85°C, 50 VDC up to 125°C. Peak withstanding voltage is greater than twice the working voltage.

TEFLON TRIMMERS—Ideal for VHF and UHF applications requiring low minimum capacity and delta C . . . high Q (2000 at 1 mHz) . . . linear tuning . . . temperature range —55° to ±150°C. Voltage breakdown 2000 VDC. PC mount .25 to 1.5 pf; solder lug .25 to 1.5 pf; panel mount .30 to 2.9 pf.

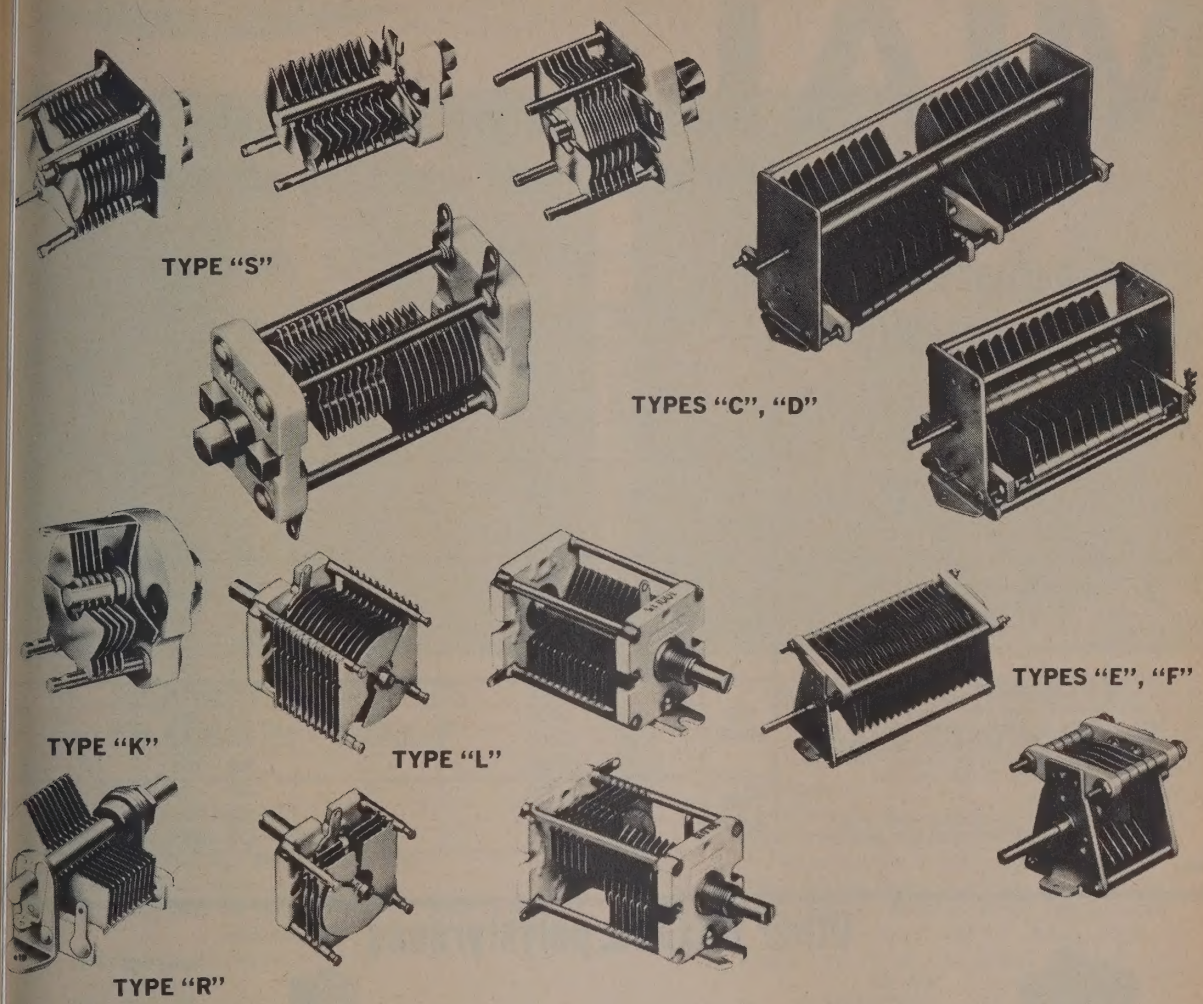
TYPE "T"—New sub-miniature air dielectric trimmer for VHF and UHF applications that call for small size (.310" dia.), high Q (greater than 1500 at 1 mHz), low TC, and low cost. Mounting dimensions of vertical mount "T" identical with ⅜" dia. PC ceramic disc trimmers. Nominal capacities from 1.3 pF to 15.7 pF. Minimum voltage breakdown is 250 VDC. End frame is 95% alumina, grade L624 or better, DC200 treated. Silver plated, Iridited metal parts resist discoloration. Plates are from one piece solid brass for uniformity, stability, and no moisture entrapment. Temp. coefficient is plus 30 ± 15 ppm/°C. Excellent retrace.

TYPE "U"—less than 0.23 sq. inch mounting area required. Rotors and stators machined from one piece of solid brass. Outstanding reliability with exceptionally uniform delta C and voltage characteristics. Highly resistant to shock and vibration—provide freedom from moisture entrapment. Voltage breakdown to 110 VDC. Silver-plated metal parts—ceramic is steatite Grade L-423 or better. Single Section types available in: Printed Circuit (vertical and horizontal mounting models), Two-Hole, and Bushing Mount styles—Differential type for Printed Circuit mounting.

TYPE "V"—High capacity in minimum space. Printed circuit and panel mount types mount in less than 0.3 sq. in. area. Rotors and stators precision machined from one piece of solid brass for high reliability and

Detailed components catalog is available free . . .

CAPACITORS • TUBE SOCKETS • CONNECTORS • PILOT LIGHTS • INSULATORS



ou tanding mechanical stability! High "Q" (greater th 1500 at 1 mHz.) . . . low temperature coefficient (p 50 ± 20 PPM/°C). Metal parts, silverplated—ce-ra is steatite grade L-423, or better. Voltage breakdown ra g 650 VDC. Slotted rotor or shaft extension for con-ve nt adjustment.

T E "S"—Slightly larger than the "M". Peak voltage ra g: 850 volts—plate spacing .013", other spacings av able. Solder plate construction; securely anchored st r supports; DC-200 treated insulator; nickel-pl d brass plates. Single Section, Butterfly, Differ-en l and Dual Types with straight locking and screw-dr r shafts.

T E "K"—Single Section—widely used for military an commercial applications. DC-200 treated insula-to notched stator terminals; extra rigid soldered pl e construction. Peak voltage ratings: 1000 volts. P e spacing .015". Available in production quanti-ti to MIL-C-92A specifications . . . variations avail-ab .

T E "R"—Single Section—extra-heavy steatite stator s port insulators—soldered .023" thick brass plates. M al parts heavily nickel-plated. Sturdy brass end fr nes—double bearing construction—silver-plated b llium copper wiping contacts. Peak voltage rating 12 volts. Specials available in production quantities.

TYPE "L"—Extreme stability and strength—rotor bearings and stator support rods soldered directly to heavy 3/16" steatite insulators. Split-sleeve bearing, silver-plated beryllium copper rotor contact for constant torque, smooth capacity variation. Plate spacing .030". Peak voltage rating 1500 volts. Single Section, Dual, Butterfly, and Differential types. Specials available in production quantities.

TYPES "C" AND "D"—Heavy .051" aluminum plates and 5/16" diameter aluminum tie rods; ¼" cadmium-plated steel shafts; laminated phosphor bronze rotor contact springs; and steatite insulation. Type "C"—overall width: 5½"—height: 5-13/32"—height bottom to shaft center: 3-3/32". Type "D"—overall width: 4¼"—height: 4"—height bottom to shaft center: 2-5/32". Dual types have center rotor connection for better balance. End frames tapped 8-32, 3 holes, for panel mounting—brackets furnished for chassis mounting.

TYPE "E" AND "F" CAPACITORS—Large amount of capacity per cubic inch and low capacity to chassis. Heavy aluminum plates .032" thick with rounded edges and large ¼" tie rods; stainless steel shafts; sturdy phosphor bronze rotor contact springs; and center rotor contact on dual types. End frames tapped 8-32, 3 holes for panel mounting—brackets furnished for chassis mounting.

Write on company letterhead

E. F. JOHNSON COMPANY®

1923 Tenth Ave. S.W., Waseca, Minnesota 56093

• TERMINALS • INDUCTORS • HARDWARE

MIAL polystyrene capacitors

that out-perform...cost less than other capacitor.

General purpose polystyrene capacitor style 611

- *Capacitance Range:* 20 to 100,000 pF
- *Temperature Coefficient:* N150 ±50 ppm/°C
- *Capacity Tolerance:* from ±1pF to ±20%
- *Voltage Range:* 33, 63, 160, 630 & 1000 VDCW
- *Q Factor:* Over 2,000 at 100 KC +25°C

The MIAL Style 611 general purpose polystyrene capacitor with a temperature coefficient: N150 ±50 ppm/°C has a better tolerance characteristic than Mica Class B, C or D. Ideally suited for TV, radio, stereo and instrumentation applications requiring long life, high reliability, and complete freedom from drift. All this, for a cost of only pennies per unit.

For Your Convenience

- Popular values are stocked in depth at Nutley, N. J. for same day shipment.

TYPE	Capacitance pF Min.	Capacitance pF Max.	Dimensions in Inches: Max. Length "L"	Max. Diameter "D"	Lead Diameter "d" ±.002
33 VDCW	100 –	1,000	.315	.106 – .165	.008 – .012
	1,001 –	2,200	.394	.150 – .193	.008 – .016
	2,201 –	5,000	.473	.173 – .260	.012 – .016
	5,001 –	30,000	.670	.210 – .476	.020
	30,001 –	100,000	.867	.380 – .676	.020
63 VDCW	70 –	820	.315	.122 – .186	.008 – .012
	821 –	5,000	.473	.160 – .315	.012
	5,001 –	10,000	.670	.270 – .319	.020
	10,001 –	25,000	.867	.292 – .410	.020
160 VDCW	20 –	600	.315	.146 – .217	.012
	601 –	2,000	.474	.195 – .285	.016
	2,001 –	5,000	.670	.220 – .350	.020
	5,001 –	15,000	.867	.290 – .453	.020
	15,001 –	25,000	1.260	.400 – .500	.020
630 VDCW	20 –	500	.470	.173 – .251	.016
	501 –	3,000	.670	.215 – .381	.020
	3,001 –	10,000	.867	.332 – .555	.020
	10,001 –	25,000	1.260	.500 – .693	.020 – .024
1000 VDCW	50 –	500	.670	.193 – .291	.020
	471 –	4,000	.867	.260 – .496	.020
	4,001 –	25,000	1.260	.370 – .970	.020 – .024

Other MIAL polystyrenes

MIAL 602
High Reliability Precision Type

MIAL 610
Sub-Miniature

MIAL 613
Axial Lead Close Tolerance

MIAL 615
End Lead Close Tolerance

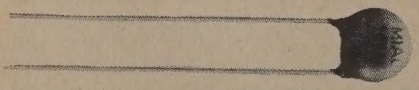
MIAL 603
Printed Circuit Mounting—High Reliability Precision Type

MIAL 612
Printed Circuit Board Mounting

MIAL 614
Radial Lead Close Tolerance

MIAL 616
Axial Lead

Miniature ceramic disc capacitors feature .240 max. diameter MIAL styles 501, 506, 511



A new series of low cost ceramic disc capacitors featuring a .240 max. diameter unit in each style in addition to standard .275 thru .690 diameter types.

Long or stub leads for printed circuits are available in all three styles.

	Capacitance Range	Voltage Rating	Capacitance Tolerance
501 NPO	up to 110 pF	500 VDCW	¼ pF to 20%
501 N750	up to 270 pF	500 VDCW	¼ pF to 20%
506 X5F	up to 4700 pF	500 VDCW	10% to 20%
511 Z5U	up to 15,000 pF	500 VDCW	20% to +80% –20%

WRITE OR CALL FOR INFORMATION AND COMPLETE MIAL CATALOG

MIAL MIAL U.S.A., INC.

165 FRANKLIN AVENUE NUTLEY, NEW JERSEY 07110 201/667 · 1600

STABILITY & QUALITY

High quality capacitors unrivalled in the precision, dependability and compactness. Quality is recognized by ever wider use in measurement equipment, computors, and automatic controllers. "LEAF" the matter of capacitors to MATSUO ELECTRIC CO.

SOLID TANTALUM CAPACITORS FOR HYBRID ICs -"MICROCAP"-

Specifications:
Operating Temperature Range: —55 +85°C
Standard Voltage Rating: 6.3, 10, 16, 20, 25, 35VDC.
Standard Capacitance Value: .001 to 22 MFD (E6 Series)
Standard Capacitance Tolerance: ±20% (M)
D. C. Leakage Current: After rated voltage applied for 5 minutes 1.0 micro ampere max., at 25°C.
Dissipation Factor: 10% max., at 25°C, 120 Hz.

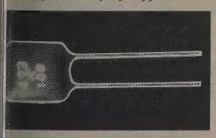
METALLIZED POLYESTER FILM CAPACITOR -"TYPE FNX-H"-

Specifications:
Operating Temperature Range: —40°C to +85°C.
Standard Voltage Rating: 100V, 200V, 400V, 600V. D.C.
Standard Capacitance Value: 0.1 MFD to 10 MFD.
Standard Capacitance Tolerance: ±20% (M) ±10% (K)
Insulation Resistance: 9,000 MΩ or 3,000 MΩ • MFD min. at 20°C
900 MΩ or 300 MΩ • MFD min. at 85°C
Dissipation Factor: 1% max. (1KHz, at 20°C)

MATSUO'S other capacitors include:

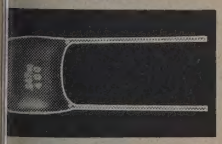
POLYESTER FILM CAPACITORS

Type MFL epoxy dipped



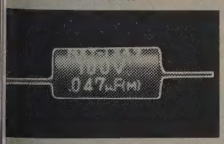
Specifications:
Operating Temperature Range: —40°C to +85°C.
Standard Voltage Rating: 50V, 100V, 200V.D.C.
Standard Capacitance Value: .001 MFD to .22 MFD E-6 series.
Standard Capacitance Tolerance: ±20% (M), ±10% (K)

Type MFK epoxy dipped, non inductive



Specifications:
Operating Temperature Range: —30°C to +85°C
Standard Voltage Rating: 100V, 200V. D.C.
Standard Capacitance Value: .01 MFD to .47 MFD E-6 series.
Standard Capacitance Tolerance: ±20% (M), ±10% (K)

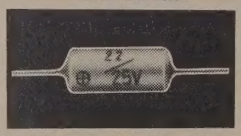
Type MXT encased in plastic tube, non-inductive



Specifications:
Operating Temperature Range: —40°C to +85°C.
Standard Voltage Rating: 100V, 200V, 400V, 600V. D.C.
Standard Capacitance Value: .001 MFD to .22 MFD E-6 series.
Standard Capacitance Tolerance: ±20% (M), ±10% (K)

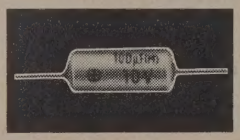
SOLID TANTALUM CAPACITORS

Type TAX hermetically sealed in matallic case



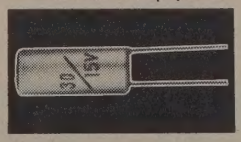
Specifications:
Operating Temperature Range: —55°C to +85°C (125°C with derating voltage)
Standard Voltage Rating: 6.3, 10, 16, 20, 25, 35, 50VDC.
Standard Capacitance Value: 0.1 MFD to 220 MFD E-6 series.
Standard Capacitance Tolerance: ±20%(M), avail. ±10%(K)

Type TSX encased in metallic case and sealed with epoxy resin



Specifications:
Operating Temperature Range: —55°C to +85°C
Standard Voltage Rating: 6.3V, 10V, 16V, 20V, 25V, 35V. D.C.
Standard Capacitance Value: 0.22 to 330 MFD E-6 series.
Standard Capacitance Tolerance: ±20% (M), ±10% (K)

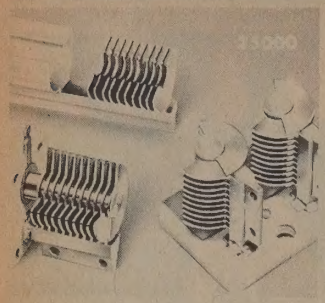
Type TSL encased in metallic case and sealed with epoxy resin

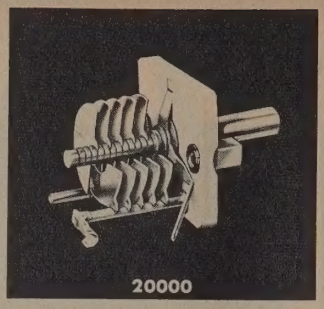


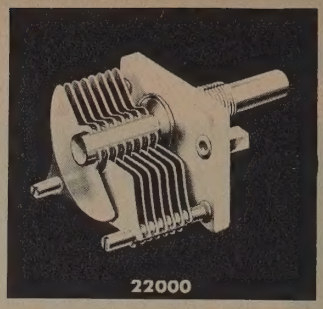
Specifications:
Operating Temperature Range: —55°C to +85°C
Standard Voltage Rating: 6.3V, 10V, 16V, 20V, 25V, 35V. D.C.
Standard Capacitance Value: 0.22 to 330 MFD E-6 series.
Standard Capacitance Tolerance: ±20% (M), ±10% (K)

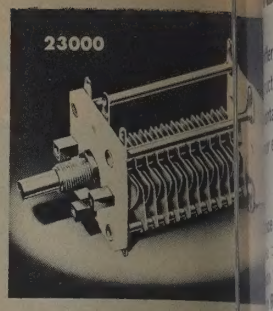
MATSUO ELECTRIC CO., LTD.

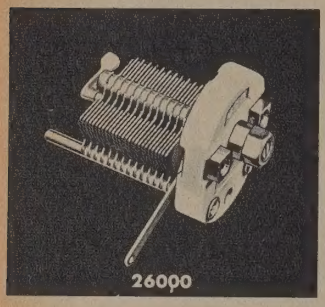
Head Office: 3-5, 3-chome, Sennari-cho, Toyonaka-shi, Osaka, Japan
Cable: "NCCMATSUO" OSAKA Telex: 523-4164 OSA
Tokyo Office: 7, 3-chome, Nishi-Gotanda, Shinagawa-ku, Tokyo

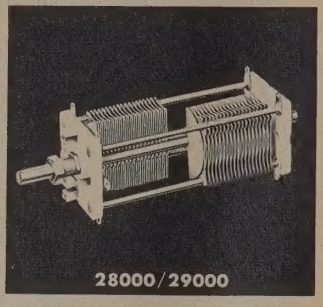


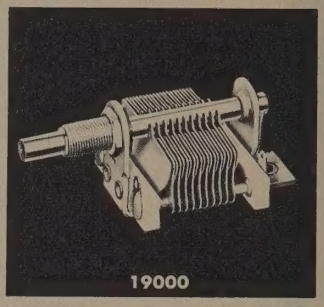


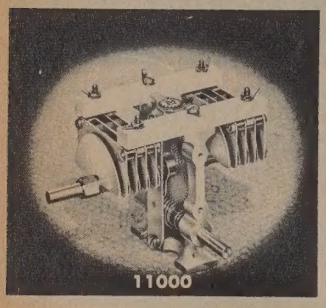


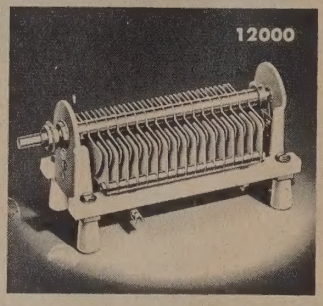


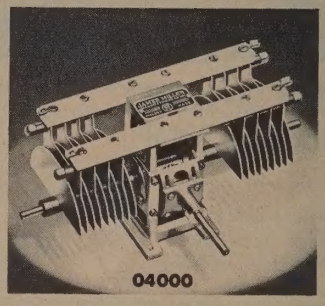












"Designed for Application"® CAPACITORS

No. 25000 miniature, precision, high Q variable air dielectric capacitors with high reliability are machined from solid bars of extruded brass. Knob or screw-driver adjust from the front. Single hole mount, mount with two screws, or with tabs. 0.010″ air gap. 350V. 21 plate **25035** is 4.0 to 35.8pf. 0.750″ x 0.562″ x 23/32″L.

No. 20000 Ceramic end plate 1-3/16″ x 1-5/16″. Silver plated plates. 0.015″ air gap — 600V. peak or 0.045″ air gap — 1400V. peak.

20005 2.0-4.5pf. 600V. ¾″L—**20100** 5.2- 111pf. 600V. 1½″L

20904 2.5-3.8pf. 1400V. ⅞″L—**20935** 6.7-39.5pf. 1400V. 2⅛″L

No. 22000 Ceramic end plate 1-1/16″ x 1-7/16″. Single bearing or double bearing. Air gap 0.020″—800V. peak or 0.060″—2000V. peak.

22006 2.8- 7.5pf. 800V. 1⅛″L—**22200MK** 11-207pf. 800V. 2-9/16″

22910 4.1-12.5pf. 2000V. 1¼″L—**22950MK** 8.5-57.0pf. 2000V. 3″L

No. 23000 Ceramic end plate 1-7/16″ x 1½″. Single bearing or double bearing. Single or dual section. Balanced or inline rotor. Air gap 0.020″-800V. peak or 0.060″—2000V. peak.

23907MKY 3.5-7pf. 2000V. 1-9/16″L—**23140MK** 10-146.5pf. 800V. 2⅛″L

No. 26000 Ceramic end plate 15/16″ x 1-7/32″. Silver plated plates. 0.015″ air gap — 600V. peak or 0.045″ air gap — 1400V. peak.

26010 2.9-11pf. 600V. ⅞″L—**26100** 5.5-109pf. 600V. 1-9/16″L

26910 3.3-11pf. 1400V. 1⅛″L—**26935** 6.8-39.5pf. 1400V. 2-3/16″L

No. 28000 Straight line capacity or **No. 29000** straight line frequency. Double ceramic end plates 1-9/16″ x 1-11/16″. Double bearing. Single or double section. Balanced or inline rotor. Air gap 0.022″-850V. peak, 0.040″-1350V. peak or 0.066″—2250V. peak.

28227MKW 16-227pf. 1350V. 4-1/16″L—**29025KM** 3.9-23.3pf. 850V. 1-9/16L

No. 19000 Ceramic insulators. Cross section 1-9/16″ x 1-11/16″. Double bearing. Air gap 0.022″-850V. peak, 0.040″ — 1350 V. peak or 0.066″ — 2250V. peak. Single section. Tapped mounting brackets.

19335 14.7-339pf. 850 V. 2⅜″L—**19950** 11.6-60pf. 2250V. 2¼″L

No. 15000 NEUTRALIZING CAPACITORS. Parallel discs or concentric cylinders. **15011** Disc 3.5pf. at 0.4″ gap to 18pf. at 0.04″ gap.

15005 Cylindrical Capacitor — 3.5pf. to 16.2pf. — 4000V. peak.

15006 Cylindrical Capacitor — 3.2pf. to 9.7pf. — 6000V. peak.

No. 11000 TRANSMITTING CAPACITORS. 16/1 or 48/1 ratio centerdrive. Ceramic insulation. Air gap 0.077″-3000V. peak or 0.176″-6000V. peak. Polished aluminum plates 0.040″ thick. Dual section.

11035 5.3-34pf. 3000V. 5-7/16″L—**11090** 10-93pf. 3000V. 7⅜″L

No. 12000 TRANSMITTING CAPACITORS. Rigid, heavy channeled aluminum end plates. Ceramic insulation. Single or dual section. Air gap 0.077″-3000V. peak or 0.176″-6000V. peak. Polished aluminum plates 0.040″ thick. Unpolished plates available for 3000V. gap.

12536 9.7-28pf. 6000V. 4″L—**12515** 16-150pf. 3000V. 5¼″L

No. 04000 BALANCED TRANSMITTING CAPACITORS. 1/1 right angle gear drive. Adjustable drive angle for sloping panel. Sturdy cast aluminum frame. Ceramic insulation. Air gap 0.077″-3000V. peak, 0.171″-6000V. peak or 0.265″-9000V. peak. Polished plates.

No. 16000 TRANSMITTING CAPACITORS. Ceramic insulation. Air gap 0.077″-3000V. peak, 0.171″-6000V. peak or 0.265″-9000V. peak. Polished aluminum plates 0.050″ thick. Single or dual section.

16550 13-52pf. 6000V. 3⅜″L—**16530** 45-297pf. 6000V. 12½″L

16559 11-65pf. 9000V. 6¼″L—**16512** 40-128pf. 9000V. 11½″L

NEW James Millen Mfg. Co., Inc.
ENGINEERS' GUIDE TO CAPACITORS

"Special" and Standard CAPACITOR CATALOG

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY

150 EXCHANGE ST., MALDEN, MASSACHUSETTS, U. S. A.

MONOLITHIC CERAMIC CHIP CAPACITORS • TYPE K • 1200

MDI offers a truly solid-state capacitor featuring monolithic construction which is inherently impervious to moisture and contamination — yet without space and cost consuming exterior encapsulation.

A new breakthrough in the state-of-the-art enables MDI to provide capacitance ranges previously unattainable in comparable sizes and characteristics.

GENERAL SPECIFICATIONS

Capacitance Range: 1.2 pF to 2.5 Mfd
Tolerance: ±20% std., ±10%, ±5% and GMV
Dissipation Factor: Less than 2% @ 1 kHz
Insulation Resistance: 1000 megohm-mfd or 100,000 megohms @ 25°C and VDCW (÷10 for 125°C)
Temperature Coefficient: ±15% max., −55°C to 125°C
Voltage-Temperature Coefficient: +15%, −25%, −55°C to 125°C
MIL Specifications: Meets applicable portions MIL-C-11015 and MIL-C-39014
Working Voltage: 25/50/100/200 VDC

Flash Test: 3 x VDCW below. 1 Mfd 2.5 x VDCW .1 Mfd and above (5 sec @ 25°C, 50 ma max.)

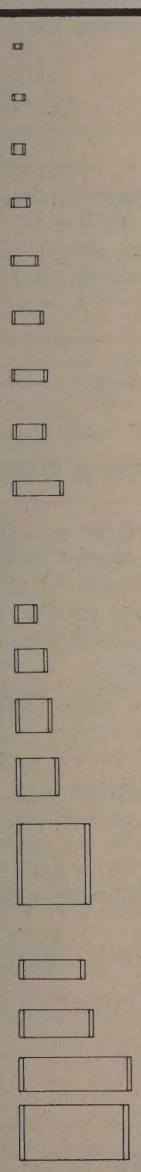
Life Test: 2 x VDCW @ 125°C, 1000 hrs

Electrodes: .015 min silver band-width standard; other noble metals available, except R11 band .005 min.

Inspection Sequence:
1. Capacitance
2. Dissipation Factor
3. Insulation Resistance
4. Flash Test

†Values Below 10pF Available in Size R11 Only.

ACTUAL PHYSICAL SIZE



	MDI SIZE	DIMENSIONS L*	DIMENSIONS *W	DIMENSIONS T(MAX)	MAX. CAPACITANCE VALUE AVAILABLE 25 VDCW	50 VDCW	100 VDCW	200 VDCW
SMALL RECTANGULAR	R11	.050	.040	.040	.01 Mfd	6800pF	2700pF	1000pF
	R13	.075	.045	.040	.015Mfd	.012Mfd	3900pF	1200pF
	R14	.077	.054	.050	.033Mfd	.015Mfd	4700pF	1500pF
	R16	.100	.050	.060	.039Mfd	.027Mfd	.012Mfd	2700pF
	R23	.150	.050	.050	.068Mfd	.056Mfd	.022Mfd	.01 Mfd
	R25	.170	.065	.065	.12 Mfd	.1 Mfd	.039Mfd	.012Mfd
	R27	.190	.065	.065	.15 Mfd	.12 Mfd	.056Mfd	.015Mfd
	R29	.180	.080	.065	.18 Mfd	.12 Mfd	.056Mfd	.015Mfd
	R31	.270	.080	.070	.33 Mfd	.2 Mfd	.1 Mfd	.033Mfd
SQUARE	S41	.125	.095	.065	.12 Mfd	.1 Mfd	.056Mfd	.012Mfd
	S43	.175	.125	.065	.18 Mfd	.15 Mfd	.068Mfd	.018Mfd
	S45	.197	.180	.065	.47 Mfd	.33 Mfd	.22 Mfd	.047Mfd
	S47	.225	.210	.065	.50 Mfd	.47 Mfd	.27 Mfd	.056Mfd
	S49	.390	.425	.065	2.5 Mfd	1.5 Mfd	1.0 Mfd	.39 Mfd
LARGE RECTANGULAR	L64	.350	.095	.070	.5 Mfd	.27 Mfd	.12 Mfd	.056Mfd
	L68	.395	.145	.060	.68 Mfd	.56 Mfd	.22 Mfd	.1 Mfd
	L72	.595	.185	.070	1.0 Mfd	.68 Mfd	.47 Mfd	.12 Mfd
	L76	.585	.298	.070	2.5 Mfd	1.5 Mfd	1.0 Mfd	.27 Mfd

*±.010 or ±7%, whichever is greater

Monolithic Electrics Inc. Post Office Box 647 ▪ Burbank, California 91503 ▪ (213) 848-4465

Nytronics Capacitors

Film and Paper

TYPE 231 (Polystyrene Film — Extended Foil) — Designed for applications requiring high insulation resistance, low dissipation factor and minimal dielectric absorption. Hermetically sealed. Available in standard tolerance of ±1% to ±20%. Can be provided to special close tolerance of ±0.1%.

TYPE 107 (Mylar and Foil) — Designed for applications requiring a flat capacitance change with temperature from +15 to +65°C. Provides exceptional electrical properties in the range of −55° to +125°C. Dissipation factor at room temperature less than 0.6%.

TYPE 223 & 230 (Metalized Mylar and Metalized Paper/Mylar) — Self-healing property makes this hermetic unit suitable for the most stringent applications. Special capacitance tolerance of ±1% can be provided.

TYPE 207 (Paper/Polyester Film) — Hermetically Sealed — Temperature range: −65°C to +125°C. Available in 8 style variations. Made to meet Mil-C-19978 character K.

TYPE 216 (Polyester Film) Hermetically Sealed — Temperature range: −65°C to +125°C. Available in 8 style variations. Made to meet Mil-C-19978.

TYPE CPO SERIES (Paper & Foil) Approved to Mil-C-25. Hermetically Sealed. CP04, CP05, CP08, CP09, CP25 through CP29, CP40, CP41, CP53, CP54, CP55, CP63, CP65, CP67, CP69, CP70, CP91. Wide range of capacitances, voltages and circuits.

Tantalum

STYLE MCS (Mil Type CS12 and CS13) — Miniature solid electrolyte hermetically sealed capacitor. Available in non-polar construction. Capacitance range: .0047 to 330 μf.

STYLE CSR 13 — Established reliability capacitor, manufactured to exacting military standards. Solid electrolyte. Meets or exceeds the requirements of MIL-C-39003A. Capacitance range: .0047 to 330 μf. Failure rate level L, M, P & R.

STYLE TAK and TAK-H — (Mil Type CL64 and CL65) A sintered anode gelled electrolyte miniature capacitor, operates under extreme environmental conditions and wide temperature ranges. Capacitance range: 1.7 to 560 μf.

STYLE MTAK — Subminiature version of TAK series. Offers all the advantages of TAK in a smaller configuration. Capacitance range: 3.3 to 330 μf.

STYLE ACS — Solid electrolyte in metal can with epoxy end fill. Available in both standard MCS and subminiature cans. Axial leads. Capacitance range: .0047 to 330 μf.

Ceramic

TYPE EK — An epoxy molded monolithic ceramic capacitor designed to meet Mil-C-11015/20B. Capacitance range from 10 pf to 3.3 μf.

DECI-CAP — A subminiature monolithic capacitor with an epoxy molded envelope 0.100" diameter by 0.50" long. Designed to meet Mil-C-11015. Capacitance range 4.7 pf to 27,000 pf ±10%.

HY-CAP — Offers high capacitance range .01 mfd to 2.5 mfd ±20%. Voltage 100 WVDC, no derating to 125°C. Designed to meet Mil-C-11015.

Ultra High Stability

NYT-CAP — A high stability monolithic ceramic with a range of 4.7 pf to 4700 pf.: 4.7 pf to 220 pf case size 0.1" dia. x 0.250" long. 270 pf to 4700 pf, ±10%: 0.350" x 0.250" x 0.1".

NYT-CHIP — A high stability monolithic ceramic chip capacitor. Chip dimensions are as follows: 4.7 pf to 220 pf: 0.170" x 0.065" x 0.070". 270 pf to 4700 pf: 0.28" x 0.195" x 0.070".

Nytronics, Inc.
CAPACITOR DIVISION
ORANGE STREET • DARLINGTON, SOUTH CAROLINA 29532 • (803) 393-5421 TWX 810-665-2

rmc DISCAPS

NEW!!

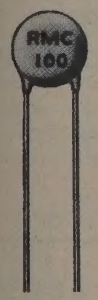
Alumina Ceramics

RMC's expanded capabilities include the production of High Alumina substrates with a range of finishes suitable for both thick and thin film deposition. Flat plate and extruded rod shapes are available.

Low Voltage Subminiatures

For applications requiring components with higher capacitance values at lower voltages ratings, RMC lists:

TYPES CM, SM, BT, or TA



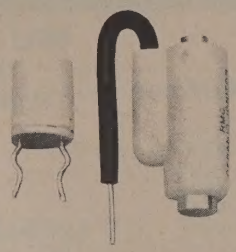
Temperature Compensating TYPE C or CG

Type C DISCAPS are designed for applications requiring a rating of 1000 volts D.C. Where a 500 volt D.C. rating is adequate. Type CG can be specified. Both types meet or exceed EIA specifications and are ideal for VHF or UHF applications.

High K-High Voltage

Maximum capacities combined with high voltage ratings are available in this line. Rated from 2000 to 6000 VDC in Z5F or Z5U temperature coefficients. Tolerances are ±10%, ±20%, +80-20% or GMV. **NEW! Additional ratings of 7½, 10 and 15 KV are now available for high voltage supply applications.**

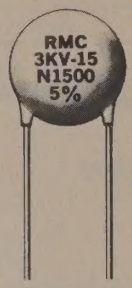
THE STANDARD OF PERFORMANCE THROUGHOUT THE ENTIRE ELECTRONICS INDUSTRY



NEW!!

Piezoelectric Ceramics

RMC can now supply your requirements for a variety of Piezoelectric Devices. Radial mode resonators for filter applications and spark ignition devices are currently available.



T.C. High Voltage

These components are suited to high frequency, corona free applications. Available in working voltages from 2000 to 6000 VDC in temperature coefficients of N-750, N-1500 or N-2200.

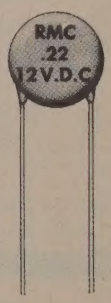
High Dielectric Constant

The industry's broadest line of high dielectric constant ceramic disc capacitors in wide capacitance ranges, select working voltages and tolerances.

Featured are:

TYPES B, JL, JF, JE, JK, BA, JG, BG

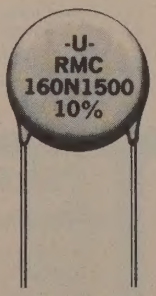
Complete specifications listed in detailed RMC catalog.



Magnacaps

Designed for application in low voltage circuits, Magnacaps combine very high capacitances with small physical sizes. These components are available in 3, 12, 16 and 25 volt ratings in wide capacity ranges.

TYPES M3, M12, M16 and M25



Specials

Widest variety of special components for varied applications. Featured are Type U, U.L. approved parts for both "Live Bypass" and "Across-the-line" applications, TC Soldering, Sparkcaps, and Low Voltage "Chip" capacitors. For special requirements, contact RMC.

Standard Mallory components are available from authorized Mallory distributors throughout the United States.

RADIO MATERIALS COMPANY
a division of P. R. MALLORY & CO. INC.
4242 W. Bryn Mawr, Chicago, Illinois 60646; Telephone: 312-478-3600

MALLORY

MUCON® SUBminiature CERAMIC CAPACITORS

MU-CAPS® OPL to MIL-C-11015

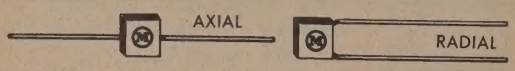
BX CHARACTERISTIC ±15% △ C.

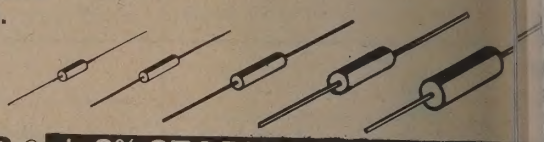
CK05 and CK06

CK05 to .1 MF. at 50 WVDC
" to .01 MF. at 100 WVDC
" to .001 MF. at 200 WVDC
CK06 to 1.0 MF. at 50 WVDC
" to .1 MF. at 100 WVDC
" to .01 MF. at 200 WVDC

CK12 thru CK16

CK12 to .01 MF. . . . .160" L. x .090" Dia.
CK13 to .047 MF. . . . .250" L. x .090" Dia.
CK14 to .27 MF. . . . .390" L. x .140" Dia.
CK15 to 1.0 MF. . . . .500" L. x .250" Dia.
CK16 to 3.3 MF. . . . .690" L. x .350" Dia.





ULTRA-STABLE MU-CAPS® ±.3% STABILITY

TEMP. COEF. NPO

WORKING VOLTAGE: 50 WVDC

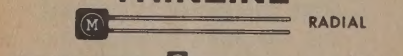
CK05 and CK06 Styles

CK05 Style to 1200 PF.
CK06 Style to 12,000 PF.

CK12 thru CK16 Styles

CK12 Style to 330 PF. . . . .160" L. x .090" Dia.
CK13 Style to 470 PF. . . . .250" L. x .090" Dia.
CK14 Style to 3,300 PF. . . . .390" L. x .140" Dia.
CK15 Style to 10,000 PF. . . . .500" L. x .250" Dia.
CK16 Style to 56,000 PF. . . . .690" L. x .350" Dia.

THINLINE



Mucon's Thinline Capacitors are made of the following 16 different ceramic bodies for a broad choice of size and electrical properties:

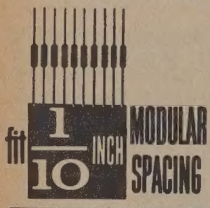
Temperature-Compensating Materials:	NP0	N080	N150
	N220	N330	N450
	N750	N1400	N2400
	N3300	N4700	N5600

General Purpose Materials: LOW-VAR, STABLE-K, HIGH-K & SUPER-K for wide range of stability and capacitance.

SPECIFICATIONS

Capacitance:
Range: TEMP.-COMP. BODIES 1/2 pf - 2200 pf; GEN. PURPOSE BODIES 50 pf - 150,000 pf
Voltages: 25 WVDC, 50WVDC, 200 WVDC and 500 WVDC
Leads: Tinned Copper, Nickel or Dumet to MIL Spec.
Shapes: Square, rectangular, single or multiple element.

NARROW-CAPS®

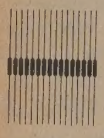


NARROW-CAPS are designed for 1/10" modular spacing on printed circuits, or for cordwood applications.

SPECIFICATIONS

Capacitance:
Range: 5 pf - 100.000 pf
Voltages: 10 WVDC - 50 WVDC
Sizes: .095" max. wide x 1/4" max. long x .095" max. thick through 750 pf. Larger values 5/16" max. long.
Leads: #26 Tinned Copper, Nickel or Dumet to MIL Spec.

SLIM-CAPS®



Designed for applications which require capacitors slimmer than NARROW-CAPS. SLIM-CAPS are .065" wide x .065" thick max. Body lengths from .100"—.250" max.

SPECIFICATIONS

Capacitance
Range: 1/2 pf - 20,000 pf
Voltages: 50 WVDC
Leads: #30 Tinned Copper, Nickel or Dumet to MIL Spec.

STANDOFFS

Standoffs are furnished in the shapes shown above, using any one of the Mucon temperature-compensating bodies or general purpose bodies.

RIBBON LEADS

Style RLA

Size and specifications same as "Thinline" capacitors shown above, except radial and axial tinned copper ribbon leads, approximately .006" thick x 3/32" wide for units with max. size of .150" and up; .045" wide for smaller units.

CHIPS SINGLE LAYER

Sizes: .030" Sq. and up
Capacitance: SUPER-K Ceramic 150 PF. to 10,00 PF
HIGH-K " 100 PF. to 5,00 PF
STABLE-K " 50 PF. to 2,70 PF
LOW-VAR " 20 PF. to 1,00 PF
TEMP. COMP. " 1 PF. to 33 PF
Electrodes: Normally silver. Other precious metals on request
Voltage: 50 WVDC

CHIPS MONOLITHIC MULTILAYE

Sizes: From .050" x .050" x .050" to .610" x .310" x .080"
Capacitance: STABLE-K Ceramic 10 PF. to 2 MF.
NPO " 1 PF. to .027 MF.
Electrodes: Normally silver. Other precious metals on request
Voltage: 50 WVDC

WRITE FOR FREE CATALOG LISTING COMPLETE DETAILED SPECIFICATIONS FOR ALL MUCON SUB-MINIATURE CERAMIC CAPACITORS and ELEMENTS

REPUBLIC ELECTRONICS CORP. 176 E. 7th St. PATERSON, N. J. 07524 201 - 279-0300 TWX 710-988-5908

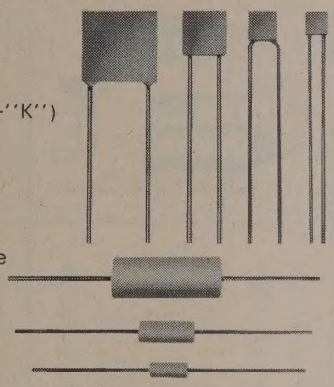
san fernando
electric manufacturing company

Specialists in capacitor design

West-Cap Division
1501 First Street
San Fernando, California 91341
Phone (213) 365-9411 TWX 910-496-1535

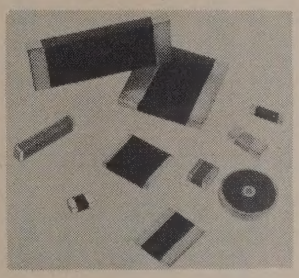
C AMIC CAPACITORS

R TANGULAR AND T ULAR STANDARDS
C PACITANCE VALUES
f n 5 pf to 100 mfd
(ble-intermediate and Hi-''K'')
f n 1 pf to .2 mfd (NPO)
V LTAGE: 25 to 500 VDC
T LERANCE: down to .25%
T PERATURE RANGE:
- C to +150°C
m ts or exceeds applicable
p ions of
M -C-11015
M -C-39014



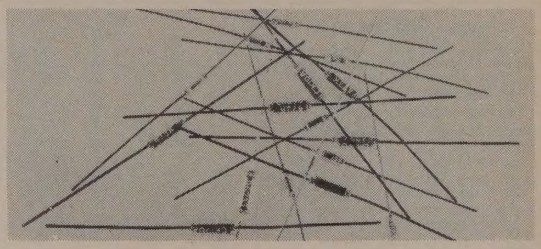
C IPS FOR H RID CIRCUITRY

C PACITANCE VALUES
f n 5 pf to 2 mfd
(dium ''K'' dielectric)
f n 1 pf to .2 mfd (NPO)
V LTAGE: 25 to 100 VDC
T LERANCE: down to .25%
T MPERATURE RANGE:
- °C to +125°C



NEPTUNE CERAMIC CAPACITORS

HERMETICALLY SEALED GLASS ENCLOSED TUBULAR
CAPACITANCE VALUES
from 10 pf to .0018 mfd (NPO)
TOLERANCE: 10% and 20% standard
TEMPERATURE RANGE: -55°C to +125°C
meets or exceeds applicable portions of
MIL-C-11015
MIL-C-39014



SUBMINIATURE RFI FILTERS
VOLTAGE RATING:
50, 100, 200 VDC—115 VAC
OPERATING CURRENT:
60 ma thru 15.0 amps
OPERATING TEMPERATURE:
-55°C to +125°C

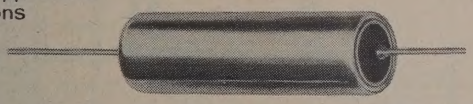
West-Cap Arizona
Subsidiary of San Fernando Electric Manufacturing Co.

2201 East Elvira Road, Tucson, Arizona 85706
TWX 910-952-1153 Data Phone (602) 294-2646

R METIC CAPACITORS

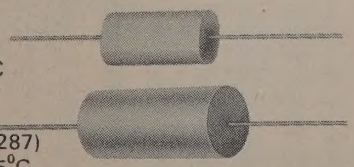
t tal Case
t h compression glass seals
P PLICABLE MIL E CIFICATIONS
L-C-25
L-C-14157C
L-C-18312
L-C-19978
a ilable in all capacitance l ues, voltages, and e erances per applicable L specifications

- Paper-Foil
- Metalized Paper
- Mylar
- Metalized Mylar
- Polycarbonate
- Metalized Polycarbonate
- Polystyrene
- Metalized Polystyrene
- Teflon
- Metalized Teflon



A P-N-FIL'' CAPACITORS

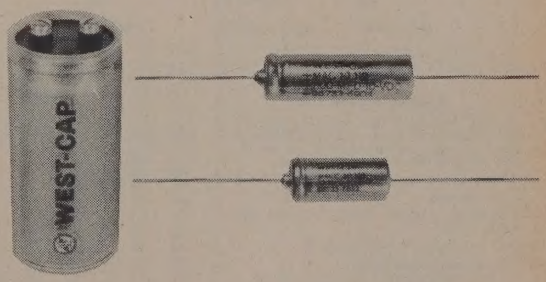
A PACITANCE VALUES
m .001 mfd to 12 mfd
O LTAGE: 50 to 1000 VDC
O LERANCE: down to 1%
Y LAR: -55°C to +125°C
T M style meets MIL-C-27287)
O LYSTYRENE: -55°C to +85°C
E TALIZED MYLAR: -55°C to +125°C
E TALIZED POLYCARBONATE: -55°C to +125°C



ELECTROLYTIC CAPACITORS

SERIES MAC Axial lead
RATINGS: 2 mfd to 70,000 mfd
from 3 VDC to 150 VDC

SERIES WHC COMPUTER GRADE
RATINGS: 200 mfd to 100,000 mfd
from 5 VDC to 150 VDC. Voltages in excess of 150 VDC to 500 VDC on special order.

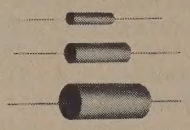


SAN FERNANDO ELECTRIC MANUFACTURING COMPANY is qualified to Military Specifications listed.

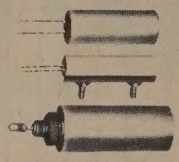
S&EI Manufacturing/Capacitors

18800 Parthenia Street, Northridge, California 91324 • (213) 349-4111 • TWX 910-493-1252

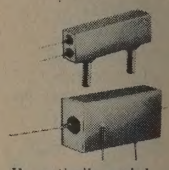
CASE STYLES →
FEATURES ↓



R — *Wrap and Fill, round*



E — *Hermetically, sealed, tubular*



G — *Hermetically, sealed, rectangular*

17 SERIES — METALIZED MYLAR

For circuits that require the ultimate electrical properties Non Polar coupled with the smallest size over a wide temp. range.

- IR: 50K Meg × MFD Min. +25° C
- DF Less Than 1% IKHZ at +25°C
- Dielectric Strength: 200% of rated VDC 1 Min. Max.
- Temperature Range: −55° C to +125° C
- Voltage versus Temp.: 100% rated Voltage to 100° C 50% derating to +125° C
- Capacity versus Temp.: −55° C to +25° C, +5% change; +25° C to +85° C, +3%, and +25° C to +105° C, +7% change
- Quality Control and Production Tests consist of 100% group A requirements of MIL C 18312 on hermetic seal style E and all tests except for moisture leak tests on styles W-U-R-N-B-D.

17R

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.17	.40	.001	.001	.001	.001
.17	.40	.022	.0068	.0033	.0012
.22	.40	.039	.027	.01	.0047
.23	.54	.12	.033	.027	.0082
.27	.54	.18	.12	.047	.01
.32	.67	.50	.22	.056	.015
.34	.83	.68	.33	.12	.039
.46	.83		.39	.18	.047
.28	.97	.82			
.39	.97	1.5	.47	.22	
.47	.97		.68	.27	
.41	1.17	2.0	.82	.33	.082
.56	1.17	5.0	1.5	.50	.18
.60	1.17			.56	
.65	1.68	10.0	4.0	1.0	.68
.89	1.68	20.0	8.0	3.0	1.5

17E

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.175	.500	.022	.0068	.0033	.001
.195	.500	.039	.0082	.0068	.0049
.235	.500		.027	.01	
.195	.625	.056			.0056
.235	.625	.12	.056	.018	.01
.312	.625	.18	.12	.047	
.312	.750	.33	.18	.056	.015
.400	.750	.50	.27	.1	.033
.400	.875	.68	.39	.12	.047
.400	1.125	1.5	.68		.056
.400	1.375	2.0			.1
.500	1.375	4.0	1.5	.39	.15
.562	1.375			.50	.18
.67	1.375	5.0		.56	
.562	1.875		.20	.82	.39
.670	1.875	10.0	4.0	1.0	.56
.750	1.875	12.0	5.0	1.5	.82

17G

CASE SIZES TK.	WD.	LG.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.22	.34	.562	.082	.027	.01	.0047
.22	.34	.687	.22	.056	.033	.018
.22	.34	.812	.33	.10	.056	.027
.22	.34	.937	.50	.12	.068	.033
.22	.34	1.125	.68	.18	.1	.047
.31	.41	.937	.82	.27	.15	.068
.31	.41	1.125	1.0	.39	.18	.1
.31	.41	1.312	1.5	.50	.27	.12
.40	.57	1.125	2.0	.75	.39	.18
.40	.57	1.312	3.0	.82	.56	.27
.40	.57	1.562		1.0	.68	.33
.40	.57	1.812	5.0	1.5	.82	.39
.50	.65	1.562		2.0	1.0	.50
.50	.65	1.812				.56
.50	.65	2.062	8.0		1.5	.75
.50	.65	2.312		3.0		.82
.60	.80	2.062	12.0		2.0	1.0
.60	.80	2.312	15.0	5.0		

22 SERIES — METALIZED POLYCARBONATE

For circuits that require flat T.C., low losses, small size over a wide temperature and frequency range. Used in many wave filter, discriminator and critical timing circuits.

- IR: 100K Meg × MFD Min. at +25 C
- DF less than .3% measured IKHZ at 25 C
- Dielectric Strength: Up to 200% of rated VDC Max. 1 Min.
- Temperature Range: −55° C to +105 C. When properly encased will operate to +125° C
- Temperature Coefficient: From −55 C to +25° C, 1.5% max change; +25° C to +105° C, −.7% max. change.
- QC & Production Tests consist of 100% to group A requirements MIL C 18312 on hermetic seal style E and to all except moisture leak test on styles W-U-R-N-B-D.

22R

CASE SIZES DIA.	LGTH.	MFD 50 VDC MFD	MFD 100 VDC MFD	MFD 200 VDC MFD	MFD 400 VDC MFD
.18	.40	.082	.039	.01	.0047
.21	.40	.18	.068	.022	.01
.18	.54	.22	.082	.027	.015
.24	.54	.33	.18	.056	.027
.38	.54	.56	.22	.082	.047
.24	.67		.25	.1	.056
.29	.67	.68	.27	.15	.1
.32	.67	.75	.39	.25	.12
.40	.67	1.0	.56		
.32	.83	1.5	.82	.27	.15
.39	.83	2.0	1.0	.39	.18
.41	.97		1.5	.47	.22
.48	.97			.56	.33
.38	1.16	4.0		.68	.39
.45	1.16	5.0	2.0	1.0	.5
.50	1.16	8.0	2.5	1.5	.68
.62	1.16	12.0			
.64	1.68	15.0	5.6		
.68	1.68	20.0	8.0		
1.06	1.68	50.0	12.0		
.44	1.78			2.0	.75
.675	1.78			4.0	

22E

CASE SIZES DIA.	LGTH.	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.175	.50	.033	.018		.0015	
.195	.50	.082	.039	.022	.0022	.001
.235	.50					
.195	.625	.12	.082		.01	
.235	.625	.18	.1	.033	.027	
.312	.625	.56	.12	.056	.033	.0082
.312	.750	.68	.27	.18	.056	.022
.400	.750	1.0	.50	.25	.082	.027
.40	.875	2.0	.56	.39	.1	.039
.50	.875		.68		.18	.056
.40	1.125	3.0	1.0	.47		
.50	1.125	5.0	2.0	.56	.25	.12
.562	1.125	6.8			.33	
.50	1.375	8.0	3.0	1.0	.50	.18
.562	1.375			1.5		
.670	1.375	10.0	5.0			.27
.562	1.875	15.0	6.8	2.0	.82	.33
.670	1.875	18.0	8.0	3.0		.50
.75	1.875	20.0	12.0	4.0	1.0	.56
1.0	1.875	40.0	22.0	8.0	1.5	.82

22G

CASE SIZES TK.	WD.	LG.	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.22	.34	.562	.39	.039	.015	.0068	.0047
.22	.34	.687	.56	.056	.056	.015	.01
.22	.34	.812	.82	.18	.082	.022	.015
.22	.34	.937	1.0	.39	.12	.033	.022
.22	.34	1.125			.18	.047	.027
.31	.41	.937	2.0	.68	.39	.056	.020
.31	.41	1.125	3.0	1.0	.50	.092	.056
.31	.41	1.312				.12	.068
.40	.57	1.125	5.0		.75	.18	.12
.40	.57	1.312		2.0	.82	.25	.15
.40	.57	1.562	7.0	3.0	1.0	.33	.18
.40	.57	1.812			1.5	.39	.25
.50	.65	1.562	10.0	7.0		.47	.27
.50	.65	1.812		10.0	2.0	.56	.33
.50	.65	2.062				.68	.39
.50	.65	2.312			3.0	.75	.50
.60	.80	2.062			5.0	1.0	.75

13 SERIES — POLYSTYRENE

For the instruments that require long term stability, low leakage, minimum dielectric absorption.

Used in many critical computer timing and hybrid circuits.

- Temperature Range: −55 C to +85 C
- IR: 100K Meg × MFD Min +25 C
- DF: .05% Max IKHZ at +25 C
- TC: 130 PPM / C +20 PPM
- Quality and Production test consists of 100% to group A level of MIL C 19978 on style E and all requirements except moisture leak test on style R.

13R

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.280	.680	.001	.001	.001	.001
.280	.680	.01	.0068	.005	.0033
.312	.680	.022	.01	.0082	.0068
.312	.875	.033	.015	.01	.032
.343	.875	.039	.027	.015	.01
.375	.875	.05	.033	.022	.015
.468	.875	.082	.039	.025	
.406	1.0	1	.047	.033	.02
.468	1.0	.12	.05	.039	.027
.437	1.25	.15	.068	.05	.033
.50	1.25	.20	1	.068	.039
.531	1.25	.27	.15	.082	.05

13E

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD
.195	.75	.0027	.0015	
.195	.75	.0039	.0018	
.195	.75	.0082	.0033	.0015
.235	.75	.012	.0068	.0027
.312	.75	.022	.015	.01
.400	.87	.068	.033	.018
.500	1.0	.12	.068	.033
.562	1.12	.22	.1	.068
.562	1.375	.33	.15	.1

*The pictorial "G" style series displayed are not standard; however depicts two popular methods of mounting features. Many mounting and terminal features can be designed and manufactured to your specifications by request to our representatives or factory direct, without delivery delay.

10 SERIES — MYLAR FOIL

For the instrument that requires high reliability, precise characteristics year after year. Used in many communication, telephone, tracking and test instrument devices.

- Temperature Range: −55° C to +125 C
- IR: 50K Meg × MFD Min. at +25° C
- Dielectric Strength: 200% of rated VDC max. 1 Min.
- DF less than .5% IKHZ at 25° C
- Temperature Coefficient:
  +5% change from −55° C to +25° C
  +5% change from +25° C to +85° C
  +9% change from +25° C to +105° C
  +14% change from +25° C to +125° C
- QC and Production Tests are 100% to group A of MIL C 19978 on hermetic style E and all tests except moisture leak requirement style R.

10R

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD	1000 VDC MFD
.156	.500	.001	.001			
.156	.500	.01	.0082			
.203	.500	.015	.015			
.203	.625	.022	.022	.0068		
.265	.625	.039	.027	.01		
.218	.750	.047	.03	.02	.0047	.001
.296	.750	.082	.047	.022	.0032	.0015
.312	.750		.068	.025	.01	
.281	.875	.1	.075	.027	.015	.0022
.375	.875	.15	1	.047	.022	.01
.359	1.0	.22		.068	.027	.015
.50	1.0			.12	.068	
.406	1.125	.39	.22			
.468	1.250	.47	.33	.15	.082	.047
.625	1.250	.82	.47		1	
.609	1.375		.56	.27	.15	

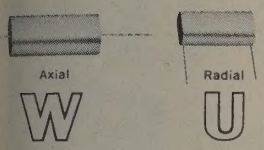
10E

CASE SIZES DIA.	LGTH.	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.195	.625	.001	.001	.001	.001
.195	.625	.015	.01	.0047	.0015
.235	.625		.015	.0068	
.312	.625		.027	.015	
.312	.750	.082	.033		.0082
.312	.875	.12	.047	.027	
.400	.875	.15	.082	.047	.022
.400	1.125	.22	.15	.068	.027
.400	1.375	.33	.22	.1	.033
.500	1.375	.50	.33	.15	.068
.562	1.375	.56	.47	.22	.082
.670	1.375	.90		.27	
.670	1.875	1.0	.56		.12
.670	1.875	1.25	.82	.39	.15
.750	1.875	1.5	1.0	.56	.31
1.0	1.875	2.0	1.5	.82	.39

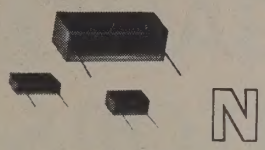
IMPORTANT NOTICE: THE NEW MINIATURE 50VDC AND 100VDC SIZES IN OUR 22 SERIES IS A MAJOR SIZE REDUCTION IN METALIZED POLYCARBONATES.

S&EI Manufacturing/Capacitors

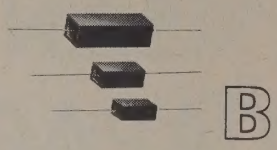
8800 Parthenia Street, Northridge, California 91324 • (213) 349-4111 • TWX 910-493-1252



Wrap and Fill, rectangular



Molded, radial leads



Molded, axial leads.

Epoxy Dip Case

17W/17U

CASE SIZES L	T	W	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.40	.12	.22	.022	.0056	.0033	.001
.40	.17	.27	.039	.027	.01	.004
.54	.17	.28	.12	.039	.018	.0082
.54	.21	.32	.18	.12	.047	.01
.67	.25	.38	.39	.18	.056	.012
.67	.30	.42	.50	.27	.032	.015
.83	.27	.38	.56	.29	.1	.033
.83	.42	.50	.68	.33	.18	.047
.97	.22	.35	.82	.47	.2	
.97	.32	.46	1.5	.68	.22	
1.17	.34	.5	2.0	.82	.33	.1
1.17	.47	.65	5.0	1.5	.56	.18
1.68	.47	.56	8.0	2.0	.82	.27
1.68	.50	.65	10.0	4.0	1.0	.39
1.68	.65	.85	15.0	5.0	1.5	.82
1.68	.75	1.0	20.0	8.0	2.0	1.5

17N

CASE SIZE L	T	H	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.395	.095	.295	.039	.01	.0027	
.42	.16	.31	.047	.027	.012	.0047
.55	.16	.31	.12	.033	.022	.012
.55	.19	.38	.18	.056		
.55	.24	.38	.27	.12	.047	
.55	.30	.40	.39		.1	
.68	.19	.50	.68			
.67	.30	.50		.27		.018
.82	.30	.70			.18	.039
.88	.25	.50	1.0	.39		
1.0	.37	.50	2.0	.68	.27	.056
1.24	.40	.75	5.0	1.5	.68	.18
1.75	.57	.75	8.0	3.0	1.5	.39

17B

CASE SIZES TK	WD	LG	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.17	.29	.42	.001	.001	.001	.001
.17	.29	.42	.047	.027	.01	.0047
.17	.29	.57	.056	.033	.012	.0067
.17	.29	.57	.12	.039	.015	.0082
.23	.36	.57	.15	.047	.018	.009
.23	.36	.57	.27	.082	.039	.01
.29	.42	.57	.39	.15	.047	
.29	.42	.67	.68	.27	.1	.015
.39	.54	.82	1.0	.5	.18	.047
.39	.54	1.04	2.0	.68	.27	
.39	.54	1.19	2.5	1.0	.39	.1
.56	.72	1.24	5.4	1.5	.56	.18
.56	.72	1.75	10.0	4.0	1.0	.5

17D

CASE SIZES L	T	H	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.39	.17	.35	.022	.01	.0068	.0022
.39	.19	.38	.039	.027	.01	.0047
.52	.17	.35	.082	.047	.015	.0056
.52	.26	.45	.18	.10	.047	.01
.65	.23	.42	.22	.12	.056	.012
.65	.25	.45	.39	.15	.082	.015
.65	.35	.55	.5	.27	.1	
.81	.27	.43	.56			.027
.81	.42	.60	.68	.39	.18	.047
.95	.37	.53	1.0	.56		
.95	.38	.59	1.5	.68	.22	
.95	.46	.66			.27	
1.15	.34	.55				.082
1.15	.39	.60	2.0	.75	.33	.10
1.15	.43	.65	3.0	1.0	.39	.12

22W/22U

CASE SIZES L	T	W	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD
.40	.12	.22	.047	.018	.01	.001
.40	.15	.27	.25	.039	.022	.01
.54	.13	.23	.27	.082	.027	.015
.54	.16	.28	.39	.1	.047	.027
.54	.21	.32	.50	.12	.082	.047
.67	.18	.29	.82	.15	.1	.056
.67	.22	.40	1.0	.39	.25	.12
.83	.28	.38	1.5	.56	.30	.15
.83	.32	.45	2.0	.68	.39	.18
.97	.33	.48		1.0	.47	.27
.97	.10	.55		1.2	.56	.36
1.16	.32	.43	5.0	1.5	.68	.50
1.16	437	.55	10.0	2.5	1:5	.63
1.16	.54	.66	12.0	3.0		
1.68	.51	.64	15.0	5.0		
1.68	.73	.86	30.0			

22N

CASE SIZES L	T	H	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.395	.095	.295	.068	.01	.0068	.0015	
.42	.16	.31	.075	.047	.01	.0022	
.42	.18	.31	.1		.022	.0047	.0022
.55	.16	.31		.12	.039	.018	.0047
.55	.18	.31	.22	.15	.056	.027	
.55	.185	.38		.18	.068		
.55	.24	.38	.50	.22	.082	.039	.012
.55	.30	.40	.68	.27		.047	.018
.67	.30	.45		.39	.22		.027
.67	.30	.50		.56		.068	
.82	.30	.42	1.0		.27	.1	.039
.82	.40	.50	1.5	1.0	.39	.15	.068
1.0	.37	.50	3.0	1.5	.68		.1
1.24	.40	.50	5.0	2.0	.82	.22	
1.24	.57	.75	10.0	4.0	1.5	.50	.27
1.75	.57	.75	18.0	6.8	3.0	.82	.33
1.75	.57	1.0	22.0	10.0			

22B

CASE SIZES THK	WDTH	LGTH	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.17	.29	.42	.1	.047	.022	.01	.0033
.17	.29	.57	.22	.1	.039	.022	.0068
.23	.36	.57	.33	.22	.082	.047	.01
.29	.42	.57	.68	.27	.1		.018
.29	.42	.67			.25		.027
.29	.42	.82	1.0	.75	.27	.068	
.39	.54	.82	1.5	1.0	.50	.12	.082
.39	.54	1.04	2.0		.68	.18	
.39	.54	1.19	5.0	3.0	.82	.33	.15
.56	.72	1.24	10.0	5.0	1.5	.5	.27
.56	.72	1.75	18.0	8.0	3.0	.82	.39
.56	.72	1.92	22.0				

22D

CASE SIZES L	T	+.032 −.096 H	50 VDC MFD	100 VDC MFD	200 VDC MFD	400 VDC MFD	600 VDC MFD
.39	.19	.36	.068	.01	.01	.0022	.0015
.39	.18	.39			.015	.0047	.0022
.39	.23	.45	.1	.0	.022	.01	
.52	.18	.39	.18	.12	.033		.0047
.52	.26	.45	.50	.22	.082	.027	.01
.52	.35	.58	.68	.27		.047	.018
.64	.35	.53			.25		.027
.64	.49	.72		.56		.12	
.81	.35	.55	.75		.33		.039
.81	.40	.63	1.0		.39	.15	.056
.81	.44	.68	1.5	1.0		.18	.082
.95	.38	.61			.47	.25	
.95	.42	.66	3.0	1.5	.56	.33	
1.15	.37	.63			.75		.1
1.15	.43	.65	5.0	2.0	1.0	.39	.12

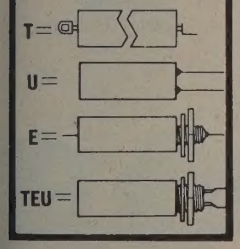
ORDERING AND PART NUMBER INFORMATION

The dimensional tolerances for case styles R-W-U-D are ±.05. Styles G-B-N-E are ±.031, on length, and ±.015 for other dimensions. All units are available in any value, ranging from .001 MFD to their maximum capacity, with tolerances to ±1%. Standard tolerance is ±20%. Other types of leads, configurations, and encasements are available upon request to meet your special requirements.

***9**

Hermetic case Style Accessories

9 = Insulated Sleeve



17

Dielectric

17 = Metalized Mylar
22 = Metalized Polycarbonate
10 = Mylar Foil
13 = Polystyrene Foil

E

Case Style

E = Hermetic Rnd.
G = Hermetic Rect.
W = Wrap Fill, Oval, Axial
U = Wrap Fill, Oval, Radial
N = Molded Radial
B = Molded Axial
R = Wrap Fill, Round
D = Epoxy Dip

***1**

Circuits

1 = Case Floating
2 = Case ground
3 = Case ground With Lead
5 = Feed Through

B

Voltage

A = 50 VDC
B = 100 VDC
C = 200 VDC
D = 300 VDC
E = 400 VDC
F = 600 VDC
G = 1000 VDC

103

Capacitance

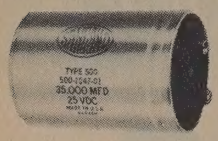
Expressed in MMFD
103 = .01 MFD
Last digit No. Zeros

K

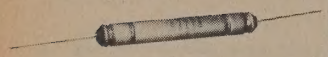
Tolerance

Standard ±20%
K = ±10%
J = ± 5%
H = ± 3%
G = ± 2%
F = ± 1%

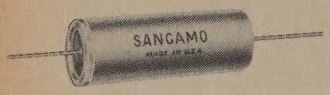
**Use these key part numbers only when ordering style E, G, hermetic seal encasements. Remaining part numbers are applicable when ordering case styles R-W-U-N-B-D.*



Type 500—Electrolytic Computer Grade 85° C
BULLETIN 2236



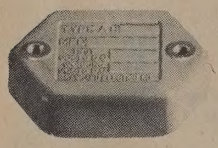
Type 557—Electrolytic −55°C to +125°C
BULLETIN 2240



Type CH—Film Metallized Polyester
BULLETIN 2426

Type 505—Electrolytic Instrument Grade
BULLETIN 2235

Type R—Mica Molded
BULLETIN 2320



Type A & H—Mica Molded Fixed Terminal
BULLETIN 2321

Type 291—Cast Mica Transmitting
BULLETIN 2324

SPECIFY SANGAMO CAPACITORS and INDUCTORS

for

Industrial
Military
Computer
Communications
and
Instrument
Applications

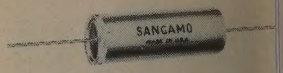
For more detailed information see the Sangamo listings in the **Radio Electronic MASTER** or contact your nearest **Sangamo** Representative.

SANGAMO
ELECTRIC COMPANY
P.O. BOX 128
PICKENS, SOUTH CAROLINA 29671
Phone: 803 - 878-6311

Type DCM—Electrolytic Computer Grade 65° C
BULLETIN 2231

Type 556—Electrolytic Commercial Grade
BULLETIN 2239

Type HVC—Paper Commercial and Military
BULLETIN 2425



Type S —Paper Hermetically Sealed
BULLETIN 2421

Type M—Mica Button
Type D—Mica Dipped
BULLETINS 2311, 2323, & 2312

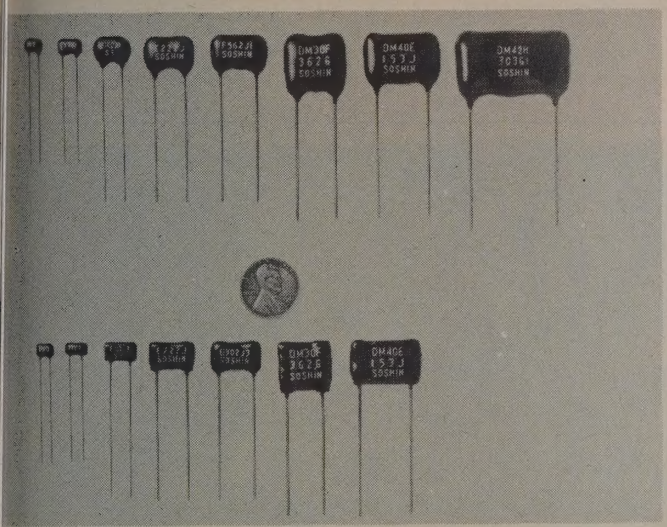
Type G—Mica Transmitting
BULLETIN 2322

Type ET & NV Inductors Fixed & Tunable
BULLETINS 2721A & 5103

SOSHIN DIPPED MICA CAPACITORS

PROOF OF RELIABILITY--2000hrs at 40°C
Usable Temperature Range-55°C to 150°C

Soshin Dipped Mica Capacitors are the only mica capacitors made in Japan passing evaluation testing by the Japanese Government equivalent to MIL-C-5D. They give the advantages of natural mica characteristics and a revolutionary coating process. From DM-42 to miniature DM-05, Soshin capacitors are reliability proven.



Soshin Dipped Mica Capacitors are dipped in a phenolic compound and case materials are vacuum impregnated with epoxsy resin. Until now, dipped mica capacitors suffered from low resistance to humidity resulting from the poor bond between the metal and resin. Now, since Soshin capacitors are specially treated, 100% resistance to temperature and humidity is possible, and because of uniform hardening, resistance is guaranteed. The special resin used has increased temperature limits from the normal −30°C to +85°C—to a guaranteed −55°C to +150°C.

Styles		Maximum allowable capacitance (pf)				Capacitance tolerance	Sizes (m/m)																										
							ONE COAT type									STANDARD type									MIL-C-5D type			Lead wires					
							500WV			300WV			100WV			500WV			300WV			100WV			500WV			ONE COAT STANDARD			MIL-C-5D		
N-D	MIL type	100 WV	300 WV	500 WV	MIL 500 WV		L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	L MAX	W MAX	T MAX	A ±1.0	D ±1.0	C MIN	A ±0.78	D ±0.05	C MIN
05	—	200	130	—	—	FGJKM				6.0	4.5	2.5	6.5	4.5	2.5				7.0	5.0	3.5	7.5	15.5	3.5				3.0	0.40	25.0			
10	CM04	440	390	330	740	↕	7.5	5.0	2.5	7.5	5.0	2.5	7.5	5.0	2.5	8.5	5.5	3.5	8.5	5.5	3.5	8.5	5.5	3.5	9.91	9.65	5.59	4.0	0.40	25.0	3.81	0.36	25.4
12	—	1200	820	430	—		8.0	6.5	3.0	9.0	7.0	4.0	9.5	7.0	4.5	9.5	9.0	4.5	10.5	10.0	5.5	11.0	10.5	6.0				4.0	0.50	35.0			
15	CM05	2000	1200	510	390		10.5	6.5	3.5	10.5	6.5	3.5	11.0	7.0	4.0	12.0	10.0	5.5	12.5	10.5	6.0	13.0	11.0	6.5	11 94	10.60	5.59	6.0	0.64	↑	5.71	0.64	25.4
16	—	2000	1500	750	—		18.0	8.0	4.5	18.5	8.5	5.0	19.5	8.5	5.0	19.0	10.5	6.0	19.5	10.5	6.5	20.0	10.5	6.5				12.5	0.64				
19	CM06	10000	6800	5100	4700		15.5	11.5	5.0	16.5	12.0	6.0	16.0	12.0	7.0	17.5	15.0	7.5	18.0	15.0	8.0	18.0	15.0	8.5	17.78	14.93	8.89	9.5	0.81		8.89	0.81	25.4
20	—	20000	12000	10000	—		18.0	13.0	6.5	18.0	13.0	6.5	18.5	13.0	9.0	19.5	15.5	10.0	20.0	16.0	10.5	20.5	16.0	12.0				11.0	0.81				
30	CM07	30000	24000	22000	20000		19.0	19.5	7.0	19.5	20.5	7.0	20.0	20.5	8.0	22.0	23.0	9.0	22.0	23.0	10.0	22.0	23.0	12.5	21.08	25.4	11.43	11.0	1.01		10.8	1.01	25.4
40	—	40000	30000	27000	—	↓	25.0	17.0	8.0	25.0	17.0	8.0	25.5	17.5	8.5	26.5	19.0	10.5	26.5	19.0	10.5	27.0	20.0	11.0				16.0	1.01	↓			
42	CM08	90000	75000	62000	47000	FGJKM										38.0	25.0	12.0	39.0	26.0	13.0	40.0	27.0	13.0	38.10	23.88	17-70	26.5	.01	35-0	2.67	1-01	25.4

Minimum allowable clearance is limited to ±0.5 pf

SOSHIN ELECTRIC CO., LTD.

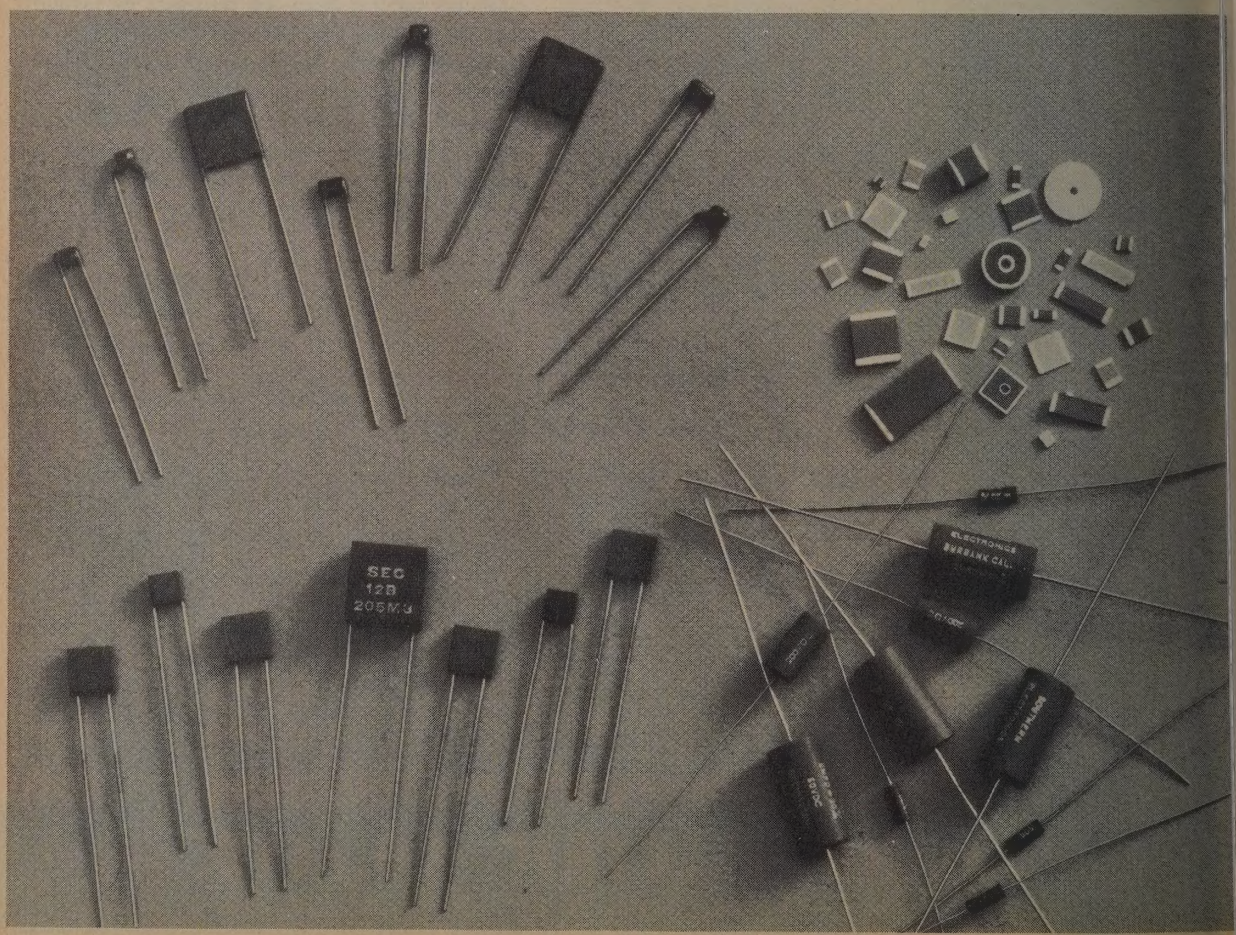
1-18-18, Nakamagome, Ota-ku, Tokyo, Japan Phone: 775-2111 (Rep.)

see our data in VSMF VISUAL SEARCH MICROFILM FILE

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Ceramic Capacitors

Southern Electronics ceramic capacitors consist of alternate layers of high permittivity ceramic and noble metal electrodes fired together to form a monolithic structure. Unique processing techniques permit the volume production of extremely thin sections of ceramic. These thin sections together with the external parallel connection of the individual sections increase the volumetric efficiency of these devices by a factor of approximately 100 compared to conventional "single-sheet" ceramic structures.



SOUTHERN ELECTRONICS CORPORATION
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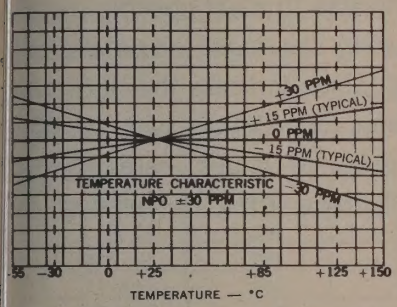
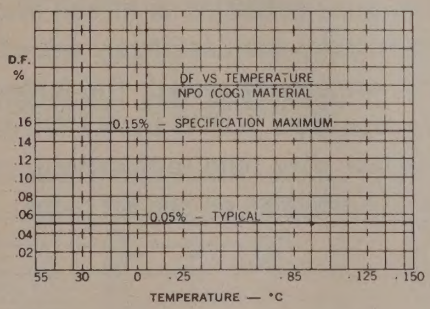
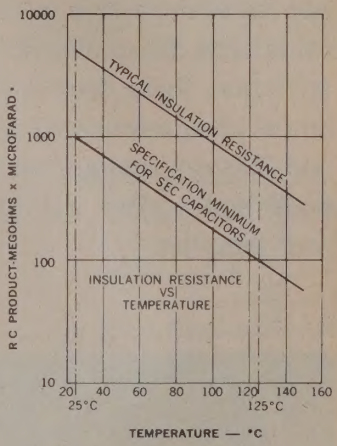
TWX 910-498-2207

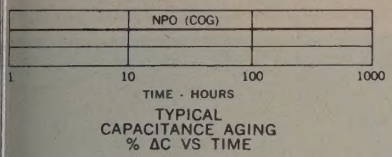
Performance Data

PO (COG) Ceramic SEC's NPO Ceramic Formulation is a highly stable non-ferroelec-tr composition which exhibits high Q, I.R. and negligible changes in capacitance over a wide ra ge of temperatures, frequencies and bias voltages. Ideally suited for tuned circuits, timing c uits, and fast rise time applications.

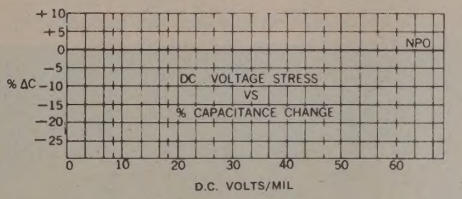




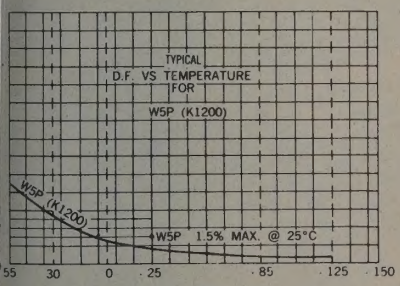


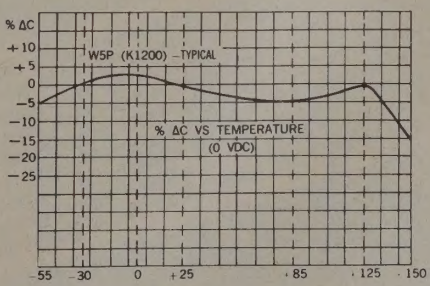


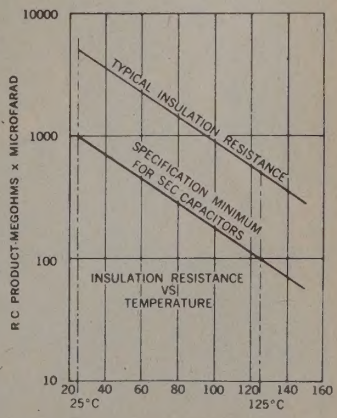
TYPICAL
CAPACITANCE AGING
% ΔC VS TIME

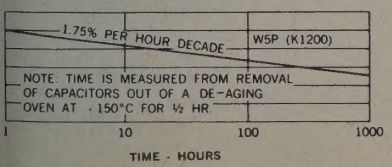


K1200 (W5P) Ceramic SEC's K1200 material is a ferroelectric dielectric system with a K of approximately 1200 at 25°C. It offers the advantage of approximately 40 times the volu-metric efficiency of the NPO material, and exhibits moderate changes in capacitance and D.F. with temperature, frequency and bias voltages. Suited for by-pass, coupling, filtering and general circuitry.

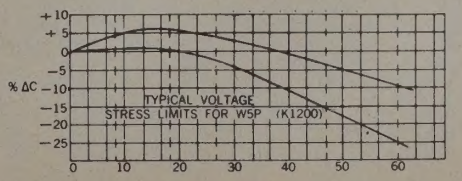








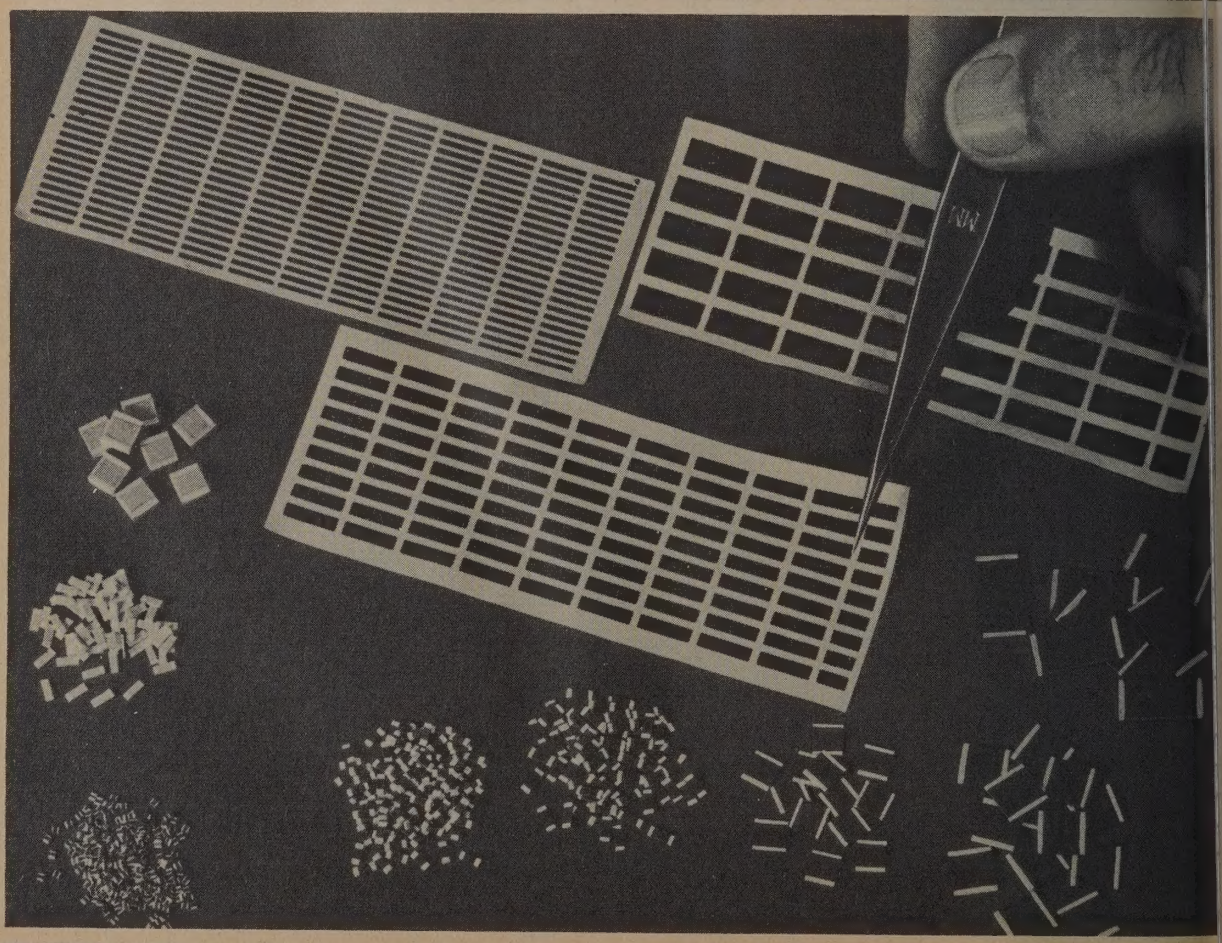
TYPICAL
CAPACITANCE AGING
% ΔC VS TIME



SOUTHERN ELECTRONICS CORPORATC
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

"Chip" Capacitors

The SEC Chip capacitor is a space-age component. Much like semiconductor chip devices, ne chip capacitor can be attached to substrates, headers or printed circuit boards. They provide x tremely high values of lumped capacitance per unit area compared with evaporated or thick m devices, since they are made up of many layers (over 45 in some cases) of high-K ceramics o the barium titanate family. The standard silver terminations permit attachment by solder refl w Special terminations (such as gold, palladium or nickel) are available to meet specific metallurgi cal criteria. Since all electrode edges are completely sealed during the high temperature firing operation, these devices are hermetically sealed. The following tables indicate the SEC standard line of silver terminated chip capacitors in NPO and K1200 ceramic formulations with 25, 50, 1 0, and 200 volt ratings. Many other sizes, end terminations, capacitance values, ceramic formu tions and voltage ratings are available on special order. Our Engineering Department invites your inquiries.



SOUTHERN ELECTRONICS CORPORATION

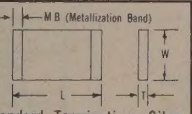
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

NPO "Chip" Capacitors

RT NUMBER CODE:

SE 805 CN 101 K A (*)

Style
NPO ramic
Capa ance
Tole ce
Volta
Opti l Electrode Material



Standard Termination, Silver

Optional:
G = Gold
P = Palladium Gold
T = Tinned Silver
N = Nickel

Specifications:

Temperature range: —55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25% D = ± .5% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability

SEC STYLE	0405	0805	1005	1505	1706	1211	2908
L ± .01	.045	.075	.095	.150	.170	.120	.290
W ± .01	.040	.050	.05	.05	.065	.110	.080
T (max)	.040	.050	.06	.06	.060	.065	.065
MB (min)	.005	.015	.015	.015	.015	.015	.015

apacitance in Pf	Capacitance Code	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200
.0 thru 82	1RO thru 820																												
100	101																												
120	121																												
150	151																												
180	181																												
220	221																												
270	271																												
330	331																												
390	391																												
470	471																												
560	561																												
680	681																												
820	821																												
1000	102																												
1200	122																												
1500	152																												
1800	182																												
2200	222																												
2700	272																												
3300	332																												
3900	392																												
4700	472																												
5600	562																												
6800	682																												
8200	822																												
10000	103																												

OTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

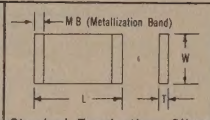
SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

NPO "Chip" Capacitors

PART NUMBER CODE:

SEC 0805 CN 101 K A (*)

- Style
- NPO Ceramic
- Capacitance
- Tolerance
- Voltage
- Optional Electrode Material



Standard Termination, Silver

Optional:
G = Gold
P = Palladium Gold
T = Tinned Silver
N = Nickel

Specifications:
Temperature range: —55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25% D = ± .5% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2 "R" signifies decimal point. 10 pf and above 101 = 100 pf 1st two digits a significant factor & 3rd digit signif number of zero

Dimensions and Availability

SEC STYLE	3909	2221	3914	3032	5918	3942	5929
L ± .01	.390	.220	.390	.300	.590	.390	.590
W ± .01	.090	.210	.140	.320	.180	.420	.290
T (max)	.070	.065	.070	.065	.070	.065	.070
MB (min)	.015	.015	.015	.015	.015	.015	.015

Capacitance in pf	Capacitance Code	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200	WVDC Z 25	A 50	B 100	C 200
1.0 thru 820	1R0thru821	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1000	102	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1200	122	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1500	152	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1800	182	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2200	222	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2700	272	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3300	332	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3900	392	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4700	472	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5600	562	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
6800	682	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
8200	822	■	■	■	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.01 uf	103	■	■	□	□	■	■	■	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.012 uf	123	■	■	□	□	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.015 uf	153	■	□	□	□	■	■	□	□	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■
.018 uf	183	■	□	□	□	■	□	□	□	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■
.022 uf	223	□	□	□	□	■	□	□	□	■	□	□	□	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■
.027 uf	273	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	■	□	■	■	■	□	■	■	■	■
.033 uf	333	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	■	□	□	■	■	■	■	■	■	■	■
.039 uf	393	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	■	□	□	■	■	□	□	■	■	■	□
.047 uf	473	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	■	■
.056 uf	563	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	□	■
.068 uf	683	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	■	□	■
.082 uf	823	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
.10 uf	104	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

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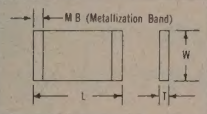
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

K1200 (W5P) "Chip" Capacitors

RT NUMBER CODE:

SE 805 BX 102 K A (*)

Style
K120 Ceramic
Capa ance
Tole ce
Volt
Opti l Electrode Material



Standard Termination, Silver

Optional:
G = Gold
P = Palladium Gold
T = Tinned Silver
N = Nickel

Specifications:
Temperature range: —55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability

SEC STYLE	0405	0805	1005	1505	1706	1211	2908
L ± .01	.045	.075	.095	.150	.170	.120	.290
W ± .01	.040	.050	.05	.05	.065	.110	.080
T (max)	.040	.050	.06	.06	.060	.065	.065
MB (min)	.005	.015	.015	.015	.015	.015	.015

Capacitance in uf	Capacitance Code	WVDC Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200
thru 3300pf	1 R0 thru 332																																
3900 pf	392																																
4700 pf	472																																
5600 pf	562																																
6800 pf	682																																
8200 pf	822																																
.01	103																																
.012	123																																
.015	153																																
.018	183																																
.022	223																																
.027	273																																
.033	333																																
.039	393																																
.047	473																																
.056	563																																
.068	683																																
.082	823																																
.10	104																																
.12	124																																
.15	154																																
.18	184																																
.22	224																																
.27	274																																
.33	334																																
.39	394																																
.47	474																																

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

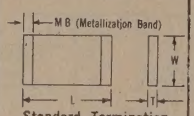
SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

K1200 (W5P) "Chip" Capacitors

PART NUMBER CODE:

SEC 0805 BX 101 K A (*)

- Style
- K1200 Ceramic Capacitance
- Tolerance
- Voltage
- Optional Electrode Material



Standard Termination, Silver

Optional:
G = Gold
P = Palladium Gold
T = Tinned Silver
N = Nickel

Specifications:
Temperature range: −55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ±5% K = ±10% M = ±20% Note: Minimum Tolerance ±.5 pf	below 10 pf 1 R2 = 1 pf "R" signifies decimal point 10 pf and above: 101 = 100 pf 1st two digits are significant factor & 3rd digit signifies number of zeros.

Dimensions and Availability

SEC STYLE	3909	2221	3914	3032	5918	3942	5929
L ± .01	.390	.220	.390	.300	.590	.390	.590
W ± .01	.090	.210	.140	.320	.180	.420	.290
T (max)	.070	.065	.070	.065	.070	.065	.070
MB (min)	.015	.015	.015	.015	.015	.015	.015

Capacitance in uf	Capacitance Code	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200	W V D C Z 25	A 50	B 100	C 200
1pf thru .039uf	1RO thru 393																												
.047	473																												
.056	563																												
.082	823																												
.10	104																												
.12	124																												
.15	154																												
.18	184																												
.22	224																												
.27	274																												
.33	334																												
.39	394																												
.47	474																												
.56	564																												
.68	684																												
.82	824																												
1.0	105																												
1.2	125																												
1.5	155																												
1.8	185																												
2.2	225																												
2.7	275																												
3.3	335																												
3.9	395																												
4.7	475																												
5.6	565																												

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead "Dipped" Capacitors

e SEC epoxy dipped series — the space saver for the designer — offers high volumetric effi-ency along with the excellent characteristics of SEC's Monolithic concept. This series is avail-le in both high-K and high-Q dielectrics. Refer to table for capacitance and physical size.

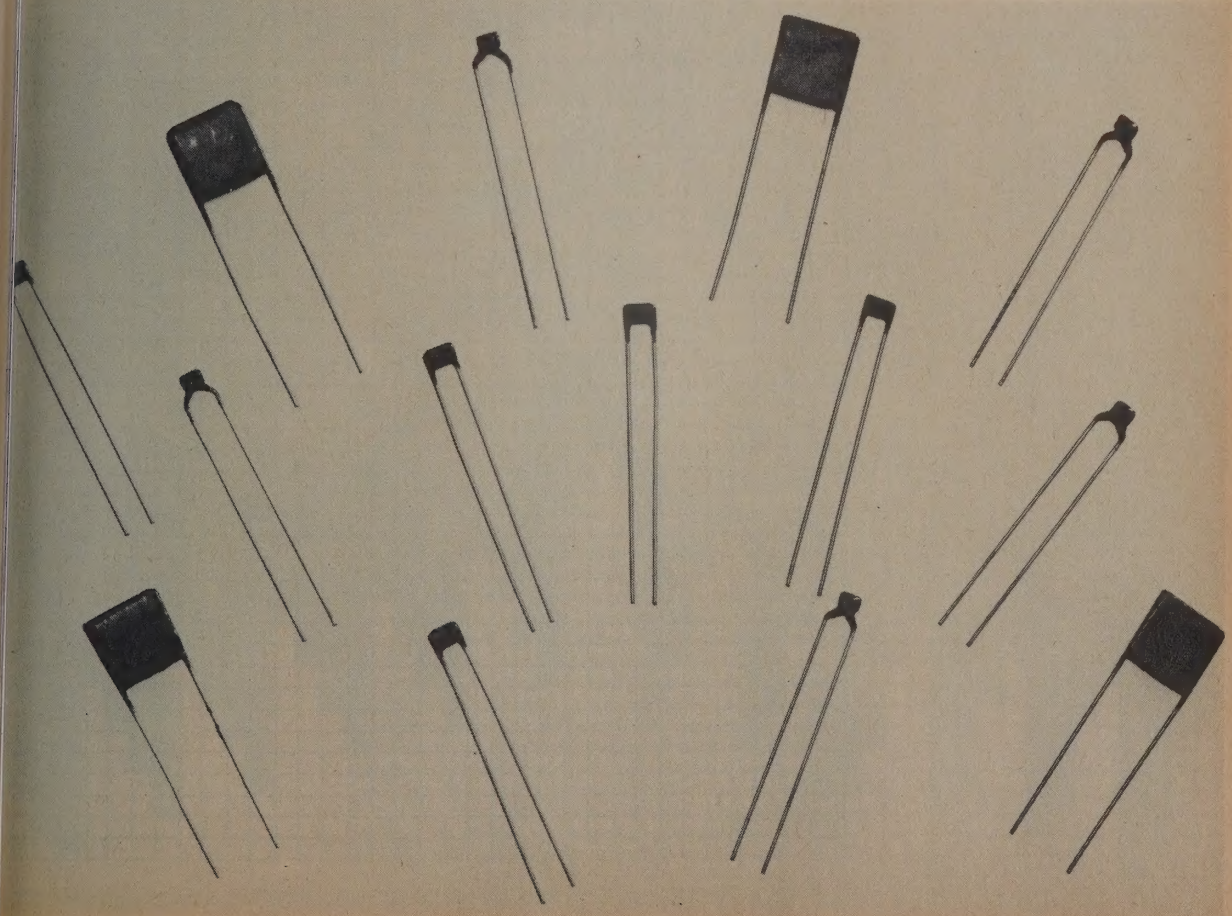
Specifications

NPO (COG)

Temperature range: −55°C to +150°C
Test frequency: 100 pf and less — 1 MHz, over 100 pf — 1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max.
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

K1200 (W5P)

Temperature range: −55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)



SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead "Dipped" (NPO)

PART NUMBER CODE:

SEC104 CN 103 K A (*)

- Style — SEC104
- NPO Ceramic — CN
- Capacitance — 103
- Tolerance — K
- Voltage — A
- Optional Lead Material — (*)

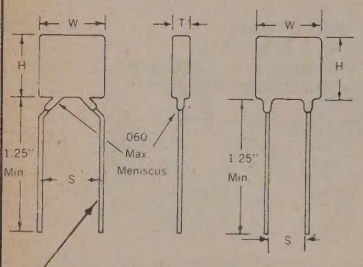
Specifications:

Temperature range: —55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25% D = ± .5% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

TYPE SEC 105



.025 Dia (Tinned Copperweld)
Optional: D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

Dimensions and Availability

STYLE	SEC 104	SEC 105	SEC 106	SEC 107	SEC 108	SEC 109	SEC 110	SEC 1
H (max)	.140	.180	.28	.28	.38	.38	.48	.48
W (max)	.140	.180	.28	.28	.38	.38	.48	.48
T (max)	.08	.08	.08	.13	.08	.13	.09	.13
S ±.020	.100	.200	.200	.200	.300	.300	.400	.400
Capacity pf	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVDC Z 25 / A 50 / B 100 / C 200	WVD Z 25 / A 50 / B 100
1.0 to 47								
56								
68								
82								
100								
120								
150								
180								
220								
270								
330								
390								
470								
560								
680								
820								
1000								
1200								
1500								
1800								
2200								
2700								
3300								
3900								
4700								
5600								
6800								
8200								
.01 uf								
.012 uf								
.015 uf								
.018 uf								
.022 uf								
.027 uf								
.033 uf								
.039 uf								
.047 uf								
.056 uf								
.068 uf								
.082 uf								
.10 uf								

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead "Dipped" (K1200)

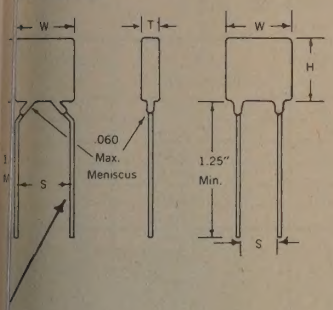
PART NUMBER CODE:
EC 104 BX 103 K A (*)
tyle
1200 Ceramic
apacitance
olerance
oltage
ptional Lead Material

Specifications:
Temperature range: —55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

PE SEC 105



Dia (Tinned Copperweld)
onal: D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

Dimensions and Availability

STYLE	SEC 104	SEC 105	SEC 106	SEC 107	SEC 108	SEC 109	SEC 110	SEC 111
H (max)	.140	.180	.28	.28	.38	.38	.48	.48
W (max)	.140	.180	.28	.28	.38	.38	.48	.48
T (max)	.08	.08	.08	.13	.08	.13	.09	.13
S ± .020	.100	.200	.200	.200	.300	.300	.400	.400

Capacity µf	SEC 104 Z 25	A 50	B 100	C 200	SEC 105 Z 25	A 50	B 100	C 200	SEC 106 Z 25	A 50	B 100	C 200	SEC 107 Z 25	A 50	B 100	C 200	SEC 108 Z 25	A 50	B 100	C 200	SEC 109 Z 25	A 50	B 100	C 200	SEC 110 Z 25	A 50	B 100	C 200	SEC 111 Z 25	A 50	B 100	C 200
1.0 to 3900pf	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4700pf	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5600pf	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
6800pf	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
8200pf	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.010	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.012	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.015	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.018	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.022	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.027	■	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.033	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.039	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.047	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.056	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.068	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.082	□	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.10	□	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.12	□	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.15	□	□	□	□	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.18	□	□	□	□	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.22	□	□	□	□	■	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.27	□	□	□	□	■	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.33	□	□	□	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.39	□	□	□	□	□	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.47	□	□	□	□	□	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.56	□	□	□	□	□	□	□	□	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.68	□	□	□	□	□	□	□	□	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
.82	□	□	□	□	□	□	□	□	■	■	□	□	■	■	■	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■
1.0	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■
1.2	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	□	□	□	■	■	■	□	■	■	■	■	■	■	■	■
1.5	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	□	□	□	■	■	□	□	■	■	■	□	■	■	■	■
1.8	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	□	□	□	■	■	□	□	■	■	■	□	■	■	■	■
2.2	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	□	□	■	■	■	□
2.7	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	■	□	□	■	■	□	□
3.3	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	■	□	□	■	■	□	□	■	■	□	□
3.9	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□	■	■	□	□
4.7	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□
5.6	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□	■	■	□	□
6.8	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	□	□	□

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
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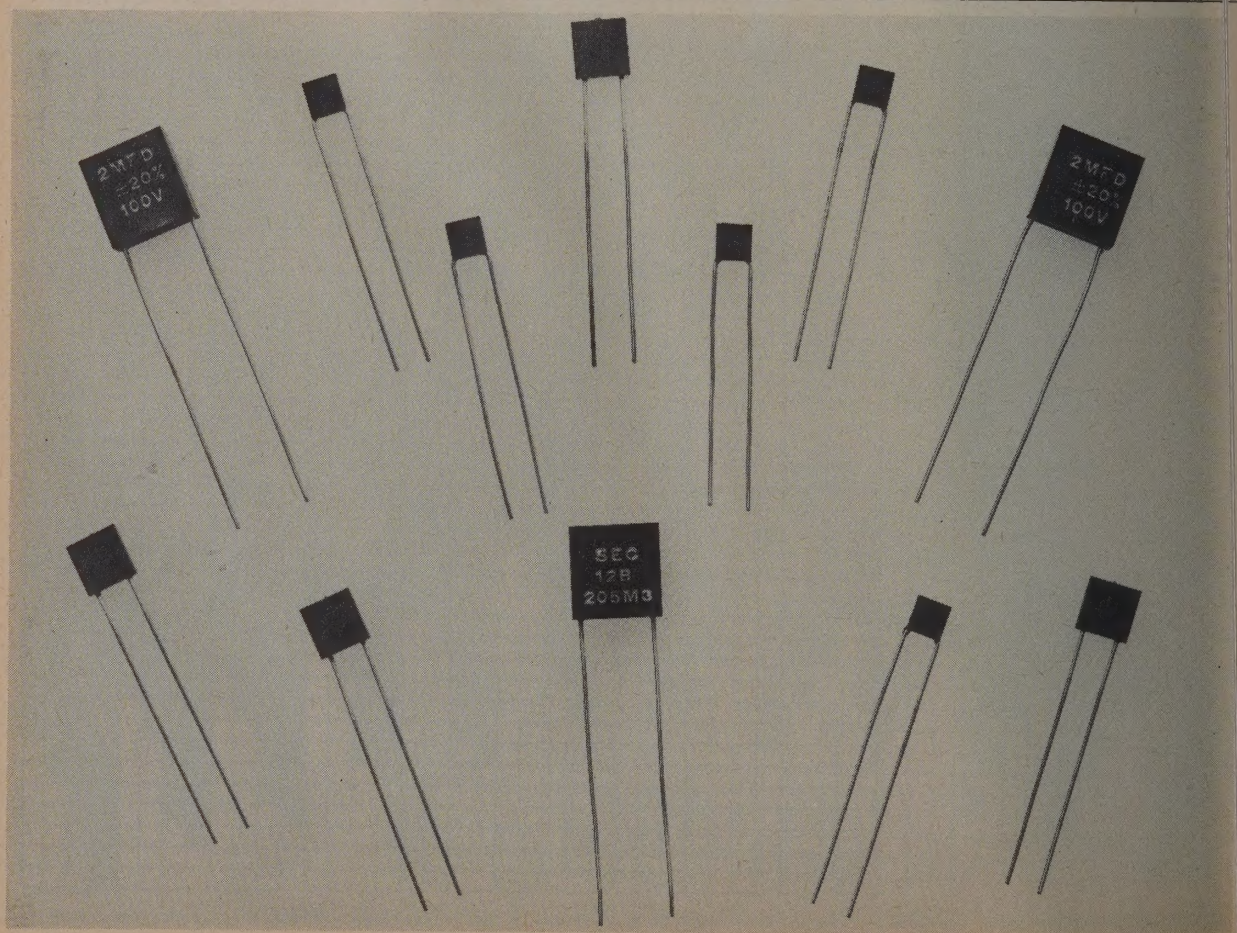
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead Capacitors

SEC radial lead capacitors are favored by design engineers using printed circuit boards substrates. Lead spacings are all on the 0.1" grid system. High temperature solder is used the attachment of the leads to the ceramic element inside the capacitor, to avoid internal reflo Transfer molding is standard for the smaller sizes listed while the larger units are encapsulate in precision molded epoxy shells by potting.



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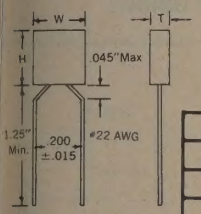
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-11015 MIL. SPEC. Capacitors

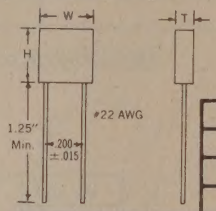
The parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-11015. Order by applicable Mil part number listed below.

Dimensions and Availability



MIL TYPE	CKO5
H ±.010	.190
W ±.010	.190
T ±.010	.090

Capacitance in pf	MIL DESIGNATION	Tolerance K±10% M±20%	50V	100V	200V
10	CKO5BX 100	K, M			
12	CKO5BX 120	K			
15	CKO5BX 150	K, M			
18	CKO5BX 180	K			
22	CKO5BX 220	K, M			
27	CKO5BX 270	K			
33	CKO5BX 330	K, M			
39	CKO5BX 390	K			
47	CKO5BX 470	K, M			
56	CKO5BX 560	K			
68	CKO5BX 680	K, M			
82	CKO5BX 820	K			
100	CKO5BX 101	K, M			
120	CKO5BX 121	K			
150	CKO5BX 151	K, M			
180	CKO5BX 181	K			
220	CKO5BX 221	K, M			
270	CKO5BX 271	K			
330	CKO5BX 331	K, M			
390	CKO5BX 391	K			
470	CKO5BX 471	K, M			
560	CKO5BX 561	K			
680	CKO5BX 681	K, M			
820	CKO5BX 821	K			
1000	CKO5BX 102	K, M			
1200	CKO5BX 122	K			
1500	CKO5BX 152	K, M			
1800	CKO5BX 182	K			
2200	CKO5BX 222	K, M			
2700	CKO5BX 272	K			
3300	CKO5BX 332	K, M			
3900	CKO5BX 392	K			
4700	CKO5BX 472	K, M			
5600	CKO5BX 562	K			
6800	CKO5BX 682	K, M			
8200	CKO5BX 822	K			
.01 uf	CKO5BX 103	K, M			
.012 uf	CKO5BX 123	K			
.015 uf	CKO5BX 153	K, M			
.018 uf	CKO5BX 183	K			
.022 uf	CKO5BX 223	K, M			
.027 uf	CKO5BX 273	K			
.033 uf	CKO5BX 333	K, M			
.039 uf	CKO5BX 393	K			
.047 uf	CKO5BX 473	K, M			
.056 uf	CKO5BX 563	K			
.068 uf	CKO5BX 683	K, M			
.082 uf	CKO5BX 823	K			
.10 uf	CKO5BX 104	K, M			



MIL TYPE	CKO6
H ±.010	.290
W ±.010	.290
T ±.010	.090

Capacitance in pf	MIL DESIGNATION	Tolerance K±10% M±20%	50V	100V	200V
.0012	CKO6BX 122	K			
.0015	CKO6BX 152	K, M			
.0018	CKO6BX 182	K			
.0022	CKO6BX 222	K, M			
.0027	CKO6BX 272	K			
.0033	CKO6BX 332	K, M			
.0039	CKO6BX 392	K			
.0047	CKO6BX 472	K, M			
.0056	CKO6BX 562	K			
.0068	CKO6BX 682	K, M			
.0082	CKO6BX 822	K			
.01 uf	CKO6BX 103	K, M			
.012 uf	CKO6BX 123	K			
.015 uf	CKO6BX 153	K, M			
.018 uf	CKO6BX 183	K			
.022 uf	CKO6BX 223	K, M			
.027 uf	CKO6BX 273	K			
.033 uf	CKO6BX 333	K, M			
.039 uf	CKO6BX 393	K			
.047 uf	CKO6BX 473	K, M			
.056 uf	CKO6BX 563	K			
.068 uf	CKO6BX 683	K, M			
.082 uf	CKO6BX 823	K			
.1 uf	CKO6BX 104	K, M			
.12 uf	CKO6BX 124	K			
.15 uf	CKO6BX 154	K, M			
.18 uf	CKO6BX 184	K			
.22 uf	CKO6BX 224	K, M			
.27 uf	CKO6BX 274	K			
.33 uf	CKO6BX 334	K, M			
.39 uf	CKO6BX 394	K			
.47 uf	CKO6BX 474	K, M			
.56 uf	CKO6BX 564	K			
.68 uf	CKO6BX 684	K, M			
.82 uf	CKO6BX 824	K			
1.0 uf	CKO6BX 105	K, M			

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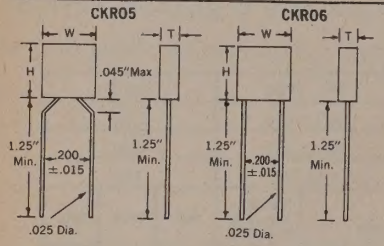
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-39014/A MIL. SPEC. Capacitors

The parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-39014/A. Order by applicable Mil part number listed below.



Dimensions and Availability

MIL TYPE	CKR05	CKR06
H ±.010	.190	.290
W ±.010	.190	.290
T ±.010	.090	.090

Capacitance pf	MIL Designation	Tolerance	WVDC 200	WVDC 100	WVDC 200
10	CKR05BX 100	K, M			
12	CKR05BX 120	K			
15	CKR05BX 150	K, M			
18	CKR05BX 180	K			
22	CKR05BX 220	K, M			
27	CKR05BX 270	K			
33	CKR05BX 330	K, M			
39	CKR05BX 390	K			
47	CKR05BX 470	K, M			
56	CKR05BX 560	K			
68	CKR05BX 680	K, M			
82	CKR05BX 820	K			
100	CKR05BX 101	K, M			
120	CKR05BX 121	K			
150	CKR05BX 151	K, M			
180	CKR05BX 181	K			
220	CKR05BX 221	K, M			
270	CKR05BX 271	K			
330	CKR05BX 331	K, M			
390	CKR05BX 391	K			
470	CKR05BX 471	K, M			
560	CKR05BX 561	K			
680	CKR05BX 681	K, M			
820	CKR05BX 821	K			
1000	CKR05BX 102	K, M			
1200	CKR06BX 122	K			
1500	CKR06BX 152	K, M			
1800	CKR06BX 182	K			
2000	CKR06BX 202	K			
2200	CKR06BX 222	K, M			
2700	CKR06BX 272	K			
3300	CKR06BX 332	K, M			
3900	CKR06BX 392	K			
4700	CKR06BX 472	K, M			
5600	CKR06BX 562	K			
6800	CKR06BX 682	K, M			
8200	CKR06BX 822	K			
.01 uf	CKR06BX 103	K, M			
.015 uf	CKR06BX 153	K			
.018 uf	CKR06BX 183	K			
.022 uf	CKR06BX 223	K			
.033 uf	CKR06BX 333	K			
.039 uf	CKR06BX 393	K			
.047 uf	CKR06BX 473	K			
.056 uf	CKR06BX 563	K			
.068 uf	CKR06BX 683	K			
.072 uf	CKR06BX 723	K			
.082 uf	CKR06BX 823	K			
.10 uf	CKR06BX 104	K			

NOTE: To complete the MIL Part Number, add the correct symbols for desired tolerance and for desired failure rate level per the following chart:

Failure Rate Level	
Symbol	%/1000 hr.
M	1.0
P	0.1
R	0.01
S	0.001

See YELLOW SECTION for Local Offices, Phones

SOUTHERN ELECTRONICS CORPORATION
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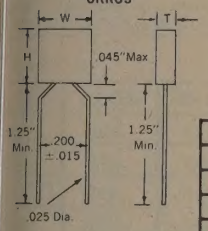
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-39014/B MIL. SPEC. Capacitors

The parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-39014/B. Order by applicable Mil part number listed below.

Dimensions and Availability

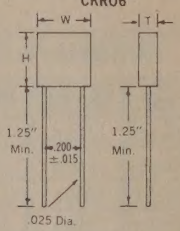
CKRO5



ML TYPE	CKRO5
H ±.010	.190
W ±.010	.190
T ±.010	.090

Capacitance in pf	MIL DESIGNATION	Tolerance K±10% M±20%	50V	100V	200V
10	CKRO5BX 100	K, M			
12	CKRO5BX 120	K			
15	CKRO5BX 150	K, M			
18	CKRO5BX 180	K			
22	CKRO5BX 220	K, M			
27	CKRO5BX 270	K			
33	CKRO5BX 330	K, M			
39	CKRO5BX 390	K			
47	CKRO5BX 470	K, M			
56	CKRO5BX 560	K			
68	CKRO5BX 680	K, M			
82	CKRO5BX 820	K			
100	CKRO5BX 101	K, M			
120	CKRO5BX 121	K			
150	CKRO5BX 151	K, M			
180	CKRO5BX 181	K			
220	CKRO5BX 221	K, M			
270	CKRO5BX 271	K			
330	CKRO5BX 331	K, M			
390	CKRO5BX 391	K			
470	CKRO5BX 471	K, M			
560	CKRO5BX 561	K			
680	CKRO5BX 681	K, M			
820	CKRO5BX 821	K			
1000	CKRO5BX 102	K, M			
1200	CKRO5BX 122	K			
1500	CKRO5BX 152	K, M			
1800	CKRO5BX 182	K			
2200	CKRO5BX 222	K, M			
2700	CKRO5BX 272	K			
3300	CKRO5BX 332	K, M			
3900	CKRO5BX 392	K			
4700	CKRO5BX 472	K, M			
5600	CKRO5BX 562	K			
6800	CKRO5BX 682	K, M			
8200	CKRO5BX 822	K			
.01 uf	CKRO5BX 103	K, M			
.012 uf	CKRO5BX 123	K			
.015 uf	CKRO5BX 153	K, M			
.018 uf	CKRO5BX 183	K			
.022 uf	CKRO5BX 223	K, M			
.027 uf	CKRO5BX 273	K			
.033 uf	CKRO5BX 333	K, M			
.039 uf	CKRO5BX 393	K			
.047 uf	CKRO5BX 473	K, M			
.056 uf	CKRO5BX 563	K			
.068 uf	CKRO5BX 683	K, M			
.082 uf	CKRO5BX 823	K			
.10 uf	CKRO5BX 104	K, M			

CKRO6



ML TYPE	CKRO6
H ±.010	.290
W ±.010	.290
T ±.010	.090

Capacitance in pf	MIL DESIGNATION	Tolerance K±10% M±20%	50V	100V	200V
.0012	CKRO6BX 122	K			
.0015	CKRO6BX 152	K, M			
.0018	CKRO6BX 182	K			
.0022	CKRO6BX 222	K, M			
.0027	CKRO6BX 272	K			
.0033	CKRO6BX 332	K, M			
.0039	CKRO6BX 392	K			
.0047	CKRO6BX 472	K, M			
.0056	CKRO6BX 562	K			
.0068	CKRO6BX 682	K, M			
.0082	CKRO6BX 822	K			
.01 uf	CKRO6BX 103	K, M			
.012 uf	CKRO6BX 123	K			
.015 uf	CKRO6BX 153	K, M			
.018 uf	CKRO6BX 183	K			
.022 uf	CKRO6BX 223	K, M			
027 uf	CKRO6BX 273	K			
.033 uf	CKRO6BX 333	K, M			
.039 uf	CKRO6BX 393	K			
.047 uf	CKRO6BX 473	K, M			
.056 uf	CKRO6BX 563	K			
.068 uf	CKRO6BX 683	K, M			
.082 uf	CKRO6BX 823	K			
.1 uf	CKRO6BX 104	K, M			
.12 uf	CKRO6BX 124	K			
.15 uf	CKRO6BX 154	K, M			
.18 uf	CKRO6BX 184	K			
.22 uf	CKRO6BX 224	K, M			
.27 uf	CKRO6BX 274	K			
.33 uf	CKRO6BX 334	K, M			
.39 uf	CKRO6BX 394	K			
.47 uf	CKRO6BX 474	K, M			
.56 uf	CKRO6BX 564	K			
.68 uf	CKRO6BX 684	K, M			
.82 uf	CKRO6BX 824	K			
1.0 uf	CKRO6BX 105	K, M			

NOTE: To complete the MIL Part Number, add the correct symbols for desired tolerance and for desired failure rate level per the following chart:

Failure Rate Level	
Symbol	%/1000 hr.
L	2.0
M	1.0
P	0.1
R	0.01
S	0.001

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead NPO (COG) Capacitors

PART NUMBER CODE:

SEC 04 CN 101 K A (*)

- Style — SEC 04
- NPO Ceramic — CN
- Capacitance — 101
- Tolerance — K
- Voltage — A
- Optional Lead Material — (*)

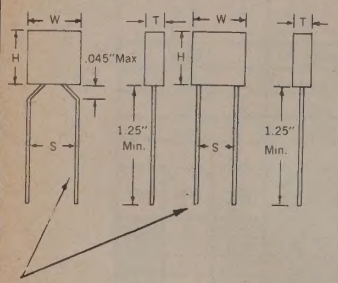
Specifications:

Temperature range: −55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25%	below 10 pf: 1R2 = 1.2p
D = ± .5%	"R" signifies decimal point.
F = ± 1%	10 pf and above
G = ± 2%	101 = 100 pf
J = ± 5%	1st two digits ar significant factors
K = ± 10%	3rd digit signifie number of zeroes
M = ± 20%	
Note: Minimum Tolerance ±.5 pf	

TYPE SEC 05



.025 Dia (Tinned Copperweld)
Optional: D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

Dimensions and Availability

STYLE	SEC 04	SEC 05	SEC 06	SEC 07	SEC 08	SEC 09	SEC 10	SEC 11
H ±.010	.145	.190	.290	.290	.395	.395	.495	.495
W ±.010	.145	.190	.290	.290	.395	.395	.495	.495
T ±.010	.095	.090	.090	.145	.095	.145	.095	.145
S ±.015	.100	.200	.200	.200	.300	.300	.400	.400

Capacity pf	SEC 04 WVDC Z 25	A 50	B 100	C 200	SEC 05 WVDC Z 25	A 50	B 100	C 200	SEC 06 WVDC Z 25	A 50	B 100	C 200	SEC 07 WVDC Z 25	A 50	B 100	C 200	SEC 08 WVDC Z 25	A 50	B 100	C 200	SEC 09 WVDC Z 25	A 50	B 100	C 200	SEC 10 WVDC Z 25	A 50	B 100	C 200	SEC 11 WVDC Z 25	A 50	B 100	C 200
1.0 to 47																																
56																																
68																																
82																																
100																																
120																																
150																																
180																																
220																																
270																																
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390																																
470																																
560																																
680																																
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8200																																
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.015 uf																																
.018 uf																																
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.033 uf																																
.039 uf																																
.047 uf																																
.056 uf																																
.068 uf																																
.082 uf																																
.10 uf																																

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Radial Lead K1200 (W5P) Capacitors

PART NUMBER CODE:

SEC 04 BX 103 K A (*)

- SEC 04 — Style
- BX — 0 Ceramic
- 103 — Capacitance
- K — Tolerance
- A — Voltage
- (*) — Optional Lead Material

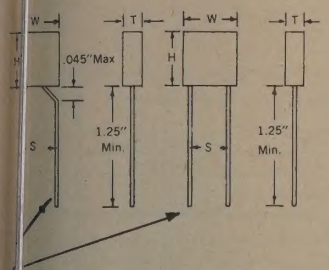
Specifications:

Temperature range: —55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever ever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

SEC 05



.6 Dia (Tinned Copperweld)
Optional: D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

Dimensions and Availability

STYLE	SEC 04	SEC 05	SEC 06	SEC 07	SEC 08	SEC 09	SEC 10	SEC 11
H ±.010	.145	.190	.290	.290	.395	.395	.495	.495
W ±.010	.145	.190	.290	.290	.395	.395	.495	.495
T ±.010	.095	.090	.090	.145	.095	.145	.095	.145
S ±.015	.100	.200	.200	.200	.300	.300	.400	.400

Capacity uf	SEC 04	SEC 05	SEC 06	SEC 07	SEC 08	SEC 09	SEC 10	SEC 11
	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200	W V D C Z A B C 25 50 100 200
1.0 to 3900pf								
4700pf								
5600pf								
6800pf								
8200pf								
.010								
.012								
.015								
.018								
.022								
.027								
.033								
.039								
.047								
.056								
.068								
.082								
.10								
.12								
.15								
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.27								
.33								
.39								
.47								
.56								
.68								
.82								
1.0								
1.2								
1.5								
1.8								
2.2								
2.7								
3.3								
3.9								
4.7								
5.6								
6.8								

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

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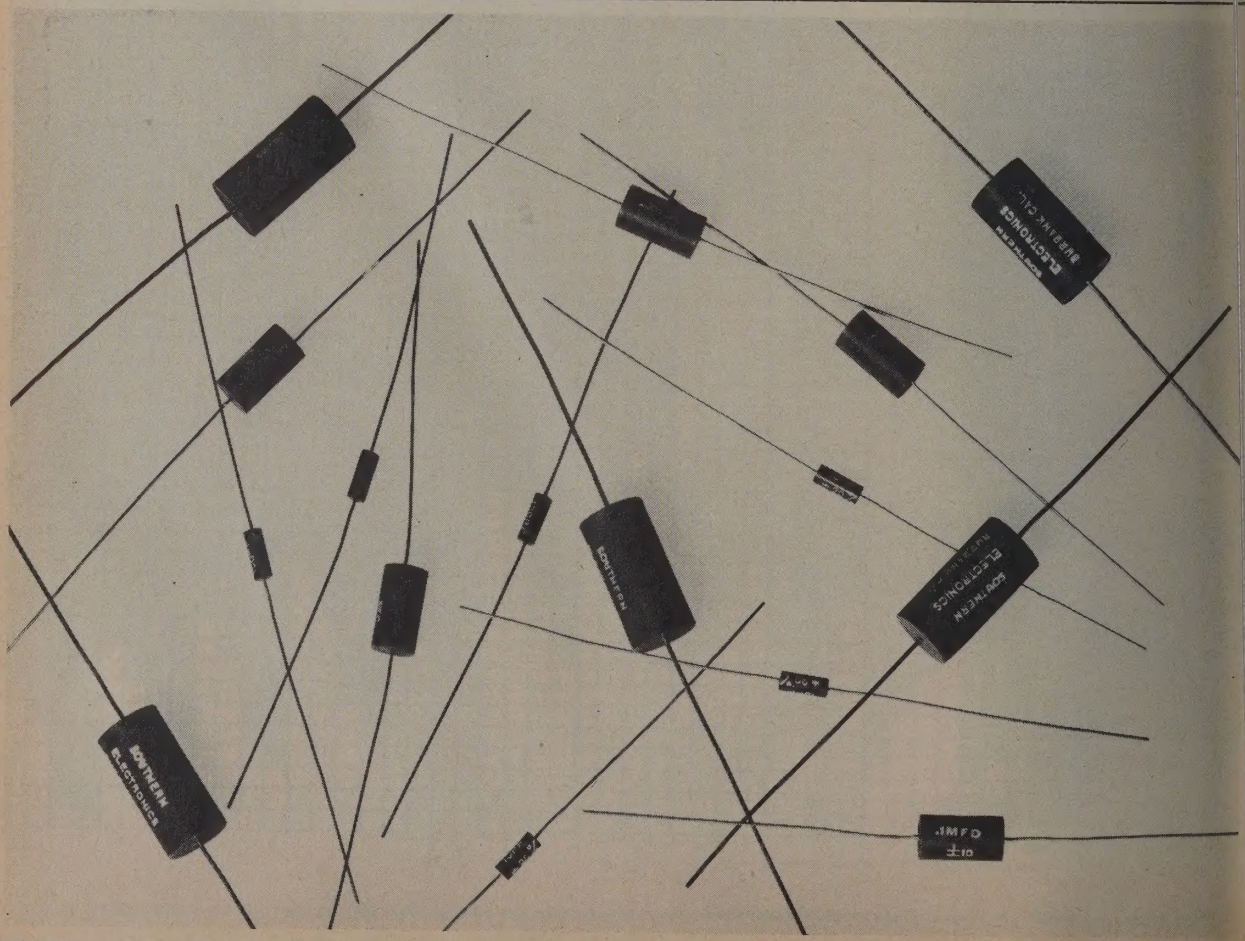
TWX 910-498-2207

Axial Lead Capacitors

SEC axial lead capacitors utilize the basic SEC chip as the capacitive element. Headed leads ar soldered directly to the chip with high-temperature solder. The subassembly is meticulousl cleaned and encapsulated in epoxy. Transfer molding is standard for the smaller sizes listec while the larger units are encapsulated in precision molded epoxy shells by potting. Potting an molding compounds are carefully selected for optimization of moisture and environmental pro tection properties. The following tables of standard SEC axial leaded capacitors are complement ed by a broad spectrum of custom units designed to meet specific applications. Other voltages lead materials and sizes are available on request.

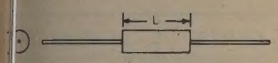


SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-11015 MIL. SPEC. Capacitors

e parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-11015. Order by applicable Mil part number listed below.

Dimensions and Availability



MIL Type	CK12	CK13	CK14	CK15	CK16
L	.160 ±.010	.250 ±.010	.390 ±.010	.500 ±.020	.690 ±.030
D	.090 ±.010	.090 ±.010	.140 ±.010	.250 ±.015	.350 ±.020

acitance in pf	MIL Designation	Tolerance	WVDC 50	WVDC 100
10	CK12BX 100	K, M		
12	CK12BX 120	K		
15	CK12BX 150	K, M		
18	CK12BX 180	K		
22	CK12BX 220	K, M		
27	CK12BX 270	K		
33	CK12BX 330	K, M		
39	CK12BX 390	K		
47	CK12BX 470	K, M		
56	CK12BX 560	K		
68	CK12BX 680	K, M		
82	CK12BX 820	K		
100	CK12BX 101	K, M		
120	CK12BX 121	K		
150	CK12BX 151	K, M		
180	CK12BX 181	K		
220	CK12BX 221	K, M		
270	CK12BX 271	K		
330	CK12BX 331	K, M		
390	CK12BX 391	K		
470	CK12BX 471	K, M		
560	CK12BX 561	K		
680	CK12BX 681	K, M		
820	CK12BX 821	K		
1000	CK12BX 102	K, M		
1200	CK12BX 122	K		
1500	CK12BX 152	K, M		
1800	CK12BX 182	K		
2200	CK12BX 222	K, M		
2700	CK12BX 272	K		
3300	CK12BX 332	K, M		
3900	CK12BX 392	K		
4700	CK12BX 472	K, M		
5600	CK12BX 562	K		
6800	CK12BX 682	K, M		
8200	CK12BX 822	K		
10,000	CK12BX 103	K, M		

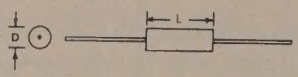
Capacitance in uf	MIL Designation	Tolerance	WVDC 50	WVDC 100
5600 pf	CK13BX 562	K		
6800 pf	CK13BX 682	K, M		
8200 pf	CK13BX 822	K		
.01 uf	CK13BX 103	K, M		
.012	CK13BX 123	K		
.015	CK13BX 153	K, M		
.018	CK13BX 183	K		
.022	CK13BX 223	K, M		
.027	CK13BR 273	K		
.033	CK13BR 333	K, M		
.039	CK13BR 393	K		
.047	CK13BR 473	K, M		
.012	CK14BX 123	K		
.015	CK14BX 153	K, M		
.018	CK14BX 183	K		
.022	CK14BX 223	K, M		
.027	CK14BX 273	K		
.033	CK14BX 333	K, M		
.039	CK14BX 393	K		
.047	CK14BX 473	K, M		
.056	CK14BR 563	K		
.068	CK14BR 683	K, M		
.082	CK14BR 823	K		
.10	CK14BR 104	K, M		
.12	CK14BR 124	K		
.15	CK14BR 154	K, M		
.18	CK14BR 184	K		
.22	CK14BR 224	K, M		
.27	CK14BR 274	K		
.10	CK15BX 104	K, M		
.12	CK15BR 124	K		
.15	CK15BR 154	K, M		
.18	CK15BR 184	K		
.22	CK15BR 224	K, M		
.27	CK15BR 274	K		
.33	CK15BR 334	K, M		
.47	CK15BR 474	K, M		
1.0	CK15BR 105	K, M		
.47	CK16BR 474	K, M		
1.0	CK16BR 105	K, M		
2.2	CK16BR 225	K, M		
3.3	CK16BR 335	K, M		

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-39014/A MIL. SPEC. Capacitors

The parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-39014/A. Order by applicable Mil part number listed below.

Dimensions and Availability



MIL Type	CKR12	CKR13	CKR19
L	.250 $^{+.020}_{-.010}$	.490 ±.010	.400 ±.010
D	.090 ±.010	.190 ±.010	.150 ±.010

Capacitance pf	MIL Designation	Tolerance	WVDC 100	MIL Designation	Tolerance	WVDC 100	MIL Designation	Tolerance	WVDC 100
10	CKR12BX 100	K, M							
22	CKR12BX 220	K, M							
33	CKR12BX 330	K, M							
47	CKR12BX 470	K, M							
56	CKR12BX 560	K							
68	CKR12BX 680	K, M							
82	CKR12BX 820	K, M							
100	CKR12BX 101	K, M							
150	CKR12BX 151	K, M							
180	CKR12BX 181	K							
220	CKR12BX 221	K, M							
330	CKR12BX 331	K, M							
390	CKR12BX 391	K							
470	CKR12BX 471	K, M							
560	CKR12BX 561	K							
680	CKR12BX 681	K, M							
720	CKR12BX 721	K							
820	CKR12BX 821	K, M							
1000	CKR12BX 102	K, M							
1200	CKR12BX 122	K							
1500	CKR12BX 152	K, M							
1800	CKR12BX 182	K							
2200	CKR12BX 222	K, M							
3300	CKR12BX 332	K, M							
4700	CKR12BX 472	K, M							
6800	CKR12BX 682	K, M							
.01 uf	CKR12BX 103	K, M							
.012 uf									
.015 uf							CKR19BX 123	K, M	
.018 uf				CKR13BX 153	K, M		CKR19BX 153	K, M	
.022 uf							CKR19BX 183	K, M	
.027 uf				CKR13BX 223	K, M		CKR19BX 223	K, M	
.033 uf							CKR19BX 273	K, M	
.039 uf				CKR13BX 333	K, M		CKR19BX 333	K, M	
.047 uf							CKR19BX 393	K, M	
.056 uf				CKR13BX 473	K, M		CKR19BX 473	K, M	
.068 uf							CKR19BX 563	K, M	
.082 uf				CKR13BX 683	K, M		CKR19BX 683	K, M	
.1 uf				CKR13BX 823	K, M		CKR19BX 823	K, M	
				CKR13BX 104	K, M		CKR19BX 104	K, M	

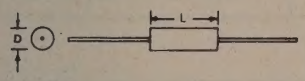
NOTE: To complete the MIL Part Number, add the correct symbols for desired tolerance and for desired failure rate level per the following chart:

Failure Rate Level	
Symbol	%/1000 hr.
M	1.0
P	0.1
R	0.01
S	0.001

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

MIL-C-39014/B MIL. SPEC. Capacitors

The parts described on this page are designed, manufactured and tested to meet the requirements of Mil-C-39014/B. Order by applicable Mil part number listed below.



MIL Type	CKR11	CKR12	CKR14	CKR15	CKR16
L	.160 ±.010	.250 ±.010	.400 ±.010	.500 ±.020	.690 ±.030
D	.090 ±.010	.090 ±.010	.150 ±.010	.250 ±.015	.350 ±.020

Capacitance in pf	MIL Designation	Tolerance	WVDC 50	WVDC 100
10	CKR11BX 100	K, M		
12	CKR11BX 120	K		
15	CKR11BX 150	K, M		
18	CKR11BX 180	K		
22	CKR11BX 220	K, M		
27	CKR11BX 270	K		
33	CKR11BX 330	K, M		
39	CKR11BX 390	K		
47	CKR11BX 470	K, M		
56	CKR11BX 560	K		
68	CKR11BX 680	K, M		
82	CKR11BX 820	K		
100	CKR11BX 101	K, M		
120	CKR11BX 121	K		
150	CKR11BX 151	K, M		
180	CKR11BX 181	K		
220	CKR11BX 221	K, M		
270	CKR11BX 271	K		
330	CKR11BX 331	K, M		
390	CKR11BX 391	K		
470	CKR11BX 471	K, M		
560	CKR11BX 561	K		
680	CKR11BX 681	K, M		
820	CKR11BX 821	K		
1000	CKR11BX 102	K, M		
1200	CKR11BX 122	K		
1500	CKR11BX 152	K, M		
1800	CKR11BX 182	K		
2200	CKR11BX 222	K, M		
2700	CKR11BX 272	K		
3300	CKR11BX 332	K, M		
3900	CKR11BX 392	K		
4700	CKR11BX 472	K, M		
5600	CKR11BX 562	K		
6800	CKR11BX 682	K, M		
8200	CKR11BX 822	K		
10,000	CKR11BX 103	K, M		
5600	CKR12BX 562	K		
6800	CKR12BX 682	K, M		
8200	CKR12BX 822	K		
.01 uf	CKR12BX 103	K, M		
.012uf	CKR12BX 123	K		
.015uf	CKR12BX 153	K, M		
.018uf	CKR12BX 183	K		
.022uf	CKR12BX 223	K, M		
.027uf	CKR12BX 273	K		
.033uf	CKR12BX 333	K, M		
.039uf	CKR12BX 393	K		
.047uf	CKR12BX 473	K, M		

Capacitance in uf	MIL Designation	Tolerance	WVDC 50	WVDC 100
.012	CKR14BX 123	K		
.015	CKR14BX 153	K, M		
.018	CKR14BX 183	K		
.022	CKR14BX 223	K, M		
.027	CKR14BX 273	K		
.033	CKR14BX 333	K, M		
.039	CKR14BX 393	K		
.047	CKR14BX 473	K, M		
.056	CKR14BX 563	K		
.068	CKR14BX 683	K, M		
.082	CKR14BX 823	K		
.10	CKR14BX 104	K, M		
.056	CKR14BR 563	K		
.068	CKR14BR 683	K, M		
.082	CKR14BR 823	K		
.10	CKR14BR 104	K, M		
.12	CKR14BR 124	K		
.15	CKR14BR 154	K, M		
.18	CKR14BR 184	K		
.22	CKR14BR 224	K, M		
.27	CKR14BR 274	K		
.056	CKR15BX 563	K		
.068	CKR15BX 683	K, M		
.082	CKR15BX 823	K		
.10	CKR15BX 104	K, M		
.12	CKR15BR 124	K		
.15	CKR15BR 154	K, M		
.18	CKR15BR 184	K		
.22	CKR15BR 224	K, M		
.27	CKR15BR 274	K		
.33	CKR15BR 334	K, M		
.47	CKR15BR 474	K, M		
.68	CKR15BR 684	K, M		
1.0	CKR15BR 105	K, M		
.47	CKR16BR 474	K, M		
.68	CKR16BR 684	K, M		
1.0	CKR16BR 105	K, M		
2.2	CKR16BR 225	K, M		
3.3	CKR16BR 335	K, M		

NOTE: To complete the MIL Part Number, add the correct symbols for desired tolerance and for desired failure rate level per the following chart:

Failure Rate Level	
Symbol	%/1000 hr.
L	2.0
M	1.0
P	0.1
R	0.01
S	0.001

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Axial Lead Tubular NPO (COG) Capacitors

PART NUMBER CODE:

SEC 50 CN 101 K A (*)

- Style
- NPO Ceramic
- Capacitance
- Tolerance
- Voltage
- Optional Lead Material

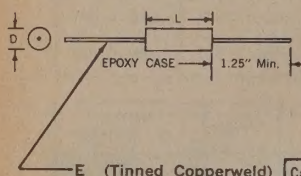
Specifications:

Temperature range: —55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25% D = ± .5% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability



Optional: E (Tinned Copperweld)
D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

STYLE	SEC 50				SEC 51				SEC 52				SEC 53				SEC 54			
L	.160 ±010				.185 ±010				.250 ±010				.390 ±010				.490 ±010			
D	.09 ±010				.09 ±010				.09 ±010				.140 ±010				.190 ±010			
E	#26 AWG				#26 AWG				#26 AWG				#22 AWG				#22 AWG			
Capacitance pf	WVDC				WVDC				WVDC				WVDC				WVDC			
	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200
1.0 to 100	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
120	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
150	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
180	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
220	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
270	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
330	■	■			■	■	■		■	■	■	■	■	■	■	■	■	■	■	■
390	■	■			■	■	■		■	■	■	■	■	■	■	■	■	■	■	■
470	■				■	■			■	■	■	■	■	■	■	■	■	■	■	■
560	■				■	■			■	■	■		■	■	■	■	■	■	■	■
680					■				■	■	■		■	■	■	■	■	■	■	■
820					■				■	■			■	■	■	■	■	■	■	■
1000									■	■			■	■	■	■	■	■	■	■
1200									■				■	■	■	■	■	■	■	■
1500									■				■	■	■	■	■	■	■	■
1800													■	■	■	■	■	■	■	■
2200													■	■	■	■	■	■	■	■
2700													■	■	■	■	■	■	■	■
3300													■	■	■	■	■	■	■	■
3900													■	■	■		■	■	■	■
4700													■	■	■		■	■	■	■
5600													■	■			■	■	■	■
6800													■	■			■	■	■	■
8200													■				■	■	■	■
.01 uf													■				■	■	■	
.012 uf																	■	■	■	
.015 uf																	■	■		
.018 uf																	■			
.022 uf																				
.027 uf																				

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Axial Lead Tubular NPO (COG) Capacitors

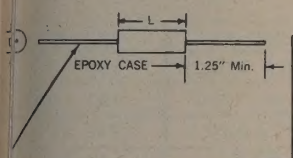
PART NUMBER CODE:
C 50 CN 101 K A (•)
yle
O Ceramic
pacitance
lerance
ltage
tional Lead Material

Specifications:
Temperature range: —55°C to +150°C
Test frequency: 100 pf and less —1 MHz, over 100 pf —1 KHz
Temperature coefficient: 0±30 ppm/°C (EIA char. COG)
Dissipation factor: 0.15% max
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
C = ±.25% D = ± .5% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability



E (Tinned Copperweld)
onal: D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

STYLE	SEC 55				SEC 56				SEC 57				SEC 58				SEC 59			
L	.500 ±.020				.690 ±.030				.690 ±.030				.690 ±.030				.690 ±.030			
D	.250 ±.015				.300 ±.020				.350 ±.020				.400 ±.020				.500 ±.020			
E	#22 AWG				#22 AWG				#22 AWG				#22 AWG				#22 AWG			
Capacitance pf	WVDC				WVDC				WVDC				WVDC				WVDC			
	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200
1.0 to 1800																				
2200																				
2700																				
3300																				
3900																				
4700																				
5600																				
6800																				
8200																				
.010 uf																				
.012 uf																				
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.018 uf																				
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.056 uf																				
.068 uf																				
.082 uf																				
.10 uf																				
.12 uf																				
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.22 uf																				
.27 uf																				
.33 uf																				
.39 uf																				

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Axial Lead Tubular K1200 (W5P) Capacitors

PART NUMBER CODE:

SEC 50 BX 101 K A (*)

- Style
- K1200 Ceramic
- Capacitance
- Tolerance
- Voltage
- Optional Lead Material

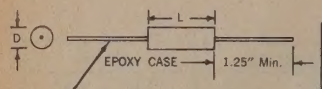
Specifications:

Temperature range: —55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability



Optional: E (Tinned Copperweld)
D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

STYLE	SEC 50				SEC 51				SEC 52				SEC 53				SEC 54			
L	.160 ±010				.185 ±010				.250 ±010				.390 ±010				.490 ±010			
D	.09 ±010				.09 ±010				.09 ±010				.140 ±010				.190 ±010			
E	#26 AWG				#26 AWG				#26 AWG				#22 AWG				#22 AWG			
Capacitance uf	WVDC				WVDC				WVDC				WVDC				WVDC			
	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200	Z 25	A 50	B 100	C 200
1 to 6800pf																				
8200 pf																				
.010																				
.012																				
.015																				
.018																				
.022																				
.027																				
.033																				
.039																				
.047																				
.056																				
.068																				
.082																				
.10																				
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.27																				
.33																				
.39																				
.47																				
.56																				
.68																				
.82																				
1.0																				
1.2																				
1.5																				
1.8																				

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVE., BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Axial Lead Tubular K1200 (W5P) Capacitors

PART NUMBER CODE:

SEC 50 BX 101 K A (*)

- Style
- K1200 Ceramic
- Capacitance
- Tolerance
- Voltage
- Optional Lead Material

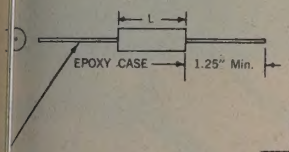
Specifications:

Temperature range: —55°C to +125°C
Temperature characteristics: W5P (±10%)
Dissipation factor: 1.5% max. @ 1 KHz, 25°C
Insulation resistance: 100 K megohms or 1000 ohm-farads, whichever is less, @ 25°C
Test Voltage: 2.5 x rated WVDC (min.)

CAPACITANCE CODE

TOLERANCE CODE	CAPACITANCE CODE EXAMPLE
J = ± 5% K = ± 10% M = ± 20% Note: Minimum Tolerance ±.5 pf	below 10 pf: 1R2 = 1.2pf "R" signifies decimal point. 10 pf and above: 101 = 100 pf 1st two digits are significant factors & 3rd digit signifies number of zeroes.

Dimensions and Availability



Optional: E (Tinned Copperweld)
D = Gold Plated Dumet
N = Gold Plated Nickel
T = Tinned Nickel

STYLE	SEC 55				SEC 56				SEC 57				SEC 58				SEC 59			
L	.500 ±.020				.690 ±.030				.690 ±.030				.690 ±.030				.690 ±.030			
D	.250 ±.015				.300 ±.020				.350 ±.020				.400 ±.020				.500 ±.020			
E	#22 AWG				#22 AWG				#22 AWG				#22 AWG				#22 AWG			
Capacitance uf	WVDC				WVDC				WVDC				WVDC				WVDC			
	Z	A	B	C	Z	A	B	C	Z	A	B	C	Z	A	B	C	Z	A	B	C
	25	50	100	200	25	50	100	200	25	50	100	200	25	50	100	200	25	50	100	200
1.0pf to .082																				
.10																				
.12																				
.15																				
.18																				
.22																				
.27																				
.33																				
.39																				
.47																				
.56																				
.68																				
.82																				
1.0																				
1.2																				
1.5																				
1.8																				
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3.3																				
3.9																				
4.7																				
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6.8																				
8.2																				
10.0																				
12.0																				
15.0																				
18.0																				
22.0																				

NOTE: Case sizes shown are at recommended voltage and temperature stress levels. For smaller case sizes at higher stress levels, contact factory.

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- Bench-top Style 901

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- Capacitor Analyzers 901

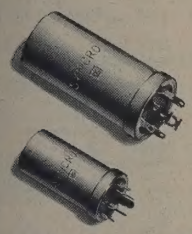
Complete technical details on any of the products listed above are available upon request to the Technical Literature Department, Sprague Products Co., 481 Marshall Street, North Adams, Mass. 01247.

6S-0102

SPRAGUE®

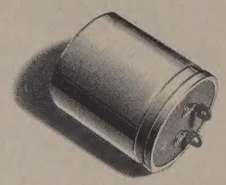
THE MARK OF RELIABILITY

Representative types of SYNCRO electrolytic capacitors



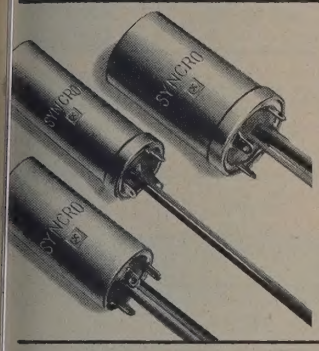
type ME

Metal Cased Twist Prong
Type ME is a metal cased electrolytic with an operating temperature range of —20° C. to +85° C. It is of all welded construction and features twist type mounting and solder lug terminals. It can be furnished with printed circuit terminals and also keller wire-wrap terminals.
Case diameter: 1″ and 1⅜″.
Length: up to 5⅜″.



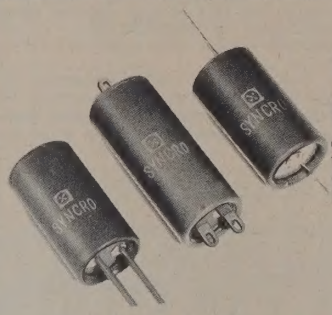
type EMF

Solder Terminals—Riveted
Type EMF is a metal cased electrolytic with an operating temperature range of —20° C. to +85° C.



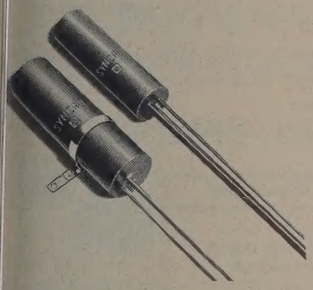
type MEL

Wax-Sealed Metal
Type MEL is a metal cased, wax-end sealed unit with flexible plastic insulated leads. The metal case shield with twist mounting is isolated.
Case diameter: 1″, 1³⁄₁₆″, 1⅜″.
Length: up to 5⅜″.



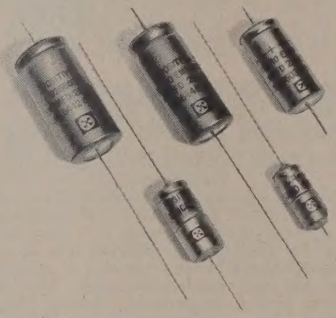
type EM

Riveted Terminals—Sleeve
Type EM is a metal cased electrolytic with an operating temperature range of —20° C. to +85° C. Riveted, bare leads are standard.



type EP

Wax-Impregnated Cardboard
Type EP is a wax-impregnated cardboard tube electrolytic with an operating temperature range of —20° C. to +75° C. Optional in single, dual, triple, quadruple and quintuple sections.

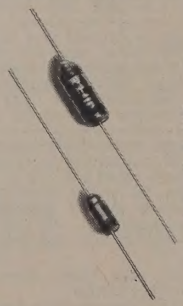


type EMW

Welded Leads
Type EMW is an all-welded metal cased tubular electrolytic with an operating temperature range of —40° C. to +85° C. Excellent for transistorized applications.
Case diameter: ⁵⁄₁₆″, ⅜″, ½″, ⅝″, ¾″, ⅞″, 1″, 1⅜″.
Length: From ⅝″ to 4⅛″.

type EMC

Computer Type
Type EMC is a metal cased electrolytic with an operating temperature range of —20° C. to +85° C. It is of all-welded construction with a molded top and screw insert terminals.
Case diameter: 1⅜″, 1¾″, 2″, 2½″, 3″.
Length: up to 5⅝″.



type EMMW

Sub-Miniature of EMW
Type EMMW is a metal cased sub-miniature electrolytic with an operating temperature range of —40° C. to +85° C. Similar in design to EMW, the EMMW is available in ³⁄₁₆″ and ¼″ diameter.

SYNCRO Capacitor Corporation

electronic division • hicksville, ohio 43526
telephone 419/542-2711 • TWX 810-490-2550

1081

Subsidiary of Syncro Corporation, Oxford, Michigan

TEX-CAP® SERIES TWENTY MYLAR* AND FOIL

GENERAL SPECIFICATIONS

Temperature Range — −55°C to +85°C at rated voltage; to 125°C with 50% derating.

Insulation Resistance — Will equal or exceed 50,000 megohm-microfarads at 25°C, but the IR need not exceed 150,000 megohms.

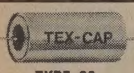
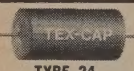
Dielectric Strength — Will withstand the application of 150% rated voltage at 25°C for 60 seconds through a limiting resistance of 100 ohms/volt.

Dissipation Factor — Will not exceed 1.0% at 1000 ±20 cps at 25°C.

Life Test — Will withstand 125% of rated voltage at 85°C for 2[illegible] hours.

Winding Design — Non-inductive, extended foil.

Capacitance Tolerance — Standard tolerance, ±5%; also availa[illegible] in ±10%, ±3%, ±2% and ±1%.

		Capacitance Range	Voltage Range	Size
 TYPE 23 Round Hermetically Sealed Metal Case	Type 23 is designed for applications where the most stringent environmental conditions will be encountered. The Mylar*-and-foil winding is housed in a hermetically sealed metal case with glass end seals. The extremely high insulation resistance inherent in Mylar provides maximum voltage/capacitance ratings with minimum capacitor size.	.001 MFD thru 2.0 MFD	200 VDC, 400 VDC and 600 VDC	.193 D. x 3/16" thru 1.375 D. x 2⅝"
 TYPE 24 Round Mylar* Tape-Wrapped	Type 24 consists of a Mylar*-and-foil winding wrapped with Mylar tape and end-filled with epoxy. This type encapsulation provides a reliable, smaller sized capacitor without reduction of voltage rating or insulation resistance. The Type 24 is an excellent economy capacitor designed for commercial use.	.001 MFD thru 2.0 MFD	200 VDC, 400 VDC and 600 VDC	.156 D. x ½" thru 1.400 D. x 1½"
TYPE 25 Round Epoxy-Encased	The Type 25 Mylar*-and-foil capacitor features a rugged skin-tight epoxy resin encasement. This design permits extremely small size combined with physical strength far exceeding metal and glass encasement.	.001 MFD thru 2.0 MFD	200 VDC, 400 VDC and 600 VDC	.175 D. x 11/16" [illegible] thru 1.400 D. x 1½"
TYPE 27PE Printed-End Molded Epoxy Case	Type 27PE is an instrument-quality capacitor consisting of a Mylar*-and-foil winding enclosed within a molded epoxy resin case with printed end. This design permits wide variations in altitude and ambient pressure with little or no change in capacitance. The molded case is perfectly round and free of mold marks.	.001 MFD thru 2.0 MFD	200 VDC, 400 VDC and 600 VDC	.250 D. x ¾" L thru 1.500 D. x 1½"

TEX-CAP® SERIES THIRTY METALIZED MYLAR*

GENERAL SPECIFICATIONS

Temperature Range — −55°C to +85°C at rated voltage; to 125°C with 50% derating.

Insulation Resistance — Will equal or exceed 15,000 megohm-microfarads at 25°C, but the IR need not exceed 60,000 megohms.

Dielectric Strength† — Will withstand the application of 150% rated voltage at 25°C for 60 seconds through a limiting resistance of 100 ohms/volt.

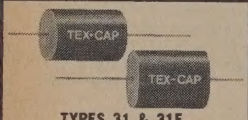
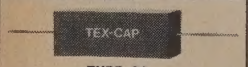
†Except Types 315 and 315F.

Dissipation Factor — Will not exceed 1.0% at 1000 ±20 cps and 25°C.

Life Test — Will withstand 125% of rated voltage at 85°C for 250 hours.

Winding Design — Non-inductive.

Capacitance Tolerance — Standard tolerance, ±5%; also available in ±10%, ±3% and ±2%.

		Capacitance Range	Voltage Range	Size
 TYPES 31 & 31F Epoxy-Encased (Round & Oval)	The subminiature Types 31 and 31F contain a winding of metalized Mylar* enclosed in a thin epoxy-dipped case. The thin covering, combined with the metalized-Mylar winding, provides a capacitor of smaller physical size with high moisture resistance, plus the "self-healing without carbonization" feature. This type of capacitor has excellent stability and life rating. Type 31 comes in a round case. Type 31F is oval-shaped.	.01 MFD thru 12.0 MFD	200 VDC, 400 VDC and 600 VDC	Type 31 .200 D. x 5/16" L. thru 1.250 D. x 2¼" Type 31F .225 W. x .125 T. x 3/16" thru 1.450 W. x .875 T. x 2¼"
TYPE 34 Round Mylar* Tape-Wrapped	Tex-Cap Type 34 consists of a metalized-Mylar winding wrapped with Mylar tape and end-filled with epoxy. This type of encapsulation provides a reliable smaller sized capacitor without reduction of voltage rating or insulation resistance. The Type 34 is an excellent economy capacitor designed for commercial use.	.01 MFD thru 12.0 MFD	200 VDC, 400 VDC and 600 VDC	.200 D. x 5/16" L. thru 1.250 D. x 2¼" L.
TYPES 35 & 35PE Molded Epoxy Case (Axial & Printed-End)	Tex-Cap Types 35 and 35PE metalized-Mylar* capacitors are enclosed in a molded epoxy-resin case. This molded case, perfectly round and free of mold marks, provides rigidity plus the ability to withstand wide variations in altitude and ambient pressures with little or no change in capacitance. The metalized-Mylar winding facilitates smaller size and self-healing without carbonization. Type 35 has axial leads, whereas Type 35PE is of printed-end construction.	.01 MFD thru 10.0 MFD	200 VDC, 400 VDC and 600 VDC	.250 D. x 5/16" L. thru 1.000 D. x 2¼" L.
 TYPE 36 Rectangular Epoxy-Encased	Tex-Cap Type 36 metalized-Mylar* film capacitors are enclosed in a premolded rectangular epoxy case. These units have a good capacity-versus-volume factor along with good dimensional uniformity. Voltage ratings for Type 36 are 50-100, 200, 400 and 600 vdc.	.01 MFD thru 8.0 MFD	50-100 VDC, 200 VDC, 400 VDC and 600 VDC	.29 W. x .17 T. x .57" L thru .72 W. x .56 T. x 1.92" L
TYPES 315 & 315F Epoxy-Encased (Round & Oval)	Tex-Cap Types 315 and 315F capacitors are designed especially for transistor and other low-voltage subminiature applications. The ultra-thin metalized-Mylar* winding, encased in a thin epoxy-dipped case, is rated at 50 or 100 vdc. The thermo-setting epoxy end-fill seals out moisture, assuring a long, dependable life. Type 315 is tubular-shaped. Oval-shaped Type 315F is available for maximum space economy.	.01 MFD thru 20.0 MFD	50 VDC and 100 VDC	Type 315 .150 D. x ½" L. thru 1.200 D. x 1¼" L. Type 315F .250 W. x .190 T. x ½" L thru 1.100 W. x .850 T. x 1¼"

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TEXAS CAPACITOR COMPANY, INC.
7830 Westglen Drive • Houston, Texas 77042 • 713-782-9232

TEX-CAP® SERIES FORTY TEFLON* AND FOIL

GENERAL SPECIFICATIONS

Insulation Resistance—Will equal or exceed 100,000 megohm-microfarads at +25°C, but the IR need not exceed 1,000,000 megohms.

Dissipation Factor—Will not exceed 0.1% at 1000 ±20 cps and 25°C.

Dielectric Strength—Will withstand the application of 200% rated voltage at +25°C for 60 seconds through a limiting resistance of 100 ohms/volt.

Voltage Range—200, 400 and 600 volts DC.

Capacitance Tolerance—Standard tolerance, ±5%; also available in ±10%, ±3%, ±2% and ±1%.

Winding Design—Non-inductive, extended foil.

Temperature Range—

Type 43 and Type 200GGS—−55°C at rated voltage without derating

Type 45—−55°C to +165°C at rated voltage; to 200°C with 33% derating.

		Capacitance Range	Voltage Range	Size
TYPE 43 Round Hermetically Sealed Metal Case	Type 43 is a Teflon*-and-foil capacitor housed in a hermetically sealed metal case with glass end seals. The use of Teflon dielectric permits excellent performance at temperatures up to 200°C without derating. This type is designed primarily for equipment where extra reliability is required in extreme temperatures. Leads are attached with solder that will not soften at temperatures well over 250°C.	.001 MFD thru 1.50 MFD	200 VDC, 400 VDC and 600 VDC	.235 D. x 7/8" L. thru 1.375 D. x 2" L.
TYPE 45 Round Hi-Temp Epoxy Case	The Type 45 Teflon*-and-foil capacitor is encased in molded heat-resistant epoxy resin. The use of Teflon dielectric permits excellent performance without derating at temperatures up to 165°C. Extended foil construction, with leads securely attached to each turn of foil, insures a non-inductive "straight through" path for alternating current.	.001 MFD thru .82 MFD	200 VDC, 400 VDC and 600 VDC	.250 D. x 3/4" L. thru 1.000 D. x 2" L.
TYPE 200GGS	The Tex-Cap Type-200GGS is a TFE-Fluorocarbon (Teflon) Dielectric Film Capacitor, housed in a nickel plated tubular non-ferrous metal case with compression glass end seals.	.001 MFD thru .68 MFD	200 VDC, 400 VDC and 600 VDC	.235 D. x 23/32" L. thru 1.00 D. x 2 5/16" L.

TEX-CAP® SERIES SEVENTY METALIZED POLYCARBONATE

GENERAL SPECIFICATIONS

Temperature Range—−55°C to +125°C with full rated voltage.

Insulation Resistance—Will equal or exceed 50,000 megohm-microfards at 25°C, but the IR need not exceed 250,000 megohms.

Dielectric Strength—Will withstand the application of 150% rated voltage at 25°C for 60 seconds through a limiting resistance of 100 ohms/volt.

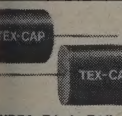
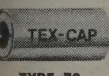
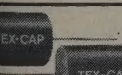
Winding Design—Non-inductive.

Dissipation Factor—Will not exceed 0.5%, or 1.0% for units greater than 10.0 mfd., at 1000 ±20 cps and 25°C.

Life Test—Will withstand 140% of rated voltage at 125°C for 250 hours.

Capacitance Tolerance—Standard tolerance, ±5%.

Vibration—Will meet or exceed the requirements of MIL-STD-202B, Method 204A.

		Capacitance Range	Voltage Range	Size
 TYPES 71 & 71F Epoxy Encased (Round & Oval)	Tex-Cap Types 71 and 71F metalized polycarbonate capacitors are enclosed in a thin, skin-tight epoxy-dipped case. They combine rugged design, low dielectric absorption, low dissipation factor, high insulation resistance and high dielectric strength, along with a higher stability than was available previously. Type 71 comes in a round case. Type 71F is oval-shaped.	.001 MFD thru 10.0 MFD	50 VDC, 100 VDC, 200 VDC, 400 VDC and 600 VDC	Type 71 .175 D. x 3/16" L. thru 1.400 D. x 2" L. Type 71F .22 W. x .12 T. x 3/16" L. thru 1.67 W. x 1.06 T. x 2" L.
 TYPE 73 Round Hermetically Sealed Metal Case	Type 73 is a metalized polycarbonate capacitor housed in a hermetically sealed metal tube with glass end seals. This provides the ultimate in moisture resistance characteristics for this type of dielectric. Type 73 is recommended in circuit applications where there is limited space and electrical characteristics must approach that of polystyrene or Teflon capacitors.	.001 MFD thru 10.0 MFD	50 VDC, 100 VDC, 200 VDC, 400 VDC and 600 VDC	.235 D. x 5/8" L. thru 1.000 D. x 2 1/16" L.
 TYPES 74 & 74F Mylar* Tape-Wrapped (Round & Oval)	Tex-Cap Types 74 and 74F metalized polycarbonate capacitors are encased in a jacket of high-temperature film with the ends epoxy-sealed. This provides moisture resistance exceeding most military specifications for non-hermetically sealed units. The size factor is decreased 35% over polycarbonate-and-foil units. Type 74 comes in a round case. Type 74F is oval-shaped.	.001 MFD thru 10.0 MFD	50 VDC, 100 VDC, 200 VDC, 400 VDC and 600 VDC	Type 74 .156 D. x 3/16" L. thru 1.380 D. x 2.0" L. Type 74F .21 W. x .10 T. x 3/16" L. thru 1.66 W. x 1.04 T. x 2" L.
TYPE 75 Round Molded Epoxy Case	Type 75 is a metalized polycarbonate capacitor encased in a pre-molded round epoxy case. This rugged encasement provides rigidity plus the ability to withstand wide variations in altitude and ambient pressure changes. Type 75, therefore, is well suited for airborne applications.	.001 MFD thru 10.0 MFD	50 VDC, 100 VDC, 200 VDC, 400 VDC and 600 VDC	.250 D. x 3/16" L. thru 1.000 D. x 2" L.
TYPE 76 Rectangular Molded Epoxy Case	Tex-Cap Type 76 is a metalized polycarbonate capacitor encased in a pre-molded rectangular epoxy case. This encasement provides maximum packaging density along with rugged construction which exceeds most military specifications and humidity requirements.	.01 MFD thru 5.0 MFD	50 VDC, 100 VDC, 200 VDC, 400 VDC and 600 VDC	.29 W. x .17 T. x .57" L. thru .72 W. x .56 T. x 1.92" L.

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TANSITOR ELECTRONICS specializes in tantalum capacitors, has a broad line of standard foil, wire or sintered anode units which meet most circuit or MIL-spec. requirements. If your volume warrants, we are happy to develop special units too.

We have a reputation for dependable deliveries and high reliability standards and have tripled our laboratory and production facilities to keep pace with customer demands.

FOR MIL-SPEC OR PROTOTYPE tantalum capacitors, our specialized knowledge and ample facilities should be helpful.

Type	Tansitor Part No.	Temp. Rating	Voltage Range	Capacitance Range, Mfds.		Size Range Inches
				Plain	Etched	
MIL-C-3965D Foil CL20, 21, 22, 23, 30, 31, 32, 33	TE 20, 21, 22, 23, 30, 31, 32, 33	−55 to +85°C +125°C derated	3 to 300	0.25 to 440	0.5 to 1,750	0.188 x 0.688 to 0.375 x 2.750
Foil	TH	−55 to +125°C	3 to 150	0.15 to 350	0.28 to 1,750	0.188 x 0.688 to 0.531 x 2.781
Foil Radial	TES	−55 to +85°C	3 to 150	1.0 to 90	1.8 to 14,000	0.312 x 0.650 to 0.625 x 2.438
Foil Axial	THH	−55 to +150°C	3 to 150	0.15 to 350	0.28 to 580	0.187 x 1.00 to 0.375 x 3.250
Foil Axial	HV	−55 to +125°C	200 to 300	0.13 to 35	None	0.187 x 0.750 to 0.531 x 2.875
MIL-C-3965D CL70, 71, 72, 73 High Etch	TE 70, 71, 72, 73	−55 to +85°C +125°C derated	15 to 150	.25 to 440	0.75 to 920	0.188 x 0.688 to 0.375 x 2.750
Custom Made	CM	−55 to +125°C	3 to 300	19 to 1,400	120 to 310,000	1.062 x 1.062 x 3.875 to 3.562 x 3.562 x 3.875
Foil, Rectangular	R	−55 to +125°C	10 to 100	13 to 460	6 to 3,500	1.312 x 0.75 x 1.375 to 1.312 x 0.75 x 2.50
MIL-C-3965D Foil CL51, 52, 53, 54	TE 51, 52, 53, 54	−55 to +85°C +125°C derated	10 to 150	13 to 460	6 to 3,500	1.312 x 0.75 x 1.375 to 1.312 x 0.75 x 2.50
Foil Axial	WF	−55 to +125°C	6 to 300	0.1 to 560		0.188 x 0.453 to 0.375 x 0.766
Solid (P)	S	−80 to +125°C	6 to 50	0.0047 to 330		0.125 x 0.250 to 0.341 x 0.75
Solid (NP)	S	−80 to +125°C	6 to 50	0.16 to 160		0.145 x 0.540 to 0.366 x 1.520
Solid (P & NP)	XS	−80 to +125°C	6 to 50	1.2 to 450		0.125 x 0.250 to 0.341 x 0.750
Solid	HA	−55 to +125°C	2 to 50	0.010 to 47		0.067 x 0.110 to 0.150 x 0.250
Solid	TC	−55 to +125°C	2 to 35	0.0047 to 1.5		0.125 x 0.070 x 0.040 to 0.375 x 0.150
Solid	Disc	−80 to +175°C	3 to 35	0.12 to 40		0.100 x 0.06 to 0.50 x 0.10
Wet	W	−55 to +125°C	6 to 125	1.7 to 1,200		0.188 x 0.453 to 0.375 x 1.250
MIL-C-3965D Wet, CL66, 67	TE 66, 67	−55 to +125°C	6 to 125	1.7 to 560		0.188 x 0.453 to 0.375 x 0.766
MIL-C-3965D Wet, CL64, 65	TE 64, 65	−55 to +125°C	6 to 125	1.7 to 560		0.188 x 0.453 to 0.375 x 0.766
Rect. Wet	RW	−55 to +125°C	6 to 150	130 to 22,000		0.720 x 1.306 to 1.062 x 3.75
MIL-C-3965D Rect. CL55	TE 55	−55 to +125°C	10 to 100	35 to 2,400		0.720 x 1.305 x 1.062 to 0.720 x 1.305 x 2.50
Rect. Wet	TE 59	−55 to +125°C	6 to 125	340 to 22,000		1.000 x 1.500 x 1.593 to 1.000 x 3.750 x 1.593

FOR TECHNICAL DATA . . .
and further information or prices
write to TANSITOR ELECTRONICS, INC.

TANSITOR

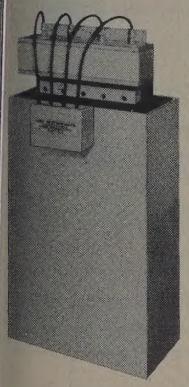
TANSITOR ELECTRONICS, INC.
WEST ROAD / BENNINGTON, VERMONT
TEL. 802-442-5473 • TWX 710-360-1782

HIGH-VOLTAGE FAST-DISCHARGE CAPACITORS

Developed in response to customers' inquiries, these capacitors meet exacting requirements in energy discharge applications.

PULSE LASER CAPACITOR
(Pat Pending)

Model ESC-302: 0.01μf, 20kv, 3 nanohenries; life: 10^8 shots at a repetition of 100 pps. Size: 4½″ dia x 3″ high.



LOW INDUCTANCE CAPACITOR & DISCHARGE SWITCH
(U.S. Patent 3 343 051)

Model ESC-248A: 3 kilojoule, 20kv, 5 nh, with Model SBG-5 discharge switch and trigger assembly. Size: 14″ x 7″ x 31″ high overall.

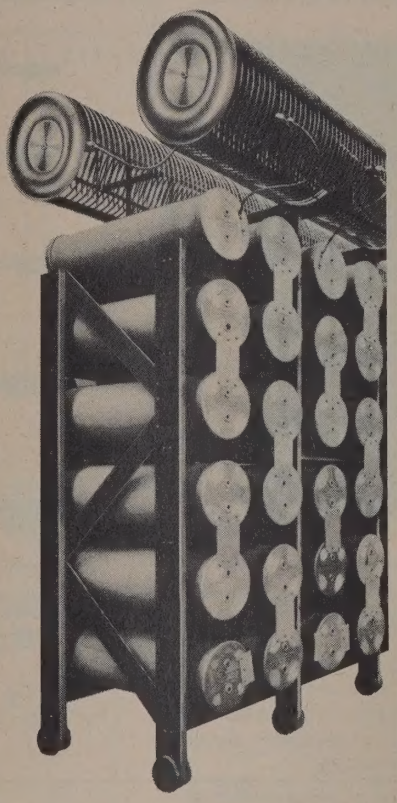
COAXIAL-DISC CAPACITOR
(U.S. Patent 3 346 790)

Model ESC-328A: 0.1μf, 20kv, 1 nh.

A new version of our patented coaxial-disc capacitor — it is expressly designed to facilitate assembly of low inductance capacitor stacks to operate at the megavolt levels required in EMP research. Photo shows 2 capacitors slightly offset. A single capacitor measures 11¼″ dia x 0.437″ thick. Units available to 50kv.

PULSE-FORMING NETWORKS

...from the smallest to the largest



Model PCE-1: Pulse-forming network installed at Griffis AFB. Peak charge voltage: 252kv; peak power: 180 megawatts; PRF: 180 pps; ripple: less than 1%.

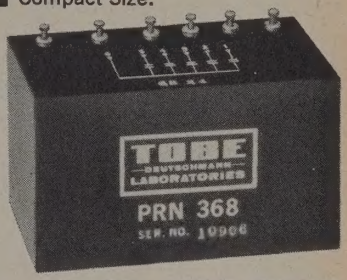
TOBE DEUTSCHMANN pulse-forming networks range from miniature units to high-power installations like the one shown above. This unit, designed and built to a rigid performance specification, is more than 8 feet high, 5 feet wide, and 22 feet long.

Whatever your requirements for PFN's, low-Z pulse lines, or pulse capacitors, we can design and build reliable units to satisfy your need.

MICA-PAPER PLASTIC FILM CAPACITORS

rated for high-voltage pulse & dc applications feature:

- High Reliability.
- Encapsulated Construction.
- Extremely Low Dissipation Factor.
- Close Tolerance Matching Between Sections.
- Compact Size.



Size 4½″ x 2 9/16″ x 2¼″ high.

Developed for airborne radar modulators, TDL mica-paper capacitors are available as multiple section E-line pulse networks with internal or external coil. Prototype quantities to your specifications can be supplied on short delivery.

Model PRN-368: Five-section pulse capacitor; capacitance per section: 0.0225μF; difference between adjacent sections: less than 450pf; life: 10,000 hrs min at 65C; PRF: 200pps at 4100 volts; pulse width: 5.7 μ sec.

NEED A COMPLETE DISCHARGE SYSTEM?

Tobe Deutschmann builds units from table-top to megajoule installations with fast rise times and high peak currents. In addition to catalog models custom work is our specialty.

Tell us about your application.

Our units have proved their reliability worldwide in both research and industrial installations. For high voltage capacitors, discharge switches, pulse networks, pulse capacitors, and RFI filters, write or call...

TOBE
DEUTSCHMANN
LABORATORIES

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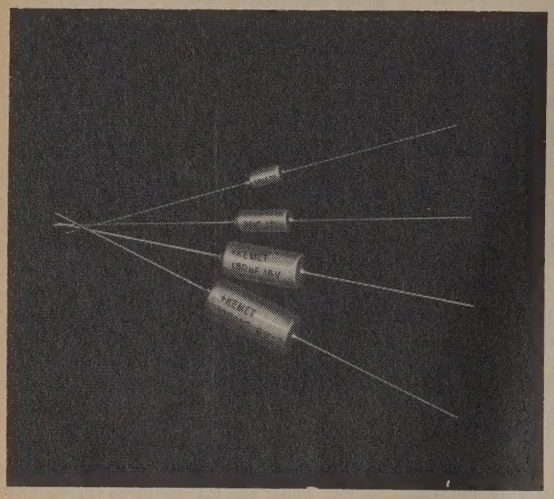
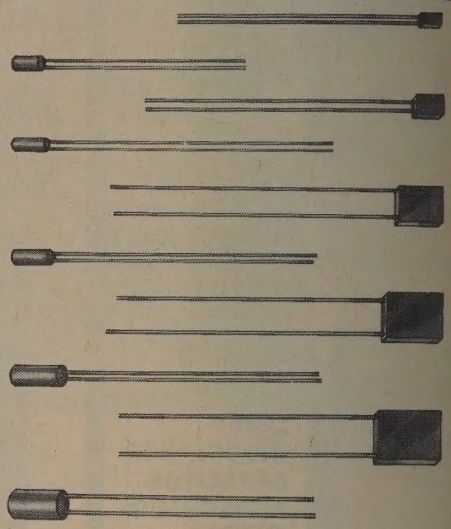
KEMET® UNION CARBIDE CAPACITORS UNION CARBIDE

KEMET® SOLID TANTALUM CAPACITORS

- Complete Line for all Industrial, Military, and Commercial Applications
- Available to Mil-C-39003A (Styles CSR13 & CSR09)
- National Sales & Distribution Network



KEMET J-Series



KEMET Micron Series

Series	Description & Features	Capacitance & Voltage Range	Size Range (Inches)	Leads	Reque Catalo
C	Molded epoxy, polar, self insulating. Ideal for commercial and industrial applications which do not require performance standards of hermetically sealed capacitors. Precision dimensions suitable for automatic insertion equipment. Bullet shaped for positive polarity identification.	.1–220 μF 6–50 VDC	4-case sizes .138 x .390 to .365 x .875	Axial	F-2622
D	Extended range molded sub miniature sizes featuring extremely high capacitance-to-volume ratio. Dimensions and tight lead wire-to-body concentricity permit automatic insertion by same equipment used for diodes and resistors. Suitable for decoupling, blocking,by-passing and filtering applications.	.0047–68 μF 6–50 VDC	3-case sizes .100 x .290 to .190 x .530	Axial	F-2632
E	Dip coated plastic encapulation providing the widely recognized shelf and operational life performance characteristics inherent in solid tantalum capacitors at prices competitive with conventional electrolytics. The dipped plastic case provides a tough barrier coating against moisture and shock and maintains precision lead spacing.	.1–330 μF 6–50 VDC	4-case sizes .175 x .350 to .400 x .750	Radial	F-2638C
J	Popular military hermetic sealed A, B, C & D case solid tantalum capacitors conforming to all requirements of Mil-C-39003A. Designed for miniaturized circuitry, they exhibit excellent stability, long life, extremely low DC leakage and D.F. over a wide temperature and frequency range.	.0047–330 μF 6–125 VDC	4-case sizes .125 x .250 to .341 x .750	Axial	F-1851D
MICRON	A complete line of microminiature capacitors designed for use in high density military, industrial and consumer circuits. Combines space saving advantages of .003 Mil MYLAR cases and KEMET's reliability engineering to achieve outstanding performance. Available in a wide variety of case styles, sizes and lead configurations.	.0047—220 μF 2—100 VDC	29-case sizes .125 x .070 x .040 to .475 x .374 x .150	Axial & Radial	F-2710B

UNION CARBIDE

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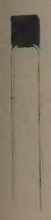
P.O. Box 5928, Greenville, S. C. 29606 • Tel.: (803) 963-7421 • TWX: 810-287-2536

EMET® UNION CARBIDE CAPACITORS UNION CARBIDE

KEMET® MONOLITHIC CERAMIC CAPACITORS

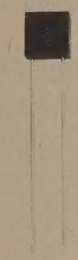
- Ideal for Bypass, Filtering & Coupling in Low Voltage and Transistorized Circuits
- Designed, Manufactured & Tested to Mil-C-11015D & Mil-C-39014A
- Capacitance Range from 10 pf to 3.3 μF
- Temperature Range –55° to +125°C

K05 CK05 - CKR05



0 - 56,000 pF

K06 - CK06 - CKR06



1200 - 1.0 μF

K12 - CK13 - CKR12

10 - 47,000 pF

K13 - CKR13

.012 - .5 μF

K19 - CK14 - CKR19

.012 - .27 μF

Category	Designation	Capacitance Range	Voltage Range	Size (max.)	Leads	Request Catalog
Commercial	K01	.25–1.0μF	50	.375 x .500 x .200	Radial	F-2724
	K02	1.0–2.0μF	50	.375 x .690 x .200	Radial	
	K05	10 pf–.056μF	50–200	.200 x .200 x .100	Radial	
	K06	1200 pf–1.0μF	25–200	.300 x .300 x .100	Radial	
	K11	10–10,000 pf	100	.100 x .170	Axial	
	K12	10 pf–.027 μF	50–100	.100 x .250	Axial	
	K13	.012–.5 μF	50–100	.200 x .500	Axial	
	K19	.012–.1 μF	100	.140 x .400	Axial	
	K20	.25–.5 μF	50	.260 x .495	Axial	
	K21	.5–1.0 μF	50	.260 x .690	Axial	
	K22	1.0–2.0 μF	50	.350 x .690	Axial	
MIL-C-11015D	CK05	10–56,000	50–200	.200 x .200 x .100	Radial	F-2724
	CK06	1200–470,000 pf	50–200	.300 x .300 x .100	Radial	
	CK12	10–10,000 pf	50–100	.100 x .170	Axial	
	CK13	5600–47,000 pf	50–100	.100 x .260	Axial	
	CK14	12,000–270,000 pf	50–100	.150 x .400	Axial	
	CK15	100,000 pf–1.0 μF	50–100	.265 x .520	Axial	
	CK16	470,000 pf–3.3 μF	50–100	.370 x .720	Axial	
MIL-C-39014A (to "P" (0.1%/1000 Hr) Failure Rate Level)	CKR05	10–1,000 pf	200	.200 x .200 x .100	Radial	F-2724
	CKR06	1200–100,000 pf	100–200	.300 x .300 x .100	Radial	
	CKR12	10–10,000 pf	100	.100 x .270	Axial	
	CKR13	15,000–100,000 pf	100	.200 x .500	Axial	
	CKR19	12,000–100,000 pf	100	.160 x .410	Axial	

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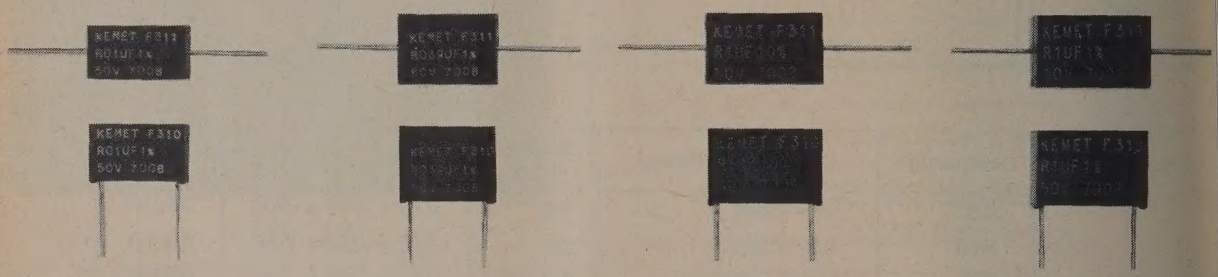
KEMET® PARYLENE FILM CAPACITORS

- Ultra stable — available to 0±50 PPM/°C
- Capacitance tolerance to ½%
- Compliance with Mil-C-55514
- Small size
- Radial and axial leads
- Capacitance range of .001 to 1.0μF

Ideal for filters, timing, tuning, differentiating and integrating circuits, band pass and band elimination.



Series	Description	Case Size	Capacitance μF 50VDC	Case Size (radial) Height	Length	Thickness	Reques Catalo
Flat Kap	The outstanding characteristics of these capacitors are obtained by utilizing the unique properties of Parylene, an ultra-thin dielectric film developed by Union Carbide Corporation in combination with specially developed thermosetting resin impregnants to provide stability and predictable temperature characteristics in a compact size. This design provides three different temperature coefficient characteristics for precision matching of the coefficient of other components where predictable drift is essential to the stability of the circuit. KEMET Flat Kaps are available in standard and nonstandard values in tolerances to ±½%. Closer tolerances and/or special capacitors in matched groups are available on special order.	A	.001 - .01	.280	.500	.125	F-2274D
		B	.012 - .039	.375	.500	.195	
		C	.047 - .1	.375	.600	.195	
		D	.15	.375	.600	.295	
		E	.22	.375	.750	.500	
		F	.33 & .47	.375	1.00	.600	
		G	.56 & .68	.375	1.50	.600	
		H	.82 & 1.0	.550	1.50	.600	

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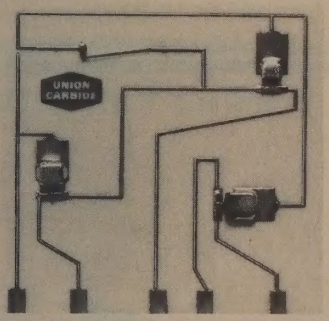
KEMET® UNION CARBIDE CAPACITORS UNION CARBIDE

KEMET® HYBRID CIRCUIT CHIP CAPACITORS

SOLID TANTALUM

- Ma mum volumetric efficiency
- Hi temperature capability
- Ec omical
- 0. to 68μF 4-50 VDC



CERAMIC

- Stable K (BX) dielectric — ±10% & ±20% tolerances
- NPO dielectric — TCC of 0±30 PPM/°C
- 10pF to .33μF 50 & 100 VDC
- Features KEMET's high temperature terminations

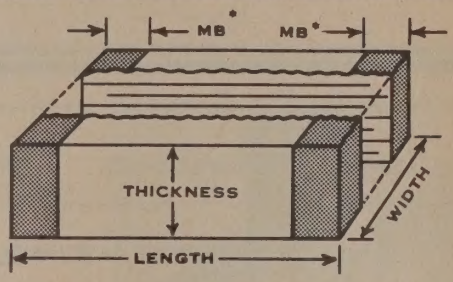


FIG. 1 *MB—METALLIZED BAND WIDTH

TANTALUM CHIP CAPACITORS

Se	Description	Case Size	Dimensions (Max.) Width	Length	Height	Capacitance & Voltage	Request Catalog
T4	Designed for use in hybrid circuit and P.C. board applications using solder reflow bonding techniques. All tantalum chips feature a special copper coating that permits assembly temperatures to 300°C and operating temperatures to 175°C when derated linearly. The anode connection consists of a solder coated nickel tab. Cathode connection is made to the solder coating surrounding the body of the chip. Other chip capacitors offering microminiature sizes and additional flexibility in bonding techniques are also available.	A	.150	.210	.070	0.10 - 6.8μF 4 - 50 VDC	F-2715C
		B	.180	.250	.070	0.47 - 15.0μF 4 - 50 VDC	
		C	.180	.310	.100	1.0 - 33.0μF 4 - 50 VDC	
		D	.180	.310	.150	2.2 - 68.0μF 4 - 50 VDC	

CERAMIC CHIP CAPACITORS

ted tage	Ten-O-Six 1006		Twelve-Ten 1210		Eighteen-Thirteen 1813		Twenty Two-Twenty Four 2224		Request Catalog
	Capacitance (pF) BX	NPO	Capacitance (pF) BX	NPO	Capacitance (pF) BX	NPO	Capacitance (pF) BX	NPO	
10 VDC	10-5,600	10-150	100-18,000	47-470	1,000-47,000	220-1,000	15,000-180,000	470-3,900	F-2731
5 VDC	10-15,000	10-270	100-39,000	47-680	1,000-100,000	220-1,800	15,000-330,000	470-5,600	
Le gth*	.095 ±.010		120 ±.010		.175 ±.010		.220 ±.015		
W th*	.055 ±.008		.095 ±.010		.125 ±.010		.240 ±.015		
Th kness	.060 Max.		.060 Max.		.060 Max.		.060 Max.		
M alized B d	.025 ±.015		.025 ±.015		.025 ±.015		.025 ±.015		

D nsions prior to end metalization. Add .005 max. for solder coated chip. All Dimensions in Inches.

NION ARBIDE

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Miniature Ceramic Capacitors

USCC

USCC specializes in the production of ceramic capacitors utilizing uniquely developed packaging concepts. Since USCC first started making ceramic capacitors in 1961, a great many changes have taken place in ceramic capacitor technology. The important role played by USCC engineering for many of these changes has been well recognized. USCC continues to innovate ideas in technical ceramics to bring forth new generations of products that greatly enhance the designers versatility. As new products are introduced or d sign improvements made to existing USCC ceramic capa tors, supplemental technical bulletins are prepared augment catalogs. You can be assured of receiving th up-to-date information by requesting your name and a dress be placed on our mailing list. Just contact us dire or any of our representatives listed in the yellow sectio

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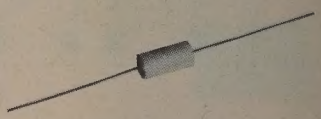
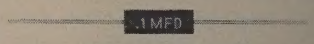
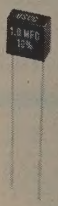
SERIES	CAPACITANCE	VOLTAGE	DIELECTRIC
TUBULAR/EPOXY CASE/AXIAL LEADS			
C10	1.0 pF-3.0 Mfd	50/100/200 Vdc	W
C13 — High Stability	0.5 pF-.2 Mfd	50/100/200 Vdc	NPO
C20	10 pF-.22 Mfd	50 Vdc	W
C22	10 pF-.12 Mfd	50/100 Vdc	W
RECTANGULAR/RESIN COATED/AXIAL LEADS			
C11	1 pF-1.0 Mfd	50/100/200 Vdc	W
C18 — High Stability	5.0 pF-.011 Mfd	50/100/200 Vdc	NPO
RECTANGULAR/EPOXY CASE/AXIAL LEADS			
C19 — High Current	.01 Mfd-10 Mfd	400 and 1200 Hz at 70 Vrms	W
RECTANGULAR/EPOXY CASE/AXIAL LEADS			
C27	.01 Mfd-2.5 Mfd	50/100 Vdc	W
RECTANGULAR/EPOXY CASE/RADIAL LEADS			
C12	1 pF-10 Mfd	100 Vdc	W
C12 HI-D	.18 Mfd-1.5 Mfd	25/50 Vdc	W
C16	10 pF-.12 Mfd	200 Vdc	W
C17 — High Stability	5.0 pF-.22 Mfd	50/100/200 Vdc	NPO







CAPACITANCE TOLERANCE AVAILABLE: W = 5, 10, 20%
NPO = 1, 2, 3, 5 and 10%

Leads are weldable or solderable

TO ORDER SPECIFY: Series, Capacitance, Tolerance and Voltage (Frequency for C19)

U.S. CAPACITOR CORPORATION ■ 2151 N. LINCOLN STREET, BURBANK, CALIF. 91504 ■ (213) 843-4222 ■ TWX: 910-498-222

Miniature Ceramic Capacitors

USCC

GENERAL SPECIFICATIONS:

W DIELECTRIC CHARACTERISTICS:

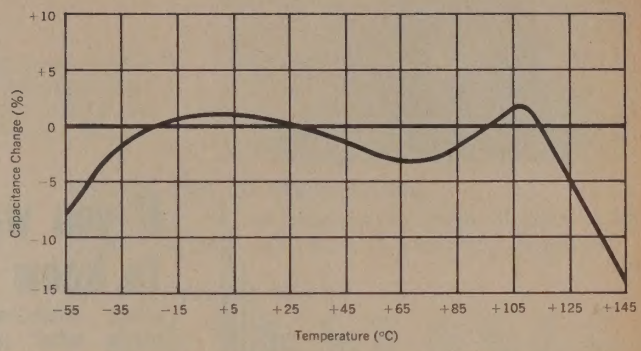
Dissipation Factor:	Less than 2.5% at 1kHz
Insulation Resistance:	100,000 megohms or 1000 megohm-Mfd at 25°C, whichever is less
Temperature Coefficient:	±15%, —55°C to +125°C
Dielectric Strength:	2.5 × rated voltage

Meets or exceeds applicable requirements of MIL-C-11015 and MIL-C-39014.

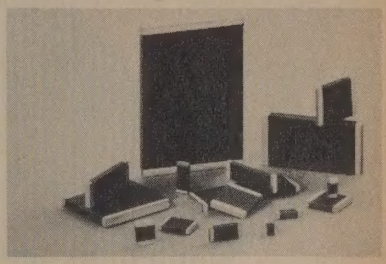
NPO DIELECTRIC CHARACTERISTICS:

Dissipation Factor:	Less than .15% at 1MHz
Insulation Resistance:	100,000 megohms or 1000 megohm-Mfd at 25°C, whichever is less
Temperature Coefficient:	0 ±30 PPM/°C, −55°C to +125°C
Dielectric Strength:	2.5 × rated voltage

Meets or exceeds applicable requirements of MIL-C-20.



CERAMOLITHIC® CHIPS



SUMMARY OF CHIP CAPACITOR VALUES
(Maximum Capacitance)

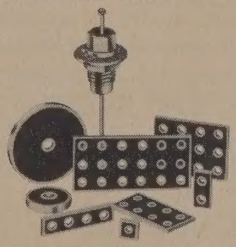
USCC	L	W	T	W DIELECTRIC			NPO DIELECTRIC		
SIZE	NOM	NOM	MAX	50V	100V	200V	50V	100V	200V
BB	.050	.050	.040	6800 pF	2200 pF	N/A	150 pF	82 pF	N/A
CA	.075	.035	.040	.01 Mfd	3300	N/A	150	82	N/A
BC	.085	.050	.045	.012	5600	N/A	220	150	N/A
BF	.100	.050	.060	.015	.01 Mfd	2700 pF	470	330	120 pF
FH	.125	.095	.065	.1	.039	8200	1800	1200	330
BI	.150	.050	.060	.056	.018	3900	1000	680	270
CJ	.170	.065	.065	.1	.033	8200	1800	1200	470
HJ	.175	.125	.065	.18	.068	.012 Mfd	4700	2700	1000
DJ	.180	.080	.065	.15	.047	.01	3300	2200	820
FP	.350	.095	.070	.27	.12	.027	5600	3300	1200
IR	.395	.145	.060	.47	.18	.039	.01 Mfd	6800	2200
KI	.197	.180	.065	.25	.1	.022	4700 pF	3300	1200
LL	.225	.210	.065	.56	.22	.047	.01 Mfd	6800	2200
LM	.250	.220	.070	.68	.27	N/A	.012	8200	N/A
TOLERANCES AVAILABLE:				± 5, 10 and 20%			±1, 2, 3, 5, 10 and 20%		

TERMINATIONS AVAILABLE: Silver, Palladium Silver, Gold, and Palladium Gold

Solder coated terminations, chip marking and voltage conditioning are also available upon request.

TO ORDER, SPECIFY: Size, Capacitance, Voltage, Capacitance Tolerance and Dielectric. The capacitance values specified are at recommended voltage stress levels. For higher capacitance values in smaller sizes, contact USCC.

FEED-THRUS AND FILTER-CAPS
Available in a variety of sizes and capacitance values.
Contact USCC for full details.



SEE SECTION 2700 FOR USCC EMI/RFI FILTERS

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what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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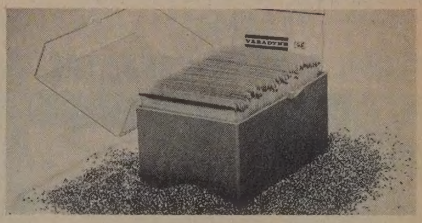
HYBRID CHIP KITS



Varadyne hybrid chip capacitor and chip resistor kits are useful for breadboarding hybrid circuits, and also find wide application for trimming production circuits where required. Chip resistors may also be used during the thick film substrate fabrication process to eliminate multiple resistor screenings particularly of very high or very low resistance value.

CAPACITOR CHIP KIT SPECIFICATIONS

The capacitor chip kit contains ten chips of each of the 51 standard RETMA values from 1 pf to .015 μf. Capacitance values from 1 pf to 100 pf are provided with an NPO characteristic. Values greater than 100 pf have a BX characteristic.

CAPACITANCE VALUES

1 pf,	1.2 pf,	1.5 pf,	1.8 pf,	2.2 pf,	2.7 pf,	3.3 pf,
3.9 pf,	4.7 pf,	5.6 pf,	6.8 pf,	8.2 pf,	10 pf,	12 pf,
15 pf,	18 pf,	22 pf,	27 pf,	33 pf,	39 pf,	47 pf,
56 pf,	68 pf,	82 pf,	100 pf,	120 pf,	150 pf,	180 pf,
220 pf,	270 pf,	330 pf,	390 pf,	470 pf,	560 pf,	680 pf,
820 pf,	1000 pf,	1200 pf,	1500 pf,	1800 pf,	2200 pf,	2700 pf,
3300 pf,	3900 pf,	4700 pf,	5600 pf,	6800 pf,	8200 pf,	.01 μf,
.012 μf,	.015 μf					

CHIP SIZE: .095″ x .050″, ±.005″, maximum thickness .050″

ELECTRODE BANDS: Silver, nominally .025″ wide.

TOLERANCE: ±10%.

OPERATING VOLTAGE: 50 WVDC.

OPERATING TEMPERATURE RANGE: −55°C to +125°C.

INSULATION RESISTANCE: 100 megohms/MFD measured at 25°C. Need not exceed 100,000 megohms.

DISSIPATION FACTOR: BX: Less than 1.5%
NPO: Less than 0.1%

TEMPERATURE COEFFICIENT:
NPO: Better than ±25 ppm/°C from −55°C to +125°C
BX: Better than ±10% from −55°C to +125°C

RESISTOR CHIP KIT SPECIFICATIONS

The resistor chip kit contains ten chips of each of the 65 standard RETMA values from 10 ohms to 2 megohms.

RESISTOR VALUES (Ohms):

10	12	15	18	22	27	33	39	47	56	68
82	100	120	150	180	220	270	330	390	470	560
680	820	1000	1200	1500	1800	2200	2700	3300	3900	4700
5600	6800	8200	10K	12K	15K	18K	22K	27K	33K	39K
47K	56K	68K	82K	100K	120K	150K	180K	220K	270K	330K
390K	470K	560K	680K	820K	1M	1.2M	1.5M	1.8M	2.0M	

CHIP SIZE:

Size 1 (.050″ x .050″, ±.005″) for values from 10 to 330K ohms
Size 2 (.075″ x .050″, ±.005″) for values from 390K to 680K ohms
Size 3 (.095″ x .050″, ±.005″) for values from 820K to 1M ohms
Size 4 (.150″ x .050″, ±.005″) for values from 1.2M to 2.0M ohms
Maximum thickness .025″

ELECTRODE BANDS: Nominally .010″ wide, Pd./Ag. standard

TOLERANCE: ±10%

OPERATING VOLTAGE: 100 WVDC

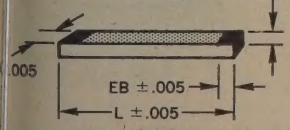
POWER RATING: Size 1: 75 mw Size 3: 150 mw
Size 2: 100 mw Size 4: 300 mw

TEMPERATURE COEFFICIENT:
Better than ±200 ppm/°C from −55°C to +150°C

CERMET THICK FILM CHIP RESISTORS

These resistors are particularly useful for breadboarding hybrid circuits and for trimming production circuits where required. They also find wide application in the production of thick film hybrids where they may be used to eliminate multiple resistor screenings, particularly of very high or very low resistance values.

CHARACTERISTICS



L — LENGTH
T — THICKNESS
W — WIDTH
EB — ELECTRODE BAND .015 NOMINAL

The chips have a palladium-silver electrode band similar to chip capacitors. This band is continuous at each end from the bottom surface of the chip, around the end, to the top where it connects to the resistor material. The chips may be electric or solder bonded to the substrate. Where required, the palladium-silver electrodes are compatible with conventional wire bonding techniques.

HOW TO ORDER

3 C 122 K

3 — Cermet chip
C — Resistance value in ohms. The first two digits represent significant figures; the last digit specifies the number of zeros to follow. (1200 ohms is illustrated.)
122 — Tolerance @ 25°C
K — F: ±1%, G: ±2%, J: ±5%, K: ±10%, M: ±20%

SPECIFICATIONS

MATERIAL: 96% Alumina with palladium-silver electrodes.

RESISTOR VALUES:
Size 1: 10 ohm to 450K ohm
Size 2: 40 ohm to 825K ohm
Size 3: 60 ohm to 1.2M ohm
Size 4: 100 ohm to 2.0M ohm

SIZES:
Size 1: .050″ x .050″
Size 2: .075″ x .050″
Size 3: .100″ x .050″
Size 4: .150″ x .050″

The standard values in ohms are:

10	12	15	18	22	27	33	39	47	56	68
82	100	120	150	180	220	270	330	390	470	560
680	820	1000	1200	1500	1800	2200	2700	3300	3900	4700
5600	6800	8200	10K	12K	15K	18K	22K	27K	33K	39K
47K	56K	68K	82K	100K	120K	150K	180K	220K	270K	330K
390K	470K	560K	680K	820K	1M	1.2M	1.5M	1.8M	2.0M	

RESISTOR TOLERANCES: Standard tolerance ±10%. Also available ±5, ±2, ±1 and ±20%.

TEMPERATURE COEFFICIENT: Measured in accordance with Mil-Std-202, Method 304; ±200 ppm/°C from −55°C to 150°C. ±50 ppm/°C available in certain configurations.

POWER RATING: Maximum continuous operating at 125°C:
Size 1: 75 mw Size 3: 150 mw
Size 2: 100 mw Size 4: 300 mw

OPERATING VOLTAGE: Maximum operating voltage 100 WVDC

SHORT TIME OVERLOAD: 2.5 times the maximum DC voltage required to dissipate full-rated power for a period of 5 seconds at 25°C

NOISE: As measured on a Quan-Tech Model 315 Resistor Noise Test Set: Up to 1000 ohms, better than −20 db
1K to 30K ohms, better than −15 db
30K to 300K ohms, better than +10 db
300K to 2M ohms, better than +15 db

TEMPERATURE CYCLING: Mil-Std-202A, Method 102A, Condition C, charge less than ±.05%

MOISTURE RESISTANCE: Mil-Std-202A, Method 106, change less than ±1%

LOAD LIFE: Better than ±1% at 85°C for 1000 hours at the DC voltage required to dissipate full-rated power

VARADYNE
PACKAGING & MATERIALS
A DIVISION OF VARADYNE, INC.

2110 BROADWAY, SANTA MONICA, CALIFORNIA 90404
TEL: (213) 829-2984, TWX (910) 343-6856

TYPE NPO & BX/CX CAPACITOR CHIPS

FEATURES

- **High volumetric efficiency**
- **True monolithic construction**
- **Available in 36 sizes**
- **High Q for high frequency application up to 2.2 gHz**

GENERAL DESCRIPTION

Varadyne's capacitor chip line offers an increased volumetric efficiency of 10 to 100 times that obtained from other types of capacitors. Values range from 1.0 pf to 2.2 μf. The monolithic construction of the units provides outstanding reliability as a result of their hermeticity, ruggedness, and overall stability. The capacitance will not change more than 0% ±25 ppm/°C in the NPO type and ±15% in the BX type capacitors over the temperature range of −55°C to +125°C. The CX stability characteristics are the same as BX with the temperature range extended to −55°C to +150°C. NPO chips have an extremely high Q factor of better than 5000 at 1 mHz.

GENERAL SPECIFICATIONS

Temperature Range: NPO/BX: −55°C to +125°C
CX: −55°C to +150°C

Tolerances: F. ±1% (NPO only)
G: ±2% (NPO only)
J: ±5%
K: ±10%
M: ±20%

Dissipation Factor: BX/CX: less than 1.5%
NPO: less than 0.1%

Insulation Resistance: 1000 megohms-mfd (measured at 25°) need not exceed 100,000 megohms.

Electrodes: Fuse bonded electrodes for soldering or braz g directly to substrates (as in hybrid circuit applicatio) or for conventional wire lead attachments. Electrodes e silver unless otherwise specified. See "HOW TO ORDE "

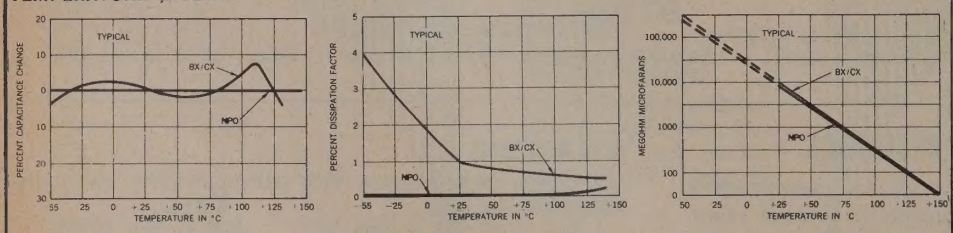
Life Test: When tested 1000 hours at 200% rated dc volta e at 125°C, dissipation factor less than 1.0% for NPO a 2.5% for BX/CX. Insulation resistance is the lower f 10,000 megohms or 100 megohms × capacitance in , parameters measured at 25°C

Moisture Resistance: Exceeds requirements of MIL-C-1101 , when tested in accordance with MIL-STD-202, Method 1 .

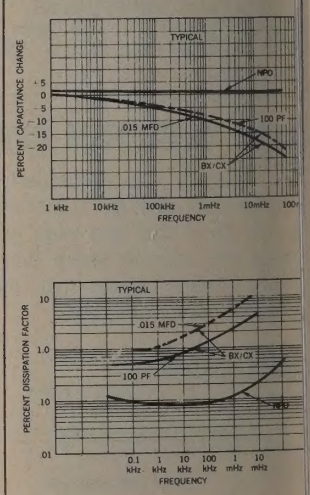
Dielectric Strength: Tested at 4 × rated voltage at 25°C 5 seconds, current limited to 50 ma.

Volumetric Efficiency: NPO: Up to .45 μf per cubic inch.
BX/CX: Up to 20 μf per cubic inch.

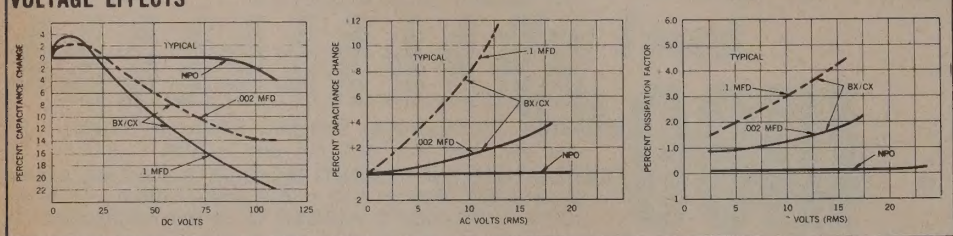
TEMPERATURE EFFECTS



FREQUENCY EFFECTS



VOLTAGE EFFECTS



HOW TO ORDER NPO

3	B	N	100	S	121	G	(P)
SIZE	TEMPERATURE RANGE B: −55°C to +125°C	TEMPERATURE STABILITY 0% ±25 ppm/°C OVER SPECIFIED TEMP. RANGE	RATED DC VOLTAGE 50, 100, 200 WVDC	CAPACITOR CHIP (SLUG)	CAPACITANCE VALUE IN PICOFARADS (pf). THE FIRST TWO DIGITS REPRESENT SIGNIFICANT FIGURES; THE LAST DIGIT SPECIFIES THE NUMBER OF ZEROS TO FOLLOW. (120 pf IS ILLUSTRATED.) FOR FRACTIONAL VALUES, THE LETTER R IS USED TO INDICATE THE DECIMAL POINT, AND THE SUCCEEDING DIGIT SHALL REPRESENT THE FRACTIONAL VALUE e.g., 2R2 INDICATES 2.2 pf.	TOLERANCE at 25°C F: ±1% G: ±2% J: ±5% K: ±10%	ADD THIS LETTER TO SPECIFY SPECIAL ELECTRODES. PLATINUM GOLD IS ILLUSTRATED. D: PALLADIUM SILVER G: GOLD P: PLATINUM GOLD S: SOLDER COATED

HOW TO ORDER BX/CX

3	B	X	100	S	122	K	(P)
SIZE	TEMPERATURE RANGE B: −55°C to +125°C C: −55°C to +150°C	TEMPERATURE STABILITY ±15% OVER SPECIFIED TEMP. RANGE	RATED DC VOLTAGE 50, 100, 200 WVDC	CAPACITOR CHIP (SLUG)	CAPACITANCE VALUE IN PICOFARADS (pf). THE FIRST TWO DIGITS REPRESENT SIGNIFICANT FIGURES; THE LAST DIGIT SPECIFIES THE NUMBER OF ZEROS TO FOLLOW. (1200 pf IS ILLUSTRATED.)	TOLERANCE at 25°C J: ±5% K: ±10% M: ±20%	ADD THIS LETTE TO SPECIFY SPE CIAL ELECTRODES PLATINUM GOLD I IS ILLUSTRATED. D: PALLADIUM SILVER G: GOLD P: PLATINUM GOLD S: SOLDER COATED

HO TO SELECT A CHIP CAPACITOR FROM THE CAPACITOR GUIDE

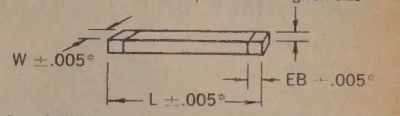
1) D de from the specifications whether an NPO BX/CX type capacitor is more desirable.
2) D de on 50 v or 100 v capacitor rating.
3) S the blue MAX column below corresponding the selections made in (1) and (2) from top ottom until a maximum value greater than desired value is found.
TE: The gray horizontal columns represent ndard capacitor sizes.
4) S further to determine all the sizes whose imum value exceeds the desired value and se minimum value is less than the desired e.
5) at the dimensions listed in the same hori- al columns as the chosen capacitance ranges a desirable size is found.
6) Look at the far left of the horizontal column corresponding to the desired size and capacitance, and read the size number. Use this number along with the capacitance value for ordering.

EXAMPLE:

A 100 v, 2700 pf capacitor is desired for the application. Scanning the 100 v NPO MAX column, maximum values of from 2700 pf to .022 µf are available in sizes 17, 7, 8, 36, 9, 24, 10, 27, 22, 14, 11, 25, 32, 12, and 15. The most desirable size is .395 x .145 x .065. Consequently, size 27 is chosen. On second consideration, however, a smaller size for the capacitance would be even more desirable. Scanning back along the MAX column, size 17 is the smallest size in which 2700 pf can be obtained. The size to order in this case is 17.

PHYSICAL TOLERANCES

"T" indicated for largest value of capacitance for given size



L —LENGTH
T —THICKNESS
W —WIDTH
EB—ELECTRODE BAND
CR—CAPACITANCE RANGE

* TOLERANCES ON DIMENSIONS
.050 to .199 ±.005″
.200 to .399 ±.010″
.400 to .599 ±.015″
.600 up ±.020″

S	NPO (K30) 50 V Min.	NPO (K30) 50 V Max.	NPO (K30) 100 V Min.	NPO (K30) 100 V Max.	BX/CX (K1200) 50 V Min.	BX/CX (K1200) 50 V Max.	BX/CX (K1200) 100 V Min.	BX/CX (K1200) 100 V Max.	Length	Width	Thickness	EB	Actual Size
3	1.0 pf	120 pf	1.0 pf	100 pf	100 pf	5600 pf	100 pf	3900 pf	.190	.035	.035	.020 to .040	
	1.0 pf	150 pf	1.0 pf	100 pf	100 pf	6800 pf	100 pf	5600 pf	.050	.050	.050	.010 to .020	
	1.0 pf	220 pf	1.0 pf	120 pf	100 pf	.015 µf	100 pf	.01 µf	.075	.045	.050	.010 to .030	
3	1.0 pf	390 pf	1.0 pf	220 pf	100 pf	.018 µf	100 pf	.01 µf	.082	.055	.060	.010 to .030	
2	10 pf	390 pf	10 pf	220 pf	100 pf	.012 µf	100 pf	.01 µf	.195	.045	.050	.050 to .070	
	1.0 pf	470 pf	1.0 pf	220 pf	100 pf	.027 µf	100 pf	.015 µf	.095	.050	.060	.015 to .035	
	10 pf	470 pf	10 pf	270 pf	100 pf	.018 µf	100 pf	.01 µf	.125	.050	.055	.010 to .030	
3	10 pf	560 pf	10 pf	330 pf	100 pf	.027 µf	100 pf	.018 µf	.100	.070	.060	.010 to .030	
	10 pf	560 pf	10 pf	390 pf	100 pf	.056 µf	100 pf	.027 µf	.145	.050	.050	.015 to .035	
	10 pf	820 pf	10 pf	470 pf	820 pf	.047 µf	820 pf	.022 µf	.175	.055	.055	.025 to .045	
	10 pf	1200 pf	10 pf	680 pf	100 pf	.10 µf	100 pf	.068 µf	120	.095	.065	.015 to .035	
	10 pf	1200 pf	10 pf	680 pf	820 pf	.068 µf	820 pf	.033 µf	.175	.070	.070	.025 to .045	
	27 pf	1800 pf	27 pf	1200 pf	1000 pf	.082 µf	1000 pf	.068 µf	.190	.060	.060	.030 to .050	
	10 pf	2200 pf	10 pf	1200 pf	1000 pf	.10 µf	1000 pf	.047 µf	.105	.105	.110	.020 to .040	
	47 pf	2700 pf	47 pf	1800 pf	2200 pf	.12 µf	2200 pf	.082 µf	.175	.125	.060	.015 to .035	
	47 pf	2700 pf	47 pf	1800 pf	2200 pf	.22 µf	2200 pf	.12 µf	.265	.085	.070	.025 to .045	
	47 pf	2700 pf	47 pf	1800 pf	2200 pf	.22 µf	2200 pf	.12 µf	.310	.080	.070	.030 to .050	
	56 pf	3300 pf	56 pf	2200 pf	1200 pf	.15 µf	1200 pf	.10 µf	.145	.165	.060	.020 to .040	
	56 pf	3300 pf	56 pf	2200 pf	1200 pf	.15 µf	1200 pf	.10 µf	.175	.160	.060	.020 to .040	
	56 pf	3300 pf	56 pf	2200 pf	1200 pf	.12 µf	1200 pf	.10 µf	.195	.125	.070	.025 to .045	
	82 pf	3300 pf	82 pf	1800 pf	3900 pf	.22 µf	3900 pf	.10 µf	.260	.175	.050	.020 to .040	
	100 pf	4700 pf	100 pf	2700 pf	3300 pf	.22 µf	3300 pf	.15 µf	170	.175	.060	.040 to .060	
	82 pf	5600 pf	82 pf	2700 pf	3900 pf	.27 µf	3900 pf	.15 µf	.340	.100	.070	.030 to .050	
	100 pf	6800 pf	100 pf	3900 pf	4700 pf	.39 µf	4700 pf	.27 µf	.370	.115	.070	.030 to .050	
	100 pf	6800 pf	100 pf	3900 pf	4700 pf	.39 µf	4700 pf	.27 µf	.410	.120	.070	.030 to .050	
	100 pf	.01 µf	100 pf	6800 pf	4700 pf	.56 µf	4700 pf	.27 µf	.200	.220	.070	.030 to .050	
	150 pf	.01 µf	150 pf	6800 pf	5600 pf	.82 µf	5600 pf	.33 µf	.275	.180	.070	.030 to .050	
	150 pf	.012 µf	150 pf	6800 pf	.015 µf	.82 µf	.015 µf	.68 µf	.220	.235	.080	.030 to .050	
	150 pf	.012 µf	150 pf	6800 pf	5600 pf	1.0 µf	5600 pf	.68 µf	.390	.145	.070	.020 to .040	
	220 pf	.012 µf	220 pf	6800 pf	.01 µf	.68 µf	.01 µf	.33 µf	.370	.190	.070	.030 to .050	
	150 pf	.015 µf	150 pf	.01 µf	5600 pf	1.0 µf	5600 pf	.68 µf	.245	.225	.080	.030 to .050	
	270 pf	.015 µf	270 pf	8200 pf	.022 µf	1.2 µf	.022 µf	.68 µf	.630	.180	.070	.030 to .040	
	330 pf	.015 µf	330 pf	.01 µf	.033 µf	1.5 µf	.033 µf	1.0 µf	.425	.300	.070	.025 to .045	
	470 pf	.033 µf	470 pf	.022 µf	.022 µf	2.2 µf	.022 µf	1.2 µf	.300	.595	.080	.030 to .050	
	470 pf	.033 µf	470 pf	.022 µf	.047 µf	2.0 µf	.047 µf	1.0 µf	.390	.430	.070	.020 to .040	
	470 pf	.033 µf	470 pf	.022 µf	.022 µf	2.2 µf	.022 µf	1.2 µf	.595	.300	.080	.030 to .050	

VARADYNE
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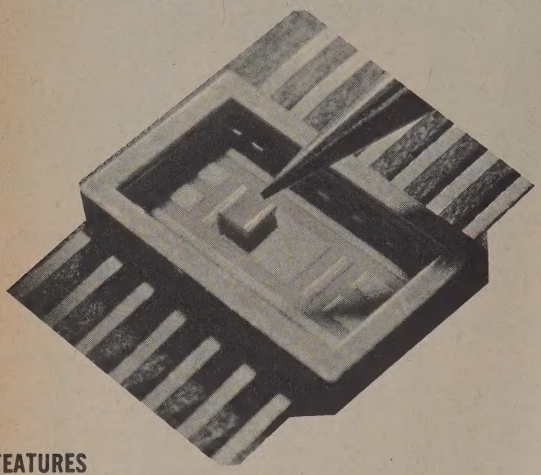
IC COMPATIBLE CHIP CAPACITORS



FEATURES

- Maximum thickness of 15 mils for compatible IC packaging
- True monolithic construction
- Extremely high values of capacitance
- High Q for high frequency application up to 100 mc

APPLICATIONS

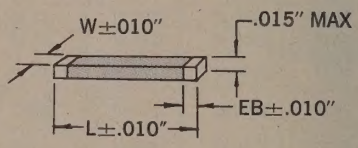
These NPO and BX capacitors are ideally suited for those applications requiring circuit optimization where it is desired to improve the IC temperature performance and speed of operation. They may also be used for filtering, bypass, coupling and isolation applications. A line of IC compatible chip resistors is also available.

GENERAL DESCRIPTION

The monolithic construction of Varadyne capacitor chips provides outstanding reliability as a result of the hermetility, ruggedness and overall stability provided by the structure of this type of capacitor. Type NPO elements are extremely stable. Their capacitance will not change more than ±20 ppm/°C over the temperature range from −55°C to +125°C. Also they have an extremely high Q factor of better than 5000 at 1 mc. Type BX elements have a capacitance change of not more than ±15% over the temperature range from −55°C to +125°C. These capacitors have a maximum thickness of .015 inches, allowing the chips to be mounted adjacent to integrated circuit chips in standard IC packages.

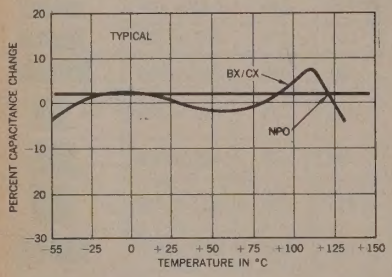
Size	Dimensions L (±.005)	W (±.005)	T (max.)	EB (±.010)	Capacity Range NPO	BX
1	.050	.050	.015	.015	15 pf to 47 pf	100 pf to 180
2	.075	.045	.015	.020	15 pf to 68 pf	100 pf to 270
3	.095	.050	.015	.020	22 pf to 100 pf	100 pf to 470
4	.145	.050	.015	.020	47 pf to 150 pf	100 pf to 680
5	.120	.095	.015	.020	69 pf to 270 pf	100 pf to .01

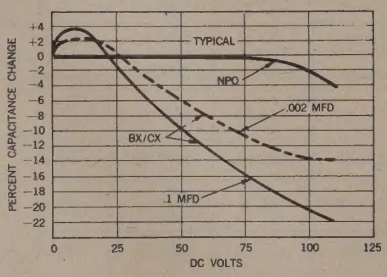
PHYSICAL TOLERANCES

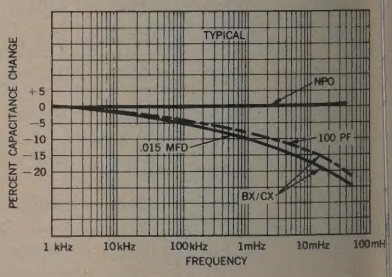


L — LENGTH
T — THICKNESS
W — WIDTH
EB — ELECTRODE BAND

TYPICAL CHARACTERISTICS







GENERAL SPECIFICATIONS

Temperature Range: −55°C to +125°C

Tolerances: F: ±1% (NPO only) J: ±5%
G: ±2% (NPO only) K: ±10% M: ±20%

Dissipation Factor: BX: Less than 1.5% — NPO: Less than 0.1%

Insulation Resistance: 1000 megohms - MFD (measured at 25°C) need not exceed 100,000 megohms.

Electrodes: Fuse-bonded palladium/silver for die-attaching or soldering directly to metallized substrates (gold, platinum/gold, palladium/silver, solder dipped). Special electrodes available on request.

Life Test: When tested 1000 hours at 200% rated DC voltage at 125°C. Dissipation Factor is less than 1.0% for NPO and 2.5% for BX, and the Insulation Resistance is the lower of 10,000 megohms or 100 megohms x capacitance in μf, parameters measured at 25°C.

Moisture Resistance: Exceeds requirements of MIL-C-11015C, when tested in accordance with MIL-STD-202, Method 106.

Dielectric Strength Test: Tested at 4 x rated voltage at 25°C for 5 seconds, current limited to 50 ma.

Operating Voltage: 50 wvdc max.

HOW TO ORDER

3 BX 050 T 121 G

SIZE

SYMBOL FOR BX TYPE CAPACITOR OR CHANGE TO BN TO ORDER NPO TYPE

RATED DC VOLTAGE

IC COMPATIBLE CHIP CAPACITOR

CAPACITANCE VALUE IN PICOFARADS (pf). THE FIRST TWO DIGITS REPRESENT SIGNIFICANT FIGURES; THE LAST DIGIT SPECIFIES THE NUMBER OF ZEROS TO FOLLOW. (120 pf IS ILLUSTRATED.) FOR FRACTIONAL VALUES THE LETTER R IS USED TO INDICATE THE DECIMAL POINT, AND THE SUCCEEDING DIGIT SHALL REPRESENT THE FRACTIONAL VALUE, e.g., 2R2 INDICATES 2.2 pf.

TOLERANCE AT 25°C

C: ±¼ pf } TIGHTEST TOLERANCES AVAILABLE
D: ±½ pf } FOR VALUES LESS THAN 10 pf
F: ±1% (NPO only)
G: ±2% (NPO only)
J: ±5%
K: ±10%
M: ±20%

FEE THRU CHIP CAPACITOR

FEA RES

- Tr monolithic ceramic construction
- E emely high values of capacitance
- A lable voltages range from 50 to 4 VDC
- L Inductance
- E llent temperature and voltage st ility
- R dily solderable inter and outer e trode terminations
- U orm size and form factor control
- M i-section design available

GE AL DESCRIPTION

Var ne feed-thru type monolithic cer ic capacitors offer the filter de-sig a wide range of available dielec-tric pes and voltages. Construction is tru onolithic type, in which the indi-vid layers are compacted and formed in unfired state and then fired to-get to produce a highly reliable, env nmentally stable ceramic slug of treme durability and ruggedness. The ompacting or monolithic process allo an increase in volumetric effi-cie of from 10 to 100 times that of evious conventional single-plate fee hru designs, which in turn allows the lter designer a new dimension in filt miniaturization. Almost any form fac (i.e. ratio between outer diameter an nner diameter) is available to fit all rrent tubular filter packages.

APPLICATIONS

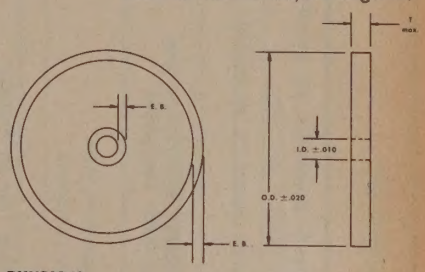
Broad band RFI filters generally require very high values of capacitance which in the past have been supplied by comparatively bulky mylar or metallized mylar tubular capacitors. Current miniaturization of RFI filters requires the increased volumetric efficiency offered by these Varadyne monolithic feed-thru capacitors. In addition, the monolithic feed-thru, being environmentally stable, does not require encasement for applications where direct soldering to a chassis or bulkhead may be necessary. In this case, excellent capacitive filtering is obtained and a ferrite slug may be added for effective "L" section filtering if desired.

Multi-section feed-thrus for special RFI filters are available on special order. These feed-thrus vary from four to twelve capacitors per section. Special interlayer design provides a high degree of separation to virtually eliminate cross channel coupling.

GENERAL SPECIFICATIONS

ELECTRICAL

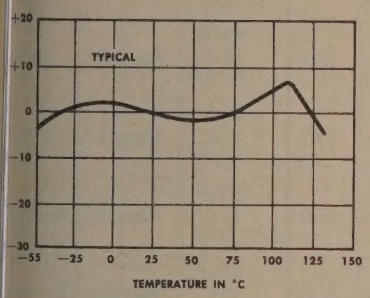
Capacitance Range	.01 μf to 1.5 μf (other values available in other dielectrics)
Dissipation Factor	Less than 2.5%
Voltage Range	50 to 400 VDC
Electrodes	Silver (fuse bonded)
Temperature Range	−55°C to 125°C
Capacity Tolerance	K: ±10% M: ±20% X: +80% −20% Z: +100% −0%
Insulation Resistance	1000 megohms—μf (at 25°C) Need not exceed 100,000 megohms

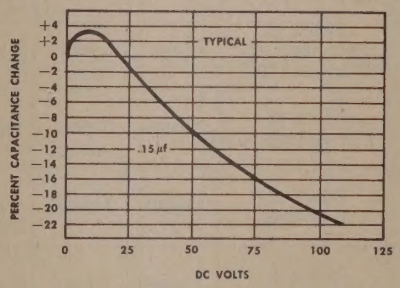


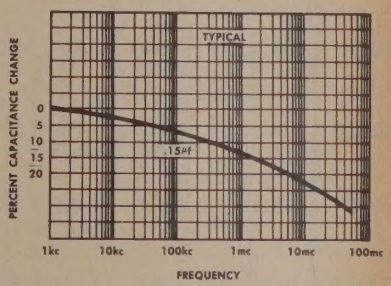
PHYSICAL

OD	Outside Diameter	**T**	Thickness
ID	Inside Diameter	**EB**	Electrode Band

TI CAL CHARACTERISTICS







ST DARD SIZES

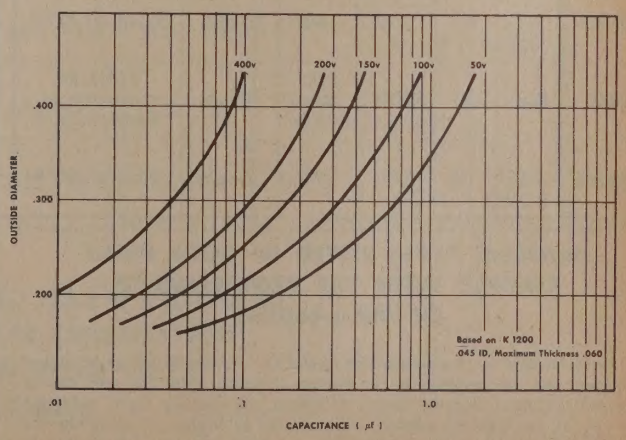
315-40	330-45	360-45
OD .315	OD .330	OD .360
ID .040	ID .045	ID .045
T .060	T .060	T .060
EB .025	EB .025	EB .025

HO TO ORDER

315-40 B X 100 F 154 X

- ID - ID (MILS)
- ERATURE RANGE 5°C to +125°C
- RATURE STABILITY ±15% SPECIFIED TEMPERATURE RANGE
- DC VOLTAGE 50, 100, 150, 200, 400 WVDC
- ITOR CHIP FEED-THRU
- ITANCE VALUE IN PICOFARADS (pf). THE FIRST DIGITS REPRESENT SIGNIFICANT FIGURES; THE DIGIT SPECIFIES THE NUMBER OF ZEROS TO W. K1200 .15 μf IS ILLUSTRATED.
- ANCE @ 25°C K: ±10% M: ±20% X: −80% −20% Z: +100% −0%

CUSTOM DESIGN GUIDE



HUMISEAL COATINGS

GENERAL CHART

Listed in this General Chart of Properties are ten of the most frequently used HumiSeal Protectiv Coatings and their principal properties. These have been tabulated in order to facilitate compariso of their characteristics and selection of the most suitable type for a specific application. In additio to these HumiSeal types we manufacture a variety of coatings for special purposes, including hig temperature applications. Should none of the coatings listed in this chart fulfill your requirement we suggest that you contact us for recommendations.

	PROPERTIES OF LIQUID HumiSeal										THERMAL PROPERTIES		
HumiSeal Type[1]	Specific Weight (lbs. per gallon)[2]	Solids Content (% by weight)[3]	Viscosity, with catalyst when applicable (centistokes)[4]	Flash Point (°F)[5]	Drying Time for Handling[6]	Recommended Curing Conditions	Time Required to Reach Optimum Properties	Pot Life, at Room Temperature	Shelf Life, at Room Temperature	Coverage per gallon (in sq. ft.) After One Dip	Continuous Use Temperature Range (°F)	Thermal Shock Test[7]	Solderability[8]
1B12	7.3	20	30	40	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	1 year	1 year	550	−75°F to +280°F	Passes	Good
1B15	7.6	35	470	30	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	1 year	1 year	450	−75°F to +270°F	Passes	Good
1B31	7.6	35	160	30	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	1 year	1 year	450	−75°F to +270°F	Passes	Good
1A20	8.5	50	120	90	60 min.	24 hrs. at room temp.	1 week	6 mos.	6 mos.	375	−70°F to +250°F	Passes	Excelle
1A27	8.0	50	5000	100	15 min.	24 hrs. at room temp.	1 week	1 year	1 year	450	−90°F to +250°F	Passes	Excelle
1A33	7.7	44	160	30	15 min.	24 hrs. at room temp.	1 week	1 year	1 year	300	−90°F to +250°F	Passes	Excelle
2A56	7.8	36	<20	70	60 min.	24 hrs. at room temp. or 2 hrs at 170°F	1 week	4 hrs.	6 mos.	650	−70°F to +250°F	Passes	Excelle
2B13	7.5	42	50	40	30 min.	90 min. at 200°F	1 week	24 hrs.	1 year	480	−70°F to +270°F	Passes	Poor
2A51	9.2	100	6000	non flam-mable	2 hrs.	24 hrs. at room temp. or 2 hrs. at 200°F	1 week	6 hrs.	6 mos.	200	−70°F to +250°F	Passes	Poor
2A53	7.8	54	300	70	30 min.	2 hrs. at 200°F	1 week	24 hrs.	1 year	400	−70°F to +250°F	Passes	Poor

HumiSeal TYPES LISTED IN BOLD PRINT COMPLY WITH THE REQUIREMENTS OF MIL-I-46058B

All technical data in this bulletin are based on test results using the stated standards and are believed to be correct. However, since the end use of HumiSeal materials (and the manner of storing and handling them) is beyond our control, we make no warranty — expressed or implied — as to the fitness of use, results to be obtained from or effects of use with respect to these materials. Their use shall be solely by the judgment of and at the risk of the end-user notwithstanding any statement contained in this bulletin.

1. The first digit in the type number specifies whether the prod is a one-, or a two-component system.
2. Fed-Std 141a, Method 4184.
3. Fed-Std 141a, Method 4044.
4. Fed.Std 141a, Method 4287.
5. Fed-Std 141a, Method 4291.
6. Fed-Std 141a, Method 4061.
7. Mil-I-46058B.
8. Visual evaluation for ease of soldering with an 85 watt ir through a 2 mil film.
9. Fluorescent or color coding dye may be added if required.
10. Fed-Std 141a, Method 2121.
11. Fed-Std 406, Method 7031, Procedure A.
12. Fed-Std 141a, Method 6303.
13. ASTM-D150-65T, at 1 MHz and 25°C.
14. Mil-I-46058B. Insulation resistance during 10th cycle, at 65 and 98% RH.

FOR ELECTRONICS

OF PROPERTIES

miSeal Protective Coatings are available in one-quart or one-gallon cans, five-gallon pails, or fifty-e gallon drums. HumiSeal types 1B15 and 1A27 are also available in 16-ounce aerosol containers. HumiSeal types listed in this chart may be applied by dip, brush or spray. Our recommended tech-ques for the proper application of coatings and the preparation of the substrates are described in r booklet titled "How to Use Protective Coatings Efficiently" which will be mailed to you on request sk for Bulletin No. 79).

OPERTIES OF CURED HumiSeal COATING

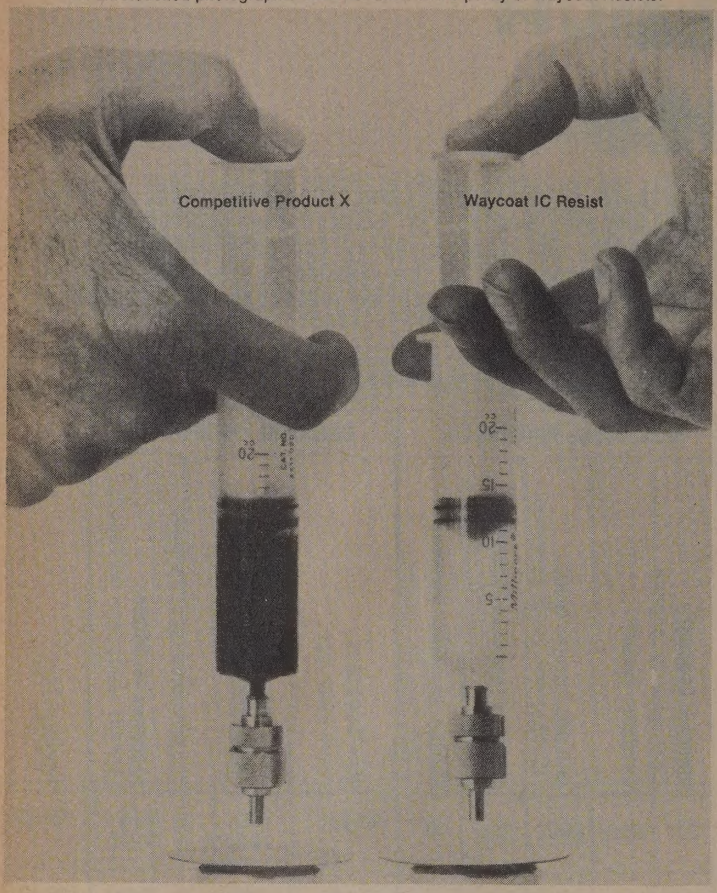
	PHYSICAL PROPERTIES						ELECTRICAL PROPERTIES					CHEMICAL PROPERTIES			
	Specific Gravity	Average Build After One Dip (mils)[10]	Water Absorption (%)[11]	Flexibility[7]	Adhesion[12]	Mar Resistance[12]	Dielectric Constant[13]	Dissipation Factor[13]	Dielectric Strength (volts)[7]	Insulation Resistance (teraohms)[7]	Moisture Resistance (gigaohms)[14]	Main Constituent	Fungus Resistance[7]	Resistance to Solvents	HumiSeal Type[1]
ter ar	1.05	0.5	.18	Very Good	Ex-cellent	Very Good	2.8	.010	6000	250	30	Acrylic	Ex-cellent	Very Good	**1B12**
ter ar	1.05	2	.20	Fair	Ex-cellent	Fair	2.3	.010	8000	350	40	Acrylic	Ex-cellent	Fair	**1B15**
ter ar	1.06	2	.20	Ex-cellent	Ex-cellent	Very Good	2.5	.010	7500	800	60	Acrylic	Ex-cellent	Good	**1B31**
ter ar	1.05	2	.30	Ex-cellent	Very Good	Ex-cellent	3.5	.028	8000	300	48	Poly-urethane	Ex-cellent	Ex-cellent	**1A20**
en ge	1.05	5	.31	Ex-cellent	Ex-cellent	Fair	3.6	.020	7500	200	12	Poly-urethane	Fair	Good	**1A27**
ow ge	1.05	2	.31	Ex-cellent	Ex-cellent	Fair	3.6	.030	7500	200	16	Poly-urethane	Ex-cellent	Good	**1A33**
nk ge	1.09	0.5	.30	Ex-cellent	Ex-cellent	Good	3.6	.024	3500	300	56	Poly-urethane	Ex-cellent	Ex-cellent	**2A56**
low ge	1.06	2	.20	Ex-cellent	Ex-cellent	Ex-cellent	3.0	.030	8000	300	33	Epoxy	Ex-cellent	Ex-cellent	**2B13**
low ge	1.10	15	.31	Fair	Good	Good	3.0	.030	6000	400	6	Epoxy	Ex-cellent	Good	**2A51**
low ge	0.95	1	.30	Ex-cellent	Ex-cellent	Ex-cellent	3.0	.030	8000	200	28	Epoxy	Ex-cellent	Ex-cellent	**2A53**

HUMISEAL DIVISION
COLUMBIA TECHNICAL CORPORATION
WOODSIDE, NEW YORK 11377
(212) 932-0800

PLEASE ASK FOR DEPT. 77

yright
/ 1970

An unretouched photographic demonstration of the purity of Waycoat Resists.



Take the plunge.

see for yourself the purity of Waycoat photo resists for the semiconductor industry.

Purity is the big reason why **WAYCOAT IC RESIST,** for the manufacture of integrated circuits, has been such a huge success. Recognizing the quickly changing requirements of the industry, **Hunt** now introduces **WAYCOAT SC RESIST** for deep or mesa-type etching and plating.

Take a good look at the advantages of the Waycoat Photo Resist System.

Application — Spin them or spray (Zicon) on SiO_2 and metallic substrates.

Quality Characteristics — Waycoat resists can be used right from the bottle without filtration because particulate matter is removed to sub-micron level and inorganic residuals are practically non-existent.

Etching — 0.2 to 0.3 mils routine with Waycoat IC Resist. But you need Waycoat SC Resist for that deep Mesa-type device.

Physical Characteristics — It's been said in the industry that Waycoat IC Resist and Waycoat SC Resist work best in the new electroplasma low temperature ashing systems. In addition you can keep Waycoat Resists on the shelf as long as you like — no gunk on the bottom of the bottles.

High Yields and Resolution — You can put more resist on, get a lower pinhole count and still get **fine line resolution.**

Waycoat Systems Approach — Don't bother filtering Waycoat IC Resist, Waycoat IC Thinner, Waycoat IC Developer or Microstrip. It's already been done to the sub-micron level. On the other hand, Waycoat SC Resist gives thicker film coatings — we recommend Waycoat PF Developer and Waycoat PF Thinner. Each system fills a specific need but all are interchangeable.

Clean Room Packaging — We package Waycoat Photo Resists and companion products in extra clean glass bottles to maintain the highest degree of purity available to the industry. So, you can be sure of batch-to-batch reproducibility. After all, it doesn't make much sense to put such pure photo resist products in ordinary, unclean containers.

For additional data — (Advanced Information Bulletin No. 210-Waycoat IC Resist, Bulletin No. 212-Waycoat SC Resist), contact the Photopolymer Division,

PHILIP A. HUNT CHEMICAL CORPORATION

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MINNEAPOLIS	612 888-5802
MONTREAL	514 521-3191
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To The Leader...In Electronic Grade Etchants

Call Hunt—the leading manufacturer of etchants for the Printed Circuit Industry — for quick dependable service and product reliability. Each major type of copper etchant produced by Hunt has guaranteed high quality and product uniformity assured by rigid laboratory control.

The following are available for immediate delivery in package or bulk shipments:

HIGH-SPEED CIRCUIT ETCH The fast etching, high capacity FERRIC CHLORIDE-type etchant that exceeds all other etchants in the etching of fine-line printed and photo resist circuitry. It etches clean and smooth with a minimum of undercut. Especially recommended for high production precision etching of the inner layers of multi-layer printed circuit boards and flexible circuitry.

NO. 826 ETCHANT The powerhouse of CHROME-type etchants designed especially for close-tolerance etching of plated circuit boards. Its long life and fast etch rate, combined with its compatibility with all types of resists — both metallic and organic — makes it equally desirable as an all-purpose etchant.

ALK-ETCH The popular choice when an ALKALINE etchant is specified. A dependable two-part system that mixes with water to provide a versatile all-purpose etching solution. It features a rapid etch rate, high copper capacity, and good bath stability. Minimizes undercutting, especially on copper laminates with plated bimetallic resists. Reduces disposal problems.

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CHEMICAL TOOLS FROM TECH SPRAY

Clean electronic equipment of all types without disassembly while running. KLEEN-ALL is non-conductive, nonflammable, can't short or arc. So safe that you can put out a match with the spray. Instantly spray-cleans relay and switch contacts without danger as they make and break under load.

No. 1604-16S 16 ounces
Less than 1 dz. 2.20/can
1 to 5 dz. 24.00/dozen
6 dz. & up 22.80/dozen

LUBE-A-TROL is a special blend of heavy duty thick white lubricant, silicone fluid and a highly efficient cleaner that is safe for all plastics. Excellent for all wire wound and carbon controls including the new miniature and plastic controls. Gives extra long lasting protection.

No. 1605-8S 8 ounces
Less than 1 dz. 1.89/can
1 to 5 dz. 20.40/dozen
6 dz. & up 19.20/dozen

RID ARC is the finest red insulating spray available. It provides excellent protection against arcing and corona discharge. Dries rapidly to tough permanent film.

No. 1609-8S 8 ounces
Less than 1 dz. 1.59/can
1 to 5 dz. 18.00/dozen
6 dz. & up 17.20/dozen

SUPER FREEZE SPRAY is a new improved chilling spray. Instantly chills suspected parts and causes intermittent ones to break down. Will not harm good components. Packed with pinpoint extension.

No. 1611-16S 16 ounces
Less than 1 dz. 1.89/can
1 to 5 dz. 20.40/dozen
6 dz. & up 19.20/dozen

CLEAR ACRYLON is an excellent protective coating for many purposes. Crystal clear coating protects against tarnish and oxidation when used on metal surfaces. Protects important papers and circuit diagrams from smudges and dirt.

No. 1612-16S 16 ounces
Less than 1 dz. 1.30/can
1 to 5 dz. 14.40/dozen
6 dz. & up 13.80/dozen

MULTI OIL is a special low viscosity low temp oil that is non-gumming and non-evaporative. It has excellent penetrating, preservative and water displacing properties. Rust and corrosion inhibitors have been added for long term protection. MULTI OIL meets the requirements of MIL-L-7870a and VV-L-800 (MIL-L-644b).

No. 1634-8S 8 ounces
Less than 1 dz. 1.19/can
1 to 5 dz. 12.84/dozen
6 dz. & up 12.00/dozen

AERO KLEEN is designed to clean aircraft switches, controls, contacts and relays. It is absolutely pure, dries rapidly and leaves no film or residue to cause drift, oscillation or frequency shift. Excellent on inductor switches, transmit/receive relays and cavity type oscillators. Formulated entirely of fluorinated hydrocarbon.

No. 1636-16S 16 ounces
Less than 1 dz. 2.69/can
1 to 5 dz. 29.00/dozen
6 dz. & up 27.50/dozen

AERO KLEEN PLUS is formulated of the same precision cleaner used in AERO KLEEN with the addition of a special military grade silicone fluid which provides lubrication and protection with a lasting film. Safe to spray into operating contacts.

No. 1637-16S 16 ounces
Less than 1 dz. 2.69/can
1 to 5 dz. 29.00/dozen
6 dz. & up 27.50/dozen

Use FD to clean VTR and Audio Tape Heads. Lifts out microscopic dirt that destroys fidelity. Can be used on microwave equipment without loss of quality. Leaves no residue.

RESEARCH LABS
Use FD in your White Rooms. Leaves no residue, high dielectric properties allow FD to be used while circuitry is in operation.

No. 1638-1G 1 gal. 16.50
No. 1638-16S 16 oz. spray can
Less than 1 dz. 2.49/can
1 to 5 dz. 27.00/dozen
6 dz. & up 25.80/dozen

TRANSISTOR SILICONE GREASE is a new product designed to coat the bases of transistors before mounting them to heat sinks. Heat conductive material draws the heat away from the transistor and transfers it to the heat sink where it is dissipated. Similar to the old style heat sink compound. Transistor Silicone Grease is easier to use and more economical.

No. 1642-6S 6 ounces
Less than 1 dz. 2.95/can
1 to 5 dz. 32.40/dozen
6 dz. & up 31.20/dozen

D-MP displaces and removes moisture from motors and other electrical equipment that have failed due to moisture. Meets MIL-C-23411, protects equipment against rust and corrosion reforming by leaving a fine protective film. Gives protection against salt water and acid fumes.

No. 1643-16S 16 ounces
Less than 1 dz. 1.49/can
1 to 5 dz. 16.20/dozen
6 dz. & up 15.60/dozen

ROSIN FLUX REMOVER is used to remove rosin fluxes from all types of electrical and electronic circuits. Specially useful on printed circuit boards in high frequency circuits where contamination can cause frequency shift. Not harmful to Nylon, Teflon or polyethylene insulation materials.

No. 1644-16S 16 ounces
Less than 1 dz. 2.25/can
1 to 5 dz. 27.00/dozen
6 dz. & up 24.60/dozen

SILICONE RESIN COAT is a tough flexible coating used to coat printed circuit boards and components to protect them. Same material as originally used during manufacture. Insulates and prevents shorts. Coats evenly and air dries quickly, requires no baking.

No. 1645-6S 6 ounces
Less than 1 dz. 1.49/can
1 to 5 dz. 16.20/dozen
6 dz. & up 15.60/dozen

SILICONE LUBRICANT lubricates auto antennas and makes them easier to raise. Seals out moisture from all objects. Lubricates and lengthens the life of rubber parts. Eliminates squeaks and prevents freezing of rubber parts.

No. 1646-16S 16 ounces
Less than 1 dz. 1.30/can
1 to 5 dz. 14.04/dozen
6 dz. & up 13.44/dozen

High Temp M.D.S. contains colloidial Molybdenum Disulfide. When sprayed onto metal surfaces the molybdnenum disulfide clings to the metal and forms an extremely effective lubricant. Very effective under high pressure and high temperature conditions.

No. 1655-8S 8 ounces
Less than 1 dz. 1.89/can
1 to 5 dz. 20.40/dozen
6 dz. & up 19.20/dozen

PENETRATING LUBRICANT is a special clear penetrant designed to loosen rusted threads and lubricate them so that they will not re-freeze. The special clear penetrant is not messy and will not stain. Excellent penetrating and lubricating qualities.

No. 1656-8S 8 ounces
Less than 1 dz. 1.19/can
1 to 5 dz. 12.84/dozen
6 dz. & up 12.00/dozen

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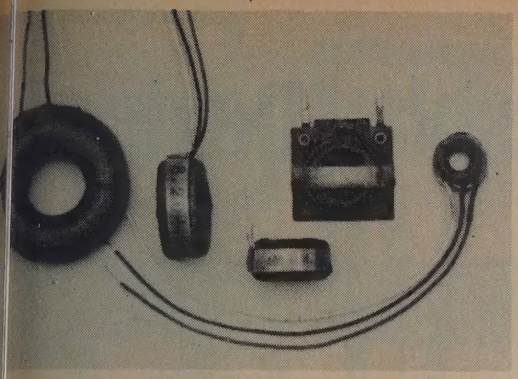
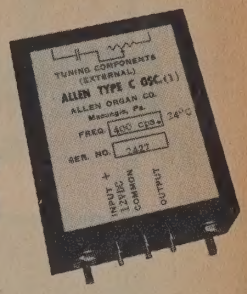


toroids OSCILLATORS



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AT ALLEN ELECTRONICS.

Allen Electronics Division manufactures these components in accordance under the most rigid quality controls, including thorough inspection and testing, for use in the world's finest electronic organs. For this reason we constantly maintain a complete inventory, which is also available to you who desire the added benefits of lower-than-competitive prices and immediate out-of-stock delivery.

TOROIDS

Available from stock. They have been used successfully in such areas as: telemetry, sound and intercommunication systems; geophysical applications; mobile communications; filters; oscillators; and test equipment.

CENTER-TAPPED

Inductance	Q	Core	O.D.	Price	Inductance	Q	Core	O.D.	Price	Inductance	Q	Core	O.D.	Price
58.2	50	P	1-5/8"	4.93	1.29 Hy.	33	P	1-1/4"	2.60	100 M.H.	10.5	P	1"	2.16
47.0	50	P	1-5/8"	4.93	1.18 Hy.	34	P	1-1/8"	2.41	91 M.H.	10.5	P	1"	2.16
43.0	50	P	1-5/8"	4.93	1.03 Hy.	31.5	P	1-1/8"	2.41	82 M.H.	10	P	1"	2.16
37.6	50	P	1-5/8"	4.93	927 M.H.	31	P	1-1/8"	2.41	78 M.H.	10	P	1"	2.16
35.4	50	P	1-5/8"	4.93	856 M.H.	30	P	1-1/8"	2.41	70 M.H.	9.3	P	1"	2.16
33.6	60	P	1-1/4"	3.66	804 M.H.	29	P	1-1/8"	2.41	65 M.H.	9.0	P	1"	2.16
31.2	55	P	1-1/4"	3.66	738 M.H.	28.75	P	1-1/8"	2.41	60 M.H.	8.7	P	1"	2.16
29.2	55	P	1-1/4"	3.66	694 M.H.	27	P	1-1/8"	2.41	56 M.H.	8.3	P	1"	2.16
27.3	55	P	1-1/4"	3.66	642 M.H.	27.25	P	1-1/8"	2.41	53 M.H.	8.1	P	1"	2.16
25.8	52	P	1-1/4"	3.66	590 M.H.	26	P	1-1/8"	2.41	50 M.H.	7.8	P	1"	2.16
23.7	46	P	1-1/4"	3.02	545 M.H.	24	P	1-1/8"	2.41	46 M.H.	7.5	P	1"	2.16
22.6	48	P	1-1/4"	3.02	494 M.H.	23	P	1-1/8"	2.41	43 M.H.	7.2	P	1"	2.16
21.5	45	P	1-1/4"	3.02	457 M.H.	21	P	1"	2.16	39 M.H.	7.0	P	1"	2.16
20.2	42	P	1-1/4"	3.02	426 M.H.	20.7	P	1"	2.16	37 M.H.	6.7	P	1"	2.16
19.5	41	P	1-1/4"	3.02	394 M.H.	20	P	1"	2.16	34 M.H.	6.5	P	1"	2.16
19.59	35	P	1-1/4"	3.02	362 M.H.	19	P	1"	2.16	31 M.H.	6.2	P	1"	2.16
18.95	34	P	1-1/4"	3.02	334 M.H.	18.5	P	1"	2.16	29 M.H.	4.6	P	11/16"	3.50
18.20	33	P	1-1/4"	3.02	317 M.H.	17.5	P	1"	2.16	27 M.H.	4.6	P	11/16"	3.50
17.88	32	P	1-1/4"	3.02	286 M.H.	17	P	1"	2.16	25 M.H.	4.5	P	11/16"	3.50
17.07	30.5	P	1-1/4"	3.02	266 M.H.	16.5	P	1"	2.16	22 M.H.	4.1	P	11/16"	3.50
16.88	29	P	1-1/4"	3.02	248 M.H.	16	P	1"	2.16	20 M.H.	3.9	P	11/16"	3.50
3.13	50	P	1-1/4"	2.60	232 M.H.	15.5	P	1"	2.16	19 M.H.	3.8	P	11/16"	3.50
2.93	48	P	1-1/4"	2.60	206 M.H.	15	P	1"	2.17	17 M.H.	3.7	P	11/16"	3.50
2.64	46	P	1-1/4"	2.60	196 M.H.	14.5	P	1"	2.16	15 M.H.	3.6	P	11/16"	3.50
2.42	43.5	P	1-1/4"	2.60	184 M.H.	14	P	1"	2.16	14 M.H.	3.3	P	11/16"	3.50
2.27	43	P	1-1/4"	2.60	167 M.H.	13.5	P	1"	2.16	12 M.H.	3.1	P	11/16"	3.50
2.15	40	P	1-1/4"	2.60	157 M.H.	13	P	1"	2.16	11 M.H.	2.9	P	11/16"	3.50
1.98	41	P	1-1/4"	2.60	147 M.H.	12.5	P	1"	2.16	10 M.H.	2.8	P	11/16"	3.50
1.81	38	P	1-1/4"	2.60	138 M.H.	12	P	1"	2.16	9 M.H.	2.7	P	11/16"	3.50
1.66	37	P	1-1/4"	2.60	126 M.H.	11.5	P	1"	2.16	8 M.H.	2.6	P	11/16"	3.50
1.48	36	P	1-1/4"	2.60	110 M.H.	11	P	1"	2.16	7 M.H.	2.5	P	11/16"	3.50
1.43	36	P	1-1/4"	2.60	106 M.H.	11	P	1"	2.16	6 M.H.	2.4	P	11/16"	3.50

NO-CENTER-TAP

Inductance	Q	Core	O.D.	Price
10 M.H.	5.7	I	1"	1.11
20 M.H.	6.1	I	1"	1.11
30 M.H.	6.7	I	1"	1.11
35 M.H.	7.2	I	1"	1.11
40 M.H.	7.6	I	1"	1.11
50 M.H.	8.9	I	1"	1.11
75 M.H.	5.7	I	1"	1.17
100 M.H.	6.4	I	1"	1.17
150 M.H.	7.5	I	1"	1.17
200 M.H.	8.4	I	1"	1.17
250 M.H.	9	I	1"	1.17
300 M.H.	9.8	I	1"	1.17
400 M.H.	11	I	1"	1.17
500 M.H.	23	P	1-1/8"	2.38
600 M.H.	25	P	1-1/8"	2.38
800 M.H.	29	P	1-1/8"	2.38
1 Hy.	18.6	F	1-1/16"	1.92
1.2 Hy.	16.1	F	1-1/16"	1.92
1.5 Hy.	15	F	1-1/16"	1.92
2 Hy.	16.5	F	1-1/16"	1.92
2.5 Hy.	24.3	F	1-1/16"	1.92
3 Hy.	26.2	F	1-1/16"	1.92
4 Hy.	25.7	F	1-1/16"	1.92
5 Hy.	18.8	F	1-1/16"	1.92
8 Hy.	35	F	1-1/16"	1.92
(±10%)				

CORE DETAILS
P = Permalloy
F = Ferrite
I = Powdered Iron

DISCOUNT SCHEDULE
1 — 24 . . . . . LIST
25 — 99 . . . . . LESS 15%
100 — 249 . . . . . LESS 20%
WRITE FOR HIGHER QUANTITY DISCOUNTS

Inductance and "Q" measured at 1 Volt
1,000 c.p.s. — Inductance Tolerance ± 2%
58.2 Hy. to 10.5 Hy. Tolerance ± 5%
Ferrite Core — Inductance Tolerance ± 5%

OSCILLATORS

TYPE "C" AUDIO OSCILLATOR

This compact unit is designed for applications that have moderate requirements for stability in respect to temperature and frequency drift. The transistorized package is completely encapsulated and provides a construction that is extremely rugged.

SPECIFICATIONS
Frequency — Any frequency from 15 Hz. to 10 kHz.
Frequency Accuracy — ± .2% of specified frequency with 12V. D.C. input, resistive load of 200K ohms and 24° C. ambient.
Frequency Drift — Approximately 1% from -20°C. to +45°C. Less than 0.3% with input voltages from 10 to 14V. D.C.
Frequency Adjustment Range (using external components) — ± 2.0% (see arrangements two and three below)
Input Voltage — 5 to 15V. D.C.
Input Current — Does not exceed 5 ma. @12V. D.C.
Output Voltage — Proportional to input voltage. Typically 1.5 to 2.0V. RMS with 12V. D.C. input and a load resistance of 200K ohms.
Output Wave Shape — Sinusoidal. Total distortion approximately 2.0% with 12V. D.C. input.
Dimensions — 15 — 249 cps. 4 3/8" x 2 13/16" x 1½"
250 — 10,000 cps. 3 9/16" x 2½" x 1 1/8"

Type "C" oscillators can be produced in the following arrangements:
1. Any specific frequency in the range at an ambient temperature of 24° C. and with no provision for frequency adjustment.
2. Provision for frequency adjustment of ±2% of a specified frequency by means of an externally connected capacitor (Type "C"). A capacitor will be furnished which will provide the specified frequency at 24° C. ambient.
3. Provision for continuously variable frequency adjustment of ± 2% of a specified frequency by means of an externally connected variable resistance and a fixed capacitor. External components not furnished but component values are specified. This feature is very convenient when a "front panel" fine adjustment of frequency is desirable.

PRICE — Order by specifying type, frequency and arrangement number.

Frequency	Price
15 — 20 Hz.	$ 39.20
21 — 100 Hz.	$ 26.50
101 — 500 Hz.	$ 21.20
501 — 10,000 Hz.	$ 26.50

QUANTITY DISCOUNT
Discount is applicable for quantities of one frequency only.

Quantity	Discount
1 — 10	Net
11 — 50	Less 15%
51 — 99	Less 20%
100 — up	Less 25%

TYPE "P" SINE WAVE OSCILLATOR

A plug-in unit with a standard octal tube base type connector. A knurled thumbscrew type adjustment on top of the unit provides for variable, fine adjustment of frequency, plus or minus two per cent of the specified frequency.

SPECIFICATIONS
Frequency — Any frequency from 20Hz. to 200 kHz.
Frequency Drift — Approximately 1% from -20° C. to +45°C. Less than 0.3% with input voltages from 10 to 14V. D.C.
Input Voltage — 5 to 15V. D.C.
Input Current — Does not exceed 5 ma. @ 12V. D.C.
Output Voltage — Proportional to input voltage. Typically 1.5 to 2.0V. RMS, with 12V. D.C. input and load resistance of 200K ohms.
Output Wave Shape — Sinusoidal. Total distortion approximately 2.0% with 12V. D.C. input.
Dimensions — Mounting area — 2 3/16" square. Overall height — 4 3/4" max. Height above octal mounting socket — 4" max.

PRICE — $35.00. Order by specifying type and frequency.
QUANTITY DISCOUNT—Same discount schedule as Type "C"

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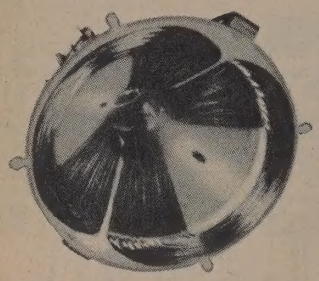
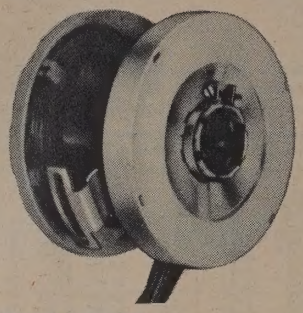
Amperex Video Display Devices

MAGNETIC DEFLECTION YOKES



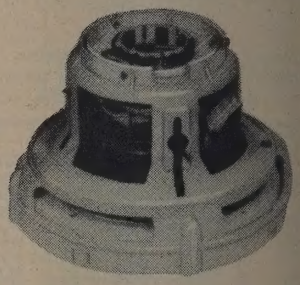
SERIES AT1040

Amperex B & W Line Deflection Yokes has been designed for use with 90° and 110° picture tubes having a neck diameter of 28mm. They employ saddle shaped line coils and toroidal frame coils with coinciding deflection centers. They have been designed for operation with tube-equipped or transistor-equipped TV.



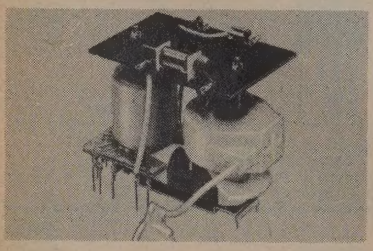
SERIES AT1055

Amperex Color Line of Deflection Yokes consists of two major groups. Variations of our **Compact** color deflection yoke AT1055 Series can be used on 19-25 inch 90° shadow mask color CRTS. This yoke employs saddle horizontal and vertical coils isolated by means of non-flammable polypropylene shell-liners. The horizontal and vertical coils are connected in series, but can be parallel connected upon request.



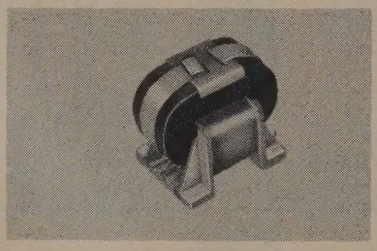
SERIES AT1022

Amperex Second Major Line of Color De flection Yokes is our AT1022 Series. Thi professional series is aimed at monito manufacturers requiring a high qualit product. Designed for 90° shadow mas color CRT sizes 18-25" offering very tigh tolerances. This yoke is designed to b rotated and oriented within its own me chanical housing.



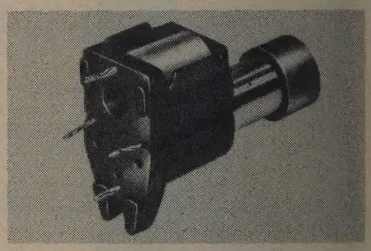
HORIZONTAL OUTPUT TRANSFORMERS: TYPE AT2083

Two types available. 3rd harmonic and 5th harmonic tuned 20-25 KV execution. Both types are of flame proof construction. Both executions are designed for use in color TV receivers.



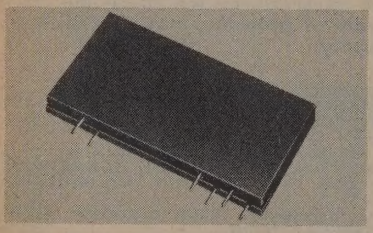
VERTICAL OUTPUT TRANSFORMERS: TYPE AT3513

Amperex AT3513 vertical output transformer is designed for tube equipped and transistorized television receivers. This output transformer is intended for use with 19 and 23 inch 110° CRTS, in conjunction with the Amperex Deflection Yoke AT1040. The magnetic circuit is comprised of 2 C-cores and three separate windings.



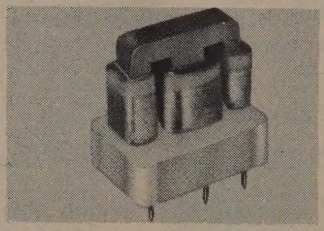
ADJUSTABLE LINEARITY CONTROL: TYPE AT4042/20

This unit has been designed for use in color TV circuits to adjust the linearity of the line deflection. It consists of a coil wound about a FERROXCUBE rod and three FERROXDURE magnets. This control is adjustable by means of a rotating magnet which adjusts the biasing field and thus the linearity of the line deflection.



DELAY LINES: (TYPE DL40 ILLUSTRATED)

Two types of Glass Delay Lines are available from Amperex. Both D. lines are intended for use in decoded circuits of color TV receivers. For receivers up to European PAL standard the nominal frequency of these lines is 4.433619 MHz and the phase delay time is 63.943 microseconds.



PINCUSHION TRANSDUCTOR: TYPE AT4041

This transductor is used in conjunction with deflection circuitry for large screen color television to correct for North-South and East-West distortion. Only device of its type, offering four-way correction. An amplitude control is also available to vary the amount of correction. Will replace active circuits performing same task.

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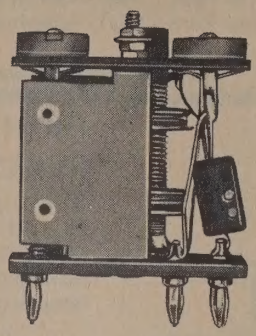

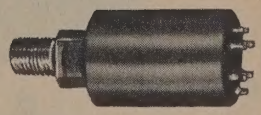

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R-388	T-279	PRC-8, 9, 10	AM-1565	CN-371	MD-239	URM-48
R-390	T-368	PRC-25	AM-1955	CV-116	ME-57	URM-79
R-390A	T-893	PRC-77	AM-1956	GRA-53	MX-2799	URM-80
R-391		RT-77	AM-1957	GRC-8,9,10	PRC-25	URM-103
R-392		RT-198	AM-1958	GRC-19	PRC-77	USM-159
R-666		RT-246	AM-2014	GRC-26	SRC-20/21	UQN-1J
R-746		RT-319	APX-65	GRC-50	SRR-11/13	VRC-12
R-1148		RT-323	APX-294	GRC-86	TCC-29	VRC-24
R-1331		RT-441	ARN-21	GRC-106	TN-339	VRM-1
URC-9		RT-581	ARN-31	GRC-109	TRC-68	WLR-1
URC-32		RT-618	ARN-32		TRD-4,15,17,23	
WLR-1		RT-771	ARN-52		TS-1777	
WRR-3						

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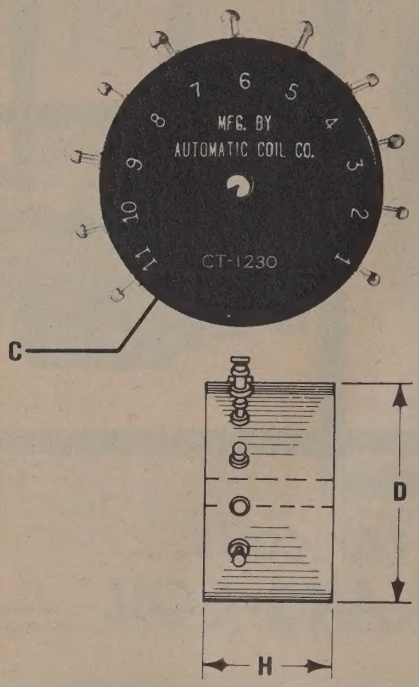
TOROIDS



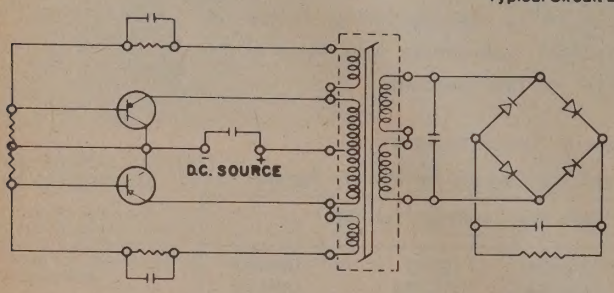
HIGH TEMPERATURE PLASTIC-CASED CONVERTER

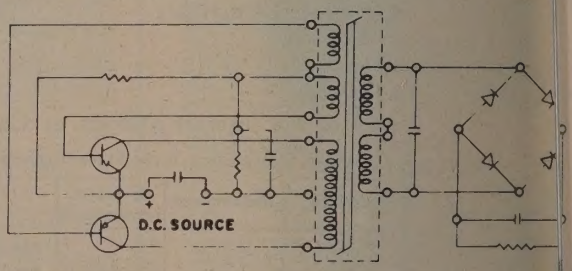
Toroids designed to exceed MIL-T-27A grade 5 class R requirements with added life expectancy thru increased efficiency and reliability.

Normal operation frequency between 1500 and 5000 Hz. Special designs obtain operating frequency to 10,000 Hz.

Part No	DC Input Volts	DC Output Volts Bridge/FW C.T.	DC Output Current (MA)	Dimension D	Dimension H	Mtg. Hc "C"
CT-630	6.3	300/150	100	2	1	#8
CT-632	6.3	325/162.5	150	2	1	#8
CT-637	6.3	375/187.5	200	2 3/4	1 3/8	#8
CT-645	6.3	450/225	150	2 3/4	1 3/8	#8
CT-1225	12.6	250/125	100	1 3/4	7/8	#6
CT-1230	12.6	300/150	200	2	1	#8
CT-1232	12.6	325/162.5	150	2	1	#8
CT-1237	12.6	375/187.5	200	2	1	#8
CT-1245	12.6	450/225	150	2	1	#8
CT-1250	12.6	500/250	250	2 3/4	1 3/8	#8
CT-1260	12.6	600/300	200	2 3/4	1 3/8	#8
CT-2825	28	250/125	80	1 1/2	3/4	#4
CT-2830	28	300/150	100	2	1	#8
CT-2832	28	325/162.5	200	2	1	#8
CT-2837	28	375/187.5	200	2	1	#8
CT-2845	28	450/225	200	2	1	#8
CT-2850	28	500/250	250	2 3/4	1 3/8	#8
CT-2860	28	600/300	200	2 3/4	1 3/8	#8

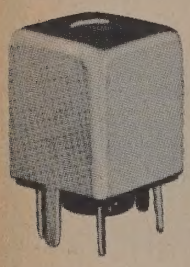
Typical Circuit Diagrams for CT Toroids

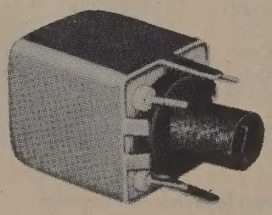


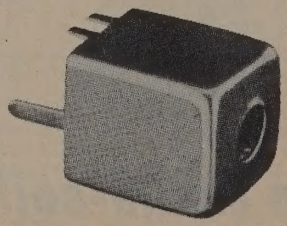


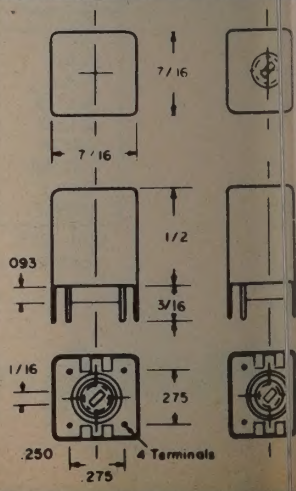
Variable rf coils • MB SERIES

miniature, shielded, printed circuit mounting









MB-Bottom Tuned
MBT-Bottom & Top Tuned
Available in inductances from .10uH to 1000uH.
For details write for catalog.

AUTOMATIC COIL

DIVISION OF DESIGNATRONICS
76 E. Second Street, Mineola, New York 11501/Telephone (516) 741-7070/TWX 510-222-5889

TOROIDAL INDUCTORS

OPEN CONSTRUCTION STYLES

OC

OCW

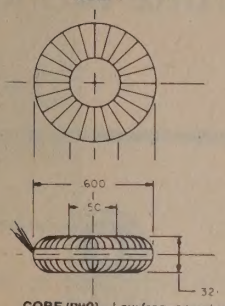
EC

OC—Wound to approx. inductance and specified turns—supplies w/18" self leads for induc.—trimming by user.

OCW—Wound to 1% inductance, banded w/glass tape & wax impreg—supplied w/6" plastic leads

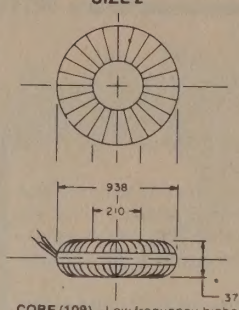
EC — same as OCW, except epoxy dipped. 2 coats

SIZE 1



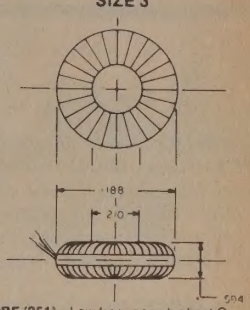
CORE (090)—Low frequency-highest Q up to 6 KHz

SIZE 2



CORE (109)—Low frequency-highest Q up to 5 KHz

SIZE 3



CORE (251)—Low frequency-highest Q up to 4 KHz

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
090-103	10mH	2.9	242
090-203	20mH	5.7	165
090-503	50mH	14.3	100
090-503	50mH	14.3	100
090-104	100mH	29	69
090-204	200mH	57	47
090-504	500mH	103	29
090-105	1H	286	20
090-205	2H	562	14
090-505	5H	1430	8.8

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
109-103	10mH	1.33	221
109-203	20mH	1.33	221
109-503	50mH	6.03	91
109-503	50mH	6.03	91
109-104	100mH	13.3	64
109-204	200mH	23.9	44
109-504	500mH	60.1	27
109-105	1H	131.8	18
109-205	2H	235	13
109-505	5H	660	11

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
251-103	10mH	0.77	172
251-203	20mH	1.54	127
251-503	50mH	4.22	72
251-503	50mH	4.22	72
251-104	100mH	6.85	50
251-204	200mH	12.3	34
251-504	500mH	30	21
251-105	1H	68.6	15
251-205	2H	123	10
251-505	5H	300	6

EPOXY CASED STYLES

ECC

ECS

ECT

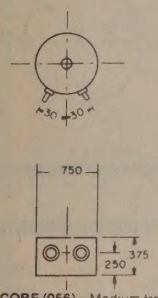
ECC provided w/clearance hole

ECS provided w/MTG stud

ECT provided w/tapped insert

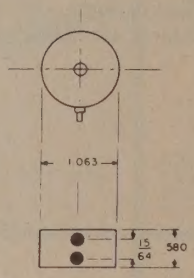
Ambient temp. range 55° C to 105° C

SIZE 1



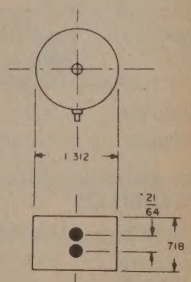
CORE (056)—Medium frequency-highest Q from 6 KHz to 20 KHz

SIZE 2



CORE (068)—Medium frequency-highest Q from 5 KHz to 20 KHz

SIZE 3



CORE (157)—Medium frequency-highest Q from 4 KHz to 20 KHz

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
056-502	5mH	2.3	360
056-103	10mH	4.9	242
056-203	20mH	11.2	165
056-503	50mH	25	100
056-104	100mH	49	69
056-204	200mH	115	47
056-504	500mH	290	29
056-105	1H	520	20
056-205	2H	1050	14

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
068-502	5mH	.92	320
068-103	10mH	2.1	221
068-203	20mH	3.7	151
068-503	50mH	9.4	91
068-104	100mH	21	64
068-204	200mH	46	44
068-504	500mH	90	27
068-105	1H	213	18
068-205	2H	475	13

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
157-502	5mH	0.6	255
157-103	10mH	1.07	172
157-203	20mH	1.89	127
157-503	50mH	6	72
157-104	100mH	10.6	50
157-204	200mH	23.9	34
157-504	500mH	60.2	21
157-105	1H	107	15
157-505	5H	605	6

HERMETICALLY SEALED STYLES

HCL

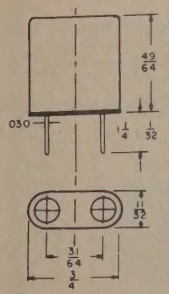
HCT

HCL - hermetically sealed in crystal case w/lead type terminals.

HCT - hermetic sealed in larger crystal case w/glass compression terms and threaded Mtg. inserts.

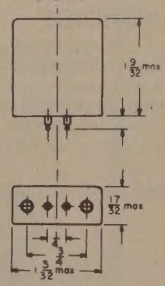
Ambient temp range 55° C to 105° C.

SIZE 1



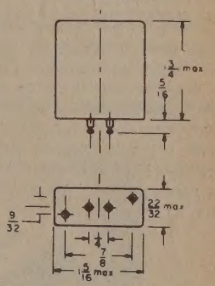
CORE (027)—High frequency-highest Q from 20 KHz to 100 KHz

SIZE 2



CORE (032)—High frequency-high Q from 20 KHz to 100 KHz

SIZE 3



CORE (075)—High frequency-high Q from 20 KHz to 75 KHz

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
027-102	1mH	1.2	942
027-202	2mH	2.1	625
027-502	5mH	5.3	374
027-103	10mH	12	251
027-203	20mH	22	172
027-503	50mH	51	103
027-104	100mH	115	71
027-204	200mH	210	48
027-304	300mH	330	41
027-504	500mH	510	30

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
032-202	2mH	.92	514
032-502	5mH	2.29	308
032-103	10mH	5.10	216
032-203	20mH	9.06	149
032-503	50mH	22.9	93
032-104	100mH	57.8	64
032-204	200mH	92	44
032-304	300mH	143	36
032-504	500mH	234	26

Part No.	Inductance ±1% at 1 KHz	DCR ±20% Ohms	SRF Min KHz
075-502	5MH	1.0	260
075-103	10MH	2.3	178
075-203	20MH	4.3	120
075-303	30MH	6.6	97
075-503	50MH	11	73
075-104	100MH	24	50
075-204	200MH	44	35
075-304	300MH	67	28
075-504	500MH	110	21

order: Prefix part # with style, ample: HCL-090-503

AUTOMATIC COIL

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76 E. Second Street, Mineola, New York 11501/Telephone (516) 741-7070/TWX 510-222-5889

MINIATURE VARIABLE INDUCTORS

Available in inductance ranges from 0.1 to 4700 uH
Designed to meet MIL-C-15305C

Designed for printed circuit application, this Automatic Coil series offers high reliability and exceptional stability over extreme temperature variations. For high reliability, inductors are fully epoxy-encapsulated. They are shock-proof and moisture-proof.

Ideal for printed circuit application, these high-Q units measure 13/32" in diameter by 1/2" high. Two mounting terminals are spaced 9/32" on center for vertical mount. The tuning access is from either end.

ELECTRICAL CHARACTERISTICS

Inductance Range: 0.33 to 4700μH Tunable Range ±20%
0.15 to 0.22μH Tunable Range ±15%
0.1μH Tunable Range ±10%
All measurements at 25°C on Q-Meter using miniature alligator clips mounted ¼" from body.

Self-Resonant Frequency: Minimum f_0 to be not less than 80% of published data as measured with Grid-Dip Meter

DENSITY CHARACTERISTICS

Volume: 0.063 cubic inches

Weight: 2.6 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

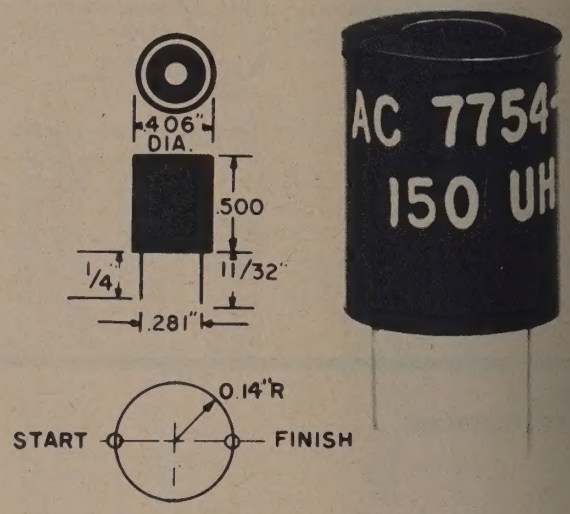
Torque: 0.75 to 5.0 inch-ounces

Operating Temperature: −55°C to +125°C

Terminal Strength: Meets five pound pull tests.

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305C, Grade 1, Class B. Vibration: Low frequency 10 Hz to 55 Hz at .06" total excursion at rate of 1 linear sweep per minute for 2 hours repeated for each of 3 mutually perpendicular planes. Shock: 50G, 11ms.

Marking: Manufacturer data printed.



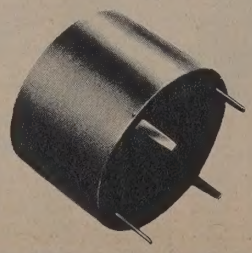
Part No.	L nom uH	Q at L nom Hz	Q at L nom MHz	Approx. Fo. L nom MHz	Max DCR at 25° C
AC 7754-D10	0.10	85	25.	500.	0.02
AC 7754-D15	0.15	100	25.	500.	0.035
AC 7754-D22	0.22	100	25.	500.	0.04
AC 7754-D33	0.33	100	25.	334.	0.04
AC 7754-D47	0.47	100	25.	285.	0.05
AC 7754-D68	0.68	100	25.	237.	0.07
AC 7754-1	1.	90	25.	205.	0.13
AC 7754-1.5	1.5	70	7.9	168.	0.24
AC 7754-2.2	2.2	73	7.9	135.	0.3
AC 7754-3.3	3.3	80	7.9	112.	0.45
AC 7754-4.7	4.7	75	7.9	100.	0.8
AC 7754-6.8	6.8	80	7.9	80.	1.1
AC 7754-10	10.	82	7.9	67.	1.9
AC 7754-15	15.	65	2.5	54.2	3.2
AC 7754-22	22.	55	2.5	17.5	3.4
AC 7754-33	33.	54	2.5	15.	3.6
AC 7754-47	47.	51	2.5	13.2	4.5
AC 7754-68	68.	55	2.5	12.0	5.5
AC 7754-100	100.	50	2.5	10.5	6.7
AC 7754-150	150.	50	2.5	10.5	6.7
AC 7754-220	220.	50	.79	3.0	11.
AC 7754-330	330.	48	.70	2.24	16.
AC 7754-470	470.	45	.79	1.9	18.
AC 7754-680	680.	42	.79	1.9	21.
AC 7754-1000	1000.	40	.79	1.4	38.
AC 7754-1500	1500.	40	.25	1.14	54.
AC 7754-2200	2200.	44	.25	0.96	66.
AC 7754-3300	3300.	46	.25	0.86	85.
AC 7754-4700	4700.	48	.25	0.76	99.

MPC SERIES COLOR-CODED TOROIDS

Molded printed circuit toroids available in ten coded E.I.A. colors. Designed to speed production of printed circuit assemblies, the color coding can be used to indicate the correct value toroid to use and where to position it on the PC board.

Inductance values range from 100 microhenries to 500 millihenries. The toroid can be furnished tapped or with a secondary winding to satisfy requirements.

Dimensions are: O.D. 27/32"; height: 5/8" max.; pins: 1/8" long +1/16"−0.



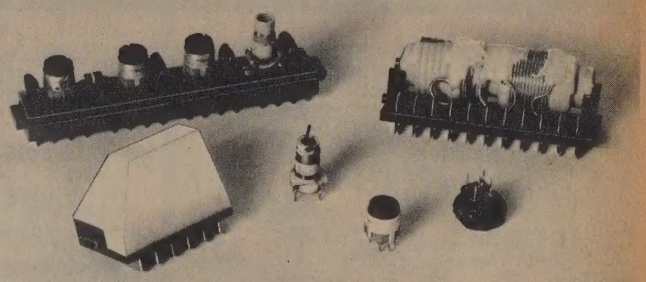
AUTOMATIC COIL

DIVISION OF DESIGNATRONICS

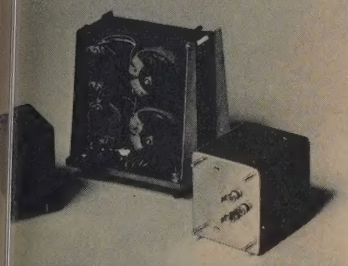
76 E. Second Street, Mineola, New York 11501/Telephone (516) 741-7070/TWX 510-222-5889

SPECIAL ASSEMBLIES

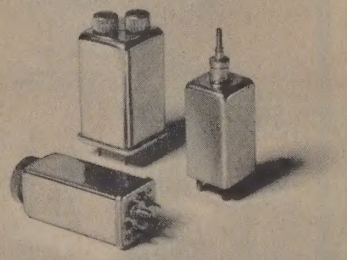
Automatic Coil, with nearly 20 years of experience, is a reliable source of standard RF coils, transformers, toroids and filters. And an innovative source of custom designed components and assemblies. Write for free catalog.



COIL ASSEMBLIES
Shown here are typical special coil assemblies manufactured for use in the U.S. Navy WRC-1 Receiver-Transmitter System (Receiver R1051, Transmitter 827, Amplifier AM-3007, Antenna Coupler CU-937)

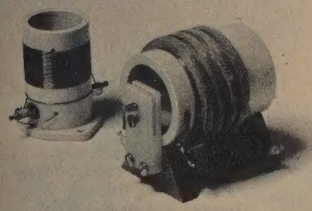


DISCRIMINATORS & FILTERS
Band Pass, Band Rejection, Low Pass, High Pass. Various types of discriminators from 1000 hertz to 3000 hertz tuned and hermetically sealed.

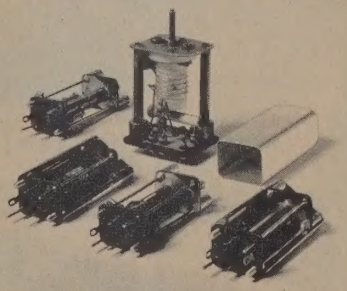


R-F & I-F XFMRS
Hermetically sealed R-F and I-F transformers for military and high quality commercial application.

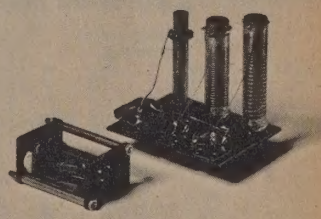
RF COIL ASSEMBLIES
These high frequency, precision coil assemblies are produced for the U.S. Navy PRC-47 Personnel Radio Communication System.



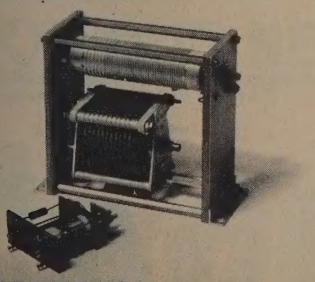
HIGH VOLTAGE XFMRS
High frequency high voltage power supply transformers, used on the Radar Jitter Tester.



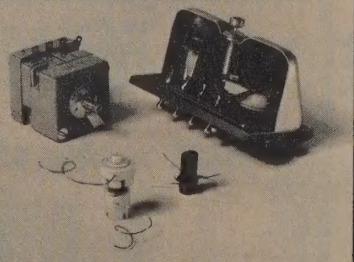
TRANSFORMERS
The complete set of 11 transformers, consisting of R-F, I-F, Limiter & Discriminator for the GRC/R108, R109 and R110 Radio Receiver. Signal Corps.



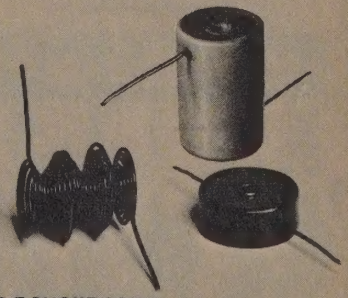
VARIABLE PITCH COILS
Complete facilities for variable pitch winding, to customer's specific requirements.



VARIABLE INDUCTOR & CAPACITOR ASSEMBLY
Pick transformer, variable inductor and capacitor assembly for a 10 K.W. Transmitter manufactured for the Navy. (T-17)



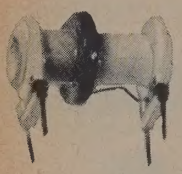
MICA FILLED SUPPORTS & ASSEMBLIES
for low loss transformers and R-F coils.



R-F CHOKE COILS
Low distributed capacity R-F Choke Coils—for the Radio AN/GRR-5.

CADDELL-BURNS

40 East 2nd Street Mineola, N. Y. 11501 — Area Code 516 Pioneer 6-23



TYPE 6200

Variable R.F. Inductors

Four Printed Circuit Terminals, Mounting — .3" x .5" Centers

Polyester Cellulose Coil Form

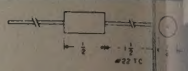
Part No.	Inductance Range Microhenries Min.	Max.	Q'	Q"	Nom. D.C. Res. Ohms	Wire Size AWG
6200—1	.06	.09	80	105	.008	22
6200—2	.09	.16	100	130	.010	22
6000—3	.15	.29	120	140	.011	22
6200—4	.19	.40	130	145	.012	22
6200—5	.32	.68	80	105	.08	20/44
6200—6	.60	1.35	80	125	.11	20/44
6200—7	1.14	2.5	90	135	.15	20/44
6200—8	2.0	4.0	100	140	.21	20/44
6200—9	3.1	5.6	110	120	.26	20/44
6200—10	4.5	8.1	48	85	.29	20/44
6200—11	7.0	11.4	43	150	.37	20/44
6200—12	9.7	16.4	80	140	.47	20/44
6200—13	15.6	26.2	90	155	.61	20/44
6200—14	19.2	44	80	110	1.80	7/44
6200—15	41	95	80	90	2.56	7/44
6200—16	70	183	65	100	3.24	7/44
6200—17	180	525	90	98	5.76	7/44
6200—18	445	1040	94	105	9.32	7/44

Note: Inductance & Q at various frequencies can be altered by changing type of core used (see parts section for cores available). Dash No. 1 thru 15 uses Powdered Iron Core 302—250— 6R. Dash No. 16 thru 18 uses Ferrite Core 303—250—6R

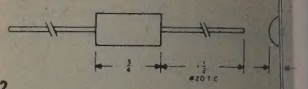
HIGH - Q MINIATURE FERRITE CHOKES, 10% Tol.

HIGH INDUCTANCE AND LOW D.C. RESISTANCE IN A MAGNETICALLY SHIELDED PACKAGE ESPECIALLY SUITED FOR LOW FREQUENCY FILTER APPLICATIONS AND TRANSISTORIZED CIRCUITS.

TYPE 1670



Stock No.	Inductance Milli-henries	Min. Q	A.C. Test Volts	Max. D.C. Res. Ohms	Current Rating MA
1670-1	.25	3.0	.007	.22	800
1670-2	.50	3.0	.014	.40	500
1670-3	1.0	3.0	.028	.75	315
1670-4	2.5	3.5	.07	2.2	250
1670-5	5.0	3.5	.14	3.9	200
1670-6	10.0	3.5	.15	7.0	125
1670-7	25.0	3.5	.30	18	125
1670-8	50.0	4.0	.40	35	75
1670-9	100.0	4.0	.24	60	50



TYPE 1662

1662-1	5.0	10.0	.14	.75	800
1662-2	10.0	10.0	.16	2.2	500
1662-3	25.0	10.0	.32	4.0	315
1662-4	50.0	10.0	.42	9.5	200
1662-5	100.0	10.0	.24	26	125
1662-6	250.0	10.0	.40	50	75
1662-7	500.0	10.0	.46	150	50
1662-8	1000.0	10.0	.25	220	30

TYPE - 435

Subminiature Variable Coil

Printed Circuit—Nylon Form
Brass Tinned Shield .420 sq. x .575 h.

Stock No.	Inductance Range Microhenries Min.	Max.	Q'	Q"	Wire Size AWG
435-1	0.25	0.5	90	60	26
435-2	0.48	1.0	85	60	30
435-3	0.9	2.1	85	60	32
435-4	1.7	3.9	55	65	36
435-5	3.5	8.5	60	50	38
435-6	7.5	17.0	60	50	38
435-7	16.5	35.0	55	60	7/44
435-8	33.0	70.0	50	50	7/44

TYPE 6320

Miniature Variable Inductor
Horizontal Mounting — Powdered Iron Shielding
Printed Circuit — Nylon Coil Form
Tin Plated Brass Can .420 sq. x .575 L.

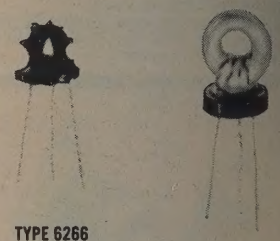
Part No.	Inductances Range Microhenries Min.	Max.	Q'	Q"	Wire Size AWG
6320—1	.25	.65	90	50	26
6320—2	.5	1.2	87	68	30
6320—3	.9	2.3	90	63	32
6320—4	2.0	5.3	68	70	36
6320—5	4.4	10	56	102	7/44
6320—6	8	16	48	100	7/44
6320—7	13	29	70	97	7/44
6320—8	23	54	58	80	7/44
6320—9	45	95	60	70	7/44
6320—10	77	155	35	65	39
6320—11	125	290	41	60	39
6320—12	230	520	42	54	39
6320—13	420	860	41	47	39
6320—14	700	1200	39	52	39

TYPE - 620

Microminiature Ferrite Chokes—10% Tol.

Form Size .075" D x 11/32" D. L.

Stock No.	Inductance Microhenries	Q	Self Res. MHz	D.C. Res.	Wire Size AWG
620-1	1	40	235	.12	36
620-2	2.5	40	150	.19	36
620-3	5	40	100	.26	36
620-4	7.5	40	90	.33	36
620-5	10	45	75	.38	36
620-6	15	60	60	.66	38
620-7	20	55	53	.80	38
620-8	25	50	49	.93	38
620-9	50	90	34	2.85	42
620-10	75	90	28	5.80	44
620-11	100	90	23	7.50	44

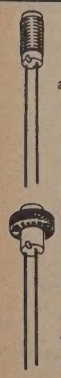


TYPE 6266

TYPE 6305 TYPE 6306

MATCHING TRANSFORMERS
BIFILAR WINDING ON FERRITE TOROID
Mounted On Transipad
Three Self-Leads On 0.1" Radius
Measured On Boonton 250-A RX Meter

Part No.	Frequency MHz	Load Ohms	Output Impedance Ohms	Cp pf.
6266	70	50	200 ± 10	—1 ± 1.0
6306	70	75	300 ± 30	—7 ± 1.0
6305	150	100	400 ± 40	—4 ± 1.0



TYPE - 680

One End Chokes—5% Tol.

Phenolic Coil Form Size .218" D. x ½" L. Particularly adapted for close point to point and printed circuit wiring.

Stock No.	Inductance Microhenries	Q	Self Res. M.C.	DC Res. Ohms	Wire Size AWG
680-1	1.0	35	140	.06	26
680-2	2.5	70	85	.22	30
680-3	5.0	70	70	.70	34
680-4	7.5	70	50	.95	34
680-5	10	35	47	1.6	36
680-6	10	30	25	1.3	36
680-7	15	30	21	1.5	36
680-8	25	25	17	2.1	36
680-9	50	25	12	3.0	36
680-10	100	35	9	4.5	36
680-11	250	30	6	7.5	36
680-12	500	30	4.4	11.0	36
680-13	750	30	3.6	14.0	36
680-14	1000	40	2.2	17.0	36
680-15	2500	40	1.5	28.0	36

TYPE - 660

Miniature Choke, Single Layer—10% Tol.

Phenolic Form .095" D. x 3/16" L.

Stock No.	Inductance Microhenries	Q	Self Res. MHz	DC Res. Ohms	Wire Size AWG
660-1	0.1	65	....	.03	26
660-2	0.2	60	....	.03	28
660-3	0.3	55	....	.06	30
660-4	0.4	55	>400	.06	30
660-5	0.5	55	360	.13	32
660-6	0.75	50	300	.22	34
660-7	1.0	30	260	.37	36
660-8	1.5	30	210	72	38
660-9	2.0	30	180	.95	38

TYPE 6150

HI CURRENT CHOKES — 10% Tolerance
VINYL INSULATED JACKET
Ferrite Form Size 3/8" D x 1" L

Stock No.	Inductance Micro-henries	Max. D.C. Res. Ohms	Current Rating Amps.	Min. Q	Wire Size AWG
6150-1	10.0	0.020	10.0	32	18
6150-2	20.0	0.035	6.0	25	20
6150-3	30.0	0.060	4.0	28	22
6150-4	40.0	0.105	2.5	30	24
6150-5	50.0	0.110	2.5	20	24
6150-6	75.0	0.180	1.5	25	26
6150-7	100.0	0.360	1.0	30	28

Send Your Prints—Coils Made to Your Specs

GO AHEAD—ASK US

COIL FORMS

Ceramic, Phenolic, Printed Circuit, Shielded Molded Choke Forms

COIL PARTS

Tubing
Cores; powdered iron, brass, ferrite
Ferrite Threaded Cores
Coil Tube Bushing and Mounting Clips
Terminal Boards, Coil Shields, Spade Bolts
Terminal Rings, Terminals, Collars
Coil Wire, Varnish, Cement, Wax, Tuning Tools

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TOUGH COIL JOBS? Whether you need a hundred pieces or a million, you'll find we offer ■ Faster turn-around on custom samples ■ Complete design and engineering assistance ■ Close production coordination including cost-saving statistical control on high volume items. We're ready to talk business.

Engineering and Development

When engineering assistance is required, Dale is staffed and equipped to perform.

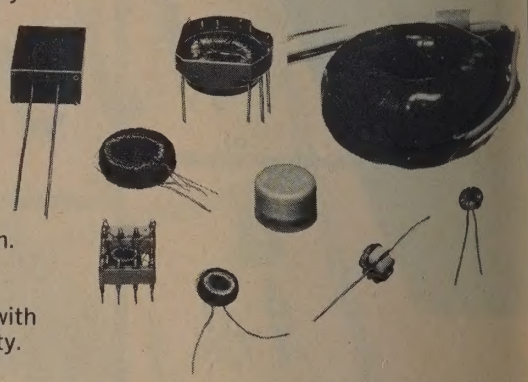
1. Production Engineering to translate your specifications into a product with **optimum quality** and **economy:**
2. Development Engineering to provide the electrical function you require.
3. Design Engineering to transform your basic idea into parts.

Production

Ability to move quickly in converting your order to finished parts is a Dale trade-mark. Facilities are available for everything from high volume commercial parts to highly sophisticated military items requiring specialized production and test equipment. In dealing with Dale, you draw on a background of production experience which can provide a definite advantage in accelerating availability.

Quality Control

Fulltime quality control personnel and the facilities of Dale's company-wide reliability and quality control organization enable fast action in establishing military test procedures and in meeting other government requirements—including MIL-Q-9858.

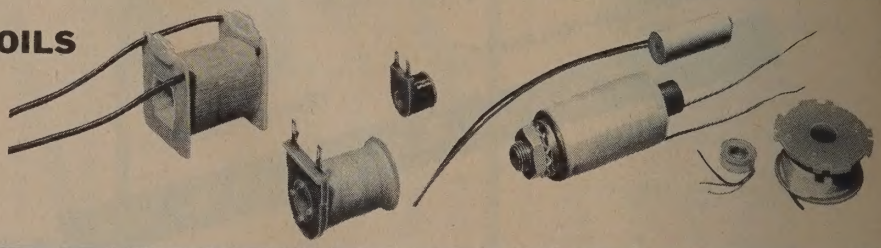


CUSTOM TOROIDS

- Potted with case sizes to fit your specific designs.
- Open Wound using Dale-formulated coatings for extra protection.
- Hermetically-sealed Cans.
- Pulse Transformers, Inverters, RF Inductors and Transformers with or without terminal boards. Unusual shapes and sizes a specialty.

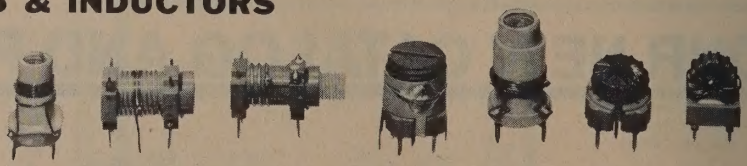
CUSTOM BOBBIN COILS

- Statistical Control on high volume production items.
- Low initial tooling cost.



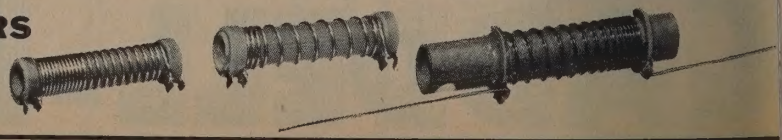
RF TRANSFORMERS & INDUCTORS

- Powdered Iron Bobbins
- Ceramic Form Types
- Molded Solenoids
- P.C. Cans & Transformers



VARIABLE PITCH INDUCTORS

- Extensive design background in all sizes.
- Complete engineering assistance.

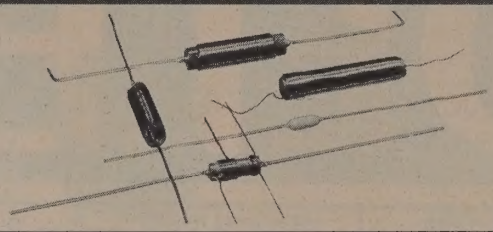


DALE ELECTRONICS, INC., Box 180, Yankton, South Dakota 57078 Phone: 605—665-9301 *A Subsidiary of The Lionel Corporation*

DALE *for Optimum Value in Inductive Components*

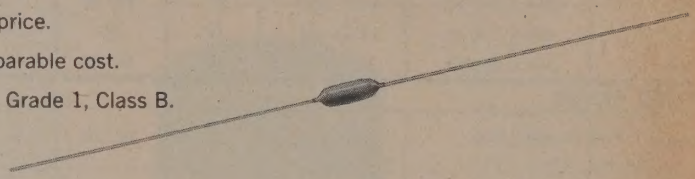
CUSTOM CHOKES

- Axial lead models
- Transformers on choke forms
- Universal wound models



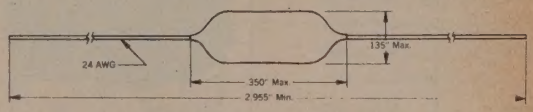
EPOXY CONFORMAL COATED CHOKE TYPE IR-2

- Equivalent in quality to molded models—at lower price.
- More durable than lacquer-coated models at comparable cost.
- Designed to meet requirements of MIL-C-15305D, Grade 1, Class B.



ELECTRICAL CHARACTERISTICS

INDUCTANCE ±10% (μh)	Q MIN.	TEST FREQ. L & Q (Mhz)	SELF-RESONANT** FREQ. MIN. (Mhz)	DC RESISTANCE MAXIMUM (Ω)	RATED DC* CURRENT (ma)
.10	40	25.0	680	.07	1440
.12	40	25.0	640	.08	1330
.15	38	25.0	600	.10	1200
.18	35	25.0	550	.12	1105
.22	33	25.0	510	.14	1025
.27	33	25.0	460	.16	960
.33	30	25.0	410	.20	855
.39	30	25.0	365	.30	700
.47	30	25.0	330	.35	650
.56	30	25.0	310	.50	545
.68	28	25.0	280	.60	495
.82	28	25.0	260	.85	415
1.00	25	25.0	240	1.00	385



*Rated DC based on temperature rise not to exceed 35° C at 90° C ambient.

**Measured with full length lead.

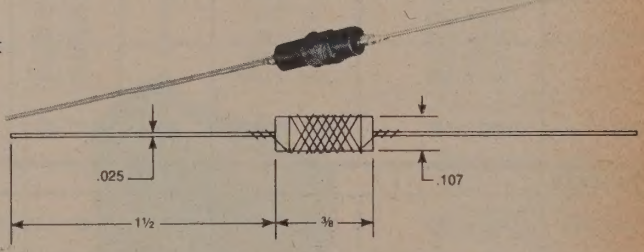
TEST EQUIPMENT

1. Boonton Radio Corporation Type 260A Q-Meter
2. Measurements Corporation Megacycle Meter, Model 59
3. Wheatstone Bridge

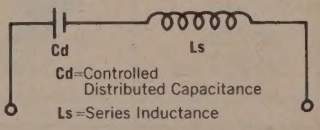
SERIES RESONANT TRAP

Dale has developed and patented a single, hybrid-type component which has the electrical characteristics of an inductor and a capacitor in series. This unit utilizes Dale's technological capabilities in the design and manufacture of hybrid components, thus reducing costs, space requirements and assembly time.

- Precise inductance and capacitance functions in a single unit.
- Saves purchasing and engineering time.
- Eliminates need for matching two components to circuit.
- Saves space.
- Reduces materials handling.



An approximate equivalent circuit is shown below. The basic design limitation is in the usable impedance range.



At this time, the design capabilities are between 1 Mhz and 90 Mhz. Please consult factory on your specific frequency requirements.

TRAPS AVAILABLE FROM STOCK

	FREQ.	FREQ. TOL.	IMP. @ RESONANCE	INDUCTANCE	CAPACITANCE
IRT-1088-3M58	3.58	± 5%	20Ω ± 20%	12.0 μh	167 pf
IRT-1088-4M50	4.5	± 5%	19Ω ± 20%	8.4 μh	150 pf
IRT-1088-10M7	10.7	± 5%	12Ω ± 20%	2.90 μh	77 pf

For complete information, write or phone

DALE ELECTRONICS, INC., Box 180, Yankton, South Dakota 57078

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DELEVAN

COILS

Delevan Series Parts	Nominal Size Dia. - Length	Inductance Range UH	Number Values Available	Q Minimum Range	Military Designation	
MICRO I ®						
100	.065 x .100 sq.	.015 - 10.0	30	35 - 40	—	Designed to fit inside or outside IC's.
150	.065 x .150 sq.	12.0 - 100	12	45	—	.100" Square .150" Square .250" Square
250	.065 x .250 sq.	120 - 1000	12	35 - 45	—	
FIXED SERIES						
1025	.095 x .250	.10 - 1000.0	49	25 - 50	—	
1537	.155 x .375	.15 - 240.0	51	33 - 75	18130 90538	
1840	.185 x .437	.15 - 27.0	25	35 - 65	75008	
2150	.215 x .560	.47 - 39.0	26	35 - 70	90542	
2500	.190 x .440 .215 x .560 .240 x .740	270 - 1000 1000 - 3600 3900 - 10,000	16 14 12	60 - 65 60 - 70 80	90539 90540 90541	
2890	.280 x .900	1.2 - 120.0	25	40 - 95	91189	
3500	.250 x .560 .310 x .560 .375 x .625 .468 x .687 .375 x .687	47 - 150 180 - 390 470 - 1000 1500 - 10,000 10,000	7 5 5 8 1	18 - 75 75 - 80 70 - 80 70 - 85 70	75052 75053 75054 75055 —	
SHIELDED						
2307	.157 x .395	.10 - 10,000	61	39 - 67	90537	
PLUG IN						
4500	.235 x .725 .282 x .625 .375 x .625 .437 x .625 .500 x .825	.47 - 39.0 47 - 150 180 - 390 470 - 1000 1500 - 10,000	20 7 5 5 8	35 - 60 15 - 60 55 - 60 35 - 50 40 - 55	— — 18100 — —	
2534	.250 x .345	100 - 150,000	39	< 10 - 80	—	
VARIABLE						
4000/4100	.400 x .952	.18 - 70,000	62	20 - 110	90543 - 46	For chassis or AC mounting, crimp on terminals.
4450	.330 x .750	.10 - 1000	48	30 - 50	LT 4K	Fine tuning — 80 threads per inch.
DSV 405	.380 x .500	.10 - 10,000	31	38 - 110	—	
DSH 406	.375 sq. x .500	.10 - 10,000	31	38 - 110	—	

Delevan coils offer the designer a wide choice of characteristics for specific applications. Standard coils are listed above. For information on custom designed coils, contact your nearest Delevan Representative . . . he's listed in the back of this book . . . or, call Delevan Electronics direct.

To obtain factory prices in quantities over 2,500, contact the Delevan representative listed in the back of this book. To order, indicate series number and inductance desired. Many items are available from inventories.

Delevan Division

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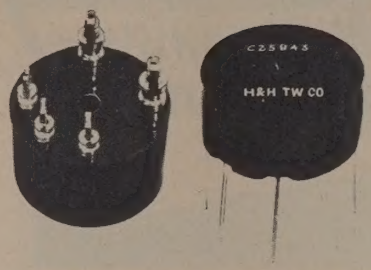
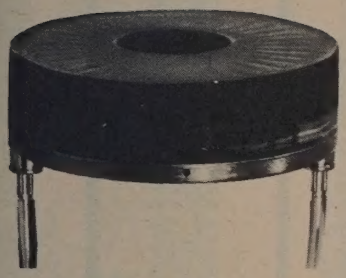
H. & H. specializes in the design and manufacture of magnetic components for military and industrial applications. When the successful Lunar Excursion Module hit the front pages, H. & H. made the newspapers . . . after much hard work.

H. & H. isn't only "first on the moon." It's first on many, many lists. If we aren't first on yours . . . we really should be.



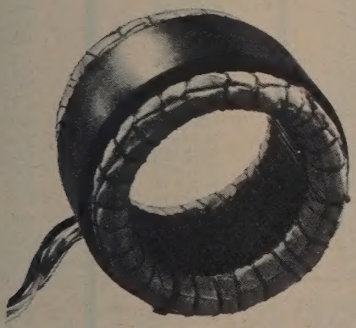
✓ *Both of these H. & H. units feature extremely critical electrical characteristics. Fully encapsulated and using unusual pin design, both are now being used aboard the U.S. Navy's underwater missiles.*

✓ *The trick to turning out this magamp (for motor speed controls) both economically and with minimal lead-time, is production "know-how."*

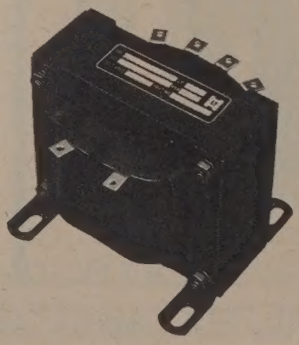


✓ *H. & H. won the bid for this alternator-stator. It's an encapsulated energy supply source for one of the DOD's latest undersea operations*

✓ *H. & H. toroids used in solid-state controls for total energy systems are climbing in demand. Assembly methods are the very latest. Prices are unusually low and quotes are "hand tailored."*



✓ *This H. & H. stator —featuring high reliability—was quickly accepted by one of the nation's leading areospace component manufacturers. Its quality is hard to surpass.*



✓ *Transformers ("C", "EI" and three-phase "E" core) for static converters, inverters and machine control. These highlight close tolerance both on electrical and mechanical characteristics.*

When you have a question . . . call us. We can help you find the answers.

We're at 216 / 261-7700.

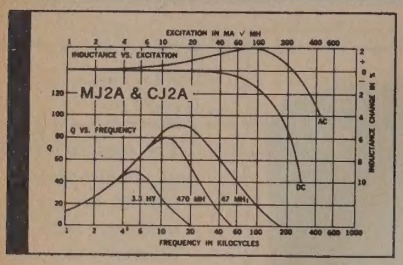
H & H TOROIDAL WINDING CO

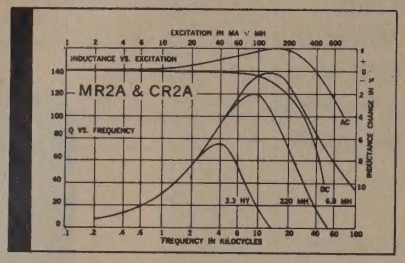
26215 Tungsten Road / Euclid, Ohio 44132

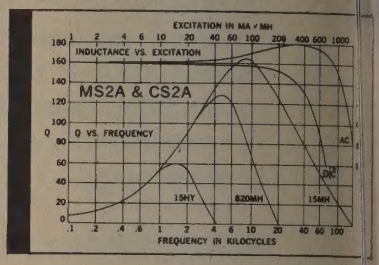
hisonic inc.

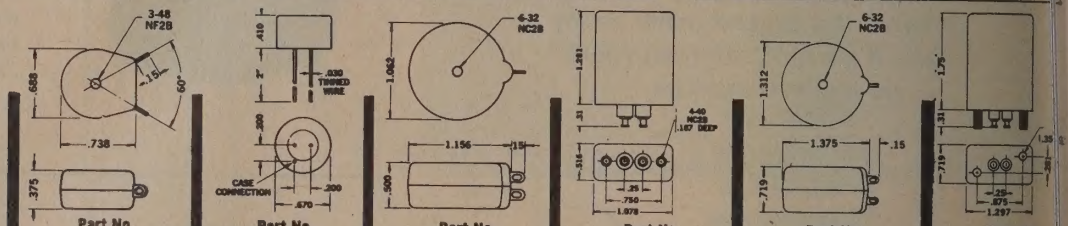
TOROIDAL INDUCTORS

Hisonic Toroidal Inductors are wound on either nickel-iro molybdenum (molybdenum permalloy) or carbonyl iron powde cores. Standard tolerance is 1% and values are true inductance Units are available uncased, molded or cased as shown. Molde units are compression molded in high strength, high tempera ture thermosetting resin and pass requirements of MIL T 27 Grade 5 Class R. Cased units are hermetically sealed in shield cans and pass requirements of MIL T 27 Grade 4 Class R









Ind. Val.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
5.6 MH	MJ2A41	CJ2A41	—	—	—	—
6.8 MH	MJ2A42	CJ2A42	MR2A42	CR2A42	MS2A42	CS2A42
8.2 MH	MJ2A43	CJ2A43	MR2A43	CR2A43	MS2A43	CS2A43
10 MH	MJ2A44	CJ2A44	MR2A44	CR2A44	MS2A44	CS2A44
12 MH	MJ2A45	CJ2A45	MR2A45	CR2A45	MS2A45	CS2A45
15 MH	MJ2A46	CJ2A46	MR2A46	CR2A46	MS2A46	CS2A46
18 MH	MJ2A47	CJ2A47	MR2A47	CR2A47	MS2A47	CS2A47
22 MH	MJ2A48	CJ2A48	MR2A48	CR2A48	MS2A48	CS2A48
27 MH	MJ2A49	CJ2A49	MR2A49	CR2A49	MS2A49	CS2A49
33 MH	MJ2A50	CJ2A50	MR2A50	CR2A50	MS2A50	CS2A50
39 MH	MJ2A51	CJ2A51	MR2A51	CR2A51	MS2A51	CS2A51
47 MH	MJ2A52	CJ2A52	MR2A52	CR2A52	MS2A52	CS2A52
56 MH	MJ2A53	CJ2A53	MR2A53	CR2A53	MS2A53	CS2A53
68 MH	MJ2A54	CJ2A54	MR2A54	CR2A54	MS2A54	CS2A54
82 MH	MJ2A55	CJ2A55	MR2A55	CR2A55	MS2A55	CS2A55
100 MH	MJ2A56	CJ2A56	MR2A56	CR2A56	MS2A56	CS2A56
120 MH	MJ2A57	CJ2A57	MR2A57	CR2A57	MS2A57	CS2A57
150 MH	MJ2A58	CJ2A58	MR2A58	CR2A58	MS2A58	CS2A58
180 MH	MJ2A59	CJ2A59	MR2A59	CR2A59	MS2A59	CS2A59
220 MH	MJ2A60	CJ2A60	MR2A60	CR2A60	MS2A60	CS2A60
270 MH	MJ2A61	CJ2A61	MR2A61	CR2A61	MS2A61	CS2A61
330 MH	MJ2A62	CJ2A62	MR2A62	CR2A62	MS2A62	CS2A62
390 MH	MJ2A63	CJ2A63	MR2A63	CR2A63	MS2A63	CS2A63
470 MH	MJ2A64	CJ2A64	MR2A64	CR2A64	MS2A64	CS2A64
560 MH	MJ2A65	CJ2A65	MR2A65	CR2A65	MS2A65	CS2A65
680 MH	MJ2A66	CJ2A66	MR2A66	CR2A66	MS2A66	CS2A66
820 MH	MJ2A67	CJ2A67	MR2A67	CR2A67	MS2A67	CS2A67
1.0 HY	MJ2A68	CJ2A68	MR2A68	CR2A68	MS2A68	CS2A68
1.2 HY	MJ2A69	CJ2A69	MR2A69	CR2A69	MS2A69	CS2A69
1.5 HY	MJ2A70	CJ2A70	MR2A70	CR2A70	MS2A70	CS2A70
1.8 HY	MJ2A71	CJ2A71	MR2A71	CR2A71	MS2A71	CS2A71
2.2 HY	MJ2A72	CJ2A72	MR2A72	CR2A72	MS2A72	CS2A72
2.7 HY	MJ2A73	CJ2A73	MR2A73	CR2A73	MS2A73	CS2A73
3.3 HY	MJ2A74	CJ2A74	MR2A74	CR2A74	MS2A74	CS2A74
3.9 HY	—	—	MR2A75	CR2A75	MS2A75	CS2A75
4.7 HY	—	—	MR2A76	CR2A76	MS2A76	CS2A76
5.6 HY	—	—	MR2A77	CR2A77	MS2A77	CS2A77
6.8 HY	—	—	MR2A78	CR2A78	MS2A78	CS2A78
8.2 HY	—	—	—	—	MS2A79	CS2A79
10.0 HY					MS2A80	CS2A80
12.0 HY					MS2A81	CS2A81
15.0 HY					MS2A82	CS2A82

Above units also available in encapsulated construction with pin terminals arranged for printed circuit board applications. Write for information on 5101 - 5103 and 5105 series.

The above units represent only a small percentage of those available as standard from Hisonic, but represent those most commonly used. Thousands of additional standard inductors are available, one of which should meet your requirements. **Special** requirements get prompt and accurate development from Hisonic Custom Design Service.

Hisonic, with a background of 23 years experience in toroidal components, is headquarters for all your needs.

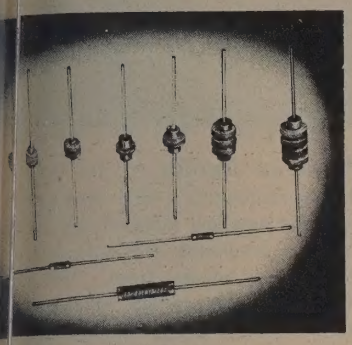
Write today for the Hisonic, Inc. catalog which contains full information on all Hisonic standard Toroidal Inductors and Hisonic Custom Design Service.

Write, Call or Wire

hisonic inc.

249 N. Troost
Olathe, Kansas 66061
Telephone: Kansas City 913
782-0012

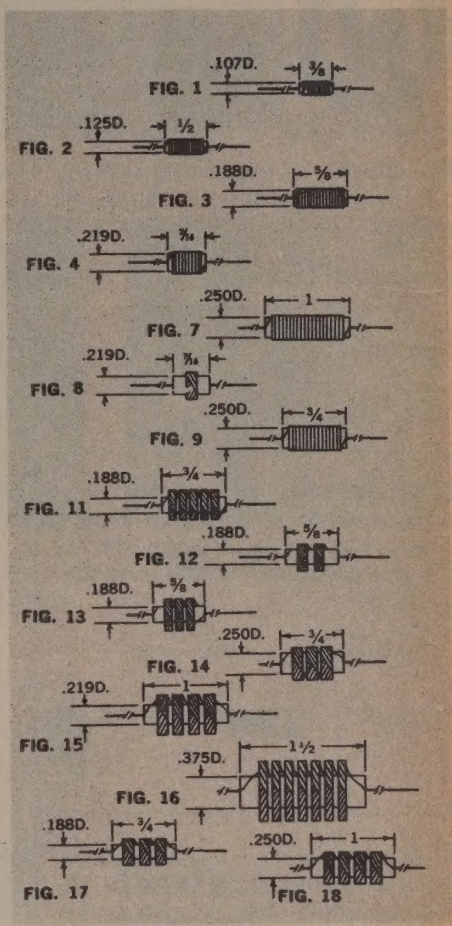
TYPICAL MILLEN INDUCTORS



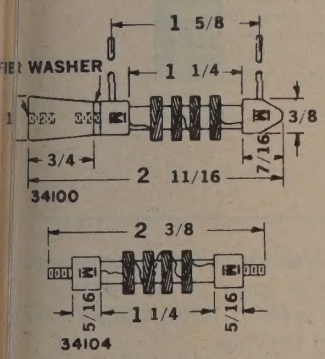
	Inductance Microhenries	Self Resonant Freq. Mc.	Fig. No.
30 .15	0.15 ± 10%	645 MC.	1
30 .22	0.22 ± 10%	510	1
30 .33	0.33 ± 10%	445	1
30 .47	0.47 ± 10%	375	2
30 .5	0.5 ± 10%	350	2
30 .68	0.68 ± 10%	300	2
30 .82	0.82 ± 10%	265	2
30 1	1 ± 10%	175	4
30 1.1	1.1 ± 10%	210	4
30 1.2	1.2 ± 10%	210	3
30 1.5	1.5 ± 5%	190	3
30 1.8	1.8 ± 5%	171	3
30 2.2	2.2 ± 5%	160	3
30 2.5	2.5 ± 5%	140	3
30 2.7	2.7 ± 5%	142	3
30 3	3 ± 5%	132	3
30 3.3	3.3 ± 5%	120	3
30 3.9	3.9 ± 5%	118	3
30 4.7	4.7 ± 5%	105	3
30 5	5 ± 5%	85	3
30 5.6	5.6 ± 5%	98	3
30 6.2	6.2 ± 5%	90	7
30 6.8	6.8 ± 5%	90	3
30 8.2	8.2 ± 5%	81	3
30 10	10 ± 5%	65	7

34300 SERIES INDUCTORS

Catalog Number	Inductance Microhenries	Self Resonant Freq. Mc.	Fig. No.
34300-12	12 ± 5%	65	3
34300-15	15 ± 5%	22	8
34300-18	18 ± 5%	22	8
34300-20	20 ± 5%	27	8
34300-22	22 ± 5%	46	9
34300-24	24 ± 5%	24	8
34300-25	25 ± 5%	26	8
34300-27	27 ± 5%	23	8
34300-30	30 ± 5%	15	8
34300-33	33 ± 5%	36	9
34300-36	36 ± 5%	35	9
34300-39	39 ± 5%	18	8
34300-47	47 ± 5%	18	8
34300-50	50 ± 5%	18	8
34300-56	56 ± 5%	28	9
34300-68	68 ± 5%	26	9
34300-75	75 ± 5%	12	8
34300-100	100 ± 5%	13	8
34300-120	120 ± 5%	12	8
34300-150	150 ± 5%	11	8
34300-180	180 ± 5%	9.8	8
34300-200	200 ± 5%	7.5	8
34300-220	220 ± 5%	12	11
34300-250	250 ± 5%	6.8	8
34300-270	270 ± 5%	11.9	11
34300-300	300 ± 5%	6	8
34300-330	330 ± 5%	8.5	17
34300-350	350 ± 5%	8	12
34300-470	470 ± 5%	7.6	13
34300-500	500 ± 5%	7.5	13
34300-750	750 ± 5%	5.8	14
34300-820	820 ± 5%	5.7	13
34300-1000	1000 ± 5%	4	12
34300-1200	1200 ± 5%	4.8	15
34300-1800	1800 ± 5%	2.6	16
34300-2200	2200 ± 5%	2.8	18
34300-2500	2500 ± 5%	2.7	18
34300-10000	10000 ± 5%	1.5	18

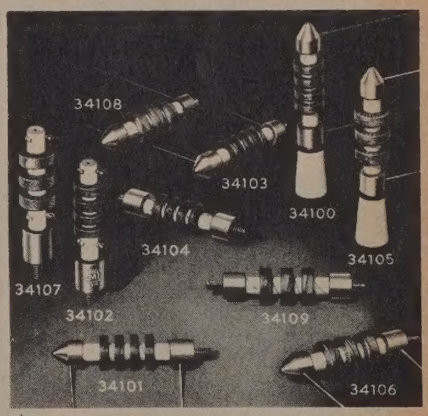


34100 SERIES R-F CHOKE COILS



Ceramic forms and insulators. Leads: #18 tinned solid wire, 2 1/8" long. Mounting screws, 6-32 threaded x 1/4" long.

Catalog Number	Inductance Millihenries	Maximum Current
34100	2.5	250 MA.
34101	2.5	250 MA.
34102	2.5	250 MA.
34103	2.5	250 MA.
34104	2.5	250 MA.
34105	1.0	300 MA.
34106	1.0	300 MA.
34107	1.0	300 MA.
34108	1.0	300 MA.
34109	1.0	300 MA.



"SPECIAL" AND STANDARD INDUCTANCES CATALOG LISTS THE COMPLETE MILLEN LINE OF INDUCTORS

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY

MALDEN, MASSACHUSETTS, U.S.A.

Nytronics Inductors

Wee-Ductor — Magnetically shielded with inductance range 0.1 to 180,000 μH, designed to MIL-C-13305, Grade 1, Class B.
Encapsulated Envelope:
0.157" diameter x .450" length.

Wee Wee-Ductor — Magnetically shielded with inductance range 0.1 to 10,000 μH. Designed to MIL-C-15305.
Encapsulated Envelope:
0.125" diameter x 0.335" length.

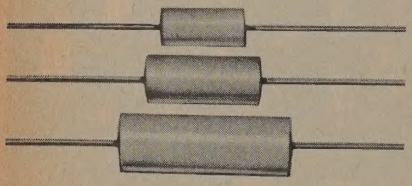
Pee-Wee Ductor — The Pee Wee Ductor represents a 66% size reduction from the smallest magnetically shielded inductor previously available anywhere. Inductance values from .025 μH to 10,000 μH. 49 values available from stock from 0.1 μH to 1,000 μH.

Super Wee-Ductor — Manufactured in accordance with MIL-C-15305D, Molded Magnetically shielded with inductance range 0.1 to 100,000 μH ±10% tolerance.
Molded Envelope:
0.163" diameter x 0.410" length.

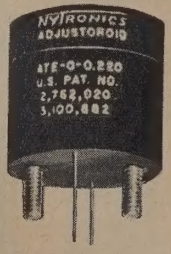
Super Wee-Wee-Ductor—Miniature shielded with inductance range 15.0 μH to 10,000 μH. Designed to MIL-C-15305, Grade 1, Class B.
Epoxy-Molded Envelope:
0.125" diameter x 0.335" length.

Pee-Cee Ductor — This inductor is designed to meet MIL-C-15305C, Grade 1, Class B. Printed board mounting is facilitated by 0.200 grid spacing and unit has shielded construction to allow maximum density packaging. Standardized in 73 stock values.

S-M-L Inductors—Non-shielded with inductance range 0.1 to 10,000 μH. Designed to MIL-C-15305, Grade 1, Class B.
Molded Envelope:
"S" Type — 0.188" diameter x 0.44" length
"M" Type — 0.25" diameter x 0.60" length
"L" Type — 0.31" diameter x 0.90" length

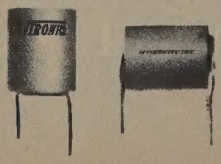


Adjustoroid—Adjustable toroid available in nominal values from 0.01 Hy to 12 Hy. This unit provides stepless adjustment in a completely hermetically sealed package.

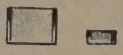


Wee V-L — Magnetically shielded adjustable range 0.1 to 100,000 μH. Designed to MIL-C-15305, Grade 1, Class B. Epoxy Molded 0.300" diameter x 0.400" length.

Variable Inductor — Unlimited with adjustable range 0.1 to 4700 μH. Designed to meet MIL-C-15305, Grade 1, Class B.
Encapsulated Envelope:
0.400" diameter x 0.500" length. Vertical or Horizontal mounting.



Wee-Chip Inductor—The Wee-Chip Inductor is a magnetically shielded miniaturized inductor made especially for mounting on substrates. Copper terminations are of the wrap-around type for the highest degree of mounting flexibility. Available from stock in 23 standard values.



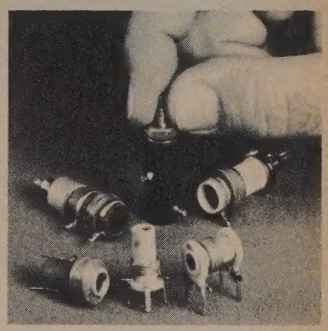
Deci-Ductor — Subminiature with inductance range 0.1 to 1000 μH. Designed to MIL-C-15305, Grade 1, Class B.
Molded Envelope:
0.100" diameter x 0.250" length.

Nytronics, Inc.
ESSEX ELECTRONICS DIVISION
ORANGE STREET • DARLINGTON, SOUTH CAROLINA 29532 • (803) 393-5421 TWX 810-665-2182

J.W. MILLER CO. Comprehensive Coil Service...
Engineering Assistance • Custom Winding • Environmental Testing
Samples-10 Days/Production Delivery-3 Weeks After Approval

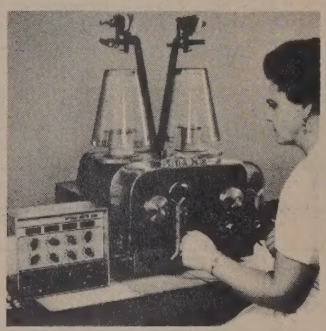
Special Coils

Special 16 Pi/30 KV windings for oil-filled high voltage transformers . . . special coil samples are shipped within 1 to 2 weeks after receipt of order.



Production shipments of special coils begin within 3 weeks after sample approval. Intensive specialization in coil design and manufacture assures excellent performance.

Where space limitations dictate one or more dimensions, Miller engineers will make recommendations to help you obtain optimum performance in your circuit.

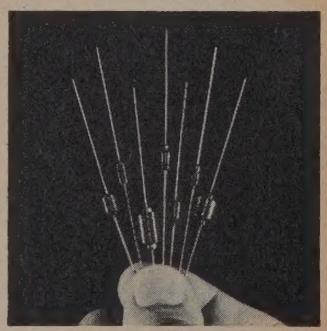


Custom wound bobbins are now available in an extensive range of inductance values and current ratings on many standard forms.

Custom Wound Bobbins

Standard Coils

Series 7830 heavy duty filter chokes provide up to 250 uh, carry up to 75 amps; widely used for RFI filters and reducing surge peaks; available from L.A. shelf stock.



RF and IF coils, chokes and filters are carried in stock, in depth, in extensive range of values and ratings, most are available from distributors' shelves at factory prices.

MILLER QUALITY PRODUCTS

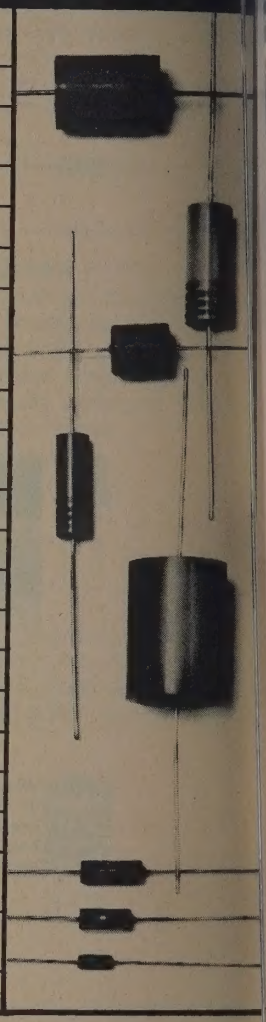
J.W. MILLER COMPANY

19070 REYES AVE. ▪ P.O. BOX 5825 ▪ COMPTON, CALIF 90224

STANWYCK

MOLDED INDUCTORS

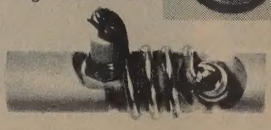
STANWYCK SERIES	INDUCTANCE MICROHENRIES	NO. OF VALUES AVAILABLE	NOMINAL SIZE DIA. – LENGTH	NEW MS NUMBER	LT TYPE	OLD MS NUMBER	STYLE
1A1000M	0.15 to 1000	47	.095 x .240				AXIAL
20000M	0.15 to 1000	56	.156 x .375	MS-18130 MS-90538	LT4K074 to 099 LT10K001 to 021	MS-16225	AXIAL
30000M	0.10 to 10	37	.170 x .440				AXIAL
40000M	11. to 1000	48	.190 x .440	MS-90539	LT10K022 to 036		AXIAL
50000M	1000. to 10000	24	.240 x .740	MS-90541	LT10K050 to 060		AXIAL
60000M	1.1 to 12 1100. to 100000	13 15	.300 x .740 .300 x .740				AXIAL AXIAL
70000M	0.15 to 27	25	.170 x .440	MS-75008	LT4K027 to 051	MS-16224	AXIAL
80000M	1.2 to 120	25	.280 x .900	MS-91189	LT4K002 to 026	MS-16221	AXIAL
90000M	0.47 to 39 1100. to 3600	20 13	.215 x .560 .215 x .560	MS-90542 MS-90540	LT4K315 to 338 LT10K037 to 049	MS-16222	AXIAL AXIAL
A	47. to 150	7	.250 x .560	MS-75052	LT7K211 to 217	MS-16223	AXIAL
B	180. to 390	5	.310 x .560	MS-75053	LT7K218 to 222	MS-16223	AXIAL
C	470. to 1000	5	.375 x .625	MS-75054	LT7K223 to 227	MS-16223	AXIAL
D	1500. to 10000	5	.468 x .687	MS-75055	LT7K228 to 232	MS-16223	AXIAL
SWS	0.10 to 100	37	.170 x .440				AXIAL
SWM	1.0 to 1000	37	.240 x .590				AXIAL
SWL	1.0 to 10000	49	.280 x .900				AXIAL
DINK – Shielded	0.10 to 180000	76	.174 x .425				AXIAL
DKM – Shielded	0.10 to 1000	49	.125 x .335				AXIAL
SIV – Adjustable Vertical	0.10 to 4700	29	.400 x .500				PRINTED CIRCUIT
SIH – Adjustable Horizontal	0.10 to 4700	29	.400 x .500				PRINTED CIRCUIT
SSD – Shielded	0.10 to 100000	73	.157 x .395	MS-90537	LT4K242 to 314		AXIAL



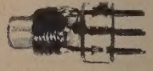
CUSTOM DESIGN

In addition to the comprehensive inductor line, Stanwyck offers the electronic esign engineer a variety of special custom design electronic components. llustrated in this section are examples of Stanwyck capabilities along these lines.

Toroids available from stock



RELAY BOBBIN COILS, HASH CHOKES



RF and IF TRANSFORMERS

The engineering staff at Stanwyck is supported by one of the most modern and fully equipped environmental test laboratories in the industry. Extensive product life testing plus rigid quality control standards result in superior custom design electronic components.

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COMPLETE LINE for every Military and Industrial Purpose in PRODUCTION QUANTITIES or CUSTOM DESIGNED to your specific requirements

- Yokes for ALL types of ⅞", 1", 1⅛", 1½", and 2⅛" neck dia. CRT's - only representative types are shown.
- Special designs for all types of computer and high speed character displays.
- Wide variety of coil impedances in both push-pull and single-ended configurations.
- Most experienced yoke engineers in the industry, plus complete production and testing capability.

MODEL D4499

MICROMETER—CONTROLLED PRECISION COIL ALIGNER

For fast, convenient alignment of yokes and focus coils in (1) ultra precision displays and flying spot scanners, and (2) laboratory research and prototype evaluation. **Exclusive** independent micrometer adjustment of pitch, yaw, horizontal and vertical translation . . . with firm precision locking. **Exclusive** true precision control and exact repeatability, plus rugged construction. For full details request catalog page.

TYPE F20

PRECISION ELECTRO-MAGNETIC FOCUS COILS for ⅞", 1½", 2⅛" and other neck dia. CRT's.

All designed for ultimate focus. Negligible effect on spot size when properly aligned to beam. Static types (all sizes)—low power or high power. Dynamic-static combinations (1½" neck dia.) . . . compact single gap design . . . or double gap design to simplify circuitry by eliminating coupling between static and dynamic coils. Wide range of coil resistances available. For full technical details, request catalog pages. Please specify your CRT and beam accelerating voltage.

TYPE P7

TYPE P8

ANTI-PINCUSHION DEVICES, both PM and EM types

Eliminates CRT geometrical picture distortion. Type P7 permanent magnet anti-pincushion assembly requires no current . . . occupies small space . . . easily adjustable . . . mounts directly on standard yokes . . . available in wide choice of magnet strengths with tight tolerances. Type P8 electromagnetic coil anti-pincushion assembly has very high precision construction . . . allows convenient front panel adjustment. For full technical details request catalog page.

TYPE C4942

Request catalog page

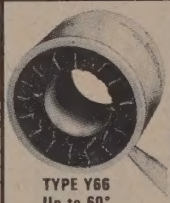
SHIELDED DYNAMIC FOCUS COIL

For sharp focus applications up to 25kv accelerating potential, such as scan converter storage tubes and flat faced high resolution CRT's. Static and dynamic coils combined into a single gap to ease alignment and position. Gap in forward position for superior focus and best image-to-object ratio.

TYPES Y58-Y60-Y62-Y64 for 42°, 52°, 70°, & 90° Deflection Angles

PRECISION STATOR YOKES for 1½" neck dia. CRT's.

High efficiency and accuracy achieved by stator type core which also provides exceptionally low astigmatism and residual magnetism. Push-pull or single-ended coils for time shared sweep displays, character displays and others. Request catalog sheet for full details.



TYPE Y66 Up to 60° Deflection Angle

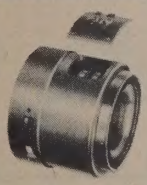
LARGE I.D. YOKES for 2⅛" neck dia. CRT's.

Single-ended and push-pull designs especially for charactron CRT's to give minimum twisting or distortion of characters. Suitable also for precision displays with other types of 2⅛" neck dia. CRT's. Request catalog sheet for full details.

TYPES V21 & V22

VIDICON YOKES & FOCUS COILS for 1" Vidicons

IN VOLUME PRODUCTION NOW. For both commercial and military applications. Engineering Service available. Special designs for all types of 1" vidicons including electrostatic focus magnetic deflection types. For full technical details request catalog page.



TYPE Y25-R Series Up to 52° and 70° Deflection Angles

COMPACT ROTATING COIL YOKES for 1½" neck dia. CRT's

For Radar Plan Position Indicator and all other rotating coil applications. Versions available with dc off-centering coils. Complete in aluminum housing containing deflection coil, slip rings and brush assembly, drive gear and bearing for easy installation into any equipment design. Only 3¾" OD x 2 11/16" long. For technical details request catalog page.

TYPE Y65 Up to 70° Deflection Angle

ENCAPSULATED MINIATURE PRECISION YOKE for ⅞" or 1" neck dia. CRT's.

Push-pull and single-ended coils available in a wide range of inpedances for transistor drivers or vacuum tube circuits. Features electrically balanced windings with equal deflection sensitivities. Close angular tolerances of the display are achieved by precise construction. Epoxy encapsulated to withstand extreme environments. For full technical details, request catalog page.

TYPES C3287/C3528

MAGNETIC SCAN-CONVERTER DEFLECTION YOKES

Stator Design for standard 1½ inch neck diameter scan converter storage tubes. High resolution, geometrical accuracy and sensitivity are combined to offer power savings, plus ultimate performance. A desirable short precision magnetic field is achieved by combining short overall length and small ears with the proper distribution, insertion and extreme care in construction. Magnetically shielded designs also available. Request catalog sheet for full details.

For engineering assistance in solving your display problems, please contact our nearest representative:

Boston-New England:	617-762-3164
New York:	212-695-3727
Philadelphia Area:	215-789-2320
Washington-Baltimore Area:	202-628-1023
Minneapolis:	612-920-1046
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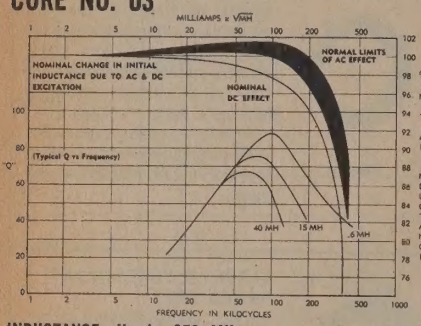
- OFFERING THE MOST COMPLETE LINE OF TOROIDAL INDUCTORS AVAILABLE FROM STOCK FOR 24 HOUR DELIVERY.
- PLASTIC MOLDED ("P" SERIES) INDUCTORS ARE MANUFACTURED TO MIL-T27B, GRADE 5, CLASS S, LIFE EXPECTANCY X.
- METAL ENCASED ("M" SERIES) ARE MANUFACTURED TO MIL-T-27B, GRADE 4, CLASS R, LIFE EXPECTANCY X.
- STANDARD INDUCTANCE TOLERANCE: ±1%.
- TEMPERATURE STABILITY: ±1% from −55°C to +100°C.

CORE NO. 03



INDUCTANCE: Up to 250 MH.
FREQUENCIES: Up to 50 KHz.
TYPICAL DCR: 1.5 Ohms/MH.

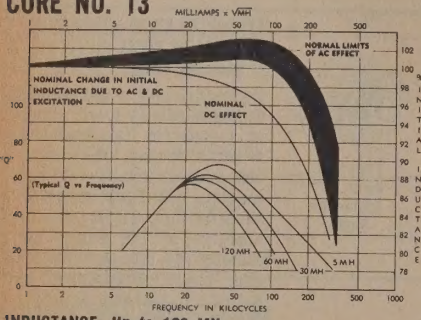
DIMENSIONS

Type	Case	A	B	C	D
P03	Style 1	.285	.450	.300	.025
M03	Style 5	.385	.448	.200	.020

STANDARD INDUCTANCE VALUES (MH)

1.0	15.0
1.25	17.5
1.5	20.0
1.75	24.0
2.0	30.0
2.4	36.0
2.5	43.0
3.0	50.0
3.6	60.0
4.3	72.0
5.0	75.0
6.0	86.0
7.2	100.0
7.5	120.0
8.0	150.0
8.6	175.0
10.0	178.0
12.0	200.0
12.5	250.0

CORE NO. 13



INDUCTANCE: Up to 100 MH.
FREQUENCIES: 10 to 200 KHz.
TYPICAL DCR: 3 Ohms/MH.

DIMENSIONS

Type	Case	A	B	C	D
P13	Style 1	.285	.450	.300	.025
M13	Style 5	.385	.448	.200	.020

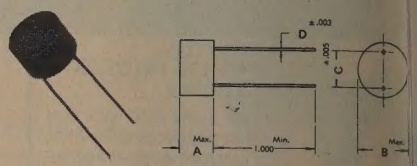
STANDARD INDUCTANCE VALUES (MH)

.50	8.6
.60	10.0
.72	12.0
.86	15.0
1.0	17.5
1.25	20.0
1.5	24.0
1.75	25.0
2.0	30.0
2.4	36.0
2.5	40.0
3.0	43.0
3.6	50.0
4.3	60.0
5.0	72.0
6.0	86.0
7.2	100.0

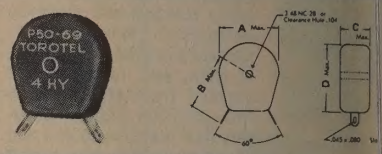
STANDARD CASE STYLES

SEE DIMENSION TABLES UNDER CORE TYPES

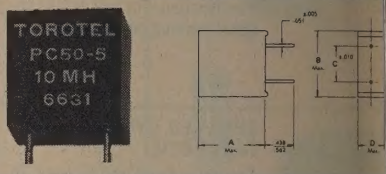
STYLE 1 EPOXY ENCAPSULATED TYPES P03, P13, P29, PS50 & PS51



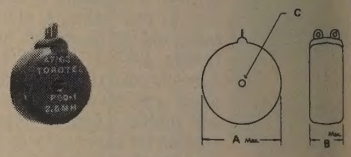
STYLE 2 COMPRESSION MOLDED TYPES P50, P51



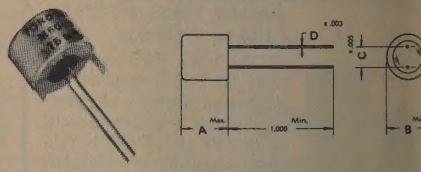
STYLE 3 EPOXY ENCASED TYPES PC50, PC51, PC06, PC48



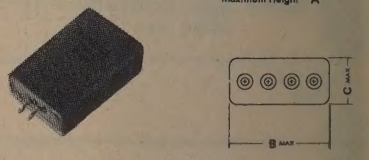
STYLE 4 COMPRESSION MOLDED TYPES P90, P89, P06, P48, P30, & P84



STYLE 5 HERMETIC SEALED TYPES M03, M13, M29, M50, M51, & M53



STYLE 6 HERMETIC SEALED TYPES M90, M89, M06, M48, M30, & M84



STANDARD MOUNTING PROVISIONS VARY. SEE SPECIFICATIONS UNDER CORE NUMBERS.

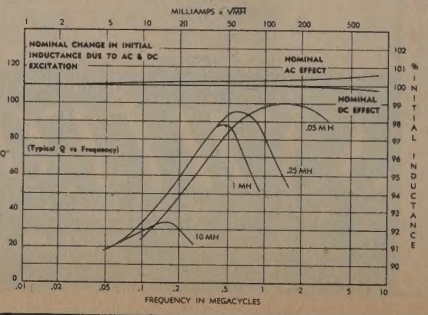
ALL CORE TYPES ALSO AVAILABLE IN "U SERIES" UNCASED UNITS.

CORE NO. 29

INDUCTANCE: Up to 15 MH.
FREQUENCIES: 50 KHz-5 MHz.
TYPICAL DCR: 20 Ohms/MH.

DIMENSIONS

Type	Case	A	B	C	D
P29	Style 1	.285	.450	.300	.025
M29	Style 5	.385	.448	.200	.020



STANDARD INDUCTANCE VALUES (MH)

.05	.200	.750	3.00
.06	.240	.860	3.60
.072	.250	1.00	4.00
.075	.300	1.20	4.30
.086	.360	1.25	5.00
.100	.400	1.50	6.00
.120	.430	1.75	7.20
.125	.500	2.00	7.50
.150	.600	2.40	8.60
.175	.720	2.50	10.0

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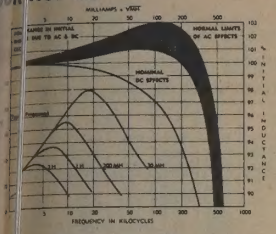
CORE NO. 50



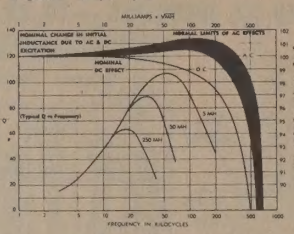
DIMENSIONS

TYPE	CASE	A	B	C	D
P50	Style 2	.693	.640	.380	.743
PS50	Style 1	.438	.680	.150	.031
PC50	Style 3	.743	.743	.500	.350
M50	Style 5	.438	.680	.150	.031

STANDARD INDUCTANCE VALUES		
1.0 MH	40. MH	430. MH
2.5 MH	43. MH	500. MH
5.0 MH	50. MH	600. MH
6.0 MH	60. MH	720. MH
7.2 MH	72. MH	750. MH
7.5 MH	75. MH	860. MH
8.6 MH	86. MH	1.0 HY
10.0 MH	100. MH	1.2 HY
12. MH	120. MH	1.25 HY
12.5 MH	125. MH	1.5 HY
15. MH	150. MH	1.75 HY
17.5 MH	175. MH	2.0 HY
20. MH	200. MH	2.4 HY
24. MH	240. MH	2.5 HY
25. MH	250. MH	3.0 HY
30. MH	300. MH	3.6 HY
36. MH	360. MH	4. HY
	400. MH	

MAXIMUM INDUCTANCE: 4.5 Hy.
FREQUENCY RANGE: Up to 20 KHz.
TYPICAL DCR: 500 Ohms/Hy.

CORE NO. 51



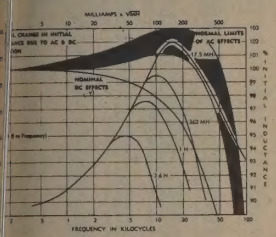
DIMENSIONS

TYPE	CASE	A	B	C	D
P51	Style 2	.693	.640	.380	.743
PS51	Style 1	.438	.680	.150	.031
PC51	Style 3	.743	.743	.500	.350
M51	Style 5	.438	.680	.150	.031

STANDARD INDUCTANCE VALUES		
1.0 MH	8.6 MH	72. MH
1.2 MH	10. MH	86. MH
1.5 MH	12. MH	100. MH
1.75 MH	15. MH	120. MH
2.0 MH	17.5 MH	150. MH
2.4 MH	20. MH	175. MH
3.0 MH	24. MH	200. MH
3.6 MH	30. MH	240. MH
4.3 MH	36. MH	300. MH
5.0 MH	43. MH	360. MH
6.0 MH	50. MH	430. MH
7.2 MH	60. MH	500. MH

MAXIMUM INDUCTANCE: 1 Hy.
FREQUENCY RANGE: 10 KHz to 100 KHz.
TYPICAL DCR: 1 Ohm/MH.

CORE NO. 90



DIMENSIONS

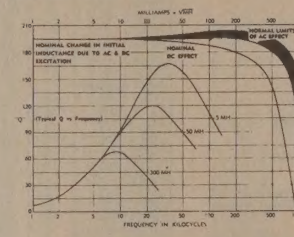
TYPE	CASE	A	B	C
P90	Style 4	.875	.453	6-32 thd.
M90	Style 6	1.093	.938	.516

TYPE M90 MTG: 2 4-40 x .156 INSERTS

STANDARD INDUCTANCE VALUES		
3.0 MH	40. MH	430. MH
3.6 MH	43. MH	500. MH
4.0 MH	50. MH	600. MH
4.3 MH	60. MH	720. MH
5.0 MH	75. MH	860. MH
7.2 MH	86. MH	1.0 HY
7.5 MH	100. MH	1.2 HY
8.6 MH	120. MH	1.25 HY
10.0 MH	125. MH	1.5 HY
12.0 MH	150. MH	1.75 HY
12.5 MH	175. MH	2.0 HY
15.0 MH	200. MH	2.4 HY
20. MH	250. MH	3.0 HY
24. MH	300. MH	3.6 HY
25. MH	360. MH	4.0 HY
30. MH	400. MH	5.0 HY
36. MH		6.0 HY

MAXIMUM INDUCTANCE: 9 Hy.
FREQUENCY RANGE: To 20 KHz.
TYPICAL DCR: 300 Ohms/Hy.

CORE NO. 89



DIMENSIONS

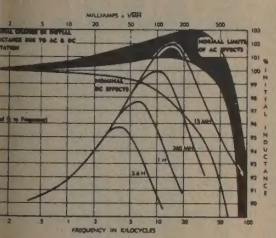
TYPE	CASE	A	B	C
P89	Style 4	.875	.453	6-32 thd.
M89	Style 6	1.093	.938	.516

TYPE M89 MTG.: 2 4-40 x .156 INSERTS

STANDARD INDUCTANCE VALUES		
1.5 MH	12.0 MH	100. MH
1.75 MH	15.0 MH	120. MH
2.0 MH	17.5 MH	150. MH
2.4 MH	20. MH	175. MH
3.0 MH	24. MH	200. MH
3.6 MH	30. MH	240. MH
4.3 MH	36. MH	300. MH
5.0 MH	43. MH	360. MH
6.0 MH	50. MH	430. MH
7.2 MH	60. MH	500. MH
8.6 MH	72. MH	600. MH
10.0 MH	86. MH	

MAXIMUM INDUCTANCE: 1.5 Hy.
FREQUENCY RANGE: To 100 KHz.
TYPICAL DCR: 700 hms/Hy.

CORE NO. 06



DIMENSIONS

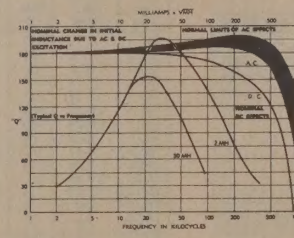
TYPE	CASE	A	B	C
P06	Style 6	1.250	1.078	.516
M06	Style 4	1.068	.505	6-32 thd.

TYPE M06 MTG.: 2 4-40 x .188 INSERTS

STANDARD INDUCTANCE VALUES		
5.0 MH	60. MH	720. MH
6.0 MH	72. MH	750. MH
7.2 MH	75. MH	860. MH
7.5 MH	86. MH	1.0 HY
8.6 MH	100. MH	1.2 HY
10. MH	120. MH	1.25 HY
12. MH	125. MH	1.5 HY
12.5 MH	150. MH	1.75 HY
15. MH	175. MH	2.0 HY
17.5 MH	200. MH	2.4 HY
20. MH	240. MH	2.5 HY
24. MH	250. MH	3.0 HY
25. MH	300. MH	3.6 HY
30. MH	360. MH	4.3 HY
36. MH	400. MH	5.0 HY
40. MH	430. MH	6.0 HY
43. MH	500. MH	7.2 HY
50. MH	600. MH	

MAXIMUM INDUCTANCE: 7.2 Hy.
FREQUENCY RANGE: To 20 KHz.
TYPICAL DCR: 210 Ohms/Hy.

CORE NO. 48



DIMENSIONS

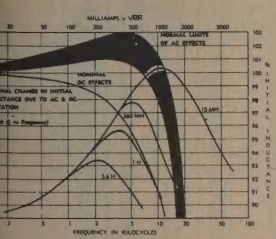
TYPE	CASE	A	B	C
P48	Style 4	1.068	.505	6-32 thd.
M48	Style 6	1.250	1.078	.516

TYPE M48 MTG.: 2 4-40 x .188 INSERTS

STANDARD INDUCTANCE VALUES		
2.0 MH	15. MH	100. MH
2.4 MH	17.5 MH	120. MH
3.0 MH	20. MH	150. MH
3.6 MH	24. MH	175. MH
4.3 MH	30. MH	200. MH
5.0 MH	36. MH	240. MH
6.0 MH	43. MH	300. MH
7.2 MH	50. MH	360. MH
8.6 MH	60. MH	430. MH
10. MH	72. MH	500. MH
12. MH	86. MH	600. MH

MAXIMUM INDUCTANCE: 1 Hy.
FREQUENCY RANGE: To 100 KHz.
TYPICAL DCR: 420 Ohms/Hy.

CORE NO. 30



DIMENSIONS

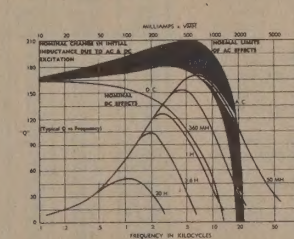
TYPE	CASE	A	B	C
P30	Style 4	1.318	.724	6-32 thd.
M30	Style 6	1.750	1.297	.719

TYPE M30 MTG.: 2 4-40 x .188 INSERTS

STANDARD INDUCTANCE VALUES		
5.0 MH	75. MH	1.25 HY
6.0 MH	86. MH	1.5 HY
7.2 MH	100. MH	1.75 HY
7.5 MH	120. MH	2.0 HY
8.6 MH	125. MH	2.4 HY
10. MH	150. MH	2.5 HY
12. MH	175. MH	3.0 HY
12.5 MH	200. MH	3.6 HY
15. MH	240. MH	4.0 HY
17.5 MH	250. MH	4.3 HY
20. MH	300. MH	5.0 HY
24. MH	360. MH	6.0 HY
25. MH	400. MH	7.2 HY
30. MH	430. MH	7.5 HY
36. MH	500. MH	8.6 HY
40. MH	600. MH	10.0 HY
43. MH	720. MH	12.0 HY
50. MH	750. MH	12.5 HY
60. MH	860. MH	15.0 HY
72. MH	1.0 HY	17.5 HY
	1.2 HY	

MAXIMUM INDUCTANCE: 17.5 Hy.
FREQUENCY RANGE: To 20 KHz.
TYPICAL DCR: 105 Ohms/Hy.

CORE NO. 84



DIMENSIONS

TYPE	CASE	A	B	C
P84	Style 4	1.730	.755	8-32 thd.
M84	Style 6	2.281	1.906	.563

M84 MTG.: 4 6-32 x .375 STUDS

STANDARD INDUCTANCE VALUES		
5.0 MH	86. MH	1.25 HY
6.0 MH	100. MH	1.5 HY
7.2 MH	120. MH	1.75 HY
7.5 MH	125. MH	2.0 HY
8.5 MH	150. MH	2.4 HY
10. MH	175. MH	2.5 HY
12. MH	200. MH	3.0 HY
12.5 MH	240. MH	3.6 HY
15. MH	250. MH	4.0 HY
17.5 MH	300. MH	4.3 HY
20. MH	360. MH	5.0 HY
24. MH	400. MH	6.0 HY
25. MH	430. MH	7.2 HY
30. MH	500. MH	7.5 HY
36. MH	600. MH	8.6 HY
40. MH	720. MH	10.0 HY
43. MH	750. MH	12.0 HY
50. MH	860. MH	12.5 HY
60. MH	1.0 HY	15.0 HY
72. MH	1.2 HY	17.5 HY
75. MH		20.0 HY

MAXIMUM INDUCTANCE: 25 Hy.
FREQUENCY RANGE: To 12 KHz.
TYPICAL DCR: 75 Ohms/Hy.

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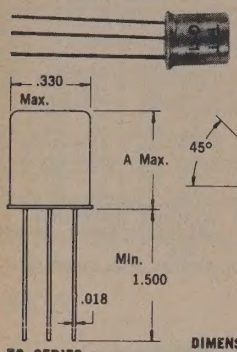
PHONE: 816 SO 1-6314 TWX-910-777-7037

MINI-L HERMETICALLY SEALED R.F. INDUCTORS — TG, TH SERIES



Series	A
TG	.390
TH	.350

DIMENSIONS

TG SERIES

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-T-27B, GRADE 4, CLASS R.
- FREQUENCY RANGE: 10 to 500 KHz.
- INDUCTANCE RANGE: 1 to 500 mh.
- INDUCTANCE TOLERANCES: ±5%.
- INDUCTANCE STABILITY: ±2% (−20°C to +85°).

TH SERIES

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-C-150305C, GRADE 1, CLASS O.
- FREQUENCY RANGE: 100 KHz to 10 KHz.
- INDUCTANCE RANGE: 10 to 1000.
- INDUCTANCE TOLERANCES: 10 uh through 33 uh ±10%, 39 uh through 130 uh ±5%, greater than and including 150 uh ±3%.
- INDUCTANCE STABILITY: ±2% (−20°C to +85°C).

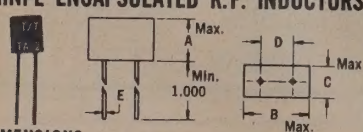
- HERMETICALLY SEALED, HIGH "Q" INDUCTOR IN A TO-5 TRANSISTOR CONFIGURATION.
- LOW EXTERNAL MAGNETIC AND ELECTROSTATIC FIELD.

Part No.	Inductance (uh)	Inductance Test Freq. (KHz)	"Q" Min.	"Q" Test Freq. (KHz)	DCR Max. (ohms)	Min. SRF (MHz)	DC Curr. (ma)
TG- 1	1.0	10	120	200	3.3	1500	123
TG- 2	1.0	10	120	200	3.6	1300	118
TG- 3	1.5	10	120	200	4.8	1160	102
TG- 4	1.75	10	120	200	5.2	1080	98
TG- 5	2.0	10	120	200	5.7	1000	94
TG- 6	2.4	10	120	200	7.9	920	80
TG- 7	3.0	10	120	150	8.9	820	75
TG- 8	3.6	10	120	150	9.8	730	71
TG- 9	4.3	10	120	150	13.7	660	60
TG-10	5.0	10	120	150	14.7	608	58
TG-11	6.0	10	120	150	20.0	540	50
TG-12	7.2	10	120	100	21.8	480	48
TG-13	8.6	10	100	100	24.0	430	45
TG-14	10.0	10	100	100	32.4	400	39
TG-15	12.0	10	100	100	34.8	360	38
TG-16	15.0	10	100	100	39.1	320	36
TG-17	17.5	10	85	70	55.0	300	30
TG-18	20.0	10	85	70	60.0	280	29
TG-19	24.0	10	85	70	64.7	250	28
TG-20	30.0	10	85	70	86.3	220	24
TG-21	36.0	10	85	70	95.8	195	23
TG-22	43.0	10	85	70	132	185	19
TG-23	50.0	10	85	70	143	165	18
TG-24	60.0	10	75	50	155	145	18
TG-25	72.0	10	75	50	172	130	17
TG-26	86.0	10	75	50	233	125	15
TG-27	100	10	75	50	252	115	14
TG-28	120	5	75	50	290	105	13
TG-29	150	5	50	40	323	95	13
TG-30	175	5	50	40	350	85	12
TG-31	200	5	50	40	477	80	10
TG-32	240	5	50	40	515	71	10
TG-33	300	5	50	40	735	63	8
TG-34	360	5	30	30	1005	57	7
TG-35	430	5	30	30	1100	51	6.5
TG-36	500	5	30	20	1200	48	6.5

- AMBIENT TEMPERATURE RANGE: −55°C to +85°C.
- DIELECTRIC WITHSTANDING VOLTAGE: 100 volts rms.
- INSULATION RESISTANCE: 10,000 meg. ohms Min.

Part No.	Inductance (uh)	Inductance Test Freq. (KHz)	"Q" Min.	"Q" Test Freq. (KHz)	DCR Max. (ohms)	Min. SRF (MHz)	DC Curr. (ma)
TH- 7	10	1000	75	2500	2.4	35.0	102
TH- 8	12	1000	75	2500	2.5	30.0	100
TH- 9	15	1000	75	2500	2.6	25.0	98
TH-10	18	1000	75	2500	2.7	23.0	96
TH-11	22	1000	75	2500	2.8	20.0	94
TH-12	27	1000	75	2500	2.9	17.0	93
TH-13	33	1000	75	2500	3.0	14.0	91
TH-14	39	500	70	2500	3.1	11.0	90
TH-15	47	500	70	2500	3.2	10.0	88
TH-16	56	500	70	2500	3.3	9.5	87
TH-17	68	500	70	2500	3.4	9.0	85
TH-18	82	500	70	2500	4.5	8.0	74
TH-19	100	500	70	1500	5.1	7.5	70
TH-20	110	500	70	1500	6.0	7.0	64
TH-21	120	500	70	1500	6.2	6.5	63
TH-22	130	500	70	1500	6.4	6.0	62
TH-23	150	500	70	1500	6.6	5.5	61
TH-24	160	500	60	790	8.6	5.3	54
TH-25	180	500	60	790	9.0	5.0	52
TH-26	200	500	60	790	9.5	4.5	51
TH-27	220	250	60	790	10.0	4.0	50
TH-28	240	250	60	790	10.6	3.8	48
TH-29	270	250	60	790	11.2	3.6	48
TH-30	300	250	60	790	14.2	3.4	42
TH-31	330	250	60	790	14.6	3.2	41
TH-32	360	250	60	790	15.0	3.0	41
TH-33	390	250	60	790	15.6	2.9	40
TH-34	430	250	60	790	16.4	2.8	39
TH-35	470	250	60	790	20.4	2.7	35
TH-36	510	250	60	790	21.8	2.6	34
TH-37	560	250	60	790	23.6	2.5	32
TH-38	620	250	60	790	24.6	2.3	32
TH-39	680	250	50	790	25.8	2.1	31
TH-40	750	250	50	790	26.8	1.9	31
TH-41	820	250	50	790	38.4	1.7	25
TH-42	910	250	50	790	40.8	1.5	25
TH-43	1000	250	50	790	42.6	1.4	24

MINI-L ENCAPSULATED R.F. INDUCTORS — TA, TF, TB & TD SERIES



DIMENSIONS

Series	A	B	C	D	E	Max. Power
TA	.225	.210	.110	.100	.020	0.2 Watt
TB	.300	.280	.160	.200	.025	0.33 Watt
TD	.390	.390	.197	.200	.025	0.5 Watt
TF	.225	.210	.110	.100	.020	0.2 Watt

TA SERIES

- MIN. "Q": 60 to 70.
- INDUCTANCE RANGE: 1 to 10 uh.
- FREQUENCY RANGE: 1 to 50 mcs.
- INDUCTANCE TOLERANCES: Less than 1.0 uh, ±10%. Greater than or equal to 1.0 uh, ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: +50 PPM/°C maximum.
- MAXIMUM POWER DISSIPATION: 0.2 watt.

TF SERIES

- MIN. "Q": 60 to 80.
- FREQUENCY RANGE: 20 to 300 mcs.
- INDUCTANCE RANGE: .01 to 1 uh.
- INDUCTANCE TOLERANCES: Less than 0.1 uh, ±20%. Greater than or equal to 0.1 uh, ±10%. Closer tolerances available by special request.
- INDUCTANCE TC: +200 PPM/°C maximum.
- MAXIMUM POWER DISSIPATION: 0.2 watt.

TD SERIES

- MIN. "Q": 40 to 80.
- INDUCTANCE RANGE: 100 to 10,000 uh.
- RECOMMENDED FREQUENCY RANGE: 50 kcs to 10 mcs.
- INDUCTANCE TOLERANCE: ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: From +60 PPM/°C, maximum to +300 PPM/°C maximum, depending upon inductance value.
- MAXIMUM POWER DISSIPATION: .50 watt.

TB SERIES

- MIN. "Q": 50 to 80.
- RECOMMENDED FREQUENCY RANGE: 50 kcs to 35 mcs.
- INDUCTANCE RANGE: 10 to 1,000 uh.
- INDUCTANCE TOLERANCE: ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: From +60 PPM/°C maximum to +300 PPM/°C maximum, depending upon inductance value.
- MAXIMUM POWER DISSIPATION: .33 watt.

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-C-15305C, GRADE 1, CLASS B (−55°C to +125°C).
- DIELECTRIC WITHSTANDING VOLTAGE: 700 volts rms.

TA SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TA- 1	0.10	60	25	450	0.04	2230
TA- 2	0.12	60	25	410	0.05	2000
TA- 3	0.15	65	25	350	0.06	1825
TA- 4	0.18	65	25	325	0.07	1675
TA- 5	0.22	65	25	300	0.08	1550
TA- 6	0.27	65	25	280	0.09	1475
TA- 7	0.33	65	25	260	0.10	1400
TA- 8	0.39	70	25	240	0.11	1325
TA- 9	0.47	70	25	220	0.15	1125
TA-10	0.56	70	25	200	0.20	1000
TA-11	0.68	70	25	180	0.25	900
TA-12	0.82	70	25	165	0.30	810
TA-13	1.0	70	25	150	0.35	750
TA-14	1.2	65	7.9	130	0.25	875
TA-15	1.5	65	7.9	120	0.30	800
TA-16	1.8	65	7.9	110	0.50	600
TA-17	2.2	65	7.9	100	0.75	500
TA-18	2.7	65	7.9	90	0.90	450
TA-19	3.3	65	7.9	70	1.0	425
TA-20	3.9	65	7.9	60	1.2	400
TA-21	4.7	60	7.9	50	1.5	350
TA-22	5.6	60	7.9	45	1.7	325
TA-23	6.8	60	7.9	40	2.0	300
TA-24	8.2	60	7.9	37	2.4	290
TA-25	10.0	60	7.9	35	2.6	280

TB SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TB- 1	10	75	2.5	35	1.1	550
TB- 2	12	75	2.5	31	1.3	500
TB- 3	15	75	2.5	27	1.5	460
TB- 4	18	80	2.5	25	1.9	410
TB- 5	22	80	2.5	22	2.2	380
TB- 6	27	80	2.5	22	2.6	350
TB- 7	33	80	2.5	18	3.3	320
TB- 8	39	80	2.5	16	3.8	290
TB- 9	47	80	2.5	14	4.6	260
TB-10	56	80	2.5	12	5.6	240
TB-11	68	80	2.5	11	6.7	220
TB-12	82	80	2.5	10	8.1	200
TB-13	100	80	2.5	9.1	9.6	180
TB-14	120	50	0.79	8.2	10.0	175
TB-15	150	50	0.79	7.5	11.0	160
TB-16	180	50	0.19	6.5	12.0	155
TB-17	220	50	0.79	5.6	13.0	150
TB-18	270	55	0.79	5.0	17.0	125
TB-19	330	55	0.79	4.5	19.0	130
TB-20	390	55	0.79	4.0	21.0	120
TB-21	470	55	0.79	3.5	22.0	115
TB-22	560	55	0.79	3.0	24.0	110
TB-23	680	55	0.79	2.8	19.0	130
TB-24	820	50	0.79	2.5	23.0	120
TB-25	1,000	50	0.79	2.1	26.0	110

- RATED TEMPERATURE RISE: 35°C at an ambient temperature of 90°C.
- LEADS: Tinned Copper. Weldable leads available by special order.

TF SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TF- 1	0.01	60	150	1000	0.02	3100
TF- 2	0.012	60	150	1000	0.02	3100
TF- 3	0.015	60	150	1000	0.02	3100
TF- 4	0.018	60	150	1000	0.02	3100
TF- 5	0.022	60	100	900	0.02	3100
TF- 6	0.027	60	100	800	0.02	3100
TF- 7	0.033	60	100	750	0.02	3100
TF- 8	0.039	60	100	700	0.02	3100
TF- 9	0.047	60	100	650	0.02	3100
TF-10	0.056	60	100	600	0.02	3100
TF-11	0.068	60	100	550	0.03	2500
TF-12	0.082	60	100	500	0.03	2500
TF-13	0.10	80	50	450	0.04	2200
TF-14	0.12	80	50	400	0.05	2000
TF-15	0.15	80	50	350	0.06	1800
TF-16	0.18	80	50	320	0.07	1650
TF-17	0.22	80	50	300	0.08	1500
TF-18	0.27	80	50	280	0.10	1400
TF-19	0.33	80	50	260	0.12	1300
TF-20	0.39	80	50	240	0.15	1150
TF-21	0.47	80	50	220	0.20	1000
TF-22	0.56	70	50	200	0.25	900
TF-23	0.68	70	50	180	0.30	800
TF-24	0.82	70	50	160	0.35	750
TF-25	1.0	70	50	150	0.40	700

TD SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TD- 1	100	75	790	8.4	6	280
TD- 2	120	75	790	7.5	7	260
TD- 3	150	75	790	6.8	8	240
TD- 4	180	75	790	6.1	10	220
TD- 5	220	80	790	5.4	12	200
TD- 6	270	80	790	4.7	14	180
TD- 7	330	80	790	4.2	17	165
TD- 8	390	80	790	3.8	20	150
TD- 9	470	75	790	3.4	.24	140
TD-10	560	75	790	3.1	28	130
TD-11	680	75	790	2.8	33	120
TD-12	820	75	790	2.5	40	110
TD-13	1,000	75	790	2.2	46	100
TD-14	1,200	45	250	1.9	30	120
TD-15	1,500	45	250	1.6	35	110
TD-16	1,800	50	250	1.4	40	105
TD-17	2,200	50	250	1.3	50	95
TD-18	2.700	50	250	1.2	60	85
TD-19	3,300	50	250	1.1	70	80
TD-20	3,900	50	250	1.0	80	75
TD-21	4,700	50	250	.9	90	70
TD-22	5,600	45	250	.8	100	65
TD-23	6,800	40	250	.7	140	60
TD-24	8,200	40	250	.6	160	55
TD-25	10,000	40	250	.6	175	50

TOTEL INC.
13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
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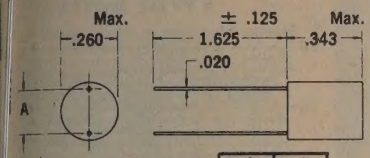
MINI-ENCAPSULATED R.F. INDUCTORS — TE, & TJ SERIES



Series	A
TE	.200
TJ	.100

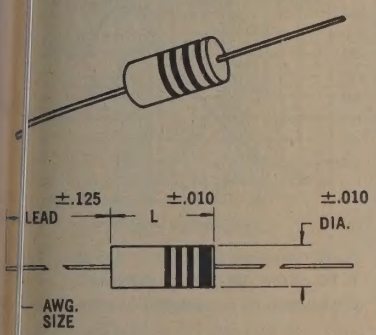
DIMENSIONS

- DESIGNED TO MEET MIL-C-15305C, GRADE 1, CLASS B (−55°C to +125°C).
- INDUCTANCE VALUES: 0.10 mh to 220.0 mh.
- FREQUENCY RANGE: 25 KHz to 2.5 MHz.
- DIELECTRIC WITHSTANDING VOLTAGE: 500 volts rms.
- RATED TEMPERATURE RISE: 35°C at an ambient temperature of 90°C.
- LEADS: Tinned Copper. Weldable leads available by special order.

Part No.	Inductance Ref. @ 1KHz (mh)	Min. "Q"	Test Freq. (KHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TJ-1 TE-1	0.10	80	790	4.5	1.8	450
TJ-2 TE-2	0.12	80	790	3.9	2.1	425
TJ-3 TE-3	0.15	75	790	3.6	2.3	400
TJ-4 TE-4	0.18	75	790	3.3	2.7	380
TJ-5 TE-5	0.22	75	790	3.0	2.9	360
TJ-6 TE-6	0.27	75	790	2.7	3.2	320
TJ-7 TE-7	0.33	70	790	2.5	3.6	300
TJ-8 TE-8	0.39	70	790	2.3	4.0	275
TJ-9 TE-9	0.47	65	790	2.1	4.4	265
TJ-10 TE-10	0.56	60	790	2.0	4.7	250
TJ-11 TE-11	0.68	55	790	1.8	5.4	240
TJ-12 TE-12	0.82	50	790	1.6	5.8	225
TJ-13 TE-13	1.00	80	250	1.5	8.7	190
TJ-14 TE-14	1.20	75	250	1.4	9.5	180
TJ-15 TE-15	1.50	75	250	1.2	11.6	160
TJ-16 TE-16	1.80	75	250	1.1	15.8	140
TJ-17 TE-17	2.20	75	250	0.95	17.3	130
TJ-18 TE-18	2.70	70	250	0.87	18.9	125
TJ-19 TE-19	3.30	70	250	0.80	25.2	110
TJ-20 TE-20	3.90	70	250	0.75	27.2	105
TJ-21 TE-21	4.70	65	250	0.70	31.5	100

Part No.	Inductance Ref. @ 1KHz (mh)	Min. "Q"	Test Freq. (KHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TJ-22 TE-22	5.60	65	250	0.60	42.0	85
TJ-23 TE-23	6.80	60	250	0.55	52.5	75
TJ-24 TE-24	8.20	55	250	0.50	63.0	65
TJ-25 TE-25	10.0	45	250	0.45	89.2	55
TJ-26 TE-26	12.0	40	79	0.40	105.0	50
TJ-27 TE-27	15.0	40	79	0.35	121.0	45
TJ-28 TE-28	18.0	40	79	0.33	136.0	40
TJ-29 TE-29	22.0	40	79	0.30	147.0	35
TJ-30 TE-30	27.0	40	79	0.26	241.0	30
TJ-31 TE-31	33.0	35	79	0.24	325.0	28
TJ-32 TE-32	39.0	35	79	0.22	367.0	25
TJ-33 TE-33	47.0	35	79	0.20	420.0	23
TJ-34 TE-34	56.0	30	79	0.18	483.0	20
TJ-35 TE-35	68.0	25	79	0.16	630.0	18
TJ-36 TE-36	82.0	20	79	0.14	893.0	16
TJ-37 TE-37	100.0	20	79	0.12	1100	15
TJ-38 TE-38	120.0	10	50	0.10	1200	14
TJ-39 TE-39	150.0	10	50	0.095	1360	13
TJ-40 TE-40	180.0	10	40	0.080	1520	11
TJ-41 TE-41	220.0	10	40	0.070	1890	10

MINI SHIELDED R.F. INDUCTORS — SB, RA, RB, & RC SERIES



- DESIGNED TO MEET MIL-C-15305C, GRADE 1, CLASS B.
- BODY MOLDED FOR HIGH RELIABILITY. EXCELLENT RESISTANCE TO IMMERSION, MOISTURE RESISTANCE, VIBRATION AND SHOCK TESTS.
- OPERATING TEMPERATURE EXTREMES FROM −55°C TO 125°C (35°C RISE AT 90°C AMBIENT).
- OPERATION TO ALTITUDES OF 70,000 FEET.
- COLOR CODED PER MIL-C-15305C.
- TINNED COPPER LEADS. WELDABLE LEADS AVAILABLE UPON REQUEST.

Series	Inductance Range (uh)	Power Rating (W)	D	L	AWG Size
RA	.15-1000	.17	.095	.250	24
RB	.15-240	.25	.155	.375	22
SB	.10-100000	.25	.157	.395 ±.020	22
RC	270-1000	.25	.190	.440	22
RD	1100-3600	.40	.215	.560	22
RF	3900-10000	.45	.240	.740	20
RG	47-150	.30	.250	.560	22
RH	1.2-120	.33	.280	.900	21
RJ	180-390	.40	.310	.560	21
RK	470-1000	.45	.375	.625	21
RL	1500-10000	.55	.468	.687	21

*Maximum Current Rating Based on (1) Temperature Rise Not to Exceed 35°C at 90°C Ambient (2) Overload Not to Exceed 1½ Times Rated Current.

SB SERIES

Part No.	Inductance @ Test Freq. (uh)	"Q" Min.	Test Freq. (MH)	Min. SRF (MHz)	Max. DCR (ohms)	Rated DC Curr. (ma)	5% ΔL DC Curr. (ma)
SB-101	.10	50	25	250	.025	2900	2900
SB-121	.12	51	25	250	.034	2800	2800
SB-151	.15	51	25	250	.037	2750	2750
SB-181	.18	50	25	250	.047	2200	2200
SB-221	.22	49	25	250	.067	1700	1700
SB-271	.27	47	25	250	.11	1500	1500
SB-331	.33	46	25	250	.13	1300	1300
SB-391	.39	44	25	250	.18	1100	1100
SB-471	.47	44	25	235	.25	1000	1000
SB-561	.56	43	25	210	.33	900	900
SB-681	.68	42	25	190	.45	750	750
SB-821	.82	40	25	180	.59	600	600
SB-102	1.00	47	25	140	.07	1900	1900
SB-122	1.20	46	7.9	130	.093	1600	1600
SB-152	1.50	45	7.9	115	.12	1300	1300
SB-182	1.80	43	7.9	105	.14	1200	1200
SB-222	2.20	45	7.9	100	.19	1100	1100
SB-272	2.70	46	7.9	92	.28	950	950
SB-332	3.30	44	7.9	85	.35	800	800
SB-392	3.90	44	7.9	75	.40	750	750
SB-472	4.70	44	7.9	70	.55	650	650
SB-562	5.60	47	7.9	65	.72	550	550
SB-682	6.80	50	7.9	55	1.02	500	500
SB-822	8.20	50	7.9	50	1.32	475	475
SB-103	10.0	49	7.9	46	1.62	450	450
SB-123	12.0	55	2.5	44	2.00	400	400
SB-153	15.0	44	2.5	49	.80	620	250
SB-183	18.0	45	2.5	45	.89	610	235
SB-223	22.0	46	2.5	41	.96	600	220
SB-273	27.0	49	2.5	38	1.19	500	200

RA SERIES

Part No.	Inductance (Microhenrys)	Inductance Tolerance (%)	"Q" Min.	L & Q Test Freq. (MHz)	Self Resonant Freq. Min. (MHz)	DC Resist. Max. (ohms)	*Max. Curr. Rat'g (ma)
RA-101	.10	10	39	25.0	690	.075	1270
RA-121	.10	10	39	25.0	650	.080	1230
RA-151	.15	10	38	25.0	600	.100	1100
RA-181	.18	10	37	25.0	550	.110	1050
RA-221	.22	10	35	25.0	510	.130	965
RA-271	.27	10	34	25.0	435	.160	870
RA-331	.33	10	31	25.0	410	.200	780
RA-391	.39	10	31	25.0	380	.300	650
RA-471	.47	10	30	25.0	340	.350	590
RA-561	.56	10	30	25.0	300	.500	500
RA-681	.68	10	30	25.0	275	.600	450
RA-821	.82	10	28	25.0	250	.840	380
RA-102	1.00	10	27	25.0	240	1.000	350
RA-122	1.20	10	27	7.9	150	.170	825
RA-152	1.50	10	30	7.9	140	.220	745
RA-182	1.80	10	32	7.9	125	.300	640
RA-222	2.20	10	32	7.9	120	.390	550
RA-272	2.70	10	37	7.9	100	.500	495
RA-332	3.30	10	45	7.9	90	.800	390
RA-392	3.90	10	45	7.9	86	.970	350
RA-472	4.70	10	45	7.9	77	1.150	320
RA-562	5.60	10	51	7.9	72	1.750	260
RA-682	6.80	10	51	7.9	62	2.000	245
RA-822	8.20	10	58	7.9	61	2.650	210
RA-103	10.0	10	58	7.9	52	3.600	180
RA-123	12.0	10	45	2.5	41	2.600	215
RA-153	15.0	10	46	2.5	40	2.750	210
RA-183	18.0	10	50	2.5	32	3.100	195
RA-223	22.0	10	50	2.5	26	3.300	190
RA-273	27.0	10	50	2.5	23	3.700	180

RB SERIES

Part No.	Inductance (Microhenrys)	Inductance Tolerance (%)	"Q" Min.	L & Q Test Freq. (MHz)	Self Resonant Freq. Min. (MHz)	DC Resist. Max. (ohms)	*Max. Curr. Rat'g (ma)
RB-151	.15	20	50	25.0	525	.03	2450
RB-221	.22	20	50	25.0	450	.05	1900
RB-331	.33	20	45	25.0	375	.09	1400
RB-471	.47	20	45	25.0	310	.12	1225
RB-561	.56	10	50	25.0	280	.13	1220
RB-681	.68	10	50	25.0	250	.15	1100
RB-821	.82	10	50	25.0	220	.22	900
RB-102	1.00	10	50	25.0	200	.25	830
RB-122	1.20	10	33	7.9	180	.42	650
RB-152	1.50	10	33	7.9	160	.50	600
RB-182	1.80	10	33	7.9	150	.65	525
RB-222	2.20	10	33	7.9	135	.95	435
RB-272	2.70	10	33	7.9	120	1.20	385
RB-332	3.30	10	33	7.9	110	2.00	300
RB-392	3.90	10	33	7.9	100	2.30	280
RB-472	4.70	10	33	7.9	90	2.60	260
RB-562	5.60	10	45	7.9	60	.32	750
RB-682	6.80	10	50	7.9	55	.50	600
RB-822	8.20	10	50	7.9	50	.60	545
RB-103	10.0	10	55	7.9	45	.90	445
RB-123	12.0	10	65	2.5	42	1.10	404
RB-153	15.0	10	65	2.5	40	1.30	370
RB-183	18.0	10	75	2.5	34	2.25	280
RB-223	22.0	10	75	2.5	30	2.50	265
RB-243	24.0	5	60	2.5	26	2.50	265
RB-273	27.0	5	60	2.5	25	2.60	260
RB-303	30.0	5	65	2.5	19	2.80	255
RB-333	33.0	5	65	2.5	19	2.90	250
RB-363	36.0	5	52	2.5	16	2.50	270
RB-393	39.0	5	52	2.5	15	2.60	265

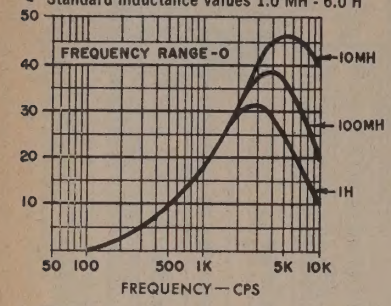
RC SERIES

Part No.	Inductance (Microhenrys)	Inductance Tolerance (%)	"Q" Min.	L & Q Test Freq. (MHz)	Self Resonant Freq. Min. (MHz)	DC Resist. Max. (ohms)	*Max. Curr. Rat'g (ma)
RC-151	0.15	20	55	25.0	510	0.030	3000
RC-221	0.22	20	50	25.0	415	0.035	2800
RC-331	0.33	20	50	25.0	350	0.065	2000
RC-471	0.47	20	50	25.0	300	0.085	1700
RC-561	0.56	10	50	25.0	270	0.125	1450
RC-681	0.68	10	45	25.0	250	0.150	1300
RC-821	0.82	10	40	25.0	210	0.205	1100
RC-102	1.00	10	40	25.0	200	0.290	930
RC-122	1.20	10	30	7.9	180	0.400	785
RC-152	1.50	10	30	7.9	170	0.485	700
RC-182	1.80	10	30	7.9	150	0.740	580
RC-222	2.20	10	30	7.9	140	0.970	505
RC-272	2.70	10	30	7.9	120	1.20	460
RC-332	3.30	10	30	7.9	70	0.140	1350
RC-342	3.90	10	30	7.9	65	0.155	1250
RC-472	4.70	10	30	7.9	60	0.210	1100
RC-562	5.60	10	30	7.9	50	0.280	935
RC-682	6.80	10	30	7.9	50	0.375	810
RC-822	8.20	10	30	7.9	48	0.440	750
RC-103	10.00	10	30	7.9	42	0.605	640
RC-123	12.00	10	50	2.5	36	1.05	490
RC-153	15.00	10	55	2.5	30	1.20	460
RC-183	18.00	10	60	2.5	30	1.95	360
RC-223	22.00	10	60	2.5	24	2.20	335
RC-273	27.00	10	65	2.5	22	2.75	300
RC-303	30.00	5	65	2.5	19	2.60	265
RC-333	33.00	5	65	2.5	19	2.60	260
RC-363	36.00	5	60	2.5	16.0	2.65	255
RC-393	39.00	5	60	2.5	15.0	2.70	250
RC-433	43.00	5	60	2.5	13.7	2.75	245

TORWICO ELECTRONICS — TOROIDAL INDUCTORS

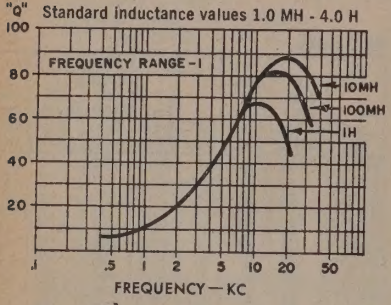
TWC Series

"Q" Standard inductance values 1.0 MH - 6.0 H



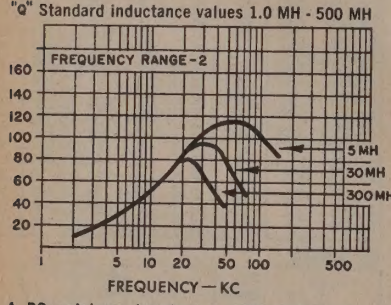
A. DC resistance (nominal) = 280 ohms/henry
B. DC current (ma) for 5% decrease in L = $\frac{135}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{372}{\sqrt{mh}}$

"Q" Standard inductance values 1.0 MH - 4.0 H

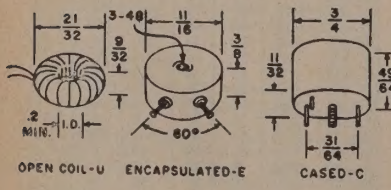


A. DC resistance (nominal) = 520 ohms/henry
B. DC current (ma) 5% decrease in L = $\frac{210}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{424}{\sqrt{mh}}$

"Q" Standard inductance values 1.0 MH - 500 MH

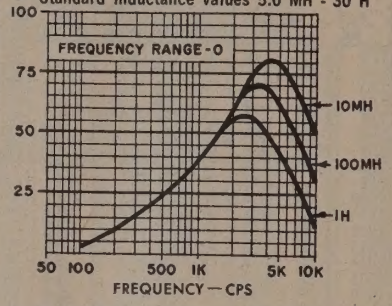


A. DC resistance (nominal) = 1100 ohms/henry
B. DC current (ma) for 5% decrease in L = $\frac{340}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{453}{\sqrt{mh}}$



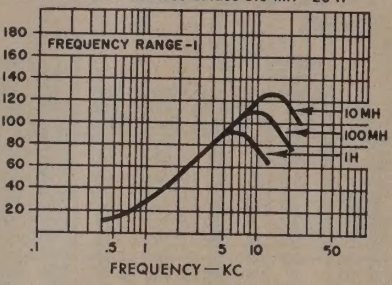
TWS Series

"Q" Standard inductance values 5.0 MH - 30 H



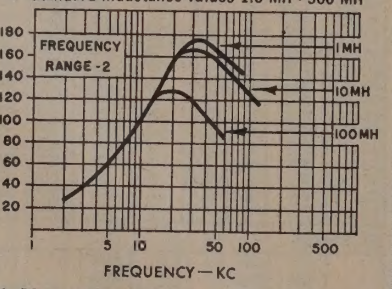
A. DC resistance (nominal) = 135 ohms/henry
B. DC current (ma) for 5% decrease in L = $\frac{320}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{708}{\sqrt{mh}}$

"Q" Standard inductance values 5.0 MH - 20 H

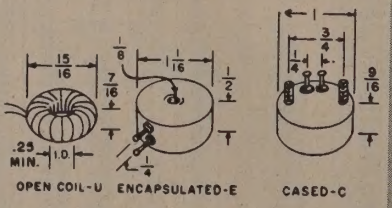


A. DC resistance (nominal) = 255 ohms/henry
B. DC current (ma) for 5% decrease in L = $\frac{380}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{790}{\sqrt{mh}}$

"Q" Standard inductance values 1.0 MH - 500 MH

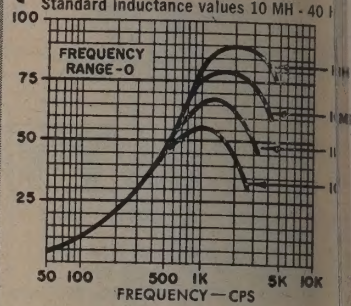


A. DC resistance (nominal) = 630 ohms/henry
B. DC current (ma) for 5% decrease in L = $\frac{420}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{822}{\sqrt{mh}}$



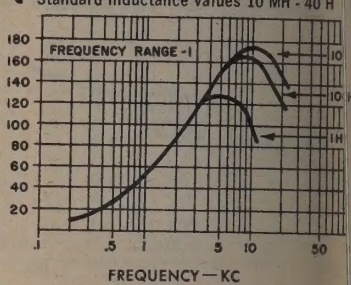
TWM Series

"Q" Standard inductance values 10 MH - 40 H



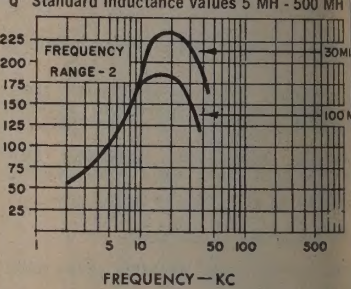
A. DC resistance (nominal) = 60 ohms/he
B. DC current (ma) for 5% decrease in L = 5
C. Maximum AC current (ma) = $\frac{1300}{\sqrt{mh}}$

"Q" Standard inductance values 10 MH - 40 H

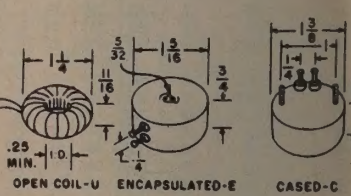


A. DC resistance (nominal) = 115 ohms/henr
B. DC current (ma) for 5% decrease in L = 55
C. Maximum AC current (ma) = $\frac{1415}{\sqrt{mh}}$

"Q" Standard inductance values 5 MH - 500 MH



A. DC resistance (nominal) = 250 ohms/henry
B. DC current (ma) for 5% decrease in L = 880
C. Maximum AC current (ma) = $\frac{1548}{\sqrt{mh}}$



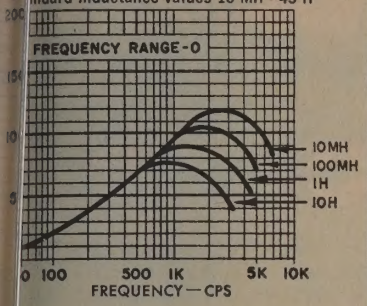
TORWICO ELECTRONICS INC. LAKEWOOD, N.J.

TORWICO ELECTRONICS

TOROIDAL INDUCTORS

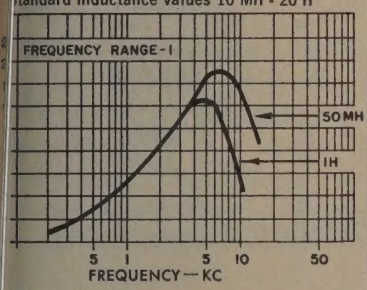
TWI Series

"Q" Standard inductance values 10 MH - 45 H

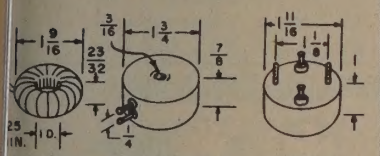


A. DC resistance (nominal) = 45 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{715}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{1500}{\sqrt{mh}}$

"Q" Standard inductance values 10 MH - 20 H

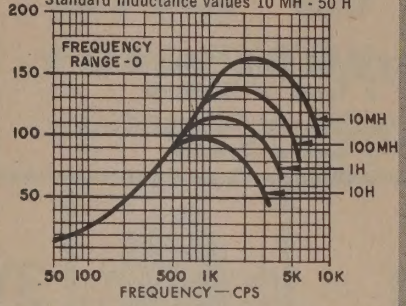


A. DC resistance (nominal) = 94 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{900}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{1644}{\sqrt{mh}}$



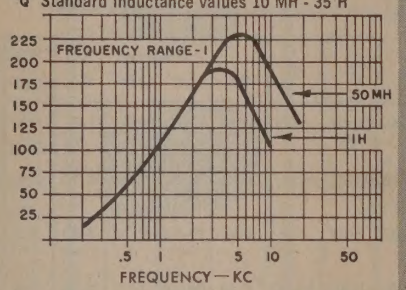
TWD Series

"Q" Standard inductance values 10 MH - 50 H

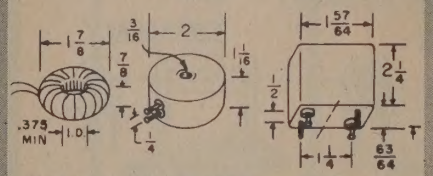


A. DC resistance (nominal) = 27 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{1100}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{2000}{\sqrt{mh}}$

"Q" Standard inductance values 10 MH - 35 H

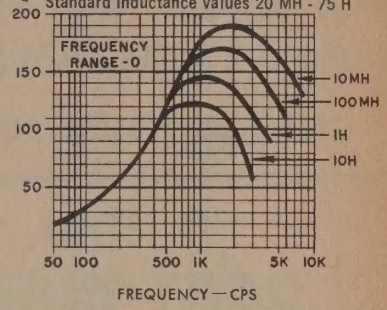


A. DC resistance (nominal) = 54 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{1200}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{2264}{\sqrt{mh}}$



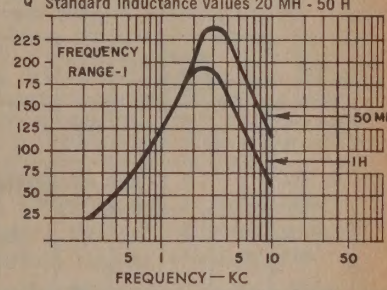
TWL Series

"Q" Standard inductance values 20 MH - 75 H

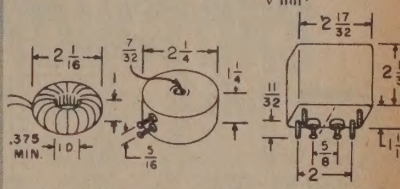


A. DC resistance (nominal) = 21 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{1450}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{3100}{\sqrt{mh}}$

"Q" Standard inductance values 20 MH - 50 H



A. DC resistance (nominal) = 35 ohms/henry
B. DC current (ma) for 5% decrease in L= $\frac{1700}{\sqrt{mh}}$
C. Maximum AC current (ma) = $\frac{3290}{\sqrt{mh}}$



HOW TO ORDER

Order these standard inductors by their part number.

Example: **TWC100MHOE**

TWC	100MH	0	E
(1)	(2)	(3)	(4)

(1) Size: TWC, TWS, TWM, TWI, TWD, TWL

(2) Inductance:

Use MH—for millihenry designation below 1.0 henry
H—for henries above 1.0 henry

(3) Frequency Range: 0, 1, 2

(4) Packaging: U—Open Coil E—Encapsulated C—Steel Cased

GENERAL SPECIFICATIONS

Tolerance—The tolerance on standard inductors is ± 1%

Test Level—Standard inductors are adjusted at 1.0 volts, 1000 cps

Maximum Voltage—The maximum voltage across standard inductors shall be 115 VRMS

Insulation Resistance—10,000 megohms minimum, except for open coil versions which shall be 1,000 megohms minimum

Standard Torwico Inductors are designed to meet the following MIL-T-27 requirements:

Open Coil—Grade 6, Class S, Life Expectancy X
Military Designation: TF6SX04ZZ

Encapsulated—Grade 5, Class S, Life Expectancy X
Military Designation: TF5SX04ZZ

Steel Cased—Grade 4, Class S, Life Expectancy X
Military Designation: TF4SX04YY

Detailed information on request!

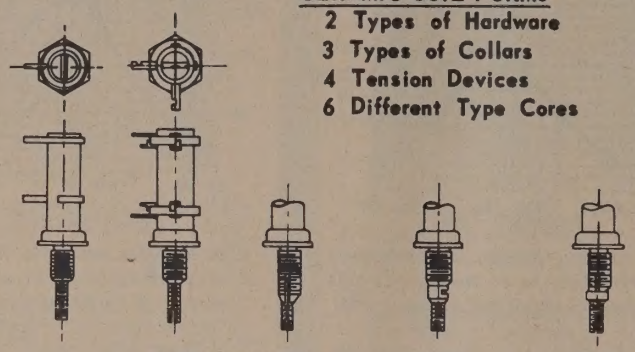
TORWICO ELECTRONICS INC. LAKEWOOD, N.J.

UNITED PRODUCTS COMPANY
unipco

ELECTRONIC ASSEMBLIES

CERAMIC COIL FORMS

2 Types of Hardware
3 Types of Collars
4 Tension Devices
6 Different Type Cores

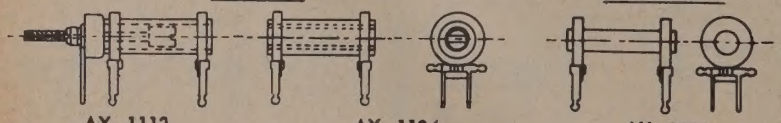


PB-TYPE (Jam Nut) CN-TYPE (Compression Nut) CS-TYPE (Compression Spring) CT-TYPE (Constant Tension)*

Basic Part No.	No. Collars	Lugs Per Collar	Total Lugs	A	B	C	D	E	F Dimension PB	CN	CS	CT	Size of Hex
AY-4124	2	2	4	.205	19/32	23/64	1/64	9/32	1/4	21/64	1/4	1/4	1/4
" -4122	2	1	2	"	"	"	"	"	"	"	"	"	"
AY-3624	2	2	4	.260	27/32	9/16	1/32	15/32	5/16	13/32	9/32	5/16	3/8
" -3622	2	1	2	"	"	"	"	"	"	"	"	"	"
AY-2524	2	2	4	.375	1 1/16	23/32	1/32	5/8	5/16	27/64	9/32	5/16	1/2
" -2522	2	1	2	"	"	"	"	"	"	"	"	"	"
AY-1724	2	2	4	.500	11/16	1 1/8	1/32	11/32	5/16	29/64	5/16	5/16	5/8
" -1722	2	1	2	"	"	"	"	"	"	"	"	"	"

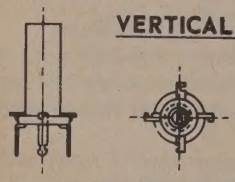
PRINTED CIRCUIT – HORIZONTAL MOUNT

CERAMIC FIBERGLAS



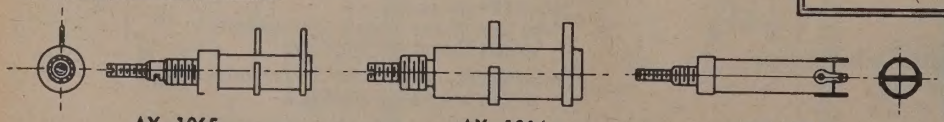
AY-1112 AY-1134 AY-1203

VERTICAL MOUNT



CERAMIC AY-1140 FIBERGLAS AY-1204 PHENOLIC AY-1142

PHENOLIC COIL FORMS

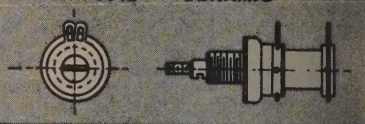


AY-1065 AY-1064 AY-1066

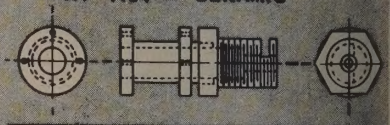
THREADED COIL FORMS

AY-1071-3 – 3 turns at 12 T.P.I.
AY-1071-5 – 5 turns at 16 T.P.I.
AY-1071-7 – 7 turns at 18 T.P.I.

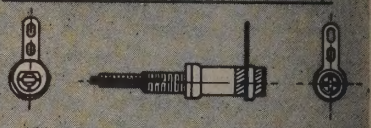
AY-1042 – CERAMIC



AY-1164 – CERAMIC

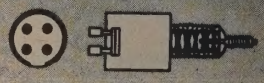


CAPACITORS (Piston/Ceramic)



AY-1041-1 0.5 – 4.5 uufd.
AY-1041-2 1.5 – 12.5 uufd.
AY-1036-1 1.0 – 8.0 uufd.
AY-1036-2 3.0 – 25.0 uufd.

SHIELDED COIL FORMS



AY-1070

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400 HERTZ LINE LP
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LOW FREQUENCY
LOW PASS
TELEGRAPH
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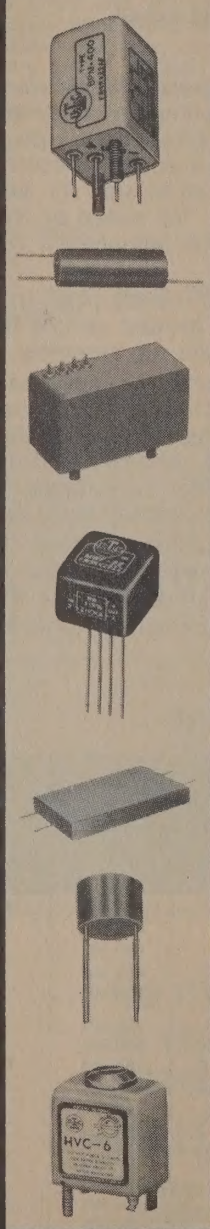
ULTRAMINIATURE

LUMPED CONSTANT DELAY LINES



HIGH Q
INDUCTORS

Almost four decades of specialization in high Q coils are reflected in the permalloy dust toroid, ferrite, and laminated structures produced by UTC today. The foremost engineering staff of its type is supported by the most modern, fully equipped materials and test laboratories. In addition, extensive life testing and rigid quality control standards create the top quality and highly reliable components associated with the UTC name. Metal cased and molded units are engineered to specifications or available from stock. Inductors ranging in applications from DC to 30 MHz, both military (to MIL-T-27C) and commercial types, are available, offering maximum Q for minimum size.

TOROIDS • TAPPED TOROIDS • LOW FREQUENCY • L DECADES • VARIBALE • TAPPED VARIABLE • VERNIER VARIABLE • MINIATURE

POWER
INDUCTORS

UTC's capabilities in range run from fractions of micro-henries to many thousands of henries, limited only by the physical size of the unit. Almost forty years of specialization in the design and production of iron core components have resulted in UTC being a first source of supply for difficult units. Military (to MIL-T-27C) and commercial types are available in all standard UTC case configurations, plus units to your specifications. Metal cased, molded, encapsulated, open, and potted units of the highest quality and reliability are available. The largest engineering staff of its kind is supported by the most modern, fully equipped materials and test laboratories. In addition, extensive life testing and rigid quality control measures assure the advanced designing and high reliability associated with UTC products.

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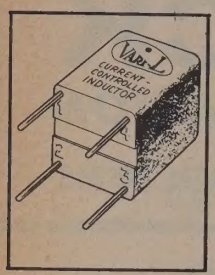
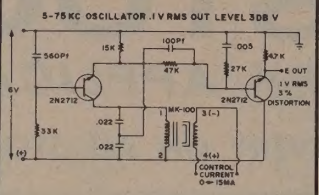
TELEPHONE: (303) 321-1511/TWX 910•931•0590

MITE SERIES ELECTRICALLY VARIABLE INDUCTORS





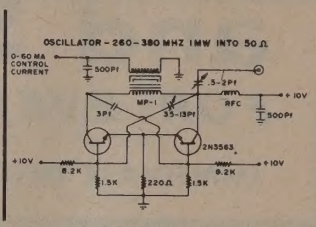


Fig. 9 Typical Vari-L circuits

The **Vari-L Inductor** consists of a high-Q coil wound on a ferromagnetic core, and an electromagnetic element for controlling its inductance. The coil is connected into an oscillator, amplifier or filter, along with suitable capacitance to establish the initial parameters; current in the control winding will then do the tuning. The rate of control can be slow for semi-fixed operation — or fast, up to several thousand Hz, for sweep or frequency modulation. The control current is usually in the milliampere range, or can be made higher to fit special applications.

The component is entirely solid-state, with no moving parts to get out of adjustment or wear out, so it can safely be located remote from the control point or potted as part of your own intricate sub-assembly.

Vari-L tuning has been in use for 15 years in numerous industrial instruments, and in critical military applications including outer space and oceanography. It is a natural for such sweep services as TV-alignment generators, spectrum analyzers, and panoramic receivers; but it is also chosen frequently because of its non-mechanical advantages such as remote control, sub-miniaturization, or automatic (closed-loop) tuning.

The **"MITE"** Series described below was brought out to keep step with the trend toward printed circuits and smaller equipment; but we also make larger units for high-power circuits or multi-function service.

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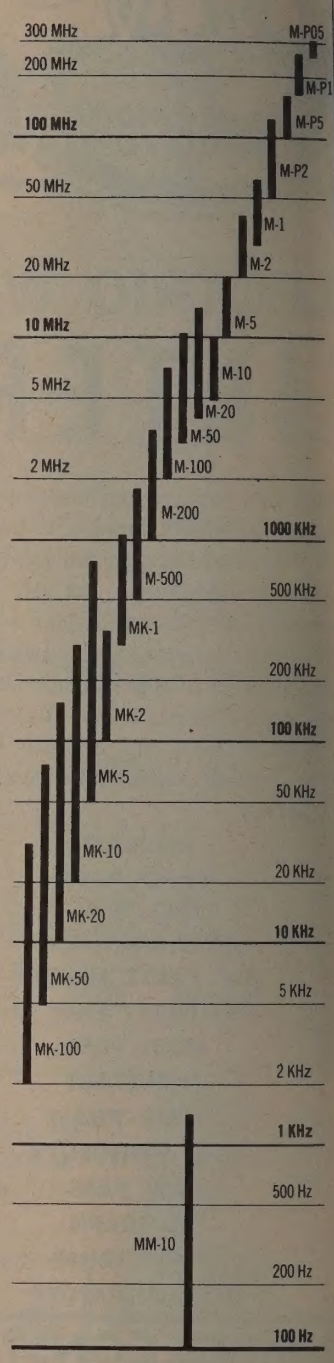
MITE SERIES INDUCTOR SPECIFICATIONS

MODEL	INDUCTANCE AT ZERO CONTROL CURRENT ±10% (L_0)	INDUCTANCE AT MAX. RECOMMEND. CONTR. CURRENT (L_{sat})	TYP. FREQ.† AT ZERO CONTROL CURRENT (F_0)	HIGH-FREQ. END OF RANGE WITH F. SHOWN (F_{sat})	CONTROL WINDING INDUCTANCE ±20% (L_c)	PRICE 1-9
MM-10	10 H	.044 H	100 CPS	1.5 KC	2.5 H	$24.80
MK-100	100 MH	.445 MH	2 KC	30 KC	450 MH	19.65
MK-50	50 MH	.223 MH	5 KC	75 KC	450 MH	19.65
MK-20	20 MH	.089 MH	10 KC	150 KC	450 MH	19.65
MK-10	10 MH	.045 MH	20 KC	300 KC	450 MH	19.65
MK-5	5 MH	.022 MH	50 KC	750 KC	450 MH	19.65
MK-2	2 MH	.163 MH	.1 MC	.35 MC	160 MH	19.65
MK-1	1 MH	.082 MH	.3 MC	1.05 MC	160 MH	19.65
M-500	500 μH	40.8 μH	.5 MC	1.75 MC	160 MH	19.25
M-200	200 μH	16.3 μH	1 MC	3.5 MC	160 MH	19.25
M-100	100 μH	8.15 μH	2 MC	7 MC	160 MH	19.25
M-50	50 μH	4.08 μH	3 MC	10.5 MC	160 MH	19.25
M-20	20 μH	1.63 μH	4 MC	14 MC	160 MH	19.25
M-10	10 μH	2.5 μH	5 MC	10 MC	80 MH	19.25
M-5	5 μH	1.25 μH	10 MC	20 MC	80 MH	19.25
M-2	2 μH	.5 μH	20 MC	40 MC	80 MH	19.25
M-1	1 μH	.25 μH	30 MC	60 MC	75 MH	19.25
M-P5	.5 μH	.125 μH	60 MC	120 MC	75 MH	19.25
M-P2	.2 μH	.078 μH	100 MC	160 MC	55 MH	19.25
M-P1	.1 μH	.051 μH	170 MC	240 MC	55 MH	19.25
M-P05	.05 μH	.035 μH	250 MC	300 MC	55 MH	19.25

For all models except MM-10 the control-winding resistance is 75 ohms, and maximum recommended control current is 60 ma. Rc of MM-10 is 30 ohms./Shield Cans are available at $1 extra per unit.

For other Vari-L products see Sections 3400 and 5600.



TYPICAL FREQUENCY RANGES OF THE "MITE"-SERIES MODELS

† The ranges shown are approximate and usually may be extended

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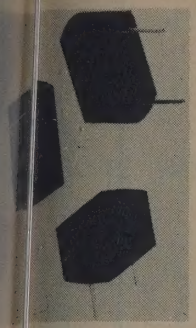


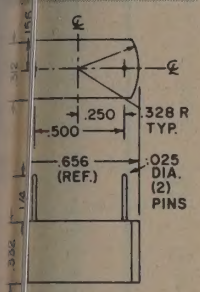


Fig. 10 Choke outline drawing

An RF choke for VHF-UHF circuitry should present a constant high impedance over a wide band of frequencies and should be non-lossy. Ordinary chokes made by winding a few turns of wire on a powdered iron or ferrite core do not fulfill this requirement because their impedance peaks sharply, and even though the actual resonance is placed outside the band the high order of impedance change over the band can be troublesome.

The chokes described below have very low loss, are virtually non-resonant and have a constant impedance over a very wide range of frequencies. They all have DC resistance of less than .1 ohms and will handle up to 2 amperes of current. Despite their small size they are suitable for use in high-power transistor oscillators and amplifiers, where they serve as RF isolators in the DC supply. Additional applications which have been tested and are diagrammed in Figure 12 are:

A. DC isolation in wide band circuits employing Z-Match transformers.

B. RF decoupling.

C. Transient and RFI suppression.

D. DC burnout protection.

Price, 1-9, Models WC-1, WC-2, WC-3, WC-4: $10.50 each. Generous quantity discounts.

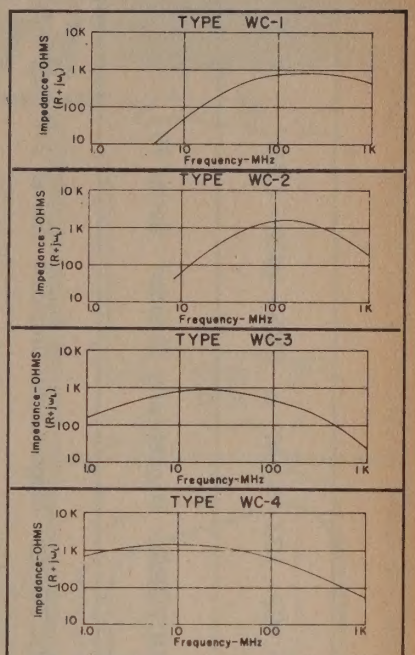


Fig. 11 Choke impedance characteristics

TYPICAL CIRCUIT APPLICATIONS

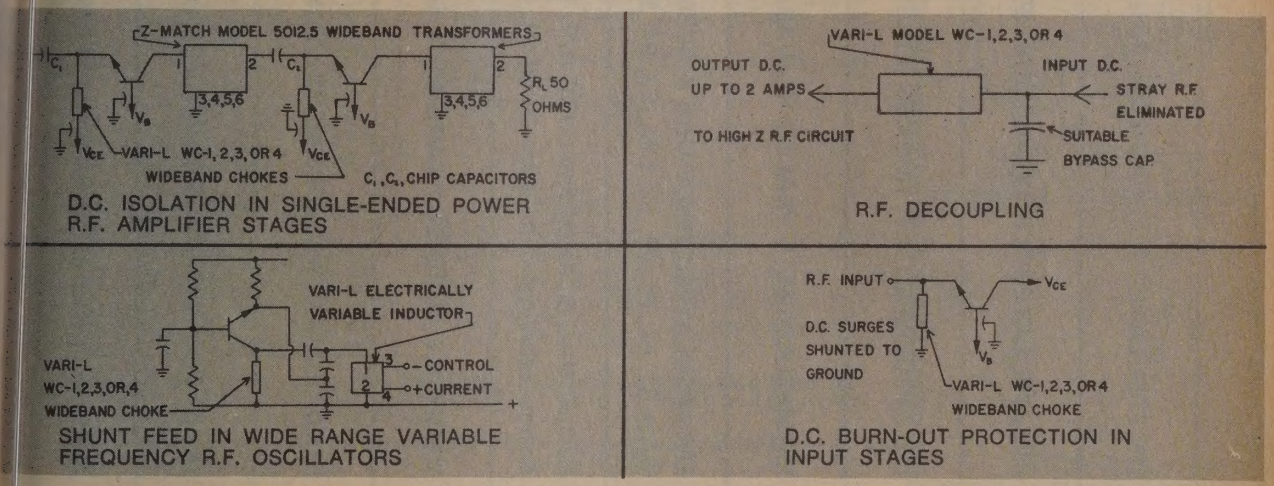
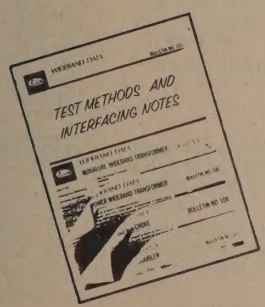


Fig. 12 Typical choke circuit applications



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For other Vari-L products see Sections 3400 and 5600.

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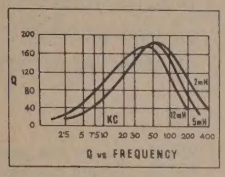
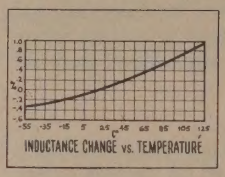
TOROIDAL INDUCTORS

CATALOG NO.	IND mH	DC mA MAX.	DC RES. OHMS
TF04026	1	820	0.75
TF04027	2	580	1.75
TF04028	3	450	2.5
TF04029	5	350	4.0
TF04030	7	300	5.5
TF04031	12	225	7
TF04032	20	175	12
TF04033	30	150	18



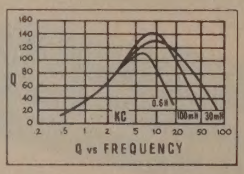


These hermetically sealed coils are used for high Q's up to 200 kcps. Temperature stability of the inductance and dependence of Q from frequency is shown here.

Constructed to meet MIL-T-27B-TF4RX20YY

All units have gray finish and are stamped with schematics legibly marked.

CATALOG NO.	IND mH	DC mA MAX.	DC RES. OHMS
TF04034	4	160	0.75
TF04035	7	135	1.5
TF04036	12	100	2.0
TF04037	20	80	3.5
TF04038	30	65	5.0
TF04039	50	50	8.0
TF04040	70	40	12
TF04041	100	35	17
TF04042	150	30	28
TF04043	250	22	45
TF04044	400	17	70
TF04045	600	14	105
TF04046	900	12	170
TF04047	1500	9	270
TF04048	2000	8	390
TF04049	2800	7	560
TF04050	4000	5	875



These hermetically sealed high Q inductors have high permeability steel enclosure for magnetic shielding.

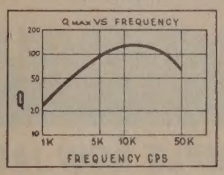
Constructed to meet MIL-T-27B-TF4RX20YY. Inductances are shown with no DC mA in coils. Inductance is practically unchanged at the frequency range shown here.

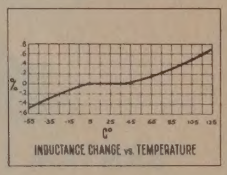
Units are legibly marked with schematics and come with gray finish.

Typical Q curves are shown here.

CATALOG NO.	IND mH	DC RES. OHMS
TF20001	1	0.3
TF20002	2	0.7
TF20003	5	1.8
TF20004	8	2.2
TF20005	10	3.2
TF20006	20	7

CATALOG NO.	IND mH	DC RES. OHMS
TF20007	50	18
TF20008	80	30
TF20009	100	32
TF20010	200	71
TF20011	500	185
TF20012	800	300





These inductors are encapsulated in glass fiber filled diallylphtalate cases approved under MIL-M-19833-GDI-30 "F". All inductors meet MIL-T-27B-TF5RX20ZZ. Cores are wound on high permeability cores of powdered molybdenum permalloy.

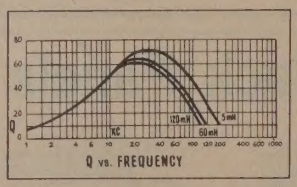
Temperature stability of inductance and dependence of Q from frequency are shown here.

Furnished with green or black finish.

CATALOG NO.	IND mH	DC mA MAX.	DC RES. OHMS
TF04013	3	50	4
TF04014	5	40	7
TF04015	8	30	11
TF04016	12.5	25	16
TF04017	20	20	25
TF04018	30	16	40
TF04019	60	10	80
TF04020	120	7	160

These inductors are for transistor and printed circuit applications providing high Q and small size. Inductances shown are without DC current. With maximum DC mA applied inductances will drop 5%.

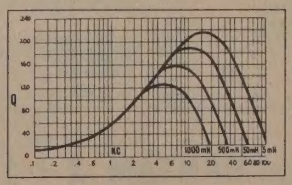
Furnished with green and black finish.

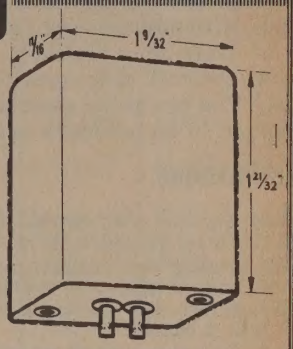


CATALOG NO.	IND mH	DC RES. OHMS
TF20021	5	1.1
TF20022	50	11
TF20023	100	25
TF20024	250	65
TF20025	500	115
TF20026	1000	250

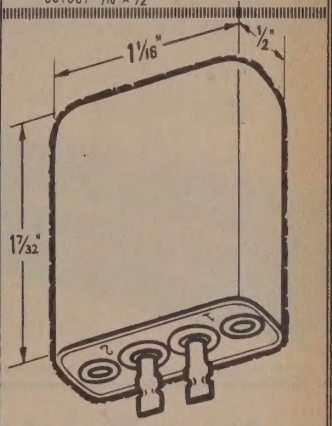
These inductors have characteristics which permit high Q, power level, and stability with a reasonable size and weight.

Available with a 4-40 threaded rod of ¼ long for easy and fast mounting and two 12" long #24 teflon insulated leads.

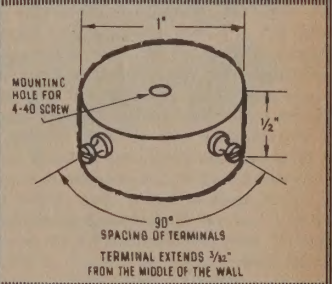




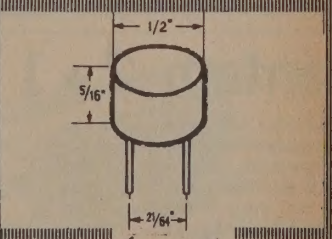
MOUNTING 7/8" × 9/32" SCREWS 4-40
CUTOUT 5/16" × 1/2"

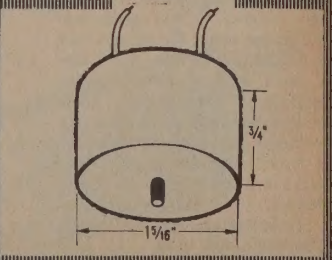


MOUNTING 3/4" SCREWS 4-40
CUTOUT 5/16" × 1/2"



SPACING OF TERMINALS
TERMINAL EXTENDS 3/32" FROM THE MIDDLE OF THE WALL





ADC Bantam Jack Panels

Bantam Jack Panels are designed to satisfy the increasing demand for more compact patchfields in modern electronic and communication equipment. Bantam Jack Panels, with miniaturized jacks, provide twice the number of jacks in a standard size panel. They require only ½ the rack space previously used by conventional panels. The new panel assemblies weigh 65% less when compared to an assembly using an equivalent number of jacks on a conventional jack panel. ■ Bantam Jack Panels are compact, lightweight, and yet provide the same dependable service as the long established telephone types. This new design offers 96 jacks (48 pairs) in a 1¾ inch x 19 inch standard sized panel. The jacks on this panel are spaced to prevent the cross patching of adjacent circuits when using double plugs.

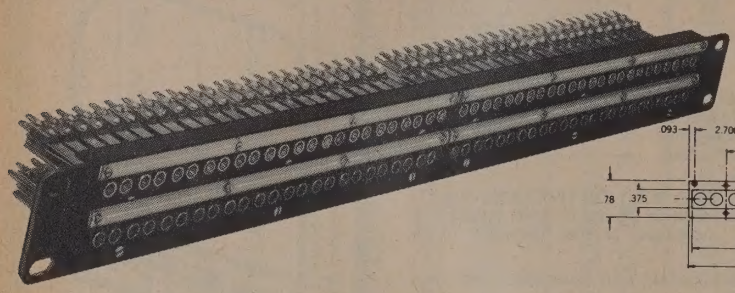
specifications

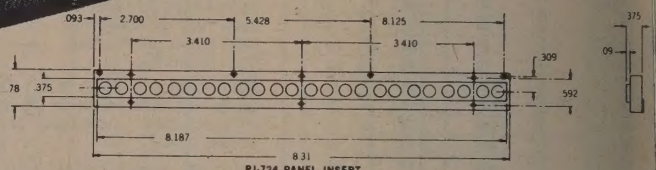
1. **Panel:** Aluminum alloy, extruded. Finished black anodized per Mil-A-8625A. Overall dimensions 1¾"x19"—Standard EIA mounting centers.
2. **Jack Mounting:** Four moulded plastic inserts, each provides for 24 jacks. Pairs of jacks on 5/16 inch centers. Double-row panel provides 96 jacks total. Blank inserts can be furnished where only single row of jacks is required.
3. **Designation Strip:** Extruded clear plastic.
4. Panel assemblies are available with a wide variety of two and three-conductor jacks. See listing of Bantam jacks for complete details.

PJ-731	Double row panel, assembly less jacks, holds 96 jacks.
PJ-737	Double row panel, with 48 pair (96 total) PJ-818 jacks.
PJ-739	Double row panel, with 48 pair (96 total) PJ-839 jacks.
PJ-724	Panel inserts, less jacks, 24 holes.
PJ-700	Panel inserts, blank (same as PJ-724 without holes).
PJ-736*	Double row panel, with 104 PJ-818 jacks.
PJ-738*	Double row panel, with 104 PJ-839 jacks.

*Panels with 104 jacks (26 per insert, jacks all on 5/16 inch centers) are available on special order.

Custom panel assemblies with up to 104 jacks are available on special order.

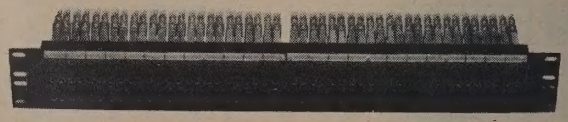




PJ-724 PANEL INSERT

Bantam Triple Row Jack Panel

Bantam Triple Row Jack Panels provides 144 jacks in a 2⅝ inch x 19 inch size panel. The specification and construction of this panel is the same as Bantam Double Row Panels except width of panel is one and one-half the standard panel size. Mounting centers conform to standard EIA rack spacing. Three rows of jacks with 48 jacks in each row. These three rows are particularly desirable for use in 2 wire and 4 wire VF Circuit applications where space can be saved by having three verticle jacks appear as a jack set. When needed number plates or labels to show row functions can be furnished on special order.



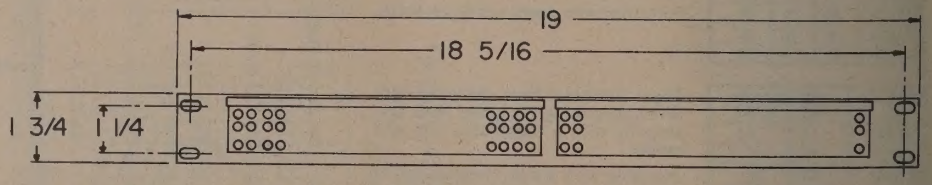
"BANTAM TRIPLE ROW JACK PANEL — 2⅝" WIDE"

BANTAM TRIPLE ROW JACK PANEL

PJ-732	Triple Row Panel Assembly, less jacks, holds 144 jacks
PJ-733	Triple Row Panel, with 144 PJ-818 Jacks
PJ-734	Triple Row Panel, with 144 PJ-839 Jacks
PJ-735	Triple Row Panel, with 96 PJ-839 Jacks (top and middle row) 48 PJ-838 Jacks (bottom row).

Bantam 2 + 1 Jack Panels

Bantam 2 + 1 Jack Panels are the newest development in the ADC line of Bantam components which offer the maximum in patching density. These unique three row panels feature three miniature jacks on a single frame, which effectively requires ⅓ less space than regular Bantam jacks. The Bantam 2+1 panels include 48 of these three conductor jacks, in a standard size 1¾ inch wide by 19 inch long panel. These panels were especially designed to provide vertically positioned jack sets such as the "Line", "Equipment" and "Monitor" jacks in a Voice Frequency Circuit. The Bantam 2 + 1 Jacks provided in these panels are available with solder type terminals and with wire wrap terminals. When required number plates or labels for identifying row functions can be provided on special order.



"BANTAM 2 + 1 JACK PANEL — 1¾" WIDE"

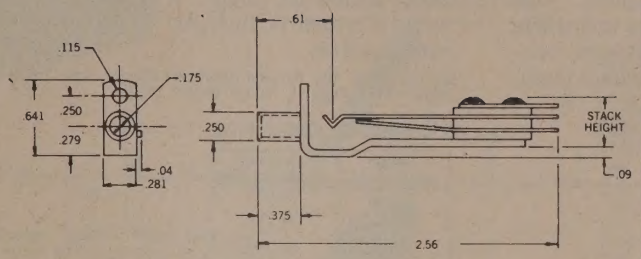
PJ-721	Panel Assembly, with 48 PJ-821 Jacks
PJ-721W	Panel Assembly, with 48 PJ-821W Jacks

ADC PRODUCTS
4900 W. 78th St., Minneapolis, Minn. 55435

Bantam Jacks

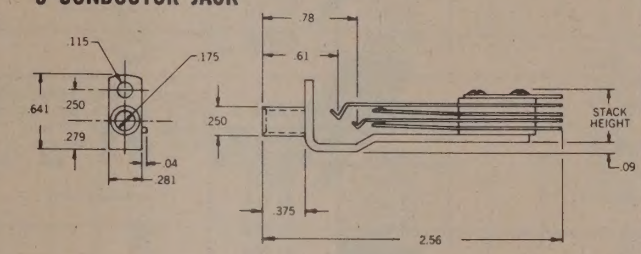
Bantam Jacks will meet the electrical, mechanical and environmental requirements of the military specification for long frame telephone jacks. Although reduced in size these jacks will provide the same reliable service equal to that expected from regular size telephone jacks. These jacks are available in a variety of two and three conductor types, with isolated circuit contacts as well as normalling contacts.

FOR COMPLETE LINE OF BANTAM LITES, SWITCHES, ACCESSORIES, SEE ADC COMMUNICATIONS COMPONENTS CATALOG.



2 CONDUCTOR JACK

3 CONDUCTOR JACK



SCHEMATIC DIAGRAM	PART NO.	STACK HEIGHT (Inches)
	PJ-803	13/32
	PJ-808	43/64
	PJ-815	35/64
	PJ-816	35/64
	PJ-818	13/32
	PJ-823	27/64
	PJ-836	5/8
	PJ-805	43/64
	PJ-824	43/64
	PJ-838	35/64
	PJ-839	17/32
	PJ-841	43/64
	PJ-880	3/4

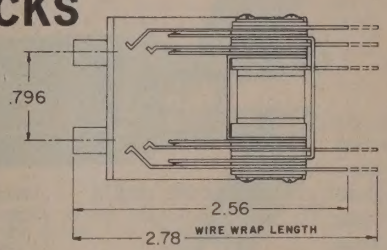
Specifications

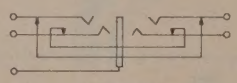
Frame: Steel, Cadmium plate with chromate conversion coating to withstand 50 hours of salt spray.
Springs: Nickel silver.
Contacts: W. E. #1 gold alloy, cross-bar contacts are welded to springs.
Insulation: Spacers, Phenolic Type PBE-P per MIL-P-3115B.
Bushing: Brass, silver soldered to frame. Finish same as frame.

All of the above jacks are available on special order with Palladium cross-bar contacts.
If gold plating is required for all surfaces, jacks should be ordered as the PJ number with a "G" suffix. ADC uses .00005 gold per MIL-G-45204, TYPE II. The solder lugs are not tinned for gold plated jacks. Any requirements other than those described require special notation.

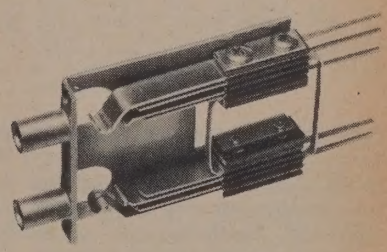
Bantam Twin Jacks

Bantam Twin Jacks are the miniature equivalent of the ADC PJ-482 or the WE 482A. These three conductor type jacks have normal contacts on both tip and ring springs strapped, thereby reducing and simplifying wiring. The Bantam Twin Jacks are designed with sleeves on .796 inch centers and are made to mount in the ADC PJ-731 Double Row Panels and the PJ-732 Triple Row Panels. Bantam Twin Jacks are available with solder terminals and wire wrap terminals.





SCHEMATIC

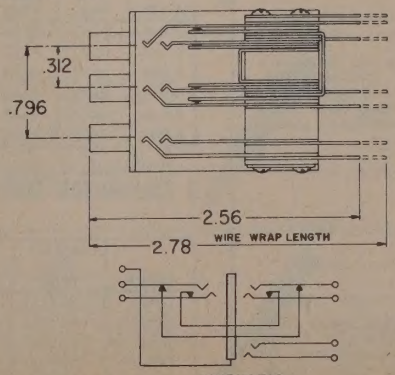


PJ-882 Bantam Twin Jack — Solder Terminals

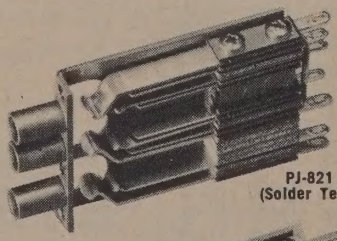
PJ-882W Bantam Twin Jack — Wire Wrap Terminals

Bantam 2 + 1 Jacks

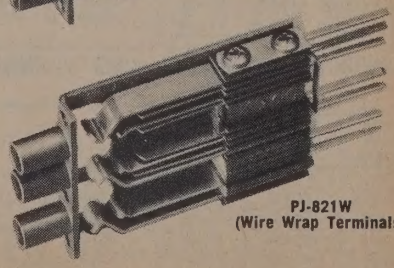
Bantam 2 + 1 Jacks offer almost unbelievable space saving advantages . . . Savings even greater than regular Bantam jacks. Bantam 2 + 1 Jacks literally permits tripling of the patching density of a 1¾ inch wide panel. This unique design features three jacks on a single frame. The jacks are three conductor types. Two of the jacks have normal contacts on both tip and ring springs. These normal contacts are strapped to simplify wiring. Ideally suited to VF Circuit applications where two of the jacks would function as "Line" and "Equipment" jacks and the third as a "Monitor" jack. Up to 48 Bantam 2 + 1 Jacks can be mounted on a 1¾ inch wide by 19 inch long panel. Bantam 2 + 1 Jacks are available with solder type terminals and with wire wrap terminals. These very remarkable miniature jacks are specifically designed to mount in the Bantam 2 + 1 Panel PJ-721.



SCHEMATIC



PJ-821 Jack (Solder Terminals)

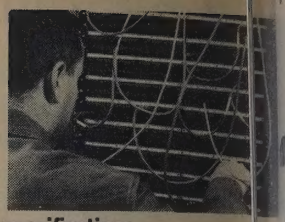


PJ-821W (Wire Wrap Terminals)

ADC Bantam Patch Cords

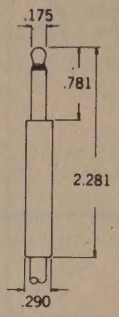
Bantam Patch Cords are plastic jacketed, shielded cords complete with molded-on plugs. The plugs are made with molded insulation between conductors. Bantam Patch Cords are available with single and double two and three conductor plugs. A cord strain relief feature is included in the plug construction.

Bantam plugs may be gold plated on special order per MIL-G-45204, Type II, .00005 inches thick.



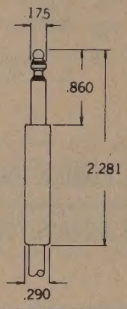
2 CONDUCTOR SINGLE PLUG

Length (see Note 1)	Single (2) Conductor Plug
6 inch	PJ-701
12 inch	PJ-702
18 inch	PJ-703
24 inch	PJ-704
30 inch	PJ-705
36 inch	PJ-706
48 inch	PJ-708
60 inch	PJ-710



3 CONDUCTOR SINGLE PLUG

Length (see Note 1)	Single (3) Conductor Plug
6 inch	PJ-711
12 inch	PJ-712
18 inch	PJ-713
24 inch	PJ-714
30 inch	PJ-715
36 inch	PJ-716
48 inch	PJ-718
60 inch	PJ-720



specifications

Cord: Plastic jacketed, stra ed copper conductors, braided s ld. Jacket color — gray.

Plugs: Conductor parts are b ss, finished to 32 microinch finish i xi- mum.

Plug Insulation: Molded polsty e.

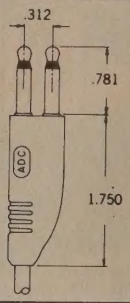
Internal Connections: Soldered

Plug Shell: Plastic, black, rigid r- moplastic.

NOTE 1: Length is measured fro e rear of the plug shell to rear of g shell on opposite end.

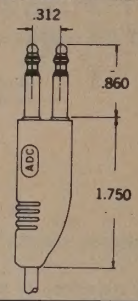
2 CONDUCTOR (DOUBLE)

Length	Double (2) Conductor Plug
6 inch	PJ-751
12 inch	PJ-752
18 inch	PJ-753
24 inch	PJ-754
30 inch	PJ-755
36 inch	PJ-756
48 inch	PJ-758
60 inch	PJ-760



3 CONDUCTOR (DOUBLE)

Length	Double (3) Conductor Plug
6 inch	PJ-761
12 inch	PJ-762
18 inch	PJ-763
24 inch	PJ-764
30 inch	PJ-765
36 inch	PJ-766
48 inch	PJ-768
60 inch	PJ-770



specifications

Cord: Plastic jacketed, stran d copper conductors, braided shi l. Jacket color — gray.

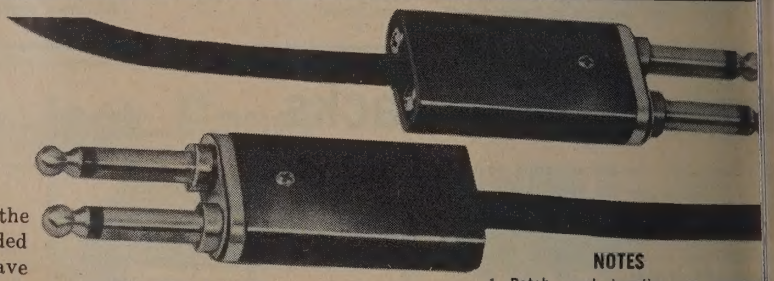
Plugs: Conductor parts are br , finished to 32 microinch finish m- mum.

Plug Insulation: Molded polystyre

Internal Connections: Soldered.

Plug Shell: Plastic, gray, flexi thermoplastic.

Patch Cords



ADC Patch Cords have become standards in the communications industry. The heavy Nylon braided jacket excels in abrasion resistance. All cords have been designed to give the ultimate combination of durability, flexibility and reliability. ADC has numerous combinations of special cord assemblies using virtually every plug combination required. You are invited to submit your requests or requirements for quotations.

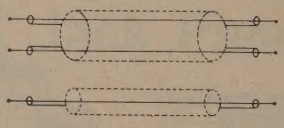
PATCH CORD LENGTH	TOLERANCE
6 inch	+ .375" —.00"
1 foot	+ .75 " —.00"
2 feet	+1.125" —.00"
3 feet	+1.375" —.00"
4 feet	+1.625" —.00"
5 feet	+2.0 " —.00"
6 feet	+2.25 " —.00"
10 feet	+2.625" —.00"

NOTES

1. Patch cord lengths are measur from backs of plug shells.
2. When outer jacket colors other th noted are required add suffix:
   S — For Slate G — For Gre
   R — For Red B — For Blac
3. All cords and cord assemblies w withstand 500 V, 60 Hz PBT betwe all conductor. Cordage is designed have minimum leakage resistance 50 Megohms with 100 volts applie

2 CONDUCTOR SHIELDED, CORD ASSEMBLIES

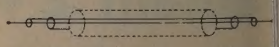
Length	Cord w/ PJ-1 Plugs	Cord w/ PJ-055B Plugs	Replacement Cords Only
6 inch	PJ-10½	PJ-50½	PJ-20½
1 foot	PJ-11	PJ-51	PJ-21
2 feet	PJ-12	PJ-52	PJ-22
3 feet	PJ-13	PJ-53	PJ-23
4 feet	PJ-14	PJ-54	PJ-24
5 feet	PJ-15	PJ-55	PJ-25
6 feet	PJ-16	PJ-56	PJ-26
10 feet	PJ-10	PJ-50	PJ-20



These cords provide two tinsel wire conductors plus a braided shield. The overall jacket is braided nylon. Black nylon is standard, also available in slate, green and red on special order, see Note 2.

3 CONDUCTOR SHIELDED, CORD ASSEMBLIES

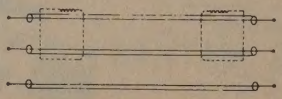
Length	Cord w/ PJ-2 Plugs	Cord w/ PJ-051R Plugs	Replacement Cords Only
1 foot	PJ-71	PJ-81	PJ-61
2 feet	PJ-72	PJ-82	PJ-62
3 feet	PJ-73	PJ-83	PJ-63
4 feet	PJ-74	PJ-84	PJ-64
5 feet	PJ-75	PJ-85	PJ-65
6 feet	PJ-76	PJ-86	PJ-66



These cords provide two tinsel wir conductors plus a braided shield Overall jacket is braided nylon. Blac nylon is standard with slate colore jacket also stocked. Green and red ar available on special order. See Note 2

2 CONDUCTOR UNSHIELDED, CORD ASSEMBLIES

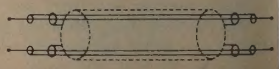
Patch Cords Length	Cord w/ PJ-327 Plugs	Cord w/ PJ-047R Plugs
1 foot	PJ-181	PJ-471
2 feet	PJ-182	PJ-472
3 feet	PJ-183	PJ-473
4 feet	PJ-184	PJ-474
5 feet	PJ-185	PJ-475
6 feet	PJ-186	PJ-476



The PJ-180 and PJ-470 series cords offer tinsel wire conductors, thermo plastic insulated. Standard color for PJ-180 series patch cords is slate. The standard color for the PJ-470 series cords is red. Other colors are available on special order, see Note 2.

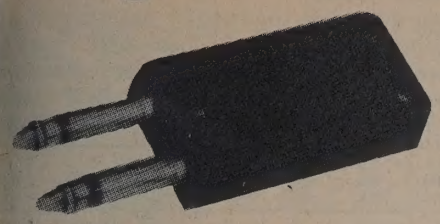
3 CONDUCTOR SHIELDED, CORD ASSEMBLIES

Length	Cord w/ PJ-7 Plugs	Cord w/ PJ-8 Plugs
1 foot	PJ-171	PJ-91
2 feet	PJ-172	PJ-92
3 feet	PJ-173	PJ-93
4 feet	PJ-174	PJ-94
5 feet	PJ-175	PJ-95
6 feet	PJ-176	PJ-96

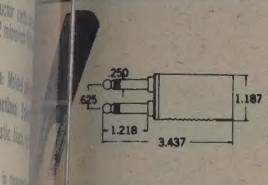


The PJ-90 and PJ-170 series cords provide four tinsel wire conductors, plus a shield common to both sleeves on the plugs. Standard color for these cords is black. They are also available in slate, green or red on special order. See Note 2.

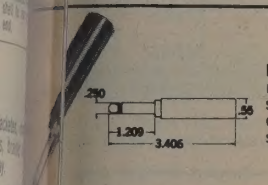
ADC Plugs



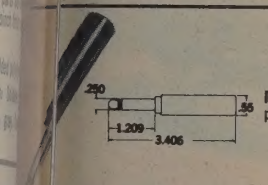
TWO CONDUCTOR



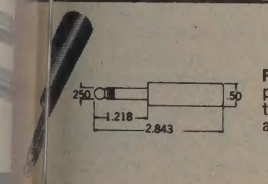
PJ-1 — Equivalent WE-241. Heavy duty die cast frame. Black phenolic shell. Has self-aligning plug sleeves on 5/8" centers for use with all standard jack panels. Two tip conductors, plus sleeve connection common to both sleeves.



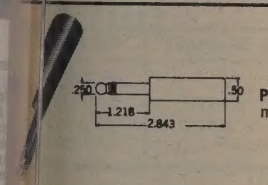
PJ-047R — Equivalent WE-347. Designed for use with tip and sleeve jacks. Molded insulation, red plastic handle, design and construction in accordance with MIL-P-642B specifications.



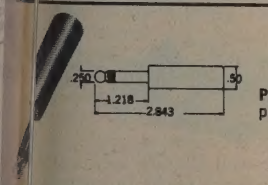
PJ-047B — Same as above except black plastic handle.



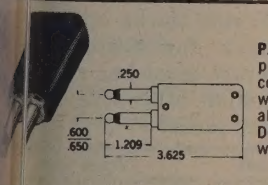
PJ-055B — Formerly ADC PJ-5, fits 1/4" phone jacks. Black plastic shell. Screw terminals, designed and manufactured in accordance with MIL-P-642B.



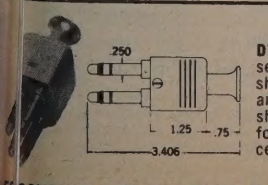
PJ-055M — Same as above except has metal handle, brass, nickel plated.



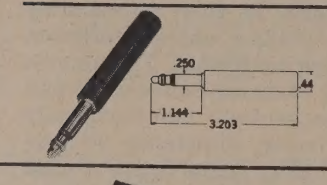
PJ-055R — Same as above except has red plastic handle.



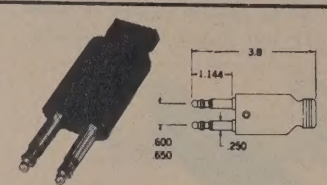
PJ-327 — Equivalent WE-327. Twin plug provides two electrically independent 2 conductor plugs in a black phenolic shell which is notched to indicate polarity. Self-aligning plug sleeves are on 5/8" centers. Designed and constructed in accordance with specification MIL-P-642B.



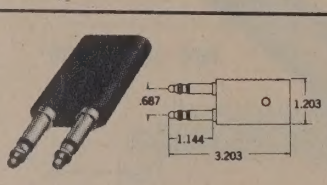
D7200 — Equivalent WE-315B. Four sleeves, self-aligning plug. Molded insulation. Brass shell notched for polarity is nickel plated and connected to plug sleeves to provide shielding for tip conductors. For use with four PJ-318 double jacks mounted on 5/8" centers. Five conductors total.



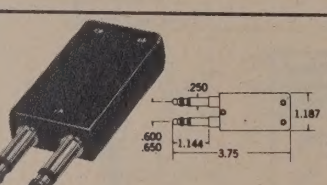
THREE CONDUCTOR



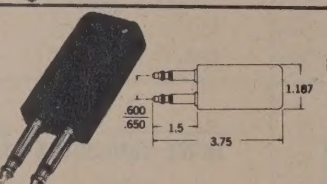
PJ-2 — Equivalent WE-291A. Designed for use with 1/4" diameter tip, ring and sleeve jacks. Especially designed cone-shaped tip to prevent momentary shorting of tip and ring conductors when used with ADC PJ-339, WE-239A or similar three circuit jacks.



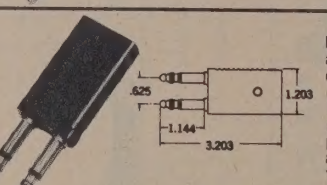
PJ-4 — Looping plug, dual three conductor type. Same conductor configuration as PJ-051 except has conductors wired internally, tip to tip, ring to ring and sleeve to sleeve. Black plastic shell.



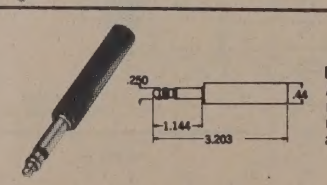
PJ-6 — Equivalent WE-213. Designed for applications requiring two separate 3 conductor circuits. Popularly used with operator's intercom/monitor headsets. Black shell notched for polarity identification. Self-aligning plug on 1 1/16" centers. (**Note:** Not intended for use with standard jack panels where jacks are mounted on 5/8" centers.)



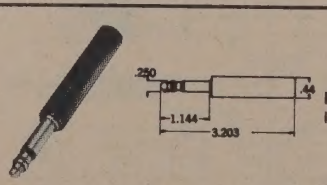
PJ-7 — Equivalent WE-425. Twin type plug with tip, ring and sleeve conductors on 5/8" centers for use with all standard jack panels. Designed to mate with three conductor jacks having 1/4" diameter sleeves. Molded insulation. Black phenolic shell is notched to indicate polarity.



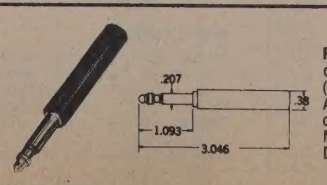
PJ-8 — Dual three conductor type with same conductor configuration as PJ-2, designed for non-shorting of tip and ring circuits when used with PJ-339, WE-239A or similar jacks. Black plastic handle notched to indicate polarity.



PJ-9 — Equivalent WE-338. Designed for applications requiring two separate 3 conductor circuits. Will mate with three-conductor jacks having 1/4" diameter sleeves. Molded insulation, black plastic handle notched to indicate polarity. Self-aligning plug sleeves on 5/8" centers. Has two separate cord entry holes and requires "Y" type cord or two separate cords.



PJ-051R — Equivalent WE-310. Formerly ADC PJ-3. Designed for use with 1/4" tip, ring and sleeve jacks. Molded insulation, red plastic shell, three conductor. Is in accordance with MIL-P-642B.



PJ-051B — Same as above except black plastic handle.

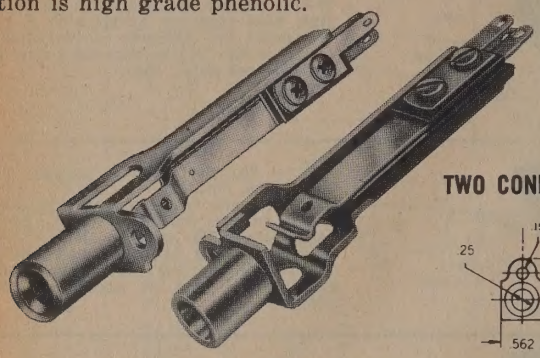
PJ-309 — Equivalent WE-309. Three conductor type. Has .207 diameter sleeve (small diameter). Intended for use with ADC PJ-246, PJ-249 and similar three circuit jacks which have .210 I.D. sleeves. Molded insulation — red plastic handle. Designed and constructed per MIL-P-642B.

FOR COMPLETE LINE OF COAXIAL PLUGS, SEE ADC COMMUNICATIONS COMPONENTS CATALOG.

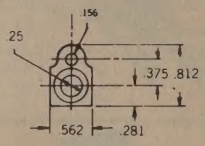
(ADC) Jacks

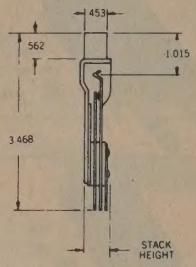
TELEPHONE TYPE

ADC is recognized as a leading supplier of long frame, telephone type jacks. As evidence of their outstanding quality, ADC jacks are used by the country's foremost manufacturers of communication equipment. The unique, ADC one-piece frame is strong, dimensionally stable and readily interchangeable both mechanically and electrically with commonly used jacks. Plating withstands 50-hour salt spray tests. W. E. #1 gold alloy contacts are welded to nickel silver springs. Lugs are hot tin dipped. Insulation is high grade phenolic.

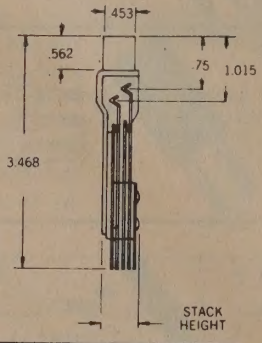


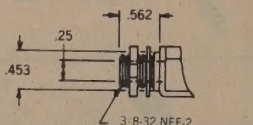
TWO CONDUCTOR





THREE CONDUCTOR





THREADED SLEEVE AVAILABLE ON SPECIAL ORDER

SPECIFICATIONS:

Frame: Steel, plated to withstand 50 hours salt spray per Mil-STD-202, Method.
Sleeve: Brass, nickle plated.
Springs: Nickle silver with tinned lugs.
Insulators: Phenolic, per Mil-P-3115 B type.

Schematic Diagram	Jacks	WE Equiv.	Frame Style	Stack Height (Inches)
	PJ-115	215-A	A	5/8
	PJ-116	216-A	A	5/8
	PJ-117	217-A	A	9/16
	PJ-123	223-A	A	7/16
	PJ-125	225-A	A	21/32
	PJ-202	None	C	3/4
	PJ-203	303-A	A	9/16
	PJ-204**	None	A	3/4
	PJ-205**	240-A	A	3/4
	PJ-206**	242-A	A	3/4
	PJ-207**	285-A	A	27/32
	PJ-208**	284-A	A	63/64
	PJ-209**	411-A	A	27/32
	PJ-226	226-A	A	5/8
	PJ-237	237-A	A	15/32
	PJ-238	238-A	A	9/16
	PJ-240	240-C	C	3/4
	PJ-241**	241-A	A	3/4
	PJ-242	242-C	C	3/4
	PJ-280	280-C	C	23/32
	PJ-318	218-A	A	1/2
	PJ-336	236-C	C	19/32
	PJ-338	438-C	C	13/16
	PJ-339	239-A	A	9/16
	PJ-418	218-C	C	1/2
	PJ-246*	246-A	A	9/16
	PJ-248*	248-A	A	9/16
	PJ-249*	249-A	A	9/16

MILITARY JACKS

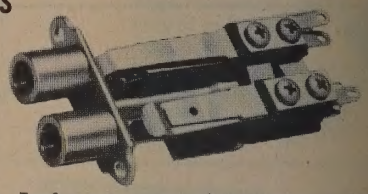
Designed to meet the rugged, exacting require of military applications. These ADC jacks are in accordance with Mil-J-641B specifications. est quality materials and closely held toleran dimensions conform with military specificatio

Schematic Diagram	MIL Jacks	Frame Style	Stack Height (Inches)	Schematic Diagram	MIL Jacks	Frame Style
	JJ-015	C	3/4		JJ-073**	A
	JJ-016	A	9/16		JJ-074	A
	JJ-017**	A	3/4		JJ-075**	A
	JJ-019	C	11/16		JJ-077	A
	JJ-022	A	9/16		JJ-078**	A
	JJ-024	A	1/2		JJ-084	A
	JJ-035	A	5/8		JJ-085	A
	JJ-042	A	9/16		JJ-086	A
	JJ-072	A	5/8		JJ-087**	A

*For use with PJ-309 or other similar type plugs having .207" di sleeves.

**Caution — Because of Stack Height these "A" frame jacks can installed on 5/8" centers. "C" Frame version if not listed can be fur on special order.

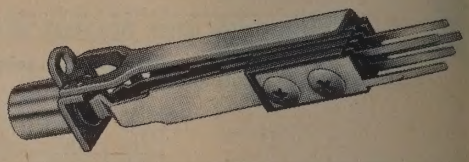
TWIN JACKS



ADC Twin Jacks are essentially two jacks wit common mounting frame. Jack sleeves are on 3/8" centers for vertical mounting in standard jack p els. Normal springs are cross-connected or strap Jack sleeves are brass, nickel plated. Die for springs are nickel silver. Frame and hardware steel, cadmium-chromate plated to withstand hours salt spray.

Part No.	WE Equivalent	No. Conductors	Use With Pl
PJ-410	410A	2	PJ-047, PJ- and PJ-32
PJ-482	482A	3	PJ-051, PJ-

WRAPID JACKS (For Wrapped Solderless Connections)



ADC offers a variety of Wrapid Jacks with .08 by .062" rectangular terminals for wrapped w connections. These jacks feature cross-bar contac Overall length is 3.825" maximum, otherwise, dim sionally the same as telephone jacks.

Schematic Diagram	Wrapid Jack	Frame Style
	PJ-238W	A
	PJ-240W	C
	PJ-241W	A
	PJ-242W	C
	PJ-339W	A

FOR COMPLETE LINE OF COAXIAL PLUGS, SEE ADC COMMUNICATIONS COMPONENTS CATALOG.

ADC Jack Panels

ADC fers the most complete assortment of jack panels avail e today. ADC panels are used in television and broad sting stations, recording studios, industrial paging syste , and communication equipment of all kinds where there s a need to efficiently switch and distribute audio signa Molded of solid phenolic, reinforced with steel to provi maximum rigidity and strength. Jacks are spaced to pe nit use of any standard double plug with ⅝" spacing. ounting brackets and designation strips* furnished with each panel. All panels designed to fit standard 19" relay rack. Consult ADC for your standard and special jack panel requirements.

*The jack panels as illustrated are equipped with ADC standard designation strips as shown. PJ-30, PJ-35, PJ-36 and PJ-37 type panels can be supplied with the reinforcement strips drilled and tapped to accommodate the Western Electric equivalent designation strips (PJ-899A, PJ-899B, PJ-903A and PJ-903B). The suffix "A" added to the part number denotes panels which are modified to accommodate these alternate type designation strips. Designation strips are to be ordered separately.

SPECI ATIONS

Panels: ded, thermoset plastic per Mil-M-14F, Type CFG, black.
Mounting Brackets: PJ-31 and PJ-33: Die cast zinc, finished black lacquer. PJ-30, PJ-35, PJ-36, PJ-37: Steel, finished cadmium + chromate per Mil-F-14072 #M262, Type II.
Reinforcing Strips: PJ-31 and PJ-33: Steel, finished nickel plated. PJ-30, PJ-35, PJ-36, PJ-37: Steel, finished cadmium + chromate per Mil-F-14072 #M262, Type II.

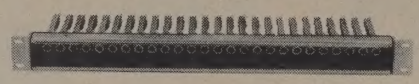
PJ-30
Double Panel. Holds 52 jacks — requires 1¾" panel space. Double designation strip. Brackets for flush rack mounting. All jack mounting holes on ⅝" centers.

PJ-31
Double Panel. Holds 48 jacks. Holes are spaced to prevent patching adjacent circuits. Requires 2⅛" panel space.

PJ-33
Single Panel. Holds 24 jacks. Holes are spaced to prevent patching adjacent circuits. Requires 1¾" panel space.

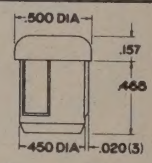
FOR LAMP SOCKET AND CAPS, ADC COMMUNICATIONS COMPONENTS CATALOG.

PJ-35 Same as PJ-30, except has 7" standoff mounting brackets.



PJ-36
Single Panel. Holds 26 jacks — requires 1¾" panel space. Brackets for flush rack mounting. All jack mounting holes on ⅝" centers.

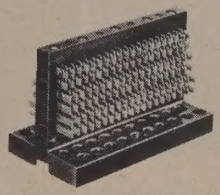
PJ-37
Triple - Row Panel. Holds 78 jacks. Requires 2⅝" panel space (1½" standard rack spaces). Provided with brackets for flush rack mounting and PJ-901 designation strips top and bottom.



HOLE PLUG
Molded of black polyethylene plastic. Fits all ADC standard jack panels. Made to plug unused jack mounting holes in jack panels. **PJ-29**

PANELS LESS JACKS	PJ-30	PJ-30A	PJ-31	PJ-33	PJ-35	PJ-35A	PJ-36	PJ-36A	PJ-37	PJ-37A
PANELS WITH PJ-318	PJ-340	PJ-340A	PJ-341	PJ-343	PJ-350	PJ-350A	PJ-360	PJ-360A	PJ-370	PJ-370A
PANELS WITH PJ-339	PJ-390	PJ-390A	PJ-391	PJ-393	PJ-395	PJ-395A	PJ-396	PJ-396A	PJ-397	PJ-397A

Molded Terminal Blocks 20 pin



Kn wn for their ruggedness, ADC "Christmas Tree" Terminal Blocks have become standards in the Broadcast and Telecommunications Industries. The ADC 20-Pin Terminal Blocks are molded of durable, black, thermo-set plastic per Military specifications MIL-M-14F. Terminals are brass with a tin alloy plating for lasting solderability (see specifications below for details on solderability). The PJ-101 series blocks have terminals graduated in length for ease of wiring. The Figure 2 solderless terminals as furnished on the PJ-161 series blocks are designed to accommodate AMP No. 60197-1 Connectors as supplied by American Micor, Inc. or may be used as regular solder terminals. ADC Terminal Blocks are numbered along the top row for easy terminal identification.

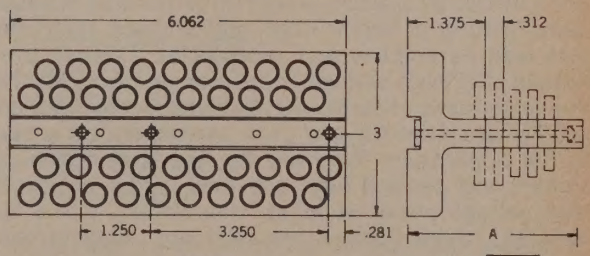


FIG. 1
Solder Type
Mat'l. .040 Thick

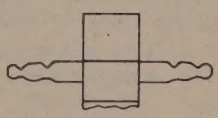
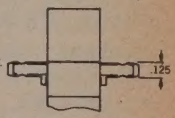


FIG. 2
Solderless or Solder.
Mat'l. .032 Thick



SPECIFICATIONS

Terminals: Brass, Tin alloy plated.

Molded Strips and Base: Black Thermoset plastic per MIL-M-14F, Type CFG.

Mounting Strip: Steel, Cadmium-Chromate per MIL-F-14072, #M262, Type II.

Current Carrying Capacity: 5 Amperes.

Insulation Resistance: 1000 Megohms Min.

Dielectric Strength: 2500 V RMS 60 Hz. between terminals.

Solderability: Per MIL-STD-202C, Method 203A Initial: Excellent (over 95% coverage).

After 49 hours salt spray per MIL-STD-202C. Method 1013: good (90% coverage).

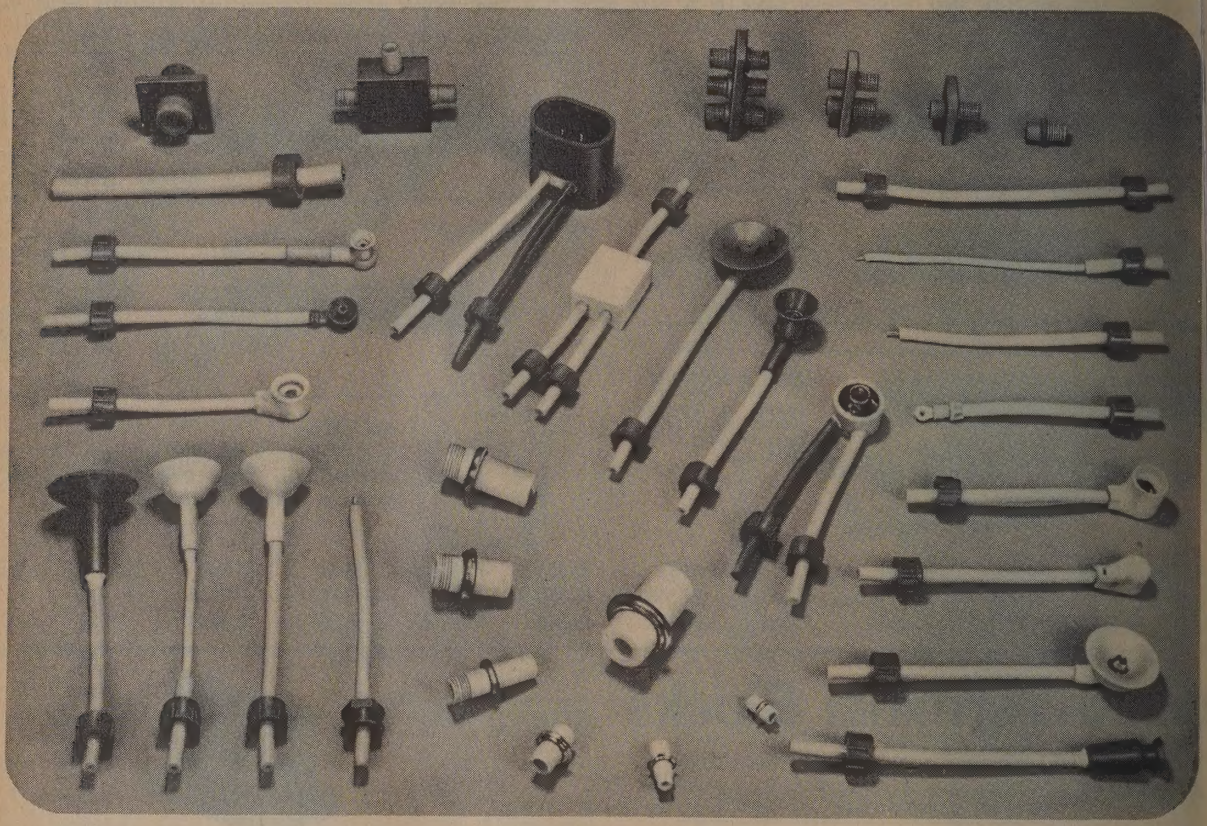
After 240 hours conditioning at +150°F and 95-98%. Relative Humidity: excellent.

After 90 days storage at room temperature: excellent.

FOR WRAP TERMINAL BLOCK OR 26-PIN BLOCKS, SEE COMPLETE ADC CATALOG.

Catalog No.		No. Rows	No. Terminals	Dim. A
Terminal Fig. 1	Terminal Fig. 2			
PJ-101	PJ-161	1	20	1.906
PJ-102	PJ-162	2	40	2.250
PJ-103	PJ-163	3	60	2.593
PJ-104	PJ-164	4	80	2.937
PJ-105	PJ-165	5	100	3.281
PJ-106	PJ-166	6	120	3.625
PJ-107	PJ-167	7	140	3.968
PJ-108	PJ-168	8	160	4.312
PJ-109		9	180	4.656
PJ-110		10	200	4.968
PJ-111		11	220	5.281
PJ-112		12	240	5.593

HIGH VOLTAGE LEAD ASSEMBLIES AND RECEPTACLES



The CAPITRON Division of AMP Incorporated is the leading manufacturer of high voltage, high altitude, high temperature lead assemblies and receptacles. Custom pre-engineered LGH*high voltage connector products incorporate the advantages of miniaturization and lightweight, and are ideal where reliability and peak performance are essential to the application. They are the result of continuing research and development activities in the connection of high voltage power supplies, modulators, pulse forming networks, high voltage transformers, magnetrons, klystrons, traveling wave tubes, and cathode ray tubes.

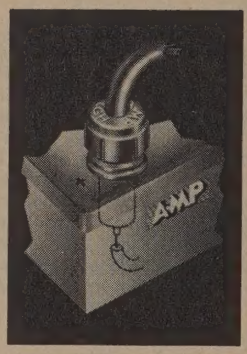
GENERAL FEATURES OF LGH COMPONENTS

- Lightweight, space saving, safe
- Wide temperature range: −55° C to +125° C (−67° F to +257° F)*
- Voltage ratings: to 50,000 volts DC†
- Easy to install—no tools needed
- Insulation: extruded silicone rubber
- Receptacles: ceramic or glass epoxy
- Quick disconnect
- High dielectric and mechanical strength
- Hermetically sealed and corona-resistant
- High altitude operation: up to 70,000 ft. without derating
- Meet applicable mil. specs. for shock and vibration resistance
- RFI shielding optional

*Higher temperature components up to +200°C (+392°F) on request

†Special designs to 200,000 volts DC on request

NOTE: See other CAPITRON High Voltage products under Catalog Sections 2100 and 4000.



Sizes and Ratings Available

TYPE	DC VOLTAGE Rating**	CURRENT RATING**
LGH ½	6,000	10 amps DC
LGH ½ L	12,000	10 amps DC
LGH 1	12,000	10 amps DC
LGH 1 L	25,000	10 amps DC
LGH 2	25,000	10 amps DC
LGH 3	35,000	10 amps DC
LGH 4	50,000	10 amps DC

**Peak AC and peak pulse voltage ratings will be somewhat less than DC ratings. Current rating is limited to 7.5 amps AC rms, 60 cycles.

Write on your letterhead for our LGH products catalog

CAPITRON DIVISION, AMP INCORPORATED
155 PARK STREET, ELIZABETHTOWN, PA. 17022.
TWX: 510-657-4561 • PHONE: 717-367-1105.

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AMP
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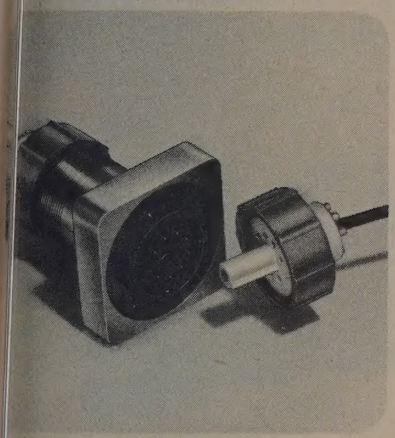
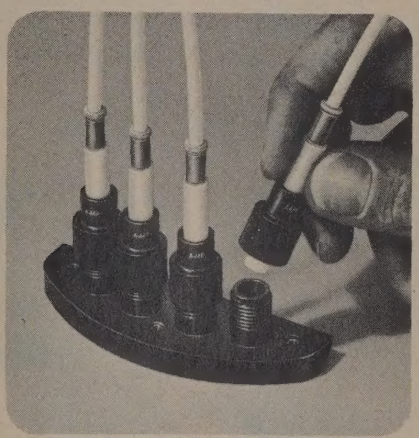
ERMETIC CONNECTORS UP TO 150,000 VOLTS D.C.

JH* Connectors eliminate glass or ceramic insulators

10 PIN CONNECTOR

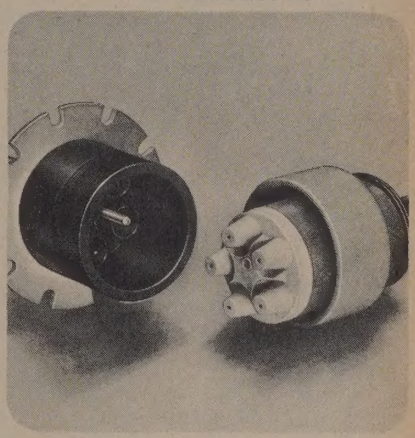


25,000 Volts D.C. center conductor and 9 low voltage pins



15,000 Volts D.C. Bulkhead Connector

5 PIN CONNECTOR



40,000 Volts D.C. Solder or "O" Ring Mounting

eatures:

- Safe—no exposed high voltage parts
- Space saving—maximum performance from the minimum size and weight
- Color coded for easy identification
- Fast connect and disconnect
- Wide temperature range (–55°C to +125°C)
- Positive mating of lead into receptacle
- R F I shielding—optional
- Fungus, moisture, oil, and chemical resistant
- High altitude operation—up to 80,000 feet without voltage derating
- Excellent mechanical strength—resistant to vibration and shock
- High dielectric strength
- Preassembled—no tools required
- High reliability—operates under extreme environmental conditions
- Versatile—top access, splice, or bulkhead application
- Corona resistant—virtually unaffected by ozone or corona
- Radiation resistant
- Lead wire remains flexible from –62°C to +250°C
- Meets applicable military specifications
- Quick, easy installation

Suitable for:

- Industrial & Military Applications
- Power Supplies
- Radar
- Avionic Electronics
- CRT's
- Medical Electronics
- Laser
- Copying Machines
- Instrumentation
- Pulse Applications
- Oceanography

Let us design an assembly that meets or exceeds your requirements. We're the leading maker of customized connectors. Whatever your connection problem contact us today.

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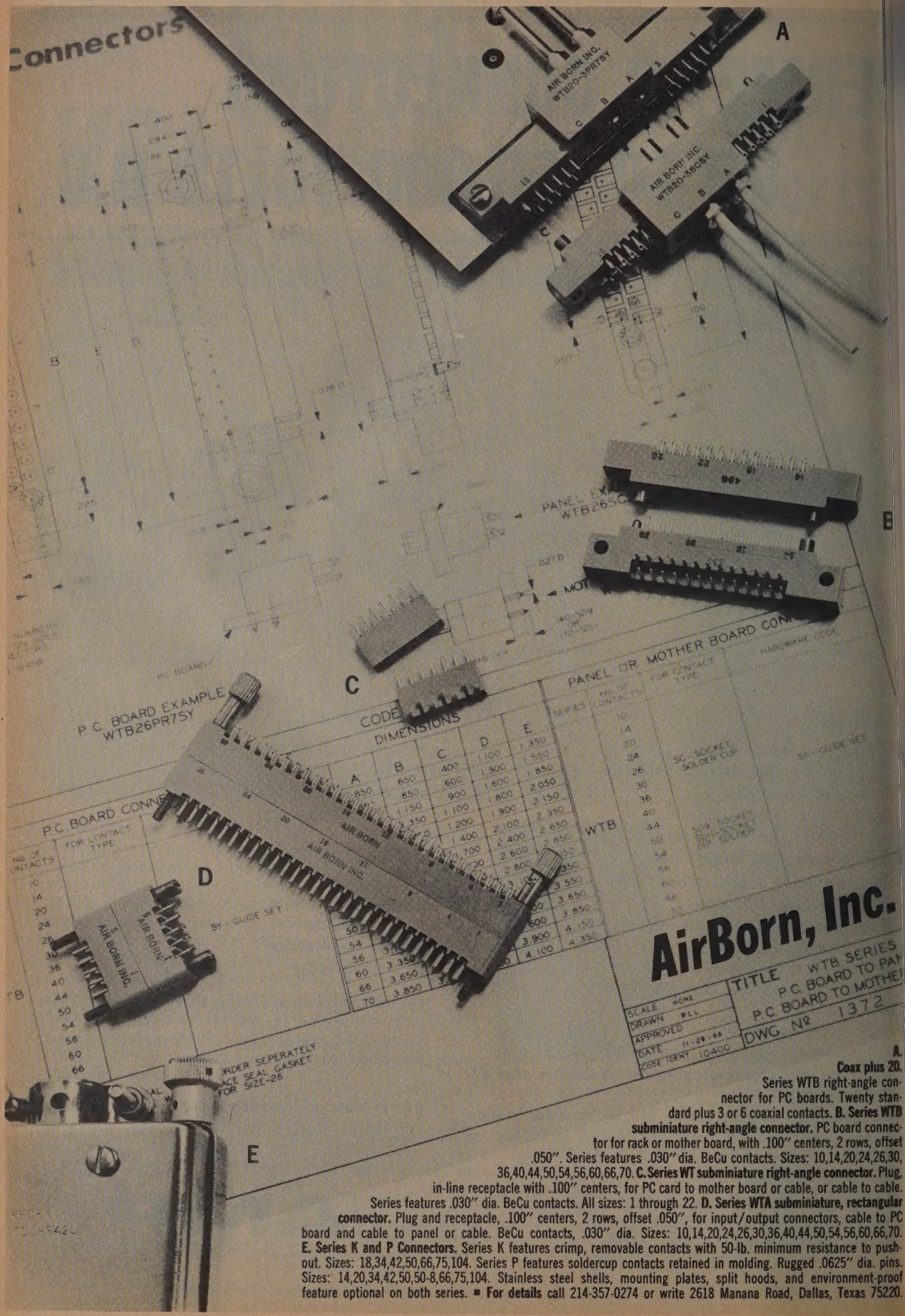
NOTE: See other CAPITRON High Voltage products under Catalog Sections 1500 and 4000.



A. Coax plus 20. Series WTB right-angle connector for PC boards. Twenty standard plus 3 or 6 coaxial contacts. **B. Series WTB subminiature right-angle connector.** PC board connector for rack or mother board, with .100″ centers, 2 rows, offset .050″. Series features .030″ dia. BeCu contacts. Sizes: 10,14,20,24,26,30, 36,40,44,50,54,56,60,66,70. **C. Series WT subminiature right-angle connector.** Plug, in-line receptacle with .100″ centers, for PC card to mother board or cable, or cable to cable. Series features .030″ dia. BeCu contacts. All sizes: 1 through 22. **D. Series WTA subminiature, rectangular connector.** Plug and receptacle, .100″ centers, 2 rows, offset .050″, for input/output connectors, cable to PC board and cable to panel or cable. BeCu contacts, .030″ dia. Sizes: 10,14,20,24,26,30,36,40,44,50,54,56,60,66,70. **E. Series K and P Connectors.** Series K features crimp, removable contacts with 50-lb. minimum resistance to push-out. Sizes: 18,34,42,50,66,75,104. Series P features soldercup contacts retained in molding. Rugged .0625″ dia. pins. Sizes: 14,20,34,42,50,50-8,66,75,104. Stainless steel shells, mounting plates, split hoods, and environment-proof feature optional on both series. ■ **For details** call 214-357-0274 or write 2618 Manana Road, Dallas, Texas 75220.

MICROPHONE CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

V! Excellite© Microphone Plugs & Connectors

w cost, dependable audio-type connector with latchlock ng. Made of sturdy ABS molded plastic with lustrous plating. Excellite connectors resist denting, chipping, g or tarnishing. They are available in cable plugs and receptacles with 3, 4 and 5 contacts.

ures

NOMICAL — Lower initial procurement cost, less downtime for llation, rewiring, field repairs.

HTWEIGHT — Considerable weight savings over comparable die-cast configurations.

ING — Unitized inserts (shell, button and insert are all one assembly) easily removed and feature screw-machined solder cup type contacts quick, efficient termination.

ITIVE GROUND — In all Excellite latchlock-type connectors, contact engages first for use as ground — eliminating chance of accidental trical damage to solid-state equipment or microphones.

ARIZATION — Key on female connector, lock-in keying on male to ent mismating.

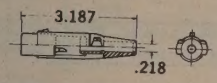
SPECIFICATIONS

- **SHELL AND CABLE CLAMP** — Molded plateable grade ABS (acrylonitrile butadiene styrene) with nickel plate over copper finish.
- **INSERT DIELECTRIC** — Molded type 6 nylon.
- **CONTACTS** — Copper alloy, silver plated and chromate dipped. Screw machine design with solder cup termination.
- **CABLE RELIEF** — General purpose 40-60 durometer neoprene rubber.
- **CABLE CLAMP** — Cable clamp and gland accepts commonly used .250" to 0.313" diameter cable.
- **ELECTRICAL CHARACTERISTICS**

	3 Contact	4 Contact	5 Contact
Voltage	133 V (RMS)	133V (RMS)	133V (RMS)
Current	15 A.	10 A.	7.5 A

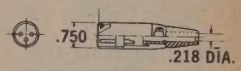
- **TEMPERATURE RATING** — −20°F to 160°F
- **DIELECTRIC WITHSTANDING VOLTAGE** — 1400 V at 60 Hz for one minute between any two contacts or between any contact and connector shell.

Straight Cord Plugs



Socket Contacts

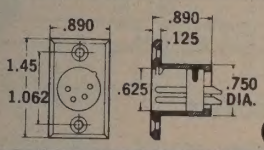
er of Contacts		3	4	5
Number		91-454	91-458	91-462
ical	Cannon	XLR-3-11C	XLR-4-11C	XLR-5-11C
alent	Switchcraft	A3F	A4F	None



Pin Contacts

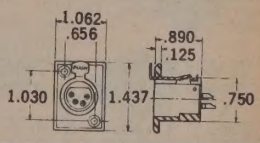
Number of Contacts		3	4	5
Part Number		91-453	91-457	91-461
Electrical	Cannon	XLR-3-12C	XLR-4-12C	XLR-5-12C
Equivalent	Switchcraft	A3M	A4M	None

Wall Mounting Receptacles



Pin Contacts (mates with above)

er of Contacts		3	4	5
Number		91-455	91-459	91-463
rical	Cannon	XLR-3-32	XLR-4-32	XLR-5-32
alent	Switchcraft	D3M	D4M	None

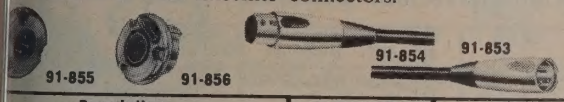


Socket Contacts (mates with above)

Number of Contacts		3	4	5
Part Number		91-456	91-460	91-464
Electrical	Cannon	XLR-3-31	XLR-4-31	XLR-5-31
Equivalent	Switchcraft	D3F	D4F	None

Series Qwik Connectors

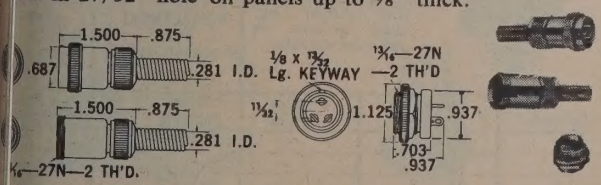
lar to above except cor structed of die-cast zinc with satin el plate. Bronze contacts are gold-plated over silver. Dielec- is blue diallyl phthalate. Features easy push-button cou- ,, intermates with Excellite connectors.



Description	3 Contacts	4 Contacts
lug, Pin Contacts	91-853	91-857
ack, Socket Contacts	91-854	91-858
hassis Receptacle, Pin Contacts	91-855	91-859
hassis Receptacle, Stocket Contacts	91-856	91-860

Series Threaded Coupling

ular style connector for 2-way radios, P.A. systems, etc. eaded coupling provides positive mating. Brass shell with ght chrome plating, black phenolic dielectric. Receptacles unt in 27/32" hole on panels up to ⅛" thick.



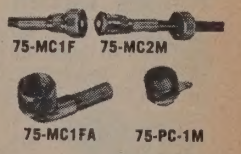
Description	3 Contacts	4 Contacts	6 Contacts
Plug, Pin Contacts	91-MC3M	91-MC4M	91-MC6M
Plug, Socket Contacts	91-MC3F1	91-MC4F1	—
Jack, Socket Contacts	91-MC3F	91-MC4F	91-MC6F
Jack, Pin Contacts	91-MC3M1	91-MC4M1	—
Recept., Socket Contacts	91-PC3F	91-PC4F	91-PC6F
Recept., Pin Contacts	91-PC3M	91-PC4M	—
Cap & Chain for Recept.	91-CCC3	91-CCC3	91-CCC3

b available in nickel plating. Substitute N for C in part number.

75 Series Single Contact

Standard type used on microphones, amplifiers, speakers, transmitters, etc. Brass machined shells with chrome finish. Threaded coupling and unique button contact permits plugs to be converted to jacks by removal of coupling ring. Receptacles mount in .385" holes when grounding. .500" holes for ungrounded two circuit operation. Spring cord protection for ¼" cable.

Description	Part No.
Chassis Receptacle	75-PC1M
Chassis Receptacle, Closed Circuit	75-CL-PC1M
Straight Plug	75-MC1F
Cable Jack	75-MC1M
Angle Plug	75-MC1FA
Cap & Chain	75-CCC1
Phone Plug Adapter	75-MC1P
Microphone Switch	75-MC1S



Miniature 75 Series

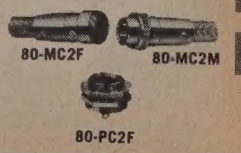
Miniature version of the above, receptacle mounts in 13/64" chassis hole. Machined brass shell with satin-nickel plating.

Description	Part No.
Plug	75-1
Jack	75-2
Receptacle	75-3

80 Series Single & Double Contacts

Solid brass shells with polished chrome finish. Single or double pin type contacts for shielded cables, etc. Receptacles mount in ⅝" hole in panels up to 11/32".

Description	1 Contact	2 Contacts
Plug, Pin Contacts	80-M	80-MC2M
Plug, Socket Contacts	80-F1	80-MC2F1
Jack, Socket Contacts	80-F	80-MC2F
Jack, Pin Contacts	80-M1	80-MC2M1
Recept., Socket Contacts	80-C	80-PC2F
Recept., Pin Contacts	80-C1	80-PC2M
Cap & Chain for Recept.	75-CCC1	75-CCC1

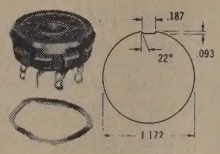


TUBE RELAY SOCKETS

AMPHENOL
THE BUNKER-RAMO CORPORATION

S Type

Retainer ring mounting. Black Phenolic and Mica Filled Phenolic. For 22 gauge (.031") to 18 gauge (.050") panel thickness. May be grooved on special order up to 13 gauge (.093"). Steatite fits .031" to .093" panels.



Contacts	Contacts	Black Phenolic	Mica Filled	Steatite
4	Brass	78-S4	—	49-SS4
5	Brass	78-S5	—	49-SS5
6	Brass	78-S6	—	49-SS6
7	Brass	78-S7S	—	49-SS7S
8 Octal	Luballoy	78-S8	78-S8T*	49-SS8
8 Loctal	Luballoy	78-S8L	—	—
9	Luballoy	78-S9	—	—
11	Luballoy	78-S11	78-S11T*	—
12	Luballoy	78-S12	—	—
16	Luballoy	78-S16	—	—

MOUNTING PLATE TYPE REPLACEMENTS TYPE S

Same as Type S, but with mounting plate assembled with retainer ring. Mounting plate slotted holes for 1½" to 1 55/64" centers. Use 6-32 screw.

MOLDED-IN-PLATE TYPE

5/32" mtg. holes on 1½" centers

Contacts	Black Phenolic	Mica Filled	Steatite #	Black Phenolic	Mica Filled
4	78-RS4*	—	49-RSS4	77-MIP-4	77-MIP-4T*
5	78-RS5*	—	49-RSS5	77-MIP-5	77-MIP-5T*
6	78-RS6	—	49-RSS6	77-MIP-6	77-MIP-6T*
7	78-RS7S	—	49-RSS7S	77-MIP-7S	77-MIP-7ST
8 Octal	78-RS8*	78-RS8T*	49-RSS8	77-MIP-8	77-MIP-8T*
8 Loctal	78-RS8L	—	—	—	—
9	78-RS9	—	—	77-MIP-9	77-MIP-9T
11	78-RS11	78-RS11T*	—	77-MIP-11	77-MIP-11T*
12	—	—	—	77-MIP-12	77-MIP-12T*
16	78-RS16	—	—	—	—
20	—	—	—	77-MIP-20	—

** Military version available with silver plated contacts and, where applicable, stainless steel mounting plate. Add suffix "M" to catalog number. Example: 77-MIP-8TM.*

 # Bottom mounted, requires 1¼" chassis holes;

Printed Circuit Sockets

Standard socket series 77MIP and 78S of eight or more contacts for mounting directly to printed circuit boards. Luballoy contact tails are ⅛" long and mount through 1/16" diameter holes.

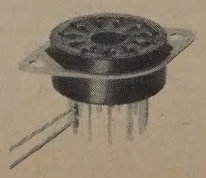
TO ORDER

Add suffix -WO125 to part number, i.e. 77MIP(X)-WO125 or 78S(X)-WO125.

Wire Wrap Sockets

Standard socket series 77MIP and 78S of eight contacts or more have ½" long contact tails for wire wrap termination.

Standard contacts are .016" thick, rated 3 amps for 22 ga. wire. Heavy duty contacts are .025" thick, rated 7.5 amps, for 16 ga. wire.



TO ORDER

Add suffix -WO500 to part number, i.e. 77MIP(X)-WO500 or 78S(X)-WO500 for standard contact. Add WO525 for heavy duty contact.

Compact "MIP" Sockets

Similar to standard MIP, but smaller. 1⅛" mounting ho Two .136" screw holes on 1 5/16" centers. 8 contacts on Phosphor bronze contacts.

88-8	Octal, Black Phenolic
88-8T	Octal Mica Filled Phenolic
88-8TM	Octal Mica Filled Phenolic with silver plated contacts and stainless steel mounting plate
88-8X	Loctal. Black Phenolic

Saddle Type Octal

Octal socket with 4 ground lugs for below chassis mountir an 2 9/64" holes on 1.312" centers for above chassis mou in Black phenolic dielectric.

168-001	Wrap around contacts, Brass
168-015	Tuning fork contacts, Luballoy

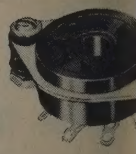
Steatite Magnal Socket

49-SS11L	11 contacts for TV or CRT. Retainer ring mounted in 1⅝" chassis hole. 1 1/16" pin circle

Floating MIP Sockets

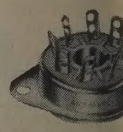
Foribration-free operation.

77-MIP-8FK	Octal. Complete with 4 rubber grommets, 2 mounting screws, nuts and washers.
77-3K	Kit for making any "MIP" into floating socket. 4 grommets, 2 mounting screws, nuts and washers. MIP screw holes must be enlarged to ¼" diameter.
77-MIP-8F	Socket only. Same as 77-MIP-8, but with ¼" mounting holes.



MIP, Cloverleaf Contacts

59-103	Octal. Same dimensions as standard MIP. Mica-filled phenolic, stainless steel mounting plate, cloverleaf contacts hot tinned dipped.



Plugs*

Phenolic bodies, nickel plated brass contacts. Polarized to e vent mismating. Mate with tube sockets shown on this pe

CP TYPE
Use with plug caps or mount on panel with retainer ring. Same grooves as 78S tube sockets.

REPLACEMENT TYPE
Removable plate.

SPEAKI
For cable n ing onl

Contacts	Black Phenolic	Mica Filled	Black Phenolic	Black Phenol
4	86-CP-4	—	86-RCP-4	71-4
5	86-CP-5	—	86-RCP-5	71-5
6	86-CP-6	—	86-RCP-6	71-6
7	86-CP-7S	—	86-RCP-7S	71-7
8 Octal	86-CP-8	86-CP-8T	86-RCP-8	70-8
9	86-CP-9	86-CP-9T	86-RCP-9	70-9
11	86-CP-11	86-CP-11T	86-RCP-11	—
12	86-CP-12	—	86-RCP-12	70-12
16	86-CP-16	—	—	—
20	—	—	—	70-20

**Mate with Tube Sockets on this page.*

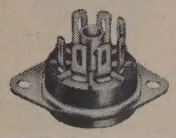
PLUGS AND SOCKETS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Miniature Sockets

Phosphor bronze contacts with cadmium plating except as noted. Rated 500 V (RMS) at 1 Amp.

Mounting	Mounting Hole	Rivet Hole Centers with Tube
7 Pin Sockets	5/8"	7/8"
9 Pin Sockets	3/4"	1 1/8"



Contacts	Dielectric	Center Shield	Standard Bottom Mtd.	Shield Base Top Mtd.
	Black Phenolic	Large	147-500	147-905
	Black Phenolic	None	147-504	—
	Mica Filled	Small	147-505	147-913
	Mica Filled	Small	—	147-916*
	Mica Filled	None	147-170-20	—
	Mica Filled	None	147-840*	—
	Black Phenolic	Large	59-409	59-406
	Mica	Large	59-410	59-407
	Mica	Large	59-412*	59-403*
	Mica	None	59-411	59-405
	Black Phenolic	Large	—	59-461
	Mica	Large	59-410-1000	—
	Black Phenolic	None	59-446	—

*Beryllium copper silver-plated contacts.

Miniature Plugs

Mated with 7 and 9 pin sockets above, Diallyl Phthalate with gold over silver plated brass contacts. 1500 V RMS at 5 Amps. Molded-in strain relief post.

	7 Pin	9 Pin
Plug	86-896	86-893
Plug with rubber cap	86-895	86-897
Plug with rubber cap, side outlet	86-894	—

Miniature Speaker, Plugs and Receptacles

Molded of black phenolic, with nickel-plated brass contacts in plug; copper alloy in receptacles. Mounts in 5/8" hole, round or square with friction retainer ring.

Contacts	Receptacle	Mates with 78-SXS at Left	Mates with 78-SXS at Left
3	78-S3S	71-3S	86-CP-3S
4	78-S4S	71-4S	86-CP-4S
5	78-S5S	71-5S	86-CP-5S
6	78-S6S	71-6S	86-CP-6S
7	78-7P	—	—

Miniature Sockets with P.C. and Wire Wrap Terminations

Same as 78-SXS receptacles above except have contact tails designed for P.C. board or wire wrap termination.

Wire Wrap
78-S4SW-0500

P.C. Mount
78-S5SW-0125

Contacts	Copper Alloy Contacts with 1/8" x 1/16" P.C. Tails. Has .020" Shoulder	Copper Alloy Contacts with 1/2" x 1/16" Tails for Wire Wrapping: Standard .016" Thick Tail for 22 Ga. Wire 3 Amps.	Copper Alloy Contacts with 1/2" x 1/16" Tails for Wire Wrapping: Heavy Duty .025" Thick Contact for 16 Ga. Wire, 7.5 Amps.
3	78-S3SW-0125	78-S3SW-0500	78-S3SW-0525
4	78-S4SW-0125	78-S4SW-0500	78-S4SW-0525
5	78-S5SW-0125	78-S5SW-0500	78-S5SW-0525
6	78-S6SW-0125	78-S6SW-0500	78-S65W-0525

Relay and Tube Base

Black phenolic base with nickel-plated brass contacts. Rated 1250 V (RMS) at 5 Amps.

Part Number	Contacts	Outside Diam.	Pin Circle	Center Post
50-035	3	.695"	.343"	No
50-801	8	1.301"	.687"	Yes
50-820	11	1.301"	.750"	Yes

Lamp Socket

For medium base prefocused lamps. 1000 watts. 110/250 volts, UL approved.

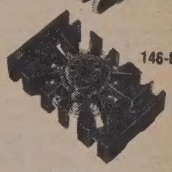
98-8	Phenolic, to 450°F.
98-1	Steatite, to 1800°F.

Relay Sockets/Industrial Tube Sockets

Heavy duty octal socket with barrier-protected screw type terminals. 1250 V RMS at 5 Amps. Two .156 mtg. holes on 1.688 centers. Molded one piece melamine construction.

146-103

Top Mounting		Bottom Mounting
146-103	No Tie Points	146-203
146-104	With 4 Tie Points	146-204



146-817

146-817 (11 contacts) — Melamine dielectric, phosphor bronze contacts with solderless reversible screw terminals. 600 V (RMS) at 10 Amps. Two .156 mtg. holes on 4.187 centers. May be gang mounted.
59-106 (14 contacts) — Mica-filled dielectric, phosphor bronze contacts.
59-470 (20 contacts) — Diallyl phthalate with beryllium copper contacts.

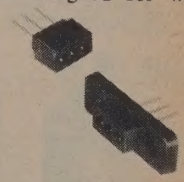
59-470

59-106

SCR Sockets

Three contact receptacle designed to accept General Electric Company's C106 SCR (Silicone controlled rectifier). Nickel silver contacts. Black nylon insulator. Voltage rating: 500 volts (RMS). Current rating: 5 Amps. Contact spacing: .200" centers. Mating engagement depth: .160" min. Contact length: Approximately .323" x .020" square. Contact tails designed for wire wrap or printed circuit board mounting.

77-115	Press fit style without flange. To fit rectangular panel or chassis cut dimensions .335 ±.005" x .1625 ±.0015".
77-116	Molded mounting flange has two .125" diameter mounting holes on .625" centers. Assembly fits out .325" x .200".



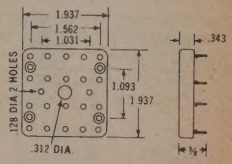
Crystal Holder Sockets

Two contacts, 3/4" centers for 1/8" prongs.

33-2	Black Phenolic
33-2	Mica Filled Phenolic

Crystal Boards

Multi-contact crystal boards molded of diallyl phthalate. Accept up to 20 crystals. May be used as compact test panels. Contact accept .040" dia. pins. Part No. 33-804



Heavy Duty Side Mount Socket

For 4 contact industrial tubes.

AMPHENOL Number	With Retaining Clip	With Terminal Block	With Bottom Cover	With Underwriter's Shield	For Jumbo 4-Pin Tubes	For UX4-Pin Tubes
146-105	X		X		X	
146-106	X				X	
146-107	X	X	X		X	
146-109				X		X
146-110				X		X

NOTE — Bottom Cover 146-910 may also be used with 146-109 and 146-110 sockets.

CONNECTORS AND HARDWARE

AMPHENOL
THE BUNKER-RAMO CORPORATION

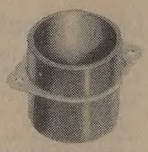
Duodecal & Diheptal Sockets

For TV and CRT tubes. Removable socket cap and body of molded phenolic. 2000 V (RMS) at 10 Amps.

Part No.	Description
59-402	Duodecal socket for a max. of 12 equally spaced pins on a circle diam. of 1.063″.
59-415	Diheptal sockets for a max. of 14 equally spaced pins on a circle diam. of 1.750″. **Small—for 2.050″ D. Tube Base.**
59-417	Diheptal sockets for a max. of 14 equally spaced pins on a circle diam. of 1.750″. **Medium—for 2.250″ D. Tube Base.**

High Voltage Sockets

For rectifiers, power supplies and other high voltage uses. Steel mounting plate.



Part No.	Contacts	Dielectric	For Tube Diam.	Mounting Information	
146-101	8	Melamine	1.377″ Max.	2 .136″ dia. holes on 2.031″ centers	1.150″ cutout
77A-4T	4	Phenolic	1.156″	2 5/32″ dia. holes on 1⅞″ centers	1½″ cutout

Grid Cap

63-1	For tube grid caps, ¼″ to ½″ diameter.

Tube Shields

Cadmium plated steel with internal spring holds tube securely.

	Miniature Tube	Maximum Tube Length
5-401	7 Pin	1 3/16
5-402	7 Pin	1¾
5-405	9 Pin	1½
5-408	9 Pin	1 15/16
5-409	9 Pin	2⅜

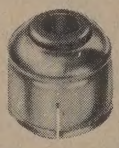
Recessing Shells

For use with 78S, 86CP, 60, 61 and 160 Series plugs and sockets.

23-1S	Aluminum. Raise or recess 1 3/16″. 1¾″ mounting hole, uses 3 No. 6 screws.
61-61	Cadmium plated steel. Recesses unit 1 3/16″. Mounts in 1 7/16″ hole. Two 5/32″ mounting holes on 1¾″ centers.

Caps

Nylon 3-858


Rubber Grommet

Side Outlet Rubber Grommet

Cable Clamp

Makes inexpensive cable connectors of standard sockets, plugs and receptacles such as 78, 60, 61, 86 and 160 Series. For applications requiring frequent mating and unmating use 3-858 or 3-859 with molded finger grip.

FINISH				
Black Thermo Plastic	Black Epoxy	Clear Cadmium	Cable Outlet	Maximum Cable O.D.
—	3-10	3-10-1000	None	Dust Cap
—	3-12	—	Metal	3/16″
—	3-13	3-857	Rubber	7/16″
—	3-17	—	Side, Rubber	7/16″
—	3-24	3-856	Cable Clamp	3/8″
3-858	—	—	Finger Grip Style	3/16″
3-859	—	—	Finger Grip Style	3/16″

Tip Jacks

Nylon body with recessed silver plated contact. For .080″ dia. phone tip. Tinned terminal. ¼″ mounting hole. Add suffix to catalog number to indicate color.

350-29175-* Turret Terminal
350-29200-* Spade Terminal
350-50200-* Feed-thru
*Suffix Color Numbers.

-1 Red
-2 Black
-3 Brown
-4 Green
-5 Orange
-6 White
-7 Blue

Rectangular Connector

70-26	4 contact cable plug
77-26	4 contact receptacle, molded-in-plate, two 5/32″ screw holes on 1⅜″ centers. 5/16″ x 1 1/16″ panel cutout

Miniature Cable Connectors

Black phenolic dielectric in cadmium plated brass shell. Polarized on tact spacing. Plugs and receptacles take cables up to ¼″ diameter. Panel receptacle mounts in ⅞″ hole with two 6-32 screw hol on 1¼″ centers.

Rated 3 Amp., 500 Volts.

PLUGS

Contacts	Long	Short
3	91-MPM-3L	91-MPM-3S
4	91-MPM-4L	91-MPM-4S
5	91-MPM-5L	91-MPM-5S
6	91-MPM-6L	91-MPM-6S

CABLE RECEPTACLES

SHIELDED PIEL RECEPTACS

Contacts	Long	Short	Mates With Long Plugs
3	91-MPF-3L	91-MPF-3S	78-PCG3
4	91-MPF-4L	91-MPF-4S	78-PCG4
5	91-MPF-5L	91-MPF-5S	78-PCG5
6	91-MPF-6L	91-MPF-6S	78-PCG6

Light Duty Connectors**

Rubber Grommet

Cable Clamp

Contacts	Pin Contacts	Socket Contacts	Pin Contacts	Socket Contacts
4	86-PM4	78-PF4	86-PM4-11	78-PF4-11
5	86-PM5	78-PF5	86-PM5-11	78-PF5-11
6	86-PM6	78-PF6	86-PM6-11	78-PF6-11
7	86-PM7S	78-PF7S	86-PM7S-11	78-PF7S-1
—	—	—	—	—
8	86-PM8	78-PF8	86-PM8-11	78-PF8-11
9	86-PM9	78-PF9	86-PM9-11	78-PF9-11
11	86-PM11	78-PF11	86-PM11-11	78-PF11-1
12	86-PM12	—	86-PM12-11	—
—	—	—	—	—
20	86-PM20	—	—	—

** *For cable to cable application, mate with each other. For cable to pa applications, mate with type S, RS, and MIP tube sockets. Do not where frequent mating and unmating is required. Use 3-858 molded with finger grip.*

110/220 Volt Plugs and Receptacles

UL approved except for 160-10. and 160-11. Used with Ser 3 caps, 23-1S and 61-61 mounting plates.

61-M

61-M10

160-2-N

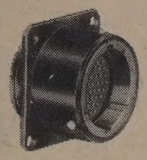
160-9-N

Mounting	Standard Plug	2 Pole Black Phenolic 15 Amp. 125 Volts Plug Polarized	Recep-tacle	2 Pole With Ground Blk Thermoplastic 15 Amp. 125 Volts Plug	Recep-tacles	3 Pole Blk Phenolic 15 Amp. 125 V Plug	Rece tacl
Retaining Ring	61-M	61-MP	61-F	160-11-N	160-10-N	60-M	60-F
Mounting Plate and Retainer Ring	61-M1	61-MP1	61-F1	160-3-N	160-2-N	60-M1	60-F1
Molded-in-Plate	—	—	61-MIP-61F	—	—	—	—
Recessed Housing	61-M10	61-MP10	61-F10	160-5-N	160-4-N	—	—
WITH STEEL CAP FOR CABLE							
Rubber Grommet	61-M4	61-MP4	61-F4	160-7-N	160-6-N	60-M4	60-F4
Cable Clamp	61-M11	61-MP11	61-F11	160-9-N	160-8-N	60-M11	60-F1

RCULAR INDUSTRIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

22 Series Ultra-Mite Connectors


Square flange plug shell, receptacle insert

Cable plug shell, plug insert

Single hole mount plug shell, plug insert

Cable receptacle shell, receptacle insert

Cable receptacle shell, plug insert

Premium Performance For Every Design Budget

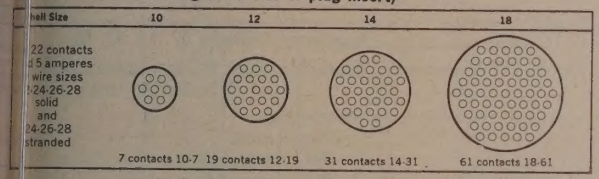
AMPHENOL Ultra-Mite connectors are a complete line of non-environmental (Class N) and environmental (Class P) connectors at prices that fit into every design budget. The connectors are available as straight plugs and square flange, single hole mounting and cable receptacles. Either plug or socket contact inserts may be selected for any of the four available shell styles. High density contact arrangements offer 7, 19, 31 and 61 contacts.

The standard Ultra-Mite insert material is an exceptional low cost plastic capable of withstanding temperature constants of up to 325°F. No-scoop construction, another quality feature, prevents damage to pin contacts in a connector when the mating connector is wiped across its face, as in blind mating connections.

- **Lowest cost** complete High-Density Miniature connector family available.
- High performance-potted constructions meet and exceed MIL-C-26482.
- Completely subminiaturized connectors with high contact density — 61 contacts in a size 18 shell.
- Size 22 Poke-Home contacts
- Lightweight — about 25% that of standard connectors with the same number of contacts.
- All Class "P" receptacles have dynamic O-Ring shell seal.
- Bayonet lock — 3 pin spring loaded coupling ring for quick disconnect.
- Crimp contact terminations.
- 5 key polarization.
- Cable clamps for strain relief.
- Connector identification molded in front and back.
- Natural recess in rear of connector for potting.

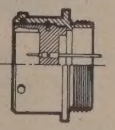
ARRANGEMENTS

INSERTS AVAILABLE (Showing front face of plug insert)



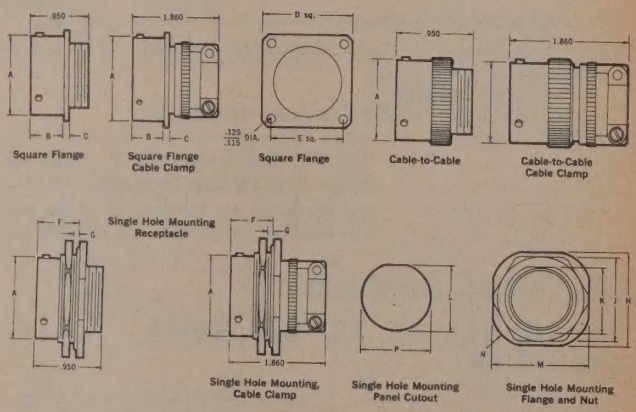
Square Flange Shell with Plug Insert

Square Flange Shell with Socket Insert



Plug or Socket Inserts in any Shell Style

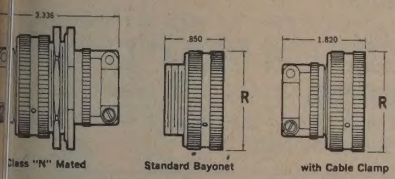
Panel Mount Shells



Shell Dimensions

CONNECTORS

Ultra-Mite connector classes "N", "P" are available in four shell styles — Straight Plug, Square Flange, Single Hole Mounting, and Cable-to-Cable. The standard Ultra-Mite coupling is bayonet lock for quick disconnect. All plugs have threaded back ends to accept cable clamps or potting forms.



DIMENSIONS	
Shell Size	"R" Dia. Max.
10	.906
12	1.078
14	1.141
18	1.375

DIMENSIONS

Shell Size	A Dia.	B Max.	C Max.	D ±.015	E ±.015	F Max.	G Panel Thickness	H Max.	J Max.	K ±.003	L ±.005	M Panel Nut Max.	N Max.	P ±.005
10	.659	.620	.067	.938	.719	.650	.109	1.109	.953	.718	.730	1.075	1.192	.760
12	.829	.620	.067	1.031	.812	.650	.109	1.296	1.140	.905	.917	1.292	1.380	.947
14	.898	.620	.067	1.125	.906	.650	.109	1.396	1.205	.968	.980	1.396	1.505	1.010
18	1.131	.620	.067	1.312	1.062	.650	.109	1.646	1.455	1.217	1.225	1.646	1.740	1.260

Contacts

Ultra-Tac contacts are recommended for best service. Relia-Tac contacts may also be used. See listing on next page for contact specifications.

HARDWARE ACCESSORIES — CABLE CLAMPS

Cable clamps support conductors extending from plugs and receptacles and prevent twisting or pulling of the contact terminations. To order cable clamps, specify the part number of the cable clamp which corresponds to the connector shell size. For example, the correct cable clamp for a 224-16N18-S02 plug is 224-552-18.*

Cable Clamp 224-552-00
Shell Size

POTTING

In "P" connectors, to seal the back of the connectors, potting compound is injected into the back of the shell and allowed to cure. It forms a chemical bond to the inner and outer walls of the connector, to the back of the insert, around the contact terminations and well out along the leads.

Not only is a back shell eliminated, but also the cable clamp. The contact terminations are completely and individually protected by the resilient mass which surrounds them and resists transmittal of vibration to the terminations. The potted assembly is moistureproof and resistant to contaminants.

Ordering Information

CONNECTOR PART NUMBER

To order the 224 Series Ultra-Mite connectors you want, put together the part numbers as illustrated in the following example. All connector part numbers are without cable clamps and potting forms. Order hardware accessories separately.

Plug connectors accept socket contacts only. Receptacle connectors accept pin contacts only. Relia-Tac and Ultra-Tac contacts are not intermateable.

224-16N18-61S02(100)

Series Designation 224

Coupling Type
1—Bayonet

Shell & Insert Type
0—Square Flange Receptacle
1—Square Flange Plug
2—Single Hole Plug
3—Single Hole Receptacle
4—Straight Plug Receptacle
6—Straight Plug Plug
8—Cable to Cable Plug
9—Cable to Cable Receptacle

Connector Classes
N—Non-Environmental
P—Potted (Receptacles only). ***

(Deviations)
100-less Contacts*

Contact Type
P—Pin (for receptacles only). P02 or P03.*
S—Socket (for plugs only). S02 or S03 (contacts included unless deviation 100 specified).

Number of Contacts
7, 19, 31, 61

Shell Sizes
10, 12, 14, 18

*Most economical way to order. Order contacts in bulk.

CIRCULAR INDUSTRIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

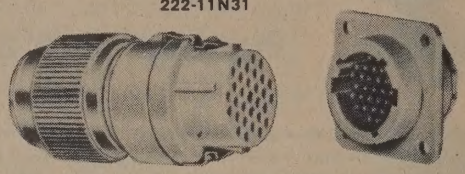
222 Series Mighty-Mite® Connectors

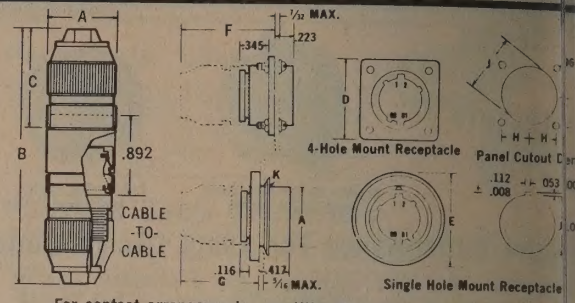
7 to 61 Contacts — .085 Contact Centers
CABLE APPLICATIONS — ENVIRONMENTAL VERSION
MEETS/EXCEEDS MIL-C-26482

222-11N31

222-22N31

222-519





For contact arrangements, see Ultra-Mite connectors on previous page.

		No. of Contacts 7	19	31	61
DIMENSIONS	A ref. diameter	.496	.621	.746	[illegible]
	B ref. length	2.402	2.618	2.948	3[illegible]0
	C ref. length	.854	.962	1.134	1[illegible]8
	D ref. square	.750	.875	1.000	1[illegible]0
	E ref. diameter	.940	1.065	1.189	1[illegible]4
	F ref. length	1.170	1.278	1.450	1[illegible]4
	G ref. length	.976	1.084	1.256	1[illegible]0
	H length	.250	.312	.375	[illegible]0
	J diameter	.511	.636	.761	1[illegible]1
ACC	Strain Relief Assembly No.	222-517	222-518	222-519	222[illegible]0
	Retaining Ring No.	2-310	2-311	2-312	2[illegible]3

Superior Performance at Low Cost

AMPHENOL Mighty-Mite connectors are low cost, highly reliable micro-miniature connectors designed to serve an exceptionally wide range of cable-to-cable and cable-to-chassis applications.

Mighty-Mite connectors are available as straight plugs, single hole mounting, square flange, and cable receptacles in both standard and environmental constructions. Standard connectors are molded of one-piece, rugged polycarbonate resin. Polysulfone constructions are available for applications involving higher temperatures (up to 325°F) and where repeated contact insertions are required.

Ordering Information

222- 1 1 N 61

- Series Designation 222
- Method of Mounting
  - 1—Flangeless
  - 2—4 hole mount receptacle
  - 3—Single hole mount Receptacle (includes retaining ring)
- Insert Style
  - 1—Plug (Lexan)
  - 2—Receptacle (Lexan)
  - 3—Plug: Polysulfone
  - 4—Receptacle: Polysulfone
- Connector Class: N—Non-environmental; P—Potted* (receptacle only)
- Number of Contacts 07, 19, 31, 61

* The "N" Plug is used with "P" receptacles for potted connectors.

NOTE: Order Contacts Separately.

Use Wire-Form pin contacts for plugs, socket contacts for receptacles.
Use Relia-Tac pin contacts for receptacles, socket contacts for plugs.

220 Series Contacts

FOR 220, 221, 222, 223, 224 SERIES CONNECTOR

Ultra-Tac Contacts

Top quality micro-miniature contacts. The socket contacts are hooded to resist test prod damage.

Relia-Tac Contacts

Durable, customer-proven contacts.

Wire Form Contacts

The unique 4-member spring design of the pin exerts self-equalizing force on socket wall, reducing contact resistance.

Standard crimp type contacts incorporate gold clad copper alloy wire members in copper sleeves; gold plate finish.

Pin Tail Contacts

Pin Tail Relia-Tac contacts may be used for mounting connectors directly to printed circuit boards. They cannot be used in 224 Series connectors.

Solder Cup Contacts

Can be soldered to leads before insertion or, with proper heat sink, after contacts are assembled.

Specifications	ULTRA-TAC	RELIA-TAC	WIRE FORM	PIN TAIL	SOLDER CUP
	.388, .151, .036 MIN, .051 MAX, .027, 220-P03; .433, .036 MIN, .051 MAX, 220-S03	.388, .151, .028 MIN, .051 MAX, .032, 220-P02; .404, .028 MIN, .051 MAX, 220-S02	.413, .028 MIN, .053 MAX, 220-P01; .413, .028 MIN, .053 MAX, 220-S01	.051 MAX., .095, .233, .151, .021 MIN., .032, 220-834-01; .720, .250, .024 MAX, .051 MAX, 220-815-02	.059 MAX., .496, .151, .036 MIN., 220-830-02; .402, .036 MIN, 220-831-02
Current (Amps) Rating	5	5	3	5	5
Contact Resistance* (ohms)	.0060	.0060	.0050 to .0060	.0050 to .0060	.0060
Wire Range (Ga.) (Solid & Stranded)	22, 24, 26	24, 26, 28	24, 26, 28	N/A	24, 26, 28
Contact Finish	Gold-over-Nickel on Copper Alloy Bodies	Gold-over-Nickel on Copper Alloy Bodies	N/A	Gold-over-Nickel on Copper Alloy Bodies	Gold-over-Nickel on Copper Alloy Bodies

* Constant to a minimum of 100 cycles of insertion and withdrawal.

Ordering Information

Minimum order quantity is 100 pieces.
Contacts can be supplied on reels for use in semi-automatic crimp machines. Contact factory.

NOTE: Except for the Wire-Form design, all socket contacts are completely shrouded within the plug inserts for optimum protection against damage. Pin contacts are normally exposed when assembled into receptacle inserts. Wire-Form contact pins are to be used in plug inserts and socket contacts in receptacles.

See YELLOW SECTION for Local Offices, Phones

MINIATURE CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

22 Series Tiny Tim® Connectors

5 TO 33 CONTACTS
POLY CARBONATE OR NYLON CONSTRUCTION

Receptacle
Relia-Tac Contacts
(Illustrated)

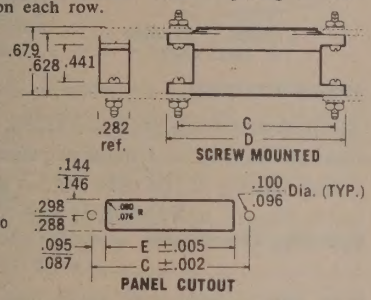
Exceptional interconnections for circuit modules, either potted-in or surface mounted, and can also be used as micro-miniature rack-and-panel, cable-to-cable, and cable-to-panel connectors.

The positive mating is the result of the snap latch engagement locking device molded into the connector body. Contact identification numbers are also molded in.

Trapezoidal mating faces are used for polarization. Guide pins provide keying. Contact spacing is .100" on centers on each row.

SPECIFICATIONS

Temperature Range:
-55°C to +125°C
Current Rating:
3 Amps (Wire-Form contacts).
5 Amps (all other contacts).
Voltage Rating:
1 KVAC (RMS) at sea level.
3 KVAC (RMS) at 70,000 ft.
Dielectric:
Polycarbonate resin. (Nylon also available).
Contact factor for performance specifications



No. of Contacts	E Length of Cutout	C Mounting Centers	D ref. Overall Length
5	.410	.593	.843
9	.610	.793	1.043
17	1.015	1.193	1.443
25	1.410	1.593	1.843
33	1.810	1.993	2.243

Ordering Information

223- 1 1 17

- Series Designation: 223-
- Method of Mounting: 1—Screw Mount
- Insert Style: 1—Plug, Lexan (Green); 2—Receptacle, Lexan (Green); 5—Plug, Nylon (Black); 6—Receptacle, Nylon (Black)
- Number of Contacts: 05, 09, 17, 25, 33

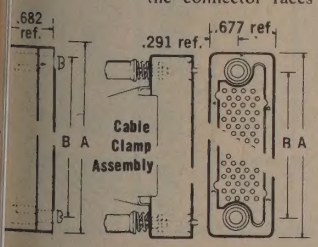
NOTE: Order Contacts Separately
Use Wire-Form pin contacts for plugs, socket contacts for receptacles.
Use Relia-Tac pin contacts for receptacles, socket contacts for plugs.

220 Series Micro-Rac®

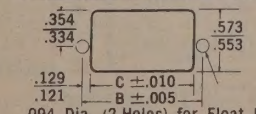
BACK AND PANEL APPLICATIONS: 52 AND 104 CONTACTS
PANEL MOUNTED: LOW COST HIGH CONTACT DENSITY

Mono-block construction. Contact identification numbers are molded in. Polarization is achieved by a trapezoidal mating area and keying with the use of guide pins or keying by molded-in slot-and-key arrangements.

Cable clamp assemblies are available for both sizes. Special size connectors can be supplied if needed. Environmental resistance can be added by potting the leads with an approved potting compound and sealing the connector faces with a molded neoprene gasket.



Dim Access.	No. of Contacts 52	104
Potting Mold	220-635	220-634
Cable Clamp	220-5	220-6
Max. Length A	1.888	3.017
Mtg. Ctrs. B	1.492	2.611
Cutout C	1.250	2.359



.094 Dia. (2 Holes) for Float Mtg. Only. .172 Dia. (2 Holes) for Mtgs. Other Than Float.

Ordering Information

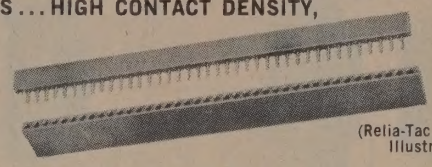
220- 1 N 104

- Series Designation: 220-
- Insert Style: 1—Plug (Lexan); 2—Receptacle (Lexan) (Includes Hardware)
- Environmental: N—Non-environmental; P—Environmental, (including gasket)
- Number of Contacts: 052, 104

NOTE: Order Contacts Separately
Use Wire-Form pin contacts for plugs, socket contacts for receptacles.
Use Relia-Tac pin contacts for receptacles, socket contacts for plugs.

221 Series Strip Connectors

ADAPTABLE TO ANY SHAPE: STACK, CUT, CUT AND STACK, USE AS IS... HIGH CONTACT DENSITY,



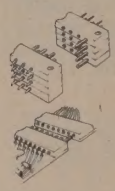
(Relia-Tac Contacts Illustrated)

AMPHENOL Strip Connectors are highly reliable, low cost micro-miniatures with great application versatility. They are furnished in 4" and 6" lengths, but you can cut and stack them to whatever configuration you need to satisfy your various application requirements.

If you want, AMPHENOL can do it all for you promptly and economically — cut the connectors to the length you want, make mounting holes, cut leads to length, and crimp, weld, or solder them to the contacts.

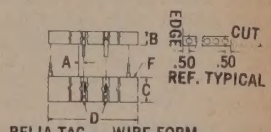
Strip connectors use Poke-Home contacts and perform superbly. Where keying is desired, guide pins are inserted in two or more plug strip contact holes.

Because Strip connectors are injection molded, special configurations can be produced quickly and inexpensively.



Strips can be used in stacked arrangement. Should be stacked parallel only.

PC board application using strip connectors.



RELIA-TAC CONTACT OR WIRE-FORM CONTACT
CUSTOM LENGTH
Number of holes multiplied by contact center dimension equals approximate length of strip.

Description	A Contact Centers	B	C	D	E	F Contact Positions
6" Plug Strip	.100	—	.456	6.00	.105	60
6" Receptacle Strip	.100	.230	—	6.00	.105	60
4" Plug Strip	.075	—	.456	4.00	.105	53
4" Receptacle Strip	.075	.230	—	4.00	.105	53
4" Plug Strip	.050	—	.281	4.00	.075	80
4" Receptacle Strip	.050	.218	—	4.00	.075	80

Ordering Information

Standard and custom lengths.

221 1 5 02

- Series Designation: 221
- Contact Centers: 1—.100 in.; 2—.075 in.; 3—.050 in. (only Nylon)
- Insert Style: 1—Plug, polycarbonate; 2—Receptacle, polycarbonate; 5—Plug, Nylon; 6—Receptacle, Nylon
- Number of Contact Holes needed: from 02 to 60 on .100 centers (standard 6" strip contains 60 holes); from 02 to 53 on .075 centers (standard 4" strip contains 53 holes); from 02 to 80 on .050 centers (standard 4" strip contains 80 holes). **Note:** Must use 2 digits.

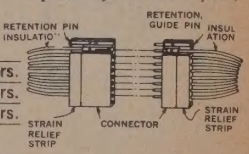
Note: Order contacts separately. Use Wire-Form pin contacts for plugs; socket contacts for receptacles. Use Relia-Tac pin contacts for receptacles; socket contacts for plugs.

Strain Relief Strips Protect Wire

AMPHENOL has a solution to the problem of excessive flexing that breaks wire strands in cable-terminated applications. Strain relief strips are available to encase and protect the wire in the crimp area at the rear of the strips. Molded in black Nylon 6/6 material, the strips can be ordered to match any Amphenol strip connector. Held in place by retention pins, which can also be used as a guide pin.

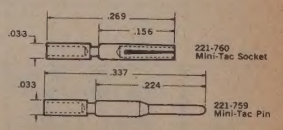
Ordering Information

221-9160—for use with strip connectors on .100 ctrs.
221-9253—for use with strip connectors on .075 ctrs.
221-9380—for use with strip connectors on .050 ctrs.



Mini-Tac Contacts

(Sub-miniature Relia-Tac contacts for .050" center mini-strip connectors only).
Current Rating: 3 Amps.
Wire Size: 26 to 32 ga. stranded wire.



Poke-Home® Guide Pins

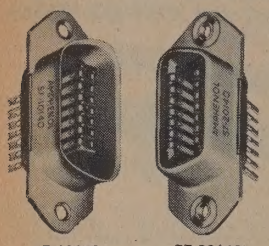
Poke-Home guide pins when seated in plug inserts serve functions of polarizing, keying or connector alignment. They can be used in conjunction with either Relia-Tac or Wire Form contacts. Contact factory for information.

MICRO RIBBON CONNECTORS

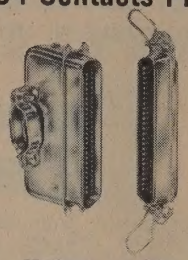
AMPHENOL
THE BUNKER-RAMO CORPORATION

57 Series Micro-Ribbon® Connectors

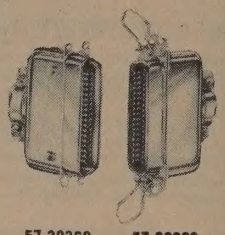
High Contact Density — 14 to 64 Contacts Protective Polarized Shell



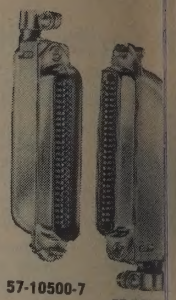
57-10140 57-20140
RACK & PANEL



57-50500 57-40500
SIDE CABLE ENTRY



57-30360 57-60360
TOP CABLE ENTRY



57-10500-7
57-2055
LOW PROFILE HOOD

All of the advantages of ribbon contacts apply to Micro Ribbon Connectors. This includes the self-cleaning, self-wiping action of the contacts and extremely low insertion and withdrawal forces. Dielectric is improved diallyl phthalate with high impact strength and low moisture absorbency characteristics. Trapezoidal shells provide polarization, and are made of zinc plated brass with a clear chromate conversion seal. Small size makes the Amphenol Micro Ribbon Connector ideal for high density miniature modules as well as rack and panel applications. Connectors may be top or bottom mounted. Rated 700V DC at sea level; 200 VDC at 70,000 feet.

Rack and Panel and Module Applications. Receptacle mounting plate includes float bushings to allow a float of .020 in each direction. This facilitates blind mating and minimizes the need for critical mounting dimensions.

Cable-To-Panel Application. Panel receptacles are equipped with sturdy spring latches which are guided and retained by cutouts in the plug's flanges. Receptacles must be top mounted. Cable entry at top side, as desired.

SPECIFICATIONS

(Meets requirements of SCL-6020A)

Current Capacity — 5 amps per contact.

Voltage Rating — 700 volts D.C. at sea level.
200 volts D.C. at 70,000 ft.

Operating Temperature — −55°C to +105°C
−67°F to +221°F

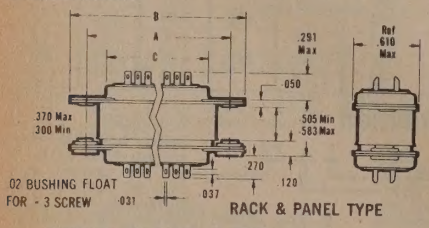
Wire Sizes — Solid — 22 gauge max.
Stranded — 24 gauge max.

Contacts — .000030" gold plated over copper flash on cadmium copper base.

Dielectric — Diallyl phthalate per Mil-M-14F Type MDG

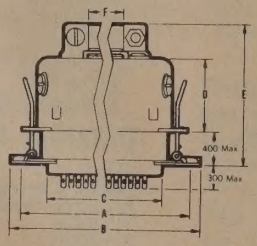
Shells — Zinc plated brass with clear chromate coating, trapezoidal shape for polarization. Gold iridescent chrome finish also available.

DIMENSIONS

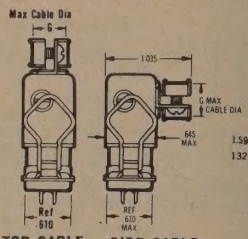


RACK & PANEL TYPE

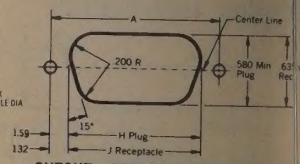
CABLE-TO-CABLE TYPE



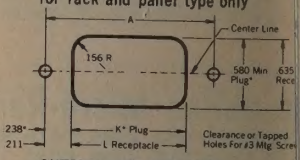
CABLE-TO-PANEL TYPE



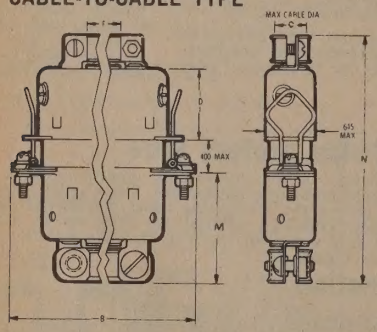
TOP CABLE ENTRY SIDE CABLE ENTRY



CUTOUT—BOTTOM MOUNTING for rack and panel type only

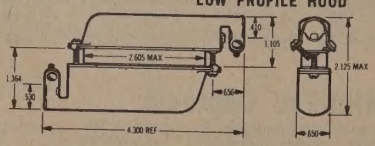


CUTOUT—TOP MOUNTING for both types



TOP CABLE ENTRY

LOW PROFILE HOOD



DIMENSIONS

		14 Contacts	24 Contacts	36 Contacts	50 Contacts	64 Contac
BOTH TYPES	A	1.417	1.842	2.352	2.947	3.542
	B	1.750	2.175	2.685	3.270	3.860
	C	.910	1.335	1.845	2.440	2.635
CABLE TO CHASSIS TYPE ONLY	D	.843	.843	.905	1.000	—
	E	1.668	1.688	1.730	1.825	—
	F	.306	.473	.640	.766	—
	G	.422	.473	.473	.473	—
BOTTOM MOUNTING FOR RACK & PANEL TYPE ONLY	H	1.098	1.523	2.033	2.628	3.224
	J	1.153	1.578	2.088	2.683	3.278
TOP MOUNTING FOR BOTH TYPES	K	.940	1.365	1.875	2.472	2.471
	L	.955	1.420	1.930	2.525	3.066
CABLE-TO-CABLE TYPE	M	1.243	1.225	1.305	1.395	—
	N	2.906	2.875	3.032	3.218	—

Contacts	Rack and Panel Module Applications: Stand. Solder Cup Tails — Plugs	Stand. Solder Cup Tails — Receptacles	Tapered P.C. Tails — Plugs	Tapered P.C. Tails — Receptacles	Cable to Panel Applications: Top Entry Cable Plugs	Side Entry Cable Plugs	Receptacles	Cable-To-Cable Application: Plugs	Receptacles
14	57-10140	57-20140	57-10140-4	57-20140-8	57-30140	57-50140	57-40140	See Cable to Panel Listing	57-60140
24	57-10240	57-20240	57-10240-3	57-20240-8	57-30240	57-50240	57-40240		57-60240
36	57-10360	57-20360	57-10360-13	57-20360-9	57-30360	57-50360	57-40360		57-60360
50	57-10500	57-20500	57-10500-27	57-20500-31	57-30500	57-50500	57-40500		57-60500
64	57-10640	57-20640	—	—	—	—	—		—

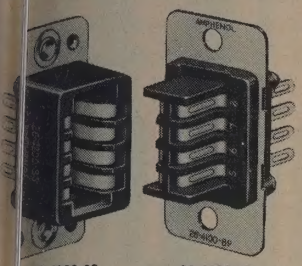
Special Low Profile:
50 contacts only.
Receptacle — 57-20500-7
Plug — 57-10500-7

See YELLOW SECTION for Local Offices, Phones

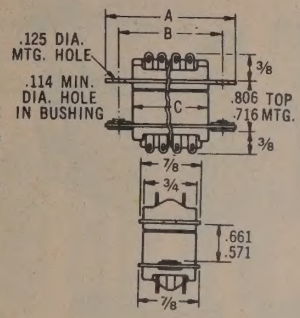
BLUE RIBBON CONNECTORS

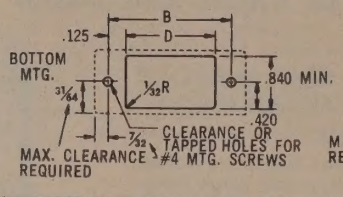
AMPHENOL
THE BUNKER-RAMO CORPORATION

26 Series Blue Ribbon Connectors
Barrier Polarization



26-4200-8S 26-4100-8P





26-182 and 26-183 only

Contacts	Plugs	Mating Receptacles	DIMENSIONS A	B	C	D
8	26-4100-8P	26-4200-8S	1.719	1.375	1.036	1.120
16	26-4100-16P	26-4200-16S	2.469	2.125	1.784	1.868
24	26-4100-24P	26-4200-24S	3.219	2.875	2.536	2.620
32	26-4100-32P	26-4200-32S	3.969	3.625	3.286	3.370
8	26-182	26-183	—	—	—	—

Tapered design of plug body provides pre-alignment of mating contacts. Dielectric barriers between contacts vary in thickness by minute dimensions to provide polarization. Float bushings allow a float of up to .02 in each direction, facilitating the blind mating common in rack and panel applications. Requires simple rectangular panel cutout.

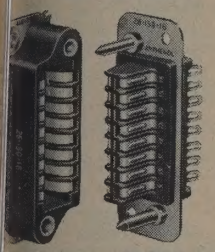
The eight contact size is also available with a molded key and keyway for polarization. Catalog numbers, 26-182 plug and 26-183 receptacle.

SPECIFICATIONS (Exceed requirements of SCL-6020A)

Current Capacity — 5 Amps per contact
Voltage Rating — 750 volts D.C. at sea level.
300 volts D.C. at 60,000 feet
Operating Temperature — −55°C to +125°C
−67°F to +257°F
Contact Plating — .00002" gold over copper base
Maximum Wire Size — 16 gauge

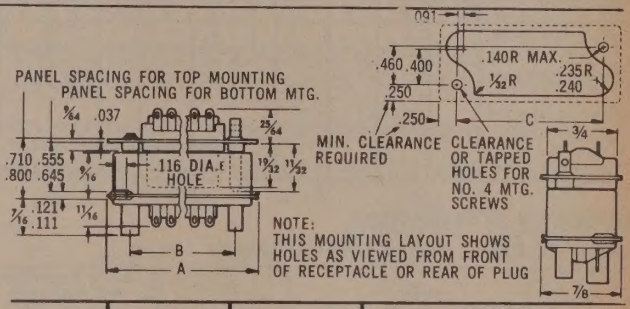
Plugs and receptacles are molded of high impact diallyl phthalate dielectric with molded-in mounting plates of corrosion resistant passivated stainless steel.

Pin Polarization



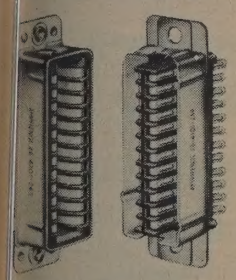
26-190-16 26-159-16

Sturdy guide pins pre-align connectors before contact engagement. Pins are of dissimilar size to avoid reverse mating. Float bushings on receptacle allow a float in all directions of .02" to minimize the need for close mounting dimensions and to assist in blind matings. Rated 5 amperes, 750V DC at sea level; 300V DC at 60,000 feet.



Contacts	Plug	Receptacle	DIMENSIONS A	B	C
16	26-159-16	26-190-16	2.442	1.842	2.024
24	26-159-24	26-190-24	3.118	2.522	2.704
32	26-159-32	26-190-32	3.789	3.202	3.384

Keyed Shells

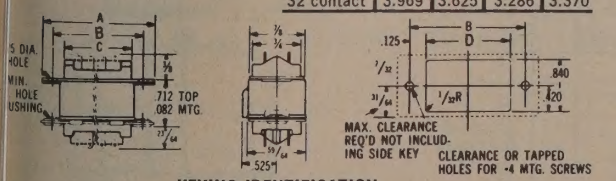


420B 4101

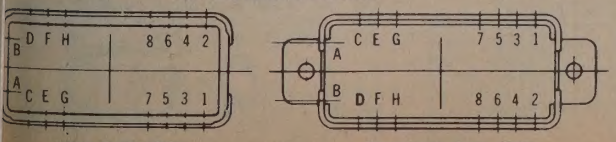
Similar to barrier polarization type, but with keyed aluminum shells to provide a large assortment of alternate positions. Mounting plates are stainless steel and receptacle includes float bushings which allow a float of .02 in all directions. Rated 5 amperes, 800 V DC at sea level; 300 V DC at 70,000 feet.

DIMENSIONS

	A	B	C	D
8 contact	1.719	1.375	1.036	1.120
16 contact	2.469	2.125	1.784	1.868
24 contact	3.219	2.875	2.536	2.620
32 contact	3.969	3.625	3.286	3.370



KEYING IDENTIFICATION



Plug Front Shell Receptacle Front Shell

Ordering Information

Contacts	Plug	Receptacle	Position	Shell Keys Letters	Numbers
8	26-4101-8P	26-4201-8S	1	A	1
	26-4102-8P	26-4202-8S	2	A	2
	26-4103-8P	26-4203-8S	3	B	1
	26-4104-8P	26-4204-8S	4	B	2
16	26-4101-16P	26-4201-16S	1	A-C	3-6
	26-4102-16P	26-4202-16S	2	A-D	2-5
	26-4103-16P	26-4203-16S	3	A-E	5-6
	26-4104-16P	26-4204-16S	4	A-F	4-5
	26-4105-16P	26-4205-16S	5	B-C	1-6
	26-4106-16P	26-4206-16S	6	B-D	1-2
	26-4107-16P	26-4207-16S	7	B-E	1-4
	26-4108-16P	26-4208-16S	8	B-F	2-3
24	26-4101-24P	26-4201-24S	1	A-C	3-6
	26-4102-24P	26-4202-24S	2	A-D	4-7
	26-4103-24P	26-4203-24S	3	A-E	5-6
	26-4104-24P	26-4204-24S	4	A-F	4-5
	26-4105-24P	26-4205-24S	5	A-G	6-7
	26-4106-24P	26-4206-24S	6	A-H	1-6
	26-4107-24P	26-4207-24S	7	B-C	2-7
	26-4108-24P	26-4208-24S	8	B-D	1-2
	26-4109-24P	26-4209-24S	9	B-E	1-4
	26-4110-24P	26-4210-24S	10	B-F	2-3
	26-4111-24P	26-4211-24S	11	B-G	3-4
	26-4112-24P	26-4212-24S	12	B-H	2-5
32	26-4101-32P	26-4201-32S	1	A-C	3-6
	26-4102-32P	26-4202-32S	2	A-D	4-7
	26-4103-32P	26-4203-32S	3	A-E	5-6
	26-4104-32P	26-4204-32S	4	A-F	4-5
	26-4105-32P	26-4205-32S	5	A-G	6-7
	26-4106-32P	26-4206-32S	6	A-H	1-6
	26-4107-32P	26-4207-32S	7	B-C	2-7
	26-4108-32P	26-4208-32S	8	B-D	1-2
	26-4109-32P	26-4209-32S	9	B-E	1-4
	26-4110-32P	26-4210-32S	10	B-F	2-3
	26-4111-32P	26-4211-32S	11	B-G	3-4
	26-4112-32P	26-4212-32S	12	B-H	2-5

BLUE RIBBON CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

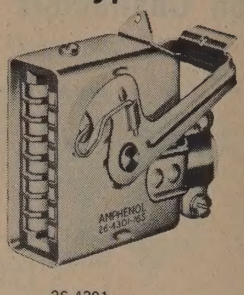
26 Series Cable to Panel and Cable to Cable Types

- Low Withdrawal Force
- Low Insertion Force
- Provisions for Safety Wiring
- Secure Spring Latch
- Alternate Positions

Cable-to-Panel Blue Ribbon Connectors include a straight plug, right angle plug, and panel receptacle. The plug is equipped with a spring tension swivel latch to insure mating, even in vibration applications. Provision for safety wiring provides additional reliability.

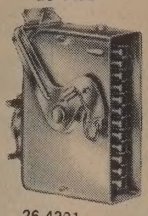
The nickel plated brass shells are notched to provide keying for alternate positions. The large number of alternate positions available is effectively doubled since the plug and receptacles are available with either a male or a female insert. Add P to the catalog number for a male insert; S for a female insert.

26-4401


26-4301

26-4401

26-4501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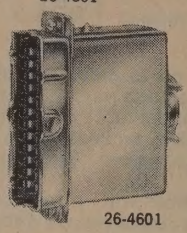
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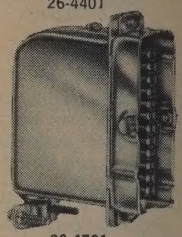
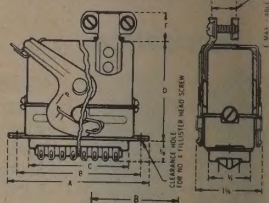
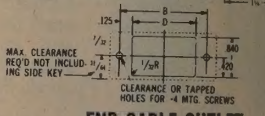

26-4701

26-4501

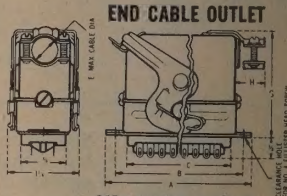
DIMENSIONS

	A	B	C	D	E	F	G	H	J	K	L	M	N
8 contact plug and receptacle mated	1.719	1.375	1.036	1.593	.312	.438	1.593	.455	1.120	2.059	1.697	4.046	3.322
16 contact plug and receptacle mated	2.469	2.125	1.784	1.719	.625	.517	1.797	.517	1.868	2.246	1.822	4.420	3.572
24 contact plug and receptacle mated	3.219	2.875	2.536	1.844	.625	.517	1.922	.517	2.620	2.371	1.947	4.670	3.822
32 contact plug and receptacle mated	3.969	3.625	3.286	1.906	.625	.517	1.984	.517	3.370	2.434	2.025	4.796	3.978

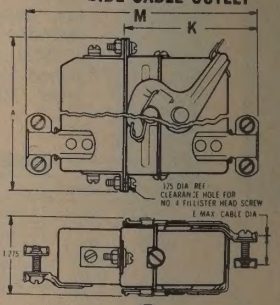


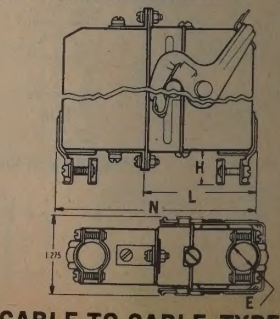


END CABLE OUTLET



SIDE CABLE OUTLET





CABLE-TO-CABLE TYPE

Ordering Information

CABLE-TO-PANEL AND CABLE-TO-CABLE

Contact	Plugs: End Cable Outlet	Plugs: Side Cable Outlet	Mating Panel Receptacles	Mating Receptacles with Back Shell: Outlet End Cable	Mating Receptacles with Back Shell: Outlet Side Cable	Position No.	Shell Keys: Letters	Shell Keys: Numbers
8	26-4301-8 S or P	26-4501-8 S or P	26-4401-8 P or S	26-4601-8	26-4701-8	1	A	1
	26-4302-8 S or P	26-4502-8 S or P	26-4402-8 P or S	26-4602-8	26-4702-8	2	A	2
	26-4303-8 S or P	26-4503-8 S or P	26-4403-8 P or S	26-4603-8	26-4703-8	3	B	1
	26-4304-8 S or P	26-4504-8 S or P	26-4404-8 P or S	26-4604-8	26-4704-8	4	B	2
16	26-4301-16 S or P	26-4501-16 S or P	26-4401-16 P or S	26-4601-16	26-4701-16	1	A-C	3-6
	26-4302-16 S or P	26-4502-16 S or P	26-4402-16 P or S	26-4602-16	26-4702-16	2	A-D	2-5
	26-4303-16 S or P	26-4503-16 S or P	26-4403-16 P or S	26-4603-16	26-4703-16	3	A-E	5-6
	26-4304-16 S or P	26-4504-16 S or P	26-4404-16 P or S	26-4604-16	26-4704-16	4	A-F	4-5
	26-4305-16 S or P	26-4505-16 S or P	26-4405-16 P or S	26-4605-16	26-4705-16	5	B-C	1-6
	26-4306-16 S or P	26-4506-16 S or P	26-4406-16 P or S	26-4606-16	26-4706-16	6	B-D	1-2
	26-4307-16 S or P	26-4507-16 S or P	26-4407-16 P or S	26-4607-16	26-4707-16	7	B-E	1-4
	26-4308-16 S or P	26-4508-16 S or P	26-4408-16 P or S	26-4608-16	26-4708-16	8	B-F	2-3
24	26-4301-24 S or P	26-4501-24 S or P	26-4401-24 P or S	26-4601-24	26-4701-24	1	A-C	3-6
	26-4302-24 S or P	26-4502-24 S or P	26-4402-24 P or S	26-4602-24	26-4702-24	2	A-D	4-7
	26-4303-24 S or P	26-4503-24 S or P	26-4403-24 P or S	26-4603-24	26-4703-24	3	A-E	5-6
	26-4304-24 S or P	26-4504-24 S or P	26-4404-24 P or S	26-4604-24	26-4704-24	4	A-F	4-5
	26-4305-24 S or P	26-4505-24 S or P	26-4405-24 P or S	26-4605-24	26-4705-24	5	A-G	6-7
	26-4306-24 S or P	26-4506-24 S or P	26-4406-24 P or S	26-4606-24	26-4706-24	6	A-H	1-6
	26-4307-24 S or P	26-4507-24 S or P	26-4407-24 P or S	26-4607-24	26-4707-24	7	B-C	2-7
	26-4308-24 S or P	26-4508-24 S or P	26-4408-24 P or S	26-4608-24	26-4708-24	8	B-D	1-2
	26-4309-24 S or P	26-4509-24 S or P	26-4409-24 P or S	26-4609-24	26-4709-24	9	B-E	1-4
	26-4310-24 S or P	26-4510-24 S or P	26-4410-24 P or S	26-4610-24	26-4710-24	10	B-F	2-3
	26-4311-24 S or P	26-4511-24 S or P	26-4411-24 P or S	26-4611-24	26-4711-24	11	B-G	3-4
	26-4312-24 S or P	26-4512-24 S or P	26-4412-24 P or S	26-4612-24	26-4712-24	12	B-H	2-5
32	26-4301-32 S or P	26-4501-32 S or P	26-4401-32 P or S	26-4601-32	26-4701-32	1	A-C	3-6
	26-4302-32 S or P	26-4502-32 S or P	26-4402-32 P or S	26-4602-32	26-4702-32	2	A-D	4-7
	26-4303-32 S or P	26-4503-32 S or P	26-4403-32 P or S	26-4603-32	26-4703-32	3	A-E	5-6
	26-4304-32 S or P	26-4504-32 S or P	26-4404-32 P or S	26-4604-32	26-4704-32	4	A-F	4-5
	26-4305-32 S or P	26-4505-32 S or P	26-4405-32 P or S	26-4605-32	26-4705-32	5	A-G	6-7
	26-4306-32 S or P	26-4506-32 S or P	26-4406-32 P or S	26-4606-32	26-4706-32	6	A-H	1-6
	26-4307-32 S or P	26-4507-32 S or P	26-4407-32 P or S	26-4607-32	26-4707-32	7	B-C	2-7
	26-4308-32 S or P	26-4508-32 S or P	26-4408-32 P or S	26-4608-32	26-4708-32	8	B-D	1-2
	26-4309-32 S or P	26-4509-32 S or P	26-4409-32 P or S	26-4609-32	26-4709-32	9	B-E	1-4
	26-4310-32 S or P	26-4510-32 S or P	26-4410-32 P or S	26-4610-32	26-4710-32	10	B-F	2-3
	26-4311-32 S or P	26-4511-32 S or P	26-4411-32 P or S	26-4611-32	26-4711-32	11	B-G	3-4
	26-4312-32 S or P	26-4512-32 S or P	26-4412-32 P or S	26-4612-32	26-4712-32	12	B-H	2-5

INSERTS: The plug and receptacle are available with either male or female inserts. Add the Suffix P for male inserts; S for female inserts.

See YELLOW SECTION for Local Offices, Phones

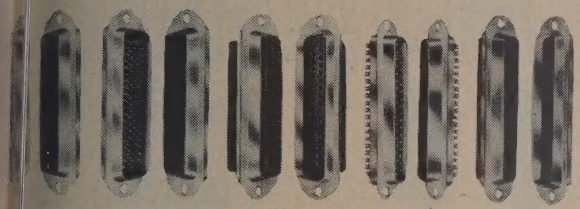
MIN RAC CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

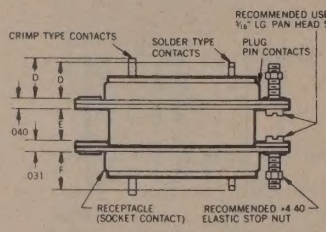
17 Series Min Rac® Connectors

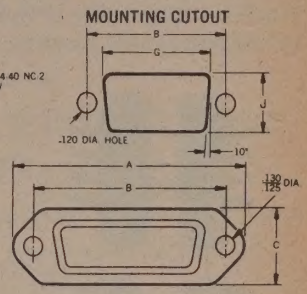
- Sub Miniature Rack and Panel
- Choice of Fixed or Removable Contacts.
- Six Styles — Unlimited Variety
- Intermates with all "D" Shaped Sub Miniatures.

A complete line of versatile connectors offering 9 to 98 contacts in a choice of arrangements and dielectrics. Cable housings are available for cable-to-panel or cable-to-cable applications, and several locking devices are offered. These lightweight, miniature connectors are ideal for computers, telecommunications, instrumentation and avionics systems not requiring environmental capability.



Home Dielectric | High Density | Encapsulated | Fixed Contact | Power & Coax





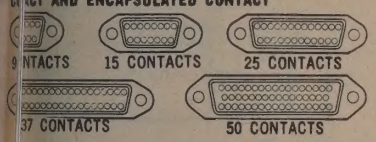
Dimensions

Contact Arrangement	All Lines A Max.	All Lines B	All Lines C Max.	D (1)	D (2)	D Encapsulated Contact Line Only	D High Density Line Only	D Power & Coax. Combination Only	E All Lines	F (1)	F (2)	F Encapsulated Contact Line Only	F High Density Line Only	F Power & Coax Comb. Only	Mounting Dimensions—All Lines G (Min.) Back Mtg.	G (Min.) Front Mtg.	H (Min.) Back Mtg.	H (Min.) Front Mtg.
9	1.239	.984	.515	21/64	17/64	29/64	.204	11/16	15/64	11/32	9/32	29/64	.192	3/4	.798	.830	.448	.505
15	1.567	1.312	.515	21/64	17/64	29/64	.204	11/16	15/64	11/32	9/32	29/64	.192	3/4	1.116	1.161	.448	.505
25	2.114	1.852	.515	21/64	17/64	29/64	.204	11/16	15/64	11/32	9/32	29/64	.192	3/4	1.654	1.701	.448	.505
37	2.754	2.500	.515	21/64	17/64	29/64	.204	23/32	15/64	11/32	9/32	29/64	.192	3/4	2.304	2.348	.448	.505
50	2.661	2.406	.626	21/64	17/64	29/64	.204	23/32	15/64	11/32	9/32	29/64	.192	3/4	2.210	2.285	.559	.645

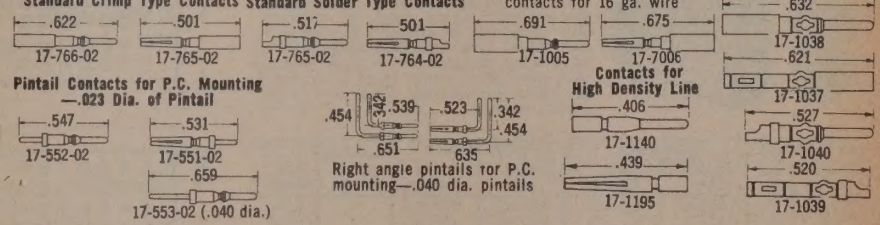
(1) Original Poke-Home and Hard Dielectric with Crimp Contacts.
(2) Original Poke-Home, Hard Dielectric and Fixed Contacts with Solder Contacts.

Contact Arrangements

FOR ORIGINAL POKE HOME HARD DIELECTRIC FIXED CONTACT AND ENCAPSULATED CONTACT



Contacts



Specifications

ORIGINAL POKE HOME & ENCAPSULATED CONTACT
Temperature Range: −55°C to +125°C.
Current Rating: 7.5 Amps.
Voltage Rating: 500 VAC (RMS) at sea level.
150 VAC (RMS) at 90,000 ft.
Dielectric: Zytel 101 nylon per Mil-P-20693.
Shells: Cadmium-plated cold-rolled steel with clear chromate finish per QQP-416A, Type I. Gold iridite finish available on request per QQP416A, Type II.
Contacts: .00002" min. gold over copper plated brass.
Wire Size: Solder: Up to #20; crimp #20, #22 and #24 AWG.

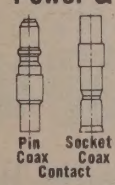
HARD DIELECTRIC
Temperature Range: −55°C to +175°C.
Current Rating: 7.5 Amps max. (#20 size contacts).
Voltage Rating: 500 VAC (RMS) at seal level.
150 VAC (RMS) at 90,000 ft.
Dielectric: Diallyl phthalate glass-filled per Mil-M-19833, Type GDI-30.
Shells: Same as above.
Contacts: Crimp-type—leaded copper with .00002" min. gold over copper flash plating per Mil-G-45204, Type II. Solder type—brass or silnic bronze with .00002" min. gold over copper flash plating per Mil-G-45204, Type II.
Wire Size: Accepts #20 AWG wire max.

FIXED CONTACTS and POWER & COAX.
Temperature Range: −55°C to +125°C.
Current Rating: 7.5 Amps max.
Voltage Rating: 500V (RMS) at sea level.
125V (RMS) at 70,000 ft.
Dielectric: Glass-filled nylon.
Shells: Same as above.
Contacts: Power—.00002" min. gold over copper plated brass. Coax.—#1 shielded contacts.
Wire Size: Up to #20 wire.

HIGH DENSITY
Temperature Range: −55°C to +135°C.
Current Rating: 3.0 Amps.
Voltage Rating: 500V (RMS) at sea level.
75V (RMS) at 70,000 ft.
Dielectric: Glass-filled nylon.
Shells: See above.
Contacts: Pins—leaded copper with .00002" min. gold over copper flash plating. Sockets—phosphor bronze with .00002" min. gold over copper flash plating.
Wire Size: #24, #26, #28 AWG.

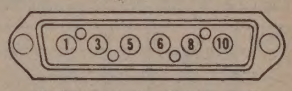
Tools Contact Crimping Tool — **357-100**
Contact Insertion and Removal Tool — **356-200**
Consult factory for proper contact locators and kits for particular contacts being used.

Power & Coax Combination Only



Pin	Cables	Socket
17-1112-01	For RG195/U and RG195A/U cable	17-1113-01
17-1132-01	For RG178B/U, RG196/U and RG196A/U cable	17-1130-01
17-1264-01	For RG58/U, RG141/U, RG141A/U, and RG303/U	17-1265-01

HIGH VOLTAGE CONNECTOR



10 #20 Contacts—Size 37 Shell

ORDERING INFORMATION
17-800 Plug 17-801 Receptacle

Cable Application Accessories

Shell Size	Cable Clamp Clear Chromate	Cable Clamp Gold Iridite	Spring Latch Locking Device Clear Chromate	Spring Latch Locking Device Gold Iridite	Screw Latch Locking Device Clear Chromate	Screw Latch Locking Device Gold Iridite	Jackscrew and Socket Assembly Clear Finish Only	Potting Molds
9	17-310-01	17-310-02	17-529	17-847	17-768	17-848	17-895	17-886-09
15	17-311-01	17-311-02	17-529	17-847	17-768	17-848	17-895	17-886-15
25	17-312-01	17-312-02	17-529	17-847	17-768	17-848	17-895	17-886-25
37	17-313-01	17-313-02	17-529	17-847	17-768	17-848	17-895	17-886-37
50	17-314-01	17-314-02	17-770	17-850	17-768	17-848	17-895	17-886-50

Ordering Information

17 — 1 1 09 0 — 1

SERIES NUMBER
17

CONNECTOR TYPE
1 Receptacle (Zytel) Socket Contacts
2 Plug (Zytel) Pin Contacts
6 Receptacle (Hard Dielectric) Socket Contacts
7 Plug (Hard Dielectric) Pin Contacts
8 Receptacle (Glass-Filled Nylon) Socket Contacts
9 Plug (Glass-Filled Nylon) Pin Contacts

FINISH
0 Cadmium w/ clear chromate
1 Cadmium w/ gold iridite

NUMBER OF POWER CONTACTS
09 — 9 contacts
15 — 15 contacts
98 — 98 contacts
Etc.

COAX CONTACTS
0 — None
1 — Coax
2 — 2 Coax
Etc.

DEVIATIONS
0 Solder Contacts
1 Crimp Contacts Male or Female
5 Solder Contact and Float Mounted (Female only)
6 Crimp Contact and Float Mounted (Female only)
11 .023 Dia. .138 Pin Tail Contacts for Nylon inserts only

Must be ordered separately.

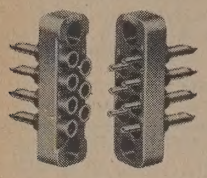
RACK AND PANEL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

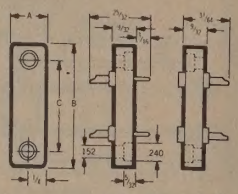
126 Series Miniature Rack and Panel Connectors

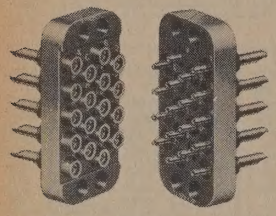
Heavy duty, reliable, time proven connectors. Dielectric is of melamine. Contacts are gold over silver plated. Voltage rating of types 1 and 2 is 700V RMS between contacts and 600V RMS between contacts and ground with a current rating of 17 amperes. Voltage rating of types 3 and 4 is 600V RMS with a current rating of 7½ amperes.

Connectors Type	Pin Part Number	Socket Part Number	No. of Contacts	Amps	Wire Solid	Gauge Strand.	Width A	Length B	Mount Cent C
1	126-016	126-017	7	17	12	14	.5	1.63	1.25
	126-204	126-205	15	17	12	14	.5	2.59	2.22
2	126-206	126-207	18	17	12	14	1.0	2.00	1.69
3	126-173	126-174	14	7½	18	20	.438	1.25	.93
	126-199	126-189	18	7½	18	20	.563	1.31	1
4	126-171	126-172	21	7½	18	20	.375	2.25	1.68
	126-188	126-187	34	7½	18	20	.75	2	1.93



TYPE 1





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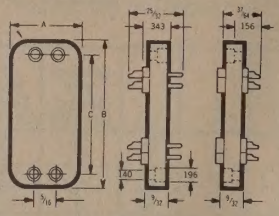
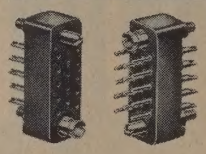
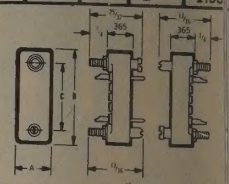
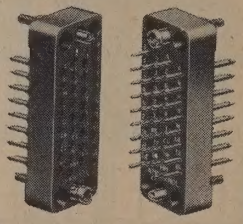


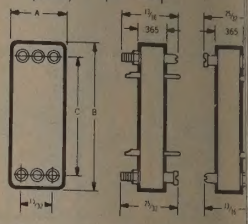


TYPE 3

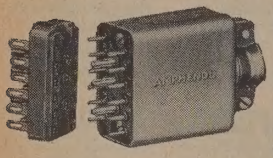




TYPE 4



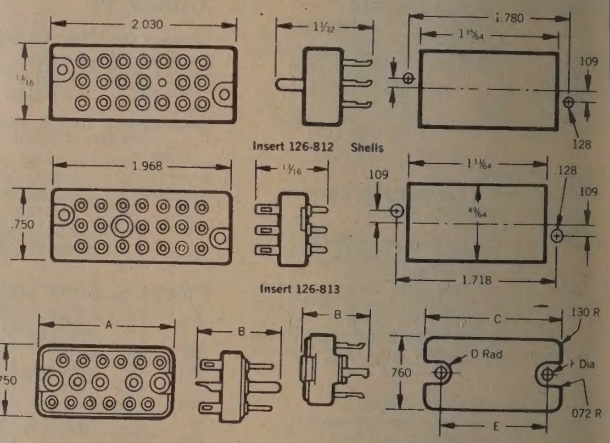
126 Series Rectangular Rack & Panel with Shells For Cable Connections



Rated a full 900V RMS, contacts are gold, over silver. Four contact configurations are available with 3 contact sizes. Contact size 12 is rated 23 amperes; size No. 16 is rated 13 amperes; size 20 is 7½ amperes. Dielectric is mica filled phenolic. Aluminum housing with mechanical strain relief is available for cable applications. Gold over silver plated contacts.

No. of Contacts Size 12	Size 16	Size 20	Pin Contacts Insert Only	With Housing	Socket Contacts Insert Only	With Housing	Mounting Screw Size No.	Shell Height
2	—	9	126-804	126-809	126-805	126-808	4	1.75
3	—	12	126-151	126-152	126-150	126-153	6	2.06
4	—	16	126-806	126-811	126-807	126-810	4	2.06
—	20	—	126-813	—	126-812	—	4	—

INSERTS	A	B	C	D	E	F
126-805	1.171	49/64	1.181	.120	.864	.120
126-151	1.500	.937	1.510	.115	1.188	.145
126-150	1.500	49/64	1.510	.115	1.188	.145
126-806	1.937	.937	1.947	.120	1.620	.120
126-807	1.937	49/64	1.947	.120	1.620	.120



115 Series

Hinge Action Mating

115-31S 115-30P

Amphenol 115 Series connectors accommodate 50 or 100 No. 16 wires and are nominally rated at 750 volts RMS 60CPS at sea level.

The vise action of the screw lock provides the leverage for easy attaching and disengaging of the plug. The two-piece inserts have molded-in numbers to facilitate wiring and checking of circuits. Receptacle Mounting — the 8-32 assembly screws are located as shown. Panel must be cut out for lead-in at the back of the receptacle

100 CONTACT CONNECTORS

	With Crimp-On Contacts	With Taper Pin Contacts	With Solder Cup Contacts
Male Plug	115-30P	115-30P(432)	115-30P-1000
Female Receptacle	115-31S	115-31S(432)	115-31C-1000
Female Plug	115-30S	115-30S(432)	115-32S
Male Receptacle	115-31P	115-31P(432)	115-32P

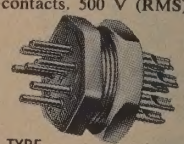
50 CONNECTORS

	With Taper Pin Contacts	With Solder Cup Contacts
Male Plug	115-114P(432)	115-114P
Female Receptacle	115-115S(432)	115-115S
Female Plug	115-114S(432)	115-114S
Male Receptacle	115-115P(432)	115-115P

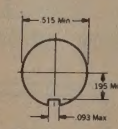
126 Series Hex Connectors 4 to 9 Contact

Popular hexagon rack and panel connectors. Diallyl phthalate dielectric gold over silver plated contacts. 500 V (RMS) at sea level.

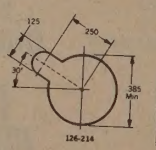
HEX. NUT TYPE

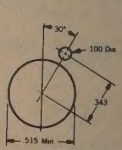


HOOD & CLAMP TYPE



Hex Nut Type Mounting Holes





All Others

LOCKING CLIP TYPE

Contacts	Hex Nut Panel Mount	Panel Mount With Locking Clip	With Hood and Cable Clamp
4 Pin	126-1431	126-214	126-214 - 1000
4 Socket	126-2815	126-233	126-215 (Hood Only)
5 Pin	126-010	126-216	126-217
5 Socket	126-011	126-218	126-223
7 Pin	126-191	126-197	126-195
7 Socket	126-192	126-198	126-196
9 Pin	126-012	126-219	126-220
9 Socket	126-013	126-221	126-222

PRINTED CIRCUIT CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

2 Series Printed Circuit Receptacles

BURCATED BELLOWS CONTACT PRINTED CIRCUIT CONNECTORS DESIGNED TO MIL-C-21097B
LW MILLIVOLT DROP • NEGLIGIBLE PC CIRCUITRY WEAR

Anenol gold-plated RIBBON contacts — with their smooth glide mating act — incur practically no wear on fragile printed circuitry. Ribbon contac are bifurcated (slit), to guarantee at least two points of electrical contac even with an irregular shaped printed circuit board. The double spring tes n of the ribbon contact, and large mating surface, provides consistent lo ontact resistance, with corresponding low millivolt drop.

.1" CENTERS

Bi cated ribbon contacts are on .156" centers and will accept PC boards of 54" to .071" thickness.

DLLYL PHTHALATE

O piece, flame resistant, glass filled diallyl phthalate. Chamfered throat o ing assists in guiding PC boards to a perfect engagement.

-C-21097B

Aphenol Blue Ribbon PC Connectors represent the most comprehensive nector line designed in accordance to MIL-C-21097B.

LARIZATION

lded keying slots between contact accept polarizing key without loss contact positioning. One nylon key is supplied with each commercial nector.

NTACT ROWS

e Ribbon PC Connectors are available with two rows of separate indeident contacts, or one row of contacts with back-up springs provided proper mating tension. The 43 position size connector is therefore ailable with either 43 or 86 contacts. Double sided contacts with single ls are also available in 6 through 36 sizes.

RMINATION

wide variety of contact tails permit Blue Ribbon Printed Circuit Conctors to be terminated by soldering, or by crimping, of either Poke-Home taper pin contacts.

SPECIFICATIONS

Operating voltage: 600 VAC (RMS) at sea level — 150 VAC (RMS) at 70,000 feet
Current rating: 5 amperes continuous
Test Voltage Between Adjacent Contacts: 1800 VAC (RMS) at sea level — 450 VAC (RMS) at 70,000 feet
Insulation Resistance: 5,000 megohms minimum

Contact Resistance
- Crimp and taper pin terminated — 35 millivolts max. at rated current
- Solder terminated — 30 millivolts max. at rated current

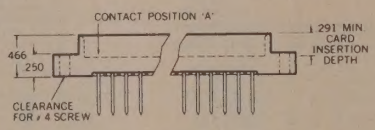
Contact Retention
- Solder terminated — 5 pounds axial load min.
- Crimp terminated — 10 pounds axial load min.
- Taper pin — 15 pounds axial load min.

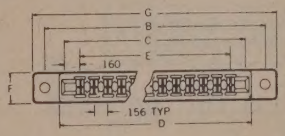
Dielectric material: Glass fiber reinforced diallyl phthalate — Type SGDF per MIL-M-14
Contact material: Beryllium copper, or phosphor bronze (see below)
Contact plating — .00003" min. gold over copper, or .00005" min. gold over copper.

Dimensions For All Terminations

Number of Contact Positions	A	B	C	D	E	F	G
6	1.832	1.532	1.100	1.230	.780	.343	1.844
10	2.456	2.156	1.723	1.854	1.404	.343	2.468
15	3.236	2.936	2.502	2.636	2.184	.343	3.248
18	3.704	3.404	2.970	3.105	2.652	.343	3.716
22	4.328	4.031	3.597	3.730	3.276	.343	4.340
25*	—	4.501	4.067	4.198	3.744	.343	4.810
28	5.264	4.964	4.530	4.652	4.212	.500	5.264
36	6.512	6.219	5.778	5.900	5.460	.500	6.512
43	7.600	7.302	6.871	7.000	6.552	.500	7.600

* 25 position available only in double row solder termination.





Ordering Information

To order the specific 225 Series connector you want, put together the part number as per the following example:

2 2 5 - 2 0 6 3 1 - 1 01 (115)

SERIES NUMBER
225-

TERMINATION CLASS

Digit	Termination
2	Solder
3	Taper Pin
4	Poke-Home

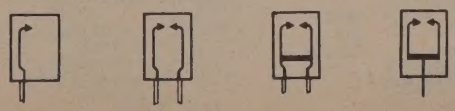
CONTACT POSITIONS

Digit Group	No. of Contacts
06	6 or 12
10	10 or 20
15	15 or 30
18	18 or 36
22	22 or 44
25	25 or 50
28	28 or 56
36	36 or 72
43	43 or 86

*Avail. in Solder only.

CONTACT CONFIGURATION

Digit	Solder Type	Poke-Home Type	Taper Pin Type
0	—	Insert less contacts.	—
1	Single row connector with back-up springs.	Insert plus loose contacts for one row plus back-up springs.	Single row connector with back-up springs.
2	Two rows of independent contacts.	Insert plus loose contacts for two rows.	Two rows of independent contacts.
3	Two rows of bridged contacts with two tails.	—	—
5**	Two rows of bridged contacts with one tail.	—	—



** Available in Phosphor Bronze only

CRIMP CONTACT ORDERING INFORMATION
Crimp contacts are available in standard beryllium copper with .000030" gold plating either in bulk or on reels.
Loose contacts—Order part number 225-605-06
Reel contacts (2400 contacts on reel) Order part number 225-605-52400

DEVIATIONS
(115) Deviation is Phosphor Bronze contact material. Available only in solder eyelet.

POLARIZATION (Optional)
If factory insertion of polarizing key is desired, add position of key as suffix here. Key will be inserted to right of contact position shown. Example: 225-20631-10103 (115). Key to right of contact #3).

TAIL STYLE

Digit Group	Style
00	Taper Pin or Crimp
01	Eyelet Solder
03	Straight Dip Solder
05	Right Angle Dip
10	Short Dip Solder
11	Military Dip Solder
12	Open Eyelet Solder

CONTACT PLATING

Digit	Plating
1	.000030" gold over copper (Industrial)
2	.000050" gold over copper (MIL-C-21097)

MOUNTING PROVISIONS

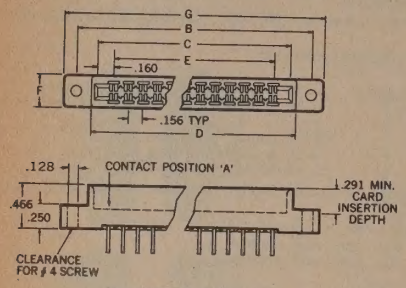
Digit	Provisions
1	.128" clearance holes
2	Float bushings for #4 screws
3	Threaded bushings (4-40)
4	.142" clearance holes (solder type)
4	.250 mounting ears (taper pin)

PRINTED CIRCUIT CONNECTORS

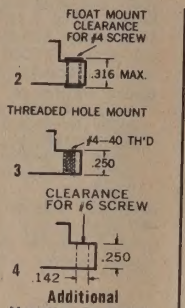
AMPHENOL
THE BUNKER-RAMO CORPORATION

225 Series Receptacles
Solder Termination

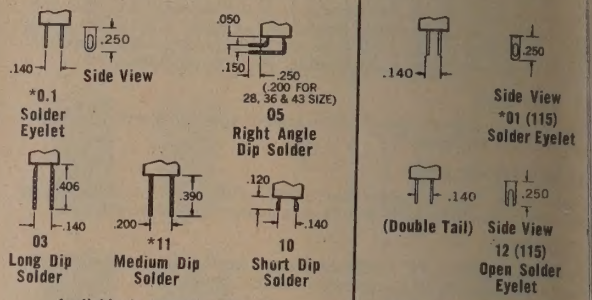
AMPHENOL Blue Ribbon Printed Circuit Connectors with solder terminations provide full flexibility of termination th different tail styles—three straight plug-in terminations (.140" and .200" grid), one right angle plug-in termination, and f r e terminations.



Mounting Provision 1



Additional Mounting Provisions



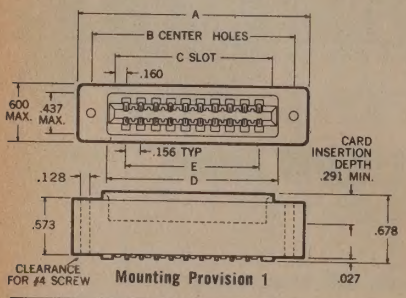
Available in Beryllium Copper

Available in Phosphor Bronze (115)

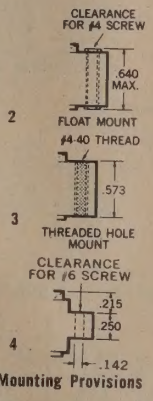
Taper Pin Termination

AMPHENOL Blue Ribbon Printed Circuit Connectors with taper pin terminations provide flexibility of assembly procedure and ease of circuit modification and repair.

Two arrangement options are available: two rows of contacts for independent opposing circuits or a single row of contacts for single circuits. Single row connectors use separate back-up springs to assure firm mating.

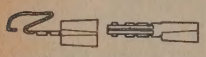


Mounting Provision 1



Additional Mounting Provisions

TAPER PIN TYPE

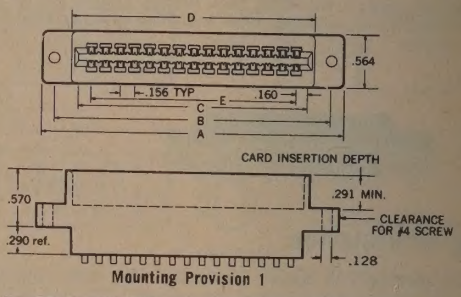


Tail style 00 accepts #53 pins. Available in beryllium copper only.

Crimp- Poke-Home Termination

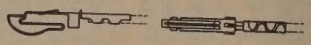
AMPHENOL Blue Ribbon Printed Circuit Connectors Poke-Home contacts offer both the economy of crimp tion and the flexibility of removable contacts — an u combination.

Two arrangement options are available: two rows of for independent opposing circuits or a single row of for single circuits. Single row connectors use separate springs to assure firm mating.



Mounting Provision 1

CRIMP POKE-HOME TYPE

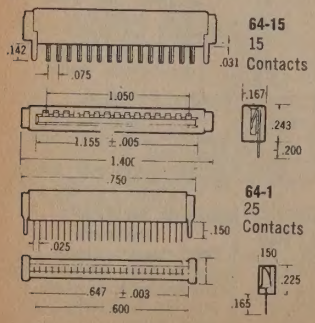


Tail style 00 available in beryllium copper only.

64 Series Micro-Edge® Edge Board Receptacles

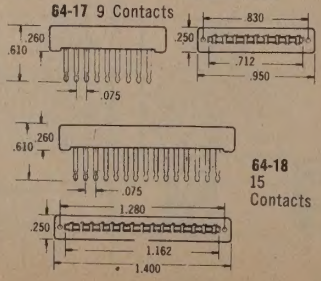
Micro-Edge contacts will not set. The Micro-Edge will accept even warped boards with firm contact action. Contacts are rounded and will not scrape or injure delicate circuits.

REGULAR TYPE



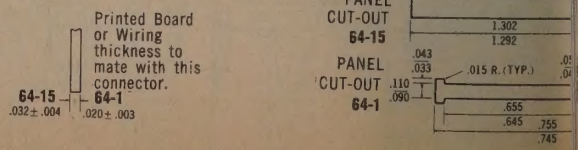
ECONOMY TYPE

(For .032" ±.004" Thick Boards)



	64-1	64-15	Economy U 64-17	-1
No. of Contacts	25	15	9	5
Overall Length	.75	1.40	.950	.4
Contact Centers	.025"	.075"	.075"	.75
Contact Diameter	.008"	.010"		
Contact Resistance, Ohms	.020-.030	.010-.020	.010	.10
P.C. Board Width Thickness	.647 .020 ±.003	1.155 .032 ±.004	.712 1/32	.62 .2
Current Rating, Amperes	.5	.5	1	
Voltage Rating	200 V AC (RMS) at sea level		750 V VAC (S) at sea lev	
Contact Material	.008" and .010" gold plated copper alloy wire		.00002" gold .00015" silver heat treated b copper	
Dielectric Material	Glass-filled diallyl phthalate, Type GDI-30 per MIL-M-19833		Mineral-filled phthalate p MIL-M-14E-M	

BOARD SIZE



See YELLOW SECTION for Local Offices, Phones

PRINTED CIRCUIT CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

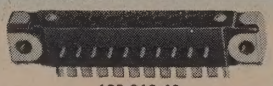
133 Series Prin-Cir Plugs

PRIN-R PLUGS flush mount directly to printed circuit boards and elimin any possibility of wear on board circuitry. Used where frequent mating nd disengagement is necessary, or where an unusually low mili-volt d is required. Ideal mating solution for boards of non-standard thickn . Gold over copper plated contacts are on .156 centers and mate with Series PRIN-CIR RECEPTACLES.

The PN-CIR PLUG, when used with the 143 Series PRIN-CIR RECEP-TACL is polarized by removing a contact. Contact removal and the marki of the connector is performed by your AiD, or at the Ampenhol Factor

DIMENSIONS

Part No.	No. of Contacts	A	B	C	D
13 06	6	1.820	1.531	1.091	.781
13 10	10	2.445	2.156	1.716	1.406
13 12	12	2.757	2.468	2.028	1.718
13 15	15	3.226	2.937	2.497	2.187
13 18	18	3.695	3.406	2.966	2.656
13 22	22	4.320	4.031	3.591	3.281



133-010-43
mates with 143 Series Receptacle

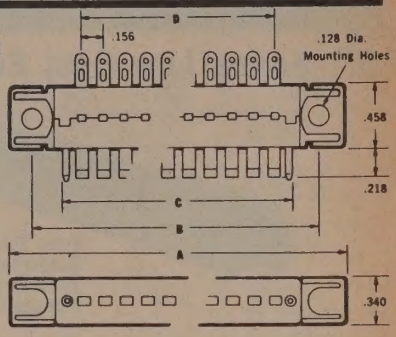
CONTACT OMISSION TABLE

Loc.	Suffix	Loc.	Suffix
A	1001	N	1012
B	1002	P	1013
C	1003	R	1014
D	1004	S	1015
E	1005	T	1016
F	1006	U	1017
H	1007	V	1018
J	1008	W	1019
K	1009	X	1020
L	1010	Y	1021
M	1011	Z	1022

AVERAGE VOLTAGE BREAK-DOWN Between Contacts: 3,250 VOLTS D.C. at Sea Level.

OPERATING VOLTAGE RATING: 600V RMS at Sea Level.

CURRENT RATING: 5 AMPS



Ordering Information

133 - 015 - 03
133 - 006 - 23 - 1002

- 133 Series PRIN-CIR PLUG
- No. of Contacts 006, 010, 012, 015, 018, 022
- Contact Tail Style
- Positioning: Contact Omission

143 Series Prin-Cir Receptacles

TUNING FORK CONTACT CANNOT BE OVERSTRESSED
.156 CONTACT CENTERS
MATES WITH .054-.070 PC BOARDS OR 133 SERIES PRIN-CIR PLUGS

Tuning fork contact design assures uniform and firm contact action, even with PC boards at extremes of thicknesses.

Gold plated over copper, tuning fork contacts glide over the delicate foil surface of the printed circuitry.

For boards of non-standard thickness, or where frequency of insertion and withdrawal will exceed 500 cycles, it is recommended that the 143 Series PRIN-CIR RECEPTACLE be used with the 133 Series PRIN-CIR PLUG. Contacts are on .156" centers. All sizes are available with a choice of contact tails.

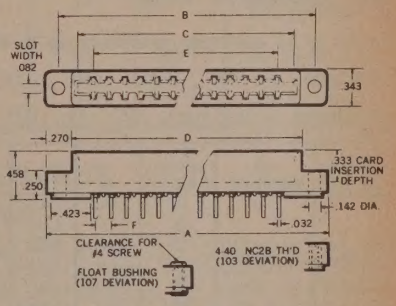
DIMENSIONS

Part No.	No. of Contact Positions	A	B	C	D	E	F
143-006	6	1.779	1.531	1.097	1.239	.781	.156
143-010	10	2.404	2.156	1.723	1.864	1.406	.156
143-012	12	2.716	2.468	2.035	2.176	1.718	.156
143-015	15	3.185	2.937	2.504	2.645	2.187	.156
143-018	18	3.654	3.406	2.972	3.114	2.656	.156
143-022	22	4.279	4.031	3.597	3.739	3.281	.156
143-028	*28	5.217	4.869	4.535	4.677	4.219	.156
143-036	**36	6.464	6.210	5.776	5.918	5.460	.156

*ALSO AVAILABLE IN THIS SIZE ON .125" CENTERS.
**36 CARD SLOT CONTAINS TWO .056 BARRIERS: ONE BETWEEN CONTACTS N&P, AND ONE BETWEEN CONTACTS b&c.

143-010-03
mates directly to a printed circuit board or with a Series 133 Plug

Loc.	Suffix	Loc.	Suffix
A	1001	N	1012
B	1002	P	1013
C	1003	R	1014
D	1004	S	1015
E	1005	T	1016
F	1006	U	1017
H	1007	V	1018
J	1008	W	1019
K	1009	X	1020
L	1010	Y	1021
M	1011	Z	1022

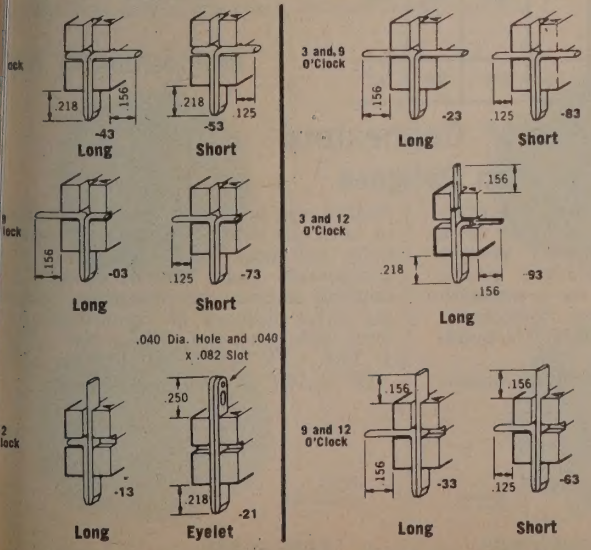


Ordering Information

143 - 006 - 01
143 - 018 - 07 - 1010

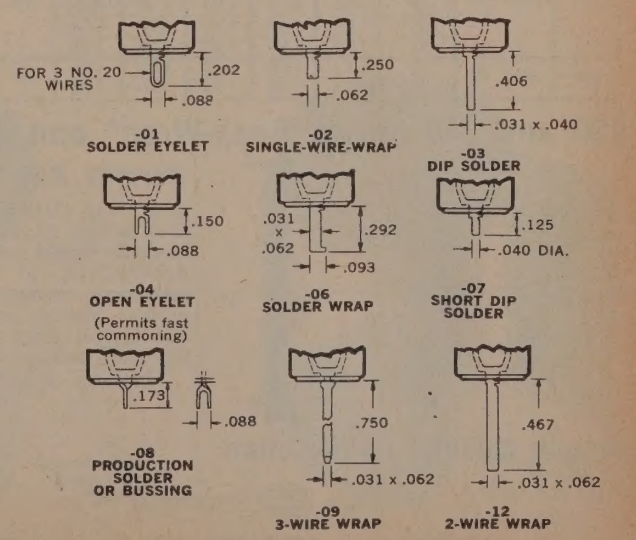
- PRIN-CIR RECEPTACLE
- No. of Contacts 006, 010, 012, 015, 018, 022, 036
- Contact Tail Style
- Positioning Key Location
- Polarizing Key is Available In Any Location

CONTACT TAIL POSITIONS .040 DIAMETER — DIP SOLDER



Contacts are viewed from front of connector. Contact position A is shown.

TAIL STYLES



PRINTED CIRCUIT CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

261 Series Low Cost Edgeboard Connectors

True Positioned for Solderless Wrap Termination on Automatic Wrapping Machines

High Performance at Reasonable Cost

These high-performance edgeboard connectors provide dual readout of double-sided printed circuit boards. The pre-loaded cantilever type contacts are assembled into the dielectric with precise spacing to permit automatic solderless wrap termination. The phosphor bronze contacts have a minimum of 50 micro-inches of gold at the contacting surface. This results in extremely low contact resistance and permits over 500 insertion and withdrawal cycles without loss of continuity or significant increase in resistance.

An Extensive Line

- 15 to 43 positions providing up to 86 contacts
- Choice of .100", .125", .150", .156" or .200" spacing
- Choice of tail sizes: .025" sq., .035" sq., or .035" x .050".

Electrical Characteristics

Contact Spacing	Current Rating (Max.) Amps	Contact Resistance (Max.) Milliohms	Voltage Rating (Sea Level)	Voltage Breakdown (Min.)
.100" on Center	5.0	6.0	300 V RMS	1800 V RMS
.125" on Center	5.0	6.0	350 V RMS	2000 V RMS
.150" on Center	6.0	5.5	400 V RMS	2500 V RMS
.156" on Center	7.5	5.0	400 V RMS	2500 V RMS
.200" on Center	7.5	4.5	500 V RMS	4500 V RMS

SPECIFICATIONS

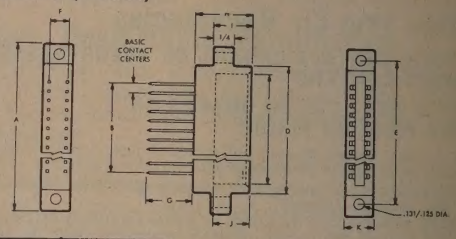
Block Material: Medium impact, electrical grade phenolic.

Contact Material: Grade A Phosphor Bronze with 50 micro-inches minimum thickness of gold on contacting surfaces.

Keying: Available on .200, .156 and .150 centers. On .125 and .100 centers key replaces one pair of contacts.

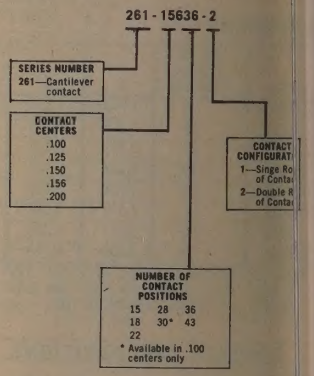
Tail length: Sufficient for three wire wraps plus space for bussing on PC board next to block. (See dimension G.)

DIMENSIONS (Inches)

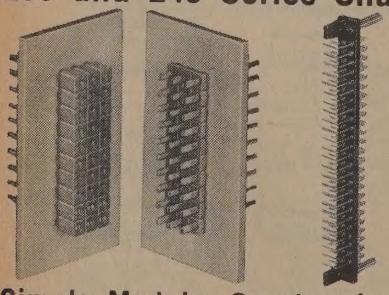


Contact Centers	Tail Dimensions	No. Contact Positions	A	B	C	D	E	F	G	H (Max.)	I (Max.)	J	K
.100	.025 square	15	2.474	1.400	1.720	1.874	2.156	.200	.627	.735	.494	.465	.343
		18	2.774	1.700	2.020	2.174	2.456						
		22	3.174	2.100	2.420	2.574	2.856						
		30	3.974	2.900	3.220	3.374	3.656						
		36	4.574	3.500	3.820	3.974	4.256						
		43	5.274	4.200	4.520	4.674	4.956						
.125	.025 square	15	2.824	1.750	2.070	2.224	2.506	.250	.627	.735	.494	.465	.365
		18	3.199	2.125	2.445	2.599	2.881						
		22	3.699	2.625	2.945	3.099	3.381						
		28	4.449	3.375	3.695	3.849	4.131						
		36	5.449	4.375	4.695	4.849	5.131						
		43	6.324	5.250	5.570	5.724	6.006						
.150	.035 square	18	3.624	2.550	2.870	3.024	3.306	.300	.765	.770	.515	.500	.443
		28	5.124	4.050	4.370	4.524	4.806						
		43	7.374	6.300	6.620	6.774	7.056						
.156	.035 x .050	15	3.258	2.184	2.504	2.658	2.940	.200	.765	.770	.515	.500	.343
		18	3.726	2.652	2.972	3.126	3.408						
		22	4.350	3.276	3.596	3.750	4.032						
		28	5.286	4.212	4.532	4.686	4.968						
		36	6.534	5.460	5.780	5.934	6.216						
		43	7.626	6.552	6.872	7.026	7.308						
.200	.035 x .050	22	5.274	4.200	4.520	4.674	4.956	.200	.765	.770	.515	.500	.343
		36	8.074	7.000	7.320	7.474	7.756						

Ordering Information



230 and 240 Series Snap-Wrap® and Mini-Wrap® Connectors



Permits Any Configuration Designed

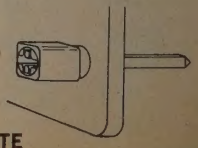
Snap-Wrap (230 Series) and Mini-Wrap (240 Series) connectors are based on a modular design concept which permits AMPHENOL to accommodate practically any configuration as a standard product. Design your own interconnection system using AMPHENOL's building block concept.

The base plate, available in various finishes, can be shaped, formed, notched or have any kind of cutouts or mounting holes you need to fit your space and components. Holes may be punched (or omitted) in many configurations, including either military or commercial patterns with spacing of .200" x .200", .150" x .150", .150" x .075", .125" x .125", .100" x .100" or .100" x .050".

Simple Modular Construction

CONTACTS
Wide Variety Available

NYLON BUSHINGS
Available in Many Colors



BASE PLATE
Any Size Required up to 24" Wide

See YELLOW SECTION for Local Offices, Phones

POWER CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

ector Guide

ries	Meets/Exceeds MIL-Spec	Description	Contacts	Pressure-Proof	Max. Temp.	Mates With
S-A	MIL-C-5015	Solid back shell formerly AN Threaded coupling, O.D. finish Diallyl Phthalate dielectric	1 to 52 Solder cup	No	257°F	All MS, 69, 89, 172 Series
S-B	MIL-C-5015	Solid back shell formerly AN Threaded coupling, O.D. finish Diallyl Phthalate dielectric	1 to 52 Solder cup	No	257°F	All MS, 69, 89, 172 Series
S-C	MIL-C-5015	Pressurized formerly AN Threaded coupling, O.D. finish Diallyl Phthalate dielectric	1 to 48 Solder cup	Yes	257°F	All MS, 69, 89 Series
S-E	MIL-C-5015	Environmental Threaded coupling, O.D. finish Neoprene rubber dielectric	1 to 48 Solder cup	Yes	257°F	All MS, 69, 89, 172 Series
S-R	MIL-C-5015	Environmental, light weight Threaded coupling, O.D. finish Neoprene rubber dielectric	1 to 48 Solder cup	Yes	257°F	All MS, 69, 89, 172 Series
48	MIL-C-26500 (USAF)	Miniature, highly environmental Threaded and bayonet coupling Black anodized finish Silicone rubber dielectric	3 to 55 Crimp/Poke-Home	Yes	392°F	48 Series only
67 innie	Proprietary	Miniature environmental Bayonet, gray anodized finish Diallyl Phthalate dielectric	3 to 48 Solder cup	Yes	257°F	67 Series only
69 okeR	MIL-C-5015	Environmental Threaded coupling, O.D. finish Neoprene dielectric	2 to 37 Crimp/Poke-Home	Yes	257°F	All MS, 69, 89, 172 Series
89 GSE	MIL-C-5015	Submersible, threaded coupling Clear, or O.D. cadmium finish Diallyl Phthalate dielectric	2 to 52 Solder cup	Yes	257°F	All MS, 69, 89, 172 Series
348	M-C-81511	Environmental, high contact density Subminiature, O.D. finish, silicone rubber inserts	3 to 155 Crimp	Yes	392°F	348 Series only
Miniature N/MS	MIL-C-19572	Pressure, waterproof, bayonet Diallyl Phthalate dielectric	5 to 24 Solder cup	Yes	257°F	165, 182 Series

nphenol ASTRO/348 MIL-C-81511* High Density Connectors

phenol designed out the costly space-wasters in removable-tact connectors when we invented Astro/348. Problem-sing metal retention clips for each contact are gone. Instead, single one-piece molded dielectric retention system locks e-Home contacts in place. Originally designed as a high sity subminiature, Astro/348 turned out to be the best h density miniature and standard connector ever made. acks more contacts of every size into standard shells than other design. MIL-C-81511 has established the standard nector family for the next decade.

R EXAMPLE

re's what Astro/348 in a size **18 shell** can give you:

Astro/348	Closest Alternative
85 #23-22 Contacts	67 #22M Contacts
37 #20 Contacts	32 #20 Contacts
19 #16 Contacts	11 #16 Contacts

l at less cost, and in less space, for each circuit carried.

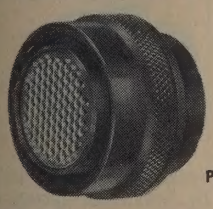
LARGER ON THE INSIDE

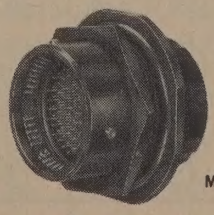
The single-piece retention disc gives other excellent advantages in addition to density. Dielectric wall thicknesses in the sub-miniature #23-22 contact arrangements **are equal to standard miniatures.** With greater density, #20's, #16's and #12's provide dielectric separation comparable to standard miniature and and power connectors.

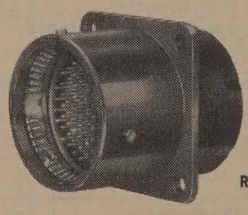
FIGHT SCOOPING

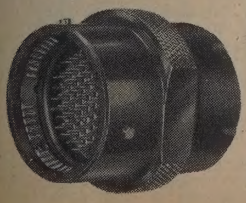
Scooping means that pin contacts in a connector can be damaged when the mating shell is accidentally wiped across the pin connector face. Astro/348 is available in two constructions: "50%" and 100% No-Scoop. 50% No-Scoop means that scooping is impossible when the pin contacts are in the receptacle shell (this is normal usage). In 100% constructions, scooping is impossible whether the pin contacts are in the plug or the receptacle.

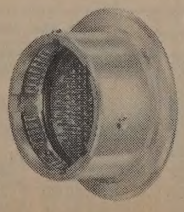
hell Constructions

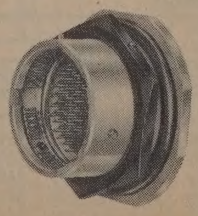

Plug


Single Hole Mtg. Receptacle


Square Flange Recepticle


Cable Receptacle


Hermetic Seal— Solder Flange Receptacle


Hermetic Seal— Receptacle Single Hole Mtg.

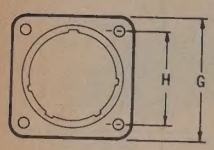
IL-C-81511 is a Military Specification for Connectors, Electric, Circular, High Density, Quick Disconnect, Environment Resistant.
strol 348 and Poke-Home are Trade Marks of The Bunker-Ramo Corp.

HIGH DENSITY CONNECTORS

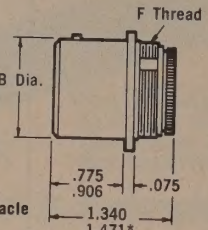
AMPHENOL
THE BUNKER-RAMO CORPORATION

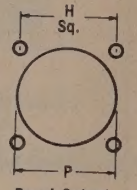
Amphenol ASTRO/348 High Density Connectors (Continued)

Shell Style and Dimensions (inches) All dimensions are shown as MAX.

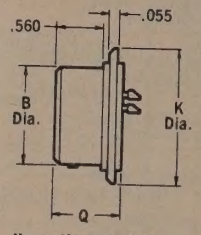


Square Flange Receptacle

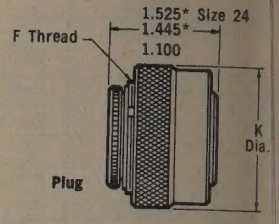


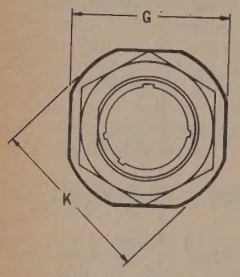


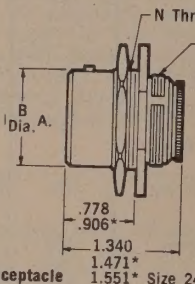
Panel Cutout .125 Max. Panel Thickness Front or Rear Panel Mount



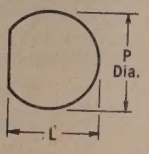
Hermetic Seal Solder Flange Receptacle



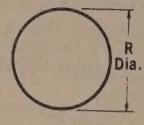




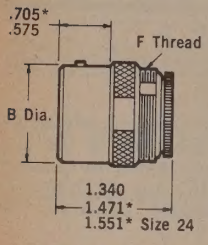
Single Hole Mounting Receptacle

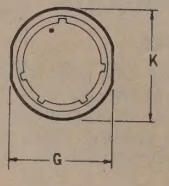


Panel Cutout .125 Max. Panel Thickness

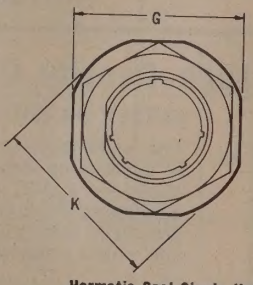


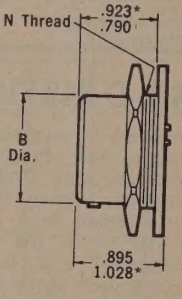
Panel Cutout .125 Max. Panel Thickness





Cable Receptable





Hermetic Seal Single Hole Mounting Receptacle

*Dimensions for 50% and 100% No-Scoop Design are the same, except 24 Size indicated by *

SHELL SIZE	8	10*	14	16	18	24-100%* No-Scoop
B Dia. Max.	.553	.678	.928	1.054	1.178	1.553
F Thread	½-28	⅝-28	⅞-28	1-28	1⅛-28	1½-28
G Max. Sq. Flange Receptacle	.820	.945	1.133	1.258	1.351	1.711
G Max. Cable Receptacle Flats	.565	.690	.940	1.066	1.190	1.565
G Max. Single Hole Mtg. Receptacle and Hermetic Seal "D" Hole Receptacle	.989	1.114	1.401	1.526	1.651	2.089
H ±.005	.594	.719	.906	.969	1.062	1.375
K Dia. Max. Cable Receptacle	.780	.900	1.150	1.280	1.400	1.775
K Dia. Max. Single Hole Mtg. Receptacle and Hermetic Seal Single Hole	1.072	1.197	1.510	1.635	1.745	2.165
K Dia. Max. Plug	.850	.975	1.225	1.350	1.475	1.900
K Dia. Hermetic Seal Solder Flange Receptacle	.945	1.070	1.320	1.446	1.570	*
L ±.005	.605	.730	.980	1.105	1.230	1.605
N Thread	⅝-20	¾-20	1-20	1⅛-20	1¼-20	1⅝-20
P Dia. ±.005	.635	.760	1.010	1.135	1.260	1.635
Q Max.	.710	.843	.710	.710	.740	*
R Dia. ±.005	.661	.786	1.036	1.162	1.286	*

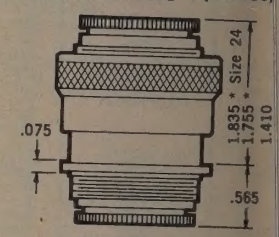
*Write factory for information.

Table of Contacts

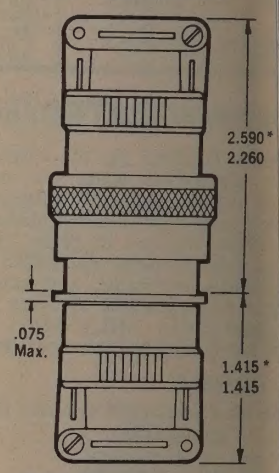
Contact Size	Wire Size	Amphenol Part Number Socket	Amphenol Part Number Pin	MS Part Number Socket	MS Part Number Pin
23-22 50% No-Scoop	#22, #24, #26	348-100-2201S-02	348-100-2202P-02	MS90460-23-22	MS90461-23-22
23-28 50% No-Scoop	#28, #30, #32	348-100-5000S-02	348-100-5000S-02	N/A	N/A
20-20 50% No-Scoop	#20, #22, #24	348-100-2000S-02	348-100-2000P-02	MS90460-20-20	MS90461-20-20
16-16 50% No-Scoop	#16, #18, #20	348-100-1600S-02	348-100-1600P-02	MS90460-16-16	MS90461-16-16
12-12 50% No-Scoop	#12, #14	348-100-1200S-02	348-100-1200P-02	N/A	N/A
23-22 100% No-Scoop	#22, #24, #26	348-100-2203S-02	348-100-2202P-02	MS3343-23-22	MS90461-23-22
20-20 100% No-Scoop	#20, #22, #24	348-100-2003S-02	348-100-2000P-02	MS3343-20-20	MS90461-20-20
16-16 100% No-Scoop	#16, #18, #20	348-100-1603S-02	348-100-1600P-02	MS3343-16-16	MS90461-16-16
12-12 100% No-Scoop	#12, #14	348-100-1203S-02	348-100-1200P-02	N/A	N/A

The last four lines have 100% No-Scoop Design.

Mated Connectors Dimensions (inches)



Mated Plug and Square Flange Receptacle



Mated Plug and Square Flange Receptacle with Cable Support

Grounding Fingers

Shell-to-shell grounding is estal lished by beryllium spring finger permanently fixed to the 50% No-Scoop receptacle shell and th 100% No-Scoop plug shell. Thes spring fingers, spaced 16 to th inch (Exception: Keyways in 50% No-Scoop), cause contact to b maintained during mating an unmating .090 inch before an after engagement.

Hardware Availability: Straight cable clamps dummy receptacles, caps and chains are available for all shell sizes both 50% and 100% no-scoop.

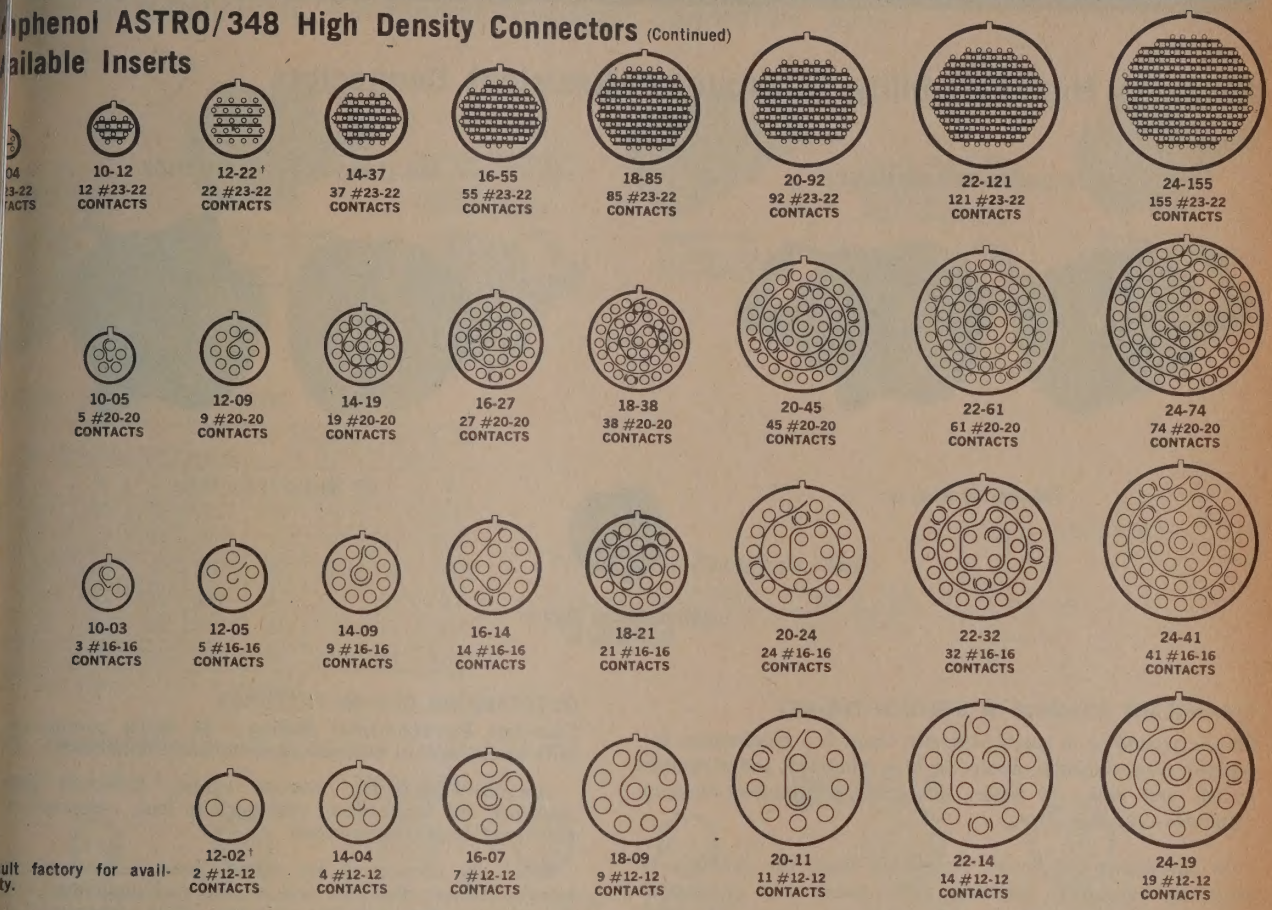
Tools for contact crimping, insertion and removal available.

HIGH DENSITY CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

phenol ASTRO/348 High Density Connectors (Continued)

ailable Inserts



onsult factory for availbility.

igh density points the way to the standard connector family for the next decade.

own are the high density insert arrangements now tooled for IL-C-81511 Astro/348 connectors. This picture of availability ustrates the growth of Amphenol's new standard connector family. Comparisons are invited against other Military Standard connector lines through all contact sizes for engineering design, density of contacts, and post per circuit.

ow to order:

STRO/348 CONNECTORS

get the specific Astro/348 connector you want, put together the part num- r as per the following example.

348 - 2 0 E 18 - 85 S 1 (200)

SERIES DESIGNATION

TYPE
2-MIL-C-81511 — 50% No-Scoop
3-MIL-C-81511 — 100% No-Scoop

SHELL STYLE
0—Square Flange Receptacle
1—Cable Receptacle
3—Single Hole Mtg. Receptacle
5—Solder Flange Receptacle (Hermetic only)
6—Straight Plug

CLASS
E—Environmental
H—Hermetic
P—Potted

SHELL SIZE
08 10 14 16 18 20 22 24*
*Shell size available only in 100% No-Scoop Design.

DEVIATIONS
Omit if no cable clamp is desired.
(200)—Connector with cable clamp.
(201)—Connector less contacts.

ALTERNATE SHELL POSITIONS

1 NORMAL	4
2	5
3	6

CONTACT STYLE
P—Pin S—Socket

INSERT ARRANGEMENT
03 04 05 07 09 11 12 14
19 21 24 27 32 37 38 41
45 55 61 74 85 92 121 155

MILITARY STANDARD PART NUMBERS

MIL-C-81511 connectors can be ordered by military numbers also. The part connector number is put together as per the following example.

M81511 / 01 E 18 - 85 P 1

SPECIFICATION NUMBER

SHELL TYPE
/01 Square Flange Receptacle — 50% No-Scoop
/02 Solder Flange Receptacle, Hermetic — 50% No-Scoop
/03 Single Hole Mtg. Receptacle — 50% No-Scoop
/04 Single Hole Mtg. Receptacle, Hermetic — 50% No-Scoop
/05 Cable Receptacle — 50% No-Scoop
/06 Straight Plug — 50% No-Scoop
/21 Square Flange Receptacle — 100% No-Scoop
/22 Solder Flange Receptacle, Hermetic — 100% No-Scoop
/23 Single Hole Mtg. Receptacle — 100% No-Scoop
/24 Single Hole Mtg. Receptacle, Hermetic — 100% No-Scoop
/25 Cable Receptacle — 100% No-Scoop
/26 Straight Plug — 100% No-Scoop

KEY POSITIONS
1, 2, 3, 4, 5, 6

CONTACT
P—Pin S—Socket

INSERT ARRANGEMENT
03 04 05 07 09 11
12 14 19 21 24 27
32 37 38 41 45 55
61 74 85 92 121 155

SHELL SIZE
08 10 14 16
18 20 22 24*
*Shell size 24 available only in 100% No-Scoop Design.

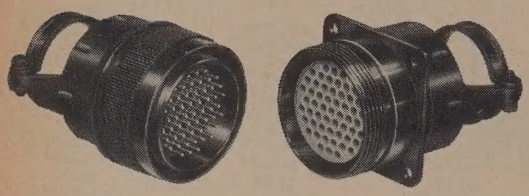
CLASS
P—Potted
E—Environmental
H—Hermetic

MINIATURE CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATIO

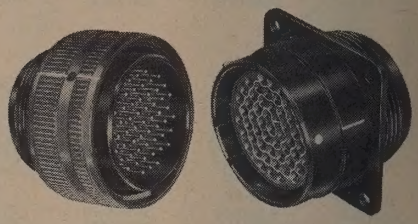
48 Series High-Reliability, Environment-Resistant Connectors

MIL-C-26500 PERFORMANCE



48 Series Regular

MIL-C-38300 PERFORMANCE



48 Series Ultra-Mate

Hermetically Sealed Receptacle

SIGNIFICANT ADVANCE IN STATE-OF-THE-ART

On the ground or in space, wherever there is a requirement for superior environmental protection, high reliability, and minimum weight and bulk, 48 Series miniature environment-resistant connectors are the answer.

In developing this series, Amphenol faced the problem of satisfying reliability, logistics, and present and anticipated environmental requirements for connector usage. To solve the problem, Amphenol had to generate advanced design concepts, formulate materials specifically for connector usage, and work out new production techniques. The resulting connectors exceed the stringent requirements of MIL-C-26500 (USAF) and MIL-C-38300 (USAF) for performance and reliability.

FULL PERFORMANCE IN EXTREME ENVIRONMENTS

Advance materials technology and complete environmental sealing enable these remarkable connectors to:

- Operate continuously at 200°C (392°F)
- Withstand thermal shock cycling from −55°C (−67°F) to 260°C (500°F)
- Support 1500V RMS from sea level to 350,000 ft., mated
- Maintain environmental and electrical integrity during and after 0 to 2000 CPS vibration during exposure to 200°C (392°F) and −55°C (−67°F)
- Withstand physical shock of 100 gravity units
- Resist corrosion, ozone, sand and dust

ULTRA-MATE CLOSED ENTRY AND FRONT SERVICING

Ultra-Mate connectors are identical to the other connectors in the 48 Series, but the socket inserts have a hard face of glass-filled epoxy. They are the first to combine the positive reliability of closed entry with the speed and convenience of front servicing. In addition, the MIL-C-26636 contacts are tamper proof. Wrong-size contacts or oversize test prods cannot be inserted in the hard dielectric contact entryways on the socket inserts.

OUTSTANDING DESIGN FEATURES

Complete Environmental Sealing — 48 Series connectors a fully sealed against extreme environmental conditions.

Amphenol-developed, silicone rubber dielectric provid resilience and unsurpassed resistance to tear, compression s fluids and high temperatures.

When the connectors are mated, insert faces compress form a resilient dielectric seal around each individual contac A continuous barrier on the periphery of the socket insert mat with a recess around the pin insert to form an additional con pression seal. A dynamic "O" ring seal between mated shel constitutes still another barrier to dirt and moisture, and pr tects the integrity of the face seals. Together with monobloc construction, this puts void-free, continuous dielectric aroun each contact through the entire connector length.

Monoblock construction, with bonded interfaces between th dielectric components (insert, anti-deflection disc, and grommet eliminates air voids and protects connectors from degradin moisture and altitude conditions. A pressurizing seal aroun each contact at the major O.D. prevents the passage of air o moisture through the contact hole, and triple sealing riser de sign at each wire hole in the grommet seals each individual wire

Go/No-Go Reliability — When an Ultra-Mate connector i mated, you can be sure there is proper contact. The socke contacts are closely surrounded by hard dielectric with a chamfered entry to guide in the pins accurately. However if the pins are bent, the hard dielectric presents a closed entry and prevents mating.

Light Weight and High Contact Density — Connector shells are impact-extruded aluminum forgings with a high strength-to-weight ratio. The insert arrangement is designed for the maximum number of contacts within the area available.

Poke-Home Contacts — Poke-home contacts (from release, rear insertable) provide for easy servicing of connector circuits without disassembling the connector from its mounting, or disturbing adjacent contacts. MIL-C-26636 contacts are crimped quickly, consistently, and reliably with either hand or power tools. They have high electrical conductivity, present a smooth configuration, and completely protect electrical contact pressure-members from environmental and handling damage. The contacts come in sizes 20, 16, 12 and shielded, with rhodium-over-silver plating. (Other platings such as gold are available; write factory for details.)

MINIATURE CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

48 Series High-Reliability, Environment-Resistant Connectors (Continued)

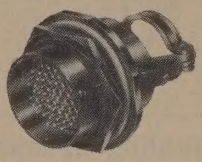
Shell Types

Threaded Plug
48-16RXX-XXX
MS24266RXXTXXX

Threaded Square Flange Receptacle
48-00RXX-XXX
MS24264RXXTXXX

Threaded Single Hole Mounting Receptacle
48-03RXX-XXX
MS24265RXXTXXX

Bayonet Plug
48-16RXX-XXX
MS24266RXXBXXX



Bayonet Single Hole Mounting Receptacle
48-13RXX-XXX
MS24265RXXBXXX

Bayonet Square Flange Receptacle
4810RXX-XXX
MS24264RXXBXXX

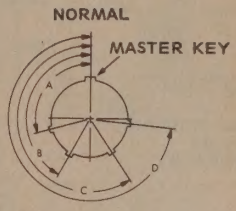
Alternate Shell Positions

	For Connectors Size 8 and 10				For Connectors Size 12, 14, 16, 18, 20, 22, and 24			
Position	A	B	C	D	A	B	C	D
Normal	105°	140°	215°	265°	105°	140°	215°	265°
	102°	132°	248°	320°	18°	149°	192°	259°
	80°	118°	230°	312°	92°	152°	222°	342°
	64°	155°	234°	304°	24°	135°	199°	240°
	35°	140°	205°	275°	84°	152°	204°	334°
	25°	115°	220°	270°	98°	152°	268°	338°

*Position 10 not available in size 8 connector.

Front Face of Receptacle Shown

Note: Alternate positions 6 through 10 incorporate special shell polarizing key and keyways. All inserts remain in the normal position.



Inserts Available (Showing front face of socket insert)

SHELL SIZE — 8

2 #20 contacts
Insert 8-2*

3 #20 contacts
Insert 8-3

SHELL SIZE — 10
MS-24260

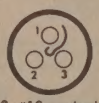
5 #20 contacts
Insert 10-5‡

2 #20 contacts
Insert 10-2*

2 #16 contacts
Insert 10-20*

SHELL SIZE — 12
MS-24260

12 #20 contacts
Insert 12-12‡



3 #16 contacts
Insert 12-3

SHELL SIZE — 14
MS-24260

15 #20 contacts
Insert 14-15‡

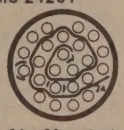
9 #20 contacts
3 #16 contacts
Insert 14-12*

7 #16 contacts
Insert 14-7‡

4 #12 contacts
Insert 14-4†

2 #16 contacts
1 #2 shielded contact
Insert 14-3

SHELL SIZE — 16
MS-24261



24 #20 contacts
Insert 16-24‡

10 #16 contacts
Insert 16-10*

SHELL SIZE — 18
MS-24262

37 #20 contacts
Insert 18-31‡

14 #16 contacts
Insert 18-14

10 #16 contacts
1 #2 shielded contact
Insert 18-11

8 #12 contacts
Insert 18-8†

SHELL SIZE — 20

41 #20 contacts
Insert 20-41‡*

37 #20 contacts
2 #16 contacts
Insert 20-39*

24 #20 contacts
4 #12 contacts
Insert 20-28*†

19 #20 contacts
6 #12 contacts
Insert 20-25*†

16 #16 contacts
Insert 20-16*

SHELL SIZE — 22
MS-24263

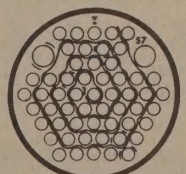
#20 contacts
Insert 22-55‡

26 #20 contacts
6 #12 contacts
Insert 22-32*†

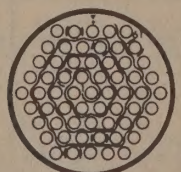
19 #16 contacts
Insert 22-19‡

12 #12 contacts
Insert 22-12†

SHELL SIZE — 24



2 #12 contacts
55 #20 contacts
Insert 24-57*†



61- #20 contacts
Insert 24-61‡*

23 #20 contacts
20 #16 contacts
Insert 24-43*

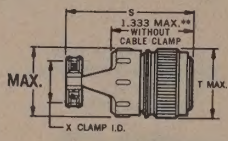
‡ Available with hard-dielectric face socket inserts for Ultra-Mate (MIL-C-38300) connectors. Pin inserts for MIL-C-38300 connectors have a resilient face and, except for marking, are identical to MIL-C-26500 pin inserts.
† Not included MS-2426X at time of printing.
* 1 shielded contact is interchangeable with #12 power contact

MINIATURE CIRCULAR CONNECTORS

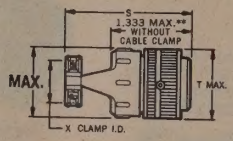
AMPHENOL
THE BUNKER-RAMO CORPORATION

48 Series High-Reliability, Environment-Resistant Connectors (Continued)

Plugs



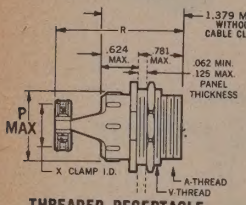
THREADED PLUG
48-06RXX-XXX
MS24266RXXT-XXX



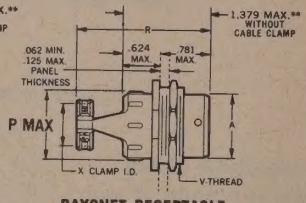
BAYONET PLUG
48-16RXX-XXX
MS24266RXXB-XXX

Shell Size	P Max.*	T Max.* Thrd.	T Max.* Bay.	X ±.015	Max.
8	.582	.708	.766	.180	332
10	.731	.836	.906	.270	332
12	.919	1.025	1.078	.400	332
14	.981	1.125	1.141	.460	267
16	1.106	1.250	1.266	.610	267
18	1.231	1.375	1.375	.690	267
20	1.356	1.510	1.510	.830	267
22	1.481	1.625	1.625	.940	267
24	1.606	1.760	1.760	1.040	267

Single Hole Mounting Receptacles

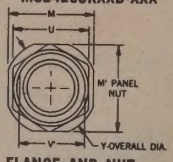


THREADED RECEPTACLE
48-03RXX-XXX
MS24265RXXT-XXX



BAYONET RECEPTACLE
48-13RXX-XXX
MS24265RXXB-XXX

PANEL CUT-OUT



FLANGE AND NUT

BOTH THREADED AND BAYONET RECEPTACLES

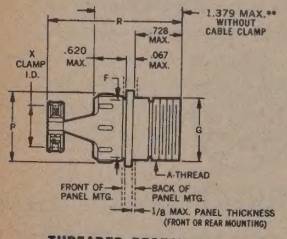
Shell Size	A Thrd.	A +.000 −.005	M Max.	M' Max.	P Max.*	U Max.	V Thrd.	V' ±.003	V'' ±.005	X ±.015	Y Max.	Z ±.005	R Max.
8	9/16-24	.536	.984	.938	.582	.828	5/8-20	.593	.605	.180	1.068	.635	1.890
10	11/16-24	.659	1.109	1.082	.731	.953	3/4-20	.718	.730	.270	1.192	.760	1.890
12	7/8-20	.829	1.296	1.299	.919	1.140	15/16-20	.905	.917	.400	1.380	.947	1.890
14	15/16-20	.898	1.396	1.371	.981	1.250	1-20	.968	.980	.460	1.505	1.010	2.125
16	1 1/16-18	1.025	1.521	1.515	1.106	1.329	1 1/8-20	1.093	1.105	.610	1.630	1.135	2.125
18	1 3/16-18	1.131	1.646	1.660	1.231	1.455	1 1/4-20	1.217	1.225	.690	1.740	1.260	2.125
20	1 5/16-18	1.256	1.771	1.770	1.356	1.642	1 3/8-18	1.342	1.350	.830	1.860	1.385	2.125
22	1 7/16-18	1.381	1.959	1.948	1.481	1.705	1 1/2-20	1.467	1.475	.940	2.040	1.510	2.125
24	1 9/16-18	1.506	2.084	2.084	1.606	1.892	1 5/8-18	1.592	1.600	1.040	2.160	1.635	2.125

**Add .042 for Ultra-Mate connectors with socket inserts.

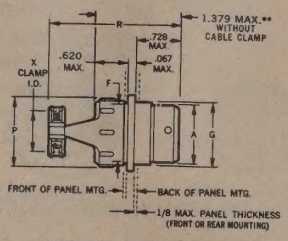
Recommended Minimum Torque for Jam Nut

Shell Size	8	10	12	14	16	18	20	22	24
Torque (Inch/Lbs.)	33	36	60	65	73	82	106	123	13[illegible]

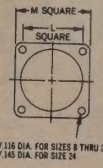
Square Flange Receptacles



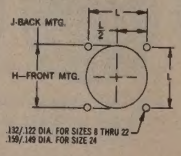
THREADED RECEPTACLE
48-00RXX-XXX
MS24264RXXT-XXX



BAYONET RECEPTACLE
48-10RXX-XXX
MS24264RXXB-XXX



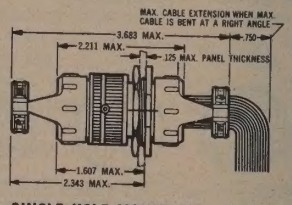
PANEL CUT-OUT DIMENSIONS FOR BOTH THREADED AND BAYONET RECEPTACLES



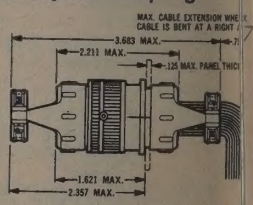
Shell Size	A. Thrd.	A +.000 −.005	F Max.	G Max.	H Min.	J Min.	L ±.005	M ±.005	P Max.	X ±.015	R Max.
8	9/16-24	.536	.437	.561	.447	.620	.594	.812	.582	.180	1.890
10	11/16-24	.659	.562	.696	.572	.748	.719	.937	.731	.270	1.890
12	7/8-20	.829	.750	.875	.760	.913	.812	1.031	.919	.400	1.890
14	15/16-20	.898	.812	.935	.822	.980	.906	1.125	.981	.460	2.125
16	1 1/16-18	1.025	.938	1.062	.948	1.107	.969	1.250	1.106	.610	2.125
18	1 3/16-18	1.131	1.062	1.187	1.072	1.209	1.062	1.343	1.231	.690	2.125
20	1 5/16-18	1.256	1.182	1.312	1.192	1.337	1.156	1.437	1.356	.830	2.125
22	1 7/16-18	1.381	1.312	1.437	1.322	1.452	1.250	1.562	1.481	.940	2.125
24	1 9/16-18	1.506	1.432	1.562	1.442	1.577	1.375	1.703	1.606	1.040	2.125

**Add .042 for Ultra-Mate connectors with socket inserts.

Mated Pairs Threaded or Bayonet Coupling



SINGLE HOLE MOUNTING RECEPTACLE AND STRAIGHT PLUG

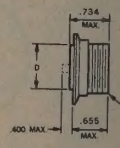


SQUARE FLANGE RECEPTACLE AND STRAIGHT PLUG

Solder Flange Hermetic Receptacles

Threaded

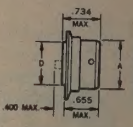
PANEL CUTOUT
Both threaded and bayonet receptacles



48-05HXX-XXP(1
MS27034HXXT-X
48-05HXX-XXP
MS27034YXXT-X

Bayonet

FLANGE
Both threaded and bayonet receptacles



48-15HXX-XXP(10
MS27034H-XXB-X
48-15HXX-XXP
MS27034Y-XXB-X

Shell Size	A+.000 −.005	A Thrd.	B Max.	D Max.	+.010 −.000 E
10	.659	11/16-24	.860	.557	.567
12	.829	7/8-20	1.065	.745	.755
14	.898	15/16-20	1.110	.807	.817
16	1.025	1 1/16-18	1.230	.933	.942
18	1.131	1 3/16-18	1.360	1.057	1.067
22	1.381	1 7/16-18	1.610	1.307	1.317

Write factory for information on sizes 8, 20 and 24.

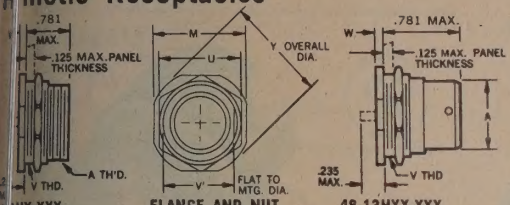
See YELLOW SECTION for Local Offices, Phones

MINIATURE CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

4 Series High-Reliability, Environment-Resistant Connectors (Continued)

Single Hole Mounting Hermetic Receptacles



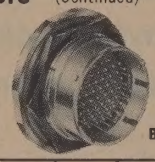
48-XXX-XXX
*M24265HXXT-XXX

FLANGE AND NUT BOTH THREADED AND BAYONET RECEPTACLES

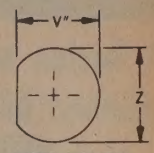
48-13HXX-XXX
*M24265HXXB-XXX

*Specify whether solder pocket or eyelet contact tail is desired.
Write factory for information on sizes 20 and 24.

THREADED



BAYONET



PANEL CUT-OUT

Shell Size	A +.000 −.005	A Thrd.	Y Max.	M Max.	U Max.	V Thrd.	V' ±.003	V'' ±.005	W Max.	Z ±.005
10	.659	11/16-24	1.192	1.109	.953	3/4-20	.718	.730	.137	.760
12	.829	7/8-20	1.380	1.296	1.140	15/16-20	.905	.917	.137	.947
14	.898	15/16-20	1.505	1.396	1.250	1-20	.968	.980	.137	1.010
16	1.025	1 1/16-18	1.630	1.521	1.329	1 1/8-20	1.093	1.105	.137	1.135
18	1.131	1 3/16-18	1.740	1.646	1.455	1 1/4-20	1.217	1.225	.137	1.260
22	1.381	1 7/16-18	2.040	1.959	1.705	1 1/2-20	1.467	1.475	.168	1.510

How to Order:

Amphenol Numbers

To get the specific 48 Series connector you want, put together the part number as per the following typical example.

48 – 0 6 R 22 – 55 P 6 – (102)

SERIES DESIGNATION
48 –

COUPLING TYPE
0—Threaded
1—Bayonet

SHELL STYLE
0—Square Flange Receptacle
3—Single Hole Mounting Receptacle ¶
5—Solder Flange Mounting Receptacle (Hermetic only) ¶
6—Straight Plug

ENVIRONMENTAL CLASS
R—Meets MIL-C-26500 (USAF)
C—Meets MIL-C-38300 (USAF) (Socket only)
H—Hermetically Sealed ¶
G—Grounding
F—Fluid Resistant

SHELL SIZE
8, 10, 12, 14, 16, 18, 20, 22, 24

NUMBER OF CONTACTS
2, 3, 4, 5, 7, 8, 10, 11, 12, 14, 15, 16, 19, 24, 25, 28, 31, 32, 39, 41, 43, 55, 57, or 61

CONTACT STYLE
P—Pin
S—Socket

Alternate Shell Positions
N, 6, 7, 8, 9, 10 as per table on page

DEVIATIONS
(100) Connector for Potting
(102) Connector Less Cable Support
(105) Connector Less Contacts
(106) Connector Less Contacts and Less Cable Support
(108) Hermetic Receptacle with Solder Cup Contact
(135) Gold Iridite Finish on Shell — 48-XXGXX-XX(135)
*(145) MIL-C-38300 Resilient Insert "P" contact only

See Table of available inserts
Hermetics are available in receptacle shell style "X3" (MS24265) and "X5" (MS27034).
The 48 Series part numbers for Ultra-Mate connectors (MIL-C-38300) are 48-XXCXX-XXSX and 48-XXRXX-XXPX(145). MIL-C-38300 connectors are furnished without cable clamp. If a cable support is desired, it must be ordered separately.

Military Standard Part Numbers

You can use MS as well as Amphenol part numbers in ordering 48 Series connectors. The MS part numbers for MIL-C-26500 connectors are worked out on the basis shown in the table below. Whether you order by the MS or the 48 Series number, all qualified connectors are shipped with the MS marking.

The part numbers for MIL-C-38300 connectors start off with the identification M38300/ and take the form M38300/XXXX-XX. To determine the specific M numbers, refer to military specification MIL-C-38300.

MS24266 R 22 T 55 P 6 X

MS SHELL DRAWING
MS24264—Square Flange Receptacle
MS24265—Single Hole Mounting Receptacle ¶
MS24266—Straight Plug
MS27034—Solder Flange Mounting Receptacle (Hermetic only)

ENVIRONMENTAL CLASS
R—Meets MIL-C-26500 (USAF)
†G—Grounding
H—Hermetically Sealed ¶ Solder Pocket Contacts
Y—Hermetically Sealed ¶ Flattened and Sealed Contacts

SHELL SIZE
8, 10, 12, 14, 16, 18, 20, 22, or 24

COUPLING TYPE
T—Threaded
B—Bayonet

NUMBER OF CONTACTS
2, 3, 4, 5, 7, 8, 10, 11, 12, 14, 15, 16, 19, 24, 25, 28, 31, 32, 39, 41, 43, 55, 57, or 61

CONTACT STYLE
P—Pin
S—Socket

Alternate Shell Positions
N, 6, 7, 8, 9, 10

CABLE SUPPORT
X—Less cable support (Omit if cable support is desired)

Part numbers, both Amphenol and Military Standard, for the contacts and assembly tools are listed below.
¶Hermetics are available in receptacle shell style (MS24265) and (MS27034).
†Contact nearest Amphenol sales office for availability.

Poke-Home Contacts and Tool Applications

CONTACTS — When you order 48 Series connectors with contacts, the contact package contains enough contacts to complete the insert arrangement and have at least 2 spares left. The package also includes enough sealing plugs for at least 15% of the contacts in the insert, in any case a minimum of 3 sealing plugs. To provide proper sealing, insert unwired contacts and sealing plugs in all unused holes. (Use a #12 contact for a #1 shielded hole.) To order contacts and sealing plugs separately use the part numbers in the table below. Contacts may also be ordered in reels for use with automatic crimping tools.

TOOLS — Note that various tools are available for crimping, inserting, and removing each size contact.

Contact Size	Wire Size AWG	Max. Current Rating Amps.	AMPHENOL Part No. Pin	AMPHENOL Part No. Socket	MS Part No. Pin	MS Part No. Socket	Crimping Tool	Bushing (Positioner)	Crimp Jaw Setting Dia. (Insp.)	Insertion Tool	Removal Tool: Standard Connector	Removal Tool: Ultra-Mate Connector
No. 20	24 22 20	3.0 5.0 7.5	48-1595-02	48-100-2000S-02 OR 248-136-2001S-02	MS24254-20P	MS24255-20S	294-126 294-186 294-243 294-293 294-358 294-506	Included 294-1266 Turret Hd. Turret Hd. 294-444 Automatic	.031-.041 .031-.041 .031-.041	294-88 (MS24256A20) or 294-213	294-89 (MS24256R20)	294-203, (MS24256RH20)
No. 16	18 16	16 22	48-1825-02	48-100-1600S-02 OR 248-136-1600S-02	MS24254-16P	MS24255-16S	294-126 294-243 294-293 294-358 294-506	Included Turret Hd. Turret Hd. 294-901 Automatic	.041-.053 .041-.053	294-96 (MS24256A16)	294-97 (MS24256R16)	294-180, (MS24256RH16)
No. 12	14 12	32 41	48-1827-02	48-1215-02	MS24254-12P	MS24255-12S	294-86 294-126 294-243 294-293 294-358 294-506	294-903 Included Turret Hd. Turret Hd. 294-903 Automatic	.0625 .062-.072 .062-.072	294-72 (MS24256A12)	294-73 (MS24256R12)	294-183, (MS24256RH12)

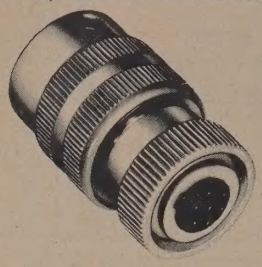
CONTACT FACTORY FOR INFORMATION AND SPECIFICATIONS ON SHIELDED CONTACTS

STANDARD CIRCULAR CONNECTORS

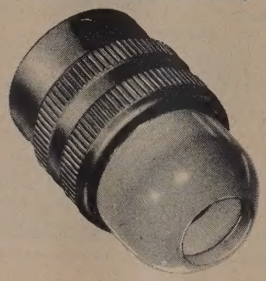
AMPHENOL™
THE BUNKER-RAMO CORPORATION

67 Series MinniE Environment Resistant Connectors

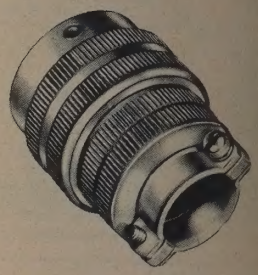
Miniature, Quick-Disconnect, Bayonet-Lock Connectors



E
With unitized grommet for individual use seal



P
Includes potting mold



C
Vise action with two screw strain relief

Environmentally Sealed

- Choice of unitized back end grommet or provision for potting. Both exceed moisture resistance requirements of MIL-C-0515.
- Face seal gasket has individual barriers to isolate each contact.
- No derating for altitude is required up to 70,000 feet if the sealed connectors are mated.
- Sealed connectors take 1500 V RMS at 70,000 feet.
- Vibration resistance per Method 204, MIL-STD-202A is 10 to 2,000 cps at 20 G's.
- Temperature cycling range per MIL-C-5015 is −67°F to
- +257°F.

Lightweight and Convenient

- Flattened incline angle of bayonet slots makes mating easier.
- Clamp and grommet combine to form a unitized seal for ease of assembly and maintenance.
- Connectors convert easily from E style to P style and vice versa.
- Yellow ring on receptacle shell gives visual indication of connector engagement.
- Weight is about half that of standard connectors with same number of contacts.
- Seventeen different insert configurations are available.
- Alternate insert positions are available.

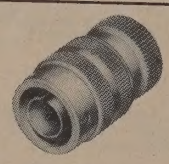
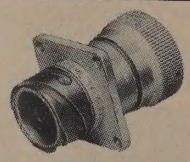
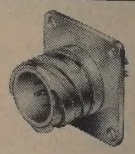
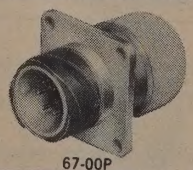
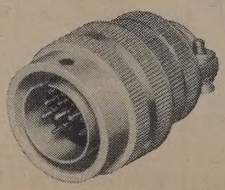
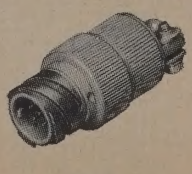
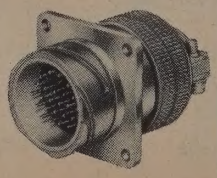
Efficient and Long-Lasting

- Spring-loaded coupling ring provides positive locking acti in bayonet slot and a constant compensating force to count act compression set of resilient face seal.
- Stainless steel bayonet slots and pins reduce wear and frictio Three-pin bayonet coupling minimizes rocking action of t mated plug and receptacle.
- Hooded female contacts resist test prod damage.
- Hard insert dielectric and resilient face seal on pin inse positively retain contacts so there is no possibility of the being pushed out of the insert.

Hermetically Sealed

Hermetically sealed 67 Series connectors are available in two shell styles — hex nut mounted receptacles. Each shell style is available in 11 different insert configurations with up to 48 contacts.

Wide Variety for Wide Range of Applications

	Plugs	Cable-to-Cable Receptacles	Wall Receptacles	Panel Mounting Receptacles	Round Flange Receptacles
With Grommet for Individual Wire Seal	 67-06E	67-01E	 67-00E	 67-02E	67-03E
With Form for Potting Seal	67-06P	67-01P	 67-00P		
With Standard Type Cable Clamp for Unjacketed Individual Wire Leads	 67-06C	 67-01C	 67-00C		

Hermetically Sealed

67-04H
Hermetically Sealed
Round Flange
Receptacle
Front Mount

67-04H(105)
Hermetically Sealed
Round Flange
Receptacle —
Stake-on Solder
Flange
Front Mount

See YELLOW SECTION for Local Offices, Phones

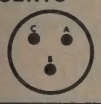
STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

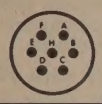
67 Series MinniE Environment Resistant Connectors (Continued)

Inserts Available (showing front face of pin insert)

SIZE 12 INSERTS

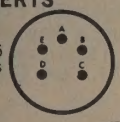


12-3 contacts

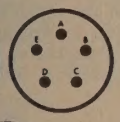


*12-7
7 #20 contacts

SIZE 14 INSERTS



*14-5
5 #20 contacts



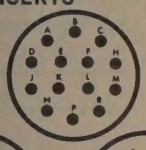
14-63
5 #16 contacts

*14-9
#20 contacts

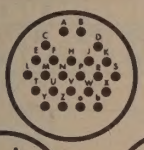
*16-61
8 #20 plus
1 shielded contact

*14-12**
12 #20 contacts

SIZE 18 INSERTS

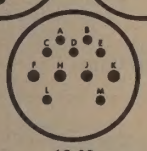


*18-64
14 #16 contacts

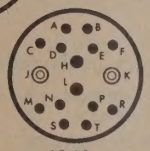


*18-24**
24 #20 contacts

*18-62
19 #20 plus
shielded contact

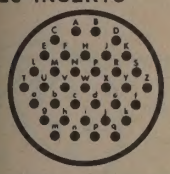


18-65
7 #20 and
4 #16 contacts



18-16
2 shielded contacts
2 #16 contacts
12 #20 contacts

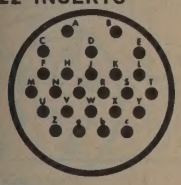
SIZE 20 INSERTS



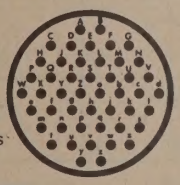
*37**
#20
contacts

20-66
19 #16
contacts

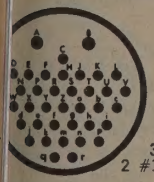
SIZE 22 INSERTS



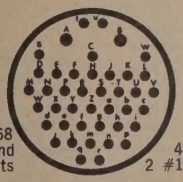
67
#16
contacts



*22-48
48 #20
contacts



22-68
36 #20 and
2 #16 contacts

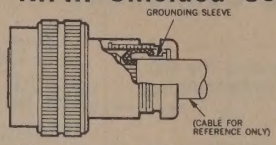


22-69
40 #20 and
2 #16 contacts

Available in hermetically sealed receptacles.
Also available with Poke-Home contact insert.
Current rating—#20 contact: 7.5 amps, #16 contact: 12 amps.
Shielded contact: 7.5 amps.

All inserts listed here are available for all shell styles and classes except hermetics. Inserts available in hermetically sealed receptacles are indicated by an asterisk. (The first two digits of the insert number show the shell size; the 3rd and 4th digits are a code for the insert configuration.)

R.F.I. Shielded Connectors



Special internal hardware enables these 67-06J style connectors to have the braid of a shielded cable terminated within the connector backshell. Alodine plated per Amphenol Specification 617 Type "C", the shell has a conductive finish and acts as a continuation of the cable braid.

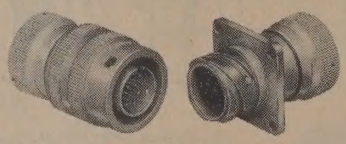
The following R.F.I. Shielded connectors are now in production:

67-5009 Size 18 shell with 24 #20 pin contacts
67-5011 Size 20 shell with 37 #20 pin contacts

These two connectors are also available with crimp Poke-Home contacts in the same insert configurations.

The mating receptacles are standard except for the Alodine finish. This can be obtained by ordering deviation (113). For other 67 Series connectors with R.F.I. shielding, consult factory.

67-906 and 67-907 Poke-Home MinniE Connectors



Removable Poke-Home crimp contacts are available in the 67-906 receptacle and 67-907 plug. They use standard 67 Series hardware (67-00E receptacle 67-06E plug, size 14) to take 12 #20 contacts and oversize contact pockets to accept larger diameter wire. The front insert is neoprene and the contact retention disc is nylon.

Poke-Home Contacts and Tools

Contact Size	Wire Size AWG	Max. Current Rating	AMPHENOL Part No. Pin	AMPHENOL Part No. Socket	Crimping Tool	Bushing (Positioner)	Crimp Jaw Setting	Insertion and Removal Tool
#20	24 22 20	3.0 5.0 7.5	67-1890	67-1772	294-358 294-1166	294-1035 294-1081	.033-.041 .031-.041	294-152
#20	24 22 20	3.0 5.0 7.5	18-313	175-257	294-358 294-1166	294-1035 294-1081	.033-.041 .031-.041	294-193

*Bushing is supplied as part of crimp tool.

How to Order:

To get the 67 Series connector you want, put together the part number as per the example in the following chart.

67 06 E 12-7 P W (100)

SERIES DESIGNATION 67 —

SHELL STYLE
- 00—Wall Mounting Receptacle
- 01—Cable Mounting Receptacle
- 02—4-Hole Mount Panel Receptacle
- 03—1-Hole Rear Panel Mount Round Flange Receptacle
- 04—Hermetically Seal Round Flange Receptacle
- 06—Cable Plug — Straight

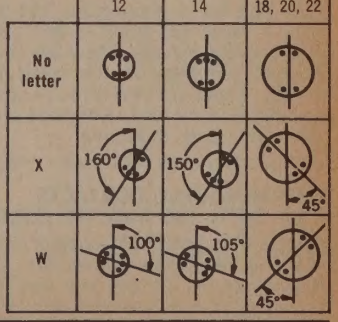
CONSTRUCTION
- E—Environmentally sealed (Unitized grommet)
- P—Environmentally sealed (Disposable Polyethylene Potting Form Furnished)
- J—Sealed Clamp for Jacketed Cable (Waterproof)
- C—Mechanical Clamp (Sealed only when potted)
- H—Hermetically Sealed (Available only on 04 Shell Style)

INSERTS AVAILABLE

TYPE OF CONTACTS
P—Pin S—Socket

DEVIATIONS
- (100)—.0001 Gold plate over silver on contacts.
- (104)—100% filled solder pockets with 60/40 solder.
- (105)—67-04H receptacle except, modified for staking and soldering on to panel.
- (106)—Tinned solder pockets.
- (108)—.0001 gold over .0001 copper, pre-filled solder pockets, 617 type "C" connector finish (conductive).
- (112)—EIA date code.
- (113)—All aluminum parts have 617 type "C" finish (conductive).

ALTERNATE INSERT POSITIONS



STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATIO

165 Series Miniature MS-Type Connectors

COMPACT AND CONVENIENT

Connectors in the 165 Series are only about one-third the size and weight of standard MS connectors with the same number of contacts.

Bayonet coupling provides quick disconnect.

WIDELY APPLICABLE

Eight different insert configurations and five different shell styles in two sizes — large and small — provide enough variations for a wide range of applications.

Plugs and cable receptacles are available with either a buil n cable clamp to provide positive strain relief or with provision r potting. On all connectors, alternate insert positions are av.- able for gang mounting.

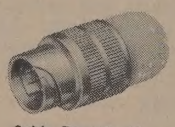
WEATHERPROOF AND PRESSURE PROOF

When mated, 165 Series connectors are pressure proof and co- pletely waterproof. The connectors using female inserts feat a sandwich construction with the insert spun into a cartridge; t connectors are factory sealed to prevent leakage. O-ring se are used in both plugs and receptacles. They meet the exacti pressure seal requirements of MIL-C-5015, Class C constructi

Cable Receptacle for Jacketed Cable

Plug for Jacketed Cable

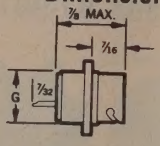
Plug for Potting

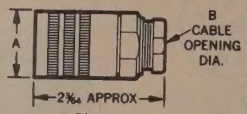


Cable Receptacle for Potting

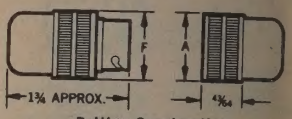
Square Flange Receptacle

Dimensions (Inches)

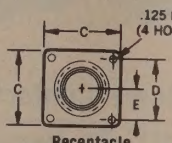




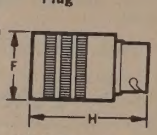
Plug



Potting Constructions



Receptacle



Cable Receptacle

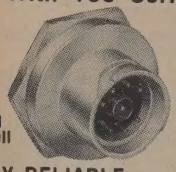
	A	B	C	D	E	F	G	H
Small	57/64	3/8	1 1/16	25/32	25/64	7/8	13/16	1 59
Large	1 9/64	21/32	1 5/16	31/32	31/64	1 1/8	1 1/16	1 1/5

Connectors with Shielded Contact and Ground Shield

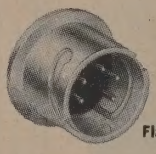
- Important in aircraft and instrumentation applications, for example, fuel gaging.
- Shield continuity was recently upgraded by additon of heat treated beryllium copper finger pressure members to the socket shield.
- Available in a number of shell styles, including potting construction plug and cable receptacle, plugs with spring-loaded coupling ring, and square flange receptacle.
- Available also in combination of environmentally sealed and cable clamp construction.
- Two different insert configurations
  Eight #20 contacts, 1 shielded contact
  Nineteen #20 contacts, 1 shielded contact

182 Series Hermetic Miniature MS-Type Connectors

Mate With 165 Series



Type 2 Threaded Back Shell



Type 1 Solder Flange Shell

HIGHLY RELIABLE

The 182 Series features a rugged compression seal which is extremely strong and highly resistant to thermal shock; it also has very high insulation resistance. To assure strictest adherence to requirements, 182 Series receptacles are tested by mass spectrometer at the maximum sensitivity of the instrument.

WIDELY APPLICABLE

Like 165 Series connectors, 182 Series receptacles come in two sizes — large and small — and are available in most 165 Series insert configurations. There are two shell styles — Type I, Solder Flange, and Type II, Threaded Back Shell, with and without O ring. There are two types of contacts available: solder pocket, and flat and pierced. Alternate insert positions (shown at right) allow for gang mounting.

THERMOCOUPLE CONTACTS (FOR BOTH 165 AND 182 SERIES)

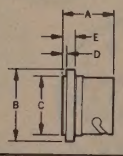
Special Thermocouple contact inserts are available for use in 165 and 182 Series connectors. Consult your Amphenol Sales Representative for any you may require.

Alternate Insert Positions

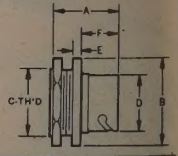
Applicable to both 165 and 182 Series

	Normal	Position X	Position W
Small			
Large			

Dimensions (Inches)



Type 1



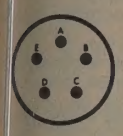
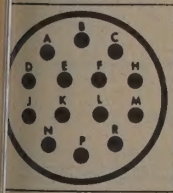
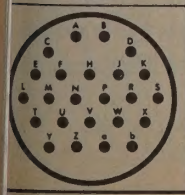
Type 2

Type I	A ±.006	B ±.006	C ±.003	D ±.002	E ±.006	F —
Small	.641	.841	.685	.042	.109	—
Large	.641	1.082	.926	.042	.204	—
Type II	**±.009**	**±.006**	**C-Thrd.**	**±.006**	**±.006**	**±.006**
Small 182-1	.791	1.064	13/16-28	.688	.127	.439
182-1-1001	.791	1.064	13/16-28	.688	.127	.439
182-1-1008	.791	1.064	13/16-28	.688	.127	.439
182-15-1002	.791	1.064	13/16-28	.688	.127	.439
All Others	.783	.877	3/4-20	.688	.074	.534
Large	.822	1.439	1 1/16-18	.925	.127	.439

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

16 and 182 Series Availability and Ordering Information (Showing front face of pin insert)

	INSERT ARRANGEMENTS (Approx. 3/5 actual size)	Insert Style	Plug	Receptacle Sq. Flange	Cable Receptacle	Hermetic Seal Receptacles: Type 1—Solder Flange Shell: Flat & Pierced Contacts	Hermetic Seal Receptacles: Type 1—Solder Flange Shell: Solder Pocket Contacts	Hermetic Seal Receptacles: Type 2—Threaded Back Shell: Flat & Pierced Contacts	Hermetic Seal Receptacles: Type 2—Threaded Back Shell: Solder Pocket Contacts	Potting Constructions: Plug	Potting Constructions: Cable Receptacles
	5 #20 contacts Current rating (Amperes) 7.5 Voltage rating (Volts RMS at sea level) 600	MALE	165-33	165-35	165-35-1002	182-35-1000	182-35-1001	182-35	182-35-1002	165-33-1000	165-35-1000
		FEMALE	165-34	165-36	165-36-1003	—	—	—	—	165-34-1000	165-36-1000
	9 #20 contacts Current rating (Amperes) 7.5 Voltage Rating (Volts RMS at sea level) 500	MALE	165-13	165-15	165-15-1002	182-15	182-15-1000	182-15-1001	182-15-1002*	165-13-1000	165-15-1000
		FEMALE	165-14	165-16	165-16-1003	—	—	—	—	165-14-1000	165-16-1000
	8 #20 contacts 1 Shielded Current rating (Amperes) 10 Voltage rating (Volts RMS at sea level) 500	MALE	165-82	165-73	165-73-1001	182-1-1007	182-1-1000	182-1-1008*	182-1-1001*	165-82-1000	165-73-1000
		FEMALE	165-61-1008	165-83	165-83-1001	—	—	—	—	165-61	165-83-1000
	12 #20 contacts Current rating (Amperes) 7.5 Voltage rating (Volts RMS at sea level) 500	MALE	165-9	165-11	165-11-1002	182-11-1001	182-11	182-11-1005	182-11-1002	165-9-1000	165-11-1000
		FEMALE	165-10	165-12	165-12-1002	—	—	—	—	165-10-1000	165-12-1000
	7 #20 contacts 4 #16 contacts Current rating (Amperes) no. 20 7.5 no. 16 17 Voltage rating (Volts RMS at sea level) 500	MALE	165-17	165-19	165-19-1002	—	—	—	—	165-17-1000	165-19-1000
		FEMALE	165-18	165-20	165-20-1003	—	—	—	—	165-18-1000	165-20-1000
	14 #16 contacts Current rating (Amperes) 17 Voltage rating (Volts RMS at sea level) 500	MALE	165-29	165-31	165-31-1003	182-31	182-31-1002	182-31-1003*	182-31-1001*	165-29-1000	165-31-1000
		FEMALE	165-30	165-32	165-32-1006	—	—	—	—	165-30-1000	165-32-1000
	19 #20 contacts 1 Shielded Current rating (Amperes) 10 Voltage rating (Volts RMS at sea level) 500	MALE	165-86	165-84	165-84-1001	182-2-1004	182-2-1000	182-2-1005*	182-2-1001*	165-86-1000	165-84-1000
		FEMALE	165-62-1007	165-85	165-85-1001	—	—	—	—	165-62	165-85-1000
	24 #20 contacts Current rating (Amperes) 7.5 Voltage rating (Volts RMS at sea level) 500	MALE	165-25	165-27	165-27-1005	182-27-1000	182-27-1006	182-27*	182-27-1005*	165-25-1000	165-27-1000
		FEMALE	165-26	165-28	165-28-1003	—	—	—	—	165-26-1000	165-28-1000

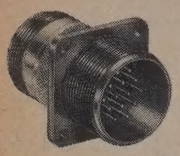
Supplied with "O" ring.

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATIO

MIL-C-5015 Connector Shell Types

Wall Mounting Receptacles

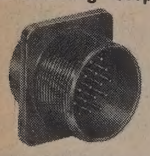


MS 3100 A
Solid Shell

Cable Receptacles

MS 3101 R
Environmental
Resistant

Box Mounting Receptacles



MS 3102 A
Solid Shell

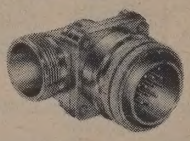
Straight Plugs

MS 3106 A
Solid Shell

Quick Disconnect Plugs

MS 3107 B
Split Shell

Angle Plugs



MS 3108 A
Solid Shell

246 Series Poke-Home Connectors

246-3400R
Wall
Receptacle

69 Series

69-OR(100)
Wall
Receptacle

NOMENCLATURE

The MS prefix (for example, MS3100) in a connector part n ber indicates an approved connector under the curent mili y specification, MIL-C-5015.

A 97 prefix indicates that the connector is an exclu e Amphenol design of A, B or C construction, probably a c nector with special purpose contacts and a variation from S requirements or one for which no MS part number has t been assigned.

A 246 or 69 prefix indicates an environment resistant c nector with crimp Poke-Home® contacts. These connect which are intermateable and interchangeable with standard S types, offer improved "R" performance over MIL-C-5 requirements.

Interchangeability of MS and AN Connectors. In accorda e with MIL-C-5015, "Connectors bearing an MS part num may replace an AN marked connector of any modificat marking if all other identifying symbols are identical." Howev if a contract requires use of connectors with the formerly proved AN marking, there are still available from Amphen.

FINISHES

The standard finish is cadmium plate with olive drab chrom conversion coating. This finish has excellent conductivity.

INSERTS

The dielectric material used in inserts for A, B, and C constru tions is diallyl phthalate. It has near perfect dimensional st bility, high arc resistance, and maintains high insulati resistance under both humidity and thermal stress.

Insert material in R construction connectors is MIL approv neoprene. This resilient insert material provides an environme tally sealed connector that exceeds MIL-C-5015 performanc

CONTACTS

Standard — MS contacts under MIL-C-5015 are silver plat and have pretinned solder pockets. Amphenol also offers optional a superior gold plating process for MS contacts.

How to Order:

EXAMPLE: To get a straight plug with 35 contacts in a size 28 shell with black anodized finish and contacts to accept taper pins order 97-3106A 28-15S(432) (608).

MS 3101 A 28-21 S Y (847) (639)

SERIES NUMBER
MS—Military Standard for A, B, C, E, & R construction
97 Like MS, but AMPHENOL exclusive design for A, B, & C construction
69 —For E & R construction

SHELL TYPE
3100—Wall Receptacle
3101—Cable Receptacle
3102—Box Receptacle
3106—Straight Plug
3107—Quick Disconnect Plug
3108—Angle Plug

SHELL CONSTRUCTION
A—Solid
B—Split
C—Pressurized
R—Environment resistant
E—Environment resistant
Omitted in ordering construction for potting.

INSERT NUMBER — Consists of

SHELL SIZE
8S, 10SL, 12S, 12, 14S, 14, 16S, 16, 18, 20, 22, 24, 28, 32, 36, 40, 44, 48
(Size is "A" thread in 16ths)

CONFIGURATIONS
Code numbers (from 1 up) for insert configurations.
Note: Code numbers are specific for each shell size. The same code number represents different configurations in different shell sizes.

SHELL FINISH
Omit for standard finish
(604)—Anodized with bichromate seal
(608)—Black anodized
(639)—Clear cadmium plate

DEVIATION FROM STANDARD
Omit this suffix if standard construction desired
(02) —High -temperature silicone compound } Insert Materials
(04) —High-temperature phoenolic (360°F) } Insert Materials
(23) —High-temperature silicone compound } Insert Materials
(115)—Small Flange Receptacle
(231)—Small Flange Receptacle, pressurized
(258)—Connector furnished with protective caps assembled to both ends.
(288)—Connector furnished with protective cap on mating end.
(426)—Gold over silver plating on contacts.
(432)—Taper pin terminal contacts.
(438)—Construction for potting.
(496)—High temperature construction.
(847)—Contacts plated .0001" min. gold over copper, marked with date of manufacture.

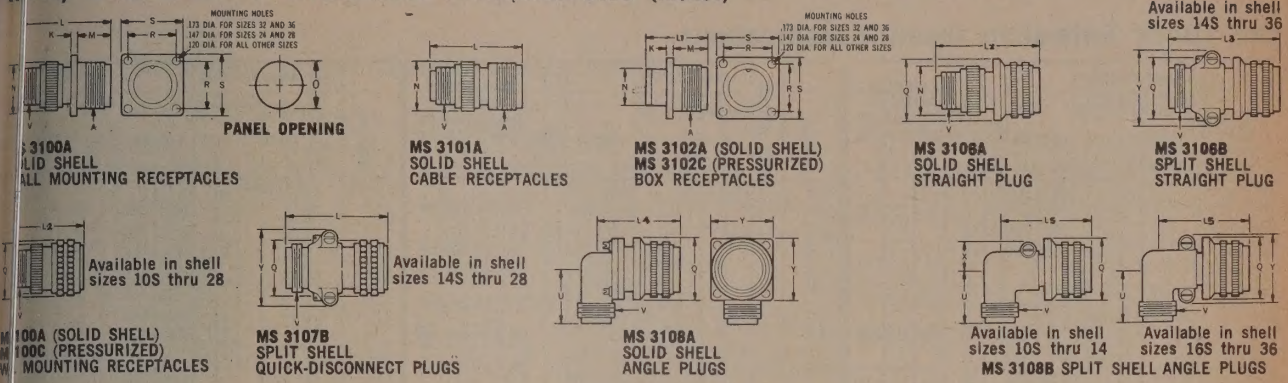
ALTERNATE INSERT POSITION
Omit for standard position.
W, X, Y, or Z for alternate positions, depending on insert.

CONTACT
P—Pin S—Socket

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

-A, B & C Hard Dielectric Dimensions (inches)



3100A
LID SHELL
ALL MOUNTING RECEPTACLES

MS 3101A
SOLID SHELL
CABLE RECEPTACLES

MS 3102A (SOLID SHELL)
MS 3102C (PRESSURIZED)
BOX RECEPTACLES

MS 3106A
SOLID SHELL
STRAIGHT PLUG

MS 3106B
SPLIT SHELL
STRAIGHT PLUG

100A (SOLID SHELL)
100C (PRESSURIZED)
MOUNTING RECEPTACLES

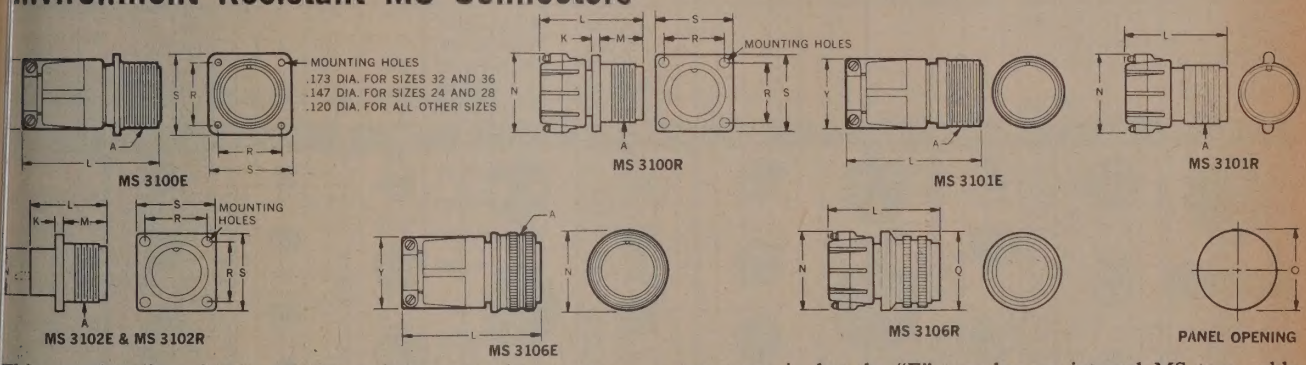
MS 3107B
SPLIT SHELL
QUICK-DISCONNECT PLUGS

MS 3108A
SOLID SHELL
ANGLE PLUGS

MS 3108B SPLIT SHELL ANGLE PLUGS

-or e	A Coupling Threads	K	L	L_1 MS 3102A	L_1 MS 3102C	L_2	L_3	L_4	L_5	M	N	O	Q	R	S	U	U_1	Y	X_1	Y_1	Fitting Threads
S	½-28	5/64	1¼	27/32	51/64	1¼	—	1¼	—	9/16	17/32	.562	¾	19/32	⅞	⅞	—	25/32	—	—	½-28
S	⅝-24	5/64	1 5/16	27/32	51/64	1 5/16	—	1¼	1⅜	9/16	⅝	.688	⅞	23/32	1	⅞	⅞	25/32	—	—	½-28
SL	⅝-24	5/64	1 9/32	27/32	27/32	1⅜	—	1 5/16	1½	9/16	⅝	.812	⅞	23/32	1	1	1	1 1/16	—	—	⅝-24
S	¾-20	5/64	1 15/32	61/64	27/32	1 7/16	—	1⅜	1 9/16	9/16	25/32	.812	1	13/16	1 3/32	1	1	1 1/16	½	—	⅝-24
	¾-20	5/64	1 27/32	1 5/16	1¼	1⅞	—	1⅜	1⅞	¾	25/32	.812	1	13/16	1 3/32	1	1	1 1/16	½	—	⅝-24
SL	¾-20	5/64	—	27/32	—	1 31/64	—	1 13/64	—	—	—	—	1	—	—	1	—	1 1/16	—	—	¾-20
S	⅞-20	5/64	1 7/16	13/16	27/32	1 7/16	1 11/16	1⅜	1 23/32	9/16	⅞	.938	1⅛	29/32	1 3/16	1	1 1/16	1 1/16	21/32	—	¾-20
	⅞-20	5/64	1 27/32	1 5/16	—	1⅞	—	1 13/16	1 15/16	¾	⅞	.938	1⅛	29/32	1 3/16	1	1 1/16	1 1/16	21/32	—	¾-20
S	1 -20	5/64	1 31/64	1 5/16	27/32	1 29/64	1 11/16	1½	1¾	9/16	1	1.062	1¼	31/32	1 9/32	1⅛	1⅛	1 5/16	—	1½	⅞-20
	1 -20	⅛	1 57/64	1 11/32	1¼	1 57/64	—	1 15/16	2⅛	¾	1	1.062	1¼	31/32	1 9/32	1⅛	1⅛	1 5/16	—	1½	⅞-20
S	1⅛-18	⅛	2	1 11/32	1¼	2	2 1/16	1 15/16	2 13/32	¾	1⅛	1.188	1 11/32	1 1/16	1⅜	1⅛	1 3/16	1 5/16	—	1 41/64	1 -20
D	1¼-18	⅛	2⅛	1 11/32	1¼	2⅛	2⅛	2 1/16	2 5/32	¾	1¼	1.312	1 15/32	1 5/32	1½	1 5/16	1 3/16	1⅝	—	1 13/16	1 3/16-18
2	1⅜-18	⅛	2⅛	1 11/32	1¼	2⅛	2⅛	2 1/16	2 13/32	¾	1⅜	1.438	1 19/32	1¼	1⅝	1 5/16	1 3/16	1⅝	—	1 15/16	1 3/16-18
4	1½-18	⅛	2¼	1 11/32	1¼	2¼	2 5/32	2 15/32	2⅝	1 3/16	1½	1.562	1 23/32	1⅜	1¾	1½	1 7/16	2	—	2 1/16	1 7/16-18
8	1¾-18	⅛	2¼	1 11/32	1¼	2¼	2 9/32	2 15/32	2⅝	1 3/16	1¾	1.812	1 31/32	1 9/16	2	1½	1 7/16	2	—	2 5/16	1 7/16-18
2	2 -18	⅛	2⅜	1 7/16	1¼	2⅜	2 5/16	2 11/16	2 13/16	⅞	2 1/32	2.062	2 7/32	1¾	2¼	1 25/32	1¾	2½	—	2 9/32	1¾-18
6	2¼-16	⅛	2⅜	1 7/16	1¼	2⅜	2 11/32	2 11/16	2 27/32	⅞	2¼	2.312	2 15/32	1 15/16	2½	1 25/32	1 15/16	2½	—	2 27/32	2 -18

Environment Resistant MS Connectors



This complete line of "E" and "R" environment resistant connectors satisfies aircraft and missile requirements as well as most applications calling for sealed components. The difference in the two types is that the "E" type has an integral MS type cable clamp as part of the connector back shell.

The "E" type meets or exceeds the "E" requirements of MIL-C-5015. Contacts and resilient inserts are factory preassembled in the shell. The integral MS type cable clamp provides extra strain relief.

The "R" type meets or exceeds both the "E" and "R" requirements of MIL-C-5015. Construction of the grommet and back shell assembly provides a great measure of wire support, eliminating the need for a cable clamp in most applications. This design also results in a size and weight reduction.

Connector Size	A Coupling Threads	K	L 3100E, 3101E, 3106E	L 3100R, 3101R, 3106R	L 3102E & R	M	N 3100R, 3101R, 3106R	N 3102E & R	O	Q	R	S	Y
8S	½-28	.078	—	1.640	1.000	.562	1.046	.437	.562	.750	.593	.875	—
10S	⅝-24	.078	—	1.640	1.000	.562	1.046	.500	.688	.875	.718	1.000	—
10SL	⅝-24	.078	2.140	1.640	1.000	.562	1.125	.625	.812	.875	.718	1.000	.865
12S	¾-20	.078	2.140	1.640	1.000	.562	1.125	.687	.812	1.000	.812	1.093	.865
14S	⅞-20	.078	2.213	1.640	1.000	.562	1.343	.750	.938	1.125	.906	1.187	.990
16S	1 -20	.078	2.273	1.640	1.000	.562	1.484	.875	1.062	1.250	.969	1.281	1.120
16	1 -20	.078	2.536	1.968	1.343	.750	1.484	.875	1.062	1.250	.969	1.281	1.120
18	1⅛-18	.125	2.608	1.968	1.343	.750	1.609	1.000	1.188	1.343	1.062	1.375	1.211
20	1¼-18	.125	2.666	1.968	1.343	.750	1.890	1.125	1.312	1.468	1.156	1.500	1.468
22	1⅜-18	.125	2.666	1.968	1.343	.750	1.890	1.250	1.438	1.593	1.250	1.625	1.468
24	1½-18	.125	2.897	1.968	1.343	.812	2.171	1.375	1.562	1.718	1.375	1.750	1.750
28	1¾-18	.125	2.897	1.968	1.343	.812	2.171	1.625	1.812	1.968	1.562	2.000	1.750
32	2 -18	.125	2.952	1.968	1.343	.875	2.531	1.906	2.062	2.218	1.750	2.250	2.056
36	2¼-16	.125	2.952	1.968	1.343	.875	2.765	2.125	2.312	2.468	1.937	2.500	2.250

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

MS Quick Reference Insert Specifications

Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
8S-1	1										1	700	500	X					
10S-2	1										1	700	500	X					
10SL-3	3										2	700	500	X	X				
10SL-4	2										2	700	500	X	X				
12ST-844	4										4								
12S-2	Like 12S-3 Rotated 250° R																		
12S-1	Like 12S-3 Rotated 100° R																		
12S-3	2										2	700	500	X	X	70	145	215	290
12S-4	1										1	1250	900						
12-5	1									1		1250	900						
12S-6	2										2	THERMO.							
14S-1	3										3	700	500						
14S-2	4										4	250	200	X	X		120	240	
14-3	1					1						700	500						
14S-4	1										1	1250	900						
14S-5	5										5	250	200	X	X		110		
14S-6	6										6	250	200	X					
14S-7	3										3	700	500			90	180	270	
14S-9	2										2	700	500			70	145	215	290
14S-10	Like 14S-2 Rot'd 100° R 700 500																		
14S-11	Like 14S-2 Rotated 250° R																		
14S-12	Like 14S-7 Rotated 100° R																		
14S-13	Like 14S-7 Rotated 260° R																		
16S-1	7										7	700	500	X	X	80			280
16-2	1								1			1750	1250						
16S-3	1										1	2450	1750						
16S-4	2										2	1250	900	X	X	35	110	250	325
16S-5	3										3	700	500	X		70	145	215	290
16S-6	3										3	700	500			90	180	270	
16-7	3					1					2	700	500			80	110	250	280
16-9	4								2		2	700	500			35	110	250	325
16-10	3								3			700	500	X	X	90	180	270	
16-11	2								2			700	500	X		35	110	250	325
16-12	1			1								700	500						
16-13	2								2	THE.		700	500			35	110	250	325
16S-14	3										3	700	500						
16S-15	Like 16S-4 Rotated 100° R																		
16S-16	Like 16S-4 Rotated 250° R																		
16S-17	Like 16S-5																		
18-1	10										4	700	500	X	X	70	145	215	290
											6	250	200						
18-3	2								2			1250	900	X		35	110	250	325
18-4	4										4	1250	900	X	X	35	110	250	325
18-5	3								2		1	1250	900			80	110	250	280
18-6	1			1								1250	900						
18-8	8								1		7	700	500	X	X	70			290
18-9	7								2		5	250	200			80	110	250	280
18-10	4								4			700	500				120	240	
18-11	5								5			700	500	X	X		170	265	
18-12	6										6	700	500	X		80			280
18-13	4				1		3					700	500			80	110	250	280
18-14	2			1							1	700	500			80	110	250	280
18-15	4								4	THE.		700	500				120	240	
18-16	1								1			4200	3000						
18-17	Like 18-9 Rotated 100°R																		
18-18	Like 18-9 Rotated 250° R																		
18-19	10										10	700	500				120	240	
18-20	5										5	700	500			90	180	270	
18-22	3										3	1250	900			70	145	215	290
18-23	Like 18-1 Rotated 100° R																		
18-24	Like 18-1 Rotated 250° R																		
18-25	Like 18-3 Rotated 100° R																		
18-26	Like 18-3 Rotated 250° R																		
18-27	Like 18-5 Rotated 100° R																		
18-28	Like 18-5 Rotated 250° R																		
18-29	5										5	700	500			90	180	270	
18-30	Like 18-20 Rotated 110° R																		
18-31	Like 18-20 Rotated 260°R																		
18-404	Like 18-3 Except Thermocouple																		
18-420	1 High Voltage Contact																		
20-1	Replaced By 20-27																		

Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
20-2	1	1										1250	900						
20-3	3									3		1250	900			70	145	215	290
20-4	4									4		1250	900	X		45	110	250	
20-5	2										2	1750	1250			35	110	250	325
20-6	3										3	1250	900			70	145	215	290
20-7	8										4	1250	900	X	X	80	110	250	280
											4	700	500						
20-8	6								2		4	250	200			80	110	250	280
20-9	8									1		1250	900			80	110	250	280
											7	700	500						
20-11	13										13	250	200						
20-12	2					1					1	700	500			80	110	250	280
20-14	4								2	3		700	500			80	110	250	280
20-15	7									7		700	500	X	X	80			280
20-16	9									2	7	700	500	X	X	80	110	250	280
20-17	6									5	1	700	500			90	180	270	
20-18	9									3	6	700	500	X	X	35	110	250	325
20-19	3								3			700	500			90	180	270	
20-20	4					1				3		700	500			80	110	250	280
20-21	9									1	8	700	500			35	110	250	325
20-22	6								3		3	700	500			80	110	250	280
20-23	2								2			700	500			35	110	250	325
20-24	4								2		2	700	500			35	110	250	325
20-25	Like 20-11 Rotated 100°R																		
20-27	14									6		700	500	X	X	35	110	250	325
										8		250	200						
20-29	17									17		700	500	X	X	80			280
20-33	11									11		700	500						
22-1	21								2			1250	900			35	110	250	325
22-2	3								3			1250	900			70	145	215	290
22-3	2					1					1	1250	900			80	110	250	280
22-4	4								2	2		700	500			35	110	250	325
22-5	6									2	4	1250	900			35	110	250	325
22-6	3								2		1	1250	900			80	110	250	280
22-7	1	1										1750	1250						
22-8	2									2		1750	1250			35	110	250	325
22-9	3									3		1750	1250			70	145	215	290
22-10	4										4	1750	1250			35	110	250	325
22-11	2										2	2450	1750			35	110	250	325
22-12	5								2		3	1250	900			80	110	250	280
22-13	5										1	1250	900			35	110	250	325
										4		700	500						
22-14	19										19	700	500	X	X	80	110	250	280
22-15	6										1	1750	1250			80	110	250	280
										5		700	500						
22-16	9									3	6	700	500			80	110	250	280
22-17	9									1	7	700	500			80	110	250	280
											1	1250	900						
22-18	8										5	1250	900			80	110	250	280
											3	700	500						
22-19	14										14	700	500	X		80	110	250	280
22-20	9										9	700	500			35	110	250	325
22-21	3	1									2	700	500			80	110	250	280
22-22	4								4			700	500				110	250	
22-23	8									1		1250	900			35		250	
										7		700	500						
22-24	6									3		1250	900			80	110	250	280
									2	1		700	500						
22-25	3	1								2		700	500			80	110	250	280
22-26	7								2	5									
22-27	9						1					1250	900			80		250	280
										8		700	500						
22-28	7								7			700	500			80			280
22-29	7			1						6		700	500			80	110	250	280
22-30	Like 22-14 Rotated 260° R																		
22-32	Like 22-5 Rotated 260° R																		
22-23	7									4		1250	900			80	110	250	280
										3		700	500						
22-34	5								3	2		1250	900			80	110	250	280
22-36	8	THERMO.								1		1250	900			90		270	
										7		700	500						

Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
22-404	8	THERMO								8									
24-1	2	1								1		1250	900			80	110	25	26
24-2	7									7		1250	900			80			28
24-3	7									2	5	1250	900			80	110	25	28
24-4	4	1									3	1250	900			80	110	25	28
24-5	16										16	700	500	X		80	110	25	28
24-6	8									3		1250	900			80	110	25	8
										5		700	500						
24-7	16									2	14	700	500			80	110	25	80
24-9	2		2									700	500			35	110	25	25
24-10	7				7							700	500			80			80
24-11	9				3		6					700	500			35	110	250	25
24-12	5		2				3					700	500			80	110	250	80
24-14	3	1					2					700	500			80	110	250	80
24-15	Like 24-5 Rotated 100° R																		
24-16	7		1							3		1250	900			80	110	250	0
							3					700	500						
24-17	5						2			3		1250	900			80	110	250	0
24-18	4									4						(Short Circuit Co			
24-19	12									12									
24-20	11						2			9		1250	900	X	X	80	110	250	0
24-21	10				1					9		1250	900			80	110	250	0
24-22	4				4							1250	900			45	110	250	
24-23	5				3					2		1250	900			80	110	250	
24-24	Like 24-5 Rotated 250° R																		
24-25	Like 24-6 Rotated 100° R																		
24-26	Like 24-6 Rotated 250° R																		
24-27	7									7		1750	1250			80			
24-28	24									24		250	200	X	X	80	110	250	
24-768	5				1		4					700	500						
24-835	1	High Voltage										*10000							
28-1	9				1		2					1250	900			80	110	250	2
					2		4					700	500						
28-2	14						2			12		1250	900	X		35	110	250	3
28-3	3				3							1750	1250			70	145	215	2
28-4	9						2			4		1250	900			80	110	250	2
										3		1750	1250						
28-5	5		2				1			2		1250	900			35	110	250	3
28-6	3		3									1250	900			70	145	215	29
28-7	2		2									1250	900			35	110	250	32
28-8	12									9		700	500			80	110	250	28
										1		1250	900						
										2		1750	1250						
28-9	12									6	6	1250	900			80	110	250	28
28-10	7									2		1200	900			80	110	250	28
			2	2			1					700	500						
28-11	22									4	18	700	500	X	X	80	110	250	28
28-12	26										26	700	500	X	X	90	180	270	
28-13	Like 28-12 Rotated 100° R																		
28-14	11										11	1250	900			80	110	250	280
28-15	35										35	700	500	X		80	110	250	280
28-16	20										20	700	500	X		80	110	250	280
28-17	15										1	2450	1750						
											3	1250	900			80	110	250	280
											11	700	500						
28-18	12										1	4200	3000						
											5	1250	900						
											2	700	500			70	145	215	290
											4	250	200						
28-19	10										2	2450	1750						
											2	1250	900			80	110	250	280
										4	2	700	500						
28-20	14									10	4	700	500	X	X	80	110	250	280
28-21	37										37	700	500	X	X	80	110	250	280
28-22	6		3								3	1250	900			70	145	215	299
28-410	4										1	High Voltage Cont.							
											3								
28-766	10			2		6	2												
28-833	7			2			5												
28-840	4		2	2															
28-880	3	Coax. Contacts																	

See YELLOW SECTION for Local Offices, Phones

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

S Quick Reference Insert Specifications (CONTINUED)

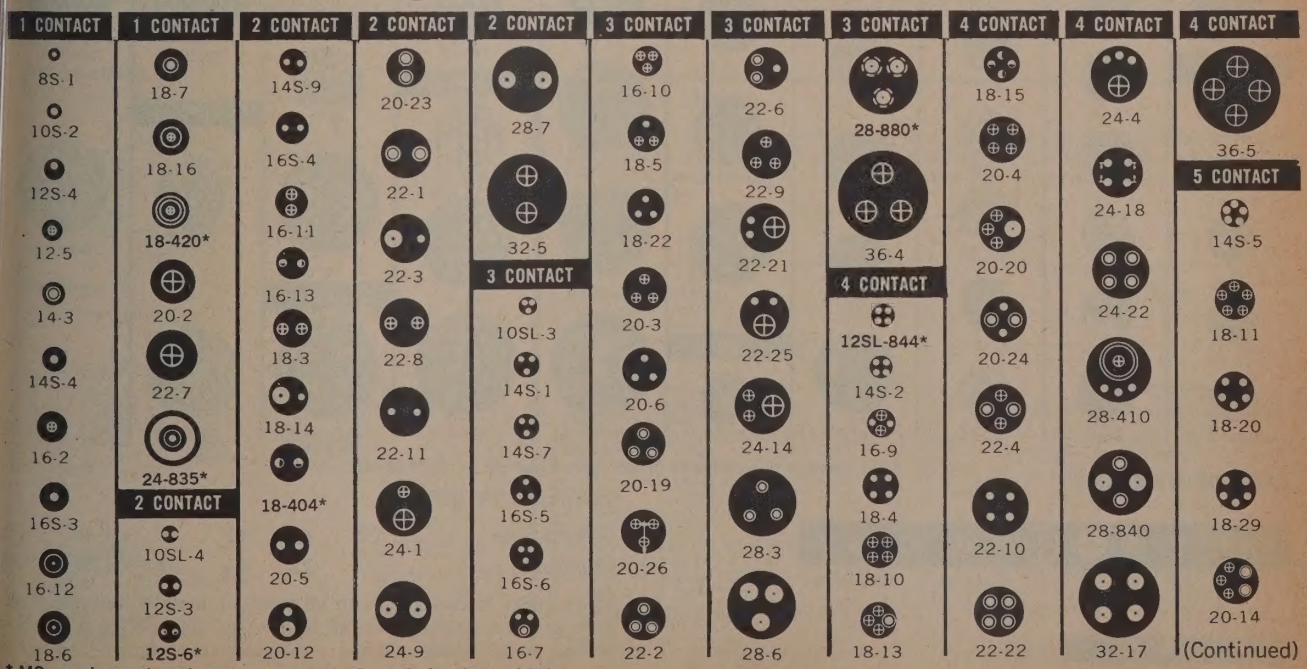
Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS■ DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
1	5					1						1750	1250			80	110	250	280
		2				2						1250	900						
2	5		3							2		1750	1250			70	145	215	290
3	9	1	2			2				4		1250	900			80	110	250	280
4	14					4						700	500			80	110	250	280
						2				8		1250	900						
5	2	2										1250	900			35	110	250	325
6	23		2	3	2					16		700	500			80	110	250	280
7	35					7				24		700	500	X	X	80	125	235	280
										4		250	200						
8	30					6				24		700	500			80	125	235	280
9	14		2							12		1250	900			80	110	250	280
10	7					1						2450	1750			80	110	250	280
				2								1250	900						
			2									700	500						
						2						1750	1250						
12	15					1				4		700	500			80	110	250	280
						4				6		1250	900						
13	23					5				18		1250	900			80	110	250	280
15	8	2				6						1250	900			35	110	250	280
16	Like 32-6 Rotated 100° R																		
17	4		4									1250	900			45	110	250	
18	Like 32-4 Rotated 100° R																		
19	Like 32- 1Rotated 100° L																		
20	Like 32-6 Rotated 100° L																		
101	12	Two Coax. Cont.				2				8		4200	3000			65	125	225	310
		Two Coax. Cont.										1250	900						

Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS■ DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
32-102	14	One Coax. Cont.									1	4200	3000			65	125	225	310
											6	1250	900						
											6	700	500						
		One Coax. Cont.																	
32-414	52										52	700	500						
36-1	22									4	18	1250	900			80	110	250	280
36-2	5	3								2		1250	900						
36-3	6	3								3		1250	900			70	145	215	290
36-4	3	1										1250	900			70	145	215	290
		2										700	500						
36-5	4	4										700	500				120	240	
36-6	6	2	4									700	500			35	110	250	325
36-7	47									7	40	700	500			80	110	250	280
36-8	47									1	46	700	500			80	110	250	280
36-9	31			1	2					14	14	700	500			80	125	235	280
36-10	48										48	700	500	X	X	80	125	235	280
36-11	Like 36-10 Rotated 100° R																		
36-12	Like 36-10 Rotated 110° L																		
36-13	17										3	1750	1250			80	110	250	280
										2	12	700	500						
36-14	16				5					5	6	1250	900			90	180	270	
36-15	35										34	700	500			60	125	245	305
											1	1250	900						
36-16	Like 36-7 Rotated 100° R																		
36-17	Like 36-7 Rotated 110° L																		
36-18	Like 36-9 Rotated 100° R																		
36-21	Like 36-9 Rotated 100° L																		

Insert No.	Total Contacts	Ampere Rating 245	135	73	41	22	CONTACT SIZE 0	4	8	12	16	VOLTS■ DC	AC	MS-E/R	PokeR	ALTERNATE POSITIONS Degrees to Right Front Pin Insert W	X	Y	Z
36-403	52										52	700	500						
36-405	15									12			5000						
										2			*9000						
										1			‡5000						
36-406	37		1	2					18	16		700	500						
36-407	15									12			5000						
										2			†9000						
										1			15000						
36-853	7									2	5								
40-1	30									6	24	1250	900			65	130	235	300
40-2	23										5	2450	1750			80	110	250	280
											18	1250	900						
40-3	23		1						4	18		1250	900			80	110	250	280
40-4	23		2	3					2	16		1250	900			80	110	250	280
40-5	15	3	2	4					6			700	500			80	110	250	280
40-6	26	1							1	24		1250	900			80	110	250	280
40-9	47			1					22	24		700	500			65	125	225	310
40-10	29		4	9						16		700	500			65	125	225	310
40-11	25	1	1	1					4	18		1250	900			80	110	250	280
40-13	Like 40-2 Rotated 100° R																		

**For 7MM High Tension Cable. 20 Amps. Max. ■Limiting operating voltage at 50,000 feet altitude are approximately 25% of the sea level values. †VOLTAGE BREAKDOWNS: 15,000 V. RMS between "A" and nearest Contacts; 3,500 V. RMS between High Voltage Contacts; 5,000 V. RMS to ground; 5,000 V. RMS between small Contacts. * 5,000 V. to ground. • Insert 20-11 contains 13 size No. 16 contacts, 10 of which have size No. 20 solder cups.*

MS/AN Insert Contact Arrangement As viewed from the front of the pin insert



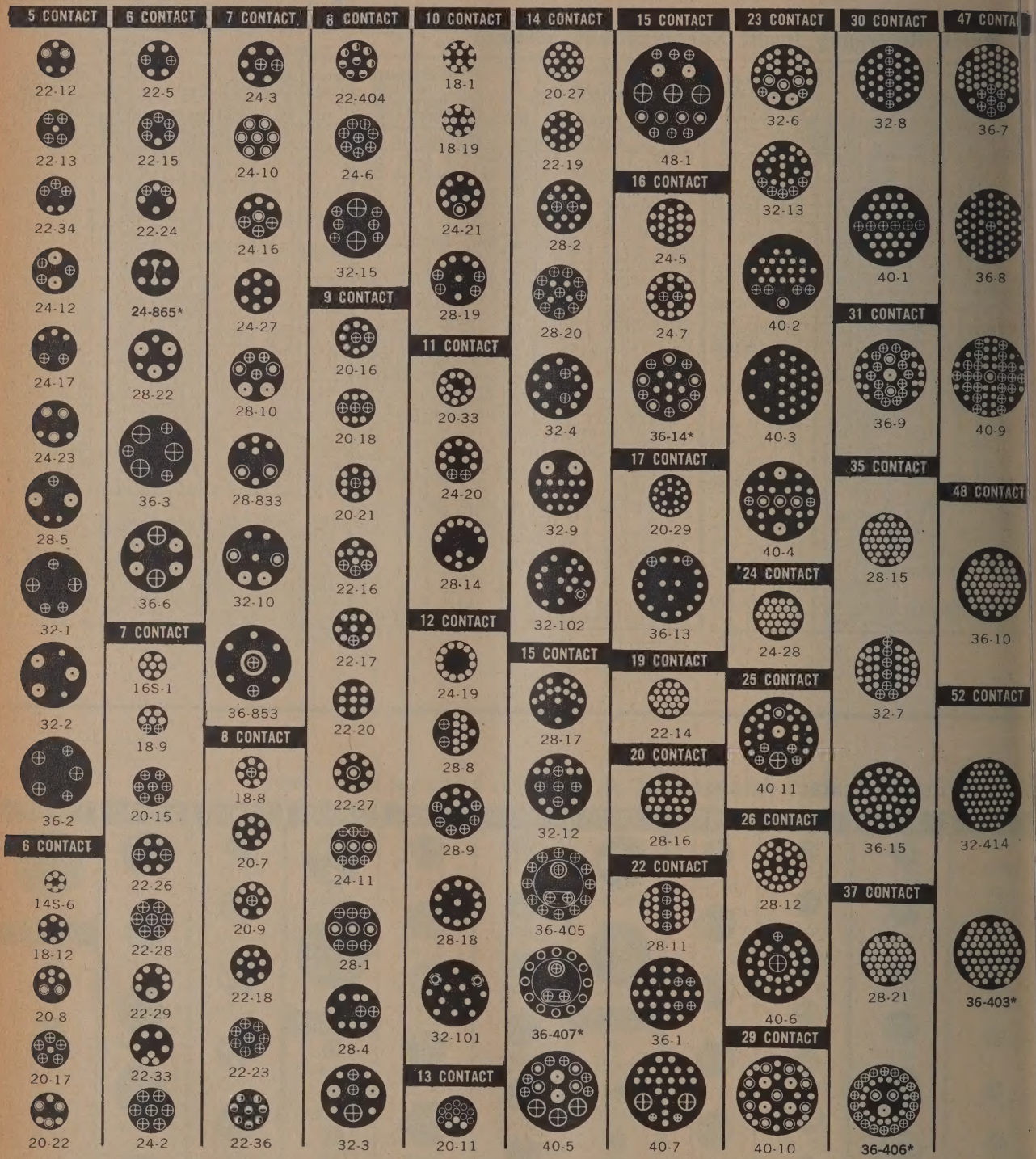
* MS number not assigned as yet. Use 97 prefix in place of MS.

(Continued)

STANDARD CIRCULAR CONNECTORS

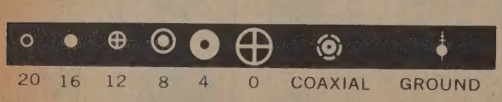
AMPHENOL
THE BUNKER-RAMO CORPORATION

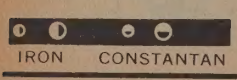
MS/AN Insert Contact Arrangement (CONTINUED)



* MS number not assigned as yet. Use **97** prefix in place of **MS**.

CODE OF WIRE SIZES





CURRENT RATING

Contact Size	20	16	12	8	4	0
Amperes	10	22	41	73	135	245

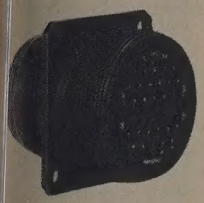
Each insert is available with all male or female contacts. Contacts are non-rotating with all solder cups aligned for maximum wiring speed. Contact sizes correspond in number coding to wire sizes.

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

46, 238 and 208 Series

New AMPHENOL Connector Series with Crimp Removable Contacts for MIL-C-5015E and Many Other Requirements



	246 Series MS340X, Class R	238 Series MS340X, Class K	208 Series Proposed MS340X, Class D and T
Application	General purpose Environmental	Aircraft firewalls and other extreme temperature situations	General purpose. High temperature and/or fluid environments
Special Features	Environmental resistant	Environmental Resistant Withstands 2000°F flame. Resistant to fuels, lubes and contaminating fluids	Environmental Resistant Resistant to high temperatures, fuels, lubes, and contaminating fluids
Overall Specification	MIL-C-5015E	MIL-C-5015E	To be included in MIL-C-5015E
Temperature Range — Extended Operation	125°C (257°F) down to −55°C	Class T: 200°C (392°F) down to −55°C (−67°F) Class K and D: 175°C (347°F) down to −55°C (−67°F)	
Shell	Aluminum — Cadmium plated followed by black chromate conversion	Cold rolled steel — Black Chrome plated over nickel	Aluminum — Black anodized
Dielectric	Resilient parts of special neoprene rubber. Retention disk of nylon	Resilient parts of fluorosilicone rubber. (Class T Vinyl Silicone) Retention disk of high-temperature glass-filled dielectric	
Contacts	Standard MS90453 pins and MS90454 sockets		
Tools	Standard MS3191 crimp MS90455 insertion and MS90456 removal tools		
Versatility	Can be intermated, intermounted, interchanged with any AN or MIL-C-5015 connector		

Dimensions

Size	A Max. With #12 & 16 Contacts	A Max. With #8, 4 & 0 Contacts	B	C	D	E Max. R, T, D	E Max. Class K	F	G	H R, T, D	H Class K	J R, T, D	J Class K	L Thrd.	M Ref.
8S	2.031	—	.577	.594	.875	.844	.715	½-28	.621	.083	.083	.123	.153	⅜-32	.562
10S	2.031	—	.577	.719	1.000	.969	.841	⅝-24	.747	.083	.083	.123	.153	½-28	.688
10SL	2.031	—	.577	.719	1.000	.969	.841	⅝-24	.747	.083	.083	.123	.153	⅝-24	.688
12S	2.031	—	.577	.812	1.094	1.062	1.092	¾ 20	.937	.083	.083	.123	.153	⅝-24	.812
12	2.125	—	.765	.812	1.094	1.062	1.092	¾-20	.937	.083	.083	.123	.153	⅝-24	.812
14S	2.031	—	.577	.906	1.188	1.156	1.164	⅞-20	1.000	.083	.083	.123	.153	¾-20	.938
14	2.125	—	.765	.906	1.188	1.156	1.164	⅞-20	1.000	.083	.083	.123	.153	¾-20	.938
16S	2.031	—	.577	.969	1.281	1.250	1.309	1-20	1.125	.083	.083	.123	.153	⅞-20	1.062
16	2.125	2.500	.765	.969	1.281	1.250	1.309	1-20	1.125	.083	.083	.123	.153	⅞-20	1.062
18	2.125	2.500	.765	1.062	1.375	1.344	1.453	1⅛-18	1.250	.125	.083	.123	.180	1-20	1.188
20	2.125	2.500	.765	1.156	1.500	1.469	1.598	1¼-18	1.375	.125	.101	.123	.180	1⅛-18	1.312
22	2.125	2.500	.765	1.250	1.625	1.594	1.742	1⅜-18	1.500	.125	.101	.123	.180	1¼-18	1.438
24	2.125	2.500	.827	1.375	1.750	1.719	1.886	1½-18	1.625	.125	.101	.150	.180	1⅜-18	1.562
28	2.125	2.500	.827	1.562	2.000	1.969	2.175	1¾-18	1.875	.125	.101	.150	.180	1⅝-18	1.812
32	2.125	2.500	.890	1.750	2.250	2.219	2.464	2-18	2.125	.125	.101	.176	.212	1⅞-16	2.062
36	2.125	2.500	.890	1.938	2.500	2.469	2.752	2¼-16	2.375	.125	.132	.176	.212	2⅛-16	2.312
40	2.125	2.500	.890	2.188	2.750	2.719	2.846	2½-16	2.627	.125	.132	.176	.212	2⅜-16	2.562

Insert Configurations Available

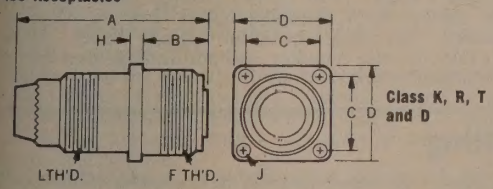
*10SL-3	18-1	20-17	24-28
*10SL-4	18-4	*20-27	*28-11
*12S-3	18-9	20-29	28-12
12-5	18-10	20-33	28-15
*14S-2	18-11	22-8	*28-21
*14S-5	18-12	22-14	*28-22
*14S-7	18-19	22-19	32-7
14S-9	18-22	*24-10	*32-17
*16S-1	20-4	24-20	*36-5
*16-11	20-6	24-27	36-10

* Denotes 208 and 238 also available

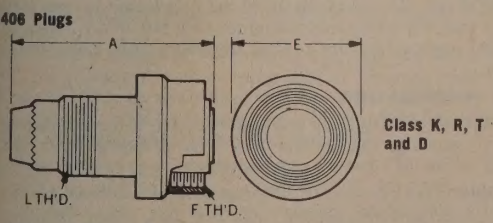
Accessory Tools

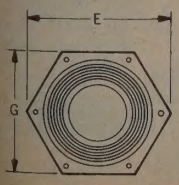
294-126	MS 3191-1 Univ. Crimp Tool
294-229	#12 Contact Insertion Tool
294-230	#12 Contact Removal Tool
294-192	#16 Contact Insertion Tool
294-219	#16 Contact Removal Tool

3400 Receptacles



3406 Plugs





How to Order:

To get the specific connector you want, put together the part number as per the following example. For the military part number, use the letters MS as the series designation. For the Amphenol part number, use 208, 238, or 246 as applicable.

246 - 3406 R 28 - 21 P W 101

SERIES
MS—Military Standard
246—General Purpose Environmental
238—2000° Flame Resistant
208—High Temperature Fluid Resistant

SHELL STYLE
3400—Wall Receptacle
3401—Cable Receptacle*
3402—Box Mounting Receptacle*†
3406—Straight Plug

CLASS
R—General Purpose Environmental (MS or 246 only)
K—2000°F Flame and Fluid Resistant (MS or 238 only)
T—High Temperature 200°C (208 or 238 only)
D—High Temperature 175°C Fluid Resistant (208 only)

DEVIATIONS
101—Connector less contacts

INSERT POSITION
Blank for normal position MIL-C-5015E

CONTACT TYPE
P—Pin **S**—Socket

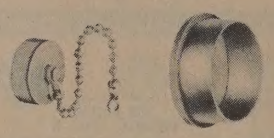
INSERT CONFIGURATION
Per MIL-C-5015E
See above for available inserts.

Note: Cable clamps and accessory hardware are ordered separately or by Amphenol deviation.
*Not available in 238 Series Class K.
†Contact factory for availability.

STANDARD CIRCULAR CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Caps - 97 Series



Two types of protective caps are available for use with MS Connectors:

Cap & Chain — For use when MS Connectors are not in use. The 9760 is made of aluminum with an olive drab chromate conversion seal and is available for either receptacles or plugs. To order the cap less chain, add the suffix G to the catalog number.

Disposable Dust Caps — Expendable polyethylene dust caps provide added protection to precision built MS Connectors during storage or shipment or completed apparatus.

Automatic Ordering — A disposable cap may be ordered with any MS Connector by adding the suffix (288) to the catalog number of the connector.

ORDERING INFORMATION

MS Connector Size	CAP & CHAIN For Engagement On		DISPOSABLE DUST CAP For Mating End	
	Receptacles 9760-	Plugs 9760-	Receptacles 97121-	Plug 97121-
8S	-8	-8P	-208	-308
10S	-10	-10P	-210	-310
10SL	-10	-10P	-210	-310
12, 12S	-12	-12P	-212	-312
12SL	-12	-12P	-212	-312
14, 14S	-14	-14P	-214	-314
16, 16S	-16	-16P	-216	-316
18	-18	-18P	-218	-318
20	-20	-20P	-220	-320
22	-22	-22P	-222	-322
24	-24	-24P	-224	-324
28	-28	-28P	-228	-328
32	-32	-32P	-232	-332

Thermocouples - 97 Series

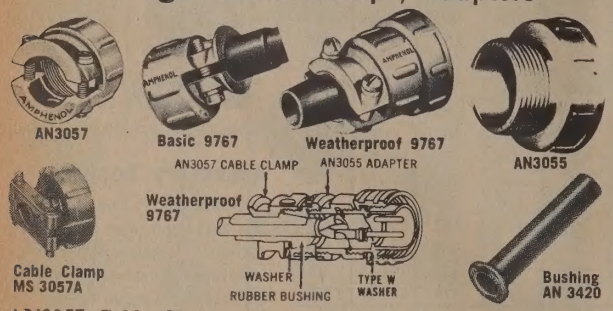
For MS Connectors

Designed to provide a disconnect in thermocouple circuits without the introduction of dissimilar metals.

There are six thermocouple insert configurations. Each of these utilizes an equal number of iron and constantan contacts. However, any MS Connector with size 16 contacts may be ordered with any of the contacts listed at right. For ease in wiring, each thermocouple contact is color coded on the solder cup end of the contact.

Contacts	Description	Color Code
Alumel	94% Nickel, 2.5% Manganese, 2% Aluminum, 1% Silicone, .5% Iron	Orange
Constantan	45% to 60% Copper, 40% to 55% Nickel, 0 to 1.4% Manganese, .1% Iron	Red
Copper	87.5% to 90% Copper, 1.8% to 2.2% Lead, .1% Iron, .5% Nickel, .5% Normal Impurities and balance Zinc	Yellow
Iron	84.4% Iron, 2% Sulphur, .4% Silicone, 2% Carbon, 3.6% Manganese, .6% Phosphor, .1% Copper, .9% Tin	White
Chromel	90% Nickel, 10% Chromium	Green

MS Fittings Cable Clamps, Adapters



AN3057 Cable Clamp — Standard cable clamp, threads onto all MS Connectors with threaded back shell. Provides reliable sturdy support. Illustration does not shown one rubber and two fiber washers which seats clamp to connector.

AUTOMATIC ORDERING — By adding deviation number (559) to the MS catalog number, the correct AN3057 cable clamp will be shipped with the MS Connector.

Basic 9767-X — Identical to AN3057 cable clamp, but the rubber washer and one of the two fiber washers are replaced with a rubber boot. Recommended for applications in which cable is subject to considerable flexing.

9767-X-X Weatherproof Cable Clamp—Same as BASIC 9767-X above with addition fo AN3055 reducing adapter. The inside of the AN3055 is tapered to the same dimensions of the front end of the rubber boot — this providing a weatherproof seal.

AN3055 Reducing Adapter — Permits smaller cable clamps to be used with MS Connectors.

AN3420 Bushing — Rubber bushing designed specifically for MS3057A Cable Clamp. Protects wire bundle and unjacketed cable from possible damage by a cable clamp. Can also be used for a reducing bushing.

MS3057A Cable Clamp — For rubber covered cable or wires protected by tubing. Both clamping halves float so cable is always centered, affording maximum strain relief. With unjacketed cable or wire bundles without tubing, use corresponding AN3420 Bushing.

Common MS Deviations

MS Connectors are available with minor deviations from standard. Deviations are ordered by adding the deviation suffix to the MS part number. Deviation numbers always appear in parenthesis.

(288) Includes 97-121 dust cap for mating end.

(417) Plugs only, type W washer cemented.

(426) Minimum of .00002" gold over .0002/.0003" silver on contacts. Use 97 prefix instead of MS.

(432) No. 16 contact. For use with AMP No. 53 taper pin. Use 97 prefix instead of MS.

(559) AN 3057 cable clamp included with connector.

(639) Cadmium plate finish wtih clear chromate conversion seal. Use 97 prefix instead of MS.

(866) Contacts with minimum of .00002" gold over. 0002/.0003" silver with tinned solder cups.

MS Potting

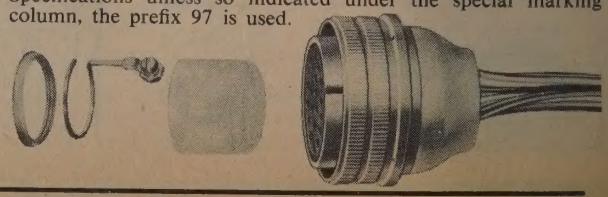
MS Connectors for potting are available in all connector styles except the MS3102. The back shell of the connector is removed and replaced with a potting mold retainer ring No. 9755-270-XX. (XX indicates connector size.) This describes the basic (438) construction.

ORDERING INFORMATION

Since the solid or split back shell is removed from the connector shell prior to potting, the A and the B is dropped from the part number of an MS potted connector.

For example: 97-3106-18-11P (596) or 97-3101-14S-4P (438)

Since the potting construction does not fall under Military Specifications unless so indicated under the special marking column, the prefix 97 is used.



RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

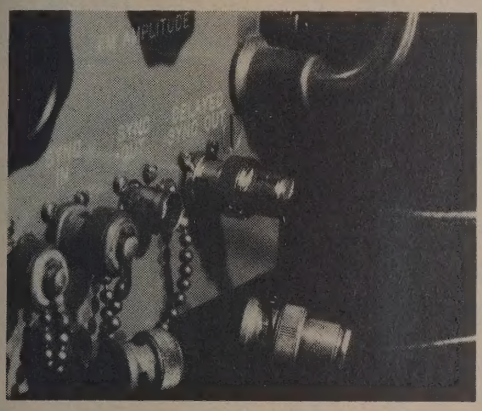
PECIFY ASTROplate — for BRAWN and BEAUTY in RF Connectors

CAUSE ASTROplate IS SPACE-AGE NEW!

years the industry has searched for a tough finish to replace er plate in commercial instrumentation, communications ipment, cable connections and the countless applications there for RF connectors. Today's applications demand the advant- s of precious metal without its softness and susceptibility to rosion. Now it's here—developed by Amphenol—world lead- n RF connectors. *It's a totally new finish.*

roplate — better than silver

lusive, new, non-tarnish finish. Under salt-spray tests (per L-Std. 202), Astoplated components have been exposed to r 400 hours without evidence of corrosion. Samples have ergone many times the standard four-hour potassium sulfide osure without showing tarnish. Under the same conditions, er tarnishes in less than one-half hour. Excelling also in abra- resistance, Astroplate measures between 200 and 350 on Vickers Hardness Test vs. 70 to 155 for silver plate. Ideal for h temperature applications, Astroplate withstands over 2500°F.



Astroplate — interchangeable with silver

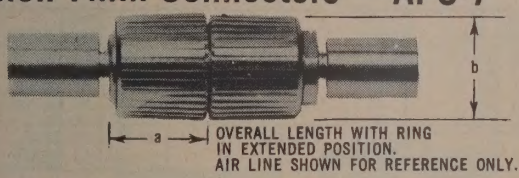
Fully compatible, Astroplate presents no galvanic corrosion problem when mated with silver, and its tested solderability (MIL-Spec QQ-S-365) is equal to that of silver.

In Stock On All Popular BNC and UHF Connectors

UG Part Number	Amphenol Part Number	Description
UHF CONNECTORS		
PL-259	83-1SP-1050	UHF Plug
SO-239	83-1R-1050	UHF Panel Receptacle
UG-176	83-168-1050	UHF Reducing Adaptor
UG-175	83-185-1050	UHF Reducing Adaptor
UG-363	83-1F-1050	UHF Bulkhead Adaptor
PL-258	83-1J-1050	UHF Adaptor
M-358	83-1T-1050	UHF Tee Adaptor
—	*83-877-1050	UHF Double Male Adaptor
—	*83-878-1050	UHF Single Hole Receptacle
UG-646	83-1AP-1050	UHF Angle Adaptor
PL-259	83-822-1050	UHF Plug
PL-259A	83-1SPN-1050	UHF Plug
BNC CONNECTORS		
UG-1094	31-221-1050	BNC Bulkhead Receptacle
UG-88	31-002-1050	BNC Plug
UG-260	31-012-1050	BNC Plug
UG-657	31-102-1050	BNC Bulkhead Receptacle
UG-625	5575-1050	BNC Bulkhead Receptacle
UG-290	31-003-1050	BNC Panel Receptacle
CW-123A	31-026-1050	BNC Cap and Chain
UG-88B	31-018-1050	BNC Plug
UG-88C	31-202-1050	BNC Plug
UG-260-A	31-021-1050	BNC Plug
UG-260-B	31-212-1050	BNC Plug
UG-260-D	31-3212-1050	BNC Plug
UG-625-B	31-236-1050	BNC Bulkhead Receptacle
UG-290-A	31-203-1050	BNC Panel Receptacle
UG-914	31-219-1050	BNC Straight Adaptor
UG-274	31-008-1050	BNC "T" Adaptor
UG-492-A	31-220-1050	BNC Bulkhead Adaptor
	31-759-1050	BNC Ground Lug

*New Products

recision 7mm Connectors — APC-7



APC-7. Precision 50-ohm connector for use with 7mm (inner liameter of outer conductor) rigid air line and semi-rigid ALJAK) coaxial cable.

Sexless coupling permits interconnection of any two APC-7's. dentical plane of electrical and mechanical contact permits ac- urate determination of the electrical length of a mated pair or f an air line assembly with a connector at each end. All com- onents held captive.

Connectors packaged in pairs in protective wooden box; as- sembly instructions and certified SWR test report included with each pair.

Specifically designed for microwave and precision test equip- ment, manufacturers now using APC-7 fittings include: Alford, Alfred, EG&G, Hewlett-Packard, Maury Microwave, Microlab/ FXR, Narda, PRD, Rantec, and Weinschel Engineering. For further information, request Catalog PIC-2.

CHARACTERISTICS (TYPICAL)

ELECTRICAL (for mated pair): **Impedance:** 50 ohm ± 0.1 ohms. **Frequency Range:** 0-18 GHz. **SWR:** 1.039 max. to 18 GHz. **Insertion loss (in db):** $<7 \times 10^{-3} \sqrt{\text{Freq. GHz}}$ (example: 0.028 db at 16.0 GHz). **RF Leakage:** <signal inside coaxial line by ratio >120 db▲. **Electrical length:** 0.723 ± 0.001 inches (1.836 ± .00254 cm). **Contact Resistance:** inner: <1.0 milliohm, outer: <0.1 milliohm.
▲RF Leakage: Until satisfactory test methods are developed, the maximum frequency of measurement is limited to 6.0 GHz.

ENVIRONMENTAL: **Thermal Limits:** storage: —67° to 158°F (—55° to 70°C) operating: 55° to 91°F (13° to 33°C). **Humidity:** 20 to 80% RH. **Pressure:** 590 to 780 mm Hg. MECHANICAL: **Mating:** sexless, coplanar by means of threaded ring housed within coupling nut. **Life:** >5000 connect/disconnect operations.

MATERIAL: **Coupling Mechanism:** stainless steel. **Body:** gold plated beryllium copper. **Center Contact:** gold plated beryllium copper. **Bead Assembly:** Rexolite insulation.

For use with	Part No.	Maximum SWR For a Mated Pair	Dimensions, Inches a	Dimensions, Inches b
7mm air line	131-1050	1.039 to 18 GHz	5/64	13/16
131-182 (.325) semi-rigid ALJAK cable	131-1019	1.10 to 12.4 GHz	1 53/64	13/16

Short and Open Circuit Terminations

Reflection coefficient 0.9995 minimum. Reference plane for opens is 1.25mm ±0.2mm beyond face of electrical mating plane.

Part No.	Description	Dimensions, Inches a	Dimensions, Inches b
131-1206	short, less coupling mechanism	3/4	11/16
131-1205	short, with coupling mechanism	1 1/8	13/16
131-1204	open, less coupling mechanism	3/4	11/16
131-1203	open, with coupling mechanism	1 1/8	13/16

APC-7 Tool Kit

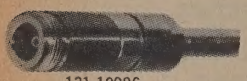
TOOL KIT 131-2025
For disassembly; assembly to air line. Contains collet extractor, spanner wrench, torque wrench & line wrench.

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

APC-N Plugs and Jacks

131-10005


131-10006

131-10003

131-10004

APC-N. 50-ohm connectors. Use interchangeably with APC-7; mate with all other type N's. Their excellent electrical performance will make them an "industry standard" for future equipment. SWR for mated pairs: only 1.06 through 12 GHz; 1.08 through 18 GHz.

CHARACTERISTICS (TYPICAL)

ELECTRICAL (for mated pair APC-N connectors). **Impedance:** 50 ohm ± 0.2 ohms. **Frequency Range:** 0-18 GHz. **SWR:** 1.08 max. to 18 GHz. **Insertion Loss (in db):** $<3x10^{-2}\sqrt{\text{Freq. GHz}}$. **RF Leakage:** <signal inside coaxial line by ratio >90 db▲. **Contact Resistance:** inner: <1.0 milliohm; outer: <1.1 milliohm.

▲**RF Leakage:** Until satisfactory test methods are developed, the maximum frequency of measurement is limited to 6.0 GHz.

ENVIRONMENTAL: **Thermal Limits:** storage: —67-158°F (—55-70°C); operating: 55-91°F (13-33°C). **Humidity:** 20 to 80% RH. **Pressure:** 590 to 780 mm Hg.

MECHANICAL: **Mating:** 5/8-24 threaded coupling. Mating dimensions are MIL-C-39012 Class II nominal with tighter tolerances. The APC-N mates with all existing Type N connectors including MIL-C-71.

MATERIAL: **Body and Coupling Nut:** stainless steel. **Cen Contacts:** gold plated beryllium copper. **Bead Assemb** Rexolite insulation.

For Use With	Con-fig.	Maximum SWR For a Mated Pair	Part No.	Dimensio Inches Lgth.	O
7mm air line	plug	1.08 to 18 GHz	131-10003	1 3/64	
7mm air line	jack	1.08 to 18 GHz	131-10004	1 3/32	
semi-rigid ALJAK	plug	1.125 to 12.4 GHz	131-10005	2 5/32	
semi-rigid ALJAK	jack	1.125 to 12.4 GHz	131-10006	2 3/16	

Subminax Series 27

Amphenol's Subminax connectors and Amphenol subminiature coaxial cables provide designers of miniature instrumentation with complete RF series of matched, constant-impedance connectors and cables possessing the same electrical efficiency and reliability as standard-size RF components.

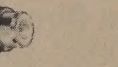
The Subminax line comprises two distinct, non-mating series: the 27 Series and the 5116 Series.

27-1

27-34

27-26

27-31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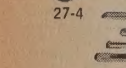
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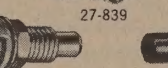
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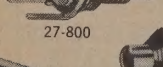
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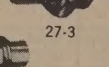
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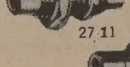
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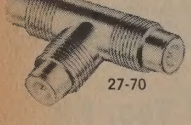
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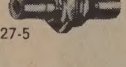

27-5

CHARACTERISTICS

ELECTRICAL: **Impedance:** 50 ohm, 75 ohm. **Frequency Range:** 0-10 GHz. **Voltage Rating:** 500 volts peak. **Dielectric Withstanding Voltage:** 1,500 volts rms. **SWR (50 ohm):** 1.2 (0-4 GHz); 1.5 (4-10 GHz); 1.3 (UG's) (0-6 GHz); 1.5 (UG's) (6-10 GHz). **Other:** multivolt drop 6 MV. insulation resistance 1,000 megohms.

ENVIRONMENTAL: **Thermal Limits: —67° to 390°F** (—55° to 199°C). **Weatherproof:** all 27 series are non-weatherproof, radial crimp have plastic boot or optional heat shrink tubing. **Hermetic Seals:** pass helium leakage test of 2×10^{-8} cc/sec. **Thermal Shock:** Mil. Std. 202 method 107. **Shock:** Mil. Std. 202 method 202. **Vibration:** Mil. Std. 202 method 204 (test cond. D). **Moisture Resistance:** Mil. Std. 202 method 106A. **Corrosion:** Mil. Std. 202 method 101 (test cond. B).

MECHANICAL: **Contacts:** radial crimp, not cap tivated; quick crimp, full captivated; field servic able, semicaptivated. **Mating:** push-on (snap-on and screw-on, (50 ohm have 10-32 threaded coup ling; 75 ohms, 5/16-32). **Cable Affixment (Braid Jacket):** radial crimp: Quick-Crimp (hex crimp) field serviceable clamp mechanism. **Cable Affix ment (Center Conductor):** solder only. **Couplin Nut:** recommended torque (hex nuts); 50 inch ounces. Axial pull-off force: withstand up t 50 lbs.

MATERIAL: **Contacts:** male and outer (push-on) brass female: beryllium copper. **Other Metal Parts** brass. **Plating (All Metal Parts):** .000050 gold ove copper, (UG's .0001" gold over copper). **Insulators** Teflon, Kel-F-Teflon, glass Teflon (hermetically sealed).

MILITARY SPECIFICATIONS: UG items fully compl with MIL-C-22557A.

PUSH-ON STRAIGHT PLUGS SCREW-ON

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-841	50	QC, CC	1
	27-1	50	RC	19/32
180, 195	27-828	75	QC, CC	1 5/64
	27-13	75	RC	5/8
178, 196	27-30	50	FS, CC	25/32
			* UG-1460	
			† UG-1465	

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-844	50	QC, CC	1 1/32
	27-7	50	RC	19/32
	†27-106	50	FS, CC	27/32
180, 195	27-835	75	QC, CC	1 5/64
	27-19	75	RC	19/32
178, 196	27-34	50	FS, CC	25/32
	*27-104	50	FS, CC	27/32

PUSH-ON ANGLE PLUGS SCREW-ON

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-843	50	QC, CC	41/64
	27-6	50	RC	9/16
180, 195	27-834	75	QC, CC	41/64
	27-18	75	RC	39/64
178, 196	27-33	50	FS, CC	9/16
	27-823	50	FS, CC, HOC	19/32

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-846	50	QC, CC	19/32
	27-26	50	RC	35/64
180, 195	27-836	75	QC, CC	41/64
	27-25	75	RC	5/8
178, 196	27-37	50	FS, CC	35/64

PUSH-ON STRAIGHT JACKS SCREW-ON

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-849	50	QC, CC	1
	27-2	50	RC	35/64
180, 195	27-837	75	QC, CC	1
	27-14	75	RC	9/16
178, 196	27-31	50	FS, CC	47/64

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-8	50	RC	19/32
	*27-105	50	FS, CC	3/4
178, 196	27-35	50	FS, CC	3/4
	†27-107	50	FS, CC	3/4
180, 195	27-20	75	RC	19/32
			* UG-1467	† UG-1462

PUSH-ON BULKHEAD JACKS SCREW-ON

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-842	50	QC, CC	1 1/16
	27-4	50	RC	41/64
180, 195	27-838	75	QC, CC	1 7/64
	27-16	75	RC	41/64
178, 196	27-32	50	FS, CC	13/16
			* UG-1463	† UG-1468

For RG-/U Cable	Part No.	Imp. Ohms	Notes.	Lgth.
174, 179, 187, 188	27-845	50	QC, CC	1 1/16
	27-10	50	RC	21/32
	†27-103	50	FS, CC	7/8
180, 195	27-839	75	QC, CC	1 1/8
	27-22	75	RC	21/32
178, 196	27-36	50	FS, CC	53/64
	*27-102	50	FS, CC	7/8

PUSH-ON BULKHEAD RECEPTACLES SCREW-ON

—	27-3	50	T	—	37/64
—	27-15	75	T	—	37/64
—	27-27	50	GT	H	45/64
—	27-45	75	GT	H	23/32

—	27-9	50	I	—	19/32
—	27-12	50	GT	H	41/64
—	27-21	75	T	—	19/32
—	27-24	75	GT	H	11/16
—	27-800	50	T	PC	43/64
1619	27-101	50	T	RM, FS, CC	5/8
1464	27-108	50	T	FM, FS, CC	41/64

PUSH-ON BULKHEAD ADAPTERS

Part No.	Imp. Ohms	Adapter Ends	Lgth.
27-5	50	JJ	5/8
27-17	75	JJ	5/8

SCREW-ON BULKHEAD ADAPTERS

For RG-/U Cable	Part No.	Imp. Ohms	Notes	Lgth.
174, 179, 187, 188	27-849	50	QC, CC	1
	27-2	50	RC	35/64

SCREW-ON TEE ADAPTERS

Part No.	Imp. Ohms	Adapter Ends	Lgth.
27-70	75	JJJ	1.050

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Suminax Series 5116

CHARACTERISTICS

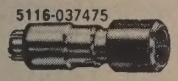
ELECTRICAL
Impedance: 50, 75 or 95 ohm.
Frequency range: 0-4 Gc.
Voltage: 500 v. peak.
Hipot potential: 1500 v. rms. 60 cycles, 1 min.

ENVIRONMENTAL
Thermal limits: —67°F to 390°F.
Weatherproof: screw-on types.
Hermetic seals: pass helium leak test of 2 x 10^{-8} cc/sec.

MECHANICAL
Mating: push-on or screw-on.
Cable affixment: Quick-Crimp.

MATERIAL
Contacts: male: brass; female: beryllium copper.
Other metal parts: brass.
Contact plating: .0002" gold-over-silver min.
Other plating: .0002" silver min.
Insulators: Teflon or glass-Teflon.

5116-037050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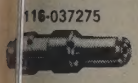
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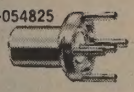

5116-054825

5116-054850

PUSH-ON STRAIGHT PLUGS SCREW-ON

For RG-/U Cable	No. 5116-	Imp. Ohms	Notes	Lgth.	For RG-/U Cable	No. 5116-	Imp. Ohms	Notes	Lgth.
178A, 178B, 196, 196A	-037050	50		1 3/32	178A, 178B, 196, 196A	-037475	50	W	1
179A, 179B, 187, 187A	-037100	75		1 3/32	179A, 179B, 187, 187A	-037525	75	W	1
180, 180A. 180B, 195, 195A	-037125	95		1 3/32	180, 180A. 180B, 195, 195A	-037550	95	W	1
188, 188A, 316	-037075	50		1 3/32	188, 188A, 316	-037575	50	W	1

PUSH-ON ANGLE PLUGS SCREW-ON

178A, 178B, 196, 196A	-037150	50		49/64	178A, 178B, 196, 196A	-037600	50	W	5/8
179A, 179B, 187, 187A	-037200	75		25/32	179A, 179B, 187, 187A	-037625	75	W	41/64
180, 180A. 180B, 195, 195A	-037225	95		25/32	180, 180A, 180B, 195, 195A	-037650	95	W	45/64
188, 188A, 316	-037175	50		23/32	188, 188A, 316	-037675	50	W	41/64

PUSH-ON STRAIGHT JACKS SCREW-ON

178A, 178B, 196, 196A	-037275	50		1	178A, 178B, 196, 196A	-037700	50	W	1
179A, 179B, 187, 187A	-037325	75		1	179A, 179B, 187, 187A	-037725	75	W	1
180, 180A, 180B, 195, 195A	-037350	95		1	180, 180A, 180B, 195, 195A,	-037750	95	W	1
188, 188A, 316	-037300	50		1	188, 188A, 316	-037775	50	W	1

PUSH-ON BULKHEAD JACKS SCREW-ON

178A, 178B, 196, 196A	-037375	50		29/32	178A, 178B, 196, 196A	-037800	50	W	25/32
179A, 179B, 187, 187A	-037425	75		29/32	179A, 179B, 187, 187A	-037825	75	W	25/32
180, 180A, 180B, 195, 195A	-037450	95		29/32	180, 180A, 180B, 195, 195A	-037850	95	W	25/32
188, 188A, 316	-037400	50		29/32	188, 188A, 316	-037875	50	W	25/32

PUSH-ON STRAIGHT RECEPTACLES SCREW-ON

No. 5116-	Imp. Ohms	Ins.	Notes	Lgth.	No. 5116-	Imp. Ohms	Ins.	Notes	Lgth.
-054825	50	T	PC	15/32	-058375	50	T	PC, W	15/32
					-054875	95	T	PC, W	15/32
					-057350	50	gT	H, W	9/16
					-057375	95	gT	H, W	9/16

PUSH-ON ANGLE RECEPTACLES SCREW-ON

-054850	50	T	PC	9/16	-054900	50	T	PC, W	15/32
					-054925	95	T	PC, W	15/32

PUSH-ON BULKHEAD RECEPTACLES SCREW-ON

-054300	50	T	MLC	45/64	-058350	50	T		1/4
-054325	50	T		23/32	-056825	75	T		9/32
					-057400	95	T		9/16

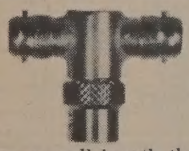
SCREW-ON BULKHEAD ADAPTERS

No. 5116-	Imp. Ohms	Ins.	Ends Mate With	Lgth.
-054475	50	T	m m	19/32
-054525	75	T	m m	19/32
-054550	95	T	m m	19/32

SCREW-ON MALE CAPS

No. 5116-	Imp. Ohms	Notes	Lgth.
-054575	50	SMC	3/8
-054650	50		13/64
-054600	75	SMC	5/16
-054675	75		13/64
-054625	95	SMC	5/16
-054700	95		13/64

Series MB



Very small bayonet-lock connectors with an overall length that, with few exceptions, measures under an inch. Of particular importance to the user are the excellent electrical and mechanical performance parameters offered at low cost. Crimp designs offered require no special crimping tools; a simple pair of standard pliers will do the job. Plugs in this series have female contacts; jacks have male contacts. For further information, request Catalog CC-7.

CHARACTERISTICS, typical

ELECTRICAL: Impedance: non-constant; **frequency range:** 0-500 MHz. **Voltage rating:** 500 v. peak.

ENVIRONMENTAL: Thermal limits: Kel-F: —67° to 390°F (—55° to 199°C); nylon: —67° to 300°F (—55° to 149°C). **Weatherproof:** all MB series are non-weatherproof. **Hermetic seal:** pass helium leak test of 2 x 10^{-8} cc/sec.

MECHANICAL: Mating: 2-stud bayonet lock. **Cable affixment:** hooded, jacket or standard braid clamp and nut; inner jacket crimp.

MATERIAL: Contacts: male: brass; female: beryllium copper. **Other metal parts:** brass. **Plating: all metal parts except contacts:** except as noted, nickel .0001" min. per QQ-N-290. **Contact plating:** except as noted, .0002" silver min. **Insulators:** as noted, Kel-F, nylon or teflon.

STRAIGHT PLUGS

RG/U Cable	Part No.	Insulation	Dimensions Inches Length	O.D.	Cable Entry	Notes
55, 58, 141, 142	49200	Kel-F	31/32	3/8	.214	jacket clamp
	45050	nylon	23/32	3/8	.203	standard clamp
	45525	Kel-F	23/32	3/8	.203	standard clamp
	44900	Kel-F	13/16	3/8	.197	standard clamp
	45325	Kel-F	13/16	3/8	.197	standard clamp
58	44200	Kel-F	23/32	3/8	.203	standard clamp/ solderless contact
	44975	nylon	23/32	3/8	.203	standard clamp/ solderless contact
	45000	nylon	23/32	3/8	.203	standard clamp/ solderless contact
59, 62, 140, 210	44800	Kel-F	27/32	3/8	.255	standard clamp
	45025	nylon	27/32	3/8	.255	hooded clamp/ solderless contact
	45550	Kel-F	27/32	3/8	.255	hooded clamp
	47800	Kel-F	31/32	3/8	.255	jacket clamp/ solderless contact
122, 180, 195	45075	nylon	23/32	3/8	.177	standard clamp
	45700	Kel-F	23/32	3/8	.148	standard clamp
	48850	Kel-F	23/32	3/8	.158	crimp/silver-plated body
174, 179, 187, 188	44950	Kel-F	13/16	3/8	.126	crimp/silver-plated body
	45125	nylon	23/32	3/8	.126	crimp
	45275	Kel-F	13/16	3/8	.126	crimp
	47750	Kel-F	47/64	3/8	.128	crimp
	48325	Kel-F	3/4	3/8	.112	standard clamp
	48825	Kel-F	25/32	3/8	.119	crimp/silver-plated body
	95200	Kel-F	25/32	3/8	.119	crimp/gold-plated contact/silver body
	45650	nylon	23/32	3/8	.104	crimp/silver-plated body

SERIES MB CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Series MB CONTINUED

STRAIGHT PLUGS continued

RG/U Cable	Part No.	Insulation	Dimensions Inches Length	O.D.	Cable Diam.	Notes
178, 196	45100	nylon	25/32	3/8	.081	crimp
	45175	nylon	23/32	3/8	.091	crimp
	45425	Kel-F	23/32	3/8	.091	crimp
	45475	Kel-F	23/32	3/8	.081	crimp
	45725	Kel-F	23/32	3/8	.091	crimp/silver-plated body
	45900	Teflon	23/32	3/8	.081	crimp/silver-plated body
	47775	Kel-F	47/64	3/8	.096	jacket clamp/ silver-plated body

ANGLE PLUGS

55, 58, 141, 142	49225	Kel-F	3/4	3/8	.214	jacket clamp/ sil.-pltd. body
	45350	Kel-F	3/4	3/8	.197	standard clamp/ sil.-pltd. body
	48175	Kel-F	3/4	3/8	.207	standard clamp
	53000	nylon	3/4	3/8	.207	hooded clamp
59, 62, 140, 210	43700	Kel-F	3/4	3/8	.255	hooded clamp/ gold pltd. contact & body
	48150	Kel-F	3/4	3/8	.255	jacket clamp
	53500	nylon	3/4	3/8	.255	hooded clamp
	53525	Kel-F	3/4	3/8	.255	hooded clamp
174	45775	Kel-F	3/4	3/8	.104	crimp
174, 179, 187 188	44925	Kel-F	3/4	3/8	.126	crimp/silver-plated body
	48800	Kel-F	3/4	3/8	.119	crimp/silver-plated body
	58900	Kel-F	3/4	3/8	.119	crimp
	68700	Teflon	3/4	3/8	.126	crimp/silver-plated body
178, 196	45400	Kel-F	3/4	3/8	.091	crimp
	45875	Kel-F	3/4	3/8	.091	crimp/silver-plated body
180, 195	48875	Kel-F	3/4	3/8	.158	crimp/silver-plated body
	49600	Kel-F	3/4	3/8	.158	crimp
	47450	Kel-F	3/4	3/8	.146	crimp
	49800	Kel-F	3/4	3/8	.150	jacket clamp/ gold pltd. body

BULKHEAD RECEPTACLES

Part No.	Insulation	Terminal	Dimensions Inches Length	O.D.	Max. Panel Thickness	Notes
44875	glass-Teflon	flat & pierce	19/32	5/16	.125	hermetically sealed/ solder mtd.
45925	Kel-F	turret	11/16	5/16	.125	silver-plated body
45975	glass-Teflon	flat & pierce	29/32	7/16	.156	hermetically sealed
46000	nylon	turret	11/16	5/16	.140	nickel pltd. body
46025	Kel-F	turret	11/16	5/16	.125	—
46025-1002	Kel-F	turret	11/16	5/16	.125	gold-pltd. contact, albaloy finish outer parts
46150	Kel-F	turret	25/32	23/32	.156	angle/"b" dim. overall width
46175	nylon	turret	11/16	5/16	.140	silver-plated body
47625	Teflon	—	7/16	7/16	—	printed circuit
53475	Teflon	turret	11/16	5/16	.125	—

STRAIGHT JACKS

RG/U Cable	Part No.	Insulation	Dimensions Inches Length	O.D.	Cable Entry	Notes
55, 58, 141, 142	49825	Kel-F	15/16	5/16	.214	jacket clamp/ sil.-pltd. body
58, 141	46700	Kel-F	3/4	5/16	.203	standard clamp/ sil.-pltd. body
59, 62, 140, 210	46775	Kel-F	1 55/64	5/16	.255	hooded clamp
174, 179, 187, 188	48950	Kel-F	3/4	5/16	.119	crimp/sil.-pltd. body
180,195	48975	Kel-F	3/4	5/16	.157	crimp/sil.-pltd. body

BULKHEAD JACKS

RG/U Cable	Part No.	Insulation	Dimensions Inches Length	O.D.	Cable Entry	Notes
55, 58, 141, 142	44675	Kel-F	15/16	5/16	.214	jacket clamp
	49300	Kel-F	1 5/64	7/16	.214	jacket clamp/ sil.-pltd. body
	46200	nylon	25/32	5/16	.203	standard clamp/ sil.-pltd. body
	46300	nylon	25/32	5/16	.203	standard clamp/ split mounting
59, 62, 140, 210	46325	nylon	31/32	5/16	.255	hooded clamp/ nickel-plated contact/ split mounting
	46875	Kel-F	1 5/64	11/32	.255	jacket clamp/ sil.-pltd. body
122, 180, 195	46375	nylon	25/32	5/16	.177	standard clamp/ split mounting
174	46625	Kel-F	25/32	5/16	.104	crimp/gold-pltd. contac
178, 196	46400	nylon	37/64	5/16	.091	crimp/nickel-plated contact/split mounting
	46475	Kel-F	37/64	5/16	.091	crimp split mounting
180	49775	Kel-F	25/32	7/16	.148	crimp/gold-pltd. contac
174, 179, 187, 188	46425	nylon	25/32	5/16	.126	crimp/split mounting
	48925	Kel-F	13/16	9/32	.119	crimp/silver-plated bod capt. cont.
180, 195	48900	Kel-F	25/32	5/16	.158	crimp/silver-pltd. conta
	49700	Kel-F	27/32	7/16	.158	crimp/silver-plated bod

STRAIGHT/BULKHEAD ADAPTERS

Part No.	Insulation	Adapter Ends	Dimensions Inches Length	O.D.	Chain Length	Notes
47225	nylon	jack-jack	13/16	5/16		—
47300	glass-Teflon	jack-jack	15/16	5/16		blkh adapt./ hermetically sealed .170 max. panel thicknes

TEE ADAPTERS

47325	Kel-F	jack-plug-jack	1 1/32	3/4		—
47425	Kel-F	jack-plug-jack	1 1/32	3/4		silver-plated body

RESISTOR TERMINATED CAPS • male contacts • non-weatherproof

To order without resistor, add —1 to part number; to order with resistor, ad resistor value to part number. 1/2 watt ± 5% resistor values (ohms) stocked 47, 51, 68, 75, 82, 91, 100, 120, 130, 150, 180, 240, 270, 300, 470, 510, 560 680, 750, 820, 1000, 1500, 3900, 4700, 10000, 100000, 150000.

48600	Kel-F		1 1/32	3/8		chain-length 3 1/4 inches

MALE CAPS

48225			9/16	3/8	1 1/2	—
48250			23/32	5/8	1 1/2	shorting male contact

FEMALE CAPS

47550			1/2	3/8	1 1/2	—

BNC/TNC

BNC's are small, lightweight, quick-disconnect bayonet lock coupling connectors. MIL-Crimp BNC's are recommended as the optimum BNC, giving optimum operating performance at low installed cost. Using standard crimping tools, these units can be assembled in a fraction of the time usually required for braid-clamp type connectors by eliminating critical assembly and soldering operations and reducing the parts to handle. Captivated center contacts prevent circuit discontinuity under environmental or mechanical stress. MIL-Crimps are weatherproof; their constant 50-ohm impedance provides excellent performance through X-band frequencies.

STRAIGHT PLUGS

RG/U Cable	Part No.	UG/U No.	Insulation	Clamp Gasket	Dimensions, Inches Length	O.D.	Cable Entry	Notes
6	9350	—	Rexolite	syn. rubber	1 1/4	9/16	.348	—
8.9	6775	959	Teflon	syn. rubber	1 21/32	11/16	.437	—
55, 142, 223	31-326	M23329/ 3-02-04	Teflon	—	1 13/64	9/16	.220	MIL-Crimp ■
55, 58, 141, 142, 223	31-002‡	88	Teflon	syn. rubber	31/32	9/16	.212	—
	14525	88A	Teflon	syn. rubber	1	9/16	.212	—
	14625	—	Teflon	syn. rubber	1	9/16	.212	female contact/polarized
	31-018‡	88B	Teflon	—	31/32	9/16	.212	non-weatherproof
	31-202▲‡	88C	Teflon	sil. rubber	1 1/16	9/16	.224	improved
	31-301▲	—	Teflon	sil. rubber	1 5/32	9/16	.219	improved/captivated contact
	31-2202▲	88D	Teflon	sil. rubber	1 3/32	9/16	.224	improved/beryl. outer contact
	31-3202▲	88E	Teflon	sil. rubber	1 3/32	9/16	.224	improved/beryl. outer contact
	84800▲		Teflon	sil. rubber	1 1/16	9/16	.224	improved/captivated contact
58C	31-3301	88G						MIL-C-39012/16-0001
58, 141	31-320	M23329/ 3-01-03	Teflon	—	1 13/64	9/16	.206	MIL-Crimp ■
59, 62, 71, 140, 210	31-321	M23329/ 3-05	Teflon	—	1 13/64	9/16	.261	MIL-Crimp ■
	31-012‡	260	Rexolite	sil. rubber	31/32	9/16	.258	—
	31-021‡	260A	Rexolite	—	1	9/16	.258	non-weatherproof
	31212▲‡	260B	Teflon	sil. rubber	1 1/16	9/16	.255	improved
	31-304▲	—	Teflon	sil. rubber	1 5/32	9/16	.255	improved/captivated contact

CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

C/TNC CONTINUED

s were developed by Amphenol for aft, missile and other applications in h extreme vibration may be encoun- d. The TNC threaded coupling mech- n eliminates "rock" under vibration characteristic of bayonet coupled nectors such as BNC that introduces e into the system and causes erratic ormance. Other than coupling, TNC's dimensionally and electrically similar NC, and have a constant impedance 0 ohms.

ir rugged mechanical construction es them an excellent choice for ap- ations requiring a high degree of ation.

-C-39012A

a complete listing of BNC Standard, C MIL-Crimp, N Standard, N MIL- mp, N MIL-Clamp and SMA Connec- s to the latest revision of MIL-C- 12/A, refer to your Distributor or phenol.

CHARACTERISTICS

CTRICAL: Impedance: unimproved BNC; non-con- t; all others: 50 ohms. **Frequency range:** 0-10 **Voltage rating:** 500 volts peak. **Dielectric With- ding Voltage:** 1500 volts rms. **SWR:** improved: MIL-Crimps: 1.2 (solder), 1.3 per spec. **Other:** tact resistance: 2.1 mv; RF leakage: —55 db; ertion loss: .04 db; insulation resistance: 5000 gohms.

NVIRONMENTAL: Thermal Limits: Teflon insula- : —67° to 390°F (—55° to 199°C); Rexolite ulators: —67° to 185°F (—55° to 85°C). **Weather- of:** standards with clamp gaskets; MIL-Crimps h heat-shrink tubing. **Hermetic Seals:** pass helium k test of 2x10-⁸ cc/sec. **Shock:** MIL-Std-202 thod 202. **Vibration:** MIL-Std-202 method 204 st cond. D). **Moisture Resistance:** MIL-Std-202 thod 106. **Corrosion:** MIL-Std-202 method 101 st cond. B). **Temperature Cycling:** MIL-Std-202 thod 102 (test cond. D). **Altitude:** MIL-Std-202 thod 105 (test cond. C).

MECHANICAL: Mating: BNC: 2-stud bayonet lock; C: 7/16-28 thread cplg. **Cable Affixment (Braid or cket):** standards: screw-thread nut and braid clamp: L-crimps: hex braid crimp. **Cable Affixment (Cen- Conductor):** MIL-Crimps: 4 indent crimp or solder; hers: solder only. **Captivated Contact:** all MIL- imps; others: where specified. **Cable Retention:** andards: 20 to 50 lbs; crimps: 80 to 100 lbs.

MATERIAL: Contacts (Center): male: brass; fe- ale: beryllium copper or phosphor bronze (all MIL- imps). **Contacts (Outer):** MIL-Crimps: phosphor onze; others: brass or beryllium copper where ecified. **Other Metal Parts:** brass. **Plating:** center ntacts, MIL-Crimps: .0001" gold over .0001" cop- r; all others: .0002" silver. **Insulators:** Teflon (all imps); Rexolite; glass-Teflon (hermetically sealed). **amp Gaskets:** synthetic rubber; silicone rubber. **eat-Shrink Tubing:** MIL-Crimps: Thermofit plastic. **rimp Ferrule:** copper.

MILITARY SPECIFICATIONS: MIL-Crimps: MIL-C- 3329A; Standard BNC: MIL-C-3608.

31-320

31-002

31-334

STRAIGHT PLUGS continued

RG/U Cable	Part No.	UG/U No.	Insulation	Clamp Gasket	Dimensions, Inches Length	O.D.	Cable Entry	Notes
59, 62, 71, 140, 210	31-2212▲	260C	Teflon	sil. rubber	1 3/32	9/16	.255	improved/beryl. outer contact
	31-3212▲‡	260D	Teflon	sil. rubber	1 3/32	9/16	.255	improved/beryl. outer contact
	70000	—	Teflon	syn. rubber	1	9/16	.258	female contact/polarized
	86475▲	—	Teflon	sil. rubber	1 1/16	9/16	.257	improved/75 ohm
59, 62	31-3302	260F						MIL-C-39012/16-0002
71	31-322	—	Teflon	—	1 13/64	9/16	.275	MIL-Crimp ■
114A	17400	—	Teflon	syn. rubber	1 21/32	11/16	.437	"b" dim. is body od
122	31-324	M23329/3-06	Teflon	—	1 13/64	9/16	.175	MIL-Crimp ■
122, 180, 195,	31-323	M23329/3-07	Teflon	—	1 13/64	9/16	.175	MIL-Crimp ■
	12000	—	Teflon	syn. rubber	1	9/16	.177	
	84975	1033	Teflon	sil. rubber	1 1/16	9/16	.177	improved
122	31-3303	1033G						MIL-C-39012/16-0003
174, 179, 187, 188	31-242	—	Teflon	—	1 13/64	9/16	.115	MIL-Crimp ■
	31-315	—	Teflon	—	1 13/64	9/16	.115	MIL-Crimp ■
	69475	—	Teflon	sil. rubber	1 1/16	9/16	.116	improved
178, 196	15875	—	Teflon	syn. rubber	1	9/16	.094	—
180	16300	—	Teflon	syn. rubber	1	9/16	.150	—
	31-325	—	Teflon	—	1 13/64	9/16	.175	MIL-Crimp ■
#18, 20, 22 H.V. wire, shielded & unshielded	13925	—	Teflon	syn. rubber	1	9/16	.123	—

ANGLE PLUGS

55, 142, 223	31-334	—	Teflon	—	1 3/16	9/16	.220	MIL-Crimp ■
55, 58, 141, 142, 223	31-204	913	Teflon	sil. rubber	1 3/32	9/16	.224	
	31-2204▲	913A	Teflon	sil. rubber	1 3/32	9/16	.224	
	31-3361*	913B						
	8525	—	Teflon	syn. rubber	1 1/4	9/16	.212	MIL-C-39012/20-0001*
	38250	—	Teflon	syn. rubber	29/32	9/16	.214	
58, 141	31-335	—	Teflon	—	1 3/16	9/16	.206	MIL-Crimp ■
59, 62, 71, 140, 210	31-336	—	Teflon	—	1 3/16	9/16	.261	MIL-Crimp ■
	31-850	—	Rexolite	syn. rubber	1 1/4	9/16	.258	
	8575	—	Teflon	syn. rubber	1 1/4	9/16	.259	
	33750	—	Teflon	syn. rubber	29/32	9/16	.259	
	86225▲	—	Teflon	sil. rubber	1 1/16	9/16	.257	improved
71	31-337	—	Teflon	—	1 3/16	9/16	.275	MIL-Crimp ■
122	31-339	—	Teflon	—	1 3/16	9/16	.175	MIL-Crimp ■
122, 180, 195,	31-338	—	Teflon	—	1 3/16	9/16	.175	MIL-Crimp ■
	33775	—	Teflon	syn. rubber	1 1/4	9/16	.177	—
174, 179, 187, 188	31-243	—	Teflon	—	1 3/16	9/16	.115	MIL-Crimp ■
	31-316	—	Teflon	—	1 3/16	9/16	.115	MIL-Crimp ■
	33275	—	Teflon	sil. rubber	1 1/4	9/16	.115	—
178, 196	21975	—	Teflon	syn. rubber	1 1/4	9/16	.096	—
180	16975	—	Teflon	syn. rubber	1 1/4	9/16	.150	—
	31-340	—	Teflon	—	1 3/16	9/16	.175	MIL-Crimp ■

STRAIGHT JACKS

55, 142, 223	31-333	M23329/3-09	Teflon	—	1 25/64	9/16	.220	MIL-Crimp ■
	31-305▲	—	Teflon	sil. rubber	1 13/64	9/16	.258	improved/captivated contact
	31-2215▲	261C	Teflon	sil. rubber	1 9/64	9/16	.258	improved
59B, 62A, 71B	31-3320	261D						MIL-C-39012/17-0002
71	31-329	—	Teflon	—	1 25/64	9/16	.275	MIL-Crimp ■
122	31-331	M23329/3-13	Teflon	—	1 25/64	9/16	.175	MIL-Crimp ■
122, 180, 195	31-330	M23329/3-14	Teflon	—	1 25/64	9/16	.175	MIL-Crimp ■
	84650	1056	Teflon	sil. rubber	1 9/64	9/16	.177	improved
174, 179, 187, 188	31-244	—	Teflon	—	1 25/64	9/16	.115	MIL-Crimp ■
	31-317	—	Teflon	—	1 25/64	9/16	.115	MIL-Crimp ■
180	16925	—	Teflon	syn. rubber	1 5/64	9/16	.150	
	31-332	—	Teflon	—	1 25/64	9/16	.175	MIL-Crimp ■
55, 58, 141, 142, 223	31-005	89	Teflon	syn. rubber	1 1/8	9/16	.212	
	31-019	89A	Teflon	—	1 5/64	9/16	.212	non-weatherproof
	31-205▲	89B	Teflon	sil. rubber	1 3/64	9/16	.224	improved
	31-302▲		Teflon	sil. rubber	1 13/64	9/16	.221	improved/captivated contact
	31-2205▲	89C	Teflon	sil. rubber	1 9/64	9/16	.224	improved
55B, 58C, 223	31-3314	89D						MIL-C-39012/17-0001
58, 141	31-327	M23329/3-08	Teflon	—	1 25/64	9/16	.206	MIL-Crimp ■
59, 62, 71, 140, 210	31-328	M23329/3-12	Teflon	—	1 25/64	9/16	.261	MIL-Crimp ■
	31-015	261	Rexolite	sil. rubber	1 1/8	9/16	.258	70 ohm
	31-022	261A	Rexolite	—	1 5/64	9/16	.258	non-weatherproof/70 ohm
	31-215▲	261B	Teflon	sil. rubber	1 9/64	9/16	.258	improved

BULKHEAD JACKS (rear mtd. except where noted)

55, 142, 223	31-341	M23329/3-16	Teflon	—	1 3/8	11/16	.220	MIL-Crimp ■
55, 58, 141, 142, 223	31-206▲	909	Teflon	sil. rubber	1 1/8	11/16	.212	improved
	2475	—	Teflon	syn. rubber	1 1/16	5/8	.212	front mounting
	2575	—	Teflon	syn. rubber	1 5/64	5/8	.212	—
	31-2206▲	909A	Teflon	sil. rubber	1 9/64	11/16	.224	improved
	31-3206▲	909B	Teflon	sil. rubber	1 9/64	3/4	.224	improved
	17725▲	—	Teflon	sil. rubber	1 49/64	5/8	.219	improved/herm. sealed
55B, 58C, 223	31-3347	909C						MIL-C-39012/19-0001
58. 141	31-342	M23329/3-15	Teflon	—	1 25/64	11/16	.206	MIL-Crimp ■
59, 62, 71, 140, 210	31-343	M23329/3-19	Teflon	—	1 25/64	11/16	.261	MIL-Crimp ■
	31-207▲	910	Teflon	sil. rubber	1 1/8	11/16	.258	improved
	31-2207▲	910A	Teflon	sil. rubber	1 9/64	11/16	.258	improved
	31-3207▲	910B	Teflon	sil. rubber	1 9/64	11/16	.258	improved
	2075	624	Rexolite	syn. rubber	1 1/16	5/8	.258	front mounting
	2675	—	Rexolite	syn. rubber	1 5/64	5/8	.258	—

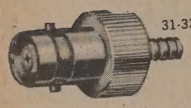
CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

BNC CONTINUED

33275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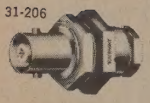
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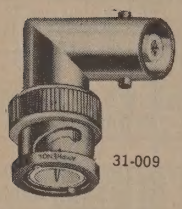
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BULKHEAD JACKS CONTINUED

RG/U Cable	Part No.	UG/U No.	Insulation	Clamp Gasket	Dimensions, Inches Length	O.D.	Cable Entry	Notes
59B, 62A, 71B	31-3348	910C						MIL-C-39012/19-0002
71	31-344	—	Teflon	—	1 25/64	11/16	.275	MIL-Crimp ■
122	31-346	M23329/3-20	Teflon	—	1 3/8	11/16	.175	MIL-Crimp ■
122, 180, 195	31-345	M23329/3-21	Teflon	—	1 3/8	11/16	.175	MIL-Crimp ■
	84725	—	Teflon	sil. rubber	1 9/64	11/16	.177	improved
174, 179, 187, 188	31-245	—	Teflon	—	1 3/8	11/16	.115	MIL-Crimp ■
	31-318	—	Teflon	—	1 3/8	11/16	.115	MIL-Crimp ■
178, 196	86850	—	Teflon	sil. rubber	1 9/64	11/16	.098	improved
	31-347	—	Teflon	—	1 3/8	11/16	.175	MIL-Crimp ■

ANGLE BULKHEAD JACKS (rear mounted)

55, 58, 141, 142, 223	14325	—	—	syn. rubber	1 11/32	31/64	.212	—
59, 62, 71, 140, 210	14225	—	—	sil. rubber	1 11/32	31/64	.258	—

PANEL JACKS (#3-56 tapped flange holes and rear mounted except as noted)

RG/U Cable	Part No.	UG/U No.	Insulation	Clamp Gasket	Dimensions, Inches Length	Flange (Sq.)	Cable Entry	Notes
8	6750	—	Teflon	syn. rubber	1 15/32	1	.438	.125 dia. flange holes
55, 58, 141, 142 223	31-001	291	Teflon	syn. rubber	1 1/8	11/16	.214	△
	31-020	291A	Teflon	—	1 5/64	11/16	.214	non-weatherproof/△
	31-201▲	291B	Teflon	sil. rubber	1 9/64	11/16	.214	improved
	31-300▲	—	Teflon	sil. rubber	1 13/64	11/16	.221	improved/captivated conta
	31-2201▲	291C	Teflon	sil. rubber	1 9/64	11/16	.221	improved
	1300	90	Teflon	syn. rubber	1 5/64	3/4	.214	.136 dia. flange holes
55B, 58C, 141A, 142B, 223	31-3333	291D						MIL-C-39012/18-0002
59, 62, 71, 140, 210	31-011	262	Rexolite	sil. rubber	1 1/8	11/16	.259	△
	31-023	262A	Rexolite	—	1 5/64	11/16	.259	non-weatherproof/△
	31-211▲	262B	Teflon	sil. rubber	1 9/64	11/16	.258	improved
	31-303▲	—	Teflon	sil. rubber	1 13/64	11/16	.258	improved/captivated conta
	31-2211▲	262C	Teflon	sil. rubber	1 9/64	11/16	.258	improved
	71000	—	Teflon	syn. rubber	1 5/64	11/16	.259	male contact/polarized/△
59B, 62A, 71B	31-3334	262D						MIL-C-39012/18-0001
122	31-3335	1055						MIL-C-39012/18-0003
122, 180, 195,	16475	—	Rexolite	syn. rubber	1 5/64	11/16	.177	△
	86400	—	Teflon	sil. rubber	1 9/64	11/16	.160	improved
174, 179, 187, 188	86425	—	Teflon	sil. rubber	1 9/64	11/16	.117	improved

■Gold-pltd. capt. cont.
▲To adapt connector for use with RG-141/142-type CUJAK cable specify accessory adapter kit 31-885.
△May be front or rear mounted.
‡Non-tarnish ASTROplate finish available. To order: add suffix 1050 to part number. Other numbers also available on special order from factory.

PANEL RECEPTACLES (#3-56 tapped flange holes except as noted)

Part No.	UG/U No.	Insulation	Dimensions Inches Length	Flange (Sq.)	Notes
31-003‡	290	Rexolite	1 1/32	11/16	
31-104	—	Polystyrene	1 5/32	3/4	.140 dia. flange holes
31-105	—	Rexolite	1 1/32	11/16	.120 dia. flange holes
31-203‡	290A	Teflon	1 1/16	11/16	improved
31-3377	290B	—	—	—	MIL-C-39012/22-0001
31-817	447	Rexolite	1 1/32	11/16	.109 dia. flange holes
31-842	—	Teflon	1 1/32	11/16	
1100	928	Rexolite	27/32	3/4	spade term.
2775	—	Teflon	1 1/16	11/16	turret terminal
3150	—	Teflon	1 1/4	3/4	male recept./.136 dia. flange holes
4500	185	Rexolite	1 5/64	3/4	turret term/.136 dia. flange holes
13550	—	Teflon	1 5/64	3/4	turret term/.136 dia. flange holes
14275	—	Rexolite	1 1/32	3/4	.136 dia. flange holes
14375	—	Rexolite	1 1/32	11/16	.136 dia. flange holes
18225	—	Teflon	25/32	11/16	printed cir./.092 dia. flange holes

STRAIGHT ADAPTERS

Part No.	UG/U No.	Insulation	Adapter Ends	Dimensions, In. Length	O.D.	Notes
31-218	491A	Teflon	plug-plug	1 1/4	9/16	improved
31-219‡	914	Teflon	jack-jack	1 9/32	7/16	improved
31-2218	491B	Teflon	plug-plug	1 1/4	9/16	improved/beryl outer cont.
8425	491	Teflon	plug-plug	1 1/4	9/16	—
21925	—	Teflon	plug-jack	1 17/32	9/16	—
75000	—	Teflon	jack-jack	1 9/32	7/16	—

ANGLE ADAPTERS

31-009	306	Teflon	jack-plug	1	9/16	—
31-209	306A	Teflon	jack-plug	1 1/16	9/16	improved/beryl outer cont.
31-2209	306B	Teflon	jack-plug	1 1/16	9/16	improved/beryl outer cont.

BULKHEAD RECEPTACLES (front mounted)

Part No.	UG/U No.	Insulation	Dimensions, Inches Length	O.D.	Max. Panel Thickness	Notes
5575‡	625	Rexolite	1 1/32	1/2	.155	□
31-236‡	625B	Teflon	1 1/16	1/2	.125	improved/□
31-3375	625C	—	—	—	—	MIL-C-39012/21-0001
31-102‡	657	Rexolite	1 19/64	37/64	.200	pressurized/□
31-239	657A	Teflon	1 19/64	37/64	.234	pressurized/□
31-238	912	glass-Teflon	1 13/64	19/32	.250	improved/herm. sealed/ lug term./□
31-2238	912A	glass-Teflon	1 13/64	19/32	.250	improved/herm. sealed/ lug term./□
31-221‡	1094	Teflon	1 1/16	1/2	.104	improved/□
31-2221	1094A	Teflon	1 3/16	1/2	.155	improved/□
31-3376	1094B	—	—	—	—	MIL-C-39012/21-0002
11300	—	Teflon	1 1/32	1/2	.155	□
11325	—	Teflon	1 1/32	1/2	.155	male contact/polarized/□
78725	—	glass-Teflon	1 7/64	19/32	.145	improved/herm. sealed/ gold plt. cont.
86250	—	glass-Teflon	1 13/32	9/16	.148	herm. seal./polarized/ plug (male) receptacle/□
87225	—	glass-Teflon	1 13/32	3/4	.323	herm. sealed/ lug terminal/□
31-016	254A	Rexolite	1 15/32	13/16	.152	pressurized/rear mtd.
31-237	911A	glass-Teflon	1 13/64	11/16	.250	improved/lug term./ herm. sealed/rear mtd.

ANGLE RECEPTACLES

31-222	1098	Teflon	29/32	19/32	.168	improved/□
31-2222	1098A	Teflon	29/32	19/32	.313	improved/□
5075	—	Teflon	1 1/16	11/16	.150	#3-56 flange holes
5675	535	Teflon	1 3/32	3/4	.150	.140 dia. flange holes

□Ground cable shield with lug P/N 31-759.

BNC CONTINUED

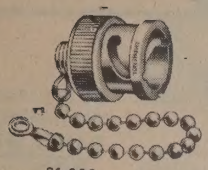
See YELLOW SECTION for Local Offices, Phones

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

BC CONTINUED

31-220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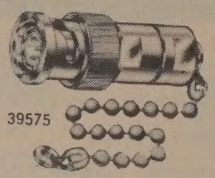
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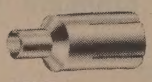
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31-759

BKHEAD & PANEL ADAPTERS

Part No.	UG/U No.	Insulation	Adapter Ends	Dimensions, Inches: Length	O.D.	Max. Panel Thickness	Notes
3 20‡	492A	glass-Teflon	jack-jack	1 13/32	11/16	.181	improved/herm seal
3 220	492B	glass-Teflon	jack-jack	1 25/64	11/16	.163	improved/herm seal/O ring
3 220	492D	glass-Teflon	jack-jack	1 17/32	11/16	.275	improved/herm seal/O ring
2	—	Teflon	jack-jack	1 13/32	11/16	.170	—
4 0	414	Teflon	jack-jack	1 9/32	11/16	.250	panel mount
4 5	414A	Teflon	jack-jack	1 9/32	11/16	.260	improved/panel mount
0 0	—	glass-Teflon	plug-plug	1 11/16	13/16	.185	hermetically sealed

E ADAPTERS

Part No.	UG/U No.	Insulation	Adapter Ends	Dimensions, Inches: Length	O.D.	Notes
008‡	274	Rexolite	jack-plug-jack	1 9/32	9/16	—
208	274A	Teflon	jack-plug-jack	1 9/32	9/16	improved/beryl outer cont.
2208	274B	Teflon	jack-plug-jack	1 9/32	9/16	improved/beryl outer cont.
5	—	Teflon	plug-plug-plug	1 13/16	9/16	—
50	—	Rexolite	jack-jack-jack	1 9/32	11/16	panel mt, mtg hole R
00	—	Teflon	plug-jack-jack	1 17/32	3/8	—
50	—	Teflon	plug-jack-plug	1 13/16	7/16	—
25	—	Teflon	cable-plug-cable	1 3/4	9/16	RG-58/U cable/syn rubber clamps

SISTOR TERMINATED CAPS

Part No.	MX No.	Insulation	Dimensions, Inches: Length	O.D.	Chain Length	Notes
• 00 □	554 (100 OHM)	Rexolite	1 1/4	9/16	3 1/2	—
575	554A	Teflon	1 1/4	9/16	3 1/2	100 ohm resistor
650 □	—	Teflon	1 1/4	9/16	3 1/2	—
725 □	—	Teflon	1 13/64	9/16	—	—
750 □	—	Rexolite	1 9/64	9/16	—	—
650	—	Teflon	1 1/2	9/16	—	51 or 75 ohm 1 watt resistor

To order without resistor, add 1 to part number; to order with resistor, add resistor value to part number. ½ watt 5% resistor values (ohms) stocked: 47, 51, 68, 75, 82, 91, 100, 120, 130, 150, 180, 240, 270, 300, 470, 510, 560, 680, 750, 820, 1000, 1500, 3900, 4700, 10000, 100000, 150000.

MALE CAPS

Part No.	CW No.	Dimensions, Inches: Length	O.D.	Chain Length	Notes
31-006	123	11/16	9/16	2 1/4	—
31-007	155	37/64	9/16	—	—
31-017	159	11/16	9/16	2 1/4	shorting male contact
31-026‡	123A	45/64	9/16	2 1/4	improved
31-027	155A	37/64	9/16	—	improved
900	—	23/32	9/16	3 1/2	—
5275	—	19/32	9/16	—	shorting male contact
87300	—	23/32	9/16	2 1/2	solder lug

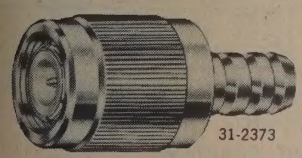
FEMALE CAPS

31-210	282	11/16	1/2	3	—
1550	—	5/8	7/16	—	shorting female contact
1750	—	25/32	9/16	—	—
2025	—	25/32	9/16	3 1/2	—
15300	—	25/32	9/16	—	shorting female contact

HOODS & ACCESSORIES

Part No.	MIL No.	Length Inches	Notes
HOODS			
10900	MX-195	7/8	RG-55, 58/U cable, square flange
10925	MX-367	7/8	RG-55, 62/U cable square flange
87175	MX-195A	13/16	RG-55, 58, 59, 62/U cables, plug-in
NUT STRAP			
1600	MT-412	3/4	4 holes with no. 4-40 NC-2B thds
SHIELD GROUNDING LUG			
31-759‡	—	29/32	used on front-mount receptacles

MIL-Crimp TNC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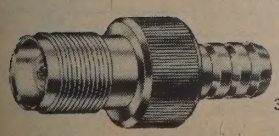
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STRAIGHT PLUGS

For RG-/U Cable	Part No.	MIL. No. M23329/	Ins.	Notes	Length
55, 142, 223	31-2373	4-02-04	T	GC	1 7/32
58, 141	31-2367	4-01-03	T	GC	1 7/32
59, 62, 140, 210	31-2368	4-05	T	GC	1 7/32
71	31-2369	—	T	GC	1 7/32
122	31-2371	—	T	GC	1 7/32
174, 188	31-2315	—	T	GC	1 7/32
179, 187	31-2242	—	T	GC	1 7/32
180, 195	31-2370	4-06	T	GC	1 7/32
Essex 21-597 or equivalent	31-2372	—	T	GC	1 7/32

ANGLE PLUGS

For RG-/U Cable	Part No.	MIL. No. M23329/	Ins.	Notes	Length
55, 142, 223	31-2381	—	T	GC	1 3/16
58, 141	31-2382	—	T	GC	1 3/16
59, 62, 140, 210	31-2383	—	T	GC	1 3/16
71	31-2384	—	T	GC	1 3/16
122	31-2386	—	T	GC	1 3/16
179, 187	31-2243	—	T	GC	1 3/16
174, 188	31-2316	—	T	GC	1 3/16
180, 195	31-2385	—	T	GC	1 3/16
Essex 21-597 or equivalent	31-2387	—	T	GC	1 3/16

STRAIGHT JACKS

55, 142, 223	31-2380	4-08	T	GC	1 3/8
58, 141	31-2374	4-07	T	GC	1 3/8
59, 62, 140, 210	31-2375	4-11	T	GC	1 3/8
71	31-2376	—	T	GC	1 3/8
122	31-2378	—	T	GC	1 3/8
179, 187	31-2244	—	T	GC	1 3/8
174, 188	31-2317	—	T	GC	1 3/8
180, 195	31-2377	4-12	T	GC	1 3/8
Essex 21-597 or equivalent	31-2379	—	T	GC	1 3/8

BULKHEAD JACKS

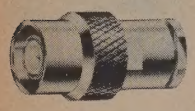
55, 142, 223	31-2388	4-14	T	GC	1 5/16
58, 141	31-2389	4-13	T	GC	1 5/16
59, 62, 140, 210	31-2390	4-17	T	GC	1 5/16
71	31-2391	—	T	GC	1 5/16
122	31-2393	—	T	GC	1 5/16
179, 187	31-2245	—	T	GC	1 5/16
174, 188	31-2318	—	T	GC	1 5/16
180, 195	31-2392	4-18	T	GC	1 5/16
Essex 21-597 or equivalent	31-2394	—	T	GC	1 5/16

TNC CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

TNC continued — Standard Type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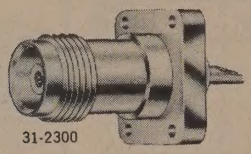
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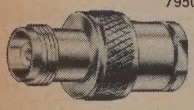
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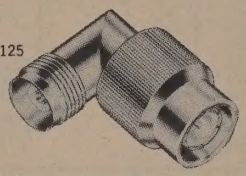

79125

50 ohm impedance • male contacts • weatherproof

STRAIGHT PLUGS

For RG-/U Cable	Part No.*	Ins.	Notes	Lgth.
55, 58, 141, 142, 223	77175	T	BOC	1⅛
	79050	T	PF, BOC	1⅛
	79875	T		1 1/16
	76175	T	GC, SW, BOC	1⅛
59, 62, 71, 140, 210	79475	T	PF, BOC	1⅛
	79525	T		1⅛
122, 180, 195	79725	T	BOC	1⅛
180	78625	T		1
	79375	T	BOC	1⅛
174, 179, 187, 188	73475	T		1 1/16

ANGLE PLUGS

55, 58, 141, 142, 223	79075	T	BOC	1⅛
	79550	T	BOC	1 3/16
59, 62, 71, 140, 210	79400	T	BOC	1 3/32

*Add—1000 to part number to order connectors with safety wiring holes.

STRAIGHT JACKS

55, 58, 141, 142, 223	79600	T	GC	1¼
59, 62, 71, 140, 210	79450	T	PM	1 9/64
180, 195	7705C	T		1 9/64

BULKHEAD JACKS

55, 58, 141, 142, 223	77425	T	GC	1 9/64
59, 62, 71, 140, 210	77350	GT	H	1 27/32
180	77100	T		1 27/32

50 ohm impedance • female contacts non-weatherproof

PANEL RECEPTACLES

Part No.	Ins.	Notes	Lgth
31-2300	T	GC	1 1/16
78200	T	GC, PM	1 1/16
79650	T	GC	1 5/32
79750	GT	GC, H	¾

BULKHEAD RECEPTACLES

31-2301	T	GC, FM	1 1/16
77300	T	GC, *FM	2 7/32
79775	T	GC, FM	2 7/32
79800	GT	H, FM	1 1/16

*Gold Plated

50 ohm impedance • non-weatherproof

ANGLE ADAPTERS

Part No.	Ins.	Adapter Ends	Lgth.
79125	T	PJ	1 1/32

BULKHEAD ADAPTERS (Hermetically Seale

79100	GT	JJ	1 13/32

TEE ADAPTERS

79700	T	JPJ	1 9/32

MALE CAPS non-weatherpro

Part No.	Lgth.
78750	⅜

FEMALE CAPS

78400	37/64

Series C

CHARACTERISTICS

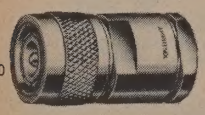
ELECTRICAL: Impedance: 50 ohm constant. **Frequency Range:** 0-10 GHz, 1,500 volt type; 0-2 GHx, 4,000 volt type. **Voltage Rating:** 1,500 volts peak—standard; 4,000 volts peak as noted. **Dielectric Withstanding Voltage:** 3,000 volts RMS, 1,500 volt type; 6,000 volts RMS, 4,000 volt type. **SWR:** 1.25.

ENVIRONMENTAL: Thermal Limits: —67° to 390°F (—55° to 199°C). **Weatherproof:** except as noted, all C Series connectors are Weatherproof. **Hermetic Seals:** pass helium leak test of $2x10^{-8}$ cc/sec. **Pressurized:** compression sea

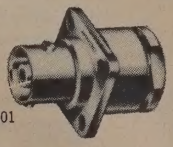
MECHANICAL: Mating: 2-stud bay net lock. **Cable Affixment:** Improved: scre thread nut and braid clamp.

MATERIAL: Contacts: male: brass; female and outer: beryllium copper. **Oth Metal Parts:** brass. **Plating:** .0002" silver min. **Insulators:** Teflon, glas Teflon (herm. sealed). **Weatherproof Gaskets:** silicone rubber.

MILITARY SPECIFICATIONS: Meet applicable sections of MIL-C-3989.


82-530

82-503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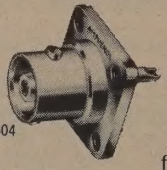
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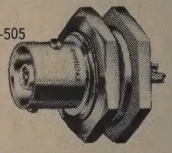
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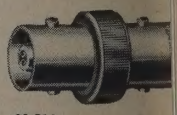

82-514

50 ohm impedance • male contacts weatherproof

STRAIGHT PLUGS

For RG-/U Cable	UG-/U No.	Part No.	Ins.	Notes	Lght.
5, 21, 143, 212, 222	626A	80025	T		1 31/64
8, 9, 87, 213, 214, 225	573A	82-530	T	AK	1 31/64
	573B	28650	T	AK	1 31/64
	628A	82-532	T	4000, AK	1¾
	—	79150	T	4000, PF	1¾
10, 12, 116, 215, 227	943A	82-538	T	AC, AK	2⅛
14, 217	707A	82-533	T		1 7/16
17, 218	708A	80075	T		2 5/32
55, 58, 141, 142, 223	709A	82-534	T		1⅜
59, 62, 71, 140, 210	—	81650	T	4000	1 9/16
	—	80375	T	4000	1 9/16
	627A	82-548	T		1 11/32
63, 114	—	80300	T		1 31/64
117, 118	711A	80200	T		2 5/32

ANGLE PLUGS

8, 9, 87, 213, 214, 225	710A	82-531	T		1⅜
55, 58, 141 142, 223	—	80775	T		1 5/16

STRAIGHT JACKS

For RG-/U Cable	UG-/U No.	Part No.	Ins.	Notes	Lght.
8, 9, 87, 213, 214, 225	572	82-503	T		1 13/32
55, 58, 141, 142, 223	—	81575	T		1¼
59, 62, 71, 140, 210	—	81550	T		1¼

BULKHEAD JACKS

8, 9, 87, 213, 214, 225	570	82-502	T	AK	1 19/32
	570A	82-614	T		1 19/32
	632	82-521	T	4000, AK	1 11/16
10, 12, 116, 215, 227	937	82-522	T		2
55, 58, 141, 142	704	81175	T		1¼
	704A	74475	T	FM	1¼
	—	81425	gT	H	1⅜
	—	81400	T		1¼
59, 62, 71, 140, 210	—	81600	T	FM, 4000	1 15/32

PANEL JACKS

8, 9, 87, 213, 214, 225	571	82-501	T	AK	1 13/32
10, 12, 116, 215, 227	938	82-523	T	AC, AK	2
	—	81275	T		2
55, 58, 141, 142	—	74675	T	FM	1¼
	—	81150	T		1¼
59, 62, 71, 140, 210	—	81100	T	FM	1¼

female contacts • 50 ohm impedance weatherproof

PANEL RECEPTACLES

UG-/U No.	Part No.	Ins.	Notes	Lgth.
568	82-504	T		1 3/32
—	82275	T		1 5/16

BULKHEAD RECEPTACLES

569	82-505	T		1 3/32
634	82-515	T	4000	1 5/16
705	82-511	GT	H	1 7/16
706	82125	T	FM	1 5/32

50 ohm impedance • weatherproof

STRAIGHT ADAPTERS

UG-/U No.	Part No.	Ins.	Adapter Ends	Notes	Lgth.
642A	83150	T	PP		1 29/64
643	82-514	T	JJ	NW	1 9/32

ANGLE ADAPTERS

567A	82-535	T	JP	NW	1¼

TEE ADAPTERS

566A	82-536	T	JPJ		1 33/64
—	83525	T	CJC	RG-13/U	2¾

BULKHEAD ADAPTERS

701	83050	GT	JJ	H,	1 9/16
—	82250	GT	JJ	H, 4000	2 1/32

SERIES C CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Series C CONTINUED

male contact • weatherproof

RESISTOR TERMINATED CAP

No.	Part No.	Notes	Length
—	83925	*	1 5/16

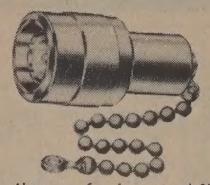
* Add resistor value (ohms) to part no. when ordering: 47, 71, 75, 82, 91, 100, 120, 130, 150, 180, 240, 270, 300, 470, 510, 560, 680, 750, 820, 1000, 1500, 3900, 4700, 10000, 150000.

MALE CAPS weatherproof

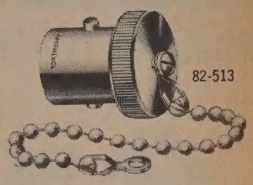
142	82-512	—	51/64
—	83675	SMC	7/8

FEMALE CAPS

143	82-513	—	27/32
—	83700	SFC	1 3/16


83925

82-512


82-513

weatherproof • improved N type

ARMOR CLAMPS

For RG-/U Cable	MX No.	Part No.	Length
10, 12, 79, 116, 215, 227	1286	82-517	1 1/8
18, 219	1441	92100	1 3/8
74, 224	1462	16850	1 3/16

HOODS non-weatherproof

MX No.	No.	Notes	Length
—	82-510	—	3/4

82-510

82-517

Series N

Medium-size, weatherproof, threaded coupling units that may be used in systems up to microwave. This series was the original microwave connector developed during World War II and SWR is consistently low across this broad frequency spectrum. Available in Regular, Improved and Improved/Captivated Contact constructions and have the MIL-Crimp/MIL-Clamp designs to MIL-C-39012. For further information, request Coaxial Connectors Catalog CC-7, or contact your distributor.

CHARACTERISTICS

ELECTRICAL: Impedance: as noted, 50 or 70 ohms. **Frequency Range:** 0-11 GHz. **Voltage Rating:** 1,500 volts peak. **Dielectric Withstanding Voltage:** 2,500 volts rms. **SWR:** MIL-Crimp/MIL-Clamp: 1-15 (solder) 1.35 per spec; others; 1.25. **Other:** contact resistance 1.0 mv, RF leakage —90db, insertion loss .15 db, insulation resistance 5,000 megohms.

ENVIRONMENTAL: Thermal Limits: Teflon: —67°F to 390°F (—55° to 199°C); Rexolite: —67°F to 185°F (—55° to 85°C). **Weatherproof:** all Series N with gasket are weatherproof. **Hermetic Seals:** pass helium leak test of 2 x 10^{-8} cc/sec. **Pressurized:** compression seal. **Shock:** MIL-Std. 202 method 202. **Vibration:** MIL-Std. 202 method 204 (test cond. B). **Moisture Resistance:** MIL-Std. 202 method 106. **Corrosion:** MIL-Std. 202 method 101 (test cond. B). **Temperature:** MIL-Std. 202 method 102 (test cond. C). **Altitude:** MIL-Std. 202 method 105 (test cond. C).

MECHANICAL: Mating: 5/8-24 threaded coupling. **Cable Affixment (Braid or Jacket):** MIL-Crimp: hex crimp; all others: screw-thread nut and braid clamp. **Cable Affixment (Center Conductor):** MIL-Crimp/MIL-Clamp: 4 indent crimp, hex crimp or solder. All others: solder. **Captivated Contact:** all MIL-Crimp/MIL-Clamp; others, where specified. **Cable Retention:** MIL-Crimp/MIL-Clamp 90-120 lbs. (70 lb. per MIL-Spec). All others 30-70 lbs.

MATERIAL: Contacts: male: brass; female: MIL-Crimp/MIL-Clamp phosphor bronze; all others: beryllium copper; Outer: MIL-Crimp/MIL-Clamp. Improved phosphor bronze, all others: brass or phosphor bronze. **Other Metal Parts:** brass. **Plating:** center contacts, MIL-Crimp/MIL-Clamp: .0001" gold over .0001" copper, all other: .0002" silver. **Insulators:** Teflon (all MIL-Crimp/MIL-Clamp) Rexolite, glass-Teflon (herm. seal). **Weatherproof Gaskets:** silicone rubber (all MIL-Clamp) synthetic rubber. **Crimp Ferrule:** copper.

MILITARY SPECIFICATIONS: MIL-Crimp/MIL-Clamp: MIL-C-39012; Standards: MIL-C-71B.

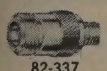
MIL-Crimp N

weatherproof • captivated center contact
50 ohms impedance • male contacts

82-340

82-349

82-343


82-337

82-346

STRAIGHT PLUGS

For RG-/U Cable	Part No.	MIL. No. M39012/	UG-/U No.	Ins.	Lgth.
5, 21, 143, 212, 222	82-341	01-0006	1680	T	1 31/64
8, 213	82-340	01-0007	1681	T	1 31/64
9, 214	82-332	01-0008	1682	T	1 31/64
11, 149	82-342	01-0013	1695	T	1 31/64
55, 142, 223	82-5370	—	—	T	1 31/64
58, 141	82-5375	—	—	T	1 31/64
59, 62, 71, 140, 210	82-5380	—	—	T	—

ANGLE PLUGS

5, 21, 143, 212, 222	82-5350	—	—	T	1 9/16
8, 213	82-349	05-0002	1707	T	1 9/16
9, 214	82-336	05-0003	1708	T	1 9/16
11, 149	82-5351	—	—	T	1 9/16
55, 142, 223	82-5374	—	—	T	1 9/16
58, 141	82-5379	—	—	T	1 9/16

female contacts

STRAIGHT JACKS

5, 21, 143, 212, 222	82-338	02-0007	1687	T	1 9/16
8, 213	82-337	02-0008	1688	T	1 9/16
9, 214	82-333	02-0009	1689	T	1 9/16
11, 149	82-339	02-0014	1694	T	1 9/16
55, 142, 223	82-5371	—	—	T	1 9/16
58, 141	82-5376	—	—	T	1 9/16

PANEL JACKS

5, 21, 143, 212, 222	82-344	02-0015	1696	T	1 9/16
8, 213	82-343	02-0016	1697	T	1 9/16
9, 214	82-334	02-0017	1698	T	1 9/16
11, 149	82-5345	—	—	T	1 9/16
55, 142, 223	82-5372	—	—	T	1 9/16
58, 141	82-5377	—	—	T	1 9/16

BULKHEAD JACKS

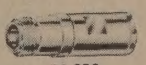
5, 21, 143, 212, 222	82-347	03-0003	1699	T	1 27/32
8, 213	82-346	03-0004	1700	T	1 27/32
9, 214	82-335	03-0005	1701	T	1 27/32
11, 149	82-348	03-0010	1706	T	1 27/32
55, 142, 223	82-5373	—	—	T	1 27/32
58, 141	82-5378	—	—	T	1 27/32

MIL-Clamp N

weatherproof • captivated center contact
50 ohm impedance • male contacts

82-357

82-360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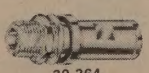

32-364

STRAIGHT PLUGS

For RG-/U Cable	Part No.	MIL. No. M39012/	UG-/U No.	Ins.	Lgth.
5, 21, 143, 212, 222	82-354	01-0001	18F	T	1 25/32
8, 9, 213, 214	82-352	01-0005	1185B	T	1 25/32
	82-352-1	01-0002	21H	T	1 25/32
11, 13, 149, 216	82-5355	—	—	T	1 25/32
55, 58, 141, 142, 223	82-5381	—	—	T	1 25/32
59, 62, 71, 140, 210	82-5386	—	—	T	1 25/32

ANGLE PLUGS

5, 21, 143, 212, 222	82-5361	—	—	T	1 1/2
8, 9, 213, 214	82-357	05-0001	594C	T	1 1/2
11, 13, 149, 216	82-5353	—	—	T	1 1/2
55, 58, 141, 142, 223	82-5385	—	—	T	1 1/2

female contacts

STRAIGHT JACKS

5, 21, 143, 212, 222	82-358	02-0001	20F	T	1 7/8
8, 9, 213, 214	82-356	02-0003	1186B	T	1 7/8
	82-356-1	02-0002	23G	T	1 7/8
11, 13, 149, 216	82-5359	—	—	T	1 7/8
55, 58, 141, 142, 223	82-5382	—	—	T	1 7/8

PANEL JACKS

5, 21, 143, 212, 222	82-362	02-0004	19F	T	1 17/32
8, 9, 213, 214	82-360	02-0006	1187B	T	1 17/32
	82-360-1	02-0005	22G	T	1 17/32
11, 13, 149, 216	82-5363	—	—	T	1 17/32
55, 58, 141, 142, 223	82-5383	—	—	T	1 17/32

BULKHEAD JACKS

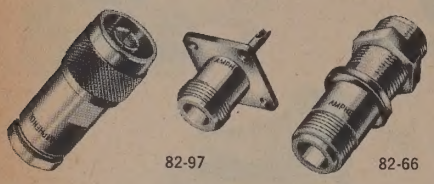
5, 21, 143, 212, 222	82-366	03-0001	159D	T	1 51/64
8, 9, 213, 214	82-364	03-0002	160E	T	1 51/64
11, 13, 149, 216	82-5365	—	—	T	1 51/64
55, 58, 141, 142, 223	82-5384	—	—	T	1 51/64

SERIES N CONTINUED

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

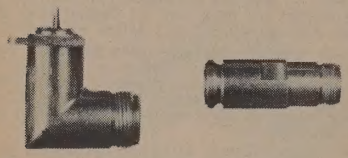
Standard Type N



82-97 82-66

82-86

82-106 13675



male contacts • weatherproof

STRAIGHT PLUGS

For RG-/U Cable	UG-/U No.	Part No.	Imp. Ohms.	Ins.	Notes	Lgth.
5, 21, 143 212, 222	18	3400	50	R	NW	2
	18B	82-86	50	T		1⅞
	18C	82-203	50	T	I	1½
	18D	82-3203	50	T	I, SW	1½
6	91A	7200	70	T		1¾
8, 9, 213, 214	21	3900	50	R		2
8, 9, 87, 213, 214, 225	21B	82-61	50	T	AK	1⅞
	21C	82-96	50	T	AK	1⅞
	21D	82-202	50	T	I, SW, AK	1½
	21E	82-3202	50	T	I, SW, AK	1½
	1185	82-312	50	T	I, CC, AK	1½
	1185A	82-3312	50	T	I, CC, AK	1½
10, 12, 116, 215, 227	941A	82-204	50	T	I, AC, AK	2⅛
	941B	82-3204	50	T	I, AC, AK	2⅛
11, 13. 149, 216	94A	82-84	70	T	AK	1⅞
	—	91150	75	T	I	1½
14, 217	204A	82-105	50	R		2
	204C	82-214	50	T	I	1 21/32
17, 218	167A	82-104	50	T		2⅜
	167D	82-215	50	T	I, SW	2⅛
	167F	82-3215	50	T	I, SW	2⅛
18, 219	982	92125	50	T	I	3
55, 58, 141, 142	188	23250	50	R	NW	1¾
	536	34000	50	R		2⅛
	536B	24025	50	T	I	1⅜
35	—	82-113	70	T		2⅜
59, 62, 71, 140, 210	603	34500	50	R		1 25/32
	603A	34525	50	T	I	1⅜
	—	34750	70	T	I	1⅝
	—	91300	70	T	I	1⅜
63, 114	1003	12400	50	T		1¾

ANGLE PLUGS

5, 21, 143, 212, 222	—	15950	50	T	I	1⅜
8, 9, 87, 213, 214, 225	594A	15425	50	T		1 7/16
	—	82-326	50	T	I, CC	1 19/64
	—	82-835	50	T		1 7/16
	—	6875	50	T		1⅝
	—	15975	50	T	I	1 9/32
11, 13, 149, 216	—	17025	70	T		1⅝

ANGLE PLUGS CONTINUED

For RG-/U Cable	UG-/U No.	Part No.	Imp. Ohms.	Ins.	Notes	Lgth.
55, 58, 141, 142	—	18750	50	T		1⅝
59, 62, 71, 140, 210	—	19250	50	T		1⅝

female contacts • weatherproof

STRAIGHT JACKS

5, 21, 143, 212, 222	20	42000	50	R		2
	20B	82-88	50	T		1 15/16
	20C	82-210	50	T	I	1 9/16
	20D	82-3210	50	T	I	1 9/16
6	92A	7700	70	T		1⅞
	—	91225	75	T	I	1 9/16
8, 9, 213, 214	23	48000	50	R	NW	2
8, 9, 87, 213, 214, 225	23A	7600	50	R		1⅞
	23B	82-63	50	T		1 15/16
	23C	82-94	50	T	I	1 13/16
	23D	82-209	50	T	I	1 9/16
	23E	82-3209	50	T	I	1 9/16
	1186	82-313	50	T	I, CC	1 9/16
10, 12, 116, 215, 227	940A	82-212	50	T	I, AC	2¼
	940B	82-3212	50	T	I, AC	2¼
11, 13, 149, 216	95A	82-89	70	T		1 15/16
17	—	14850	50	T		2 9/16
55, 58, 141 142	—	35000	50	R		1 13/16
	—	35025	50	T	I	1½
59, 62, 71, 140, 210	602	36500	50	R		1⅝

PANEL JACKS

5, 21, 143, 212, 222	19	3500	50	R		2
	19B	82-87	50	T		1 13/16
	19C	82-207	50	T		1 9/16
	19D	82-3207	50	T	I	1 9/16
6	93A	7800	70	T		1⅞
8, 9, 87, 213, 214, 225	22B	82-62	50	T		1 13/16
	22C	82-95	50	T		1 13/16
	22D	82-208	50	T		1 9/16
	22E		50	T	I	1 9/16
	1187	82-314	50	T	I, CC	1 9/16
10, 12, 116, 215, 227	935A	82-211	50	T	I	2¼
	935B	82-3211	50	T	I	2¼
11, 13, 149, 216	96A	82-90	70	T		1 13/16
55, 58, 141, 142	1052	36000	50	R		1 13/16
55, 58, 141, 142, 223	1095A	36250	50	T	I	1½
59, 62, 71, 140, 210	593	35500	50	R		1 13/16
	—	35550	70	T		1 13/16
	—	91250	70	T	I	1½

BULKHEAD JACKS

5, 21, 143, 212, 222	159B	15550	50	T	I	1¾
8, 9, 87, 213, 214, 225	160A	82-67	50	T		1 13/16
	160B	82-93	50	T		1 13/16
	160D	91025	50	T	I	1¾
8, 9, 213, 214	—	23025	50	gT	H	2 5/32
55, 58, 141, 142	556	35250	50	T		1 13/16
55, 58, 141, 142, 223	556B	35275	50	T	I	1 43/64
59, 62, 71, 140, 210	—	18250	50	R		1 27/32

male • male contact • weatherproof

PANEL RECEPTACLES

UG-/U No.	Part No.	Imp. Ohms	Ins.	Notes	Lgth.
—	49000	50	R	FM	1 3/32

PANEL RECEPTACLES CONTINUED

female • female contacts • weatherproof

UG-/U No.	Part No.	Imp. Ohms	Ins.	Notes	Lgth.
58	82-24	50	T		[illegible]
58A	82-97	50	T		[illegible]
58B	82-368	50	T	M39012/ 04-0002	[illegible]
231	2750	50	R	RG-58/U	[illegible]
—	82-112	70	T		[illegible]
—	9575	50	T		[illegible]

BULKHEAD RECEPTACLES

680	82-811	50	GT	H, FM	[illegible]
680B	82-369	50	G	M39012/ 04-0001	[illegible]
—	13275	50	gT	H, FM	[illegible]
—	31150	50	T	W, FM	[illegible]
—	19550	50	GT	H, FM	[illegible]

ANGLE RECEPTACLES

997A	8975	50	T		[illegible]
—	23775	50	T		[illegible]

weatherproof

STRAIGHT ADAPTERS

UG-/U No.	Part No.	Imp. Ohms.	Ins.	Notes	Adapter Ends	L
29	15000	50	R		JJ	[illegible]
29A	82-65	50	T		JJ	[illegible]
29B	82-101	50	T		JJ	[illegible]
57A	45250	50	T		PP	[illegible]
57B	82-100	50	T		PP	[illegible]
—	17075	70	T		PP	[illegible]
—	21650	70	T		JJ	[illegible]

ANGLE ADAPTERS

27A	82-64	50	T		JP	[illegible]
27B	82-98	50	T		JP	[illegible]
27C	82-213	50	T		JP	[illegible]

BULKHEAD ADAPTERS

30	82-66	50	R	P	JJ	[illegible]
30C	82-201	50	G	H	JJ	[illegible]
30D	91100	50	G	H	JJ	[illegible]
—	82-849	50	T	P	JJ	[illegible]
—	90950	50	G	H	JJ	[illegible]

TEE ADAPTERS

28A	82-99	50	T		JJJ	[illegible]
107	4800	50	R		JPJ	3
107A	82-36	50	T		JPJ	2
107B	82-102	50	T		JPJ	[illegible]
—	4850	50	R		PPP	[illegible]

CROSS ADAPTERS

—	17125	50	T		JJJJ	[illegible]

weatherproof

MALE CAPS

MX No.	Part No.	Notes	Length
913	82-106		[illegible]
—	9225		[illegible]
—	13700	SMC	[illegible]
—	18575		[illegible]

FEMALE CAPS

—	6950		[illegible]
—	13675	SFC	1

non-weatherproof

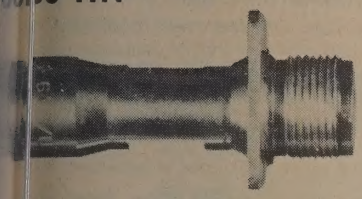
ARMOR CLAMPS

For RG-/U Cable	MX No.	Part No.	Notes	Lgth
10, 12, 79, 116, 215, 227	564	82-48	N or HN	⅞
	564A	82-109	N or HN	1 1/16
	1286	82-517	I	1⅛
18, 219	1441	92100	I	1⅜
74, 224	1462	16850	I, W	1 3/16

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Series HN



Amphenol HN Series are constant 50 ohm impedance connectors designed for high voltage applications. Connectors are weatherproof and are available in Regular, Improved and Improved/Captivated Contact constructions.

Amphenol's patented Captivated Contact Design prevents possible contact recession under temperature extremes. Contacts are fixed within the connector body by front and rear contact insulators that butt against metal body parts.

CHARACTERISTICS, TYPICAL

ELECTRICAL: Frequency range: 0 — 4GHz. **Voltage rating:** 1,500 volts peak; **dielectric withstanding voltage:** 5,000 volts rms. **SWR:** 1.3.

ENVIRONMENTAL: Thermal limits: Teflon insulation: —67° to 390° (—55° to 199°C); Rexolite insulation: —67° to 185°F (—55° to 85°C). **Weatherproof:** all HN Series are weatherproof. **Hermetic seals:** pass helium lead test of 2×10^{-8} cc/sec. **Pressurized:** Compression seal.

MECHANICAL: Mating: ¾ —20 threaded coupling. **Cable affixment:** screw-thread nut and braid clamp.

MATERIALS: Contacts: male: brass; female: beryllium copper; **body:** brass; **other metal parts:** brass. **Plating:** .0002" silver min. **Insulators:** Teflon, Rexolite, glass-Teflon (hermetic seal). **Weatherproofing gaskets:** synthetic rubber; silicone rubber.

MILITARY SPECIFICATIONS: HN Connectors meet applicable sections of MIL-C-3643.

STRAIGHT JACKS

RG/U Cable	Part No.	UG/U No.	Insulation	Clamp Gasket	Dimensions, Inches Length	O.D.	Diam.	Notes
8, 9, 87, 213, 214, 225	82-39	60A△	Rexolite	syn. rubber	2½	1 3/16	.444	—
	82-814	60B△	Teflon	sil. rubber	2½	11/16	.444	modified cable clamp
	82-321	1214△	Teflon	sil. rubber	2⅞	11/16	.444	improved/captivated contact
10, 12, 116, 215, 227	33250	927	Teflon	sil. rubber	3	¾	—	armor clamp
17, 218	82-107	333A	Rexolite	syn. rubber	2 7/16	1 5/16	.900	modified cable clamp
	44025	333B	Teflon	sil. rubber	2½	1 5/16	.900	improved
18	82-56	333	Rexolite	syn. rubber	2¾	1⅜	.900	armor clamp
	82-175	—	Teflon	nat. rubber	2½	¾	.333	82-887 kit clamping

PANEL JACKS

8, 9, 87, 213, 214, 225	82-40	61A△	Rexolite	syn. rubber	2½	1 3/16	.444	—
	11150	61C△	Teflon	sil. rubber	2 5/16	1 3/16	.444	improved
	82-815	61B△	Teflon	sil. rubber	2½	1 3/16	.444	modified cable clamp
	82-324	1215△	Teflon	sil. rubber	2 15/16	1 3/16	.444	improved/captivated contact
17	82-108	334A	Rexolite	syn. rubber	2 7/16	1 5/16	.960	modified cable clamp
18	82-57	334	Rexolite	syn. rubber	2¾	2	.984	armor clamp/.257 dia. flange holes

△ Amphenol adapter kit 82-887 will adapt connector for use with ALJAK/CUJAK metal jacketed cables.

STRAIGHT PLUGS

8, 9, 87, 213 214, 225	82-38	59A△	Rexolite	syn. rubber	2⅜	⅞	.444	—
	82-804	59B△	Teflon	sil. rubber	2⅜	⅞	.444	modified cable clamp
	82-320	1213△	Teflon	sil. rubber	2¾	⅞	.444	improved/captivated contact
	17900	59D△	Teflon	sil. rubber	2 7/32	⅞	.444	improved/beryl. outer contact
10, 12, 116, 215, 227	9375	925	Teflon	sil. rubber	2 49/64	27/32	.511	armor clamp
14, 217	8125	494	Rexolite	sil. rubber	2	1	.562	—
17, 218	82-111	495A	Rexolite	syn. rubber	2 11/16	1 5/16	.900	—
	82-325	—	Rexolite	syn. rubber	2 11/16	1 5/16	.900	captivated contact
	30350	495D	Teflon	sil. rubber	2 13/32	1 5/16	.900	improved/beryl. outer contact
54A	82-816	—	Teflon	sil. rubber	1 13/16	⅞	.257	—
55, 58, 141 142	16750	—	Teflon	syn. rubber	1 13/16	27/32	.214	—

ANGLE PLUGS

RG/U Cable	Part No.	Insulation	Cable Clamp	Dimensions, Inches Length	O.D.	Cable Diam.	Notes
8, 9, 87, 213, 214, 225	82-833	Rexolite	sil. rubber	1½	⅞	.444	—
	82-856	Teflon	sil. rubber	1½	⅞	.444	—
55, 58, 141 142	19625	Teflon	syn. rubber	1⅜	⅞	.214	1500 VRMS

PANEL RECEPTACLES

Part No.	UG/U No.	Insulation	Dimensions, Inches Length	O.D.	Max. Panel Thickness
82-92	496	Rexolite	1 17/32	1 3/16	—
82-805	560	Teflon	1⅞	1 3/16	—
11750	—	Teflon	1½	1 3/16	—

female contacts • hermetically sealed

BULKHEAD RECEPTACLES

82-836	—	glass-Teflon	1¾	1 3/16	.187
82-843	—	glass-Teflon	1 49/64	1¼	.187

both ends • weatherproof • 50 ohm impedance

STRAIGHT ADAPTER

15800	—	Teflon	2⅛	⅞	—

ANGLE ADAPTERS

Part No.	UG/U No.	Insulation	Adapter Ends	Dimensions, Inches Length	O.D.	Notes
82-91	212A	Rexolite	jack-plug	1 15/32	⅞	—
82-115	212C	Teflon	jack-plug	1 15/32	⅞	beryl. outer contact
11100	212B	Teflon	jack-plug	1 7/16	⅞	modified const.

BULKHEAD ADAPTER

Part No.	UG/U No.	Insulation	Dimensions, Inches Length	O.D.	Max. Panel Thickness
11050	1019	Teflon	1 31/32	1	.343

TEE ADAPTERS

Part No.	UG/U No.	Insulation	Length In Inches
9950	413	Rexolite	1 15/16
11950	—	Teflon	1 15/16

ARMOR CLAMPS

RG/U Cable	Part No.	MX No.	Dimensions, Inches Length	O.D.	Cable Entry	Notes
10, 12, 79, 116, 215, 227	82-48	564	⅞	11/16	.470	use with regular const.
	82-109	564A	1 1/16	11/16	.511	use with regular const.
	82-517	1286	1⅛	¾	.511	use with improved connectors
18, 219	92100	1441	1⅜	1 5/16	.963	use with improved connectors
74, 224	16850	1462	1 3/16	⅞	.625	use with improved connectors

male contact • weatherproof • ½ watt ± 5% resistor • 48 ohms impedance

RESISTOR TERMINATED CAP

Part No.	DA No.	Insulation	Dimensions, Inches Length	O.D.	Chain Length
9550	12A	Rexolite	1¼	27/32	2¼

MALE CAPS • weatherproof

Part No.	Dimensions, Inches Length	O.D.	Chain Length	Notes
82-130	19/32	⅞	2 9/16	—
9900	7/16	⅞	—	cap only
10250	7/16	⅞	2¼	—

FEMALE CAPS

13650	29/32	⅞	4	—

RF COAXIAL CONNECTORS

AMPHENOL
THE BUNKER-RAMO CORPORATION

Series UHF

Series UHF are low-cost, general purpose connectors for use in a wide variety of lower frequency applications (up to 300 mc) where constant impedance is not necessarily required. Available in small and large body sizes, they have a peak voltage rating of 500 volts.

While most UHF connectors have conventional solder-type cable affixment, Quick-Crimp UHF feature Amphenol's patented hex crimp design which permits faster, easier and more reliable assembly.

The 83-850 and 83-851 plugs eliminate one or both of two common soldering operations in assembly. The 83-850 has completely solderless braid and contact assembly; the 83-851 has solderless braid assembly.

CHARACTERISTICS

ELECTRICAL: Impedance: non-constant. **Frequency range:** 0-300 MHz. **Voltage rating:** 500v. peak.

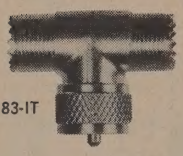
ENVIRONMENTAL: Thermal limits: Teflon: —67°F to 390°F; Rexolite and polystyrene: —67°F to 185°F; mica-filled Bakelite: —67°F to 300°F. **Non-weatherproof,** except as noted.

MECHANICAL: Mating: 5/8-24 thrd. coupling (small body), 1-20 thrd. coupling (large body). **Cable affixment:** braid solder, Quick Crimp or Solderless.

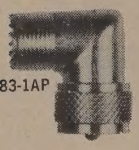
MATERIAL: Contacts: male: brass; female: beryllium copper. **Bodies:** die cast zinc or brass. **Plating:** .0002" silver min. **Insulators:** Teflon, Rexolite, polystyrene or mica-filled Bakelite.

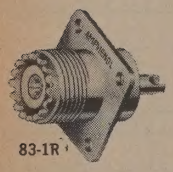
OTHER DATA: small and large body types do not intermate. UHF connectors ordered will be small size body unless large is specified.

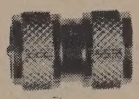
83-ISP


83-IT

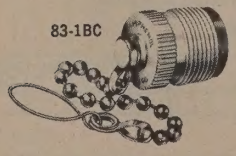
83-1J


83-1AP


83-1R


83-877

83-1AC


83-1BC

58000

non-constant impedance • male contacts
non-weatherproof
small body, except as noted

STRAIGHT PLUGS

For RG-/U Cable	MIL No.	Part No.	Ins.	Notes	Lgth.
8, 9, 11, 13,	PL-259	83-822 †	T		1½
63, 87, 149,	PL-259	83-ISP †	FB		1½
213, 214, 216,	PL-259A	83-756	T		1 9/16
225	PL-259A	83-ISPN †	FB		1 9/16
	—	83-ISP-1002	FB		1½
	—	83-851	FB	SBC	1 43/64
8, 11, 149, 213	—	83-87	B	QC	1 23/32
11, 149	—	83-850	FB	SC, SBC	1 43/64
17, 218	—	83-86	T		2⅛
	—	10450	R		2⅛
34	UG-358/U	83-21SP	FB	LB, W	1 13/16
55, 142, 223	—	83-90	B	QC	1 23/32
58, 141	UG-203/U	83-776	FB		1 9/16
	—	83-89	B	QC	1 23/32
59, 62, 71,	UG-111/U	83-750	FB		1 11/16
140, 210	—	83-88	B	QC	1 23/32

small body

ANGLE PLUGS

For RG-/U Cable	MIL No.	Part No.	Ins.	Notes	Lgth.
8, 9,11 13, 63	—	83-67	T		1⅜
87, 149, 213, 214, 216, 225	—	83-59	PST		1⅜

non-constant impedance
female contact • non-weatherproof
small body, except as noted

PANEL RECEPTACLES

MIL No.	Part No.	Ins.	Notes	Lgth.
SO-239	83-1R†	FB		1 1/16
SO-239A	83-798	T		1 1/16
UG-357/U	83-21R	FB	LB	1 3/64
—	83-716	C	P	1 3/16
—	83-876	B	—	1 1/16
—	83-878†	—	Single Hole	—

small body

BULKHEAD RECEPTACLES

UG-266/U	4575	R	P	1 13/32
—	83-875	R, T	FM	1 3/32
—	74525	GT	H, RM	1 13/32
—	83-875-1002	RT	FM	1 3/32

non-constant impedance • non-weatherproof
small body, except as noted
adapter ends are Jack-Jack

STRAIGHT ADAPTERS

UG-/U No.	Part No.	Ins.	Notes	Lgth
224	29500	R		1¾
PL-258	83-1J†	PST		1⅛
360	83-21J	PST	LB	1⅛
363	83-1F†	PST		2
—	11850	T		1⅛
—	13725	T		1⅜
—	A3877†	—	Double Male	—

small body

ANGLE ADAPTERS

MIL No.	Part No.	Ins.	Adapter Ends	Lgth.
M-359A	83-58	PST	JP	1 27/32
UG-646/U	83-1AP†	PST	PJ	1 3/32

small body

TEE ADAPTERS

M-358	83-1T	PST	JPJ	1⅝

small body

REDUCING ADAPTERS

For RG-/U Cable	UG-/U No.	Part No.	Length
55, 58, 141, 142	175	83-185†	1
59, 62, 71, 140, 210	176	83-168†	1

non-weatherproof • small body

HOODS

For RG-/U Cable	MIL No.	Part No.	Lgth.
8, 9, 10, 11, 12,	MX-543	5475	1
63, 79, 87, 115,	UG-106/U	83-1H	¾
149, 213, 215	UG-372/U	83-1HP	⅞
58, 141	UG-177/U	83-765	¾
55, 59, 140, 142, 223	MX-539	5375	1

weatherproof • small body

MALE CAPS

Part No.	Length
83-1AC	15/32

FEMALE CAPS

83-1BC	11/16

non-weatherproof • male contact

BINDING POST

UG-/U No.	Part No.	Ins.	Length
332	58000	R	1⅞

† Non-tarnish ASTROplate finish available. To order: add suffix 1050 to part number. Other numbers also available on special order from factory.

RF COAXIAL CONNECTORS/ADAPTERS

AMPHENOL
THE BUNKER-RAMO CORPORATION

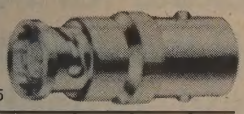
tween Series Adapters

RACTERISTICS

TRICAL: Impedance: non-constant. **Frequency:** per used. **Voltage:** per cable used.
VIRONMENTAL: Thermal Limits: Teflon: —67°F to F; Rexolite: —67°F to 185°F; Kel-F: —67° to F; mica-filled; Bakelite: —67°F to 300°F; polyene: —67°F to 185°F. **Weatherproof:** except as noted. **Hermetic Seals:** pass helium leakage test of 2×10^{-8} cc/sec.

MECHANICAL: Mating: per series.
MATERIAL: Contacts: male: brass; female: beryllium copper. **Other Metal Parts:** brass. **Plating:** .0002" silver min. **Insulators:** Teflon, Rexolite, Kel-F, mica-filled Bakelite, polyethylene or glass-Teflon.

C TO C
herproof


83175

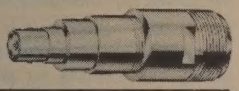
U	Part No.	Ins.	Imp. Ohms/Notes	BNC	C	Lgth.
	83175	T	50	Plug	Jack	1 5/32
	83200	T	50	Jack	Plug	1 15/64

C TO N
therproof

31-217

U	Part No.	Ins.	Imp. Ohms/Notes	BNC	N	Lgth.
	31-830	T	—	Jack	Plug	1 15/32
A	31-216	T	—/I	Jack	Plug	1 5/16
	3025	T-R	50	Plug	Jack	1 3/4
	2975	T-R	50	Plug	Jack	1 3/4
A	31-217	T	—/I	Plug	Jack	1 7/16
4	5225	T	50	Plug	Plug	1 1/2
	2800	T	50/AN	Jack	Jack	1 7/16
	4250	T	70	Jack	Plug	1 9/16
	4900	T	50	Plug	Plug	1 1/2
	5850	T-R	50/P	Jack	Jack	1 27/32
	21850	T	50	Jack	Jack	1 1/2
	93075	GT	—/H	Jack	Jack	1 11/16

TO LC
atherproof


82350

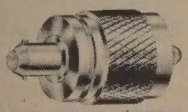
/U o.	Part No.	Ins.	Imp. Ohms/Notes	C	LC	Lgth.
	82350	T	—	Jack	Jack	3 29/64

TO N
atherproof

82-508

-/U o.	Part No.	Ins.	Imp. Ohms/Notes	C	N	Lgth.
4	82-508	T	50	Jack	Plug	1 3/8
5A	82-540	T	50	Plug	Jack	1 17/32
	83875	T	50/AN	Jack	Plug	1 9/32

B TO UHF
on-weatherproof


47400

G-/U o.	Part No.	Ins.	Imp. Ohms/Notes	MB	UHF	Lgth.
	47400	T	—	Jack	Plug	1 11/32

HV TO UHF weatherproof

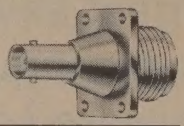
G-/U o.	Part No.	Ins.	Imp. Ohms/Notes	MHV	UHF	Lgth.
—	28050	T	—	Jack	Plug	1 9/32
—	28075	T	—	Plug	Jack	1 3/8

BNC TO SUBMINAX 27
non-weatherproof

27-29

Part No.	Ins.	Imp. Ohms/ Notes	Mates With Sub. 27 Plug	Used In BNC UG-/U	Lgth.
27-28	T	50	50 ohm, Screw-On	88	1 5/16
27-29	T	50	50 ohm, Push-On	88	1 5/16
27-40	T	50/GC	50 ohm, Screw-on	89, 291	1 5/16
27-41	T	75	75 ohm, Push-On	260B	1 1/4
27-42	T	75	75 ohm, Screw-On	261B, 262B	1.355
27-805	T	75	75 ohm, Screw-On	260B	1 17/64

BNC TO HN
weatherproof



UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	BNC	HN	Lgth.
309	8900	T	50	Jack	Plug	1 1/2
559	17750	R	50/AN	Plug	Jack	1 1/2
—	32750	T-R	—	Plug	Jack	1 3/8
—	35050	T	50	Jack	Jack	1 3/8

BNC TO SM non-weatherproof

UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	BNC	SM	Lgth.
691	89250	GT	—/H	Jack	Jack	1 1/8

BNC TO UHF non-weatherproof

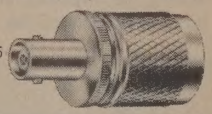
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	BNC	UHF	Lgth.
255	2900	R	50	Plug	Jack	1 5/16
273	31-028	R	—	Jack	Plug	1 3/16
—	2925	T	50	Plug	Jack	1 5/16
—	12025	T	50	Jack	Plug	1 9/32

C TO MB
weatherproof

83950

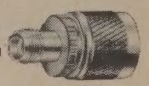
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	C	MB	Lgth.
—	83950	gT	—/H	Jack	Jack	1 7/32

HN TO MHV
weatherproof


20625

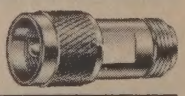
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	HN	MHV	Lgth.
—	20625	T	50	Plug	Jack	1 1/2

N TO TNC
non-weatherproof


78800

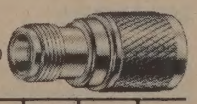
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	N	TNC	Lgth.
—	78800	T	50	Plug	Jack	1 5/16
—	78825	T	50	Jack	Jack	1 25/64
—	78875	T	50/W	Plug	Plug	1 9/32
—	79825	T	50	Jack	Plug	1 21/32
—	79850	T	50/W	Plug	Plug	1 9/32

N TO UHF
weatherproof


34125

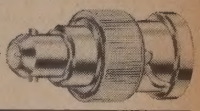
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	N	UHF	Lgth.
83	14000	T-R	—	Jack	Plug	1 9/16
83B	34125	T	—	Jack	Plug	1 13/16
146	4400	R	—/NW	Plug	Jack	1 13/32
318	26700	R	—	Plug	Plug	1 47/64
—	14650	T	—/NW	Plug	Jack	1 13/32

HN TO N
weatherproof


16050

UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	HN	N	Lgth.
—	16050	T	50	Plug	Jack	1 9/16
—	16075	T	50	Jack	Plug	1 9/16
—	16100	T-R	50	Jack	Jack	1 49/64

BNC TO MB
weatherproof


47275

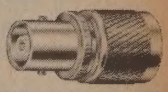
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	BNC	MB	Lgth.
—	33200	T-K	50	Jack	Jack	1 5/32
—	47200	GT	50/H	Jack	Jack	1 1/8
—	47250	T-K	50	Jack	Plug	15/16
—	47275	T-K	50	Plug	Jack	1

BNC TO TNC
non-weatherproof

76400

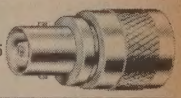
UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	BNC	TNC	Lgth.
—	76400	T	50	Jack	Jack	1 9/32
—	79025	T	50	Plug	Jack	1 1/4
—	79675	T	50	Jack	Plug	1 1/4

C TO HN
non-weatherproof


83350

UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	C	HN	Lgth.
702	83350	T	—	Jack	Plug	1 1/2
703A	83400	T	—	Plug	Jack	1 1/2

C TO UHF
non-weatherproof


83225

UG-/U No.	Part No.	Ins.	Imp. Ohms/Notes	C	UHF	Lgth.
637	83225	T	—	Jack	Plug	1 3/8

Precision Adapters For APC-7

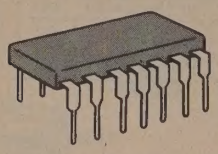
	Part No.	Maximum SWR For a Single Adapter	Dimensions, Inches Lgth.	O.D.
APC-7 TO N				
female	131-1025	1.03 @ 4 GHz	1 43/64	13/16
male	131-1035	1.04 @ 9 GHz 1.08 @ 18 GHz	1 13/16	13/16
APC-7 TO BNC				
female	131-1027	1.035@ 4 GHz	1 39/64	13/16
male	131-1037	1.045@ 9 GHz 1.08 @ 12 GHz 1.12 @ 18 GHz	1 23/32	13/16
APC-7 TO TNC				
female	131-1026	same as BNC	1 39/64	13/16
male	131-1036		1 3/4	13/16
APC-7 TO SMA				
female	131-1028	1.07 @12.4 GHz	1 11/32	13/16
male	131-1038	1.15 @ 18 GHz	1 3/8	13/16
APC-7 TO GR				
874	131-1022 or GR874-QAP7L‡	1.04 @4 GHz 1.06 @9 GHz	2 1/16	1
900	131-1023 or GR900-QAP7‡	1.011@4 GHz 1.021@8.5 GHz	2 9/16	1 1/16

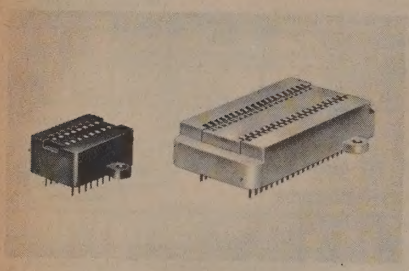
‡ Available from General Radio and Amphenol.

Vol. 3 PASSIVE COMPONENTS MATERIALS/HARDWARE

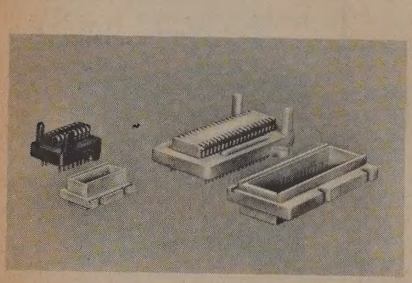
SOCKET SOLUTIONS ...PLUS!

BARNES has the largest selection of sockets for I.C., MSI, LSI and Transistors in the industry... PLUS the world's most complete line of carriers / contactors and breadboards!

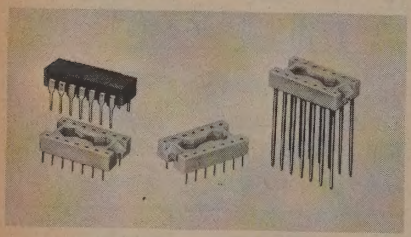




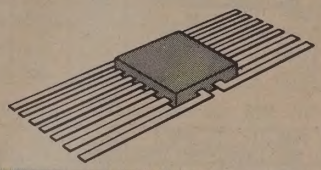
DIP SOCKETS . . .
For testing, aging, burn-in and breadboarding. Features easy loading, long, reliable life with no lead deformation.

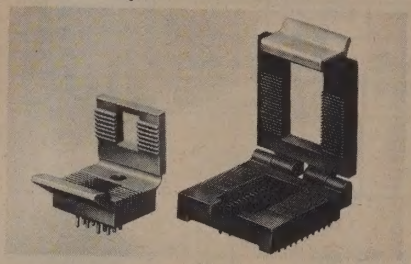


DIP CARRIERS/CONTACTORS . . .
For device protection during shipment, testing and manual or automatic handling. Provides uniform geometry and polarization protection for all package sizes and types.

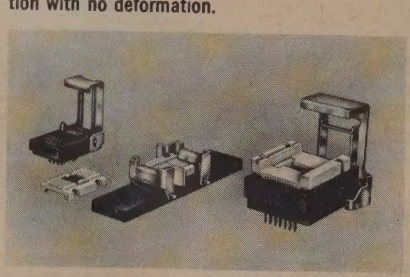


DIP PRODUCTION SOCKETS . . .
For high density production mounting of I.C.'s. Features low body profile, available in wire-wrap or solder tab terminals, temperatures to 150°C.

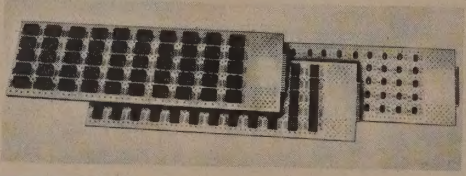




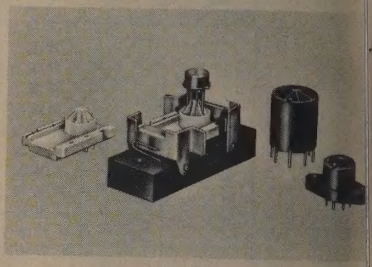
FLAT PACK SOCKETS . . .
For testing, aging, burn-in, breadboarding and production mounting. Features fast, one-hand loading and unloading, and positive lead separation with no deformation.



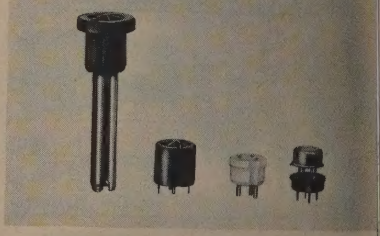
FLAT PACK CARRIERS/CONTACTORS . . .
For device protection during shipment, testing and manual or automatic handling. Provides uniform geometry and polarization protection for all package sizes and types.



BREADBOARDS . . .
For high temperature circuit design, environmental testing, aging and burn-in for Dual-in-Line, Flat Pack and TO style I.C. packages. Available with 5 to 75 device positions per board with card receptacle edge connector.



TO SOCKETS, CARRIERS/CONTACTORS . .
For testing, aging, burn-in and breadboard g . . . and for device protection during shipme , testing and handling for all sizes and pin c figurations.



TRANSISTOR SOCKETS . . .
For testing, aging, burn-in, breadboarding a production mounting. Features easy insertio excellent electrical characteristics and low profi for high density production mounting, as well wide temperature range capability.

For more information about socket sol tions plus the world's most complete line carriers, contactors and breadboards, writ for a comprehensive BARNES catalog.

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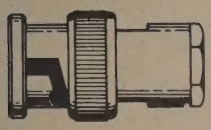
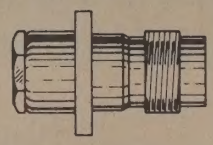
Broadest line of RF CONNECTORS on the market



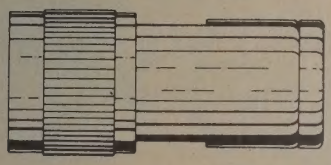
B Square Cut: 60 second cable assembly; weatherproof; small and light-ht with quick disconnect bayonet-lock coupling. BNC uses small cables, tes to peak load of 500 volts. Manufactured in accordance with MIL-C-3608A.

Cable	RG55B, 223	RG58	RG59, 62, 71	RG122	RG174
ug	30220-9	30220-2	30220-4	30220-11	30220-13
able Jack	30516-5	30516-1	30516-3	30516-7	30516-9
H.Mt.Jack	30517-5	30517-1	30517-3	30517-7	30517-9



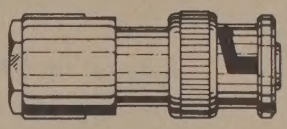
TNC Square Cut: A screw thread adaptation of BNC Square Cut. Assembly electrical and mechanical features are identical to the improved BNC Square Cut series and, except for threaded sleeve, are manufactured in accordance with MIL-C-3608A.

Cable	RG55B, 223	RG58	RG59, 62, 71	RG122	RG174
Plug	8280-5	8280-1	8280-3	8280-7	8280-9
Cable Jack	8281-5	8281-1	8281-3	8281-7	8281-9
S.H.Mt.Jack	8282-5	8282-1	8282-3	8282-7	8282-9



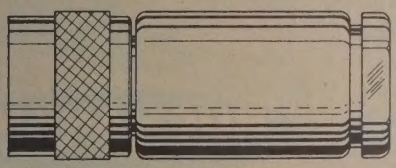
quare Cut: A line of low voltage, constant impedence connectors (50 ohms) igned for quick cable assembly on small and medium size RF cable. They e a peak rating of 1,000 volts and are weatherproof.

Cable	RG55B, 233	RG58	RG59, 62, 71	RG8, 213	RG9, 214
Plug	33072-5	33072-1	33072-3	30533-1	30533-3
Cable Jack	33073-5	33073-1	33073-3	30534-1	30534-3
S.H.Mt.Jack	33086-5	33086-1	33086-3	30535-1	30535-3



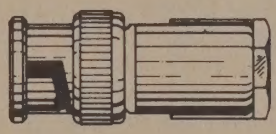
BNC High Voltage: A high voltage adaptation of the standard BNC. This series is of weatherproof construction rated at 4,000 V. at sea level.

Cable	RG55	RG58	RG59	RG195
Plug	2085-1	3621-2	UG932 A/U	3652-1
Cable Jack	3066-1	3066-1	UG1016 A/U	3954-1
S.H.Mt.Jack	3650-1	3650-1	3650-2	3655-1



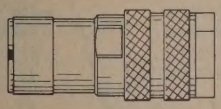
RIAX Group A: Incorporates the normal coaxial design with center contact d outer contact, but with a third contact made through the body shell to ac-mmodate the triaxial cable ground. Group A is of the same diameter as the ype C (UG-Series) connector line.

Cable	RG8	RG11	RG59	RG58
Plug	3875-1	3881-1	3880-1	—
Cable Jack	3874-1	3906-1	3902-1	—
S.H.Mt.Jack	3945-1	—	3974-1	3973-1



TRIAX Group B: Group B TRIAX is of the same diameter as the BNC series. It is available also in a polarized version.

Cable	21-738	50-3822	21-204	93-3930
Plug	2743-1	30088-1	4774-1	30061-1
Cable Jack	2741-1	30571-1	—	—
S.H.Mt.Jack	3107-1	—	30230-2	30062-1



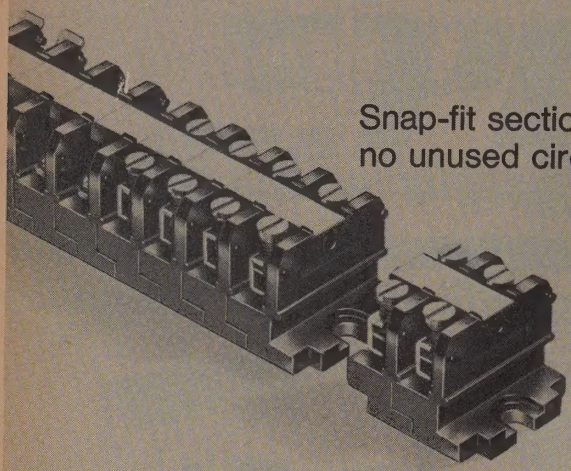
ADM: Miniature coaxial cable connectors featuring small bayonet-locking, super-or cable gripping mechanism; waterproof construction and easy assembly with nly 3 basic parts. Intermateable with DM Series; multiple polarization available. Fully tested to MIL-C-25516—B and C. Floating ground, ungrounded and un-shielded versions available.

	Cable	Pol. E	Pol. F	Pol. J	Pol. K
Plug	RG179	43016-3	43003-2	43016-1	43003-3
Cable Jack	RG179	43005-1	43004-1	43005-2	43004-2
S.H.Mt.Jack	RG179	43006-1	43007-1	43006-2	43007-2

Part numbers shown above (partial listing only) are suitable for most connector applications. All are available for fast delivery from Bendix stock. Bendix provides *one source* for all your RF connector requirements, including custom engineering and special finishes. Call or write for complete Catalog: Microwave Devices Division, The Bendix Corporation, Hurricane Road, Franklin, Indiana 46131. Phone (317) 736-6136.

Bendix Electronics

4 most sought-after terminal block features:



Snap-fit sections...
no unused circuits.

Variety of contact types.

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marking areas.

Direct or Channel
mounting.

Only BUCHANAN has them all!

Only Buchanan gives you the 4 most sought-after features in its terminal blocks—features that put more profit in your designs.

Assembly is fast because blocks are packaged in preassembled snap-fit sections. Clearly visible marking areas and contacts make wiring and marking fast and simple. Four different contact types meet the requirements of any application. You even have a choice of flat base or dovetail base. Bonus: New BUCHANAN® nylon and polypropylene blocks are designed to allow more circuits per foot than comparable competitive blocks.

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Write for UL, CSA listings and NEC tables.

Extra-Heavy Duty Phenolic— #4 thru 250 MCM, 600V NEMA, 10 circuits per foot.

Switch Fuse Blocks— for wire sizes #18 thru #8-15 amps. 16 circuits per foot.

NEW 1/0 Nylon— special base for direct or channel mounting, #10 thru #1/0 AWG, 600V, 16 circuits per foot.

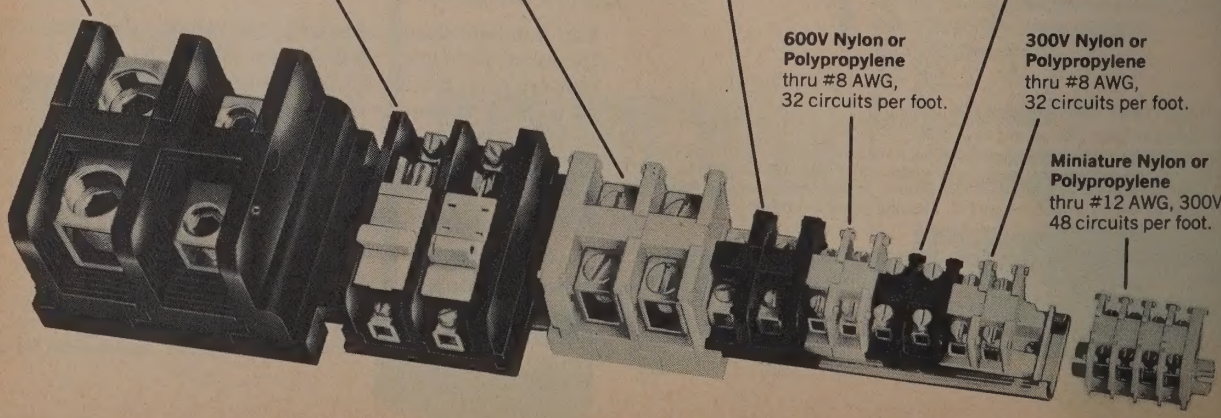
Heavy Duty Phenolic— #18 thru #4 600V NEMA, 750V IEEE, 21 circuits per foot.

Medium Duty Phenolic— #22 thru #8 AWG, 750V IEEE, 28 circuits per foot.

600V Nylon or Polypropylene thru #8 AWG, 32 circuits per foot.

300V Nylon or Polypropylene thru #8 AWG, 32 circuits per foot.

Miniature Nylon or Polypropylene thru #12 AWG, 300V, 48 circuits per foot.



3528

BUCHANAN

Headquarters for universal crimping tools

Step-adjustable crimp tool

Dial seven pre-determined crimp depths with eight indent, cycle-controlled tool. Direct reading indicator.

Crimps MS pin and socket contacts sizes 12, 16, 20 and 22 to wire sizes #12 thru #26 AWG with or without turret head assemblies as shown on MS3191. **MS3191-4. LISTED UNDER QPL MIL-T-22520 CLASS I.**

Infinitely adjustable crimp tool also available. Eight indent, cycle-controlled tool crimps depths from .025" to .075". Direct reading indicator. Crimps contacts #12 and smaller. Meets performance requirements of MIL-T-22520.

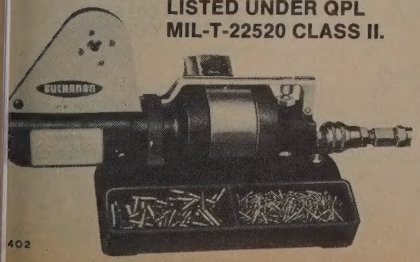
Miniature Step-adjustable crimp tool

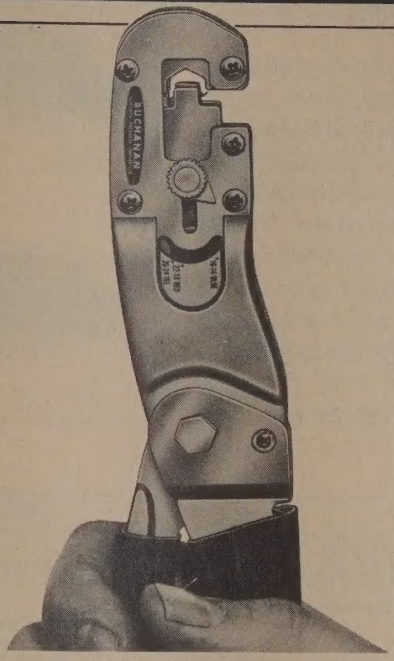
Dial eight predetermined crimp depths from .015" thru .043". Crimps micro-miniature contacts #20 and smaller to wire sizes #20 AWG and smaller with or without positioners. Selection of MS positioners available. Eight indent, cycle-controlled tool. **MS3198-1. LISTED UNDER QPL MIL-T-22520 CLASS I.**

Miniature infinitely adjustable tool also available for contacts #20 and smaller. Crimps depth values from .015" thru .043". Meets performance requirements of MIL-T-22520.

Manual Feed Tool

Pneumatic; cycle-controlled; portable or bench mounted with foot pedal. Crimps contacts #8 thru #22. Weighs less than 5 lbs. **LISTED UNDER QPL MIL-T-22520 CLASS II.**





C-Frame Tools

Lighter, easier to operate, compact yet strong. In-line die system; cycle controlled.

CT Tools. Crimp MS 25036 terminal lugs, MS 25181 splices and other fittings. Dial for size selector knob.

CTS Standard size, Cat. #11545, for fittings 12-10 thru 26-24. Meets performance requirements of MIL-T-22910.

CTM Miniature, Cat. #11707, for sizes 16-14 thru 26-24. **MS90413-1 (AS). LISTED UNDER QPL MIL-T-22910 CLASS I.**

•

CH Tools. Hex dies for use on RF connectors and shielded terminating ferrules.

CHS Standard Size. Pop-in die. **M22910/7-1. LISTED UNDER QPL MIL-T-22910 CLASS I.**

CHM Miniature. Fixed die. **MS 90487. LISTED UNDER QPL MIL-T-22910 CLASS I.**

CHM pop-in die also available. Meets performance requirements of MIL-T-22910.

•

CD Tools. Special dies for special custom applications. Standard size (CDS) and miniature size (CDM). C-frame or closed frame models.

Positioner controlled crimp tool

MIL standard 4-indent, cycle-controlled tool crimps most proprietary and mil spec contacts #12 thru #22. **MS 3191-A. LISTED UNDER QPL MIL-T-22520 CLASS I.**

Miniature positioner controlled tool also available. Crimps most contacts #20 and smaller. Ideal for confined areas. 6¾" long; 10 ounces.

Automatic Feed Tool

Four-indent tool automatically feeds contacts from disposable carriers (protects contacts from damage). Crimps as fast as operator inserts wires. Bench unit holds 2,000 or more contacts. For portable application, carriers in self-positioning, "see-thru" magazines hold up to 102 contacts. Crimps contacts #12 thru #22. **LISTED UNDER QPL MIL-T-22520 CLASS II.**

NEW! AUTO/FEED Crimping System

VIBRAPAK™ inserts hold up to 4000 pin and socket contacts. Can be loaded, labeled, sealed, and delivered to you by any contact manufacturer you choose. Provides you with a built-in positive lot control and contact identification system. BUCHANAN® AUTO/FEED system crimps contact sizes 16 thru 22. Accommodates most contacts covered by MIL-C39029, MIL-C23216, MIL-C26636. Meets performance requirements of MIL-T-22520.

BUCHANAN
ELECTRICAL PRODUCTS CORPORATION

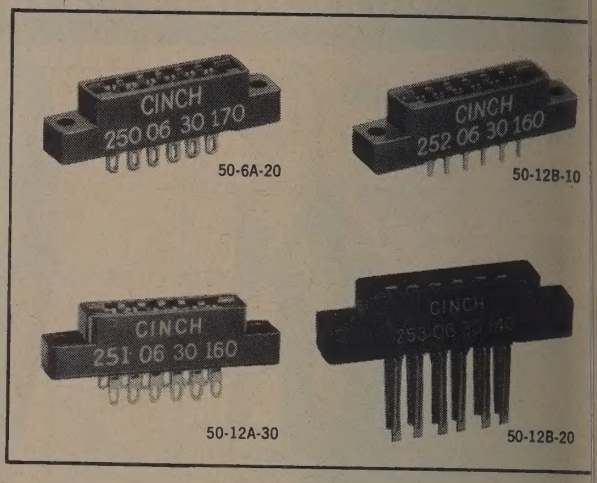
A subsidiary of Amerace Esna Corporation
1065 Floral Avenue • Union, New Jersey 07083
(201) 289-8200 • Telex 13-8214

402

PRINTED CIRCUIT EDGE CONNECTORS

PRECISION MILITARY AND COMMERCIAL PRINTED CIRCUIT BOARD EDGE CONNECTORS

These Cinch printed circuit connectors are designed for minimum printed circuit card wear, low insertion force and positive contact with the printed circuit board. Insulation is glass-filled diallyl phthalate, type SDG-F per MIL-M-14. Contacts are of phosphor bronze with a minimum of 30 micro-inches thickness gold plate. Units with solder tab or dip solder terminations utilize bifurcated contacts permitting two flexing surfaces instead of one for positive contact. Bifurcated contacts are especially recommended for added contact reliability where vibration or printed circuit board irregularities would otherwise cause trouble. Types meeting Military Specification MIL-C-21097B are also available as indicated. These connectors have beryllium copper contacts with 50 micro-inches gold finish.



COMMERCIAL TYPES Without Bushings

SINGLE READOUT		
CONTACT POSITIONS	CINCH PART NO.	FACTORY NO.
CONVENTIONAL SOLDER TAILS		
6	50-6A-20	250-06-30-170
10	50-10A-20	250-10-30-170
12	50-12A-20	250-12-30-170
15	50-15A-20	250-15-30-170
18	50-18A-20	250-18-30-170
22	50-22A-20	250-22-30-170
25	50-25A-20	250-25-30-170
DIP SOLDER TAILS		
6	50-6B-10	252-06-30-240
10	50-10B-10	252-10-30-240
15	50-15B-10	252-15-30-240
18	50-18B-10	252-18-30-240
22	50-22B-10	252-22-30-240
25	50-25B-10	252-25-30-240

DOUBLE READOUT		
CONTACT POSITIONS	CINCH PART NO.	FACTORY NO.
CONVENTIONAL SOLDER TAILS		
6	50-12A-30	251-06-30-160
10	50-20A-30	251-10-30-160
12	50-24A-30	251-12-30-160
15	50-30A-30	251-15-30-160
18	50-36A-30	251-18-30-160
22	50-44A-30	251-22-30-160
25	50-50A-30	251-25-30-160
DIP SOLDER TAILS		
6	50-12B-10	252-06-30-160
10	50-20B-10	252-10-30-160
12	50-24B-10	252-12-30-160
15	50-30B-10	252-15-30-160
18	50-36B-10	252-18-30-160
22	50-44B-10	252-22-30-160

CONTACT POSITIONS	CINCH PART NO.	FACTORY NO.
WIRE WRAP POST		
6	50-12B-20	253-06-30-140
10	50-20B-20	253-10-30-140
12	50-24B-20	253-12-30-140
15	50-30B-20	253-15-30-140
18	50-36B-20	253-18-30-140
22	50-44B-20	253-22-30-140

POLARIZING KEYS		
PART NO.	DESCRIPTION	FACTORY NO.
50-PK-2	Between-Contact Type	456-07-35-003
50-PK-1	In-Contact Type	474-11-54-200

NOTE: Polarizing keys are not furnished with connectors and must be ordered as a separate item.

MILITARY PC CONNECTORS (Per MIL-C-21097B) With Conventional Wiring Tails

SINGLE READOUT			
CONTACT POSITIONS	CINCH PART NO.	MIL PART NO.	FACTORY NO.
NO BUSHINGS			
6	50-6A-20M	M21097/1-001	250-06-30-220
10	50-10A-20M	M21097/1-037	250-10-30-220
15	50-15A-20M	M21097/1-073	250-15-30-220
18	50-18A-20M	M21097/1-109	250-18-30-220
22	50-22A-20M	M21097/1-145	250-22-30-220
MOLDED-IN BUSHINGS			
6	50-6A-20-MB	M21097/1-004	250-06-30-230
10	50-10A-20MB	M21097/1-040	250-10-30-230
15	50-15A-20MB	M21097/1-076	250-15-30-230
18	50-18A-20MB	M21097/1-112	250-18-30-230
22	50-22A-20MB	M21097/1-148	250-22-30-230
FLOATING BUSHINGS			
6	50-6A-20MFB	M21097/1-007	250-06-30-240
10	50-10A-20MFB	M21097/1-043	250-10-30-240
15	50-15A-20MFB	M21097/1-079	250-15-30-240
18	50-18A-20MFB	M21097/1-115	250-18-30-240
22	50-22A-20MFB	M21097/1-151	250-22-30-240

DOUBLE READOUT			
CONTACT POSITIONS	CINCH PART NO.	MIL PART NO.	FACTORY NO.
NO BUSHINGS			
6	50-12A-30M	M21097/1-019	251-06-30-270
10	50-20A-30M	M21097/1-055	251-10-30-270
15	50-30A-30M	M21097/1-091	251-15-30-270
18	50-36A-30M	M21097/1-127	251-18-30-270
22	50-44A-30M	M21097/1-163	251-22-30-270
MOLDED-IN BUSHINGS			
6	50-12A-30MB	M21097/1-022	251-06-30-280
10	50-20A-30MB	M21097/1-058	251-10-30-280
15	50-30A-30MB	M21097/1-094	251-15-30-280
18	50-36A-30MB	M21097/1-130	251-18-30-280
22	50-44A-30MB	M21097/1-166	251-22-30-280
FLOATING BUSHINGS			
6	50-12A-30MFB	M21097/1-025	251-06-30-290
10	50-20A-30MFB	M21097/1-061	251-10-30-290
15	50-30A-30MFB	M21097/1-097	251-15-30-290
18	50-36A-30MFB	M21097/1-133	251-18-30-290
22	50-44A-30MFB	M21097/1-169	251-22-30-290

DOUBLE READOUT WITH DIP SOLDER TAILS — No Bushings

CONTACT POSITIONS	CINCH PART NO.	MIL PART NO.	FACTORY NO.
6	50-12B-10M	M21097/1-028	252-06-30-220
10	50-20B-10M	M21097/1-064	252-10-30-220
15	50-30B-10M	M21097/1-100	252-15-30-220
18	50-36B-10M	M21097/1-136	252-18-30-220
22	50-44B-10M	M21097/1-172	252-22-30-220

ELECTRICAL SPECIFICATIONS

VOLTAGE RATING (AC RMS, adj. terminals): 830 (Sea Level); 300 (3.4 Hg, 50,000 Feet); 200 (1.3 Hg, 70,000 Feet); CURRENT: 5.0 Amps; CONTACT RESISTANCE: .005 Ohms at Rated Current; INSULATION RESISTANCE: 5000 Megohms.

ENVIRONMENTAL SPECIFICATIONS (Per MIL-C-21097 and MIL-STD-202, latest versions.)

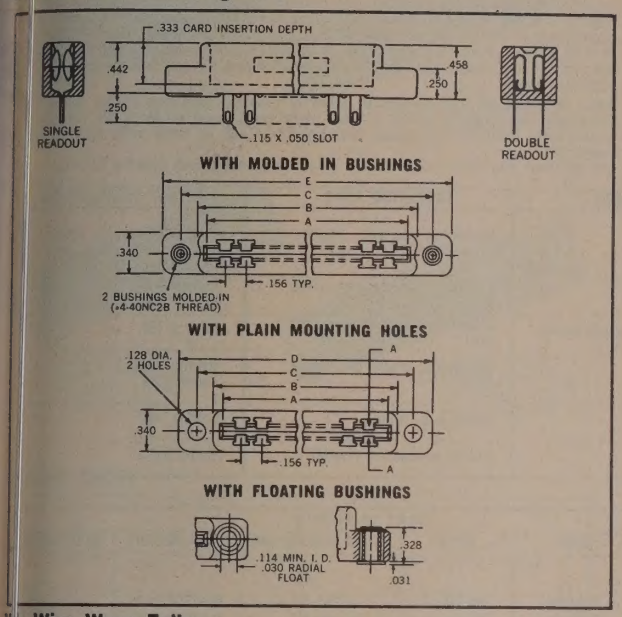
SHOCK: 3 blows of 50G, Method 202B; TEMPERATURE CYCLING: 5 continuous cycles per Method 107B, Test Condition B; Beryllium copper, −65°C to 125°C; Phosphor bronze, −65°C to 105°C; SALT SPRAY: 48 hrs. per Method 101B, Condition B; VIBRATION: Per Method 204A, Condition B for bifurcated contacts; Method 201A for non-bifurcated contacts; HUMIDITY: Per Method 103B, Condition B.

CINCH

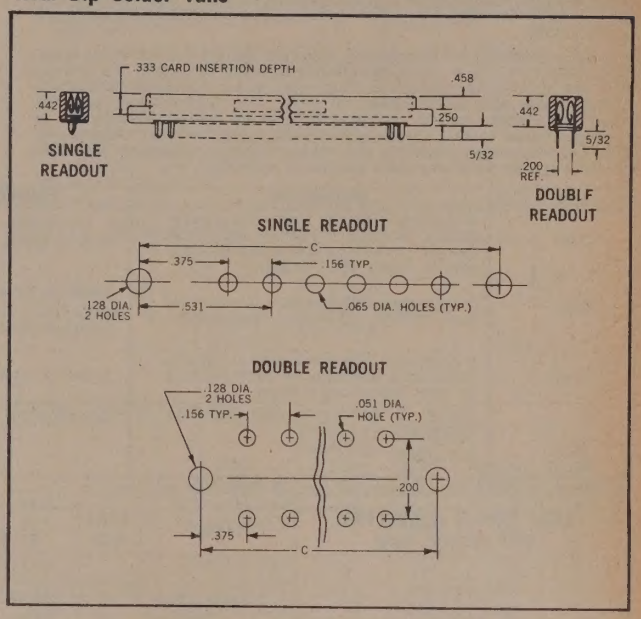
PRINTED CIRCUIT EDGE CONNECTORS (Cont'd.)

DIMENSIONS:

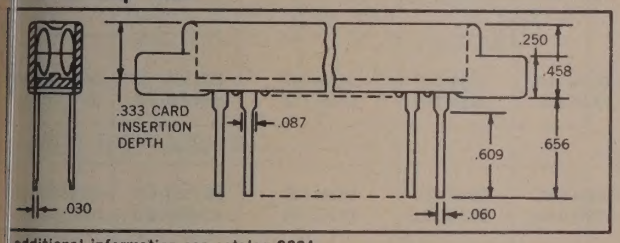
Wi Conventional Wiring Tails



With Dip Solder Tails



h Wire Wrap Tails



additional information see catalog CC24

NO. OF CONTACT POSITIONS	DIMENSIONS A	B	C	D	E
6	1.100	1.239	1.531	1.785	1.937
10	1.724	1.864	2.156	2.410	2.562
12	2.036	2.177	2.469	2.723	2.875
15	2.504	2.645	2.937	3.191	3.343
18	2.972	3.114	3.406	3.660	3.812
22	3.596	3.739	4.031	4.285	4.437
25	4.067	4.208	4.500	4.754	4.906

TYKON® HIGH DENSITY EDGE CONNECTORS*

High density edge connectors with .050" centers for use with double sided .062" pc boards. Furnished with conventional wiring tails suitable for welding or soldering. Insulator is glass filled diallyl phthalate per MIL-M-14F, Type SDG-F. Contacts are ryllium copper with finish of copper flash plus .00003 gold plate r MIL-G-45204 Type II. Available in 6, 10, 15, 20 or 25-position sizes.

atent Pending

ECTRICAL SPECIFICATIONS

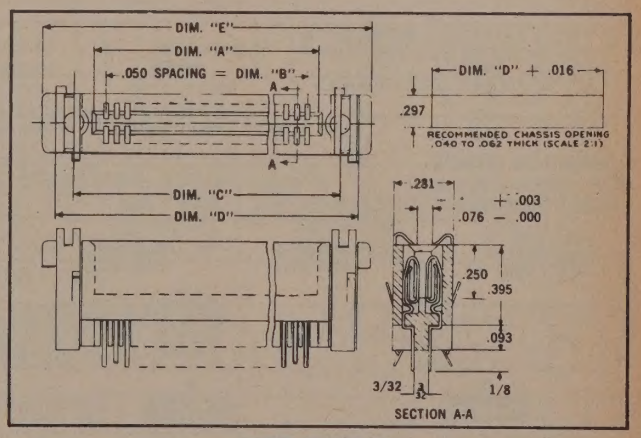
LTAGE RATINGS: a.) At sea level (adj. terminals) 500 Volts AC RMS, 730 ts DC, b.) At sea level (to ground) 1160 Volts AC RMS, 1660 Volts DC, At an altitude of 60,000 ft. (adj. terminals) 165 Volts AC RMS, 230 Volts , d.) At an altitude of 60,000 ft. (to ground) 300 Volts AC RMS, 400 Volts DC; RRENT RATING: .050 amps; CONTACT RESISTANCE at 20 Millivolts: .040 ms maximum, .020 ohms average; MILLIVOLT DROP at 0.50 amps: 20 llivolts maximum; INSULATION RESISTANCE (As received): 5000 megohms nimum.

KON MOUNTING CLIP

r use in semi-flush pc board mounting. Separate item. Made of carbon el with cadmium-plate plus yellow chromate finish. Part No. 50-MC.

KON POLARIZING KEY

" shaped cellulose acetate. Part No. 50-PK.



PART NUMBERS

ITEM	PART NO.	CONTACT POSITIONS	DIMENSIONS A	B	C	D	E
6-position connector	50-12A-40	6	.350	.250	.550	.725	.850
10-position connector	50-20A-40	10	.550	.450	.750	.925	1.050
15-position connector	50-30A-40	15	.800	.700	1.000	1.175	1.300
20-position connector	50-40A-40	20	1.050	.950	1.250	1.425	1.550
25-position connector	50-50A-40	25	1.300	1.200	1.500	1.675	1.800
Mounting Clip	50-MC						
Polarizing Key	50-PK						

CINCH

D-SUBMINIATURE CONNECTORS†

The Cinch D Subminiature Connectors are designed for applications where space and weight are prime considerations. These high contact density connectors are especially well-suited for aircraft, missile and ground support installations. Although designed essentially for rack-and-panel installations, D series connectors may be adapted for cable attachment by means of accessory junction shells with integral clamps.

In addition to the original D series with two-piece insulators, Cinch offers Golden D and MARK III ROYAL D connectors utilizing monobloc insulators. The Golden D connector is available with either crimp-type, snap-in, removable contacts or standard solder pot contacts. MARK III ROYAL D connectors have the "Little Caesar" rear release contact assembly. Contacts are inserted by hand and extracted at the rear of the connector with a simple plastic tool. The "Little Caesar" contact assembly was selected by the National Aerospace Standards Committee for vital programs demanding great operational reliability.

All D Subminiature connectors will inter-mate if insert arrangements correspo These connectors are designed to meet or exceed most of the requirements MIL-C-8384 Rev. B.

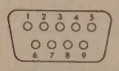
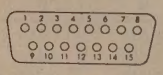
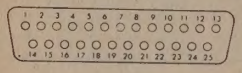
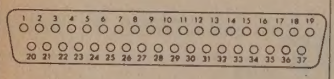
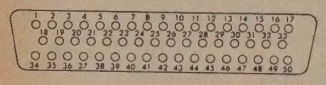
Combination layouts are supplied with unfilled coaxial and/or HV contact caviti Coaxial and HV contacts must be ordered separately, and may be used int changeably in any of the layouts listed. HV contacts accommodate wire sizes to #20. Coaxial contacts (with crimp or solder type terminations) and HV conta are snap-in and removable. Solder type coaxial and HV contacts have captivat center contacts.

Royal D, Mark III and Golden D, Mark II contacts use crimp tool MS-3191 Extraction tool 599-11-11-150 is used with each Royal D, Mark III commerc connectors; insertion-extraction tool 599-11-11-165 is used with each milit connector.

For detailed test data and technical information see Cinch Catalog CM-46.

TYPE	DESCRIPTION	COMMON NAME	INSULATOR TYPE	CONTACT TERMINATION
D*MA	D connectors for the most critical applications. Monobloc insulators and "Little Caesar" contact assemblies Military version meets MIL-C-24308.	Mark III ROYAL D	Monobloc diallyl, thalate, GD-1-30F	Crimp insert by hand, remove with small tool.
D*M	D connectors with monobloc insulator for more critical application requirements.	Golden D, Mark I	Monobloc, diallyl phthalate, SDG	Solder pot Solder pot with coaxial
		Golden D, Mark I Combination	Monobloc, diallyl phthalate, SDG	and/or HV
D*SM	D connectors with crimp, snap-in contacts in monobloc insulators for quick assembly in more critical applications.	Golden D, Mark II	Monobloc, diallyl phthalate, MDG	Crimp, snap-in removable
D*	Original D connectors with two-piece insulators.	Original D	Two-piece, zytel	Solder pot
DATA-PHONE	Same as D*	—	Diallyl phthalate, GDI-30	Same as D*

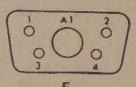
†Manufactured under license agreement with ITT Cannon Electric, Inc.

BASIC LAYOUT CONNECTORS (#20 contacts only)	LAYOUT	SHELL SIZE	PART NUMBER D*	D*M	D*SM	D*MA Commercial	D*MA Military	DATAPHONE*
	9 Contact Plug Socket	E E	DE-9P DE-9S	DEM-9P DEM-9S	DESM-9P DESM-9S	DEMA-9P DEMA-9S	M24308/4-1 M24308/2-1	— —
	15 Contact Plug Socket	A A	DA-15P DA-15S	DASM-15P DASM-15S	DASM-15P DASM-15S	DEMA-15P DEMA-15S	M24308/4-2 M24308/2-2	DA-19603-403 DA-19603-404
	25 Contact Plug Socket	B B	DB-25P DB-25S	DBM-25P DBM-25S	DBSM-25P DBSM-25S	DEMA-25P DEMA-25S	M24308/4-3 M24308/2-3	DB-19604-432 DB-19604-433
	37 Contact Plug Socket	C C	DC-37P DC-37S	DCM-37P DCM-37S	DCSM-37P DCSM-37S	DEMA-37P DEMA-37S	M24308/4-4 M24308/2-4	— —
	50 Contact Plug Socket	D D	DD-50P DD-50S	DDM-50P DDM-50S	DDSM-50P DDSM-50S	DEMA-50P DEMA-50S	M24308/4-5 M24308/2-5	— —

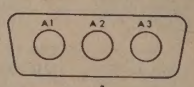
Add suffix "F" for shell with float mounts, as DEF, DEMF, etc. ** Require Dataphone Hoods.

COMBINATION LAYOUTS (#20 contacts with coaxial and/or HV cavities*)

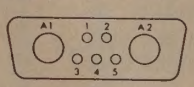
SHELL SIZE
PLUG PART NO.
SOCKET PART NO.



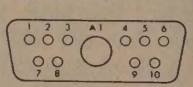
E
DEM-5W1P
DEM-5W1S



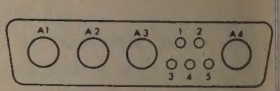
A
DAM-3W3P
DAM-3W3S



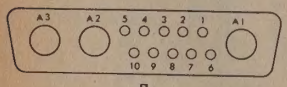
A
DAM-7W2P
DAM-7W2S



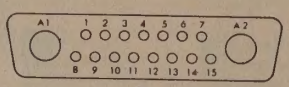
A
DAM-11W1P
DAM-11W1S



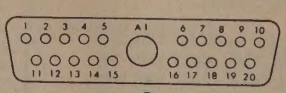
B
DBM-9W4P
DBM-9W4S



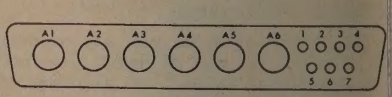
B
DBM-13W3P
DBM-13W3S



B
DBM-17W2P
DBM-17W2S



B
DBM-21W1P
DBM-21W1S



C
DCM-13W6P
DCM-13W6S

PERFORMANCE DATA

VOLTAGE RATING: 1250 VAC test, 1700 flashover; CURRENT RATING: 5 Amperes; INSULATION RESISTANCE: Greater than 5,000 megohms, determined in accordance with MIL-STD-202A, Method 302; CONTACT VOLTAGE DROP: (#20 contacts) 2.67 millivolts maximum per amp when tested in accordance with MIL-C-8384B, Paragraph 4.6.4; INDIVIDUAL CONTACT SEPARATION FORCE: 1 to 8 ounces; CONTACT RETENTION FORCE: 10 lbs. min. after 10 insertions; 5 lbs. min. after 100 insertions; MOISTURE RESISTANCE: Exceeds test requirements of MIL-STD-202A, Method 106†; VIBRATION: Exceeds test requirements of MIL-STD-202A, Method 204†; SHOCK: Exceeds test requirements of MIL-STD-202A, Method 202A†; CORROSION RESISTANCE: Exceeds requirements of 50 hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B†; HIGH POTENTIAL: MIL-STD-202A, Method 301†; TEMPERATURE CYCLING: MIL-STD-202A, Method 102A, Condition D.†

MATERIALS

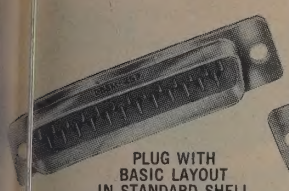
SHELLS: Steel cadmium plated with yellow chromate coating, except Dataphone connectors have clear chromate coating; INSULATORS: D*-Zytel; D*M and Dataphone-Diallyl phthalate, glass filled per MIL-M-14F, Type SDG; D*SM-Diallyl phthalate asbestos filled per MIL-M-14F, Type MDG; D*MA-Diallyl phthalate, glass fibre filled per MIL-P-19833; PIN CONTACTS: D* and D*M-Brass, gold plated (.00003) over silver; D*SM and D*MA-Leaded copper, gold plated (.00003) over silver; Dataphone-Brass, gold plated (.00005) over copper; SOCKET CONTACTS: D*-Phosphor bronze, gold plated (.00003) over silver; D*M-Brass, gold plated (.00003) over silver; D*SM-Leaded copper, gold plated (.00003) over silver; Copper alloy, gold plate over silver plate with stainless steel sleeves. Dataphone-Phosphor bronze, gold plated (.00005) over copper.

† As referenced in MIL-C-24308.

See YELLOW SECTION for Local Offices, Phones

CINCH

D-SUBMINIATURE CONNECTORS (Cont'd.)



PLUG WITH BASIC LAYOUT IN STANDARD SHELL

PLUG WITH COMBINATION LAYOUT IN STANDARD SHELL

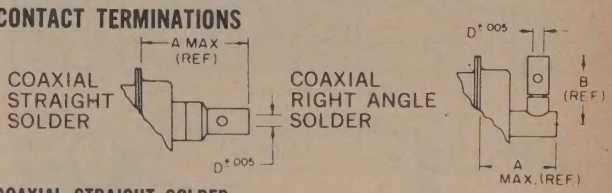
SOCKET WITH BASIC LAYOUT IN SHELL WITH FLOAT MOUNTS

SOCKET WITH COMBINATION LAYOUT IN SHELL WITH FLOAT MOUNTS

Connectors Individually Packed in Heat-Sealed Containers to Assure Extended Shelf Life

To protect D-Subminiature connectors from contamination and other corrosive elements in the air, Cinch individually packs each connector in heat-sealed polyvinyl-chloride containers (as shown) with an inert gas, oxygen-free atmosphere. This assures every customer of extended shelf life. A separate compartment is also provided in each container for the loose crimp-type contacts supplied with the Golden D, Mark II and Mark III connector.

CONTACT TERMINATIONS



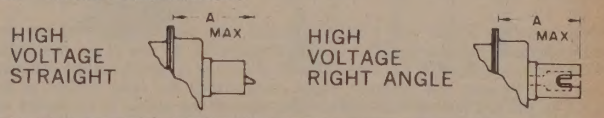
COAXIAL STRAIGHT SOLDER

	Order Number	Contact Ext. from Rear of Flange A	Dielectric Entry D	Overall Length	RG Cables
Plug	DM-53740-5008	.739	.040	.929	196/U
Plug	DM-53740-5001	.739	.067	.929	187/U 188/U
Plug	DM-53740-5002	.847	.110	1.037	195/U
Plug (Short Type)	DM-53740-5000	.670	.040	.860	196/U
Receptacle	DM-53742-5001	.739	.067	.929	187/U 188/U
Receptacle	DM-53742-5002	.847	.110	1.037	195/U
Receptacle	DM-53742-5004	.847	.125	1.037	58/U

COAXIAL RIGHT ANGLE SOLDER

	Order Number	Contact Ext. from Rear of Flange A	B	Dielectric Entry D	Overall Length	RG Cables
Plug	DM-53741-5000	.530	.492	.040	.734	196/U
Plug	DM-53741-5001	.530	.492	.067	.734	187/U 188/U
Receptacle	DM-53743-5003	.530	.601	.110	.734	195/U
Receptacle	DM-53743-5004	.530	.601	.125	.734	58/U

HIGH VOLTAGE COMBINATIONS

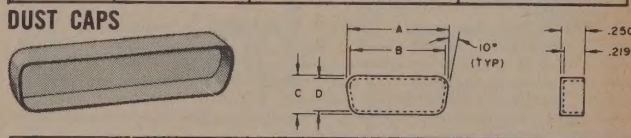


	Order Number	Contact Ext. from Rear of Flange A	Wire Size	Overall Length
Plug	DM-53745-0000	.539	#20	.734
Receptacle	DM-53744-0000	.539	#20	.734
Plug	DM-53745-5000	.491	#20	.697
Receptacle	DM-53744-5000	.491	#20	.697

STANDARD CRIMP CONTACTS (Style 1)

	Mark II D*SM	Mark III D*MA Commercial	Mark III D*MA Military
Pin	031-0932-004	330-5291-000	M24308/11-1
Socket	031-0931-006	031-1007-000	M24308/10-1

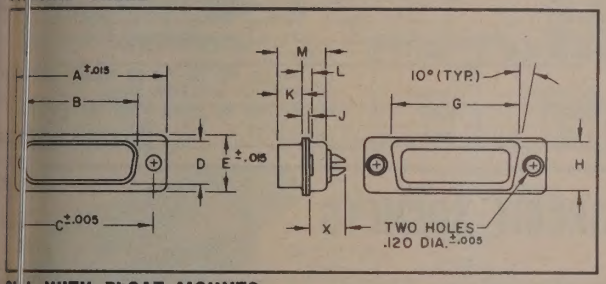
DUST CAPS



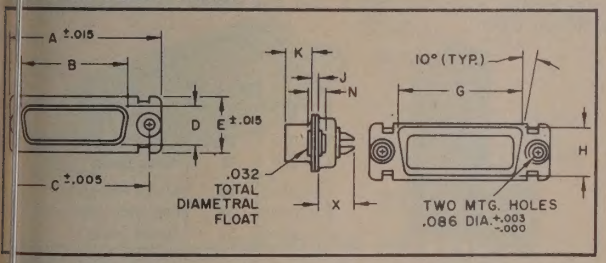
Order Number by Shell Size	For Use with	A	B	C	D
DE-59-20	DE-9S	.694	.627	.362	.295
DE-60-20	DE-9P	.749	.682	.412	.345
DA-59-20	DA-15S	1.022	.955	.362	.295
DA-60-20	DA-15P	1.077	1.010	.412	.345
DB-59-20	DB-25S	1.562	1.495	.362	.295
DB-60-20	DB-25P	1.635	1.568	.430	.363
DC-59-20	DC-37S	2.210	2.143	.362	.295
DC-60-20	DC-37P	2.283	2.216	.430	.363
DD-59-20	DD-50S	2.116	2.049	.474	.407
DD-60-20	DD50P	2.179	2.112	.536	.469

MATERIAL: Polypropylene (clear)

STANDARD SHELL



SHELL WITH FLOAT MOUNTS



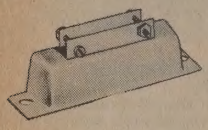
SHELL SIZE	A	B	C	D	E	G
—Plug	1.213	.697	.984	.360	.494	.759
—Socket	1.213	.640	.984	.308	.494	.759
—Plug	1.541	1.025	1.312	.360	.494	1.083
—Socket	1.541	.968	1.312	.308	.494	1.083
—Plug	2.088	1.583	1.852	.378	.494	1.625
—Socket	2.088	1.508	1.852	.308	.494	1.625
—Plug	2.729	2.231	2.500	.378	.494	2.272
—Socket	2.729	2.156	2.500	.308	.494	2.272
—Plug	2.635	2.127	2.406	.484	.605	2.178
—Socket	2.635	2.026	2.406	.420	.605	2.178

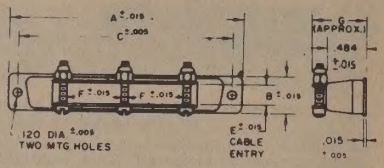
SHELL SIZE	H	J	K	L	M	N	X†
—Plug	.422	.030	.236	.045	.422	.120	.422
—Socket	.422	.030	.243	.045	.429	.120	.390
—Plug	.422	.030	.236	.045	.422	.120	.422
—Socket	.422	.030	.243	.045	.429	.120	.390
—Plug	.422	.039	.231	.060	.426	.129	.422
—Socket	.422	.030	.243	.045	.429	120	.390
—Plug	.422	.039	.231	.060	.426	.129	.422
—Socket	.422	.030	.243	.045	.429	.120	.390
—Plug	.534	.039	.231	.060	.426	.129	.422
—Socket	.534	.030	.243	.045	.429	.120	.390

d F to Part Nos. in the above table for Float Mounts (Ex. DEMF-5WIP).
tolerances are ± .010 unless noted otherwise.
ensions B and D are measured as outside dimensions at the bottom of the draw.
SM only; D* dimension is .312, D*M dimension is .390 for all plugs and sockets.

D-SUBMINIATURE CONNECTORS (Cont'd.)

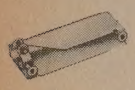
JUNCTION SHELLS



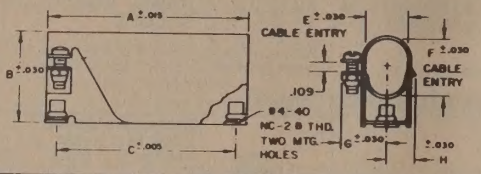


STRAIGHT CLAMP

Order Number by Shell Size	No. of Cable Locking Screws Required	A	B	C	E	F	G
DA-19678-1	2	1.531	.500	1.312	.296	.312	.640
DB-19678-2	2	2.078	.500	1.852	.296	.796	.640
DC-19678-3	3	2.718	.500	2.500	.296	.687	.640
DD-19678-4	3	2.625	.609	2.406	.390	.687	.703

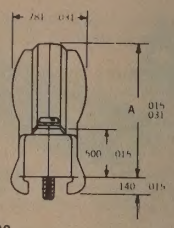


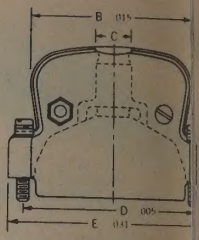
RIGHT ANGLE



Order Number by Shell Size	A	B	C	E	F	G	H
DE-19977-5	1.203	.718	.984	.437	.437	.468	.281
DA-19977-1	1.531	.718	1.312	.437	.437	.468	.281
DB-19977-2	2.078	.968	1.852	.437	.625	.468	.281
DC-19977-3	2.718	1.187	2.500	.437	.812	.468	.281
DD-19977-4	2.625	1.250	2.406	.562	.906	.531	.343

DATAPHONE HOODS

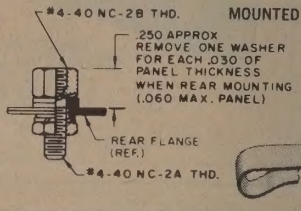


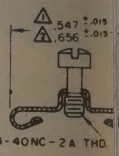


MATERIAL: Gray Melamine

Part No.	Contacts	A	B	C	D	E
DA-51225-1	15	1.297	1.219	.266	1.312	1.6
DB-51226-1	25	1.406	1.797	.328	1.852	2.2

SCREW LOCK ASSEMBLIES





FEMALE

MALE

Order Number	Type	Usage
D-20418-2	Female	DE, DA, DB, DC, DD PIN OR SOCKET WITH OR WITHOUT JUNCTION SHELL
D20419	Male	DA, DE PIN OR SOCKET; DB, DC SOCKET
D20420	Male	DD SOCKET

INTEGRATED CIRCUIT SOCKETS

Cinch IC sockets are ideal for testing and prototype purposes as well as production applications. Convenient and dependable, these sockets reduce the possibility of damage to leads and hermetic seals. Cinch IC sockets provide positive electrical contact and low contact resistance. They offer excellent resistance to corrosive atmosphere and to extremes in temperature and humidity.

PRECISION D.I.P. SOCKETS

These sockets combine high contact retention with low contact resistance and high environmental stability. They accept standard 14, 16 and 24-pin dual-inline packages having round or flat leads. (Standard spacing is .300" between lead rows and .100" between lead centers.) Socket leads are on the same centers as the D.I.P. itself. This feature allows easy installation of the socket in PC boards designed for direct insertion of the D.I.P. Choose between diallyl phthalate insulators with gold plated beryllium copper contacts or GP black phenolic insulators with electro-tin plated beryllium copper contacts.

MATERIALS

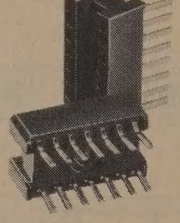
INSULATORS: GP Black Phenolic per MIL-M-14, type CFG Diallyl Phthalate per MIL-M-14, type SDG; CONTACTS: Beryllium copper with gold or electro-tin plating. **RECOMMENDED MOUNTING METHODS:** CHASSIS: 4-40 x ¼" Fillister head screw; P. C. BOARD: Solder in.

ELECTRICAL SPECIFICATIONS

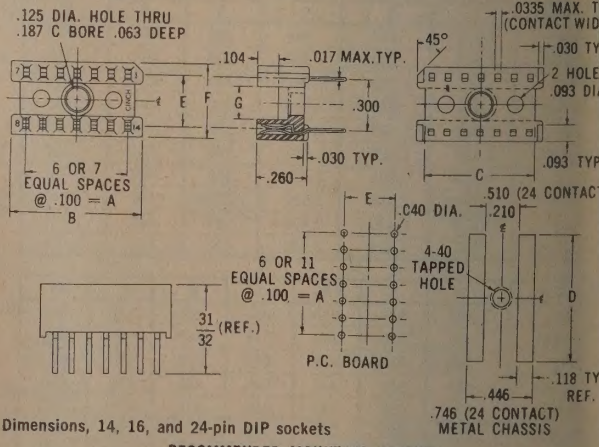
CURRENT RATING: 1.0 ampere; CONTACT RESISTANCE: 6 milliohms (at 1 ampere); CAPACITANCE PER MIL-STD-202: Method 305 at 100 KHz between adjacent contacts: 0.33 pfd average (phenolic), 0.28 pfd average (diallyl phthalate), between opposing contacts: 0.12 pfd average (phenolic), 0.10 pfd average (diallyl phthalate); WITHSTANDING VOLTAGE BETWEEN ADJACENT CONTACTS: 1800 VRMS; INSULATION RESISTANCE: 1.0 x 10^6 megohms minimum (phenolic); 2.0 x 10^6 megohms minimum (diallyl phthalate).

MECHANICAL SPECIFICATIONS

VIBRATION: Per MIL-STD-202C, Condition D, Method 204A, 10-2000 C.P.S. at 20 G's or .060" double amplitude. No continuity interruptions of 1 microsecond or longer. No damage to contact or insulator. No disengagement of DIP module from the socket; SHOCK: Per MIL-STD-202C, Method 202B/3 blows in each of 3 mutually perpendicular planes. Shock level of 150 G's. No continuity interruptions of 1 microsecond or longer. No damage to contact or insulator. No disengagement of DIP module from the socket; TEMPERATURE RANGE: Phenolic: −65° to 150°C.



Part No.	Contacts	Materials
14-DIP	14	GP Black Phenolic
16-DIP	16	Insulator with Electro-t
24-DIP	24	Plated Leads
14-DIP-1	14	Diallyl Phthalate
16-DIP-1	16	Insulator with gold
24-DIP-1	24	Plated Leads



Dimensions, 14, 16, and 24-pin DIP sockets

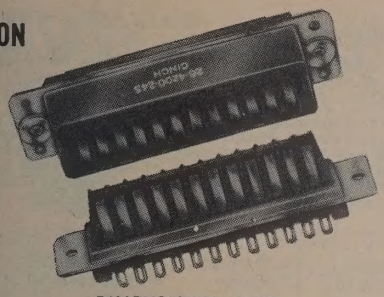
RECOMMENDED MOUNTING LAYOUTS

No. of Contacts	A	B	C	D	E	F	G	H ±.015	J
14	.600	.770	.690	.796	.300	.424	.187	.300	.043
16	.700	.870	.790	.896	.300	.424	.187	.300	.093
24	1.100	1.270	1.190	1.296	.600	.724	.488	.600	.125

CINCH

BLUE RIBBON* and MICRO RIBBON* RACK and PANEL CONNECTORS

BLUE RIBBON



ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS: (a) At Sea Level 800 VDC, (b) At 70,000 Feet 300 VDC; CONTACT CURRENT RATING: 5 Amperes; CONTACT RESISTANCE: .003 Ohms Maximum; INSULATION RESISTANCE (As Received): 100,000 Megohms Minimum.

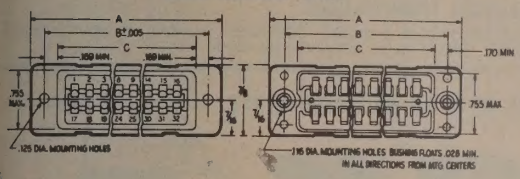
MECHANICAL SPECIFICATIONS

CONTACTS: Plug, Copper, ASTM-B-152, Type ETP, Socket, Phosphor bronze, ASTM-B-103, MIL-B-892, Grade A; FINISH: .00002 Gold per MIL-G-45204, Type II over copper flash; MOUNTING PLATE: Passivated stainless steel.

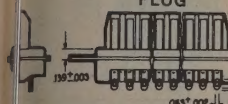
No. of Contacts	Part Numbers Plug	Part Numbers Socket	A	Dimensions B	Dimensions C	D (Min.)
8	26-4100-8P	26-4200-8S	1 23/32	1.375	1 1/32	1.120
16	26-4100-16P	26-4200-16S	2 15/32	2.125	1 25/32	1.868
24	26-4100-24P	26-4200-24S	3 7/32	2.875	2 17/32	2.620
32	26-4100-32P	26-4200-32S	3 31/32	3.625	3 9/32	3.370

*Tolerances: Fractions ± 1/64
Decimals ± .005

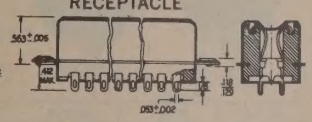
DIMENSIONAL DATA

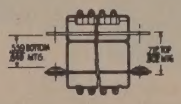


PLUG

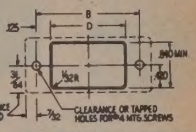


RECEPTACLE





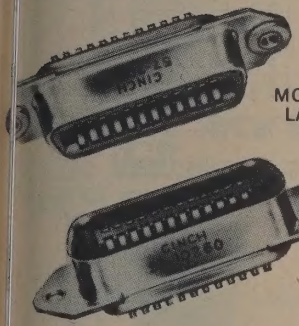
MATING PLUG & RECEPTACLE



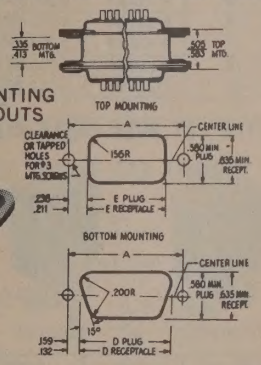
MOUNTING LAYOUT

MICRO-RIBBON

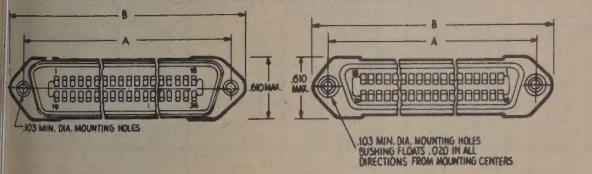
MATING PLUG & RECEPTACLE

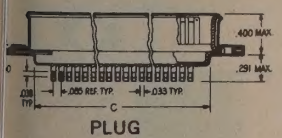


MOUNTING LAYOUTS

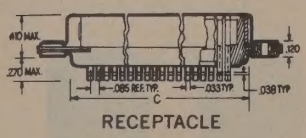


DIMENSIONAL DATA



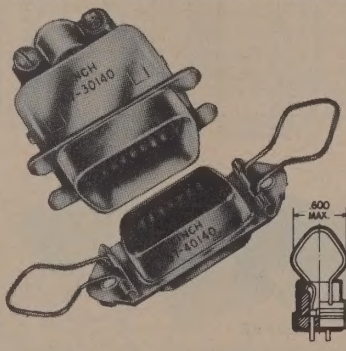


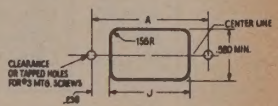
PLUG



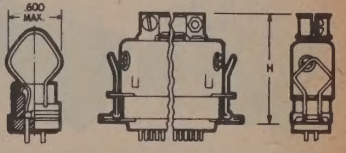
RECEPTACLE

MICRO-RIBBON CABLE-TO-CHASSIS



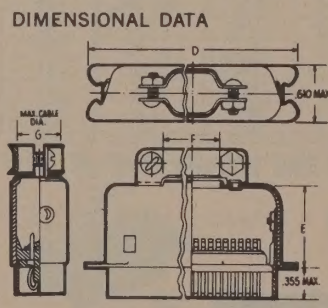


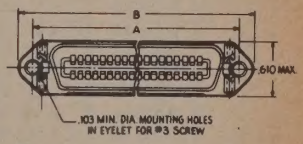
MOUNTING LAYOUT

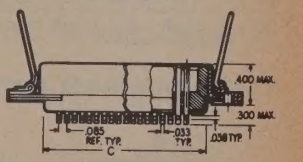


MATING PLUG AND RECEPTACLE

DIMENSIONAL DATA







RECEPTACLE

No. of Contacts	Socket No.	Plug No.	Socket No.	Plug No.	A	B	C	D	D min.	E	E min.	F	G	H	J min.
14	57-20140	57-10140	57-40140	57-30140	1.417	1.750	.910	1.495	1.098	.843	.940	.306	.422	1.668	.940
24	57-20240	57-10240	57-40240	57-30240	1.842	2.175	1.335	1.920	1.523	.825	1.365	.473	.473	1.668	1.365
36	57-20360	57-10360	57-40360	57-30360	2.352	2.685	1.845	2.431	2.033	.905	1.875	.640	.473	1.730	1.875
50	57-20500	57-10500	57-40500	57-30500	2.947	3.270	2.440	3.025	2.628	.995	2.472	.766	.473	1.825	2.472

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS: (a) At Sea Level 500 VRMS, 700 VDC, (b) At 70,000 Feet 125 VRMS, 200 VDC; CONTACT CURRENT RATING: 5 Amperes; CONTACT RESISTANCE: .003 Ohms Average; INSULATION RESISTANCE (As Received): 5000 Megohms Minimum.

MECHANICAL SPECIFICATIONS

CONTACTS: Cadmium bronze, ASTM-B-105; FINISH: .00002 Gold per MIL-G-45204, Type II, over copper flash; HOUSINGS: Brass alloy with .0002 to .0004 zinc. Plus clear chromate.

*Manufactured under license from Bunker-Ramo, Inc.

"JONES" PLUGS and SOCKETS — 300 SERIES

In addition to the 300 series listed here, Jones Connectors are available in higher ratings.

400 Series: 1200V, 15 amps
2400 Series: 1700V, 15 amps
500 Series: 3KV, 25 amps

For information on these connectors and additional data on the units listed here, contact any Cinch Electronics District Office, or your Cinch Distributor, who has these items in stock for immediate delivery.

P-302-CCT

S-302-AB

ELECTRICAL SPECIFICATIONS

All connector ratings are based on a continuously mated condition. "Rated Voltage" is ⅓ of Voltage Breakdown.

Rated Voltage ..... 730 Volts rms. Contact Resistance .... .016 Ohms max.

Under most normal operating conditions where not all contacts are carrying substantially full rated current, maximum current per contact is rated at 10 amps. The Jones 300 series plugs and sockets are recognized under the Component Program of Underwriters' Laboratories, Inc. In accordance with UL Standard #8, the Underwriters' Laboratories ratings are derived from the condition wherein all contacts are carrying "rated" current simultaneously. The resultant ratings are as follows:

Rated Current		Rated Wattage	
(2-12 contacts)	7.5 amperes	(2-12 contacts)	1875 watts
(15-33 contacts)	4.5 amperes	(15-33 contacts)	1125 watts

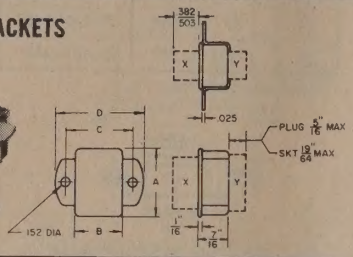
MECHANICAL SPECIFICATIONS

INSULATOR: Molded phenolic;; CONTACTS: Phosphor bronze, cadmium plated; HOUSING: Formed metal, black wrinkle finish.

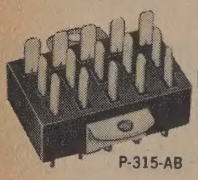
TYPE AB WITH ANGLE BRACKETS

P-306-AB

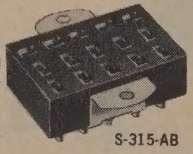
S-306-AB



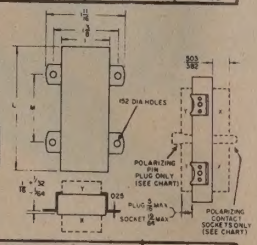
No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches A	B	C	D
2	P-302-AB	S-302-AB	21/32 Dia.	—	31/32	1 7/32
3	P-303-AB	S-303-AB	1	7/16	3/4	1 1/16
4	P-304-AB	S-304-AB	3/4	11/16	1	1 5/16
6	P-306-AB	S-306-AB	1	11/16	1	1 5/16
8	P-308-AB	S-308-AB	1 1/4	11/16	1	1 5/16
10	P-310-AB	S-310-AB	1 3/16	11/16	1	1 3/16
12	P-312-AB	S-312-AB	1 1/4	15/16	1 1/4	1 3/16



P-315-AB



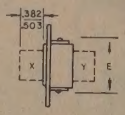
S-315-AB

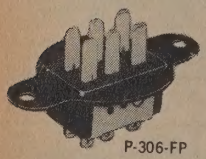


No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches L	M	Polarizing Pin†
15	P-315-AB	S-315-AB	1 5/8	See Note	NO
18	P-318-AB	S-318-AB	1 15/16	1 1/4	NO
21	P-321-AB	S-321-AB	2 1/4	13/16	NO
24	P-324-AB	S-324-AB	2 3/16	1 1/4	14
27	P-327-AB	S-327-AB	2 7/8	1 9/16	14
30	P-330-AB	S-330-AB	3 3/16	1 7/8	14
33	P-333-AB	S-333-AB	3 1/2	2 3/16	17

Note: P-315-AB and S-315-AB require only two mounting brackets, mounted on center of connector.

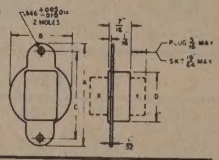
TYPE FP WITH FLUSH PLATE





P-306-FP

S-306-FP

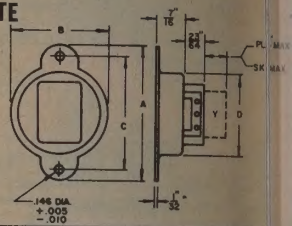


No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches A	B	C	D	E (Max.)
2	P-302-FP	S-302-FP	2 1/16	1 1/4	1 3/4	—	23/32
3	P-303-FP	S-303-FP	2 1/16	1 1/4	1 3/4	15/16	1/2
4	P-304-FP	S-304-FP	2 1/16	1 1/4	1 3/4	11/16	3/4
6	P-306-FP	S-306-FP	2 1/16	1 1/4	1 3/4	15/16	3/4
8	P-308-FP	S-308-FP	2 9/16	1 3/4	2 1/4	1 3/16	3/4
10	P-310-FP	S-310-FP	2 9/16	1 3/4	2 1/4	1 31/64	3/4
12	P-312-FP	S-312-FP	2 9/16	1 3/4	2 1/4	1 3/16	1

TYPE RP WITH RECESSED PLATE

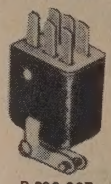
P-306-RP

S-306-RP



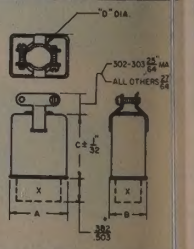
No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches A	B	C	D (Ma
2	P-302-RP	S-302-RP	2 1/16	1 1/2	1 3/4	1.35
3	P-303-RP	S-303-RP	2 1/16	1 1/2	1 3/4	1.35
4	P-304-RP	S-304-RP	2 1/16	1 1/2	1 3/4	1.35
6	P-306-RP	S-306-RP	2 1/16	1 1/2	1 3/4	1.35
8	P-308-RP	S-308-RP	2 9/16	2	2 1/4	1.85
10	P-310-RP	S-310-RP	2 9/16	2	2 1/4	1.85
12	P-312-RP	S-312-RP	2 9/16	2	2 1/4	1.85

TYPE CCT WITH CABLE CLAMP IN TOP



P-306-CCT

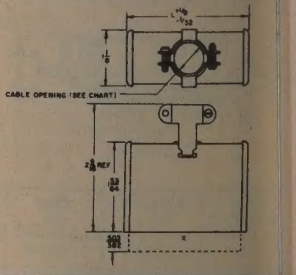
S-306-CCT



No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches A	B	C	D
2	P-302-CCT	S-302-CCT	21/32 Dia.	—	61/64	3/4
3	P-303-CCT	S-303-CCT	1	7/16	61/64	3/4
4	P-304-CCT	S-304-CCT	3/4	11/16	61/64	3/4
6	P-306-CCT	S-306-CCT	1	11/16	1 5/64	7/8
8	P-308-CCT	S-308-CCT	1 1/4	11/16	1 5/64	1/2
10	P-310-CCT	S-310-CCT	1 9/16	11/16	1 13/64	1/2
12	P-312-CCT	S-312-CCT	1 1/4	15/16	1 13/64	9/16

P-315-CCT

S-315-CCT



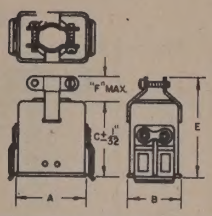
No. of Contacts	Plug Part Nos.	Socket Part Nos.	L +1/8 —1/32	Cable Opening Standard	Max.	Polarizing Pin
15	P-315-CCT	S-315-CCT	1 11/16	9/16	7/8	NO
18	P-318-CCT	S-318-CCT	2	9/16	7/8	NO
21	P-321-CCT	S-321-CCT	2 5/16	5/8	7/8	NO
24	P-324-CCT	S-324-CCT	2 5/8	5/8	7/8	14
27	P-327-CCT	S-327-CCT	2 15/16	5/8	7/8	14
30	P-330-CCT	S-330-CCT	3 1/4	3/4	7/8	14
33	P-333-CCT	S-333-CCT	3 9/16	3/4	7/8	17

CINCH

"JONES" PLUGS AND SOCKETS — 300 SERIES (Cont'd.)

TYPE CCT-K WITH CABLE CLAMP IN TOP OF CAP AND WITH KEEPERS

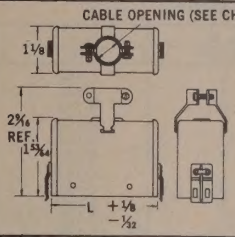
S-306-CCT-K



No. of Contacts	Socket Part Nos.	Dimensions in Inches A	B	C	E	F	Cable Opening
	S-302-CCT-K	21/32 Dia.	—	61/64	1 3/8	25/64	3/8
	S-303-CCT-K	1	7/16	61/64	1 3/8	25/64	5/16
	S-304-CCT-K	3/4	11/16	61/64	1 13/32	27/64	3/8
	S-306-CCT-K	1	11/16	1 5/64	1 1/2	27/64	7/16
	S-308-CCT-K	1 1/4	11/16	1 5/64	1 5/8	27/64	1/2
	S-310-CCT-K	1 9/16	11/16	1 13/64	1 21/32	27/64	1/2
	S-312-CCT-K	1 1/4	15/16	1 13/64	1 5/8	27/64	9/16

CABLE OPENING (SEE CHART)

S-315-CCT-K

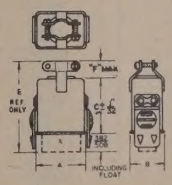


No. of Contacts	Socket Part Nos.	L +1/8 −1/32	Cable Opening	Polarizing Pin
15	S-315-CCT-K	1 11/16	9/16	NO
18	S-318-CCT-K	2	9/16	NO
21	S-321-CCT-K	2 5/16	5/8	NO
24	S-324-CCT-K	2 5/8	5/8	14
27	S-327-CCT-K‡	2 15/16	5/8	14
30	S-330-CCT-K‡	3 1/4	3/4	14
33	S-333-CCT-K‡	3 9/16	3/4	17

Keepers are centered on each side, not on each end as shown.

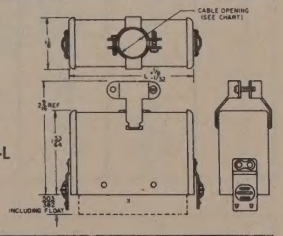
TYPE CCT-L WITH CABLE CLAMP IN TOP OF CAP AND WITH LOCKS

P-306-CCT-L



No. of Contacts	Plug Part Nos.	Dimensions in Inches A	B	C	E	F	Cable Opening
2	P-302-CCT-L	21/32 Dia.	—	61/64	1 13/16	25/64	3/8
3	P-303-CCT-L	1	7/16	61/64	1 13/16	25/64	5/16
4	P-304-CCT-L	3/4	11/16	61/64	1 27/32	27/64	3/8
6	P-306-CCT-L	1	11/16	1 5/64	1 15/16	27/64	7/16
8	P-308-CCT-L	1 1/4	11/16	1 5/64	2 1/16	27/64	1/2
10	P-310-CCT-L	1 9/16	11/16	1 13/64	2 3/32	27/64	1/2
12	P-312-CCT-L	1 1/4	15/16	1 13/64	2 1/16	27/64	9/16

P-315-CCT-L



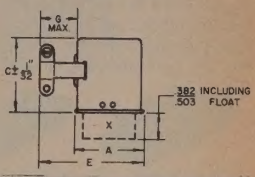
No. of Contacts	Plug Part Nos.	L +1/8 −1/32	Cable Opening Standard	Max.	Polarizing Pin
15	P-315-CCT-L	1 11/16	9/16	7/8	NO
18	P-318-CCT-L	2	9/16	7/8	NO
21	P-321-CCT-L	2 5/16	5/8	7/8	NO
24	P-324-CCT-L	2 5/8	5/8	7/8	14
27	P-327-CCT-L‡	2 15/16	5/8	7/8	14
30	P-330-CCT-L‡	3 1/4	3/4	7/8	14
33	P-333-CCT-L‡	3 9/16	3/4	7/8	17

Locks are centered on each side, not on each end as shown.

TYPE CCE WITH CABLE CLAMP IN END

P-306-CCE

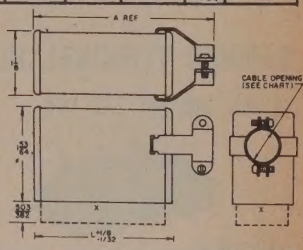
S-306-CCE



No. of Contacts	Plug Part Nos.	Socket Part Nos.	Dimensions in Inches A	B	C	E	G	Cable Opening
6	P-306-CCE	S-306-CCE	1	11/16	1 1/16	1 9/16	27/64	7/16
8	P-308-CCE	S-308-CCE	1 1/4	11/16	1 1/16	1 13/16	27/64	1/2
10	P-310-CCE	S-310-CCE	1 9/16	11/16	1 3/16	2 5/32	27/64	1/2
12	P-312-CCE	S-312-CCE	1 1/4	15/16	1 3/16	1 3/4	27/64	9/16

P-315-CCE

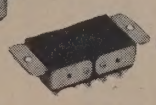
S-315-CCE



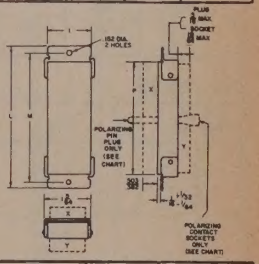
No. of Contacts	Plug Part Nos.	Socket Part Nos.	A (Ref.)	L +1/8 −1/32	Cable Opening Standard	Max.	Polarizing Pin
15	P-315-CCE	S-315-CCE	2 7/16	1 11/16	9/16	13/16	NO
18	P-318-CCE	S-318-CCE	2 3/4	2	9/16	13/16	NO
21	P-321-CCE	S-321-CCE	3 1/16	2 5/16	5/8	13/16	NO
24	P-324-CCE	S-324-CCE	3 3/8	2 5/8	5/8	13/16	14
27	P-327-CCE	S-327-CCE	3 11/16	2 15/16	5/8	13/16	14
30	P-330-CCE	S-330-CCE	4	3 1/4	3/4	13/16	14
33	P-333-CCE	S-333-CCE	4 5/16	3 9/16	3/4	13/16	17

TYPE EB WITH END BRACKETS

P-315-EB



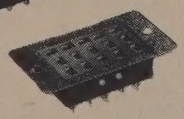
S-315-EB



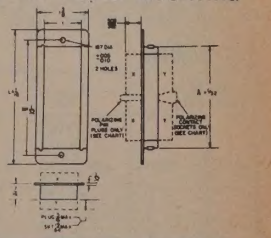
No. of Contacts	Plug Part Nos.	Socket Part Nos.	L ± 1/32"	M ± 1/32"	P ± 1/16"	Polarizing Pin
15	P-315-EB	S-315-EB	2 5/16	2	1 5/8	NO
18	P-318-EB	S-318-EB	2 5/8	2 5/16	1 13/16	NO
21	P-321-EB	S-321-EB	2 15/16	2 5/8	2 1/4	NO
24	P-324-EB	S-324-EB	3 1/4	2 13/16	2 9/16	14
27	P-327-EB	S-327-EB	3 9/16	3 1/4	2 7/8	14
30	P-330-EB	S-330-EB	3 7/8	3 9/16	3 3/16	14
33	P-333-EB	S-333-EB	4 3/16	3 7/8	3 1/2	17

TYPE SB WITH SHALLOW BRACKETS FOR FLUSH MOUNTING

P-315-SB



S-315-SB



No. of Contacts	Plug Part Nos.	Socket Part Nos.	A ± 1/32"	M ± 1/32"	L ± 1/16"	Polarizing Pin
15	P-315-SB	S-315-SB	1 11/16	2 1/8	2 35/64	NO
18	P-318-SB	S-318-SB	2	2 7/16	2 55/64	NO
21	P-321-SB	S-321-SB	2 5/16	2 3/4	3 11/64	NO
24	P-324-SB	S-324-SB	2 5/8	3 1/16	3 31/64	14
27	P-327-SB	S-327-SB	2 15/16	3 3/8	3 51/64	14
30	P-330-SB	S-330-SB	3 1/4	3 11/16	4 5/64	14
33	P-333-SB	S-333-SB	3 9/16	4	4 27/64	17

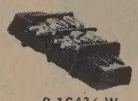
CINCH

TERMINAL BLOCKS and ACCESSORIES

The Jones barrier terminal blocks are made of molded phenolic. Eyelets and screws are nickel-plated brass and terminals are hot solder dipped brass. Fibre or phenolic marker strips are available for all barrier blocks. Barrier blocks are available in standard terminal configurations as shown. Optional terminals are available as indicated by the Y, W, or ¾ W suffix on the part numbers in the charts.

2-140

2-172-W


2-164¾-W

2-164-Y

The standard terminal block with binder head screws can be used for wire or special terminal attachment.
¾ W terminals are available for solder attachment of wires on one side of the terminal block. W terminals are available for solder connection of wires to both sides of the terminal block. (Available as standard on 172 series; special order on others.) Y terminals are available for solder connection of wires underneath the terminal block.

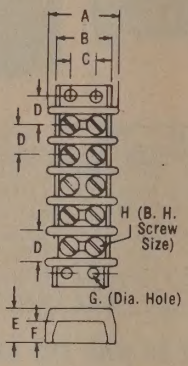
ELECTRICAL SPECIFICATIONS

Series	Max. Volts r.m.s. Without Marker Strip	Max. Volts r.m.s. With Marker Strip	Max. Current In Amps.	Max. Wa per Termin
140	1100	1200	15	3,750
141	1100	1600	20	5,000
142	1600	2500	30	7,500
150	1700	2600	50	12,500
151	1800	3400	70	17,500
152	2100	3800	90	54,000
164	1100	1200	15	3,750
171	1000	—*	5	625
172	1000	2000	5	625
173	1000	2000	5	625
174	1000	2000	5	625

*No marker strip available.

BARRIER TERMINAL BLOCKS

SERIES 140/141/142/164



DIMENSIONS

	140	141	142	164
A	7/8"	1 1/8"	1 5/16"	7/8"
B	1 1/16"	7/8"	1 1/16"	1 1/16"
C	5/16"	27/64"	1/2"	5/16"
D	3/8"	7/16"	9/16"	3/8"
E	13/32"	1/2"	5/8"	13/32"
F	1/4"	5/16"	3/8"	1/4"
G	.160"	.175/ .185"	.209"	.171/ .175"
H	5/40 x 3/16	6/32 x 1/4	8/32 x 5/16	6/32 x 1/4

140 SERIES

No. of Terminals	Std.*	¾W	Y
1	1-140	1-140-¾W	1-140-Y
2	2-140	2-140-¾W	2-140-Y
3	3-140	3-140-¾W	3-140-Y
4	4-140	4-140-¾W	4-140-Y
5	5-140	5-140-¾W	5-140-Y
6	6-140	6-140-¾W	6-140-Y
7	7-140	7-140-¾W	7-140-Y
8	8-140	8-140-¾W	8-140-Y
9	9-140	9-140-¾W	9-140-Y
10	10-140	10-140-¾W	10-140-Y
11	11-140	11-140-¾W	11-140-Y
12	12-140	12-140-¾W	12-140-Y
13	13-140	13-140-¾W	13-140-Y
14	14-140	14-140-¾W	14-140-Y
15	15-140	15-140-¾W	15-140-Y
16	16-140	16-140-¾W	16-140-Y
17	17-140	17-140-¾W	17-140-Y
18	18-140	18-140-¾W	18-140-Y
19	19-140	19-140-¾W	19-140-Y
20	20-140	20-140-¾W	20-140-Y
21	21-140	21-140-¾W	21-140-Y

*140 series barrier blocks are available with up to 25 terminal positions on special order. Part Nos. follow the conventional numbering system.

141 SERIES

No. of Terminals	Std.	¾W	Y
1	1-141	1-141-¾W	1-141-Y
2	2-141	2-141-¾W	2-141-Y
3	3-141	3-141-¾W	3-141-Y
4	4-141	4-141-¾W	4-141-Y
5	5-141	5-141-¾W	5-141-Y
6	6-141	6-141-¾W	6-141-Y
7	7-141	7-141-¾W	7-141-Y
8	8-141	8-141-¾W	8-141-Y
9	9-141	9-141-¾W	9-141-Y
10	10-141	10-141-¾W	10-141-Y
11	11-141	11-141-¾W	11-141-Y
12	12-141	12-141-¾W	12-141-Y
13	13-141	13-141-¾W	13-141-Y
14	14-141	14-141-¾W	14-141-Y
15	15-141	15-141-¾W	15-141-Y
16	16-141	16-141-¾W	16-141-Y
17	17-141	17-141-¾W	17-141-Y
18	18-141	18-141-¾W	18-141-Y
19	19-141	19-141-¾W	19-141-Y
20	20-141	20-141-¾W	20-141-Y

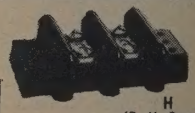
142 SERIES

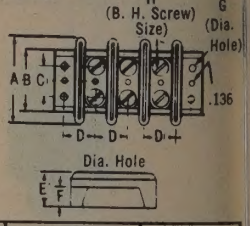
No. of Terminals	Std.	¾W	Y
1	1-142	1-142-¾W	1-142-Y
2	2-142	2-142-¾W	2-142-Y
3	3-142	3-142-¾W	3-142-Y
4	4-142	4-142-¾W	4-142-Y
5	5-142	5-142-¾W	5-142-Y
6	6-142	6-142-¾W	6-142-Y
7	7-142	7-142-¾W	7-142-Y
8	8-142	8-142-¾W	8-142-Y
9	9-142	9-142-¾W	9-142-Y
10	10-142	10-142-¾W	10-142-Y
11	11-142	11-142-¾W	11-142-Y
12	12-142	12-142-¾W	12-142-Y
13	13-142	13-142-¾W	13-142-Y
14	14-142	14-142-¾W	14-142-Y
15	15-142	15-142-¾W	15-142-Y
16	16-142	16-142-¾W	16-142-Y
17	17-142	17-142-¾W	17-142-Y

164 SERIES

No. of Terminals	Std.	¾W	Y
1	1-164	1-164-¾W	1-164-Y
2	2-164	2-164-¾W	2-164-Y
3	3-164	3-164-¾W	3-164-Y
4	4-164	4-164-¾W	4-164-Y
5	5-164	5-164-¾W	5-164-Y
6	6-164	6-164-¾W	6-164-Y
7	7-164	7-164-¾W	7-164-Y
8	8-164	8-164-¾W	8-164-Y
9	9-164	9-164-¾W	9-164-Y
10	10-164	10-164-¾W	10-164-Y
11	11-164	11-164-¾W	11-164-Y
12	12-164	12-164-¾W	12-164-Y
13	13-164	13-164-¾W	13-164-Y
14	14-164	14-164-¾W	14-164-Y
15	15-164	15-164-¾W	15-164-Y
16	16-164	16-164-¾W	16-164-Y
17	17-164	17-164-¾W	17-164-Y
18	18-164	18-164-¾W	18-164-Y
19	19-164	19-164-¾W	19-164-Y
20	20-164	20-164-¾W	20-164-Y
21	21-164	21-164-¾W	21-164-Y

SERIES 150/151/152





DIMENSIONS

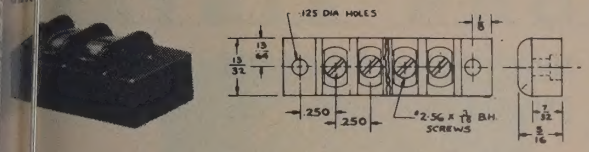
	150	151	152
A	1 13/16"	2"	2 1/2"
B	1 5/16"	1 1/2"	1 13/16"
C	5/8"	3/4"	7/8"
D	11/16"	7/8"	1 1/8"
E	3/4"	15/16"	1 1/8"
F	7/16"	1/2"	5/8"
G	.160"	.180"	.209"
H	10/32 x 3/16	12/32 x 3/8	1/4/28 x 1/2

No. of Terminals	150 SERIES Std.	150 SERIES Y	151 SERIES Std.	152 SERIES Std.
1	1-150	1-150-Y	1-151	1-152
2	2-150	2-150-Y	2-151	2-152
3	3-150	3-150-Y	3-151	3-152
4	4-150	4-150-Y	4-151	4-152
5	5-150	5-150-Y	5-151	5-152
6	6-150	6-150-Y	6-151	6-152
7	7-150	7-150-Y	7-151	
8	8-150	8-150-Y	8-151	
9	9-150	9-150-Y		
10	10-150	10-150-Y		

CINCH

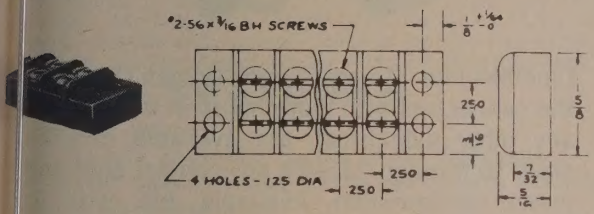
BARRIER TERMINAL BLOCKS (Cont'd.)

SERIES 171



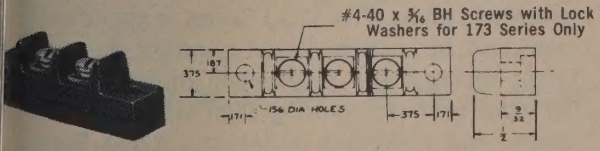
No. of Terminals	Std.
2	2-171
3	3-171
4	4-171
5	5-171
6	6-171
7	7-171
8	8-171

SERIES 172



No. of Terminals	Std.	W	¾W	Y
2	2-172	2-172-W	2-172-¾W	2-172-Y
3	3-172	3-172-W	3-172-¾W	3-172-Y
4	4-172	4-172-W	4-172-¾W	4-172-Y
5	5-172	5-172-W	5-172-¾W	5-172-Y
6	6-172	6-172-W	6-172-¾W	6-172-Y
7	7-172	7-172-W	7-172-¾W	7-172-Y
8	8-172	8-172-W	8-172-¾W	8-172-Y
9	9-172	9-172-W	9-172-¾W	9-172-Y
10	10-172	10-172-W	10-172-¾W	10-172-Y
11	11-172	11-172-W	11-172-¾W	11-172-Y
12	12-172	12-172-W	12-172-¾W	12-172-Y
13	13-172	13-172-W	13-172-¾W	13-172-Y
14	14-172	14-172-W	14-172-¾W	14-172-Y

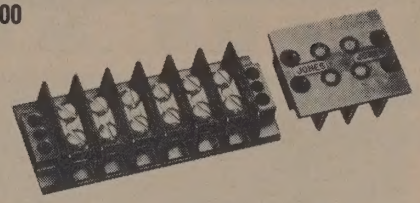
SERIES 173-174



A COMPLETE LINE OF MARKER STRIPS AND FANNING STRIPS IS AVAILABLE FOR THESE BARRIER TERMINAL BLOCKS

Contact any Cinch Electronics District Office, or your Cinch Distributor, who has them in stock for immediate delivery.

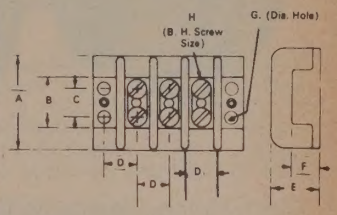
SERIES 500



The new 500 series Jones Barrier Terminal Blocks are designed for applications where electrical and mechanical performance requirements are especially critical. Bottoms are closed so that insulating strips are not required. Knockouts are molded into the base so that Y terminals can be accommodated if desired. A top-mounted marker strip can be furnished as described on page 16.

SERIES DIMENSIONS

	540	541	542
A	1⅛"	1⅜"	1⅝"
B	19/32"	¾"	⅞"
C	5/16"	27/64"	½"
D	⅜"	7/16"	9/16"
E	39/64"	11/16"	⅞"
F	21/64"	⅜"	½"
G	.160"	.175/ .185"	.209"
H	5/40 x 3/16	6/32 x ¼	8/32 x 5/16



SERIES 540

Creepage Distance: ½ inch. **Max. Voltage:** 2300 volts r.m.s. **Max. Current:** 15 amps.

No. of Terminals	Part No.	No. of Terminals	Part No.	No. of Terminals	Part No.
2	2-540	12	12-540	22	22-540
3	3-540	13	13-540	23	23-540
4	4-540	14	14-540	24	24-540
5	5-540	15	15-540	25	25-540
6	6-540	16	16-540	26	26-540
7	7-540	17	17-540	27	27-540
8	8-540	18	18-540	28	28-540
9	9-540	19	19-540	29	29-540
10	10-540	20	20-540	30	30-540
11	11-540	21	21-540	31	31-540

SERIES 541

Creepage Distance: ⅝ inch. **Max. Voltage:** 2800 volts r.m.s. **Max. Current:** 20 amps.

No. of Terminals	Part No.	No. of Terminals	Part No.	No. of Terminals	Part No.
2	2-541	12	12-541	22	22-541
3	3-541	13	13-541	23	23-541
4	4-541	14	14-541	24	24-541
5	5-541	15	15-541	25	25-541
6	6-541	16	16-541	26	26-541
7	7-541	17	17-541	27	27-541
8	8-541	18	18-541	28	28-541
9	9-541	19	19-541	29	29-541
10	10-541	20	20-541	30	30-541
11	11-541	21	21-541		

SERIES 542

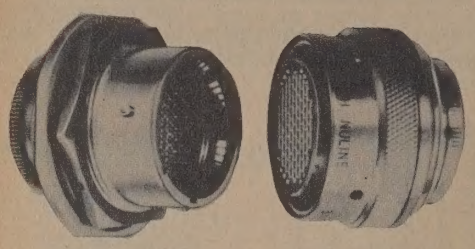
Creepage Distance: ¾ inch. **Max. Voltage:** 4000 volts r.m.s. **Max. Current:** 30 amps.

No. of Terminals	Part No.	No. of Terminals	Part No.	No. of Terminals	Part No.
2	2-542	11	11-542	20	20-542
3	3-542	12	12-542	21	21-542
4	4-542	13	13-542	22	22-542
5	5-542	14	14-542	23	23-542
6	6-542	15	15-542	24	24-542
7	7-542	16	16-542	25	25-542
8	8-542	17	17-542	26	26-542
9	9-542	18	18-542		
10	10-542	19	19-542		

CINCH-NULINE

THE SINGLE SOURCE FOR ALL ROUND CONNECTOR NEEDS

MIL-C-81511 SUBMINIATURE CYLINDRICAL CONNECTORS



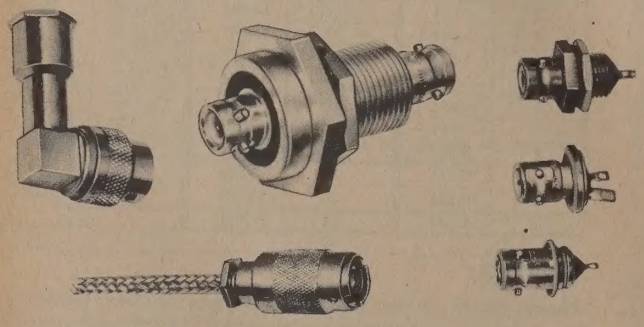
Cinch-Nuline "Astro/348®" connectors represent the highest state-of-the-art in round connectors. They have 0.085″ contact centers with dielectric separation of 0.021″, and the dielectric has a one-piece retention system that eliminates metal construction. Other important features include scoop-proof mating, grounding prior to electrical contact, removable crimp contacts, and extreme environment stability. Available are shell sizes for contact configurations of 4, 12, 37, 55, and 85 contacts, five receptacle styles, and standardized accessories including uniquely designed, strain relieving "J" Adapters. Request Catalog Number CN-5.

MIL-C-26500 & MIL-C-38300 CYLINDRICAL CONNECTORS

Cinch-Nuline "Omega®" and "Golden Omega®", the connectors with more hours in the air than any other cylindrical, are available in shell sizes 10 through 22, with any contact style and insert configuration. Available, too, with G-Type conductive shells and lanyard release assemblies. These Cinch-Nuline round connectors operate continuously at 200°C, and withstand violent thermal shock and high G vibration. They resist corrosion, ozone, sand, and dust. Request Catalog Number CN-3.

® Registered TM, Bunker-Ramo Corporation

MIL-C-25516 MINIATURE ENVIRONMENTAL-RESISTANT COAXIAL CONNECTORS



Cinch-Nuline 1200 Series Connectors are environmentally and hermetically sealed connectors for single conductor coaxial and unshielded cables. The 1200 Series is specifically designed for critical liquid quantity measurement systems and other high impedance and RF applications requiring high vibration resistance and maximum reliability. 1200 Series connectors are available in a wide range of configurations in both solder and crimp type terminal designs. Request Catalog Number CN-7.

Contact your local Cinch-Sales Office, or write . . .

CINCH-NULINE

1015 SOUTH SIXTH STREET • MINNEAPOLIS, MINNESOTA 55414
Phone: (612) 339-8301 TWX: 910-576-2748

CO-ORD SWITCH

A DIVISION OF LVC INDUSTRIES INC.

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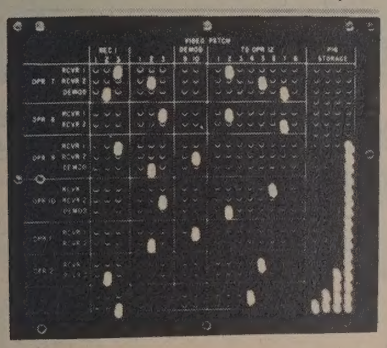
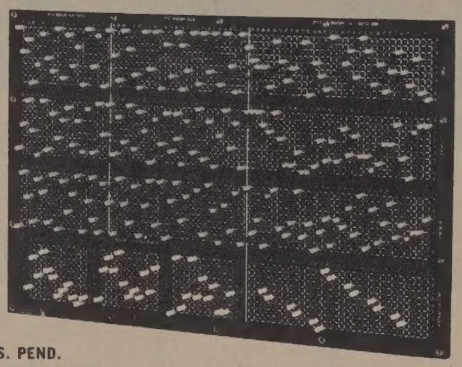
MATRIX PROGRAM BOARDS





U.S. & FOREIGN PATS. PEND.

CO-ORD Matrix Program Boards are composed of 2 to 6 decks of contacts that are bussed in parallel rows on .250 centers. The contact rows of one deck are usually oriented perpendicular to the rows of adjacent deck(s) so as to obtain switching crosspoints. Electrical connections of the bussed contact rows are effected by inserting shorting pins at the desired crosspoints; "CO-AX", phone plug type pins are available for networks which require component insertion (Diodes, resistors, etc.). Single board matricies of up to 11,000 crosspoints are available in standard or special arrangements. Bussed and isolated contacts can be had alone or in combination. Panels may be screened, engraved, or fitted with pre-punched templates for rapid program changing.

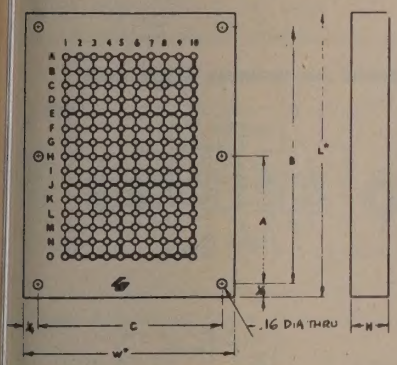
FEATURES

- Closed entry contacts
- High mechanical environment capacity for MIL applications
- Low interlead capacitance (cross-talk) for high frequency applications
- Attractive and uncluttered panel
- Compact package
- Standard sizes available off the shelf
- Permits insertion of components into network without soldering
- Wide variety of switching combinations available using standard hardware

APPLICATIONS

- Computer memories
- Cordless patch panels
- Function generators (Analog/Digital)
- Power distributors
- Thermocouple signal selectors
- Circuit/Component test programmers
- Lighting systems (Special effects)
- Variable sequence selectors
- Variable diode matrices
- Code generators
- Traffic control panels
- Decade switches
- Vending machine control
- Numeric controlled machinery
- Data channeling & logging
- Communications distributors

STANDARD MATRIX BOARDS—SERIES 63014



SPECIFICATIONS

1-Contact Resistance
- a Total Pin Resistance: .004 OHM MAX.
- b Volume Resistivity of Strip: .003 OHM/IN

2-Breakdown Voltage: 1000 VRMS MIN.

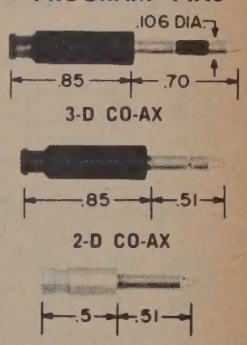
3-Current Capacity: 5 AMPS Continuous

4-Materials
- a Plastic Parts: Black Phenolic XXX
- b Flexible Contacts: Heat Treated Beryl. Copper
- c Terminals: Brass
- d Finishes: Gold, Silver or Nickel

DASH	MATRIX	L	W	A	B	C
-1	10 X 10	3¾	3¾	–	3.250	3.250
-2	10 X 15	5	3¾	–	4.500	3.250
-3	10 X 20	6¼	3¾	–	5.750	3.250
-4	10 X 25	7½	3¾	3.500	7.000	3.250
-5	15 X 20	6¼	5	–	5.750	4.500
-6	15 X 25	7½	5	3.500	7.000	4.500
-7	20 X 20	6¼	6¼	–	5.750	5.750
-8	50 X 10	13¾	3¾	4.000 & 7.000	13.250	3.250
-9	25 X 25	7½	7½	3.500	7.000	7.000

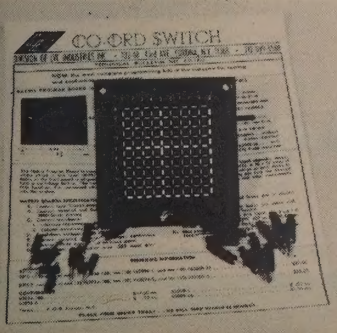
H	2-D	3-D	4-D	5-D	6-D
	9/16	¾	15/16	1⅛	1 5/16

PROGRAM PINS



2-D SHORTING PIN
Pins up to 6 deck available

PROGRAM BOARD KITS



KIT BPS-1 consists of a 10 x 10 matrix board similar to #63014-1, above, 10 shorting pins and 10 "CO-AX" diode pins with 1N270's installed $27.00

KIT BPS-2 is the same as BPS-1 but without diodes $22.25

10 x 10 matrix board	$17.00 ea.
Shorting pin	.12 ea.
Diode pin w/1N270	.99 ea.
Diode pin w/o diode	.51 ea.

AVAILABLE FROM STOCK

1/10 INCH CENTERLINE MATRIX

Offers a ½ reduction in both size and weight over standard matrices and can be made to meet any customer specifications. Ideal where space is critical.

SEE OUR BLOC-LITE SUBMINIATURE LIGHTING DEVICES IN SECTION 2400

AVAILABLE FROM STOCK

OUR COMPLETE LINE OF

STANDARD SOLDER-TYPE & INSULATED TERMINALS & HARDWARE

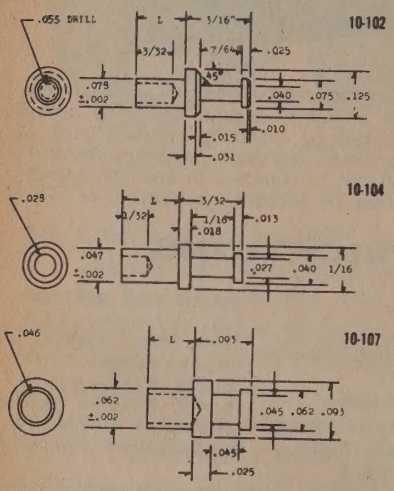
WE MAINTAIN THE MOST PRECISE, UP-TO-DATE HIGH SPEED SWISS AUTOMATIC SCREW MACHINERY AVAILABLE

MIL Spec. Platings Available: Silver: MIL-F-14072, QQ-S-365 • Electro-Tin: MIL-T-10727, Type 1 • Electro-Tin-Lead (Electro-Solder): MIL-F-14072 • Hot-Solder-Dip: MIL-F-14072, Type 221 • Hot-Tin-Dip: MIL-T-10727 • Gold: MIL-G-45204, Type II • Nickel: QQ-N-290, Type VI • Cadmium: QQ-P-416A, Type II, Class B, Clear Chromate • Bright Alloy: MIL Spec. • Copper: MIL Spec.

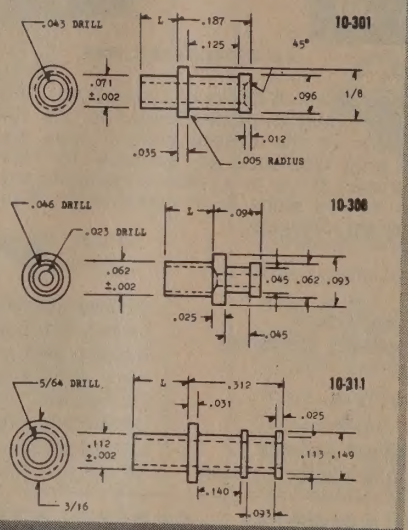
ALL STANDARD PANEL AND CHASSIS HARDWARE AVAILABLE

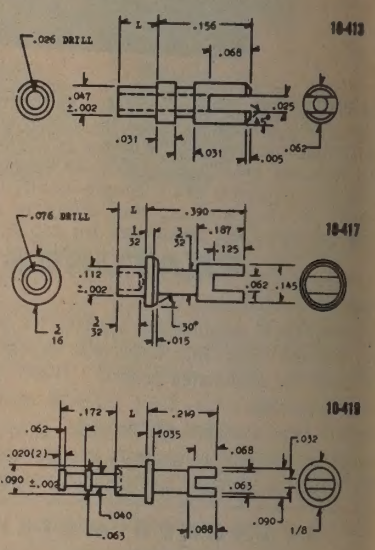
THESE ARE ONLY 36 OF THE HUNDREDS OF STYLES OF TERMINALS WE PRODUCE

SINGLE TURRET TERMINALS, SERIES 10-100

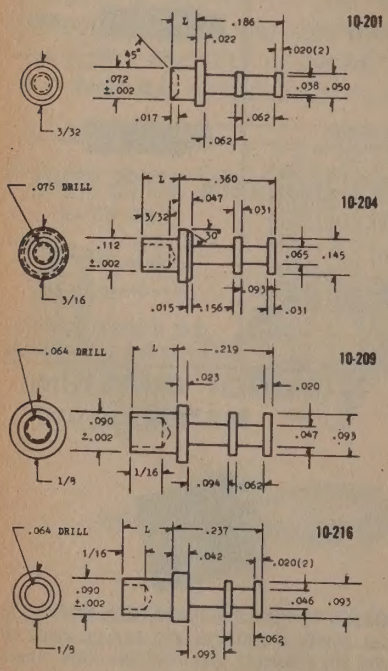


TUBULAR TERMINALS, SERIES 10-300





DOUBLE TURRET TERMINALS, SERIES 10-200

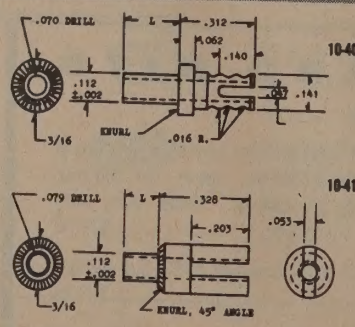


PRECISION-MADE

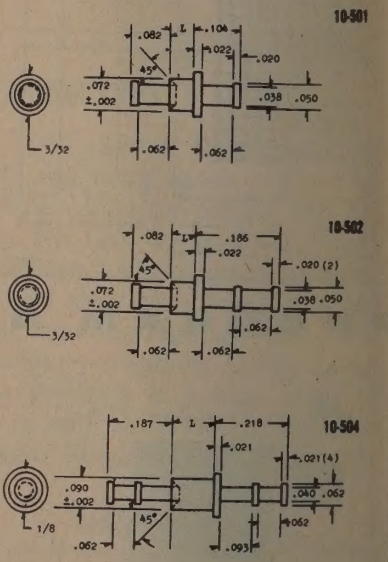
MODULE PINS
CONNECTOR PINS
PRINTED CIRCUIT PINS

ANY & ALL SIZES TO YOUR SPECS

SEND DRAWINGS FOR PROMPT QUOTATION



DOUBLE END TERMINALS, SERIES 10-500



CALL OR WRITE FOR FREE CATALOG • BE SURE TO SPECIFY SHANK LENGTH & BOARD THICKNESS

CONCORD ELECTRONICS CORPORATION

DEPT. JE

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AVAILABLE FROM STOCK

OUR COMPLETE LINE OF

STANDARD SOLDER-TYPE & INSULATED TERMINALS & HARDWARE

WE MAINTAIN THE MOST PRECISE, UP-TO-DATE HIGH SPEED SWISS AUTOMATIC SCREW MACHINERY AVAILABLE

QUOTATIONS GIVEN ON CUSTOM DESIGNS

TERMINAL MATERIALS:

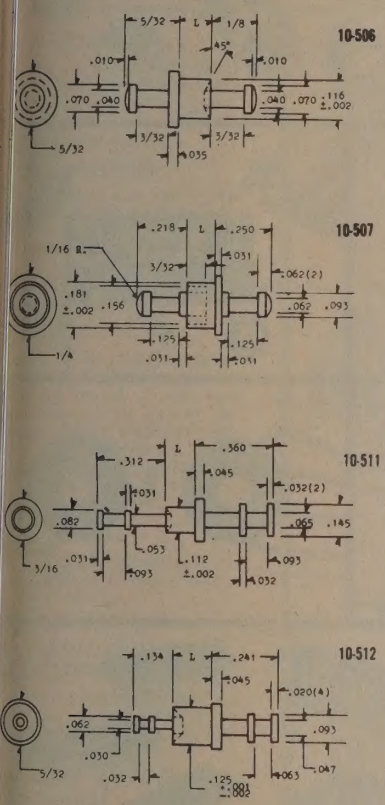
- **BRASS** QQ-B-626, Comp. 22, ½ hard. Brass tubing for hollow terminals is ASTM-B 135 grade.
- **BRONZE** to ASTM-B 140-58, Alloy B (leaded commercial bronze).

TERMINALS TO THE FOLLOWING SPECIFICATIONS:

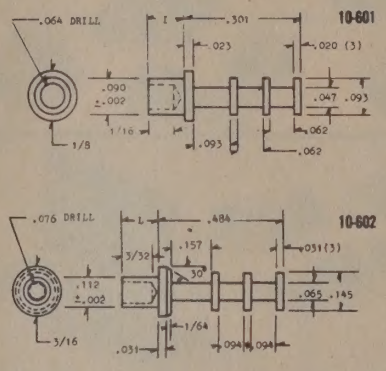
- NASA
- NATIONAL AEROSPACE
- MIL-T-55155
- FEDERAL SPEC. NUMBERS
- MS MILITARY STANDARDS

THESE ARE ONLY 36 OF THE HUNDREDS OF STYLES OF TERMINALS WE PRODUCE

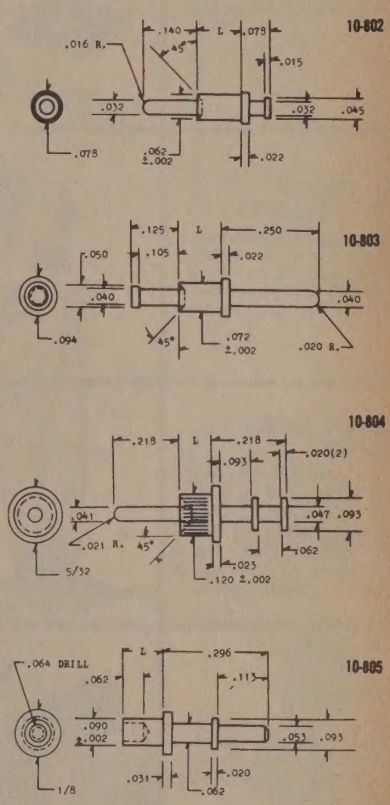
DOUBLE END TERMINALS, SERIES 10-500



TRIPLE TURRET TERMINALS, SERIES 10-600



PIN TYPE TERMINALS, SERIES 10-800



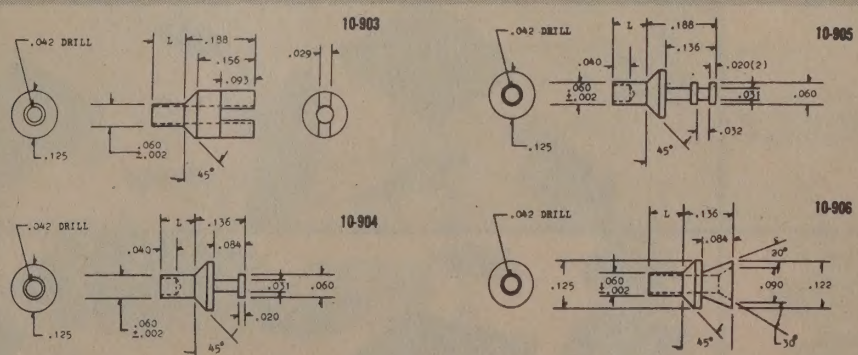
PRECISION-MADE

MODULE PINS
CONNECTOR PINS
PRINTED CIRCUIT PINS

ANY & ALL SIZES TO YOUR SPECS

SEND DRAWINGS FOR PROMPT QUOTATION

PRINTED CIRCUIT TERMINALS SERIES 10-900



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CONNECTOR CORPORATION

6025 N. KEYSTONE AVENUE • CHICAGO, ILLINOIS 60646 • TELEPHONE: 312, 539-3108

For many years the electronic industry has relied on the wide range of products, engineering services and consistent production quality of Connector Corporation.

A limited cross section of Connector Corporation's line is illustrated. Your specific requirement can be exactly met and mass produced with good delivery. Many items can be supplied with leads attached and color coded, offering production savings for your assembly. Special items can be designed or developed at relatively low cost. Just let us know what you need.

Products are available in a wide range of insulations and contact materials:

Insulations include: general purpose or mica-filled low loss Phenolic, glass filled alkyd, polypropolene, ceramic,etc., in mold versions. Laminated types include XP, XX XXXP Phenolics, X2B Hard Rubber, Gla Epoxy, Glass alkyd.

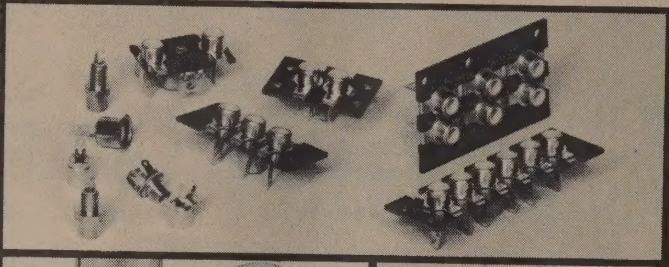
Contacts and Platings include: High tensi brass, phosphor bronze or beryllium copp with cadmium, electro tin, silver, hot t dipped, silver-gold flash, gold plating, et

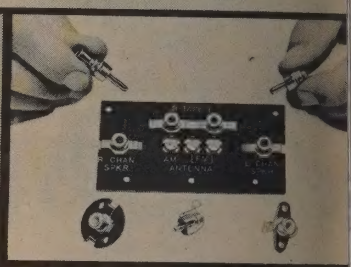
TUBE SOCKETS

Most standard and many special molded & ceramic configurations available as well as laminated socket types. Fixed or collapsible types of shielding are available.

MULTI PURPOSE PHONO CONNECTORS

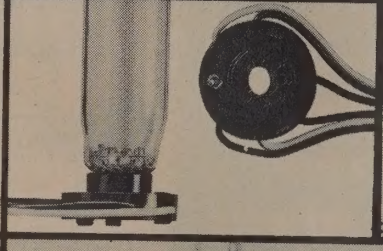
Sockets available in multiples up to 12 per section. Broad line of individual male and female types in a variety of mountings. Highly reliable for dependable repeated use.

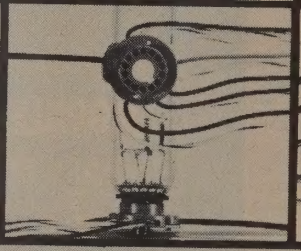


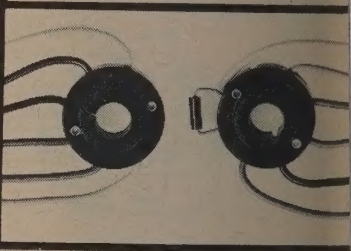


KINESCOPE SOCKET ASSEMBLIES

Include: Miniature Di Heptal Socket for 90° color tubes, 110° Eightar CRT sockets, miniature types for JEDEC E7-91, B7-247 basing (HEPTAL). Many special configurations and types may be furnished in quantity lots.

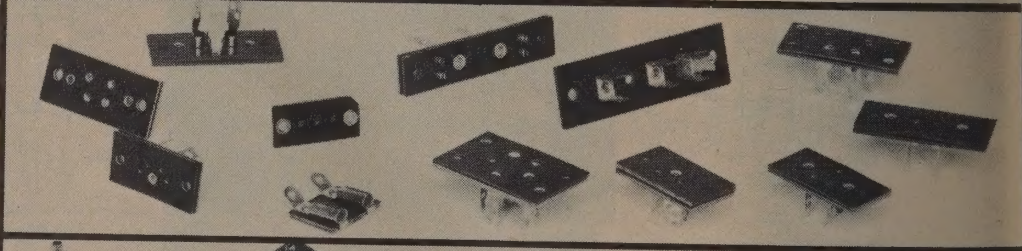






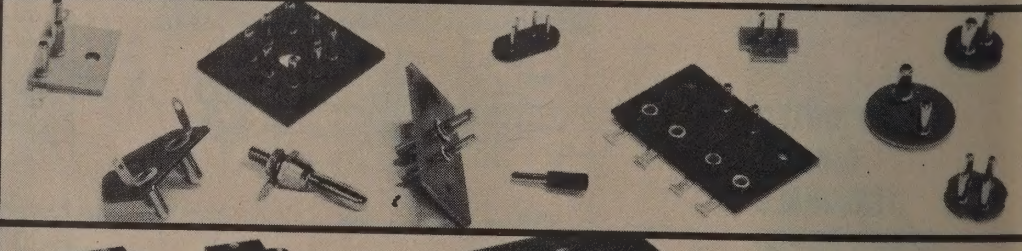
RECEPTACLES

Numerous varieties. Available in molded or laminated construction. Reliable contacts offer positive electrical and mechanical mating.



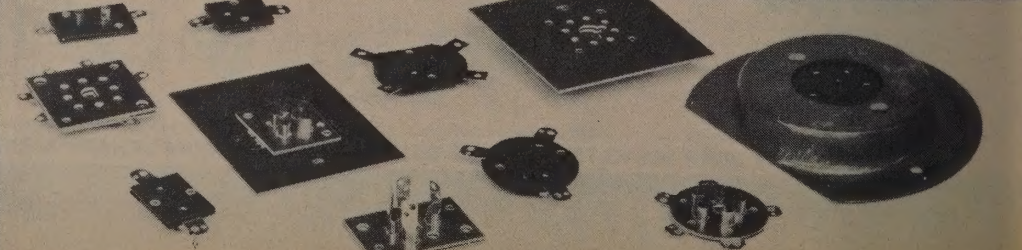
PLUGS

Numerous types available, with molded or laminated phenolic insulations. Leads may be supplied to specification.



BATTERY SOCKETS

Complete line for commercial & military batteries. Custom designed to your requirements.



See YELLOW SECTION for Local Offices, Phones

CONNECTOR CORPORATION

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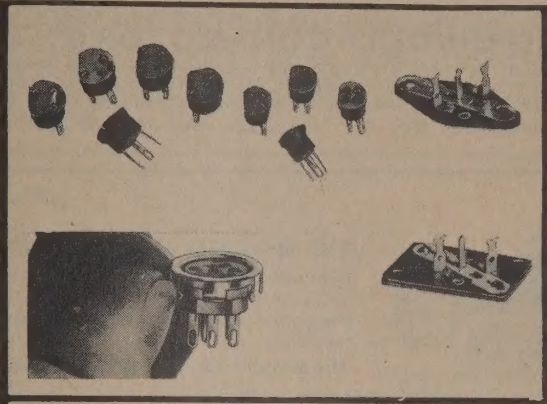
NSISTOR AND VISTOR SOCKETS

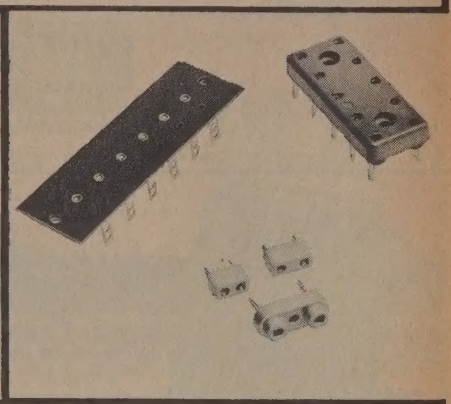
lable to mate with 3-pin, ne transistors, and also with nd 4-pin transistors of any figuration on .200 or .100 pin circle.

iature positive contact MIL lity nuvistor sockets for high lity military and commercial ipment.

YSTAL SOCKETS

ommodate single & multiple stals. Include both p.c. and iventional solder lug versions crystals with .486, .273 and 2 pin centers and with .050 .040 pin diameters. Also avail- e to MIL Specs.



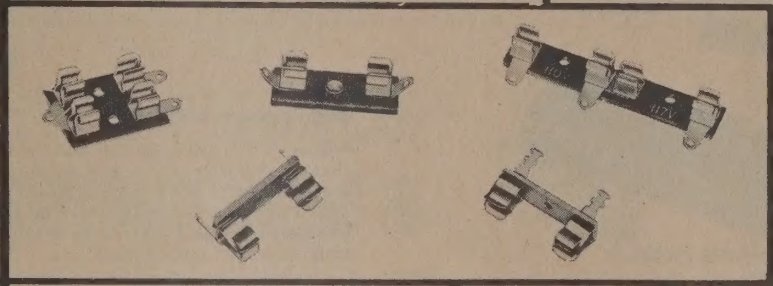


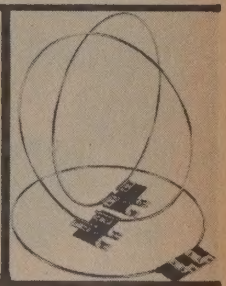
SE HOLDERS

sitive grip open type. Features: sy solderability, and versatility construction which permit ltiples or variations to your ec at reasonable cost.

F TV ANTENNAE

taches easily. Can be rotated many different planes for opti- m performance. Long life, uble-free operation.



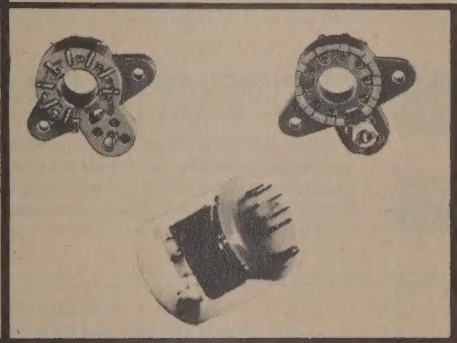


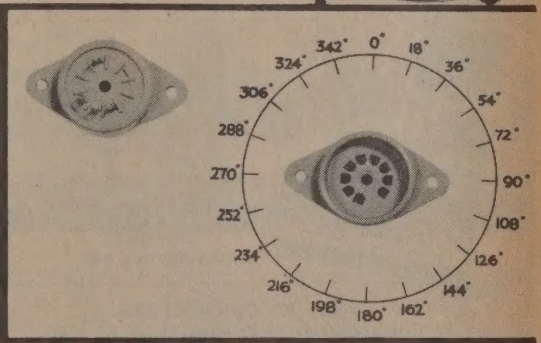
RANSMITTER TUBE OCKETS

w loss at very high frequencies vailable. Vented to provide aximum cooling of tube base nd anode contact area by con- ection. Voltage breakdown char- cteristics are enhanced by ap- ropriate barriers between con- ct positions where indicated.

IGH VOLTAGE UBE SOCKETS

esigned for application with use appropriate insulating materi- ls and spacings.



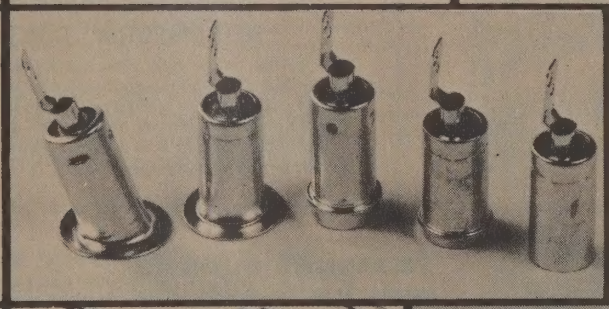


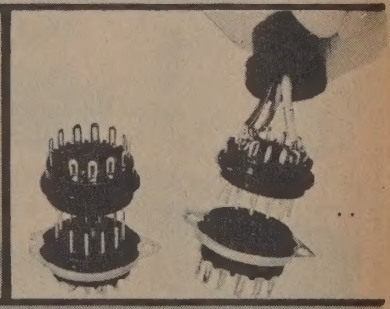
RF COAXIAL ANTENNA CONNECTORS

or auto receivers & similar ap- lications. Rugged construction. xcellent contact resistance and etention.

MULTI-PIN MALE/FEMALE CONNECTORS

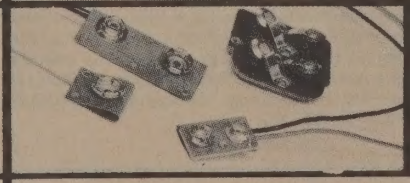
Provide quick reliable connect and disconnect for cable assem- blies. Insert and extract easily, yet have reliable contact reten- tion and resistance.

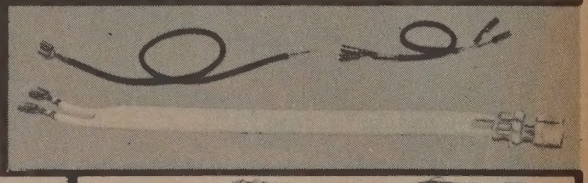




BATTERY CONNECTORS AND WIRE ASSEMBLIES

Snap-on and positive contact types available with wired leads if desired. Wire assemblies fur- nished to your specifications as to type of wire, length and ter- mination attachments.

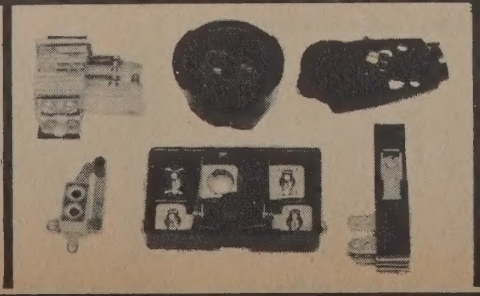


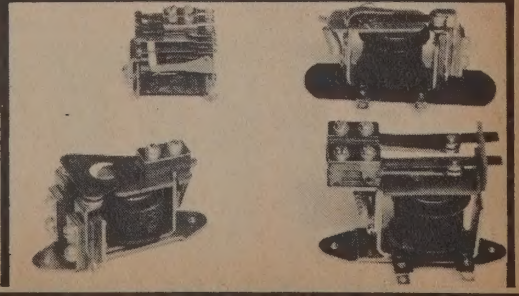


SEALECTRIC

SEALECTRIC SWITCHES AND RELAYS

For standard & special applica- tions, send us your requirements.





Precision Electronic Connectors

PRINTED CIRCUIT CONNECTORS*

Provide positive, space-saving connections between printed circuitry and conventional wiring through PC boards, tape cables or "plug" mounted subassemblies. Feature Continental's patented "Bellowform" contacts; glass-filled Diallyl Phthalate, Plasko Alkyd, mineral filled Melamine moldings. Receptacles accommodate 1/32", 3/64", 1/16", 3/32" or 1/8" board thickness single and dual readouts on .050", .075" .100", .125", .150", .156" and .200" centers.

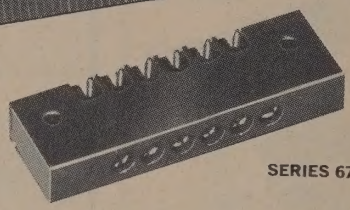
*Patent No. 2,875,42

SERIES 600

PC BOARD RECEPTACLE

Card edge printed circuit connectors 1/32", 3/64", 1/16", 3/32" and 1/8" printed circuit boards. Available in wide range of sizes, single and dual readout contact construction . . . up to 210 terminals.

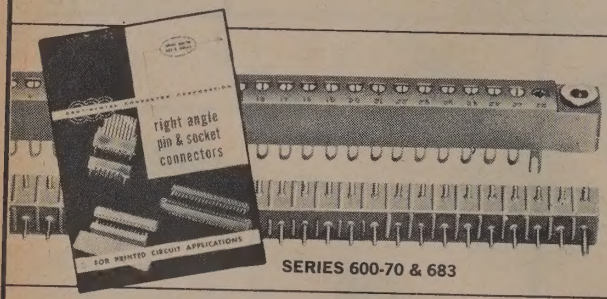
Also available with .025" and .045" square solderless-wrap terminations.



SERIES 672

PC TEST POINT

Provide conveniently located test points to check printed circuitry. Available with 4, 5, 6, 8, 10, 11, 20, 21, 28, 30, 42 and 63 contacts which grip and hold securely a standard .080" test probe. Connectors have recessed and floating pin terminals mounted at right angle to the test socket. Pins dip solder to printed circuit board.



SERIES 600-70 & 683

PC RIGHT ANGLE PIN AND SOCKET

MEET MIL-E-5400K SPECIFICATIONS

Provide additional flexibility in printed circuit system design. Mating parts have set of solder cups on socket and set of right angle pins on plug which mounts and dip solders to the printed circuit board. Wide variety of configurations, contact sizes, moldings and mounting styles are available.

MOST PC CONNECTORS AVAILABLE IN THESE WIRING STYLES

Wire-Wrapped

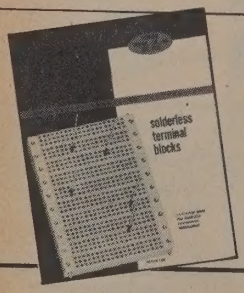
Eyelet Lug

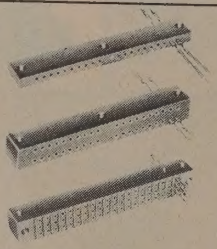
Dip Solder

Taper Tab

EXCLUSIVE PATENTED "BELLOWFORM" CONTACT

Coil spring action grip clasps printed circuit board firmly over 100% of the contact area. Contact permits use of undersized or oversized board tolerances while maintaining low contact resistance. It "rides" with the printed circuit board under extreme vibration conditions or misalignment.





TERMINAL BLOCKS

SERIES 145-58, 145-50 AND 145-48. Precision reamed, solderless taper pin receptacles in single, dual and triple row construction, molded-in for highest durability. Available in any combination of feedthru individual or shorting terminals. Internal bus between any combination of terminals eliminates external wiring. Mounting holes for stacking, right angle and perpendicular mounting. Molding is glass filled Dially Phthalate (MIL-P-19833, Type GDI-30).

complete catalog data on request

CONTINENTAL

CONTINENTAL CONNECTOR CORPORATION • 34-63 56th STREET

See YELLOW SECTION for Local Offices, Phones

for Commercial & Military Applications

PLUG & SOCKET CONNECTORS for every requirement.

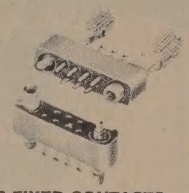
A complete line of high-reliability connectors for computer, missile, aircraft, communications and other critical applications. In addition to standard specifications, these connectors can be supplied with such optional accessories as aluminum hoods, protective shells, polarizing screwlocks*, and solder filled contacts. Various molding compounds are also available.

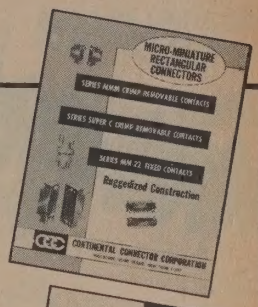
*Patent No. 2,746,022

MICRO-MINIATURE

5 TO 104 CONTACTS. Ruggedized to withstand shock and vibration extremes. Meet MIL-C-8384 specs. Available with guide pins and sockets, polarizing screwlocks, cable brackets, hoods and glass filled Diallyl Phthalate molding.

Breakdown Voltage (sea level), 2000V. RMS • Current Rating, 3A • Min. Creepage Bet. Contacts, .070″ • Min. Air Space Bet. Contacts, .040″ • Contacts, center-to-center 3/32″ • Pin Diameter, .030″ • Solder Cup, #22 AWG wire.



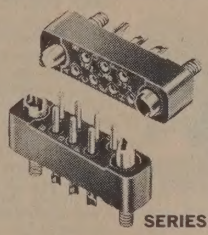


SERIES MM22 FIXED CONTACTS AND SERIES MMM CRIMP REMOVABLE CONTACTS

SUBMINIATURE

5 TO 104 CONTACTS. Meet or exceed applicable paragraphs of MIL-C-5015 and MIL-C-8384. Optional features include guide pins and sockets, polarizing screwlocks, protective shells and aluminum hoods. Glass-filled Diallyl Phthalate molding.

Breakdown Voltage (sea level), 2000V. RMS • Current, 5A. Cont., 7.5A max. • Min. Creepage Bet. Contacts, .078″ • Min. Air Space Bet. Contacts, .045″ • Contacts, center-to-center, 1/8″ • Pin Diameter, .040″ • Solder Cup, #20 AWG wire.

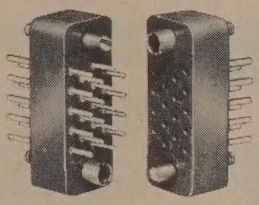


SERIES SM20

MINIATURE

4 TO 104 CONTACTS. A larger size, also available with guide pins and sockets, polarizing screwlocks, aluminum hoods, protective shells, and various molding compounds. Can be supplied with similar specifications in hexagonal types with 1, 4, 5, 7, 9 and 10 contacts.

Breakdown Voltage (sea level), 3000V. RMS • Current Rating, 5A. cont., 7.5A. max. • Min. Creepage Bet. Contacts, 1/8″ • Min. Air Space Bet. Contacts, .070″ • Contacts, center-to-center, .150″ • Pin Diameter, .040″ • Solder Cup, #20 AWG wire.

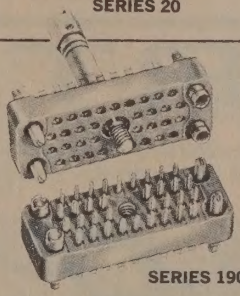


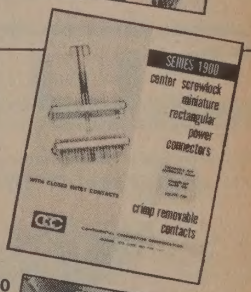
SERIES 20

CENTER SCREWLOCK

34, 50, 78, 104, 152 CONTACTS. Double lead thread action screwlock, stainless steel side channels and closed entry contacts for maximum reliability. 152 removable contacts Series 2500152 and 10-contact and 22-contact types, for #20 AWG wire also available.

Breakdown Voltage (sea level), 3000V. RMS • Current Rating, 10A. cont., 13A. max. • Pin Diameter, .062″ • Min. Creepage Bet. Contacts, .110″ • Min. Air Space Bet. Contacts, .050″ • Contacts, center-to-center, .150″ • Solder Cup (also solderless-wrap and taper pin), #16 AWG wire.

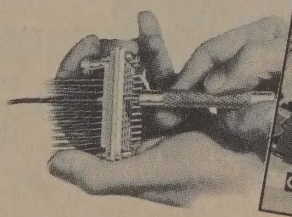




SERIES 1900

MINIATURE AND MICROMINIATURE WITH CRIMP REMOVABLE CONTACTS

Miniature rectangular rack and panel connectors with removable crimp termination contacts. Available with 7, 9, 14, 18, 20, 26, 34, 50, 66, 75, and 104 contacts. For solderless wiring. Insertion, removal and crimping tools available. Conform to MIL-C-22857 specifications. Also in Microminiature Sizes: 50, 100, 200 Contacts. Series 25MM.



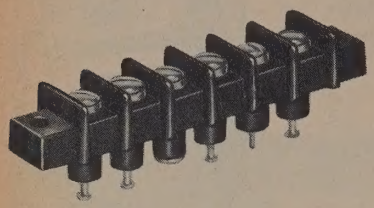
SERIES 25

complete catalog data on request

CONNECTORS

CURTIS TERMINAL BLOCKS

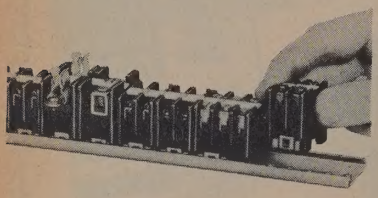
FEED-THRU BLOCKS



"GFT" SERIES
300 VOLTS
20 AMPS

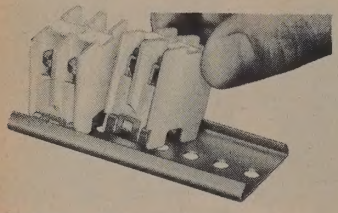
The GFT Series offer fully insulated feed through. Black thermosetting phenolic moldings. Terminals: Bright tin plated external #6-32 or #8-32 screws or ¼ and 3/16 tab terminals. Internal choice of screw, solder turret, taper pin receptacle, or PC pin. One to 26 poles per block. Terminal spacing 7/16" C. to C.

TRACK-MOUNTED BLOCKS



"W" SERIES
600 VOLTS

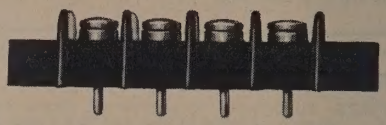
Prepunched steel track accepts vertical snap-in 2 or 3 pole modules. Terminals are screw bar 25 amps and tubular connectors, with or without traveling pressure pads, 50 amps, and high current 75 amps single pole tubular. Also single pole 13/32 x 1½ ferrule-type cartridge fuse holders and 15 amps pivoting disconnect switch. Six foot lengths available. Terminal spacing 7/16" C. to C.



"SW" SERIES
600 VOLTS

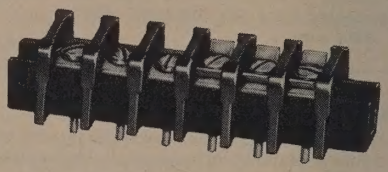
Fit same track as "W" Series. Two or three pole units of white molded polypropylene. Terminals are screw bar 25 amps and tubular connectors, with or without traveling pressure pads, 50 amps. Six foot lengths available. Terminal spacing 3/8" C. to C.

PRINTED CIRCUIT BLOCKS



TYPE GBP
300 VOLTS
20 AMPS

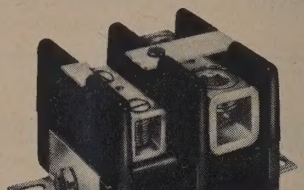
Identical to GFT with inte[illegible] .062 dia. printed circuit [illegible] and without feed-thru ins[illegible]tion sleeve.



TYPE SEP
300 VOLTS
5 AMPS

The SE printed circuit b[illegible] has black thermosetting [illegible]nolic moldings. Termin[illegible] External surface screws, [illegible] or without surface clamps [illegible] combination 2, 4 or 6 .1[illegible] quick-disconnect tabs. In[illegible]nal PC pins are .047" [illegible] One to 26 poles per blo[illegible] Terminal spacing ¼" C. to[illegible]

HIGH CURRENT BLOCKS



TYPES "T" & "U"
600 VOLTS

Sectional design with alu[illegible]num mounting brackets. T[illegible]minals are high pressure [illegible]bular of electrolytically p[illegible] copper. Black thermosetti[illegible] phenolic moldings.

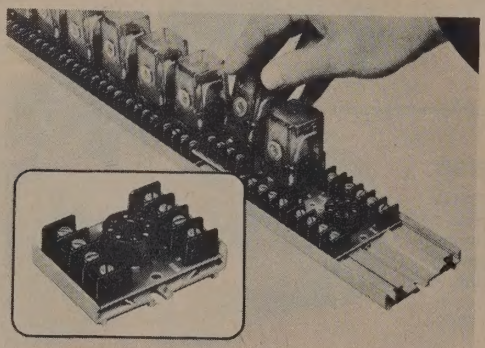
"T" rated 125 amps — ta[illegible] AWG No. 6 to No. 1/0 wi[illegible] One to six poles per blo[illegible]

"U" rated 250 amps — ta[illegible] No. 6 to 250 MCM w[illegible] AWG. One to four poles [illegible] block.

Terminal spacing 1 3/32" [illegible] to C.

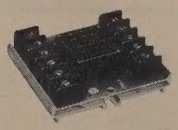
CURTIS RELAY SOCKET ASSEMBLIES

All Curtis Relay Socket Assemblies are of printed circuit construction with either Curtis GB or SE Terminal Block Connections. (Wire clamps optional.) They pop-in or out vertically into prepunched vinyl track to 48" lengths, requiring only two or three mounting screws. Patent pending. CSA approved. Special configurations upon request.



RS8

Octal socket for 2 P.D.T. relays. Rated 10 amps, 250 volts.



RS10

11 pin receptacle for 3 P.D.T. relays. Rated 10 amps, 250 volts.

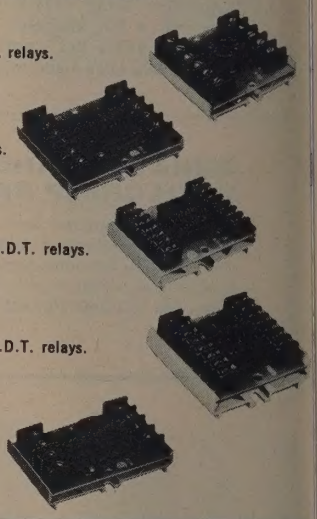
RS11 11 pin round receptacle for 3 P.D.T. relays. Rated 10 amps, 250 volts.

RS12 11 pin receptacle for 3 P.D.T. relays. Rated 10 amps, 250 volts.

RS14 14 pin receptacle for miniature 4 P.D.T. relays. Rated 5 amps, 125 volts

RS15 15 pin receptacle for miniature 4 P.D.T. relays. Rated 5 amps, 125 volts.

RS16 8 pin receptacle for 2 P.D.T. relays. Rated 10 amps, 250 volts.



FREE Send today for your 24-page Terminal Block Catalog and Relay Socket Assemblies literature.

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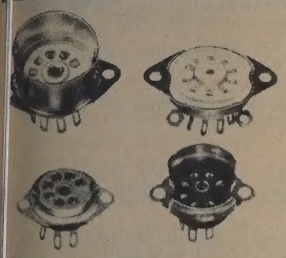
BINDING POSTS, CONNECTORS, SOCKETS

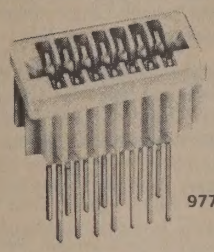
custom connecting devices...

SOCKETS



, 8 and 9-Pin Miniature Sockets. o MIL-S-12883A or commercial equirements. Contacts: brass, hosphor-bronze or beryllium-opper, with various finishes. Mica-filled, general purpose phenolic or eramic. Top mount, bottom mount, plit-saddle or shield base versions. 4 ground lugs available in ottom mount version. Various mounting centers.

P.C. CARD EDGE CONNECTOR



9775-89

Miniature Card-Edge Connector designed for automatic solderless wrap connections.

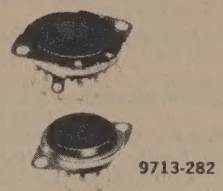
Specifications:

Housing: Glass filled nylon.

Contacts: Beryllium-copper, gold over nickel-plated, on 0.100 centers, 0.025 square tails.

Accepts a 0.062 thick P.C. board.

SOCKETS



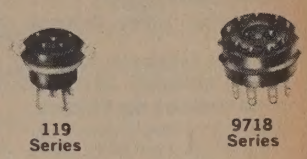
9878-1

9713-282

Compactron Socket, #9878-1. Accommodates any Compactron tube. Top or bottom mount saddle. 4 ground lugs on bottom mount optional. 1 5/16" centers. Mica-filled or general purpose phenolic.

10-Pin Socket, #9713-282. Accepts new 10-Pin tube. Top or bottom mount. 4 ground lugs on bottom mount optional. Mica-filled or general purpose phenolic.

SOCKETS



119 Series

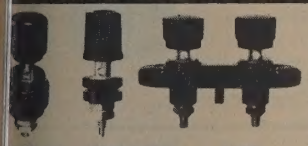
9718 Series

119 Connector. 1 to 5 contacts. 7/8" mounting centers.

9718 Series. Up to 12 contacts. 1 5/16" mounting centers. Many combinations available without tooling.

(Mating plugs available for all models)

UNIVERSAL BINDING POSTS



9738-19 9766-150-1 7186

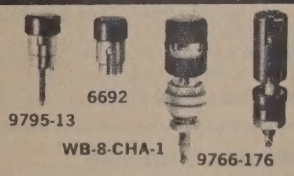
Multi-type. Accepts banana plug. "D" insulators for keyed mounting. Non-removable tops. Red or black phenolic.

#9738-19 — Rated 30 amps at 1000V. Nickel-plated brass.

#9766-150-1 — Miniature. Extends only 51/64" from panel when closed. Max. dia., 17/32". Gold flash on nickel-plated brass.

Twin Assemblies, #7186. Boss insulates posts from panel. 7/8" mounting centers. 6-32 molded-in stud. 1/2" dia. non-removable tops. Brass and phenolic.

SPRING BINDING POSTS



6692

9795-13

WB-8-CHA-1 9766-176

Quick connections. D-shaped hole for uniform tension across wire. Accepts phono-tip. Threaded stem and dowel optional. Nickel-plated brass. Red or black phenolic caps.

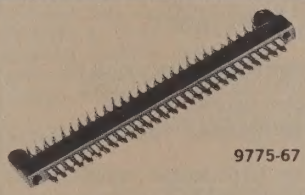
#9795-13 — with stem and dowel.

#6692 — without stem or dowel.

#WB-8-CHA-1 — To Signal Corps spec. U 106/U. Watertight. Can also be produced to MIL-P55149/8.

#9766-176 — Miniature, watertight. Meets MIL-P-55149/7 Max. dia. 0.40". High impact strength nylon plastic body.

RIGHT ANGLE MALE CONN.



9775-67

Designed primarily for terminating printed circuit boards into wire-wrap plates on military air-borne and ship board electronic equipment, this header also has numerous commercial applications.

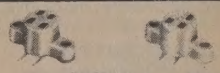
Specifications:

Insulator: Diallyl phthalate.

Contacts: Brass, gold over nickel-plated, on 0.100 square grid.

Available in 34, 40 and 50 contact configurations.

TRANSISTOR SOCKETS



9866-13-6 9866-13-4

Designed for JEDEC series transistors. One-piece integral saddle design. Speedy assembly with rivets or #2 screws. Contacts are silver-plated beryllium copper with gold flash. Mica-filled phenolic sockets meet MIL-M-14 MFE specs.

POWER TRANSISTOR SOCKET

9866-15-1

For to -3 power transistors. Special design permits **complete** electrical isolation of base connection. 1-piece molded construction of high impact Bakelite.

FUSE HOLDER

9138

Heavy-duty Holder. Housing, #9138. Cap, #9137. Solder or crimp-type contacts. General purpose phenolic.

Springs according to type of fuse. Assembled or unassembled. Can also be supplied in thermoplastic nylon.

ADAPTORS

9864-1C 9865-1C

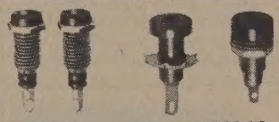
9864-1 9865-1

Converts any 7 or 9-Pin miniature socket into a connector. Brass cadmium contacts, mica-filled or general purpose phenolic.

7-Pin Socket, #9864-1
Cap, #9864-1C

9-Pin-Socket, #9865-1
Cap, #9865-1C

TIP JACKS



9768-17 7115 9768-13

Metal Jack, #9768-17. Beryllium-copper contacts. Nylon insulator in wide range of colors.

Molded Jack, #7115. Red or black general purpose.

Metal Jack, #9768-13. Brass body. Phosphor-bronze contacts. Cap in red or black phenolic. Locking nut and insulation washer available.

SOCKETS

9748-1

Crystal Socket (TS0205C01), #9748-1. Glazed Steatite per JAN-1-10. Meets MIL-S-12883A. Contacts: phosphor-bronze or beryllium copper, silver-plated. Also available in black general purpose and mica-filled low loss.

HUGH H. EBY CO.

REQUEST TECHNICAL BULLETIN

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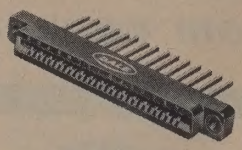
DALE® for Optimum Value in Connectors

SERIES EBT 156



PHYSICAL and ELECTRICAL

Number of Contacts: 8, 10, 12, 15, 18 or 22
Contact Spacing: .156"
Board Thickness: .054" to .070"
Board Slot Depth: .330"
Current Rating: 5 amps
Test Voltage between Contacts: At Sea Level: 1800 VRMS; At 70,000 feet: 450 VRMS
Insulation Resistance: 5000 meg. min.
Contact Resistance: 30 millivolts max. at rated current

COMPONENT MATERIAL

Body: Glass-filled phenolic per MIL-M-14, Type MFH, black
Contacts: Nickel silver per QQ-C-585, alloy 770, spring temper. Gold flash optional.
Polarizing Key: Glass-filled nylon
Optional Threaded Mounting Insert: Nickel plated brass. (Type Y)
Optional Floating Mounting Bushing: Cadmium plated brass. (Type Z)

APPLICATION For use with 1/16" printed circuit boards requiring an edgeboard type connector on .156" centers.

SERIES EBTL 050

PHYSICAL and ELECTRICAL

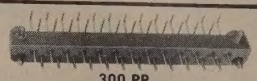
Number of Contacts: 8, 16, 20, 25, 32, 50 or 64 per side
Contact Spacing: .050"
Board Thickness: Size 1 = .027"-.035"; Size 2 = .056"-.068"
Board Slot Depth: .200"
Current Rating: 0.5 amp
Test Voltage between Contacts: At Sea Level: 1200 VRMS; At 50,000 feet: 675 VRMS
Insulation Resistance: 5000 meg. min.
Contact Resistance: 10 millivolts max. at rated current

COMPONENT MATERIAL

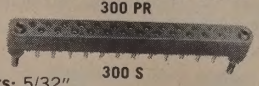
Body: Glass-filled phenolic per MIL-M-14, Type MFH, black
Contact Backer Strips: Epoxy glass laminate per MIL-P-18177, Type GEE, black
Contacts: Beryllium copper per QQ-C-533, alloy 172. Gold plate per MIL-G-45204.
Polarizing Key: Polycarbonate

APPLICATION For use with 1/32" and 1/16" printed circuit boards in integrated thin film, and semiconductor circuitry with .050" contact spacing.

SERIES 300



300 PR



300 S

PHYSICAL and ELECTRICAL

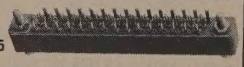
Number of Contacts: 7, 15, 19 and 25
Contact Spacing: 0.250", staggered rows provide a .125" grid.
Contact Gauge: #20 AWG
Minimum Creepage Path between Contacts: 5/32"
Minimum Air Space between Contacts: 7/64"
Current Rating: 7.5 amps
Breakdown Voltage: At Sea Level: 3600 VRMS; At 70,000 feet: 975 VRMS

COMPONENT MATERIAL

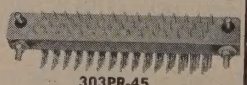
Contact Pin: Phosphor Bronze
Contact Socket: Phosphor Bronze
Contact Plating: Gold over silver
Guide Pins: Stainless steel, passivated
Standard Body: Glass-filled diallyl phthalate per MIL-P-19833, Type GDI-30 green. Other body material supplied upon request.

APPLICATION Where permanent mounting of male connector to printed circuit board is required with mating female connector available.

SERIES 303



303S-45



303PR-45

PHYSICAL and ELECTRICAL

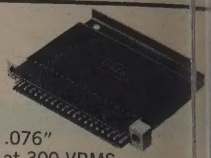
Number of Contacts: 45
Contact Gauge: #22 AWG
Minimum Creepage between Contacts: 1/16"
Minimum Air Space between Contacts: 1/64"
Contacts, Center to Center: .050"
Voltage Breakdown, Contact to Contact and Contact to Ground: At Sea Level: 1200 VRMS • At 70,000 feet: 325 VRMS
Current Rating: 3 amps

COMPONENT MATERIAL

Contact: Phosphor Bronze, Gold Plated
Contact Plating: Gold over silver
Studs, Pilot Pins, Washers, Nuts: Corrosion-resistant steel, passivated
Standard Body: Glass-filled diallyl phthalate per MIL-M-19833, Type GDI-30 green

APPLICATION For use in equipment requiring printed circuit connectors of the dip solder type with mating female connector.

SHP 40



PHYSICAL and ELECTRICAL

Number of Contacts: 40
Contact Spacing, center to center: .100"
Minimum Air Space between contacts: .043"
Minimum Air Space between rows of contacts: .076"
Current Rating: 3 amps minimum per contact at 300 VRMS
Breakdown Voltage: At Sea Level: 1500 VRMS; At 60,000 feet: 450 VRMS
Resistance between contact ends: 10 milliohms max.
Minimum Insulation Resistance: 100,000 megohms from contact to contact and from contact to heatsink.

COMPONENT MATERIAL

Body: Diallyl phthalate per MIL-P-19833, Type GDI-30F, green
Heatsink: Aluminum alloy 5052-H32, QQ-A-250/8; anodize MIL-A-8625, Type II, Class 2, black
Contacts: One-piece construction of brass, 1/2 hard, QQ-B-613, Composition 2; copper plate per MIL-C-14550; gold plate per MIL-G-45204. Mating surfaces have a 32 microinch finish.
Contact Shield: Aluminum alloy 5052-H32, QQ-A-250/8; anodize MIL-A-8625, Type II, Class 2, black.

APPLICATION For use in the various Navy standard hardware programs and commercial modular designs.

SERIES PJ

PJEI-20DG

PJI-20DG

PHYSICAL and ELECTRICAL

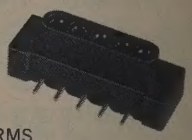
Current Rating: 7.5 amps
Socket Contact Engages: 0.080" dia. probe

COMPONENT MATERIAL

Standard Body: Glass-filled diallyl phthalate per MIL-M-19833, Type GDI-30, green
Pin Contacts: Brass
Socket Contacts: Phosphor Bronze
Contact Plating: Gold over silver

APPLICATION Printed circuit checkout and testing.

MODEL 500 SR5



PHYSICAL and ELECTRICAL

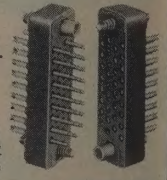
Number of Contacts: 5
Contact Spacing: 0.150"
Contact: Accepts .080" dia. probe
Current Rating: 5 amps
Breakdown Voltage: At Sea Level: 3000 VRMS; At 70,000 feet: 676 VRMS

COMPONENT MATERIAL

Contact Socket: Phosphor Bronze
Contact Plating: Gold over silver
Standard Body: Glass-filled diallyl phthalate per MIL-P-19833, Type GDI-30, green. Other materials available upon request.

APPLICATION Permanent or semi-permanent test points for checkout and testing of printed circuits.

SERIES MM22 and MM24



MMP22-34SL

MMS22-34SL

MMP22-5 MMS22-5

PHYSICAL and ELECTRICAL

Number of Contacts: 5, 7, 9, 11, 14, 20, 26, 29, 34 and 44
Contact Spacing: 3/32"
Contact Gauge: MM22 Series = 22 gauge. • MM24 = 24 gauge
Minimum Creepage Path between contacts: 5/64"
Minimum Air Space between contacts: 3/64"
Current Rating: MM22 Series = 5 amps; MM24 Series = 3 amps
Breakdown Voltage: At Sea Level: 2000 VRMS; At 70,000 feet: 500 VRMS

COMPONENT MATERIAL

Contact Pin: Phosphor Bronze
Contact Socket: Phosphor Bronze
Contact Plating: Gold over silver
Screwlocks: Stainless steel, passivated
Guides: Brass, gold plated
Standard Body: Glass-filled diallyl phthalate per MIL-P-19833, Type GDI-30, green. Other body material supplied upon request.

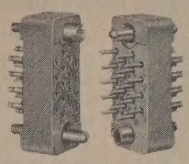
APPLICATIONS Especially suited for use in airborne, instrumentation and portable equipment applications or wherever the following requirements must be met: Minimum space and weight without sacrifice of performance, high quality materials, long service life, high vibration and shock resistance, and positive locking.

DALE® for Optimum Value in Connectors

ERIES M20

HYSICAL and ELECTRICAL

mber of Contacts: 18
ntact Spacing: 0.150″
ntact Gauge: #20 AWG
nimum Creepage Path between Contacts: 1/8″
nimum Air Space between Contacts: 3/32″
rrent Rating: 7.5 amps
eakdown Voltage: At Sea Level: 3000 VRMS
At 70,000 feet: 675 VRMS


MS20 MP20

OMPONENT MATERIAL

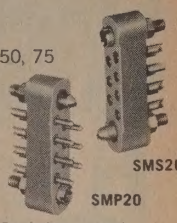
ntact Pin: Brass
ntact Socket: Phosphor Bronze (beryllium copper also available).
ntact Plating: Gold over silver
crewlocks: Stainless steel
Standard Body: Glass-filled diallyl phthalate per MIL-P-19833, Type GDI-30, green. Other materials available on request.
Guides: Stainless steel

PPLICATIONS For use in instrumentation, avionics, ommunications, missiles, guidance systems, computers, portable quipment and test equipment.

SERIES SM20

PHYSICAL and ELECTRICAL

Number of Contacts: 5, 7, 11, 14, 20, 26, 34, 42, 50, 75
Contact Spacing: 0.125″
Contact Gauge: #20 AWG
Minimum Creepage Path between Contacts: 5/64″
Minimum Air Space between Contacts: 3/64″
Current Rating: 7.5 amps
Breakdown Voltage: At Sea Level: 2000 VRMS
At 70,000 feet: 500 VRMS


SMS20 SMP20

COMPONENT MATERIAL

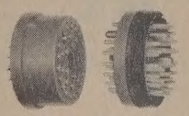
Contact Pin: Brass
Contact Socket: Phosphor Bronze. Beryllium copper also available.
Contact Plating: Gold over silver
Guides: Stainless steel, passivated
Screwlocks: Stainless steel, passivated
Standard Body: Glass-filled diallyl phthalate per MIL-P-19833, Type GDI-30, green. Other body material supplied upon request.

APPLICATIONS For use wherever space is at a premium and a high quality connector is required in avionics, automation, communications, controls, instrumentation, missiles, computers and guidance systems.

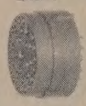
SERIES QX32

PHYSICAL and ELECTRICAL

Minimum Creepage between Contacts: 9/64″
Minimum Air Space between Contacts: 7/64″
All male contacts are .093″ in diameter. Current ratings vary only because some solder cups are made for #12 AWG and others for #16 AWG.


QX32S-1 QX32P

Voltage Breakdown Contact to Contact (#12 AWG solder cup): At Sea Level: 3300 VRMS
At 70,000 feet: 712 VRMS
Current Rating: 23 amps #12 AWG • 13 amps #16 AWG
Voltage Breakdown Contact to Contact (#16 AWG solder cup): At Sea Level: 3600 VRMS • At 70,000 feet: 750 VRMS


QX32S

COMPONENT MATERIAL

Closed Entry Socket Contacts: Phosphor Bronze*, gold over silver
Inserts and Hardware: Stainless steel, passivated*
"O" Ring: Synthetic rubber **Boot:** Neoprene
Body Material: Glass-filled diallyl phthalate per MIL-M-19833, Type GDI-30, green. Consult factory for other materials.
For use with QX32S, a shorting plug to ground static electricity is available. See QX72 and MX72 shorting plugs below.
*Contact factory. Beryllium copper can be specified to ordinance drawing 10182288.

APPLICATION Used in the firing system of missiles.

SERIES S20

COMPONENT MATERIAL

Molded Body: Orlon-filled diallyl phthalate per MIL-M-14F, Type SDI-5 (blue), furnished as standard.
Contact Pin: Brass, gold over silver
Contact Socket: 4 tine beryllium copper, gold over silver
Coaxial Insulator: Teflon
Coaxial Socket Body: Brass, silver plating standard. Gold also available.
Coaxial Socket Contact: Beryllium copper, gold over silver
Shell and Retaining Plate: Aluminum, cadmium plated and gold iridited

Coaxial Contacts are for use with Adapter No. 2710-10 by Cannon or No. 5988 by Greymar and fit RG 188/U cable.

S20P-41 and S20S-41

PHYSICAL and ELECTRICAL

Minimum Creepage Path between Contacts: 1/8″
Minimum Air Space between Contacts: 1/16″
Contacts, center to center: 3/32″
Ambient Temperature Range: −67° F to +250° F
Approximate Weight: S20S-41 = 1.5 oz.
S20P-41 = 1.0 oz.
Voltage Breakdown, contact to contact: At Sea Level: 2500 VRMS
At 70,000 feet: 600 VRMS
Current Rating: 10 amps

S20P-41 S20S-41

S20P-20-8 and S20S-20-8

PHYSICAL CHARACTERISTICS

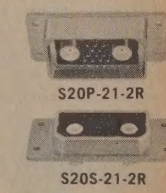
Minimum Creepage Path between Contacts: 1/8″
Minimum Air Space between Contacts: 1/16″
Contacts, center to center: 3/32″
Approximate Weight: S20P-20-8 = 1.5 oz.
S20S-20-8 = 1.0 oz.
Ambient Temperature Range: −67° F to +250° F

S20P-20-8X S20S-20-8X

S20P-21-2R and S20S-21-2R

PHYSICAL CHARACTERISTICS

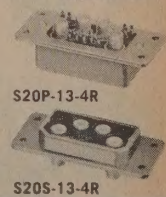
Minimum Creepage Path between Contacts: 7/64″
Minimum Air Space between Contacts: 1/16″
Contacts, center to center: .150″
Ambient Temperature Range: −67° F to +250° F
Approximate Weight: S20P-21-2R = 1.6 oz.
S20S-21-2R = 1.1 oz.


S20P-21-2R S20S-21-2R

S20P-13-4R and S20S-13-4R

PHYSICAL CHARACTERISTICS

Minimum Creepage Path between Contacts: 7/64″
Minimum Air Space between Contacts: 1/16″
Contacts, center to center: .150″
Ambient Temperature Range: −67° F to +250° F
Approximate Weight: S20P-13-4R = 1.8 oz.
S20S-13-4R = 1.3 oz.

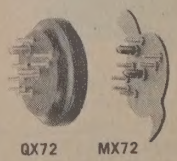

S20P-13-4R S20S-13-4R

QX72 and MX72

COMPONENT MATERIAL

QX72

Molded Body: Red asbestos-filled diallyl phthalate per MIL-M-14, Type MDG. For other molding compounds, contact factory.
Molded-in Insert Plate: Aluminum QQ-A-325
Guide Pins and Contact Pins: Aluminum QQ-A-325


QX72 MX72

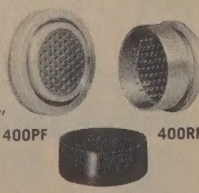
MX72

Body: Stainless Steel
Guide Pins and Contact Pins: Stainless steel
Body Finish: Exposed surface has yellow zinc chromate primer per MIL-P-8585 followed by red enamel TT-E-489, color 11105 in FED. STD-595.

SERIES 400 and 401

PHYSICAL and ELECTRICAL

Voltage Breakdown, contact to contact:
At Sea Level: 2000 VRMS
At 70,000 feet: 500 VRMS
Minimum Creepage Path between Contacts: 5/64″
Minimum Air Space between Contacts: 3/32″
Contacts, center to center: .150″


400PF 400RM

COMPONENT MATERIAL

Molded Body: Glass-filled diallyl phthalate per MIL-M-19833, Type GDI-30. For other materials, contact factory.
Hood: Aluminum, anodized (on 401PF)
Shells, Mounting Nut and Coupling Nut: Aluminum, clear anodized.
Contact Pins: Brass, gold over silver
Contact Socket: Phosphor Bronze, gold over silver
Lock Ring: Brass, cadmium plated
Retaining Ring: Stainless steel **Protective Cap:** Polyvinyl

401PF Mates with Series 400RM

APPLICATION Series 400: For use in equipment requiring a 41, 51 or 55 pin sealed connector, with a mating non-sealed female connector. **Series 401:** For identical applications where hood is required. Mates with Series 400RM connectors.

For complete information, write or phone:

DALE ELECTRONICS, INC.
CONNECTOR DIVISION
P.O. BOX 609
COLUMBUS, NEBRASKA 68601
PHONE: 402—564-3131

WIRING DEVICES FOR EVERY NEED

TERMINALS & SPLICES

- Wire Ranges: #26 thru 4/0, Loose Piece. Mounted on Tape or in Continuous Strips in #26 thru 10 Sizes
- Tongue Types: Ring, Rectangular, Spade, Flanged Spade, Hook and Slotted Ring
- Approvals: Terminals are Covered by UL., CSA and Military Specifications, where Applicable

AVIKRIMP® — Tin-plated brass sleeve strengthens barrel. Color coded Nylon insulating sleeve adds more wire protection. Operating temperatures: continuous duty— −40°F to 250°F, intermittent duty — to 350°F. WIRE RANGE: #26-10

INSULKRIMP® — PVC insulation sleeve permanently attached to butted seam barrel (#22-10) or brazed seam barrel (#8-2). Operating temperatures: continuous duty— −40°F to 167°F, intermittent — to 300°F. WIRE RANGE: #22-2

NYLAKRIMP™ — Ideal for larger wire applications involving temperature extremes and vibration. Rigid, overhanging Nylon insulating sleeve covers silver-brazed barrel. Withstands continuous duty temperatures from −60°F to 250°F. WIRE RANGE: #8-4/0

VIBRAKRIMP® — Made for excessive vibration applications. Seamless tin-plated brass sleeve covers basic KRIMPTITE barrel. Its overhang prevents wire flex. Single crimp terminates wire. WIRE RANGE: #22-10

VERSAKRIMP™ — Has silver brazed barrel. Seam will not open under stress or wire pull. Crimps using many types of tooling. Ideal for solid or stranded wires. WIRE RANGE: #22-4/0

KRIMPTITE™ — One piece, non-insulated design. Ideal general purpose terminal for uses where special features are unnecessary. Full length barrel makes crimping easy. WIRE RANGE: #26-10

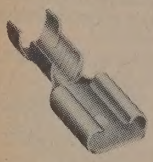
BUTT SPLICE — Accepts stripped wires from each end. Wires "butt" in center. A crimp at each end provides secure connection. Available in insulated and non-insulated styles. WIRE RANGE: #22-4/0

PARALLEL SPLICE — Stripped wires insert from each end and lie side-by-side. Single crimp in center forms a secure connection. Available in insulated and non-insulated styles. WIRE RANGE: #22-4/0

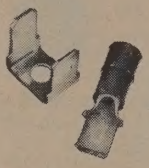
SEND FOR CATALOG OEM-6

QUICK CONNECTS

- Female Receptacles and Male Tabs



PDQ™ quick connect receptacle terminals handle 26-12 AWG wires and .110 x .020, .110 x .032, .187 x .020 and .250 x .032 inch male tabs. Insulated or non-insulated barrels. Available loose piece, on tape or continuous strip. Meet N.E.M.A. and U.L. standards.

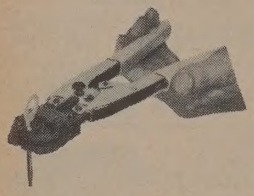


Male tab terminals and single or twin tab lugs fit PDQ receptacle terminals perfectly. Lugs have standard 180°, 90°, 45° angles. Custom angles available. Single, dual or custom mounting holes. Tabs are .250 thru .110 inches wide.

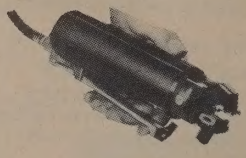
SEND FOR CATALOG PDQ-1

CRIMPING TOOLS

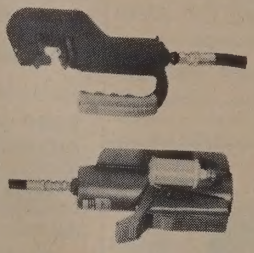
- Hand Operated and Semi-automatic . . . Matched-to-terminal Designs . . Free 30-day Evaluation Trials



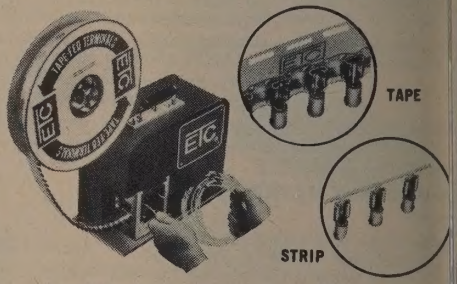
RATCHET HAND TOOLS — Special ratchet mechanism won't allow terminal to be released until fully crimped. Handles terminals and splices from #26 thru #10 AWG.



PORTABLE AIR TOOLS — 27 oz. AT-200 hand tool uses standard air pressure to crimp #26 thru #6 AWG terminals and splices. Bench adapter accessories available.



AIR-HYDRAULIC TOOL — Compact PUTT-PUMP™ operates on standard air pressure to crimp #8 thru #1/0 wires. ELECTRIC-HYDRAULIC RAPID-PUMP™ crimps #8 thru #4/0 wires.

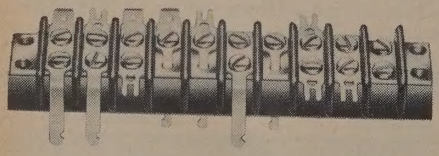


AUTOMATIC FEED TAPE AND STRIP PRESSES — Terminals are loaded into crimping dies automatically. Cycled for up to 3,600 terminations per hour. Crimps #26 thru #10 AWG sizes. Air and electrically operated models.

SEND FOR CATALOG CT-1

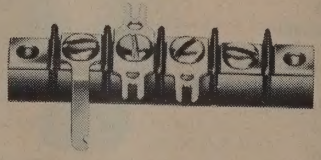
TERMINAL BLOCKS

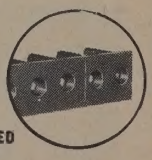
- Closed Back . . . Open Back . . . Military Blocks



TWIN SCREW — Choose closed back design with molded-in plates and protected mounting holes. Or open back design. Rated 5 to 30 amps. Complete selection of lugs and hardware.

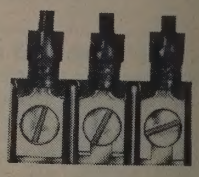
OPEN BACK





CLOSED BACK

SINGLE SCREW — These blocks weigh less and occupy less space. Same design features as their twin screw counterparts. 5 to 30 amp. rating. Full selection of lugs and hardware.



TERMINAL BLOCK TERMINALS — Match-fitting to blocks assures reliability in sizes 26 thru 10 AWG. Spade, Flanged Spade and Rectangular tongues are 3/16", 1/64", 21/64" or 27/64" wide.

SEND FOR CATALOG TB-1

ETC, INCORPORATED
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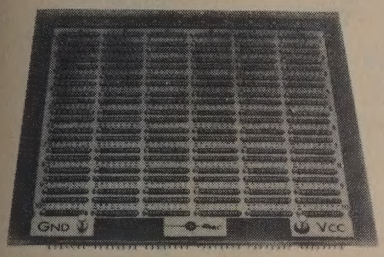
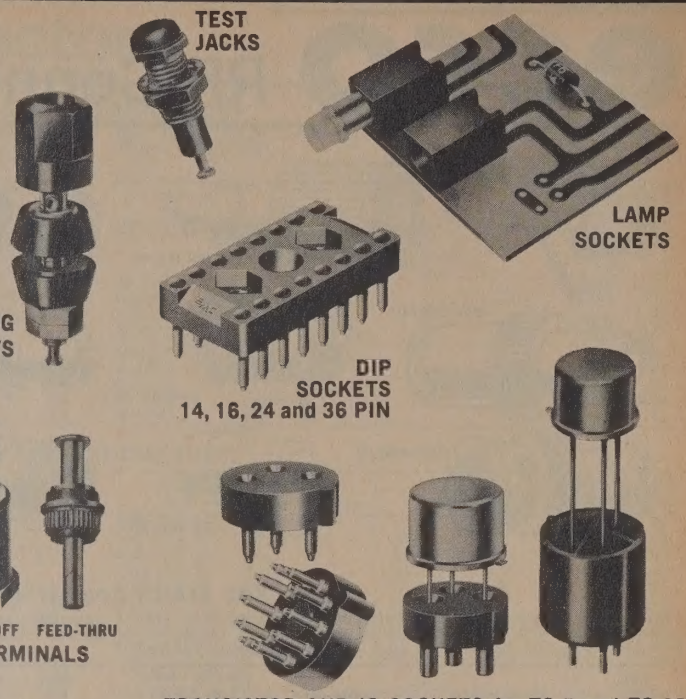
EMC

Interconnection Specialists

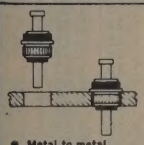


Nurl-Loc® HIGH DENSITY I.C. PACKAGING PANELS

New high density packaging panels that include non-twisting Nurl-Loc® terminals are summarized in Bulletin FS-14, available on request. Used with 14 and 16 pin dual-in-line I. C.'s, the panels include power and ground shields for I. C. high frequency applications, as well as other desirable features. Two designs are standard, for 60 and 30 pattern boards, with other layouts available on special order.



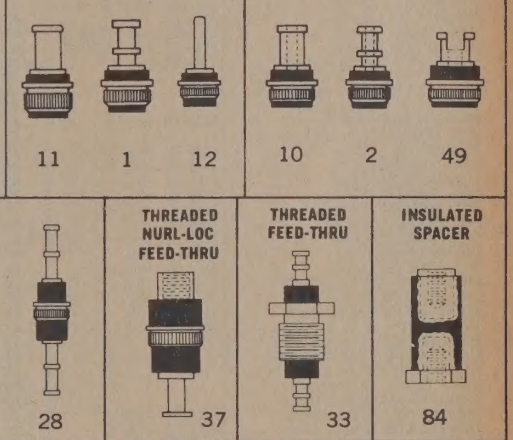
TERMINALS

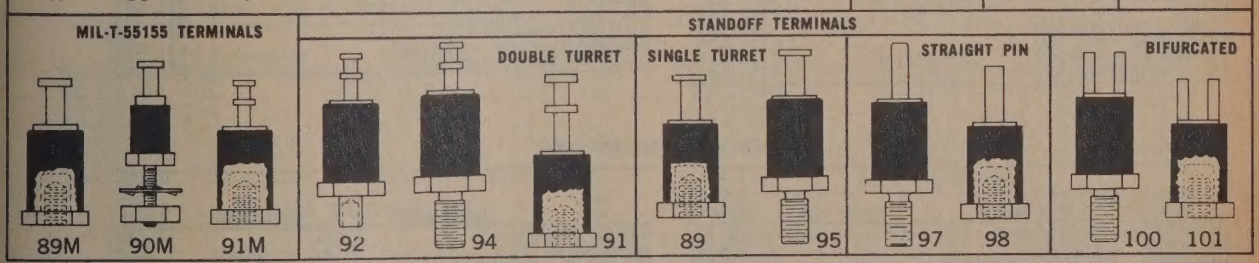


- Metal to metal press-in design
- Solid molded construction
- Highest radial and axial pull-out resistance

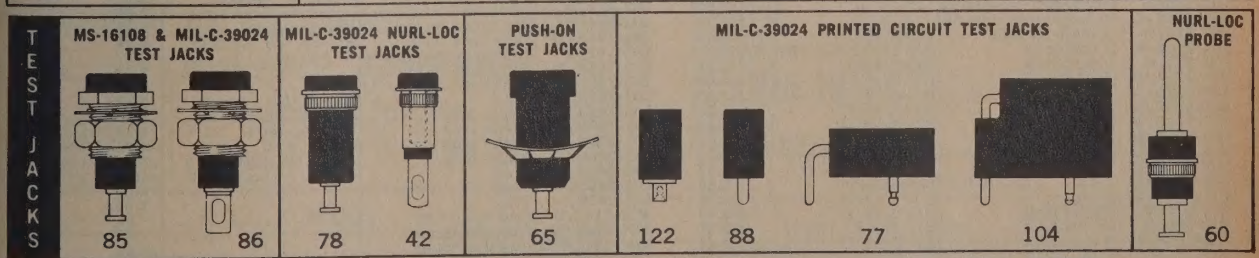
Nurl-Loc® TERMINALS AND TEST JACKS

Electronic Molding offers the largest variety of molded insulated terminals and test jacks available anywhere. The metal inserts are molded into high-temperature Diallyl Phthalate, (500°F) forming a strong integral unit that will not crack while soldering. The metal-to-metal Nurl-Loc press-in feature (shown left) assures highest radial and axial pullout resistance of any terminal of this type. Ten colors and mounting tools are available.





TEST JACKS



ELECTRONIC MOLDING CORPORATION

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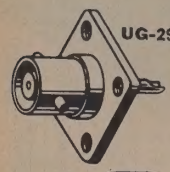
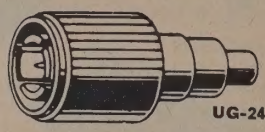
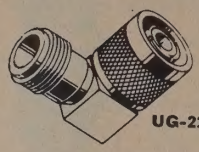
Phone (401) 726-2100

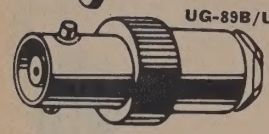
ecco RF Connectors

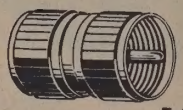

UG-290A/U

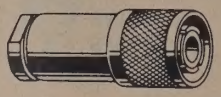

UG-245/U

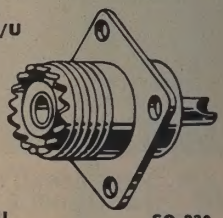

UG-212C/U

PL-259

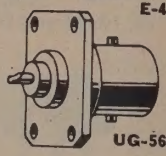

UG-89B/U


E-4000


UG-59B/U


SO-239

UG-88C/U


UG-568/U

UG-29B/U

BNC SERIES CONNECTORS

Small, rugged, lightweight, weatherproof BNC connectors. Designed for use with small RF coaxial cables. Quick disconnect bayonet couplings permit fast and easy installation. Normal impedance is 50 ohms; rated at 500 volts peak. Practical frequency limit, 10,000 MHz.

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-88/U	Plug	RG-55, -58/U	$0.60	$0.58
UG-88B/U	Plug	RG-55, -58/U	.61	.59
UG-88C/U	Plug	RG-55, -58/U	.66	.64
UG-88D/U	Plug	RG-55, -58, -223/U	.71	.69
UG-88E/U	Plug	RG-55, -58/U	.71	.69
UG-89/U	Jack	RG-55, -58/U	.83	.81
UG-89A/U	Jack	RG-55, -58/U	.81	.79
UG-89B/U	Jack	RG-55, -58, -223/U	.60	.58
UG-89C/U	Jack	RG-55, -58, -223/U	.61	.59
UG-90/U	Panel jack	RG-58/U	1.38	1.36
CW-123A/U	Cap and chain	.....	.33	.32
UG-155A/U	Cap assembly	.....	.18	.17
UG-185/U	Receptacle	.....	.95	.93
MX-195A/U	Hood	RG-55, -58/U	.21	.20
UG-254A/U	Receptacle	.....	3.83	3.78
UG-260/U	Plug	RG-59, -62, -71/U	.68	.66
UG-260A/U	Plug	RG-59, -62, -71/U	.69	.67
UG-260B/U	Plug	RG-59, -62, -71/U	.63	.61
UG-260C/U	Plug	RG-59, -62, -71/U	.71	.69
UG-260D/U	Plug	RG-59, -62, -71/U	.71	.69
UG-261/U	Jack	RG-59, -62, -71/U	1.16	1.13
UG-261A/U	Jack	RG-59, -62, -71/U	1.13	1.10
UG-261B/U	Jack	RG-59, -62, -71/U	.66	.64
UG-261C/U	Jack	RG-59, -62, -71/U	.66	.64
UG-262/U	Panel jack	RG-59, -62, -71/U	1.14	1.12
UG-262B/U	Panel jack	RG-59, -62, -71/U	.96	.94
UG-262C/U	Panel jack	RG-59, -62, -71/U	.98	.96
UG-274/U	Tee adapter	RG-59, -62, -71/U	2.18	2.13
UG-274A/U	Tee adapter	.....	1.37	1.32
UG-274B/U	Tee adapter	.....	1.41	1.38
CW-282/U	Cap and chain	.....	.38	.37
UG-290/U	Receptacle	.....	.81	.79
UG-290A/U	Receptacle	.....	.89	.87
UG-291/U	Panel jack	RG-55, -58/U	1.23	1.19
UG-291A/U	Panel jack	RG-55, -58/U	1.25	1.21
E-1002	Panel jack	.....	1.43	1.38
E-1003	Panel jack	.....	.74	.73
UG-1019/U	Panel jack	.....	2.94	2.90
UG-1104A/U	Panel jack	.....	1.23	1.19
UG-1174/U	Panel jack	.....	1.54	1.47

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-291B/U	Panel jack	RG-55, -58/U	$0.93	$0.92
UG-291C/U	Panel jack	RG-55, -58, -223/U	.93	.92
UG-306/U	Angle adapter	.....	2.00	1.95
UG-306A/U	Angle adapter	.....	1.34	1.30
UG-306B/U	Angle adapter	.....	1.28	1.25
UG-349A/U	Angle adapter	.....	1.50	1.46
UG-349B/U	Angle adapter	.....	1.35	1.32
UG-414/U	Adapter	.....	1.67	1.65
UG-414A/U	Adapter	.....	1.23	1.19
UG-447/U	Receptacle	.....	.83	.81
UG-491A/U	Adapter	.....	1.20	1.16
UG-491B/U	Adapter	.....	1.33	1.30
UG-491C/U	Adapter	.....	1.28	1.24
UG-492A/U	Blkhd adapter	.....	1.70	1.65
UG-492B/U	Blkhd adapter	.....	2.01	1.96
UG-492C/U	Blkhd adapter	.....	1.34	1.30
UG-492D/U	Blkhd adapter	.....	1.47	1.45
UG-535/U	Angle receptacle	.....	1.92	1.87
UG-604/U	Receptacle	.....	.96	.94
UG-625/U	Receptacle	.....	.81	.79
UG-625B/U	Receptacle	.....	.47	.46
UG-657/U	Receptacle	.....	.89	.87
UG-909/U	Bulkhead jack	RG-55, -58/U	.96	.94
UG-909A/U	Bulkhead jack	RG-55, -58/U	.96	.94
UG-909B/U	Bulkhead jack	RG-55, -58/U	.95	.93
UG-910/U	Bulkhead jack	RG-55, -58/U	.99	.97
UG-910A/U	Bulkhead jack	RG-59, -62, -71/U	1.11	1.06
UG-910B/U	Bulkhead jack	RG-59, -71/U	1.11	1.06
UG-911A/U	Receptacle	.....	.99	.97
UG-912/U	Receptacle	.....	.73	.71
UG-912A/U	Receptacle	.....	.98	.96
UG-913/U	Angle plug	RG-55, -58/U	1.50	1.46
UG-913A/U	Angle plug	RG-55, -58/U	1.47	1.45
UG-914/U	Adapter	.....	.80	.78
UG-928/U	Receptacle	.....	1.20	1.16
UG-1094/U	Receptacle	.....	.44	.43
UG-1094A/U	Receptacle	.....	.59	.58
UG-1098/U	Angle receptacle	.....	1.47	1.42
UG-1098A/U	Angle receptacle	.....	1.55	1.52

C SERIES CONNECTORS

MIL No.	Description	Cable Size	Net Ea., 1-49*
UG-567A/U	Angle adapter	.....	$2.52
UG-568/U	Receptacle	.....	1.26
UG-569/U	Bulkhead receptacle	.....	1.53
UG-569A/U	Bulkhead receptacle	.....	1.58
UG-570/U	Bulkhead jack	RG-8, -9/U	1.68
UG-570A/U	Panel jack	RG-8, -9, -213, -214/U	1.87
UG-571/U	Panel jack	RG-8, -9/U	1.88
UG-571A/U	Panel jack	RG-8, -9, -213, -214/U	2.09
UG-572A/U	Jack	RG-8, -9, -213, -214/U	2.01
UG-573A/U	Plug	RG-8, -9/U	1.38
UG-573B/U	Plug	RG-8, -9/U	1.40
UG-626B/U	Plug	RG-5, -6, -212/U	1.62
UG-627A/U	Plug	RG-59, -62, -71/U	1.53
UG-627B/U	Plug	RG-59, -62, -71/U	1.53
UG-628A/U	Plug	RG-8, -9/U	1.68
UG-628B/U	Plug	RG-8, -9/U	1.68
UG-629/U	Panel jack	RG-5, -6/U	2.00
UG-631/U	Panel jack	RG-59, -62, -71/U	1.64
UG-631A/U	Panel jack	RG-5, -6/U	1.41

MIL No.	Description	Cable Size	Net Ea., 1-49*
UG-633/U	Jack	RG-5, -6/U	$2.12
UG-633A/U	Jack	RG-5, -6, -212/U	2.13
UG-643/U	Adapter	.....	1.56
UG-704/U	Bulkhead jack	RG-55, -58/U	1.31
UG-704A/U	Bulkhead jack	RG-55, -58, -223/U	1.40
UG-705/U	Bulkhead receptacle	.....	2.27
UG-705A/U	Bulkhead receptacle	.....	2.27
UG-706/U	Bulkhead receptacle	.....	1.40
UG-707B/U	Plug	RG-14/U	2.30
UG-709A/U	Angle plug	RG-55, -58/U	1.50
UG-709B/U	Angle plug	RG-55, -58/U	1.13
UG-710A/U	Angle plug	RG-8, -9/U	2.34
UG-710B/U	Angle plug	RG-8, -9, -213/U	2.91
UG-943A/U	Plug	.....	1.62
UG-943B/U	Plug	.....	1.65
UG-945B/U	Plug	.....	3.00
MX-1142/U	Cap and chain	.....	.51
MX-1143/U	Cap and chain	.....	.66
MX-1143A/U	Cap and chain	.....	.66

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ecco RF Connectors

UHF SERIES CONNECTORS

UHF connectors for small and medium sized cables. Non-weather-proof and non-constant impedance. For limited applications up to 500 MHz, and peak voltages up to 500 volts. For higher voltage and temperature applications, connectors are available with Teflon* insulation.

*Registered DuPont trademark.

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-102/U	Twin plug	.....	$1.43	$1.40
UG-103A/U	Twin receptacle	.....	1.53	1.50
UG-111/U	Plug	RG-59, -62, -71/U	.59	.58
UG-175/U	Reducing adapt.	RG-58/U	.12	.12
UG-176/U	Reducing adapt.	RG-59, -62, -71/U	.12	.12
UG-203/U	Plug	RG-55, -59, -62, -71/U	1.23	1.19
SO-239	Receptacle	RG-8, -9, -10, -11, -12, -13, -63, -65/U	.35	.34
SO-239A	Recept., Teflon		.73	.70
PL-258	Adapter	.....	.54	.53
PL-259	Plug	RG-8, -9, -10, -11, -12, -13, -63, -65/U	.48	.47
PL-259A			.73	.71
PL-259/A-T	Plug	RG-8, -9, -10, -11, -12, -13, -63, -65/U	$0.92	$0.90
M-358	Tee adapter	.....	1.40	1.36
M-359	Angle adapter	.....	.77	.75
UG-363/U	Blkhd adapter	.....	1.94	1.90
MX-913/U	Cap and chain	.....	.38	.37
E-4000	Double male adapters	.....	.90	.88
E-4005		.....	.95	.93
E-4011		.....	.42	.41
E-4012		.....	1.45	1.40
E-4014		.....	.53	.52

N SERIES CONNECTORS

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-18B/U	Plug	RG-5, -6, -21/U	$1.32	$1.28
UG-18C/U	Plug	RG-5, -6, -21/U	1.20	1.16
UG-18D/U	Plug	RG-5, -6, -21, -212/U	1.32	1.28
UG-19B/U	Panel jack	RG-5, -6, -21/U	1.71	1.65
UG-19C/U	Panel jack	RG-5, -6, -21/U	1.38	1.35
UG-19D/U	Panel jack	RG-5, -6, -21, -212/U	1.45	1.41
UG-20B/U	Jack	RG-5, -6, -21/U	1.51	1.47
UG-20C/U	Jack	RG-5, -6, -21/U	1.11	1.08
UG-20D/U	Jack	RG-5, -6, -21, -212/U	1.20	1.16
UG-20E/U	Jack	.....	1.23	1.19
UG-21B/U	Plug	RG-8, -9/U	1.20	1.16
UG-21C/U	Plug	RG-8, -9/U	1.26	1.21
UG-21D/U	Plug	RG-8, -9/U	1.10	1.06
UG-21E/U	Plug	RG-8, -9, -213, -215/U	1.20	1.16
UG-21F/U	Plug	.....	1.13	1.10
UG-21G/U	Plug	.....	1.13	1.10
UG-22B/U	Panel jack	RG-8, -9/U	1.61	1.56
UG-22C/U	Panel jack	RG-8, -9/U	1.65	1.60
UG-22D/U	Panel jack	RG-8, -9/U	1.25	1.21
UG-22E/U	Panel jack	RG-8, -9, -213, -215/U	1.32	1.28
UG-22F/U	Panel jack	.....	1.36	1.21
UG-23B/U	Jack	RG-8, -9/U	1.34	1.31
UG-23C/U	Jack	RG-8, -9/U	1.40	1.36
UG-23D/U	Jack	RG-8, -9/U	1.05	1.03
UG-23E/U	Jack	RG-8, -9, -213, -215/U	1.05	1.03
UG-27B/U	Angle adapter	.....	2.25	2.20
UG-27C/U	Angle adapter	.....	1.91	1.85
UG-27D/U	Angle adapter	.....	1.85	1.81
UG-28A/U	Tee adapter	.....	2.28	2.21
UG-29B/U	Adapter	.....	.93	.90
UG-30/U	Adapter	.....	2.66	2.58
UG-30C/U	Blkhd adapter	.....	2.57	2.50
UG-30D/U	Blkhd adapter	.....	2.18	2.13
UG-30E/U	Blkhd adapter	.....	2.31	2.26
UG-57B/U	Adapter	.....	1.32	1.27
UG-58/U	Receptacle	.....	.83	.81
UG-58A/U	Receptacle	.....	$0.80	$0.78
UG-93A/U	Panel jack	RG-6/U	1.56	1.52
UG-92A/U	Jack	RG-6/U	1.56	1.52
UG-94A/U	Plug	RG-11, -13/U	1.45	1.41
UG-95A/U	Jack	RG-11, -13/U	1.40	1.36
UG-96A/U	Panel jack	RG-11, -13/U	1.70	1.65
UG-107B/U	Tee adapter	.....	2.25	2.20
UG-159B/U	Blkhd jack	RG-5, -21/U	2.14	2.04
UG-160C/U	Blkhd jack	RG-8, -9/U	1.94	1.90
UG-160D/U	Blkhd jack	RG-8, -9, -213, -214/U	1.95	1.90
UG-167D/U	Plug	RG-17/U	3.08	3.00
UG-167E/U	Plug	RG-17, -218/U	3.08	3.00
UG-204C/U	Plug	RG-14/U	1.98	1.94
UG-536A/U	Plug	RG-55, -58/U	.95	.93
UG-536B/U	Plug	RG-55, -58, -223/U	.95	.93
UG-556B/U	Blkhd jack	RG-55, -58, -223/U	1.98	1.94
MX-564A/U	Armor clamp	RG-10, -12/U	.47	.46
UG-603A/U	Plug	RG-59, -62, -71/U	1.02	1.00
MX-913/U	Cap and chain	.....	.38	.37
UG-940A/U	Jack	RG-10, -12/U	1.19	1.17
UG-940B/U	Jack	RG-8, -9, -10, -213, -214, -215/U	1.31	1.27
UG-941A/U	Plug	RG-10, -12/U	1.25	1.21
UG-941B/U	Plug	RG-8, -9, -10, -213, -214, -215/U	1.35	1.30
UG-982A/U			3.78	3.72
UG-982/U	Plug	RG-18, -219/U	4.47	4.40
UG-997A/U	Plug	RG-18, -219/U	2.40	2.35
UG-1003/U	Plug	RG-63, -114/U	1.45	1.41
UG-1095A/U	Panel jack	RG-55, -58, -223/U	1.25	1.22
UG-1095B/U	Panel jack	RG-55, -58, -223/U	1.23	1.19
UG-1185/U	Plug	RG-8, -9/U	1.04	1.02
UG-1185A/U	Plug	RG-8, -9, -213, -214/U	1.04	1.02
UG-1186/U	Jack	RG-8, -9/U	1.07	1.05
UG-1186A/U	Jack	RG-8, -9, -213, -214/U	1.10	1.07
UG-1187/U	Panel jack	RG-8, -9/U	1.05	1.03
MX-1286/U	Armor clamp	RG-10, -12, -215/U	.45	.44
MX-1441/U	Armor clamp	RG-18, -219/U	1.67	1.62
MX-1530A/U	End seal	.....	.39	.38
MX-1554A/U	End seal	.....	1.25	1.22

TYPE HN CONNECTORS

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-59B/U	Plug	RG-8, -9/U	$2.94	$2.84
UG-59E/U	Plug	RG-8, -9/U	2.52	2.45
UG-60B/U	Jack	RG-8, -9/U	2.87	2.79
UG-60D/U	Jack	RG-8, -9/U	1.86	1.79
UG-212C/U	Angle adapter	.....	4.43	4.40
MX-564A/U	Armor clamp	RG-10, -12/U	.47	.46
UG-1214/U	Jack	RG-8, -9, -87A/U	4.07	4.00

LN SERIES CONNECTORS

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-100B/U	Plug	RG-14/U	$3.53	$3.48

LC-LT SERIES CONNECTORS

MIL No.	Description	Cable Size	Net Ea., Lots 1-49	50-99*
UG-154/U	Plug	RG-17, -18, -218, -219/U	$16.05	$15.45
UG-154A/U			7.31	7.21
UG-352A/U	Receptacle	.....	6.35	6.30
UG-352B/U	Receptacle	.....	6.35	6.30

PLUGS

MIL No.	Description	Net Each, Lots of 1-49	50-99*
UG-59D/U	Plug	$2.70	$2.65

N ADAPTERS

MIL No.	Description	Net Each, Lots of 1-49	50-99*
UG-201A/U	N to BNC	$1.13	$1.10
UG-349A/U	N to BNC	1.50	1.46
UG-564/U	N to C	1.38	1.35
UG-565A/U	N to C	1.73	1.70
UG-83B/U	N to UHF	1.10	1.06

BNC ADAPTERS

MIL No.	Description	Net Each, Lots of 1-49	50-99*
UG-255/U	BNC to UHF	$1.38	$1.36
UG-273/U	BNC to UHF	1.07	1.05
UG-309/U	BNC to HN	1.94	1.90
UG-636/U	BNC to C	1.80	1.75
UG-636A/U	BNC to C	2.00	1.95
UG-637/U	C to UHF	1.56	1.52
UG-959A/U	BNC	1.50	1.46
UG-970/U	TWIN to UHF	4.10	4.00
UG-971/U	TWIN to C	5.15	5.00
UG-972/U	QDS	1.79	1.72
UG-999A/U	N to LC	Prices on Request	

ANGLE ADAPTERS

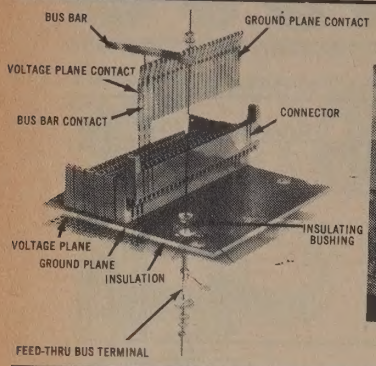
MIL No.	Description	Net Each, Lots of 1-49	50-99*
UG-212A/U	Angle adapter	$4.53	$4.50
UG-212C/U	Angle adapter	4.43	4.40
UG-335A/U	Angle adapter	1.37	1.34

★COMPLETE CATALOG AND LARGER QUANTITY PRICES AVAILABLE ON REQUEST

1027X-70A

151 PASADENA AVENUE • SOUTH PASADENA, CALIFORNIA 91030

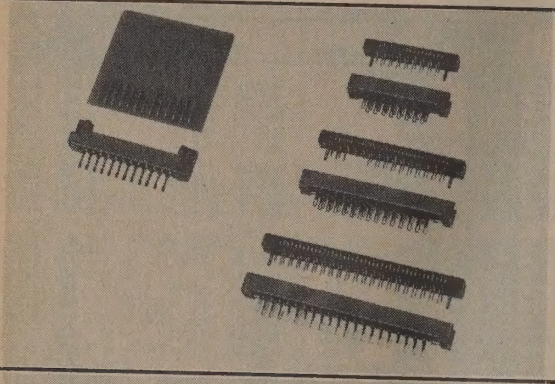
Total Connector Capability from the Innovator:



METAL PLATE BACK PANEL CONNECTORS AND WIRING SERVICE

The metal plate connecting system is the modern day method o mounting and interconnecting electronic components. Most dramati ly used in the computer equipment field, this packaging system provid a high density system compatible with automatic wiring methods. he metal plate system is modular in concept and Elco has a wide assortm nt of standard parts we'll assemble and wire to your particular ne s.

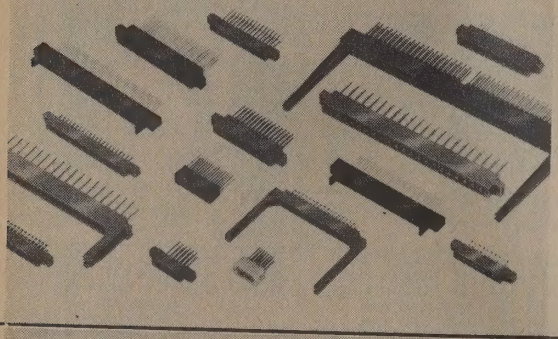
Request Catalogue MPM



METAL-TO-METAL PRINTED CIRCUIT CONNECTORS MINIATURE AND SUBMINIATURE

Three specifications (MIL-E-5400, MIL-E-8189, and MIL-T-21200) requ two-piece metal-to-metal printed circuit connectors in airborne equ ment. VARICON™ connectors are metal-to-metal and provide a multit of options: contact spacings of .050″, .075″, .100″, .156″ and .20 terminals for wire wrap, crimp, solder, and taper tab; connector si from 2 to 152 contacts.

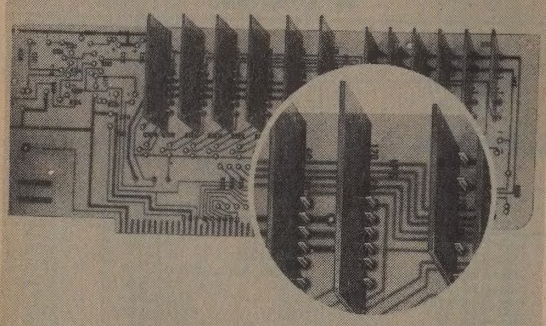
Request Catalogue PCM



CARD-EDGE PRINTED CIRCUIT CONNECTORS

Card-edge connectors mate directly with the printed circuit ca and are available in a wide range of sizes (4 to 100 contacts), config rations, and contact spacings (.100″, .125″, .150″, .156″, and .200 Optional means for terminating include wire wrap, solder, and taper ta Other options include: connectors with or without card guides; vario mounting provisions — threaded inserts, floating eyelets, force fit hub and standard mounting holes.

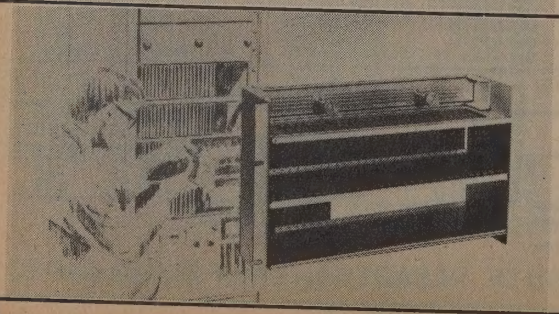
Request Catalogue CEM



BOARD-TO-BOARD PRINTED CIRCUIT CONNECTORS

Make your connections with a total system (the Elco system). Whethe your p.c. boards are perpendicular, parallel, or even tandem to each other, we have the right type, connector size, and contact spacing (.100″, .125″, .150″, .156″, and .200″). Each and every type uses exclusively, the VARICON™ contact, a two-piece (metal-to-metal) contac complying fully with the latest revision of MIL-E-5400, MIL-E-8189, an MIL-T-21200.

Request Catalogue BBM



PRINTED CIRCUIT CARD ENCLOSURES

The Elco VARIPAK® II enclosure is a highly versatile device for packaging printed circuit cards and connectors. Made of rugged aluminum, the Varipak can be used in storage cabinets, pull-out drawers, and even as the framework for small instrument panels. The Varipak's construction allows air flow throughout the unit, aiding in longer component life. There are 32 standard sizes available with basic parts stocked at all authorized Elco distributors.

Request Catalogue VEM

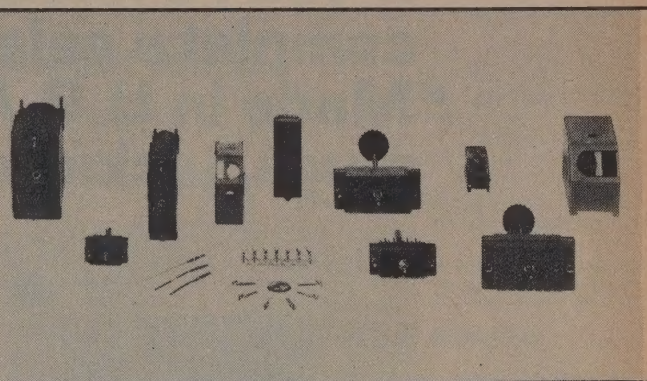
Elco Corporation

WILLOW GROVE, PA. 19090 • (215) 659-7000; TWX 510-665-5573
EL SEGUNDO, CALIF. 90245 • (213) 675-3311; TWX 910-325-6602

ANGULAR AND PANEL NECTORS

full line of rack-and-panel and I/O (input/output) connectors come wide choice of styles. With standard, miniature, and even ar styles you can have from 2 up to 140 VARICON™ contacts, or ically any size in between. We've just created a family of high- ty connectors (.100″ and .125″ spacing) engineered for high relia- (including military) as well as controlled-environment applications.

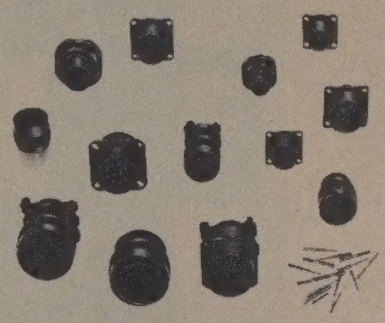
est Cataloque RPM



-C-26482 -C-26500 CULAR CONNECTORS

supplies both MIL-C-26482 (Navy) and MIL-C-26500 (USAF) circular nectors. MIL-C-26482 environment-resisting, quick-disconnect connec- are equipped with solder or crimp contacts; available in a choice of shell sizes with 3 to 61 contacts. MIL-C-26500 connectors are igned to be essentially voidless in order to withstand environmental emes encountered by missiles and space vehicles. Equipped with np contacts, the connectors are available in nine shell sizes with o 61 contacts.

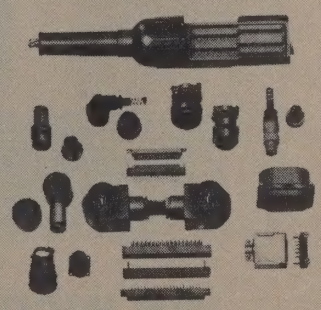
uest Catalogue CCM



LITARY ECIFICATION ONNECTORS

o manufactures a full line of connectors designed to and meeting ict military system specifications. Connector types are: MIL-C-21097 d MIL-C-55302 printed circuit connectors; MIL-C-12520, MIL-C-26482, L-C-26500, MIL-C-55181, MIL-C-55243, and U-344/345 power con- ctors; MIL-C-10544, MIL-C-55074, and MIL-C-55116 communications nnectors; MIL-C-23216 and MIL-C-26636 contacts.

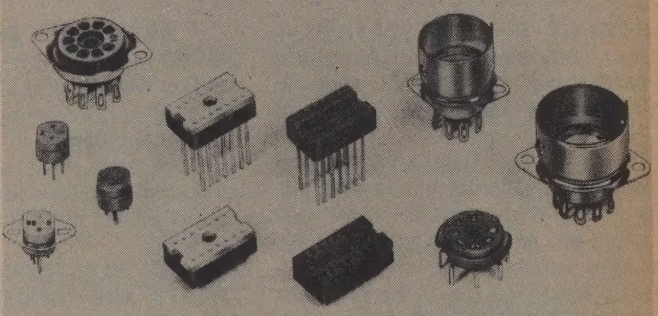
equest Catalogue MSM



IP RANSISTOR AND UBE SOCKETS

DIP, transistor, and tube sockets; all manufactured by Elco and all exhibiting the high quality expected of an Elco product. State-of-the-art design, stringent raw material control, and advanced manufacturing techniques all contribute to the exceptional performance of Elco high-reliability sockets. See our catalogue for 14- and 16-pin DIP sockets, 7- and 9-pin tube sockets, transistor sockets, relay sockets, and crystal sockets.

Request Catalogue CSM



CONNECTOR INSTALLATION TOOLS

Elco provides all of the necessary equipment to install their connectors. Our automatic and manual contact staking tools firmly affix the contact to the printed circuit card, producing exceptional electrical as well as mechanical contact. Our automatic and manual crimping tools join contact to wire by mechanically deforming the contact around both the conductor and the insulation of the wire. All installation tools are engineered to provide long, efficient service.

Request Catalogue ITM

If you're looking for the most complete selection of "Made in U.S.A." plugs, jacks, and components...

Write today for your free new industrial catalogue FR-70-1. Department 1D-7.

...we wrote the book on it.

PRODUCT DIVERSIFICATION — Over 10,000 electronic products are manufactured, using the latest in machinery, in our 350,000 square-foot plant in Rockford, Illinois, and warehoused in Los Angeles and New York. Electronic chemicals, hardware, tools, service aids, test equipment, antennas, phono drives, chassis punches, and audio accessories are only a few of the products numbered in GC-Electrocraft product line.

RESEARCH AND DEVELOPMENT — GC's complete facilities, highly trained and skilled personnel enable us to develop and manufacture the ultimate in precision component parts. New products are developed and introduced regularly, many just to meet industry's specifications.

GC ELECTROCRAFT COMPONENTS ARE QUALITY PRODUCTS — designed, engineered and manufactured to meet the most exacting standards. GC Electronics' over 30 years of experience in the electronics industry is your assurance of satisfaction.

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A DIVISION OF **HYDROMETALS, INC**

GC's industrial products are available from selected industrial distributors conveniently located throughout the nation.

TERMINAL BOARDS

CR151 TYPE D ONE-PIECE BOARDS

t terminal types.
e board width — ⅞ in., 1⅛ in., 1 5/16 in.

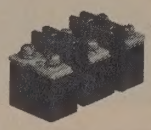
Boards rated 15, 20, and 30 amperes with breakdown voltages of 3600, 4800, and 7500 volts, respectively.
15-amp boards available in increments of 1 through 36 points; 20-amp boards in 1 through 30 points; 30-amp boards in 1-24 points.
Terminals on 15-amp boards accept through size #14 wire; 20-amp boards through size #12 wire; 30-amp boards through size #10 wire.
Choice of marked or unmarked boards or six types of marking strips.

Write for Bulletin GEA-7317

CR151 TYPE B ONE-PIECE BOARDS

Rated 30-amperes, 600-volts for control circuits.
Available with 4-, 6-, and 12-points.
Screw, captive saddle-clamp, or screw terminals on one side, clamp terminals on the other.
Terminals accept wires through size #10.
Write-on marking strips, 15/32-in. wide, provided with boards.

CR2960 ONE-PIECE BOARDS



Control circuit boards rated 20-amperes at 600-volts; available with 4- and 6-points.

Power circuit boards rated 50-, 100-, and 150-amperes at 600-volts; available with 3 points per board.

All types have screw terminals.

Terminals accept wires through #8.

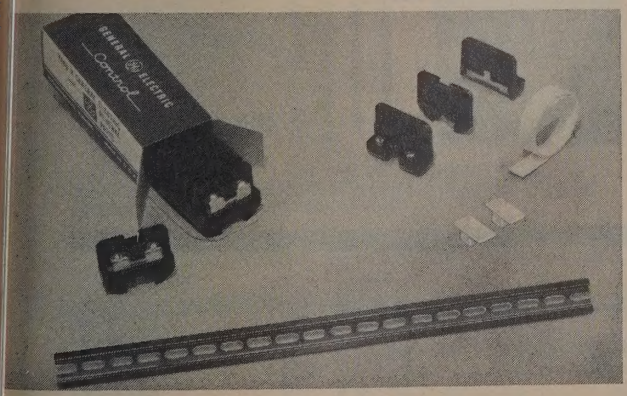
CR151 TYPE C SECTIONAL BOARDS

n be mounted directly on panel (top) or in a channel (bottom) which is then unted on panel.

nall CR151 Type C terminal boards provide two-way mount-g and assembly flexibility. When the board has been assem-ed, you can mount it directly on a panel or you can semble blocks in molded channels on applications where aximum flexibility is required. Blocks can be added after itial installation to meet increased requirements in control rcuits.

These terminal boards can be ordered in three ways: 1) as individual blocks, 2) as factory-assembled blocks without channel, 3) as factory-assembled blocks in mounting channel based on specification.
Complete line of components for customer assembly.
Choice of three 25-amp terminal types and two 50-amp terminal types.
Both boards meet IEEE switchgear standards for 750 volts.
Screw terminals accept 5/16 in. ring or spade connectors, #22 - #12 wire.
25-amp box terminals accept #18 - #8 wire; 50-amp box terminals accept #10 - #4 wire.
25-amp box clamp terminals accept #22 - #10 wire; 50-amp clamp box terminals #14 - #4 wire.
Interlocking construction . . . blocks slide together.
25-amp blocks are 1 in. high, 1⅛ in. wide; 50-amp blocks are 1 7/16 in. high, 1½ in. wide.
Easy addition of blocks provides expansion flexibility.
Panel or channel mounting.
Factory-assembled forms for direct mounting in 2 through 12 point sections for 25-amp forms and 2 through 6 for 50-amp forms; for channel mounting, 2 through 99 points.
Choice of painted surface or separate marking strip.

CR151 TYPE A SECTIONAL BOARDS

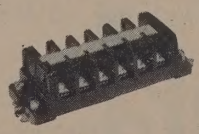


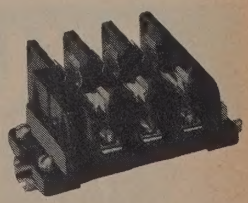
Components for customer assembly

From three basic components, you can build custom boards to meet most terminal board requirements:
- Mounting track — in lengths from 3½ to 48 inches.
- Terminal blocks — ten types are available.
- Mounting assembly kit — contains two end blocks, one standard size barrier, two nylon guide inserts, and one 16-inch marking strip.

Additional blocks or blocks with different terminals can be added to existing boards.
Ten types of terminal blocks available.
Blocks rated 25-, 50-, 125-amperes.
30-amp fuse blocks, 15-amp isolating switch blocks offered.
25-amp forms accept #16 through #10 wire; 50-amp forms accept #14 through #4 wire; 125-amp forms accept #14 through #0 wire.
Adaptor kit available for installing overload relays.
Fanning strip accessory holds wires for fast, easy connection.
Marking strip can be marked with pencil or ink; can be cut to any length required.

Factory-assembled boards





74 standard factory-assembled boards with two through 36 points are available to meet most applications. All terminals on any one board are of the same type, and all boards are complete with marking strip ready for panel mounting.

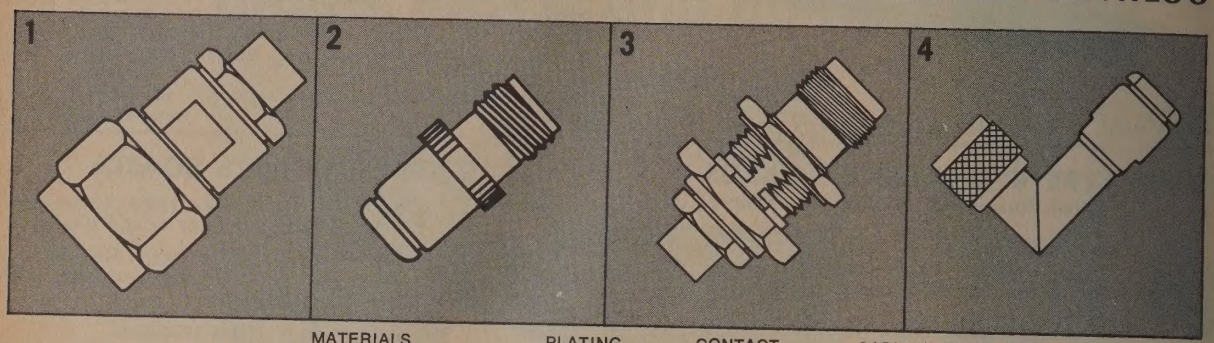
For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

Solitron/Microwave

GENERAL RF FITTINGS DIVISION

CONDENSED CATALOG



LEGENDS

MATERIALS
B=BRASS
C=BERYLLIUM COPPER
S=STAINLESS STEEL
A=ALUMINUM

PLATING
S=SILVER
G=GOLD
R=RHODIUM
N=NICKEL
P=PASSIVATION

CONTACT
L=LOOSE
C=CAPTIVATED
P=POLARIZED

CABLE ATTACHMENT
S=SOLDERED
C=CRIMP
K=CLAMP
CS=CRIMP OR SOLDER

TNC SERIES

GRFF PT. NO.	MATERIAL	PLATING	CONFIGURATION	CONTACT	CABLE RG/U	METHOD OF ATTACHMENT
4000 — 0002	B	S	1	L	55, 58, 141, 142	K
4000 — 8009	A	R	1	C	55, 58, 141, 142	K
4000 — 0014	B	S	1	P	55, 58, 141, 142	K
4001 — 0001	B	S	1	L	59, 62, 71	K
4001 — 8002	A	R	1	C	59, 62, 71	K
4001 — 0004	B	S	1	P	59, 62, 71	K
4003 — 8003	A	R	1	C	180	K
4025 — 0002	B	S	2	L	55, 58, 141, 142	K
4025 — 8005	A	R	2	C	55, 58, 141, 142	K
4025 — 0012	B	S	2	P	55, 58, 141, 142	K
4026 — 0002	B	S	2	P	59, 62, 71	K
4026 — 8003	A	R	2	C	59, 62, 71	K
4027 — 0001	B	S	2	L	180	K
4027 — 0002	B	S	2	C	180	K
4028 — 0001	B	S	2	L	174, 179A, 187, 188	K
4028 — 0002	B	S	2	C	174, 179A, 187, 188	K
4113 — 0002	B	S	3	L	55, 58, 141, 142	K
4113 — 8003	A	R	3	C	55, 58, 141, 142	K
4114 — 0002	B	S	3	C	59, 62, 71	K
4115 — 0001	B	S	3	L	180	K
4116 — 0003	B	S	3	P	174, 179A, 187, 188	K
4004 — 8002	A	R	1	C	174, 179A, 187, 188	K
4092 — 0002	B	S	4	L	55, 58, 141, 142	K
4092 — 0003	B	S	4	C	55, 58, 141, 142	K
4092 — 8015	A	R	4	P	55, 58, 141, 142	K
4060 — 0001	B	S	5	C		
4060 — 8003	A	R	5	C		
4060 — 0011	B	S	5	P		
4060 — 8019	A	R	5	T		
4066 — 0006	B	S	6	T		
4068 — 0001	B	S	6	C	HERMETIC	
4000 — 0010	B	S	7	L	55, 42, 223	C
4000 — 0011	B	S	7	L	58, 141, 303	C
4008 — 0005	B	S	7	L	143, 304	C
4534 — 6002	S	P	8	C		

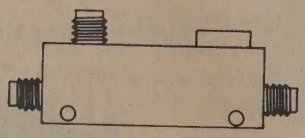
TM SERIES

GRFF PT. NO.	MATERIAL*	PLATING	CONFIGURATION	CONTACT	CABLE RG/U	METHOD OF ATTACHMENT
3000 — 0001	B	S	1	L	178,196	K
3001 — 0001	B	S	1	L	180	K
3002 — 8001	A	R	1	L	161,179	K
3003 — 0001	B	S	1	L	55, 58, 141, 142	K
3003 — 0006	B	S	1	P	55, 58, 141, 142	K
3003 — 0007	B	S	1	C	55, 58, 141, 142	K
3020 — 8001	A	R	2	L	122, 195	K
3021 — 0001	B	S	2	L	174, 179A, 187, 188	K
3024 — 0001	B	S	2	L	161, 179	K
3025 — 0001	B	S	2	L	082SR	K
3026 — 0001	B	S	2	L	55, 58, 141, 142	K
3027 — 0001	B	S	2	L	178, 196	K
3032 — 0001	B	S	2	L	141SR	K
3030 — 0001	B	S	3	L	122, 195	K
3031 — 8001	A	R	3	L	174, 179A, 187, 188	K
3036 — 0001	B	S	3	L	78, 196	K
3037 — 0001	B	S	3	L	161, 179	K
3010 — 0001	B	S	4	C	122, 195	K
3011 — 0001	B	S	4	C	174, 179A, 187, 188	K
3014 — 0001	B	S	4	C	178, 196	K
3015 — 0001	B	S	4	C	161, 179	K
3050 — 0001	B	S	5	C		
3050 — 0009	B	S	5	C		
3051 — 0001	B	S	5	C		
3052 — 0001	B	S	5	C	HERMETIC	
3055 — 0001	B	S	6	C		
3056 — 0001	B	S	6	C		
3057 — 0001	B	S	6	C		
3057 — 8003	A	R	6	C		
3058 — 0001	B	S	6	C	HERMETIC	
3571 — 6002	S	P	8	C		

NOTE—CONNECTORS MAY BE MADE OUT OF OTHER MATERIALS ON SPECIAL ORDER

ESCA

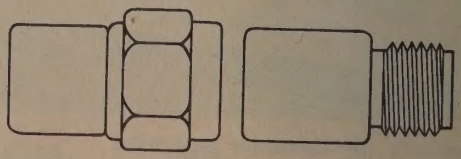
DIRECTIONAL COUPLERS AND TERMINATIONS



COUPLING: 10 AND 20DB
DIRECTIVITY: 20 DB MIN.

FREQ: 0.5 — 1.0 GHz
1.0 — 2.0 GHz
2.0 — 4.0 GHz
4.0 — 8.0 GHz

PRICE 1-9 $49



SMA: ½ Watt VSWR 1.20 to 18 GHz
TYPE N: 5 Watt VSWR 1.20 to 12 GHz

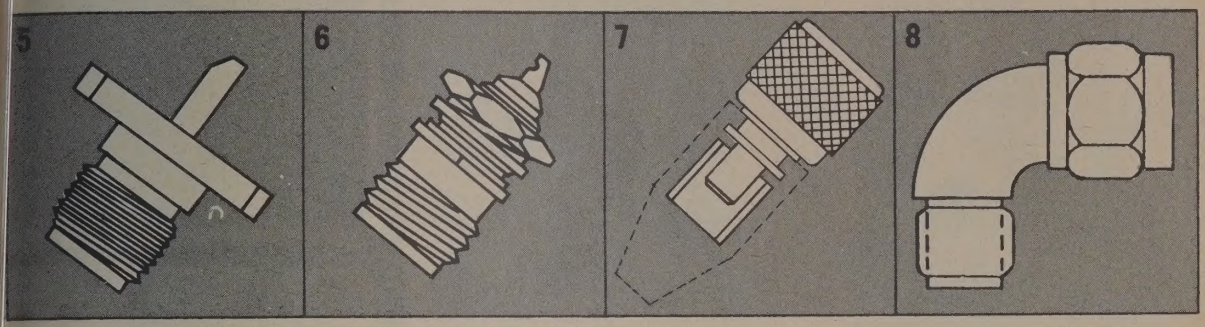
SMA $11.00
TYPE N $12.00

Cove Road • Port Salerno, Florida 33492 • 305/287-5000 • TWX: (510) 953-6010

Solitron/Microwave

GENERAL RF FITTINGS DIVISION

CONDENSED CATALOG

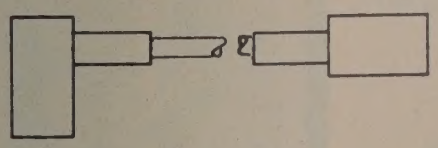


2900 SMA SERIES GRFF PT. NO.	MATERIAL	PLATING	CONFIGURATION	CONTACT	CABLE RG/U	METHOD OF ATTACHMENT
2900 — 6001	S	G	7	L	55,142,223	C, S
2900 — 6002	S	G	1	L	55,142,223	K
2902 — 6001	S	G	1	L	.141SR	S
2902 — 6002	S	G	1	L	.141SR	K
2906 — 6001	S	G	1	L	.086SR	S
2920 — 6002	S	G	2	S	55,142,223	K
2922 — 6001	S	G	2	S	.141SR	S
2922 — 6002	S	G	2	S	.141SR	K
2926 — 6001	S	G	2	S	.086SR	S
2942 — 6001	S	G	3	S	.141SR	S
2950 — 6001	S	G	5	C	SINGLE COND.	S
2970 — 6001	S	G	6	C	SINGLE COND.	S
2994 — 6002	S	G	8	C		

PN SERIES GRFF PT. NO.	MATERIAL	PLATING	CONFIGURATION	CONTACT	CABLE RG/U	METHOD OF ATTACHMENT
6501 — 0001	B	G	1	L	RG214	S
6502 — 0001	B	G	1	L	.325TFE	S
6503 — 0001	B	G	1	L	.325SR	S
6504 — 0001	B	G	1	L	.250TFE	S
6505 — 0001	B	G	1	L	.141SR	S
6509 — 0001	B	G	1	L	RG214	S
6521 — 0001	B	G	2	L	RG214	S
6522 — 0001	B	G	1	L	.325TFE	S
6523 — 0001	B	G	2	L	.325SR	S
6524 — 0001	B	G	2	L	.250TFE	S
6525 — 0001	B	G	2	L	.141SR	S
6541 — 0001	B	G	2	L	RG214	S
6542 — 0001	B	G	3	L	.325TFE	S
6543 — 0001	B	G	3	L	.325SR	S
6544 — 0001	B	G	3	L	.250TFE	S
6545 — 0001	B	G	3	L	.141SR	S
6549 — 0001	B	G	3	L	RG214	S
6594 — 6002	S	G	8	L		

plaxial DIVISION

70 JACONNET ST. / NEWTON HIGHLANDS, MASS. 02161



Provides performance of semi-rigid, with flexibility of braided cable. Available in bulk length or cable assemblies.

CUSTOMER BENEFITS:
Cable bending eliminated, lighter weight, better performance, simpler layouts, reduces cost.

TO ORDER:
Specify connector desired on each end, cable length, and cable type from chart.

FLEXIBLE RF CABLE WITH PLATED ON SOLID OUTER CONDUCTOR—

Plaxial Spec.	Imp. Ohms	Dielectric Material	Center Condt.
1-75	75	Irradiated Polyethylene	No. 28 A.W.G. Solid
2-50	50	Irradiated Polyethylene	19/35 Stranded
3-50	50	Irradiated Polyethylene	No. 21 A.W.G. Solid
4-50	50	TFE Teflon	No. 20 A.W.G. Solid
5-50	50	FEP Teflon	No. 20 A.W.G. Solid
6-50	50	FEP Teflon	19/34 Stranded

THE Solitron/Microwave FAMILY INCLUDES:

FILMOHM

ROYAL MICROWAVE DEVICES

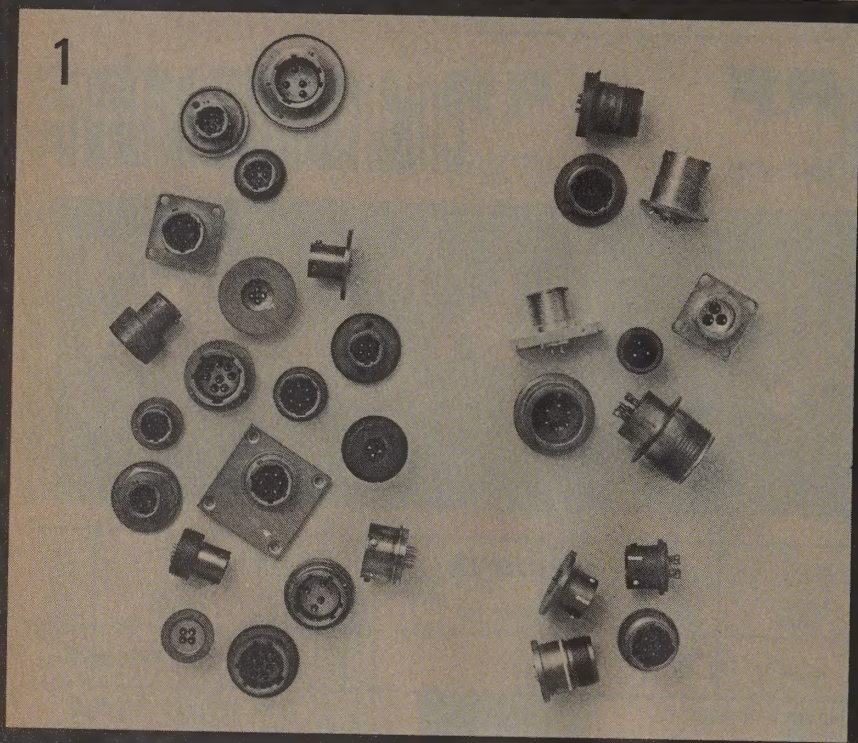
MCL/CHEMICALS

MICROWAVE SEMICONDUCTOR

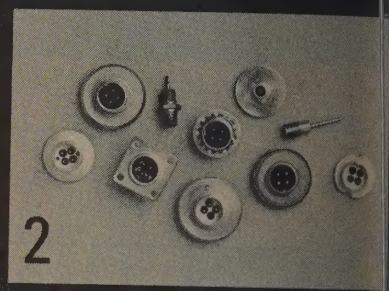
plus

Solitron DEVICES, INC.
SEMICONDUCTOR DIVISIONS

Cove Road • Port Salerno, Florida 33492 • 305/287-5000 • TWX: (510) 953-6010



Glass to Metal Hermetically Sealed Connectors Headers and Feed-Thru terminals



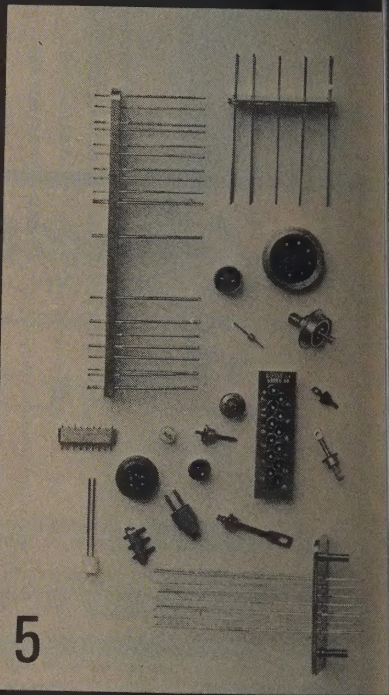
The Glass Technology division of GULTON INDUSTRIES offers a broad line of connectors, headers and feed-thru terminals for both commercial and aerospace applications. Geared for specials as well as standards, basic designs are available with stainless or cold rolled steel shells; weld, solder, box or flange mount styles; or in custom configurations to meet individual requirements.

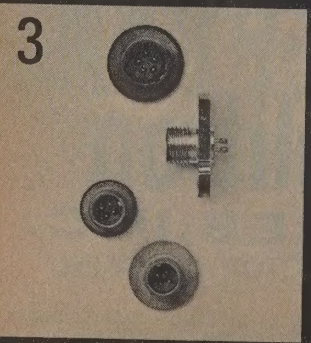
Typical Specifications:

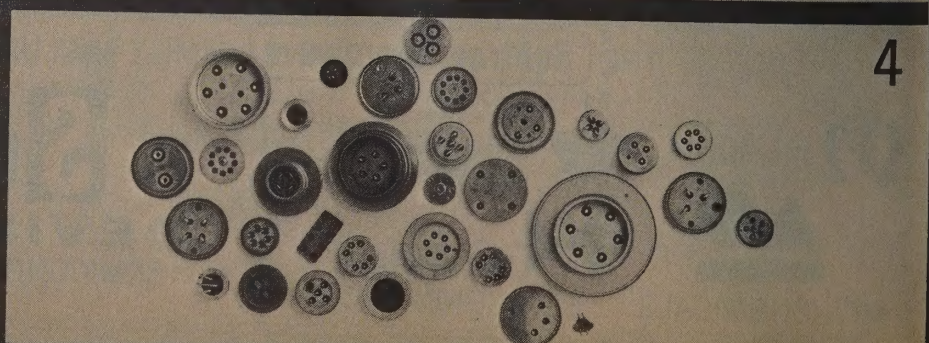
Leak rate: 1.2×10^{-10}cc Helium/sec.
Vibration: 0-2,000 cps @ 100 g's rms
Operating range: —420°F to +600°F
Pressure range: to 40,000 psi
Insulation resistance: 1×10^{12} ohms @ 300°F

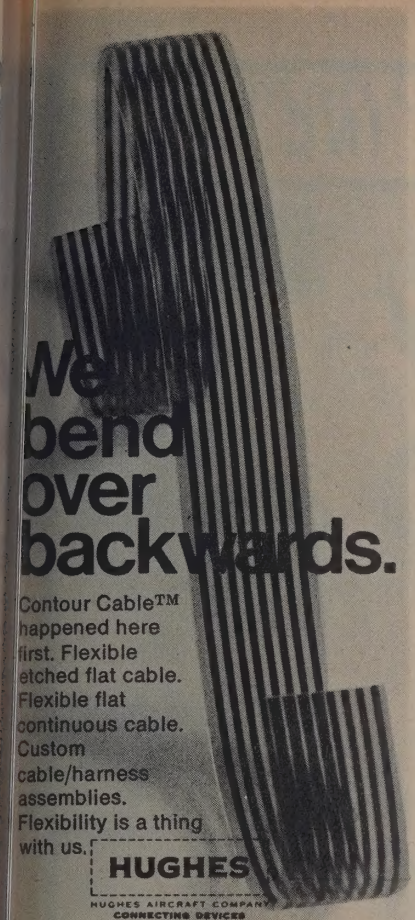
1. Hermetically sealed NAS and MIL type connectors
2. Sub-miniature hermetically sealed connectors
3. Low silhouette and double-start threaded hermetically sealed connectors
4. Hermetically sealed headers
5. Single and multi-pin feed-thru terminals

Gulton
GLASS TECHNOLOGY DIVISION
822 Production Place, Newport Beach, Calif. 92660





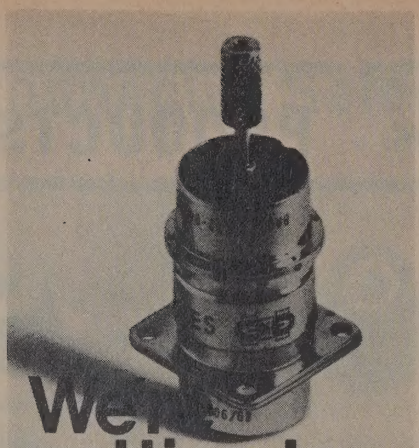




We'll bend over backwards.

Contour Cable™ happened here first. Flexible etched flat cable. Flexible flat continuous cable. Custom cable/harness assemblies. Flexibility is a thing with us.

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES



We're getting to be known as rounders.

We invented the BULLS-EYE Connector and created a reputation as circular subminiature specialists. Goes to show you what a little concentration can do. (Like 102 contacts in a #18 shell.)

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES

We've got your number.

Show us a spec, and we'll show you miniature and subminiature printed circuit connectors in 10 sizes with 10 to 96 contacts. We're good at the numbers game.

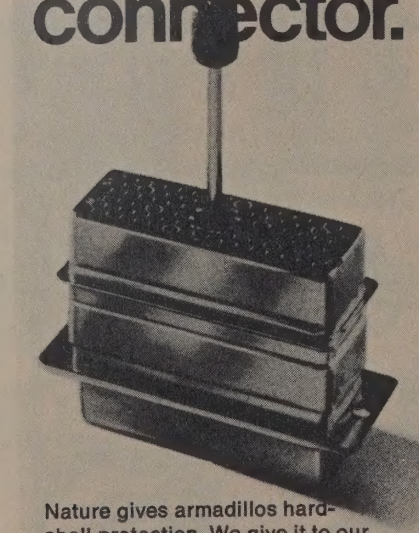
HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES

We'll save your space.

The way we make subminiatures, they're more subminiature. More fully packed. Same contact size and spacing, only we get 110 contacts to the inch. Socket to 'em!

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES

The armadillo connector.



Nature gives armadillos hard-shell protection. We give it to our D series connectors. Stainless steel armor to keep 'em foolproof. They align perfectly. Fully environmental. 5 sizes. Maybe we outdo armadillos.

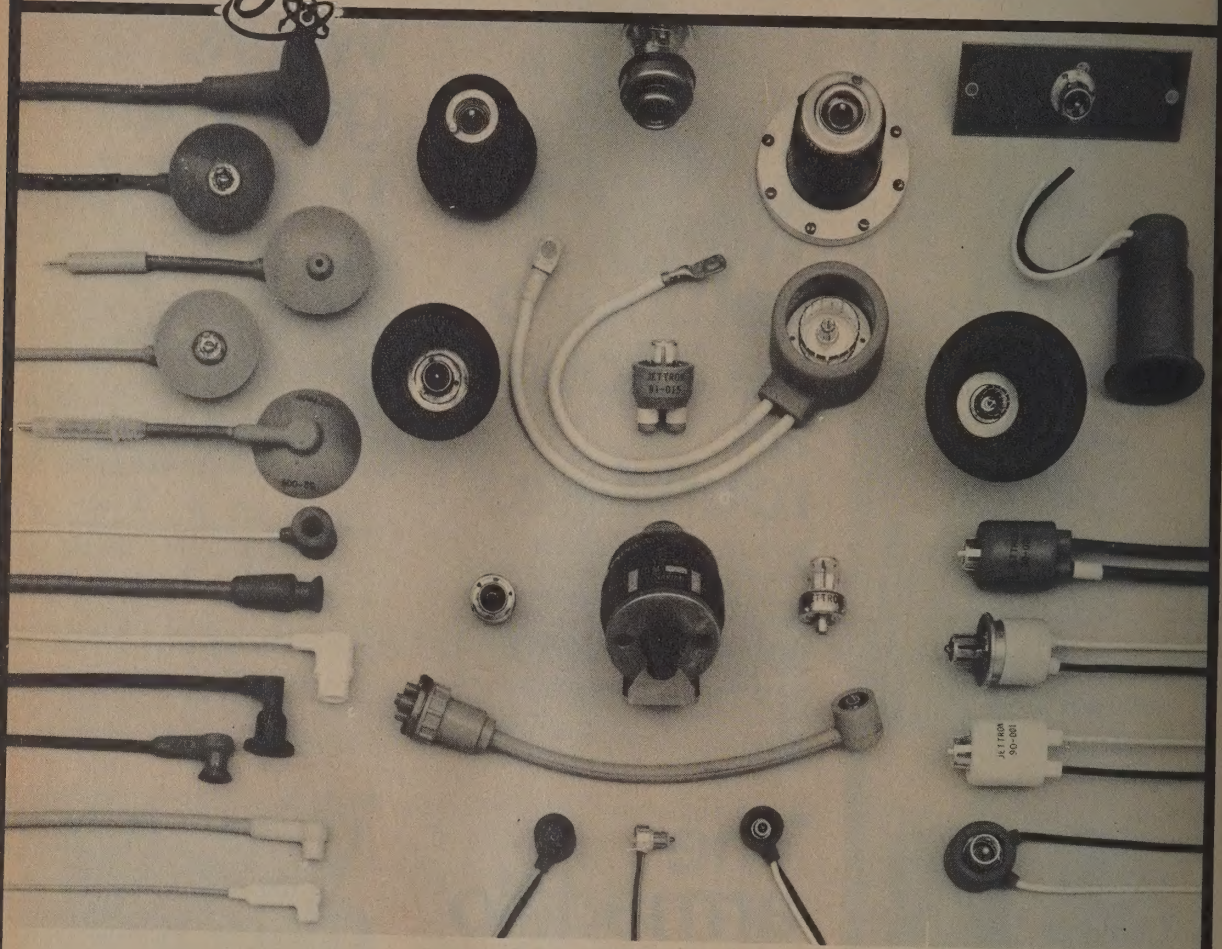
HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES

Speed 'em up!

Our new Pull-Thru gun lets you pull (not push) contacts through a connector. At four times the speed. Works on many connectors. With three contact sizes. Fast? The no-holdup gun.

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES

jettron · PRODUCTS INC.



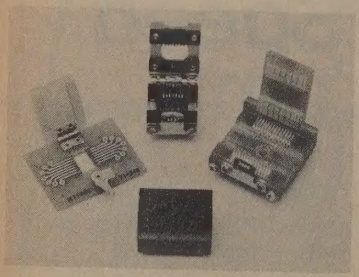
HIGH VOLTAGE LEAD ASSEMBLIES

- Cathode Ray Tubes
- H.V. Power Supplies
- .050 Pin Terminal — United Electronics
- .080 Pin Terminal — No. 596, RCA 3E29
- J1-21, J1-22 & J1-25 Terminals — CR Tubes

MAGNETRON INPUT CONNECTORS

- STANDARD TUBE TYPES: 4J50 4J52 4J52A 6551 6865 7008 7111
- MINIATURE TUBE TYPES: L-3028 L-3058 L-3105 L-3150 L-3157 L-3182 L-3186 L-3189 L-3209 MA-205
- MAGNETRON MFG'S: BOMAC, LITTON, M.A., S.F.D., SYL., W.E.

INTEGRATED CIRCUIT TEST SOCKETS
Production/Aging

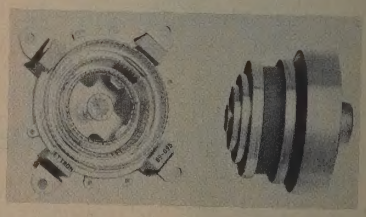


TRANSISTOR SOCKETS

- 7/16", 11/16", 7/8" Silicon High Power Transistors

Types:
- Sensing
- Handle
- Common Bridge
- Octal Base
- 120° Spacing
- Micro-Diodes: Micro, Pico, Cross, Test Type
- T0-5, T0-18 SENSING
- Nylon Funnel, 1 Million Insertion, T0-5 Type

TUBE SOCKETS
"For Special Purpose Tubes"



- Miniature Ceramic GE 7077, 7486, 8262, 7296, 7768, 7841, Z2866, Z2869 & "Y" Nos.
- ML 8534 & ML 8629 Series
- Beam Power RCA: 6816, 7213, & 7650, 8072, 8226, 8501 Types
- Lighthouse 2C39 Family of Tubes GE, Machlett & R.C.A. Types

• RESEARCH • DEVELOPMENT • PRODUCTION

Our basic designs permit fast, easy modifications to suit your requirements without premium charges or extended deliveries.

58 Route 10 • Hanover, New Jersey 07936
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ITT Cannon Connector Selection Guide

This Guide is designed to help you select the proper connector series and the appropriate catalog from which to specify your connector. Below is a suggested method of selection:

INSTRUCTIONS

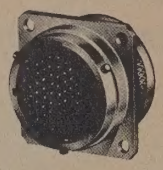
1. Determine your basic application requirement:
   (a) Rectangular Rack/Panel
   (b) Circular
   (c) Microminiature
   (d) Special Application Connectors

   Go to one of these four headings in the chart. Below each heading are several blocks listing the various connector series. (If a MIL Spec connector is required, turn to the back side of this Guide for the applicable catalog.)
2. Determine the required number of circuits, wire or contact size, and contact termination (solder, crimp, welded, etc.). Check these requirements with the data on the right side (dark shaded area) of each block.
3. Next, select the desired connector size, shell style or coupling method, on the left side (light shaded area) of each block.
4. Check the legend at the bottom of chart to see if environmental (symbols □ or ■) or hermetic (symbol •) requirements are satisfied.
5. Refer to the proper catalog for detailed product data and ordering information.

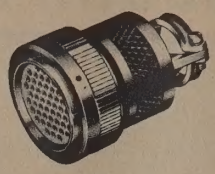
NOTE: For information on connectors not included in the chart, consult factory.

CANNON ITT

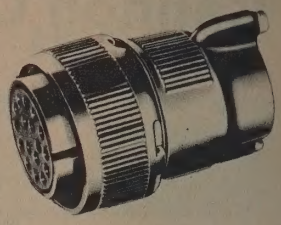
Circular



MIL-C-38999
SUBMINIATURE



MIL-C-83723
MINIATURE



MIL-C-5015
STANDARD

KJ — high density, MIL-C-38999

Bayonet Coupling

High performance, high density, lightweight, compact, environment-resistant connectors; rear release of crimp snap-in contacts.

KJ CATALOG

□ ●

3-128 CONTACTS

Contact/Wire Size
22M
22D
22
20
16

CRIMP TERMINATION

PV — high performance, NAS1599

Bayonet Coupling

Mates with MIL-C-26482 types with bayonet coupling and rear release of crimp snap-in contacts

KV/PV CATALOG

□ ●

3-61 CONTACTS

Contact/Wire Size
20
16
12

CRIMP TERMINATION

PV — miniature circular MIL-C-83723

Bayonet Coupling

Mates with MIL-C-26482 and NAS1599 bayonet coupled connectors. High performance, environmentally sealed; fluid resistant; rear release crimp snap-in contacts

MIL-C-83723 CATALOG

□

3-61 CONTACTS

Contact/Wire Size
20
16
12

CRIMP TERMINATION

KPT/KPTM/KPSE general purpose, MIL-C-26482

Bayonet Coupling

KPT — Solder termination
KPTM — Crimp contacts in DUAL-SHORE® insulator
KPSE — Crimp contacts in integrally molded insulator

Note: Receptacles with hard anodic, non-conductive finish and flanges positioned for rear panel mounting are available.

MCB CATALOG

□ ●

2-61 CONTACTS

Contact/Wire Size
20
16

SOLDER OR CRIMP TERMINATION

KM — environmental, MIL-C-25955

Acme Threads

KM —environmentally sealed with crimp, snap-in contacts
KM-MK2—improved KM with thru-grommet contact insertion

MC CATALOG

□ ●

3-54 CONTACTS

Contact/Wire Size
20
16

CRIMP TERMINATION

KO — rugged lightweight

Acme Threads

Miniature environmental version of standard K connector with special Acme threads

MC CATALOG

□ ●

3-50 CONTACTS

Contact/Wire Size
20
16
12

SOLDER TERMINATION

MC — subminiature, sealed connectors

Rugged

Designed to withstand severe handling and environmental conditions

MC CATALOG

□ ●

3-12 CONTACTS

Contact/Wire Size
20

SOLDER TERMINATION

MS — general purpose, MIL-C-5015

Threaded Coupling

MS-A—solid shell
MS-B—split shell
MS-C—receptacle, pressurized
MS-E—environmental, cable clamp
MS-R—environmental, endbell

MS CATALOG

Note: Catalog also includes connectors for potting, bulkhead, quick disconnect and weatherproof applications.

■ ●

1-102 CONTACTS

Contact/Wire Size
16
12
8
4
0

SOLDER TERMINATION
High Voltage Cartridges and Coax. Cartridges available.

CV — standard circular connector

Threaded Coupling

High performance connectors designed to MIL-C-5015; rear release crimp snap-in contacts.

CV CATALOG

□

1-48 CONTACTS

Contact/Wire Size
0-16

CRIMP TERMINATION

CV — standard circular MIL-C-83723

Threaded Coupling

Mates with MIL-C-5015 thread coupled connectors. Environment and fluid resistant, rear release crimp snap-in contacts.

MIL-C-83723 CATALOG

□

1-48 CONTACTS

Contact/Wire Size
16
12
8
4
0

CRIMP TERMINATION

CA-RX — MIL-C-5015 type, crimp contacts

Threaded Coupling

CA-RX—MIL-C-5015 type connector with crimp, snap-in contacts in DUAL-SHORE® insulator
BFRX —pressurized bulkhead type

RX CATALOG

□

1-54 CONTACTS

Contact/Wire Size
20
16
12
8
4
0

CRIMP TERMINATION

K — lightweight, rugged general purpose

Quick Coupling

K—with special Acme thread coupling nut
RK—same as K except has a reverse coupling nut

K CATALOG

Note: Catalog also includes connectors for firewall, bulkhead television and telephone recording applications.

●

1-110 CONTACTS

Contact/Wire Size
20
16
14
10
8
6
4
2
0

Coax. contacts avail.
SOLDER TERMINATION

LR/MR — weatherproof, submersible

Submersible

Rugged environmental MIL-C-5015 type, designed to MIL-C-12520B

LR—hard insulator } Threaded
MR—resilient insulator } Threaded
MR—resilient insulator—bayonet

LR/MR CATALOG

□

1-56 CONTACTS

Contact/Wire Size
16
12
8
4
0

SOLDER TERMINATION

LEGEND
□ Environmental version only
■ Environmental versions available
● Hermetic versions available; For information refer to hermetic sections of respective catalogs

CANNON ITT

See YELLOW SECTION for Local Offices, Phones

Microminiature

USING PROVEN TWIST PIN CONTACTS*

MICRO-D™ connectors — rack/panel

MD —monobloc, glass-filled thermoset plastic insulator
MDN—thermoplastic insulator
MDA—thermoplastic insulator
MDB—same as MD connector with integral screw mounting holes
MDE—environmental type
MDM—Mark II metal shell

1/8 scale
.050" Centers

MMC CATALOG

9-51 CONTACTS
Amps
3
SOLID OR STRANDED LEADS

MICRO-K™ connectors — circular

A high density connector using twisted pin contacts on .050" centers; 75% smaller/80% lighter per contact than MIL-C-26482 types.

Threaded Coupling
.050" Centers

MMC CATALOG

7-55 CONTACTS
Amps
3
SOLID OR STRANDED LEADS

50-MIL STRIP™ connectors

For edge mounting on PC boards and encapsulation in modules
MTA—polycarbonate insulator (up to 120 contacts)
MTB—diallyl phthalate (up to 81 contacts)

.050" Centers

MMC CATALOG

UP TO 120 CONTACTS
Amps
3
SOLID OR STRANDED LEADS

CENTI-LOC™ connectors — strip

Low cost, commercial strip connector available in "yardage" form for up to 53 crimp snap-in contacts on .075" centers and up to 60 contacts on 100" centers.

.075" or .100" Centers

1-60 CONTACTS
Contact/Wire Size
22 thru 26

CENTI-LOC connectors — rectangular

CDL Series: Rectangular layouts are available with 139, 104 or 102 crimp, removable contacts on .075" centers.

.075" Centers

MMC CATALOG

102-139 CONTACTS

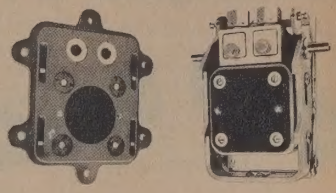
SOLDER OR CRIMP TERMINATION

*Licensed by New Twist

OTHER SPECIAL CONNECTORS . . . consult factory

Battery connectors
Buffet connectors
Bussed contacts
CAM-RAC™ modules
Cupronickel connectors
Custom harnessing
Edgeboard connectors
Environment-resistant connectors (see legend)
Hermetically sealed connectors (see legend)
High voltage contacts
Hydrospace connectors
Non-magnetic connectors
RFI shielding
Special finishes
Special insulator materials
Stainless steel connectors
Thermocouple contacts
Universal Interconnect System
Waterproof connectors

Special Applications



FRF connectors

Firewall connector with front release of crimp snap-in MS90453 and MS90454 contacts; moisture sealed and exceeds MIL-C-5015 fireproof requirements or 400° F continuous use and 600° F shorter term

FRF CATALOG

2-47 CONTACTS
Contact/Wire Size
16
12
8
4
0
CRIMP TERMINATION

HIGH TEMPERATURE connectors

HRM —1300°F, nuclear radiation-resistant miniature circular connector
CA-HR—650° & 1000°F, radiation-resistant
CA-KE — 350°F, moisture-resistant, for sealable wires, meets MIL-C-5015 fireproof test or 350°F continuous
CA-KR — 350°F, moisture-resistant, for unsealable wires, meets MIL-C-5015 fireproof test or 350°F continuous
MS-K —350°F, meets MIL-C-5015 fireproof test, crimp contacts
FW —257° & 350°F, crimp or solder contacts

Threaded Coupling

HT CATALOG

1-73 CONTACTS
Contact/Wire Size
16
12
8
4
0
SOLDER, CRIMP OR WELD TERMINATIONS

MISSILE & SPACE APPLICATIONS

Interstage and umbilical connectors, electro-mechanical devices and pyrotechnic devices required in the missile and space field.

GM CATALOG

BACKPLANE assemblies

Economical, highly reliable edgeboard connectors for use in computers, business machines, electro data processing equipment.

BP CATALOG

44-96 CONTACTS

wire wrapping termination

RFI FILTER CONTACT connectors

Rack/panel and circular connectors with π type filter elements on each contact. Maximum RFI suppression with great space and weight savings over separate filters.

FP CATALOG

Contact/Wire Size
20

SOLDER TERMINATION; consult factory for availability of CRIMP filter contacts.

AUDIO/ELECTRONIC connectors

Used on microphones, tape recorders, amplifiers, test instrumentation, computers and other low level circuit applications

AUD CATALOG

2-8 CONTACTS
Contact/Wire Size
10
14
16
Coax. contacts avail.
SOLDER TERMINATION

FLAT FLEXIBLE CABLE terminations

Highly reliable, vibration-resistant cable assembly. Long flex life, effective shielding. Space & weight savings

FWA CATALOG OR CONSULT FACTORY

HYDROSPACE/WATERPROOF connectors

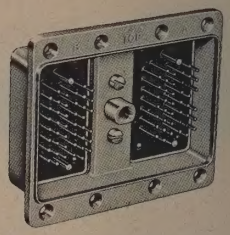
High pressure and corrosion resistant to withstand the stringent environments of undersea vehicles. Designed to MIL-C-24217, MIL-C-22249, and MIL-C-22539.

HC/WP CATALOG

3-208 CONTACTS
Contact/Wire Size
20
16
12
8
4
SOLDER OR CRIMP TERMINATION

CANNON ITT

Rectangular & Rack/Panel



D Subminiature

D* — original D, solder contacts
D*M — monobloc insulator, solder contacts
D*MA — rear release of crimp snap-in contacts
MIL-C-24308 — Full QPL

1/8 scale

D CATALOG

9-50 CONTACTS

Contact/Wire Size
20

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

BURGUN-D™ connector — economical D subminiature

General purpose economy version of popular D Subminiature; rear release of crimp snap-in contacts

1/8 scale

D CATALOG

9-50 CONTACTS

Contact/Wire Size
20

Size 13-20 contacts one #18 or two #20
CRIMP TERMINATION

2D — double density D

D subminiature shell and hardware; 19, 31, 52, 79 or 100 crimp removable contacts

1/8 scale

D CATALOG

19-100 CONTACTS

Wire Size
22 through 26

CRIMP TERMINATION

DPK — high performance, environmental

Environmental sealing, thermal resistant connector with rear release of crimp snap-in contacts

1/8 scale

DPK CATALOG

18-161 CONTACTS

Contact/Wire Size
4
8
12
16
20
22

Coax. contacts avail.
CRIMP TERMINATION

DPD — general purpose

DPD — standard rack/panel connector with widest range of contact arrangements
DPDL — large flange DPD
DPDB — back mounting DPD
DPDMA — rear release of crimp snap-in contacts
DPDR — DPD type with resilient insulator
DPDRM — DPD with crimp, snap-in contacts in DUAL-SHORE® insulator

1/8 scale

DP CATALOG

2-128 CONTACTS

Contact/Wire Size
0
2
4
6
8
10
14
16
20

Coax. contacts avail
SOLDER OR CRIMP TERMINATION

DPX2 — two gang DPX

DPX2 — two gang shell
DPX2-F&M — screw coupling
DPX2-A — ARINC A shell
DPX2-B — ARINC B shell
DPX2MA — rear release of crimp snap-in contacts

1/8 scale

DP CATALOG

2-212 CONTACTS

Contact/Wire Size
4
8
12
16
20
22

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPX — small, rugged, general purpose

DPX — split shell
DPXA — solid shell DPX
DPXAF — float mount DPXA
DPXB — ARINC shell DPX
DPXL — large flange DPX
DPXLF — float mount DPXL
DPXAMA — rear release of crimp snap-in contacts

1/8 scale

DP CATALOG

1-106 CONTACTS

Contact/Wire Size
4
8
12
16
20
22

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPD2 — two gang DPD

DPD2 — two gang DPD
DPD2MA — two gang DPD with rear release of crimp snap-in contacts
DPD2R — DPD2 with resilient insulator
DPD2RM — crimp, snap-in contacts in DUAL-SHORE® insulator

1/8 scale

DP CATALOG

4-224 CONTACTS

Contact/Wire Size
0
2
4
6
8
10
14
16
20

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPA — small, rugged general purpose

DPA — solid shell, solder contacts
DPAF — float mount DPA
DPAL — large flange DPA
DPAMA — rear release of crimp snap-in contacts

1/8 scale

DP CATALOG

2-32 CONTACTS

Contact/Wire Size
4
8
12
14
16
20

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPG — small, extended shell

DPG — extended DPA type connector with peripheral seal
DPGM — crimp snap-in contacts in monobloc insulator

1/8 scale

DP CATALOG

2-32 CONTACTS

Contact/Wire Size
4
8
12
16
20

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPJ — general purpose, extended shell

DPJ — extended connector with peripheral seal
DPJM — crimp snap-in contacts in monobloc insulator
DPJMB — rear release of crimp snap-in contacts

1/8 scale

DP CATALOG

3-98 CONTACTS

Contact/Wire Size
4
8
12
16
20

Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

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CANNON ITT

opular Connector Specifications

MIL-C-24308 (Navy)

This specification covers miniature rack and panel connectors, polarized shell, with non-removable solder and removable crimp type contacts in the general purpose, nonmagnetic, and hermetic (non-removable pins only) classes.

See D Catalog

Specification Number	ITT Cannon Number	Specification Number	ITT Cannon Number
M24308/1-1	DEMM9S	M24308/5-1	DEMM9SNM
M24308/1-2	DAMM15S	M24308/5-2	DAMM15SNM
M24308/1-3	DBMM25S	M24308/5-3	DBMM25SNM
M24308/1-4	DCMM37S	M24308/5-4	DCMM37SNM
M24308/1-5	DDMM50S	M24308/5-5	DDMM50SNM
M24308/2-1	DEMAM9S	M24303/6-1	DEMAM9SNM
M24308/2-2	DAMAM15S	M24308/6-2	DAMAM15SNM
M24308/2-3	DBMAM25S	M24308/6-3	DBMAM25SNM
M24308/2-4	DCMAM37S	M24308/6-4	DCMAM37SNM
M24308/2-5	DDMAM50S	M24308/6-5	DDMAM50SNM
M24308/3-1	DEMM9P	M24308/7-1	DEMM9PNM
M24308/3-2	DAMM15P	M24308/7-2	DAMM15PNM
M24308/3-3	DBMM25P	M24308/7-3	DBMM25PNM
M24308/3-4	DCMM37P	M24308/7-4	DCMM37PNM
M24308/3-5	DDMM50P	M24308/7-5	DDMM50PNM
M24308/4-1	DEMAM9P	M24308/8-1	DEMAM9PNM
M24308/4-2	DAMAM15P	M24308/8-2	DAMAM15PNM
M24308/4-3	DBMAM25P	M24308/8-3	DBMAM25PNM
M24308/4-4	DCMAM37P	M24308/8 4	DCMAM37PNM
M24308/4-5	DDMAM50P	M24308/8-5	DDMAM50PNM

MIL-C-21617 (Ships)

This specification covers small, rectangular polarized-shell connectors for cord mounting and equipment rack/panel use. They are non-environmental type (DPX) connectors with solder-terminated contacts, size 20 through 4. Contact arrangements with coax contacts are also covered.

See DP Catalog

Specification Number	ITT Cannon Number	Specification Number	ITT Cannon Number
PF 013A	DPX-13-33S	JM 013A	DPX-13-34P
PF 013A	DPXA-13-33S	JM 013A	DPXA-13-34P
PF 017A	DPX-17-33S	JM 017A	DPX-17-34P
PF 017A	DPXA-17-33S	JM 017A	DPXA-17-34P
PF 023A	DPX-23-33S	JM 023A	DPX-23-34P
PF 023A	DPXA-23-33S	JM 023A	DPXA-23-34P
PF 026A	DPX-26-33S	JM 026A	DPX-26-34P
PF 026A	DPXA-26-33S	JM 026A	DPXA-26-34P
PF 032A	DPX-32-33S	JM 032A	DPX-32-34P
PF 032A	DPXA-32-33S	JM 032A	DPXA-32-34P
PF 040A	DPX-40-33S	JM 040A	DPX-40-34P
PF 040A	DPXA-40-33S	JM 040A	DPXA-40-34P
PF 007C	DPX-C7-33S	JM 007C	DPX-C7-34P
PF 007C	DPXA-C7-33S	JM 007C	DPXA-C7-34P
PF 016C	DPX-16C3-33S	JM 016C	DPX-16C3-34P
PF 016C	DPXA-16C3-33S	JM 016C	DPXA-16C3-34P

MIL-C-25955

This specification covers miniature circular electrical connectors of an environment resisting class with snap-in contacts. The spec also covers receptacles of a hermetically sealed class with non-removable contacts.

See MC Catalog

MS Number	ITT Cannon Number	MS Number	ITT Cannon Number
MS24234	KM0 and KM1-S	MS24238	KM9
MS24235	KM1 and KM1-S	MS24239	KH02
MS24236	KM6 and KM6-S	MS24240	KH10
MS24237	KM8	MS24241	KH30

MIL-C-5015

This specification covers circular, general purpose connectors, both sealed and unsealed. These MS connectors were the original AN (Army-Navy) specification connectors and feature threaded coupling and solder termination of size 16 thru 0 contacts.

See MS Catalog

MS Number	ITT Cannon Number	MS Number	ITT Cannon Number
MS3057	MS3057	MS3107	MS3107
MS3100	MS3100	MS3108	MS3108
MS3101	MS3101	MS25042	CA17530
MS3102	MS3102	MS25043	CA2209
MS3103	MS3103	MS25183	CA3106ER
MS3105	MS3105	MS25183A	CA06ER
MS3106	MS3106	MS39056	AN3420

NAS1599

This industry (National Aerospace Standards) specification covers threaded and bayonet coupling type, miniature circular connectors. These high performance, environment-resistant connectors use crimp removable contacts inserted, released and extracted from the termination side. Threaded connectors (KV) mate with MIL-C-26500 types; bayonet connectors (PV) mate with MIL-C-26482 types. Both connectors use NAS1600 contacts and closed-entry socket insulators.

See KV/PV Catalog

NAS Number	ITT Cannon Number	NAS Number	ITT Cannon Number
NAS1641	KV41	NAS1662	pin contacts
NAS1642	KV42	NAS1663	socket contacts
NAS1643	KV43	NAS1664	tools
NAS1650	PV50	NAS1665	short endbells
NAS1651	PV51	NAS1666	straight endbells
NAS1652	PV52	NAS1667	90° endbells
NAS1653	PV53	NAS1668	wire hole fillers

MIL-C-38999 (Air Force)

This specification covers high density, high performance, miniature circular connectors. These connectors feature bayonet coupling to meet the environmental and electrical requirements of MIL-C-38999.

See KJ Catalog

MS Number	ITT Cannon Number	MS Number	ITT Cannon Number
MS27472	KJ0	MS27473	KJ6
MS27513	KJ2R	MS27474	KJ7
MS27476	KJ2Y (hermetic)	MS27477	KJ7Y (hermetic)
MS27497	KJ3	MS27478	KJ1Y
—	KJ5R		

MIL-C-26482 (Navy)

This specification covers general purpose, miniature circular connectors, with environmental and non-environmental types. These connectors feature bayonet coupling, five keyway polarization and both solder and crimp removable contacts.

See MCB Catalog

MS Number	ITT Cannon Number	MS Number	ITT Cannon Number
MS3110	KPT00	MS3120	KPSE00
MS3112	KPT02	MS3122	KPSE02
MS3113	KPTH (hermetic)	MS3124	KPSE07
MS3114	KPT07	MS3126	KPSE06
MS3115	KPT	MS3180	KPT80
MS3116	KPT06	MS3181	KPT81
MS3119	KPTB		

MIL-C-83723

This specification covers two families of environment-resistant connectors. The CV (MIL-C-5015-type threaded coupling) and the PV (MIL-C-26482 and NAS1599-type bayonet coupling), accommodating crimp removable, rear release contacts. The connectors are fully qualified and QPL approved under MIL-C-83723 (USAF).

See MIL-C-83723 Catalog

CV

MS Number	ITT Cannon Number
M83723-17F XXXXX	CV1RXX-XS-113
M83723-18F XXXXX	CV1RXX-XP-113
M83723-19F XXXXX	CV0RXX-XS-113
M83723-20F XXXXX	CV0RXX-XP-113
M83723-21F XXXXX	CV2RXX-XS-113
M83723-22F XXXXX	CV2RXX-XP-113
M83723-23F XXXXX	CV6RXX-XS-113
M83723-24F XXXXX	CV6RXX-XP-113

PV

MS Number	ITT Cannon Number
M83723-01F XXXX N	PVS0G XX B XX S X
M83723-02F XXXX N	PVS0G XX B XX P X
M83723-03F XXXX N	PVS4G XX B XX S X
M83723-04F XXXX N	PVS4G XX B XX P X
M83723-05F XXXX N	PVS7G XX B XX S X
M83723-06F XXXX N	PVS7G XX B XX P X
M83723-07F XXXX N	PVS1G XX B XX S X
M83723-08F XXXX N	PVS1G XX B XX P X
M83723-13F XXXX N	PVS6G XX S XX S X
M83723-14F XXXX N	PVS6G XX S XX P X

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Sub-miniature, standard types

Whatever the choice . . . sub-miniature connectors for printed circuit use—or Johnson's patented "Six-Way" Binding Posts . . . time and time again design and development engineers specify Johnson connectors!

A complete line of polyamide insulated connectors are readily available to meet most military and commercial applications—included are: sub-miniatures for printed circuit applications; insulated solderless tip and banana plugs; tip and banana jacks; tip jack and sleeve assemblies; metal-clad and "rapid-mount" tip jacks; dual banana plugs and "6-way" binding posts. Available in 6 colors for coded applications, designed to operate throughout an extremely wide temperature range and under conditions of high relative humidity—voltage breakdowns available up to 11,000 volts on some types! For detailed information on the complete Johnson connector line and other Johnson electronic components—write today for our newest components catalog!

SUB-MINIATURE INSULATED CONNECTORS—Designed for printed circuit applications! Extremely compact, body is tough low-loss polyamide—resists extremes of shock, vibration, temperature and moisture. Operating voltages to 1500 volts RMS . . . 5 amperes current carrying capacity . . . contact resistance; less than 2 milliohms. Capacitance between two adjacent jacks: less than one pf. at 1 MC. 10 colors available. **Horizontal Jack**—Two sizes available. Smaller version accepts .080" dia. tip plug in either end. Larger version accepts .080" dia. tip plug in either end, top and bottom. **Vertical Jack**—Mounts through single .052" hole, requires minimum mounting area. **Sub-Miniature Tip Plug**—for use with miniature jack, .080" dia. with machined brass tip and solder lead connection. **"RIB-LOC" Terminal Design**—Single or double turret stand-offs and feed-thrus, tip jacks and tip plugs. Mount securely in .136" hole. MIL-P-20693 insulation. **New RIB-LOC tip jack**—Press-in installation. Accepts .080" tip plug in recessed, closed-entry type contact. Rated 10 amps with 8000 VDC breakdown. **Test-Point Strip/Handle**—Rapid-mounting polyamide body contains 12 test points each rated at 5 amps., maximum current capacity. Operating voltage 1500 volts RMS at seal level, 350 volts RMS at 50,000 feet. Contact resistance less than 2 milliohms.

STANDARD INSULATED CONNECTORS—A complete line of connectors molded of tough, low-loss, shock-proof polyamide in 10 colors meeting Fed. Std. 595—won't chip or crack with the hardest usage. **Tip, Banana and Dual Banana Plugs**—Metal parts nickel-plated—solderless connection up to 16 gauge wire. Current rating: 10 and 15 amps., respectively. **Tip and Banana Jacks**—molded bodies, current rating: 10 and 15 amps., respectively. Available in six types: **Standard Tip Jack**—Recessed cadmium-plated formed contact. Voltage breakdown: 9,000 volts DC; **Deluxe Tip Jack**—Recessed silver-plated machined contact. Voltage breakdown: 11,000 volts DC; **Rapid-Mount Tip Jack**—Low cost fast mounting. "Speed clip" snaps into hole, then jack is inserted. Voltage breakdown: 7,000 volts DC; **Standard Metal-clad Jack**—Nickel-plated jacket, formed silver-plated contact. Voltage breakdown: 7,000 volts DC; **Metal-Clad Tip Jack, Military**—Nickel-plated jacket, machined gold-plated beryllium copper contact. Voltage breakdown: 8,000 volts DC; **Banana Jack**—Recessed cadmium-plated insert for .175" plugs. Voltage breakdown: 12,500 volts DC. **Jack and Sleeve**—Ideal for patch cords, or insulated rear connection of panel-mounted tip jack. **Binding Posts**—Versatile "6-way" usage. Silver-plated shank, self-captivated thumb nut. Voltage breakdown: 7,000 volts DC. Current ratings: 15 and 40 amps., respectively.

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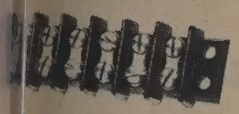
Kulka TERMINAL BOARDS

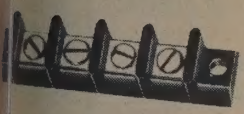


STANDARD

410, 600, 600A, 601, 602 Series. Current range 5 thru 30 Amps; Voltage Range 1000 thru; 600 RMS; Wire sizes 20-14 Ga.; 1 thru 26 Terminals.

HEAVY DUTY

603, 604, 605 Series, Current range 50 thru 90 Amps, Voltage 1700 thru 2100 RMS; Wire Sizes #6 to 2 ga.; 1 thru 12 terminals.



SINGLE ROW

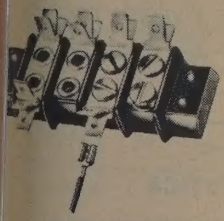
599, 699, 812 Series. Current range 15 thru 30 Amps; Voltage range 1100 thru 1600 RMS; Wire sizes: #22 to #12 ga.; 1 thru 23 terminals.

STUD and TURRET

For greater wiring convenience. Choice of terminals:

- Regular Screw Type
- Solder Turret • Feedthru
- Threaded Stud, etc.

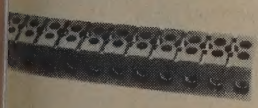
Also, choice of finishes: electro-tinned, silver-plated, even gold over silver. design facilities are available for your special requirements.



"KLIPTITE"

For fast connect and disconnect. Available on Kulka's full line of terminal boards.

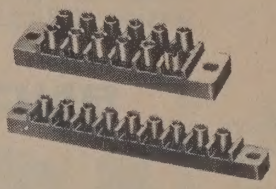
- Just clip on wire terminal fast for tight connection.
- Up to 6 connections per stage.
- Vari-angled tabs.
- Available rivetted to terminal hardware or with screw assembly.



PRESSURE CONTACT

9-85 SERIES

Ideal for power equipment. One-piece molded plastic for industrial or military use. Extra-safe, completely enclosed. 2 to 12 terminals. Rated at 85 Amps, 8000 Volts.

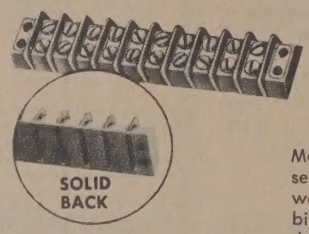


MILITARY BOARDS

Per MIL-T-16784B

Designed by the Bureau of Ships according to MIL-T-16784B, superseding MIL-T-16784A (Ships). They are made to BUSHIPS 9000-S6505-73214 drawings, with the latest revisions, and BUORD S64101.

MOLDED MATERIAL: MAI-60, in accordance with MIL-M-14F.



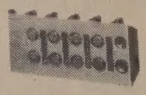
MILITARY BOARDS

SOLID BACK

MADE to MEET or EXCEED

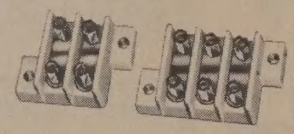
MIL-T-55164

Molded-in Terminals. Equal molded sections. Kulka improved design, for weight saving, greater strength, flexibility. All sizes available, classes 37TB thru 42TB.



CLOSED BACK TERMINAL BOARDS

670, 670A, 671, 672 Series. Current range 15 to 30 Amps, Voltage range 2500 to 3300 Volts RMS. Wire sizes #22 thru #12 ga.; 1 thru 30 terminals.

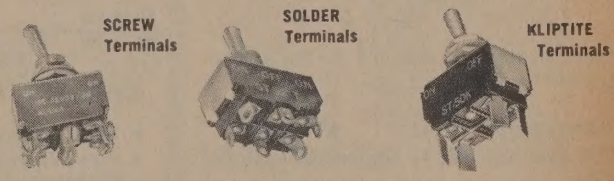


HIGH HEAT

1215 SERIES

For temperatures up to 850°. Made in two and three terminal units with incremental configuration. Stainless steel stud type terminals.

TOGGLE SWITCHES



Made to Military Specifications: JAN-S-23, MIL-S-21195, MIL-S-6745 and MIL-S-3950B. Available in SPST, SPDT, DPST and DPDT types. DA and AC up to 1600 cps. Your choice of terminals: Screw, solder or tab.

Also, MINIATURE, SUBMINIATURE, TAPER PIN, PRINTED CIRCUIT, WIRE-WRAP, SCREW CLAMP TERMINAL BOARDS AND ACCESSORIES. Available in a variety of Military and Commercial Grade materials.

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KULKA COMPLETE TERMINAL BOARD CATALOG 17B ON REQUEST

KINGS

K-GRIP JR.™ CONNECTORS

Almost 50% smaller, 50% lighter, K-Grip Jr. is the design answe to better RF connectors. A three-piece configuration, it is a crimp-pe version of Kings standard RF connector reduced to its simplest fo

FEATURES:

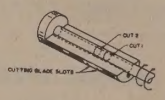
- Superior Strength . . . pull-out resistance unequalled by any other crimp-type connecnector in the industry.
- Uniform, Rapid Handling . . . connector-to-cable attachment reduced to a minimum — with exacting uniformity from unit to unit.
- Foolproof Assembly . . . Snug-fit design requires no highly skilled personnel.
- Broad Application Capability — Available in all standard connector types for RG-174 through RG-214.

Kings K-Grip Jr. Connectors are available in two tarnish-resistant finishes — a TR-4™, used over silver plating; or the TR-5™, a more durable, brilliant alloy finish.

CABLE RETENTION METHOD

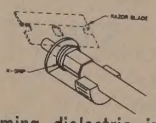
The K-Grip Jr. cabling procedure is as follows — After the braid has been trimmed, the K-Grip is inserted between the dielectric and braid. The K-Grip sleeve is slid over the braid and crimped in place. K-Grip, thus eliminates the time consuming braid combing operation and results in a stronger connection.
For precise easy cabl e trimming, the use of Kings jacket and dielectric trim jigs is recommended.

JACKET TRIM—JIG (KTJ) CP-200A & CP-400 (Patent Pending)



Used for making cuts 1 and 2 in the cabling procedure.

DIELECTRIC TRIM—JIG (KTD) CP-200A (Patent Pending)



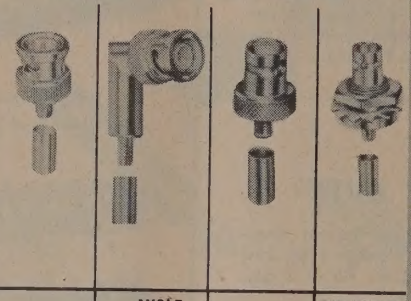
Used for trimming dielectric in the cabling procedure.

HAND CRIMP TOOL . . . KTH-1000

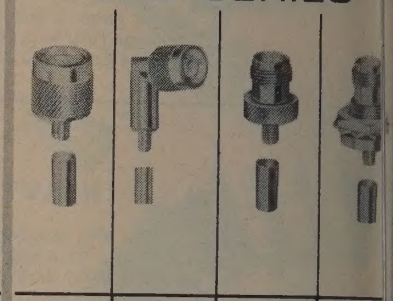
With removable dies — accommodates all die sizes.

Crimping of contacts and K-Grip Jr.™ may be easily and reliably accomplished by the use of Kings special crimping tools.

BNC SERIES



TNC SERIES



PLUG	ANGLE PLUG	JACK	BULKHEAD JACK	PLUG	ANGLE PLUG	JACK	BULKHE JACK
CABLE GROUP RG-174, 179A, 179B, 187, 187A, 188 and 188A/U							
KC-59-95	KC-59-109	KC-39-34	KC-19-68	KA-59-69	KA-59-70	KA-39-27	KA-19-
*KC-59-152		*KC-39-50	*KC-19-93	*KA-59-120			*KA-19-
CABLE GROUP RG-122, 180, 180A, 195 and 195A/U							
KC-59-107	KC-59-108	KC-39-36	KC-19-67	KA-59-58	KA-59-74	KA-39-28	KA-19-
*KC-59-169	*KC-59-171	*KC-39-52	*KC-19-96	*KA-59-142		*KA-39-44	
CABLE GROUP RG-58, 58A, 58C and 141/U							
KC-59-78	KC-59-101	KC-39-26	KC-19-61	KA-59-44	KA-59-71	KA-39-17	KA-19-3
*KC-59-123	*KC-59-153	*KC-39-38	*KC-19-83	*KA-59-103	*KA-59-151	*KA-39-34	*KA-19-6
CABLE GROUP RG-223, 55A, 142 and 142A/U							
KC-59-80	KC-59-103	KC-39-27	KC-19-64	KA-59-45	KA-59-72	KA-39-18	KA-19-
*KC-59-162		*KC-39-51	*KC-19-140	*KA-59-87		*KA-39-35	*KA-19-
CABLE GROUP RG-142B, 55 and 55B/U							
KC-59-104	KC-59-105	KC-39-35	KC-19-65	KA-59-57	KA-59-73	KA-39-26	KA-19-3
*KC-59-167	*KC-59-215	*KC-39-47	*KC-19-90	*KA-59-86		*KA-39-36	
CABLE GROUP RG-59, 59A, 59B, 62, 62A, 62C and 210/U							
KC-59-79	KC-59-102	KC-39-28	KC-19-62	KA-59-46	KA-59-76	KA-39-19	KA-19-43
*KC-59-128	KC-59-222	*KC-39-45	*KC-19-89	*KA-59-94			
CABLE GROUP RG-71. 71A and 71B/U							
KC-59-81	KC-59-106	KC-39-29	KC-19-66	KA-59-47	KA-59-75	KA-39-20	KA-19-44
*KC-59-135		*KC-39-60	*KC-19-91				
CABLE GROUP WE-724 and Belden 8281							
KC-59-180		KC-39-65	KC-19-114				
*KC-59-181		*KC-39-66	*KC-19-115				

*TR-5 FINISH

*TR-5 FINISH

CHARACTERISTICS

- Small, lightweight, bayonet coupling
- Used with small diameter RF cables
- Beryllium copper outer contacts
- Nominal 50 ohm impedance
- Excellent electrical performance from DC through X-Band
- Tested at 1500 volts RMS
- Teflon insulated

CHARACTERISTICS

- Positive locking thread-type coupling
- Withstands extreme vibration and shock
- Used with small diameter RF cables
- Beryllium copper outer contacts
- Nominal 50 ohm impedance
- Excellent electrical performance from DC through X-Band
- Tested at 1500 volts RMS
- Low noise level
- Teflon insulated

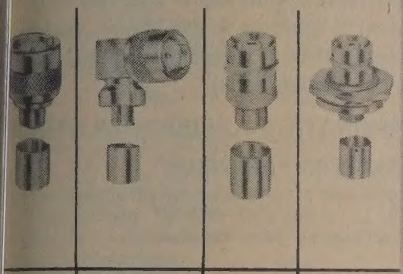
K-GRIP Jr. is a registered T.M. of Kings Electronics Co., In

The types listed above are also available in a weatherproof version meeting mil spec. M3901

KINGS
ELECTRONICS CO. INC.
38 MARBLEDALE ROAD | TUCKAHOE, N. Y. 10707 | (914) SW 3-6262 | TWX 710-562-0110 | TELEX 1-37449

KINGS K-GRIP JR.™ CONNECTORS

C SERIES



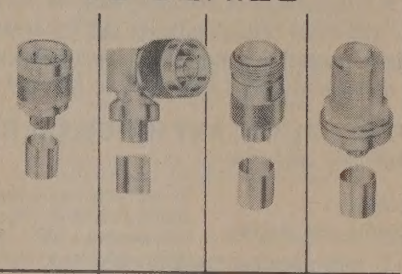
PLUG	ANGLE PLUG	JACK	BULKHEAD JACK
CABLE GROUP RG-58, 58A, 58C and 141/U			
KD-59-62	KD-59-67	KD-39-14	KD-19-43
*KD-59-96		*KD-39-25	
CABLE GROUP RG-223, 55A, 142 and 142A/U			
KD-59-63	KD-59-68	KD-39-17	KD-19-41
*KD-59-97			
CABLE GROUP RG-142B, 55 and 55B/U			
KD-59-64	KD-59-69	KD-39-18	KD-19-42
CABLE GROUP RG-59, 59A, 59B, 62, 62A, 62C and 210/U			
KD-59-65	KD-59-70	KD-39-15	KD-19-39
*KD-59-89			
CABLE GROUP RG-71, 71A and 71B/U			
KD-59-66	KD-59-71	KD-39-16	KD-19-40
CABLE GROUP RG-5, 5A, 5B, 6, 6A, 21, 21A, 143, 143A, 212 and 222/U			
KD-59-58	KD-59-59	KD-39-13	KD-19-38
CABLE GROUP RG-8, 8A, 11, 11A and 213/U			
KD-59-51	KD-59-60	KD-39-11	KD-19-36
*KD-59-98	*KD-59-107	*KD-39-23	
CABLE GROUP RG-9, 9A, 9B, and 214/U			
KD-59-52	KD-59-61	KD-39-12	KD-19-37
*KD-59-99		*KD-39-24	

*TR-5 FINISH

CHARACTERISTICS

- Bayonet coupling designed for use with medium sized RF cables
- Beryllium copper outer contacts
- Nominal 50 ohm impedance
- Excellent electrical performance from DC through X-Band
- Tested at 2500 volts RMS
- Teflon insulated

N SERIES



PLUG	ANGLE PLUG	JACK	BULKHEAD JACK
CABLE GROUP RG-58, 58A, 58C and 141/U			
KN-59-86	KN-59-91	KN-39-38	KN-19-53
*KN-59-118		*KN-39-46	
CABLE GROUP RG-223, 55A, 142 and 142A/U			
KN-59-87	KN-59-94	KN-39-39	KN-19-54
*KN-59-122			
CABLE GROUP RG-142B, 55 and 55B/U			
KN-59-88	KN-59-95	KN-39-40	KN-19-55
*KN-59-120			
CABLE GROUP RG-59, 59A, 59B, 62, 62A, 62C and 210/U			
KN-59-89	KN-59-92	KN-39-36	KN-19-56
CABLE GROUP RG-71, 71A and 71B/U			
KN-59-90	KN-59-93	KN-39-37	KN-19-57
CABLE GROUP RG-5, 5A, 5B, 6, 6A, 21, 21A, 143, 143A, 212 and 222/U			
KN-59-82	KN-59-85	KN-39-35	KN-19-52
CABLE GROUP RG-8, 8A, 11, 11A and 213/U			
KN-59-67	KN-59-83	KN-39-30	KN-19-50
*KN-59-132		*KN-39-52	*KN-19-88
CABLE GROUP RG-9, 9A, 9B, and 214/U			
KN-59-68	KN-59-84	KN-39-31	KN-19-51
*KN-59-104		*KN-39-47	*KN-19-87

*TR-5 FINISH

CHARACTERISTICS

- Positive locking thread type coupling
- Used with medium diameter RF cables
- Nominal 50 ohm impedance
- Excellent electrical performance from DC through X-Band
- Tested at 2500 volts RMS
- Teflon insulated throat

UHF SERIES

PLUG	
RG-58, 58A, 58C/U	
KU-59-46	*KU-59-53
RG-59, 59A, 59B, 62, 62A	
KU-59-44	*KU-59-54
RG-11, 11A	
KU-59-43	*KU-59-58
RG-8, 8A, 213	
KU-59-42	*KU-59-52
WE-724 Belden 8281	
KU-59-56	*KU-59-59

CHARACTERISTICS

- Positive locking, thread type coupling
- Used with small and medium diameter RF cables

MHV SERIES

PLUG	JACK	BULKHEAD JACK
RG-58, 58A, 58C and 141/U		
KV-59-17	KV-39-06	KV-19-16
	Polarized	
KV-59-18	KV-39-07	KV-19-17
RG-59, 59A, 59B, 62, 62A, 62C, and 210/U		
KV-59-15	KV-39-08	KV-19-15
*KV-59-23		*KV-19-19
	Polarized	
KV-59-16	KV-39-09	KV-19-18
*KV-59-20		*KV-19-22

*TR-5 Finish

CHARACTERISTICS

- Bayonet coupling
- Both standard and polarized versions available
- Nominal 50 ohm impedance
- Tested at 5000 volts RMS
- Teflon insulated

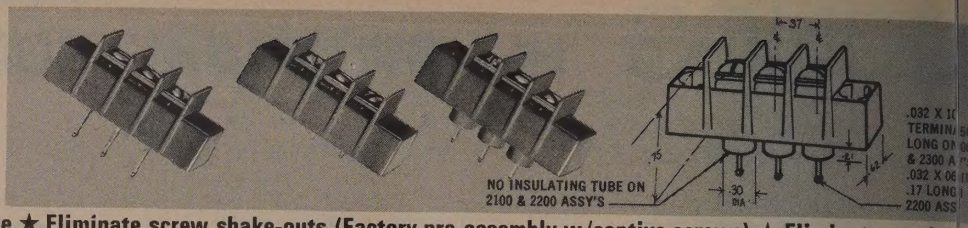
K-GRIP Jr. is a registered T.M. of Kings Electronics Co., Inc.

The types listed above are also available in a weatherproof version meeting mil spec. M39012.

KINGS
ELECTRONICS CO. INC.
38 MARBLEDALE ROAD | TUCKAHOE, N. Y. 10707 | (914) SW 3-6262 | TWX 710-562-0110 | TELEX 1-37449

MAGSTRIP®

LOW COST RESILIENT BARRIER STRIPS



★ Eliminate barrier breakage ★ Eliminate screw shake-outs (Factory pre-assembly w/captive screws) ★ Eliminate special lugs (Magstrip accepts standard 5/16"-wide lugs) ★ Eliminate wire crimping entirely (w/wire-retaining plates) ★ Use less strip space for same number of terminals ★ Get full 7/16" (20-amp) rating capacity and #6 screws on 3/8" centers ★ Use higher, unbreakable barriers for full 300-V rating ★ Choose a modern insulating material that best fits your application ★ Use colored strips for product dress-up or function definition ★ Cut down on special orders (Magstrip is stocked in all combinations)

3 DIFFERENT MATERIALS, 4 DIFFERENT COLORS, ANY HARDWARE COMBINATION—*ALWAYS IN STOCK*

STRIP MATERIAL: Polycarbonate (shatterproof), Polysulfone (high heat resistance), or Polystyrene (low cost)

STRIP CONFIGURATION: Flat base, or self-insulating feed-thru

STRIP COLORS: Black, blue, red or gray (and others on special order, including transparent)

HARDWARE: TOP—Wire-retainer plates and captive panhead screws, in either nickel plated brass or steel; or binding screws only, in brass or steel (All screws, #6) BASE—Either std. solder connectors, or circuit board pins.

MAGSTRIP® ORDERING

On each order, write *Catalog Number* . . . plus numerical suffix specifying terminal *positions-per-strip* (Max.-30) . . . plus *Strip Material* specification ("CB"—Polycarbonate, "PS"—Polysulfone, or "ST"—Polystyrene) . . . plus strip color (Black. red, blue or gray)

CATALOG NUMBER	DESCRIPTION			PRICING*	
	Base	Base Hardware	Top Hardware	Fixed Price per strip	Add p terminal posit
2120	Flat	Standard solder connector	Steel binding screw	$ .10	$ .129
2140	"	"	Brass binding screw	.10	.138
2160	"	"	Steel panhead screw & wire-retainer	.10	.147
2180	"	"	Brass panhead screw & wire-retainer	.10	.159
2220	"	Circuit board pin	Steel binding screw	.10	.124
2240	"	"	Brass binding screw	.10	.133
2260	"	"	Steel panhead screw & wire-retainer	.10	.142
2280	"	"	Brass panhead screw & wire-retainer	.10	.154
2320	Insulating feed-thru	Standard solder connector	Steel binding screw	.15	.135
2340	"	"	Brass binding screw	.15	.144
2360	"	"	Steel panhead screw & wire-retainer	.15	.153
2380	"	"	Brass panhead screw & wire-retainer	.15	.165

*Above pricing is for *Polycarbonate* ("CB") strip material. For *Polystyrene* SUBTRACT $.02 terminal position. For *Polysulfone* ADD $.03 per terminal position.
EXAMPLE: 2120—"ST"—8—BLACK specifies black polystyrene strip with 8 terminal positions flat base and steel binding screw. Pricing: .10 + (8 X .129) − (8 X .02) = .97

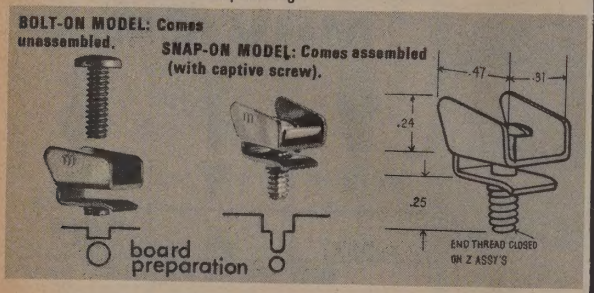
QUANTITY PRICING: 1 to 99 terminal strips—List Price
100 to 999—30% off list
1000 to 9999—50% off list
10,000 & up—55% off list

MAGTERM®

THE INDEPENDENT PERIMETER TERMINALS

THEY WORK WITHOUT TERMINAL STRIPS

Fasten directly onto perimeter of circuit board. Save space and cost wherever you don't need the insulation of barrier strips. Snap-on (w/captive screws) or bolt-on design. Simple, quick installation. Brass conductive elements, nickel plated. Made to fit boards 1/16", 3/32" or 1/8" thick. Full 20-amp. rating.



MAGTERM® ORDERING

ON EACH ORDER, 3 SPECIFICATIONS:

1. **CATALOG NUMBER**—For board thickness and locator pin
2. **SUFFIX "A"**—For Steel Binding Screw
   SUFFIX "B"—For Brass Binding Screw
   SUFFIX "C"—For Steel Panhead Screw with wire-retainer plate
   SUFFIX "D"—For Brass Panhead Screw with wire-retainer plate
3. **SUFFIX "Z"**—For preassembled terminals (captive screws)
   SUFFIX "K"—For disassembled terminals

EXAMPLE: 6101-A-Z

QUANTITY PRICING: 1 to 99 terminals—List Price
100 to 999 terminals—30% off list
1000 to 9999 terminals—50% off list
10,000 & up terminals—55% off list

*Terminals 6102, 6112, 6103, 6113 are subject to special low-quantity pricing. On these items, *consult factory before ordering.*

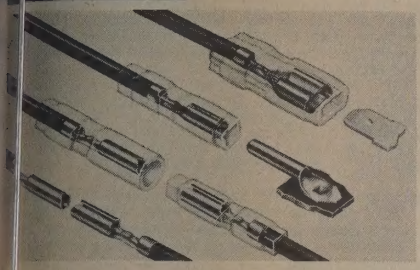
CATALOG NUMBER	Board Thickness	Locator Pin	LIST PRICE PER TERMINAL							
			A-K	A-Z	B-K	B-Z	C-K	C-Z	D-K	D-Z
6101	1/16"	yes	$ .100	$ .104	$ .112	$ .116	$ .115	$ .119	$ .136	$ .140
6111	1/16"	no	.096	.100	.108	.112	.111	.115	.131	.135
6102*	3/32"	yes	.100	.104	.112	.116	.115	.119	.136	.140
6112*	3/32"	no	.096	.100	.108	.112	.111	.115	.131	.135
6103*	1/8"	yes	.100	.104	.112	.116	.115	.119	.136	.140
6113*	1/8"	no	.096	.100	.108	.112	.111	.115	.131	.135

(All prices subject to change without notice . . . 11/69)

MAGNUM ELECTRIC CORPORATION 1000 Streetman, Erie, Michigan 48133 • PHONE: (313) 848-2555

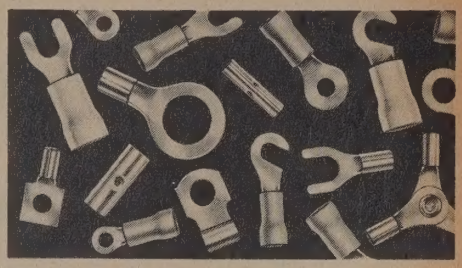
MALCO

ELECTRONIC TERMINALS AND CONNECTORS

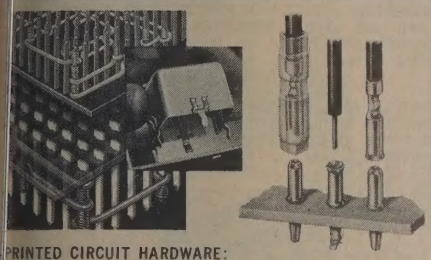


UICK-CONNECT RECEPTACLES:
large family of female receptacles for quick-connect male rminals supplied in chain style for automatic crimping. hese terminals are available for round, square or rectangular ale pins or blades. Terminals crimp to wires from 27-AWG 16-AWG. REQUEST BULLETIN NO. 611.

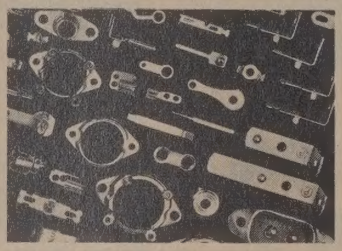
- Terminals produced by high-speed production equipment insure highest quality at lowest prices.
- Chain style terminals may be applied by Malcomatic Machines for lowest possible assembly costs.
- Precision tooling and rigid quality control assure products that meet or exceed industry specifications—consistently.
- Most complete line of circuit hardware and small stampings available for Radio-TV, Electrical and Electronic, Communications, Automotive and Aviation Industries.
- Prompt delivery on over 2,000 different parts.
- Full staff of Malco engineers to solve customer application and design problems.



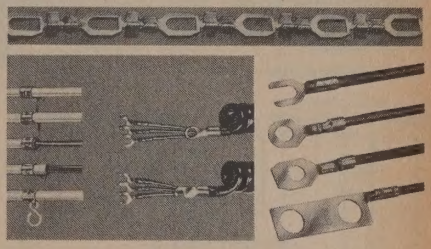
SOLDERLESS TERMINALS:
Broad range of sizes and types. Available insulated (straight or flared entry) or non-insulated. Made of pure soft copper with special internally serrated barrels for maximum crimp reliability. Full range from AWG 22 to AWG 10. REQUEST BULLETIN NO. 617.



PRINTED CIRCUIT HARDWARE:
Feed-Thru Terminals in chain style for automatic insertion n P. C. Cards. Available in a full range of sizes in "Wrap-A-Wire" or round pin styles. Interlock pin, "Wrap-A-Wire" and quick-connect tab lugs for edge-board or terminal strip applications. Spring clips for shielding cans. REQUEST BULLETIN No. 691.

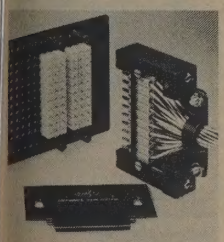


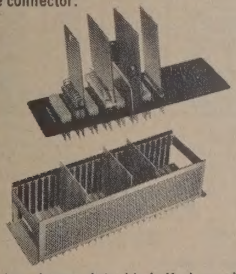
ELECTRONIC HARDWARE:
Socket and connector hardware, soldering and non-soldering terminals, quick-connect lugs. Phono plug and receptacle hardware, P. C. brackets and binding posts. REQUEST BULLETIN NO. 10.



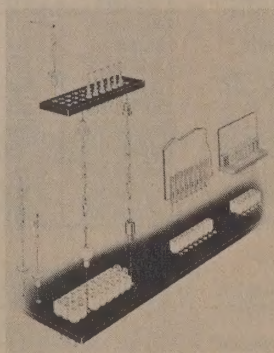
RING AND SPADE TERMINALS:
In chain style, applied by Malcomatic equipment. Available in a variety of sizes and types: hook, ring, spade, flag, either wire/insulation crimp or insulation-pierce crimp. Also, cord clamps for strain relief applications. REQUEST BULLETIN NO. 605.

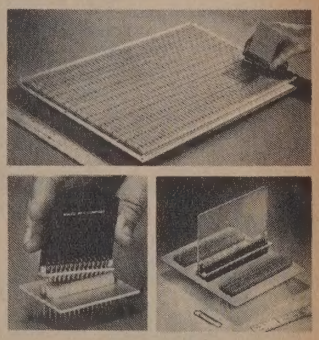
The Wrapost Aluminum Systems Panel (WASP) Connector was developed by Malco Manufacturing Company, Inc. to provide a modular, multi-function connector to systems designers. By using standard connector terminals and insulators within a custom metal chassis, connectors for the first time can be economically fitted to the circuit rather than the conventional method of fitting the circuit to the connector.



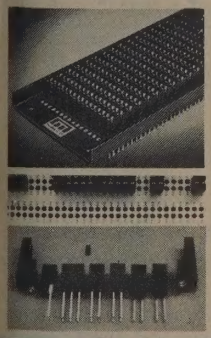


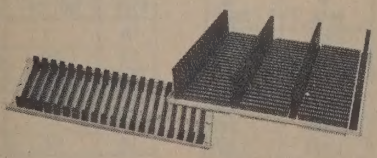
WASP—The "Wasp" Connector is a heavy duty blade/fork combination with .045" square wrap tails for automatic machine terminations. This line features the broadest range of connector terminal variations in the industry. Available in .125" thick aluminum plates up to 24"x 24" with terminals on. 200" square or offset patterns. REQUEST BULLETIN NO. 631.



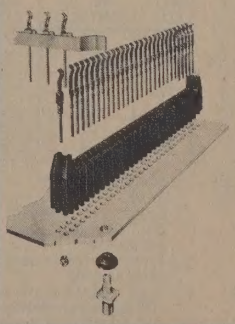


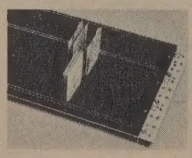
MINI-WASP—This line is a miniature version of the "Wasp" Connector. It is available in .080" aluminum plates on .100", .125" or .150" square or offset patterns. Terminals are high-reliability blade/fork type with .025" square wrap tails. The "Mini-Wasp" Connector Line features ground connectors as well as insulated connectors in the same manner as the "Wasp" line. Thus, the aluminum plate becomes a complete ground plane. REQUEST BULLETIN NO. 647.





CARDEC 200—The Cardec 200 Card Edge Plate Connector System is designed for direct entry P. C. card applications. The Cardec 200 version accepts 1/16" printed circuit cards with contacts on .200" centers with .045" square wrap tails. This connector system features the ground plane concept and modular construction of the "Wasp" Connector line while affording the economy of edge connector systems. REQUEST BULLETIN NO. 681.



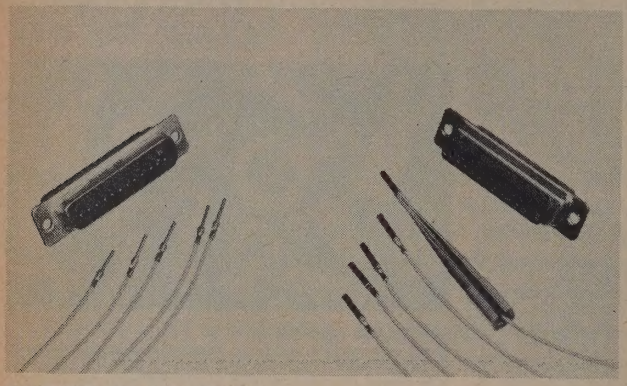


CARDEC 125—Cardec 125 is a modular card edge connector system with contacts on .125" centers for maximum packaging density (.047" cards on solid .250" centers). In addition to the features of Cardec 200, this system offers printed circuit card voltage bus hardware for low resistance voltage distribution. As with all the Malco Plate Connector lines, Cardec 125 is supplied in your configuration completely assembled and ready for automatic wire-wrapping right out of the package. REQUEST BULLETIN NO. 681.

MALCO

MALCO MANUFACTURING COMPANY INC
5150 W. ROOSEVELT RD. · CHICAGO, ILLINOIS 60650 · PHONE (312) 287-6700
PRECISION ELECTRONIC TERMINALS AND CONNECTORS

MATRIX D SUB-MINIATURE RACK & PANEL CONNECTORS TO MIL-C-2430



Matrix MD series general purpose connectors are used in applications where small size, light weight and reliability are demanded. They feature six 20 crimp contacts* that are inserted from the rear, released from the rear and removed from the rear. They meet the specifications of MIL-C-24308.

The gold-plated Matrix MD contacts may be crimped to wire sizes 20, 22 or 24 with standard MS tools, and are quickly and easily inserted into correct position. They are held in position by high strength self-locking retainers, and are simply released from the rear with a non-conductive plastic tool which cannot damage the contact retainer.

The insulators in the Matrix MD series are of glass filled diallyl phthalate for highest mechanical and electrical strength. The socket contact apertures are chamfered at the interface to provide fail safe lead-in of pin contacts. Circuit identification is clearly printed in white on the face and rear of each black green insulator. The yellow chromate finished cadmium plated steel shells incorporate mounting ears, and provide keystone polarization for each of the models.

**Matrix MD 308 crimp contacts conform to the dimensional and material requirements of MS 18281, and may be used with other MIL-C-2308 connectors. These contacts may be purchased separately from Matrix Science in production quantities.*

FEATURES OF THE MD 308

1. Crimp or Solder Contacts
2. Standard or Float Mounts
3. The Most Superior Solder Socket Design Available
4. Non-Magnetic Shells
5. Intermateable and Intermountable With Existing D Subminiature Connectors Per MIL-C-24308
6. Shell Sizes Of 9, 15, 25, 37, 50
7. Instant Delivery
8. A Nationwide Stocking Distributor Program

MD308 G F —25 P 1 ***NUMBER SYSTEM

- **Connector modification** (Consult factory)
- **Type of contact.** 1 designates solder. 2 designates crimp.
- **Mating half of connector.** P designates with pin contacts. S designates with socket contacts.
- **Contact arrangement and model.** 09 for 9 contact model. 15 for 15 contact model. 25 for 25 contact model. 37 for 37 contact model. 50 for 50 contact model.
- **"F" (if specified) = Floating mount shells**
- **Class designation.** G for general purpose connectors with steel shells. N for non-magnetic connectors with gold plated brass shells and Beryllium Copper socket contact sleeves.
- **Series prefix.**

PERFORMANCE SPECIFICATIONS:

VOLTAGE RATING
Sea Level: 1,000 VAC
At 70,000 Feet: 325 VAC

CURRENT RATING
Size 20 contacts: 7.5 amperes, max.

CONTACT RETENTION STRENGTH
Contact will not pull out upon application of 10 pounds force in the direction of mating forces.

CONTACT DURABILITY
No mechanical or electrical defects harmful to the operation of the connector after 500 cycles of engagement and disengagement, per MIL-C-24308, Para. 3.5.10.

CONTACT ENGAGEMENT & SEPARATION FORCE
Minimum: .50 ounces (with minimum dia. pin)
Maximum: 12.0 ounces (with minimum dia. pin)

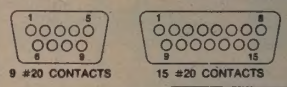
OPERATING TEMPERATURE RANGE
—67°F to 257°F

VIBRATION RESISTANCE
No interruption of electrical continuity longer than 1 microsecond. Per MIL-STD 202, method 204, condition D.

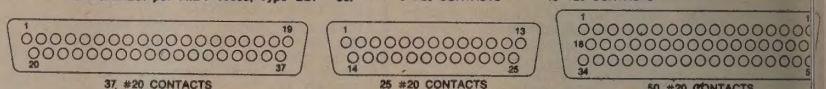
PHYSICAL SHOCK RESISTANCE
No damage or interruption of electrical conductivity longer than 1 microsecond. Per MIL-STD 202, method 213, condition G.

FACE VIEW OF PIN INSERTS (LAYOUTS)

MATERIALS: per MIL-P-19833, Type GDI — 30F



9 #20 CONTACTS — 15 #20 CONTACTS



37, #20 CONTACTS — 25 #20 CONTACTS — 50 #20 CONTACTS

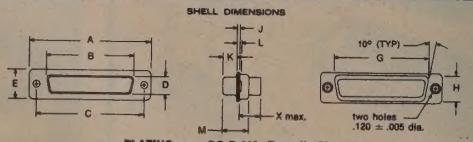
PART NUMBER	A ±.015	B ±.010	C ±.005	D ±.010	E ±.015	G ±.010	H ±.010	J ±.010	K ±.010	L ±.010	M ±.010	M
MD308-9P	1.213	.697	.984	.360	.494	.759	.422	.030	.236	.045	.422	.3
MD308-9S	1.213	.640	.984	.308	.494	.759	.422	.030	.243	.045	.429	.3
MD308-15P	1.541	1.025	1.312	.360	.494	1.083	.422	.030	.236	.045	.422	.3
MD308-15S	1.541	.968	1.312	.308	.494	1.083	.422	.030	.243	.045	.429	.3
MD308-25P	2.088	1.583	1.852	.378	.494	1.625	.422	.039	.231	.060	.426	.3
MD308-25S	2.088	1.508	1.852	.308	.494	1.625	.422	.030	.243	.045	.429	.3
MD308-37P	2.729	2.231	2.500	.378	.494	2.272	.422	.039	.231	.060	.426	.3
MD308-37S	2.729	2.156	2.500	.308	.494	2.272	.422	.030	.243	.045	.429	.3
MD308-50P	2.635	2.127	2.406	.484	.605	2.178	.534	.039	.231	.060	.426	.3
MD308-50S	2.635	2.062	2.406	.420	.605	2.178	.534	.030	.243	.045	.429	.3

ASSEMBLY TOOLS

CRIMPING TOOLS:
Type MS 3198-1 with MS 3198-5P locator.
Buchanan Tool Number 612596 with 613533 locator.
Daniels Tool Number MH 780 with A 13 locator.

NON-CONDUCTIVE CONTACT REMOVAL TOOL
Use Size 20 NAS type plastic rear release removal tool, or Size 20 MS 18278 tool.
Matrix part number: 6500-017-20

SHELL DIMENSIONS



PLATING: per QQ-P-416, Type II, Class 2

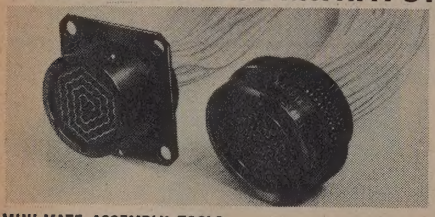
Pin Contact:
5000-007-020

Socket Contact:
5100-014-020 (std.)
5100-014-120 (non-magnetic)

Note: contact dimensions & materials per MS18281

PLATING: .00010 gold over copper strike (std.)

MINI-MATE SUBMINIATURE ELECTRICAL CONNECTORS



MINI-MATE ASSEMBLY TOOLS
Contact insertion tool, model 90-0001-022
Contact removal tool, model 90-0002-022

FEATURES:

- ☐ Shortest and lightest subminiature connector available in today's market.
- ☐ Up to 85, low millivolt drop, removable crimp contacts on .080" centers in ⅓ the space and with ¼ the weight of miniature types.
- ☐ Simple, reliable assembly
  - Rear insertion of contacts
  - Front release
  - Rear removal
- ☐ Positive lock bayonet coupling.
- ☐ Low Engagement force.
- ☐ Electrical contact after only .020" penetration.
- ☐ Probe proof closed entry sockets.
- ☐ High performance silicone grommets and interfacial seals for environmental immunity.
- ☐ 5 key polarization.
- ☐ Hard chrome or black anodize finish.
- ☐ Uses standard crimp tool (MS-3191).
- ☐ Meets or exceeds applicable sections of MIL-C-26482, MIL-C-81511, MIL-C-38999 and NAS-1599.
- ☐ Receptacles available with glass dielectrics for hermetically sealed applications.

SHELL SIZE	NO. OF CONTACTS	Q MAX. DIA.	F MAX.	G MAX.
08	7	.750	1.050	1.323
10	19	.859	1.050	1.323
12	31	1.031	1.050	1.458
14	48	1.156	1.285	1.548
16	61	1.281	1.285	1.683
18	85	1.356	1.285	1.683

SHELL SIZE	CONTACTS NO. OF	A DIA.	R	S MA
08	7	.473	.594	.8
10	19	.590	.719	.9
12	31	.750	.812	1.0
14	48	.875	.906	1.1
16	61	1.000	.969	1.2
18	85	1.125	1.062	1.3

Shell Size	No. Of Contacts	A Dia.	G	H +.000 —.010	S	V Thread
08	7	.473	1.074	.539	.950	9/16-24
10	19	.590	1.199	.655	1.074	11/16-2
12	31	.750	1.387	.818	1.262	7/8-20
14	48	.875	1.512	.942	1.387	1-20
16	61	1.000	1.637	1.066	1.512	11/8-18
18	85	1.123	1.762	1.191	1.637	11/4-18

matrix SCIENCE CORPORATION
435 MAPLE AVENUE
TORRANCE, CALIF. 90503
(213) 775-2411
TWX 910-349-6953

TRIX TERMINAL JUNCTION SYSTEMS DESIGNED TO MIL-T-81714

THE TRIX MODULE

The trix Module is the basis of a new generation of interconnection system ents introduced by Matrix Science Corporation in 1963. The device is the ment in a method of interconnecting an unlimited number of wires. The it of a now large group of connection devices using the same concept is TRIX TERMINAL BLOCK. The Terminal Block was the first of these modular and its fundamental concepts have been used in most products now avail- is a female contact socket housed in a plastic body which incorporates a king retainer to hold the male member solidly in place. This device fea- losed entry."

he male contact is pushed into position with a non-conductive tool, this produces the vitally important wiping action between male and female contact surfaces which improves con tion integrity.

er step to protect the environmental immunity of the connection is d by the addition of resilient sealing glands around all wire entries. an optional part of most Matrix Modules.

st Terminal Block had eight female contacts which were all connected to on bus plate. Split-bus units followed to provide a variety of common con- patterns within a single block.

al progression of product development provided means by which the al Blocks became modules of multi-unit assemblies. Any number may be ed to provide connection and interconnection for an unlimited number s.

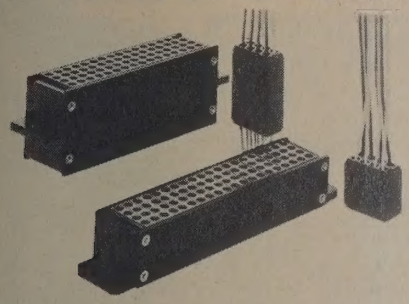
parent advantages of the Terminal Block method of making connections weight and space savings, plus connections that are inherently more re- than open connections tied to terminal strips and similar devices. The nportant improvement, though, is a marked increase in design and applica- exibility early users found in their change to this simplified interconnection method. Because the wire termination employed requires tooling and procedures identical to those for connector pins and sockets, and because the termination can be attached to a broad range of wire sizes, the Matrix Module has been found to provide a fully compatible interconnection system.

GENERAL DESCRIPTION TERMINAL BLOCKS, FEEDTHRU BLOCKS AND PROGRAMMING BLOCKS

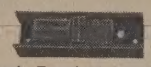
Terminal Blocks — Matrix Terminal Blocks are used for general purpose interconnection and bussing. They are available in four sizes, the larger of which accommodates AWG 12 thru AWG 14 wires, and smaller sizes with which wires AWG 16 thru 26 may be used. Aluminum rails and end brackets with alpha coding for each connection point are used to mount the blocks and form multi-block assemblies.

Feedthru Blocks — Matrix Feedthru Blocks are for general purpose interconnection and bussing in applications where circuit wiring must be connected to two sides of a panel, bulkhead or patchboard. The same crimp-type male contacts used for wire termination and connection to Terminal Blocks are used for Feedthru Blocks as well as the Programming Blocks shown below. Aluminum rails and end brackets with alpha coding are used for mounting these modules, and for forming multi-block assemblies.

Programming Blocks — Matrix Programming Blocks are feedthru blocks whose connection points on one end do not include the self-locking retainers used in the other blocks. Male contacts may be plugged-in and removed from these points without tools while connections at opposing points on the blocks remain locked in place. These blocks are used in patch-boarding and similar applications (MTB Series only).



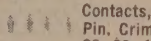
Track, Terminal Junction Module, Feedthru Type



Track, Terminal Junction Module, Feedback Type

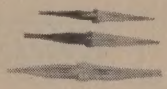
Splices, Wire, Removable Contact 22, 20, 16 and 12 Gauge

Module, Terminal Junction, Feedthru Type



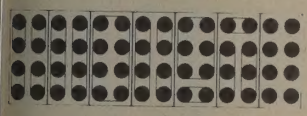
Contacts, Electric, Pin, Crimp, Removable 22, 20, 16 and 12 Gauge

Module, Terminal Junction, Feedback Type



Insertion and Removal Tools

STANDARD BUSSING ARRANGEMENTS



02 03 04 05 06 07 01

WIRE SPLICES: MATRIX WIRE SPLICE MWS**E

PART NO.	CONTACT SIZE
MWS22E	22
MWS20E	20
MWS16E	16
MWS12E	12

EXPLANATION OF PART NUMBER=

MWS ** E
- E — ENVIRONMENTAL SERIES WIRE SPLICE
- ** — WIRE SPLICE/CONTACT SIZE
- MWS — MATRIX WIRE SPLICE

MODULE LINE NOMENCLATURE

Block Assembly

20 E * - ***

- NUMBER SYSTEM
  - 3 digits indicates deviation number mixed blocks on bussing
  - 2 digits indicates buss arrangement all blocks identical
- Number of module blocks per row
- Number of module block rows wide
- "A" for Non-Environmental
- "E" for Environmental
- Size 20 for 20 AWG wire
- Size 16 for 16 AWG wire
- Style MTB std. terminal block
- Style MFB std. feed-thru block
- Style MPB program block
- Style MAP adapter block

e Assembly Kit

B20E***

Same as above, except less module blocks.

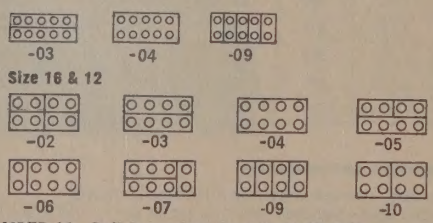
idual Module Block Assembly

B 20 E **

- Number System
  - 2 digits indicates buss arrangement. Ref.: 01, 02, 03, 04, 05, 06 and 07.
- "A" for Non-Environmental
- "E" for Environmental
- Size 20 for 20 AWG wire
- Size 16 for 16 AWG wire
- Style MTB std. terminal block
- Style MFB std. feed-thru block
- Style MPB program block
- Style MAP adaptor block

MRTB SERIES: Module, Removable Feed-Back Type MRTB**E**

BUSSING ARRANGEMENTS - Size 20 & 22



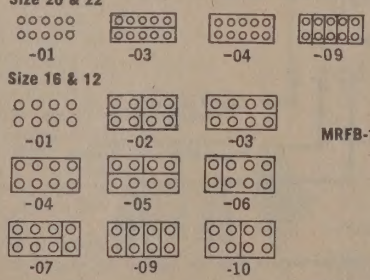
EXPLANATION OF PART NUMBER=

MRTB ** E **
- E — Bussing Arrangement (See Tab Box)
- ** — Environmental Series Module
- MRTB — Module/Contact Size
- MRTB — Matrix Removable Terminal Block

MRTB-10: Rail Assembly, Feed-Back Module

MRFB SERIES: Module, Removable Feed-Thru Type MRFB**E**

BUSSING ARRANGEMENTS



EXPLANATION OF PART NUMBER=

MRFB ** E **
- E — Bussing Arrangement (See Tab Box)
- ** — Environmental Series Module
- MRFB — Module/Contact Size
- MRFB — Matrix Removable Feed-Thru Block

MRFB-10: Rail Assembly, Feed-Thru Module

MTB, MFB, MPB and MRTB, MRFB & WIRE SPLICES:

TERMINATION TOOLS and PIN CONTACTS

	TOOL INSERT/REMOVE	CONTACTS	CRIMP TOOL
SIZE 20	6500-001-20	5000-018-22 — 22-24-26 AWG WIRE	MS-3191 or MS-3198
		5000-018-20 — 20-22-24 AWG WIRE	
SIZE 16	6500-001-16	5000-018-16 — 16-18-20 AWG WIRE	
SIZE 12	6500-001-12	5000-018-12 — 12-14 AWG WIRE	

matrix science corporation

MATRIX DOUBLE CONTACT-D

DOUBLE CONTACT RACK & PANEL or CABLE CONNECTOR

If you have the "out-of-space and overweight" miseries and your wire count is going up . . . there is remedy close at hand. As close as your nearest phone.

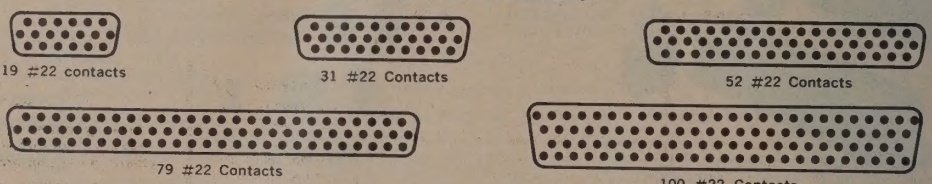
MATRIX has packed twice the number of contacts in their Standard D shell—without fudging on reliability features. In fact, some "firsts" have been added:

Standard-machined, crimp, removable contacts on .075 centers with split-tine locking feature.
15 Lb. contact retention in a diallylphthalate insulator.

Sockets have unique, hooded, closed entry feature.

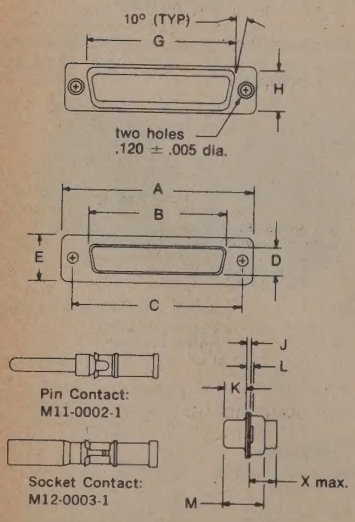
Interfacial, moisture seal.

FACE VIEW OF PIN INSERTS



PART NUMBER	A ±.015	B ±.010	C ±.005	D ±.010	E ±.015	G ±.010	H ±.010	J ±.010	K ±.010	L ±.010	M ±.010	X MAX.
MD308G-9-19S2	1.213	.697	.984	.360	.494	.759	.422	.030	.236	.045	.422	.315
MD308G-9-19P2	1.213	.640	.984	.308	.494	.759	.422	.030	.243	.045	.429	.314
MD308G-15-31S2	1.541	1.025	1.312	.360	.494	1.083	.422	.030	.236	.045	.422	.315
MD308G-15-31P2	1.541	.968	1.312	.308	.494	1.083	.422	.030	.243	.045	.429	.314
MD308G-25-52S2	2.088	1.583	1.852	.378	.494	1.625	.422	.039	.231	.060	.426	.315
MD308G-25-52P2	2.088	1.508	1.852	.308	.494	1.625	.422	.030	.243	.045	.429	.314
MD308G-37-79S2	2.729	2.231	2.500	.378	.494	2.272	.422	.039	.231	.060	.426	.315
MD308G-37-79P2	2.729	2.156	2.500	.308	.494	2.272	.422	.030	.243	.045	.429	.314
MD308G-50-100S2	2.635	2.127	2.406	.484	.605	2.178	.534	.039	.231	.060	.426	.315
MD308G-50-100P2	2.635	2.062	2.406	.420	.605	2.178	.534	.030	.243	.045	.429	.314

SHELL DIMENSIONS



MATERIALS & SPECIFICATIONS

Shell: Steel, cadmium/iridite, QQ-P-416 Type II, Class 2
Insulator: Diallyl phthalate, SDG-F per MIL-M-14
#22 Contacts: Pin—Copper alloy
Socket—Copper alloy
Socket hood—Stainless steel
Contact plating: Gold (.00010) over copper flash, MIL-G45204, Type II, Class 2
Contact retention clip—Copper alloy
Interfacial seal: Silicone per MIL-STD-417 TA-505

PART NUMBER

MD308 G F 9-19 P 2

- **Type of contact** 2 designates crimp
- P designates pin contacts; S designates socket contacts
- **Insert Arrangement**
  - 9-19 19 contacts
  - 15-31 31 contacts
  - 25-52 52 contacts
  - 37-79 79 contacts
  - 50-100 100 contacts
- F for float mounts
- **Class designation** G for general purpose connectors with steel shells; N for non-magnetic
- **Series prefix**

PERFORMANCE

Current: 5 amps
Voltage: sea level — 1000 VRMS
70,000 Ft. — 250 VRMS
Contact retention: 15 pounds axial load
Durability: No mechanical or electrical defects after 500 cycles of engagement and disengagement
Contact engagement and separation force: Minimum: .5 ounces (with minimum .029 dia pin)
Maximum: 6.0 ounces (with maximum .031 dia pin)
Thermal Shock: −67 F to 257 F
Vibration resistance: No interruption of electrical continuity longer than 1 microsecond (MIL-STD-202, method 204, condition C)
Shock resistance: No damage or interruption of electrical continuity longer than 1 microsecond (MIL-STD-202, method 202)

NOTE: Rear of connectors should be potted to assure environmental performance.
When using as an in-line, cable connector — and positive locking is required — use Matrix part numbers MD 308G-014 and MD 308G-001 screw lock assemblies.

ASSEMBLY TOOLS:

Crimp tool: MS 3198-1 with A-101 locator (Daniels)
Contact insertion tool: Matrix #90-0001-022
Contact removal tool: Matrix #90-0002-022

matrix SCIENCE CORPORATION 435 MAPLE AVE. / TORRANCE, CALIF. 90503 / (213) 775-2411 / TWX 910-349-6953

mueller clips

THE WORLD'S LARGEST AND ONLY COMPLETE LINE

MANUFACTURED FOR GENERAL SALE SINCE 1908

• AVAILABLE AT JOBBERS everywhere •

"WE BEGIN WHERE THE WIRE ENDS"

(For detailed information, refer to the Mueller Clip pages in the "Radio Electronic Master.")

IN UNIVERSAL USE FOR ALL KINDS OF QUICK, TEMPORARY ELECTRICAL CONNECTIONS. PLATED STEEL AND SOLID COPPER. INSULATORS IN STANDARD RED AND BLACK, AND IN SPECIAL COLORS — WHITE, BLUE, YELLOW AND GREEN.

"Mini-gator" and "Micro-gator" clips to fit the smallest crevices in tightly compacted equipment. Separate insulators for skin-tight, complete insulation.

Alligator Clips, including completely insulated model.

Crocodile Clips. (Nesting teeth.)

"Pee Wee" Clips, including completely non-ferrous type.

General purpose test clips with meshing teeth.

Needle Clips — Twin Clip — Geophone Clips.

Clips for Battery Booster Cables and Chargers.

Heavy duty Test and Battery Clips.

Large welding ground clamps.

Appliance ground clamps.

Separate flexible insulators.

NO. 123 DISPLAY-SELECTOR BOARD, a permanent, gloss-finish board of our entire line. Shipped complete, set up, with items in place over their printed code numbers. We absorb much of the cost, charging only $10.00 net postpaid in order to provide a unit which solves all quick-testing and clip-terminal problems for engineering and design departments, manufacturers and laboratories. Order direct from factory.

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t Lake City, Utah 84117	L. B. Putnam Co., P. O. Box 2435
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Heavy duty design for the commercial or industrial user who knows what he wants. Finely stranded pure copper cable with rubber insulation for maximum flexibility in coldest weather. 6 ga. 259 strands #30 wire, 4 ga. 413 strands #30. Mueller Hippo-Clips strongly clinched to cable and soldered for maximum current flow. Three models: 8' and 12' 6 ga. 100 amp.; 12' 4 ga. 200 amp.

Our Reader Service Department will answer your technical questions, and will honor your request for the latest catalog of our complete line.

FREE SAMPLE CLIPS AVAILABLE

Factory will supply free sample clips for your inspection. Refer to complete listing in "Radio Electronic Master."

AVAILABLE AT JOBBERS EVERYWHERE

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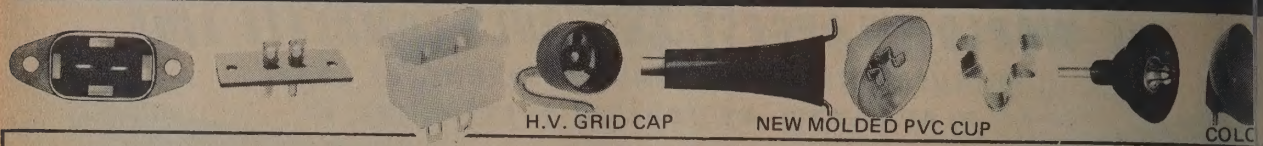
ntt NATIONAL TEL-TRONICS CORP

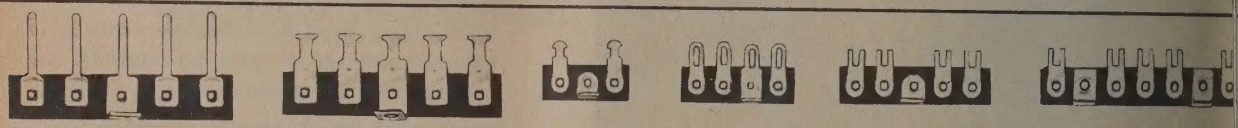
55 NORTHERN BOULEVARD • GREAT NECK, N. Y. 11021



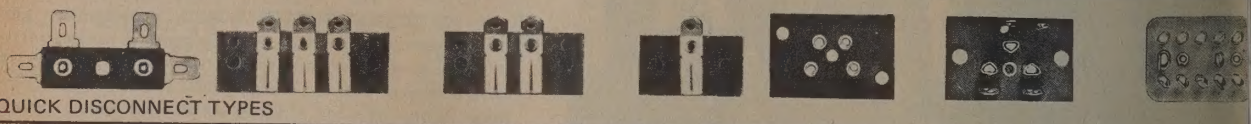
INTERLOCKS — SNAP-IN TYPE — ANODE CONNECTORS AND GRID CAP ASSEMBLIES

BINDING POST BOARDS — HEAVY DUTY BINDING POST BOARDS

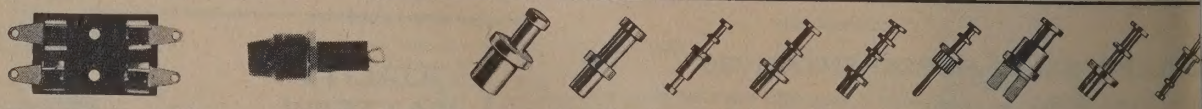
MINIATURE TERMINAL STRIPS — CONICAL TERMINAL STRIPS



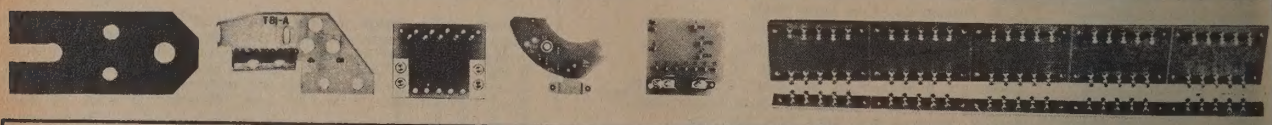
SPECIAL TERMINAL STRIPS — STANDARD TERMINAL STRIPS



DISCONNECT STRIPS — CONTACT STRIPS — PIN PLUG AND SOCKET



FUSE HOLDERS — TURRET TERMINALS IN MIL AND COMMERCIAL SPECS



FABRICATED PARTS — TERMINAL BOARDS — SCORED BOARDS

STANDARD AND HIGH FIDELITY SPEAKERS

A full line. Send for complete catalog.

The National Tel-Tronics product line appears in full detail with complete specifications in THE RADIO MASTER

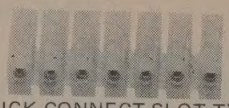
NATIONAL TEL-TRONICS CORP.

5 NORTHERN BOULEVARD • GREAT NECK, N. Y. 11021

ntt

FLEXIBLE SCREW TYPE

FLEXIBLE QUICK DISCONNECT



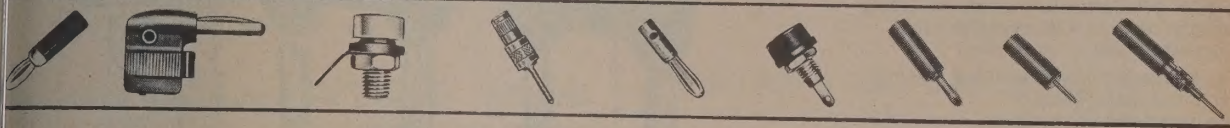
QUICK CONNECT SLOT TYPE

PUSH BUTTON

QUICK DISCONNECT

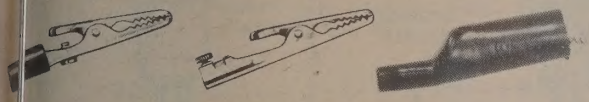
FLEXIBLE TERMINAL BLOCKS

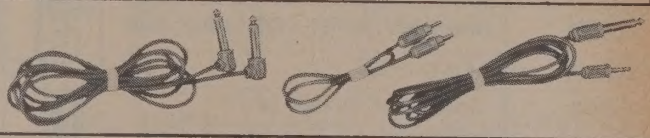
PUSH BUTTON TERMINAL BLOCKS



TIP AND BANANA PLUGS AND JACKS

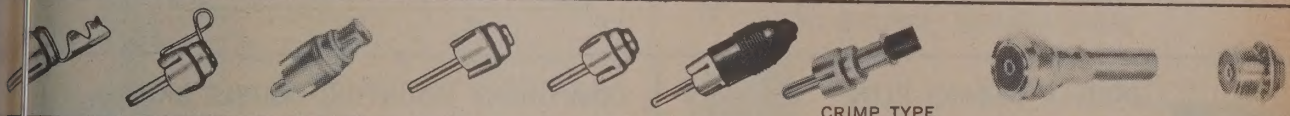
BINDING POSTS





ALLIGATOR CLIPS

MOLDED CABLES



CRIMP TYPE

COMPLETE LINE OF PHONO PLUGS

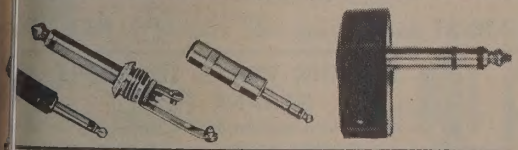
MICROPHONE CONNECTORS

SWITCHING TYPES

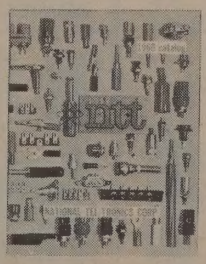
COMPLETE LINE OF PHONO CONNECTORS AND JACKS

TEST PRODS AND SETS

NYLON TIP JACKS



TELEPHONE PLUGS



TELEPHONE JACKS

HARDWARE FOR COLOR T.V.

erminal strips, interlocks, light shields, node connectors, and specials to your pecifications.

We have illustrated on these two pages the various categories of parts that National Tel-Tronics manufactures. For more detailed information send for our 54 page catalog.

POMONA ELECTRONICS

¾" SPACED MOLDED BANANA PLUGS

General Specifications listed below apply to items using banana plugs in this catalog.

FEATURES . . .

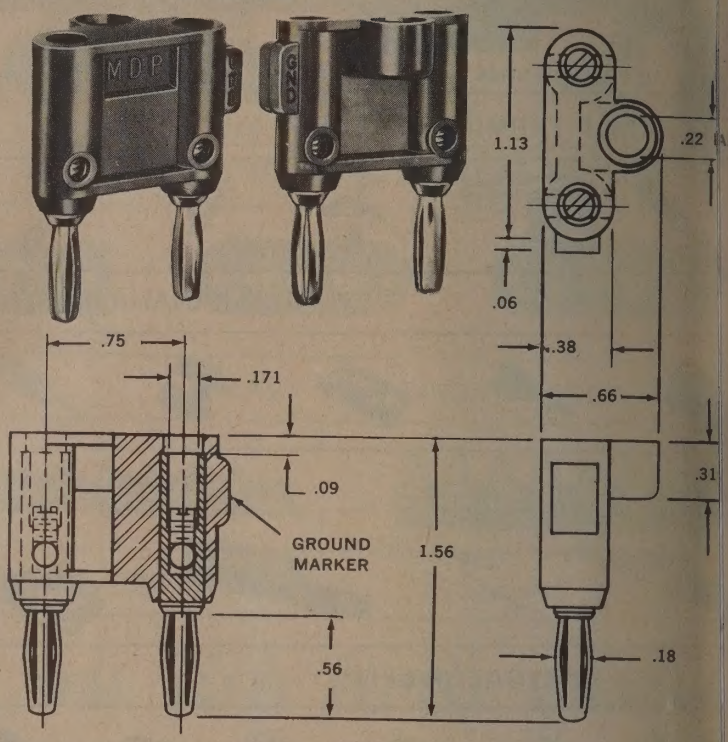
- One piece beryllium copper heat treated spring for maximum long life.
- Rounded spring design results in maximum contact area.
- STACK-UP feature allows an unlimited number of connections at the same electrical point.
- Tough thermoplastic molded directly on to the metal body of the plugs and connectors.

SPECIFICATIONS . . .

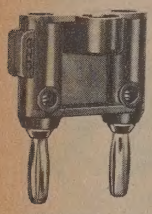
- Fits standard 0.166 dia. banana jacks.
- Spring, beryllium copper alloy 170 per QQ-C-533.
- Plug body, Brass per QQ-B-626. Comp. 22.
- Nickel plated per QQ-N-290, Class 2.
- Contact resistance less than 0.001 ohms per banana plug.

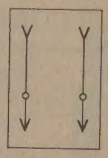
RATINGS	Models: MDP; MDP-ST; 1330; 1330-ST; 2970
Capacity :	0.8 pf to 10 MC
Current :	15 Amps. Cont., 30 Amps. Int.
Voltage :	5000 W.V. D.C.
Temperature :	—25°C to +85°C, operating temp.

ACTUAL SIZE



DOUBLE BANANA PLUG



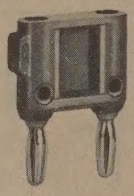


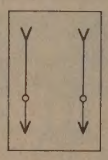
Double banana plug on ¾" centers; set screws secure leads; simplifies cable construction or component mounting; banana jacks permit top Stack-Up for multiple connections.

COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL MDP (Specify Color) QUANTITY DISC. CODE (A) **NET .75**

COMPONENT MOUNTING DOUBLE BANANA PLU



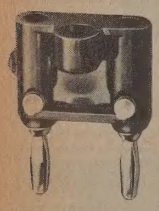


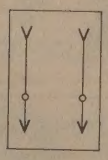
Double banana plug on ¾" centers; set screw secure leads; features recess for mounting sma components; banana jacks permit top Stack-U for multiple connections.

COLORS: Black, Red

MODEL 1330 (Specify Color) QUANTITY DISC. CODE (A) **NET .7**

DOUBLE BANANA PLUG WITH SOLDER TURRET TERMINALS



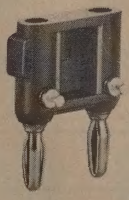


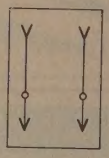
Similar to Model MDP, except has solder turret terminals for permanent noise-free connections of cables and components. Double banana plug on ¾" centers; banana jacks permit top Stack-Up for multiple connections.

COLOR: Black

MODEL MDP-ST QUANTITY DISC. CODE (A) **NET .95**

COMPONENT PLUG WITH SOLDE TURRET TERMINALS



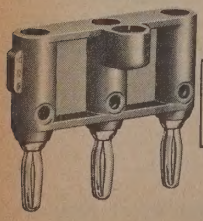


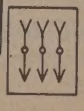
Similar to Model 1330, except has solder turr terminals for permanent noise-free connectior of components, etc. Double banana plug on ¾ centers: Banana jacks permit top Stack-Up fo multiple connections.

COLORS: Black, Red.

MODEL 1330-ST (Specify Color) QUANTITY DISC. CODE (A) **NET .9**

TRIPLE BANANA PLUG



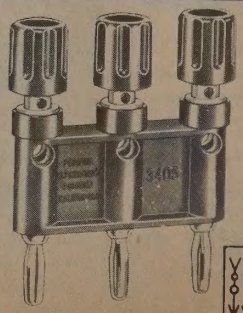


Triple banana plug on ¾" centers; set screws secure leads. Ideal for balanced line 2 conductor shielded cable assemblies. Banana jacks permit top Stack-up for multiple connections.

COLORS: Black, Red.

MODEL 2970 (Specify Color) QUANTITY DISC. CODE (A) **NET 1.25**

BINDING POSTS TO TRIPLE BANANA PLUG



Features insulated binding posts on ¾" center for rapid mounting and interchangeability o components. Binding posts allow top Stack Up for multiple connections. Side Stack-Up provided by thru-holes in plug body.

UPPER: Insulated Triple binding posts, on ¾" centers. Cross holed (.166 dia.) in body provide side Stack-Up connections.

LOWER: Triple banana plug, on ¾" centers.

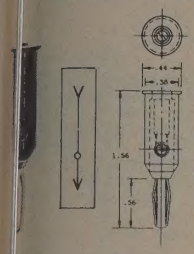
COLORS: Body, Black. Binding Posts, Red/ Black/Black.

MODEL 3405 QUANTITY DISC. CODE (A) **NET 4.50**

POMONA ELECTRONICS

BANANA PLUG ACCESSORIES

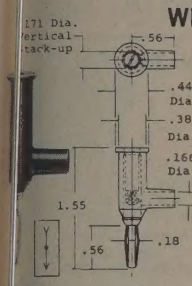
SOLDERLESS BANANA PLUG—STACK-UP



Wire firmly held in place with internal set screw, eliminating soldering. Assembly of test leads simplified.
UPPER: Banana jack, .171 dia.; Brass, nickel plated.
LOWER: Banana plug, one piece nickel plated beryllium copper spring for use with standard 0.166 dia. banana jack.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL 1325 (Specify color) QUANTITY DISC. CODE (A) **NET .50**

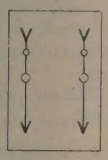
SOLDERLESS BANANA PLUG WITH SAFETY COLLAR—STACK-UP



Features: Integral safety collar insulates exposed wire leads. Wire firmly held in place with internal set screw, eliminating soldering. Assembly of test leads simplified.
UPPER: Banana jack, .166 dia.; Brass, nickel plated.
LOWER: Banana plug, one piece nickel plated beryllium copper spring for use with standard 0.166 dia. banana jack.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL 1825 (Specify Color) QUANTITY DISC. CODE (A) **NET .50**

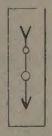
BINDING POSTS TO DOUBLE BANANA PLUG



Features insulated binding posts on ¾″ centers for rapid mounting and interchangeability of components. Binding posts allow top Stack-Up for multiple connections. Side Stack-Up provided by thru-holes in plug body.
UPPER: Insulated double binding posts, on ¾″ centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: Double banana plug, on ¾″ centers.
COLORS: Body, Black. Binding Posts, Black/Red.

MODEL 1286 QUANTITY DISC. CODE (A) **NET 2.50**

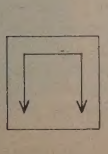
BINDING POST TO SINGLE BANANA PLUG



Features insulated binding post. Binding post allows top Stack-Up for multiple connections. Side Stack-Up provided by thru-hole in plug body.
UPPER: Insulated binding post. Cross hole (.166 dia.) in body provides side Stack-Up connections.
LOWER: Single banana plug, one piece nickel plated beryllium copper spring for use with standard 0.166 dia. banana jack.
COLORS: Black, Red.

MODEL 2894 (Specify color) QUANTITY DISC. CODE (A) **NET 1.50**

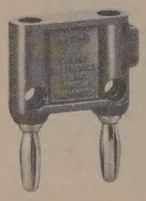
METAL SHORTING BAR

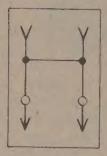


Low profile, nickel plated brass shorting bar. Double banana plugs on ¾″ centers swaged to 3/32″ thick brass bar. Resistance, less than 1.5 milliohms installed. Current rating: 15 Amps. Cont., 30 Amps. Int.

MODEL 1855 QUANTITY DISC. CODE (A) **NET .85**

INSULATED SHORTING BAR

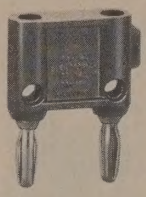


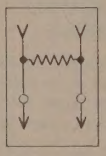


Ideal as a connecting link for use with ¾″ spaced banana jacks. Banana plugs internally solder-bonded with #14 AWG wire. Banana jacks provide top Stack-Up. Cross holes (.166 dia.) in body provide side Stack-Up connections. Resistance less than 1.5 milliohms installed. Current rating 15 Amps. Cont., 30 Amps. Int. "Shorting Bar" marked on top of plug.
COLORS: Natural, Black, Red.

MODEL MDP-S (Specify Color) QUANTITY DISC. CODE (A) **NET 1.25**

MOLDED PRECISION RESISTOR



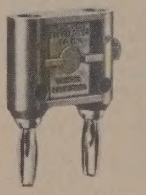


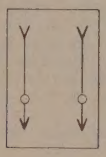
Ideal where rapid interchange of resistance values is required. Used in breadboarding, R & D labs., Standards, Terminations, etc. Deposited carbon 1% resistor, ½ watt, molded internally. Resistor soldered to double banana plug, on ¾″ centers. Top Stack-Up provided for multiple connections. Cross holes (.166 dia.) in body provide side Stack-Up connections. Resistance value stamped on top of plug.

(OHMS)					
	50	200	1K	100K	1 Meg.
	75	250	5K	200K	2 Meg.
	120	500	10K	250K	5 Meg.
	130	600	20K	500K	10 Meg.
	150	900	50K		

MODEL MDP-R (Specify Value) QUANTITY DISC. CODE (A) **NET 2.95**

ADAPTER—.080 TIP JACKS TO DOUBLE BANANA PLUG

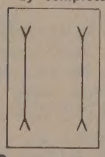




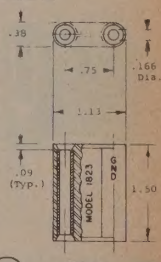
Permits .080 Tip plugs to be used with equipment having banana jacks.
UPPER: Tip jacks, beryllium copper, gold flashed; spaced on ¾″ centers to accept .080 dia. pin tip plugs.
LOWER: Double banana plug, on ¾″ centers, nickel plated. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Black.

MODEL 1845 QUANTITY DISC. CODE (A) **NET .95**

DOUBLE BANANA PLUG SPLICE

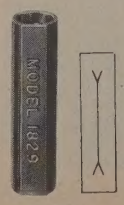


Provides rapid method for splicing cables. Reduces necessity of storing extra long cables. Molded thermoplastic body eliminates shock hazard by completely enclosing banana plug contact. Brass, nickel plated banana jacks. .166 dia., on ¾″ centers.
COLORS: Black, Red.

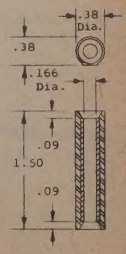


MODEL 1823 (Specify color) QUANTITY DISC. CODE (A) **NET .50**

SINGLE BANANA PLUG SPLICE



Provides rapid method for splicing single banana plug patch cords. Reduces the necessity of storing extra long patch cords. Molded thermo-plastic body eliminates shock hazard by completely enclosing banana plug contact. Brass, nickel plated banana jack, .166 dia.
COLORS: Black, Red.
Standard Package: 10 (per color)

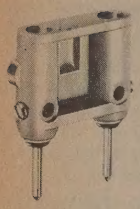


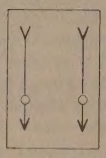
MODEL 1829 (Specify color) QUANTITY DISC. CODE (A) **NET .25 ea.**

POMONA ELECTRONICS

.080 PIN TIP PLUG ACCESSORIES

COMPONENT MOUNTING — TIP JACKS TO DOUBLE PIN TIP PLUG — SET SCREWS

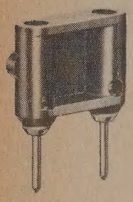


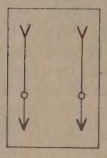


Features set screws on side of body to secure leads or components. Recess permits mounting of small component parts.
UPPER: Tip jacks, beryllium copper, gold flashed, spaced on ¾" centers, to accept .080 dia. pin tip plugs.
LOWER: Pin tips, .080 dia. on ¾" centers. Brass, nickel plated.
COLORS: Black, Red.

MODEL 2192 (Specify color) QUANTITY DISC. CODE (A) **NET 1.85**

COMPONENT MOUNTING PLUG— BANANA JACKS TO DOUBLE PIN TIP —SET SCREWS

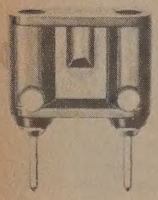


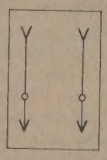


Permits single or double banana plugs to be used in equipment having tip jacks. Features recess for component mounting. Internal set screws firmly secure wire leads.
UPPER: Banana jacks, .166 dia., on ¾" centers. Brass, nickel plated.
LOWER: Pin tips .080 dia. on ¾" centers. Brass, nickel plated.
COLOR: Black.

MODEL 1858 QUANTITY DISC. CODE (A) **NET .75**

PLUG — COMPONENT MOUNTING — DOUBLE PIN TIP PLUG—SOLDER TURRETS

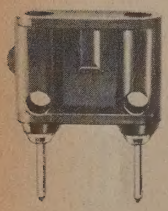


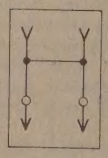


Features recess for mounting components. Gold flashed solder turrent terminals for permanent noise-free connections.
UPPER: Tip jacks, beryllium copper, gold flashed; spaced on ¾" centers to accept .080 dia. pin tip plugs.
LOWER: Pin tips, .080 dia. brass, nickel plated.
COLORS: Black, Red.

MODEL 1904 (Specify color) QUANTITY DISC. CODE (A) **NET 1.10**

INSULATED SHORTING BAR

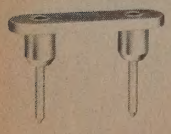


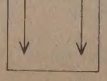


Used as a connecting link with equipment having tip jacks. Plugs internally solder bonded with 14 AWG wire. Top stack-up feature.
Current rating: 5 AMPS. cont., 10 AMPS. int. "Shorting Bar" marked on top of plug.
UPPER: Banana jacks, .166 dia. on ¾" centers. Brass, nickel plated.
LOWER: Pin tips, .080 dia. on ¾" centers. Brass, nickel plated. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLORS: Black, Red.

MODEL 1730 (Specify color) QUANTITY DISC. CODE (A) **NET 1.25**

METAL SHORTING BAR

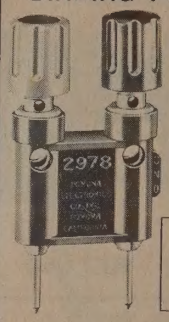


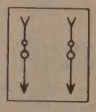


Used as a connecting link with equipment having tip jacks. Low profile, nickel plated brass shorting bar. Double pin tip plugs on ¾" centers swaged to 3/32" thick brass bar.
RESISTANCE: Less than 1.5 milliohms installed.
CURRENT RATING: 5 Amps Cont., 10 Amps Int.

MODEL 2072 QUANTITY DISC. CODE (A) **NET .85**

BINDING POSTS TO DOUBLE PIN TIP PLUG

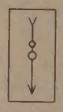




Features insulated binding posts on ¾" c ers for rapid mounting and interchangeability o m- ponents. Binding posts allow top Stack-U for multiple connections. Side Stack-Up provid by thru-holes in plug body.
UPPER: Insulated double binding posts on ¾ en ters. Top and side stack-up connectors (.166 a.) Cross holes (.166 dia.) in body provide side ck- Up connections.
LOWER: Pin tips, .080 dia. on ¾" centers. ss, nickel plated.
COLORS: Body, Black, Binding Posts, Black/R

MODEL 2978 QUANTITY DISC. CODE (A) **NET 2.5**

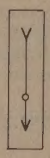
BINDING POST TO SINGLE PIN TIP PLUG



Features insulated binding post. Binding pos t- lows top Stack-Up for multiple connections. e Stack-Up provided by thru-holes in plug body.
UPPER: Insulated binding post. Top and side S k- Up connectors (.166 dia.). Cross hole (.166 dia in body provide side Stack-Up connections.
LOWER: Pin tip, .080 dia. brass, nickel plated
COLORS: Black, Red.

MODEL 2953 (Specify color) QUANTITY DISC. CODE (A) **NET 1.5**

SOLDERLESS PIN TIP PLUG—STACK-U



Wire firmly held in place with internal set screw, el- inating soldering. Assembly of test leads simplifie
UPPER: Tip jack, beryllium copper, gold flashed; cepts .080 dia. pin.
LOWER: Pin tip, .080 dia., brass, nickel plated.
COLORS: Black, Red.

MODEL 1922 (Specify color) QUANTITY DISC. CODE (A) **NET .9**

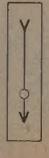
ADAPTER — BANANA JACK TO PIN TIP

Permits standard single banana plug patch co to be used with equipment having tip jacks.
UPPER: Banana jack, .166 dia. Brass, nic plated.
LOWER: Pin tip, .080 dia. Brass, nickel plat Cross hole (.166 dia.) in body provides side Sta Up connection.
COLORS: Black, Red.

Standard Packag 10 (per colo

MODEL 1432 (Specify Color) QUANTITY DISC. CODE (A) **NET .20 e**

ADAPTER — .080 TIP JACK TO BANANA PLUG



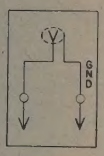
Permits .080 dia. pin tip patch cords to be used with equi ment having banana jacks. Insulation molded to plug body.
UPPER: Tip jack, beryllium copper, gold flashed. Accepts .08 dia. pin.
LOWER: Banana plug, one piece nickel plated beryllium co per spring for use with standard 0.166 dia. banana jack. Cro hole (.166 dia.) in body provides side Stack-Up connection.
COLORS: Black, Red.

MODEL 1809 (Specify Color) QUANTITY DISC. CODE (A) **NET .7**

POMONA ELECTRONICS

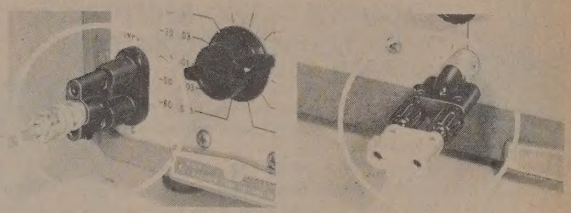
BNC ADAPTERS

ADAPTER — BNC RECEPTACLE TO DOUBLE BANANA PLUG



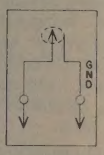
Permits BNC plug to be used with equipment having banana jacks. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾″ centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Black.

MODEL 1269 QUANTITY DISC. CODE (A) **NET 2.95**



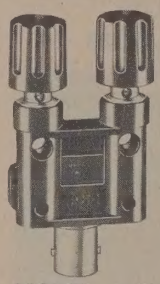
Now! Increase the flexibility of your laboratory with the use of POMONA Molded test accessories. Minimize the necessity of stocking a large quantity and variety of coaxial cables by using POMONA molded adapters. Tough thermo-plastic material molded to plug body or connectors insures maximum strength, moisture resistance and excellent insulative properties.

ADAPTER — BNC PLUG TO DOUBLE BANANA PLUG

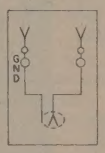


Permits BNC receptacle to be used with equipment having banana jacks. Minimizes number of coaxial connections for maximum efficiency.
UPPER: BNC plug.
LOWER: Double banana plug, on ¾″ centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Black.

MODEL 1270 QUANTITY DISC. CODE (A) **NET 3.95**

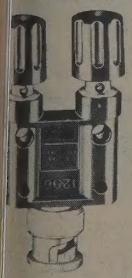


ADAPTER — BINDING POSTS TO BNC RECEPTACLE

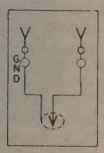


Permits single or double banana plugs to be used with equipment having BNC plug.
UPPER: Insulated binding posts, on ¾″ centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: BNC receptacle.
COLOR: Body, Black. Binding Posts: Black/Red.

MODEL 1452 QUANTITY DISC. CODE (A) **NET 4.95**

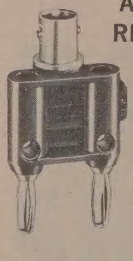


ADAPTER — BINDING POSTS TO BNC PLUG

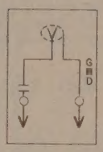


Permits single or double banana plugs to be used with equipment having BNC receptacle. Excellent for use with laboratory oscilloscopes.
UPPER: Insulated binding posts, on ¾″ centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: BNC plug.
COLOR: Body, Black. Binding Posts: Black/Red.

MODEL 1296 QUANTITY DISC. CODE (A) **NET 4.95**



ADAPTER — SIGNAL ISOLATOR — BNC RECEPTACLE TO DOUBLE BANANA PLUG

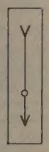


Permits BNC male connector to be used with equipment having banana jacks. General purpose ceramic capacitor molded internally. Rated @ .01 mfd ±20%, 200 WVDC. Insulation resistance 10,000 megohms min. Ideal for isolating DC signals from VTVM inputs and signal generator outputs.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾″ centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Blue.

MODEL 1868 QUANTITY DISC. CODE (A) **NET 7.85**

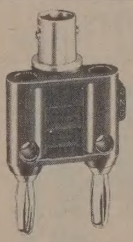
NW

ADAPTER — SINGLE BINDING POST TO BNC PLUG

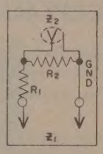


Permits single banana plug to be used with equipment having a BNC receptacle. Connector body features a Non-Tarnish finish.
UPPER: Insulated binding post for multiple stacking.
LOWER: BNC Plug.
COLOR: Binding Post: Black or Red (specify)

MODEL 3430 (Specify color) QUANTITY DISC. CODE (A) **NET 2.50**



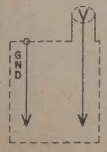
ADAPTER — BNC MATCHING PAD



Adapts 600 OHM sources to 50, 75 or 93 OHM cables. Excellent for matching signal generators and VTVM's to standard coaxial cables. Ideal for receiver alignment. Molded in deposited carbon resistors 1%, ¼W.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾″ centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.

MODEL	COLOR	RANGE — OHMS	NET	QUANTITY DISC. CODE
1656-1	Yellow	600 to 50	10.85	(A)
1656-2	Red	600 to 75	10.85	
1656-3	White	600 to 93	10.85	
1656-4	Blue	300 to 50	10.85	

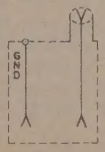
ADAPTER — BNC RECEPTACLE TO SHIELDED BANANA PLUGS



Permits BNC plug to be used with equipment having banana jack binding posts. Black anodized aluminum shield reduces noise Pick-up more than 70 DB. Ideal for low level inputs to oscilloscopes, wave analyzers, etc.
UPPER: BNC receptacle.
LOWER: Shielded double banana plug, on ¾″ centers.

MODEL 1645 QUANTITY DISC. CODE (A) **NET 3.75**

ADAPTER — BNC RECEPTACLE TO SHIELDED BANANA JACKS

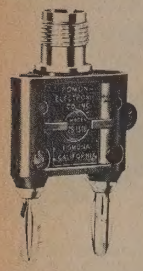


Permits BNC plug to be used with equipment having banana plugs. Black anodized aluminum shield reduces noise pick-up more than 70 DB. Ideal for low level inputs to oscilloscopes, wave analyzers, etc.
UPPER: BNC receptacle.
LOWER: Shielded double banana jacks, on ¾″ centers.
COLOR: Black.

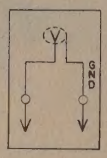
MODEL 1681 QUANTITY DISC. CODE (A) **NET 3.75**

POMONA ELECTRONICS

TNC & "N" ADAPTERS

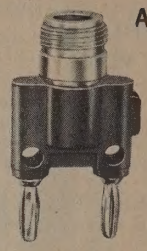


ADAPTER — TNC RECEPTACLE TO DOUBLE BANANA PLUG

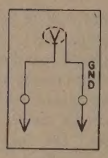


Permits TNC plug to be used with equipment having banana jacks. Perfect for connecting modern control systems to laboratory test equipment.
UPPER: TNC receptacle.
LOWER: Double banana plug, on ¾" centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Black.

MODEL 1340 QUANTITY DISC. CODE (A) **NET 5.85**

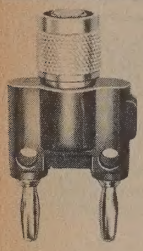


ADAPTER — TYPE "N" RECEPTACL TO DOUBLE BANANA PLUG

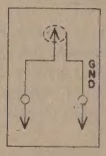


Permits Type "N" plug to be used it equipment having banana jacks. Ide fo connecting R.F. equipment to conven na test equipment.
UPPER: Type "N" receptacle.
LOWER: Double banana plug, on ¾" an ters. Cross holes (.166 dia.) in body pr de side Stack-Up connections.
COLOR: Black.

MODEL 1740 QUANTITY DISC. CODE (A) **NET 5.5**

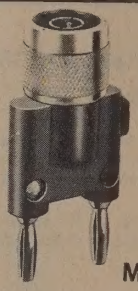


ADAPTER — TNC PLUG TO DOUBLE BANANA PLUG

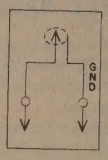


Permits TNC receptacle to be used with equipment having banana jacks. Minimizes your stock of coaxial cables.
UPPER: TNC plug.
LOWER: Double banana plug, on ¾" centers. Cross holes (.166 dia.) in body provide side Stack-Up connections.
COLOR: Black.

MODEL 1981 QUANTITY DISC. CODE (A) **NET 6.85**

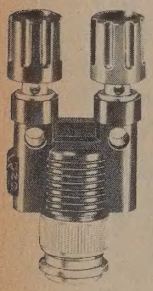


ADAPTER — TYPE "N" PLUG TO DOUBLE BANANA PLUG

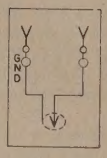


Permits type "N" receptacle to be used it equipment having banana jacks.
UPPER: Type "N" plug.
LOWER: Double banana plug, on ¾" ce rs. Cross holes (.166 dia.) in body provide de Stack-Up connections.
COLOR: Black.

MODEL 1770 QUANTITY DISC. CODE (A) **NET 6.5**

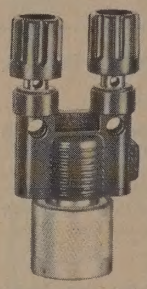


ADAPTER — BINDING POSTS TO TNC PLUG

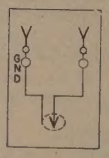


Permits single or double banana plugs to be used with equipment having a TNC receptacle. Exceptional for signal insertion with rapid interchangeability of terminations.
UPPER: Insulated binding posts, on ¾" centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: TNC plug.
COLOR: Body, Black. Binding Posts: Black/Red.

MODEL 1982 QUANTITY DISC. CODE (A) **NET 7.85**

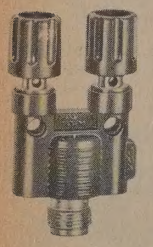


ADAPTER — BINDING POSTS TO TYPE "N" PLUG

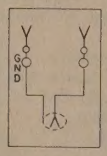


Permits single or double banana plugs to be used h equipment having Type "N" receptacle. Binding p s allow component insertion.
UPPER: Insulated binding posts, on ¾" cen ters with .166 dia. banana jacks. Cros holes (.166 dia.) in body provide side Stacl Up connections.
LOWER: Type "N" plug.
COLOR: Black. Binding Posts: Black/Red.

MODEL 1796 QUANTITY DISC. CODE (A) **NET 7.8**

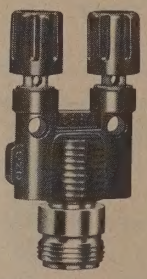


ADAPTER — BINDING POSTS TO TNC RECEPTACLE

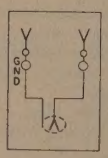


Permits single or double banana plugs to be used with equipment having TNC plug. Useful for rapid interconnection of systems and components.
UPPER: Insulated binding posts, on ¾" centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: TNC receptacle.
COLOR: Body, Black. Binding Posts: Black/Red.

MODEL 1976 QUANTITY DISC. CODE (A) **NET 6.85**



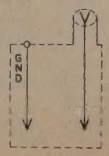
ADAPTER — BINDING POSTS TO TYPE "N" RECEPTACLE



Permits single or double banana plugs be used with equipment having type " plug. Useful for rapid interconnection systems and components.
UPPER: Insulated binding posts, on centers with .166 dia. banana jacks. Cr holes (.166 dia.) in body provide side Sta Up connections.
LOWER: Type "N" receptacle.
COLOR: Body, Black. Binding Posts: Blac Red.

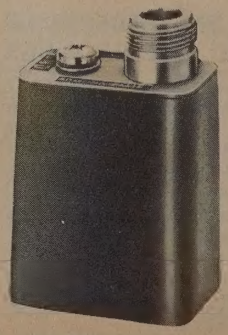
MODEL 1992 QUANTITY DISC. CODE (A) **NET 6.8**

ADAPTER — TNC RECEPTACLE TO SHIELDED BANANA PLUGS

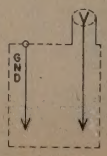


Permits TNC plug to be used with equipment having banana jack binding posts. Black anodized aluminum shield reduces noise pick-up more than 70 DB.
UPPER: TNC receptacle.
LOWER: Double banana plug, on ¾" centers.
COLOR: Black.

MODEL 1975 QUANTITY DISC. CODE (A) **NET 5.85**



ADAPTER — TYPE "N" RECEPTACLE TO SHIELDED BANANA PLUGS



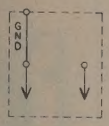
Permits type "N" plug to be used with equ ment having banana jack binding posts. Bla Anodized aluminum shield reduc noise pick-up more than 70 D
UPPER: Type "N" receptacle.
LOWER: Double banana plug, ¾" centers.
COLOR: Black.

MODEL 1983 QUANTITY DISC. CODE (A) **NET 5.8**

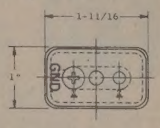
POMONA ELECTRONICS

SHIELDED BANANA PLUGS UHF ADAPTERS

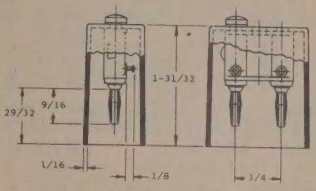
SHIELDED DOUBLE BANANA PLUG IN-LINE CABLE ENTRY



RATED: 15A CONTINUOUS
1200 WVDC
3400 VDC BREAKDOWN
2.5 PF @ 1 MC



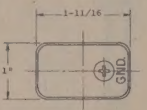
ielded double plug ¾" spaced
e cast aluminum shell, black
odized
oise pick-up reduced 70 DB
ld flashed solder turret terminals for
sitive reliable cable connections
e piece nickel plated beryllium copper
rings for use with standard 0.166 dia.
nana jack binding posts.
unded banana spring design results in
aximum contact area and minimum
ntact resistance
ND clearly molded in shell
able opening, 7/32" diameter



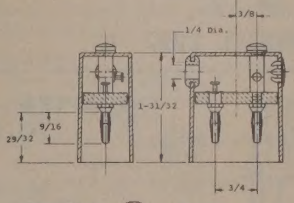
ODEL 1433 QUANTITY DISC. CODE (A) **NET 2.75**

SHIELDED DOUBLE BANANA PLUG RIGHT ANGLE CABLE ENTRY

RATED: 15A CONTINUOUS
2800 PEAK WV
5000 VDC BREAKDOWN
2.0 PF @ 1 MC.



hielded double plug, ¾" spaced
eramic insulating base
ie cast aluminum shell, black
nodized
ND clearly molded in shell
oise pick-up reduced 70 DB
ne piece nickel plated beryllium copper
prings for use with 0.166 diameter
anana jack binding posts.
ounded banana spring design results in
naximum contact area and minimum
ontact resistance
inyl grommet and nickel plated
nap button supplied



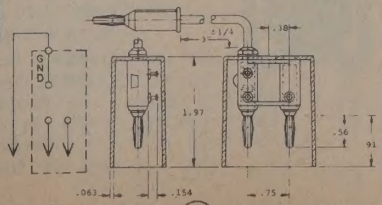
ODEL 1791 QUANTITY DISC. CODE (A) **NET 3.95**

BALANCED LINE SHIELDED DOUBLE BANANA PLUG

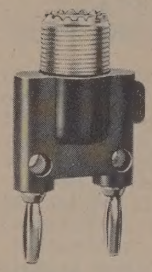
- Unique 3 terminal design allows connection to shielded two conductor cable while maintaining balanced conditions
- Minimizes ground loop errors in low signal level applications
- Die cast aluminum shell, black anodized
- Noise pick-up reduced at least 70 DB
- Gold flashed solder turret terminals for reliable noise free connections
- One piece nickel plated beryllium copper springs for use with standard 0.166 dia. banana jack binding posts.

RATED:

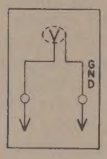
15A Continuous	5000 V peak breakdown, line to line
1000 WV Peak; line to shield	2.0 pf @ 1 MC Capacity; line to line
2000 WV peak; line to line	3.0 pf @ 1 MC. capacity; both lines to shield.
2500 V peak breakdown; line to shield	



ODEL 1921 QUANTITY DISC. CODE (A) **NET 5.85**



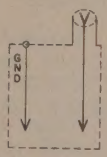
ADAPTER — UHF RECEPTACLE TO DOUBLE BANANA PLUG



Permits UHF plug to be used with equipment having banana jacks.
UPPER: UHF receptacle, ⅝" dia.
LOWER: Double banana plug, on ¾" centers. Cross holes (.166 dia.) in body provide side Stack-Up cannections.
COLOR: Black.

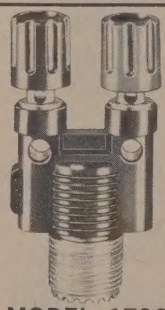
MODEL 1707 QUANTITY DISC. CODE (A) **NET 4.85**

ADAPTER — UHF RECEPTACLE TO SHIELDED BANANA PLUGS

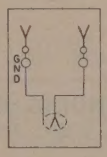


Permits UHF plug to be used with equipment having banana jack binding posts. Black anodized shield reduces noise pick-up at least 70 DB.
UPPER: UHF receptacle, ⅝" dia.
LOWER: Double banana plug on ¾" centers.
COLOR: Black.

MODEL 1708 QUANTITY DISC. CODE (A) **NET 4.85**

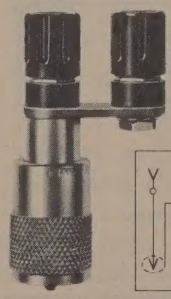


ADAPTER — BINDING POSTS TO UHF RECEPTACLE

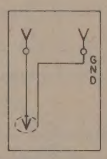


Permits single or double banana plugs to be used with equipment having UHF plug.
UPPER: Insulated binding posts, on ¾" centers with .166 dia. jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.
LOWER: UHF receptacle, ⅝" dia.
COLOR: Body, Black. Binding posts: Black/Red.

MODEL 1792 QUANTITY DISC. CODE (A) **NET 5.85**



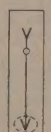
ADAPTER — BINDING POSTS TO UHF PLUG



Permits single or double banana plugs to be used with equipment having a UHF receptacle, ⅝" dia. Convenient for use with modern oscilloscopes. Center conductor binding post Red; Ground, Black.
UPPER: Insulated binding posts, on ¾" centers with .166 dia. jacks.
LOWER: UHF plug.

MODEL 1699 QUANTITY DISC. CODE (A) **NET 5.85**

ADAPTER — BINDING POST TO UHF PLUG



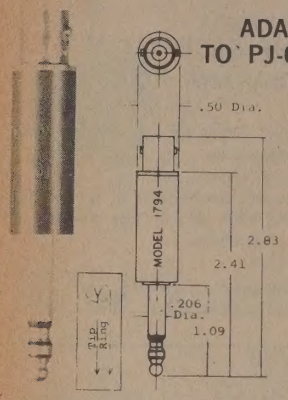
Permits single banana plug to be used with equipment having a UHF receptacle, ⅝" dia. Adds flexibility to your oscilloscope.
UPPER: Insulated binding post with .166 dia. banana jack.
LOWER: UHF plug.

MODEL 1698 QUANTITY DISC. CODE (A) **NET 3.85**

POMONA ELECTRONICS

PHONE AND PHONO PLUG ADAPTERS

ADAPTER-BNC RECEPTACLE TO PJ-068/PJ-309* PHONE PLUG

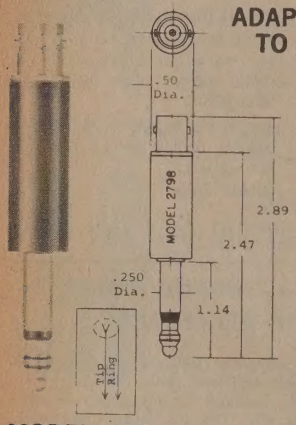


Permits BNC plug to be used with equipment having three circuit phone jacks for .206 dia. phone plugs. Readily adapts equipment to available BNC coaxial cables. Tip connected to inner contact of connector and Ring connected to shell. Sleeve, no connection.

LOWER: Phone Plug, PJ-068/PJ-309*
COLOR: Black
*PJ-309 Interchangeable with WE-309

MODEL 1794 QUANTITY DISC. CODE (A) **NET 6.85**

ADAPTER — BNC RECEPTACLE TO PJ-051* PHONE PLUG

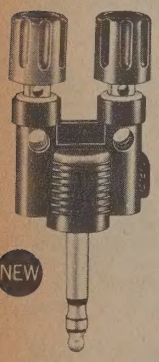


Permits BNC plug to be used with equipment having three circuit phone jacks for .250 dia. phone plugs. Readily adapts equipment to available BNC coaxial cables. Tip connected to inner contact of connector and Ring connected to shell. Sleeve, no connection.

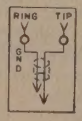
UPPER: BNC receptacle, UG1094/U.
LOWER: Phone Plug, PJ-051*
*PJ-051 Interchangeable with WE 310

MODEL 2798 QUANTITY DISC. CODE (A) **NET 6.85**

ADAPTER-BINDING POSTS TO PJ-068/PJ-309* PHONE PLUG



NEW

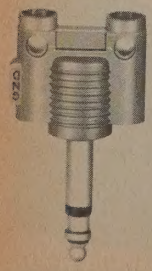


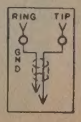
Permits single or double banana plug to be used with equipment having three circuit phone jacks for .206 dia. phone plugs. Ideal for rapid mounting of components and test leads. The PJ-068 and PJ-309 Plug have the same mechanical dimensions.

UPPER: Insulated binding posts on ¾" centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side stack-up.
LOWER: Phone Plug, PJ-068/PJ-309*
COLOR: Body, Black. Binding Posts: Black/Red.
*PJ-309 Interchangeable with WE 309.

MODEL 3365 QUANTITY DISC. CODE (A) **NET 6.85**

ADAPTER-BANANA JACKS TO PJ-051* PHONE PLUG



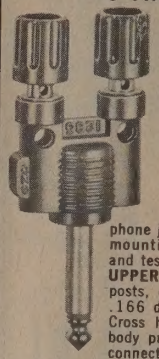


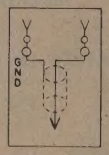
Permits single or double banana plugs to be used with equipment having three circuit phone jacks for .250 dia. phone plugs. Tip connected to hot side of adapter and Ring connected to ground side. Sleeve, no connection.

UPPER: Double banana jack, on ¾" centers. Crossholes (.166 dia.) in body provide side Stack-up connection.
LOWER: Phone Plug, PJ-051*
COLOR: Black
*PJ-051 Interchangeable with WE310

MODEL 2112 QUANTITY DISC. CODE (A) **NET 5.85**

ADAPTER — BINDING POSTS TO PHONE PLUG





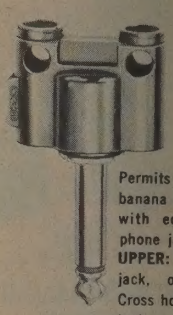
Permits single or double banana plug to be used with equipment having phone jacks. Ideal for rapid mounting of components and test leads.

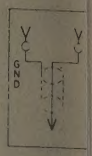
UPPER: Insulated binding posts, on ¾" centers with .166 dia. banana jacks. Cross holes (.166 dia.) in body provide side Stack-Up connections.

LOWER: ¼" dia. phone plug, 1-3/16" long.
COLOR: Body, Black. Binding Posts: Black/Red.

MODEL 1285 NET 4.85 QUANTITY DISC. CODE (A)

ADAPTER — BANANA JAC TO PHONE PLUG





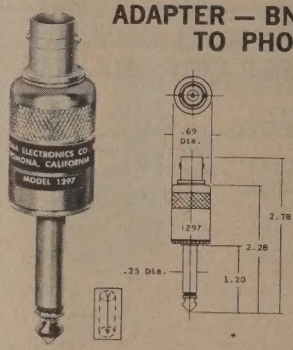
Permits single or dou banana plugs to be u with equipment hav phone jacks.

UPPER: Double ban jack, on ¾" cente Cross holes (.166 dia.) body provide side Sta Up connections.

LOWER: Standard ¼" dia. phone plug, 1-3/16" long.
COLOR: Black.

MODEL 1980 NET 2.8 QUANTITY DISC. CODE (A)

ADAPTER — BNC RECEPTACLE TO PHONE PLUG

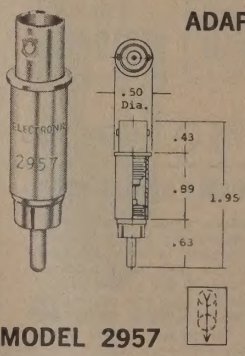


Permits BNC plug to be used wit equipment having standard ¼" dia phone jacks. Readily adapts equip ment to available BNC coaxia cables. All metal construction t insure proper shielding.

UPPER: BNC receptacle, UG1094/U.
LOWER: Standard ¼" dia. phon plug, 1 3/16" Long.

MODEL 1297 QUANTITY DISC. CODE (A) **NET 5.85**

ADAPTER — BNC RECEPTACLE TO PHONO PLUG

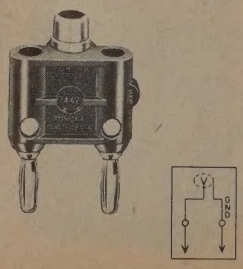


Permits BNC plug to be used with equipment having phono jacks. Readily adapts equipment to available BNC coaxial cables. All metal construction reduces pick-up more than 70 DB. to insure proper shielding.

UPPER: BNC receptacle UG1094/U.
LOWER: Phono plug.

MODEL 2957 QUANTITY DISC. CODE (A) **NET 3.50**

ADAPTER — PHONO JACK TO DOUBLE BANANA PLUG



Permits Phono plug to be used with equipment having banana jacks or binding posts. Quickly converts a cable with a phono plug to a double banana plug.

UPPER: Phono jack.
LOWER: Double Banana plug, on ¾" centers. Cross holes (.166 dia.) in body provide Side Stack-Up connections.
COLOR: Black.

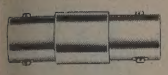
MODEL 1442 QUANTITY DISC. CODE (A) **NET 3.85**

See YELLOW SECTION for Local Offices, Phones

POMONA ELECTRONICS

TEST ADAPTERS

ADAPTER — BNC JACK TO JACK

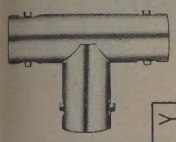


Allows the interconnection of two coaxial cables with BNC plugs.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.

ODEL 3283 — QUANTITY DISC. CODE (A) NET 1.50

ADAPTER — BNC "T" — 3 JACKS

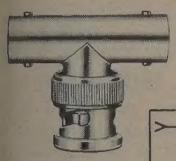


Allows the interconnection of three coaxial cables with BNC plugs.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.

IODEL 3284 — QUANTITY DISC. CODE (A) NET 4.85

ADAPTER — BNC "T" JACK — PLUG — JACK

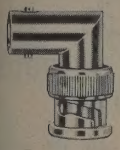


With this adapter, equipment or coaxial cables having a single BNC jack are changed to two BNC jacks.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper female and outer male contact.

MODEL 3285 — QUANTITY DISC. CODE (A) NET 3.25

ADAPTER — RIGHT ANGLE BNC JACK TO BNC PLUG

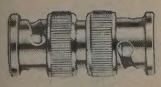


Adapts straight BNC plug to right angle BNC plug.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper female and outer finger contact.
- Gold flashed female and male contact.

MODEL 3534 — QUANTITY DISC. CODE (A) NET 3.25

ADAPTER — BNC PLUG TO PLUG



Allows the interconnection of two coaxial cables with BNC Jacks.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper outer finger contacts.
- Gold flashed male contacts.

MODEL 3533 — QUANTITY DISC. CODE (A) NET 2.95

ADAPTER — BNC JACK TO UHF PLUG

Allows the use of a BNC plug on equipment having a UHF Jack.

FEATURES:
- Non-Tarnish finish.
- Rexolite insulation.
- Gold flashed beryllium copper female contact.
- Gold flashed male contact.

MODEL 3286 — QUANTITY DISC. CODE (A) NET 1.75

ADAPTER — UHF JACK TO BNC PLUG

Allows the use of a UHF Plug on equipment having a BNC Jack.

FEATURES:
- Non-Tarnish finish.
- 50 Ohm impedance.
- Rexolite insulation.
- Gold flashed Phosphor Bronze female UHF and male BNC contacts.

MODEL 3287 — QUANTITY DISC. CODE (A) NET 2.95

ADAPTER — BNC JACK TO TYPE "N" PLUG

Allows the use of a BNC Plug on equipment having a type "N" jack.

FEATURES:
- Non-Tarnish finish.
- Teflon insulation.
- Gold flashed contacts.

MODEL 3288 — QUANTITY DISC. CODE (A) NET 1.95

ADAPTER — TYPE "N" JACK TO BNC PLUG

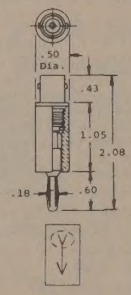
NEW

Allows the use of a Type "N" plug on equipment having a BNC jack.

FEATURES:
- Non-Tarnish finish.
- Teflon insulation.
- Beryllium copper female "N" contact and BNC outer finger contact.
- Gold flashed female "N" and male BNC contact.

MODEL 3535 — QUANTITY DISC. CODE (A) NET 2.95

ADAPTER—BNC RECEPTACLE TO SINGLE BANANA PLUG

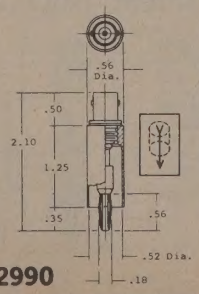


Permits BNC plug to be used with equipment having banana jacks. Inner conductor connected only. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.

UPPER: BNC receptacle, UG1094/U.
LOWER: Single Banana Plug.
COLOR: Black.

MODEL 1894 — QUANTITY DISC. CODE (A) NET 2.50

ADAPTER — BNC RECEPTACLE TO SHIELDED BANANA PLUG



Permits BNC plug to be used with equipment having banana jacks or binding posts. Ideal for use when shielding of single banana jacks is needed. Nickel plated brass shield reduces pick-up more than 70 DB.

UPPER: BNC Receptacle, UG1094/U.
LOWER: Shielded single banana plug.

MODEL 2990 — QUANTITY DISC. CODE (A) NET 2.50

POMONA ELECTRONICS

ISOLATION PLUGS — COMPONENT MOUNTINGS

CREATE passive and active networks, voltage dividers, isolation networks or attenuators with the Split-Terminal isolation plugs described below.

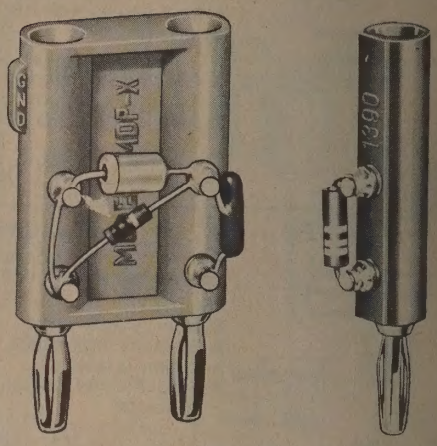
Gold flashed solder turret terminals provide permanent, reliable noise-free connections for component mounting.

Tough thermo-plastic material molded to plug body and connectors insures maximum strength, moisture resistance and excellent insulative properties.

Specifications for MDP-X, 1390, 1837, 1468:

- Fits standard 0.166 dia. banana jack.
- Spring, heat treated beryllium copper alloy 170 per QQ-C-533.
- Plug body, Brass per QQ-B-626 Comp. 22.
- Nickel plated per QQ-N-290, Class 2.
- Contact resistance less than 0.001 ohms per banana plug.

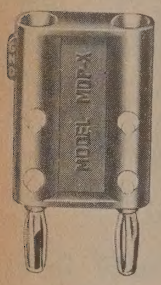
TYPICAL APPLICATION



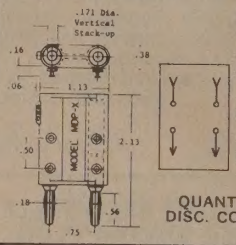
ACTUAL SIZE

MODEL MDP-X **MODEL 1390**

DOUBLE BANANA PLUG, FOUR TERMINAL ISOLATION



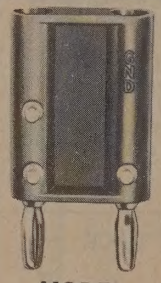
Provides four terminal isolation. Top Stack-Up receptacles isolated from lower plugs. Ideal for insertion of matching networks in laboratory VTVM's, signal generators, etc. Gold flashed solder turret terminals for permanent noise-free connections.



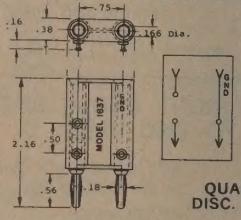
UPPER: Double banana jacks, .166 dia., on ¾" centers.
LOWER: Double banana plug on ¾" centers.
COLOR: Red.

MODEL MDP-X QUANTITY DISC. CODE (A) **NET 3.25**

DOUBLE BANANA PLUG, THRE TERMINAL ISOLATION



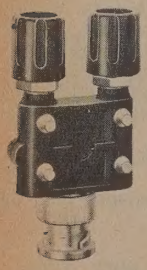
Provides three terminal isolation. Excellent for "L" ar "Pi" networks. Plug and receptacle nickel plated. Go flashed solder turret terminals for permanent noise-fre connections. "Ground" straight feed-thru. Hot sic isolated.

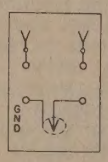


UPPER: Banana jacks, .16 dia. on ¾" centers.
LOWER: Double banana plug on ¾" centers.
COLOR: Blue.

MODEL 1837 QUANTITY DISC. CODE (A) **NET 2.75**

ADAPTER — BINDING POSTS TO BNC PLUG, ISOLATION



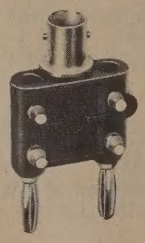


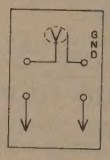
Permits single or double banana plugs to be used with equipment having BNC receptacle. Provides isolation for a four terminal network. Binding posts facilitate connections of test leads or additional components. Gold flashed solder turret terminals provide permanent noise-free connections.

UPPER: Insulated binding posts, on ¾" centers with .166 dia. jacks.
LOWER: BNC plug.
COLOR: Body, Black.
Binding Posts: Black/Red.

MODEL 1469 QUANTITY DISC. CODE (A) **NET 10.85**

ADAPTER — BNC RECEPTACLE TO DOUBL BANANA PLUG, ISOLATION



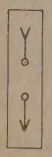


Permits BNC plug to be used with equipmen having banana jacks. Provides isolation for four terminal network. Excellent for matchin pad networks. Gold flashed solder turret termi nals for permanent noise-free connnections.

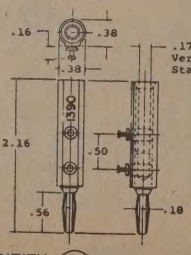
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾" centers
COLOR: Black.

MODEL 1468 QUANTITY DISC. CODE (A) **NET 9.85**

PLUG — SINGLE BANANA, ISOLATION



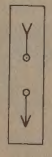
Provides two terminal isolation. Top Stack-Up receptacle is isolated from lower plug to permit addition of series resistors, diodes, etc. Ideal for computers, lab. circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.



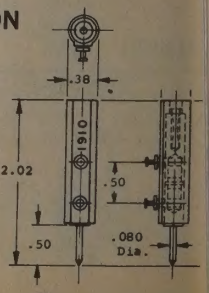
UPPER: Banana jack, .166 dia.
LOWER: Banana plug.
COLORS: Black, Red.

MODEL 1390 (Specify color) QUANTITY DISC. CODE (A) **NET 1.25**

PLUG — PIN TIP, ISOLATION



Pin tip jack is isolated from .080 pin tip plug. Provides for addition of series components. Ideal for use with computer boards, lab circuit designs, etc. Gold flashed solder turret terminals for permanent noise-free connections.



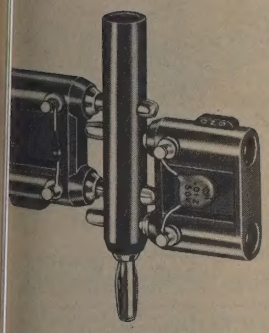
UPPER: Tip jack, beryllium copper, gold flashed; accepts .080 dia. pin.
LOWER: Pin tip, .080 dia. Brass, nickel plated.
COLORS: Black Red.

MODEL 1910 (Specify color) QUANTITY DISC. CODE (A) **NET 1.10**

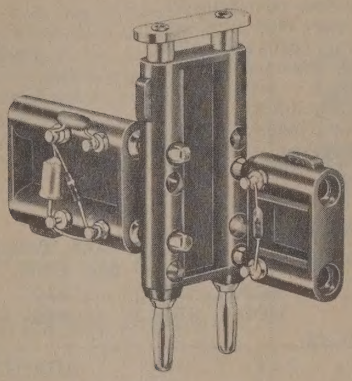
POMONA ELECTRONICS

SERIES-PARALLEL ISOLATION PLUGS CONNECTOR TEST ADAPTERS

SERIES PARALLEL ISOLATION PLUGS



MODEL 3501



MODEL 3502

These plugs enable you to build unlimited combinations of series parallel networks eg., voltage dividers attenuator and etc.

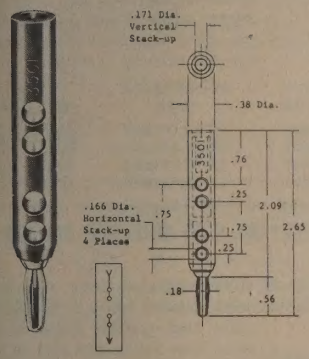
Upper crossholes spaced ¾" on centers from lower crossholes to allow connection of double banana plugs. Double banana plugs may be plugged in from both sides.

FEATURES:

- Fits .166 dia. Banana jacks.
- Spring, heat treated beryllium copper alloy 170 per QQ-C-533.
- Plug bodies and jacks, Brass, nickel plated per QQ-N-290 class 2.
- Tough thermoplastic molded to banana jacks and plug bodies.

NW

SERIES-PARALLEL ISOLATION PLUG



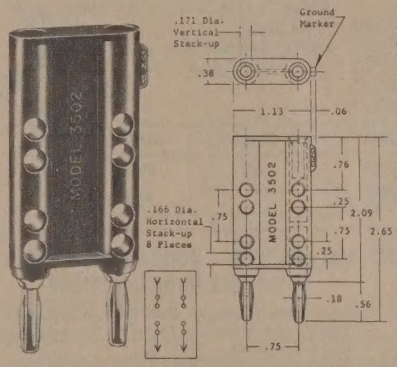
Top banana jack and upper pair of crossholes isolated from lower pair of crossholes and banana plug.

UPPER: Banana jack .166 dia.
CENTER: 4 crossholes .166 dia.
LOWER: Banana Plug.
COLOR: Red.

MODEL 3501 — QUANTITY DISC. CODE (A) NET 1.50

DUAL SERIES-PARALLEL ISOLATION PLUG

NEW



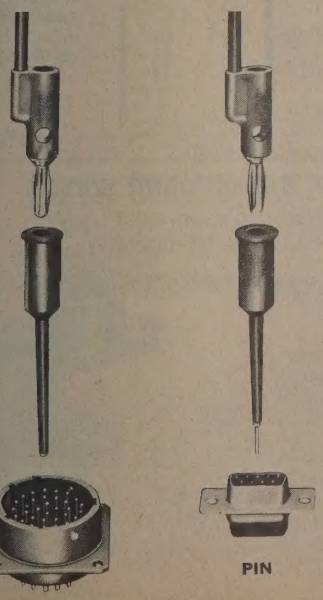
Excellent for building attenuators, voltage dividers, isolation networks, etc. Top banana jacks and upper pair of crossholes isolated from lower pair of crossholes and banana plugs.

UPPER: Double banana jack .166 dia., on ¾" centers.
CENTER: 8 crossholes .166 dia.
LOWER: Double banana plug on ¾" centers.
COLOR: Red.

MODEL 3502 — QUANTITY DISC. CODE (A) NET 3.25

NW

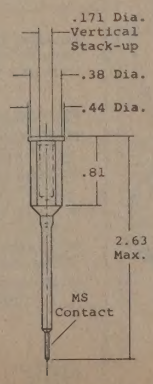
TYPICAL APPLICATION



CONNECTOR TEST ADAPTERS

An ideal test adapter for the rapid testing of the hard to get at contacts of multi-pin MS type connectors such as miniature circular, standard circular and rack and panel. Excellent for testing of continuity, voltage and signal on individual contacts. Test adapter available in Pin and socket contacts sizes of 20, 16 and 12.

- Gold flashed contacts conform to "MS" Dimensions.
- Flexible tip prevents damage to connector contacts if test adapter is accidently bent.
- Flexible tip allows testing of adjacent contacts.
- Fully insulated to prevent accidental shorting.
- Accepts standard banana plug.



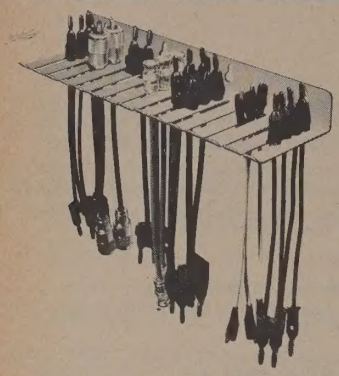
UPPER: Banana jack, .166 dia., brass, nickel plated.
LOWER: "MS" style contact, gold flashed, see tab block.
Color: See tab block.

MODEL	CONTACT SIZE	TYPE	COLOR	NET
3560	20	Socket	Red	1.25
3561	20	Pin	Black	1.25
3562	16	Socket	Red	1.25
3563	16	Pin	Black	1.25
3564	12	Socket	Red	1.75
3565	12	Pin	Black	1.50

QUANTITY DISC. CODE (A)

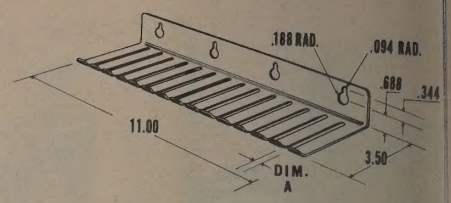
POMONA ELECTRONICS

MISCELLANEOUS ACCESSORIES



TEST LEAD HOLDER

No need to spend time searching for a particular test lead. With this new rack, all of your patch cords and cable assemblies can be conveniently filed for instant selection — within easy reach. Holder mounts quickly on any vertical surface. Test leads are easy to store, easy to remove. Two models to choose from for different size cables.



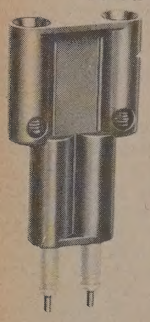
MATERIAL: Cold Rolled Steel.
FINISH: Baked Enamel.

	MAX. CABLE DIA. (DIM. A)	COLOR	NET
MODEL 1508	.210"	Orange	2.95
MODEL 2708	.450"	Blue	2.95

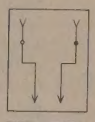
QUANTITY DISC. CODE (A)

SEE PAGE 54 FOR TEST SOCKET ADAPTER HOLDER

ADAPTER — AMP PROGRAM BOARD



Permits single or double banana plugs to be used with AMP program boards having ¼" or ⅜" center to center spacing. Ideal for mounting components. Internal set screws secure leads. Useful in analog computer applications, etc.

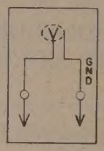


UPPER: Banana jacks, on ¾" centers. Brass, nickel plated.
LOWER: Dual AMP pins, on ¼" or ⅜" centers.

QUANTITY DISC. CODE (A)

MODEL	PIN SPACING	COLOR	NET
1977	⅜"	Black	4.85
1991	¼"	Gray	4.85

ADAPTER — MICRODOT RECEPTACL TO DOUBLE BANANA PLUG



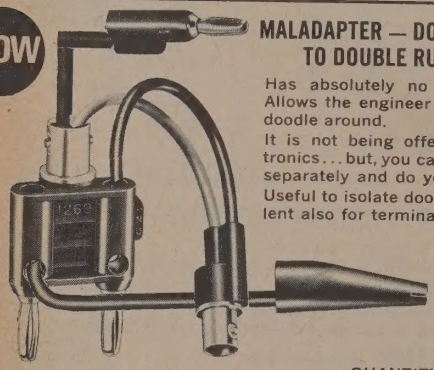
Permits Microdot miniature coaxial plug be used with equipment having banana jack Cross holes in body provide side Stack-U connections.
UPPER: Microdot receptacle, Screw-On Typ
LOWER: Double banana plug, on ¾" cen ters. Cross holes (.166 dia.) in body pro vide side Stack-Up connections.

MODEL	TYPE (Ohms)	BODY COLOR	RECEPTACLE TYPE	NET
1275	50	Green	10-32 thread	6.85
1276	50	Black	Slide-on	9.85
1277	70	Violet	12-32 thread	9.85
1279	93	White	¼-32 thread	9.85

QUANTIT DISC. CODE (A)

WOW

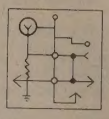
MALADAPTER — DOODAD RECEPTACLE TO DOUBLE RUBE GOLDBERG



Has absolutely no function whatsoever. Allows the engineer to sit at his desk and doodle around.

It is not being offered by Pomona Electronics... but, you can buy our components separately and do your own thing.

Useful to isolate doodling engineers. Excellent also for terminating complete project.

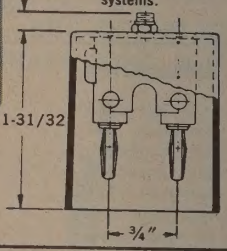


MODEL NG rated X

QUANTITY DISC. CODE ☺ **NET .00**

ADAPTER—MICRODOT RECEPTACLE TO SHIELDED BANANA PLUG

Permits Microdot miniature coaxial plug, 50 ohm, be used with equipment having banana jack bindir posts. Black anodized aluminum shield r duces noise pick-up more than 70 DB. Ide for noise reduction in low level acceleratio systems.



UPPER: Microdot Receptacle, Screw-On Type, Receptacle Thread 10-32.
LOWER: Shielded Double banana plug, on ¾" centers.
COLOR: Black.

QUANTITY DISC. CODE (A)

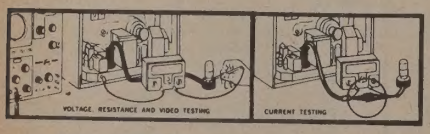
MODEL 1575 **NET 7.85**

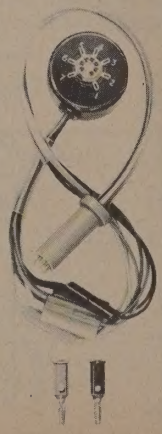
Universal Harness

TESTING ADAPTER

Takes the Trouble out of Trouble Shooting!

TEST SOCKET: Extended test tabs, phosphor bronze contacts, heavy duty molded phenolic base with easy-to-read socket connections. **CURRENT MEASUREMENT CONNECTIONS:** Fully insulated, molded .080 phone tip plugs. **INSULATED PLUG:** Fits either shielded or unshielded tube sockets.





Model 1737 (7 Pin) Model 1738 (8 Pin)
Model 1739 (9 Pin)

QUANTITY DISC. CODE (D) **NET 9.95**

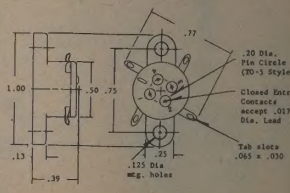
TRANSISTOR BREADBOARD SOCKET

For Transistors with TO-5, and TO-12 Lead Arrangement

Excellent for breadboarding. All connections made on top of breadboard for quick accessible test points.

FEATURES:

- Closed entry contacts accept .016—.019 dia. leads.
- Beryllium copper contacts silver plated.
- Contact numbers on top of socket.
- Socket molded of low loss mica filled phenolic.
- Easily mounted with two #2 screws.

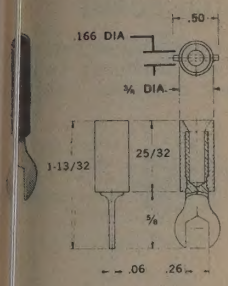


MODEL XS-T4

QUANTITY DISC. CODE (C) **NET .75**

POMONA ELECTRONICS — TEST ACCESSORIES

INSULATED SPADE LUG ADAPTER

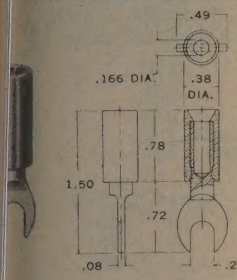


Permits single banana plug to be used with equipment having binding posts. Tough thermoplastic molded to body for maximum reliability and low shock hazard. Spade lug body, one piece machined brass, nickel plated.

UPPER: Banana jack, .166 dia.
LOWER: Spade lug, .26 opening.
COLORS: Black, Red.

MODEL 1614 (Specify color) QUANTITY DISC. CODE (A) **NET .35**

TELLURIUM COPPER INSULATED SPADE LUG ADAPTER

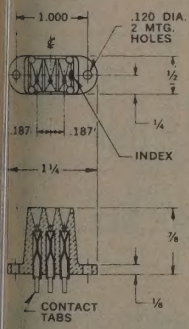


Permits single banana plug to be used with equipment having binding posts. Tough thermoplastic molded to body for maximum reliability and low shock hazard. Spade lug body, one piece machined tellurium copper, gold plated per MIL-G-45204, Type 11, Class 1.

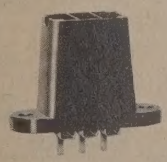
UPPER: Banana jack, .166 dia.
LOWER: Spade lug, .26 opening.
COLORS: Black, Red.

MODEL 2305 (Specify Color) QUANTITY DISC. CODE (A) **NET .95**

TRANSISTOR SOCKET



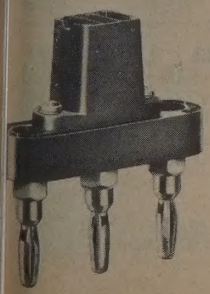
For use in testing 3 lead transistors with .017 dia. leads. Beryllium copper springs for long life. Ideal for aging racks, incoming inspection, life testing, etc.



MODEL TS-187 QUANTITY DISC. CODE (A)

MODEL	TEMP. RANGE	INSULATION RESISTANCE	COLOR	NET
TS187	—100°C To +200°C.	1 x 10^5 Megohms Min. @ 500 V.D.C. @ 40% R.H., 24°C.	Black	1.75

ADAPTER — TRANSISTOR TEST SOCKET

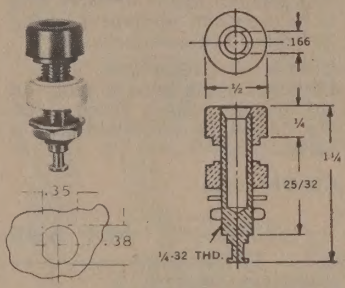


Permits the insertion of transistors with .017 dia. leads into equipment having banana jacks on ¾" centers. Ideal for incoming inspection. Transistor socket contact and banana spring made of beryllium copper. Heavy duty phenolic construction. Insulation resistance: 1 x 10^5 megohms min. @ 500 V.D.C., at 40% R.H., 24°C.

MODEL 1472 QUANTITY DISC. CODE (A) **NET 5.85**

INSULATED BANANA JACK ASSEMBLY SILVER PLATED

Used with standard banana plug. Body, one piece brass, silver plated. Head insulation molded of tough Polycarbonate thermoplastic. Heavy duty shouldered ceramic insulator. Nickel plated lockwasher and hex nut included.



FEATURES:
- Closed entry receptacle, .166 dia.
- Insulator head molded to body
- Mounts in ⅜" dia. hole, panels from .035" to .375" thick
- Solder turret terminal
- Rated: 2,500 WVDC

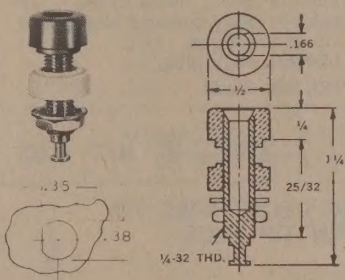
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

STD. PKG. 10 (per color) unassembled.

MODEL 1581 (Specify color) QUANTITY DISC. CODE (A) **NET .25 ea.**

INSULATED BANANA JACK ASSEMBLY GOLD PLATED

Used with standard banana plug. Body, one piece brass, gold plated. Head insulation and panel insulator are molded of tough Polycarbonate thermoplastic. Nickel plated lockwasher and hex nut included.



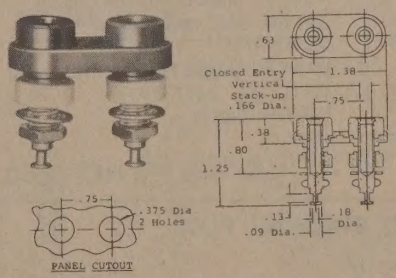
FEATURES:
- Closed entry receptacle, .166 dia.
- Insulator head molded to body
- Mounts in ⅜" dia. hole, panels from .035" to .375" thick
- Solder turret terminal
- Rated: 2,500 WVDC

COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

STD. PKG. 10 (per color) unassembled.

MODEL 2854 (Specify color) QUANTITY DISC. CODE (A) **NET .35 ea.**

INSULATED DOUBLE BANANA JACK ASSEMBLY SILVER PLATED



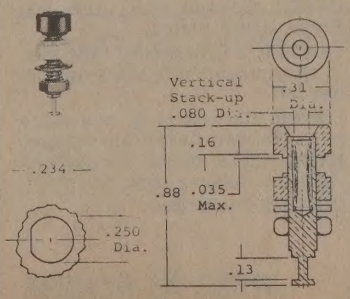
Double banana jack silver plated on ¾" centers with one red and one black jack. Choice of Black or Red plate.

Mounts in panels from .035" to .275" thick.

MODEL 2269 Black Plate
MODEL 2269-2 Red Plate

MODEL 2269 (Specify color) QUANTITY DISC. CODE (A) **NET .75**

.080 DIA. PIN TIP JACK



Miniature jack accepts .080 dia. pin tip plugs. Polycarbonate Thermoplastic insulated head molded directly to gold flashed brass body. Contact spring, heat treated beryllium copper, gold flashed. Nickel plated hex nut and lockwasher included unassembled.

COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

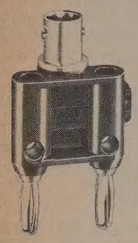
STD. PKG. 10 (per color)

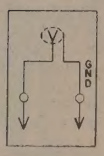
MODEL 3542 (Specify color) QUANTITY DISC. CODE (A) **NET .25 ea.**

POMONA ELECTRONICS

MISCELLANEOUS ACCESSORIES TWINAX JACKS & PATCH CORDS

ADAPTER—MHV RECEPTACLE TO DOUBLE BANANA PLUG





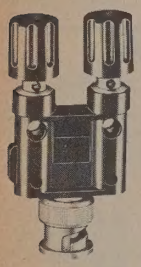
This adapter allows an MHV Plug to be used with equipment having ¾″ spaced banana jacks.

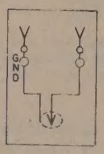
UPPER: MHV receptacle.
LOWER: Double banana plug, on ¾″ centers. Cross holes (.166 Dia.) in body provide side Stack-Up connections.

COLOR: Black.

MODEL 3290 QUANTITY DISC. CODE (A) **NET 5.85**

ADAPTER—BINDING POSTS TO MHV PLUG





This adapter converts a MHV Receptacle to standard ¾″ 5 way binding posts.

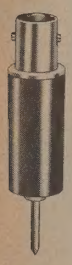
UPPER: Insulated binding posts on ¾″ centers with (.166 dia.) banana jacks. Cross holes (.166 dia.) in body provide side Stack Up connections.
LOWER: MHV plug.

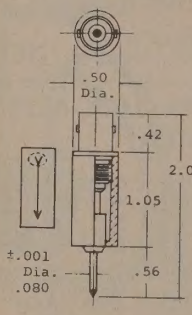
COLOR: Black.

MODEL 3291 QUANTITY DISC. CODE (A) **NET 7.85**

NEW

ADAPTER—BNC RECEPTACLE TO SINGLE PIN TIP PLUG





Permits BNC plug to be used with equipment having .080 dia. pin tip jacks. Inner conductor connected only. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.

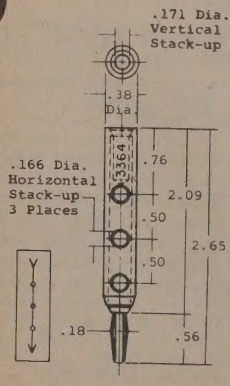
UPPER: BNC receptacle, UG1094/U.
LOWER: Single Pin Tip Plug .080 dia.

COLOR: Black.

MODEL 3415 QUANTITY DISC. CODE (A) **NET 2.50**

NEW

QUAD STACKING PLUG



Features four parallel connectors to the same point. Excellent for use when many test points must be tied together.

UPPER: Banana jack, .166 dia. Brass, nickel plated.
CENTER: 3 Crossholes, .166 dia. in body provide side stack-up connection.
LOWER: Banana plug, one piece heat treated beryllium copper spring, nickel plated, for use with .166 dia. banana jack.

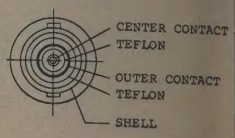
COLORS: Black, Red.

MODEL 3364 (Specify color) QUANTITY DISC. CODE (A) **NET .95**

TWINAX JACKS AND PATCH CORDS

Due to the ever increasing need for low level signal patching and balanced line applications, Pomona introduces Twinax Patch cords and jacks. For use with 2 conductor shielded cable.

These connectors feature a concentric design with a center contact, outer contact and outer shell (see dwg.). This concentric design does not require matching of halves such as the Polarized stepped insulator connectors.



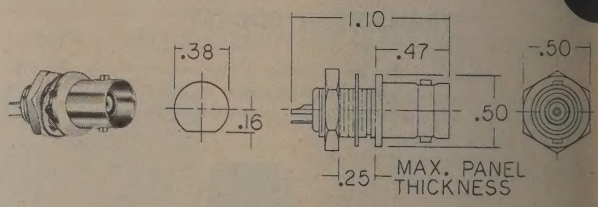
MATERIAL:
- Bodies and Fittings: Brass per QQ-B-626 Comp. 22 ½ hard.
- Insulators: Teflon per MIL-P-19468.
- Center Contacts:
  Female — Beryllium copper per QQ-C-530 Cond. H.
  Male — Brass per QQ-B-626, Comp. 22 ½ hard.
- Outer Contacts: Beryllium copper per QQ-C-530 Cond. H.

FINISH:
- Bodies and Fittings: Non-Tarnish.
- Center Contacts: Gold over copper plate.
- Outer Contacts: Gold over copper plate.

RATING:
- 500 VRMS

NEW

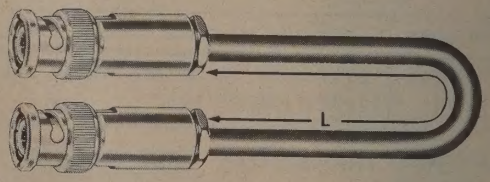
BULKHEAD RECEPTACLE



MODEL 3580 QUANTITY DISC. CODE (A) **NET 4.50**

NEW

TWINAX CABLE PLUG BOTH ENDS



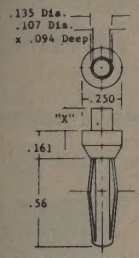
CABLE DESCRIPTION:
- 2 Conductor shielded.
- Conductors—22 AWG (16 x 34) with polyethylene insulation
- Shield — Tinned copper, 87% coverage.
- Jacket — Gray vinyl, .231″ O.D.
- Capacitance—Between conductors, 18 Pf/ft, nominal. Between one conductor and remaining conductor connected to shield, 33 Pf/ft, nominal.

MODEL	LENGTH	NET
3581-J-18	18″	14.85
3581-J-24	24″	14.85
3581-J-36	36″	14.85
3581-J-48	48″	14.85
3581-J-60	60″	14.85

QUANTITY DISC. CODE (B)

POMONA ELECTRONICS

STANDARD AND MINIATURE BANANA PLUGS



RIVET TYPE BANANA PLUG

Excellent for riveting to panels or boards. Used with standard .166 dia. banana jacks.

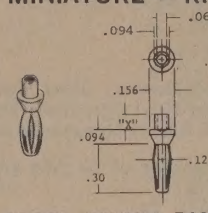
- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Jack body, Brass Per QQ-B-626 comp. 22.
- Plating, Nickel per QQ-N-290, class 2.
- Rated, 15A. Cont., 30A. Int.

(Swaging Tool No. 3518 NET 9.50)

MODEL	"X" DIM.	PANEL
3257	.094	1/16"
3258	.125	3/32"
3259	.156	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .22 ea.



MINIATURE — RIVET TYPE BANANA PLUG

Excellent for riveting to panels or boards. Used with miniature .104 dia. banana jacks.

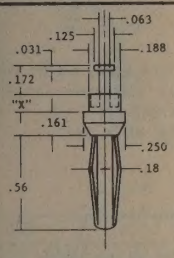
- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Plug body, Brass per QQ-B-626 comp. 22.
- Plating, Gold flashed per MIL-G-45204 Type II (.00002/.00003).
- Rated, 5A. Cont., 10A. Int.

(Swaging Tool No. 3520 NET 9.50)

MODEL	"X" DIM.	PANEL
3268	.094	1/16"
3271	.125	3/32"
3272	.156	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .22 ea.



RIVET TYPE BANANA PLUG WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires. Used with standard .166 dia. banana jacks.

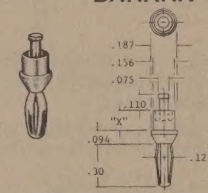
- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Jack body, Brass Per QQ-B-626 comp. 22.
- Plating, Nickel per QQ-N-290, class 2.
- Rated, 15A. Cont., 30A. Int.

(Swaging Tool No. 3519 NET 9.50)

MODEL	"X" DIM.	PANEL
3260	.105	1/16"
3261	.135	3/32"
3262	.165	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .25 ea.



MINIATURE — RIVET TYPE BANANA PLUG WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires. Used with miniature .104 dia. banana jacks.

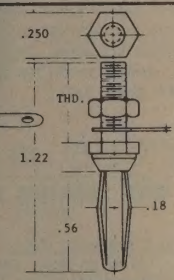
- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Plug body, Brass per QQ-B-626 comp. 22.
- Plating, Gold flashed per MIL-G-45204 Type II (.00002/.00003).
- Rated, 5A. Cont., 10A. Int.

(Swaging Tool No. 3521 NET 9.50)

MODEL	"X" DIM.	PANEL
3273	.105	1/16"
3274	.135	3/32"
3275	.165	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .29 ea.



BANANA PLUG WITH THREADED STUD

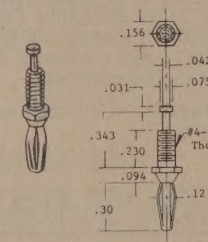
Threaded stud for rapid mounting. Used with standard .166 dia. banana jacks. Furnished with hex nut and solder lug.

- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Plug body, Hex brass per QQ-B-626 comp. 22.
- Plating, Nickel per QQ-N-290, class 2.
- Rated, 15A. Cont., 30A. Int.

Standard Package 10
Unassembled

MODEL	THREAD
3263	6-32 x 1/2"
3264	8-32 x 1/2"

QUANTITY DISC. CODE (A) NET .29 ea.



MINIATURE — BANANA PLUG WITH THREADED STUD

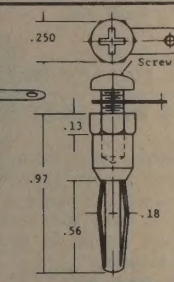
Threaded stud for rapid mounting. Solder turret for attachment of wires. Used with .104 dia. miniature banana jacks.

- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Plug body, Brass per QQ-B-626 comp. 22.
- Plating, Gold flashed per MIL-G-45204 Type II (.00002/.00003).
- Rated, 5A. Cont., 10A. Int.

Standard Package 10

MODEL 3276

QUANTITY DISC. CODE (A) NET .25 ea.



BANANA PLUG WITH SCREW

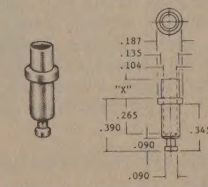
Mounts to various size panels. Used with standard .166 dia. banana jacks. Furnished with screw and solder lug.

- Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.
- Plug body, Hex brass per QQ-B-626 comp. 22.
- Plating, Nickel per QQ-N-290, class 2.
- Rated, 15A. Cont., 30A. Int.

Standard Package 10
Unassembled

MODEL	SCREW
3265	6-32 x 1/4"
3266	8-32 x 1/4"

QUANTITY DISC. CODE (A) NET .29 ea.



MINIATURE — RIVET TYPE BANANA JACK WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires. .104 dia. jack accepts miniature banana plug.

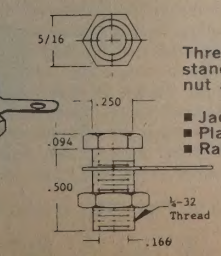
- Jack body, Brass per QQ-B-626 comp. 22.
- Plating, Gold flashed per MIL-G-45204 Type II (.00002/.00003).
- Rated, 5A. Cont., 10A. Int.

(Swaging Tool No. 3522 NET 9.50)

MODEL	"X" DIM.	PANEL
3277	.105	1/16"
3278	.135	3/32"
3279	.165	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .15 ea.



UNINSULATED—BANANA JACK

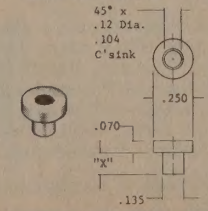
Threaded for rapid mounting. Used with standard banana plugs. Furnished with hex nut and solder lug.

- Jack body, Brass per QQ-B-626 comp. 22.
- Plating, Nickel per QQ-N-290, class 2.
- Rated, 15A. Cont., 30A. Int.

Standard Package 10
Unassembled

MODEL 3267

QUANTITY DISC. CODE (A) NET .15 ea.



MINIATURE — RIVET TYPE BANANA JACK

Excellent for riveting to panels or boards. .104 dia. jack accepts miniature banana plug.

- Jack body, Brass per QQ-B-626 comp. 22.
- Plating, Gold flashed per MIL-G-45204 Type II (.00002/.00003).
- Rated, 5A. Cont., 10A. Int.

(Swaging Tool No. 3523 NET 9.50)

MODEL	"X" DIM.	PANEL
3280	.105	1/16"
3281	.135	3/32"
3282	.165	1/8"

Std. Pkg. 10

QUANTITY DISC. CODE (A) NET .10 ea.

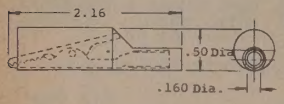
ALL PRODUCTS SHOWN ACTUAL SIZE

POMONA ELECTRONICS

TEST CLIPS ½" SPACED PIN TIP PLUGS

INSULATED ALLIGATOR CLIP TO BANANA JACK

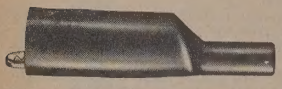
Clip, No. 60 Mueller, Steel, Cadmium Plated Vinyl insulators, No. 62 (5 Red, 5 Black). Unassembled.



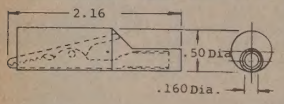
Standard Package of 10 clips and 10 insulators.

MODEL 2240 QUANTITY DISC. CODE (A) **NET .20 ea.**

GOLD PLATED—INSULATED ALLIGATOR CLIP TO BANANA JACK



Alligator Clip, solid Copper, Gold plated. Vinyl insulators (5 Red, 5 Black). Unassembled.

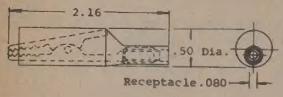


Standard Package of 10 clips and 10 insulators.

MODEL 3289 QUANTITY DISC. CODE (A) **NET .50 ea.**

INSULATED ALLIGATOR CLIP TO PIN TIP JACK

Alligator Clip, Steel, Cadmium Plated. Tip Jack, Beryllium Copper, Gold Flashed, accepts .080 dia. Pin tip plug. Vinyl insulators (5 Red, 5 Black). Unassembled.



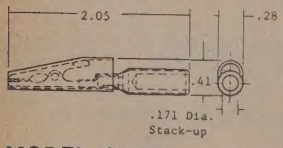
Standard Package of 10 clips and 10 insulators.

MODEL 1437 QUANTITY DISC. CODE (A) **NET .50 ea.**

NEW

INSULATED MINIGATOR CLIP TO BANANA JACK

This minigator clip accepts a standard banana plug in the rear. Clip is steel, cadmium plated. Banana jack, brass, nickel plated. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators (5 red, 5 black). Unassembled.



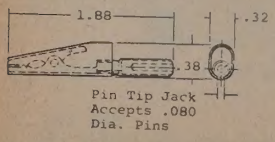
Standard Package of 10 clips and 10 insulators.

MODEL 3448 QUANTITY DISC. CODE (A) **NET .50 ea.**

NEW

INSULATED MINIGATOR CLIP TO PIN TIP JACK

This Minigator clip accepts a .080 dia. pin tip plug. Clip is steel, cadmium plated. Tip jack, Beryllium copper, gold flashed. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators (5 red, 5 black). Unassembled.



Standard Package of 10 clips and 10 insulators.

MODEL 3491 QUANTITY DISC. CODE (A) **NET .50 ea.**

½" SPACED MINIATURE PIN TIP PLUGS

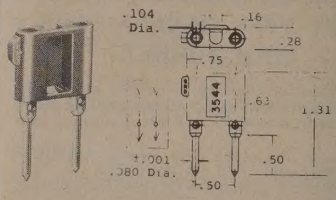
FEATURES:

- Fits .080 dia. pin tip jacks.
- Plug Bodies brass, Gold flashed per MIL-G-45204 Type (.00002/.00003).
- Stack-up spring, beryllium copper alloy 170 per QQ-C-53 Gold flashed.
- Tough Thermoplastic molded directly to plug bodies.

RATINGS:

- Operating Temp.: —25°C to +85°C.
- Working Voltage: 2500 VDC.
- Current: 5 amps cont., 10 amps. int.

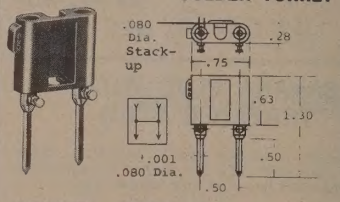
MINIATURE—DOUBLE PIN TIP PLUG WITH SET SCREWS



Miniature double pin tip plug on ½ centers. Set screws secure cable component leads.
COLORS: Black, Red.

MODEL 3544 (Specify color) QUANTITY DISC. CODE (A) **NET .75**

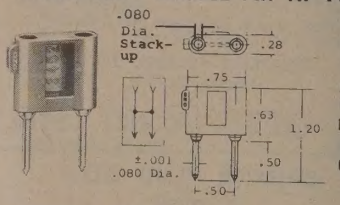
MINIATURE—DOUBLE PIN TIP PLUG WITH SOLDER TURRET TERMINALS



Miniature double Pin Tip plug on ½ centers. Gold flashed solder turret terminals for permanent noise-free connection of cables. .080 Tip jack on ½" centers permit top stacking.
COLORS: Black, Red.

MODEL 3545 (Specify color) QUANTITY DISC. CODE (A) **NET .95**

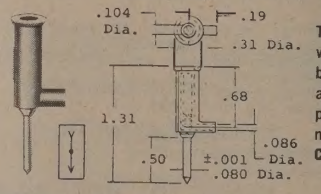
MINIATURE—DOUBLE PIN TIP PLUG WITH SHORTING BAR



Ideal as a connecting link for use with ½" spaced pin tip jacks. .080 dia. Tip jacks on ½" center permit top stacking. Banana plugs internally solder-bonded with #20 AWG wire. "Shorting Bar" stamped on plug.
COLORS: Black, Red.

MODEL 3452 (Specify color) QUANTITY DISC. CODE (A) **NET 1.25**

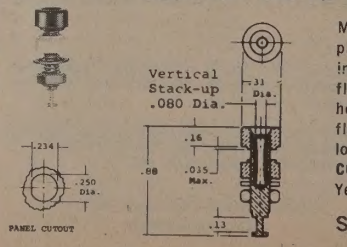
MINIATURE—SOLDERLESS PIN TIP PLUG WITH SAFETY COLLAR



This integral collar insulates exposed wire leads and acts as a strain relief by preventing the flexing of the lead at the set screw. Wire firmly held in place with internal set screw, eliminating soldering.
COLORS: Black, Red.

MODEL 3548 (Specify color) QUANTITY DISC. CODE (A) **NET .50**

MINIATURE—PIN TIP JACK .080 DIA.



Miniature jack accepts .080 dia. pin tip plugs. Polycarbonate Thermoplastic insulated head molded directly to gold flashed brass body. Contact spring, heat treated beryllium copper, gold flashed. Nickel plated hex nut and lockwasher included unassembled.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

Std. Pkg. (10 per color).

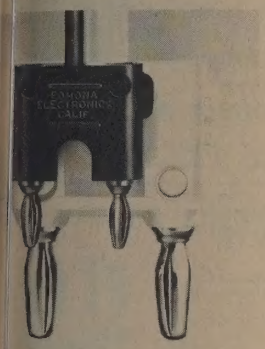
MODEL 3542 (Specify color) QUANTITY DISC. CODE (A) **NET .25 ea.**

POMONA ELECTRONICS

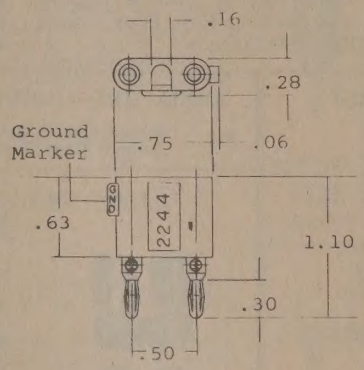
½" SPACED MINIATURE BANANA PLUGS AND ACCESSORIES

ONE THIRD SMALLER Miniature Banana Plugs, a state-of-the-art development for the ever increasing demand for miniaturized test equipment.

Banana plug springs are precision formed of one-piece beryllium copper, heat treated for maximum life and low contact resistance. Tough thermoplastic molded to plug bodies.



ACTUAL SIZE

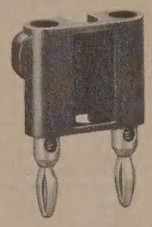


SPECIFICATIONS:

- Fits 0.104 dia. miniature banana jacks.
- Plug body brass, per QQ-B-626, Comp. #22.
- Gold flashed per MIL-G-45204 Type 11 (.00002/.00003).
- Spring, beryllium copper alloy 170 per QQ-C-533.

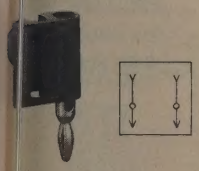
RATINGS:

- Operating temp.: —25°C to +85°C.
- Working voltage: 2500 VDC.
- Current: 5 amps cont., 10 amps. int.



ACTUAL SIZE

MINIATURE—DOUBLE BANANA PLUG WITH SET SCREWS



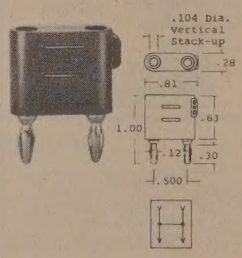
Miniature double banana plug on ½" centers. Internal set screws to secure cable or component leads. .104 dia. banana jacks on ½" centers permit top Stack-Up for multiple connections.

COLORS: Black, Red.

MODEL 2244 Black
MODEL 2244-2 Red

MODEL 2244 QUANTITY DISC. CODE (A) **NET .85**

MINIATURE—DOUBLE BANANA PLUG WITH SHORTING BAR



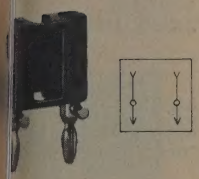
Ideal as a connecting link for use with ½" spaced banana jacks. .104 dia. banana jacks on ½" centers permit top Stack-Up for multiple connections. Banana plugs internally solder-bonded with #18 AWG wire. "Shorting Bar" stamped on plug.

COLORS: Black, Red.

MODEL 2035 Black
MODEL 2035-2 Red

MODEL 2035 QUANTITY DISC. CODE (A) **NET 1.25**

MINIATURE—DOUBLE BANANA PLUG WITH SOLDER TURRET TERMINALS



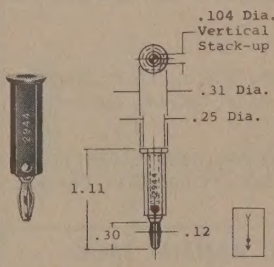
Miniature double banana plug on ½" centers. Solder turret terminals for permanent noise-free connections of cables or components. .104 dia. banana jacks on ½" centers permit top Stack-Up for multiple connections.

COLORS: Black, Red

MODEL 2245 Black
MODEL 2245-2 Red

MODEL 2245 QUANTITY DISC. CODE (A) **NET 1.05**

MINIATURE SOLDERLESS BANANA PLUG-STACK-UP



Miniature banana plug for rapid assembly of test leads. For use with miniature binding posts or banana jacks. Wire firmly held in place with internal set screw, eliminating soldering.

UPPER: Miniature banana jack .104 dia. Brass, gold flashed.

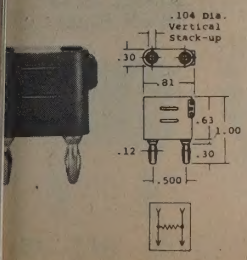
LOWER: Miniature banana plug, one piece gold flashed beryllium copper spring for use with .104 dia. miniature banana jacks.

COLORS: Black, Red.

MODEL 2944-0 Black
MODEL 2944-2 Red

MODEL 2944 QUANTITY DISC. CODE (A) **NET .50**

MINIATURE—DOUBLE BANANA PLUG WITH MOLDED PRECISION RESISTOR

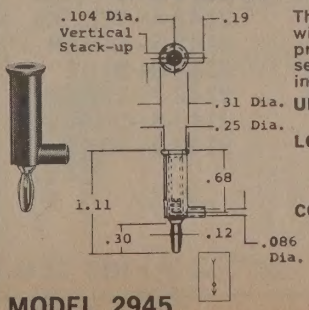


Ideal where rapid interchange of resistance values is required. Deposited carbon 1% ¼ watt, molded internally. .104 dia. banana jacks on ½" centers permit top Stack-Up for multiple connections. Resistance value stamped on plug.

COLOR: Blue (OHMS) 50 10K 600 50K 1K 100K

MODEL 2246 (Specify Value) QUANTITY DISC. CODE (A) **NET 2.95**

MINIATURE SOLDERLESS BANANA PLUG WITH SAFETY COLLAR-STACK-UP



This integral collar insulates exposed wire leads and acts as a strain relief by preventing the flexing of the lead at the set screw. Wire firmly held in place with internal set screw, eliminating soldering.

UPPER: Miniature banana jack. .104 dia. Brass, gold flashed.

LOWER: Miniature banana plug, one piece gold flashed beryllium copper spring for use with .104 dia. miniature banana jacks.

COLORS: Black, Red.

MODEL 2945-0 Black
MODEL 2945-2 Red

MODEL 2945 QUANTITY DISC. CODE (A) **NET .50**

POMONA ELECTRONICS

MINIATURE BINDING POSTS MINIATURE BANANA JACKS

MINIATURE BINDING POSTS

A complete 5-way Binding Post in "Miniature." Captive Thumb Nut and Binding Post Body, machined brass; gold or nickel plate Thumb Nut and Mounting Base molded of High Impact Polycarbonate Thermoplastic. Heavy Duty Shouldered Ceramic Insulato Lockwasher and hex nut included, unassembled, nickel plated.

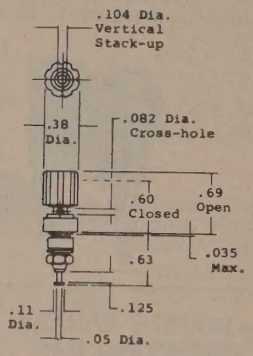
SPECIFICATIONS:

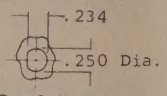
■ 5-way Binding Post ■ Mounts ¼" dia. "D" hole ■ Panels up to 3/16" thick ■ Captive Thumb Nut ■ .082 dia. Cross hole ■ Thumb Nut and Binding Post Body — Gold Flashed per MIL-G-45204 Type 2 OR Nickel Plated per QQ-N-290 Class 2.

RATINGS:

■ Operating Temp.: —65°C to +150°
■ Working Voltage: 1500 VDC.
■ Current: 5 Amps Cont., 10 Amps In

MINIATURE—INSULATED BINDING POST





Panel Cutout

QUANTITY DISC. CODE (A)

MODEL 2382-* *(Specify Color) Gold Flashed Assembly **NET .90**

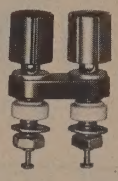
MODEL 2439-* *(Specify Color) Nickel Plated Assembly **NET .75**

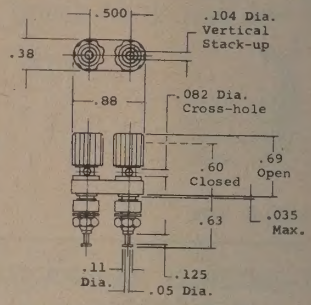
(*) COLORS

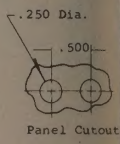
-0 Black	-5 Green
-1 Brown	-6 Blue
-2 Red	-7 Violet
-3 Orange	-8 Gray
-4 Yellow	-9 White

MINIATURE—INSULATED DOUBLE BINDING POST

Double binding post body on ½" centers with one Red and one Black binding post. Choice of Black or Red plate.







Panel Cutout

MODEL 2383-* *(Specify Color) Gold Flashed Assembly **NET 1.80**

MODEL 2440-* *(Specify Color) Nickel Plated Assembly **NET 1.50**

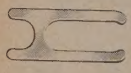
QUANTITY DISC. CODE (A)

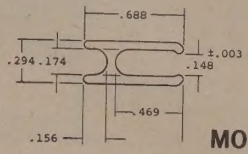
(*) COLORS

-0 Black Plate
-2 Red Plate

NEW

BINDING POSTS SHORTING LINK





Shorting Link for miniature Binding Posts on ½" centers. A snap-on feature holds Link on post when short not needed. **MATERIAL:** Brass .031 thick. **FINISH:** Nickel Plated per QQ-N-290 class 2 or Gold Flashed per MIL-G-45204 Type 2.

QUANTITY DISC. CODE (A)

Std. Pkg. 10

MODEL 3478 (Gold Flashed) **NET .22 ea.** **MODEL 3479** (Nickel Plated) **NET .15 ea.**

MINIATURE BANANA JACKS

Developed by the need for miniaturization of test equipment and test panels. The new generation of test jacks. Built to Pomona Electronics high standard of quality.

Wide selection of colors available.

Molded of High Impact Polycarbonate Thermoplastic. Banana Jack body, one piece machined brass, gold flashed. Heavy duty shouldered ceramic insulator. Lockwasher and hex nut included, unassembled, nickel plated.

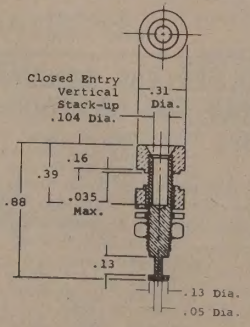
SPECIFICATIONS:

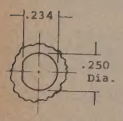
■ Closed entry jack .104 dia. ■ Insulator head molded to body. ■ Mounts in ¼" dia. hole. Model 2142, Panels up to ¼" thick. Model 2143, Panels up to 3/16" thick. ■ Solder turret terminal.

RATINGS:

■ Operating Temp.: —65°C to +150°C.
■ Working Voltage: 1500 VDC.
■ Current: 5 Amps Cont., 10 Amps Int.

MINIATURE—INSULATED BANANA JACK





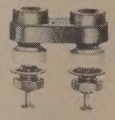
PANEL CUTOUT

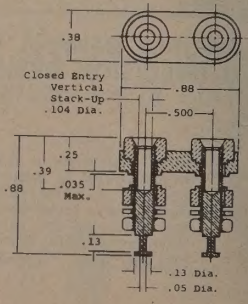
2142 —BLACK
2142-1—BROWN
2142-2—RED
2142-3—ORANGE
2142-4—YELLOW
2142-5—GREEN
2142-6—BLUE
2142-7—VIOLET
2142-8—GRAY
2142-9—WHITE

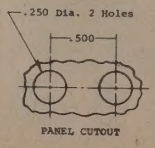
MODEL 2142 Standard Package: 10 (per color) QUANTITY DISC. CODE (A) **NET .25 ea.**

MINIATURE—INSULATED DOUBLE BANANA JACK

Double banana jack on ½" centers with one red and one black jack. Choice of Black or Red plate.







PANEL CUTOUT

MODEL 2143 (Black Plate)

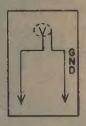
MODEL 2143-2 (Red Plate)

MODEL 2143 QUANTITY DISC. CODE (A) **NET .75**

POMONA ELECTRONICS

½" SPACED MINIATURE BANANA PLUG ADAPTERS AND ACCESSORIES

ADAPTER — BNC RECEPTACLE TO MINIATURE DOUBLE BANANA PLUG



This adapter allows a BNC plug to be used with equipment having ½" spaced miniature .104 dia. banana jacks. Excellent for adapting test equipment to standard coaxial cables.

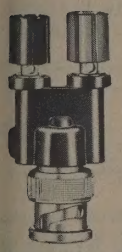
UPPER: BNC receptacle, UG 1094/U.

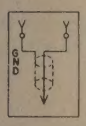
LOWER: Miniature double banana plug on ½" centers, for use with .104 dia. miniature jacks. Gold flashed one piece heat treated beryllium copper springs.

COLOR: Black.

MODEL 3269 — QUANTITY DISC. CODE (A) **NET 3.25**

ADAPTER — MINIATURE BINDING POSTS TO BNC PLUG





This adapter converts a BNC receptacle to miniature ½" spaced 5 way binding posts.

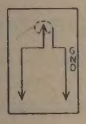
UPPER: Insulated, gold flashed miniature 5 way binding posts on ½" centers with .104 dia. miniature banana jacks.

LOWER: BNC plug.

COLOR: Black.

MODEL 3296 — QUANTITY DISC. CODE (A) **NET 4.85**

ADAPTER — BNC PLUG TO MINIATURE DOUBLE BANANA PLUG



Allows a BNC cable jack to be used on equipment having ½" spaced .104 dia. banana jacks.

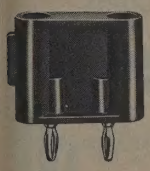
UPPER: BNC plug.

LOWER: Miniature double banana plug on ½" centers, for use with .104 dia. miniature jacks. Gold flashed one piece heat treated beryllium copper springs.

COLOR: Black.

MODEL 3270 — QUANTITY DISC. CODE (A) **NET 4.25**

ADAPTER — STANDARD DOUBLE BANANA JACK TO MINIATURE DOUBLE BANANA PLUG



Permits standard double banana plug on ¾" centers to be used with equipment having miniature double banana jacks on ½" centers.

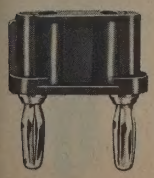
UPPER: Standard double banana jacks .166 dia. on ¾" centers. Brass, nickel plated.

LOWER: Miniature double banana plug on ½" centers. One piece nickel plated beryllium copper spring for use with .104 dia. miniature banana jacks.

COLOR: Black.

MODEL 2952 — QUANTITY DISC. CODE (A) **NET 1.25**

ADAPTER — MINIATURE DOUBLE BANANA JACK TO STANDARD DOUBLE BANANA PLUG



Permits miniature double banana plug on ½" centers to be used with equipment having standard double banana jacks on ¾" centers.

UPPER: Miniature double banana jacks, .104 dia. on ½" centers. Brass, nickel plated.

LOWER: Standard double banana plug on ¾" centers. One piece nickel plated beryllium copper spring for use with .166 dia. standard banana jacks.

COLOR: Black.

MODEL 2943 — QUANTITY DISC. CODE (A) **NET 1.25**

ADAPTER—STANDARD BANANA JACK TO MINIATURE BANANA PLUG

Permits standard banana plug to be used with equipment having miniature banana jacks.

UPPER: Banana jack, .166 dia.; Brass, nickel plated.

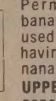
LOWER: Miniature banana plug, one piece nickel plated beryllium copper spring for use with .104 dia. miniature banana jacks.

COLORS: Black, Red.

MODEL 2138 — 2138-0 Black, 2138-2 Red — **NET .50**

QUANTITY DISC. CODE (A)

ADAPTER—MINIATURE BANANA JACK TO STANDARD BANANA PLUG



Permits miniature banana plugs to be used with equipment having standard banana jacks.

UPPER: Miniature banana jack, .104 dia.; Brass, nickel plated.

LOWER: Standard banana plug, one piece nickel plated beryllium copper spring for use with .166 dia. banana jacks.

COLORS: Black, Red.

MODEL 2477 — 2477-0 Black, 2477-2 Red — **NET .50**

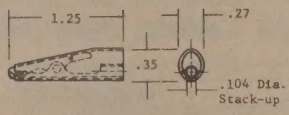
QUANTITY DISC. CODE (A)

MINIATURE — METAL SHORTING BAR

Low profile, gold flashed, brass shorting bar. Miniature banana plugs on ½" centers swaged to 1/16" thick brass bar. Center hole accepts #4-40 screw for easy removal. Current rating 5 Amps. cont., 10 Amps INT.

MODEL 3030 — QUANTITY DISC. CODE (A) **NET .85**

INSULATED MINIGATOR CLIP TO MINIATURE BANANA JACK

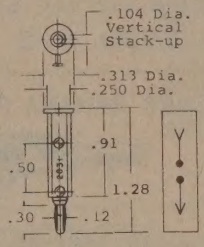


This Minigator clip accepts a miniature banana plug in the rear. Clip is steel, cadmium plated. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators (5 red, 5 black). Unassembled.

Standard Package of 10 clips and 10 insulators.

MODEL 3217 — QUANTITY DISC. CODE (A) **NET .20 ea.**

MINIATURE — SINGLE BANANA PLUG ISOLATION



Provides two terminal isolation. Allows for addition of series components. Excellent for circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.

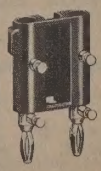
UPPER: Miniature banana jack, .104 dia. Brass, gold flashed.

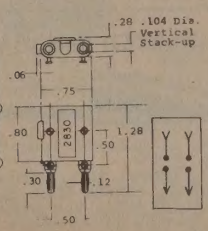
LOWER: Miniature banana plug, one piece gold flashed beryllium copper spring.

COLOR: Black, Red.

MODEL 2831 (specify color) — QUANTITY DISC. CODE (A) **NET 1.50**

MINIATURE — DOUBLE BANANA PLUG — 4 TERMINAL ISOLATION





Provides four terminal isolation. Top Stack-up receptacles isolated from lower plugs. Ideal for insertion of matching networks in computer boards, circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Miniature double banana jack, .104 dia. Brass, gold flashed.

LOWER: Miniature double banana plug on ½" centers. Gold flashed one piece beryllium copper spring.

COLOR: Red.

MODEL 2830 — QUANTITY DISC. CODE (A) **NET 3.85**

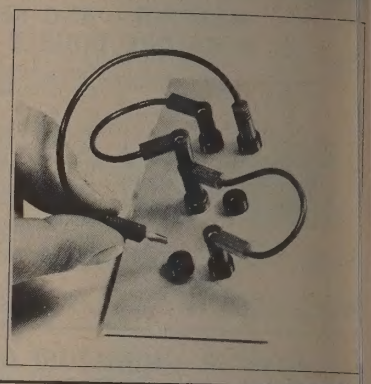
See YELLOW SECTION for Local Offices, Phones

POMONA ELECTRONICS

MINIATURE PATCH CORDS

Miniature patch cords for use with .104 dia. miniature banana jacks. Excellent for miniaturization of test equipment and high density packaging for patch systems.

Banana plug springs precision formed of one piece beryllium copper, heat treated for maximum life and low contact resistance. Tough thermoplastic molded to plug body and wire.



FEATURES:

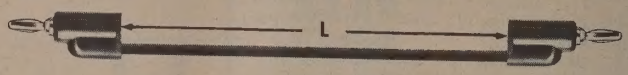
■ Fits .104 dia. miniature banana jacks ■ Plug body brass, per QQ-B-626, Comp. #22 ■ Gold flashed per MIL-G-45204 Type II (.00002/.00003) ■ Spring, one piece heat treated beryllium copper, alloy 170 per QQ-C-533.

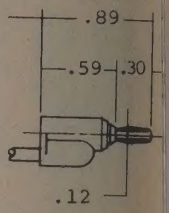
SPECIFICATIONS:

■ WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation .087" O.D.
■ RATED: 5 A. Cont., 10 A. Int., 5,000 V.D.C. ■ OPERATING TEMP.: —0°C to +105 C°

MINIATURE—BANANA PLUG STACK-UP PATCH CORD

MODEL	LENGTH	NET
1081-4	4"	1.50
1081-8	8"	1.50
1081-12	12"	1.50
1081-18	18"	1.50
1081-24	24"	1.50
1081-36	36"	1.50
1081-48	48"	1.55
1081-60	60"	1.60



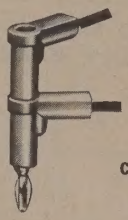


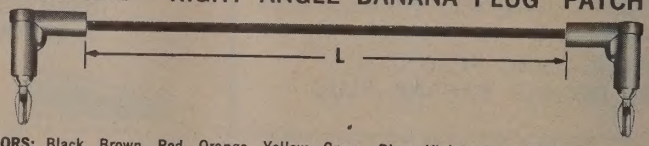
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

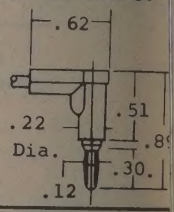
MODEL 1081 (Specify Color) ★QUANTITY DISC. CODE (A)

MINIATURE— RIGHT ANGLE BANANA PLUG PATCH CORD STACK-UP

MODEL	LENGTH	NET
2860-4	4"	1.50
2860-8	8"	1.50
2860-12	12"	1.50
2860-18	18"	1.50
2860-24	24"	1.50
2860-36	36"	1.50
2860-48	48"	1.55
2860-60	60"	1.60





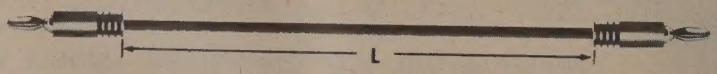


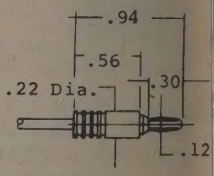
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL 2860 (Specify Color) ★QUANTITY DISC. CODE (A)

MINIATURE—BANANA PLUG PATCH CORD

MODEL	LENGTH	NET
2842-4	4"	1.00
2842-8	8"	1.00
2842-12	12"	1.00
2842-18	18"	1.00
2842-24	24"	1.00
2842-36	36"	1.00
2842-48	48"	1.05
2842-60	60"	1.10



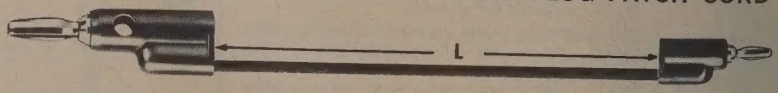


COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL 2842 (Specify Color) ★QUANTITY DISC. CODE (A)

STANDARD BANANA PLUG TO MINIATURE BANANA PLUG PATCH CORD

MODEL	LENGTH	NET
3014-4	4"	1.50
3014-8	8"	1.50
3014-12	12"	1.50
3014-18	18"	1.50
3014-24	24"	1.50
3014-36	36"	1.50
3014-48	48"	1.55
3014-60	60"	1.60



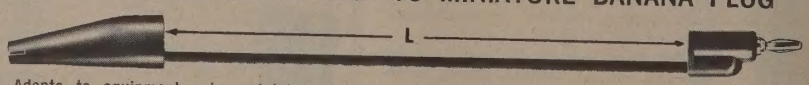
A patch cord for rapid interconnection of equipment having standard and miniature banana jacks. Both plugs have a stack-up feature.
STANDARD BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 20 AWG, Strand. 41 x 36 T.C. extra flexible polyvinyl insulation .087" O.D.

MINIATURE BANANA PLUG: Spring, one piece beryllium copper, heat treated, gold flashed. Tough thermoplastic molded to plug body and wire.
RATED: 5 A. Cont., 10 A Int. 5,000 W.V.D.C.
OPERATING TEMP.: —25° C to +105° C.
COLORS: Black, Red.

MODEL 3014 (Specify Color) ★QUANTITY DISC. CODE (A)

INSULATED MINIGATOR CLIP TO MINIATURE BANANA PLUG

MODEL	LENGTH	NET
3222-4	4"	1.00
3222-8	8"	1.00
3222-12	12"	1.00
3222-18	18"	1.00
3222-24	24"	1.00
3222-36	36"	1.00
3222-48	48"	1.05
3222-60	60"	1.10



Adapts to equipment using miniature banana jacks.
CLIP: Minigator, Steel, cadmium plated.
MINIATURE BANANA PLUG: Spring, one piece beryllium copper, heat treated, gold flashed. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on black wire.
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, .087" O.D.
OPERATING TEMP.: —25° C to +105° C.
COLORS: Black, Red

MODEL 3222 (Specify Color) ★QUANTITY DISC. CODE (A)

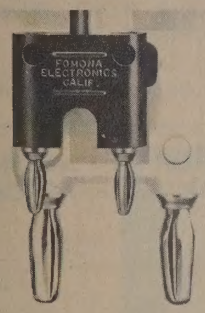
See YELLOW SECTION for Local Offices, Phones

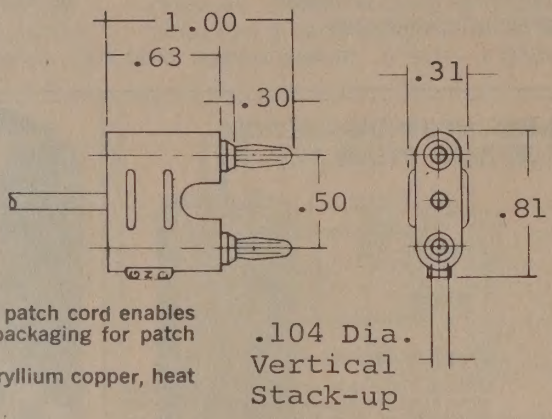
POMONA ELECTRONICS

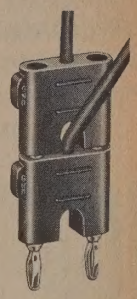
½" SPACED MINIATURE DOUBLE BANANA PLUG PATCH CORDS

MOLDED MINIATURE DOUBLE BANANA PLUG PATCH CORDS

ACTUAL SIZE







STACK-UP

½ smaller...

A iniature double banana plug on ½" centers. This patch cord enables m aturization of test equipment and high density packaging for patch sy ems.

B ana plug springs precision formed of one piece beryllium copper, heat tr ted for maximum life and low contact resistance.

F TURES...

- ne piece beryllium copper heat treated spring for long fe.
- ounded spring design results in maximum contact area.
- ND., clearly molded on plug body and shell.
- older-bonded noise-free connections.

SPECIFICATIONS . . .

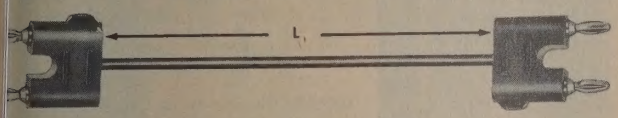
- Fits standard 0.104 dia. banana jacks, on ½" centers.
- Spring beryllium copper alloy 170 per QQ-C-533.
- Plug body brass per QQ-B-626, Comp. 22.
- Gold flashed per MIL-G-45204, type II.

BLE DESCRIPTION:

elded coax., RG174/U. Polyethylene insulation, Vinyl jacket. Nom. cap. 5 pf/ft. Nom. Imp. 50 Ohms. Nom. O.D. .100". **Color: Black.**

NOTE: Molded double plug matches color of cable.

INIATURE — DOUBLE BANANA PLUG BOTH ENDS



NN: END — Miniature Double Banana plug on ½" centers.

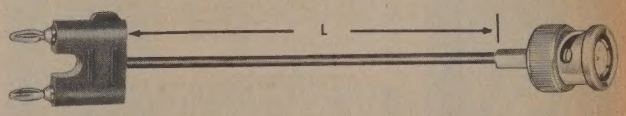
CABLE: Shielded Coax., RG174/U.

CONN: 2nd END — Miniature double banana plug on ½" centers.

MODEL	LENGTH
2247-K-12	12"
2247-K-24	24"
2247-K-36	36"
2247-K-48	48"
2247-K-60	60"

IODEL 2247 QUANTITY DISC. CODE (B) **NET 4.95**

MINIATURE—DOUBLE BANANA PLUG TO BNC MALE



CONN: 1st END — Miniature Double Banana Plug on ½" centers

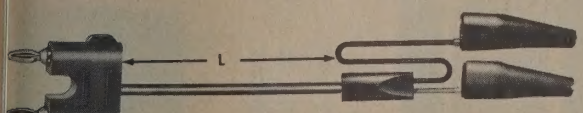
CABLE: Shielded Coax., RG174/U

CONN: 2nd END — Male BNC

MODEL	LENGTH
2248-K-12	12"
2248-K-24	24"
2248-K-36	36"
2248-K-48	48"
2248-K-60	60"

MODEL 2248 QUANTITY DISC. CODE (B) **NET 5.95**

MINIATURE — DOUBLE BANANA PLUG TO MINIGATOR CLIPS



ONN: st END — Miniature Double Banana plug on ½" centers.

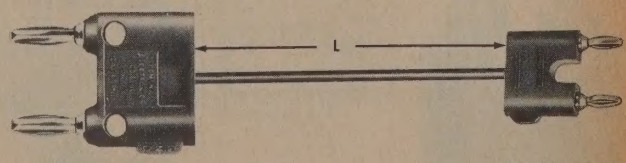
CABLE: Shielded Coax., RG174/U.

CONN: 2nd END — Minigator Clips, Steel, cad plated Inculators, Vinyl: Black/Red.

MODEL	LENGTH
3027-K-12	12"
3027-K-24	24"
3027-K-36	36"
3027-K-48	48"
3027-K-60	60"

MODEL 3027 QUANTITY DISC. CODE (B) **NET 5.95**

DOUBLE BANANA PLUG TO MINIATURE DOUBLE BANANA PLUG



CONN: 1st END — Double Banana Plug, on ¾" Centers.

CABLE: Shielded Coax., RG174/U.

CONN: 2nd END — Miniature double banana plug on ½" Centers.

MODEL	LENGTH
2443-K-12	12"
2443-K-24	24"
2443-K-36	36"
2443-K-48	48"
2443-K-60	60"

MODEL 2443 QUANTITY DISC. CODE (B) **NET 4.95**

POMONA ELECTRONICS

"BLACK BOXES"

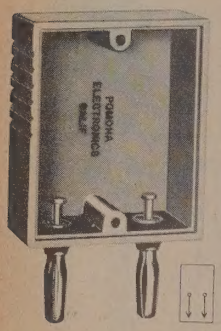
CREATE passive and active networks, voltage dividers, isolation networks or attenuators with these units. Solder turret terminals for permanent noise-free connection of components, etc. Entire unit may be potted or encapsulated.

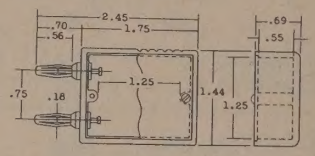
Housing molded of thermosetting electrical grade phenic Cover, punched XXP laminated paper base phenolic. Co housing and cover, BLACK. Cover plate and 2 each #56 cover screws included.

APPLICABLE SPECIFICATIONS:

Operating Temp: —25°C to +125°C. Working Voltage: 5000 VDC. Current: 15 Amps Cont., 30 Amps Int.

COMPONENT MOUNTING—ACROSS BANANA PLUGS



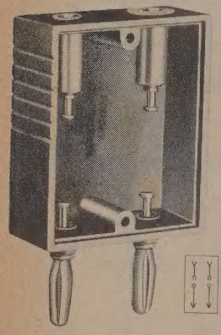


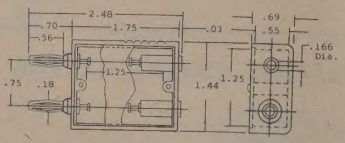
UPPER: No Connection.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

MODEL 2096 QUANTITY DISC. CODE (A) **NET 1.95**

COMPONENT MOUNTING—BANANA JACKS TO DOUBLE BANANA PLUG—JUNIOR SIZE



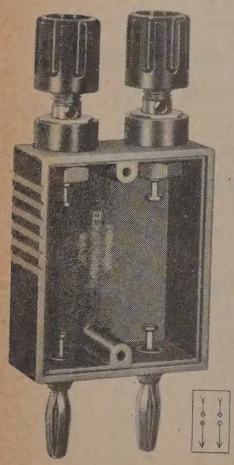


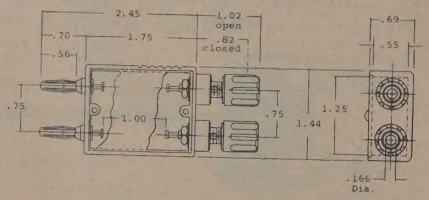
UPPER: Banana jacks, .166" dia. and solder turret terminals on ¾" centers. Brass, nickel plated. Polarity indicator on top, color, RED.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

MODEL 2098 QUANTITY DISC. CODE (A) **NET 3.45**

COMPONENT MOUNTING—BINDING POSTS TO DOUBLE BANANA PLUG—JUNIOR SIZE

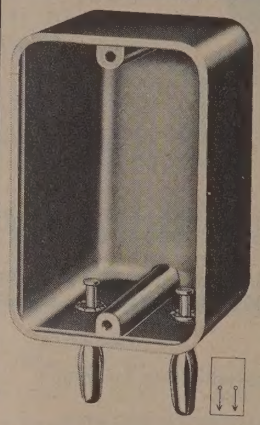




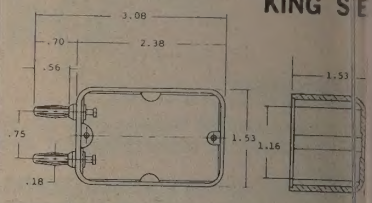
UPPER: Banana jack binding posts with solder turret terminals, on ¾" centers. Red and Black.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

MODEL 2259 QUANTITY DISC. CODE (A) **NET 4.85**



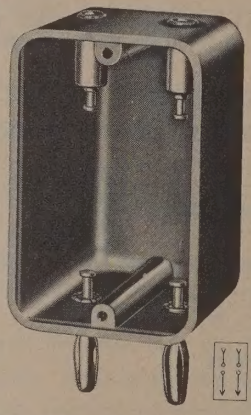
COMPONENT MOUNTING—ACROSS BANANA PLUGS—KING SIZE



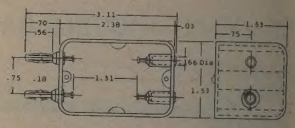
UPPER: No Connection.

LOWER: Banana plugs on ¾" centers. O piece beryllium copper spring, heat treat nickel plated. Plug body and solder tur terminals, brass, nickel plated. For u with standard .166" dia. banana jacks.

MODEL 1177 QUANTITY DISC. CODE (A) **NET 1.5**



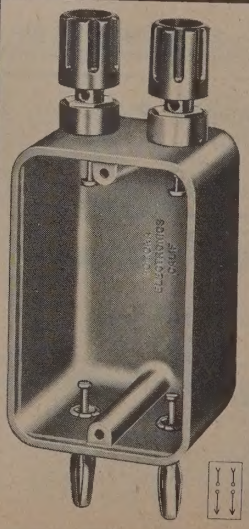
COMPONENT MOUNTING BANANA JACKS TO DOUBL BANANA PLUG— KING SIZ



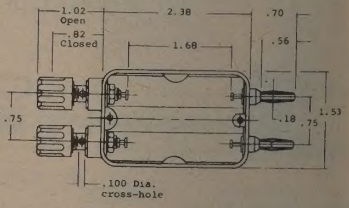
UPPER: Banana jacks, .166" dia. and so der turret terminals on ¾" centers. Bras nickel plated. Polarity indicator on to color, RED.

LOWER: Banana plugs on ¾" centers. Or piece beryllium copper spring, heat treate nickel plated. Plug body and solder turr terminals, brass, nickel plated. For use wit standard .166" dia. banana jacks.

MODEL 2224 QUANTITY DISC. CODE (A) **NET 3.4**



COMPONENT MOUNTING—BINDING POSTS TO DOUBLE BANANA PLUG—KING SIZE



UPPER: Banana jack binding posts with solder turret terminals, on ¾" centers. Red and Black.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

MODEL 2262 QUANTITY DISC. CODE (A) **NET 4.85**

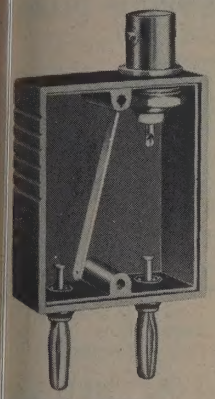
See YELLOW SECTION for Local Offices, Phones

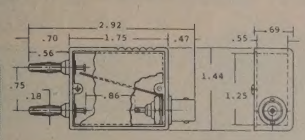
POMONA ELECTRONICS "BLACK BOXES"

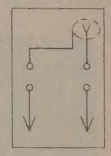
REATE passive and active networks, voltage dividers, olation networks or attenuators with these units. older turret terminals for permanent noise-free con- ection of components, etc. Entire unit may be potted r encapsulated.

Housing molded of thermosetting electrical grade phenolic. Cover, punched XXP laminated paper base phenolic. Color, housing and cover, BLACK. Cover plate and 2 each #2-56 cover screws included.

COMPONENT MOUNTING—BNC RECEPTACLE TO DOUBLE BANANA PLUG







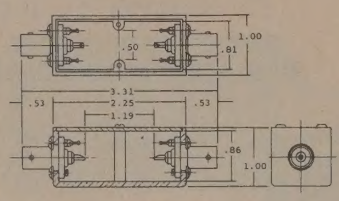
UPPER: BNC Receptacle UG1094/U

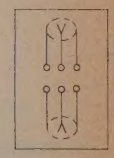
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 500 V Peak.

MODEL 2097 QUANTITY DISC. CODE (A) **NET 3.85**

COMPONENT MOUNTING—BNC RECEPTACLE BOTH ENDS





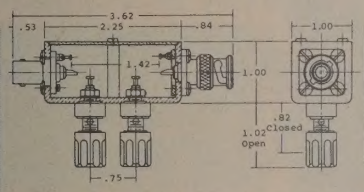
UPPER: BNC Receptacle UG290A/U

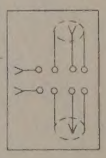
LOWER: BNC Receptacle UG290A/U

APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 500 V Peak.

MODEL 2101 QUANTITY DISC. CODE (A) **NET 5.85**

COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS





UPPER: BNC Receptacle UG290A/U

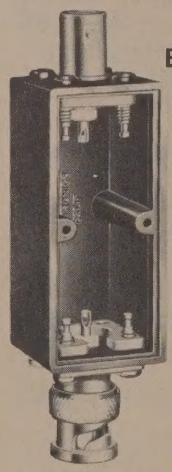
CENTER: Banana jack binding posts with solder turret terminals. Red and Black.

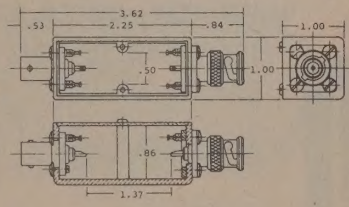
LOWER: BNC Plug. UG1104A/U.

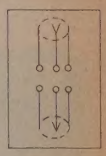
APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 500 V Peak.

MODEL 2100 QUANTITY DISC. CODE (A) **NET 10.85**

COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG







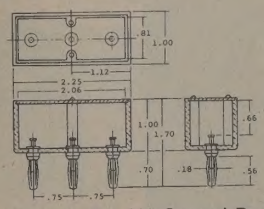
UPPER: BNC Receptacle UG290A/U

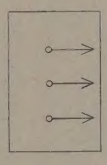
LOWER: BNC Plug UG1104A/U

APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 500 V Peak.

MODEL 2099 QUANTITY DISC. CODE (A) **NET 7.50**

COMPONENT MOUNTING—(3) ¾" SPACED BANANA PLUGS



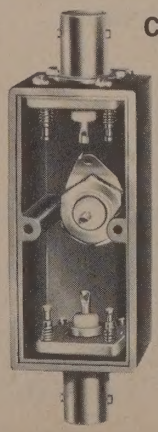


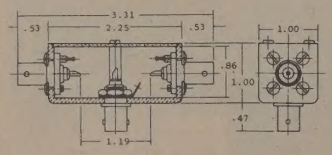
Three-in-line ¾" Spaced Banana Plugs.
One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

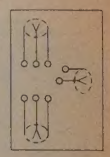
APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 5000 VDC.
Current: 15 Amps Cont., 30 Amps Int.

MODEL 2095 QUANTITY DISC. CODE (A) **NET 2.75**

COMPONENT MOUNTING—BNC RECEPTACLE "T"







UPPER: BNC Receptacle UG290A/U

CENTER: BNC Receptacle UG1094/U

LOWER: BNC Receptacle UG290A/U

APPLICABLE SPECIFICATIONS:
Operating Temp: −25°C to +125°C.
Working Voltage: 500 V Peak.

MODEL 2102 QUANTITY DISC. CODE (A) **NET 8.50**

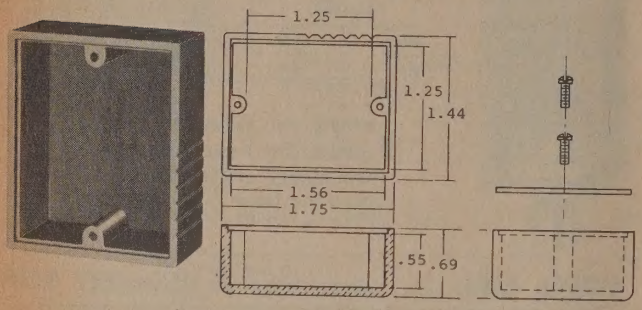
POMONA ELECTRONICS

"BLACK BOXES"

Boxes of unlimited uses for packaging of components and circuitry. Also ideal for potting and encapsulating. Available in three sizes as shown below. Housing molded of thermosetting electrical grade phenolic. Cover, punched XXP laminated paper base phenolic. Color, Housing and cover, Black. Cover plate and 2 each #2-56 cover screws included.

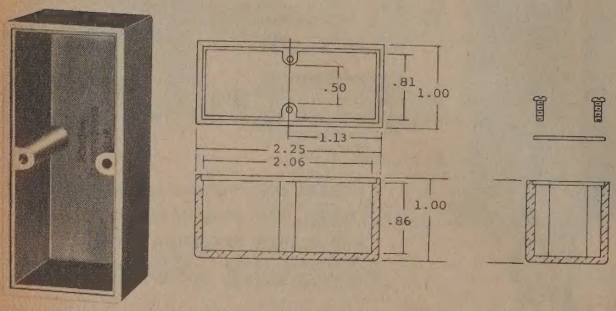
Operating Temperature: —25°C to +125°C.

BLACK BOX—JUNIOR SIZE



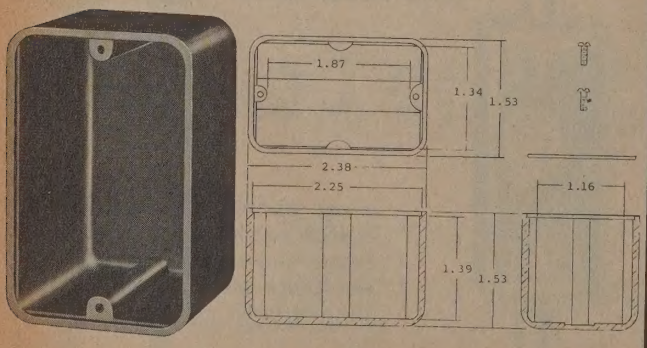
MODEL 2105 QUANTITY DISC. CODE (A) NET .85

BLACK BOX—QUEEN SIZE



MODEL 2103 QUANTITY DISC. CODE (A) NET .85

BLACK BOX—KING SIZE

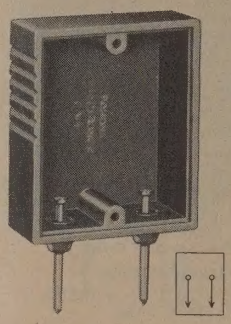


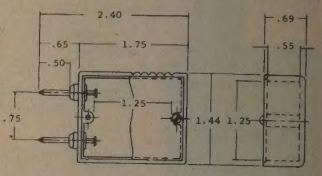
MODEL 2104 QUANTITY DISC. CODE (A) NET .85

CREATE passive and active networks, voltage dividers, isolation networks or attenuators with these units. Solder turret terminals for permanent noise-free connection of components, etc. Entire unit may be potted or encapsulated.

Housing molded of thermosetting electrical grade phenolic. Cover, punched XXP laminated paper base phenolic. Color, housing and cover, BLACK. Cover plate and 2 each #2-56 cover screws included.

COMPONENT MOUNTING—ACROSS PIN TIP PLUG





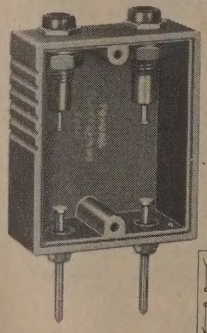
UPPER: No Connection.

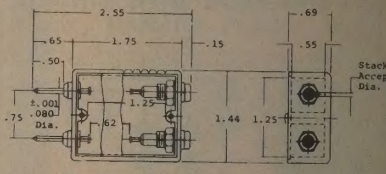
LOWER: Pin tip plugs, .080 dia. on ¾" centers. Plug bodies and solder turret terminals, brass, nickel plated.

APPLICABLE SPECIFICATIONS:
Operating Temp.: —25°C to +125°C.
Working Voltage: 5000 VDC.
Current: 5 Amps Cont.. 10 Amps Int.

MODEL 2268 QUANTITY DISC. CODE (A) NET 1.9

COMPONENT MOUNTING—PIN TIP JACKS TO DOUBLE PIN TIP PLUG—JUNIOR SIZE





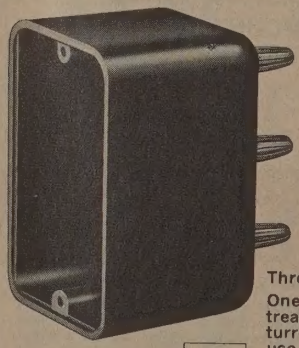
UPPER: Tip jacks, on ¾" centers, per MS-16108. One Red, one Black.

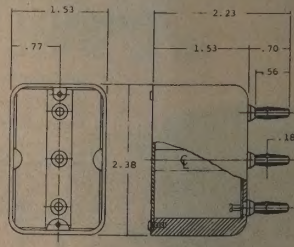
LOWER: Pin tip plugs, .080 dia. on ¾" centers. Plug bodies and solder turret terminals, brass, nickel plated.

APPLICABLE SPECIFICATIONS:
Operating Temp.: —25°C to +125°C.
Working Voltage: 5000 VDC.
Current: 5 Amps Cont., 10 Amps Int.

MODEL 2260 QUANTITY DISC. CODE (A) NET 4.85

COMPONENT MOUNTING — (3) ¾" SPACED BANANA PLUGS — KING SIZE





Three-in-line ¾" Spaced Banana Plugs.

One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard .166" dia. banana jacks.

APPLICABLE SPECIFICATIONS:
Operating Temp: —25°C to +125°C.
Working Voltage: 5000 VDC.
Current: 15 Amps Cont., 30 Amps In.

MODEL 1943 QUANTITY DISC. CODE (A) NET 3.25

POMONA ELECTRONICS

SHIELDED "BLACK BOXES" SIZE "A"

W AVAILABLE, *SHIELDED* "BLACK BOXES." Boxes that ill the requirement for RF applications.

al for compact packaging, eg., voltage dividers, isolation works, impedance matching networks, and other varied s.

ver and self-tapping screws included.

PLICABLE SPECIFICATIONS: (ALL MODELS)

erating Temp.: −55°C to +150°C.

rking Voltage: 500 V Peak (Model 2415, 1500 V Peak).

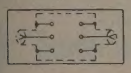
ise Rejection: Greater than 70DB.

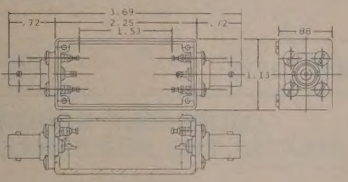
FEATURES:

- SHIELDED HOUSING; Die Cast Aluminum. FINISH: BLUE baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- COVER; .040 Thick Aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- Four screws secure cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.

COMPONENT MOUNTING— BNC RECEPTACLE BOTH ENDS

NN: } BNC Receptacle Jack,
t END { UG290A/U.
NN: } BNC Receptacle Jack,
d END { UG290A/U.

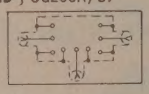


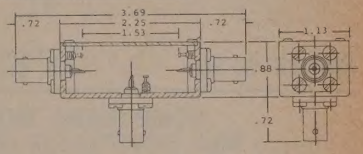


MODEL 2390 QUANTITY DISC. CODE (A) **NET 6.85**

COMPONENT MOUNTING— BNC RECEPTACLE "T"

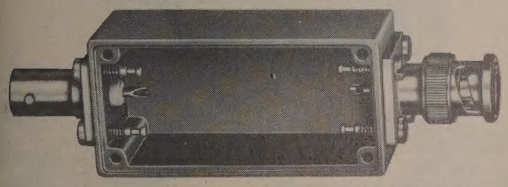
CONN: } BNC Receptacle Jack,
1st END { UG290A/U.
CENTER: BNC Receptacle Jack, UG290A/U.
CONN: } BNC Receptacle Jack,
2nd END { UG290A/U.



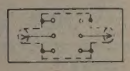


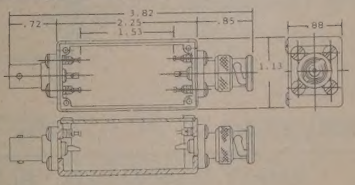
MODEL 2392 QUANTITY DISC. CODE (A) **NET 9.50**

COMPONENT MOUNTING— BNC RECEPTACLE TO BNC PLUG



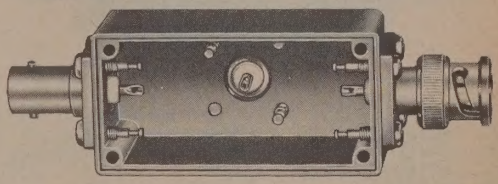
CONN: } BNC Receptacle Jack,
1st END { UG290A/U.
CONN: } BNC Receptacle Plug,
2nd END { UG1104A/U.



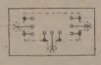


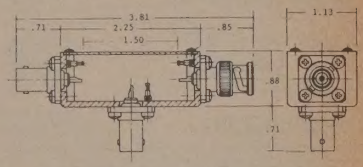
MODEL 2391 QUANTITY DISC. CODE (A) **NET 7.85**

COMPONENT MOUNTING — "T" TWO BNC RECEPTACLES TO BNC PLUG



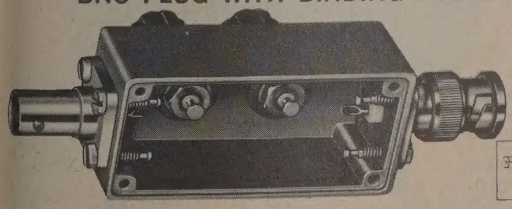
CONN: } BNC Receptacle Jack,
1st. END { UG290A/U.
CENTER: BNC Receptacle Jack, UG290A/U.
CONN: } BNC Receptacle Plug,
2nd END { UG1104A/U.

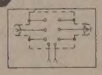




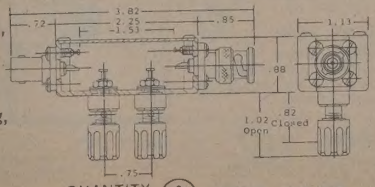
MODEL 2401 QUANTITY DISC. CODE (A) **NET 10.85**

COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS





CONN: } BNC Receptacle Jack,
1st END { UG290A/U.
CENTER: Banana jack binding posts with solder turret terminals. Red and Black.
CONN: } BNC Receptacle Plug,
2nd END { UG1104A/U.



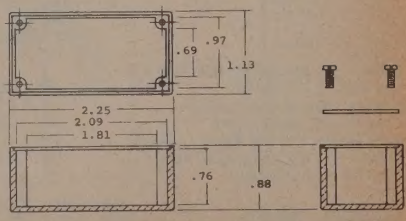
MODEL 2393 QUANTITY DISC. CODE (A) **NET 10.85**

EMPTY — SHIELDED "BLACK BOX"

SIZE "A"

MODEL 2397
FINISH: Blue Baked Enamel.
Includes cover with part number on cover and four cover screws.

MODEL 2400
FINISH: None
Includes unmarked cover and four cover screws.

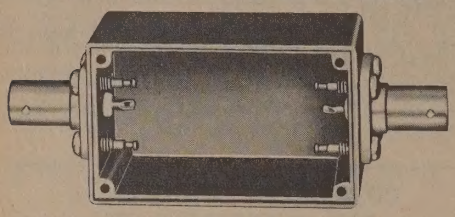


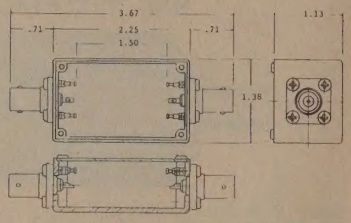
MODEL 2397
MODEL 2400 QUANTITY DISC. CODE (A) **NET 1.50**

POMONA ELECTRONICS

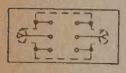
SHIELDED "BLACK BOXES" SIZE "B"

COMPONENT MOUNTING — BNC RECEPTACLE BOTH ENDS



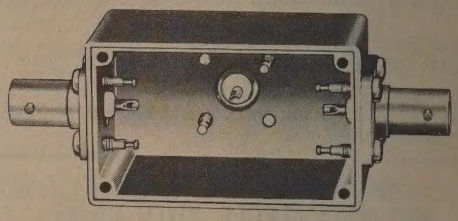


CONN: 1st END } BNC Receptacle Jack, UG290A/U.
CONN: 2nd END } BNC Receptacle Jack, UG290A/U.

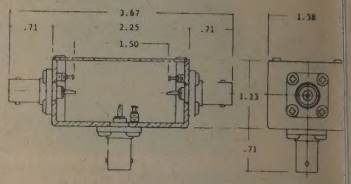


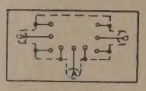
MODEL 3230 QUANTITY DISC. CODE (A) **NET 6.85**

COMPONENT MOUNTING — BNC RECEPTACLE "T"



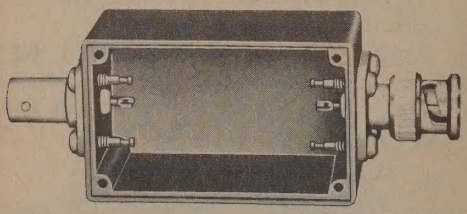
CONN: 1st. END } BNC Receptacle Jack, UG290A/U.
CENTER: BNC Receptacle Jack, UG290A/U.
CONN: 2nd END } BNC Receptacle Jack, UG290A/U.

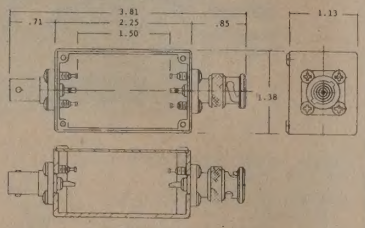




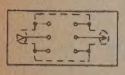
MODEL 3232 QUANTITY DISC. CODE (A) **NET 9.50**

COMPONENT MOUNTING — BNC RECEPTACLE TO BNC PLUG





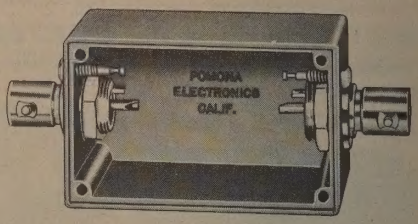
CONN: 1st END } BNC Receptacle Jack, UG290A/U.
CONN: 2nd END } BNC Receptacle Plug, UG1104A/U.



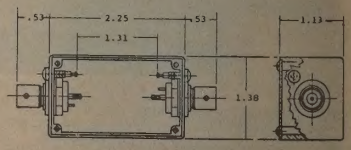
MODEL 3231 QUANTITY DISC. CODE (A) **NET 7.85**

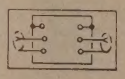
COMPONENT MOUNTING — ISOLATED BNC RECEPTACLE BOTH ENDS

NEW



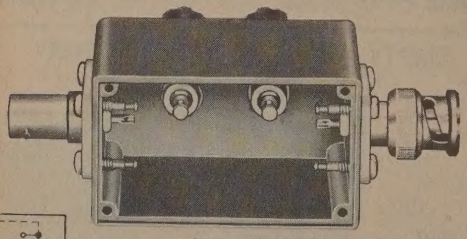
CONN: 1st END } *Isolated* BNC Receptacle Jack
CONN: 2nd END } *Isolated* BNC Receptacle Jack

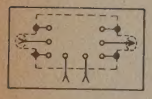


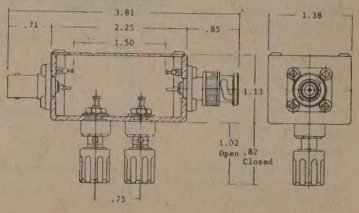


MODEL 3239 QUANTITY DISC. CODE (A) **NET 13.85**

COMPONENT MOUNTING — BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS



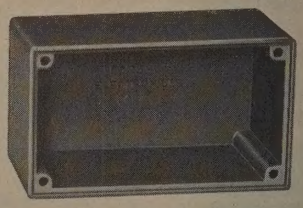




CONN. 1st. END } BNC Receptacle Jack, UG290A/U.
CENTER: Banana jack binding posts with solder turret terminals. Red and Black.
CONN: 2nd END } BNC Receptacle Plug, UG1104A/U.

MODEL 3233 QUANTITY DISC. CODE (A) **NET 10.85**

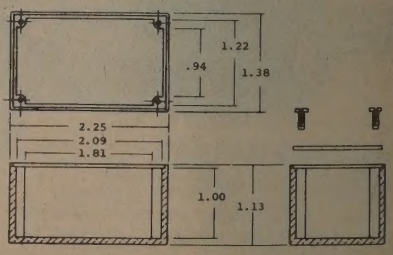
EMPTY — SHIELDED "BLACK BOX"



SIZE "B"

MODEL 2417
FINISH: Blue Baked Enamel.
Includes cover with part number on cover and four cover screws.

MODEL 2428
FINISH: None
Includes unmarked cover and four cover screws.



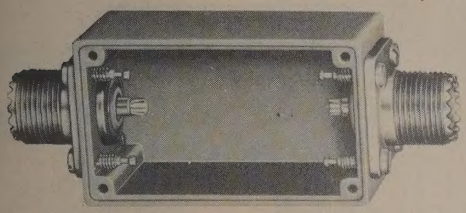
MODEL 2417
MODEL 2428

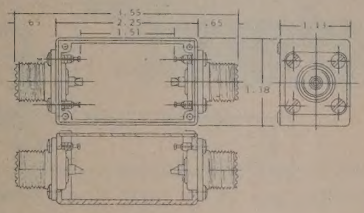
QUANTITY DISC. CODE (A) **NET 1.50**

POMONA ELECTRONICS

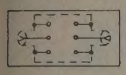
SHIELDED "BLACK" BOXES SIZE "B"

COMPONENT MOUNTING— UHF RECEPTACLE BOTH ENDS



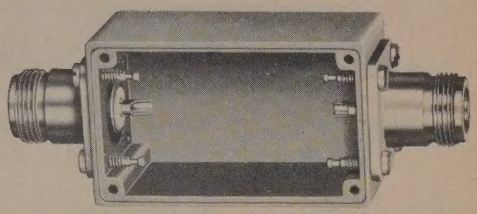


NN: } UHF Receptacle Jack.
: END
NN: } UHF Receptacle Jack.
d END

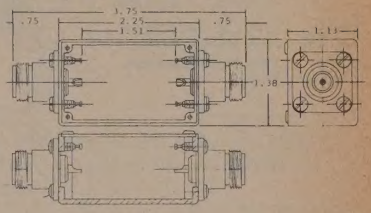


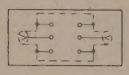
ODEL 2412 QUANTITY DISC. CODE (A) NET 7.85

COMPONENT MOUNTING— TYPE "N" RECEPTACLE BOTH ENDS



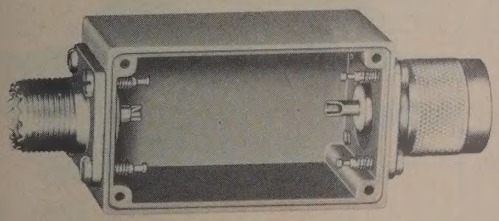
CONN: } Type "N" Receptacle
1st END } Jack, UG58A/U.
CONN: } Type "N" Receptacle
2nd END } Jack, UG58A/U.



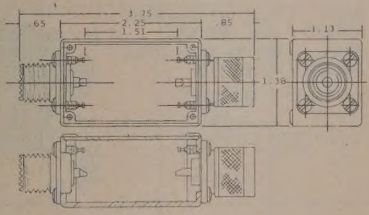


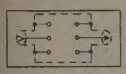
MODEL 2410 QUANTITY DISC. CODE (A) NET 6.85

COMPONENT MOUNTING— UHF RECEPTACLE TO UHF PLUG



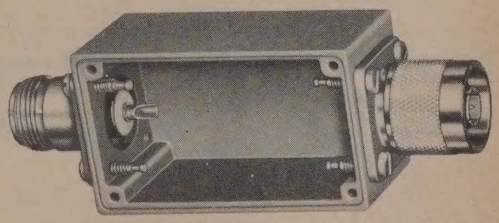
ONN: } UHF Receptacle Jack.
st END
ONN: } UHF Receptacle Plug.
nd END



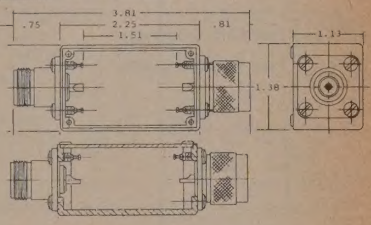


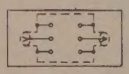
MODEL 2413 QUANTITY DISC. CODE (A) NET 10.85

COMPONENT MOUNTING— TYPE "N" RECEPTACLE TO TYPE "N" PLUG



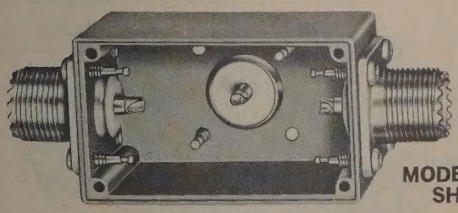
CONN: } Type "N" Receptacle
1st END } Jack, UG58A/U.
CONN: } Type "N" Receptacle
2nd END } Plug.



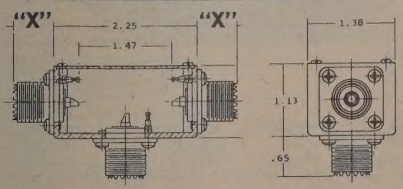


MODEL 2411 QUANTITY DISC. CODE (A) NET 9.85

COMPONENT MOUNTING — UHF AND TYPE "N" RECEPTACLE "T"

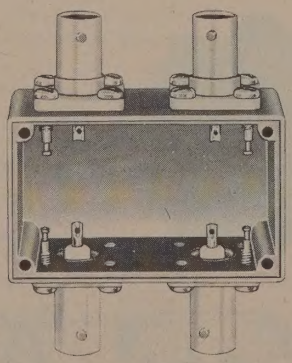


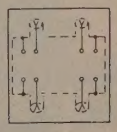
MODEL 2418 SHOWN

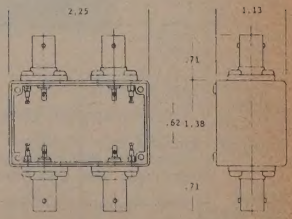


MODEL	CONNECTORS	"X" DIM.	Quantity Disc. Code	NET
2418	(3) UHF Receptacle Jacks.	.65	(A)	10.85
2419	(3) Type "N" Receptacle Jacks, UG58A/U.	.75	(A)	9.50

COMPONENT MOUNTING — CROSS CONNECTIONS







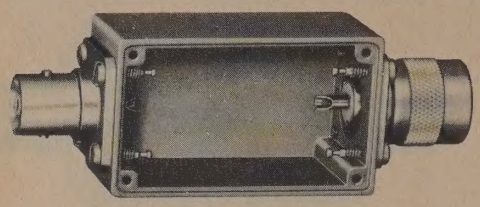
CONN: 4 each BNC Receptacle Jacks, UG290A/U.

MODEL 3234 QUANTITY DISC. CODE (A) NET 11.75

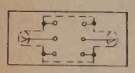
POMONA ELECTRONICS

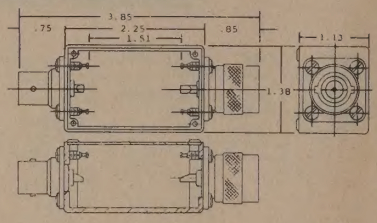
SHIELDED "BLACK BOXES" SIZE "B"

COMPONENT MOUNTING— TYPE "C" RECEPTACLE TO TYPE "C" PLUG



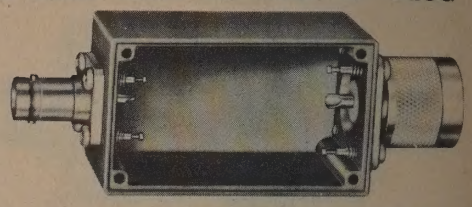
CONN: 1st END } Type "C" Receptacle Jack, UG568/U.
CONN: 2nd END } Type "C" Receptacle Plug.



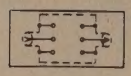


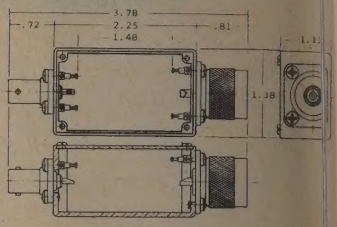
MODEL 2415 QUANTITY DISC. CODE (A) **NET 11.75**

COMPONENT MOUNTING — BNC RECEPTACLE TO TYPE "N" PLUG



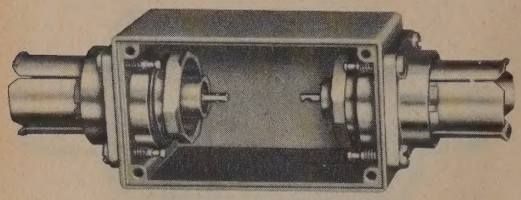
CONN: 1st END } BNC Receptacle Jack, UG290A/U.
CONN: 2nd END } Type "N" Receptacle Plug.



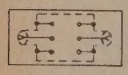


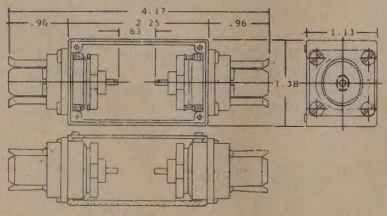
MODEL 2420 QUANTITY DISC. CODE (A) **NET 9.1**

COMPONENT MOUNTING— GR-874 CONNECTOR BOTH ENDS



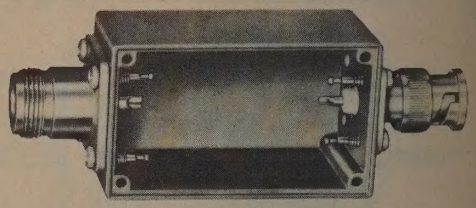
CONN: 1st END } Type GR-874 Connector.
CONN: 2nd END } Type GR-874 Connector.



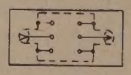


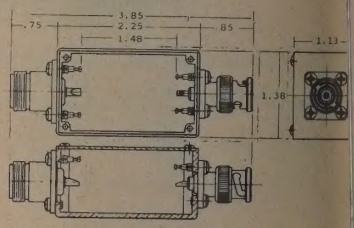
MODEL 2416 QUANTITY DISC. CODE (A) **NET 24.75**

COMPONENT MOUNTING — TYPE "N" RECEPTACLE TO BNC PLUG



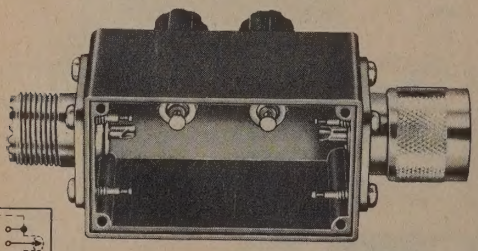
CONN: 1st END } Type "N" Receptacle Jack, UG58A/U.
CONN: 2nd END } BNC Receptacle Plug, UG1104A/U.

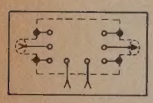




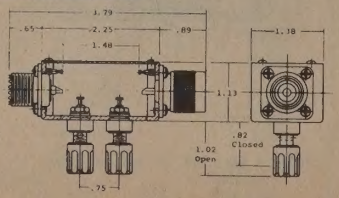
MODEL 2421 QUANTITY DISC. CODE (A) **NET 7.8**

COMPONENT MOUNTING — UHF RECEPTACLE TO UHF PLUG WITH BINDING POSTS



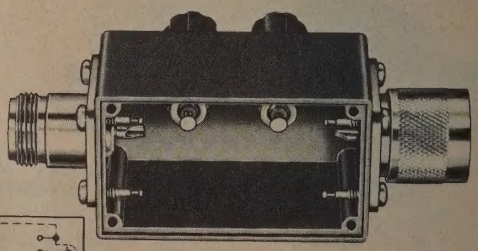


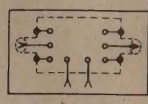
CONN: 1st END } UHF Receptacle Jack.
CENTER: Banana jack binding posts with solder turret terminals. Red and Black.
CONN: 2nd END } UHF Receptacle Plug.



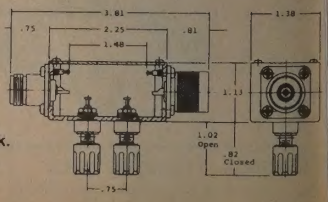
MODEL 2422 QUANTITY DISC. CODE (A) **NET 13.85**

COMPONENT MOUNTING TYPE "N" RECEPTACLE TO TYPE "N" PLUG WITH BINDING POSTS





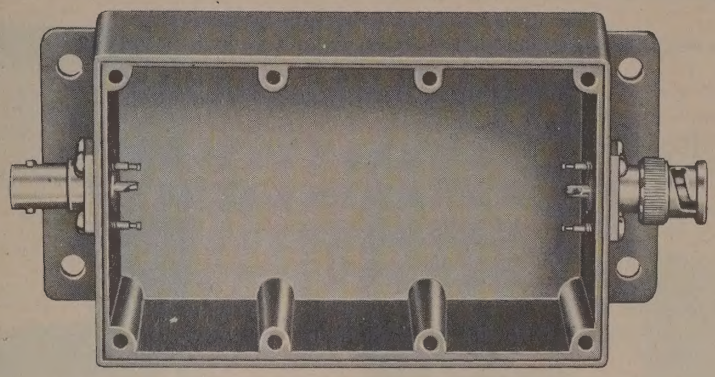
CONN: 1st END } Type "N" Receptacle Jack, UG58A/U.
CENTER: Banana jack binding posts with solder turret terminals. Red and Black.
CONN: 2nd END } Type "N" Receptacle Plug.



MODEL 2423 QUANTITY DISC. CODE (A) **NET 12.85**

POMONA ELECTRONICS

LARGER SHIELDED "BLACK BOXES" SIZE "C"



MODEL 2903

(Shown 2/3 actual size)

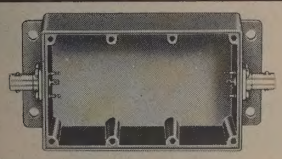
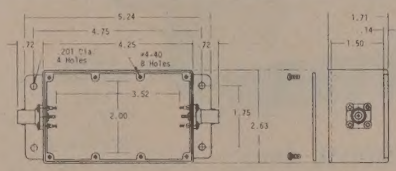
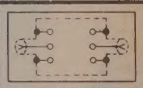
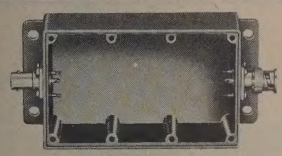
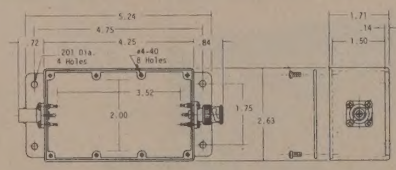
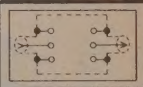
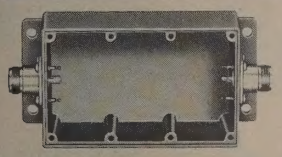
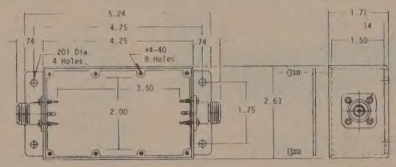
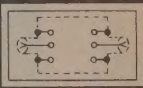
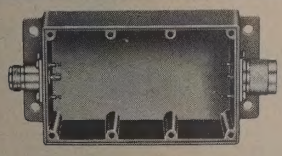
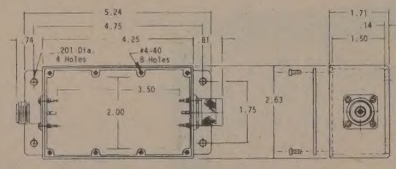
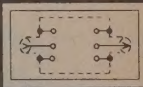
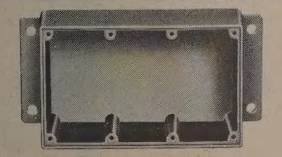
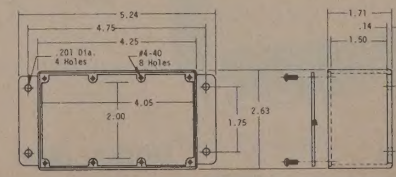
NEW Series of **LARGER** shielded "BLACK BOXES."

These larger boxes are excellent for compact packaging of voltage dividers, isolation networks and many other applications.

APPLICABLE SPECIFICATIONS: (All Models)
Operating Temp.: —55°C to +150°C.
Working Voltage: 500 Peak.
Noise Rejection: Greater than 70DB

FEATURES:

- SHIELDED HOUSING; Die Cast Aluminum, Alloy #A380, FINISH: BLUE baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- COVER: .080 Thick Aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- 8 ea. #4-40 x ¼" screws secure cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.
- 2 flanges for easy mounting of box.

MODEL	CONN. 1st END	CONN. 2nd END			
 MODEL 2902	BNC Receptacle Jack UG290A/U	BNC Receptacle Jack UG290A/U		 QUANTITY DISC. CODE (A)	NET 9.85
 MODEL 2903	BNC Receptacle Jack UG290A/U	BNC Receptacle Plug UG1104A/U		 QUANTITY DISC. CODE (A)	NET 10.85
 MODEL 2904	TYPE "N" Receptacle Jack UG58A/U	TYPE "N" Receptacle Jack UG58A/U		 QUANTITY DISC. CODE (A)	NET 9.85
 MODEL 2905	TYPE "N" Receptacle Jack UG58A/U	TYPE "N" Receptacle Plug		 QUANTITY DISC. CODE (A)	NET 12.85
 MODEL 2901	NONE	NONE		QUANTITY DISC. CODE (A)	NET 5.85
MODEL 2906 SEE 2901	NONE	NONE	Same as Model 2901 except box is unpainted and cover is unmarked.	QUANTITY DISC. CODE (A)	NET 5.85

POMONA ELECTRONICS

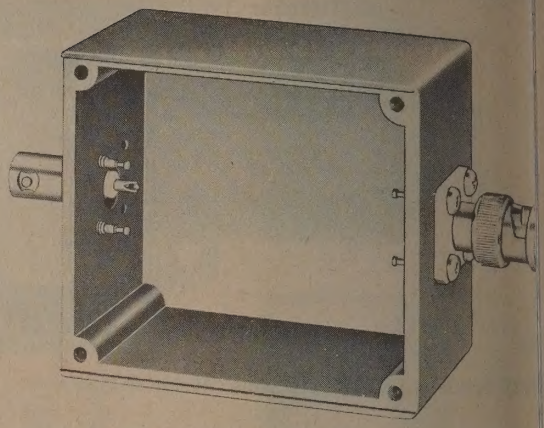
SHIELDED "BLACK BOXES" SIZE "D"

Another new series of shielded "Black Boxes." These boxes fill the need between the size "B" and "C" boxes. These boxes are excellent for compact packaging of voltage dividers, isolation networks and many other applications.

APPLICABLE SPECIFICATIONS: (All Models)
Operating Temp.: —55°C to +150°C.
Working Voltage: 500 Peak.
Noise Rejection: Greater than 70DB

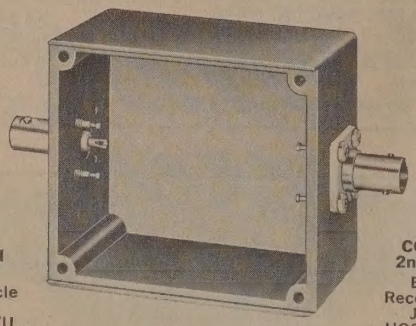
FEATURES:

- **SHIELDED HOUSING:** Die Cast Aluminum, Alloy #A380, FINISH: BLUE baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- **COVER:** .063 Thick Aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- 4 ea. #4-40 x ¼" screws secure cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.



MODEL 3603 (Shown 2/3 actual size)

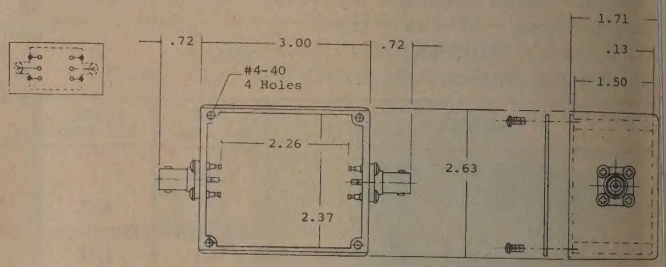
NEW



CONN: 1st End BNC Receptacle Jack UG290A/U

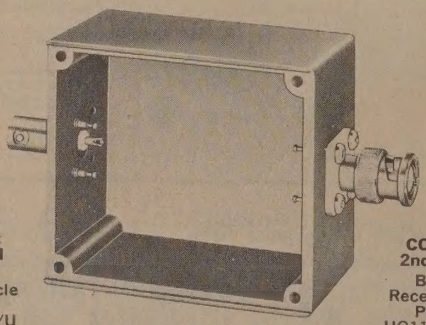
CONN: 2nd End BNC Receptacle Jack UG290A/U

MODEL 3602



QUANTITY DISC. CODE (A) **NET 8.85**

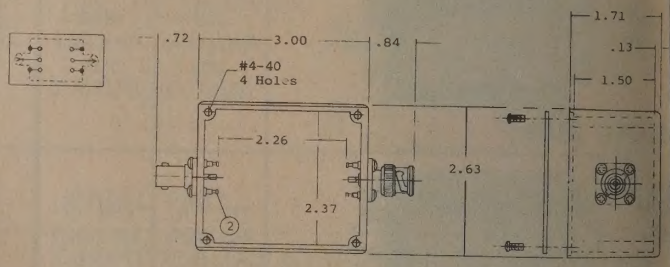
NEW



CONN: 1st End BNC Receptacle Jack UG290A/U

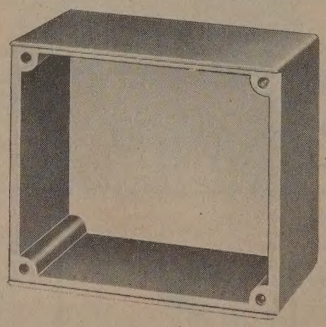
CONN: 2nd End BNC Receptacle Plug UG1104A/U

MODEL 3603



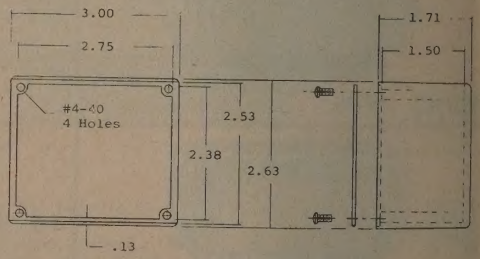
QUANTITY DISC. CODE (A) **NET 9.85**

NEW



CONN: 1st End None

CONN: 2nd End None



MODEL 3601

FINISH: Blue Baked Enamel. Includes cover with part number on cover and four cover screws.

MODEL 3606

FINISH: None. Includes unmarked cover and four cover screws.

QUANTITY DISC. CODE (A) **NET 3.85**

POMONA ELECTRONICS

SHIELDED "BLACK BOXES" WITH CARD GUIDES – 1½" DEEP

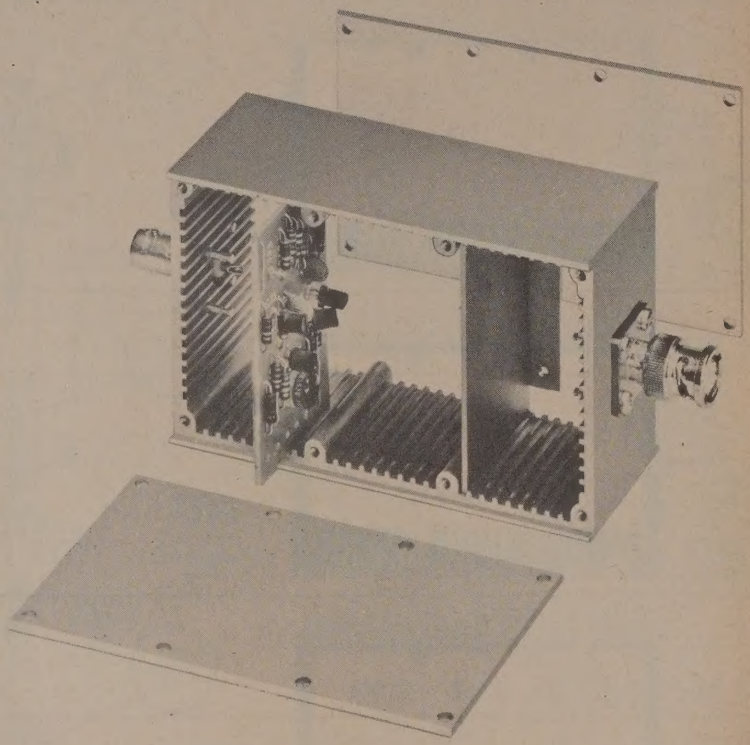
SHIELDED "BLACK BOXES" WITH CARD GUIDES

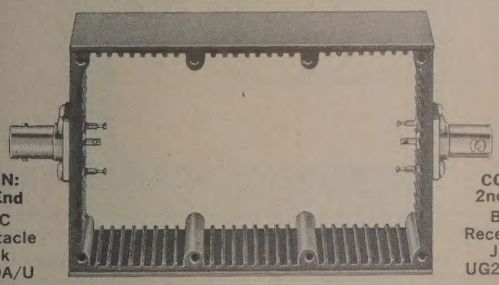
uminum boxes, slotted to accept 1/16" rcuit boards and shielding dividers. xcellent for packaging electronic cir-itry. Boxes have removable top and ottom covers. Useable inside space: ' x 2" x 1½".

APPLICABLE SPECIFICATIONS:
(All Models)
perating Temp.: —55°C to +150°C.
orking Voltage: 500 Peak.
oise Rejection: Greater than 70DB

EATURES:

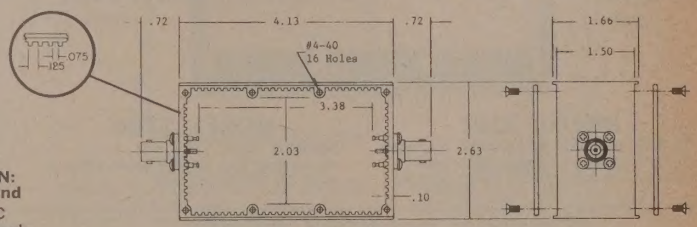
- **SHIELDED HOUSING:** Extruded Aluminum, Alloy #6061-T6. FINISH: BLUE baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- **COVERS:** Top and bottom, .080 thick Aluminum #6061-T6 with clear anodized Finish per MIL-A-8625A.
- **COVER SCREWS:** 16 EA #4-40x¼" screws secure top and bottom cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.





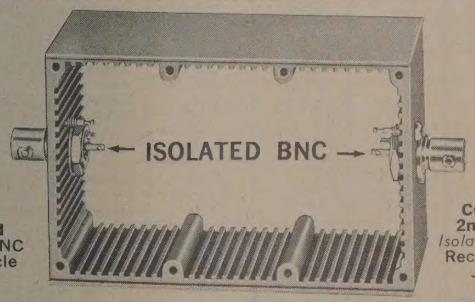
CONN: 1st End BNC Receptacle Jack UG290A/U

CONN: 2nd End BNC Receptacle Jack UG290A/U



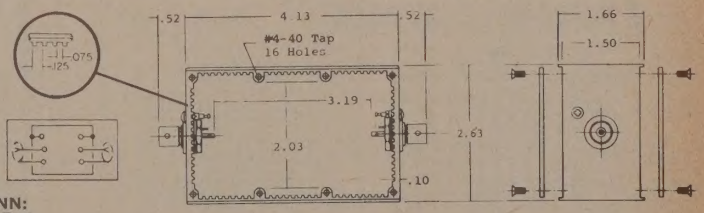
MODEL 3302 QUANTITY DISC. CODE (A) **NET 10.85**

NEW

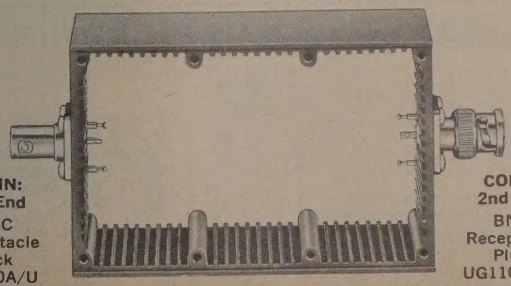


CONN: 1st End *Isolated* BNC Receptacle Jack

CONN: 2nd End *Isolated* BNC Receptacle Jack

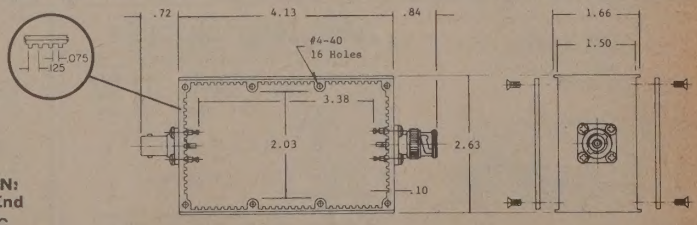


MODEL 3307 QUANTITY DISC. CODE (A) **NET 19.95**



CONN: 1st End BNC Receptacle Jack UG290A/U

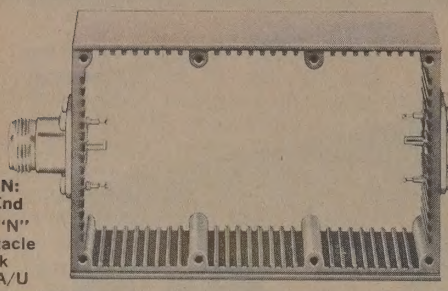
CONN: 2nd End BNC Receptacle Plug UG1104A/U



MODEL 3303 QUANTITY DISC. CODE (A) **NET 11.85**

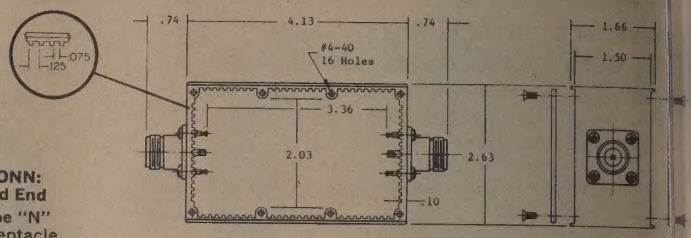
POMONA ELECTRONICS

SHIELDED "BLACK BOXES" WITH CARD GUIDES – 1½" DEEP

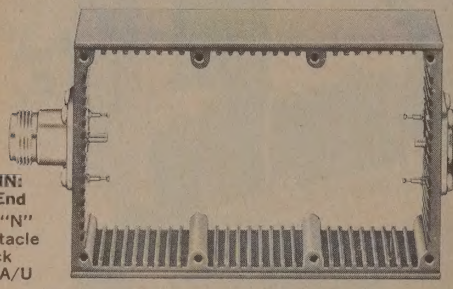


CONN: 1st End
Type "N" Receptacle Jack UG58A/U

CONN: 2nd End
Type "N" Receptacle Jack UG58A/U

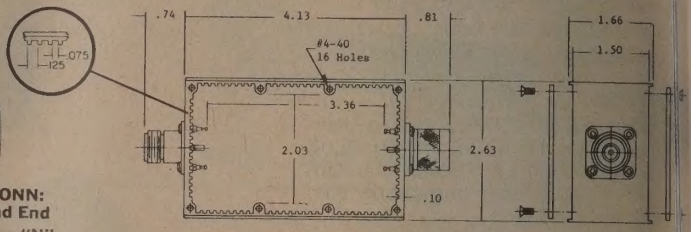


MODEL 3304 QUANTITY DISC. CODE (A) NET 11.5

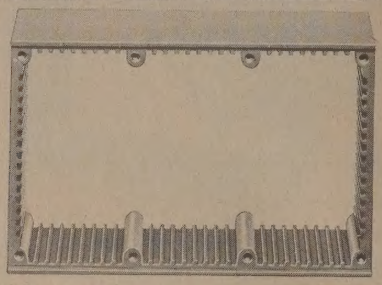


CONN: 1st End
Type "N" Receptacle Jack UG58A/U

CONN: 2nd End
Type "N" Receptacle Plug

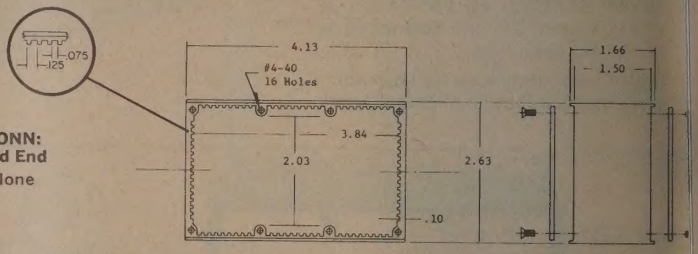


MODEL 3305 QUANTITY DISC. CODE (A) NET 14.5



CONN: 1st End
None

CONN: 2nd End
None



MODEL 3301
FINISH: Blue Baked Enamel. Includes top and bottom covers with part number on one and 16 cover screws.

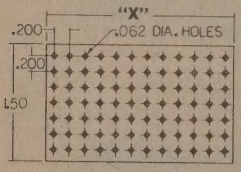
MODEL 3306
FINISH: None. Includes unmarked top and bottom covers with 16 cover screws.

QUANTITY DISC. CODE (A) NET 6.8

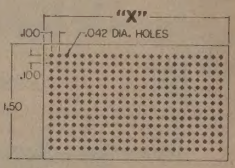
CIRCUIT MOUNTING BOARDS

Two sizes of various types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 1/16" thick.

- Boards 1.50 x 2.39 used laterally.
- Boards 1.50 x 3.90 used lengthwise.



BOARD A

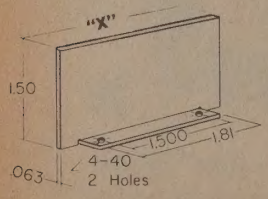


BOARD B

QUANTITY DISC. CODE (A)

BRD.	MODEL	NO. OF HOLES	"X" DIM.	MATERIAL	NET
A	3321	12 x 7	2.39	Paper-Epoxy (PEE)	.50
A	3322	NONE	2.39	Paper-Epoxy (PEE)	.35
A	3323	12 x 7	2.39	Glass-Epoxy (GEE)	.65
A	3324	NONE	2.39	Glass-Epoxy (GEE)	.45
A	3325	12 x 7	2.39	Glass-Epoxy (GEE) COP. CLAD 1 Side	.75
B	3326	23 x 15	2.39	Glass-Epoxy (GEE)	.85
A	3330	20 x 7	3.90	Paper-Epoxy (PEE)	.65
A	3331	20 x 7	3.90	Glass-Epoxy (GEE)	.85
A	3332	20 x 7	3.90	Glass-Epoxy (GEE) COP. CLAD 1 Side	1.10
B	3333	39 x 15	3.90	Glass-Epoxy (GEE)	1.10

SHIELDING DIVIDERS



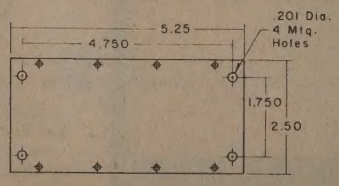
Two sizes of Aluminum dividers for dividing the box into shielded compartments. **MATERIAL:** .063 Aluminum, clear anodized per MIL-A-8625A.

- Divider 1.50 x 2.39 used laterally.
- Divider 1.50 x 3.90 used lengthwise.

MODEL	"X" DIM.	NET
3327	2.39	.85
3334	3.90	1.10

QUANTITY DISC. CODE (A)

LARGER BOTTOM PLATE FOR MOUNTING



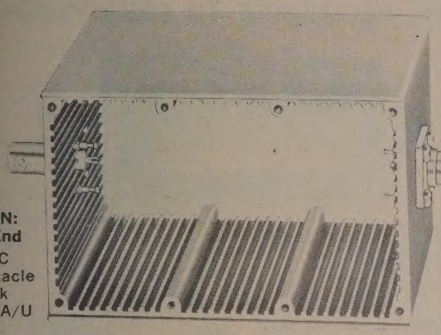
This larger plate, when attached to the box, provides flanges for mounting.
MATERIAL: .080 Aluminum #6061-T6, clear anodized per MIL-A-8625A.

MODEL 3328 (Plate only) QUANTITY DISC. CODE (A) NET 1.25

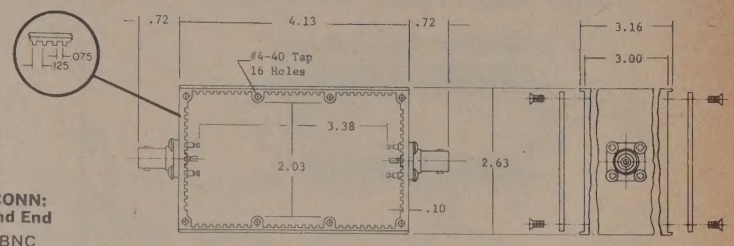
POMONA ELECTRONICS

SHIELDED "BLACK BOXES" WITH CARD GUIDES – 3" DEEP

NEW



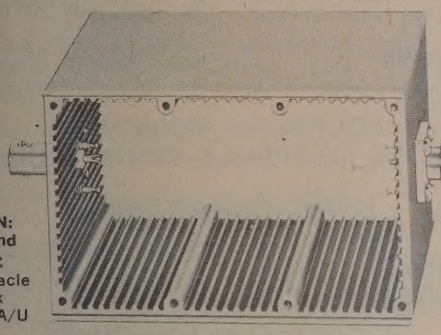
CONN: 1st End
BNC Receptacle Jack UG290A/U



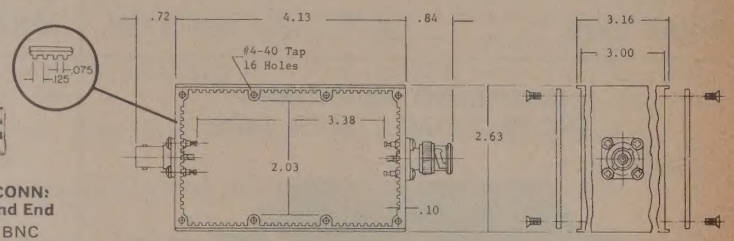
CONN: 2nd End
BNC Receptacle Jack UG290A/U

MODEL 3312 QUANTITY DISC. CODE (A) **NET 12.85**

NEW



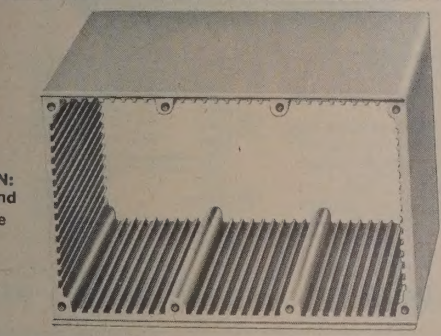
CONN: 1st End
BNC Receptacle Jack UG290A/U



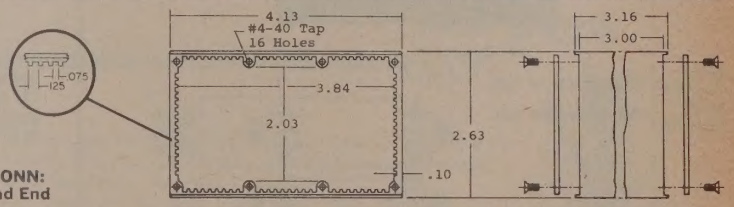
CONN: 2nd End
BNC Receptacle Plug UG1104A/U

MODEL 3313 QUANTITY DISC. CODE (A) **NET 13.85**

NEW



CONN: 1st End
None



CONN: 2nd End
None

MODEL 3311
FINISH: Blue Baked Enamel. Includes top and bottom covers with part number on one and 16 cover screws.

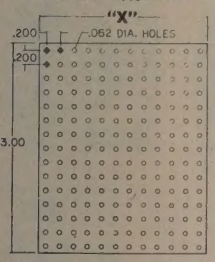
MODEL 3316
FINISH: None. Includes unmarked top and bottom covers with 16 cover screws.

QUANTITY DISC. CODE (A) **NET 8.85**

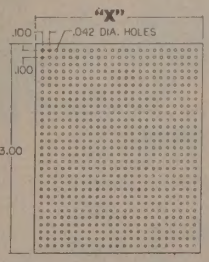
NEW

CIRCUIT MOUNTING BOARDS

Two sizes of various types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 3/16" thick.



BOARD A



BOARD B

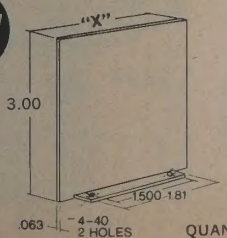
- Boards 3.00 x 2.39 used laterally.
- Boards 3.00 x 3.90 used lengthwise.

QUANTITY DISC. CODE (A)

BRD.	MODEL	NO. OF HOLES	"X" DIM.	MATERIAL	NET
A	3550	12 x 15	2.39	Paper Epoxy (PEE)	1.00
A	3551	12 x 15	2.39	Glass-Epoxy (GEE)	1.25
A	3552	12 x 15	2.39	Glass-Epoxy (GEE) COP. CLAD 1 Side	1.50
B	3553	23 x 30	2.39	Glass-Epoxy (GEE)	1.75
A	3554	20 x 15	3.90	Paper Epoxy (PEE)	1.00
A	3555	20 x 15	3.90	Glass-Epoxy (GEE)	1.50
A	3556	20 x 15	3.90	Glass-Epoxy (GEE) COP. CLAD 1 Side	1.75
B	3557	39 x 30	3.90	Glass-Epoxy (GEE)	1.50

NEW

SHIELDING DIVIDERS



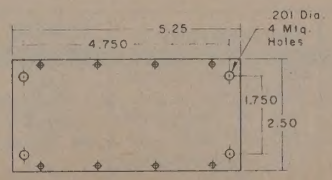
Two sizes of Aluminum dividers for dividing the box into shielded compartments. **MATERIAL:** .063 Aluminum, clear anodized per MIL-A-8625A.

- Divider 3.00 x 2.39 used laterally.
- Divider 3.00 x 3.90 used lengthwise.

MODEL	"X" DIM.	NET
3558	2.39	1.10
3559	3.90	1.35

QUANTITY DISC. CODE (A)

LARGER BOTTOM PLATE FOR MOUNTING



This larger plate, when attached to the box, provides flanges for mounting.

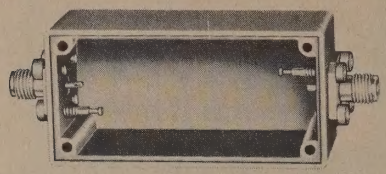
MATERIAL: .080 Aluminum #6061-T6, clear anodized per MIL-A-8625A.

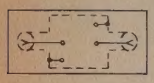
MODEL 3328 (Plate only) QUANTITY DISC. CODE (A) **NET 1.25**

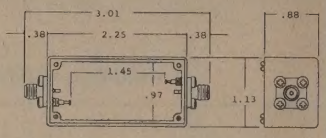
POMONA ELECTRONICS

SHIELDED "BLACK BOXES"

COMPONENT MOUNTING — OSM* RECEPTACLE BOTH ENDS



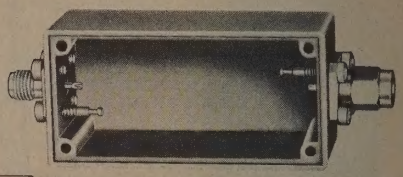


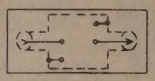


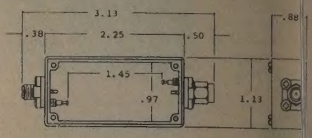
CONN: 1st END } OSM Receptacle Jack.
CONN: 2nd END } OSM Receptacle Jack.

MODEL 2399 QUANTITY DISC. CODE (A) **NET 17.95**

COMPONENT MOUNTING — OSM* RECEPTACLE TO OSM* PLUG



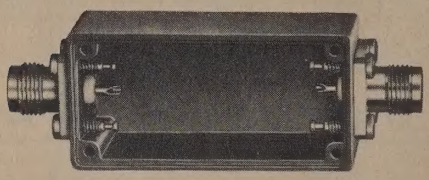




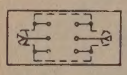
CONN: 1st END } OSM Receptacle Jack.
CONN: 2nd END } OSM Receptacle Plug.

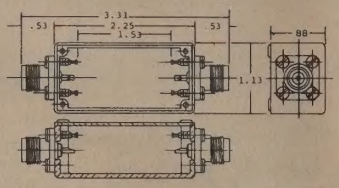
MODEL 2398 QUANTITY DISC. CODE (A) **NET 22.9**

COMPONENT MOUNTING— TNC RECEPTACLE BOTH ENDS



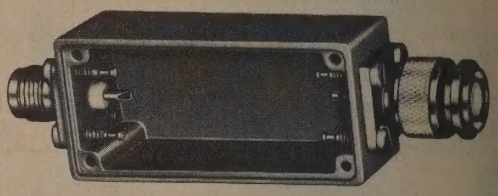
CONN: 1st END } TNC Receptacle Jack.
CONN: 2nd END } TNC Receptacle Jack.



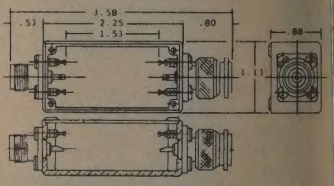


MODEL 2396 QUANTITY DISC. CODE (A) **NET 7.85**

COMPONENT MOUNTING— TNC RECEPTACLE TO TNC PLUG

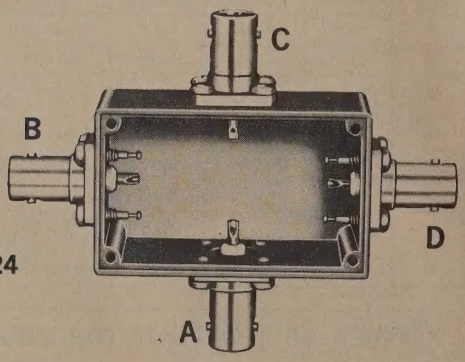


CONN: 1st END } TNC Receptacle Jack.
CONN: 2nd END } TNC Receptacle Plug.

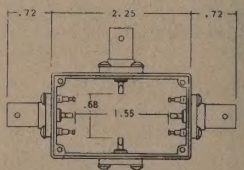


MODEL 2395 QUANTITY DISC. CODE (A) **NET 9.50**

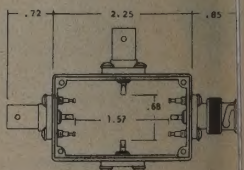
COMPONENT MOUNTING — CROSS CONNECTIONS



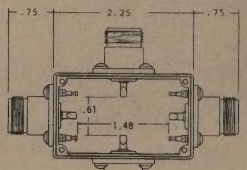
MODEL 2424



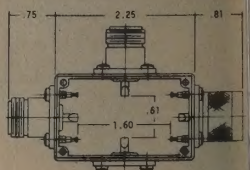
2424



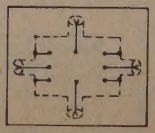
2426



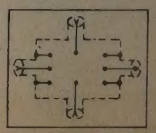
2425



2427



2424, 2425



2426, 2427

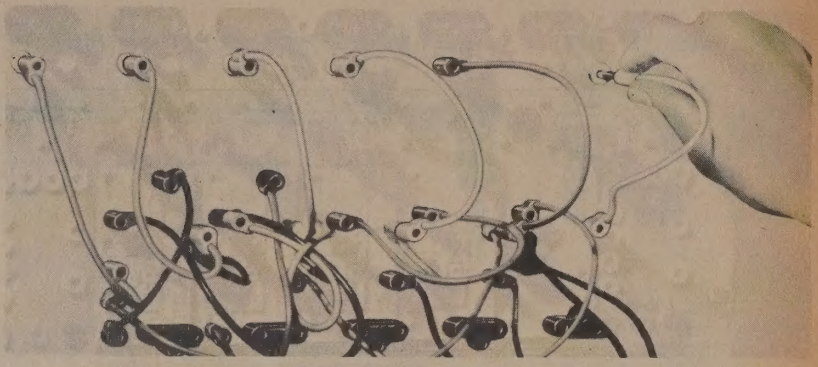
MODEL	CONNECTION A, B AND C	CONNECTION D	Quantity Disc. Code	NET
2424	BNC Receptacle Jack, UG290A/U.	BNC Receptacle Jack, UG290A/U.	(A)	11.75
2425	Type "N" Receptacle Jack, UG58A/U.	Type "N" Receptacle Jack, UG58A/U.	(A)	11.75
2426	BNC Receptacle Jack, UG290A/U.	BNC Receptacle Plug, UG1104A/U.	(A)	12.85
2427	Type "N" Receptacle Jack, UG58A/U.	Type "N" Receptacle Plug.	(A)	12.85

*OSM is a registered trademark of OMNI Spectra, Inc.

POMONA ELECTRONICS — PATCH CORDS BANANA PLUGS

OMONA BANANA PLUG PATCH CORDS

igh thermoplastic insulation molds the g and leads into a strong moisture re- tant integral unit. Excellent for computer rd and test equipment applications. ed by leading industries in applications ere extreme reliability is of prime portance.



ATURES

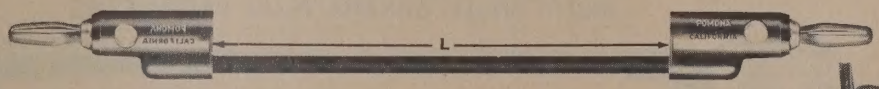
- One piece beryllium copper heat treated spring for maximum long life.
- Rounded spring design results in maximum contact area.
- Extra flexible polyvinyl insulation used on all leads.

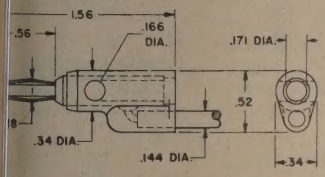
SPECIFICATIONS

- Fits standard 0.166 dia. banana jacks.
- Spring, beryllium copper alloy 170 per QQ-C-533.
- Plug body, brass per QQ-B-626, Comp. 22.
- Nickel plated per QQ-N-290, Class 2.
- Contact resistance less than 0.001 ohms per banana plug.
- Operating Temp.: −0°C to +105°C.
- Wire, 18 AWG, stranding 65 x 36 T.C.
- Insulation, polyvinyl .144″ O.D.
- Ratings: 15 A. Cont., 30 A. Int. 10,000 W.V.D.C.

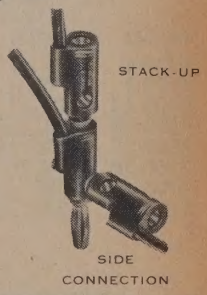
STACK-UP BANANA PLUG PATCH CORD

ODEL	LENGTH	NET
4	4″	1.50
8	8″	1.50
12	12″	1.50
18	18″	1.50
24	24″	1.50
36	36″	1.50
48	48″	1.55
60	60″	1.60





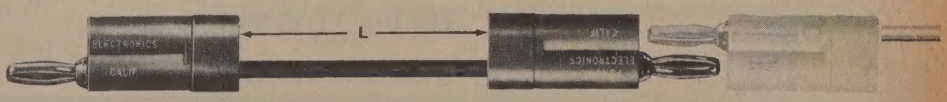
Multiple stacking feature accommodates the most complex stacking; keeps circuitry neater. Greatly simplifies circuit connections and changes. Reliable solder-bonded connections withstand pull test in excess of 50 lbs. Banana plugs both ends.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.



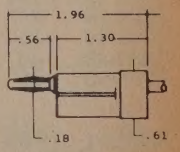
MODEL B (Specify Color) QUANTITY DISC. CODE (A) ★

EXTENSION STACKING BANANA PLUG PATCH CORD

ODEL	LENGTH	NET
B-4	4″	1.75
B-8	8″	1.75
B-12	12″	1.75
B-18	18″	1.75
B-24	24″	1.75
B-36	36″	1.75
B-48	48″	1.80
B-60	60″	1.85



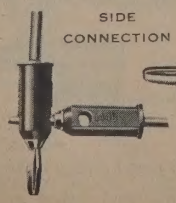
Dual purpose. Insulates all hot leads when used as an extension cord. Endless extension couplings possible with any banana plug patch cord. Provides vertical stacking from any jack. Reliable solder-bonded connections withstand pull test in excess of 50 lbs. Banana plugs both ends.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

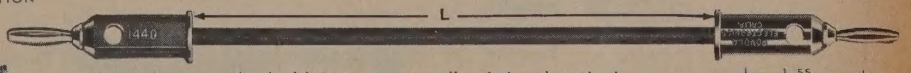


MODEL HB (Specify Color) QUANTITY DISC. CODE (A) ★

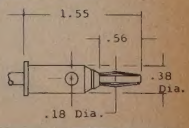
HORIZONTAL STACKING BANANA PLUG PATCH CORD

ODEL	LENGTH	NET
440-4	4″	1.25
440-8	8″	1.25
440-12	12″	1.25
440-18	18″	1.25
440-24	24″	1.25
440-36	36″	1.25
440-48	48″	1.30
440-60	60″	1.35





Ideal as an interconnecting lead between power supplies, test equipment, etc. Horizontal stacking feature. Banana plugs on both ends.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.



MODEL 1440 (Specify Color) QUANTITY DISC. CODE (A) ★

★ Various lengths may be aggregated for best quantity price.

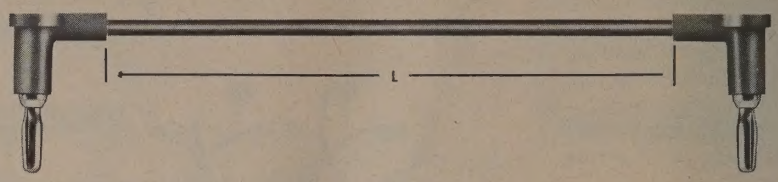
OTHER LENGTHS AVAILABLE TO ORDER

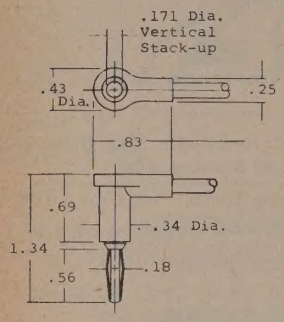
POMONA ELECTRONICS

PATCH CORDS BANANA PLUGS

STACK-UP RIGHT ANGLE BANANA PLUG PATCH CORD

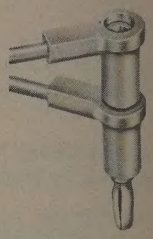
MODEL	LENGTH	NET
2864-4	4"	1.50
2864-8	8"	1.50
2864-12	12"	1.50
2864-18	18"	1.50
2864-24	24"	1.50
2864-36	36"	1.50
2864-48	48"	1.55
2864-60	60"	1.60





Vertical Stacking feature allows endless circuit connections and the right angle design keeps wires close to the chassis. An oversize shoulder allows easy connect and disconnect.

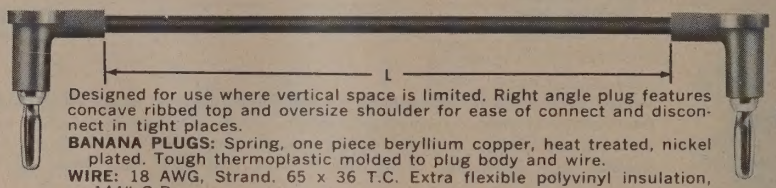
BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, .144" O.D.
OPERATING TEMP.: —0°C to +105°C.
RATED: 15 A. Cont., 30 A. Int. 10,000 W.V.D.C.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.



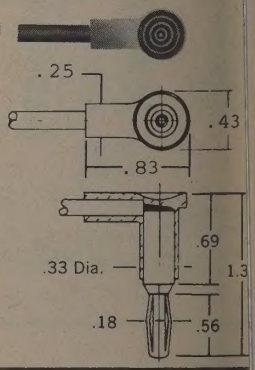
MODEL 2864 (Specify Color) QUANTITY DISC. CODE (A) ★

RIGHT ANGLE BANANA PLUG PATCH CORD

MODEL	LENGTH	NET
2700-4	4"	1.25
2700-8	8"	1.25
2700-12	12"	1.25
2700-18	18"	1.25
2700-24	24"	1.25
2700-36	36"	1.25
2700-48	48"	1.30
2700-60	60"	1.35



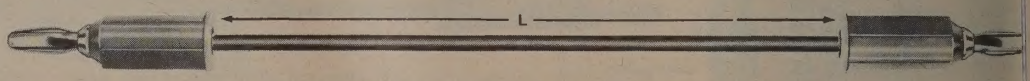
Designed for use where vertical space is limited. Right angle plug features concave ribbed top and oversize shoulder for ease of connect and disconnect in tight places.
BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, .144" O.D.
OPERATING TEMP.: —0°C to +105°C.
RATED: 15 A. Cont., 30 A. Int. 10,000 W.V.D.C.
COLORS: Black, Red



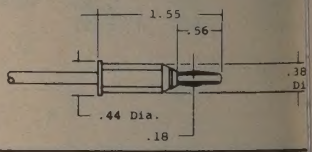
MODEL 2700 (Specify Color) QUANTITY DISC. CODE (A) ★

BANANA PLUG PATCH CORD

MODEL	LENGTH	NET
1985-4	4"	1.25
1985-8	8"	1.25
1985-12	12"	1.25
1985-18	18"	1.25
1985-24	24"	1.25
1985-36	36"	1.25
1985-48	48"	1.30
1985-60	60"	1.35

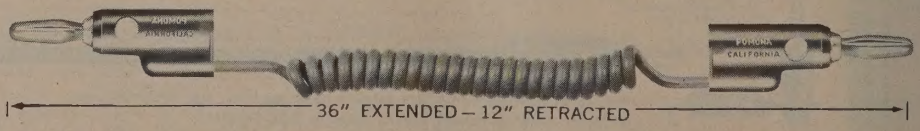


Excellent for general lab work. Permits interconnection between test instruments, etc. Banana plugs both ends.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.



MODEL 1985 (Specify Color) QUANTITY DISC. CODE (A) ★

RETRACTILE (COILED) PATCH CORD—WITH STACK-UP BANANA PLUGS



Permits the use of one size patch cord in place of many various lengths. **BANANA PLUGS:** Spring, one piece beryllium copper heat treated, nickel plated. Tough thermoplastic molded to body and wire. **WIRE:** 20 AWG; Stranding 41 x 36 tinned copper; rubber insulation .145" O.D. **RATED:** 4 A. Cont., 10 A Int./5000 WVDC. **OPERATING TEMP.:** —20°C to +60°C. **COLOR:** Black, Red.

MODEL 2484-36 (Specify Color) QUANTITY DISC. CODE (A) **NET 2.50**

POMONA ELECTRONICS

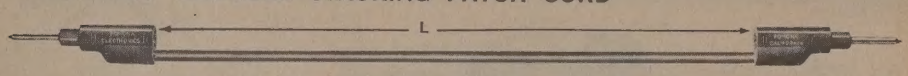
PATCH CORDS .080 TIP

PIN TIP VERTICAL STACKING PATCH CORD

MODEL	LENGTH	NET
	4″	1.75
	8″	1.75
12	12″	1.75
18	18″	1.75
24	24″	1.75
36	36″	1.75
48	48″	1.80
60	60″	1.85

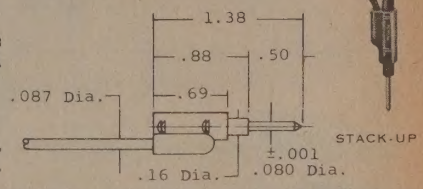
MODEL P
(Specify Color)

★ QUANTITY DISC. CODE (A)



A must in circuit designing and testing, with instruments that utilize tip jacks.
PIN TIP: .080 dia., ½″ long, brass, gold flashed.
TIP JACK, STACK-UP: Beryllium copper, gold flashed. Accepts .080 dia. pin.

WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation .087″ O.D.
RATED: 5 A. Cont., 10 A. Int. 5,000 W.V.D.C.
OPERATING TEMP.: —0°C to +105°C.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

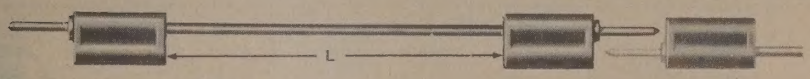


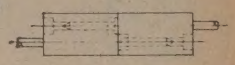
PIN TIP EXTENSION STACKING PATCH CORD

MODEL	LENGTH	NET
727-4	4″	1.85
727-8	8″	1.85
727-12	12″	1.85
727-18	18″	1.85
727-24	24″	1.85
727-36	36″	1.85
727-48	48″	1.90
727-60	60″	1.95

MODEL 1727
(Specify Color)

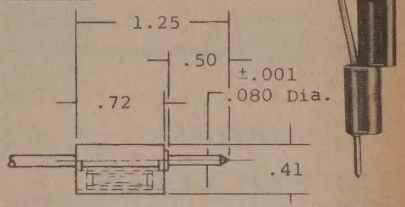
★ QUANTITY DISC. CODE (A)





Dual purpose; insulates exposed leads when used as an extension cord. Endless extension coupling possible. Also provides stacking from .080 jack.
PIN TIP: .080 dia., ½″ long, brass, gold flashed.
TIP JACK: Beryllium copper, gold flashed. Accepts .080 dia. pin.

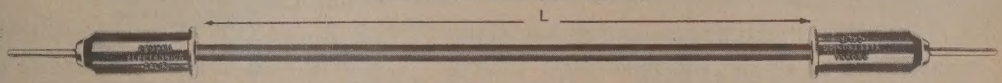
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation .087″ O.D.
RATED: 5 A. Cont., 10 A. Int. 5,000 W.V.D.C.
OPERATING TEMP.: —0°C to +105°C.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.



PIN TIP PATCH CORD

MODEL	LENGTH	NET
990-4	4″	1.10
990-8	8″	1.10
990-12	12″	1.10
990-18	18″	1.10
990-24	24″	1.10
990-36	36″	1.10
990-48	48″	1.15
990-60	60″	1.20

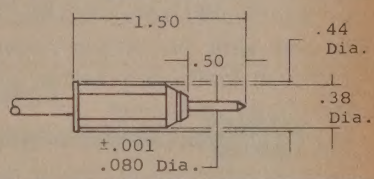
MODEL 1990
(Specify Color)



Heavy Duty patch cord. Excellent for general lab work. Permits interconnection between test instruments that utilize tip jacks.
PIN TIP: .080 dia., ½″ long, brass, nickel plated.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.

RATED: 5 A. Cont., 10 A. Int. 10,000 W.V.D.C.
OPERATING TEMP.: —0°C to +105°C.
COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

★ QUANTITY DISC. CODE (A)



PIN TIP PATCH CORD

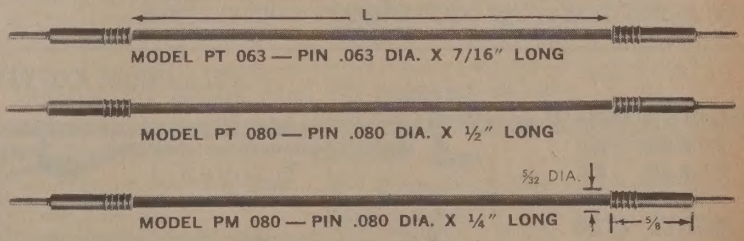
MODEL			LENGTH	NET
063-4	PT080-4	PM080-4	4″	.85
063-8	PT080-8	PM080-8	8″	.85
063-12	PT080-12	PM080-12	12″	.85
063-18	P8080-18	PM080-18	18″	.85
063-24	PT080-24	PM080-24	24″	.85
063-36	PT080-36	PM080-36	36″	.85
063-48	PT080-48	PM080-48	48″	.90
063-60	PT080-60	PM080-60	60″	.95

COLORS: PT063 and PM080—Red and Black only.
PT080 — Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

MODEL PT & PM
(Specify Color)

PIN TIP: Brass, gold flashed.
WIRE: 22 AWG, Strand. 19 x 34 T.C. Insulation, polyvinyl .064″ O.D.
RATED: 3 A. Cont., 7.5 A. Int. 1,000 W.V.D.C.
OPERATING TEMP.: —0°C to +105°C.

★ QUANTITY DISC. CODE (A)



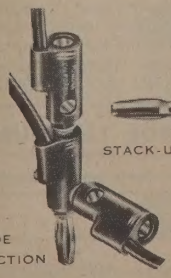
Small body style permits usage in equipment having receptacles spaced closely together. Three models shown.

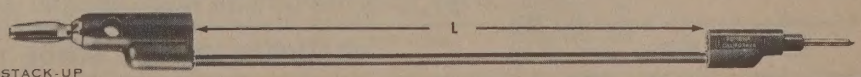
BANANA PLUG TO PIN TIP STACK-UP PATCH CORD

Adapts to equipment using banana jacks and pin jacks. Banana plug and pin tip allow vertical stack-up.

MODEL	LENGTH	NET
1126-4	4″	1.75
1126-8	8″	1.75
1126-12	12″	1.75
1126-18	18″	1.75
1126-24	24″	1.75
1126-36	36″	1.75
1126-48	48″	1.80
1126-60	60″	1.85

MODEL 1126
(Specify Color)





BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated.
PIN TIP: .080 dia. ½″ long, brass, gold flashed.

TIP JACK, STACK-UP: Beryllium copper, gold flashed. Accepts .080 Dia. pin.
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation .087″ O.D.
RATED: 5 A. Cont., 10 A. Int. 5,000 W.V.D.C.
OPERATING TEMP.: —0°C to +105°C.
COLORS: Black, Red.

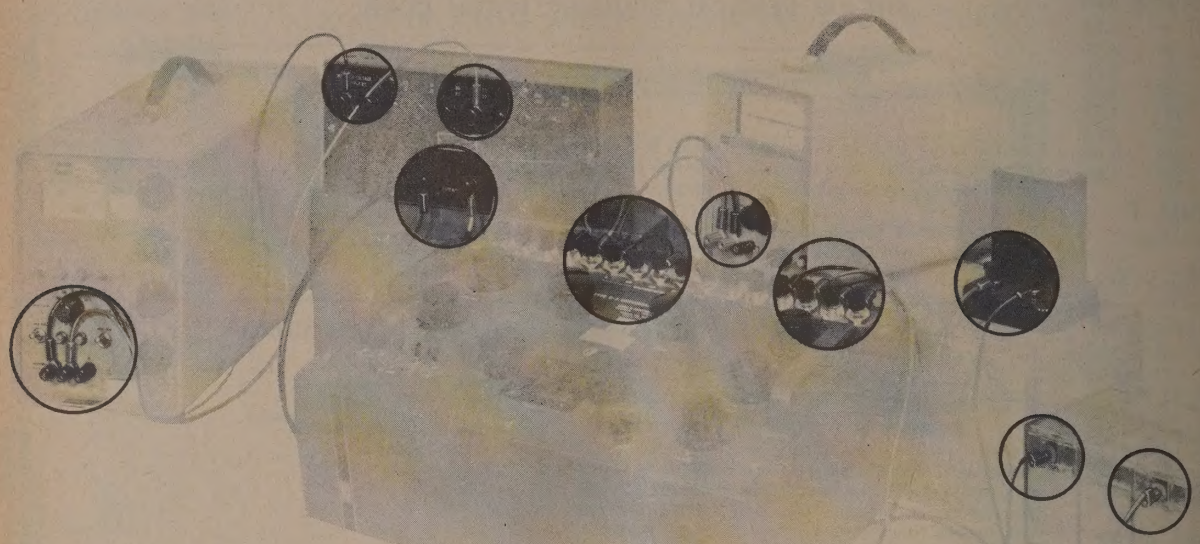
★ QUANTITY DISC. CODE (A)

★ Various lengths may be aggregated for best quantity price.

OTHER LENGTHS AVAILABLE TO ORDER

POMONA ELECTRONICS

JUMPERS — LOW THERMAL E.M.F.



TELLURIUM COPPER LEADS FOR PRECISION MEASUREMENTS

POMONA ELECTRONICS has advanced the state of the art in measurements where Thermoelectric Effects are significant sources of error. Comparators designed for use with the Kelvin-Varley voltage divider and microvolt leads were tested with Primary Standards Laboratory equipment.

Thermoelectric voltages were not detected until the most sensitive galvanometer range was used.

THERMOELECTRIC PROPERTIES—Tellurium copper gold plated spade lugs cold-staked to multi-stranded 12 gauge COPPER wire minimize thermoelectr effects—an absolute necessity for low voltage, hi precision measurements.

LOW RESISTANCE—12 gauge multi-strande COPPER wire results in extremely low cable resis ance. Spade lugs plated with 50 micro inches go for minimum contact resistance and minimu thermal EMF when using copper binding post (Less than 0.01 $\mu v/c^{\circ}$).

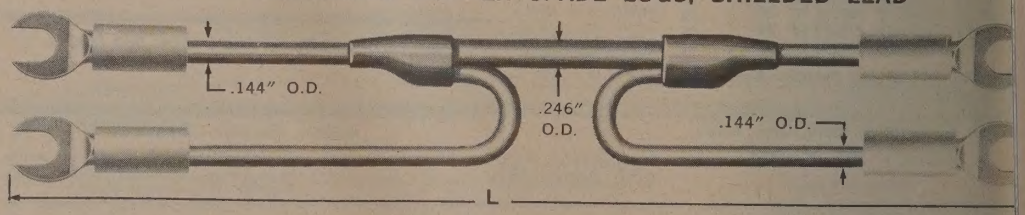
TELLURIUM COPPER SPADE LUGS, SHIELDED LEAD

MODEL	LENGTH
1756-24	24"
1756-48	48"

MODEL 1756
(Specify Length)

★ QUANTITY DISC. CODE (A)

NET 9.85

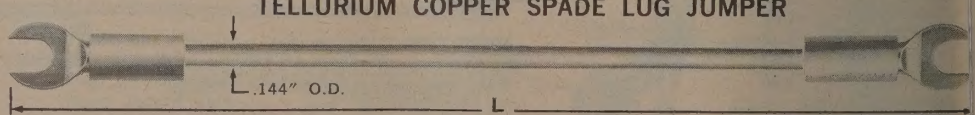


Designed for use with Kelvin Varley voltage dividers where extreme precision is required for low voltage measuremen Features guard shield to effectively reduce shunt resistance. Tough thermo-plastic molded to spade lug body, color; cent conductor lug red, shield lug black. Tellurium copper heavy duty one piece machined spade lug gold plated per MIL-G-4520 Type II, Class I. Center conductor 12 AWG multi-stranded bare copper, shield lead wire, 18 AWG, stranded. Polyethyle primary insulation. Braided shield bare copper. Polyvinyl jacket, color black, per MIL-C-17C Type IIA.

TELLURIUM COPPER SPADE LUG JUMPER

MODEL	LENGTH	NET
1693-12	12"	2.75
1693-18	18"	2.75
1693-24	24"	2.75
1693-36	36"	2.75
1693-48	48"	2.75
1693-60	60"	2.75

MODEL 1693 (Specify Color) ★ QUANTITY DISC. CODE (A)



Single conductor tellurium copper spade lug jumper used in applications where guard shield is not required. Tough thermo plastic molded to spade lug body. Color matches wire. Tellurium Copper heavy duty one piece machined spade lug gold plate per MIL-G-45204. Type II, Class I. Conductor, 12 AWG multi-stranded bare copper. Insulation polyvinyl, 105°C, .144" O.D

COLORS: Black, Red, Green.

★ Various lengths may be aggregated for best quantity price.

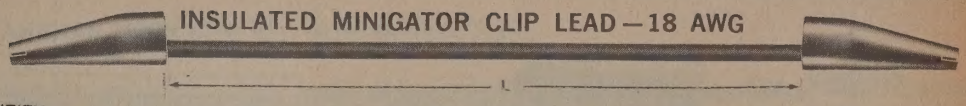
POMONA ELECTRONICS

JUMPERS — CLIP LEADS

INSULATED MINIGATOR CLIP LEAD—18 AWG

MODEL	LENGTH	NET
G-B-4	4″	.95
G-B-8	8″	.95
G-B-12	12″	.95
G-B-24	24″	.95
G-B-36	36″	.95
G-B-48	48″	1.00
G-B-60	60″	1.05

(Specify Color)



QUANTITY DISC. CODE (A) ★

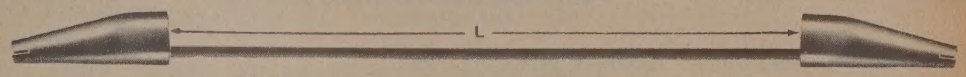
CLIP: Minigator, steel, cad plated.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.

INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red.

INSULATED MINIGATOR CLIP LEAD—20 AWG

MODEL	LENGTH	NET
236-4	4″	.95
236-8	8″	.95
236-12	12″	.95
236-24	24″	.95
236-36	36″	.95
236-48	48″	1.00
236-60	60″	1.05

(Specify Color)



QUANTITY DISC. CODE (A) ★

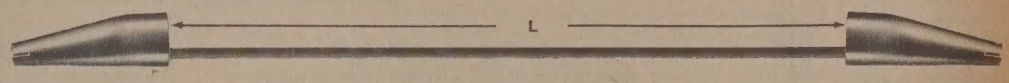
CLIP: Minigator, steel, cad. plated.
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, .087″ O.D.

INSULATOR: Red Vinyl with Red Wire. Black on all other colors.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red.

INSULATED MICROGATOR CLIP LEAD—20 AWG

MODEL	LENGTH	NET
613-4	4″	.95
613-8	8″	.95
613-12	12″	.95
613-24	24″	.95
613-36	36″	.95
613-48	48″	1.00
613-60	60″	1.05

(Specify Color)



QUANTITY DISC. CODE (A) ★

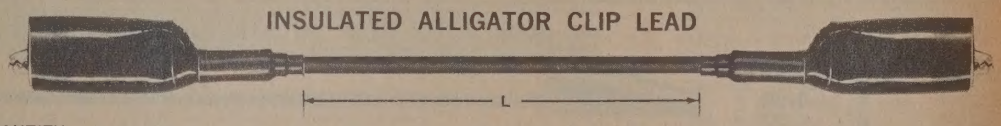
CLIP: Microgator, solid copper.
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, .087″ O.D.

INSULATOR: Red Vinyl with Red Wire. Black on all other colors.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red.

INSULATED ALLIGATOR CLIP LEAD

MODEL	LENGTH	NET
AL-B-4	4″	1.10
AL-B-8	8″	1.10
AL-B-12	12″	1.10
AL-B-24	24″	1.10
AL-B-36	36″	1.10
AL-B-48	48″	1.15
AL-B-60	60″	1.20

(Specify Color)



QUANTITY DISC. CODE (A) ★

CLIP: Alligator, steel, cad plated.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.

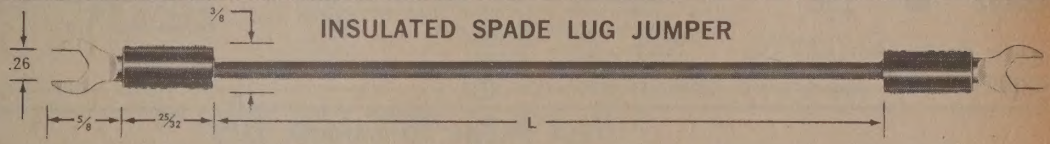
INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red.

INSULATED SPADE LUG JUMPER

MODEL	LENGTH	NET
1743-12	12″	1.25
1743-24	24″	1.25
1743-36	36″	1.25
1743-48	48″	1.30
1743-60	60″	1.35

(Typical Dimensions spade lug)

(Specify Color)



QUANTITY DISC. CODE (A) ★

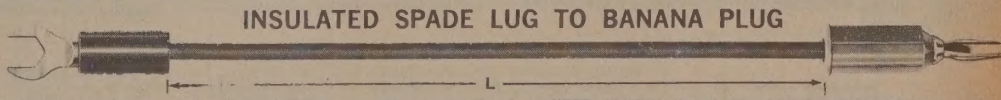
Spade lug heavy duty machined one piece brass. Tough thermo-plastic molded to spade lug body.
SPADE LUGS: Brass 1/16″ thick, nickel plated.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.

RATED: 15 A. Cont., 30 A Int. 10,000 W.V.D.C.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red, Green, White.

INSULATED SPADE LUG TO BANANA PLUG

MODEL	LENGTH	NET
1987-12	12″	1.25
1987-24	24″	1.25
1987-36	36″	1.25
1987-48	48″	1.30
1987-60	60″	1.35

(Specify Color)



QUANTITY DISC. CODE (A) ★

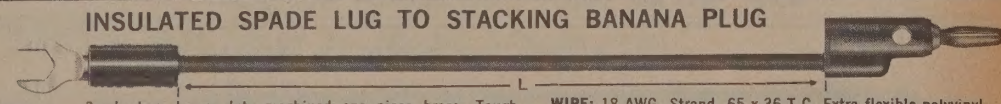
Spade lug, heavy duty machined one piece brass. Tough thermo-plastic molded to spade lug and banana plug body.
SPADE LUG: Brass 1/16″ thick, nickel plated.
BANANA PLUG: Spring one piece beryllium copper heat treated, nickel plated.

WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.
RATED: 15 A. Cont., 30 A. Int. 10,000 W.V.D.C.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red

INSULATED SPADE LUG TO STACKING BANANA PLUG

MODEL	LENGTH	NET
1370-12	12″	1.00
1370-24	24″	1.00
1370-36	36″	1.00
1370-48	48″	1.05
1370-60	60″	1.10

(Specify Color)



QUANTITY DISC. CODE (A) ★

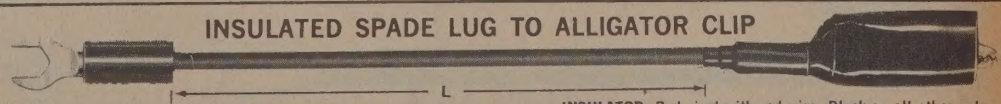
Spade lug, heavy duty machined one piece brass. Tough thermo-plastic molded to spade lug and banana plug body.
SPADE LUG: Brass 1/16″ thick, nickel plated.
BANANA PLUG: Spring one piece beryllium copper heat treated, nickel plated.

WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.
RATED: 15 A. Cont., 30 A. Int. 10,000 W.V.D.C.
OPERATING TEMP.: —25°C to +105°C.
COLORS: Black, Red, Green, White.

INSULATED SPADE LUG TO ALLIGATOR CLIP

MODEL	LENGTH	NET
1960-12	12″	1.25
1960-24	24″	1.25
1960-36	36″	1.25
1960-48	48″	1.30
1960-60	60″	1.35

(Specify Color)



QUANTITY DISC. CODE (A) ★

Spade lug, heavy duty machined one piece brass. Tough thermo-plastic molded to spade lug body.
SPADE LUG: Brass 1/16″ thick, nickel plated.
CLIP: Alligator, steel, cad plated.

INSULATOR: Red vinyl with red wire. Black on all other colors.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation .144″ O.D.
OPERATING TEMP.: —25°C to +105°C
COLORS: Black, Red

★ Various lengths may be aggregated for best quantity price.

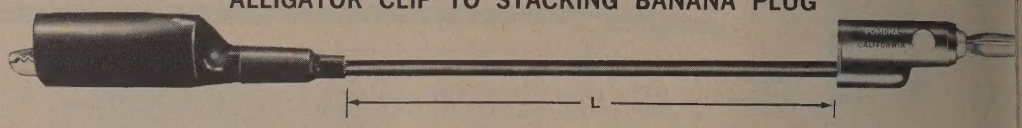
OTHER LENGTHS AVAILABLE TO ORDER

POMONA ELECTRONICS

CLIP LEADS TEST PROBES

ALLIGATOR CLIP TO STACKING BANANA PLUG

MODEL	LENGTH	NET
1166-4	4"	1.10
1166-8	8"	1.10
1166-12	12"	1.10
1166-24	24"	1.10
1166-36	36"	1.10
1166-48	48"	1.15
1166-60	60"	1.20



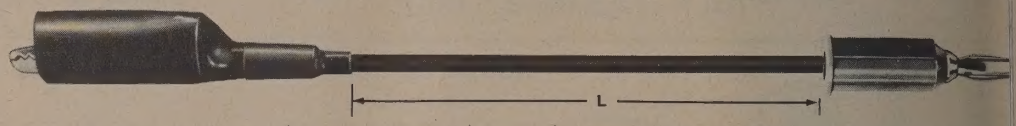
Adapts to equipment using standard banana jacks.
CLIP: Alligator, Steel, cadmium plated
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on all other colo
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvi insulation .144" O.D.
OPERATING TEMP.: −25°C to +105°C.
COLORS: Black, Red.

MODEL 1166 (Specify Color) QUANTITY DISC. CODE (A) ★

ALLIGATOR CLIP LEAD TO BANANA PLUG

MODEL	LENGTH	NET
1959-4	4"	1.10
1959-8	8"	1.10
1959-12	12"	1.10
1959-24	24"	1.10
1959-36	36"	1.10
1959-48	48"	1.15
1959-60	60"	1.20



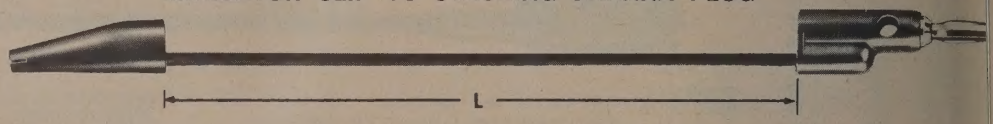
Adapts to equipment using standard banana jacks.
CLIP: Alligator, Steel, cadmium plated
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body.

INSULATOR: Red vinyl with red wire. Black on all other colo
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvin insulation .144" O.D.
OPERATING TEMP.: −25°C to +105°C.
COLORS: Black, Red.

MODEL 1959 (Specify Color) QUANTITY DISC. CODE (A) ★

MINIGATOR CLIP TO STACKING BANANA PLUG

MODEL	LENGTH	NET
3220-4	4"	1.00
3220-8	8"	1.00
3220-12	12"	1.00
3220-24	24"	1.00
3220-36	36"	1.00
3220-48	48"	1.05
3220-60	60"	1.10

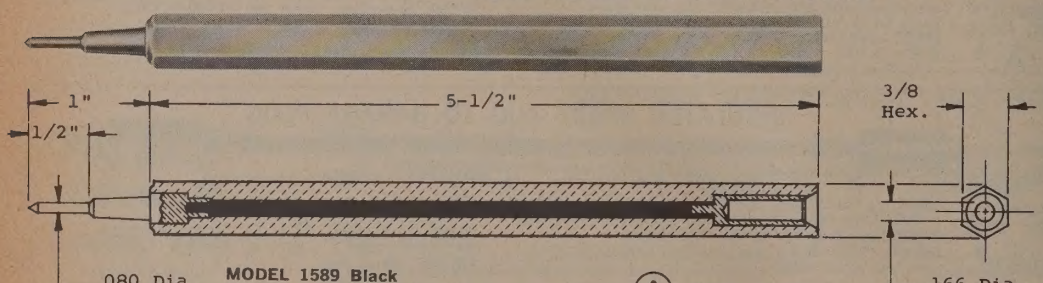


Adapts to equipment using standard banana jacks.
CLIP: Minigator, Steel, cadmium plated.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on all other colors
WIRE: 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyviny insulation .087" O.D.
OPERATING TEMP.: −25°C to +105°C.
COLORS: Black, Red.

MODEL 3220 (Specify Color) QUANTITY DISC. CODE (A) ★

TEST PROBE TO BANANA JACK



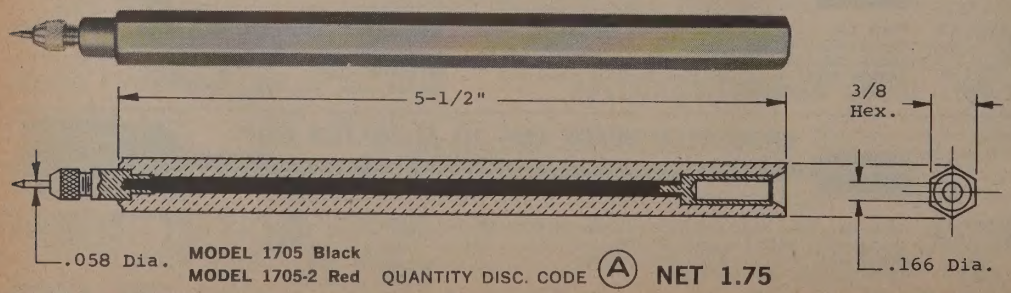
MODEL 1589 Black
MODEL 1589-2 Red QUANTITY DISC. CODE (A) **NET 1.50**

Banana jack in handle con nected to tip. Permits use o standard banana plugs fo circuit testing as a test prod Heavy duty insulated handl molded to banana jack anc tip.

PIN TIP: .080 dia. x ½" long, brass nickel plated.

BANANA JACK: .166 dia. Brass nickel plated. Accepts standard banana plug.

NEEDLE TIP PROBE TO BANANA JACK



MODEL 1705 Black
MODEL 1705-2 Red QUANTITY DISC. CODE (A) **NET 1.75**

Sharp replaceable needle tip allows testing of encapsulated circuits. Banana jack in handle connected to tip. Permits use of standard banana plugs for circuit testing as a test prod. Heavy duty insulated handle molded to banana jack and tip.

PIN TIP: Replaceable needle tip, steel nickel plated.

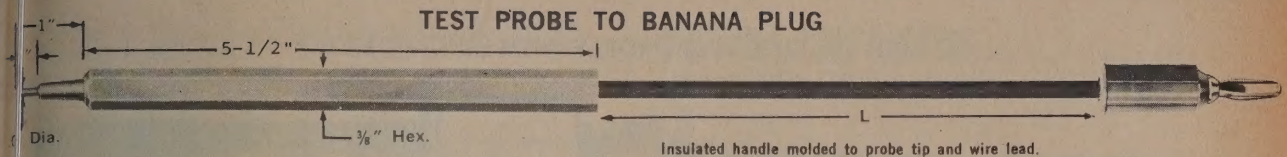
BANANA JACK: .166 dia. Brass nickel plated. Accepts standard banana plug.

★ Various lengths may be aggregated for best quantity price.

OTHER LENGTHS AVAILABLE TO ORDER

POMONA ELECTRONICS — TEST PROBES

TEST PROBE TO BANANA PLUG

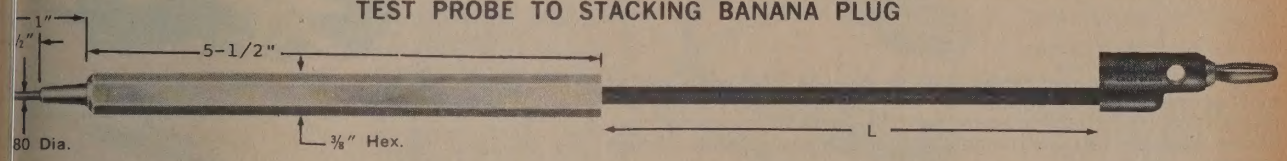


MODEL 1986-48-B	48" Long	Black	NET 1.75
MODEL 1986-48-R	48" Long	Red	NET 1.75

QUANTITY DISC. CODE (A)

Insulated handle molded to probe tip and wire lead.
PROBE PIN TIP: .080 dia. x ½" long. Brass nickel plated.
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, .144" O.D.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermo-plastic molded to body.
COLORS: Black, Red.

TEST PROBE TO STACKING BANANA PLUG

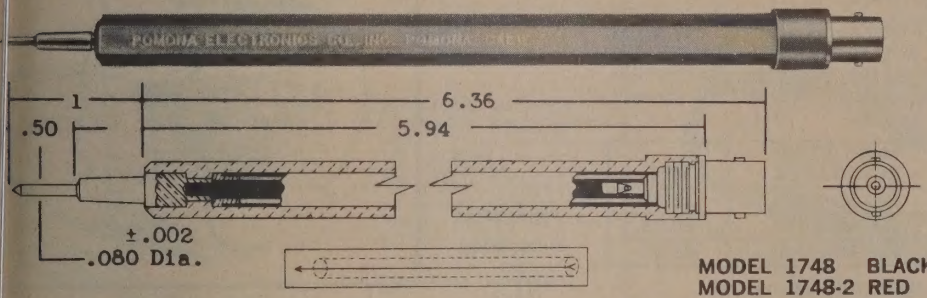


MODEL 1382-48B	48" Long	Black	NET 1.95
MODEL 1382-48R	48" Long	Red	NET 1.95

QUANTITY DISC. CODE (A)

Insulated handle molded to probe tip and wire lead.
PROBE PIN TIP: .080 dia. x ½" long. Brass nickel plated
WIRE: 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, .144" O.D.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermo-plastic molded to plug body and wire.
COLORS: Black, Red.

TEST PROBE TO BNC RECEPTACLE

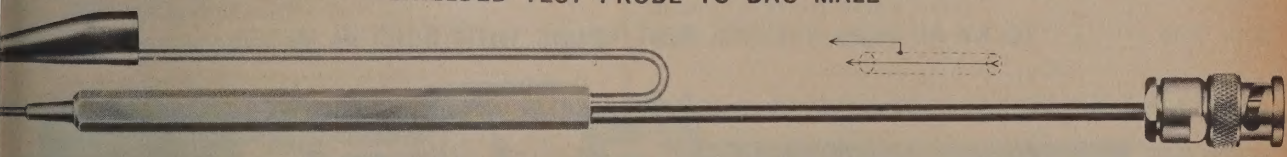


BNC receptacle in handle connected to tip. Permits the use of coaxial cables with BNC plug for circuit testing as a test prod. Tough thermoplastic molded to BNC receptable and tip. Shield extends to within 1½" of the probe tip end.
PIN TIP: .080" dia. x ½" long, brass, nickel plated.
RECEPTACLE: BNC, UG1094/U.

MODEL 1748 BLACK
MODEL 1748-2 RED

QUANTITY DISC. CODE (A) **NET 5.85**

SHIELDED TEST PROBE TO BNC MALE



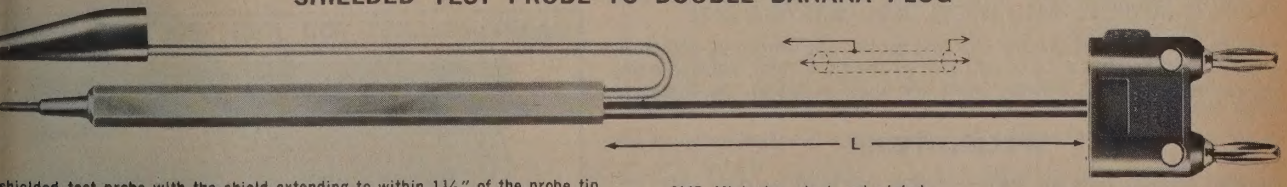
shielded test probe with the shield extending to within 1½" of the probe tip nd. One piece molded construction. Insulated handle molded to probe tip and able. Insulated minigator clip connected to shield lead.
ROBE PIN TIP: .080 dia. x ½" long. Brass, nickel plated.
ONNECTOR: BNC Male, UG88E/U.

CLIP: Minigator, steel, cad. plated.
INSULATOR, VINYL: Color, Black.
CABLE: Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermo-plastic.

QUANTITY DISC. CODE (B)

MODEL 2739-C-48 . . . . . **48" long** **NET 6.85**

SHIELDED TEST PROBE TO DOUBLE BANANA PLUG



shielded test probe with the shield extending to within 1½" of the probe tip nd. One piece molded construction. Insulated handle molded to probe tip and able. Insulated minigator clip connected to shield lead.
ROBE PIN TIP: .080 dia. x ½" long. Brass nickel plated.
OUBLE BANANA PLUG: On ¾" centers. Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermo-plastic molded to double plug body. Color, Black.

CLIP: Minigator, steel, cad. plated.
INSULATOR, VINYL: Color, Black.
CABLE: Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermo-plastic.

QUANTITY DISC. CODE (B)

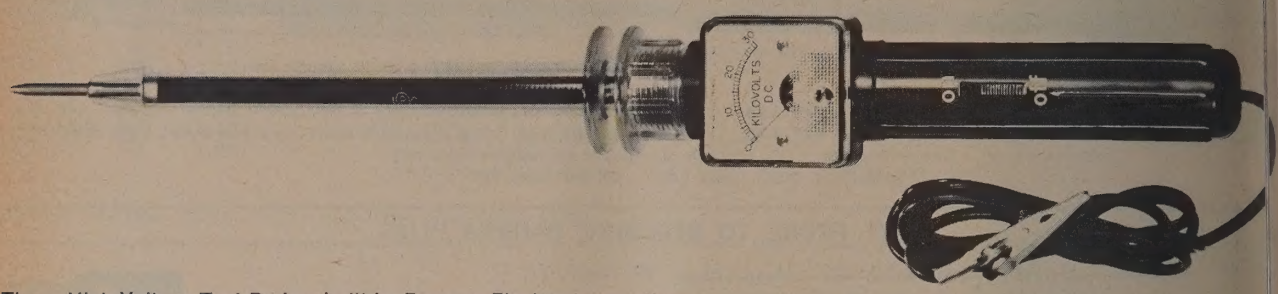
MODEL 1569-C-48 . . . . . **48" long** **NET 6.85**

OTHER LENGTHS AVAILABLE TO ORDER

POMONA ELECTRONICS

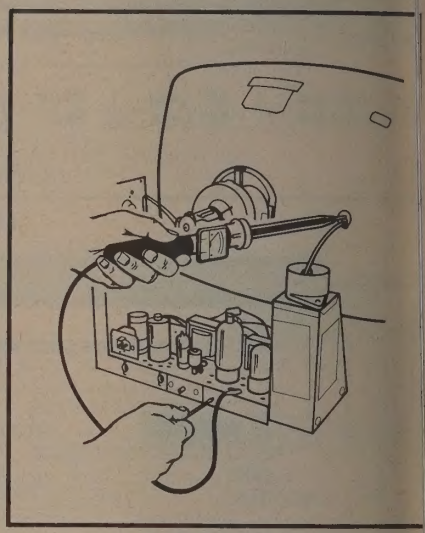
HIGH VOLTAGE TEST PROBES

DC HIGH VOLTAGE TEST PROBES WITH BUILT-IN METER



These High Voltage Test Probes built by Pomona Electronics are the most advanced instruments of their kind on the market; the only test probes featuring a built-in voltmeter. The Test Probes are self-contained, portable test instruments for rapid measurements of high voltages.

Easy to operate! Just ground the test probe instrument by attaching alligator clip to chassis, contact test probe tip to high voltage being measured and read voltage from the built-in meter. No warm-up time. No batteries.



PATENT PENDING

SPECIFICATIONS:

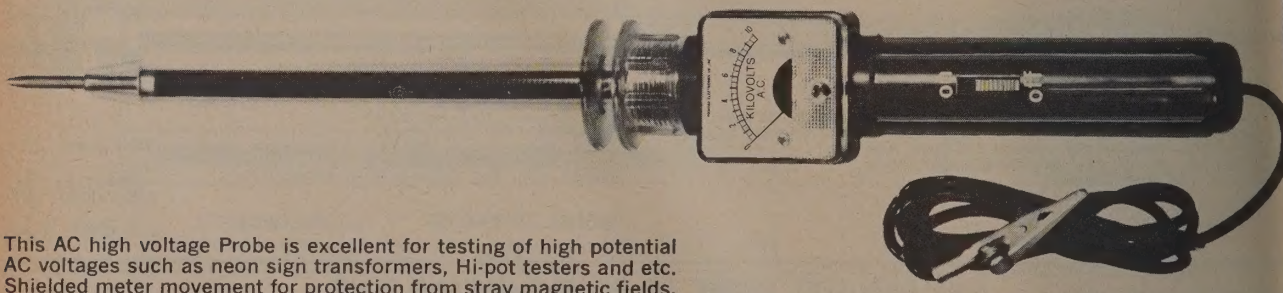
RANGE: See below. **SENSITIVITY:** 20,000 ohms/volt (50 ua) movement. **ACCURACY:** ± 3% full scale. **MULTIPLIER RESISTANCE:** See below. **MATERIAL:** Handle—high impact thermoplastic. Probe—high impact polystyrene. **LENGTH:** 14¾″ overall. **WEIGHT:** 8 ounces.

MODEL	VOLTS Full Scale	MULTIPLIER RESISTANCE	NET
2900	30,000	600 Megohm	19.95
3157(*)	15,000	300 Megohm	29.95
3163(*)	6,000	120 Megohm	29.95

*Models 3157 and 3163 are supplied with Model 3295 carrying case.

QUANTITY DISC. CODE (C)

10 KV AC HIGH VOLTAGE TEST PROBE WITH BUILT-IN METER



This AC high voltage Probe is excellent for testing of high potential AC voltages such as neon sign transformers, Hi-pot testers and etc. Shielded meter movement for protection from stray magnetic fields. PROBE IS SUPPLIED WITH MODEL 3295 CARRYING CASE.

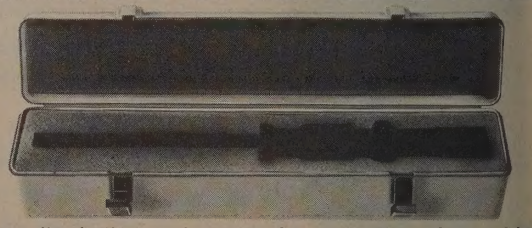
Easy to operate! Just ground the test probe instrument by attaching alligator clip to chassis, contact test probe tip to high voltage being measured and read voltage from the built-in meter. No warm-up time. No batteries.

SPECIFICATIONS:

RANGE: 10,000 Volts AC. **SENSITIVITY:** 2,000 Ohms/Volt (500 UA) movement. **ACCURACY:** ± 3% 30 cps to 1000 cps. **MULTIPLIER RESISTANCE:** 20 Megohm ± 2%. **MATERIAL:** Handle—high impact thermoplastic. Probe — high impact polystyrene. **LENGTH:** 14¾″ overall. **WEIGHT:** 8 ounces.

MODEL 3200 QUANTITY DISC. CODE (C) **NET 29.95**

CARRYING CASE FOR HIGH VOLTAGE PROBES



A quality built carrying case for protection of your high voltage probe. The case is made of tough thermoplastic. The inside is lined with soft, shock absorbing material.

MODEL 3295 QUANTITY DISC. CODE (D) **NET 5.95**

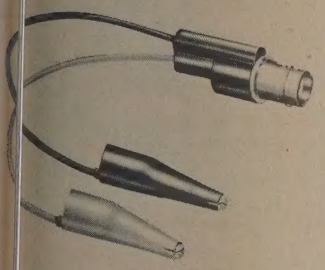
POMONA ELECTRONICS

MOLDED BREAKOUTS

A w series of "Breakouts", designed to convert standard co ial cables to test cables.
By onnecting proper Breakout receptacle or plug to corresp ding cable plug or receptacle, any standard coaxial cable be mes a test cable equipped with clip leads.
A onnections feature a non-tarnish finish, and tough molded th moplastic insulation molded to connector and wire.

APPLICABLE SPECIFICATIONS:
Wire: (With Alligator Clips) 18 AWG, Strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, .144" O.D.
Wire: (With Minigator Clips) 20 AWG, Strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, .087" O.D.
Operating Temp.: —25°C to +85°C.
Working Voltage: 500 V Peak.

BNC RECEPTACLE TO TEST CLIPS

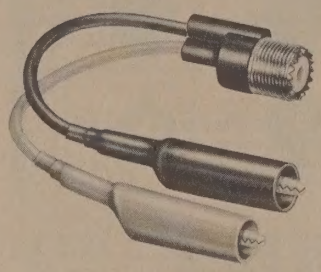


CONNECTOR: BNC Receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or Alligator, Steel, cad. plated. Insulators, Vinyl: 1 Black, 1 Red.

OVERALL LENGTH 7"

MODEL 2630 (ALLIGATOR CLIPS)
MODEL 2631 (MINIGATOR CLIPS) QUANTITY DISC. CODE (A) **NET 3.45**

UHF RECEPTACLE TO TEST CLIPS

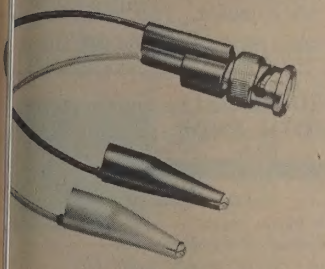


CONNECTOR: UHF Receptacle Jack.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or Alligator, Steel, cad. plated. Insulators, Vinyl: 1 Black. 1 Red.

OVERALL LENGTH 7"

MODEL 2632 (ALLIGATOR CLIPS)
MODEL 2633 (MINIGATOR CLIPS) QUANTITY DISC. CODE (A) **NET 3.45**

BNC PLUG TO TEST CLIPS

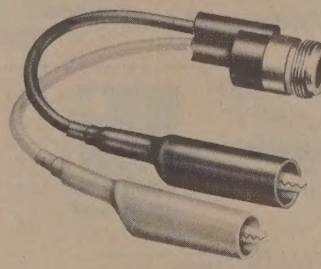


CONNECTOR: BNC Plug.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or Alligator, Steel, cad. plated. Insulators, Vinyl: 1 Black, 1 Red.

OVERALL LENGTH 7"

MODEL 2885 (ALLIGATOR CLIPS)
MODEL 2886 (MINIGATOR CLIPS) QUANTITY DISC. CODE (A) **NET 4.50**

TYPE "N" RECEPTACLE TO TEST CLIPS

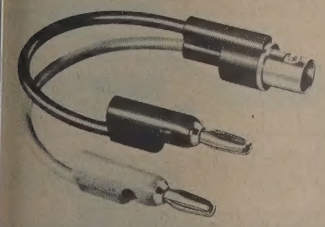


CONNECTOR: Type "N" Receptacle, UG58A/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or Alligator, Steel, cad. plated. Insulators, Vinyl: 1 Black, 1 Red.

OVERALL LENGTH 7"

MODEL 2636 (ALLIGATOR CLIPS)
MODEL 2637 (MINIGATOR CLIPS) QUANTITY DISC. CODE (A) **NET 4.50**

BNC RECEPTACLE TO STACKING BANANA PLUGS

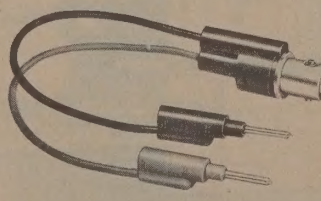


CONNECTOR: BNC Receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 18 AWG.
STACKING BANANA PLUGS: Spring, one piece heat-treated beryllium copper, nickel plated: 1 Black, 1 Red.

OVERALL LENGTH 7"

MODEL 3073 QUANTITY DISC. CODE (A) **NET 3.85**

BNC RECEPTACLE TO STACKING PIN TIP PLUGS



CONNECTOR: BNC Receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 20 AWG
STACKING PIN TIP PLUGS: 2 single plugs, .080 dia.: 1 Black, 1 Red.

OVERALL LENGTH 7"

MODEL 3221 QUANTITY DISC. CODE (A) **NET 3.85**

TNC RECEPTACLE TO TEST CLIPS

OVERALL LENGTH 7"

CONNECTOR: TNC Receptacle Jack.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or Alligator, Steel, cad. plated. Insulators, Vinyl: 1 Black, 1 Red.

MODEL 2634 (ALLIGATOR CLIPS)
MODEL 2635 (MINIGATOR CLIPS) QUANTITY DISC. CODE (A) **NET 3.45**

POMONA ELECTRONICS

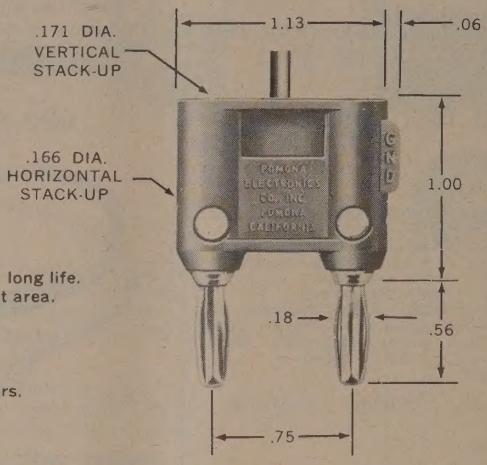
PATCH CORDS DOUBLE BANANA PLUGS

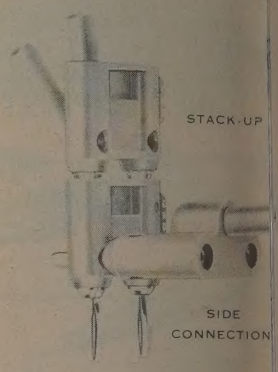
POMONA MOLDED DOUBLE BANANA PLUG PATCH CORDS AND TEST LEADS

. . . indispensable for bridge transformer connections, three terminal capacitor measurements and general hook-up for two wire systems. They are horizontally and vertically stackable in parallel.

Tough thermo-plastic material molded to plug body and cable insures maximum strength, moisture resistance and excellent insulative properties.

Used by leading industries in applications where extreme reliability is of prime importance.





FEATURES . . .

- One piece beryllium copper heat treated spring for long life.
- Rounded spring design results in maximum contact area.
- GND., clearly molded on plug body and shell.
- Solder-bonded noise-free connections.

SPECIFICATIONS . . .

- Fits standard 0.166 dia. banana jacks, on ¾" centers.
- Contact resistance less than 0.001 ohms per plug.
- Spring beryllium copper alloy 170 per QQ-C-533.
- Plug body brass per QQ-B-625, Comp. 22.
- Nickel plated per QQ-N-290, Class 2.

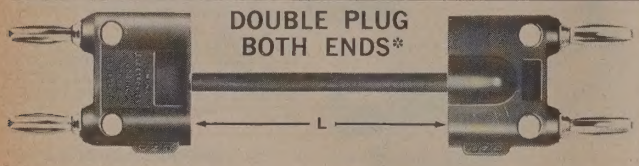
CABLE TYPE DESCRIPTION

TWO COND. TWISTED PAIR
18 AWG, Strand. 65 x 36 T.C. Vinyl insulation. Vinyl jacket, .250" O.D. Nom. Cap. 30 pf/ft.
COLOR: Gray.

SHIELDED MICROPHONE CABLE
Polyethylene insulation. Vinyl jacket, .205" O.D. Nom. Cap. 25 pf/ft.
COLOR: Gray.

SHIELDED COAXIAL CABLE
RG58C/U Polyethylene insulation. Vinyl jacket, .195" O.D. Nom. Cap. 28.5 pf/ft. **COLOR:** Black.

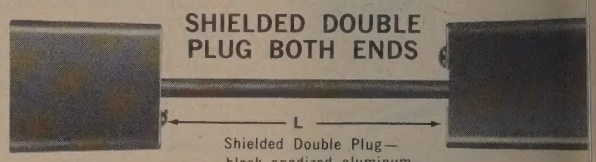
DOUBLE PLUG BOTH ENDS*



TWO COND. TWISTED PR.	SHIELDED MIC. CABLE	RG58C/U	RG59B/U	LENGTH	NET
2BA-18	2BB-18	2BC-18	2BE-18	18"	4.95
2BA-24	2BB-24	2BC-24	2BE-24	24"	4.95
2BA-30	2BB-30	2BC-30	2BE-30	30"	4.95
2BA-36	2BB-36	2BC-36	2BE-36	36"	4.95
2BA-48	2BB-48	2BC-48	2BE-48	48"	4.95
2BA-60	2BB-60	2BC-60	2BE-60	60"	4.95

★ QUANTITY DISC. CODE (B)

SHIELDED DOUBLE PLUG BOTH ENDS

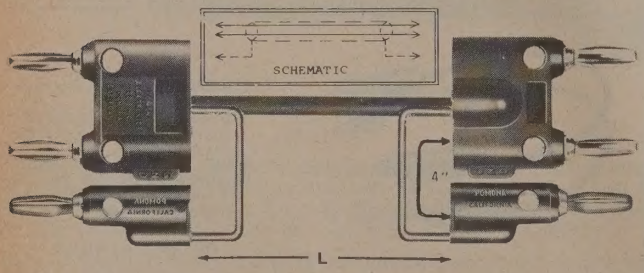


Shielded Double Plug—black anodized aluminum

SHIELDED COAX. CABLE	LENGTH	NET
1550-C-18	18"	6.95
1550-C-24	24"	6.95
1550-C-30	30"	6.95
1550-C-36	36"	6.95
1550-C-48	48"	6.95
1550-C-60	60"	6.95

★ QUANTITY DISC. CODE (B)

TWO COND. SHIELDED BALANCED LINE

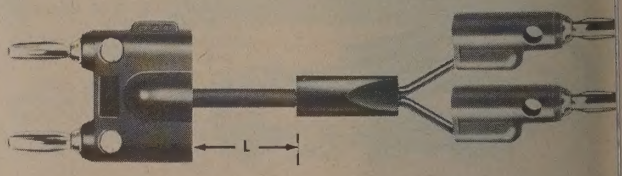


NOTE: For BNC type TWINAX Patch cords and jacks, see Page 18.

CABLE DESCRIPTION	MODEL	LENGTH	NET
2-Cond. shielded mic. cable. Polyethylene insulation. Vinyl jacket, .231" O.D. Nom. Cap. between cond. 18 pf./ft. Nom. Cap. between one cond. and remaining cond. connected to shield, 32 pf./ft. COLOR: Cable and double plug, Gray. Single ground plug, Green.	1167-18	18"	7.95
	1167-24	24"	7.95
	1167-30	30"	7.95
	1167-36	36"	7.95
	1167-48	48"	7.95
	1167-60	60"	7.95

★ QUANTITY DISC. CODE (B)

DOUBLE PLUG TO SINGLE BANANA PLUGS



CABLE DESCRIPTION	MODEL	LENGTH	NET
TWO COND. TWISTED PAIR — 18 AWG, Strand. 65 x 36 T.C. Vinyl insulation. Vinyl jacket, .250" O.D. Nom. Cap. 30 pf/ft. **COLOR:** Double Plug: Gray; Single Plugs: Red, Black	1368-A-18	18"	5.9
	1368-A-24	24"	5.9
	1368-A-30	30"	5.9
	1368-A-36	36"	5.9
	1368-A-48	48"	5.9
	1368-A-60	60"	5.9

★ QUANTITY DISC. CODE (B)

*NOTE: Molded double plug matches color of cable. Two cond. Twisted pair, GRAY. Shielded mic. cable, GRAY. Coaxial RG58C/U Cable, BLACK.

★ Various lengths may be aggregated for best quantity price.

1. Other cable colors available to order on the Two Cond. Twisted Pair and Shielde Mic. cable models with plug to match.
   COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White
2. Other lengths and cable types available to order.

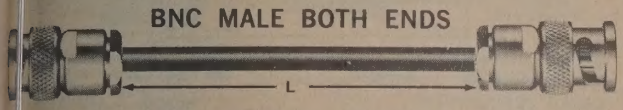
POMONA ELECTRONICS

PATCH CORDS BNC CONNECTING LEADS

CABLE TYPES

ELDED ROPHONE LE	Polyethylene insulation, Vinyl jacket, .205" O.D. Nom. Cap. 25 pf.ft. COLOR: Gray.	SHIELDED COAXIAL CABLE	RG58C/U RG59B/U RG62A/U

BNC MALE BOTH ENDS



N: END } UG88E/U Male BNC — CABLE: Shielded Coax., RG58C/U — CONN: 2nd END } UG88E/U Male BNC

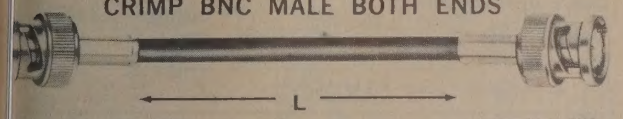
N: END } UG260B/U Male BNC — CABLE: Shielded Coax., RG59B/U or RG62A/U — CONN: 2nd END } UG260B/U Male BNC

CABLE TYPES

IELDED C. CABLE	RG58C/U	RG59B/U	NET	RG62A/U	NET	LENGTH
NC-B-18	BNC-C-18	BNC-E-18	5.95	BNC-M-18	6.95	18"
NC-B-24	BNC-C-24	BNC-E-24	5.95	BNC-M-24	6.95	24"
NC-B-30	BNC-C-30	BNC-E-30	5.95	BNC-M-30	6.95	30"
NC-B-36	BNC-C-36	BNC-E-36	5.95	BNC-M-36	6.95	36"
NC-B-48	BNC-C-48	BNC-E-48	5.95	BNC-M-48	6.95	48"
NC-B-60	BNC-C-60	BNC-E-60	5:95	BNC-M-60	6.95	60"

★QUANTITY DISC. CODE (B)

CRIMP BNC MALE BOTH ENDS



NN: t END } Crimp Male BNC (Comparable to UG88E/U) — CABLE: Shielded Coax., RG58C/U. — CONN: 2nd END } Crimp Male BNC (Comparable to UG88E/U)

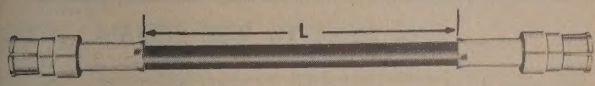
NN: t END } Crimp Male BNC (Comparable to UG260B/U) — Cable: Shielded Coax., RG59B/U or RG62A/U — CONN: 2nd END } Crimp Male BNC (Comparable to UG260B/U)

CABLE TYPES

G58C/U	RG59B/U	NET	RG62A/U	NET	LENGTH
249-C-12	2249-E-12	4.60	2249-M-12	5.95	12"
249-C-24	2249-E-24	4.60	2249-M-24	5.95	24"
249-C-36	2249-E-36	4.60	2249-M-36	5.95	36"
249-C-48	2249-E-48	4.60	2249-M-48	5.95	48"
249-C-60	2249-E-60	4.60	2249-M-60	5.95	60"

★ QUANTITY DISC. CODE (B)

"PUSH ON" BNC MALE BOTH ENDS



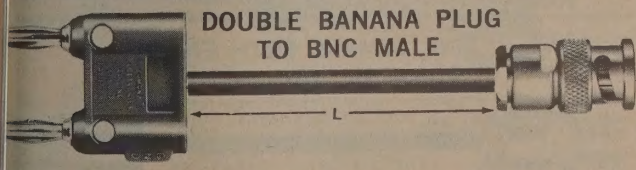
ONN: st END } Crimp "PUSH ON" BNC, Male. — CABLE: Shielded Coax., RG58C/U. — CONN: 2nd END } Crimp "PUSH ON" BNC, Male.

test cable for rapid interconnec- ion of equipment. Connector is ushed on and requires no twisting. eryllium copper outer fingers aintain continuity of shield. Excel- ent for those hard to get at places.

MODEL	LENGTH
3199-C-12	12"
3199-C-24	24"
3199-C-36	36"
3199-C-48	48"
3199-C-60	60"

MODEL 3199 ★QUANTITY DISC. CODE (B) NET 4.60

DOUBLE BANANA PLUG TO BNC MALE



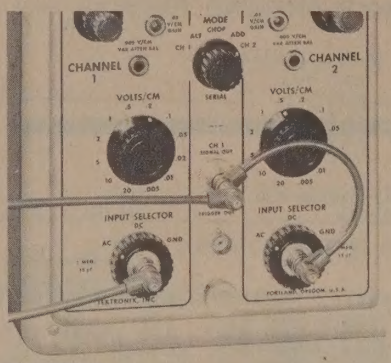
ONN.: ST END } Double Banana Plug, on ¾" Centers. — CABLE: Shielded coax., RG58C/U — CONN.: 2ND END } UG88E/U, Male BNC

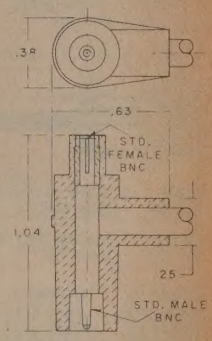
SHIELDED MIC. CABLE	SHIELDED COAX. CABLE	LENGTH	NET
2BB-BNC-18	2BC-BNC-18	18"	5.95
2BB-BNC-24	2BC-BNC-24	24"	5.95
2BB-BNC-30	2BC-BNC-30	30"	5.95
2BB-BNC-36	2BC-BNC-36	36"	5.95
2BB-BNC-48	2BC-BNC-48	48"	5.95
2BB-BNC-60	2BC-BNC-60	60"	5.95

★QUANTITY DISC. CODE (B)

"PUSH ON" STACKING BNC PATCH CORDS

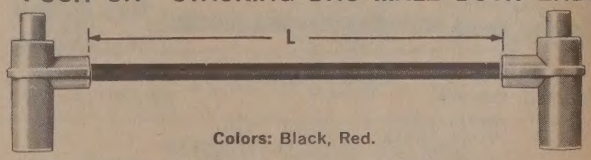
These multiple stacking patch cords connect the center conductors of BNC jacks having a common chassis. Excellent for use with instruments such as oscilloscopes. Stacking feature enables an endless number of connections to the same point.





FEATURES:
- **CONTACT:** Male and Female, one piece heat treated beryllium copper, gold flashed.
- **WIRE:** 18 AWG., stranded 65 x 36 T.C., polyvinyl insulation.
- **INSULATION:** Tough thermoplastic, polypropylene, molded around contact and wire.
- **OPERATING TEMP.:** —25° C to + 125° C.

"PUSH ON" STACKING BNC MALE BOTH ENDS



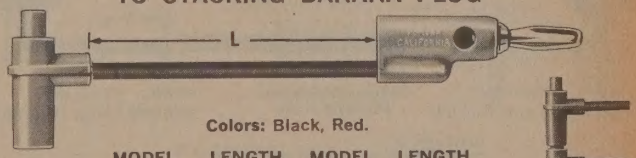
Colors: Black, Red.

MODEL	LENGTH	MODEL	LENGTH
3201-4	4"	3201-24	24"
3201-8	8"	3201-36	36"
3201-12	12"	3201-48	48"
3201-18	18"	3201-60	60"

★ QUANTITY DISC. CODE (B)

MODEL 3201 (Specify Color) NET 1.75

"PUSH ON" STACKING BNC MALE TO STACKING BANANA PLUG

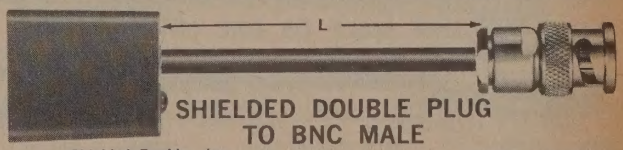


Colors: Black, Red.

MODEL	LENGTH	MODEL	LENGTH
3202-4	4"	3202-24	24"
3202-8	8"	3202-36	36"
3202-12	12"	3202-48	48"
3202-18	18"	3202-60	60"

MODEL 3202 (Specify Color) ★QUANTITY DISC. CODE (B) NET 1.75

SHIELDED DOUBLE PLUG TO BNC MALE



CONN.: 1ST END } Shielded Double plug, on ¾" centers. Black anodized aluminum. — CABLE: Shielded coax., RG58C/U — CONN.: 2ND END } UG88E/U, Male BNC

SHIELDED COAX. CABLE	LENGTH	NET
1555-C-18	18"	6.95
1555-C-24	24"	6.95
1555-C-30	30"	6.95
1555-C-36	36"	6.95
1555-C-48	48"	6.95
1555-C-60	60"	6.95

★QUANTITY DISC. CODE (B)

★ Various lengths may be aggregated for best quantity price.

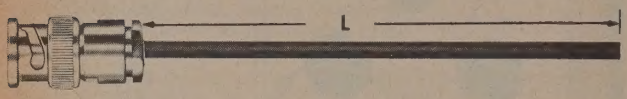
OTHER LENGTHS AND CABLE TYPES AVAILABLE TO ORDER

POMONA ELECTRONICS

PATCH CORDS BNC CONNECTING LEADS

Pomona Electronics cable assemblies and patch cords are used in applications where extreme reliability is of prime importance.

BNC MALE ONE END ONLY



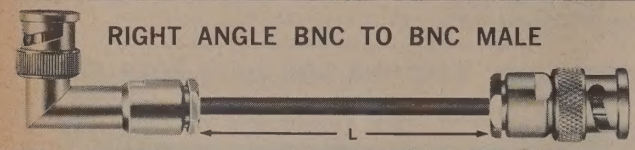
CONN: 1st END } UG88E/U Male BNC — CABLE: Shielded Coax., RG58C/U — CONN: 2nd END } None

CONN: 1st END } UG260B/U Male BNC — Cable: Shielded Coax., RG59B/U or RG62A/U — CONN: 2nd END } None

RG58C/U	RG59B/U	NET	RG62A/U	NET	LENGTH
1661-C-12	1661-E-12	3.95	1661-M-12	4.60	12"
1661-C-24	1661-E-24	3.95	1661-M-24	4.60	24"
1661-C-36	1661-E-36	3.95	1661-M-36	4.60	36"
1661-C-48	1661-E-48	3.95	1661-M-48	4.60	48"
1661-C-60	1661-E-60	3.95	1661-M-60	4.60	60"

★QUANTITY DISC. CODE (B)

RIGHT ANGLE BNC TO BNC MALE

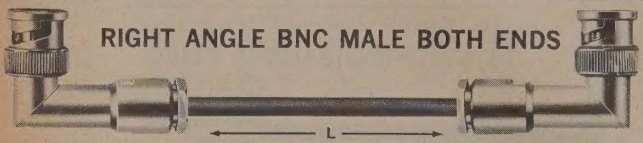


CONN.: 1ST END } UG913A/U, Angle Male BNC — CABLE: Shielded Coax., RG58C/U — CONN.: 2ND END } UG88E/U, Male BNC

SHIELDED COAX. CABLE	LENGTH	NET
1383-C-18	18"	7.95
1383-C-24	24"	7.95
1383-C-30	30"	7.95
1383-C-36	36"	7.95
1383-C-48	48"	7.95
1383-C-60	60"	7.95

★QUANTITY DISC. CODE (B)

RIGHT ANGLE BNC MALE BOTH ENDS

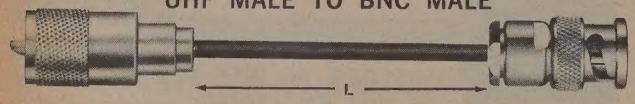


CONN.: 1ST END } UG913A/U, Angle Male BNC — CABLE: Shielded Coax., RG58C/U — CONN.: 2ND END } UG913A/U, Angle Male BNC

SHIELDED COAX. CABLE	LENGTH	NET
1155-C-18	18"	10.95
1155-C-24	24"	10.95
1155-C-30	30"	10.95
1155-C-36	36"	10.95
1155-C-48	48"	10.95
1155-C-60	60"	10.95

★QUANTITY DISC. CODE (B)

UHF MALE TO BNC MALE

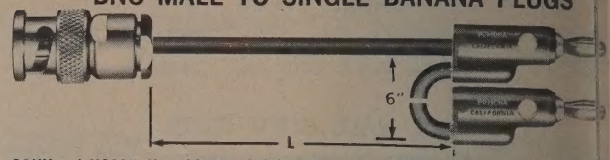


CONN.: 1ST END } PL259, UHF Male — CABLE: Shielded Coax., RG58C/U. — CONN.: 2ND END } UG88E/U, Male BNC

SHIELDED COAX. CABLE	LENGTH	NET
1367-C-18	18"	5.95
1367-C-24	24"	5.95
1367-C-30	30"	5.95
1367-C-36	36"	5.95
1367-C-48	48"	5.95
1367-C-60	60"	5.95

★QUANTITY DISC. CODE (B)

BNC MALE TO SINGLE BANANA PLUGS



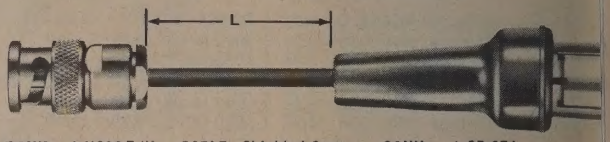
CONN: 1st END } UG88E/U Male BNC — CABLE: Shielded Coax., RG58C/U — CONN: 2nd END } Single Banana Plug Color: 1 Black, 1 R

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D. Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	N
2241-C-18	18"	5
2241-C-24	24"	5
2241-C-36	36"	5
2241-C-48	48"	5

★QUANTITY DISC. CODE (B)

BNC MALE TO GR-874



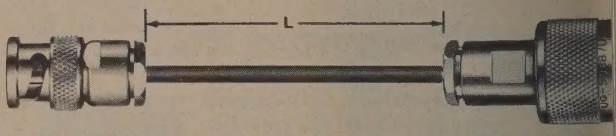
CONN: 1st END } UG88E/U Male BNC — CABLE: Shielded Coax., RG58C/U — CONN: 2nd END } GR-874

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	NI
1703-C-24	24"	12.
1703-C-36	36"	12.
1703-C-48	48"	12.

★QUANTITY DISC. CODE (B)

BNC MALE TO SERIES "N" MALE



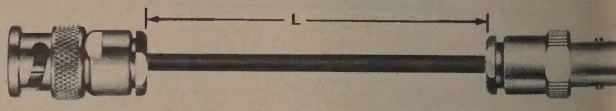
CONN: 1st END } UG88E/U Male BNC — CABLE: Shielded coax., RG58C/U — CONN: 2nd END } UG536B/U "N" Male

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	NE
1366-C-24	24"	6.9
1366-C-36	36"	6.9
1366-C-48	48"	6.9

★QUANTITY DISC. CODE (B)

BNC MALE TO BNC FEMALE



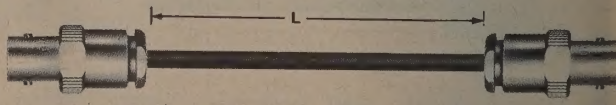
CONN: 1st END } UG88E/U Male BNC — CABLE: Shielded coax., RG58C/U — CONN: 2nd END } UG89C/U Female BNC

CABLE DESCRIPTION: Shielded Coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	NET
2223-C-12	12"	6.95
2223-C-24	24"	6.95
2223-C-36	36"	6.95
2223-C-48	48"	6.95
2223-C-60	60"	6.95

★QUANTITY DISC. CODE (B)

BNC FEMALE BOTH ENDS



CONN: 1st END } UG89C/U Female BNC — CABLE: Shielded Coax., RG58C/U — CONN: 2nd END } UG89C/U Female BNC

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	NET
1808-C-12	12"	6.95
1808-C-24	24"	6.95
1808-C-36	36"	6.95
1808-C-48	48"	6.95
1808-C-60	60"	6.95

★QUANTITY DISC. CODE (B)

★ Various lengths may be aggregated for best quantity price.

OTHER LENGTHS AVAILABLE TO ORDER

POMONA ELECTRONICS

PATCH CORDS CONNECTING LEADS

ALLIGATOR CLIPS TO BNC MALE

CONN.: 1ST END — Alligator Clips, Steel, cad plated. Insulators, Vinyl: Black/Red.

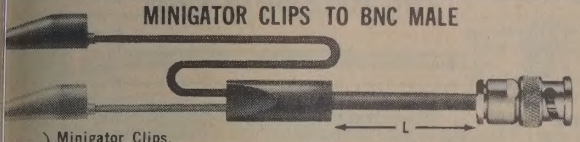
CABLE: Shielded Mic. or Shielded Coax, RG58C/U.

CONN.: 2ND END — UG88E/U, BNC, Male.

SHIELDED MIC. CABLE	SHIELDED COAX. CABLE	LENGTH	NET
AL-B-BNC-18	AL-C-BNC-18	18″	5.95
AL-B-BNC-24	AL-C-BNC-24	24″	5.95
AL-B-BNC-30	AL-C-BNC-30	30″	5.95
AL-B-BNC-36	AL-C-BNC-36	36″	5.95
AL-B-BNC-48	AL-C-BNC-48	48″	5.95
AL-B-BNC-60	AL-C-BNC-60	60″	5.95

★ QUANTITY DISC. CODE (B)

MINIGATOR CLIPS TO BNC MALE



CONN.: 1ST END — Minigator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

CABLE: Shielded Mic. or Shielded Coax, RG58C/U.

CONN.: 2ND END — UG88E/U, BNC, Male

SHIELDED MIC. CABLE	SHIELDED COAX. CABLE	LENGTH	NET
MG-B-BNC-18	MG-C-BNC-18	18″	5.95
MG-B-BNC-24	MG-C-BNC-24	24″	5.95
MG-B-BNC-30	MG-C-BNC-30	30″	5.95
MG-B-BNC-36	MG-C-BNC-36	36″	5.95
MG-B-BNC-48	MG-C-BNC-48	48″	5.95
MG-B-BNC 60	MG-C-BNC-60	60″	5.95

★ QUANTITY DISC. CODE (B)

ALLIGATOR CLIPS TO DOUBLE BANANA PLUG*

CONN.: 1ST END — Alligator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

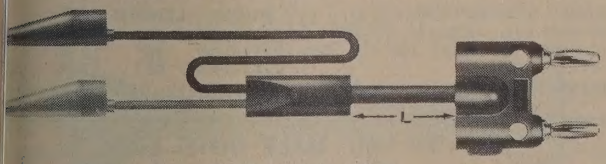
CABLE: Two Cond. Twisted Pair, Shielded Mic. or Shielded Coax, RG58C/U.

CONN.: 2ND END — Double Banana Plug, on ¾″ centers.

TWO COND. TWISTED PAIR	SHIELDED MIC. CABLE	SHIELDED COAX. CABLE	LENGTH	NET
2BA-AL-18	2BB-AL-18	2BC-AL-18	18″	5.95
2BA-AL-24	2BB-AL-24	2BC-AL-24	24″	5.95
2BA-AL-30	2BB-AL-30	2BC-AL-30	30″	5.95
2BA-AL-36	2BB-AL-36	2BC-AL-36	36″	5.95
2BA-AL-48	2BB-AL-48	2BC-AL-48	48″	5.95
2BA-AL-60	2BB-AL-60	2BC-AL-60	60″	5.95

★ QUANTITY DISC. CODE (B)

MINIGATOR CLIPS TO DOUBLE BANANA PLUG*



CONN.: 1ST END — Minigator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

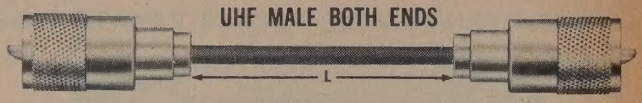
CABLE: Two Cond. Twisted pair, Shielded Mic. or Shielded Coax, RG58C/U.

CONN.: 2ND END — Double Banana Plug, on ¾″ centers.

TWO COND. TWISTED PAIR	SHIELDED MIC. CABLE	SHIELDED COAX. CABLE	LENGTH	NET
2BA-MG-18	2BB-MG-18	2BC-MG-18	18″	5.95
2BA-MG-24	2BB-MG-24	2BC-MG-24	24″	5.95
2BA-MG-30	2BB-MG-30	2BC-MG-30	30″	5.95
2BA-MG-36	2BB-MG-36	2BC-MG-36	36″	5.95
2BA-MG-48	2BB-MG-48	2BC-MG-48	48″	5.95
2BA-MG-60	2BB-MG-60	2BC-MG-60	60″	5.95

★ QUANTITY DISC. CODE (B)

UHF MALE BOTH ENDS



CONN.: 1ST END — PL259, UHF, Male

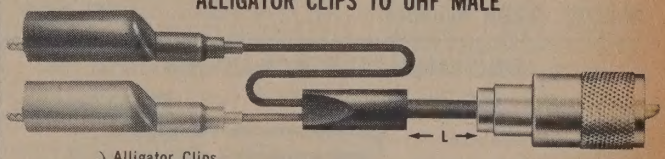
CABLE: Shielded coax., RG58C/U

CONN.: 2ND END — PL259, UHF, Male

SHIELDED COAX. CABLE	LENGTH	NET
UHF-C-18	18″	5.95
UHF-C-24	24″	5.95
UHF-C-30	30″	5.95
UHF-C-36	36″	5.95
UHF-C-48	48″	5.95
UHF-C-60	60″	5.95

★ QUANTITY DISC. CODE (B)

ALLIGATOR CLIPS TO UHF MALE



CONN.: 1ST END — Alligator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

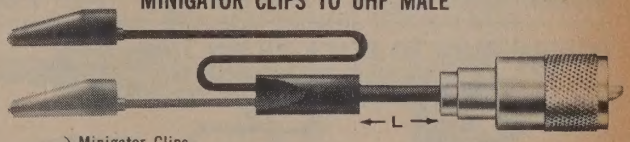
CABLE: Shielded coax., RG58C/U

CONN.: 2ND END — PL259, UHF, Male

SHIELDED COAX. CABLE	LENGTH	NET
AL-C-UHF-18	18″	5.95
AL-C-UHF-24	24″	5.95
AL-C-UHF-30	30″	5.95
AL-C-UHF-36	36″	5.95
AL-C-UHF-48	48″	5.95
AL-C-UHF-60	60″	5.95

★ QUANTITY DISC. CODE (B)

MINIGATOR CLIPS TO UHF MALE



CONN.: 1ST END — Minigator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

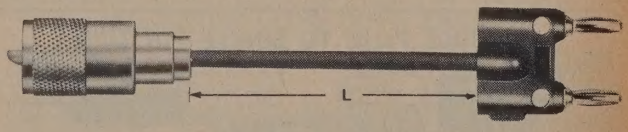
CABLE: Shielded Coax., RG58C/U

CONN.: 2ND END — PL259 UHF, Male

SHIELDED COAX. CABLE	LENGTH	NET
MG-C-UHF-18	18″	5.95
MG-C-UHF-24	24″	5.95
MG-C-UHF-30	30″	5.95
MG-C-UHF-36	36″	5.95
MG-C-UHF-48	48″	5.95
MG-C-UHF-60	60″	5.95

★ QUANTITY DISC. CODE (B)

UHF MALE TO DOUBLE BANANA PLUG*



CONN.: 1ST END — PL259 UHF, Male

CABLE: Shielded Coax., RG58C/U

CONN.: 2ND END — Double Banana Plug, on ¾″ centers.

SHIELDED COAX. CABLE	LENGTH	NET
2BC-UHF-18	18″	5.95
2BC-UHF-24	24″	5.95
2BC-UHF-30	30″	5.95
2BC-UHF-36	36″	5.95
2BC-UHF-48	48″	5.95
2BC-UHF-60	60″	5.95

★ QUANTITY DISC. CODE (B)

NOTE: Molded double plug matches color of cable. Two cond. Twisted pair, GRAY. Shielded mic. cable, GRAY. Coaxial RG58C/U cable, BLACK.

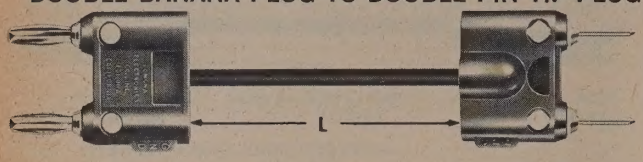
1. Other CABLE COLORS available to order on the Two Cond. Twisted Pair and Shielded Mic. cable models, with plug to match. COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.
2. Other lengths and cable types available to order.

* Various lengths may be aggregated for best quantity price.

POMONA ELECTRONICS

PATCH CORDS CONNECTING LEADS

DOUBLE BANANA PLUG TO DOUBLE PIN TIP PLUG



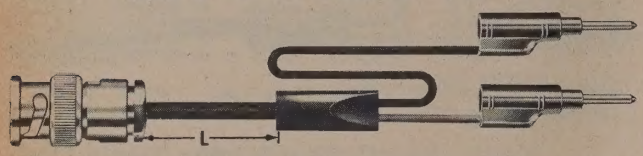
CONN: 1st END } Double Banana Plug, on ¾" Centers **CABLE:** Shielded Coax., RG58C/U **CONN: 2nd END** } Double Pin Tip Plug, .080 Dia. on ¾" Centers

CABLE DESCRIPTION:
Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
2288-C-18	18"
2288-C-24	24"
2288-C-36	36"
2288-C-48	48"
2288-C-60	60"

MODEL 2288 ★QUANTITY DISC. CODE (B) **NET 4.95**

BNC MALE TO STACK-UP PIN TIPS



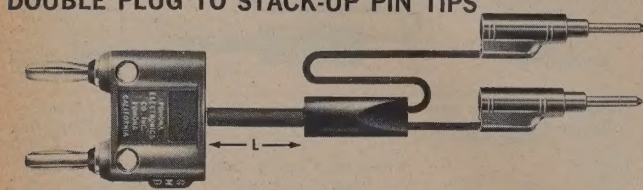
CONN: 1st END } UG88E/U Male BNC **CABLE:** Shielded Coax., RG58C/U **CONN: 2nd END** } Single Stack-Up Pin Tip Plugs, .080 Dia.; Color: 1 Black, 1 Red.

CABLE DESCRIPTION:
Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
2882-C-18	18"
2882-C-24	24"
2882-C-36	36"
2882-C-48	48"
2882-C-60	60"

MODEL 2882 ★QUANTITY DISC. CODE (B) **NET 7.50**

DOUBLE PLUG TO STACK-UP PIN TIPS



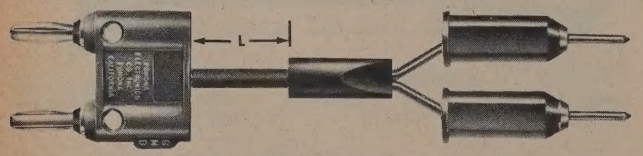
CONN: 1st END } Double Banana Plug, on ¾" Centers. **CABLE:** Shielded Coax., RG58C/U **CONN: 2nd END** } Single Stack-Up Pin Tip Plugs, .080 Dia. Color: 1 Black, 1 Red.

CABLE DESCRIPTION
Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.
COLOR: Cable and Double Plug, Black.

MODEL	LENGTH	NET
2BC-PP-18	18"	7.50
2BC-PP-24	24"	7.50
2BC-PP-36	36"	7.50
2BC-PP-48	48"	7.50
2BC-PP-60	60"	7.50

★QUANTITY DISC. CODE (B)

DOUBLE PLUG TO SINGLE PIN TIPS

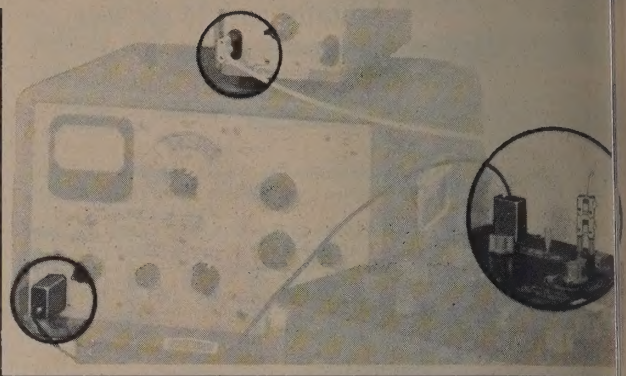


CONN: 1st END } Double Banana Plug, on ¾" Centers. **CABLE:** Two Cond. Twisted Pair **CONN: 2nd END** } Single Pin Tip Plugs, .080 Dia. Color: 1 Black, 1 Red

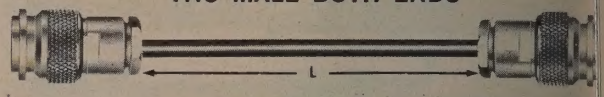
CABLE DESCRIPTION
Two Cond. Twisted pair. 18 AWG, Strand. 65 x 36 T.C. Vinyl insulation, vinyl jacket, .250" O.D. Nom. Cap. 30 pf/ft.
COLOR: Cable and Double plug, Gray.

MODEL	LENGTH	NET
2184-A-24	24"	5.95
2184-A-36	36"	5.95
2184-A-48	48"	5.95
2184-A-60	60"	5.95

★QUANTITY DISC. CODE (B)



TNC MALE BOTH ENDS



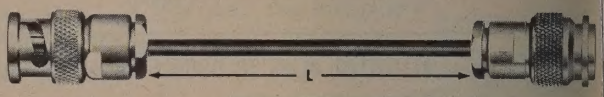
CONN: 1st END } Male TNC **CABLE:** Shielded coax., RG58C/U **CONN: 2nd END** } Male TN

CABLE DESCRIPTION
Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	N
1944-C-12	12"	7.
1944-C-24	24"	7.
1944-C-36	36"	7.
1944-C-48	48"	7.
1944-C-60	60"	7.

★QUANTITY DISC. CODE (B)

BNC MALE TO TNC MALE



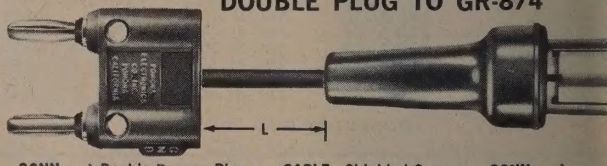
CONN: 1st END } UG88E/U Male BNC **CABLE:** Shielded coax., RG58C/U **CONN: 2nd END** } Male TN

CABLE DESCRIPTION:
Shielded Coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH	NE
1948-C-12	12"	6.9
1948-C-24	24"	6.9
1948-C-36	36"	6.9
1948-C-48	48"	6.9
1948-C-60	60"	6.9

★QUANTITY DISC. CODE (B)

DOUBLE PLUG TO GR-874



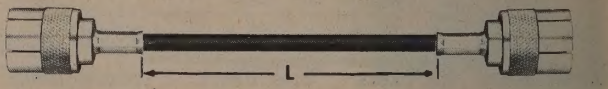
CONN: 1st END } Double Banana Plug, on ¾" Centers. **CABLE:** Shielded Coax., RG58C/U **CONN: 2nd END** } GR-87

CABLE DESCRIPTION
Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.
COLOR: Cable and double plug, Black.

MODEL	LENGTH	NET
2243-C-24	24"	12.85
2243-C-36	36"	12.85
2243-C-48	48"	12.85

★QUANTITY DISC. CODE (B)

PUSH ON UHF MALE BOTH ENDS



CONN: 1st END } Crimp Push on UHF, Male. **CABLE:** Shielded Coax., RG58C/U **CONN: 2nd END** } Crimp Push on UHF, Male.

A test cable for rapid interconnection of equipment. Connector is pushed on and requires no screwing on of shell. Continuity of shield is maintained. Excellent for those hard to get at places.

MODEL	LENGTH
3137-C-12	12"
3137-C-24	24"
3137-C-36	36"
3137-C-48	48"
3137-C-60	60"

MODEL 3137 ★QUANTITY DISC. CODE (B) **NET 5.95**

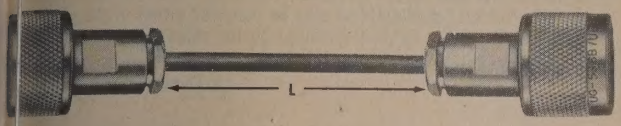
★ Various lengths may be aggregated for best quantity price.

OTHER LENGTHS AVAILABLE TO ORDE

POMONA ELECTRONICS

PATCH CORDS CONNECTING LEADS

SERIES "N" MALE BOTH ENDS



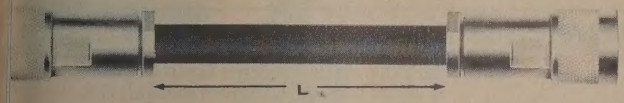
CONN: 1 END { UG536B/U "N" Male CABLE: Shielded Coax., RG58C/U. CONN: 2nd END { UG536B/U "N" Male

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
2256-C-24	24"
2256-C-36	36"
2256-C-48	48"
2256-C-60	60"

MODEL 2256 ★ QUANTITY DISC. CODE (B) NET 7.95

SERIES "N" MALE BOTH ENDS



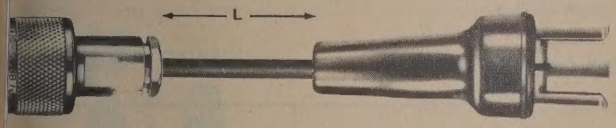
CONN: 1 END { UG21E/U "N" Male CABLE: Coax., RG213/U or RG214/U CONN: 2nd END { UG21E/U "N" Male

CABLE TYPES

RG213/U	NET	LENGTH	RG214/U	NET
1658-S-18	10.85	18"	1658-T-18	12.85
1658-S-24	10.85	24"	1658-T-24	12.85
1658-S-36	10.85	36"	1658-T-36	12.85
1658-S-48	11.35	48"	1658-T-48	13.60
1658-S-60	11.85	60"	1658-T-60	14.35

MODEL 1658 ★ QUANTITY DISC. CODE (B)

SERIES "N" MALE TO GR-874



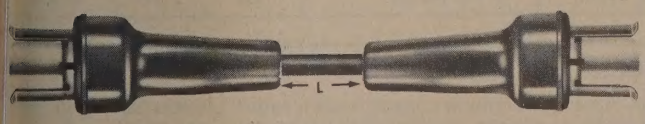
CONN: 1st END { UG536B/U "N" Male CABLE: Shielded Coax., RG58C/U CONN: 2nd END { GR-874

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
2438-C-24	24"
2438-C-36	36"
2438-C-48	48"
2438-C-60	60"

MODEL 2438 ★ QUANTITY DISC. CODE (B) NET 13.85

GR-874 TO GR-874



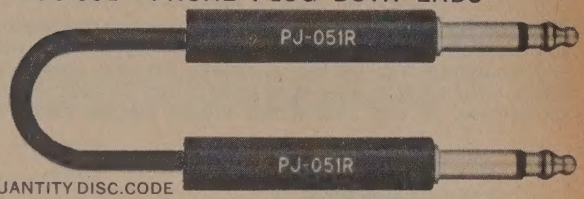
CONN: 1st END { GR-874 CABLE: Shielded coax., RG58C/U CONN: 2nd END { GR-874

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation. Vinyl jacket, .195" O.D., Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
2316-C-24	24"
2316-C-36	36"
2316-C-48	48"
2316-C-60	60"

MODEL 2316 ★ QUANTITY DISC. CODE (B) NET 22.95

PJ-051* PHONE PLUG BOTH ENDS



★ (B) QUANTITY DISC.CODE

CONN.: 1ST END { PJ-051* CABLE: TWO COND. TWISTED PAIR CONN.: 2ND END { PJ-051*

*PJ-051 Interchangeable with WE310.

Patch Cord is wired tip to tip, and ring to ring. No sleeve connection.

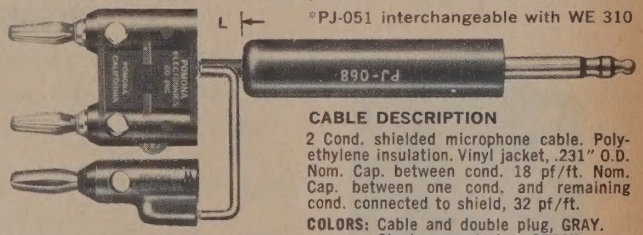
CABLE DESCRIPTION: Two Cond, Twisted pair, 18 AWG, Strand. 65 x 36 T.C. Vinyl Insulation, Vinyl jacket .250" O.D., Nom. Cap. 30 pf/ft. COLOR: Cable, Gray. Phone Plug Handle, Red.

MODEL	LENGTH	NET
2524-A-18	18"	7.95
2524-A-24	24"	7.95
2524-A-36	36"	7.95
2524-A-48	48"	7.95
2524-A-60	60"	7.95

DOUBLE PLUG BALANCED LINE TO PJ-068 OR PJ-051*

CONN: 1st END { Double and Single Banana Plug CABLE: 2 Cond. Shielded Microphone CONN: 2nd END { PJ-068 or PJ-051 Phone Plug

*PJ-051 interchangeable with WE 310



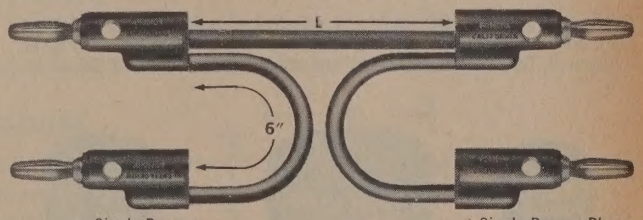
CABLE DESCRIPTION: 2 Cond. shielded microphone cable. Polyethylene insulation. Vinyl jacket, .231" O.D. Nom. Cap. between cond. 18 pf/ft. Nom. Cap. between one cond. and remaining cond. connected to shield, 32 pf/ft.

COLORS: Cable and double plug, GRAY. Single ground plug, GREEN.

MODEL	LENGTH	NET
2174-36	36"	9.85 (PJ-068)
2977-J-36	36"	9.85 (PJ-051)

★ QUANTITY DISC. CODE (B)

SINGLE BANANA PLUGS BOTH ENDS



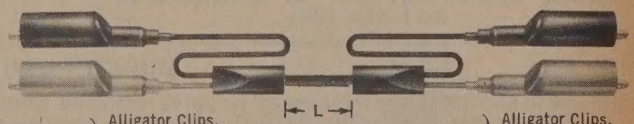
CONN: 1st END { Single Banana Plugs Colors: Inner Conductor plug, Red. Ground Plug, Black. CABLE: Shielded Coax., RG122/U CONN: 2nd END { Single Banana Plugs. Colors: Inner Conductor Plug, Red. Ground Plug, Black.

CABLE DESCRIPTION: Shielded coax., RG122/U polyethylene insulation. Vinyl jacket, .160" O.D., Nom. Cap. 29.5 pt/ft.

MODEL	LENGTH
2239-R-24	24"
2239-R-36	36"
2239-R-48	48"
2239-R-60	60"

MODEL 2239 ★ QUANTITY DISC. CODE (B) NET 4.95

ALLIGATOR CLIPS BOTH ENDS



CONN: 1st END { Alligator Clips, Steel, cad plated Insulators, Vinyl: Black/Red. CABLE: Shielded Coax., RG58C/U CONN: 2nd END { Alligator Clips, Steel, cad plated Insulators, Vinyl: Black/Red.

CABLE DESCRIPTION: Shielded coax., RG58C/U, Polyethylene Insulation Vinyl jacket, .195" O.D. Nom. Cap. 28.5 pf/ft.

MODEL	LENGTH
1152-C-12	12"
1152-C-24	24"
1152-C-36	36"
1152-C-48	48"
1152-C-60	60"

MODEL 1152 ★ QUANTITY DISC. CODE (B) NET 6.95

*NOTE: Molded double plug matches color of cable. Two cond. Twisted pair, GRAY. Shielded mic. cable, GRAY. Coaxial RG58C/U cable, BLACK.

1. Other CABLE COLORS available to order on the Two Cond. Twisted Pair and Shielded Mic. cable models, with plug to match. COLORS: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.
2. Other lengths and cable types available to order.

★Various lengths may be aggregated for best quantity price.

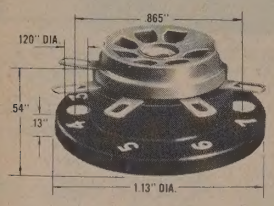
POMONA ELECTRONICS

BREADBOARD SOCKETS SOCKET SAVERS

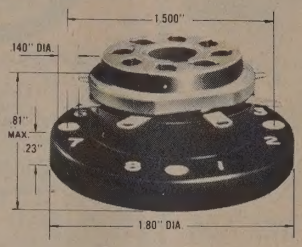
SURFACE MOUNTED BREADBOARD SOCKETS

IDEAL FOR EXPERIMENTAL CIRCUIT DESIGN, portable and enclosed units, plug-in and packaged assemblies. They feature: An insulated base to prevent connections from shorting to chassis; Eliminates double chassis design; Circuits may be wired in an enclosed unit; The base connections are numbered for easy identification; Grade-A phosphor bronze spring contacts; Standard center to center mounting holes; For ease of installation the 7 and 9 Pin Miniatures may be mounted either in the center or the sides, the 8 Pin Octal is mounted on the sides; Small mounting holes permits the re-use of experimental chassis.

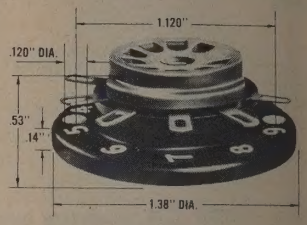
QUANTITY DISC. CODE (A)



7 PIN MINIATURE
MODEL XS-7 NET .65

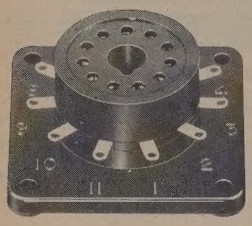


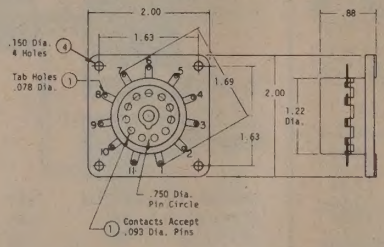
8 PIN OCTAL
MODEL XS-8 NET .85



9 PIN MINIATURE
MODEL XS-9 NET .75

11 CONTACT RELAY SOCKET





Ideal for use in Industrial Control equipment requiring a rugged compact 11 contact configuration.

FEATURES:
- Simplified above chassis mounting.
- Socket and Base molded of diallyl phthalate.
- Socket connections numbered for easy identification.
- Socket may be gang mounted.
- Heat treated Beryllium copper contacts.
- 600 VRMS at 10 amps.

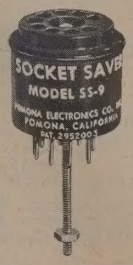
MODEL 2811 QUANTITY DISC. CODE (A) **NET 2.7**

SOCKET SAVERS

The Socket Saver® is designed to be installed on tube checkers and other electronic equipment to prevent wear and tear of sockets on original equipment. They are easy to install and remove. This eliminates the necessity of replacing and rewiring sockets on original equipment. Built quality materials. BERYLLIUM COPPER LONG LIFE CONTACTS to give maximum service.

MODEL SS-7

MODEL SS-8



MODEL SS-9

MODEL SS-789 KIT SET OF THREE 5.45
(SS-7, SS-8, SS-9)

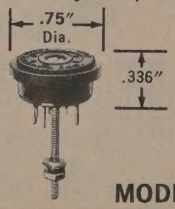
U.S. PAT. NO. 2952003

QUANTITY DISC. CODE (C)

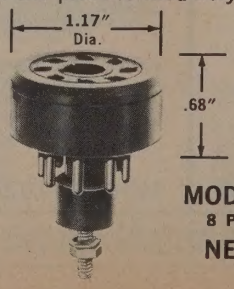
MODEL	TYPE	SIZE H	SIZE D	NET PRICE
SS-7	7 Pin Miniature	.81	.75	1.75
SS-8	8 Pin Octal	.81	1.25	1.95
SS-9	9 Pin Miniature	.81	.89	1.75
SS-11	11 Pin Octal	1.00	1.25	2.50
SS-12	12 Pin Compactron	.81	1.13	2.25
1451	9 Pin Magnoval	.88	1.20	2.25
1751	9 Pin Novar	.81	1.18	2.25

MINIATURIZED SOCKET SAVERS®

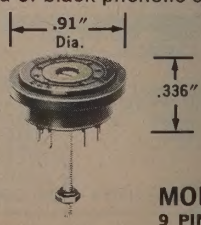
For use in applications where vertical height is restricted. Contacts made of beryllium copper, heat treated. Models 1847 and 1849 closed entry receptacles, contact and pin one piece formed beryllium copper, molded of black phenolic electrical grade.



MODEL 1847
7 PIN MINIATURE
NET 1.95



MODEL 1848
8 PIN OCTAL
NET 1.95

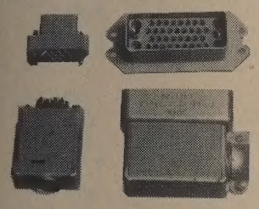


MODEL 1849
9 PIN MINIATURE
NET 1.95

QUANTITY DISC. CODE (C)

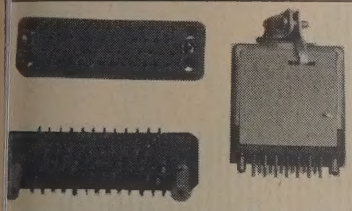
RACK and PANEL CONNECTORS

For QUICK REACTION to your connector needs, come to POSITRONIC INDUSTRIES. Military and Industrial quality Rack and Panel connectors readily available as standard catalog products. Any catalog listed connector may be promptly modified for our customer's special applications. Most cataloged connectors shipped within 10 days. Special connectors will be designed and shipped 21 to 90 days after design approval.



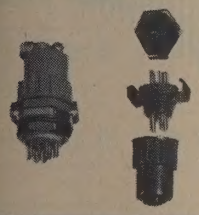
RECTANGULAR REMOVABLE CONTACTS

Mil-C-22857, 14, 18, 20, 26, 34, 50, 66, 75 and 104 contacts. Crimp and solder contacts for #16 through #24 AWG wire. Hoods, shells, guide pins, sockets and polarizing jackscrews available. DAP molded connector bodies.



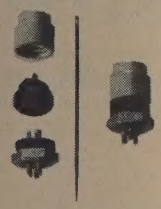
MINIATURE RECTANGULAR

Mil-C-8384, 7 to 50 contacts. Guide pilots, sockets, hoods, shells, and screw locks standard accessories. Solder pot #20 AWG wire contacts. MME and DAP moldings.



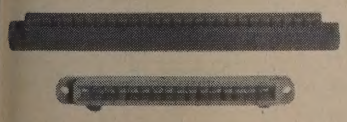
MINIATURE HEXAGONAL

Mil-C-8384, 4 to 9 solder pot contacts #20 AWG wire. Threaded bodies ⅜-24, ½-20 in MME and DAP. Mounting accessories and hoods available.



SUBMINIATURE HEXAGONAL

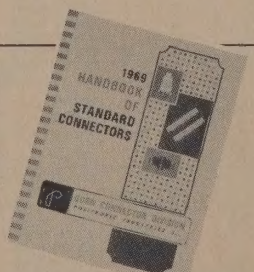
2 and 3 solder pot contacts #24 AWG wire. ¼-20 threaded body in MME and DAP. Hood and mounting accessories available. 5/16 Hex dia. length mated connectors including hood ⅝ max.



PRINTED WIRING & TEST POINT

6, 8, 10, 12, 15, 18, 22, 25 contacts, tuning fork, .156 and .150 spacing. 1/16 thick boards. MME and DAP bodies.

Free 32 page Handbook of Standard Connectors containing complete electrical and physical data of our connectors is available upon request.



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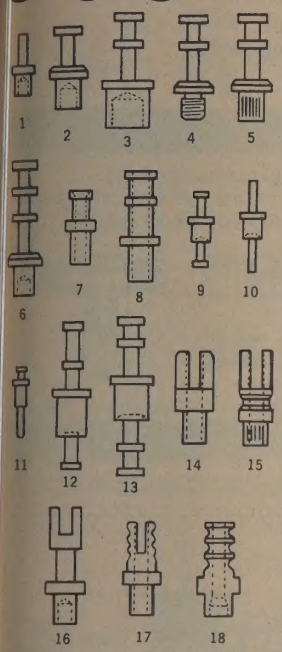
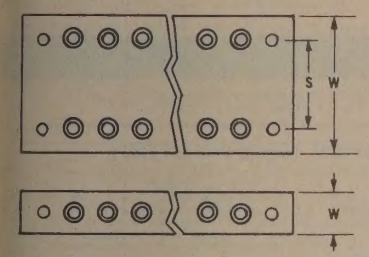


Fig. No.	Part No.	Shank (Thread)	Turret	Shoulder	Above	Below	Thickness	Notes	1-999	1M-4999	5M & Up
1	1P4-26	.090	—	.125	.173	—	1/32-1/8	Pin Dia. .040	$12.50	$10.00	$ 9.50
2	1S2-25	.047	.040	.062	.093	—	1/64-1/8		9.15	8.10	7.00
2	1S4-19	.090	.070	.125	.181	—	1/32-1/8		9.30	7.90	6.70
2	1S6-17	.112	.145	.187	.234	—	1/32-3/16		12.50	11.00	10.10
3	1D3-8	.061	.062	.093	.156	—	1/64-1/8		11.50	9.90	8.10
3	1D3-11	.072	.050	.093	.186	—	1/64-1/8	C-Sink 45° x .020 in Shank	9.90	8.10	7.50
3	1D4-6	.090	.093	.125	.237	—	1/32-1/8		9.00	7.70	7.00
3	1D5-5	.090	.109	.156	.281	—	1/32-1/8		13.20	11.00	10.10
3	1D6-1	.112	.145	.187	.360	—	1/32-1/4		12.50	11.00	10.10
4	1D6-15	4-40	.145	.187	.360	—	1/8 & 3/16	4-40 Thd.	17.05	16.50	15.40
4	1D6-16	4-40	.145	.187 Hex	.360	—	1/8 & 3/16	4-40 Thd.	17.05	16.50	15.40
5	1KD3-9	.061	.062	.093	.156	—	1/64-1/8	Knurled Shank	14.50	12.10	11.10
5	1KD6-2	.112	.145	.187	.360	—	1/32-3/16	Knurled Shank	15.95	14.15	12.40
6	1T4-13	.090	.093	.125	.316	—	1/32-1/8		11.00	9.90	9.10
6	1T6-12	.112	.145	.187	.484	—	1/32-3/16		19.50	18.20	17.40
7	2S4-38	.061	.093	.125	.156	—	1/64-1/8	.043 Dia. Thru Hole	11.00	10.45	8.80
7	2S4-39	.071	.096	.125	.187	—	1/64-1/8	.043 Dia. Thru Hole	11.00	10.45	8.80
7	2S6-35 (.067)	.110	.141	.187	.187	—	1/32-3/16	.067 Thru Hole	14.00	12.50	10.40
8	2D5-33	.078	.109	.156	.328	—	1/32-1/8	.043 Dia. Thru Hole	22.00	19.75	16.40
8	2D6-29	.112	.145	.187	.328	—	1/32-1/4	.078 Dia. Thru Hole	12.00	10.50	9.90
9	3SS3-67	.078	.050	.093	.104	.082	1/64-1/8		8.50	7.35	7.00
9	3SS4-65	.090	.062	.125	.133	.113	1/32-1/8		11.00	9.40	9.00
9	3SS5-63	.116	.070	.156	.156	.125	1/32-1/8		11.00	9.40	9.00
10	3PP4-66	.090	—	.125	.177	.156	1/32-1/8	Pin Dia. .040	18.50	15.90	14.75
11	3SP2-60	.062	.045	.078	.078	.140	1/64-1/8		12.50	11.20	9.35
11	3SP3-59	.072	.050	.093	.078	.250	1/64-1/8		12.50	11.20	9.35
12	3DS3-58	.072	.050	.093	.186	.082	1/64-1/8		9.75	8.50	7.90
12	3DS4-57	.090	.062	.125	.219	.103	1/32-1/8		12.10	10.35	9.90
12	3DS8-54	.202	.144	.250	.344	.109	1/32-3/16		25.30	22.00	20.05
13	3DD3-49	.072	.050	.093	.186	.164	1/64-1/8		10.25	8.80	8.40
13	3DD4-48	.090	.062	.125	.219	.187	1/32-1/8		12.75	10.90	10.40
13	3DD6-45	.156	.093	.187	.250	.218	1/32-3/16		28.00	25.00	21.00
13	3DD8-43	202	.144	.250	.357	.312	1/32-1/4		28.00	26.00	24.75
14	4S3-78	.061	—	.093	.156	—	1/64-1/8	Thru Hole .043	11.00	9.40	9.00
14	4S5-77	.112	—	.156			1/32-3/16	Thru Hole .078 Dia.	15.90	14.40	13.75
14	4S6-74	.112	—	.187	.345	—	1/32-3/16	Thru Hole .078 Dia.	19.95	17.60	15.70
15	4S5-76	.125	—	.156	.344	—	1/32-3/16	Thru Hole .070	19.00	17.00	16.10
16	5S4-86	.090	.090	.125	.219	—	1/32-1/8	Slot .032 Wide	17.60	15.95	14.30
16	5S6-82	.112	.145	.187	.390	—	1/32-3/16	Slot .063 Wide	17.60	15.95	14.30
17	52S6-83	.113	.140	.187	.328	—	1/32-3/16	Thru Hole .070 Dia. Slot .046 Wide	22.50	18.00	15.90
18	52S6-84	.112	.130	.187	.315	—	1/32-3/16	Thru Hole .060 Dia.	21.00	19.50	17.10

SEE ORDERING CHART BELOW.

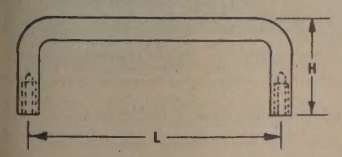
TERMINAL BOARDS



Part No.	W	S	Material	NEMA	1-49	50-249	250-500
2600A *	5/16	—	Phenolic (PBE)	(XXX)	$ .83 ea.	$ .72 ea.	$ .66 ea.
2600B *	3/4	1/2	Phenolic (PBE)	(XXX)	1.80	1.60	1.49
2600C *	1	3/4	Phenolic (PBE)	(XXX)	1.87	1.65	1.54
2601	1/2	—	Paper Phenolic	(XXX)	.83	.72	.66
2602	2	1 1/2	Paper Phenolic	(XXX)	1.80	1.60	1.49
2603	2 1/2	2	Paper Phenolic	(XXX)	1.87	1.65	1.54
2604	3	2 1/2	Paper Phenolic	(XXX)	1.98	1.71	1.60
2611	1/2	—	Linen Phenolic	(LE)	.88	.77	.72
2612	2	1 1/2	Linen Phenolic	(LE)	1.92	1.71	1.60
2613	2 1/2	2	Linen Phenolic	(LE)	2.04	1.76	1.65
2614	3	2 1/2	Linen Phenolic	(LE)	2.09	1.80	1.71
2621	1/2	—	Glass Epoxy	(GEE)	.99	.88	.83
2622	2	1 1/2	Glass Epoxy	(GEE)	2.26	2.04	1.93
2623	2 1/2	2	Glass Epoxy	(GEE)	2.42	2.20	2.08
2624	3	2 1/2	Glass Epoxy	(GEE)	2.53	2.31	2.20

* Board Thickness 1/16" - Terminal is No. 2S4-38B. Board Thickness is 3/32 Terminal is No. 1D6-1C

HANDLES & FERRULES



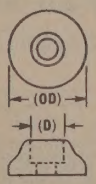
Part No.	Fig.	L (D)	H (OD)	Material	Finish	1-49	50-249	250-500
2101	1A	3	1 5/16	Brass	Nickel Plate	$ .95 ea.	$ .80 ea.	$ .69 ea.
2102	1A	4 1/2	1 1/2	Brass	Nickel Plate	1.00	.85	.74
2103	1A	6 1/2	1 3/4	Brass	Nickel Plate	1.15	.95	.84
2105	1B	(.320)	(3/4)	Brass	Nickel Plate	.13	.12	.11
2107	1B	(.320)	(.562)	Brass	Nickel Plate	.12	.11	.10
2121	1A	3	1 5/16	Stainless Steel		.95	.80	.70
2122	1A	4 1/2	1 1/2	Stainless Steel		1.00	.85	.75
2123	1A	6 1/2	1 3/4	Stainless Steel		1.10	.90	.80
2126	1B	(.320)	(3/4)	Stainless Steel		.16	.15	.14
2127	1B	(.320)	(.562)	Stainless Steel		.13	.12	.11
2130	1A	4	1 7/8	Aluminum	Black Anodize	1.15	.94	.82
2130F	1B	(3/8)	(3/4)	Aluminum	Black Anodize	.13	.12	.11
2141	1A	3	1 5/16	Brass	Nickel Plate	.95	.80	.69
2142	1A	4 5/16	1 1/2	Brass	Nickel Plate	1.00	.85	.74
2143	1A	6 7/16	1 3/4	Brass	Nickel Plate	1.15	.95	.84
2160	1A	4 1/4	2 1/8	Brass	Nickel Plate	1.20	1.00	.95
2171	1A	3	1 5/32	Brass	Nickel Plate	1.70	1.25	1.18
2172	1A	4 5/16	1 1/2	Brass	Nickel Plate	1.90	1.45	1.35
2173	1A	6 7/16	1 3/4	Brass	Nickel Plate	2.15	1.60	1.50
2174	1A	9	1 3/4	Brass	Nickel Plate	2.40	1.75	1.65
2181	1A	3	1 5/32	Aluminum	Black Anodize	1.25	.95	.85
2182	1A	4 5/16	1 1/2	Aluminum	Black Anodize	1.35	1.00	.90
2183	1A	6 7/16	1 3/4	Aluminum	Black Anodize	1.45	1.05	.95
2184	1A	9	1 3/4	Aluminum	Black Anodize	1.60	1.15	1.05

SEE ORDERING CHART AT LEFT.

ORDERING CHART

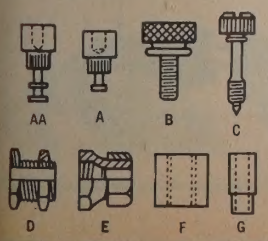
Add Suffix to Indicate Board Thickness

Suffix	Bd. Thickness
AA	1/4
A	1/32
B	1/16
C	3/32
D	1/8
E	5/32
F	3/16
G	1/4



All Terminals Brass, Silver Plated.
Specify other finishes when ordering.

HARDWARE



Part No.	Fig.	Diameter in Inches: Shank (Thread)	Diameter in Inches: Turret	Shoulder	Height (In.): Above	Height (In.): Below	Board Thickness	Notes	1-49	50-249	250-500
1700	AA	.202	.141	.312	.250	.312	1/32 - 3/16		$.09	$.07	$.06
1710	A	.220	.125	.312	.250	.170	1/32 - 3/16		.09	.07	.06

		Length	Thds./in.	Dia.	Material	Finish				
2000	B	23/32	6-32	7/16 on 1/2 dia. head	Brass	Nickel Plate		.18	.15	.13
			8-32	3/8 on 7/16 dia. head	Brass	Nickel Plate				
			10-32	5/16 on 3/8 dia. head	Brass	Nickel Plate				
2010	C	15/16	6-32	5/16	Half hard Brass	Nickel Plate		.22	.19	.16
14	D	5/16	3/8 -32 nef 2	1/2 hex	Brass	Bright Alloy	7/16, & 11/32	.20	.17	.15
77	E	7/16	1/4 -32	3/4 hex	Brass	Bright Alloy		.20	.18	.16
77A	E	5/8	3/8 -32	5/8 hex	Brass	Bright Alloy		.22	.20	.18
79	E	7/16	1/4 -32 nef 2	3/4 hex	Brass	Bright Alloy		.20	.18	.16
79A	E	17/32	1/4 -32 nef 2	3/4 hex	Brass	Bright Alloy		.22	.20	.18
2301	F	1/4	4-40	3/16	Brass	Cadmium or Nickel Plate		.07	.06	.05
2302-6	F	1/4-3/4	6-32	1/4	Brass	Cadmium or Nickel Plate	1/8" Incr.	.10	.08	.06
2307-10	F	3/8-3/4	8-32	3/8	Brass	Cadmium or Nickel Plate	Specified	.12	.10	.08
2500	G	1/8-1/2	6-32 top	1/4	Brass	Cadmium Plate	1/32 - 3/16	.10	.08	.06
2510	G	1/8-1/2	6-32 top	1/4	Brass	Cadmium Plate	1/32 - 3/16	.10	.08	.06
2520	G	1/8-12	2-56 top	.156	Brass	Cadmium Plate	1/32 - 1/8	.10	.08	.06

REYNOLDS INDUSTRIES, INC.

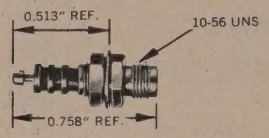
High Voltage Coaxial Connectors

Factory Location: 5005 McConnell Ave./Los Angeles, Calif. 90066
Mailing Address: P.O. Box 850 Dept. M/Marina Del Rey, Calif. 90291
(213) 823-5491/870-5671/Telex: 65-2424

SERIES 600 S HIGH ALTITUDE, HIGH VOLTAGE COAXIAL CONNECTORS AND CABLE ASSEMBLIES

VOLTAGE RATING: 10,000 VDC PANEL CONNECTORS, CABLE CONNECTORS AND CABLE ASSEMBLIES (ADAPTERS 5000 VDC.)

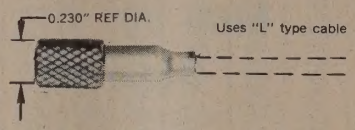
PANEL CONNECTOR: P/N 167-3771



Rated at 10KVDC at any altitude for limited pulse applications, such as EBW firing circuits, providing the rear portion of the connector is suitably encapsulated and it is mated to P/N 167-3770. Threaded sleeve couplings. Gold plated.

Production Test: 100% tested @ 15KVDC for 10 sec. 2% lot tested at altitude to 21KVDC, 3 minutes min.

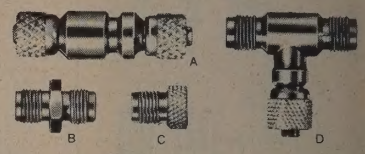
CABLE CONNECTOR: P/N 167-3770-A



Rated at 10KVDC at any altitude for limited pulse applications, provided it is mated to a suitably encapsulated P/N 167-3771. Threaded sleeve coupling. Soldered center contact and braid assembly. Uses "L" type cable, Reynolds P/N 167-2896. Gold Plated.

Production Test: All insulators are tested to withstand 15KVDC for 10 sec. 2% of each lot are cabled and tested at altitude to 21KVDC, 3 minutes min.

COAXIAL ADAPTERS: RATED 5000 VDC



Rated at 5KVDC for limited service under steady state DC condition. Coupling: Threaded Sleeve. *A:* Double End, Female. P/N 167-3887. *B:* Double End, Male. P/N 167-3318. *C:* Shorting Plug, Male. P/N 167-3833. *D:* "T" Adapter. P/N 167-3888.

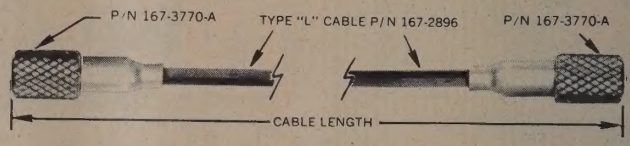
Production Test: 100% tested at 7.5KVDC, 10 sec. Max. permissible leakage: 10 microamperes (mated).

COAXIAL CABLE ASSEMBLIES: P/N 167-3306

Rated to 10KVDC for limited pulse applications at any altitude. Uses P/N 167-3770 connectors, Reynolds "L" cable. Soldered per MIL-S-6872.

Production Test: 100% test @ 21KVDC for 15 sec. Max. Leakage: 10 microamperes. Inspected for pin-to-pin or point-to-point continuity of center conductor and shield after assembly.

To Order: Add length desired to basic part number using a dash and " F" for feet, " N" for inches. Example: 167-3306-10F-8N is 10 feet 8 inches long.

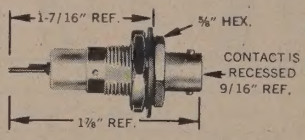


SERIES 500 HIGH VOLTAGE COAXIAL CABLE CONNECTORS AND CABLE ASSEMBLIES

VOLTAGE RATING: 10,000 VDC*

*The voltage ratings shown are for limited service under steady-state DC conditions at sea level. Under these conditions, the connectors operate in the corona region, and therefore have a limited service capability.

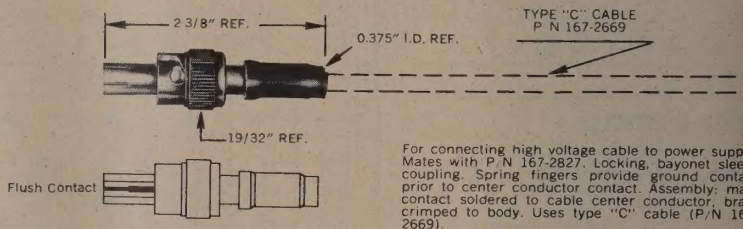
RECESSED CONTACT PANEL CONNECTOR P/N 167-2827



Recessed contact for use on the "hot" side of a HV circuit to minimize personnel hazard. Leakage (unmated): less than 1 microamp. at rated voltage. Spring fingers on mating connector 167-2826 provide ground before center conductor makes contact. Coupling: bayonet sleeve.

Production Test: 100% tested @ 13KVDC, 15 sec.

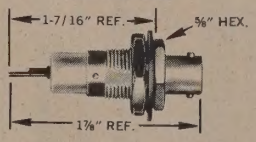
FLUSH CONTACT CABLE CONNECTOR P/N 167-2826. (MATES P/N 167-2827)



For connecting high voltage cable to power supply. Mates with P/N 167-2827. Locking, bayonet sleeve coupling. Spring fingers provide ground contact prior to center conductor contact. Assembly: male contact soldered to cable center conductor, braid crimped to body. Uses type "C" cable (P/N 167-2669).

Production Test: 100% tested at 13KVDC for 15 sec.

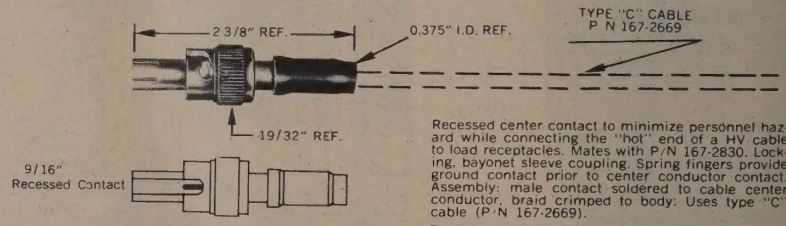
FLUSH CONTACT PANEL CONNECTOR P/N 167-2830



For use on the load or "cold" side of a high voltage circuit. Mates with P/N 167-2829. Coupling: bayonet sleeve. Spring fingers on mating connector provide ground contact before center conductor contact.

Production Test: 100% tested at 13KVDC for 15 sec.

RECESSED CONTACT CABLE CONNECTOR P/N 167-2829. (MATES P/N 167-2830)



Recessed center contact to minimize personnel hazard while connecting the "hot" end of a HV cable to load receptacles. Mates with P/N 167-2830. Locking, bayonet sleeve coupling. Spring fingers provide ground contact prior to center conductor contact. Assembly: male contact soldered to cable center conductor, braid crimped to body. Uses type "C" cable (P/N 167-2669).

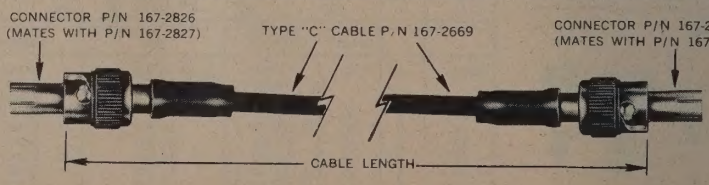
Production Test: 100% tested at 13KVDC for 15 sec.

COAXIAL CABLE ASSEMBLIES: P/N 167-2969

Rated as 10KVDC with both ends mated. Comprised of P/N 167-2829 (recessed contact) for "hot" end of cable, and P/N 167-2826 (Flush contact) for connection to power source. Uses type "C" cable (P/N 167-2669).

Production Test: 13 KVDC potential between center conductor and shell: 15 seconds minimum.

To Order: Add length desired to basic part number using a dash and " F" for feet, " N" for inches. Example: 167-2969-10F-8N is 10 feet 8 inches long.

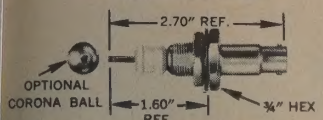


SERIES 531 SAFE HIGH VOLTAGE COAXIAL CABLE CONNECTORS AND ASSEMBLIES. Center Contact on Panel and Cable Connectors is Recessed 0.556"

VOLTAGE RATING: 10,000 VDC*

*The voltage ratings shown are for limited service under steady-state DC conditions at sea level. Under these conditions, the connectors operate in the corona region, and therefore have a limited service capability.

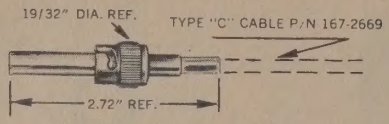
"SAFE" PANEL CONNECTOR: P/N 167-3555 RECESSED CONTACT



Provides rated voltage standoff, mated or unmated. Recessed contact for minimum personnel hazard. Less than 1 microamp. leakage at rated voltage (unmated, with corona ball). Mates with P/N 167-3554. Coupling bayonet sleeve. Mating connector provides ground contact before center conductor makes contact. To order corona ball, add "B" to part number.

Production Test: 100% tested at 15KVDC for 15 sec.

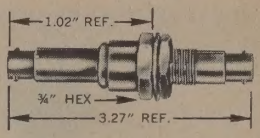
CABLE CONNECTOR: P/N 167-3554



Provides rated voltage standoff, mated or unmated. Recessed contact for minimum personnel hazard. Leakage (unmated) at rated voltage: less than 1 microamp. Mates. P/N 167-3555 and 167-3646. Coupling: bayonet sleeve. Provides a ground contact prior to center conductor establishing contact. Assembly: soldered center contact, crimped sleeve braid. Uses type "C" cable (P/N 167-2669).

Production Test: 100% tested at 15KVDC for 15 sec.

DOUBLE ENDED PANEL CONNECTOR/ADAPTER: P/N 167-3646



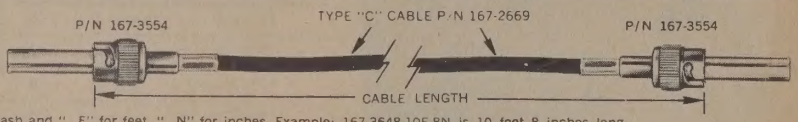
Panel mounted coupler for connecting to two cables. Recessed contact for min. personnel hazard. Leakage (mated or unmated) at rated voltage: less than 1 microamp. Mates P/N 167-3554, both ends. Mating connector provides ground before center conductor makes contact. Coupling: bayonet sleeve locking.

Production Test: 15KVDC for 1 minute.

COAXIAL CABLE ASSEMBLY: P/N 167-3648

Comprised of P/N 167-3554 connectors (recessed contacts) at both ends for minimum personnel hazard. Mates P/N 167-3555 and P/N 167-3646 Leakage at rated voltage less than 1μa. Uses type "C" cable (P/N 167-2669). Soldered per MIL-S-6872.

Production Test: 100% tested at 15KVDC for 1 min.



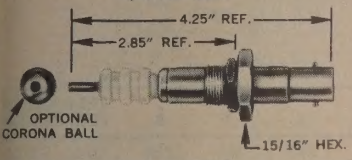
To Order: Add length desired to basic part number using a dash and "_F" for feet, "_N" for inches. Example: 167-3648-10F-8N is 10 feet 8 inches long.

SERIES 521 SAFE HIGH VOLTAGE COAXIAL CABLE CONNECTORS AND ASSEMBLIES. Center Contact on Panel and Cable Connectors is Recessed 0.896"

VOLTAGE RATING: 20,000 VDC*

*The voltage ratings shown are for limited service under steady-state DC conditions at sea level. Under these conditions, the connectors operate in the corona region, and therefore have a limited service capability.

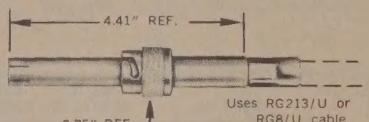
RECESSED CONTACT PANEL CONNECTOR P/N 167-3517



Provides rated voltage standoff, mated or unmated. Recessed contact for minimum personnel hazard. Less than 1 microamp. leakage at rated voltage (unmated, with corona ball). Mates P/N 167-3516. Coupling: bayonet sleeve. Mating connector grounds before center conductor makes contact. To order optional corona ball, add "B" to part number.

Production Test: 100% tested at 28KVDC, 15 seconds.

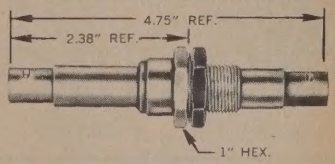
COAXIAL CABLE CONNECTOR: P/N 167-3516



Provides rated voltage standoff, mated or unmated. Recessed contact for minimum personnel hazard. Less than 1 microamp. leakage at rated voltage (unmated). Mates with P/N 167-3517 and P/N 167-3406. Grounds before center conductor makes contact. Coupling: bayonet sleeve. Uses RG213/U or RG8/U cable. Assembly: Soldered center contact, crimped braid.

Production Test: 100% tested at 28KVDC for 15 sec.

COAXIAL DOUBLE-ENDED PANEL CONNECTOR/ADAPTER P/N 167-3406



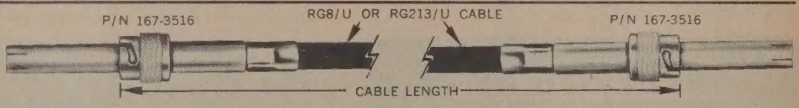
Panel mount coupler/adapter for connecting 2 cables. Recessed center contact for minimum personnel hazard. Leakage (mated or unmated) at rated voltage: less than 1 microamp. Mates P/N 167-3516 on both ends. Coupling: bayonet sleeve. Mating connector grounds before center conductor establishes contact.

Production Test: 100% tested at 28KVDC, 1 minute.

COAXIAL CABLE ASSEMBLY: P/N 167-3638

Comprised of P/N 167-3516 connectors (recessed contacts) at both ends for minimum personnel hazard. Mates P/N 167-3517 and P/N 167-3406. Leakage at rated voltage is less than 1 microampere. Uses RG8/U cable. Soldered per MIL-S-6872.

Production Test: 100% tested at 28KVDC for 15 sec.



To Order: Add length desired to basic part number using a dash and "_F" for feet, "_N" for inches.

Example: 167-3638-10F-8N is 10 feet 8 inches long. For RG213/U cable, add RG213 at end of part no.

SERIES 310 HIGH VOLTAGE, HIGH ALTITUDE, MOISTURE PROOF COAXIAL CONNECTORS AND ASSEMBLIES

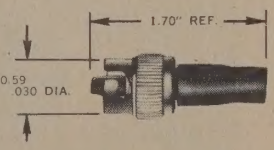
VOLTAGE RATING: 15,000 VDC*

*The voltage rating shown is for limited service under steady-state DC conditions. Under these conditions, the connectors operate in the corona region, and therefore have a limited service capability.

COAXIAL CABLE CONNECTOR: P/N 167-4356

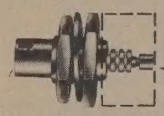
Rated at 15 KVDC at any pressure altitude for limited pulse applications, provided it is mated to a suitably encapsulated panel connector. Locking bayonet sleeve coupling. Assembly: female contact soldered to cable center conductor, braid crimped to body. Use type "C" cable (P/N 167-2669).

Production Test: 100% tested at 15 KVDC for 10 seconds max. 2% lot tested at pressures from sea level to a vacuum at 21 KVDC.



MATING CONNECTOR

Rear Mount P/N 167-3295 (shown)
Front Mount P/N 167-2370

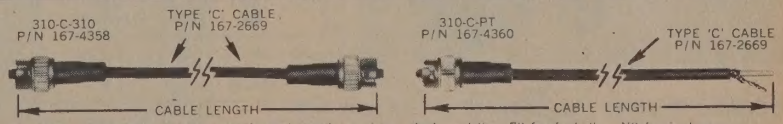


This area must be encapsulated or otherwise insulated when connector is subjected to reduced pressure, moisture or voltages above 5000 VDC.

COAXIAL CABLE ASSEMBLY: P/N 167-4358 and 167-4360

Type 310-C-310 (P/N 167-4358) cable assemblies are comprised of P/N 167-4356 connectors at both ends. Type 310-C-PT (P/N 167-4360) cable assemblies are comprised of a P/N 167-4356 connector at one end and pigtail leads at the other. Leakage at rated voltage is less than 1 microampere. Uses type "C" cable (P/N 167-2669). Soldered per MIL-S-6872.

Production Test: 100% tested at 21 KVDC for 15 seconds at a pressure altitude of 130,000 feet.



To Order: Add length desired to basic part number using a dash and "_F" for feet, "_N" for inches.
Example A: A type 310-C-310 cable 10-feet 8-inches long would be ordered as 167-4358-10F-8N.
Example B: A type 310-C-PT cable 10-feet 8-inches long would be ordered 167-4360-10F-8N.

SPECIAL CONNECTORS AND CABLE ASSEMBLIES

The connector assembly pictured at left is typical of many custom designed and produced connectors and cable assemblies produced by Reynolds Industries for critical and exacting programs for the military and space programs. If you require a special design for umbilical disconnects, interstage separation connectors or exploding bridge wire ordnance applications, we invite you to avail yourself of our twenty years of experience in this specialized field. Your inquiry is invited. The example shown is a stage separation connector produced by Reynolds Industries for a major aerospace contractor.

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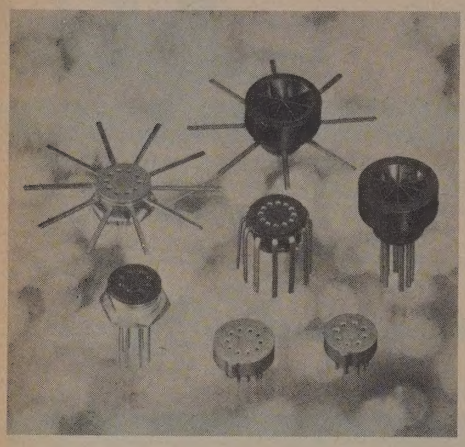
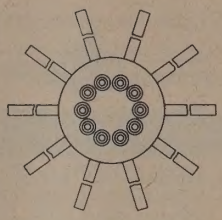
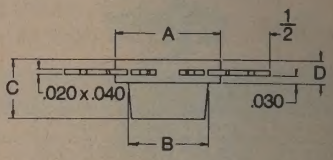
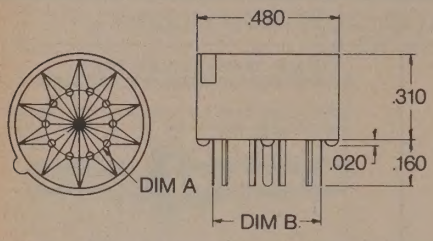
IC Sockets for TO-5





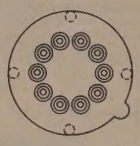


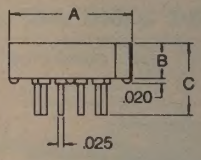
PART NO.	NO. OF CONTACTS	CONTACT CIRCLE DIA.	A	B	C	D
LP-5176	6	.200	.375	.280	.210	.080
LP-5178	8	.200	.375	.280	.210	.080
LP-51710-2	10	.200	.375	.280	.230	.080
LP-51710-23	10	.230	.405	.312	.230	.090
LP-51712-23	12	.230	.405	.312	.230	.090



PART NO.	DIM A	DIM B	NO. OF LEADS
TS-5178-2	.200	.350	8
TS-51710-23	.230	.380	10

Used W/O Carrier





PART NO.	NO. OF CONTACTS	CONTACT CIRCLE DIA.	A	B	C	TERMINATION LEAD PATTERN
SD-5176	6	.200	.370	.125	.255	TO-5, 6 Pins
SD-5176-8	6	.200	.370	.125	.255	TO-5, 6 Pins
SD-5178	8	.200	.370	.125	.255	TO-5, 8 Pins
SD-517-810-23	8	.230	.370	.125	.255	TO-5, 8 Pins
SD-51710-23	10	.230	.370	.125	.255	TO-5, 10 Pins

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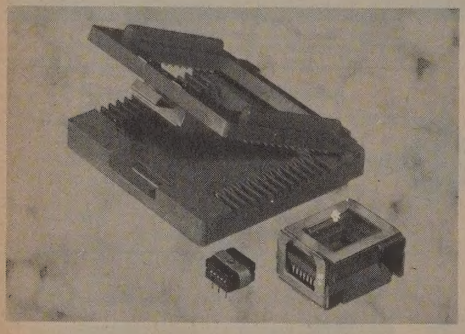
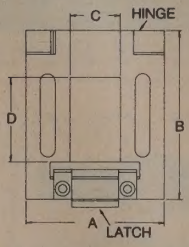
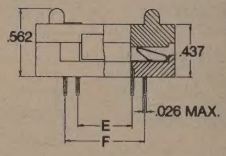
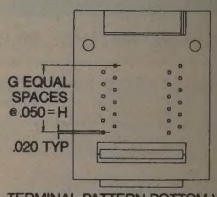
IC Sockets for Flat Pak



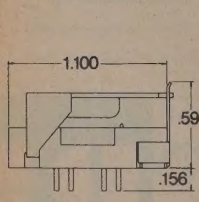


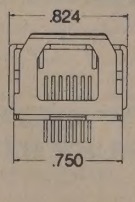


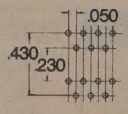


TERMINAL PATTERN BOTTOM VIEW

PART NO.	NO. OF LEADS	MAX. PACKAGE	DIM A	DIM B	DIM C	DIM D	DIM E	DIM F	DIM G	DIM H
FP-24	24	3/8 x 5/8	1.156	1.400	.420	.703	.305	.505	11	.550
FP-36	36	1 x 1	1.765	1.762	1.037	1.062	.922	1.122	17	.850



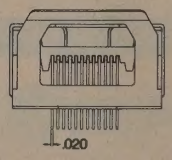


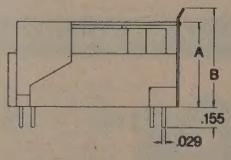


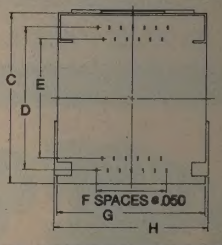
PART # FP-3314 – ILLUSTRATED

TERMINAL HOLE PATTERN

PART NO.	NO. OF CONTACTS	PACKAGE SIZE	CARRIER SIZE
FP-3314	14	(10 thru 14 leads) 3/8" Sq. (Max.)	3/4" x 1"
FP-3316	16	3/8" Sq. (Max.)	3/4" x 1"







PART NO.	NO. OF CONTACTS	DIM A	DIM B	DIM C	DIM D	DIM E	DIM F	DIM G	DIM H	CARRIER SIZE
FP-3326	26	.813	.895	1.490	1.212	1.012	12	1.250	1.312	1 1/4" x 1 1/4"
FP-3340	40	.891	.975	2.040	1.763	1.563	19	2.000	2.065	2" x 2"

IC Sockets for DIP

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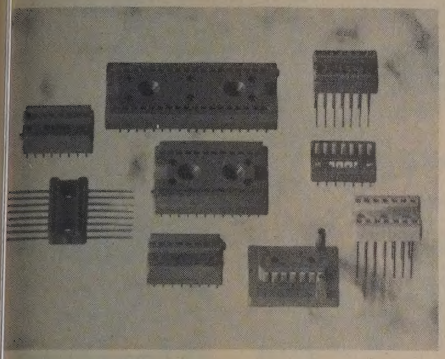
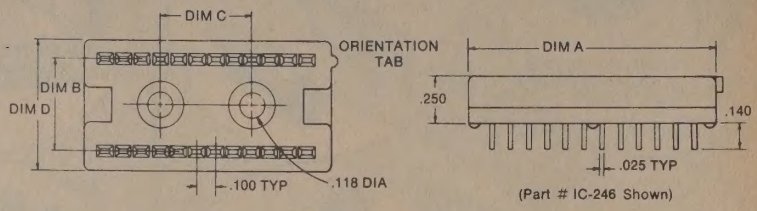
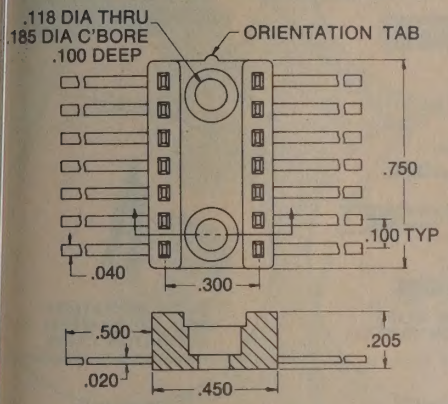




(Part # IC-246 Shown)

PART NO.	A	B	C	D	NUMBER OF CONTACTS
IC-143-S1	.750	.300	.582	.490	14
IC-163-S1	.850	.300	.625	.490	16
IC-246	1.300	.600	.500	.850	24
IC-286	1.500	.600	.500	.850	28
IC-366	2.000	.600	1.000	.850	36
IC-406	2.100	.600	1.000	.850	40

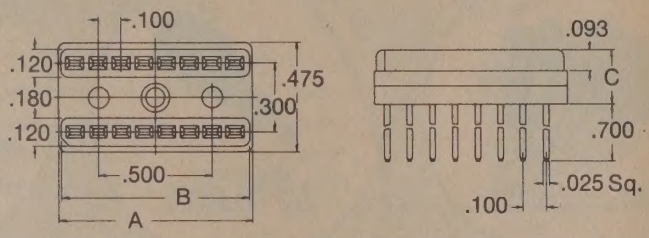


(PART # LP-31014 Shown)

PART NUMBERS

LP-31014- (-A or -B)* For 14 Lead IC.
LP-31016- (A or B)* For 16 Lead IC.

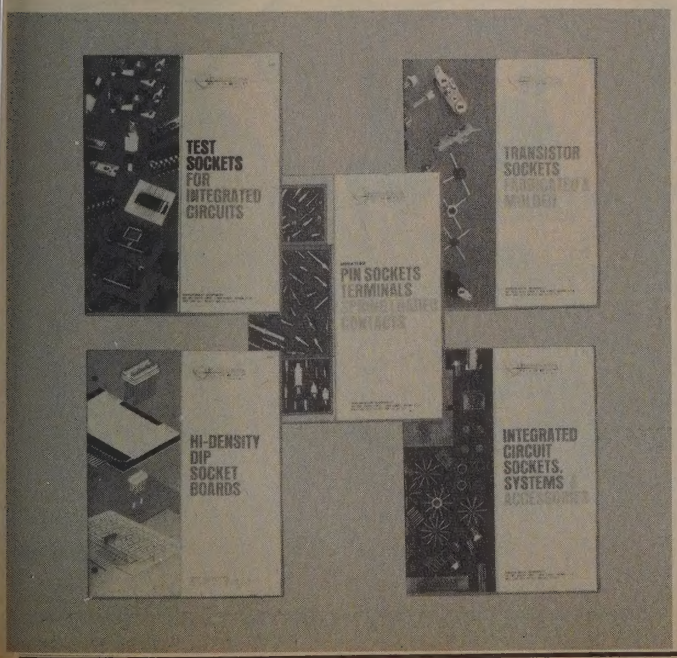
*Specify suffix "A" for flat or round IC Leads up to .016"; "B" if over .016".



PART NO.	DIM A	DIM B	DIM C	NO. OF CONTACTS
IC-143-W-B	.750	.730	.240	14
IC-163-W-B	.850	.830	.240	16
ICP-143-W-B	.750	.750	.215	14
ICP-163-W-B	.850	.830	.215	16

Newest Literature

Robinson NUGENT



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INTEGRATED CIRCUIT SOCKETS, SYSTEMS & ACCESSORIES RN Catalog E1268

HI-DENSITY DIP SOCKET BOARDS RN Catalog E0969

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PIN SOCKETS, TERMINALS, SPRING LOADED CONTACTS RN Catalog E1169

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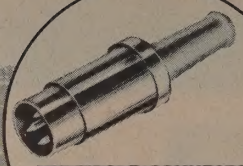
MULTIPOLE CONNECTORS UNSHIELDED



MULTIPOLE CONNECTORS DOUBLE-SHIELDED SHIELDED, UNSHIELDED

MINIATURE SOCKETS SHIELDED AND UNSHIELDED

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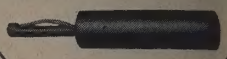
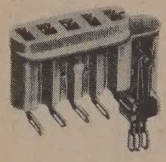
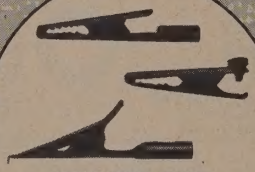




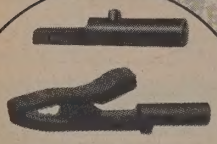
I.E.C. CONNECTORS

MULTI-WAY BINDING POSTS AND TERMINALS

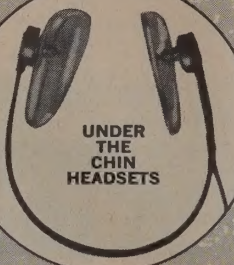


ALLIGATOR CLIPS STAINLESS OR PLATED

ULTRA-MINIATURE AND MICRO-MESH ALLIGATOR CLIPS



ALLIGATOR CLIPS INSULATED, QUICK-ACTING



UNDER THE CHIN HEADSETS

MINIATURE SWITCHES
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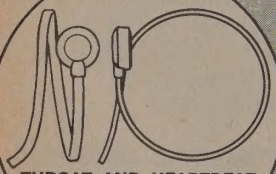

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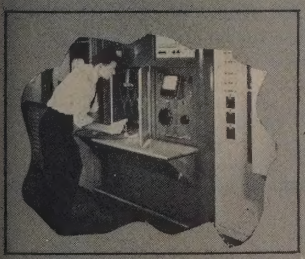

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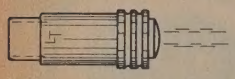
ORDERING INFORMATION

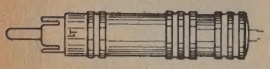
1. Specify Plug or Jack by part number for first end of assembly.
2. Specify wire or cable type.
3. Specify plug, jack, lug, terminal, or type of preparation (strip, split, and tin, etc.) for second end of assembly.
4. Specify overall assembly length.

MOLDED PHONO PLUGS AND JACKS

P-100 Available as right angle PR-100



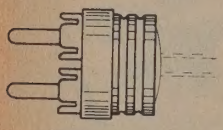
J-200 Available as right angle JR-200



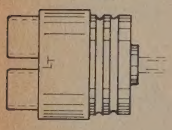
P-101 EXTRA-LONG FOR DEEP WELL APPLICATIONS

Available as jack J-201

MOLDED DUAL PHONO PLUGS AND JACKS FOR STEREO APPLICATIONS



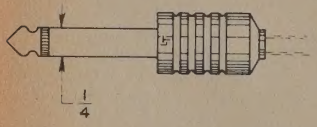
P-102 Available as right angle PR-102



J-202 Available as right angle JR-202

MOLDED PHONE PLUGS AND JACKS

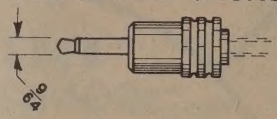
STANDARD SIZE



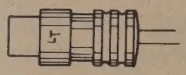
P-103 Available as right angle PR-103

J-203

MINIATURE MOLDED PHONE PLUGS AND JACKS



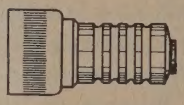
P-104 Available as right angle PR-10



J-204

MOLDED MICROPHONE CONNECTORS

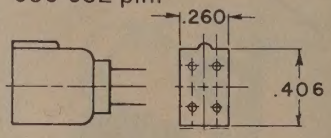
P-105



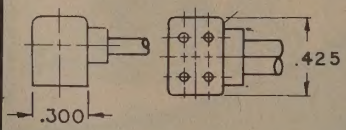
J-205

MOLDED TAPE HEAD CONNECTORS

7/32-inch by 1/8-inch contact spacing; contacts to fit 050-052 pin.



J-206



JR-206 (Right angle)

SPECIALS

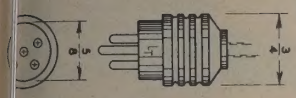
Modifications of standard items are available upon request.

LAB-TRONICS
DIVISION OF ROWE INDUSTRIES INCORPORATED
6225 Benore Road Toledo, Ohio 43612
Phone: 419/729-3951
TELEX 286014 TWX 810-442-1734

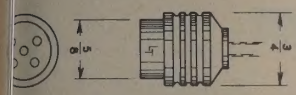
CONNECTOR-CABLE ASSEMBLIES

MOLDED PLUGS AND JACKS

OLDED MULTI-PIN CONNECTORS ATE WITH A VARIETY OF UNIVERSAL UGS AND JACKS

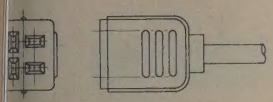


P-107



J-207

OLDED LAB-TRONICS EQUIVALENTS .TO INDUSTRY-STANDARD 4-CONTACT ONNECTORS

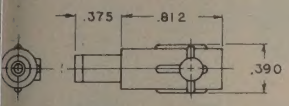


J-208

Male plug also available as P-108

ATTERY CHARGER CONNECTORS

ommonly used with battery operated radio, TV, tape layers, and similar equipment.

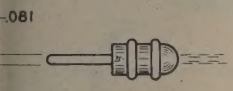


P-106 (6-volt)

P-109 (9-volt)

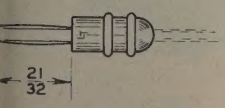
P-112 (12-volt)

IP AND BANANA PLUGS



P-114

Also available with .125" diameter contact

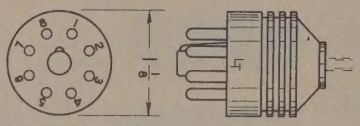


P-115

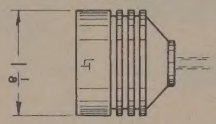
LAB-TRONICS PLUGS AND JACKS...
are molded in colors from PVC or TENITE® or material of your choice.

WIRE AND CABLE...
in a wide variety of gauge-sizes, constructions and colors are in stock at all times.

MOLDED TUBE-BASE PLUGS AND JACKS: 8-PIN OCTALS

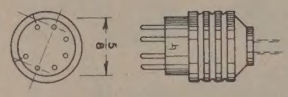


P-110

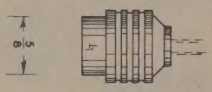


J-210

7-PIN MINIATURES

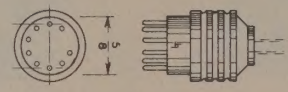


P-111 Available as right angle PR-111



J-211 Available as right angle JR-211

9-PIN MINIATURES

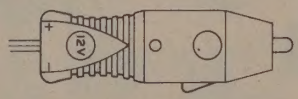


P-113 Available as right angle PR-113

J-213 Available as right angle JR-213

CIGARETTE LIGHTER ADAPTER PLUGS

UNIVERSAL SIZE

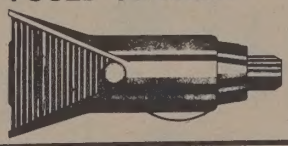


P-116

FUSED VERSION

SPECIFY FUSE SIZE

P-117



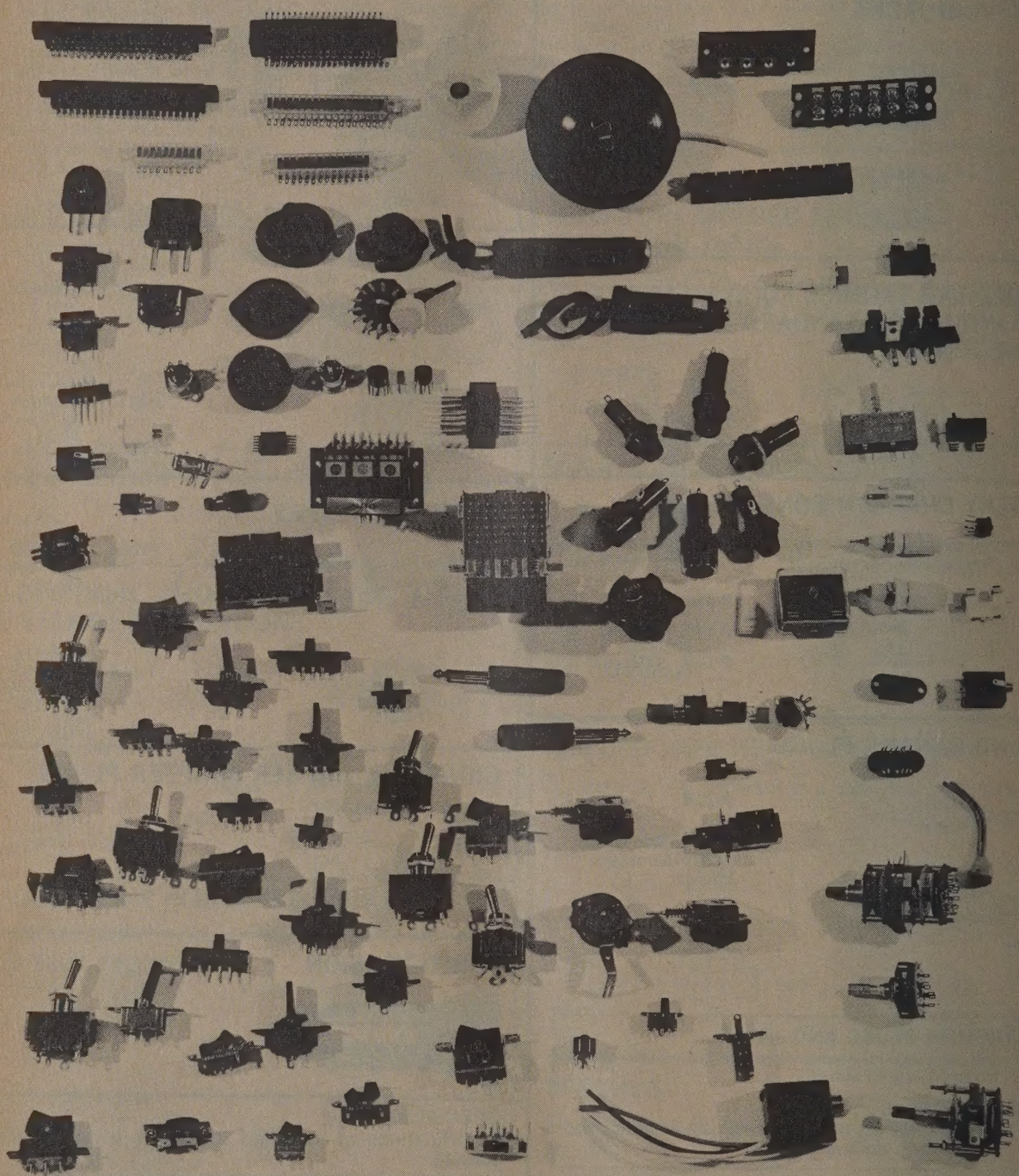
SPECIALS
Modifications of standard items are available upon request.

LAB-TRONICS
DIVISION OF ROWE INDUSTRIES INCORPORATED
6225 Benore Road Toledo, Ohio 43612
Phone: 419/729-3951
TELEX 286014 TWX 810-442-1734

SMK's HIGHLY DEPENDABLE COMPONENTS

Over 45-year background of technique

SMK is far in front as Japan's top producer in the Electronic Components field. All high-quality, dependable products reflect SMK's myriad of Research and Development activities and all of users have completely satisfied with the availability of a wide range of products and our supply capability.



MAIN PRODUCTS:

- Connectors • Switches • Tube Sockets • Fuse Holders • Binding Posts • Lamp Sockets
- Jacks • Plugs • Other Components

SMK

SHOWA MUSEN KOGYO CO., LTD.

No. 5-5, 6-chome, Togoshi, Shinagawa-ku, Tokyo, 141 Japan Phone: 785-1111 Cable Address: "SHOWAMUSEN TOK"

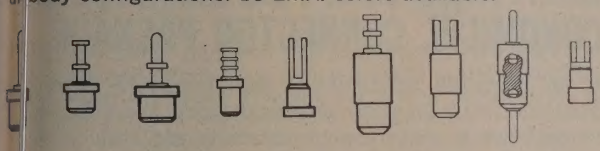
SEALECTRO CIRCUIT HARDWARE

PRESS-FIT® TEFLON* INSULATED TERMINALS

Sim ly punch or drill the correct hole in a chassis or panel an nsert the "Press-Fit" terminal . . . it's in for good and wit all of the outstanding insulating properties of Teflon. "P ss-Fit" terminals are available in the most complete ac s-the-board selection of types in the industry—from mi -miniature units designed, developed and available on from Sealectro to heavy duty types especially designed fo igh current capacities.

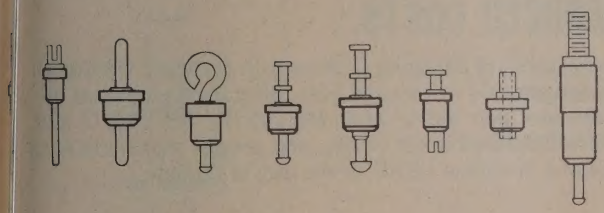
S AND-OFFS

Ex mely wide selection of bushings, lugs, platings and fin es in micro-miniature, sub-miniature, and miniature si . One piece assembly—no additional hardware involved. Fr .073″ to .215″ diameter bushings with a variety of lug ar body configurations. 10 E.I.A. colors available.



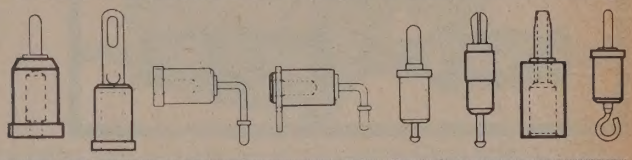
FED-THRUS

M hined from virgin Teflon to extremely close tolerances f fast, easy and sure installation. Bushing diameters from .5″ to .218″ in over 350 micro-miniature, sub-miniature, iature, and tubular units. Available in 10 standard E.I.A. ors and dozens of terminal styles.



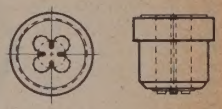
JACKS AND PROBES

Ideal for test points, instrument probes, jumper plugs and multiple connectors while many units are designed for printed circuit applications. Body and mating jack and probe configurations are available to fill virtually every requirement. Offered in 10 standard E.I.A. colors for ease of circuit coding.



CLOVERLEAF RECEPTACLES

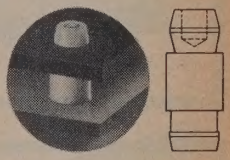
Designed to allow dip-soldering of metal chassis. Unique design for three, four or more thru-leads provides multi-wire connections with each wire in a perfect capillary flow configuration for positive, uniform solder connections. "Press-Fit" chassis installation.



U.S. Pat. No. 3,193,617

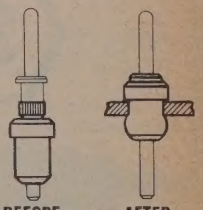
SPACER/BUSHINGS

Completely eliminate the need for metal stand-offs, spacers, and insulators. Install in seconds. Specifically designed for mounting printed circuit boards on metal chassis or panels. "Press-Fit" chassis installation with "snap-on" P. C. board mounting.



NEW Rivet-Loc TERMINALS (Pat. Pending)

Rivet-Loc terminals are a new type terminal designed for insertion in either chamfered or unchamfered holes. They overcome the inherent shortcomings of older semi-assembled terminal types while providing uniform above chassis height. After bushing insertion in the chassis, the lug is inserted from the major diameter side expanding the bushing and securely locking the terminal in the chassis.

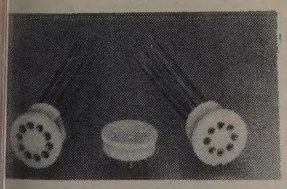


BEFORE INSTALLATION AFTER INSTALLATION

PRESS-FIT® NEW TRANSISTOR & I.C. SOCKETS & HARDWARE

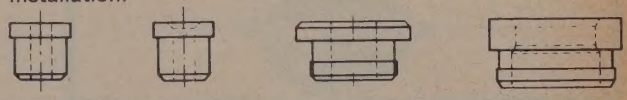
OCKETS

w cost, high precision sockets for transistors and inte ated circuit packages offering "Press-Fit" installation combined with virgin Teflon bodies and precise new contact design for maximum electrical and mechanical performance. Standard units designed for 3 and 4 lead TO-18 and TO-5 packages and 8, 10, and 12 lead integrated circuit packages.



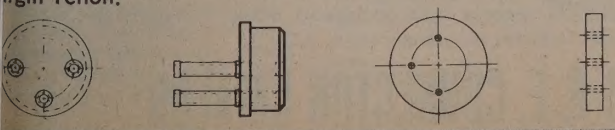
"PRESS-FIT" BUSHINGS

A complete line of over 500 standard bushing configurations designed for lead feed-thrus, insulators, bearings, stand-offs, component mounting devices and hundreds of other applications. All machined from virgin Teflon, offered in E.I.A. colors, and featuring simple economical and permanent "Press-Fit" installation.



OLDERS AND PADS

he widest line of Teflon transistor and I.C. holders and pads the industry. Available in numerous JEDEC packages with om 3 to 12 leads. Color coded and precision machined from irgin Teflon.



*Registered Trademark E. I. DuPont de Nemours & Co.

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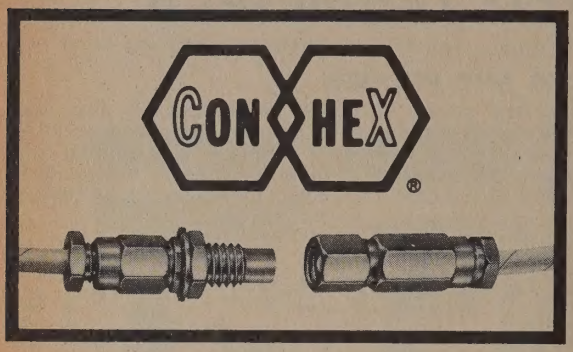
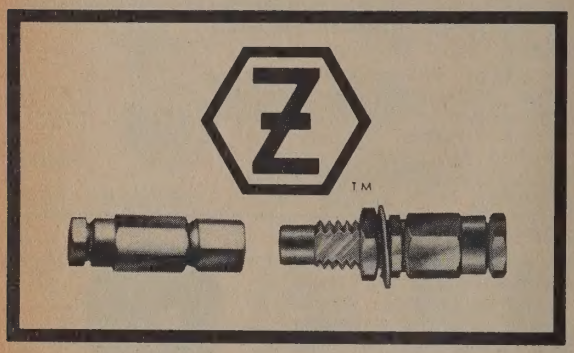
CIRCUIT HARDWARE DIVISION
SEALECTRO
CORPORATION
MAMARONECK • NEW YORK 10543
PHONE: 914 698-5600 TWX: 710-566-1110
Sealectro Ltd., Portsmouth, Hants, England
Sealectro S.A. Villiers-le-Bel, Paris, France

CONHEX® R. F. CONNECTORS



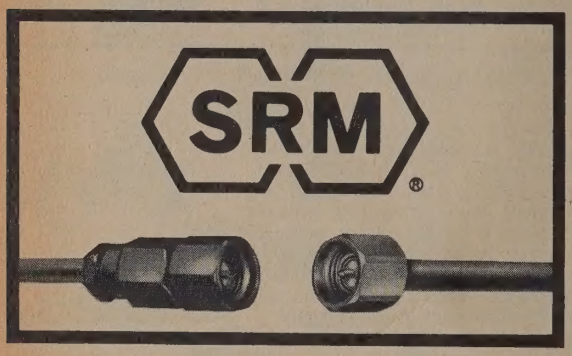
PERFORMANCE, PRICE, DELIVERY FOR RG-188/U AND SIMILAR CABLES UP TO 12.4 GHz

Conhex subminiature R. F. connectors are designed to meet or exceed the requirements of MIL-C-22557. Over 300 standard units — straight, right angle, bulkhead, strip-line, screw-on, snap-on and slide-on — are standard items.



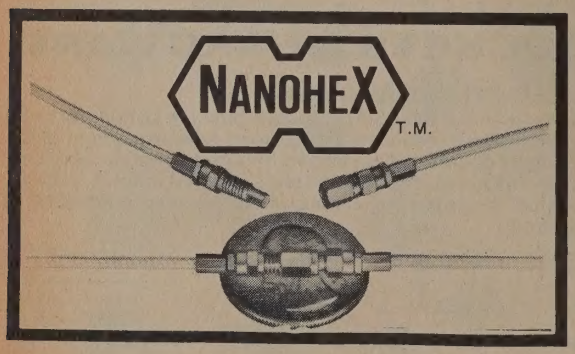
RELIABILITY AND HIGH PERFORMANCE IN AN ECONOMICAL CONNECTOR PACKAGE

Designed for complete compatibility with miniature coaxial cables, such as .141" diameter semirigid types, the Ƶ Series offers the optimum in performance, reliability and cost. More and major manufacturers are discovering that Sealectro Ƶ connectors not only meet their VSWR and power handling requirements but are many times more reliable than similar size connectors especially when subjected to adverse environmental conditions.



FOR STANDARD MATING ENGAGEMENTS AT REDUCED COSTS.

SRM connectors are designed to mate with standard OSM-type mating engagements at reduced cost. SRM connectors are designed for use with RG-141/U, RG-142/U, RG-188/U and similar subminiature coaxial cables, and provide maximum performance and minimum VSWR all the way to 18 GHz



MAXIMUM SPACE AND PAYLOAD SAVINGS WITH PERFORMANCE TO 12.4GHz

Specifically designed for microminiature RG-196/U and RG-178/U, Nanohex connectors are the smallest commercially available. They combine extremely small size and light weight with exceptional performance and reliability. Over 50 standard types including straight, right angle, printed circuit, and bulkhead mounted units in screw-on, slide-on and snap-on are featured in the complete line.

SEALECTRO®

R. F. COMPONENTS DIVISION
SEALECTRO
CORPORATION
MAMARONECK, NEW YORK
Phone: 914 698-5600 TWX: 710-566-1110
Sealectro Ltd., Portsmouth, Hants, England

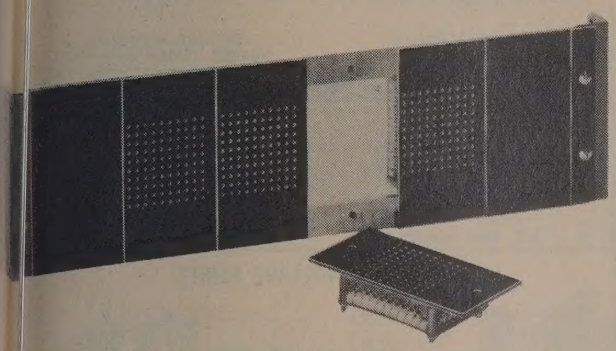
Write for the complete SEALECTRO R. F. CONNECTOR CATALOG

SEALECTRO

SEALECTROBOARD®

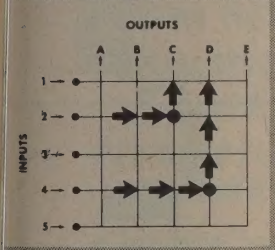
X

CORDLESS PROGRAMMING BOARDS



"ealectroboard" programming and switching provides com-te ease and simplicity of operation with drastic reductions hardware and space. A single pin is used to complete the ogram circuit or insertion of a component . . . move the to a new location and you have a new program function. "ealectroboards" are made in 2 to 5 deck versions and with variety of pin styles such as shorting pins, diode holders d skip pins as well as with engraved or silk-screened panel arking and color coded program areas.

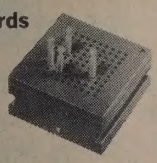
odular "Sealectroboard" are designed to facilitate program ard expansion in prototype and design appications and e offered off-the-shelf from Sealectro Distributors. Each odular board is a 10 x 10 matrix with two contact decks bussed upper and lower or bussed upper, individual lower contact configurations. Companion mounting and panel pieces are designed for 19" relay rack mounting and allow expansion from a single board up to 6 boards in just 5½" of rack space. Write for our complete catalog and technical specifications. . . .



ussed Upper and ower Contacts

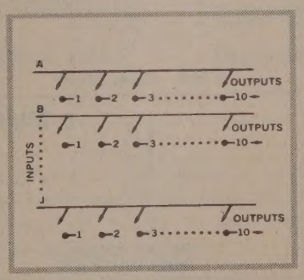
he Modular Sealectroboard is vailable with bussed upper nd lower contacts and pro-ides an ideal means for input/ utput switching. The standard 0 x 10 hole Modular Sealec-roboard may be considered 10 ingle Pole, Single Throw, Normally Open switches with 0 inputs each.

New Miniboards



Pack a 10 x 10 hole format (100 crosspoints) into a 1 inch square. These new microminiature boards have all of the standard features of the larger size Sealectroboard, including modular, expandable construction, shorting and diode pins, and Sealectro's built in reliability.

U.S. Pat. No. 3,027,534



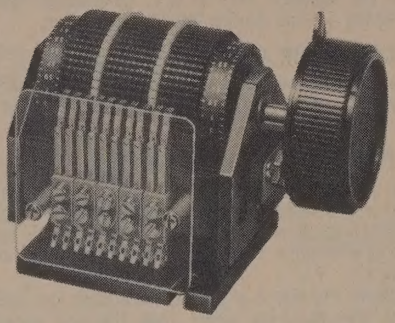
Bussed Upper and Individual Lower Contacts

The Modular Sealectroboard is also available with bussed upper and individual lower contacts which provide individual electrical access to each program hole and a path between many terminals and a lesser number of bussed terminals. The standard 10 x 10 hole Modular Sealectroboard with this contact configuration may be considered a 10 Pole, Single Throw, Normally Open switch with 10 positions per pole.

PROGRAM SWITCHING

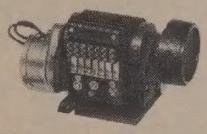
SEALECTROSWITCH®

PROGRAMMING SWITCHES



Programs may be changed in seconds without special tools and with 100% reproducibility. The Sealectroswitch programming switch provides a degree of versatility that can't be met by comparable devices . . . and in half the space and half the cost. Extremely high "built in accuracies" are provided through precision machined drums while flexibility is obtained through unique, field-adjustable, sliding contact actuators. Check these features • Field Adjustable Cams With Multiple ON/OFF Functions or Point-to-Point Switches • Manual or Remote Operation With Timing Motor or Solenoid Drive • Transfer Speeds to 50 Milliseconds Without Appreciable Contact Bounce • Removable Drums • Form A, B, and C Contacts in a Single Unit • Up to 57 Circuit Controls in a Single Unit. • Contacts Rated for Dry Circuit to 2 Amps, 24 VDC or 115 VAC. • Optional 10 Amp or 20 Amp, 115 VAC U. L. Approved Contacts.

Recycling timer with point-to-point or cam action, single snap-action contact.

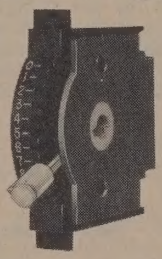


Enclosed, snap-action contacts and timing motor drive.

60 program positions, 60 contacts and stepping motor drive.

U.S. Pat. No. 3,330,917 Also protected by foreign patents

SEALECTRO SLIDE 'N SWITCH™



The Sealectro Slide 'n Switch circuit selector is designed to provide a highly reliable random access switching device for the programming of all types of automated equipment. Standard units are 11 position, single pole with a built-in "skip" function. If it is desired to switch from position 1 to position 5, the Slide 'n Switch handle is pulled out and the switch handle moved from 1 to 5. No electrical contact is made with any of the intermediate switch contacts.

Multiple units may be stacked side-by-side to provide any number of decade switches while the unique printed circuit board construction of the switch permits any special electrical coding to be supplied at minimum cost. Slide 'n Switch output terminations mate with standard edge-mount pc card connectors.

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A. Q. L. is organized in compliance with methods outlined in MIL-STD-105. The entire quality control program is geared to meet MIL-Q-9858 specifications.

SPECIALTY CONNECTOR PLATING FINISHES

Precious metal plating is available for all Specialty R. F. Connectors. As an added safeguard, all silver plated connectors have a tarnish inhibitor. This added safeguard in no way affects the electrical, mechanical or solderability characteristics. It extends the original luster over a longer period of time.

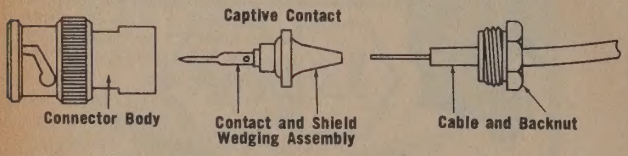
I. P. 23 (Instrument Plating) is a special finish that has been developed for Instrument Manufacturers where long life and appearance is a necessity. This finish has withstood more than 200 hours of sulphurated potash atmosphere with no noticeable deterioration.

ADAPTERS BETWEEN SERIES

S/C Part No.	Mil Type	Series	End to End	Series	Pol.	Mtg.	Engr. Data
29JJ100-1		BNC	Jack Jack	TNC			
29JJ101-1		N	Jack Jack	TNC		DD1	Herm Seal
29JJ102-1		BNC	Jack Jack	FG	B	D5	Gold Finish
29JJ105-1		BNC	Jack Jack	1051/U Push On			
29JP100-1	UG-273/U	BNC	Jack Plug	UHF			
29JP101-1	UG-255/U	UHF	Jack Plug	BNC			
29JP102-1		BNC	Jack Plug	TNC			
29JP103-1		TNC	Jack Plug	N			
29JP104-1	UG-201A/U	BNC	Jack Plug	N			
29JP105-1	UG-565A/U	N	Jack Plug	C			
29JP106-1		N	Jack Plug	SC			
29JP107-1		BNC	Jack Plug	FG	B		Gold Finish
29JP108-1	UG-255A/U	UHF	Jack Plug	BNC			Teflon Ins.
29JP109-1		N	Jack Plug	TNC			
29JP110-1	UG-83B/U	N	Jack Plug	UHF			
29JP111-1	UG-309/U	BNC	Jack Plug	HN			
29JP112-1		TNC	Jack Plug	BNC			
29JP113-1		BNC	Jack Plug	1050/U Push On			
29JP115-1		N	Jack Plug	HN			
29JP119-1	UG-349B/U	N	Jack Plug	BNC			
29JP120-1		BNC	Jack Plug	TPS			Gold Finish
29JP121-1		TPS	Jack Plug	BNC			Gold Finish
29PP100-1		TNC	Plug Plug	BNC			
29PP101-1		TNC	Plug Plug	N			
29PP102-1	UG-1034/U	BNC	Plug Plug	N			
29PP103-1		BNC	Plug Plug	FG	B		Gold Finish

WITH FAST 3 PIECE ASSEMBLY . . . MEETS MIL-C-39012, CATEGORY "A" (FIELD REPLACEABLE WITH ORDINARY TOOLS)

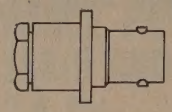
The old UG connectors required several cutting and stripping assembly operations demanding precise and time consuming steps to produce an electrically and mechanically sound assembly. The new "straight cut" design reduces the assembly time to a fraction of the old UG method. Provides greater mechanical strength at the cable entry, and requires no costly crimping tools to assemble. It can be completely disassembled and reused since it does not contain any rubber gaskets or crimped parts.

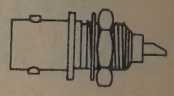


ASSEMBLY INSTRUCTIONS

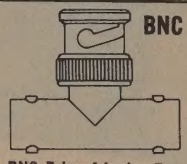
1. Strip cable exposing only the center conductor (¼" for BNC and TNC). Tin center conductor.
2. Slide backnut over the cable and back out of the way.
3. Insert cable into the contact and shield wedging assembly so that the conical end of the assembly wedges between the shield and the cable dielectric core. The cable dielectric core and center conductor are therefore inside the unit while the shield and cable jacket ride up over the conical end of the unit.
4. The center conductor is exposed through the solder hole in the pin contact. Solder the conductor to the pin through the hole.
5. Insert the assembly into the connector body until it bottoms and the pin contact protrudes through the front insulator.
6. Thread the backnut into the body and tighten. The wedge action of the backnut against the cable jacket will provide an excellent mechanical clamp and/or strain relief.

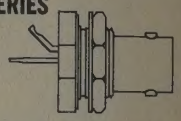
BNC SERIES


BNC Jack - Straight - Flange Mount

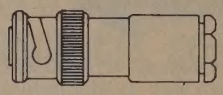

BNC Jack Receptacle - Straight - Single Hole Mount

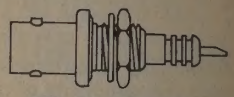
BNC TRIAX SERIES


BNC Triax Adapter Tee

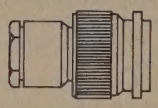

BNC Triax Jack Receptacle - Single Hole Mount

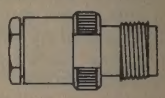
BNC HIGH VOLTAGE SERIES


BNC Plug

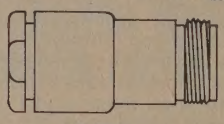

BNC Jack Receptacle - Single Hole Mount

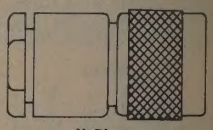
TNC SERIES


TNC Plug - Straight

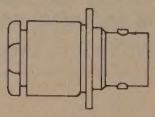

TNC Jack

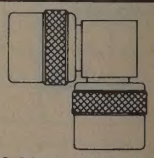
N SERIES


N Jack

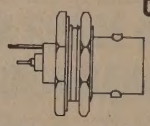

N Plug

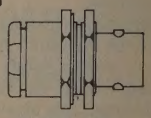
C SERIES


C Jack - Flange Mount

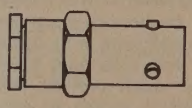

C Adapter Right Angle

C TRIAX SERIES


C Triax Jack Receptacle - Single Hole Mount


C Triax Jack - Single Hole Mount

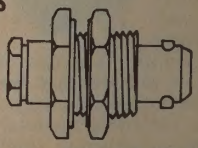
TPS SERIES


TPS Jack

TPS Plug

FG SERIES

FG Plug


FG Jack - Single Hole Mount

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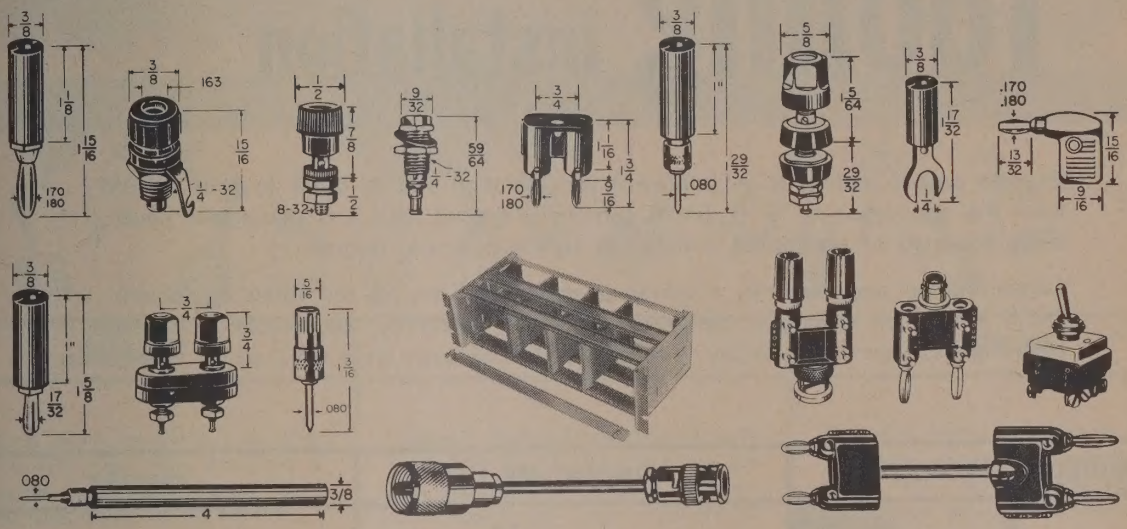

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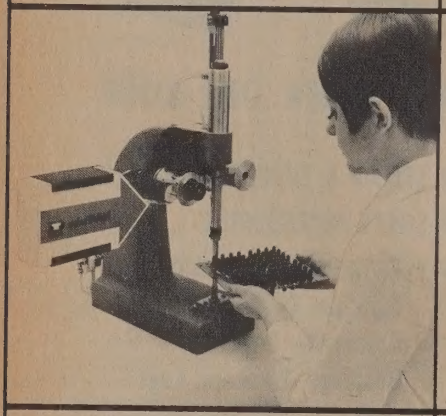	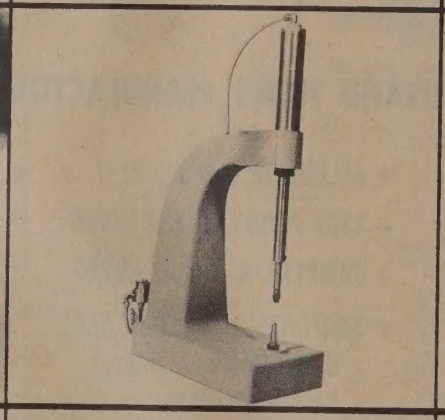	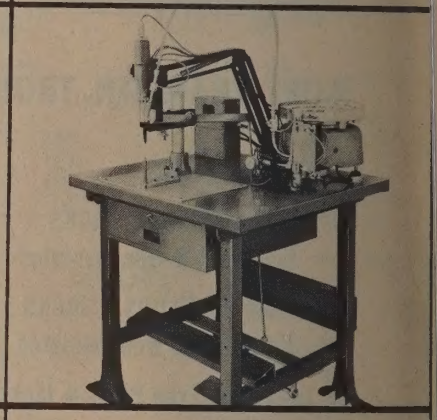
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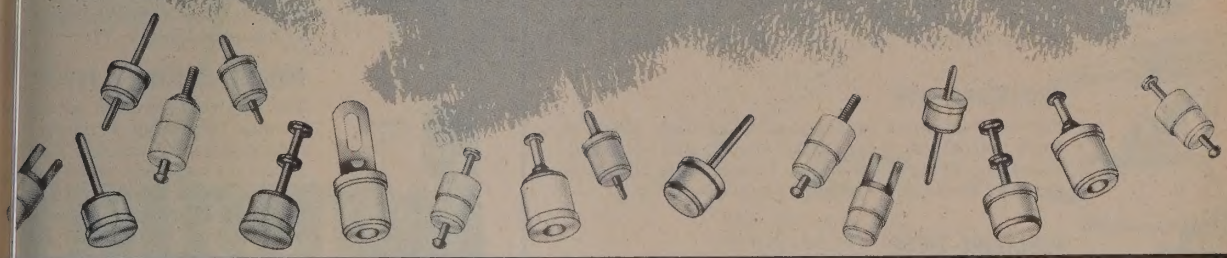

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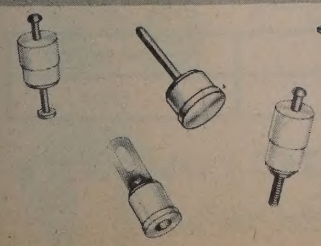
SMITH miniPAK

THE MINIPAK CARTRIDGE is designed to work in conjunction with the **Minisert Automatic.** It contains a precision, hermetically sealed "carrier band" which protects the terminals from atmospheric contaminants, eliminating the problems of solderability and shelflife.



HERMAN H. SMITH, Inc.

A NORTH AMERICAN PHILIPS COMPANY

812 SNEDIKER AVENUE, BROOKLYN, N. Y. 11207

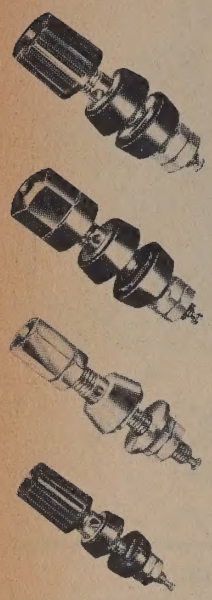
Telephone: (212) 272-9400 • TWX: 710-584-2363

SMITH

Terminal Division

5-way® BINDING POSTS

5 WAYS TO CONNECT • GOLD-PLATED BRASS PARTS • RANGE OF COLORS



FLUTED NUT TYPES

Plastic parts of standard (not miniature) size types molded of Lexan polycarbonate resin; brass parts are gold-plated. Rated for 30 amperes, 1000 volts working. Nickel-plated brass types available on special order.

HEX NUT TYPES

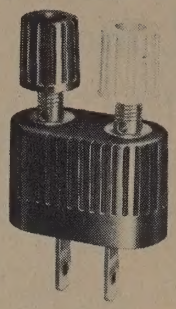
Rated for 30 amperes, 1000 volts working. Brass parts are gold-plated; plastic parts are of nylon compounded to meet military specifications MIL-M-20693A, Type IV. Nickel-plated brass types available on order.

GROUNDING TYPE

For making rapid connections to ground. Made of finely machined brass nickel-plated and polished. Panel grounding collar frozen to shaft has "D" type shoulder for locking in keyed panel hole.

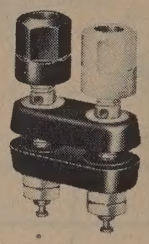
MINIATURE TYPES

Fluted nut design only. Rated for 15 amperes, 1000 volts working. Gold-plated brass parts; nylon plastic parts compounded to meet military specification MIL-P-20693A, Type IV. Types with nickel-plated brass available also.



DUAL ADAPTER TYPE

Designed to facilitate line volt e connections from output recep- cles to binding posts. Has integ l parallel-blade plug. Rating is 5 amperes, 125 volts. Body is bla ; captive black and white thumbn s are mounted on ¾" centers. Br s parts are gold-plated. Ideal - safe, rigid connections to equ - ment lacking a parallel-blade pl and cord assembly.



DOUBLE ASSEMBLY TYPES

For instrument and equipme panels requiring binding pos mounted on ¾" centers. Rated f a current capacity of 30 amper and a working voltage of 1000 vol Brass parts are gold-plated; par insulators in black only. Rugge self-contained assembly mak mounting more accurate, fast and easier than two individu binding posts and gives maximu strength where connections are fr quently made.

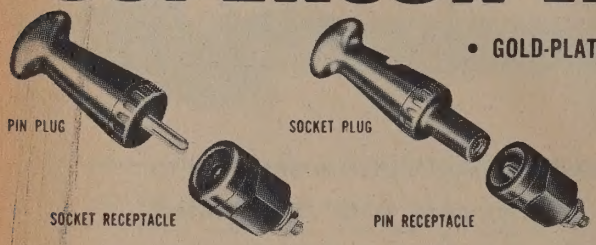
STYLE	TYPE
BINDING POSTS	
FLUTED NUT — STANDARD	DF31*
HEX NUT — STANDARD	DF30*
GROUNDING — ALL METAL	GP30NC
FLUTED NUT — MINIATURE	DF21*

STYLE	TYPE
DUAL ADAPTER TYPE	
BLACK & WHITE FLUTED NUTS	DAP15BWC
DOUBLE ASSEMBLY TYPES	
BLACK & WHITE HEX NUTS	DF30-2-BWTC
TWO BLACK HEX NUTS	DF30-2-BBC
BLACK & RED HEX NUTS	DF30-2-BRC

*Add desired color suffix to series designation number: BC (black), BLC (blue), RC (red), WTC (white), YC (yellow), GNC (green). For example: DF21BLC.

SUPERCON® ELECTRICAL CONNECTORS

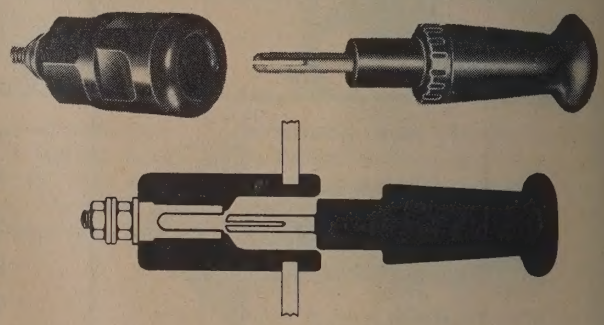
• GOLD-PLATED CURRENT CARRYING PARTS • SIMPLIFIED, QUICK ASSEMBLY



Nylon plastic parts, gold-plated brass current-carrying parts. Plugs accomodate either soldered or solderless connections to a wide range of cable sizes. Plug grips are of a simple, two-piece threaded construction for quick assembly. Receptacles have color-matched nylon caps and bodies. 25, 50 and 100 ampere types are rated 125-250 volts a-c or d-c current rupturing, 600 volts disconnect use only. 250 ampere types are rated 600 volts disconnect use only.

AMPERES	PIN PLUGS TYPE†	SOCKET RECEPTACLES TYPE†	SOCKET PLUGS TYPE†	PIN RECEPTACLES TYPE†
25	PP25G	RS25G	PS25G	RP25G
50	PP50G	RS50G	PS50G	RP50G
100	PP100G	RS100G	PS100G	RP100G
250	PP250G	RS250G	PS250G	RP250G

†Add desired color suffix to series designation number: B (black), BL (blue), R (red), WT (white), Y (yellow), GN (green). For example: PS25GWT.



EXTRA-SAFE "L" TYPE

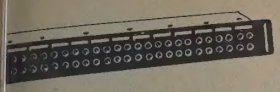
"L" types have all current-carrying parts insulated to remove any possibility of physical contact when making connections. Rated same as 50 ampere conventional types. When ordering, add available color suffix to type number: B (black), R (red), WT (white).

SOCKET RECEPTACLES	PIN PLUGS
LSR50G	LPP50G

THE SUPERIOR ELECTRIC COMPANY

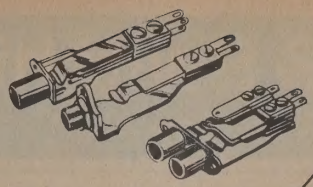
1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

SEE OTHER SUPERIOR ELECTRIC PRODUCT PAGES IN SECTIONS 3500, 4000, AND 5600



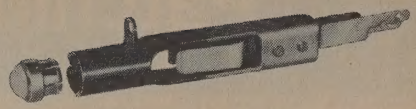
ACK MOUNTING ANELS

sed for mounting tandard and miniature elephone and coaxial icks, keys, lamp ockets, etc. quivalents of W.E. nd many others vailable. Request ulletins on Product Family 70.



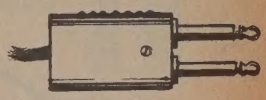
SINGLE and TWIN TELEPHONE JACKS

Standard and miniature size jacks. All circuit configurations. Panels for these provided by Product Family 70. Request bulletin on Product Family 51, 53, and 55 on jacks.



LAMP SOCKETS and KEYS

Mount on telephone type jack mounting panels. Sockets use telephone type slide-base lamp. Numerous varieties of turn and push keys. Request bulletin on Product Families 54 and 56.



TELEPHONE PLUGS

Nearly all types, W.E., Kellogg, A.E., etc. both single and twin in two and three circuit forms. All have molded in place nylon insulation. Request bulletins on Product Family 80.

TRIMM'S

Full Line

TERMINAL and RELATED PATCHING EQUIPMENT —and HEADSETS

Available from our industrial distributor in your area.

AUDIO PATCH, SWITCHBOARD, and TEST CORDS

With standard and miniature size single and twin telephone plugs. Nylon braided tinsel conductor cords. Request bulletin on Product Family 30.

COAX JACKS — PLUGS — PATCH CORDS — and RELATED COMPONENTS

Standard sized single and twin jacks including normal through and terminating types, W.E. and RCA compatible, fitting wide assortment of coax cables and other connectors. Twin looping plugs, single plugs, plug adapters, patch cords, etc. Also specialized triax and twinax concentric series jacks and plugs as well as miniaturized type. Request bulletin on Product Family 60.

HEADSETS

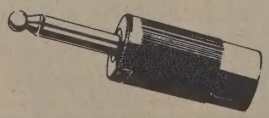
Many types in all cost ranges, applicable to wide variety of applications. Request bulletin on Product Family 01 through 29.

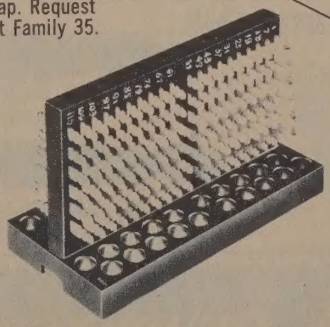
AUDIO PLUGS and JACKS

Numerous low cost plugs and jacks for hi-fi, tape recorders, sound equipment, etc. Request bulletin on Product Family 40.

TERMINAL BLOCKS

Originally used by the telephone industry (often called Christmas Tree type) now also widely used in other system work. Up to 14 rows per block; 10, 20, and 26 terminals per row. Lug types — solder, wire-wrap, and hybrid solder-wire wrap. Request bulletin on Product Family 35.

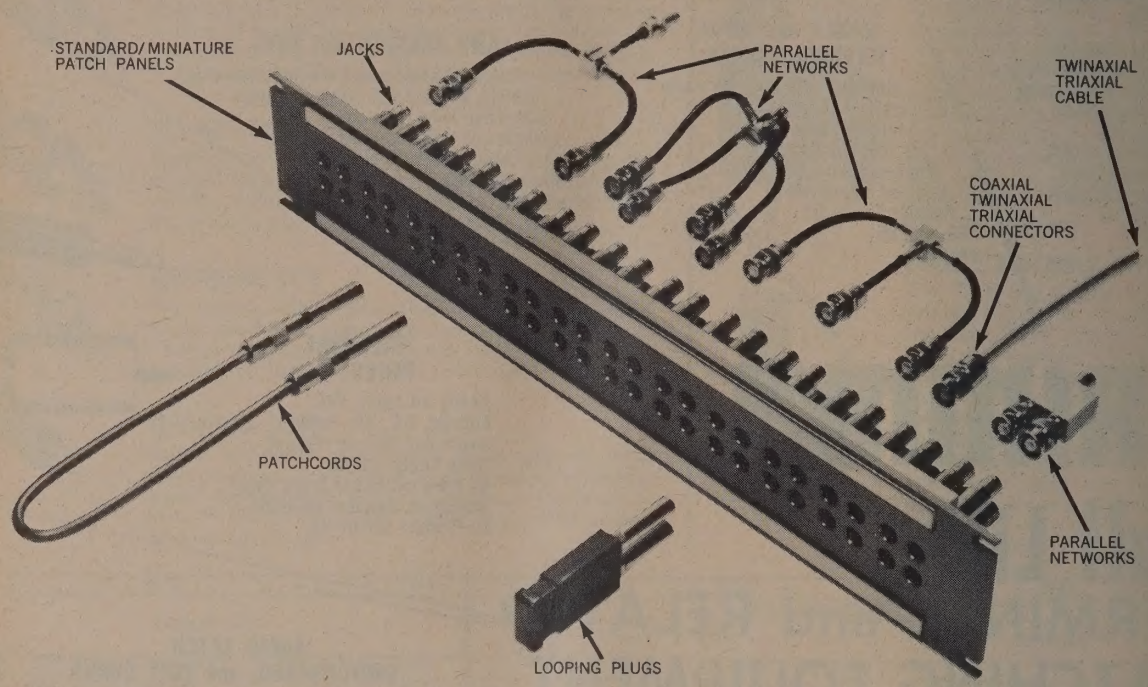




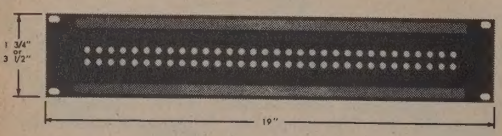
TRIMM INC. P.O. BOX 489 — LIBERTYVILLE, ILLINOIS 60048 312-362-3700

Patching & Switching

Coax/Twinax/Triax



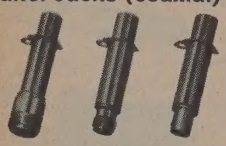
The above components are available in coaxial standard sizes as well as coaxial miniature and Western Electric type miniature. Twinaxial and Triaxial systems are also available and recommended where ground loops, magnetic fields and capacitive fields are a problem.



Patch Panel Configurations

Standard Panels: 12, 14, 20, 24, 26, 36, 40, 48, 52 holes
Miniature Panels: 32, 64, 96 holes
JS = alum. panel (common ground)
JSI = insulated panel

Panel Jacks (coaxial)



Jacks that accept either .070″ pins (RCA) or .090 pins (W.E.)—rear mating with UHF, BNC, cable input, C, TNC, N and miniature TPS plugs

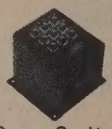
Also available: self terminating or normalling jacks

Twinax/Triax Connectors & Cable

Plugs, Receptacles, Feed thrus and Panel Jacks

¼″ dia. 50, 75, 78, 124Ω twinax/triax cable

Video and Data Switching Systems



Coax Switch 3 x 2

Twinax/Triax Matrix 1 x 6

Matrices: Remotely programmable switching devices wherein any input can be connected to any output. Available in either x, y plane or x, y, z format. Isolation up to 110db @ 60 MHz

Switches: Multi-pole, multi-throw formats up to 20 poles, 20 throws in coax or twinax
Made to customer specifications

TROMPETER ELECTRONICS INC.

Write for new catalogs
Patching
Switching

8936 Comanche Avenue Chatsworth, California 91311 Telephone (213) 882-1020

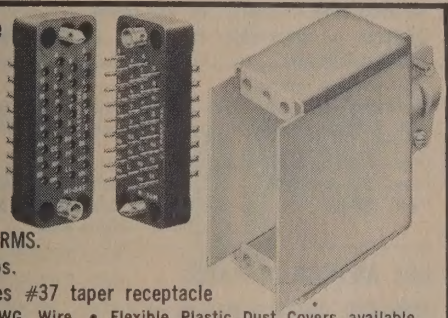
U.S. COMPONENTS INC.

1.) Established Reliability Connectors and Contacts.
2.) Qualified Products — Connectors, Contacts, Crimping Tools and Hardware.
3.) Largest Variety Standard Shelf Items — Rapid Delivery.
4.) Custom-Built Connectors to Customer Specifications.
5.) Quality Assurance Built Into Our Products.
6.) Major Electronic Company Q.A. Approvals.
7.) Government QPLs and Underwriters Lab. Approvals.
8.) Research and Development Facilities.

20 Zerega Ave., Bronx, N. Y. 10462 • Tel. 212-824-1600 • Telex: 1-2411 • TWX: 710-593-2141 • Cable Address: COMPONENTS NYK.

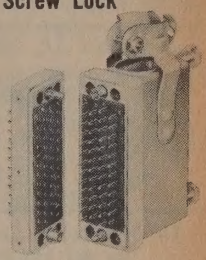
Rack and Panel Connectors

I-SERIES - Miniature



umber of contacts: 7, 12 (8-4), 14, 18, 20, 21, 26, 34, 41, 50, 75
aximum wire size: #20 AWG wire
oltage breakdown etween contacts — ea level: 3000V. A.C. RMS.
urrent rating: 7.5 amps.
I-SDL (solderless): uses #37 taper receptacle
lso available for #18 AWG. Wire. • Flexible Plastic Dust Covers available.

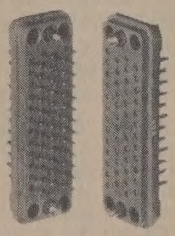
MI-BSL "FBI" SERIES - Miniature Bracket Screw Lock



Floating Body Isolation

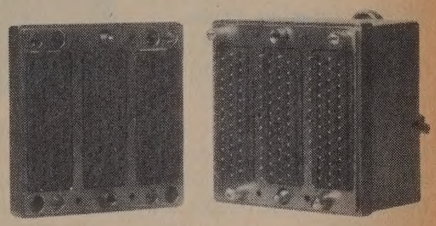
Number of contacts: 34, 41, 50, 75.
Maximum wire size: #20 AWG wire.
Voltage breakdown between contacts — sea level: 3000V. A.C. RMS.
Current rating: 7.5 amps.
Hoods: aluminum anodized.
Brackets: die-cast aluminum.
MI-BSL-SDL (solderless): uses #37 taper receptacle.
Patent Nos. 2,761,108, 2,845,603, 2,845,604.
Additional Patents Pending. Also available for #18 AWG. Wire.

MI SERIES - Miniature
MI-SL SERIES - Miniature Screwlock



imilar to MI & MI-SL Series except: End Holes of 7 hru 26, & 41, and Center Holes of 34 thru 104 ave Square Shape, for MS Hardware).
umber of contacts: 7, 9, 8-4, 14, 18, 20, 21, 26, 34, 41, 42, 50, 75 & 104.
ire sizes accommodated: No. 20 A.W.G. (No. 18 on special order).
in diameter: .040
urrent rating: 7.5 amps., max.
est voltage, between contacts, sea level: Meets MIL-C-008384C requirements.
Contact options: Closed-entry, dip solder (.038 or .025 dia), turret.
Hardware: MS18194, MS18195, MS18196, MS18197 and MS Hoods (shields), all per MIL-C-008384C or its successor.
Guide pins and guide sockets: Many alternates.
Connectors and hardware qualified to MIL-C-008384C.
IMIs interchangeable with their counterparts in MI, REMI, and URC (size 20 contact) SERIES.
Patent No. 2,761,108. • Request Catalog IMI.

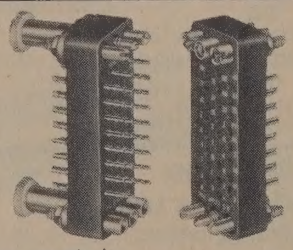
Floating Body Isolation



MI-BMSL SERIES Miniature Bracket Modular Screw Lock

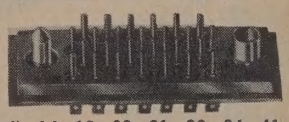
Number of contacts: 123, 150, 225.
Maximum wire size: #20 AWG wire.
Voltage breakdown between contacts — sea level: 3000V. A.C. RMS.
Current rating: 7.5 amps.
Hoods: aluminum anodized.
Brackets: die-cast aluminum.
MI-BMSL-SDL (solderless): uses #37 taper receptacle.
Patent Nos. 2,761,108, 2,845,603, 2,845,604. Also available for #18 AWG. Wire.
Additional Patents Pending

MI-KSL SERIES
Miniature Hoodless Knob Type Screw Lock



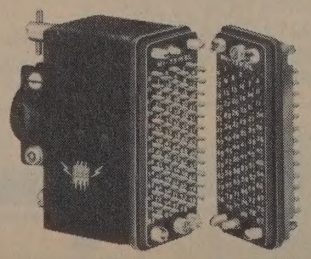
Number of contacts: 7, 12 (8-4) 14, 18, 20, 21, 26, 34, 41, 50, 75.
Maximum wire size: #20 AWG wire.
Voltage breakdown between contacts — sea level: 3000V. A.C. RMS.
Current rating: 7.5 amps.
MI-KSL-SDL (solderless): uses #37 taper receptacle.
Patent No. 2,761,108. • Also available for #18 AWG. Wire.

HMI-SL SERIES
Hermetic Seal Miniature Screwlock



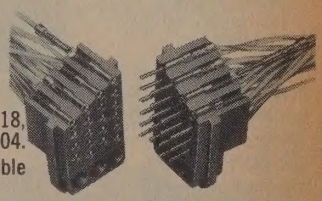
Number of contacts: 7, 12 (8-4), 14, 18, 20, 21, 26, 34, 41, 50, 75.
Voltage breakdown between contacts — sea level: 2200V. A.C. RMS, MIN.
Current rating: 7.5 amps.
Mates with corresponding MI-FSL (female) series connectors.
Also available in Draw-Pull Type. Mates with MI-F (female) Series Connectors.

MI-SL SERIES
Miniature Screw Lock



Number of contacts: 7, 12 (8-4), 14, 18, 20, 21, 26, 34, 41, 50, 75.
Maximum wire size: #20 AWG. wire.
Voltage breakdown between contacts — sea level: 3000V. A.C RMS.
Current rating: 7.5 amps.
MI-SL-SDL solderless): uses #37 taper receptacle.
Patent No. 2,761,108. • Also available for #18 AWG Wire.

REMI® SERIES
Standard and Screwlock



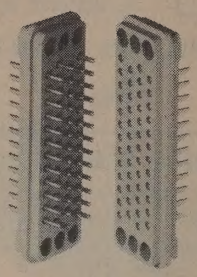
Number of contacts: 7, 12 (8-4), 14, 18, 20, 21, 26, 34, 41, 42, 50, 75, 104.
Type of contact: crimp style, removable with "snap-in, snap-out" feature.
Wire sizes accommodated: #14, #16, #18, #20, #22, #24, #26, #30 AWG and sizes #16 down to #32 per MIL-W-16878,
Snap-In . . . Snap-Out Contacts REMI Hand-Operated,* Pneumatic and Semi-Automatic Crimping Tools Available.
Patent No. 2,979,689 & 6 International Patents.
Contacts available meeting MS18134, MS18136, per MIL-C-23216, latest.
All sleeves meet MS18135. Insertion and Removal Tool Meets MS18137.
Request Catalog REMI.
* MIL-T-22520 latest rev.

Rack and Panel Connectors

MIW SERIES

Miniature Rectangular Power Connectors

(Similar to MI Series except .062 dia. contact)



Number of contacts: 7, 9, 11, 14, 18, 20, 21, 26, 34, 41, 42, 50, 75, 104.

Pin diameter: .062

Wire sizes accommodated: up to #16 AWG.

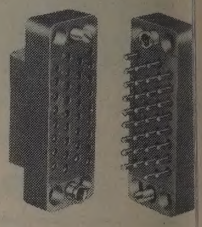
Current rating: 13 amps., max.

Breakdown voltage between contacts — sea level: 2000V. A.C., RMS.

Connectors meet applicable provisions of MIL-C-8384, latest revision.

ANYCON* Connectors

URC and URC-SL SERIES



Number of contacts: 9, 14, 18, 20, 26, 34, 42, 50, 66, 75, and 104.

Maximum wire size: #16 AWG.

Voltage breakdown between contacts — sea level: 2950V. A.C. RMS.

Current rating: 13 amps.

Contac size (standard): 20 & 16.

Shielded coax contacts: See list below.

Contacts — Removable, crimp-type. Socket closed entry type: See list below.

Order contacts separately.

Connectors meet MIL-C-22857, latest revision. Also commercial.

Both draw-pull and twin screwlock types available, with or without hood or shells.

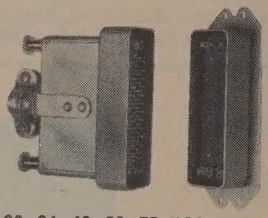
Crimping tools, insertion and removal tools available.

Patent No. 2,761,108. UNDERWRITERS' LABORATORIES APPROVED

* ANY CONtact, std. size 16 or 20, or shielded coax in ANY CONtact position

Request Catalog URC.

XMI Protective Shells for MI SERIES
XIMI Protective Shells for IMI SERIES
XREMI Protective Shells for REMI SERIES
XURC Protective Shells for URC SERIES



Number of contacts: 7, 14, 18, 20, 26, 34, 42, 50, 75, 104.

Material: Top quality aluminum, per Fed. spec.

Meet latest revision MS17775 unless otherwise specified.

Anodized per latest revision MIL-A-8625, or special conductive finishes on request.

Used on plugs and receptacles, all draw-pull or screwlock types.

Polarization optional, at specified position.

For 9 & 66 contact shells, write factory.

Request Catalog IMI, REMI, or URC.

URC ANYCON CONTACTS

STANDARD, CONTACT SIZE 16 † ‡

MS17803-16-16 Pins for wire sizes 16, 18, 20 AWG.
MS17803-16-20 Pins for wire sizes 20, 22, 24 AWG.
MS17804-16-16 Sockets for wire sizes 16, 18, 20 AWG.
MS17804-16-20 Sockets for wire sizes 20, 22, 24 AWG.

† Qualified against MIL-C-23216.

‡ Available also in contact size 20 for wire sizes 16 thru 30 AWG.

SHIELDED 'COAX',* CONTACT SIZE 16

MS18232-1 Pins for RG-178B/U & RG-196A/U cable.
MS18233-1 Sockets for RG-178B/U & RG-196A/U cable.
MS18265-1 Sockets for RG-161/U, RG-179B/U, & RG-187A/U cable.
MS18265-2 Sockets for RG-174/U, RG-188A/U, & RG-316/U cable.
MS18266-1 Pins for RG-161/U, RG-179B/U, & RG-187A/U cable.
MS18266-2 Pins for RG-174/U, RG-188A/U, & RG-316/U cable.

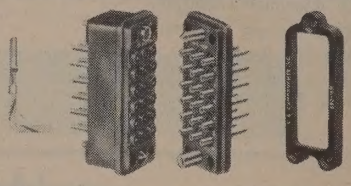
* For government end use.

Crimping tools per MIL-T-22520 (latest) and/or MS drawing requirements. Hand, semi-automatic, and automatic.

Request Catalog URC.

980 SERIES

Power Guide Pin Spring Release



Number of contacts: 12, 18, 24, 34.

Maximum wire size: #16 AWG. wire.

Voltage breakdown between contacts — sea level: 4600V. A.C. RMS.

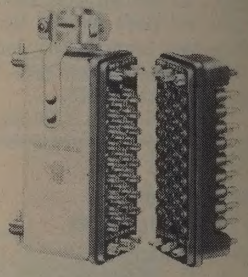
Current rating: 13 amps.

980-SDL (solderless): uses #53 taper pin.

Patent No. 2,658,182. Request Catalog 980-990.

980-SL SERIES

Power Screw Lock



Number of contacts: 12, 18, 24, 30.

Maximum wire size: #16 AWG. wire.

Voltage breakdown between contacts — sea level: 4600V. A.C. RMS.

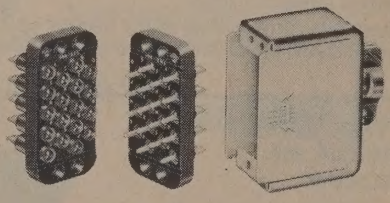
Current rating: 13 amps.

980-SL-SDL (solderless): uses #53 taper pin.

Patent Nos. 2,658,182, 2,761,108.

Request Catalog 980-990.

990 and 990-S (Short Contacts) SERIES - Power



Number of contacts: 7, 10, 15, 18.

Maximum wire size: #16 AWG. wire.

Voltage breakdown between contacts — sea level: 4000V. A.C. RMS.

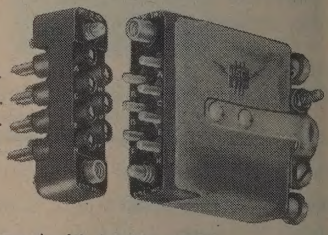
Current rating: 13 amps.

990-TU (Turret type).

Request Catalog 980-990.

990-SL SERIES

Power Screw Lock



Number of contacts: 7, 10, 15, 18.

Maximum wire size: #16 AWG. wire.

Voltage breakdown between contacts — sea level: 4000V. A.C. RMS.

Current rating: 13 amps.

990-TU (Turret type).

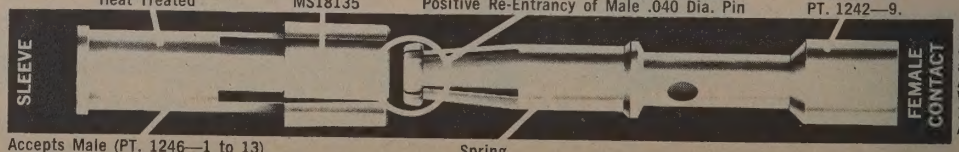
Double Lead threads, "Twice the speed with Double Lead."

Patent No. 2,761,108. Request Catalog 980-990.

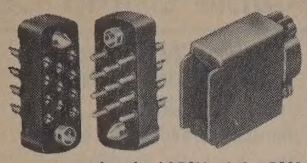
THE REMI CONCEPT

Removable • Closed Entry • Crimp Type Contacts — Mechanical Stresses Confined between METALLIC Elements.

REMI Connectors Mate with REMI, MI, or URC (with .040 Dia. Contact) Series.



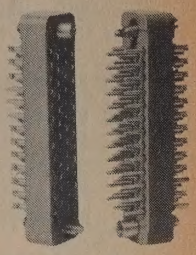
ack and Panel Connectors & Edgeboard P.C. Connectors



I SERIES - Subminiature

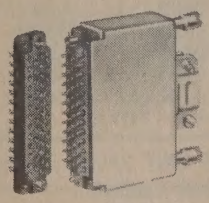
mber of contacts: 5, 7, 11, 14, 20, 26, 29, 34, 42, 50, 75, 104.
ximum wire size: #20 AWG. wire.
ltage breakdown between contacts — sea level: 1950V. A.C. RMS.
rrent rating: 7.5 amps.
so available with closed entry contacts — CSMI Series.
MI Protective Shells available for all types. Request Catalog SMI.

UMI SERIES - Ultraminiature Draw-Pull & Screwlock



Number of contacts: 5, 7, 9, 11, 14, 20, 26, 29, 34, 44, 50.
Maximum wire size: #22 AWG. wire.
Voltage breakdown between contacts — sea level: 1800V. A.C. RMS.
Current rating: 3 amps.
Patent No. 2,761,108.
ALSO AVAILABLE WITH:
Closed Entry Contacts: CUMI Series.
Removable Crimp Contacts: RUMI Series.
.025 D. Pin and Socket: SSMI Series.
Request Catalog UMI-RUMI.

MI-HSL - Subminiature Hooded Screwlock
MI-KSL - Subminiature Hoodless Screwlock (Not Shown)

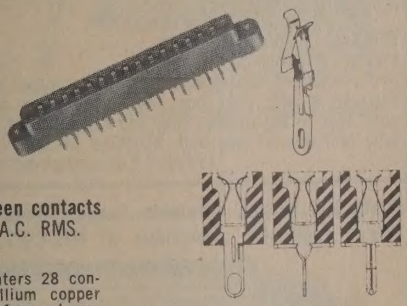


Number of contacts: 5, 7, 11, 14, 20, 26, 29, 34, 42, 50, 75, 104.
Maximum wire size: #20 AWG. wire.
Voltage breakdown between contacts — sea level: 1950V. A.C. RMS.
Current rating: 7.5 amps.
Also available with closed entry contacts — CSMI-SL Series.
Patent Nos. 2,761,108 & 3,030,602. Request Catalog SMI.
XSMI Protective Shells available for all types.

MH SERIES Miniature Hex

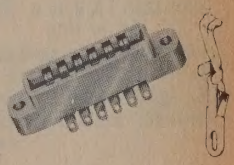
Number of contacts: 4, 5, 7, 9
Current rating: 7.5 amps.
Maximum wire size: #20 AWG. wire.
Voltage breakdown between contacts — sea level: 1215V. A.C. RMS.
Voltage breakdown contacts to ground: 1785V. A.C. RMS.
MH-SDL (solderless): uses #37 taper receptacle.
ALSO AVAILABLE FOR #18 AWG. WIRE
Patent No. 2,848,702.

UPCR SERIES Single Row Printed Card Receptacle



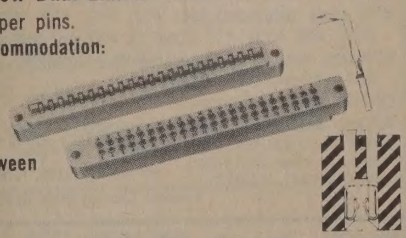
Number of contacts — (Phosphor Bronze): 6, 10, 15, 18, 22.
Solder wire hole size: .05 x .12.
Voltage breakdown between contacts — sea level: 2500V. A.C. RMS.
Current rating: 5 amps.
Also available on .125 centers 28 contacts UP4CR-28. For beryllium copper contacts add prefix "B" before cat. no.
Polarizing pins and contacts — snap-in or out design permitting easy interchangeability.
Patent No. 2,835,689. Request Catalog UPCR.
Connectors meet MIL-C-21097, latest revision.

UPCR-D - Double Row Printed Card Receptacle - Solder Type Terminals



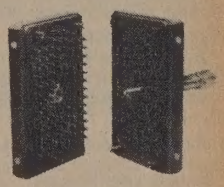
Card range thickness accommodation:
UPCR-D: .058 - .072 (nom. 1/16")
UPCR-93D: .080 - .104 (nom. 3/32")
Number of contacts (Phosphor Bronze*): 6, 7‡, 10, 15, 18, 22 per row, (2) rows.
Solder wire hole size: .05 x .12.
Voltage breakdown between contacts — sea level: 2500V. A.C. RMS.
Current rating: 5 amps.
Both bifurcated and non-bifurcated contacts available.
Polarizing pins and contacts — snap-in or out design permitting easy interchangeability.
* For beryllium copper contacts add prefix "B" before catalog number.
‡ Molded in polysulfone, one of the strongest, most heat-resistant, self-extinguishing thermoplastics available. Excellent electrical properties. For availability of other items in polysulfone, contact factory.
Patent No. 2,909,755. Request Catalog UPCR.
Connectors meet MIL-C-21097, latest revision.

UPCR-DTLP - Single Row Dual Linked Contact



UPCR-DLTP: Uses #53 taper pins.
Card Range thickness accommodation: .052 - .072 (nom. 1/16")
Number of contacts (Beryllium Copper): 18, 22.
Voltage breakdown between contacts — sea level: 2500V. A.C. RMS.
Current rating: 5 amps.
Tails locked in place with stainless steel retaining ring which controls retention force on the #53 taper pins accepted by contacts.
Request Catalog UPCR.

MIWC SERIES - 104 Contact Center Screwlock Plugs & Receptacles



Connector type: Rack and panel.
Contact types: 0.062 dia. pin and mating closed-entry socket.
Contact spacing: 0.150 center-to-center.
Current rating: 13 amps. max. 10 amps cont.
Voltage breakdown between contacts — sea level: 3000V. A.C. RMS.
Solder cup: 0.073 dia. for #16 AWG. max. wire.
Available versions: MIWC-104M2SL, MIWC-104F2K (illustrated above); MIWC-104M2K, MIWC-104F2SL

CONNECTOR TYPES AVAILABLE:

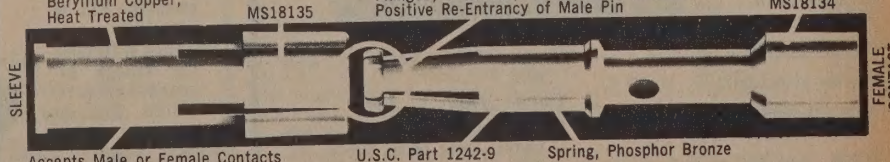
Rack and Panel
Plug and Receptacle
Edgeboard
Two-Piece Printed Circuit
High Density
Test Point
Miniature Hexagonal
Circular
Zero-Entry-Force P.C
Hermetically Sealed

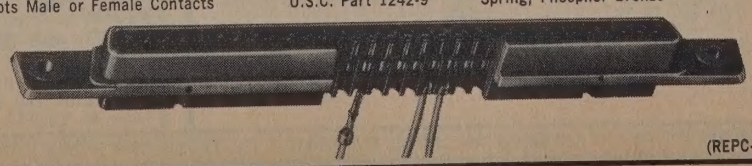
U.S.C. Manufacturers' Connectors and/or Contacts Meeting or Exceeding All Applicable Provisions of Latest Revision of:

MIL-C-8384
MIL-C-21097
MIL-C-22857
MIL-C-23216
MIL-C-23353
MIL-C-25955
MIL-C-39029
MIL-C-55302
MS18134
MS18136
NAS713, NAS714, NAS715

Quality Control to Latest Revision of MIL-Q-9858, MIL-I-45208, NASA NPC200.
Calibration Per MIL-C-45662 Traceable to National Bureau of Standards.

THE REPC CONCEPT (Mechanical Stresses Confined Between METALLIC Elements)

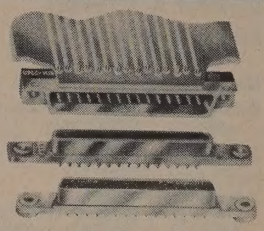




(REPC-F32 Shown)

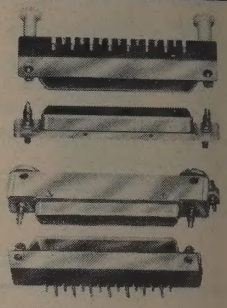
Two-Piece P.C. Connectors & Removable Crimp Contact Connectors

UPCC-M & F SERIES
Printed Circuit Connectors & Mates (Meet MIL-C-23353/1, 2, & 3 and NAS 713, 714, 715)



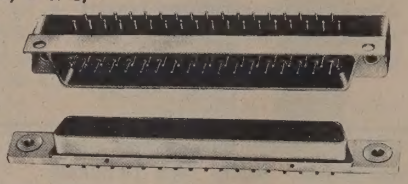
Contact spacing: 0.156.
Number of contacts: 7, 11, 15, 19, 23, 32.
Male dip solder. Card range thickness accommodation:
UPCC-M( ) A, B, or C: 1/16", 1/8", or 1/4".
Female UPCC-F( ): Max. #20 AWG. wire.
Female dip solder terminals. UPCC-FDN( ).
Current rating: 7.5 amps.
Voltage breakdown between contacts — sea level: 2500V. A.C. RMS.
REPC-F series also mates with UPCC-M series.
Request Catalog UPCC-REPC.

UPCC-SL SERIES - Printed Circuit Screwlock & Mate
UPCC-SLH SERIES Hooded Screwlock & Mate



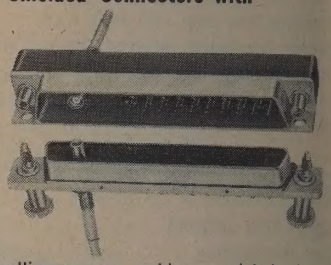
(Meet applicable provisions of MIL-C-23353 & NAS-713, 714, 715)
Contact spacing: 0.156.
Number of contacts: 7, 11, 15, 19, 23, 32.
Current rating: 7.5 amps.
Voltage breakdown between contacts—sea level: 2500V. A.C. RMS.
UPCC-SL
UPCC-M2K-( ) A, B, C for 1/16", 1/8", 1/4" P.C. or — E for solder eyelet.
UPCC-F2SL-( ) for #20 max. AWG. wire or — TU for turret terminals.
UPCC-SLH
UPCC-M2SL-( ) A, B, C for 1/16", 1/8", 1/4" P.C. or — E for solder eyelet.
UPCC-F2HSL-( ) for #20 max. AWG. wire or — TU for turret terminals.
Patent No. 2,953,767. Request Catalog UPOC-REPC.

UPCC-SGM & SGF SERIES - Printed Circuit Connector & Mates (Meet MIL-C-23353/4, 5 & 6)



Contact spacing: 0.100
Number of contacts: 11, 17, 23, 29, 35.
Male dip solder. Card range thickness accommodation:
UPCC-SGM( ) A, B, or C: 1/16", 1/8", or 1/4".
Female dip solder terminals. UPCC-SGFDN( ).
Current rating: 7.5 amps.
Voltage breakdown between contacts — sea level: 2360V. A.C. RMS.
REPC-SGF series also mates with UPCC-SGM series.
Request Catalog UPCC-REPC.

TWO UNIT UPCC - 19 Pin Shielded Connectors with Coaxial Contacts

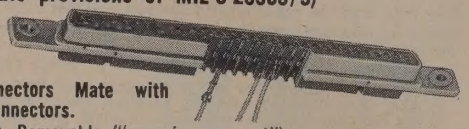


The male connectors meet all applicable provisions of the latest revisions of MIL-C-23353 and MIL-C-23353/6.

The female connectors meet all applicable provisions of the latest revisions of MIL-C-23353 and MIL-C-23353/4.

COAXIAL CONTACTS: High mating retention type plug with socket of top quality beryllium copper, gold over nickel plated. Receptacle with .031 nom. dia. pin of top quality beryllium copper, gold over nickel plated. Plug and receptacle are of snap-lock mounting type and are for use with RG180/U or RG195/U cable (Ref.).
Request Catalog UPCC-REPC.

REPC-F SERIES - Female Chassis Connector (Meet applicable provisions of MIL-C-23353/9)

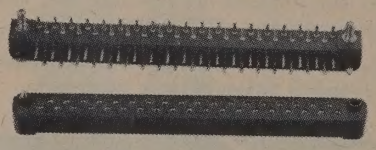


REPC-F( ) Connectors Mate with UPCC-M( ) Connectors.
Type of Contact: Removable ("snap-in, snap-out") crimp type, closed-entry.*
Contact spacing: 0.156.
Number of contacts: 7, 11, 15, 19, 23, 32.
Wire sizes accommodated: #14, #16, #18, #20, #22, #24, #26, #30 AWG. wire and sizes #16 down to #32 per MIL-W-16878.
Crimping tools: Hand-operated MIL-T-22520C and MS, also pneumatic and semi-automatic types.
Current rating: 7.5 amps.
Voltage breakdown between contacts — sea level: 2500V. A.C. RMS.
Patent No. 2,979,689 & 6 International Patents.
* Contacts meet MS18134 } per MIL-C-23216
* Sleeves meet MS18135 }
Request Catalog UPCC-REPC.

REPC-SGF SERIES - Female Chassis Connector (Meet applicable provisions of MIL-C-23353/10)

REP-SGF( ) connectors mate with UPCC-SGM( ) connectors.
Type of contact: Removable ("snap-in, snap-out") crimp type, closed-entry.*
Contact spacing: 0.100.
Number of contacts: 11, 17, 23, 29, 35.
Wire sizes accommodated: #14, #16, #18, #20, #22, #24, #26, #30 AWG. and sizes #16 down to #32 per MIL-W-16878.
Crimping tools: Hand-operated MIL-T-22520C and MS, also pneumatic and semi-automatic types.
Current rating: 7.5 amps.
Voltage breakdown between contacts — sea level: 2360V. A.C. RMS.
Patent No. 2,979,689 & 6 International Patents.
* Contacts meet MS18134 } Per MIL-C-23216, latest revision.
* Sleeves meet MS18135 }
Request Catalog UPCC-REPC.

MIG SERIES
Right Angle Plug & Receptacle Connectors



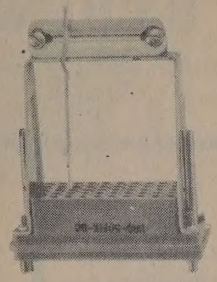
Contact spacing: 0.100.
Number of contacts: 11, 15, 23, 37.
Male dip solder. Card range thickness accommodation.
MIG-M: from 1/32" to 1/4".
Female. MIG-F: Max. #20 AWG. wire.
Current rating: 7.5 amps.
Voltage breakdown between contacts — sea level: 1060V. A.C. RMS.
Request Catalog MIG-WG-RWG.

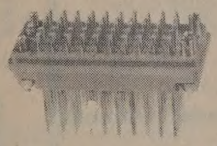
WG-37M - Connector Plug, Right Angle .100 Grid P.C.
RWG-37F - Mating Receptacle, Crimp Removable Contacts

Number of contacts: 37.
Wire sizes accommodated: #14 to #30 AWG.
Dielectric withstanding voltage between contacts: 1500V. D.C. at sea level.
Current rating: 7.5 amps., max.
WG-37M: is screw mounted. **WG-37MR:** is rivet mounted.
RWG-37F: uses MS18134 contact & MS18135 sleeve of MIL-C-23216 latest rev., and other REMI contacts.
Crimping tools: per MIL-T-22520 latest, and commercial. Hand, semi-automatic and automatic.
Patent No. 2,979,689 & 6 International Patents. Request Catalog MIG-WG-RWG.

Miscellaneous Connectors

RG-M1SL-WW - Connector Plug, Wire rapped Terminals
RG: FIK-BC - Mating Receptacle, Crim Removable Contacts
200 .200 contact grid spacing





Num of contacts: 50.
Pin meter: .062.
Male erminals: .045 square, wire wrapped ty
Fem contacts (ordered separately): Meet M 7804-16-16 of MIL-C-23216 latest.
Wir ccommodation: #16, #18, #20 AWG.
Brin ng Tools: per MIL-T-22520 latest, and c mercial. Hand, semi-automatic and a matic.
Cur t rating: 13 amps., max.
Die tric withstanding voltage, between con- ts — sea level: Depends upon wire s used on males.
Co ctors meet all applicable provisions of L-C-22857, latest revision

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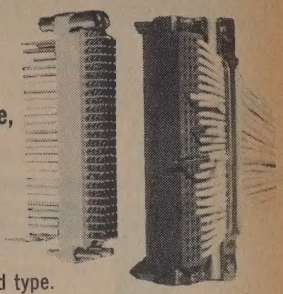
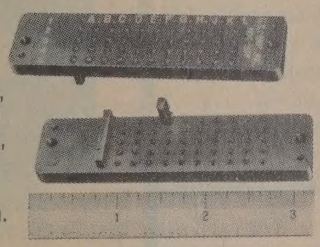
GR-100MISL-WW Connector Plug, Wire-Wrapped Terminals
RGR-100FIKL-CC - Mating Receptacle, Crimp Removable Contacts
.100 x .100 contact grid spacing



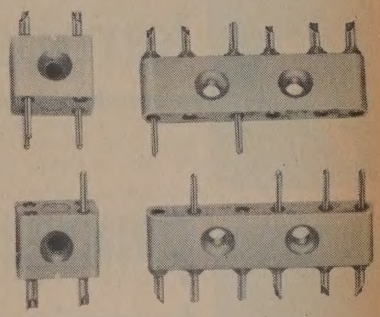
Number of contacts: 100.*
Pin diameter: .030.
Male terminals: .025 square, wire wrapped type.
Female contacts (ordered separately) wire accommodation: #22 thru #26 AWG.
Crimping tool: MS3198-1 per MIL-T-22520, latest revision.
Current rating: 5 amps., max.
Dielectric withstanding voltage, between contacts — sea level: Depends upon wire sizes used on males.
Contacts meet applicable provisions of MIL-C-23216, latest revision.
Connectors meet applicable provisions of MIL-C-8384, latest revision.
Patent No. 2,761,108.
*Also 20, 40, 60 and 80.

NO SERIES



Nu er of contacts NOG-( )F: 5, 10, 55.
Nu er of contacts NOG-( )M: 1, 2, 4, or 5.
Co act size 20: .040 dia.
P dip solder terminals: .020 dia.
Cu ent rating: 5 amps, continuous.
Vo ge breakdown between nearest contacts sea level, normal m idity: 3000V. A.C. RMS.

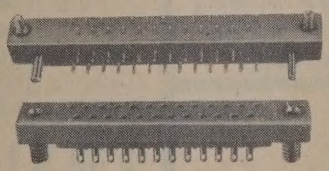
Side Mounting Miniature Connectors



Number of contacts: 4 or 6.
Pin diameter: .040.
Wire sizes accommodated: #20 to #22 AWG.
Current rating: 7.5 amps., max.
Voltage breakdown, between contacts — sea level: 2000V. A.C., RMS.
Many polarizations available (males and females in same connector body).

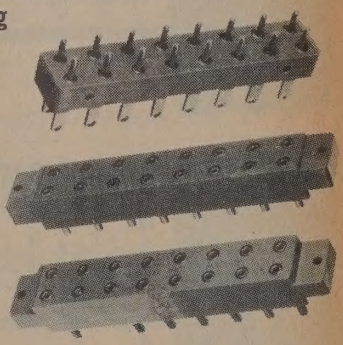
MG-4M & F **MG-6M & F**

-25M - Connector Plug Right gle .100 Grid P.C.
-25F - Mating Receptacle, der Eyelet Terminals



nber of contacts: 25.
, thicknesses accommodated: 1/16", 1/32", 5/32".
diameter: .040.
rent rating: 5 amps. continuous.
erating voltage — sea level: 900V. A.C. RMS.
male contacts: Solder eyelet accepts 2 #20 AWG. wires.
larized foolproof assembly. Blind alignment.

960-16M - Power Connector Plug
960-16F - Mating Receptacle
960-16FT - Mating Receptacle (Anti-Rotation Contacts)



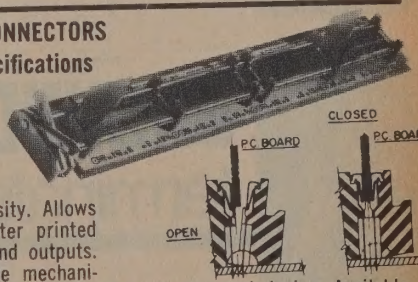
Number of contacts: 16.
Pin diameter: .094.
Male contacts, removable, dual wiring holes.
Female contacts, removable crimp type.
Wire sizes accommodated: #12 thru #20 AWG.
Current rating: 23 amps.
Polarization contacts available.
Breakdown voltage, between contacts — sea level: 6000V. A.C. RMS.

TP-16 and UTP-S5 - Test Point Connectors

TP-16
umber of contacts: 16.
ocket contact: accepts standard .080 dia. test probe and retains probe with spring pressure. Pin end of contact is .030 dia.
urrent rating: 5 amps., max.
reakdown voltage, between contacts — sea level: 3500V. A.C. RMS.

UTP-S5
Number of contacts: 5, button type.
Pin end of contact: .030 dia.
P.C. board accommodated: 3/32".
Current rating: 5 amps., max.
Voltage rating: 600V. A.C. RMS.
Test voltage — sea level: 1800V. A.C. RMS.

ZERO-ENTRY-FORCE CONNECTORS
Built to Customer Specifications



TYPICAL:

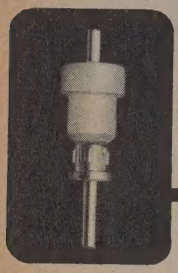
1.) (Illustrated). Z-E-F connector used in advanced computer applications involving maximum packaging density. Allows use of 3 edges of master printed circuit card for inputs and outputs. All connections are made mechanically and simultaneously by means of a cam-actuated device. Available in many configurations of connectors with from 56 to 520 contacts.

2.) (Not Illustrated). Z-E-F connector used in test set-up for special electronic modular components. Manual control levers are snapped closed, gently pressing the contacts against the module's pins for the test. Connectors come in 4 sizes (52 or 62 contacts), 3.6 in. long by 2 to 2.5 in. wide.

Write us about your requirements.

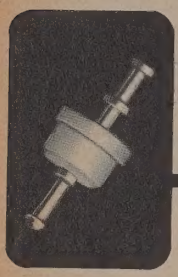
U.S. TERMINALS INC.

7502 Camargo Road, Cincinnati, Ohio 45243, Phone 513 561-8145 TWX 810-461-22



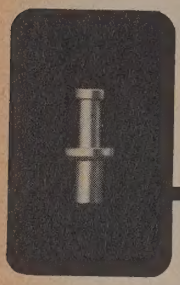
SLIP LOCK® terminals

No hole chamfering is ever required. Patented single-piece terminals can be inserted from either side of your chassis or card and lock in place under simple pressure. Reliability is unparalleled.



PRESS TYPE terminals

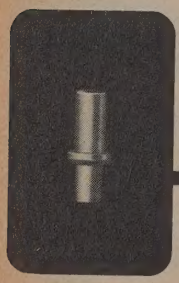
Press type terminals also are immune to mechanical shocks and vibrations and are suitable for all metal chassis applications. Electrode pins meet the latest exacting military specifications.



PRINTED CIRCUIT terminals

Bulletin 6802

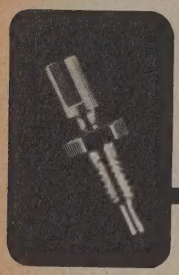
Available in brass or high-conductivity copper to meet the most exacting requirements. Precision machining assures trouble-free installation and service. Controlled heat treating and plating guarantee excellent solderability. Special designs are available.



PRINTED CIRCUIT test jacks

Bulletin 6802

Printed Circuit Sockets/Test Jacks offer new flexibility and compactness in printed circuit design. Suitable for test point jacks, min. tube sockets, module sockets, diode and transistor sockets and stacking P.C. boards.

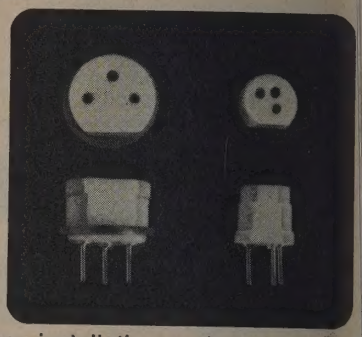


GROUNDING terminals

Made to the same high standards as the above designs, grounding terminals are one-piece brass units, knurled or threaded for inserting or bolting to the metal chassis.

BELT LINE transistor sockets

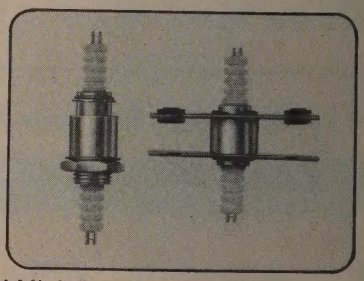
Bulletin 6901



Easy installation sockets have beryllium copper age hardened receptacles; fit standard/existing mounting hole sizes. No chamfer necessary! Shoulder on pin at insulation prevents cold solder joints, pin extensions can be bent without cracking. "D" cross section prevents rotation. Teflon insulation is used. Lowest cost, highest quality sockets available. Special designs available, also Press Type Sockets.

High Voltage connectors

Bulletin 6804



HV Miniature Connectors offer precise contact design, precious metal plating and Teflon insulation. Optimum creepage path for high-voltage use is engineered to meet MIL-C-8384. Breakdown voltages to 18,000 vdc.

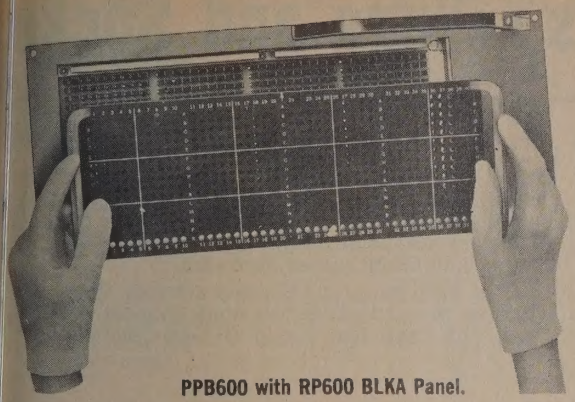
U.S. TERMINALS

U.S. Terminals products are manufactured under one or more of the following patents: U.S.—3349365, 3095470, 3267205, 3244801; British—972756; Canadian—729317. Other patents applied for.

VECTOR PATCHBOARDS

REMOVABLE PANEL PRE-PROGRAMING TYPE

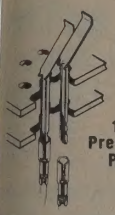
- Guaranteed Post Patching Capability Without Contact Damage
- All connections make and break simultaneously
- Mount In any position for space conservation



PPB600 with RP600 BLKA Panel.

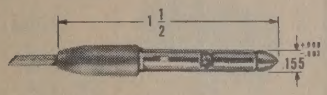
Reliable, low cost, Vector Pre-Programming Patchboard units function like a multiple contact switch to engage and disengage up to 1200 contacts simultaneously with a single lever action. The units are most useful where: 1. Maximum flexibility of connection arrangements is required. 2. A variety of connection setups must be changed quickly and without error.

Wiring tabs are supplied standard for solder or solderless slip-on contact, or for wire wrap. Contact springs are beryllium copper heat treated for long life, nickel plated or gold flashed.



Solderless Slip-On Contact

1723/1 fits Pre-Programming Patchboards



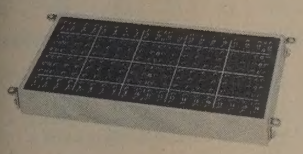
Pre-Programing Patch Cord Plug

Recept. Frame Cat. No.	Outside Dimen. W.	Outside Dimen. H.	No. of Contacts	Mating Remov. Panels Unmarked Cat. No.	Mating Remov. Panels Std. marked Cat. No.
PPB204	10⅜″	6″	204	RP204BLK	RP204BLKA
PPB300	10⅜″	6″	300	RP300BLK	RP300BLKA
PPB450	16″	6″	450	RP450BLK	RP450BLKA
PPB600	16″	6″	600	RP600BLK	RP600BLKA
PPB1200	17″	10¾″	1200	RP1200BLK	RP1200BLKA

Depth beyond panel is 2⅝″

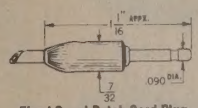
Single Patch cords available 6″, 9″, 15″, 24″. Order as K3.06, K3.09, K3.15, K3.24. Jumper specify Cat. No. KP-1. Doubles and triples for shielding. "Splits" and cords with molded integral diodes available.

FIXED PANEL TYPE

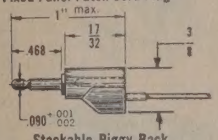


PB1020-2

Cat. No.	Contacts	Outside Dimensions W.	Outside Dimensions H.
PB33-2	9	1.130″	x 1.130″
PB110-2	10	2.985″ x	.600″
PB210-2	20	2.985″ x	.865″
PB510-2	50	2.985″ x	1.660″
PB1010-1	100	3.250″ x	3.250″
PB1010-2	100	2.985″ x	2.985″
PB1020-2	200	5.635″ x	2.985″
PB1520-2	300	5.635″ x	4.310″



Fixed Panel Patch Cord Plug



Stackable Piggy Back Fixed Panel Patchboard Cords

Piggyback	Standard	Lgth.
K9.06	K2.06	6″
K9.09	K2.09	9″
K9.15	K2.15	15″
——	K2.02-1	Jumper

Fixed Panel style Patchboards provide reliable low cost single conductor patching on control and test panels where pre-programming is not required. Low resistance beryllium copper, gold flashed contacts are independent wrap-around type and located on .265″ centers.

Single wire, piggy-back, splits, and jumper type programming patch cords are available. Permanent connections are made by soldering wires or using solderless slip-on contacts, 1723-41 crimped to wires on the rear of the boards. Boards listed have standard white alpha-numeric markings front and back and brackets are furnished as standard.

Special Sizes

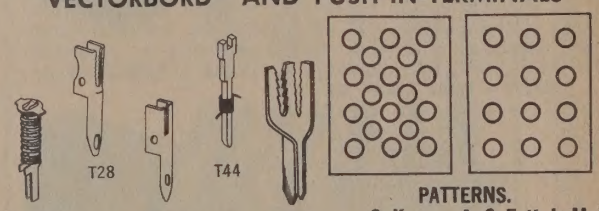
Larger contact systems can be made by mounting standard panels adjacent. Special sizes up to 2200 contacts are readily made to order at minimum cost. Special marking and screening in colors are also available. Insulation material is black phenolic .093″ thick. Terminals are beryllium copper, heat treated, nickel plated gold flashed per QQS-365. Plug tips are nickel plated brass and if so specified, gold flashed.

MOST POPULAR SIZES AND MATERIALS

CAT. NO.	PATTERN	DIMENSIONS W	DIMENSIONS L
.062″ Glass Epoxy			
169P44-062	P	4.5 ″	17″
169P84-062	P	8.5 ″	17″
85G24WE	G	4.80″	17″
170H48WE	H	4.80″	17″
.062″ Epoxy Paper			
64A18EP	A	4.80″	17″
85F24EP	F	4.80″	17″
85G24EP	G	4.80″	17″
42G24EP	G	4.80″	8.51″
64P44-062EP	P	4.5 ″	6.5″
169P44-062EP	P	4.5 ″	17″
.062″ XXXP Phenolic			
64A18	A	4.80″	17″
42G24	G	4.80″	8.51″

CAT. NO.	PATTERN	DIMENSIONS W	DIMENSIONS L
.093″ XXXP Phenolic			
32AA18	A	4.80″	8.51″
64AA18	A	4.80″	17″
64AA32	A	8.5 ″	17″
.032″ Epoxy Glass			
59P19-032	P	2 ″	6 ″
169P59-032	P	6 ″	17″
126M76-032	M	4 ″	6.5″
.062″ Epoxy Paper Copper Clad, 2 Sides			
64P44-062EPC2	P	4.5 ″	6.5″
169P44-062EPC2	P	4.5 ″	17″
.062″ Epoxy Glass Copper Clad, 2 Sides			
85F42WEC2	F	8.5 ″	17″

VECTORBORD® AND PUSH-IN-TERMINALS



PATTERNS. G, K A, C, F, H, L, M, P

VECTORBORD® and MICRO-VECTORBORD® AVAILABILITY

HOLE SIZE	.025″		.042″		.062″					.093″		
HOLE SPACING	.05″x.05″	.05″x.1″*	.1″x.1″	.1″x.2″*	.1″x.1″	.1″x.2″	.2″x.2″	.188″x.188″	.141″x.141″	.265″x.265″	.2″x.2″	.25″x.25″
PATTERNS	M	K	P	Q	H	G	F	B	E	A	C	L
MATERIALS Epoxy Glass per Mil-P-18177 Type GEE Grade FR4	X	X	X	X	X	X	X		X	X		
Epoxy Paper per Mil-P-22324 Type PEE Grade EXXXP			X	X		X	X		X	X		X
XXXP Phenolic per Mil-P-3115						X	X	X		X	X	X
Epoxy Glass, Copper Clad, 1 side per Mil-P-13949 Type FL-GF	X		X	X		X	X					
Epoxy Glass, Copper Clad, 2 sides, per Mil-P-13949 Type FL-GF	X		X	X		X	X					
Epoxy Paper, Copper Clad, 1 side, per Mil-P-13949 Type PX			X				X					
Epoxy Paper, Copper Clad, 2 sides per Mil-P-13949, Type PX			X				X					
Mylar, per Mil-I-631	X											
THICKNESSES	.007″ .032″	.032″	.016″ .032″ .047″ .062″	.062″	.062″	.032″ .062″	.062″	.062″	.062″	.062″ .093″	.062″	.062″ .093″
PUSH-IN TERMINALS AVAILABLE	K27		T42-1, T44 K24A		T28, T28-1, T28S, T28S-1 K39A					T32A, T30N-2, T9.4, T9.6		

*Staggered pattern

VECTOR ELECTRONIC CO., INC., 12460 Gladstone Ave., Sylmar, Calif. 91342 Phone (213) 365-9661

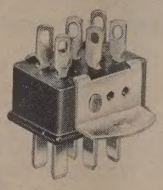
BEAUPLUG® Connectors / Plugs and Sockets

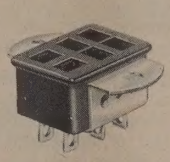
BEAUPLUG Series 3300

BEAUPLUG Series 3300 is interchangeable with Cinch-Jones 300 Series. Molded bakelite bases; cadmium plated contacts (gold, silver and rhodium available); polypropylene backshells (metal available); and bright plated hardware. UL rated at 250v at 10 amp.

Series 3300 Plugs and Sockets are available as: DB Deep Bracket Mounted; EB End Bracket; FHT Flared Hole Top; FHT-L Flared Hole Top Latch; FHT-K Flared Hole Top Keeper; CCE Cable Clamp End; CCT-L Cable Clamp Top Latch; CCT-K Cable Clamp Top Keeper.

Beauchaine Number	Contacts	List	Each 1-49	Each 50-99	Each 100-249	Each 250-499
PLUGS — ANGLE BRACKETS MOUNTED (-AB)						
P-3303-AB	3	$.38	$.228	$.19	$.152	$.144
P-3304-AB	4	.42	.252	.21	.168	.16
P-3306-AB	6	.51	.306	.255	.204	.194
P-3308-AB	8	.61	.366	.305	.244	.232
P-3310-AB	10	.69	.414	.345	.276	.262
P-3312-AB	12	.77	.462	.385	.308	.293
P-3315-AB	15	1.05	.63	.525	.42	.399
P-3318-AB	18	1.30	.78	.65	.52	.494
P-3321-AB	21	1.65	.99	.825	.66	.627
P-3324-AB	24	2.00	1.20	1.00	.80	.76
P-3327-AB	27	2.35	1.41	1.175	.94	.893
P-3330-AB	30	2.70	1.62	1.35	1.08	1.026
P-3333-AB	33	3.05	1.83	1.525	1.22	1.159
SOCKETS — ANGLE BRACKETS MOUNTED (-AB)						
S-3303-AB	3	$.40	$.24	$.20	$.16	$.152
S-3304-AB	4	.44	.264	.22	.176	.167
S-3306-AB	6	.55	.33	.275	.22	.209
S-3308-AB	8	.69	.414	.345	.276	.262
S-3310-AB	10	.82	.492	.41	.328	.312
S-3312-AB	12	.95	.57	.475	.38	.361
S-3315-AB	15	1.20	.72	.60	.48	.456
S-3318-AB	18	1.45	.87	.725	.58	.551
S-3321-AB	21	1.80	1.08	.90	.72	.684
S-3324-AB	24	2.15	1.29	1.075	.86	.817
S-3327-AB	27	2.50	1.50	1.25	1.00	.95
S-3330-AB	30	2.90	1.74	1.45	1.16	1.102
S-3333-AB	33	3.20	1.92	1.60	1.28	1.216
PLUGS — CABLE CLAMP TOP (-CCT)						
P-3303-CCT	3	$.75	$.45	$.375	$.30	$.285
P-3304-CCT	4	.83	.498	.415	.332	.315
P-3306-CCT	6	.92	.552	.46	.368	.35
P-3308-CCT	8	.99	.594	.495	.396	.376
P-3310-CCT	10	1.11	.666	.555	.444	.422
P-3312-CCT	12	1.22	.732	.61	.488	.464
P-3315-CCT	15	1.56	.936	.78	.624	.593
P-3318-CCT	18	1.83	1.098	.915	.732	.695
P-3321-CCT	21	2.20	1.32	1.10	.88	.836
P-3324-CCT	24	2.56	1.536	1.28	1.024	.973
P-3327-CCT	27	2.92	1.752	1.46	1.168	1.11
P-3330-CCT	30	3.36	2.016	1.68	1.344	1.277
P-3333-CCT	33	3.75	2.25	1.875	1.50	1.425
SOCKETS — CABLE CLAMP TOP (-CCT)						
S-3303-CCT	3	$.77	$.462	$.385	$.308	$.293
S-3304-CCT	4	.84	.504	.42	.336	.319
S-3306-CCT	6	.95	.57	.475	.38	.361
S-3308-CCT	8	1.11	.666	.555	.444	.422
S-3310-CCT	10	1.23	.738	.615	.492	.467
S-3312-CCT	12	1.42	.852	.71	.568	.54
S-3315-CCT	15	1.72	1.032	.86	.688	.654
S-3318-CCT	18	2.00	1.20	1.00	.80	.76
S-3321-CCT	21	2.30	1.38	1.15	.92	.874
S-3324-CCT	24	2.72	1.632	1.36	1.088	1.034
S-3327-CCT	27	3.06	1.836	1.53	1.224	1.163
S-3330-CCT	30	3.56	2.136	1.78	1.424	1.353
S-3333-CCT	33	3.83	2.298	1.915	1.532	1.455
PLUGS — SHALLOW BRACKETS MOUNTED (-SB)						
P-3315-SB	15	$1.38	$.828	$.69	$.552	$.524
P-3318-SB	18	1.70	1.02	.85	.68	.646
P-3321-SB	21	2.07	1.242	1.035	.828	.787
P-3324-SB	24	2.50	1.50	1.25	1.00	.95
P-3327-SB	27	2.80	1.68	1.40	1.12	1.064
P-3330-SB	30	3.20	1.92	1.60	1.28	1.216
P-3333-SB	33	3.55	2.13	1.775	1.42	1.349
SOCKETS — SHALLOW BRACKETS MOUNTED (-SB)						
S-3315-SB	15	$1.58	$.948	$.79	$.632	$.60
S-3318-SB	18	1.90	1.14	.95	.76	.722
S-3321-SB	21	2.25	1.35	1.125	.90	.855
S-3324-SB	24	2.67	1.602	1.335	1.068	1.015
S-3327-SB	27	3.00	1.80	1.50	1.20	1.14
S-3330-SB	30	3.40	2.04	1.70	1.36	1.292
S-3333-SB	33	3.75	2.25	1.875	1.50	1.425


P-3306-AB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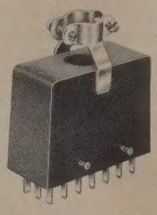
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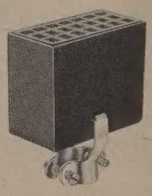
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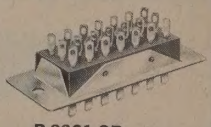
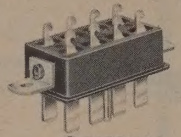

P-3321-SB

S-3321-SB

BEAUPLUG Series 5400

BEAUPLUG Series 5400 is interchangeable with Cinch-Jones 2400 Series. Rated at 250v at 15 amps. Molded bakelite bases; cadmium plated contacts (gold, silver and rhodium available); polypropylene backshells (metal available); and bright plated hardware.

Series 5400 Plugs and Sockets are also made as: DB Deep Bracket Mounted; LAB Less Angle Bracket; FHE Flared Hole End; CCE Cable Clamp End. UL and CSA listed.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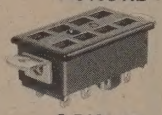
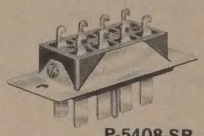
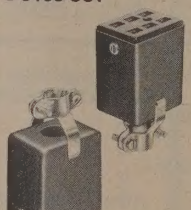

S-5408-AB

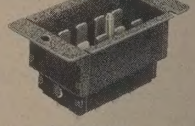

P-5408-SB

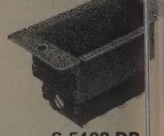
S-5408-SB

S-5406-CCT


P-5406-CCT

Beauchaine Number	Contacts	List	Each 1-49	Each 50-99	Each 100-249	Each 250-499
PLUGS — ANGLE BRACKETS MOUNTED (-A						
P-5404-AB	4	$1.12	$.672	$.56	$.448	$.4
P-5406-AB	6	1.27	.762	.635	.508	.4
P-5408-AB	8	1.45	.87	.725	.58	.5
P-5410-AB	10	1.76	1.056	.88	.704	.6
P-5412-AB	12	1.98	1.188	.99	.792	.7
SOCKETS — ANGLE BRACKETS MOUNTED (-						
S-5404-AB	4	$1.27	$.762	$.635	$.508	$.4
S-5406-AB	6	1.46	.876	.73	.584	.5
S-5408-AB	8	1.70	1.02	.85	.68	.6
S-5410-AB	10	1.90	1.14	.95	.76	.7
S-5412-AB	12	2.12	1.272	1.06	.848	.8
PLUGS — SHALLOW BRACKETS MOUNTED (-S						
P-5404-SB	4	$1.26	$.756	$.63	$.504	.4
P-5406-SB	6	1.47	.882	.735	.588	.5
P-5408-SB	8	1.60	.96	.80	.64	.6
P-5410-SB	10	1.93	1.158	.965	.772	.7
P-5412-SB	12	2.11	1.266	1.055	.844	.8
SOCKETS — SHALLOW BRACKETS MOUNTED (-						
S-5404-SB	4	$1.38	$.828	$.69	$.552	.5
S-5406-SB	6	1.61	.966	.805	.644	.6
S-5408-SB	8	1.87	1.122	.935	.748	.7
S-5410-SB	10	2.08	1.248	1.04	.832	.7
S-5412-SB	12	2.30	1.38	1.15	.92	.8
PLUGS — CABLE CLAMP TOP (-CCT)						
P-5404-CCT	4	$1.70	$1.02	$.85	$.68	.6
P-5406-CCT	6	1.93	1.158	.965	.772	.7
P-5408-CCT	8	2.04	1.224	1.02	.816	.7
P-5410-CCT	10	2.35	1.41	1.175	.94	.8
P-5412-CCT	12	2.59	1.554	1.295	1.036	.9
SOCKETS — CABLE CLAMP TOP (-CCT)						
S-5404-CCT	4	$1.87	$1.122	$.935	$.748	.7
S-5406-CCT	6	2.02	1.212	1.01	.808	.7
S-5408-CCT	8	2.28	1.368	1.14	.912	.8
S-5410-CCT	10	2.51	1.506	1.255	1.004	.9
S-5412-CCT	12	2.75	1.65	1.375	1.10	.9


P-5408-DB


S-5408-DB

BEAUCAP Octal Plug Caps

2001

Series 2001 octal type plug and socket caps e-place the metal caps with rubber grommets d fishpaper insulation. (Beau Products Divis n does not make the octal plugs and socke.) Type 2001-1 caps have no hole for cable; T e 2001-2 have cable hole in top; Type 2001-3 h e cable hole on side; Type 2001-4 have cable h e top with cable clamp. 4 NEMA colors: bla, blue, red, and green.

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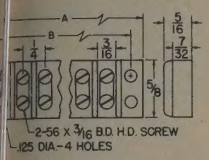
Beau Products Division
117 Union Avenue, Laconia, N.H. 03246
Tel: (603) 524-5101 TWX: 710-364-1843

BEAU® Barrier Terminal Strips and Terminal Blocks

Open Back Barrier Terminal Strips

S 10000 — 10 AMP

e #26 to #22. Stand screw /16" brass, nickel-plated.

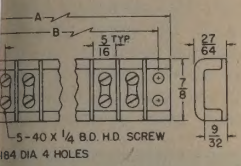


No. Circuits	A	B	No. Circuits	A	B
10001	3/4	1/2	10011	3 1/4	3
10002	1	3/4	10012	3 1/2	3 1/4
10003	1 1/4	1	10013	3 3/4	3 1/2
10004	1 1/2	1 1/4	10014	4	3 3/4
10005	1 3/4	1 1/2	10015	4 1/4	4
10006	2	1 3/4	10016	4 1/2	4 1/4
10007	2 1/4	2	10017	4 3/4	4 1/2
10008	2 1/2	2 1/4	10018	5	4 3/4
10009	2 3/4	2 1/2	10019	5 1/4	5
10010	3	2 3/4	10020	5 1/2	5 1/4

ed Back Barrier Terminal Strips

ES 15000 — 15 AMP

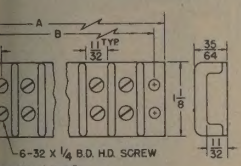
ize #22 to #16. Stand screw 1/4" brass, nickel-plated.



No. Circuits	A	B	No. Circuits	A	B
15001	1 1/32	3/4	15014	5 29/32	5 5/8
15002	1 13/32	1 1/8	15015	6 9/32	6
15003	1 25/32	1 1/2	15016	6 21/32	6 3/8
15004	2 5/32	1 7/8	15017	7 1/32	6 3/4
15005	2 17/32	2 1/4	15018	7 13/32	7 1/8
15006	2 29/32	2 5/8	15019	7 25/32	7 1/2
15007	3 9/32	3	15020	8 5/32	7 7/8
15008	3 21/32	3 3/8	15021	8 17/32	8 1/4
15009	4 1/32	3 3/4	15022	8 29/32	8 5/8
15010	4 13/32	4 1/8	15023	9 9/32	9
15011	4 25/32	4 1/2	15024	9 21/32	9 3/8
15012	5 5/32	4 7/8	15025	10 1/32	9 3/4
15013	5 17/32	5 1/4	15026	10 13/32	10 1/8

IES 19000 — 20 AMP

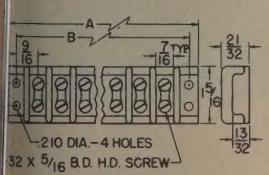
size #16 to #14. Stand screw x 1/4" brass, nickel-plated.



No. Circuits	A	B	No. Circuits	A	B
19001	1 3/16	7/8	19014	6 7/8	6 9/16
19002	1 5/8	1 5/16	19015	7 5/16	7
19003	2 1/16	1 3/4	19016	7 3/4	7 7/16
19004	2 1/2	2 3/16	19017	8 3/16	7 7/8
19005	2 15/16	2 5/8	19018	8 5/8	8 5/16
19006	3 3/8	3 1/16	19019	9 1/16	8 3/4
19007	3 13/16	3 1/2	19020	9 1/2	9 3/16
19008	4 1/4	3 15/16	19021	9 15/16	9 5/8
19009	4 11/16	4 3/8	19022	10 3/8	10 1/16
19010	5 1/8	4 13/16	19023	10 13/16	10 1/2
19011	5 9/16	5 1/4	19024	11 1/4	10 15/16
19012	6	5 11/16	19025	11 11/16	11 3/8
19013	6 7/16	6 1/8	19026	12 1/8	11 13/16

RIES 22000 — 30 AMP

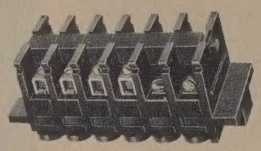
size #14 to #12. Stand screw x 5/16" brass, nickel-plated.



No. Circuits	A	B	No. Circuits	A	B
22001	1 17/32	1 1/8	22014	8 27/32	8 7/16
22002	2 3/32	1 11/16	22015	9 13/32	9
22003	2 21/32	2 1/4	22016	9 31/32	9 9/16
22004	3 7/32	2 13/16	22017	10 17/32	10 1/8
22005	3 25/32	3 3/8	22018	11 3/32	10 11/16
22006	4 11/32	3 15/16	22019	11 21/32	11 1/4
22007	4 29/32	4 1/2	22020	12 7/32	11 13/16
22008	5 15/32	5 1/16	22021	12 25/32	12 3/8
22009	6 1/32	5 5/8	22022	13 11/32	12 15/16
22010	6 13/32	6 3/16	22023	13 29/32	13 1/2
22011	7 5/32	6 3/4	22024	14 15/32	14 1/16
22012	7 23/32	7 3/16	22025	15 1/32	14 5/8
22013	8 9/32	7 7/8			

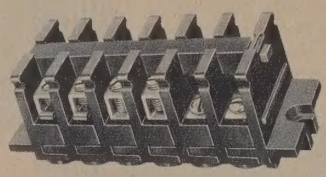
ADD-A-POINT Terminal Blocks

Medium Duty 600v, 5000 Series — Insulated moldings are of thermosetting phenolic material, Type CFG. Brass screw type connectors can be supplied with choice of box, pressure or screw type contacts. Pressure type features exclusive "Sure Grip" pressure pad design to insure against damage to the wire. **Series may be direct or channel mounted.**



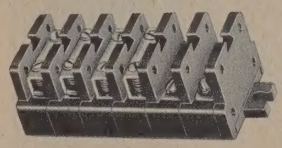
Model 5200

Heavy Duty 600v, 6000 Series — Material specification same as 5000 Series. Electrical specifications allow use of up to #4 wire with box type contacts. Available with either painted or plain marking surfaces.



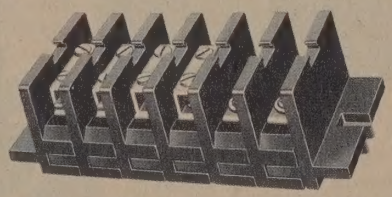
Model 6200

Miniature Medium Duty 600v, SM Series — Moldings are of thermosetting phenolic CFG material. Offering a low silhouette, these miniature blocks require less clearance than the conventional blocks. Available in box type, with or without pressure pad, or conventional screw contact. For service up to 40 amp.



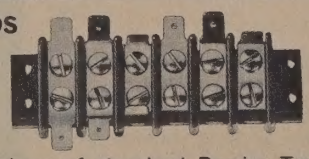
Model SM

Heavy Duty 600v, P Series — Molded with the same material as above models, this larger series is rated up to 60 amp service. Available with box, pressure type or screw contacts of pure electrolytic copper. Like other models, the P Series is available for channel or direct mounting.



Model P

FAST-TAB Barrier Terminal Strips



DIMENSIONS	DESCRIPTION	PART NO.	A	B	C	D	E	F	G
	TWO SIDED TAB	1410	1 3/8	.187	9/32	1/4	5/16	.136	—
	FLAT	1810	1 5/8	.250	5/16	5/16	27/64	.144	—
		2110	1 53/64	.250	13/32	5/16	1/2	.171	—
	TWO SIDED TAB	1411	1 3/16	.187	9/32	1/4	5/16	.136	11/16
	45° ANGLE	1811	1 27/64	.250	5/16	5/16	27/64	.144	53/64
		2111	1 19/64	.250	13/32	5/16	1/2	.171	1 1/32
	TWO SIDED TAB	1412	—	.187	9/32	1/4	5/16	.136	11/16
	90° ANGLE	1812	—	.250	5/16	5/16	27/64	.144	53/64
		2112	—	.250	13/32	5/16	1/2	.171	1 1/32
	ONE SIDED TAB	1413	15/16	.187	9/32	1/4	5/16	.136	—
Hole Dia.	FLAT	1813	1 5/32	.250	5/16	5/16	27/64	.144	—
		2113	1 3/8	.250	13/32	5/16	1/2	.171	—
	ONE SIDED TAB	1414	—	.187	9/32	1/4	5/16	.136	19/32
	45° ANGLE	1814	—	.250	5/16	5/16	27/64	.144	3/4
		2114	—	.250	13/32	5/16	1/2	.171	31/32
	ONE SIDED TAB	1415	—	.187	13/32	1/4	5/16	.136	19/32
	90° ANGLE	1815	—	.250	5/16	5/16	27/64	.144	3/4
		2115	—	.250	13/32	5/16	1/2	.171	31/32

Modified versions of standard Barrier Terminal Strips designed to save time and labor. 6 different terminal variations. Fastening can be made by riveting, eyeletting or with standard screws. All parts are of 1/32 brass, cadmium plated.

Vernitron Electrical Components
Beau Products Division
117 Union Avenue, Laconia, N.H. 03246
Tel: (603) 524-5101 TWX: 710-364-1843

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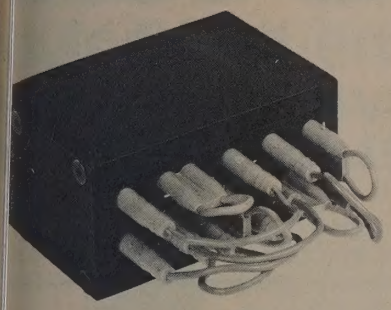
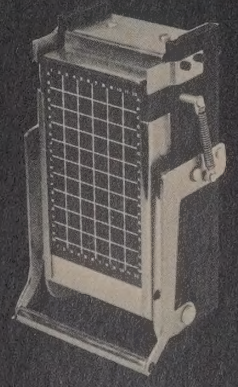
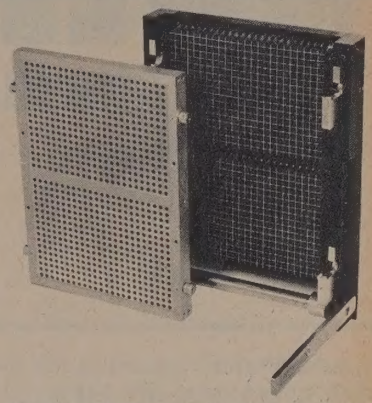
Patchboard Programming Systems and Accessories



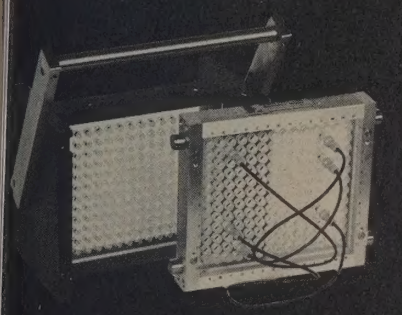
Fixed Systems —26 standard models ranging from 30 contact points to 7,188 combine reliability and economy to meet a wide variety of programming needs primarily in industrial controls and communications.



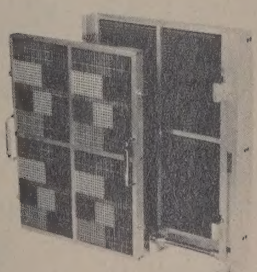
Lever Lock Systems —are most utilized by large computer manufacturers. A lever provides the necessary force to simultaneously mate up to 680 patchcord tips and paddle contacts. A smaller model offers 252.



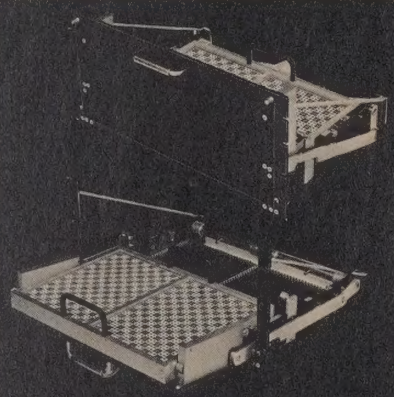
Shielded Systems —Each paddle contact is isolated with metal shielding. Crosstalk reduction is 92 db at 1000 cycles, 100 volts peak to peak. There are six models ranging from 360 to 4200 contacts.



True Thru-Shielded Systems —offer individual shielding, matched impedance, VSWR of 1.01 from 100 MHz to 500 MHz. These advanced programming systems can be manufactured to virtually any specifications.



Roll Cam Systems —offer greatest capability and reliability, large number of contacts (24 sizes from 48 to 5120 contacts). Camming action engages full patchboard gently and accurately, multiple wiping action optimizes connections.



Drawer Type Systems —a roll cam designed for horizontal mounting to save up to 50% in panel areas. Also provides R.F. shielding. Five standard sizes range from 480 to 1870 contacts. All fit 19"-wide racks.

Plating—Nickel or Gold
Board Material—Phenolic or Diallyl Phthalate
Contact Diameters—.093 and .053
Connections—Solder, wire wrap or Locktite
Finish—clear polish or black anodized
Silk Screen—Alpha/numeric grid or special designs
Patchcords—Manual or fixed; single tip to nine-prong tip; squids; splits; shunts.
All unconditionally guaranteed.
Tools—a variety of 27 tools for crimping, extraction, insertion, and paddle contacts.
Send for complete 40-page catalog today.

VPC

VIRGINIA PANEL CORPORATION
1400 NEW HOPE ROAD
WAYNESBORO, VIRGINIA 22980
(703) 942-8376

We have salesmen in 24 U.S. cities. Please refer to the proper section in this catalog for the one nearest you, or contact our factory in Waynesboro, Va.

Besides our 75 standard models of programming systems, some of which are described on this page, VPC also produces a wide variety of custom products.

We invite your inquiries and will appreciate your business.

Winchester

the standard connector line that solves

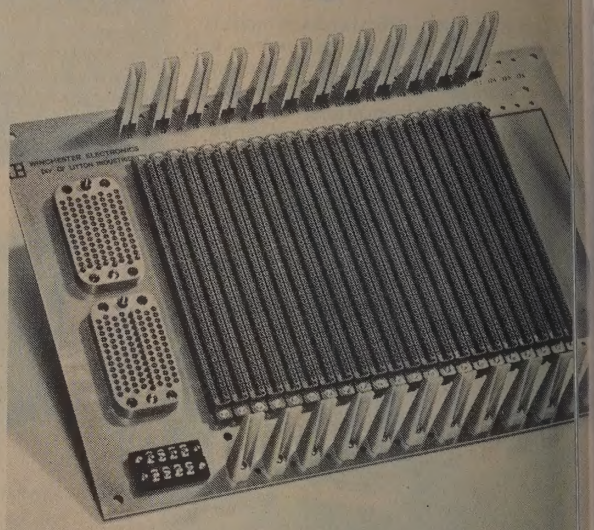
WINCHESTER ELECTRONICS
DIVISION OF LITTON INDUSTRIES
Main Street & Hillside Avenue
Oakville, Connecticut 06779 Phone (203) 274-88

ACCURFRAME®

The AccurFrame® system is the simple yet accurate positioning of precision molded Wire-Wrap connectors onto a metal frame. This technique offers substantial cost reduction, versatility of application and flexibility of design for automatic wire wrapping.

The heart of the AccurFrame packaging is our HW Series of Wire-Wrap printed circuit connectors. Designed for .062 printed circuit cards, the connectors are precision molded of diallyl phthalate with contact spacings of .100 x .200 inches or .125 x .250 inches. The contacts are bifurcated phosphor bronze with gold over nickel plating. The terminal posts are .025 inches square and have been designed to MIL-STD-1130. Post ends are flat within .020 inches of true position, and each post will accept up to three #30 AWG solid wires. Correct post alignment and retention is assured in the body of the connector by twisting the terminal a full 90 degrees.

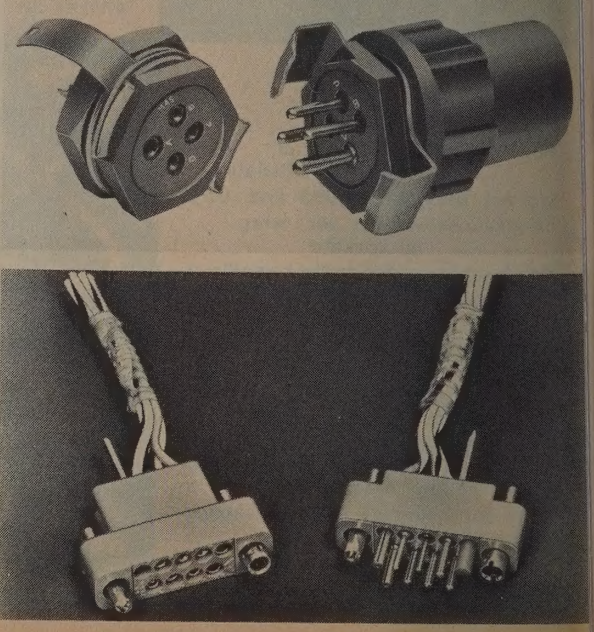
Standard AccurFrames are available for off-the-shelf delivery. Custom designs and configurations can be made to order.



RACK AND PANEL CONNECTORS

The following chart indicates our broad range of standard rack and panel connectors, available in a wide variety of dielectrics. Many were developed for and qualify under Mil-C 008384 and Mil-C 22857.

Type of Connector	Current Rating (range)	No. of Contacts (range)	Max. Wire Size (Stranded)	Protective Types	Termination Types*	Series
Miniature	7.5–13 amps	7–104	No. 16	Yes	S.D.	MRA, MRE, XMRA, XMRE, SA, QRE
Subminiature, Hi-Density	3–7.5 amps	4–104	No. 20	Yes	S.D.	SME, SRM, SRE, SREC/D, SLE
Microminiature	5 amps	32–74	No. 22	Yes	S.D.	SRD, 42
Environmental	7.5–13 amps	14–104	No. 16	Yes	S	EA, EE, CM/CRB
Hi-Voltage Circular	3–13 amps	1–12	No. 16	Yes	S	JF, JFA, M, PM, SM
Removable contact	5–13 amps	7–260	No. 13	Yes	S, S*, D, C, SH, W	MRAC, XAC, CAC, 40, NIM, SREC, SQC

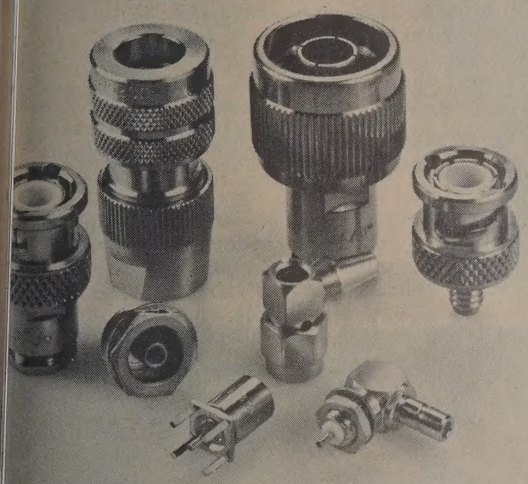


*Termination Types
S—Solder Cup
D—Dip Solder
C—Crimp Removable Contacts
SH—Shielded Contacts
S*—Solder Removable Contacts
W—Wire Wrap Terminations

Electronics

many non-standard problems.

RF CONNECTORS



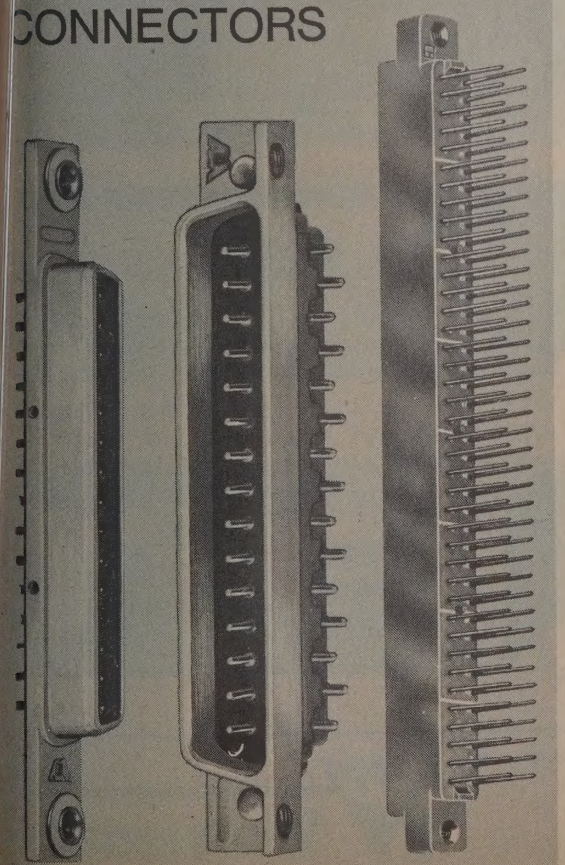
Winchester Electronics offers the complete line of Radiall coaxial connectors. These include standard BNC, TNC, Type N (Mil-C 39012), SMA, SMB, SMC, UG and miniatures (Mil-C 22557), as well as the proprietary miniQUICK and SUBLOCK Series of quick disconnect high performance connectors.

Winchester Electronics also offers full capability to design and produce special RF and High Voltage connectors to customer requirements.

The miniature and sub-miniature series is finished with a heavy gold plate. The standard series is plated with NSR, a patented nickel base finish providing better physical characteristics than standard nickel plating.

All connectors are machined to close tolerances, are rack plated, and provide superior electrical performance at competitive prices.

PRINTED CIRCUIT CONNECTORS



Type	Spacing	Circuit Board Thick.	Connectors Single or Double Sided	Class	Series	Number of Contacts	Termination
	.050	.031	Double	M/I	PCM	20/40 30/60 40/80 50/100	S
	.050	.031	Single	M/I	PCM	25	S
	.050	.062	Double	M/I	PCM	20/40 25/50 30/60 40/80 50/100	S
	.078	.062	Single	I	KM	14 21 31 37 44	S
	.100	.062	Double	M/I	HCD	25/50 30/60 36/72 48/96	D S
	.100	.062	Double	M/I	HW	20/40 22/40 25/50 30/60 32/64 36/72 43/86 48/96 50/100	W
	.125	.062	Double	M/I	HW	28/56 31/62 40/80 49/98 50/100	W
	.125	.062	Single	I	PQ	31	S, D, W, A
	.125	.062	Double	I	PQD	31/62	S, D, W, A
Card	.150	.062	Single	I	PBH	25	S, D, W, A
	.150	.062	Double	I	PBDH	25/50	S, D, W, A
Edge	.150	.062	Double	I	PJDH	25/50	S, D, W, A
	.156	.062	Single	C	8B	6 10 12 15 18 22 28 30	S, D, W, A
	.156	.062	Double	C	8BD	6/12 10/20 12/24 15/30 18/36 22/44 28/56 30/60	S, D, W, A
	.156	.062	Double	C	8BDJ	6/12 10/20 12/24 15/30 18/36 22/44 28/56 30/60	S, D, W, A
	.156	.062	Single	M	HB	6 15 18 22 28	D, S, W
	.156	.062	Single	I	HK	6 15 18 22 28	D, S, W
	.156	.062	Double	M	HBD	10/20 15/30 18/36 22/44 36/72 43/86	D, S, W
	.156	.062	Double	I	HKD	10/20 15/30 18/36 22/44 36/72 43/86	D, S, W
	.156	.062	Single	I	K	6 10 12 15 18 22	SC
	.156	.062	Single	I	KKM	6 10 12 15 18 22	S
Board Joiner	.100	to .187	—	M/I	WD	11 22	D
	.100	to .187	—	M/I	WD	11 22	Plug-D, FT Recpt-SC, D
Dip Solder	.100	to .250	—	M/I	WM	11 17 23 29 35	Plug-D Recpt-SC, D TT
	.100	to .250	—	I	42	50	D
	.156	to .250	—	M/I	W NAS 714 NAS 715	7 11 15 19 23	Plug, D Recpt-SC, D TT
Recpt.	.156	—	—	M/I	WC	23	C

CONTACT TERMINATION LEGEND

S—solder tab
W—wire wrap
D—dip solder
A—taper tube
C—crimp socket contact
SC—solder cup
TT—turret terminal
FT—feed-thru

CLASS DEFINITION

Class M—Designed to meet military requirements as to materials, plating and performance.
Class I—Same as Class M except for reduced plating.
Class C—Economical non-military applications.

See YELLOW SECTION for Local Offices, Phones

PLUGMOLD® MULTIOUTLET SYSTEMS FOR ELECTRONIC APPLICATIONS

Plugmold systems: the versatile, efficient way to organize electrical wiring and devices

To contain power wiring — along with a variety of outlets, switches, jacks, circuit breakers and other devices — use versatile Plugmold systems. Rugged, attractive Plugmold systems accommodate 14 to 2/0 AWG wire and accept a variety of electrical devices up to 60A, circuit breakers to 100A.

- With outlets and other devices placed where you need them, Plugmold adds efficiency and convenience wherever it is used.
- Made of steel, Plugmold protects wiring and keeps it accessible.
- A complete line of fittings makes it easy to apply Plugmold to almost any wiring situation.
- All Plugmold multioutlet assemblies and fittings are listed by Underwriters' Laboratories, Inc., and Canadian Standards Association.
- For engineering assistance, contact your nearest Wiremold representative — listed in the EEM yellow section.

Plugmold with prewired outlets

PLUGMOLD 2000 and 2200: Furnished completely prewired (No. 12 Type TW). Grounding outlets (15A, 125V) are spaced at regular intervals.

Outlet Spacing: 6, 9, 12, 18, 30, 60″ on centers.

Lengths: 1, 3, 5, 6′, and in Snapicoil® prewired harness up to 500′.

Circuit arrangements . . .

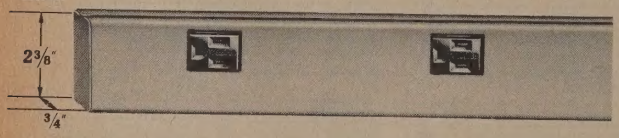
G Series: 2-wire, 1-circuit; Plugmold base serves as grounding conductor.

GA Series: 3-wire, 2-circuit; outlets wired alternately; Plugmold base serves as grounding conductor.

GB Series: 2-wire, 1-circuit; has insulated grounding conductor. (On special order, GB series available with insulated, isolated grounding conductor.)

2000

2200



Other Plugmold systems

Four types are furnished unwired. Outlets and othe devices may be spaced as desired.

PLUGMOLD 2100: For use with various receptacles mad by Wiremold (15A, 125V; 15A, 250V; 15A, 277V; and 20A 125V). Devices include 2- and 3-wire receptacles, Lumilin single receptacle, single-pole switch, and keyless socket Accepts wiring from 14 to 6 AWG. Devices can also b installed in 1-, 2-, and 3-gang Wiremold boxes as desired

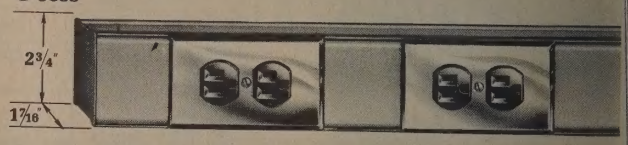
PLUGMOLD G-3000: For use with most outlets (up to 50A and devices designed for a 1-gang box. Accepts wiring from 14 to 2 AWG.

PLUGMOLD G-4000: Used with or without channel divide strip. With divider, one compartment holds power wiring (devices to 20A), the other carries low potential (communications, etc.) circuits. Without divider, the full channel accepts devices to 50A. Max. depth of devices, 1 5/8″. Accepts wiring from 14 to 2 AWG.

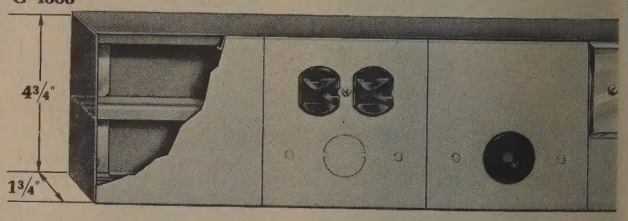
PLUGMOLD G-6000: For use with most outlets (up to 60A) and devices designed for a 1- or 2-gang box. Holds circuit breakers (to 100A). Accepts wiring from 14 to 2/0 AWG.

2100

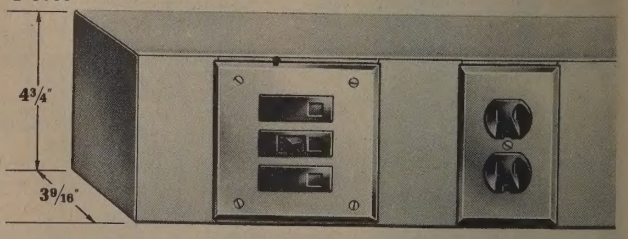
G-3000



G-4000



G-6000



SEND FOR WIREMOLD "ELECTRICAL PRODUCTS" CATALOG 685 AND SELECTION GUIDE

THE WIREMOLD COMPANY • HARTFORD, CONNECTICUT 06110

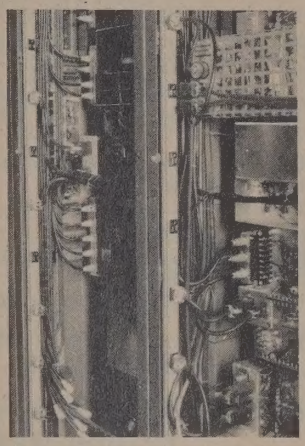
WIREMOLD®

PLUGMOLD® MULTIOUTLET SYSTEMS FOR ELECTRONIC APPLICATIONS

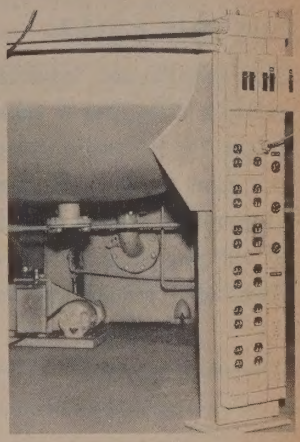
Typical uses of Plugmold

Original equipment: Plugmold adds value, convenience and efficiency to control consoles, cabinets, racks, benches, chassis, modular equipment, data processing equipment, trailers, shelters, etc.

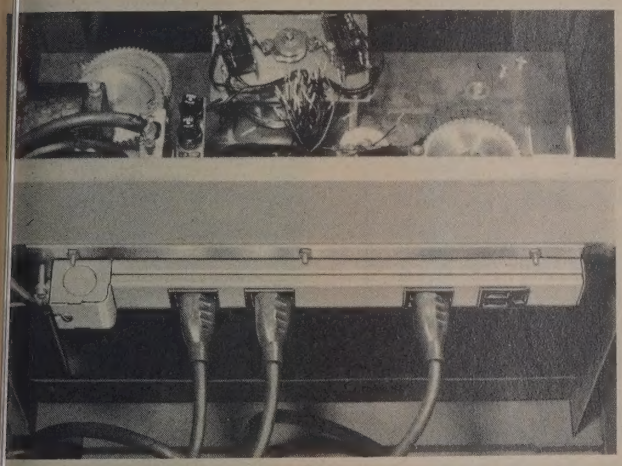
In laboratory and production areas: Use Plugmold on benches, over benches, on walls and partitions — wherever you need to put electricity to work.



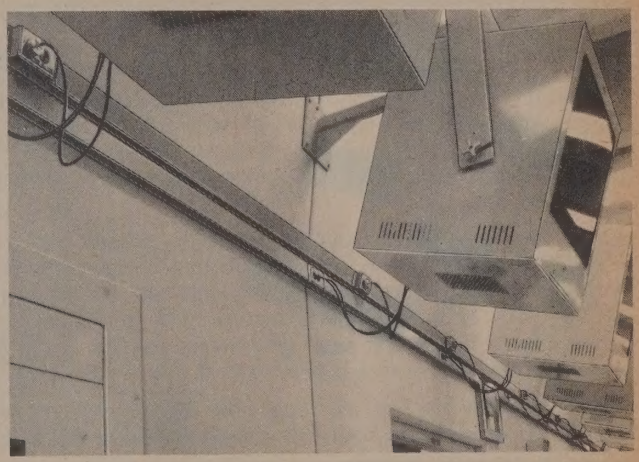
Strips of Plugmold in cabinets feed radio/TV transmitting equipment. *WTIC Broadcast House, Hartford, Conn.*



Rotary accelerator has Plugmold on leg to handle a variety of services. *G.E. Space Center, Valley Forge, Pennsylvania.*



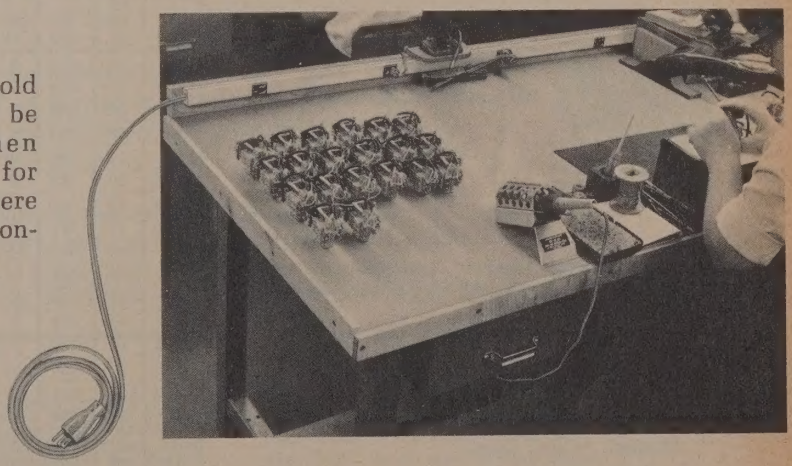
Central time transmitter in computer uses Plugmold to feed power to fan, clocks, etc. *Friden, Inc., Rochester, N.Y.*



Plugmold brings power wiring and antennae leads to closed-circuit TV monitors. *J. F. Kennedy Space Center.*

20CSK Cord Set Kit

The Cord Set Kit converts runs of Plugmold 2000 into portable power units that can be easily moved with work benches, then plugged in again at a new location. Ideal for laboratory and production situations where changing needs require frequent repositioning of benches.



WIREMOLD®

SOLD BY ELECTRICAL DISTRIBUTORS EVERYWHERE

ALLEN AVIONICS, INC.
255 EAST SECOND STREET • MINEOLA, NEW YORK 11501 • 516-747-5450

LUMPED CONSTANT DELAY LINES

CUSTOM-BUILT

Allen Avionics, Inc. manufactures a wide variety of delay lines to customers' specifications. The following specifications encompass areas in which we normally work. If, however, your requirements fall outside of the following parameters, we would still be interested in hearing from you.

RANGE — Delay times from 3 nanoseconds through audio ranges are available.

TIME DELAY/RISE TIME RATIO — Time delay to rise time ratio to 300/1.

CONSTRUCTION — Units are hermetically sealed in metal cans with glass to metal termir s. Epoxy encapsulated units are also available.

SIZE — Sizes are available from ⅝ x ⅝ x .450 inches.

TOLERANCE — Normal tolerance on time delay is 5%. In most cases tolerances of ½ can be held.

TEMPERATURE — Most of our lines are manufactured to 50 parts/million/degree C from mi s 55 degree C to 105 degree C.

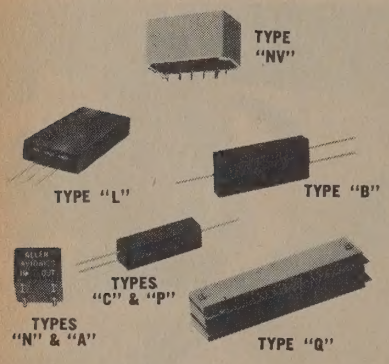
SALT SPRAY & HUMIDITY — No problem is encountered here due to the complete seal and e utilization of special paints.

SHOCK & VIBRATION — Units are foamed in hermetically sealed cans which enables them meet military specifications.

DELIVERY — Prototypes of special lines can often be delivered in a week or two.

Our engineering staff is always available to help with any delay line and application proble

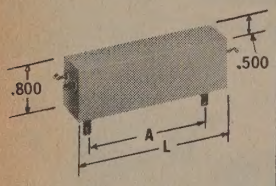
STOCKED DELAY LINES FROM 20 NANOSECONDS TO 1000 MICROSECONDS



TYPE	TIME DELAY	IMPED-ANCE	TIME DELAY TO RISE TIME RATIO	SIZE
N	20, 30, 40, 50, 60, 70, 80, 90, 100 ns.	100 Ω	3.5 to 1	⅝″ x ⅝″ x .450″
A	0.1, 0.2, 0.3, 0.4, 0.5 μs.	500 Ω	3.5 to 1	⅝″ x ⅝″ x .450″
	0.5, 0.6, 0.7, 0.8, 0.9, 1.0 μs.	1000 Ω		
C	.4, .5, .6, .7, .8, .9, 1.0, 1.1, 1.2 μs.	1000 Ω	5 to 1	6/10″ x ½″ x 2″
P	.2, .3, .4, .5, .6, .8, 1.0, 1.2, 1.6, 2.0 μs.	500 Ω	5 to 1	6/10″ x ½″ x 2″
Q*	.2, .3, .4, .5, .6, .8 μs.	100 Ω	5 to 1	1 5/16″ x 4.9″ x .550″
	.1, .2, .3, .4, .5, .6, .8,1.0, 2.0 μs.	500 Ω		
	.2, .3, .4, .5, .6, .8, 1 μs.	1000 Ω		
NV	10 to 100 ns. in 10 ns. steps	100 Ω	5 to 1	.675″ x 1.30″ x .735″
B	5, 10, 15 μs.	1000 Ω	5 to 1	½″ x 1⅜″ x 3⅛″
L	25, 75, 200, 250 μs.	250 Ω	5 to 1	2½″ x 4½″ x .8″
	50, 150, 400, 500 μs.	500 Ω		
	100, 300, 800, 1000 μs.	1000 Ω		

* Since the Quick Line is a tapped module consisting of 10 sections, the tap increment of any module can b determined by dividing the module time delay by 10. Modules of the same impedance can be put togethe in groups of 1, 2, 3 and 4 to achieve different time delay and rise time combinations.

STANDARD MINIATURE DELAY LINES



L Dim. Inches	A Dim. ±.005
1.5	1.140
2.0	1.640
2.5	2.140
3.0	2.640
3.5	3.140
4.0	3.640

All delay lines are 100% tested for delay time, rise time, attenuation, and impedance before and after potting, and again before shipment.

Construction: Hermetically sealed in metal case and potted in epoxy resin.
Mounting: 4/40 studs.
Terminals: 4 glass headers.
Finish: Military Gray.
D.C. working voltage: 300.
D.C test voltage: 600.
Temperature: from −55 to 105°C .005%/°C.
Impedance tolerance: ±10%

Td. (μs)	Td. Tol. %	Tr. (μs)	Att. %	Lgth. In.	Part No.
.1	10	.030	5	1.5	5XP1
.15	10	.045	5	1.5	5XP15
.16	10	.033	5	2	8XP16
.2	10	.059	5	1.5	5XP2
.2	10	.036	10	2.5	10XP2
.24	10	.049	5	2	8XP24
.24	10	.037	10	3	12XP24
.25	10	.074	5	1.5	5XP25
.3	5	.040	15	3.5	15XP3
.3	10	.053	10	2.5	10XP3
.3	10	.089	5	1.5	5XP3
.32	10	.066	5	2	8XP32
.35	10	.104	5	1.5	5XP35
.36	10	.056	10	3	12XP36
.36	5	.041	15	4	18XP36
.4	5	.043	15	4	20XP4
.4	10	.071	10	2.5	10XP4
.4	10	.082	5	2	8XP4
.4	10	.118	5	1.5	5XP4
.45	5	.059	15	3.5	15XP45
.48	10	.074	10	3	12XP48
.48	10	.098	5	2	8XP48
.5	10	.088	10	2.5	10XP5
.54	5	.061	15	4	18XP54

Td. (μs)	Td. Tol. %	Tr. (μs)	Att. %	Lgth. In.	Part No.
.56	10	.115	5	2	8XP56
.6	5	.064	15	4	20XP6
.6	5	.078	15	3.5	15XP6
.6	10	.093	10	3	12XP6
.6	10	.106	10	2.5	10XP6
.64	10	.131	5	2	8XP64
.7	10	.123	10	2.5	10XP7
.72	5	.081	15	4	18XP72
.72	10	.111	10	3	12XP72
.75	5	.098	15	3.5	15XP75
.80	5	.085	15	4	20XP8
.80	10	.141	10	2.5	10XP8
.84	10	.130	10	3	12XP84
.9	5	.117	15	3.5	15XP9
.9	5	.101	15	4	18XP9
.96	10	.148	10	3	12XP96
1.00	5	.106	15	4	20X1
1.05	5	.137	15	3.5	15X1P05
1.08	5	.121	15	4	18X1P08
1.2	5	.127	15	4	20X1P2
1.26	5	.141	15	4	18X1P26
1.4	5	.148	15	4	20X1P4
1.44	5	.161	15	4	18X1P44
1.6	5	.169	15	4	20X1P6

100, 500 & 1,000 ohm impedance.

ALLEN AVIONICS, INC.
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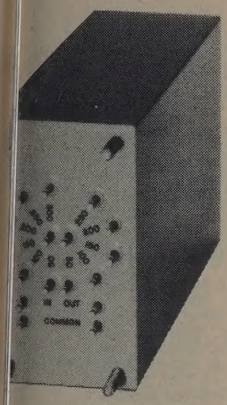
T LINE EQUALIZER



TYPE AV-535

THE ALLEN AVIONIC'S AV-535 EQUALIZER IS DESIGNED TO COMPENSATE FOR LOSSES IN RG-11/U (75 OHM) CABLE AND ITS EQUIVALENTS. THE UNIT IS CAPABLE OF EQUALIZING 50 TO 300 FEET IN 50 FOOT INCREMENTS.

Terminals on mounting surface are so arranged to provide for simplified strapping for compensation of different cable lengths. All units are foamed and hermetically sealed in steel cans.

IMPEDANCE: 75 ohms ±2 ohms to 8 megs.

ATTENUATION OF CABLE PLUS EQUALIZER: 3 db.

Attenuation of equalizer alone is as shown in the following table:

Feet	0.1 mc	2 mc	4 mc	8 mc
50	2.97 db	2.86 db	2.79 db	2.67 db
100	2.93	2.68	2.53	2.27
150	2.90	2.51	2.28	1.88
200	2.86	2.35	2.03	1.52
250	2.82	2.19	1.82	1.21
300	2.78	2.02	1.58	0.86

TOLERANCE: ±.07 db.

SIZE: 2 x 3½ x 5 inches (not including mounting stud length).

MOUNTING CENTERS: 1½ x 3 inches.

STUD SIZE: 8/32 x 1/2 inch long.

ULSE & VIDEO DELAY LINE

TYPE AV-397

These delay lines are designed to be used with any 75 ohm system for either pulse or video delay. Although intended primarily for equalizing the delays in various lengths of coaxial cable, the line can be used wherever any delay from .025 μs. to 2.075 μs. is needed. The delay is changed by adding individual lines of various delays to give the desired total delay.

Each type AV-397 delay line consists of seven individual delay lines each having its own input and output terminals. Each of these seven lines may be used individually or collectively. By connecting the output of one to the input of another, 83 different time delays are available in .025 μs. steps from .025 μs. to 2.075 μs. The delay of each individual line is marked between its input and output terminals. The total time delay is the sum of the delays of the individual lines that are connected.

Distortion with a normal TV type pulse is well under 2% and not normally visable. Using the full delay of 2.075 μs., the response to video is down by 3 db at 5 megacycles.

MAXIMUM DELAY: 2.075 microseconds ±3% variable in .025 microsecond steps from .025 microseconds to 2.075 microseconds.

TIME DELAY OF INDIVIDUAL LINES: 1, .5, .2, .2, .1, .05, .025 microseconds.

RISE TIME FOR ENTIRE LINE: .06 microseconds maximum.

FREQUENCY RESPONSE: 3 db down at 5 megacycles for 2.075 microseconds delay.

DISTORTION: 2% maximum with .2 microsecond input pulse.

IMPEDANCE: 75 ohms ±5%.

DC WORKING VOLTS: 300.

TEMPERATURE COEFFICIENT: 50 parts/million/C° from −55°C to 105°C.

ATTENUATION: 7% maximum for 2.075 microsecond delay.

MECHANICAL: Hermetically sealed in a steel can 2" x 2½" x 5½", painted gray with black identification markings, and using 10/32 x ½ inch studs spaced on 1½" x 2" centers for mounting.

VARIABLE DELAY LINE — MODEL 75-2

Model 75-2 consists of seven delay lines each having its own switch. The time delay is changed by switching one or more individual lines in series. The delayed output is always the summation of individual delay lines and not the result of a tapped line. This feature is an important factor in eliminating undesirable reflections in the output pulse. The passive networks are capable of any of 83 different time delays ranging from .025 microseconds to 2.075 microseconds in .025 microsecond increments. The delay line finds general use in the laboratory in such applications as delaying the sync on sampling scopes so that the output of delay lines may be observed. Two RG11/U connectors serve as the input and output.

Time Delay: From .025 to 2.075 μs. in .025 μs. increments.
Delay Tolerance @ Maximum Setting: 3%.
Time Delay of Individual Lines: .025, .05, .1, .2, .2, .5, 1 μs.
Rise Time: .06 μs. max. @ max. delay.
Impedance: 75 ohms.
Attenuation: 7% maximum.
Distortion: 2% max. with .2 μs. input pulse.
D.C.W.V.: 300
Size: 7" x 8" x 8"

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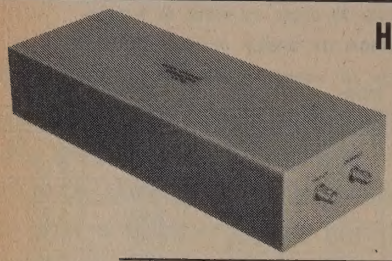
LUMPED CONSTANT DELAY LINES



HIGHEST $\frac{\text{TIME DELAY}}{\text{RISE TIME}}$ RATIO EVER BUILT!

These Delay Lines have the highest ratio of time delay to rise time that has ever been built in a Lumped Constant Line. Unlike other types of high ratio lines, the Lumped Constant Delay Line has a passband from D.C. to its cutoff frequency and maintains a constant delay over these frequencies. These lines are also unique in that they offer relatively low insertion loss.

This group of lines is characterized by ti time delay tolerances, low pulse distortion, cellent phase linearity and good temperat stability.

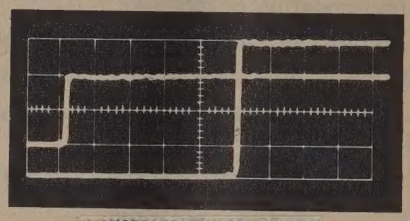
For laboratory use, any time delays from microseconds to 100 microseconds can be bu into variable decade instruments with ratios over 100/1. These units could have a reso tion of up to 1/5000 of the total delay.

Series "HF" HIGH FREQUENCY

The HF Series in most cases will serve as more than adequate electrical replacement for coaxial cable. The inconvenience of handling and storing cable will thus be eliminated. Standard impedances of 50 and 75 ohms are available. Units are normally supplied with BNC connectors. Tapped lines and time delays other than those shown below can be supplied.

Time Delay Microseconds	Rise Time Microseconds Maximum	Bandwidth (3 db) Megacycles
50/1 RATIO ATTENUATION 9 db MAXIMUM SIZE: 2½" x 4½" x 12"		
.5	.010	36.0
.6	.012	30.0
.7	.014	25.7
.8	.016	22.5
.9	.018	20.0
1.0	.020	18.0
1.25	.025	14.4
1.5	.030	12.0
1.75	.035	10.3
2.0	.040	9.0
2.5	.050	7.2
3.0	.060	6
3.5	.070	5.15
4.0	.080	4.5
4.5	.090	4.0
4.75	.095	3.8
75/1 RATIO ATTENUATION 12 db MAXIMUM SIZE: 3½" x 4½" x 12"		
1.5	.020	18
1.75	.023	15.4
2.0	.027	13.5
2.25	.030	12.0
2.50	.033	10.8
2.75	.037	9.8
3.0	.040	9.0
3.25	.043	8.3
3.50	.047	7.7
3.75	.050	7.2
4.0	.053	6.75
4.25	.057	6.35
4.50	.060	6.0
4.75	.063	5.7
100/1 RATIO ATTENUATION 15 db MAXIMUM SIZE: 3½" x 6½" x 16"		
2.0	.020	18
2.25	.023	16
2.5	.025	14.4
2.75	.028	13
3.0	.030	12
3.25	.033	11.1
3.5	.035	10.3
3.75	.038	9.6
4.0	.040	9
4.25	.043	8.48
4.5	.045	8
4.75	.048	7.58

Series "HR"



1 MICROSECOND PER DIVISION
(5 Microseconds Delay — .05 Microsecond Rise Time)

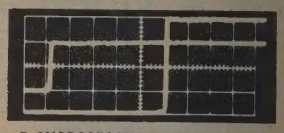
Time Delay Micro-seconds	Rise Time Micro-seconds	Bandwidth (3 db) Megacycles	Imped-ance Ohms
100/1 RATIO ATTENUATION 8 db MAXIMUM SIZE: 2½" x 4½" x 12"			
5	.05	7.2	50-100
6	.06	6.0	50-100
7	.07	5.15	50-100
8	.08	4.5	50-100
9	.09	4	50-100
10	.1	3.6	50-100
15	.15	2.4	50
20	.20	1.8	50
25	.25	1.44	50
30	.3	1.2	50
35	.35	1.03	50
40	.40	.9	50
45	.45	.8	50
50	.50	.72	50
130/1 RATIO ATTENUATION 9 db MAXIMUM SIZE: 3½" x 4½" x 12"			
5	.039	9.36	50
10	.077	4.68	50-100
15	.116	3.11	50-100
20	.154	2.34	50
25	.193	1.86	50
30	.232	1.55	50
35	.271	1.33	50
40	.308	1.17	50
45	.348	1.035	50
50	.387	.930	50
60	.462	.780	50
75	.580	.620	50
90	.693	.520	250
100	.770	.468	250

Series "VHR"

The "VHR" Series have a characteristic impe ance of 50 ohms. While the units listed a standards, we can manufacture the "VHR" Lin to your exact delay specifications.

These units are hermetically sealed in a me can 3½ x 6½ x 16 inches, with four ¼ x studs on the 6½ x 16 inch surface.

Two BNC connectors are located on the 3½ 6½ inch surface for input and output connection Variable Decade Delay Units can be manufactur for laboratory use from the "VHR" Lines.



5 MICROSECONDS PER DIVISION
(25 Microseconds Delay—.1 Microsecond Rise Tim

Time Delay Microseconds	Rise Time Microseconds
150/1 RATIO ATTENUATION 16 db MAXIMUM SIZE: 3½" x 6½" x 16"	
10	.067
15	.100
20	.133
25	.167
30	.200
35	.233
40	.267
45	.300
50	.333
55	.367
60	.400
63	.420
65	.433
70	.467
200/1 RATIO ATTENUATION 18 db MAXIMUM	
10	.050
15	.075
20	.100
25	.125
30	.150
35	.175
40	.200
45	.225
50	.250
55	.275
60	.300
63	.315
65	.325
70	.350
75	.375
250/1 RATIO ATTENUATION 20 db MAXIMUM	
20	.080
25	.100
30	.120
35	.140
40	.160
45	.180
50	.200
60	.240
63	.252
65	.260
70	.280
80	.320
90	.360
100	.400

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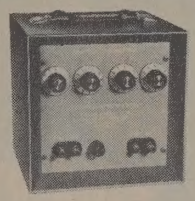
LUMPED CONSTANT DECADE DELAY LINES

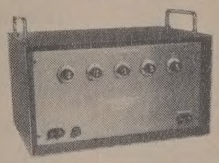
TYPE "D"

Type "D" Variable Decade Delay Units are engineered to provide variable time delays with absolute stability for accurate triggering and excellent reproduction of the input pulse. These lumped constant delay lines are completely passive. All models have a minimum of 1000 to 1 resolution and consist of three or more decade switches. Any delay output of Type "D" decade delay unit is the summation of individual lines. It is not the result of a tapped line. This feature is an important factor in eliminating undesirable reflections in the output pulse. Accuracy at any delay exceeding 1% of the unit's total delay is within 3%. These units have a characteristic impedance of 500 ohms in and out. While the units listed are standard, other delays and impedances can be manufactured to specifications.



Cabinet Size: 8" wide x 8" high x 7" deep

Cabinet Size: 14" wide x 8" high x 10" deep



Cabinet Size: 17" wide x 9½" high x 11½" deep

Part No.	Maximum Time Delay In Microseconds	Resolution In Microseconds	Rise Time @ Max. Delay In Microseconds	Attenuation in db
D11	11.1	.01	.45	3
D21	21.1	.01	.85	5
D41	41.1	.01	1.65	5
DD41	41.1	.01	.83	5
D61	61.1	.01	2.45	6
DD61	61.1	.01	1.23	6
D1C	111.1	.01	4.45	3
DD1C	111.1	.01	2.23	8
D2C	211.1	.01	8.45	3
DD2C	211.1	.01	4.23	3
D4C	411.1	.01	16.45	3
DD4C	411.1	.01	8.23	6
D6C	611.1	.01	24.45	3
DD6C	611.1	.01	12.23	6
D1K	1111.1	.01	40.45	3
DD1K	1111.1	.01	20.23	8
D2K	2111	.1	84.5	5
D4K	4111	.1	164.5	6
D6K	6111	.1	244.5	8
D11K	11,111	.1	444.5	11
D21K	21,111	1	844.5	11
DD2K	2111	.1	42.25	5
DD4K	4111	.1	82.25	6
DD6K	6111	.1	122.25	8
DD11K	11,111	.1	222.25	11
DD21K	21,111	1	422.25	11
DD41K	41,111	1	822.25	12
DD61K	61,111	1	1222.25	12

DELAY LINE SYNTHESIZERS

Primary use is to experimentally determine the exact requirements of a delay line in order to avoid over-specifying. A safety factor of 50%, caused by not knowing the exact required rise time, results in approximately 280% increase in cost, size and weight. In addition, the added components reduce the reliability to ⅓ of the original.

The delay output of the Synthesizer is the summation of individual lines. It is not the result of a tapped line. This feature is an important factor in eliminating undesirable reflections in the output pulse.

The rise time control filter (Fig. 1) is especially designed to give a flat response to a pulse input with the only effect being a change in rise time. The filter may be used alone in any other application where is it desired to slow the rise time of a pulse by a known amount while still maintaining symmetrical wave form without ringing.

When a line with almost no ripple or distortion is required, the rise time control may be used with only a slight decrease in rise time to obtain the pulse pictured in Fig. 2.

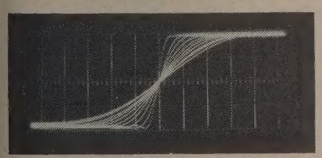


FIG. 1
Output of rise time control

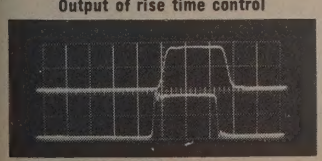


FIG. 2
Effect of rise time control on distortion

Model 73-11

The Model 73-11 Synthesizer can be used in any breadboard circuit where a time delay of up to 11 microseconds is required. The 50 ohm input allows for direct impedance match to the output of most pulse generators.

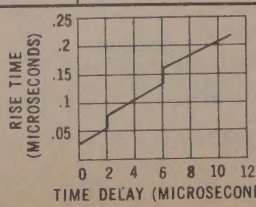
The basic delay line finds general use in the lab in such applications as delaying the sync on sampling scopes so that the output of delay lines may be observed, or in any application where the internal delay of the scope is not sufficient.

The filter may be used alone to control the rise time of pulse generators which are too fast for the application at hand.

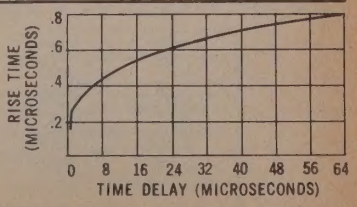
Model 500-63

The Model 500-63 Synthesizer can be used in any breadboard circuit where a time delay up to 63.5 microseconds is required. The 500 ohm input allows for direct impedance match to transistor circuits.

Time Delay:	From .025 microseconds to 11.075 microseconds in .025 microsecond increments.	From .5 microseconds to 63.5 microseconds in .5 microsecond increments.
Rise Time of Delay Lines:	@ maximum delay: .22 μs. See graph.	@ maximum delay: .8 μs. See graph.
Impedance:	50 or 73 ohm input or output — switch controlled.	500 ohms
Rise Time Control:	Rise time 0.01 microseconds to 1.1 microseconds in .01 microsecond increments.	Rise time .1 microseconds to 11 microseconds in .1 microsecond increments.
Rise Time Control Tolerance:	5%	10%



Rise time at different delays for basic delay line.



Independent control of time delay and rise time is available to experimentally determine required time delay and rise time for minimum size, weight, cost and for maximum reliability.

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SPIRADEL®*

THE MOST COMPACT

Highest Time Delay to Rise Time Ratio

DISTRIBUTED DELAY LINE

STANDARD HEIGHT OF ALL UNITS: 7/16"

Impedance (Ohms)	Time Delay (Nano-seconds)	Rise Time (Nano-seconds) Maximum	Delay to Rise Time Ratio Minimum	Band-width Minimum (MC)	Attenu-ation Maximum (%)	Diameter Inches
	20	5	4/1	70	10	1.2
	30	6.5	4.62/1	53.8	10	1.2
	40	7.5	5.33/1	46.7	10	1.2
	50	7.7	6.5/1	45.5	10	1.2
150	60	7.9	7.6/1	44.3	10	1.6
	70	8	8.75/1	40	10	1.6
	80	8.2	9.75/1	35.9	15	1.6
	90	8.5	10.6/1	33	15	1.6
	100	9	11.1/1	31.5	15	1.6
	100	12	8.3/1	29.2	15	1.2
	150	14	10.7/1	25.0	15	1.2
	200	17	11.7/1	20.6	15	1.2
	250	19	13.1/1	18.4	20	1.6
	300	21	14.3/1	16.7	20	1.6
	350	23	15.2/1	15.3	20	1.6
	400	24	16.7/1	14.6	25	1.6
	450	26	17.3/1	13.5	25	2.5
325	500	28	17.8/1	12.5	25	2.5
	550	29	18.9/1	12.1	25	2.5
	600	31	19.4/1	11.3	25	2.5
	650	33	19.7/1	10.6	25	2.5
	700	34	20.6/1	10.3	30	2.5
	750	35	21.4/1	10.0	30	2.5
	800	37	21.6/1	9.5	30	2.5
	850	39	21.8/1	9.0	30	2.5
	900	41	22.0/1	8.5	30	2.5
	950	43	22.1/1	8.1	30	2.5
	1000	45	22.2/1	7.8	30	2.5
	1000	70	14.3/1	5	20	2.5
	1500	85	17.6/1	4.11	25	2.5
	2000	100	20/1	3.5	25	2.5
	2500	115	21.7/1	3.04	35	2.5
	3000	125	24/1	2.8	40	3.25
600	3500	140	25/1	2.5	40	3.25
	4000	150	26.7/1	2.34	50	3.25
	4500	165	27.3/1	2.12	50	3.25
	5000	170	29.4/1	2.06	50	3.75
	5500	185	29.7/1	1.89	60	3.75
	6000	200	30/1	1.75	60	3.75

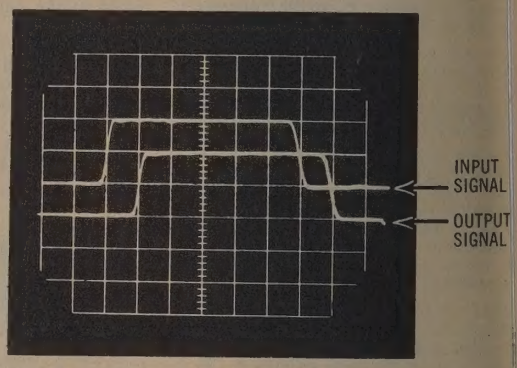
TO ORDER STANDARD UNIT SPECIFY SPIRADEL, TIME DELAY & IMPEDANCE

FOR IMMEDIATE DELIVERY!

SPIRADEL is a small diameter, distributed constant fixed delay line, featuring higher delay to rise time ratio and excellent pulse fidelity. Its new shape offers greater package design versatility than most other delay lines available, and the entire unit is encapsulated for maximum environmental protection.

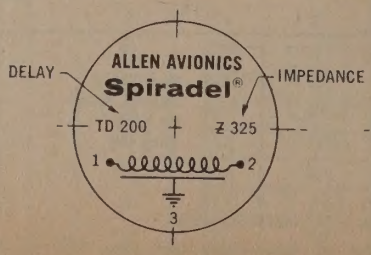
The SPIRADEL line covers a delay range of 20 to 6000 nanoseconds. Any delay within this range may be selected. Time delay to rise time ratios range up to 30 to 1. Any impedance from 150 to 600 ohms is available. Standard delay tolerance is 5%, although tighter tolerances can be held.

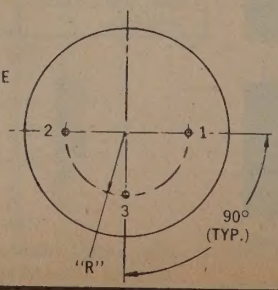
SPIRADEL units are designed for operation from −55°C up to +105°C. Bandwidth is from DC to the frequency f = .35/rise time.

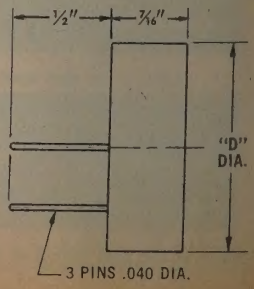


Actual oscilloscope presentation photo of input and output pulses of 100 ns. Spiradel, illustrating excellent pulse fidelity.

"D"	"R"
1.2"	.400"
1.6"	.600"
2.5"	1.050"
3.25"	1.425"
3.75"	1.675"







*Patented and patents applied for.

See YELLOW SECTION for Local Offices, Phones

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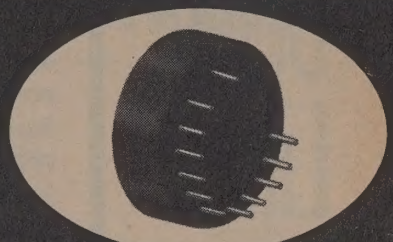
NEW! "TAPPED" SPIRADEL®

THE MOST COMPACT DISTRIBUTED DELAY LINE



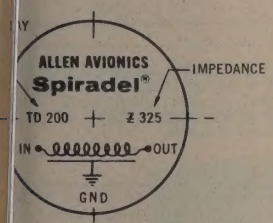
FEATURING EXCELLENT PULSE FIDELITY AT ALL 10 DELAYS

HIGHEST TIME DELAY TO RISE TIME RATIOS FOR COMPARATIVE SIZE AT LOWEST COST!

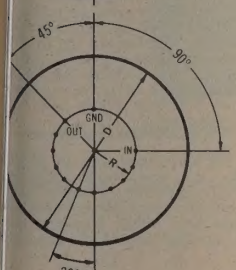
EXCEPTIONALLY FINE PHASE LINEARITY OVER WIDE FREQUENCY RANGE

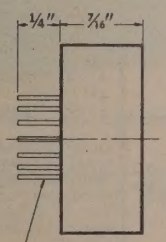
"Tapped" Spiradels are available in 150 and 325 ohm Lines in range of delays from 20 to 1000 nanoseconds. While delays in table are standard, any delay within this range can be built. Total delay tolerance is ±5%. Tap delay shall be multiples of 10% of total delay ±5% or 2 nanoseconds, whichever is greater.

Spiradel units are designed for operation from −55°C up to +85°C. Bandwidth is from DC to the frequency f = .35/rise time.



"D"	"R"
1.6"	.600"
2.0"	.800"
2.5"	1.050"
3.25"	1.425"





STANDARD HEIGHT OF ALL UNITS: 7/16"

Impedance (Ohms)	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Delay to Rise Time Ratio Minimum	Bandwidth Minimum (MC)	Attenuation Maximum (%)	Diameter Inches
150	20	7	2.86/1	50	10	1.6
	30	8.5	3.53/1	41.1	10	1.6
	40	9.5	4.2/1	36.8	10	1.6
	50	9.7	5.15/1	36	10	1.6
	60	9.9	6.05/1	35.3	10	2.0
	70	10.0	7/1	35	10	2.0
	80	10.2	7.84/1	34.3	15	2.0
	90	10.5	8.55/1	33.3	15	2.0
	100	11	9.1/1	31.8	15	2.0
325	100	14	6.75/1	25	15	1.6
	150	16	9.36/1	21.8	15	1.6
	200	19	10.5/1	18.4	15	1.6
	250	21	11.9/1	16.6	20	2.0
	300	23	13/1	15.2	20	2.0
	350	25	14/1	14	20	2.0
	400	26	15.3/1	13.4	25	2.0
	450	28	16.1/1	12.5	25	2.5
	500	30	16.6/1	11.6	25	2.5
	550	31	17.7/1	11.3	25	3.25
	600	33	18.1/1	10.6	25	3.25
	650	35	18.5/1	10	25	3.25
	700	36	19.4/1	9.7	30	3.25
	750	37	20.2/1	9.4	30	3.25
	800	39	20.5/1	9.2	30	3.25
	850	41	20.7/1	8.5	30	3.25
	900	43	20.9/1	8.1	30	3.25
	950	45	21.1/1	7.8	30	3.25
	1000	47	21.3/1	7.4	30	3.25

TAP DELAY VALUES ARE MULTIPLES OF 10% OF ABOVE DELAYS
TO ORDER STANDARD UNIT SPECIFY TAPPED SPIRADEL, TOTAL TIME DELAY & IMPEDANCE

SERIES "S" & "LV" SWITCH VARIABLE LUMPED CONSTANT DELAY LINES

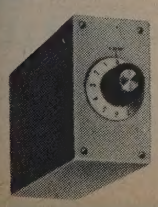
These units are composed of 4 individual delay lines having a common ground. The switch is so arranged that (except for position one which is no time delay) it connects one or more of the delay lines in series across the input and output terminals. Therefore, the delayed output is always the summation of individual delay lines and not the result of a tapped line. This feature is an important factor in eliminating undesirable reflections in the output pulse.

All units in this series can have their time delays varied to any multiple of 1/10 of the total delay.

Units are supplied in gray steel cans, 2 x 3½ x 5 inches. Four 8/32 inserts and four terminals (1 input, 1 output and 2 grounds) are on the 2 x 3½ inch surface. The switch knob is located on the opposite surface.

Distortion with .02 μsec. input: 10% maximum.

All units have variable time delays in any multiple of 1/10 of the total delay.



	Impedance	Time Delay @ Maximum Setting (microseconds)	Maximum Attenuation	Notes
S Series	75 ohms	.3, .6, .9, 1.2	5%	Time delay to rise time ratio at maximum delay: 10 to 1 minimum. D.C.W.V.: 300.
	500 ohms	.6, .9, 1.2, 1.8, 2.4, 3, 4.5, 6.0	10%	
LV Series	250 ohms	200	50%	Time delay to rise time ratio at maximum delay: 5 to 1 minimum. D.C.W.V.: 100
	500 ohms	400, 500		
	1000 ohms	100, 300, 1000		

Delay Lines

Andersen designs and develops many more different types of delay devices (including optical and microwave) than any other concern.

Andersen is the only firm producing delay devices for the entire range of frequencies.

Andersen is the sole major manufacturer of delay devices specializing in signal processing systems.

Andersen supplies a substantially greater volume of delay equipment than any other source.

	TYPICAL APPLICATIONS	RANGE OF PARAMETER	NEWEST DEVELOPMENTS and UNIQUE CHARACTERISTICS
AUDIO	Sonar, voice equalization, ASW sensors.	1 usec to 1 sec delay, balance or unbal anced. Typical delay-bandwidth products up to 40. Impedances from 100 to 1000 ohms.	Delay-BW products up to 60 or more fixed lines, and 15 or more for electrica variable lines. Extremely low attenuati for delay-BW of 40 max, e.g. 0.001 db p usec max. For higher delay-BW 0.01 per usec max. Extremely low frequen ripple, better than 1%. Phase respon and group delay to better than 1% at 3 response.
VIDEO	Radar-sonar signal processing, comb filters, correlation, cancelling, television broadcast, delay equalization, field storage, signal sycnchronization.	Lumped constant lines with delay-BW products of 40 to 60, delays from 1 nsec to milliseconds. Quartz lines with CF to 150 Mhz and delays to 4000 msec. Electrically variable delays of 0.1-100 usec with delay-BW product of 15.	High fidelity storage of one full field of signal. Variable delay of full 360° chrominance. EVDL's with improved grou delay and response characteristic meeting video color standards.
IF-RF	Non-dispersive: MTI, clutter cancellation, coherent integration, target simulation, range markers, coded sequence processing, transversal equalizers, receiver gain control versus time, time multiplexing correlation, Variable time delay, digitally controlled. Dispersive: Pulse expansion-compression systems, spectrum analyzers, doppler estimators.	CF to 150 Mhz, BW to 50% of CF. Delay 4000 usec in single unit, longer when used in cascade. Products always offered with unity gain.	Short delays with low spurious, e.g., 1 use delay, 48 db spurious at 60 Mhz. Wid BW, e.g., 65% at 60 Mhz CF. Flat amplitu response e.g., plus or minus 0.2 db 30 BW 60 Mhz CF. VSWR across BW e.g., 1 to 1 nom 50 ohms.
MICRO-WAVE	Non-dispersive: ECM, ECCM, radar processing and checkout systems, fusing, altimeters, transponders. Dispersive: High resolution pulse compression and similar wide band signal processing.	CF UHF through X-band, delay 200 nsec to 10 usec. BW to 500 Mhz. Pulse-compression ratios to 500 to 1.	10 db insertion loss at 500 Mhz, delays t 10 usec at X-band. Dispersive lines wit 500 Mhz Bw, .5 usec dispersion. Trans ducer peak power capability to 50 watts average power 2 watts.
DISPER-SIVE	Pulse expansion — compression systems, spectrum analyzers, panoramic receivers, doppler estimators.	C.F. 1-120 MHz, Dispersive B.W. to 60 MHz, Delay Dispersion to 1000 microseconds, Compression Ratio to 2500. All units available with ovens and temperature controllers, meet Mil-specs. Complete pulse compression systems our specialty.	IMCON systems, B.W. up to 15 MHz, dispersion up to 300 micro-seconds, small size, good linearity and temperature stability. DELECON systems offer B.W. up to 60 MHz, dispersion up to 30 microseconds, good linearity and temperature stability. STRIP LINES are least expensive, B.W. up to 6 MHz, compression ratio up to 200 per strip, low insertion loss, small size.
DIGITAL	Deltics, delta modulators, spectrum analyzers, matched filters, serial memories, scratch pad, refresh, buffer storage, A-D conversion.	Wiresonic: CF to 2 Mhz, storage 20,000 bits per unit. Glass: CF to 20 Mhz, storage 4500 bits per unit. Quartz: CF to 40 Mhz, storage 30,000 bits per unit.	Dual channel, 35 Mhz memory in single small package. Low cost high capacity temperature compensated multi-line packages. Lowest cost per bit in comparison with ferrites and MOS. Highest bits per cubic inch. Lowest power dissipation per bit.
OPTICAL	Laser modulation, Switched light sources, Q switches, mode lockers, beam deflectors, optical signal processing, cross and auto correlation, radar pulse compression-expansion matched filters, spectrum and Fourier analyzers, acousto optical continuously variable and multi-tapped delay lines.	CF 0.1 Mhz to 12 Ghz. BW octave or greater. Modulation to 4 Ghz. Time-BW products to 20,000 Mhz-useconds. Spectral ranges from UV to IR.	High efficiency, high power broad band transducers, IR modulation Stable, high rep rate Q switches, liquid cooling for high power, compact solid state designs.

ANDERSEN LABORATORIES, INC.

1280 BLUE HILLS AVENUE • BLOOMFIELD, CONN. 06002 • 203-242-0761

signal processing equipment

Andersen is also the leading producer of delay oriented signal processing systems for broadcast, computer and radar fields.

RTRONIC
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OMPANY

MILITARY GRADE

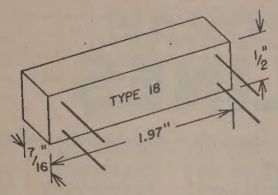
DELAY LINES

TYPE 18

e Time: 20% to 25% of delay time

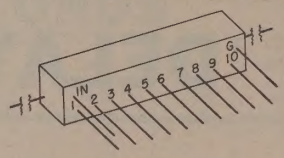
ads: #22 A.W.G tinned copper, 1½" long

elay (sec)	Type 18H Impedance (ohms)	Type 18L Impedance (ohms)
0.05	125	62
0.1	250	62
0.2	500	50
0.25	625	62
0.3	750	75
0.4	1000	100
0.5	1250	125
0.6	1500	150
0.7	1750	175
0.75	1875	188
0.8	2000	200
0.9	2250	225
1.0	2500	250
1.5	1875	375
2.0	2500	500
2.5	3125	625
3	1875	750
4	2500	1000
5	3125	1250
6	1500	
7	1750	
8	2000	
9	2250	
10	2500	



TYPE 18 AND TYPE 22

Delay Tolerance: 2%
Thermal Coefficient of Delay: 0.003%/°C to 0.01%/°C
Test Voltage: 800 vDC
Working Voltage: 400 v, DC or pulse
Temperature Range: −65°C to 125°C
Ordering Information: Part numbers are given by designating first the type number and letter, and then the delay, e.g., 22L-0.75. Intermediate values of delay and impedance can also be furnished.



TYPE 22

10 Taps, equally spaced

Rise Time: 15% to 20% of total delay time

Dimensions: ½" x ½" x 2½"

Leads: #22 AWG tinned copper or brass, 1¼" long

Leads on end faces are spare ground leads to provide added mounting rigidity. They may be clipped off if not needed, since a third ground lead is provided on the long face.

Delay (μsec)	Type 22H Impedance (ohms)	Type 22L Impedance (ohms)
0.05	100	50
0.1	200	50
0.2	400	100
0.25	500	50
0.3	600	60
0.4	800	80
0.5	1000	100
0.6	1200	120
0.7	1400	140
0.75	1500	150
0.8	1600	160
0.9	1800	180
1.0	2000	200
1.5	3000	300
2.0	2000	400
2.5	2500	500
3	3000	600
4	2000	800
5	2500	1000
6	3000	1200
7	1400	
8	1600	
9	1800	
10	2000	
12	2400	
15	3000	

PRECISION, RUGGEDNESS, RELIABILITY

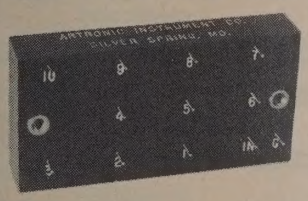
These four series of military grade delay lines are encapsulated in an epoxy casting resin, which is poured under vacuum and cured to a solid, void-free block of high-temperature plastic. All components and wires are solidly supported against shock and vibration and completely protected from moisture and salt spray. All four series meet the requirements of MIL-STD-202B..

The remarkable performance and stability of these very compact delay lines is due to the extraordinary care taken in the design and manufacturing processes. Phase characteristics are individually adjusted for optimum pulse performance, to give fast-rising, noise-free output pulses with minimum overshoot and distortion. A complete system of inspections and tests at every stage of construction and assembly assures the utmost in quality and reliability.

OTHER TYPES AND CUSTOM DESIGNS ALSO AVAILABLE

SERIES L — 10 Taps

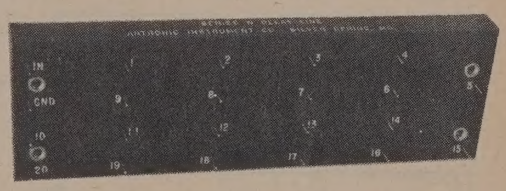
Rise Time: 7% to 8% of Total Delay



Size: ½" x 1.5" x 2.9"
Mounting: Two 6-32 tapped inserts

SERIES N — 20 Taps

Rise Time: 3% to 4% of Total Delay



Size: ½" x 2" x 6.4" Mounting: Four 6-32 Tapped Inserts

BANDWIDTHS IN MC

Delay (μsec)	Characteristic Impedance (Ohms) 50	200	500	1,000	2,000
0.1	110				
0.2	58	58			
0.3	39	39			
0.4	29	29			
0.5	23	23	23		
0.6	19	19	19		
0.7	16	16	16		
0.8		14	14		
0.9		13	13		
1.0		11	11	11	
2.0		5.8	5.8	5.8	5.8
3.0		3.9	3.9	3.9	3.9
4.0			2.9	2.9	2.9
5.0			2.3	2.3	2.3
6.0			1.9	1.9	1.9
7.0			1.6	1.6	1.6
8.0				1.4	1.4
10				1.1	1.1
15				0.7	0.7
20					0.6
25					0.5
30					0.4

SERIES L AND SERIES N

Delay Tolerance: 2%
Delay Temp. Coeff.: 0.003%/°C to 0.01%/°C
Test Voltage: 800 vDC
Working Voltage: 400 vDC max
Pulse Voltage: 400 v peak max
Temperature Range: −65°C to 125°C
Connections: 22 gauge pins, ⅜" long

Designed to plug into printed wiring boards for dip-soldering into place, these high-performance units are readily adaptable to other types of circuit construction, since the 22 gauge pins may be easily formed to fit lugs or terminal posts. The pins are laid out on the standard 0.1" printed circuit grid.

Careful control of the attenuation characteristic and the provision of special phase-compensating circuits result in superlative pulse performance. The tables give the cut-off frequencies of the delay lines which are available in each series. Part Numbers: Give series, impedance, and delay; e.g., N-1000-40.

BANDWIDTHS IN MC

Delay (μsec)	Characteristic Impedance (Ohms) 50	200	500	1,000	2,000
1	39	39			
1.5	26	26			
2	19	19			
2.5	15	15	15		
3		13	13		
4		9.7	9.7		
5		7.8	7.8	7.8	
6		6.5	6.5	6.5	
8		4.8	4.8	4.8	
10		3.9	3.9	3.9	3.9
12			3.2	3.2	3.2
15			2.6	2.6	2.6
20			1.9	1.9	1.9
25			1.5	1.5	1.5
30				1.3	1.3
40				0.9	0.9
50				0.7	0.7
75					0.5
100					0.4

THE ARTRONIC INSTRUMENT COMPANY
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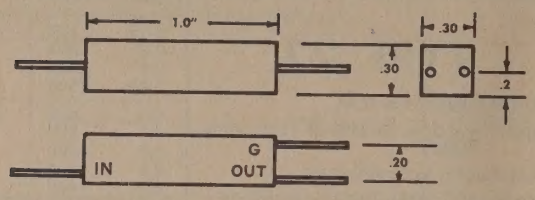
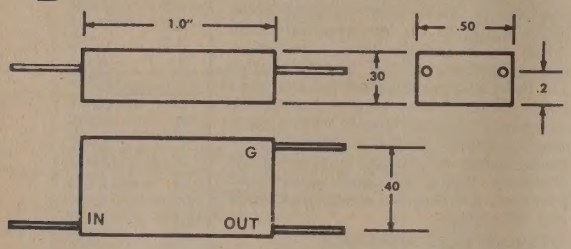
DELAY LINES

A



Lead Dia. = .032

B



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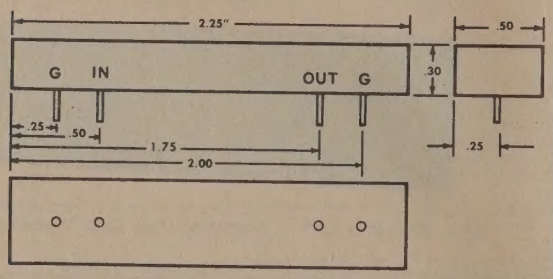

Lead Dia. = .032

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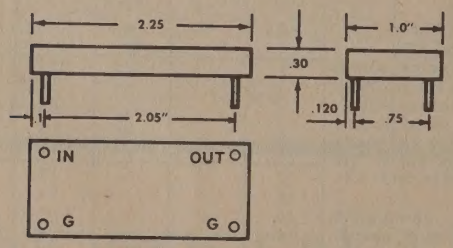

Lead Dia. = .032

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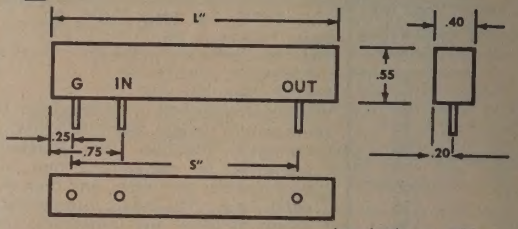

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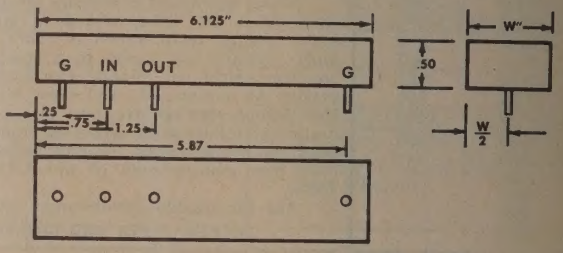

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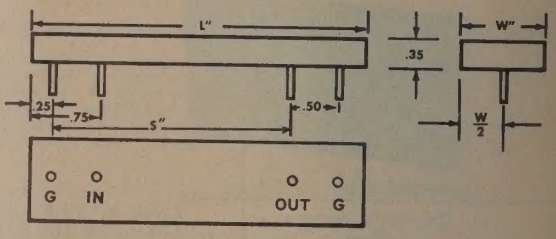

Lead Dia. = .032

The condensed version of our catalog items are listed here showing the most widely used sizes and types available for prompt shipment. Space prohibits the full listing of the many specials and the variations available.

CAUTION: Before finalizing your design, it is highly recommended you contact our Engineering Staff for their expert guidance, founded on our vast experience and up-to-date technology — a phone call can save you valuable time and money.

bel **BEL FUSE INC.** 203 Van Vorst Street • Jersey City, N. J. 07302 / (201) HE 2-0463

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NANOSECONDS

Part Number — Impedance ±10%				DELAY TIME ±5% nsec	RISE TIME nsec	CON-FIGU-RATION	LEAD SPACING "S" INCHES	LENGTH "L" INCHES	WIDTH "W" INCHES
93Ω	200Ω	500Ω	1000Ω						
0420-0001-93	0420-0001-02	0420-0001-05	0420-0001-10	1	2.0	A	—	1.0	.3
0420-0002-93	0420-0002-02	0420-0002-05	0420-0002-10	2	2.0	A	—	1.0	.3
0420-0003-93	0420-0003-02	0420-0003-05	0420-0003-10	3	2.0	A	—	1.0	.3
0420-0004-93	0420-0004-02	0420-0004-05	0420-0004-10	4	2.0	A	—	1.0	.3
0420-0005-93	0420-0005-02	0420-0005-05	0420-0005-10	5	2.0	A	—	1.0	.3
0420-0010-93	0420-0010-02	0420-0010-05	0420-0010-10	10	2.0	A	—	1.0	.3
0420-0015-93	0420-0015-02	0420-0015-05	0420-0015-10	15	2.5	B	—	1.0	.5
0420-0020-93	0420-0020-02	0420-0020-05	0420-0020-10	20	2.5	B	—	1.0	.5
0420-0025-93	0420-0025-02	0420-0025-05	0420-0025-10	25	2.8	C	—	2.25	.5
0420-0030-93	0420-0030-02	0420-0030-05	0420-0030-10	30	3.0	C	—	2.25	.5
0420-0035-93	0420-0035-02	0420-0035-05	0420-0035-10	35	3.5	C	—	2.25	.5
0420-0040-93	0420-0040-02	0420-0040-05	0420-0040-10	40	4.0	C	—	2.25	.5
0420-0045-93	0420-0045-02	0420-0045-05	0420-0045-10	45	4.5	C	—	2.25	.5
0420-0050-93	0420-0050-02	0420-0050-05	0420-0050-10	50	5.0	C	—	2.25	.5
0420-0055-93	0420-0055-02	0420-0055-05	0420-0055-10	55	5.4	D	—	2.25	1.0
0420-0060-93	0420-0060-02	0420-0060-05	0420-0060-10	60	5.8	D	—	2.25	1.0
0420-0065-93	0420-0065-02	0420-0065-05	0420-0065-10	65	6.2	D	—	2.25	1.0
0420-0070-93	0420-0070-02	0420-0070-05	0420-0070-10	70	6.6	D	—	2.25	1.0
0420-0075-93	0420-0075-02	0420-0075-05	0420-0075-10	75	7.0	D	—	2.25	1.0
0420-0080-93	0420-0080-02	0420-0080-05	0420-0080-10	80	7.4	D	—	2.25	1.0
0420-0085-93	0420-0085-02	0420-0085-05	0420-0085-10	85	7.8	D	—	2.25	1.0
0420-0090-93	0420-0090-02	0420-0090-05	0420-0090-10	90	8.2	D	—	2.25	1.0
0420-0095-93	0420-0095-02	0420-0095-05	0420-0095-10	95	8.5	D	—	2.25	1.0
0420-0100-93	0420-0100-02	0420-0100-05	0420-0100-10	100	8.5	D	—	2.25	1.0
0420-0125-93	—	—	—	125	12.5	G	2	3.00	.75
—	0420-0125-02	—	—	125	12.5	G	2.8	3.8	.625
—	—	0420-0125-05	0420-0125-10	125	12.5	E	1.20	1.8	.4
0420-0150-93	—	—	—	150	15.0	G	2	3.0	1.0
—	0420-0150-02	—	—	150	15.0	G	2.8	3.8	.625
—	—	0420-0150-05	0420-0150-10	150	15.0	E	1.20	1.8	.4
0420-0175-93	—	—	—	175	17.5	G	2	3.0	1.0
—	0420-0175-02	—	—	175	17.5	G	2.8	3.8	.625
—	—	0420-0175-05	0420-0175-10	175	17.5	E	1.20	1.8	.4
0420-0200-93	—	—	—	200	19.0	G	2	3.0	1.0
—	0420-0200-02	—	—	200	19.0	G	2.8	3.8	.625
—	—	0420-0200-05	0420-0200-10	200	19.0	E	1.20	1.8	.4
0420-0250-93	—	—	—	250	23.0	G	2	3.0	1.0
—	0420-0250-02	—	—	250	23.0	G	2.8	3.8	.625
—	—	0420-0250-05	0420-0250-10	250	23.0	E	1.20	1.8	.4
0420-0300-93	—	—	—	300	27.0	G	5.125	6.125	1.5
—	0420-0300-02	—	—	300	27.0	G	2.8	3.8	.925
—	—	0420-0300-05	0420-0300-10	300	27.0	E	2.20	3.0	.4
0420-0400-93	—	—	—	400	36.0	G	5.125	6.125	1.5
—	0420-0400-02	—	—	400	36.0	G	2.8	3.8	.925
—	—	0420-0400-05	0420-0400-10	400	36.0	E	2.20	3.0	.4
0420-0500-93	—	—	—	500	40.0	G	5.125	6.125	1.5
—	0420-0500-02	—	—	500	40.0	G	2.8	3.8	.925
—	—	0420-0500-05	0420-0500-10	500	40.0	E	2.20	3.0	.4
—	0420-0600-02	—	—	600	50.0	G	2.8	3.8	1.5
—	—	0420-0600-05	0420-0600-10	600	50.0	E	2.20	3.9	.4
—	0420-0700-02	—	—	700	60.0	G	5.125	6.125	.8
—	—	0420-0700-05	0420-0700-10	700	60.0	E	2.20	3.9	.4
—	0420-0800-02	—	—	800	70.0	G	5.125	6.125	.8
—	—	0420-0080-05	0420-0800-10	800	70.0	E	3.40	4.25	.4
—	0420-0900-02	—	—	900	80.0	G	5.125	6.125	.8
—	—	0420-0900-05	0420-0900-10	900	80.0	E	4.40	5.25	.4
—	0420-1000-02	—	—	1000	90.0	G	5.125	6.125	.8
—	—	0420-1000-05	0420-1000-10	1000	90.0	E	4.40	5.25	.4
—	0420-1500-02	—	—	1500	150.0	F	—	6.125	2.0
—	—	0420-1500-05	0420-1500-10	1500	150.0	F	—	6.125	.8
—	0420-2000-02	—	—	2000	200.0	F	—	6.125	2.0
—	—	0420-2000-05	0420-2000-10	2000	200.0	F	—	6.125	.8
—	0420-2500-02	—	—	2500	250.0	F	—	6.125	2.0
—	—	0420-2500-05	0420-2500-10	2500	250.0	F	—	6.125	.8
—	0420-3000-02	—	—	3000	300.0	F	—	6.125	2.0
—	—	0420-3000-05	0420-3000-10	3000	300.0	F	—	6.125	1.2
—	0420-3500-02	—	—	3500	350.0	F	—	6.125	3.0
—	—	0420-3500-05	0420-3500-10	3500	350.0	F	—	6.125	1.2
—	0420-4000-02	—	—	4000	400.0	F	—	6.125	3.0
—	—	0420-4000-05	0420-4000-10	4000	400.0	F	—	6.125	2.0
—	0420-4500-02	—	—	4500	450.0	F	—	6.125	3.0
—	—	0420-4500-05	0420-4500-10	4500	450.0	F	—	6.125	2.0
—	0420-5000-02	—	—	5000	500.0	F	—	6.125	3.0
—	—	0420-5000-05	0420-5000-10	5000	500.0	F	—	6.125	2.0

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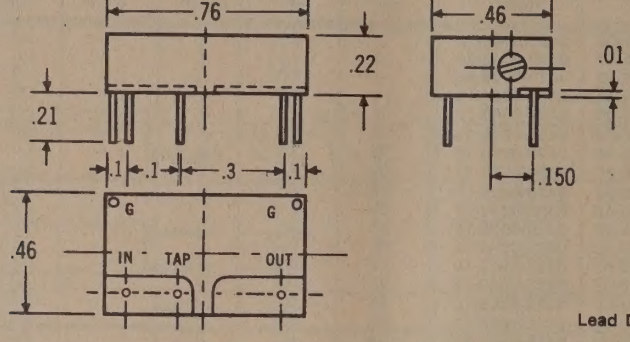
DUAL-IN-LINE VARIABLE DELAY LINES

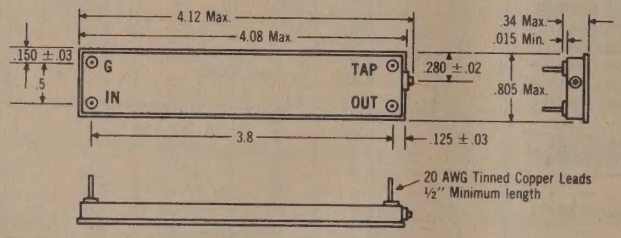
DV Series



BEL introduces the first variable delay line compatible with IC Dual-In-Line packaging featuring: • Hermetic Seal-O-Ring construction • Precious metal contacts • Resolution — MIN 2% (for high reliability performance)

Lead Dia. = .020

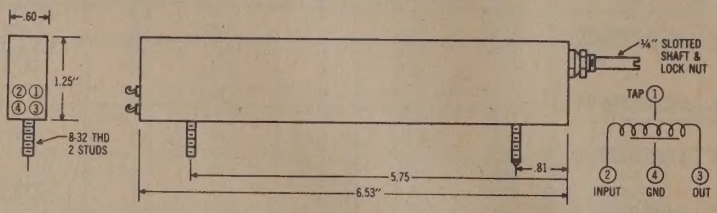
NV Series



VARIABLES

These precision hermetically sealed variables are available in a wide range of delays and impedances. Both may be provided with various mounting and terminal configurations to suit most applications.

CV Series
LV Series



VARIABLES

These precision hermetically sealed variables are available in a wide range of delays and impedances. Both may be provided with various mounting and terminal configurations to suit most applications.

Part Number	Td Range	Rise Time	Impedance ±10%	Style
0430-0040-05	0-40 nsec	15 nsec	500 Ω	NV
0430-0050-02	0-50 nsec	12 nsec	200 Ω	
0430-0150-10	0-150 nsec	55 nsec	1000 Ω	
0430-0250-05	0-250 nsec	60 nsec	500 Ω	
0430-0250-04	0-250 nsec	55 nsec	400 Ω	
0431-0450-10	0-450 nsec	70 nsec	1000 Ω	CV
0431-0700-05	0-700 nsec	110 nsec	500 Ω	
0431-0750-05	0-750 nsec	110 nsec	500 Ω	
0431-1000-05	0-1000 nsec	135 nsec	500 Ω	
0448-0005-01	0-5 nsec	5 nsec	100 Ω	DV
0448-0020-02	0-20 nsec	15 nsec	200 Ω	
0448-0030-03	0-30 nsec	20 nsec	350 Ω	
0448-0040-05	0-40 nsec	25 nsec	500 Ω	
0432-0250-01	0-250 nsec	35 nsec	100 Ω	LV
0431-0500-10	0-500 nsec	75 nsec	1000 Ω	
0431-1000-05	0-1000 nsec	120 nsec	500 Ω	

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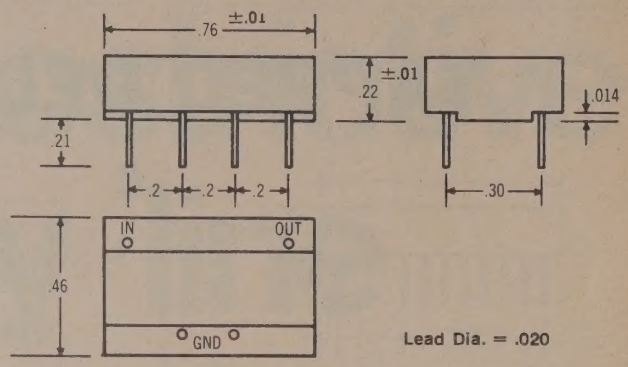
DUAL-IN-LINE DELAY LINES



- Delays from 1-1000 nanoseconds.
- Band Width to 60 mhz.
- Impedance 50 to 1000 ohms.
- Resistive Terminations if desired.
- Tapped Delay Lines available.
- Several separate lines in one case.
- Contact Bel Engineering for special applications.

Time Delay nsec ±5%*	Impedance ±10%					
	50Ω	75Ω	100Ω	200Ω	500Ω	1000Ω
5	0440-0005-50 Tr = 5	0440-0005-75 Tr = 5	0440-0005-01 Tr = 3	0440-0005-02 Tr = 4	0440-0005-05 Tr = 4	0440-0005-10 Tr = 6
10	0440-0010-50 Tr = 10	0440-0010-75 Tr = 8	0440-0010-01 Tr = 3.5	0440-0010-02 Tr 4.5 =	0440-0010-05 Tr = 5.5	0440-0010-10 Tr = 7
15	0444-0015-50 Tr = 10	0440-0015-75 Tr = 12	0440-0015-01 Tr = 4	0440-0015-02 Tr = 5	0440-0015-05 Tr = 6	0440-0015-10 Tr = 8
20	0444-0020-50 Tr = 10	0444-0020-75 Tr = 20	0440-0020-01 Tr = 6	0440-0020-02 Tr = 6	0440-0020-05 Tr = 6	0440-0020-10 Tr = 10
30	0444-0030-50 Tr = 12	0444-0030-75 Tr = 20	0444-0030-01 Tr = 18	0440-0030-02 Tr = 8	0440-0030-05 Tr = 8	0440-0030-10 Tr = 15
40	0440-0040-50 Tr = 17	0444-0040-75 Tr = 20	0444-0040-01 Tr = 18	0440-0040-02 Tr = 20	0440-0040-05 Tr = 10	0440-0040-10 Tr = 20
50	0444-0050-50 Tr = 18	0444-0050-75 Tr = 20	0444-0050-01 Tr = 18	0440-0050-02 Tr = 17	0440-0050-05 Tr = 20	0440-0050-10 Tr = 30
60	0444-0060-50 Tr = 23	0444-0060-75 Tr = 20	0444-0060-01 Tr = 18	0440-0060-02 Tr = 17	0440-0060-05 Tr = 25	0440-0060-10 Tr = 35
70	0444-0070-50 Tr = 23	0444-0070-75 Tr = 22	0444-0070-01 Tr = 19	0440-0070-02 Tr = 18	0440-0070-05 Tr = 30	0440-0070-10 Tr = 40
80	0444-0080-50 Tr = 28	0444-0080-75 Tr = 22	0444-0080-01 Tr = 19	0440-0080-02 Tr = 20	0440-0080-05 Tr = 34	0440-0080-10 Tr = 45
90	0444-0090-50 Tr = 30	0444-0090-75 Tr = 23	0444-0090-01 Tr = 20	0444-0090-02 Tr = 21	0440-0090-05 Tr = 36	0440-0090-10 Tr = 47
100	0444-0100-50 Tr = 35	0444-0100-75 Tr = 23	0444-0100-01 Tr = 20	0444-0100-02 Tr = 21	0440-0100-05 Tr = 37	0440-0100-10 Tr = 50
125	0444-0125-50 Tr = 45	0444-0125-75 Tr = 40	0444-0125-01 Tr = 22	0444-0125-02 Tr = 30	0440-0125-05 Tr = 40	0440-0125-10 Tr = 55
150	0444-0150-50 Tr = 50	0444-0150-75 Tr = 35	0444-0150-01 Tr = 27	0444-0150-02 Tr = 30	0440-0150-05 Tr = 45	0444-0150-10 Tr = 60
200	0444-0200-50 Tr = 55	0444-0200-75 Tr = 50	0444-0200-01 Tr = 37	0444-0200-02 Tr = 40	0444-0200-05 Tr = 40	0444-0200-10 Tr = 60
300			0444-0300-01 Tr = 57	0444-0300-02 Tr = 60	0444-0300-05 Tr = 55	0444-0300-10 Tr = 60
400				0444-0400-02 Tr = 60	0444-0400-05 Tr = 65	0444-0400-10 Tr = 70
500				0444-0500-02 Tr = 110	0444-0500-05 Tr = 95	0444-0500-10 Tr = 95
600				0440-0600-02 Tr = 110	0444-0600-05 Tr = 100	0444-0600-10 Tr = 125
700				0444-0700-02 Tr = 120	0444-0700-05 Tr = 110	0444-0700-10 Tr = 140
800					0444-0800-05 Tr = 120	0444-0800-10 Tr = 140
900					0444-0900-05 Tr = 135	0444-0900-10 Tr = 180
1000					0444-1000-05 Tr = 150	0444-1000-10 Tr = 185

* or 1 nsec (whichever is greater)

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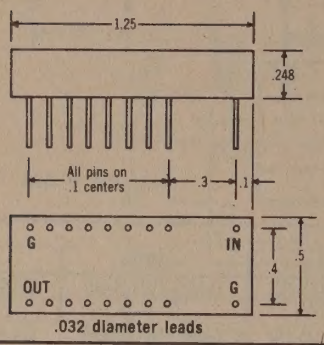
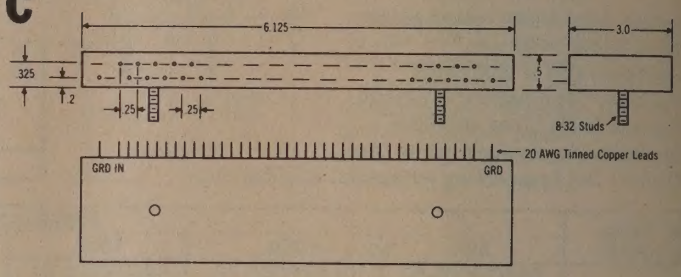
TAPPED DELAY LINES

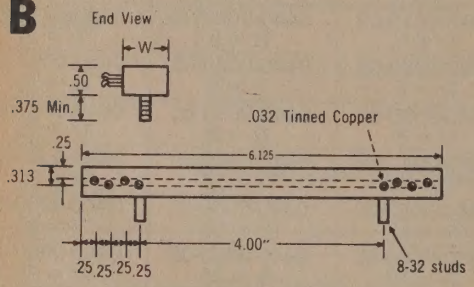
A



C

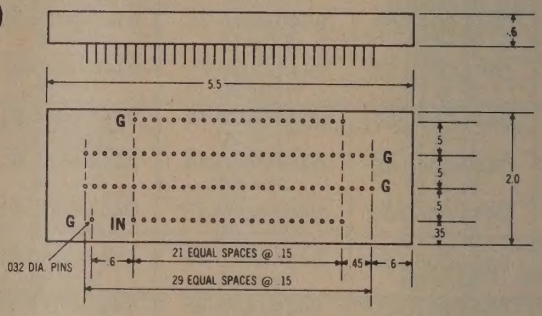


B



Hook Ter. available at slight add. cost.

D



Part No.	Delay nsec	Tr nsec	No. of Taps	Delay/Tap nsec	Impedance	Width "	Style
0414-0155-01	15	5	15	1	100 Ω	½	A
0414-0155-02	15	5	15	1	200 Ω	½	A
0414-0155-03	15	5	15	1	500 Ω	½	A
0414-0131-01	100	15	20	5	500 Ω	.8	B
0414-0447-01	200	25	20	10	500 Ω	.8	B
0414-0448-01	300	35	20	15	500 Ω	.8	B
0414-0449-01	400	45	20	20	500 Ω	.8	B
0414-0131-02	500	55	20	25	500 Ω	.8	B
0414-0450-01	600	60	20	30	500 Ω	.8	B
0414-0451-01	700	70	20	35	500 Ω	.8	B
0414-0452-01	800	80	20	40	500 Ω	.8	B
0414-0453-01	900	90	20	45	500 Ω	.8	B
0414-0131-03	1000	100	20	50	500 Ω	.8	B
0404-0454-01	1000	30	100	10	100 Ω	2.0	D
0404-0455-01	2000	200	20	100	500 Ω	.8	B
0404-0456-01	3000	300	20	150	500 Ω	.8	B
0404-0457-01	4000	400	20	200	500 Ω	.8	B
0404-0458-01	5000	500	20	250	500 Ω	.8	B
0404-0459-01	7500	750	20	375	500 Ω	1.5	B
0404-0460-01	10,000	1000	20	500	500 Ω	1.5	B
0404-0461-01	12,500	750	25	500	500 Ω	3	C
0404-0462-01	15,000	900	30	500	500 Ω	3	C
0404-0463-01	17,500	1100	35	500	500 Ω	3	C
0404-0464-01	20,000	1200	40	500	500 Ω	3	C

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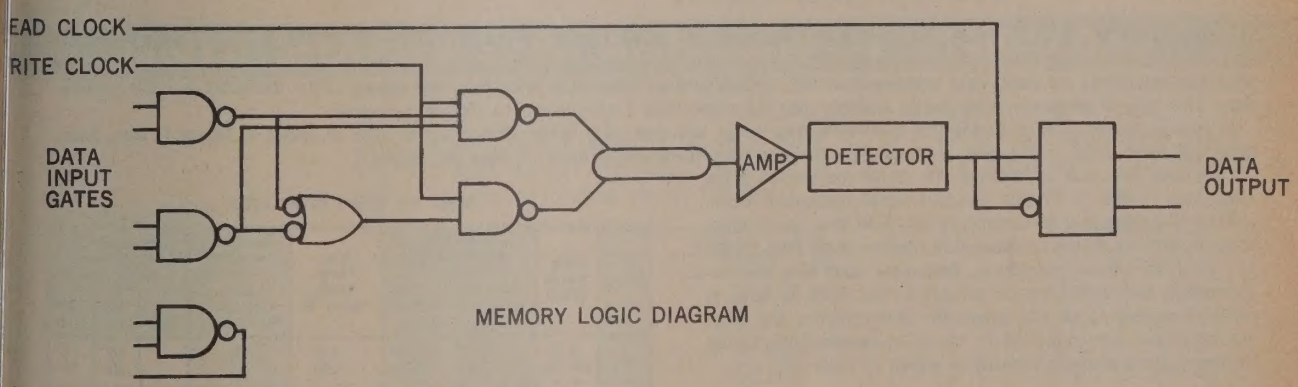
magnetostrictive delay line memories

Model	Storage Bits - (Max)	Delay μs (Max)	Size L x W x H	Max. Power +12	+5	−6
SM	4300	3450	7.70 x 7.00 x .75	—	100 ma	—
MM	6250	5000	9.00 x 8.00 x .75	—	100	—
LM	11000	8340	10.00 x 9.10 x 1.00	20 ma	100	20 ma
SC	12500	10000	14.50 x 10.50 x .83	20	100	20
DM	22000	8340	14.50 x 10.50 x 1.00	40	200	40
DT	22000	16700	14.50 x 10.50 x 1.00	40	200	40



MEMORY LOGIC DIAGRAM

In quantity . . . on most applications:
Price per Bit is less than 1¢
Average power per Bit as low as 0.1 mw
All memories are TTL compatible
All input/outputs are NRZ format

SYSTEMS APPLICATION & DESIGN ENGINEERING ALWAYS AVAILABLE. CUSTOM PACKAGES FOR ANY REQUIREMENT

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Bliley

If you buy quality

BLILEY GLASS DELAY LINES FOR DIGITAL STORAGE

Digital glass memories have recently found wide application as an ultrasonic storage device in computers and associated digital processing equipment. Bliley ultrasonic digital delay lines meet this requirement with bit rates as high as 30M bits/sec and access times as low as one microsecond. Although digital lines operate at one-half the period of the center frequency, the recommended bit rate is approximately two-thirds of the center frequency.

Digital lines operate in the RZ or return to zero mode which is the least demanding on external circuitry. Additional circuitry is required for NRZ operation to obtain increased storage capacity or BIPOLAR operation for increased signal to noise ratio. Most digital lines utilize low temperature coefficient glass as the delay medium to obtain good delay time stability with temperature change as indicated in Figure 1.

Attenuation depends upon delay time, operating frequency, required signal to noise ratio, terminating impedance, input and output admittance conditions and pulse shape. The most efficient operation of a digital line is achieved at its point of minimum attenuation (center frequency) although it may operate satisfactorily at any point throughout its 3 db bank pass. To reduce loss level, ceramic transducers are used up to 20 MHz and quartz transducers from 20 MHz to 30 MHz.

Typical digital response characteristics are shown in Table I, and Table II indicates the present design range parameters for glass lines.

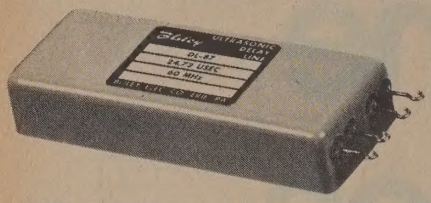
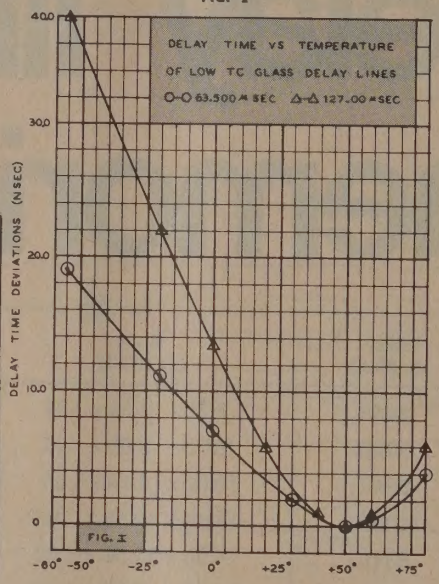


FIG. 1



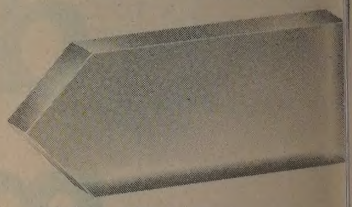


TABLE I. TYPICAL DIGITAL CHARACTERISTICS

Delay Time (μsec)	Pulse Width (nsec)	Atten. (max.) (db)	S/N (min.) (db)	Term. Imp. (ohms)	Max. Delay Change Temp. 10-80°C (nsec)
1.700	85	22	25	50	3.0
10.000	12	30	20	50	2.0
26.500	80	26	20	100	2.0
26.500	30	26	20	100	2.0
52.800	30	35	20	50	4.0
50.000	25	32	20	50	4.0
63.500	18	70	25	50	5.0
63.500	75	32	20	50	5.0
63.400	50	38	25	100	5.0
98.700	84	26	20	100	8.0
140.400	84	26	20	100	10.0
200.000	75	36	20	50	17.0
250.000	25	50	20	50	21.0

TABLE II. DIGITAL DESIGN RANGE

Center Frequency	3.0 MHz	to	30.0 MHz
Input Pulse Width	167 nsec.	to	16.7 nsec.
Delay Time	1.0 μsec.	to	300 μsec.
Signal to Noise Ratio	15 db	to	25 db
Termination Impedance	1500 ohms	to	15 ohms
Attenuation: Ceramic Transducers	20 db	to	40 db
Quartz Transducers	30 db	to	80 db
Delay Time Tolerance at 25°C	±0.2% (1-20 μsec.)	to	±5 nsec. (10-300 μsec.)
Delay Time Stability 0 to +80°C	(0.2% @ 1 μsec. 0.01% @ 10 μsec.)	to	0.01% (10-300 μsec.)

Bliley is equipped to manufacture a broad range of custom-designed delay lines. Our experienced staff will welcome an opportunity to analyze your specifications and prepare quotations for your requirement. Literature will be sent promptly upon request.

BLILEY ULTRASONIC DELAY LINES FOR RF APPLICATIONS

Ultrasonic delay lines are widely used in conventional RF systems such as video pulse integrators and moving target indicators in radar applications. This type of ultrasonic delay line is available over the range from 1 microsecond to 4500 microseconds.

In general, low TC glass is used for the short delay time range, with frequency temperature characteristics as shown in Figure 1. Long lines, which use fused quartz as the delay medium, have a temperature coefficient of minus 75 ppm per degree C.

Long delay lines may be specified with carrier frequencies in the range from 10 MHz to 40 MHz. Spurious signal attenuation shown in Table III applies only to frequency range 25-40 MHz. Best attenuation of spurious signals is achieved in medium delay time ranges and at higher carrier frequencies. Dependent upon loss level requirements, bandwidth may be estimated from 50% to 65% of carrier frequency. Loss and bandwidth characteristics are interdependent and are controlled by choice of terminations, carrier frequency and transducer capacity as shown in Table IV.

TABLE III. LONG DELAY LINES

Delay Time Range (μsec)	30-400	200-700	300-1400	500-1600	600-2000	1400-2700	600-3300	1300-4500
Spurious db Down	50	55	60	55	55	50	45	45
3rd Time Signal db Down	40	45	55	—	—	—	—	—

TABLE IV. SHORT DELAY LINES

Group	Freq. Range (MHz)	Delay Time Range (Microseconds)		Max. Temp. Coeff. (ppm/°C)	Bandwidth as percent of carrier (with 93 ohm termination)	Loss level (db) with different termination		
		Ringing Single Ended	Absorber Double Ended			50 ohm	93 ohm	1000 ohm
A	5-60 60-100	.75-60 .75-60	.75-30 .75-30	—100 —100	30 15		45 50	28 33
B	5-60 60-100	.75-40 .75-40	.75-20 .75-20	+85 +85	35 15		43 48	27 31
C	5-60 60-100	.75-40 .75-40	.75-20 .75-20	+20 +20	35 15		43 48	27 31
D	5-30	1.00-60	1.00-30	—100	40 (50 ohm) term.)	12		
E	5-30	1.00-40	1.00-20	+20	40 (50 ohm) term.)	12		

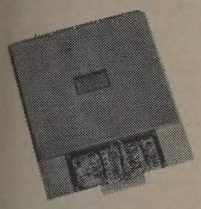
Bliley

For further information call (814) 838-3571 or wire TWX 510-696-6886

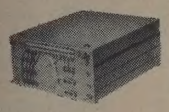
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512

2545 W. GRANDVIEW BOULEVARD

DELAY LINE COMPUTER MEMORIES DELCOMS



THE DELAY LINE COMPUTER MEMORY (DELCOM) offers the **Lowest Price Per Bit** of any high speed memory device. Computer Devices Corp. offers convenient standard packages for all practical storage capacities from 10 bits to 20,000 bits in single delay line units as well as multi delay line units* with massive storage capacities. All Delcoms are compatible with DTL and T²L logic. Normal power requirements are +12 and −12 VDC and +5 VDC. However, Delcoms are tailored to your bit rate, delay, input-output logic and power requirements.



MODEL SERIES	MAXIMUM STORAGE (BITS)	MAXIMUM (Hz) BIT RATE	SIZE INCHES
MS 2219	1,300	2.6	3.25 x 4 x 1
MS 777	1,500	2.3	3.50 x 6.37 x .5
MS 772	4,000	2.2	4.50 x 6.25 x 1.12
MS 773	8,000	2.0	8 x 10.50 x .62
MS 2150	16,000	2.0	11 x 14 x .75
MS 775	20,000	2.0	12 x 15 x .75
*MA 2254	10,000	2.0	6.50 x 4 x 3.50
*MA 2255	24,000	2.0	8 x 5 x 2.75
*MA 2256	250,000	2.0	19 x 14 x 17

*Examples of multi delay line units.

ODRESSABLE RANDOM ACCESS MEMORY

4000 Series

Random Access
Binary coded address
Average access time 512 μsec
Integrated circuits throughout
Storage modularly expandable without limit
Immune to primary power failure
Visual display available

TORAGE

ne basic unit stores either 1024—12 bit words ex-andable in 2 bit steps per module or 2048 — 6 bit ords expandable in 1 bit steps per module.

ther models with capacity of up to 16,384 words of ny length.

KEYED OSCILLATOR

For Precision Gating
Frequencies from 0.5 to 25 MHz

The 0G5000 is a square wave oscillator which can be precisely gated by means of a control voltage. The leading edge of the 1st output pulse occurs within 3 nanoseconds of the gating or keying signal. It will respond to a gate width equal to one output frequency cycle or greater. Size: 2.0x1.7x.62".

CONTROL SIGNAL is ground to −4V or −5V DC with rise time of less than 10% of output period length.

OUTPUT SIGNAL is ground to +4V DC from DTL or T²L logic gates. Duty cycle: 50% ±10%. Period accuracy: Better than ±1%.

DIGITAL DELAY LINES FOR DIGITAL AND CW APPLICATIONS

MAGNETOSTRICTIVE DELAY LINES are extremely stable with temperature, with stabilities of up to .5 PPM/°C achievable. Although primarily used in digital applications at bit rates of up to 1 MHz RZ or 2 MHz NRz, they also delay CW signals with center frequencies from 200 KHz to 1 MHz with a bandwidth of 20%. Insertion loss is about 60 db.

MODEL	DELAY (μsec)	SIZE (INCHES)
ML 545	up to 23 μsec	1 x 5 x .375
MT 767	1,000	3.5 x 4.0 x .46
MT 762	2,000	4.0 x 5.0 x .50
MT 763	4,000	6.0 x 7.0 x .50
MT 764	8,000	9.5 x 10.5 x .75
MT 765	16,000	10.5 x 11.5 x .56

MULTIPLE OUTPUT DELAY LINES

Multi-tap Delay Lines are supplied with as many tap points as desired and are useful as word generators and correlators.

MODEL	TOTAL DELAY μsec	NO. OF TAPS	TAP SPACING μsec	SIZE
ML718	15	12	1.25	1.75 x 8 x .50
ML790	16	16	1.0	1.75 x 8 x .50
ML791	20.3	14	1.45	1.75 x 8 x .50
ML883	28	24	1.0	3 x 9.37 x .50

SEE VARIABLE DELAY LINE SECTION FOR VARIABLE MAGNETOSTRICTIVE DELAY LINES

COMPUTER DEVICES CORP.
63 AUSTIN BOULEVARD COMMACK, N. Y. 11725
516—543-4220

VARIABLE DELAY LINES

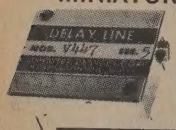
THIN LINE VARIABLE Nanosecond Range

Compatible with Dual-In-Line packaging with .25" overall thickness. Sealed in plastic case. Lumped Constant parameters. Temperature coefficient less than 50 PPM/°C. .020" P.C. mounting pins.

MINIATURE DISTRIBUTED VARIABLE Nanosecond Range

Hermetically sealed in a metal case. Distributed parameter with temperature coefficient of less than 150 PPM/°C. .030" P.C. mounting pins.

MINIATURE LUMPED VARIABLE Nanosecond Range

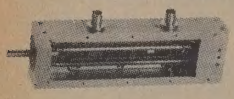


Hermetically sealed in a metal case. Lumped constant parameter. Temperature coefficient less than 50 PPM/°C. .030" P.C. mounting pins.

MICROSECOND RANGE VARIABLE

Hermetically sealed in a metal case. Lumped or distributed constant parameters for longer delays and special applications.

NOVEL INFINITE RESOLUTION



with input and output impedance of equal value. Voltage standing wave ratio less than ½ db to 45 MHz.

ONE TURN VARIABLE

Lumped parameter multi position switch provides resolution of 100:1.

INFINITE RESOLUTION VARIABLE

provides absolutely stepless delay change to high frequency signals. Ideal phase shifter.

MAGNETOSTRICTIVE DIGITAL VARIABLE

For delay of radar pulses or digital data. These units utilize the magnetostrictive delay line and are supplied with electronics to faithfully reconstruct the delayed input data.

LOW FREQUENCY ANALOG VARIABLE DELAYS

Decade switched. Lumped parameter. Temperature stability less than 40 PPM/°C, VSWR less than ±½ db; phase linearity ±¼%.

ANALOG DELAYS WITH DIGITAL TECHNIQUES

can provide delays in excess of 1 second to analog signals as high as 1 MHz.

MODEL	DELAY RANGE	RISE TIME OR FREQ. RESP.	IMPEDANCE OHMS	SIZE INCHES
V1570-1	0 - 10 Nsec	2 Nsec	100	.25 x .75 x 1.
V1570-2	0 - 20	4	100	.25 x .75 x 1.
V1570-3	0 - 40	8	100	.25 x .75 x 1.
V1570-4	0 - 80	16	100	.25 x .75 x 1.
V1570-5	0 - 160	32	200	.25 x .75 x 1.
V1570-6	0 - 320	64	200	.25 x .75 x 1.
DV900-11	0 - 20 Nsec	7 Nsec	1000	.31 x .62 x 1.7
DV900-12	0 - 20	7	500	.31 x .62 x 1.7
DV900-13	0 - 50	17	1000	.31 x .62 x 1.7
DV900-14	0 - 50	17	500	.31 x .62 x 1.7
DV900-15	0 - 100	33	1000	.31 x .62 x 1.7
DV1446-1	0 - 50	18	2000	.31 x .62 x 1.7
DV900-21	0 - 20 Nsec	3.5 Nsec	1000	.3 x .62 x 3.50
DV900-22	0 - 20	3.5	500	.3 x .62 x 3.50
DV900-23	0 - 50	9	1000	.3 x .62 x 3.50
DV900-24	0 - 50	9	500	.3 x .62 x 3.50
DV900-25	0 - 100	17	1000	.3 x .62 x 3.50
DV900-26	0 - 100	17	500	.3 x .62 x 3.50
DV900-27	0 - 250	42	1000	.3 x .62 x 3.50
DV900-28	0 - 350	60	1000	.3 x .62 x 3.50
DV1446	0 - 100	20	2000	.3 x .62 x 3.50
V447-1	0 - 55 Nsec	15 Nsec	150	.31 x 1 x 1.25
V447-2	0 - 100	30	50	.31 x 1 x 1.25
V447-3	0 - 150	25	150	.31 x 1 x 2.45
V447-4	0 - 250	30	50	.31 x 1 x 2.45
V447-5	0 - 300	30	150	.31 x 1 x 3.45
V447-6	0 - 500	60	50	.31 x 1 x 3.45
V172	0 - .55 μsec	.08 μsec	1000	.5 x 1.5 x 4.5
V703	0 - .95	.07	500	.75 x 1.87 x 7
DV219	0 - 1.0	.11	1000	.62 x 1.25 x 6.5
V443	0 - 3.0	.25	200	.62 x 2 x 4.5
DV575-1	2 - 25 Nsec	70 MHz	200	1 x 1.25 x 5.37
DV575-2	2 - 50	70	100	1 x 1.25 x 5.37
DV575-3	2 - 50	70	200	1 x 1.25 x 5.37
DV575-4	2 - 50	70	93	1 x 1.25 x 5.37
DV575-5	2 - 25	70	50	1 x 1.25 x 5.37
DV575-6	2 - 50	70	93	1 x 1.25 x 5.37
V168-1	0 - .2 μsec	.015 μsec	100	4 x 4 x 1.25
V168-2	0 - 1.5	.08	1000	4 x 4 x 1.25
V168-3	0 - 3.0	.15	1000	4 x 4 x 1.25
DV1556-1	2 - 33 Nsec	28 to 32 MHz	93	.5 x 1 x 3.5
DV1556-2	2 - 40 Nsec	26 to 30 MHz	93	.5 x 1 x 3.5
MV994	2 - 18 μsec	2 MHz	300/3000	1 x 5 x .5
MV781	2 - 30	2	300/3000	1 x 9 x .5
MV785-1	0 - 1 Msec	2	100	19 x 17 x 3.5
MV785-2	0 - 10 Msec	2	100	19 x 17 x 5.25
MV785-3	0 - 100 Msec	2	100	19 x 17 x 10.5
AV175	0 - .15 Msec	to 30 KHz	500	9 x 3 x 6
AV287	0 - .50	20	1000	19 x 3.5 x 12
AV206	0 - 1.0	20	600	19 x 3.5 x 12
AV731	0 - 5.0	5	1000	19 x 5.25 x 15
AV211	0 - 10.0	2.5	600	19 x 5.25 x 15
AV1561-1	0 - 25 Msec	to 30 KHz	100	19 x 5.25 x 17
AV1561-2	0 - 50	30	100	19 x 7.0 x 17
AV1561-3	0 - 100	30	100	19 x 7.0 x 17

COMPUTER DEVICES CORP. specializes in the design and production of variable delay devices and will custom design units to meet your specific requirements. If the Delay Lines in this partial listing do not fill your need, please call.

This condensed catalogue information is only meant to serve as a guide. Before finalizing on a design it is most prudent to utilize the experience, ingenuity and up-to-date information of our Engineering Staff. Expert guidance, which can save you hours of searching, is as close to you as your telephone —

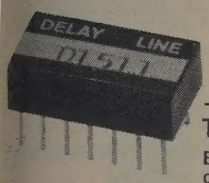
516-543-4220

COMPUTER DEVICES CORP.

FIXED AND TAPPED DELAY LINES

THINLINE—NANOSECOND SUB-MINIATURE LINES

.21 inch thickness and pin arrangement makes these lines compatible with dual-in-line packaging. Encapsulated in plastic.



MODEL	IMPEDANCE OHMS	DELAY	RISE TIME OR FREQ. RESP.	SIZE INCHES
D1521-1	Available in 50, 93 and 100 ohms	50 Nsec	20 Nsec	.21 x .39 x .7
D1521-4		25	10	
D1521-7		10	4	
D152-10		5	2	
D1551-1	200	100 Nsec	10 Nsec	.21 x 1.0 x 1.5
D1551-2		150	15	
D1551-3		200	20	
D1551-4		250	25	
D1551-5		300	30	

TAPPED DELAYS

Each line provides 10 tap delays spaced at equal intervals.

	D1511-1	100	10 Nsec	3 Nsec	.21 x .39 x .7
	D1511-2		20	6	
	D1511-4		40	13	
	D1511-6		60	20	
	D1511-8		80	26	
	D1511-10		100	33	
MANY TAPS PER LINE 50 taps	D1543	100	150 Nsec	13 Nsec	.25 x .8 x 5.2
50 taps	D1544	100	300	20	.25 x 1.0 x 5.3
30 taps	D1545	100	90	8	.25 x .8 x 3.2

MINIATURE LUMPED CONSTANT

Hermetically sealed in a metal container. Delay tolerance ±5%.

Temperature stability less than 50 PPM/°C. P.C. Mounting.

D647- — — 0	Available in 93, 330, 500 and 1000 ohms	.05 μsec
D647- — — 1		.10
D647- — — 2		.25
D647- — — 3		.50
D647- — — 4		.75
D647- — — 5		1.00
D647- — — 6		1.45
D647- — — 7		2.90
D647- — — 8		4.35

Available with 3 delay to rise time ratios in 3 case sizes
4:1 .30 x 1.0 x 1.25
8:1 .30 x 1.0 x 2.45
12:1 .30 x 1.0 x 3.45

INEXPENSIVE DISTRIBUTED CONSTANT DELAYS

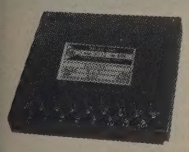
Plastic encapsulated units with a temperature coefficient of 150 PPM/°C. P.C. Mounting. Many other models available including the nanosecond range.

DD679- — — 1	Available in 330, 500 and 1000 ohms	.1 μsec
DD679- — — 2		.2
DD679- — — 3		.3
DD679- — — 4		.4
DD679- — — 5		.5
DD679- — — 6		.6
DD679- — — 7		.7
DD679- — — 8		.8
DD679- — — 9		.9
DD679- — — 10		1.00

Available with delay to rise time ratios of: In 2 case sizes
5:1 .37 x .5 x 4.5
10:1 .37 x 1.0 x 4.5

ATC TRANSPONDER AND BEACON CODING DELAY LINES

Standard 1.45 μsec tap spacings plus other special delay points are provided. Hermetically sealed steel cased, plastic encapsulated and PC mounted units are offered.



D1560	400	10.15 μsec	.33 μsec	.55 x 2.25 x 3.62
D1365	180	20.3	.5	.87 x 3.5 x 3.5
D1000	330	20.3	.5	.35 x 2 x 4
D120	180	25.0	.55	.75 x 5 x 4.37
D298A	500	25.3	.6	1.62 x 2.87 x 4.25
D637	180	20.3	.3	2.37 x 2.75 x 3.18
D1190	400	20.3	.4	.63 x 4 x 5
D1191	500	24.65	.5	.63 x 4 x 5
D1210	500	8.0	.5	.5 x 1 x 4

LONG DELAYS OF LOW FREQUENCY

Fixed and multi-tapped delays with high accuracy and flat response VSWR ±½ db; phase linearity ±¼%.

DA921	2000	420 μsec	100 KHz	14 x 2 x 1
DA563	1000	500	30	7 x 2.5 x 2
DA301	600	1,000	20	19 x 3.5 x 9
DA261	500	5,000	5	19 x 5.25 x 10
DA607	500	20,000	3.5	19 x 7 x 15
DA177	1000	100,000	.2	19 x 21 x 12

ANALOG DELAYS WITH DIGITAL TECHNIQUES can provide delays in excess of 1 second to analog signals as high as 1 MHz.

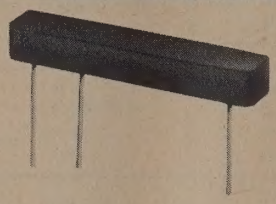
MDA2300-1	50	25,000 μsec	30 KHz	19 x 3.5 x 17
MDA2300-2	50	50,000	30	19 x 5.25 x 17
MDA2300-3	50	100,000	30	19 x 21 x 17

MANY OTHER MODELS AND SPECIALTY Delay Lines are available. If exactly what you want is not listed, please call.

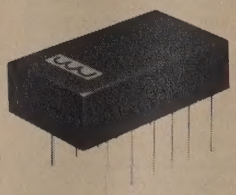
COMPUTER DEVICES CORP.
63 AUSTIN BOULEVARD COMMACK, N. Y. 11725
516-543-4220

Columbia Components Corporation Delay Lines

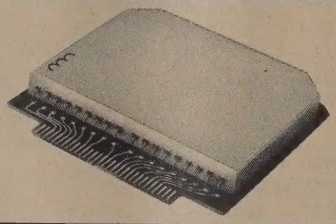
Q-Lines (Lumped Constant)
State-of-the-art design and packaging technology enables CCC to offer delay to rise time ratios of up to 100:1, with the smallest envelope sizes possible. Coupled with extremely low attenuation, distortion and operating temperature ranges of −55°C to +125°C make CCC Q-Lines ideal for a wide range of applications.
Write for data sheet DL-6-368



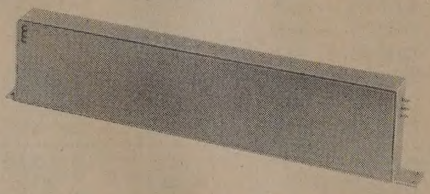
Minilines (Distributed Constant)
Economically priced delay lines featuring low profile envelopes which are ideal for printed circuit mounting and applications requiring high package density. Delays up to 2 μsec, impedances for 100 to 1,000 ohms and rise times as low as 2.5 nanoseconds are available and meet all applicable portions of MIL-D-23859A.
Write for data sheet DL-4/5-368



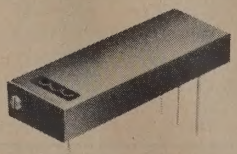
Dual-In-Line (Mates with standard) DIP Socket)
Series DU nanosecond delay lines offer the ultimate in hi-density packaging commensurate with fast rise time. Designed for frequencies up to 125 MHz., at impedances of 100 and 200 ohms, with minimum distortion and insertion loss, this series offers uncompromising speed and accuracy in Computer, Radar and Pulse train positioning applications.
Write for data sheet DL-10-270



Transponder and Beacon Coder Delay Lines
Tap delay spacing of 1.45 microseconds with special tap delays designed for the various systems are available as off shelf and customer designed items. These lines have minimum volume and weight for airborne use and are normally supplied wired to printed circuit cards. These delay lines exhibit high delay accuracy and unsurpassed temperature stability — normally 10 ppm/°C.



Electrically Variable Delay Lines (E.V.D.L.)
Sophisticated voltage variable devices for applications such as Aperture Phase Correction in color television signal generation. Or as a Phase Modulator where the modulating voltage is used as the device bias. CCC E.V.D.L.'s are being used at frequencies up to 50 MHz by major producers of studio broadcasting equipment throughout the world.



Varilines (Mechanically Variable Delay Lines)
Columbia manufactures a wide range of precision variable delay lines encompassing delay ranges of from 0 to 20 nanoseconds, to 0 to 15 microseconds in impedance ranges of 50 to 2,000 ohms. These units can be supplied continuously variable or may be decade switched, and suitable for printed circuit applications.
Write for data sheet DL-1-368

Magnetic Core Delay Cable
Economical low-loss, high impedance delay elements for use in pulse work demanding extremely fast rise times. These delay cables can be supplied in calibrated lengths with molded-on end terminations, ready for installation or may be obtained in bulk. Delivery is usually from stock.
Write for data sheet DL-7-368

For special applications, quotations and delivery information, please call or write. Ask for complete catalog.

COLUMBIA COMPONENTS CORP. A SUBSIDIARY OF COMPUTER INSTRUMENTS CORP.

60 MADISON AVENUE, HEMPSTEAD, NEW YORK 11550 / (516) 483-8200 / TWX 510-222-4189

military & commercial

DELAY LINES

WITH OR WITHOUT CIRCUITRY

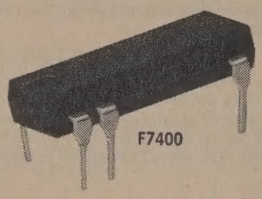
MAGNETOSTRICTIVE ★ LUMPED CONSTANT ★ ULTRASONIC ★ DISTRIBUTED CONSTANT ★ DISPERSIVE STRIP

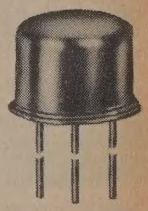
MAGNETOSTRICTIVE DELAY LINES — Fixed and variable delays to 10,000 microseconds. Fixed — FMS Series; Variable — VM Series.

FIXED MAGNETOSTRICTIVE DELAY LINE — Up to 10,000 bits of data for memory storage. Circuitry compatible with all microcircuit logic. Choice of data format: RZ, NRZ or Bipolar.

ULTRASONIC DELAY LINES — Replaces most quartz or glass lines. Offers superior performance, lower attenuation and smaller size at less cost. Frequencies to 30 MHz. Delays to 200 usec and greater.

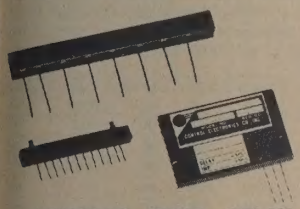
SUBMINIATURE DELAY LINES



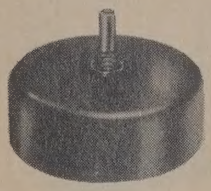


TO-5 and micrologic packaged delay lines from 0.01 to 0.64 and longer delays. Ideal for timing transistors and other circuit components.

LUMPED CONSTANT DELAY LINES — Many shapes available including miniature types with pin connectors for PC Boards, connector fingers for plug-in units...multi-tapped units...terminal-ended units, etc. Delays from 0.05 usec to 500 usec for standard units. Delay to risetime ratios up to 100:1. Temperature stability to 50 ppm/C°.



COMPACT FIXED DELAY LINES FOR PC BOARDS — Extremely high density packaging. Typical Unit: 25:1 delay-to-rise-time ratio in a volume of 2 cubic inches.

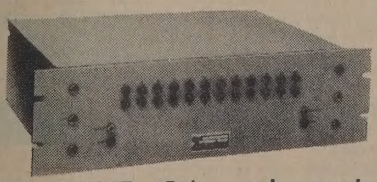


VARIABLE DELAY LINE Resolution of 1 part in 120. Delay up to 10 usec. 1" x 3½".

UNIQUE BINARY CODED SECTIONAL DELAY LINE — Uses miniature transfer switches. Also available with terminals for remote switching.

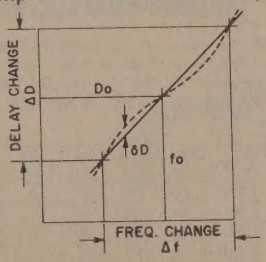
IFF MULTI-TAP DELAY LINES Standard IFF delay lines with taps every 1.45 usec. High density packaging available for airborne transponder use.

AUDIO, HIGH FREQUENCY & DISTRIBUTED CONSTANT DELAY LINES — With unusual circuits, extreme delays, high frequency application, rapid rise times, conforming waveform circuits and corrective circuits. Write for complete details.



AUDIO DELAY CABINET — Relay rack mounted cabinet houses 25 millisecond delay with taps at every ms. Units can be cascaded for longer delays.

DISPERSIVE STRIP DELAY LINES — Delay varies with frequency. A prime application is in Pulse Compression Radar Systems, eliminating large, expensive filter components. Compression ratios of 150:1, typical.



$\Delta D \cdot \Delta f$ = COMPRESSION RATIO OR DISPERSION FACTOR

$\frac{\Delta f}{fo}$ = BANDWIDTH %

fo = MIDBAND FREQUENCY

Do = MIDBAND DELAY

A subsidiary of Bell Electronic Corp.

For all your Delay Line requirements, contact:

CONTROL ELECTRONICS COMPANY, INC.

153 Florida Street, Farmingdale, L.I., N.Y. 11735 • (516) 694-0125

DATA DELAY DEVICES
253 CROOKS AVE., CLIFTON, N.J. 07011 Tel. (201) 772-1106

SHORT FORM CATALOG

DELAY LINES

STEP VARIABLE

DESCRIPTION

L-C networks in tandem, with precise delay increments and low attenuation. Use as delay syntesizers for evaluation of Worst-Case design analysis; as time delay standards and Phase measuring devices. Meets Military specifications. Type 510 and 511 use a single 10 positions switch.

SPECIFICATIONS

ACCURACY: ± 2% of setting. ATTENUATION and *TIME DELAY see table. *RISE TIME: 2% of time delay or less. TEMPERATURE COEFFICIENT: ± 50 PPM/°C. DISTORTION: Less than 3% for pulse signals on most types. Essentially no harmonic distortion for sine wave signals. SIZE: 8 x 3.5 x 4.5 (20.32 x 8.89 x 11.43 cm) Max. for type 510 and 511. 16.75 x 5.25 x 5.5 (41.54 x 13.33 x 13.97 cm) Max. for type 1510 and 1511 (Rack-Mount Panel available on request).

*other can be provided on request.

RISE TIME = 2% IMPEDANCE = 600 Ω				RISE TIME = 2% IMPEDANCE = 1000 Ω			
Type no.	Total Delay (us)	Delay Step (us)	Attn db	Type no.	Total Delay (us)	Delay Step (us)	Attn db
510–A	10.0	1.0	1	511–A	10.0	1.0	.6
510–B	25.0	2.5	1.5	511–B	25.0	2.5	1.0
510–C	50.0	5.0	2.0	511–C	50.0	5.0	1.5
510–D	100.00	10.0	3.5	511–D	100.0	10.0	2.5
510–E	500.00	50.0	4.0	511–E	500.0	50.0	3.0
510–F	1,000.00	100.00	4.5	511–F	1,000.00	100.0	4.0
1510–A	11.0	.1	1	1511–A	11.0	.1	.6
1510–B	110.0	1	3.5	1511–B	110.0	1	2.5
1510–C	1,100.0	10	4	1511–C	1,100.0	10	4.0
				1511–D	11,000	100	6.0

HIGH DENSITY

SPECIFICATIONS

TIME DELAY: 0-35 μs DELAY ACCURACY: ± 3%. RISE TIME: 3% of time delay. IMPEDANCE: up to 4000 ohms. PHASE RESPONSE: 1% up to 3db. FREQUENCY RESPONSE: up to 10 MC. ATTENUATION: Less than 0.1 db/μs TEMPERATURE COEFFICIENT: 1000 PPM/°C.

RISE TIME = 3% For other rise times SEE BULLETIN SERIES 100

TYPE 100A	DELAY (μs)	IMPEDANCE (OHMS)	TYPE 100A	DELAY (μs)	IMPEDANCE (OHMS)	TYPE 100A	DELAY (μs)	IMPEDANCE (OHMS)
525-A	5.25	075	1050E	10.50	400	700-G	7.00	600
350B	3.50	100	1400E	14.00	400	1400G	14.00	600
700-B	7.00	100	2100E	21.00	400	2100G	21.00	600
350-C	3.50	150	2800E	28.00	400	2800G	28.00	600
700-C	7.00	150	700-F	7.00	500	3500G	35.00	600
1050C	10.50	150	1050F	10.50	500	700-H	7.00	1000
350-D	3.50	200	1400F	14.00	500	1050H	10.50	1000
700-D	7.00	200	2100F	21.00	500	1400H	14.00	1000
1050D	10.50	200	2800F	28.00	500	2100H	21.00	1000
1400D	14.00	200	3500F	35.00	500	2800H	28.00	1000
700-E	7.00	400						

CONTINUOUSLY VARIABLE

SPECIFICATIONS

DELAY VARIATION: 0 to 10 shaft rev. ACCURACY: ± 3% or better. BANDWIDTH: f(3db)=.35/TR. IMPEDANCE TOLERANCE: ± 10% or better. OPERATING TEMPERATURE: -60°C to +125°C. TEMPERATURE COEFFICIENT: 50 PPM/°C for type 500. 170 PPM/°C for type 501. CASE: plastic. DIMENSION: 6.5 x 1.56 x 1.12 (16.5 x 3.96 x 2.85 cm). SHAFT: .25 dia. (.635 cm). MOUNTING: 2 - 6 - 32 centered on 1.56 side, spaced 6.25.

TYPE	IMP. (Ω)	DELAY (μs)	TR (μs)	ATT. (db)	RES. (ns)	TYPE	IMP. (Ω)	DELAY (μs)	TR (μs)	ATT. (db)	RES. (ns)
500-A	75	1.25	.12	1.5	2.5	500-F	250	0.50	.05	.5	1.0
500-A1	75	1.50	.15	1.5	3.0	500-F1	250	1.00	.10	2	1.2
500-B	100	1.00	.10	1.0	2.0	500-G	300	0.60	.06	1.2	.6
500-B1	100	1.50	.15	1.5	3.0	500-G1	300	1.25	.12	3	1.0
500-B2	100	2.00	.20	4	2	500-J	450	0.90	.09	2	.7
500-C	120	0.90	.09	1.0	2	501-A	220	0.15	.025	.25	.4
500-C1	120	1.75	.17	3	1.8	501-B	370	0.25	.040	.50	.5
500-D	150	0.62	.060	.9	1.3	501-C	400	0.35	.045	.50	.45
500-D1	150	1.50	.15	1.5	3	501-D	440	0.60	.060	.5	.6
500-D2	150	2.50	.25	9	2.0	501-E	540	0.70	.080	.6	.7
500-D3	150	2.75	.27	9	2.2	501-F	630	1.10	.10	1	.7
500-E	200	2.00	.20	6	1.6						

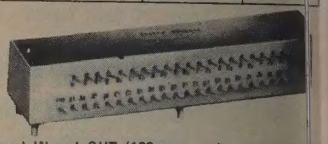
ELECTRICALLY VARIABLE

SPECIFICATIONS

DELAY VARIATION: 30% or more of total delay. DELAY TRACKING: ± 4%, ± 1% if control is sawtooth. DELAY/VOLTAGE LINEARITY: Normally non-linear. FREQUENCY RESPON MHz. Max. DELAY/RISE TIME RATIO: 10/1 (other to specification). MAXIMUM CURRENT: IMPEDANCE VARIATION: Less than 4%. VOLTAGE SWING: 0-20V max. ATTENUATION than 2db over the voltage swing. SIZE 5 x 1.25 x 1.25 (12.7 x 3.17 x 3.17 cm) max. CASE Epoxy. TERMINALS: #18 gauge pins, .25 long.

P/N	DELAY CHANGE (μs)	MAX. DELAY (μs)	MIN. DELAY (μs)	VOLTAGE RANGE	IMPEDANCE (Ω)	MAX. RISE-TIM (μs)
300-A	10	33	23	20	150	4.1
300-B	4.8	21	16.2	20	220	2.8
300-C	3.2	15	11.8	20	300	2.0
300-D	2.0	10	8	20	500	1.3
300-E	1.6	7	5.4	20	700	.91
300-F	1.0	4.5	3.5	20	85	.67

AUDIO



SPECIFICATIONS

TOTAL DELAY: See table. TAP DELAY: Normal IN and OUT (100 taps can be accommoda DELAY ACCURACY: ± 3% (± ½% on request). IMPEDANCE: 200 to 10,000 ohms. ± 5%. ATTE ATION: 6 db or better. PHASE RESPONSE: ± 1% over bandwidth. TEMPERATURE RANGE: -5 to +125°C. TEMPERATURE COEF.: ± 50 PPM/°C (± 15 PPM/°C on request). WORKING VOLT.: WVDC (400 WVDC on request). CASE: Vertically sealed metal. SIZE: 5.75 x 3 x 2 (14.6 x 7.67 x cm). MOUNTING: 4 - 10 - 32 x .25 studs, spaced 3.5 x 2. TERMINALS: Glass-to-metal or press

PART NO. 7000 -	DELAY (μs)	RISE TIME (μs)	BW (KHZ)	IMPEDANCE (Ω)	PART NO. 7000 -	DELAY (μs)	RISE TIME (μs)	BW (KHZ)	IMPEDAN (Ω)
100A	100	4	0-80	500	800B	800	32	0-10	1000
100B	100	4	0-80	1000	1000A	1000	40	0-8	500
200A	200	8	0-40	500	1000B	1000	40	0-8	1000
200B	200	8	0-40	1000	2000A	2000	80	0-4	500
400A	400	16	0-20	500	2000B	2000	80	0-4	1000
400B	400	16	0-20	1000	4000A	4000	160	0-2	500
800A	800	32	0-10	500	4000B	4000	160	0-2	1000

LOW COST

SPECIFICATIONS

TEMPERATURE RANGE: -55°C to -105°C. WORKING VOLTAGE: 200 VDC. CASE: Nickel plat brass, glass to metal end seals.

PART NO. 2000 -	DELAY ± 3%	RISE TIME	D.C. RES. OHMS	IMPEDANCE OHMS ± 5%	MAX. ATTEN.	LENGTH (INCHES)
100A	100 ns	30 ns	7	500	4%	1
200A	200 ns	70 ns	10	500	2%	1
200C	200 ns	70 ns	17	1000	2%	1
300A	300 ns	100 ns	5	500	1%	1
300C	300 ns	100 ns	12	1000	2%	1
400A	400 ns	100 ns	15	500	3%	1.5
400C	400 ns	100 ns	15	1000	3%	1.5
500B	500 ns	120 ns	14	700	2%	1.5
1000D	1000 ns	200 ns	36	1400	3%	1.5
1100E	1100 ns	280 ns	30	1500	2%	1.5

COMPUTER DELAY LINES

SPECIFICATIONS

TEMPERATURE RANGE: -55°C to +125°C. DISTORTION: 5% Max. DC WORKING VOLTAGE: 200 VDC. CASE EPOXY. SIZE L x .45 x .33 ma

PART NO. 1000 -	DELAY ± 2%	RISE TIME	RES. D.C. OHMS	IMP. OHMS 10%	LENGTH MAX. (IN)	PART NO. 1000 -	DELAY ± 2%	RISE TIME	RES. D.C. OHMS	IMP. OHMS 10%	LENGTH MAX. (IN)
25A	25ns	20ns	3.5	500	2	400A	400ns	44ns	41	500	3
50A	50ns	22ns	6	500	2	450A	450ns	46ns	46	500	3
100A	100ns	24ns	11	500	2	500A	500ns	50ns	51	500	3
125A	125ns	25ns	13.5	500	2	600A	600ns	56ns	61	500	5.25
200A	200ns	31ns	21	500	2	700A	700ns	62ns	71	500	5.25
225A	225ns	32ns	23.5	500	2	800A	800ns	68ns	81	500	5.25
250A	250ns	35ns	26	500	2	900A	900ns	74ns	91	500	5.25
300A	300ns	37ns	31	500	2	1000A	1000ns	80ns	100	500	5.25

VARTOR

DESCRIPTION
Variable inductor, reliable. Typical uses–sweep generators, analyzers, telemetry equipments, etc.

SPECIFICATIONS
INDUCTANCE RANGE: See table. INDUCTANCE VARIATION RATIO: 10:1. 0 to 100 MA. TRACKING ACCURACY: ± 4%. MATCHED UNITS: ± 1% (or better on request). CASE: Potted (printed circuit). SPECIAL UNITS: To specification, (lower bias current, greater inductance variation more linear).

Q.	SIGNAL WINDING				CONTROL WINDING		
	INDUCT. RANGE (MH)	Q MIN.	Q MAX.	FREQ. RANGE* (KHz)	CURRENT RANGE (MA)	"L" MAX. (MH)	D.C. RES. (OHMS)
0	3.4 – 20	70	110	30 – 90	1 – 100	220	60
1	1.3 – 12	23	95	40 – 120	1 – 100	210	60
2	1.0 – 2.0	50	70	110 – 150	1 – 80	200	60
3	1.4 – 2.1	60	150	240 – 300	5 – 100	200	60
4	.80 – 5.2	55	96	150 – 400	5 – 100	205	45
5	.55 – 1.2	30	110	330 – 450	10 – 100	200	60

TOROIDS

DESCRIPTION
Have the highest "Q" in the freq. range of 0.1 KHz to 1 MHz. Potted, rugged, temperature stable, and low cost. Matched units available.

SPECIFICATIONS
INDUCTANCE RANGE: 0.050 MH to 36 H. DC or AC VARIATION EXCITATION:* "Q" FACTOR: Max.*. INSULATION RESISTANCE: Terminals to case 10,000 meg. at 100 VDC. TEMPERATURE COEFFICIENT: ± 18 PPM/°C from -55°C to +85°C. MULTIPLE TAPS: available. ACCURACY: ± 1% or ±.5%.
*Bulletin No. 90.

COIL DES. 3D-90T	IND. MH @ 10 KHz	RDC OHMS	CD (PF)	MAX. (MA)	COIL DES. 3D-90T	IND. MH @ 10 KHz	RDC OHMS	CD (PF)	MAX. (MA)
-1	.05 ± 2.5%	.8	13	78	-17	.86 ± 1.0%	7.1	22	40
-2	.06 ± 2.5%	.9	13	78	-18	1.0 ± 1.0%	7.8	24	40
-3	.072 ± 2.5%	1.0	14	78	-19	1.2 ± 1.0%	8.2	26	40
-4	.086 ± 2.5%	1.05	14	78	-20	1.5 ± 1.0%	11.0	27	31
-5	.10 ± 2.5%	1.1	15	78	-21	1.75 ± 1.0%	11.7	27	31
-6	.12 ± 2.5%	1.25	16	78	-22	2.0 ± 1.0%	12.8	28	31
-7	.15 ± 2.5%	1.7	17	55	-23	2.4 ± 1.0%	14.0	30	31
-8	.175 ± 2.5%	2.0	17	55	-24	3.0 ± 1.0%	18.7	30	25
-9	.20 ± 1.5%	2.2	18	55	-25	3.6 ± 1.0%	20.6	28	25
-10	.24 ± 1.5%	2.4	18	55	-26	4.3 ± 1.0%	22.6	32	25
-11	.30 ± 1.5%	2.7	19	55	-27	5.0 ± 1.0%	30.0	33	20
-12	.36 ± 1.5%	2.9	19	55	-28	6.0 ± 1.0%	33.6	34	20
-13	.43 ± 1.5%	3.2	20	55	-29	7.2 ± 1.0%	39.6	35	20
-14	.50 ± 1.5%	4.4	20	47	-30	8.6 ± 1.0%	50.5	38	16
-15	.60 ± 1.5%	5.0	21	47	-31	10.0 ± 1.0%	54.5	38	16
-16	.72 ± 1.5%	5.4	21	47					

DECADE INDUCTORS

DESCRIPTION
audio and low frequencies. Used in prototype, lab. standards, wave filters, equalizers, tuned circuits and related applications. Switches are Make before Break and constructed of ceramic stator-and-rotor members with ball-and-socket detent. Contacts silver alloy.

SPECIFICATIONS
ACCURACY: ± .25% at 1KHZ (other freq. on request). DC RESISTANCE: Approx. 40 ohms per H. TEMPERATURE COEFFICIENT: ± 26 PPM/°C between 16°C and 32°C. MAX. VOLTAGE: 130 VRMS. MAXIMUM CURRENT:*. TERMINALS: Type 400 soldering lugs on .75 spacing. Type 1400 tip-top binding posts on standard .75 in. spacing. CASE DIMENSIONS: Type 400 8 x 3.5 x 4 (20.32 x 8.89 x 10.16 cm) Max. Type 1400 16.75 x 8.25 x 5.5 (42.54 x 20.32 x 13.97 cm) max. INDUCTANCE CHANGE WITH AC CURRENT:*. INCREMENTAL INDUCTANCE:*.

See catalog sheet on Decade Inductors.

TYPE	TOTAL INDUCTANCE	INDUCTANCE INCREMENT	TYPE	TOTAL INDUCTANCE	INDUCTANCE INCREMENT
400 – A	1 mhy	.1 mhy	400 – E	10 hy	1 hy
400 – B	10 mhy	1 mhy	1400 – A	1.111 hy	.1 mhy
400 – C	.1 hy	.01 hy	1400 – B	11.11 hy	1 mhy
400 – D	1 hy	.1 hy			

LOW FREQUENCY OSCILLATORS

SPECIFICATIONS
OPEN-CIRCUIT VOLTAGE: 1.5 VRMS. FREQUENCY ACCURACY: ± 0.1% or ± 1HZ (whichever is greater). POWER: +12 VDC, 0.5 MA. DISTORTION: Less than 1%. OUTPUT LOADING: 1 Meg-Ohm Min. (if less specify). TEMPERATURE COEFF.: 0.016%/°C (others on request). TEMPERATURE RANGE: -25°C to +85°C. ENCAPSULATION: Epoxy resin. TERMINALS: (4) No. 18 gauge pins, 1.10 x 1.10 spacing. SIZE: 1.5 x 1.5 x .5 (3.81 x 3.81 x 1.27 cm).

MODEL	FREQ. (HZ)	MODEL	FREQ. (HZ)	MODEL	FREQ. (HZ)
LF010-A	1,000	LF010-H	7,000	LF010-P	14,000
LF010-B	1,600	LF010-J	8,000	LF010-Q	15,000
LF010-C	2,000	LF010-K	9,000	LF010-R	16,000
LF010-D	3,000	LF010-L	10,000	LF010-S	17,000
LF010-E	4,000	LF010-M	11,000	LF010-T	18,000
LF010-F	5,000	LF010-N	12,000	LF010-U	19,000
LF010-G	6,000	LF010-O	13,00	LF010-V	20,000

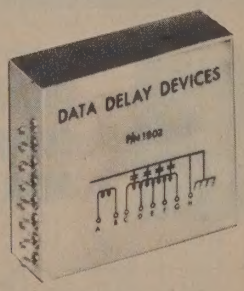
LOW AND HIGH PASS FILTERS

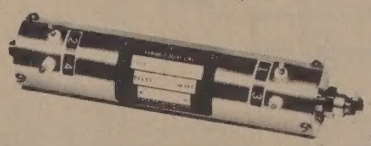
DESCRIPTION
Designed to meet or exceed requirements of MIL-F-18327. Compact, light weight, reliable, more than meets the demands of modern equipment design. Housed in hermetically sealed case. Plug-in terminals for printed circuit boards.

SPECIFICATIONS
INSERTION LOSS: 1.5 db. ATTENUATION: ± 0.5 db. OPERATING VOLTAGE: greater than 10V. SKIRT RESPONSE: -55 db. IMPEDANCE: unbalanced. SERVICE LIFE: in excess of 10,000 hrs. TERMINALS: 0.040 dia. x ¼. MOUNTING: #4-40NC - 2B inserts (4). SIZE: 3.18 x 1.25 x .56 (8.09 x 3.17 x 1.42 cm).

FREQ. (KHZ)	IMP. OHMS	PART NO.		FREQ. (KHZ)	IMP. OHMS	PART NO.	
		HP	LP			HP	LP
1.0	1000	H 101	L 101	10.0	1000	H 113	L 113
1.0	600	H 102	L 102	10.0	600	H 114	L 114
1.5	1000	H 103	L 103	12.0	1000	H 115	L 115
1.5	600	H 104	L 104	12.0	600	H 116	L 116
2.0	1000	H 105	L 105	15.0	1000	H 117	L 117
2.0	600	H 106	L 106	15.0	600	H 118	L 118
3.0	1000	H 107	L 107	20.0	1000	H 119	L 120
3.0	600	H 108	L 108	20.0	600	H 120	L 120
4.0	1000	H 109	L 109	25.0	1000	H 121	L 121
4.0	600	H 110	L 110	25.0	600	H 122	L 122
5.0	1000	H 111	L 111	30.0	1000	H 123	L 123
5.0	600	H 112	L 112	30.0	600	H 124	L 124

CUSTOM DESIGNED ITEMS





DATA DELAY DEVICES
253 CROOKS AVE., CLIFTON, N.J. 07011 Tel. (201) 772-1106

ESC ELECTROMAGNETIC DELAY LINES

COMPUTER DELAY LINES

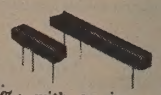
TO MIL-D-23859
USUALLY IN STOCK

ESC miniature computer delay lines feature multiple taps and adjustability of delay. They are transfer molded epoxy or in epoxy cases and are designed for PC board mounting.

Model	Time Delay (usec.)	Rise Time (usec.)	Impedance (Ohms)	D.C. Resistance (Ohms)	Dimensions (L"xW"H")
10A09	100	20	93	4.0	3.250x.870x.380
19-71D	125	20	93	3.2	1.550x.875x1.550
19-23G	2x125	20	93	2x3.2	3.250x.875x.360
12A21	225	35	93	5.0	3.250x.875x.380
12A22	45	17	93	2.5	1.50x.875x.380
12A23	200	35	93	5.0	3.250x.875x.380
12A24	180	35	93	5.0	3.250x.875x.380
19-82	250	55	100	4.5	3.250x.870x.360
11A79	250	55	100	4.5	3.250x.870x.380
19-73	350	50	93	2.5	1.500x.875x.380
11A77	350	40	93	4.0	3.250x.870x.380
11A78	500	90	100	8.5	3.250x.870x.380
11A70	1000	100	100	4.0	3.250x.870x.380
13A27	1, 2, 4	4	50	.7	.490x.490x.370

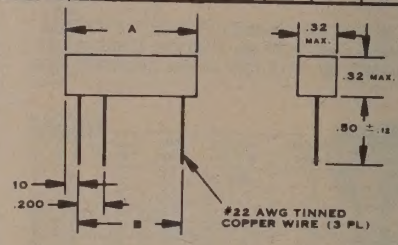
SUBMINIATURE NANOSECOND DELAY LINES

- **Operating Temperature:** −55°C to +125°C
- **Temperature Coefficient:** 100 ppm/°C
- **Attenuation:** 0.5 db max.
- **Distortion (typical):** ±10%; with an input rise time of 20% of specified rise time or 1 nsec. whichever is greater
- **Dielectric Strength:** 100 VDC



SERIES SM
TO MIL-D-23859
USUALLY IN STOCK

IMPEDANCE 100Ω ±10%				IMPEDANCE 200Ω ±10%				IMPEDANCE 500Ω ±10%			
Model No.	Delay nsec. ±5%	Rise Time nsec. Max.	Case	Model No.	Delay nsec. ±5%	Rise Time nsec. Max.	Case	Model No.	Delay nsec. ±5%	Rise Time nsec. Max.	Case
SMA10	10	2.5	1	SMB10	10	2.5	1	SMC100	100	30	1
SMA20	20	6.0	1	SMB20	20	6	1	SMC150	150	45	1
SMA30	30	8.5	1	SMB30	30	8.5	1	SMC200	200	60	1
SMA40	40	12	1	SMB40	40	12	1	SMC300	300	80	1
SMA50	50	15	1	SMB50	50	15	1	SMC400	400	55	2
SMA60	60	12	2	SMB60	60	12	2	SMC500	500	70	2
SMA80	80	16	2	SMB80	80	16	2	SMC600	600	80	2
SMA100	100	20	2	SMB100	100	20	2	SMC1200	1200	250	2



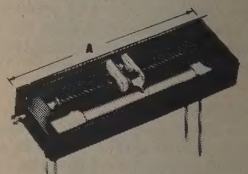
CASE	A	B
1	1.00	0.800
2	2.00	1.800

MINIATURE TRIMMER DELAY LINE

The Series 800 Trimmer delay line is designed for circuits requiring precision delay adjustments and is particularly suitable for printed board mounting. Sealed in an alkyd resin case, and with precious metal contacts, the "Trimline" will meet or exceed most equipment specifications.

USUALLY IN STOCK

- Attenuation: less than .5 db
- Resolution: less than 1 nsec.
- External termination (not supplied)
- Dielectric Strength: 300 VDC
- Operating temperature: −55°C to +125°C
- O Ring shaft seal
- High impedance tap (variable)
- Width: .75" max.
- Height: .35" max.



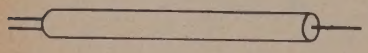
SERIES 800 "TRIMLINE"™

MODEL	DELAY* (nsec)	CHAR. IMPEDANCE (ohms)	APPROXIMATE TD/TR RATIO	"A" DIM	APPROX. # OF REVOLUTIONS
801	50	200	4:1	2.25	6
802	75	1000	4:1	2.25	6
803	100	200	7:1	4.00	12
804	125	500	4:1	2.25	6
805	150	1000	7:1	4.00	12
806	250	500	7:1	4.00	12
807	10	100	4:1	2.25	6
808	20	100	7:1	4.00	12

* Min. delay at max. position.

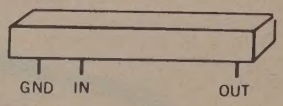
TO MIL-D-23859
USUALLY
IN STOCK

DISTRIBUTED CONSTANT DELAY LINES



CYLINDRICAL TYPE

- −55°C to +125°C
- Temperature coefficient of delay approximately 200 PPM°C
- Encapsulation in resin
- Delays from .02 μsec to 1.2 μsec.
- Impedance: 100, 200, 500, 1000, 1200 and 1800 ohms



PRINTED BOARD TYPE

ESC ELECTRONICS
534 BERGEN BOULEVARD • PALISADES PARK, N. J. 07650 • (201) 947-0400
World's Leading Designer and Producer of Delay Lines
A Division of General Laboratory Associates / A Simmonds Precision Subsidiary

ESC ELECTROMAGNETIC DELAY LINES

TO MIL-D-23859 USUALLY IN STOCK

MINIATURE VARIABLE DELAY NETWORKS

The Series 700 of Miniature Variable Delay Networks has been designed and created by ESC to meet the increasing demand for variable delay lines suitable for printed board mounting.

- Operation: continuously variable shaft rotation of 4½ turns from zero to maximum delay.
- High impedance tap (variable)
- Outside dimensions: 4½" x 1½" x ½"
- Operating temperature —55°C to 125°C
- Resolution: better than 1/1000 of maximum delay
- External termination (not supplied)
- Can be operated above ground potential
- O Ring shaft seal.

MODEL NO.	TIME DELAY*	IMPEDANCE	PULSE RISE TIME**
701	.125 usec.	1500 ohms	.03 usec. (max.)
702	.25 usec.	1800 ohms	.06 usec. (max.)
703	.50 usec.	1000 ohms	.10 usec. (max.)
704	.75 usec.	680 ohms	.15 usec. (max.)
705	1.0 usec.	560 ohms	.20 usec. (max.)
706	1.25 usec.	470 ohms	.25 usec. (max.)
707	1.50 usec.	390 ohms	.30 usec. (max.)
708	.65 usec.	93 ohms	.10 usec. (max.)
Pulse Attenuation —1.0 db (max.) all units DC Working Volts — 500 volts (max.)			

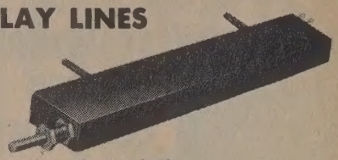
*Minimum delay at max. position.

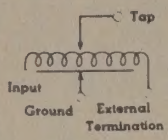
**Pulse rise time at termination of delay line.

Mechanical and electrical modifications available on special order.

TO MIL-D-23859 USUALLY IN STOCK

CONTINUOUSLY VARIABLE DELAY LINES





SERIES 400

- Attenuation: less than 1.0 db
- Resolution: better than .001 μsec.
- External termination not supplied)
- Can be operated above ground potential
- Operating temperature: — 55°C to + 125°C
- O Ring shaft seal.
- Operation: continuously variable shaft rotation of 10 turns from zero to maximum delay
- High impedance tap (variable)
- Outside dimensions: 6 17/32 x ⅝ x 1¼

No.	Delay (Max.)	Rise Time* (Max.)	Impedance (Ohms)
401	.10 μsec	.03 μsec	100
402	.20 μsec	.04 μsec	200
403	.70 μsec	.095 μsec	500
404	.50 μsec	.09 μsec	750
405	.40 μsec	.075 μsec	1000
406	.25 μsec	.045 μsec	1300
407	.20 μsec	.04 μsec	1500

*As measured at termination.

SERIES 500*

- Resolution: better than 1/1000 of maximum delay
- External termination (not supplied)
- Can be operated above ground potential
- O Ring shaft seal
- Operation: continuously variable shaft rotation of 10 turns from zero to maximum delay
- High impedance tap (variable)
- Outside dimensions: 7¼" x 1" x 1⅝"
- Operating temperature —55°C to +125°C

*Delay to rise time ratio of 10:1, also available upon special order.

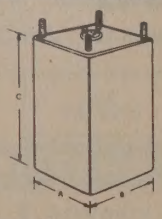
No.	Delay (Max.)	Impedance (Ohms)	Rise Time* (Max.)	Attenuation
501	.9 μsec	1000	.2 μsec	.5 db
502	2.0 μsec	470	.40 μsec	1.2 db
503	4.0 μsec	220	.80 μsec	2.5 db
504	9.0 μsec	100	1.8 μsec	5.0 db
505	15.0 μsec	56	3.0 μsec	9.0 db

*As measured at termination

CUSTOM DESIGNS: In addition to the above listed models, ESC can supply you with custom-designed Continuously Variable Delay Lines for your special applications.

TO MIL-D-23859

MILLISECOND DELAY NETWORKS



Dim.	A	B	C
D	2.25	3.75	4.25
E	2.12	2.25	4.50
F	2.12	2.25	3.00
G	3.41	6.81	4.89
H	3.00	3.50	5.06
J	3.00	3.50	3.81
K	4.44	5.44	6.69
M	4.25	5.00	5.44
Q	3.63	4.25	5.50

SPECIFICATIONS:

Delay Tolerance ..... ±5%

Attenuation:

10, 20, 25 μsec ..... 1.5 db

50, 100, 200 μsec ..... 2.0 db

250 μsec ..... 2.5 db

500 μsec and over ..... 4.0 db

Characteristic Impedance		Size Letter	500Ω	1000Ω	2000Ω
Delay (ms)	Rise Time (μs)		Model	Model	Model
.1	2.0	G	7C103	7D103	7F103
.1	3.0	H	6C103	6D103	6F103
.1	4.0	J	5C103	5D103	5F103
.2	4.0	G	7C203	7D203	7F203
.2	6.0	H	6C203	6D203	6F203
.2	8.0	J	5C203	5D203	5F203
.25	5.0	G	7C253	7D253	7F253
.25	7.5	H	6C253	6D253	6F253
.25	10.0	J	5C253	5D253	5F253
.5	10.0	G	7C503	7D503	7F503
.5	15.0	H	6C503	6D503	6F503
.5	20.0	J	5C503	5D503	5F503
1.0	20.0	K	7C104	7D104	7F104
1.0	30.0	M	6C104	6D104	6F104
1.0	40.0	Q	5C104	5D104	5F104
2.0	40.0	K	7C204	7D204	7F204
2.0	60.0	M	6C204	6D204	6F204
2.0	80.0	Q	5C204	5D204	5F204
3.0	60.0	K	7C304	7D304	7F304
3.0	90.0	M	6C304	6D304	6F304
3.0	120.0	Q	5C304	5D304	5F304
5.0	100.0	K	7C504	7D504	7F504
5.0	150.0	M	6C504	6D504	6F504
5.0	200.0	Q	5C504	5D504	5F504

GEOPHYSICAL APPLICATIONS

Part Number 81-27 Total time delay of 28 msec. tapped at 1.0 msec. intervals. Amplitude response flat within ±.25 db from 15 cps to 250 cps. Phase response linear with ±.075% over the same frequency range. Impedance is 5000Ω and attenuation less than 6.0 db. Size 6" x 10" x 14".

Part Number 81-43 Total time delay of 50 msec. impedance is 5000. Atten. vs. frequency: —3 db at 800 cps; within ±1 db from 100 to 600 cps. Insertion loss is 8 db.

SONAR APPLICATIONS

Part Number 81-41 Total time delay of 2.9 msec. tapped at 100 μsec intervals. Tap tolerance of 20 μsecs over temperature range of 0° to 65°C and dynamic range of 0.10 to 10 volts with $\cos^2$ input pulse. Impedance is 1000Ω and attenuation less than 6.0 db. Hermetically sealed metal case, 3.5" x 4.5" x 11.5".

ESC ELECTRONICS

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World's Leading Designer and Producer of Delay Lines

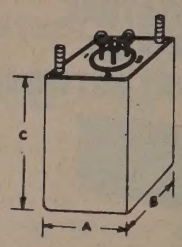
A Division of General Laboratory Associates · A Simmonds Precision Subsidiary

ESC ELECTROMAGNETIC DELAY LINES

TO MIL-D-23859 USUALLY IN STOCK

STANDARD LUMPED CONSTANT DELAY LINES

- Delay Tolerance ± 5%
- Attenuation:
  1 μsec. or less — 1 db Max.
  2.5 and 5.0 μsec —3 db Max.
  10, 25 and 50 μsec. — 6 db Max.
- Temperature Stability — .00005 μsec/μsec/°C
- Operating Temperature Range —55°C to +125°C
- Output Pulse Distortion ± 10% Max.



Dim.	A	B	C
L	1 3/16	1 3/16	3 1/4
N	1 3/16	1 3/16	2
O	1 3/16	1 3/16	3
P	1 5/8	1 7/8	3
R	1 5/8	1 7/8	3 3/4
S	1 7/16	1 7/8	3 1/4
T	1 3/16	1 3/16	2 1/2
V	2 1/8	2 1/4	4 1/2
W	1 3/16	1 3/16	3 7/8
X	2 1/8	2 1/4	3 1/2
Y	2 13/16	3 5/16	4 1/2
Z	1	1	2

CHARACTERISTIC IMPEDANCE →		50Ω		100Ω		200Ω		500Ω		1000Ω		1200Ω		2000Ω	
Delay (μsec)	RISE TIME (μsec)	Size Letter	Model	Size Letter	Model	Size Letter	Model	Size Letter	Model	Size Letter	Model	Size Letter	Model	Size Letter	Model
0.25	.05	N	1G250	Z	1A250	Z	1B250	Z	1C250	Z	1D250	Z	1E250		
0.25	.025	L	2G250	T	2A250	T	2B250	T	2C250						
0.25	.015			O	3A250	O	3B250	O	3C250						
0.50	.1	N	1G500	Z	1A500	Z	1B500	Z	1C500	Z	1D500	Z	1E500	Z	1F500
0.50	.05	T	2G500	T	2A500	T	2B500	T	2C500	T	2D500				
0.50	.03	O	3G500	O	3A500	O	3B500	O	3C500						
1.0	.20	N	1G101	N	1A101	Z	1B101	Z	1C101	Z	1D101	Z	1E101	Z	1F101
1.0	.10	T	2G101	T	2A101	T	2B101	T	2C101	T	2D101	T	2E101	T	2F101
1.0	.06	O	3G101	O	3A101	O	3B101	O	3C101		3D101				
1.0	.03			R	4A101	R	4B101								
2.5	.50	L	1G251	L	1A251	N	1B251	Z	1C251	Z	1D251	Z	1E251	Z	1F251
2.5	.25	P	2G251	T	2A251	T	2B251	T	2C251	T	2D251	T	2E251	T	2F251
2.5	.15	S	3G251	O	3A251	O	3B251	O	3C251	O	3D251	O	3E251	O	3F251
2.5	.075	R	4G251	R	4A251	R	4B251	R	4C251	R	4D251	R	4E251		
5.0	1.0	W	1G501	L	1A501	L	1B501	N	1C501	Z	1D501	Z	1E501	N	1F501
5.0	.50	P	2G501	P	2A501	T	2B501	T	2C501	T	2D501	T	2E501	T	2F501
5.0	.30	S	3G501	S	3A501	O	3B501	O	3C501	O	3D501	O	3E501	O	3F501
5.0	.15	X	4G501	R	4A501	R	4B501	R	4C501	R	4D501	R	4E501		
10.0	2.0			W	1A102	L	1B102	N	1C102	N	1D102	N	1E102	N	1F102
10.0	1.0	R	2G102	P	2A102	P	2B102	T	2C102	T	2D102	T	2E102	T	2F102
10.0	.6	V	3G102	S	3A102	S	3B102	O	3C102	O	3D102	O	3E102	O	3F102
10.0	.3	X	4G102	X	4A102	R	4B102	R	4C102	R	4D102	R	4E102	R	4F102
25.0	5.0							L	1C252	O	1D252				
25.0	2.5					P	2B252	P	2C252	P	2D252	T	2E252	T	2F252
25.0	1.5	V	3G252	V	3A252	V	3B252	S	3C252	O	3D252	O	3E252	S	3F252
25.0	.75	Y	4G252	X	4A252	X	4B252	R	4C252	R	4D252	R	4E252	R	4F252
50.0	5.0							P	2C502						
50.0	3.0			V	3A502	V	3B502	S	3C502	S	3D502	S	3E502	S	3F502
50.0	1.5	Y	4G502	Y	4A502	X	4B502	X	4C502	R	4D502	R	4E502	R	4F502

AIR TRAFFIC CONTROL APPLICATIONS

Transponders • Beacon Decoding Networks • Airborne Computers
IFF Coding and Decoding • Radar • DME

Model	Time Delay (usec)	Rise Time (usec.)	Impedance (Ohms	Attenuation (db)	Taps (usec.)	Size (L"xW"xH")
54-05	24.65	0.47	400	3.0 @ 25 C	1.45 ±.05	4.3x4x.5
45-13	27.0	0.65	470	3 max.	16 at 1.45 intervals ±.05	3.25x2.50x2.0
54-21	24.65 ±.1	0.47 max.	470	4.0 @ 25 C	18 at 1.45 intervals	5.28x4x.818 (max.)
54-39	2 lines of 10.15	0.33	400	1.5 @ 25 C	1.45 ±.05	4.75x4.85x.625
54-40	25.2	0.50	400	3 max. @ 25 C	6 at .2 intervals ±.05	4.75x4.85x.625
53-42	27.0	0.55 max.	180	6 max.	26 — not periodic	.125x2.187x 1.687
54-67	29 ±1%	2.0 max.	400	2	Tapped @ 11.0 ±1%	3x.25x1.5
54-76	2 lines of 10.15	.3	400	2	60 — not periodic	4.75x4.5x.7

Although the pulse interval is standardized, other parameters such as impedance, rise time, tolerances, and size are subject to the system designer's discretion. Our long experience in this field can help you choose an economically satisfactory solution without compromising system performance. Some representatives lines are described below.

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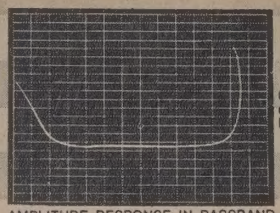
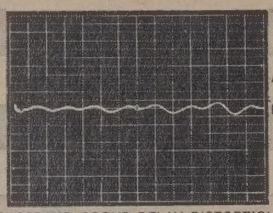
HOW KAPPA GETS CONSTANT DELAY IN STEEP RESPONSE FILTERS!



AMPLITUDE RESPONSE IN PASSBAND



PASSBAND GROUP DELAY DISTORTION

Difficult? . . . of course! . . . but

WE PROGRAMMED A GENERAL SOLUTION

in double precision **FOR** a high-speed digital computer, to enable us to meet the demands of systems requiring delay distortionless transmission.

ANY PREDETERMINED ENVELOPE DELAY

can now be attained

BY ITERATION OF THE POLES AND ZEROES

of a complete system with up to 50 equalizer sections. By **ACHIEVING EQUAL RIPPLE RESPONSE** this method outperforms any other equalization technique in minimizing delay distortion. KAPPA design engineers can assist you in attaining **ECONOMICALLY** an improved accuracy of time correlation between signals in data transmission systems.

KAPPA 2211 SERIES FILTERS

(TYPE: BAND PASS)

PASS BAND RESPONSE:	
Frequency Range:	3300-6000 Hz (1 db points)
Amplitude ripple:	± 0.25 db.
Group Delay Distortion:	Less than ± 100 usec.
Insertion Loss at 4500 Hz:	Less than 2.5 db
STOP BAND RESPONSE:	Min 50 db at 3000 Hz and lower Min 50 db at 6420 Hz and higher
Impedance Range:	500-6000 ohms
Pass Band Harmonic Distortion:	Less than −65 db
Intermodulation Distortion between equal simultaneous level tones:	55 db below −10 dbm
Environmental:	MIL F-18237 B

For prompt engineering assistance call us collect at (201) 541-4226

Contact us for the name of your nearest representative or consult listing in this directory. Complete new catalog available.

KAPPA NETWORKS, INC.
Delay Line Specialists • Electric Wave Filters
Manufacturing Engineers
165 ROOSEVELT AVENUE · CARTERET, NEW JERSEY 07008 · TEL. (201) 541-4226

KAPPA FILTERS

Excellence in Design

Uniformity in Production

Timely Delivery

Low Pass
High Pass
Band Pass
Band Stop
RFI
Delay Correcting Networks
DC to 100 MHZ

SPECIFY:
Type:
Frequencies:
Cutoff:
Max. Attenuation:
Impedance:

We will computer-design your special Filter requirements for production reality.

Feel free to consult our well-staffed Filter Department for any help, anytime.

KAPPA NETWORKS, INC.
Delay Line Specialists
Electric Wave Filters
Manufacturing Engineers
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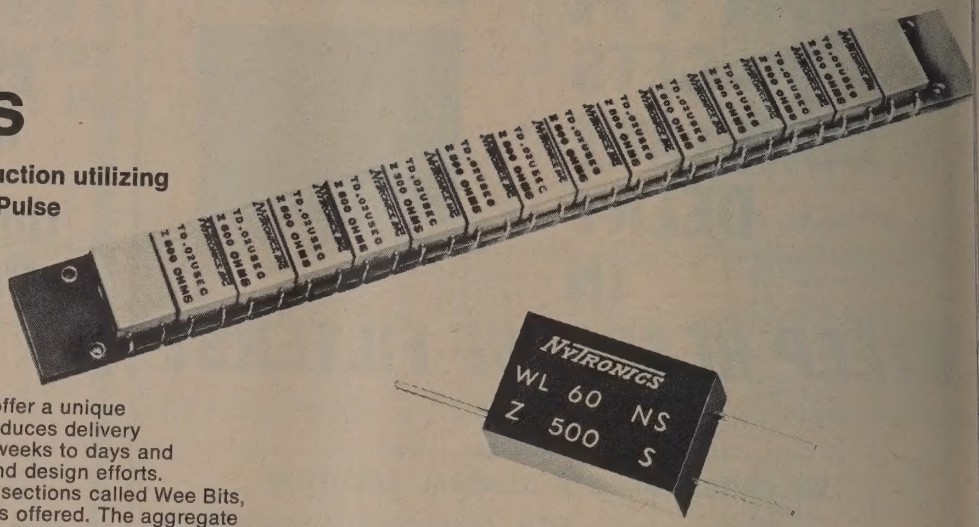
World's largest manufacturer of broadcast quality delay lines.

Nytronics Delay Line Sections



Wee Bits

Unique sectional construction utilizing individual pre-designed Pulse Delay elements.

48 hour delivery, not 8 weeks.

No tooling expenses.

Wee Bit Line — Wee Bits offer a unique sectionalized delay line that reduces delivery for prototype delay lines from weeks to days and eliminates expensive tooling and design efforts. Consisting of pre-designed LC sections called Wee Bits, a discreet value of delay time is offered. The aggregate number of Wee Bits determines the total delay time and is a function of delay to rise time ratio. The Wee Line assembly is made of selected Wee Bits mounted on printed circuit boards that conform to MIL-P-13949B, stacked or single layer and permits increment of delay to be tapped without disturbing uniform pulse shape. Wee Bit size 0.401″ long by 0.625″ wide by 0.230″ height and are epoxy molded to meet environmental conditions of MIL-C-15305C. Temperature range —55°C to 125°C. 300 VDC working voltage. Delay time available per Wee Bit from 10 nanoseconds to 100 nanoseconds in 10 nanoseconds increments. Wee Bits also stocked with 200 nanoseconds delay. This unique Wee Bit sectionalized delay line concept allows reduction of approximately 40% in number of sections ordinarily required*, flexibility of design, and line tapping. Individual Wee Bits only may be purchased for assembly on customer's circuits. Wee Bits are also available in shielded cases.

*Compared to constant K

LEADING ELECTRICAL PARTICULARS

Delay Tolerance:	±5%
Risetime Tolerance:	±20%
Noise:	1 to 10%, less than 3% for most types
Ripple:	1 to 10%, less than 3% for most types
Attenuation:	0.2 db/μsec. to 1.0 db/μsec. most types 0.2 db/μsec.
Temp. Coefe.:	150 $(10)^6$ μs/μs —°C
Impedance:	500 ohms ±5%
Operating Voltage:	300 Volts D.C.

Tr MEASURED AT 10% & 90% and Td MEASURED AT 50% POINTS OF INPUT AND OUTPUT PULSES. Individual Sections furnished in ±5% Tolerance (or ±1NS, whichever is greater) and must be tested in accordance with Nytronics, Inc. DSI 394.

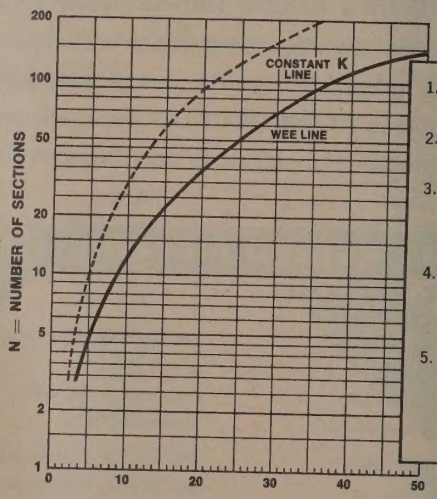
LEADING MECHANICAL PARTICULARS (for 15 section delay line)

Length of 15 cells	6.125″
Length of 15 cells plus P.C. mounting board	7.141″
Width of cells plus P.C. mounting board	0.750″
Height of cells plus P.C. mounting board	0.330″

Basic cell size:

Length: – 0.401″ Width: – 0.625″ Height: – 0.230″

Temperature range and operating environmental conditions are covered by MIL-C-15305.



1. Divide desired time delay by desired rise time to obtain Td/Tr ratio.
2. From chart determine corresponding number of sections required.
3. Determine the delay per section required by dividing total delay desired by no. of sections determined in step 2.
4. Select the standard section having the delay determined in step 3. For intermediate values select next lower standard element.
5. Total delay is sum of individual section delays. Trimming of total delay is accomplished by selecting appropriate value of last cell.

$$\frac{Td}{Tr\ eff.}$$

$$Tr\ eff. = \sqrt{Tr^2 out - Tr^2 in}$$

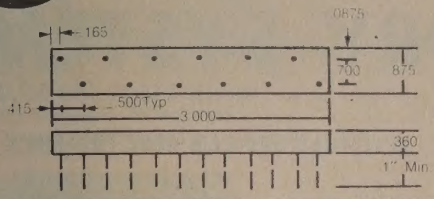
If Tr out ≧ 10x Tr in, Tr eff. = Tr out

Nytronics, Inc.
ESSEX ELECTRONICS DIVISION
ORANGE STREET • DARLINGTON, SOUTH CAROLINA 29532 • (803) 393-5421 TWX 810-665-2182

See YELLOW SECTION for Local Offices, Phones

RCL *electromagnetic delay lines*

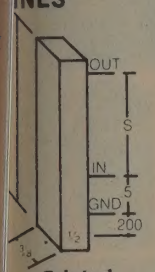
IMPED NSTANT LAY NES



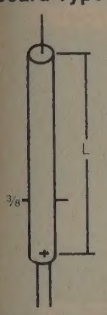
RCL rt No.	Delay nsec.*	Rise Time nsec. (max.)	Imped-ance ohms (±5%)	Distor-tion % (max.)	Attenu-ation % (max.)	Work-ing Volt. (max.)	External Taps
-148	50	5	100	8	10	100	Every 5 nsec.
-149	100	10	100	8	10	100	Every 10 nsec.
-150	200	20	100	8	10	100	Every 20 nsec.
-151	250	20	100	8	10	100	Every 25 nsec.
-152	300	30	100	8	10	100	Every 30 nsec.
-153	400	40	100	8	10	100	Every 40 nsec.
-154	500	50	100	8	10	100	Every 50 nsec.

lerance −2, +3 nsec. or 5% whichever is greater

ISTRIBUTED ONSTANT ELAY NES



Printed Board Type

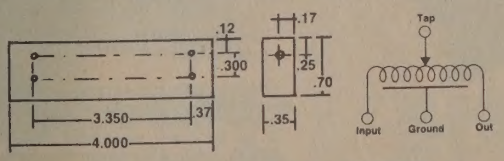


Cylindrical Type

Part No. Cylin-drical	Delay µsec (± 5%)	Im-ped-ance ohms (± 10%)	Rise Time µsec. max.	Attenua-tion db max.	Cylin-drical "L"	Printed Board "L"	Printed Board "S"
D200-05-C	.05	200	.025	1 db/µsec. or .25 db whichever is greater	1½"	2"	.7
D200-10-C	.10		.028		2¾"	3"	1.7
D200-15-C	.15		.030		3½"	3¾"	2.5
D200-20-C	.20		.032		5"	6"	3.7
D200-25-C	.25		.035		5¾"	6"	4.7
D500- 1-C	.1	500	.045	1.2 db/µsec. or .25 db whichever is greater	1"	2"	.7
D500- 2-C	.2		.055		1½"	2"	.7
D500- 3-C	.3		.060		2"	2"	.7
D500- 4-C	.4		.065		2¼"	2½"	1.3
D500- 5-C	.5		.075		3"	3"	1.7
D500- 6-C	.6		.080		3¼"	3½"	2.3
D500- 7-C	.7		.085		3¾"	3¾"	2.5
D500- 8-C	.8		.090		4½"	4¼"	2.9
D500- 9-C	.9		.095		4¾"	4¾"	3.5
D500-10-C	1.0		.10		5½"	5¼"	3.9
D500-11-C	1.1		.12		5¾"	5½"	4.3
D500-12-C	1.2		.13		6"	6"	4.7
D1000- 1-C	.1	1000	.040	1.6 db/µsec. or .25 db whichever is greater	1"	2"	.7
D1000- 2-C	.2		.045		1¾"	2"	.7
D1000- 3-C	.3		.055		2¼"	2½"	1.3
D1000- 4-C	.4		.065		3"	3"	1.7
D1000- 5-C	.5		.070		3¼"	3½"	2.3
D1000- 6-C	.6		.075		3¾"	3¾"	2.5
D1000- 7-C	.7		.080		4¼"	4¼"	2.9
D1000- 8-C	.8		.085		4¾"	4¾"	3.5
D1000- 9-C	.9		.090		5"	5¼"	3.9
D1000-10-C	1.0		.100		5¾"	5¾"	4.5
D1000-11-C	1.1		.110		6"	6¼"	4.9
D1200- 1-C	.1	1200	.040	1.6 db/µsec. or .25 db whichever is greater	1¼"	2"	.7
D1200- 2-C	.2		.045		1¾"	2"	.7
D1200- 3-C	.3		.050		2½"	2½"	1.3
D1200- 4-C	.4		.055		3"	3"	1.7
D1200- 5-C	.5		.060		3¾"	3¾"	2.5
D1200- 6-C	.6		.065		4¼"	4¼"	2.9
D1200- 7-C	.7		.070		4¾"	5"	3.7
D1200- 8-C	.8		.075		5½"	5½"	4.3
D1200- 9-C	.9		.080		6"	6¼"	4.9

To order printed circuit unit use Suffix "P" instead of "C".

VARIABLE DELAY LINES



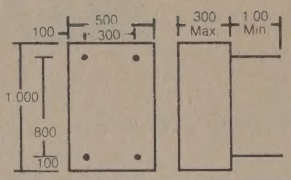
12 TURN ADJUSTMENT

RCL Part No.	Delay Range nsec.	Imped-ance ohms.	Rise Time Max. nsec.
AV200-50	0- 50	200	6
AV500-40	0- 40	500	6
AV1000-150	0-150	1000	30
AV500-250	0-250	500	50

10 TURN ADJUSTMENT

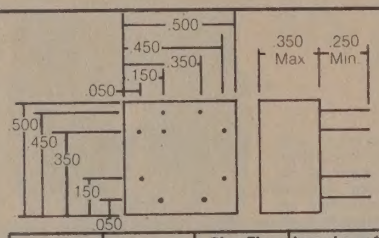
RCL Part No.	Delay Range nsec.	Imped-ance ohms.	Rise Time Max. nsec.
XV500-700	0-700	500	80
XV500-750	0-750	500	80
XV1000-450	0-450	1000	75
XV200-200	0-200	200	40
XV750-500	0-500	750	90

MINIATURE DELAY LINES



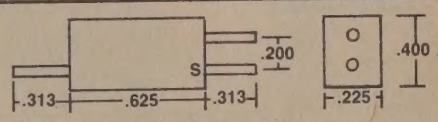
RCL Part No.	Delay nsec. (±2%)	Rise Time nsec. (max.)	Impedance ohms (±5%)	Distor-tion % (max.)	Attenu-ation % (max.)	Working Volt. (max.)
L-142	20	3	100	8	5	100
L-143	25	4	100	8	5	100
L-144	40	6	100	8	5	100
L-145	50	8	100	8	5	100
L-146	75	12	100	8	5	100
L-147	100	20	100	8	5	100

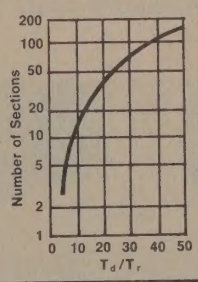
SUBMINIATURE DELAY LINES



RCL Part No.	Delay nsec.*	Rise Time nsec (max.)	Impedance** ohms (±5%)	Distor-tion % (max.)	Attenu-ation % (max.)	Working Volt. max.
L-130	4	2.5	50	8	5	100
L-131	6	2.5	50	8	5	100
L-132	8	3	50	8	5	100
L-133	10	3	50	8	5	100
L-134	12	3	50	8	5	100
L-135	16	3	50	8	5	100
L-136	4-4-4-4	3	50	8	5	100
L-137	8-8	3	50	8	5	100
L-138	1-2	2.5	50	8	5	100
L-139	1-2-3	3	50	8	5	100
L-140	1-2-4	3	50	8	5	100
L-141	20	4	50	8	5	100

*±.5 nsec. or 5% whichever is greater.
**Impedances of 75, 93, 120 and 150 ohms also available.





ECONOLINE DELAY LINES

The chart at the left can be used to determine the number of modules required to provide a desired delay and rise time.

1. Determine the delay to rise time ratio by dividing the desired time delay by the desired rise time.
2. Using the chart determine the number of sections required for this T_d/T_r.
3. Divide this number of sections by the total delay to determine the delay per section.

Total delay is the sum of the individual section delays. It can be trimmed to the desired value by selecting the proper value of the last module.

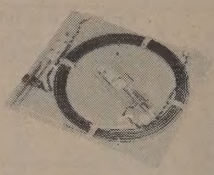
RCL Part No.	Delay nsec (±5%)	Impedance ohms (±5%)	Attenuation db/µsec.	Working Volt. (min.)
EL-10	10	500	1	300
EL-20	20	500	1	300
EL-30	30	500	1	300
EL-40	40	500	1	300
EL-50	50	500	1	300
EL-60	60	500	1	300
EL-70	70	500	1	300
EL-80	80	500	1	300
EL-90	90	500	1	300
EL-100	100	500	1	300
EL-200	200	500	1	300

RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-999-5511

DELAY LINES... MEMORY SYSTEMS

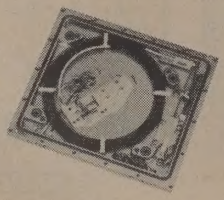
...AVAILABLE AS COMPONENTS...

LOW COST COMMERCIAL delay lines offer the lowest price per bit of any high-speed fast-access memory device. Tailor made lines can be mounted on customer pc boards with input and output transducers matched to available circuits. Delays from a few microseconds to 15 milliseconds are available



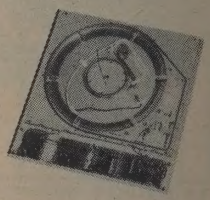
HERMETICALLY SEALED lines are recommended for critical commercial and industrial applications requiring reliable operation in uncontrolled environments. Bit rates to 4 mc using NRZ techniques and 2 mc using RZ or bipolar recording are available.

FULL MIL SPEC units are qualified to aircraft (MIL-E-5400), shipboard (MIL-E-16400) and aerospace specifications offering continuous operation under severe shock and vibration over wide temperature ranges (—55°C to +125°C). Tapped lines and wide adjustment lines are available



...WITH INTERFACE ELECTRONICS...

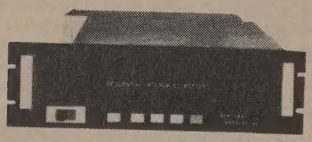
DISCRETE COMPONENT electronics can be mounted within delay line case or using conventional printed circuit board construction. Circuits include input gating, line drivers, linear read amplifiers, NRZ or bipolar detectors and re-timing flip flops



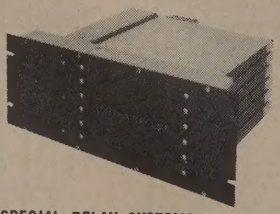
INTEGRATED CIRCUITS permit exceptional volumetric efficiency, (more than 150 bits per cubic inch) at low cost and with complete compatibility with various IC manufacturers. Lines can be synchronized to external clock or provided with internal crystal oscillator

SPECIAL SUBSYSTEMS can be provided. Typical is 4-line 33-msec, 84,000-bit recirculating buffer for raster scan display applications. Special interface cards adjust logic levels to any NPN, PNP, or integrated circuit interface. Storage costs as low as ½¢ per bit.

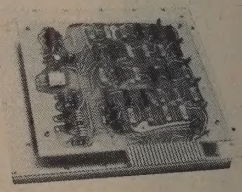
...OR IN COMPLETE MEMORY AND INFORMATION PROCESSING SYSTEMS...



KEYBOARD-COMMUNICATIONS BUFFERS are available to provide paper tape to magnetic tape buffering, keyboard buffering, or buffering to teletype or telephone data links. Basic system stores 4096 characters, can be expanded to 128,000 characters. I/o rates of up to 4800 baud can be provided.



SPECIAL DELAY SYSTEMS are available such as the illustrated Audio Delay Unit which delays audio or FM data up to 100 ms with excellent linearity and less than 5% distortion. A frequency response of ±1 db, 20 Hz to 20 kHz and a dynamic range of 40 db are other features.



LIMITED MESSAGE BUFFER SYSTEMS are available for buffering small remote terminal devices. Storage is up to 4,000 characters, input/output rates are compatible with telephone or teletype lines. Options include floating battery power supplies, direct interfacing to communication lines, non-destructive readout, and selective edit.

Consult your Digital Devices representative for further information

TYCO
DIGITAL DEVICES DIVISION

Phone 516 - 921-2400
TWX 510-221-2187
200 MICHAEL DRIVE
SYOSSET, N. Y. 11791

Delay Lines AND Dynamic Analysis

UNIVERSAL AD-YU ELECTRONICS, INC.

249-259 TERHUNE AVENUE • PASSAIC, NEW JERSEY
CABLE: UAD PASSAIC • PHONE (201) 472-5622

WIDE-BAND DELAY STANDARD

Accuracy Traceable To National Bureau Of Standards

TYPE 20A SERIES

Type 20A Series Wide-Band Decade Delay Standard — Bandwidth over 1000 mc. Resolution 1 nanosecond. Characteristic Impedance 50, 75, or 93 ohms. Accuracy 1%. Type 20B1-3 Series Continuously Variable Delay Standard — Bandwidth over 8000 mc; 1% Accuracy. Readability 0.05 ps; infinitesimal resolution.

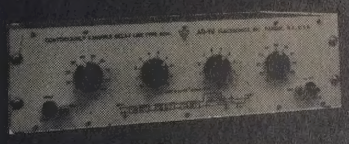
CONTINUOUS SWEEP TIME DELAY CORRELATOR

TYPE 1050

Produces true and accurate time correlation by using a continuously variable delay line. Wide frequency response. Large dynamic range. Instantaneous and continuous sweeping. Use as narrow-band filter for removing noise. Use to determine transmission time and path of transmission. Use to determine degree of coherence between two random signals. Continuously Variable Time Delay: Zero to 0.18 ms up to 180 ms. Frequency Range: 3 cps to 200 kc. Analog output available for plotting correlation curve; accuracy ±0.4% of full scale.

DECADE DELAY LINES

4-Decade Variable, Resolution 1/10000.



TYPE 801-2 SERIES

Absolute stability, no time jitter. Faithful reproduction of input signal. Especially suitable for time correlation study. Delay up to 0.2 sec.; 200 sections. Bandwidth over 200 kc. Variable in four decades. Total Delay: 50 us, 100 us, 500 us, 1000 us, 10 ms, to 200 ms. Impedance 250 ohms to 1k. Rack mount panel.

DYNAMIC ANALYSIS SYSTEM

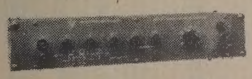
Plots Mechanical Impedance Curve, 50 CPC To 10 KC.

TYPE 1010

140 db dynamic range. Noise level up to 1000 percent without affecting accuracy. Accuracy: Phase ¼°, amplitude ratio ½ db. Sweep rate: 6, 18, 60 minutes or 3 hours. Automatically plots phase and amplitude ratio curve. Fourier response, transfer function, transmissibility, spectral density of random or periodic signals.

STEP VARIABLE DELAY LINES

TYPE 602-3 SERIES



TYPE 611 SERIES

Type 602-3 Series—Equal input and output impedance. Rise Time: Less than 4% of total delay. 11 equal steps. Impedance: 50, 75, 93, up to 1k ohms. Type 611 Series—Total Delay Range: 8 us to 128 us. 5-step variable control. Rack mount construction.

TYPE	TOTAL DELAY	IMPED.	TYPE	TOTAL DELAY	INPUT IMPED.	OUTPUT IMPED.
602b	1.1 us	75 ohms	611a1	8 us	600 ohms	300 ohms
602g4	16.5 us	300 ohms	611a3	32 us	750 ohms	375 ohms
603	27.5 us	600 ohms	611b1	16 us	150 ohms	75 ohms
603b1	11 us	1000 ohms	611b4	12 us	600 ohms	400 ohms

DUAL-CHANNEL SYNCHRONOUS FILTER

0.5° Phase Accuracy, 40 DB Dynamic Range.

TYPE 1034

Automatically and continuously tracked with the frequency of an external synchronized signal from 2 cps to 10 kc. Phase matched within 0.5 degree over the entire range. Useful for plotting phase and amplitude characteristics between two distorted signals. Isolates noise and distortion up to ten times signal level. Transistorized with rugged construction for reliable operation.

WIDE-BAND FIXED DELAY LINES

TYPE 10T SERIES

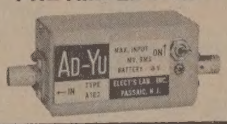
Rise Time Less Than 2% Of Total Delay. Type 10T Series Ultra Fast Rise Time Delay Lines. Bandwidth: Over 70 mc. Maximum Signal: Up to 300v. Impedance: 50, 75, 93, 500 ohms. Coaxial connectors for input and output.

TAPPED DELAY LINES

TYPE 8T SERIES

Up to 100 taps available. Impedance: 50 ohms to 5k. Total Delay: 0.05 to 0.2 sec. Rise time less than 2% of total delay. Meets MIL specifications

ULTRA LOW NOISE PRE-AMPLIFIERS



TYPE	GAIN	OUTPUT	BANDWIDTH
A1027A	20±0.3	35 Ohms	0.1c to 1.2mc
A1027B	40±0.5	30 Ohms	3c to 400kc
A1027C	40±0.5	30 Ohms	3c to 400kc

Input Impedance Over 1000 Megohms. Completely transistorized, non-microphonic, completely shielded. Distortion: Less than 1%. Use as pre-amplifier for hydrophones, piezoelectric transducers, capacitance microphones, etc. Use as impedance converter from high impedance source or capacitive source to low impedance coaxial cable.

CONTINUOUSLY VARIABLE DELAY LINES

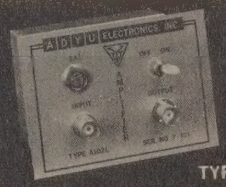
TYPE 505-9 SERIES

Resolution Time 8×10^{-11} sec., Bandwidth Over 60 mc.

TYPE 551-7 SERIES

Type 505-9 Series — Mechanical Rotation: 345°; Rise Time: 10% of total delay. Impedance: 50 ohms to 1k. Total Delay: 0.05 us up to 10 us. Attenuation: Less than 1 db for most types. Type 551-7 Series — 20 turns mechanical rotation. Small physical size. Suitable for radar IF phase shift. Impedance: 50 ohms to 1k. Useful up to 60 mc. Total Delay: 0.01 us to 10 us.

WIDE-BAND PRE-AMPLIFIERS



TYPE A1023

Completely Transistorized, Non-Microphonic, No Hum, Completely Shielded. Miniature in size with built-in battery or external power supply. Wideband noise less than 4 microvolts.

TYPE	A102	A102B	A102E	A102J	A102K
GAIN	100	1000	100	100	10,000
BANDWIDTH	1c to 150kc	1c to 200kc	1c to 5mc	1c to 1mc	4c to 500kc

VARIABLE DELAY LINES

TYPE 521 SERIES

Type 521 Series—60 steps coarse control plus continuously adjustable vernier control. Resolution Time: 8×10^{-11} second. Maximum delay over 30 microseconds. Type 605 Series—60 steps; Type 606.7 Series—120 steps. Time delay accuracy ±1% at any point. Can be used for matched low output impedance.

TYPE	521a	521b	605a	605m	606a	606j	607k	607p
TOTAL DELAY (US)	6	9	0.6	6000	1.2	1200	2400	48000
IMPEDANCE (OHMS)	500	750	75	500	75	1000	500	500

MICROWAVE COAXIAL SWITCH

Type MC-104A — double-pole double-throw; Type MC-104B—single-pole double-throw. DC to 2 kmc with VSWR less than 1.05. Life Expectancy: 15000 operations minimum. 50 ohms input and output impedance.

MICROWAVE IMPEDANCE CONVERTER

Type MC-102A, 50 ohms to 73 ohms; Type MC-102B, 50 ohms to 93 ohms. Converts 50 ohms to 73 ohms, 50 ohms to 93 ohms or vice versa. DC to 3000 mc. Low VSWR. 1 watt average, 10 watts peak.

VIDCOR CO., Inc.

1251 W. EL SEGUNDO BLVD. • GARDENA, CALIFORNIA 90247 • TEL. (213) 757-0119
(213) 757-0110

SPECIAL FEATURES

- High density package without loss of bandwidth or rise time
- "M" Series provides 75% reduction over conventional unit size
- Temperature Range: −55°C to 125°C with low temperature coefficient
- Lead spacings designed for 0.1" circuit board grids
- Designed to allow low cost production
- Dimensions — .30 x .30 maximum cross-section, 2.5" maximum length

SPECIAL DELAY LINES

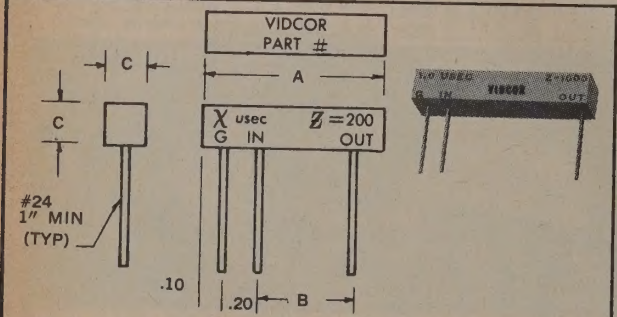
Vidcor Company offers at low cost, custom designed lines to your requirements in addition to the typical size shown. Custom delay lines have been made in various external configurations consistent with customer requirements.

MICROMINIATURE DELAY LINE -M

STANDARD MODEL SPECIFICATIONS

DELAY TIME (μ SEC)	0.1	0.3	0.5	0.7	1.0
RISE TIME (μ SEC)	0.03	0.08	0.10	0.12	0.18
DIMENSION "A"	1"	1"	1"	1¼"	1½"
DIMENSION "B"	0.6"	0.6"	0.6"	0.9"	1.1"

ATTENUATION	Less than 1 db
CHARACTERISTIC IMPEDANCE	Up to 1500 ohms
TOLERANCE	5% for delay time and 10% for characteristic impedance
OVERSHOOT	Less than 10 percent
TEST VOLTAGE	500 volts (DC)
TEMPERATURE COEFFICIENT	0.1 percent per degree centigrade
TERMINALS	#24 AWG, 1" minimum length, tinned copper leads
SIZE TOLERANCE	Decimal dimensions ±.02", fractional dimension ±1/32"



TOLERANCES: +.00 −.02 BODY DIMENSIONS
MATERIAL: THERMOSETTING RESIN
DIELECTRIC BREAKDOWN TEST: 300 VDC
MAXIMUM TEMPERATURE: +105°C
Standard size packaging for all delays.
Weldable "Dumet" leads are available at additional cost.

NANOSECOND DELAY LINES 200 OHMS

Tin-Coated Leads Part No.	T_d nanosec ±10%	T_r nanosec ±10%	Attenuation % max.	Attenuation % max.	Case Dimensions (inches) A	B	C
A1345	10	5	3	5	1.00	.60	.25
A1346	12	7	3	5			
A1347	14	8	3	5			
A1170	15	12	5	5	1.00	.60	.25
A1171	20	13	5	5			
A1148	25	14	5	5			
A1173	30	15	5	5	1.00	.60	.25
A1174	40	15	5	5			
A1142	50	16	5	5			
A1348	60	18	5	5	1.00	.60	.25
A1363	70	20	5	5	1.00	.60	.25
A1525	80	20	5	5			
A1532	90	20	5	5	1.00	.60	.25

500 OHMS

Miniature Delay Lines Impedance 500 ohms ±10%
Case: Diallylphathalate glass filled per Mil-M-14 SDG

VIDCOR Part No.	Time Delay T_d (nanosec)	Rise Time max. (nanosec)	Attenuation % max.	Case Dimensions (inches) A	B	C
A1458	45	12	5	1.25	.6	.3
A1459	95	20	5	1.25	.6	.3
A1471	100	30	5	1.00	.6	.3
A1479	150	45	5	1.25	.6	.3
A1448	175	50	5	2.50	.6	.3
A1087	200	87	5	.875	.6	.3
A1512	300	80	5	1.00	.6	.3
A1422	225	80	5	1.00	.6	.3
A1423	275	80	5	1.00	.6	.3
A1480	300	85	5	1.25	.6	.3
A1527	400	90	5	1.25	.6	.3
A1090	500	100	5	1.00	.6	.3
A1481	600	150	8	1.50	.6	.3
A1092	700	165	8	1.50	.6	.3
A1093	800	175	9	1.50	.6	.3
A1094	900	185	10	1.50	.6	.3
A1095	1000	215	10	1.50	.6	.3
A1482	1200	300	12	2.00	.6	.3

HIGH DENSITY DELAY LINES - 1000Ω

Tin Coated Leads Part No.	T_d μsec ±5%	T_r μsec max.	Attenuation % max.	Attenuation % max.	Case Dimensions (inches) A +.00 −.02	B ±.02	C ±.02
A1325	0.1	.04	10	10	1.00	.60	.30
A1326	.2	.07	10	10	1.00	.60	.30
A1057	.3	.085	10	10	1.00	.60	.30
A1058	.4	.10	10	10	1.00	.60	.30
A1053	.5	.12	10	10	1.00	.60	.30
A1329	.6	.14	10	10	1.25	.90	.30
A1060	.7	.16	10	10	1.25	.90	.30
A1331	.8	.17	10	10	1.50	1.10	.30
A1062	.9	.21	10	10	1.50	1.10	.30
A1063	1.0	.25	10	10	1.50	1.10	.30
A1139	1.1	.26	15	10	2.00	1.60	.30
A1140	1.2	.22	15	10	2.00	1.60	.30
A1141	1.3	.25	15	10	2.00	1.60	.30
A1333	1.4	.27	15	10	2.00	1.60	.30
A1055	1.5	.27	15	10	2.00	1.60	.30
A1064	2.0	.4	15	10	2.50	2.10	.30

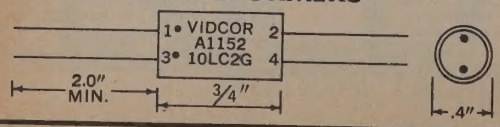
MINIATURE TAPPED DELAY LINES

CHARACTERISTIC IMPEDANCE 1000Ω. 5% TOL. MAINTAINED ON ALL DELAYS.

Part Number	Total Delay	Taps (μsec)	Case Dim. (inches) A	C
A1465	0.1 μsec	.02, .04, .06 & .08 μsec	1.5	.30
A1466	0.5 μsec	.1, .2, .3 & .4 μsec	1.5	.30
A1467	1.0 μsec	.3, .5, .7 & .9 μsec	2.00	.30
A1468	1.0 μsec	.2, .4, .6 & .8 μsec	2.00	.30
A1469	2.0 μsec	.6, 1.0, 1.4 & 1.8 μsec	2.50	.30
A1470	2.0 μsec	.4, .8, 1.2 & 1.6 μsec	2.50	.30

The delay lines above display a basic design that has been fully engineered and field tested. Other values of delay, impedance and tap delay are available on short notice and at low cost to buyer.

PULSE TRANSFORMERS



Part No.	A1150	A1152	A1155	A1156	A1158	A1160	A1164	A1166
Pulse Width (μsec)	2.0	5.0	6.0	6.0	16.0	10.0	10.0	16.5
Ratio	1:1	1:1	1:1:1	1:2	1:1	1:1:1	1:1:1	1:1:2
Rise Time (nsec)	40	30	60	60	60	90	100	100

See YELLOW SECTION for Local Offices, Phones

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

SPECIFY "ARNOLD" FOR YOUR PERMANENT MAGNET

ALNICO MAGNETS

Arnold permanent magnets are available in all types of Alnico material, in sizes ranging from large castings weighing over 80 pounds to very small sintered parts weighing less than one gram.

Alnico 5 can usually be depended upon to deliver the greatest energy product to the magnetic circuit per weight of magnet material. It is therefore generally the first choice for a magnetic material except where special physical considerations are paramount. Modified or premium grades are also available, such as Alnico 5-7, a crystal-oriented material used where size and weight must be reduced without loss of energy.

Special assemblies such as rotors, traveling wave tube magnets, magnetron magnets, etc. may be supplied in an aluminum jacket to facilitate mounting and supply an added protection to the magnet.

Large magnet assemblies may be supplied for focusing mass spectrometer and other measuring applications where a high degree of stability and uniformity of field is required.

Many sizes and types of Alnico magnets are carried in stock for immediate delivery.

ALNICO 8 Available from Arnold in production quantities, Alnico 8 possesses the highest coercive force of all Alnico grades, as well as a high energy product and a relatively low temperature coefficient. It is especially suited for traveling wave tube periodic focusing applications. Gap flux densities greater than 1000 gausses are attainable in tubular-type straight field focusing magnets. Alnico 8 is also recommended for applications which involve strong demagnetizing fields, or where space considerations dictate the use of a short magnet.

SPECIAL PERMANENT MAGNET MATERIALS

ARNOX 3 Arnox 3 is a molded-type magnet having high coercive force and moderately low residual induction and energy product. Principal uses are for magnetic requirements which are not stringent, and for a relatively short magnet of reasonable cross section. Accurate dimensions and close tolerances can be economically obtained. These magnets can be premagnetized before assembly, and have very high resistance to demagnetiziation. Slightly better magnetic properties are obtained in the pressing direction than in other directions.

ARNOX 5 Arnox 5 is a ceramic permanent magnet material composed of highly oriented barium ferrite. It has many times the energy product of Arnox 3 and is comparable in many applications to Alnico 5. Because of its high coercive force, its use is recommended in applications where a short magnetic length is desirable or where extremely high demagnetizing forces are encountered.

VICALLOY Vicalloy is a carbon-free permanent magnet alloy containing about 10% vanadium, 50% cobalt and the balance iron.

Vicalloy may be fabricated in the form of castings, hot rolled bars and forgings, or cold rolled strip, wire and tubing. After suitable heat treatment, the material is quite readily machinable. Vicalloy is available on special order in bar, strip and thin tape for recording purposes.

SILECTRON C, E, O AND DISTRIBUTED GAP CORES Precision-rolled Silectron strip in 1, 2, 4 and 12 mil thicknesses. They are supplied in a wide variety of shapes, and in sizes from a fraction of an ounce to several hundred pounds. In addition to standard transformer applications, they may also be supplied for special applications such as saturable reactors, instrument transformers and pulse transformers.

Distributed Gap Cores reduce watt loss by 30%, exciting current by 70% and cost by 10% over conventional 12 mil C cores of the same size and weight. Made of the best commercial grades of .012 grain-oriented silicon steel, cores are available in 36 basic sizes for power transformer and reactor applications.

Over 1,000 stock cores are listed in the Arnold Silectron catalog. A wide selection of preferred sizes are stocked for immediate shipment.

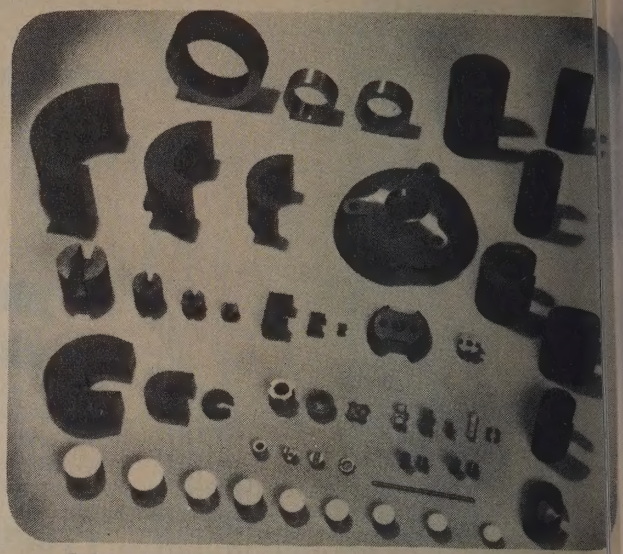
TAPE WOUND CORES OF HIGH PERMEABILITY MATERIALS Arnold tape wound cores are available made of Deltamax, 4-79 Mo-Permalloy, Supermalloy, Mumetal, 4750 Electrical Metal, Silectron, or the new rectangular-loop material, Supermendur. All except Supermendur cores are available in standard tape thicknesses of ½, 1, 2, 4 or 12-mils.

Toroidal cores are made in 30 standard sizes with protective nylon or aluminum cases. Special sizes produced to individual requirements. Wide selection of Deltamax, Square Permalloy and Supermalloy type 6T cores (aluminum cased, oil filled, hermetically sealed and epoxy coated) carried in stock for immediate shipment.

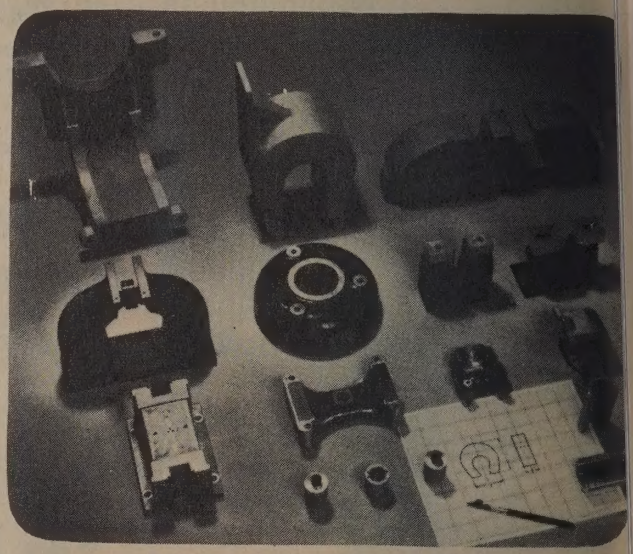
BOBBIN CORES Arnold bobbin cores are available in a wide range of sizes, tape thicknesses, widths and number of wraps to suit the ultimate use of the core in electronic computer assemblies. Magnetic materials usually employed are Deltamax and Square Permalloy in standard thicknesses of 1, ½, ¼ and ⅛ mil. Bobbins are supplied in ceramic or stainless steel.

MO-PERMALLOY POWDER CORES Available in a wide range of sizes, from .183" OD to 5.218" OD. They are given various types of enamel and varnish finishes, some of which permit winding with heavy Formex insulated wire without supplementary insulation over the core.

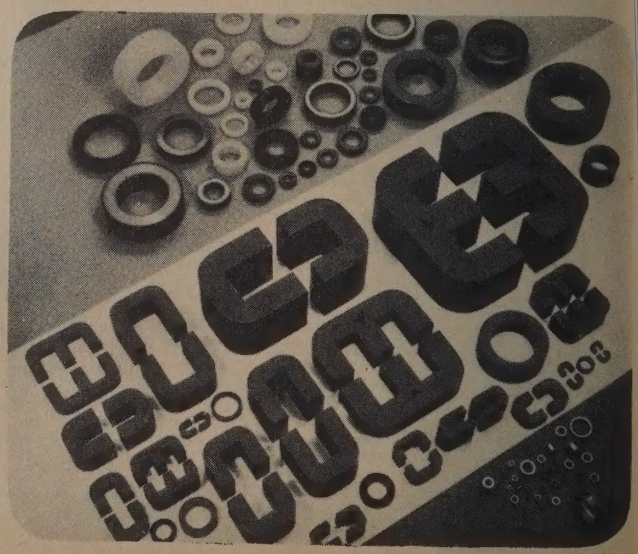
These powder cores are supplied in standard permeabilities of 14, 26, 60 and 125 Mu; high-permeability cores of 147, 173 and 205 Mu are also available in all sizes. They provide constant permeability over a wide range of flux density, and in many cases may be furnished stabilized to provide essentially constant permeability over a specific temperature range. Preferred sizes carried in warehouse stock for immediate shipment.



Typical group of Arnold permanent magnets, both cast and sintered types.

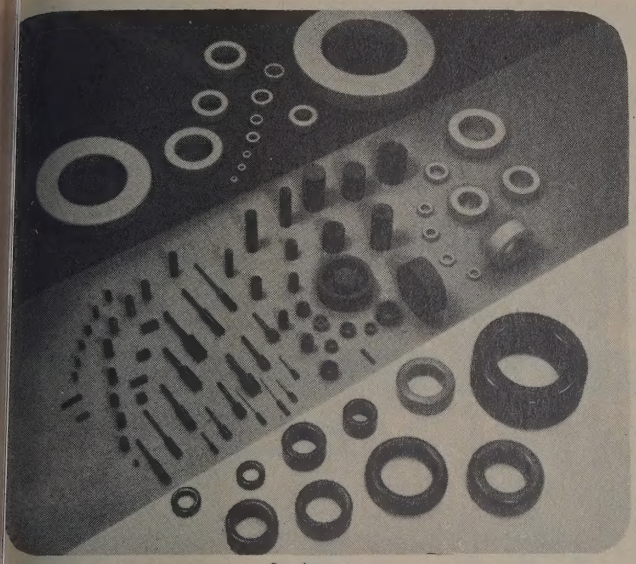


Typical group of permanent magnet assemblies.

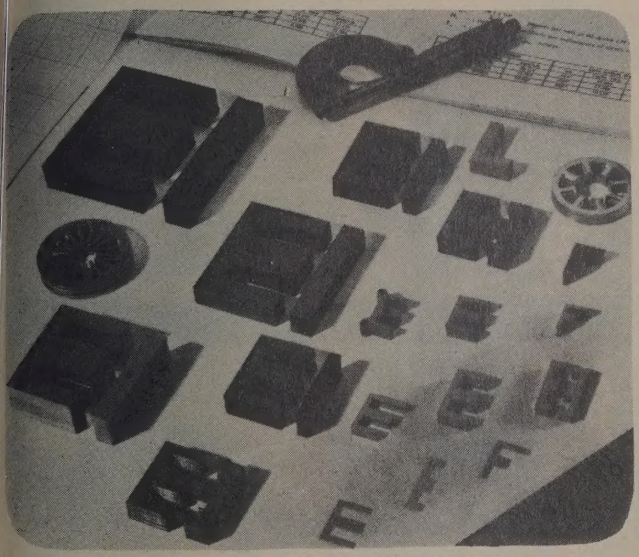


Top to bottom: Tape wound cores, Silectron C, E and O cores, and bobbin cores.

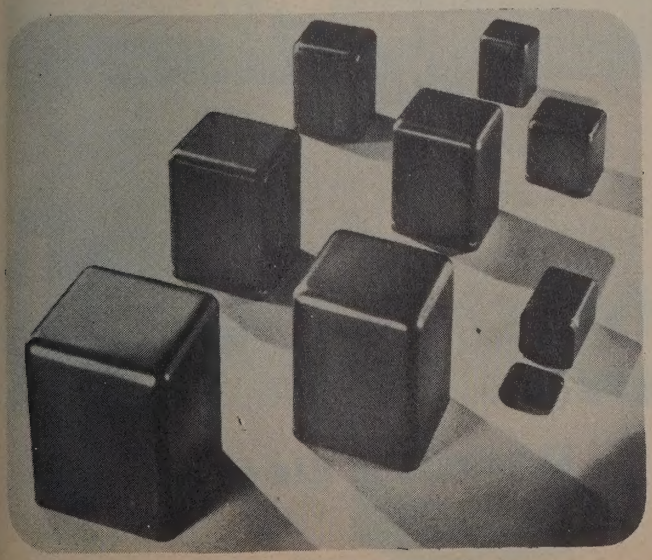
ND OTHER **MAGNETIC MATERIAL** REQUIREMENTS . . .



Powder cores.



Laminations of silicon and nickel-iron.



Typical group of drawn transformer cans.

IRON POWDER CORES A wide selection of cores is available from simple cylinders to special cores of complicated design. The line includes all standard types of threaded cores, cup, sleeve, slug and cylindrical insert cores; for use in antenna and RF coils, oscillator coils, IF coils, perm tuning, FM coils, television coils, noise filter coils, induction heating and bombarder coils, and other low frequency applications. Preferred sizes are carried in warehouse stock for quick shipment. A standard series of iron powder toroids is also manufactured, conforming to the standard sizes adopted by the Metal Powder Industries.

LAMINATIONS AND FORMED PARTS Arnold produces a wide selection of silicon-steel, nickel-iron and cobalt-iron laminations for motors and transformers. Thin-gauge laminations (1, 2 and 4-mil thicknesses) of high-permeability materials are specialties. A complete line of transformer cans and hardware is available, including Mil-T specification. Shielding materials are available in bulk form, without annealing.

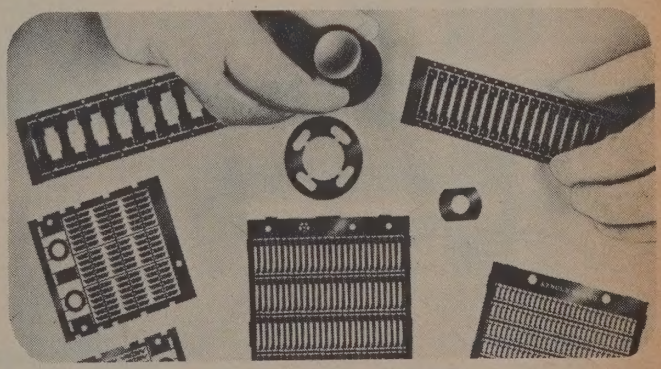
MSS IRON POWDER CORES have very high electrical resistivity yet lower magnetostrictive noise than other commercial iron powder even when cores are operated at saturation flux density.

SOFT FERRITES Arnold soft ferrite cores are available in a wide range of sizes and shapes. Ferrites may be used in RF coils, discriminator circuits, telemetering, multiplex receivers, IF band circuitry and pulse transformers.

ROLLED PRODUCTS Precision rolling and slitting of strip and foil from .069″ to .000069″ on virtually any material including alloys of aluminum, brass, copper, magnetic and nickel alloys, stainless steels and pure metals. Precision control of gauge tolerances and other mechanical and physical properties. Produced in the country's newest and cleanest conversion facility. Soft ferrites are ferremagnetic materials performing essentially as insulators. They are compounded from high purity oxide components and are processed according to techniques common to ceramic materials.

OGALLALA ELECTRONICS, a division of The Arnold Engineering Company is a leader in electromagnet technology featuring foil-wound coils from small (½″ x 2″) to large (4′ x 4′ x 6′), operable from liquid nitrogen-cooled to 500°C radiation cooled. Coils made for lasers, Helmholtz equipment, solenoids, tube focusing devices, high field magnetizing and de-magnetizing. Foil-wound coils offer better utilization of space, cooler operation, weight reductions and lower costs.
Ogallala Electronics offers an assembly capability for precision permanent magnet assemblies and electro-plating facility.

CHEMICAL MICRO-MILLING One of Arnold's newest lines is also one of its fastest growing. Produces a wide variety of Photoetched parts for the semiconductor and precision electronics fields. Located at Fullerton, California and has complete facilities which are undergoing rapid expansion.



Examples of clinically milled parts.

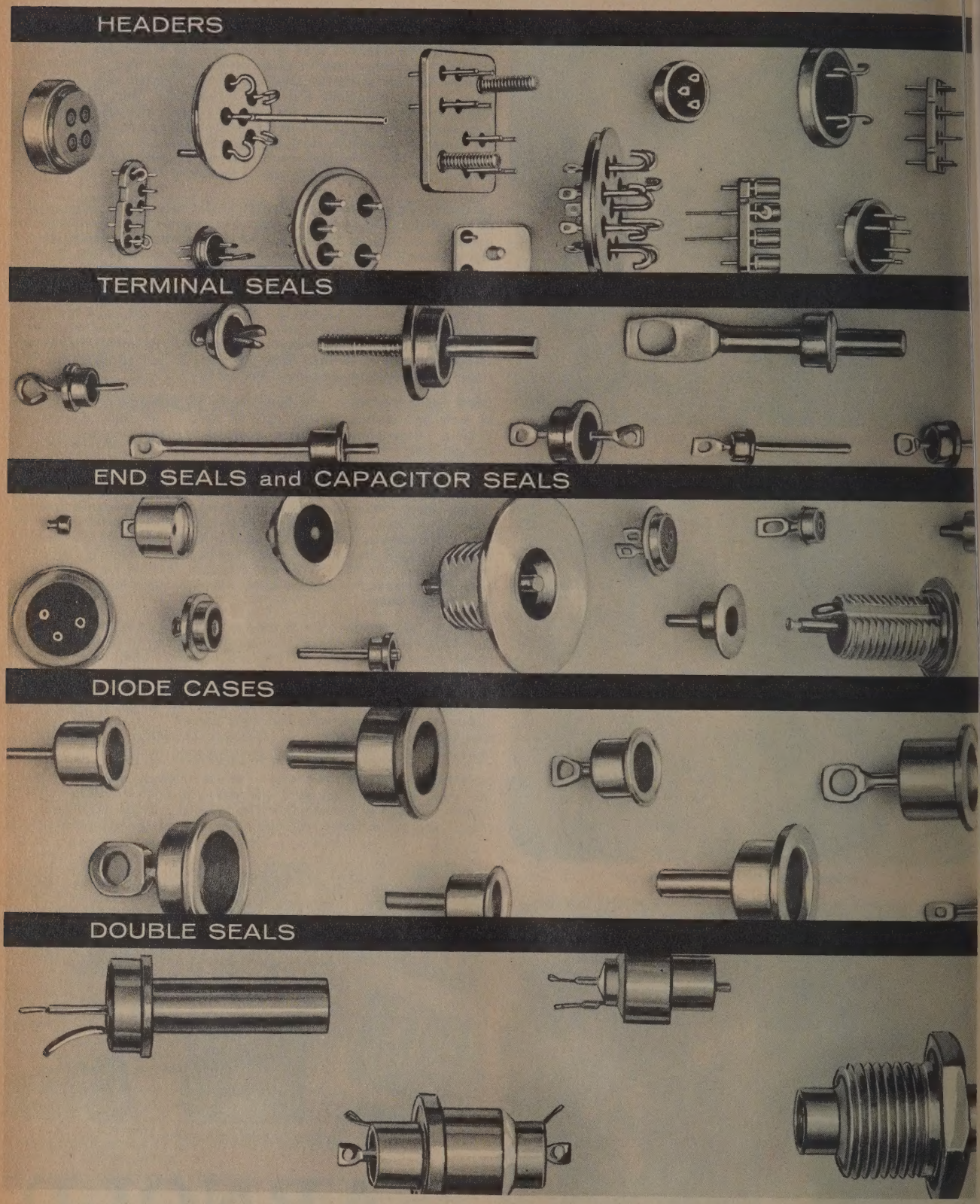
ARNOLD

SPECIALISTS IN MAGNETIC MATERIALS

THE ARNOLD ENGINEERING COMPANY, Main Office: MARENGO, ILL.
BRANCH OFFICES and REPRESENTATIVES in PRINCIPAL CITIES

WRITE FOR COMPLETE TECHNICAL DATA

Glass-to-metal PRECISION HERMETIC SEALS



Custom designing to your individual requirements is our special skill. For information call your representative or write direct to Microwave Devices Division, The Bendix Corporation, Hurricane Road, Franklin, Indiana 46131. Phone 317/736-6136.

Bendix Electronics

Fom the people who pioneered magnetic recording

Brush magnetic rubber.

non-wearing medium for magnetic recording

olded bands of tough, highly stable bber . . . densely impregnated with agnetic oxide . . . smooth-surfaced r minimum head wear . . . an ideal emory system for machine or ocess-control sequences, data ocessing, fault recording, petitive message reporting (over ,000,000 repeats without failure).

Recorded data is virtually ermanent until erased . . . normal perating life well above 10,000 ours at 30 ips.

Prolonged life • Minimum ead Wear • High Signal/noise atio • High Fidelity • High eliability • Low Operating Cost.

In either Hypalon® or extra-tough diprene® . . . bands ½" to 6" width, 2" to 18" diameters.

Whatever your problem involving nagnetic media, give us your specifications. Gould Inc., Brush Instruments Division, 3631 Perkins Ave., Cleveland, Ohio 44114.

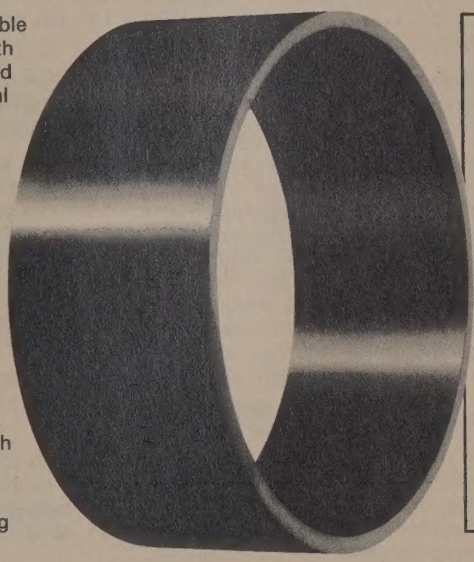
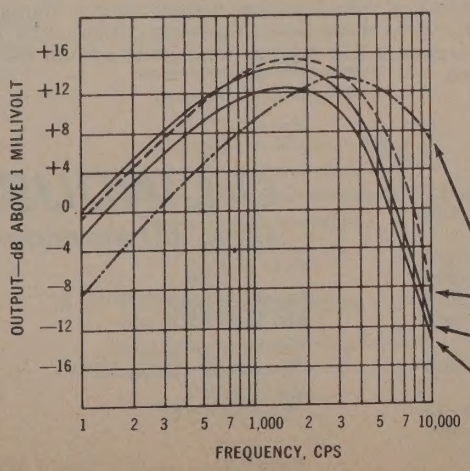


TABLE I
MATERIAL SPECIFICATION OF MAGNETIC BANDS

Magnetic Properties	Hypalon	Adiprene	Hypalon
Compound	98306	03866	98308
Coercive force *Hc-Oersteds	350	355	385
Remanence *Br - Gauss	720	510	690
Maximum Induction—Gauss	1130	800	1050
Physical Properties			
Tensile Strength, PSI Min. ASTM-D-412-51T-Die C	1500	1800	1500
Elongation Before Breakage, Min. ASTM-D-412-Die C	100%	200%	100%
Normal Elongation Recommended for Mounting	6%	6%	6%
Hardness, Shore "A" Durometer	85 ±5	80 ±5	85 ±5
Relaxation—Max. (Inches) ASTM-D-412-512-Die C.	.125"	.175"	.125"

*Magnetic properties are average values obtained from hysterisis loops and assumed magnetic cross sectional area. The loops were obtained using a 60 CPS magnetizing field of 4000 oersteds, peak to peak. Physical properties were determined from a random sampling of bands.



MAGNETIC BAND FREQUENCY RESPONSE

Brush BK-1090 Record—Reproduce Head.

Speed: 7½ in./Sec.

Record Current: 0.2 Milliamps/Winding (0.4 Milliamps Total)

Bias Current: 1.5 Milliamps/Winding (3.0 Milliamps Total) @ 50 KCPS

Optimum Record Current is taken as that current which produces an output 12 dB down from saturation.

Optimum Bias Current is that current which produces 2% or less third harmonic distortion at 750 CPS record signal.

Standard instrumentation Recording Tape

Band 640303 Hypalon Compound 98308

Band 640300 Hypalon Compound 98306

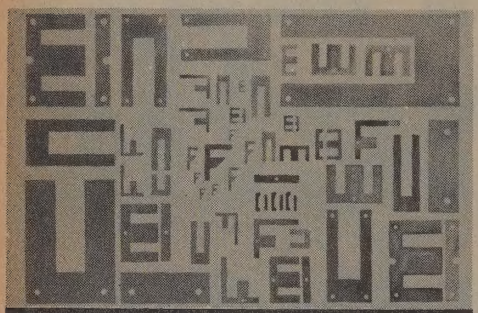
Band 640302 Adiprene Compound 03866

GOULD **BRUSH**

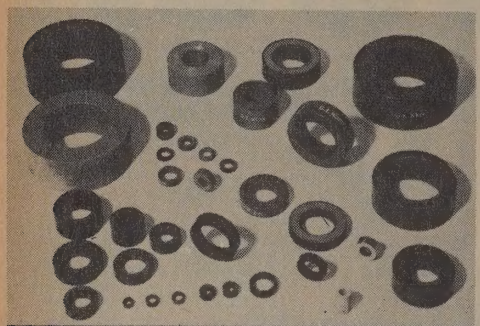
See YELLOW SECTION for Local Offices, Phones

G-L INDUSTRIES, INC.
G-L Electronics Division...

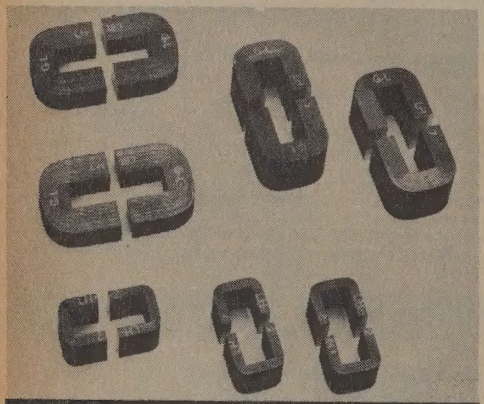
manufacturers of magnetic components



MAGNETIC LAMINATIONS Request Bulletin TB-108A



TAPE WOUND CORES Request Bulletin TB-105



"C" CORES Request Bulletin TB-109

MAGNETIC LAMINATIONS
...nickel alloys and grain-oriented silicon steel

Available without tooling charge in a wide variety of standard EI, EE, F, D IU, L shapes, in 6 and 14 mil thicknesses, of non-oriented (round loop) a oriented (square loop) 50% nickel alloys, high permeability 80% nickel alloy and grain-oriented silicon steel.

Exclusive G-L "Hy-Q" finish and use of highest quality carbide dies, provid high stacking factor, high interlaminar resistance, and high "Q" in tran formers, filters, reactors, chokes, and inductors.

Maximum initial permeability is obtained from precisely controlled hydroge anneals in closed furnaces. In the 80% nickel alloys, G-L "Mu-Max" lamina tions have raised the minimum initial permeability available to the designe by an average of 30%.

Special shapes are tooled in G-L's own Die Shop either with steel dies fo economical short-runs or in carbide for maximum die life. Typical specialtie are head laminations, spacers, and shields in thicknesses down to 1 mil, wit thickness tolerances as close as 50 microinches.

TAPE WOUND CORES and BOBBIN CORES

Promptly produced in gapless toroidal form—in sizes from 1/16" OD an 1/32" tape width...to more than 10" OD and 2-3/4" tape width, weighin thousands of grams.

Wide selection of available alloys, as tabulated below, cover applications from tiny pulse transformers for transistorized ignition systems to massive core for mag-amp controlled power supplies of missile launching submarines.

Cores are wound with 1/8 mil to 14 mil thick tape in various nickel alloys and silicon steel—uncased, or cased in a choice of aluminum, molded phenolic, or new glass filled nylon boxes...or on stainless or ceramic bobbins. Aluminum cased cores optionally available with G-L's "EE" coating, which not only eliminates taping before winding the core, but also provides a seal resistant to vacuum impregnation. The "EE" coating is neither tacky nor brittle, exhibits no cold flow, and does not soften at high temperatures. Aluminum cased cores, "EE" coated, have been used successfully in magnetic amplifiers at temperatures as high as 200°C., and have survived the shock of missile launching and in-flight centrifugal and centripetal forces, as high as 200 G.

"C" CORES

A wide range of 4 mil "C" cores from the smallest requirements up to approximately 4-1/2" in overall length are now available from stock. G-L "C" cores are produced by new manufacturing techniques with special emphasis on maintaining precise dimensional and electrical uniformity, to assure easy assembly and low power losses.

Because of new improved impregnation materials and techniques, "C" cores manufactured by G-L will operate continuously in temperature environments in excess of 200 degrees Centigrade without deterioration of the interlaminar bond.

AVAILABILITY:

LAMINATIONS—Stocks of all popular standard shapes, alloys, and thicknesses warehoused on both East and West Coasts for immediate shipment.

TAPE WOUND CORES—Stocks of IEEE, EIA standard sizes cased in plastic, aluminum, and EE coated, warehoused on both East and West Coasts for immediate shipment. Most other sizes available in quantity in less than two weeks.

"C" CORES—Prototype stock maintained on both East and West Coasts for immediate delivery.

BOBBIN CORES — Catalog bobbin sizes available in quantity in three weeks or less...bobbin cores are normally made to customer specifications.

G-L INDUSTRIES, INC.
G-L Electronics Division

Factory, Engineering Offices & East Coast Warehouse
300 Harvard Avenue
Westville, New Jersey 08093
609 GL 6-7300
TWX 609-456-6429

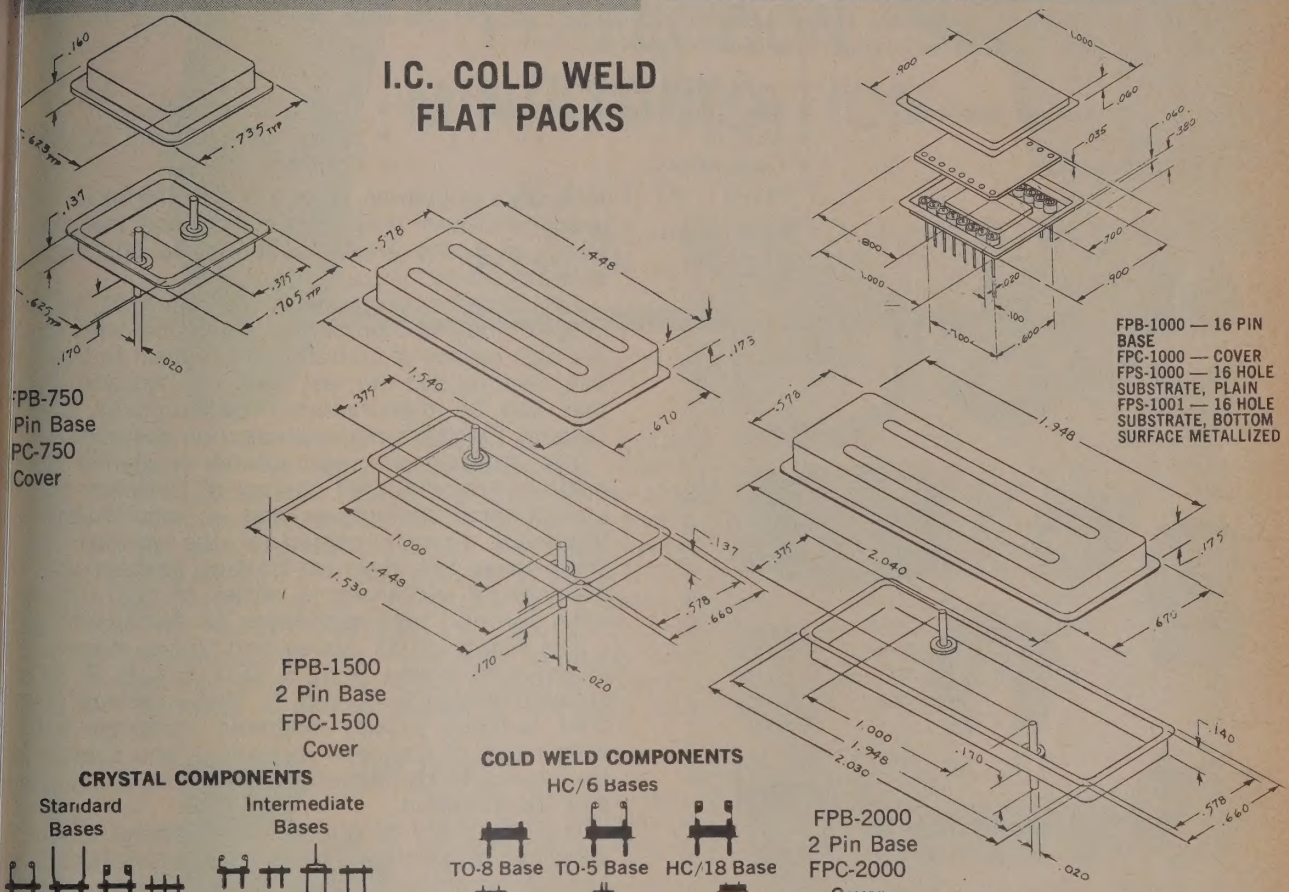
West Coast Warehouse
Collins & Hyde, Inc.
5380 Whittier Boulevard
Los Angeles, California 90022
(213) 685-6540
TWX 910-580-3646

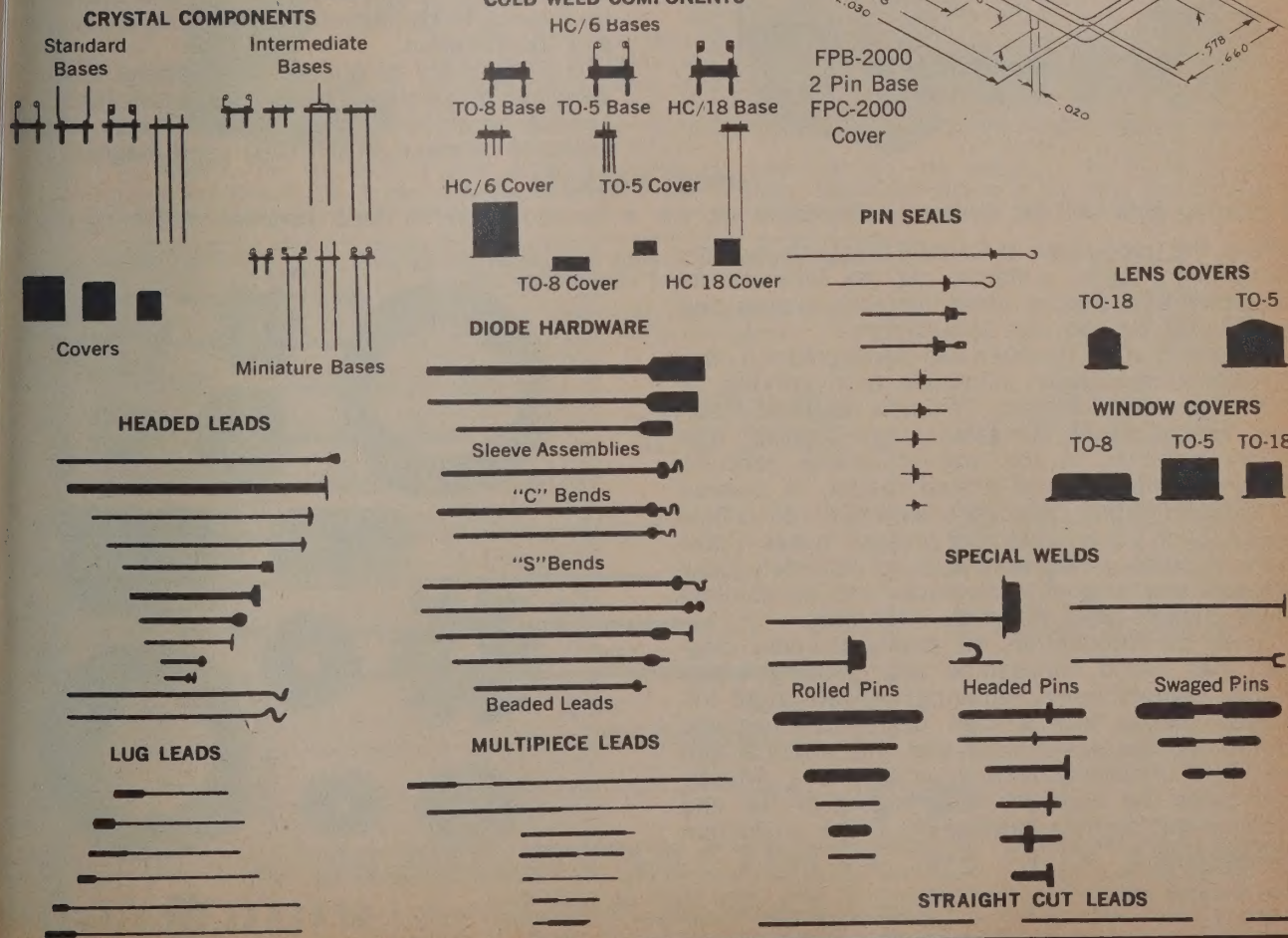
REPRESENTATIVES THROUGHOUT UNITED STATES AND CANADA

GTI CORPORATION
Saegertown Components Division

COMPONENTS

I.C. COLD WELD FLAT PACKS



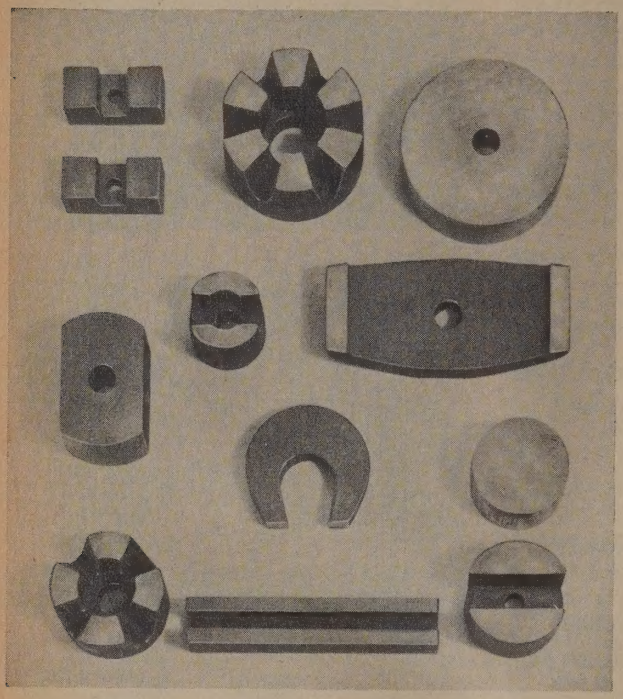


PERMANENT MAGNETS

Many GE permanent magnets are stocked and may be ordered by catalog number. Where a stocked magnet does no meet all the application's requirements, General Electric can design a magnet that does. Engineering design assistance or information on stocked and special magnets is available on request.

ALNICO MAGNETS

- Radio and television speakers
- Telephones
- Refrigerator latches
- Electron tube assemblies
- Motors
- Generators
- Toys and novelties
- Space vehicles and missiles
- Controls



In today's industries, Alnico is still the most widely used permanent magnet material, and the growing family of Alnico grades continues to find new and ever-increasing usage.

This broad acceptance is the result of the wide range of magnetic properties obtainable with Alnico, the high degree of stability with respect to time and temperature, and the vast array of sizes and shapes that can be manufactured economically through General Electric's mass production methods.

The Alnicos are precipitation-hardened alloys made by conventional casting or sintered powder metallurgical techniques and a specialized heat treatment. Precise control of the various Alnico chemistries plus the heat treating process give the material its well-known qualities of high magnetic induction and high resistance to demagnetization.

The family of GE Alnico permanent magnets includes cast Alnico 3, 4, 5, 5DG, 5-7, 6, 8, 9, and sintered Alnico 2, 5, and 8. These various grades offer industry proven magnetic materials with a wide range of magnetic inductions and coercivities (resistance to demagnetization) in the exact shape and size required.

The versatility of Alnico, plus General Electric's advanced research and design and application engineering capabilities, continues to broaden the acceptance of these most widely used magnets.

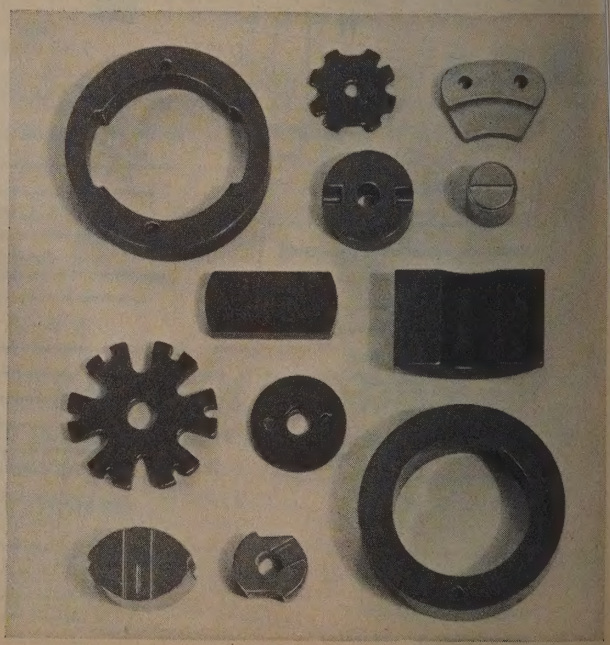
LODEX® MAGNETS

- Hearing aids
- Core meters
- Miniature motors
- Speedometers
- Reed switches
- Timing motors

Lodex, the trade name of General Electric's recently developed magnet material, can be formed economically into precise close-tolerance shapes and small sizes for intricate applications.

A product of GE research and development, Lodex production techniques eliminate form grinding or high-temperature treating. This new magnetic material, consisting of elongated single domain iron cobalt particles in the size of smoke particles uniformly dispersed in a lead matrix, is pressed or extruded (rather than cast or sintered) into its final shape. Such a manufacturing process makes it possible to produce magnet shapes to extremely close physical and magnetic tolerances and to maintain close piece-to-piece magnetic uniformity.

Since its introduction, the family of Lodex magnets has found widespread and growing usage among manufacturers requiring intricate, tight tolerance shapes with a high degree of magnetic uniformity. Designers know that this physical and magnetic uniformity in their applications virtually eliminates the need for final testing of the end product and permits automation in the production process.

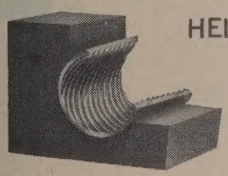


For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

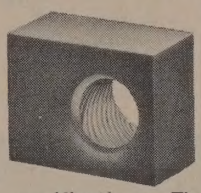
Shown above is a miniature version (exact size) of the highly dependable and reliable HELISHAFT. Because of the extreme need for compactness, *Helitronics* has perfected the miniaturization of all its components; HELISHAFT*, HELIBLOC*, HELINUT* and HELISLIDE*. These poly-start threaded components working as highly efficient teams, divide the work load precisely and equally over each of the multiple threads, realizing a unique degree of accuracy and smoothness of flow, while minimizing wear. The high degree of refinement in today's electronic and mechanical techniques requires that same degree of perfection in all components of the equipment.

All industries including Microwave, Electronic Instruments, Missile, Medical, and Scientific Toys, have recognized the important part Helitronic parts are playing in today's demand for *progress*, with *reliability* and *dependability*.



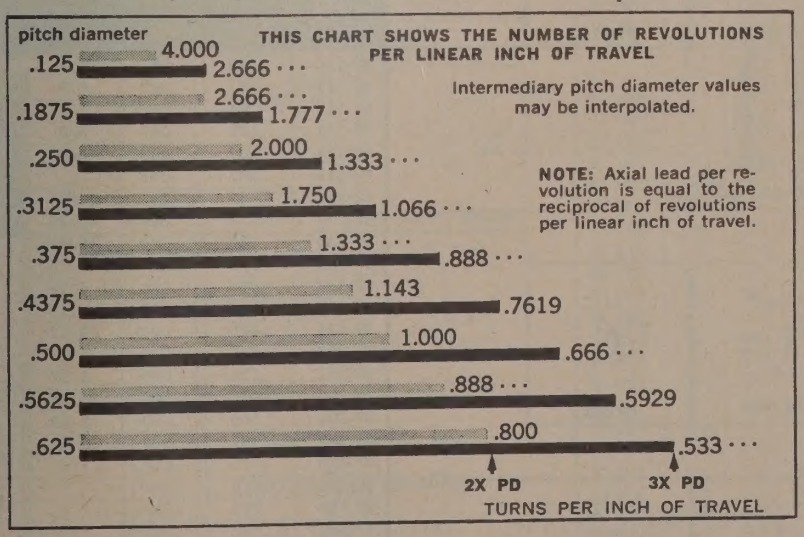
HELINUT*

The HELINUT, a poly-start thin-walled internally threaded metal sleeve (a wall thickness as low as .010) is precisely mated to each individual HELISHAFT. The HELINUT is used as an embedment in our HELISLIDE. It can be potted, or press-fit and staked for your specific needs.



HELIBLOC*

Utilizing the favorable characteristics of Teflon†, the HELIBLOC is a poly-start internally threaded lead-nut or contact slider block, made in a variety of shapes and sizes, to fit your specifications. The design of the HELIBLOC has been tested and proven in the field to be a repetitively reliable mate for the HELISHAFT.



Send for your FREE informative & descriptive literature on all components of the Helitronic unit. All inquiries must be on company letterhead. For immediate information call the plant; area code 201 621-7773. Write our sales office for a representative to call on you.

*T.M.-PAT. PEND. ALL RIGHTS RESERVED
†TEFLON T.M. E. I. DUPONT

HELITRONICS CORP.

SALES OFFICES and RESEARCH, DEVELOPMENT, PRODUCTION:
155 Tichenor St., Newark, N. J. 07105 (area code 201) 621-7773

Specify BERYLLIUM COPPER SPRINGS *micro-processed*

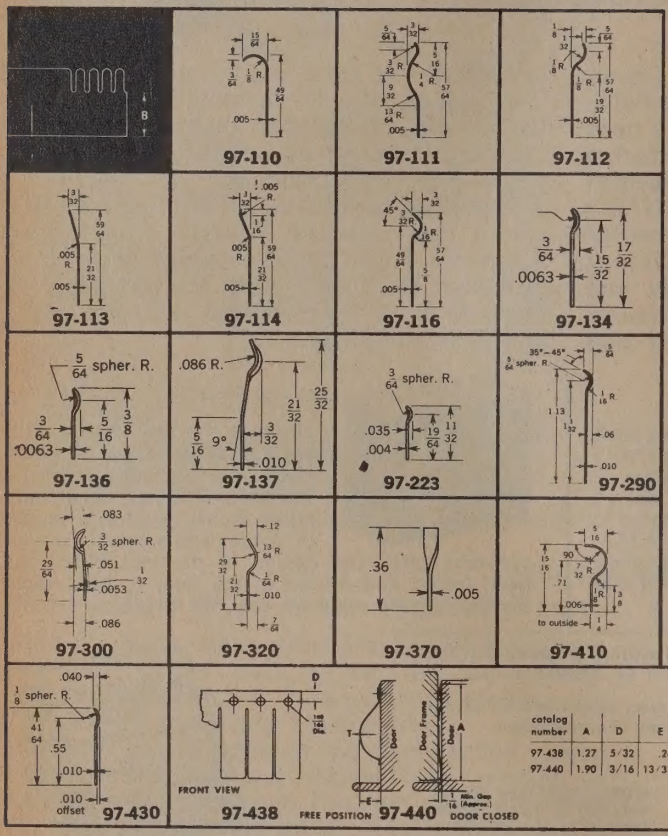
Specially developed equipment and production processes, combined with the broad experience of I-S engineers, assure higher efficiency and better performance in springs for electronic controls and high frequency applications. Only 100% laboratory certified raw material is used in the production of micro-processed precision springs.

All strips and rings on these two pages are made of beryl[illegible] copper Alloy No. 25, conforming to ASTM-B194 and Fed[illegible] QQ-C-533a Alloy 172. Strips are especially useful for gro[illegible]ing and bonding in high frequency equipment. Rings [illegible] made from contact finger stock, and are open in free p[illegible]tion. All are standard products available from stock!

Ask about "Sticky-Fingers"—the electronic shielding strips with self-adhesive!

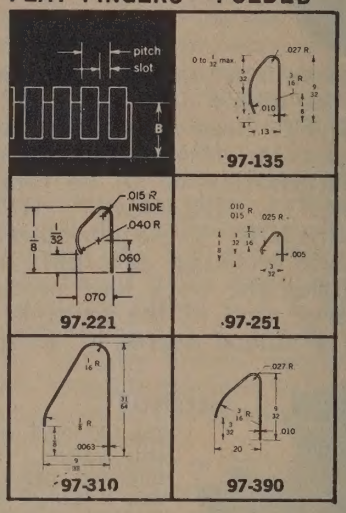
FINGER CONTACT STRIPS

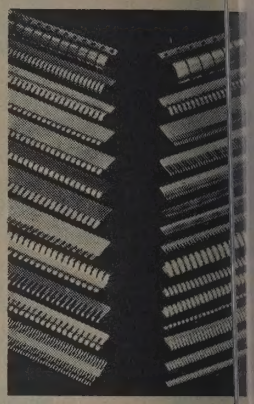
FINGERS ON ONE EDGE



catalog number	A	D	E	T
97-438	1.27	5/32	.26	.005
97-440	1.90	3/16	13/32	.007

FLAT FINGERS—FOLDED

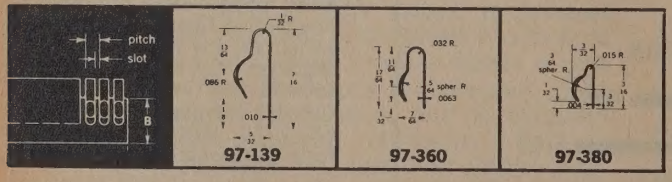




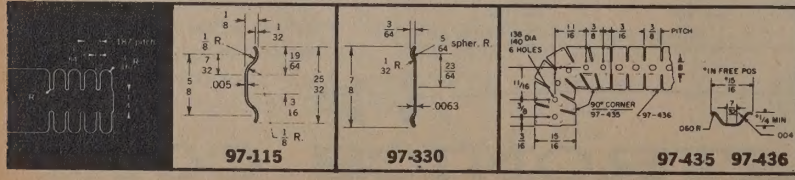
ENGINEER'S SAMPLE ASSORTMENT

One each of 29 items listed here.
Cat. No. 97-272.
Price: $25.00

SPHERICAL FINGERS—FOLDED



FINGERS ON BOTH EDGES



Fastener 97-445 for 97-435 and 97-436

Kits available. Write for General Catalog

Catalog Number	Pitch	Slot	B	Stock Length	Weigh Lbs. p 1000 i
97-110	.187	.047	5/8	16"	1.3
97-111	.187	.047	5/8	16"	1.3
97-112	.187	.047	5/8	16"	1.3
97-113	.187	.047	5/8	16"	1.3
97-114	.187	.047	5/8	16"	1.3
97-115	.187	.047		16"	1.1
97-116	.187	.047	41/64	16"	1.3
97-134	.075	.025	7/32	16"	.9
97-135	.134	.040	15/64	16"	1.4
97-136	.075	.025	1/16	16"	.6
97-137	.094	.031	5/16	16"	2.0
97-139	.094	.031	5/16	16"	2.0
97-221	.060	.020	3/32	12"	.33
97-223	.060	.020	1/8	16"	.35
97-251	.127	.050	3/32	12"	.3
97-290	.075	.025	11/16	16"	3.0
97-300	.165	.040	3/16	16"	.8
97-310	.187	.062	3/8	16"	1.4
97-320	.172	.047	3/8	16"	2.4
97-330	.075	.025		16"	1.3
97-360	.075	.025	7/32	16"	.9
97-370	.095	.030	.16	16"	.43
97-380	.060	.020	1/8	16"	.35
97-390	.134	.040	15/64	16"	1.4
97-410	.157	.040	11/32	16"	1.8
97-430	.154	.059	1/4	16"	1.4
97-436	.375	.015	7/32	24"	1.2
97-438	.375	.040		25 ft.	1.6
97-440	.500	.040		25 ft.	3.6

MPLETE ENGINEERING AND DESIGN SERVICE

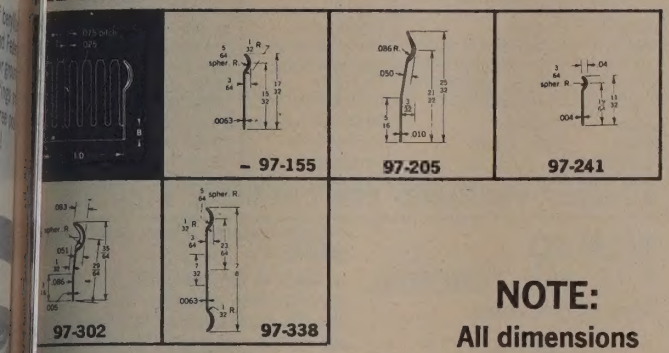
engineers are available at all times to assist you in solving problems in the application of micro-processed beryllium er springs. Their extensive knowledge and wide facilities n enable them to recommend better parts at lower cost. otype quantities produced quickly and economically.

FINISHES AVAILABLE:

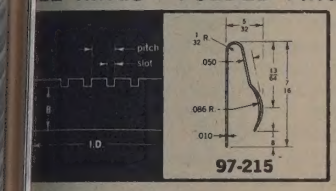
Standard finger contact strips and high frequency contact rings are supplied "As Heat Treated" (purchaser to apply finish) or "Bright Finish" (tarnish-resistant). Other finishes also available: Silver plated—or gold, rhodium, nickel or cadmium. Write for complete catalog.

FINGER CONTACT RINGS

LE RINGS

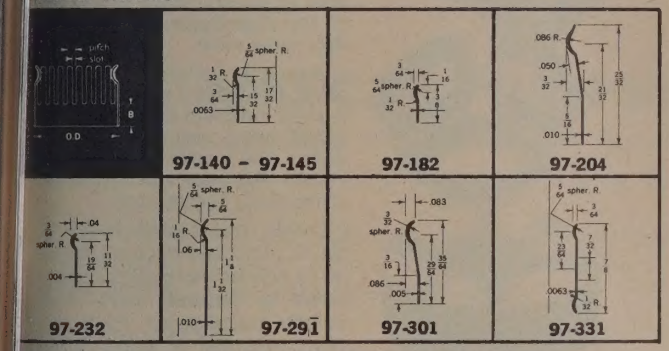


LE RINGS—FOLDED FINGERS

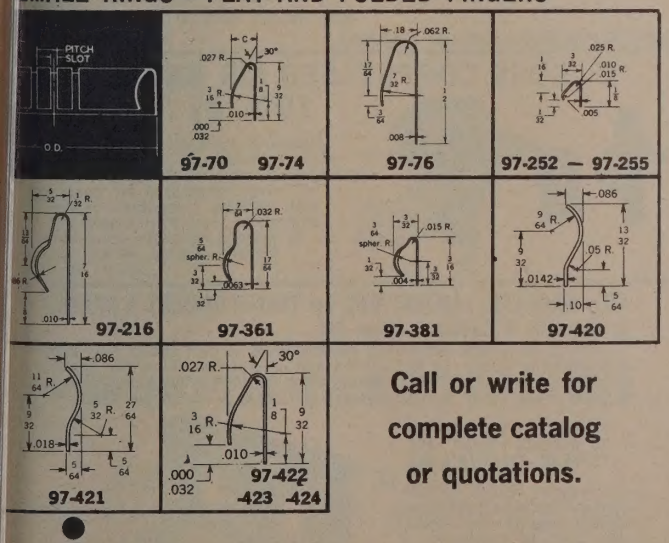


NOTE:
All dimensions shown in inches. Other diameters in all designs supplied to order.

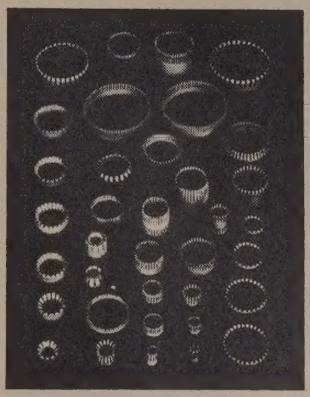
MALE RINGS



EMALE RINGS—FLAT AND FOLDED FINGERS



Call or write for complete catalog or quotations.



ENGINEER'S SAMPLE ASSORTMENT

Thirty-six different contact rings, all identified. One or more from each family of rings shown here. Cat. No. 97-273. Price: $15.00.

Catalog Number	MALE Pitch	Slot	I.D.	Fingers	Nominal Ring Dia.	B	Weight in Lbs. per M	Made from Strip
97-150	.075	.025	.208	9	1/4	7/32	.6	97-134
97-151	.075	.025	.327	14	3/8	7/32	1.0	97-134
97-152	.075	.025	.447	19	1/2	7/32	1.3	97-134
97-153	.075	.025	.685	29	3/4	7/32	2.0	97-134
97-154	.075	.025	.949	40	1.0	7/32	2.8	97-134
97-155	.075	.025	1.449	61	1 1/2	7/32	4.3	97-134
97-205	.094	.031	.886	30	1.0	5/16	5.3	97-137
97-215	.094	.031	1.240	42	1 1/2	5/16	8.6	97-139
97-241	.060	.020	.339	18	3/8	1/8	.4	97-223
97-302	.165	.040	1.842	35	1 31/32	3/16	4.6	97-300
97-338	.075	.025	.447	19	1/2		1.8	97-330

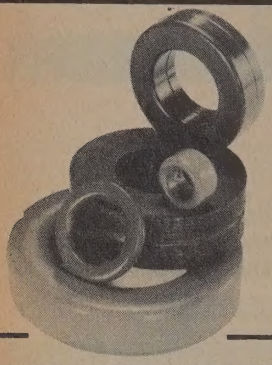
Catalog Number	FEMALE Pitch	Slot	O.D.	Fingers	Nominal Pin Dia.	B	Weight in Lbs. per M	Made from Strip
97-70	.135	.040	1.219	28	1 1/64	15/64	5.5	97-135
97-74	.135	.040	.875	20	43/64	15/64	3.9	97-135
97-76	.165	.015	.637	12	11/32	1/4	3.2	97-340
97-140	.075	.025	.292	12	1/4	7/32	.8	97-134
97-141	.075	.025	.436	18	3/8	7/32	1.3	97-134
97-142	.075	.025	.555	23	1/2	7/32	1.6	97-134
97-143	.075	.025	.795	33	3/4	7/32	2.3	97-134
97-144	.075	.025	1.057	44	1.0	7/32	3.1	97-134
97-145	.075	.025	1.558	65	1.5	7/32	4.3	97-134
97-182	.075	.025	.555	23	1/2	1/16	1.1	97-136
97-204	.094	.031	1.040	34	1.0	5/16	6.6	97-137
97-216	.094	.031	1.244	41	1.0	5/16	7.0	97-139
97-232	.060	.020	.536	28	1/2	1/8	.6	97-223
97-252	.127	.050	1.250	31	1.085	3/32	1.1	97-251
97-253	.127	.050	1.155	28	.985	3/32	1.0	97-251
97-254	.127	.050	.905	22	.735	3/32	.8	97-251
97-255	.127	.050	.650	16	.480	3/32	.6	97-251
97-301	.165	.040	1.737	33	1 5/8	3/16	4.3	97-300
97-331	.075	.025	.795	33	3/4		3.0	97-330
97-361	.075	.025	1.008	42	27/32	7/32	2.3	97-360
97-381	.060	.020	1.207	63	1 1/16	1/8	1.3	97-380
97-420	.193	.075	.500	8	.323	1/16	1.9	
97-421	.100	.050	.500	15	.368	1/16	2.2	
97-422	.154	.050	.600	12	.368	1/4	2.3	
97-423	.159	.050	.775	15	.540	1/4	3.	
97-424	.135	.040	1.050	24	.810	15/64	4.7	

INSTRUMENT SPECIALTIES CO., INC. Little Falls, New Jersey
Phone: 201-256-3500 • TWX: 710-988-5732

The INTER-TECHNICAL Group, Inc.

UNITED STATES AGENCY OF THE TELCON GROUP OF COMPANIES

P. O. BOX 23
IRVINGTON-ON-HUDSON, N. Y. 1053
TEL: 914-591-8822
TWX: 710-564-0802



TELCON METALS LTD.

is one of the largest and oldest manufacturers of nickel, iron and cobalt alloys for magnetic applications. Their fully integrated facilities provide raw materials and fabricated components covering the whole range of commonly used magnetic materials.

HIGH PERMEABILITY TOROIDS — are available in all materials listed in the accompanying table in standard tape thickness.

PHOTO-ETCH — high permeability alloys for recording and playback head laminations are available.

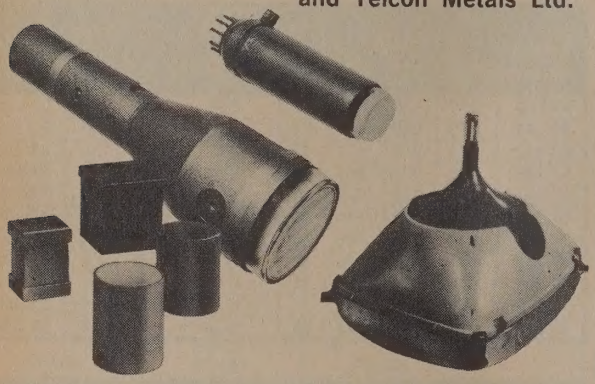
TELCON HIGH PERMEABILITY MAGNETIC ALLOYS AND FABRICATED TOROIDS

80% NICKEL	50% NICKEL	OTHER ALLOYS	ULTRATHIN FOIL
Round TELCON 79 TELCON 40 TELCON 60 TELCON 100 **Square** ORTHO TELCON 79	**Round** RADIOMETAL 50 SUPER RADIOMETAL HYRHO RADIOMETAL SATMUMETAL **Square** HCR ALLOY	PERMENDUR PERMENDUR 24 SUPERMENDUR VICALLOY RADIOMETAL 36 Magnetic Compensating Alloy REMENDUR	As thin as 0.000125" in a wide range of materials including many of those listed and others including Beryllium copper, tantalum, and zirconium.

HIGH PERMEABILITY FOIL — SURFACE PREPARED FOR CHEMICAL ETCHING

MAGNETIC SHIELDS UP TO 30" DIAMETER FOR CATHODE RAY TUBES & TRANSFORMERS

by Magnetic & Electrical Alloys Ltd. and Telcon Metals Ltd.



An extensive range of standard shields are available for cathode ray tubes, transformers, chokes, photo multipliers, vibrators, high gain amplifiers and magnetic tape recorder heads. Special patterns also can be produced to meet individual requirements. Shields can be supplied in a wide range of magnetic alloys and are available either single or multilayer. Technical assistance available on your shielding problems.

TELFORM

DEEP DRAWN COMPLEX SHAPES

A NEW CONCEPT IN MAGNETIC SHIELD CONSTRUCTION

Specially developed for quantity production of high efficiency complex shields, new TELFORM construction utilizes precision drawn segments to drastically reduce welded seams. The result is extra close fitting shields with improved shielding characteristics. This new technique is applicable for CRT tubes up to approximately 20" long. No premium charge even though dimensions, finish and appearance are far more uniform throughout batches than conventionally fabricated shields. Rapid delivery after initial tooling. Available in 80%, 50% and 36% nickel-iron alloys up to 0.10" thick.

Extremely Competitive Prices on Custom Shields. Send for Illustrated Catalog and Ask for a Quotation. Substantial savings can be offered when Magnetic Shields and Tubes are purchased as assemblies. **Also see EEM page 2137.**

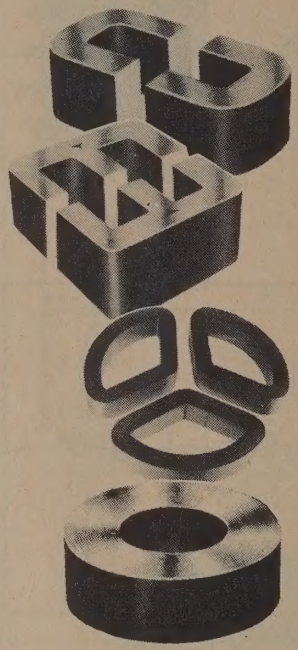
OTHER TELCON PRODUCTS:

- Thermostatic Bimetals
- High Permeability Strip, Rod & Wire For Component Manufacturing & Shielding
- Glass to Metal Seal Alloys.

TELMAG

E, C and TOROIDAL

Tape-wound cores



- Grain oriented Silicon Steel Components.
- Made to EIA Spec. RS217 & trade specifications primarily from American Allegheny-Ludlum "Silectron" by our British associate TELCON MAGNETIC CORES LTD. . . . one of the largest manufacturers of grain oriented silicon steel components.
- Available in all American standard or special sizes to American core numbers. Popular types available from New York warehouse for immediate delivery.
- Sold at prices that help you solve your constantly rising cost level problem—due to the unique combination of American material and one of the largest manufacturing facilities in the world.
- Now also available "Circular E cores" for improved performance of 3-phase transformers. Savings in weight, larger window area, better cooling and magnetically balanced circuits offer broad advantages over conventional 3-phase cores.
- Toroidal cores available in 2, 4, 6 and 12/13 mil tape thickness. Cores can be supplied impregnated or edge bonded for improved rigidity. Also available gapped or cut. Prices are always calculated by weight; there is no need to accept catalog sizes if your design calls for a special size.

COMPLETE PUBLISHED PRICE LIST AVAILABLE.

"C" CORE COMPRESSED AIR BANDING TOOL by TELMAG

Manufacturing rejects caused by variations in banding of "C" transformer cores can now be eliminated. The new "C" core Compressed Air Banding Tool provides consistent banding stresses in assembly-line operation. By making cores useful which were formerly rejected, the tool soon pays for itself.

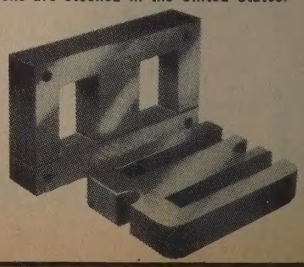
NiFe MAGNETIC LAMINATIONS for TRANSFORMERS & CHOKES

by Magnetic & Electrical Alloys Ltd. . . .

. . . one of the largest commercial manufacturers of high quality NiFe alloy laminations in Europe. To find out the cost savings that M.E.A. can provide let us quote on your next requirement. For off-the-shelf delivery at the lowest quantity prices, many std. laminations are stocked in the United States.

SINGLE "E" LAMINATIONS TO REPLACE "EI187" AND "EE24-25" TYPES IN 6 MIL

An exclusive M.E.A. development that increases performance, reduces material cost, reduces labor cost. No modification of bobbin, clamps or other parts required, and when the final lamination has been inserted into the bobbin, the single "E" is practically self-clamping. End result is a 50% saving in assembly cost.



KE HERMETIC SEALS

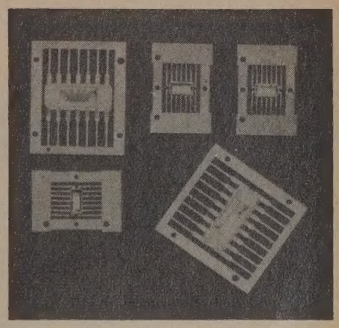
NTEGRATED CIRCUIT PACKAGE

Four kinds of packages are introduced herein consisting of a combination of stacked glass and metal.

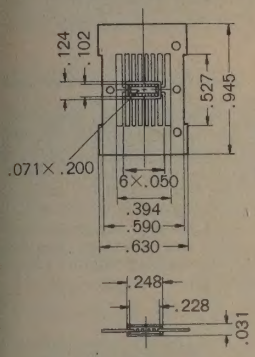
Metal is Kovar alloy and glass is made by Koto of a composition known as Koto Glass No. 701.

The perfect hermeticity and mechanical strength of the package is insured both by the good medium layer contained between metal and glass and also by the special material of glass, which has been achieved as a result of years research and development at Koto Electric.

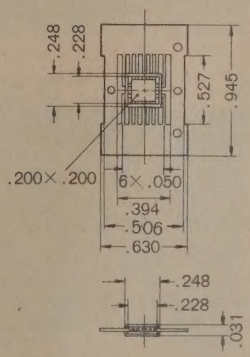
To seal the Kovar alloy lid to the package after IC-mounting, it is recommended the use of gold-tin alloy or lead-tin-silver alloy solder.



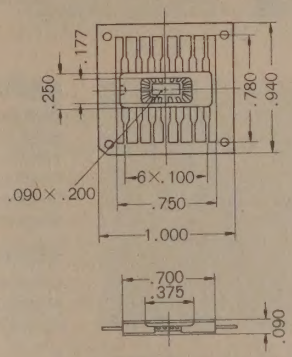
1/4" × 1/8" FLAT PAK



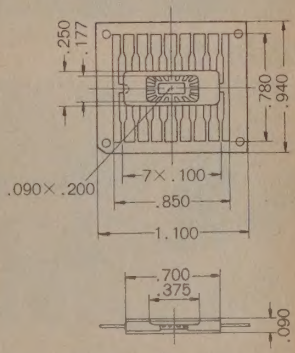
1/4" × 1/4" FLAT PAK



14 LEAD DIP



16 LEAD DIP



BASE AND CAP FOR PHOTOEMISSION DIODE

These packages are used for Photoemission diodes such as Gallium Arsenide, Gallium Arsenide Phosphide etc.

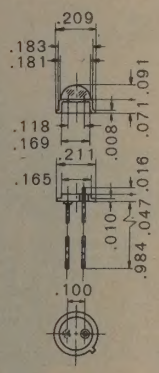
The package consists of a cap with convex lens which is hermetically sealed to the window part and base of the compression seal.

The materials used are such as to result in unusual strength and thermal shock capabilities.

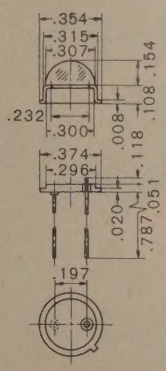
The windows are clear, without bubble, seed or cracks.

Caps with red color lenses are also available.

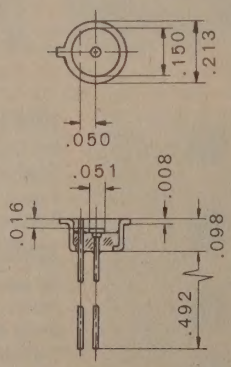
PD-05

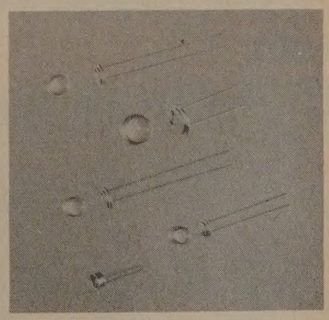


PD-09



PC-1





KOTO ELECTRIC CO., LTD. SAITAMA JAPAN

Cable : KOTOELEC URAWA

REPRESENTATIVES

MARUBENI-IIDA(AMERICA), INC.

New York Head Office, Pan American Bldg., 200 Park Avenue, New York, N.Y. 10017 • Phone 212-973-6500

Chicago Branch, 938 Merchandise Mart, Chicago, Ill. 60654 • Phone 312-527-3800

Los Angeles Branch, 624 South Grand Avenue, Los Angeles, Calif. 90017 • Phone 213-628-6271

MAGNETICS
butler, pennsylvania 16001 • phone: (412) 285-4711 • twx: 710-373-381
A Division of Spang Industries Inc.

tape wound cores

applications

Magnetic Amplifiers **Reactors**
Converters **Regulators**
Inverters **Static Magnetic Devices**

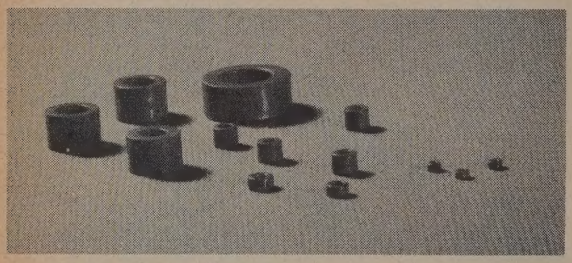
These Tape Wound Cores are made from high permeability alloys of nickel-iron, grain oriented silicon-iron, and cobalt-iron. The alloys are known as Orthonol®, Alloy 48, Square and Round Permalloy 80, Supermalloy, Magnesil®, and Supermendur. Cores are available in all AIEE standard sizes and over 500 special sizes.

For a wide range of frequency applications, materials are produced in thicknesses from ½ mil through 14 mils. All core sizes can be provided in phenolic or plastic, aluminum, or GVB coated aluminum boxes. Magnesil® material, being less sensitive to external stresses, is also available unboxed or epoxy encapsulated. Commonly used sizes are in stock for immediate shipment.

literature available

Tape Wound Core Manual — TWC300
How to Reduce Magnetic Circuit Size and Response Time
Designing Magnetic Circuits for High Frequencies
How to Design Magnetic Circuits for Extreme Temperature Environments
Environmental Effects on Magnetic Characteristics of Tape Wound Toroidal Cores
Shortcuts in Selection of Tape Wound Core for Magnetic Circuitry
Bulletin No. 2-65 GVB
TWC-PN — Tape Wound Cores Specification Data
Converter and Inverter Design Aids
Miniature Tape Wound Cores — Bulletin 16
Tape Wound Core Calculator (slide rule)
Bulletin TWC-S1 High Frequency Core Loss Curves

bobbin cores



applications

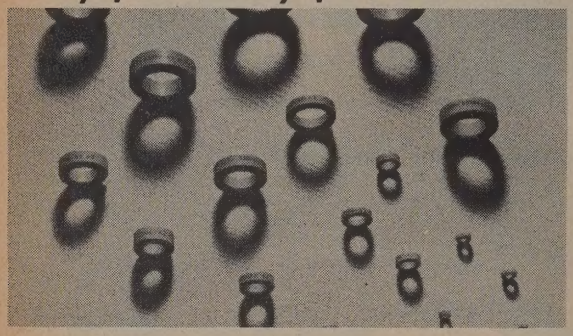
Computers (Memory Cores)
High frequency counters
Timers
Oscillators
Inverters
Magnetic Amplifiers

Bobbin Cores, manufactured from Permall 80 and Orthonol® ultra-thin tape (.00012 to .001″ thick), are available in widths fro .023″ to .250″ (wider on special requests Wound on non-magnetic stainless steel bo bins, core diameters are available down .050″ or less with flux capacities as low a several maxwells. Magnetics Inc.'s sophist cated pulse test equipment reproduces mo test programs and can measure accurate in the millivolt-microsecond region. Standar sizes are available from stock.

literature available

Catalog BC-303R
Miniature standard sizes — Bulletin 16
Bulletin TWC-S1 High Frequency Core Loss Curves

moly-permalloy powder cores



applications

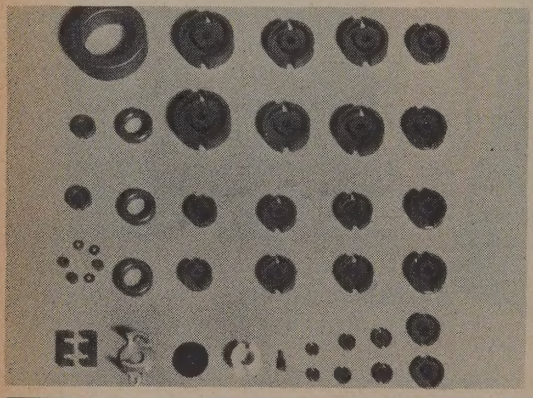
Inductors for high Q, low loss filter circuits
Loading Coils
Transformers
Chokes

For linear applications, these cores are available in permeabilities of 14, 26, 60, 125, 160, 200, 300, and 550 and have guaranteed inductance limits of ±8%. Insulation on cores is a high dielectric strength finish not affected by normal potting compounds and waxes. 16 sizes include ID's from 1.40″ to .110″ and OD's from 2.25″ to .250″. Standard cores include either temperature stabilized (as wide as −65°C to +125°C) or unstabilized. Most core types can be shipped immediately from stock.

literature available

Catalog PC-303R
300 Permeability Moly-Permalloy Powder Core Brochure
Bulletin No. 13 — Sub-Miniature Moly-Permalloy Powder Cores
Powder Core Calculator (slide rule)

ferrites



shapes

Pot Cores
Toroids
E, I, U Cores
Special Shapes

applications

Inductors
Filters
Delay lines
Transformers

literature available

Ferrite Catalog FC-208S
Iso-Q Contour Curves
Ferrite Core Calculator (slide rule)

High purity manganese zinc ferrite pot cores exhibit low loss characteristics and exceptionally low disaccommodation. They are available with linear temperature characteristics (−30°C to +70°C) in permeabilities of 750, 1400, and 2000, or flat temperature characteristics (+20°C to +70°C) in a 2300 permeability material.

For transformer applications, the inductance of ungapped pot cores is guaranteed to ±20%; for filters, cores are gapped to standard inductance factors guaranteed to ±3%. Thirteen physical sizes (7 x 4 mm to 36 x 22 mm, including 8 international standard sizes) are stocked, and each size offers a variety of standard inductance values from which to choose.

In addition to a complete selection of tuning assemblies, the line also features a unique one-piece spring steel mounting clamp and bobbins for chassis or printed circuit board designs.

Other available types include toroids, E, and U-I cores. Special shapes can also be provided.

special components

In addition to the standard high quality component lines, Magnetics Inc. offers unique capabilities in the design and manufacture of specialized components fabricated from any alloy and in any size or shape. — Expertly staffed laboratories are complete with the most modern magnetic testing equipment, pilot plant facilities, and large scale production equipment for processing components in powdered, sintered, strip, wire, rod or other forms. — Special components for custom applications include unusual core configurations from strip as thin as ⅛ mil, or flat intricate pieces made by the chemical milling technique. Also included are various shapes pressed from powders and then sintered and/or annealed. — Components can be made from custom-blended magnetic or specialty alloys which are processed through the company's Metals Division. — Send specific inquiries to the Magnetics Inc. Special Products Dept.

MAGNETICS butler, pennsylvania 16001 • phone: (412) 285-4711 • twx: 710-373-3821

Division of Spang Industries Inc.

agnetic laminations

applications

Quality Transformers
Chokes
Reactors

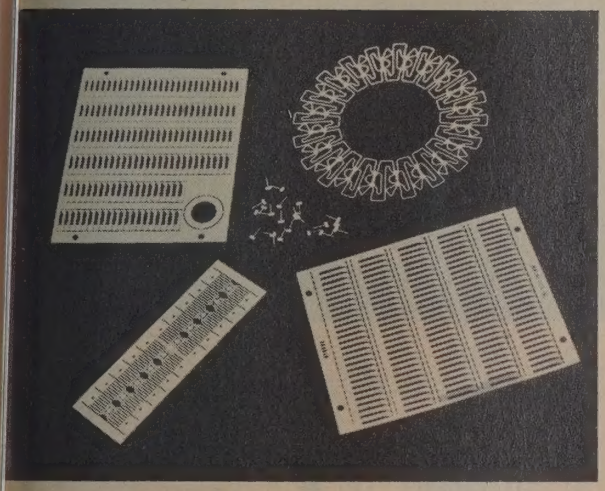
Hydrogen annealed Laminations, manufactured to guaranteed minimum permeability limits, are available in Permalloy 80, Alloy 48 and Orthonol®, in thicknesses of .004", .006", and .014". Thirty-eight standard shapes in sizes ranging from the DU-87 and the EI-12 down to the EI-093, EE-30-31, DU-63 and the F-094, can be shipped from stock or on special order. Special shapes can be made to fit specific needs, including rotor-stator and recording head laminations.

Small, intricate, or thin (to .0005") parts can be produced by a photo-etching, or chemical milling process.

literature available

Catalog ML-303R (Standard Laminations)
Bulletin PF-1 (Photo-etched Parts)

hotofab parts



applications

Any thin gauge (.030" to .0005") metal parts

Precision flat components from any magnetic or specialty alloy can be made inexpensively and quickly by the Magnetics Inc. photo-etch process. Small shapes can be chemically milled in prototype quantities at low cost, then later tooled for stamping when the item reaches the production stage.

The process is particularly effective for intricate configurations made from materials less than .006" thick. Materials are available in thicknesses ranging from .030" to .0005". Tolerances on dimensions depend on the type of material and thickness of the part being produced.

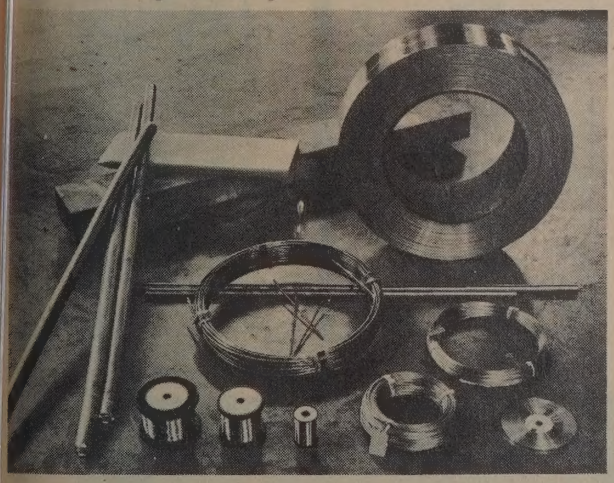
Rotors and stators, head laminations, and integrated circuit flat pack lead pre-forms are only a few of the parts which can be made. Any part that can be stamped can also be produced as a Phofab® Part.

Complete metal processing facilities provide special alloy compositions.

literature available

Bulletin PF-1

specialty alloys



Rod, wire, and thin gauge strip products are manufactured by a powder metallurgy process which is extremely effective where close control of chemistry (±0.01%) is required. In addition, this metallurgical approach produces a homogeneous alloy with trace elements at a level of less than 0.005%. As a result, physical properties are uniform within each heat and from heat to heat.

A wide range of standard compositions including Ni-Fe, Ni-Fe-Mo, Ni-Co-Fe, Ni-Cr-Fe, etc., is available, as well as alloys blended to specific customer requirements. Areas of application include electronics, glass sealing, vapor deposition, and specialty plating anodes.

For initial customer evaluations, laboratory pilot production equipment provides small quantities. In production facilities, these alloys and products can then be scaled up with precise duplication of composition and properties.

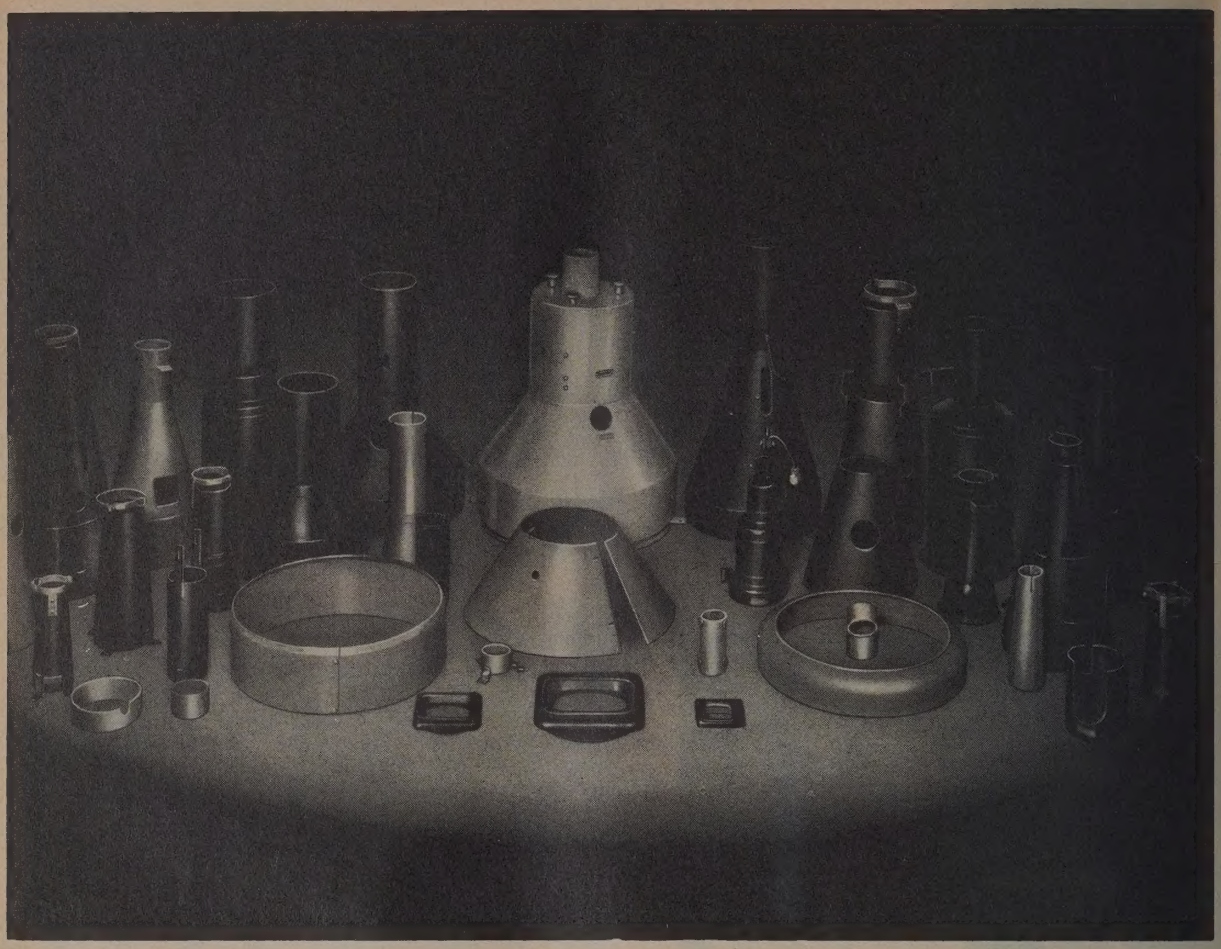
A variety of conventionally melted alloys is available by conversion reroll to thin gauge strip (0.0005"-0.005"). Mill services include tension leveling, slitting, strip annealing, and billet sintering.

literature available

Bulletin M-1

special components

In addition to the standard high quality component lines, Magnetics Inc. offers unique capabilities in the design and manufacture of specialized components fabricated from any alloy and in any size or shape. — Expertly staffed laboratories are complete with the most modern magnetic testing equipment, pilot plant facilities, and large scale production equipment for processing components in powdered, sintered, strip, wire, rod or other forms. — Special components for custom applications include unusual core configurations from strip as thin as ⅛ mil, or flat intricate pieces made by the chemical milling technique. Also included are various shapes pressed from powders and then sintered and/or annealed. — Components can be made from custom-blended magnetic or specialty alloys which are processed through the company's Metals Division. — Send specific inquiries to the Magnetics Inc. Special Products Dept.



MILLEN MAGNETIC SHIELDS

MU-METAL and/or **NICOLOI** annealed after fabrication. Stock shields or custom-made.

Typical of the MILLEN line of magnetic shields are:

CATALOG NUMBER	FACE DIAMETER	NECK DIAMETER	LENGTH	TYPICAL TUBE
SHIELDS FOR CATHODE RAY TUBES				
80801-C	1 11/32	1 31/64	3 1/4	1EP1
80802-A	2 5/16	1 9/16	5 1/4	2BP1
80803-B	3.45	2	9 7/16	3KP1
80805-F	6 1/8	1 7/8	13 7/16	5UP1
SHIELDS FOR MULTIPLIER PHOTOTUBES				
80801-B	1.500	1.500	3 5/8	1P21
80802-E	2 5/16	2 5/16	5 7/16	6810-A
80803-J	3 1/2	2 1/2	4 7/16	6363
80805-M	5 15/32	2 19/32	5 11/16	6364
SHIELDS FOR CHARGE STORAGE TUBES				
80803-L	3 7/16	3 7/16	12 1/4	6499
80805-N	5 1/2	3 1/4	14	6866

MILLEN

INDUSTRIAL ELECTRONICS MASTER DATA BOOK

Comprehensive Coverage of

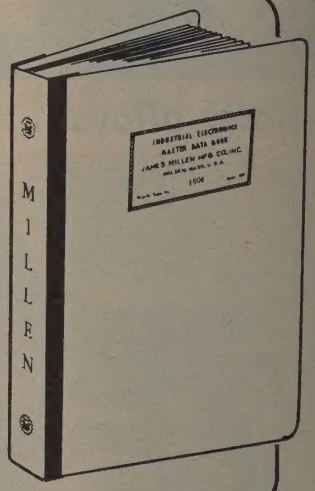
MILLEN PRODUCTS

with

Dimensional Drawings

Available to:

Industry Personnel
Qualified Engineers
Purchasing Agents
Design Draftsmen



JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY

MALDEN, MASSACHUSETTS, U.S.A.

MAGNETIC SHIELDS FOR CATHODE RAY TUBES

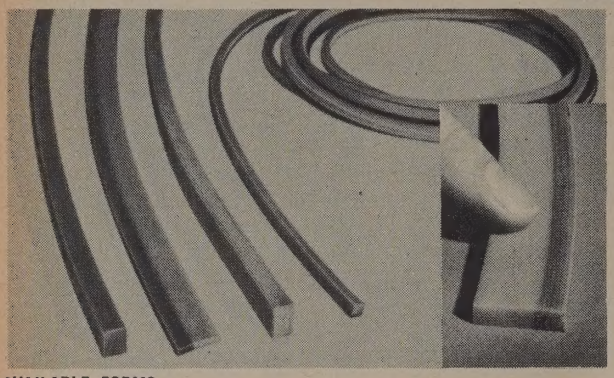
TUBE TYPES	MILLEN SHIELD	(INCHES) FACE DIAMETER INSIDE	(INCHES) NECK DIAMETER INSIDE	LENGTH (INCHES)	TUBE BASE CLAMP	ANODE HOLE	CON-TACT CUTOUT	MIN. D.C. FIELD REDUCTION IN GUN AREA 2.5 Gauss	1.0 Gauss	USE WITH MILLEN BEZEL #	SOCKET SHIELD BEZEL ASSEMBLY
1CP-	80801-A	1.38	1.38	2.75	NONE	0	0	335	290	80071	90091-A
1EP-	80801-C	1.34	1.48	3.25	NONE	0	0	415	340	80071-B	80091-C
2AP-	80802-D	2.19	1.56	5.25	1.37	0	0	425	400	80072	80092-D
2BP-	80802-A	2.19	1.56	5.25	1.47	0	0	425	400	80072-B	80092-A
3AP-	80803-B	3.45	2.00	9.44	1.64	0	0	500	450	80073	80093-B
3ABP-	80803-K	3.45	3.45	8.75	NONE	2	0	405	375	80073-C	80093-K-1
3ACP-	80803-E	3.45	2.37	7.94	2.25	1	0	500	450	80073-C	80093-E-1
3ADP-	80803-H	3.45	2.50	8.44	1.50	1	1	425	400	80073-C	80093-H
3AHP-	80803-MB	3.06 x 1.62	1.69	8.00	NONE	0	0	425	400	80173-B	80093-MB
3AQP-	80803-D	3.45	1.75	7.62	1.50	0	0	425	400	80073	80093-D
3ASP-	80809-MA	3.06 x 1.62	1.69	7.50	NONE	1	0	550	500	80173-B	80093-MA
3AYP-	80803-M	3.06 x 1.62	1.69	7.50	NONE	0	0	550	500	80173-B	80093-M
3BP-	80803-C	3.45	2.37	7.94	2.25	0	0	425	400	80073-C	80093-C-1
3BDP-	80803-M	3.06 x 1.62	1.69	7.50	NONE	0	0	550	500	80173-B	80093-M-2
3BGP-	80803-MA	3.06 x 1.62	1.69	7.50	NONE	1	0	550	500	80173-B	80093-MA-2
3BFP-	80803-R	3.45	1.25	12.13	1.50	1	0	500	435	80073-C	80093-R-1
3DP-	80803-C	3.45	2.37	7.94	2.25	0	0	425	400	80073	80093-C
3FP7-	80803-E	3.45	2.37	7.94	2.25	1	0	500	450	80073	80093-E
3GP-	80803-A	3.45	2.00	9.44	1.69	0	0	500	450	80073	80093-A
3JP7-	80803-E	3.45	2.37	7.94	2.25	1	0	500	450	80073-C	80093-E-1
3KP-	80803-B	3.45	2.00	9.44	1.64	0	0	500	450	80073	80093-B
3MP-	80803-F	3.45	1.75	6.44	1.50	0	0	425	400	80073	80093-F
3RP-	80803-D	3.45	1.75	7.62	1.50	0	0	425	400	80073	80093-D
3SP-	80803-M	3.06 x 1.62	1.69	7.50	NONE	0	0	550	500	80173-B	——
3WP-	80803-G	3.45	1.75	9.44	1.50	0	0	550	500	80073-C	80093-G-1
3XP-	80803-M	3.06 x 1.62	1.69	7.50	NONE	0	0	550	500	80173-B	80093-M
3YP-	80803-MC	3.06 x 1.62	1.69	5.75	NONE	0	0	550	500	80173-B	80093-MC
S.C.3042	80805-A	6.12	1.87	15.50	1.69	0	0	550	500	80075-M	80095-A-2
S.C.3093	80805-K	6.12	2.50	15.75	2.25	0	1	425	400	80075-C	80095-K
S.C.3377	80803-S	3.6 x 3.6	2.00	12.13	NONE	1	1	550	500	80174-A	NONE
S.C.3561	80805-U	4.37 x 6.37	4.37	18.25	NONE	1	0	550	500	NONE	NONE
4KP-	80804-A	3.6 x 3.6	1.56	9.69	1.47	0	0	550	500	NONE	NONE
4MP-	80803-U	3.6 x 3.6	2.00	12.13	NONE	1	1	550	500	80174-A	80093-U
5ABP-	80805-H	6.12	2.50	15.00	2.25	1	0	600	540	80075-B	80095-H
5ADP-	80805-H	6.12	2.50	15.00	2.25	1	0	600	540	80075-B	80095-H
5AFP-	80805-D	5.50	4.50	16.00	NONE	3	2	500	460	80075-B	80095-D
5AGP-	80805-J	6.12	2.50	16.38	2.25	1	1	550	500	80075-B	80095-J
5AHP-	80805-W	5.13	2.38	7.25	1.50	1	2	500	450	80075	NONE
5AMP-	80805-K	6.12	2.50	15.75	2.25	0	1	550	500	80075-B	80095-K
5AQP-	80805-H	6.12	2.50	15.00	2.25	1	0	600	540	80075-B	80095-H
5ATP-	80805-K	6.12	2.50	15.75	2.25	0	1	550	500	80075-B	80095-K
5AUP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5AWP-	80805-C	5.50	2.69	15.00	NONE	2	1	600	540	80075-B	80095-C
5AXP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5BDP-	80805-C	5.50	2.69	15.00	NONE	2	1	600	540	80075-B	80095-C
5BFP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5BGP-	80805-V	6.13	2.50	16.38	2.25	1	1	600	540	80075-B	80095-V
5BHP-	80085-A	5.44	2.38	16.00	2.25	1	1	600	540	80075-B	80095-A4
5BNP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075	NONE
5BTP-	80805-33-B	5.63	2.63	10.50	NONE	1	0	550	500	80075-B	NONE
5CP-	80805-B	6.12	2.50	15.50	2.25	1	0	600	540	80075	80095-B
5CAP-	80085-A	5.44	2.38	16.00	2.25	1	1	600	540	80075-J	80095-A4
5CBP-	80085-B	5.44	2.38	18.25	2.25	1	1	600	540	80075-J	80095-B5
5CEP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5CKP-	80805--Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5DWP-	80085-C	5.44	2.38	18.50	2.25	1	1	600	540	80075-J	80095-C4
5DYP-	80805-W	5.13	2.38	7.25	1.50	1	2	500	450	80075-B	NONE
5FP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5GP-	80805-A	6.12	1.87	15.50	1.69	0	0	550	500	80075	80095-A
5HP-	80805-A	6.12	1.87	15.50	1.69	0	0	550	500	80075	80095-A
5JP-	80805-G	6.12	1.87	14.25	1.69	1	4	600	540	80075	80095-G
5LP-	80805-E	6.12	1.87	14.56	1.62	1	0	600	540	80075	80095-E
5MP-	80805-F	6.12	1.87	13.44	1.50	0	0	600	540	80075	80095-F
5NP-	80805-A	6.12	1.87	15.50	1.69	0	0	550	500	80075	80095-A
5RP-	80805-C	5.50	2.69	15.00	NONE	2	1	600	540	80075-B	80095-C
5SP-	80805-D	5.50	4.50	16.00	NONE	3	2	500	450	80075-B	80095-D
5UP-	80805-F	6.12	1.87	13.44	1.50	0	0	600	540	80075	80095-F
5WP-	80805-Y	6.12	6.12	11.00	NONE	1	0	350	330	80075-B	NONE
5XP-	80805-C	5.50	2.69	15.00	NONE	2	1	600	540	80075-B	80095-C
5YP-	80805-J	6.12	2.50	16.38	2.25	1	1	550	500	80075-B	90095-J

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN, MASSACHUSETTS, U.S.A.

Product Summary For Quick Reference ME-40

Name	POLASTRIP
Function	General purpose EMI and Pressure Gasketing
Forms	Strip material and fabricated gaskets
Construction	Oriented wire conductive paths in matrix of silicone
Gasket Height	.062 to .625 inches
Max. Joint Unevenness	.010 to .100 inches
Gasket Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 46db; 18MHz(E) >102dB; 1.0GHz(P) >93dB

METEX Polastrip™



AVAILABLE FORMS

Polastrip: Composite EMI and pressure gasketing strip ⅛″ x ⅛″ to ⅝″ x ½″ in cross section. See table 1 for full tabulation. Other sizes also available. Conductive paths are either Monel or Aluminum oriented wire.

Combo Polstrip: A strip gasket material with the conductive paths molded into only one edge of the strip. Recommended for particularly difficult pressure sealing problems. See table 2 for full tabulation. Other sizes also available.

Polastrip or Combo Polastrip Fabricated Gaskets: Metex will fabricate to your specifications ready-to-use gaskets made from either Polastrip or Combo Polastrip. See drawing standards on this page.

SPECIFICATIONS

Elastomer: Solid silicone per MIL-R-5847 and ZZ-R-765 (color gy Sponge per AMS-3195

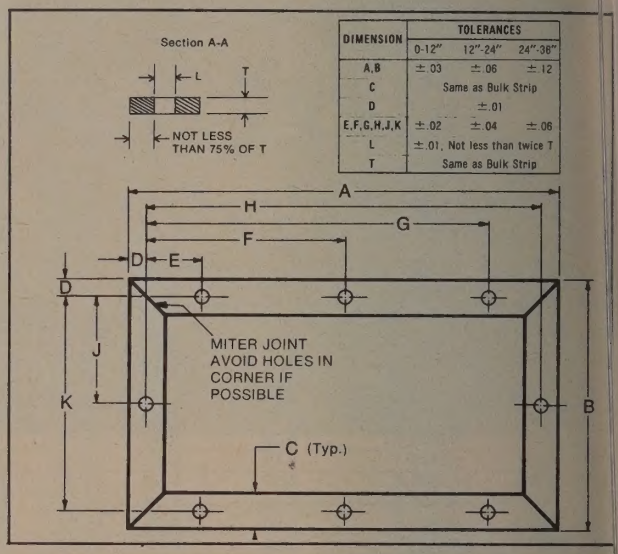
Temperature Range: −70°F to 500°F.

Conductive Paths: Monel — QQ-N-281-A; Aluminum — AMS-4182A

HOW TO ORDER

Strips: Select part number from tables 1 and 2. Supplied in multiple o 18 ft. (continuous lengths on special orders).

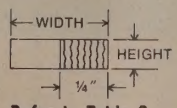
Fabricated gaskets: Supply drawings, sketches or dimensional tabulat based on drawing standards outlined below.



DIMENSION	TOLERANCES 0-12″	12″-24″	24″-38″
A,B	±.03	±.06	±.12
C	Same as Bulk Strip		
D	±.01		
E,F,G,H,J,K	±.02	±.04	±.06
L	±.01, Not less than twice T		
T	Same as Bulk Strip		

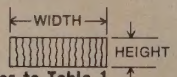
TOLERANCES	Solid Silicone		Sponge Silicone	
Sizes	Height	Width	Height	Width
.125 to .250	±.010	±.015	±.015	±.031
Over .250 to .375	±.015	±.031	±.015	±.031
Over .325 to 1.000	+.031 −.015	±.031	±.031	±.046

TABLE 2 — COMBO POLASTRIP



Refer to Table 2

Height	Width	Solid Silicone Monel	Sponge Silicone Monel
.062	.500	07-0101-0256	N/A
.062	.625	07-0101-0259	N/A
.062	.750	07-0101-0260	N/A
.093	.500	07-0101-0298	07-0201-0552
.093	.625	07-0101-0545	07-0201-0553
.093	.750	07-0101-0547	07-0201-0555
.125	.500	07-0101-0177	07-0201-0188
.125	.625	07-0101-0178	07-0201-0189
.125	.750	07-0101-0179	07-0201-0190
.188	.500	07-0101-0181	07-0201-0192
.188	.625	07-0101-0182	07-0201-0193
.188	.750	07-0101-0183	07-0201-0194
.250	.500	07-0101-0184	07-0201-0195
.250	.625	07-0101-0185	07-0201-0196
.250	.750	07-0101-0186	07-0201-0197



Refer to Table 1

TABLE 1

Height	Width	Solid Silicone Monel	Solid Silicone Aluminum	Sponge Silicone Monel	Sponge Silicone Aluminum
.125	.125	07-0101-0004	07-0101-0048	07-0201-0032	07-0202-0068
.125	.188	07-0101-0020	07-0102-0050	07-0201-0034	07-0202-0070
.125	.250	07-0101-0010	07-0102-0054	07-0201-0013	07-0202-0074
.125	.312	07-0101-0024	07-0102-0059	07-0201-0040	07-0202-0079
.125	.375	07-0101-0028	07-0102-0063	07-0201-0044	07-0202-0083
.125	.500	07-0101-0088	07-0102-0092	07-0201-0090	07-0202-0094
.125	.625	07-0101-0152	07-0102-0164	07-0201-0158	07-0202-0170
.156	.125	07-0101-0096	07-0102-0098	07-0201-0097	07-0202-0099
.188	.125	07-0101-0019	07-0102-0049	07-0201-0033	07-0202-0069
.188	.188	07-0101-0011	07-0102-0051	07-0201-0014	07-0202-0071
.188	.250	07-0101-0021	07-0102-0055	07-0201-0037	07-0202-0075
.188	.312	07-0101-0025	07-0102-0060	07-0201-0041	07-0202-0080
.188	.375	07-0101-0120	07-0102-0122	07-0201-0121	07-0202-0123
.188	.500	07-0101-0089	07-0102-0093	07-0201-0091	07-0202-0095
.188	.625	07-0101-0153	07-0102-0165	07-0201-0159	07-0202-0171
.250	.125	07-0101-0100	07-0102-0102	07-0201-0101	07-0202-0103
.250	.188	07-0101-0017	07-0102-0052	07-0201-0035	07-0202-0072
.250	.250	07-0101-0003	07-0102-0056	07-0201-0012	07-0202-0076
.250	.312	07-0101-0026	07-0102-0061	07-0201-0042	07-0202-0081
.250	.375	07-0101-0029	07-0102-0064	07-0201-0045	07-0202-0084
.250	.500	07-0101-0031	07-0102-0066	07-0201-0015	07-0202-0086
.250	.625	07-0101-0154	07-0102-0166	07-0201-0160	07-0202-0172

TABLE 1 (Continued)

Height	Width	Solid Silicone Monel	Solid Silicone Aluminum	Sponge Silicone Monel	Sponge Silicone Aluminum
.312	.188	07-0101-0016	07-0102-0053	07-0201-0036	07-0202-0073
.312	.250	07-0101-0022	07-0102-0057	07-0201-0038	07-0202-0077
.312	.312	07-0101-0027	07-0102-0062	07-0201-0043	07-0202-0082
.312	.375	07-0101-0124	07-0102-0126	07-0201-0125	07-0202-0127
.312	.500	07-0101-0136	07-0102-0138	07-0201-0137	07-0202-0139
.375	.188	07-0101-0104	07-0102-0106	07-0201-0105	07-0202-0107
.375	.250	07-0101-0023	07-0102-0039	07-0201-0058	07-0202-0078
.375	.312	07-0101-0112	07-0102-0114	07-0201-0113	07-0202-0115
.375	.375	07-0101-0030	07-0102-0065	07-0201-0046	07-0202-0048
.375	.500	07-0101-0140	07-0102-0142	07-0201-0141	07-0202-0143
.375	.625	07-0101-0155	07-0102-0167	07-0201-0161	07-0202-0173
.500	.250	07-0101-0108	07-0102-0110	07-0201-0109	07-0202-0111
.500	.312	07-0101-0116	07-0102-0118	07-0201-0117	07-0202-0119
.500	.375	07-0101-0128	07-0102-0130	07-0201-0129	07-0202-0131
.500	.500	07-0101-0009	07-0102-0067	07-0201-0047	07-0202-0087
.500	.625	07-0101-0156	07-0102-0168	07-0201-0162	07-0202-0174
.500	.750	07-0101-0509	07-0102-0532	07-0201-0374	07-0202-0535
.500	.875	07-0101-0513	07-0107-0584	07-0201-0585	07-0202-0516
.500	1.000	07-0101-0520	07-0102-0528	07-0201-0524	07-0202-0586
.625	.375	07-0101-0132	07-0102-0134	07-0201-0133	07-0202-0135
.625	.500	07-0101-0144	07-0102-0146	07-0201-0145	07-0202-0147

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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METEX Pola-H™

FIGURE 1

Product Summary For Quick Reference **ME-41**

HIGH PERFORMANCE EMI AND PRESSURE SEALING GASKETING

Especially designed for low frequency Magnetic (H) Fields

Name	**POLA-H**
Function	EMI and Pressure Gasketing
Forms	Strip Material, Fabricated Gaskets
Construction	Highly conductive paths in silicone elastomer
Gasket Height	0.12 to 0.62 inches
Max. Joint Unevenness for above heights	0.02 to 0.10 inches
Gasket Compressing Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 56dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB
Pressure Sealing	To 250 p.s.i.

SPECIFICATIONS

Elastomer: Solid silicone per MIL-R-5847 and ZZ-R-765 (color gray), temperature range −70°F to 380°F.

Conductive Paths: Solid, continuous copper ASTM-D-152, tin plated.

Contact Points: Alloy coated in special process to assure maximum conductivity and maximum corrosion protection.

HOW TO ORDER

Strips: Select part number from Tables 1 and 2. Supplied in multiples of 18 ft.

Fabricated Gaskets: Supply drawings, sketches or dimensional tabulations based on standard in figure 2.

For further information and design assistance call Metex or your local representative. Never any obligation!

AILABLE FORMS

LA-H material is available in three basic forms:

LA-H Strips: From 1/8" x 1/8" to 5/8" x 5/8" in cross section. See Table for full tabulation.

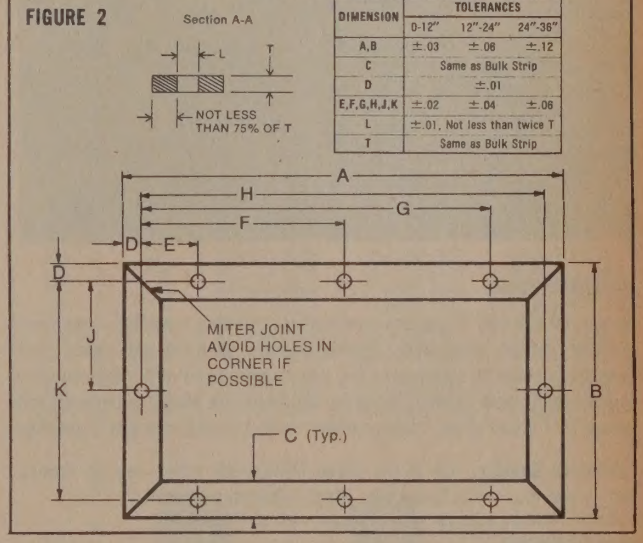
LA-H Combo Strip: A strip gasket material with the conductive paths olded into only one edge of the strip. Recommended for particularly fficult pressure sealing problems. See Table 2 for full tabulation.

LA-H or POLA-H Combo Fabricated Gaskets: Metex will fabricate to ur specifications ready-to-use gaskets made from either POLA-H or LA-H Combo Strips. Use figure 2 for drawing standards when prepar- g your drawings.

any cost saving variations of part numbers and designs shown on this age are available; use METEX DESIGN ASSISTANCE SERVICE. Metex ffers the most complete and most experienced design assistance in e industry at no obligation. Call Metex, Cal-Metex, or your local epresentatives (listed in the yellow pages).

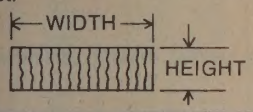
ull design procedures in the complete Metex catalog, ME-30, sent free n request.

FIGURE 2



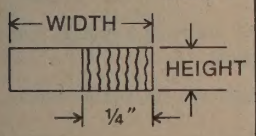
DIMENSION	TOLERANCES 0-12"	12"-24"	24"-36"
A,B	±.03	±.06	±.12
C	Same as Bulk Strip		
D	±.01		
E,F,G,H,J,K	±.02	±.04	±.06
L	±.01, Not less than twice T		
T	Same as Bulk Strip		

TABLE 1



HEIGHT Nominal	HEIGHT Actual	WIDTH — Nominal and Actual 1/8 .125 ±.015	3/16 .188 ±.015	1/4 .250 ±.015	5/16 .312 ±.031	3/8 .375 ±.031	1/2 .500 ±.031	5/8 .625 ±.031
1/8	.125 ±.010	07-5123-0404	07-5123-0604	07-5123-0804	07-5123-1004	07-5123-1204	07-5123-1604	07-5123-2004
5/32	.156 ±.010	07-5123-0405	07-5123-0605	07-5123-0805	07-5123-1005	07-5123-1205	07-5123-1605	07-5123-2005
3/16	.188 ±.010	07-5123-0406	07-5123-0606	07-5123-0806	07-5123-1006	07-5123-1206	07-5123-1606	07-5123-2006
1/4	.250 ±.010	07-5123-0408	07-5123-0608	07-5123-0808	07-5123-1008	07-5123-1208	07-5123-1608	07-5123-2008
5/16	.312 ±.015	07-5123-0410	07-5123-0610	07-5123-0810	07-5123-1010	07-5123-1210	07-5123-1610	07-5123-2010
3/8	.375 ±.015	07-5123-0412	07-5123-0612	07-5123-0812	07-5123-1012	07-5123-1212	07-5123-1612	07-5123-2012
1/2	.500 +.031 −.015	07-5123-0416	07-5123-0616	07-5123-0816	07-5123-1016	07-5123-1216	07-5123-1616	07-5123-2016
5/8	.625 +.031 −.015	07-5123-0420	07-5123-0620	07-5123-0820	07-5123-1020	07-5123-1220	07-5123-1620	07-5123-2020

TABLE 2



HEIGHT Nominal	HEIGHT Actual	WIDTH — Nominal and Actual 1/2 .500 ±.031	5/8 .625 ±.031	3/4 .750 ±.031	7/8 .875 ±.031	1 1.000 ±.031
1/8	.125 ±.010	07-5323-1604	07-5323-2004	07-5323-2404	07-5323-2804	07-5323-3204
5/32	.156 ±.010	07-5323-1605	07-5323-2005	07-5323-2405	07-5323-2805	07-5323-3205
3/16	.188 ±.010	07-5323-1606	07-5323-2006	07-5323-2406	07-5323-2806	07-5323-3206
1/4	.250 ±.010	07-5323-1608	07-5323-2008	07-5323-2408	07-5323-2808	07-5323-3208

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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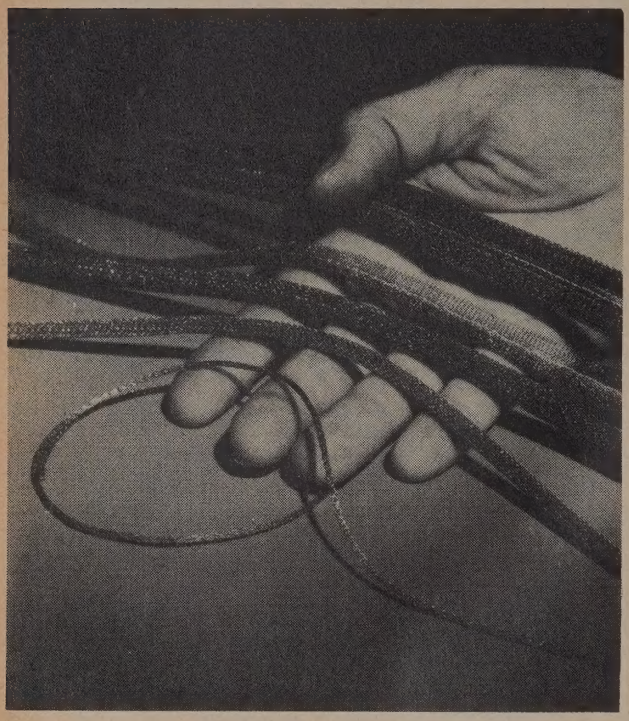
METEX
EMI Strips™
(all metal)

Product Summary For Quick Reference ME-42

Name	Metex ÉMI Strips (all metal)
Function	EMI Gasketing
Forms	Round and rectangular cross section strips, also with attachment fins
Construction	All resilient knitted wire mesh
Gasket Height	.062 to .500 inches
Joint Unevenness	.020 to .160 inches
Gasket Compressing Force	5 to 100 p.s.i.
EMI Rating	14kHz(H) 25-30dB; 18MHz(E) >102dB; 1.0GHz(P) 83 >93dB



AVAILABLE FORMS

Strips: METEX EMI Strips are continuous gasketing material made from resilient knitted wire mesh. Standard cross sections are round, rectangular, round with attachment fin, and double round with attachment fin (see sketches with tables). Standard materials are Monel, aluminum and Ferrex.™(1) Other sizes, cross sections and materials are also available.

Fabricated Gaskets: All of the listed METEX EMI strips can be formed and joined into ready-to-use one piece fabricated gaskets.

(1) Metex Trademark for tin plated, copper clad steel gasketing.

SPECIFICATIONS

		% By Weight
Monel	QQ-N-281B or AMS-4730-A	
Aluminum	Alloy 5056	
Ferrex (Tin plated, copper clad, steel)		
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

HOW TO ORDER

Strip Materials: Are ordered by part number from tables 1, 2, 3 or 4. Strips are usually supplied on spools in continuous lengths.

Fabricated Gaskets: Since such details as corner radii, corner and joint construction vary with type and size of EMI strip, it is not possible to show a simple drawing standard. Please supply sketch or verbal description based on this outline.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

HOW TO ORDER (Cont'd)

1. Choose strip by part number.
2. Specify inside dimensions or diameter for these cross sections:

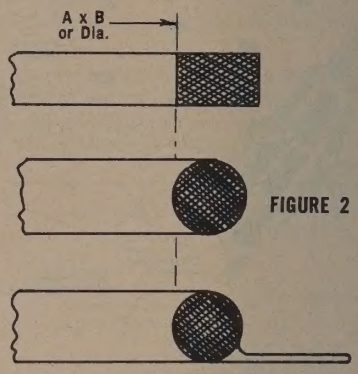


FIGURE 2

Or outside dimensions or diameter for this cross section:

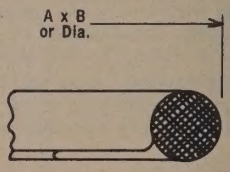


FIGURE 3

3. **Tolerances:** A x B or dia. are:
   0-5″; ±.03
   5-10″; ±.06
   Over 10″; ±.06 for every 10″.
4. On request METEX will supply a detailed drawing conforming wit your description.

TOLERANCES (for Tables 1 thru 4)

Rectangular Strips	Round Strips
.062 to .188, +.015 −.000	.062 to .125, +.015 −.000
over .188 to .375, +.032 −.000	over .125 to .188, +.032 −.000
over .375 to .500, +.047 −.000	over .188 to .375, +.047 −.000
over .500 to 1.000, +.062 −.000	over .375 to .750, +.062 −.000

Measured under 4 ounce load with ¾″ anvils on a Federal Product Model 22P hand snap gauge or equivalent.

Single Round with Fin and Double Round with Fin, overall width.
up to 1.00, ±.06
Over 1.00, ±.12

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METEX
Cal Strips™

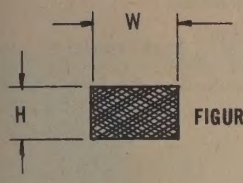

FIGURE 4

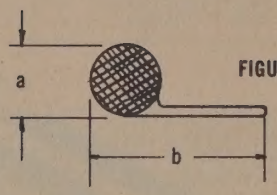

FIGURE 6

TABLE 1 — RECTANGULAR CROSS SECTION

Height	Width	Monel	Aluminum	Ferrex
.062	.062	01-0101-0408	01-0102-0401	01-0104-0408
.062	.125	01-0101-0218	01-0102-0499	01-0104-0218
.062	.187	01-0101-0213	01-0102-0649	01-0104-0213
.062	.250	01-0101-0144	01-0102-0179	01-0104-0144
.062	.312	01-0101-0777	01-0102-1143	01-0104-0777
.062	.375	01-0101-0149	01-0102-0206	01-0104-0149
.062	.500	01-0101-0780	01-0102-0801	01-0104-0780
.062	.625	01-0101-0812	01-0102-1620	01-0104-0812
.062	.750	01-0101-0258	01-0102-1081	01-0104-0258
.062	1.000	01-0101-1539	01-0102-0635	01-0104-1539
.093	.093	01-0101-0424	01-0102-0267	01-0104-0424
.093	.125	01-0101-0377	01-0102-0728	01-0104-0377
.093	.187	01-0101-0203	01-0102-1028	01-0104-0203
.093	.250	01-0101-0167	01-0102-1140	01-0104-0167
.093	.312	01-0101-0332	01-0102-0158	01-0104-0332
.093	.375	01-0101-0197	01-0102-0448	01-0104-0197
.093	.500	01-0101-0285	01-0102-0442	01-0104-0285
.093	.625	01-0101-0238	01-0102-1821	01-0104-0283
.125	.125	01-0101-0199	01-0102-0204	01-0104-0199
.125	.187	01-0101-0177	01-0102-0171	01-0104-0177
.125	.250	01-0101-0153	01-0102-0173	01-0104-0153
.125	.312	01-0101-0336	01-0102-0654	01-0104-0336
.125	.375	01-0101-0192	01-0102-0761	01-0104-0192
.125	.500	01-0101-0286	01-0102-0159	01-0104-0286
.125	.625	01-0101-1607	01-0102-0939	01-0104-1607
.125	.750	01-0101-0251	01-0102-0784	01-0104-0251
.125	1.000	01-0101-1092	01-0102-1826	01-0104-1092
.156	.125	01-0101-0194	01-0102-0182	01-0104-0194
.187	.187	01-0101-0168	01-0102-0143	01-0104-0168
.187	.250	01-0101-0958	01-0102-0495	01-0104-0958
.187	.312	01-0101-0516	01-0102-0653	01-0104-0516
.187	.375	01-0101-0217	01-0102-0414	01-0104-0217
.187	.500	01-0101-1639	01-0102-1814	01-0104-1639
.187	.625	01-0101-1815	01-0102-1822	01-0104-1815
.187	.750	01-0101-0547	01-0102-1824	01-0104-0547
.187	1.000	01-0101-1817	01-0102-1067	01-0104-1817
.250	.250	01-0101-0169	01-0102-0268	01-0104-0169
.250	.312	01-0101-0581	01-0102-0389	01-0104-0581
.250	.375	01-0101-0310	01-0102-0787	01-0104-0310
.250	.500	01-0101-1523	01-0102-1623	01-0104-1523
.250	.625	01-0101-0818	01-1102-1823	01-0104-0818
.250	.750	01-0101-1530	01-0102-1825	01-0104-1530
.250	1.000	01-0101-1598	01-0102-1827	01-0104-1598
.312	.312	01-0101-0390	01-0102-1144	01-0104-0390
.375	.375	01-0101-0265	01-0102-0708	01-0104-0265
.375	.625	01-0101-1816	01-0102-1621	01-0104-1816

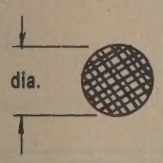

FIGURE 5

TABLE 2 — ROUND CROSS SECTION

Diameter	Monel	Aluminum	Ferrex
.062	01-0101-0064	01-0102-0131	01-0104-0064
.093	01-0101-0056	01-0102-0775	01-0104-0056
.125	01-0101-0006	01-0102-0035	01-0104-0006
.156	01-0101-0311	01-0102-0124	01-0104-0311
.187	01-0101-0020	01-0102-0029	01-0104-0020
.250	01-0101-0250	01-0102-0032	01-0104-0250
.312	01-0101-0439	01-0102-0026	01-0104-0439
.375	01-0101-0017	01-0102-0877	01-0104-0017
.437	01-0101-0088	01-0102-1156	01-0104-0088
.500	01-0101-0110	01-0102-0575	01-0104-0110

TABLE 3 — ROUND WITH FIN

a Diameter	b Overall Dimension	Monel	Aluminum	Ferrex
.062	.375	01-0101-0983	01-0102-0827	01-0104-0983
.062	.500	01-0101-0756	01-0102-0053	01-0104-0756
.062	.625	01-0101-0091	01-0102-1165	01-0104-0091
.062	.750	01-0101-1160	01-0102-1166	01-0104-1160
.093	.375	01-0101-0826	01-0102-0828	01-0104-0826
.093	.500	01-0101-0977	01-0102-1167	01-0104-0977
.093	.750	01-0101-0998	01-0102-1168	01-0104-0998
.125	.375	01-0101-0008	01-0102-0095	01-0104-0008
.125	.437	01-0101-0076	01-0102-0065	01-0104-0076
.125	.500	01-0101-0060	01-0102-0043	01-0104-0060
.125	.562	01-0101-1161	01-0102-1169	01-0104-1161
.125	.625	01-0101-0061	01-0102-0339	01-0104-0061
.125	.750	01-0101-0079	01-0102-1170	01-0104-0079
.156	.500	01-0101-1162	01-0102-1171	01-0104-1162
.156	.750	01-0101-1163	01-0102-1173	01-0104-1163
.187	.437	01-0101-0075	01-0102-1174	01-0104-0075
.187	.500	01-0101-0092	01-0102-1175	01-0104-0092
.187	.625	01-0101-0058	01-0102-0066	01-0104-0058
.187	.750	01-0101-0051	01-0102-0031	01-0104-0051
.187	.875	01-0101-1164	01-0102-1176	01-0104-1164
.250	.500	01-0101-1331	01-0102-1194	01-0104-1331
.250	.625	01-0101-0109	01-0102-0341	01-0104-0109
.250	.750	01-0101-0106	01-0102-0034	01-0104-0106
.250	.875	01-0101-0534	01-0102-1195	01-0104-0534
.250	1.000	01-0101-1330	01-0102-1196	01-0104-1330
.312	.625	01-0101-0530	01-0102-0028	01-0104-0530
.312	.750	01-0101-0362	01-0102-1197	01-0104-0362
.312	.875	01-0101-0592	01-0102-1198	01-0104-0592
.375	.625	01-0101-0568	01-0102-1199	01-0104-0568
.375	.750	01-0101-1191	01-0102-0546	01-0104-1191
.375	.875	01-0101-0009	01-0102-1200	01-0104-0009
.375	1.000	01-0101-0270	01-0102-0536	01-0104-0270
.437	.750	01-0101-1192	01-0102-1201	01-0104-1192
.437	.875	01-0101-0098	01-0102-1202	01-0104-0098
.437	1.000	01-0101-0274	01-0102-1203	01-0104-0274
.500	.750	01-0101-0789	01-0102-1204	01-0104-0789
.500	.785	01-0101-1193	01-0102-1205	01-0104-1193
.500	1.000	01-0101-1040	01-0102-1206	01-0104-1040

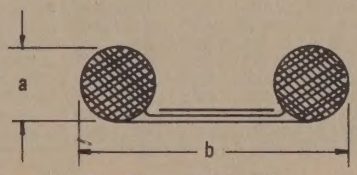

FIGURE 7

TABLE 4 — DOUBLE ROUND WITH FIN

a Diameter	b Overall Dimension	Monel	Aluminum	Ferrex
.062	.500	01-0101-0922	01-0102-1263	01-0104-0922
.062	.625	01-0101-0041	01-0102-1264	01-0104-0041
.062	.750	01-0101-1261	01-0102-1265	01-0104-1261
.062	.875	01-0101-1262	01-0102-1266	01-0104-1262
.125	.500	01-0101-0449	01-0102-0045	01-0104-0449
.125	.625	01-0101-0012	01-0102-0430	01-0104-0012
.125	.750	01-0101-0085	01-0102-0697	01-0104-0085
.125	.875	01-0101-0515	01-0102-0407	01-0104-0515
.125	1.000	01-0101-0625	01-0102-1267	01-0104-0625
.187	.625	01-0101-0019	01-0102-1279	01-0104-0019
.187	.750	01-0101-0049	01-0102-0048	01-0104-0049
.187	.875	01-0101-0735	01-0102-0416	01-0104-0735
.187	1.000	01-0101-0344	01-0102-1280	01-0104-0344
.250	.750	01-0101-0949	01-0102-1281	01-0104-0949
.250	.875	01-0101-1276	01-0102-1282	01-0104-1276
.250	1.000	01-0101-0452	01-0102-0701	01-0104-0452
.375	1.000	01-0101-1277	01-0102-1283	01-0104-1277
.375	1.250	01-0101-1278	01-0102-1284	01-0104-1278

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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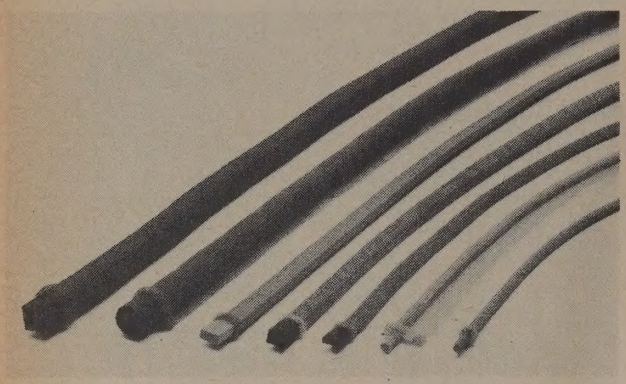
METEX EMI Strips™
(elastomer core)

Product Summary For Quick Reference ME-43

Name	METEX EMI Strips (elastomer core)
Function	EMI sealing. Also some dust, drip, and rain sealing
Forms	Round and rectangular cross section strips, also with attachment fins
Construction	Knitted wire mesh over sponge elastomer core.
Gasket Height	.125 to .625 inches
Joint Unevenness	.050 to .300 inches
Suggested Compression Force	5 to 100 p.s.i.
EMI Rating	14 kHz(H) 25 to 35dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB



AVAILABLE FORMS

Strips: Two covers of wire mesh are knitted over rectangular or round neoprene or silicone sponge elastomer. The round cross section is also available with an attachment fin (see sketches with tables). Standard materials for the knit cover are Monel and Ferrex.™(1) Many other sizes, cross sections and materials are also available.

Fabricated Gaskets: Many of the listed Metex EMI elastomer core strips can be formed into ready-to-use one piece fabricated gaskets.

(1) Metex Trademark for tin plated, copper clad steel gasketing.

FIGURE 2

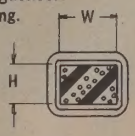


TABLE 1 — RECTANGULAR CROSS SECTION

Dimensions		Part Numbers			
		Neoprene Sponge		Silicone Sponge	
Height	Width	Monel	Ferrex	Monel	Ferrex
.125	.125	01-0401-1845	01-0404-1845	01-0501-0319	01-0504-0319
.125	.156	01-0401-1518	01-0404-1518	01-0501-0666	01-0504-0666
.125	.188	01-0401-1846	01-0404-1846	01-0501-1320	01-0504-1320
.125	.250	01-0401-1847	01-0404-1847	01-0501-1853	01-0504-1853
.188	.188	01-0401-1848	01-0404-1848	01-0501-1854	01-0504-1854
.250	.250	01-0401-1564	01-0404-1564	01-0501-1855	01-0504-1855
.250	.375	01-0401-0888	01-0404-0888	01-0501-1856	01-0504-1856
.250	.500	01-0401-1849	01-0404-1849	01-0501-1857	01-0504-1857
.375	.500	01-0401-0328	01-0404-0328	01-0501-1858	01-0504-1858
.375	.625	01-0401-1850	01-0404-1850	01-0501-1859	01-0504-1859
.500	.500	01-0401-1851	01-0404-1851	01-0501-1860	01-0504-1860
.500	.750	01-0401-1852	01-0404-1852	01-0501-1861	01-0504-1861

FIGURE 3

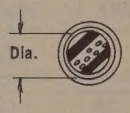


TABLE 2 — ROUND CROSS SECTION

Dimensions	Part Numbers			
	Neoprene Sponge		Silicone Sponge	
Diameter	Monel	Ferrex	Monel	Ferrex
.062	—	—	01-0501-1890	01-0504-1890
.125	01-0401-0541	01-0404-0541	01-0501-1891	01-0504-1891
.188	01-0401-0571	01-0404-0571	01-0501-1892	01-0504-1892
.250	01-0401-0627	01-0404-0627	01-0501-1893	01-0504-1893
.312	01-0401-0626	01-0404-0626	01-0501-1894	01-0504-1894
.375	01-0401-1886	01-0404-1886	01-0501-1895	01-0504-1895
.438	01-0401-0747	01-0404-0747	01-0501-1896	01-0504-1896
.500	01-0401-0845	01-0404-0845	01-0501-1897	01-0504-1897
.750	01-0401-0633	01-0404-0633	01-0501-1898	01-0504-1898

(1) Metex™ for tin plated, copper clad steel gasketing.

SPECIFICATIONS

Neoprene Sponge	MIL-R-6130B Type II, Grade A Condition Medium, −30°F to 150°F	
Silicone Sponge	AMS-3195 −80°F to 400°F	
Monel	QQ-N-281B or AMS-4730-A	
Ferrex (Tin plated, copper clad steel)		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

TOLERANCES

Rectangular Elastomer		Round Elastomer
Up to .125	+.031 −.015	Up to .500 dia. ±.031
Over .125 to .375	±.031	Over .500 dia. ±.047
Over .375 to .750	±.062	

Above dimensions and tolerances refer to the elastomer core. Outsi dimensions or diameters including mesh covers will be approximate .031 greater.

Overall Width Round, Single-Fin

Up to 1.00 ±.06
Over 1.00 ±.12

HOW TO ORDER

Strip Material: Are ordered by part number from tables 1, 2 or Strips are usually supplied on spools and in continuous lengths.

Fabricated Gaskets: Metex EMI elastomer core strips are not as easi joined into one piece fabricated gaskets as some other Metex gasketin strips (all metal EMI strips, Metalex). We, therefore, suggest that th designer write or call Metex or the local Metex Engineering Rep. Ind cate by part number the strip you would like to have fabricated into gasket. State the overall dimensions of the gasket. Metex will eithe supply a drawing for the fabricated gasket or suggest an alternat design that will satisfy all your requirements.

FIGURE 4

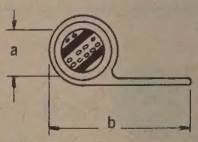


TABLE 3 — SINGLE-ROUND WITH FIN

Dimensions		Part Numbers			
		Neoprene Sponge		Silicone Sponge	
a Dia.	b Overall	Monel	Ferrex	Monel	Ferrex
.125	.500	01-0401-1862	01-0404-1862	01-0501-0690	01-0504-0690
.125	.625	01-0401-1863	01-0404-1863	01-0501-1877	01-0504-1877
.125	.750	01-0401-1864	01-0404-1864	01-0501-1878	01-0504-1878
.188	.500	01-0401-0630	01-0404-0630	01-0501-1879	01-0504-1879
.188	.625	01-0401-1865	01-0404-1865	01-0501-1880	01-0504-1880
.188	.750	01-0401-1866	01-0404-1866	01-0501-1881	01-0504-1881
.250	.625	01-0401-0819	01-0404-0819	01-0501-1882	01-0504-1882
.250	.750	01-0401-1867	01-0404-1867	01-0501-1883	01-0504-1883
.250	1.000	01-0401-1868	01-0404-1868	01-0501-1884	01-0504-1884
.500	1.000	01-0401-1869	01-0404-1869	01-0501-1885	01-0504-1885
.625	1.375	01-0401-1870	01-0404-1870	01-0501-0734	01-0504-0734

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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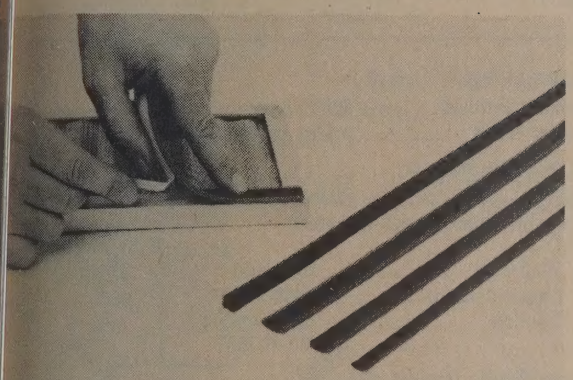
ETEX
mbo-Strip®

Product Summary For Quick Reference **ME-44**

Name	Combo-Strip
Function	EMI and Pressure Gasketing
Forms	Rectangular cross section strips
Construction	METEX EMI strips in parallel with elastomer
Gasket Height	.062 to .375 inches
Joint Unevenness	.012 to .075 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 30dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB



LABLE FORMS

s: Standard Combo-Strips are available with sponge neoprene or ge silicone elastomer portion and with Monel or Ferrex™(1) EMI eting. Cross sections are shown at top of each table. A version two EMI strips is also standard. For attachment convenience, sure sensitive adhesive backing is available on all standard Combo-s. Many other versions also available, call or write Metex or local ineering representative.

ricated Gaskets: Please refer to data sheet for Combo Gaskets®, n ME-60. Combo Gaskets have cross sections similar to Combo-Strips the rubber portion is die cut from sheet and thus has no joints. s construction is preferred to joined Combo-Strips with a joint at h corner.

ECIFICATIONS

stomer Materials

oprene Sponge	MIL-R-6130B, Type II Grade A, Condition Medium (−30°F to 150°F)
icone Sponge	AMS-3195 (−80°F to 400°F)
oprene Solid	MIL-R-6855, Class II Grade 40 (−45°F to 220°F)
icone Solid	MIL-R-5847, Class II, Grade 40 (−130°F to 500°F)
na-N Sponge	MIL-R-6130A, Type II, Grade B (−60°F to 160°F)
na-N Solid	MIL-R-6855, Class II, Grade 40 (−60°F to 220°F)

MI Gasketing Materials

onel	QQ-N-81B, AMS-4730-A	
errex (Tin plated, copper clad steel)		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM D-227	40%
Tin Plate	ASTM B-33	3%
	MIL-W-3861	

OLERANCES

Dimension A
062 to .125; +.031, −.015
Over .125 to 3.75; ±.031

Dimension B
p to 1.00; ±.031

Dimensions C & D
.062 to .188; +.015, −.000
Over .188 to .375; +.031, −.000

Measured under a 4 oz. load, ¾" anvils on a Federal Products Model 22P hand snap gauge or equivalent.

(1) Metex Trademark for tin plated, copper clad steel gasketing.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

HOW TO ORDER

Strip Materials: Order by part number from tables. If none of the listed parts are suitable specify desired cross section dimensions A, B, C, and D; elastomer material and EMI gasketing material. Specifications on some suggested alternate elastomers are listed under "Specifications."

IMPORTANT: For solid elastomers, the EMI gasket is normally .031" thicker than elastomer thickness; see figure 4.
Material is usually supplied rolled on itself (like roll of tape and shipped lying flat between layers of cardboard.

Fabricated Gaskets: See data sheet on Combo Gaskets form ME-60.

Adhesive Backed: All of the listed Combo-Strips can be ordered with pressure sensitive adhesive backing by a simple part number change: for neoprene change the "2" with shaded background to a "6". For silicone change the "3" with shaded background to a "7".

For example: 01-0201-1134 without adhesive becomes 01-0601-1134 with adhesive.

FIGURE 2

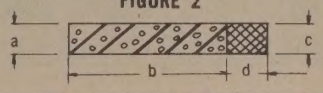


TABLE 1

Dimensions				Neoprene Sponge		Silicone Sponge	
a	b	c	d	Monel	Ferrex	Monel	Ferrex
.062	.250	.062	.125	01-0201-1756	01-0204-1756	01-0301-1772	01-0304-1772
.062	.375	.062	.125	01-0201-1757	01-0204-1757	01-0301-1773	01-0304-1773
.062	.500	.062	.125	01-0201-1692	01-0204-1692	01-0301-1774	01-0304-1774
.062	.625	.062	.125	01-0201-1739	01-0204-1739	01-0301-1775	01-0304-1775
.093	.250	.093	.125	01-0201-1344	01-0204-1344	01-0301-1776	01-0304-1776
.093	.375	.093	.125	01-0201-1332	01-0204-1332	01-0301-1777	01-0304-1777
.093	.500	.093	.125	01-0201-1758	01-0204-1758	01-0301-1778	01-0304-1778
.093	.750	.093	.125	01-0201-1333	01-0204-1333	01-0301-1779	01-0304-1779
.125	.125	.125	.125	01-0201-1138	01-0204-1138	01-0301-1780	01-0304-1780
.125	.187	.125	.187	01-0201-1136	01-0204-1136	01-0301-1781	01-0304-1781
.125	.250	.125	.125	01-0201-1135	01-0204-1135	01-0301-1782	01-0304-1782
.125	.250	.125	.250	01-0201-1130	01-0204-1130	01-0301-1783	01-0304-1783
.125	.375	.125	.125	01-0201-1132	01-0204-1132	01-0301-1784	01-0304-1784
.125	.500	.125	.125	01-0201-1134	01-0204-1134	01-0301-1785	01-0304-1785
.125	.500	.125	.250	01-0201-1131	01-0204-1131	01-0301-1786	01-0304-1786
.125	.500	.125	.500	01-0201-1133	01-0204-1133	01-0301-1787	01-0304-1787
.125	.625	.125	.125	01-0201-1055	01-0204-1055	01-0301-1788	01-0304-1788
.125	.750	.125	.125	01-0201-1759	01-0204-1759	01-0301-1789	01-0304-1789
.187	.187	.125	.125	01-0201-1760	01-0204-1760	01-0301-1790	01-0304-1790
.187	.250	.156	.125	01-0201-1056	01-0204-1056	01-0301-1515	01-0304-1515
.187	.250	.187	.125	01-0201-1622	01-0204-1622	01-0301-1791	01-0304-1791
.187	.375	.187	.125	01-0201-1761	01-0204-1761	01-0301-1792	01-0304-1792
.187	.500	.187	.125	01-0201-1762	01-0204-1762	01-0301-1793	01-0304-1793
.187	.750	.187	.250	01-0201-1763	01-0204-1763	01-0301-1794	01-0304-1794
.250	.250	.250	.125	01-0201-1764	01-0204-1764	01-0301-1795	01-0304-1795
.250	.500	.250	.125	01-0201-1766	01-0204-1766	01-0301-1797	01-0304-1797
.250	.750	.250	.125	01-0201-1767	01-0204-1767	01-0301-1798	01-0304-1798
.375	.250	.375	.125	01-0201-0817	01-0204-0817	01-0301-1800	01-0304-1800
.375	.500	.375	.250	01-0201-1768	01-0204-1768	01-0301-1801	01-0304-1801
.375	.750	.375	.250	01-0201-1769	01-0204-1769	01-0301-1802	01-0304-1802
For adhesive backed				change to 6		change to 7	

All part numbers shown (and others) also available with solid neoprene, solid silicone, and Buna-N, solid or sponge.

FIGURE 3

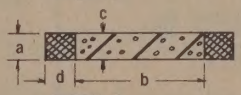
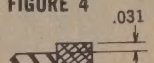


FIGURE 4



WHEN USING "SOLID" ELASTOMER, MESH IS NORMALLY .031 HIGHER BECAUSE MESH COMPRESSES EASIER THEN SOLID ELASTOMER UNDER SAME PRESSURE.

TABLE 2

Dimensions				Neoprene Sponge		Silicone Sponge	
a	b	c	d	Monel	Ferrex	Monel	Ferrex
.125	.250	.125	.125	01-0201-1765	01-0204-1765	01-0301-1796	01-0304-1796
.125	.375	.125	.125	01-0201-1770	01-0204-1770	01-0301-1799	01-0304-1799
.125	.500	.125	.125	01-0201-1771	01-0204-1771	01-0301-1803	01-0304-1803
.125	.250	.156	.125	01-0201-1804	01-0204-1804	01-0301-1805	01-0304-1805
.125	.375	.156	.125	01-0201-1681	01-0204-1681	01-0301-1806	01-0304-1806
.125	.500	.156	.125	01-0201-1807	01-0204-1807	01-0301-1810	01-0304-1810
.187	.250	.187	.125	01-0201-1808	01-0204-1808	01-0301-1811	01-0304-1811
.187	.500	.187	.125	01-0201-1809	01-0204-1809	01-0301-1812	01-0304-1812
For adhesive backed				change to 6		change to 7	

All part numbers shown (and others) also available with solid neoprene, solid silicone, and Buna-N, solid or sponge.

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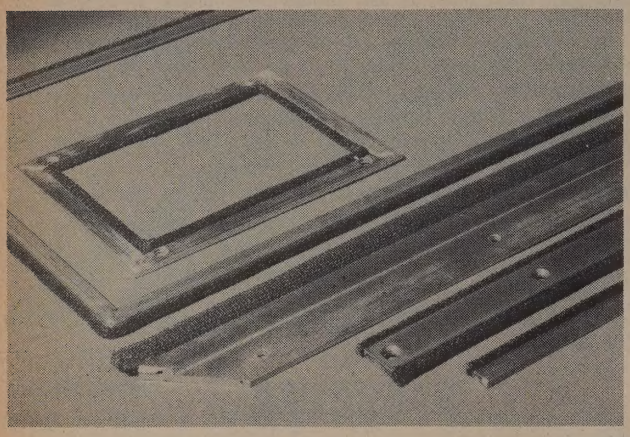
METEX
Metalex®

Product Summary For Quick Reference ME-4

Name	Metalex
Function	EMI Gasketing (Some parts also weathe gasketing)
Forms	Rigid strips, fabricated lengths, fabricated frames
Construction	Metex EMI strips clamped into aluminum extrusion
Gasket Height	.154 to .250 inches
Joint Unevenness	.031 to .125 inches
Suggested Compression Force	5 to 100 p.s.i.
EMI Rating	14kHz(H) 30dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB



SPECIFICATIONS

Aluminum Extrusion 6063-T-42
Optional Finish ..... Irridite per MIL-C-5541

EMI Gasketing Material

Monel ..... QQ-N — 281B or AMS-4730-A
Ferrex (Tin plated, copper clad steel)

		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

Weather Sealing Material

Sponge neoprene ..... MIL-R-6130B Type II, Grade A Condition Medium
Sponge Silicone AMS-3195

AVAILABLE FORMS

Bulk Strips: Metalex as listed can be supplied in 15 or 7½ ft. lengths. Ends of EMI gasketing will not be finished. EMI gasketing can be Monel, or Ferrex.™(1) An elastomer weather sealing gasket can be supplied on any Metalex strip with single EMI gasketing. Many other extrusions and EMI gasket combinations also available, call Metex or local representative.

Fabricated Lengths: Custom-fabricated lengths of Metalex are supplied to close tolerances, with holes as required and with finished ends on EMI gaskets.

Fabricated Frames: Metalex is most frequently supplied as custom fabricated, ready-to-install frames. Holes and other machine operations are usually included.

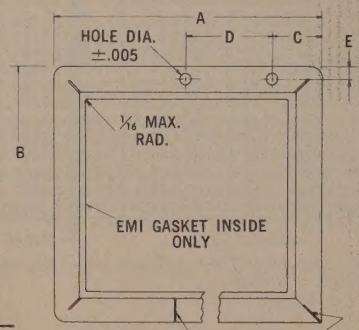


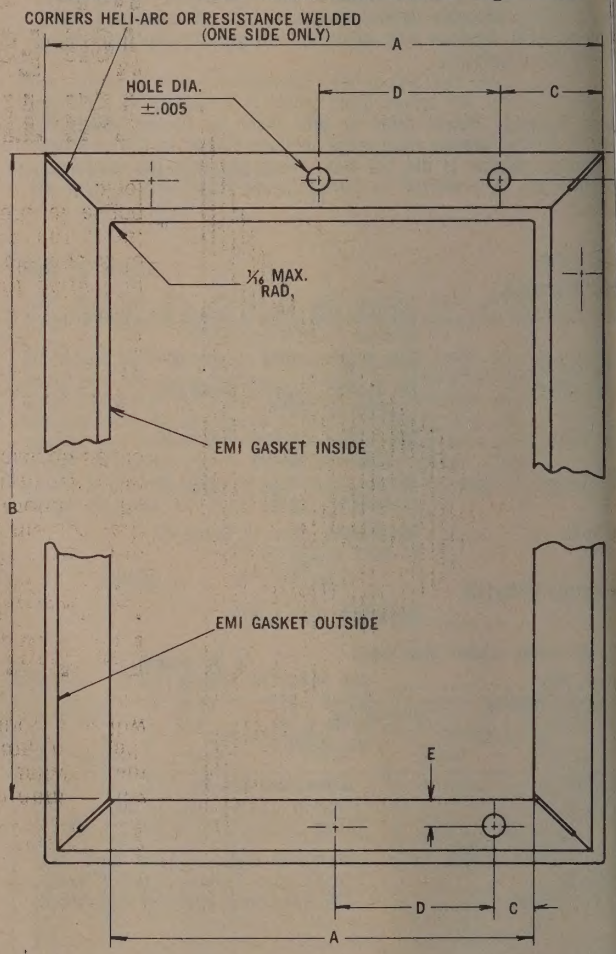
FIGURE 2 — NOTCH & BEND CONSTRUCTION (Semi-Rigid Frame)

FRAME MAY BE JOINED IN CORNER OR ALONG ONE SIDE, AND IS HELI-ARC WELDED ON ONE SURFACE ONLY.

TOLERANCES

Dimensions	0-12"	12"-24"	24"-36"	36"-48"
A & B	±.020	±.030	±.047	±.062
C, D, & E	±.010	±.015	±.025	±.030

FIGURE 3 — 4 PIECE WELDED CONSTRUCTION (Rigid Frame)



For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

(1) Metex Trademark for tin plated, copper clad steel gasketing.

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Metalex®

TO ORDER

Strips: Order by part number using one element, as indicated, each of tables 1, 2 and 3 and combining thus:

06 — 01XX — YYYY — ZZ

- ZZ — EMI Gasket, table 2
- YYYY — Mount Strip, table 1
- 01XX — Weather Seal, table 3

example: the strip shown in figure 4 is part 06-0131-6075-42. dard lengths 7½ and 15 ft. Shipped straight in shipping tubes.

Fabricated Lengths: Supply sketch or drawing based on drawing standard shown (figure 5). Specify Metalex by part number, cross sectional tolerances per table 1, 2 and 3. Indicate if optional Irridite finish is required.

Fabricated Frames: Two standard frame constructions are available:

— All corners welded, figure 3. This is most rigid version and has tightest dimensional control. EMI gasketing can be either around inside of or outside of frame.

— Notched and bent, figure 2. This is less rigid, but manufacturing costs are lower. EMI gasketing can only be on inside of frame.

Choose version that most nearly meets your needs on rigidity, dimensional control and cost. Then supply sketch or verbal description based on drawing standard in figure 2 or 3.

Many other variations of these standard parts and fabricated forms are available at reasonable cost. Call Metex or local representative for design assistance. Never any obligation.

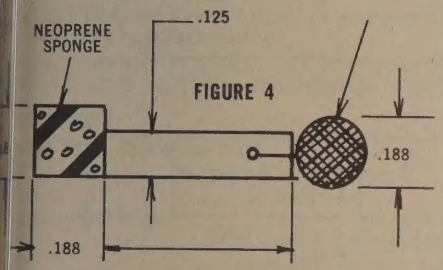


FIGURE 4

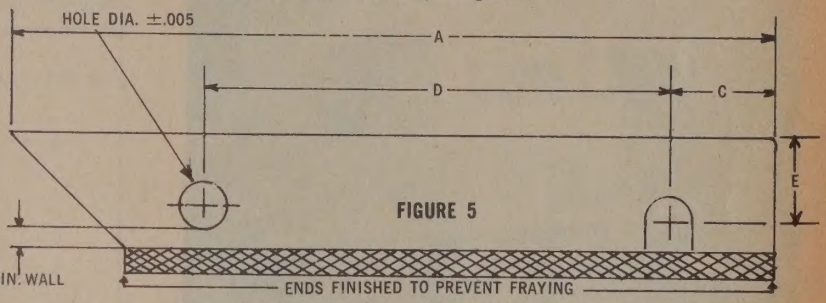
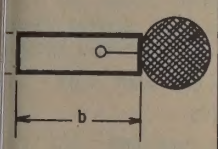


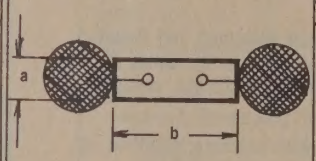
FIGURE 5

LE 1 — METALEX MOUNTING STRIP
ingle EMI Gasketing



Dimensions a	Dimensions b	Part Numbering System 06-01XX-YYYY-ZZ
.093	.375	6038
.093	.437	6044
.125	.312	6031
.125	.375	6037
.125	.437	6043
.125	.500	6050
.125	.625	6062
.125	.750	6075
.125	1.000	6100
.125	1.250	6125

TABLE 1 — METALEX MOUNTING STRIP (Continued)
for Double EMI Gasketing



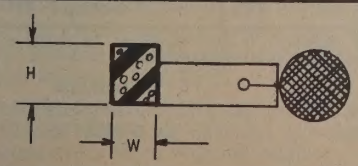
Dimensions a	Dimensions b	Part Numbering System 06-01XX-YYYY-ZZ
.125	.500	7050
.125	.625	7062
.125	1.250	7125

LE 2 — EMI GASKETING

Cross Section	Construction	Dimensions	Part Numbering System 06-01XX-YYYY-ZZ Monel	Part Numbering System 06-01XX-YYYY-ZZ Ferrex
	All Metal	.188, +.031, −000 Dia.(1)	08	42
		.250, +.047, −.000 Dia.(1)	03	43
	All Metal	.156 H x .125 W, +.015, −.000(1)	04	48
		.188 H x .125 W, +.015, −.000(1)	02	49
	Neoprene Sponge	.188, +.047, −.031 Dia.(2)	10	44
		.250, +.062, −.031 Dia.(2)	12	46
	Silicone Sponge	.188, +.047, −.031 Dia.(2)	13	45
		.250, +.062, −.031 Dia.(2)	16	47

All dimensions measured under a 4 oz. load ¾" anvils on a Federal Products Model 22P hand snap gage or equivalent.
Elastomer core dimensions. Overall diameter approximately .031 larger.

BLE 3 — SPONGE ELASTOMER SEAL (Only for Metalex with Single EMI Gasket)



Size H	Size W	Part Numbering System 06-01XX-YYYY-ZZ Neoprene Sponge	Neoprene Solid	Silicone Sponge	Silicone Solid
.125 +.031 −.015	.125 +.031 −.015	91	92	01	02
.125 +.031 −.015	.188 ±.031	11	12	21	22
.188 ±.031	.188 ±.031	31	32	41	42
.250 ±.031	.188 ±.031	51	52	61	62
.250 ±.031	.250 ±.031	71	72	81	82
NO ELASTOMER		00			

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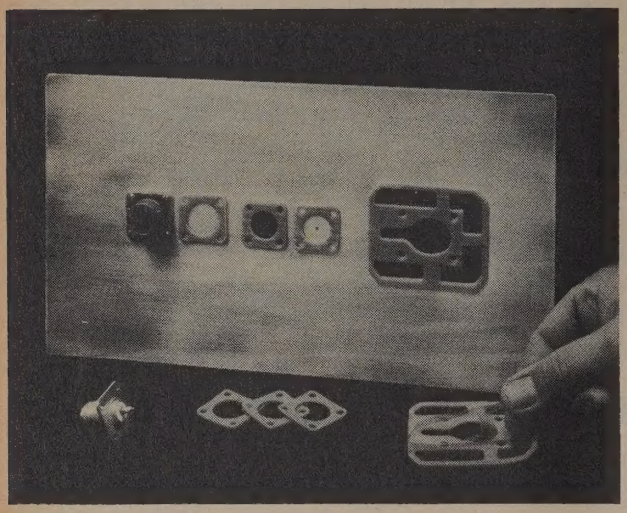
METEX
Polasheet™ and Polastick™

Product Summary For Quick Reference **ME-50**

Name	Polasheet and Polastick
Function	EMI and Pressure Gasketing Sheet material, cut gaskets. (Polastick with adhesive backing)
Construction	Oriented wire conductive paths in a matrix of elastomer
Gasket Height	.055 to .250 inches
Joint Unevenness	.008 to .050 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 35dB; 18MHz(E) >102dB; 1.0GHz(P) >92dB



AVAILABLE FORMS

Sheet Material: Standard sheet sizes for both Polasheet and Polastick are 3" and 4½" by 3 ft. long. Wider sheets are made by joining 3" or 4½" wide sheets. The elastomer is sponge or solid silicone, conductive paths are Monel or aluminum.

Adhesive Backing: Polastick is Polasheet with pressure sensitive adhesive backing for easy mounting.

Custom Cut Gaskets: Figure 2 shows drawing standards for custom cut gaskets. Tooling costs are very nominal.

Connector Gaskets: Polasheet and Polastick gaskets designed for standard connectors are listed in data sheet "Connector Gaskets" ME-55.

SPECIFICATIONS

Solid Silicone: MIL-R-5847 and ZZ-R-765 (color gray) temperature −70°F to 500°F.

Sponge Silicone: AMS-3195, −80°F to 400°F.

Conductive Paths: Monel wire, QQN-281-B, Aluminum — AMS-4182, Alloy 5056.

Adhesive: Shear strength 2 p.s.i. peel strength 4 oz. For best results apply 20 p.s.i. force to gasket to fully activate pressure sensitive adhesive. Adhesion improves with age.

Shelf Life: Applies to adhesive only — 50 days.

HOW TO ORDER

Sheets: All sheets are 3" or 4½" x 36". Order by part number from table 1. If width more than 4½" is required, METEX will bond two or more sheets together.

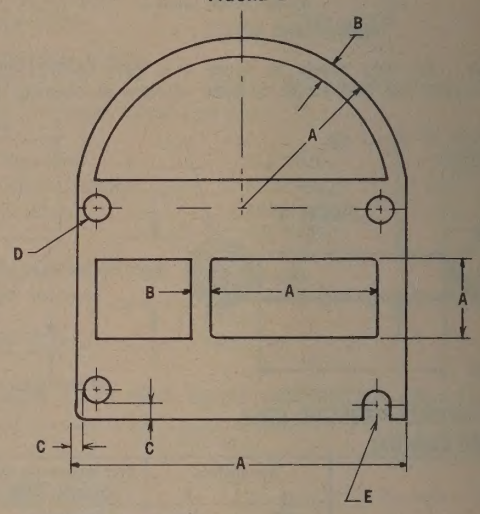
CUSTOM CUT GASKETS

Supply drawing or sketch to standards shown in figure 2. Also specify one of the standard thicknesses from table 1.

Connector Gaskets: Order by part number from tabulation in data sheet "Connector Gaskets," form ME-55.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

FIGURE 2



DRAWING STANDARDS

Tolerances

"A" Dimensions — 0-4.00" ±.015; over 4.00" ±.03

"B" — Min. cross section width .125

"C" — Min. wall thickness (edge to hole) .080

"D" — Min. hole dia. .060

"E" — If min. wall thickness, as shown in "C," cannot be accommodated, holes should change to slots.

Thickness	Sheet Width	Polasheet Solid Silicone Monel*	Polastick Adhesive-back Solid Silicone Monel*	Polasheet Sponge Silicone Monel*
.055 +.010 −.005	3	07-0701-3004	07-0701-3004-77	07-0801-3004
	4½	07-0701-4504	07-0701-4504-77	07-0801-4504
.062 ±.010	3	07-0701-3006	07-0701-3006-77	07-0801-3006
	4½	07-0701-4506	07-0701-4506-77	07-0801-4506
.094 ±.010	3	07-0701-3009	07-0701-3009-77	07-0801-3009
	4½	07-0701-4509	07-0701-4509-77	07-0801-4509
.125 ±.010	3	07-0701-3012	07-0701-3012-77	07-0801-3012
	4½	07-0701-4512	07-0701-4512-77	07-0801-4512
.156 ±.010	3	07-0701-3015	07-0701-3015-77	07-0801-3015
	4½	07-0701-4515	07-0701-4515-77	07-0801-4515
.188 ±.010	3	07-0701-3018	07-0701-3018-77	07-0801-3018
	4½	07-0701-4518	07-0701-4518-77	07-0801-4518
.250 ±.010	3	07-0701-3025	07-0701-3025-77	07-0801-3025
	4½	07-0701-4525	07-0701-4525-77	07-0801-4525

*Monel is preferred, but Aluminum is also available. To order or specify Aluminum change the underlined 1 in the examples to 2.

Monel	Aluminum
07-070<u>1</u>-3004	07-070<u>2</u>-3004
07-080<u>1</u>-4512	07-080<u>2</u>-4512

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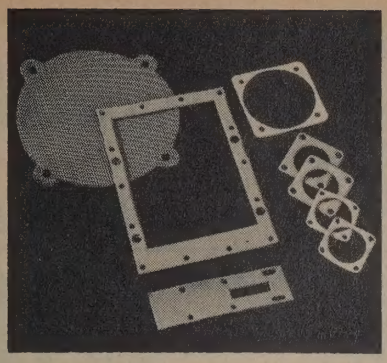
METEX Porcupine™ Metalastic



AILABLE FORMS

eets: Standard sheet width is 8″ for .030 thick material and 9.75″ .020 thick material in continuous lengths. Both thicknesses are avail- e filled with silicone for pressure gasketing and unfilled for EMI y gasketing. Conductive paths can be either Monel or aluminum.

stom Cut Gaskets: Figure 2 shows drawing standards for custom cut skets. Tooling costs are nominal.

nnector Gaskets: Porcupine gaskets designed for standard connectors e listed in data sheet "Connector Gaskets" ME-55.

ECIFICATIONS

panded Metal Conductive Paths

onel QQ-N-281-B
uminum ..... Alloy 3003-H-14
astomer (filled only)
licone ..... MIL-R-5847, Class 2, Grade 50
Temperature Range −65°F to 500°F

U.S. Pat. 3,206,536

OW TO ORDER

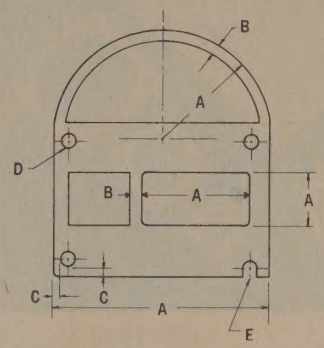
heet Materials: Order by part number from table 1.

ustom Cut Gaskets: Supply drawing or sketch to standard shown in gure 2. Also specify standard material from table 1.

onnector Gaskets: Order by part number from tabulation in data sheet Connector Gaskets," form ME-55.

Product Summary For Quick Reference — **ME-51**

Name	Porcupine
Function	EMI only or EMI and Pressure Gasketing
Forms	Sheet material and cut gaskets
Construction	Expanded Monel, unfilled and filled with Silicone
Gasket Height	.020 and .030 inches
Joint Unevenness	.003 to .004 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 35dB; 18MHz(E) >102dB; 1.0GHz(P) 85dB



DRAWING STANDARDS

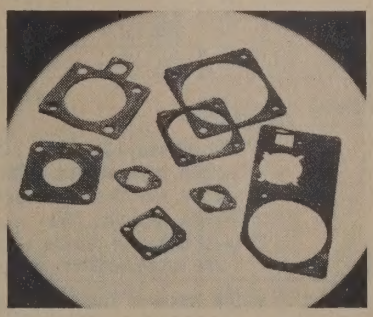
Tolerances

"A" Dims. — 0-4.00, ±.015, over 4.00, ±.03
"B" — Min. cross section width .140
"C" — Min. wall thickness (edge to hole) .090
"D" — Min. hole dia. .060
"E" — If min. wall thickness, as shown in "C," cannot be accommodated, holes should change to slots.

TABLE 1 — PORCUPINE SHEETS

Description		Part Number		
Thickness	Silicone Filled	Conductive Paths Monel	Conductive Paths Aluminum	Sheet Width
.020 ± .004	No	08-0601	08-0602	9.75 ± .25
.020 ± .004	Yes	08-0201	08-0202	9.75 ± .25
.030 ± .004	No	08-0501	08-0502	8.00 ± .25
.030 ± .004	Yes	08-0101	08-0102	8.00 ± .25

METEX Metalastic®



AVAILABLE FORMS

Sheets: Standard sheet width for Metalastic is 8″, standard thicknesses are .016″ and .020″. Woven wire is aluminum, the elastomer is either neoprene or silicone.

Die Cut Gaskets: Figure 2 shows drawing standards for die cut gaskets. Tooling costs are nominal.

Connector Gaskets: Metalastic gaskets designed for standard connectors listed in data sheet "Connector Gaskets" ME-55.

SPECIFICATIONS

Aluminum	.016″ Thick:	30 x 30 mesh
	.020″ Thick:	24 x 24 mesh
	Both:	AMS-4182A
Neoprene	AMS-3222C	−40°F to 225°F
Silicone	AMS-3302B	−65°F to 500°F

HOW TO ORDER

Sheet: Order by part number from table 1. All sheets are 8″ wide. Supplied in random lengths of at least 3 ft.

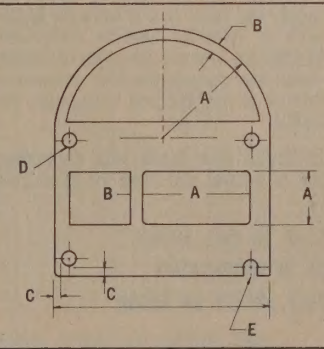
Custom Cut Gaskets: Supply drawing or sketch to standard shown in figure 2. Also specify standard material from table 1.

Connector Gaskets: Order by part number from tabulation in data sheet "Connector Gaskets," form ME-55.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

Product Summary For Quick Reference — **ME-52**

Name	Metalastic
Function	EMI and Pressure Sealing
Forms	Sheets and cut gaskets
Construction	Woven wire impregnated with elastomer
Gasket Height	.016 and .020 inches
Joint Unevenness	.001 to .002 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 35dB; 18MHz(E) >102dB; 1.0GHz(P) 40dB



DRAWING STANDARDS

Tolerances

"A" Dims. — 0-4.00, ±.015, over 4.00, ±.03
"B" — Min. cross section width .125
"C" — Min. wall thickness (edge to hole) .080
"D" — Min. hole dia. .080
"E" — If min. wall thickness, as shown in "C," cannot be accommodated, holes should change to slots.

TABLE 1

Thickness	Elastomer	Sheet Part Number	Width
.016 ± .004	Neoprene	04-0602	8.00 $^{+.25}_{-.00}$
.016 ± .004	Silicone	04-0502	8.00 $^{+.25}_{-.00}$
.020 ± .004	Neoprene	04-0202	8.00 $^{+.25}_{-.00}$
.020 ± .004	Silicone	04-0102	8.00 $^{+.25}_{-.00}$

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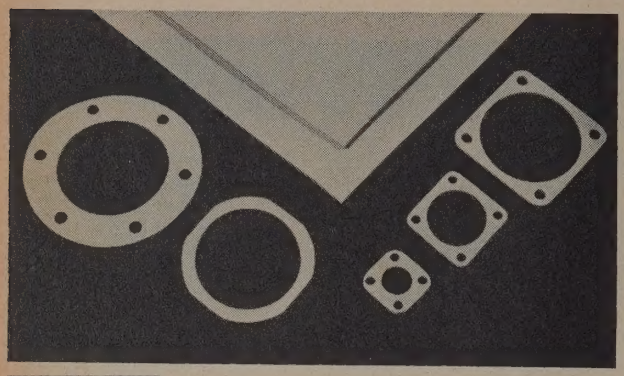
METEX Xecon

conductive elastomer

Product Summary For Quick Reference ME-54

Name	XECON (eXtra Electrically CONductive)
Function	EMI and Pressure Gasketing
Forms	Sheets, die cut gaskets, molded shapes
Construction	Silver on inert substrate in matrix of silicone
Gasket Height	.020 to .156 inches
Joint Unevenness	.003 to .030 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 35dB; 18MHz(E) >102dB; 1.0GHz(P) >95dB; 10GHz(P) 70dB



AVAILABLE FORMS

Sheets: 15 x 15, .020 to .156 inches thick.

Die Cut Gaskets: .020 to .156 inches thick (see data sheet ME-55 for XECON gaskets for standard connectors).

Waveguide Gaskets

DESCRIPTION

XECON is the name for the complete line of conductive elastomers from Metex. It is the result of more than a year of intensive research and development work with a goal to offer a uniquely better conductive elastomer. XECON is this better conductive elastomer:

1. Silver is deposited on an inert substrate eliminating chemical reaction with the metalic substrates often used.
2. The inert substrate is also much lighter, thus XECON is also lighter; typically its specific gravity is 1.9.
3. XECON, unlike some other conductive elastomers, can be exposed to up to 200°C for extended periods without loss of conductivity.
4. XECON will also be available in other than silicone elastomers.

DEVELOPMENT STATUS

At the deadline time for this EEM page, the basic R & D work on XECON was completed, only the detail work of releasing specific compounds remained. The first compound XECON CS-1 was released. Complete specifications are detailed below. Additional compounds with durometers ranging from 60 to 75 and variations in tensile and elongation are scheduled for release by May 15, 1970.

By June 15, 1970 a new family of XECON compounds with durometers between 40 and 60 will be released to answer the need for conductive elastomers with lower durometers.

THEREFORE BE SURE TO CALL METEX OR YOUR LOCAL REPRESENTATIVE FOR THE LATEST DATA SHEETS ON XECON

TABLE 1

Part Number	Thickness	Sheet Size
20-0201-1515	.020	15 x 15
20-0301-1515	.031	15 x 15
20-0601-1515	.062	15 x 15
20-0901-1515	.093	15 x 15
20-1201-1515	.125	15 x 15
20-1501-1515	.156	15 x 15

SPECIFICATIONS (compound CS-1 only)

Specific Gravity		1.9
Durometer A		75
Resistivity	100 p.s.i.	.008 ohm
Deflection	100 p.s.i. meth. A	2.4%
Deflection	100 p.s.i. meth. B	10.4%
Comp. Set		1.6%
Tensile		300 p.s.i.
Elongation		80%
Operating Temp.		−60°C to 200°C

HOW TO ORDER

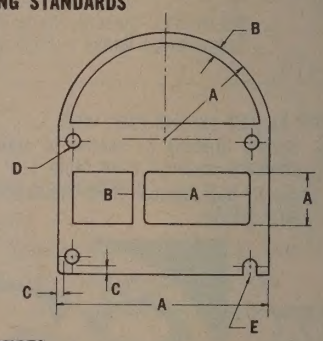
Sheets: Order by part number from table 1.

Cut Gaskets: Supply drawing based on standards shown in figure 2.

Connector Gaskets: Order by part number from data sheet ME-55.

Waveguide Gaskets: Order by part number from table 2.

DRAWING STANDARDS



TOLERANCES

"A" Dimensions — 0-4.00 ±.015, over 4.00 ±.03
"B" — Min. cross section width .090
"C" — Min. wall thickness (edge to hole) .070
"D" — Min. hole dia. .060
"E" — If min. wall thickness, as shown in "C," cannot be accommodated, holes should change to slots.

TABLE 2 — XECON GASKETS FOR WAVEGUIDES

ASESA Flange No.	METEX Part No.	ASESA Waveguide No.	Substitute For "O" Ring M.S. No.
UG-40B/U	21-0301-0004	RG-52/U	90064-13
UG-52B/U	21-0301-0005	RG-51/U	90064-14
UG-54B/U	21-0301-0008	RG-48/U	90064-17
UG-136B/U	21-0301-0004	RG-67/U	90064-13
UG-137B/U	21-0301-0005	RG-68/U	90064-14
UG-148C/U	21-0301-0007	RG-49/U	90064-16
UG-343B/U	21-0301-0006	RG-50/U	90064-15
UG-406B/U	21-0301-0007	RG-95/U	90064-16
UG-417A/U	21-0301-0010	RG-69/U	90065-2
UG-418A/U	21-0301-0010	RG-103/U	90065-2
UG-435A/U	21-0301-0011	RG-104/U	90065-3
UG-437A/U	21-0301-0011	RG-105/U	90065-3
UG-440B/U	21-0301-0006	RG-106/U	90064-15
UG-541A/U	21-0301-0003	RG-91/U	90064-12
UG-541A/U	21-0301-0003	RG-107/U	90064-12
UG-553/U	21-0301-0009	RG-112/U	90065-1
UG-554/U	21-0301-0009	RG-113/U	90065-1
UG-585A/U	21-0301-0008	RG-75/U	90064-17
UG-596A/U	21-0301-0002	RG-53/U	90064-11
UG-596A/U	21-0301-0002	RG-66/U	90064-11
UG-598A/U	21-0301-0002	RG-121/U	90064-11
UG-600A/U	21-0301-0001	RG-96/U	90064-10

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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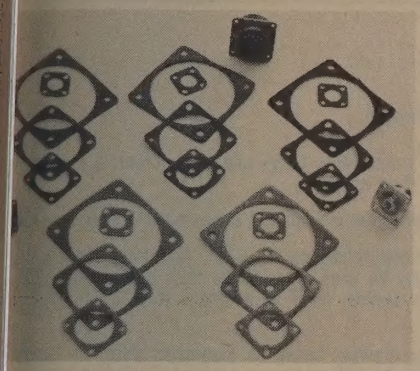
METEX
onnector Gaskets

Product Summary For Quick Reference **ME-55**

This data sheet lists EMI plus pressure sealing gaskets for these connectors:
— AN Series
— Standard RF Types
— Bendix Pigmy Series

Made from these METEX materials.

Material	Reference Data Sheet
Porcupine Metalastic	ME-51
Polasheet and Polastick	ME-50
Metalastic	ME-52
Xecon	ME-54



SPECIFICATIONS

Polasheet and Polastick

Silicone ..... MIL-R-5847, and ZZ-R-765 (color gray)
Temperature −70°F to 500°F
Monel Wire QQ-N-281B
Thickness ..... .055 +.010, −.005

Porcupine

Silicone ..... MIL-R-5847, Class 2 Grade 50, −65°F to 500°F
Monel QQ-N-281-B
Thickness ..... .030 ± .004

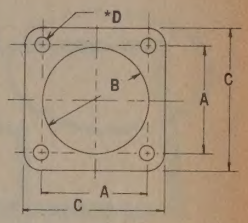
Xecon

Silver on substrate in silicone
Thickness ..... ±.031 ±.005

Metalastic

Neoprene ..... AMS-3222C, −40°F to 225°F
Silicone ..... AMS-3302B, −65°F to 500°F
Aluminum ..... AMS-4182A, 24 x 24 mesh.
Thickness ..... .020 ± .004

FIGURE 2



*For Silicone Metalastic, Holes become Slots

AILABLE FORMS

Series: Table 1 lists gaskets for the standard connectors.

Types: Table 2 lists gaskets for the common ies of RF connectors.

ndix Pigmy. Tables 3 and 4 list gaskets for ndix series PT, PC, SO and SP connectors or uivalent.

Cross Reference:

S-3100A	MS-3102A	Table 1	MS-3110	Table 2
S-3100B	MS-3102B	Table 1	MS-3112	Table 2
S-3100C	MS-3102C	Table 1	MS-3119	Table 2
S-3100E	97-3102	Table 1		

W TO CHOOSE GASKETING MATERIAL

st General Purpose: The best general purpose aterial is Porcupine® Metalastic. It can compen- te for joint unevenness to .005″ and thickness .030 ±.004.

rge Joint Unevenness: If the surface on which the nnector is mounted is likely to have a poor fit rge joint unevenness) then Polasheet™ is recom- ended. It can compensate for joint unevenness of 08″ and material thickness is .055 +.010 −.005.

est Pressure Sealing: Xecon™ offers best pres- re sealing capabilities. Material thickness is 31 ±.005.

inimum Space: Metalastic® is recommended only r applications where space is tight. It can mpensate for .001 to .002 joint unevenness but only .020 ±.004 thick. The silicone version is ecommended for temperature extremes (−65°F 500°F) and neoprene for −40°F to 225°F.

dhesive Backing: All Polasheet gaskets are also vailable with pressure sensitive adhesive backing alled Polastick) for convenient mounting.

OW TO ORDER

rder by part number from tables 1, 2 3, or 4. ote that Polastick™ (Polasheet with pressure ensitive adhesive) is not listed separately. Order olastick by adding -77 to the listed Polasheet umber i.e., Polasheet is 07-0501-0010, the equiva- ent Polastick is 07-0501-0010-77.

OLERANCES (ALL MATERIALS)

Dimensions A, B, C, and D ±.015.

TABLE 1 — GASKETS FOR AN SERIES CONNECTORS

Shell Size	A	B	C	D	Porcupine Metalastic	Polasheet (Polastick add -77)	Metalastic Neoprene	Metalastic Silicone	Xecon
8	.594	.500	.875	.172	08-0301-0062	07-0501-0008	04-0402-0008	04-0302-2495	21-0101-0002
10	.719	.625	1.000	.172	08-0301-0063	07-0501-0010	04-0402-0010	04-0302-2371	21-0101-0003
12	.813	.750	1.094	.172	08-0301-0064	07-0501-0012	04-0402-0012	04-0302-2470	21-0101-0004
14	.906	.875	1.188	.172	08-0301-0065	07-0501-0014	04-0402-0014	04-0301-2483	21-0101-0005
16	.969	1.000	1.281	.172	08-0301-0066	07-0501-0016	04-0402-0016	04-0302-2488	21-0101-0006
18	1.063	1.125	1.375	.203	08-0301-0067	07-0501-0018	04-0402-0018	04-0302-2489	21-0101-0007
20	1.156	1.250	1.500	.203	08-0301-0068	07-0501-0020	04-0402-0020	04-0302-2484	21-0101-0008
22	1.250	1.375	1.625	.203	08-0301-0069	07-0501-0022	04-0402-0022	04-0302-2485	21-0101-0009
24	1.375	1.500	1.750	.203	08-0301-0070	07-0501-0024	04-0402-0024	04-0302-2490	21-0101-0010
28	1.563	1.750	2.000	.203	08-0301-0071	07-0501-0028	04-0402-0028	04-0302-2491	21-0101-0011
32	1.750	2.000	2.250	.219	08-0301-0072	07-0501-0032	04-0402-0032	04-0302-2492	21-0101-0012
36	1.938	2.031	2.500	.219	08-0301-0073	07-0501-0036	04-0402-0036	04-0302-2493	21-0101-0013
40	2.188	2.438	2.750	.219	08-0301-0074	07-0501-0040	04-0402-0040	04-0302-2494	21-0101-0014
44	2.375	2.781	3.000	.219	08-0301-0075	07-0501-0044	04-0402-0044	04-0302-2599	21-0101-0015
48	2.625	3.031	3.250	.219	08-0301-0076	07-0501-0048	04-0402-0048	04-0302-2600	21-0101-0016

TABLE 2 — GASKETS FOR RF SERIES CONNECTORS

Type	A	B	C	D	Porcupine Metalastic	Polasheet (Polastick add -77)	Metalastic Neoprene	Metalastic Silicone	Xecon
BN	.500	.437	.687	.109	08-0301-0475	07-0501-0217	04-0402-2601	04-0302-2602	21-0101-0036
BNC	.500	.437	.687	.109	08-0301-0475	07-0501-0217	04-0402-2601	04-0302-2602	21-0101-0036
C	.719	.625	1.000	.172	08-0301-0476	07-0501-0010	04-0402-0010	04-0302-2371	21-0101-0037
HN	.906	.750	1.188	.140	08-0301-0477	07-0501-0253	04-0402-2603	04-0302-2604	21-0101-0038
LC	1.437	1.250	2.000	.257	08-0301-0478	07-0501-0259	04-0402-2605	04-0302-2606	21-0101-0039
N	.719	.625	1.000	.172	08-0301-0476	07-0501-0010	04-0402-0010	04-0302-2371	21-0101-0037
UHF	.969	1.000	1.281	.172	08-0301-0479	07-0501-0016	04-0402-0016	04-0302-2488	21-0101-0040

TABLE 3 — GASKETS FOR BENDIX SERIES PT AND PC CONNECTORS

Shell Size	A	B	C	D	Porcupine Metalastic	Polasheet (Polastick add -77)	Metalastic Neoprene	Metalastic Silicone	Xecon
6	.469	.375	.688	.130	08-0301-0123	07-0501-0060	04-0402-0206	04-0302-0406	21-0101-0017
8	.594	.500	.812	.130	08-0301-0124	07-0501-0061	04-0402-0208	04-0302-0408	21-0101-0018
10	.719	.625	.938	.130	08-0301-0125	07-0501-0062	04-0402-0210	04-0302-0410	21-0101-0019
12	.813	.750	1.031	.130	08-0301-0126	07-0501-0063	04-0402-0212	04-0302-0412	21-0101-0020
14	.906	.875	1.125	.130	08-0301-0127	07-0501-0064	04-0402-0214	04-0302-0414	21-0101-0021
16	.969	1.000	1.219	.130	08-0301-0128	07-0501-0065	04-0402-0216	04-0302-0416	21-0101-0022
18	1.063	1.125	1.312	.130	08-0301-0129	07-0501-0066	04-0403-0218	04-0302-0418	21-0101-0023
20	1.156	1.250	1.438	.130	08-0301-0130	07-0501-0067	04-0402-0220	04-0302-0420	21-0101-0024
22	1.250	1.375	1.563	.130	08-0301-0131	07-0501-0068	04-0402-0222	04-0302-0422	21-0101-0025
24	1.375	1.500	1.688	.156	08-0301-0132	07-0501-0069	04-0402-0224	04-0302-0424	21-0101-0026

TABLE 4 — GASKETS FOR BENDIX SERIES SP CONNECTORS

Shell Size	A	B	C	D	Porcupine Metalastic	Polasheet (Polastick add -77)	Metalastic Neoprene	Metalastic Silicone	Xecon
SP6	.641	.375	.953	.160	08-0301-0113	07-0501-0050	04-0402-0106	04-0302-0306	21-0101-0027
SP8	.734	.500	1.047	.160	08-0301-0114	07-0501-0051	04-0402-0108	04-0302-0308	21-0101-0028
SP10	.812	.625	1.125	.160	08-0301-0115	07-0501-0052	04-0402-0110	04-0302-0310	21-0101-0029
SP12	.938	.750	1.250	.160	08-0301-0116	07-0501-0053	04-0402-0112	04-0302-0312	21-0101-0030
SP14	1.031	.874	1.344	.160	08-0301-0117	07-0501-0054	04-0402-0114	04-0302-0314	21-0101-0031
SP16	1.125	1.000	1.438	.160	08-0301-0118	07-0501-0055	04-0402-0116	04-0302-0316	21-0101-0032
SP18	1.203	1.125	1.516	.160	08-0301-0119	07-0501-0056	04-0402-0118	04-0302-0318	21-0101-0033
SP20	1.297	1.250	1.672	.160	08-0301-0120	07-0501-0057	04-0402-0120	04-0302-0320	21-0101-0034
SP22	1.375	1.375	1.750	.160	08-0301-0122	07-0501-0058	04-0402-0122	04-0302-0322	21-0101-0035

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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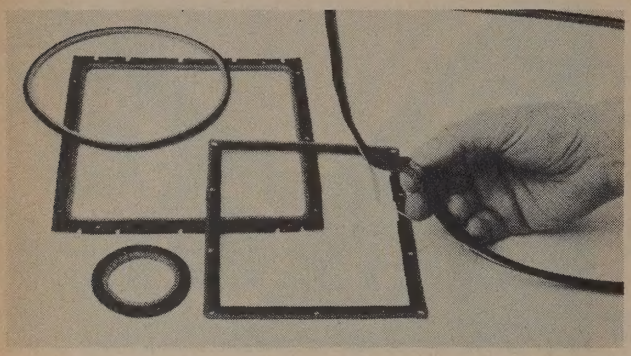
METEX Combo Gaskets®

Product Summary For Quick Reference ME-60

Name	Combo Gasket
Function	EMI and pressure gasketing
Forms	Custom Fabricated gaskets
Construction	Die cut elastomer plus joined EMI gasketing strip
Gasket Height	.062 to .250 inches
Joint Unevenness	.012 to .050 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz(H) 30dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB



AVAILABLE FORMS

Combo Gaskets are available as custom fabricated gaskets (for the same construction in strip form see data sheet for Combo strips, ME-44). The most common thickness is .125", but .062", .092", .188" and .250" are also readily available. See "Specifications" for list of available elastomers and EMI gasketing. Compression stops to prevent overcompression of sponge elastomers are available. Pressure sensitive and solvent activated adhesive backing is available on all Combo Gaskets.

SPECIFICATIONS

Elastomer Materials

Neoprene Sponge	MIL-R-6130B, Type II, Grade A, Condition Medium (−30°F to 150°F)
Silicone Sponge	AMS-3195 (−80°F to 400°F)
Neoprene Solid	MIL-R-6855, Class II Grade 40 (−45°F to 220°F)
Silicone Solid	MIL-R-5847, Class II, Grade 40 (−130°F to 500°F)
Buna N Sponge	MIL-R-6130A, Type II, Grade B (−60°F to 160°F)
Buna N Solid	MIL-R-6855, Class II, Grade 40 (−60°F to 220°F)

EMI Gasketing Materials

Monel QQ-N-281B, AMS-4730-A

Ferrex (Tin plated, copper clad steel)

		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM D-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

HOW TO ORDER

First choose the elastomer material.

Sponge materials are recommended for applications requiring a high degree of compressibility and pressure differences are small.

Solid materials are recommended for use in joints that must maintain a high pressure difference and require less compressibility.

Neoprene is a good general purpose rubber, but is limited in temperature range and cannot be used with some hydrocarbons that cause it to swell.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

HOW TO ORDER (Continued)

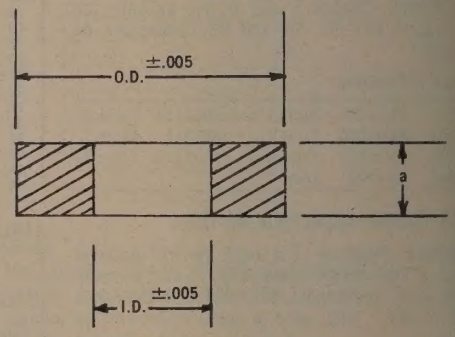
Buna-N has a greater temperature range and is resistant to more hydrocarbons and solvents than neoprene.

Silicone is used for applications requiring a maximum temperature range.

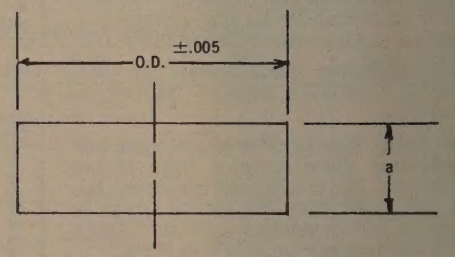
Thickness: Most common thickness is .125". Use this whenever possible; .062" should only be used when space does not permit .125" or .092". Combo Gaskets seldom need to be more than .250" thick, but are available.

Then supply sketch or drawing based on standards shown in figure 2. Also specify elastomer and EMI gasketing material. Preferred elastomers and EMI gasketing materials are tabulated in the specifications. Also specify pressure sensitive or solvent activated adhesive if desired. Specify compression stops for sponge elastomers if desired in accordance with figure 2. Many other elastomers and EMI gasketing are also available.

FIGURE 2



WASHER TYPE (Use at screw holes)



SOLID TYPE (Use between screw holes)

TOLERANCES

a Dim.*	Aluminum	Stain. Stl.
.040 - .072	±.004	±.006
.072 - .098	±.006	±.008
.098 - .130	±.008	±.010
.130 - .150	±.010	±.012

Choose standard gauge sheet material only.

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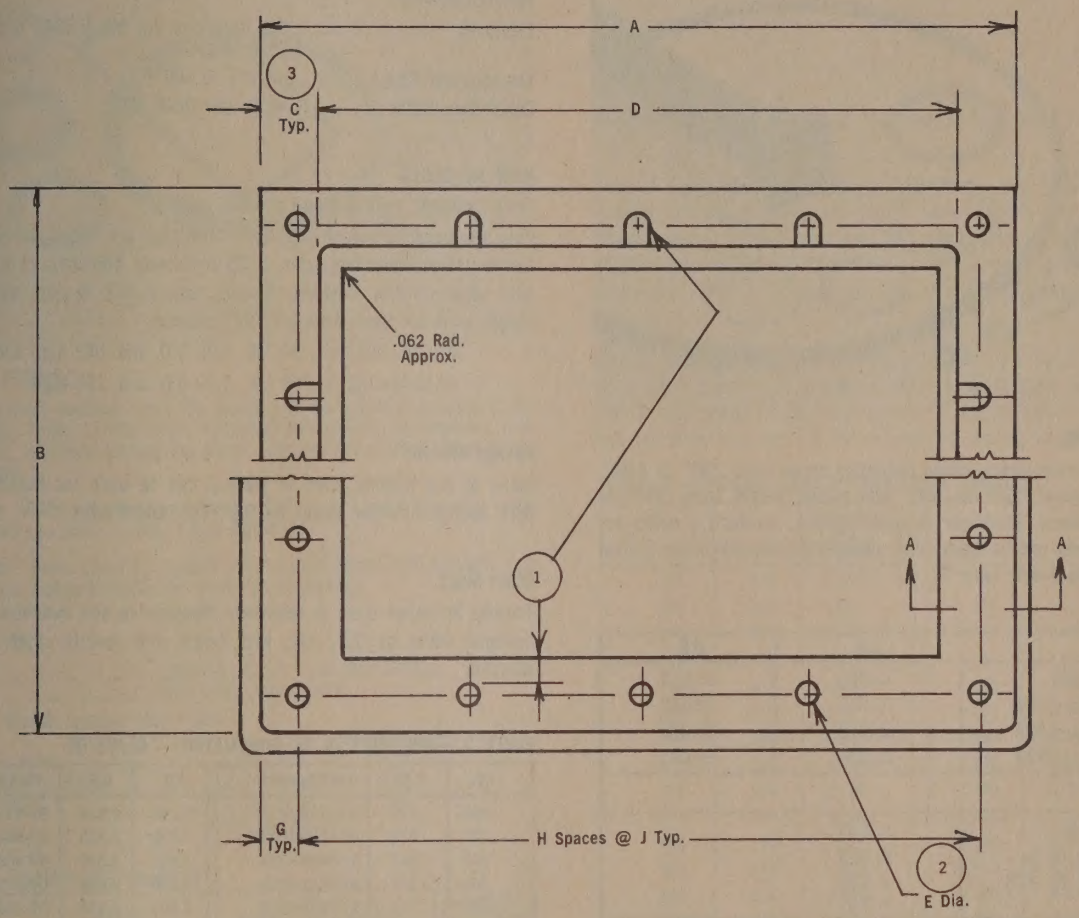
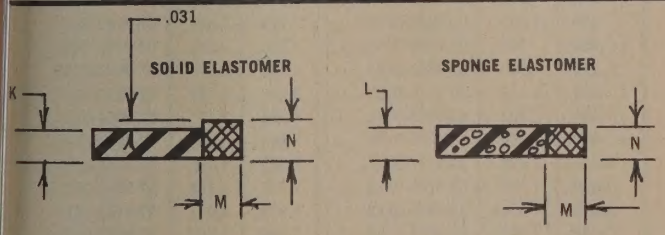
METEX
Combo Gaskets®

DRAWING STANDARDS





[1] Minimum wall thickness should equal elastomer thickness. "U" Slots should be used if minimum wall requirement cannot be met.
[2] Hole diameter should be equal to or greater than elastomer thickness.
[3] Minimum width of elastomer portion is the greater of 1/8" or elastomer thickness.

Dimensions		Solid Elastomer	Sponge Elastomer
A, B, C, & D		±.015 min. ±.015 for each 5" Length	±.031 min. ±.031 for each 5" Length
G & J		±.015 min. ±.015 for each 5" Length	±.015 min. ±.015 for each 5" Length
K & L	.062 - .125	±.015	+.031 −.015
	over .125	±.031	±.031

EMI Gasketing M & N	Tolerance
.062 to .188	+.015 −0
.188 to .375	+.031 −0

Measured under 4 oz. load with 3/4" anvils on a Federal Products Model 22P hand snap gauge or equivalent.

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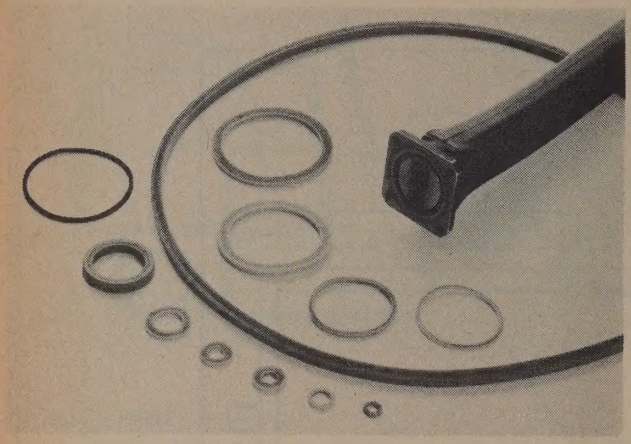
METEX Polaring™

Product Summary For Quick Reference ME-61

Name	Polaring
Function	EMI and Pressure Sealing
Forms	Jointless annular rings
Construction	Oriented wire conductive paths in matrix of silicone
Gasket Height	.062 to .625 inches
Joint Unevenness	.012 to .100 inches
Suggested Compression Force	20 to 100 p.s.i.
EMI Rating	14kHz 46dB; 18MHz >102dB; 1.0GHz >93dB



AVAILABLE FORMS

Polarings are annular rings. Inside diameters range from .250″ to 9.00″, wall thickness from .062″ to .500″ and gasket height from .062″ to twice wall thickness. Elastomer is solid silicone, conductive paths are Monel. Some sizes can be made with sponge silicone. Available tooling is listed in table 1 and table 2.

TOLERANCES

	I.D.	O.D.
0 to 1.999	±.010	±.010
2.000 to 3.499	±.015	±.015
3.500 to 4.499	±.015	±.020
4.500 to 5.999	±.020	±.031
Height		
Up to ¼	±.010	
Over ¼ to ⅜	±.015	
Over ⅜ to .625	+.030 −.015	

TABLE 1 — SILICONE IS 40 DUROMETER — CLASS II

I.D.	O.D.	Part Number	I.D.	O.D.	Part Number
.203	.305	07-9001-0XXX	.770	.925	07-9043-0XXX
.300	.460	07-9127-0XXX	.781	.906	07-9044-0XXX
.364	.500	07-9007-0XXX	.782	.960	07-9045-0XXX
.375	.625	07-9008-0XXX	.926	1.096	07-9047-0XXX
.400	.650	07-9009-0XXX	.972	1.140	07-9051-0XXX
.414	.544	07-9013-0XXX	1.000	1.125	07-9052-0XXX
.437	.650	07-9015-0XXX	1.092	1.270	07-9055-0XXX
.500	.630	07-9017-0XXX	1.114	1.254	07-9056-0XXX
.510	.650	07-9023-0XXX	1.212	1.395	07-9059-0XXX
.531	.750	07-9024-0XXX	1.239	1.379	07-9060-0XXX
.570	.922	07-9026-0XXX	1.335	1.525	07-9061-0XXX
.575	.694	07-9027-0XXX	1.346	1.526	07-9063-0XXX
.604	.718	07-9029-0XXX	1.364	1.504	07-9067-0XXX
.625	.800	07-9031-0XXX	1.432	1.561	07-9068-0XXX
.641	.766	07-9036-0XXX	1.497	1.683	07-9149-0XXX
.660	.833	07-9037-0XXX	1.530	1.650	07-9072-0XXX
.688	.813	07-9040-0XXX	1.614	1.754	07-9077-0XXX
.700	.855	07-9041-0XXX	7.015	7.201	07-9117-0XXX

* Indicate height by replacing XXX with three place decimals; see "How to Order."

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

SPECIFICATIONS

Elastomer	Solid silicone per MIL-R-5847 and ZZ-R-7 (color gray)
Temperature Range	−70°F to 500°F
Conductive Paths	Monel per QQ-N-281-B

HOW TO ORDER

From Available Tooling (solid silicone only)

Polaring sizes for which tooling is available are listed in table 1 (4 Durometer Silicone) and table 2 (25 Durometer Silicone). To order par with solid silicone elastomer simply replace XXX in part number wi height in three place decimals; for instance:

07-9042-0062 is .750 I.D., 1.00 O.D. and .062 high and

07-9042-0125 is .750 I.D., 1.00 O.D. and .125 high

Sponge Silicone

Some of the tooling listed in table 1 can be used for Polarings mad with Sponge Silicone. Order by O.D., I.D., and Height.

Other Sizes

Tooling for other sizes is relatively inexpensive and available on shor delivery. Order by O.D., I.D., and Height and specify solid or sponge silicone.

TABLE 2 — SILICONE IS 25 DUROMETER — CLASS III

I.D.	O.D.	Part Number	I.D.	O.D.	Part Number
.250	.575	07-9128-0XXX	1.780	2.125	07-9150-0XXX
.260	.370	07-9139-0XXX	1.820	2.310	07-9081-0XXX
.305	.555	07-9005-0XXX	1.875	2.500	07-9083-0XXX
.407	.657	07-9011-0XXX	1.900	2.036	07-9131-0XXX
.500	.750	07-9019-0XXX	2.000	2.438	07-9085-0XXX
.500	.812	07-9021-0XXX	2.027	2.410	07-9087-0XXX
.625	.875	07-9033-0XXX	2.102	2.488	07-9141-0XXX
.625	1.000	07-9035-0XXX	2.120	2.635	07-9089-0XXX
.660	.906	07-9039-0XXX	2.700	2.930	07-9091-0XXX
.750	1.000	07-9042-0XXX	2.739	2.879	07-9093-0XXX
.932	1.172	07-9049-0XXX	2.750	4.000	07-9092-0XXX
1.051	1.301	07-9053-0XXX	2.765	3.185	07-9094-0XXX
1.130	1.500	07-9058-0XXX	2.800	3.000	07-9096-0XXX
1.176	1.426	07-9057-0XXX	2.820	3.820	07-9138-0XXX
1.312	1.562	07-9146-0XXX	2.840	3.320	07-9095-0XXX
1.350	1.560	07-9065-0XXX	2.999	3.247	07-9137-0XXX
1.453	1.828	07-9069-0XXX	3.480	5.520	07-9099-0XXX
1.456	1.720	07-9071-0XXX	3.780	4.120	07-9101-0XXX
1.561	1.765	07-9073-0XXX	4.000	4.450	07-9102-0XXX
1.576	1.840	07-9075-0XXX	4.375	4.600	07-9103-0XXX
1.612	1.818	07-9147-0XXX	4.500	4.750	07-9105-0XXX
1.625	2.000	07-9076-0XXX	4.572	5.072	07-9107-0XXX
1.650	2.240	07-9140-0XXX	4.780	5.010	07-9108-0XXX
1.656	1.843	07-9078-0XXX	4.800	5.050	07-9109-0XXX
1.687	2.125	07-9080-0XXX	4.844	5.750	07-9112-0XXX
1.705	1.970	07-9079-0XXX	4.875	5.035	07-9110-0XXX
1.747	1.933	07-9130-0XXX	4.965	5.215	07-9113-0XXX

* Indicate height by replacing XXX with three place decimals; see "How to Order."

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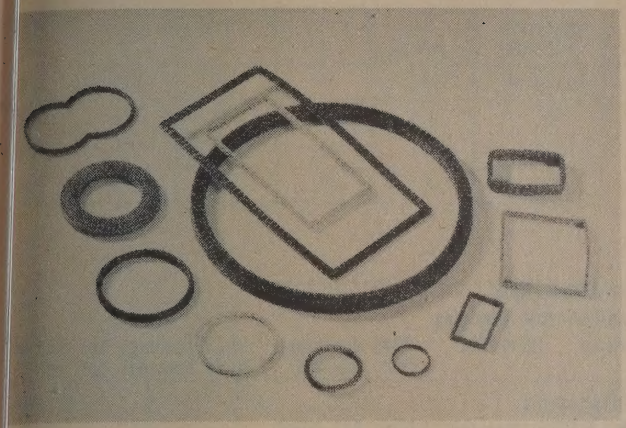
METEX Compressed® EMI Gaskets™

Product Summary For Quick Reference **ME-62**

Name	**Compressed Metex EMI Gaskets**
Function	EMI Gasketing
Forms	Jointless, die formed gaskets
Construction	Compressed knitted wire mesh
Gasket Height	.040 to .375 inches
Joint Unevenness	.015 to .100 inches
Gasket Compressing Force	5 to 100 p.s.i.
EMI Rating	14kHz(H) 25-30dB; 18MHz(E) >102dB; 1.0GHz(P) >93dB



AVAILABLE FORMS

Rings: The most common form for Metex EMI compressed gaskets is an annular ring. Table 1 lists units designed for specific waveguides and table 2 lists available tooling for other popular sizes. Many other sizes also available.

Rectangular Units: Rectangular Metex EMI compressed gaskets with constant wall are also available (see figure 1).

Other Forms: More complex shaped compressed Metex EMI gaskets are also possible. Consult Metex or local representative.

SPECIFICATIONS

Monel ..... QQ-N-281 Class A or AMS-4730-A
Aluminum ..... AMS-4182, Alloy 5056
Ferrex (Tin plated, copper clad steel)

		% By Weight
Steel Wire	SAE 1010	50%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

TABLE 1 — WAVEGUIDE GASKETS

ASESA Flange No.	METEX Part No.	Gasket Material	ASESA Waveguide No.	Substitute for "O" Ring M.S. No.
UG-40B/U	02-0101-0017-04	Monel	RG-52/U	90064-13
UG-52B/U	02-0101-0307-01	Monel	RG-51/U	90064-14
UG-54B/U	02-0101-0406-01	Monel	RG-48/U	90064-17
UG-136B/U	02-0102-0017-15	Aluminum	RG-67/U	90064-13
UG-137B/U	02-0102-0307-03	Aluminum	RG-68/U	90064-14
UG-148C/U	02-0201-0358-01	Monel	RG-49/U	90064-16
UG-343B/U	02-0201-0426-01	Monel	RG-50/U	90064-15
UG-406B/U	02-0102-0358-02	Aluminum	RG-95/U	90064-16
UG-417A/U	03-0301-2912	Monel	RG-69/U	90065-2
UG-418A/U	03-0302-2913	Aluminum	RG-103/U	90065-2
UG-435A/U	03-0301-2911	Monel	RG-104/U	90065-3
UG-437A/U	03-0302-0618	Aluminum	RG-105/U	90065-3
UG-440B/U	02-0202-0426-02	Aluminum	RG-106/U	90064-15
UG-541A/U	02-0101-0157-02	Monel	RG-91/U	90064-12
UG-541A/U	02-0101-0157-02	Monel	RG-107/U	90064-12
UG-553/U	03-0301-2909	Monel	RG-112/U	90065-1
UG-554/U	03-0302-2910	Aluminum	RG-113/U	90065-1
UG-585A/U	02-0202-0406-02	Aluminum	RG-75/U	90064-17
UG-596A/U	02-0101-0439-02	Monel	RG-53/U	90064-11
UG-596A/U	02-0101-0439-02	Monel	RG-66/U	90064-11
UG-598A/U	02-0102-0439-03	Aluminum	RG-121/U	90064-11
UG-600A/U	02-0101-0527-03	Monel	RG-96/U	90064-10

HOW TO ORDER

Waveguide Gaskets: Order by part number from table 1, tolerances per table 3.

Annular Rings (existing tooling): METEX has the largest selection of existing tooling. A few are listed in table 2. Pick size by die number. Specify gasket height (not less than .040", not more than twice wall width). Specify Monel, aluminum or Ferrex and compressibility (soft, medium or hard). Tolerances in table 3 apply to nominal dimensions in table 2.

Other Sizes and Shapes: Specify O.D., I.D., and height (wall not less than .062", height not less than .040" or more than twice wall width). METEX will check its Die List to see if tooling exists that is close to the specified O.D. and I.D. If so, existing tooling will be used.

TABLE 2 — PARTIAL LIST OF AVAILABLE TOOLING

I.D.	O.D.	Specify Die Number	I.D.	O.D.	Specify Die Number
.250	.375	726	1.000	1.380	433
.250	.409	161	1.250	1.410	586
.250	.500	53	1.250	1.500	240
.250	.594	117	1.250	1.625	356
.250	.625	445	1.250	1.744	302
.250	.738	815	1.500	1.775	728
.370	.455	2115	1.500	1.931	66B
.375	.545	309	1.500	2.107	134
.375	.625	204E	1.750	2.000	19
.375	.810	521A	2.000	2.250	152A
.500	.750	775	2.000	2.375	38D
.500	.875	99F	2.000	3.000	237C
.625	1.000	772	2.500	2.875	238
.750	1.000	93A	2.500	2.938	269
1.000	1.250	20	2.500	2.750	617
1.000	1.375	433	3.000	3.312	518
1.000	1.250	20	3.000	4.000	674

TABLE 3 — TOLERANCES

Sizes	O.D.	I.D.
Up to 1"	+.015, −.000	+.000, −.015
1" to 2"	+.020, −.000	+.000, −.020
2" to 3"	+.025, −.000	+.000, −.025
3" to 4"	+.030, −.000	+.000, −.030
Over 4"	+.040, −.000	+.000, −.040

THICKNESS: +.015
−.000 Measured under 4 oz. load, ¾" anvils on a Federal Products Model 22P hand snap gage or equivalent.

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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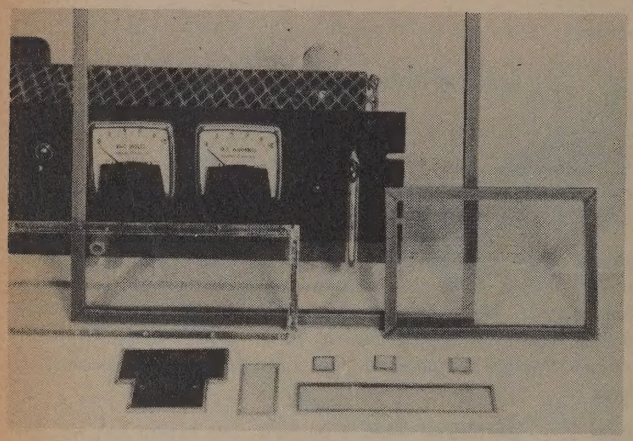
METEX Shield VU

Product Summary For Quick Reference ME-70

Name	Shield Vu
Function	EMI Shielded see-through window
Forms	Rectangular or round panels
Construction	Open mesh laminated between clear acrylic with EMI gasketed frame
Maximum Size	48″ square or diameter
EMI Rating	14kHz(H) 30dB; 18MHz(E) 90dB; 1.0GHz(P) 55dB



AVAILABLE FORMS

Shield Vu panels have an open mesh EMI shield laminated between two panels of glass which are in turn mounted in a suitable frame.

EMI Shielding: The standard knitted wire mesh shielding is either .0045 diameter Monel with 10 to 13 openings per inch and 80% viewing area, or .002 diameter Monel with 20 to 24 openings per inch and 85% viewing area. Other wire materials and mesh openings are also offered to allow maximum choice of shielding vs. viewing area.

"Glass": Standard construction is two layers of .062″ clear acrylic. Sizes as thin as two layers of .032″ thick and as thick as two layers of .125″ are available. Acrylic can also be Polarized, colored, or treated for low reflectivity. The space between the two panels can be filled with a clear laminating material (called "fully laminated") to reduce the number of interfaces and to allow changes in environmental pressure. Only fully laminated panels should be used in applications subject to rapid changes in environmental pressure.

Framing*: Two standard framing designs are offered:

- **Polastrip™:** This combines an EMI and pressure seal in one easy to install frame.
- **Aluminum:** This welded frame offers a more rigid mount and can also be used as an attractive escutcheon.

  Shield Vu panels are also supplied without frames for maximum design versatility. Some such panels are included in figure 1.
- **Other:** Shield Vu panels can also be mounted in round frames or supplied mounted in customer-specified bezels.

* U.S. Patents 2,674,644; 3,126,440 and others pending.

DESIGN STANDARDS

Polastrip Frame: Figure 2 and table 1 show the standard design for Polastrip mounting. Table 2 (also referring to figure 2) tabulates some alternate designs that are readily available. Figure 3 gives drawing standards for rectangular Shield Vu panels with other easily supplied Polastrip frames. These same cross sections can also be supplied in round panels.

Aluminum Frame: Figure 4 and table 3 show available aluminum frame cross sections. The standard, style 1144, is indicated in bold face type. Figure 4 also shows drawing standards for complete frames.

Other Possibilities: Shield Vu panels are also available without frames (figure 1) some as small as .75 x .75 and .06 thick. Round Shield Vu panels are easily supplied. They can also be mounted in customer designed bezels.

SPECIFICATIONS

Knitted Mesh Shielding

Monel	QQ-N-281B	.0045 diameter	10-13 openings per inch c
		.002 diameter	20-24 openings per inch

Clear Acrylic

MIL-P-5425 (does not apply to .032 thick)

Polastrip Frame

Solid Silicone MIL-R-5847 Sponge Silicone AMS-3195 Monel QQ-N-281E

Aluminum Frame

Alloy 6063-T-42 Finish MIL-C-5541 (Standard)

EMI Gasket

Monel QQ-N-281B

Ferrex (Tin coated copper clad steel)

		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM D-227	40%
Tin Plate	ASTM B-33	3%
	MIL-W-3861	

HOW TO ORDER

Standard Panels

Polastrip Framing: Where possible use one of the standard styles in table 1 and specify by style number. If one of the alternate designs is more desirable, select dimensions A, B, C, and D from table 2 and supply drawing based on figure 2 and 3. Also specify if panel is to be fully laminated.

Aluminum Framing: Where possible use style 1144, the standard design; otherwise specify an alternate by style number. Supply drawings based on figure 4. Also specify if panel is to be fully laminated.

Special Panels: Since special variations of Shield Vu panels are often easy to supply without increased cost or delivery, we suggest you consult Metex application engineers or local representatives for the least expensive way to achieve the function you require.

TOLERANCES

For Polastrip Cross Sections

Dim.	Solid Silicone			Sponge Silicone		
	0-.250	.312-.437	.500-.750	0-.250	.312-.437	.500-.750
a	±.010	±.015	+.031 −.015	±.015	±.015	±.031
b	±.015	±.031	±.031	±.031	±.031	±.046
c	+.030 −.015	—	—	+.030 −.015	—	—

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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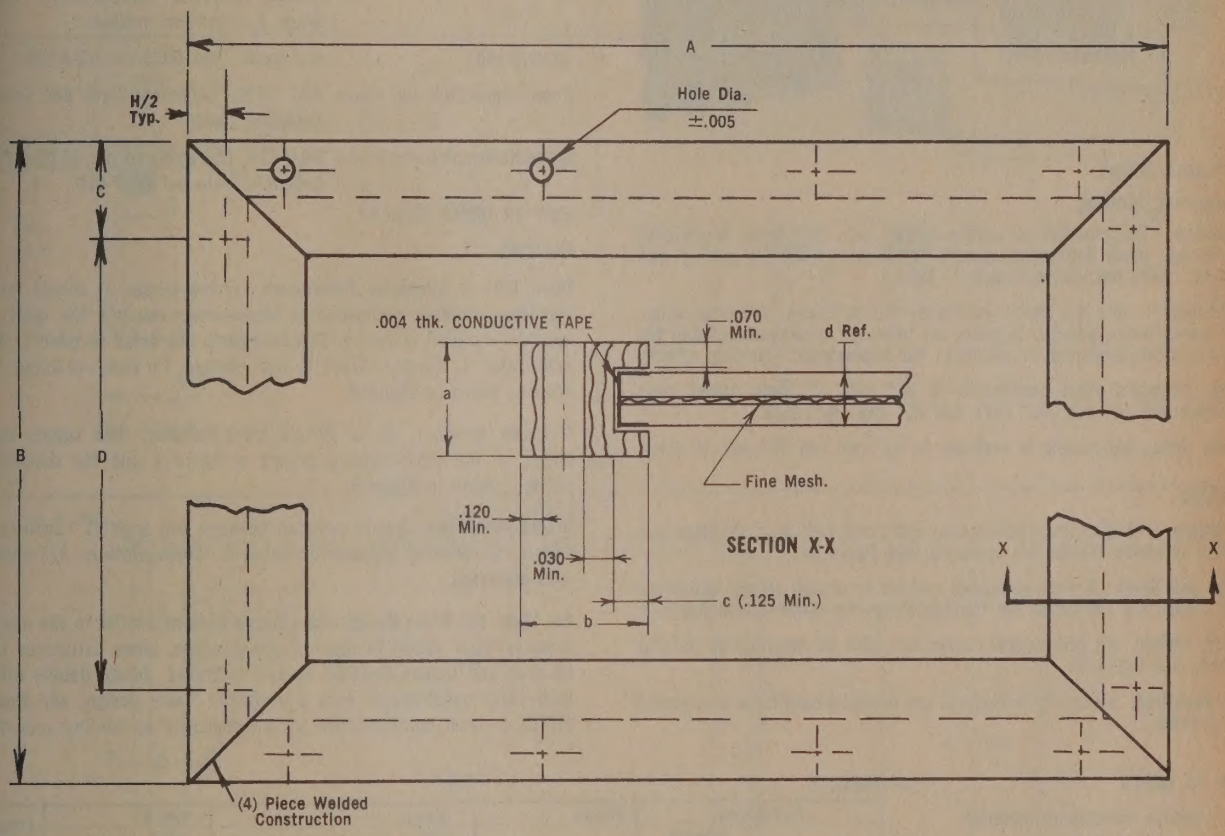
METEX
Shield VU

TABLE 1 — STANDARD POLASTRIP FRAMED SHIELD VU PANEL STYLES

Style No.	a	b	c	d Ref.	Max. Mtg. Hole Dia.
1047	.312	.312	.125	.130	No Holes
1013	.312	.375	.125	.130	.100
1058	.312	.500	.125	.130	.218
1078	.312	.625	.188	.130	.250

TABLE 2 — ALTERNATE POLASTRIP FRAMING DESIGNS ALSO AVAILABLE

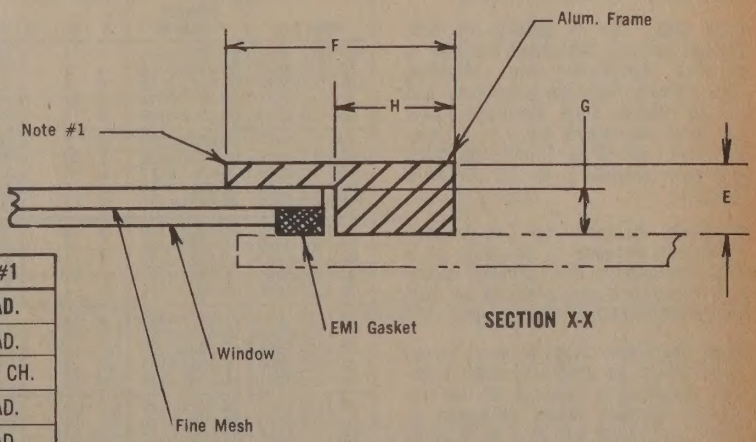
a	b	c	d
.187	.187	.125 to .188	.060
	.250		
	.312		
.250	.250	.125 to .188	.060 to .120
	.375		
	.500		
.312	.312	.125 to .188	.060 to .170
	.375		
	.500		
	.625		
.375	.375	.125 to .250	.060 to .230
	.500		
	.750		
.500	.375	.125 to .250	.090 to .360
	.500		
	.750		



	0" to 12"	12" to 24"	Over 24"
A & B	±.020	±.030	±.047
C, D & F/2	±.010	±.015	±.025

TABLE 3 — ALUMINUM FRAMED SHIELD VU AVAILABLE CROSS SECTION STYLES (Style 1144 is Standard)

Style #	E	F	G	H	Note #1
1144	**.188**	**.625**	**.129**	**.312**	**.03 RAD.**
1145	.210	.500	.120	.250	.03 RAD.
1166	.312	.500	.178	.250	⅛ x 30° CH.
1128	.380	.625	.281	.285	.03 RAD.
1165	.437	.875	.250	.560	.06 RAD.
1169	.500	.875	.343	.500	.12 RAD.



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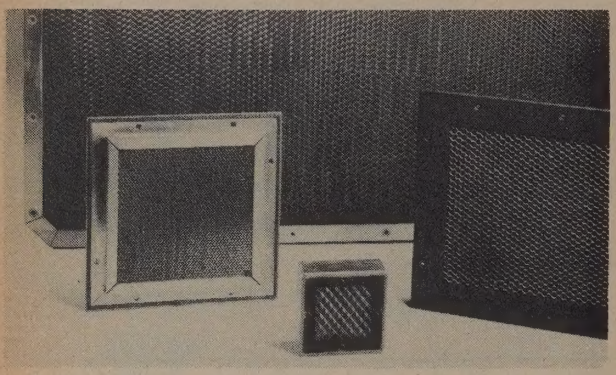
METEX
Shield Cell™ Omni Cell™

Product Summary For Quick Reference **ME-71**

Name	Shield Cell and Omni Cell
Function	EMI Shielded Ventilating Panel
Construction	Metal Honeycomb in EMI gasketed frame
EMI Rating	⅛″ Cell Aluminum 14kHz(H) 45dB; ⅛″ Omni Cell 50dB; ¼″ Cell Steel 55dB; ALL PANELS 18MHz(E) >102dB; ⅛″ Cell Aluminum 10GHz(P) 50dB; ⅛″ Cell Omni Cell 70dB; ¼″ Cell Steel 75db



AVAILABLE FORMS

Honeycomb Shielding

Aluminum: The standard structure is ⅛″ cell, ½″ thick, electrically permeated, epoxy bonded honeycomb. Other sizes available are 3/16″ cell size ¾″ thick and ¼″ cell size 1″ thick.

Omni Cell™: This is a Metex exclusive; two ⅛″ cells, ¼″ thick aluminum honeycombs mounted together for total ½″ thickness and with foil directions perpendicular to eliminate non-symmetrical shielding effects.

Steel: Standard steel honeycomb is ¼″ cell, 1″ thick. Other sizes available and ⅛″ cell, ½″ thick and 3/16″ cell, ¾″ thick.

Brass: Brass honeycomb is available in 3/16″ cell and ¾″ and 1″ thick.

FRAMING

Aluminum: For aluminum honeycomb and Omni Cell four standard aluminum extrusion frames are available (see figure 2).

Brass and Steel: A wide variety of welded or brazed frames are available. These are similar to the framing shown for aluminum in figure 2.

Round Panels: All honeycomb panels can also be mounted in circular frames, (see figure 4).

EMI Gasketing: All shield cell panels are normally supplied with installed EMI gaskets.

HOW TO ORDER

First, choose honeycomb material:

Omni Cell: This is usually the best general purpose honeycomb because it provides significantly more shielding than ordinary aluminum honeycomb, and is only slightly more expensive. Steel and brass honeycomb are 4 to 6 times as heavy, cost 3 to 4 times as much and only provide 5 to 10 dB more shielding.

Aluminum: Because Omni Cell provides significant increase in shielding at a slight increase in cost, ordinary aluminum honeycomb panels should be used only when shielding is not critical.

Brass and Steel: Brass or steel honeycomb should be used only when maximum shielding is required to low frequency magnetic fields. Compared to Omni Cell, weight will be 4 to 6 times greater, cost will be 3 to 4 times more.

SPECIFICATIONS

Aluminum and Omni Cell

Honeycomb-Aluminum	MIL-C-7438
Frame-Aluminum	QQ-A-274, Alloy 6063-T42 (finishes on bot — Iridite per MIL-C-5541)
EMI Gasket	Monel per QQ-N-281-B Sponge neoprene — MIL-R-6130B Type I Grade A, condition medium.
Captive Nuts	Aluminum, Type 6053-T-4, QQ-A-696
Steel Honeycomb and Frame	AISI 1010; Cadmium Plate per QQ-P-416 Chromate finish
Brass Honeycomb and Frame	QQ-B-613; Dip Soldered per ASTM-B-32-46T Cadmium Plate per QQ-P-416

HOW TO ORDER (Cont'd)

FRAMING

Omni Cell or Aluminum Honeycomb: Frame design II should be used whenever possible because it is inexpensive, requires the least space and has installed fasteners. Standard parts are listed in table 1; dimensions refer to figure 3. Order by part number. For sizes not listed, supply drawing based on figure 3.

If frame design I, III, or IV are more suitable, then supply drawing based on the cross-sections shown in figure 2 and the dimensioning pattern shown in figure 3.

Round panels are usually mounted between two spun "L" sections that form a "C" channel as shown in figure 4. Flange width is .375 minimum; .500 preferred.

For Steel and Brass Honeycomb: Frame designs similar to the aluminum cross-sections shown in figure 2 are possible. Since extrusions cannot be used and frames must be welded or brazed, design details will vary with exact construction. Pick a preferred frame design, and then call METEX or local representative for assistance in completing your design.

TABLE 1

Part Number		Overall			Side A			Side B		Effective Area Sq. In.
Omni Cell	Ordinary Aluminum	A	B	"C" Dim.	No. Fasteners	Spacing	"D" Dim.	No. Fasteners	Spacing	
06-1102-0872	06-0302-0111	4	4	1.750	1	—	1.750	1	—	9
06-1102-0873	06-0302-0112	4	6	1.750	1	—	1.000	2	3.500	15
06-1102-0874	06-0302-0113	4	8	1.750	1	—	.750	3	3.000	21
06-1102-0875	06-0302-0114	4	12	1.750	1	—	1.250	4	3.000	33
06-1102-0876	06-0302-0108	5	5	2.250	1	—	.750	2	3.000	16
06-1102-0877	06-0302-0115	5	7	2.250	1	—	1.500	2	3.500	24
06-1102-0878	06-0302-0116	5	10	2.250	1	—	1.250	3	3.500	36
06-1102-0879	06-0302-0117	6	6	1.000	2	3.500	1.000	2	3.500	25
06-1102-0880	06-0302-0118	6	8	1.250	2	3.000	.750	3	3.000	35
06-1102-0881	06-0302-0119	6	12	1.000	2	3.500	1.250	4	3.000	55
06-1102-0882	06-0302-0120	6	18	1.000	2	3.500	1.250	5	3.750	85
06-1102-0883	06-0302-0121	7	7	1.500	2	3.500	1.500	2	3.500	36
06-1102-0884	06-0302-0122	7	10	1.500	2	3.500	1.250	3	3.500	54
06-1102-0885	06-0302-0123	7	14	1.500	2	3.500	1.500	4	3.500	78
06-1102-0886	06-0302-0124	8	8	2.000	2	3.500	.750	3	3.000	49
06-1102-0887	06-0302-0125	8	12	.750	3	3.000	1.250	4	3.000	77
06-1102-0888	06-0302-0126	8	16	.750	3	3.000	1.250	5	3.250	105
06-1102-0889	06-0302-0109	10	10	1.250	3	3.500	1.250	3	3.500	81
06-1102-0890	06-0302-0127	10	14	1.250	3	3.500	1.500	4	3.500	117
06-1102-0891	06-0302-0128	10	18	1.250	3	3.500	1.250	5	3.750	153
06-1102-0892	06-0302-0129	12	12	1.250	4	3.000	1.250	4	3.000	121
06-1102-0893	06-0302-0110	12	16	1.250	4	3.000	1.250	5	3.250	165
06-1102-0894	06-0302-0083	12	20	1.250	4	3.000	1.000	6	3.500	209
06-1102-0895	06-0302-0130	12	24	1.250	4	3.000	1.250	7	3.500	253

For variations of part numbers and designs shown on this page use METEX DESIGN ASSISTANCE SERVICE. Call Metex, Cal-Metex, or your local representative listed in yellow section.

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METEX Shield Cell™ Omni Cell™

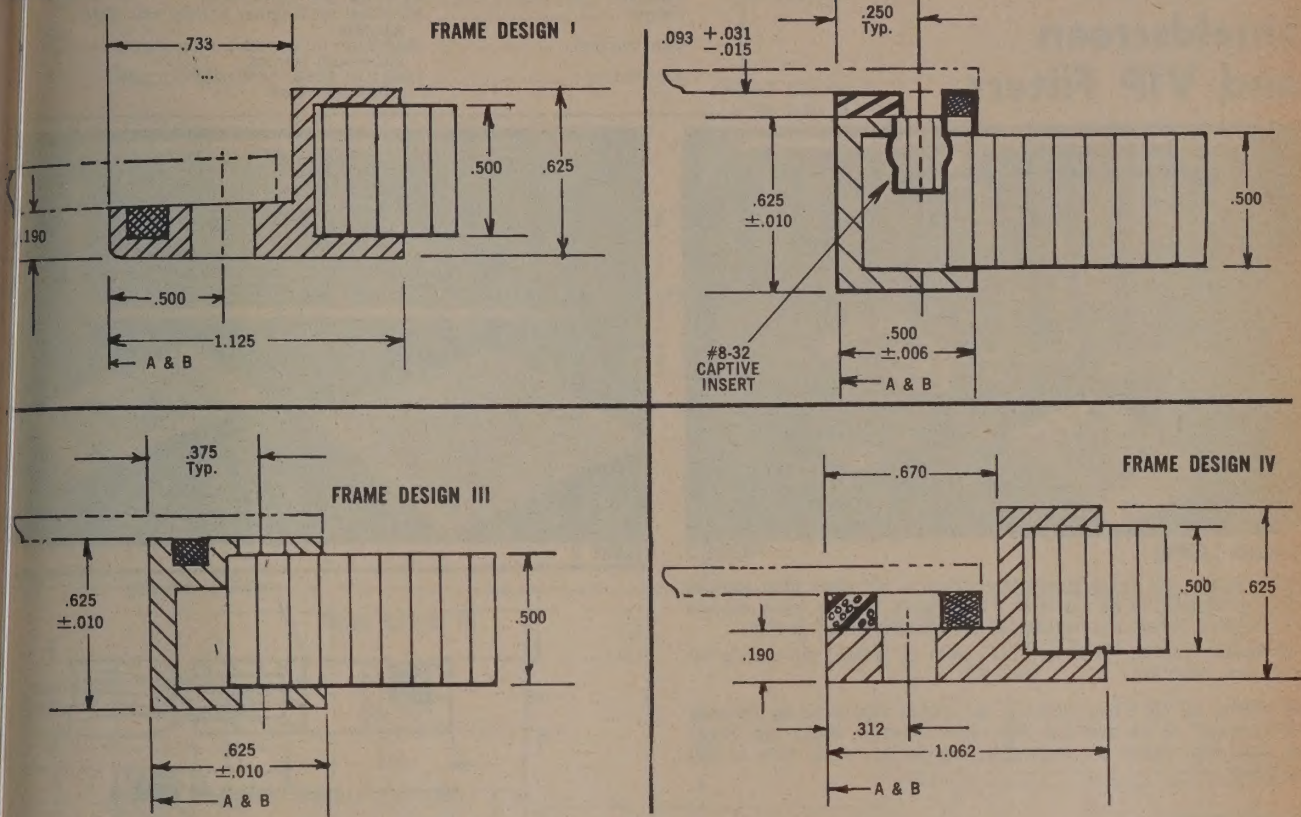


FIGURE 2

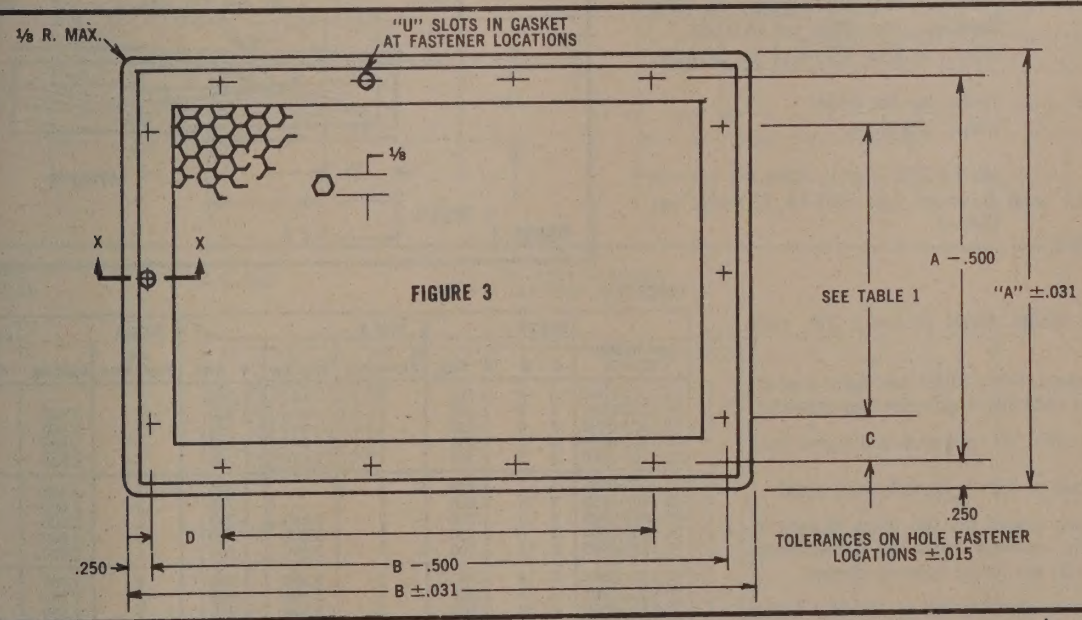
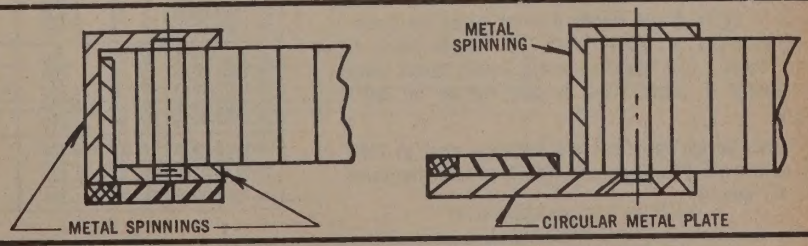


FIGURE 4

CIRCULAR SHIELD CELL PANELS

The standard frame designs cannot be formed into a circle. Shown in figure 4 are two recommended frame designs for a circular shield cell using spun metal frame.



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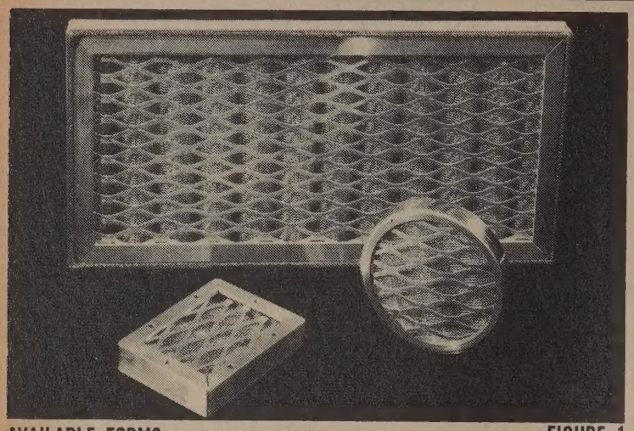
METEX

Shieldscreen and VIP Filters

Product Summary For Quick Reference ME-72

Name	Shieldscreen Filters, VIP Filters
Function	Air Filter and EMI Shield
Forms	All metal rectangular panels with EMI gaskets
Construction	Aluminum oil wettable filter media in aluminum frames
EMI Rating	14kHz(H) 55dB; 18MHz(E) >102dB; 1.0GHz(P) 55dB



AVAILABLE FORMS FIGURE 1

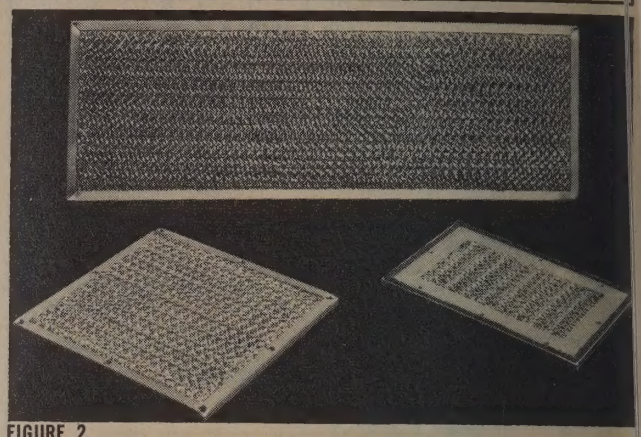


FIGURE 2

Shield Screen: All shield screen filters have a .50" thick filter medium which is mounted in an aluminum frame (figure 1). Four frame designs are standard. Panels are rectangular and include an EMI gasket.

The medium can be "Wet" or "Dry" (with or without oil coating for more dust retention).

VIP Filters: All VIP filters (figure 2), are coated with an oil for "Viscous ImPingement" of the dust and thus retain it better. Media and frames are aluminum, panels are rectangular and include some form of EMI gasketing.

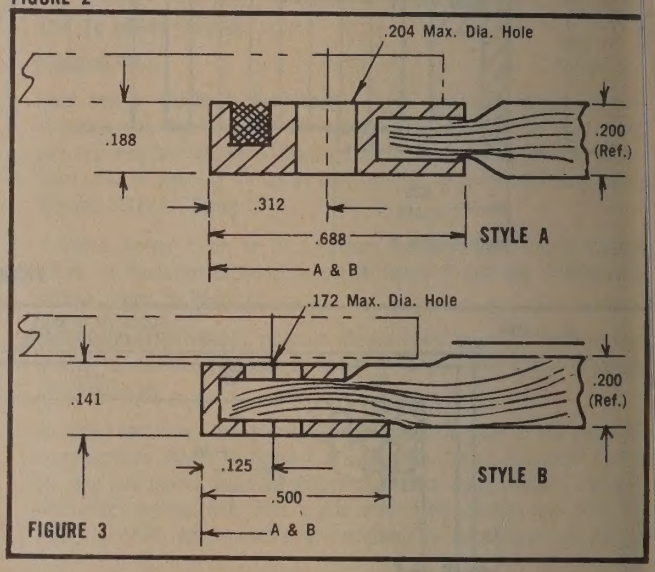


FIGURE 3

SPECIFICATIONS

Frames	Aluminum, Alloy 6063-T-42, per QQ-A-200/9
Filter Media	Aluminum, Alloy 5056, per RR-W-365
Grilles	Aluminum, Alloy 3003-H-14, per QQ-A-359
Finish on Frames, Media and Grilles*	Iridite, per MIL-C-5541
EMI Gasket	Monel, QQN-281-A
Sponge Neoprene* (when used)	MIL-R-6130A, Type II, Grade A
Captive Nuts* (when used)	Aluminum, Type 6053-T-4, QQ-A-696 Type 1, Class 3

* Not used on VIP Filters.

HOW TO ORDER

First choose which design, Shield Screen or VIP, suits your needs.

VIP: Requires less space, filters better (has higher dust arrestance) is easier to clean and is generally less expensive.

Shield Screen: Has lower air resistance and higher dust capacity.
Shielding effectiveness of both is approximately equal.

Order VIP by choosing one of the two frame designs in figure 3 and supply drawings based on dimensioning pattern in figure 5. Do not locate holes in corners.

Order Shield Screen by choosing one of the four frame designs in figure 4 and supply drawing based on dimensioning patterns in figure 5. Do not locate holes in corners. Table 1 lists standard Shield Screen panels using frame design II. Order these by part number for quick delivery.

Many other design variations are possible, most at little or no extra cost. Please consult METEX or local representative for details.

TABLE 1

Part Number Style II	Overall A	Overall B	Overall "C" Dim.	Side A No. Fasteners	Side A Spacing	Side A "D" Dim.	Side B No. Fasteners	Side B Spacing	Effective Area Sq. In.
06-1302-0896	4	4	1.750	1	—	1.750	1	—	9
06-1302-0897	4	6	1.750	1	—	1.000	2	3.500	15
06-1302-0898	4	8	1.750	1	—	.750	3	3.000	21
06-1302-0899	4	12	1.750	1	—	1.250	4	3.000	33
06-1302-0900	5	5	2.250	1	—	.750	2	3.000	16
06-1302-0901	5	7	2.250	1	—	1.500	2	3.500	24
06-1302-0902	5	10	2.250	1	—	1.250	3	3.500	36
06-1302-0903	6	6	1.000	2	3.500	1.000	2	3.500	25
06-1302-0904	6	8	1.250	2	3.000	.750	3	3.000	35
06-1302-0905	6	12	1.000	2	3.500	1.250	4	3.000	55
06-1302-0906	6	18	1.000	2	3.500	1.250	5	3.750	85
06-1302-0907	7	7	1.500	2	3.500	1.500	2	3.500	36
06-1302-0908	7	10	1.500	2	3.500	1.250	3	3.500	54
06-1302-0909	7	14	1.500	2	3.500	1.500	4	3.500	78
06-1302-0910	8	8	2.000	2	3.500	.750	3	3.000	49
06-1302-0911	8	12	.750	3	3.000	1.250	4	3.000	77
06-1302-0912	8	16	.750	3	3.000	1.250	5	3.250	105
06-1302-0913	10	10	1.250	3	3.500	1.250	3	3.500	81
06-1302-0914	10	14	1.250	3	3.500	1.500	4	3.500	117
06-1302-0915	10	18	1.250	3	3.500	1.250	5	3.750	153
06-1302-0916	12	12	1.250	4	3.000	1.250	4	3.000	121
06-1302-0917	12	16	1.250	4	3.000	1.250	5	3.250	165
06-1302-0918	12	20	1.250	4	3.000	1.000	6	3.500	209
06-1302-0919	12	24	1.250	4	3.000	1.250	7	3.500	253

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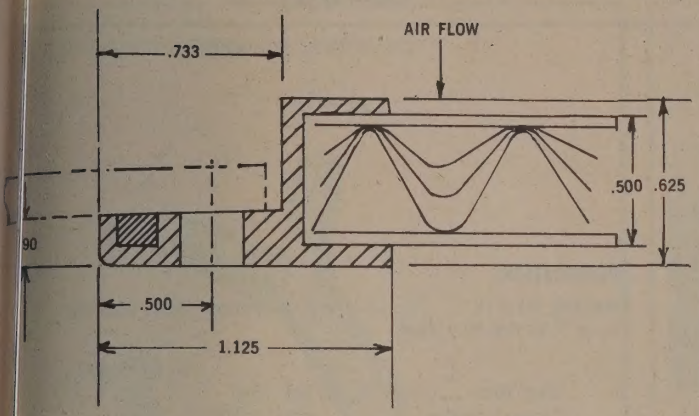
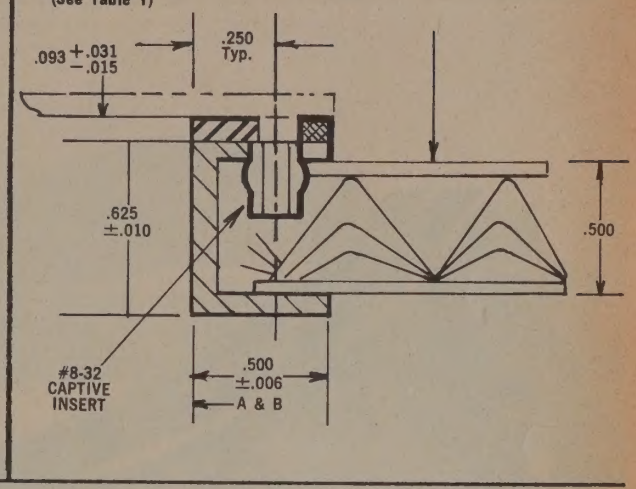
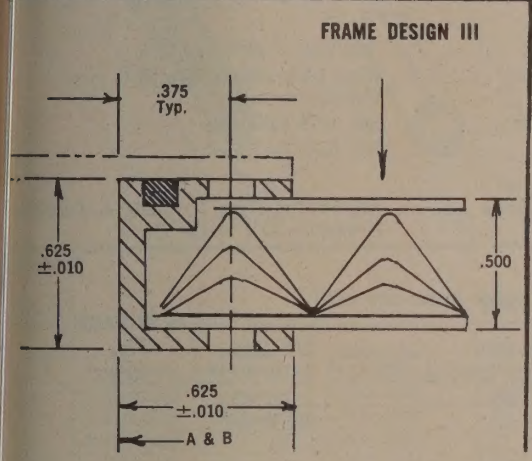
METEX Shieldscreen and VIP Filters







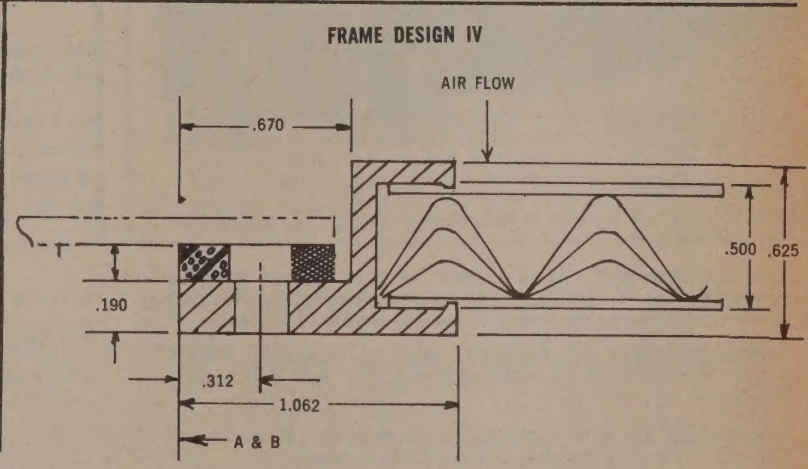


FIGURE 4

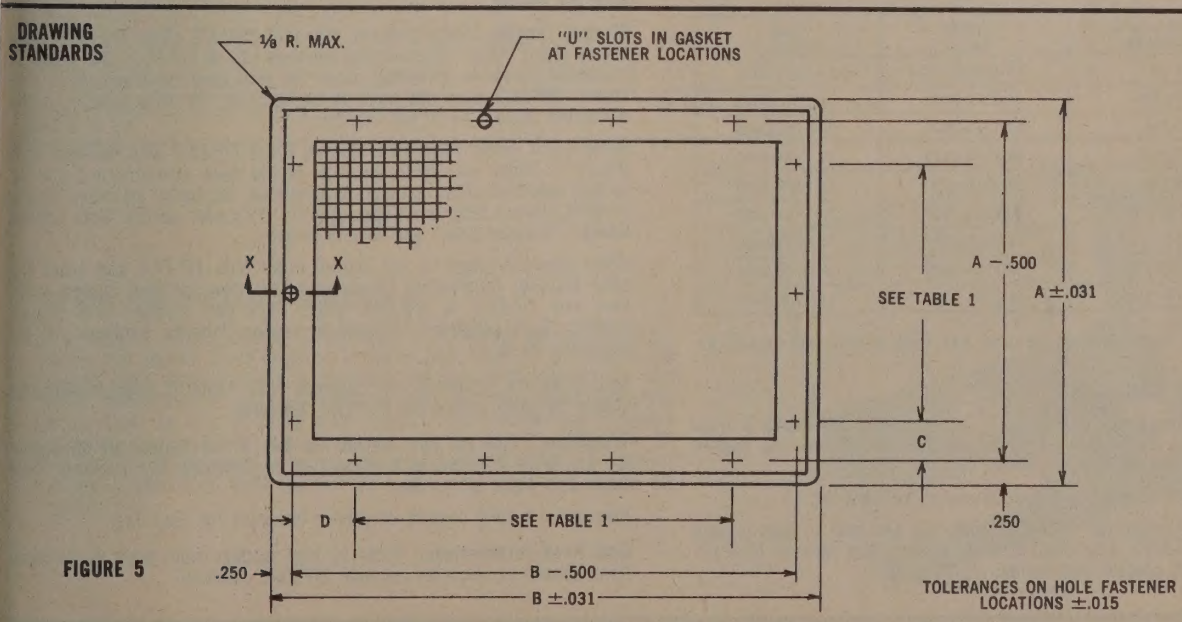


FIGURE 5

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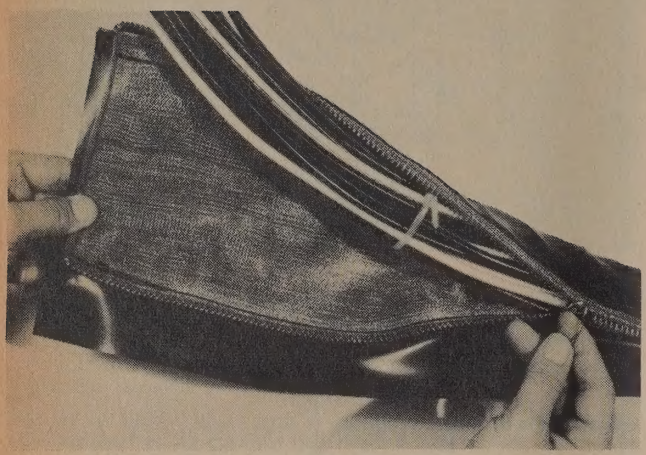
METEX
ZIP-EX-2

Product Summary For Quick Reference **ME-73**

Name	ZIP-EX-2
Function	Zip-on, Zip-off cable shield
Forms	Flat material wraps around cable 1″ to 6″ diameter
Construction	Flexible knit wire shielding with protective vinyl cover, metal slide fastener teeth attached directly to shielding mesh
EMI Rating	14kHz(H) 52dB; 18MHz(E) 75dB; 1.0GHz(P) 55dB



AVAILABLE FORMS

ZIP-EX-2: The bulk material is available in a nominal I.D. ranging from 1″ to 6″ (table 1).

Transition Components: Figure 2 shows the three standard transition components. The "Y" and the reducer are made from ZIP-EX-2. The split coupler is solid metal and is used to join two lengths of ZIP-EX-2.

Terminations: METEX also supplies hardware for terminating ZIP-EX-2. A split termination can be added **after** cable has been laid in place. See figure 2.

Slide Fastener Kit: A kit containing all the hardware and special tool required to terminate the slide fastener is also available.

TABLE 1

Sizes	Contained Diameter	Finished Ends	Bulk Length (1)
*1	0-¾	14-1114-0400	14-1104-0400
*1½	½-1¼	14-1114-0600	14-1104-0600
*2	1-1¾	14-1114-0800	14-1104-0800
2½	1½-2¼	14-1114-1000	14-1104-1000
3	2-2¾	14-1114-1200	14-1104-1200
3½	2½-3¼	14-1114-1400	14-1104-1400
4	3-3¾	14-1114-1600	14-1104-1600
5	3½-4¾	14-1114-2000	14-1104-2000
6	4½-5¾	14-1114-2400	14-1104-2400

* These are always in stock.
(1) Slide fastener termination not included. See slide fastener Termination Kit on Page

HOW TO ORDER TRANSITIONS

Pick the part number for the "Y", "T" or reducer by dimension A from table 2. Indicate B dimension by inserting the numbers in the dashes (see Dim. B column, table 3).

Also order a split coupler of proper diameter for each leg.

Example: A "Y" transition with a 5″ main leg and two 3″ legs is part number 14-5115-2012. Also order 2 split couplers part number 15-6012-0005 and 1 split coupler part number 15-6020-0005.

SPECIFICATIONS

Shielding Material ..... 4 layers, 2 stranded .0045 diameter Ferrex™ knitted wire mesh

		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

Outer Jacket	.020 Vinyl (−40°F to 120°F)
Slide Fastener	Brass teeth crimped directly to mesh shielding material
Split Couplers	SAE 1010 Tin Plated
Termination	SAE 1010 Tin Plated

EMI Gasket

Neoprene Sponge ..... MIL-R-6130B, Type II, Grade A, Condition Medium (−30°F to 150°F)

Ferrex (Tin plated, copper clad steel)

		% By Weight
Steel Wire	SAE 1010	57%
Copper Cladding	ASTM B-227	40%
Tin Plate	ASTM B-33 MIL-W-3861	3%

HOW TO ORDER

Straight Lengths: Table 1 shows standard ZIP-EX-2 sizes. The dimension shown under "size" refers to the nominal I.D. of ZIP-EX-2. The range of contained diameter (including cable ties and other protrusions) is also shown. ZIP-EX-2 does **not** need to be tight on the wire bundle so the contained cable size is not critical.

When exact length required is known, order ZIP-EX-2 with finished ends (figure 1). Metex will finish the ends of the mesh shielding and provide factory installed slide fastener terminations. Normally, maximum length is 40 ft.; longer lengths on special order. Pick part number from column headed "finished ends" and specify length.

When required length is not known, order bulk ZIP-EX-2 and order the slide fastener termination kit shown below. You can then custom make your own ZIP-EX-2 to required length. Pick part number from column headed "Bulk Lengths." Supplied in random lengths, minimum 10 ft., maximum 40 ft.

Split Couplers: Order by part number from table 2. Coupler diameter should be same as nominal ZIP-EX-2 diameter.

Transitions: Pick the part number for the "Y" or reducer by dimension A from table 2. Indicate B dimension by inserting the numbers from table 3 in place of the XX.

Also order a split coupler of proper diameter for each leg.

Bulk Head Terminations: Order by part number from table 4. Terminations should be same as nominal ZIP-EX-2 diameter.

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METEX
ZIP-EX-2

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STANDARD ZIP-EX-2 TRANSITION COMPONENTS

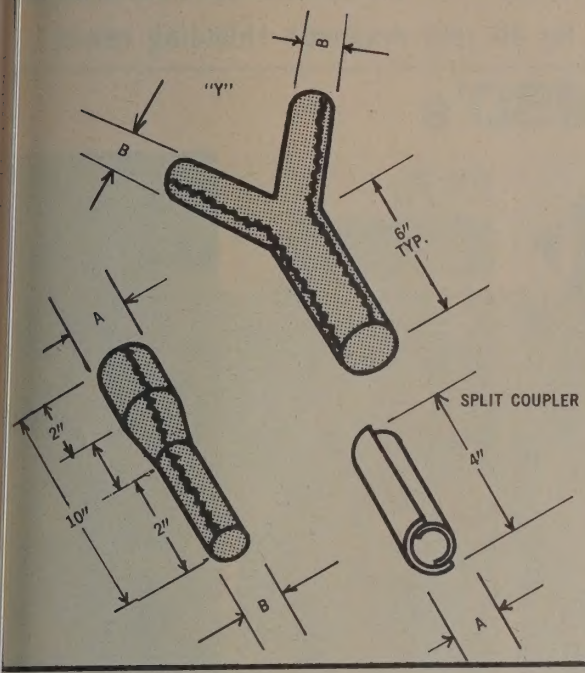
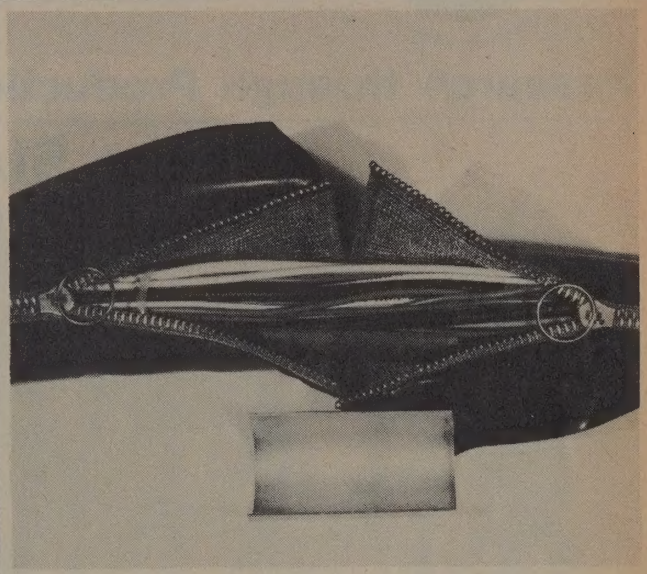


FIGURE 3



Split couplers are used to make splices between lengths of ZIP-EX-2 or between transition components and ZIP-EX-2. The loose half of the split coupler is placed in position, the two slide fasteners pulled closed. The splice is completed by securing the ends with standard cable tie-wraps.

TABLE 2

Dim. A	"Y" * Part Number	Reducer * Part Number	Split Coupler Part Number
1"	14-5114-04XX	N/A	15-6004-0005
1½"	14-5114-06XX	14-2114-06XX	15-6006-0005
2"	14-5114-08XX	14-2114-08XX	15-6008-0005
2½"	14-5114-10XX	14-2114-10XX	15-6010-0005
3"	14-5114-12XX	14-2114-12XX	15-6012-0005
3½"	14-5114-14XX	14-2114-14XX	15-6014-0005
4"	14-5114-16XX	14-2114-16XX	15-0616-0005
5"	14-5114-20XX	14-2114-20XX	15-6020-0005
6"	14-5114-24XX	14-2114-24XX	15-6024-0005

* Indicate B dimension by substituting the number from Table 3 for XX.

TABLE 3

Dim. B	Substitute for XX in Table 2
1"	04
1½"	06
2"	08
2½"	10
3"	12
3½"	14
4"	16
5"	20
6"	24

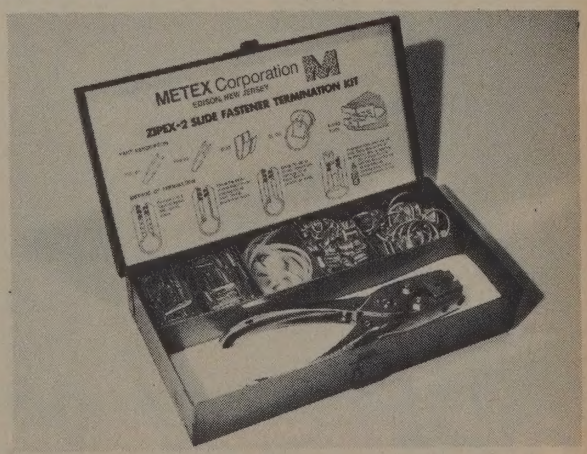
TABLE 4 — TERMINATIONS

Nominal ZIP-EX-2 Size	Standard Termination	Split Termination	Total Installed Height	Bolt Circle	No. of Equally Spaced Holes	Flange O.D.
*1	15-6004-0001	15-6004-0002	1.19	1.63	4	2.00
*1½	15-6006-0001	15-6006-0002	1.19	2.25	4	2.56
*2	15-6008-0001	15-6008-0002	1.19	2.75	4	3.06
2½	15-6010-0001	15-6010-0002	1.44	3.25	4	3.56
3	15-6012-0001	15-6012-0002	1.44	3.75	4	4.05
3½	15-6014-0001	15-6014-0002	1.44	4.25	4	4.56
4	15-6016-0001	15-6016-0002	1.44	4.75	6	5.06
5	15-6020-0001	15-6020-0002	1.44	5.75	6	6.06
6	15-6024-0001	15-6024-0002	1.44	6.75	8	7.06

* These are always in stock.

ZIP-EX-2 SLIDE FASTENER TERMINATION KIT

The ZIP-EX-2 Slide Fastener Termination Kit contains enough hardware items and special tools required to finish both ends of 15 lengths (30 closed slide fastener ends) of standard ZIP-EX-2. With this kit you can make bulk ZIP-EX-2 cable shielding to your specific needs. Complete instructions on how to make slide fastener terminations are included. Complete kit, including special tool is part number 15-4000-0001. To replace hardware items order part number 15-4000-0002. It contains enough hardware to finish another 30 lengths, but does not include the special tool.



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Magnetic Shield Division has the total magnetic shielding capability to assi you in solving any shielding problem. 80% of current shield designs orig nated with MSD and this design and engineering experience is available t you for research, planning and fabrication.

Research through Production for all your magnetic shielding needs

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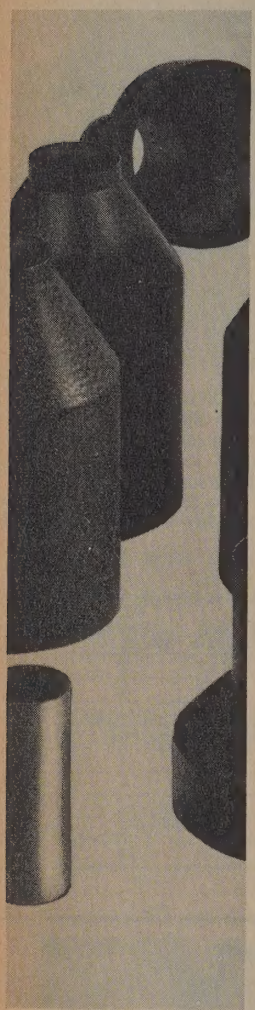

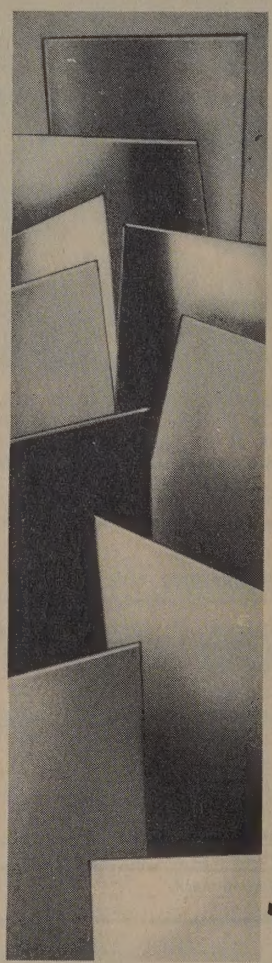

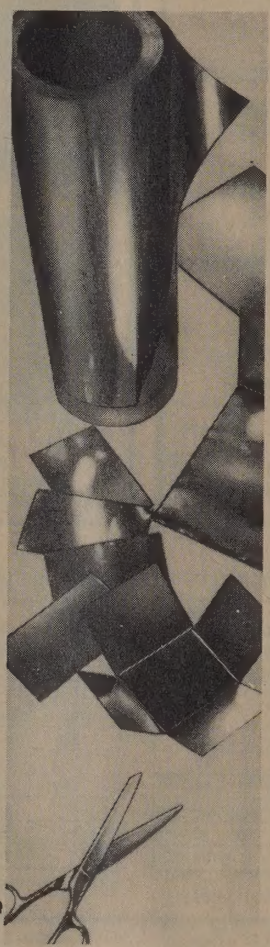

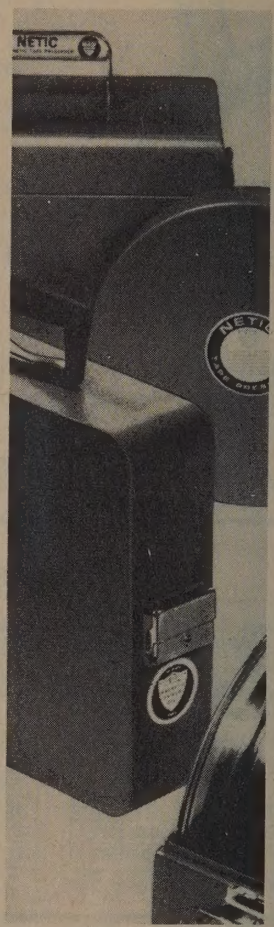

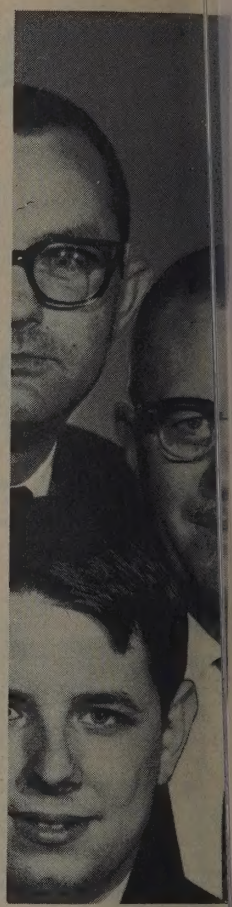

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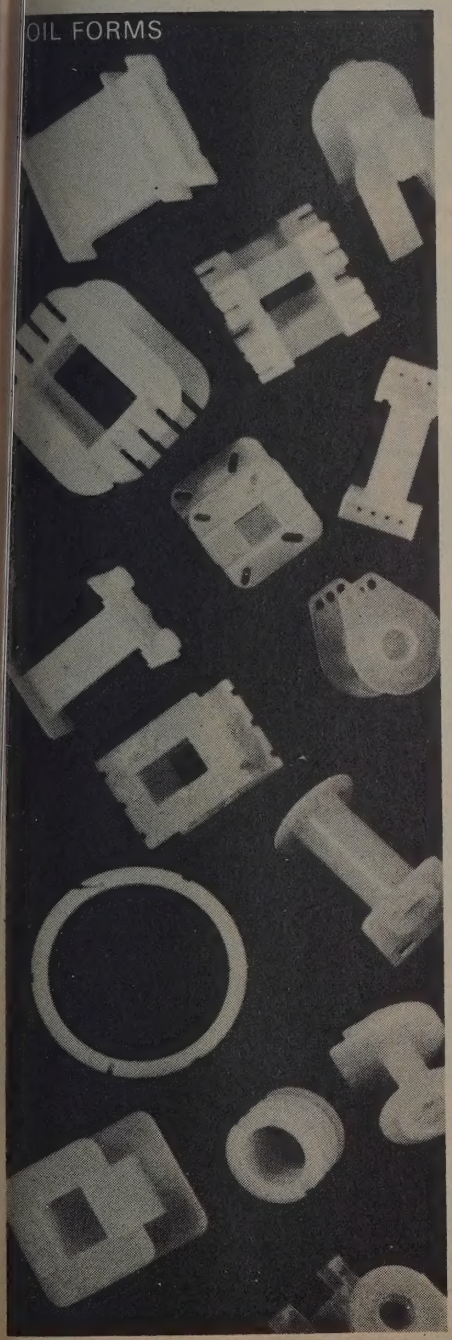
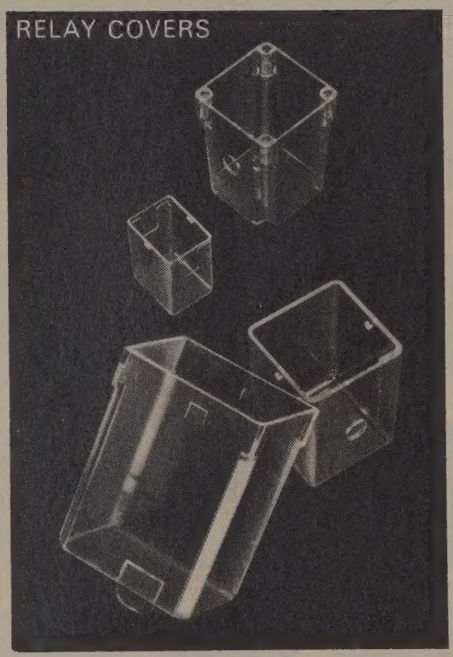
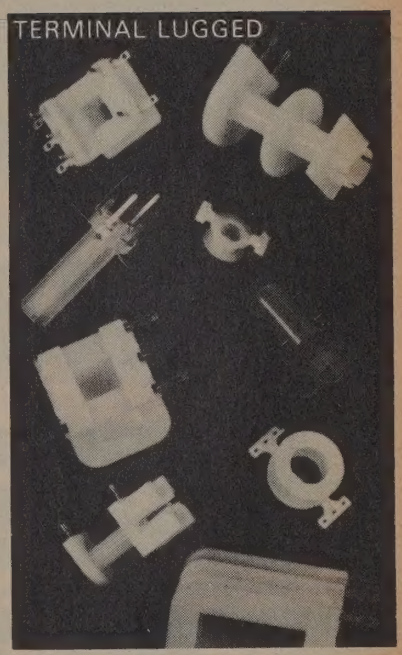
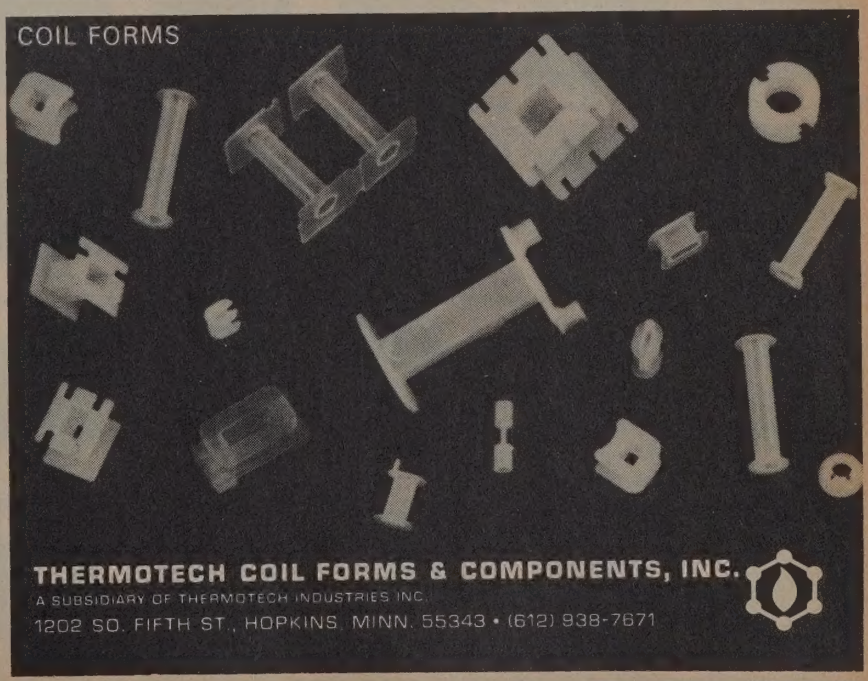
Stock Bobbins



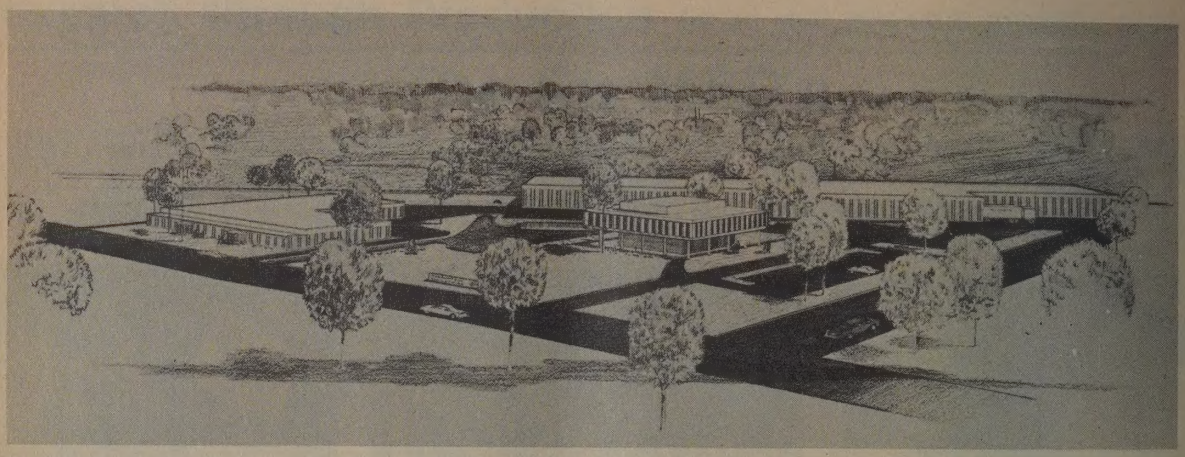






Thermotech Industries

"Where new ideas take shape in plastics"



Thermotech Industry's new industrial complex, with its over 125,000 square feet of space, will house Thermotech's growing executive offices, purchasing and accounting departments, research and development facilities, and corporate administrative offices. Located on a 10 acre tract, the industrial park provides for unlimited future growth.

Thermotech Industries - - divisions and subsidiaries.

BOOKER & WALLESTAD DIVISION, 1324 S. 5th St., Hopkins, Minn. 55343.

The Booker & Wallestad Division specializes in custom-molding of Fluorocarbon and other high temperature thermoplastic materials in short, medium and long runs.

COSOM CORPORATION (SUBSIDIARY), 6030 Wayzata Blvd., Minneapolis, Minn.

Cosom Corporation manufactures and markets lead-up sports training equipment for schools, marine accessories and fishing equipment.

Cosom also specializes in molding Fiberglass reinforced plastic. Cosom offers hand lay-up, spray-up, matched die molding, premix molding, mandrel wrapping, centrifugal casting, potting and encapsulation.

FLORIDA DIVISION, 3200 Tyrone Blvd., St. Petersburg, Fla.

The Florida Division of Thermotech Industries is a fully integrated division having its own tool and mold making facilities. Thermotech Florida specializes in injection, compression and transfer molding of precision plastic parts.

RODGERS PLASTICS EQUIPMENT, INC., 7401 Walker Street, St. Louis Park, Minn.

Rodgers subsidiary specializes in the manufacture of screw-transfer, transfer, compression, and metal working and drawing presses.

Rodgers also makes a complete line of object printers designed for high speed printing of containers and a line of heat sealing machinery.

THERMOTECH PLASTICS DIVISION, 1302 South 5th Street, Hopkins, Minn.

Thermotech Plastic specializes in precision molding of Phenalic, Diallyl, Phthalate and other custom molding Thermoset plastic parts.

Extremely close tolerance work, molding of inserts into parts and molding to government specifications are key specialties of Thermotech Plastics.

WILCOX PRODUCTS COMPANY (SUBSIDIARY).

Wilcox Products specializes in injection molding of Thermoplastic parts up to 25 ounce capacity. Wilcox provides maximum adaptability and service.

Customer design request carefully evaluated before recommendations and quotations are made. Design department available to assist customer in developing a part to fit needs. Wilcox utilizes special properties to meet special requirements — heat resistance, impact strength, low moisture absorption.

COIL FORMS AND COMPONENTS, INC., 1202 S. 5th St., Hopkins, Minn.

Coil Forms and Components specializes in precision intricate injection molding of Coil Forms in Thermoplastic, Thermosetting and Fluorocarbon materials.

Fast quality production is assured with Thermotech's custom designed machines which are automated to serve you on an around-the-clock basis.

Coil Forms now has a stock line of over 600 coil forms which are sold primarily to electrical and electronic companies.

RAINBOW PLASTICS PRODUCTS, INC., 6012 Wayzata Blvd., Minneapolis, Minn.

Rainbow Plastics specializes in precision injection molding of Thermoplastic parts. Presses will accommodate up to 64 ounce capacity. Presses available for long and short runs.

INDEX TO STANDARD PRODUCTS

Introduction ..... page 2
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Round Core Stock Bobbins ..... page 4
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Reed Switches ..... page 6
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Terminal lugs for Staked Bobbins ..... page 8
Transformer Bobbin for Printed Circuits w/lugs ..... page 8
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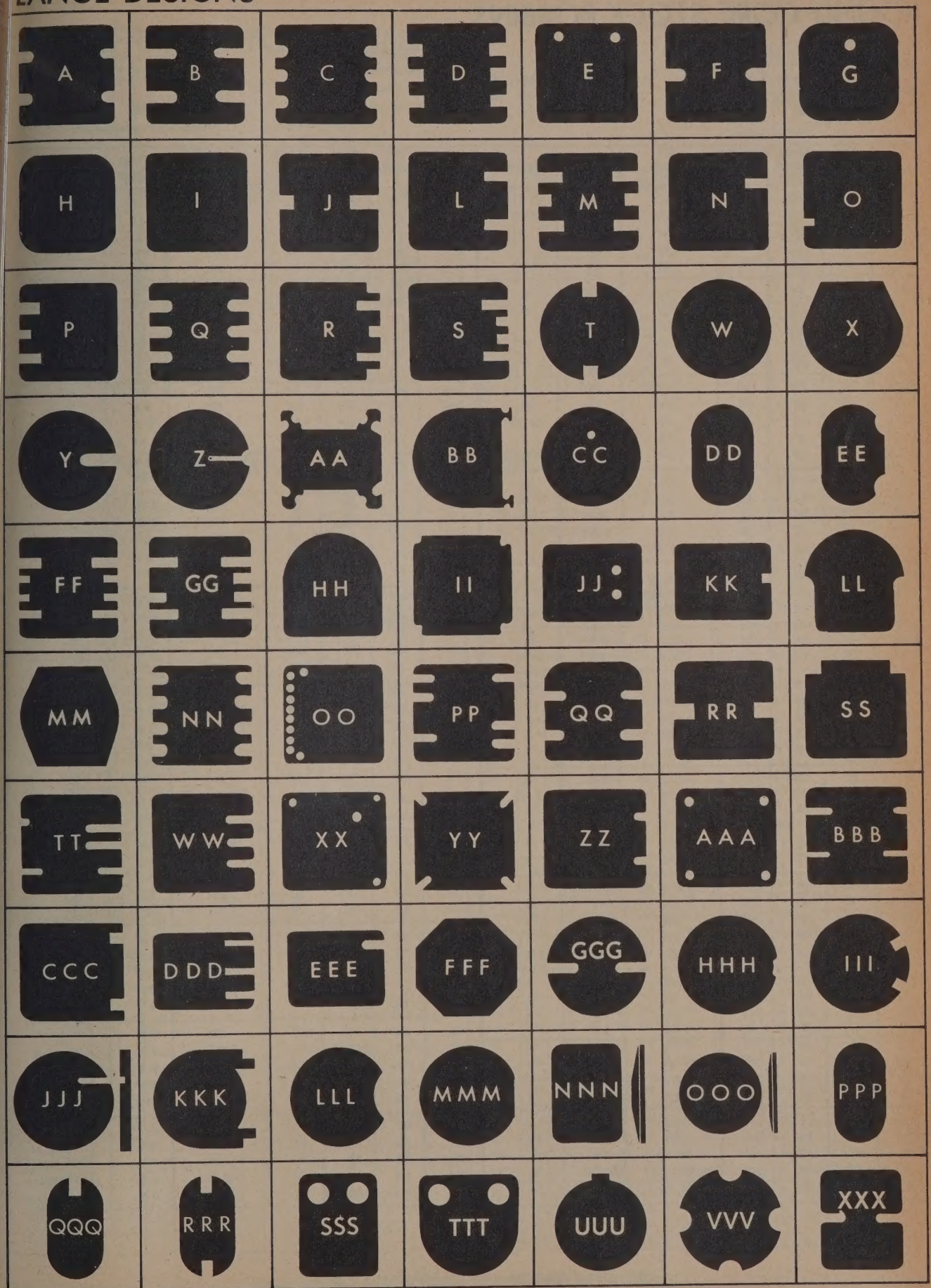
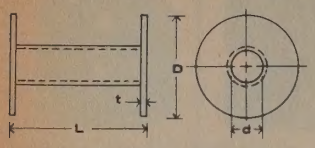
FLANGE DESIGNS



Custom Coil forms molded in Thermoplastic, Thermosets and Fluorocarbons.

ROUND CORE STOCK BOBBINS



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D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE
FL FLUOROCARBON

*When two dimensions are given, flanges are rectangular.

*When two dimensions are given the first is the core thickness and the second is the thickness of the flange.

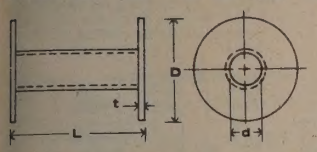
**Tapered flanges.

***Allow 3 to 4 weeks delivery.

Part Number	Hole Diameter d	Flange Diameter D*	Length Overall L	Wall Thickness t*	Flange Design	Material
2-314	.030	.184	.180	.012	T-T	N
2-226***	.050	.170	.200	.010	W-W	N/NG
2-135	.063	.180	.206	.012	W-W	N
2-367	.067	.132	.300	.020	W-W	N
2-421	.094	.330	.685	.015	W-W	N/GN
2-403	.098	.280	.330	.015	W-W	GN
2-290	.098	.280	.370	.015	W-W	GN
2-236***	.099	.328	.681	.015	W-W	N
2-354	.104	.197	.650	.012	W-W	GN
2-289	.110	.230	.140	.012	HH-KKK	N
2-149***	.110	.290	.360	.020	W-W	N
2-436	.110	.290	.800	.018	Y-Y	GN
2-399	.110	.312	.130	.015	W-W	LEXAN
2-125***	.113/3 ribs	.280	.435	.014	W-W	N
2-125A***	.113	.280	.435	.014	W-W	N
2-401	.114	.290	.390	.021	W-W	GN
2-297	.120	.345	.750	.015	W-W	N
2-402	.120	.396	.406	.025	W-W	N
2-402A	.120	.396	.406	.025	W-VVV	N
2-271***	.125	.285	.300	.015/.020	W-W	N
2-272***	.125	.342	.300	.015/.020	W-W	N
2-201	.125	.342	.540	.020/.015	W-W	N
2-156***	.125	.430	.627	.020	W-W	N/GN
2-473	.125	.355	.490	.015	W-HHH	N
2-207***	.128	.496	.352	.018	W-W	N
2-281	.130	.230	.770	.014	W-W	N/GN
2-282	.130	.300	.770	.014	W-W	N/GN
2-164	.135	.360	.255	.018	W-GGG	N
2-383	.136	.250	.126	.014	W-W	N
2-208	.138	.375	.875	.030	W-Y	N
2-208A	.138	.375	.875	.030	W-T	N
2-441	.140	.593	.820	.032	W-W	N
2-463	.147	.875	.430	.035	W-LLL	P.P/N
2-238***	.150	.496	.386	.017	W-W	N
2-247	.152	.800/1.000	.950	.075	I-I	N
2-287***	.155	.400	.280	.012	W-W	N
2-410	.157	.300	.168	.010	W-W	N
2-427	.180	.530	1.350	.020/.045 to .065	**000-000	N
2-392	.188	.495	.280	.029	W-W	N
2-232	.190	.405	.620	.030	W-W	N
2-301	.190	.495	.453	.018	W-LLL	N
2-432	.190	.650	.333	.032	W-UUU	N-NG
2-418	.191	.750	.505	.030	W-W	N
2-420	.192	.500	.350	.030	W-W	N
2-475	.192	.500	.360	.018	W-CC	N
2-409	.193	.650	.345	.026	W-W	N
2-318	.194	.418	.125	.020	W-Y	N
2-140	.195	.500	.436	.015	W-W	N
2-458	.195	.420	.533	.011	W-Y	N
2-459	.195	.420	.399	.011	W-Y	N
2-313	.200	.538 x .538	.625	.025	I-E	N
2-245	.203	.830	.345	.025	W-W	N
2-425	.205	.375	.430	.020/.030	W-W	N
2-179	.218	.625	1.090	.020/.025 to .040**	000-000	NL
2-340	.218	.808	.503	.030/.020	000-000	N
2-151	.220	.625	.950	.020/.025 to 040**	000-000	N/GN
2-168***	.221	.592	.935	.020	W-LL	NL
2-302	.250	.495	.621	.018	W-LLL	N
2-131	.255	.618	.934	.026	W-W	N
2-131A	.255	.725	.934	.025	W-W	N
2-470	.255	.525	.750	.031	W-W	N
2-474	.255	.500	.820	.025	W-W	N
2-123***	.285	1.000	.990	.024	W-CC	N
2-464	.288	.430	.812	.020	W-Y	N
2-105***	.290	1.000	.980	.030	Z-W	N
2-105A***	.290	1.000	.980	.030	Y-W	N
2-455	.293	.870	.685	.030	W-W	N
2-303	.305	.625	.692	.020	W-W	N
2-188***	.310	.510	.375	.015	W-III	D/N
2-454	.312	.875	.562	.030	W-W	N
2-415	.315	.875	.575	.035/.035-.070	W-W	N
2-180	.315	.875	.600	.035	W-MM	N/GN
2-435	.315	.875	.650	.032	W-MM	
2-181	.315	.875	.700	.035	W-MM	N/GN
2-411	.316	.750	1.187	.022	W-W	GN
2-144	.316	.875	.590	.035	W-W	N/GN
2-320	.316	.875	.595	.027	W-W	N
2-118	.316	.875	.690	.035	W-W	N/GN
2-187	.316	1.155	.500	.031	W-HHH	N
2-363	.320	.725	.850	.030	III-III	GN
2-235***	.320	.750	.562	.022	W-W	N/FL
2-431	.320	.755	1.337	.050	W-TTT	N-GN
2-296	.320	.875	.590	.025	W-X	N
2-296A	.320	.875	.590	.025	X-T	N
2-248	.320	.935	.535	.027	W-W	N/GN
2-445	.320	.725	1.000	.062	W-IRR	N
2-444	.322	.535	.276	.015	W-III	NL
2-446	.322	.535	.428	.015	W-III	NL
2-273	.325	.456	1.163	.015	W-W	N/GN
2-273A	.325	.502	1.163	.015	W-W	N/GN
2-193***	.328	.812	1.250	.040/.047	W-W	N/GN
2-422	.330	.720 Sq.	1.030	.032	E-E	GN
2-165***	.333	.859x.859	1.176	.045/.057	I-I	N
2-130***	.370	.872	.982	.025	W-W	N
2-178	.375	.635	.135	.010	W	N
2-426	.375	.718	.937	.025	W-CC	N
2-115***	.376	.656	.968	.035	W-W	N/FL
2-120	.376	1.000	.968	.032	BB-W	N
2-429	.377	1.367		.060/.030	W-W	D
2-360	.378	.962	1.100	.020/.030	W-Y	GN
2-126	.380	1.000	.620	.024	W-W	N
2-395	.380	1.125	.562	.030	W-W	N
2-167	.382	.677	.310	.025	W-W	N/GN
2-319	.385	.980	.605	.028	W-W	N
2-143	.385	1.125	.628	.031/.047	W-HH	N
2-199***	.385	1.125	1.093	.035	HHH-HHH	N
2-127	.388	1.000	.995	.027	W-W	N
2-366	.390	.900	.812	.030	W-W	GN
2-353	.408	1.000	1.187	.036/.047	W-W	LUMARITH
2-380	.425	1.050	.255	.035/.025	W-W	D

Send prints or samples for prompt, competitive price or quotation

ROUND CORE STOCK BOBBINS



N NYLON
GN NYLON GLASS REINFORCED
D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE
FL FLUOROCARBON

*When two dimensions are given, flanges are rectangular.

*When two dimensions are given the first is the core thickness and the second is the thickness of the flange.

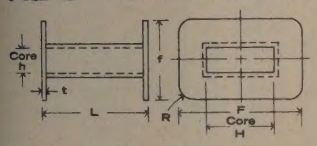
**Tapered flanges.

***Allow 3 to 4 weeks delivery.

Part Number	Hole Diameter d	Flange Diameter D*	Length Overall L	Wall Thickness t*	Flange Design	Material
2-312	.420	1.210	.425	.030	000-000	N
2-430	.430	.755	.650	.015	W-W	N-GN-NL
2-244***	.435	.725	.650	.020	W-III	N/GN
2-469	.463	.738	.650	.015	W-III	NL
2-222***	.500	.935	.730	.030	W-III	N/GN
2-456	.510	.964	.735	.020	W-III	NL
2-457	.510	.964	.520	.020	W-III	NL
2-237	.516	1.500	1.093	.040	W-W	N
2-330	.518	1.303	1.063	.042	W-W	GN
2-448	.560	1.400	.325	.030	W-W	N

Part Number	Hole Diameter d	Flange Diameter D*	Length Overall L	Wall Thickness t*	Flange Design	Material
2-176	.572	1.406	1.750	.060	W-W	N
2-195***	.600	1.525	1.810	.065	W-FFF	N
2-451	.630	1.460	.440	.030	W-W	N
2-122	.637	1.375	.490	.032	W-W	N
2-357	.635	.990	.620	.032	Y-Y	N
2-376	.660	1.213	.910	.025/.030	W-CC	D
2-372	.765	1.750	1.562	.042	W-W	GN
2-228***	.795	1.645	1.344	.020	W-MMM	NL
2-286***	.967	1.985	2.040	.080	W-JJJ	N
2-262	1.614	2.375	.600	.050	W-W	N

RECTANGULAR STACKS - STOCK BOBBINS



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**Tapered flanges.

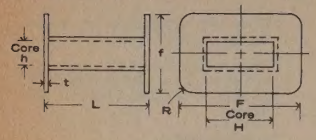
***Allow 3 to 4 weeks delivery.

Part Number	Hole h	Hole H	Flange f	Flange F	Length Overall L	Wall Thickness t*	Flange Design	Matl.	Lamination Number Or Application
3-121	.015	.098	.500	Dia.	.227	.020	W-W	N	
3-368	.024	.073	.169	.218	.238	.012	I-O	GN	
3-304	.033	.066	.298	.240	.270	.012	CCC-CCC	N	Microsyl Core
3-254***	.033	.066	.250	.280	.280	.012	I-I	N	Microsyl Core
3-292	.034	.068	.135	.185	.281	.012	F-F	GN	Mycrosyl Core
3-292A***	.034	.068	.135	.185	.281	.015	F-F	GN	
3-205	.036	.070	.166	.200	.360	.014	I-I	N	
3-377	.055	.070	.185	.200	.100	.015	H-I	GN	
3-279	.056	.302	.203	.449	.301	.015	I-I	N	Microsyl Core
3-177***	.063	.101	.355	.400	.500	.025	G-H	N	
3-378	.070	.105	.200	.235	.100	.015	H-H	GN	
3-412	.070	.465	.175	.615	.450	.020	I-I	N	
3-389	.070	.365	.185	.500	.450	.015	I-I	N	
3-382	.071	.168	.192	.306	.437	.016	I-I	N	
3-461	.075	.388	9/16	1¼	1½	.032	PPP-IRR	N	
3-212***	.079	.154	.185	.260	.125	.012	I-I	N	
3-148	.096	.146	.270	.320	.151	.012	II-II	N	
3-433	.096	.400	.270	.580	.151	.012	I-I	N	
3-252***	.097	.115	.239	.279	.125	.020/.012	I-I	N	
3-136	.100	.150	.275	.329	.273	.015	I-I	N	EE 30-31 9/64" Stack
3-337	.100	.150	.275	.329	.275	.012	I-B	N	EE 30-31 9/64" Stack
3-145	.100	.187	.277	.364	.270	.015	I-I	N/GN	EE 30-31 3/16" Stack
3-145A	.100	.188	.278	.364	.270	.015	I-Q	N	EE 30-31 3/16" Stack
3-145B	.100	.188	.278	.364	.270	.015	Q-Q	N	EE 30-31 3/16" Stack
3-310	.100	.199	.300	.400	.110	.012	I-I	GN	Microsyl Core
3-299	.100	.200	.280	.390	.210	.012	H-H	N/GN	EI-187 3/32" Stack
3-471	.100	.325	.195	.420	1.110	.020	I-I	N	
3-269***	.102	.197	.285	.385	.209	.012	I	N/GN	Microsyl 3/16 x .742 Stack
3-190***	.103	.114	.270	.270	.148	.018	F-F	N	
3-288***	.103	.266	.266	.430	.150	.015	I-I	N	EI-094 1/4" Stack
3-211***	.104	.140	.294	.330	.230	.012	I-I	N	
3-331	.106	.206	.240	.340	.604	.012	I-G	N	Microsyl Core

Part Number	Hole h	Hole H	Flange f	Flange F	Length Overall L	Wall Thickness t*	Flange Design	Matl.	Lamination Number Or Application
3-249	.106	.263	.266	.424	.406	.025	I-I	N	
3-424	.110	.396	.240	.550	1.120	.032	I-I	D	
3-424A	.110	.396	.230	.550	1.110	.030	I-I	GN	
3-398	.125	.250	.375	.502	.309	.020	I-I	N	
3-356	.130	.318	.368	.555	.305	.020	H-H	N	EE 28-29 5/16" Stack
3-256***	.130	.192	.360	.438	.300	.020	I-I	N	
3-253***	.131	.145	.375	.375	.474	.012	XX-XX	N	
3-153	.131	.255	.373	.498	.311	.020	I-JJ	N/GN	EE 28-29 1/4" Stack
3-449	.136	.260	.330	.450	.485	.021	I-I	N	
3-462	.132	.757	9/16	1¼	1½	.032	I-E	N	
3-240	.145	.625	.395	.875	.308	.018	H-H	N	
3-315	.156	.215	.406	.465	.150	.020	I-F	N	
3-321	.156	.312	.310	.450	.370	.015	I-I	N/GN	
3-291	.156	.312	.385	.540	.370	.014	I-RR	GN	
3-327	.165	.200	.500	.535	.425	.025	D-D	N	EI 187 x 5/32" Stack
3-450	.167	.385	.516	.734	.500	.025	I-A	N	
3-128***	.168	.521	.627	.968	.839	.032/.025	DD-EE	N	
3-295***	.176	.266	.290	.380	.170	.015	I-EEE	N	E 25 1/4" Short Stack
3-333	.180	1.690	.609	2.230	.855	.062	H-H	N	
3-465	.181	.353	.360	.574	.383	.020	H-KK	N	
3-241	.190	.440	.500	.750	.969	.020	H-H	N	
3-204***	.192	.255	.436	.566	.455	.030	I-I	N	
3-332	.194	.256	.500	.570	.340	.015	I-I	GN	EI 187 1/4" Stack
3-246	.197	.225	.445	.480	.675	.020	I-I	N/GN	
3-258	.197	.275	.562	.625	.400	.020	I-WW	N	
3-307	.197	.571	.550	.925	.240	.020	I-I	N	EI 186 9/16" Stack
3-173	.198	.258	.332	.392	.656	.017/.021	I-I	N	
3-250	.200	.263	.360	.424	.406	.025	I-I	N	
3-134	.200	.263	.558	.597	.427	.023/.020	D-D	N	EI 187 1/4" Stack
3-134A	.200	.263	.558	.597	.427	.023/.020	D-I	N	EI 187 1/4" Stack
3-134B	.200	.263	.558	.597	.427	.023/.020	FF-FF	N	EI 187 1/4" Stack
3-191	.200	.296	.535	.670	.420	.028	I-L	N	
3-191A	.200	.296	.535	.670	.420	.025	D-D	N	
3-191C	.200	.296	.535	.670	.420	.025	I-I	N	
3-138	.200	.355	.535	.695	.425	.020	I-I	N	EI 187 11/32" Stack

Custom Coil Forms molded in Thermoplastic, Thermosets and Fluorocarbons

RECTANGULAR STACKS - STOCK BOBBINS



N NYLON
GN NYLON GLASS REINFORCED
D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE
FL FLUOROCARBON

*When two dimensions are given, flanges are rectangular.

*When two dimensions are given the first is the core thickness and the second is the thickness of the flange.

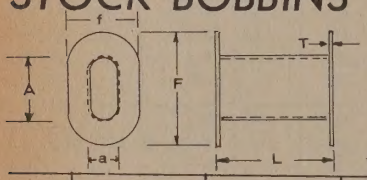
**Tapered flanges.

***Allow 3 to 4 weeks delivery.

Part Number	Hole h	Hole H	Flange f	Flange F	Length Overall L	Wall Thickness t *	Flange Design	Matl.	Lamination Number Or Application
3-338	.200	.355	.535	.695	.425	.022	L-DDD	N	EI 187 11/32" Stack
3-298***	.200	.355	.437	.695	.656	.020	I-I	N	EI 188
3-306	.200	.385	.535	.885	.425	.025	NN-NN	GN	EI 187 3/8" Stack
3-283	.200	.385	.540	.720	.425	.030	I-I	FL/N/GN	EI 187 3/8" Stack
3-283A	.200	.385	.540	.720	.425	.025	D-D	N/GN	EI 187 3/8" Stack
3-283B	.200	.385	.540	.625	.425	.025	D-D	N/GN	EI 187 3/8" Stack
3-325	.200	.760	.450	1.000	1.120	.025	I-ZZ-ZZ	N	EI 75 3/16" Stack
3-274***	.207	.406	.437	.636	.610	.030	QQ-QQ	N	Arnold AM-6 "C" Core
3-358.	.228	.256	.557	.557	.500	.020/.025	H-H	N/GN/PP	
3-284	.250	.390	.562	.718	1.085	.030	I-I	N	Arnold AH 246 "C" Core
3-391	.258	.383	.565	.690	1.120	.026	I-I	N	
3-322	.260	.450	.532	.722	.675	.025	I-SS	N	1314 W Lamination
3-322A	.260	.450	.532	.722	.675	.025	I-I	N	1314 W Lamination
3-224	.260	.385	.840	.967	.706	.032	Q-Q	N	
3-224A	.260	.385	.840	.967	.706	.032	M-M	N	
3-414	.260	.508	.500	.860	.500	.030	I-I	N	
3-166	.260	.510	.785	1.070	1.195	.020/.025 to .045**	NNN-NNN	NL	Arnold AH 40 "C" Core
3-221***	.260	.513	.800	1.060	1.170	.028/.035 to .068**	NNN-NNN	N	Arnold AH 40 "C" Core
3-379	.266	.515	.725	.970	.406	.020	I-I-I	N	
3-150***	.266	.515	.720	.970	.490	.033	I-I	N	EE 24-25 1/2" Stack
3-150A***	.266	.515	.720	.970	.490	.040	D-D	N	EE 24-25 1/2" Stack
3-362	.266	.515	.720	.970	.490	.040	I-S	N	
3-255	.266	.515	.720	.975	.490	.040	H-H	N	EE 24-25 1/2" Stack
3-227	.266	.391	.720	.875	.476	.030	I-I	N	EE 24-25 3/8" Stack
3-227A	.266	.391	.720	.875	.476	.030	Q-Q	N/GN	EE 24-25 3/8" Stack
3-116***	.266	.630	.500	1.110	.469	.020	I-I	N	DU 124 5/8" Stack

Part Number	Hole h	Hole H	Flange f	Flange F	Length Overall L	Wall Thickness t *	Flange Design	Matl.	Lamination Number Or Application
3-175***	.312	.385	.875	.865	.660	.030	OO-OO	N	E 38 5/16" Stack
3-142***	.325	.465	.710	.850	.425	.035	I-I	N	Ferrox Cube 206 F440
3-142A***	.325	.465	.710	.850	.425	.035	WW-WW	N	Ferrox Cube 206 F440
3-467	.327	.760	1.060	1.460	.650	.040	I-I	Noryl	
3-468	.327	.760	1.060	1.460	.422	.040	I-I	Noryl	
3-417	.335	.640	.700 .700	1.210 1.000	.297	.030	I-SSS	N/GN	
3-119	.348	.510	.813	.984	.719	.022	I-I	N	F 13 1/2" Stack
3-393	.385	.510	.986	1.100	.796	.028	I-I	N	
3-172***	.390	.662	1.050	1.302	1.035	.028	I-I	N/GN	
3-341	.435	.844	1.807	1.900	.555	.035	I-I	GN	
3-242***	.448	.510	1.038	1.100	.796	.032	I-L	N	EI 21 7/16" Stack
3-192***	.453	.468	.968	1.000	.968	.031	H-H	N	
3-231	.453	.531	.969	1.062	.969	.038	I-I	N	
3-428	.500	.758	1.120	1.312	.562	.032	I-I	N/GN	
3-355	.510	.635	1.100	1.225	.796	.030	NN-NN	N	
3-355A	.510	.635	1.100	1.225	.796	.032	I-M	N	
3-163	.510	1.020	1.170	1.800	.850	.055	KK-KK	N	
3-413	.525	.595	1.300	1.500	1.350	.045	Special	N/GN	
3-442	.560	1.560	1.160	2.140	.500	.050	I-I	N	
3-329	.573	1.151	1.375	1.937	1.000	.040	I-AAA	N/GN	
3-370	.578	.640	1.109	1.171	.828	.025	I-I	N	
3-323	.633	.758	1.359	1.484	1.115	.031	I-I	N/GN	EI 75 5/8" Stack
3-225	.635	.755	1.205	1.343	.916	.030	I-I	N	EI 625 3/4" Stack
3-225A	.635	.755	1.205	1.343	.916	.030	I-L	N	EI 625 3/4" Stack
3-104***	.635	1.015	1.370	1.750	1.370	.050	I-I	N	
3-400	.690	.846	1.296	1.445	.492	.030	I-TT	GN	
3-396	.953	1.515	2.077	2.640	1.188	.032	I-I	GN	
3-397	.953	1.515	2.077	2.640	1.312	.032	I-I	GN	

REED SWITCHES-STOCK BOBBINS



N NYLON
GN NYLON GLASS REINFORCED
D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE

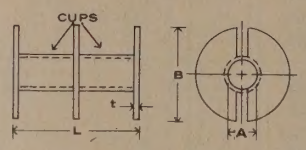
*When two dimensions are given the first is the core thickness and the second is the thickness of the flange.

**Tapered flanges.

***Allow 3 to 4 weeks delivery.

Part Number	HOLE a	HOLE A	FLANGE f	FLANGE F	Length Overall L	Wall Thickness T	Flange Design	Matl.
8-251	.102	.506	.312	.719	.656	.017	PPP-PPP	N
8-437	.110	.240	.290	.420	.800	.018	QQQ-QQQ	GN
8-438	.110	.350	.290	.530	.800	.018	QQQ-QQQ	GN
8-439	.110	.460	.290	.640	.800	.018	QQQ-QQQ	GN
8-440	.110	.680	.290	.860	.800	.018	QQQ-QQQ	GN
8-352	.130	.505	.420	.800	.875	.030	PPP-QQQ	N
8-347	.130	.505	.500	.875	.687	.015/.030	PPP-PPP	N/GN
8-345	.130	.505	.500	.875	1.405	.015/.030	PPP-PPP	N/GN
8-350	.130	.505	.550	.927	.875	.030	PPP-PPP	N
8-349	.130	.505	.650	1.000	.875	.030	PPP-PPP	N
8-472	.130	.260	.230	.360	.770	.014	PPP-PPP	N
8-419	.194	.382	.475	.662	1.062	.025	PPP-PPP	N
8-348	.194	.382	.688	.875	1.062	.025/.030	PPP-PPP	N/GN
8-351	.220	.450	.590	.810	1.437	.025/.030	PPP-PPP	N
8-346	.255	.755	.875	1.375	.687	.025/.040	PPP-PPP	N/GN
8-473	.228	.708	.525	1.000	1.375	.025	QQQ-QQQ	N

CUP CORE - STOCK BOBBINS

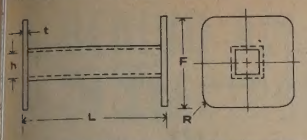


N NYLON
GN NYLON GLASS REINFORCED
D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE

Part Number	Hole Diameter A	Flange Diameter B	Length Overall L	Number of Cups	Wall Thickness t	Matl.	FOR USE WITH
6-278	.160	.290	.137	1	.012	D	
6-276	.194	.350	.168	1	.014	D	
6-277	.194	.350	.168	2	.014	D	
6-101***	.205	.450	.280	1	.015/.020	N	General Ceramics Cup Core F261, F211, F280
6-160	.449	.705	.440	1	.027	Delrin	General Ceramics Cup Core F1027-1 General Ceramics Bobbin B477-1
6-161	.449	.705	.440	2	.020	Delrin	General Ceramics Cup Core F1027-2 General Ceramics Bobbin B477-2
6-162	.449	.705	.440	3	.020	Delrin	General Ceramics Cup Core F1027-3 General Ceramics Bobbin B477-3
6-157	.461	.831	.429	2	.025	Delrin	General Ceramics Cup Core F1148-2 General Ceramics Bobbin B479-2
6-158	.539	.980	.508	2	.035	Delrin	General Ceramics Cup Core F1153-2 General Ceramics Bobbin B480-2
6-159	.649	1.142	.563	2	.035	Delrin	General Ceramics Cup Core F1152-2 General Ceramics Bobbin B481-2
6-159A	.649	1.142	.563	1	.035	Delrin	

Custom Coil Forms molded in Thermoplastic, Thermosets and Fluorocarbons

SQUARE STACK STOCK BOBBINS



N NYLON
GN NYLON GLASS REINFORCED
D DELRIN
NL NYLATRON
P POLYCARBONATE (LEXAN)
PP POLYPROPYLENE
FL FLUOROCARBON

*When two dimensions are given, flanges are rectangular.

*When two dimensions are given the first is the core thickness and the second is the thickness of the flange.

**Tapered flanges.

***Allow 3 to 4 weeks delivery.

Part Number	Hole Square h	Flange Square F*	Length Overall L	Wall Thickness t**	Flange Design	Material	Lamination Number
4-452	.100	.178	.092	.010	I-I	D	
4-110	.104	.270 x .310	.271	.015/.012	A-I	N	EE 30-31
4-110A	.104	.270 x .310	.271	.015/.012	B-I	N	EE 30-31
4-110B	.104	.270 x .310	.271	.015/.012	D-I	N	EE 30-31
4-110C	.104	.270 x .310	.271	.015/.012	I-I	N	EE 30-31
4-223	.104	.270	.150	.012	KK-KK	N/GN	EI 094
4-112	.125	.376	.312	.020	I-I	N/FL	EE 28-29
4-112B	.130	.376	.312	.020	II-II	N	
4-112A	.125	.376	.312	.020	C-C	N or GN	EE 28-29
4-133	.128	.368	.307	.016	I-I	N/FL	EE 28-29
4-261	.131	.375	.220	.020	I-I	N	
4-114***	.133	.273	.300	.018	I-I	N	EE 28-29
4-183***	.145	.428	.268	.025	NN-NN	N	
4-326	.162	.370 x .400	.310	.012	I-I	N	35E
4-423	.164	.365	.305	.012	I-I	N	
4-316	.168	.355	.165	.015	I-YY	N	
4-111	.194	.545	.245	.020	I-I	N/FL	EI 186, F 14
4-111A	.194	.545	.245	.020	D-D	N	EI 186, F 14
4-102D	.200	.535	.425	.025	I-B	N	
4-108***	.200	.535	.675	.020	I-I	N/FL	EE 186-187
4-209***	.200	.575 x .535	.332	.026	NN-NN	N	
4-102	.200	.535	.425	.025	C-C	P/N/GN	E 187
4-102A	.200	.535	.425	.025	I-I	N/GN	EI 187
4-102B	.200	.535	.425	.025	I-JJ	N	EI 187
4-102C	.200	.535	.425	.020	I-I	N	EI 187
4-233***	.200	.535	.425	.035	I-I	N	
4-336	.200	.535	.425	.025	I-BBB	N	
4-359	.204	.557	.552	.020/.025	H-H	N/GN/PP	
4-239***	.220	.640	.340	.030	I-I	N	
4-385	.255	.495	1.220	.026	I-I	N	
4-106	.257	.750 x .656	.480	.020	I-F	N	EE 24-25
4-109***	.257	.665 x 1.000	.492	.022	AA-AA	N	EE 24-25
4-132***	.257	.740	.550	.028	G-H	N	
4-182***	.257	.430	.406	.025	I-I	N	
4-373	.258	.543 x .625	1.120	.026	I-I	N	
4-384	.258	.617	1.486	.020/.028	I-I	N	
4-447	.263	.625	.720	.020	I-I	N	
4-113	.262	.740	.476	.026	H-H	N	EE 24-25
4-113B	.262	.720 x .750	.476	.035	H-H	N	EE 24-25
4-113C	.266	.720 x .750	.476	.035	I-I	N	EE 24-25
4-113D	.266	.720 x .750	.476	.033	J-I	N	EE 24-25
4-113E***	.266	.720 x .750	.475	.035	I-M	N	EE 24-25
4-113F***	.266	.720 x .750	.476	.035	M-M	N	EE 24-25
4-113G	.266	.720 x .750	.476	.026	C-C	N or GN	EE 24-25
4-113H	.266	.720 x .750	.476	.020	H-H	N or GN	EE 24-25
4-234	.266	.745 x .750	.496	.035	Q-Q	N	
4-229***	.270	.750	.585	.025	H-G	N	
4-113A	.275	.720 x .750	.476	.050	N-O	N	EE 24-25
4-293	.281	.625	1.020	.015	I-I	N	"C" Core
4-453	.330	.810	.940	.025/.035	H-H	GN	
4-137***	.380	.860	.682	.030	I-I	N	EE 26-27
4-374	.383	.850	1.188	.030	I-I	N	
4-300***	.385	.860	.682	.030	D-D	N/GN	EE 26-27
4-129	.390	.967	.706	.045	Q-Q	N/FL	EE 26-27
4-243	.390	.968	.755	.037	Q-Q	N	EI 375
4-103C	.390	.975	.735	.030	TT-I	N	EI 375
4-103	.395	.968	.735	.035	I-I	N	EI 375
4-103E	.395	.968	.735	.031	D-D	N	EI 375
4-103G	.395	.968	.735	.032	F-F	N	
4-103H	.395	.968	.735	.032	F-I-F	N	
4-103A	.395	.970	.730	.035	P-P	N/FL	EI 375
4-103B	.395	.970	.730	.030	I-M	N/FL	EI 375
4-103D	.395	.970	.730	.040	R-R	N	EI 375
4-103F	.395	.975	.730	.030	TT-I	N	EI 375
4-103J	.395	.970	.730	.040	I-I-I	N	
4-405	.505	.870	.985	.025	I-I	N	
4-328	.510	1.100	.796	.030/.036	L-L	PP	EI 21
4-107	.510	1.093	.796	.025	I-I	N	EI 21
4-107A	.510	1.100	.796	.040	P-P	N	EI 21
4-107B	.510	1.100	.796	.040	S-S	N	EI 21
4-107C	.510	1.100	.796	.040	GG-GG	N	EI 21
4-107D	.510	1.100	.796	.031	I-PP	N	EI 21
4-189***	.510	1.250	.810	.050/.060	I-I	N	
4-152	.640	1.218	.918	.038	L-L	N/GN	EI 625
4-152A	.640	1.218	.918	.038	I-I	N/GN	EI 625
4-324	.697	1.344	1.000	.031	I-I	N/GN	EI 68
4-196	.758	1.480	1.115	.035	I-I	N	EI 75
4-259	.880	1.740	1.270	.040	I-I	N	EI 11
4-476	1.016	1.969	1.484	.042	I-I	GN	EI 100

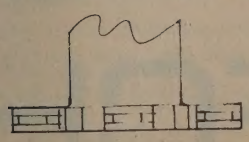
TRANSFORMER STOCK BOBBINS SQUARE STACKS WITH STAKED LUGS

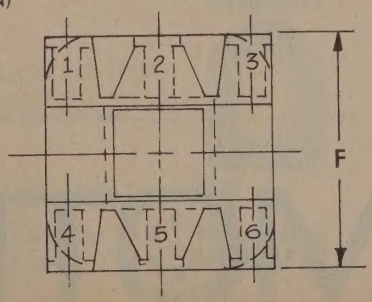
Part Number	Hole Square h	Flange Square F	Length Overall L	Height H	Material	Lamination Number
5-511	.266	.875	.476	.569	N	EE 24-25 1/4" Stack
5-502	.390	1.000/ .980	.734	.795	N	EI 375 3/8" Stack
5-503	.510	1.100/1.125	.796	.860	N	EI 21 1/2" Stack
5-508	.510/.635	1.100/1.125	.792	.858	N	EI 21 5/8" Stack
5-509	.635	1.235/1.250	.921	.983	N	EI 625 5/8" Stack

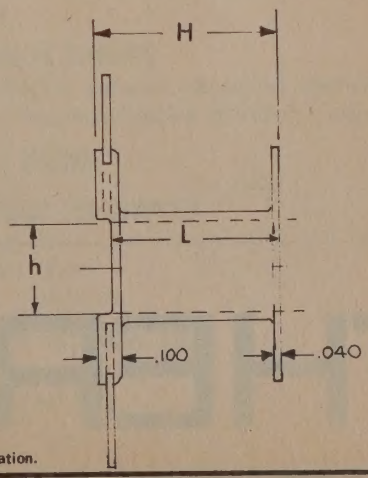
N NYLON

WHEN ORDERING STATE

1. BOBBIN PART NUMBER
2. LUG PART NUMBER
3. NUMBER OF LUGS REQUIRED
4. POSITION OF LUGS BY STATION (SEE DRAWING OF BOBBIN)

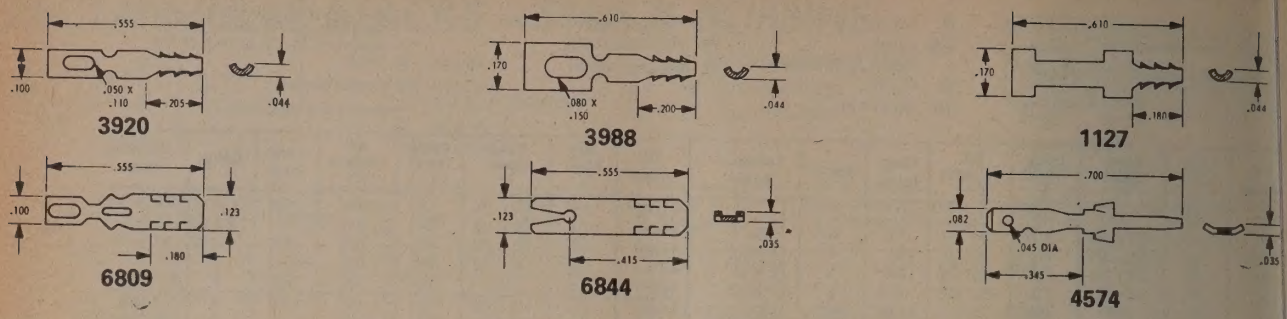






Send prints or samples for prompt, competitive price or quotation.

TERMINAL LUGS FOR STAKED BOBBINS



1. Material brass pre-solder coat
2. Lugs will withstand 6 lb. pull test

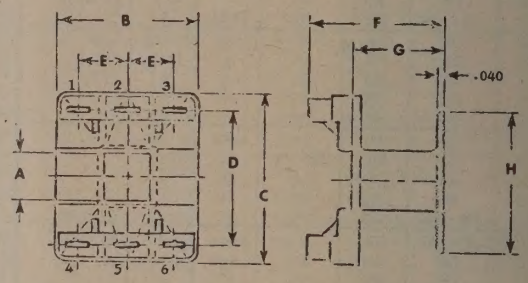
TRANSFORMER BOBBIN FOR PRINTED CIRCUIT

Part Number	A	B	C	D	E	F	G	H	Lamination Number	Available With Lug
7-700	.260 Sq.	.725	.875	.720	.250	.691	.476	.725/.750	EE 2425 1/4" Stack	4574
7-701	.390 Sq.	.975	1.125	1.000	.312	.938	.735	.975 Sq.	EI 375 3/8" Stack	4574

MATERIAL – NYLON

WHEN ORDERING STATE

1. BOBBIN PART NUMBER
2. LUG PART NUMBER
3. NUMBER OF LUGS REQUIRED
4. POSITION OF LUGS BY STATION (SEE DRAWING OF BOBBIN)

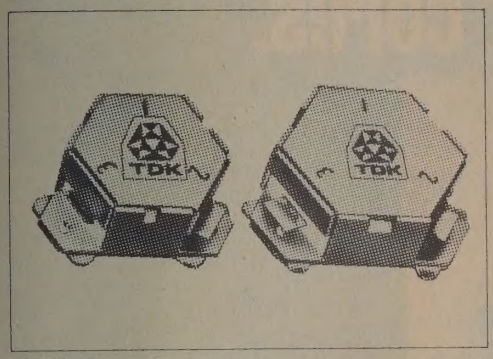


Custom Coil Forms molded in Thermoplastic, Thermosets and Fluorocarbons.

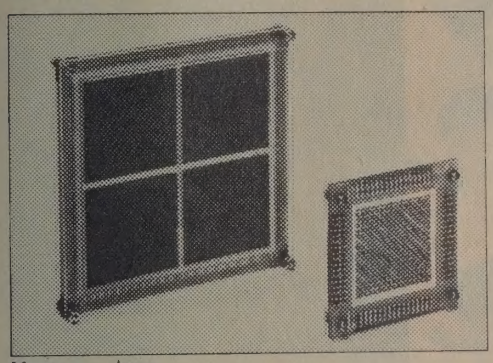
For More Information Contact Your Local Thermotech Representative:

THERMOTECH

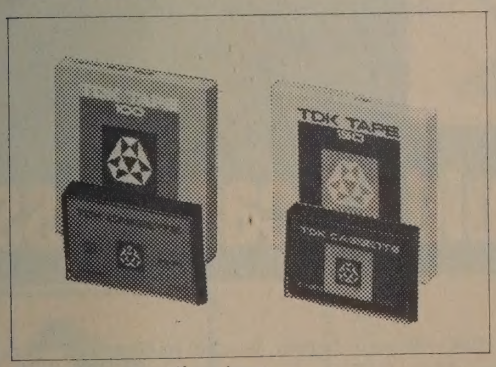
BEHIND ALL PROGRESS IN ELECTRONICS, THERE IS MATERIAL REVOLUTION



Hexalator



Memory plane



Magnetic recording tape

TDK PRODUCTS

FERRITE FOR CONSUMER PRODUCTS

Yoke core
FBT core
Convergence core
EI core
Antenna core
Balun core
Bobbin core
Cup core
Inductor core
Insert core
Insert core for car radio
Threaded core
Impeder for welding
Radio absober

COMMUNICATIONS FERRITES

Bonded glass head core
High density ferrite core
Pulse transformer core
Hexalator
YIG single crystal
R core
Q core
EP core
Pot core
EE core
Microwave material
Circulator
Isolator

CERAMIC CAPACITORS

Temperature compensating disc type
High dielectric disc type
Miniature tubular type
Feed thru type
Cylinder trimmer
High voltage use
MIL type
Ceramic substrates for IC's
Chip type semiconductive

COIL COMPONENTS

Super-micro inductor
Epoxy casted choke coil
Ferrite shielded choke coil
Transfer molded choke coil
Pincushion correction transformer
Horizontal linearity coil
Delay line
Noise filter for computer application
Module

TRANSDUCER ELEMENTS

Piezoelectric ceramic transducer element
Ferrite magnetostrictive transducer element

FERRITE MAGNET

COMPONENT FOR COMPUTER

Memory core
Memory plane
Pulse transformer

MAGNETIC RECORDING TAPES

Cassette tape
Reel-to-reel tape

TDK ELECTRONICS CO.,LTD.
2-14-6 Uchikanda, Chiyoda-ku, Tokyo, Japan.
TDK ELECTRONICS CORP.

*For detailed information, write to:

23-73 48th Street, Long Island City, New York 11103
Phone: (212) 721-6881

- **LOS ANGELES Branch,** 931 Douglas Street, El Segundo, California 90245 Phone: (213) 644-8625
- **CHICAGO Branch,** 2906 West Peterson Avenue, Chicago, Illinois 60645 Phone: (312) 973-1222

Tokin is either the world's first or second largest maker of ferromagnetic pot cores.

Tokin couldn't care less.

It's not making more pot cores than anybody that's important to us—it is making them **better** than anybody else that matters.

This is the way we feel about each of our products, from metal magnetic and ferrite cores right on up to memory systems. You could say that the history of magnetic material manufacture in Japan is the history of Tokin—a good reason to want to keep our reputation as Japan's largest and most advanced magnetic material manufacturer.

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Tohoku Metal Industries, Ltd. **Tokin**

Koei Bldg. 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan
Telephone: Tokyo 542-6171 Cable Address: TOHOKUMETAL TOKYO

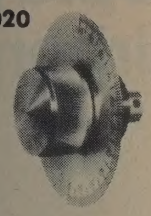
Main Products: Ferrite Cores, Memory Cores, Memory Matrices, Ferrite Magnetostrictive Vibrators, Pulse Transformers, Permanent Magnets (Cast, Ferrite), Tape Wound Cores, Bobbin Cores, Magnetic Laminations, Fe-Co Alloys, Sendust Cores

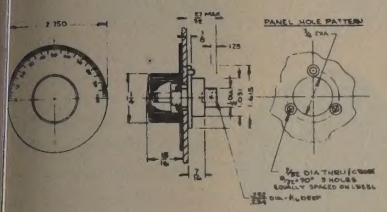
PLANETARY DRIVES

5:1 7:1 10:1 15:1 RATIO (OTHERS AVAILABLE)

VEMALINE

MODEL 4020





HOW TO ORDER

4020-□-□ SERIES 5:1 RATIO
4025-□-□ SERIES 15:1 RATIO
4035-□-□ SERIES 10:1 RATIO

EXAMPLE

4020-1-□ With standard knob & dial.
4020-2- No knob or dial.
4020-3- With standard fast adjusting knob (5:1 only).
4020-4-□ With dial, but not knob.

Note: For Fast Slewing Feature Prefix Part No. with "FS" or "FL"

DIALS

Add to above part numbers the suffix desired for scale. Dials available 1-1/4", 2-3/4" or 4".

A – Blank
B – Calibrated CCW 0–100, –180°
C – Calibrated CW 0–100, –180°
D – Calibrated CCW 0–360, –360°
E – Calibrated CW 0–360, –360°
F – Calibrated CCW 0–100, –360°
G – Calibrated CW 0–100, –360°

NOTE: CCW indicates counter clock wise reading on dial. Dial rotates same direction as knob.

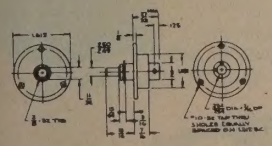
4020 - 1 - B - 1-3/4"

EXAMPLE:

10:1 Std. Knob CCW 0-100 -180° Dial Size

MEETS ALL APPLICABLE MILITARY SPECIFICATIONS

EXAMPLE:
MODEL 4020
WITH DIAL LOCK 4037
& SYNCHRO ATTACHMENT

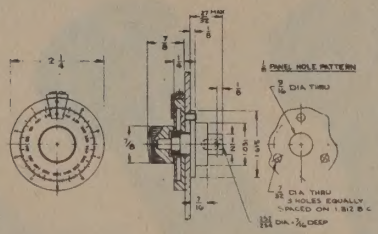


DIAL POINTERS AND DIAL LOCKS AVAILABLE

MODEL 5020

ULTRA SMOOTH PRECISION BALL DRIVEN PLANETARY DIAL

5020 WITH FAST SLEWING KNOB



FOR INDICATOR OR ROTARY COMPONENTS, TUNING COILS, POTENTIOMETERS, RESOLVERS, SYNCHROS, etc

- ZERO BACKLASH—(DIAL TO OUTPUT SHAFT.
- INITIAL OUTPUT TORQUE 15 IN. OZ. HIGHER TORQUES AVAILABLE.
- AVAILABLE FOR SYNCHRO, OR OTHER SERVO COMPONENTS.
- CAN BE CUSTOM MODIFIED.
- SMOOTH AND ACCURATE DRIVE ACTION.
- CORROSION RESISTANT.
- FOR MILITARY AND COMMERCIAL ELECTRONIC EQUIPMENT.
- HOUSING MADE OF ANODIZED ALUMINUM.
- STAINLESS STEEL SHAFT.
- VARIOUS STOCK DIALS AVAILABLE. AVAILABLE WITH STOPS & DIAL LOCKS.

5020-□-□ SERIES 5:1 RATIO
5025-□-□ SERIES 15:1 RATIO
5035-□-□ SERIES 10:1 RATIO

Comes only with knob & 1-3/4" Dia. Dial (A-G)
Note: Fast Approach feature in Knob Prefix Part No. F

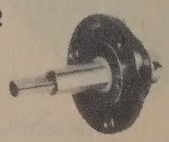
FL4020-□

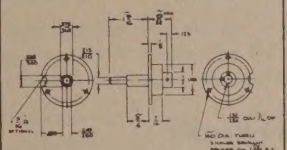
FAST APPROACH SLEWING DIAL AVAILABLE

Contact us for additional information and availability.

MANY OTHER PLANETARY DRIVES AVAILABLE. WRITE FOR CATALOG.

4042

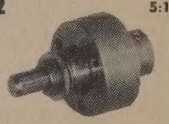


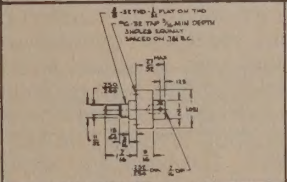


For closed circuit TV lens adjustment, Potentiometer & Coil fine tuning. Output torque from 15 IN. OZ. to 60 IN. OZ. Standard ratio 5:1 (available 10:1, 15:1 on request).

TAKES STANDARD KNOB SERIES 3027 and 1073.

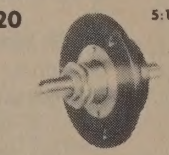
4032 5:1

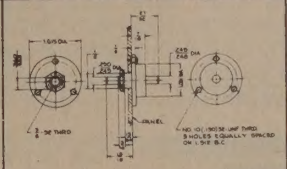




Only 1" Dia. Housing for use in confined areas. Standard ratio 5:1 (available 10:1, 15:1 on order.) Also available with 1/4" (Part #4033) male output shaft instead of standard female collar.

S4020 5:1

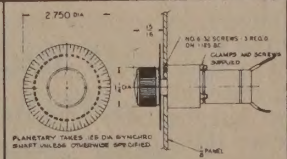




Similar to 4020 except with 1/4" male output shaft instead of standard female collar.

Standard ratio 5:1 (available 10:1, 15:1 on request).

4520 5:1



Similar to 4020 except for synchro mounting, comes complete with mounting clamps.

HOW TO ORDER

45□□-8-□-□-□
45□□-10-□-□-□
45□□-11-□-□-□

See ordering info. for 4020 for ratio desired. synchro avail Knob Dial Mark Dial Size

DIAL & KNOB ASSEMBLY ONLY AVAILABLE.

3027-□-1 2-3/4" Dia. Dial
3027-□-2 1-3/4" Dia. Dial
3027-□-3 4" Dia. Dial

□= USE DIAL A-G AS DESIRED

VEMALINE PRODUCTS COMPANY

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200 / (201) TWX 337-4500

DACO Self-Reactivating Desiccators [Dehumidifiers] for head-up displays, navigational systems and other airborne optical equipment.

Provide clean, moisture-free air

Moisture condensing as a result of changes in temperature and air pressure during flight causes optical instruments to fog and electrical connections to short. DACO Desiccators trap moisture and thoroughly dry the air before it enters the instrument. A special drying cell reduces the moisture content of saturated air to such a small amount that the dew point falls as low as –70°F. Condensation within the instrument is prevented even under such extreme conditions as those in the Arctic regions or at 80,000 feet altitude. In addition, DACO Desiccators prevent dust from entering the system, blocking solid particles as small as 10 microns.

Automatic desiccant regeneration for long continuous service

DACO Desiccators continue to remove moisture from the air, without replacement of the desiccant, long after the desiccant in static desiccators would become saturated and have to be replaced. The exclusive DACO design automatically purges and regenerates the desiccant during flight, making it possible to use these desiccators for several years without servicing.

Reliable, verified performance

DACO Self-Reactivating Desiccators are among the most reliable components on an aircraft. An entirely new departure from previous types of desiccators, they have been designed specifically for use with airborne instrumentation, and are produced under careful control in facilities designed especially for this purpose. The performance of every DACO Desiccator under its specified application conditions is verified by testing before shipment.

Small Size

Designed to fit into tight locations, DACO Desiccators have a maximum diameter of 1.47 inches (exclusive of the mounting flange). Their length ranges from 4 to 7.63 inches, depending upon the air handling capacity.

Wide choice of models

Models are supplied to condition 0.05 to 1.5 cubic feet of air (net cavity volume). Each model is available as a 115-volt AC/DC or a 28-volt AC/DC unit. A variety of mounting flanges and a choice of standard port or port for use with air hose, are also provided.

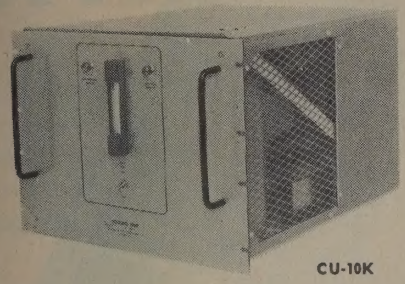
For additional details, model specifications, dimension drawings and ordering information, ask for DACO Bulletin 500.

DACO Instrument Company, Inc.
Merritt Boulevard, Trumbull, Connecticut 06611 (U.S.A.)
Telephone: (203) 375-5871 TWX: 710-453-1095 Cable: DACOINST TRUMBULL, CONN.

DACO™

COOLING UNITS
HEAT EXCHANGE - REFRIGERATING

Electro IMPULSE, INC.



CU-10K

CU SERIES

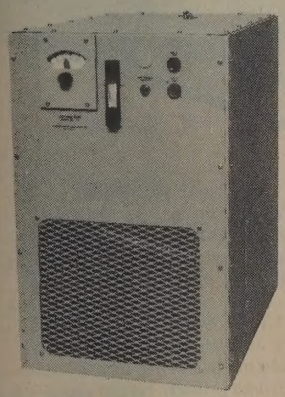
at exchange cooling units are useful whenever it is de- able to prevent runaway heat conditions. Heat is absorbed a circulating coolant liquid, then exhausted into the am- ent by forced air passing through a radiator.

se this series when coolant temperatures can be allowed to se above ambient.

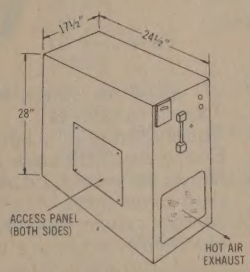
Model	Capacity Watts	Coolant Flow GPM (0-Back Pressure)	Input Power Frequency	Amps	Suitable Liquids*	Back Pressure P.S.I.
CU-500	500	.3	110v - 60 Hz 24v - DC	6	O	15
CU-1500	1500	.5	24v - DC		O	40
CU-2500	2500	1	110v - 60 Hz	6	ETH	50
CU-5000	5000	2	110v - 60 Hz	10		50
CU-5000S	5000	2	110v - 400 Hz			60
CU-10K	10000	2	110v - 60 Hz	11	—	50
CU-10K-S	10000	2	110v - 400 Hz		W	60
CU-20K	20000	4	110v - 60 Hz	12		60
CU-50K	50000	10	220v - 60 Hz	12	—	20
CU-100K	100000	20	220v - 60 Hz	15	O	20

*Suitable Liquids: Water — W. Oil — O. Ethylene Glycol with inhibitors — ETH.
Optional Equipment Available: Flow Switch, Thermometers, Thermostat, Flowmeter, Heater and Water De-ionizer.

RU SERIES



RU-75



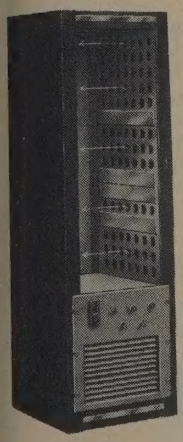
Models from this series are required when coolant temperatures must be below ambient. Using refrigeration, they can provide temperatures to 0 degrees C and below, while removing up to 6800 watts of heat.

These units are ideal for remote applications. Coolant temperatures are low, flow rate is steady, and the final heat sink can be in a location which will not cause overloading of air-conditioning equipment.

Special options can provide temperature control of ±1 degree C, while combinations of refrigeration and heating can hold temperatures at any point above ambient.

Model	Capacity Watts	Coolant Flow GPM (O-Back Pressure)	Max. Back Pressure P.S.I.	Operating Power 60 cps	HP
RU-12.5	212.5	1	60	115	.5
RU-25	425	1	60	115	.5
RU-50	850	1	60	115	.7
RU-75	1,275	1	60	115	1
RU-100	1,700	2	60	115	1
RU-200	3,400	2	60	220	1.3

Optional Equipment Available: Thermometer, Thermostat, Flow Meter, Heater.
In chart above, change model designation to RC for Rack Cooler specifications, and to RUH for Refrigeration-Heating Combination shown at left.

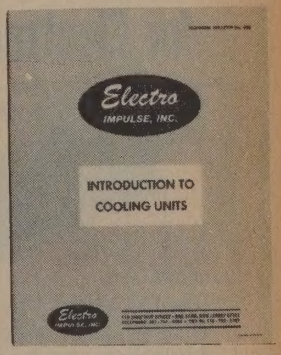


RACK COOLER

This series is designed for air, rather than liquid cooling. A sealed volume of air is cooled by a refrigeration system and continually re-circulated within the enclosure. Cool sensitive rack-mounted electronic equipment, or use duct work and manifolds for extensive cooling of radar or other electronic control consoles and cabinets.

For specifications, see chart above and merely substitute "RC" for "RU" in the Model column.

REQUEST FREE APPLICATION BULLETIN #696: "INTRODUCTION TO COOLING UNITS"

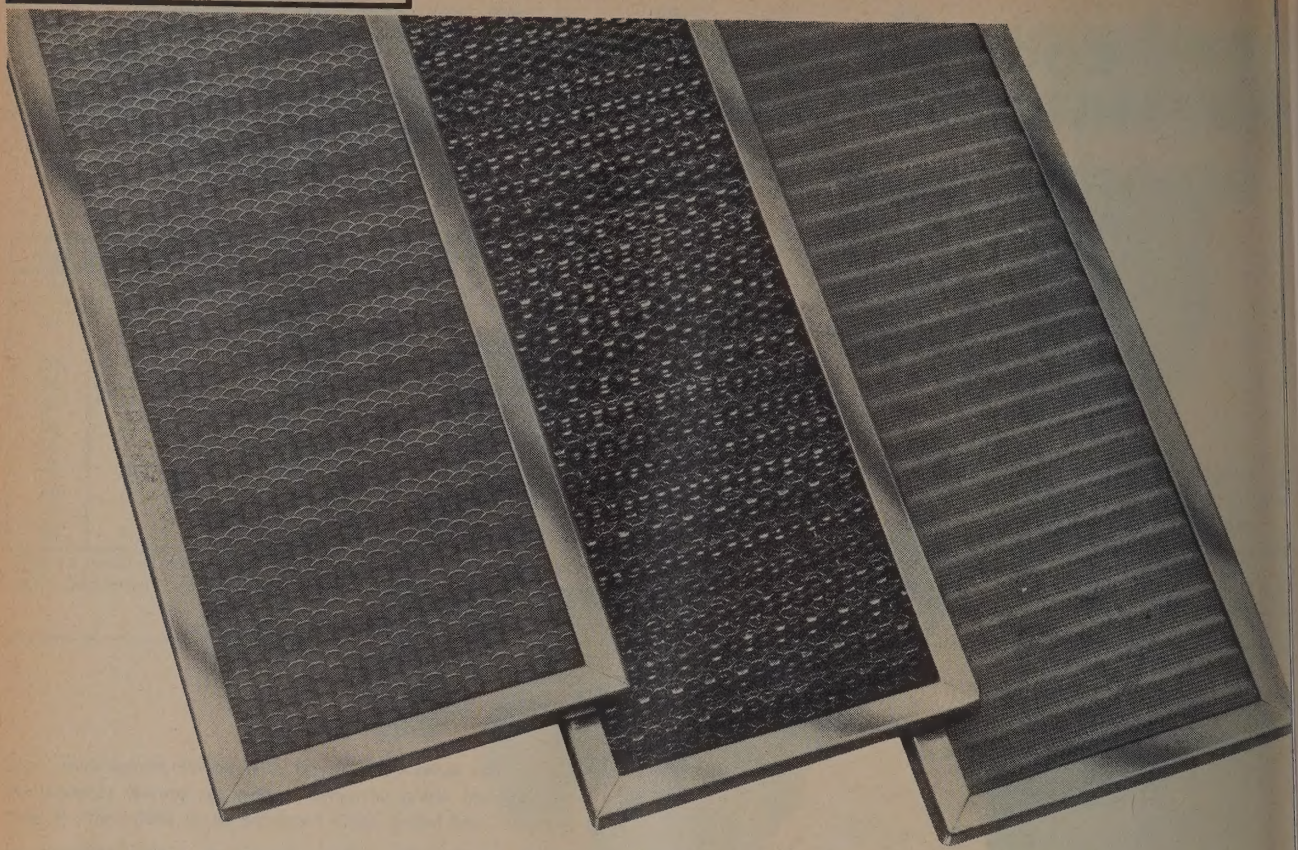


SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Electro IMPULSE, INC.

116 CHESTNUT STREET • RED BANK, NEW JERSEY 07701
TELEPHONE: 201 - 741-0404 • TWX No. 710-722-5767

SEE OUR OTHER PRODUCTS ON PAGES 667, 872, 873.

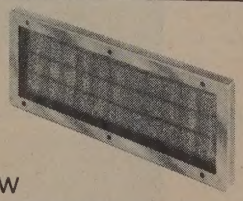


EVANS air filters

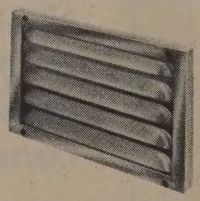
for Electronic Cabinet Application

. . . used on Computers . . . Card Readers . . . Tape Transports . . . Transceivers . . . Power Supply Units . . . both large and small cabinetry. Evans Air filters are permanent. Rigid. Aluminum. Made to withstand the brutal abuse of military field conditions. Frames have mitered corners for smooth, close tolerance fit. Die cut, expanded aluminum grids are criss crossed and precision fitted into each filter. Patented Brillo Lock design gives more air delivery with positive cleaning results.

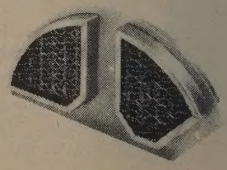
Tolerance:	± 1/32″
Velocity:	200 to 900 FPM
Efficiency:	75% AFI Test
Finishes:	Available in chemical film finish to meet requirements of MIL-C-5541 . . . MIL-F-14072 . . . MIL-A-8625
Sizes:	Filter of 1/2″ or 3/4″ dimension. Made to a maximum area 400 sq. inches . . . with maximum length 25″ on one side without special bracing. For complete information write or call.



LOW RESISTANCE FILTER
Special serts permit fastening solidly to blower unit. Made for air drop equipment.



LOUVERED FILTERS
For outside application. Louvers protect filter media from water, ice, snow.



HEAVY DUTY UNIT
For rugged military use. Extra rigid frame made from .063 aluminum.

The George Evans Corporation 121-37th Street, Moline, Illinois 61265
Phone 309/762-9456

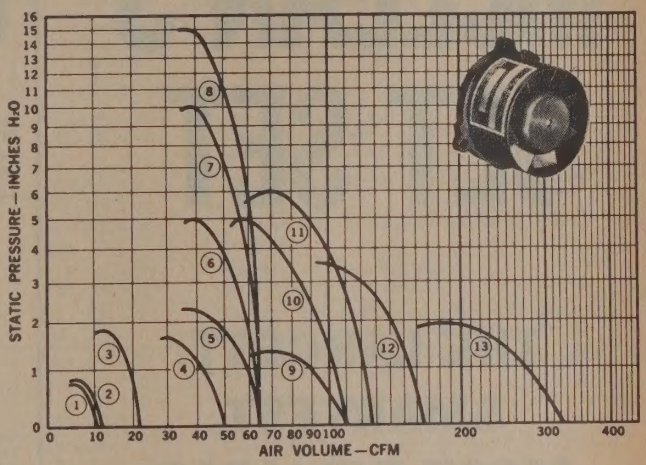
TRW BLOWER & FAN SELECTOR

Globe Industries offers a wide range of A.C. and D.C. fans and blowers for every cooling need. Many standard models are stocked for 24-hour delivery. And because Globe is the largest precision motor source, we can move fast to provide engineered specials in prototype or production quantities. Check your needs below. Hundreds of other units available. Request Catalog BBL.

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

A.C. AND D.C. VANEAXIAL BLOWERS

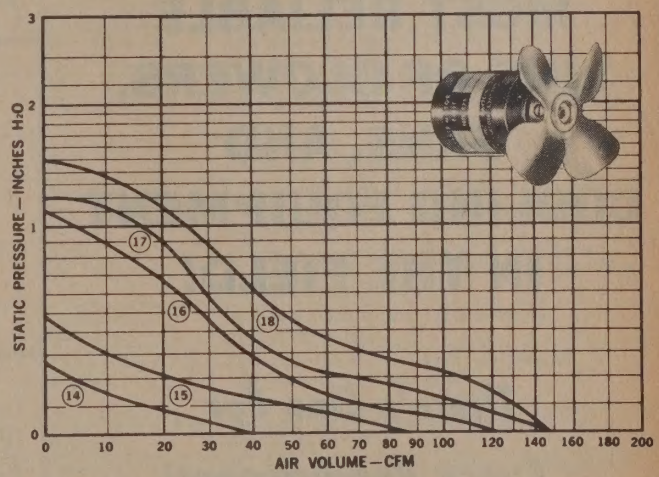
Curve No.	Type	Dia.	Weight	Power Source	Part No.
1	VAX-1-DC	1⅛"	1.4 oz.	26 v.d.c.	19A1040
2	VAX-1-AC	1⅛"	1.5 oz.	26 v.a.c., 400 cps. 1-phase	19A1173
3	VAX-1.5 AC	1¾"	4.2 oz.	115 v.a.c., 400 cps	19A1233
4	VAX-2-MM	2"	5 oz.	26 v.d.c.	19A907
5	VAX-2-MC	2"	5 oz.	200 v.a.c., 400 cps 3-phase	19A774
6	STAX-3-FC	3", 1 stage	48 oz.	200 v.a.c., 400 cps 3-phase	19A920
7	STAX-3-FC	3", 2 stage	28.6 oz.	200 v.a.c., 400 cps 3-phase	19A921
8	STAX-3-FC	3", 3 stage	29 oz.	200 v.a.c., 400 cps 3-phase	19A922
9	VAX-3-BD	3"	16 oz.	28 v.d.c.	19A827
	VAX-3-GN	3"	16 oz.	115 v.d.c., or 115 v.a.c., 60 cps. 1-phase	19A908
10	VAX-4-FC	4"	2 lbs.	200 v.a.c., 400 cps 3-phase	19A1348
11	VAX-4.5-LC	4 11/16"	5½ lbs.	200 v.a.c., 400 cps 3-phase	19A1350
12	VAX-3-FC	3"	14 oz.	115 v.a.c., 400 cps 3-phase	19A798
13	VAX-4.5-GR	4¾"	4½ lbs.	115 v.d.c., or 115 v.a.c., 60 cps 1-phase	19A832



A.C. AND D.C. FANS

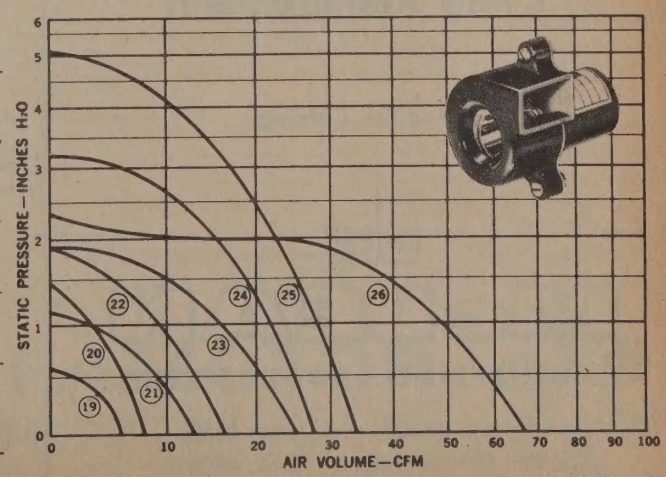
Air volume varies with direction of air flow and type of enclosure.

Curve No.	Type	Dia.	Power Source	Part No.
14	FC	3" fan	115 v.a.c., 60 cps 1-phase	19A643
15	MC	4" fan	115 v.a.c., 60 cps 1-phase	19A552
15	FC	4" fan	115 v.a.c., 60 cps 1-phase	19A644
16	FC	4½" fan	115 v.a.c., 60 cps 1-phase	19A645
17	FC	5½" fan	115 v.a.c., 60 cps 1-phase	19A647
18	FC	5" fan	115 v.a.c., 60 cps 1-phase	19A646



A.C. AND D.C. CENTRIFUGAL BLOWERS

Curve No.	Type	Dia.	Power Source	Part No.
19	SS	1" blower	27 v.d.c.	19A566
20	SC	1" blower	115 v.a.c., 400 cps 1-phase	19A565
21	MM	1½" blower	27 v.d.c.	9A589
22	MC	2" blower	115 v.a.c., 400 cps 1-phase	19A518
23	LL	2" blower	27 v.d.c.	3A851
24	MC	2½" blower	115 v.a.c., 400 cps 1-phase	19A532
25	FC	2" blower	115 v.a.c., 400 cps 3-phase	19A725
26	YC	1½" blower	115 v.a.c., 60 cps 1-phase	19A1185



McLEAN'S JET SET

THE LARGEST, SMARTEST, MOST RELIABLE LINE OF BLOWERS, FANS, AND COOLING EQUIPMENT IN THE FIELD!

There's One For Every Requirement!

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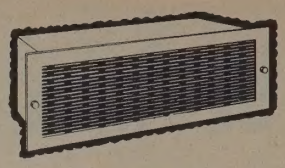
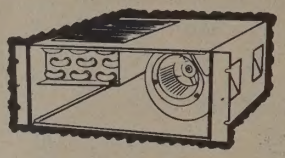


PACKAGED RACK BLOWER

Pressurizes and cools. Removes air pollution. Over 100 models, up to 1000 CFM. Commercial. Mil-Spec. EMI Shielded.

PACKAGED FAN (REVERSIBLE)

Low cost. Minimum space. Shallow depth. Pressurizes or exhausts. Four models, to 1200 CFM. Commercial. Mil-Spec. EMI Shielded.

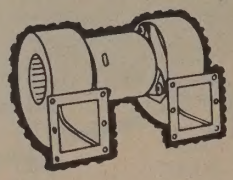


HEAT EXCHANGER

Maintains cabinet at 80°F max. with 1 KW heat dissipation. Air recirculates in rack and is cooled by exchanger in blower case.

HEATER-COOLER

For field installations, unheated military huts, unattended control stations. Maintains even 65°F with surrounding air as low as 10°F.

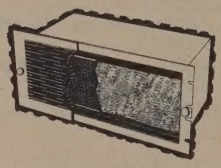


CENTRIFUGAL BLOWER

Single or dual. For spot cooling or pressurizing. 10 to 1000 CFM. Exhaust in any position. Commercial and Mil-Spec.

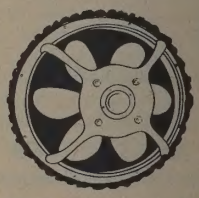
VENTURI-MOUNTED FAN

Rugged economy. 420 CFM, push or pull. Mounts top, bottom, or side. No vibration. Quiet. Commercial or Mil-Spec.



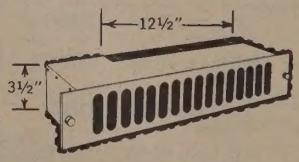
EMI SHIELDED UNITS

Cuts signal leakage either inward or outward in the airstream. Certified to MIL-I-6181D.



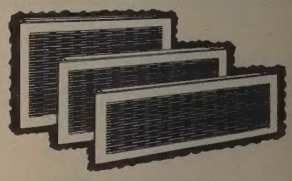
ORIFICE FAN — PANEL FAN

Extra-low-cost cooling. Up to 550 CFM. Strong, quiet, vibration-free. Easy to install. Life lubrication.



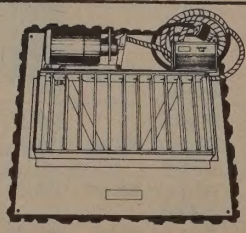
SLOT BLOWER

Ideal for densely packed circuitry. Fits 3½" panel slot. Forces narrow air slot (12½" wide) into cabinet. 150 CFM. Quiet.



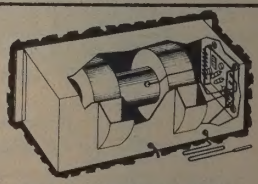
FILTER-GRILLE PANEL

Self-contained. Easy to install. Provide more exhaust louver area for improved air discharge. Washable filter. Standard or custom sizes.



TEMPERATURE CONTROLLED LOUVER

Solid-state! Fail-safe! Modulates cool air flow between 55-85°F. Automatic!



SOLID-STATE TEMPERATURE CONTROLLER

Cuts audible noise level. Modulates blower speed! Keeps equipment operating between 80-90°F. More reliable than air conditioning—but costs less.

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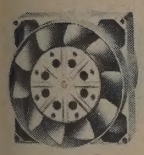
DISTINCTLY SUPERIOR FANS & BLOWERS

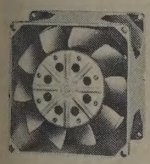
• ALL-METAL CONSTRUCTION • FAR GREATER RELIABILITY
• LOWER NOISE • IMPROVED SHAPE FACTOR • REDUCED ELECTROMAGNETIC FIELD
• LOWER OPERATING TEMPERATURE • LOWEST COST

NEW-PENTAFLOW SERIES WITH 5-YEAR WARRANTIES

(silicone-based lubricant for longer life)

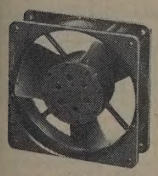
SELECT THE OPTIMUM FAN FOR YOUR APPLICATION


Series 1000A


Series 2000

Series 4500

Series 4700


Series 4800

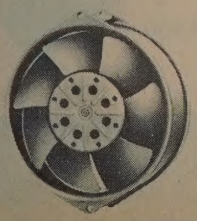
Series 8500

Series 3000

	Series	CFM*	SIL**	Dimensions (inches) Weight	Notes
INDUCTION-MOTOR TYPES	1000A 1300	125	43 dB	4½ x 4½ x 2 2 lb., 10 oz.	For laboratory and office machines, communications and industrial control equipment, sound systems.
	1110	110	50 dB	4½ x 4½ x 2 2 lb., 8 oz.	400 Hz axial design for airborne equipment.
	2000/2050	130	42 dB	4½ x 4½ x 2 2 lb., 1 oz.	Highest free air delivery available in 4½" package.
	2110	135	50 dB	4½ x 4½ x 2 2 lb., 1 oz.	400 Hz, ball bearing design — 20,000 hours operation.
	3000/3050	65	Adjustable	3½ x 3½ x 2 1 lb., 2 oz.	Double the air flow of other 3½" fans. Noise level varies with adjustable speed.
SHADED-POLE-MOTOR TYPES	1500/1550	105	39.6 dB	4½ x 4½ x 2 1 lb., 10 oz.	General purpose fan. High performance, low noise, low cost.
	2500/2550	115	43 dB	4½ x 4½ x 2 2 lb., 1 oz.	High volume delivery. Low cost. Broad range of applications.
	4500/4550 4500 P ‡(5 yr. warranty)	115	37.5 dB	4½ x 4½ x 1½ 1 lb., 4 oz.	Low cost, low noise, high volume air flow.
	4506/4566	115	37.5 dB	4½ x 4½ x 1½ 1 lb., 4 oz.	Ball bearing design — 20,000 hours operation at 85°C.
	4600 4600 P ‡(5 yr. warranty)	130	37 dB	4½ x 4½ x 1½ 1 lb., 4 oz.	Ball-thrust bearing design handles 30% higher back pressure than conventional 4½" designs.
	4700/4750	65	37 dB	4 1/8 diam. x 1½ 1 lb.	Saves space and weight where venturi housing is not required.
	4800	70	18 dB	4½ x 4½ x 1½ 1 lb., 4 oz.	Low speed. Virtually noiseless. Ideal for Hi/Fi, Stereo, TV, medical, and office equipment.
	7500/7550	250	40.6 dB	6 diam. x 2 2 lb., 7 oz.	For large enclosures with high resistance to air flow. Replaces 2 smaller fans or one 7" or 10" conventional design†.
	7506/7556	250	40.6 dB	6 diam. x 2 2 lb., 7 oz.	Ball bearing versions. 20,000 hours operation at 85°C.
	8500/8550 8500 P ‡(5 yr. warranty)	43	28.8 dB	3 1/8 x 3 1/8 x 1½ 18½ oz.	Ultra-compact, 3 times the air flow of nearest competitive designs.
	8506/8556	43	28.8 dB	3 1/8 x 3 1/8 x 1½ 18½ oz.	Ball bearing versions. 20,000 hours operation at 85°C.
	8700	35	22 dB	3 diam. x 1½ 13 oz.	For use where venturi housing not required. Mounts on 4" bracket.
ACCESSORIES	5501	Cadmium-plated steel mounting brackets for Series 5503.			
	5502	Multi-layer, oil treated metal filter			(May be used together or separately.)
	5503	Metal screen in die-cast metal frame			
	5504/6/7/8	Metal and plastic finger guards; various sizes			
	5505	Plug and 24" cord			
	5509	Air Straightener			
	5510	Oiler Kit			
	5511	Adapter Flange			

*CFM, Cubic Feet per Minute ** SIL, "Speech Interference Level" ‡ "P" models only

†Series 7500 will deliver 200 CFM at 0.2" water back-pressure. Flanges available for replacing conventional 7" or 10" conventional designs with these superior fans.


Series 7500

PAMOTOR

ONE OF THE **PURDY** GROUP OF COMPANIES
770 AIRPORT BLVD., BURLINGAME, CALIFORNIA 94010
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ROTATING COMPONENTS
Division of INSTRUMENT SYSTEMS CORPORATION
1560 FIFTH AVE., BAY SHORE, N. Y. 11706
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BLOWERS

FEATURES: • 50-60 or 400 Hz • Variable or Dual frequency • 1 or 3 phase • BRUSHLESS DC • up to 440 Volts AC • Superior performance • greater efficiency • Rugged construction • Permanently lubricated for long life • Dynamically balanced • Quality controlled per MIL-Q-9858 • Meet or exceed MIL & UL specifications • Ambient temperature range: -55 degrees C to +125 degrees C and up • High Altitude • Versatile mounting and adaptors • Operate in any position • Compact •

TYPE F400

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B400-1	50/60	1	115	1.0	0.22	25	3200	49	4.53	6.45	6.04
B400-2	50/60	1	115	1.0	0.5	50	3150	88	6.40		
B400-3	50/60	3	200	--	0.2	64	3300	125	7.00		
B400-4	400	1	115	1.0	0.95	85	3600	100	6.28		
B400-5	400	3	208	--	0.8	110	5450	93	5.40		
B400-6	400	3	208	--	1.5	260	5650	265	7.59		
DOUBLE BLOWER											
B400-7	50/60	1	115	4.0	0.50	55	3400	115	8.00		
B400-8	50/60	3	208	--	0.45	120	3400	280	12.56		
INVERTED											
B400-9	50/60	1	115	1.0	0.38	40	3300	75	4.47		
B400-10	50/60	3	208	--	0.28	35	3300	75	4.47	6.45	6.04

INVERTED TYPE B600 (NOT SHOWN)

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B600-1	60	1	115	2.5	2.0	210	3000	200	6.31	9.70	8.66
B600-2	60	1	208	2.5	1.1	210	3000	200	6.31		
B600-3	60	3	208	--	0.9	300	3000	300	6.31		
B600-4	60	3	200	--	0.22	56	1600	175	4.75	9.70	8.66

TYPE B3500 (NOT SHOWN)

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B3500-1	50/60	1	115	1.0	0.45	50	3300	85	5.19	6.85	6.26
B3500-2	50/60	1	115	2.5	0.69	72	3300	248	7.91		
B3500-3	50/60	1	208	2.0	0.75	90	3200	175	6.13		
B3500-4	50/60	3	208	--	0.26	75	3300	180	6.13		
B3500-5	400	1	115	4.0	1.4	140	5300	140	5.57		
B3500-6	400	1	115	1.0	1.5	120	3500	185	6.63		
B3500-7	400	1	115	1.0	1.5	120	3500	240	7.91		
B3500-8	400	3	208	--	0.85	100	3750	100	5.06		
B3500-9	400	3	208	--	1.25	160	3750	255	7.91	6.85	6.26

TYPE B500 (NOT SHOWN)

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B500-1	50/50	1	115	4.0	1.0	120	3200	160	6.65	7.78	7.22
B500-2	50/60	1	115	2.5	2.0	220	3100	255	9.16		
B500-3	50/60	1	208	4.0	0.6	125	3200	160	6.65		
B500-4	50/60	1	208	2.5	1.2	220	3250	155	9.16		
B500-5	50/60	3	208	--	0.8	110	3250	160	6.65		
B500-6	50/60	3	208	--	1.2	190	3250	265	9.16		
B500-7	400	3	208	--	1.25	220	3600	180	6.65		
INVERTED											
B500-8	50/60	1	115/ 230	4.0	1.0	110	3200	155	5.17		
B500-9	50/60	1	115	2.0	0.30	30	1700	77	4.94		
B500-10	50/60	3	208	--	0.6	95	3300	152	5.17		
B500-11	400	3	208	--	2.4	190	3700	174	5.17	7.78	7.22

TYPE B2500

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B2500-1	50/60	1	115	1.0	0.11	10	3400	23	3.32	3.72	4.19
B2500-2	50/60	1	115	1.0	0.12	11	3300	23	4.08		
B2500-3	50/60	3	208	--	0.06	12	3400	21	3.44		
B2500-4	400	1	115	0.5	0.45	46	7500	50	3.94		
B2500-5	400	1	115	0.05	0.3	30	5000	33	4.08		
B2500-6	400	3	208	--	0.20	38	7500	50	3.94		
B2500-7	320 1000	1	115	1.25	0.8	80	7200	45 min.	4.29	3.72	4.19

TYPE B4500

ELECTRICAL								AIR	DIMENSIONS		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	W	H
B4500-1	50/60	1	115	2.5	1.8	200	3200	290	7.97	8.72	7.81
B4500-2	50/60	3	208	--	1.3	215	3200	340	8.53		
B4500-3	50/60	3	115	--	1.5	260	3100	390	9.03		
B4500-4	50/60	3	115	--	1.8	310	2950	455	9.72		
B4500-5	50/60	1	115	2.0	0.35	35	1650	150	6.41		
B4500-6	50/60	1	115	4.0	0.7	75	1700	240	7.97		
B4500-7	400	3	208	--	2.6	175	3700	170	5.81	8.72	7.81

ROTATION & BLAST CCW rotation - 12 o'clock is standard: CCW & CW rotation and any of eight blasts available. Specify desired rotation and blast required

OPTIONAL ACCESSORIES

OUTLET { Flange, Ductclamp }

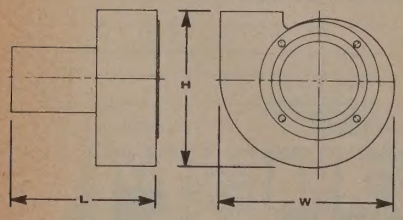
INLET { Screen, Rim with Clamp, Cone }

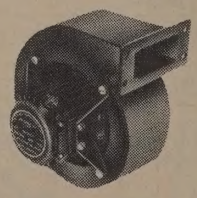
HOW TO ORDER OR INQUIRE

START with type design No. *(this is not a part No.)

ADD Ambient temperature - Min. and Max. Optional accessories you require. Special environmental conditions. For modified or custom design, send your specs.

SEND to or call RC for quotation, drawing and part No.





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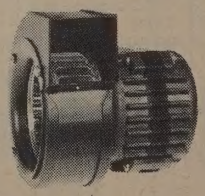
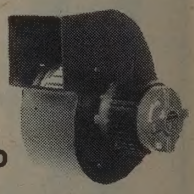


B2500



B4500

SYNCHRONOUS MOTORS • TACHOMETER GENERATORS • BLOWERS • BRUSHLESS DC BLOWERS • INDUCTION GENERATORS • P.M. GENERATORS
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ROTATING COMPONENTS
Division of INSTRUMENT SYSTEMS CORPORATION
1560 FIFTH AVE., BAY SHORE, N. Y. 11706
(516) 666-8500 TWX 516 666-7047

FANS

FEATURES: • 50-60 or 400 Hz • Variable or Dual frequency • 1 or 3 phase • BRUSHLESS DC • up to 440 Volts AC • Superior performance • greater efficiency • Rugged construction • Permanently lubricated for long life • Dynamically balanced • Quality controlled per MIL-Q-9858 • Meet or exceed MIL & UL specifications • Ambient temperature range: -55 degrees C to +125 degrees C and up • High Altitude • Versatile mounting and adaptors • Operate in any position • Compact •

TYPE F300 (NOT SHOWN)

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F300-1	50/60	1	115	1	0.1	9	3300	40	3.00	4.25	3-.169
F300-2	50/60	3	208	--	0.06	10	3500	32	2.86		Dia.
F300-3	60/400	1	115	1	.12/.35	12/25	3000	35	3.00		holes
F300-4	400	1	115	1	0.15	25	11000	100	3.25		equally
F300-5	400	3	200	--	0.15	23	11000	100	2.59	4.25	spaced

TYPE F700

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F700-1	50/60	1	115	4	0.5	58	3300	500	5.94	8.38	8-.156
F700-2	50/60	1	115	4	0.5	58	3300	500	5.94		Dia.
F700-3	50/60	1	115	4	1.0	90	3300	600	5.94		holes
F700-4	50/60	3	208	--	0.3	40	3300	500	5.09		equally
F700-5	50/60	1	115	2	0.45	45	1700	250	5.00		spaced
F700-6	400	1	115	1	1.25	95	3700	550	5.75		
F700-7	400	3	208	--	1.00	106	3700	550	5.10	8.38	

TYPE F4500

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F4500-1	50/60	1	115	1	0.08	9	3300	110	2.94	6.00	3-.193
F4500-2	50/60	1	115	0.5	0.06	7	1700	58	2.94		Dia.
F4500-3	50/60	1	230	1	0.05	10	3200	105	2.94		holes
F4500-4	50/60	3	115	--	0.27	16	3500	120	3.44		equally
F4500-5	50/60	3	208	--	0.06	13	3400	115	2.94		spaced
F4500-6	50/60	3	208	--	0.07	11	1750	60	3.44		
F4500-7	60/400	1	115	1	0.39	26	3350	115	4.44		
					0.57	63	3500	120			
F4500-8	400	1	115	1	0.5	60	7000	240	4.44		
F4500-9	400	3	200	--	0.28	72	7100	250	3.44		
F4500-10	400	3	200	--	0.27	50	6000	225	4.44	6.00	

TYPE F6500

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F6500-1	50/60	1	115	1	0.21	24	3300	300	3.88	8.50	6-.180
F6500-2	50/60	1	115	2	0.20	23	1700	160	3.88		Dia.
F6500-3	50/60	3	208	--	0.20	23	3300	305	3.88		holes
F6500-4	50/60	3	115	--	0.22	23	3300	305	3.88		equally
F6500-5	400	1	115	1	0.77	66	3800	350	4.94		spaced
F6500-6	400	3	208	--	0.83	75	3900	360	4.94		
F6500-7	400	3	208	--	0.78	90	5600	500	4.94	8.50	

TYPE B400 (NOT SHOWN)

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F400-1	50/60	1	115	1	0.08	9	3450	85	2.91	5.50	3-.193
F400-2	50/60	3	208	--	0.06	12	3450	85	2.91		Dia.
F400-3	60/400	1	115	0.5	0.24	21	3200	80	3.41		holes
					0.20	36	3700	100			equally
F400-4	400	1	115	0.5	0.50	46	7500	180	3.41		spaced
F400-5	400	3	115	--	0.40	38	7500	180	3.41		
F400-6	400	3	200	--	0.22	53	8500	210	3.41	5.50	

TYPE F800 (NOT SHOWN)

ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F800-1	50/60	1	115	2	1.6	60	3300	500	6.25	10.00	8-.180
F800-2	50/60	1	115	3	0.55	65	3300	630	6.25		Dia.
F800-3	50/60	1	115	4	1.0	120	3300	810	6.75		holes
F800-4	50/60	1	115	2.5	1.5	170	3300	1000	7.88		equally
F800-5	50/60	1	115	2	0.3	25	1700	260	4.69		spaced
F800-6	50/60	1	115	2	0.3	25	1700	330	4.69		
F800-7	50/60	1	115	2	0.35	30	1700	400	4.69		
F800-8	50/60	1	115	2	0.45	45	1700	500	4.69		
F800-9	50/60	3	208	--	0.6	85	3300	800	6.75		
F800-10	50/60	3	208	--	0.75	130	3300	950	6.75		
F800-11	400	1	115	1	1.25	95	3800	540	6.25		
F800-12	400	1	115	1	1.2	125	3800	740	6.75		
F800-13	400	3	208	--	1.0	150	3800	780	6.75		
F800-14	400	3	208	--	1.6	210	3800	900	7.88		
F800-15	400	3	208	--	3.7	680	5600	1650	7.88	10.00	

TYPE F5500

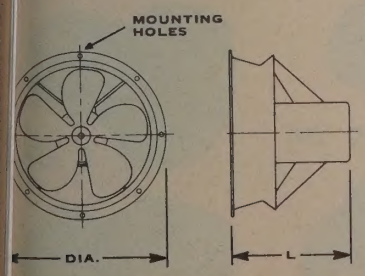
ELECTRICAL								AIR	MOUNTING		
Type Design No.	Freq. Hz	Ph.	Volts	Cap. Mfd.	Nom. Amps	Nom. Watts	Nom. RPM	CFM@ 0" SP	L	Dia.	Hdware
F5500-1	50/60	1	115	1	0.18	20	3450	180	3.63	7.50	6-.180
F5500-2	50/60	1	115	2	0.5	40	3350	315	4.63		Dia.
F5500-3	50/60	1	115	1	0.20	23	1750	95	3.63		holes
F5500-4	50/60	3	115	--	0.20	16	3450	180	3.63		equally
F5500-5	50/60	3	208	--	0.20	16	3450	180	3.63		spaced
F5500-6	50/60	3	208	--	0.06	11	1750	95	3.63		
F5500-7	400	1	115	1	0.55	65	6400	315	4.88		
F5500-8	400	3	200	--	0.29	56	5500	290	4.88	7.50	

HOW TO ORDER OR INQUIRE

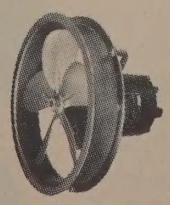
START with type design No. *(this is not a part No.)

ADD Air Flow direction A ← or B →. Ambient temperatures - Min. and Max. Optional accessories you require. Special environmental conditions. For modified or custom design, send your specs.

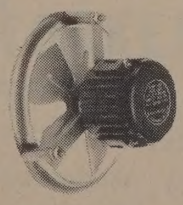
SEND to or call RC for quotation, drawing and part No.



(AIR FLOW) A ⬅ ➡ B



F700



F4500

F5500
F6500

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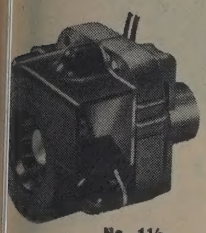
UNITED TECHNICAL PUBLICATIONS

Superior . . . **RIPLEY COMPANY, INC.** **RIPLEY** ESTABLISHED 1936 *through Research* **MIDDLETOWN, CONN.**

SPACE-SAVING *Precision Bearing* MOTOR-BLOWERS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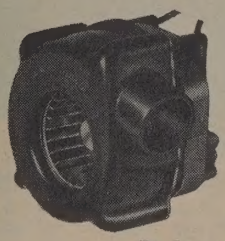
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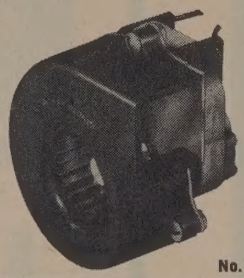
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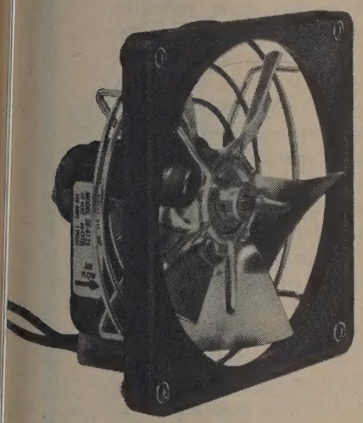
A new line of compact Motor-Blowers are now available with air deliveries ranging from 5 to 19 cfm free air output. Designed to fill the requirements where space is a problem and a minimum of 5-year maintenance free performance is imperative. The precision bearing "power-pac" motor with permanent sealed-in lubrication requires no oiling and operates at an extremely low noise level. The unit can be mounted in any position. The low input wattage required is a cost saving factor of particular advantage in multiple installations.

MODEL NUMBER	TYPE	INPUT VOLTAGE	WATTS	DUTY CYCLE	RPM	OUTPUT FREE AIR CFM	DIMENSIONS H x W x D	LIST PRICE
UK-1500	1½	115 V. AC-60 Cycle	7.5	Continuous	3400	5	2 15/16" x 3 5/8" x 3 1/16"	$10.17
UK-2000	2	115 V. AC-60 Cycle	7.5	Continuous	3300	10	3¾" x 3½" x 3¼"	$10.27
UK-2500	2½	115 V. AC-60 Cycle	8	Continuous	3250	19	4⅜" x 3⅞" x 3¼"	$10.40



GUARANTEED FOR FIVE YEARS

AXIAL FAN

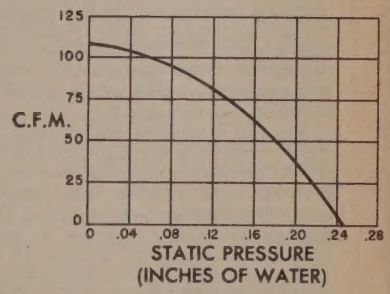
THE BIG VALUE IN RUGGEDNESS COMPACTNESS & HIGH EFFICIENCY

108 CFM CAPACITY

SPACE SAVING DESIGN

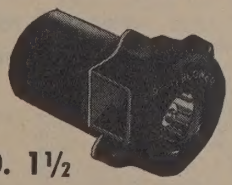
MODEL SK-4125

108 CFM Axial Fan designed for electronic and instrumentation cooling. Guaranteed for Five Years — (upon approval of application). Mounts on 4⅛" square — vertical or horizontal operating position. Permanently sealed-in lubrication — maintenance free. Overall mounting plate size is 4 11/16" square and depth is 3 1/16".



L-R MOTOR & BLOWER ASSEMBLIES

NO. 1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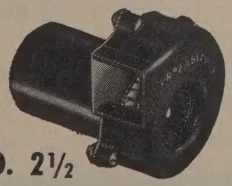
NO. 2


NO. 2½

NO. 2¾

NO. 3

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to meet your exact application requirements

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for immediate delivery

Ripley offers a full line of air-moving units, axial fans, motor-blower assemblies, precision-bearing blowers. Write for price list and free catalog.

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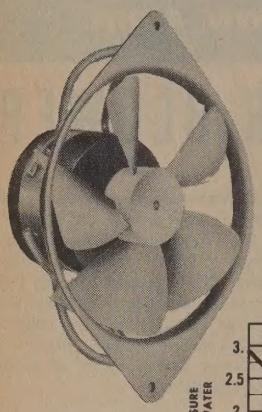
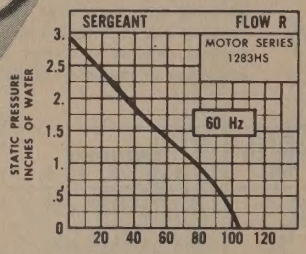
sergeant T.M. FAN





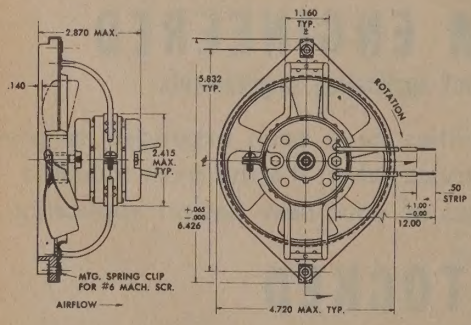
The Sergeant fan joins the famous Muffin and Skipper fans to form a family of three general purpose, commercial flushing fans in a choice of three price ranges. While the Sergeant fan is extremely low in price, it is reliable and ideally suited for cooling electronic equipment. The fan measures 4 1/16" by 2 3/4" in depth.

The Sergeant is available for either direction of airflow. It may be quickly mounted using two mounting holes which fit the industry's standard 4.125" square hole layout. Mounting in any attitude is permissible and there is a choice of mounting directly to the panel wall where the impeller may extend beyond the panel or flush mounting by including a venturi spacer.

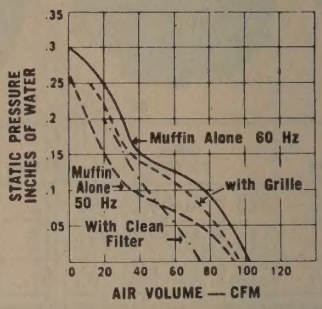
This fan is suitable for ambients up to 130°F (55°C) and has a design life of five years at 75°F (25°C) without maintenance. The fan is impedance protected and satisfies U.L. requirements. The sound interference level is a low 43 db at free delivery. The Sergeant draws watts. Electrical connection is made to 12" long 18 gauge leads.

The mounting spiders are formed steel wire, bright zinc plated. The venturi is cold rolled steel, bright zinc plated. The venturi spacer and the impeller are injection molded acetal resin thermoplastic.

For 115 vac, 50-60 Hz. Weight



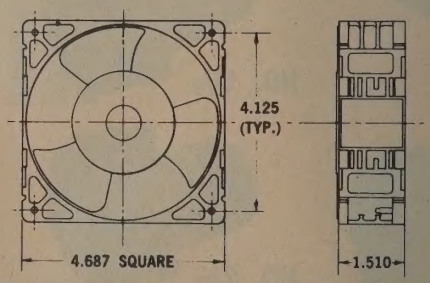
muffin® fan



The Muffin Fan is the most reliable commercial tubeaxial fan available. The Muffin Fan can be expected, with a 90% survival rate, to operate up to 10 years at room temperature. Installed in equipment, it minimizes component derating, increases the life expectancy of the equipment and assures top performance. Ultra-long-life bearings are precisely aligned for vibration-free operation. Encapsulated motor winding adds years to life of unit. Molded in bus-bar motor leads. Completely integrated design of motor, blades, optional venturi, grille and filter in a performance matched assembly. The Muffin Fan is designed for 115 VAC, 50-60 Hz, 1 Phase applications. Models for 230 VAC are also available. It has UL yellow card component recognition. File No. E-31293.

WEIGHT 1.0 POUND

MOUNTING HOLE DIMENSIONS 4.125"



For Further Information Request Catalog Sheet E-2820

ROTRON® INCORPORATED

WOODSTOCK, NEW YORK 12498
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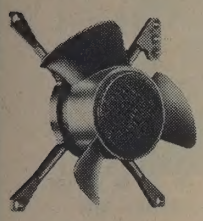
PACIFIC DIVISION 1912 WEST BURBANK BOULEVARD, BURBANK, CALIFORNIA 91506
TEL: 213 849-7871

Sentinel, Muffin, Whisper, and Centaur Fans

AVAILABLE IN 4 VERSIONS



"SKELETON FAN"

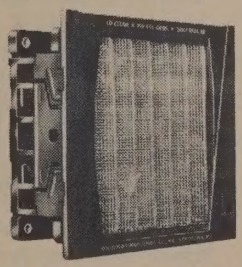
Consists of a motor-driven propeller with 4 mounting arms containing molded-in leads. It can be mounted as an air-stirring device among hot components or can be mounted in a round, sharp-edged or bellmouth aperture in the equipment enclosure.

"VENTURI FAN"

An assembly of the "SKELETON FAN" mounted in a 4.68" square molded plastic VENTURI BLOCK only 1.50" thick. May be used in either a round or square opening in an equipment panel. Mounting holes are provided on both upstream and downstream sides to permit the fan to push or pull air. It may also be used with the MOUNTING CLIPS described in this folder.

"GRILLE FAN"

The "GRILLE FAN" results from the addition of the GRILLE and MOUNTING CLIPS to the "VENTURI FAN". The "VENTURI FAN" may be mounted against the inside surface of the equipment enclosure and the grille snapped into place from the outside. The grille is an advanced aerodynamic design which minimizes the accumulation of lint and dust, and keeps the acoustical noise level to the minimum while insuring maximum airflow.



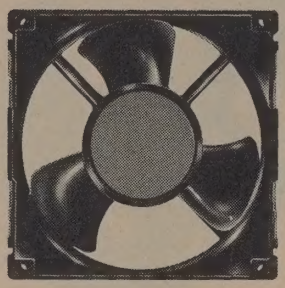
"FILTER FAN"

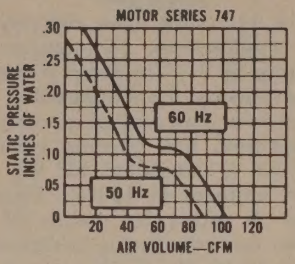
A complete cooling package consisting of matched fan and filter for maximum efficiency. The FILTER BOX locks in place between the GRILLE FRAME and the "VENTURI FAN" adding less than .75" to over-all depth. This unit completely eliminates guess work and risks involved in unmatched fan/filter assemblies. FILTER BOX, GRILLE and MOUNTING CLIPS are also available as separate accessories for existing "VENTURI FAN" installations.

Accessory Items For Sentinel, Muffin, Whisper and Centaur Fans.

Mounting Clips No. 13996 (Set)
Spiral Grille No. 16238
Filter Assembly No. 15449
Filtercoat No. 18440
Finger Guard No. 20132-2
Plug & Cord Assembly No. 16415

Sentinel® FAN

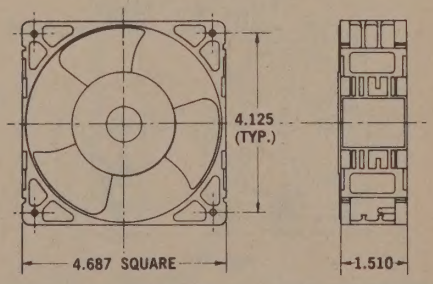




The Sentinel Fan has retained the high air performance, versatility, compact design and low noise level of the Muffin Fan but is designed for the more "rugged" application where the ambient temperature is higher. It is also for the customer that requires long, trouble free life without the requirement for maintenance. The Sentinel Fan may be used in a maximum ambient of 100°C and will withstand greater shock and vibration than the Muffin Fan was designed for. To achieve this design criterion the Sentinel Fan incorporates a glass-filled phenolic venturi block, an encapsulated stator, stainless steel ball bearings and an aluminum heat sink which draws heat from the windings to provide a cool running motor. The Sentinel Fan was designed to meet U.L. approval and has been satisfactorily qualified to MIL-E-4970A. The Sentinel Fan is designed for 115 VAC, 50-60 Hz, 1 Phase applications. Models for 230 VAC are also available.

WEIGHT 1.0 POUND

MOUNTING HOLE DIMENSIONS 4.125"



For Further Information Request Catalog Sheet E-2810.

ROTRON® INCORPORATED

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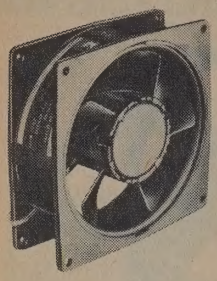
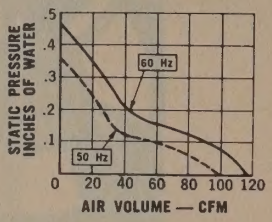
TEL: 213 849-7871

SPARTAN FAN



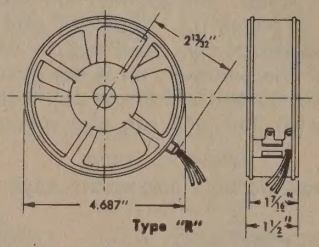


Delivers 115 CFM free delivery for military applications. Dimensions of 4 11/16" square by 1½" in depth make this fan dimensionally interchangeable with the Muffin Fan. Powered by a multi-slot, double-shielded, ball bearing induction motor which is lubricated for life at a maximum ambient of 100°C. Electrical connection is made by means of 12" leads. The Spartan Fan is designed for 115 VAC, 50-60 Hz, 1 Phase and 400 Hz, 1 Phase and 400 Hz, 3 Phase. The Type "R" version contains round mounting rims for use with standard motor mounting clamps. The air-flow direction may be reversed by turning fan end-for-end. The Venturi Ring, spiders and hub are a single aluminum casting suitable for shock and vibration requirements. The Spartan Fan meets applicable military specifications for ground and shipboard use.

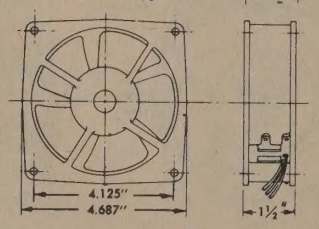
OPTIONAL ACCESSORIES: Terminal Block.
"Synclamps" for Clamping Rim Mtg. Part #24254. (3 Required Per Fan).
"Rever-Synclamps" for Clamping Rim Mtg. Part #14015.(3 Required Per Fan).

WEIGHT 1.0 POUND

MOUNTING HOLE DIMENSIONS 4.125"



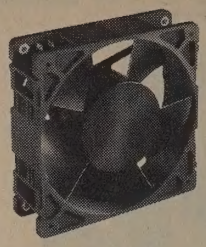
Type "R"



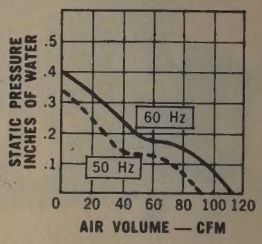
Type "S"

For Further Information Request Catalog Sheet E-2802.

CENTAUR® FAN



Available in 4 Versions



New aerodynamic principles by Rotron permit the new Centaur to achieve greater aerodynamic efficiencies than ever before from axial flow fans — and with low acoustical disturbance and compact size.

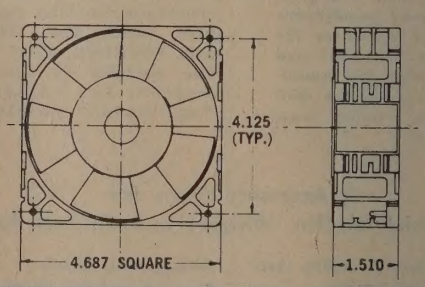
The Centaur with its computer designed five-bladed impeller molded of high impact polycarbonate is precisely matched to a powerful shaded pole motor — available with either oil-impregnated sleeve bearings or precision ball bearings lubricated for life. The recommended operating ambient temperature is −40°C to +55°C with sleeve bearings, and −40°C to +72°C with ball bearings. The motor is mounted to a spider of die cast aluminum which is in turn assembled to a venturi of high temperature resistant black phenolic.

The Centaur will deliver 115 cfm of air, free delivery operating at 115 volts, 60 Hz, or 100 cfm free delivery at 230 volts, 50 Hz making it possible for the design engineer to select a fan to deliver the same cfm on European power sources as Muffin fans or Sentinel fans at 60 Hz power used in the U.S.A.

The Centaur is designed to be physically interchangeable with the Muffin fan or the Sentinel fan.

WEIGHT 1.2 POUNDS

MOUNTING HOLE DIMENSIONS 4.125"



For Further Information Request Catalog Sheet E-2850.

ROTRON® INCORPORATED

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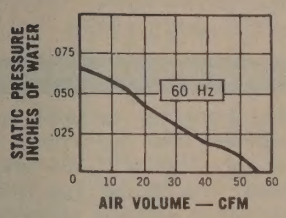
TEL: 213 849-7871

Whisper® Fan

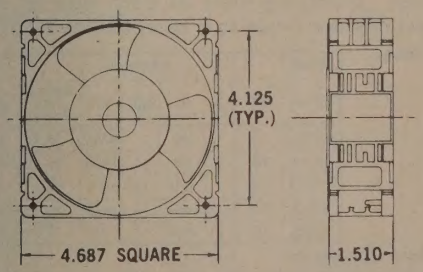
MARK I
Available in 4
Versions



Breathing 55 cubic feet of cool air over, under and around every heat-generating component, the Whisper Fan improves performance of hi-fi equipment, radio-TV receivers and O.E.M. equipments by minimizing drift due to temperature change within the enclosure. So quiet you have to feel the breeze to know it's going. Only 18 db SIL. Also supplied as Whisper Fan Kit complete with special mounting, hardware, plug and cord for electrical connections and detailed instructions. Whisper Fan is designed for 115 VAC only, 50-60 Hz, 1 Phase.

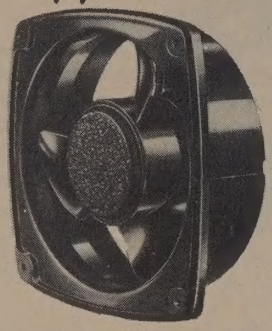
WEIGHT 1.0 POUND

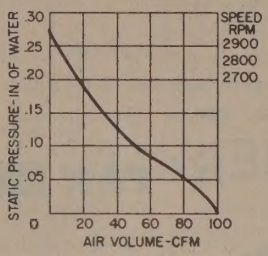
Mounting hole dimensions 4.125"



For Further Information Request Catalog Sheet E-2801

Skipper® FAN





The Skipper Fan signals the best in really economical cooling for computers, office copying equipment, transmitters — all commercial applications requiring 100 cfm of cool air.

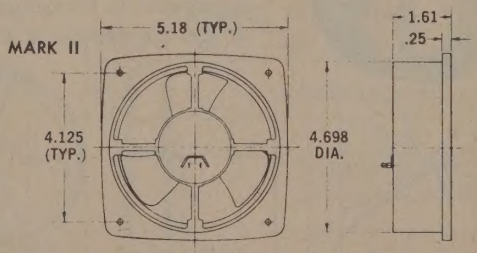
It incorporates high quality, precision design and the LOWEST COST. And that's not all. It is designed to SAVE in installation expense — requiring no mounting nuts or bolts — no bolt holes to drill.

Consider these features:

- Requires no mounting nuts or bolts.
- 100 cfm.
- Quiet—just 38 db SIL.
- Thin—only $1\frac{13}{16}$".
- Small diameter $5\frac{3}{16}$".
- Lightweight—14 oz.
- Reversible air direction (using optional plate part no. 19561-2).
- Designed to operate in temperatures up to 140°F (60°C).
- Designed to meet UL specifications.
- Complete accessories.

WEIGHT 14 OUNCES

Mounting hole dimensions 4.125"



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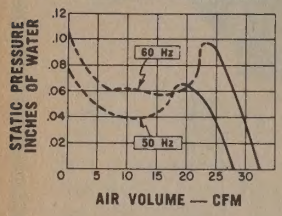
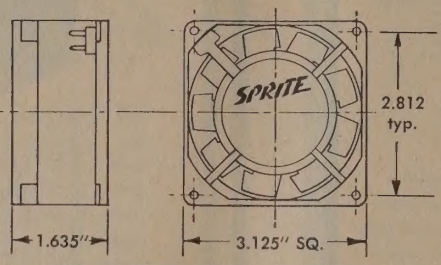
SPRITE® FAN

The Sprite fan has been designed especially for commercial cooling applications in low-profile electronic equipment, where size and reliable LOW COST performance are the important requirements.

It is only 3⅛" square, still, this rugged little fan with its nine-bladed propeller delivers 33 cfm — tailored to produce high pressure at the ranges approaching free delivery. (See Curve)



WEIGHT 14 OUNCES

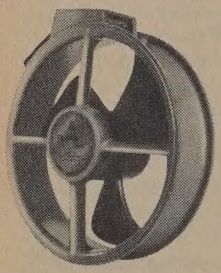


Review these important features:

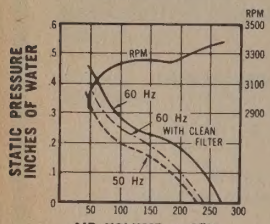
- Small—only 3⅛" square.
- Peppy—delivers 33 cfm.
- Reversible air flow—Simply turn fan end-for-end.
- Impedance protected.
- Designed to meet UL requirements.
- Designed to operate in temperature up to 140°F (60°C).
- Quiet—only 35 db SIL.
- Long life—up to five years.

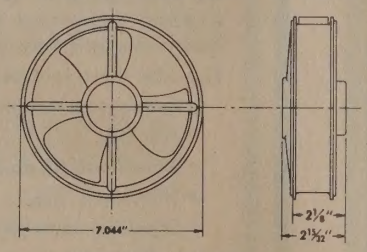
FEATHER® FAN

For Further Information Request Catalog Sheet E-3001



The Feather Fan delivers 270 CFM for flushing computer consoles, power supplies, heat exchangers and electronic control equipment that can spare little room for a cooling device. The fan's depth dimension of only 2¹⁵⁄₃₂" x 7" diameter imposes little space displacement on the system to be cooled. The Feather Fan is constructed of high-impact polycarbonate plastic which is resistant to extreme temperatures and boasts outstanding dimensional stability. The fan is powered by multi-slot induction motor that incorporates prelubricated stainless steel ball bearings for an ambient temperature range of −55°C to +65°C. 115 VAC, 50-60 Hz, 1 phase. A capacitor is provided which is mounted on the fan venturi. The electrical connection is made to tinned brass terminals and a mating plug and cord is available. The fan is provided with clamping rims for easy mounting and the airflow is reversible by turning the fan end-for- end. A matched filter box #17785 which is permanent, nonloading and washable is optional as are fan guards.





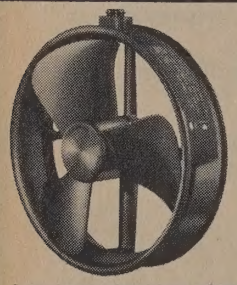
WEIGHT 1.5 POUNDS

OPTIONAL ACCESSORIES:
Rim Guard #14559.
Panel Guard #14651.
Plug & Cord #16398.
Filter Box #17785
Mounting Clamp #16410 (3 required per fan).
Panel Mount Guard Clip #14611 (3 required per guard).
Rotron Filtercoat #18440.

Also available to meet MIL-B-23071/1/. Please Inquire.

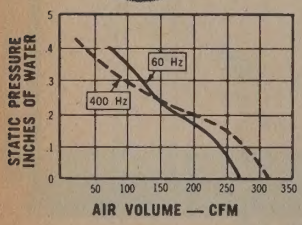
SAUCER® FAN

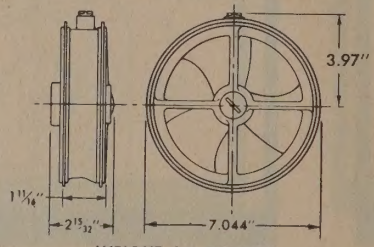
For Further Information Request Catalog Sheet E-3000



The Saucer Fan is ideally suitable for integration into modern electronic packages requiring 270 CFM of cooling air. Its axial length or thickness is strictly limited to the minimum measurement required by a highly efficient propeller, with no further space sacrificed for the driving motor. In other words, **"It is all fan"**. Airflow is reversible by turning the fan end-for-end. Clamping rims at each end of venturi provide easy mounting. Electrical connections are made to a compact terminal block. The Saucer Fan meets applicable military specifications for ground equipment.

A 400 Hz version is also available.





WEIGHT 1.6 POUNDS

MOTOR	ELECTRICAL							AIR
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Watts at Free Delivery	Line Amps.	CFM
654DS	115	1	400	—	3750	30.5	0.25	310
650JS	200	3	400	—	3800	25	0.13	310
340ZS	115	1	50-60	2.0	3300	24	0.23	270
544JS	200	3	50-60	—	3300	20	0.10	270
559DS	115	1	50-60	2.0	1680	10.5	0.10	140

OPTIONAL ACCESSORIES:
Flush Mount Guard #14651, Rim Mount Guard #14559, Clip #14611. (For mounting flush mount guard)
"Synclamps" for clamping rim mounting part #24254 (3 required per fan)
"Rever-Synclamps" for clamping rim mounting part #14015 (3 required per fan)
Filter Box #19869.

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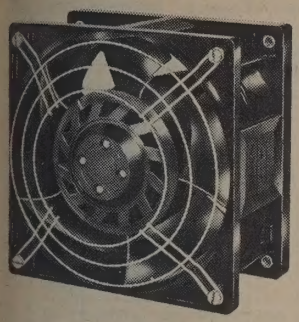
TARZAN® FAN

For Further Information Request Catalog Sheet M-8000.

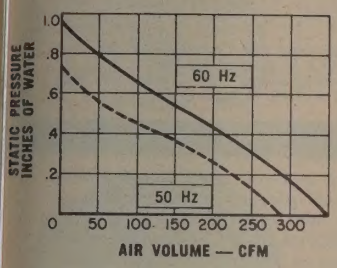


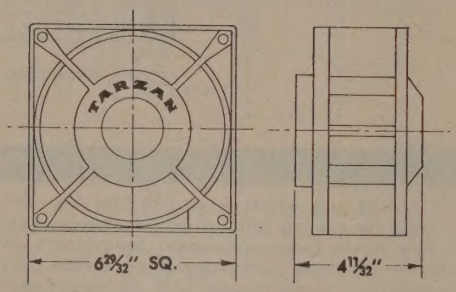
WEIGHT 5 POUNDS

The Tarzan fan brings an entirely new concept of air moving device versatility to the science of electronic cooling — CENTRIFUGAL BLOWER PERFORMANCE IN A COMPACT AXIAL FLOW FAN. This unique Rotron aerodynamic design (patent applied for) develops much greater pressure than comparably sized axial flow fans.

Its straight line performance curve permits the packaging engineer to realize full potential from the Tarzan at any point along the curve with no instability normally found in a curve of an axial flow fan.

When considering a squirrel cage centrifugal blower to deliver 175 cfm at 1/2" water static pressure — CONSIDER A TARZAN FIRST — SAVE SPACE — eliminate discharge diffusers.





More features:

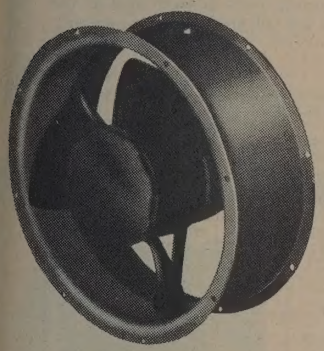
- Long maintenance free life.
- Economically priced.
- Reversible air flow — Simply turn fan end-for-end.
- Ball bearings — lubricated for life.
- 115 VAC, 50/60 Hz.
- 230 VAC, 50/60 Hz.

Optional accessories:

- Plug and Cord #17555.
- Filter Box #20990.
- Finger Guard #21196-2.

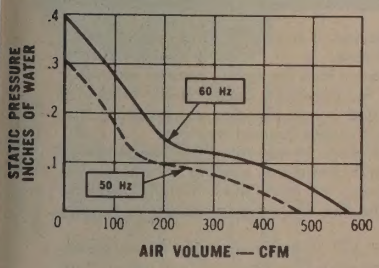
Caravel® FAN

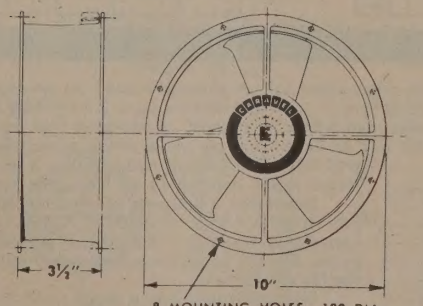
For Further Information Request Catalog Sheet E-3050



WEIGHT 5 POUNDS

The Caravel Fan delivers an air volume of 575 CFM while holding a narrow depth dimension of only 3½" x 10" diameter. This high performance and compact design makes it ideal for flushing large racks and cabinets. The fan may be mounted directly to a panel or cabinet wall using the holes located around the circumference of the venturi. Airflow may be reversed by turning the fan end-for-end. The motor is provided with ball bearings for long, quiet life. No maintenance is required. The electrical connection is made to a terminal block and a mating plug and cord is optional. The Caravel is suitable for the most rugged commercial applications where the cabinet temperature does not exceed 140°F. Thermal protection for the motor, designed to meet UL approval, is available on special order.





CARAVEL TYPE CHART

TYPE	VAC	PHASE	Hz	CFM
CL2T	115	1	50/60	575
CL3T	230	1	50/60	575

OPTIONAL ACCESSORIES: Screen Guard #19694-2
Plug & Cord #17555

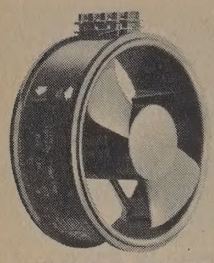
ROTRON® INCORPORATED

WOODSTOCK,
NEW YORK 12498
TEL: 914 679-2401

PACIFIC DIVISION 1912 WEST BURBANK BOULEVARD, BURBANK, CALIFORNIA 91506
TEL: 213 849-7871

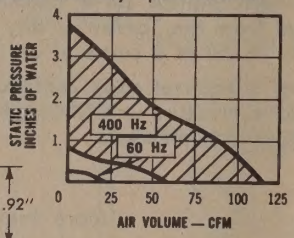
PROPIMAX® 2

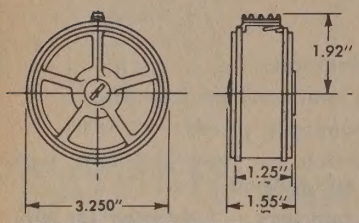
For Further Information Request Catalog Sheet E-2900



WEIGHT 6.5 OUNCES

The PROPIMAX-2 is ideal for 400 Hz airborne and missile applications where high shaft speeds are mandatory to obtain maximum air performance in a minimum of space. Selection from constant speed or high altitude varying speed "Altivar"® motors, which change shaft speed directly with altitude. A 50-60 Hz design is also available. The units are lubricated for a maximum ambient temperature of 125°C and will have a life expectancy of 2000 hours of continuous duty in an ambient atmosphere of 14.7 psia and 72°C. For fan life specifications for motor series 366ZS contact factory. The airflow is reversible by turning venturi ring end-for-end. There are clamping rims at each end of venturi for quick mounting. A single terminal block for all electrical connections. Meets applicable military specifications.





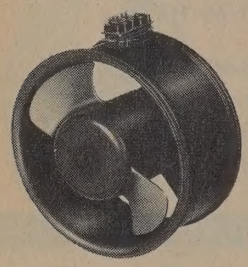
MOTOR	ELECTRICAL							AIR
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM
606NS	115	1	50-60	1.0	3100	7.0	0.06	17
366ZS	115	1	400	0.75	21000	41.0	0.37	122
464ZS	115	1	400	0.15	11000	10	0.10	62
367JS	200	3	400	—	20500	34	0.13	118
415ZS*	115	1	400	0.15	12300	18	0.18	67
395JS*	200	3	400	—	12500	18	0.10	68
704WS	200	3	400	—	11500	17	0.12	65

*Altivar

OPTIONAL ACCESSORIES: "Synclamps" for Clamping Rim Mtg. Part #24254. (3 Required Per Fan).
"Rever-Synclamps" for Clamping Rim Mtg. Part #14015. (3 Required Per Fan).

PROPIMAX-3 & 3B

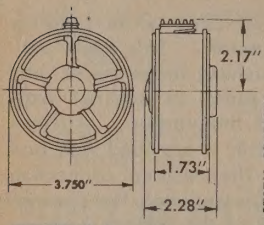
For Further Information Request Catalog Sheet E-2901.

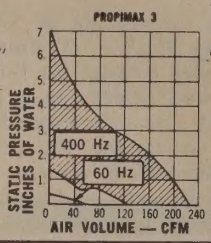


WEIGHT 15.2 OUNCES

The PROPIMAX 3 and 3B will deliver up to 220 CFM free delivery and will work against high air impedance. It is ideal for cooling small airborne systems which must place maximum emphasis on size and weight. This means heavy component density with large heat loads and high air impedance in relation to the envelope dimensions of the system. The PROPIMAX 3 has a two bladed propeller and is powered by a constant speed 400 Hz motor operating at 22,000 RPM. The PROPIMAX 3 will deliver large volumes of air against relatively high static pressures. The PROPIMAX 3B is provided with a four bladed propeller for operation at speeds of 12,000 RPM or less on 400 Hz. The PROPIMAX 3B will deliver large volumes of air against lower static pressure levels. The PROPIMAX 3B offers a choice of a constant speed 11,000 RPM design and high altitude, variable speed "ALTIVAR"® motors which change speed directly with altitude. There is also a 50-60 Hz design available.

The units are lubricated for a maximum ambient temperature of 125°C and will have a life expectancy of 2,000 hours of continuous duty in an ambient atmosphere of 14.7 psia and 72°C. For more stringent duty conditions fan life specifications must be individually defined. Airflow is reversible by turning fan end-for-end. There are clamping rims at each end of the venturi for quick mounting. A single terminal block for all electrical connections. Meets applicable military specifications.





OPTIONAL ACCESSORIES:
"Synclamps" for Clamping Rim Mtg. Part #14015. (3 Required Per Fan).
"Rever-Synclamps" for Clamping Rim Mtg. Part #24254. (3 Required Per Fan).

PROPIMAX 3

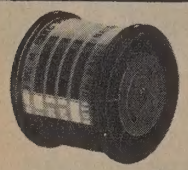
MOTOR	ELECTRICAL							AIR
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM
409ZS	115	1	400	2.5	22,500	100	1.0	220
341JS	200	3	400	—	22,500	80	0.3	220

PROPIMAX 3B

MOTOR	ELECTRICAL							AIR
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM
763ZS	115	1	60	0.5	3,450	10.5	0.12	58
754DS	115	1	400	2.0	11,100	60	0.6	190
718ZS	115	1	400	0.25	7,400	25.5	0.3	125
400ZS*	115	1	400	0.5	6,250	35	0.3	110
473JS	200	3	400	—	11,000	54	0.26	190
387JS*	200	3	400	—	8,300	67	0.3	190
805ZS	115	1	50 60 400	0.25	2,400 3,100 3,300	25 24 25	0.26 0.24 0.23	40 52 57

* Altivar

nanos FAN

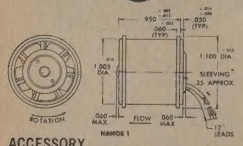


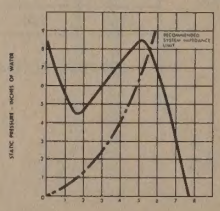
The Nanos fills the requirement for an extremely small air moving device. It is only 1" in diameter by 1" long or it may be provided in a 1" cube and delivers up to 7.5 cfm free delivery.

This fan is the smallest and lightest of a family of miniature high frequency fans for tightly packed electronic black boxes. The impeller and correctional vanes are of airfoil construction for maximum aerodynamic efficiency and minimal acoustical noise. Power is provided by an inverted construction, hysteresis motor, utilizing an air lubricated hydrodynamic journal bearing.

The Nanos is designed to withstand 100G shock in any direction. The temperature range is −55°C to +100°C. Under normal continuous running conditions, life expectancy would be in excess of 20,000 hours or more than 500,00 start-stop cycles. The fan may be mounted in any attitude. The airflow is reversible by turning the fan end-for-end.

Electrical connection is made to (3) leads 12" long. Choice may be made between a round configuration with clamping rims of a 1" cube which will mount flush at either end or on the side. For the servo configuration specify Nanos-1 or for the cube unit Nanos-1B or 1-C depending on desired airflow direction. Power requirement is 26 vac, 400 Hz 1ϕ.





ACCESSORY
Synclamp Rotron PN #24688
(3) required per fan

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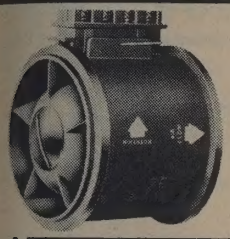
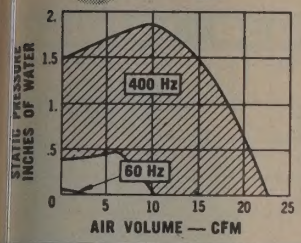
VANEAXIAL FANS

Vaneaxial fans are usually employed in high component density assemblies which require high performance under relatively high air impedance and at the same time offer minimum space for the cooling device. Vaneaxial fans in this group offer exceptional reliability under extreme operating conditions. These fans are generally of high frequency (400 Hz) power designs with resulting extremely high motor rpm. This speed provides the excellent pressure building abilities within their small physical size. They can also be supplied with 50-60 Hz motors. Models with Altivar motors are available for high altitude use in aircraft and unmanned high atmosphere vehicles.

AXIMAX® 1

For Further Information Request Catalog Sheet F-3100.



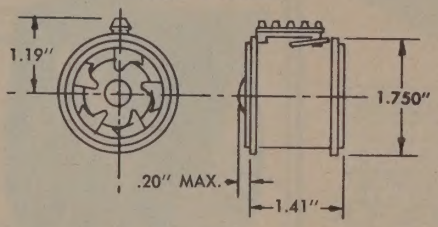


The smallest and lightest of a family of miniature, high frequency fans for use in tightly packaged airborne "black boxes" where size and weight must be held to an absolute minimum, where reliability is critical and where high heat loads must be dissipated with cooling air. The Aximax 1 will answer all of these requirements while overcoming considerable air resistance. It will deliver 17 CFM at 1" w.g. Mounting is by Clamping rims.

The Aximax 1 is available for both pressurized and non-pressurized applications and is built for single-phase or three-phase operations, and meets applicable military specifications.

A 50-60 Hz motor is available.

Weight 4 ounces.

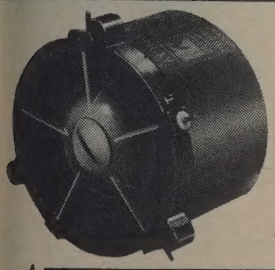


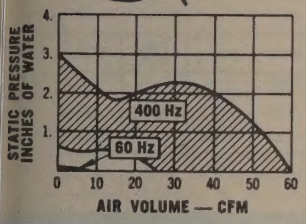
MOTOR	ELECTRICAL							AIR	
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM	Max. S.P. at 0 Del.
606NS	115	1	50-60	1.0	3200	7	0.06	2.6	0.03
623YS	115	1	400	0.25	22750	0.16	0.15	22	1.5
367JS	200	3	400	—	22500	0.10	0.1	22	1.5
464YS	115	1	400	0.15	11400	8.5	0.09	11	0.4

OPTIONAL ACCESSORIES: Altivar Motor.
"Synclamps" for Clamping Rim Mtg. Part #24254. (3 Required Per Fan).
"Rever-Synclamps" for Clamping Rim Mtg. Part #14015. (3 Required Per Fan).

AXIMAX 2

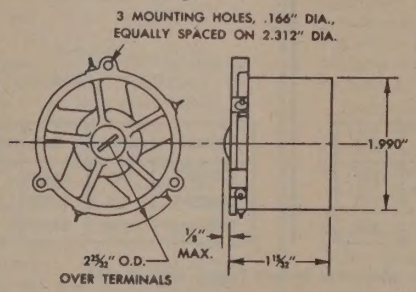
For Further Information Request Catalog Sheet F-3200.





Air delivery of 60 CFM, free delivery, is provided from a fan 2" in diameter by 1.5" axial length. The Aximax 2 is designed for maximum cooling against high static pressures with a minimum space and weight loss. It is available from a choice of constant speed or variable speed motor designs for low or high ambient densities. The Aximax 2 can be supplied with clamping rim mounting and electrical connection to a compact terminal block or as shown in the sketch. It meets applicable military specifications. A 50-60 Hz motor is also available.

Weight: 4.5 ozs.



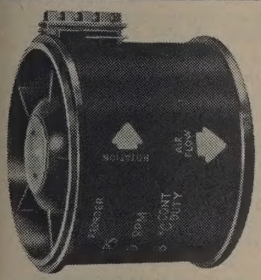
MOTOR	ELECTRICAL							AIR	
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM	Max. S.P. at 0 Del.
606NS	115	1	50-60	1.0	3150	7.0	0.06	8	0.08
368YS	115	1	400	0.5	20000	38	0.33	58	2.8
367JS	200	3	400	—	20500	34	0.13	60	3.0
464YS	115	1	400	0.15	11000	10	0.10	30	0.9
415YS*	115	1	400	0.15	11000	18	0.2	32	1.0
395JS*	200	3	400	—	11000	18	0.1	32	1.0
414YS**	115	1	400	0.25	19500	14	0.14	30	2.5
398JS**	200	3	400	—	20500	12	0.06	32	2.8

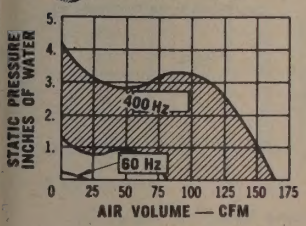
*Varying Low Density
**Varying High Density

OPTIONAL ACCESSORIES:
Altivar Motor, Clamping Rim Mounting.

AXIMAX 3

For Further Information Request Catalog Sheet F-3300.

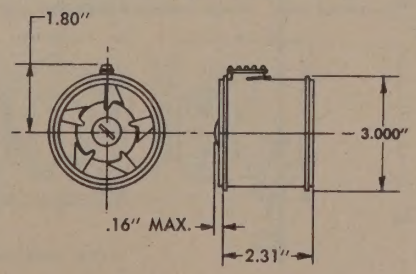




The Rotron Aximax 3 vaneaxial fan is specifically designed for high frequency cooling applications where high air deliveries against high static pressures are to be obtained in a minimum of space, therefore requiring high shaft speed. For airborne equipment, including missiles, the features of the fan will be found particularly attractive. Selection can be made from constant speed motors or varying speed motors for low ambient densities. Airflow is reversible by turning fan end for end. The Aximax 3 is mounted by clamping rims. It meets most applicable military specifications.

A 50-60 Hz motor is also available.

Weight: 14 ozs.



MOTOR	ELECTRICAL							AIR	
Series	Volts	Phase	Hz	Cap. Mfd.	RPM	Full Watt Load	Line Amps.	Max. CFM	Max. S.P. at 0 Del.
599NS	115	1	50-60	0.5	3500	3.0	0.03	23	0.13
341JS	200	3	400	—	22000	126	0.41	157	4.5
422DS	115	1	400	1.0	11300	23	0.28	78	1.2
528YS	115	1	400	2.0	22500	130	1.3	157	4.5
473JS	200	3	400	—	11800	25	0.22	82	1.25
387JS*	200	3	400	—	13900	56	0.25	98	1.7
400YS*	115	1	400	0.5	11000	35	0.30	76	1.1
558YS	115	1	50 60 400	0.25	3200 4500	14 17	0.15 0.16	21 31	0.1 0.2

*Altivar

OPTIONAL ACCESSORIES: Altivar Motor.
"Synclamps" for Clamping Rim Mtg. Part #24254. (3 Required Per Fan).
"Rever-Synclamps" for Clamping Rim Mtg. Part #14015 (3 Required Per Fan).

ROTRON® INCORPORATED

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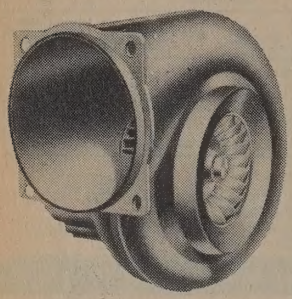
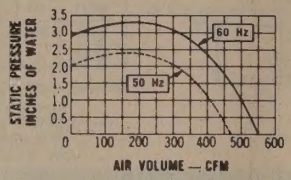
TEL: 213 849-7871

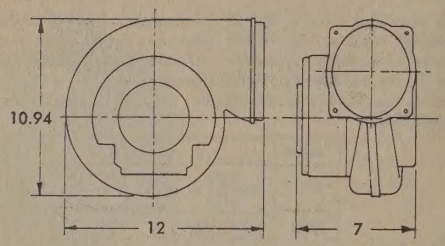
CENTRIMAX®

Model CXH33A

- Delivers more air with more efficiency than conventional squirrel cage blower.
- Package size substantially smaller than assembled squirrel cage blower.
- Motor completely integrated with impeller design.
- No maintenance — oversize, double shielded, precision ball bearings — lubricated for life.
- Ultimate in reliability — no centrifugal starting switches or relays which are the cause of most single phase motor failures.
- Every unit comes equipped with adjustable blast direction — impeller housing can be rotated 360°.



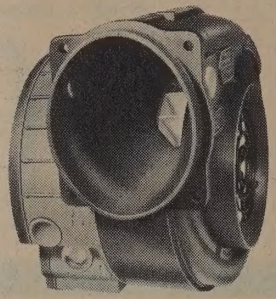


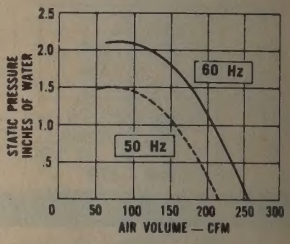


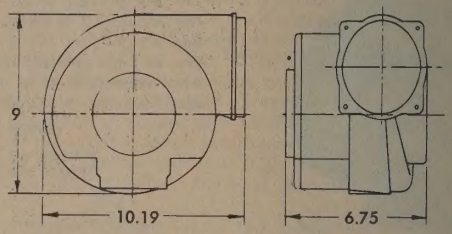
Model	Volts	Hz	Phase	Watts	Amps.	Cap. Mfd.	CFM
CXH33A2	115	50-60	1	420	3.7	12.0	540
CXH33A3	230	50-60	1	380	1.7	6.0	545
CXH33A33	220	50-60	3	410	1.3	—	530

Model CXH29A

- Can be installed in any attitude and mounted from any one of three mounting surfaces.
- Designed to accept standard, readily available round ducting.
- Blower housing fabricated from flame retardant polyester resin.
- Never rust, never bend.
- Thermal safety cut out feature available as optional.
- Operating temperature from −20°C to 85°C.
- Available in 115 VAC, 60 Hz, single phase; 230 VAC, 50 Hz, single phase; 208-230 VAC, 50-60 Hz, three phase.







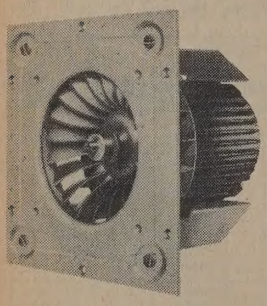
Model	Volts	Hz	Phase	Watts	Amps.	Cap. Mfd.	CFM
CXH29A2	115	50-60	1	145	1.4	6.0	250
CXH29A3	230	50-60	1	135	0.65	6.0	250
CXH29A33	220	50-60	3	130	0.45	—	245

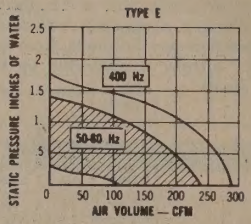
For Further Information Request Catalog Sheet G-3350.

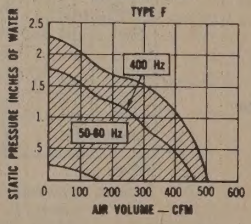
Model G

For complete details request Rotron catalog sheet G-3340.

TYPES E & F

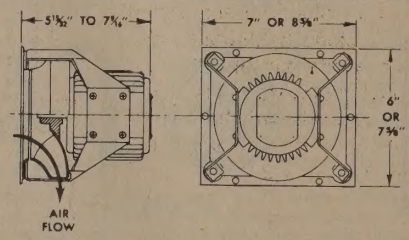






The Model G blowers are another type of blower incorporating the centraxial impeller. This blower uses the impeller without a scroll type housing. It consists of a mounting inlet plate holding the motor and the centraxial impeller. It has the unique feature of drawing the air in axially and discharging it uniformly radially 360° around the impeller. The Model G blower incorporates great flexibility in installing the blower in tight spaces.

Two basic sizes of the Model G blower are available. The Type E with airflows up to 285 cfm and maximum static pressures at no delivery up to 1¾" and the Type F with airflows up to 500 cfm and maximum static pressure at no delivery up to 2¼". Motors are available for either 115 or 230 volts, single or three phase, and 50/60 or 400 Hz. Applicable military specifications can be met. Protective screens on the inlet and mounting for the Rotron Model 2A Airflow Switch are available as accessories.



ROTRON® INCORPORATED

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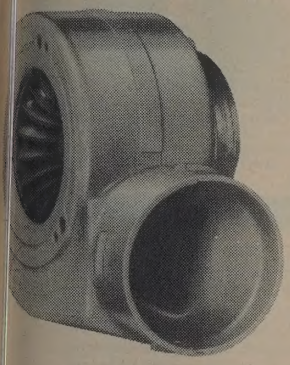
TEL: 213 849-7871

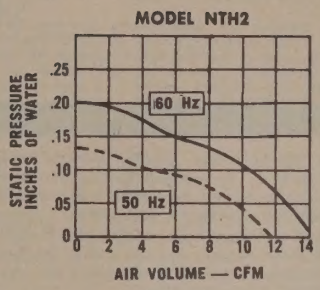
CENTRAXIAL BLOWERS

Centraxial blowers, so named for their unique im- ers, are far more efficient than squirrel cage blowers similar capacity or size. The centraxial impeller ctions similarly to a turbine impeller. Therefore, might compare efficiency by comparing a water bine to an old fashioned water wheel. Centraxial wers cost less to buy, cost less to install because of ir built-in versatility and cost less to operate since y require less power to get performance.

They operate in the specific speed range of 9,000 80,000.

NUGGET® BLOWER



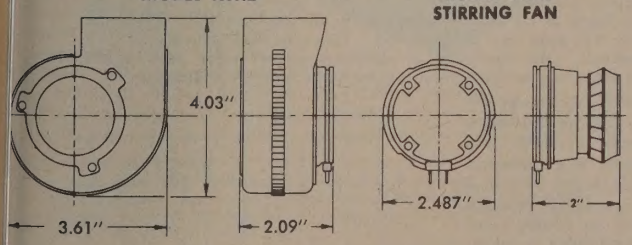


The Nugget (Model NTH2) is a new, compact, low cost blower ideally table for spot cooling applications in test instruments, transmitters, TV meras, office machinery, and tape recorders. Its centraxial wheel, a w design concept by Rotron affords greater efficiency than standard uirrel cage wheels — greater volume to pressure characteristics. It is ly $3\frac{19}{32}$" x $4\frac{1}{32}$" x $2\frac{3}{32}$". The Nugget delivers 14 CFM. The Nugget in- rporates a specially designed miniature subfractional horsepower in- ction motor that draws only 7 watts. 115 VAC, 50-60 Hz, 1 Phase, 00 RPM. The rugged blower housing is injection molded from poly- rbonate plastic to form a combination of features which will prove lpful and convenient to any packaging engineer. The Nugget is also ailable without housing to be used as an air stirring device (Model TP2). This model requires a space of only $2\frac{1}{2}$" x 2".

PTIONAL ACCESSORIES:

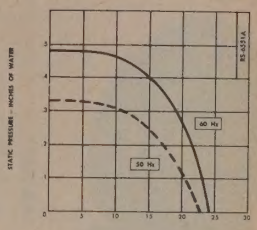
- ug & Cord Assembly, Part No. 17555 or both models)
- m (inlet), Part No. 17469 or Model NTH2 only)
- let Clamp Part No. 17597-1 or Model NTH2 only) se with Rim #17469)
- Outlet Clamp, Part No. 17597-1 (For Model NTH2 only)
- Flange (Outlet) Part No. 17471 (For Model NTH2 only)
- 3 Brass Inserts, Part No. 19803 to be used on Blower Inlet, Model NTH2

WEIGHT 0.6 POUNDS



For Further Information Request Catalog Sheet G-3310.

biscuit™ BLOWER



The Biscuit blower is designed for packaging within the confines of equipment having a vertical profile of no more than $1\frac{3}{4}$". This new blower provides high pressure centrifugal blower performance in a space never before possible. It has a depth dimension of only $1\frac{9}{16}$".

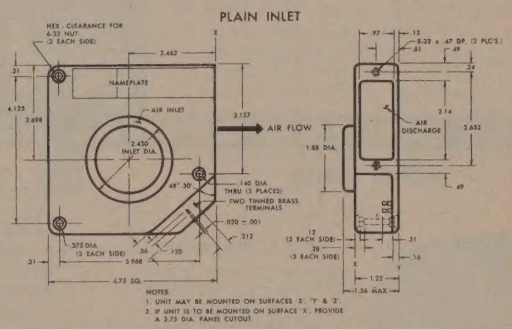
Delivering up to 25 cfm free delivery and with a high static pressure capability, it permits a significant increase in the packaging density of instruments using the latest integrated circuit technology.

The Biscuit blower features the same inverted motor construction and resiliently mounted permanently lubricated sleeve bearing system as Rotron's famous Muffin® fan and, therefore, provides a design life in excess of 10 years at room ambient without maintenance.

Among the commercial applications for which it is designed are computer terminals, core memories, heat exchangers and sinks, power supplies, projector lamps and rack mounted instruments. In the office equipment field, the Biscuit is ideal for the cooling of copying machines, optical character readers and X-Y plotters and recorders.

Encapsulated stator construction integrates the electrical portion of the shaded pole motor into the blower housing to provide a monolithic structure totally impervious to moisture. The Biscuit may be mounted from the back, the inlet or the discharge. Electrical connection is made to a choice of tinned solder terminals or plug and cord #17555 may be specified. Other options include an inlet ring, hose clamp or outlet guard.

The Biscuit is designed for U.L. component recognition and has a low speech interference level of 44 db. It operates on a power source of 115 vac, 50-60 Hz. Also available for 230 vac. Power draw is 16 watts. Specify BT2A-1 for a plain inlet or BT2A-2 for a rim inlet.



ACCESSORIES
Outlet Guard #24540
Hose Clamp #001-048
Plug and Cord #17555

For Further Information Request Catalog Sheet H-3306.

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TEL: 213 849-7871

Spiral® BLOWERS

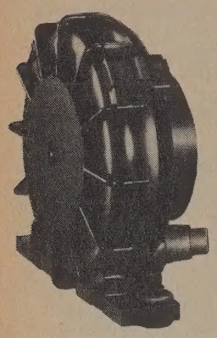
Spiral blowers are revolutionary new motor-blower packages designed to develop unusually high positive or negative air pressure at low to moderate volume of air. Thus, performance achieved without the use of sliding seals or vanes. Contacting surfaces are confined to the precision extra wide ball bearings, lubricated for extremely long life — no maintenance is required.

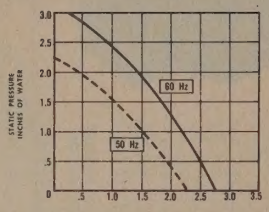
Life expectancy is enhanced by their low speed motors as well as by the absence of brushes or commutators. The RF noise, characteristic of the universal motors generally used in vacuum cleaner type blowers, is eliminated.

Optional accessories include adjustable trimmer valve, differential pressure gauges for instantaneous trimming to system requirements and a thermal protector.

MINI-SPIRAL

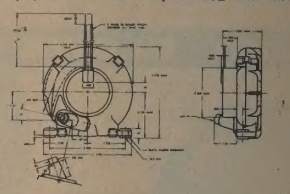
For Further Information Request Catalog Sheet J-6550.





The Mini-Spiral is a high pressure, low flow air moving device specifically designed for gas sampling applications. The unique regenerative energy conversion characteristic of the Spiral® blower has been combined with the highly reliable ball bearing system of the famous Sentinel® fan, offering proven long life and reliability in a compact package. This tiny blower which measures 4 5/32" in diameter by 1 13/16" in depth will create a suction of 3" wg, which could normally be achieved with a centrifugal blower many times its size and power consumption.

The Mini-Spiral may be used in commercial equipment to draw up to 2½ cfm through long lengths of tubing, resistance filter or chemical beds. It may be operated continuously at shut-off (no airflow) when it would provide maximum suction of 3" wg for gas sampling, fume removal, document hold down, tape hold down or the removal of chad.

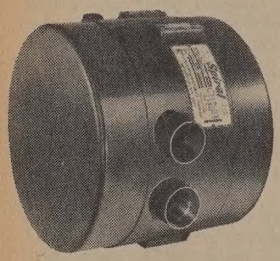


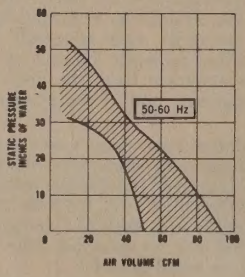
The blower housing and impeller are a high strength, glass filled, flame retardant phenolic. Bearings are double shielded, single row, radial ball, stainless steel which are lubricated for life. Magnet wire is Nema Class F. Termination consists of two U.L. style 1180 Teflon® leads, 20 AWG, 12" long.

The Mini-Spiral satisfies U.L. requirements and may be operated continuously in an ambient up to 72°C. It has a life expectancy of 50,000 hours at 40°C. A low speech interference level of 45 db renders the Mini-Spiral suitable for application in office equipment. Mounting is easily provided for running screws through two butyl rubber grommets. The weight is only 1.1 lbs.

DUPLEX SPIRAL

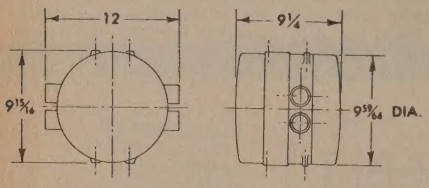
For Further Information Request Catalog Sheet J-6610.





The Duplex Spiral offers greater performance characteristics than the Spiral Model SL2 above. By internal ducting of the airflow from two impellers, higher pressures are achieved with Model SL4; Model SL5 extends the airflow range, and Model SL6 provide an economical source of two independent high pressure air streams, which can be utilized at different pressure levels. While the dimensions of all these models are the same, the functions cannot be changed in the field. The Duplex Spiral is designed for use in ambient temperatures up to 55°C, in typical applications as:

- Magnetic tape slack control and capstan motor cooling in one package (Model SL6).
- Document and card handling equipment.
- Paper tape and card reading equipment.
- Power supply for fluid amplifiers.
- Laser head cooling.
- Printed circuit motor cooling.
- Materials handling.
- Waveguide pressurization, or cooling.
- Actuation of machine elements.
- Gas sampling and purification.
- Air bearings for tape and film.
- Microwave cavity cooling.
- For holding photographic film or paper on rollers OR frames.



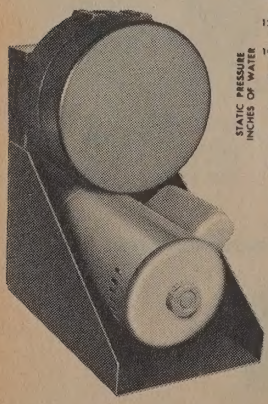
Remember these features:

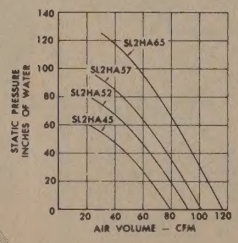
- Two independent air sources from one package.
- Two jobs for the price of one.
  OR
- Extended performance — pressures — vacuums to 2 PSIG.
  OR
- Extended performance — airflow delivery up to 94 CFM.
- Oil free air flow — no possible contamination.
- Quiet.
- Low Speed — 3300 RPM.
- Economically priced.
- Continuous duty.
- Available for single or three phase, 50-60 Hz power, 115 or 208/230 VAC.
- Optional accessory — Dust filter.

BELT DRIVEN SPIRAL BLOWER

For complete details, request Rotron catalog sheet J-6620.

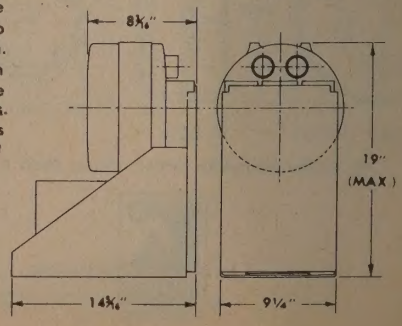
MODEL SL2HA





To obtain even higher pressures and airflows than can be obtained with a Model SL2 or Duplex Spiral shown above, Rotron has adopted the Model SL2 to be belt driven from an external motor. This permits the blower speed of the Model SL2 Spiral to be increased for higher air performance. Pressures or vacuums up to 4½ psig can be obtained. Flows at free delivery of 115 cfm can be obtained. The flexibility of different pulley ratios permits the designer to meet altitude and frequency requirements without overdesign.

Motors used with this blower are induction motors with no brushes to wear and operate at 3450 rpm. They are available in all common voltages and frequencies and have permanently lubricated ball bearings. Belts are designed for 10,000 hours life with no maintenance or adjustments.



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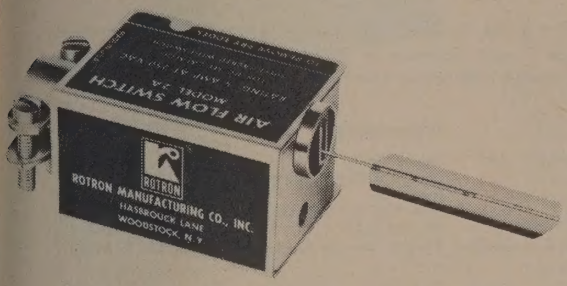
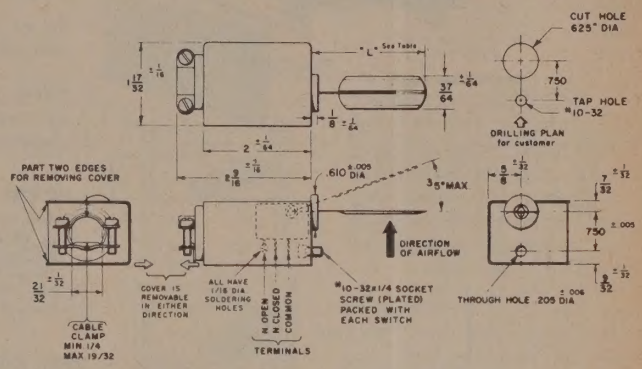
AIRFLOW INTERLOCK SWITCH

For Further Information Request Catalog Sheet K-6800.

The Rotron Model 2A Airflow Interlock Switch provides insurance against equipment damage due to a loss of the cooling airflow regardless of the reason for the malfunction. The Model 2A Airflow Switch is a velocity actuated switch, not pressure actuated, and senses the loss of airflow because of an obstruction, or air leak up-stream from its location, or due to the failure of the cooling fan. The switch is a single pole double throw type and normally open and normally closed contacts are available which may be used to turn off the power to the endangered equipment or actuate alarm systems. Eight different vane sizes are available to size the switch for various air velocities. A convenient determinator kit permits quick selection of the proper air vane for a particular application.





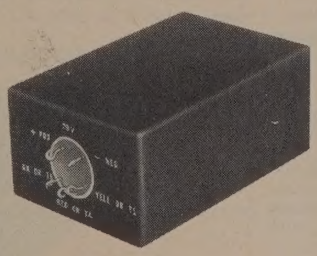
Rotron Model 2A Airflow Switches Will Actuate and De-Actuate in an Airstream of the Following Velocity in Ft./Min. For "Standard" Air (29.9 Inch HG, 70°F).

		HORIZONTAL AIRSTREAM							
		VERTICAL-UP AIRSTREAM		ARM HORIZONTAL		ARM VERTICAL VANE DOWN		VERTICAL-DOWN AIRSTREAM	
Type No.	Dim. "L" Max.	Increasing Air Ft./Min.	Decreasing Air Ft./Min.	Increasing Air Ft./Min.	Decreasing Air Ft./Min.	Increasing Air Ft./Min.	Decreasing Air Ft./Min.	Increasing Air Ft./Min.	Decreasing Air Ft./Min.
		Actuate	Deactuate	Actuate	Deactuate	Actuate	Deactuate	Actuate	Deactuate
1000	2 27/32	785	700	735	630	750	615*	NOT USABLE	NOT USABLE
1350	2 7/32	1125	1030	1025	970	1000	890	720**	685**
1600	1 13/16	1340	1212	1215	1095	1225	1130	1040*	865**
1800	1 21/32	1550	1450	1460	1335	1500	1375	1280	1115*
2000	1 7/16	1800	1675	1790	1580	1760	1580	1595*	1425*
2450	1 1/8	2340	2120	2120	1867	2270	2035	2125	1950
3000	15/16	2925	2700	2690	2420	2880	2570	2780	2395
4000	3/4	4000	3680	3720	3485	3870	3520	3760	3565

NOTE: All figures shown above are ±10% except: *Denotes ±15% **Denotes±20%

POWER CONVERSION MODULES

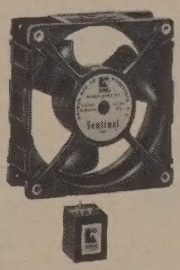
SYSTEM POWER SUPPLY PROBLEMS FOR DTL, TTL, MOS AND OTHER LOGIC DRIVES?
SYSTEM POWER SUPPLY PROBLEMS FOR COOLING DEVICES?



Rotron can solve these independently or combine both requirements in a common supply. Power DC to AC inverters, AC to AC converters, and DC supplies can be designed to meet your specifications. Rotron's approach of combining these requirements results in increased efficiencies, weight and size reduction of the often neglected power supply. Your Packaging Engineer will be grateful for the additional volume allotted to today's dense packages.

Please call upon us to consult in the solution of your power supply problems. As a bonus, free consultation is offered on your cooling applications.

Wide assortment of BATAC and DELTAC (frequency converter) designs available. For further information, contact Rotron Applications Engineering Dept. Woodstock, N.Y. Return to Section #4000 for other BATAC and DELTAC Applications.



ROTRON DC FANS BRUSHLESS DC WITH ROTRON BATAC®

The Batac solid-state DC to AD single-phase inverter gives long, maintenance-free life to air-moving devices that operate on DC power. Single-phase fans mate with the low-voltage square-wave output of the Batac, eliminating the need for a transformer. The Batac/Fan combination offers all the advantages of AC operation—no brush dust or brush changes, arc-free operation, and no commutator to create RFI.

FEATURES

- Rotron reliability and performance from a DC power source
- Efficient—Every design tailored to a specific load
- Compact—Batac sizes range from 1 5/16" x 1 1/8" x 1" to 2 1/2" x 3 1/2" x 4 1/16"
- Available with protection against accidental reversal of input voltage
- Offered with integral RFI suppression network
- For use in ambients between −40°C and +71°C
- Offered with voltage surge protection
- Reasonably priced

Also available for use with the aforementioned fans is a variety of solid state Deltac converters capable of increasing or decreasing output frequency with respect to input, on 115 VAC, single phase supplies.

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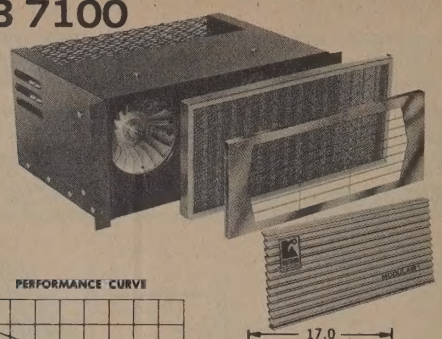
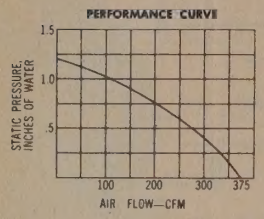
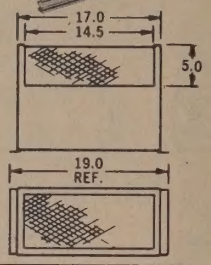
MB 7100







DESCRIPTION — The Modulair MB 7100 is a most efficient cabinet panel blower incorporating two (2) famous Rotron Centraxial wheels noted for their high pressure building characteristics and driven by two matched ball bearing motors, pre-lubricated for years of maintenance-free life.

The standard MB 7100 normally occupies a panel opening of 7", however, recessed models, Type 175 and Type 275, require only 5¼" panel space and utilize the cabinet space between the bottom cabinet frame and the base of the cabinet, with no loss in airflow.

The air is discharged evenly across the entire width of the Modulair in a turbulent pattern. The noise level is only 65 db (SIL).

WHERE TO USE — In EIA standard rack cabinets where component density is great and there is much resistance to airflow — where pressure building capabilities of the MB 7100 are necessary.

MOTORS

- Two (2) motors are used in MB 7100
- Ball Bearings
- Pre-lubricated
- Life — 5 years
- Thermal Protection standard

ACCESSORIES

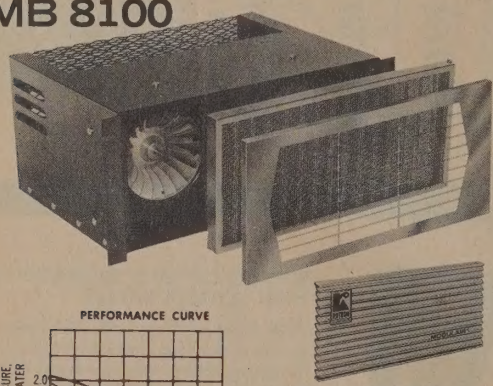
Deluxe Grille	24360-2
Deluxe Grille for Recessed Types 175 & 275	24360-1
Dust Filter	24361-2
Dust Filter for Recessed Types 175 & 275	24361-1
RFI/EMI Filter	24362-2
RFI/EMI Filter for Recessed Types 175 & 275	24362-1

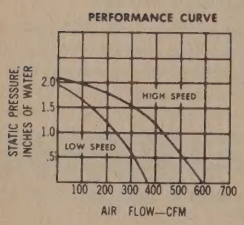
TYPE CHART

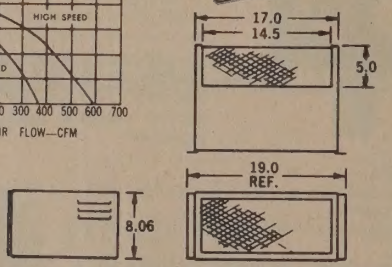
MODULAIR		ELECTRICAL							Air	Panel Height Inches	Dust Filter Washable	RFI/EMI Filter	Recessed Model
Series	Type	Volts	Phase	Hz	*Capacitor	RPM	Watts	Line Amps	CFM				
MB7100	100	115	1	50/60	5.0 μf	3200	205	1.8	375	7.0	Yes	No	No
MB7100	175	115	1	50/60	5.0 μf	3200	205	1.8	375	5.25	Yes	No	Yes
MB7100	200	115	1	50/60	5.0 μf	3200	205	1.8	375	7.0	Yes	Yes	No
MB7100	275	115	1	50/60	5.0 μf	3200	205	1.8	375	5.25	Yes	Yes	Yes

*Supplied with Modulair, integrally mounted.

MB 8100







DESCRIPTION — Modulair Model MB 8100 normally occupies a panel space of 8¾" and delivers 600 cfm from two Rotron designed Centraxial wheels noted for their high pressure building characteristics and driven by two (2) matched ball bearing motors, pre-lubricated for years of maintenance free operation.

Modulair Model MB 8100, Types 175 and 275 are recessed models requiring only 7" panel space and utilize the space available between the bottom cabinet frame and the base of the cabinet, with no loss in airflow.

The air is discharged evenly across the entire width of the Modulair in a turbulent pattern to affect every area of the cabinet and eliminate hot spots. The noise level is only 75 db (SIL) at high speed and 70 db (SIL) at low speed.

WHERE TO USE — In EIA standard rack cabinets where component density is great and there is much resistance to airflow — where pressure building capabilities of MB 8100 are necessary.

MOTORS

- Two (2) motors are used in MB 8100
- Ball Bearings
- Pre-lubricated
- Life — 5 years
- Thermal Protection standard

ACCESSORIES

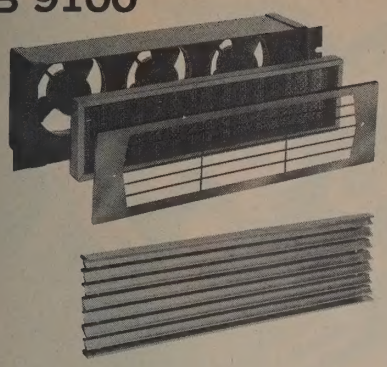
Deluxe Grille	24360-3
Deluxe Grille for Recessed Types 175 & 275	24360-2
Dust Filter	24361-3
Dust Filter for Recessed Types 175 & 275	24361-2
RFI/EMI Filter	24362-3
RFI/EMI Filter for Recessed Types 175 & 275	24362-2

TYPE CHART

MODULAIR		ELECTRICAL							Air	Panel Height Inches	Dust Filter Washable	RFI/EMI Filter	Recessed Model
Series	Type	Volts	Phase	Hz	*Capacitor	RPM	Watts	Line Amps	CFM				
MB8100	100	115	1	50/60	5.0 μf	3400	800	7.5	600	8.75	Yes	No	No
MB8100	175	115	1	50/60	5.0 μf	3400	800	7.5	600	7.00	Yes	No	Yes
MB8100	200	115	1	50/60	5.0 μf	3400	800	7.5	600	8.75	Yes	Yes	No
MB8100	275	115	1	50/60	5.0 μf	3400	800	7.5	600	7.00	Yes	Yes	Yes
MB8150	100	115	1	60	5.0 μf	3400/2200	800/450	7.5/4.2	600/380	8.75	Yes	No	No
MB8150	175	115	1	60	5.0 μf	3400/2200	800/450	7.5/4.2	600/380	7.00	Yes	No	Yes
MB8150	200	115	1	60	5.0 μf	3400/2200	800/450	7.5/4.2	600/380	8.75	Yes	Yes	No
MB8150	275	115	1	60	5.0 μf	3400/2200	800/450	7.5/4.2	600/380	7.00	Yes	Yes	Yes

NOTE: Model MB8150 available with thermostatic controls.
*Supplied with Modulair, integrally mounted.

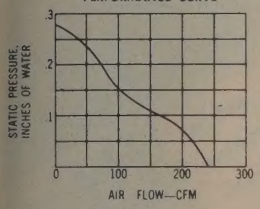
MB 9100

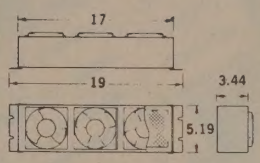


DESCRIPTION — Modulair MB 9100 series incorporates the performance capabilities of three (3) famous MUFFIN fans and delivers 240 cfm of clean, filtered air from a package only 5¼" high and 3½" deep. Life expectancy of the MUFFIN fan is 10 years.
The Modulair MB 9100 series can also be supplied with Rotron's ball bearing Sentinel and Spartan fans to meet military specifications or with Rotron's new Centaur for a 20% increase in air delivery. Model 9100 is impedance protected. The noise level is only 52 db (SIL).
WHERE TO USE — Modulair MB 9100 should be used in EIA rack cabinets where the component density and resistance to airflow is minimal and where there is relatively free passages for the flow of air.
DUST FILTERS — Modulair model MB 9100 comes equipped with low impedance, washable, 3 ply corrugated screen viscous impingement filter.

ACCESSORIES		
	Deluxe Grille	24360-1
	Dust Filter	24361-1
	Finger Guards	20132-2
	Filter Coat	18440

PERFORMANCE CURVE

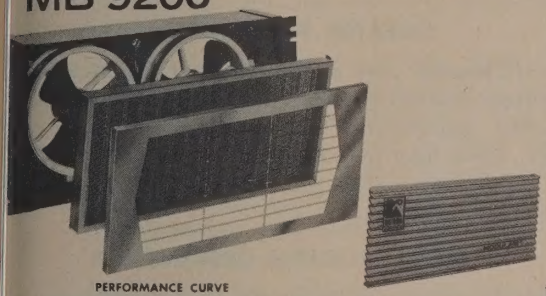




TYPE CHART

	MODULAIR						ELECTRICAL							Air	
	Series	Type	Fan	Comm	Mil	Bearings	Volts	Phase	* Cap.	Hz	RPM	Watts	Line Amps	CFM	Dust Filter
(D)	MB9100	100	Muffin	x		Sleeve	115	1		50/60	3200	42.0	0.48	240	Yes
	MB9100	125	Muffin	x		Sleeve	230	1		50/60	3250	42.0	0.24	240	Yes
	MB9100	150	Muffin	x		Sleeve	230	1		50	2700	30.0	0.18	202	Yes
	MB9100	200	Sentinel		x	B.B.	115	1		50/60	3250	42.0	0.45	240	Yes
	MB9100	225	Sentinel		x	B.B.	230	1		50/60	3250	42.0	0.24	240	Yes
	MB9100	250	Sentinel		x	B.B.	230	1		50	2750	30.0	0.20	202	Yes
	MB9100	300	Spartan		x	B.B.	115	1	1.0	50/60	3300	37.5	0.33	280	Yes
	MB9100	325	Spartan		x	B.B.	230	1	1.0	50/60	3250	33.0	0.15	278	Yes
	MB9100	350	Spartan		x	B.B.	115	1	0.39	400	3700	39.0	0.39	324	Yes
	MB9100	400	Centaur	x		Sleeve	115	1		60	3100	45.0	0.66	276	Yes
	MB9100	425	Centaur	x		Sleeve	115	1		50	2650	60.0	0.93	230	Yes
	MB9100	450	Centaur	x		Sleeve	208 230	1		60	3100	48.0	0.36	276	Yes
	MB9100	475	Centaur	x		Sleeve	208 230	1		50	2650	69.0	0.48	230	Yes

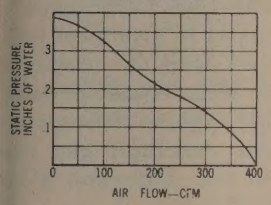
MB 9200

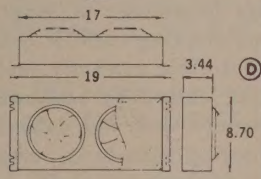


DESCRIPTION — Two (2) powerful ball bearing Rotron Feather Fans delivering 400 cfm from a package 8¾" high and only 3½" deep make up the Modulair MB 9200 series.
The Modulair MB 9200 can also be supplied with Rotron's Saucer fan to meet military specifications. Modulair MB 9200 can be supplied with thermal protection. The noise level is only 56 db (SIL).
WHERE TO USE — Modulair MB 9200 should be used in EIA rack cabinets where component density and resistance to airflow is minimal and where there are relatively free passages for the flow of air.
DUST FILTERS — All Modulairs come equipped with low impedance, washable, porous, Scott Foam filters enclosed in a rigid aluminum frame.

ACCESSORIES		
	Deluxe Grille	24360-3
	Dust Filter	24361-3
	Finger Guards	14651

PERFORMANCE CURVE

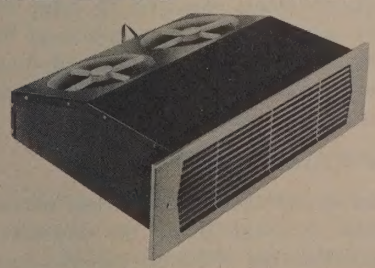




TYPE CHART

	MODULAIR					ELECTRICAL							Air	
	Series	Type	Fan	Comm	Mil	Volts	Phase	* Capacitor	Hz	RPM	Watts	Line Amps	CFM	Dust Filter
(D)	MB9200	100	Feather	x		115	1	2.0	50/60	3380	40	0.36	400	Yes
	MB9200	125	Feather	x		230	1	0.5	50/60	3350	40	0.18	400	Yes
	MB9200	300	Saucer		x	115	1	2.0	50/60	3300	48	0.46	400	Yes
	MB9200	325	Saucer		x	230	1	0.5	50/60	3300	48	0.46	400	Yes
	MB9200	350	Saucer		x	115	1	1.0	400	3750	61	0.60	470	Yes

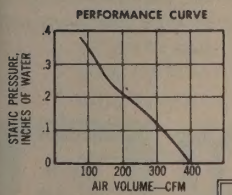
MB 5100 TWINPAX

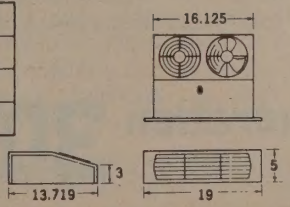


DESCRIPTION — The Modulair MB 5100 Twinpax utilizes the performance capabilities of two (2) Rotron Feather Fans or two (2) Rotron Saucer Fans, as in Modulair MB 9200, to discharge 400 cfm of clean, cool, filtered air.
MB 5100 Twinpax requires only 5¼" panel space, an unusually low profile for a unit with so much performance.
Modulair MB 5100 Twinpax can be supplied with thermal protection. The noise level is only 55 db (SIL).
WHERE TO USE — Modulair MB 5100 Twinpax should be used in EIA rack cabinets where component density and resistance to airflow is minimal and where there are relatively free passages for the flow of air.
DUST FILTERS — Modulair MB 5100 Twinpax is supplied with a large permanent aluminum washable filter.

ACCESSORIES		
	Deluxe Grille	24360-1
	Filtercoat	18440
	Finger Guards	19699

PERFORMANCE CURVE





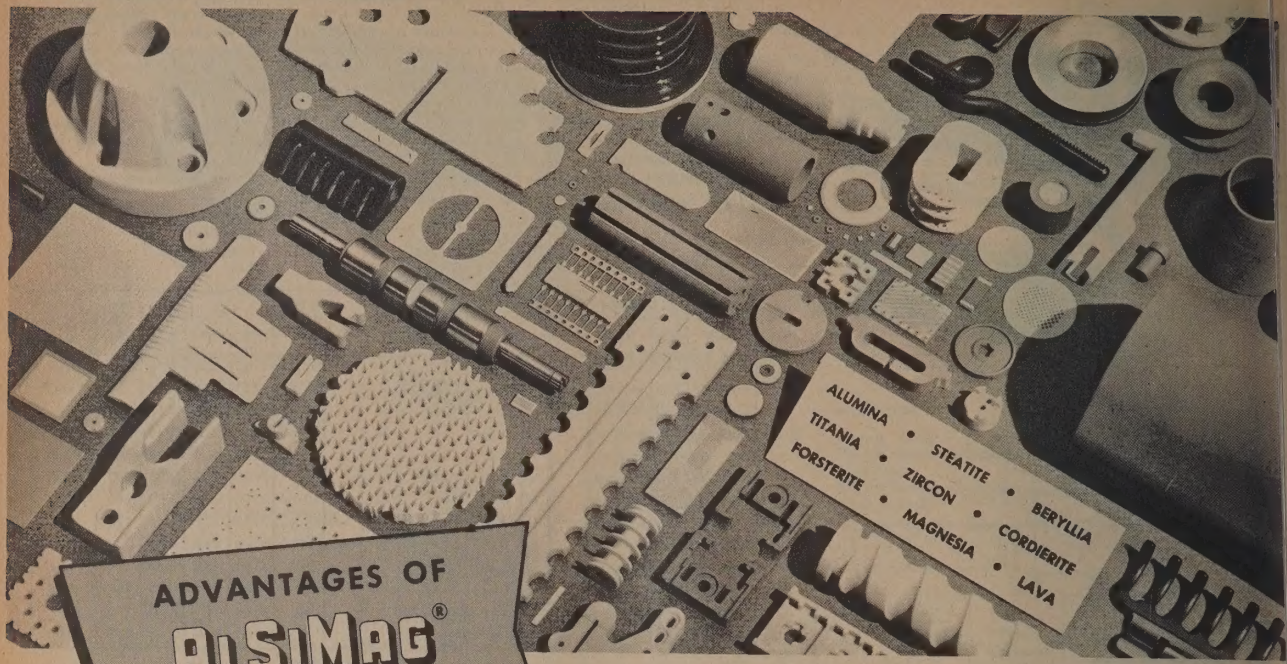
TYPE CHART

	MODULAIR					ELECTRICAL							Air	
	Series	Type	Fan	Comm	Mil	Volts	Phase	* Capacitor	Hz	RPM	Watts	Line Amps	CFM	Dust Filter
(D)	MB5100	100	Feather	x		115	1	2.0	50/60	3380	40	0.36	400	Yes
	MB5100	125	Feather	x		230	1	0.5	50/60	3350	40	0.18	400	Yes
	MB5100	300	Saucer		x	115	1	2.0	50/60	3300	48	0.46	400	Yes
	MB5100	325	Saucer		x	230	1	0.5	50/60	3300	48	0.46	400	Yes
	MB5100	350	Saucer		x	115	1	1.0	400	3750	61	0.60	470	Yes

*Supplied with Modulair, integrally mounted.
(D) AVAILABLE FROM ROTRON DISTRIBUTORS.

ROTRON INCORPORATED

WOODSTOCK, NEW YORK 12498



ADVANTAGES OF ALSIMAG® TECHNICAL CERAMICS

MORE MATERIALS

For many decades American Lava has worked with leading firms to develop special ceramics for their advanced designs. The result is the greatest number of special ceramic compositions available from any source. This wealth of ceramic materials can help in two ways. First, it may give you the exact performance you require. Second, it enables you to select the most economical material that meets your design requirements.

MORE PROCESSES

American Lava offers the broadest processing capabilities in the industry. These include forming ceramics by all modern methods including pressing, extrusion, injection molding, isostatic pressing, plus metallization, plating, chemical milling, machining, grinding, lapping, and hermetic bonding.

Many of these processes were pioneered by American Lava. Examples are (1) the ability to produce certain as-fired ceramics to precision tolerances and (2) the proprietary AlSiBase process for producing thin flat ceramics.

MORE SPECIALIZED ENGINEERING TALENT

American Lava, built on engineering ability, has demonstrated that it is the best source for any problem involving technical ceramics.

GREATER PRECISION

Technical ceramics play an increasingly important part in American industry because they can meet especially demanding requirements. American Lava has the experience, know-how and facilities to produce ceramics to the closest tolerances, and to measure and inspect them by agreed means.

MORE MODERN DESIGNS

Technical leadership at American Lava Corporation is based on working with its customers to give them what they want. This currently involves work on composite substrates, composite packages, buried metal patterns, super-smooth and flat substrates, special temperature compensating dielectrics, ceramic capacitors and new ceramic coatings for metal and low expansion glass.

VOLUME PRODUCTION

American Lava has the resources, know-how and the desire to make commitments required to meet volume requirements of its customers. A long parade of firsts in new manufacturing capabilities have allowed American Lava to keep pace with the ever changing need for technical ceramics in volume.

EXPEDITED PROTOTYPES

Special procedures speed the production of prototypes for your evaluation. A chart giving the characteristics of our most frequently used AlSiMag ceramic compositions will be sent on request. Suggestions are available from our specialized engineering staff.

CODE IDENT. NO. 70371

American Lava Corporation

PHONE 615 265-3411 • CHATTANOOGA, TENNESSEE 37405, U.S.A.

A SUBSIDIARY OF 3M COMPANY

68th YEAR OF CERAMIC LEADERSHIP

For service, contact American Lava representatives in Offices of Minnesota Mining and Manufacturing Company in these cities (see your local telephone directory): Boston: Needham Heights, Mass. • Chagrin Falls, Ohio • Chicago: Elmhurst, Ill. • Dallas, Tex. Indianapolis, Ind. • Laurens, S. C. • Los Angeles, Calif. • Metropolitan New York: Ridgefield, N. J. • Up-State New York and Canada: Phoenix, New York • Orange, Conn. • Philadelphia, Penna. • Roanoke, Virginia • St. Louis: Lee's Summit, Mo. South San Francisco, Calif. • International: c/o American Lava Corporation, Chattanooga, Tenn. 37405, U.S.A., TELEX 558432.

DOW CORNING

DOW CORNING® SILICONE MATERIALS

SILICONE ENCAPSULATING MATERIALS

Two-part SYLGARD® Resins

Sylgard resins are solventless, pourable, deep section curing silicone materials that provide tough, firm, yet resilient packages for electronic components and circuits. They provide excellent protection against high humidity, heat, cold, thermal shock, moisture and radiation; they are self-extinguishing and completely reversion-resistant.

Circuits embedded in Sylgard resin are easily repaired—the resin is cut away, the repair made, and fresh resin is poured in place. There is no loss in dielectric integrity.

As supplied, these resins flow readily around complex circuitry. If required, they may be thinned to very low viscosity with Sylgard® 1330 thinner.

Sylgard resins cure with the addition of a catalyst, without releasing volatile by-products. There is virtually no shrinkage, even when these materials are cured in deep sections. Curing rate can be heat-accelerated without causing bubbling. No moisture is required for curing, and no post-cure is necessary to prevent depolymerization.

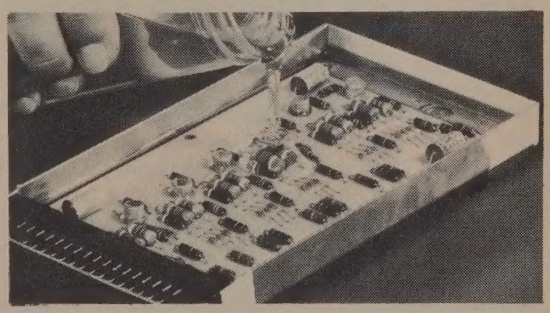
Both clear and opaque types are supplied. For maximum adhesion, a Sylgard® primer is recommended.

Sylgard® 182 and 183 resins are heat curing, offer a selection of pot life and cure times. Typical curing rate is 4 hours at 65 C. Serviceable temperature range is from −65 to 200 C for the clear resin (182); −65 to 250 C for the black (183).

Sylgard® 184 and 185 resins are similar to the above, but cure at room temperature. Typical cure time is 24 hours.

Sylgard® 186 and 187 resins, although similar to the rest of the family, offer extra physical strength and toughness. Their tear strength—100 ppi—is many times greater than the other Sylgard resins, and they provide more than three times the elongation. They are used where durability and maximum protection against mechanical damage are required.

Sylgard® 188 and 189 resins are specifically designed for use where shock absorption is vital.



One-part SYLGARD Resin

Sylgard® 3150 resin is a one-part, premixed, white, solventless resin that cures at moderate temperature to form a resilient, easily repairable encapsulant for electronic components. It cures without exotherm, even in confined spaces, and retains its physical and electrical stability over a wide frequency range and 100% RH. Its low viscosity (100 poises at 25 C) aids in potting and filling deep, intricately shaped components and assemblies.

Stress-free potting gel

Sylgard® 51 dielectric gel is supplied as a water-white, medium-viscosity liquid that readily surrounds components. With the addition of a catalyst and the application of heat, it cures to form a clear, resilient, jelly-like material that combines outstanding dielectric properties with thermal stability and moisture resistance. Typical electric strength is 800 volts/mil; dissipation factor at 100 Hertz is 0.0005.

No damaging stresses are exerted on delicate parts by this material during cure—after cure it develops virtually no stresses throughout its wide operating temperature span of −65 to 200 C.

Since this material is transparent, potted circuits can be traced visually. Test probes can be inserted through the gel for instrument checking of circuits and components—the gel "heals" itself immediately when the test probes are removed.

DOW CORNING CORPORATION, MIDLAND, MICHIGAN 48640

DOW CORNING

DOW CORNING® SILICONE MATERIALS

SILICONE ENCAPSULATING MATERIALS

DOW CORNING RTV ENCAPSULANTS

Dow Corning's family of two-part room-temperature-curing silicone rubber encapsulants offers optimum processing flexibility plus outstanding environmental and electrical protection for many types of equipment. These materials stay rubbery and flexible from −65 to 250 C, and have good dielectric properties over this range. Their excellent resilience helps absorb mechanical shock and vibration, and they protect components against temperature extremes, moisture, dirt, weathering and corrosive atmospheres. Encapsulated circuits are easily repaired by cutting away old material and repouring fresh encapsulant. Package integrity is fully restored.

Production flexibility

Four of the RTV encapsulant bases are designed to be used with any one of three catalysts, in varying proportions, to give working times from less than a minute to more than an hour. Thus a minimum inventory of material is required to meet a variety of applications. When used in 10:1 base-to-catalyst ratio, these materials are well suited to automatic dispensing and mixing equipment. They can be cured at room temperature or under heat, depending on the catalyst used; the room-temperature-vulcanizing types cure in deep sections without exotherm.

Dow Corning® 3110 RTV encapsulant is a white, low-viscosity silicone rubber base.

Dow Corning® 3111 RTV encapsulant is a red version of 3110.

Dow Corning® 3112 RTV encapsulant is a white, medium-viscosity silicone rubber base that cures to a high durometer, high-strength rubber.

Dow Corning® 3116 RTV encapsulant is a white, medium-viscosity silicone rubber base with a low specific gravity.

These three bases can be pigmented for color coding.

Dow Corning® 3120 RTV encapsulant is a red, medium-viscosity silicone rubber base; cures to a high-durometer, high-strength rubber.

The catalysts used with these four bases are all paste-consistency materials containing active organo-metallic compounds. They are designed for easy measuring and for mixing by either automatic or mechanized methods.

Dow Corning® RTV standard (S) catalyst is the most widely used of the three. It permits at least 30 minutes working time, cures well in deep sections.

Dow Corning® RTV fast (F) catalyst is used for high-speed production. It is ideally suited for use with automated mixing and dispensing equipment where mixing is done just prior to dispensing. Working time with 10% of this catalyst is about 2 minutes. Rubbers using this catalyst cure well in deep sections.

Dow Corning® heat-accelerated (H) catalyst is used where long working time is desired but where fast curing is necessary. With this catalyst, thin sections (⅛ inch) of RTV encapsulants are cured in as little as 5 min. at 150 C.

Dow Corning® 1203 primer is recommended for maximum adhesion. Red.

Dow Corning® 1204 primer is a clear version of 1203.

Reversion Resistant RTV

Dow Corning® 3118 RTV encapsulant is a buff-colored, medium-viscosity, reversion-resistant encapsulant specially designed to cure in deep sections. It is supplied with its own curing agent, a master-batched co-reactant polymer. The required curing agent concentration is 4% by weight of the RTV encapsulant base.

Pot life and cure time vary with temperature. At 25 C, pot life is 1½ hours, and curing time is 24 hours.

PROTECTIVE COATINGS AND VARNISHES

Dow Corning offers a variety of protective coatings, including resilient conformal coatings, varnishes and wax-like films, which give physical and electrical protection to electric motors, transformers, circuit boards, memory planes, and other equipment. These coatings are highly resistant to humidity, and retain their properties even after thermal cycling.

Dow Corning® 3140 RTV noncorrosive coating is a tough, transparent, rubbery conformal coating that cures without emitting corrosive by-products. Coating clarity allows easy visual inspection of components, simplifies component repair or replacement.

Dow Corning® 3141 RTV noncorrosive coating is a white version of 3140.

DOW CORNING CORPORATION, MIDLAND, MICHIGAN 48640

DOW CORNING

DOW CORNING® SILICONE MATERIALS

PROTECTIVE COATINGS AND VARNISHES (continued)

Silastic® S-2288 dispersion cures to a tough rubbery coating that withstands repeated flash-over without tracking, reduces current leakage. It is used as an over-coating for porcelain and epoxy insulators, bushings and stand-offs, or any piece of electrical equipment subjected to severe arcing or tracking.

Dow Corning® 630 protective coating is transparent, dries to a flexible, non-melting, wax-like, water-repellent coating. It is easily removed for component repair by soaking in solvent and brushing, or by an ultrasonic solvent bath.

Dow Corning® GP-77 varnish is a tough, multi-purpose impregnant for Class A, B, F and H systems. Applied by dipping, flooding or impregnating, this varnish is used on equipment designed for operation at temperatures to 200 C, including random- and form-wound stators, dry-type transformers, and high-speed armatures.

Dow Corning® 997 varnish is designed for continuous service at temperatures to 250 C, gives superior protection against overload, severe duty cycling, high-temperature ambients, many chemicals, corrosive atmospheres and other environmental hazards. It has many times the thermal life of organic Class B varnishes.

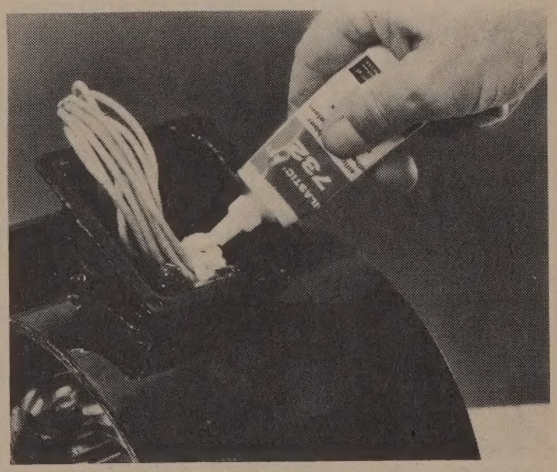
Dow Corning® 1890 protective sealer is an easy-to-apply silicone rubber dispersion used to form a tough, rubbery protective coating on motor stator windings, bus-bars, transformers, splices and connections and many types of electrical hardware. It protects against moisture, abrasive dust, chemicals and weathering, can be applied by spraying or brushing.

ONE-PART RTV ADHESIVE/SEALANTS

One-part, ready-to-use Dow Corning® and Silastic® brand adhesive/sealants are general-purpose, room-temperature-curing materials suitable for a wide range of applications. When fully cured, they have all the physical and electrical properties typical of silicone rubber, including excellent heat stability, resistance to weathering, moisture and ozone, and excellent insulating properties.

They are supplied in collapsible tubes or dispensing cartridges, and are easily extruded onto the surface where the bond or seal is desired. They are easily worked with a spatula . . . do not sag or slump of their own weight, even on vertical or overhead surfaces. For maximum adhesion on surfaces other than silicone rubber, Dow Corning® 1203 primer is recommended.

Silastic® 732 adhesive/sealant is used to bond metals, glass, plastic, silicone rubber, asbestos and ceramics. Typical uses include insulating and sealing wire and cable splices and connections; holding conduit terminal boxes in place; and bonding components to printed circuits. It retains its flexibility from −60 to 260 C, provides excellent electrical insulating properties, and resists weathering, moisture, ozone and other harsh environmental conditions.



Dow Corning® 3144 RTV noncorrosive adhesive/sealant cures without releasing corrosive byproducts. It is ideal for use in contact with copper, particularly printed circuit boards, small-diameter wire, and other corrosion-sensitive electronic components. It is a translucent, toothpaste-consistency material that cures tack-free in 24 hours. It offers unusually high strength, and retains its resilience from −75 to 250 C.

Dow Corning® 3145 RTV noncorrosive adhesive/sealant is an opaque version of 3144.

DOW CORNING CORPORATION, MIDLAND, MICHIGAN 48640

DOW CORNING

DOW CORNING® SILICONE MATERIALS

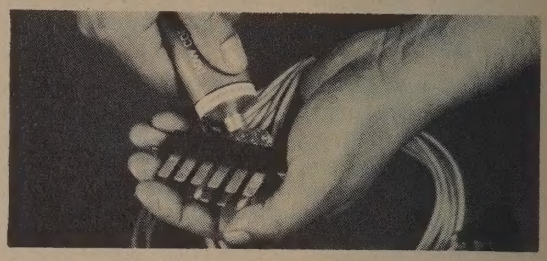
DIELECTRIC COMPOUNDS

Dow Corning supplies a variety of non-hardening, water repellent, grease-like silicone compounds for use as water-repellent seals and insulators for switches, cable connectors, battery terminals and many other applications. These materials withstand harsh environments, are noncorrosive to metals, inert to most plastics, and practically nonvolatile.

Dow Corning® 3 and 103 compounds are used to reduce corrosion on switch contacts and battery terminals; to lubricate rubber and plastic O-rings and seals; to insulate and waterproof ignition systems, control switches and circuit breakers; to prevent sticking of switches exposed to icing conditions. They are serviceable from —40 to 200 C and withstand a wide range of harsh conditions.

Dow Corning® 7 and 107 compounds are light gray, translucent materials that can be applied as supplied, or dispersed in a solvent and applied by brushing or spraying. They serve as excellent mold release agents.

Dow Corning® 4 compound, similar to the 103 compound, features constant consistency from −100 to 200 C. It is designed to meet the requirements of MIL-I-8660B. Applications include use on battery terminals, switch contacts, relays, high tension ignition harness and as a lubricant for O-rings and seals made from rubber and plastics.



HEAT SINK COMPOUND

Non-hardening, non-melting heat sink compound provides the fast heat removal that keeps diodes, transistors, rectifiers and other electrical and electronic devices operating longer and more efficiently.

Dow Corning® 340 silicone heat sink compound is a grease-like silicone material heavily filled with heat-conductive metal oxides. Thermal conductivity (k factor) is in the range of 0.0015 cal/cm²-sec-(°C/cm).

Product Type	Product Designation	Packages
Potting and Encapsulating Resins	Sylgard® 51 dielectric gel	1, 8, 40, 400 lb. cans
	Sylgard® 182 resin, clear, heat cure	1, 11, 55, 5, 50 lb. kits
	Sylgard® 183 resin, black, heat cure	
	Sylgard® 184 resin, clear, RT cure	
	Sylgard® 185 resin, black, RT cure	
	Sylgard® 186 resin, translucent, RT cure (high strength)	
	Sylgard® 187 resin, black, RT cure (high strength)	
	Sylgard® 3150 resin, white, heat cure (one part)	1, 10, 50, 500 lb. cans
	Sylgard® primer	pint and gallon cans
RTV Rubber Encapsulants	Dow Corning® 3110 RTV encapsulant	1 lb., 10 lb. pail, 50 lb. pail
	Dow Corning® 3112 RTV encapsulant	
	Dow Corning® 3116 RTV encapsulant	
	Dow Corning® 3120 RTV encapsulant	
	Dow Corning® RTV catalyst F, S, H, 1 and 4	tubes, 1 lb., 5 lb. and 10 lb. cans
	Dow Corning® 3118 RTV encapsulant (4% catalyst)	1 lb., 10 lb. pail, 50 lb. pail
Impregnating Varnishes	Dow Corning® GP-77 varnish	1 and 5 gallon cans, 55 gallon drums
	Dow Corning® 996 varnish	1 and 5 gallon cans, 55 gallon drums
	Dow Corning® 997 varnish	pint, gallon, 5 gallon, 55 gallon drums
Protective Coatings	Dow Corning® 1890 protective sealer	2 lb. jar, 8 lb. and 38 lb. pails
	Dow Corning® 991 varnish	1 and 5 gallon cans, 55 gallon drums
	Dow Corning® 630 protective coating	pint, gallon, 5 gallon
	Dow Corning® 3140 and 3141 RTV noncorrosive coatings	2 oz. tubes; 1 lb. cans
Adhesive/Sealants	Silastic® 732 RTV adhesive/sealant	2 and 5 oz. tubes; 6 and 12 oz. cartridges
	Dow Corning® 899 RTV adhesive/sealant	12 cartridges/carton (cartridge 1/12 gal.)
	Silastic® 140 RTV adhesive/sealant	2 and 5 oz. tubes; 6 oz. cartridges
	Dow Corning® 3144 and 3145 RTV adhesive/sealants	2 oz. tubes; 12 oz. cartridges
Compounds (Dielectric)	Dow Corning® 3 and 103 compounds	2 and 8 oz. tubes; 10 and 50 lb. cans
	Dow Corning® 7 and 107 compounds	2 and 8 oz. tubes; 10 and 50 lb. cans
	Dow Corning® 4 compound	2 and 8 oz. tubes; 10 and 50 lb. cans
	Dow Corning® 19 compound	8 oz. tubes; 10 lb. cans
Compounds (Heat Sink)	Dow Corning® 340 heat sink compound	5 oz. tubes; 14 oz. cartridges; 20 lb. and 100 lb. pails

DOW CORNING CORPORATION, MIDLAND, MICHIGAN 48640

DOW CORNING

DOW CORNING® SILICONE MATERIALS

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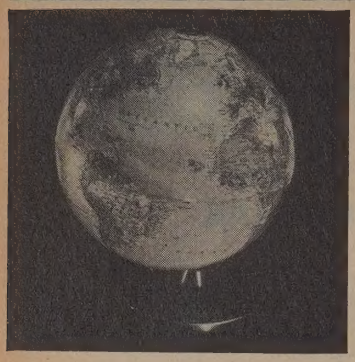

Worldwide Service and Prompt Delivery for Quartz, Lucalox® and Electronic Glass Products

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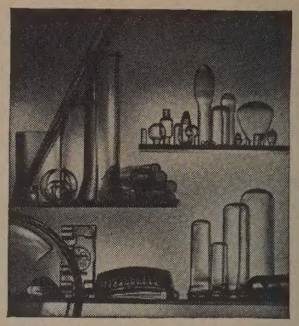
GLASS

Machine-pressed shapes, formed to specification without additional grinding and polishing, can be furnished in a wide variety of glass compositions. At far right, is an example of an as pressed lens system for an audio visual entertainment unit for children. A highly experienced staff is available for customized orders in glass tubing, special glass formulations (beads) and other glass components.



L

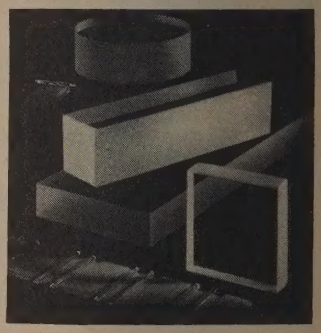
LUCALOX®

Lucalox®, a polycrystalline alumina, is available in standard tubing, rod, plates, discs and custom parts. This versatile ceramic is ideal for such critical applications as electrical insulators in corrosive environments, where wear surfaces require dimensional stability and for windows when low loss factor is important. Lucalox can transmit up to 90% of total light in the visible spectrum. Outstanding characteristics include: chemically inert to cesium, fluorine, sodium, potassium; transmits radiation in both visible and infrared wave lengths; surface may be polished to less than one micro-inch; high dielectric strength. Lucalox can be fabricated to complex specifications. Standard shapes in stock.

Q

QUARTZ

General Electric high purity fused quartz is available in clear and translucent tubing and rod, solid shapes, standard fabrication, and to custom specifications. New Type 125 fused quartz, a high-quality, economical material which features the absence of large bubbles, is suitable for commercial grade optical and mirror applications. It has low stress birefringence and high transmission in both UV and IR wavelengths.



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SINCE 1922

Insulating Tubings and Sleevings- High Temperature Wire and Cable

HYGRADE®

HYGRADE Fabric-Base Insulating Sleevings, the oldest and best known in the industry, are constructed of carefully braided fiberglass yarn, impregnated and coated with varnishes, vinyls, resins, or silicone rubber compounds.

HYGRADE SR-398 Silicone Rubber Coated Fiberglass Sleeving is a Class H material of closely woven glass braid coated with highly abrasion-resistant silicone rubber.

HYGRADE SV-862 Silicone Varnish Impregnated Fiberglass Sleeving is a flexible Class H insulation with unusual resistance to temperature extremes and weathering.

HYGRADE VF Flexible Fiberglass Sleeving is a tough, Class B insulation of plastic-covered fiberglass combining excellent electricals, flexibility, heat stability.

HYGRADE Polytube 463 Class F Flexible Fiberglass Sleeving is an acrylic-coated material compatible with the wire enamels used in motors and transformers.

HYGRADE Polytube 962 Class F Flexible Fiberglass Sleeving is a polyurethane-coated insulation compatible with the wire enamels in motors and transformers.

HYGRADE Thermoflex 1200 Class C Flexible Fiberglass Sleeving is made of 100% tightly braided fiberglass. For use at continuous temperatures as high as 1200°C.

HYGRADE Thermoflex 500 Class C Flexible Fiberglass Sleeving is made of tightly braided and pigmented fiberglass. For continuous operating temperatures to 500°C.

Ask for data sheets on these HYGRADE and FLEXITE products

FLEXITE®

Included in the FLEXITE line are extruded plastic tubings of Teflon, Silicone Rubber, Vinyls, Polyethylene, Nylon, and other plastics; Shrinkdown Heat Shrinkable extruded Tubings; and TGL Triangular Guide Line Wrapping Tape.

FLEXITE TFE Extruded Tubing of DuPont Teflon is a flexible material for continuous use at 250°C, with outstanding electricals, heat stability, chemical resistance.

FLEXITE AR-400 Modified Teflon Tubing is a flexible material with exceptional abrasion and cut-through resistance at temperatures from —70°C to 250°C.

FLEXITE SR-200 Silicone Rubber Extruded Tubing is made of an extremely elastic compound, and is excellent for high voltage applications at Class H temperatures.

FLEXITE Teflon FEP Extruded Tubing is a fluorocarbon tubing suitable for continuous use at 200°C. It possesses outstanding electricals and chemical resistance.

FLEXITE HT-105C Extruded Vinyl Tubing is U/L recognized for continuous use at 105°C. It is a strong, very flexible tubing suited for many general applications.

FLEXITE E Extruded Vinyl Tubing is an extremely flexible tubing designed primarily for low temperature applications (to —68°C), as in aeronautical instrumentation.

FLEXITE Polyethylene is a flexible Class A tubing offering excellent electricals, compatibility and abrasion resistance over a wide (—70°C to 80°C) temperature range.

FLEXITE Shrinkdown HT-105 Heat Shrinkable Tubing is a flexible material supplied in expanded sizes to cover shapes; it shrinks 50% on application of heat (190°F).

FLEXITE Shrinkdown PO-135 is a Class B flexible tubing which shrinks at 235°F. It is widely used to jacket cables, insulate terminals, and as a printed marker.

FLEXITE Shrinkdown TE-250 is a Heat Shrinkable Teflon Tubing for use at Class H temperatures. It shrinks at 621°F to make a form-fitting Teflon cover over shapes.

1 SOURCE *for* EXCELLENCE *in Insulating Tubings and Sleevings • High Temperature Wire and Cable*

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Dilectrix FLUOROFILM® TFE and TFE/FEP TEFLON TAPES AND FILMS

Fluorofilm is a void-free multilaminar cast film. It is fabricated by the unique Dilectrix continuous casting process, wherein each micro-thin lamina is independently sintered and cured. Each successive lamina is fused to the preceding one until the predetermined thickness is achieved. This process yields two important features: freedom from voids or pinholes and greater tensile strength.

Dilectrix Fluorofilm cast Teflon films and tape conform to Military Specification MIL-P-22241A. The basic film is cast in thicknesses from ⅛ mil to 5 mils, widths from ¼" to 12", and splice-free continuous lengths of 500 ft.

TYPE	THICKNESS RANGE (MILS)	DESCRIPTION	TYPICAL APPLICATIONS
C	⅛ to ¾	Cast TFE† film.	Delay lines, insulation and capacitor dielectric — General purpose insulation.
CD	¼ to ¾	Cast TFE film, Duplex wound. 2 rolls, of same film thickness, wound on one core.	In capacitors to eliminate dust between layers, loading of only 2 rolls on winders, stands higher tension when winding on mandrels.
CM	¼ to ¾	Cast TFE film. One side metallized. Pure aluminum vacuum applied, controlled thickness produces resistance of approx. 1 ohm/sq. in.	Conductor and dielectric in single unit for capacitor manufacture. Available with insulated margins. Reduces unit size and reject loss.
DF-100**	1, 2, 3, 4 & 5	Multilaminar TFE film. Processed for void-free and pinhole-free qualities.	Wire and cable wrapping, coil interlayer, slot and phase insulation. Anti-friction surfaces.
DF-1700**	1, 2, 3, 4 and 5	Multilaminar TFE. One side FEP coated and heat bondable.	Folded and weld-seamed, an excellent chemical tubing resistive to corrosive fumes, gases, liquids.
DF-1700-DB**	2, 3, 4 & 5	Multilaminar TFE film. Both sides FEP coated and heat bondable.	Insulation over wire shielding because it takes lower temperature to weld it together than is required for an extruded, unsintered TFE tape.
DF-1100**	2, 3 and 4	Multilaminar TFE film. One Side Receptive to Adhesives by a Proprietary Surface Treatment.	Same as DF-500 but for more exacting applications.
DF-1200**	2, 3 and 4	Multilaminar TFE film with Pressure Sensitive Backing.	Most versatile. Adheres to most any surface: Metal, wood, ceramics, plastics, etc. Used as harness bundling, spot insulation, slot linings, core wrapping. For non-slip surfaces, gasket facings, etc.
DF-1300	2½ only	Multilaminar TFE film. Black. Both Sides Coated for Epoxy Adhesion.	Coil wrappings where epoxy potting resins are used.
DF-1400	2½ only	Multilaminar TFE film. Black. Treated to make both sides conductive.	Ideal for low noise cable wrapping.

PHYSICAL AND MECHANICAL PROPERTIES

TYPICAL FOR ALL DILECTRIX MULTILAMINAR CAST TEFLON FILMS			
PROPERTY	VALUE	ASTM METHOD	FOR DF-1200 ONLY
Specific Gravity	2.1-2.2	D1505-67	
Tensile Strength—Machine Direction lbs./sq. in.	4,300	D882-54T	3000
Transverse Direction lbs./sq. in.	3,500	D882-54T	3000
Elongation—Machine Direction—%	400	D882-54T	300
Transverse Direction—%	400	D882-54T	300
Thermal Stability, wt. loss/hr. at 600°F.	0.0002%	D-624	
Stiffness, 77°F, lbs./sq. in.	40,000-60,000	D-747	
Water Absorption, %	0.00	D570-42	
Moisture Permeability, 0.001" gms./100 sq. in./dia.	0.2		
Specific Heat (100°-260°F) BTU/lb./°F	0.25		
Coefficient of Thermal Linear Expansion/°F, 77°-140°F	5.5×10^{-5}	D696-44T	
Brittleness Temperature, °F	<-100		
Maximum Continuous Service Temperature, °F	+500 to −400		375
Flammability, in./min.	non-flammable	D635-44	
Resistance to weathering	excellent		
Static or Kinetic Coefficient of friction against polished steel	0.04		
Solvent Resistance	unaffected by any known solvent		
Chemical Resistance	excellent		
Bond Strength to Steel			40 oz./1" width

ELECTRICAL PROPERTIES

Dielectric Constant, 60-10^8 Cycles	2.0	D150-54T	
Power Factor, 60-10^8 Cycles	<0.0003	D150-54T	
Volume Resistivity, ohm-cm.	$>10^{15}$	D257-52T	
Surface Resistivity, 100% R.H., Megohms	3.6×10^6	D257-52T	
Dielectric Strength, Short Time (0.001") V/Mil.	3400	D149-55T	3000
Surface Arc Resistance, Sec.	Does not track	D495-48T	

Dilectrix films are available in continuous roll lengths of 100 or 500 ft., in widths from ¼" to 12" in increments of 1/32".
*Price quotation and samples furnished upon request. **The above types are available in colors. †TFE is DuPont's Teflon*

Dilectrix CORPORATION A SUBSIDIARY OF NATVAR CORPORATION • 69 Allen Blvd., Farmingdale, N.Y. 11735

NATVAR – one source for all types of flexible electrical insulation

ATVAR COATED FIBERGLASS SLEEVINGS

atvar coated fiberglass sleevings combine the strength and eat-resistance of a braided glass fiber sleeve with selected oatings to achieve strong, reliable insulations for all tempera-ures up to Class 180. The various coatings have been selected or the optimum combination of properties required for their espective temperature ranges. All Natvar coated sleevings are nspected and tested in accordance with ASTM Specification)-350. They conform to ASTM D-372 and applicable NEMA and nilitary specifications.

NATVAR STYROFLEX® Capacitor Film

Natvar Styroflex film permits the manufacture of close tolerance capacitors with high yields and exceptional insulation resistance values. Styroflex is available in thicknesses from 0.00025″ to 0.006″ and widths from ½″ to 10″.

NATVAR VINYL TUBINGS

Natvar vinyl tubings are available with a wide range of properties. Each class of tubing is produced from a vinyl compound especially formulated to yield the most favorable properties for the intended use. Natvar tubings are offered to conform to the following specifications: MIL-I-63ID, Type F, Form U: Grade A, Class I, Category I; Grade A, Class II, Category I; Grade B, Class I and II, Category I; Grade C, Class I and II, Category I. MIL-I-7444B. MIL-I-22076A.

NATVAR COATED MATERIALS

Natvar manufactures a complete line of cured and semi-cured (B Stage) coated fabrics for all temperature classes. Coatings include silicones, polyesters, epoxides, isocyanates and acrylics. Base fabrics are cambric, fiberglass, polyester-fiberglass and Nomex*-fiberglass. They are inspected and tested in accordance with appropriate ASTM and NEMA standards, and conform to Military Specifications where applicable.

*DuPont trademark

COATED FABRICS AND COMPOSITES

CLASS 180°C
- Silicone Rubber Coated Fiberglass
- Silicone Varnished Fiberglass
- Coated Fiberglass and Quinorgo Combination
- Dura™ Resin B-Stage Products
- Polytemp™ Polyester Coated Fiberglass

CLASS 155°C
ISOCYANATE COATED FABRICS
- Isoglass® Coated Fiberglass
- Isoteraglas® Coated Polyester-Glass
- Novaglas-P® Coated Nomex*-Glass
- Isoplex® Various Fiberglass, Asbestos or Film Composites
- F-LAR™ Structured Polyester Film
- Semi-Cured (B Stage) Coated Fabrics

CLASS 130°C
- Teraglas® Varnished Polyester-Glass
- Varnished Fiberglass
- Varnished Polyester Film
- Various Fiberglass and Asbestos Composites
- Acryliglas® Acrylic Coated Fiberglass

CLASS 105°C
- Varnished Cambric
- Oil Packed Varnished Cambric
- Varnished Cambric and 100% Rag Paper Composite

FLEXIBLE SLEEVING

CLASS 180°C
- Silicone Rubber Coated Fiberglass Sleeving

CLASS 155°C
- Isolastane® Fiberglass Sleeving
- Acryliglas® Fiberglass Sleeving

CLASS 130°C
- Vinyl Coated Fiberglass Sleeving

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- Styroflex® Capacitor Film

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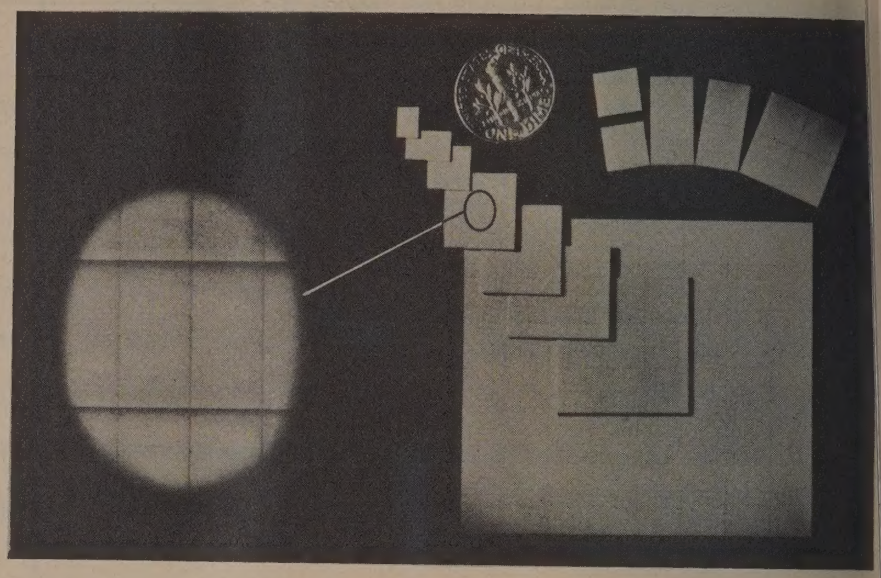
MULTIPART ALUMINA SUBSTRATES

FEATURES

- Multi-printing for economical production
- Net sizes to less than .10 square inches
- Minimum kurf for high density thin films
- 96% to 99.5% Al_2O_3
- Variety of sizes, colors, finishes, metallizations available
- Glazed 96% available for inexpensive thin films



GENERAL DESCRIPTION

Varadyne's MULTIPART alumina substrates have found particular acceptance in hybrid microelectronics and semiconductor industries. High standards in grain size control and laminating compaction have yielded high density substrates in which the user can expect straight, accurate separation of individual pieces, as well as smoother, more uniform surfaces.

Kurf loss of MULTIPART substrates is less than .003 inches wide with the depth approximately 50% of material thickness. As a result, a single part can be easily snapped from the multipiece substrate with minimum loss in area and without rounded, jagged, or severely chamfered edges.

MULTIPART substrates are available in a variety of shapes, sizes, colors, metallizations, and surfaces, including glazed or polished finish. Typical size is 2 x 2 inches; other sizes can be accommodated. Metallization is one of Varadyne's specialties, with molymanganese, thin film patterns, or any number of thick film inks (also produced by Varadyne) available. Both thick and thin film conductor-resistor networks are trimmed to tolerances specified by the customer; less than 0.1% can be maintained.

DESIGN CRITERIA

PARAMETER	AQL	STANDARD
Outside Dimensions	1.5 cum.	±1%, none less than ±.003″
Critical Dimensions (when required)	1.5 cum.	±½%, none less than ±.002″
Hole Centers	1.5 cum.	±1%, none less than ±.003″
Hole Diameters	1.0 cum.	±10%, none less than ±.001″ and none more than ±.005″
Hole Diameters (glazed)	1.0 cum.	±10%, none less than ±.002″ and none more than ±.005″
Thickness	1.0	±10%
Scored Substrates		Substrates should break to ±1%, none less than ±.006″
Camber	2.5	.004″ per inch, none less than .002″

HOW TO ORDER

When ordering substrates, specify each of the following categories:

Al_2O_3 PURITY

96%
99.5%

PLATING

Nickel
Copper
Silver
Tin
Gold

COLOR

White
Blue
Pink (opaque)
Black
Coral

THICKNESS

Range:
.005 to .028

METALLIZATION

Molybdenum-manganese
Palladium-gold
Platinum-gold
Palladium-silver
Gold
Chrome-copper
Chrome-gold

SURFACE FINISH

1 glaze
2 polish
10 as fired (99.5%)
24 as fired (96%)

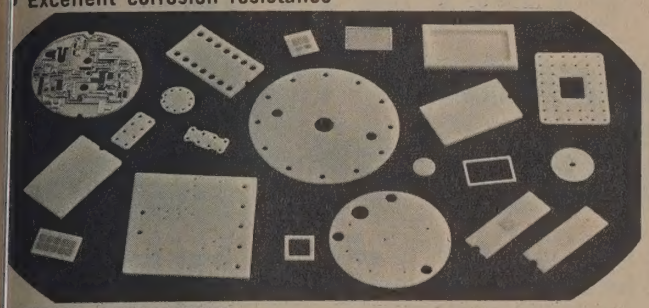
SIZE

A number of segment sizes established as industrial standards are readily available. Typical multipart size is 2″x2″; others are supplied upon request.

LUMINA SUBSTRATES CAPABILITIES

EATURES

- Excellent for thick and thin film applications
- Surface finish less than 25 microinches
- Camber less than .004in./in.
- High dielectric strength, low dielectric loss
- High resistivity
- Excellent corrosion resistance



GENERAL DESCRIPTION

Varadyne's experience in ceramic and ceramic-metal components provides a source for alumina substrates in virtually any size and shape, metallized or unmetallized. VS-95, an extremely hard, vitreous, 95% aluminum oxide (Al_2O_3) body, is manufactured with a 25 microinch or better as-fired surface for use in thick film work, and a glazed surface for thin film work.

Substrates are also available in 85 to 99% Al_2O_3, glazed or unglazed, for similar applications. All substrates can be supplied in colors for application coding and traceability. The smoother and flatter surface of the substrates assures pattern definition and deposit uniformity. Varadyne alumina substrates have inherently high mechanical strength and are capable of high temperature operation. They possess excellent thermal conductivity properties, allowing the hybrid circuit desginer to achieve maximum power packaging density.

Varadyne's most unique substrate capability is substrate metallization. Thick and thin film conductor and resistor networks are available with resistors trimmed to tolerances specified by the customer. In addition, molymanganese metallization can be provided, plated or unplated.

APPLICATIONS AND CONFIGURATIONS

- Base material for thick and thin film hybrid circuits
- Parts for ceramic flat packs
- Insulators and standoffs
- Available in colors and opaque
- Scored substrates
- Any size and shape up to 3" x 4" x .050"
- Holes as small as .010" in any shape
- Gold and gold over nickel plating (MoMn base)
- Solder coated

DESIGN CRITERIA

Parameter	AQL	Standard
Outside Dimensions	1.5 cum.	±1%, none less than ±.003"
Critical Dimensions (when required)	1.5 cum.	±½%, none less than ±.002"
Hole Centers	1.5 cum.	±1%, none less than ±.003"
Hole Diameters	1.0 cum.	±10%, none less than ±.001" and none more than ±.005"
Hole Diameters (glazed)	1.0 cum.	±10%, none less than ±.002" and none more than ±.005"
Thickness	1.0	±10%
Scored Substrates		Substrates should break to ±1%, none less than ±.006"
Camber	2.5	.004" per inch, none less than .002

PROPERTIES

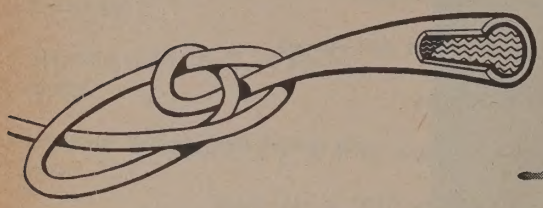
Property	Unit	VS-95 95% Al_2O_3
Water Absorption	%	Impervious
Specific Gravity		3.71
Density	lbs. per cu. in.	.129
Color		White
Safe Temperature at Continuous Heat	°C	1 500
	°F	2 732
Hardness	Mohs' Scale	9
	Rockwell 45 N	74
Thermal Expansion Linear Coefficient	Per °C 25-100°C	5.6×10^{-6}
	Per °C 25-400°C	6.6×10^{-6}
	Per °C 25-700°C	7.2×10^{-6}
Tensile Strength	lbs. per sq. in.	28,500
Compressive Strength	lbs. per sq. in.	375,000
Flexural Strength	lbs. per sq. in.	48,000
Resistance to Impact	inch-lbs.	7.0
Thermal Conductivity* −25°C	cal cm/sec cm²°C	.072
Dielectric Strength, 60 Cycle ac, Test Discs ¼" Thick	volts per mil	250
Volume Resistivity 25°C	Ohm-centimeters	1.9×10^{14}
Volume Resistivity 500°C	Ohm-centimeters	8.0×10^{8}
Volume Resistivity 1000°C	Ohm-centimeters	2.9×10^{5}
Te Value†	°C	900
	°F	1652
Dielectric Constant, 1 Mc, 25°C		8.9
Dissipation Factor, 1 Mc, 25°C	.0002	
Loss Factor, 1 Mc, 25°C	.0017	

* Conversion factor: 1 cal cm/sec cm² °C = 2902 BTU in./hr ft² °F

† Te value is the temperature at which a centimeter cube has a resistance of one megohm.

RELIABLE PRODUCTS DELIVERED ON TIME

VARFLEX *the complete line of electrical insulating sleeving and tubing*



Whatever your problem, heat, cold, flexibility miniaturization, high insulating or dielectric strength—Varflex can supply the required reliability and delivery. Our rapidly expanding plant is fully equipped to supply sleeving for any combination of characteristics you may need. In addition to maintaining large stock for off-the-shelf delivery, Varflex has the productive capacity to provide prompt delivery (often 48 hours) on special orders. As insulation specialists, we are ready to work with you on unusual specifications or applications.

Check your needs against this complete line:

VARGLAS SILICONE RUBBER. Tubing: The ultimate in flexibility, yet dielectric protection to 8000 volts. Class H-A-1 certified to meet Government Specification MIL-I-18057 (SHIPS). Class H-B-1 (4000 volts) available, also. Continuous exposure from minus 70° to 400°F. does not affect coating or Fiberglas braid. Sleeving: Made in Class H-C-1 (2500 volts), Class H-C-2 (1500 volts) and Class H-C-3.

VARGLAS SILICONE RESIN. Tubing: Class H-A-1 is recommended for applications requiring extremes of heat endurance and high dielectric strength (7000 volts). Class H-B-1 is identical except for dielectric guarantee (4000 volts). Good abrasion resistance. Both grades conform to MIL-I-3190A. Sleeving: Made in Classes H-C-1 (2500 volts), H-C-2 (1500 volts) and H-C-3.

SILFLEX SLEEVING. A light coating of Silicone resin on Fiberglas braid. Extremely flexible within a temperature range from minus 85°F. to 500°F.

VARGLAS SILICONE LEAD WIRE. Made from solid or stranded wire covered with one or more walls of Fioerglas braid and impregnated with Silicone. Built to your specifications.

VARGLAS SILICONE TYING CORDS. Continuous filament Fiberglass cords impregnated with Silicone resin, 1/64" to 1/4" diameter. Specify Type 46 for dry cure, Type 48 for tacky cure.

VARGLAS CLASS F TUBING. Made with synthetic resins such as epoxy, polyester or urethane on glass braid and offering better than Class B heat resistance (up to 155°C for continuous operation) while maintaining good electrical properties.

VARFIL TUBING AND SLEEVING. Fiberglas braids impregnated with polyester resin. Four grades available in coils as well as 36" lengths in most sizes. In a class by itself because of its toughness, flexibility, high temperature resistance and ability to withstand bending and twisting without dielectric loss. Compatible with varnish. Over 1000 hours at 125°C., with intermittent operation at 150°C.

VARFLO TUBING AND SLEEVING. Class B insulation. For those who need flexibility, solvent, oil and moisture resistance. Has good shelf life and will not lose dielectric strength when subjected to severe twisting. Three grades . . . Classes B-A-1, B-B-1 and B-C-1. Flame and fungus resistant if specified. B-A-1 approved under MIL-1-21557. Passes proposed Navy 90° bend test after 2,000 hours at 300°F with 3500 volt end point.

VARGLAS VARNISHED TUBING. Flexible continuous coatings of flame resistant varnish built up over Fiberglas braid in eight or more carefully controlled operations. Varnished tubings have thinner walls and good heat resistance.

VARGLAS VARNISHED SLEEVING. NEMA Classes B-C-1, B-C-2 and B-C-3 are similar except for dielectric strength. The impregnant is oleoresinous varnish.

VARGLAS ACRYLIC CLASS F (155°C). Highly resistant to acids, organic solvents, oils and water and exhibits fair resistance to alkalies. It is compatible with polyester, acrylic, epoxy, phenolic and formvar wire enamels. Designed to perform for long periods in the 150°C-175°C range without loss of any electric or physical properties. All standard grades.

VARGLAS LECTON ACRYLIC. Specifically designed for hermetic motors. Non-contamination of Freon and other refrigerants in Class B motors. B-A-1, B-B-1, and B-C-1 grades.

VARGLAS NON-FRAY SLEEVINGS: Type H: The normalizing treatment given the Fiberglas braid removes the organic impurities and tends to hold the individual filaments together. The lack of any bonding agent means it may be subjected to temperatures as high as 1600°F. Recommended for applications where dielectric requirements are not of prime importance. Resists fungus and is noncorrosive. Type HP: Similar to Type H, but dyed various colors for coding purposes. Ideal as secondary insulation where primary covering might disintegrate due to high temperature or continual flexing. Colors may fade at 300°F. Type HO: A very light treatment of resin added after the braid has been normalized—just enough to hold the sleeving round for accurate cutting. Will distend to cover soldered joints or terminals. Available in eight colors. Colors fade at 300°F., but sleeving unaffected up to 1600°F. Better by 400° than formerly available.

VARGLAS LITEWALL SLEEVING. Wall thickness of Type A is .008" and of Type B, .006". Both types available untreated or treated. If treated, may be supplied in colors. Standard I.D. sizes 1/16" to 1/2" inclusive. Larger sizes on request.

SYNTHOLVAR EXTRUDED TUBING. Made from vinyl polymers. High dielectric and tensile strength. Will not support combustion nor absorb moisture. Smooth surface, thin wall and flexibility all make for ease in assembling operations. Super HH for installations where temperatures of 105°C. must be withstood. Type XLT will function at temperatures down to —65°C. Specify fungus resistant tubing where needed. Conforms to applicable MIL specifications.

COTTON OR RAYON TUBING. These tubings are furnished with varnish as the impregnant. They are braided from long staple yarns. Standard NEMA grades. They are Classes A-A-1 and A-B-1. Also, sleeving is available in three NEMA grades. Classes A-C-1, A-C-2 and A-C-3.

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Varflex products meet or exceed applicable government specifications including: MIL-I-18057A, MIL-I-3190B, MIL-I-7444B, MIL-I-631D, MIL-I-21557

TEFLON* TUBING

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PRODUCING ALL OUR PRODUCTS IN OUR OWN PLANT

SPECIAL CAPABILITIES

Extremely close tolerances on I.D., O.D., wall thickness and concentricity

Finer sizes than covered by published specifications

Straight lengths

Long lengths of expanded tubing in all sizes

SPECIFICATIONS

Zeus will manufacture tubing to the latest revisions of published specifications or to a customer's engineered specifications.

Specifications for TFE Tubing

Spaghetti: Tubing

MIL-I-22129	— Standard Wall	AMS 3655	— Thin Wall
CS 25263	— Standard Wall	AMS 3654	— Lightweight Wall
AMS 3653	— Standard Wall		

Heat Shrinkable TFE Expanded Tubing

MIL-I-23053/12	— All Wall Thickness and "Over Expanded"
AMS 3584	— "Over Expanded"
AMS 3585	— Thin Wall

Teflon Extrusions — Properties and Applications

An almost unlimited range of uses exists for Zeus Teflon extrusions. Their tolerance to temperatures from +500°F to −100°F and their excellent electrical properties make them ideal for a wide variety of insulation applications. (Dielectric breakdown voltage is as high as 1000 volts per mil of thickness.)

Teflon's resistance to ultra-hot and ultra-cold corrosive liquids and gases opens up another range of uses. Teflon is resistant to all known acids, alkalies and solvents. Water absorption is practically nil.

And Teflon's "anti-stick" properties make it ideal for a multitude of mechanical uses. Contact our engineers for helpful data on how Teflon extrusions can improve your products or processes.

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*TFE—Dupont trade mark "TEFLON"

TFE TUBING

AWG Spaghetti Sizes

Fractional inch electrical sizes (choice of standard wall, thin wall, or lightweight)

Fractional inch industrial sizes (heavier walls than standard wall electrical sizes)

Special wall thickness on request

EXPANDED TFE TUBING

For Heat Shrink Applications

4-2-1
2-2-1

- Medical, Electrical and Mechanical Grades
- Sizes to Published Specifications and
- Customers Close Tolerance Requirements
- Extra-Large Diameters Available
- Long Lengths
- Cut Pieces

TFE Profile Shapes

Long Lengths

Hollow or solid cross sections

Special Wire Constructions

TFE Heavy Wall Construction

Coaxial cores to extremely close tolerances and exceptional concentricity

SOLID TFE BEADING

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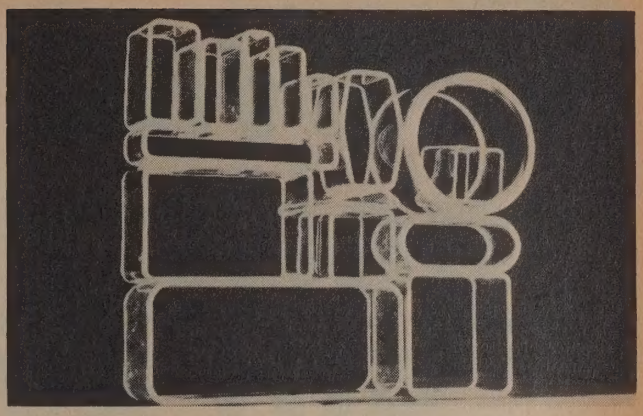

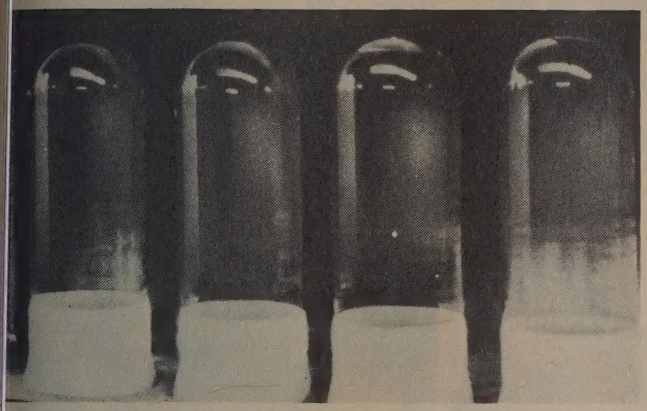

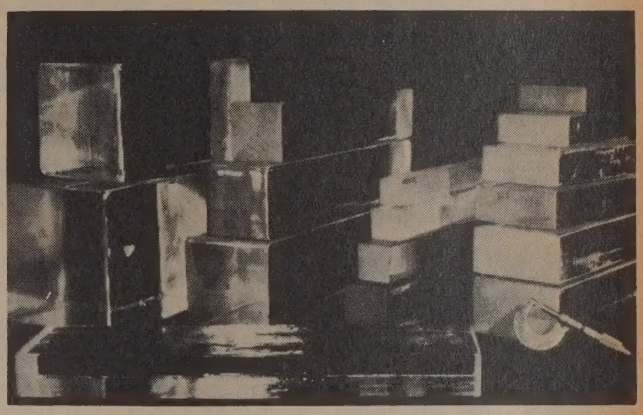

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When your plans call for fused quartz or fused silica, call us. Amersil produces both in forms that are highly pure, non-contaminating, resistant to acid and thermal shock, and exhibit high dielectric strength. Our materials can be ordered in a variety of forms and sizes that are either transparent, opaque, or combinations of each. Both types are available as furnace tubes, epitaxial reactors, bell jars, insulators, slice boats, diffusers, distillation apparatus, beakers, flasks, joints . . . and tubing, rod, plates and discs. Amersil is also sales agent for Worden Quartz microbalances and springs.

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Triple header

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Thermometals are thermostatic bimetals that change shape with temperature and build up force with change of temperature when constrained. They can be used for Temperature Indication, Control and Compensation or Sequence Control. Thermometals can be rolled to any thickness, formed into almost any shape . . . plated, brazed or welded.

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Ideal materials for contacts for heavy duty applications. Our special powder metallurgy processes make possible contacts of sintered materials that can't be alloyed. Available in rivet form, steelbacks, faced screws, discs, washers and special shapes. Assemblies available riveted, hot upset, welded or brazed.

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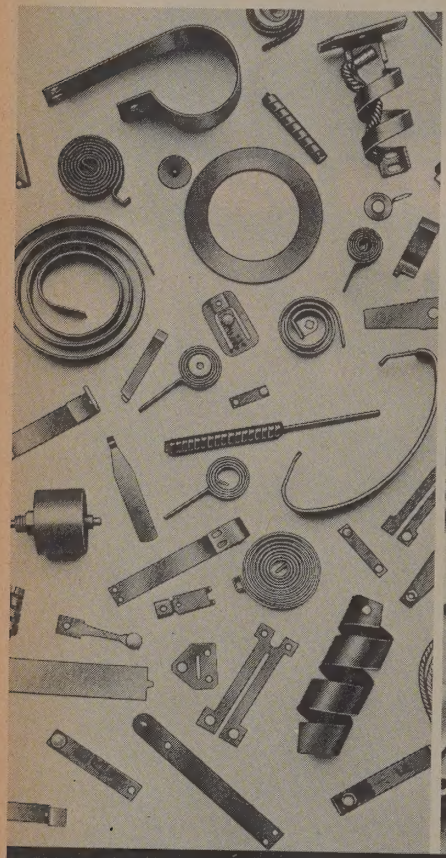
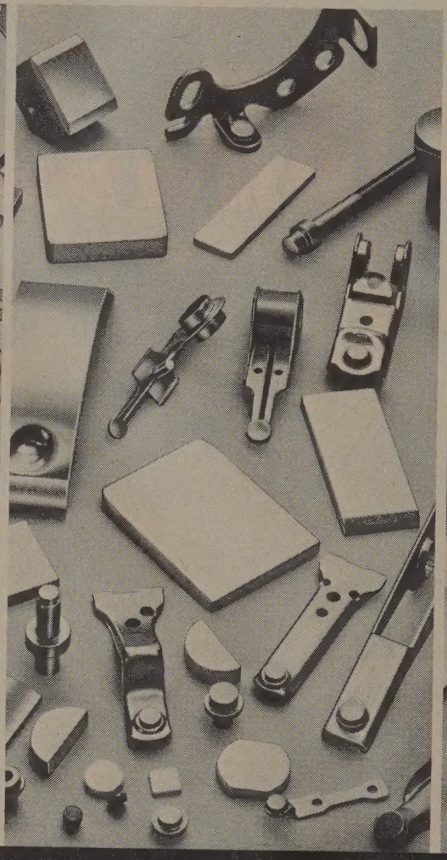
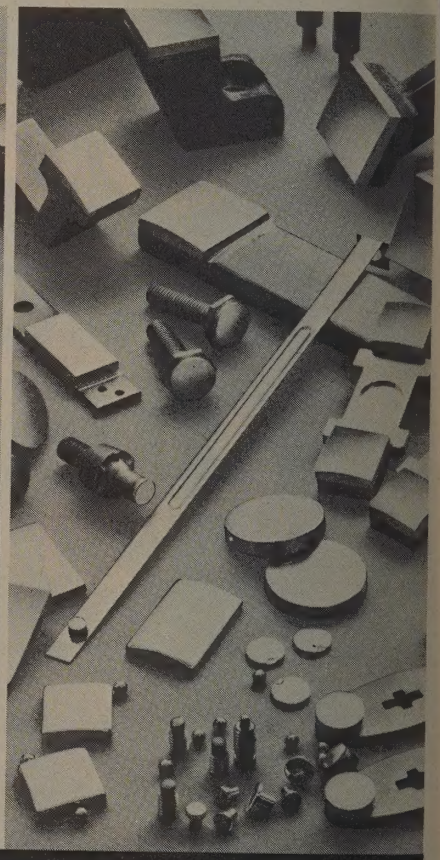
Over 1750 precious and sintered metals for electrical contacts. With this variety we can produce every conceivable form of contact in sizes ranging from microminiature to 1¼ in. square (NEMA #6 & #7) motor starters. Whether it's for make and break or for rotating systems we can design and produce the contacts you need.







We have the experience, the engineering and production capabilities to solve any of your contact or thermostatic metal problems. For information and/or engineering assistance write the H. A. Wilson Technical Service Department.

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27

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High purity iron oxides especially suited for use in both hard and soft ferrites and garnets. Available in both spheroidal and acicular shapes with average particle diameters from 0.2 to 0.8 microns. Impurities are at a minimum; Fe_2O_3 assay is 99.5% for the spheroidal type.

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- WIRE and ROD

Alloys can be supplied in commercial grade, electronic grade, vacuum tube grade, and in high purity 99.9%, 99.99%, 99.999%.

* Temperatures indicated are approximate and may vary slightly. Melting range indicates liquidus and solidus points.

Key to Abbreviations used:
Alum. — Aluminum
B. — Bor. — Boron
Cad. — Cadmium
Chrom. — Chr. — Chromium
Cop. — Copper
Mag. — Magnesium
Man. — Mang. — Manganese
Nick. — Nickel
Pallad. — Palladium
Phos. — Phosphorus
Silic. — Sil. — Silicon
Silv. — Silver
Tit. — Titanium

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE* Deg. Cent.	Deg. Fahr.
2388	83% Magnesium, 5% Zinc, 12% Aluminum	410 - 566	770 - 1050
2420	45% Silv., 15% Copper, 16% Zinc, 24% Cad.	627 - 635	1162 - 1170
2430	50% Silv., 15.5% Cop., 16.5% Zinc, 18% Cad.	626 - 636	1160 - 1175
2440	50% Silv., 15% Copper, 25% Zinc, 10% Cad.	627 - 640	1160 - 1185
2450	45% Silv., 18% Copper, 21% Zinc, 16% Cad.	616 - 643	1141 - 1190
2460	56% Silver, 22% Copper, 17% Zinc, 5% Tin	619 - 652	1145 - 1205
2465	81% Silver, 19% Germanium	653 - 653	1206 - 1206
2470	61% Silver, 24% Copper, 15% Indium	630 - 685	1166 - 1265
2480	82.7% Copper, 10% Silver, 7.3% Palladium	643 - 685	1190 - 1265
2485	50% Silv., 15.5% Cop., 16% Cad., 3% Nick.	632 - 688	1170 - 1270
2490	70% Silver, 30% Indium	281 - 693	537 - 1279
2500	35% Silv., 26% Copper, 21% Zinc, 18% Cad.	608 - 703	1125 - 1295
2503	45% Silv., 30% Cop., 12% Zinc, 13% Mang.	704 - 704	1298 - 1298
2507	80% Copper, 15% Silver, 5% Phosphorus	643 - 704	1190 - 1300
2510	80% Copper, 15% Silver, 5% Palladium	640 - 705	1185 - 1300
2515	60% Silver, 20% Copper, 7% Zinc, 10% Cadmium, 3% Tin	688 - 704	1270 - 1300
2520	30% Silv., 29% Copper, 21% Zinc, 20% Cad.	607 - 705	1125 - 1300
2530	60% Silver, 27% Copper, 13% Indium	635 - 705	1175 - 1300
2535	66.7% Silver, 22.3% Copper, 11% Zinc	693 - 716	1280 - 1320
2550	60% Silver, 25% Copper, 15% Zinc	682 - 718	1260 - 1325
2560	60% Silver, 30% Copper, 10% Tin	602 - 718	1115 - 1325
2565	65% Silver, 20% Copper, 15% Zinc	693 - 718	1280 - 1325
2570	87% Copper, 7% Phosphorus, 6% Silver	640 - 721	1190 - 1325
2573	60.5% Silv., 22.5% Cop., 7% Zinc, 10% Cad.	695 - 723	1285 - 1335
2577	60% Silv., 20% Copper, 10% Zinc, 10% Cad.	695 - 723	1285 - 1335
2580	50% Silver, 28% Copper, 22% Zinc	677 - 727	1250 - 1340
2590	40% Silver, 30.5% Copper, 29.5% Zinc	582 - 727	1080 - 1340
2600	75% Silver, 25% Zinc	705 - 730	1300 - 1345
2610	57.3% Silv., 32.7% Cop., 7% Tin, 3% Mang.	604 - 730	1120 - 1345
2613	67.3% Silv., 32.7% Cop., 7% Tin, 3% Mang.	604 - 730	1120 - 1345
2617	55% Silver, 31.5% Copper, 11.7% Zinc, 1.8% Nickel	704 - 734	1300 - 1355
2620	60% Silver, 30% Copper, 10% Zinc	604 - 743	1120 - 1370
2630	45% Silver, 30% Copper, 25% Zinc	677 - 743	1250 - 1370
2633	61% Silver, 24% Copper, 15% Zinc	682 - 745	1260 - 1375
2637	98% Silver, 2% Lithium	750 - 750	1382 - 1382
2640	34% Cop., 31.5% Silv., 15.5% Zinc, 19% Cad.	627 - 754	1165 - 1390
2650	70% Silver, 20% Copper, 10% Zinc	723 - 754	1335 - 1390
2653	66.7% Silver, 27.7% Copper, 5.6% Zinc	732 - 754	1350 - 1390
2655	66.7% Silver, 28.25% Copper, 5.05% Zinc	738 - 758	1360 - 1395
2657	72.15% Silver, 22.8% Copper, 5.05% Zinc	729 - 760	1345 - 1400
2660	68% Silver, 27% Copper, 5% Zinc	743 - 760	1370 - 1400
2663	68% Silver, 26.6% Copper, .4% Zinc, 5% Tin	743 - 760	1370 - 1400
2665	40% Silver, 35% Copper, 25% Zinc	727 - 763	1340 - 1405
2667	48% Copper, 32% Zinc, 20% Silver	743 - 766	1370 - 1410
2670	38% Copper, 32% Zinc, 30% Silver	743 - 766	1370 - 1410
2675	72% Silver, 28% Copper, + .2% Lithium	766 - 766	1410 - 1410
2680	93% Copper, 7% Phosphorus	714 - 770	1317 - 1418
2685	75% Silver, 20% Copper, 5% Zinc	732 - 774	1350 - 1425
2690	50% Silver, 34% Copper, 16% Zinc	690 - 775	1275 - 1427
2695	40.15% Copper, 32.85% Zinc, 27% Silver	732 - 776	1350 - 1430
2700	40% Silver, 30% Cop., 28% Zinc, 2% Nickel	670 - 779	1220 - 1435
2710	72% Silver, 28% Copper	779 - 779	1435 - 1435
2720	63% Silver, 27% Copper, 10% Indium	660 - 780	1220 - 1436
2725	40% Silver, 36% Copper, 24% Zinc	721 - 785	1330 - 1445
2740	91% Copper, 7% Phosphorus, 2% Silver	640 - 788	1185 - 1450
2753	75% Silver, 22% Copper, 3% Zinc	743 - 788	1365 - 1450
2757	92.75% Copper, 7.25% Phosphorus	710 - 793	1310 - 1460
2750	71.15% Silver, 28.1% Copper, .75% Nickel	780 - 795	1436 - 1463
2760	50% Copper, 40% Silver, 10% Manganese	800 - 800	1472 - 1472
2765	80% Copper, 15% Silver, 5% Phosphorus	643 - 802	1190 - 1475
2770	63% Silv., 28.5% Cop., 6% Tin, 2.5% Nick.	691 - 802	1275 - 1475
2772	75% Silver, 24.5% Copper, .5% Nickel	779 - 802	1435 - 1475
2774	88.75% Copper, 6.25% Phosphorus, 5% Silver	644 - 805	1190 - 1480

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE* Deg. Cent.	Deg. Fahr.
2775	89% Copper, 5% Silver, 6% Phosphorus	643 - 806	1190 - 1485
2776	92.8% Copper, 7.2% Phosphorus	707 - 806	1305 - 1485
2778	80% Silver, 16% Copper, 4% Zinc	738 - 810	1360 - 1490
2780	68.4% Silver, 26.6% Copper, 5% Palladium	807 - 810	1485 - 1490
2805	80% Copper, 15% Silver, 5% Phosphorus	641 - 816	1185 - 1500
2810	45% Copper, 35% Zinc, 20% Silver	727 - 816	1430 - 1500
2813	47.7% Copper, 32.8% Zinc, 19.45% Silver	782 - 816	1440 - 1500
2817	47% Copper, 35% Zinc, 18% Silver	782 - 816	1440 - 1500
2820	50% Gold, 29.5% Silver, 20.5% Copper	794 - 821	1460 - 1510
2840	49% Gold, 27.5% Silver, 23.5% Copper	794 - 824	1460 - 1515
2850	53% Gold, 23.5% Silver, 23.5% Copper	805 - 827	1480 - 1520
2860	77% Silver, 21% Copper, 2% Nickel	779 - 830	1435 - 1525
2865	60% Silv., 20% Zinc, 15% Copper, 5% Nickel	666 - 840	1230 - 1545
2870	58.3% Gold, 24% Silver, 17.7% Copper	815 - 843	1500 - 1550
2952	56% Copper, 37% Zinc, 7% Silver	857 - 871	1575 - 1600
2954	51.5% Copper, 45% Zinc, 3.5% Tin	863 - 877	1585 - 1610
2956	89% Nickel, 11% Phosphorus	877 - 877	1610 - 1610
2958	57.5% Copper, 25% Silver, 17.5% Zinc	680 - 887	1255 - 1625
2960	62.5% Silver, 32.5% Copper, 5% Nickel	779 - 885	1435 - 1625
2965	56% Copper, 40% Zinc, 4% Tin	866 - 888	1590 - 1630
2968	77% Nickel, 13% Copper, 10% Phosphorus	888 - 888	1630 - 1630
2970	80% Gold, 20% Copper	889 - 889	1632 - 1632
2987	92.5% Silver, 7.3% Copper, .2% Lithium	780 - 890	1435 - 1634
2990	92.5% Silver, 7.5% Copper	810 - 890	1490 - 1634
2993	79.5% Gold, 20.5% Copper	890 - 890	1635 - 1635
2880	60% Gold, 20% Silver, 20% Copper	835 - 845	1535 - 1553
2890	65% Silv., 28% Copper, 5% Mang., 2% Nick.	752 - 849	1385 - 1560
2895	58.5% Silver, 31.5% Copper, 10% Palladium	824 - 852	1515 - 1566
2900	53% Copper, 38% Zinc, 9% Silver	788 - 852	1510 - 1566
2920	54% Silv., 40% Copper, 5% Zinc, 1% Nickel	718 - 857	1325 - 1575
2922	52.5% Copper, 25% Silver, 22.5% Zinc	816 - 857	1500 - 1575
2924	40% Silv., 30% Copper, 25% Zinc, 5% Nickel	660 - 860	1220 - 1580
2926	50% Copper, 40% Zinc, 10% Silver	813 - 867	1495 - 1590
2928	52.5% Copper, 47.5% Zinc	854 - 869	1570 - 1595
2940	90% Silver, 10% Copper	779 - 870	1434 - 1598
2945	52% Copper, 38% Zinc, 10% Silver	821 - 871	1510 - 1600
2950	58% Copper, 37% Zinc, 5% Silver	857 - 871	1575 - 1600
2997	76.85% Nickel, 13% Chromium, 10% Phosphorus, .15% Manganese	879 - 894	1615 - 1640
3000	75% Gold, 20% Copper, 5% Silver	885 - 895	1625 - 1645
3010	52% Silver, 28% Copper, 20% Palladium	879 - 898	1614 - 1648
3020	95% Copper, 5% Phosphorus	714 - 900	1317 - 1653
3025	57% Copper, 42% Zinc, 1% Tin	889 - 899	1630 - 1650
3030	65% Silver, 20% Copper, 15% Palladium	850 - 900	1562 - 1652
3040	60% Gold, 37% Copper, 3% Indium	860 - 900	1580 - 1652
3043	60% Copper, 40% Zinc	899 - 904	1650 - 1660
3050	60% Copper, 40% Silver	779 - 910	1434 - 1670
3060	81.5% Gold, 15.5% Copper, 3% Nickel	900 - 910	1652 - 1670
3063	42% Nick., 34.5% Iron, 7.5% Cobalt, 5% Cop.	871 - 913	1600 - 1675
3067	66.7% Gold, 33.3% Copper	903 - 920	1655 - 1685
3070	58.3% Gold, 39.6% Copper, 2.1% Silver	905 - 921	1660 - 1690
3071	99.5% Silver, .5% Lithium	915 - 925	1679 - 1698
3073	47% Cop., 42% Zinc, 10.5% Nick., .5% Silv.	918 - 932	1685 - 1710
3074	48% Copper, 42% Zinc, 10% Nickel	921 - 936	1690 - 1715
3077	71.5% Titanium, 28.5% Nickel	942 - 942	1728 - 1728
3080	99% Silver, 1% Arsenic	910 - 950	1670 - 1742
3090	54% Silver, 25% Palladium, 21% Copper	901 - 950	1654 - 1742
3110	70% Copper, 30% Silver	779 - 950	1434 - 1742
3120	82% Gold, 18% Nickel	950 - 950	1742 - 1742
3123	47% Copper, 43% Zinc, 10% Nickel	905 - 955	1660 - 1750
3127	85% Silver, 15% Tin	953 - 960	1745 - 1760
3130	Silver	961 - 961	1761 - 1761
3140	96% Silver, 4% Manganese	961 - 961	1761 - 1761
3150	62% Tungsten, 35% Silver, 3% Nickel	962 - 962	1764 - 1764
3160	55.5% Copper, 41.7% Gold, 2.8% Silver	924 - 963	1695 - 1765

WIRES — RODS — TUBING
Sizes from .0005 to 1¼" diameter in continuous or cut lengths.

ROLLED AND FORMED SHAPES
Facilities available for precision sections of unusual configurations. From almost any alloy.

BARS — INGOTS — CASTINGS
In weights from milligrams to several hundred pounds.

CLAD METALS

STRIP, FOIL AND SHEET
Thickness from .0003 to 2", widths from .005 to 24".

WIRE RINGS AND PREFORMS
Sizes from .020 to 24" inside diameter formed from almost any size, round, square, rectangular or special shaped wire.

SPHERES, POWDERS AND GRAIN
Supplied in sizes from .0005 to .250 with tolerance as close as ±.0002 (or closer for special requirements.)

PREFORMS AND STAMPINGS
In sizes from .015 to 10" I.D., thickness from .0003 to ½".

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE* Deg. Cent.	Deg. Fahr.
3170	85% Silver, 15% Manganese	960 - 971	1760 - 1780
3180	50% Gold, 50% Copper	950 - 975	1742 - 1787
3190	85% Copper, 8% Tin, 7% Silver	664 - 985	1225 - 1805
3200	94% Gold, 6% Copper	965 - 990	1769 - 1814
3201	91.75% Iron, 4.5% Sil., 3% Boron, .75% Tit.	979 - 993	1795 - 1820
3202	91.25% Nickel, 4.5% Silicon, 2.9% Boron, 1.35% Iron	979 - 993	1795 - 1820
3203	83.35% Nickel, 6% Chromium, 3% Boron, 2.5% Iron, .15% Manganese	955 - 996	1750 - 1825
3204	82% Nickel, 7% Chromium, 4.5% Silicon, 2.9% Boron, 3.6% Iron	979 - 996	1795 - 1825
3205	80% Copper, 20% Silver	782 - 999	1440 - 1830
3206	82.5% Nickel, 7% Copper, 3% Boron, 4.5% Silicon, 3% Iron	971 - 999	1780 - 1830
3207	35% Gold, 65% Silver	980 - 1000	1796 - 1832
3208	43% Gold, 57% Copper	980 - 1000	1796 - 1832
3209	72.5% Nickel, 16% Chromium, 3.5% Boron, 3% Iron, 5% Silicon	996 - 1005	1825 - 1840
3210	95% Silver, 5% Palladium	970 - 1010	1778 - 1850
3220	60% Copper, 40% Gold	985 - 1010	1805 - 1850
3225	40% Gold, 60% Copper	990 - 1010	1814 - 1850
3230	77% Copper, 20% Gold, 3% Indium	970 - 1015	1778 - 1859
3240	62.5% Copper, 37.5% Gold	990 - 1015	1814 - 1859
3243	63% Copper, 37% Gold	990 - 1016	1815 - 1860
3247	60% Manganese, 40% Nickel	1018 - 1018	1864 - 1864
3250	95.8% Copper, 3.1% Silicon, 1.1% Mang.	950 - 1019	1742 - 1866
3260	65% Copper, 35% Gold	1000 - 1020	1832 - 1868
3263	67% Manganese, 16% Cobalt, 16% Nickel, 1% Boron	1005 - 1021	1840 - 1870
3265	73.2% Nickel, 13.5% Chromium, 4.5% Silicon, 4.5% Iron, 3.5% Boron	960 - 1022	1760 - 1875
3267	91.8% Nickel, 4.5% Silicon, 3.5% Boron, 2.2% Manganese	983 - 1022	1800 - 1875
3270	62% Copper, 35% Gold, 3% Nickel	990 - 1025	1814 - 1877
3290	97% Copper, 3% Silicon	970 - 1025	1778 - 1877
3293	89.35% Nickel, 6.15% Phos., 4.5% Silicon	879 - 1025	1615 - 1880
3297	80% Copper, 20% Gold	1008 - 1025	1850 - 1880
3310	99% Gold, 1% Gallium	1025 - 1030	1877 - 1886
3315	74.85% Nickel, 17% Manganese, 8% Silicon, .15% Carbon	1010 - 1032	1850 - 1890
3320	70% Copper, 30% Gold	1015 - 1035	1859 - 1895
3322	70.55% Nickel, 16.5% Chrom., 4.5% Silicon, 4% Iron, 3.85% Boron, .6% Carbon	971 - 1038	1780 - 1900
3324	73.2% Nickel, 13.5% Chromium, 4.5% Iron, 4.5% Silicon, 3.5% Boron, .8% Carbon	977 - 1038	1790 - 1900
3327	91% Nick., 4.5% Sil., 1.5% Iron, 3% Bor.	1027 - 1038	1800 - 1900
3330	99.5% Gold, .5% Antimony	950 - 1040	1742 - 1904
A963	Gold, Silver	1030 - 1040	1886 - 1904
3335	97% Copper, 3% Arsenic	940 - 1050	1724 - 1922
3340	70% Manganese, 30% Nickel	1030 - 1050	1886 - 1922
3343	97% Copper, 3% Germanium	1035 - 1050	1894 - 1922
3360	94.6% Nickel, 3.5% Silicon, 1.9% Boron	1041 - 1055	1905 - 1930
3370	81.35% Nickel, 15% Chromium, 3.5% Boron, .15% Carbon	1055 - 1055	1930 - 1930
3380	95% Copper, 5% Silver	1000 - 1060	1832 - 1940
A966	Gold	1063 - 1063	1945 - 1945
3400	97% Copper, 3% Gallium	1050 - 1065	1922 - 1949
3410	72% Gold, 22% Nickel, 6% Chromium	974 - 1066	1785 - 1950
3415	93.8% Nickel, 3.5% Silicon, 1.5% Iron 1.2% Boron	982 - 1066	1800 - 1950
3420	90% Silver, 10% Palladium	1002 - 1066	1835 - 1950
3430	71% Platinum, 29% Tin	1070 - 1070	1958 - 1958
3440	65% Gold, 35% Nickel	965 - 1075	1769 - 1967
3445	73.85% Nickel, 13.5% Chrom., 4.5% Iron, 4.5% Silicon, 3.5% Boron, .15% Carbon	971 - 1077	1780 - 1970
3450	99.7% Copper, .3% Silicon	1083 - 1083	1981 - 1981

ALLOY NO.	ALLOY COMPOSITION	MELTING RANGE* Deg. Cent.	Deg. Fahr.
3460	Copper	1083 - 1083	1981 - 1981
3470	82% Copper, 18% Palladium	1080 - 1090	1967 - 1994
3480	81.45% Nickel, 15% Chromium, 3.5% Boron, .15% Manganese	1036 - 1087	1900 - 1990
3490	35% Copper, 30% Palladium, 20% Nickel, 15% Manganese	1090 - 1090	1994 - 1994
3500	63% Nickel, 16% Tungsten, 11.5% Chrom., 3.75% Iron, 3.25% Silicon, 2.5% Boron	977 - 1105	1790 - 2020
3505	55% Copper, 20% Palladium, 15% Nickel, 10% Manganese	1105 - 1105	2020 - 2020
3510	75% Silver, 20% Palladium, 5% Manganese	1071 - 1121	1960 - 2050
3520	70.85% Nickel, 19% Chromium, 10% Silicon, .15% Carbon	1080 - 1135	1975 - 2075
3530	71% Nickel, 19% Copper, 10% Silicon	1079 - 1135	1975 - 2075
3540	88.7% Copper, 10% Nickel, 1.3% Iron	1100 - 1150	2012 - 2102
3550	82.55% Nickel, 10% Chrom., 2.5% Silicon, 2.5% Iron, 2% Boron, .45% Carbon	971 - 1160	1780 - 2120
3560	73% Silver, 27% Platinum	995 - 1160	1823 - 2120
3570	80% Silver, 20% Palladium	1070 - 1160	1958 - 2120
A971	Gold, Platinum	1125 - 1180	1875 - 2156
3580	75% Copper, 25% Nickel	1105 - 1205	2102 - 2201
3590	65% Palladium, 35% Cobalt	1220 - 1220	2228 - 2228
3600	64% Silver, 33% Palladium, 3% Manganese	1149 - 1232	2100 - 2250
3610	60% Palladium, 40% Nickel	1238 - 1238	2260 - 2260
3620	69.4% Copper, 30% Nickel, .6% Iron	1170 - 1240	2138 - 2264
A972	92% Gold, 8% Palladium	1190 - 1240	2174 - 2264
3630	60% Copper, 40% Palladium	1200 - 1250	2192 - 2282
3640	54% Palladium, 36% Nickel, 10% Chromium	1232 - 1260	2250 - 2300
3650	55% Copper, 45% Nickel	1230 - 1300	2246 - 2372
A973	87% Gold, 13% Palladium	1260 - 1305	2300 - 2381
3660	70% Nickel, 30% Palladium	1290 - 1320	2354 - 2408
3670	53.5% Nickel, 46.5% Molybdenum	1320 - 1320	2408 - 2408
3680	63% Cobalt, 37% Molybdenum	1330 - 1330	2426 - 2426
3690	67% Nick., 28.5% Cop., 2.5% Iron, 2% Mag.	1299 - 1349	2370 - 2460
3700	67% Nickel, 29.25% Copper, 3% Aluminum, .75% Tin	1316 - 1349	2400 - 2460
A974	75% Gold, 25% Platinum	1210 - 1410	2210 - 2570
A975	75% Gold, 25% Palladium	1380 - 1410	2516 - 2570
3710	72.85% Nickel, 17% Chromium, 10% Iron, .15% Carbon	1393 - 1427	2540 - 2600
A976	65% Gold, 35% Palladium	1421 - 1440	2601 - 2624
3720	94% Nickel, 4.75% Aluminum, 1% Tin, .25% Carbon	1435 - 1445	2615 - 2635
3730	64% Iron, 36% Nickel	1445 - 1445	2633 - 2633
3740	Nickel	1453 - 1453	2647 - 2647
3750	99.1% Iron, .45% Magnesium, .25% Silicon, .20% Carbon	1516 - 1516	2760 - 2760
3760	Palladium	1552 - 1552	2826 - 2826
A977	Gold, Platinum	1410 - 1650	2570 - 3002
3765	Titanium	1660 - 1660	3020 - 3020
3770	75% Platinum, 20% Palladium, 5% Gold	1645 - 1695	2993 - 3083
A978	Gold, Platinum	1580 - 1708	2876 - 3110
3780	Platinum	1769 - 1769	3216 - 3216
3800	Zirconium	1852 - 1852	3366 - 3366
3810	80% Molybdenum, 20% Ruthenium	1900 - 1900	3452 - 3452
3820	60% Platinum, 40% Rhodium	1935 - 1950	3515 - 3542
3830	Rhodium	1966 - 1966	3574 - 3574
3840	60% Platinum, 40% Iridium	1950 - 1990	3542 - 3614
3850	90% Molybdenum, 10% Silicon	2120 - 2150	3848 - 3902
3860	Iridium	2450 - 2450	4442 - 4442
3870	Niobium (Columbium)	2468 - 2468	4474 - 4474
3880	Tungsten Carbide	2480 - 2480	4496 - 4496
3890	Ruthenium	2500 - 2500	4532 - 4532
3900	Tantalum	2996 - 2996	5425 - 5425
3910	Rhenium	3180 - 3180	5756 - 5756

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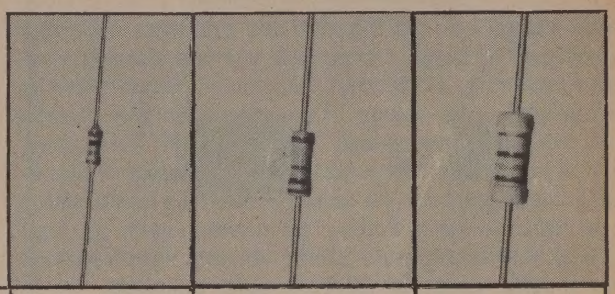
UNITED TECHNICAL PUBLICATIONS

Amperex CARBON FILM FIXED Resistors

High stability, very low noise level, and exceptionally long life make these resistors ideal for applications requiring a steady low power drop. Their accuracy and consistency are relatively unaffected by adverse climatic conditions.

Resistors of 10Ω to 10MΩ have a homogenous film of pure carbon deposited on a high grade ceramic body by cracking a hydrocarbon gas. Resistors having values lower than 10Ω have a nickel film instead of cracked carbon.

Contact caps of special alloy are pressed onto the ends of the resistor body to which the tin coated electrolytic copper connecting wires are welded. Finally the resistors are coated with three or more layers of a special lacquer for electrical, mechanical and climatic protection. This special lacquer will withstand regular industrial cleaning solutions used for cleansing printed circuit boards.



SPECIFICATIONS	⅛W	¼W	½W
	(CR16) 1-10-5P	(CR25) 1-4-5P	(CR37) 1-2-5P
Power rating P_{NOM} T_A <70°C	0.125W	0.25W	0.5W
Maximum voltage AC or DC	150V	250V	350V
Voltage (RMS) that may be applied for 1 sec. across insulated coat	300V	500V	700V
Insulation resistance	10^4MΩ	10^4MΩ	10^4MΩ
	ALL TYPES		
Ambient temperature	−55 to +155°C		
Temperature coefficient	see figure 2		
Noise voltage	see figure 1		

Voltage Breakdown

2x limiting voltage for 1 min. between terminals of resistor and metal foil ..... no breakdown or flashover

Short Term Overload (Room Temperature)

loaded 5 sec. at 6.25 P_{MAX} at 25°C (not to exceed 2x maximum voltage)
10 cycles: 5 sec on 10 sec off
ΔR_{MAX} 1%

Shelf Test at 25°C_{NOM} for 12 months

ΔR_{MAX} for R < 1MΩ 1.5%
R > 1MΩ 3%

Temperature Cycling

5 cycles: 3 hours −55°C
3 hours +155°C
ΔR_{MAX} ..... 0.5% or 0.5Ω

Humidity Specifications

After long-term exposure to damp heat at 40°C, 5 VDC
RH = 90-95% for 56 days with no drying
5 VDC
ΔR_{MAX} for R_{NOM} = 10Ω to 100 kΩ 1%
R_{NOM} = 100 kΩ to 1MΩ 2%
R_{NOM} = 1 MΩ or higher 3%

Solder Test (thermal shock)

Terminations immersed for 3 sec. up to .24 inches from end cap in solder bath at 350°C
ΔR_{MAX} ..... 0.5% or 0.5Ω

Lead Test

a. Tensile: diameter .024-.032 inches; load 2.20 lbs; 10 sec.
diameter > .032 inches; load 4.41 lbs;
10 sec. ..... no damage
b. Bending: diameter .024-.032 inches; load 1.10 lbs; 4 x 90°
diameter > .032 inches; load 2.20 lbs;
4 x 90° ..... no damage
c. Torsion: 2 x 360° in opposite directions ..... no damage
ΔR_{MAX} (for all tests) ..... 0.5% or 0.5Ω

Shock Test

3 x 1500 shocks in three directions: 50 G;
ΔR_{MAX} ..... 0.5% or 0.5Ω

Vibration

Frequency: 10-500 Hz
Displacement 0.06 in. or acceleration 10G; three directions; total 9 hrs.
ΔR_{MAX} ..... 0.5% or 0.5Ω

Voltage Coefficient 5PPM/Volt (0.0005%/Volt)

Resistor Range

Style	Limiting Voltage (Vdc or Vrms)	Resistance Range	Tolerance ±
CR16 (⅛ Watt)	150	10Ω to 220kΩ 270kΩ to 1MΩ	5% 10%
CR25 (¼ Watt)	250	1Ω to 9.1Ω 10Ω to 1MΩ 1.2MΩ to 10MΩ	5% 2% or 5% 10%
CR37 (½ Watt)	350	1Ω to 9.1Ω 10Ω to 1MΩ 1.2Ω to 10MΩ	5% or 10% 2%, 5%,or 10% 10%

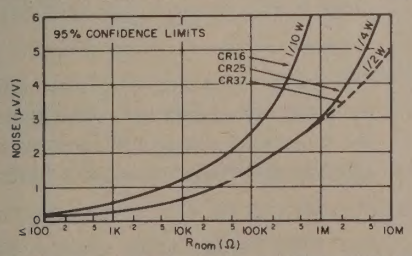


Figure 1. Noise as a function of the resistance value, applicable to all resistor wattages (as per IEC specifications 195; Method of measurement of current noise generated in fixed resistors).

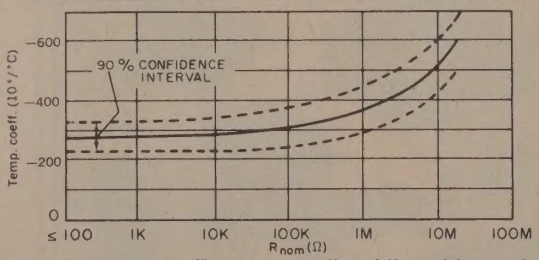


Figure 2. Temperature coefficient as a function of the resistance value, applicable to all resistor wattages.

AMPEREX ELECTRONIC CORPORATION
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PRECISION WIRE-WOUND RESISTORS

Balco/Marstan brings together the precision capacitor experience of Balco Capacitors and the precision resistor capability of Marstan Electronics. Balco/Marstan specializes in the design of ultraprecision film capacitors, wirewound resistors, and networks — resistive, capacitive, or RC. The product line — special or standard — is designed for the user who needs a combination of demanding performance parameters such as high stability, low temperature coefficient, and tight tolerance over a wide range of environmental extremes.

BALCO/MARSTAN ENCAPSULATED RESISTORS
Feature:

- Accuracies to 0.005%
- Matching of Sets to 0.005%
- Tracking of 1 PPM/°C
- Available Per MIL-R-93D

RESISTANCE WIRE CHARACTERISTICS

The following chart lists typical specifications. Special techniques developed by Marstan permit reliable combination winding of the listed alloys to provide any value of temperature coefficient from −10 to +6000 PPM/°C.

WIRE TRADE NAME	TEMPERATURE COEFFICIENT (PPM/°C)	THERMAL EMF vs COPPER (μV/°C)	RESISTIVITY (ohms/cmf)	USES
Moleculoy III Alloy COJ	0 ±5 0 ±5	+3.0 +10.0	800 1040	For high resistance values and very low temperature coefficient requirements. Excellent for resistive network applications.
Moleculoy Allow 800 Evanohm	0 ±20 0 ±20 0 ±20	+3.0 +2.5 +2.0	800 800 800	For high resistance values and low temperature coefficient requirements. Good for resistive network applications.
Neutroloy Alloy 45 Cupron	0 ±20 0 ±20 0 ±20	−43.0 −43.0 −43.0	300 300 300	For low resistance values and low temperature coefficient requirements. Good for resistive network applications.
Protoloy Alloy A Tophet A	+80 ±20 +65 +85	+6.0 +6.0 +4.7	650 650 650	For high resistance values and positive temperature coefficient requirements. Used for matching capacitor temperature coefficient in RC network applications.
Electroloy Alloy C Tophet C	+150 +150 +150	+2.0 +2.0 +0.6	675 675 675	For high resistance values and positive temperature coefficient requirements. Used for matching capacitor temperature coefficient in RC network applications.
Pelcoloy Balco	+4500 +4500	−40.0 −40.0	120 120	For high temperature coefficient requirements. Good for temperature sensitive resistor applications.
Nickel 270 HP Nickel	+5000 +6000	−22.0 −22.0	60 50	For very high temperature coefficient requirements. Excellent for temperature sensitive resistor applications.

PRECISION RESISTOR TYPES

MAW axial lead resistors are suitable for point to point wiring. Standard units are supplied with 2 inch solderable leads, but can be provided with weldable leads. Available in a range from 0.1 ohm to 20 megohms and 0.1 watt (0.093" diameter x 0.188" long) to 2 watts (½" diameter x 2" long).

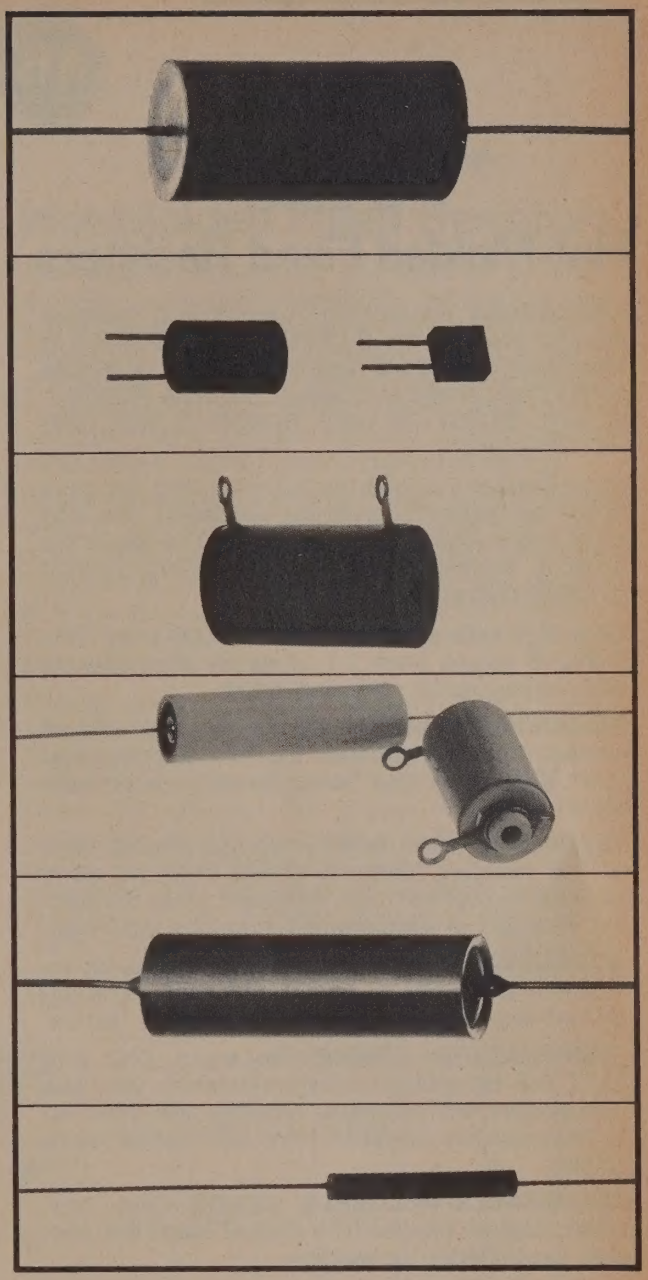
MPC printed circuit style resistors are designed for applications where board space is critical. They are available in a range from 0.1 ohm to 10 megohms and ¼ watt (¼" diameter x ⅜" long) to 1½ watts (½" diameter x 1½" long).

MRL radial lug resistors are designed for center hole mounting to provide a rugged, space saving configuration. They can be provided with radial lead wire, if required. Available in ranges from 0.1 ohm to 15 megohms and ¼ watt (¼" diameter x ¼" long) to 2½ watts (⅞" diameter x 2⅛" long).

MCRL and **MCAW** ceramic bobbin resistors provide exceptionally high stabilities under wide extremes of temperature. Axial leads are standard on the MCAW series, while radial lugs or leads are available on the MCRL series.

MAHS hermetically sealed resistors provide exceptionally high stabilities under extreme environments. The MOA oil filled, hermetically sealed series is designed to permit more effective transmission of heat from the winding to the metal case and to provide greater long term stabilities.

Specials include the MTS series of temperature sensitive resistors with matched temperature coefficient characteristics, MNS "needle" shape and Multi Tap Precision Resistors. Many special sizes and shapes can be tailored to meet your specifications.

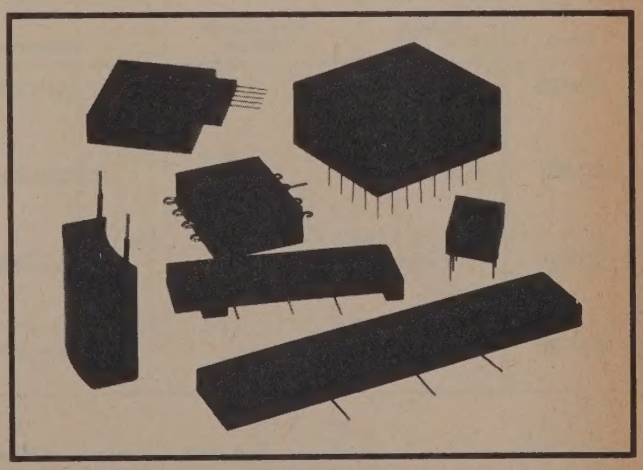


PRECISION NETWORKS

Our unique side by side resistor and capacitor processing ensures the ultimate in component compatibility and overall network performance. Resistors and capacitors can be precisely matched to track over wide temperature ranges.

Typical Networks Manufactured by Balco/Marstan:

- Matched impedance Attenuators
- Summing Networks
- Integrators
- Voltage Dividers
- Phase Shifters
- Binary Resistance Networks
- Twin T Networks
- Bridges
- A/D and D/A Converters
- Timing Networks



Balco marstan

BALCO ELECTRONICS, INCORPORATED

307 Washington Street, Orange, N.J. 07050 • (201) 677-1200

ALLEN-BRADLEY
Milwaukee, Wisconsin 53204

S-Level Hot-Molded Fixed Resistors.

Allen-Bradley hot-molded composition resistors are approved for the S-LEVEL of MIL-R-39008 in all wattage ratings and resistance values. Available in this high reliability category are style RCR05—⅛ watt, RCR07—¼ watt, RCR20—½ watt and RCR32—1 watt.

Allen-Bradley's exclusive hot-molding process molds the resistance material, insulation, and lead wires into a solid, integral structure. The result is a uniform, rugged unit that has excellent thermal diffusion characteristics.

S-Level qualified resistors are available in all MIL-R-39008 values from 2.7 ohms to 22 megohms with tolerances of ±5% and ±10%.

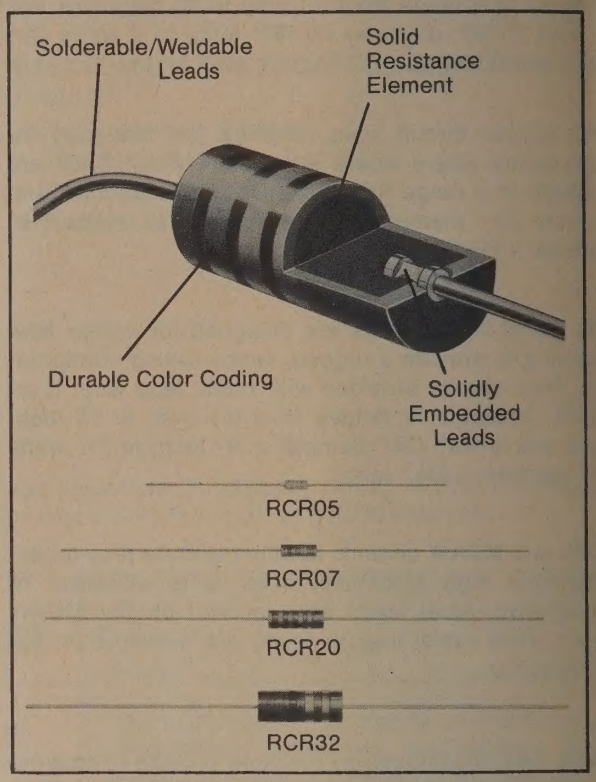
RELIABLE—Recognized as the most reliable of all electronic components. We have accumulated over 300-million test hours in accordance with MIL-R-39008.

TRACKING—When tested in flip-flop circuits, pairs of A-B resistors randomly drawn from the same package or reel will track with each other throughout changes of temperature, humidity, and load.

CONSERVATIVE RATINGS—All performance specifications are based on extensive testing, protracted field experience, and substantial safety factors.

TEMPERATURE STABLE—Between 0°C and 85°C, A-B hot-molded resistors exhibit a very low temperature characteristic, typically less than two or three percent deviation from room temperature values.

SOLDERABLE/WELDABLE LEADS—The hot-solder coated, oxygen-free copper leads are suitable for soldering or welding.

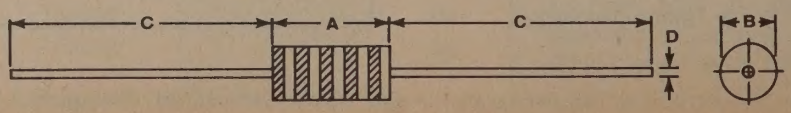


MASSIVE RESISTANCE ELEMENT—Large, uniform cross-section of the conducting material results in low current density without hot spots. This means a high overload capacity.

SOLIDLY EMBEDDED LEADS—Lead wire ends are formed to provide secure embedment and large contact area.

PERMANENT COLOR CODING—Bright, baked-on colors are impervious to commonly used solvents.

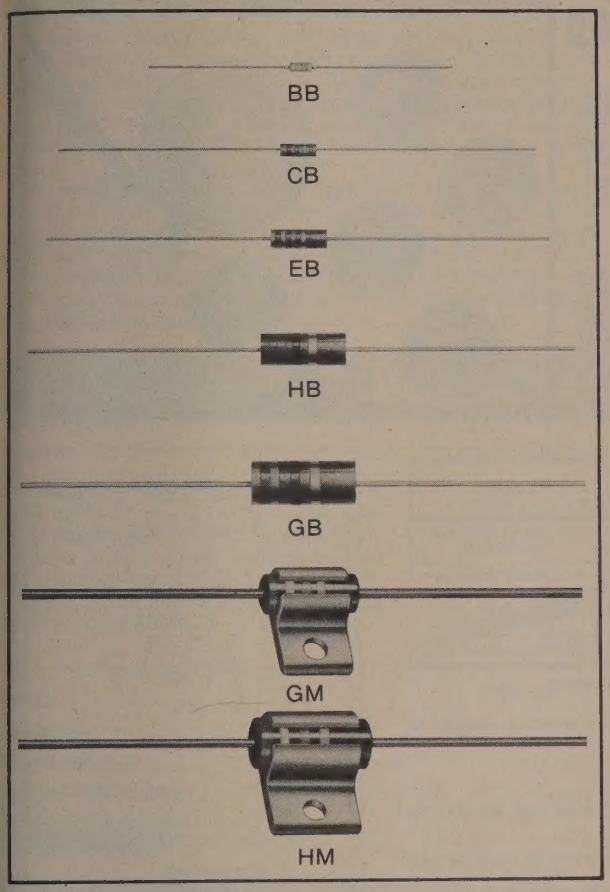
Style	Power at 70°C	Resistance Range	Tolerance	Voltage Rating (RMS)	Dimensions (inches)			
					a	b	c	d
RCR05	1/8 watt	2.7 ohms to 22 megohms	±5%—±10%	150 V	0.145	0.062	1.0	0.015
RCR07	1/4 watt		±5%—±10%	250 V	0.250	0.090	1.5	0.025
RCR20	1/2 watt		±5%—±10%	350 V	0.375	0.140	1.5	0.033
RCR32	1 watt		±5%—±10%	500 V	0.562	0.225	1.5	0.041



EC70-14 A

ALLEN-BRADLEY

Milwaukee, Wisconsin 53204



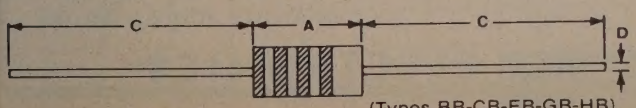
Industrial Grade Hot-Molded Fixed Resistors.

Allen-Bradley hot-molded composition resistors are high-quality units intended for general purpose use in the electronics industry. They are backed by more than 35 years of manufacturing experience comprising billions of resistors. All units feature rugged and reliable construction, solderable/weldable leads, uniform tracking characteristics, temperature stability, and conservative ratings.

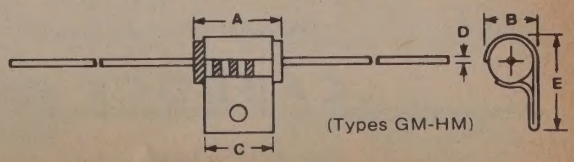
These resistors are available in five ratings—⅛ watt (BB), ¼ watt (CB), ½ watt (EB), 1 watt (GB), and 2 watt (HB). Because of their small size, uniformity, ruggedness, and moderate cost, they are equally at home in industrial or consumer product applications. Units are available in all standard EIA and MIL resistance values.

Copper-clad hot-molded resistors (Types GM and HM) are vested with copper clamps for rigid mounting directly on metal chassis or panel. Such mounting is an advantage in equipment subject to shock and vibration. The copper efficiently conducts heat from the resistors to the chassis or panel. Insulation resistance is greater than 100,000 megohms. And the electrical insulation between the leads and the copper clamp can easily withstand 1500 volts. Capacitance between lead wires and clamp is low at approximately 5.6 MMF for Type GM and 9 MMF for Type HM.

Type	Power At 70°C	Resistance Range	Tolerance	Voltage Rating (RMS)	Maximum Ambient Temperature	Dimensions (inches)						
						a	b	c	d	e	f	g
BB	1/8 watt	2.7 ohms to 100 megohms	±5%—±10% ±20%	150 V	+130°C	0.145	0.062	1.0	0.015			
CB	1/4 watt	2.7 ohms to 100 megohms	±5%—±10% ±20%	250 V	+150°C	0.250	0.090	1.5	0.025			
EB	1/2 watt	1.0 ohms to 100 megohms	±5%—±10% ±20%	350 V	+150°C	0.375	0.140	1.5	0.033			
GB	1 watt	2.7 ohms to 100 megohms	±5%—±10% ±20%	500 V	+150°C	0.562	0.225	1.5	0.041			
HB	2 watts	10 ohms to 100 megohms	±5%—±10% ±20%	750 V	+150°C	0.688	0.312	1.5	0.045			
GM	3 watts	2.7 ohms to 22 megohms	±5%—±10%	500 V	+150°C	0.562	0.305	1.5	0.041	0.305	7/16	21/32
HM	4 watts	10 ohms to 22 megohms	±5%—±10%	750 V	+150°C	0.688	0.391	1.5	0.045	0.391	9/16	49/64



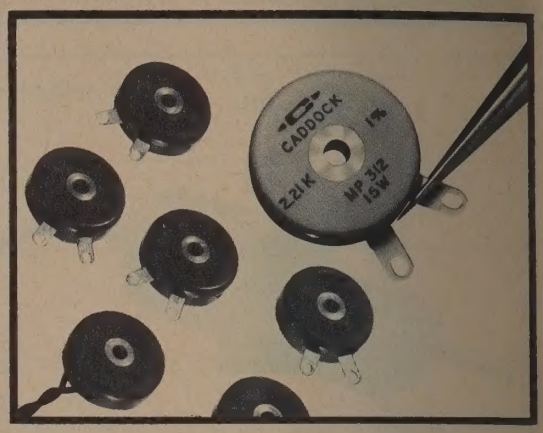
(Types BB-CB-EB-GB-HB)



(Types GM-HM)

NEW TYPE MP POWER FILM RESISTORS*

CHASSIS MOUNTED

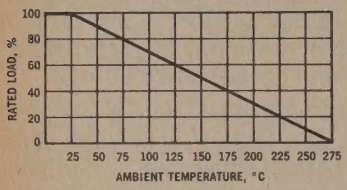


Features: High Stability Micronox Film Element ▪ Non-Inductive ▪ Higher Resistance Range ▪ Lower Cost ▪ Low Profile—Smaller Size—Lighter Weight

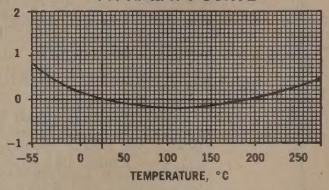
Micronox film is fired on high strength ceramic substrate; then mounted on anodized aluminum base. This construction gives vastly improved efficiency in heat transfer from resistor element to chassis. Molded silicone encases the electrical elements for high environmental performance.

*** PATENTS PENDING**

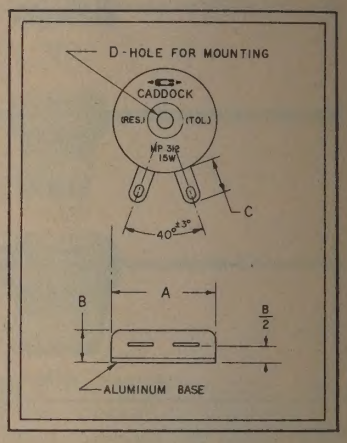
DERATING CURVE



TYPICAL R-T CURVE



Model No.	Power Rating†	Max. Voltage	Diel. Str.	High Temp. TC‡	Resistance Range		Dimensions				Terminals
					Min.	Max.	A	B	C	D	
MP311	15 Watts	300	600	50	50Ω	200 K	.600	.188	—	.092	12" Min Teflon Leads 26AWG 7x34
MP312	15 Watts	300	600	50	10Ω	200 K	.600	.188	.185	.092	Gold Plated Solder Lugs
MP329	30 Watts	450	1000	50	50Ω	200 K	.850	.250	—	.142	12" Min Teflon Leads 22AWG 7x30
MP330	30 Watts	450	1000	50	10Ω	200 K	.850	.250	.250	.142	Gold Plated Solder Lugs



† Power rating based on chassis mounting — MP311 and MP312 on 6"x4"x2"x.040 aluminum chassis
MP329 and MP330 on 5x7x2x.040 aluminum chassis
‡ TC — 50ppm Referenced to 25°C, ΔR taken at +150°C and +275°C. (Low temp. TC will be nominally —85ppm/°C at —55°C. See typical R-T curve.)

Resistance Tolerance: ±1% standard (Other tolerances on special order.)
Insulation Resistance: 10,000 Megohms, dry. Method — Mil-R-18546D, para. 4.6.8.
Solderability: Per Mil-R-18546D, para. 3.7, para. 4.6.4.
Terminal Strength: Per Mil-Std-202, Method 211, Cond. A (Pull Test), 5 lbs., and Cond. B (Bend Test). Max ΔR, .2% or .2Ω, whichever is greater.
Thermal Shock: Per Mil-R-18546D, para. 4.6.9, max. ΔR, .5% or .2Ω, whichever is greater.
Momentary Overload: 2 times rated power or 1.5 times max. allowable working voltage, whichever gives the lower power, for 5 seconds. Max. ΔR, .5% or .2Ω, whichever is greater.
Moisture Resistance: Mil-Std-202, Method 106B, less steps 7a and 7b, max. ΔR, .5% or .2Ω, whichever is greater.
Life: Per Mil-R-18546D, para. 4.6.12, 1,000 hrs., Max. ΔR 1% or .2Ω, whichever is greater.
Shock, Medium Impact: 50G, per Mil-Std-202, Method 205, Cond. C.
Vibration, High Frequency: Per Mil-Std-202, Method 204, Cond. B, Max. ΔR .2% or .2Ω, whichever is greater, through shock and vibration sequence.

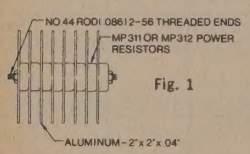


Fig. 1

Fig. 1. **Stacked Assembly** shows **high density packaging** of power resistors. By stacking with 2 inch square aluminum plates between the resistors, heat can be dissipated in three ways:

1. **Convection with plates oriented horizontally.** The power rating per graph, Fig. 2, is 4 watts each resistor and would be useful in rating applications where horizontal installation is necessary or where equipment is rotating and part orientation is variable.
2. **Convection with plates oriented vertically.** The power rating, per graph, Fig. 2, is 6 watts each resistor.
3. **Ducted Air Flow.** This method of application permits the highest possible power density and offers the additional advantage of ducting heat out of the equipment.

Fig. 3. **Power Rating vs. Chassis Area** provides design information for conventional application of MP resistors, per Mil-R-18546, by mounting on aluminum chassis or panel.

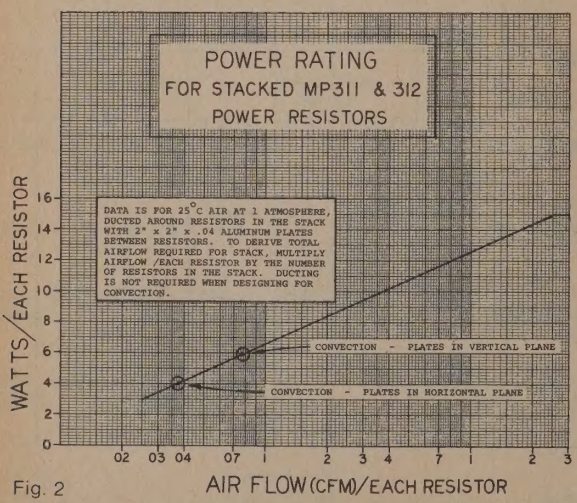


Fig. 2

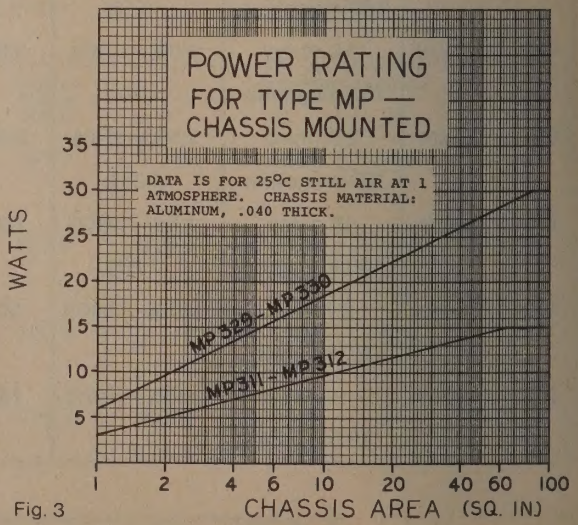


Fig. 3

CADDOCK ELECTRONICS

3127 Chicago Avenue, Riverside, California 92507 • Telephone: (714) 683-5361

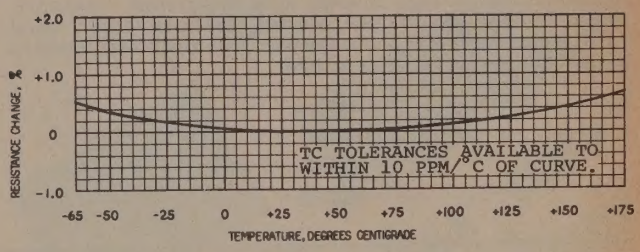
ADDOCK ADVANCED STATE OF THE ART

ICRONOX* Resistance Films

ronox resistance films are produced exclusively by dock Electronics. They are composed of complex oxides d in air at temperatures above 1400°F. The resulting films relatively insensitive to high ambient temperatures and rmal shock. Precision resistors, useable to 1000°F. can be de with these films. The films show negligible effect from isture.

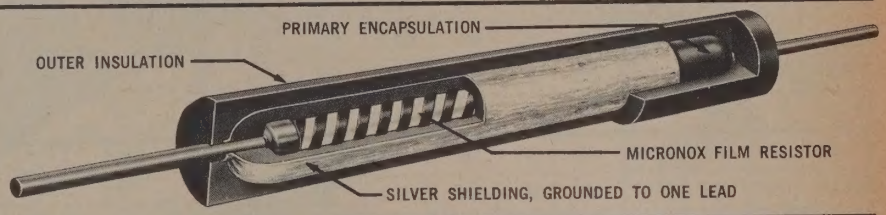
This totally new approach to precision resistors and net- ks opens new design possibilities because of the wide istance range, precise temperature characteristics, and high perature and power capability. Temperature coefficient be accurately reproduced (±10ppm/°C. if required). The ical curve shown will vary slightly with resistivity of the film d configuration of the substrate.

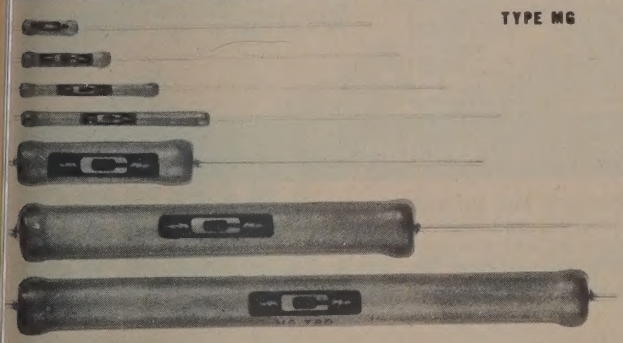
Micronox oxide systems provide an almost continuous range of resistivity from 5 ohms per square to 25,000 ohms per square, without degradation of electrical characteristics throughout this range.

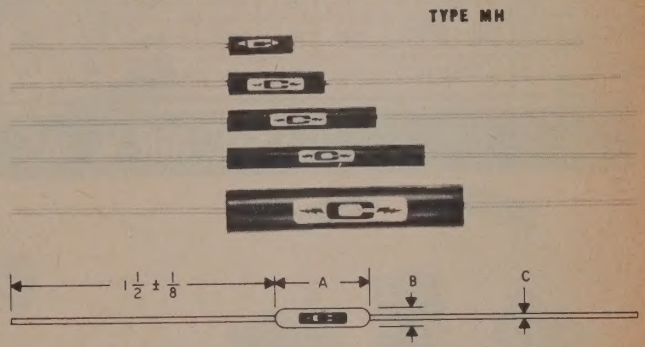


TYPE MG & MH Miniature Megohm Resistors

KCLUSIVE SHIELDED RESISTOR ODEL MH711, designed for extremely gh voltage applications, in very high sistance strings. Unit remains excep- onally stable since shielding prevents lm degradation from corona developed high voltage fields.





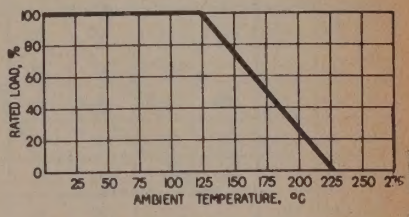


Miniaturized to one-fifth the size of conventional types, cover- ng the 1 to 220 megohm range. Micronox film sintered on igh strength core. End cap construction.

Resistance Tolerance: ±1% (tolerances to .2% on special order). **Insulation Resistance:** 100 megohms, minimum. **Overvoltage:** 1.5 times working voltage for 5 seconds, R shift .8% max. **Thermal Shock:** MIL-STD-202, method 107, cond. C, R shift .5% max. **Moisture Resistance:** MIL-STD-202, method 106, R shift .8% max. **Loadlife:** 1000 hours at rated power, R shift .8% max.

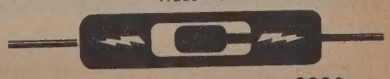
Model No.	Wattage	Max. Voltage	Oper. Temp. (Max.)	Dielect. Str'gth	TC ppm/°C†	Resistance		Dimensions			Encapsulation	Leadwire
						Min.	Max.	A	B	C		
MG 650	.5	600	225°C	750	80	500 K	5 meg	.313 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MG 660	.6	1000	225°C	750	80	1 meg	10 meg	.500 ±.030	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MG 680	.8	1500	225°C	750	80	1 meg	15 meg	.750 ±.030	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MG 710	1.0	2000	225°C	750	80	1 meg	20 meg	1.000 ±.040	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MG 714	1.0	1000	225°C	750	80	1 meg	20 meg	.562 ±.060	.150 ±.030	.032 ±.002	Silicone Conformal	Gold Plated Dumet
MG 721	2.0	2500	225°C	1000	80	1 meg	30 meg	1.000 ±.050	.240 ±.030	.040 ±.002	Silicone Conformal	Tinned Copperweld
MG 750	3.0	3000	225°C	1000	80	3 meg	150 meg	2.125 ±.060	.315 ±.030	.040 ±.002	Silicone Conformal	Tinned Copperweld
MG 780	5.0	4000	225°C	1000	80	4 meg	220 meg	3.125 ±.060	.315 ±.030	.040 ±.002	Silicone Conformal	Tinned Copperweld
MH 651	.5	600	225°C	750	80	500 K	5 meg	.313 ±.020	.094 ±.006	.025 ±.002	Black Molded Type	Gold Plated Dumet
MH 661	.6	1000	225°C	2000	80	1 meg	10 meg	.500 ±.030	.114 ±.010	.025 ±.002	Black Molded Type	Gold Plated Dumet
MH 681	.8	1500	225°C	2000	80	1 meg	15 meg	.750 ±.030	.114 ±.010	.025 ±.002	Black Molded Type	Gold Plated Dumet
MH 682	.8	800	225°C	1000	80	1 meg	12 meg	.400 ±.020	.150 ±.010	.025 ±.002	Black Molded Type	Gold Plated Dumet
MH 713	1.0	2000	225°C	2000	80	1 meg	20 meg	1.000 ±.030	.114 ±.010	.025 ±.002	Black Molded Type	Gold Plated Dumet
Type MH with special internal shielding, designed to eliminate degradation due to corona												
MH 711	1.0	2000	225°C	2000	80	1 meg	20 meg	1.200 ±.040	.220 ±.015	.025 ±.002	Black Molded Type	Gold Plated Dumet

DERATING CURVE



†Temperature Coefficient: Referenced to 25°C, ΔR taken at −15°C and +105°C

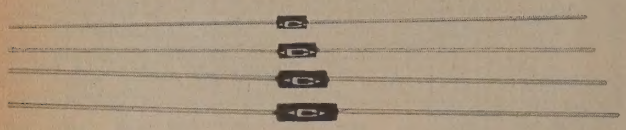
*Trade Mark

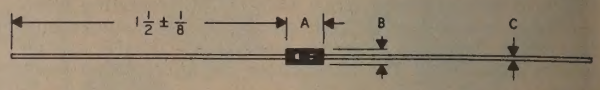


MICROMINIATURE FILM RESISTORS

TYPE ML & MM Precision Film Resistors

Micronox film on high strength core for greater resistance range. End cap construction. Molded type case for increased resistance to abrasion and solvents. Twice the power rating of metal film resistors of a given size.

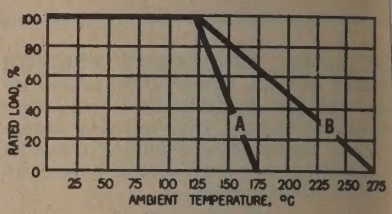




Resistance Tolerance: ±1% (tolerances to .1% on special order). **Insulation Resistance:** 100 megohms, minimum. **Overload:** 5 times rated power for 5 seconds, R shift .5% max., or .5 ohms max., whichever is greater. **Overvoltage:** 1.5 times max. voltage for 5 seconds, R shift .5% max., or .5 ohms max., whichever is greater. **Thermal Shock:** MIL-STD-202, method 107, cond. B, R shift .2% max., or .5 ohms max., whichever is greater. **Moisture Resistance:** MIL-STD-202, method 106, R shift .5% max., or .5 ohms max., whichever is greater. **Loadlife:** 1000 hours at rated power, R shift .5% max., or .5 ohms, whichever is greater.

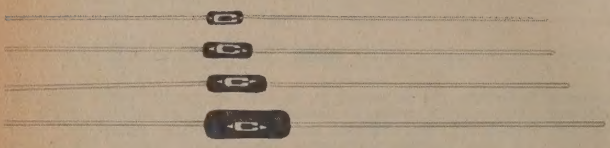
Model No.	Wattage	Max. Voltage	Oper. Temp. (Max.)	Dielect. Str'gth	TC ppm/°C†	Resistance		Dimensions			Encapsulation	Leadwire
						Min.	Max.	A	B	C		
ML 104	.08	200	175°C	400	50	50Ω	300 K	.160 ±.010	.065 ±.010	.016 ±.002	Green Molded Type	Gold Plated Dumet
ML 114	.15	200	175°C	500	50	50Ω	500 K	.188 ±.020	.070 ±.015	.020 ±.002	Green Molded Type	Gold Plated Dumet
ML 124	.25	300	175°C	750	50	50Ω	600 K	.250 ±.020	.094 ±.006	.025 ±.002	Green Molded Type	Gold Plated Dumet
ML 131	.4	500	175°C	750	50	50Ω	1 meg	.313 ±.020	.094 ±.006	.025 ±.002	Green Molded Type	Gold Plated Dumet
ML 181	.6	600	175°C	750	50	50Ω	5 meg	.400 ±.020	.150 ±.010	.025 ±.002	Green Molded Type	Gold Plated Dumet
MM 112	.12	200	275°C	400	50	10Ω	500 K	.160 ±.010	.065 ±.010	.016 ±.002	Black Molded Type	Gold Plated Dumet
MM 125	.25	200	275°C	500	50	10Ω	1 meg	.188 ±.020	.070 ±.015	.020 ±.002	Black Molded Type	Gold Plated Dumet
MM 152	.4	300	275°C	750	50	10Ω	2 meg	.250 ±.020	.094 ±.006	.025 ±.002	Black Molded Type	Gold Plated Dumet
MM 177	.6	500	275°C	750	50	20Ω	5 meg	.313 ±.020	.094 ±.006	.025 ±.002	Black Molded Type	Gold Plated Dumet
MM 215	1.0	800	275°C	1000	50	10Ω	10 meg	.400 ±.020	.150 ±.010	.025 ±.002	Black Molded Type	Gold Plated Dumet

DERATING CURVE

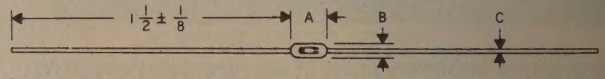


†Temperature Coefficient: Referenced to 25°C, ΔR taken at −15°C and +105°C

TYPE MR & MS Power Film Resistors



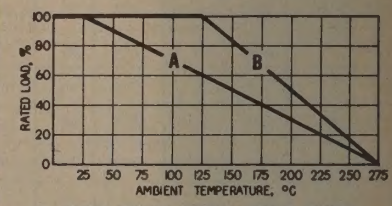
Micronox film on high strength core. End cap construction. Featuring smallest size for given power ratings. Specially designed with a wide range of resistance values for high temperature operation. For less stringent requirements, a choice of temperature coefficients is offered.



Resistance Tolerance: ±1% (tolerances to .1% on special order). **Insulation Resistance:** 100 megohms, minimum. **Overload:** 5 times rated power for 5 seconds, R shift .5% max., or .5 ohms max., whichever is greater. **Overvoltage:** 1.5 times max. voltage for 5 seconds, R shift .5% max., or .5 ohms max., whichever is greater. **Thermal Shock:** MIL-STD-202, method 107, cond. C, R shift .5% max., or .5 ohms max., whichever is greater. **Moisture Resistance:** MIL-STD-202, method 106, R shift .5% max., or .5 ohms max., whichever is greater. **Loadlife:** 1000 hours at rated power, R shift .5% max., or .5 ohms max., whichever is greater.

Model No.	Wattage	Max. Voltage	Oper. Temp. (Max.)	Dielect. Str'gth	TC ppm/°C†	Resistance		Dimensions			Encapsulation	Leadwire
						Min.	Max.	A	B	C		
MR 129	.25	200	275°C	500	150	10Ω	500 K	.188 ±.020	.070 ±.015	.020 ±.002	Silicone Conformal	Nickel
MR 154	.40	300	275°C	750	150	10Ω	1 meg	.250 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Nickel
MR 178	.60	500	275°C	750	150	20Ω	3 meg	.313 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Nickel
MS 126	.25	200	275°C	500	50	10Ω	1 meg	.188 ±.020	.070 ±.015	.020 ±.002	Silicone Conformal	Gold Plated Dumet
MS 150	.5	—	275°C	500	50	10Ω	2 K	.188 ±.020	.070 ±.015	.020 ±.002	Silicone Conformal	Gold Plated Dumet
MS 151	.5	300	275°C	750	50	10Ω	2 meg	.250 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MS 175	.75	—	275°C	750	50	10Ω	2 K	.250 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MS 176	.75	500	275°C	750	50	20Ω	5 meg	.313 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MS 210	1.0	—	275°C	750	50	20Ω	3 K	.313 ±.020	.094 ±.015	.025 ±.002	Silicone Conformal	Gold Plated Dumet
MS 220	2.0	—	275°C	750	50	50Ω	4 K	.400 ±.060	.140 ±.030	.025 ±.002	Silicone Conformal	Tinned Copperweld

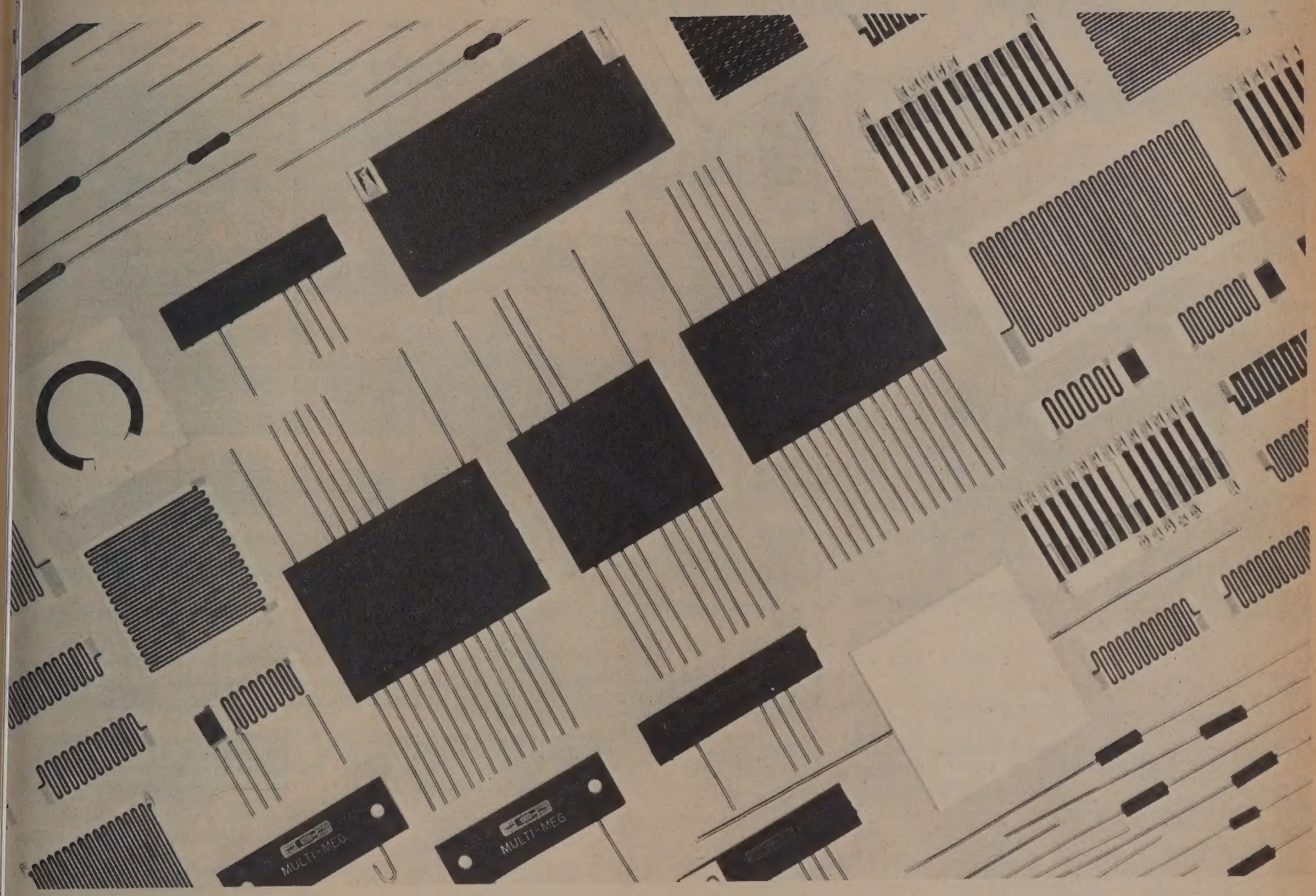
DERATING CURVE



A—Models MS150, MS175, MS210, MS220
B—all MR models, and MS126, MS151, MS176

†Temperature Coefficient: Referenced to 25°C, ΔR taken at −15°C and +105°C

CADDOCK ELECTRONICS
3127 Chicago Avenue, Riverside, California 92507 • Telephone: (714) 683-5361

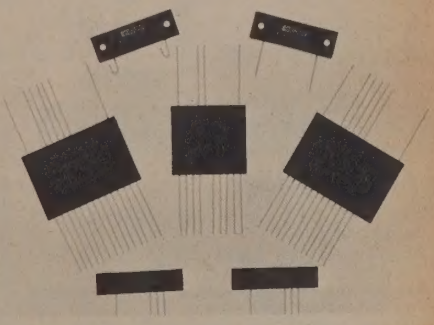


SPECIAL RESISTIVE DEVICES

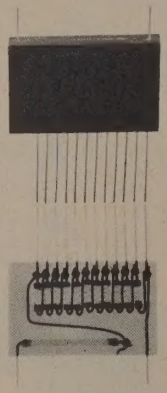
Caddock produces miniature wirewound and film resistors, as well as networks on ceramic substrate. We can combine the best of these techniques in producing your special resistor or network requirement.

- **HIGH RESISTANCE RESISTORS to 5000 megs, 1%, 80 PPM/°C**
- **PRECISION VOLTAGE DIVIDERS with tracking as close as 2 PPM/°C**
- **DAC LADDER NETWORKS to 12 bits, and DECADE NETWORKS to your specs**

Send us prints or sketches on your specific requirement for a prompt design and cost proposal.



MOLDING FACILITIES equipped to produce your package design, or mold your networks in available package configurations.



X-RAY FACILITIES available to verify and assure integrity and soundness of package—up to 100% inspection.

TESTING FACILITIES to supply output and performance data under actual operating temperature extremes. Qualifying test data available to satisfy qualification requirement on similar devices.

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CADDOCK ELECTRONICS 3127 Chicago Avenue, Riverside, California 92507 • Phone (714) 683-5361

CAL-R® INC. RESISTOR DIVISION

a subsidiary of CapTech, Inc.

PRECISION POWER RESISTORS

FEATURES

1. Copperweld leads standard. Nickel A or Alloy 180 available.
2. Core-alumina and steatite ceramics.
3. Silicone coating to give maximum wire protection and extra high resistance to moisture.
4. Failure rates of less than .006% per 1000 hours @ +25°C with 60% confidence.

ELECTRICAL CHARACTERISTICS

A. TOLERANCES: 5.0% to .01%. 1% standard for off-shelf delivery. Special matching available to .001% tolerance.
B. TEMPERATURE COEFFICIENT: 20 ppm/degree C standard. Special T.C.'s to 5 ppm/degree C available.
C. Dielectric strength greater than 1000 V.A.C.
D. Special configurations available on request.
E. SA (X) Types Thermal shock proof from 275°C to —55°C.
F. SAV (X) Types Thermal shock proof from 350°C to —55°C.
G. STABILITY: consistent with tolerances, all parts stabilized in production. Less than 0.1% drift in 2000 hours operation at full Cal-R wattage rating for 1% tolerance parts.
H. RESISTANCE RANGES: .05 ohms to 250K ohms.
I. INDUCTIVE TYPES: Single layer space wound with largest wire permissible.
J. Non-inductive Types feature dual balanced windings for minimum inductance.

ENVIRONMENTAL

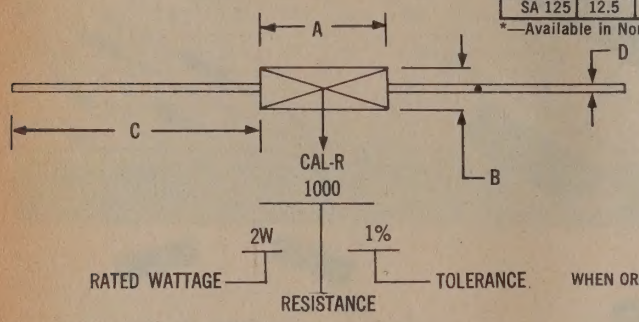
Meet or exceed applicable paragraphs of MIL-R-26E and MIL-R-39007.

STANDARD RESISTANCE & TOLERANCE RANGES

*Type		*Type		MIL Equiv.	Dimensions				4 Tolerances & Max. Resistance Based on .0007 Min. Wire Dia.	
SA and SAX (Noninduct)	1 Rated Wattage	SAV and SAVX (Noninduct)	2 Rated Wattage	MIL-R-26E & 39007	A ± .062	B ± .032 3	C ± .062	D ± .002	1% & Higher	.5%, .25%, .1% & .05%
SA 01	.4	SAV 03	.5		.250	.078	1½	.020 24 Ga.	1.4KΩ	950Ω
SA 02	.5	SAV 06	.6	RW 81U RWR 81	.250	.085	1½	.020 24 Ga.	2KΩ	1.2KΩ
SA 04	.75	SAV 09	.9		.312	.078	1½	.020 24 Ga.	3KΩ	1.3KΩ
SA 05	.8	SAV 12	1.2		.312	.094	1½	.020 24 Ga.	4.9KΩ	2.4KΩ
SA 10	.9	SAV 22	2.2		.344	.094	1½	.020 24 Ga.	5KΩ	2.5KΩ
SA 15	1.0	SAV 25	2.5	RW 70U RW 80U RWR 80	.406	.094	1½	.020 24 Ga.	7KΩ	3.5KΩ
SA 17	1.0	SAV 26	2.6		.531	.094	1½	.020 24 Ga.	10KΩ	5KΩ
SA 20	2.0	SAV 33	3.0		.500	.156	1½	.032 20 Ga.	15KΩ	7.5KΩ
SA 30	2.5	SAV 41	4.1	RW 69V	.500	.188	2	.032 20 Ga.	20KΩ	10KΩ
SA 31	3.0	SAV 45	4.5	RWR 89 RW 79U	.560	.187	2	.032 20 Ga.	25KΩ	12KΩ
SA 32	2.0	SAV 46	4.6	RWR 71	.812	.188	2	.032 20 Ga.	40KΩ	20KΩ
SA 35	3.0	SAV 52	5.2		.625	.250	2	.040 18 Ga.	35KΩ	17KΩ
SA 50	5.0	SAV 74	7.4	RWR 74 RW 74U RWR 84	.875	.312	2	.040 18 Ga.	60KΩ	30KΩ
SA 55	5.5	SAV 82	8.2	RW 67V	1.00	.313	2	.040 18 Ga.	70KΩ	35KΩ
SA 70	7.0	SAV 96	9.6		1.219	.312	2	.040 18 Ga.	90KΩ	45KΩ
SA 95	9.5	SAV 106	11.0	RW 55V	1.375	.469	1½	.040 18 Ga.	160KΩ	80KΩ
SA 100	10.0	SAV 145	14.5	RWR 78 RW 78U RW 68V	1.781	.375	2	.040 18 Ga.	200KΩ	100KΩ
SA 125	12.5	SAV 150	15.0	RW 56V	2.000	.469	1½	.040 18 Ga.	250KΩ	140KΩ

*—Available in Noninductive (code symbol "X").

1 —Nominal, based on maximum 275°C. Hot spot at 25°C. Ambient. (char. U)
2 —Nominal, based on maximum 350°C. Hot spot at 25°C. Ambient. (char. Y)
3 —Tolerance for noninductive types below 150Ω ±.062.
4 —Noninductive maximum resistances are one-half of listed values.



WHEN ORDERING SPECIFY: TYPE, WATTAGE, RESISTANCE AND TOLERANCE.

POWER RESISTORS

OUTSTANDING FEATURES

1. Copperweld leads hot tin dipped for maximum solderability.
2. Completely welded construction terminal to terminal.
3. High density extruded aluminum housing provides superior heat conduction.
4. Housing deep finned for maximum heat dissipation under natural and forced convection.
5. Windings—High uniformity single layer space wound, designed to give maximum core coverage for even heat dissipation. MCX (non-inductive) types have dual balanced windings for minimum inductance.
6. Core—Steatite ceramic, centerless ground for uniformity.
7. Silicone coated resistance element to give maximum wire protection and extra high resistance to moisture.

ELECTRICAL CHARACTERISTICS

Tolerances—5.0% to .05%, 1% standard for off-shelf delivery.

Temperature Coefficient—20 ppm/degree C standard. Special T.C.'s to 5 ppm/degree C available.

Dielectric strength greater than 1000 V.A.C. on MC-100 and MC-250, and greater than 2000 V.A.C. on MC-500.

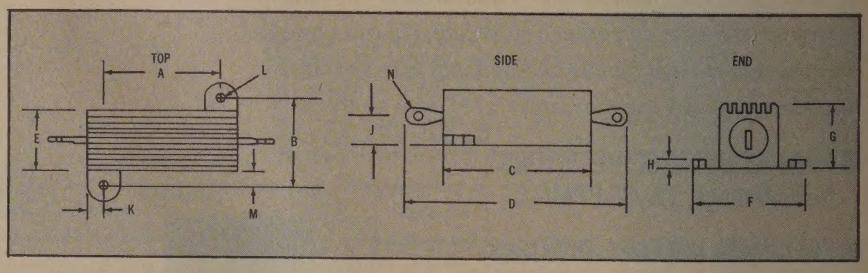
Dielectric Test—performed on 100% basis.

Stability—consistent with tolerances, all parts stabilized in production. Less than 0.5% drift in 1000 hours operation at full Cal-R wattage rating for 1% tolerance parts. Resistance ranges—.05 ohms to 210K ohms.

ENVIRONMENTAL

Meet or exceed all requirements of MIL-R-18546D, including "N" characteristic and MIL-R-39009.

FOUR STANDARD MC TYPE RESISTOR SPECIFICATIONS IN MIL-R SIZES



DIMENSIONS

Type	A	B	C	D	E	F	G	H	J	K	L	M	N
MC-80	.444	.490	.600	1.125	.334	.646	.317	.075	.139	.078	.093	.078	.050
MC-100	.562	.625	.750	1.375	.438	.873	.408	.094	.172	.093	.093	.094	.086
MC-250	.719	.781	1.063	1.938	.500	1.094	.531	.094	.219	.171	.125	.141	.086
MC-500	1.563	.844	1.969	1.781	.563	1.156	.625	.094	.281	.203	.125	.141	.086
TOL. ±	.005	.005	.016	.063	.031	.031	.031	.016	.031	.010	.005	.016	.015

STANDARD RESISTANCE & TOLERANCE RANGES

Type	Mil Equiv. Mil-R-18546C Mil-R-39009	Cal-R Watts Normal Rating	Watts Mil-R Rating	Weight MC	Weight MCX	TOLERANCES AND MAXIMUM RESISTANCES* 1% Up	.5%	.25%	.1%	.05%
MC-80 (X)	RE 60 (N) RER 60	8	5	3.0 gr	3.3 gr	.5 Ω to 20 K Ω	1 Ω to 10 K Ω	2.5 Ω to 10 K Ω	3 Ω to 10 K Ω	5 Ω to 10 K Ω
MC-100 (X)	RE 65 (N) RER 65	10	10	6.5 gr	8.8 gr	.5 Ω to 25 K Ω	1 Ω to 10 K Ω	2.5 Ω to 10 K Ω	3 Ω to 10 K Ω	5 Ω to 10 K Ω
MC-250 (X)	RE 70 (N) RER 70	25	20	12.5 gr	16.5 gr	.1 Ω to 70 K Ω	.2 Ω to 30 K Ω	.3 Ω to 30 K Ω	.5 Ω to 30 K Ω	1 Ω to 30 K Ω
MC-500 (X)	RE 75 (N) RER 75	50	30	27 gr	30.8 gr	.1 Ω to 200 K Ω	.2 Ω to 80 K Ω	.3 Ω to 80 K Ω	.5 Ω to 80 K Ω	1 Ω to 80 K Ω

Available in Noninductive (code symbol "X"—Cal-R) (code symbol "N"—Mil)

*Noninductive maximum resistances are one-half of listed values.

OWER RESISTORS . . . Cont'd.

5 (5 WATTS) OUTSTANDING FEATURES

Copperweld leads hot tin dipped — Gold plated DUMET or "A" nickel available.
High density extruded aluminum housing provides superior heat conduction. Housing deep finned for maximum heat dissipation.
Windings — high uniformity single layer space wound, designed to give maximum core coverage for even heat dissipation. T5X (non-inductive) types have dual balanced windings for minimum inductance.
Core — Alumina ceramic, centerless ground for uniformity.

3 (3 WATTS) OUTSTANDING FEATURES

Windings — Reverse pie wound — all pies filled for maximum heat dissipation. Unique recessed end cap designed to isolate winding termination from all lead stress.
Protective overcoating covering entire resistor before molding insures maximum protection and secures winding without introducing stress.
Resistor element encased in nonburning epoxy by transfer molding techniques.
Copperweld leads hot tin dipped standard — Gold plated DUMET or "A" nickel available.

STANDARD RESISTANCE & TOLERANCE RANGES

Type	Normal Rating	Weight	Tolerances and Maximum Resistances 1% UP	.5%	.25%	.1%	.05%
T5	5 WATTS	.8 gr	1Ω-5K	1Ω-5K	5Ω-3K	10Ω-2.5K	10Ω-2.5K
T3*	3 WATTS	.8 gr	3K-300K	3K-300K	3K-300K	3K-300K	3K-300K

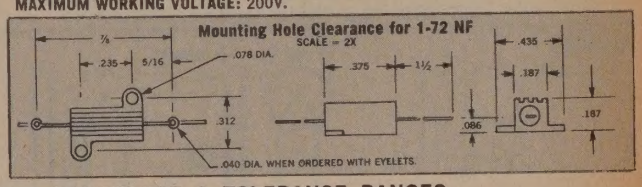
*200 VAC MAX.

T-5 ELECTRICAL CHARACTERISTICS

TOLERANCES: 5.0% to .05%. 1% standard for off-shelf delivery.
TEMPERATURE COEFFICIENT: 30 ppm/°C standard. Special T.C.'s to 5 ppm/°C available.
STABILITY: consistent with tolerances, all parts stabilized in production. Less than 0.5% drift in 1000 hours operation at full CAL-R wattage rating for 1% tolerance parts.
RESISTANCE RANGES: .5 ohms to 3 K ohms.
DIELECTRIC STRENGTH: greater than 500 V.A.C.
DIELECTRIC TEST: performed on 100% basis.

T-3 ELECTRICAL CHARACTERISTICS

TOLERANCE: 1 to .005% absolute. To .002% matching tolerance for matched sets.
TEMPERATURE COEFFICIENT: 10 ppm/°C is standard. Special TCs in ranges from +6000 ppm to 2 ppm/°C available.
STABILITY: consistent with tolerances. All parts stabilized in production, including 1% parts. Components available with stability of .002% per year.
WINDINGS: multiple pie reversed type to minimized inductance. Special windings available to provide fast rise times.
RESISTANCE: Ranges 3 K ohms to 300 K ohms.
MAXIMUM WORKING VOLTAGE: 200V.



PRECISION RESISTORS

OUTSTANDING FEATURES

1. All pies filled for maximum heat dissipation.
2. Unique recessed end cap designed to isolate winding termination from all lead stress.
3. Terminals welded to end cap for maximum strength — will withstand 15 lbs. linear pull.
4. Double slots tangent to mandrel to prevent shorting between pie windings eliminating space-wasting construction features or the need for insulating tape.
5. Protective overcoating covering entire resistor before molding insures maximum moisture protection and secures winding without introducing stress.
6. Standard leads — copperweld hot tin dipped or annealed Dumet gold plated.
7. Special matching available to .001% tolerance.

EECTRICAL CHARACTERISTICS

TOLERANCE: 1 to .005% absolute. To .002% matching tolerance for matched sets.

TEMPERATURE COEFFICIENT: 10 ppm/°C is standard. Special TCs in ranges from +6000 ppm to 2 ppm/°C available.

STABILITY: consistent with tolerances. All parts stabilized in production, including 1% parts. Components available with stability of .002% per year.

WINDINGS: multiple pie reversed type to minimized inductance (except on Miniature Series). Special windings available to provide low rise times.

RESISTANCE: Ranges 1 ohm to 10 megohms.

PHYSICAL CHARACTERISTICS

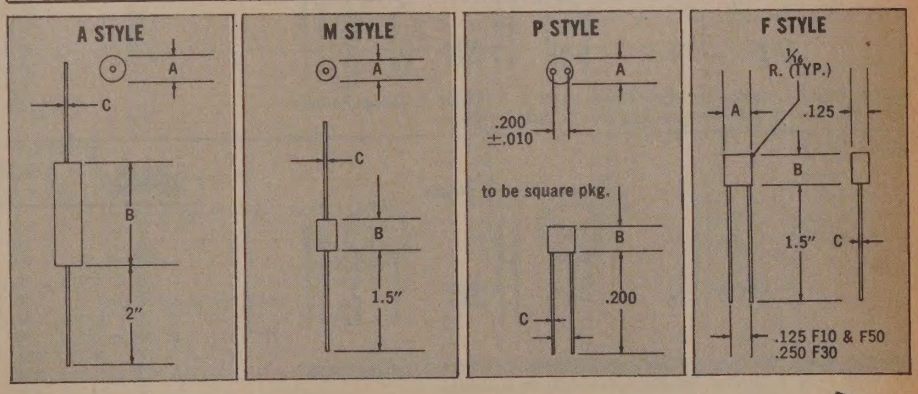
MATERIAL: Hi-Temp epoxy with matching coefficient of expansion between core and case. Leads are gold over Dumet.

ENVIRONMENTAL

Meet or exceed all requirements of MIL-R-93C and MIL-R-39005.

STANDARD RESISTANCE & TOLERANCE RANGES

Dimensions CAL-R Part No.	"A" ±.010	"B" ±.010	"C"	Rated Wattage	MIL Equiv. MIL-R-93C MIL-R-39005	Tolerances and Maximum Resistances ±1%	±.5%	±.1%	±.05%	±.01%
M10	.080	.200	.016 #26 AWG	.05		100Ω100K	300Ω-80K	1K-80K	3K-50K	10K-25W
M20	.100	.200	.016 #26 AWG	.06		25Ω-150K	50Ω-100K	100Ω-100K	500Ω-80K	2.5K-50K
M30	.125	.250	.020 #24 AWG	.08		10Ω-250K	20Ω-250K	80Ω-250K	300Ω-200K	1.5K-150K
M40	.125	.375	.020 #24 AWG	.10		10Ω-400K	20Ω-400K	80Ω-400K	300Ω-300K	1.K-200K
A2525	.250	.250	.032 #20 AWG	.2	RBR75	10Ω-750K	20Ω-750K	50Ω750K	200Ω-650K	1.K-500K
A2537	.250	.375	.032	.25	RB56 RBR56	10Ω-1MEG	20Ω-1MEG	50Ω-1MEG	200Ω-1MEG	800Ω-800K
A2550	.250	.500	.032	.25	RB55 RBR55 AFRT10	10Ω-2.5MEG	20Ω-2.5M	50Ω-2.5M	100Ω-2.5M	500Ω-2.5M
A2575	.250	.750	.032	.35	RB54 RBR54 AFRT11	5Ω-3M	10Ω-3M	50Ω-3M	100Ω-3M	500Ω-3M
A25100	.250	1.00	.032	.4	RB53 RBR53 AFRT12	5Ω-3.5M	10Ω-3.5M	50Ω-3.5M	100Ω-3.5M	500Ω-3.5M
A3775	.375	.750	.032	.5		5Ω-4M	10Ω-4M	50Ω-4M	100Ω-4M	400Ω-3M
A37100	.375	1.00	.032	1.0	RB52 RBR52 AFRT13	2Ω-5.5M	4Ω-5.5M	20Ω-5.5M	50Ω-5.5M	300Ω-4.5M
A5050	.500	.500	.032	.5		10Ω-4M	20Ω-4M	50Ω-4M	100Ω-4M	400Ω-3M
A5062	.500	.625	.032	.5						
A5070	.812	.312	.032	.5	RBR76	5Ω-5.5M	10Ω-5.5M	50Ω-5.5M	100Ω-5.5M	400Ω-4.5M
A50100	.500	1.00	.032	1.0	RB57 AFRT14	1Ω-7MEG	5Ω-7M	20Ω-7MEG	50Ω-7MEG	200Ω-5MEG
P2531	.250	.312	.025 #22 AWG	.12		10Ω-1MEG	20Ω-1M	50Ω-1M	100Ω-1M	800Ω-800K
P3750	.375	.500	.025	.35		5Ω-1.5M	10Ω-1.5M	30Ω-1.5M	100Ω-1.5M	800Ω-1.MEG
F10	.250	.250	.032 #20 AWG	.125		10Ω-750K	20Ω-750K	50Ω-750K	200Ω-650K	1.K-500K
F30	.500	.250	.032	.25		10Ω-1M	20Ω-1MEG	50Ω-1M	200Ω-1M	800Ω-800K
F50	.250	.500	.032	.25		5Ω-1.3M	10Ω-1.3M	20Ω-1.3M	100Ω-1.3M	200Ω-1.M

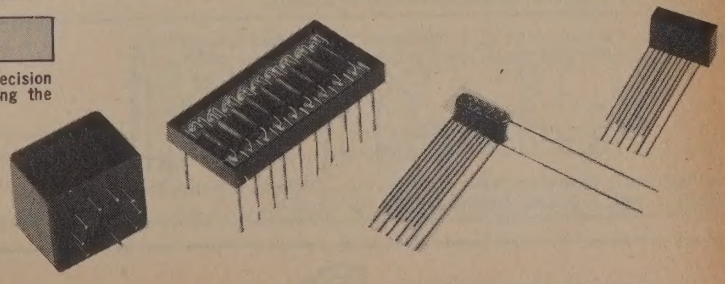


CAL-R PRECISION NETWORKS

Cal-R engineers, specialists in advanced network design, offer precision assemblies, packaged to meet the most exacting specifications, allowing the circuit designer maximum freedom without costly packaging problems.

GENERAL SPECIFICATIONS

RESISTOR VALUES: From 1 ohm thru 5 megohms
FULL SCALE ACCURACY: to .005%
TEMPERATURE COEFFICIENT TRACKING: to 1 PPM/°C.
TEMPERATURE COEFFICIENT ABSOLUTE: to 2 PPM/°C.
AMBIENT TEMPERATURE RANGE: —55°C to +125°C.
STANDARD TEMPERATURE COEFFICIENT: 0 to ±10 PPM.
STABILITY: to 10 PPM per year.
FAST RECOVERY TIME: to within .02% of final value within 100 ns.



CAL-R® INC. / CAPACITOR DIVISION · RESISTOR DIVISION · THERMONETICS DIVISION
a subsidiary of CapTech, Inc.
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 451-9761 • TWX 910-343-6966

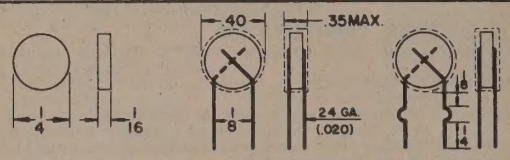
CARBORUNDUM® VARISTORS

DISCS

DIMENSIONS OVER COATING

FIG. 1 FIG. 2 FIG. 3

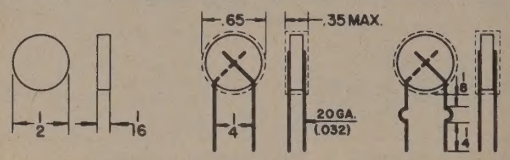
551BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	9.0	2.4	3.1	551BNR-26
1.0	11.0	2.3	3.7	551BNR-27
1.0	14.0	2.2	3.7	551BNR-28
1.0	18.0	2.1	3.9	551BNR-29
1.0	24.0	2.0	4.2	551BNR-30
1.0	29.0	1.9	4.5	551BNR-31
1.0	40.0	1.8	4.8	551BNR-32
1.0	54.0	1.8	4.9	551BNR-33
1.0	68.0	1.8	5.0	551BNR-34
1.0	88.0	1.8	5.1	551BNR-35

Specifications: 1. Continuous Power Rating @ 40°C—0.30 Watt. 2. Voltage Rating—100 Volts, Peak. 3. Coating (Dielectric & Moisture Resistant)—Fig. 1—None. Figures 2 & 3—PVC or Red Enamel (Glyptal®). 4. Standard Leads are Tinned Copper.

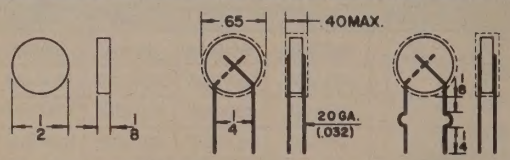
432BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	6.0	2.9	2.5	432BNR-101
1.0	7.5	2.5	3.0	432BNR-102
1.0	10.0	2.3	3.2	432BNR-103
1.0	12.0	2.2	3.3	432BNR-104
1.0	17.0	2.0	3.7	432BNR-105
1.0	24.0	1.8	4.2	432BNR-106
1.0	30.0	1.8	4.2	432BNR-107
1.0	40.0	1.8	4.2	432BNR-108
1.0	48.0	1.8	4.6	432BNR-109
1.0	70.0	1.8	4.6	432BNR-110
1.0	90.0	1.7	4.8	432BNR-111

Specifications: 1. Continuous Power Rating @ 40°C—0.50 Watt. 2. Voltage Rating—100 Volts, Peak. 3. Coating—same as above. 4. Same as above.

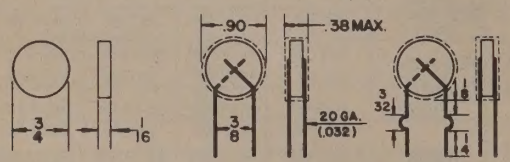
379BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	12.0	2.9	2.5	379BNR-10
1.0	15.0	2.5	3.0	379BNR-11
1.0	20.0	2.3	3.2	379BNR-12
1.0	24.0	2.2	3.3	379BNR-13
1.0	34.0	2.0	3.7	379BNR-14
1.0	48.0	1.9	4.2	379BNR-15
1.0	60.0	1.8	4.2	379BNR-16
1.0	80.0	1.8	4.2	379BNR-17
1.0	100.0	1.8	4.6	379BNR-18
1.0	135.0	1.8	4.6	379BNR-19
1.0	180.0	1.7	4.8	379BNR-20

Specifications: 1. Continuous Power Rating @ 40°C—0.50 Watt. 2. Voltage Rating—200 Volts, Peak. 3. Coating—Same as above. 4. Same as above.

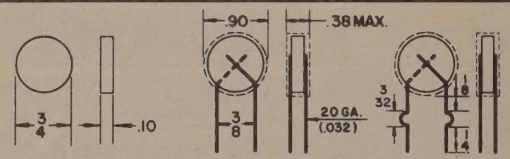
328BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	2.0	3.0	2.2	328BNR-40
1.0	3.0	2.7	2.5	328BNR-41
1.0	4.5	2.6	2.6	328BNR-42
1.0	6.0	2.4	3.0	328BNR-43
1.0	8.0	2.4	3.0	328BNR-44
1.0	12.0	2.2	3.7	328BNR-45
1.0	14.0	2.0	3.7	328BNR-46
1.0	18.0	1.9	4.2	328BNR-47
1.0	24.0	1.8	4.2	328BNR-48
1.0	33.0	1.8	4.2	328BNR-49
1.0	48.0	1.8	4.6	328BNR-50
1.0	60.0	1.8	4.6	328BNR-51
1.0	80.0	1.7	4.8	328BNR-52

Specifications: 1. Continuous Power Rating @ 40°C—0.75 Watt. 2. Voltage Rating—100 Volts, Peak. 3. Coating—same as above. 4. Same as above.

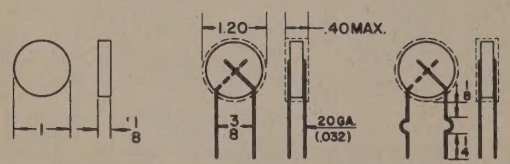
925BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	12.0	2.4	3.0	925BNR-10
1.0	16.0	2.4	3.0	925BNR-11
1.0	24.0	2.0	3.7	925BNR-12
1.0	28.0	2.0	3.7	925BNR-13
1.0	36.0	1.9	4.0	925BNR-14
1.0	48.0	1.9	4.2	925BNR-15
1.0	68.0	1.8	4.2	925BNR-16
1.0	90.0	1.8	4.6	925BNR-17
1.0	120.0	1.8	4.6	925BNR-18
1.0	160.0	1.7	4.8	925BNR-19

Specifications: 1. Continuous Power Rating @ 40°C—0.75 Watt. 2. Voltage Rating—200 Volts, Peak. 3. Coating—Same as above. 4. Same as above.

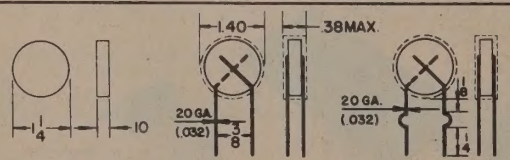
463BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 5.0 ma / E @ 0.5 ma	Nominal "N"	Carborundum Part Number
5	16	2.2	3.3	463BNR-30
5	24	2.2	3.3	463BNR-31
5	28	2.0	3.7	463BNR-32
5	36	2.0	3.7	463BNR-33
5	48	1.9	4.2	463BNR-34
5	62	1.8	4.2	463BNR-35
5	85	1.8	4.2	463BNR-36
5	110	1.7	4.8	463BNR-37
5	140	1.7	4.8	463BNR-38
5	190	1.7	5.0	463BNR-39

Specifications: 1. Continuous Power Rating @ 40°C—1.50 Watt. 2. Voltage Rating—200 Volts, Peak. 3. Coating—Same as above. 4. Same as above.

927BNR



Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 5.0 ma / E @ 0.5 ma	Nominal "N"	Carborundum Part Number
5	9	2.7	2.6	927BNR-19
5	15	2.4	3.0	927BNR-20
5	25	2.3	3.1	927BNR-21
5	40	2.3	3.2	927BNR-22
5	70	2.2	3.5	927BNR-23
5	100	2.1	3.7	927BNR-24
5	140	1.9	4.8	927BNR-25

Specifications: 1. Continuous Power Rating @ 40°C—2.25 Watts. 2. Voltage Rating—200 Volts, Peak. 3. Coating—Same as above. 4. Same as above.

CARBORUNDUM The Carborundum Company, Electronics Plant, Niagara Falls, N. Y. 14302, 716—278-2521

CARBORUNDUM® VARISTORS
RODS

231BNR

FIG. 1

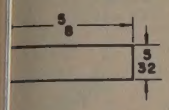
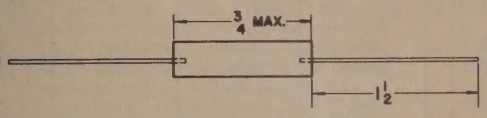


FIG. 2



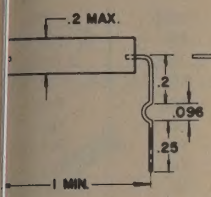


FIG. 3

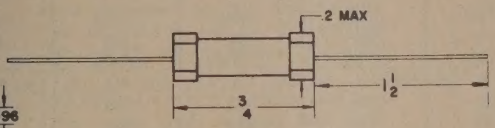


FIG. 4

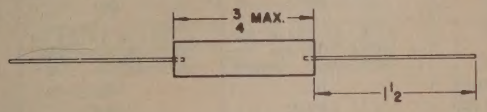
Current Milliamps	Voltage DC ±10%	Max. Ratio E @ 1.0 ma / E @ 0.1 ma	Nominal "N"	Carborundum Part Number
1.0	100	2.1	3.1	231BNR-18
1.0	135	2.0	3.4	231BNR-19
1.0	180	1.9	3.6	231BNR-20
1.0	240	1.8	4.1	231BNR-21
1.0	320	1.8	4.1	231BNR-22
1.0	430	1.7	4.7	231BNR-23
1.0	575	1.7	4.8	231BNR-24
1.0	750	1.7	4.8	231BNR-25

Specifications: 1. Continuous Power Rating @ 40°C—0.75 Watt. 2. Voltage Rating—800 Volts, Peak. 3. Coating: Styles 2 & 3 Epoxy; Style 4 None. 4. Standard Leads—20 ga. Tinned Copper.

233BNR

FIG. 1

FIG. 2



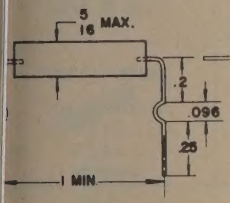


FIG. 3

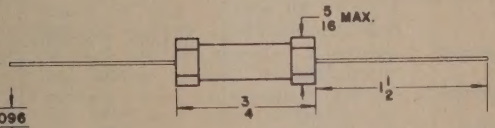


FIG. 4

1	68	2.2	3.3	233BNR-30
1	88	2.2	3.3	233BNR-31
1	110	2.0	3.7	233BNR-32
1	140	2.0	3.7	233BNR-33
1	175	1.8	4.2	233BNR-34
1	250	1.8	4.2	233BNR-35
1	320	1.8	4.2	233BNR-36
1	410	1.7	4.8	233BNR-37
1	520	1.7	4.8	233BNR-38
1	710	1.7	5.0	233BNR-39

Specifications: 1. Continuous Power Rating @ 40°C—1.00 Watt. 2. Voltage Rating—800 Volts, Peak. 3. Coating—Same as 231BNR. 4. Leads—Same as 231BNR.

234BNR

FIG. 1

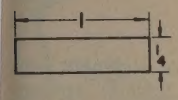
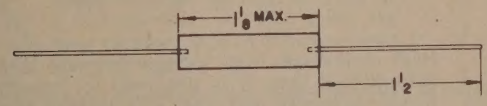


FIG. 2



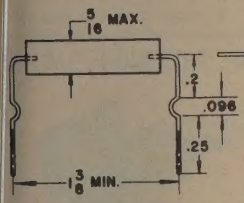


FIG. 3

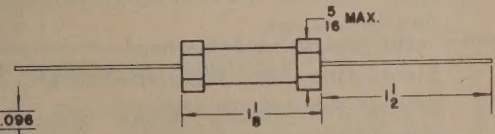


FIG. 4

1	135	2.2	3.3	234BNR-42
1	175	2.2	3.3	234BNR-43
1	220	2.0	3.7	234BNR-44
1	290	2.0	3.7	234BNR-45
1	350	1.9	4.2	234BNR-46
1	500	1.8	4.2	234BNR-47
1	680	1.8	4.2	234BNR-48
1	825	1.7	4.8	234BNR-49
1	1050	1.7	4.8	234BNR-50

Specifications: 1. Continuous Power Rating @ 40°C—1.50 Watt. 2. Voltage Rating—1500 Volts, Peak. 3. Coating—Same as 231BNR. 4. Leads Same as 231BNR.

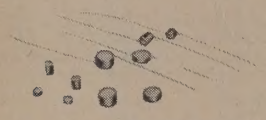
CARBORUNDUM

The Carborundum Company, Electronics Plant, Niagara Falls, N. Y. 14302, 716—278-2521

CTS CORPORATION ELKHART, INDIANA

RESISTORS & RESISTOR MODULES

SOLID CERMET PELLET AND CHIP RESISTORS



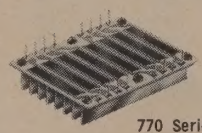
Ceradot Resistors

150 Series

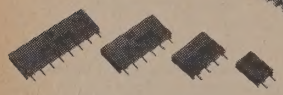
	Series					
	A	B	C	E	150	151
Size, Dia. x Length	.050" x .030"	.100" x .062"	.050" x .062"	.100" x .030"	.075" x .050" x .030"	.090" x .050" x .030"
Minimum Resistance	50Ω	25Ω	100Ω	15Ω	200Ω	200Ω
Maximum Resistance	100KΩ	50KΩ	200KΩ	25KΩ	350KΩ	350KΩ
Wattage Rating at 125°C	1/10	1/8	1/10	1/10	1/8	1/8
Temp. Coefficient, ppm/°C	±300	±300	±300	±300	±300	±300
Voltage Rating	50V	50V	50V	50V	50V	50V
Standard Res. Tolerance	±10%	±10%	±10%	±10%	±10%	±10%
Spec. Res. Tol. Avail.	5%, 2%, 1%	5%, 2%, 1%	5%, 2%, 1%	5%, 2%, 1%	5%, 2%, 1%	5%, 2%, 1%
Termination—Gold	Yes	Yes	Yes	Yes	Yes	Yes
Termination—Plat. Gold	Yes	Yes	Yes	Yes	Yes	Yes
Termination—Tinned	Yes	Yes	Yes	Yes	Yes	Yes
Termination—Silver	Yes	Yes	Yes	Yes	Yes	Yes
Termination—Leaded	Yes	Yes	Yes	Yes	No	No
Order From	Lafayette	Lafayette	Lafayette	Lafayette	Lafayette	Lafayette

RESISTOR MODULES

760 Series



770 Series



750 Series

	Series		
	750	760	770
Description	2, 4, 6, and 8 pin in-line modules on .125" lead centers	8, 14 and 16 pin in-line modules on .100" lead centers	1.5" x 1.225" power terminating module on .125" lead centers
Minimum Resistance	10Ω	10Ω	10Ω
Maximum Resistance	1 MegΩ	1 MegΩ	1 MegΩ
Wattage Rating	8 pin — 2.0 watts 4 pin — 1.0 watt	8 pin — .75 watt 14 pin — 1.5 watts 16 pin — 1.75 watts	8 to 20 watts
Std. Temp. Coefficient in ppm/°C	±300	±300	Contact factory
Spl. Temp. Coefficient in ppm/°C	±150	±150	Contact factory
Std. Resistance Tol.	±5%	±5%	±1%
Spl. Temp. Coefficient	±0.5%	±1%	±0.5%
Order From	Berne	Berne	Lafayette

POTENTIOMETER-RESISTOR NETWORK

670 SERIES

A potentiometer-resistor network for high voltage circuits where an adjustable pick-off is desired.

Resistance Range:
- R1—1-50 Megohms
- R2—1-30 Megohms
- R3—1-25 Megohms
- R4—1-10 Megohms

Standard Resistance Tolerance: ±30%

Minimum Resistance Tolerance:
- R1, R3 & R4—±10%
- R2 —±25%

Max. Voltage Rating—8000 V

Power Rating—3 watts @ 55°C

Mfg. at Elkhart

HIGH VOLTAGE RESISTOR

680 SERIES

High resistance, high voltage Cermide resistor available with and without taps. It is designed for bleeder resistor, voltage divider networks and other high voltage applications.

Resistance Range:
20K Ohms to 1,000 Megohms

Standard Resistance Tolerance—±30%

Minimum Resistance Tolerance—±10%

Max. Voltage Rating—30,000 V

Power Rating—3.5 watts @ 55°C

Mfg. at Elkhart

ORDERING INFORMATION:

Place orders at locations shown above, using the following addresses:

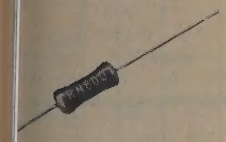
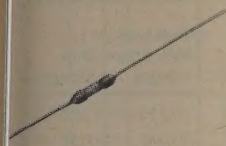
CTS of Berne, Inc., 406 Parr Road, Berne, Indiana 46711 • Telephone 219-589-3111 • TWX 810-323-1580
CTS Microelectronics, Inc., P.O. Box 1278, Lafayette, Indiana 47902 • Telephone 317-463-2565 • TWX 810-342-1882
CTS of Elkhart, Div., 1142 W. Beardsley Ave., Elkhart, Indiana 46514 • Telephone 219-523-0210 • TWX 810-294-2256

PRECISION FILM RESISTORS, WIRE-WOUND POTENTIOMETERS AND AUTOMOTIVE SPARK SUPPRESSORS

Precision Metal Film Resistors

PRODUCT REFERENCE CHART — MIL R 10509

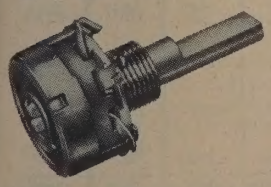
GENERAL SPECIFICATIONS

SERIES	DESCRIPTION	CW Type	MIL Style	MIL Char.	Wattage Rating 70°C	Wattage Rating 125°C	Resistance Min.	Resistance Max.
 X	Vacuumette type "X" series are conformal coated, evaporated metal film resistors designed for higher performance and stability, identified by a reddish-brown color of E-coating. In addition to standard temperature coefficients per MIL characteristics, they are available with T.C. of ±100 PPM (EIA Code T1). QPL approved per MIL R 10509	X55	RN55	D, C, E	⅛	1/10	10Ω	301K
		X60	RN60	D, C, E	¼	⅛	10Ω	1 Meg.
		X65	RN65	D, C, E	½	¼	10Ω	2 Meg.
VFM	VFM series are molded resistors, with more types in the higher wattages than Series "X," and made by the same rigid manufacturing methods. They are identified by a tan color molded jacket providing greater mechanical protection and will sustain rough handling. QPL approved per MIL R 10509	VFM05	RN60	D, C, E	¼	⅛	10Ω	1 Meg.
		VFM10	RN65	D, C, E	½	¼	10Ω	2 Meg.
		VFM15	RN70	D, C, E	¾	½	10Ω	2.49 Meg.
		VFM25	RN75	B	1	1	10Ω	5.11 Meg.
 VF*	VF series trim line resistors are offered as a multi-rated, multi-purpose conformally coated metal film. Smaller than MIL type, they provide the same maximum performance capabilities at a lower cost. Units are coded similar to "X" series, but are identified by standard commercial marking.	VF05	—	—		⅛	10Ω	1 Meg.
		VF11	—	—		¼	10Ω	2 Meg.
		VF15	RN20	X		½	10Ω	2.5 Meg.
		VF25	RN25	X		1	10Ω	5 Meg.
NA	Noblette type NA series are metal film resistors with the advantage of extreme high and low resistance values in varying wattages. Values are obtained by application of "noble" metals through a C-W developed pyro-chemic process. Film is protected by a layer of vitreous enamel and a rubberized, charcoal gray enamel paint. Axial lead construction.	NA15	—	—	½w @ 40°C		0.5Ω	3 Meg.
		NA20	—	—	½w @ 40°C		0.5Ω	3 Meg.
		NA25	—	—	1w @ 40°C		0.5Ω	5 Meg.
		NA30	—	—	2w @ 40°C		1.0Ω	10 Meg.
NR	Nobeloy type NR resistors are similar in composition and appearance to NA series, except that they have radial lead construction. Resistor body is in tube form, permitting additional mounting by means of a thru-bolt. They also offer higher and lower resistance value in varying wattages from ½W to 5W.	NR20	—	—	½w @ 40°C		0.5Ω	3 Meg.
		NR25	—	—	1w @ 40°C		0.5Ω	5 Meg.
		NR30	—	—	2w @ 40°C		1.0Ω	10 Meg.
		NR50	—	—	5w @ 40°C		2.0Ω	10 Meg.

NOTE: *Available in T.C., T1, T2, T9.
Request Bulletin 2094-70

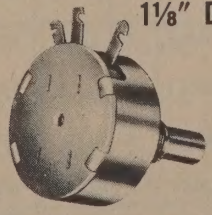
MIL CHAR. D = T.C. ±100 PPM (T1) E = T.C. ± 25 PPM (T9)
C = T.C. ± 50 PPM (T2) B = T.C. ±500 PPM

¾" DIAMETER WIRE-WOUND CONTROLS



Electrical circuit choice of potentiometer, rheostat, or fader up to 10,000 ohms resistance. Power dissipation to 3.0 watts with anticipated life of 10,000 cycles. Available with grounded or insulated rotor and plastic or metal shafts. Choice of mounting style: bushing (illustrated), eyelet-to-chassis, twist tab, or snap-in ears to printed circuit board. Request Bulletin No. 2080-67.

1⅛" DIAMETER WIRE-WOUND CONTROLS



Resistance range to 25,000 ohms. Available as potentiometer, rheostat, or "L" pad. Up to 5.0 watts power dissipation with anticipated life to 25,000 cycles. Available with insulated rotor and choice of bushing or twist-tab mount. Bushing and shaft dimensions available to meet your specific requirements. Request Bulletin No. 2060

AUTOMOTIVE and OIL BURNER SPARK SUPPRESSORS

For suppression of radio and television noise interference due to ignition spark discharge at plugs and high tension distributor; and due to ignition discharge action of oil burner igniting coil. Complete line of resistive type suppressors. Request Bulletin 125.

C-W products assure high reliability at reasonable prices. Full cooperation on custom engineering, field service, emergency stocking and special models.

See Sec. 5100 for complete line of C-W Slide-Switches.

CONTINENTAL-WIRT ELECTRONICS CORP.
26 W. QUEEN LANE, PHILADELPHIA, PA. 19144
(AREA CODE 215) VI 8-7700
TWX 710-670-1230

CORNING ELECTRONICS / Houghton Park, Corning, New York 14830 / Phone 607, 962-4444

We make resistors for guys who can't stand failures

LOW POWER RESISTORS

APPLICATIONS	Corning Style	MIL Type	MIL Spec. (MIL-R-)	MIL Char.	Wattage Rating	Rated Temp. °C	Derated Temp. °C	Hot Spot	Volt. Rating	Resistance Range	Stand. Tol.	Body Dia. Max.
LOW POWER INSULATED FLAME PROOF	*FP½				½	70°	150°		350	10Ω-470K	2, 5%	.150″
	FP 2				3, 2	40°, 70°	250°	222°, 190°	500	9Ω-90K	5, 10%	.325″
	FP 3				4, 3	40°, 70°	250°	277°, 253°	500	9Ω-40K	5, 10%	.325″
	FP 4				5, 4	40°, 70°	250°	258°, 245°	500	16Ω-90K	5, 10%	.325″
	FP 5				7, 5	40°, 70°	250°	288°, 254°	600	19Ω-90K	5, 10%	.325″
	FP 7				—7	— 70°	250°	— 290°	700	24Ω-90K	5, 10%	.325″
	FP 10				10, —	40°, —	250°	333° —	700	24Ω-90K	5, 10%	.325″

ESTABLISHED RELIABILITY RESISTORS

	Type	MIL. Type	MIL. Spec. (MIL-R-)	MIL. Char.	Wattage Rating	Rated Temp. °C	Stand. Tol.	Temp. Co-eff.	Resistance Range	Lead Dia.	Dia. Max.	Clean Lead, Max. Body Length	Volt. Rating
HC	HC3	RLR05	39017		⅛	70	2-5%	100ppm	10-150K	.016	.066	.160	200
	HC4	RLR07	39017		¼	70	2-5%	100ppm	10-160K	.025	.098	.245	250
	HC5	RLR20	39017		½	70	2-5%	100ppm	10-1MEG	.032	.148	.375	350
	HC6	RLR32	39017		1	70	2-5%	100ppm	10-1MEG	.040	.200	.593	500
HH/HK	HH4/ HK4	RNC55[1]	55182	H,K	1/10	125	1%	50ppm/ 100ppm	49.9-100K	.025	.098	.245	200
	HH5/ HK5	RNC60[1]	55182	H,K	⅛	125	1%	50ppm/ 100ppm	49.9-499K	.025	.148	.375	250

[1] a. "RNC" Lead Material — Type C copper per MIL-STD-1276.
b. Per MIL-R-55182 "RNC" lead type is a direct one way substitute for "RNR" lead type.
c. Per MIL-STD-199 "RNC" is the preferred lead type.

PRECISION, SEMI-PRECISION AND GENERAL PURPOSE RESISTORS

Application	Corning Style	MIL. Type	MIL. Spec. (MIL-R-)	MIL. Char.	Wattage Rating	Rated Temp., °C	Derated Temp., °C	Volt Rating	Resistance Range	Stand. Tol.	Body Dia. Max.	Body Length Max.	Clean Wire to Wire Max.
PRECISION	NC 4	RN 55	10509 F	C	⅛, 1/10	70°, 125°	165°, 175°	200	49.9Ω-150K	½%	.098″	.250″	.281″
									49.9Ω-301K	1%			
	NC 5	RN 60	10509 F	C	¼, ⅛	70°, 125°	165°, 175°	250	49.9Ω-499K	½%	.148″	.416″	.450″
									49.9Ω-1MEG	1%			
	NC 6	RN 65	10509 F	C	½, ¼	70°, 125°	165°, 175°	300	49.9Ω-1MEG	½%	.200″	.593″	.633″
									49.9Ω-2MEG	1%			
PRECISION	NA 55	RN 55	10509 F	D	⅛, 1/10	70°, 125°	165°, 175°	200	49.9Ω-150K	½%	.098″	.250″	.281″
									10Ω-301K	1%			
	NA 60	RN 60	10509 F	D	¼, ⅛	70°, 125°	165°, 175°	300	49.9Ω-499K	½%	.148″	.416″	.450″
									10Ω-1MEG	1%			
	NA 65	RN 65	10509 F	D	½, ¼	70°, 125°	165°, 175°	350	49.9Ω-1MEG	½%	.200″	.593″	.633″
									10Ω-2MEG	1%			
	NA 70	RN 70	10509 F	D	¾, ½	70°, 125°	165°, 175°	500	51Ω-1MEG	½,1%	.263″	.790″	.875″
SEMI-PRECISION	C 3	—	—	—	⅛	70°	150°	200	10Ω-150K	1,2,5,10%	.066″	.160″	.160″
	C 4	RL 07S	22684 B		¼	70°	150°	250	10Ω-301K	1,2,5%	.098″	.250″	.281″
			(10509)		⅛	70°	165°						
			(10509)		1/10	125°	175°						
					⅛	125°	175°						
	C 5	RL 20S	22684 B		½	70°	150°	350	10Ω-1MEG	1,2,5%	.148″	.416″	.450″
			(10509)		¼	70°	165°						
					⅛	125°	175°						
					¼	125°	175°						

ASS AND METAL OXIDE FILM RESISTORS

rfect combination to handle resistor jobs

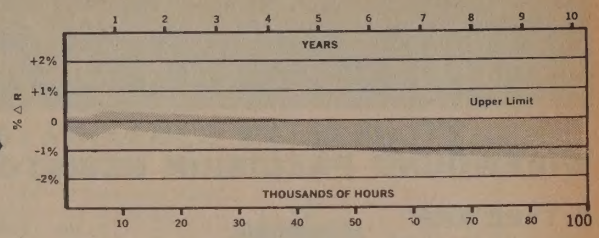
pendable resistor performance, tailored to specific circuit uirements results from CORNING® Materials and cess skills.

gh resistivity tin oxide film is combined with optical ality glass substrate yielding exceptionally strong, uni- m resistance components.

is construction is the basic reason for the proven sta- lity and reliability demonstrated in the 100,000 hour test ta summarized at right.

0,000 TOTAL TEST HOUR DATA DEMONSTRATES LONG TERM ABILITY RESULTING FROM THIS UNIQUE CONSTRUCTION.

Extended load life performance, 150 CORNING Tin Oxide Resistors



orning Style	Clean Wire to Wire Max.	Lead Dia. (±.002)	Temp. Coeff.	Load Life △R	Moist. Resist. △R	Temp. Cycle △R	Short Time Over-load △R	Low Temp. Oper. △R	Dielec-tric With-stand △R	Effect Solder Heat △R	Term. Strength △R	Shock △R	Vibra-tion △R	Shelf Life △R	Volt. Coeff. (Typical)
FP½	0.380″	.032″	±150 ppm/°C	±1.5%	±1.5%	±1%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 2	0.718″	.045″		±5%		±1%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 3	0.955″	.032″	±200 ppm/°C from	±5%		±1%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 4	1.565″	.032″	—55° to +150°C	±5%		±1%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 5	1.745″	.032″		±5%		±1%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 7	2.075″	.032″		±5%	±2%	±2%	±2%	±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V
FP 10	2.075″	.032″		±5%				±.5%	±.5%	±.5%	±.5%	±.5%	±.5%	±.2%	.001%/V

* FP½ (FP-20) is qualified to MIL-R-22684

Type	Temp. Cycle △R	Low Temp. Oper. △R	Term. Strength △R	Dielectric Withstand. Voltage △R	Effect Solder Heat △R	Moist. Resist. △R	Shock △R	Vibration △R	Short Time Overload △R	Load Life 2000HR	Load Life 10,000HR	Screening 100%	Failure Rate % Per 1000 Hours, 60% Confidence Level
HC3	.25%	.25%	.25%	.10%	.25%	.50%	.10%	.10%	.50%	2%	4%	Power Conditioning (24 Hours) 1.5X rated Power. Max △R ±.50%	Corning is QPL to MIL-R-39017. For failure rate information Please call (607) 962-4444
HC4	.25%	.25%	.25%	.10%	.10%	.50%	.10%	.10%	.25%	2%	4%		
HC5	.25%	.25%	.25%	.10%	.10%	.50%	.10%	.10%	.25%	2%	4%		
HC6	.25%	.25%	.25%	.10%	.10%	.50%	.10%	.10%	.25%	2%	4%		
HH4/ HK4	NA	.15%	.10%	.10%	.10%	.40%	.10%	.10%	NA	.5%	2%	Temperature Cycling and Overload (1 Hour) at 5X rated power. Max △R ±.25%	Corning is QPL to MIL-R-55182. For failure rate information Please call (607) 962-4444
HH5/ HK5	NA	.15%	.10%	.10%	.10%	.40%	.10%	.10%	NA	.5%	2%		

Corning Style	Stand. Lead Dia.	Temp. Coeff.	Load Life △R	Moist. Resist. △R	Temp. Cycle △R	Short Time Overload △R	Low Temp. Oper. △R	Dielectric With-standing △R	Effect Solder Heat △R	Term. Strength △R	Shock △R	Vibra-tion △R	Shelf Life △R	Volt Co-Eff. (Typical)
NC 4	.025″		±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NC 5	.025″	±50 ppm from −55°C to +175°C	±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NC 6	.025″		±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NA 55	.025″	±100 ppm/°C from −55°C to +175°C	±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NA 60	.025″	for NA 55, 60 and 65. ±150 ppm/°C	±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NA 65	.025″	from −55°C to +165°C for NA 70.	±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
NA 70	.032″		±.5%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.20%	±.10%	±.10%	±.10%	.001%/V
C 3	.016″	±100, 200 ppm	±1.0%	±.5%	±0.25%	±0.5%	±0.25%	±0.25%	±0.1%	±0.20%	±0.25%	±0.25%	±.10%	.001%/V
C 4	.025″	±100 ppm from −55°C to +175°C	1%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
			0.5%											
			0.5%											
			1%											
C 5	.032″	±100 ppm from −55°C to +175°C	1%	±.5%	±.25%	±.25%	±.25%	±.10%	±.10%	±.10%	±.10%	±.10%	±.10%	.001%/V
			0.5%											
			0.5%											
			1%											

Corning is QPL to MIL-R-10509 and MIL-R-22684.
Data based on guaranteed Corning specifications. Actual performance typically better.

For Optimum Value in Resistors... DALE®

WIREWOUND PRECISION RESISTORS, ESTABLISHED RELIABILITY

■ TYPE ARS*

Failure rate .000136% per 1000 hours at 50% rated power, 25°C ambient (60% confidence level). Failure defined as ΔR>0.5%.

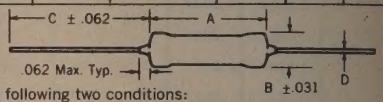
■ TYPE AGS*

Miniature version of ARS Series with BeO core for optimum thermal conductivity, operational stability and increased reliability. Significantly smaller size. Failure rate .000044% per 1000 hours at 50% rated power, 25°C ambient (60% confidence level). Failure defined as ΔR>0.5%.

*Available with solderable and weldable leads.

DALE TYPE	MIL-R-39007B TYPE	POWER RATING (watts)	MIN. RES. (ohms)	MAX. RES. (ohms)	MAX. WORKING VOLTAGE	MAX. WEIGHT (grams)	DIM. A	DIM. B	DIM. C	DIM. D
ARS-2	RWR-71	2	0.1	16.2K	180	1.6	.812±.062	.187	1.5	.032
ARS-5	RWR-74	5	0.1	12K	250	4.75	.875±.062	.312	2.0	.040
ARS-10	RWR-78	10	0.1	40K	650	12.00	1.780±.062	.375	2.0	.040
AGS-1	RWR-81	1	0.5	1.0K	25	.35	.250±.031	.085	1.5	.020
AGS-2	RWR-82	1.5	0.1	1.3K	32	.30	.312±.016	.078	1.5	.020
AGS-3	RWR-80	2.25	0.1	2.67K	52	.375	.406±.031	.094	1.5	.020
AGS-5	RWR-89	4	0.1	4.12K	112	1.25	.560±.062	.187	1.5	.032
AGS-10	RWR-84	7	0.1	12.4K	275	4.25	.875±.062	.312	2.0	.040

Tolerance: All established reliability resistors have a standard resistance tolerance of 1%.



POWER RATING

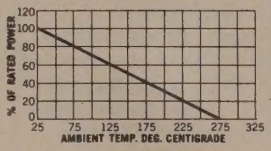
Dale ARS and AGS power ratings are based on the following two conditions:
1. 0.5% maximum ΔR in 2000 hours load life. 2. 275°C maximum operating temperature.

■ TYPE ARH

Advanced design housed power wirewounds made on the same line and under the same high reliability standards as the ARS and AGS. Failure rate of .1% at 100% rated power.

DERATING ARS, AGS, ARH

Established reliability data is based on operation at 50% rated power at 25°C. At high ambient temperatures, the derating curve at right applies:



DALE TYPE	MIL-R-39009A TYPE	POWER RATING (watts) MTD.	POWER RATING (watts) FREE AIR	RESISTANCE RANGES (ohms) MIN.	RESISTANCE RANGES (ohms) MAX.	MAX. WORKING VOLTAGE	MAX. WT. GRAMS
ARH-5	RER-60	5	3	.1	4.12K	220	3
ARH-10	RER-65	10	6	.1	5.62K	340	8
ARH-25	RER-70	20	8	.1	12.1K	650	15
ARH-50	RER-75	30	10	1.0	39.2K	1400	32

Tolerance: All established reliability resistors have a standard resistance tolerance of 1%. Non-inductive versions also available.

DIMENSIONS: See section on RH resistors. Types ARH-5 thru 50 will correspond with RH-5 thru 50.

POWER RATING

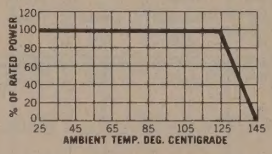
Dale ARH resistor ratings are based on the following requirements:
1. 275° maximum internal hotspot temperature
2. 1% maximum ΔR in 2000 hour load life
3. Proper heat sink
   4x6x2x.040 aluminum chassis = ARH-5 and ARH-10
   5x7x2x.040 aluminum chassis = ARH-25 and ARH-50

■ TYPE AWA

Established reliability epoxy-molded precision bobbin wirewound resistor with high stability and low T.C.; offers excellent moisture protection and low noise. Quality verified by acceptance testing.

DERATING

Dale AWA resistors have an operating temperature range of −55°C to +145°C. Derating is required for temperatures above 125°C. The curve at right applies.



DALE TYPE	MIL-R-39005B TYPE	POWER RATING (Watts)	MINIMUM RESISTANCE RANGE (Ohms) .01%	.02%	.05%	.1%	1%	MAX. RES. (Ohms) ALL TOL.	MAX. WORKING VOLTAGE	MAX. WT. (Grams)
AWA-55	RBR-55	.15	10	10	10	10	.1	250K	200	1.2
AWA-54	RBR-54	.25	10	10	10	10	.1	450K	300	1.5
AWA-53	RBR-53	.33	10	10	10	10	.1	1.1 Meg.	300	3.1
AWA-52	RBR-52	.50	10	10	10	10	.1	1.21 Meg.	600	3.8

POWER RATING

Dale AWA power ratings are based on the following two conditions:
1. 1% maximum ΔR in 2000 hours load life.
2. 125°C maximum operating temperature.

DIMENSIONS:

See section on WWA resistors. Dimensions on Types RBR-52 thru RBR-55 will conform to Types RB-52 thru RB-55.

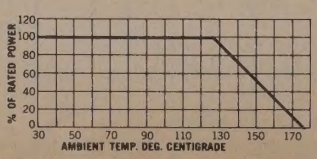
METAL FILM PRECISION RESISTORS, ESTABLISHED RELIABILITY

■ TYPE EMF

Failure Rate: Verified Failure Rate of .1% per 1000 hours at 60% confidence level. Estimated Failure Rate: .01% per 1000 hours. Failure Rate Goal: .001% per 1000 hours.

DERATING

Dale EMF resistors have an operating temperature range of −65°C to +175° C. They must be derated according to the curve at right.



DALE TYPE	MIL. TYPE	125°C RATING	MAX. WEIGHT (GRAMS)	MAX. WORKING VOLTAGE	RESISTANCE RANGE (OHMS) T-1 (K)	T-2 (H)	T-9 (J)
EMF 50	RNR50-RNC50	1/20 W	.11	200	49.9 to 100K	49.9 to 100K	49.9 to 100K
EMF 55	RNR55-RNC55	1/10 W	.35	200	30.1 to 301K	49.9 to 200K	49.9 to 200K
EMF 60	RNR60-RNC60	1/8 W	.45	250	24.9 to 1 Meg.	49.9 to 499K	49.9 to 499K
EMF 65	RNR65-RNC65	1/4 W	.84	300	24.9 to 2 Meg.	499 to 1 Meg.	499 to 1 Meg.
EMF 70	RNR70-RNC70	1/2 W	1.6	350	24.9 to 2.49 Meg.	24.9 to 1 Meg.	24.9 to 1 Meg.
EMF 75	– –	1 W	4.4	500	24.9 to 4.07 Meg	49.9 to 2.61 Meg	49.9 to 2.61 Meg.

Standard Resistance Tolerances: .1% (B), .25%, .5% (D) and 1% (F).

DIMENSIONS

See section on MF resistors. Dimensions on Types RNR50-RNC50 thru RNR70 – RNC70 will conform to Types RN-50 thru RN-70. Note: EMF-75 conforms to RN-75.

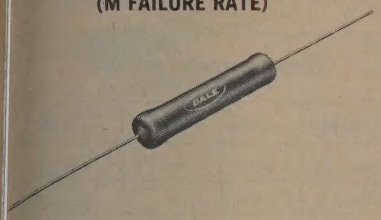
POWER RATING

Dale EMF power ratings are based on the following two conditions:
1. 0.5% maximum ΔR in 2000 hours load life.
2. 175°C maximum operating temperature.

DALE for Optimum Value in Wirewound Resistors

WIREWOUND PRECISION RESISTORS, ESTABLISHED RELIABILITY

(M FAILURE RATE)



TYPE ESS (Solderable Leads)
TYPE ESW (Weldable Leads)

TYPE EGS (Solderable Leads)
TYPE EGW (Weldable Leads)

These styles meet the requirements of MIL-R-39007 Failure Rate Level M (1%/1000 hours). See ARS and AGS for lower failure rates.

POWER RATING

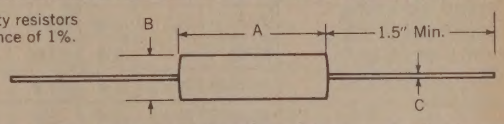
Power ratings are based on the following two conditions:

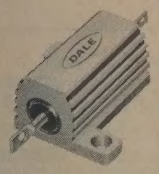
1. 1% maximum ΔR in 1000 hours load life.
2. 275° C maximum operating temperature.

DALE TYPE	MIL-R-39007 TYPE	POWER RATING (Watts)	RESISTANCE RANGE (Ohms) .1%	RESISTANCE RANGE (Ohms) .5% & 1%	MAX. WEIGHT (Grams)	DIMENSIONS A	DIMENSIONS B	DIMENSIONS C
EGS-1	RWR-81S	1	.499-1000	.1-1000	.21	.250	.075	.020
EGW-1	RWR-81W	1	.499-1000	.1-1000	.21	.250	.075	.020
EGS-2	RWR-82S	1.5	.499-1300	.1-1300	.23	.312	.075	.020
EGW-2	RWR-82W	1.5	.499-1300	.1-1300	.23	.312	.075	.020
EGS-3	RWR-80S	2	.499-2670	.1-2670	.34	.422	.093	.020
EGW-3	RWR-80W	2	.499-2670	.1-2670	.34	.422	.093	.020
ESS-2B	RWR-89S	3	.499-4120	.1-4120	.70	.560	.187	.032
ESW-2B	RWR-89W	3	.499-4120	.1-4120	.70	.560	.187	.032
ESS-5	RWR-74S	5	.499-12,100	.1-12,100	4.2	.875	.312	.040
ESW-5	RWR-74W	5	.499-12,100	.1-12,100	4.2	.875	.312	.040
EGS-10	RWR-84S	7	.499-12,400	.1-12,400	3.6	.875	.312	.040
EGW-10	RWR-84W	7	.499-12,400	.1-12,400	3.6	.875	.312	.040
ESS-10	RWR-78S	10	.499-39,200	.1-39,200	9.0	1.780	.375	.040
ESW-10	RWR-78W	10	.499-39,200	.1-39,200	9.0	1.780	.375	.040

Tolerance: All established reliability resistors have a standard resistance tolerance of 1%.

DIMENSIONS





TYPE ERH (Inductive Winding)
TYPE ENH (Non-inductive Winding)

Meet the requirements of MIL-R-39009 Failure Rate Level M (1%/1000 hours). See ARH for lower failure rates.

POWER RATING

Dale ERH and ENH resistor ratings are based on the following requirements:

1. 275° C maximum internal hotspot temperature
2. 1% maximum ΔR in 2000 hour load life
3. Proper heat sink

4x6x2x.040 aluminum chassis = ERH-5 & ERH-10
5x7x2x.040 aluminum chassis = ERH-25 & ERH-50

DALE TYPE	MIL-R-39009 TYPE	POWER RATING (Watts) DALE	POWER RATING (Watts) MIL	RESISTANCE RANGE (Ohms) 1%	MAX. WORKING VOLTAGE	MAX. WEIGHT (Grams)	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (Ohms) ±50PPM	±30PPM	±20PPM
ENH-5	RER-40	7.5 (5)	5	1 to 1.65K	110	3.3	1 to 9.9	10 to 25	26 to 1.65K
ENH-10	RER-45	12.5 (10)	10	1 to 2.8K	190	8.8	1 to 9.9	10 to 40	41 to 2.8K
ENH-25	RER-50	25	15	1 to 6.04K	390	16.5	1 to 9.9	10 to 85	86 to 6.04K
ENH-50	RER-55	50	30	1 to 19.6K	890	35.0	1 to 9.9	10 to 235	236 to 19.6K
ERH-5	RER-60	7.5 (5)	5	0.10 to 3.32K	160	3	1 to 9.9	10 to 49	50 to 3.32K
ERH-10	RER-65	12.5 (10)	10	0.10 to 5.62K	265	6	1 to 9.9	10 to 79	80 to 5.62K
ERH-25	RER-70	25	15	0.10 to 12.1K	550	13	1 to 9.9	10 to 169	170 to 12.1K
ERH-50	RER-75	50	30	0.10 to 39.2K	1250	28	1 to 9.9	10 to 469	470 to 39.2K

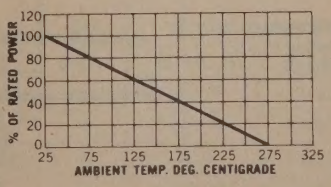
Tolerance: All established reliability resistors have a standard resistance tolerance of 1%. Non-inductive versions also available.

DIMENSIONS

See section on RH resistors. Types ENH and ERH-5 thru 50 will correspond with RH-5 thru 50.

DERATING
ESS, ESW, EGS, EGW, ERH, ENH

Established reliability data is based on operation at 50% rated power at 25° C. At high ambient temperatures, the derating curve at right applies.



DOCUMENTATION

Qualification, acceptance and failure-rate maintenance test data is retained by Dale and is available upon request. Lot traceability and identification data is maintained by Dale for 5 years.

RELIABILITY PROGRAMS

The established reliability series are the result of an extensive reliability program at Dale Electronics which includes basic design and materials improvement, special production and test facilities, and trained, reliability-oriented personnel. A separate program group has been set up to provide customer service on established reliability programs, and the facilities and know-how of the Dale established reliability organization can be directed toward the development of reliability programs for specific user requirements. Inquiries may be directed to your local Dale representative or to the factory.

DALE® for Optimum Value in Wirewound Resistors

WIREWOUND PRECISION RESISTORS, SILICONE COATED OR MOLDED

(Available with Weldable Leads)

■ TYPE RS

Meets applicable requirements of MIL-R-26E, MIL-R-26C and MIL-R-23379. Non-inductive styles available.

■ TYPE RLS

Radial leads for printed circuit board mounting. Meets applicable requirements of MIL-R-26E. Non-inductive styles available.

DALE TYPE	MIL-R-26E TYPE*	DALE RATING U .05% thru 5%	DALE RATING V 3% & 5%	RESISTANCE RANGES (OHMS) .05% .1%, .25%	RESISTANCE RANGES (OHMS) .5%, 1% 3%, 5%	MAX.** WORKING VOLTAGE U	MAX.** WORKING VOLTAGE V	MAX. WT. GRAMS	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (OHMS)† ± 90 PPM	± 50 PPM	± 30 PPM	± 20 PPM
RS-¼	–	.4 W	–	10 to 950	1 to 3.4K	20	–	.21	Below 1 Ω	1 to 6.9	–	7 to 3.4K
RS-½	–	.75 W	–	10 to 1.3K	1 to 4.9K	29	–	.23	Below 1 Ω	1 to 9.9	–	10 to 4.9K
RS-1A	RW-70	1.0 W	–	1 to 2.7K	.1 to 10.4K	52	–	.34	Below 1 Ω	1 to 9.9	10 to 19	20 to 10.4K
RS-1B	–	1.1 W	–	1 to 4.0K	.1 to 15K	62	–	.40	Below 1 Ω	1 to 9.9	10 to 29	30 to 15K
RS-2	–	4.0 W	5.5 W	1 to 12.7K	.1 to 47.1K	210	250	2.1	Below 1 Ω	1 to 9.9	10 to 79	80 to 47.1K
RS-2A	–	3.25 W	4.75 W	1 to 11.4K	.1 to 42.1K	185	220	.90	Below 1 Ω	1 to 9.9	10 to 79	80 to 42.1K
RS-2B	RW-79	3.0 W	3.75 W	1 to 6.5K	.1 to 24.5K	135	148	.70	Below 1 Ω	1 to 9.9	10 to 49	50 to 24.5K
RS-2C	–	2.5 W	3.25 W	1 to 8.6K	.1 to 32.3K	138	157	1.6	Below 1 Ω	1 to 9.9	10 to 59	60 to 32.3K
RS-2C-23	RW-69	2.5 W	3.25 W	1 to 8.6K	.1 to 32.3K	138	157	1.6	Below 1 Ω	1 to 9.9	10 to 59	60 to 32.3K
RS-5	–	5.0 W	6.5 W	.5 to 25.7K	.1 to 95.2K	330	376	4.2	Below 1 Ω	1 to 9.9	10 to 169	170 to 95.2K
RS-5-69	RW-74	5.0 W	6.5 W	.5 to 24.5K	.1 to 91.0K	323	368	4.2	Below 1 Ω	1 to 9.9	10 to 169	170 to 91.0K
RS-5-70	RW-67	5.0 W	6.5 W	.5 to 25.7K	.1 to 95.2K	330	376	4.2	Below 1 Ω	1 to 9.9	10 to 169	170 to 95.2K
RS-7	–	7.0 W	9.0 W	.5 to 41.4K	.1 to 154K	504	576	4.7	Below 1 Ω	1 to 9.9	10 to 269	270 to 154K
RS-10	–	10 W	13 W	.5 to 73.4K	.1 to 273K	799	911	9.0	Below 1 Ω	1 to 9.9	10 to 469	470 to 273K
RS-10-38	RW-78	10 W	13 W	.5 to 71.3K	.1 to 265K	788	898	9.0	Below 1 Ω	1 to 9.9	10 to 469	470 to 265K
RS-10-39	RW-68	10 W	13 W	.5 to 73.4K	.1 to 273K	799	911	9.0	Below 1 Ω	1 to 9.9	10 to 469	470 to 273K

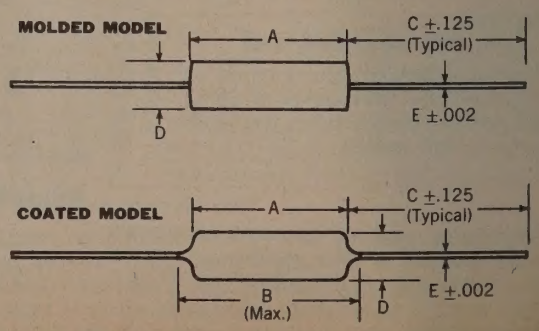
**Max. working voltage determined at .0008 dia. wire resistance values. †Consult factory for special T.C. requirements.

* MIL-R-26C, MIL-R-23379 TYPES

	MIL-R-26C (G & V)	MIL-R-23379
RS-1A	–	RWP-18
RS-2C	RW-69	–
RS-2C-23	–	RWP-20
RS-5	RW-67	RWP-21
RS-10	RW-68	RWP-23

DIMENSIONS (Consult factory for RLS Types)

	TYPE	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
MOLDED MODELS	RS-¼	.250±.015	–	1.500	.078±.015	.020
	RS-½	.312±.015	–	1.500	.078±.015	.020
	RS-1A	.422±.015	–	1.500	.093±.032	.020
	RS-1B	.575±.015	–	1.500	.093±.032	.020
COATED MODELS	RS-2	.625±.062	.765	2.000	.250±.032	.040
	RS-2A	.812±.062	.890	1.500	.188±.032	.032
	RS-2B	.560+.062	.622	1.500	.187±.031	.032
	RS-2C	.500±.062	.593	1.500	.218±.032	.040
	RS-2C-23	.500±.062	.593	1.500	.218±.032	.032
	RS-5	.875±.062	1.000	2.000	.312±.032	.040
	RS-5-69	.875±.062	.937	2.000	.312±.031	.040
	RS-5-70	.875±.062	1.000	1.500	.312±.031	.032
	RS-7	1.218±.062	1.281	2.000	.312±.032	.040
	RS-10	1.780±.062	1.875	2.000	.375±.032	.040
	RS-10-38	1.780±.062	1.842	2.000	.375±.031	.040
	RS-10-39	1.780±.062	1.875	1.500	.375±.031	.032



POWER RATINGS RS, RLS, G SERIES

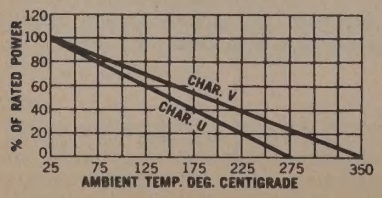
These Series have two power ratings, depending on operating temperature and stability requirements.

CHARACTERISTIC U: 1. 275°C maximum hotspot temperature
2. .5% maximum ΔR in 2000 hour load life

CHARACTERISTIC V: 1. 350°C maximum hotspot temperature
2. 3% maximum ΔR in 2000 hour load life

DERATING RS, RLS, G

RS, RLS and G coated resistors have an operating temperature range of −55°C to +350°C. Dale RS molded resistors have an operating temperature range of −55°C to +275°C. They must be derated at high ambient temperatures according to the curves below.



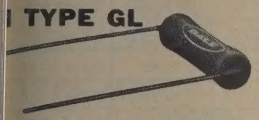
DALE® for Optimum Value in Wirewound Resistors

WIREWOUND PRECISION RESISTORS, SILICONE COATED *(Available with Weldable Leads)*

TYPE G

eryllium oxide core for ecreased size, increased ability. Meets applica- e specifications of MIL- -26 and MIL-R-23379. on-inductive styles vailable.

TYPE GL



adial leads for printed ircuit board mounting. Meets applicable require- nents of MIL-R-26E.

DALE TYPE	MIL-R-26E TYPE*	DALE RATING U .05% thru 5%	DALE RATING V 3% & 5%	RESISTANCE RANGES (OHMS) .05%, .1%, .25%	RESISTANCE RANGES (OHMS) .5%, 1%, 3%, 5%	MAX.** WORKING VOLTAGE U	MAX.** WORKING VOLTAGE V	MAX. WT. GRAMS	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (OHMS)† ± 90 PPM	± 50 PPM	± 30 PPM	± 20 PPM
G-1	RW-81	1.0 W	—	10 to 950	1 to 3.4K	33	—	.20	Below 1 Ω	1 to 6.9	—	7 to 3.4K
G-2	—	1.5 W	—	10 to 1.3K	1 to 4.9K	42	—	.21	Below 1 Ω	1 to 9.9	—	10 to 4.9K
G-3	RW-80	2.25 W	—	1 to 2.7K	.1 to 10.4K	80	—	.34	Below 1 Ω	1 to 9.9	10 to 19	20 to 10.4K
G-5	—	4.0 W	5 W	1 to 6.5K	.1 to 24.5K	153	170	.80	Below 1 Ω	1 to 9.9	10 to 49	50 to 24.5K
G-5A	—	4.5 W	6.5 W	1 to 11.4K	.1 to 42.1K	214	257	.95	Below 1 Ω	1 to 9.9	10 to 79	80 to 42.1K
G-5C	—	5 W	7 W	1 to 8.6K	.1 to 32.3K	194	230	1.2	Below 1 Ω	1 to 9.9	10 to 59	60 to 32.3K
G-6	—	6 W	8 W	1 to 12.7K	.1 to 47.1K	258	298	2.0	Below 1 Ω	1 to 9.9	10 to 79	80 to 47.1K
G-10	—	7 W	10 W	.5 to 25.7K	.1 to 95.2K	390	467	3.6	Below 1 Ω	1 to 9.9	10 to 169	170 to 95.2K
G-12	—	10 W	12 W	.5 to 41.4K	.1 to 154K	607	665	4.2	Below 1 Ω	1 to 9.9	10 to 269	270 to 154K
G-15	—	15 W	18 W	.5 to 73.4K	.1 to 273K	979	1072	7.6	Below 1 Ω	1 to 9.9	10 to 469	470 to 273K

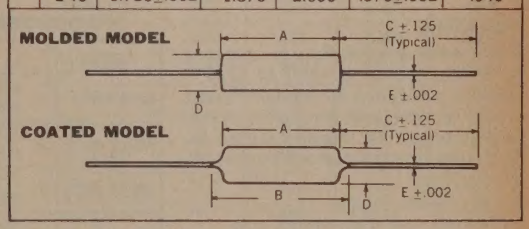
**Maximum Working Voltage determined at .0008 dia. wire resistance values. †Consult factory for special T.C. requirements.

*MIL-R-26C, MIL-R-23379 TYPES

	MIL-R-26C	MIL-R-23379
G-1	—	RWP-17
G-3	—	RWP-19
G-5C	RW-69	—
G-5C-2	—	RWP-20
G-10	RW-67	RWP-21
G-15	RW-68	RWP-23

DIMENSIONS

	TYPE	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
MOLDED MODELS	G-1	.250±.015	—	1.500	.078±.015	.020
	G-2	.312±.015	—	1.500	.078±.015	.020
	G-3	.422±.015	—	1.500	.093±.032	.020
COATED MODELS	G-5	.562±.062	.640	1.500	.188±.032	.032
	G-5A	.812±.062	.890	1.500	.188±.032	.032
	G-5C	.500±.062	.593	1.500	.218±.032	.040
	G-6	.625±.062	.765	2.000	.250±.032	.040
	G-10	.875±.062	1.000	2.000	.312±.032	.040
	G-12	1.218±.062	1.281	2.000	.312±.032	.040
	G-15	1.780±.062	1.875	2.000	.375±.032	.040



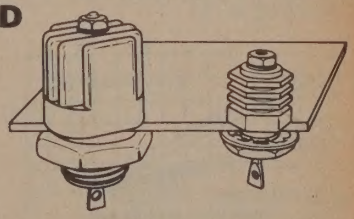
POWER RATING
Power ratings of Dale G resistors are 1.4 to 4 times higher than those of conventional wirewound resistors of equivalent size.

Stability When Dale G resistors are operated at the same ratings (Char. U) as conventional Dale RS resistors of equivalent size, the shift in resistance is 50% or less than that of the RS.

For additional power and derating information, see section on RS resistors.

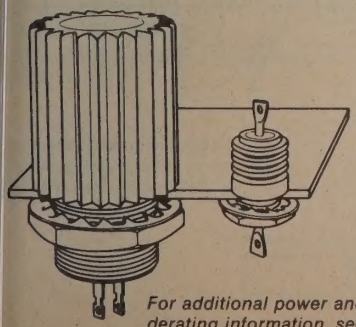
WIREWOUND POWER RESISTORS, HEAT SINK ENCASED

■ TYPE PH



TWO TERMINAL CONFIGURATIONS (PH-10-1, PH-25, PH-50 and PH-100). Thru chassis mounting—two connections required on one or both sides of panel. Meet electrical and environmental requirements of MIL-R-18546.

SINGLE TERMINATION, CHASSIS GROUND (PH-10-5 and PH-25-8). Speeds assembly time as only one connection is required. Often utilized as a drive line resistor in a high speed core memory system using a series termination technique. Non-inductive windings have low reactance properties giving exceptionally fast cycle time.



For additional power and derating information, see section on RH resistors

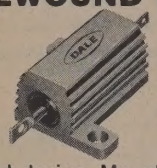
DALE TYPE	DALE RATING (WATTS)	RESISTANCE RANGES (OHMS) .05%, .1%, .25%	RESISTANCE RANGES (OHMS) .5%, 1%, 3%	MAX. WORKING VOLTAGE	MAX.* WT. (GRAMS)	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (OHMS)† ±50 PPM	±30 PPM	±20 PPM
PH-10A	10	1 to 12.7K	.1 to 47.1K	240	6	1 to 9.9	10 to 79	80 to 47.1K
PH-10-1	10	1 to 12.7K	.1 to 47.1K	240	6	1 to 9.9	10 to 79	80 to 47.1K
PH-10-5	10	.5 to 6.3K	.1 to 23.5K	170	6	1 to 9.9	10 to 79	80 to 23.5K
PH-25	25	.5 to 25.7K	.1 to 95.2K	425	22	1 to 9.9	10 to 169	170 to 95.2K
PH-25-8	25	.25 to 12.8K	.1 to 47.7K	300	22	1 to 9.9	10 to 169	170 to 47.7K
PH-50	50	3 to 52K	.1 to 75K	1500	80	1 to 99	100 to 999	1K to 75K
PH-100	100	5 to 35K	.1 to 50K	1700	186	1 to 99	100 to 999	1K to 50K

*A weight increase of 10% should be allowed for non-inductive types. †Consult factory for values below 1Ω and for special T.C. requirements.

DALE®

for Optimum Value in Housed Wirewound Resistors

WIREWOUND POWER RESISTORS, HEAT SINK ENCASED



Patented design. Mount to the chassis. Provide high power and precision tolerance in a variety of sizes, mounting and terminal configurations. RH and HG types exceed MIL-R-18546. Non-inductive styles available.

■ TYPE RH

5 through 250 watts. Bonus power dissipation ability within MIL-R-18546 size.

■ TYPE HG

Beryllium oxide core for optimum heat dissipation. Doubles Mil. Spec. power at no increase in size. Exceptional stability at mil. levels.

DALE TYPE	MIL-R-18546 TYPE	MIL-R-39009 TYPE	POWER RATING* (WATTS)		RESISTANCE RANGES (OHMS)		MAX. WORKING VOLTAGE	MAX.† WT. GRAMS	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (OHMS)††		
			DALE**	MIL	.05%, .1%, .25%	.5%, 1%, 3%			±50 PPM	±30 PPM	±20 PPM
RH-5	RE-60	RER-60	7.5 (5)	5	1 to 6.5K	.1 to 24.5K	160	3	1 to 9.9	10 to 49	50 to 24.5K
RH-10	RE-65	RER-65	12.5 (10)	10	1 to 12.7K	.008 to 47.1K	265	6	1 to 9.9	10 to 79	80 to 47.1K
RH-25	RE-70	RER-70	25	20	.5 to 25.7K	.008 to 95.2K	550	13	1 to 9.9	10 to 169	170 to 95.2K
RH-50	RE-75	RER-75	50	30	.5 to 73.4K	.01 to 273K	1250	28	1 to 9.9	10 to 469	470 to 273K
RH-100	RE-77	–	100	75	.3 to 50K	.1 to 50K	1900	400	1 to 99	100 to 949	950 to 50K
RH-250	RE-80	–	250	120	.3 to 75K	.1 to 75K	2300	800	1 to 99	100 to 999	1K to 75K
HG-5	RE-60	–	15	5	1 to 6.5K	.1 to 24.5K	220	3	1 to 9.9	10 to 49	50 to 24.5K
HG-10	RE-65	–	20	10	1 to 12.7K	.1 to 47.1K	340	6	1 to 9.9	10 to 79	80 to 47.1K
HG-25	RE-70	–	35	20	.5 to 25.7K	.1 to 95.2K	650	13	1 to 9.9	10 to 169	170 to 95.2K
HG-50	RE-75	–	50	30	.5 to 73.4K	.1 to 273K	1400	28	1 to 9.9	10 to 469	470 to 273K

*Rating is based on chassis mounting area and stability. For MIL-R-39009 ratings, see section on ARH resistors.

**NOTE: Figures in parentheses on RH-5 and RH-10 indicate wattage printed on these resistors. New construction allows them to be rated at 7.5 and 12.5 watts – but they will be printed with these higher ratings only upon customer request.

†A weight increase of 10% should be allowed for non-inductive styles.

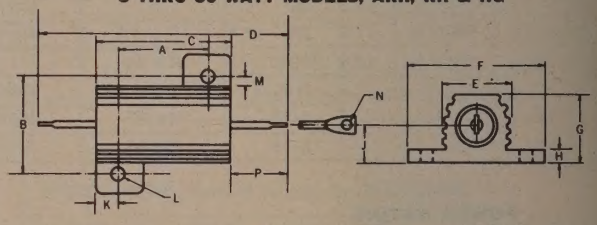
††Consult factory for values below 1 ohm and for special T.C. requirements.

POWER RATING RH, HG, PH TYPES

Dale housed resistor ratings are based on the following requirements:

1. 275°C maximum internal hotspot temperature
2. 1% maximum ΔR in 1000 hour load life for RH-5, 10, 25, 50; PH-10, 25, 50. 3% maximum ΔR in 1000 hour load life for RH-100, 250; PH-100.
3. Proper heat sink.
   4x6x2x.040 aluminum chassis = RH-5, 10; HG-5, 10; PH-10
   5x7x2x.040 aluminum chassis = RH-25; HG-25, 50; PH-25
   12x12x.059 aluminum panel = RH-50
   12x12x.125 aluminum panel = RH-100, 250; PH-50, 100

5 THRU 50 WATT MODELS, ARH, RH & HG



DERATING

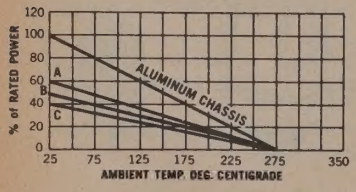
Dale housed resistors have an operating temperature range of −55°C to +275°C. Derating is required for reduced chassis mounting area and for high ambient temperatures. The following curves apply to operation of unmounted resistors:

A = RH-5, 10
B = RH-25; PH-10, 25
C = RH-50, 100, 250; PH-50, 100; HG-5, 10, 25, 50

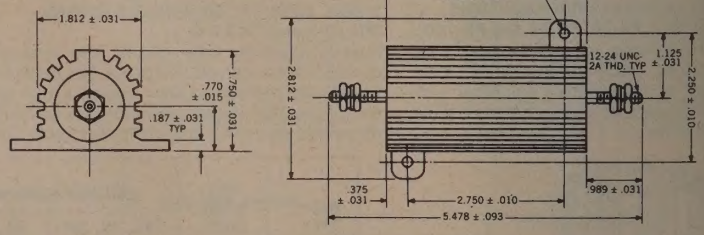
DIMENSIONS – 5 thru 50 WATT MODELS – ARH, RH & HG

TYPE*	A	B	C	D	E	F	G	H	J	K	L	M	N	P
RH-5, HG-5	±.444 .005	±.490 .005	±.600 .031	±1.125 .062	±.334 .015	±.646 .015	±.320 .015	±.065 .010	±.133 .010	±.078 .010	±.093 .005	±.078 .015	±.050 .005	±.262 .062
RH-10, HG-10	±.562 .005	±.625 .005	±.750 .031	±1.375 .062	±.420 .015	±.800 .015	±.390 .015	±.075 .010	±.165 .010	±.093 .010	±.093 .005	±.102 .015	±.086 .005	±.312 .062
RH-25, HG-25	±.719 .005	±.781 .005	±1.062 .031	±1.938 .062	±.550 .015	±1.080 .015	±.546 .015	±.088 .010	±.231 .010	±.172 .010	±.125 .005	±.115 .015	±.086 .005	±.438 .062
RH-50, HG-50	±1.563 .005	±.844 .005	±1.968 .031	±2.781 .062	±.630 .015	±1.140 .015	±.610 .015	±.088 .010	±.260 .010	±.196 .010	±.125 .005	±.107 .015	±.086 .005	±.406 .062

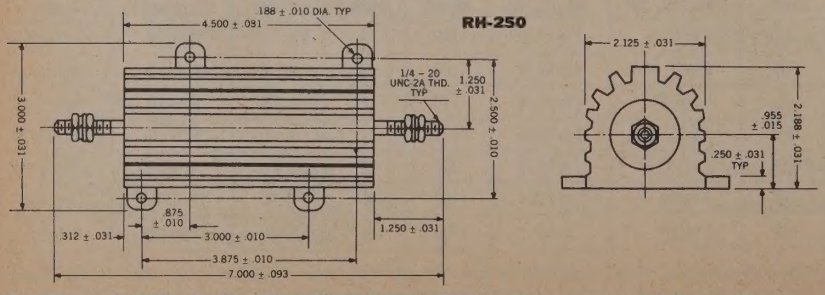
*Types ARH, EHR, ENH 5 thru 50 correspond with RH-5 thru 50.



RH-100



RH-250



DALE® for Optimum Value in Bobbin Wirewound Resistors

WIREWOUND PRECISION RESISTORS, BOBBIN TYPE *(Available with Weldable Leads)*

Non-inductive precision resistors. Epoxy molded for high dielectric strength and complete environmental protection. Meet applicable requirements of MIL-R-93D.

TYPE WWA

Patented design insures high stability. Special tolerances and matching available.

TYPE MWA

Subminiature size retains Dale's unique bobbin-type design and high protection molding coating.

DALE TYPE	MIL-R-93 TYPE	POWER RATING (WATTS)	MINIMUM RESISTANCE RANGE (OHMS)*					MAXIMUM RESISTANCE (OHMS) ALL TOLERANCES	MAXIMUM WORKING VOLTAGE	MAXIMUM WEIGHT (GRAMS)
			.05%	.1%	.25%	.5%	1%			
MWA-8	–	.1	50	10	5	2	1	100K	27	.21
MWA-10	–	.125	50	10	5	2	1	160K	37	.23
WWA-13	–	.125	50	10	5	2	1	311K	50	.35
WWA-22	–	.15	130	20	5	.2	.1	600K	100	.9
WWA-23	RB-56	.15	105	12	5	.2	.1	650K	150	1.0
WWA-24	RB-55	.20	40	12	6	.2	.1	900K	200	1.2
WWA-26	RB-54	.25	20	10	5	.2	.1	1.72 Meg.	300	1.5
WWA-36	RB-53	.33	15	4	1	.2	.1	4 Meg.	300	3.1
WWA-38	RB-52	.50	10	3	1	.2	.1	5.4 Meg	600	3.8
WWA-44	†	.5	15	4	1	.2	.1	5.75 Meg.	500	3.4
WWA-45	†	.5	10	3	1	.2	.1	7.5 Meg.	550	5.4
WWA-48	RB-57	.75	10	3	1	.2	.1	11.5 Meg.	850	6.5
WWA-412	RB-58	.875	10	3	1	.2	.1	17.5 Meg.	1050	8.4
WWA-416	RB-59	1	10	3	1	.2	.1	23 Meg.	1400	15.5

*Consult factory for tolerances below .05%.

†Although there is no direct mil. model of the same physical size, the Dale type will meet the electrical and environmental requirements of MIL-R-93.

SPECIAL MODIFICATIONS

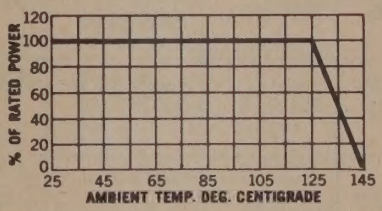
- Special tolerances are available to as low as .005%.
- Resistors can be matched to a tolerance of .001%.
- Special T.C.'s are available to ±2 ppm/° C over a limited temperature range.
- T.C.'s can be matched to an accuracy of 1 ppm/° C.

POWER RATING

MWA, WWA and WWP power ratings correspond to MIL-R-93 ratings and are based on .5% maximum ΔR in 1500 hours load life. For commercial applications, power ratings may be doubled.

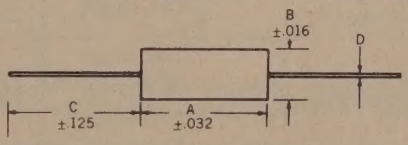
DERATING

Dale MWA, WWA and WWP resistors have an operating temperature range of −55° C to +145° C. Derating is required for temperatures above 125° C. The curve at right applies.



DIMENSIONS

TYPE	DIM. A	DIM. B	DIM. C	DIM. D
MWA-8	.250	.078	1.500	.020
MWA-10	.312	.078	1.500	.020
WWA-13	.375	.125	2.000	.020
WWA-22	.250	.250	2.000	.032
WWA-23	.375	.250	2.000	.032
WWA-24	.500	.250	2.000	.032
WWA-26	.750	.250	2.000	.032
WWA-36	.750	.375	2.000	.032
WWA-38	1.000	.375	2.000	.032
WWA-44	.500	.500	2.00	.032
WWA-45	.625	.500	2.00	.032
WWA-48	1.00	.500	2.00	.032
WWA-412	1.500	.500	2.00	.032
WWA-416	2.00	.500	2.00	.032

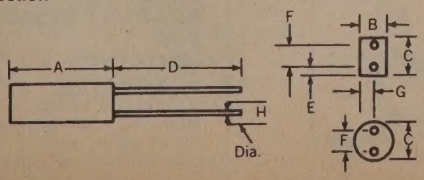


TYPE WWP

Rectangular or round printed circuit construction. High resistance per unit volume. Meets applicable requirements of MIL-R-93.

DALE TYPE	MIL-R-93D TYPE	POWER RATING (WATTS)	MINIMUM RESISTANCE RANGE (OHMS)						MAXIMUM RESISTANCE (OHMS) ALL TOLERANCES	MAXIMUM WORKING VOLTAGE	MAXIMUM WEIGHT (GRAMS)
			.02%	.05%	.1%	.25%	.5%	1%			
WWP-18	–	⅛ W	1.5K	600	150	50	25	10	1 Megohm	150 V	1.0
WWP-14	–	¼ W	1K	400	150	50	25	10	1.5 Megohms	300 V	1.5
WWP-225	RB-71	⅛ W	–	105	12	5	.2	.1	515K	150 V	1.0

For additional Power Rating and Derating Information, see section on MWA and WWA styles.



DIMENSIONS

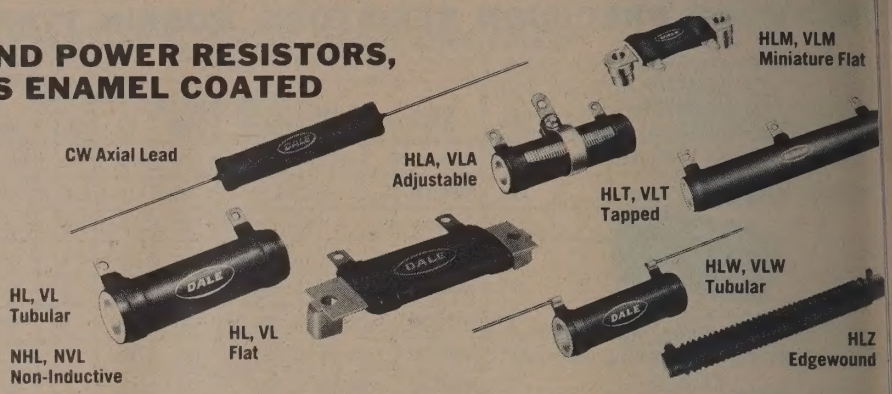
TYPE	A (±.020)	B (±.020)	C (±.020)	D (Min.)	E (±.010)	F (±.010)	G (±.010)	H
WWP-18	.300	.125	.250	1	.062	.125	.062	.032
WWP-14	.600	.125	.250	1	.062	.125	.062	.032
WWP-225	.312	–	.250	1	.025	.200	–	.025

DALE® for Optimum Value in Wirewound Resistors

INDUSTRIAL WIREWOUND POWER RESISTORS, SILICONE OR VITREOUS ENAMEL COATED

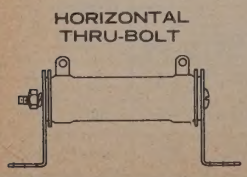
Dale's expanded industrial wirewound line provides both silicone and vitreous coated models. Silicone models are recommended where maintenance of tolerance and T.C. is of primary concern. Vitreous models are recommended where maximum resistance to chemical action is required.

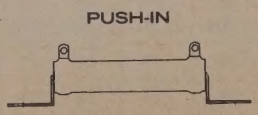
CONTACT DISTRIBUTOR FOR PRICES.

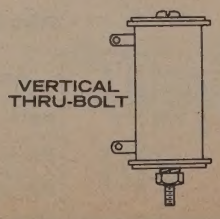


TYPE	APPLICATION	APPLICABLE MIL SPEC AND TYPES	WATTAGE RATING	RESISTANCE RANGE	CORE SIZES	TERMINALS	MOUNTINGS	TOLERANCE
CW Axial Lead	Axial leads. For applications requiring high performance at low cost	MIL-R-26 RW-67, 68, 69	2.5-13 watts	.1 ohm to 100K ohms	Body Dia. .188 to .375" Body Length .500 to 1.781" Leads 1.5 to 2"	Leads	Terminals	±5% (10% below 1 ohm)
HL, VL Tubular	General purpose wirewound resistors with a broad power range.	MIL-R-26 RW-29, 30, 31, 32, 33, 35, 36, 37, 38, 47	5-225 watts	.1 ohm to 1.3 Megohms	O.D. 1/4 to 1-1/8" Length 1-10½"	Lugs	Push-in bracket or thru-bolt	±5% (10% below 1 ohm)
NHL, NVL Non-Inductive	High frequency circuits and applications requiring low inductive effect and minimum distributed capacity	None	5-225 watts	1 ohm to 90K ohms	O.D. 1/4 to 1-1/8" Length 1-10½"	Lugs or Leads	Push-in bracket or thru bolt	±5%
HL, VL Flat	For limited space requiring high power-to-size ratio. Vertical or horizontal stacking.	MIL-R-26 RW-20 thru RW-24	30-95 watts	.1 ohm to 150K ohms	Length 1¼ to 6"	Lugs	Spring push-in	±5% (10% below 1 ohm)
HLM, VLM Miniature Flat	For limited space, high power-to-size requirements particularly in high vibration areas.	None	10-20 watts	.1 ohm to 51K ohms	Length 3/4 to 2-1/16"	Lugs	Thru mount with spacers	±5% (10% below 1 ohm)
HLA, VLA Adjustable	For resistance or voltage adjustment	MIL-R-19365C RX-29, 32, 33, 35, 36 37, 38, 47	12-225 watts	1 ohm to 100K ohms	O.D. 5/16 to 1-1/8" Length 1½ to 10½"	Lugs	Push-in bracket or thru bolt	±5%
HLT, VLT Tapped	For voltage divider networks	MIL-R-26 RW-22, 23, 24, 33, 35, 36, 37, 38, 47	11-225 watts	.1 ohm to 1.1 Megohms	O.D. 5/16 to 1-1/8" Length 1½ to 10½"	Lugs	Push-in bracket or thru bolt	±10% each section (±10% total)
HLW, VLW Tubular	General application where terminal wires are required for direct electrical connection	None	3-20 watts	.1 ohm to 80K ohms	O.D. 13/64 to 7/16" Length 1" to 2"	Lugs with terminal wires	Terminals, thru bolt or push-in bracket	±5% (10% below 1ohm)
HLZ Edge-wound	For heavy duty requirements where space is at a premium. High thermal capacity.	None	35-375 watts	.05 ohm to 32 ohms	O.D. 1/4 to 1-1/8" Length 1 to 10-1/2"	Lugs	Push-in bracket or thru bolt	±10%

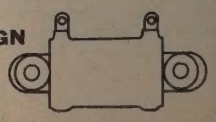
MOUNTING BRACKETS for TUBULAR STYLES







EXCLUSIVE BRACKET DESIGN FOR MINIATURE FLAT STYLE



Mounting strap fits snugly through core and is bound tightly against unit by two eccentric spacers. Eliminates expensive cements and improves heat transfer and power handling capabilities.

DALE for Optimum Value in Power Wirewound Resistors

TYPE CP

- Fireproof inorganic construction
- Special inorganic molding compound provides high thermal conductivity
- Superior moisture and thermal resistance

Construction: Resistance wire is high quality, premium grade wound onto a woven fiberglass core. Terminals are tinned copperweld crimped to the wound core with a special brass alloy.

Tolerance: ±10% standard. ±5% also available.

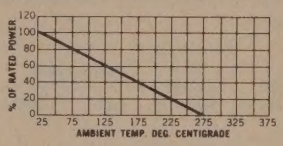
Operating Temperature: −55° C to +275° C.

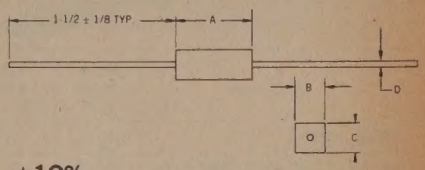
Temperature Coefficient: Below 1 ohm 0 ±400 PPM (TYP.). Above 1 ohm 0 ±200 PPM (TYP.).

Terminal Strength: 5 lbs. minimum.

DALE TYPE	WATTAGE RATING	EIA STANDARD RS-344 TYPE	RESISTANCE	MAX. WORKING VOLTAGE	DIMENSIONS A±1/32	B±1/32	C±1/32	D±.001
CP-2	2	CRU2A	.1 to 2.4K	65	11/16	1/4	1/4	.032
CP-3	3	CRU3	.1 to 7.5K	150	7/8	5/16	5/16	.036
CP-5	5	CRU5	.1 to 8.5K	200	7/8	3/8	11/32	.036
CP-7	7	CRU7	.12 to 18K	350	1-25/64	3/8	11/32	.036
CP-10	10	CRU10	.18 to 30K	540	1-7/8	3/8	11/32	.036

DERATING





Ordering Information:

When ordering, please specify Dale type, wattage, resistance value and tolerance.

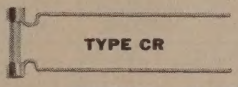
Example: A 2-watt CP resistor with resistance at 1000 ohms and tolerance of ±10% is designated as shown.

CP	2	1K	±10%
1	2	3	4

1. Resistor type
2. Wattage
3. Resistance
4. Tolerance

TYPES CA and CR

TYPE CA



TYPE CR

Construction:

Dale CA and CR Series have a high quality, premium resistance wire wound on woven fibreglass core impregnated and coated with a special grade silicone. Available with special smokeproof coating for moisture protection.

Resistance Range: .1 ohm minimum to 7K, dependent on resistor core length.

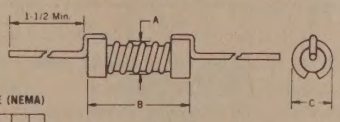
Tolerance: ±10% standard, ±5% also available.

Leads: Standard lead diameter is .036" (#19 AWG). .032" diameter (#20 AWG) is also available. Standard minimum lead length is 1½". Standard lead material is tinned copperweld. Axial lead pull strength on CA Series is 4 lbs. minimum.

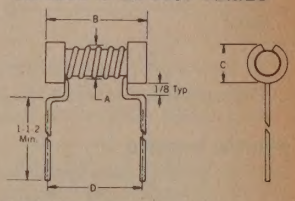
DIMENSIONAL AND POWER SPECIFICATIONS

DALE TYPE	DIM. A	DIM. B MIN.	DIM. B MAX.	DIM. C	DIM. D ±1/16	WATTAGE RATING PER INCH
CA-4000	.110	.5"	2.0"	.150	NA	4
CA-5000	.150	.5"	2.0"	.200	NA	5
CR-4000	.110	.4"	2.0"	.150	(B-.062")	4
CR-5000	.150	.4"	2.0"	.200	(B-.093")	5

CA-4000 & CA-5000 SERIES



CR-4000 & CR-5000 SERIES

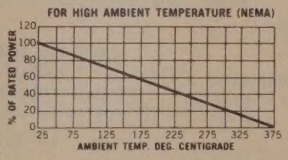


POWER RATINGS

4000 Series = 4 watts per inch
5000 Series = 5 watts per inch

DERATING

FOR HIGH AMBIENT TEMPERATURE (NEMA)



Ordering Information:

When ordering, please specify resistor body length, watts/inch, resistance and tolerance.

Example: A 1½" unit, 5 watts per inch; 350 ohms, ±10% radial lead unit is designated as shown.

CR	5	150	350Ω	±10%
1	2	3	4	5

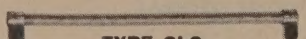
1. Resistor type
2. Core diameter designation
3. Overall resistor body length
4. Resistance
5. Tolerance

TYPE RF FUSE RESISTOR

Dale RF resistors can reliably function as a fuse and as a wirewound resistor. RF resistors are similar in appearance to Type CA, CP or CR models, but are wound with special wire conforming to performance required. Contact factory for design assistance.

TYPES CL and CLC

TYPE CL



TYPE CLC

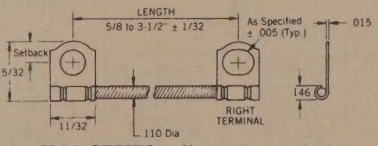
- Recessed core prevents resistance wire protrusion.
- Lugs are double-crimped for positive electrical contact and high terminal pull strength.
- Any variation of mounting hole and slot available.

Construction, Resistance Range, Tolerance and Derating same as CA.

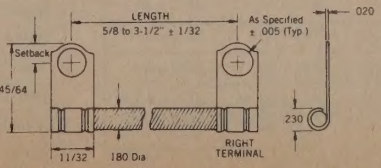
Resistance Identification: Resistance is always stamped on the left terminal tab in two places.

Terminals: (CL Series) Mounting holes as shown are Dale standard. Any variation of hole and slot is available, also tabs with no holes are available. Standard terminal material is tin plated steel. Special tinned brass is available on request.

Ordering Information: Same as CA except (3) 3. Mounting length between centers.



CL-4000 SERIES - 4½ watts per inch

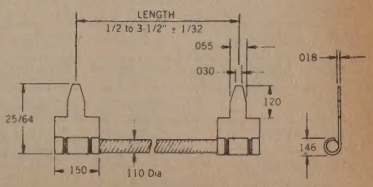


CL-6000 SERIES - 6 watts per inch

DIMENSIONS

	CL-4000	CL-6000
Setback	.145"	.135"
Left Terminal	.133" dia.	.215" dia.
Right Terminal	.133" x .153" slot	.215" dia.

Other terminal dimensional variations available on request.



CLC-4000 SERIES - 4½ watts per inch (Printed Circuit Tab)

DALE® for Optimum Value in Metal Film Resistors

PRECISION METAL FILM RESISTORS *(Available with Weldable Leads)*

Vacuum-deposited metal film resistors. Meet both MIL-R-10509 and MIL-R-22684. Good R.F. characteristics. Low noise level. Wide choice of tolerances and T.C.'s.

■ TYPE MF

Epoxy molded. Meets MIL-R-10509 and MIL-R-22684.

■ TYPE MFF

Epoxy conformal coated. Meets electrical and environmental characteristics of MIL-R-10509F, but is dimensionally smaller.

EXTENDED RANGE MODELS

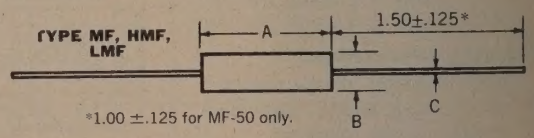
Type LMF (values down to 1 ohm) and Type HMF (values up to 50 Megohms). Identical to Type MF in construction and other performance features.

DALE TYPE	MIL-R-10509 TYPE	125° C RATING (Char. C & E)	70° C RATING (Char. D)	MIL-R-22684 Type	MIL-R-22684 Rating	MAX. WT. (Grams)	MAX. WORKING VOLTAGE	DIMENSIONS A	B	C	D
MF50, HMF50	RN-50	1/20 w	–	–	–	.11	200	.150±.020	.065±.015	.016 Dia.	–
MF-1/10, LMF-1/10, HMF-1/10	RN-55	1/10 w	1/8 w	RL-07	1/4 w	.35	200	.260±.010	.095±.005	.025 Dia.	–
MF-1/8, LMF-1/8, HMF-1/8	RN-60	1/8 w	1/4 w	RL-20	1/2 w	.45	300	.406±.015	.135±.010	.025 Dia.†	–
MF-1/4, LMF-1/4, HMF-1/4	RN-65	1/4 w	1/2 w	–	–	.84	350	.593±.015	.203±.015	.025 Dia.	–
MFS-1/2, LMF-1/2, HMF-1/2	RN-70	1/2 w	3/4 w	–	–	1.6	500	.730±.020	.250±.015	.032 Dia.	–
MF-3/4, HMF-3/4	RN-70F	3/4 w*	–	–	–	1.9	500	.790±.020	.260±.015	.032 Dia.	–
MF-1, HMF-1	RN-75	–	1 w**	–	–	4.4	500	1.093±.020	.375±.015	.032 Dia.	–
MF-2	RN-80	–	2 w**	–	–	7.9	750	2.188±.020	.375±.015	.032 Dia.	–
CMF-1/10	–	1/10 w	1/8 w	RL-07	1/4 w	.25	200	.264±.031	.089±.008	.025 Dia.	.328
CMF-1/8	–	1/8 w	1/2 w	RL-20***	1/2 w	.50	300	.397±.031	.186±.015	.025 Dia.	.484
MFF-1/8	–	1/8 w	–	–	–	.40	300	.343±.031	.109±.015	.025 Dia.	.453
MFF-1/4	–	1/4 w	–	–	–	.65	350	.468±.031	.125±.015	.025 Dia.	.578
MFF-1/2	–	1/2 w	–	–	–	.95	500	.562±.031	.187±.031	.032 Dia.	.734
MFF-1	–	–	1 w	–	–	2.7	500	.937±.062	.296±.031	.032 Dia.	1.187
MFF-2	–	–	2 w	–	–	4.7	750	2.062±.062	.296±.031	.032 Dia.	2.312

*Characteristic F **Characteristic B ***For RL-20 per MIL-R-22684, order CMF-20. CMF-1/8 conforms to RL-20 except lead dia. is .025".
Tolerance MIL-R-10509 ±1%, ±.5%, ±0.25%, ±0.10% standard, †.032" MIL-R-22684
MIL-R-22684 ±2%, ±5%. Special tolerances and matching on request.

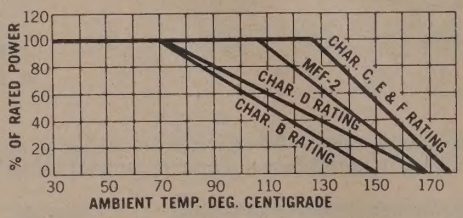
POWER RATING

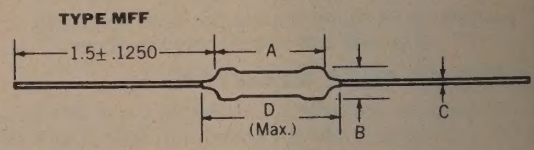
Dale MF resistors have two power ratings, depending on operating temperatures of 70° C and 125° C. MFF resistor power ratings are based on full power at 125° C. All are based on a maximum ΔR of .5% in 1000 hour load life.



DERATING

Dale MF resistors have an operating temperature range of −65° C to +175° C. They must be derated according to the curves at right.





RESISTANCE RANGE (OHMS) TYPES MF, MFF, CMF

Standard tolerance: 1%, .5%, .25%, .1%

	T-0* (Char. D)	T-1* (Char. D)	T-2 (Char. C)	T-9 (Char. E)
MF50	24.9-100K	49.9-100K	100-100K	100-100K
MF-1/10, CMF-1/10	10-301K	30.1-301K	30.1-301K	30.1-301K
MF-1/8, MFF-1/8, CMF-1/8	10-1 M	24.9-1 M	30.1-499K	30.1-499K
MF-1/4, MFF-1/4	10-2 M	24.9-2 M	30.1-1 M	30.1-1 M
MFS-1/2, MFF-1/2	10-2.49 M	24.9-2.49 M	24.9-1 M	24.9-1 M
MF-3/4	10-2.49 M	24.9-2.49 M	100-1 M	100-1 M
MF-1, MFF-1	10-5.11 M	24.9-4.02 M	49.9-2.61 M	49.9-2.61 M
MF-2, MFF-2	30.1- 10 M	100-8 M	100-6 M	200-5.11 M

*T-0 and T-1 are available in tolerance of ±.25% and greater only.
11 standard T.C.'s available in −55° C to +175° C range.

NEW EXTENDED RESISTANCE RANGE (OHMS)

TYPES LMF, HMF **Standard Tolerance 1%***

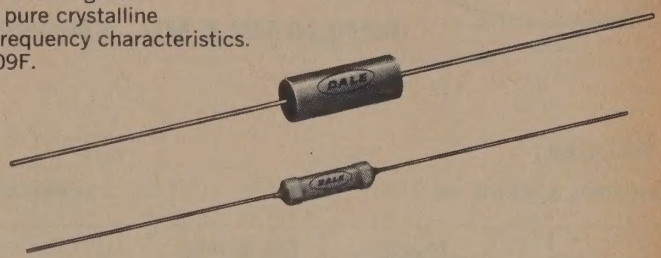
	T-0	T-1	T-2	T-9
LMF-1/10	1-9.9	5-30	10-30	15-30
LMF-1/8	1-9.9	5-24	10-30	15-30
LMF-1/4	1-9.9	5-24	10-30	15-30
LMF-1/2	1-9.9	5-24	10-24	15-24
HMF50	100K-700K	100K-700K	100K-500K	100K-200K
HMF-1/10	301K-2.5M	301K-2.5M	301K-2M	301K-500K
HMF-1/8	1M-5M	1M-5M	499K-3M	499K-1M
HMF-1/4	2M-15M	2M-15M	1M-10M	1M-2M
HMF-1/2	2.49M-30M	2.49M-30M	1M-20M	1M-3M
HMF-3/4	2.49M-30M	2.49M-30M	1M-20M	1M-3M
HMF-1	5.11M-50M	4.02M-50M	2.61M-30M	2.61M-5M

*Special T.C.'s and tolerances are available on request.

DALE® for Optimum Value in Carbon Film Resistors

EPOSITED CARBON RESISTORS *(Available with Weldable Leads)*

esigned for inherent stability, long load life and excellent protection against nvironmental factors in a wide range of applications. Made of pure crystalline arbon film bonded to selected ceramic cores. Excellent high frequency characteristics. ypes DC and MC meet functional requirements of MIL-R-10509F.



TYPE MC

olded housing. Completely insulated and protected against nvironmental or mechanical damage. Specially formulated olding compound gives best humidity protection available.

TYPE DC

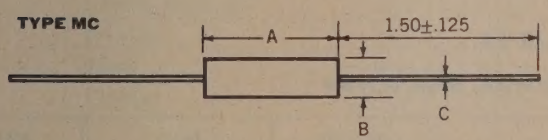
pecially coated for complete insulation against moisture, alt spray and other severe environmental factors. Miniature size.

DALE TYPE	MIL. TYPE		POWER RATING (WATTS)		MINIMUM RESISTANCE (OHMS)	MAXIMUM 1% RESISTANCE (OHMS)	MAXIMUM 2% RESISTANCE (OHMS)	MAX. WT. (GRAMS)		MAXIMUM WORKING VOLTAGE
	MC	DC	B	D*				MC	DC	
MC-1/10, DC-1/10	RN-55	—	1/10	1/8	2	400K	400K	.35	.20	200
MC-1/8, DC-1/8	RN-60	—	1/8	1/4	1	3 Megohms	5 Megohms	.45	.30	300
MC-1/4, DC-1/4	RN-65	RN-10	1/4	1/2	2	5 Megohms	6 Megohms	.85	.35	350
MCS-1/2, DCS-1/2	RN-70	RN-20	1/2	3/4	1	10 Megohms	15 Megohms	1.50	.80	500
MC-1, DC-1	RN-75	RN-25	1	—	1	15 Megohms	30 Megohms	4.50	2.8	500
MC-2, DC-2	RN-80	RN-30	2	—	2	100 Megohms	125 Megohms	8.25	5.5	750
— DC-5	—	—	—	5	5	150 Megohms	300 Megohms	—	21.9	14,000

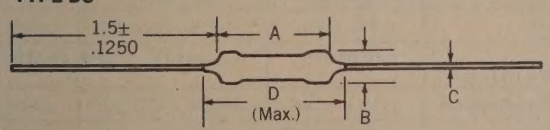
*Applies to MC only.

Tolerance: .5%, 1%, 2%
Operating Temp. Range: −55° C to +165° C
Temperature Coefficient: −200 PPM to −500 PPM, depending on value within normal resistance range.

TYPE MC



TYPE DC

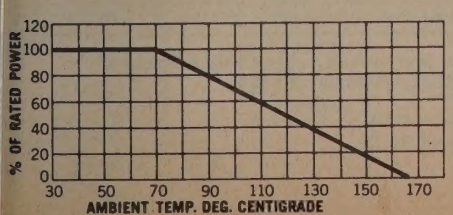


DIMENSIONS

DALE TYPE	A	B	C	D
MC-1/10	.260±.010	.095±.005	.025 Dia.	—
MC-1/8	.406±.015	.135±.010	.025 Dia.	—
MC-1/4	.593±.015	.203±.015	.025 Dia.	—
MCS-1/2	.730±.020	.250±.015	.032 Dia.	—
MC-1	1.093±.020	.375±.015	.032 Dia.	—
MC-2	2.188±.020	.375±.015	.032 Dia.	—
DC-1/10	.281±.031	.094±.015	.025 Dia.	.375
DC-1/8	.343±.031	.109±.031	.025 Dia.	.453
DC-1/4	.468±.031	.109±.031	.025 Dia.	.578
DCS-1/2	.562±.062	.187±.031	.032 Dia.	.734
DC-1	.937±.062	.296±.031	.032 Dia.	1.187
DC-2	2.062±.062	.296±.031	.032 Dia.	2.312
DC-5	4.000±.125	.438±.031	.040 Dia.	4.300

POWER RATING
Dale MC and DC power ratings are based on 1% maximum ΔR in 1000 hours load life at 70° C.

DERATING
Dale MC and DC resistors have an operating temperature range of −55° C to +165° C. They must be derated at high ambient temperatures according to the curve.



For complete information write or phone-

DALE ELECTRONICS, INC.
P.O. Box 609 • COLUMBUS, NEBRASKA 68601
PHONE: 402-564-3131 • TWX: 402-564-2807 • TELEX: 048-6434

DALE®

WIREWOUND RESISTORS

APPLICABLE MIL. ENVIRONMENTAL SPECIFICATIONS

■ MIL-R-26

TYPES RS, G, RLS & GL

TEST	MIL-R-26E REQUIREMENT	DALE MAXIMUM RS, G, RLS & GL*
Load Life	± (.5%+.05Ω) ΔR	± (.5%+.05Ω) ΔR
Moisture Resistance	± (.2%+.05Ω) ΔR	± (.2%+.05Ω) ΔR
Temp. Coefficient	30-90 PPM/°C Max.	See tables Pages 2 & 3
Thermal Shock	± (.2%+.05Ω) ΔR	± (.2%+.05Ω) ΔR
Short Time Overload	± (.2%+.05Ω) ΔR	± (.2%+.05Ω) ΔR
Dielectric	± (.1%+.05Ω) ΔR	± (.1%+.05Ω) ΔR
Low Temp. Storage	± (.2%+.05Ω) ΔR	± (.2%+.05Ω) ΔR
High Temp. Exposure	± (.5%+.05Ω) ΔR	± (.5%+.05Ω) ΔR
Shock	± (.1%+.05Ω) ΔR	± (.1%+.05Ω) ΔR
Vibration	± (.1%+.05Ω) ΔR	± (.1%+.05Ω) ΔR
Terminal Strength	± (.1%+.05Ω) ΔR	± (.1%+.05Ω) ΔR

All ΔR figures shown are maximum, based on units with an initial tolerance of 1% and maximum operating temperature of 275°C.

*GL & RLS physical configurations are not covered in MIL-R-26. Environmental specifications will be same as for RS & G styles.

TYPES CW, HL, NHL, HLM, HLA, HLT & HLW

TEST	MIL-R-26E REQUIREMENT	DALE TYPICAL* HL Tubular & Flat	DALE TYPICAL CW
Load Life	± (3%+.05Ω) ΔR	± (.2% +.05Ω) ΔR	± (0.5%+.05Ω) ΔR
Moisture Resistance	± (2%+.05Ω) ΔR	± (0.5%+.05Ω) ΔR	± (0.5%+.05Ω) ΔR
Temp. Coefficient	260-400 PPM/°C	±50 PPM/°C except on low values	±50 PPM/°C except on low values
Thermal Shock	± (2%+.05Ω) ΔR	± (0.5%+.05Ω) ΔR	± (0.2%+.05Ω) ΔR
Short Time Overload	± (2%+.05Ω) ΔR	± (0.5%+.05Ω) ΔR	± (0.2%+.05Ω) ΔR
Dielectric	± (0.1%+.05Ω)	± (0.1%+.05Ω) ΔR	± (0.1%+.05Ω) ΔR
Low Temp. Storage	± (2%+.05Ω) ΔR	± (0.2%+.05Ω) ΔR	± (0.2%+.05Ω) ΔR
High Temp. Exposure	± (2%+.05Ω) ΔR	± (1%+.05Ω) ΔR	± (1%+.05Ω) ΔR
Shock	± (0.2%+.05Ω) ΔR	N/A	± (0.1%'.05Ω) ΔR
Vibration	± (0.2%+.05Ω) ΔR	N/A	± (0.1%+.05Ω) ΔR
Terminal Strength	± (1%+.05Ω) ΔR	± (0.1%+.05Ω) ΔR	± (0.1%+.05Ω) Δ R

ΔR figures shown are based on units with an initial tolerance of 5% and maximum operating temperature of 350°C.

*NHL, HLM, HLA and HLW physical configurations are not covered in MIL-R-26. However, environmental specifications will be same as for HL tubular and HL flat styles.

■ MIL-R-18546

TYPES RH, HG & PH

TEST	MIL-R-18546	DALE TYPICAL RH, HG & PH*
Load Life	±(1%+.05Ω)ΔR	±(.5%+.05Ω)ΔR
Moisture Resistance	±(1%+.05Ω)ΔR	±(.5%+.05Ω)ΔR
Resistance Temperature Characteristic	±50 PPM to 2000Ω ±30 PPM over 2000Ω	See tables on pages 3 & 4
Thermal Shock	±(.5%+.05Ω)ΔR	±(.25%+.05Ω)ΔR
Momentary Overload	±(.5%+.05Ω)ΔR	±(.25%+.05Ω)ΔR
Dielectric	±(.2%+.05Ω)ΔR	±(.1%+.05Ω)ΔR
High Temp. Storage	±(.5%+.05Ω)ΔR	±(.25%+.05Ω)ΔR
Shock	±(.2%+.05Ω)ΔR	±(.1%+.05Ω)ΔR
Vibration	±(.2%+.05Ω)ΔR	±(.1%+.05Ω)ΔR
Terminal Strength	±(.2%+.05Ω)ΔR	±(.1%+.05Ω)ΔR

All ΔR figures shown are based on units with an initial tolerance of 1% and maximum operating temperatures of 275° C.

*PH physical configuration is not covered in MIL-R-18546. However, environmental specifications will be same as for RH & HG styles.

■ MIL-R-93

TYPES WWA, MWA & WWP

TEST	MIL-R-93 REQUIREMENT	DALE MAXIMUM	DALE TYPICAL
Moisture	±(.1%+.05Ω)	±(.05%+.05Ω)ΔR	±.02% ΔR
T.C. (10 ohms and over)	± 20 ppm/°C	±20 ppm/°C	±15 ppm/°C
Short Time Overload	±(.1%+.05Ω)	±(.05%+.05Ω)ΔR	±.01% ΔR
Dielectric	±(.05%+.05Ω)	±(.02%+.05Ω)ΔR	±.00% ΔR
Low Temp. Storage	±(.2%+.05Ω)	±(.05%+.05Ω)ΔR	±.02% ΔR
High Temp. Exposure	±(.5%+.05Ω)	±(.10%+.05Ω)ΔR	±.04% ΔR
Low Temp. Operation	±(.25%+.05Ω)	±(.05%+.05Ω)ΔR	±.02% ΔR
Temperature Cycling	±(.2%+.05Ω)	±(.15%+.05Ω) ΔR	±.07% ΔR
Terminal Strength	±(.05%+.05Ω)	±(.01%+.05Ω)ΔR	±.00% ΔR
Salt Water	±(.25+.05Ω)	±(.15%+.05Ω) ΔR	±.03% ΔR
Life	±(.5%+.05Ω)	±(.25%+.05Ω)ΔR	±.09% ΔR
Shock	±(.1%+.05Ω)	±(.02%+.05Ω)ΔR	±.00% ΔR
Vibration	±(.1%+.05Ω)	±(.03%+.05Ω)ΔR	±.01% ΔR

All ΔR figures shown are based on units with an initial tolerance of 1% and maximum operating temperature of 145°C.

DALE®

METAL and CARBON FILM RESISTORS

APPLICABLE MIL. ENVIRONMENTAL SPECIFICATIONS

MIL-R-10509

PES MF & MFF*

QUIREMENT	CHAR. B		CHAR. D		CHAR. C		CHAR. E		CHAR. F	
il. Temp. Coefficient	± 500 PPM		+200 –500 PPM		±50 PPM		±25 PPM		±50 PPM	
pplicable Dale T.C. Code	T-00 (200 PPM)		T-1 (100 PPM) T-0 (150 PPM)		T-2 (50 PPM)		T-9 (25 PPM)		T-2 (50 PPM)	
OWER RATING	at 70°C		at 70°C		at 125°C		at 125°C		at 125°C	
VIRONMENTAL TEST	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.
mperature Cycling	±0.5%ΔR	±0.10%	±0.5%ΔR	±0.10%	±0.25%ΔR	±0.10%	±0.25%ΔR	±0.10%	±0.25%ΔR	±0.10%
w Temp. Operation	±0.5%ΔR	±0.05%	±0.5%ΔR	±0.05%	±0.25%ΔR	±0.05%	±0.25%ΔR	±0.05%	±0.25%ΔR	±0.05%
hort Time Overload	±0.5%ΔR	±0.02%	±0.5%ΔR	±0.02%	±0.25%ΔR	±0.02%	±0.25%ΔR	±0.02%	±0.25%ΔR	±0.02%
lectric Withstanding Voltage	±0.5%ΔR	±0.01%	±0.5%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%
fect of Soldering	±0.5%ΔR	±0.02%	±0.5%ΔR	±0.02%	±0.1% ΔR	±0.02%	±0.1% ΔR	±0.02%	±0.1% ΔR	±0.02%
oisture Resistance	±1.5%ΔR	±0.05%	±1.5%ΔR	±0.05%	±0.5% ΔR	±0.05%	±0.5% ΔR	±0.05%	±0.5% ΔR	±0.05%
oad Life	±1.0%ΔR	±0.05%	±1.0%ΔR	±0.05%	±0.5% ΔR	±0.15%	±0.5% ΔR	±0.15%	±0.5% ΔR	±0.15%
hock	±0.5%ΔR	±0.01%	±0.5%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%
ibration	±0.5%ΔR	±0.01%	±0.5%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%	±0.25%ΔR	±0.01%

l ΔR figures shown are based on units th an initial tolerance of 1%.

*Environmental performance figures shown above are typical for MFF conformally coated resistors. However, this style is dimensionally smaller than the RN types per MIL-R-10509.

PE D

REQUIREMENT	CHAR. D		CHAR. C		CHAR. E	
ENVIRONMENTAL TEST	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.
Temperature Cycling	±0.5% Δ R	±0.10%	±0.25% Δ R	±0.1%	±0.25% Δ R	±0.10%
Low Temp. Operation	±0.5% Δ R	±0.05%	±0.25% Δ R	±0.05%	±0.25% Δ R	±0.05%
Short Time Overload	±0.5% Δ R	±0.10%	±0.25% Δ R	±0.10%	±0.25% Δ R	±0.10%
Dielectric Withstanding Voltage	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%
Effect of Soldering	±0.5% Δ R	±0.05%	±0.1% Δ R	±0.05%	±0.1% Δ R	±0.05%
Moisture Resistance	±1.5% Δ R	±0.25%	±0.5% Δ R	±0.25%	±0.5% Δ R	±0.25%
Load Life	±1.0% Δ R	±0.5%	±0.5% Δ R	±0.5%	±0.5% Δ R	±0.5%
Shock	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%
Vibration	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%

All ΔR figures shown are based on units with an initial tolerance of 1% and maximum operating temperature of 175°C. This physical configuration is not covered in MIL-R-10509.

YPES MC & DC

REQUIREMENT	CHAR. B		CHAR. D	
Power Rating Temp.	70° C		70° C	
Temperature Coefficient	±500 PPM/°C		+200 –500 PPM/°C	
ENVIRONMENTAL TESTS	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.
Temperature Cycling	0.5%ΔR	0.25%ΔR	0.5%ΔR	0.25%ΔR
Low Temp. Operation	0.5%ΔR	0.05%ΔR	0.5%ΔR	0.05%ΔR
Short Time Overload	0.5%ΔR	0.05%ΔR	0.5%ΔR	0.05%ΔR
Dielectric Withstanding Voltage	0.5%ΔR	0.01%ΔR	0.5%ΔR	0.01%ΔR
Effect of Soldering	0.5%ΔR	0.01%ΔR	0.5%ΔR	0.01%ΔR
Moisture Resistance	1.5%ΔR	0.25%ΔR	1.5%ΔR	0.25%ΔR
Load Life	1.0%ΔR	0.10%ΔR	1.0%ΔR	0.20%ΔR
Shock	0.5%ΔR	0.10%ΔR	0.5%ΔR	0.10%ΔR
Vibration	0.5%ΔR	0.10%ΔR	0.5%ΔR	0.10%ΔR

All ΔR figures shown are based on units with an initial tolerance of 1%.

DAVEN Precision Wire Wound Resistors & Networks

Non-magnetic, radiation-resistant, tolerances from ±.002% to ±1.0%.

LEAD TYPES: Axial wire, radial wire, printed circuit wire, radial lug, printed circuit lug, plus many wire lead materials and platings.

385 STYLES: Epoxy, varnish or silicone coated, metal encased, solder sealed.

SIZES: From .1″ dia. x .235″ long to ⅞″ dia. x 2⅛″ long.

OHMIC RANGE: 1 milliohm to 25 megohms.

TOLERANCE (production basis): Absolute — down to & including ±.002%. Matched — down to & including ±.001%.

TEMP. COEF.: ±1 PPM/°C to +6000 PPM/°C.

STABILITY: Down to 0±20 PPM for 3 yrs.

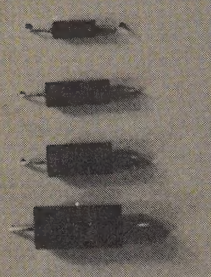
RISE TIME: Down to .05 μsec. POWER: .03 watts to 10 watts. VOLTAGE: 1000v to 2000v.

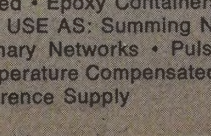
THERMAL EMF: Down to 2.5 μv/°C.

NOISE: Down to thermal noise level.

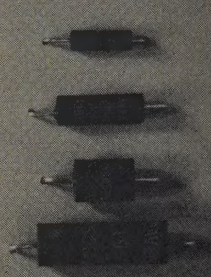
MIL SPECS: Meet or exceed MIL-R-93 & MIL-R-39005-MIL-R-26 or MIL-R-39007 as applicable.

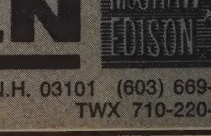
HIGHEST RELIABILITY with over 20 million test hours certified failure rate of .01% per 1000 hrs. based on full power @ 125°C. In almost every major missile/hi-reliability program.





DAVEN PART	DIA.	LENGTH	MAX. WATTS	MAX. RES.	DAVEN PART
Axial Lead Types					
1409	.1	.235	.03	40K	
	.125	.312	.05	100K	1282
1402	.142	.375	.1	200K	
	.160	.500	.125	300K	1403
1274	.187	.375	.125	300K	
	.250	.343	.25	500K	1283
1250	.250	.500	.33	800K	
	.250	.750	.5	1.2 MEG	1195
Cylindrical Printed Circuit Types					
	.250	.312	.25	400K	1350
1351	.250	.375	.25	500K	
	.250	.437	.25	600K	1352
Instrument Grade					
DAX ½	.093	.312	.15	800Ω	
	.093	.406	.33	2K	DAX-1
DAX-2	.218	.500	.66	5K	
	.250	.625	1.0	6K	DAX-3
Precision Power					
DAS ½	.093	.312	.50	800Ω	
	.093	.406	1.0	2K	DAS-1
DAS-2	.218	.500	2.0	5K	
	.250	.625	3.0	6K	DAS-3
Hermetically Sealed					
1510	.281	.750	.25	1 MEG	





Hi Density Printed Circuit Types

PT. NO.	HGT.	WIDTH	THICKNESS	MAX WATTS	MAX RES.	PT. NO.
	.165	.325	.160	.125	600K	1370
1371	.165	.500	.160	.33	900K	
	.265	.265	.140	.125	500K	1380
1381	.265	.510	.140	.33	1 MEG	

NETWORKS: Available in a variety of sizes and shapes • Hermetically Sealed • Epoxy Containers

FOR USE AS: Summing Networks • Voltage Dividers • RC Networks • Binary Networks • Pulse Networks • Cold Junction Reference • Temperature Compensated • Ladder Adder • Current Source • Voltage Reference Supply

DAVEN McGRAW EDISON

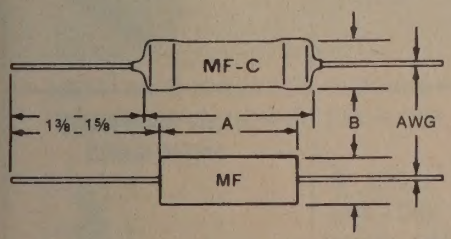
Dept. EEM-70, Manchester, N.H. 03101 (603) 669-0940
TWX 710-220-1747

ETAL FILM PRECISION RESISTORS

CHARACTERISTIC CODE: Characteristic D (0 ±100 PPM/°C)
Characteristic C & F (0 ±50 PPM/°C)
Characteristic E (0 ±25 PPM/°C)
MIL-R-22684 (0 ±100° PPM/°C)

ELECTRA/MIDLAND TYPES & DIMENSIONS			POWER RATING (WATTS) @		CHARAC-TERISTIC & T.C. of R (PPM/°C)	RESISTANCE RANGE (See Notes)	TOLER-ANCE(3)	MIL EQUIV.
MOLDED	CONFORMALLY COATED							
MIL LINE		TRIM LINE	125°C	70°C				
	MF3C A = .130/.170 B = .050/.080 AWG = #26		1/20	1/10	D = ±100 C = ±50 E = ±25	10 ohm-100K 30.1 ohm-100K 30.1 ohm-100K	F,D F,D F,D	RN50
MF4 A = .250/.270 B = .115/.135 WG = #22	MF4C A = .219/.281 B = .083/.110 AWG = #22		1/10	¼	D = ±100 C = ±50 E = ±25	10 ohm-499K 30.1 ohm-499K 30.1 ohm-499K	F,D B,C,D,F B,C,D,F	RN55
MF5 A = .385/.415 B = .125/.145 WG = #22	MF52C A = .375/.430 B = .130/.160 AWG = #22	MF5C A = .281/.343 B = .083/.110 AWG = #22	⅛	½	D = ±100 C = ±50 E = ±25	10 ohm-1 Meg.(1) 30.1 ohm-1 Meg. 30.1 ohm-1 Meg.	F,D B.C.D.F B.C.D.F	RN60
MF6 A = .580/.610 B = .210/.230 WG = #22	MF62C A = .600/.656 B = .157/.177 AWG = #22	MF6C A = .500/.560 B = .130/.160 AWG = #22	¼ ½	1	D = ±100 C = ±50 E = ±25 F = ±50	10 ohm-2 Meg.(1) 49.9 ohm-2 Meg. 49.9 ohm-2 Meg. 49.9 ohm-2 Meg.	F,D B,C,D,F B,C,D,F B,C,D,F	RN65
MF7 A = .745/.765 B = .245/.275 WG = #20	MF72C A = .688/.765 B = .220/.260 AWG = #20	MF7C A = .600/.656 B = .150/.180 AWG = #20	½ ¾	1	D = ±100 C = ±50 E = ±25 F = ±50	10 ohm-2.49 Meg.(1) 49.9 ohm-2.49 Meg. 49.9 ohm-2.49 Meg. 49.9 ohm-2.49 Meg.	F,D B,C,D,F B,C,D,F B,C,D,F	RN70
MF8 A = 1.100/1.120 B = .390/.410 WG = #20		MF8C A = .960/1.020 B = .280/.320 AWG = #20	1	2	B = ±100 C = ±50 E = ±25	10 ohm-5.11 Meg.(2) 49.9 ohm-3 Meg. 49.9 ohm-3 Meg.	F,D B,C,D,F B,C,D,F	RN75
MF9 A = 2.215/2.265 B = .375/.415 WG = #20		MF9C A = 2.025/2.165 B = .280/.320 AWG = #20	2	3	B = ±100 C = ±50 E = ±25	100 ohm-10 Meg. 100 ohm-10 Meg. 249 ohm-5.11 Meg.	F,D B,C,D,F B,C,D,F	RN80
	MF07C A = .219/.281 B = .082/.098 AWG = #22		⅛	¼	±100	51 ohm-150K 10 ohm-301K (extended range-commercial only)	G,J	RL07
	MF20C A = .384/.416 B = .130/.160 AWG = #20		¼	½	±100	51 ohm-470K 15 ohm-499K (extended range-commercial only)	G,J	RL20

TO ORDER. SPECIFY (TYPE) – MF52C – E – 1001 – F
(Add lead options, packing data if needed.)



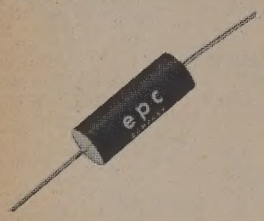
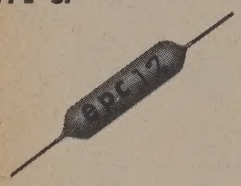
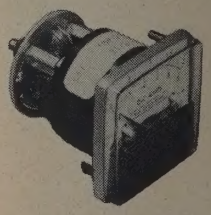
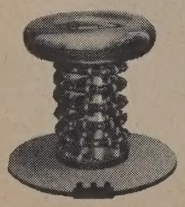
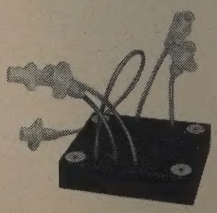
NOTES: Carbon Film may be supplied in the following values with T.C. of R = –200 to –500 PPM/°C:

(1) 10 Ω to 14.9 Ω
(2) 10 Ω to 14.9 Ω and 3.01 to 5.11 Meg.
(3) Tolerance Code: B = 0.10%. C = 0.25%. D = 0.50%. F = 1.0%. G = 2.0%. J = 5.0%

ELECTRA/MIDLAND CORPORATION
P.O. Box 760 • Mineral Wells, Texas 76067 • (817) 323-7071 • TWX 910-890-5855
A TRANSITRON COMPANY

epc CORPORATION

MANUFACTURERS OF PRECISION WIRE-WOUND RESISTORS • RESISTOR NETWORKS CURRENT SHUNTS AND HIGH VOLTAGE DIVIDERS • NO ORDER TOO SMALL OR LARGE

EPC DEVICES	DESCRIPTION	Mil Equiv. MIL	Mil Equiv. EPC	CONDENSED SPECIFICATIONS
TYPE CA 	Encapsulated precision wire-wound resistors offering exceptional resistance stability, T.C. 5 ppm std. and low thermal EMF's. Designed to meet MIL-R-93C. Group encapsulization, Radial-lug and special physical configurations available. Request CA Brochure	RB-08 RB-16 RB-17 RB-18 RB-19 RB-56 RB-55 RB-54 RB-53 RB-52 RB-71 RB-70	610 630 640 650 660 680 690 710 750 760 460 465	Power: .02 to 2.5W Range: 1Ω to 20MΩ depending on size Tolerance: .005%, .01%, .025%, .05%, .1% and 1% Temp. Coef.: 5 PPM/°C std. on values over 100Ω
TYPE SP 	Silicone coated precision wire-wound power resistors, offering exceptional stability and performance under severe environmental conditions. Also available utilizing Beryllium oxide cores. For greater power-size ratio and stability. Request SP Bulletin	RW-70 RW-69 RW-79 RW-74 RW-55 RW-78 RW-68 RW-56	SP-1 SP-2A SP-5 SP-6 SP-7A SP-10A SP-10B SP-12	Power: .25W to 12.5W Range: .1Ω to 275KΩ depending on size Tolerance: 1% is std. Available to .01% Temp. Coef.: 20 PPM/°C. Slightly higher for lower values. Special T.C.'s available
NETWORKS	Resistor networks to customer specification utilizing ultra precision wire-wound, metal film, carbon film, or wire-wound power resistors. All circuits assembled on printed circuit boards. FAST DELIVERY ON PROTOTYPE AND LARGE ORDERS			Power: .1W to 10W Range: .1Ω to 5MΩ Nominal Resistance Tolerance: To ±.005% D.C. W-W Resistance Ratio Tolerance: To .001% D.C. W-W Long Term Stability: .001% Response Time: 100MS
CURRENT SHUNTS	Standard D.C. current shunts from .001Ω to 1Ω. Accuracy ±.25%, available to .01%. Also external portable and switchboard shunts for use with D.C. Ammeters. 1 to 200 amp. with a 50MV drop. Accuracy ±1%. SPECIAL OEM CURRENT SHUNT RANGING FOR PANEL METERS			**METER SHUNTS** 
HIGH VOLTAGE DIVIDERS 	100KV high voltage divider with ratio accuracy of ±.05% at 100,000 to 1. The divider can be used for A.C. (at 60HTz only) measurements to 1% accuracy. Also available are high voltage divider networks utilizing wire-wound carbon, or metal film resistors to customer specification.			**HIGH VOLTAGE NETWORKS** 

ELECTRONIC PRECISION COMPONENTS CORPORATION

2 BROOKDALE PLACE • MOUNT VERNON, N. Y. 10550 • TELEPHONE: (914) 664-2333

Charles T. Gamble Industries

New Jersey & Fairview Avenue • Riverside, New Jersey 08075 • 609-461-1900

PRECISION WIRE WOUND RESISTORS & NETWORKS

Charles T. Gamble Industries has engineered and designed non-inductive precision wire wound resistors to meet the requirements of Mil-R-93D. These resistors are completely sealed against the effects of high humidity and salt water immersion cycling. The material used in the manufacture of our resistors has a very high dielectric strength. The bobbin material used in winding the resistors is one and the same as the encapsulating material. All resistors use resistance wire with very low thermal E.M.F. to the copper leads. Where thermal effects can be disregarded, welded construction with nickel alloy leads may be specified.

Standard temperature coeficient is ±10 PPM/°C. Lower T.C.'s, and T.C.'s as high as 6000 PPM/°C can be supplied.

Tolerance available (non power styles): 1%, 0.5%, 0.1%, 0.05%, 0.025%, 0.02% and 0.01%. Resistors with tolerances of 0.1% and below are stabilized by artificial aging and temperature cycling.

NETWORKS: RC NETWORKS, LADDER NETWORKS, VOLTAGE DIVIDERS, BINARY NETWORKS

Sub-miniature Axial lead Precision resistors have been designed for applications where space is a prime factor.

Encapsulated printed circuit resistors are designed for printed circuit board application, where space is a factor.

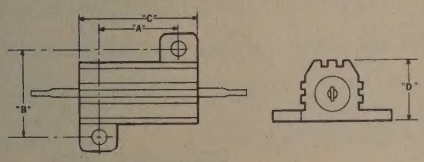
Radial lug type resistors have been designed to meet the requirements of Mil-R-93D.

All resistors are hermetically sealed with epoxy resin to protect the windings against the effects of high humidity and salt water immersion cycling. Resistors can either be inductive or non-inductive wound.

The materials used in the construction of radial lug type resistors are identical to those used in the construction of axial lead types.

These resistors are supplied with a thru hole for mounting to the chassis by means of a #6 thru bolt.

HEAT SINK MOUNTED PRECISION WIREWOUND POWER RESISTORS



POWER RATING	DIMENSIONS A	B	C	D	MAXIMUM OHMS
10 WATT	.562	.625	.750	.390	20,000
25 WATT	.718	.781	1.062	.542	60,000
50 WATT	1.563	.844	1.968	.610	70,000

Ratings shown are based upon use of appropriate chassis mounting.

STANDARD AXIAL LEAD PRECISION RESISTORS

Type	Military Specs. New	Old	Commercial Wattage Rating	Max. Resist. Based on .0007 E Alloy	Military Wattage Rating	Max. Volts	Size Length	Dia.
0808AL			.125W	300K		200V	¼″	¼″
1108AL	RB56		.125W	350K	.125W	250V	11/32″	¼″
1608AL	RB55	AFRT 10	.250W	400K	.15 W	184V	½″	¼″
1208AL			.200W	350K	.250W	225V	⅜″	¼″
2408AL	RB54	AFRT 11	.333W	1 meg.	.250W	300V	¾″	¼″
2412AL	RB53	AFRT 12	.500W	1.2 meg.	.333W	300V	¾″	⅜″
3212AL	RB52	AFRT 13	1.000W	2 meg.	.400W	600V	1″	⅜″
1616AL			.500W	1.3 meg.		300V	½″	½″
3216AL	RF57	AFRT 14	1.000W	3 meg.	.750W	600W	1″	½″
4816AL	RB58	AFRT 15	2.000W	6 meg.	1.000W	900V	1½″	½″
6416AL	RB59	AFRT 16	2.500W	10 meg.	1.250W	1200V	2″	½″
2008AL			.500W	.425 meg.		300V	⅝″	¼″
1612AL			.400W	.500 meg.		300V	½″	⅜″
2012AL			.750W	.600 meg.		600V	⅝″	⅜″
3208AL			.500W	1.1 meg.		300V	1″	¼″
2016AL			.750W	2 meg.		600V	⅝″	½″
1212AL			.250W	1 meg.		225V	⅜″	⅜″

SUB-MINIATURE AXIAL LEAD PRECISION RESISTORS

Type	Commercial Wattage Rating	Maximum Resistance based on .0007 E Alloy	Maximum Voltage	Size Length	Dia.
500156AL	.1W	70K	85 Volts	½″	5/32″
625156AL	.15W	100K	125 Volts	⅝″	5/32″
375125AL	.125	50K	72 Volts	⅜″	⅛″
109250AL	.120	25K	50 Volts	¼″	7/64″
375187AL	.1W	40K	65 Volts	⅜″	3/16″
375109AL	.120	30K	55 Volts	⅜″	7/64″
375093AL	.1	20K	55 Volts	⅜″	3/32″

ENCAPSULATED PRINTED CIRCUIT RESISTORS

Type	Military Specs.	Commercial Wattage	Military Wattage	Max. Volts	Max. Resist. Based on .0007	Sizes Length	Dia.	Lead Spacing	Lead Length
0808PC		.125W		90V	70K	¼″	¼″	.100	1″
1208PC		.200W		200V	200K	⅜″	¼″	.100	1″
1608PC		.250W		184V	400K	½″	¼″	.100	1″
2408PC		.333W		300V	1 meg.	¾″	¼″	.100	1″
3208PC		.500W		750V	1.1 meg.	1″	¼″	.100	1″
1008PC	RB71	.250W	.125W	240V	250K	5/16″	¼″	.200	1″
1612PC	RB70	.500W	.250W	150V	.301 meg.	½″	⅜″	.200	1″
3212PC		1.000W		1350V	1.75 meg.	1″	⅜″	.250	1″
3232PC		1.250W		1700V	2.50 meg.	1″	½″	.250	1″

STANDARD RADIAL LUG PRECISION RESISTORS

Type	Military Specs. New	Old	Commercial Wattage	Military Wattage Rating	Maximum Voltage	Max. Resist. Based on .0007	Size Length	Dia.
1616RLU	RB08	AFRT 17	.500	¼W	300V	885K	½″	½″
2020RLU	RB16	AFRT 18	.666	⅓W	300V	1 meg.	⅝″	⅝″
3220RLU	RB17	AFRT 19	1.000	½W	600V	2.5 meg.	1″	⅝″
4024RLU	RB18		1.500	¾W	600V	6.5 meg.	1¼″	¾″
6828RLU	RB19		2.000	1W	900V	12 meg.	2⅛″	⅞″

CHARLES T. GAMBLE INDUSTRIES
Precision Wire Wound Resistors
New Jersey Avenue & Fairview Street
Riverside, New Jersey 08075 Tel: (609) 461-1900

ECONISTORS
PRECISION WIREWOUND RESISTORS

ECONISTORS: TO ±0.005%, LOW COST, IMMEDIATE SHIPMENT FROM STOCK

ECONISTORS represent a price and delivery breakthrough in precision wirewound resistor manufacture. While in every important particular equivalent to high-accuracy components costing several times as much, ECONISTORS are available at prices comparable to, for example, thick film resistors while these cannot compare with ECONISTORS in terms of accuracy, stability, load life and hysteresis.

NOW IN STOCK IN QUANTITY ON BOTH EAST AND WEST COASTS, ECONISTORS will be shipped in any quantity of any standard value within 72 hours after an order is received.

CONDENSED SPECIFICATIONS

Ohmic Values: See following charts
Accuracy: (@ 25°C)±.005% / .01% / .025% / 0.1%
T.C.: ±5 PPM/°C, max., —55°C to +125°C
±3 PPM/°C, typical, 0°C to +85°C
Stability: ±35 PPM/year; ±50 PPM, 3 years
Power Rating (+125°C): 0.25 watt
(+85°C): 0.33 watt
Max. Voltage: 200 VDC or AC peak
Dimensions (8E16): 0.25" OD x 0.5" lg (values below 700K)
(8E24): 0.25" OD x 0.75" lg (values above 700K)
Leads: Axial wire; #22AWG tinned copper; 1.5" lg, min.

8E16 ECONISTORS — PRICES* — STANDARD VALUES

1 PIECE TO 99 PIECES

Exact Resistance Value in Ohms	±0.1% Tolerance			±.025% Tolerance			±.01% Tolerance			±.005% Tolerance		
	1-9 pcs.	10-49 pcs.	50-99 pcs.	1-9 pcs.	10-49 pcs.	50-99 pcs.	1-9 pcs.	10-49 pcs.	50-99 pcs.	1-9 pcs.	10-49 pcs.	50-99 pcs.
10 Ω												
20 Ω	$1.10	$1.00	$ .90	$1.25	$1.15	$1.05	$1.70	$1.60	$1.50	$4.40	$3.50	$2.60
50 Ω												
100 Ω-200 Ω												
250 Ω												
400 Ω-500 Ω												
800 Ω-1 K												
1.5 K	.95	.85	.70	1.10	1.05	.95	1.45	1.35	1.25	3.95	2.99	2.05
2 K												
2.5 K												
4 K - 5 K												
8 K - 10 K												
20 K												
25 K	1.00	.90	.75	1.15	1.10	1.00	1.50	1.40	1.30	3.95	2.99	2.05
40 K												
50 K	1.00	.90	.80	1.15	1.10	1.00	1.55	1.45	1.35	3.95	2.99	2.05
80 K - 100 K	1.10	1.00	.90	1.25	1.20	1.15	1.70	1.60	1.45	4.15	3.25	2.35
180 K	1.25	1.20	1.10	1.60	1.55	1.45	1.95	1.85	1.69	4.40	3.50	2.65
200 K												
250 K	1.40	1.35	1.25	1.75	1.70	1.60	2.10	2.00	1.84	4.55	3.65	2.80
500 K	1.90	1.80	1.70	2.30	2.20	2.05	2.70	2.60	2.40	5.15	4.25	3.35
1 Meg.	3.40	3.05	2.75	3.60	3.25	3.00	3.80	3.65	3.20	5.95	5.05	4.15

Minimum Item Charge $3; Minimum Order Charge $20.

100 PIECES TO 2499 PIECES

Resistance Value in Ohms	±0.1%				±.025%				±.01%				±.005%			
	100 to 249	250 to 499	500 to 999	1000 to 2499	100 to 249	250 to 499	500 to 999	1000 to 2499	100 to 249	250 to 499	500 to 999	1000 to 2499	100 to 249	250 to 499	500 to 999	1000 to 2499
10 Ω																
20 Ω	$ .89	$ .88	$ .87	$ .86	$1.04	$1.03	$1.02	$1.01	$1.49	$1.47	$1.46	$1.44	$2.57	$2.55	$2.52	$2.50
50 Ω																
100 Ω-200 Ω																
250 Ω																
400 Ω-500 Ω																
800 Ω-1 K																
1.5 K	.69	.69	.68	.67	.94	.93	.92	.91	1.24	1.23	1.21	1.20	2.03	2.01	1.99	1.97
2 K																
2.5 K																
4 K - 5 K																
8 K - 10 K																
20 K																
25 K	.74	.74	.73	.72	.99	.98	.97	.96	1.29	1.27	1.26	1.25	2.03	2.01	1.99	1.97
40 K																
50 K	.79	.78	.78	.77	.99	.98	.97	.96	1.34	1.32	1.31	1.30	2.03	2.01	1.99	1.97
80 K - 100 K	.89	.88	.87	.86	1.14	1.13	1.12	1.10	1.44	1.42	1.41	1.39	2.33	2.30	2.28	2.26
180 K																
200 K	1.09	1.08	1.07	1.06	1.44	1.42	1.41	1.39	1.67	1.66	1.64	1.62	2.62	2.60	2.57	2.54
250 K	1.24	1.23	1.21	1.20	1.58	1.57	1.55	1.54	1.82	1.80	1.78	1.77	2.77	2.74	2.72	2.69
500 K	1.68	1.67	1.65	1.63	2.03	2.01	1.99	1.97	2.38	2.35	2.33	2.30	3.32	3.28	3.25	3.22
1 MEG	2.72	2.70	2.67	2.64	2.97	2.94	2.91	2.88	3.17	3.14	3.10	3.07	4.11	4.07	4.03	3.98

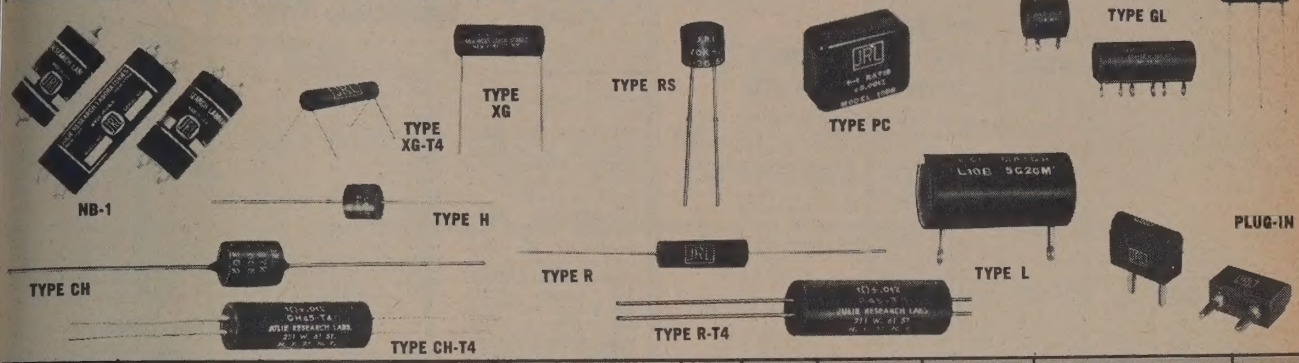
*PER RESISTOR; EXACT VALUE; F.O.B. MT. VERNON, N. Y., DOMESTIC
NON-STANDARD VALUES: Available in all tolerances from 1 ohm to 1.1 Megohm, two week delivery. Write for Bulletin 811.

U.S.A.: 500 NUBER AVENUE, MT. VERNON, NEW YORK (212) 292-1500 TWX 710 560 0014
EUROPE: 39 RUE ROTHSCHILD, GENEVA, SWITZERLAND (022) 31 81 80 TELEX 22266

GENERAL RESISTANCE
DIVISION OF CHRONETICS

JULIE RESISTORS

Julie evanohm resistors, acknowledged to be the most stable available anywhere, are offered in a wide variety of styles and sizes. The table below lists some of the more common specifications that the user must know in order to make a practical selection for his application. The Julie engineering staff is always pleased to assist in selecting the proper resistors and is able and willing to assist in designing special purpose or custom resistors. Further technical information is available upon request.



Type Description	Range Resistors	Range Ratios	Accuracy (%) Resistors	Accuracy (%) Ratios	Stability %/year	Temp. Coefficient PPM/°C Resistors	Temp. Coefficient PPM/°C Ratios	Self Heating PPM/Watt	Voltage (Volts)	Current/Power	Size	Remarks	Price** per one
NB-1 Ultra Stable oil immersed resistors	0.1 ohm - 10 meg	up to 10^6:1	.0015 1 K to 1 meg	.0005 (near 1:1)	Resistors: .0015 Ratios: .0005	5 (25 available)	2 (0.5 available)	10	200 v Between Terminals	Allow for rise of temp. of 10°C/watt	1⅛" dia. 1¾"-5⅝" long	NBS Certifiable 4-term for 3 K ohms and lower	$35-$150
CH and CH-T4 Compact oil-filled Resistors	0.1 ohm - 5 meg	1:1 - 10^6:1	.005	.002 - .1	.002 (2T) .003 (4T)	5 (1.0 available)	2.5 (0.7 available)	20	300 across Terminals 500 to case	up to 2 amp	⅜"-½" dia. ½"-2" long	Style CH offers minimum and/or matched phase shift. Two or four terminals available.	$10-$50
L Radial Lug Encapsulated Resistor	1 ohm - 10 meg	See GL	.01 100 ohm - 5 meg	.003 - .1	.003 Standard Ranges	5 (1.0 available)	2.5 (0.7 available)	30	125-300 Depending on size	to 300 v to 2 amps. to 2 Watts	⅝"-1" dia. 9/16"-2 1/32" long	High performance under Military environment. Equivalent to Mil Resistors RB 16, 17, 18, and 19	$7.50-$20
H Low Reactance Encapsulated Precision Resistors	1 ohm - 5 meg	1:1 - 10^4:1	.01 100 ohm - 5 meg	.005 (near 1:1)	.003 Standard Ranges	5 (1.0 available)	2.5 (0.7 available)	30	0-1000 Depending on size	to 1000 v to 2 amps. to 2 Watts	⅜"-½" dia. ½"-2" long axial leads	Features a low-reactance construction and fast time constant for AC application	$6.50-$35
HS Special low Reactance Encapsulated Radial Resistors	10 ohm - 1 meg	1:1 - 10^6:1	.0025	.001	.0025	5 (.5 - 2.5 available)	.1	25	0-1000 Depending on size	0-1000 v	⅜"-½" dia. ½"-2" long	A highly accurate resistor for exceptionally low reactance applications	$10-$50
XG and XG-T4 Radial lead Encapsulated Resistors	0.1 ohm - 10 meg	1:1 - 10^6:1	.01 2 ohm - - 5 meg	.005 (near 1:1)	.003	5 (1.0 available)	2.5 (0.7 available)	30	0-1000 Depending on size	to 250 v (100 v on special order) to 2 amps. to 2 Watts	⅜"-⅝" dia. 9/16"-2½" long	A mass produced resistor with high uniformity and reliability. Two or four terminals available.	$5-40
R and R-T4 Axial lead Compact Encapsulated Resistors	0.1 ohm - 10 meg	1:1 - 10^4:1	.01 1 ohm-.5 meg	.005 (near 1:1)	.003	5 (1.0 available)	2.5 (0.7 available)	30	0-1000 Depending on size	to 250 v (1000 v on special order) to 2 amps. to 2 amps.	¼"-½" dia. 9/16"-2" long	Special characteristics are readily providable. Four terminal R-T4 provides extremely low reactance values	$4-25
RS Top Hat Encapsulated Precision Resistors for PC Boards	1 ohm - 750 K ohms	1:1 - 10^6:1	.0025	.002	.003	5 (1.0 available)	2.5 (0.7 available)	30	0-1000 Depending on size	¼ watt	13/32" dia. ½" long	Economical and efficient for use in original equipment manufacture	$4-20
GL Group Encapsulated Precision Resistors Radial-lead or Radial lug Terminal	1 ohm - 5 meg	1:1 - 10^4:1	.01 100 ohm - 5 meg (available to .0025)	.005 (near 1:1)	.003	5 (1.0 available)	2.5 (0.7 available)	30	0-1000 Depending on size	to 300 v to 2 amps. 1 watt/per section	5/16"-⅝" dia. (length depends on requirement)	Two - ten resistors per string, depending on resistance requirement. Available in radial lug and axial wire leads and as low reactance type HGL.	$10-20
PLUG-IN Resistors	1 ohm - 2 meg	See Type L for Additonal Specifications									1 11/16 high 15/16" wide 21/32" deep	Banana plug terminals fit any standard insulated universal post with ⅜" spacing between centers.	$10-150
PC Miniature (Low Profile) Oil Filled Resistors for Printed Circuits	0.1 ohm - 2 meg	1:1 - 10^6:1	.005 1000 ohms - 1 meg	.0025 (near 1:1)	.002	5	2.5 (0.5 available)	20	0-300 Depending on size	to 300 v to 2 Amps. 1 watt	1 3/16" long 57/64" wide ½" seated height	Case may be grounded or floated or guarded Low reactance type HPC also available.	$10-150

Note: All Julie Resistors are non-inductively wound, and meet or exceed military environmental requirements. The low limit of resistors for standard accuracy is 100 ohms.
** Price ranges are based on variables of value, temperature coefficient, etc. for quantities of one . . . quantity discounts are available on request.

JULIE RESEARCH LABORATORIES, INC.

211 WEST 61st STREET, NEW YORK, NEW YORK 10023 • (212) 245-2727

KELVIN

Precision Wire-wound Resistors Power Resistors & Resistor Networks

Kelvin is a pioneer in the field of very high stability, close tolerance, precision wire-wound resistors. Resistors shown represent only part of the broad Kelvin line. Complete catalog data is available on request.

Typical "HRL" Resistor Test Results

TEST	MIL-R-39005 MAXIMUM	"HRL" SERIES AVERAGE	"HRL" SERIES MAXIMUM
Short Time Overload	±.01%	.0012%	.0080%
Temperature Cycling	±.05	.0014	.0100
Moisture Resistance	±.1	.0072	.0192
Dielectric Strength	±.01	.0010	.0013
Terminal Strength	±.05	.0001	.0004
Shock	±.01	.0008	.0010
Vibration	±.01	.0007	.0020

HIGH RELIABILITY "HRL" SERIES

Kelvin's "HRL" Series Resistors were designed to achieve a failure rate of .003%/1000 hours at a 90% confidence level. All data is based on life tests conducted at full rated power at 125°C for a minimum of 1500 hours. No "acceleration factors" are used. Present failure rates are .003%/1000 hours at a 60% confidence level.

KELVIN TYPE	WATTAGE	RESISTANCE MAXIMUM	DIA. ±.015	LENGTH ±.015	MAXIMUM VOLTS	LEAD DIA.	MIL-R-38101	MIL-R-39005
HRL-20	.08	25K	.187	.375	150 V	#22		
HRL-1009	.125	50K	.250	.295	150 V	#22	38101-12	
HRL-1097	.125	90K	.193†	.500	150 V	#22	38101-7	
HRL-417	.125	125K	.250	.343	150 V	#20		RBR-56
HRL-467	.150	225K	.250	.500	150 V	#20		RBR-55
HRL-334	.200	350K	.375	.500	300 V	#20		
HRL-812	.250	500K	.250	.750	300 V	#20	38101-4-8-11	RBR-54
HRL-815	.333	750K	.375	.750	300 V	#20		RBR-53
HRL-1100	.500	600K	.312	.812	300 V	#20	38101-5-9	
HRL-254	.500	1.5 meg	.375	1.000	600 V	#20		RBR-52
HRL-27	.750	2.0 meg	.500	1.000	600 V	#20	38101-3-6-10	

† ±.010 Tolerance

SUB-MINIATURE TYPES

AXIAL LEAD

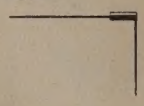
KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.
273-P	.04	50K	.080	.250	75	#24
EP-00	.05	100K	.080	.375	100	#24
460-P	.06	125K	.100	.281	100	#24
375-P	.05	100K	.125	.125	75	#24
301-P	.05	175K	.125	.250	100	#24
EP-01	.10	200K	.125	.375	100	#22
470-P	.10	500K	.160	.500	100	#24
EP-20	.15	700K	.187	.375	100	#22
304-P	.15	500K	.250	.250	100	#22
430-P	.15	600K	.250	.312	100	#20
417-P	.20	700K	.250	.343	100	#20

***WATTAGE RATINGS:** Based on a maximum ambient temperature of 125°C, derated to zero watts at +145°C.

****RESISTANCE MAX.:** Contact factory for availability of values above maximums shown; **TOLERANCES:** 1% through .005% available on most types and resistance values; **TEMPERATURE COEFFICIENT:** ±20 ppm/°C standard.

COMBINATION AXIAL-RADIAL LEAD

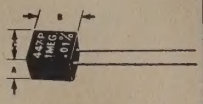
KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.
315-P	.05	100K	.080	.375	100	#24
303-P	.05	100K	.125	.250	100	#24
162-P	.10	200K	.125	.375	100	#22
158-P	.15	700K	.187	.375	100	#22



PRINTED CIRCUIT TYPES

High Density Packaging

KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	SIZE ±.020 A	B	C	MAX. VOLTS	LEAD DIA.	LEAD SPACING
446-P	.250	2 Meg.	.140"	.270"	.500"	100	#20	250
447-P	.125	1 Meg.	.140"	.270"	.250"	100	#20	.125

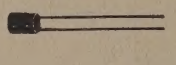


***WATTAGE RATINGS:** Based on a maximum ambient temperature of 125°C, derated to zero watts at +145°C.

****RESISTANCE MAX.:** Contact factory for availability of values above maximums shown; **TOLERANCES:** 1% through .005% available on most types and resistance values.

Standard Printed Circuit

KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.	LEAD SPACING
252-P	.15	375K	.250	.250	100	#22	.150
176-P	.15	450K	.250	.312	100	#22	.150
178-P	.20	650K	.250	.400	200	#22	.150
277-P	.20	700K	.250	.437	200	#22	.150
471-P	.25	750K	.250	.500	300	#22	.150
177-P	.30	850K	.312	.500	400	#22	.200
179-P	.30	1.1M	.375	.500	400	#22	.200
155-R	.50	3.0M	.500	.625	400	#22	.250



HIGH STABILITY SERIES

AXIAL LEAD

KELVIN TYPE	COMMERCIAL WATTAGE	RESISTANCE MAX	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.
OA	.15	560K	.187	.375	300	#22
OB	.25	1.2 Meg.	.250	.500	300	#22
OC	.33	2.2 Meg.	.250	.750	400	#22
OD	.33	2.4 Meg.	.375	.500	300	#20
OE	.50	3.6 Meg.	.375	.828	400	#20
OF	.60	5.2 Meg.	.375	1.000	400	#20
OG	.50	4.0 Meg.	.500	.500	400	#20
OH	.60	6.4 Meg.	.500	.625	400	#20
OJ	1.00	8.0 Meg.	.500	1.000	800	#20
OK	1.50	10.0 Meg.	.500	1.500	900	#20
OL	1.75	10.5 Meg.	.500	1.750	900	#20
OM	2.00	13.0 Meg.	.500	2.000	1000	#20

LONG TERM STABILITY: .003% resistance change per year maximum under conditions involving normal equipment and room temperature variations. Engineering report E-001 available on request.

STANDARD TYPES

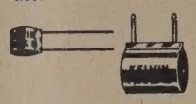
AXIAL-WIRE LEAD

KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.
EP-21	.25	1.5 Meg.	.250	.500	400	#22
467-P	.25	1.5 Meg.	.250	.500	400	#20
EP-23	.33	2.75 Meg.	.250	.750	400	#22
812-P	.33	2.75 Meg.	.250	.750	400	#20
363-P	.40	3.0 Meg.	.250	1.000	400	#22
334-P	.33	3.0 Meg.	.375	.500	300	#20
815-P	.50	4.5 Meg.	.375	1.750	600	#20
EP-24	.50	4.5 Meg.	.375	.828	600	#20
EP-25	.50	5.0 Meg.	.500	.500	400	#20
254-P	.60	6.5 Meg.	.375	1.000	800	#20
EP-26	.60	8.0 Meg.	.500	.625	400	#20
EP-27	1.00	10.0 Meg.	.500	1.000	800	#20
EP-28	1.50	12.0 Meg.	.500	1.500	800	#20
366-P	1.75	13.0 Meg.	.500	1.750	900	#20
EP-29	2.00	15.0 Meg.	.500	2.000	1000	#20

***WATTAGE RATINGS:** Based on a maximum ambient temperature of 125°C, derated to zero watts at +145°C.

****RESISTANCE MAX.:** Contact factory for availability of values above maximums shown; **TOLERANCES:** 1% through .005% available on most types and resistance values; **TEMPERATURE COEFFICIENT:** ±20 ppm/°C standard;

WINDINGS: Non-inductive.



LUG and RADIAL LEAD

KELVIN TYPE	COMMERCIAL WATTAGE*	RESISTANCE MAX.**	DIA. ±1/32	LENGTH ±1/32	MAX. VOLTS	TERMINAL TYPE†	MOUNTING HOLE
EP-22	.10	350K	.312	.250	100	#24 x 2" (Wire Lead)	#2
346-P	.25	1.0M	.375	.440	150	Lug	#4
264-P	.33	1.5M	.375	.500	300	Lug	#4
EP-09	.50	4.0M	.500	.500	400	Lug	#6
263-P	.50	4.0M	.625	.500	400	Lug	#6
EP-15	.60	5.0M	.500	.625	400	Lug	#6
EP-16	1.00	6.5M	.500	1.000	800	Lug	#6
EP-30	1.50	10.0M	.500	1.500	900	Lug	#6

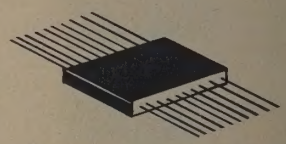
†All Lug Types available with #20 gage radial leads (except EP-22) by specifying letter "R" after type number.

FOR FAST RISE TIME APPLICATIONS

AXIAL LEAD

"RT" style resistors provide exceptionally high frequency performance, in addition to the other recognized advantages of wire-wound resistors. □ "RT" resistors can be supplied with rise times as low as 25 nanoseconds (from 10% to 90% of peak pulse amplitude with a 100 KC pulse input), depending on resistance values and physical configurations.

KELVIN TYPE	COMMERCIAL WATTAGE	RESISTANCE MAX.	DIA. ±1/64	LENGTH ±1/32	MAX. VOLTS	LEAD DIA.
RTA	.15	560 K	.187	.375	300	#22
RTB	.25	1.2 Meg.	.250	.500	400	#22
RTC	.33	2.2 Meg.	.250	.750	400	#22
RTD	.33	2.4 Meg.	.375	.500	300	#20
RTE	.50	3.6 Meg.	.375	.828	400	#20
RTF	.60	5.2 Meg.	.375	1.000	400	#20
RTG	.50	4.0 Meg.	.500	.500	400	#20
RTH	.60	6.4 Meg.	.500	.625	400	#20
RTJ	1.00	8.0 Meg.	.500	1.000	800	#20
RTK	1.50	10.0 Meg.	.500	1.500	900	#20
• RTL	1.75	10.5 Meg.	.500	1.750	900	#20
RTM	2.00	13.0 Meg.	.500	2.000	1000	#20



RESISTOR NETWORKS

Kelvin develops and produces, to customer requirements, packaged resistor networks for use as voltage dividers, analog to digital converters, summing and integrator networks, binary resistive networks and special configurations.

Electrical Characteristics Available:

- Nominal resistance tolerances to ±.002% (DC)
- Resistance ratio tolerances as close as .0005% (DC)
- Long term resistance stability of ±.001% per year.
- Low reactances to provide rise times as low as 25 nanoseconds.
- Temperature coefficients of resistors track as close as 0.5 ppm/°C. from —55° to +125°C.

Standard resistor networks in two series (R-2R and BCD) are available from catalog specifications. The potting, encapsulation and physical size flexibility of Kelvin resistors and case production techniques makes it possible to offer custom built units to exact customer requirements at reasonable prices. Our engineering department will review your requirements and submit price quotation and technical notes. 12-page Bulletin LN-37 available on request.

POWER RESISTORS

Series KS or KM — Silicone coated or molded power resistors from .4W to 13W. Sizes from .078"x.250". Tolerances to .025%. TCs to 5 PPM. Temperature to 350°C.

Series KC — Chassis mounted power resistors from 7W to 50W. Sizes from .334"x.600". Tolerances to .025%. TCs to 5 PPM. Temperature to 275°C.

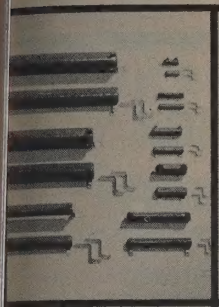
Series KSB — Beryllium oxide power resistors from 1W to 18W. Smallest available precision power resistor for rated wattage. Sizes from .078"x.250". Tolerances to .025%. TCs to 5 PPM. Temperature to 350°C.

KELVIN 5919 Noble Ave. • Van Nuys, California 91401 • Phone: (213) 782-6662

MEMCOR COMPONENTS

A PRODUCT OF
LTV ELECTROSYSTEMS, INC.
MEMCOR DIVISION
HUNTINGTON, INDIANA 46750

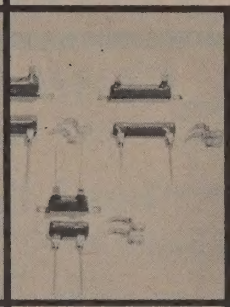
WIREWOUND RESISTORS



TYPE
FR
TAB TERMINAL

POWER RATING 5-200 WATTS
STD. RES. RANGE 1-100,000 OHMS
CORE SIZE 1" x 15/16" TO 10 1/2" x 1 1/8"

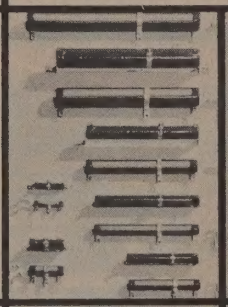
VITREOUS ENAMEL WIREWOUND
FIXED TUBULAR
WITH TABS (MILITARY EQUIVALENT AVAILABLE)



TYPE
FRL
RADIAL LEAD TERMINAL

POWER RATING 5-20 WATTS
STD. RES. RANGE 1-100,000 OHMS
CORE SIZE 1" x 15/16" TO 2" x 7/16"

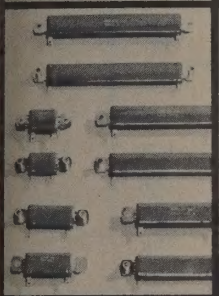
VITREOUS ENAMEL WIREWOUND
FIXED TUBULAR
WITH LEADS



TYPE
AR
TAB TERMINAL

POWER RATING 10-200 WATTS
STD. RES. RANGE 1-100,000 OHMS
CORE SIZE 1 3/4" x 15/16" TO 10 1/2" x 1 1/8"

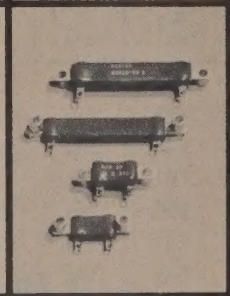
VITREOUS ENAMEL WIREWOUND
ADJUSTABLE TUBULAR
WITH TABS



TYPE
OR
TAB TERMINAL

POWER RATING 30-55 WATTS
STD. RES. RANGE 1-20,000 OHMS
CORE SIZE 1 1/4" x 1" x 5/16" TO 3 1/2" x 1" x 5/16"

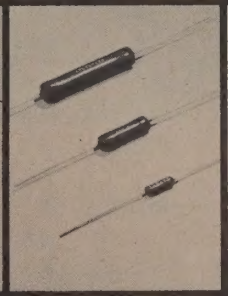
VITREOUS ENAMEL WIREWOUND
OVALS
WITH TABS (MILITARY EQUIVALENT AVAILABLE)



TYPE
MOR
TAB TERMINAL

POWER RATING 10-20 WATTS
STD. RES. RANGE 1-50,000 OHMS
CORE SIZE 3/4" x 3/8" x 1 15/16" TO 2" x 3/8" x 2 5/8"

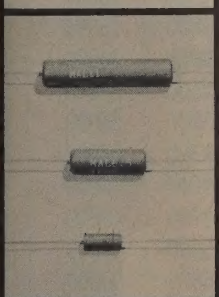
VITREOUS ENAMEL WIREWOUND
MIDGET OVALS
WITH TABS



TYPE
VAL
AXIAL LEAD

POWER RATING 3-10 WATTS
STD. RES. RANGE 1-51,000 OHMS
CORE SIZE 3/16" x 5/32" TO 1 11/32" x 5/16"

VITREOUS ENAMEL WIREWOUND
AXIAL LEADS
(MILITARY EQUIVALENT AVAILABLE)



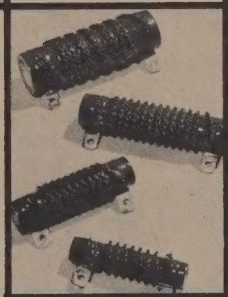
TYPE
MAL
AXIAL LEAD

POWER RATING 1-11 WATTS
STD. RES. RANGE 1-200,000 OHMS
UNIFORM DIMENSIONS CLOSE TOLERANCES

MOLDED SILICONE
AXIAL LEADS
(MILITARY EQUIVALENT AVAILABLE)

MEMCOR Components . . . resistors and rheostats . . . are manufactured by the MEMCOR Components facility of the MEMCOR Division of LTV Electrosystems, Inc.

MEMCOR Components represent the cumulative design skill and production knowledge of two great lines of resistance products — Tru-Ohm and Hardwick, Hindle. This "second generation" product maintains all of the proven features of both original lines plus the manufacturing refinements that can only result from industry experience.



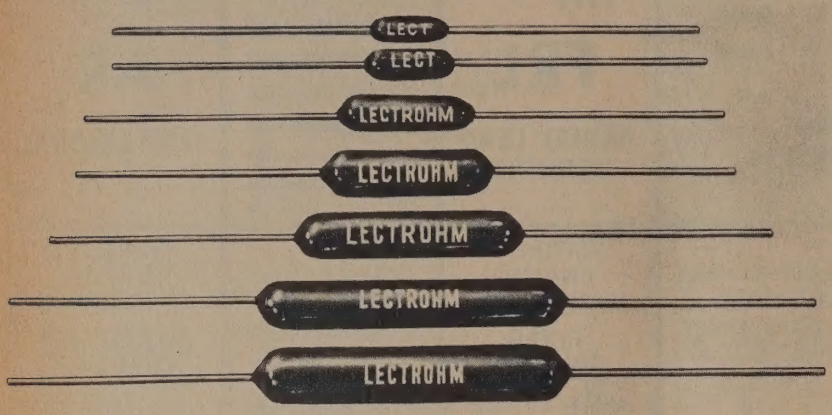
TYPE
RR
TAB TERMINAL

POWER RATING 40-1500 WATTS
STD. RES. RANGE 0.02-100 OHMS
CORE SIZE 2" x 9/16" TO 20" x 2 1/2"

VITREOUS ENAMEL WIREWOUND
EDGEWOUND
WITH TABS

See YELLOW SECTION for Local Offices, Phones

Lectrohm RESISTORS

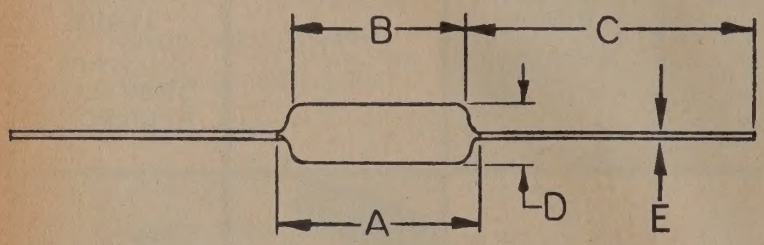


AXIAL LEAD RESISTORS

- All welded construction
- Ceramic-silicone coating
- Special temperature coefficients available

Silicone Coating	Mil R 26	Wattage for 275°C Hot Spot	Wattage for 350°C Hot Spot	LENGTH A Max.	LENGTH B Max.	LENGTH C ±1/8	D* ±1/32	E Diam.	Min. Res.	Max. Res.
XTA1		.8	1	.660	.500	1½	.093	.020	1.0	6K
XTA2		1.5	2	.630	.468	1½	.170	.025	0.1	6K
XTA3	RW69	3	3.6	.670	.515	1½	.200	.032	0.1	10K
XTA5A		4	5	.950	.781	1½	.240	.032	0.1	15K
XTA5	RW67	5	6.5	1.170	.968	1½	.300	.032	0.1	25K
XTA8		6.5	8	1.437	1.23	1½	.300	.032	0.1	35K
XTA10A		8	10	2.063	1.843	1½	.300	.032	0.1	50K
XTA10	RW68	10	12.5	2.125	1.875	1½	.375	.040	0.1	60K
XTA14	RW55	11	14	1.562	1.375	1½	.480	.040	0.5	40K
XTA20	RW56	16	20	2.312	2.125	1½	.480	.040	0.5	80K

* Diameter may be exceeded on very low value resistors.



COATINGS: Lectrohm's ceramic silicone coating has dimensional uniformity which is required for automatic insertion.

WATTAGE: Watt ratings have been established for hot spot temperatures of 275°C and 350°C for use in an ambient temperature of 25°C.

Table of Standard Resistance Values (OHMS)

AXIAL LEAD TYPE				
1.0	50	390	1200	9000
1.5	56	400	1500	10000
2.0	68	430	1800	15000
2.4	75	450	2000	20000
3.0	82	470	2500	22000
4.0	100	500	3000	25000
5.0	120	560	3300	27000
7.5	150	600	4000	30000
10	200	620	4700	40000
15	220	680	5000	47000
20	250	750	5600	50000
22	270	800	6200	
30	300	900	7000	
33	330	1000	7500	

HOW TO ORDER

Order Resistors by Series Number Followed by Resistance and Tolerance
Example: **XTA 3 - 150 T3**

XTA	3	150	T3
TYPE AXIAL CERAMIC-SILICONE COATING	WATTAGE RATING	RESISTANCE OHMS	TOLERANCE %

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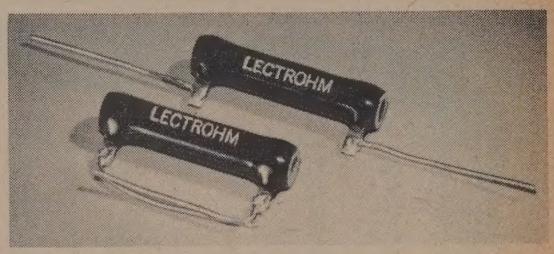
Lectrohm RESISTORS

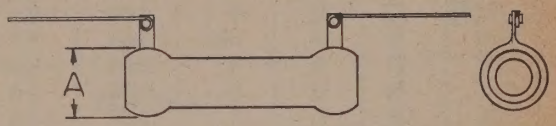
VITREOUS ENAMELED

Selection Guide-Standard Types

FIXED (Pig Tail Lead)

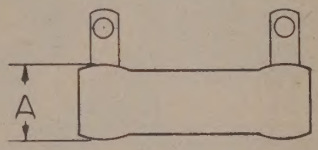
Series No.	Wattage Rating	RESISTANCE (ohms) Max.	RESISTANCE (ohms) Min.	CORE DIMENSIONS Length (±1/16)	CORE DIMENSIONS O.D. (±1/32)	CORE DIMENSIONS I.D. (±1/32)	A Max.
CA5	5	10000	0.1	1	5/16	3/16	11/32
CA10	10	50000	0.1	1¾	5/16	3/16	11/32
CA20	20	100000	0.1	2	7/16	5/16	17/32





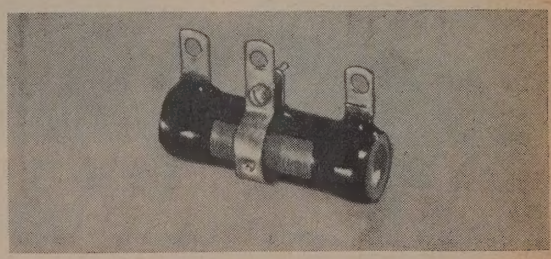
FIXED (Tab Terminal)

E25	25	100000	0.1	2	9/16	5/16	11/16
E50	50	250000	0.2	4	9/16	5/16	11/16
E75	75	390000	0.5	6	9/16	5/16	11/16
E100	100	600000	0.5	6½	¾	½	27/32
E160	160	1200000	0.8	8½	1⅛	¾	1¼
E200	200	1500000	1.0	10½	1⅛	¾	1¼



ADJUSTABLE

D10	10	10000	1.0	1¾	5/16	3/16	11/32
D25	25	25000	1.0	2	9/16	5/16	11/16
D50	50	100000	1.0	4	9/16	5/16	11/16
D75	75	100000	1.0	6	9/16	5/16	11/16
D100	100	100000	1.0	6½	¾	½	27/32
D160	160	100000	1.0	8½	1⅛	¾	1¼
D200	200	100000	1.0	10½	1⅛	¾	1¼



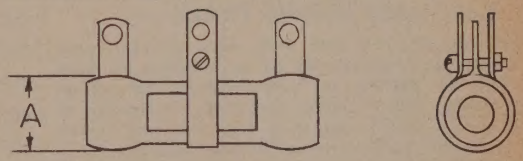


Table of Standard Resistance Values (OHMS)

1.0	25	200	2000	10000
2.0	50	250	2500	15000
3.0	75	500	3000	25000
4.0	100	750	3500	50000
5.0	125	1000	5000	100000
10.0	150	1500	7500	

HOW TO ORDER

Order Resistors by Series Number Followed by Resistance and Tolerance. Example: **E 50 - 100 T5**

E	50	100	T5
TYPE FIXED LUG	WATTAGE RATING	RESISTANCE OHMS	TOLERANCE %

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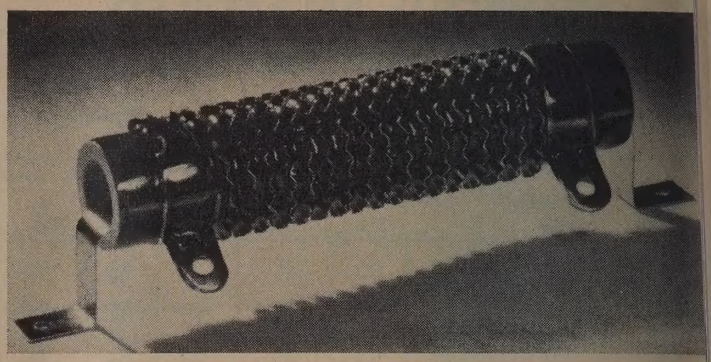
Lectrohm RESISTORS

ROE SERIES

Watts	CORE SIZE O.D.	CORE SIZE I.D.	CORE SIZE Length	RESISTANCE Min. Ohms	RESISTANCE Max.* Ohms
36	9/16	5/16	2	0.02	1.8
45	9/16	5/16	3	0.03	3.0
90	9/16	5/16	4	0.04	3.8
105	9/16	5/16	5	0.05	5.2
135	9/16	5/16	6	0.06	6.5
100	3/4	1/2	3 1/2	0.03	3.7
105	3/4	1/2	4	0.04	4.6
135	3/4	1/2	5	0.06	6.5
160	3/4	1/2	6	0.07	8.3
180	3/4	1/2	6 1/2	0.08	9.0
125	1	5/8	4	0.06	6
150	1	5/8	5	0.08	8.5
190	1	5/8	6	0.10	11.5
215	1	5/8	7	0.12	13.5
315	1	5/8	10	0.20	21
155	1 1/8	3/4	4 1/4	0.06	5.5
185	1 1/8	3/4	5	0.09	10.5
220	1 1/8	3/4	6	0.11	12.5
240	1 1/8	3/4	6 1/2	0.12	13
300	1 1/8	3/4	8 1/2	0.17	20
375	1 1/8	3/4	10 1/2	0.22	25
400	1 1/8	3/4	11 1/4	0.24	26
420	1 1/8	3/4	11 3/4	0.30	28



"RIB-ON-EDGE" RESISTORS

Rib-on-edge resistors are made to order for high wattage service where low resistances are required. They are also used for intermittent duty where relatively small size resistors must dissipate high wattages.

Rib-on-edge resistors are constructed of special alloy ribbon resistance wire crinkled and wound on edge around a tubular ceramic core. The resistance element is welded to a heavy terminal. The entire assembly is then secured to the ceramic tube by a special high temperature vitreous enamel. This type of resistor is classed as a "bare" resistor by NEMA and Underwriters' Standards and has a 375°C maximum operating temperature. The higher temperature rise permits the higher rating.

Rib-on-edge resistors can be made in fixed, adjustable, or tapped styles.

* Maximum resistances can be increased 25% with Lectrohm's unique full-crinkle winding.

Order by series number and resistance required.
(ROE followed by watts and ohms.)
OTHER SIZES CAN BE MADE TO FIT YOUR REQUIREMENTS.

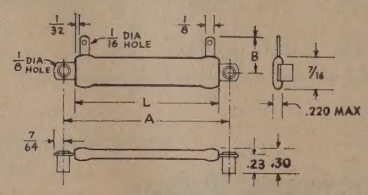
LECTROHM OVALS

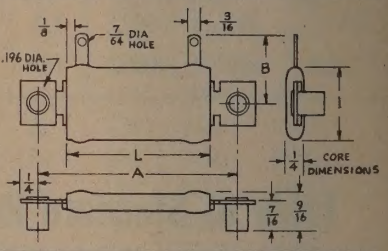
Flat- or oval-core type units have an oval cross section and are mounted by flat brackets of "stud type" for stacking, or "step brackets" for normal mounting. The mounting bracket is constructed of aluminum which acts as a heat sink and makes the higher wattage rating for the size core. They are available with ceramic silicone coating.

Miniature Oval Free Air Watts	Resistance Min.	Resistance Max.	XOVMS Series L	A	B (Core Size 3/8 x 1/8)
10	1	15K	3/4"	1"	7/16"
15	1	25K	1"	1 1/4"	7/16"
20	1	40K	1 1/2"	1 3/4"	7/16"
25	1	50K	2"	2 5/16"	7/16"

Step bracket (push-on) is not applicable.

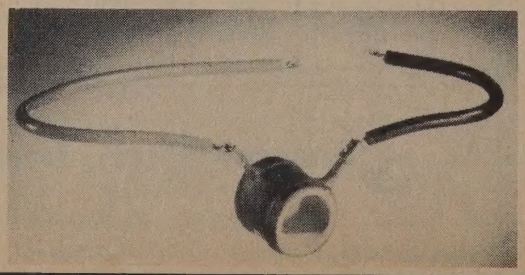
Standard Oval Stacking Bracket Free Air Watts	Resistance Min.	Resistance Max.	XOVS Series L	A	B (Core Size 1 x 1/4)
30	0.1	10K	1 1/4"	2"	15/16"
40	0.2	25K	2"	2 3/4"	15/16"
55	0.3	50K	3 1/2"	4 1/4"	15/16"
65	0.4	80K	4 3/4"	5 1/2"	15/16"
75	0.5	100K	6"	6 3/4"	15/16"

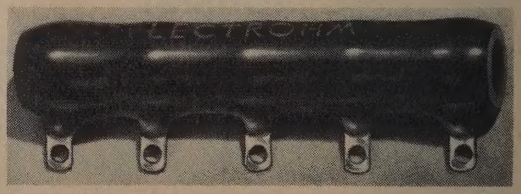




SPECIAL RESISTORS

Resistors having special lug configurations, tapped sections, special blank spaces, insulated flexible leads and many other special custom features, are available.





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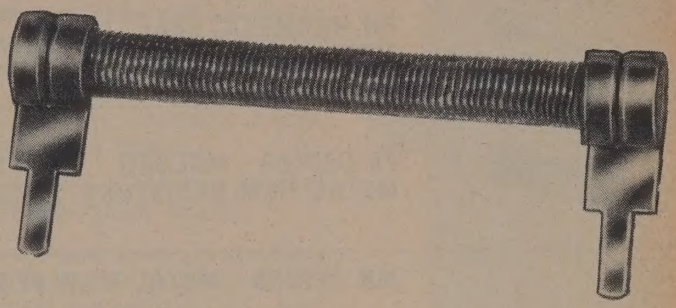
Lectrohm RESISTORS

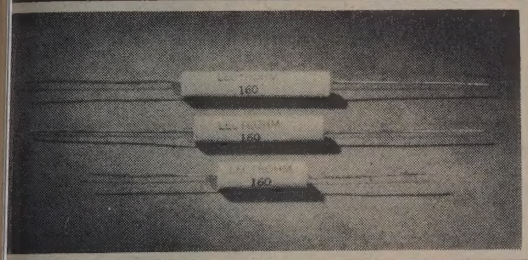
TYPE FP RESISTORS

Lectrohm type FP power resistor is one of the lowest cost power resistors available for printed circuit board applications.

The resistance element is tightly wound with premium quality resistance wire on fiberglas cores. Tinned steel terminals are clinched to the resistance element by automatic machines.

Terminals are designed to be inserted in 0.050″ or 0.070″ diameter holes. Center-to-center distance of prongs on terminals are variable from 0.5″ to 2.5″. Power rating is 4 watts per inch and resistance range is from 0.2 ohms per inch to 1,000 ohms per inch.



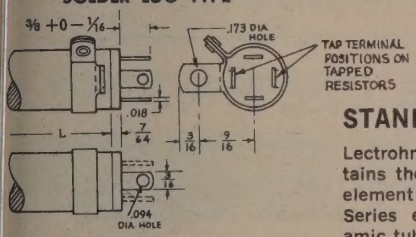


Lectrohm's SAC Series contains the patented fiberglas element from the FLU Series inclosed in a ceramic tube. The tube is then filled with quartz and the ends are sealed with humidity resistant silicone. SAC's are also available with "fuse weld" construction upon request.

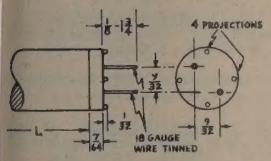
SAC SERIES

Series	Dim.	Watts	Max. Res.
SAC5	5/16 x 1	5	2,000 ohms
SAC7	5/16 x 1½	7	3,000 ohms
SAC10	5/16 x 1¾	10	4,000 ohms

SOLDER LUG TYPE

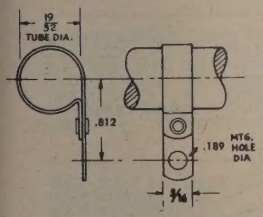


PRINTED CIRCUIT



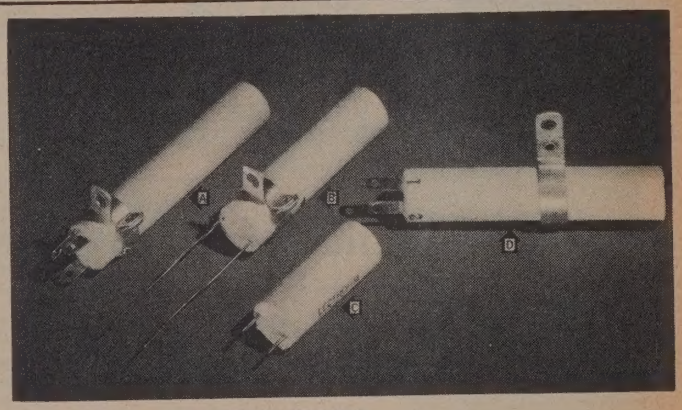
HORIZONTAL MOUNTING BRACKET

Catalog No. 53163



STANDARD UPRIGHT

Lectrohm's SAC Series contains the patented fiberglas element from the FLU Series enclosed in a ceramic tube. The tube is then filled with quartz and the ends are sealed with humidity resistant silicone.

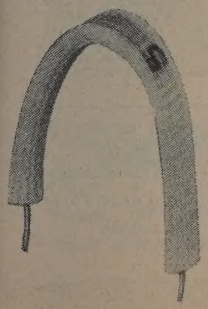


RESISTOR SPECIFICATIONS

Pigtail Type Series	Lug Type Series	Printed Circuit Series	Horizontal Mounting Series	Length L	Watts	Max. Res.
UC10	UE10	UP10	UM10	1½″	10	5,000 ohms
UC15	UE15	UP15	UM15	2″	15	7,500 ohms
UC20	UE20	UP20	UM20	2½″	20	10,000 ohms
UC25	UE25	UP25	UM25	3″	25	12,500 ohms
UC30	UE30	UP30	UM30	3½″	30	15,000 ohms

Order by series number and resistance required.

LECTROHM FLEXIBLES



LECTROHM STANDARD FLEXIBLES (FLU Series) are fixed wirewound resistors that can be used in small, confined spaces, and, being flexible, can be bent to conform to the available space. The are wound on a specially treated flat fiberglas core and insulated by a fiberglas sleeve. Free air rating is 2 watts per inch with the surface temperature at the hottest spot not exceeding 340°F. The terminals are hot tinned brass clamped to the resistance element so securely that they will stand a 10 pound pull applied axially. Lead wires are hot tinned 18, 20 and 22 gauge, 1⅜ inches. long.

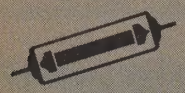
The sleeved or insulated type is the FLU Series. It is also available without sleeving (bare element) in our ELE Series.

Maximum resistance is 2000 ohms per inch of winding and minimum resistance is 0.2 ohms per inch. Fuse-weld construction is limited to 750 ohms per inch.

Lectrohm, Inc.
A subsidiary of
COOK ELECTRIC
5562 Northwest Highway • Chicago, Ill. 60630 • 312/763-1700

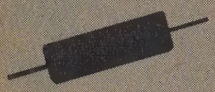
MEPCO PRODUCT CHECK LIST

MEPCO



FH HERMETIC SEAL METAL FILM RESISTORS

• MAN RATED-SPACE PROVEN DESIGN • TRUE HERMETIC SEAL • ULTIMATE MOISTURE PROTECTION • EXCEEDS ALL MIL-R-55182 ENVIRONMENTAL REQUIREMENTS • BETTER THAN "S" FAILURE RATE • EXCELLENT STABILITY • ESTABLISHED RELIABILITY



FE SERIES - MOLDED METAL FILM RESISTORS

• ESTABLISHED RELIABILITY — PER MIL-R-55182 • MEETS OTHER STANDARD MIL REQUIREMENTS • PRECISION NETWORKS AND MATCHED SETS • ABSOLUTE TOLERANCE AS LOW AS .1% • RATIO TOLERANCE AS LOW AS .05% • TC's TO 15PPM • AVAILABLE FROM FACTORY STOCK FOR IMMEDIATE DELIVERY

MR SERIES - METAL FILM RESISTORS

• HI REL DEVICES AT LOW REL PRICES • 100% SCREENING • IMMEDIATE DELIVERY FROM FACTORY INVENTORY

MR 25 and 30 - COMMERCIAL LEVEL • CONFORMAL COATED • COLOR CODING • MEETS ENVIRONMENTAL REQUIREMENTS OF MIL-R-22684 and 10509* • TC ±100PPM • TOLERANCES TO 1%

MR 24 and 34 - MILITARY INDUSTRIAL LEVEL • CONFORMAL COATED • MIL-R-10509 CHARACTERISTIC D • TC's ±100PPM • TOLERANCES TO 1%

MR 31 and 39 - MILITARY RELIABILITY LEVEL • MOLDED ENCLOSURE • MIL-R-10509 CHARACTERISTIC C • TX RELIABILITY LEVEL • ±50PPM • TOLERANCE TO 1%

*EXCEPT POLARIZED MOISTURE TEST

HERMETICALLY SEALED CARBON FILM RESISTORS

• TRUE HERMETIC SEAL — PROVIDES ABSOLUTE ENVIRONMENTAL PROTECTION • PERFORMANCE PROVEN RELIABILITY • TOLERANCES AS LOW AS ±1% • TC's ±200 TO–500PPM • MIL-R-10509 — CHARACTERISTIC G • RESISTANCE RANGES 50Ω THRU 20 MEG

GE SERIES - THICK FILM DISCRETE RESISTORS

• RESISTANCE RANGE TO 50 MEG OHMS • MIL CONFIGURATIONS 1/20W. TO 1/4W • TC's ±150PPM • TOLERANCE TO 1% • MOLDED ENCLOSURE

"TINYCHIP" THICK FILM RESISTOR CHIPS

• MINIATURE SIZE — .050" x .050" TYPICAL • TOLERANCES TO 1% AVAILABLE • CUSTOM DESIGN AVAILABLE • SUPERIOR STABILITY • BONDABLE TERMINATIONS

PRECISION WIREWOUND RESISTORS

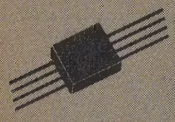
• TOLERANCES AS LOW AS .005% • TEMPERATURE COEFFICIENTS TO ±3PPM • HIGH STABILITY • CHOICE OF CONFIGURATIONS (AXIAL LEAD, RADIAL LEAD, PC, CERAMIC, BOBBIN)

WIREWOUND POWER RESISTORS

• HIGH POWER HANDLING CAPABILITIES IN SMALL SIZE • EXCELLENT PROTECTION AGAINST MOISTURE AND ENVIRONMENTAL HAZARDS • TOLERANCES TO ±.05%, TC's AS LOW AS 5PPM • BROAD RANGE OF STYLES • LOW THERMAL EMF

MINIATURE CERAMIC CAPACITORS

• THIN PLATE DESIGN (SMALLER THAN DISC CAPACITORS) • PRICED LOWER THAN OTHER THIN PLATE OR MONOLITHIC CAPACITORS • NON-MIGRATORY ELECTRODE SYSTEM FOR HIGH RELIABILITY • MEETS OR EXCEEDS MIL-C-11015 (CK 41, 42 and 43) • 100% FINAL TEST • HIGH TEMPERATURE SOLDER — ELIMINATES REFLOW PROBLEMS • FAST DELIVERY—LARGE INVENTORY MAINTAINED • HIGH VOLUME PRODUCTION CAPABILITY



HYBRID MICROCIRCUITS

• THICK FILM SUBSTRATES — PASSIVE AND ACTIVE CIRCUITS • HIGH STABILITY • LOW TC • PRECISION CIRCUIT CALIBRATION • CHIP AND WIRE ATTACHMENT OF ACTIVE DEVICES • LOWEST COST PROVEN TECHNOLOGY • DIGITAL AND LINEAR DEVICES • CUSTOM AND STANDARD CIRCUITS — 6 STANDARD DEVICES AVAILABLE FOR "OFF THE SHELF" DELIVERY — DESIGN, PROTOTYPING AND PRODUCTION OF CUSTOM CIRCUITS TO MEET INDIVIDUAL CUSTOMER REQUIREMENTS • EXPERIENCED, FLEXIBLE, COMPETITIVE — OVER 6 YEARS OF CONTINUOUS MANUFACTURING OF BOTH MILITARY (PER MIL-STD 883) AND INDUSTRIAL AND COMMERCIAL PRODUCTS

PRINTED CIRCUIT EDGE CONNECTORS

• EDGE CONNECTORS, INTERCONNECTORS, HIGH DENSITY CONNECTORS • COMBINATION CONNECTORS • COMPETITIVE PRICING • STATE OF THE ART TECHNOLOGY — HIGH DENSITY — BIFURCATED SPRINGS — STANDARD CONTACT SPACINGS — 4 TERMINATION STYLES • CUSTOM CAPABILITIES — COMPLETE DESIGN AND PRODUCTION CAPABILITIES TO PRODUCE CONFIGURATIONS TO MEET CUSTOMER REQUIREMENTS • ON TIME DELIVERY — FROM FACTORY STOCK • INTERCHANGEABLE WITH COMPETITIVE CONNECTORS

MEPCO, INC. Columbia Road, Morristown, N. J. 07960

A NORTH AMERICAN PHILIPS COMPANY

MILWAUKEE RESISTOR CORPORATION
700 WEST VIRGINIA STREET, MILWAUKEE, WISCONSIN 53204 • PHONE (414) 271-9900

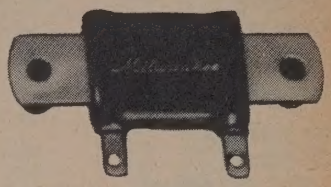
VAL RESISTORS

OVAL RESISTORS are for use where space saving is desired and where the use of the 'Heat Sink' function of the metal chassis, rack or panel may be employed. Resistance tolerance of ±5% is standard except on low resistance and multi-tapped units. COATINGS of vitreous enamel or silicone base are offered.

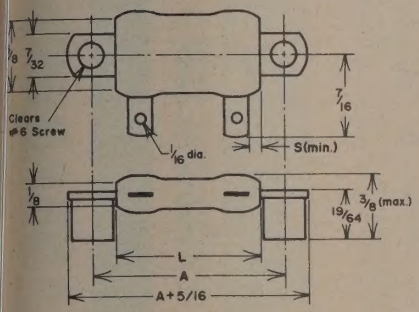
OVALS are available in regular or miniature sizes an original development of MILWAUKEE Resistor.

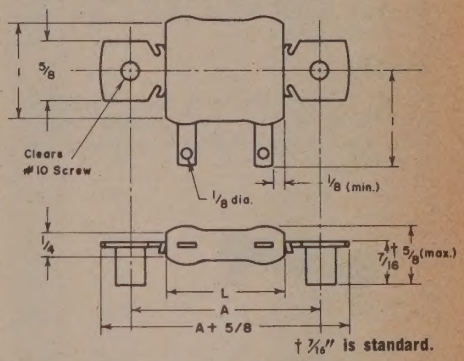
Additional miniature oval core sizes are available increasing the possibility of taps and isolated sections. Other intermediate sizes are also available. Only regular ovals are available as adjustable. For temperature coefficient below 20 ppm/°C consult the factory.

MINIATURE OVALS



REGULAR OVALS





Watts*	Ohms	Dimensions A	Dimensions L	Dimensions S
10	.1 to 5K	1"	3/4"	7/16"
15	.15 to 25K	1 1/4"	1"	7/16"
20	.2 to 50K	2 5/16"	2"	7/16"

* Rating based on mounting on steel panel 10"x10"x.040".

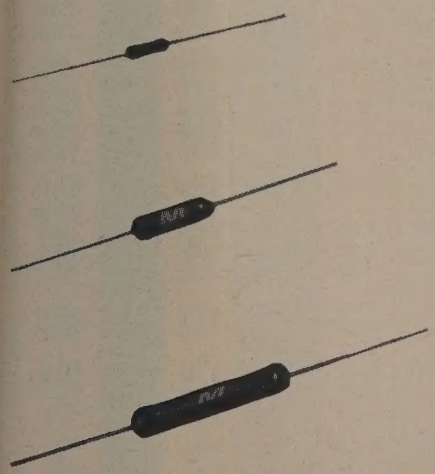
Oval Resistors are stackable. When stacking, the resistors should be derated to avoid excessively high temperatures. The table below shows approximate rating percentages.

Number of Resistors Stacked	Percent of Single Unit Rating: Vertical Stacking	Percent of Single Unit Rating: Horizontal Stacking
2	80	75
3	70	60
4	65	50

Watts*	Ohms	Dimensions A	Dimensions L
30	.10 to 10K	2"	1 1/4"
40	.13 to 25K	2 3/4"	2"
55	.18 to 30K	4 1/4"	3 1/2"
70	.22 to 55K	5 1/2"	4 3/4"
95	.25 to 75K	6 3/4"	6"

*Rating is based on mounting on steel pad 10"x10"x.040".

AXIAL RESISTORS



Available in a variety of sizes from 1 watt through 11 watts on request.

APPLICATIONS

- Electronic Circuitry
- Printed Circuits
- Radio, Television and Sound Reproduction
- Miniature Controls

FEATURES

- Rugged yet small.
- Highly stable.
- Matched expansion in core caps and coating for temperature stability.
- Standard 5% tolerance over 1 ohm, available in closer tolerances on request.
- Wattage ratings based on 300°C rise at 40°C ambient.
- Standard Stock — 3, 6.5 and 11 watt sizes.
- Leads Hot Tin Dipped.

CONSTRUCTION

- Wire Wound on Ceramic Core
- All Welded
- Vitreous or Silicone Base Coating

Number	Watts	Size	Ohms
2-7-ΩL	3	9/64 Dia x 9/16	1 to 10,000
4-14-ΩL	6.5	13/32 x 1	1 to 20,000
5-28-ΩL	11	13/32 Dia x 1 7/8	1 to 50,000

Ohmic values below 1 ohm or higher than shown, available on request.
When ordering use number, dash, resistance value; i.e. 3 watt, 500 ohm, 2-7-500L.

MILWAUKEE RESISTOR CORPORATION

700 WEST VIRGINIA STREET, MILWAUKEE, WISCONSIN 53204 • PHONE (414) 271-9900

FIXED AND ADJUSTABLE VITREOUS ENAMELED POWER RESISTORS

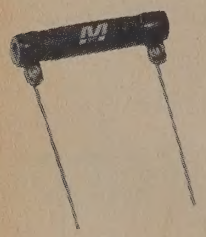
Also available with silicone or sand and cement coating

WATT RATING

Free air rating of 8 through 225 watt resistors meet NEMA 300°C rise in 40°C ambient.

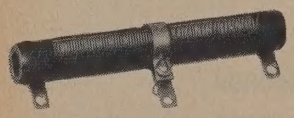
TERMINALS

All 8, 12 and 20 watt fixed resistors are standard with 1½" tinned leads. They are available with conventional lug terminals.



12 watt adjustable and the 25 through 225 watt fixed and adjustable resistors have lug type terminals.

Available are single and double quick connect and many other special terminals to suit your requirements.



TOLERANCE

Standard resistance tolerance is ±5%. Other tolerances are available.

MOUNTING

Spring clips, vertical thru bolts and horizontal L brackets are available on all 8 through 225 watts. For ferrule mountings, special spring clips, mica washers, terminal hardware and other accessories, consult the factory.

ADDITIONAL RESISTORS

36 additional wattage ratings are available with different core diameters and lengths. Non-inductive, tapped, live bracket, porcelain bushings, printed circuit board, strip and fuse resistors are manufactured to your specifications.

MILWAUKEE will satisfy your resistor requirements with custom values, tolerances, T.C., shapes, sizes and coatings with its engineering leadership.

	8 Watt	5/16" x 1" Catalog No.	12 Watt	5/16" x 1¾" Catalog No.		20 Watt	7/16" x 2" Catalog No.	25 Watt	9/16" x 2" Catalog No.	
Ohms	Amps	Fixed	Amps	Fixed	Adjustable	Amps	Fixed	Amps	Fixed	Adjustab
1	2.83	10020	3.46	10620	15310	4.47	11220	5.00	12010	15700
1.5	2.30	10030	2.83	10630	—	3.66	11230	4.10	12020	—
2	2.00	10040	2.45	10640	15320	3.16	11240	3.54	12030	15710
3	1.63	10060	2.00	10650	15330	2.58	11260	2.88	12040	15720
4	1.41	10070	1.73	10660	15340	2.24	11270	2.50	12050	15730
5	1.26	10080	1.54	10670	15350	2.00	11280	2.24	12060	15740
7.5	0.97	10090	1.26	10680	15360	1.64	11290	1.77	—	15750
10	0.89	10100	1.10	10690	15370	1.41	11300	1.58	12070	15760
12	0.81	10104	1.00	—	15374	—	—	—	—	—
15	0.73	10110	0.89	10700	15380	1.15	11310	1.29	12080	15770
20	0.63	10120	0.77	10710	15390	1.00	11320	1.12	12090	15780
25	0.56	10130	0.69	10720	15400	0.89	11330	1.00	12100	15790
30	0.51	10140	0.63	10730	—	0.82	11340	0.92	—	15792
35	0.47	10150	0.58	10740	—	0.76	11350	—	—	—
40	0.44	10160	0.54	10750	15410	0.71	11360	0.79	12110	15796
50	0.40	10170	0.49	10760	15420	0.63	11370	0.71	12130	15800
75	0.32	10180	0.40	10770	15430	0.52	11380	0.58	12150	15810
100	0.28	10190	0.35	10780	15440	0.45	11390	0.50	12160	15820
125	0.25	10200	0.31	10790	—	0.40	11400	0.45	12170	15825
150	0.23	10210	0.28	10800	15450	0.36	11410	0.41	12180	15830
200	0.20	10220	0.24	10810	15460	0.32	11420	0.35	12200	15840
225	0.18	10230	0.23	10820	15465	0.30	11430	0.33	12205	—
250	0.17	10240	0.22	10830	15470	0.28	11440	0.32	12210	15850
300	0.16	10250	0.20	10840	15480	0.26	11450	0.29	12220	15860
350	0.15	10260	0.18	10850	15485	0.24	11460	0.27	12230	15865
400	0.14	10270	0.17	10860	15490	0.22	11470	0.25	12240	15870
450	0.13	10275	0.16	10865	—	—	—	—	—	—
500	0.12	10280	0.15	10870	15500	0.20	11480	0.22	12250	15880
600	0.11	10290	0.14	10880	—	0.18	11490	0.20	12260	15882
700	0.11	10300	0.13	10890	—	0.17	11500	0.19	12270	—
750	0.10	10305	0.12	10895	15510	—	—	0.18	12280	15890
800	0.10	10310	0.12	10900	15520	0.15	11510	0.17	12290	15900
900	0.094	10320	0.11	10910	—	0.15	11520	0.17	12295	—
1K	0.089	10330	0.11	10920	15530	0.14	11530	0.16	12300	15910
1.1K	0.085	10335	—	—	—	—	—	—	—	—
1.2K	0.081	10340	0.10	10930	15533	0.13	11540	0.14	12306	—
1.25K	0.080	10350	0.097	10940	15535	0.12	11550	0.14	12310	15915
1.5K	0.073	10370	0.089	10960	15540	0.12	11570	0.13	12320	15920
1.75K	0.067	10380	0.082	10970	15545	0.11	11580	0.12	12325	—
2K	0.063	10390	0.077	10980	15550	0.10	11590	0.12	12330	15930
2.25K	0.059	10400	0.073	10990	15555	0.094	11600	—	—	—
2.5K	0.056	10410	0.069	11000	15560	0.089	11610	0.10	12340	15940
3K	0.046	10420	0.063	11010	15570	0.081	11620	0.091	12350	15950
3.5K	0.043	10430	0.058	11020	15575	0.075	11630	0.084	12360	15955
4K	0.040	10440	0.054	11030	15580	0.070	11640	0.079	12370	15960
4.5K	0.038	10450	0.051	11040	15585	0.066	11650	0.075	—	15965
5K	0.036	10460	0.049	11050	15590	0.063	11660	0.070	12380	15970
6K	0.033	10470	0.044	11060	15600	0.057	11670	0.064	12390	15980
7K	0.030	10480	0.041	11070	—	0.053	11680	0.060	12396	15986
7.5K	0.029	10485	0.036	11075	15610	—	—	0.057	12400	15990
8K	0.029	10490	0.035	11080	15612	0.050	11690	0.056	12410	15992
9K	0.027	10496	0.033	11085	15616	—	—	0.053	—	15996
10K	0.026	10500	0.032	11090	15620	0.043	11700	0.050	12420	16000
12.5K	0.023	10510	0.028	11100	—	0.032	11710	0.045	12435	16005
15K	0.021	10520	0.026	11110	—	0.029	11720	0.036	12440	16010
17.5K	0.019	10530	0.024	11120	—	0.028	11730	0.033	12445	16015
20K	0.018	10540	0.022	11130	—	0.026	11740	0.031	12450	16020
22.5K	0.017	10550	0.021	11140	—	0.025	11750	—	—	—
25K	0.015	10560	0.020	11150	—	0.023	11760	0.028	12460	16030
30K	—	10570	0.018	11160	—	0.021	11770	0.026	12470	—
35K	—	—	0.017	11170	—	0.019	11780	0.024	12480	—
40K	—	—	0.016	11180	—	0.018	11790	0.022	12490	—
50K	—	—	0.014	11200	—	0.016	11810	0.019	12500	—
60K	—	—	—	—	—	0.015	11830	0.016	12510	—
70K	—	—	—	—	—	0.014	11850	0.013	12520	—
75K	—	—	—	—	—	0.013	11860	—	—	—
80K	—	—	—	—	—	0.013	11870	0.012	12530	—
100K	—	—	—	—	—	0.011	11910	0.0094	12550	—

MILWAUKEE RESISTOR CORPORATION

700 WEST VIRGINIA STREET, MILWAUKEE, WISCONSIN 53204 • PHONE (414) 271-9900

50 Watt	5/16" x 4" Catalog No.		75 Watt	5/16" x 6" Catalog No.		100 Watt	3/4" x 6½" Catalog No.		175 Watt	1⅛" x 8½" Catalog No.		225 Watt	1⅛" x 10½" Catalog No.	
Amps	Fixed	Adjustable	Amps	Fixed	Adjustable	Amps	Fixed	Adjustable	Amps	Fixed	Adjustable	Amps	Fixed	Adjustable
7.07	12600	16106	8.66	13200	16550	10.00	13800	17010	13.2	14310	17450	15.00	14810	17900
—	—	—	—	—	—	—	—	—	10.8	14320	—	12.30	14820	—
5.00	12610	16110	6.12	13210	16560	7.07	13810	17020	9.35	14330	17460	10.60	14830	17910
4.07	12620	16120	5.00	13220	16570	5.77	13820	17030	7.63	14340	17470	8.67	14840	17920
3.53	12630	16130	4.33	13230	16580	5.00	13830	17040	6.60	14350	17480	7.50	14850	17930
3.16	12640	16140	3.87	13240	16590	4.47	13840	17050	5.92	14360	17490	6.72	14860	17940
2.59	12650	16150	—	—	16600	3.66	—	17060	4.83	—	17500	5.49	—	17950
2.23	12660	16160	2.74	13250	16610	3.16	13850	17070	4.18	14370	17510	4.74	14870	17960
—	—	—	—	—	16614	—	—	—	—	—	—	—	—	—
1.63	12670	16170	2.24	13260	16620	2.58	13860	17080	3.42	14380	17520	3.88	—	17970
1.58	12680	16180	1.95	13270	16630	2.24	13870	17090	2.96	14390	17530	3.36	14880	17980
1.41	12690	16190	1.73	13280	16640	2.00	13880	17100	2.64	14400	17540	3.00	14890	17990
—	—	—	1.58	13290	—	1.82	13890	—	2.42	14410	17542	2.74	14900	17992
—	—	—	—	—	—	—	—	—	2.24	14415	17544	2.54	—	17994
1.12	12700	—	1.37	13300	—	1.58	13900	17106	2.09	14420	17546	2.38	14910	—
1.00	12710	16200	1.22	13310	16650	1.41	13910	17110	1.87	14430	17550	2.12	14920	18000
0.82	12730	16210	1.00	13330	16660	1.15	13920	17120	1.52	14440	17560	1.73	14930	18010
0.71	12740	16220	0.86	13340	16670	1.00	13930	17130	1.32	14450	17570	1.50	14940	18020
—	—	—	0.78	13350	—	0.90	13940	—	1.18	14460	17575	1.35	14950	—
0.58	12750	16230	0.71	13360	16680	0.82	13950	17140	1.08	14470	17580	1.25	14960	18030
0.50	12760	16240	0.61	13370	16690	0.71	13960	17150	0.94	14480	17590	1.06	14970	18040
—	—	—	—	—	—	—	—	—	—	—	—	1.00	—	18045
0.45	12770	16250	0.55	13380	16700	0.63	13970	17160	0.84	14490	17600	0.95	14989	18050
0.41	12780	16260	0.50	13390	16710	0.57	13980	17170	0.76	14500	17610	0.87	14990	18060
0.38	12790	—	0.46	13400	—	0.54	13990	17175	0.71	14510	17615	0.80	15000	18065
0.35	12800	16270	0.43	13410	16720	0.50	14000	17180	0.66	14520	17620	0.75	15010	18070
—	—	—	0.41	13415	—	0.47	14010	—	0.63	—	17625	—	—	—
0.32	12810	16280	0.39	13420	16730	0.45	14020	17190	0.59	14530	17630	0.67	15020	18080
0.29	12820	16284	0.36	13430	16734	0.41	14030	17194	0.52	14540	17634	0.61	15030	—
0.27	12830	—	—	—	—	—	—	—	0.50	14546	17638	—	—	—
0.26	12840	16290	0.32	13440	16740	0.37	14040	17200	0.48	14550	17640	0.55	15040	18090
0.25	12850	16300	0.30	13450	16750	0.35	14050	17210	0.47	14560	17650	0.53	15050	18100
—	—	—	—	—	—	—	—	—	0.44	14565	—	—	—	—
0.22	12860	16310	0.27	13460	16760	0.32	14060	17220	0.42	14570	17660	0.47	15060	18110
0.21	12864	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	0.29	14070	—	0.38	14580	17664	—	—	—
0.20	12870	16315	0.24	13470	—	0.28	—	17225	—	—	—	—	—	—
0.18	12880	16320	0.22	13480	16770	0.26	14080	17230	0.34	14590	17670	0.39	15070	18120
0.17	—	16325	—	—	—	—	—	—	—	—	—	—	—	—
0.16	12890	16330	0.19	13490	16780	0.22	14090	17240	0.20	14600	17680	0.34	15080	18130
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.14	12900	16350	0.17	13500	16790	0.20	14100	17250	0.26	14610	17690	0.30	15090	18140
0.13	12910	16360	0.16	13510	16800	0.18	14110	17260	0.24	14620	17700	0.27	15100	18150
0.12	12920	16365	0.15	13520	—	—	—	—	—	—	—	—	—	18153
0.11	12930	16370	0.14	13530	16810	0.16	14120	17270	0.21	14630	17710	0.24	15110	—
0.10	—	16375	—	—	—	—	—	—	0.20	—	17715	0.22	—	18158
0.10	12940	16380	0.12	13540	16820	0.14	14130	17280	0.19	14640	17720	0.21	15120	18160
0.092	12950	16390	0.11	13550	16830	0.13	—	17290	0.17	—	17730	0.19	—	18170
0.085	—	16396	0.10	—	16836	—	—	—	0.16	—	17736	—	—	—
0.081	12960	16400	0.10	13560	16840	0.12	14140	17300	0.15	14650	17740	0.17	15130	18180
0.079	12970	16402	0.096	—	16842	—	—	—	0.15	14652	—	—	—	—
0.075	—	16406	0.091	—	16846	—	—	—	—	—	—	—	—	—
0.071	12980	16410	0.086	13570	16850	0.10	14150	17310	0.13	14660	17750	0.15	15140	18190
0.063	12995	16415	—	—	—	—	—	—	0.12	14670	17755	—	—	—
0.057	13000	16420	0.070	13580	16860	0.081	14160	17320	0.11	14680	17760	0.13	15150	18200
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.050	13010	16430	0.061	13590	16870	0.071	14170	17330	0.094	14690	17770	0.11	15160	18210
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.045	13020	16440	0.054	13600	16880	0.063	14180	17340	0.083	14700	17780	0.095	15170	18220
0.035	13030	16450	0.050	13610	16890	0.058	14190	17350	0.076	14710	17790	0.087	15180	18230
0.032	13040	16460	0.046	—	16900	0.054	—	17360	0.071	14715	17800	0.080	—	18240
0.030	13050	16470	0.043	13620	16910	0.050	14200	17370	0.066	14720	17810	0.075	15190	18250
0.026	13060	16490	0.033	13630	16930	0.045	14210	17390	0.059	14730	17830	0.067	15200	18260
0.025	—	16500	0.030	13640	16940	0.041	14220	17400	0.054	14740	17840	0.061	15210	18270
—	—	—	—	—	—	—	—	—	0.048	14746	—	0.056	15216	—
0.021	13070	16510	0.027	13650	16950	0.032	14230	17410	0.048	14750	17850	0.055	15220	18280
0.020	13080	16520	0.026	—	16960	0.031	—	17420	0.047	—	17860	0.053	15230	18290
0.018	13090	16530	0.023	13660	16970	0.028	14240	17430	0.042	14760	17870	0.047	15240	18300

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RIBWOUND RESISTORS

APPLICATIONS

Particularly useful where high energy is to be dissipated in the lower ohmic ranges. Due to its ability to operate at higher temperatures and dissipate greater heat, the ribwound resistor is almost one-half the physical size of the equivalently rated round-wire style resistor. Ribwound wattage ratings are based on a temperature rise of 375°C. They may be mounted with spring clips (thru 1 ⅛" dia.); thrubolt mounting hardware, individual or multiple-stacked bracket assemblies or live bracket mountings.

CONSTRUCTION

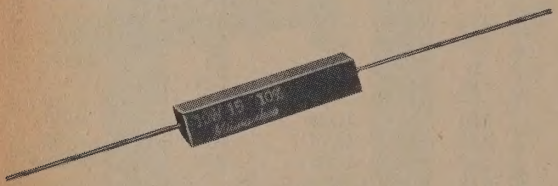
Crimped ribbon resistance wire is edge-wound and then locked to the ceramic core with vitreous enamel. Resistance wire is spot-welded to the terminal connectors. Ribwound resistors can be furnished in fixed, adjustable, or tapped styles. Cement coating can be furnished. Several 300 watt units are stocked in both fixed and adjustable styles. Listed are the more popular 300 watt ohmic values. All other wattage ratings and styles are made to order.

300 Watt	1⅛" x 8½"		
		Catalog No.	
Ohms	Max. Amps	Fixed	Adjustable
.07	65.5	25610	85610
.10	54.7	25620	85620
.15	44.7	25630	85630
.2	38.7	25640	85640
.25	34.6	25650	85650
.3	31.6	25660	85660
.35	29.4	25670	85670
.375	28.3	25680	85680
.4	27.4	25690	85690
.5	24.5	25700	85700
.6	22.4	25710	85710
.75	20	25720	85720
1	17.3	25730	85730
1.25	15.5	25740	85740
1.5	14.1	25750	85750
1.75	13.1	25760	85760
2	12.2	25770	85770
2.5	10.9	25780	85780
3	10.0	25790	85790
3.5	9.2	25800	85800
4	8.6	25810	85810
5	7.7	25820	85820
6	7.0	25830	85830
6.75	6.7	25840	85840
7.5	6.3	25850	85850
8	6.1	25860	85860
9	5.7	25870	85870
10	5.5	25880	85870
12	5.0	25890	85890
15	4.5	25900	85900
17	4.2	25910	85910
20	3.8	25920	85920
25	3.4	25930	85930
33	3.0	25940	85940
40	2.7	25950	85950

Watts	Core Size	Ohmic Range*
40	9/16 x 2	.01 to 5
50	¾ x 2	.007 to 4.5
60	¾ x 2½	.016 to 7
75	¾ x 3	.016 to 8
90	9/16 x 4	.018 to 9.6
100	¾ x 3½	.022 to 10
110	¾ x 4	.024 to 12.5
120	¾ x 4½	.026 to 14
135	¾ x 5	.03 to 16
150	1⅛ x 4	.03 to 15.5
160	¾ x 6	.035 to 20
160	1⅛ x 4¼	.035 to 17
175	1⅛ x 4½	.039 to 18.2
180	¾ x 6½	.04 to 22
220	1⅛ x 6	.05 to 26.5
225	1⅛ x 6⅛	.05 to 27.0
240	1⅛ x 6½	.05 to 29
300	1⅛ x 8½	.07 to 40
375	1⅛ x 10½	.08 to 51
400	1⅛ x 11¼	.08 to 55
400	1⅝ x 8½	.05 to 58
420	1⅛ x 11¾	.1 to 57.5
500	1⅝ x 10½	.12 to 74
550	1⅝ x 11¾	.13 to 85
750	2½ x 12	.27 to 110
1000	2½ x 15	.375 to 143
1500	2½ x 20	.55 to 198
2000	3¼ x 20	2. to 245

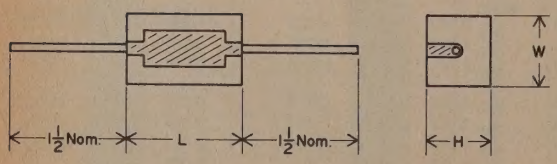
* May be different for adjustable.

BATHTUB RESISTORS



"MILWAUKEE" Bathtub Resistors are wound on a high quality fiber-glass cord. Terminals with axial leads are securely clamped to the windings and encapsulated in a square ceramic case with a high temperature, inorganic, humidity proof, silicone compound. The rectangular shape of the ceramic case lends itself to compactness for easy installation and rapid heat dissipation. Good dielectric qualities with voltage breakdowns up to 1500 volts are achieved through encapsulation. Standard tolerance is ±10%. Closer tolerances are available.

SPECIAL LOW OHMIC VALUES for auto radio 5 watt size are in stock.



M.R.C. Part No.	Watts	Dim. "L" ±1/32	Dim. "W"	Dim. "H"	Max. Ohms	Min. Ohms
2BT6-14-Ω	5	⅞	.375	.344	6K	.1
2BT6-18-Ω	6	1⅛	.375	.344	11K	.1
2BT6-22-Ω	7	1⅜	.375	.344	15K	.1
2BT6-30-Ω	10	1⅞	.375	.344	25K	.1
2BT8-30-Ω	15	1⅞	.50	.50	25K	.1
2BT8-40-Ω	20	2½	.50	.50	30K	.2

5 Watt to 10 Watt — 20 Ga. Std. Leads
15 Watt & 20 Watt — 18 Ga. Std. Leads
All above RESISTORS also available with 18 or 20 Ga leads upon request.

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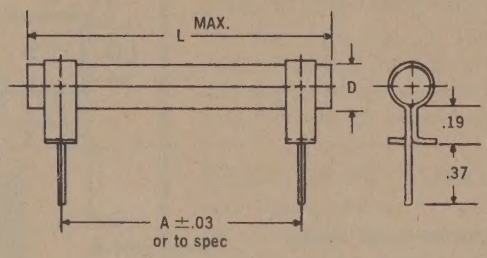
PRINTED CIRCUIT BOARD POWER RESISTORS



FIXED

Watts	L	A	D	Max. Ohms
3	15/16	0.6	13/64	14K
5	1¼	0.9	13/64	25K
7	1⅝	1.3	13/64	40K
10	2	1.7	13/64	60K
15	2	1.7	5/16	90K
20	2½	2.2	5/16	110K

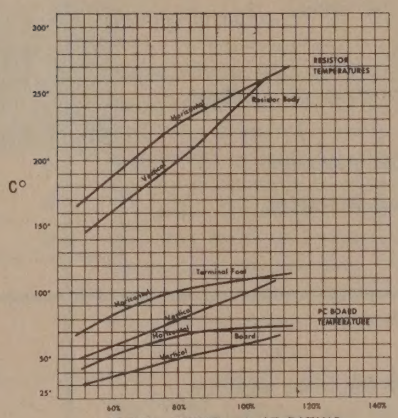
ADJUSTABLE

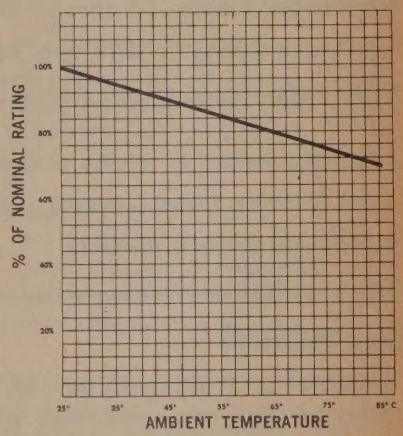
Watts	L	A	D	Max. Ohms
15	2	1.7	5/16	2K*
20	2½	2.2	5/16	3K*

* For higher ohms, consult factory

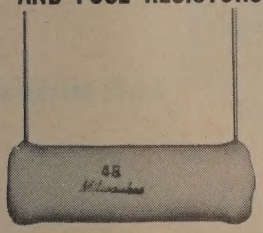
FEATURES

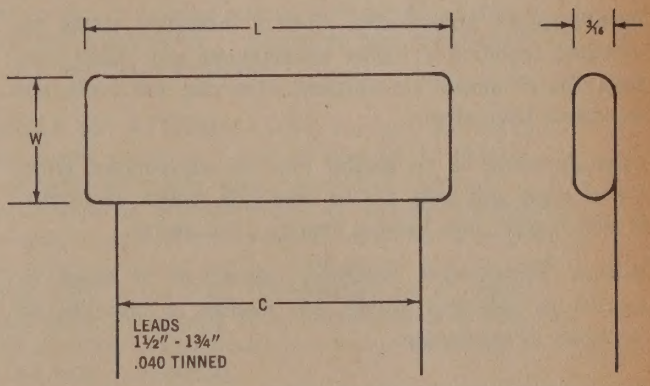
- Built-in standoff keeps board cool.
- Mounting feet prevent rocking.
- Power ratings 3 to 20 watts.
- Complete OHM range.
- One-piece, welded terminals
- Rectangular leads .020 x .040 in.
- Silicon base coating. Vitreous enamel coating available.
- Standard tolerance ±5%.
- 20 PPM upon request.
- Patent 3,462,651.





STRIP AND FUSE RESISTORS





STRIP resistors are designed for special applications and provide excellent performance characteristics at very economical prices.

Sturdy asbestos cores support the high quality resistance wire which terminates with 1½" tinned copper leads. Completely protected with high temperature cement and sand.

The wattage ratings listed are our standard units. Special wattages, length, width, or thickness are custom engineered for your specific requirement.

The core width and length are in 1/16th inch increments. The core thickness for the listed units is 1/8th inch. Other thicknesses are available, as are tapped units. Standard tolerance is 10% and other tolerances are available.

FUSE resistors are available in the same rating as any strip resistor. Dimensions are the same. Pin receptacles can be added to the leads for mounting. Fuse specifications of trip current and trip time should be specified.

Watts	Size	Ohmic Range	Nominal Overall		
			L	W	C
5	6-19	1.5 - 3K	1 5/16	½	1
8	6-23	1.5 - 4K	1 9/16	½	1¼
10	8-23	1.5 - 4.8K	1 9/16	5/8	1¼
12	8-31	3 - 7.5K	2 1/16	5/8	1¾
15	10-31	5 - 7.5K	2 1/16	¾	1¾
20	10-39	7 - 9K	2 3/16	¾	2¼
25	10-47	10 - 10K	3 1/16	¾	2¾
25	12-39	10 - 10K	2 3/16	7/8	2¼
30	12-47	12 - 12K	3 1/16	7/8	2¾

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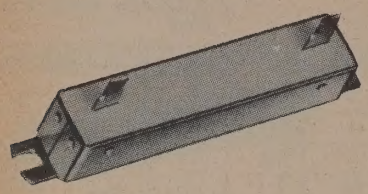
METAL CASE RESISTORS

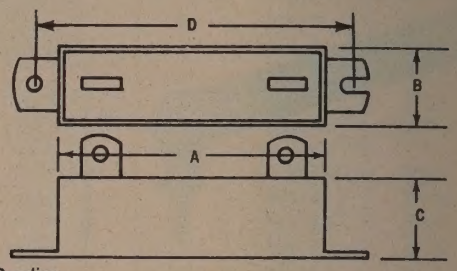


SAVINGS

Space — First Cost — Assembly Cost

- **High Heat Sink** — flush mounting dissipates heat faster.
- **Multi-resistance and Wattage Values** — single or multiple ratings — series or parallel.
- **Wattage Rating** — 20 to 100 watts (higher on specials).
- **Resistance Values** — 0.1 ohm to 100,000 ohms.
- **Dielectric Strength** — 1500 volts RMS.
- **Terminals** — quick connect — screw connection — insulated leads.
- **Mounting Plate** — for Diodes or Rectifier Available.
- **Salt Corrosion Tested — Rugged — Shock Resistant.**
- **Additional Wattages Available.**

TYPICAL SIZES — RATINGS



Patent Pending

Flush Mounting Gives High Heat Sink

TERMINALS TO CUSTOMER SPECIFICATIONS

WATTS Ratings at 275°C Rise Showing benefit of mounting flush for full heat sink.		DIMENSIONS			
Without Heat Sink	With Heat Sink	A	B	C	D
20	45	1″	¾″	¾″	1 7/16″
40	70	2½″	¾″	¾″	3″
50	100	3 11/16″	¾″	¾″	4⅛″

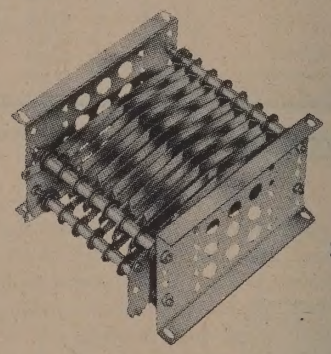
GRID RESISTORS

"Milwaukee Grid" Resistors (patented) are the most versatile developed. They are competitively priced and incorporate more life and greater dependability features than ever before provided by conventional grid resistors.

Vibration-proof, unbreakable, all-mica insulation allows for extended operation at higher temperatures and higher voltages. The all-welded construction eliminates hot spots and resistance fluctuations.

Power-per-pound is far greater than on conventional grids. Any of these grid units can be used with natural ventilation or with booster fans without changing the design.

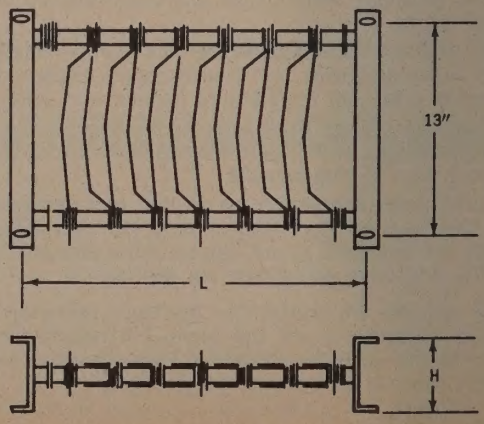
Modular construction facilitates connection in series or parallel for extended ratings. Any number of taps can be employed in the design.



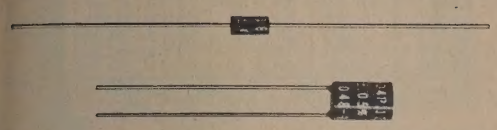
2-DECK BRACKET-MOUNTED

	KW*	4 Deck	2 Deck	Single Deck
L	20	28″	—	—
	15	22″	—	—
	10	16″	28″	—
	5	8″	16″	28″
	2½	—	10″	16″
	1¼	—	—	8″
H	Standard	17″	6″	3″

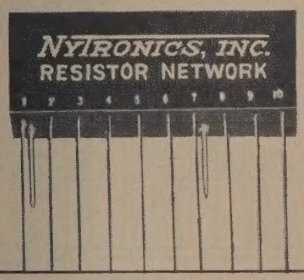
* Wattage based on 375°C rise.
Patent 3,212,045.



Nytronics Resistors



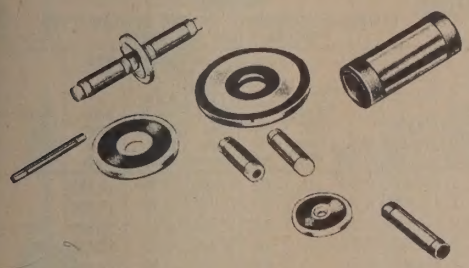
PRECISION WIRE WOUND RESISTORS offer design engineers high stability, reliability, and tolerances to .001% in axial lead and printed circuit configurations. These products are subject to temperaturing cycling and aging stages in manufacturing to insure high stability.



RESISTOR NETWORKS The superior versatility of the wire wound resistor to other types of resistors makes possible an extremely high degree of accuracy.

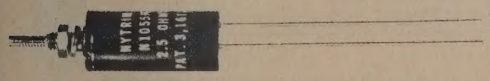
Typically, the resistors are manufactured to compensate for the characteristics of the capacitor or inductor to nullify the C or L variation with environment.

These resistors are especially useful for binary ladder networks, phase shift and timing, binary summing, and voltage divider networks.

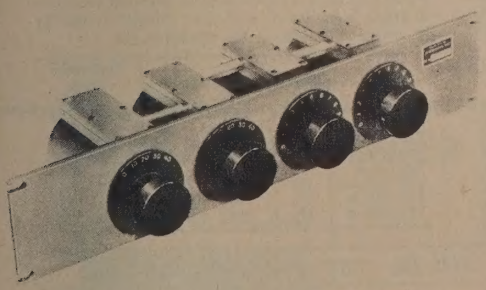


THIN FILM RESISTORS are designed for use at Frequencies from DC to 10,000 MC. They are produced with resistance elements ranging in thickness from 50 to 5,000 angstroms. Units have minimal "skin effect" and drop-off of resistance at these frequencies.

The thin film resistors are furnished in metal and carbon film and offer optimum performance in high frequency and high temperature applications. The carbon units are manufactured with pyrolytically deposited film on ceramic substrate, while the metal film is vacuum deposited and protected with an inorganic coating.



NYTRIM a 28-turn adjustable low value resistor, providing infinite resolution. This unit has particular application in accurate trimming of stable low value fixed resistors used in bridge and similar types of precision measuring equipment. The NYTRIM is used to equalize resistance in numerous circuits requiring fine adjustments — laboratory type transformers, filters, and transmission circuits.



VARIABLE RF ATTENUATORS are accurate variable step attenuators designed to operate from DC to 500MHz. They are rotary adjustable types, supplied as individual unmounted units or in combinations on rack mounted panels.

Each resistor used in the attenuator networks is mounted in a cavity which eliminates reactive components over the useful frequency range of the units. The resistors are of highly stabilized variety, pre-cured to minimize long term drift, and installed in a manner which prevents element value shift due to the heat of soldering.

Nine basic types are available: 5 types at 75 ohms impedance and 4 types at 50 ohms impedance. Combinations of these up to four can be supplied on standard 3½" x 19" rack mounted panels.

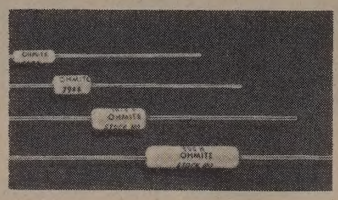
Nytronics, Inc.
PRECISION RESISTOR DIVISION
INDUSTRIAL AVENUE • KUTZTOWN, PENNSYLVANIA 19530 • (215) 683-7307

SERIES 99 MOLDED AXIAL LEAD VITREOUS ENAMELED RESISTORS

- FIRST MOLDED, WIREWOUND, VITREOUS ENAMEL RESISTOR
- INSULATED! Meets 1000 VAC Test
- WITHSTANDS 1500°F Temperature without Distortion
- RESISTS Chipping, Breaking
- VITRIFIED MARKINGS, Resist Abrasion and Active Solvents
- UNIFORM SIZE Permits Clip-Mounting with Significant Heat Sink Benefits
- HIGH OVERLOAD CAPABILITY

An exclusive technique (U.S. Patent No. 3,229,237) permits application of the vitreous enamel coating by **molding** instead of the conventional "dip" process. The dimensionally consistent and thicker coating that results, guarantees a 1000 VAC insulation rating plus unparalleled capability for withstanding very high temperatures, high humidity and immersion in salt solution.

These resistors are normally mounted by their axial leads. However, their consistent form also permits mounting in clips with heat sink benefits up to 100%. Resistor markings are also vitreous and will not burn off even under extreme overloads. Resistance tolerance is ±5%. Series 99 resistors meet the requirements of MIL-R-26 for "insulated" resistors. See Bulletin 103 or Catalog 50 for specific MIL types.



TYPE 994, COMMERCIAL, HIGH STABILITY

Standard Tolerance 3% • Tolerances to 0.25% Available

Type 994 units feature long term stability and the Series 99 low temperature coefficient of resistance (T.C.).

Stability: Type 994 resistors, on a 2000 hour, cyclic, load-life test (1½ hour on, ½ hour off) have less than ±2% ΔR.

Standard Tolerance for Type 994 resistors is ±3%. Tolerances to ±0.25% are available.

Ohmite Style	Rated Watts @ 25°C	Dimensions (inches) Lgth. ±.015	Dia. +.031 −.000	Leads 1½" AWG	Typ. Wt. (g's)	Resistance Range (Ohms)	Max. Wkg. Volts RMS
994-1A	1.5	.422*	.125*	24	0.4	0.1-6650	
994-2A	2.25	.375	.188	20	0.8	0.1-6490	85
994-3A	3.25	.547	.203	20	1.3	0.1-22,100	200
994-5A	6.5	.922	.312	20	3.6	0.1-80,600	460
994-5B	5	.938	.203	20	2.0	0.1-53,600	500
994-7A	9	1.218	.312	20	4.5	0.1-118,000	670
994-10A	11	1.781	.312	20	6.9	0.1-187,000	1100
994-15A	14	2.00	.394	20	13.0	0.1-243K	1100

TYPE 995, COMMERCIAL POWER APPLICATIONS

Standard tolerance for Type 995 units is ±5% for values 1 ohm and above; ±10% for values below 1 ohm. For tolerances to ±0.25%, consult factory.
Low temperature coefficient.

5% TOLERANCE; CLOSER TOLERANCES AVAILABLE

Ohmite Style	Rated Watts @ 25°C	Dimensions (inches) Lgth. ±.015	Dia. +.031 −.000	Leads 1½" AWG‡	Typ. Wt. (g's)	Resistance Range† (Ohms)	Max. Wkg. Volts RMS
995-1A	1.5	.422*	.125*	24	0.4	0.1-6650	
995-2A	2.25	.375	.188	20	0.8	0.1-6490	85
995-3A	3.25	.547	.203	20	1.3	0.1-22,100	190
995-5A	6.5	.922	.312	20	3.6	0.1-80,600	460
995-5B	5	.938	.203	20	2.0	0.1-53,600	500
995-7A	9	1.218	.312	20	4.5	0.1-118,000	670
995-10A	11	1.781	.312	20	6.9	0.1-187,000	1100
995-15A	15	2.00	.394	20	13	0.1-243,000	1100

* Tolerance ±.015, −.005. † For closer tolerances than 1%, minimum value is 1 ohm. ‡ AWG 20 = .032"; AWG 24 = .020".

TYPE 991 FOR MILITARY APPLICATIONS

Meets the requirements of MIL-R-26E, Styles RW67V, RW68V and RW69V (350°C max. hot spot). Surpass the stability requirements of ±3% ΔR on the 2000 hour cyclic load-life test. The low TC of Series 99 units far surpasses the requirements of MIL-R-26E. Standard resistance tolerance is ±5% for values 1 ohm and above; below 1 ohm, ±10%; other tolerances can be supplied.

RESISTORS FOR MIL-R-26E

Ohmite Style	"V" Char. MIL Style	Rated Watts @25°C	Ohms Range	Dimensions Lgth. ±.015	Dia. +.001 −.000	Leads 1½ AWG	Typ. Wt. (g's)
991- 3A	RW69V	3	0.1-2K	.547	.203	20	1.3
991- 5A	RW67V	6.5	0.1-8.2K	.922	.312	20	3.6
991-10A	RW68V	11	0.1-20K	1.781	.312	20	6.9
991-15A	RW56V	14	0.1-9.1K	2.00	.394	20	13.0

SERIES 88 MOLDED PRECISION POWER RESISTORS

FOR T.C. LESS THAN 0 ±10PPM/°C AND NONINDUCTIVE VERSIONS, CONSULT FACTORY.

TYPE 882 FOR COMMERCIAL POWER APPLICATIONS

This type intended for commercial power applications. These units derate to zero watts at 350°C ambient; T.C. = 0 ±10ppm/°C ; insulation tested at 1000 VAC except 500 volts for 1 watt size.

STANDARD TOLERANCE ±3%, CLOSER AVAILABLE

Ohmite Style	Nom. Watts 25°C	Dimensions Lgth. +.020 −.010	Dia. ±.020	Leads 1½" AWG	Typ. Wt. Grams	Ohms Range Std. 3% Tol.	Max. Wkg. Volts RMS
882-1A	1.5	0.417	0.105	24	0.3	0.10-10,700	—
882-1B	1.5	0.542	0.105	24	0.3	0.10-17,400	—
882-2	2.25	0.375	0.188	20	0.6	0.10-10,500	85
882-3	3.25	0.542	0.230	20	1.3	0.10-34,800	200
882-5	6.5	0.917	0.323	18	3.3	0.10-127,000	460
882-7	9	1.218	0.323	18	4.3	0.10-187,000	670
882-10	11	1.822	0.343	18	6.3	0.10-316,000	1100

* Ohmite's standard power tolerance is 3% supplied at no extra charge over 5% for values 1 ohm and higher; 10% for values below 1 ohm. Closer tolerances are available.

TYPE 884 HIGH STABILITY, PRECISION-POWER TYPE

Type 884 resistors (Riteohm 88) are classified as high stability, precision-power types. They are aged and conservatively rated for maximum long term stability and exhibit superior characteristics despite relatively high operating temperature at rated wattage.

Type 884 units are available in tolerances of 0.05% and derate † to zero watts at 275°C ambient; T.C. = 0 ±ppm/°C; insulation tested at 1000 VAC except 500 volts for 1 watt size.
† For applications where maximum stability is of primary importance as may be the case with close tolerance resistors, a derating of 50% is recommended.

STANDARD TOLERANCES TO .05% AVAILABLE FOR VALUES 1 OHM AND ABOVE

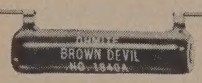
Ohmite Style	Nom. Rated Watts 25°C	Dimensions Lgth. +.020 −.100	Dia. ±.020	Leads 1½" Long AWG	Typ. Wt. (g's)	Resistance Ranges[2] Closer Than 0.5% Tol. (Min. Ohms)	0.5% Tol. & Greater (Min. Ohms)	Max. Ohms All Tols.	Max. Wkg. Volts RMS
884-1A[1]	1	0.417	0.105	24	0.3	0.499	0.10	10,700	
884-1B	1	0.542	0.105	24	0.3	0.499	0.10	17,400	
884-2	2	0.375	0.188	20	0.6	0.499	0.10	10,500	85
884-3[2]	3	0.542	0.230	20	1.3	0.499	0.10	34,800	200
884-5[3]	5	0.917	0.323	18	3.3	0.499	0.10	127,000	460
884-7	7	1.218	0.323	18	4.3	0.499	0.10	187,000	670
884-10[4]	10	1.822	0.343	18	6.3	0.499	0.10	316,000	1100

[1] Commercial equivalent of RW70.
[2] Commercial equivalent of RW79 except for size.
[3] Commercial equivalent of RW74
[4] Commercial equivalent of RW78 except for size.

TUBULAR VITREOUS ENAMELED RESISTORS

TYPE 200, BROWN DEVIL®

"BROWN DEVIL" (Type 200) vitreous enameled, wirewound resistors, have been an industry byword for small rugged power resistors. Compact, with surprising overload capability. Five sizes are stocked in a broad selection of values.



Ohmite Style	Rated Watts	Dimensions Lgth.	Dia.	Leads 1½" AWG	Resistance Range (Ohms)
200-3AA-48	3	7/16	.200	20	0.11 -10K
200-5¼CA-48	5¼	5/8	¼	20	0.15 -20K
200-8D-48	8	1	5/16	18	0.034-25K
200-12D-48	12	1¾	5/16	18	0.083-57.1K
200-20H-48	20	2	7/16	18	0.14 -113K

TYPE 270, FIXED, RADIAL LUG

Lug type resistors are wire-wound on high quality ceramic cores, protected and insulated by Ohmite vitreous enamel.

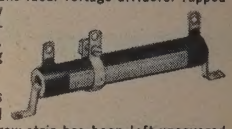
Wire of finest alloy and largest possible size is used for each resistance. Original uniform close spacing of the turns maintained by anchoring effect of the vitreous enamel. Wire securely welded to the terminal lugs. Resistance tolerance: ±5% for values 1 ohm or higher; ±10% below 1 ohm.

Wattage ratings are for use in free air. When mounted in closed spaces or where circulation of air is restricted, they should not be used at more than one-half rating.

Ohmite Style	Rated Watts	Core Dimensions Lgth.	Dia.	Resistance Range (Ohms)
270-12D-57	12	1¾	5/16	0.75-51.6K
270-25K-40	25	2	7/16	0.15-100K
270-50K-40	50	4	9/16	0.38-260K
270-100M-40	100	6½	¾	0.23-101K
270-175P-46	175	8½	1⅛	0.13-101K
270-225P-46	225	10½	1⅛	0.17-129K

TYPE 210, "DIVIDOHM®" ADJUSTABLE

"Dividohm" resistors make ideal voltage dividers. Tapped "bleeders" are made by using one or more adjustable lugs, as required. Also useful for obtaining odd resistance values.



"Dividohm" resistors are vitreous enameled resistors on which a narrow strip has been left uncovered to expose a portion of each turn. Contact is made by an embossed contact on the adjustable lug.

Ohmite Style	Rated Watts	Core Dimensions Lgth.	Dia.	Resistance Range (Ohms)
210-12D-57	12	1¾	5/16	0.95- 30K
210-25K-40	25	2	7/16	0.24- 67K
210-50K-40	50	4	9/16	0.62-176K
210-75K-40	75	6	9/16	1.0 -284K
210-100M-40	100	6½	¾	2.0 -104K
210-175P-46	175	8½	1⅛	0.67-100K
210-225P-46	225	10½	1⅛	0.86-128K

TYPE 250, "THIN" RESISTORS — FIXED

Ohmite Code	Rated Watts	Core Dimensions Lgth.	W.	Thk.	Resistance Range (Ohms)
250-10TA-51	10	¾	⅜	⅛	0.15 to 12.9K
250-15TA-51	15	1	⅜	⅛	0.25 to 21.6K
250-20TA-51	20	2	⅜	⅛	0.64 to 56.1K
250-25TD-51	25	1½	13/16	¼	0.14 to 16.0K
250-30TE-57	30	1¼	1	¼	0.093 to 10.8K
250-40TE-57	40	2	1	¼	0.22 to 25.0K
250-55TE-57	55	3½	1	¼	0.92 to 36.5K

Ohmite "Thin" Resistors are used where space is at a premium. Wirewound on flat, oval shaped ceramic cores. Coated with Ohmite's exclusive vitreous enamel.

Stack-mounted "Thin" resistors

Integral thru-core mounting brackets equalize heat distribution and conduct heat directly to metal mounting surface. Reduce wattage rating 15% if mounted on non-metallic surface.

Total height from bottom of bracket to top of resistor: 9/16" for 10 thru 20 watts; 11/32" for 25 thru 55 watt size.

TYPE 260, "THIN" DIVIDOHM® — ADJUSTABLE

Ohmite Code	Rated Watts	Core Dimensions Lgth.	Wdth.	Thk.	Resistance Range (Ohms)
260-15TA3-51	15	1	⅜	⅛	2.8 to 21.6K
260-20TA3-51	20	2	⅜	⅛	7.2 to 56.1K
260-30TE1-57	30	1¼	1	¼	1.0 to 10.8K
260-40TE1-57	40	2	1	¼	2.4 to 25.0K
260-55TE1-57	55	3½	1	¼	10.0 to 36.5K

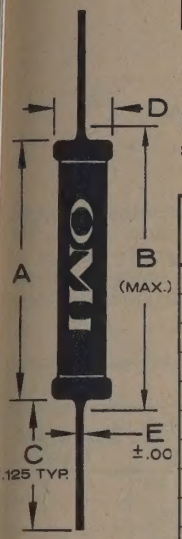
WRITE FOR COMPLETE INFORMATION AND SPECIFICATIONS ON OHMITE RESISTORS

OHMITE MFG. CO., a NORTH AMERICAN PHILIPS company • 3635 HOWARD STREET, SKOKIE, ILLINOIS 60076 • PHONE (312) 675-2600 • TWX 910-223-0805

OMI RESISTORS T SERIES

MTRONICS MANUFACTURING, INC. • 2406 LEAVENWORTH STREET, OMAHA, NEBRASKA 68105 • (402) 348-9500

PRECISION POWER RESISTORS, AXIAL LEADS



Highly reliable, silicone coated, precision resistors manufactured to meet MIL-R-26 specifications. There are 17 basic sizes with power ratings from ½ to 10 watts and resistance ranges from .05 ohms to 275K ohms. Resistance tolerances from .05% to 5% (1%, standard). Temperature coefficient of resistance 2PPM up (20PPM, standard).

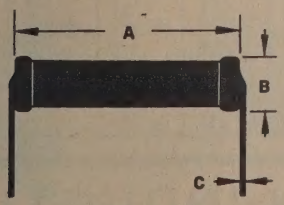
OMI TYPE	MIL TYPE	OMI WATTAGE RATING		RESISTANCE RANGE		MAX. WORKING VOLTAGE*		Max. Weight Grams	PHYSICAL DIMENSIONS				
		U	V	Min.	Max.	U	V		A	B	C	D	E
T-½A	—	.4	—	.5	3.4K	18	—	.21	.210 ±.015	.265	1.500	.078 ±.015	.020
T-½	—	.75	—	.5	7.5K	31	—	.30	.330 ±.015	.390	1.500	.078 ±.015	.020
T-1A-20	RW-70 U	1.0	1.25	.1	10K	50	55	.36	.406 ±.031	.437	1.500	.093 ±.031	.020
T-1A	—	1.0	1.25	.1	10K	50	55	.36	.406 ±.031	.437	1.500	.093 ±.031	.020
T-1B	—	1.1	1.30	.1	12K	62	67	.40	.530 ±.015	.590	1.500	.093 ±.031	.020
T-1C	—	1.0	—	.1	5K	28	33	.33	.265 ±.015	.335	1.500	.093 ±.031	.020
T-2	—	1.5	—	.1	10K	72	79	.95	.343 ±.015	.410	1.500	.187 ±.031	.032
T-2A	—	3.0	3.75	.1	22K	135	148	.70	.560 ±.062	.622	1.500	.187 ±.031	.032
T-2A-20	RW-79 U	3.0	3.75	.1	22K	135	148	.70	.560 ±.062	.622	1.500	.187 ±.031	.032
T-2B	—	3.0	—	.1	40K	170	200	.92	.812 ±.062	.890	1.500	.188 ±.031	.032
T-2C	—	2.5	3.00	.05	32K	138	157	1.5	.500 ±.062	.593	2.000	.218 ±.032	.040
T-2C-20	RW-69 V	2.5	3.00	.05	32K	138	157	1.5	.500 ±.062	.593	2.000	.218 ±.032	.040
T-3	—	4.0	5.50	.05	40K	210	250	2.3	625 ±.062	.765	2.000	.250 ±.032	.040
T-5	—	5.0	6.00	.05	90K	300	365	4.3	.875 ±.062	.937	2.000	.312 ±.031	.040
T-5-20	RW-74 U	5.0	6.00	.05	90K	300	365	4.3	.875 ±.062	.937	2.000	.312 ±.031	.040
T-6	—	6.0	6.50	.05	95K	330	376	4.8	1.000 ±.094	1.094	2.000	.312 ±.031	.040
T-6-20	RW-67 V	6.0	6.5	.05	95K	330	376	4.8	1.000 ±.094	1.094	2.000	.312 ±.031	.040
T-7	—	7.0	8.00	.05	100K	350	390	5.2	1.185 ±.062	1.247	2.000	.312 ±.031	.040
T-7A	—	7.0	9.00	.05	150K	504	576	7.0	1.375 ±.094	1.469	2.000	.469 ±.094	.040
T-7A-20	RW-55 V	7.0	9.00	.05	150K	504	576	7.0	1.375 ±.094	1.469	2.000	.469 ±.094	.040
T-10	—	10.0	11.00	.05	250K	788	898	9.0	1.780 ±.062	1.842	2.000	.375 ±.031	.040
T-10-20	RW-78 U	10.0	11.00	.05	250K	788	898	9.0	1.780 ±.062	1.842	2.000	.375 ±.031	.040
T-10B-20	RW-68 V	10.0	11.00	.05	250K	788	898	9.0	1.875 $^{+.063}_{-.125}$	1.875	2.000	.344 ±.094	.040
T-10A	—	10.5	14.00	.05	275K	799	911	10.0	1.925 ±.062	2.094	2.000	.375 ±.062	.040
T-10A-20	RW-56 V	10.5	14.00	.05	275K	799	911	10.0	2.000 ±.094	2.094	2.000	.469 ±.094	.040

* Max. working voltage determined at .0008 wire.

SPECIAL FEATURES • Close tolerances (to .01% available). • Extremely high stability. • Low TC of resistance (to 2PPM). • Welded construction terminal to terminal. • Wide temperature range; from −65° to 275°C. • A specially formulated silicone coating makes OMI T-series resistors impervious to moisture, salt spray, abrasion and expanded temperatures.

PRECISION POWER RESISTORS, RADIAL LEADS

TR SERIES



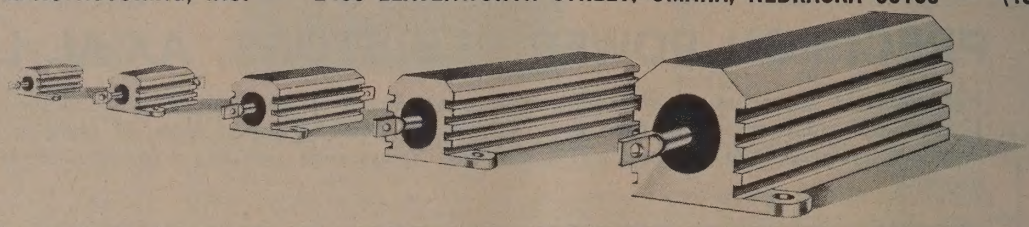
SPECIFICATIONS

TR electrical, mechanical, material, power rating and derating specifications are identical to models of equivalent wattage and size in the OMI T Series. Also available, non-inductively wound, and identified as the "NR" Series.

Type	Dim. A	Dim. B	Dim. C
TR-1A	.406 ±.031	.093 ±.031	.020
TR-1B	.531 ±.031	.093 ±.031	.020
TR-2A	.562 ±.062	.187 ±.031	.020
TR-2C	.500 ±.062	.218 ±.031	.032
TR-2B	.812 ±.062	.187 ±.031	.020
TR-3	.625 ±.062	.250 ±.031	.032
TR-5	.875 ±.062	.312 ±.031	.032
TR-7	1.218 ±.062	.312 ±.031	.032
TR-10	1.780 ±.062	.375 ±.031	.032

OMI RESISTORS HT HF

OMTRONICS MANUFACTURING, INC. • 2406 LEAVENWORTH STREET, OMAHA, NEBRASKA 68105 • (402) 348-950



HT Models are anodized, aluminum-housed, precision wire-wound resistors, designed to chassis mount for maximum heat dissipation. They are manufactured to meet or exceed MIL-R-18546 specifications. Four sizes: 5 to 50 watts (mounted), resistance ranges from .1 ohm to 250K, depending on size. Tolerances —1% standard — .05% to 5% available. Temperature coefficient from 2PPM up. (20PPM, standard.)

HF Models are identical in dimensions, resistance ranges, tolerance and temperature coefficients with those of the HT Series, but offer a great increase in their power ratings as similar size through the use of beryllium oxide cores for increased heat dissipation. These are manufactured to exceed MIL-R-18546 power ratings.

STANDARD ELECTRICAL SPECIFICATIONS

OMI Type		MIL Type	Power Rating (Watts)*			Resistance Range		Max. Working Voltage		Max. Weight Grams
			HF (OMI)	HT	MIL	MIN.	MAX.	HF	HT	
HF-5	HT-5	RE-60	15	5	5	.1	22K	220	160	3
HF-10	HT-10	RE-65	20	10	10	.1	47K	340	265	7
HF-25	HT-25	RE-70	35	25	20	.1	90K	650	550	14
HF-50	HT-50	RE-75	50	50	30	.1	250K	1400	1250	29
	HT-75			75		.1	75K		1500	120

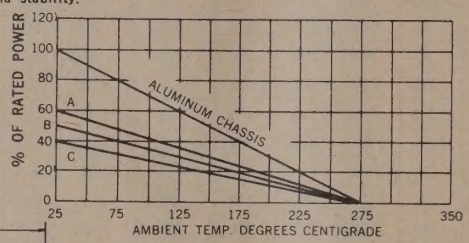
*Rating is based on chassis mounting area and stability.

Chassis Dimensions:

HT-5, HF-5, HT-10 and HF-10 — 6x4x2x .04", Aluminum Chassis.

HT-25, HF-25, HT-50 and HF-50 — 7x5x 2x.04". Aluminum Chassis.

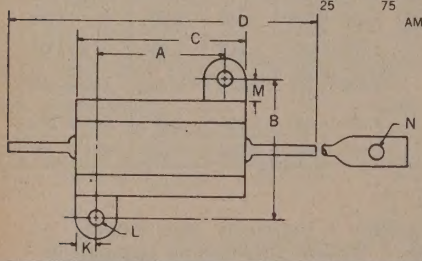
HT-75 — 12"x12"x.062, Aluminum Panel.

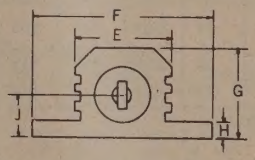


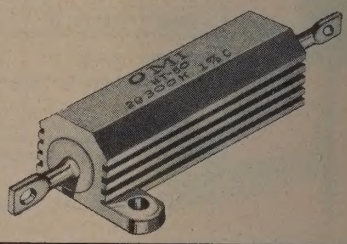
DERATING

OMI, HT and HF resistors have an operating temperature range of —55°C to +275°C. Derating is required for reduced chassis mounting area and for high ambient temperatures. The graph curves shown apply to operation of unmounted resistors. Free air rating.

A = HT5, HT-10
B = HT-25
C = HT-50, all HF Series and HT-75







DIMENSIONAL SPECIFICATIONS — HOUSED TYPE

TYPE		A	B	C	D	E	F	G	H	J	K	L	M	N
HF-5	HT-5	.444 ±.005	.490 ±.005	.600 ±.031	1.125 ±.062	.334 ±.015	.646 ±.015	.320 ±.015	.065 ±.010	.140 ±.010	.078 ±.010	.093 ±.005	.078 ±.015	.050 ±.005
HF-10	HT-10	.562 ±.005	.625 ±.005	.750 ±.031	1.375 ±.062	.430 ±.015	.800 ±.015	.400 ±.015	.075 ±.010	.190 ±.010	.093 ±.010	.093 ±.005	.102 ±.015	.086 ±.005
HF-25	HT-25	.719 ±.005	.781 ±.005	1.062 ±.031	1.938 ±.062	.530 ±.015	1.080 ±.015	.560 ±.015	.085 ±.010	.260 ±.010	.172 ±.010	.125 ±.005	.115 ±.015	.086 ±.005
HF-50	HT-50	1.563 ±.005	.844 ±.005	1.968 ±.031	2.781 ±.062	.615 ±.015	1.140 ±.015	.615 ±.015	.085 ±.010	.300 ±.010	.196 ±.010	.125 ±.005	.107 ±.015	.086 ±.005
	HT-75	2.125 ±.005	1.500 ±.005	2.500 ±.031	3.375 ±.093	1.125 ±.031	1.875 ±.031	1.125 ±.031	.125 ±.015	.625 ±.015	.187 ±.015	.172 ±.005	.187 ±.015	.095 ±.005

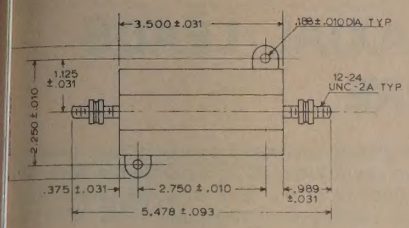
HN HFN ALUMINUM HOUSED, NON-INDUCTIVE

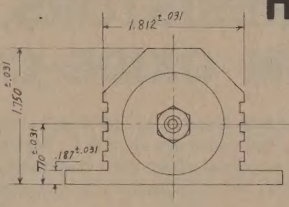
HN and HFN Models with equivalent electrical and physical specifications to the HT and HF Series are also available with non-inductive windings. To order HT, non-inductively wound, specify "HN". To order HF, non-inductively wound, specify "HFN" instead of the basic HT and HF models. **NOTE:** The following conditions apply to non-inductive types as compared to HT or HF:

1. Maximum resistance values must be divided by 2.
2. Maximum working voltage must be multiplied by .707.
3. Maximum weights may slightly exceed those shown above.

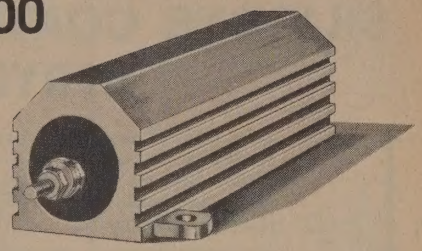
OMI RESISTORS HT

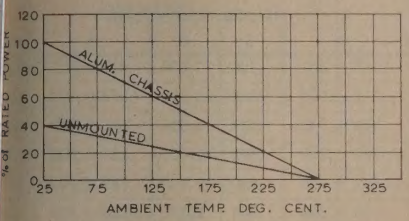
MTRONICS MANUFACTURING, INC. • 2406 LEAVENWORTH STREET, OMAHA, NEBRASKA 68105 • (402) 348-9500





HT-100

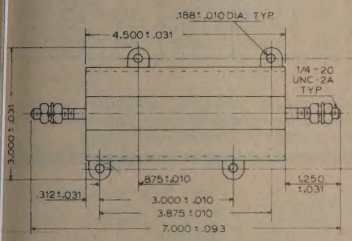


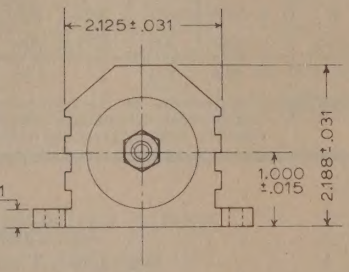


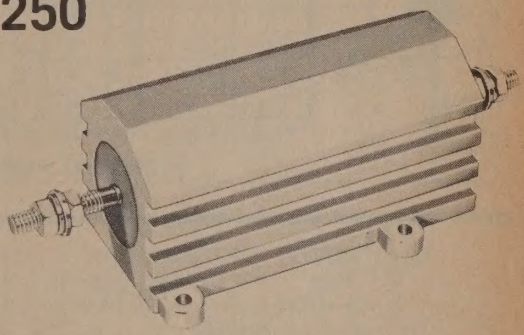
STANDARD ELECTRICAL SPECIFICATIONS							
OMI Type	MIL Type	Power Rating (Watts)*		Resistance Range		Max Working Voltage	Max. Weight Grams
		(OMI) HT	MIL	MIN.	MAX.	HT	
HT-100	RE-77	100	75	.1	50K	1900	400
HT-250	RE-80	250	120	.1	75K	2500	800

Chassis Dimensions: 12"x12"x.125 Aluminum Panel

HT-250





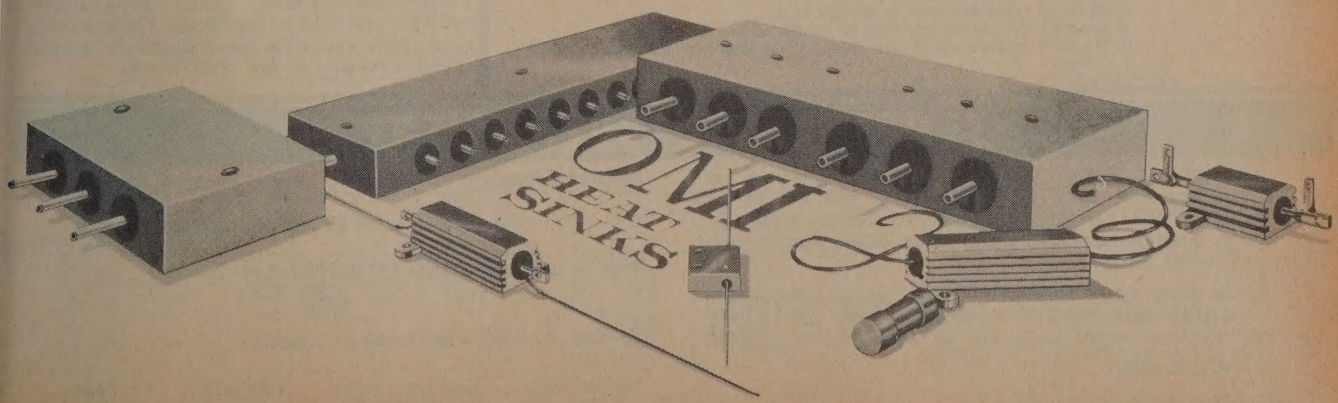


HEAT SINK CAPABILITIES

OMI's factory tooling and engineering experience put at your disposal facilities of design and production to manufacture heat sink resistors for your specific requirements.

Manufactured to your specific parameters, these resistors include the following outstanding characteristics: (A) High power capabilities, (B) 4-Wire low value resistors as well as the standard 2-wire units, (C) Combined characteristics such as .05 ohms ±5 PPM and 4-wire termination and (D) high temperature, high pressure integral molding into housing constructions.

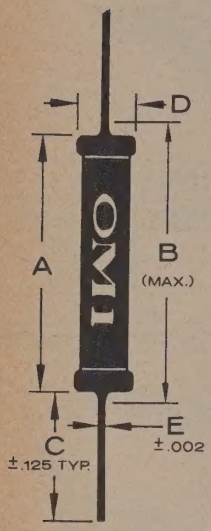
This advanced state of the art allows us to confidently solicit your inquiries for special design modes.



OMI RESISTORS F SERIES

OMTRONICS MANUFACTURING, INC. • 2406 LEAVENWORTH STREET, OMAHA, NEBRASKA 68105 • (402) 348-950

SILICONE COATED RESISTORS, AXIAL LEADS BERYLLIUM OXIDE CORE

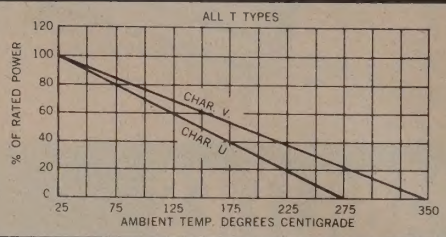


The OMI F Series resistors — at ratings from 1 to 15 watts—offer greatly increased power ratings over co ventional resistors of equivalent size. All resistors in the F Series are manufactured in accordance with MI Specs. and are available in ten basic physical sizes with resistance ranges from 0.1 ohm to 250K ohms. Resi ance tolerances from 0.05% to 5% (1%, standard) and temperature coefficient of resistance from 2PPM u (20PPM, standard).

OMI TYPE	MIL TYPE	OMI WATTAGE RATING		RESISTANCE RANGE		MAX. WORKING VOLTAGE*		Max. Weight Grams	PHYSICAL DIMENSIONS				
		U	V	Min.	Max.	Min.	Max.		A	B	C	D	E
F-1	RW-81U	1.0 W	1.5 W	1 to	3.4K	29	35	.21	.250 ±.031	.265	1.500	.078 ±.015	.020
F-2	—	1.5 W	2.0 W	1 to	7.5K	42	48	.21	.312 ±.015	.327	1.500	.078 ±.015	.020
F-3	RW-80U	2.25W	2.75W	.1 to	10K	74	81	.36	.406 ±.031	.437	1.500	.093 ±.032	.020
F-5	—	4.0 W	5 W	.1 to	22K	153	170	.80	.562 ±.062	.640	1.500	.188 ±.032	.032
F-5A	—	4.5 W	6.5 W	.1 to	40K	214	257	.96	.812 ±.062	.890	1.500	.188 ±.032	.032
F-5C	—	5 W	7 W	.1 to	32K	194	230	1.5	.500 ±.062	.593	2.000	.218 ±.032	.040
F-6	—	6 W	8 W	.1 to	40K	258	298	2.3	.625 ±.062	.765	2.000	.250 ±.032	.040
F-10	—	7 W	10 W	.1 to	90K	390	467	4.3	.875 ±.062	1.000	2.000	.312 ±.032	.040
F-12	—	10 W	12 W	.1 to	100K	607	665	5.2	1.218 ±.062	1.281	2.000	.312 ±.032	.040
F-15	—	15 W	18 W	.1 to	250K	979	1072	9.0	1.780 ±.062	1.875	2.000	.375 ±.032	.040

* Maximum working voltage determined at .0008 dia. wire.

SPECIAL FEATURES All features of the conventional precision power resistors, plus the beryllium oxide core for optimum heat dissipation, allow reduction of physical size of resistor while maintaining equivalent power ratings of conventional types.



DERATING

Applicable to both F and T Series

Both OMI, T and F Series resistors have an operating temperature range of −55°C to 275°C (characteristic U) or to 350°C (characteristic V). Derating is required for high ambient temperatures in accordance with the curve shown at left.

N FN

NON-INDUCTIVE TYPES

Available with both Axial and Radial Leads

OMI Models of equivalent physical and electrical specifications are available with non-inductive windings. They are identified by the letter "N"; to order non-inductively wound T Series, specify "N"; to order non-inductively wound F Series, specify "FN".

NOTE: The following conditions apply to specifications applicable to the non-inductively wound types, as compared to the basic T or F types.

1. Maximum resistance must be diveded by 2.
2. Maximum working voltage must be multiplied by .707.
3. Maximum weights may slightly exceed those shown for the basic T or F types.

MINIATURE POWER RESISTORS

FR SERIES

Radial Leads

As in the OMI, TR Series, models of equivalent electrical, mechanical, power rating and derating specifications are available in FR3, FR5, FR5A, FR5C, FR6, FR10, FR12, and FR15 dimensions. These models are also available non-inductively wound and identified as the FNR Series.

TEMPERATURE COEFFICIENT

Although all OMI, T, F, HT and HF resistors are manufactured with a temperature coefficient of ±20PPM/°C over the full temperature range and resistance range as standard production, closer temperature coefficients are available.

Special Close T.C. Availability: All styles can be supplied with temperature coefficients of ±10PPM, ±5PPM, and ±2PPM. Non-inductively wound styles can be supplied with ±10PPM.

Temperature Range: −65°C to +275°C.

Tolerance Range: 0.05% to 5%.

Resistance Range: 0 to 2 watts, 25 ohms to maximum for each size.
Over 2 watts, 50 ohms to maximum for each size.

Code to Designate Special T.C: 10PPM C-10
5PPM C-5
2PPM C-2

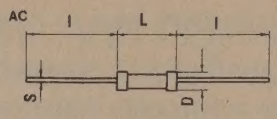
To Order Resistors with Special T.C., Specify:
(example)

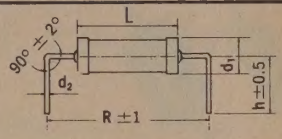
Resistor Type	Resistance Value	Tolerance	T.C. Code
T-5	4700 ohms	0.5%	C-5

PIHER INTERNATIONAL CORPORATION

CARBON FILM RESISTORS

LE OF TYPES AND VALUES



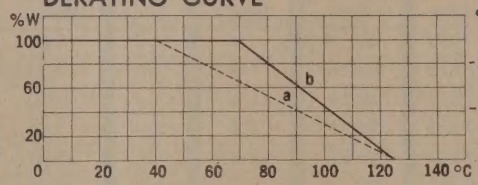


NOMINAL DISSIPATION) (WATTS)		0.250	0.33	0.50	1	2
DIMENSIONS (INCHES)	D	0.90	.125	.149	.268	.354
	L	.254	.363	.394	.620	.950
	S	.027	.027	.031	.031	.035
	l	1.238	1.184	1.170	1.250	1.092
LASS 5						
VOLTAGE	WORKING	150	350	500	750	750
	TEST	300	700	1000	1500	1500
HMIC	10%	5.1Ω - 470KΩ	10Ω - 2.7MΩ	10Ω - 10MΩ	10Ω - 10MΩ	10Ω - 10MΩ
VALVES	5%	5.1Ω - 330KΩ	10Ω - 2.7MΩ	50Ω - 10MΩ	50Ω - 10MΩ	50Ω - 10MΩ
MARKING		INTERNATIONAL COLOR CODE				
LASS 2						
VOLTAGE	WORKING	100	250	350	500	500
	TEST	200	400	500	750	750
HMIC	5%	5.1Ω - 330KΩ	10Ω - 2.7MΩ	10Ω - 10MΩ	10Ω - 10MΩ	10Ω - 10MΩ
VALVES	2%	5.1Ω - 56KΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	10Ω - 10MΩ
MARKING		INTERNATIONAL COLOR CODE				

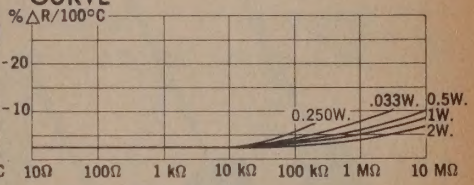
OPERTIES

- rt-time Overload Test: $\Delta R < 0.3\%$
- ulation Resistance: $R > 10^4$ Megohms
- rmal Shock: $\Delta R < 0.5\%$
- minal Strength: 3 Kgs.
- Temperature Test: $\Delta R < 0.1\%$
- rage Variation at One Year: 0.15%
- lectric Withstanding Voltage: 1000 V

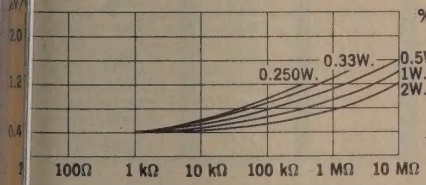
DERATING CURVE



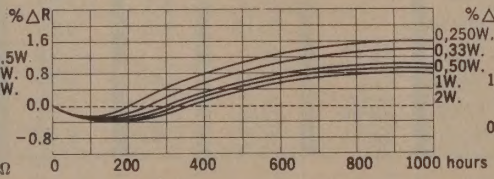
TEMPERATURE COEFFICIENT CURVE



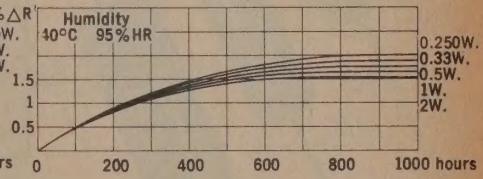
ISE LEVEL CURVE



LIFE CURVE

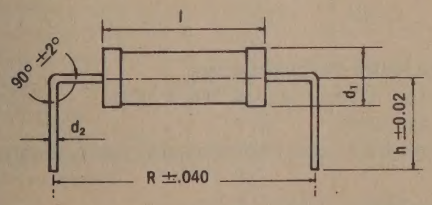


HUMIDITY CURVE



UT AND FORMED RESISTORS

TYLE U



Type Dimensions	¼ W.	⅓ W.	½ W.	1 W.	2 W.
R Minimum	.393	.487	.527	.761	1.073
l (in.)	.254 +.01	.363 +.01	.394 +.01	.615	.927 +.02
d_1 (in.)	.090	.120	.144	.268	.354
d_2 (in.)	.027	.027	.031	.031	.035

QUALITY PRODUCTS

- CARBON FILM RESISTORS
- TUBULAR AND DISC CAPACITORS
- TRIMMING CAPACITORS
- POTENTIOMETERS
- DIELECTRIC CERAMIC
- STEATITE
- SILICON SEMICONDUCTORS

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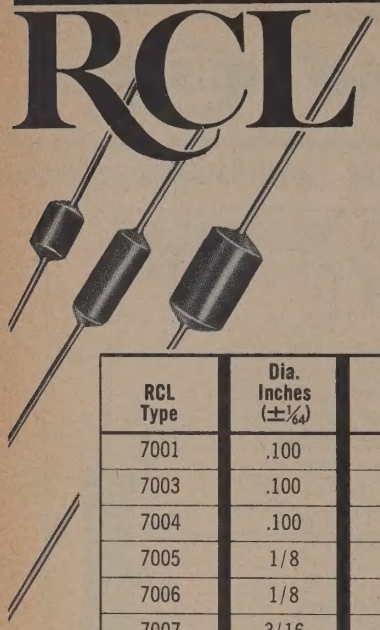
RCL *subminiature axial lead resistors*



These extremely small, encapsulated resistors meet and exceed the specifications of MIL-R-93D. Special RCL techniques also allow the production of custom sizes at minimal cost to the customer.

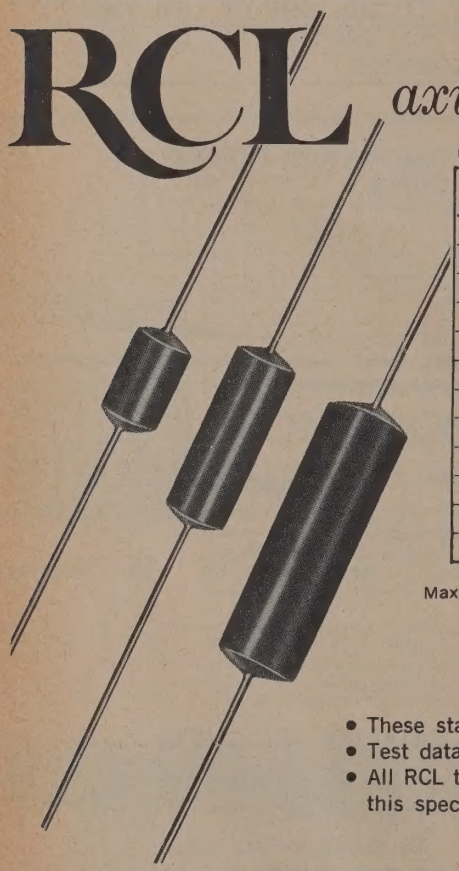
Tolerances available: from ±1.0% to ±0.001%

Temperature coefficient: Standard is ±10 PPM/°C.
Temperature coefficients available as low as ±1 PPM/°C.

RCL Type	Dia. Inches (±1/64)	Length Inches (±1/32)	Max. Watts	Max. Volts	Max. Res. .001 Wire	Max. Res. .0005 Wire	Non-inductive	Lead Diam. (Length 2" ±1/8")
7001	.100	.200	0.05	75	10K	100K	No	#26AWG
7003	.100	.260	0.05	100	10K	150K	No	#24AWG
7004	.100	.300	0.05	100	10K	250K	Yes	#24AWG
7005	1/8	1/4	0.1	100	10K	300K	Yes	#22AWG
7006	1/8	5/16	0.1	100	16K	350K	Yes	#22AWG
7007	3/16	3/8	0.125	200	60K	700K	Yes	#22AWG
7008	1/4	1/4	0.150	100	100K	1 Meg.	Yes	#20AWG
7009	1/4	11/32	0.25	200	127K	1.4 Meg.	Yes	#22AWG
7010	1/4	1/2	0.33	400	226K	3 Meg.	Yes	#20AWG

Maximum wattage rating is at 25° C through 125° C.

RCL *axial lead encapsulated resistors*



lead length: 2" ±1/8" #20 AWG, non-inductive winding

Type	MIL-R-93D Type	Dia. In. (±1/64)	Lgth In. (±1/32)	Maximum Watts	MIL Wattage	Maximum Volts	Max. Res. .001 Wire
7009	RB-56	1/4	11/32	0.25	0.125	200	127K
7010	RB-55	1/4	1/2	0.33	0.15	400	226K
7020	RB-54	1/4	3/4	0.50	0.25	400	511K
7030	RB-53	3/8	3/4	0.60	0.33	400	750K
7040	RB-52	3/8	1	1.00	0.50	800	1.5 Meg.
7044	—	1/2	1/2	0.50	—	400	1 Meg.
7045	—	1/2	5/8	0.60	—	400	1 Meg.
7045A	—	7/16	5/8	0.60	—	400	650K
7050	RB-57	1/2	1	1.25	0.75	800	2 Meg.
7050A	—	7/16	1	1.25	—	800	1.5 Meg.
7060	RB-58	1/2	1-1/2	1.50	1.0	900	3 Meg.
7070	RB-59	1/2	2	2.00	1.25	1,200	5 Meg.

Maximum wattage rating is from −55° C to +125° C.

MILITARY SPECIFICATIONS

- These standard sizes meet the physical dimensions of MIL-R-93D.
- Test data and approval information available.
- All RCL types meet and exceed the electrical and environmental characteristics of this specification.

INDUSTRY'S BEST DELIVERY

RCL ELECTRONICS, INC.

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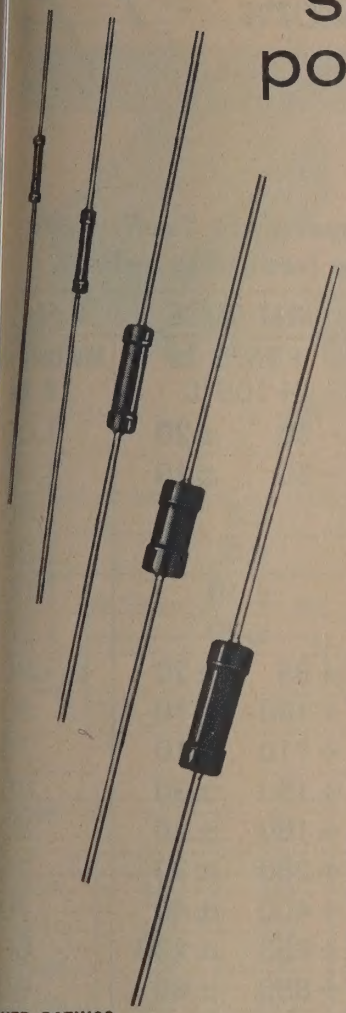
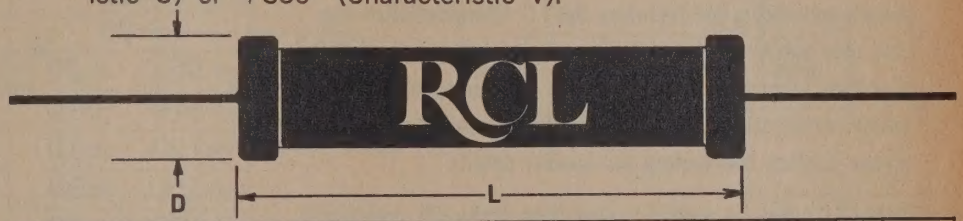
RCL SERIES T
silicone coated precision power wire-wound resistors



General Specifications Available:

- ☐ **Standard temperature coefficient:** ±10 PPM/°C. Additional TC's available from −50 PPM/°C to +6000 PPM/°C.
- ☐ **Tolerance:** ±1.0% is standard. Available to ±.01%.
- ☐ **Wattage Range:** ½ watts to 14 watts.
- ☐ **Resistance Values:** from .01 ohms to 275K. Higher values available.
- ☐ **Coating:** Silicone coating withstands moisture, salt, water immersion, and cleansing solutions.
- ☐ **Leads:** Tinned copperweld is standard. Leads are weldable and solderable.
- ☐ **Dielectric Strength:** 1000 VAC "V" block test.
- ☐ **Insulation Resistance:** 5000 Megohms minimum at 100 volts D.C.
- ☐ **Wide Temperature Range:** From −65°C to +275°C (Characteristic U) or +350° (Characteristic V).

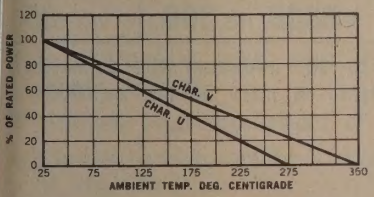


RCL TYPE	MIL-R 26 E TYPE	WATTAGE RATING U	WATTAGE RATING V	DIMENSIONS DIA. ±.031*	DIMENSIONS LEN. ±.062*	MAX. RESISTANCE RCL MAX.	MAX. RESISTANCE MIL-R 26 E MAX.	LEAD DIAM.
T-½A		.4		.078	.220	2.5K		#24
T-½		.75		.078	.330	7.5K		#24
T-1A		1.0	1.25	.093	.406	10K		#24
T-1A-70	RW-70	1.0		.094	.406 ±.031	10K	3.16K	#24
T-1B		1.1	1.30	.093	.530	12K		#24
T-1C		1.0		.093	.280	5K		#24
T-2		1.5		.156	.343	10K		#20
T-2A		3.0	3.75	.187	.500	22K		#20
T-2A-69	RW-69		3.00	.188 ±.063	.500 ±.063	22K	.91K	#20
T-2B		3.0	3.75	.188	.812	40K		#20
T-2B-79	RW-79	3.0		.187	.560	22K	10.5K	#20
T-2C		3.0	3.25	.250	.500	40K		#18
T-3		4.0	5.5	.250	.625	45K		#18
T-5		5.0	6.5	.312	.875	91K		#18
T-5-74	RW-74	5.0		.312	.875	95K	38.3K	#18
T-6		6.0	7.5	.312	1.000	95K		#18
T-6-67	RW-67		6.5	.313 ±.063	1.000 ±.094	95K	3.6K	#20
T-7		7.0	9.00	.312	1.185	100K		#18
T-7A		7.0	9.00	.375	1.375	150K		#18
T-7A-55	RW-55		7.00	.469 ±.094	1.375 ±.094	150K	9.1K	#20
T-10		10.0	13.00	.375	1.812	250K		#18
T-10-78	RW-78	10.0		.375	1.780	260K	90.9K	#18
T-10-68	RW-68		11.00	.344 ±.094	1.875 $^{+.063}_{-.125}$	265K	8.2K	#20
T-10A		10.5	14.00	.375	1.925	275K		#18
T-10-A-56	RW-56		14.00	.469 ±.094	2.000 ±.094	275K	16K	#20

Lead Length: 1¼" minimum. * Tolerance applies to all types unless otherwise indicated.

POWER RATINGS:
The RCL "T" Series has two power ratings, depending on operating temperature and stability requirements:
CHARACTERISTIC U: 275°C maximum hot-spot temperature.
CHARACTERISTIC V: 350°C maximum hot-spot temperature.

DERATING:
RCL Series "T" resistors have an operating temperature range of −65°C to +275°C (Characteristic U), or to +350°C (Characteristic V).



Ultra-fast delivery for prototpyes and initial production needs.

RCL ELECTRONICS, INC.

General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-999-5511

RCL *special temperature coefficient wire wound resistors*

- Applications include transistor circuits, zener diode temperature compensation, temperature measuring devices.
- Available in a range of temperature coefficients from −50 ppm/°C. to +6,000 ppm/°C.
- Values range from 10 ohms to 5 megohms.
- All available with axial or printed circuit leads.
- All meet applicable paragraphs of Mil-R-93D

These special T.C.'s are arrived at by the blending of special metals and alloys, and therefore the T.C. characteristics may vary over extremes of temperature. Each of these alloys has a special temperature characteristic. If your specific application necessitates coverage over a wide temperature range, please contact the factory for special details.

These T.C.s may be applied to almost all of the RCL precision and power resistors. Write for catalog for complete details.

Considerable attention should be paid to the column headed "R FACTOR". This factor should be applied to the "MAX RESISTANCE" values found for the style chosen in the normal catalog listing, and the resulting figure becomes the true maximum resistance for this high T.C. unit. This is caused by the varying resistivities of the metals used to obtain the listed T.C.'s.

Special Temperature Coefficients available (see table below)

COLD RANGE	HEAT RANGE	R FACTO
−55°C to +25°C	+25°C to +105°C	Multiply Max. R by
−50 ±20	−50 ±20	1.00
−30 ±10	−30 ±10	1.00
±3	±3	1.00
±5	±5	1.00
±10	±10	1.00
±20	±20	1.00
+95 ±20	+85 ±20	.80
+110 ±10	+100 ±10	.80
+120 ±10	+110 ±10	.75
+150 ±30	+150 ±30	.85
+180 ±20	+180 ±20	.80
+280 ±30	+280 ±30	.25
+380 ±40	+400 ±40	.70
+700 ±200	+650 ±200	.60
+850 ±80	+850 ±80	.60
+1100 ±100	+1050 ±100	.50
+1250 ±100	+1150 ±100	.50
+1500 ±200	+1450 ±200	.55
+2600 ±200	+2550 ±200	.50
+3400 ±300	+3600 ±300	.36
+4000 ±400	+4500 ±400	.10
+5000 ±300	+6000 ±300	.05

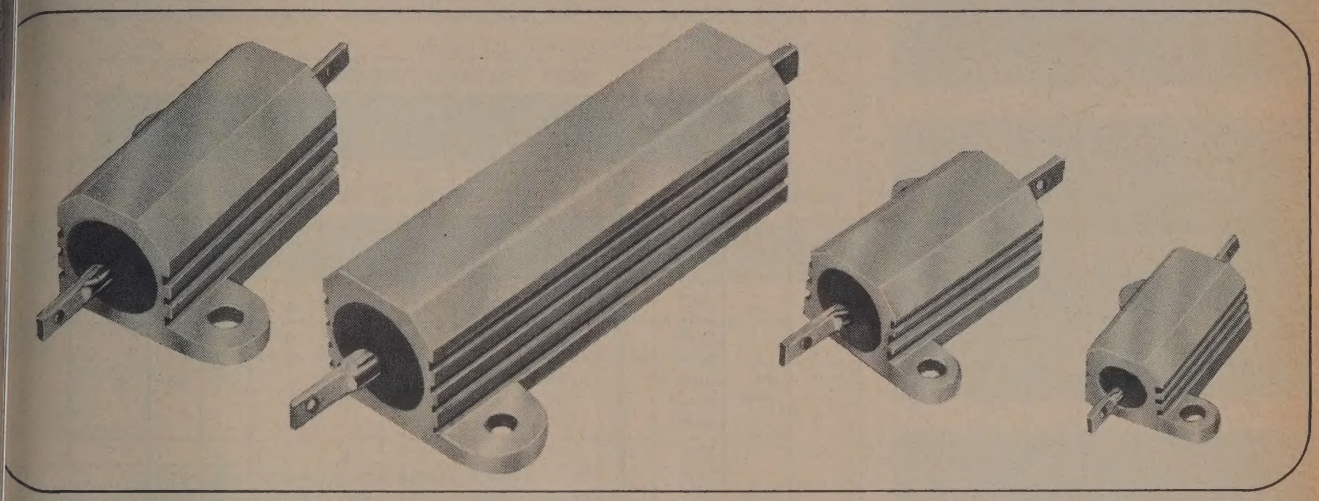
Above T.C.'s refer to .001 minimum wire diameter. Some alloys available in sizes as low as .0007.

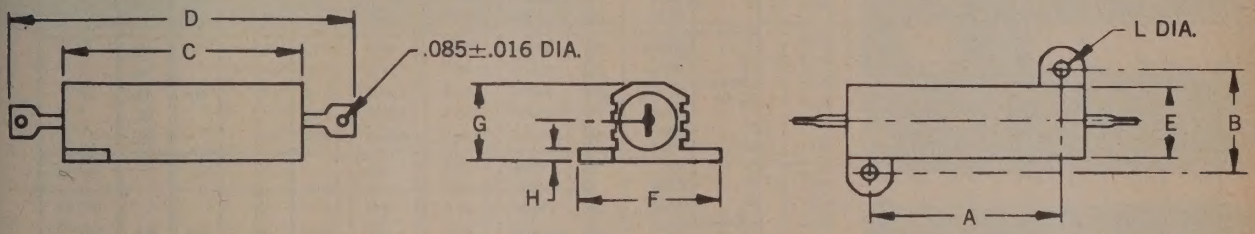
INDUSTRY'S BEST DELIVERY

RCL **ELECTRONICS, INC.**

General Sales Office
700 South 21st Street,
Irvington, N. J. 07111
(Area Code 201) 374-3311
TWX 710-999-5511

RCL aluminum housed precision power resistors





TYPE	A	B	C	D	E	F	G	H	L	MIL-Type
Tol.	±.005	±.005	±.032	±.062	±.015	±.015	±.015	±.010	±.005	—
AL-5	.445	.490	.600	1.125	.335	.645	.321	.065	.094	RE-60
AL-10	.562	.625	.750	1.375	.420	.795	.400	.074	.094	RE-65
AL-25	.750	.780	1.060	1.940	.530	1.075	.560	.087	.125	RE-70
AL-50	1.562	.845	1.970	2.780	.615	1.135	.615	.087	.125	RE-75

FEATURES

- Tolerance: Available from ±3% to ±.01%.
- Standard T.C.: ±10 PPM/°C. Lower T.C.'s are available.
- All popular types, 5 watts through 50 watts
- Molded and welded construction
- Screw mounts on chassis
- Exceptionally high stability at all conventional power ratings
- Utilizes heat-sink effect of chassis
- Clearly marked on top surface of housing for ease of identification after mounting
- Exceeds MIL-R-18546D
- Complete protection against environment

RCL TYPE	MIL-R-18546D TYPE	POWER RATING* (WATTS) RCL	POWER RATING* (WATTS) MIL	RESISTANCE RANGES (OHMS)	MAX. WORKING VOLTAGE	MAX. WT. GRAMS
AL-5	RE-60G	7.5	5	.05 to 24.5K	160	3
AL-10	RE-65G	12.5	10	.05 to 47.1K	265	6
AL-25	RE-70G	25	20	.05 to 95.2K	550	14
AL-50	RE-75G	50	30	.05 to 273K	1250	29

Rating based on chassis mounting.

NON INDUCTIVE STYLES:
The same physical and electrical specifications are available with non-inductive winding. They are identified by adding the letter N after the AL identification.

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General Sales Office:
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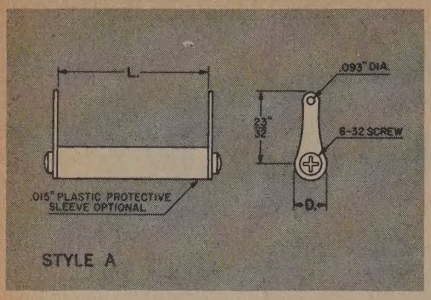
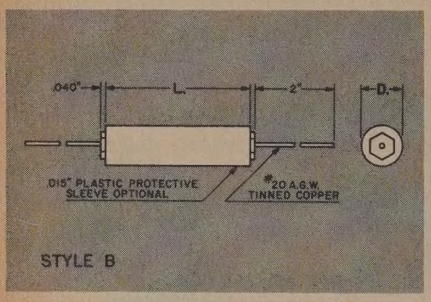


STYLE A



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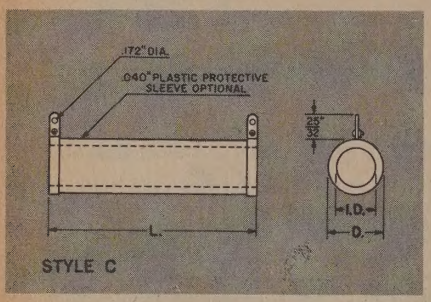

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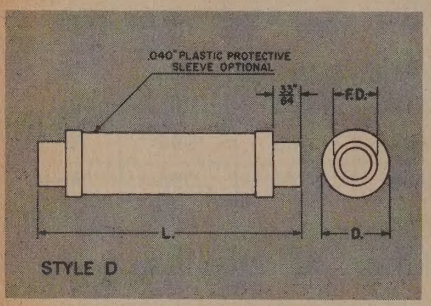
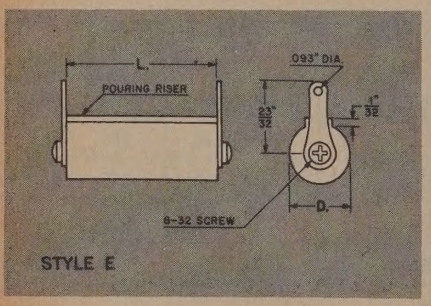


STYLE D



STYLE E

Resistance Products Co.

914 SOUTH 13TH STREET
HARRISBURG, PA 17104
PHONE 717-236-5081
TWX = 510 650-4920

SPECIFICATIONS

The following charts list the specifications for more than 150 standard and precision carbon film resistors. For special values or configurations, consult the factory.

HIGH VOLTAGE RESISTORS

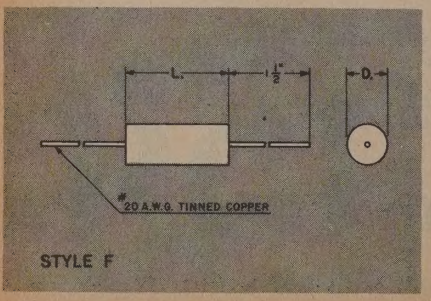
TERMINAL	TYPE	WATTS MAX.	VOLTS MAX.	OHMS MIN.	OHMS MAX.	DIMENSIONS INCHES L	D	ID	FD	DWG. STYLE
Radial Lugs	BBF	1	3500	10 K	10 G	1	5/16 *	NA	NA	A
	BBM	2	7500	10 K	25 G	1 3/4	5/16 *			
	BBR	3	15000	20 K	25 G	3	5/16 *			
	BBV	5	30000	40 K	25 G	5 1/2	5/16 *			
	BFQ	4	15000	20 K	25 G	2 1/2	5/16 *			
	BFT	6	25000	40 K	25 G	4	5/16 *			
	BFW	10	40000	70 K	25 G	6 1/2	5/16 *			
Axial Wire Leads	BAEW	.5	2500	10 K	1 G	3/4	1/4 *	NA	NA	B
	BAKW	1	5000	20 K	2 G	1 1/2	1/4 *			
	BBFW	1	3500	10 K	10 G	1	5/16 *			
	BBMW	2	7500	10 K	25 G	1 3/4	5/16 *			
	BBRW	3	15000	20 K	25 G	3	5/16 *			
Radial Bands	DJU	10	25 KV	50 K	100 G	4 1/2	3/4 **	1/2	NA	C
	DPW	20	35 KV	100 K	100 G	6 1/2	1 1/8 **	3/4		
	DPX	30	65 KV	200 K	100 G	10 1/2	1 1/8 **	3/4		
	DVY	60	90 KV	400 K	100 G	14 1/2	1 1/2 **	1 1/8		
	DZW	35	40 KV	300 K	100 G	6 1/2	2 **	1 3/16		
	DZZ	100	125 KV	700 K	100 G	18 1/2	2**	1 3/16		
Ferrule Ends	DPW-1	20	35 KV	100 K	100 G	7 11/16	1 1/8 **	NA	13/16	D
	DPX-1	30	65 KV	200 K	100 G	11 11/16	1 1/8 **		13/16	
	DVY-1	60	90 KV	400 K	100 G	15 11/16	1 1/2 **		1 3/64	
	DZW-1	35	40 KV	300 K	100 G	7 11/16	2 **		1 3/64	
	DZZ-1	100	125 KV	700 K	100 G	19 11/16	2**		1 3/64	
Radial Lugs	EBF	1	3500	10 K	1 G	1	7/16	NA	NA	E
	EBM	2	7500	10 K	1 G	1 3/4	7/16			
	EBR	3	15000	20 K	1 G	3	7/16			
	EBV	4	30000	40 K	1 G	5 1/2	7/16			
	EFQ	4	15000	20 K	1 G	2 1/2	3/4			
	EFT	5	25000	40 K	1 G	4	3/4			
	EFW	8	40000	70 K	1 G	6 1/2	3/4			
Axial Wire Leads	EAEW	.5	2500	10 K	1 G	1	5/16	NA	NA	F
	EAKW	1	5000	20 K	1 G	1 3/4	5/16			
Axial Wire Leads	EBFW	1	3500	10 K	1 G	1	7/16	NA	NA	G
	EBMW	2	7500	10 K	1 G	1 3/4	7/16			
	EBRW	3	15000	20 K	1 G	3	7/16			
Radial Bands	EJU	8	25 KV	50 K	1 G	4 1/2	1	1/2	NA	H
	EPW	16	35 KV	100 K	1 G	6 1/2	1 3/8	3/4		
	EPX	24	65 KV	200 K	1 G	10 1/2	1 3/8	3/4		
	EVY	48	90 KV	400 K	1 G	14 1/2	1 3/4	1 1/8		
	EZW	28	40 KV	300 K	1 G	6 1/2	2 5/16	1 3/16		
	EZZ	80	125 KV	700 K	1 G	18 1/2	2 5/16	1 3/16		
Ferrule Ends	EPW-1	16	35 KV	100 K	1 G	7 11/16	1 3/8	NA	13/16	I
	EPX-1	24	65 KV	200 K	1 G	11 11/16	1 3/8		13/16	
	EVY-1	48	90 KV	400 K	1 G	15 11/16	1 3/4		1 3/64	
	EZW-1	28	40 KV	300 K	1 G	7 11/16	2 5/16		1 3/64	
	EZZ-1	80	125 KV	700 K	1 G	19 11/16	2 5/16		1 3/64	

All dimensional tolerances ±1/64" or 1% whichever is greater.

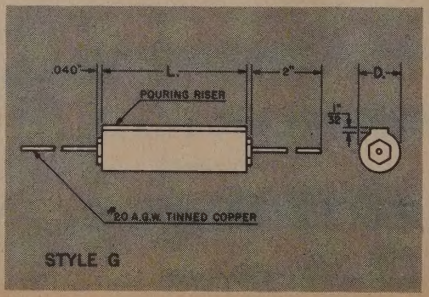
* Unless otherwise specified all type B resistors are normally supplied sleeved with a .015 wall clear vinyl sleeving which increases the diameter shown by .03.

Order resistors without sleeving if units are to be operated near maximum limits, at elevated ambient, or in all coolant.

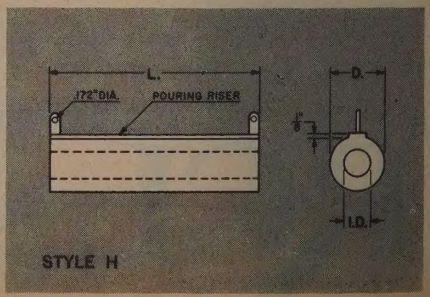
** Sleeving available on request. Increase dia. shown by .08.



STYLE F



STYLE G



STYLE H

Resistance Products Co.

914 SOUTH 13TH STREET • HARRISBURG, PENNSYLVANIA 17104
PHONE 717-236-5081 • TWX #510 650-4920

Help stamp out resistance problems
***specify* — RPC Precision Carbon Film Resistors!**

MILITARY OR COMMERCIAL RESISTORS

TERMINAL	TYPE	WATTS MAX.	VOLTS MAX.	OHMS MIN.	OHMS MAX.	DIMENSIONS INCHES L	DIMENSIONS INCHES D	MIL SPEC	DWG. STYLE
Axial Wire Leads	HSB[1]	.5	2500	1 M	1 T	7/8	0.345	MIL-R-14293 Style RM30S	K
	HSK[1]	1	5000	1 M	5 T	1 5/8	0.345	MIL-R-14293 Style RM50U	
	FAC[2]	.25	250	20	10 M	9/16	0.10	MIL-R-10683	J

[1] Hermetic
[2] Non-Hermetic

PRECISION TOLERANCE RESISTORS

TERMINAL	TYPE	MAX. WATTS	VOLTS MAX.	RESISTANCE VALVE (MAX.) ±2%	RESISTANCE VALVE (MAX.) ±1%	DIMENSIONS INCHES L	DIMENSIONS INCHES D	DWG. STYLE
Radial Lugs	BP-2	2	10 KV	20 G	5 G	2	5/16	A
	BP-4	4	15 KV	50 G	10 G	3 1/2	5/16	
	BP-6	6	30 KV	50 G	10 G	6	5/16	
	BP-8	8	30 KV	50 G	10 G	5	5/16	
	BP-10	10	60 KV	50 G	10 G	11	5/16	
	BP-12	12	50 KV	50 G	10 G	8	5/16	
	BP-20	20	80 KV	50 G	10 G	13	5/16	
Axial Wire Leads	BP-1W	1	5 KV	2 G	1 G	1 1/2	1/4	B
	BP-2W	2	10 KV	20 G	5 G	2	5/16	
	BP-4W	4	15 KV	50 G	10 G	3 1/2	5/16	
	BP-6W	6	30 KV	50 G	10 G	6	5/16	
Radial Lugs	EBP-2	2	10 KV	2 G	500 M	2	7/16	E
	EBP-4	4	15 KV	2 G	500 M	3 1/2	7/16	
	EBP-6	6	30 KV	2 G	500 M	6	7/16	
	EBP-8	8	30 KV	2 G	500 M	5	3/4	
	EBP-9	9	60 KV	2 G	500 M	11	7/16	
	EBP-10	10	50 KV	2 G	500 M	8	3/4	
	EBP-16	16	80 KV	2 G	500 M	13	3/4	
Axial Wire Leads	EBP-1W	1	5 KV	1 G	100 M	1 1/2	5/16	G
	EBP-2W	2	10 KV	2 G	500 M	2	7/16	
	EBP-4W	4	15 KV	2 G	500 M	3 1/2	7/16	
	EBP-6W	6	30 KV	2 G	500 M	6	7/16	
Radial Lugs	HP-2	2	10 KV	100 G	25 G	2	5/16	A
	HP-4	4	15 KV	100 G	25 G	3 1/2	5/16	
	HP-6	6	30 KV	100 G	25 G	6	5/16	
	HP-8	8	30 KV	100 G	25 G	5	5/16	
	HP-10	10	60 KV	100 G	25 G	11	5/16	
	HP-12	12	50 KV	100 G	25 G	8	5/16	
	HP-20	20	80 KV	100 G	25 G	13	5/16	
Axial Wire Leads	HP-1W	1	5 KV	100 G	25 G	1 1/2	1/4	B
	HP-2W	2	10 KV	100 G	25 G	2	5/16	
	HP-4W	4	15 KV	100 G	25 G	3 1/2	5/16	
	HP-6W	6	30 KV	100 G	25 G	6	5/16	

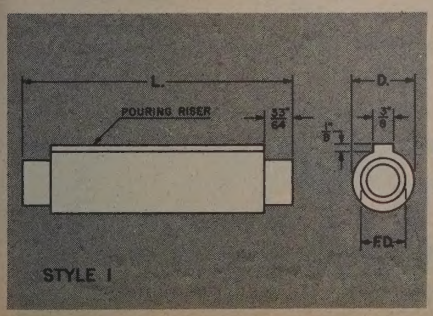
HIGH FREQUENCY RESISTORS

TERMINAL	TYPE	WATTS MAX.	VOLTS MAX.	OHMS MIN.	OHMS MAX.	DIMENSIONS INCHES L	DIMENSIONS INCHES D	DIMENSIONS INCHES ID	DIMENSIONS INCHES FD	DWG. STYLE
Radial Lugs	FBF	1	500	20	25 M	1	5/16	NA	NA	A
	FBM	2	1000	25	50 M	1 3/4	5/16			
	FBR	3	2000	35	100 M	3	5/16			
	FBV	5	3700	60	100 M	5 1/2	5/16			
	FFQ	4	1500	20	50 M	2 1/2	5/16			
	FFT	6	2800	25	75 M	4	5/16			
	FFW	10	4500	40	100 M	6 1/2	5/16			
Axial Wire Leads	FAEW	.5	400	20	20 M	3/4	1/4	NA	NA	B
	FAKW	1	800	25	40 M	1 1/2	1/4			
	FBFW	1	500	20	25 M	1	5/16			
	FBMW	2	1000	25	50 M	1 3/4	5/16			
	FBRW	3	2000	35	100 M	3	5/16			
Radial Bands	GJU	10	3000	20	50 M	4 1/2	3/4	1/2	NA	C
	GPW	20	4000	20	50 M	6 1/2	1 1/8	3/4		
	GZW	35	4500	20	35 M	6 1/2	2	1 5/16		
	GPX	30	7000	30	100 M	10 1/2	1 1/8	3/4		
	GVY	60	10000	35	100 M	14 1/2	1 1/2	1 1/8		
	GZZ	100	12500	30	100 M	18 1/2	2	1 5/16		
Ferrule Ends	GPW-1	20	4000	20	50 M	7 11/16	1 1/8	NA	13/64	D
	GZW-1	35	4500	20	35 M	7 11/16	2		1 3/64	
	GPX-1	30	7000	30	100 M	11 11/16	1 1/8		13/64	
	GVY-1	60	10000	35	100 M	15 11/16	1 1/2		1 3/64	
	GZZ-1	100	12500	30	100 M	19 11/16	2		1 3/64	

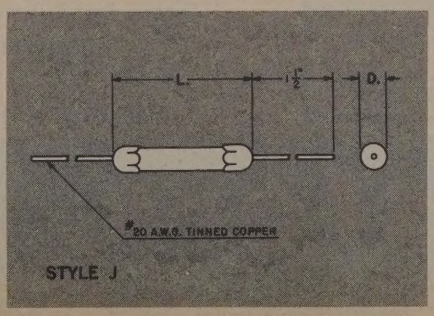
HIGH MEGOHM RESISTORS

TERMINAL	TYPE	WATTS MAX.	VOLTS MAX.	OHMS MIN.	OHMS MAX.	DIMENSIONS INCHES L	DIMENSIONS INCHES D	DIMENSIONS INCHES ID	DIMENSIONS INCHES FD	DWG. STYLE
Radial Lugs	HBF	1	3500	1 M	25 T	1	5/16 ***	NA	NA	A
	HBM	2	7500	1 M	50 T	1 3/4	5/16 ***			
	HBR	3	15000	1 M	100 T	3	5/16 ***			
	HBV	5	30000	1 M	100 T	5 1/2	5/16 ***			
	HFQ	4	15000	1 M	100 T	2 1/2	5/16 ***			
	HFT	6	25000	1 M	100 T	4	5/16 ***			
	HFW	10	40000	1 M	100 T	6 1/2	5/16 ***			
	HACW	.25	1000	10 M	10 G	9/16	0.10	NA	NA	J
	HADW	.5	5000	10 M	10 G	1	0.10			
Axial Wire Leads	HAEW	.5	2500	1 M	1 T	3/4	1/4	NA	NA	B
	HAKW	1	5000	1 M	5 T	1 1/2	1/4			
	HBFW	1	3500	1 M	25 T	1	5/16			
	HBMW	2	7500	1 M	50 T	1 3/4	5/16			
	HBRW	3	15000	1 M	100 T	3	5/16			

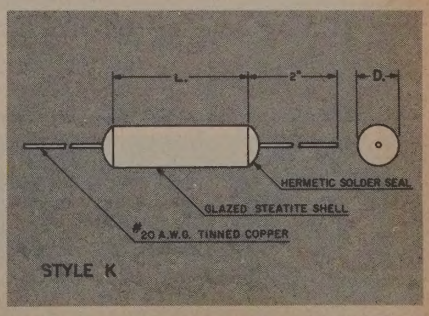
*** Values up to 10 Gigaohms are provided with .015 plastic sleeves, increasing overall diameter by .03 inch. Resistors of greater than 10 G, and Types HACW, HADW, are provided with special coating to minimize effects of handling and humidity, no change in diameter.



STYLE I



STYLE J



STYLE K

Over 25 Years' *Versatile* OHMIC CAPABILITY Meet Your Wirewound Resistor Requirements

AXIAL LEAD

No.	Watts	Resistance Min. Max.	Dimensions O.D. x Lgth.
3 AX	3	0.1- 10,000	1/4 max. x 9/16
5 AX	5	0.1- 30,000	11/32 max. x 1 1/16
10 AX	10	0.1- 50,000	13/32 max. x 1 5/16

MIL-R-26 AXIAL LEAD

RW67V	6.5	0.10- 3,600	11/32 x 1 1/16
RW68V	11	0.10- 8,200	13/32 x 1 5/16
RW69V	3	0.10- 910	1/4 x 9/16

Silicone-base coated, moisture-resistant.
TC = 0 ± 20 ppm/°C, 10 ohms and above.
Commercial equivalents available.

FIXED LUG

No.	Wattage	Resistance Min.-Max.	Max. Dimensions O.D. x Lgth.
1 M	5	0.1- 11,000	5/16 x 1
1 3/4 M	10	0.1- 50,000	5/16 x 1 3/4
2 E	20	0.25-100,000	7/16 x 2
2 B	25	0.25-100,000	9/16 x 2
4 B	50	0.5-175,000	9/16 x 4
6 1/2 C	100	1.0-300,000	3/4 x 6 1/2
8 1/2 R	160	1.0-300,000	1 1/8 x 8 1/2
10 1/2 R	200	1.0-400,000	1 1/8 x 10 1/2

MIL-R-26 FIXED LUG

RW29V	11	0.10- 5,600	7/16 x 1 3/4
RW30V	11	0.10- 2,700	9/16 x 1
RW31V	14	0.10- 6,800	9/16 x 1 1/2
RW32V	17	0.10-10,000	9/16 x 2
RW33V	26	0.10-18,000	9/16 x 3
RW35V	55	0.10-43,000	29/32 x 4

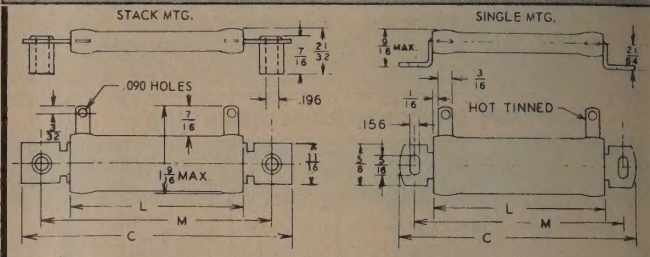
ADJUSTABLE

No.	Wattage	Resistance Min.-Max.	Max. Dimensions O.D. x Lgth.
1 3/4 MA	10	1.0- 10,000	5/16 x 1 3/4
2 BA	25	1.0- 25,000	9/16 x 2
4 BA	50	1.0-100,000	9/16 x 4
6 BA	75	1.0-100,000	9/16 x 6
6 1/2 CA	100	1.0-100,000	3/4 x 6 1/2
8 1/2 RA	160	1.0-100,000	1 1/8 x 8 1/2
10 1/2 RA	200	1.0-100,000	1 1/8 x 10 1/2

MIL-R-19365 ADJUSTABLE

RX29V	11	1- 470	7/16 x 1 3/4
RX32V	17	1- 910	9/16 x 2
RX33V	26	1-1,500	9/16 x 3
RX35V	55	1-3,600	29/32 x 4

FLAT OVAL



Watts* Free Air	Core—L	Min. Ohms	Max. Ohms	Mounting	C	M
30	1 1/4	0.1	10K	Single Stack	2 1/8 2 1/2	1 3/4 2
40	2	0.2	30K	Single Stack	2 7/8 3 1/4	2 1/2 2 3/4
55	3 1/2	0.3	60K	Single Stack	4 3/8 4 3/4	4 4 1/4
65	4 3/4	0.4	85K	Single Stack	5 5/8 6	5 1/4 5 1/2
75	6	0.5	100K	Single Stack	6 7/8 7 1/4	6 1/2 6 3/4

MINIATURE, FLAT OVAL

Construction similar to above large size resistors.

WATTS* Free Air	Min. Ohms	Max. Ohms
10	1.0	15 K
15	1.0	25 K
20	1.0	50 K

Write for Bulletin RMF 5.0/1068

*Ratings of large and miniature, flat oval resistors based on mounting on steel panel 10" x 10" x .040". When mounted on non-metallic surface, reduce wattage approximately 15%.

RIBBON-WOUND RESISTORS

Watts	Core Size D	Core Size L	Ohms Min. Res.	Ohms Max. Res.	Watts	Core Size D	Core Size L	Ohms Min. Res.	Ohms Max. Res.
400	1 1/8	11 1/4	0.24	18.00	135	3/4	5	0.06	4.25
375	1 1/8	10 1/2	0.22	16.50	105	3/4	4	0.04	3.00
300	1 1/8	8 1/2	0.17	13.00	100	3/4	3 1/2	0.03	2.40
240	1 1/8	6 1/2	0.11	8.20	135	9/16	6	0.06	5.50
185	1 1/8	5	0.09	6.40	105	9/16	5	0.05	3.65
180	3/4	6 1/2	0.08	6.00	90	9/16	4	0.04	2.75

Available with adjustable tap bands or with tapped windings.

NON-INDUCTIVE RESISTORS: for high frequency power circuits. Available in all fixed-lug types, 10 watts and larger. Standard tolerances: ±10%.

RESISTANCE TOLERANCES: Standard: ±5%, 1.0 ohm and over. Special: down to ±1%.

Write For Complete Catalog

resistors, inc.

CUSTOM DESIGNING, ENGINEERING, MANUFACTURING

5226 West 26th Street, Chicago, Illinois 60650
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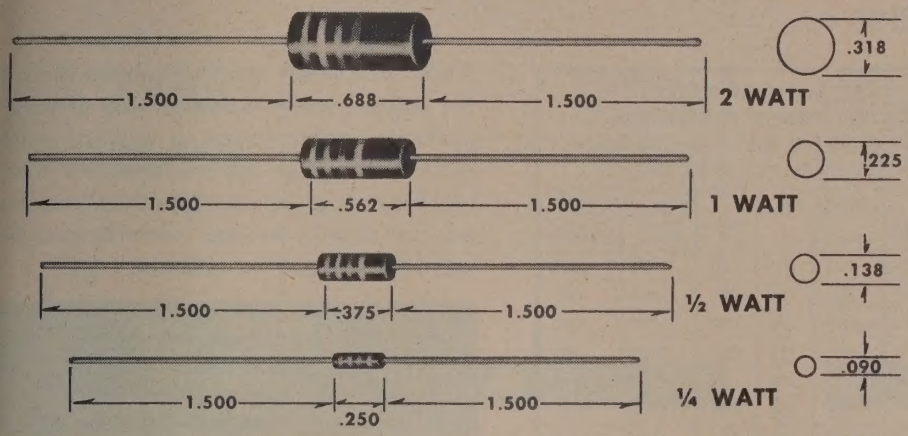
STACKPOLE

FIXED COMPOSITION RESISTORS



Stackpole Resistors offer superior performance in terms of load life, moisture resistance, shelf life, and other important characteristics. Available in ¼, ½, 1, and 2 watt insulated types in resistance values with 5%, 10% and 20% tolerances as shown below.

EASIEST SOLDERING

is asured thanks to an exclusive extra solder coating applied after the usual tin dipping. Leads of Stackpole Resistors solder readily by any method—dip or iron—stay tarnish free even after months in storage. And, their baked-on color codes resist solvent scrubbing operations . . . maintain uniform, attractive appearance.

269 STANDARD VALUES FOR MODERN CIRCUITRY

±20%	±10%	±5%	±20%	±10%	±5%	±20%	±10%	±5%	±20%	±10%	±5%
10	10	10		390	390	15000	15000	15000		560000	560000
		11			430			16000			620000
	12	12	470	470	470		18000	18000	680000	680000	680000
		13			510			20000			750000
15	15	15		560	560	22000	22000	22000		820000	820000
		16			620			24000			910000
	18	18	680	680	680		27000	27000	1.0 Meg	1.0 Meg	1.0 Meg
		20			750			30000			1.1 Meg
22	22	22		820	820	33000	33000	33000		1.2 Meg	1.2 Meg
		24			910			36000			1.3 Meg
	27	27	1000	1000	1000		39000	39000	1.5 Meg	1.5 Meg	1.5 Meg
		30			1100			43000			1.6 Meg
33	33	33		1200	1200	47000	47000	47000		1.8 Meg	1.8 Meg
		36			1300			51000			2.0 Meg
	39	39	1500	1500	1500		56000	56000	2.2 Meg	2.2 Meg	2.2 Meg
		43			1600			62000			2.4 Meg
47	47	47		1800	1800	68000	68000	68000		2.7 Meg	2.7 Meg
		51			2000			75000			3.0 Meg
	56	56	2200	2200	2200		82000	82000	3.3 Meg	3.3 Meg	3.3 Meg
		62			2400			91000			3.6 Meg
68	68	68		2700	2700	100000	100000	100000		3.9 Meg	3.9 Meg
		75			3000			110000			4.3 Meg
	82	82	3300	3300	3300		120000	120000	4.7 Meg	4.7 Meg	4.7 Meg
		91			3600			130000			5.1 Meg
100	100	100		3900	3900	150000	150000	150000		5.6 Meg	5.6 Meg
		110			4300			160000			6.2 Meg
	120	120	4700	4700	4700		180000	180000	6.8 Meg	6.8 Meg	6.8 Meg
		130			5100			200000			7.5 Meg
150	150	150		5600	5600	220000	220000	220000		8.2 Meg	8.2 Meg
		160			6200			240000			9.1 Meg
	180	180	6800	6800	6800		270000	270000	10.0 Meg	10.0 Meg	10.0 Meg
		200			7500			300000			11.0 Meg
220	220	220		8200	8200	330000	330000	330000		12.0 Meg	12.0 Meg
		240			9100			360000			13.0 Meg
	270	270	10000	10000	10000		390000	390000	15.0 Meg	15.0 Meg	15.0 Meg
		300			11000			430000			16.0 Meg
330	330	330		12000	12000	470000	470000	470000		18.0 Meg	18.0 Meg
		360			13000			510000			20.0 Meg
									22.0 Meg	22.0 Meg	22.0 Meg

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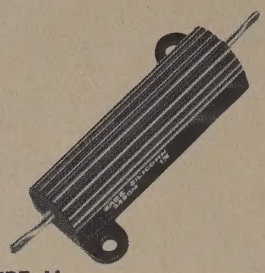
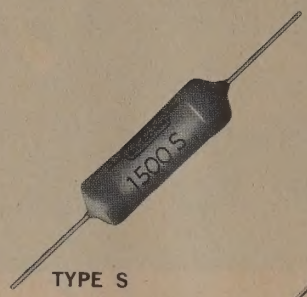
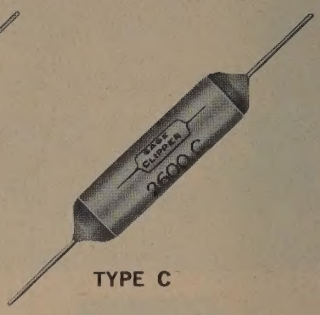


TYPE M



TYPE S



TYPE C

TYPE C CLIPPER METAL SHEATHED RESISTORS

Similar in all respects to Type S, fully insulated plus addition of metal sleeve for heat sink mounting in spring clip holders.

TYPE S, NS SILICONE COATED POWER RESISTORS

Meet or exceed MIL-R-26D requirements. N designates non-inductive.

STYLE	Rating Watts		STYLE	Rating Watts	Nominal Size Length	Nominal Size Dia.	Lead Dia.	Standard Range, Ω Regular Winding	Standard Range, Ω Non-Inductive*
	Full heat sink rating		100S	1	.400	.094	.020	8400	3000
			200S	2	.400	.125	.020	11000	3900
			300S	3	.400	.187	.020	15000	5300
			250S	.5	.250	.078	.020	3800	1350
			500S	.8	.312	.078	.020	5000	1750
			750S	1	.531	.094	.020	12000	4200
			1000S	1	.406	.094	.020	8400	3000
			1100S	2	.500	.125	.032	15000	5500
			1150S	2	.687	.125	.032	25500	9000
2200C	6	→	1200S	3	.500	.187	.032	20000	7000
			1230S	3	.500	.219	.040	20000	7000
			1240S	3	.562	.187	.032	24000	8400
2250C	6	→	1250S	3	.812	.187	.032	40000	14000
			1300S	3	.625	.250	.040	30000	10500
2400C	7	→	1400S	4	.750	.250	.040	42000	15000
			1500S	5	.875	.312	.040	71000	25000
2550C	11	→	1550S	5	1.000	.312	.040	88000	31000
2600C	14	→	1600S	7	1.219	.312	.040	114000	40000
2650C	16	→	1650S	8	1.375	.375	.040	170000	60000
			1700S	10	1.781	.375	.040	230000	80000
2750C	20	→	1750S	10	1.937	.375	.040	257000	90000
			1900S	10	1.375	.431	.040	210000	73000
			1950S	11	1.937	.431	.040	314000	110000

*S styles only

SAGE SILICOHM® fixed wirewound units ar not ordinary power resistors. They provide re markable miniaturization vs required wattag performance. Sage has pioneered the area o power handling capacity combined with preci sion and stability features ordinarily associated with MIL-R-93 and like resistors.

TYPE SB & NSB HIGH WATTAGE COMMERCIAL BERYLLIA CORE RESISTORS

STANDARD SOLDERABLE LEADS	STANDARD WELDABLE LEADS	RATED WATTS G	RATED WATTS V	Approx. Grams WEIGHT
250SB	257SB	1	1.5	.18
500SB	507SB	1.5	2	.28
1000SB	1007SB	2.25	2.75	.32
1200SB	1207SB	3.5	4.5	1.0
1230SB		5	6.5	1.1
1240SB	1247SB	4	5	1.1
1250SB	1257SB	4.5	6	1.2
1300SB	1307SB	6	8	1.8
1500SB	1507SB	7	9	3.6
1600SB	1607SB	9	12	4.2
1700SB	1707SB	14	18	7.3

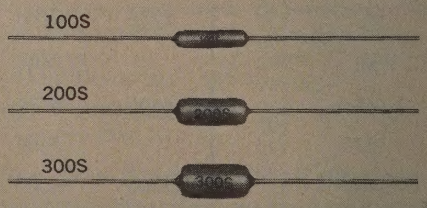
One watt 250SB actual size.

TYPE S CONSTRUCTION

Showing ceramic core, spaced single layer winding welded to monel cap, and multiple layer Impervohm® coating.

MINIATURE TYPE S "CORDWOOD" SERIES

1, 2, 3 watt .4 inch body length



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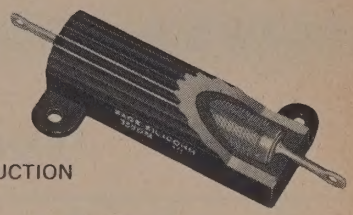
For complete specifications request Catalog R-66

INDUSTRY'S FINEST RESISTORS...Commercial, Military, High Reliability

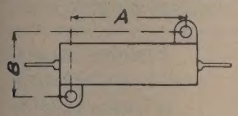
TYPE M METAL CLAD CHASSIS MOUNT RESISTORS



TYPE M CONSTRUCTION

luminum housed resistors for heat sink ounting. Meet or exceed requirements f MIL-R-18546D. Dielectric strength to 500 volts rms.

ll dimensions are inches nominal. Comlete specifications available on request.



STYLE	Rating Watts	A	B	Max. Resistance Ω Regular Winding	Max. Resistance Ω Non-Induct.
3105M	8	.444	.490	24,000	8,400
3010M	14	.562	.625	30,000	10,500
3225M	25	.719	.781	71,000	25,000
3550M	50	1.562	.844	230,000	80,000

TYPE MB HIGH WATTAGE
BERYLLIUM OXIDE CORES

STYLE	RATED WATTS 25°C ambient chassis mounted	RATED WATTS 25°C ambient free air
3105 MB/NMB	15	6
3010 MB/NMB	20	8
3225 MB/NMB	35	14
3550 MB/NMB	50	20

MB suffix designates regular single layer wind, NMB non-inductive wind.

MIL-R-26D TYPE DESIGNATIONS

EXAMPLE: RW69 — Body Style; V — Characteristic, V only (350°C max.); 471 — Nominal resistance, Ω. Two significant digits plus third indicating number of zeros. Below 10ΩR = decimal and last digit is significant.

TOLERANCE: ±5% for values 1Ω and up; ±10% below 1Ω.
TC: ±260 ppm/°C 20Ω and up; 400 ppm/°C below 20Ω.

MIL STYLE	SAGE STYLE	MIL WATTS	DEFINED OHMIC RANGE (Single layer wound .00175 min. wire dia.)
RW55V	1900S	7	.1—5100
RW56V	1950S	14	.1—9100
RW67V	1550S	6.5	.1—3600
RW68V	1700S	11	.1—8200
RW69V	1200S	3	.1—910

EXAMPLE:
RW70 — Body Style; U — Characteristic, U only (275°C max.); 49R9 — Nominal resistance, Ω. Three significant digits plus fourth indicating number of zeros. Below 100ΩR = decimal and following digits are significant.; F — Tolerance ±% B = .1% D = .5% F = 1.0%

TC: ±30 ppm/°C 10Ω and above
±50 ppm/°C 1Ω to 10Ω
±90 ppm/°C below 1Ω

MIL STYLE	SAGE STYLE	MIL WATTS	VOLTAGE Max.	DEFINED OHMIC RANGE Min.	Max. for .001" wire (Navy)	Max. for .0008" wire (all other)
RW70U	1000S	1	——	.1	1210	3160
RW74U	1500S	5	300	.1	12100	38300
RW78U	1700S	10	720	.1	40200	90900
RW79U	1240S	3	135	.1	3570	10500
RW80U	1000SB	2	——	.1	1240	3160
RW81U	250SB	1	25	.1	649	——

MIL-R-18546D TYPE DESIGNATIONS

Example:
RE65 — Style; G — Characteristic, 275°C Max. G for regular inductive winding N for non-inductive winding; 1001 — Nominal resistance, Ω. ±1% only. Three significant digits plus fourth indicating number of zeros. Below 100Ω R = decimal and following digits are significant.

T.C. ±30 ppm/°C 2000Ω and above
±50 ppm/°C under 2000Ω

MIL STYLE	SAGE STYLE	MIL WATTS	DEFINED OHMIC RANGE Min.	Max. (.001 wire)
RE60G	3105M	5	.1	3320
RE60N	3105NM	5	1.0	1650
RE65G	3010M	10	.1	5620
RE65N	3010NM	10	1.0	2800
RE70G	3225M	20	.1	12100
RE70N	3225NM	20	1.0	6040
RE75G	3550M	30	.1	39200
RE75N	3550NM	30	1.0	19600

CONSIDER THESE DETAILS:

- Wattage Rating, ½ to 50 watts
- Tolerance and stability as close as .05%
- T.C. 20 ppm/°C or 10 ppm/°C
- 1000 volt rms body insulation
- Low values not available in other resistors (specials to .01Ω)
- Characteristic U or V wattage rating: to 275°C or 350°C
- Power load life stability <.5%/1000 hours
- Weldable leads when specified
- Non-inductive winding when specified

SAGE ELECTRONICS CORPORATION

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UNITED TECHNICAL PUBLICATIONS

PRECISION METAL FILM RESISTORS

TRW®

ELECTRONICS GROUP

MIL-R-55182C QUICK REFERENCE CHART

MIL Specified Characteristic	C (Hermetically sealed)	H (Non-hermetically sealed)	E (Hermetically sealed)	J (Non-hermetically sealed)	K (Non-hermetically sealed)
Maximum resistance-temperature characteristic Temperature Coefficient or T.C.	±0.005% or ±50 PPM/°C	±0.005% or ±50 PPM/°C	±0.0025% or ±25 PPM/°C	±0.0025% or ±25 PPM/°C	±.010% or ±100 PPM/°C
Maximum ambient temperature at rated wattage	125°C	125°C	125°C	125°C	125°C
Maximum ambient temperature at zero wattage derating	175°C	175°C	175°C	175°C	175°C
MIL (IRC) specified sizes—					
RNC50, RNR50 (MMC)	—	1/20 W, 200 V (T2)	—	1/20 W, 200 V (T9)	1/20 W, 200 V (T0)
RNC55, RNR55 (CCM)	1/10 W, 200 V	1/10 W, 200 V (T2)	1/10 W, 200 V	1/10 W, 200 V (T9)	1/10 W, 200 V (T0)
RNC60, RNR60 (CCA)	1/8 W, 250 V	1/8 W, 250 V (T2)	1/8 W, 250 V	1/8 W, 250 V (T9)	1/8 W, 250 V (T0)
RNC63, RNR63	1/4 W, 300 V	—	1/4 W, 300 V	—	—
RNC65, RNR65 (CCB)	1/4 W, 300 V	1/4 W, 300 V (T2)	1/4 W, 300 V	1/4 W, 300 V (T9)	1/4 W, 300 V (T0)
RNC70, RNR70	1/2 W, 350 V	—	1/2 W, 350 V	—	1/2 W, 350 V (T0)
Resistance tolerances ± percent	1.0%, 0.5%	1.0%, 0.5%	1.0%, 0.5%, 0.1%	1.0%, 0.5%, 0.1%	1.0%, 0.5%

MIL-R-10509 QUICK REFERENCE CHART

MIL Specified Characteristic	B	C	D	E
Maximum resistance-temperature characteristic. (Temperature Coefficient or T.C.)	±0.05% or ±500 PPM/°C	±0.005% or ±50 PPM/°C	+0.02% −0.05% or +200 PPM/°C −500 PPM/°C	±0.0025% or ±25 PPM/°C
Maximum ambient temperature for full rated wattage	70°C	125°C	70°C	125°C
Temperature limits for linear wattage derating from 100% loading	150°C	175°C	165°C	175°C
MIL (IRC) Specified Sizes—				
RN50 (MMC)	—	1/20 W, 200 V (T2)	—	1/20 W, 200 V (T9)
RN55 (CCM, CEA)	—	1/10 W, 200 V (T2)	1/8 W, 200 V (T0)	1/10 W, 200 V (T9)
RN60 (MEA, CCA)	—	1/8 W, 250 V (T2)	1/4 W, 300 V (T0)	1/8 W, 250 V (T9)
RN65 (MEB, CCB, MDB)	—	1/4 W, 300 V (T2)	1/2 W, 350 V (T0)	1/4 W, 300 V (T9)
RN70 (MEC, MDC)	—	1/2 W, 350 V (T2)	3/4 W, 500 V (T0)	1/2 W, 350 V (T9)
RN75 (MDF, MEF)	1 W, 500 V*	1 W, 500 V (T2)	—	1 W, 500 V (T9)
RN80 (MDH)	2 W, 750 V*	—	—	—
MIL specified resistance tolerances (others available for commercial units)	1.0%	1.0%, 0.5%, 0.25%, 0.1%	1.0%	1.0%, 0.5%, 0.25%, 0.1%

*Available in this characteristic only.

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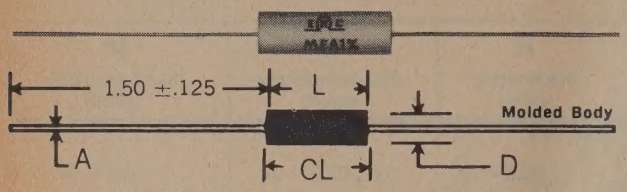
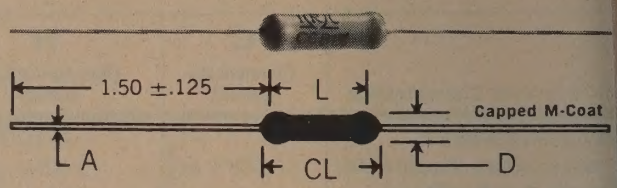
TRW® HIGH STABILITY PRECISION METAL FILM RESISTORS

ELECTRONICS GROUP

MOLDED AND M-COAT TYPES





IRC Type	Standard Resistance Range (Ohms)	Maximum Extended Range (Ohms)	Wattage (W) 70°C	Wattage (W) 125°C	Maximum Continuous Voltage (V)	MIL-R-10509 Char.	MIL-R-10509 Resistance Range (Ohms)	Dimensions in Inches: Body Length (L)	Body Dia. (D)	Clean Lead Length (CL)	Lead Gage (A)	
MOLDED TYPES												
MEA T-0	10 to 499K	1.5 Meg	1/4	1/8	250V	D	10 to 1 Meg	.406 ±.015	.130 ±.010	.545	#22	.0253
T-2 T-9	30.1 to 499K	—				C-E	49.9 to 499K					
MEB T-0	10 to 1 Meg	2.0 Meg	1/2	1/4	300V	D	10 to 2 Meg	.594 ±.015	.203 ±.015	.733	#22	.0253
T-2 T-9	49.9 to 1 Meg	—				C-E	49.9 to 1 Meg					
MEC T-0	10 to 1.5 Meg	3.0 Meg	3/4	1/2	350V	D	10 to 2.49 Meg	.719 ±.020	.261 ±.020	.863	#20	.032
T-2 T-9	24.9 to 1.5 Meg	—				C-E	24.9 to 1 Meg					
MEF T-0	49.9 to 4 Meg	10.0 Meg		1	500V	B	10 to 5.11 Meg	1.105 ±.020	.395 ±.020	1.253	#20	.032
T-2 T-9	49.9 to 4 Meg	—				C-E	49.9 to 2 Meg					
MEH T-0	100 to 10 Meg	30.0 Meg		2	750V	B	30.1 to 10 Meg	2.234 ±.020	.395 ±.020	2.378	#20	.032
T-2 T-9	100 to 10 Meg	—				—						
CAPPED M-COAT TYPES (CONFORMALLY COATED)												
UC† T-0	50 to 10K	—	1/20 W at 100°C		200V			.125 ±.020	.047 ±.010	.160	#30	.010*
T-2	50 to 10K	—										
MMC T-0	10 to 100K	200K	1/8	1/20	200V	—	—	.152 ±.020	.065 ±.010	.200	#26	.016**
T-2 T-9	49.9 to 100K	—				C-E	10 to 100K					
CCM T-0	20 to 301K	1.5 Meg	1/8	1/10	200V	D	10 to 301K	.250 ±.031	.088 ±.010	.325	#22	.0253
T-2 T-9	30.1 to 301K	—				C-E	49.9 to 100K					
CEA T-0	10 to 499K	1.5 Meg	1/4	1/8	250V	D	10 to 301K	.250 ±.031	.090 ±.010	.325	#22	.0253
T-2 T-9	30.1 to 499K	—				C-E	49.9 to 100K					
CCA T-0	10 to 1 Meg	2.0 Meg	1/2	1/4	300V	D	10 to 1 Meg	.400 ±.031	.140 ±.020	.540	#22	.0253
T-2 T-9	49.9 to 1 Meg	—				C-E	49.9 to 499K					
CCB T-0	10 to 1.5 Meg	3.0 Meg	3/4	1/2	350V	D	10 to 2 Meg	.594 ±.031	.180 ±.020	.734	#22	.0253
T-2 T-9	49.9 to 1.5 Meg	—				C-E	49.9 to 1 Meg					
CEC T-0	10 to 1.5 Meg	3.0 Meg	1	1/2	350V	—	—	.594 ±.031	.180 ±.020	.734	#20	.032
T-2 T-9	49.9 to 1.5 Meg	—				C-E	—					

*Gold Plated Dumet Leads 1.00 ±.062 †Trademark of TRW Inc. **Lead Length 1.00 ±.062

TEMPERATURE COEFFICIENTS

These high stability evaporated metal film resistors are available in nine temperature coefficient tolerances.

MIL-R-10509 Char.	Code	Temperature** Coefficient	Temperature Span
*D	T-0	0 ±100PPM/°C	−55°C to +165°C
*C	T-2	0 ±50PPM/°C	−55°C to +175°C
*E	T-9	0 ±25PPM/°C	−55°C to +175°C
	T-3	0 to +100PPM/°C	−55°C to +165°C
	T-4	0 to −100PPM/°C	−55°C to +165°C
	T-5	0 ±25PPM/°C	+25°C to +145°C
	T-6	0 to +50PPM/°C	−55°C to +165°C
	T-7	0 to −50PPM/°C	−55°C to +165°C
	T-8	0 ±25PPM/°C	+25°C to +165°C
		0 ±35PPM/°C	−55°C to +25°C

*Standard types. All others are special.
**Parts Per Million per degree centigrade (100PPM equals 0.01%).
T.C. code marking is combined with the code for the date of manufacture.

RESISTANCE RANGE

The maximum extended ranges shown above are also available with a TC of +100PPM/°C, −250PPM/°C—Code TR or +100PPM/°C, −500PPM/°C—Code TE ±1.0% tol. only.

TOLERANCES

Metal film resistors are supplied in standard tolerances of ±1.0%, ±0.5%, and ±0.25%. In addition, tolerances of ±0.1% and ±0.05% are available on special order.

VOLTAGE COEFFICIENT

Voltage coefficient when measured between 1/10 and full rated voltage is less than 5PPM/Volt, for all values. On low and medium value resistors, the voltage coefficient is essentially zero.

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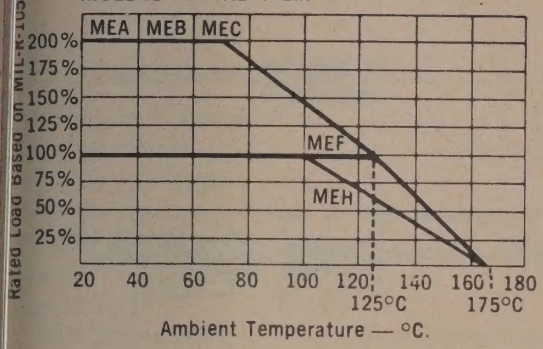
HIGH STABILITY PRECISION METAL FILM RESISTORS

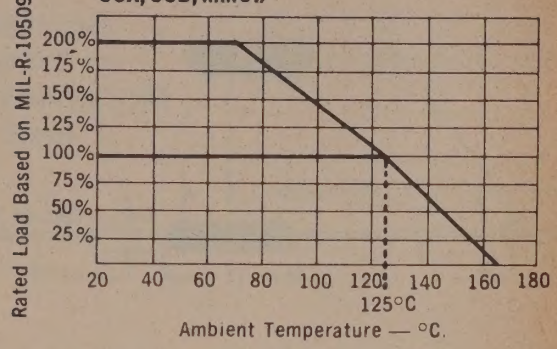
TRW®

ELECTRONICS GROUP

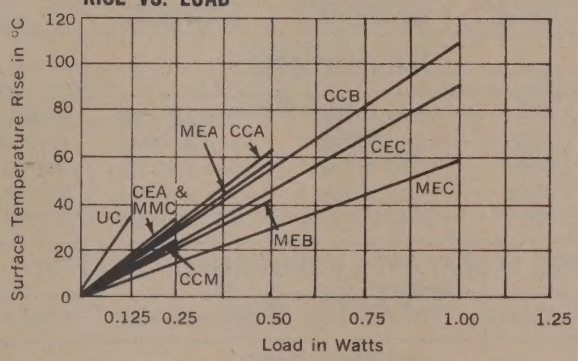
DERATING CURVE
MOLDED METAL FILM



DERATING CURVE
M-COAT METAL FILM (UC,CCM,CEA, CCA,CCB,MMC.)



SURFACE TEMPERATURE RISE VS. LOAD



METAL FILM MATCHING

Metal Films can be matched to within the maximum deviations outlined

TYPE OF MATCH	MINIMUM TOLERANCE MATCH	MINIMUM TC MATCH	MAXIMUM DEVIATION BETWEEN ANY TWO UNITS IN SET	TEMPERATURE
Tolerance (All Units Same Value)	0.02%	NA	0.02%	25°C Only
Tolerance — Ratio	0.05%	NA	0.05%	25°C Only
TC Only (T5, T8 or T9)	NA	3 PPM/°C	initial tolerance +0.024%	25°C to 105°C
TC Only (T9 Only)*	NA	8 PPM/°C	initial tolerance +0.11%	−55°C to +165°C
TC and Tolerance All Units Same Value (T5, T8 or T9)	0.02%	3 PPM/°C	0.044%	25°C to 105°C
TC and Tolerance All Units Same Value (T9 Only)*	0.02%	8 PPM/°C	0.13%	−55°C to +165°C
TC and Tolerance Ratio (T5, T8 or T9)	0.05%	3 PPM/°C	0.074%	25°C to 105°C
TC and Tolerance Ratio (T9 Only)*	0.05%	8 PPM/°C	0.16%	−55°C to +165°C

Resistors may not be returned after 90 days. Resistors must be outside specification by more than 0.02% to be returnable for deviation.

* Units matched for an operating temperature span exceeding +25°C to +105°C (−55°C to +165°C maximum), all units in the set must be of same style. When units are ratio matched for this excessive operating temperature span all units must also fall within a single range of resistance values as indicated.

MEA . . . 100 ohms — 25K
1K — 500K

MEF . . . 150 ohms — 120K
1K — 1 meg
2K — 2.5 meg
4K — 4 meg

MEB . . . 100 ohms — 40K
2K — 700K
3K — 1 meg

MEH . . . 300 ohms — 300K
3K — 5 meg
7K — 10 meg

MEC . . . 150 ohms — 55K
2K — 500K
3K — 1.5 meg

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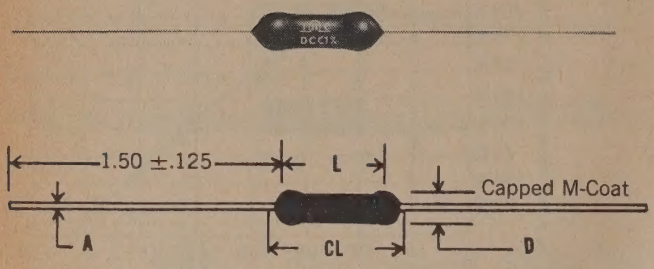
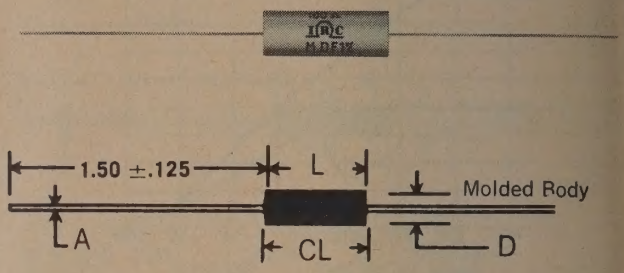
TRW CARBON FILM RESISTORS MOLDED & COATED DEPOSITED

ELECTRONICS GROUP





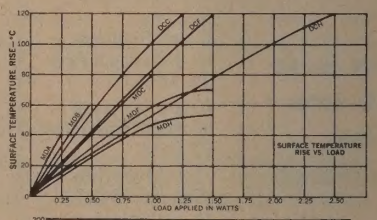
IRC Type	Wattage "X" Char. 40°C	"B" Char. 70°C	"D" Char. 70°C	IRC 125°C	Maximum Voltage	Standard Resistance Range (Ohms)	MIL-R-10509 Resistance Range (Ohms)	MIL Type		Ranges Available at ±0.5% Tolerance Min.	Max.
MOLDED TYPE											
MDA	—	1/8	1/4	1/8	300V	10 to 5 Meg*	10 to 1.0 Meg	RN60B	RN60D	50	500K
MDB	—	1/4	1/2	1/4	350V	10 to 5 Meg*	10 to 2.0 Meg	RN65B	RN65D	50	500K
MDC	—	1/2	3/4	1/2	500V	10 to 25 Meg*	10 to 2.49 Meg	RN70B	RN70D	50	1 Meg
MDF	—	1	—	—	500V	10 to 50 Meg*	10 to 5.11 Meg	RN75B	—	100	2 Meg
MDH	—	2	—	—	750V	15 to 100 Meg*	30.1 to 10 Meg	RN80B	—	200	2.5 Meg
CAPPED M-COAT TYPE (CONFORMALLY COATED)											
DCC	1/2	1/2	—	—	350VDC	10 to 25 Meg*	10 to 2.0 Meg	RN20X	—	50	1 Meg
CAPPED TYPE											
DCF	1	—	—	—	500VDC	10 to 50 Meg*	10 to 4.99 Meg	RN25X	—	100	2 Meg
DCH	2	—	—	—	750VDC	15 to 100 Meg*	30.1 to 10 Meg	RN30X	—	200	2.5 Meg

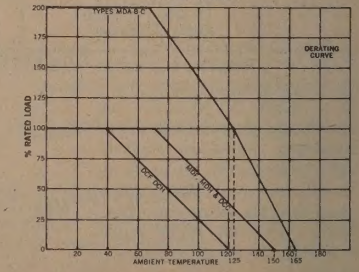
*These high resistance values, being above the highest MIL-R-10509 top values, have higher temperature coefficients, but otherwise are designed to meet the requirements of the specification (see Temperature Coefficient Curves). These high resistance values must be measured carefully under controlled conditions of humidity and temperature, to reduce possible variations due to test conditions and temperature coefficients. Due to higher temperature coefficient, value above approximately two times MIL maximum will be supplied with a standard tolerance of ±2.0%.

TOLERANCE. Standard tolerance is ±1%. ±0.5% tolerance is available at a slight additional cost.

VOLTAGE COEFFICIENT. This factor is negligible. Statistically, the voltage coefficient is less than 20 ppm/v.

SHELF LIFE. Shelf life tests show average resistance change of less than 0.25%.





DIMENSIONS

IRC TYPE	BODY LENGTH (L)	BODY DIAMETER (D)	CLEAN LEAD LENGTH (CL)	LEAD GAUGE (A)
DCC	.594 ±.031	.180 ±.020	.750	#20 .032
DCF	.938 ±.062	.297 ±.031	1.250	#20 .032
DCH	2.062 ±.062	.297 ±.031	2.375	#20 .032
MDA	.406 ±.015	.130 ±.010	.545	#22 .0253
MDB	.594 ±.015	.203 ±.015	.733	#22 .0253
MDC	.719 ±.020	.261 ±.020	.863	#20 .032
MDF	1.105 ±.020	.395 ±.020	1.253	#20 .032
MDH	2.234 ±.020	.395 ±.020	2.378	#20 .032

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1/8 AND 1/4 WATT MOLDED METAL GLAZE RESISTORS (TYPE RG)

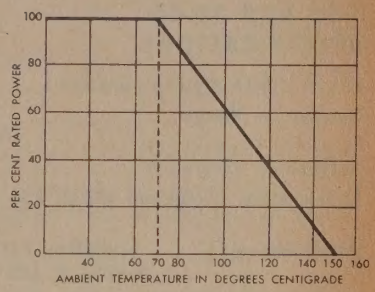
TRW®
ELECTRONICS GROUP

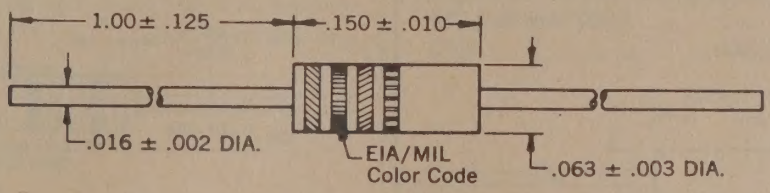
1/8 WATT

RG⅛ SPECIFICATIONS

MIL-R-11 style equivalent RC05
Resistance Range ..... 10Ω through 100K
Resistance Tolerance ..... ±5%
Power Rating ..... ⅛ Watt at 70°C, derated to 0 at 150°C
Temperature Coefficient ..... Less than ±500 PPM/°C
Maximum Continuous Working Voltage 200V
Dielectric Withstanding Voltage ..... 300V at atmospheric pressure
Insulation Resistance ..... 1,000 Megohms, Dry

DERATING CURVE TEMPERATURE — POWER

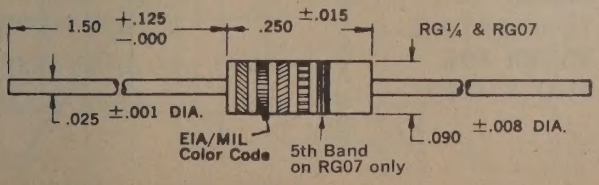




1/4 WATT

RG¼ SPECIFICATIONS

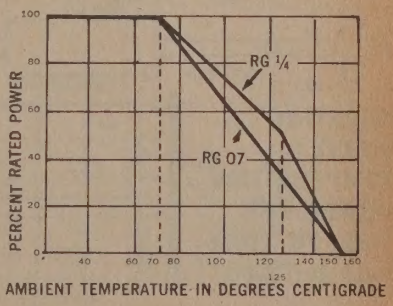
MIL-R-11 style equivalent RC07
Resistance Range ..... 6.2Ω through 680K
Resistance Tolerance ..... ±5%
Power Rating ..... ¼ Watt @ 70°C, derated to 0 at 150°C
Commercial — ½ watt @ 70°C
¼ watt @ 125°C, derated to 0 at 150°C
Maximum Continuous Working Voltage 250V
Dielectric Withstanding Voltage ..... 500V RMS at atmospheric pressure
325V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... ¼ watt — 20°C, ½ watt — 40°C



RG07 SPECIFICATIONS

MIL-R-22684 style equivalent RL07
MIL-R-39017 style equivalent RLR07
Resistance Range ..... 10Ω through 150K
Resistance Tolerance ..... ±2% and ±5%
Power Rating ..... ¼ Watt at 70°C, derated to 0 at 150°C
Maximum Continuous Working Voltage 250V
Dielectric Withstanding Voltage ..... 500V RMS at atmospheric pressure
325V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... 20°C

DERATING CURVE TEMPERATURE — POWER FOR RG¼ & RG07



TRW

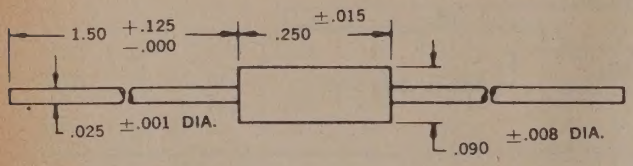
1/4 AND 1/2 WATT PRECISION MOLDED THICK FILM RESISTORS (TYPES T & TF)

ELECTRONICS GROUP

1/4 WATT

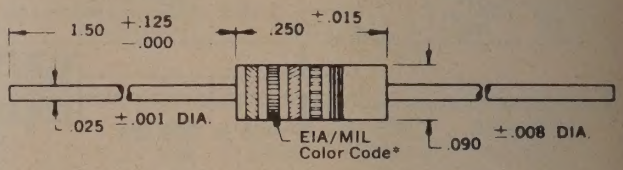
T-55 AND TO-55 SPECIFICATIONS

MIL-R-10509 style equivalent RN55
Resistance Range ..... T-55 — 10Ω through 301K
TO-55 — 10Ω through 499K
Resistance Tolerance ..... ±1%
Temperature Coefficient (PPM/°C) ..... T-55 — +200, −500
TO-55 — ±100
Power Rating ..... ¼ Watt at 70°C, derated to 0 at 160°C
⅛ Watt at 125°C, derated to 0 at 160°C
Maximum Continuous Working Voltage 250V
Dielectric Withstanding Voltage ..... 500V RMS at atmospheric pressure
325V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... 20°C



TF07 SPECIFICATIONS

MIL-R-22684 style equivalent RL07
Resistance Range ..... 1Ω through 10Ω
Resistance Tolerance ..... ±1%, ±2% and ±5%
Temperature Coefficient (PPM/°C) ..... ±100
Power Rating ..... ¼ Watt at 70°C, derated to 0 at 150°C
Dielectric Withstanding Voltage ..... 500V RMS at atmospheric pressure
325V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... 20°C

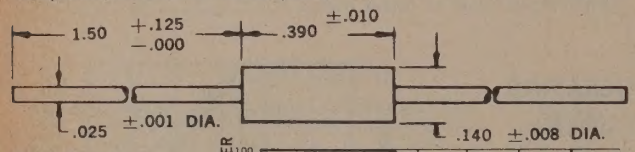


*On ±2 and ±5% units. Printed markings standard on ±1% units.

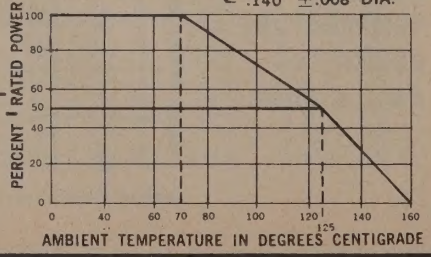
1/2 WATT

T-60 AND TO-60 SPECIFICATIONS

MIL-R-10509 style equivalent RN60
Resistance Range ..... T-60 — 24.9Ω through 499K
TO-60 — 10Ω through 1 Meg.
Resistance Tolerance ..... ±1%
Temperature Coefficient (PPM/°C) ..... T-60 — +200, −500
TO-60 — ±100
Power Rating ..... ½ Watt at 70°C, derated to 0 at 160°C
¼ Watt at 125°C, derated to 0 at 160°C
Maximum Continuous Working Voltage 350V
Dielectric Withstanding Voltage ..... 700V RMS at atmospheric pressure
400V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... 40°C

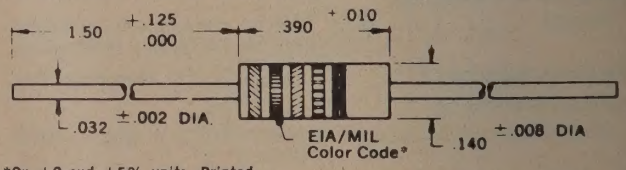


DERATING CURVE TEMPERATURE — POWER FOR T-55, TO TO-55, T-60 & TO-60



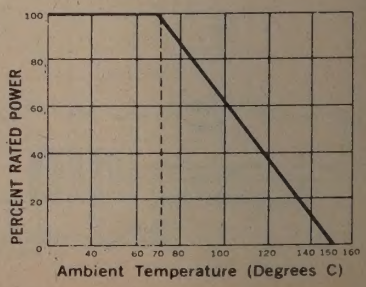
TF20 SPECIFICATIONS

MIL-R-22684 style equivalent RL20
Resistance Range ..... 1Ω through 10Ω
Resistance Tolerance ..... ±1%, ±2% and ±5%
Temperature Coefficient (PPM/°C) ..... ±100
Power Rating ..... ½ Watt at 70°C, derated to 0 at 150°C
Dielectric Withstanding Voltage ..... 700V RMS at atmospheric pressure
400V RMS at 3.4 inches of Mercury
Insulation Resistance ..... 1,000 Megohms, Dry
Temperature Rise at rated power ..... 40°C



*On ±2 and ±5% units. Printed markings standard on ±1% units.

DERATING CURVE TEMPERATURE — POWER FOR TF07 & TF20



1/2, 1 AND 2 WATT MOLDED METAL GLAZE RESISTORS (TYPE RG)

TRW®
ELECTRONICS GROUP

1/2 WATT

RG20 SPECIFICATIONS

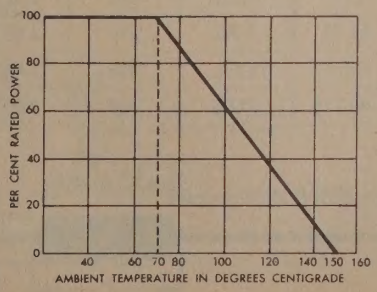
MIL-R-22684 style equivalent	RL20
MIL-R-39017 style equivalent	RLR20
Resistance Range	4.3Ω through 470K
Resistance Tolerance	±2% and ±5%
Power Rating	½ Watt at 70°C, derated to 0 at 150°C
Maximum Continuous Working Voltage	350V
Dielectric Withstanding Voltage	700V RMS at atmospheric pressure 400V RMS at 3.4 inches of Mercury
Insulation Resistance	1,000 Megohms, Dry
Temperature Rise at rated power	40°C

1 WATT

RG32 SPECIFICATIONS

MIL-R-22684 style equivalent	RL32
MIL-R-39017 style equivalent	RLR32
Resistance Range	10Ω through 1.0 Meg.
Resistance Tolerance	±2% and ±5%
Power Rating	1 Watt at 70°C, derated to 0 at 150°C
Maximum Continuous Working Voltage	500V
Dielectric Withstanding Voltage	1000V RMS at atmospheric pressure 500V RMS at 3.4 inches of Mercury
Insulation Resistance	1,000 Megohms, Dry
Temperature Rise at rated power	55°C

DERATING CURVE TEMPERATURE — POWER FOR RG20, RG32, RG2 & RG42



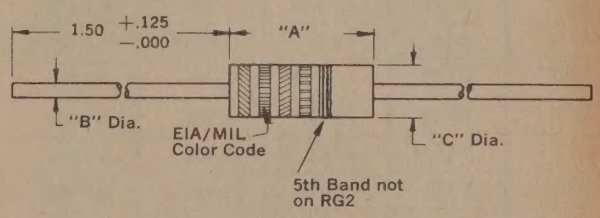
2 WATTS

RG2 SPECIFICATIONS

Resistance Range	10Ω through 1.5 Meg.
Resistance Tolerance	±5%
Power Rating	2 Watts at 70°C, derated to 0 at 150°C
Maximum Continuous Working Voltage	500V
Dielectric Withstanding Voltage	1000V RMS at atmospheric pressure 500V RMS at 3.4 inches of Mercury
Insulation Resistance	1,000 Megohms, Dry
Temperature Rise at rated power	90°C

RG42 SPECIFICATIONS

MIL-R-22684 style equivalent	RL42
Resistance Range	10Ω through 1.5 Meg.
Resistance Tolerance	±2% and ±5%
Power Rating	2 Watts at 70°C, derated to 0 at 150°C
Maximum Continuous Working Voltage	500V
Dielectric Withstanding Voltage	1000V RMS at atmospheric pressure 500V RMS at 3.4 inches of Mercury
Insulation Resistance	1,000 Megohms, Dry
Temperature Rise at rated power	90°C



DIMENSIONS

IRC TYPE	"A"	"B"	"C"
RG20	.390 ± .010	.032 ± .002	.140 ± .008
RG32	.562 ± .031	.040 ± .002	.190 ± .015
RG2	.688 ± .040	.032 ± .002	.318 ± .018
RG42	.688 ± .040	*.045 ± .002	.318 ± .018

*.032 leads available on request.

TRW® MINIATURE PRECISION POWER WIREWOUND RESISTORS

ELECTRONICS GROUP

IRC Type	MIL-R-26E Equiv. & Rating (Watts) at 25°C	IRC Rating 350°C Max. Hot Spot (Watts) at Ambient 125°C	25°C	Commercial Range (Ohms) Min.	Max.	Max. Cont. Working Volt.	Non-Inductive Ranges (Ohms) Min.	Max.
AS-1/2		0.5	1	0.5	6K	100	*	*
AS-1	RW70U (1)	1	2	0.1	7.5K	130	0.1	3.8K
AS-2	RW69V (3)	2	3	0.1	20K	140	0.5	10K
AS-2A		2.5	4	0.1	42.1K	300	0.5	21K
AS-2B	RW79U (3)	3	4	0.1	24K	185	0.5	12K
AS-3		3	5	0.1	30K	200	0.5	15K
AS-5	RW74U (5) RW67V (6.5)	5	7	0.1	60K	400	0.8	30K
AS-7		7	9	0.1	90K	600	1.0	45K
AS-10	RW68V (11) RW78U (10)	10	14	0.1	175K	1000	3.0	50K
ASC-10	RW55V (7)	7	10	0.1	90K	600	1.0	45K
ASC-15	RW56V (14)	10	15	0.1	175K	1000	3.0	50K

*Inductance on AS-½ is less than 1 μh at 1 MC.

MIL-R-26C IRC Type	MIL Type	Rating (Watts) G	V	Range (Ohms) Min.	Max.
AS-2	RW59, 69	2.5	3	0.1	2K
AS-5	RW57, 67	5	6.5	0.1	8.2K
AS-10	RW58, 68	8	11	0.1	20K
ASC-10	RW55	5	7	0.1	5.1K
ASC-15	RW56	10	14	0.1	8.2K

MIL-R-23379A IRC Type	MIL Type	Rating (Watts)	Range (Ohms) Min.	Max.
AS-1	RWP-18	1	1	1.21K
AS-2	RWP-20	3	0.1	3.57K
AS-5	RWP-21	5	0.1	12.1K
AS-10	RWP-23	10	0.499	40.2K

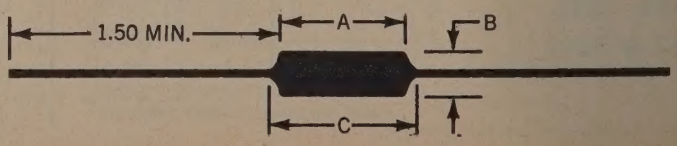
AVAILABLE RESISTANCE/TOLERANCE OHMS

IRC Type	0.1%	0.25%	.5%, 1%	3%, 5%
AS-1/2	5-2K	2.5-2K	1-6K	0.5-6K
AS-1	5-3K	2.5-3K	1-7.5K	0.1-7.5K
AS-2	5-4.2K	2.5-4.2K	1-20K	0.1-20K
AS-2A	5-8K	2.5-8K	1-42.1K	0.1-42.1K
AS-2B	5-4.5K	2.5-4.5K	1-24K	0.1-24K
AS-3	5-6.5K	2.5-6.5K	1-30K	0.1-30K
AS-5	5-15.5K	2.5-15.5K	1-60K	0.1-60K
AS-7	5-22K	2.5-22K	1-90K	0.1-90K
AS-10	5-55K	2.5-55K	1-175K	0.1-175K
ASC-10	5-22K	2.5-22K	1-90K	0.1-90K
ASC-15	5-55K	2.5-55K	1-175K	0.1-175K

PHYSICAL DIMENSIONS INCHES

IRC Type	Dim. A ±.032	Dim. B ±.032	Dim. C Max.	Lead Dia.	Weight Grams
AS-1/2	.312	.062	.375	.020	.185
AS-1	.406	.093	.500	.020	.235
AS-2	.500	.218	.625	.032	.960
AS-2A	.812	.187	.937	.032	1.10
AS-2B	.562	.187	.687	.032	.900
AS-3	.687	.250	.812	.040	1.60
AS-5	.875	.312	1.000	.040	2.57
AS-7	1.250	.312	1.375	.040	3.32
AS-10	1.812	.375	1.937	.040	5.46
ASC-10	1.375	.468	1.468	.040	10.3
ASC-15	2.000	.468	2.093	.040	14.0

PACKAGING—Ladder Pack (standard) and Lead Tape (optional at additional cost).
CUT & FORMED LEADS—Contact TRW with your requirements.
POSITIVE TEMPERATURE COEFFICIENT—Available to +5500 PPM/°C, contact TRW.
FUSIBLE TYPES —Available for missile, computer and other critical applications, contact TRW.
CONTROLLED RISE TIME—devices available, contact TRW.



¼" TO 2 WATTS CARBON COMPOSITION AND WIREWOUND RESISTORS

TRW®

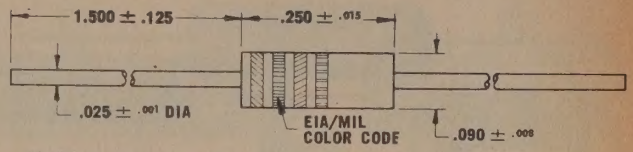
ELECTRONICS GROUP

TYPE GBT®-¼

¼ Watt Carbon Composition

SPECIFICATIONS

MIL-R-11 Style	RC07
MIL-R-39008 Style	RCR07
Resistance, Standard	RC07-2.7 Ohms thru 22 Megohms RCR07-2.7 Ohms thru 22 Megohms (EIA/MIL Standard Values)
Tolerances, Standard	±5%, 10%, 20%
Power Rating	¼ Watt @ 70°C derating to 0 @ 150°C



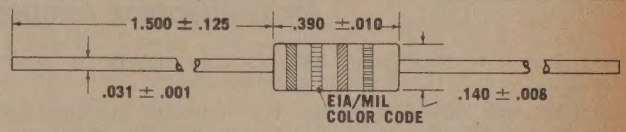
Maximum Continuous Working Voltage	250 Volts
Minimum Insulation Resistance — Dry	10,000 Megohms
Minimum Insulation Resistance — Wet	100 Megohms
Minimum Dielectric Withstanding Voltage:	
Atmospheric Pressure	500 Volts, R.M.S.
Reduced Pressure	325 Volts, R.M.S.
Hot Spot Temperature Rise at ¼ Watt	32°C, Average
Shunt Capacitance	0.15 pf, Average

TYPE GBT®-½

½ Watt Carbon Composition

SPECIFICATIONS

MIL-R-11 Style	RC20
MIL-R-39008 Style	RCR20
Resistance, Standard	RC20-2.7 Ohms thru 22 Megohms RCR20-2.7 Ohms thru 22 Megohms
Special	24 Megohms thru 100,000 Megohms (EIA/MIL Standard Values)
Tolerances, Standard	±5%, 10%, 20%
Special	±5%, 10%, 20%, 30% (depending on resistance value)
Power Rating	½ Watt @ 70°C derating to 0 @ 150°C



Maximum Continuous Working Voltage	350 Volts
Minimum Insulation Resistance — Dry	10,000 Megohms
Minimum Insulation Resistance — Wet	100 Megohms
Minimum Dielectric Withstanding Voltage:	
Atmospheric Pressure	700 Volts, R.M.S.
Reduced Pressure	450 Volts, R.M.S.
Hot Spot Temperature Rise at ½ Watt	50°C, Average
Shunt Capacitance	0.175 pf, Average

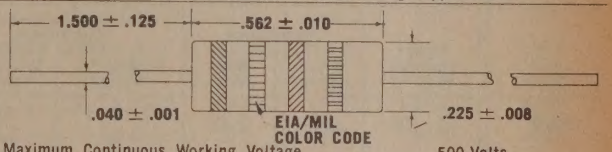
Note: IRC Type GBT-½V is available for high voltage applications.

TYPE GBT®-1

1 Watt Carbon Composition

SPECIFICATIONS

MIL-R-11 Style	RC32
MIL-R-39008 Style	RCR32
Resistance, Standard	RC32-2.7 Ohms thru 22 Megohms RCR32-2.7 Ohms thru 22 Megohms
Tolerance, Standard	±5%, 10%, 20%
Power Rating	1 Watt @ 70°C derating to 0 @ 150°C



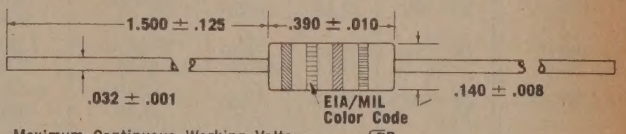
Maximum Continuous Working Voltage	500 Volts
Minimum Insulation Resistance — Dry	10,000 Megohms
Minimum Insulation Resistance — Wet	100 Megohms
Minimum Dielectric Withstanding Voltage:	
Atmospheric Pressure	1000 Volts, R.M.S.
Reduced Pressure	625 Volts, R.M.S.
Hot Spot Temperature Rise at 1 Watt	70°C, Average
Shunt Capacitance	0.25 pf, Average

TYPE BW-20

1 Watt Wirewound

SPECIFICATIONS

EIA RS-344 Style	CRU1
MIL-R-11 Style Size Equivalent	RC20
Resistance, Standard	0.24 Ohms thru 750 Ohms (EIA/MIL Standard Values)
Tolerances, Standard	±5%, 10%
Special	±2%
Power Rating	1 Watt 50°C ½ Watt 100°C ¼ Watt 125°C; derating to 0 @ 160°C



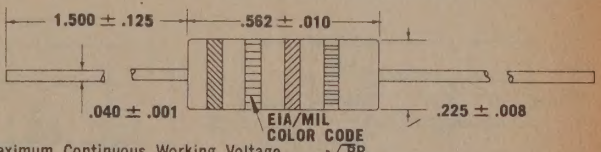
Maximum Continuous Working Voltage	$\sqrt{PR}$
Minimum Insulation Resistance — Dry	10,000 Megohms
Minimum Insulation Resistance — Wet	100 Megohms
Minimum Dielectric Withstanding Voltage:	
Atmospheric Pressure	700 Volts, R.M.S.
Reduced Pressure	450 Volts, R.M.S.
Hot Spot Temperature Rise at 1 Watt	100°C
Marking	Standard EIA/MIL Color Code (double width first band)

TYPE BWH

2 Watts Wirewound

SPECIFICATIONS

EIA RS-344 Style	CRU2
MIL-R-11 Style Size Equivalent	RC32
Resistance, Standard	0.10 Ohms thru 2400 Ohms (EIA/MIL Standard Values)
Tolerances, Standard	±5%, 10%
Power Rating	2 Watts @ 70°C 1 Watt @ 115° C ½ Watt @ 137°C; derating to 0 @ 160°C



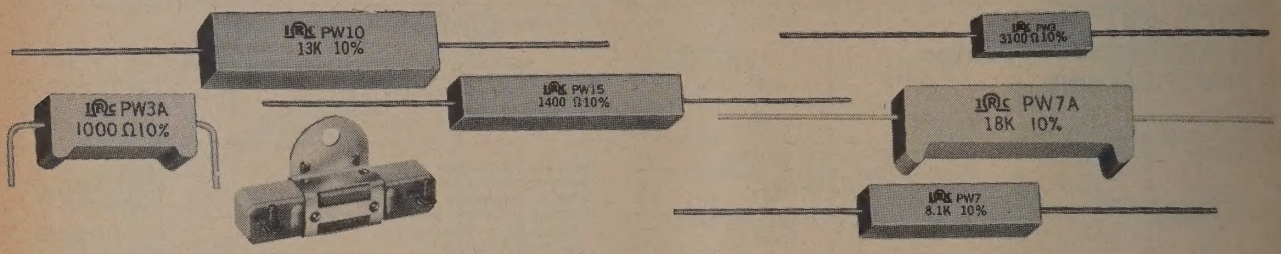
Maximum Continuous Working Voltage	$\sqrt{PR}$
Minimum Insulation Resistance — Dry	10,000 Megohms
Minimum Insulation Resistance — Wet	100 Megohms
Minimum Dielectric Withstanding Voltage:	
Atmospheric Pressure	1,000 Volts, R.M.S.
Reduced Pressure	625 Volts, R.M.S.
Hot Spot Temperature Rise at 2 Watts	115°C
Current Noise	Negligible
Marking	Standard EIA/MIL Color Code (double width first band)

PACKAGING AND CUT & FORMED LEADS

IRC general purpose resistors are packaged in a variety of styles. Cut and formed leads are also available. Consult TRW with your specific requirements.

TRW HIGH TEMPERATURE POWER RESISTORS

ELECTRONICS GROUP



FEATURING FIREPROOF INORGANIC CONSTRUCTION

for temperature compensation • circuit protection

IRC Type PW Wirewound Resistors are available in nine ratings: 2, 3, 5, 7, 10, 15, 20, 22 and 50 watts.

DESIGN AND CONSTRUCTION: The resistance elements of PW resistors are rigorously quality controlled for resistance, temperature coefficient, diameter and elongation. The wire is wound on a fiberglass core, which forms a smooth, uniform surface. The fill is the same inorganic fireproof material used in premium IRC resistors. The husky, oxygen-free copper lead wires are held by ¼ hard brass terminals. The whole assembly is then sealed in a crackfree steatite ceramic case. Special PW resistors are also available for circuit protection and temperature compensation. Optional construction is available for printed circuit board applications.

TOLERANCE: ±10% is the standard tolerance on Standard Temperature Coefficient Resistors.

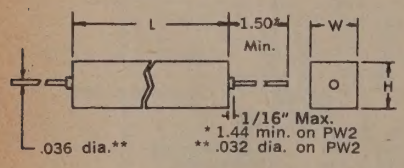
SPECIFICATIONS

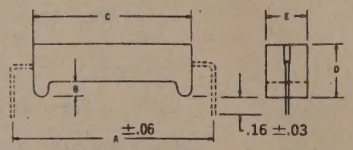
IRC Type	Power Rating† W @ °C	Resistance Min.* (ohms)	Resistance Max. (ohms)	Standard Temperature Coefficient (−55°C to +275°C) 0.06%/°C (ohms)	Standard Temperature Coefficient (−55°C to +275°C) 0.03%/°C (ohms)	Special Temperature Coefficients +0.55%/°C (ohms)	Special Temperature Coefficients +0.45%/°C (ohms)	Special Temperature Coefficients +0.26%/°C (ohms)	Special Temperature Coefficients +0.13%/°C (ohms)
PW2	2 85	0.18	2.4K	0.18 to 0.62	0.68 to 2.4K	0.1 to 30	0.24 to 130	0.82 to 120	1.0 to 10
PW3	3 40	0.1	7.5K	0.1 to 0.27	0.3 to 7.5K	0.1 to 56	0.1 to 270	0.20 to 270	0.24 to 20
PW5	5 40	0.1	8.5K	0.1 to 0.36	0.39 to 8.5K	0.1 to 68	0.1 to 300	0.24 to 300	0.27 to 22
PW7	7 40	0.1	18K	0.1 to 0.56	0.62 to 18K	0.1 to 150	0.15 to 680	0.51 to 670	0.62 to 51
PW10	10 40	0.18	30K	0.18 to 0.91	1.0 to 30K	0.1 to 240	0.24 to 1100	0.82 to 1100	1.0 to 82
PW15	15 25	0.18	30K	0.18 to 0.91	1.0 to 30K	0.1 to 240	0.24 to 1100	0.82 to 1100	1.0 to 82
PW20	20 25	0.24	2K	0.24 to 0.39	0.43 to 560	0.1 to 3	0.1 to 16	0.14 to 36	0.14 to 39
PW22	22 25	.27	12K	0.27 to 1.3	1.3 to 12K	0.15 to 360	0.36 to 1800	1.25 to 1800	1.5 to 120
PW50	50 25	0.43	560	—	0.43 to 560	0.1 to 5	0.1 to 27	0.24 to 60	0.24 to 65

*CONSULT TRW FOR LOWER RANGES. †Derated to 0 @ 250°C.

DIMENSIONS

2, 3, 5, 7, 10, 15 and 22-WATT STYLES





DIMENSIONS ±.03

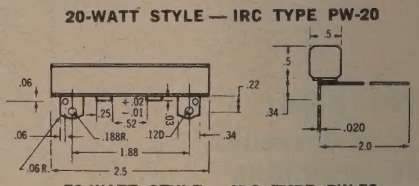
TYPE	L	W	H
PW2	.69	.25	.25
PW3	.88	.31	.31
PW5	.88	.38	.35
PW7	1.39	.38	.35
PW10	1.88	.38	.35
PW15	1.88	.50	.50
PW22	2.50	.50	.50

RECOMMENDED MTG. DIM.

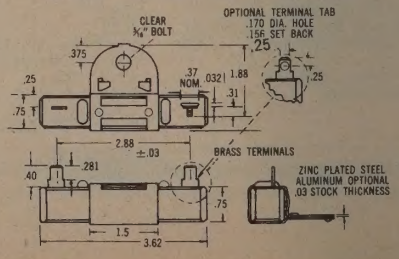
TYPE	A	B	C	D	E
PW-2A	1.06	.06	.69	.31	.25
PW-3A	1.25	.06	.88	.38	.31
PW-5A	1.25	.06	.88	.41	.38
PW-7A	1.75	.12	1.39	.47	.38
PW-10A	2.25	.12	1.88	.47	.38
PW-15A	2.25	.12	1.88	.50	.50

Standard parts are supplied with straight axial leads. Consult factory for available configurations for printed circuit mounting.

20-WATT STYLE — IRC TYPE PW-20



50-WATT STYLE — IRC TYPE PW-50



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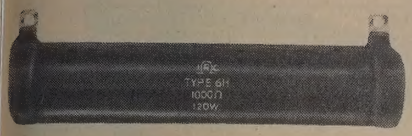
TUBULAR POWER WIREWOUND RESISTORS

TRW®

ELECTRONICS GROUP



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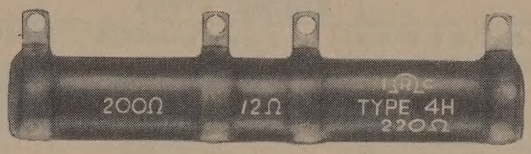

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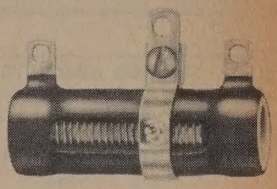


ADJUSTABLE

TOLERANCE, Standard tolerance for tubular resistors is ±5% above 1 ohm and ±10% below 1 ohm. Tolerance on adjustable, tapped, and non-inductive resistors is ±10%.

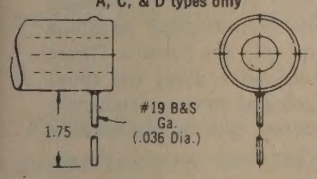
(Wattage ratings are based on 350°C hot spot at 40°C ambient with resistor suspended in free air without mounting hardware.)

IRC Wattage	IRC Type	(Fixed only) Ratings MIL Equiv.	(Fixed only) Ratings V	Core Dimension Length in inches	Core Dimension O.D. in inches	Core Dimension I.D. in inches	Terminals Std.	Terminals Special	Minimum Ohms‡	Max. Ohms .0025 wire	Max. Ohms .00175 wire	(A) Max. Ohms .0014 wire	(Fixed only) Max. Ohms .0008 wire
4	⅞A			.88	.31	.19	12A	1*, 13A	0.10	200	775	—	10K
5	1A			1.00	.31	.19	13A	1**, 12A	0.10	530	1,550	—	15K
12	1¾A(A)	RW29	11	1.75	.31	.19	13A†	1, 12A	0.10	2,500	5,600	10K	50K
12	1C	RW30	11	1.00	.44	.27	12A	1, 13A	0.10	900	2,500	—	20K
15	1½C	RW31	14	1.50	.44	.27	12A	1, 13A	0.10	2,000	6,300	—	50K
20	2C(A)	RW32	17	2.00	.44	.27	13A†	1, 12A	0.10	4,000	10K	16K	80K
25	2D(A)			2.00	.56	.38	12A	1,4A, 13A	0.10	4,500	12K	20K	100K
26	3C(A)	RW33	26	3.00	.44	.27	12A	1,13A	0.10	8,000	18K	31K	150K
30	2½D(A)			2.50	.56	.38	12A	1,4A, 13A	0.10	6,500	18K	30K	150K
35	3D(A)			3.00	.56	.38	12A	1,4A, 13A	0.10	8,250	23.8K	40K	200K
45	3E(A)			3.00	.75	.50	12A	4A, 13A	0.15	11K	31K	50K	250K
50	3½E(A)			3.50	.75	.50	12A	4A, 13A	0.20	13.5K	40K	65K	300K
50	4D(A)			4.00	.56	.38	12A	1,4A, 13A	0.20	12K	35K	60K	300K
60	4E(A)	RW35	55	4.00	.75	.50	12A	4A, 13A	0.20	16K	45K	75K	350K
60	5D(A)			5.00	.56	.38	12A	1,4A, 13A	0.25	15.5K	45K	80K	400K
65	4½E(A)			4.50	.75	.50	12A	4A, 13A	0.25	18.5K	53.5K	88K	400K
75	5E(A)			5.00	.75	.50	12A	4A, 13A	0.27	21K	61K	100K	450K
80	4H(A)	RW36	78	4.00	1.12	.75	4A	—	0.30	23K	68.5K	110K	525K
100	6½E(A)			6.50	.75	.50	12A	4A, 13A	0.36	28.5K	82.5K	140K	600K
120	6H(A)	RW37	113	6.00	1.12	.75	4A	—	0.47	38K	112.5K	180K	850K
130	6½H(A)			6.50	1.12	.75	4A	—	0.56	41.5K	120K	220K	900K
160	8H(A)	RW38	159	8.00	1.12	.75	4A	—	0.68	54K	156K	280K	1.15 meg.
175	8½H(A)			8.50	1.12	.75	4A	—	0.75	57K	167K	300K	1.25 meg.
225	10½H(A)	RW47	210	10.50	1.12	.75	4A	—	0.91	72K	210K	350K	1.5 meg.
250	12H(A)			12.00	1.12	.75	4A	—	1.00	82K	244K	400K	1.75 meg.

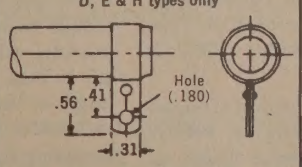
* 6 Watts ** 8 Watts † 12A std. on adjustable type ‡ Except #1 terminal

(A) Adjustable resistors are shown by adding the letter "A" to the designation of standard resistors.

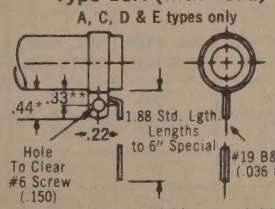
Type 1
A, C, & D types only



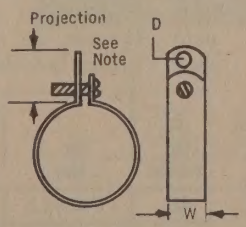
Type 4A
D, E & H types only



Type 12A (no Lead)
Type 13A (with Lead)
A, C, D & E types only



Tapper, ferrule and non-inductive types available, consult TRW.



Dimensions

IRC Type	W	Proj.	D
A	.19	.54	.120
C	.25	.59	.156
D	.25	.78	.15
E	.31	.75	.18
H	.31	.75	.18

NOTE: D, E & H types are threaded. Type A & C are furnished with screw and nut.

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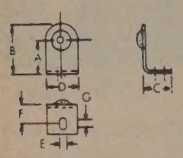
TRW® TUBULAR & FLAT POWER WIREWOUND RESISTORS

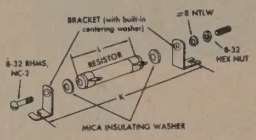
ELECTRONICS GROUP

BRACKET TYPES

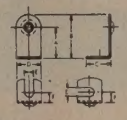
D and DD BRACKETS



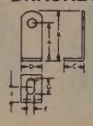
D, DD, E, or H BRACKET MOUNTING (Thru-Bolt)



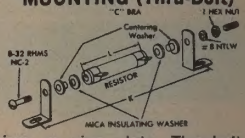
E and H BRACKETS



C BRACKET

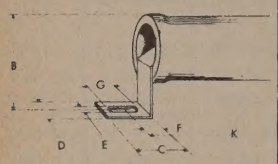


MOUNTING (Thru-Bolt)

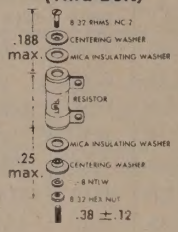


MATERIALS: Standard is steel with cadmium or zinc plate. Thru-bolt mounting hardware in brass with nickel plate is available at additional cost.

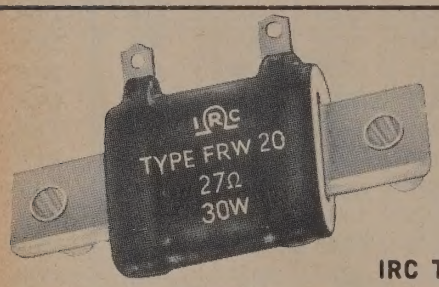
Z BRACKET STANDARD



VERTICAL MOUNTING (Thru-Bolt)



Bracket Type	Use With Resistor O.D.	Type	DIMENSIONS A	B	C	D	E	F	G	K = L +
C	.44	C	1.00	1.38	.75	.50	.22	.44	.44	1.00
D	.56	D	.44	.75	.87	.62	.14	.62	.22	1.31
DD	.56	D	.69	1.00	.62	.62	.14	.37	.22	.81
E	.75	E	1.13	1.56	.87	.87	.28	.37		.81
H	1.13	H	1.50	2.06	1.00	1.13	.37	.50		1.06
Z-0	.31	A		.59	.50	.31	.17	.23	.27	.47
Z-1	.56	D		1.25	.56	.31	.17	.31	.30	.62
Z-2	.75	E		1.44	.62	.37	.17	.34	.36	.68
Z-3	1.13	H		2.06	.69	.50	.19	.40	.25	.81
Z-4	.44	C		.63	.45	.22	.14	.25	.14	.50



IRC TYPE FRW

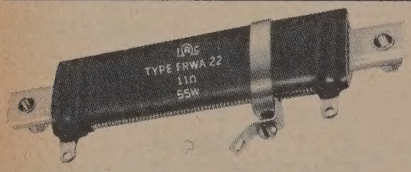
TOLERANCES

Standard tolerance for single section, flat power wirewound resistors is ±5% above 1 ohm, and ±10% below 1 ohm.

Standard tolerance on tapped and adjustable FRW resistors is ±10%.

Wattage rating based on 350°C hot spot at 40°C ambient with resistor mounted horizontally on a 10" x 10" x .040" steel plate in free air using standard mounting brackets.

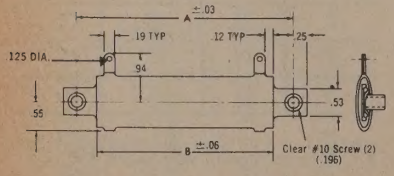
IRC Wattage	IRC Type	MIL Type and Rating	V Watts	DIMENSIONS Mounting Centers	Core Length	Minimum Ohms	Max. Ohms .0025 Wire	Max. Ohms .00175 Wire	Max. Ohms .0014 Wire
30	FRW-20	RW20	21	2.00	1.25	0.1	2.75K	8K	15K
40	FRW-21	RW21	31	2.75	2.00	0.1	6K	18K	35K
55	FRW-22	RW22	53	4.25	3.50	0.20	13K	38K	75K
70	FRW-23	RW23	68	5.50	4.75	0.25	19K	56K	110K
95	FRW-24	RW24	91	6.75	6.00	0.35	25K	75K	140K



ADJUSTABLE FLAT TYPE FRWA

The adjustable feature of Tubular Type Resistors is also available on Flat Type FRWA Resistors. Adjustable FRWA's come in four sizes.

The general characteristics of Tubular Type Resistors also pertain to FRWA units. However, the compact design of these resistors provides a much higher power-space ratio than that of standard tubular resistors. Non-magnetic mounting brackets extend into the resistor. These aid in heat distribution along the entire length of the unit and serve as conductors to transfer internal heat to the chassis. Mounting bracket design prevents the resistor from rotating and loosening.



IRC Wattage	IRC Type	DIMENSIONS A Mounting Centers	B Core Length	Minimum Ohms	Max. Ohms .0025 Wire	Max. Ohms .00175 Wire	Max. Ohms .0014 Wire
40	FRWA-21	2.75	2.00	0.1	6K	18K	35K
55	FRWA-22	4.25	3.50	0.2	13K	38K	75K
70	FRWA-23	5.50	4.75	0.25	19K	56K	110K
95	FRWA-24	6.75	6.00	0.35	25K	75K	140K

*Adjustable resistors are shown by adding the letter "A" to the designation of standard resistors.

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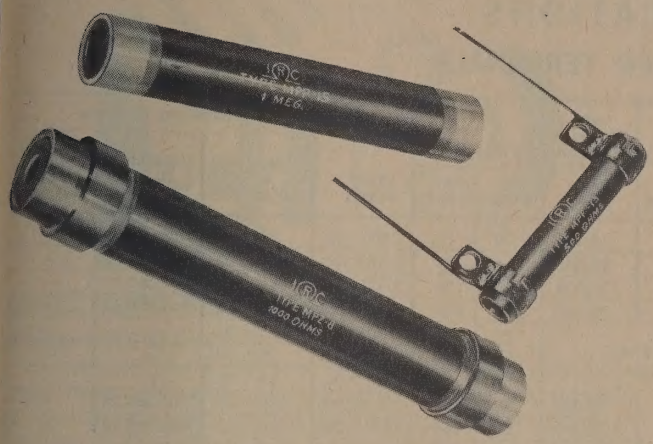
HIGH FREQUENCY, HIGH VOLTAGE RESISTORS

TRW®

ELECTRONICS GROUP



TYPE MP

IRC type MP resistors have a specially designed resistance film which provides optimum performance in all characteristics while operating at high frequencies. The cross-sectional area of this exclusive film is held to less than 0.001″ thickness to assure low inherent capacity and freedom from skin-effect.

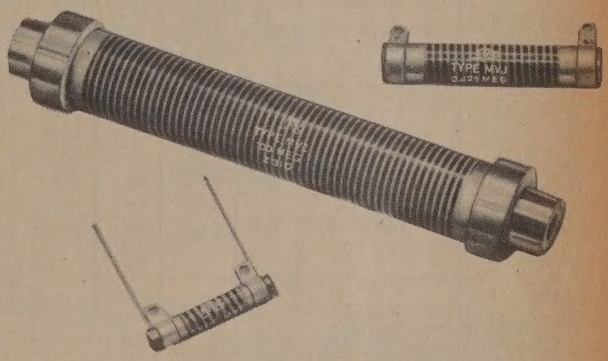
Terminal bands of colloidal silver are applied to each end of the resistor to form a permanent low resistance contact to the resistance film. Lug, axial lead or ferrule terminals, when required, are secured to the silver end-bands. A protective coating is baked on the entire resistor film.

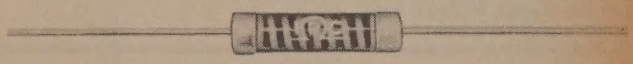
Type MP Resistors are used extensively for applications such as broad band RF amplifiers, RF probes, rhombic antenna terminating resistors, dummy loads for transmitters and dielectric heating equipment, television side-band filters, surge generator and other circuits involving high frequency measuring circuits and radar pulse equipment.

TYPE MV

For high voltage requirements where high resistance and power are needed, IRC Type MV Resistors offer exceptional stability. IRC's exclusive composition film type resistance coating is applied in helical form on a ceramic tube to provide a conducting path of long, effective length. The mechanical spacing of the helical turns gives a uniform pitch, and allows uniform voltage gradient throughout the length of the resistor.

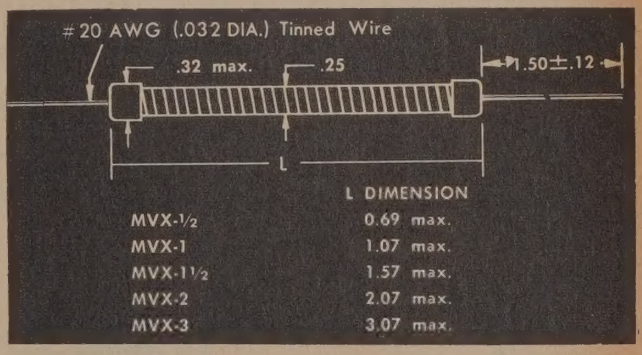
MV Resistors are particularly suited for voltmeter multipliers, high resistance standards, bleeders, grid leaks, voltage dividers, TV high voltage circuits, cathode ray tube circuits. Also, protective equipment for high voltage circuits, photoelectric cell applications, high range bridge circuits, ionization chambers and similar electronic applications.





HIGH OHMIC—TYPE MVX

Type MVX meets the requirements for a small, high-range resistor with axial leads. It can be mounted through a hole in a panel or terminal board of insulating material without terminal interference. Construction corresponds to that of other MV types except for the terminal and method of terminal attachment.



TERMINALS. MVX Resistors can be furnished with or without end caps and axial leads. When furnished without leads, contact must be made to .25-inch silvered ends by pressure clips, since they cannot be soldered.

TOLERANCE. Standard tolerance for MVX Resistors is ±20%. ±5% and ±10% are available as shown in the table at right, at extra cost.

Type	Power Rating In Watts	Peak Voltage Rating	MINIMUM AVAILABLE RESISTANCE ±5%, 10%, 20% Tolerance	MAXIMUM AVAILABLE RESISTANCE ±5% Tol. In Megs	±10% Tol. In Megs	±20% Tol. In Megs
MVX-½	.5	1,000	1K	200	1,000	4,000
MVX-1	1	3,500	2.5K	350	2,500	8,000
MVX-1½	1.5	7,500	5K	700	5,000	16,000
MVX-2	2	10,000	10K	1,000	10,000	20,000
MVX-3	3	15,000	10K	1,000	12,500	30,000

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TRW HIGH FREQUENCY, HIGH VOLTAGE RESISTORS

ELECTRONICS GROUP

SPECIFICATIONS

WITH LUG TERMINALS OR COLLOIDAL SILVER TERMINALS

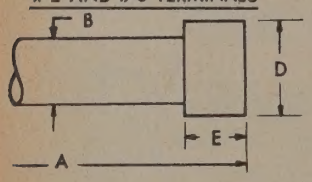
Type	Terminal Type	Power Rating† (W @ 25°C)	MP Peak Voltage Rating* (Volts)	MV Peak Voltage Rating* (KV)	MV Minimum Available Resistance ±10% or ±20% Tolerance	MV Minimum Available Resistance ±5% Tolerance	MV Maximum Available Resistance (Megs)	MP Resistance Min. in Ohms	MP Resistance Max. in Megs	Body Length	Dimensions in Inches: Resistor Body Diameter	Dimensions in Inches: Ceramic Inside Diameter	Dimensions in Inches: Width of Silver Bands #15 Term.
MPC/MVC-1	‡**	1	500	3.5	2.5K	10K	10,000	20	30	1.00±.03	.31±.03	Thd. #6-32	—
MPC/MVC-2	‡**	2	750	7.5	5K	25K	20,000	35	70	1.75±.03	.31±.03	Thd. #6-32	—
MPC/MVC-3	‡**	3	1,400	15.0	10K	100K	40,000	50	130	3.00±.03	.31±.03	Thd. #6-32	—
MPC/MVC-5	‡**	5	2,600	30.0	20K	200K	75,000	100	250	5.5 ±.06	.31±.03	Thd. #6-32	—
MPX/MVX-1	Axial Leads	1	500	3.5	See page 2765 For Ranges			20	25	1.00±.03	.25±.03	—	—
MPX/MVX-2	Axial Leads	2	750	10.0				30	100	2.00±.03	.25±.03	—	—
MPX/MVX-3	Axial Leads	3	1,250	15.0				50	150	3.00±.06	.25±.03	—	—
MPH/MVH-2	‡	4	1,000	15.0	20K	150K	60,000	30	50	2.5 ±.06	.56±.03	Thd. #6-32	—
MPH/MVH-4	‡	6	1,750	25.0	50K	400K	100,000	50	100	4.00±.06	.56±.03	Thd. #6-32	—
MPF/MVF	12, 13	2	500	5.0	2.5K	25K	15,000	20	50	1.75±.03	.31±.03	.19±.03	.38±.03
MPG/MVG	12, 13, 15, 16, 17	4	500	5.0	10K	100K	25,000	20	20	2.00±.03	.56±.03	.38±.03	.56±.06
MPJ/MVJ	12, 13, 15, 16, 17	5	1,000	10.0	20K	200K	50,000	35	50	3.00±.03	.56±.03	.38±.03	.56±.06
MPB/MVB	15	7.5	1,200	12.0	50K	400K	100,000	20	30	3.11±.03	1.00±.03	.75±.03	.56±.06
MPD/MVD	15	10	1,500	15.0	100K	700K	100,000	25	40	3.80±.03	1.00±.03	.75±.03	.56±.06
MPK/MVK	15, 16, 17	10	2,000	20.0	40K	300K	100,000	70	100	5.00±.03	.56±.03	.38±.03	.56±.06
MPP/MVP	12, 13, 15, 16, 17	10	1,750	15.0	50K	400K	100,000	35	70	4.5 ±.06	.75±.03	.50±.03	.56±.06
MPA/MVA	15, 16, 17	20	2,750	25.0	200K	1.0meg	100,000	35	75	6.5 ±.06	1.12±.03	.75±.03	.56±.06
MPZ/MVZ	15, 16, 17	20	2,750	25.0	200K	1.0meg	100,000	35	70	6.12±.06	1.12±.03	.75±.03	.56±.06
MPE/MVE	15, 16, 17	25	3,800	40.0	300K	1.5meg	100,000	40	100	8.31±.06	1.12±.03	.75±.03	.56±.06
MPO/MVO	15, 16, 17	30	4,750	50.0	400K	2.0meg	100,000	50	125	10.5±.06	1.12±.03	.75±.03	.56±.06
MPQ/MVQ	15, 17	50	4,750	50.0	500K	3.5meg	100,000	30	65	10.5±.12	2.00±.05	1.56±.03	.88±.06
MPR/MVR	15, 17	90	8,500	100.0	1meg	7.0meg	100,000	60	130	18.5±.12	2.00±.05	1.56±.03	.88±.06
MVM-5	‡	5	—	30.0	Std. Tol. ±2% 100 Meg. to 1500 Meg.			—	—	5.5 ±.06	.31±.03	Thd. #6-32	—
MVM-6	‡	6	—	30.0	Std. Tol. ±2% 100 Meg. to 1500 Meg.			—	—	6.0 ±.06	.31±.03	Thd. #6-32	—

‡ Solder lug or screw mounted.
* Rated continuous working voltage determined by $E = \sqrt{PR}$
E should not exceed value listed in column above
** Also available with axial leads.
†Derated to 0 at 105°C

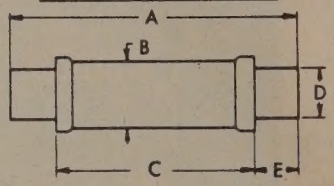
E = Max. continuous voltage
P = Power in watts
R = Resistance in ohms

These resistors are also available as ferrules in some sizes. Consult TRW.

#2 AND #6 TERMINALS



#5, 7 AND 8 TERMINALS



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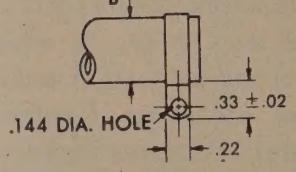

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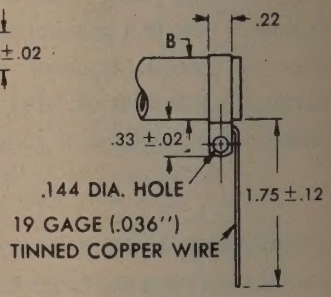

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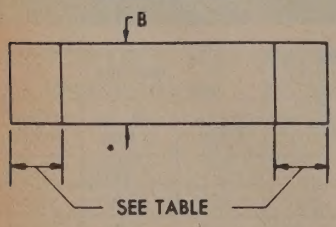

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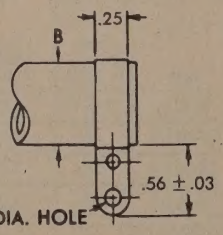

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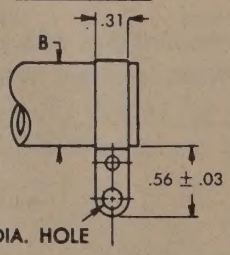
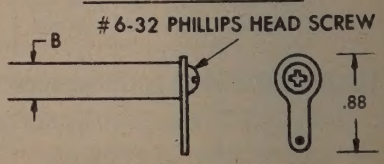


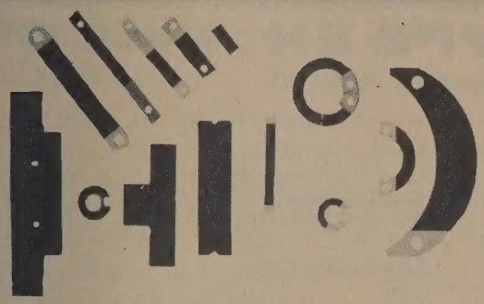
SOLDER LUG TERMINAL



RESISTANCE STRIPS & CONCENTRIC DISC RESISTORS

TRW®

ELECTRONICS GROUP



CONCENTRIC DISC RESISTORS

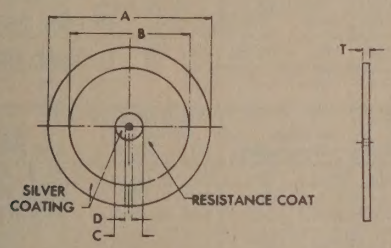
RESISTANCE ELEMENTS

Concentric Disc Resistors are die stamped from resistance strip. Inner and outer rings of colloidal silver are applied to provide contact with coaxial line fixtures. *Mechanical pressure type contacts must be used rather than soldered connections.*

RESISTANCE VALUES AND TOLERANCES

Standard resistance values available are 5 ohms to 100,000 ohms. Standard tolerance is ±20% with ±10% available on special order. For other resistance values or tolerances contact TRW, Boone, N.C.

DIMENSIONS



STANDARD DISCS*

Disc Types	Dimensions in Inches A	B	C	D	T**(±.005)
DRT	.25	.22	.12	.076	.027
DRU	.28	.22	.12	.076	.027
DRX	.38	.28	.12	.076	.027
DRB	.50	.38	.12	.076	.027
DRD	.63	.44	.19	.076	.027
DRF	.75	.50	.25	.076	.027
DRJ	1.00	.75	.25	.076	.027
DRN	1.50	1.25	.25	.076	.027

* Special sizes available upon request.
Sizes include standard dimensions for colloidal silver contact rings.
** Other thicknesses available on special order.

CHARACTERISTICS

Power Rating

Type	Power Rating in Watts at 25°C ambient	Power Rating in Watts at 40°C ambient
DRT	0.06	0.03
DRU	0.07	0.03
DRX	0.10	0.05
DRB	0.12	0.06
DRD	0.14	0.08
DRF	0.16	0.09
DRJ	0.45	0.25
DRN	1.30	0.70

Discs should not be operated at a maximum surface temperature exceeding 80°C.

VOLTAGE RATING

Maximum rated voltage is 500 volts per inch of current path, but not to exceed power ratings shown above.

RESISTANCE PER SQUARE

While Concentric Disc Resistors should not be ordered in terms of ohms/square it may be desirable for other purposes to determine this value. Following is the formula:

$$\text{resistance/square} = \left(\frac{2.73}{\log_{10}\frac{B}{C}}\right)\left(\text{total resistance}\right)$$

Where B and C are as shown in the figure under DIMENSIONS above.

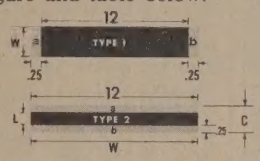
HOW TO ORDER

Standard Concentric Disc Resistors should be ordered by the disc type, total resistance between silver terminals and resistance tolerance. Special concentric discs should give all dimensions indicated above, total resistance between silver terminals and resistance tolerance.

RESISTANCE STRIPS

DIMENSIONS AND TYPES

IRC Standard Resistance Strips are available in two types as shown in the figure and table below.



DIMENSIONS IN INCHES

Note: a and b areas are silver terminations.

TYPE 1

Length Between Terminals ±.06	Total Strip Width (W) ±.03	Thickness (±.005)
12	0.88	.027
12	1.19	.027
12	1.38	.027
12	1.50	.027
12	1.75	.027
12	2.75	.027

TYPE 2

Width W ±.06	L ±.03	C ±.03	Thickness (±.005)
12	.38	0.88	.027
12	.69	1.19	.027
12	.88	1.38	.027
12	1.00	1.50	.027
12	1.25	1.75	.027
12	2.25	2.75	.027

Special lengths, widths, and thicknesses are available. Consult TRW, P.O. Box 393, Boone, N.C. 28607.

TOLERANCE

Standard tolerance is ±20%. Special Tolerances of ±15% and ±10% are available on special order.

RESISTANCE VALUES

19 ohms/square to 1.0 megohm/square.

COATING

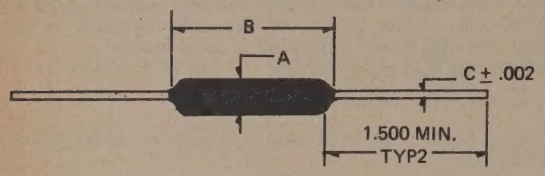
IRC resistance strips consist of a high grade paper base phenolic laminate with IRC resistance material permanently bonded. They can be supplied with a low resistance colloidal silver contact coating over any portion of the surface where a low resistance positive contact is desired. Mechanical pressure type contacts must be used rather than soldered connections.

tel labs

POWER RESISTORS

TYPE EL SILICONE POWER

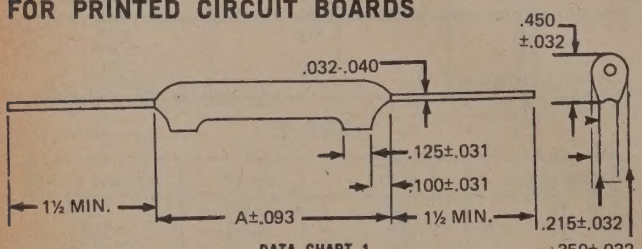
MEETS OR EXCEEDS MIL-R-26



Tel Labs Style	Mil Desig. (RW)	Diameter (A)	Length (B)	Lead Size (C)	Wattage 275°C	Wattage 350°C	Radial Leads (special)	Radial Leads Size
EL¼		.090±.031	.215±.031	.020	0.5W	1.0W	Yes	—
EL½		.090±.031	.280±.031	.020	0.5W	1.0W	Yes	.020
EL1A	RW70	.090±.031	.395±.031	.020	1.0W	1.25W	Yes	.020
EL1B		.090±.031	.530±.031	.020	1.0W	1.25W	Yes	.020
EL1C		.135±.031	.335±.031	.025	1.0W	2.0W	No	—
EL2		.250±.031	.625±.062	.032-.040	3.0W	4.0W	Yes	.032
EL2A		.187±.031	.825±.062	.032	3.25W	4.5W	Yes	.032
EL2B		.187±.031	.625±.062	.032	3.0W	3.5W	Yes	.032
EL2C	RW59, 69	.250±.031	.562±.062	.032-.040	3.0W	4.0W	Yes	.032
EL2D		.250±.031	.500±.062	.032-.040	3.0W	4.0W	Yes	.032
EL2E		.195±.031	.500±.062	.025	2.5W	3.5W	No	—
EL2F		.187±.031	.500±.062	.032	2.5W	3.0W	Yes	.032
EL2G		.187±.031	.430±.062	.032	2.5W	3.0W	Yes	.032
EL2H		.187±.031	.385±.062	.032	2.5W	3.0W	Yes	.032
EL21	RW79	.195±.031	.560±.062	.032	3.0W	3.5W	Yes	.032
EL3		.295±.031	.500±.062	.032-.040	3.0W	4.0W	Yes	.032
EL5	RW74	.290±.062	.925±.093	.032-.040	5.0W	6.0W	Yes	.032
EL5A	RW57, 67	.350±.062	1.000±.093	.032-.040	5.0W	6.5W	Yes	.032
EL7		.290±.062	1.200±.093	.032-.040	5.0W	6.5W	Yes	.032
EL7A		.350±.062	1.360±.093	.032-.040	5.0W	7.0W	Yes	.032
EL10A	RW58, 68	.350±.062	1.815±.093	.040	10.0W	12.0W	Yes	.032

TYPE ELM POWER RESISTORS

FOR PRINTED CIRCUIT BOARDS



DATA CHART 1

TEL LABS STYLE	LENGTH "A"	WATTAGE "U"	WATTAGE "V"	RESISTANCE .05%—0.5%	1%—5%	RADIAL LEADS
ELM5A	1.000	5W	6W	.5Ω-35k	.1Ω- 90k	YES
ELM7A	1.360	6W	7W	.5Ω-45k	.1Ω-100k	YES
ELM10A	1.815	10W	12W	.5Ω-75k	.1Ω-275k	YES

DATA CHART 2

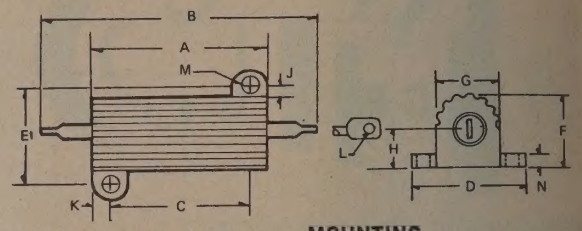
TEL LABS STYLE	TEMPERATURE COEFFICIENT ±50 PPM	±30 PPM	±20 PPM
ELM5A	BELOW 1Ω	1Ω to 9.9Ω	10Ω to 90k
ELM7A	BELOW 1Ω	1Ω to 9.9Ω	10Ω to 100k
ELM10A	BELOW 1Ω	1Ω to 9.9Ω	10Ω to 275k

1. Less than 100°C temp., rise when derated to 30% of wattage under characteristic "V."
2. Silicone Coated
3. Non-Inductively wound version available. One-half the resistance value shown in data chart 1.
4. Reduces the possibility of burned printed circuit boards.
5. Insures resistor identification.
6. Shock and vibration problems reduced when properly installed.

TEL LABS, INC. 1050 – 1060 SECOND STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE: 603-625-8994 TWX 710-220-1844

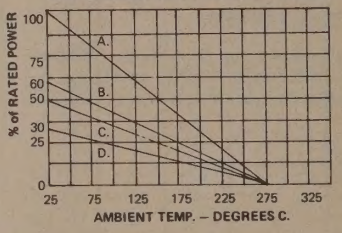
TYPE EH CHASSIS MOUNT

ALUMINUM HOUSED



TEL LABS STYLE	A ±.031	C ±.005	E ±.005
EH5	.600	.444	.490
EH10	.750	.562	.625
EH25	1.062	.718	.781
EH50	1.937	1.562	.843

Also available Non-Inductively Wound



MOUNTING

EH25, 50 5x7x2 Aluminum Chassis
EH5, 10 4x6x2 Aluminum Chassis

WEIGHT (AVG.)

EH5 3.0 GRAMS
EH10 5.6 GRAMS
EH25 11.7 GRAMS
EH50 25.0 GRAMS

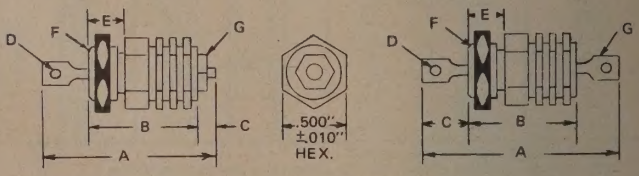
A. EH5, 10, 25, 50 Mounted
B. EH10 Unmounted
C. EH5, 25 Unmounted
D. EH50 Unmounted

TEL LABS STYLE (Anodyzed)	WATTAGE Mounted	WATTAGE Unmounted	RESISTANCE RANGE 1% - 5%	TEMP. COEFFICIENT ±50 PPM	TEMP. COEFFICIENT ±20 PPM
EH5	8W	4W	0.1Ω to 22K	0.1Ω to 30Ω	OVER 30Ω
EH10	10W	6W	0.1Ω to 40K	0.1Ω to 50Ω	OVER 50Ω
EH25	25W	10W	0.1Ω to 70K	0.1Ω to 100Ω	OVER 100Ω
EH50	50W	12W	0.1Ω to 250K	0.1Ω to 300Ω	OVER 300Ω

Meets or exceeds MIL R-18546D.

TYPE FP ALUMINUM HOUSED

FEED THROUGH



POWER RATING

275° C maximum hotspot Temperature
Heat Sink 4"x6"x2"x.040" Aluminum Chassis
FP10 one end grounded
FP10-1 Feed through terminals — one each side chassis

WEIGHT 6 GRAMS

Available Noninductively Wound (FP10N). One-Half Maximum Resistance of Table 2.

TEL LABS STYLE	WATTAGE MOUNTED ON SPECIFIED HEAT SINK	RESISTANCE RANGE 1% - 5%	TEMP. COEFFICIENT ±50 PPM	TEMP. COEFFICIENT ±20 PPM
FP10	10W	.1Ω to 35K	0.1Ω to 30Ω	OVER 30Ω
FP10-1	10W	.1Ω to 35K	0.1Ω to 50Ω	OVER 50Ω

TEL LABS STYLE	A ±.031"	B ±.010"	C ±.031"	D ±.005"	E ±.010"	F	G
FP10	1.265"	.750"	.180"	.086"	.250"	3/8-24 UNF-2A	4/40 UNC
FP10-1	1.400"	.750"	.325"	.086"	.250"	3/8-24 UNF-2A	SAME AS D

PRECISION RESISTORS

TYPE SA EPOXY

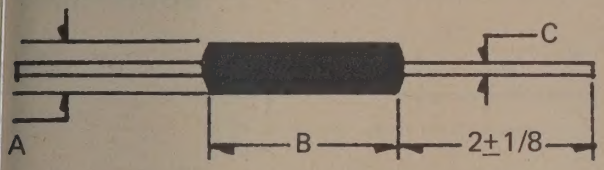
NCAPSULATED AXIAL

ESIGNED TO MEET OR EXCEED MILR93D.

ll units represented may be modified for minimum inducance and capacitive effects at frequencies above the audio ange. Rise and decay time characteristics are measured rom 10% to 90% of peak pulse amplitude with a 100 ilocycle pulse input.

emperature coefficients are available to 0 ± 4PPM/°C and .C. matches are available to 2PPM/°C.

tabilities of 0.005% per year are available on a production asis.



Tel Labs Style	Mil R93D Desig.	Diam. A ± .015	Length B ± .031	Lead Diam. C.	MAX. VALUE Mil.	MAX. VALUE Comm.	WATTAGE Mil.	WATTAGE Comm.	MAX. VOLTAGE Mil.	MAX. VOLTAGE Comm.
SA1	RB55	.250	.500	.032	226 K	1.1 Meg	.15W	.3W	400	400
SA2	RB54	.250	.750	.032	448 K	2 Meg	.25W	.4W	300	400
SA3	RB53	.375	.875	.032	750 K	8 Meg	.333W	.5W	300	400
SA4	RB52	.375	1.000	.032	1.5 Meg	10 Meg	.5W	.75W	600	800
SA5	RB57	.500	1.062	.032	2 Meg	16 Meg	.75W	1.0W	800	1000
SA6	RB58	.500	1.531	.032	3 Meg	24 Meg	1.0W	1.5W	900	1200
SA7	RB59	.500	2.031	.032	5.11 Meg	24 Meg	1.25W	2.0W	1200	1800
SA11		.250	.625	.032		400 K		.33W		800
SA13		.312	.937	.032		1.2 Meg		.5W		800
SA16	RB56	.250	.375	.032	127 K	205 K	.125W	.25W	200	200
SA19		.250	.250	.032		500 K		.2W		200

NOTE: In no case should maximum voltage exceed wattage rating.

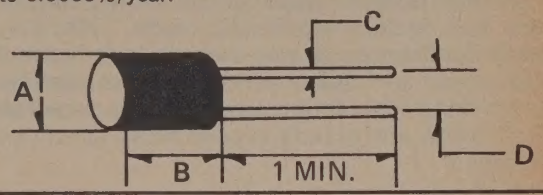
SUBMINIATURES

Tel Labs Style	Diameter A ±.015	Length B ±.031	Lead Diam. C.	Maximum Value	Maximum Wattage	Maximum Voltage
SA9	.135	.312	.025	400 K	.08W	100
SA10	.185	.560	.025	500 K	.2W	100
SA17	.109	.270	.020	200 K	.05W	100
SA20	.165	.500	.025	400 K	.150W	100, 200
SA21	.187	.375	.025	500 K	.125W	100, 200
SA22	.150	.437	.025	375 K	.07W	100
SA24	.125	.250	.020	75 K	.05W	100
SA25	.110	.300	.020	85 K	.05W	100
SA26	.125	.375	.025	140 K	.05W	100
SA29	.100	.300	.025	80 K	.05W	100
SA30	.200	.405	.025	175 K	.05W	100
SA31	.100	.220	.020	70 K	.04W	100

In no case should maximum voltage exceed wattage rating.

TYPE PW SERIES

Conformal and Shell Encapsulated. Designed Specifically for Printed Circuit Applications. Temperature coefficients from 0±20 PPM to 0±5 PPM Matching to 2 PPM. Inductive or Noninductive Winding. Stabilities available on a production basis to 0.0005%/year.



Mil R 93D Desig.	Tel Labs Style	A ± .015	B ± .032	C	D ± .015	MAX. VALUE Mil.	MAX. VALUE Comm.	WATTAGE Mil.	WATTAGE Comm.	MAX. V. Mil.	MAX. V. Comm.
RB71	PW1	.250	.312	.025	.200	100K	125K	.125W	.15W		300
	PW2	.250	.406	.025	.200		175K		.2W		600
RB70	PW20	.375	.500	.032	.200, .250	301K	375K	.250W	.33W	150	600
	PW40	.468	.625	.032	.250, .300		500K		.3W		600
	PW31	.500	.625	.032	.250, .300		1.75 Meg		.6W		600
	PW10	.406	1.250	.032	.250, .300		1.0 Meg		1.0W		1200
	PW50	.531	1.000	.032	.250, .300		3.0 Meg		1.0W		1200

TYPE CR/CA/CL SERIES

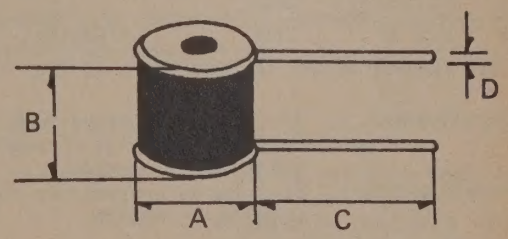
CERAMIC CORE RESISTORS

"CR" Ceramic Radial Leads

"CA" Ceramic Axial Leads

"CL" Ceramic Lugs

Ceramic spool type unit. Windings sealed in varnish. Hole provided for screw mounting. Operate from -65°C to 105°C. Inherently good stability.
Excellent for use under laboratory conditions and most commercial applications.



Style	Diameter A ±.015	Length B ±.031	Lead Diam. D	Max Value (.0005 Wire)	Wattage	Max. V	Hole (clearance) Screw #
CR16	.250	.250	0.20	100K	0.1W	200	0
CR1	.250	.406	.020-0.25	400K	0.15W	400	2
CR23	.281	.343	.020-.025	250K	0.15W	200	2
CR18	.343	.312	.020-.025	400K	0.2W	200	6
CR2	.250	.687	.020-.025	1.25 Meg.	0.25W	400	0
CR20	.375	.437	.020-.032	1.0 Meg.	0.25W	200	4
CR25	.500	.437	.025-.032	1.5 Meg.	0.33W	400	6
CR27	.375	.656	.025-.032	1.5 Meg.	0.5W	400	4
CR31	.500	.625	.025-.032	3.0 Meg.	0.5W	400	6
CR35	.500	.562	.025-.032	3.25 Meg.	0.5W	400	6
CR53	.500	1.000	.025-.032	6.0 Meg.	1.0W	800	6
CR60	.750	1.250	.025-.032	6.0 Meg.	1.5W	800	6
CR71	.812	2.093	.025-.032	20.0 Meg.	2.5W	1600	6

1. All units above may be supplied with Axial Leads, specify "CA".
2. Lugs may be supplied on the following; CL25, CL31, CL35, CL53, CL60, CL71

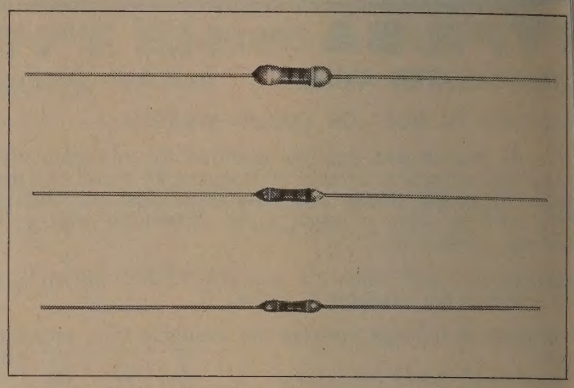
TEL LABS, INC. 1050 – 1060 SECOND STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE: 603-625-8994 TWX 710-220-1844

Rohm
QUALITY · RELIABILITY

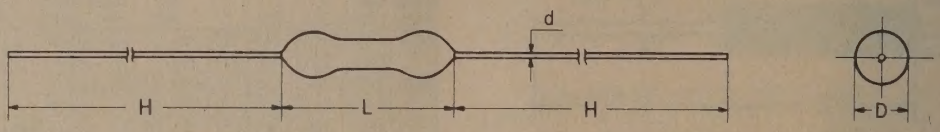
DEPOSITED CARBON FILM RESISTORS MINIATURE. COATED

R-1/4·R-1/8·R-1/32

Our automated and accurate processing systems turn out nearly 10 million R (coated) type per day.... Originally designed by Toyo Electronics Industry Corp. for general purpose applications in low power equipment and miniature printed-circuits. This R (coated) type is conformally coated with an inner coat of epoxy resin and an outer sheath of melamine resin. Performance characteristics meet all requirement of JIS-C-6402, and greatly exceed those of any composition types.



DIMENSIONS:



TYPE	BODY DIMENSIONS				WIRE TREMINATIONS			
	DIAMETER (D)		LENGTH (L)		DIAMETER (d)		LENGTH (H)	
	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
R-1/32	0.065	1.65 ±0.15	0.272	6.9 ±0.7	0.018	0.45 ±0.02	1.181	30.0 ±3.0
R-1/8	0.087	2.2 ±0.2	0.295	7.5 ±1.0	0.021	0.55 ±0.02	1.181	30.0 ±3.0
R-1/4	0.110	2.8 ±0.2	0.355	9.0 ±1.0	0.021	0.55 ±0.02	1.181	30.0 ±3.0

MARKING: EIA standard color coding

TYPICAL PERFORMANCE CHARACTERISTICS

TYPE	RATING		RESISTANCE TOLERANCES	RESISTANCE RANGE	AVERAGE TEMPERATURE COEFFICIENT	
	WATTS AT 70°C	VOLTS d.c or a.c RMS			BELOW 100KΩ	ABOVE 100KΩ
R-1/32	0.031W	50V	± 5% (J)	0.5 Ω to 250K Ω	−300ppm/°C	−400ppm/°C
R-1/8	0.125W	200V		0.5 Ω to 820K Ω	−300ppm/°C	−400ppm/°C
R-1/4	0.25 W	250V	±10% (K)	0.5 Ω to 1.5M Ω	−250ppm/°C	−400ppm/°C

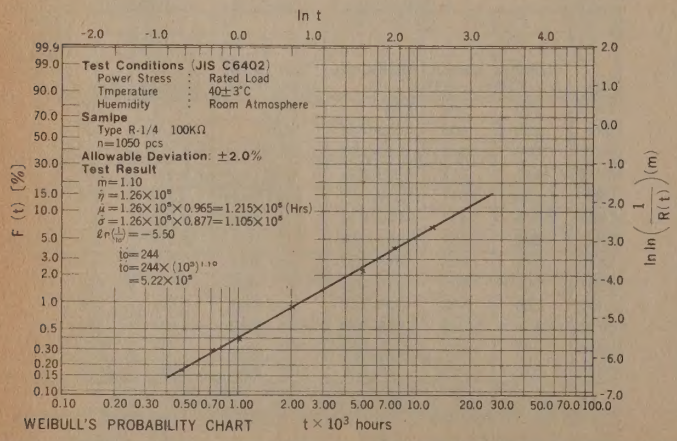
AMBIENT TEMPERATURE CATEGORY: −40°C to +125°C

Short-time overload: Tested in accordance with MIL-R-22684 the change in resistance will be less than ±0.5%.

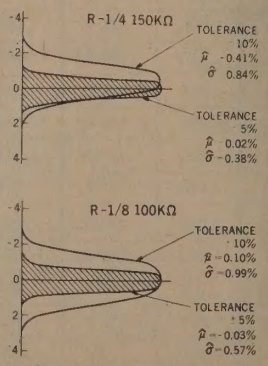
Resistance to soldering heat: The change in resistance due to soldering: < ±0.25%.

Temperature cycle: Tests per MIL-STD-202 (Condition D) the change in resistance will be less than ±0.5%.

Humidity operation with rated load: Tested in accordance with JIS-C-6402 the change in resistance will not exceed ±2.5%.



WEIBULL'S PROBABILITY CHART

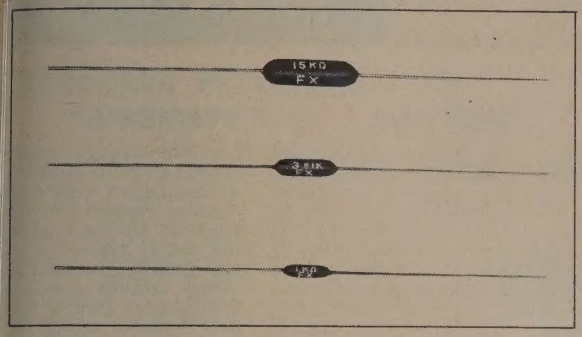


RESISTANCE DISTRIBUTION

TOYO ELECTRONICS INDUSTRY CORPORATION

EVAPORATED METAL FILM RESISTORS HIGH STABILITY. COATED

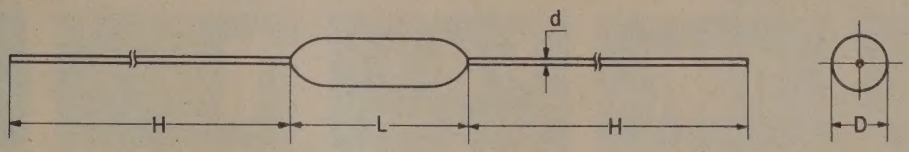
Rohm QUALITY · RELIABILITY



CRA-½·CRA-¼·CRA-⅛

A highly stable and half-sized microminiature metal film resistor conformally protected against adverse environmental conditions by multiple epoxy coatings. Performance characteristics meet all requirements of MIL-R-10509F, (Char. D). These stable and inexpensive metal film resistors are recommended for use whenever miniature circuits are required for sophisticated electronic equipment.

DIMENSIONS:



TYPE	MIL STYLE	BODY DIMENSIONS DIAMETER (D) (in)	(mm)	LENGTH (L) (in)	(mm)	WIRE TERMINATIONS DIAMETER (d) (in)	(mm)	LENGTH (H) (in)	(mm)	WEIGHT PER 100 PIECES
CRA-1/8	RN55	0.098	2.5 ±0.3	0.256	6.5 ±0.8	0.021	0.55 ±0.02	1.50	38 ±3.0	28 g
CRA-1/4	RN60	0.119	3.0 ±0.4	0.355	9.0 ±1.0	0.021	0.55 ±0.02	1.50	38 ±3.0	35 g
CRA-1/2	RN65	0.117	4.5 ±0.4	0.555	14.0 ±1.0	0.024	0.6 ±0.02	1.50	38 ±3.0	68 g

MARKING: Watage, Resistance, Tolerance, T.C., Imprinted

TYPICAL PERFORMANCE CHARACTERISTICS

TYPE	MIL STYLE	RATING WATTS AT 70 ° C	VOLTS d.c or a.c RMS	MAXIMUM OVERLOAD VOLTAGE d.c or a.c RMS	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	SHELF STABILITY (ONE YEAR)	INSULATION RESISTANCE
CRA-1/8	RN55	0.125 W	200 V	400 V	49.9 Ω to 100K Ω	(X) 100 ppm/ °C	TYPICALLY ±0.03%	10^3 megohm minimum
CRA-1/4	RN60	0.25 W	300 V	600 V	49.9 Ω to 500K Ω	(Y) 50 ppm/ °C		
CRA-1/2	RN65	0.50 W	350 V	700 V	49.9 Ω to 700K Ω	(Z) 25 ppm/ °C		

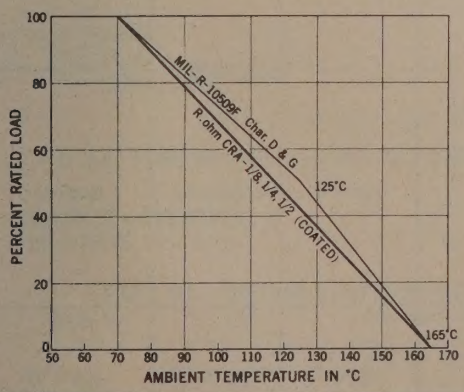
Ambient Temperature category: −55 ° C to +165 ° C

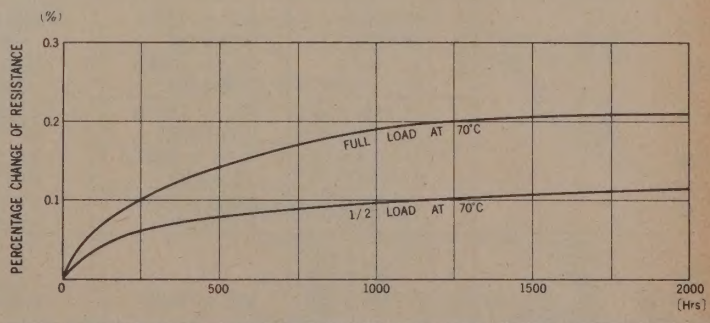
Short-time overload: Tested in accordance with MIL-R-10509. Average change Ω0.1%.

Low-temperature operation: At −65 ° C ¾ hour rated load, the change in resistance will be less than ±0.25%.

Resistance to soldering heat: Tests per MIL-STD-202C average change≦±0.1%.

Moisture exposure: Moisture insulation resistance 100 megohms minimum. Change in resistance will not exceed applicable value.





HEAD OFFICE: 21, Sain-Misosaki-cho, Ukyo-ku, Kyoto 615, Japan
TELEPHONE: (075) 311-2121 (10 Lines).
EXPORT DEPT: C. P. O. BOX 103, Kyoto, Japan
CABLE ADDRESS: ROHM KYOTO
TELEX: 5422 545 ROHM KYO
TOKYO OFFICE: 3-3, Higashi Azabu, Minato-ku, Tokyo 106.
FRANKFURT: 6 Frankfurt/M 70, Oppenheimer st., 49 W. Germany

VISHAY RESISTOR PRODUCTS

A DIVISION OF VISHAY INTERTECHNOLOGY, INC.
63 LINCOLN HIGHWAY ■ MALVERN, PA. 19355
TELEPHONE: (215) 644-1300 ■ TWX: 510-668-8944

PRECISION RESISTORS

TEMPERATURE COEFFICIENT

Vishay Resistors are produced by applying a specific bulk metal film of known and controllable properties on glass. This self-compensating system of glass and metal produces a dome shaped TC curve with zero TC at 25°C, and a maximum variation of 1ppm from 0 to 60°C.

TOLERANCE

The Vishay patented process, which combines photoetching techniques and bulk metal film set on glass, permits trimming to extremely high accuracy. Coarse and fine adjustment to tolerances of ±0.005% is standard and ±0.001% is available when resistors are hermetically sealed.

TRACKING

Optimum TC tracking between all Vishay resistors — *regardless of value* — is obtained because all are made of the same alloy, are of identical thickness, and are set in the same manner on glass. Vishay will guarantee TC tracking of their resistors *even when manufactured more than 2 years apart!*

RISE TIME

The etched planar construction of Vishay resistors results in extremely low and reproducible reactance. Settling time is less than 1 nanosecond for individual resistors; when grouped in network form, a typical R/2R ladder of 10 bits will have less than 10 nanoseconds rise time and less than 50 nanoseconds settling time; and no ringing.

STABILITY

Flexible welded ribbon leads and elastomeric encapsulation isolate the resistive element from mechanical stresses, giving the Vishay resistor ultra-high stability. The standard Vishay stability guarantee is 25ppm/yr. (50ppm max. over 3 years); and by hermetically sealing the resistors, Vishay can achieve 5ppm/yr.

1 PPM/°C. (0 to +60°C.) FOR ALL VALUES | **±0.001%** | **1/2 PPM/°C. FOR ALL VALUES** | **1 NANOSECOND** | **5 PPM/YR.**

Other characteristics, including .01% ΔR through Load Life; and non-measurable Noise, make Vishay resistors the most significant breakthrough in advancing circuit design since the transistor.

STYLE	DIMENSIONS	VALUE RANGE and WATTAGE RATING[1]	TOLERANCE	TEMPCO FOR ALL VALUES: Absolute 0°C. to 60°C.	TEMPCO FOR ALL VALUES: Tracking	SHELF LIFE
S102 Lead spacing: .150±.010	H — .320±.020 L — .295±.010 W — .100±.010	30Ω to 75KΩ 0.30 watts	0.005% to 1.00%	1ppm/°C.	1.5ppm/°C.	25ppm/yr. (50ppm max. 3 yrs.)
S104 Lead spacing: .400±.020	H — .520±.020 L — .565±.020 W — .150±.010	60Ω to 150KΩ 0.50 watts				
S105 Lead spacing: .650±.020	H — .520±.020 L — .810±.020 W — .150±.010	90Ω to 225KΩ 0.75 watts				
S106 Lead spacing: .650±.020	H — .520±.020 L — 1.190±.020 W — .245±.020	120Ω to 300KΩ 1.00 watts				
S302	H — .200±.020 L — .375±.020 W — .375±.020	30Ω to 75KΩ 0.30 watts				
C302	D — .275±.010 L — .510±.020	30Ω to 75KΩ 0.30 watts				
HA412	3/8" dia. x 5/8" long	30Ω to 75KΩ 0.30 watts	0.0010% (min. 1KΩ)	1ppm/°C.	0.5ppm/°C.	5ppm/yr.
HA512	1/2" dia. x 5/8" long	30Ω to 225KΩ 0.50 watts[2]	0.0025% (min. 500Ω)			
HA414	3/8" dia. x 1" long	30Ω to 150KΩ 0.50 watts[2]	0.005% 0.01%			
HA516	1/2" dia. x 1" long	120Ω to 450KΩ 1.0 watts[2]	0.020% 0.05%			
HA518	1/2" dia. x 1 1/2" long	180Ω to 750KΩ 1.25 watts[2]	0.10% 1.00%			
HP202 Lead spacing: .150±.010	H — .400±.020 L — .425±.020 W — .177±.020	30Ω to 75KΩ	0.001%	1ppm/°C.	0.5ppm/°C.	5ppm/yr.

NOTES: Leads are #22 AWG tinned copper. [1] rated @ 125°C. [2] maximum power listed at ambient temperature of 25°C. without heat sink. S104, S105, S106, HA and HP available in 1Ω to 30Ω values, upon request.

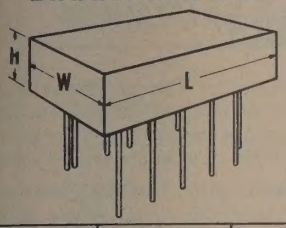
VISHAY RESISTOR PRODUCTS

A DIVISION OF VISHAY INTERTECHNOLOGY, INC.
63 LINCOLN HIGHWAY ■ MALVERN, PA. 19355
TELEPHONE: (215) 644-1300 ■ TWX: 510-668-8944

ONLY VISHAY MAKES NETWORKS WITH ALL THESE SPECIFICATIONS

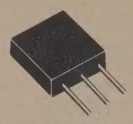
- RESOLUTION TO **16** BITS
- FULL SCALE ACCURACY TO **0.005%**
- RISE TIME LESS THAN **1** NANOSECOND
- SETTLING TIME LESS THAN **50** NANOSECONDS
- TEMPCO LESS THAN **1** PPM/°C FOR ALL VALUES (0°C TO 60°C)
- TRACKING TO **1/2** PPM/°C
- STABILITY **25** PPM OVER 3 YRS.
- **BCD** TO 4 DIGITS

STANDARD NETWORKS
BINARY and R-2R

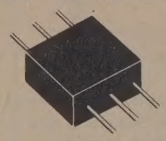


Model No.	No. Bits	L (inches)
Series 500	4 or 5	0.700
	6, 7, or 8	1.080
H = 0.5"	9 or 10	1.300
	11	1.500
W = 0.750"	12 or 13	1.660
	14 or 15	1.900
Series 375	4	0.730
	5 or 6	1.080
H = 0.375"	7 or 8	1.380
	9 or 10	1.680
W = 1.230"	11 or 12	1.980
	13 or 14	2.280
	15	2.590

EXTEND THE PERFORMANCE OF AMPLIFIERS, VOLTAGE DIVIDERS, AND R-2R LADDER NETWORKS BY USING THESE VISHAY 2-ELEMENT AND 4-ELEMENT RESISTOR NETWORKS:



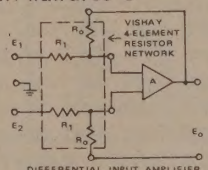
Model 300144
2-element
.100" x .295" x .320"
Lead spacing .100"



Model 300145
4-element
.200" x .375" x .375"
Lead spacing .125"

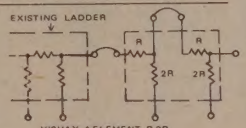
Power rating — 0.1 watt at 85°C

IMPROVE AMPLIFIER PERFORMANCE



DIFFERENTIAL INPUT AMPLIFIER
$E_o = \frac{R_0}{R_1}(E_1 - E_2)$

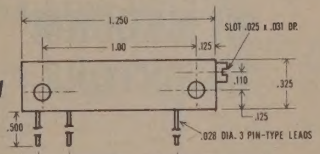
EXTEND ACCURACY OF LADDER NETWORKS



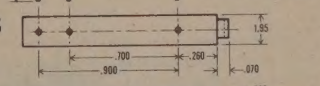
VISHAY 4-ELEMENT R-2R ACCURACY EXTENDER

TRIMMERS WITH TC OF 10 PPM/°C.

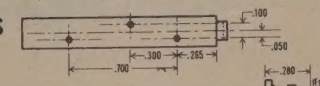
DIMENSIONS



TYPICAL SIDE VIEW

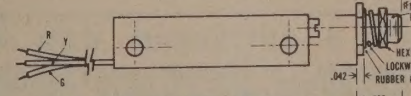


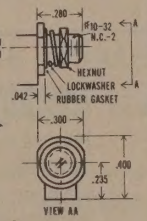
STYLE "P" INLINE PINS
(BOTTOM VIEW)



STYLE "Y" STAGGERED PINS
(BOTTOM VIEW)

3-color coded leads #30 A.W.G. teflon-coated insulated stranded wire 11½" minimum length.

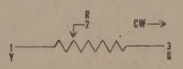




STYLE "L" FLEXIBLE LEADS

STYLE "LB" PANEL-MOUNTED FLEXIBLE LEADS

SCHEMATIC—PIN CODING FOR STYLES "P" & "Y"



PART NO. ORDERING INFORMATION

Model No.	Style	Resistance Value (ohms)
1202	P, Y, or L	2, 5, 10, 20, 100, 200 250, 1K, 2K, 5K, 10K
1201	P	15K, 20K

EXAMPLE: Flex leads, panel mtd., 10K, part no. is 1202LB-10K

SPECIFICATIONS

ELECTRICAL

Resistance Tolerance
±5% except 2Ω is ±10%

Power Rating
½ watt at 85°C — zero at 150°C

Temperature Coefficient (−55°C to +150°C)
10ppm Max. — 5ppm Typical

Resolution
Infinite (.05% Setability)

End Resistance
2Ω Max.

Insulation Resistance
1000 Megohms min. — 500V D.C.

D. C. Offset (Contact Resistance)
Less than .01Ω

Dielectric Strength
1000 volts

Frequency Capability
Up to 100 MHz — Rise time 1 nanosec. inductance 0.08μH

MECHANICAL

Full Adjustment
25 turns

Shaft-Torque
5 oz. in. max.

ENVIRONMENTAL

Operating Temperature Range
−55°C to +150°C

Shock
Setting Stability less than .5%

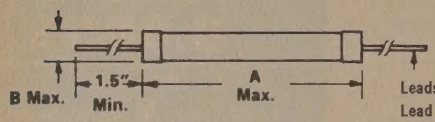
Vibration
Setting Stability less than .5%

VICTOREEN RESISTORS

When You Require Precision Resistors for Ultracritical Applications Involving

HIGH VOLTAGE · HIGH IMPEDANCE · HIGH STABILITY · HIGH WATTAGE

TYPE MOX (Metal Oxide Glaze) RESISTORS



Leads are 20 AWG tinned Copper or Dumet. Lead diameter = .020" for MOX-400,750,1125; .032" for MOX 1-5.

Type Number	Resistance Range	Wattage Rating @ 70°C	Max* Oper Voltage	Max. Oper Temp	Dimensions, inches		Encapsulation
					A	B	
MOX-400	2500 megohms	.25	1000 V	220°C	.420±.050	.130±.010	Si Conformal
MOX-750	5000 megohms	.50	2000 V	220°C	.790±.050	.130±.010	Si Conformal
MOX-1125	10,000 megohms	1.00	5000 V	220°C	1.175±.060	.130±.010	Si Conformal
MOX-1	500 megohms	2.5	7500 V	220°C	1.062±.060	.284±.010	Si Conformal
MOX-2	1000 megohms	5	15,000 V	220°C	2.062±.060	.284±.010	Si Conformal
MOX-3	1500 megohms	7.5	22,500 V	220°C	3.062±.060	.284±.010	Si Conformal
MOX-4	2000 megohms	10	30,000 V	220°C	4.000±.060	.284±.010	Si Conformal
MOX-5	2500 megohms	12.5	37,500 V	220°C	5.062±.060	.284±.010	Si Conformal

*Applicable above critical resistance

MOX-1E — MOX-5E in same values with diameter (B) $.315^{+.030}_{-.020}$

2 and 5% available in all values. 1% to 1000 megohms.

Temp Coefficient: This parameter varies with resistance value. Coefficients of 150 ppm in the low resistance values can be maintained, increasing to 2000 ppm in the higher values.

Voltage Coefficient: This parameter also depends on resistance value. Where a low voltage coefficient is required, it is possible to obtain values of 5 ppm or less.

Stability: Better than ±2% for 2000 hours at full load for MOX-400, -750, -1125; better than ±1% for 2000 hours for MOX-1 through -5.

Insulation Resistance: Adequate to 750 volts; with our special epoxy versions MOX-1E — MOX-5E available. This increases to 6000 volts with an attendant loss of power handling capabilities.

Standard Tolerances: For MOX-1 through -5, 1%, 2% and 5% available in all types and values. 2 and 5% available in all values. 1% to 1000 megohms. For MOX-400, -750, and -1125, 1% to 2000 megohms, 2% to 5000 megohms, 5% to 10,000 megohms. ½% in limited values on request.

Varnished Carbon Resistors

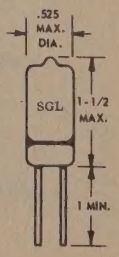
HV Series High Voltage Resistors Features—Resistances from .01—25,000 megohms. Power ratings: Radial lug 1—10W; axial lead 1—5W. Max working voltages: Radial lug 3500—40,000 volts; axial lead 3500—30,000 volts.

HP Series High Power Resistors Features—Radial band type. Resistances 0.5—100,000 megohms. Power ratings 12—100W. Max. working voltages 15—125 KV.

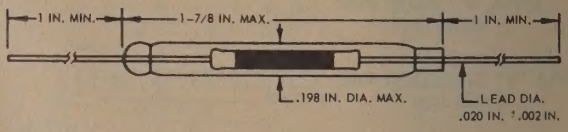
HF Series High Frequency Resistors—Elements are applied as a solid coating resulting in low inductance. Features: Resistances 20 ohms—100 megohms. Power ratings: Radial lug 1—10W; radial band 12—90W; axial lead 1—5W. Max working voltages: Radial lug 375—3100; radial band 1250—8500; axial lead 375—1500 volts.

Protective Spark Gaps

Types SGL, SGS, and SGC Series spark gaps are available for designing into equipment a high degree of protection from nearby lightning strikes or other transient producing phenomena. Various configurations and mounting arrangements available. Complete specifications on request.



TYPE RX-1 HI-MEGOHM RESISTORS



Features — Hi-Megohm resistors continue to be Victoreen's forte and the Type RX-1 series is pre-eminent as the most reliable of its type. Manufactured in accordance with MIL-R-14293A, characteristic T. Carbon coated glass rod resistor element banded with silver for electrical contact. Special silicone varnish coating. Noise level negligible. Available in resistances from 10^7—10^{14} ohms. Power rating is 1 divided by resistance in megohms. Tolerance 1% below 10^{12}, 2% and 5% below 10^{13} ohms, 10% over entire range. Max working voltage 1000V. Max ambient temperature 100°C.

VICTOREEN INSTRUMENT DIV. of VLN
10101 WOODLAND AVENUE • CLEVELAND, OHIO 44104
EUROPE: ARNDALE HOUSE, THE PRECINCT: EGHAM, SURREY, ENGLAND • TEL: EGHAM 4887

VICTOREEN

A-3505

WELWYN RESISTORS

RELIABILITY IN RESISTORS — FROM 0.1 Ω TO 1,000,000 Meg.

MINIATURE OXIDES to MIL-R-22684B

Type	Rating Watts	Dielectric Strength	Rated Voltage	Resistance Range Min.	Resistance Range Max.
RL07	1/4	1000V	250 Volts	47 Ω	150K
RL20	1/2	1000V	350 Volts	10 Ω	470K

TYPE	LGTH.		DIA.		LEADS	
RL07	.250″	±.031″	.090″	±.008″	.025″	±.002″
RL20	.375″	±.025″	.145″	±.005″	.032″	±.002″

TOLERANCE: STD. AT ±2% AND ±5%

IDENTIFICATION: STD. COLOR BANDING

PRICES: .033 - .30 (BULLETIN M3B)

PLUS A COMPLETE LINE OF FLAMEPROOF POWER OXIDES, 2 - 10 WATT (BULLETIN M5).

PRECISION METAL FILM to 150 MEG.

Type No.	Resistance Range	T.C. in PPM	Wattage Rating @ 70°C	Wattage Rating @ 125°C	Dimensions L	Dimensions D
M11E	50Ω — 250K	25	½	¼	.470″	.145″
M11C	10Ω — 500K	50				
M11D	10Ω — 500K	100				
M11	High Value 501K to 10 Meg.	150				
M22E	50Ω — 500K	25	1	½	.625″	.205″
M22C	10Ω — 2 Meg.	50				
M22D	10Ω — 2 Meg.	100				
M22	High Value 2.1 Meg. to 25 Meg.	150				
M13E	50Ω — 1 Meg.	25		1	.840″	.285″
M13C	10Ω — 3 Meg.	50				
M13D	10Ω — 3 Meg.	100				
M13	High Value 3.1 Meg. to 50 Meg.	150				
M14E	120Ω — 2 Meg.	25	2W @ 100°C		2.000″	.285″
M14C	40Ω — 5 Meg.	50				
M14D	10Ω — 10 Meg.	100				
M14	High Value 10.1 Meg. to 150 Meg.	150				

TOLERANCE: 1% STD. ALSO .5% AND 0.25% (Bulletin M14C)

PRICE: .10 - 4.50

HIGH VOLTAGE OXIDES

Welwyn Type	Watts @ 40°C	Termination	Dimensions L	Dimensions D	**Working Voltage	Pulse Voltage	Temp. Rise	Tolerance	Resistance Range Min.	Resistance Range Max.
F43D	½	Standard Wire Leads	1.094″	0.312″	4KV	15KV	26°C	± 2%	2M	3,000M
F43KU	½	Comb. Lead/Threaded Cap	1.188″	0.312″	4KV	15KV	26°C	± 5%	2M	100,000M
*F43TU	½	Threaded Caps, Both Ends	1.280″	0.312″	4KV	15KV	26°C	±10%		
F44D	1	Standard Wire Leads	2.000″	0.312″	14KV	50KV	36°C	± 2%	2M	10,000M
F44KU	1	Comb. Lead/Threaded Cap	2.094″	0.312″	14KV	50KV	36°C	± 5%	2M	150,000M
*F44TU	1	Threaded Cap, Both Ends	2.187″	0.312″	14KV	50KV	36°C	±10%		

* 10-32 x 3/16″ Coupling Stud Supplied with Each Unit. TOLERANCE STD. AT ±2% AND ±5% PRICES: 1.10 to 3.50 (Bulletin M7C)

ULTRA LOW VALUES

TYPE	WATTS	% TOL.	LGTH.	DIA.	RESISTANCE RANGE MIN.	RESISTANCE RANGE MAX.
A20	1/2	1, 2, 5	.375″	.145″	0.1 Ω	9.9 Ω
A31	1-1/2	2, 5, 10	.6875″	.203″	0.27 Ω	27 Ω
A32	3	2, 5, 10	.8906″	.328″	0.27 Ω	27 Ω

PRICES: .075 - .95 (BULLETINS LV10A)

ATTENUATOR PADS

WRITE FOR BULLETIN AP13 COVERING OUR EXTENSIVE LINE OF PADS.

ULTRA HIGH VALUES

MH52 — Sleeved,
MH51 — Sleeved, Miniature
M51 — Glass Enclosed

TYPE	VOLTS	LGTH.	DIA.	RANGE
MH52	2000	.88″	.140″ ± .020″	60M - 10KM
MH51	1000	.50″	.140″ ± .010″	30M - 5KM
M51	500	1.88″	.216″ ± .006″	10M - 1MM

TOLERANCE:
MH52 - 1%, 2%, 5%. MH51 - 10%, 20%. M51 - 1%, 2%, 5%, 10%.
(BULLETIN HV8C)

WELWYN NOW MARKETING & WAREHOUSING BEYSCHLAG OF WEST GERMANY

SUPERIOR QUALITY 5% DEPOSITED CARBONS PRICED COMPETITIVELY WITH COMPS

Europe's leading supplier of deposited carbon resistors Beyschlag products are now being stocked in depth both in the U.S.A. and Canada. Quality control at every step in the production process, coupled with highly automated manufacturing technique, guarantees the enviable reputation for quality and reliability that Beyschlag have earned throughout the world for over 20 years.

Type	Wattage @ 40°C	Wattage @ 70°C	L	D	Wkg. Volt	Tol.	Range
BB	⅜	¼	.250″	.098″	150	5%	10 Ω - 1 M
B⅛	½	⅓	.325″	.114″	250	5%	1 Ω - 1 M
B⅓	¾	½	.475″	.166″	500	5%	1 Ω - 10 M
B½	1	⅔	.550″	.236″	630	5%	4.7 Ω - 22 M
B1	2	1⅓	.740″	.355″	750	5%	10 Ω - 22 M

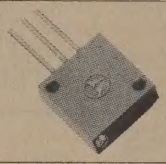
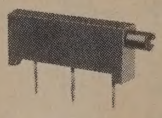
(BULLETIN WB-1)

ALL PRICES SHOWN FOR GUIDANCE ONLY. SPECIFIC PRICES SUBJECT TO VALUE, TOLERANCE, QUANTITY AND SPECIFICATION.

USA: WELWYN INTERNATIONAL, INC. • 811 SHARON DR. • WESTLAKE, OHIO • (216) 871-8900 • TWX 810-427-9125 • CABLE WELINT • TELEX 00985276
CANADA: WELWYN CANADA LTD. • P.O. BOX 2484 • 1255 BRYDGES ST. • LONDON, ONT. • CAN. • (519) 451-9490 • CABLE WELCAN • TELEX 024-843

MICROPOT® INFINITE RESOLUTION TRIMMING POTENTIOMETERS

AMPHENOL™
THE BUNKER-RAMO CORPORATION

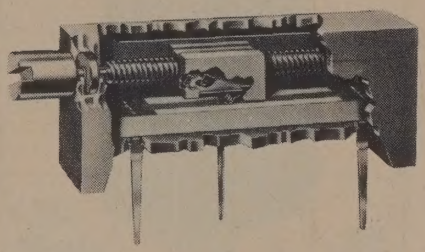
	Description	Amphenol Model No.	Adjustment Turns	Terminals[2]	Resistance Range in Ohms[3]	Resistance Tolerance	Temperature Range	Temperature Coefficient Potentiometer (PPM/°C)
FILM-MET™‡	Microminiature 3/8" Square	2301*	26	P,W,X	10 to 10K	±10%	−55° to +150°C	100 ppm
FILM-MET™‡	High-Temperature 1¼" Rectangular	2851[1]*	22	L,SL,P	20 to 20K	±10%	−55° to +150°C	100 ppm
FILM-MET™‡	Subminiature ½" Square 	2901[1]*	25	P,L,W,Y,X	10 to 20K	±10%	−55° to +150°C	100 ppm
FILM-MET™‡	Microminiature ¾" Rectangular Solvent-Resistant 	3811*	15	P	10 to 20K	±10%	−55° to +125°C	100 ppm
CERMET	Microminiature 3/8" Square	2305*	26	P,W,X	20 to 1 Meg.	±10%	−55° to +150°C	150 ppm
CERMET	High Temperature 1¼" Rectangular	2855[1]*	22	P,L,SL	100 to 1 Meg.	±10%	−55° to +150°C	150 ppm
CERMET	Subminiature ½" Square	2905[1]*	25	P,L,W,Y,X	10 to 10 Meg.	±10%	−55° to +150°C	150 ppm
CERMET	Microminiature ¾" Rectangular Solvent-Resistant	3805 3815*	22	P	50 to 500K	±10%	−55° to +125°C	150 ppm
CERMET	Subminiature ½" Round	6905	Single-turn	P	20 to 10 Meg.	±10%	−55° to +125°C	150 ppm

[1] Panel mounting bracket available.
[2] Terminations: L — Color coded wire leads
SL — Solder lugs
P — Printed circuit pins
W — Printed circuit pins (edge mount, top adjust leadscrew)
X — Printed circuit pins (edge mount, side adjust leadscrew)
Y — Printed circuit pins — staggered (edge mount, top adjust leadscrew)
[3] See Catalog T-1 for standard resistance values.
* Humidity Proof ‡ U.S. Patent No. 3,353,134; also foreign patents
® MICROPOT — Trademark registered U.S. Patent Office
Humidity-proof trimmers pass MIL-R-27208A moisture resistance test.

Maximum Power Rating in Watts	SIZE IN INCHES			Application
	H	W	L	
½ @ 85°C	0.198 0.415 0.415	0.375 0.193 0.200	0.375P 0.375W 0.375X	Military Industrial
¾ @ 85°C	0.32	0.28	1.25	Military Industrial
¾ @ 85°C	0.220 0.187 0.500 0.575 0.500	0.500 0.500 0.195 0.190 0.195	0.500P 0.500L 0.500W 0.500Y 0.500X	Military Industrial
¾ @ 40°C	0.31	0.16	0.75	Commercial
½ @ 85°C	0.198 0.415 0.415	0.375 0.193 0.200	0.375P 0.375W 0.375X	MIL-R-22097 RJ24
¾ @ 85°C	0.32	0.28	1.25	MIL-R-22097 RJ11
½ @ 85°C	0.220 0.187 0.500 0.575 0.500	0.500 0.500 0.195 0.190 0.195	0.500P 0.500L 0.500W 0.500Y 0.500X	MIL-R-22097 RJ22
¾ @ 40°C	0.31	0.16	0.75	Commercial
½ @ 40°C	0.255	0.500 Dia.		Industrial Commercial

AMPHENOL CONTROLS DIVISION
The Bunker-Ramo Corp.
Janesville, Wisconsin 53545

Film-Met™ by Amphenol



It's the first major improvement in trimmers since cermets. Film-Met™ is an exclusive Amphenol resistance element* completely different from wirewound and cermet types.

Ends Compromise

This new trimmer won't always replace wirewounds and cermets, which Amphenol also makes. Their characteristics fit many design parameters perfectly. But not all!

For example: Film-Met offers both infinite resolution and low temperature coefficient. Amphenol's new resistance element also provides excellent high frequency and pulse characteristics along with low current and low thermal noise.

Temperature Coefficient

Film-Met has a low TRC of 100 ppm/°C maximum with 50 ppm/°C available on request.

Noise

For applications requiring critical current and thermal-noise levels, Film-Met must be your choice. This is especially true in applications where other components feature low thermal noise. Film-Met is now available for that critical job.

Setability

Film-Met contact setability is improved over cermet because of lower contact resistance variation, and vastly improved over the resolution inherent in wirewound trimmers. The lower CRV of Film-Met results from the smooth metallic element surface overcoated with a noble metal which provides a low resistance interface with the precious metal contact. While wirewound trimmers exhibit an extremely low CRV, the resolution of each turn of resistance wire limits the setability of the contact as compared to infinite resolution trimmers such as Film-Met and cermet.

Other Film-Met Features

Film-Met also should be your choice for high frequency and pulse application because of its excellent performance characteristics in these areas. Due to its high frequency characteristics and infinite resolution, Film-Met can be used for exact impedance matching.

100% Metal Element

Amphenol's exclusive Film-Met element uses the same vacuum deposition process as metal-film fixed resistors.

Continuous monitoring techniques during deposition assure maintenance of established performance levels.

Amphenol's patented Film-Met elements are 100% protected by noble metal overlays. And they're 100% thermally stabilized to provide ultimate performance.

Film-Met trimmers are available in ¾" rectangular commercial — 3811 series; ½" square military — 2901 series; and 1¼" rectangular military — 2851 series.

The Next Step

Now you know a little about Film-Met. What it is, how it performs and how it's made.

Explore the possibilities of this new type of trimmer further.

Write today for evaluation samples and specification sheets. Amphenol Controls Division, Janesville, Wisconsin.

* U.S. Patent No. 3,353,134; also foreign patents.

MICROPOT® WIREWOUND TRIMMING POTENTIOMETERS

AMPHENOL™
THE BUNKER-RAMO CORPORATION

Description	Amphenol Model No.	Adjustment Turns	Terminals[2]	Resistance Range in Ohms[3]	Resistance Tolerance	Temperature Range	Temperature Coefficient Potentiometer (PPM/°C)	Maximum Power Rating in Watts
1¼″ Rectangular	992[1] 994[1]*	22	L,SL,P	10 to 50K	10 to 75 ±10% 100 ohms to 100K ±5%	−55°C to +125°C	70 ppm	1 @ 40°C
Microminiature ⅜″ Square	2300*	26	P,W,X	10 to 20K	±5%	−55°C to +150°C	50 ppm	¾ @ 85°C
Microminiature ¾″ Rectangular	2600 2610*	22	P	10 to 20K	±10%	−55°C to +125°C	100 ppm	1 @ 40°C
Miniature High Temperature 1″ Rectangular	2700[1]*	15	L,W	10 to 50K	±5%	−55°C to +150°C	50 ppm	¾ @ 85°C
High Temperature 1¼″ Rectangular	2750[1]*	22	P L,SL	10 to 20K 10 to 50K	±5%	−55°C to +150°C	50 ppm	¾ @ 85°C
High Temperature 1¼″ Rectangular	2850[1]* 2860[1]	22	L,SL,P	10 to 50K	±5%	−55°C to +150°C	50 ppm	¾ @ 85°C
Subminiature ½″ Square	2900[1]*	25	P,L,W,X,Y	10 to 50K	±5%	−55°C to +150°C	50 ppm	¾ @ 85°C
Microminiature ⅜″ Square Solvent-Resistant	3600 3610*	23	P,W,X	100 to 20K	±10%	−55°C to +125°C	100 ppm	½ @ 40°C
Microminiature ¾″ Rectangular Solvent-Resistant	3800 3810*	22	P	10 to 20K	±10%	−55°C to +125°C	100 ppm	1 @ 40°C
Subminiature ½″ Round	6900	Single-turn	P	10 to 50K	±10%	−55°C to +125°C	50 ppm	1 @ 40°C

[1] Panel mounting bracket available.
[2] Terminations: L — Color coded wire leads
SL — Solder lugs
P — Printed circuit pins
W — Printed circuit pins (edge mount, top adjust leadscrew)
X — Printed circuit pins (edge mount, side adjust leadscrew)
Y — Printed circuit pins — staggered (edge mount, top adjust leadscrew)
[3] See Catalog T-1 for standard resistance values.
* Humidity Proof
® MICROPOT — Trademark registered U.S. Patent Office
Humidity-proof trimmers pass MIL-R-27208A moisture resistance test.

SIZE IN INCHES H	W	L	Application
0.32	0.28	1.25	Industrial Commercial
0.198 0.415 0.415	0.375 0.193 0.200	0.375P 0.375W 0.375X	MIL-R-27208 RT24
0.31	0.16	0.75	Commercial
0.32	0.18	1.0	MIL-R-27208 RT10
0.32	0.19	1.25	MIL-R-27208 RT12
0.32	0.28	1.25	Military Industrial MIL-R-27208 RT-11
0.220 0.187 0.500 0.575 0.500	0.500 0.500 0.195 0.190 0.195	0.500P 0.500L 0.500W 0.500Y 0.500X	MIL-R-27208 RT22
0.20	0.375	0.375	Commercial
0.31	0.16	0.75	Commercial
0.255	0.500 Dia.		Industrial Commercial

AMPHENOL CONTROLS DIVISION
The Bunker-Ramo Corp.
Janesville, Wisconsin 53545

Get fast digital readout from this new low cost miniature Microdial®.

1380 Series

FEATURES . . .

- **Precision digital dial designed for precision potentiometers up to ten turns — yet exceptionally low cost.**
- **Zinc die cast housing and rear cover for demanding applications.**
- **Indexing accuracy is 1 part in 1,000.**
- **Modern styling and small size.**
- **Easy mounting . . . A single set screw mounts dial to potentiometer shaft.**

Amphenol's new 1380 Series miniature digital dial is available in a black finish model 1381 or a fine black-grey hammer finish model 1385. The 1380 accepts a ¼" shaft diameter and modification for a ⅛" shaft diameter is available as a special option. Fingertip brake assures maintenance of critical dial settings. And the 1380 offers you ultra-modern styling to compliment any panel layout.

3100 Series, Digital

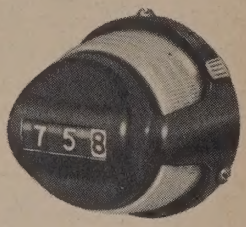
Remarkably accurate (1000:1 indexing accuracy) miniature 3100 Series dial almost makes a standard circular dial look gigantic by comparison. This new Microdial measures only 1⅛ x 1 21/32 inches and protrudes only 25/32" from a panel.

Digits (with illumination optional) are magnified by a convex lens in recessed window. Three-digit, ten-turn dial rotates continuously clockwise or counter clockwise with push-pull fingertip brake to lock settings. This 3100 miniature Microdial will mount on panels from 1/16" through 3/16" thick.

Standard color: natural brushed aluminum finish.

Special Options

Amphenol, with the broadest and most versatile concentric scale and digital dial lines in the industry, offers you more than standard units. An example is the 1300 and 1330 series digitals which can be modified to give you such special features as index lines, internal illumination and special readouts. Contact your Amphenol representative for full details.



1300 Series, Digital

Gives you fast, accurate indication of shaft position up to 1,000 turns. All models (3-digit 10-turn, 4-digit 100-turn, and 5-digit 1,000-turn) mount directly on shaft to be controlled, eliminating backlash. Speed: up to 6,000 counts per minute.

Large, contrasting numerals readable even from angular view because convex windows reduce glare, reflections. Rugged, dust-sealed construction includes Cycolac[1] counter wheels, Nylatron[2] GS gear assemblies, knurled aluminum control knobs. Brake optional. Special readouts are also optional. All models conform to military requirements.

[1]Reg. TM Borg-Warner Corp.
[2]Reg. TM The Polymer Corp.

1330 Series, Digital

You get straight-on or angular readout with this illuminated turns-counting Microdial. One-piece lens/window magnifies numerals 1.5x. In exactly 10 turns, unit counts from 000 through 999. Fingertip brake locks settings in place.

This Microdial is sealed against dust yet its snap-on cap makes lamp replacement easy. Standard finishes for color coding: dark or light gray, red, white, and black; other colors available on request.

Microdial®—Trademark Reg. U.S. Patent Office

MICROPOT® PRECISION POTENTIOMETERS

AMPHENOL
THE BUNKER-RAMO CORPORATION

	Size in Inches: Diameter	Size in Inches: Length	Size in Inches: Shaft Dia.		Amphenol Model No.	Standard Resistance Range in Ohms[6]	Standard Resistance Tolerance	Linearity Tolerance —Standard	Temperature Range	Max. Power Rating, Watts
SINGLE TURN	7/8	.797	1/8		2540	100 to 10K	±3%	±0.5	−55°C to +125°C	1.25 @ 70°C
	1 1/8	.593	1/8		2550	100 to 20K	<10K ±5% >10K ±3%	±0.5	−55°C to +125°C	1.5 @ 70°C
	1 5/8	.818	1/4		2560	100 to 40K	<5K ±5% >5K ±3%	±0.5	−55°C to +125°C	2 @ 70°C
	2	1.018	1/4		2580	100 to 60K	<5K ±5% >5K ±3%	<50Ω ±1% >50Ω ±0.5%	−55°C to +125°C	4 @ 70°C
	3	1.018	1/4		2590	200 to 100K	<5K ±5% >5K ±3%	±0.5%	−55°C to +125°C	6 @ 70°C
	1 7/16	.656	1/4		3460	100 to 50K	±5%	±0.5%	−55°C to +125°C	4 @ 40°C
3-TURN	7/8	1.055 Serv. .930 Bush.	1/8		2130	10 to 50K	10-30Ω ±5%. 100-50K ±3%	±0.5%	−55°C to +125°C	4 @ 40°C
	1 3/4	1 31/64	1/4		205-3T[1]	10 to 50K	10Ω ±10% 50-50K ±3%	±0.5%	−55°C to +105°C	3 @ 40°C
	2	1 3/8 Serv. 1 9/16 Bush.	1/4		930[2]	20 to 50K	≦100Ω ±10% ≥100Ω ±3%	±0.25%	−55°C to +125°C	3 @ 40°C
10-TURN	7/8	1.182	1/4		4100	100 to 100K	100-100K ±5%	±0.25%	−55°C to +125°C	2 @ 40°C
	7/8	1.455	1/4		2150	25 to 100K	25-50Ω ±5% 100-100K ±3%	±0.25%	−55°C to +105°C	3 @ 40°C
	7/8	1.455	1/8		2160	25 to 100K	25-50Ω ±5% 100-100K ±3%	±0.25%	−55°C to +105°C	3 @ 40°C
	7/8	1.455	1/4		2170[1]	25 to 100K	25-50Ω ±5% 100-100K ±3%	±0.15%	−55°C to +105°C	3 @ 40°C
	7/8	1.573 Serv. 1.448 Bush.	1/8		2100	25 to 120K	25-50Ω ±5% 100-100K ±3% 120K ±5%	±0.25%	−55°C to +125°C	5 @ 40°C
	1 13/16	2 1/8	1/4		2200	25 to 300K	25-50Ω ±5% 100-100K ±3% >100K ±5%	100Ω-100K ±0.25%	−55°C to +105°C	5 @ 40°C
	1 13/16	2 1/8	1/4		2220	25 to 300K	25-50Ω ±5% 100-100K ±3% 200K ±5%	±0.25% ±0.15% ±0.25%	−55°C to +105°C	5 @ 40°C
	1 13/16	2 1/8	1/4		2250[3]	25 to 300K	25-50Ω ±5% 100-100K ±3% 200K ±5%	<100Ω ±0.5% 100Ω-200K ±0.25% ≧200K ±0.5%	−55°C to +105°C	5 @ 40°C
	1 13/16	2 1/8	1/4		2270[4]	25 to 300K	25-50Ω ±5% 100-100K ±3% 200K ±5%	±0.25% ±0.15% ±0.25%	−55°C to +105°C	5 @ 40°C
	1 3/4	2 1/8	1/4		205[1]	1.15 to 300K	<50Ω ±10% >50Ω ±3%	±0.1%	−55°C to +105°C	5 @ 40°C
	2	2 1/16 Serv. 2 1/4 Bush.	1/4		900[2]	1 to 100K	<25Ω ±10% <50Ω ±5% >100Ω ±3%	±0.1%	−55°C to +125°C	5 @ 40°C

[1] Zero base linearity standard
[2] Absolute linearity standard
[3] Different mounting configuration than Model 2200
[4] Different mounting configuration than Model 2220
[5] Available in Servo or Bushing Mount for Military-Industrial 2400 Series.
[6] See Catalog PD-1 for standard resistance values.

Type of Mounting	Maximum No. of Sections	Application
Servo[5]	3	MIL-R-12934 RR0900
Servo[5]	3	MIL-R-12934 RR1100
Servo[5]	3	MIL-R-12934 RR1500
Servo[5]	3	MIL-R-12934 RR2000
Servo[5]	3	MIL-R-12934 RR3000
Bushing	3	Commercial
Bushing Servo	3	Military Industrial
Bushing	1	Military Industrial
Bushing Servo	3	Military Industrial
Bushing	1	Industrial Commercial
Bushing	2	Industrial Commercial
Bushing Servo	2	Industrial Commercial
Bushing Servo	2	Industrial Commercial
Bushing Servo	3	MIL-R-12934 RR1000
Bushing	3	Industrial Commercial
Bushing	3	Industrial Commercial
Bushing	3	Industrial Commercial
Bushing	3	Industrial Commercial
Bushing	1	Military Industrial
Bushing Servo	3	Military Industrial

®MICROPOT—Trademark Reg. U.S. Patent Office
AMPHENOL CONTROLS DIVISION
The Bunker-Ramo Corp., Janesville, Wisconsin 53545

Single-Turn Potentiometers

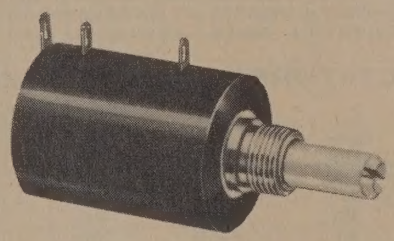
Amphenol offers five single turn potentiometers that meet MIL-R-12934 in all requirements. The 2500 potentiometers feature rugged welded terminations; a dual contact wiper that withstands up to 50 g's shock or acceleration; diallyl phthalate construction of rotor, insulator ring and element mount for high stability under varying humidity and temperature environments; and a movable clamp band that allows all phasing and zero settings to be accomplished in the field.

Multi-Turn Potentiometers

Amphenol offers a complete line of precision potentiometers of ⅞" and 2" diameter with 10 turns. Three turn versions are offered in series 205, 2130, and 930. Models range from the high precision, finely-made 900 series to the inexpensive 4100 series. The 900 and 205 series offer precision stainless steel leadscrews, molded windings, and fine linearity adjustment. The 4100 series offers high electrical precision with a durable, simple design which insures long, trouble-free operation at a modest price. Amphenol's line also includes Mil-type and Mil-qualified three and ten turn models.

Many models in our percision pot line lend themselves to a full line of optional features to meet special customer requirements. We invite your inquiries.

4100 Series Potentiometer

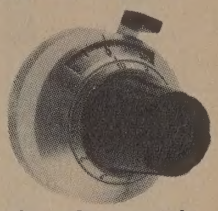


FEATURES . . .

- **Improved performance. Dissipates 2 watts 40°C for 1,000 hours.**
- **Over 200,000 revolution life.**
- **Welded gold-plate terminations.**
- **Molded single-piece shaft and rotor produces excellent thermal and dimensional stability.**
- **Phenolic case with molded element grooves assures a perfect helix, high linear accuracy.**
- **Exclusive wiper drive mechanism guarantees zero backlash.**
- **Precious metal spring-loaded wiper prevents corrosion and noise.**

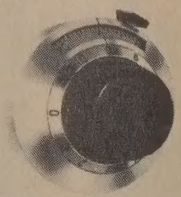
The 4100 miniature ⅞" potentiometer gives you the performance of a high priced unit, yet sells at a low commercial price. A totally new design concept enables Amphenol to eliminate a major cost factor in manufacture of the 4100. With the 4100, you get low cost without compromising on circuit design.

Specify these concentric scale Microdials® for precise potentiometer control



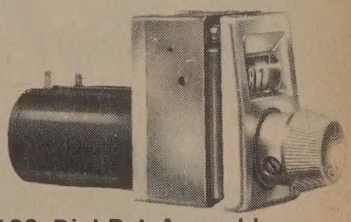
1370 Series, Concentric

Only ⅞" diameter (1" with finger brake), this 10-turn Microdial® projects 29/32" from panel. Don't let the small size of this dial fool you. It has the same silent gear action of the conventional size Amphenol dials. It indicates angular position of potentiometers and multiturn devices of 10 turns and less with 1000:1 indexing accuracy. Inner dial counts turns, outer dial counts hundredths. Locks rigidly on to shaft to eliminate backlash. Epicyclical internal gearing assures readout accuracy. Finger-tip lever offers positive brake action without disturbing critical settings.



1350 Series, Concentric

The 1350, only 1 3/16" diameter, indicates angular position of potentiometers and multiturn devices of ten turns and less with 1000:1 indexing accuracy. Inner dial counts turns, outer dial counts off hundredths. Locks rigidly onto shaft to prevent backlash. Internal gearing is epicyclical type so you always know exact reading. Fingertip brake holds shaft position until reset.



3100 Dial-Pot Assembly

Amphenol's Dial-Pot assembly saves you time and money . . . eliminates costly mounting and phasing. If you now buy pots and dials separately, but for the same application, your production people must (1) mount the pot from back of panel, (2) mount the dial from front of panel, and (3) phase the dial to the pot so the dial reads zero at zero electrical output. Amphenol prephases and preassemblies the 3100 dial to any potentiometer at no extra cost. You simply mount the assembly from rear of panel and wire into your circuit.

Microdial®—Trademark Reg. U.S. Patent Office

Helipot® PRECISION POTENTIOMETERS

SINGLE-TURN (WIREWOUND, CERMET & CONDUCTIVE PLASTIC)

Housing Diameter (inches)	Resistance Element	Helipot Model Number	Mounting Type	Bearing Type	Range of Resistance Values (ohms)	Min. Practical Independent Linearity* (±%)	Power Rating (Watts at °C)	Starting Torque (max.,02-in.)	Number of cups (max.,02-in.)	Ambient Temperature Range (°C)
⅞	Wire	TP	Bushing	Ball	186-15K	0.2	1.25-70	0.1	5	−65 to 125
	Wire	TSP	Servo	Ball	186-15K	0.2	1.25-70	0.1	5	−65 to 125
	Wire	5101	Bushing	Sleeve	186-116K	0.25	0.75-40	0.2	5	−25 to 85
	Wire	5103	Servo	Ball	186-116K	0.25	0.75-40	0.2	5	−25 to 85
	Cermet	3103	Servo	Ball	70-1 meg	0.3	1.25-50	0.5	6	−25 to 105
	Cermet	6103	Servo	Ball	70-1 meg	0.3	3.0-85	0.5	6	−65 to 150
	C.P.	3153	Servo	Ball	1K-50K	0.2	1.0-50	0.5	6	−25 to 105
	C.P.	6153	Servo	Ball	1K-50K	0.1	1.5-70	0.5	6	−65 to 125
1 1/16	Wire	5203	Servo	Ball	50-100K	0.15	4.0-85	0.15	5	−65 to 150
	Wire	5211	Bushing	Sleeve	50-25K	0.15	1.0-40	0.4	5	−25 to 85
	Wire	5212	Servo	Sleeve	50-25K	0.15	1.0-40	0.4	5	−25 to 85
	Wire	5213	Servo	Ball	50-25K	0.15	1.0-40	0.3	5	−25 to 85
	Cermet	3203	Servo	Ball	50-1 meg	0.25	1.5-50	0.5	6	−25 to 105
	Cermet	6213	Servo	Ball	50-1 meg	0.25	5.0-85	0.5	6	−65 to 150
	C.P.	3253	Servo	Ball	1K-50K	0.15	1.25-50	0.5	6	−25 to 105
	C.P.	6263	Servo	Ball	1K-50K	0.10	1.5-70	0.5	6	−65 to 125
1 5/16	Wire	5311	Bushing	Sleeve	10-44.6K	0.25	2.0-40	1.0	1	−25 to 85
	Cermet	3301	Bushing	Sleeve	1K-1 meg	0.3	0.75-65	1.0	1	−25 to 105
	Cermet	6301	Bushing	Ball	150-1 meg	0.25	6.0-85	0.7	1	−65 to 150
	Cermet	6303	Servo	Ball	150-1 meg	0.25	6.0-85	0.7	1	−65 to 150
	C.P.	3351	Bushing	Sleeve	1K-75K	0.3	0.75-65	1.0	1	−25 to 105
	C.P.	6351	Bushing	Ball	1K-75K	0.05	2.5-70	1.5	8	−65 to 125
	C.P.	6353	Servo	Ball	1K-75K	0.05	2.5-70	1.5	8	−65 to 125
1 7/16	Wire	5401	Bushing	Sleeve	25-50K	0.15	2.0-40	1.6	8	−65 to 85
	Wire	5402	Servo	Sleeve	25-50K	0.15	2.0-40	1.6	8	−65 to 85
	Wire	5403	Servo	Ball	25-50K	0.15	2.0-40	0.6	8	−65 to 85
	Wire	5404	Pilot	Sleeve	25-50K	0.15	2.0-40	1.6	8	−65 to 85
	Wire	5405	Pilot	Ball	25-50K	0.15	2.0-40	0.6	8	−65 to 85
2	Wire	5611	Bushing	Sleeve	15-80K	0.10	3.5-40	1.5	8	−65 to 85
	Wire	5612	Servo	Sleeve	15-80K	0.10	3.5-40	1.5	8	−65 to 85
	Wire	5613	Servo	Ball	15-80K	0.10	3.5-40	0.8	8	−65 to 85
	Wire	5614	Pilot	Sleeve	15-80K	0.10	3.5-40	1.5	8	−65 to 85
	Wire	5615	Pilot	Ball	15-80K	0.10	3.5-40	0.8	8	−65 to 85
	Wire	5616	Pilot/Servo	Sleeve	15-80K	0.10	3.5-40	1.5	8	−65 to 85
	Wire	5617	Pilot/Servo	Ball	15-80K	0.10	3.5-40	0.8	8	−65 to 85
	Cermet	6601	Bushing	Ball	100-1 meg	0.15	10.0-85	1.5	8	−65 to 150
	Cermet	6603	Servo	Ball	100-1 meg	0.15	10.0-85	1.5	8	−65 to 150
	C.P.	6651	Bushing	Ball	1K-75K	0.05	2.5-70	1.5	8	−65 to 125
	C.P.	6653	Servo	Ball	1K-75K	0.05	2.5-70	1.5	8	−65 to 125
3	Wire	5711	Bushing	Sleeve	25-145K	0.075	5.0-40	1.5	8	−65 to 85
	Wire	5712	Servo	Sleeve	25-145K	0.075	5.0-40	1.5	8	−65 to 85
	Wire	5713	Servo	Ball	25-145K	0.075	5.0-40	1.3	8	−65 to 85
	Wire	5714	Pilot	Sleeve	25-145K	0.075	5.0-40	1.5	8	−65 to 85
	Wire	5715	Pilot	Ball	25-145K	0.075	5.0-40	1.3	8	−65 to 85

*Values listed are available on special order. Standard Independent Linearity for all Helipot single-turn precision potentiometers is ±0.5%.

LEGEND TO ABBREVIATIONS: **C.P.**—Conductive Plastic. **Pilot**—3 hole/pilot mount. **Pilot/Servo**—Servo/3 hole pilot mount. **FQ**—Factory quote.

MULTI-TURNS (WIREWOUND)

Housing Diameter (inches)	Number of Turns	Helipot Model Number	Mounting Type	Bearing Type	Range of Resistance Values (ohms)	Standard Independent Linearity (± %)	Min. Practical Independent Linearity (± %)	Power Rating (watts at °C)	Starting Torque (max., 02-in.)	Ambient Temperature Range (°C)
⅞	3	7363	Servo	Ball	3-32.3K	0.25	0.15	1.5 at 40	0.6	−65 to 85
		7366	Bushing	Ball	3-32.3K	0.25	0.15	1.5 at 40	0.8	−65 to 85
	5	7463	Servo	Ball	5-53.8K	0.25	0.15	1.5 at 40	0.6	−65 to 85
		7466	Bushing	Ball	5-53.8K	0.25	0.15	1.5 at 40	0.8	−65 to 85
	10	7216	Bushing	Sleeve	10-125K	0.25	0.05	1.5 at 40	0.6	−65 to 85
		7221	Bushing	Sleeve	10-125K	0.25	0.05	1.5 at 40	0.6	−65 to 85
		7223	Servo	Ball	10-125K	0.25	0.05	1.5 at 40	0.6	−65 to 85
		7233	Servo	Ball	250-125K	0.25	0.05	2.0 at 70	0.6	−65 to 125
		7246	Bushing	Sleeve	10-125K	0.25	0.25	2.0 at 25	2.0	−65 to 85
		7263	Servo	Ball	10-107.8K	0.20	0.05	2.0 at 40	0.6	−65 to 125
		7266	Bushing	Sleeve	10-107.8K	0.20	0.05	2.0 at 40	0.8	−65 to 125
1 13/16	3	C	Bushing	Sleeve	5-194.7K	0.50	0.10	3.0 at 40	3.0	−65 to 85
		9301	Bushing	Sleeve	30-192.6K	0.25	0.04	3.0 at 40	1.3	−65 to 85
		9303	Servo	Ball	30-192.6K	0.25	0.04	3.0 at 40	1.3	−65 to 85
		9323	Servo	Ball	35-194.7K	0.40	0.10	3.0 at 40	3.0	−65 to 85
	10	A	Bushing	Sleeve	10-648K	0.25	0.05	5.0 at 40	3.0	−65 to 85
		7601	Bushing	Sleeve	100-650K	0.15	0.015	5.0 at 40	1.3	−65 to 85
		7603	Servo	Ball	100-650K	0.15	0.015	5.0 at 40	1.3	−65 to 85
		7623	Servo	Ball	100-648K	0.20	0.05	5.0 at 40	3.0	−65 to 85
3 5/16	15	B	Bushing	Sleeve	40-1.987 meg	0.5	0.025	10.0 at 40	2.7	−65 to 85
		BS	Servo	Sleeve	40-1.987 meg	0.5	0.025	10.0 at 40	2.7	−65 to 85
		BSP	Servo	Ball	40-1.987 meg	0.5	0.025	10.0 at 40	2.7	−65 to 85
	25	D	Bushing	Sleeve	60-3.312 meg	0.5	0.025	15.0 at 40	3.5	−65 to 85
		DSP	Servo	Ball	60-3.312 meg	0.5	0.025	15.0 at 40	3.5	−65 to 85
	40	E	Bushing	Sleeve	125-5.298 meg	0.5	0.025	20.0 at 40	3.5	−65 to 85
		ESP	Servo	Ball	125-5.298 meg	0.5	0.025	20.0 at 40	3.5	−65 to 85

Beckman INSTRUMENTS, INC., **HELIPOT DIVISION,** 2500 HARBOR BLVD., FULLERTON, CALIF. 92634

Helipot® NON-LINEAR PRECISION POTENTIOMETERS

elipot manufactures non-linear precision potentiometers, iden-
al to linear models in every way except for the resistance
ement. Non-linear models, with outputs ranging from the sim-
est monotonic function to the most complex non-monotonic
nction, can be supplied with either wirewound, cermet or con-
uctive plastic resistance elements. The approximate conform-
y, total resistance and power rating of a Helipot non-linear
otentiometer can be determined by using the following formulas and the constants listed in the table below.

$$\text{Conformity} = (\text{max. slope}) \times (\text{min. practical linearity})$$

$$\text{Total Resistance} = \frac{\text{max. total resistance}}{\text{max. slope}}$$

$$\text{Power Dissipation} = \frac{\text{max. slope}}{\text{power rating}}$$

SINGLE-TURN WIREWOUNDS

	Nominal Diameter					
	7/8"	1 1/16"	1 5/16"	1 7/16"	2"	3"
Min. Practical Linearity (± %)	0.15	0.12	0.10	0.08	0.07	0.05
Max. Total Resistance (ohms)	60K	100K	45K	50K	215K	145K
Power Rating (watts at 40°C)	1.25	1.50	1.50	3.5	3.5	5.0

MULTI-TURN WIREWOUNDS

	Nominal Diameter and Rotation					
	7/8" 1,800°	7/8" 3,600°	1 13/16" 1,080°	1 13/16" 3,600°	3 5/16" 5,400°	3 5/16" 9,000°
Min. Practical Linearity (± %)	0.075	0.05	0.04	0.025	0.025	0.025
Max. Total Resistance (ohms)	63K	125K	190K	650K	2 meg	3.3 meg
Power Rating (watts at 40°C)	1.4	2.0	3.0	5.0	10.0	15.0

SINGLE-TURN CERMETS

	Nominal Diameter			
	7/8"	1 1/16"	1 5/16"	2"
Min. Practical Linearity (±%)	0.25	0.20	0.20	0.15
Max. Total Resistance (ohms)	1 meg	1 meg	1 meg	1 meg
Power Rating (watts at 85°C)	3.0	5.0	6.0	10.0

SINGLE-TURN CONDUCTIVE PLASTICS

	Nominal Diameter			
	7/8"	1 1/16"	1 5/16"	2"
Min. Practical Linearity (±%)	1.00	1.00	0.075	0.05
Max. Total Resistance (ohms)	50K	50K	100K	150K
Power Rating (watts at 25°C)	1.25	1.75	2.0	3.0

Helipot DUODIAL® & DIGIDIAL® TURNS-COUNTING DIALS

	DUODIAL MODEL								
	RBB	RB RBC RBD	RBJ	2601	2606 2607	901	902	903	904
Counting capacity, max., turns	15					10	15	25	40
Diameter, nominal	1 13/16"			7/8"		4 3/4"			
Depth, from face of panel	1 9/64"	1"		51/64"		1 1/32"			
For shaft diameter	1/4"		1/8"	1/8"	1/4"	1/4"			
Max. shaft extension, face of panel	15/16"	13/16"		43/64"	25/32"	23/32"			
Min. shaft extension, face of panel	45/64"	9/16"		15/32"	7/64"	15/32"			
For bushing thread	1/2-32-NS	3/8-32-NEF	1/4-32-NEF		3/8-32-NEF				
Max. bushing extension, face of panel	17/32"	13/32"	19/64"	17/64"	19/64"	1/4"			
Locking mechanism	Positive Action					Not Available			

For use with Helipot® precision potentiometer models:

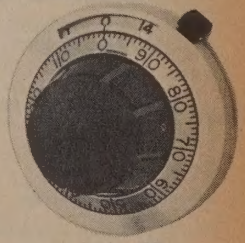
RBB, 902	2601	RB, RBC, RBD, 2606, 2607	901	903	904
B	7221	7216, 7246, 7266, 7366 7466, 7601, 9301, A, C	A	D	E

	DIGIDIAL MODEL					
	201	202	203	205	210	211
Counting capacity, max., turns	10					
Height	2 1/16"			2 3/32"	1 21/32"	
Width	1 15/16"			1 61/64"	1 7/32"	
Depth, from face of panel	1 1/8"			1 1/2"	1 9/32"	
For shaft diameter	1/4"					1/8"
Max. shaft extension, face of panel	7/8					
Min. shaft extension, face of panel	17/32"					
For bushing thread	3/8-32-NEF					1/4-32-NEF
Max. bushing extension, face of panel	1/4"					
Color	Blue	Black	Gray	Black with satin trim		
Locking mechanism	Positive action, friction type					

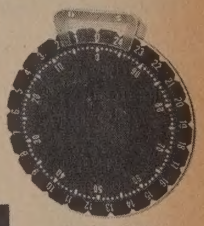
For use with Helipot® precision potentiometer models:

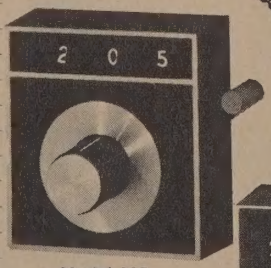
201, 202, 203, 205, 210	211
7216, 7246, 7266, 7366, 7466, 7601, 9301, A, C	7221

Series 2600

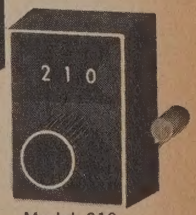

Series RB

Series 200


Series 900



Model 205



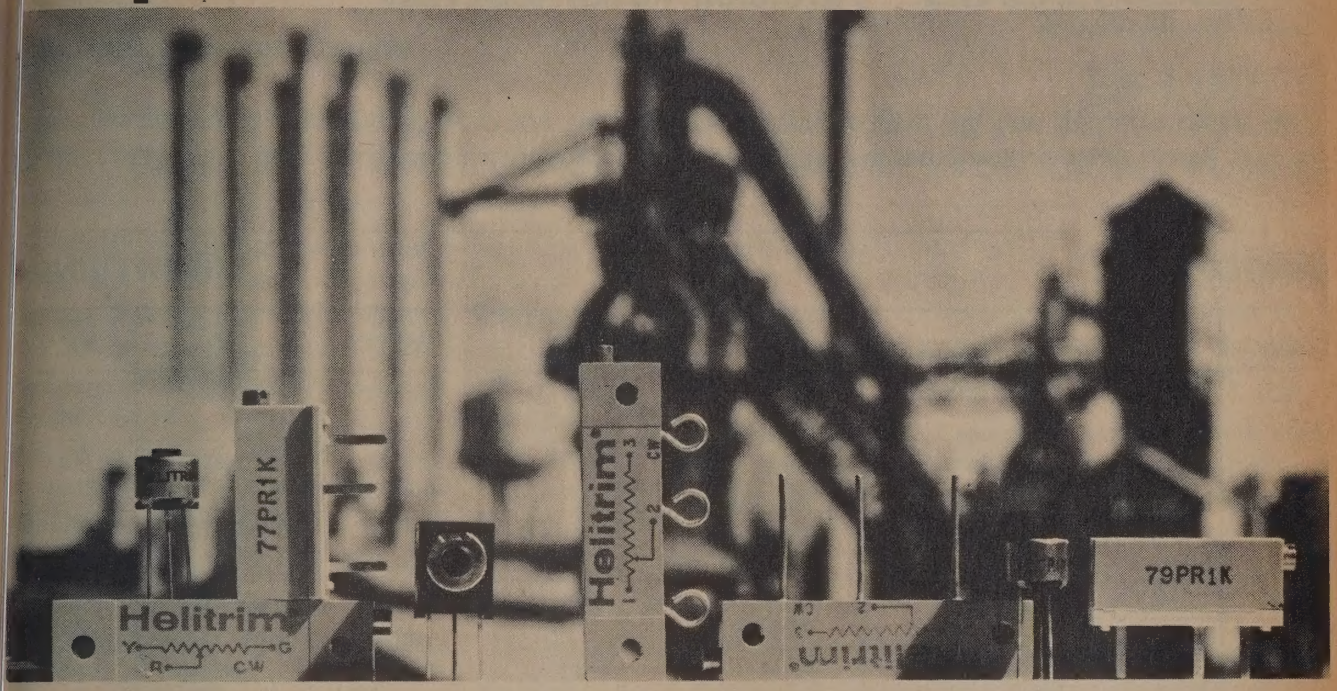
Model 210

Beckman INSTRUMENTS, INC., **HELIPOT DIVISION,** 2500 HARBOR BLVD., FULLERTON, CALIF. 92634

Helipot® TRIMMING POTENTIOMETERS

Helitrim
Helitrim
Helitrim

Helipot® TRIMMING POTENTIOMETERS



GENERAL PURPOSE—CERMET

	Series 50	Series 62	Series 66	Series 76-77-79	Series 78
Range of standard resistance values	10Ω thru 2megΩ	10Ω thru 1megΩ	10Ω thru 2megΩ	10Ω thru 2megΩ	10Ω thru 2megΩ
Standard resistance tolerance (closer tolerances available)	50Ω thru 2meg; ±10% other values; ±20%	100Ω thru 500KΩ; 15% other values; ±20%	100Ω thru 500KΩ; ±10% other values; ±20%	100Ω thru 500KΩ; ±10% other values; ±20%	100Ω thru 500KΩ; ±10% other values; ±20%
Resolution	Essentially infinite	Essentially infinite	Essentially infinite	Essentially infinite	Essentially infinite
Voltage setting ability (% of full scale)	±0.01%	±0.05%	±0.05%	±0.05%	±0.05%
Power rating, watts	1.5 at 125°C	0.5 at 70°C	0.5 at 25°C	0.75 at 25°C	0.75 at 70°C
Adjustment turns, nominal	32	1	20	15	22
Operating temperature range	−65°C to 200°C	−25°C to 125°C	−25°C to 105°C	−55°C to 105°C	−25°C to 125°C
Standard resistance values & tempcos	ohms ppm/°C	ohms ppm/°C	ohms ppm/°C	ohms ppm/°C	ohms ppm/°C
Tempcos of ±50 ppm/°C available on special order for all trimmers in all standard resistances from 100 ohms through 2 megohms	10, 20: 0 to +500 50: 0 to +250 100, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, 100K, 200K, 250K, 500K, 1 meg, 2 meg: ±100	10, 20: 0 to +500 50: 0 to +250 100, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, 100K, 200K, 250K, 500K, 1 meg: ±100	10, 20: 0 to +500 50: 0 to +250 100, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, 100K, 200K, 250K, 500K, 1 meg, 2 meg: ±100	10, 20: 0 to +500 50: 0 to +250 100, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, 100K, 200K, 250K, 500K, 1 meg, 2 meg: ±100	10, 20: 0 to +500 50: 0 to +250 100, 500, 1K, 2K, 5K, 10K, 20K, 25K, 50K, 100K, 200K, 250K, 500K, 1 meg, 2 meg: ±100
Dimensions, L x H x W, inches	1¼ x 5/16 x .297	¼ Dia. x ¼ high	⅜ x ⅜ x .200	¾ x .340 x .190	1¼ x .320 x .195
Mounting configurations	Pin, Lead, Lug	Pin top adjust, Pin top thumbwheel adjust, Pin side adjust	Bottom pin, Edge pin top adjust, Edge pin side adjust	Pin	Lead, Pin, Lug
Price, list	$8.00 (Lead) $7.50 (Pin, Lug)	$1.75 (Pin top adjust) $2.50 (other styles)	$3.50	$1.95	$3.00
	High temperature trimmer with metal housing meets most requirements of MIL-R-22097.	Commercially-priced miniature trimmer available with stops and longer pins.	Low-cost ⅜" square trimmer sealed for PC board washing and potting with low viscosity materials.	Economical ¾" trimmer sealed for solvent cleaning and low viscosity potting.	This adjustment trimmer with sealed plastic housing and RJ11 style pin spacing.

Beckman INSTRUMENTS, INC. **HELIPOT DIVISION** 2500 Harbor Blvd., Fullerton, Calif. 92634

BOURNS INC

PRECISION POTENTIOMETERS

DIALLYL PHTHALATE HOUSING

Only standard models and the most significant specifications are listed in this catalog. Please call your nearest Bourns office or distributor for detailed specifications, part numbers and prices.

SINGLE-TURN — *WIREWOUND*

Model	Size Dia. x Length (Inches)	Mounting	Resistance Range Ohms	Linearity (%)	Electrical Angle	Mechanical Life Revolutions	Price 10-24 Pieces
3535	7/8 x 11/16	Bushing	25-20K 50K	±0.5	350° ±2°	2,000,000	$15.20 25.65
3585	7/8 x 11/16	Servo	25-20K 50K	±0.5	350° ±2°	2,000,000	19.95 31.35
3435	1 1/16 x 13/16	Bushing	50-10K 20K & 50K	±0.5	350° ±2°	2,000,000	21.85 28.50
3485	1 1/16 x 11/16	Servo	50-10K 20K & 50K	±0.5	350° ±2°	2,000,000	23.75 29.45
3437	1 1/16 x 23/32	Bushing	50-50K	±0.5	320° ±5°	200,000	10.00
3415	2 x 27/32	Bushing	50-100K	±0.3	350° ±2°	1,000,000	18.05
3465	2 x 13/16	Servo	50-100K	±0.3	350° ±2°	1,000,000	19.95

MULTI-TURN — *WIREWOUND AND CONDUCTIVE PLASTIC*

Size Dia. x Length (Inches)	Rotation	Mounting	Wirewound Model	Resistance Range Ohms	Price 10-24 Pieces	Conductive Plastic Model	Resistance Range Ohms	Price 10-24 Pieces
1/2 x 1	10-Turn	Bushing	3700	50-100K	$23.27	3701	1K-500K	$33.25
1/2 x 1 3/16	10-Turn	Servo	3750	50-100K	32.30	3751	1K-500K	42.75
1/2 x 1	10-Turn	Bushing	3707	100-100K	16.39	—	—	—
7/8 x 1	10-Turn	Bushing	3500	50-125K 150K, 200K, 250K 500K	9.50 18.05 26.60	3501	1K-500K 1, 2, 4 Meg.	14.25 33.25
7/8 x 1.580	10-Turn	Servo	3550	50-125K 150K, 200K, 250K 500K	19.00 27.55 36.10	3551	1K-500K 1, 2, 4 Meg.	33.25 47.50
7/8 x 1 1/8	10-Turn	Bushing	3509	50-100K	5.66	—	—	—
7/8 x 1 11/16	5-Turn	Bushing	3520	25-75K 100K 250K	12.82 21.37 29.92	3521	1K-500K	18.52
7/8 x 1 3/16	5-Turn	Servo	3570	25-75K 100K 25K	17.57 26.12 34.67	3571	1K-500K	24.70
7/8 x 35/64	3-Turn	Bushing	3510	25-50K 100K	14.25 31.35	3511	1K-200K	19.95
7/8 x 13/64	3-Turn	Servo	3560	25-50K 100K	19.00 36.10	3561	1K-200K	23.75
1 13/16 x 1 3/4	10-Turn	Bushing	3400	100-250K 500K 1 Meg.	9.50 18.05 33.25	—	—	—

BOURNS INC PRECISION POTENTIOMETERS

ALUMINUM HOUSING

B-LINE™

SINGLE-TURN WIREWOUND, CERMET, BI-FILM™, CONDUCTIVE PLASTIC

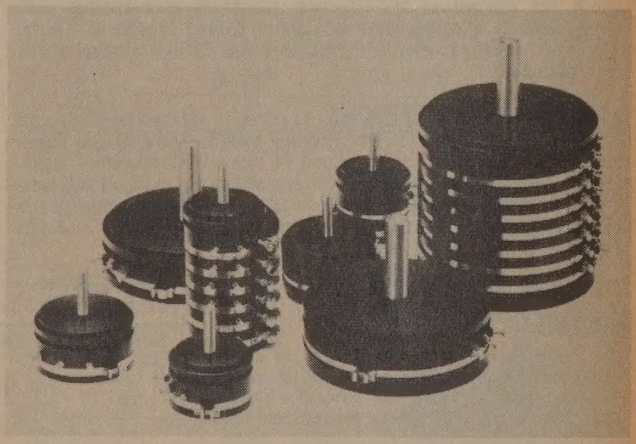
The B-LINE series is a new concept in precision potentiometers. Blackboxing — designing for a specific package size — can be accomplished without concern for the type of potentiometric elements to be used. In fact, the element type may be the last thing chosen. Updating — converting existing applications to state of the art elements — is no longer limited by available space behind the panel. The B-LINE potentiometer's extremely thin profile fits anywhere another potentiometer has been used.

Potentiometers in this series are in diameters of 7/8", 1 1/16" and 2", bushing or servo mount. Wirewound, cermet, conductive plastic and BI-FILM™ elements are available in each size — 24 standard models in all, with a choice of 96 variations.

Look at the range of selection: size, mounting and type of element — cermet for exceptional stability, conductive plastic for rotational life, BI-FILM for the best of both, and wirewound for noise-free performance.

MECHANICAL DIMENSIONS

Diameter (Inches)	Length Servo Mount (Inches)	Length Bushing Mount (Inches)	Length Additional Cups (Inches)
7/8	.475	.600	.200
1 1/16	.475	.600	.200
2	.600	.600	.200

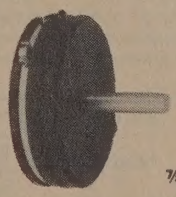


ELEMENT CHARACTERISTICS

	Resistance Range Ohms	Resolution %	Mechanical Life Revolutions	Representative Temp. Coeff.	Prices 10-24 Pieces
Wirewound	50 - 100K	.385/.028	2×10^6	±20 ppm/°C	$28.80
Cermet	20 - 1 Meg	Infinite	5×10^6	±200 ppm/°C	43.20
BI-FILM™	20 - 1 Meg	Infinite	25×10^6	±100 ppm/°C	45.00
Conductive Plastic	1K - 100K	Infinite	50×10^6	±300 ppm/°C	36.00

B-LINE™ MODEL SELECTOR

Diameter (Inches)	Mounting	ELEMENT TYPE Wirewound	Cermet	BI-FILM™	Conductive Plastic
7/8	Servo	6530	6532	6533	6534
7/8	Bushing	6630	6632	6633	6634
1 1/16	Servo	6540	6542	6542	6544
1 1/16	Bushing	6640	6642	6642	6644
2	Servo	6570	6572	6572	6574
2	Bushing	6670	6672	6672	6674



7/8" DIA. SERVO MOUNT

BOURNS INC

PRECISION POTENTIOMETERS

COMMON CHARACTERISTICS FOR POTENTIOMETER SELECTION

MECHANICAL LIFE: Mechanical life is measured in terms of change in resistance as the wiper wears away the element during adjustment. Wirewound elements will withstand at least 2,000,000 passes by the wiper with a resistance change of less than 2%. Film-type elements are much more durable. Conductive Plastic elements will allow more than 50,000,000 wiper passes. Cermet, an abrasive film, has a limit of 5,000,000 revolutions. The new BI-FILM™ element offers 25,000,000.

ELECTRICAL LIFE: Electrical life is measured in thousands of hours of service. If there were no other factors to consider, such as changes in ambient environment, or continued mechanical wear, the electrical life of any operating element would be almost infinite. But combined effects of humidity, high and low ambient temperatures, mechanical shock, mechanical vibration, and unusual operating conditions eventually degrade the electrical characteristics beyond the point of usefulness.

EFFECTS OF HUMIDITY: High humidity affects wire elements by causing a high resistance, polarized short, resulting in electrolytic corrosion of the wire and eventual burnout. Conductive Plastic, on the other hand, acts as a humistat, absorbing and releasing moisture vapor according to the weather and resultantly changing as much as 10% in total resistance. If it is selectively absorbed, the moisture causes one part of the element to have a lower resistance than another part, thereby severely affecting linearity. Cermet, a fired ceramic and metal material, is virtually unaffected by humidity. The BI-FILM element shows very little effect.

TEMPERATURE COEFFICIENT: Changes in temperatures also affect the total resistance of the element, thereby changing the power requirements. This effect is measured in terms of temperature coefficient, or change in resistance in parts per million per degree centigrade. Wire is inherently superior in this respect. Temperature coefficients in the ±20ppm/°C to ±70ppm/°C range are common. Film elements have much greater coefficients.

MAXIMUM TEMPERATURE: High ambient temperatures combine with the dissipated power to overheat the element or the insulation materials in the potentiometer. Cermet offers superior performance. It will stand 150°C easily, and up to 200°C in some special applications. Conductive Plastic itself and the plastic insulation of the wirewound units are limited to 125°C. Still lower maximum temperatures are characteristic of industrial potentiometers.

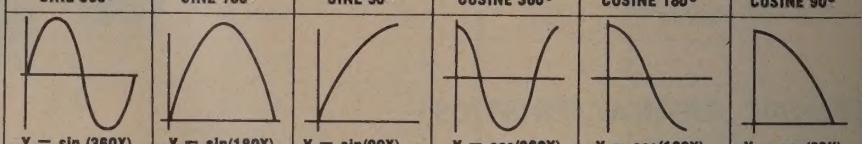
MECHANICAL SHOCK AND VIBRATION: Performance is the result of a compromise between tight mechanical tolerances and stiff, high-pressure wipers on the one hand and mechanical wear and high torque on the other. In general, Bourns standard units will withstand 50Gs shock and 15Gs vibration without damage or intermittent wiper continuity.

WIPER CURRENT: A potentiometer with any of the film-type elements exhibits an unpredictable and uncontrollable variation in output (termed "Contact Resistance Variation") as a result of current flowing through the wiper. Only extremely low wiper current (a few microamps) may be drawn from conductive plastic elements without severely damaging the element. For these reasons, wirewound elements are recommended for all applications in which there is a significant wiper current. Film-type elements are used primarily for voltage-balanced systems for high impedance circuitry.

LOADING ERROR: Conformity to the desired function is also affected by low resistance in the wiper circuit. This resistance acts to shunt a part of the element, resulting in a non-linear relationship between wiper position and output voltage. This is known as loading error. It is greatest when voltage output from the wiper is 67% of the maximum voltage applied to the element. For a load ratio of 100:1, the loading error would be .15%. For a load ratio of 10:1, the error would be 1.5%. This error is additive to conformity tolerance in establishing the expected accuracy of the unit. If the resulting performance is beyond system limits, a more expensive non-linear element may be required to compensate for the load.

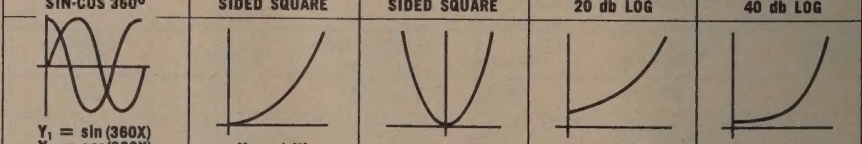
NON-LINEAR FUNCTIONS

The curves shown here are indicative of the varied selection of standard functions offered in single and multi-turn wirewound and conductive plastic precision potentiometers. These functions and conformities are described in our brochure, "Bourns Standard Non-Linear Functions," number N.F./J/1.



			SINE						COSINE					
			SINE 360°		SINE 180°		SINE 90°		COSINE 360°		COSINE 180°		COSINE 90°	
			Y = sin (360X)		Y = sin(180X)		Y = sin(90X)		Y = cos(360X)		Y = cos(180X)		Y = cos(90X)	
SINGLE TURNS Wirewound, Conductive Plastic, Cermet or BI-FILM™ ⅞" DIA.	Resistance Range[1], Ω		250	4K	250	4K	1K	13K	250	4K	1K	15K	1K	13K
	Conformity[2] ± %	Std.	2.0	1.5	1.8	1.5	1.6	1.3	2.0	1.5	1.8	1.5	1.6	1.3
		Best	1.1	0.9	1.1	0.9	0.6	0.5	1.1	0.9	1.1	0.9	0.6	0.5
10-TURNS Wirewound	Resistance Range, Ω		1K	25K	1K	25K	1K	100K	1K	25K	1K	100K	1K	100K
	Conformity[2] ± %	Std.	0.7	0.7	1.3	0.9	1.0	1.0	0.7	0.7	0.7	0.7	1.0	1.0
		Best	0.25	0.2	0.25	0.2	0.2	0.15	0.25	0.2	0.3	0.2	0.2	0.15

Many other non-linear functions are available from Bourns experienced engineering staff; for example, load correction or empirically derived functions. Send us your particular specifications for a prompt, accurate solution to your non-linear requirements.



			SIN-COS 360°	SINGLE SIDED SQUARE		DOUBLE SIDED SQUARE		20 db LOG		40 db LOG	
			Y_1 = sin (360X) Y_2 = cos(360X)	Y = +X²		Y = ±X²		Y = 10^X-1		Y = 10^2(X-1)	
SINGLE TURNS Wirewound, Conductive Plastic, Cermet or BI-FILM™ ⅞" DIA.	Resistance Range[1], Ω		AVAILABLE IN SINGLE CUP ONLY IN 2" DIA. UNIT.	1K	13K	250	3.5K	1K	12K	500Ω	5K
	Conformity[2] ± %	Std.		1.5	1.0	1.8	1.5	1.5	1.0	2.5	2.0
		Best		0.7	0.6	1.4	1.0	0.8	0.7	1.5	1.2
10-TURNS Wirewound	Resistance Range, Ω			1K	70K	1K	20K	1K	70K	1K	35K
	Conformity[2] ± %	Std.		0.7	0.5	1.0	1.0	0.5	0.5	1.0	1.0
		Best		0.20	0.15	0.30	0.25	0.20	0.15	0.35	0.3

BOURNS INC PRECISION POTENTIOMETERS

KNOBPOT® READOUT POTENTIOMETERS

Model	Resistance (Ohms)[1]	Tolerance (%)[1]	Dial Acc. % VR[1]	Mechanical Life (Rev)
KNOBPOT® 3600	100-100K	±5	±0.5	200,000

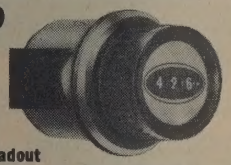
Power Watts	Maximum Operating Temp. Range (°C)	Shock	Vibration	Length	Price 10-24
1.5 at 25°C	−65° to +85°	50G	10G	1″	$21.30

⅞″ Dia.
10-Turn
Clock Face Readout

Model	Resistance (Ohms)[1]	Tolerance (%)[1]	Dial Acc. % VR[1]	Mechanical Life (Rev)
3640	100-250K	±3	±0.1	200,000

Power Watts	Maximum Operating Temp. Range (°C)	Shock	Vibration	Length	Price 10-24
2.5 at 25°C	−65° to +85°	50G	10G	1½″	$21.30

1¼″ Dia.
10-Turn
Clock Face Readout

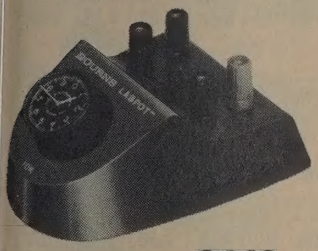


Model	Resistance (Ohms)[1]	Tolerance (%)[1]	Dial Acc. % VR[1]	Dial Repeatability % VR	Electrical Rotation	Mechanical Life (Rev)
3650	100-250K	±3	±0.1	0.005	3600° Nominal	200,000

Power Watts	Maximum Operating Temp. Range (°C)	Shock	Vibration	Length	Price 10-24
2.5 at 25°C	−25° to +85°	50G	10G	2 15/32″	$26.39

1¼″ Dia.
10-Turn
Digital Readout

LABPOT™ POTENTIOMETERS



3660

The Model 3660 LABPOT potentiometer with its unique "clock-dial" face and the Model 3665 LABPOT potentiometer with a three-place digital readout are precision units designed for a variety of circuit development and educational applications. Large, five-way binding posts facilitate fast hookup of any leads. Each unit is fused for protection against burnout and an extra fuse is furnished inside the case.

SPECIFICATIONS

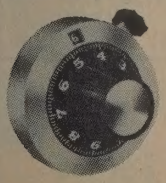
Std. Resistances:	100Ω 1K, 10K, 100K (others available on request)
Resistance Tolerance:	±1%
Dial Accuracy % VR	.20% 100Ω, .15% 1K, .10% 10K and 100K
Repeatability:	±.05% voltage ratio
Operating Temp. Range:	−65 to +85°C
Power Rating:	2.5W at room temp.
Mechanical Life:	200,000 dial rev.
Weight:	14 ounces

Model	10-24 Pieces	Model	10-24 Pieces
3660	$42.66	3665	$45.50

3665

TURNS-COUNTING DIALS

H-490 Series 1″ Dia.



H-510 Series 1⅜″ Dia.

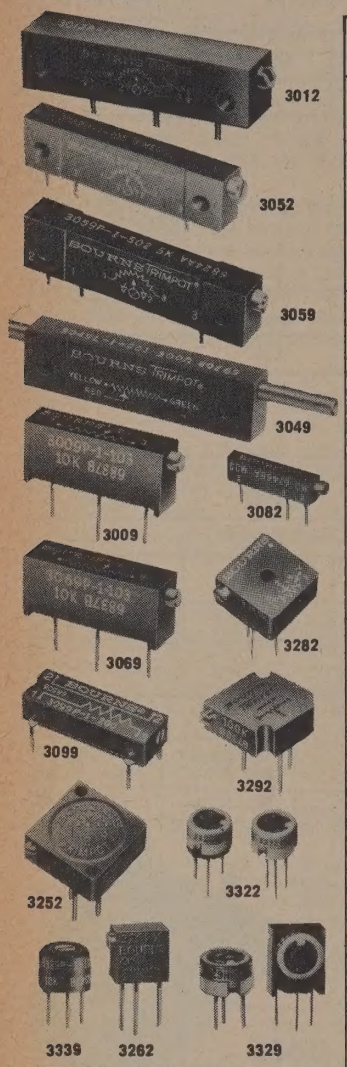
Part No.	Body Finish	Shaft Dia. (Inches)	Brake	Price 10-24
H-491-1	Clear	3/32	No	$6.70
H-492-1	Clear	3/32	Yes	6.89
H-493-1	Black	3/32	No	6.89
H-494-1	Black	3/32	Yes	7.03
H-491-2	Clear	⅛	No	6.70
H-492-2	Clear	⅛	Yes	6.89
H-493-2	Black	⅛	No	6.89
H-494-2	Black	⅛	Yes	7.03
H-491-3	Clear	¼	No	6.41
H-492-3	Clear	¼	Yes	6.60
H-493-3	Black	¼	No	6.60
H-494-3	Black	¼	Yes	6.79
H-510-1	Clear	⅛	Yes	5.42
H-510-2	Clear	¼	Yes	5.42

BOURNS, INC. • TRIMPOT PRODUCTS DIVISION • 1200 Columbia Ave., Riverside, California 92507 • Phone: 714-684-1700

BOURNS INC ADJUSTMENT POTENTIOMETERS

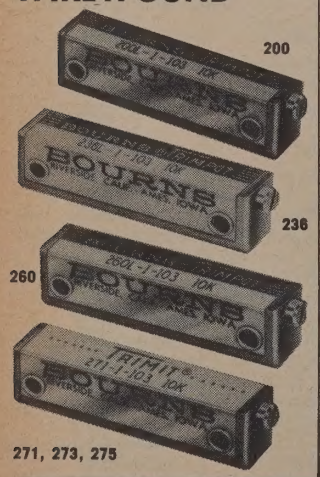
BOURNS IS THE WORLD'S LARGEST PRODUCER OF ADJUSTMENT POTENTIOMETERS

CERMET



	Description	Dimensions H x W x L	Terminals[1]	Res.[4] Tol. (%)	Power (Watt) at 70°C	Max. Temp. °C	Nom. Adj. Turns	Humidity[5] Mil Spec	Standard Resistances Ω[3]	Prices[2] 1-9	10-24	25-49
3012	High Temperature PALIRIUM[7] Cermet Element (RJ 11)	.31x.28x1.25	L,P	±10	1.0	175	22	Yes	10-2 Meg	$5.94	$5.50	$4.95
3052	High Temperature PALIRIUM[7] Cermet Element (RJ 12)	.31x.19x1.25	L,P,Y,S	±10	1.0	175	22	Yes	10-2 Meg	5.94	5.50	4.95
3009	Commercial E-Z-TRIM[7] Potentiometer	.35x.19x.75	P,Y	±10	0.75 at 25°C	125	20	Yes	10-2 Meg	1.94	1.84	1.75
3059	High Temperature Humidity Proof (RJ 12)	.32x.19x1.25	L,P,Y,J	±10	1.0	150	22	Yes	10-2 Meg	3.00	2.85	2.70
3069	Commercial E-Z-TRIM[7] Potentiometer	.35x.25x.75	P	±10	0.75 at 25°C	125	20	Yes	10-2 Meg	1.94	1.84	1.75
3082	Humidity Proof PALIRIUM[7] Cermet Element	.10x.15x.50	P	±10	0.3 at 85°C	150	10	Yes	10-2 Meg	7.70	7.13	6.42
3099	Dual In-Line Cermet Element	.30x.19x.75	P	±10	0.75 at 25°C	125	20	Yes	10-2 Meg	3.75	3.35	3.00
3049	Instrumentation-Oriented Linear Measuring Device	.32x.19x1.25	L,J	±10	1.0	175	½" Travel	Yes	10-1 Meg	7.50	6.98	6.28
3252	High Performance Humidity Proof	.50x.50x.22	L,P,W,X	±10	1.0	150	23	Yes	10-2 Meg	5.62	5.35	5.06
3262	Humidity Proof High Temperature	.25x.17x.25	P,W,X	±10	0.25 at 85°C	175	12	Yes	10-1 Meg	7.70	7.40	7.10
3282	Humidity Proof PALIRIUM[7] Cermet Element	.20x.375x.375	L,P,W,H	±10	0.5 at 85°C	175	25	Yes	10-1 Meg	6.50	6.18	5.85
3292	Thin Line PALIRIUM[7] Cermet Element (RJ 24)	.15x.375x.375	L,P,W,X	±10	0.5 at 85°C	175	22	Yes	10-1 Meg	6.50	6.18	5.85
3322	High Performance PALIRIUM[7] Cermet Element (RJ 50)	.250 Dia.x.22	P	±10	0.5 at 85°C	175	240°	Yes	10-1 Meg	5.50	5.22	4.90
3329	High Performance PALIRIUM[7] Cermet Element	.250 Dia.x.180 .245x.29x.375	P,H W	±20 ±20	0.5 at 85°C	150	240°	Yes	10-1 Meg 10-1 Meg	1.75 2.50	1.66 2.38	1.57 2.25
3339	Four-Turn PALIRIUM[7] Cermet Element	.300 Dia.x.25	P		0.5 at 85°C	150	4	Yes	10-1 Meg	2.50	2.32	2.09

WIREWOUND

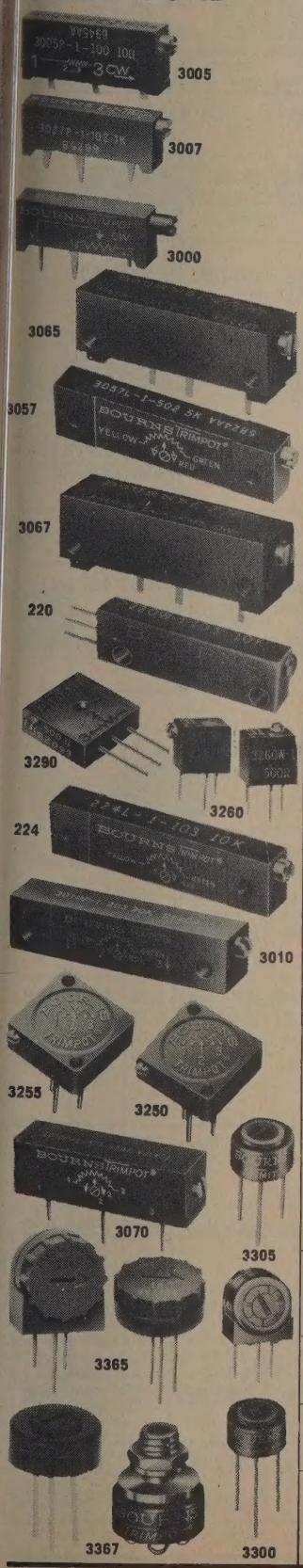


200	Low Cost TRIMPOT[7] Potentiometer	.31x.25x1.25	L,S,P L	±10	0.5	125	25	Steady State	10-10K 20K & 25K 50K 100K	$4.86 6.48 7.56 9.18	$4.50 6.00 7.00 8.50	$4.05 5.40 6.30 7.65
236	Humidity Proof	.36x.30x1.34	L,S,P L	±10	0.8	135	25	Yes	10-10K 20K & 25K 50K 100K	7.02 8.64 9.18 11.34	6.50 8.00 8.50 10.50	5.85 7.20 7.65 9.45
260	High Temperature	.28x.25x1.25	L,S,P L	±10	1.0	175	25	Steady State	10-10K 20K & 25K 50K 100K	5.94 7.56 8.10 9.72	5.50 7.00 7.50 9.00	4.95 6.30 6.75 8.10
271 273 275	Commercial TRIMIT[7] Potentiometer	.28x.25x1.25	L S P	±10	0.50 at 25°C	105	25	Steady State	10-10K 20K 50K	3.19 4.32 5.40	2.95 4.00 5.00	2.66 3.60 4.50

BOURNS INC ADJUSTMENT POTENTIOMETERS

BOURNS HAS THE WORLD'S LARGEST SELECTION OF ADJUSTMENT POTENTIOMETERS

WIREWOUND



	Description	Dimensions H x W x L	Terminals[1]	Res.[4] Tol. (%)	Power (Watt) at 70°C	Max. Temp. °C	Nom. Adj. Turns	Humidity[5] Mil Spec	Standard Resistances Ω[3]	1-9	Prices[2] 10-24	25-49
3005	Sealed Commercial E-Z-TRIM[7] Potentiometer	.31x.17x.75	P	±10	1.0 at 40°C	125	20	Steady State	10-25K	$2.00	$1.85	$1.75
3007	Commercial E-Z-TRIM[7] Potentiometer	.31x.16x.75	P	±10	1.0 at 40°C	125	20	Steady State	10-25K	1.75	1.62	1.46
3065	Humidity Proof Commercial E-Z-TRIM[7] Potentiometer	.36x.29x1.0	S,P	±10	0.5 at 25°C	85	15	Steady State	50-20K	2.00	1.85	1.67
3067	Commercial E-Z-TRIM[7] Potentiometer	.36x.28x1.0	S,P	±10	0.5 at 25°C	85	15	No	50-20K	1.85	1.71	1.54
3255	Commercial TRIMIT[7] Potentiometer	.19x.50x.50 .22x.50x.50	L P,W,X	±5	1.0 at 50°C	150	25	Steady State	10-10K 20K-25K 50K	3.19 4.32 4.78	2.95 4.00 4.43	2.66 3.60 3.98
3305	Sealed Commercial TRIMIT[7] Potentiometer	.31x.25x.375	W	±5	0.5 at 70°C	125	280°	Steady State	10-5K 10K 25K	2.25 2.50 3.00	2.16 2.40 2.88	2.07 2.30 2.76
		.31 dia. x .19	P						10-5K 10K 25K	1.75 2.00 2.50	1.68 1.92 2.40	1.61 1.84 2.30
3365	Sealed Industrial TRIMIT[7] Potentiometer	.59x.315x.50	W	±5	1.0 at 25°C	125	280°	Steady State	10-10K 20K & 25K 50K	3.55 4.38 4.71	3.23 3.98 4.28	2.90 3.58 3.85
		.50 dia. x .23	P						10-10K 20K & 25K 50K	3.30 4.13 4.46	3.00 3.75 4.05	2.70 3.38 3.65
3367	Humidity Proof Single-Turn	.50 dia. x .24	P	±5	0.5	105	285°	Steady State	10-20K 50K	4.86 6.84	4.50 6.33	4.05 5.70
		.50 dia. x .54	S						10-20K 50K	5.67 7.65	5.25 7.08	4.73 6.38
220	High Humidity High Temperature (RT 10)	.31x.18x1.0	L,W	±5	1.0	175	15	Yes	10-10K 20K & 30K	8.64 10.26	8.00 9.50	7.20 8.55
224	High Temperature (RT 12)	.32x.19x1.25	L,S,P	±5	1.0	175	22	Yes	10-10K 20K & 25K 50K 100K	7.02 8.64 9.18 11.34	6.50 8.00 8.50 10.50	5.85 7.20 7.65 9.45
3000	High Humidity High Temperature	.31x.16x.75	P	±10	0.5	175	15	Yes	50-10K 20K	9.72 10.80	9.00 10.00	8.10 9.00
3010	High Temperature (RT 11)	.31x.28x1.25	L,P	±5	1.0	175	25	Yes	10-10K 20K & 25K 50K 100K	7.02 8.64 9.18 11.34	6.50 8.00 8.50 10.50	5.85 7.20 7.65 9.45
3057	Commercial High Temperature Humidity Proof	.32x.19x1.25	L,P,Y,J	±5	0.75	125	22	Yes	10-10K 20K & 25K 50K	4.25 5.10 5.52	4.04 4.85 5.24	3.82 4.59 4.97
3070	Fine Resolution	.31x.31x1.06 .355x.31x1.06	H,L,P,S	±5	1.5	175	10	Yes	100-20K 50K	10.50 12.50	10.25 12.25	10.00 12.00
		.31x.31x1.06	L,S P/Mt.						100-20K 50K	11.50 13.50	11.20 13.20	10.90 12.90
3250	Humidity Proof High Temperature (RT 22)	.19x.50x.50	L	±5	1.0	175	25	Yes	10-10K 20K & 25K 50K	6.71 7.56 10.00	6.22 7.00 9.27	5.59 6.30 8.34
		.22x.50x.50	P,W, W66						10-10K 20K & 25K 50K	7.23 7.97 10.53	6.69 7.38 9.75	6.02 6.64 8.78
3260	Humidity Proof High Temperature	.25x.25x.17	H,W	±5	0.2	175	11	Yes	10-1K 2K & 5K 10K & 20K 25K	7.50 8.25 10.50 11.00	6.95 7.64 9.72 10.19	6.25 6.88 8.75 9.17
3280	Humidity Proof High Temperature	.203x.375x.375	L,P,W, W66	±5	1.0	175	25	Yes	10-10K 20K-25K 50K	7.56 9.18 9.72	7.00 8.50 9.00	6.30 7.05 8.10
3290	Humidity Proof High Temperature	.150x.375x.375 .145x.375x.375 .145x.375x.390	P L W,H	±5	1.0	175	25	Yes	10-10K 20K & 25K 50K	7.33 8.75 10.10	6.79 8.10 9.35	6.11 7.30 8.42
3300	Humidity Proof Single-Turn High Temperature	.37x.25x.31 .31 dia. x .18	W P	±5	0.5	175	300°	Yes	10-10K 25K	5.94 7.56	5.50 7.00	4.95 6.30
		.31 dia. x .46	S						10-10K 25K	8.91 10.53	8.25 9.75	7.43 8.78

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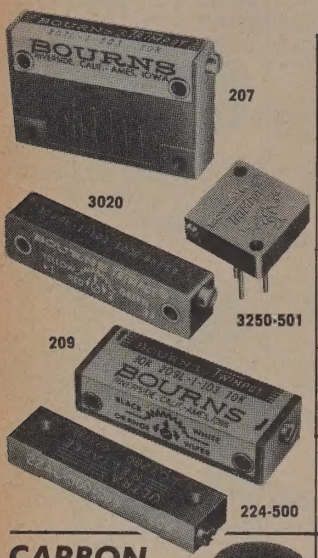
BOURNS INC ADJUSTMENT POTENTIOMETERS

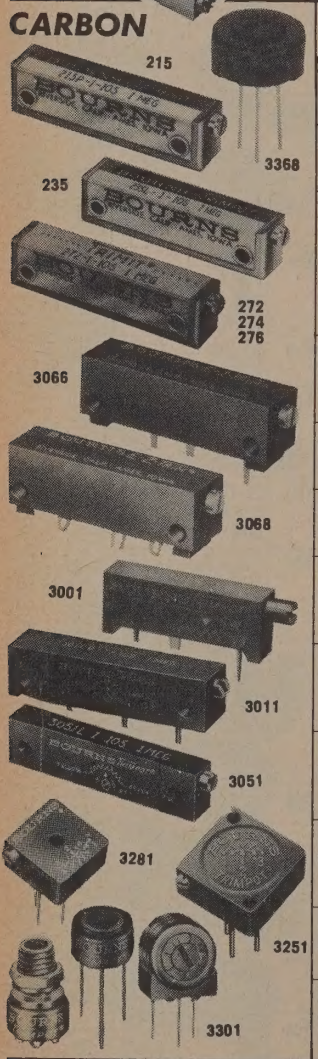
BOURNS IS THE WORLD'S LARGEST PRODUCER OF ADJUSTMENT POTENTIOMETERS

SPECIAL PURPOSE WIREWOUND



	Description	Dimensions H x W x L	Terminals[1]	Res.[4] Tol. (%)	Power (Watt) at 70°C	Max. Temp. °C	Nom. Adj. Turns	Humidity[5] Mil Spec	Standard Resistances Ω[3]	Prices[2] 1-9	10-24	25-49
207	High Power (2-Watt)	.81x.28x1.25	L	±10	2.0 at 50°C	175	25	No[6]	100-50K 100K	$10.26 11.88	$9.50 11.00	$8.55 9.90
209	Dual Element TWINPOT[7] Potentiometer	.31x.50x.125	L	±10	0.5 each element	135	25	Steady State[6]	10-10K 20K & 25K 50K	12.96 14.58 16.20	12.00 13.50 15.00	10.80 12.15 13.50
224-500	Ultra-Reliable	.32x.19x1.25	L,P	±5	0.5	150	22	Yes	100-10K 20K	14.58 16.20	13.50 15.00	12.15 13.50
3020	High Power Humidity Proof	.33x.25x1.25	L	±5	5 at 25°C	200	25	Yes	100-10K 20K & 25K 50K	14.04 15.66 16.20	13.00 14.50 15.00	11.70 13.05 13.50
3250-501	High Reliability	.19x.50x.50 .22x.50x.50	L P,W,X	±5	0.5	150	25	Yes	100-10K 20K	13.50 14.58	12.50 13.50	11.25 12.15

CARBON



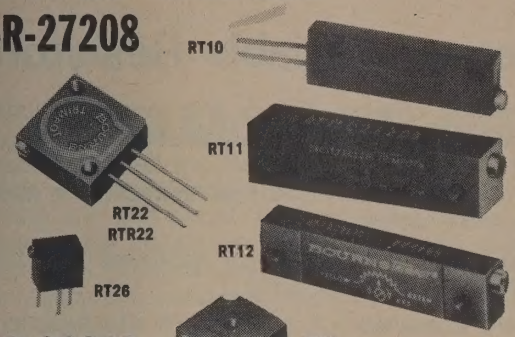
	Description	Dimensions H x W x L	Terminals[1]	Res.[4] Tol. (%)	Power (Watt) at 70°C	Max. Temp. °C	Nom. Adj. Turns	Humidity[5] Mil Spec	Standard Resistances Ω[3]	Prices[2] 1-9	10-24	25-49
215	RESISTON[7] Element	.31x.28x1.25	L,S,P	±20	0.25 at 50°C	135	22	Steady State	5K-5 Meg	4.86	4.50	4.05
235	RESISTON[7] Element	.36x.30x1.34	L,S,P	±20	0.25 at 50°C	135	22	Yes	5K-5 Meg	7.02	6.50	5.85
272 274 276	Commercial TRIMIT[7] RESISTALOY[7] Element Potentiometer	.31x.28x1.25	L S P	±20	0.20 at 25°C	105	25	No	5K-5 Meg	3.78	3.50	3.15
3066	Humidity Proof Commercial E-Z-TRIM[7] Potentiometer	.36x.28x1.0	S,P	±20	0.20 at 25°C	85	15	Steady State	20K-1 Meg	1.95	1.85	1.75
3068	Commercial E-Z-TRIM[7] Potentiometer	.36x.28x1.0	S,P	±20	0.20 at 25°C	85	15	No	20K-1 Meg	1.85	1.71	1.54
3368	Single-Turn RESISTON[7] Element	.50 dia. x .24 .50 dia. x .54	P S	±20	0.25 at 50°C	105	285°	Steady State	20K-1 Meg 20K-1 Meg	5.94 6.75	5.50 6.25	4.95 5.63
3001	Humidity Proof High Temperature RESISTON[7] Element	.31x.16x.75	P	±20	0.20	150	15	Yes	20K-1 Meg	9.18	8.50	7.65
3011	High Temperature RESISTON[7] Element (RJ 11)	.31x.28x1.25	L,S,P	±20	0.25 at 50°C	150	22	Yes	5K-5 Meg	7.02	6.50	5.85
3051	High Temperature RESISTON[7] Element (RJ 12)	.31x.19x1.25	L,S,P	±20	0.25 at 50°C	150	22	Yes	5K-5 Meg	7.02	6.50	5.85
3251	High Temperature RESISTON[7] Element (RJ 22)	.19x.50x.50 .22x.50x.50	L P,W, W66		0.5 at 50°C	150	25	Yes	20K-1 Meg	7.83	7.25	6.53
3281	Humidity Proof RESISTON[7] Element	.20x.375x.375	L,P,W, W66	±20	0.5 at 50°C	150	25	Yes	20K-1 Meg	7.56	7.00	6.30
3301	Humidity Proof RESISTON[7] Element	.375x.25x.31 .31 dia. x .18 .31 dia. x .46	W P S	±20	0.25	150	300°	Yes	10K-1 Meg 10K-1 Meg	5.94 8.91	5.50 8.25	4.95 7.43

BOURNS INC ADJUSTMENT POTENTIOMETERS

BOURNS HAS MORE POTENTIOMETERS LISTED ON DESC'S QUALIFIED PRODUCTS LISTS THAN ANY OTHER MANUFACTURER

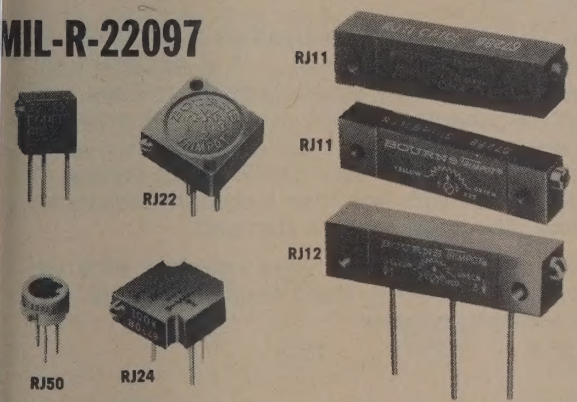
MIL-SPEC MODELS

MIL-R-27208



MIL-R-39015

MIL-R-22097



Qualified Styles	Qualified Terminals	Qualified Resistances Ω	Prices[2] 1-9	10-24	25-49
RT10	L	100Ω-10K	$8.64	$8.00	$7.20
RT11	L,P	10Ω-10K 20K	5.56 6.11	5.13 5.64	4.71 5.18
RT12	L,P,Y	10Ω-10K 20K	5.56 6.11	5.13 5.64	4.71 5.18
RT22	L	50Ω-10K 20K	5.27 5.75	5.01 5.46	4.74 5.18
	P,W,X	50Ω-10K 20K	4.72 5.20	4.48 4.94	4.25 4.68
RT24	L,P,W,X	10Ω-10K	7.33	6.79	6.11
RT26	W,X	10Ω-1K 2K-5K	7.50 8.25	6.95 7.64	6.25 6.88
RTR12 Failure Rate Level "M"	L,P	500Ω-10K 20K	19.78 21.40	18.32 19.82	16.49 17.84
RTR22 Failure Rate Level "M"	L,P,W,X	500Ω-10K 20K	11.75 13.41	10.85 12.38	9.72 11.10

Qualified Styles	Qualified Terminals	Characteristics	Qualified Resistances Ω	Prices[2] 1-9	10-24	25-49
RJ11	L,P	C	100Ω-1 Meg.	$5.94	$5.22	$4.95
RJ11	L,P	A B	20K-1 Meg. 100Ω-1 Meg.	5.56	5.13	4.71
RJ12	L,P,Y	C	10Ω-1 Meg.	5.94	5.22	4.95
RJ12	L,P,Y	B	10Ω-1 Meg.	5.56	5.13	4.71
RJ22	L,P,W,X	C B	10-1 Meg. 20K-1 Meg.	6.25	5.94	5.63
RJ24	L,P,W,X	C B	10Ω-1 Meg. 20K-1 Meg.	6.50	6.18	5.85
RJ26	W,X	B & C	10Ω-1 Meg.	7.00	6.50	5.84
RJ50	P	C	10Ω-1 Meg.	5.50	5.22	4.90

MOUNTING HARDWARE

H-01 — 1½, 2-56 machine screw
H-02 — 2-56 Stainless steel rod stock (12" length only)
H-03 — 2-56 Hex nut, stainless steel for use on H-01 and H-02
H-04 — 1-72 machine screw, 1" long
H-05 — 1-72 hex nut, stainless steel (for use on H-04)
H-12S — Stainless steel side bracket for models with 1" mounting centers
H-15S — Stainless steel side bracket. For all Bourns models having 0.830" mounting centers
H-22S — Stainless steel side bracket for models with ¾" mounting centers
H-25 — Stainless steel stacking straps for models with 0.520" mounting centers
H-11E — Stainless steel end bracket for models with 1" mounting centers
H-21E — Stainless steel end bracket for models with ¾" mounting centers
H-26S — Stainless steel side bracket models with 0.520" mounting centers
H-24S — Stainless steel stacking straps with threaded holes. For all Bourns models having 0.520" mounting centers
H-28S — Stainless steel stacking straps for models having .419" mounting centers

PANEL MOUNTING

Most models are available with the added convenience of panel mounting. Unique design permits quick factory conversion of "off the shelf" units. Clip brackets, mounting brackets and mounting screws are available for other mounting requirements.

	Add to price of basic unit		
209	2.16	2.00	1.80
3250	.97	.90	.81
All others	.81	.75	.68

NOTES

[1] Key to terminal types: J=Printed Circuit. L=Insulated stranded leads. S=Solder Lugs (includes panel mount bushings on models 3300S, 3301S, 3367S, 3368S only). P.Y=Printed circuit pins (flat mounting). W=Printed circuit pins (edge mounting). Additional worm gear terminal classification: W-66=Printed circuit pins (edge mounting-side adjustment).
[2] Local distributors quote prices to 500 pieces. Contact local office for prices in higher quantities.
[3] The following resistances are standard if they fall within the limits listed: Wirewound — 10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 25K, 50K, 100K. CARBON — 5K, 10K, 20K, 50K, 100K, 200K, 500K, 750K, 1 Meg., 2 Meg., 5 Meg. CERMET — 10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 750K, 1 Meg. Other resistances available on special order.
[4] Closer tolerances available on request except commercial models.
[5] All models are sealed against sand and dust.
[6] Humidity-proof versions available on special order. Contact factory for part number price and delivery.
[7] BOURNS, TRIMPOT, TWINPOT, TRIMIT, E-Z-TRIM, RESISTALOY, RESISTON, PALIRIUM, SILVERWELD, KNOBPOT and QUADRATRON are registered trademarks of Bourns, Inc. Other products made by Bourns, Inc., are identified by trademarks which include: TRIMISTOR, TRIMM, MIL-E-TRIM, CARBOLON, PANLTRIM, MILISEAL, CLOCKPOT, TRIMR. LABPOT, and INFINITRON. Bourns, Inc. is the owner of rights under the following listed United States Letters Patents relating to certain of its adjustment potentiometers: 2,706,230/2,777,926/2,831,949/2,873,337/2,882,375/2,922,976/2,935,716/2,945,198/2,946,975/3,010,092/3,018,459/2,898,569/3,089,110/RE 25,412/RE 25,725/3,107,336/RE 25,510/3,124,799/3,124,955/3,139,601. other patents pending. Certain Bourns products are under issued and pending foreign patents.

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ALLEN-BRADLEY
Milwaukee, Wisconsin 53204

Hot Molded Composition and Cermet Variable Resistors.

The Allen-Bradley name on variable resistors means quality performance that helps protect the reputation of the equipment you manufacture.

The key to quality in A-B composition variable resistors is an exclusive hot-molded resistance track. This molded track has a large cross-section that results in low current densities for improved short-term overload protection and a long operating life. Control is smooth, resolution is almost infinite, and the low initial noise level actually decreases with use. Since they are essentially non-inductive, they can be used at higher frequencies where wire-wound units are impractical.

All composition types are available in five standard tapers (linear, modified linear, CW modified logarithmic, CCW modified logarithmic, and CW exact logarithmic). Special tapers can be provided.

The dual and triple section Type J, and the dual section Type GD are ideally suited for attenuator applications. Special resistance values can be supplied.

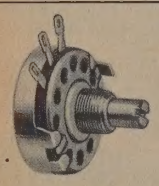
Types J and K are 1-5/32 inches in diameter and are suitable for both military and commercial applications where high reliability is of prime consideration. The Type J operational life is in excess of 100,000 cycles with less than 10-percent resistance change. This is the most thoroughly "field tested" (over 20 years) variable resistor available. Types G, L, W, and GD are ½-inch diameter and are designed for critical applications where space is a factor.

Type J and G are MIL-R-94 approved for Styles RV4 and RV6 respectively.

Type J is available in single, dual and triple configurations. The single and dual J can be provided with SPST, SPDT and DPST switches. Type G is available with or without a SPST switch. Type GD is a compact dual section control. Types K and L are high temperature versions of Types J and G, respectively.

Type Q features Allen-Bradley's proprietary cermet resistance material. It is designed for severe environment applications in military and industrial equipment. Only ½ inch in diameter, it can dissipate 0.5 watt at 125°C. Resolution is almost infinite with an operational life in excess of 50,000 cycles with less than 5-percent resistance change. The linear taper is standard.

Standard Options for all types include a wide variety of shaft endings, shaft lengths, bushings and appropriate hardware.

	Type	Range and Tolerance	Power Rating	Voltage Rating (rms or dc)	Operating Temperature Range	Electrical and Mechanical Rotation	Configurations	Dimensions	Enclosure
	Composition J (RV4)	50 ohms—5.0 megohms ±10% ±20%	2.25 W @ 70°C	500 V	−55°C to +120°C	312°	Single* Dual* Triple *w or w/o SPST	5/8 inch deep by 1-5/32 inch dia. (single section)	Dust-tight and splashproof
	Composition K	(Special values to 1000 megohms available for Type J)	3.0 W @ 70°C		−55°C to +150°C		SPDT and DPST switch on type J only.		
	Composition G (RV6)	100 ohms—5.0 megohms ±10% ±20%	0.5 W @ 70°C	350 V	−55°C to +120°C	295°	Single section w or w/o SPST switch	15/32 in. deep by 1/2 inch dia.	Immersion-proof
	Composition L		0.8 W @ 70°C		−55°C to +150°C		Single section		
	Composition W	100 ohms—5.0 megohms ±10% ±20%	0.5 W @ 70°C	350 V	−55°C to +120°C	295°	Single section	15/32 in. deep by 1/2 inch dia.	Immersion-proof
	Composition GD (Dual)	100 ohms—5.0 megohms ±10% ±20%	0.5 W @ 70°C	350 V	−55°C to +120°C	295°	Dual section	35/64 in. deep by 1/2 inch dia. (dual section)	Immersion-proof
	Cermet Q	50 ohms—2.5 megohms ±10% ±20%	0.5 W @ 125°C	350 V	−65°C to +175°C	295°	Single section	15/32 in. deep by 1/2 inch dia.	Immersion-proof

ALLEN-BRADLEY

Milwaukee, Wisconsin 53204

Hot Molded Composition and Cermet Trimmers.

Allen-Bradley trimmers are designed for you to install, set, and forget. Easy, pinpoint control and dependable stability are two of the best reasons why A-B's family of variable resistors are specified for high quality electronic equipment. A-B trimmers give you smooth adjustment at all times with almost infinite resolutions. There are no abrupt changes in resistance to produce transients (common to wire-wound trimmers).

These rugged and compact trimmers will satisfy the most demanding requirements. Their continuous, stepless resistance control makes possible easy, accurate adjustment. Since they have low distributed capacitance, and are relatively non-inductive, regardless of resistance value, Allen-Bradley trimmers can be used in applications where the ordinary wire-wound types are entirely unsatisfactory.

TYPES F, FD, O, Y, R, and N feature Allen-Bradley's exclusive hot-molded composition technique. The resistance material, collector track, insulation and metal terminals are all molded into one integral structure. No cracks or crevices for moisture to gain admittance. The dual-section Type FD is ideally suited for Bridged-T or L-Pad attenuator applications. Linear tapers are standard; however, other tapers and special resistance values can be supplied.

TYPES S and Z are cermet trimmers, designed for severe environment applications. A-B proprietary cermets have exceptional stability in high temperature and high humidity environments. Leads are permanently anchored and bonded.

Standard options include vertical or horizontal mounting, panel mount bushing, and thumb-wheel adjustment, depending on type of trimmer.

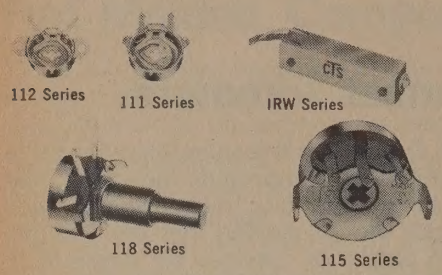
	Trimmer Type	Element and Adjustment Turns	Range and Tolerance	Power Rating	Operating Temperature Range	Voltage Rating (rms or ds)	Dimensions L H W	Terminal Types	Enclosure
	Type F	Composition Single turn	100 ohms—5 Megohms ±10% ±20%	0.25 W @ 70°C	−55°C to +120°C	350 V	1/2 Dia. x 17/32	Pin or Solder Lug	Immersion-proof
	Type FD (Dual)	Composition Single turn	100 ohms—50 Megohms ±10% ±20%	0.25 W @ 70°C	−55°C to +120°C	350 V	1/2 Dia. x 21/32 (dual section)	Front Section-Solder lug only. Rear-Pin or Lug Optional.	Immersion-proof
	Type O	Composition Single turn	100 ohms—5 Megohms ±10% ±20%	0.4 W @ 70°C	−55°C to +150°C	350 V	1/2 Dia. x 17/32	Pin or. Solder Lug	Immersion-proof
	Type Y	Composition Single turn	100 ohms—5 Megohms ±10% ±20%	0.25 W @ 50°C	−55°C to +100°C	350 V	1/2 Dia. x 23/64	Pin (Solder Lug on snap-in version only)	Dust-tight and Splash-proof
	Type R (RJ11)	Composition 25 turn	100 ohms—2.5 Megohms ±10% ±20%	0.25 W @ 70°C	−55°C to +125°C	300 V	1-1/4 x 23/64 x 1/4	Pin or Solder Lug	Immersion-proof
	Type N	Composition 25 turn	100 ohms—2.5 Megohms ±10% ±20%	0.33 W @ 50°C	−55°C to +100°C	300 V	1-1/4 x 23/64 x 1/4	Pin	Immersion-proof
	Type S	Cermet Single turn	50 ohms—1.0 Megohms ±10% ±5% (Special)	0.5 W @ 85°C	−65°C to +150°C	300 V	3/8 Dia. x 3/8	Pin	Immersion-proof
	Type Z	Cermet Single turn	50 ohms—1.0 Megohms ±10% ±20% ±5% (Special)	0.5 W @ 70°C	−55°C to +125°C	300 V	1/4 x 1/4 x 1/4	Pin	Immersion-proof

Note: Dimensions apply to versions shown. Will vary for other versions.

EC70-14 A

CTS CORPORATION ELKHART, INDIANA TRIMMERS

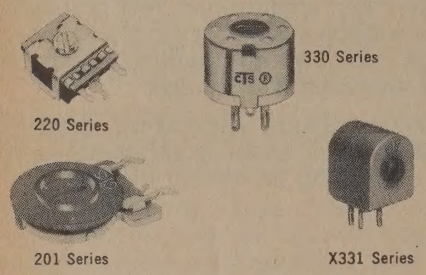
WIREWOUND



Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
110-112	1700	3/4″ Dia.	1.5-3	1/2Ω-10KΩ	(3 watts) 105°C (180°C)	Berne
115-118	1750A	3/4″ Dia.	2-3	1/2Ω-20KΩ	105°C (180°C)	Berne
IRW*	5625A	1¼″ Rectilinear	1/2	400Ω-2KΩ	150°C	Canada

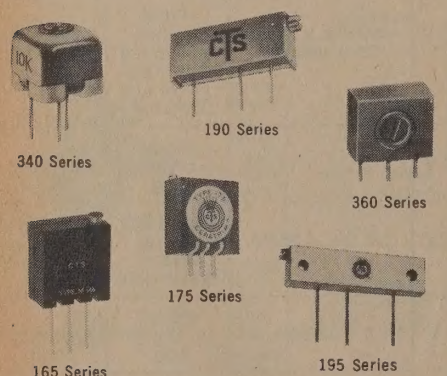
* Infinite resolution wirewound

COMPOSITION



Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
201	1201	19/32″ Dia.	1/4	100Ω-5 Meg	85°C	Elkhart
X203	1203	Side-by-Side	1/8	100Ω-5 Meg	85°C	Asheville
220	2500	7/16″ x 1/2″	1/8	100Ω-2.5 Meg	85°C	Brownsville
330, X331 (Carbon Ceramic)	2330C	1/2″ Dia.	3/8	100Ω-2.5 Meg	150°C	Keene

CERMET



Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
165*	3165B	3/8″ Square	1/2	20Ω-2 Meg	150°C	Berne
170	3170	1/2″ Square	3/4	20Ω-2 Meg	150°C	Berne
175**	3175	1/2″ Square	1/2	50Ω-1 Meg	150°C	Berne
185	3185	1¼″ Rectilinear	1	25Ω-1 Meg	175°C	Berne
B185	B3185	Bushing Mount	—	—	—	Berne
190-192	3190D	3/4″ Rectilinear	1/2	20Ω-2 Meg	150°C	Berne
195	3195A	1¼″ Rectilinear	3/4	20Ω-1 Meg.	150°C	Berne
340	3340	1/4″ Square	1/2	10Ω-1 Meg	150°C	Berne
360	3360A	7/16″ x 25/64″	1/2	20Ω-2.5 Meg	125°C	Berne
385	3385	11/32″ Dia.	1/8-1/4	20Ω-500KΩ	175°C	Berne
630	3630B	1/2″ Dia.	1/2	.0Ω-2.5 Meg	150°C	Berne
660	3660	3/8″ Dia.	1/4	100Ω-500KΩ	175°C	Berne

* Approved to MIL-R-22097 Style RJ24
** Approved to MIL-R-22097 Style RJ22

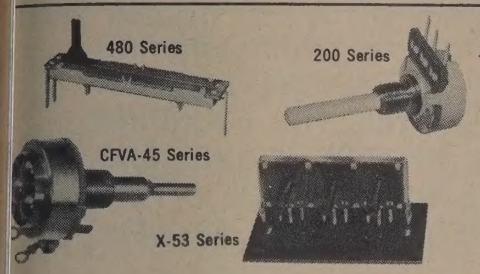
ORDERING INFORMATION: Place orders at locations shown above, using the following addresses:

CTS of Elkhart, Div., 1142 W. Beardsley Ave., Elkhart, Indiana 46514 • Telephone 219-523-0210 •TWX 810-294-2256
CTS of Asheville, Inc., Mills Gap Road, Skyland, North Carolina 28776 • Telephone 704-684-6451 • TWX 510-935-0059
CTS of Berne, Inc., 406 Parr Road, Berne, Indiana 46711 • Telephone 219-589-3111 • TWX 810-323-1580
CTS Microelectronics, Inc., P.O. Box 1278, Lafayette Indiana 47902 • Telephone 317-463-2565 • TWX 810-342-1882
CTS Keene, Inc., P.O. Box 1977, Paso Robles, Calif. 93446 • Telephone 805-238-0350

In Canada, order from:
CTS of Canada, Ltd., 80 Thomas Street, Streetsville, Ontario, Canada • Telephone 416-826-1141

CTS CORPORATION ELKHART, INDIANA POTENTIOMETERS

COMMERCIAL COMPOSITION



Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
450/45	Cat. 1001	15/16″ Dia.	1/4 to 1/2	50Ω-15 Meg	85C°	Elkhart Brownsville*
VA45	1150	15/16″ Dia.	1/4 to 1/2	100Ω-10 Meg	85°C	Brownsville
CFVA-45	1151A	15/16″ Dia.	1/4 to 1/2	100Ω-10 Meg	85°C	Brownsville
70	1100	3/4″ Dia.	.2 to .3	200Ω-7.5 Meg	85°C	Brownsville
200	1200B	5/8″ Dia.	.2 to 1/4	100Ω-5 Meg	85°C	Elkhart
2-200 & C2-200	1200B	5/8″ Dia.	.2 to 1/4	100Ω-5 Meg	85°C	Elkhart
240	1350A	5/32″ Dia.	1/20	500Ω-1 Meg	85°C	Asheville
M-250	1300	9/32″ Dia.	1/10	100Ω-1 Meg	85°C	Asheville
480	1480B	2″ Slide con.	1/4 to 1/2	100Ω-10 Meg	85°C	Elkhart
490	1490	2″ Slide con. Stereo	1/8 to 1/4 (per sect.)	100Ω-10 Meg	85°C	Elkhart
HVC	1600	2″ Dia.	2	5KΩ-50 Meg	100°C	Asheville
52-53	2700A	Side-by-Side	1/4 to 1/3	100Ω-10 Meg	85°C	Asheville

*West of Mississippi River, excluding Minnesota, and South Eastern U.S. order 45 series from CTS of Brownsville.

COMMERCIAL WIREWOUND

Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
252	1901	1 17/64″ Dia.	2	3Ω-15KΩ	85°C	Keene
2W	1800A	1 1/4″ Dia.	2	1Ω-50KΩ	100°C	Asheville
AW	2100	15/16″ Dia.	5	1Ω-25KΩ	105°C	Asheville
VA-AW	1150	15/16″ Dia.	5	1Ω-25KΩ	105°C	Asheville
CFVA-AW	1151A	15/16″ Dia.	5	1Ω-25KΩ	105°C	Asheville

MILITARY COMPOSITION

Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
65 (RV5)*	2400A	3/4″ Dia.	1/2	100Ω-2.5 Meg	150°C	Brownsville
90 (RV2)*	2300A	15/16″ Dia.	1	100Ω-2.5 Meg	150°C	Brownsville

* Approved to MIL-R-94C

MILITARY WIREWOUND

Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
25 (RA30)*	2000	1 17/32″ Dia.	4	3Ω-25KΩ	125°C	Keene
252 (RA20)*	1900	1 17/64″ Dia.	2	3Ω-15KΩ	125°C	Keene

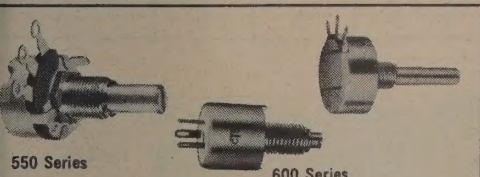
* Approved to MIL-R-19B

MILITARY AND INDUSTRIAL CARBON CERAMIC

Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
300 (RV6)*	2450	1/2″ Dia.	3/4	100Ω-2.5 Meg	150°C	Keene
320 (RV4)*	1400	1 1/16″ Dia.	3	250Ω-2.5 Meg	150°C	Keene
321	1401	1 1/16″ Dia.	3	250Ω-2.5 Meg	150°C	Keene

* Approved to MIL-R-94C

MILITARY AND INDUSTRIAL CERMET



Series	Data Sheet	Description	Wattage	Resistance Range	Max. Op. Temp.	Order From
400	3400	1 3/64″ Dia.	3	20Ω-5 Meg	175°C	Berne
500	3500	3/4″ Dia.	1 1/2	20Ω-5 Meg	175°C	Berne
550	3550A	3/4″ Dia.	2	50Ω-5 Meg	150°C	Berne
551 (RVC5)*	3550A	3/4″ Dia.	2	50Ω-5 Meg	150°C	Berne
2-550 & C2-550	3550B	3/4″ Dia.	2	50Ω-5 Meg	150°C	Berne
600 (RVC6)*	3600	1/2″ Dia.	1/2	20Ω-2.5 Meg	175°C	Berne
660	3660	3/8″ Dia.	1/4	100Ω-500KΩ	175°C	Berne

Attached power switches available in rotary, push-pull and push-push types for most CTS potentiometers. Consult us for additional information.

* Approved to MIL-R-23285B

ORDERING INFORMATION: Place orders at locations shown above, using the following addresses:

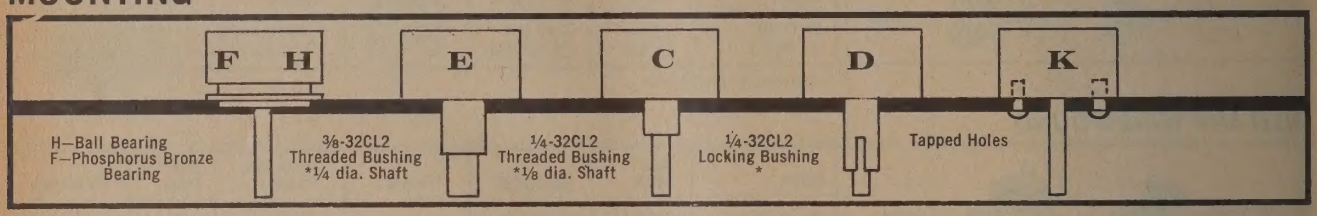
CTS of Elkhart, Div., 1142 W. Beardsley Ave., Elkhart, Indiana 46514 • Telephone 219-523-0210 • TWX 810-294-2256
CTS Keene, Inc., P.O. Box 1977, Paso Robles, Calif. 93446 • Telephone 805-238-0350
CTS of Asheville, Inc., Mills Gap Road, Skyland, North Carolina 28776 • Telephone 704-684-6451 • TWX 510-935-0059
CTS of Berne, Inc., 406 Parr Road, Berne, Indiana 46711 • Telephone 219-589-3111 • TWX 810-323-1580
CTS of Brownsville, Inc., 1100 Roosevelt Street, Brownsville, Texas 78520 • Telephone 512-546-5184 • TWX 910-870-1721
In Canada, order from:
CTS of Canada, Ltd., 80 Thomas Street, Streetsville, Ontario, Canada • Telephone 416-826-1141

CARTER
MANUFACTURING CORPORATION

CARTER MANUFACTURING CORP. IS AN ORGANIZATION OF ENGINEERS AND CRAFTSMEN SPECIALIZING IN THE UNUSUAL IN POTENTIOMETERS AND SWITCH ENGINEERING AND THEIR MANUFACTURE. SINCE THE FOUNDING IN 1955 WE HAVE DEVELOPED FULL CAPABILITY IN WIRE WOUND AND CONDUCTIVE PLASTIC POTENTIOMETERS AND WILL WELCOME THE OPPORTUNITY TO WORK WITH YOU ON YOUR UNIQUE REQUIREMENTS AS WELL AS STANDARD COMMERCIAL OR MIL TYPES.

WIRE WOUND SINGLE TURN — MIL STD.									PLASTIC HOUSING—COM.	
SIZE	½"	⅞"	1 1/16"	1 7/16"	1⅝"	1¾"	2"	3"	2"	3"
TYPE	120	118	223	157	136	160	119	236	508	511
MIL. SIZE	05	09	11	15	17	18	20	30	—	—
FUNCTION ANGLE	320°	320°	320°	320°	320°	320°	350°	350°	320°	320°
STD. LIN.	±.5%	±.4%	±.3%	±.25%	±.2 %	±.18%	±.15%	±.1%	±.25%	±.25%
SPL. LIN.	±.3%	±.25%	±.2%	±.1%	±.1%	±.09%	±.09%	±.07%	±.2%	±.2%
MAX. RES.	75KΩ	100KΩ	100KΩ	150KΩ	150KΩ	175KΩ	200KΩ	500KΩ	250KΩ	500KΩ
WATTS	2	3	3.5	4	4	4	4.5	5	3	5

MOUNTING



CONDUCTIVE PLASTIC SINGLE TURN — MIL STD.									PLASTIC HOUSING—COM.	
SIZE	½"	⅞"	1 1/16"	1 7/16"	1⅝"	1¾"	2"	3"	2"	3"
TYPE	CP120	CP118	CP223	CP157	CP136	CP160	CP119	CP236	CP508	CP511
MIL. SIZE	05	09	11	15	17	18	20	30	—	—
FUNCTION ANGLE	320°	340°	340°	345°	345°	345°	345°	345°	345°	345°
STD. LIN.	±.7%	±.5%	±.5%	±.4%	±.4%	±.35%	±.3%	±.25%	±1%	±.7%
SPL. LIN.	±.2%	±.1%	±.05%	±.04%	±.04%	±.03%	±.03%	±.01%	±.5%	±.25%
MAX. RES.	60KΩ	100KΩ	150KΩ	150KΩ	175KΩ	200KΩ	250KΩ	400KΩ	250KΩ	400KΩ
WATTS	1	1.4	1.6	2	2.2	2.6	3	5	3	5

GENERAL SPECIFICATIONS

WIRE WOUND POTENTIOMETERS	CONDUCTIVE PLASTIC POTENTIOMETERS
Resistance Tolerance ±5% Std. Spl. Avail.	Resistance Tolerance ±5% Std. Spl. Avail.
Function Angles Spl. Available.	Function Angles Spl. Available.
Rotation Continuous, Stops Available.	Rotation Continuous, Stops Available.
Taps to Single Turn of Wire With Positive Elimination of Failure.	Taps of Low Resistance or Zero Width Available.
Power Rating to Zero Watts at 150°C.	Power Rating to Zero Watts at 150°C.
Ambient Temp. −65°C to +125°C Std. to 150°C Available.	Ambient Temp. −65°C to +125°C Std. to 150°C Available.

CARTER MANUFACTURING CORP. • 23 WASHINGTON STREET • HUDSON, MASSACHUSETTS 01749 • TEL. 617 - 562-6987

CARTER
MANUFACTURING CORPORATION

WIRE WOUND MULTI-TURN POTENTIOMETERS

SIZE	½"	½"	½"		SIZE	⅞"	⅞"	⅞"	
TYPE	120-3	120-5	120-10		TYPE	118-3	118-5	118-10	
MIL SIZE	05	05	05		MIL SIZE	09	09	09	
FUNCTION ANGLE	1080°	1800°	3600°		FUNCTION ANGLE	1080°	1800°	3600°	
STD. LIN.	±.75%	±.5%	±.2%		STD. LIN.	±.15%	±.08%	±.04%	
SPL. LIN.	±.2%	±.1%	±.05%		SPL. LIN.	±.07%	±.04%	±.02%	
MAX. RES.	30KΩ	50KΩ	100KΩ		MAX. RES.	30KΩ	50KΩ	100KΩ	
WATTS	2	2	2		WATTS	3	3	3	
TAPS	AS SPEC.	AS SPEC.	AS SPEC.		TAPS	AS SPEC.	AS SPEC.	AS SPEC.	

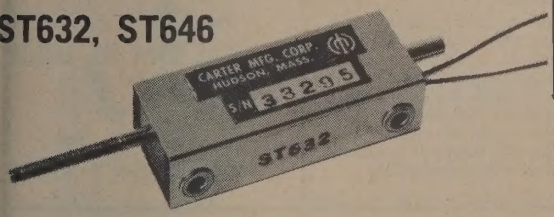
RECTILINEAR POTENTIOMETERS — WIRE OR CONDUCTIVE PLASTIC

ST476, ST510

MOUNTING —
THREADED BUSHING STD.
CLAMPS - SPECIAL

ST518

ST632, ST646

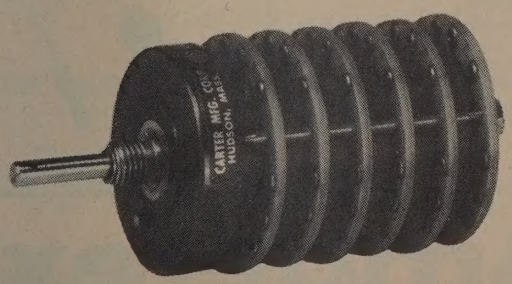


TYPE	SIZE	STROKE	RES. Ω	STD. LIN.	SPL. LIN.	ELEMENTS	WATTS 125°
ST476	½" Dia.	To 8"	100K/" Max.	2% Stroke	1% Stroke	1 or 2	1
ST510	¾" Dia.	To 12"	150K/" Max.	2% Stroke	1% Stroke	1 or 2	1.5
ST518	5/16" x ¼" x 1¼"	To ½"	75K/" Max.	2% Stroke	1% Stroke	1	.25
ST403	1¼" x 1¼"	To 36"	100K/" Max.	2% Stroke	1% Stroke	1 or 2	1
ST632	5/16" x ½"	To 4"	60K/" Max.	1% Stroke	1% Stroke	1 or 2	.25
ST646	½" x ½"	To 6"	60K/" Max.	2% Stroke	2% Stroke	1	.25

CARTER manufactures many custom variations of these rectilinear potentiometers. When requesting quotations please specify stroke, resistance, linearity, any taps, any switching, environmental requirements and quantity.

Wire wound and conductive plastic elements can also be furnished for special requirements.

SWITCHES



CARTER manufactures custom made switches in conjunction with potentiometers or as enclosed wafer types. They may be simple angle indicators or precision commutators. Such applications requiring high precision, miniaturization and sophisticated switching functions have been solved, many within the parameters of common switch approaches. CARTER's unique switch engineering has supplied the answer when the number of poles or contacts are in contradiction with the available space. When interconnections become a problem they can be greatly reduced by custom designed internal interconnections increasing reliability and improved appearance.

Amperex Resistors VARIABLE NON-LINEAR

CARBON POTENTIOMETER

Reliable trimmers, despite small size and low cost, for tube or transistorized PCs. Consist of annular carbon track riveted to base plate of resin bonded paper. Screw driver slot or plastic knob for readjustment. Available in seven mechanical types.

Dimensions

Type	Length	Width	Depth
E097	0.787	0.709	0.177
E086	0.394	0.394	0.150
	Diameter		Depth
440	.488 ± .002		.205 ± .008

Type E086: Linear Resistance Range: 100Ω to 1M ±20%: 13 ranges

Effective angle of rotation ..... 240 ±5°
Maximum permissible power dissipation (of total resistance) at an ambient temperature of 40°C 0.1W
Permissible ambient temperature range ..... −30° to +70°C

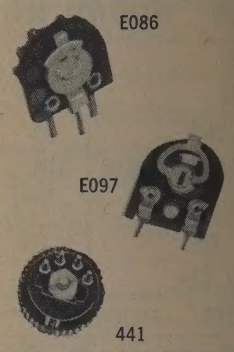
Type E097: Linear Resistance Range: 100Ω to 4.7M ±20%: 15 ranges

Effective angle of rotation ..... 220 ±5°
Maximum permissible power dissipation (of total resistance) at ambient temperature of 40°C 0.25W
Permissible ambient temperature range ..... −30° to +70°C

Type 440: Linear Resistance Range: 4700Ω, 10KΩ, 22KΩ, ±20%

Nominal resistance values 4.7K, 10K, 22K
Resistance law ..... linear and logarithmic
Working temperature range ..... −10° to +70°C
Life expectancy ..... in excess of 15,000 cycles

(Available with ON-OFF switch as Type 441)



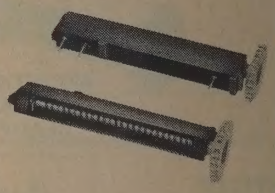
CARBON PRE-SET POTENTIOMETER

Application:
These potentiometers have been designed for pre-set resistance adjustment in capacitance diode television tuners. However, they can also be applied for capacitance diode tuning of other apparatus, e.g. radio receivers, or for any other fine resistance adjustment.

Construction:
The straight carbon track is fitted in a housing of black synthetic resin. The slider, which is connected to the centre contact, is activated by a silvered brass spindle. No damage occurs when one continues to turn the spindle after the slider has reached the extreme position. For adjustment the spindle is provided with a plastic knurled wheel.
The potentiometers are suited for mounting on printed-wiring boards.

Technical Performance

Nominal resistance values ..... 10K-25K-50K-100K others as requested
Tolerance on the nominal resistance ..... ±20%
Maximum permissible dissipation at 70°C (P_n) 0.125W
Maximum current through slider contact ..... 1 mA
Voltage range between pins 1 and 3 (or 4) at a voltage of 30 V_{dc} connected to pins 1 and 2 ..... 0.1±0.1 to 29.5+0.5 V_{dc}
Limiting voltage ..... 100 V_{rms}
Setting stability at ΔT_{amb} = 30°C and 0.1 P_n ..... ≤0.1%
Setting stability after damp-heat test (21 days, T_{amb} = 40°C, R.H. = 90—95%) and at 0.1 P_n ..... ≤0.5%
Repeatability (clockwise or counterclockwise) 0.1%
Operating-temperature range ..... —10 to +70°C
Operating torque ..... 0.5 — 1 Ncm
Number of effective operating turns 20
Life ..... max. 1000 cycles



VOLTAGE DEPENDENT

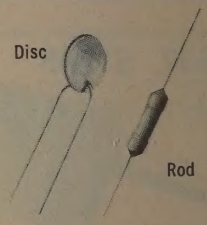
Most important property is the non-linearity between their resistance and the applied voltage. Voltage dependency is due to contact resistance between the silicon carbide crystals. Crystal contacts form a network of series and parallel resistors which determine the electrical characteristics.

Available Types

Disc types available: 0.8W to 3W
Rod types available: 0.7W

Applications

VDRs can be used in spark suppression and contact-protection applications, as well as in series with a resistor for voltage stabilization. Although the stabilizing circuit with a VDR cannot compete with more elaborate circuits, it has vital advantages of simplicity and small space adaptability.



POSITIVE TEMPERATURE COEFFICIENT THERMISTORS

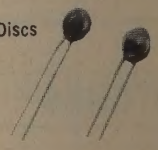
PTC Thermistors increase in resistance as the temperature increases. PTCs are disc shaped with connecting leads and are lacquer coated for protection against atmospheric influences.

Available Types

Standard Discs 1W 40 to 50V series
Standard Discs 0.5W 25V series

Applications

Resistance changes of 10%/°C or better permit the use of PTCs wherever any of the following factors are decisive: ambient temperature; dissipated power; inertia of PTC and positive temperature coefficient.



NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS

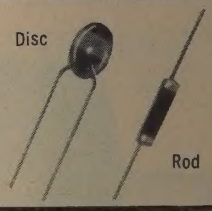
NTC thermistors are resistors which exhibit a high negative temperature coefficient of resistivity. They are made of semiconducting oxidic materials. The resistance of the oxides decreases rapidly when the temperature rises.

Available Types

Rod Type
Disc Type
Miniature Bead Type
Special Types for Automobiles
Special Types for Radio and TV

Applications

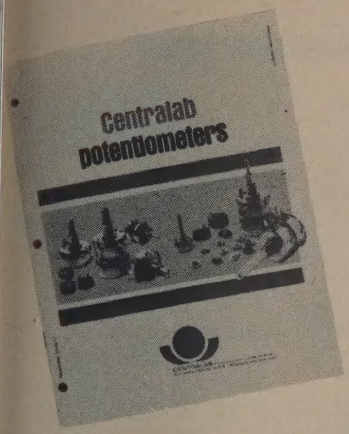
Resistance changes of 3% to 6% per °C permit the use of NTCs in applications such as: ambient temperature measurement and control; resistance determined by dissipation and time delays.



AMPEREX ELECTRONIC CORPORATION
Component Division: 35 Hoffman Ave., Hauppauge, N.Y.
Telephone: 516-234-7000 TWX 510-227-8552

Amperex®
TOMORROW'S THINKING IN TODAY'S PRODUCTS
A NORTH AMERICAN PHILIPS COMPANY

Centralab potentiometers and trimmers are available in the size, resistance wattage and styles you need!



Request your copy of this potentiometer catalog through Centralab's advertising department.

Below is a brief summary of the types listed in our sixty page potentiometer catalog. These potentiometers are in many cases available ganged and with either front or rear mounted wafer switches as well as rear mounted line switches. Special tapers for almost every application are already available.

Most of these potentiometers have dustproof construction. Equivalent noise resistance of as low as ½% of nominal maximum resistance is available.

Many models are available with numerous mountings and terminal configurations, enabling easy fitting into printed circuit boards or wired construction.

Diameter Inches	Rotation Mechanical	Resistance Range, Ohms	Tapers	Terminals	Power Rating	Application Mil.	Com'l.	Ind.
MODEL 1 MINIATURE COMPOSITION—SPST Switch Available								
5/8 without knob 45/64 with knob	260°	200—10 meg	variety	solder lug or P.C.	.2W @ 40°C		X	X
MODEL 2 COMPOSITION—Available in an almost unlimited range of mountings, terminals, shafts & line switches								
15/16	300°	200—10 meg	variety	variety of solder lugs & P.C.	.5W @ 40°C		X	X
MODEL 3 COMPOSITION								
43/64	260°	100—10 meg	variety	solder lug	.25W @ 40°C	X	X	X
43/64	260°	100—10 meg	variety	solder lug	.5W @ 70°C	X	X	X
MODEL 3W WIRE WOUND								
43/64	250°	30K—10 meg	variety	solder lug	1.5W @ 40°C		X	X
43/64	250°	30K—10 meg	variety	solder lug	2.W @ 70°C	X		X
MODEL 4 WIRE WOUND								
1-5/32	295°	1—100K	variety	solder lug	.5W @ 40°C	X	X	X
MODEL 5 COMPOSITION SINGLE OR MULTIPLE MINIATURE TRIMMERS (with integral fixed PEC® resistors & capacitors on ceramic plate optional)								
approx. 3/4" square (single unit)	290°	200—10 meg	linear	solder lug or P.C.	.25W @ 70°C	X	X	X
MODEL 6 MINIATURE COMPOSITION—SPST Switch Available								
1/2	250°	200—10 meg	variety	solder lug	.1W @ 40°C		X	X
MODEL 8 MICRO-MINIATURE COMPOSITION—SPST Switch Available								
9/32	250°	200—10 meg	variety	P.C.	.1W @ 40°C		X	
MODEL 9 MINIATURE COMPOSITION								
45/64	260°	100—10 meg	variety	solder lug or P.C.	.2W @ 40°C	X	X	X
MODEL 12 HOT MOLDED								
1-7/64	312°	10-5 meg	variety	solder lug	2.25 @ 70°C	X	X	X

FOR IMMEDIATE DELIVERY

Many types, in most popular resistance ranges, are stocked by Centralab Industrial Distributors.

CENTRALAB
Electronics Division
GLOBE-UNION INC.
5757 NORTH GREEN BAY AVENUE
MILWAUKEE, WISCONSIN 53201

Infinite Resolution PRECISION COMPONENTS

ROTARY Single-Turn POTENTIOMETERS

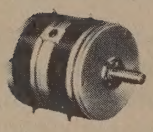
LINEAR-FUNCTIONAL/SINE-COSINE

#50

#78

#105 (Ganged)

#205



#206 (Ganged)

#175 (Ganged Special)

SPECIFICATIONS

	LINEAR	SINE-COSINE
Mechanical Rotation	360° Continuous	
Electrical Function Angle	350° Nominal	360°
Resistance Range	0.5KΩ-2 MegΩ	500Ω-50KΩ/Quad.
Best Linearity or Conformity	.1% ÷ Inch of Dia.	.3% P-P ÷ Inch of Dia.
Virtual Resolution	1/250,000	
Wattage	Diameter x 2 Watt(s)	
Temperature Range	—55°C to 150°C	
Taps, Maximum No.	Diameter x 6	
Starting Torque (In.—Oz.)	Diameter x .15	Diameter x .3
Guaranteed Life (at 100 R.P.M.)	To 30 Million Cycles Depending on Circuitry	

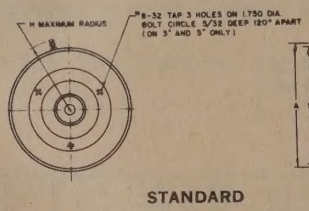
DIMENSIONS

MODEL	50 Linear	78 Linear	105 Linear 106 Sin-Cos	155 Linear 156 Sin-Cos	175 Linear 176 Sin-Cos	175S 205S 305S Linear	205 Linear 206 Sin-Cos	305 Linear 306 Sin-Cos	505 Linear 506 Sin-Cos
A	1/2	7/8	1 3/32	1 7/64	1 3/4	—	2	3	5
B*	.4375	.7500	1.0300	1.3125	1.5620	—	1.8750	2.8750	4.8750
C*	—	—	—	—	—	—	—	.7500	.7500
D*	.1250	.1250	.1250	.1250	.2500	—	.2500	.2500	.2500
E	.060	.040	.040	.062	.060	—	.060	.047	.047
F	47/64	.635	.635	.725	.985	.725 Each add'l cup adds only .200" Length	.985	1.350	1.870
H	**	19/32	11/16	29/32	1 1/32		1 5/32	1 13/64	2 13/64
K	3/8	3/8	3/8	3/8	3/8		3/8	3/8	3/8
L	5/8	3/4	3/4	3/4	3/4		3/4	3/4	3/4

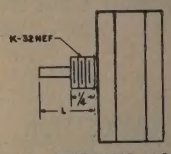
*+.0000 −.0005
**Axial Rear Terminations

Low Torque-Low Inertia Pots are Available in 1¼" O.D.

	177 Linear	178 Sin-Cos
Torque, In.-Oz.	.1	.2
Inertia, Oz.-In.²	.025	.065



STANDARD



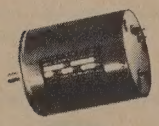
BUSHING MOUNT

ROTARY Multi-Turn POTENTIOMETERS

LINEAR-FUNCTIONAL

#5010

#7814



#20010

SPECIFICATIONS

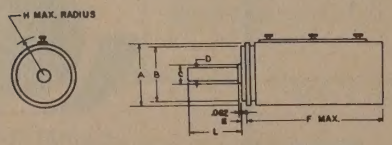
MODEL	5010	7810**	7820**	7813/7814***	20010
Mechanical Rotation	3600° +20° −0°	3700° MIN.	7200° +100° −0°	3600° +100° −0°	3600° +110° −0°
Electrical Function Angle	3600° ±10°	3600° ±10°	7200° ±10°	3600° ±5°	3600° ±5°
Resistance Range	5KΩ—500KΩ	250Ω—125KΩ		5KΩ—1.5 MegΩ	5KΩ—3 MegΩ
Best Linearity or Conformity	0.1%	.075%	.05%	0.05%	0.01%
Virtual Resolution (Typical)	1/150,000	1/200,000		1/400,000	
Wattage at 25°C	2	1		2	4
Temperature Range	—55°C to +150°C				
Taps Maximum No.*	1		2	1	
Starting Torque (In.Oz) at 25°C	0.2	1.5		0.5	1.0
Guaranteed Life (at 100 R.P.M.)	To 100 x 10⁶ Revolutions Depending on Circuitry				
Stop Strength	10 IN.-OZ. MAX.			75 IN.-OZ.	160 IN.-OZ.

*For voltage reference, specify 0° width taps. For current carrying, specify zero resistance taps.
**Available in Dual Units, same case dimensions.
***Model 7813 same as 7814 except for axial rear terminations

DIMENSIONS

MODEL	5010	7810	7820	7814	20010
A	.500	.875			2.000
B*	.4735	.750		.750	1.875
C	.188	.273		—	
D*	0.937	.1875		.1250	.250
E	.062				.035
F	1.531	1.953		1.875	2.625
H	.400	.600		.562	**
J	.250				312
K	.250	.375			
L	.625	.750		.500	.750

*+.0000 −.0005
**Axial Rear Terminations



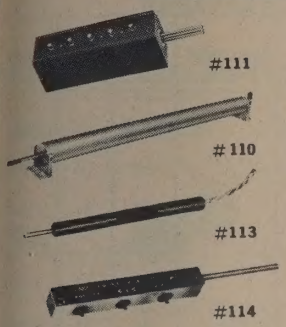
STANDARD BUSHING MOUNT

COMPUTER INSTRUMENTS CORPORATION/92 MADISON AVE., HEMPSTEAD, N.Y. 11550/516-483-8200

Infinite Resolution PRECISION COMPONENTS

LINEAR MOTION POTENTIOMETERS

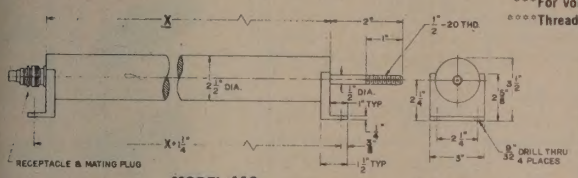
LINEAR-FUNCTIONAL



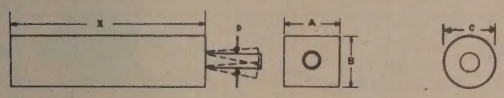
SPECIFICATIONS

MODEL	110*	111*	112	113*	114	116**	117	118**	119*
Electrical Stroke	To 60"	To 28"	To 12"	To 4"	To 1"	To 12"	To 1.5"	To 1.25"	To 10"
Cross Section Configuration	○	□	□	○	□	□	▭		○
Resistance Range	250Ω/in. to 200KΩ/in.	150Ω/in. to 200KΩ/in.		500Ω/in. to 250KΩ/in.		150Ω/in. to 125KΩ/in.	250Ω/in. to 125KΩ/in.	500Ω/in. to 250KΩ/in.	350Ω/in. to 250KΩ/in.
Best Linearity	0.2% ÷ Length of Electrical Stroke								
Virtual Resolution	1/400,000								
Wattage	1 Watt per Inch of Stroke								
Temperature Range	−55° to +150°C								
Taps Maximum No.***	4	To Suit		1		To Suit	1		
Starting Force Oz. at 25°C	16	8	4	8	4		8		
Life	30 Million Strokes, Depending on Circuitry								
Shaft Misalignment Feature	Available			Not Available		Available	Not Available	Available	

*Available in Dual Units, same case dimensions.
**Available in Dual Unit providing the resistance and function of both elements is the same.
***For voltage reference, specify zero width taps. For current carrying, specify zero resistance taps.
****Threaded, ball, spring-return and other shaft endings available.



MODEL 110



DIMENSIONS

MODEL	110*	111*	112	113*	114	116**	117	118**	119*
A	—	1.00	.500	—	.250	.500	.967	.875	—
B	—	1.00	1.10	—	.312	1.100	.635	.500	—
C	2.50	—	—	.500	—	—	—	—	.750
D	.50	.250	.187	.125	.0625	.1875	.1565	.1875	
X	Length of Mech. Travel +6"	Length of Mech. Travel +1.125"	Length of Mech. Travel +1.210"	Length of Mech. Travel +1.375"	1.75"	Length of Mech. Travel +1.210"	3.01"	2.50"	Length of Mech. Travel +2.00"

COMMUTATORS—PRECISION SWITCHES

SPECIFICATIONS

MODEL	5015	715	115	1715	215	315	515
Mechanical Rotation	360° Continuous						
Max. Number of Isolated Conductive Segments	6	8	8	20		38	62
Tolerance on Contact Spacing	2°		1½°	1°		1/2°	
Max. Number of Wipers Per Cup°	1		2		4		
Tolerance on Wiper Spacing	2°	1½°	1°		1/2°	1/4°	
Typ. Wiper Current	100 MA	250 MA					
Starting Torque (Max. In.—Oz.)°°	.05	.2		3		.5	.8
Temperature Range	−55° to +150°C						
Max. Operating Speed (R.P.M.)	1000	1000		900			500
Guaranteed Life†	To 90 x 10^6 at 1000 R.P.M.	To 30 x 10^6 Cycles at 100 R.P.M.					

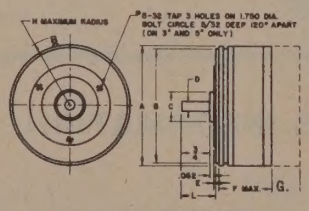
°If Wire Terminations are used; Maximum No. of Poles can be Increased by a Factor of 3.
°°Less if Required. Specify.
†Depending on Circuitry

DIMENSIONS

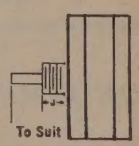
MODEL	5015	715	115	1715	215	315	515
A	1/2	7/8	1 3/32	1¾	2	3	5
B°	.437	.7500	1.0300	1.5620	1.8750	2.8750	4.8750
C°	—	—	—	—	—	.7500	.7500
D°	.125	.1250	.1250	.2500	.2500	.2500	.2500
E	.060	.040	.040	.060	.060	.060	.060
F	.640	.635	.655	.985	.985	1.050	1.050
G	—	.250	.250	.465	.465	.500	.500
H	°°	19/32	11/16	1 1/32	1 5/32	1 13/64	2 13/64
J	—	1/4	1/4	1/4	1/4	1/4	1/4
K	—	3/8	3/8	3/8	3/8	3/8	3/8

°Tolerance +.0000 −.0005
°°Axial Rear Wire Terminations

Commutators can be supplied in ganged assemblies with potentiometers.



STANDARD

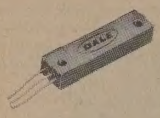


BUSHING MOUNT

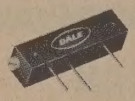
DALE® for Optimum Value in Potentiometers

INDUSTRIAL GRADE TRIMMER POTENTIOMETERS

WIREWOUND ELEMENT

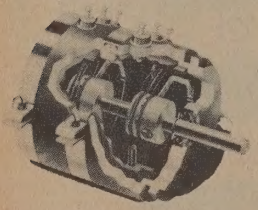
SERIES	ILLUSTRATION	MODEL	CONFIGURATION	STANDARD RESISTANCE & TOLERANCE	HUMIDITY PROOF (Mil. Spec.)	POWER RATING	OPERATING TEMP. RANGE	ADJUSTMENT TURNS	HEIGHT	WIDTH	LENGTH
100		195 193 198 199	• 28 AWG Stranded Vinyl Leads emerging separately • 28 AWG Stranded Vinyl Leads attached to Lugs • Gold-plated Printed Circuit Solder Lug • Gold-plated Solder Lug	10 ohms to 100K ohms ±5%	No	0.8 watt at 70° C, derated to 0 at 135° C	−65° C to 135° C	25 ± 2	.22 .22 .22 .22	.31 .31 .31 .31	1.32 1.25 1.25 1.25
200		295 293 298 299	• 28 AWG Stranded Vinyl Leads emerging separately • 28 AWG Stranded Vinyl Leads attached to Lugs • Gold-plated Printed Circuit Solder Lug • Gold-plated Solder Lug	10 ohms to 100K ohms ±10%	No	0.5 watt at 70° C, derated to 0 at 105° C	−65° C to 105° C	25 ± 2	.22 .22 .22 .22	.31 .31 .31 .31	1.32 1.25 1.25 1.25
300		398 399	• Gold-plated Printed Circuit Solder Lug • Gold-plated Solder Lug	10 ohms to 100K ohms ±15%	No	.25 watt at 70° C, derated to 0 at 85° C	−65° C to 85° C	25 ± 2	.22	.31	1.25
1100		1187 1188* 1199*	• Printed Circuit Pins 21 AWG • 28 AWG Stranded Teflon Leads • Spade-type Solder Lug	10 ohms to 100K ohms ±10%	No	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	25 ± 2	.28	.31	1.25
2100		2187 2188* 2199*	• Printed Circuit Pins 21 AWG • Stranded Vinyl Leads 28 AWG • Spade Type Solder Lug	10 ohms to 100K ohms ±10%	Optional	1 watt at 70° C, derated to 0 at 125° C	−65° C to 125° C	25 ± 2	.28	.31	1.25
2200		2280 2292 2297	• Printed Circuit Pins 22 AWG • 26 AWG Solid Leads • 28 AWG Stranded Vinyl Leads	10 ohms to 100K ohms ±10%	Optional	1 watt at 70° C, derated to 0 at 125° C	−65° C to 125° C	15 ± 2	.18	.32	1.00

FILM ELEMENT

8100		8187 8188* 8189*	• Printed Circuit Pins 21 AWG • Stranded Vinyl Leads 28 AWG • Gold-plated Solder Lug	10 ohms to 2 Megohms ±10% 100Ω to 500K ±20% other values	Optional	.75 watt at 70° C, derated to 0 at 125° C	−65° C to 125° C	25 ± 2	.28	.31	1.25

*Indicates model is also available in Panel Mount version.

PRECISION POTENTIOMETERS—SINGLE TURN *(Write for Catalog B)*



• Precision machined anodized aluminum cups • Molded Diallyl Phthalate liners • Welded tap and terminal construction • Precious metal wipers and slip rings • Flush clamp bands • Gold-plated terminals • Precision sleeve or ball bearings • Centerless ground stainless steel shafts • Single or ganged units.

SPECIFICATIONS:
- Meet requirements of MIL-R-12934 and NAS-710
- Eight physical sizes, 3/4" to 3" diameter
- Electrical angles and functions to specification
- Special mechanical configurations available

ORDERING INFORMATION

WHERE TO ORDER:

From your Authorized Dale Distributor, your Dale Representative, or Dale Electronics, Inc., Box 609, Columbus, Nebraska 68601—PHONE 564-3131 AREA CODE 402 TWX 402-564-2807

TERMS: 1% 10—Net 30 **F.O.B. POINT:** Columbus, Nebraska

SPECIAL CHARGES:

Minimum Order Charge $10.00
Minimum Item Charge ..... $ 7.50

DALE ELECTRONICS, INC.

1342 28th Ave., Columbus, Nebraska 68601

DALE® for Optimum Value in Potentiometers

TRIMMER QUICK REFERENCE GUIDE

- New rectilinear wirewound and film models
- New square wirewound models
- Expanded low-priced Econo-Trim series with sealability for pennies more
- Mil-style construction methods used throughout
- Panel mount models available in most series

MILITARY GRADE TRIMMER POTENTIOMETERS (High Temperature, Precision)

SERIES	ILLUSTRATION	MODEL	CONFIGURATION	STANDARD RESISTANCE & TOLERANCE	HUMIDITY PROOF (Mil. Spec.)	POWER RATING	OPERATING TEMP. RANGE	ADJUSTMENT TURNS	HEIGHT	WIDTH	LENGTH
600	Mil. Equiv. RT-10	691 680 690* 697* 692*	• Alternate position Printed Circuit Pins 22 AWG • Printed Circuit Pins 22 AWG • Hook Type Wire Solder Terminal • 28 AWG Stranded Teflon Leads • 26 AWG Solid Leads	10 ohms to 100K ohms ±5%	Yes	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	15 ± 2	.18	.32	1.00
1200	Mil. Equiv. RT-11	1287 1288* 1299*	• Printed Circuit Pins 21 AWG • Stranded Teflon Leads 28 AWG • Spade Type Solder Lug	10 ohms to 100K ohms ±5%	Yes	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	25 ± 2	.28	.31	1.25
1600	Mil. Equiv. RT-12	1680 1697* 1692* 1690*	• Printed Circuit Pins 21 AWG • Stranded Teflon Leads 28 AWG • 22 AWG Solid Wire • Solder Lug	10 ohms to 100K ohms ±5%	Yes	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	22 ± 3	.19	.32	1.25
5000	Mil. Equiv. RT-22	5050 5080 5091	• Stranded Teflon Leads 30 AWG • Printed Circuit Pins 21 AWG, Edge Mount • Printed Circuit Pins 21 AWG	10 ohms to 50K ohms ±5%	Yes	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	25 ± 2	.19 .22 .22	.50 .50 .50	.50 .50 .50
5800	Mil. Equiv. RT-24	5850 5891 5880 5887	• Stranded Teflon Leads 30 AWG • Printed Circuit Pins 22 AWG, Base Mount • Printed Circuit Pins 22 AWG, Edge Mount • Printed Circuit Pins 22 AWG Side Adjust	10 ohms to 50K ohms ±5%	Yes	1 watt at 70° C, derated to 0 at 175° C	−65° C to 175° C	25 ± 3	.145 .150 .145 .150	.375 .375 .375 .375	.375 .375 .375 .375

*Indicates model is also available in Panel Mount version.

COMMERCIAL GRADE ECONO-TRIM POTENTIOMETERS

WIREWOUND ELEMENT

SERIES	ILLUSTRATION	MODEL	CONFIGURATION	STANDARD RESISTANCE & TOLERANCE	HUMIDITY PROOF (Mil. Spec.)	POWER RATING	OPERATING TEMP. RANGE	ADJUSTMENT TURNS	HEIGHT	WIDTH	LENGTH
2300		2387 2317 2389 2319	• Unsealed } Printed Circuit Terminals, Gold Plated • Sealed } Printed Circuit Terminals, Gold Plated • Unsealed } Hook-type Solder Lugs, Gold Plated • Sealed } Hook-type Solder Lugs, Gold Plated	10 ohms to 50K ohms ±10%	Optional	0.5 watt at 25° C, derated to 0 at 105° C	−55° C to 105° C	15 turns nominal	.36	.28	1.00
2400		2487 2417	• Unsealed } Printed Circuit Terminals, Gold Plated • Sealed } Printed Circuit Terminals, Gold Plated	10 ohms to 50K ohms ±10%	Optional	1 watt at 40° C, derated to 0 at 125° C	−55° C to 125° C	20 turns nominal	.31	.16	.75

FILM ELEMENT

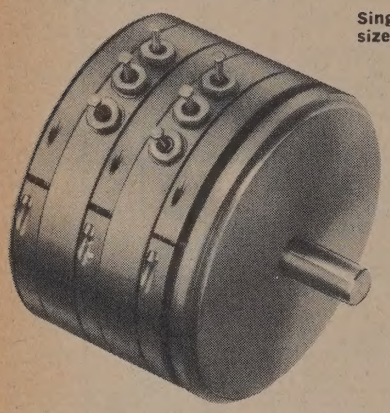
SERIES	ILLUSTRATION	MODEL	CONFIGURATION	STANDARD RESISTANCE & TOLERANCE	HUMIDITY PROOF (Mil. Spec.)	POWER RATING	OPERATING TEMP. RANGE	ADJUSTMENT TURNS	HEIGHT	WIDTH	LENGTH
8300		8387 8317 8389 8319	• Unsealed } Printed Circuit Terminals Gold Plated • Sealed } Printed Circuit Terminals Gold Plated • Unsealed } Hook-type Solder Lugs, Gold Plated • Sealed } Hook-type Solder Lugs, Gold Plated	10 ohms to 2 Megohms ±10% 100Ω thru 500K ±20% all other values	Optional	.75 watt at 25° C, derated to 0 at 105° C	−55° C to 105° C	15 turns nominal	.36	.28	1.00
8400		8487 8417	• Unsealed } Printed Circuit Terminals Gold Plated • Sealed } Printed Circuit Terminals Gold Plated	10 ohms to 2 Megohms ±10% 100Ω thru 500K ±20% all other values	Optional	.75 watt at 25° C, derated to 0 at 125° C	−55° C to 125° C	20 turns nominal	.31	.16	.75

Digilog
PRECISION POTENTIOMETERS

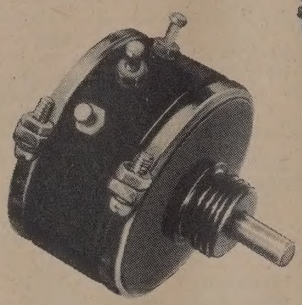
A product family in which Digilog can quickly meet your needs for

- NON-LINEAR FUNCTIONS
- SPECIAL CONFIGURATIONS
- APPLICATION ENGINEERING KNOW-HOW

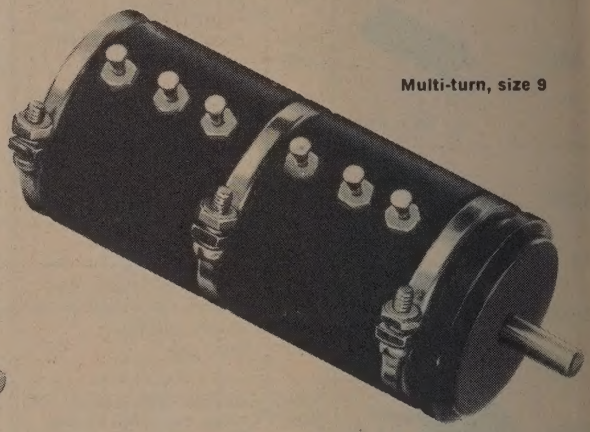
Need custom winding or non-standard configurations? Do you have problems with "dry circuit" noise, high wiper currents, special temperature or radiation environments? Digilog has both know-how and facilities to come up with the solutions — fast.



Single turn sizes 14-30



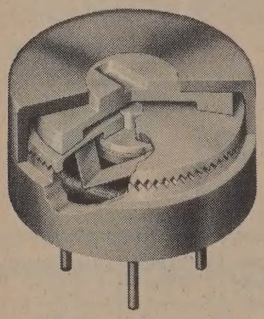
Single turn, sizes 8-11



Multi-turn, size 9

Shaft diameters, ⅛" and ¼"
Servo, bushing and screw mounting types
Power ratings, 1.5 to 7.5 watts
Temp. range, −55°C to +125°C

Temp. coefficient of resistance, +50 PPM/°C nominal
Stnd. resistance tolerance, ± 3%
All models comply with applicable paragraphs of MIL-R-12934
For special requirements, submit drawings and specs or request application data sheet



"DIFFERATIO" MODELS
Wirewound and metal film

Models 20 & 21 — ½"

Models 30 & 31 — ⅓"

Models 40 & 41 — ⅓"

"MECHATRIM" MODELS
Metal Film

Model 51

Model 61

Model 81

Model 91

DIGILOG TRIMMING POTENTIOMETERS

• Single and multiple turn • Wirewound and metal film • Exclusive "differatio" models with 20-turn electrical and mechanical travel

TRIMMING POTENTIOMETERS

MODEL	STYLE	Element Type	Resistance Range (ohms)	Dimensions (Inches) W L H	Electrical & Mechanical Travel	Power Rating (Watts)
20	Round, Top Adj. P.C. Pins	Wirewound	100-20,000	0.500 dia.x0.250	20 Turns Stops & Clutch	1.0
21	Round, Top Adj. P.C. Pins	Metal Film	500-25,000	0.500 dia. x0.250	20 Turns Stops & Clutch	1.0
30	Round, Top Adj. P.C. Pins	Wirewound	50-20,000	0.312 dia.x0.180	20 Turns Stops & Clutch	0.5
31	Round, Top Adj. P.C. Pins	Metal Film	100-10,000	0.312 dia.x0.180	20 Turns Stops & Clutch	0.5
40	Side Adjust P.C. Pins	Wirewound	50-20,000	0.250x0.312x0.375	20 Turns Stops & Clutch	0.5
41	Side Adjust P.C. Pins	Metal Film	100-10,000	0.250x0.312x0.375	20 Turns Stops & Clutch	0.5
*51	Round, Top Adj. P.C. Pins	Metal Film	100-10,000	0.280 dia.x0.250	300° Stops	0.5
*61	Side Adjust P.C. Pins	Metal Film	100-10,000	0.312x0.312x0.360	300° Stops	0.5
*81	Square P.C. Pins	Metal Film	200-25,000	0.500x0.500x0.235	40 Turns Continuous	1.0
*91	Square Flex. Leads	Metal Film	200-25,000	0.500x0.500x0.190	40 Turns Continuous	1.0

Temperature Range: —55°C to +175°C; **Standard Resistance Tolerance:** Wirewound elements ±5%; Metal-film elements ±20%; **Temperature Coefficient of Resistance:** +30 PPM/°C Nominal.

Digilog Electronics Corporation Trimming Potentiometers comply with the applicable paragraphs of MIL-R-22097 and MIL-R-27208.

* Models 51 and 61 are the MECHATRIM® HT-250-2 and HT-250-4 and Models 81 and 91 are the MECHATRIM® HT-500-2 and HT-500-1 formerly manufactured by the Mechatrol Division of Servomechanisms, Inc., and by Teledyne Precision, Inc.

digilog electronics corp.
13253 NORTHRUP WAY • BELLEVUE, WASHINGTON 98004
PHONE: (206) 746-4836 • TWX 910-443-2467

LECTRIM™ CERMET TRIMMING POTENTIOMETERS

ELECTRA/MIDLAND's new precision cermet materials have been combined with some innovative design to create this growing line of tiny, tough, infinite-resolution trimmers. Many units are now on the QPL list, and many are available with the patented pressed-in-shaft construction (ask your E/M rep about this!).

Actual Size	Type Number	Resistance Range	Terminal Types Available	TR Tolerance	Operating Temp. Range	T.C. PPM/°C	Power Rating	Seal
¼" SQUARE	Hi-Performance RJ26	10 Ohms to 2 Megohms	P,W,X	±10%	−65° to +150°C	±100 100 Ohms-500K Ohms	.25 Watt at 85°C	Immersion in 85°C water
	Mil-R-22097D Char. "C" RJ26	100 Ohms to 1 Megohm	P,W,X	±10%	−55° to +150°C	±250	.25 Watt at 85°C	Immersion in 85°C water
¼" ROUND SINGLE-TURN	Industrial ET50P, W	50 Ohms to 2 Megohms	PC Pins	±20%	−55° to +150°C	±100	.5 Watt at 85°C	Immersion in 65°C water
	Side Adjust ET50X	50 Ohms to 2 Megohms	PC Pins	±20%	−55° to +150°C	±100	.5 Watt at 85°C	Immersion in 65°C water
⅜" SQUARE	Hi-Performance RJ24	10 Ohms to 2 Megohms	L,P,W,X	±10%	−65° to +150°C	±100 200 Ohms to 1 Meg	.5 Watt at 85°C	Immersion in 85°C water
	Mil-R-22097D Char. "C" RJ24	100 Ohms to 1 Megohm	P,W,X	±10%	−55° to +150°C	±250	.5 Watt at 85°C	Immersion in 85°C water
	Industrial ET 24	50 Ohms to 2 Megohms	L,P,W,X	±20%	−55° to +150°C	±150	.5 Watt at 85°C	Immersion in 65°C water
¼" RECTANGULAR	Industrial ET34P	10 Ohms to 2 Megohms	PC Pins	±20%	−55° to +150°C	±150	.5 Watt at 85°C	Immersion in 65°C water
	RJ11 Pin-spaced ET34X	10 Ohms to 2 Megohms	RJ11 spaced PC Pins	±20%	−55° to +150°C	±150	.5 Watt at 85°C	Immersion in 65°C water

—total resistance
—printed circuit

MIL-R-22097D—non wirewound trimmer mil spec.
TC—temperature coefficient

PPM/°C—parts per million per degrees centigrade

CERMETRIK THICK FILM RESISTOR NETWORKS (DUAL-IN-LINE PACKAGE)

ELECTRA/MIDLAND cermet is used in making thick film networks. Passivation is accomplished by screening with a glass material. Electra technology offers the advantage that substrate, cermet, and passivation materials have almost identical expansion coefficient, hence networks can be provided with superior TC or R characteristics.

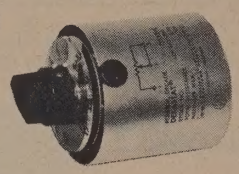
1. Resistance Range . . . . . 10 ohms to 1.5 megohm
2. Resistance Tolerance . . . . . ±1% to ±10%
3. Number per Network . . . . . Up to 13 depending upon circuit.
4. Absolute TC of R . . . . . ±100 PPM/°C, −55°C to 125°C
5. Tracking TC of R . . . . . ±25 PPM/°C, resistors with 20:1 R ratio within a package.
6. Matching of Resistance . . . . To ±.1%
7. Package . . . . . 14 Pin DIP Ceramic, Epoxy Sealed, 1 watt @ 70°C.
   14 Pin DIP Plastic, ½ watt @ 70°C.

ELECTRA/MIDLAND CORPORATION
CERMETRIK DIVISION • 3347 Industrial Ct. • San Diego, California 92121 • (714) 453-0353
A TRANSITRON COMPANY

e|s|i® precision decades and components

Electro Scientific Industries makes available panel mount decades, dividers and individual resistors that provide the nucleus components for all our precision measurement and calibration equipment (see Section 2900). The patented Dekadial® stacked decades save panel space at 0.02% accuracy in the decades, 20 ppm for the dividers. Solid silver-alloy switches are used throughout, plus silicone-treated ceramic switch wafers. The wire-wound resistors are produced by a proprietary winding aging process for highest precision and stability.

Resistive Decades



DS 12 Individual Decade Resistor

Nine different total resistances available for DC and audio frequency applications. Can be used as a divider by cutting jumper.

Dekastats®

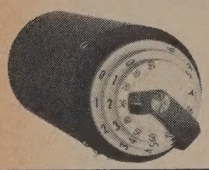
DS 1365 Precision Dekastat

Three coaxial decades available in four different total resistances.

MODEL	DESCRIPTION	PER STEP	TOTAL RESISTANCE	NOMINAL ACCURACY	PRICE
DS 12	Single 10-step resistance decades	0.01 Ω—1 MΩ	0.1 Ω—10 MΩ	0.02%	$25.—$110.
DS 1265	Decade resistor, coaxial 2 decades plus rheostat	0.1, 1, 10 Ω/dial div.	1.2, 12 kΩ	0.02%	95.
			120 kΩ*	0.02%	115.
DS 1365	Decade resistor, coaxial, 3 decades	1, 10, 100 Ω	1.2, 12, 120 kΩ	0.02%	95.
		0.01 Ω	120 Ω*	0.02%	120.
DS 1463	4 dial coaxial, 3 decades plus rheostat	0.1, 1 Ω/dial div.	12, 120 kΩ	0.02%	110.
DS 1464	Decade resistor—4 decade coaxial	0.1, 1 Ω	1.2, 12 kΩ	0.02%	115.
		10 Ω	120 kΩ	0.02%	125.
		0.01 Ω, 100 Ω	120 Ω, 1.2 MΩ*	0.02%	150.

*Special order

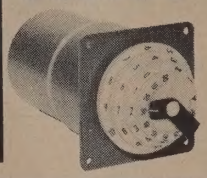
Dekapot® Dividers



DP 1311 Decade Potentiometer

Kelvin-Varley linearity is guaranteed 20 ppm stable/yr. Three decades plus 100-division potentiometer gives resolution of 0.0003%. Three different values available.

Dekatrans®



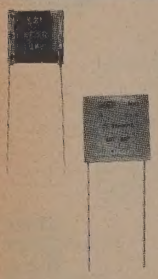
DT 1145 Miniature Decade Ratio Transformer

Dekatrans are inductive voltage dividers for use at audio frequencies. High input impedance, low output, and low phase shift make it ideal for testing voltage and current division, turns-ratio measurement, divider calibration and impedance comparison.

MODEL	DESCRIPTION	VALUE OR RATIO	LINEARITY	PRICE
*DV 411	Resistive divider, adjustable base, 3 decades plus pot	1 kΩ	20 ppm	$240.
		10, 100 kΩ	20 ppm	195.
DP 1211	Panel-mounting—coaxial dial decade potentiometer (Kelvin-Varley); 2 decades plus pot	1, 10 kΩ	20 ppm	100.
		100 kΩ*	20 ppm	115.
		1 k to 100 kΩ*	20 ppm	150.
DP 1311	Decade potentiometer—3 decades plus pot	1, 10, 100 kΩ	20 ppm	150.
		1 kΩ to 100 kΩ	20 ppm	180.
DT 1135	Panel mounting ratio transformer—2 decades plus pot	1.1105	100 ppm	190.
DT 1145	Panel mounting ratio transformer—3 decades plus pot	1.11100	10 ppm	260.

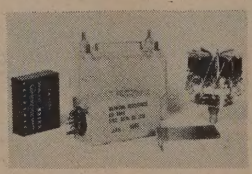
*Special order

Precision Wirewound Resistors and Resistor Networks



Wirewound Resistors

A special ageing process ensures stability to 0.005% standard, or 0.001% on the best available. Standard accuracy is 0.01%, but 0.0015% is available. Changes in environment have little affect and ac residuals are low. Come in open frames (RF), encased in daillyl phthalate (RC) or hermetically sealed cases (RH).



Custom Resistor Networks

Ideal for solving problems in ratio, temperature coefficient matching and special packaging. Economical and backed by 2-year warranty. Packaging available in variety of configurations, from low cost terminal boards to MIL-approved, hermetically sealed units. Ratios of 1:1 matched to 0.0002%; temperature coefficients matched to 1 ppm/°.

See ESI's Instruments and Standards in Section #2900

e|s|i, Electro Scientific Industries, 13900 N.W. Science Park Drive, Portland, Oregon 97229

PRECISION CONDUCTIVE PLASTIC POTENTIOMETERS

INFINITE RESOLUTION—LOW NOISE—CO-MOLDED ELEMENTS—LONG LIFE—CONFORMS TO MIL-R-39023

rical		751P	752P	749P	757P	754P	743P
Diameter		.875	1.062	1.438	1.750	2.000	3.000
stance Range (Ohms)		250 - 100K	250 - 150K	250 - 150K	500 - 200K	500 - 200K	500 - 300K
stance Tolerance	Standard	±10%	±10%	±10%	±10%	±10%	±10%
	Special	±5%	±5%	±5%	±5%	±5%	±5%
er Dissipation for Standard sistance Values @ 85°C		1.3 Watts Derated to 0 at 150°C	1.5 Watts Derated to 0 at 150°C	1.8 Watts Derated to 0 at 150°C	2 Watts Derated to 0 at 150°C	2.2 Watts Derated to 0 at 150°C	2.5 Watts Derated to 0 at 150°C
pendent Linearity	Standard	±0.5%	±0.5%	±0.40%	±0.35%	±0.3%	±0.25%
	Special	±0.20%	±0.15%	±0.10%	±0.10%	±0.1%	±0.05%
trical Angle—Nom.		342°	350°	351°	352°	353°	355°

PRECISION WIREWOUND POTENTIOMETERS

HIGH RESOLUTION—LOW NOISE—HIGH FUNCTIONAL ACCURACY
CUSTOM ENGINEERED—CONFORMS TO MIL-R-12934F

		977	751	752	741	749	757	754	743
y Diameter		.750	.875	1.062	1.125	1.438	1.750	2.000	3.000
stance Range (Ohms) ±5%		1K to 50K	200 to 100K	300 to 150K	300 to 150K	600 to 250K	1 to 300K	800 to 350K	1K to 340K
olution lies to Maximum trical Angle Only)	Up to 1K	0.36 to 0.14%	0.3 to 0.19%	0.3 to 0.2%	0.2 to 0.17%	0.28 to 0.17%	0.28 to 0.14%	0.28 to 0.12%	0.15 to 0.09%
	1K to 25K	0.14 to 0.073%	0.19 to 0.092%	0.2 to 0.09%	0.17 to 0.075%	0.17 to 0.05%	0.15 to 0.054%	0.12 to 0.061%	0.09 to 0.048%
	25K to 100K		0.092 to 0.06%	0.09 to 0.06%	0.075 to 0.045%	0.05 to 0.04%	0.054 to 0.035%	0.061 to 0.035%	0.048 to 0.03%
	Over 100K			0.06 to 0.05%	0.045 to 0.033%	0.04 to 0.035%	0.035 to 0.028%	0.035 to 0.027%	0.03 to 0.02%
arity Tolerance pendent	Standard	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.25%	±0.25%	±0.25%
	Special	±0.15%	±0.15%	±0.15%	±0.15%	±0.15%	±0.15%	±0.10%	±0.075%
ctive Electrical Angle		350° NOM	350° NOM	350° NOM	350° NOM	350° NOM	350° NOM	350° NOM	350° NOM
er Rating ts/CUP	Single—CUP STD @ 40°C/H. Temp. @ 85°C	1.5/1.5	2/2	2/2	2/2	4/4	6/6	8/8	6
	Multi—CUP STD @ 40°C/H. Temp. @ 85°C	1/1	1/1	1/1	1/1	2/2	3/3	4/4	5
nber of Additional Taps Available		Up to 8	Up to 10	Up to 13	Up to 13	Up to 16	Up to 24	Up to 23	Up to 27

S Cosine, Log and Empirical Functions in Both Conductive Plastic and Wirewound Precision Potentiometers Available.

PRECISION WIREWOUND MULTI-TURNS

	Resistance Range	Independent Linearity	Resolution	Electrical Angle
PE 990 7/8"	100 to 200K ±2%	Standard 0.1% Special 0.05%	0.05% to 0.01%	Standard 3600 $^{+4°}_{-0°}$

ilable in Loaded Linear and Non-Linear Functions.

Note: Greater angles, resistance ranges and tighter tolerances in both Wirewound and Conductive Plastic potentiometers available on special order. Complete specifications available, write or call for information.

FAIRCHILD CONTROLS ALSO MANUFACTURES PRESSURE TRANSDUCERS, PRESSURE SWITCHES, LEVEL CONTROLS, OPERATIONAL AMPLIFIERS, SIGNAL CONDITIONING EQUIPMENT.

FAIRCHILD

CONTROLS

A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
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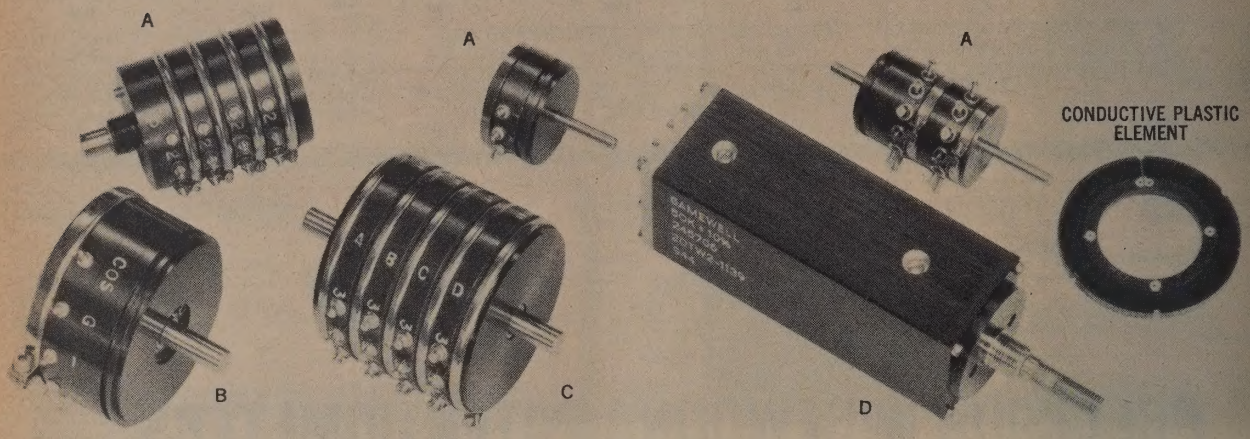
GAMEWELL® PRECISION POTENTIOMETERS



Custom-engineered conductive plastic and wire wound types

Highest standard of performance for your most demanding applications. Tough, dependable, remarkably precise. Specify exactly what you want. In most cases, precision pots actually cost less than so-called "off the shelf" economy pots. Or order elements only. For complete data, write Eagle Signal, 925 Lake Street, Baraboo, Wisconsin 53913.

CONDUCTIVE PLASTIC OR WIRE WOUND ELEMENTS, SINGLE TURN METAL CASED MODELS, LINEAR—NON-LINEAR

A

MODEL WW		8WB	8W	10WB	12W	14WB	14W	17W	18W	21W	23W	26W	28W	32W	48W	32MP+
MODEL CP		—	8C	—	—	—	14C	17C	—	21C	23C	26C	28C	32C	48C	—
Size		½	½	⅝	¾	—	⅞	1 1/16	1⅛	1 5/16	1 7/16	1⅝	1¾	2	3	2
Resistance Range	WW	50-55K	50-55K	50-40K	100-50K	⅞	100-100K	125-120K	140-140K	150-145K	200-155K	200-175K	250-200K	300-225K	500-260K	100-475K
Ohms Std.	CP	—	500-20K	—	—	50-95K	500-20K	1K-20K	—	1K-20K	1K-25K	1K-30K	1K-40K	1K-50K	5K-100K	—
Linearity Std. Ind.	WW	3.0	1.0	1.0	1.0	—	0.5	0.5	0.5	0.25	0.25	0.2	0.2	0.15	0.1	0.3
±%	CP	—	1.0	—	—	1.0	0.5	0.5	—	0.25	0.25	0.2	0.2	0.15	0.1	—

SINE COSINE AND SPECIAL PHASE-SHIFT POTENTIOMETERS

B

MODEL WW			17SC		18SC		32SC	30X5	48SC	RL11	RL14
PHASE-SHIFT				17SC-2BR		28SC-2BR					
Size			1 1/16	1 1/16	1⅛	1¾	2	1⅞	3	2 5/16	4⅜
Resistance Range			18K±5%	14.4K±1%	300-20K ±5% Per. Quad.	16K±5%	500-60K ±5% Per. Quad.	2K-80K	1K-80K ±5% Per. Quad.	16K±5%	34.4K±1%
Ohms Std.											
Conformity	Angular		±1.0°	±1.0°	—	±0.6°	—	±0.7°	—	±0.6°	±0.5°
	Amplitude	WW	±0.75%	±1.0%	±1.0%	±0.4%	±0.5%	—	±0.3%	±0.4%	±0.3%
	Peak-Peak		P-P	—	P-P	P-P	P-P	—	P-P	P-P	P-P
	Amplitude	CP	±0.5%	—	±0.5%	—	±0.25%	—	±0.2%	—	—
	Peak-Peak		P-P	—	P-P	—	P-P	—	P-P	—	

WIRE WOUND, SINGLE TURN PLASTIC-CASED LINEAR MODELS

C

MODEL	20A or B	26A or B	32A or B	48A or B	80A or B
Size	1¼	1⅝	2	3	5
Resistive Range	175-150K	150-110K	100-75K	300-260K	500-600K
Lin. Std. ±%	0.25	0.2	0.15	0.1	0.07

A—Phaseable B—Non-phaseable

CONDUCTIVE PLASTIC OR WIRE WOUND PRECISION 1 OR 2 ELEMENTED TRANSLATORY POTENTIOMETERS

D

MODEL		08TC, 08TW	12TC, 12TW	16TC, 16TW	20TC, 20TW
Size		½ Dia.	¾ Dia.	1 Dia.	1¼ Square
Resistance/inch Stroke		100-20K	100-30K	100-40K	100-40K
Lin. Std. Ind.	Up to 6"	±0.5	±0.5	±0.5	±0.5
	6" and up	±0.25	±0.25	±0.25	±0.25

MP —Modular type precision potentiometers.
WB —Single turn precision wire wound metal-cased trimmer potentiometers.
W —Single turn precision wire wound metal-cased potentiometers.
C —Single turn precision conductive plastic metal-cased potentiometers.
SC —Single turn precision wire wound Sine-Cosine potentiometers.
WW —Wire Wound **TW** —Wire Wound
CP —Conductive Plastic **TC** —Conductive Plastic

NOTE: Precision units are usually supplied with servo mounting flanges. Bushing or 3-hole mountings are available when specified.
All except RL models and the "A" plastic-cased models may be ganged.

Eagle Signal
a systems division of
GULF + WESTERN INDUSTRIES, INC

925 Lake Street
Baraboo, Wisc. 53913

MARKITE®

The Originator of PRECISION . . .

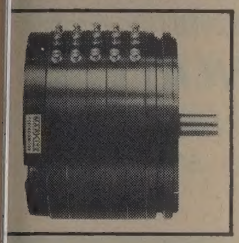
. . Conductive Plastic POTENTIOMETERS

PRODUCT CONCEPTS

LIMLINE(TM)

recision Conductive Plastic Potentiometers

arkite's precision engineering and rigid manufacturing ontrols has achieved unusually high performance, reliability

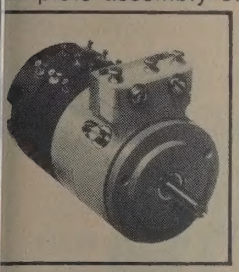


and design latitude in the development of Slimline (TM) conductive plastics potentiometers. The Slimline series is available from 1-1/16″ dia. to 3″ dia. in standard servo mounts. Each additional cup adds only 2/10″ in depth. Complete mechanical and electrical specifications are available on request.

ROTALIGN(TM)

nitized Rotary Controls

arkite's new concept offers systems manufacturers a omplete assembly of one or more precision plastic poten-

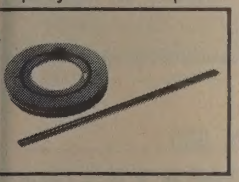


tiometers mated with other rotary components on a common shaft. Conventionally, the assembly of these components into one system required the manufacturer to mount each component individually, with frequent loss of accuracy, misalignment or coupling errors, now eliminated by Markite's unitized system.

LASTIC STRIPS AND DRUMS

ngineered for Precision Performance

arkite's conductive plastic strips and drums are currently mployed as replacements for slide-wires in industrial re-

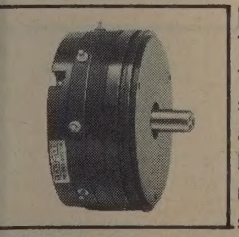


corders and controllers, as well as axis positioning on machine tools and other industrial equipment such as x-ray machines. Markite conductive plastic is especially adaptable in applications requiring consistent low noise.

SINE-COSINE POTENTIOMETERS

limline Rotary Precision

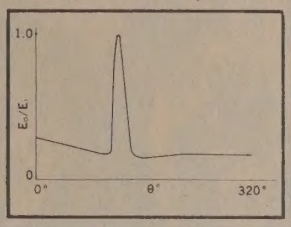
arkite's rotary sine-cosine precision potentiometers are more precise, predictable in system use, over a much longer

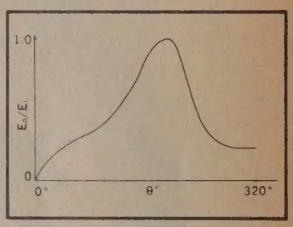


life than conventional potentiometers. They are especially useful in applications requiring consistently low noise, such as in read-out display devices and analog computers. Because they utilize Markite's space-saving Slimline (TM) multi-cup units can be used where space is at a premium.

PERFORMANCE FEATURES

- **Infinite resolution.**
- **Multi-million Cycle system life.**
- **Rugged one-piece molded element.**
- **Eliminates possibilities of opens and shorts.**
- **Standard accuracy ± 0.5%. Special accuracy to ± 0.01%.**
- **No wiper bounce in extreme environment.**
- **Consistent, uniform low noise through system life.**
- **Insignificant quadrature effect.**
- **Prototype performance assured by precision manufacture.**
- **Non linear outputs.**





THE MARKITE LINE

Markite—originator of conductive plastics—offers the industry's most comprehensive line of single and multi-cup rotary and rectilinear conductive plastic precision potentiometers with linear or non-linear outputs.

Requirements for unusual electrical and mechanical characteristics for aerospace, high temperature, underwater or other critical military and industrial applications are readily met.

Single-Turn Rotary Conductive Plastic Precision Potentiometers

- from ½″ through 5″
- standard series (rear or side terminals) or space-saving Slimline series (side terminals)
- servo, panel or special mounts
- special cables or connectors as required
- ganging of almost any number of cups to a common shaft
- single or double shaft extensions

Rectilinear (Translatory) Conductive Plastic Precision Potentiometers

- 1″ through 10″ stroke; longer lengths available
- circular or rectangular cross-sections
- single or multiple resistance elements
- special cables or connectors as required

Conductive Plastic Precision Resistance Elements

- side-wire strips, drums, and sector elements of infinite resolution. Markite conductive plastic assures greater design flexibility, multi-million cycle life.
- strips available up to 72″, flat or manufactured as o.d. of round drum; other configurations to meet customer requirements.

MARKITE

For complete specifications contact: MARKITE CORPORATION

155 Waverly Place, New York, N.Y. 10014
Phone (212) ORegon 5-1384 TWX: 710-581-3673

MEMCOR COMPONENTS

A PRODUCT OF
LTV ELECTROSYSTEMS, INC.
MEMCOR DIVISION
HUNTINGTON, INDIANA 46750

POWER RHEOSTATS

TYPE 12 1/2
12½ WATT
1-5000 OHMS
7/8" DIAM.-.035 LBS.

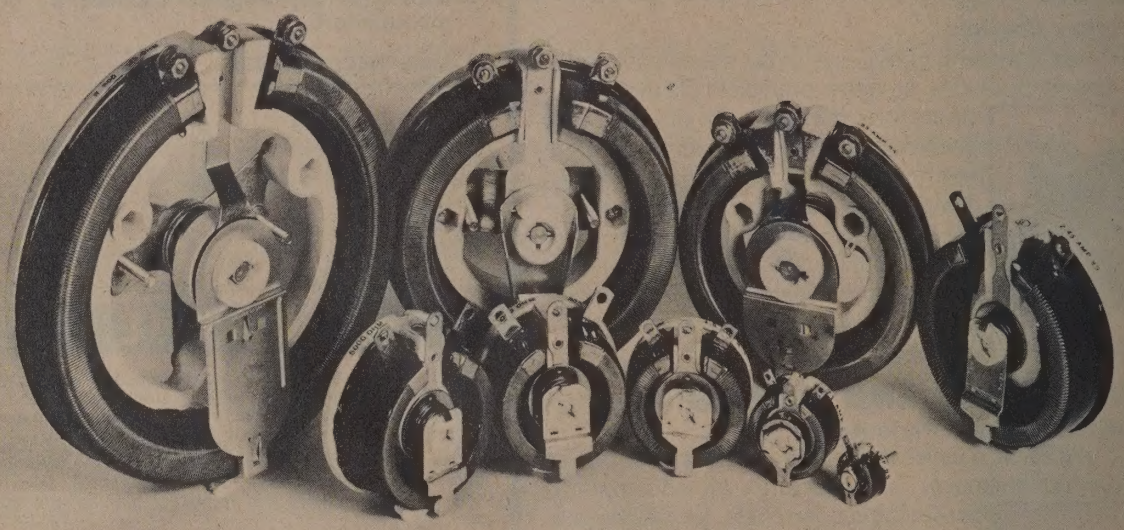
TYPE 25
25 WATT
1-5000 OHMS
1 9/16" DIAM.-0.23 LBS.

TYPE 50
50 WATT
0.5-10,000 OHMS
2 15/16" DIAM.-0.45 LBS.

TYPE 75
75 WATT
0.5-10,000 OHMS
2 3/4" DIAM.-0.60 LBS.

TYPE 100
100 WATT
0.5-10,000 OHMS
3 1/8" SIAM.-0.72 LBS.

TYPE 150
150 WATT
0.5-10,000 OHMS
4" DIAM.-1.50 LBS.



TYPE 225
225 WATT
1-2500 OHMS
5" DIAM.-2.18 LBS.

TYPE 300
300 WATT
1-2500 OHMS
6" DIAM.-3.0 LBS.

TYPE 500
500 WATT
1-2500 OHMS
8" DIAM.-3.75 LBS.

TYPE 750
750 WATT
1-2500 OHMS
10" DIAM.-7.31 LBS.

TYPE 1000
1000 WATT
1-2000 OHMS
12" DIAM.-10.0 LBS.

SPECIAL RHEOSTATS WITH TAPERED SECTIONS, LOCKING DEVICES, OFF POSITIONS, TANDEM MOUNTINGS, SPECIAL SHAFTS ON BUSHINGS, AND MANY OTHER VARIATIONS CAN BE SUPPLIED

CUSTOM DIVISION

new england instrument company

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SINGLE-TURN CONDUCTIVE PLASTIC AND WIREWOUND PRECISION POTENTIOMETERS

- AVAILABLE WITH LINEAR OR NONLINEAR FUNCTIONS
- AVAILABLE WITH MULTIPLE TAPS
- AVAILABLE IN SINGLE OR MULTI-CUP CONFIGURATIONS
- AVAILABLE IN SERVO OR BUSHING MOUNTS
- AVAILABLE WITH OTHER COMPONENTS DESIGNED-IN (SPRING-RETURNS, STOPS, SWITCHES, MOTORS, ETC.

RELATIVE MERITS OF CONDUCTIVE PLASTIC VS. WIREWOUND

The major advantages of conductive plastic potentiometers over wirewounds are infinite resolution and longer life. In most other respects, the two types are comparable. NEI has made it a strong point over the years to maintain **balanced** capability in conductive plastic and wirewound potentiometers. Each has its advantages in given applications, and NEI is the **only** company that can objectively recommend and supply **either** type.

GENERAL SPECIFICATIONS — CONDUCTIVE PLASTIC

Resistance Tolerance
Standard: ±10%

Ambient Temperature Range
Standard: −55°C to +150°C

Bearings
Stainless steel ball bearings are standard.

Mechanical Rotation
Normally continuous; however, stops are available.

Electrical Function Angle
Standard: 340° ±5°

Travel Resolution
Essentially infinite

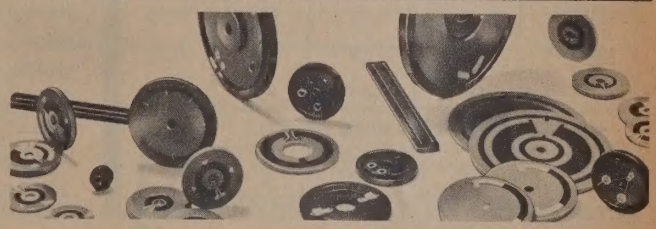
Life
50 million revolutions

SERIES	DIAMETER	NOMINAL RESISTANCE RANGE	NOMINAL POWER RATING	MAXIMUM STARTING TORQUE	NOMINAL ACCURACY
55 FT	½″	1K to 10K	0.5 W @ 25°C	0.35 oz-in	±1.0%
34 FT	¾″	1K to 20K	1.0 W @ 25°C	0.35 oz-in	±0.75%
78 FT	⅞″	1K to 25K	1.0 W @ 25°C	0.35 oz-in	±0.75%
116 FT	1 1/16″	1K to 50K	1.0 W @ 25°C	0.35 oz-in	±0.5%
176 FT	1 7/16″	1K to 75K	1.5 W @ 25°C	0.50 oz-in	±0.5%
158 FT	1⅝″	1K to 75K	2.0 W @ 25°C	0.50 oz-in	±0.5%
200 FT	2″	1K to 100K	3.0 W @ 25°C	0.75 oz-in	±0.3%
300 FT	3″	1K to 100K	5.0 W @ 25°C	1.0 oz-in	±0.25%

VALUES SHOWN ABOVE ARE NOMINAL. FOR SPECIFIC REQUIREMENTS, REFER TO NEI'S COMPLETE CATALOG OR CONTACT OUR APPLICATIONS ENGINEERING DEPARTMENT.

PRECISION CONDUCTIVE PLASTIC ELEMENTS

NEI can supply elements for any customer requirement; including linear and rotary motion, linear or nonlinear functions, and radial sector or full rotary elements. Elements can be molded to meet virtually any packaging requirement, and can be supplied with matching wiper arm assemblies.



GENERAL SPECIFICATIONS — WIREWOUND

Resistance Tolerance
Standard: ±5%

Ambient Temperature Range
Standard: −55°C to +125°C
Special: −55°C to +150°C

Bearings
Stainless steel ball-bearings are standard.

Mechanical Rotation
Normally continuous; however, stops are available.

SERIES	DIAMETER	NOMINAL RESISTANCE RANGE	NOMINAL POWER RATING	MAXIMUM STARTING TORQUE	NOMINAL ACCURACY
55W	½″	100 ohms to 50K	2W @ 25°C	0.5 oz-in	±3.0%
34W	¾″	100 ohms to 100K	2W @ 25°C	0.45 oz-in	±2.0%
78W	⅞″	100 ohms to 150K	2.5W @ 25°C	0.4 oz-in	±1.0%
116W	1 1/16″	100 ohms to 150K	3W @ 25°C	0.4 oz-in	±0.75%
176W	1 7/16″	100 ohms to 250K	3W @ 25°C	0.5 oz-in	±0.5%
158W	1⅝″	500 ohms to 350K	3.5W @ 25°C	0.65 oz-in	±0.5%
200W	2″	500 ohms to 500K	4W @ 25°C	0.80 oz-in	±0.40%
300W	3″	500 ohms to 750K	6W @ 25°C	1.0 oz-in	±0.25%

VALUES SHOWN ABOVE ARE NOMINAL. FOR SPECIFIC REQUIREMENTS, REFER TO NEI'S COMPLETE CATALOG OR CONTACT OUR APPLICATIONS ENGINEERING DEPARTMENT.

WAFERPOT™ SINGLE-TURN PRECISION CONDUCTIVE PLASTIC POTENTIOMETERS

(LINEAR & NONLINEAR FUNCTION POTENTIOMETERS SPECIFICALLY DESIGNED FOR HIGH-DENSITY PACKAGING)

SPECIFICATIONS		MODEL 78FT	MODEL 116FT	MODEL 176FT	MODEL 200FT
MECHANICAL	Body Diameter	⅞″	1 1/16″	1 7/16″	2″
	Length (single cup only)	.680	.680	.680	.680
	Length each additional cup	.200	.200	.200	.200
	Starting Torque	.35 oz-in MAX.	.35 oz-in MAX.	.50 oz-in MAX.	.75 oz-in MAX.
	(per cup, additional)	.25 oz-in MAX.	.25 oz-in MAX.	.35 oz-in MAX.	.50 oz-in MAX.
ELECTRICAL	Standard Resistance Values	1K to 50K	1K to 50K	1K to 75K	1K to 100K
	Standard Resistance Tolerance	±10%	±10%	±10%	±10%
	Standard Accuracy	±0.5%	±0.5%	±0.5%	±0.3%
	Travel Resolution (essentially infinite for all models)				
	Electrical Function Angle	340° ±5°	340° ±5°	340° ±5°	340° ±5°
	Power Rating @ 25°C (derates linearly to 0 watts @ 125°C)	1.0 watt	1.0 watt	1.5 watts	3.0 watts

THE SPECIFICATIONS SHOWN ABOVE ARE TYPICAL. SPECIAL ELECTRICAL REQUIREMENTS AND MECHANICAL REQUIREMENTS CAN BE MET FOR VIRTUALLY ALL PARAMETERS.

STANDARDS DIVISION

new england instrument company

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ECONOPOT® MKI

SPECIFICATIONS

MODEL NUMBER	MOUNTING	INDEPENDENT LINEARITY (STANDARD)	TOTAL RESISTANCE	(100 PCS. OR MORE)
78ESA102	Servo	1%	1K	$13.60
78ESA502	Servo	1%	5K	13.60
78ESA103	Servo	1%	10K	13.60
78ESB102	Servo	0.5%	1K	16.45
78ESB502	Servo	0.5%	5K	16.45
78ESB103	Servo	0.5%	10K	16.45
78ESC102	Servo	0.25%	1K	19.55
78ESC502	Servo	0.25%	5K	19.55
78ESC103	Servo	0.25%	10K	19.55
78EBA102	Bushing	1%	1K	11.55
78EBA502	Bushing	1%	5K	11.55
78EBA103	Bushing	1%	10K	11.55
78EBB102	Bushing	0.5%	1K	14.40
78EBB502	Bushing	0.5%	5K	14.40
78EBB103	Bushing	0.5%	10K	14.40
78EBC102	Bushing	0.25%	1K	17.50
78EBC502	Bushing	0.25%	5K	17.50
78EBC103	Bushing	0.25%	10K	17.50

All data subject to change without notice

ELECTRICAL CHARACTERISTICS — ALL MODELS

PARAMETER	VALUE	REMARKS
Resistance	1K, 5K, 10K	See table
Linearity	1%, 0.5%, 0.25%	See table
Electrical angle	340° ±5°	
Output smoothness		As per MIL-R-39023
Rotational Life (Servo)	10,000,000 revolutions	without catastrophic failure
Resolution		Essentially infinite
Minimum Voltage		As specified in MIL-R-39023
End Voltage	0.5% of total applied voltage, maximum	As specified in MIL-R-39023
Power Rating	1 watt at 70°C derated to 0 at 125°C	As per Class 5 of MIL-R-39023
Insulation Resistance	1000 megohms minimum	As specified in MIL-R-39023
Dielectric Withstanding Voltage	750 volts rms	As specified in MIL-R-39023 for units less than 1¼" diameter
Resistance Tolerance	±10%	

ENVIRONMENTAL CHARACTERISTICS — ALL MODELS

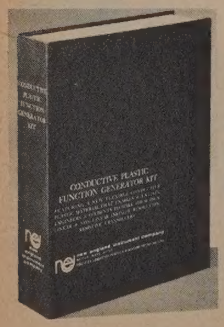
PARAMETER	VALUE
Temperature Cycling	Test condition C, Method 102 of MIL-STD-202C
Operating Temperature	−65°C to +125°C
Humidity Cycling	Will meet MIL-R-12934 for Class 5 units
Salt Spray	Will meet test as specified in MIL-R-12934
Shock	50G, 11 milliseconds as per MIL-R-12934 Test Condition C
Vibration	0.06 inches double amplitude or 15G, whichever is less, from 10-2000 cps, as specified in MIL-R-12934, Test Condition B

DESIGN OPTIONS

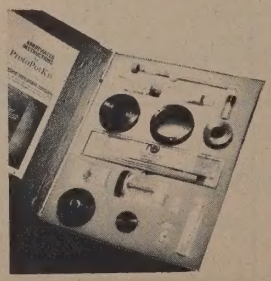
1. Center Tap: (Voltage tap located at 50% plus or minus the linearity tolerance)
   ADD the following prices:
   Linearity:
   (a) ± 5% ..... $ 2.00
   (b) ± 1% 5.00
   (c) ± .5% 5.00
   (d) ± .25% 7.50
2. Shaft Variations: Standard is ⅛" Diameter:
   (a) Shaft Diameter ¼" (servo only) requires 1/16" longer shaft than standard ..... ADD $3.00
   (b) Shaft length up to 2" (standard ⅛" diameter) ..... ADD $2.00
   (c) Screw driver slot shaft end: ADD $1.00
   (d) Shaft ground flat on one side: ADD $2.00
3. Electrical angle other than standard:
   (Standard 340° ± 5°)
   Engineering charge per order $70.00
   ADD per unit 5.00
4. Torque Requirements (standard 0.5 oz.-in.):
   (a) Low torque (servo mounted units only) down to 0.2 in.-oz. minimum ..... ADD $5.00
   (b) High torque (bushing mounted units only) up to 6 in.-oz. ADD $5.00
5. Linearity (Standard .25%, .5%, 1%,) 5.0% linearity or greater with resistance tolerance ± 20%
   Deduct $2.00
6. Linearity accuracies greater than 0.25% with standard resistance tolerance ..... prices on request.
   Resistance tolerances better than 10% ..... prices on request.

CONDUCTIVE PLASTIC FUNCTION GENERATOR KIT

FEATURING A NEW FLEXIBLE CONDUCTIVE PLASTIC MATERIAL THAT ENABLES SCIENTISTS, ENGINEERS, & STUDENTS TO MAKE THEIR OWN LINEAR & NON-LINEAR INFINITE RESOLUTION RESISTIVE TRANSDUCERS

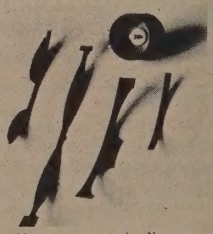


Conveniently packaged for book-case storage

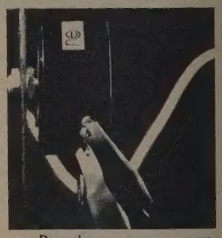


Contains everything needed to make your own potentiometers

New flexible conductive plastic material (PATENT PENDING) enables you to cut complex element shapes for virtually any required electrical function in a 1K to 40 K resistance range.



You can cut linear or nonlinear elements for rotary pots up to 2" diameter or for linear motion applications up to 5" stroke.



Develop your own working prototype potentiometers. Save time and cost, and prove out your requirements in advance.

new england instrument company nei

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STANDARDS DIVISION

ECONOPOT® MKII

MECHANICAL SPECIFICATIONS — SERVO MODELS

TYPE	A ±.005	B +.0000 −.0005	C +.0000 −.0003	D ±.030	E MAX.	F MAX.	*G MAX.	H ±.005	J ±.005	K MIN.	L ±.015	M ±2°	N MAX.	P MAX.	R MAX.	S ±.010 ±5°	**T MAX.
78	.875	.750 .749	.1248	.625	.790	.505	.145	.062	.062	.057	.355	30°	.605	.605	.781	.015x45°	.900
116	1.062	.9688	.1248	.625	.790	.505	.145	.062	.062	.057	.355	25°	.680	.680	.975	.015x45°	1.090
176	1.437	1.3125	.2498	.625	.910	.505	.201	.062	.062	.088	.355	20°	.910	.910	1.312	.030x45°	1.472
200	2.000	1.8750	.2498	.625	.910	.505	.201	.062	.093	.088	.335	15°	1.170	1.152	1.875	.030x45°	2.000

For Single Gang Depth Dimension — "E" is the Total Depth
For Multi Gang Depth Dimension —"E" for First Cup "F" for each Additional Cup "G" for Cover

*Not used on one gang.
**Diameter over clamp ring (optional)

Note: Clamp rings are optional. Mounting hardware supplied.

MECHANICAL SPECIFICATIONS — BUSHING MODELS

TYPE	A ±.005	B +.0000 −.0003	C CL2 THD.	D ±.030	E ±.015	F MAX.	G MAX.	H ±.005	J MAX.	K ±2°	L MAX.	M MAX.	N ±.005	P ±.003	**R MAX.	S CHAMFER +.010 ±5°
78	.875	.1248	¼x32	⅜	⅜	.727	.510	.355	.062	30°	.605	.605	.312	.062	.900	1/64x45°
114	1.250	.2498	⅜x32	⅜	⅜	.855	.800	.500	.062	30°	.818	.850	.531	.093	1.320	1/32x45°
158	1.625	.2498	⅜x32	⅜	⅜	.855	.800	.500	.062	30°	1.011	1.080	.531	.093	1.703	1/32x45°
200	2.000	.2498	⅜x32	⅜	⅜	1.000	.960	.685	.067	25°	1.165	1.152	.531	.125	2.000	1/32x45°

For Single Gang Depth Dimension—"F" is Total Depth
For Multi Gang Depth Dimension —"F" for First Cup "G" for each Additional Cup

**Diameter over clamp ring (optional)

ELECTRICAL SPECS-SERVO MODELS

POT DIA.	TYPE NO.	RESISTANCE AVAILABLE STD. (OHMS)	LINEARITY AVAILABLE STD.	POWER RATING
.875	78	1,000 5,000 10,000 25,000 50,000	±.25% ± .5% ± 1%	1 Watt
1.062	116	1,000 10,000 25,000 50,000	± .25% ± .5% ± 1%	1 Watt
1.437	176	1,000 10,000 25,000 50,000 100,000	± .25% ± .5% ± 1%	2 Watt
2.000	200	1,000 10,000 25,000 50,000 100,000	±.25% ± .5% ± 1%	2 Watt

80 STOCK MODELS

ELECTRICAL SPECS-BUSHING MODELS

POT DIA.	TYPE NO.	RESISTANCE AVAILABLE STD. (OHMS)	LINEARITY AVAILABLE STD.	POWER RATING
.875	78	1,000 5,000 10,000 25,000 50,000	±.25% ± .5% ± 1%	1 Watt
1.250	114	1,000 10,000 25,000 50,000	±.25% ± .5% ± 1%	1 Watt
1.625	158	1,000 10,000 25,000 50,000 100,000	±.25% ± .5% ± 1%	2 Watt
2.000	200	1,000 10,000 25,000 50,000 100,000	±.25% ± .5% ± 1%	2 Watt

All Data Subject to Change Without Notice.

GENERAL SPECIFICATIONS

MECHANICAL

Precision Machined Aluminum Parts are Anodized for Corrosion Resistance

Bearings
Stainless Steel Ball Bearings are Standard on Servo Models

Housings (All Models)
Precision Fabricated from Diallyl Phthalate

Shaft
Centerless Ground Stainless Steel

Mechanical Rotation
Continuous 360° (Stops Available on Bushing Models)

Maximum Starting Torque (Servo Models):
0.5 in-oz. for first cup/0.3 in-oz. for each additional cup

ELECTRICAL

Total Resistance Tolerance
Standard ±10%

Resistance tolerances better than 10% . . . prices on request.

Function Angle
Standard 340° ±5°

Output smoothness per MIL-R-39023

Electrical Overtravel
Supplied Both Ends of Electrical Function

Dielectric Strength
1000 VRMS under Standard Atmospheric Conditions

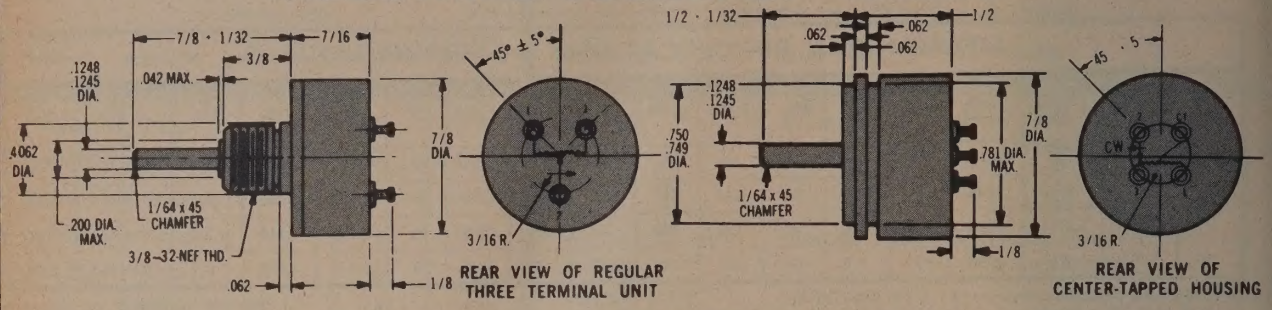
Travel Resolution
Less than 0.0050° (Essentially Infinite)

STANDARDS DIVISION

new england instrument company

GENERAL OFFICES 14 KENDALL LANE • NATICK, MASSACHUSETTS 01760 • TEL. 617-873-971

INDUSTRIAL ECONOPOT MODEL C



ELECTRICAL SPECIFICATIONS

BUSHING MODEL

Model	Mounting	Independent Linearity (standard)	Total Resistance ±20%	Price (100 pcs. or more)
78CBA102	Bushing	1%	1K	4.99
78CBA502	Bushing	1%	5K	4.99
78CBA103	Bushing	1%	10K	4.99
78CBB102	Bushing	0,5%	1K	7.50
78CBB502	Bushing	0.5%	5K	7.50
78CBB103	Bushing	0.5%	10K	7.50

Electrical Angle: 342° ± 5°
Life: 25,000,000 revolutions — Servo
25,000,000 manual settings — Bushing
Power Rating: 1 watt at 70°C derated to 0 at 125°C, as per class 5 of MIL-R-39023
Torque: 1.0 oz. in. (standard)

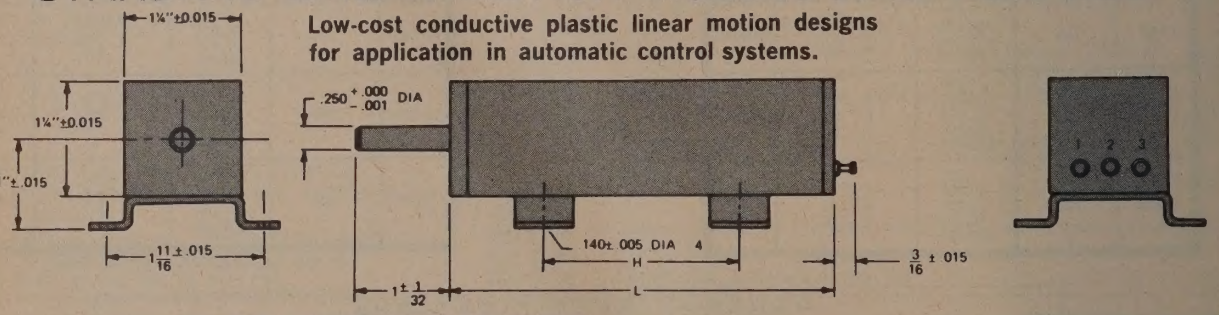
SERVO MODEL

Model	Mounting	Independent Linearity (standard)	Total Resistance ±20%	Price (100 pcs. or more)
78CSA102	Servo	1%	1K	7.60
78CSA502	Servo	1%	5K	7.60
78CSA103	Servo	1%	10K	7.60
78CSB102	Servo	0.5%	1K	9.70
78CSB502	Servo	0.5%	5K	9.70
78CSB103	Servo	0.5%	10K	9.70
78CSC102	Servo	0.25%	1K	12.25
78CSC502	Servo	0.25%	5K	12.25
78CSC103	Servo	0.25%	10K	12.25

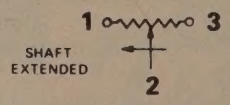
1/4" Diameter shaft - available on request
1/4" Long bushing - available on request
Design options available on request.

STANDARD LINEAR MOTION MODELS 114L, 34L & 100L

Low-cost conductive plastic linear motion designs for application in automatic control systems.



E	ELEC. STROKE	SPECIFY UP TO 30" MAX
M	MECH. STROKE	E + 3/32 MAX
L	BODY LENGTH	E + 3" MAX
H	HOLE LOCATION	E + 1" ± .015



SPECIFICATIONS

ELECTRICAL

Resistance per inch of stroke length: 50K ohms per inch maximum
Number of Elements: single or dual
Total Resistance Tolerance: ± 10%
Independent Linearity,
Standard: ± 1%
Special: ± 0.1% (for stroke lengths over 4")
Power Rating: 0.5 watts per inch stroke at 25°C
Resolution: essentially infinite
Insulation Resistance: 1000 megohms minimum

MECHANICAL

Case Width,
Standard: 1¼" square
Special: ¾" and 1" square
Stroke Length,
Standard: up to 30"
Special: up to 100"
Starting Torque: 4 oz. in.
Taps: available (specify location and type, i.e.: current or voltage)

Note: the shaft can be rotated without detrimental effect to the unit.

OHMITE has the answer in wirewound rheostats

Twelve sizes in wirewound, vitreous enameled rheostats are stocked by Ohmite distributors all over the country and at the Ohmite factory. This selection, the most extensive available to industry, covers ratings that meet the major portion of design, production and emergency needs. Ratings of 7½, 12½, 25, 50, 75, 100, 150, 225, 300, 500, 750 and 1000 watts are standard.

FEATURES OF CONSTRUCTION: Ohmite rheostats are designed to produce permanently smooth, close control. The construction is all ceramic and metal; there is nothing to smoke, char, shrink, or shift. All models have insulated shafts with provision to keep the rheostat from turning on the panel. The resistance wire is wound over a solid ceramic core. Each turn is a separate resistance step and is locked against shifting by vitreous enamel (except Model C). The core and base are also bonded by vitreous enamel. The pivoted universal-action-mounted contact brush is of metal-graphite and varies to fit current and resistance. It rides upon a large flat surface and assures perfect contact without wear on the wire. Pressure at the contact and at the center lead are independent. Ohmite Rheostat Models H, J, G, K, L, P, and N, all marked Series A, are listed under the Underwriters' Laboratories Reexamination Service.

RATING: The current carrying capacities shown in the tables are for use in **free air;** when units are enclosed, these currents should be reduced possibly as much as 30% to 50%, depending upon the degree of ventilation. The rated current will cause the rheostat to dissipate its rated wattage when the full resistance is in the circuit.

MODEL C, MINIATURE — 7.5 Watts* (See Bul. 203)

The Model C provides greater design flexibility. In addition to its small size, its versatile solder terminals will also plug into common transistor sockets or circuit boards. It is stocked with both standard and locking type bushings.

Ohms	Amps.	Std. Shaft Catalog No.	Locking Shaft Catalog No.
10	.86	4908	4948
15	.71	4909	4949
25	.55	4910	4950
35	.46	4911	4951
50	.39	4912	4952
75	.32	4913	4953
100	.27	4914	4954
150	.22	4915	4955
200	.19	4916	4956
250	.17	4917	4957
350	.15	4918	4958
500	.12	4919	4959
750	.10	4920	4960
1000	.086	4921	4961
1500	.071	4922	4962
2500	.055	4923	4963
3500	.046	4924	4964
5000	.039	4925	4965

* Rating on Metal Panel.

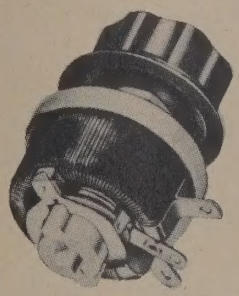
Diameter: .515″ max.
Shaft: ⅛″ Diameter.
Standard—**Code:** C—_____—S-1 (Ohms)
Locking—**Code:** C—_____—LO-1 (Ohms)
Resistace Tolerance: ±10%
Torque: 0.25 to 3 oz.-inch
Weight: 0.27 oz.
Standard Mounting: For panels up to ⅛″ by ¼-32 bushing with non-turn projection. Solder terminals also fit EIA type TSE-3R100 transistor socket.
Rotation: 300° ±5°
Standard Knob: No. 5151. Specify separately on order when desired.

MODEL H — 25 Watts

Diameter: 1⅝″. **Code:** H—_____—F-2. (Ohms) **Shaft:** ¼″ diameter.
Resistance Tolerance: ±10%. **Torque:** 0.25 to 0.5 pound-inch. **Weight:** 0.19 lb. **Standard Mounting:** For panels up to ¼″ by ⅜″-32 bushing with No. 5050 non-turn washer. **Rotation:** 300° ±5°. **Standard Knob:** No. 5150. Specify separately on order when desired.

Catalog No.	Total Ohms	Max. Amps.	Catalog No.	Total Ohms	Max. Amps.
0140	1	5.000	0154	250	.316
0141	2	3.540	0155	350	.267
0142	3	2.880	0156	500	.222
0143	6	2.040	0157	750	.182
0144	8	1.770	0158	1,000	.155
0145	10	1.580	0159	1,500	.129
0146	15	1.290	0160	2,500	.100
0147	25	1.000	0161	3,500	.084
0148	35	.845	0162	5,000	.070
0149	50	.707	4200†	7,500	.058
0150	75	.575	4201†	10,000	.050
0151	100	.500	4202†	15,000	.040
0152	125	.445	4203†	20,000	.035
0153	175	.375	4204†	25,000	.032

† Silicone-ceramic coating, 500 V. max. Not listed UL Series A.

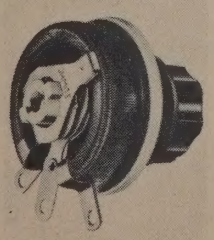


MODEL J — 50 Watts

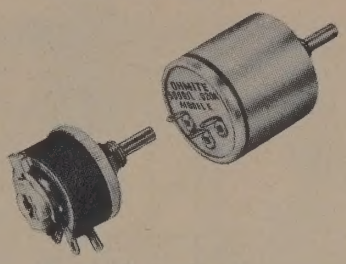
Diameter: 2⅝″. **Code:** J—_____—F-2. (Ohms) **Shaft:** ¼″ diameter.
Shaft: ¼″ diameter. **Resistance Tolerance:** ±10%. **Torque:** 0.25 to 2.0 pound-inches. **Weight:** 0.32 lb. **Standard Mounting:** For panels up to ¼″ by ⅜″-32 bushing with No. 5050 non-turn washer. **Rotation:** 300° ±5°. **Standard Knob:** No. 5150. Specify separately on order when desired.

Catalog No.	Total Ohms	Max. Amps.	Catalog No.	Total Ohms	Max. Amps.
0308	0.5	10.000	0324	500	.316
0309	1	7.070	0325	800	.250
0310	2	5.000	0326	1,000	.224
0311	4	3.530	0327	1,600	.176
0312	6	2.880	0328	2,500	.141
0313	8	2.500	0329	3,500	.119
0314	12	2.040	0330	5,000	.100
0315	16	1.760	0331	8,000	.079
0316	22	1.500	0332	10,000	.070
0317	35	1.190	4210†	15,000	.058
0318	50	1.000	4211†	20,000	.050
0319	80	.790	4212†	25,000	.045
0320	125	.630	4213†	30,000	.041
0321	150	.575	4214†	40,000	.035
0322	225	.470	4215†	50,000	.032
0323	300	.408			

†Silicone-ceramic coating, 750 V. max. Not listed UL Serial A.



MODEL E — 12.5 Watts*



Diameter: ⅞″ Unenclosed.
Code: E—_____—R-1 (Ohms) Dia: 1¾″ in aluminum enclosure
Code: EW—_____—R-1 (Ohms)
Shaft: ⅛″ Diameter.
Resistance Tolerance: ±10%.
Torque: 1 to 6 oz.-inch
Weight: 0.6 oz.; enclosed 0.85 oz.
Standard Mounting: For panels up to ⅛″ by ¼″-32 bushing, with non-turn projection.
Rotation: 300° ±5°.
Standard Knob: No. 5151. Specify separately on order when desired.

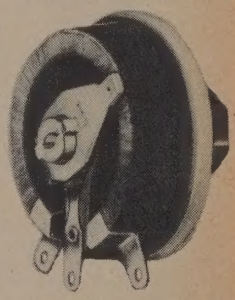
Total Ohms	Max. Amps.	Catalog No.	Catalog No.
1	3.53	0101	W0101
2	2.50	0102	W0102
2.5	2.24	0102A	W0102A
3	2.04	0103	W0103A
5	1.58	0103A	W0103A
6	1.44	0104	W0104
8	1.25	0105	W0105
10	1.12	0106	W0106
15	.91	0107	W0107
25	.71	0108	W0108
35	.60	0109	W0109
50	.50	0110	W0110
75	.41	0111	W0111
100	.35	0112	W0112
125	.32	0113	W0113
150	.29	0113A	W0113A
175	.27	0114	W0114
200	.25	0114A	W0114A
250	.22	0115	W0115
350	.19	0116	W0116
500	.16	0117	W0117
750	.13	0118	W0118
1,000	.11	0119	W0119
1,500	.091	0120	W0120
2,500	.071	0121	W0121
3,500	.060	0122	W0122
5,000	.050	0123	W0123
7,500	.041	4190†	W4190†
10,000	.035	4191†	W4191†
12,500	.031	4192†	W4192†
15,000	.029	4193†	W4193†

† Silicone-ceramic coating, 350 V. max.
* Rating on metal panel.

MODEL G — 75 Watts

Diameter: 2¾″. **Code:** G—_____—F-2. (Ohms) **Shaft:** ¼″ diameter.
Resistance Tolerance: ±10%. **Torque:** 0.5 to 2.0 pound-inches. **Weight:** 0.52 lb. **Standard Mounting:** For panels up to ¼″ by ⅜″-32 bushing with No. 5050 non-turn washer. **Rotation:** 300° ±5°. **Standard Knob:** No. 5150. Specify separately on order when desired.

Catalog No.	Total Ohms	Max. Amps.	Catalog No.	Total Ohms	Max. Amps.
1100	0.5	12.300	1112	200	.612
1101	1	8.660	1113	300	.500
1102	2	6.120	1114	400	.433
1103	3	5.000	1115	500	.388
1104	5	3.880	1116	750	.316
1105	7.5	3.160	1117	1,000	.274
1106	10	2.740	1118	1,500	.224
1107	16	2.170	1119	2,000	.194
1108	25	1.730	1120	2,500	.173
1109	50	1.230	1121	5,000	.123
1110	75	1.000	1122	7,500	.100
1111	100	.866	1123	10,000	.087



MODEL K — 100 Watts

Diameter: 3⅛″. **Code:** K—_____—F-2. (Ohms) **Shaft:** ¼″ diameter.
Resistance Tolerance: ±10%. **Torque:** 0.5 to 2.0 pound-inches. **Weight:** 0.64 lb. **Standard Mounting:** For panels up to ¼″ by ⅜″-32 bushing with No. 5050 non-turn washer. **Rotation:** 300° ±5°. **Standard Knob:** No. 5150. Specify separately on order when desired.

Catalog No.	Total Ohms	Max. Amps.	Catalog No.	Total Ohms	Max. Amps.
0440	0.5	14.100	0452	200	.707
0441	1	10.000	0453	300	.575
0442	2	7.070	0454	400	.500
0443	3	5.750	0455	500	.447
0444	5	4.470	0456	750	.365
0445	7.5	3.650	0457	1,000	.316
0446	10	3.160	0458	1,500	.258
0447	16	2.500	0459	2,000	.224
0448	25	2.000	0460	2,500	.200
0449	50	1.410	0461	5,000	.141
0450	75	1.150	0462	7,500	.115
0451	100	1.000	0463	10,000	.100

FOR DETAILS ON OTHER MODELS FROM 150 TO 1000 WATTS PLUS SPECIAL TAPERED WINDINGS AND FEATURES, WRITE FOR CATALOG 200.

OHMITE MFG. CO., a NORTH AMERICAN PHILIPS company • 3635 HOWARD STREET, SKOKIE, ILLINOIS 60076 • PHONE (312) 675-2600 • TWX 910-223-0805

REON RESISTORS/POTENTIOMETERS

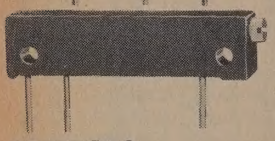
Reon manufactures a complete line of wirewound resistors to Mil-R-93C

MULTI-TURN TRIMMING POTENTIOMETERS WIREWOUND

High Temperature—175°C
Humidity Proof—Mil
Wirewound—5% Tol.
Meets Mil-R-27208B

Model 101/ Style RT10

Model 201/ Style RT11


Model 301/ Style RT12

FEATURES

- ★ High power dissipation: 1 watt at 70°C
- ★ Operating temperature range: −65°C to +175°C
- ★ Moisture proof per MIL-STD—202C Method 106
- ★ GROUP Weld technique joins terminals directly to several turns of the resistance coil for High reliable terminations.
- ★ One piece molded housing:
  - ★ Provides a direct contact heat sink for the resistance coil, eliminating hot spots.
  - ★ Bonds each coil of the resistance element in place.
  - ★ Seals out moisture, eliminating external sealing problems.
- ★ Matched materials assure minimum stress on resistance wire and minimum temperature coefficient.
- ★ One piece self-locking contact wiper assures maximum reliability and setting stability when exposed to vibration, shock and acceleration.
- ★ Unique length and diameter of the resistance element permits the use of more turns of larger diameter resistance wire resulting in a more rugged assembly, and exceptional resolution.

RESISTANCE NETWORKS

- ★ Ladder
- ★ Fast rise time
- ★ Close temperature coefficient match (1 PPM)
- ★ Custom made to your specifications

VARIABLE RESISTORS ½" Diameter: Conductive Plastic Element

Reon Type	DESCRIPTION	Mil-R-94 Type
BA	Standard Bushing	RV6N
BL	Locking Bushing	RV6L
BS	Panel Seal Standard Bushing	RV6S
BT	Panel Seal Locking Bushing	RV6T
BH	High Voltage Bushing (3,500 V)	

SPECIFICATIONS:
Power Rating—½w @ 70°, 0 w @ 120°C
Resistance Range—50 ohms* to 5 megohms

STANDARD VALUES:

100 Ohms*	5,000 Omhs	.25 Meg*
250 Ohms	10,000 Ohms	.5 Meg
500 Ohms	25,000 Ohms	1 Meg
1000 Ohms	50,000 Ohms	2.5 Meg*
2500 Ohms	.1 Meg	5 Meg*

*available linear only

Tolerance—10% (5% & 20% also available)
Rotation—295° (360° also available)
Tapers—(A) Linear (C) Clockwise Semilog (F) ccw semilog
Terminal Types—Lug or pin lead
Mounting Data—Bushing: ¼" Diameter ¼" ⅜", ½" lengths
Shaft: ⅛" Diameter 3/16" thru 3" lengths

SINGLE TURN TRIMMING POTENTIOMETERS Conductive Plastic Element—½" Diameter

Reon Type	DESCRIPTION	Height
H	Printed Circuit Mount	.532
CK	Knob Adjust	.350
CL	Screw Adjust	.350
CN	Right Angle Mount *	.625

* Also available for Models B & H.

SPECIFICATIONS:
Power Rating—¼ w @ 70°C, 0 w @ 120°C
Resistance Range—50 ohms to 5 Megohms

STANDARD VALUES:

50 Ohms*	5,000 Ohms	.25 Meg
100 Ohms*	10,000 Ohms	.5 Meg
250 Ohms*	25,000 Ohms	1 Meg
500 Ohms	50,000 Ohms	2.5 Meg*
1000 Ohms	100,000 Ohms	5.0 Meg*
2500 Ohms		

*Linear Taper Only

Tolerance—10% (5% & 20% also available)
Rotation—295° (360° also available)
Tapers—(A) Linear, (C) Clockwise Semilog, (F) ccw semilog
Terminal Types—Lead or Lug (with or without Ground Lug)
Shaft—Stainless Steel or Plastic

NOTE: All types meet environmental conditions of MIL-R-94D

VARIABLE RESISTORS 1⅛" Diameter: Carbon Element

Reon Type	DESCRIPTION	Mil-R-94 Type
RA	Standard Bushing	RV4N
RL	Locking Bushing	RV4L
RD	2 Section (also available in 3 & 4 section)	
RC	Concentric Shaft	

SPECIFICATIONS:
Power Rating—2 w @ 70°C, 0 w @ 120°C
Resistance Range—50 ohms to 5 megohms

STANDARD VALUES:

100 Ohms	5,000 Ohms	.25 Meg
250 Ohms	10,000 Ohms	.5 Meg
500 Ohms	25,000 Ohms	1 Meg
1000 Ohms	50,000 Ohms	2.5 Meg
2500 Ohms	.1 Meg	5 Meg

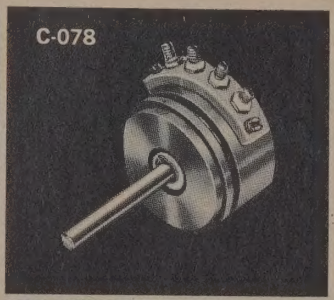
Tolerance—10% (20% also available)
Rotation—312°
Tapers—(A) Linear, (C) Clockwise Semilog (F) ccw semilog . . . under 100 ohms available linear only
Terminal Types—Lug
Mounting Data—Bushing: ⅜" Diameter ¼", ⅜", ½" lengths High Voltage available
Shaft: ¼" Diameter ⅜" thru 3" lengths Switch also available

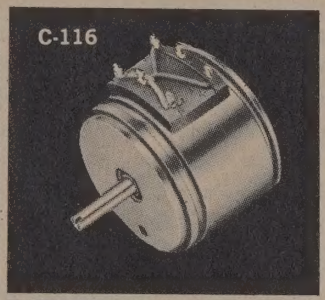
REON reon resistor corporation
155 saw mill river road, yonkers, n. y. 10701, (914) 965-9850

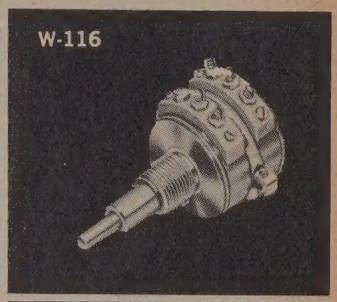
SAMARIUS HAS THE ANSWER

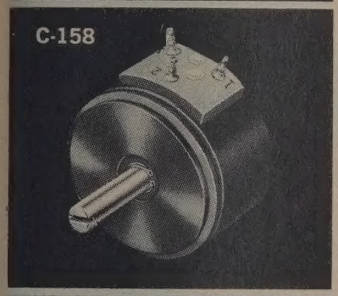
IF YOUR PROBLEM IN POTENTIOMETERS IS LITTLE OR BIG—DELICATE OR RUGGED—ACCURATE OR PRECISE—SINGLE OR MULTIPLE—THIN OR THICK—MINIATURE OR MONSTER—LIGHT OR HEAVY—SAMARIUS HAS THE ANSWER FOR YOU.

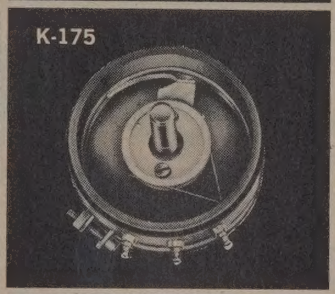
Our complete line of precision potentiometers start from Series C-050—½" micro miniature to Series HP-500—5" high resolution and linearity accurate potentiometers.

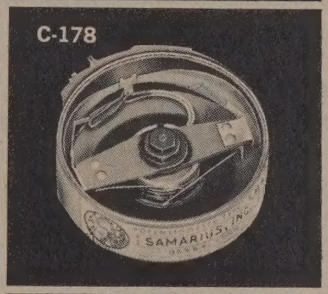


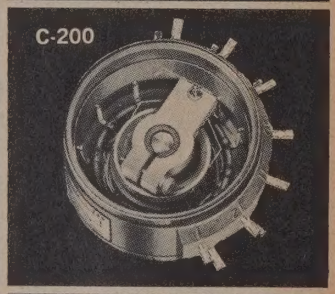


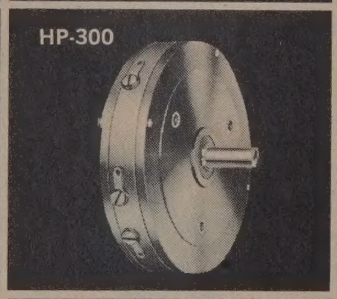


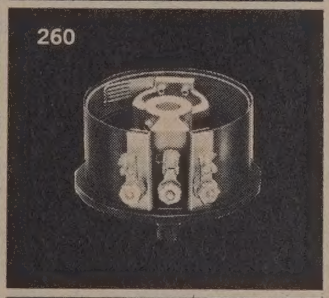


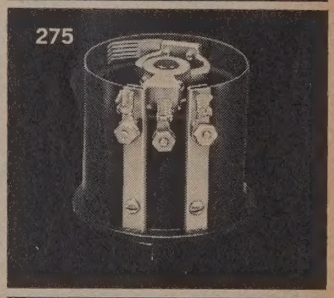


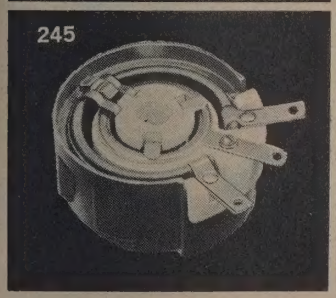


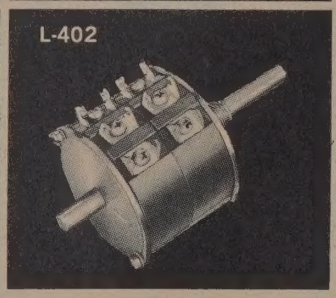


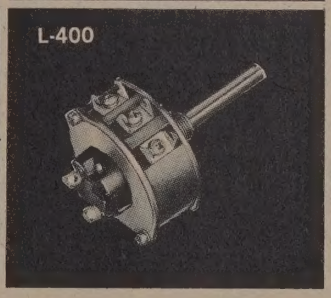


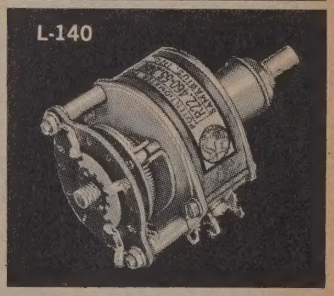












HIGH PRECISION POTENTIOMETER WINDINGS

Samarius, Inc. furnish their clients with a custom winding service for wire wound potentiometer elements in card and mandrel types. Linear or functional requirements are acheived through cooperative R & D with customers. Card profiles are ground with exact duplication from master templates on our own engineered and built machines to tolerances to meet all specifications. We can supply card windings for ¼" miniature potentiometers to cards 12 feet long and 4 inches wide. Mandrel windings are available up to 16 feet long in any type of wire needed. Over 30 years' experience in supplying high precision potentiometer windings to the field. Call on our engineering staff for their help in solving your winding or potentiometer problems.

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SAMARIUS INC.

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TWX Number is 710 - 451 - 2495 203 - 735 - 7405

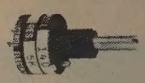
Spectrol

Precision Potentiometers Trimming Potentiometers Multidials • Switches

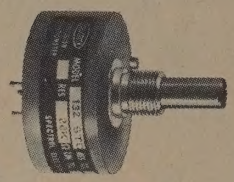
THE INDUSTRY'S FINEST PRECISION POTENTIOMETERS

For more than fifteen years, Spectrol has been a leader in the design and manufacture of precision potentiometers, both linear and non-linear, standard and special designs. All Spectrol single-turn, three-turn, five-turn, and ten-turn precision potentiometers meet or exceed applicable military and commercial specifications for rotational load life, temperature range, shock, vibration, humidity, and salt spray; and Spectrol is the only manufacturer who produces every Mil-Approved precision potentiometer qualified to MIL-R-12934.

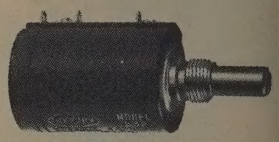
⅔ Actual Size



Model 140



Models 132, 138, 139

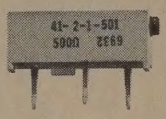


Model 532

HIGH-QUALITY COMPETITIVELY PRICED TRIMMERS

For more than ten years, Spectrol has been engaged in the design and manufacture of high quality trimming potentiometers. Spectrol's complete lines of both cermet and wirewound trimmers are available in all the primary configurations—rectangulars, squares, and rounds—in both low-cost industrial and Mil-Approved versions, and Spectrol trimmers are stocked in depth at more than 75 distributor locations throughout the United States and Canada.

Actual Size



Model 41-2

Model 51

Model 53-2

Model 84

Model 62-1

Model 62-2

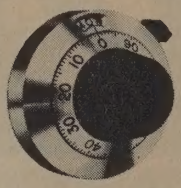
Model 53-1

Models 42, 78, RT12

ATTRACTIVE PRECISION-MADE MULTIDIALS

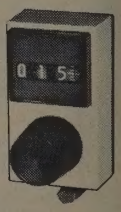
Spectrol's line of handsome, precision-made Multidials includes both vernier and digital types. These turns-counting dials, for use on multi-turn potentiometers and other rotating devices, are not only superior in appearance but also in sturdy design, "feel," and precise operation.

½ Actual Size



Model 21

Model 11



Model 15

VERSATILE ROTARY SELECTOR SWITCHES

Spectrol's versatile Model 87 Rotary Selector Switch brings a new dimension of flexibility to discrete component circuitry. Available in volume quantities at production line prices, these handy switches can be mounted directly on to printed circuit boards or panel mounted. They can be used in many ways... often to make other components do multiple duty.

Actual Size

Model 87-11

Model 87-21

Model 87-31

CONDUCTIVE PLASTIC, CERMET, AND WIREWOUND CAPABILITY

At Spectrol, there is a tradition of personalized engineering service to assist the customer in selecting standards or developing "specials" that will fit his design best. This tradition is backed by an unusual in-depth capability that is dedicated to the design and production of wirewound, cermet, and conductive plastic potentiometers, trimmers, and related components.

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Spectrol

Precision Potentiometers
Trimming Potentiometers
Multidials • Switches

PRECISION POTENTIOMETERS—Single Turn and Multiturn

Diameter	Turns	Model No.	Resistance Element	Resistance Range (Ohms)	Resistance Tolerance	Linearity Tolerance		Max. Power Rating (Watts)	Operating Temp. Range	Mounting Available
						Standard	Best Practical			
½"	1	140/142	Wire	50 to 70K	±3%	±1.0%	±.50%	2 @ 40°C	—55°C to +125°C	Bushing
½"	10	162	Wire	100 to 100K	±3%	±5%	±.15%	2 @ 40°C	—55°C to +125°C	Bushing
½"	10	163	Wire	100 to 100K	±3%	±5%	±.15%	2 @ 40°C	—55°C to +125°C	Bushing (⅜")/Servo
½"	10	164	Wire	100 to 100K	±3%	±5%	±.15%	2 @ 40°C	—55°C to +125°C	Bushing/Servo
⅞"	1	702*	Wire	5 to 109K	±3%	500Ω to 109K ±0.5%	±.25%	1.25 @ 70°C	—65°C to +125°C	Bushing
⅞"	3	552	Wire	5 to 45K	±3%	±.25%	±.125%	1.0 @ 70°C	—65°C to +125°C	Bushing/Servo
⅞"	5	520	Wire	10 to 76K	±3%	±.25%	±.15%	2 @ 40°C	—55°C to +105°C	Bushing
⅞"	10	502*	Wire	15 to 152K	±3%	±.25%	±.05%	2.0 @ 70°C	—65°C to +125°C	Bushing/Servo
⅞"	10	532	Wire	15 to 180K	±5%	±.25%	±.10%	3 @ 40°C	—55°C to +105°C	Bushing
⅞"	10	510	Wire	15 to 152K	±3%[1]	±.25%	±.10%	3 @ 40°C	—55°C to +105°C	Bushing
⅞"	10	500	Wire	15 to 152K	±3%[1]	±.25%	±.05%	3 @ 40°C	—55°C to +125°C	Bushing/Servo
⅞"	10	530	Wire	15 to 150K	±3%	±.25%	±.10%	3 @ 40°C	—55°C to +105°C	Bushing
1"	10	570	Wire	20 to 185K	±3%	±.25%	±.05%	3 @ 40°C	—55°C to +105°C	Bushing/Servo/Screw
1 1/16"	1	122*	Wire	5 to 142K	±3%	200Ω to 142K ±0.5%	±.20%	1.5 @ 70°C	—65°C to +125°C	Bushing/Servo
1⅛"	1	110	Wire	5 to 30K	±3%	300Ω to 30K ±0.5%	±.20%	2 @ 40°C	—55°C to +105°C	Bushing/Servo
1 5/16"	1	100	Wire	5 to 39K	±3%	100Ω to 39K ±0.5%	±.15%	2.75 @ 40°C	—55°C to +105°C	Bushing/Servo
1 5/16"	1	132	Wire	5 to 39K	±3%	200Ω to 39K ±0.5%	±.20%	2.75 @ 40°C	—55°C to +105°C	Bushing
1 5/16"	1	138	C.P	500 to 100K	±10%	±0.5%	±0.5%	2.0 @ 40°C	—55°C to +125°C	Bushing
1 5/16"	1	139	Cermet	500 to 1 Megohm	±10%	±0.5%	±0.5%	5.0 @ 40°C	—55°C to +125°C	Bushing
1 7/16"	1	170*	Wire	5 to 49K	±3%	100Ω to 49K ±.50%	±.15%	2.75 @ 40°C	—55°C to +105°C	Bushing/Servo
1 7/16"	3	820	Wire	15 to 119K	±3%	±.25%	±.075%	3.75 @ 40°C	—55°C to +105°C	Bushing/Servo
1 7/16"	10	870*	Wire	40 to 398K	±3%	±.25%	±.03%	6.5 @ 40°C	—55°C to +105°C	Bushing/Servo
1⅝"	1	190	Wire	5 to 65K	±3%	500Ω to 65K ±.30%	±.15%	3.5 @ 40°C	—55°C to +105°C	Bushing/Servo/Screw
1¾"	1	202	Wire	5 to 65K	±3%	500Ω to 65K ±..25%	±.15%	3.5 @ 70°C	—65°C to +125°C	Bushing/Servo/Screw
1 13/16"	10	800	Wire	20 to 519K	±3%	±.25%	±.025%	8.0 @ 40°C	—55°C to +125°C	Bushing/Servo/Screw
1 13/16"	10	802*	Wire	20 to 519K	±3%	±.25%	±.025%	5.0 @ 70°C	—65°C to +125°C	Bushing/Servo/Screw
1 13/16"	3	852	Wire	15 to 155K	±3%	±.25%	±.05%	2.0 @ 70°C	—65°C to +125°C	Bushing
1 13/16"	10	860	Wire	20 to 519K	±3%[2]	±.25%	±.10%	8.0 @ 40°C	—55°C to +105°C	Bushing
1 13/16"	3	830	Wire	15 to 155K	±3%	±.25%	±.05%	3 @ 40°C	—55°C to +105°C	Bushing
2"	1	302*	Wire	5 to 85K	±3%	200Ω to 85K ±.25%	±.10%	4.0 @ 70°C	—65°C to +125°C	Bushing/Servo/Screw
3"	1	402*	Wire	10 to 155K	±3%	200Ω to 158K ±.25%	±.075%	6.0 @ 70°C	—65°C to +125°C	Bushing/Servo/Screw

*These configurations available in Mil-approved models per (RR Series) MIL-R-12934.
[1] ±5% below 100Ω. [2] ±5% below 200Ω.

TRIMMING POTENTIOMETERS—Rectangular, Square and Round

Configuration	Size	Model No.	Element	Resistance Range (Ohms)	Adjustment Ratio	TEMPCO (PPM/°C)	Maximum Power Rating (Watts)
Rectangular (PC)	¾"	41	Cermet	10 to 1 Meg.	15 to 1	±100	½ @ 70°C
Rectangular (L, PC, SH)	1¼"	74	Wire	10 to 50K	22 to 1	±50	1 @ 70°C
Rectangular (L, PC, SH)	1¼"	94	Wire	50 to 20K	22 to 1	±100	½ @ 70°C
Rectangular (L, PC, SH)	1¼"	78	Cermet	10 to 1 Meg.	22 to 1	±100	¾ @ 70°C
Rectangular (L, PC, SH)	1¼"	949	Cermet	100 to 1 Meg.	22 to 1	±100	¾ @ 70°C
Rectangular (L, PC)	1¼"	42 (RT12)	Wire	10 to 50K	22 to 1	±50	1 @ 70°C
Rectangular (L, PC, SH)	1¼"	44 (RT11)	Wire	10 to 50K	22 to 1	±50	1 @ 70°C
Square (L, PC)	⅜"	50 (RT24)	Wire	10 to 50K	23 to 1	±50	¾ @ 85°C
Square (PC)	⅜"	51 (RT24)	Wire	10 to 50K	23 to 1	±50	¾ @ 85°C
Square (L, PC)	½"	55 (RT22)	Wire	10 to 50K	23 to 1/42 to 1	±50	1½ @ 70°C
Round (PC)	¼"	62	Cermet	10 to 1 Meg.	1 to 1	±100	¾ @ 25°C
Round (PC)	5/16"	53	Wire	10 to 1 Meg.	1 to 1	±250	½ @ 85°C
Round (To —9, PC)	5/16"	80	Wire	10 to 50K	1 to 1	±50	1 @ 50°C
Round (PC, SH).	½"	84	Wire	10 to 50K	1 to 1	±50	1½ @ 70°C

DIALS—Vernier and Digital

Size	Model No.	Type	Number of turns	Minor Scale Division	Shaft Bore (Inches)	Finish
1" Dia.	11	Vernier	11	1/50 Turn	.250	Chrome
1 13/16" Dia.	21	Vernier	15	1/100 Turn	.250	Chrome
1" width	15	Digital (3)	10	1/500 Turn	.250	Chrome
1 13/16" Dia.	25-1	Digital (3)	11 (3 Digit)	1/500 Turn	.250	Chrome
1 13/16" Dia.	25-4	Digital (4)	100 (4 Digit)	1/500 Turn	.250	Chrome

SWITCHES—Rotary Selector

Configuration	Size	Model No.	Switch Action	Contact Current Rating	Life At Rated Current	Contact Resistance	Operating Temperature Range
Screwdriver Adjust	½"	87-11	Positive Detent, 36° Indexing, Stops	250MA @ 28VCD	4,000 Switching Operations, Per Position	.05Ω Max.	—65° to +150°C
Knob Adjust	½"	87-21					
Bushing Mount	½"	87-31					

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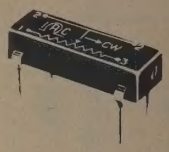
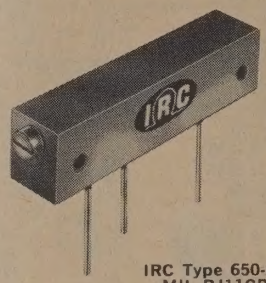
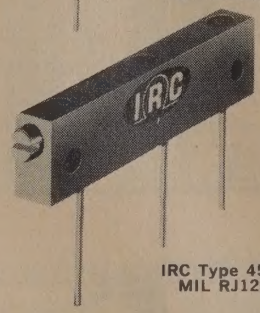
TRW PRECISION RECTANGULAR METAL GLAZE TRIMMERS

ELECTRONICS GROUP

TRW has a Circuitrim potentiometer for every application.

TRW offers all 4 popular styles: rectangular, square, round and cube in both MIL and economy packages. Circuitrim potentiometers are also available in a large assortment of mounting styles.

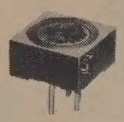
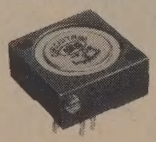
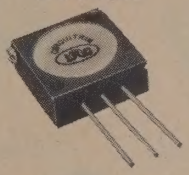
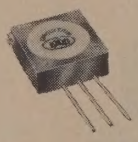
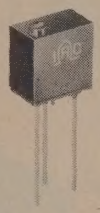
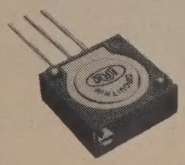
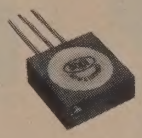
The following pages graphically portrays TRW's complete line.

	1¼" RECTANGULAR	1¼" RECTANGULAR	DUAL IN-LINE "IC" PACKAGE
	IRC Type 450-00 MIL RJ12CL	IRC Type 650-00 MIL RJ11CL	 IRC Type 990
	IRC Type 450-10 MIL RJ12CP	 IRC Type 650-20 MIL RJ11CP	
	 IRC Type 450-20 MIL RJ12CY		
SPECIFICATION			
ELECTRICAL			
Resistance Range	10Ω to 1 Meg.	10Ω to 1 Meg.	10Ω to 1 Meg.
Resistance Tolerance	±10% (Std.)	±5%	±10%
Power Rating	¾W @ 85°C	¾W @ 85°C	¾W @ 40°C
Operating Temperature Range	−65°C to +150°C	−65°C to +150°C	−65°C to +150°C
Temperature Coefficient (Max.)	±150PPM/°C	±150PPM/°C	±150PPM/°C
MECHANICAL			(TO-116 Size)
Dimensions (L x W x H)	1.25 x .190 x .315	1.25 x .275 x .315	.76 x .25 x .20
Total Adjustment Turns	22 ±5	22 ±5	18 Nom.
	Meets the difficult Char. C performance of MIL-R-22097. Bushing mount version available. 20% tolerance reduces costs.	The most stable Infinite Resolution trimmer available. Typical ΔR after Load Life test of 0.8%, far surpassing Char. C performance.	Infinite Resolution timmer in a Dual In-Line package. Eases P.C. board layout.

PRECISION SQUARE & ROUND METAL GLAZE TRIMMERS

TRW®

ELECTRONICS GROUP

	½" SQUARE	⅜" SQUARE	5/16" SQUARE	½" ROUND
	IRC Type 255-00 MIL RJ22CL	 IRC Type 750-10 MIL RJ24BP	IRC Type 850-20	IRC Type 150
	 IRC Type 255-10 MIL RJ22CP			IRC Type 160
	 IRC Type 255-207 MIL RJ22CX	 IRC Type 750-307	 IRC Type 850-208	IRC Type 156-4
	 IRC Type 255-208 MIL RJ22CW	 IRC Type 750-308		
SPECIFICATIONS				
ELECTRICAL				
Resistance Range	10Ω to 2 Meg.	10Ω to 1 Meg.	10Ω to 1 Meg.	10Ω to 2 Meg.
Resistance Tolerance	±10% (Std.)	±10% (Std.)	±10% (Std.)	±10% (Std.)
Power Rating	¾W @ 70°C	½W @ 70°C	0.3W @ 70°C	¾W @ 70°C
Operating Temperature Range	−65°C to +150°C	−65°C to +150°C	−65°C to +150°C	−65°C to +150°C
Temperature Coefficient (Max.)	±150PPM/°C	±150PPM/°C	±150PPM/°C	±150PPM/°C
MECHANICAL **Dimensions (L x W x H)**	(255-00, -207, -208) .50 x .50 x .192	(Type 750-10) .375 x .375 x .195	.312 x .312 x .190	(Type 150) .50 Dia. x .235
Total Adjustment Turns	24 ±2	19 ±2	13 ±2	1
	Meets MIL-R-22097, Char. C requirements. Bushing mount also available.	MIL style performance in choice of 3 pin arrangements.	Smallest Infinite Resolution trimmer available with multiple mechanical turns.	Commercial pricing with speedy single-turn adjustment. Further savings available in 20% tolerance version.

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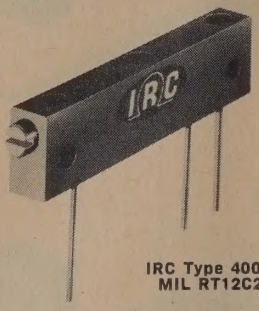
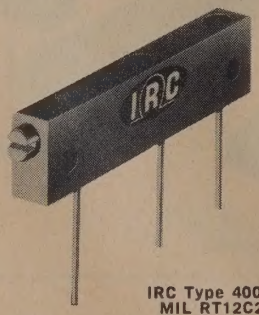
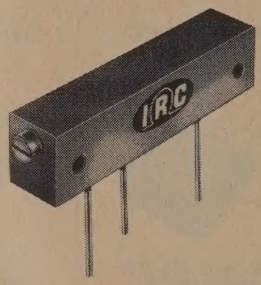
TRW PRECISION RECTANGULAR WIREWOUND TRIMMERS

ELECTRONICS GROUP

	1¼" RECTANGULAR	1¼" RECTANGULAR	DUAL IN-LINE "IC" PACKAGE
	IRC Type 400-00 MIL RT12C2L	IRC Type 600-00 MIL RT11C2L	IRC Type 940
	 IRC Type 400-10 MIL RT12C2P		
	 IRC Type 400-20 MIL RT12C2Y	 IRC Type 600-20 MIL RT11C2P	
SPECIFICATIONS			
ELECTRICAL			
Resistance Range	10Ω to 100K	10Ω to 100K	10Ω to 20K
Resistance Tolerance	±5%	±5%	±10%
Power Rating	1W @ 70°C	1W @ 70°C	1W @ 40°C
Operating Temperature Range	—65°C to +150°C	—65°C to +150°C	—65°C to +125°C
Temperature Coefficient (Max.)	±50PPM/°C	±50PPM/°C	±50PPM/°C
MECHANICAL Dimensions (L x W x H)	1.25 x .190 x .315	1.25 x .275 x .315	(TO-116 Size) .76 x .25 x .20
Total Adjustment Turns	22 ±5	22 ±5	18 Nom.
	Thinnest MIL style trimmer meeting MIL-R-27208. Also available with bushing mount.	Popular MIL-R-27208 trimmer for toughest service. #12-28 bushing mount available.	First Dual in-Line "IC" package in the industry for convenience in P.C. board layout and manufacturing ease.

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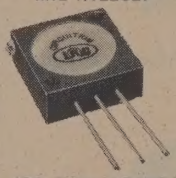
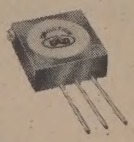
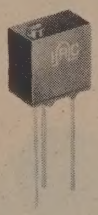
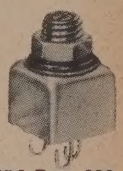
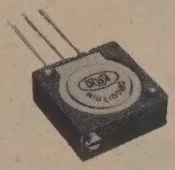
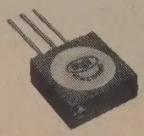
PRECISION SQUARE, ROUND & CUBE WIREWOUND TRIMMERS

TRW®

ELECTRONICS GROUP

	½" SQUARE	⅜" SQUARE	5/16" SQUARE	½" ROUND	5/16" CUBE
	IRC Type 205-00 MIL RT22C2L	IRC Type 700-10 MIL RT24C2P	IRC Type 800-20	IRC Type 100	IRC Type 300
	IRC Type 205-10 MIL RT22C2P			IRC Type 110	IRC Type 310
	 IRC Type 205-207 MIL RT22C2X	 IRC Type 700-307	 IRC Type 800-208	IRC Type 106-4	 IRC Type 320
	 IRC Type 205-208 MIL RT22C2W	 IRC Type 700-308			
SPECIFICATIONS					
ELECTRICAL					
Resistance Range	10Ω to 50K	10Ω to 50K	10Ω to 20K	10Ω to 50K	50Ω to 20K
Resistance Tolerance	±5%	±5%	±5%	±5%	±5%
Power Rating	1W @ 70°C	¾W @ 85°C	0.6W @ 70°C	1W @ 70°C	Types 300 & 310-0.6W Type 320-1W @ 60°C
Operating Temperature Range	−65°C to +175°C	−65°C to +175°C	−65°C to +150°C	−55°C to +150°C	−55°C to +150°C
Temperature Coefficient (Max.)	±50PPM/°C	±50PPM/°C	±50PPM/°C	±50PPM/°C	±70PPM/°C
MECHANICAL **Dimensions (L x W x H)**	(205-00, -207, -208) .50 x .50 x .192	(Type 700-10) .375 x .375 x .195	.312 x .312 x .190	(Type 100) .50 Dia. x .235	(Type 300) 5/16" x 5/16" x 15/64"
Total Adjustment Turns	25 ±2	21 ±2	15 ±2	1	1
	Meets all MIL-R-27208 requirements. Bushing mount also available.	Meets all MIL-R-27208 requirements. Ideal for tight space needs.	Smallest worm and gear actuated trimmer meeting MIL performance while economically priced.	MIL performance at commercial prices. Features speedy single-turn adjustment. Also available in a variety of mounting styles.	Humidity proof performance in a micro-miniature package.

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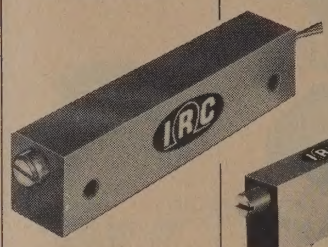
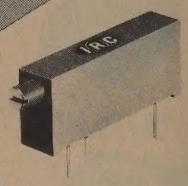
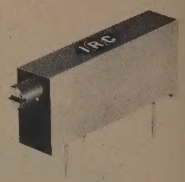
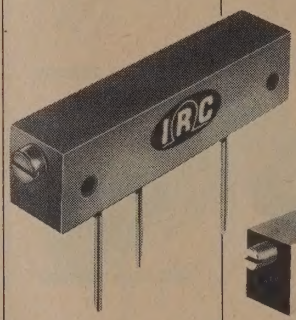
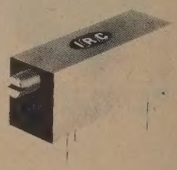
TRW® RECTANGULAR & ROUND COMMERCIAL/INDUSTRIAL TRIMMERS

ELECTRONICS GROUP

	½" ROUND WIREWOUND	½" ROUND METAL GLAZE	1¼" RECTANGULAR WIREWOUND	¾" RECTANGULAR WIREWOUND	¾" RECTANGULAR METAL GLAZE
	IRC Type 500	IRC Type 550	 IRC Type 60-00	 IRC Types 900-20 & 910-20	 IRC Types 950-20 & 960-20
	IRC Type 506	IRC Type 556	 IRC Type 60-20	 IRC Types 920-20 & 930-20	IRC Types 970-20 & 980-20
SPECIFICATIONS					
ELECTRICAL					
Resistance Range	10Ω to 50K	10Ω to 2 Meg.	10Ω to 50K	10Ω to 20K	10Ω to 1 Meg.
Resistance Tolerance	±10%	±30%	±10%	±10%	±10%
Power Rating	½W @ 70°C	½W @ 70°C	1W @ 70°C	1W @ 40°C	¾W @ 25°C
Operating Temperature Range	−55°C to +105°C	−25°C to +105°C	−55°C to +125°C	−65°C to +125°C	−65°C to +125°C
Temperature Coefficient (Max.)	±100PPM/°C	±250PPM/°C	±70PPM/°C	±100PPM/°C	±250PPM/°C
MECHANICAL Dimensions (L x W x H)	(Type 500) ½" Dia. x 15/64"	(Type 550) ½" Dia. x 15/64"	1.25 x .275 x .315	.75 x .16 x .31	.75 x .16 x .31
Total Adjustment Turns	1	1	22 ±5	20 Nom.	20 Nom.
	For applications requiring low initial cost with excellent wirewound stability.	Infinite Resolution, low cost and mechanically rugged design trimmers in the popular ½" dia. size.	Truly a sturdy trimmer that you can "set and forget." Bushing mount also available.	Smallest rectangular trimmer for low cost commercial and industrial needs.	Infiinite Resolution, low-cost trimmers in smallest rectangular package in the industry.

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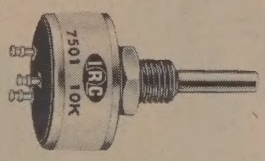
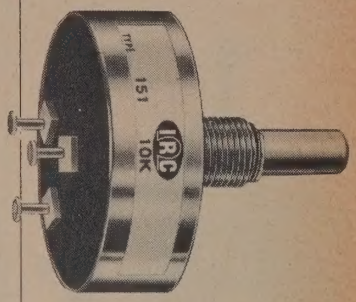
PRECISION ROTARY SINGLE-TURN WIREWOUND TRIMMERS

TRW®

ELECTRONICS GROUP

	½" ROUND	¾" ROUND	1½" ROUND
	IRC Type 5001	 IRC Type 7501	 IRC Type 151
SPECIFICATIONS			
ELECTRICAL			
Resistance Range	10Ω to 50K	50Ω to 75K	100Ω to 100K
Resistance Tolerance	±5%	±5%	±5%
Power Rating	2W @ 40°C	2¼W @ 40°C	3½W @ 40°C
Operating Temperature Range	—55°C to +150°C	—55°C to +150°C	—55°C to +150°C
Linearity	±5%	±1%	±0.5%
MECHANICAL			
Dimensions (Dia. x L)	½" x 63/64"	¾" x 1¼"	1½" x 1½"
Mechanical Rotation	320° ±5° (Stops Std.)	Continuous (Stops available)	Continuous (Stops available)
Electrical Rotation	320° ±5°	345° ±5°	350° ±5°

For panel-mounted applications involving severe environmental or high temperature conditions, these IRC single-turn, metal cased trimming potentiometers handle power requirements to 3½ watts. Moisture sealed construction is available for all types. Center tap available on Types 7501 and 151.

TRW® PRECISION MULTI-TURN WIREWOUND POTENTIOMETERS

ELECTRONICS GROUP

	½″ DIAMETER, 10 TURNS	¾″ DIAMETER, 10 TURNS	¾″ DIAMETER, 10 TURNS	⅞″ DIAMETER, 10 TURNS
	IRC Type 5000	IRC Type 7300	IRC Type 7500	IRC Type 8400
SPECIFICATIONS				
ELECTRICAL				
Resistance Range	25Ω to 100K	25Ω to 100K	50Ω to 250K	25Ω to 100K
Resistance Tolerance	±5% (Std.)	±5%	±5% (Std.)	±5%
Power Rating	1½W @ 40°C	3W @ 40°C	3W @ 40°C	3W @ 40°C
Operating Temperature Range	—55°C to +125°C	—55°C to +105°C	—55°C to +125°C	—55°C to +105°C
Linearity	±.5% (Std.)	±.25%	±.25% (Std.)	±.25%
MECHANICAL Dimensions (Dia. x LBP)	½″ x 1 39/64″	¾″ x 1⅛″	¾″ x 1 55/64″	⅞″ x 1⅛″
Rotation	3600° +4° —0°	3600° +15° —0°	3600° +4° —0°	3600° +15° —0°
	A sturdy, yet compact multi-turn that can take rough handling with its 100 oz. in. Stop Strength.	Compact, plastic case design with readily accessible end terminals.	Unique metal case construction for excellent moisture protection.	Most popular size multi-turns. Also available in 3 turns or with ⅛″ dia. shaft and ¼″ dia. bushing. Center tap available on type 8403.

See page 1544 for Revodex® Counting Dials.

PRECISION MULTI-TURN WIREWOUND POTENTIOMETERS

TRW®

ELECTRONICS GROUP

	1″ DIAMETER, 10 TURNS	1″ DIAMETER, 15 TURNS	1½″ DIAMETER, 10 TURNS
	IRC Type 1000	IRC Type 1215	IRC Type HD-150
SPECIFICATIONS			
ELECTRICAL			
Resistance Range	500Ω to 250K	500Ω to 450K	500Ω to 600K
Resistance Tolerance	±5% (Std.)	±5% (Std.)	±3% (Std.)
Power Rating	3W @ 40°C	4W @ 40°C	5W @ 40°C
Operating Temperature Range	—55°C to +125°C	—55°C to +125°C	—55°C to +100°C
Linearity	±.5% (Std.)	±.1% (Std.)	±.25% (Std.)
MECHANICAL **Dimensions (Dia. x LBP)**	1″ x 1 35/64″	1″ x 2 3/32″	1½″ x 2″
Rotation	3600° +4° —0°	5400° +4° —0°	3600° +4° —0°
	IRC patented stop system gives 100 oz. in. Stop Strength plus availability in 2 to 10 turns.	Metal case construction. Also available in 20 turn version.	For industrial requirements demanding the best resolution and linearity.

See page 1544 for Revodex® Counting Dials.

TECHNO MINIATURE WIREWOUND

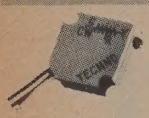
Backed by a vigorous and extensive program of reliability testing, Techno wirewound trimming potentiometers have earned a reputation for quality and performance unmatched in the industry. Complete Quality Assurance facilities, including a fully equipped and MIL-approved test and environmental laboratory, guarantee the consistently superior performance of every Techno trimmer.

Techno's unique design incorporates a limited number of internal parts into a two-half plastic case that permits 100% final inspection prior to sealing. The design provides maximum flexibility and a uniform standard of excellence for a wide variety of military and industrial applications.

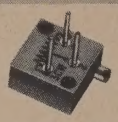
Throughout the electronics industry, designers and engineers have learned to trust Techno when precision trimming potentiometers are needed.

⅜" SQUARE WIREWOUND TRIMMING POTENTIOMETERS

HUMIDITY PROOF



MODEL 117S

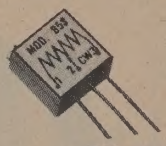


MODEL 126S

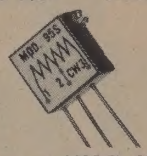
MODEL 133S

MODEL 151S

MODEL 176S



MODEL 85S

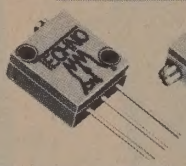


MODEL 95S

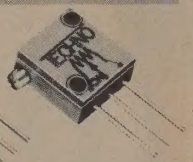
MILITARY — MIL-R-27208

MODEL RT24C2L

MODEL RT24C2P



MODEL RT24C2W



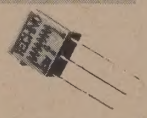
MODEL RT24C2X

MODEL NO.	RESISTANCE RANGE (ohms)[1]	TERMINALS[2]	ADJUSTMENT TURNS[3]
	Chart A		
117S	10 — 50k	L	25
126S	10 — 50k	P	25
133S	10 — 50k	P[4]	25
151S	10 — 50k	W	25
176S	10 — 50k	X	25
85S	10 — 50k	W offset	25
95S	10 — 50k	X offset	25
RT24C2L	10 — 10k	L	25
RT24C2P	10 — 10k	P	25
RT24C2W	10 — 10k	W	25
RT24C2X	10 — 10k	X	25

¼" SQUARE WIREWOUND TRIMMING POTENTIOMETERS

HUMIDITY PROOF

MODEL 12S



MODEL 14S

MODEL 15S

MILITARY — MIL-R-27208

MODEL RT27C2W

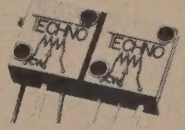
MODEL RT27C2X

MODEL RT27C2P

	Chart B		
12S	10 — 25k	W[5]	25
14S	10 — 25k	X[6]	25
15S	10 — 25k	P[7]	25
RT27C2W	10 — 5k	W[5]	25
RT27C2X	10 — 5k	X[6]	25
RT27C2P	10 — 5k	P[7]	25

SPECIAL WIREWOUND TRIMMING POTENTIOMETERS

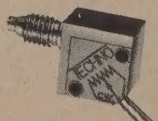
MODEL 191S



MODEL 193S

MODEL 105S

MODEL 160S



MODEL 108S

MODEL 75SCT

	Chart C		
191S Dual Trimmer	10 — 50k[8]	X	25
193S Dual Trimmer	10 — 50k[8]	L	25
105S Panel Mount	10 — 50k	L	25
160S Panel Mount	10 — 50k	SH	25
108S Shaft Lock	10 — 50k	L	25
75SCT Center Tap	100 — 20k	P	25

TECHNO-COMPONENTS CORP. A SUBSIDIARY OF OAK ELECTRO/NETICS CORP

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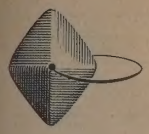
TRIMMING POTENTIOMETERS



Established Reliability — Style RTR24

Techno provides 100% screening in accordance with MIL-R-39015 for ⅜" square trimming potentiometers in P, W and X styles. Consult factory for details.

SIZE (Inches)	POWER RATING (watts)	TEMPERATURE RANGE (°C)
.375 x .375 x .150	1 @ 50°C	−65 to 175
.375 x .375 x .218	1 @ 50°C	−65 to 175
.375 x .375 x .190	1 @ 50°C	−65 to 175
.405 x .375 x .185	1 @ 50°C	−65 to 175
.405 x .375 x .185	1 @ 50°C	−65 to 175
.375 x .375 x .203	1 @ 50°C	−65 to 175
.375 x .375 x .203	1 @ 50°C	−65 to 175
.375 x .375 x .150	¾ @ 85°C	−65 to 175
.375 x .375 x .218	¾ @ 85°C	−65 to 175
.405 x .375 x .185	¾ @ 85°C	−65 to 175
.405 x .375 x .185	¾ @ 85°C	−65 to 175
.250 x .250 x .156	½ @ 50°C	−65 to 175
.250 x .250 x .156	½ @ 50°C	−65 to 175
.250 x .250 x .185	½ @ 50°C	−65 to 175
.250 x .250 x .156	⅜ @ 85°C	−65 to 175
.250 x .250 x .156	⅜ @ 85°C	−65 to 175
.250 x .250 x .185	⅜ @ 85°C	−65 to 175
.405 x .775 x .185	1 @ 50°C	−65 to 175
.405 x .775 x .185	1 @ 50°C	−65 to 175
.453 x .437 x .282	1 @ 50°C	−65 to 175
.453 x .468 x .282	1 @ 50°C	−65 to 175
.453 x .437 x .282	1 @ 50°C	−65 to 175
.375 x .375 x .250	1 @ 50°C	−65 to 175

STANDARD RESISTANCES

CHART A

RESISTANCE (ohms)	MILITARY RT24	HUMIDITY PROOF	NOMINAL RESOLUTION (%)
10	X	X	1.1
20	X	X	.85
50	X	X	.65
100	X	X	.51
200	X	X	.40
500	X	X	.45
1K	X	X	.34
2K	X	X	.27
5K	X	X	.20
10K	X	X	.16
20K		X	.13
50K		X	.10

CHART B

RESISTANCE (ohms)	MILITARY RT27	HUMIDITY PROOF	NOMINAL RESOLUTION (%)
10	X	X	1.65
20	X	X	1.35
50	X	X	1.13
100	X	X	.82
200	X	X	.62
500	X	X	.62
1K	X	X	.49
2K	X	X	.34
5K	X	X	.27
10K		X	.21
20K		X	.17
25K		X	.16

CHART C

RESISTANCE (ohms)	NOMINAL RESOLUTION (%)	RESISTANCE (ohms)	NOMINAL RESOLUTION (%)
10	1.1	2K	.27
20	.85	5K	.20
50	.65	10K	.16
100	.51	20K	.13
200	.40	25K	.12
500	.45	35K	.11
1K	.34	50K	.10

NOTES:

1. Tolerance: ±5%. Closer tolerances available.
2. Terminal legend: L = stranded insulated leads. P = printed wiring pins, base mounted. W = printed wiring pins, edge mounted 180° from adjustment shaft. X = printed wiring pins edge mounted 90° from adjustment shaft. SH = solder hooks.
3. All models with clutch stop rotation.
4. Standoffs to facilitate printed wiring board washing.
5. Available with Teflon insulated 5-inch leads as Model 11S.
6. Available with Teflon insulated 5-inch leads as Model 13S.
7. Available with .030" printed wiring board standoffs as Model 16S.
8. Resistance value per section.

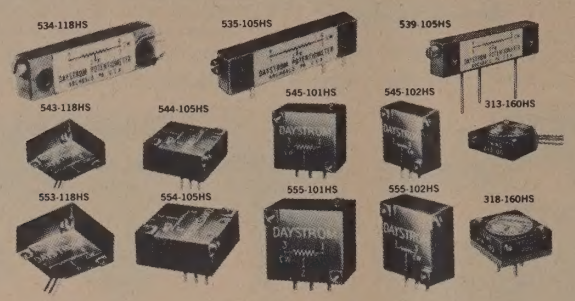
U.S. Patent Numbers 3,096,498 and 3,195,092

TECHNO-COMPONENTS CORP. A SUBSIDIARY OF OAK ELECTRO/NETICS CORP

7803 LEMONA AVENUE ▪ VAN NUYS, CALIFORNIA 91405 ▪ (213) 781-1642 ▪ TWX: 910-495-2015

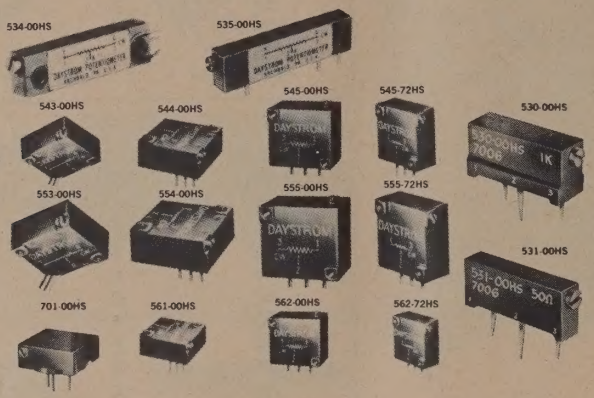
WESTON® POTENTIOMETERS

MILITARY GRADE WIREWOUND SQUARETRIM®



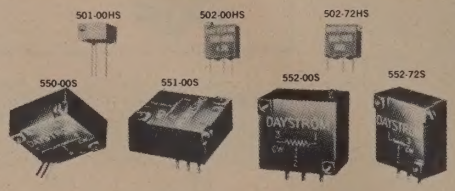
MODEL No.	TERMINALS
534-118HS	L
535-105HS	P
539-105HS	Y
543-118HS	L
544-105HS	P
545-101HS	W
545-102HS	X
553-118HS	L
554-105HS	P
555-101HS	W
555-102HS	X
313-160HS	L
318-160HS	P

GENERAL PURPOSE WIREWOUND SQUARETRIM®



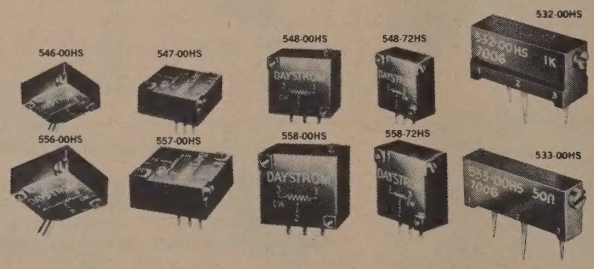
530-00HS	P
531-00HS	P
534-00HS	L
535-00HS	P
539-00HS	Y
543-00HS	L
544-00HS	P
545-00HS	W
545-72HS	X
553-00HS	L
554-00HS	P
555-00HS	W
555-72HS	X
561-00HS	P
562-00HS	W
562-72HS	X
701-00HS	P

INDUSTRIAL COMMERCIAL MULTI-TURN WIREWOUND-TRIMMING



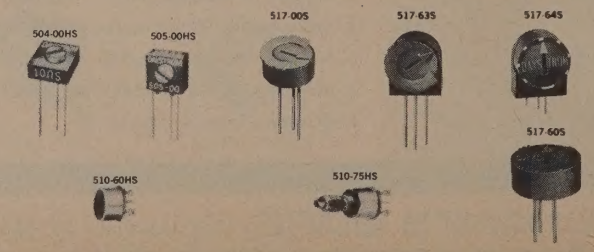
501-00HS	P
502-00HS	W
502-72HS	X
550-00S	L
551-00S	P
552-00S	W
552-72S	X

HI-STABILITY CERMET ELEMENT



532-00HS	P
533-00HS	P
546-00HS	L
547-00HS	P
548-00HS	W
548-72HS	X
556-00HS	L
557-00HS	P
558-00HS	W
558-72HS	X

WIREWOUND SINGLE TURN



504-00HS	P
505-00HS	X
510-60HS	S
510-00HS	P
510-75HS	S
517-00S	P
517-60S	P
517-63S	X
517-64S	X

a Schlumberger company

WESTON® WESTON COMPONENTS DIVISION
Archbald, Pa. 18403

MILITARY DESIGNATION	SIZE INCHES	THICK INCHES	STAND. RES. RANGE (OHMS)	RES. TOL.	PWR. RATING (WATTS)	MAX. OPER. TEMP. FROM −55 DEG. C.	HUMIDITY	STOPS	MECH. ADJUST. (TURNS)
RT12C2L	.315 x 1.25	.190	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	24
RT12C2P	.315 x 1.25	.190	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	24
RT12C2Y	.325 x 1.25	.195	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	24
RT24C2L	.375 x .375	.150	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
RT24C2P	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
RT24C2W	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
RT24C2X	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
RT22C2L	.500 x .500	.187	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	35
RT22C2P	.500 x .500	.220	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	35
RT22C2W	.500 x .500	.220	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	35
RT22C2X	.500 x .500	.220	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	35
RTR22DL	.500 x .500	.187	200—50K	5%	.75 @ 85°C	150	MIL-R-39015	Standard	45
RTR22DP	.500 x .500	.255	200—50K	5%	.75 @ 85°C	150	MIL-R-39015	Standard	45
N.A.	.350 x .75	.280	10—35K	10%	1 @ 40°C	125	MIL-R-27208	Standard	15
N.A.	.310 x .75	.165	10—35K	10%	1 @ 40°C	125	MIL-R-27208	Standard	15
N.A.	.315 x 1.25	.190	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	24
N.A.	.315 x 1.25	.190	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	24
N.A.	.325 x 1.25	.195	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	24
N.A.	.375 x .375	.150	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
N.A.	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
N.A.	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
N.A.	.375 x .375	.160	10—50K	5%	.75 @ 85°C	150	MIL-R-27208	Standard	25
N.A.	.500 x .500	.187	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	MIL-R-27208	Standard	35
N.A.	.250 x .250	.170	10—20K	5%	.2 @ 70°C	150	MIL-R-27208	Standard	13
N.A.	.250 x .250	.170	10—20K	5%	.2 @ 70°C	150	MIL-R-27208	Standard	13
N.A.	.250 x .250	.170	10—20K	5%	.2 @ 70°C	150	MIL-R-27208	Standard	13
N.A.	.500 x .500	.230	10—50K	5%	1 @ 70°C	150	Steady State	Standard	37
N.A.	.312 x .312	.175	10—20K	5%	.6 @ 70°C	150	MIL-R-27208	Standard	15
N.A.	.312 x .312	.200	10—20K	5%	.6 @ 70°C	150	MIL-R-27208	Standard	15
N.A.	.312 x .312	.190	10—20K	5%	.6 @ 70°C	150	MIL-R-27208	Standard	15
N.A.	.500 x .500	.187	10—50K	5%	1 @ 70°C	150	Steady State	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	Steady State	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	Steady State	Standard	35
N.A.	.500 x .500	.220	10—50K	5%	1 @ 70°C	150	Steady State	Standard	35
N.A.	.350 x .75	.280	10—2 Meg	10%	.75 @ 40°C	125	MIL-R-22097	Standard	15
N.A.	.350 x .75	.165	10—2 Meg	10%	.75 @ 40°C	125	MIL-R-22097	Standard	15
N.A.	.375 x .375	.150	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	25
N.A.	.375 x .375	.160	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	25
N.A.	.375 x .375	.160	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	25
N.A.	.375 x .375	.160	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	25
N.A.	.500 x .500	.187	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	35
N.A.	.500 x .500	.220	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	35
N.A.	.500 x .500	.220	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	35
N.A.	.500 x .500	.220	10—2 Meg	10%	.5 @ 85°C	150	MIL-R-22097	Standard	35
N.A.	.312 x .312	.175	10—20K	5%	.6 @ 70°C	150	MIL-R-27208	Standard	1
N.A.	.312 x .312	.190	10—20K	5%	.6 @ 70°C	150	MIL-R-27208	Standard	1
N.A.	.360 Dia.	.250	10—30K	5%	1 @ 50°C	175	H-Cyclic	Standard	1
N.A.	.360 Dia.	.250	10—30K	5%	1 @ 50°C	175	H-Cyclic	Standard	1
N.A.	.360 Dia.	.250	10—30K	5%	1 @ 50°C	175	H-Cyclic	Standard	1
N.A.	.500 Dia.	.253	10—50K	5%	1 @ 55°C	125	Steady State	Positive	1
N.A.	.500 Dia.	.225	10—50K	5%	1 @ 55°C	125	Steady State	Positive	1
N.A.	.580 x .500	.343	10—50K	5%	1 @ 55°C	125	Steady State	Positive	1
N.A.	.550 x .500	.315	10—50K	5%	1 @ 55°C	125	Steady State	Positive	1

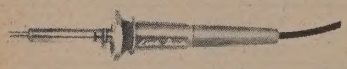
AB AMERICAN BEAUTY

SOLDERING IRONS AND ACCESSORIES

Specify voltage, wattage and other options on each order. If your plug needs differ from standard (plug cap on 2-wire cord, NEMA-type plug on 3-wire cord) specify plug manufacturer's name and catalog number.

For complete catalog of AB soldering equipment, ask for Catalog No. 230CP.

LITTLE DANDY



The economy-priced miniature iron that stands up to production line conditions. Steel cored heating element with non-ceramic insulator. Molded handle, aerated finger grip (impervious to oil, perspiration). Balanced, non-roll design. Plug type tips.

Cat. No.	Wattage Std.	Wattage Spec.	Tip Dia.	Shpg. Wt.	Net
3108	20	25/30	1/8"	1/2 lb.	$5.15
3110	25	30/35	3/16"	1/2 lb.	5.15
3112	40	50/60	1/4"	1/2 lb.	6.90

NOTES: Three wattage options each model (3108: 20, 25, 30. 3110: 25, 30, 35. 3112: 40, 50, 60.) For 3-wire cord with NEMA plug, add "S3" to catalog number and $0.70 to price.

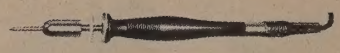
BANTAMS

Small irons of traditional American Beauty quality in a wide range of inputs and tip diameters.

Cat. No.	Wattage	Tip Dia.	Shpg. Wt.	Net
3114	60	1/4"	1 lb.	$8.80
3118	30	1/8"	3/4 lb.	7.00
3118-X	50	1/8"	3/4 lb.	8.00
3118-XP	50	1/8"	3/4 lb.	8.00
3118-SC	30	1/8"	3/4 lb.	7.00
3118-SCP	30	1/8"	3/4 lb.	7.00
3120	30	3/16"	3/4 lb.	7.10
3120-X	50	3/16"	3/4 lb.	8.00
3120-XP	50	3/16"	3/4 lb.	8.00
3120-SC	30	3/16"	3/4 lb.	7.10
3120-SCP	30	3/16"	3/4 lb.	7.10

NOTES: In above catalog numbers, "X" means "extra heat for continuous duty only"; "SC" means "short casing"; "P" means "pencil type handle". For 3-wire cord with NEMA plug, add "S3" to catalog number and $1.40 to price.

B-SERIES IRONS



Best miniature at any price. Advanced design. Precise balance, floating element for fast heat recovery. *Boxed with 3 assorted tips.

Cat. No.	Wattage	Tip Point Diameter	Shpg. Wt.	Net
B-2000L	22.5	*	1/2 lb.	$11.35
B-2500-L	30	*	1/2 lb.	11.35

NOTES: *1 each 1/8" chisel, 1/16" chisel, 1/8" cone. For 3-wire cord with NEMA plug, add "S3" to catalog number and $0.70 to price.

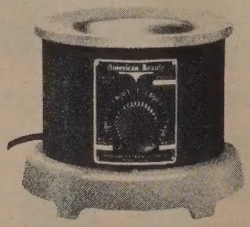
STANDARD IRONS

Production lines around the world use hundreds of thousands of these proven American Beauties.

Cat. No.	Wattage Std.	Wattage Spec.	Tip Dia.	Shpg. Wt.	Net
3125	60	75	1/4"	1 lb.	$ 8.80
3128	60	75	1/4"	1 lb.	8.00
3138	100	130/150	3/8"	2 lbs.	11.35
3138-X	175	—	3/8"	2 lbs.	12.75
3138-Y	100	130/150	1/4"	2 lbs.	11.35
3138-XY	175	—	1/4"	2 lbs.	8.00
3158	200	—	5/8"	3 lbs.	14.00
3158-X	250	300	5/8"	3 lbs.	15.40
3178	300	—	7/8"	4 lbs.	18.45
3178-X	300	400	7/8"	4 lbs.	19.75
3198	550	675	1 1/8"	5 3/4 lbs.	22.85

NOTES: "X" in catalog number means "extra hot, for continuous duty only." For 3-wire cord with NEMA plug, add "S3" to catalog number and $1.40 to price.

GENERAL PURPOSE SOLDER POTS

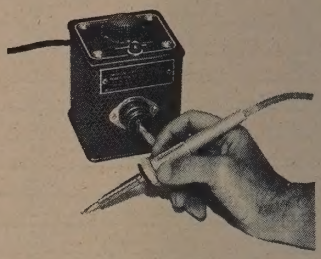


Crucibles of cast iron, chemically stable to keep solder pure. Center tapped for dross skimmer or extra fixturing. Wide lipped for extra fixture mounting. Shallow; 1 1/2" deep. Heat solder to 400° in 15 minutes — 750° in 25 minutes. Adjustable, direct reading thermostat.

Cat. No.	Solder Capacity	Shpg. Wt.	Net
300	1 lb.	6 1/2 lbs.	$33.35
301	(Same as NO. 300, with dross skimmer)	6 1/2 lbs.	36.60
600	2 1/2 lbs.	9 lbs.	35.10
601	(Same as NO. 600, with dross skimmer)	9 lbs.	38.30

NOTES: Standard cords are 2-wire SJO; for 3-wire cord, add "S3" to catalog number and $1.40 to price.

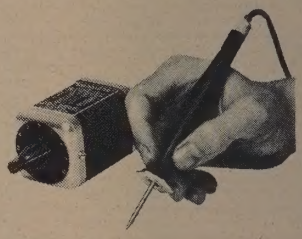
V-3000 SYSTEM



New type system dependably dials and maintains any tip temperature from 350° to 750°. High reserve for fast recovery. Iron is 40-watt, uses any 3/16" plug type tip.

Cat. No.	Wattage	Shpg. Wt.	Net
V-3000	Variable	5 lbs.	$47.00

TRANSFORMER TYPE IRONS



Use these American Beauties where isolation from line voltage is necessary. Heating elements in tips for quick tip heat changes. T-6 has variable heat dial. T-12 and T-30, non-variable.

Cat. No.	Wattage Std.	Wattage Spec.	Tip Dia.	Shpg. Wt.	Net
T-6	Variable		9/64"	1 1/2 lbs.	$25.50
T-12E/W T-1216	17	20	1/16"	1 1/2 lbs.	17.00
T-30E/W T-3016	30	25	1/16"	2 lbs.	19.15

INFINITELY VARIABLE POWER CONTROL UNIT

Dials and accurately controls soldering iron tip heat. (Also reliably controls small motor speeds.) Wattage: zero to 125W; infinitely variable, stepless. Fused. Pilot lighted.

Cat. No.	Shpg. Wt.	Net
477	3 3/4 lbs.	$25.50

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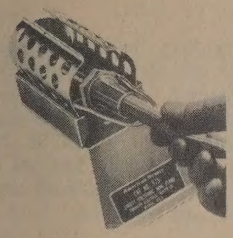
AB AMERICAN BEAUTY

SOLDERING IRONS AND ACCESSORIES

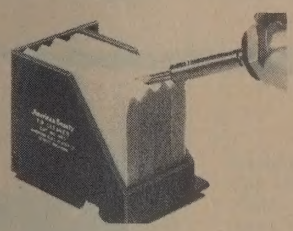
SAFETY SOLDERING IRON STAND



Gravity controlled. Opens, closes automatically. Operator doesn't look up from work. Accommodates all miniature irons.

Cat. No.	Descrip.	Shpg. Wt.	Net
575	Soldering Stand	1 lb.	$3.35

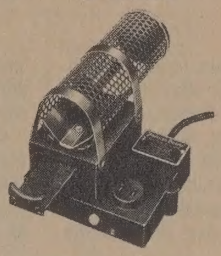
ONE-PASS TIP CLEANERS



Cleans all sides of tip in one motion. Eliminates tip damage, linting, stray solder pellets. Rubberized base, bored for mounting.

Cat. No.	Descrip.	Shpg. Wt.	Net
480	Complete set	½ lb.	$2.50
480-S	Sponges only (ea.)	3 oz.	.16

TEMPERATURE REGULATING STANDS



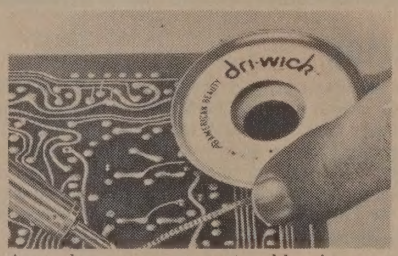
Maintains soldering iron at preset temperature during idle and intermittent use. Minimizes warmup, prevents overheating, saves current. Pilot light. Adjustable to length of iron.

Cat. No.	Use	Shpg. Wt.	Net
475	For 100W-600W irons	3¼ lbs.	$11.35
476	For 30W-85W irons	3¼ lbs.	11.35

NOTES: For performated guard (as shown) add "SG" to catalog number and $1.40 to price. Standard cord is HPD; if you want either 2-wire or 3-wire SJO cord specify on order.

DRI-WICK

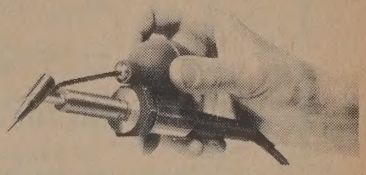
"The de-soldering tool on a spool"



Any place you can put solder in, you can take it out with Dri-Wick. Just lay Dri-Wick on joint and apply tip of soldering iron. Capillary action draws all solder out of joint, ready for salvage or re-work. Made of specially woven copper, each strand coated with water-white resin. Packed 5 ft. per spool, 25 spools per carton.

Cat. No.	For Solder Pad Size	Net (per spool) 1 to 24	Unbroken Cartons
484-1	.060" or smaller	$1.49	$1.19
484-2	.060" to .125"	1.49	1.19
484-3	.125" to .190"	1.49	1.19
484-4	.190" to .250"	1.69	1.35
484-6	.250" or larger	1.49	1.19

LITTLE DANDY DE-SOLDERING TOOL



Hollow tip surrounds connection, melts solder, vacuums work clean. Use on miniature or standard components in printed circuits and some conventional wiring. Tool combines new, simplified de-soldering attachment with Little Dandy (#3112) handle and heating element. Heats to working temperature in 2 minutes. Tips are replaceable. Plug-type insertion of attachment into heating element.

Cat. No.	Description	Shpg. Wt.	Net
490	Tool Complete	½ lb.	$13.25
495	De-soldering attachment only	½ lb.	6.90
497-60	Tip only w/ .060" aperture	¼ lb.(dz.)	.48
497-50	Tip only w/ .050" aperture	"	.48
497-40	Tip only w/ .040" aperture	"	.48
497-30	Tip only w/ .030" aperture	"	.48

NOTE: For 3-wire cord with NEMA plug, order "490-S3" and add $ to price.

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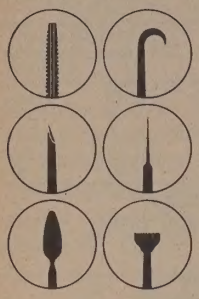
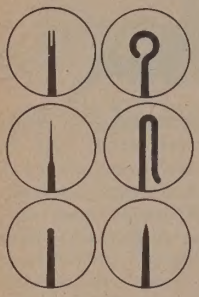
CIRCON microElectronics MicroTools • Hardware • Indicator Lights



MicroTools

70 tip configurations are precision forged, ground, and lapped onto 0.030″ diameter steel shafts. The unique features of the CIRCON MicroTool line are the micro-size of the working tips, the range of tip designs, and the perfectly balanced interchangeable MicroTool Handle. Tip designs include a MicroScale having divisions of 0.002″, a Tungsten MicroNeedle with a 0.00025″ radius point, and a MicroKnife sharpened to surgical standards. The entire area behind the Tip is 24 carat gold plated to insure corrosion resistance and freedom from contamination.

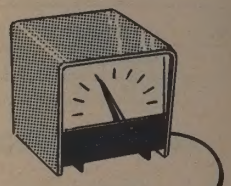
CIRCON has prepared the most popular MicroTool combinations in standard kits of 8 (KMT 3), 23 (KMT 2), and 67 (KMT 1) instruments. Each set is packaged in a custom, foam lined, hardwood case for maximum accessibility and protection.

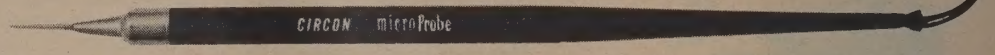


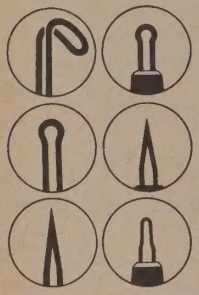
MicroProbes

20 electrical MicroProbe tips are designed specifically for Microcircuit testing. Each gold plated MicroProbe is mated to a carefully balanced insulated handle and light lead wire to yield optimum control and "feel." Among the tip designs is a Tungsten Probe having a 0.00025″ radius point. CIRCON MicroProbes may be selected with a 0°, 45°, or a 90° bend in the region of the Tip for maximum accessibility and visibility.

CIRCON offers MicroProbe sets for specific applications, such as the 5 unit Thin Film Kit (KMT 16TF), and the 20 unit Quality Control Kit (KMT 16QC).

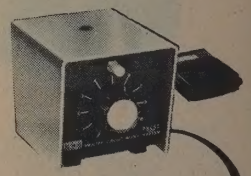






MicroSoldering

CIRCON offers the smallest and most precise manual MicroSoldering instrument on the market. The six special purpose MicroSoldering tips are machined onto high strength 0.015″ diameter wire which does not require tinning. The light weight, pencil type Handle permits accurate work on the smallest elements in difficult areas. The Controller regulates tip temperature from 200° to 1800° F. by dial setting, while the heat pulse duration is foot switch controlled. In conjunction with CIRCON'S gold plated Solder Balls, the Pulse Dot MicroSoldering System allows precise control of solder, flux, rise time, temperature, and total heat input.



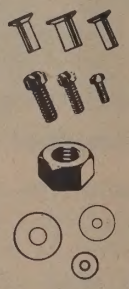
MicroElectronic Hardware

(Delivery from stock. Minimum order 100 units)

Eyelets—Miniature Rolled, Flat, and Funnel type electronic eyelets. Every eyelet a precision product with absolute uniformity from part to part. Shot Burnished—Gold Plated eyelets meeting **NASA** and **MIL** Specs are stocked; cadmium, tin, silver, and solder plated upon order. Lengths from 1/64″ to 7/16″ in 1/32″ increments. The Circuit Designers Eyelet Kit (EK-1) is a valuable aid for design and production work.

Eyelet Setting Tools—Superior quality tools designed to provide flexible inexpensive tooling for precision setting of CIRCON eyelets. May be used in automatic or manual press equipment or simple vise-held tools.

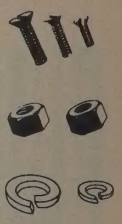
Rivets & Terminal Lugs—For instrument, electronic and printed circuit applications involving space requirements smaller than normal subminiature hardware permits. Sizes from 1/16″ x 1/32″ and up in 1/32″ increments. Shot-burnished and 24 carat gold-plated.



Screws—Precision instrument screws of stainless steel or brass plated with gold, nickel, and cadmium. Instrument head (oval modified fillister) or flat head (82°). Sizes from #000 to #4—Lengths from ⅛″ and up in 1/16″ increments. Taps are available for all screw sizes.

Nuts—Nickel, gold, and cadium plated brass instrument nuts in sizes from #000 to #4. Precision manufactured to **NASA** and **MIL** specs.

Washers—Split Lock, Insulating, and Flat instrument washers in sizes #000 to #4. Precision manufactured to be smooth, clean and free from burrs. Suitable for use in vigorous environment, at all frequencies.



Miniature Indicator Lights

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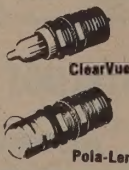
OmniVue

Two unique lines offering unparalleled flexibility for the Panel Designer. CIRCON'S MicroMiniature indicators are 0.25″ diameter and may be mounted in densities of 14 per square inch.

The ⅜″ diameter SubMiniature Indicators may be combined into more than 1500 possible configurations due to interchangeable components. Each Subminiature Indicator may incorporate any of: 5 lens types; neon or incandescent bulbs; 16 to 1 range in brightness; insulated or grounded mounting; 2 standard bases; and 7 colors. Of special interest are CIRCON's Pola-Lens variable intensity indicator, and the BugEye 3-D plastic lens available in standard shapes or on a low volume custom basis.

The Panel Designer's Kit (MIK-3) containing CIRCON'S complete line is a valuable aid in design and prototype work. Hundreds of configurations possible at an $25 introductory price.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	Ag	Cu	Zn	Cd	Other			
5	**5**	**89**	**0**	**0**	**P6**	**1190**	**1300**	**4.37**
15	**15**	**80**	**0**	**0**	**P5**	**1190**	**1300**	**4.45**
35	**35**	**26**	**21**	**18**		**1125**	**1295**	**4.90**
45	**45**	**15**	**16**	**24**		**1125**	**1145**	**4.92**
50	**50**	**15.5**	**16.5**	**18**		**1160**	**1175**	**5.00**
503	**50**	**15.5**	**15.5**	**16**	**Ni3**	**1170**	**1270**	**5.00**
355	**56**	**22**	**17**	**0**	**Sn5**	**1145**	**1205**	**5.00**
I-401	5	0	16.6	78.4		480	600	4.53
377	5	0	0	95		640	740	4.60
B-70	7	85			Sn8	1225	1805	5.42
A-4	9	53	38	0		1410	1565	4.50
20	20	45	30	5		1140	1500	4.64
A-11	20	45	35	0		1315	1500	4.68
A-79	25	52.5	22.5	0		1250	1575	4.71
A-13	30	38	32	0		1370	1410	4.67
250	40	30	28	0	Ni2	1220	1435	4.76
254	40	30	25	0	Ni5	1220	1580	4.72
A-14	40	36	24	0		1235	1415	4.80
105	45	30	12	0	Mn13	1298	1298	4.76
A-18	45	30	25	0		1225	1370	4.82
A-25	50	34	16	0		1250	1425	4.99
54	54	40	5	0	Ni1	1340	1575	5.06
A-33	60	25	15	0		1245	1325	5.02
60	60	30	0	0	Sn10	1115	1325	5.23
T-50	62.5	32.5	0	0	Ni5	1435	1590	5.19
Easy	65	20	15	0		1240	1325	5.06
Medium	70	20	10	0		1275	1360	5.14
301	72	28	0	0		1435	1435	5.24
AE-102	72	27.8	0	0	Li.2	1410	1410	5.22
K-427	75	0	25	0		1300	1345	5.06
T-51	75	24.5	0	0	Ni.5	1435	1475	5.30
Hard	75	22	3	0		1365	1450	5.28
T-52	77	21	0	0	Ni2	1435	1525	5.32
A-49	80	16	4	0		1345	1490	5.29
AE-100	92.8	7.0	0	0	Li.2	1410	1610	5.46
S-475	95	0	0	0	Al 5	1550	1600	5.73

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SOURCE OF NUMBER AND SPECIFICATION							
ASTM B260-62T and AWS A5.8-62T	Mil-B 15395-A Ships-Amend 30 Nov. 1962 Superseding Navy 47-S-13E	Interim Fed. Spec. QQ-B-00655a (Army Ord.)	All Federal Government Agencies Fed. Spec. QQ-S-561d	ASME Boiler Pressure Vessel Code Sec. 1 X	Society of Automotive Engineers Aeronautic Materials Spec.	SILVALOY BRAZING ALLOY	Silver Content of Alloys
BCup-5	III	FS-BCuP-5	3	BCuP-5	—	15	15
BCup-3	—	FS-BCuP-3	—	BCuP-3	—	5	5
BAg-1	VII	FS-BAg-1	—	BAg-1	AMS4769	45	45
BAg-2	VIII	FS-BAg-2	—	BAg-2	AMS4768	35	35
BAg-3	V	FS-BAg-3	5	BAg-3	AMS4771	503	50
BAg-1a	IV	FS-BAg-1a	4	BAg-1a	AMS4770B	50	50
BAg-4	—	FS-BAg-4	—	BAg-4	—	250	40
—	0	—	0	—	—	A-11	20
BAg-5	I	FS-BAg-5	1	BAg-5	—	A-18	45
BAg-6	—	FS-BAg-6	—	BAg-6	—	A-25	50
BAg-13	—	—	—	—	AMS4772A	54	54
BAg-7	—	FS-BAg-7	—	BAg-7	—	355	56
BAg-8	—	FS-BAg-8	—	BAg-8	—	301	72
BAg-19	—	—	—	—	—	AE-100	92.5
BAg-8a	—	—	—	—	—	AE-102	72
	II	FS-BAg-9	2	BAg-9	—	EASY	65
	—	FS-BAg-10	—	BAg-10	—	MEDIUM	70
	—	FS-BAg-11	—	BAg-11	—	HARD	75
BAg-18	—	FS-BAg-12	—	—	AMS4773	60	60
	—	—	—	—	AMS4774	H-700	63
	—	FS-BAgMn	—	BAgMn	AMS4766	850	85
A.W.S. Brazing Flux No. 3A	FED. SPEC. O-F-499c		TYPE B		AMS 3410D	ULTRA FLUX	
Flux No. 4	FED. SPEC. O-F-499c		TYPE B			ALUMINUM BRONZE FLUX	
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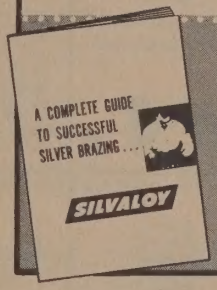

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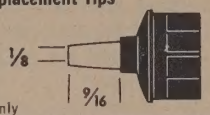
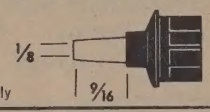
	UNIT Quantity	PRICE Each
DS007-17 Deluxe Model Soldapullt® desoldering tool	1-25	$9.95
	26-50	$9.20
	51-100	$8.45
	101-500	$7.70
	501-up	$7.20
DRT008-18 Deluxe Replacement Tips	1-25	$2.00
	26-50	$1.75
	51-100	$1.50
	101-up	$1.25
SS001-11 Standard Model Soldapullt® desoldering tool	1-25	$5.95
	26-50	$5.50
	51-100	$5.00
	101-500	$4.50
	501-up	$4.00
SRT002-12 Standard Replacement Tips	1-25	$1.50
	26-50	$1.25
	51-100	$1.00
	101-up	$ .75
MMS005-15 Micro Tipped Standard Model Soldapullt® desoldering tool	1-25	$6.95
	26-50	$6.50
	51-100	$6.00
	101-500	$5.50
	501-up	$5.00
MRT006-16 Micro Replacement Tips	1-25	$1.50
	26-50	$1.25
	51-100	$1.00
	101-up	$ .75
LTS003-13 Long Tipped Standard Model Soldapullt® desoldering tool	1-25	$6.95
	26-50	$6.50
	51-100	$6.00
	101-500	$5.50
	501-up	$5.00
LRT004-14 Long Tipped Replacement Tips	1-25	$2.00
	26-50	$1.75
	51-100	$1.50
	101-up	$1.25
SV026 Soldavac™ desoldering tool	1-25	$2.95
	26-50	$2.80
	51-100	$2.65
	101-500	$2.50
	501-up	$2.35
SRT002-12 Soldavac™ Replacement Tips	1-25	$1.50
	26-50	$1.25
	51-100	$1.00
	101-up	$ .75

wt. 5 oz. △ □



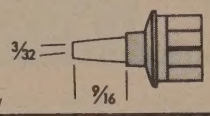
fits on Deluxe Model DS007 only

wt. 4 oz. △ □



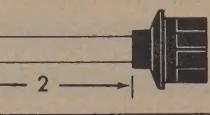
fits Standard Model SS001 and Soldavac Model SV026 only

wt. 4 oz. △ □



fits Micro tipped Standard Model MMS005 only

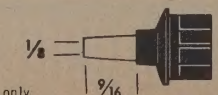
wt. 4 oz. △ □



fits Long tipped Standard Model LTS003 only

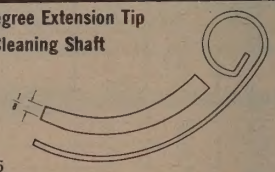
wt. 3 oz. △ □

U.S. AND FOREIGN PATENTS APPLIED FOR

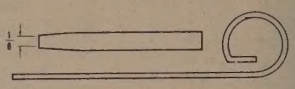


fits Soldavac Model SV026 and Soldapullt Model SS001 only

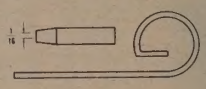
	UNIT Quantity	PRICE Each
45ET011-21 45 Degree Extension Tip and Cleaning Shaft	1-25	$2.75
	26-50	$2.50
	51-100	$2.25
	101-up	$2.00
LET012-22 Long Extension Tip and Cleaning Shaft	1-25	$2.25
	26-50	$2.00
	51-100	$1.75
	101-up	$1.50
MET013-23 Micro Extension Tip and Cleaning Shaft	1-25	$2.00
	26-50	$1.75
	51-100	$1.50
	101-up	$1.25
MIN014-24 Mini Tip Extension and Cleaning Shaft	1-25	$2.00
	26-50	$1.75
	51-100	$1.50
	101-up	$1.25



fits all models except Micro Tip MMS005



fits all models except Micro Tip MMS005



fits all models except Micro Tip MMS005

AM010-20 Direct Factory Trade In

Customers may trade in their old, worn out Soldapullt, Ersa or Soldavac tools at a cost of only 60% of the retail price.

OLD TOOLS MUST ACCOMPANY TRADE IN REQUEST

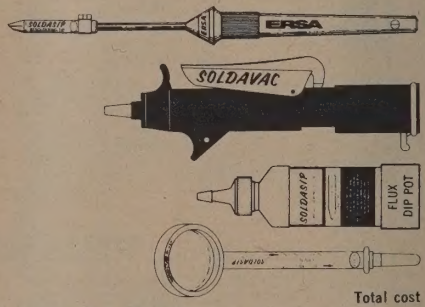
Trade in allowance examples

SS001-11	1-25 pcs.	26-50 pcs.
Retail cost	$5.95	$5.50
Trade in allowance	$2.38	$2.20
Your cost	$3.57	$3.30
15% handling chg.	.54	.50
Total	$4.11	$3.80

X-34 Experimenter's SOLDER ABILITY Kit

AVAILABLE AS DIRECT FACTORY OFFER OR FROM PARTICIPATING DISTRIBUTORS.

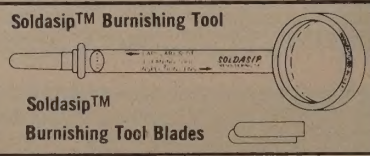
$10.95 — 30 DAY FREE TRIAL



	$6.50
	$2.95
	$1.75
	$1.50
Total cost	$12.70
You save	$1.75
Your cost only	$10.95

For fast soaking action, Use both our Soldasip Resoldering Flux and Soldasip Burnishing tool.

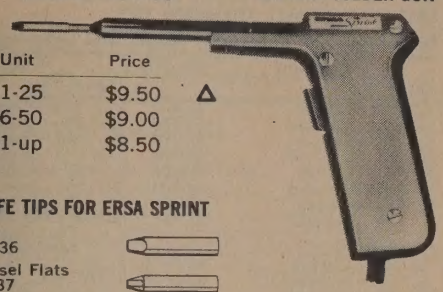
	UNIT	PRICE
BT028 Soldasip™ Burnishing Tool	1-25	$1.50
	26-50	$1.40
	51-100	$1.30
	101-up	$1.20
RBB029 Soldasip™ Burnishing Tool Blades	1-25	$ .50
	26-50	$ .40
	51-up	$ .30



△ 6 month warranty on tools only. Warranty does not include tips.
□ 12 page instruction included with tools

+ RESOLDERING = SOLDER (EDSYN T.M.) ABILITY

* ERSA SPRINT 850KD/115V-35 INSTANT SOLDER GUN



Unit	Price
1-25	$9.50
26-50	$9.00
51-up	$8.50

Δ

ERSADUR LONG LIFE TIPS FOR ERSA SPRINT

Chisel Form Tip
Part No. 852KD-36

Conical with Chisel Flats
Part No. 852LD-37

Conical Tip
Part No. 852BD-38

Extra Long Angle Face
Part No. 852VD-39

Unit	Price
1-25	$1.95
26-50	$1.75
51-up	$1.50

EDSYN SOLDASIP RESOLDERING TIP FOR ERSA SPRINT

Part No. ST070

Sips up solder like a sponge or solders like a dream . . . TRY IT!

* ERSA TIP 16 16KD/115V-40 STANDARD TYPE SOLDERING IRON

Δ

Unit	Price
1-25	$6.50
26-50	$6.00
51-up	$5.50

ERSADUR LONG LIFE TIPS FOR ERSA TIP 16

Angle Face Tip
Part No. 172/15LD-41

Chisel Form Tip
Part No. 172/15KD-42

Reinforced Angle Face
Part No. 172/15SD-43

Pencil Form Tip
Part No. 172/15BD-44

Unit	Price
1-25	$1.95
26-50	$1.75
51-up	$1.50

EDSYN SOLDASIP RESOLDERING TIP FOR ERSA TIP 16

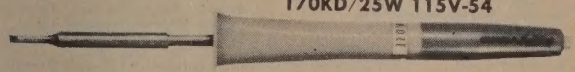
Part No. ST025

Sips up solder like a sponge or solders like a dream . . . TRY IT!

* ERSA MULTITIP

Δ

170KD/8W 115V-52
170KD/15W 115V-53
170KD/25W 115V-54



COMBINATION STANDARD TYPE AND PISTOL GRIP SOLDERING IRON

8 WATT 15 WATT 25 WATT

Unit	Price
1-25	$6.50
26-50	$6.00
51-up	$5.50

PISTOL GRIP OPTIONAL AT EXTRA COST

ERSADUR LONG LIFE TIPS FOR ERSA MULTITIP

EDSYN SOLDASIP RESOLDERING TIP FOR ERSA MULTITIP

8 WATT	15 WATT	25 WATT	
172/8LD-55	172/15LD-41	172/25LD-59	Angle Face Tip
172/8KD-56	172/15KD-42	172/25KD-60	Chisel Form Tip
172/8BD-57	172/15BD-44	172/25BD-61	Pencil Form Tip
172/8SD-58	172/15SD-43	172/25SD-62	Reinforced Angle Face
ST071	ST025	ST072	Soldasip Tip

RF027 SOLDASIP™ RESOLDERING FLUX

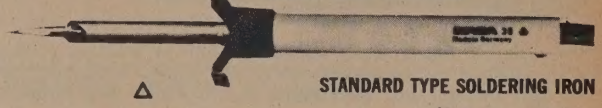
Unit	Price
1-25	$1.95
26-50	$1.75
51-up	$1.50

1-25	$1.75
26-50	$1.65
51-100	$1.55
101-up	$1.45

wt. 4 oz.

* ERSA 30

30KD/30W 115V-45
30KD/40W 115V-46



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STANDARD TYPE SOLDERING IRON

Unit	Price
1-25	$5.75
26-50	$5.25
51-up	$4.75

ERSADUR LONG LIFE TIPS FOR ERSA 30

Straight Chisel Tip
Part No. 32KD-47

Reinforced Chisel Tip
Part No. 32SD-48

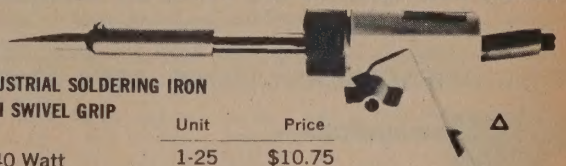
Pencil Form Tip
Part No. 32BD-49

Bevelled Both Sides
Part No. 32LD-50

45° Bent Chisel Tip
Part No. 32JD-51

Unit	Price
1-25	$1.95
26-50	$1.75
51-up	$1.50

* ERSA VARIUS 550KD/40W 115V-63 550KD/50W 115V-64



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INDUSTRIAL SOLDERING IRON WITH SWIVEL GRIP

	Unit	Price
40 Watt	1-25	$10.75
or 50 Watt	26-50	$10.25
	51-up	$9.75

ERSADUR LONG LIFE TIPS FOR ERSA VARIUS

Chisel Form Tip
Part No. 552KD-65

Angle Face Tip
Part No. 552LD-66

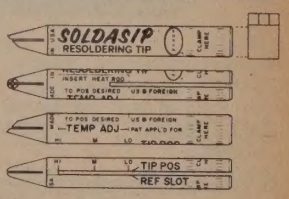
Pointed Tip
Part No. 552BD-67

Bevelled Both Sides
Part No. 552VD-68

Unit	Price
1-25	$3.00
26-50	$2.75
51-up	$2.50

SOLDASIP™ RESOLDERING TIP

THE MOST UNIQUE RESOLDERING TIP AVAILABLE, FITS ON ERSA SOLDERING TOOLS. SIPS UP SOLDER LIKE A SPONGE OR SOLDERS LIKE A DREAM . . . TRY IT!



wt. 2 oz.

"O" RINGS

0-SS30	Standard Soldapullt "O" Ring	
0-DS31	Deluxe Soldapullt "O" Ring	
0-SVB32	Soldavac Black Plunger "O" Ring	
0-SVW33	Soldavac White Bumper "O" Ring	

1-50	$ .25
51-up	$ .20

STE009 FREE SAMPLE FOR EVALUATION

CHECK ONE ONLY

Ersa Tip 16 — 16ST/115V-40 with Soldasip Resoldering Tip ☐

Soldavac SV026 desoldering tool ☐

REQUEST FOR NO CHARGE SAMPLE MUST BE ON YOUR COMPANY STATIONERY

Covered by one or more of the following U.S. and Foreign Patents: U.S. 3,114,026, 3,263,889, 3,443,734, D.215,216, D.215,197, Argentina 170,878, 170,560, Australia 286,159, Belgium 687,337, 666,113, 698,167, 698,168, 727,281, 722,132, 727,280, Canada 746,275, 730,450, 800,801, 822,266, 250,31,484, Costa Rica 1577, Denmark 43,332, France 1,428,006, 1,522,810, 1,525,445, Germany 1,259,682, 1,289,393, 5254, 5255, Great Britain 995,949, 1,069,720, 1,110,209, 1,131,195, 938,499, Israel 4534, Italy 707,813, 744,991, 807,692, 807,693, 840,490, Japan 474,814, 510,038, 533,917, 533,918, Luxembourg 54,252, 54,251, 58,178, 57,113, 58,179, New Zealand 142,931, 149,086, 149,087, Sweden 218,639, Switzerland 456,311, 458,024, 458,886, Other U.S. and Foreign Patents Pending.

* Irons come equipped with KD chisel form tips. Any other tip may be substituted upon request.

Prices subject to change without notice. Prices higher outside the continental limits of the U. S. A.

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SOLDERING IRONS

Irons up to 1250 watts are available

PENLINE-120 SOLDERING IRONS — 120 VOLTS; 25, 30, 40 AND 45 WATTS

Lowest cost GE iron; ideally suited for light to medium production in electronics, communications, and allied industries, for repair and maintenance operations, and by the "do-it-yourself" electronics kit builder.

Description	Cat. No.
Handle and Cordset	
Two-conductor*	6D400
Three-conductor, with NEMA standard plug	6D400G2
Heater Assemblies for Threaded Tips	
25W, 6D415; 30W, 6D414; 40W, 6D413*	

Description		Cat. No.
Tip and Heater Assemblies-Ironclad		
1/8" Chisel Tip	30 watts	6D410*
5/32" Chisel Tip	30 watts	6D411*
5/32" Chisel Tip	45 watts	6D412*

Use interchangeable threaded tips.

* U.L. listed.

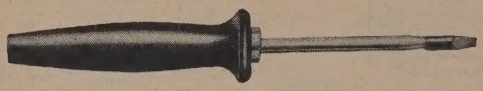
INTERCHANGEABLE THREADED TIPS

For Penline-120, Pistol-Grip, Midget, and Lightweight Heater Assemblies

Description	Cat. No.
Chisel Tips	
1/16" Dia—Copper	6D4P5
3/32" Dia—Ironclad	6D4P6
1/8" Dia—Copper	6D4P7
5/32" Dia—Ironclad	6D4P8
3/16" Dia—Copper	6D4P9
7/32" Dia—Ironclad	6D4P10
3/32" Dia—Copper	6D4P11
3/16" Dia—Ironclad	6D4P12
Pyramid Tips	
1/8" Dia—Copper	6D4P15
5/32" Dia—Ironclad	6D4P16
11/32" Dia—Copper	6D4P17
3/8" Dia—Ironclad	6D4P18

Description	Cat. No.
Spade Tips	
1/16" Dia—Copper	6D4P1
1/16" Dia—Ironclad	6D4P21
3/32" Dia—Ironclad	6D4P2
1/8" Dia—Ironclad	6D4P22
1/8" Dia—Copper	6D4P3
5/32" Dia—Ironclad	6D4P4
Long Chisel Tips	
3/16" Dia—Copper	6D4P13
7/32" Dia—Ironclad	6D4P14
Cone Tips	
1/8" Dia—Copper	6D4P19
5/32" Dia—Ironclad	6D4P20

LIGHTWEIGHT SOLDERING IRONS — 120 VOLTS; 40 AND 60 WATTS



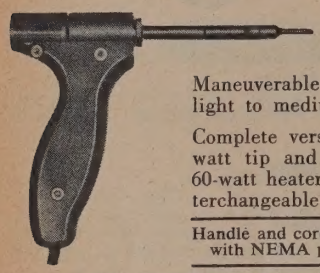
Ideal for light and medium production-line soldering and maintenance and repair operations in electronics and communications industries. Tip and heater assemblies can be changed in seconds.

* U.L. listed.

Complete Iron - Includes handle and 6-foot cordset, and 60-watt tip and heater assembly	
7/32" Ironclad Chisel Tip*	6A273
3/16" Ironclad Pyramid Tip*	6A283
3/16" Ironclad Chisel Tip	6A283G23
Handle and Cordset	
Two conductor	6A273G62
Three-conductor with NEMA standard plug	6A273G63

Tip and Heater Assemblies - 60 watts	
7/32" Ironclad Chisel Tip	6A300
3/16" Ironclad Pyramid Tip	6A301
3/16" Ironclad Chisel Tip	6A301G4
Heater Assemblies for Threaded Tips (Use Interchangeable Tips listed above)	
40 watts	6A304
60 watts	6A301G7

PISTOL-GRIP SOLDERING IRONS - 120V; 40, 60W



Maneuverable and comfortable, excellent for light to medium production.

Complete versatility with choice of three 60-watt tip and heater assemblies; or 40- and 60-watt heater assemblies with 20 different interchangeable ironclad or copper threaded tips.

Handle and cordset, three-wire with NEMA plug	6A303

Can be used with Lightweight tip and heater assemblies or with Lightweight heater assemblies and interchangeable tips.

MIGHTY MIDGET SOLDERING IRON - 12V; 100W

A lightweight iron with high heat capacity for heavy soldering where larger irons, up to 200 watts, prove unwieldly for rapid repetitive soldering.

Tip and Heater Assembly
1/2" Ironclad Chisel Tip — for 60 w, 6A211G54; 80 w, 6A211G50; 100 w, 6A211G33.

Handle and Cordset	
Two-conductor	6A210G61
Transformer - 115-volt primary	
Four Tap — for 55/70/85/100 watts	6A364G7

MIDGET SOLDERING IRONS — 6 VOLTS; 25 and 45 WATTS (Also tapped transformers)

A versatile iron for light production in electronics, and communication industries — handles like a pencil, weighs but 1¾ oz. Tip renewal is easy and fast — complete tip and heater assembly can be changed in a few seconds.

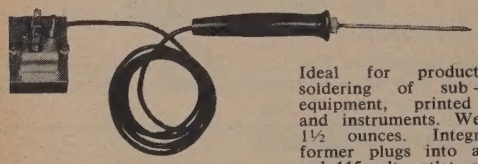
Handle and Cord Set			
For single-and 4-tap transformers	6A203	For transformer with 3-heat switch	6A203G2

Tip and Heater Assemblies - All ironclad tips		
5/32" Chisel Tip	25 watts	6A211
1/8" Cone Tip	25 watts	6A213
3/16" Pyramid Tip	25 watts	6A215
1/8" Chisel Tip	25 watts	6A217
3/16" Chisel Tip	45 watts	6A211G31

Heater Assembly for Threaded Tips (Use Interchangeable Tips)		
25 watts		6A221
Transformers - 115-volt Primary¶		
Single Tap	35 watts	6A362G2
Four Tap —for 26/29/32/35 watts		6A364G2
With Three-heat Switch† —18 to 35 watts		6A434

¶Single- and four-tap transformers are available with 240-volt primary in quantities of 36 or more.
†Suitable for use only with Handle and Cordset 6A203G2.

MINIATURE SOLDERING IRONS — 6 VOLTS; 12 VOLTS



Ideal for production line soldering of sub-miniature equipment, printed circuits, and instruments. Weighs only 1½ ounces. Integral transformer plugs into any standard 115-volt outlet, makes iron portable for maintenance work.

Complete Iron - Includes handle and 6-foot cordset, tip and heater assembly, and transformer		
1/8" Chisel Tip	3" Shank	6A428G3
1/8" Chisel Tip	6" Shank	6A428G4
1/8" Pyramid Tip	3" Shank	6A428G7
1/8" Pyramid Tip	6" Shank	6A428G8

Complete Iron Less Transformer		
1/8" Chisel Tip	3" Shank	6A428G5
1/8" Chisel Tip	6" Shank	6A428G6
Renewal Tip and Heater Assembly		
1/8" Chisel Tip	3" Shank	6A429G3
1/8" Chisel Tip	6" Shank	6A429G4
1/8" Pyramid Tip	3" Shank	6A429G5
1/8" Pyramid Tip	6" Shank	6A429G6

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W. Va.: see Pa. Pittsburgh
Wis.: Appleton (414) 743-6586
Milwaukee see Ill.
Wyo.: see Colo.
Canada: Toronto, 24 Ward St.

For complete information contact nearest Sales Representative above, nearest authorized GE Distributor or nearest GE Sales Office listed on inside front cover.

GENERAL ELECTRIC

Soldering Irons and Tips from Hexacon

VOLTAGE RANGE: 6 to 240 • OPERATE IDENTICALLY ON A.C. OR D.C., ANY CYCLE
STANDARD VOLTAGES 110/120, 121/130, 220/240 • SPECIFY VOLTAGE ON ORDER

Equipped with flexible 5 and 6-ft. approved Neoprene rubber heater cord, which is water-proof, kink-free and resistant to oil, abrasion and heat. Nickel chromium replaceable heating elements, insulated with finest mica, protected by rugged outer housing. Replaceable tips.

HEXACON MINIRONS

WITH ALL THE EXTRA FEATURES

- Rugged quality construction that will withstand production line conditions
- Slim-line case promotes maximum visibility
- Long life and non-freezing Durotherm tips

SLIM LINE CASE — SLIM LINE HANDLE

No. 21A tip diameter 1/8"
No. 22A tip diameter 3/16"
No. 23A tip diameter 1/4"

DEPENDABLE PERFORMANCE • UP TO 60 WATTS

HEXACON HORNET Model, H10

World's Smallest Industrial Soldering Iron for Micro-Electronic Soldering. Plastic handle, cooled thru ventilated design and stainless steel mirror, reflects heat away from hand.

Cat. No. H10K Kit (H10 Iron, 2 Tips and Sponge*)
Cat. No. H11K Kit (H11 Iron, 2 Tips and Sponge*)
Cat. No. H14K Kit (H14 Iron, 2 Tips and Sponge*)
*Tip Cleaning Sponge in Container

Cat. No. H10 Iron less tip, 12 Watts
Cat. No. H11 Iron less tip, 17 Watts
Cat. No. H14 Iron less tip, 20 Watts

Iron with 3-wire cord and Nema plug available

Cat. No. 91 Package of 12 tip cleaning sponges in container

DUROTHERM and XTRADUR Tips. Sizes 1/32" to 3/16"

PLUG-TIP IRONS

Cat. No.	Watts	Tip Dia.	Ship. Wt.
P70	100	3/8"	1 1/8 lbs.
P100	110	3/8"	1 3/8 lbs.
P111	125	3/8"	1 3/8 lbs.
P115	150	3/8"	1 1/2 lbs.
P150	150	3/8"	1 1/2 lbs.
P153	175	3/8"	1 1/2 lbs.
P155	190	3/8"	1 1/2 lbs.
P151	175	1/2"	1 5/8 lbs.
P152	200	1/2"	1 5/8 lbs.
P200	200	5/8"	2 3/8 lbs.
P250	250	5/8"	2 3/8 lbs.
P300	300	7/8"	3 lbs.
P550	550	1 1/8"	4 3/8 lbs.

SUPER-PENCIL IRONS

FASTEST AND MOST DURABLE PENCIL IRON.

All the advantages of a Soldering Pencil, but a full-fledged industrial soldering iron with nickel-chromium mica-wound element. Tiny tips outperform irons with larger tips and higher wattages.

Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
25S	25	1/8"	1/2 lb.	26S40	40	3/16"	1/2 lb.
25S20	20	1/8"	1/2 lb.	*26S50	50	3/16"	1/2 lb.
25S30	30	1/8"	1/2 lb.	*24S	50	1/4"	1/2 lb.
25S35	35	1/8"	1/2 lb.	*24S35	35	1/4"	1/2 lb.
*25S50	50	1/8"	1/2 lb.	*24S40	40	1/4"	1/2 lb.
26S	30	3/16"	1/2 lb.	*24S60	60	1/4"	1/2 lb.
26S35	35	3/16"	1/2 lb.				

Weighs only 2 oz.

*Standard Equipment DUROTHERM Non Sticking Long-Life Tips.

BANTAM HATCHET IRONS

PERFECT BALANCE FOR INACCESSIBLE PLACES

Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
25H	25	1/8"	1/2 lb.	*26H50	50	3/16"	1/2 lb.
25H35	35	1/8"	1/2 lb.	24H	50	1/4"	1/2 lb.
*25H50	50	1/8"	1/2 lb.	24H40	40	1/4"	1/2 lb.
26H	30	3/16"	1/2 lb.	*24H60	60	1/4"	1/2 lb.
26H35	35	3/16"	1/2 lb.				

Weighs only 3 oz.

Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
30H	60	1/4"	7/8 lb.	30H70	70	1/4"	7/8 lb.
30H40	40	1/4"	7/8 lb.	30H75	75	1/4"	7/8 lb.
30H50	50	1/4"	7/8 lb.				

Weighs only 5 oz.

Standard Equipment DUROTHERM Non-Sticking Long-Life Tips.

PINPOINT SOLDERING IRONS

FOR PINPOINT ACCURACY ON PRECISION SOLDERING

Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
P25	25	1/8"	1/2 lb.	*P2440	40	1/4"	1/2 lb.
P2530	30	1/8"	1/2 lb.	*P2460	60	1/4"	1/2 lb.
P2535	35	1/8"	1/2 lb.	P30	60	1/4"	7/8 lb.
*P2550	50	1/8"	1/2 lb.	P3040	40	1/4"	7/8 lb.
P26	30	3/16"	1/2 lb.	P3050	50	1/4"	7/8 lb.
P2635	35	3/16"	1/2 lb.	P3070	70	1/4"	7/8 lb.
P2640	40	3/16"	1/2 lb.	P3075	75	1/4"	7/8 lb.
*P2850	50	3/16"	1/2 lb.				
*P24	50	1/4"	1/2 lb.				

Weighs Only 3 oz.

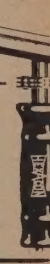
*Standard Equipment DUROTHERM Non-Sticking Long-Life Tips.

SUPER-POWERED IRONS

HIGHER SPEED SMALLER TIPS

Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
P114	100	1/4"	1 3/8 lbs.	P212	200	1/2"	2 1/4 lbs.
P154	150	1/4"	1 1/2 lbs.	P338	300	3/8"	2 3/4 lbs.
P238	200	3/8"	2 1/4 lbs.				

HATCHET TYPE IRONS



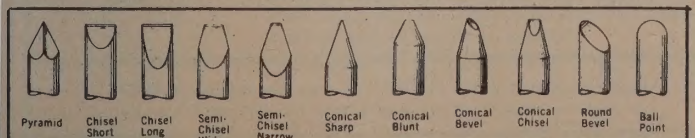
Perfect Balance				Less Fatigue			
Cat. No.	Watts	Tip Dia.	Ship. Wt.	Cat. No.	Watts	Tip Dia.	Ship. Wt.
70H	100	3/8"	1 3/8 lbs.	151H	175	1/2"	1 5/8 lbs.
100H	110	3/8"	1 1/2 lbs.	200H	200	5/8"	2 1/4 lbs.
150H	150	3/8"	1 5/8 lbs.	300H	300	7/8"	3 lbs.
153H	175	3/8"	1 5/8 lbs.				

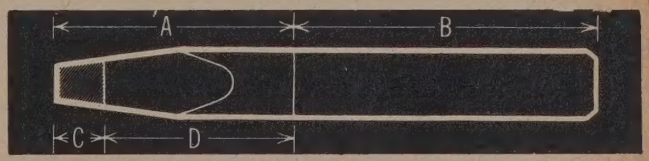
LONG-LIFE SOLDERING TIPS OUTLAST COPPER TIPS UP TO 20 TO 1

DUROTHERM NON-FREEZING TIPS: Iron coated and immunized. Absolutely prevents tips from sticking. Minimum loss of heat delivery. **YOUR SPECIAL TIPS QUOTED ON REQUEST FIT ALL MAKES**

Note: Also available; XTRADUR Iron-coated Pretinned Tips. Multi-coated for extra long wear which immunizes shank of tip from solder, thus preventing adhering of solder, except on working surface of tip — prevents creeping and spilling of solder.

LONGEST WEARING AND BEST PERFORMING TIP EVER PRODUCED





DUROTHERM COATING Bonded to Base Copper **A**—Heavy Iron Coating **B**-Scale-Resistant **C**-Pretinned Section **D**-Multi-coated and immunized

HEXACON ELECTRIC COMPANY ▪ 621 CLAY AVE., ROSELLE PARK, N. J. 07204

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UNITED TECHNICAL PUBLICATIONS

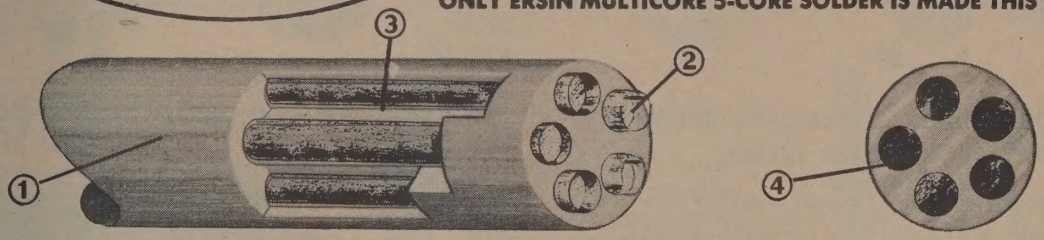
ERSIN

Multicore

5-core wire rosin solder
Available in 1-lb. and 7-lb. reels

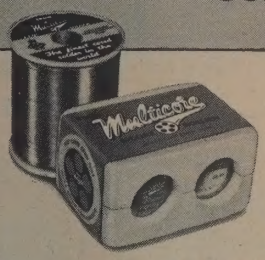
This is no ordinary solder!

ONLY ERSIN MULTICORE 5-CORE SOLDER IS MADE THIS WAY



These illustrations show the construction of ERSIN Multicore 5-Core Solder. Multicore solder is made only from pure virgin metals (1) with 5 cores of exclusive extra-active, non-corrosive ERSIN Flux (2). Multicore's special manufacturing process locates the 5 cores of ERSIN Flux close to each other and at the perimeter, so that there is only an ultra-thin wall of solder between the cores of flux and the work (3). This unique core configuration (4) also keeps the flux near the heat source, to melt faster—wet the metal more effectively. This enables ERSIN Multicore solder to produce the consistently reliable joints for which it is known.

Conforms to Federal Specification QQ-S-571



EXCLUSIVE PACKAGING IN POLYSTYRENE AND SKIN-WRAP FOR UTMOST PROTECTION IN SHIPPING AND STORAGE

STANDARD TIN/LEAD ALLOYS AND GAUGES

Available from stock: 63/37; 60/40; 50/50; 40/60; Savbit; Special Alloys—H.M.P. (High Melting Point, 565° F.); L.M.P. (Low Melting Point, 354° F.). Other alloys upon request.

Gauges: 14 s.w.g. (.080") through 24 s.w.g. (.022"). NOTE: Soldering iron tips should always be 108° F. above melting point of alloy.

NEEDLE FINE GAUGES

For microminiaturization, integrated circuits and other similar requirements. Off-the-shelf delivery in alloys 63/37 and 60/40, in even gauges from 28 s.w.g. (.014") through 34 s.w.g. (.009").

COPPER LOADED SAVBIT ALLOY

Copper-loaded SAVBIT stops the wear and erosion of copper soldering iron tips...increases tip life by 1,000%.

Characteristics and specifications: Savbit Alloy is available in Ersin Multicore 5-core solder containing non-corrosive extra-fast Ersin Flux in 14, 16, 18, 20, 22 and 24 gauge. Melting point: Virtually the same as standard tin/lead alloys. Excellent conductivity, tensile and shear strength.

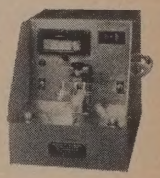
HIGH PURITY EXTRUDED BAR SOLDER

The same superior quality solder as in Multicore 5-Core Wire Rosin solder. Highest purity is achieved by advanced quality control, possible only with the Extrusion process. Extreme uniformity and smooth texture, without the cross-graining of cast bars. Virgin metals. Conforms to Federal Specification QQ-S-571d with respect to alloy composition in Sn60 (60/40), Sn63 (63/37), and Sn50 (50/50). Skin wrapped for distributors; bulk-packed for manufacturers. Also, low antimony "EXTRUSOL" Commercial Bar Solder—bulk packed.

ERSIN LIQUID FLUXES

Made to the high quality standards of Ersin Multicore. Three formulas. No. 5380 meets Military Specification MIL-F-14256C, Type A (Activated). No. 0360 meets Military Specification MIL-F-14256C, Type W (Non-activated). Other commercial liquid fluxes available such as: No. 4370 highly activated commercial flux. Foam, water soluble, protective coatings and cleaners upon request.

NEW SOLDERABILITY TEST MACHINE



A precision instrument to determine the solderability of component termination wires that operates on a principle entirely different from, and superior to, the immersion method—electronic digital timing. Accurate, positive, totally reliable, yet economical because no technician is needed to operate it, and tests are run with great rapidity. Developed in association with I.E.C. Built in England by Multicore Solders, Ltd. Complies with I.E.C. Publication 68-2 Test T. Descriptive literature available on request.

FREE evaluation test samples, "Modern Solders" technical booklet, and fully detailed information on any of these products will be sent promptly. Address request, on company letterhead, to: Multicore Sales Corp., Dept. RY399, Westbury, N.Y. 11590.

MULTICORE SALES CORP., WESTBURY, N.Y. 11590, Div. British Industries Co.

ORYX

PRECISION SOLDERING EQUIPMENT

WHY PRODUCTION MANAGERS CHOOSE ORYX SOLDERING IRONS

1. MINIATURE SIZE

ORYX soldering irons are small and easy to handle as pencils. Their miniature size helps to speed any precision soldering operation. Damage to adjacent components is eliminated. If you can see it, you can solder it with ORYX!

2. FEATHER WEIGHT

A standard, utility-type 100 watt soldering iron weighs about 2 lbs. The so-called pencil-type irons typically weigh between 2 and 6 ounces. ORYX soldering irons, by contrast, weigh as little as ¼ ounce. This true feather weight virtually eliminates hand fatigue. Workers can turn out many more joints per hour with fewer rejects.

3. HIGH EFFICIENCY

All ORYX soldering irons utilize a unique element-in-the-tip design principle. By generating the heat within the tip, far fewer watts are needed to achieve results comparable to much larger irons. This principle also provides quicker heat recovery because the heat path between element and joint is so very short. The need for large insulating handles is eliminated.

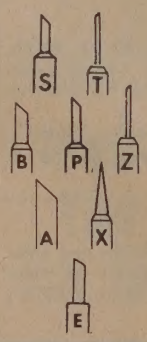
LOW-VOLTAGE SOLDERING IRONS

MODEL 5-S—(As shown in photograph). Eyepiece model less than 5" long, for precise finger control. Weighs 7 grams. Nominal temperature 575°F. Furnished with 1/16" S tip. Also takes T tip. 4.5-volts, 4.5-watts (Use 54204-T tapped transformer for 4.5 volts) .....Net **$5.95**

MODEL 6A—The most popular Oryx soldering iron. Designed for printed circuit soldering. Weighs only ¼ oz. Nominal temperature 690°F. Furnished with 3/32" removable B tip. Also takes other tips listed below. 6-volts, 6-watts. Net **$5.95**

MODEL 9-6—Similar to model 6A, but greater heat capacity. Weighs ¼ ounce. Nominal temperature 750°F. Furnished with 5/32" A tip. Also takes B tip. 6-volts, 8.3 watts **$5.95**

MODEL 11-6—Special model for high-temperature solders. Temperature 835°F. Weighs ¼ oz. Furnished with 3/32" solid nickel E tip. Nickel tip provides long life at high temperatures. 6-volts, 10-watts .....Net **$7.45**

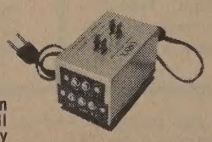


REPLACEMENT TIPS for low-voltage soldering irons.

Type	Material	Plating	Diameter	For Model	Net Ea.
A	Copper alloy	Nickel	5/32"	9-6	$ .54
B	Copper alloy	Nickel	3/32"	6A, 9-6	.54
E	Solid Nickel	—	3/32"	11-6	1.80
P	Copper alloy	Nickel	1/16"	6A	.60
S	Copper alloy	Nickel	1/16" (short)	5-S	.60
T	Gold and copper	Nickel	1/25"	5-S, 6A	2.85
V-PL	Copper alloy	Iron	3/32"	6A, 9-6	1.80
X	Copper alloy	Nickel	1/25" (pointed)	6A	.90
X-PL	Copper alloy	Iron	1/25" (pointed)	6A, 9-6	1.85
Z	Copper alloy	Nickel	1/25"	6A	.85
Z-PL	Copper alloy	Iron	1/25"	6A	1.80

TRANSFORMER

for low-voltage soldering irons.



TAPPED TRANSFORMER—Output 4½ to 6-volts in ½ v. steps. For exact temperature control on all ORYX 6-volt tools. Operates on 115 V. AC—ready to plug in. Model 54204-T .....Net **$7.80** ea.

TELVAC

LABORATORY TOOLS / APPARATUS

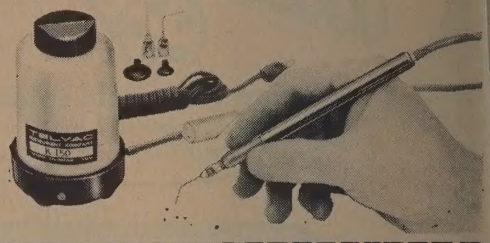
VACUUM TWEEZER SYSTEM

This new parts-handling system positively and precisely lifts parts varying in size from microscopic to those weighing several ounces. Parts are handled without damage or contamination. Defects caused by pinching, scratching, or marring are eliminated. Critical surfaces are protected. Vacuum is turned on and off with forefinger. For 115 V. A.C. Complete system, ready to plug in.

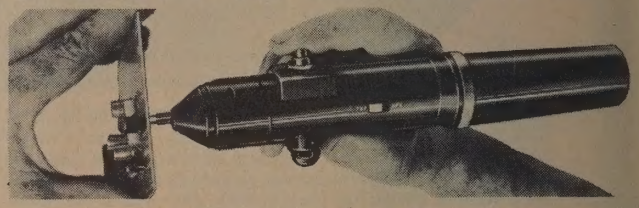
Complete System K-150

Net ea.

$36.50



"IN-CIRCUIT" TRANSISTOR TESTER



A new test instrument for the circuit designer or test technician. Makes rapid "go-no go" evaluations of semiconductors while they are still in the circuit. Checks cut-off and conduction on PNP and NPN transistors and diodes without the need for costly unsoldering. To use, the operator sets the selector switch to NPN or PNP. He then presses the tester's sharp spring-loaded pins (arranged in TO-5 configuration) against the transistor's printed circuit connections. Open and shorted transistors are readily identified by noting the condition of the tester's pilot light. Diodes and unmounted transistors are similarly tested using a set of extending leads and clips. An optional 7-position diode adapter may be used to test diodes in the circuit. Furnished complete with extending leads and alkaline battery, ready to operate.

MODEL SC-4 TESTER .....Net **$74.50** ea.

MODEL 1330 DIODE ADAPTER .....Net **19.50** ea.

INSTRUMENT REPAIR KIT

A 35-piece kit of fine precision tools for the instrument shop or laboratory. Includes miniature soldering iron, taper-jaw diagonal cutter, needle-nose plier, precision screwdriver kit, tiny stub-nose scrissors, eye loupe, needle-file set, 11-piece knife set, hex wrench set, spline-key set, soldering aid set, and a precision Dumont-type tweezer.

MODEL K-50..... Net **$59.50**

NEEDLE FILES

Precision Swiss needle files with vinyl cushion finger grips

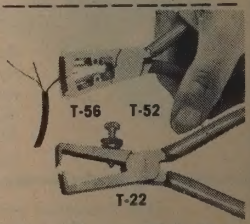
Set of 8 precision Telvac files in plastic case. No. 3 cut.

Cat. No. 2000 (4" styles) ..... Net **$6.95** ea.

Cat. No. 2100 (6¼" styles) ..... Net **8.95** ea.

WIRE STRIPPERS

Unique wire-stripping pliers. Just squeeze and pull! Models T-52 and T-56 require no operator adjustment. Use T-52 for #8 to #24 wires and T-56 for #18 to #28 wires. T-22 is set by operator to required wire size from #8 to #24. Tool steel heads have razor-sharp edges. All models have red vinyl cushion grips.



T-52 .....Net **$8.35** ea. **T-56** .....Net **$11.95** ea. **T-22** .....Net **$4.95** ea.

ORYX-TELVAC tools available from distributors everywhere. Ask for complete catalog.

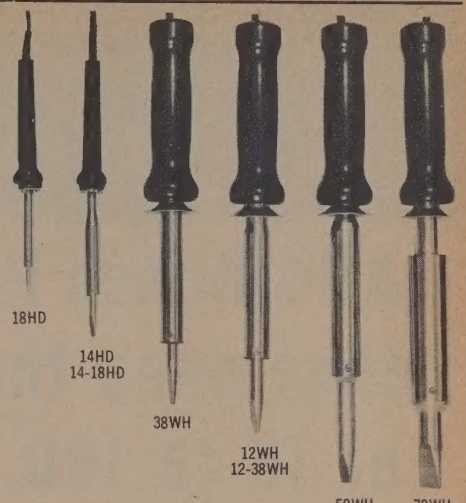
TELVAC INSTRUMENT CO. 18531-E VENTURA BLVD., TARZANA, CALIFORNIA 91356

WALL BRAND SOLDERING PRODUCTS

SINCE 1864

MADE IN USA

HOT AIR GUNS AND TIPS



HD Type and WH Type Heavy-duty Irons

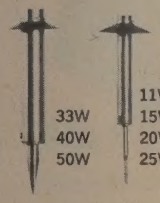
Wallbrand heavy-duty irons are engineered for highest efficiency performance. Rugged construction assures long-life for demanding production line needs. No radionic interference. Triple-life resistance wire wound on pure mica and constant tip temperature with extra fast recovery permits continuous heavy-duty use. 120 volts AC or DC. Other voltages available on request. Handles remain cool after long hours of operation. Tips are easily changed. Special irons customized to particular requirements.

Model	Watt Input	Tip Dia.	Length W/O Tip	Thermo/ Gram Value
18HD	25	1/8"	6⅝"	300
14HD	40	1/4"	7½"	900
38WH	80	3/8"	10¼"	1500
12WH	125	1/2"	10¼"	2000
12-38WH	125	3/8"	10¼"	2000
12-38HC	155	3/8"	10¼"	3500
58WH	200	5/8"	12¼"	3500
58-12WH	200	3/8"	12¼"	3500
78WH	300	7/8"	12⅜"	5400
78-58WH	300	5/8"	12⅜"	5400

XLS Pencil Iron

One handle fits 9 elements

Lightweight pencil series features quick element interchangeability and highest performance. Cool, unbreakable blue polycarbonate handle takes heating elements from 11 to 75 watts. Each can be changed by line operator without special tools. Available with either 2 or 3 wire cord. Uses regular or iron plated tips. Elements encased in long-life stainless steel jackets.



DH (DUO HEAT) Pencil

Pat. Pending

Developed for use in intermittent soldering operations

Revolutionary lightweight pencil operates continuously at low heat, but has higher heat available when needed. Constant low heat is adequate for light to medium jobs, get high heat instantly by pressing handle switch; tip and element life infinitely increased. Indestructible molded handle stays cool and comfortable. Wide variety of plug-in tips easily interchangeable.

Model	Continuous Low Heat	High Heat
DH-1	15W 520°F	47W 920°F
DH-2	20W 630°F	53W 975°F

IDL INSTANT DEPENDABLE LASTING IRON

Pat. Pending

3 oz. pencil controlled by thermal time delay relay

Heats in seconds. No transformer. When handle button is depressed 180W element heats initially until soldering temperature is reached. Thermal time delay relay then cuts in 40W element automatically. Pencil cannot overheat. Interchangeable plug-in 1/8" tips need no special tools to change. Unbreakable handle stays cool. Especially good for diversified light to medium jobs.

Trig-R-Heat Gun

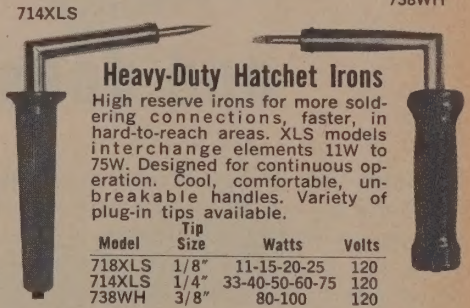
Feather light 14 oz. gun has no transformer. Reaches hard-to-get at spots easily. Tips will not deform. Heats and recovers instantly. Rugged, precision built. Tip and element assemblies changed easily.

Model	Tip Size	Max. Watts	Min. Watts	AC/DC Volts	Weight W/O Cord
214LT	1/4"	400	150	120	14 oz.
212LT	1/2"	500	300	120	24 oz.
TIP AND ELEMENT ASSEMBLY					
214TE	1/4"	400	150	120	6 oz.
212TE	1/2"	500	300	120	16 oz.

864 Commercial Duty Iron

Pencil iron has cool, molded plastic handle, balanced for comfort. Triple-life resistance wound. Copper tip maintains constant temperature.

Tip Size	Watts	Volts
3/16"	30	120
3/16"	40	120



Heavy-Duty Hatchet Irons

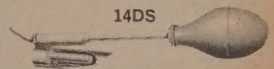
High reserve irons for more soldering connections, faster, in hard-to-reach areas. XLS models interchange elements 11W to 75W. Designed for continuous operation. Cool, comfortable, unbreakable handles. Variety of plug-in tips available.

Model	Tip Size	Watts	Volts
718XLS	1/8"	11-15-20-25	120
714XLS	1/4"	33-40-50-60-75	120
738WH	3/8"	80-100	120

(SIH not shown)

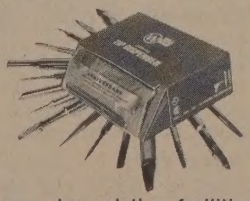
Soldering Pencil Holder

Can be mounted on top, in front or below bench. Adjusts to any angle. Bench model includes tip cleaning sponge and tray. SPH for up to 5/8" shaft. Model SIH for up to 1" shafts.



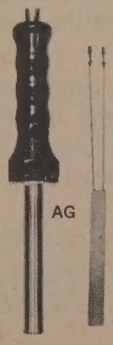
Desoldering Tool

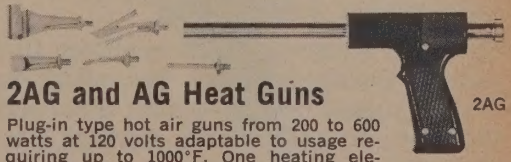
Keeps solder in molten state in reservoir. Operated with one hand. Tip replaceable with two openings — .080" dia. and .064" dia. Fits 614, 14HD, 714XLS and XLS 33W to 75W series.



Tips and Tip Dispenser

Tip sizes from 1/8" through 7/8" in wide variety of configurations for specific industrial and commercial needs. Three grades — **Anniversary type:** Super finished, iron and chrome plated. **Wallklad:** Iron coated and chrome plated. For production and critical lab use. **Wallbrand:** Commercial, copper, nickel plated. Wall's own iron plating facilities produce high quality long-life tips. 1/8" through 3/8" iron plated or copper tips available in handy tip dispenser. Tips individually sealed in color-coded continuous belting, plastic envelope.





2AG and AG Heat Guns

Plug-in type hot air guns from 200 to 600 watts at 120 volts adaptable to usage requiring up to 1000°F. One heating element fits both models. Pistol grip available with trigger (extra cost), opens air and heat at same time. Five tip styles interchangeable. Special tips on request. 3-wire cord assembly. Guns include neoprene air hose, hose fittings, pressure regulator and gauge. Send for Bulletin HG-1265.

WALL MANUFACTURING CO.

BOX 3349 KINSTON, N. C. 28501 TEL. 919/527-4186

Write Dept. EEM-70 for illustrated catalog I-669A

Industrial soldering irons and pencils are built to exceed Federal specification W-S-570. Wallbrand soldering products are UL and CSA listed.

Weller INDUSTRIAL SOLDERING TOOLS

A 1⅔ Ounce Pencil Iron that does the work of 15 to 100 watt irons...

and does it faster and better!

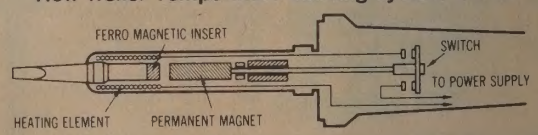
The new low voltage W-TCP Soldering Pencil automatically adjusts to every soldering job in the range usually covered by 15 watt to 100 watt irons. Operators can go from delicate component soldering to heavy ground lugs, and never switch irons! Weller's controlled energy reserve delivers the extra heat as it is needed.

Despite its phenomenal capacity range, the Weller W-TCP never overheats. A foolproof, magnetic control accurately senses tip temperature moment-by-moment, and regulates power input, virtually eliminating cold solder joints or excess heat.

The Weller Soldering Pencil and Power Unit are an unbeatable production team. Low voltage design means a more rugged heating element and much longer tip life. Premium plated tips are available in a wide range of shapes and temperatures.

Write or phone for the new Weller Catalog of production soldering equipment and name of your nearest Weller technical representative.

How Weller Temperature Sensing System Works



Magnet is attracted to ferromagnetic tip insert when iron is cold, holding switch contacts closed. As tip heats, approaching selected Curie point of insert, attraction is reduced causing magnet to retract and open switch. As tip cools slightly, magnet is again attracted to tip insert sensor, maintaining tip temperature within close limits.

Model W-TCP — Temperature controlled Low Voltage Soldering Pencil with 3/16" 700°F tip and power unit. Weight with tip, less power unit and cord, 1⅔ oz., overall length 7½". Supplied with burn-proof silicone rubber cord and 120 V., 50/60 cycle transformer with pencil holder and cleaning sponge. Secondary isolated for operator's protection. Tips available for 500°, 600°, 700°, 800° idling temperature.

Model TCP-1 — Soldering Pencil only, with silicone covered cord, 3/16" 700°F Tip. May be operated from any 24 volt power source.

Model PU-1 — Power Unit only, as described under W-TCP. 120 V., 50/60 cycles. (Also available for 230-250 V.)

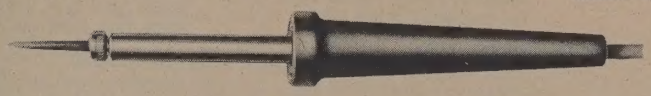
WELLER OFFERS A COMPLETE LINE OF SOLDERING TOOLS FOR PRODUCTION, MAINTENANCE AND SERVICING.

with Energy Reserve and Temperature Control

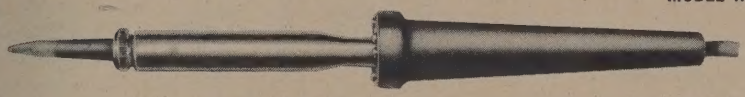
9320

TEMPERATURE-CONTROLLED INDUSTRIAL SOLDERING TOOLS

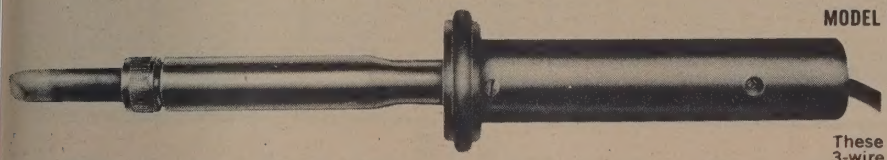
. . . with Energy Reserve



MODEL W-60 Covers 15 Watt to 100 Watt spectrum with one tool. 60 Watts, 120 V., Wgt. 2½ ozs., 7¼" long. With 800°F. ⅛" screwdriver tip.



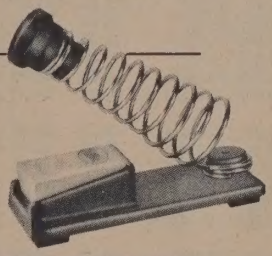
MODEL W-100 Covers 50 Watt to 150 Watt spectrum with one tool. 100 Watts, 120 V., Wgt. 3½ ozs., 8¼" long. With 800°F. ¼" screwdriver tip.



MODEL W-200 Covers 150 Watt to 300 Watt spectrum with one tool. 200 Watts, 120 V., Wgt. 10 ozs., 9½" long. With 800°F. 7/16" chisel tip.

These models can be supplied with 2-wire or 3-wire cords. (Weller "Temperature Sensing" tips are available in standard industrial configurations at 500°, 600°, 700° and 800°F. for the model W60; and in 600°, 700° and 800°F. for models W100, W200's).

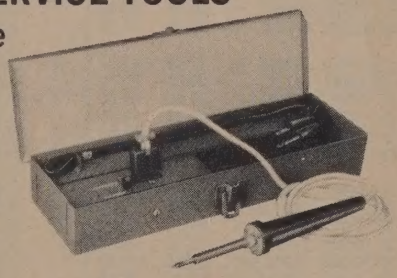
SOLDERING TOOL STAND



Model PH-60—Stand will accommodate W-60 and W-100 tools, with interchangeable funnels. Includes tip cleaning sponge. Heavy cast base. Spring guard protects operator from contact with heated tip.

TEMPERATURE-CONTROLLED FIELD SERVICE TOOLS

. . . with Energy Reserve



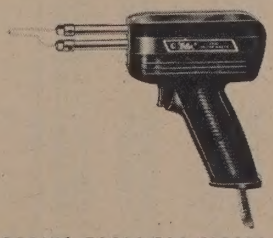
We invite inquiries concerning your field service soldering equipment needs. We offer to develop soldering kits adapted to meet your special requirements.

TCP-12 12-14 volt operation PB-6 Self contained,
TCP-24 24-28 volt operation battery powered

Weller "Temperature Sensing" tips available in standard industrial configurations at 500°, 600°, 700° and 800°F.

WORLD FAMOUS *Weller* **DUAL-HEAT GUNS**

The original soldering gun. Available in three dual-heat models.



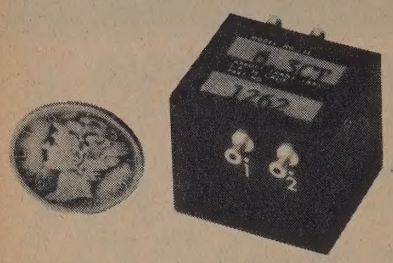
PRODUCTION SOLDERING TOOLS FOR ELECTRONIC MANUFACTURING

Weller® INDUSTRIAL PRODUCTS DIVISION

WELLER ELECTRIC CORPORATION • 100 WELLCO ROAD, EASTON, PA. 18042 • 215 • 258-5371

KINGSTON, ONTARIO, CANADA • HORSHAM, SUSSEX, U. K. • BESIGHEIM, WEST GERMANY

abbott 400 ∼ transformers



specifications

Input Primary
115V, 400 Hz ±20 Hz, 1 phase*

Regulation
10% no load to full load

Secondary Voltage Tolerance
Within 5% when measured at full load and 115 VAC input

Insulation Test
2500 VDC or 150% of secondary voltage (whichever is higher)

Construction
To MIL-T-27C, grade: 5, class: "S", life: "X" (10,000 hrs.) case: smaller (see drawing)

Environment
Encapsulated to meet MIL-E-5272C, including vibration to Proc. XII, temperature to 105°C, shock, sand, dust, humidity, saltspray, fungus, sunshine, rain, explosion, and altitude (to a vacuum)

Output Secondary
See voltage and current of specific models listed

features

- Hermetically sealed
- 105°C operation
- To meet MIL-T-27C
- Designed exclusively for 400 Hz
- For aerospace application
- Molded diallyl phthalate

MODEL TYPE	WEIGHT lbs. (max)	PRIMARY DCR ohms (typical)	EXCITATION CURRENT amps (max)
2E	0.06	201	0.020
6E	0.12	61	0.020
15E	0.26	14	0.040
24E	0.29	12	0.040
80E	0.75	2.0	0.100
175E	1.84	0.7	0.100

DELIVERY IS NORMALLY FROM STOCK

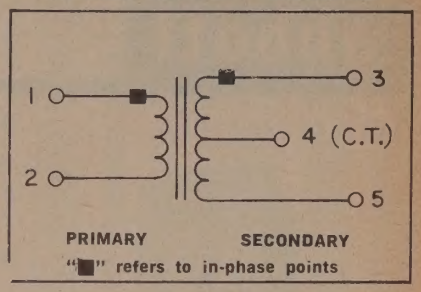
Output Volt (at F.L.)	Output Current (Amps)	Size (See Dwg.)	Sec. DCR (ohms)	Model Number	Price 1 Pc.	Price 2-4 pcs.
5.0	0.400	A	0.60	2E5CT	$28.80	$24.00
	1.200	B	0.144	6E5CT	26.40	22.00
	3.000	C	0.046	15E5CT	24.00	20.00
	4.800	D	0.040	24E5CT	31.20	26.00
	16.000	E2	0.009	80E5CT	33.60	28.00
	35.000	F2	0.012	175E5CT	72.00	60.00
6.3	0.317	A	1.06	2E6.3CT	28.20	23.50
	0.950	B	0.24	6E6.3CT	25.90	21.60
	2.380	C	0.088	15E6.3CT	23.50	19.60
	3.800	D	0.107	24E6.3CT	30.60	25.50
	12.800	E2	0.016	80E6.3CT	32.90	27.40
	27.800	F2	0.019	175E6.3CT	70.60	58.80
8.0	0.250	A	1.63	2E8CT	27.60	23.00
	0.750	B	0.396	6E8CT	25.30	21.10
	1.880	C	0.135	15E8CT	23.00	19.20
	3.000	D	0.140	24E8CT	30.00	25.00
	10.000	E2	0.017	80E8CT	32.30	26.90
	22.000	F2	0.010	175E8CT	69.10	57.60
10	0.200	A	2.50	2E10CT	27.10	22.60
	0.600	B	0.587	6E10CT	24.80	20.70
	1.500	C	0.27	15E10CT	22.60	18.80
	2.400	D	0.180	24E10CT	29.30	24.40
	8.000	E	7.2	80E10CT	31.60	26.30
	17.500	F2	0.020	175E10CT	67.70	56.40
12.6	0.158	A	4.10	2E12.6CT	26.50	22.10
	0.475	B	0.99	6E12.6CT	24.20	20.20
	1.180	C	0.32	15E12.6CT	22.10	18.40
	1.900	D	0.225	24E12.6CT	28.70	23.90
	6.350	E	0.030	80E12.6CT	31.00	25.80
	13.900	F2	0.021	175E12.6CT	66.20	55.20
14	0.142	A	5.59	2E14CT	25.90	21.60
	0.428	B	1.11	6E14CT	23.80	19.80
	1.070	C	0.35	15E14CT	21.60	18.00
	1.720	D	0.32	24E14CT	28.10	23.40
	5.600	E	0.04	80E14CT	30.20	25.20
	12.500	F2	0.022	175E14CT	64.80	54.00
16	0.125	A	6.63	2E16CT	25.30	21.10
	0.375	B	1.58	6E16CT	23.30	19.40
	0.940	C	0.54	15E16CT	21.10	17.60
	1.500	D	0.35	24E16CT	27.50	22.90
	5.000	E	0.05	80E16CT	29.50	24.60
	10.900	F2	0.025	175E16CT	63.40	52.80
18	0.111	A	9.00	2E18CT	24.70	20.60
	0.333	B	2.21	6E18CT	22.70	18.90
	0.832	C	0.74	15E18CT	20.60	17.20
	1.330	D	0.40	24E18CT	26.90	22.40
	4.450	E	0.08	80E18CT	28.90	24.10
	9.700	F	0.027	175E18CT	61.90	51.60
20	0.100	A	10.9	2E20CT	$24.20	$20.20
	0.300	B	2.78	6E20CT	22.20	18.50
	0.750	C	1.4	15E20CT	20.20	16.80
	1.200	D	0.48	24E20CT	26.20	21.80
	4.000	E	0.09	80E20CT	28.20	23.50
	8.750	F	0.020	175E20CT	60.50	50.40
22	0.091	A	14.6	2E22CT	23.60	19.70
	0.273	B	2.80	6E22CT	21.60	18.00
	0.680	C	0.92	15E22CT	19.70	16.40
	1.090	D	0.63	24E22CT	25.60	21.30
	3.630	E	0.12	80E22CT	27.60	23.00
	7.900	F	0.020	175E22CT	59.00	49.20
25	0.080	A	20.4	2E25CT	23.00	19.20
	0.240	B	3.60	6E25CT	21.10	17.60
	0.600	C	1.3	15E25CT	19.20	16.00
	0.900	D	0.68	24E25CT	25.00	20.80
	3.200	E	0.13	80E25CT	26.90	22.40
	7.000	F	0.042	175E25CT	57.60	48.00
28	0.071	A	30.0	2E28CT	22.40	18.70
	0.214	B	4.20	6E28CT	20.60	17.20
	0.535	C	1.83	15E28CT	18.70	15.60
	0.855	D	0.98	24E28CT	24.40	20.30
	2.850	E	0.14	80E28CT	26.20	21.80
	6.250	F	0.043	175E28CT	56.20	46.80
31	0.064	A	25.6	2E31CT	21.80	18.20
	0.192	B	5.71	6E31CT	20.00	16.70
	0.485	C	1.62	15E31CT	18.20	15.20
	0.772	D	1.27	24E31CT	23.80	19.80
	2.470	E	0.18	80E31CT	25.60	21.30
	5.650	F	0.061	175E31CT	54.70	45.60
35	0.057	A	29.5	2E35CT	21.40	17.80
	0.171	B	6.89	6E35CT	19.60	16.30
	0.428	C	2.28	15E35CT	17.80	14.80
	0.685	D	1.70	24E35CT	23.00	19.20
	2.280	E	0.28	80E35CT	24.80	20.70
	5.000	F	0.098	175E35CT	53.30	44.40
39	0.051	A	38.6	2E39CT	20.80	17.30
	0.154	B	9.39	6E39CT	19.00	15.80
	0.384	C	2.54	15E39CT	17.30	14.40
	0.615	D	2.20	24E39CT	22.40	18.70
	2.050	E	0.32	80E39CT	24.20	20.20
	4.480	F	0.110	175E39CT	51.80	43.20
43	0.046	A	44.3	2E43CT	20.20	16.80
	0.139	B	10.25	6E43CT	18.50	15.40
	0.348	C	2.85	15E43CT	16.80	14.00
	0.556	D	2.42	24E43CT	21.80	18.20
	1.860	E	0.35	80E43CT	23.50	19.60
	4.060	F	0.114	175E43CT	50.40	42.00
48	0.041	A	57	2E48CT	$19.60	$16.30
	0.125	B	15.30	6E48CT	18.00	15.00
	0.312	C	4.05	15E48CT	16.30	13.60
	0.500	D	3.27	24E48CT	21.20	17.70
	1.660	E	0.40	80E48CT	22.80	19.00
	3.650	F	0.160	175E48CT	49.00	40.80
55	0.036	A	89	2E55CT	19.00	15.80
	0.109	B	17.30	6E55CT	17.40	14.50
	0.262	C	7.2	15E55CT	15.80	13.20
	0.435	D	3.83	24E55CT	20.60	17.20
	1.450	E	0.67	80E55CT	22.20	18.50
	3.170	F	0.196	175E55CT	47.50	39.60
63	0.031	A	100	2E63CT	18.40	15.30
	0.095	B	24.9	6E63CT	16.90	14.10
	0.238	C	6.51	15E63CT	15.40	12.80
	0.380	D	5.35	24E63CT	19.90	16.60
	1.270	E	0.71	80E63CT	21.50	17.90
	2.770	F	0.20	175E63CT	46.10	38.40
70	0.028	A	139	2E70CT	17.90	14.90
	0.085	B	27.1	6E70CT	16.30	13.60
	0.214	C	9.4	15E70CT	14.90	12.40
	0.342	D	8.10	24E70CT	19.30	16.10
	1.140	E	0.80	80E70CT	20.90	17.40
	2.500	F	0.25	175E70CT	44.60	37.20
80	0.025	A	163	2E80CT	17.30	14.40
	0.075	B	39.0	6E80CT	15.80	13.20
	0.198	C	13.4	15E80CT	14.40	12.00
	0.300	D	9.0	24E80CT	18.70	15.60
	1.000	E	0.92	80E80CT	20.20	16.80
	2.180	F	0.34	175E80CT	43.20	36.00
90	0.022	A	218	2E90CT	16.70	13.90
	0.067	B	41.0	6E90CT	15.40	12.80
	0.166	C	15.9	15E90CT	13.90	11.60
	0.267	D	12.5	24E90CT	18.10	15.10
	0.890	E	1.08	80E90CT	19.40	16.20
	1.940	F	0.38	175E90CT	41.80	34.80
100	0.020	A	283	2E100CT	16.10	13.40
	0.060	B	59.5	6E100CT	14.80	12.30
	0.150	C	16.8	15E100CT	13.40	11.20
	0.240	D	14.4	24E100CT	17.50	14.60
	0.800	E	1.64	80E100CT	18.80	15.70
	1.750	F	0.52	175E100CT	40.30	33.60
110	0.018	A	392	2E110CT	15.60	13.00
	0.054	B	62.3	6E110CT	14.30	11.90
	0.136	C	22.1	15E110CT	13.00	10.80
	0.218	D	19.5	24E110CT	16.80	14.00
	0.728	E	2.03	80E110CT	18.10	15.10
	1.590	F	0.72	175E110CT	38.90	32.40

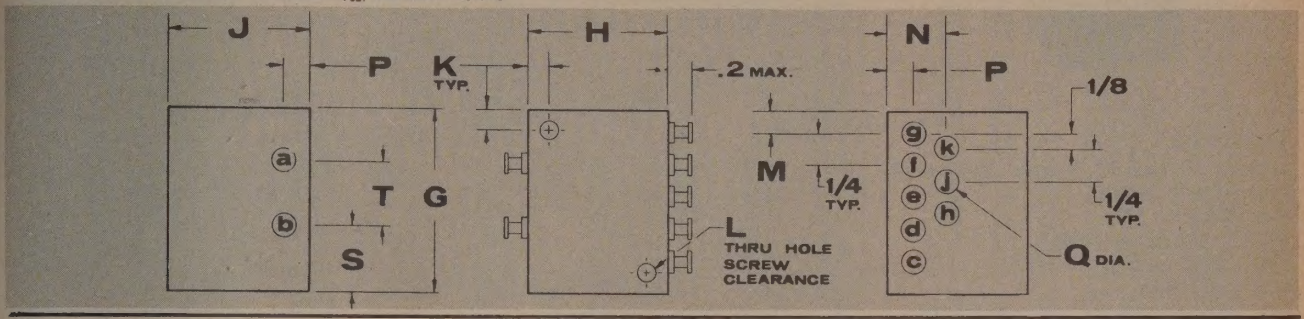
* **NOTE:** These transformers are designed to operate at 400 Hz. For Abbott's 60 Hz transformers, see page 2850.

SIZE	G	H	J	K	L	M	N	P	Q	S	T	†TERMINALS USED (1)	(2)	(3)	(4)	(5)
A	0.87	0.74	0.78	3/32	4-40	3/16	1/4	1/8	.062	3/16	1/4	a	b	f	k	g
B	1.25	1.19	0.88	1/8	4-40	1/4	3/8	3/16	.062	—	—	e	f	g	h	j
C	1.43	1.24	1.27	1/8	4-40	1/4	3/8	3/16	.062	—	—	d	e	f	g	h
D	1.47	1.28	1.40	1/8	4-40	1/4	3/8	3/16	.062	—	—	d	e	f	g	h
E	2.31	1.52	1.75	1/4	8-32	1/2	—	3/16	.080	—	—	c	d	e	f	g
E2*	2.31	1.52	1.75	1/4	8-32	1/2	—	3/16	.080	3/4	1/2	a	b	c	e	g
F	2.75	2.71	2.31	1/4	8-32	3/4	—	3/16	.080	—	—	c	d	e	f	g
F2*	2.75	2.71	2.31	1/4	8-32	3/4	—	3/16	.080	1	1/2	a	b	c	e	g

* Larger Output Terminals used on Units With Current 10 amps or Greater. Height: 0.375. Dia: 0.115.
† Letters Indicate Terminal Placement Only. Terminals are Numbered (1) Thru (5). See Diagram.
Tolerances on all dimensions: Fractions ±1/32; Decimals ±0.015

TYPICAL CIRCUIT DIAGRAM





Output Volt (at F.L.)	Output Current (Amps)	Size (See Dwg.)	Sec. DCR (ohms)	Model Number	Price 1 pc.	Price 2-4 pcs.
123	0.016	A	495	2E123CT	$15.00	$12.50
	0.048	B	96.0	6E123CT	13.70	11.40
	0.122	C	30.7	15E123CT	12.50	10.40
	0.195	D	21.9	24E123CT	16.20	13.50
	0.650	E	2.35	80E123CT	17.50	14.60
	1.420	F	0.81	175E123CT	37.40	31.20
138	0.014	A	550	2E138CT	14.40	12.00
	0.043	B	133.0	6E138CT	13.20	11.00
	0.108	C	36.0	15E138CT	12.00	10.00
	0.174	D	30.3	24E138CT	15.60	13.00
	0.580	E	3.17	80E138CT	16.80	14.00
	1.260	F	1.14	175E138CT	36.00	30.00
157	0.038	B	153.0	6E157CT	14.50	12.10
	0.095	C	53	15E157CT	13.20	10.50
	0.152	D	36.1	24E157CT	16.40	13.70
	0.508	E	3.60	80E157CT	17.60	14.70
	1.100	F	1.31	175E157CT	37.80	31.50
175	0.034	B	168.0	6E175CT	14.50	12.10
	0.085	C	56	15E175CT	13.20	11.00
	0.136	D	49.5	24E175CT	17.20	14.30
	0.455	E	5.50	80E175CT	18.50	15.40
	1.000	F	1.87	175E175CT	39.60	33.00
200	0.030	B	248.0	6E200CT	15.20	12.70
	0.071	C	65	15E200CT	13.80	11.50
	0.120	D	57	24E200CT	18.00	15.00
	0.400	E	5.60	80E200CT	19.30	16.10
	0.875	F	2.65	175E200CT	41.40	34.50
220	0.027	B	278	6E220CT	15.80	13.20
	0.068	C	91.5	15E220CT	14.40	12.00
	0.109	D	79	24E220CT	18.70	15.60
	0.364	E	8.1	80E220CT	20.20	16.80
	0.790	F	2.92	175E220CT	43.20	36.00
250	0.024	B	407	6E250CT	16.60	13.80
	0.060	C	141	15E250CT	15.00	12.50
	0.096	D	114	24E250CT	19.60	16.30
	0.320	E	11.2	80E250CT	21.00	17.50
	0.700	F	3.95	175E250CT	45.00	37.50
275	0.021	B	417	6E275CT	17.20	14.30
	0.054	C	146	15E275CT	15.60	13.00
	0.087	D	120	24E275CT	20.30	16.90
	0.290	E	13.6	80E275CT	21.80	18.20
	0.635	F	4.65	175E275CT	46.80	39.00
310	0.019	B	592	6E310CT	$17.90	$14.90
	0.048	C	160	15E310CT	16.20	13.50
	0.077	D	180	24E310CT	21.10	17.60
	0.266	E	14.1	80E310CT	22.70	18.90
	0.565	F	6.80	175E310CT	48.60	40.50
350	0.017	B	680	6E350CT	18.50	15.40
	0.042	C	232	15E350CT	16.80	14.00
	0.068	D	200	24E350CT	21.80	18.20
	0.217	E	21.2	80E350CT	23.50	19.60
	0.500	F	8.0	175E350CT	50.40	42.00
387	0.038	C	310	15E387CT	17.40	14.50
	0.062	D	225	24E387CT	22.70	18.90
	0.206	E	22.7	80E387CT	24.40	20.30
	0.450	F	10.0	175E387CT	52.20	43.50
433	0.034	C	457	15E433CT	18.00	15.00
	0.055	D	300	24E433CT	23.40	19.50
	0.184	E	31.6	80E433CT	25.20	21.00
	0.404	F	11.2	175E433CT	54.00	45.00
486	0.049	D	340	24E486CT	24.20	20.20
	0.164	E	35.6	80E486CT	26.00	21.70
	0.360	F	16.0	175E486CT	55.80	46.50
550	0.043	D	484	24E550CT	25.00	20.80
	0.145	E	41.0	80E550CT	26.90	22.40
	0.316	F	18.0	175E550CT	57.60	48.00
630	0.126	E	73.0	80E630CT	27.70	23.10
	0.277	F	25.8	175E630CT	59.40	49.50
700	0.114	E	83.0	80E700CT	28.60	23.80
	0.250	F	28.5	175E700CT	61.20	51.00
800	0.100	E	112	80E800CT	29.40	24.50
	0.217	F	41.5	175E800CT	63.00	52.50
900	0.088	E	158	80E900CT	30.20	25.20
	0.194	F	46.4	175E900CT	64.80	54.00
1000	0.080	E	176	80E1000CT	31.10	25.90
	0.175	F	53.0	175E1000CT	66.60	55.50
1100	0.072	E2	198	80E1100CT	31.90	26.00
	0.158	F2	71.0	175E1200CT	68.40	57.00
1200	0.066	E2	216	80E1200CT	32.80	27.30
	0.145	F2	78.5	175E1200CT	70.20	58.50
1400	0.056	E2	300	80E1400CT	$33.60	$28.00
	0.125	F2	117	175E1400CT	72.00	60.00
1600	0.050	E2	335	80E1600CT	34.40	28.70
	0.109	F2	168	175E1600CT	73.80	61.50
1800	0.044	E2	530	80E1800CT	35.30	29.40
	0.097	F2	192	175E1800CT	75.60	63.00
2000	0.040	E2	575	80E2000CT	36.10	30.10
	0.087	F2	214	175E2000CT	77.40	64.50
2200	0.036	E2	810	80E2200CT	37.00	30.80
	0.079	F2	304	175E2200CT	79.20	66.00
2400	0.033	E2	910	80E2400CT	37.80	31.50
	0.072	F2	333	175E2400CT	81.00	67.50
2600	0.030	E2	1310	80E2600CT	38.60	32.20
	0.067	F2	356	175E2600CT	82.80	69.00
2800	0.028	E2	1425	80E2800CT	39.50	32.90
	0.062	F2	394	175E2800CT	84.60	70.50
3000	0.026	E2	1440	80E3000CT	40.30	33.60
	0.058	F2	530	175E3000CT	86.40	72.00
3200	0.054	F2	560	175E3200CT	88.20	73.50
3400	0.051	F2	740	175E3400CT	90.00	75.00
3600	0.048	F2	790	175E3600CT	91.80	76.50
3800	0.046	F2	836	175E3800CT	93.60	78.00
4000	0.043	F2	1115	175E4000CT	95.40	79.50
4200	0.041	F2	1175	175E4200CT	97.20	81.00
4400	0.039	F2	1352	175E4400CT	99.00	82.50
4600	0.038	F2	1357	175E4600CT	100.80	84.00
4800	0.036	F2	1730	175E4800CT	102.60	85.50
5000	0.035	F2	2240	175E5000CT	104.40	87.00

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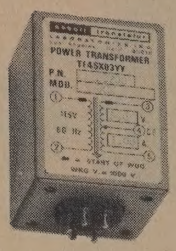
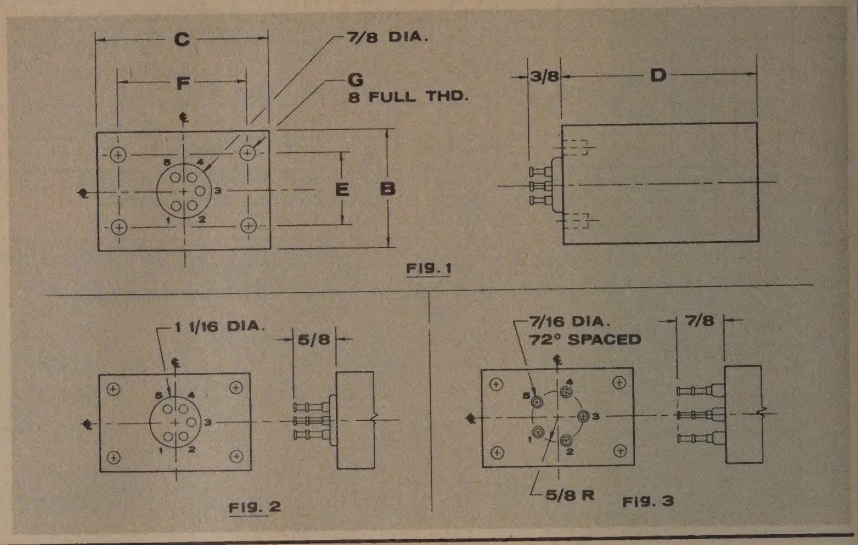
abbott 60 ∼ transformers





features

- Quality MIL-spec 60 Hz power transformers
- Hermetically sealed
- to meet MIL-T-27C
- 105°C ambient operation
- 5 to 5000 volts
- 5 to 300 watts

DELIVERY IS FROM STOCK

specifications

INPUT PRIMARY: 115 VRMS, 60 Hz ±5 Hz, 1 phase

INSULATION TEST: 1750 VRMS or 150% of secondary voltage (whichever is higher)

CONSTRUCTION: To MIL-T-27C, grade: 4, class: "S", life: "X" (10,000 hrs.) case: (see drawing)

ENVIRONMENT: 105°C maximum ambient temperature. Encapsulated to meet MIL-E-5272C and MIL-E-5400K for vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, shunshine, rain, explosion and altitude (to a vacuum)

WORKING VOLTAGE: 1000 VAC for all transformers with secondary voltages up to and including 1200 VAC; 80% of rated secondary voltage for all others

SECONDARY VOLTAGE TOLERANCE: Within 3% of listed output voltage when measured at full load and 115 VAC input

OUTPUT SECONDARY: See voltage and current of specific models listed in the following pages.

TYPICAL CIRCUIT DIAGRAM

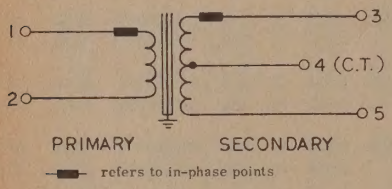


FIG. 1 SIZE CHART

SIZE	B	C	D	E	F	G
A1	1½	1¾	2⅜	1 1/16	1¼	6-32
A2	1¾	2 1/16	2¾	1¼	1½	6-32
A3	1⅞	2⅜	3⅛	1¼	1¾	8-32
A4	2	2⅜	3⅛	1½	1¾	8-32
A5	2⅛	2 11/16	3½	1½	2	8-32
A6	2¼	2 11/16	3½	1⅝	2	8-32
A7*	2⅝	3⅛	4⅛	2	2¼	8-32
A8*	2⅞	3 7/16	4½	2¼	2½	10-32
A9*	3⅛	3¾	4⅞	2 7/16	2¾	10-32
A10*	3⅞	4 1/16	5¼	2⅝	3	¼-20
A11*	3⅞	4 11/16	6	2¾	3½	¼-20

* See Fig. 2 for Header Configuration Used on Units with Current Greater Than 10 Amps.
See Fig. 3 for Header Configuration Used on Units with Voltage Greater Than 1200 Volts.

Output Volt (at F.L.)	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
5.0	1.00	A1	1.0	5P5CT	$34.50	$28.80
	2.00	A2	1.5	10P5CT	31.60	26.40
	3.00	A3	2.0	15P5CT	28.80	24.00
	4.00	A4	2.5	20P5CT	31.60	26.40
	6.00	A5	3.0	30P5CT	37.40	31.20
	8.00	A6	3.3	40P5CT	39.20	32.70
	16.00	A7	5.0	80P5CT	46.10	38.40
6.3	0.79	A1	1.0	5P6.3CT	33.70	28.10
	1.58	A2	1.5	10P6.3CT	31.10	25.90
	2.38	A3	2.0	15P6.3CT	28.20	23.50
	3.16	A4	2.5	20P6.3CT	31.00	25.80
	4.76	A5	3.0	30P6.3CT	36.60	30.50
	6.35	A6	3.3	40P6.3CT	38.40	32.00
	12.70	A7	5.0	80P6.3CT	45.60	38.00
	19.00	A8	6.5	120P6.3CT	52.70	43.90
8.0	0.67	A1	1.0	5P8CT	33.10	27.60
	1.25	A2	1.5	10P8CT	30.30	25.20
	1.88	A3	2.0	15P8CT	27.60	23.00
	2.50	A4	2.5	20P8CT	30.40	25.30
	3.76	A5	3.0	30P8CT	36.00	30.00
	5.00	A6	3.3	40P8CT	37.70	31.40
	10.00	A7	5.0	80P8CT	44.60	37.20
	15.00	A8	6.5	120P8CT	51.60	43.00
	20.00	A9	8.2	160P8CT	58.50	48.80
10.0	0.50	A1	1.0	5P10CT	32.50	27.10
	1.00	A2	1.5	10P10CT	29.70	24.80
	1.50	A3	2.0	15P10CT	27.00	22.50
	2.00	A4	2.5	20P10CT	29.70	24.80
	3.00	A5	3.0	30P10CT	35.10	29.20
	4.00	A6	3.3	40P10CT	36.80	30.70
	8.00	A7	5.0	80P10CT	43.60	36.40
	12.00	A8	6.5	120P10CT	54.30	45.20
	16.00	A9	8.2	160P10CT	57.30	47.70
	20.00	A10	10.5	200P10CT	64.10	53.40
12.6	0.40	A1	1.0	5P12.6CT	31.70	26.40
	0.79	A2	1.5	10P12.6CT	29.00	24.20
	1.19	A3	2.0	15P12.6CT	26.40	22.00
	1.59	A4	2.5	20P12.6CT	29.00	24.20
	2.38	A5	3.0	30P12.6CT	34.30	28.60
	3.18	A6	3.3	40P12.6CT	36.00	30.00
	6.35	A7	5.0	80P12.6CT	42.70	35.60
	9.53	A8	6.5	120P12.6CT	49.40	41.20
	12.70	A9	8.2	160P12.6CT	56.00	46.70
	15.90	A10	10.5	200P12.6CT	62.70	52.30
14	0.36	A1	1.0	5P14CT	31.10	25.90
	0.72	A2	1.5	10P14CT	28.50	23.70
	1.07	A3	2.0	15P14CT	25.90	21.60
	1.43	A4	2.5	20P14CT	28.50	23.70
	2.15	A5	3.0	30P14CT	33.60	28.00
	2.86	A6	3.3	40P14CT	35.30	29.40
	5.72	A7	5.0	80P14CT	41.80	34.80
	8.59	A8	6.5	120P14CT	48.30	40.30
	11.40	A9	8.2	160P14CT	54.90	45.70
	14.30	A10	10.5	200P14CT	61.40	51.20
16	0.34	A1	1.0	5P16CT	30.30	25.20
	0.68	A2	1.5	10P16CT	27.90	23.20
	0.94	A3	2.0	15P16CT	25.30	21.10
	1.25	A4	2.5	20P16CT	27.80	23.20
	1.87	A5	3.0	30P16CT	32.90	27.40
	2.50	A6	3.3	40P16CT	34.50	28.80
	5.00	A7	5.0	80P16CT	40.80	34.00
	7.50	A8	6.5	120P16CT	47.30	39.40
	10.00	A9	8.2	160P16CT	53.60	44.70
	12.50	A10	10.5	200P16CT	60.00	50.00
	18.70	A11	17.0	300P16CT	76.00	63.30
18	0.28	A1	1.0	5P18CT	$29.60	$24.70
	0.56	A2	1.5	10P18CT	27.10	22.60
	0.83	A3	2.0	15P18CT	24.70	20.60
	1.11	A4	2.5	20P18CT	27.20	22.70
	1.67	A5	3.0	30P18CT	32.20	26.80
	2.21	A6	3.3	40P18CT	33.70	28.10
	4.44	A7	5.0	80P18CT	40.00	33.30
	6.68	A8	6.5	120P18CT	46.20	38.50
	8.89	A9	8.2	160P18CT	52.40	43.60
	11.10	A10	10.5	200P18CT	58.60	48.80
	16.70	A11	17.0	300P18CT	74.30	61.90
20	0.25	A1	1.0	5P20CT	29.00	24.20
	0.50	A2	1.5	10P20CT	26.50	22.10
	0.75	A3	2.0	15P20CT	24.10	20.10
	1.00	A4	2.5	20P20CT	26.50	22.10
	1.50	A5	3.0	30P20CT	31.30	26.10
	2.00	A6	3.3	40P20CT	32.90	27.40
	4.00	A7	5.0	80P20CT	38.90	32.40
	6.00	A8	6.5	120P20CT	45.10	37.60
	8.00	A9	8.2	160P20CT	51.10	42.60
	10.00	A10	10.5	200P20CT	57.30	47.70
	15.00	A11	17.0	300P20CT	72.50	60.40
22	0.23	A1	1.0	5P22CT	28.30	23.60
	0.45	A2	1.5	10P22CT	25.90	21.60
	0.68	A3	2.0	15P22CT	23.60	19.60
	0.91	A4	2.5	20P22CT	25.90	21.60
	1.36	A5	3.0	30P22CT	30.60	25.50
	1.82	A6	3.3	40P22CT	32.10	26.80
	3.64	A7	5.3	80P22CT	38.10	31.70
	5.45	A8	6.5	120P22CT	44.00	36.70
	7.27	A9	8.2	160P22CT	50.00	41.60
	9.10	A10	10.5	200P22CT	55.90	46.60
	13.60	A11	17.0	300P22CT	70.80	59.00
25	0.20	A1	1.0	5P25CT	27.60	23.00
	0.40	A2	1.5	10P25CT	25.30	21.10
	0.60	A3	2.0	15P25CT	23.00	19.20
	0.80	A4	2.5	20P25CT	25.30	21.10
	1.20	A5	3.0	30P25CT	29.90	24.90
	1.60	A6	3.3	40P25CT	31.30	26.10
	3.20	A7	5.0	80P25CT	37.10	30.90
	4.80	A8	6.5	120P25CT	43.00	35.80
	6.40	A9	8.2	160P25CT	48.70	40.60
	8.00	A10	10.5	200P25CT	54.50	45.40
	12.00	A11	17.0	300P25CT	69.10	57.60
28	0.18	A1	1.0	5P28CT	26.80	22.40
	0.36	A2	1.5	10P28CT	24.70	20.60
	0.54	A3	2.0	15P28CT	22.40	18.70
	0.71	A4	2.5	20P28CT	24.60	20.50
	1.07	A5	3.0	30P28CT	29.10	24.30
	1.43	A6	3.3	40P28CT	30.60	25.50
	2.86	A7	5.0	80P28CT	36.20	30.20
	4.29	A8	6.5	120P28CT	41.90	34.90
	5.72	A9	8.2	160P28CT	47.50	39.60
	7.10	A10	10.5	200P28CT	53.10	44.30
	10.70	A11	17.0	300P28CT	67.30	56.10
31	0.16	A1	1.0	5P31CT	26.20	21.80
	0.32	A2	1.5	10P31CT	24.00	20.00
	0.48	A3	2.0	15P31CT	21.80	18.20
	0.64	A4	2.5	20P31CT	24.00	20.00
	0.97	A5	3.0	30P31CT	28.50	23.70
	1.29	A6	3.3	40P31CT	29.80	24.80
	2.58	A7	5.0	80P31CT	35.30	29.40
	3.87	A8	6.5	120P31CT	40.80	34.00
	5.17	A9	8.2	160P31CT	46.30	38.60
	6.40	A10	10.5	200P31CT	51.80	43.20
	9.67	A11	17.0	300P31CT	65.60	54.70

Output Volt (at F.L.)	Output Current (Amps)	Size (See Dwg.)	Wt. lbs.	Model Number	Price 1 pc.	Price 2-4 pcs.
35	0.14	A1	1.0	5P35CT	$25.60	$21.30
	0.29	A2	1.5	10P35CT	23.40	19.50
	0.43	A3	2.0	15P35CT	21.30	17.70
	0.57	A4	2.5	20P35CT	23.40	19.50
	0.86	A5	3.0	30P35CT	27.60	23.00
	1.14	A6	3.3	40P35CT	28.90	24.10
	2.28	A7	5.0	80P35CT	34.30	28.60
	3.43	A8	6.5	120P35CT	39.70	33.10
	4.57	A9	8.2	160P35CT	45.10	37.60
	5.71	A10	10.5	200P35CT	50.40	42.00
	8.59	A11	17.0	300P35CT	63.90	53.20
39	0.13	A1	1.0	5P39CT	24.80	20.70
	0.26	A2	1.5	10P39CT	22.70	18.90
	0.38	A3	2.0	15P39CT	20.70	17.20
	0.51	A4	2.5	20P39CT	22.70	18.90
	0.77	A5	3.0	30P39CT	26.80	22.40
	1.03	A6	3.3	40P39CT	28.20	23.50
	2.05	A7	5.0	80P39CT	33.40	27.80
	3.07	A8	6.5	120P39CT	38.60	32.20
	4.10	A9	8.2	160P39CT	43.80	36.50
	5.12	A10	10.5	200P39CT	49.00	40.80
	7.69	A11	17.0	300P39CT	62.20	51.80
43	0.12	A1	1.0	5P43CT	24.10	20.10
	0.23	A2	1.5	10P43CT	22.10	18.40
	0.35	A3	2.0	15P43CT	20.10	16.80
	0.46	A4	2.5	20P43CT	22.10	18.40
	0.70	A5	3.0	30P43CT	26.20	21.80
	0.93	A6	3.3	40P43CT	27.40	22.80
	1.85	A7	5.0	80P43CT	32.50	27.10
	2.79	A8	6.5	120P43CT	37.60	31.30
	3.70	A9	8.2	160P43CT	42.60	35.50
	4.64	A10	10.5	200P43CT	47.70	39.70
	6.95	A11	17.0	300P43CT	60.40	50.40
48	0.10	A1	1.0	5P48CT	23.40	19.50
	0.21	A2	1.5	10P48CT	21.60	18.00
	0.31	A3	2.0	15P48CT	19.50	16.30
	0.42	A4	2.5	20P48CT	21.50	17.90
	0.63	A5	3.0	30P48CT	25.40	21.20
	0.83	A6	3.3	40P48CT	26.60	22.20
	1.63	A7	5.0	80P48CT	31.50	26.30
	2.50	A8	6.5	120P48CT	36.40	30.40
	3.33	A9	8.2	160P48CT	41.40	34.50
	4.17	A10	10.5	200P48CT	46.30	38.60
	6.26	A11	17.0	300P48CT	58.70	48.90
55	0.09	A1	1.0	5P55CT	22.70	18.90
	0.18	A2	1.5	10P55CT	20.80	17.30
	0.27	A3	2.0	15P55CT	19.00	15.80
	0.36	A4	2.5	20P55CT	20.90	17.40
	0.55	A5	3.0	30P55CT	24.70	20.60
	0.73	A6	3.3	40P55CT	25.90	21.60
	1.46	A7	5.0	80P55CT	30.70	25.60
	2.18	A8	6.5	120P55CT	35.40	29.50
	2.91	A9	8.2	160P55CT	40.20	33.50
	3.64	A10	10.5	200P55CT	45.00	37.50
	5.46	A11	17.0	300P55CT	57.00	47.50
63	0.08	A1	1.0	5P63CT	21.90	18.30
	0.16	A2	1.5	10P63CT	20.20	16.80
	0.24	A3	2.0	15P63CT	18.40	15.30
	0.32	A4	2.5	20P63CT	20.20	16.80
	0.48	A5	3.0	30P63CT	23.90	19.90
	0.64	A6	3.3	40P63CT	25.00	20.80
	1.27	A7	5.0	80P63CT	29.60	24.70
	1.91	A8	6.5	120P63CT	34.30	28.60
	2.52	A9	8.2	160P63CT	38.90	32.40
	3.18	A10	10.5	200P63CT	43.50	36.30
	4.76	A11	17.0	300P63CT	55.20	46.00
70	0.071	A1	1.0	5P70CT	21.40	17.80
	0.143	A2	1.5	10P70CT	19.50	16.30
	0.212	A3	2.0	15P70CT	17.80	14.80
	0.286	A4	2.5	20P70CT	19.50	16.30
	0.429	A5	3.0	30P70CT	23.10	19.20
	0.572	A6	3.3	40P70CT	24.20	20.20
	1.140	A7	5.0	80P70CT	28.80	24.00
	1.720	A8	6.5	120P70CT	33.30	27.70
	2.280	A9	8.2	160P70CT	37.70	31.40
	2.860	A10	10.5	200P70CT	42.20	35.20
	4.290	A11	17.0	300P70CT	53.50	44.60
80	0.067	A1	1.0	5P80CT	20.70	17.20
	0.125	A2	1.5	10P80CT	19.00	15.80
	0.187	A3	2.0	15P80CT	17.20	14.40
	0.250	A4	2.5	20P80CT	19.00	15.80
	0.375	A5	3.0	30P80CT	22.40	18.70
	0.500	A6	3.3	40P80CT	23.50	19.60
	1.000	A7	5.0	80P80CT	27.80	23.20
	1.500	A8	6.5	120P80CT	32.10	26.80
	2.000	A9	8.2	160P80CT	36.50	30.40
	2.500	A10	10.5	200P80CT	40.80	34.00
	3.750	A11	17.0	300P80CT	51.80	43.20
90	0.055	A1	1.0	5P90CT	19.90	16.60
	0.111	A2	1.5	10P90CT	18.40	15.30
	0.167	A3	2.0	15P90CT	16.70	13.90
	0.222	A4	2.5	20P90CT	18.30	15.20
	0.332	A5	3.0	30P90CT	21.60	18.00
	0.445	A6	3.3	40P90CT	22.70	18.90
	0.890	A7	5.0	80P90CT	26.90	22.40
	1.340	A8	6.5	120P90CT	31.20	26.00
	1.780	A9	8.2	160P90CT	35.40	29.50
	2.220	A10	10.5	200P90CT	39.60	33.00
	3.320	A11	17.0	300P90CT	50.10	41.70
100	0.050	A1	1.0	5P100CT	19.20	16.00
	0.100	A2	1.5	10P100CT	17.60	14.70
	0.150	A3	2.0	15P100CT	16.10	13.40
100	0.200	A4	2.5	20P100CT	$17.70	$14.80
	0.300	A5	3.0	30P100CT	21.00	17.50
	0.400	A6	3.3	40P100CT	21.90	18.30
	0.800	A7	5.0	80P100CT	26.00	21.60
	1.200	A8	6.5	120P100CT	30.00	25.00
	1.500	A9	8.2	160P100CT	34.00	28.40
	2.000	A10	10.5	200P100CT	38.10	31.70
	3.000	A11	17.0	300P100CT	48.30	40.30
110	0.045	A1	1.0	5P110CT	18.70	15.60
	0.091	A2	1.5	10P110CT	17.00	14.20
	0.136	A3	2.0	15P110CT	15.50	12.90
	0.182	A4	2.5	20P110CT	17.00	14.20
	0.272	A5	3.0	30P110CT	20.10	16.80
	0.364	A6	3.3	40P110CT	21.10	17.60
	0.726	A7	5.0	80P110CT	25.00	20.80
	1.090	A8	6.5	120P110CT	28.90	24.10
	1.450	A9	8.2	160P110CT	32.80	27.30
	1.820	A10	10.5	200P110CT	36.70	30.60
	2.720	A11	17.0	300P110CT	46.60	38.80
123	0.040	A1	1.0	5P123CT	17.90	14.90
	0.081	A2	1.5	10P123CT	16.40	13.60
	0.122	A3	2.0	15P123CT	14.90	12.40
	0.162	A4	2.5	20P123CT	16.40	13.60
	0.244	A5	3.0	30P123CT	19.30	16.10
	0.325	A6	3.3	40P123CT	20.30	16.90
	0.650	A7	5.0	80P123CT	24.00	20.00
	0.970	A8	6.5	120P123CT	27.90	23.20
	1.300	A9	8.2	160P123CT	31.60	26.40
	1.620	A10	10.5	200P123CT	35.40	29.50
	2.440	A11	17.0	300P123CT	44.90	37.40
138	0.036	A1	1.0	5P138CT	17.20	14.40
	0.073	A2	1.5	10P138CT	15.80	13.20
	0.108	A3	2.0	15P138CT	14.40	12.00
	0.145	A4	2.5	20P138CT	15.80	13.20
	0.217	A5	3.0	30P138CT	18.70	15.60
	0.289	A6	3.3	40P138CT	19.50	16.30
	0.580	A7	5.0	80P138CT	23.20	19.30
	0.870	A8	6.5	120P138CT	26.80	22.40
	1.150	A9	8.2	160P138CT	30.50	25.40
	1.450	A10	10.5	200P138CT	34.10	28.40
	2.170	A11	17.0	300P138CT	43.20	36.00
157	0.064	A2	1.5	10P157CT	16.70	13.90
	0.096	A3	2.0	15P157CT	15.00	12.50
	0.127	A4	2.5	20P157CT	16.60	13.80
	0.191	A5	3.0	30P157CT	19.60	16.40
	0.254	A6	3.3	40P157CT	20.60	17.20
	0.510	A7	5.0	80P157CT	24.40	20.40
	0.760	A8	6.5	120P157CT	28.20	23.50
	1.020	A9	8.2	160P157CT	32.00	26.70
	1.270	A10	10.5	200P157CT	35.90	29.90
	1.910	A11	17.0	300P157CT	45.30	37.70
175	0.057	A2	1.5	10P175CT	17.30	14.40
	0.086	A3	2.0	15P175CT	15.80	13.20
	0.114	A4	2.5	20P175CT	17.30	14.40
	0.171	A5	3.0	30P175CT	20.50	17.10
	0.228	A6	3.3	40P175CT	21.60	18.00
	0.457	A7	5.0	80P175CT	25.50	21.20
	0.685	A8	6.5	120P175CT	29.50	24.60
	0.914	A9	8.2	160P175CT	33.50	27.90
	1.140	A10	10.5	200P175CT	37.50	31.20
	1.710	A11	17.0	300P175CT	47.50	39.60
200	0.050	A2	1.5	10P200CT	18.20	15.20
	0.075	A3	2.0	15P200CT	16.50	13.70
	0.100	A4	2.5	20P200CT	18.20	15.20
	0.150	A5	3.0	30P200CT	21.60	18.00
	0.200	A6	3.3	40P200CT	22.65	18.80
	0.400	A7	5.0	80P200CT	26.70	22.30
	0.600	A8	6.5	120P200CT	30.90	25.70
	0.800	A9	8.2	160P200CT	35.00	29.20
	1.000	A10	10.5	200P200CT	39.10	32.60
	1.500	A11	17.0	300P200CT	49.60	41.30
220	0.045	A2	1.5	10P220CT	19.00	15.80
	0.068	A3	2.0	15P220CT	17.20	14.40
	0.091	A4	2.5	20P220CT	19.00	15.80
	0.136	A5	3.0	30P200CT	22.40	18.70
	0.182	A6	3.3	40P220CT	23.50	19.60
	0.364	A7	5.0	80P220CT	27.80	23.20
	0.546	A8	6.5	120P220CT	32.10	26.80
	0.728	A9	8.2	160P220CT	36.50	30.40
	0.914	A10	10.5	200P220CT	40.80	34.00
	1.360	A11	17.0	300P220CT	51.80	43.20
250	0.060	A3	2.0	15P250CT	17.90	14.90
	0.080	A4	2.5	20P250CT	19.70	16.40
	0.120	A5	3.0	30P250CT	23.40	19.50
	0.160	A6	3.3	40P250CT	24.50	20.40
	0.320	A7	5.0	80P250CT	29.00	24.20
	0.480	A8	6.5	120P250CT	33.60	28.00
	0.640	A9	8.2	160P250CT	38.20	31.80
	0.800	A10	10.5	200P250CT	42.70	35.60
	1.200	A11	17.0	300P250CT	53.90	44.90
275	0.055	A3	2.0	15P275CT	18.70	15.60
	0.073	A4	2.5	20P275CT	20.50	17.10
	0.109	A5	3.0	30P275CT	24.20	20.20
	0.146	A6	3.3	40P275CT	25.50	21.20
	0.292	A7	5.0	80P275CT	30.20	25.20
	0.437	A8	6.5	120P275CT	34.90	29.10
	0.581	A9	8.2	160P275CT	39.60	33.00
	0.728	A10	10.5	200P275CT	44.30	36.90
	1.090	A11	17.0	300P275CT	56.10	46.80
310	0.065	A4	2.5	20P310CT	21.40	17.80
	0.097	A5	3.0	30P310CT	25.30	21.10
	0.130	A6	3.3	40P310CT	26.40	22.00
	0.258	A7	5.0	80P310CT	31.30	26.10
310	0.387	A8	6.5	120P310CT	$36.20	$30.20
	0.516	A9	8.2	160P310CT	41.10	34.30
	0.645	A10	10.5	200P310CT	46.00	38.40
	0.967	A11	17.0	300P310CT	58.20	48.50
350	0.057	A4	2.5	20P350CT	22.10	18.40
	0.086	A5	3.0	30P350CT	26.20	21.80
	0.114	A6	3.3	40P350CT	27.40	22.80
	0.229	A7	5.0	80P350CT	32.50	27.10
	0.343	A8	6.5	120P350CT	37.60	31.30
	0.457	A9	8.2	160P350CT	42.60	35.50
	0.571	A10	10.5	200P350CT	47.70	39.70
	0.857	A11	17.0	300P350CT	60.40	50.40
387	0.077	A5	3.0	30P387CT	27.10	22.60
	0.103	A6	3.3	40P387CT	28.50	23.70
	0.203	A7	5.0	80P387CT	33.70	28.10
	0.310	A8	6.5	120P387CT	39.00	32.50
	0.414	A9	8.2	160P387CT	44.20	36.80
	0.517	A10	10.5	200P387CT	49.50	41.20
	0.775	A11	17.0	300P387CT	62.50	52.10
433	0.069	A5	3.0	30P433CT	28.00	23.30
	0.093	A6	3.3	40P433CT	29.30	24.40
	0.185	A7	5.0	80P433CT	34.80	29.00
	0.277	A8	6.5	120P433CT	40.30	33.60
	0.370	A9	8.2	160P433CT	45.70	38.10
	0.463	A10	10.5	200P433CT	51.20	42.70
	0.693	A11	17.0	300P433CT	64.80	54.00
486	0.062	A5	3.0	30P486CT	29.00	24.20
	0.082	A6	3.3	40P486CT	30.40	25.30
	0.164	A7	5.0	80P486CT	36.00	30.00
	0.246	A8	6.5	120P486CT	41.60	34.70
	0.329	A9	8.2	160P486CT	47.30	39.40
	0.411	A10	10.5	200P486CT	52.80	44.00
	0.618	A11	17.0	300P486CT	66.90	55.70
550	0.073	A6	3.3	40P550CT	31.30	26.10
	0.145	A7	5.0	80P550CT	37.10	30.90
	0.218	A8	6.5	120P550CT	43.00	35.80
	0.291	A9	8.2	160P550CT	48.70	40.64
	0.364	A10	10.5	200P550CT	54.50	45.40
	0.546	A11	17.0	300P550CT	69.10	57.60
630	0.064	A6	3.3	40P630CT	32.40	27.00
	0.127	A7	5.0	80P630CT	38.40	32.00
	0.191	A8	6.5	120P630CT	44.30	36.90
	0.254	A9	8.2	160P630CT	50.30	41.90
	0.318	A10	10.5	200P630CT	56.20	46.80
	0.477	A11	17.0	300P630CT	71.20	59.30
700	0.114	A7	5.0	80P700CT	39.40	32.80
	0.172	A8	6.5	120P700CT	45.60	38.00
	0.229	A9	8.2	160P700CT	51.70	43.10
	0.286	A10	10.5	200P700CT	57.80	48.20
	0.429	A11	17.0	300P700CT	73.40	61.20
800	0.100	A7	5.0	80P800CT	40.70	33.90
	0.150	A8	6.5	120P800CT	47.00	39.20
	0.200	A9	8.2	160P800CT	53.30	44.40
	0.250	A10	10.5	200P800CT	59.70	49.70
	0.375	A11	17.0	300P800CT	75.50	62.90
900	0.089	A7	5.0	80P900CT	41.80	34.80
	0.133	A8	6.5	120P900CT	48.30	40.30
	0.178	A9	8.2	160P900CT	54.90	45.70
	0.222	A10	10.5	200P900CT	61.40	51.20
	0.333	A11	17.0	300P900CT	77.70	64.80
1000	0.080	A7	5.0	80P1000CT	43.10	35.90
	0.120	A8	6.5	120P1000CT	49.80	41.50
	0.160	A9	8.2	160P1000CT	56.50	47.10
	0.200	A10	10.5	200P1000CT	63.20	52.70
	0.300	A11	17.0	300P1000CT	79.80	66.50
1100	0.109	A8	6.5	120P1100CT	50.80	42.40
	0.145	A9	8.2	160P1100CT	58.20	48.50
	0.182	A10	10.5	200P1100CT	64.80	54.00
	0.272	A11	17.0	300P1100CT	82.00	68.40
1200	0.100	A8	6.5	120P1200CT	52.20	43.50
	0.133	A9	8.2	160P1200CT	59.80	49.80
	0.167	A10	10.5	200P1200CT	66.50	55.40
	0.250	A11	17.0	300P1200CT	84.10	70.10
1400	0.114	A9	8.2	160P1400CT	61.30	51.10
	0.143	A10	10.5	200P1400CT	68.20	56.80
	0.214	A11	17.0	300P1400CT	86.40	72.00
1600	0.125	A10	10.5	200P1600CT	69.90	58.30
	0.187	A11	17.0	300P1600CT	88.50	73.70
1800	0.167	A11	17.0	300P1800CT	90.70	75.60
2000	0.150	A11	17.0	300P2000CT	92.80	77.30
2200	0.073	A11	17.0	160P2200CT	95.00	79.20
2400	0.067	A11	17.0	160P2400CT	97.15	80.90
2600	0.061	A11	17.0	160P2600CT	99.30	82.80
2800	0.057	A11	17.0	160P2800CT	101.40	84.50
3000	0.053	A11	17.0	160P3000CT	103.60	86.40
3200	0.050	A11	17.0	160P3200CT	105.70	88.10
3400	0.047	A11	17.0	160P3400CT	108.00	90.00
3600	0.045	A11	17.0	160P3600CT	110.10	91.70
3800	0.042	A11	17.0	160P3800CT	112.30	93.60
4000	0.040	A11	17.0	160P4000CT	114.40	95.30
4200	0.038	A11	17.0	160P4200CT	116.60	97.20
4400	0.036	A11	17.0	160P4400CT	118.70	98.90
4600	0.035	A11	17.0	160P4600CT	120.90	100.80
4800	0.033	A11	17.0	160P4800CT	123.00	102.50
5000	0.032	A11	17.0	160P5000CT	125.20	104.40

See YELLOW SECTION for Local Offices, Phones

CTU
CONSOLIDATED TRANSFORMERS UNLIMITED

UNMATCHED CAPABILITIES FROM TWO OUTSTANDING DIVISIONS

TRANFORMER ENGINEERS FROM 10 MILLIWATTS

TRANSFORMERS UNLIMITED TO 500 KVA IN SIZE

TRANSFORMER ENGINEERS, a 30 year old specialty transformer manufacturer, has merged with TRANSFORMERS UNLIMITED to form two divisions of CONSOLIDATED TRANSFORMERS UNLIMITED. These two divisions are capable of manufacturing transformers and power supplies from 10 milliwatts to over 500 KVA in size. With this wide range of capability, Consolidated Transformers can now meet more customer requirements than any other manufacturer in the industry.

Transformer Engineers has designed a new line of low cost, highly efficient lightweight transformers called **Micro Mini's.** These small, tough, versatile plug-in transformers are ideal for transistor circuitry and many types of power, pulse and audio inductor applications. The units are especially adaptable to the new IC Age of Micro Electronics. **Specifications:** MIL-T-27B, Grade 5, Class S • Weight .06 ounces • .038 cubic inches in size • −195°C to −130°C • Leads .025 inch Type 'A' Nickel.

MICRO MINI PULSE TRANSFORMERS

Part No.	Ratio a:b:c	μV Sec (*) Wdg. A
TEC80751	1.1	250
TEC80752	1.1	2500
TEC80753	1:1:1	250
TEC80754	1:1:1	2500
TEC80755	1:2	250
TEC80756	1:2	2500
TEC80757	1:2:1	250
TEC80758	1:2:1	2500
TEC80759	3:1:3	2000
TEC80760	4:1:2	250
TEC80761	4:1:2	2500
TEC80762	4:1:4	250
TEC80763	4:1:4	2500

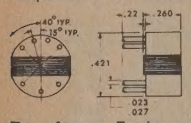
REACTORS

Part No.	Ind. Hys.	D.C.I. Ma.	Resistance Ohms	Term. Pos.	RMS, Test V	Term. Config.
80501	0.18	5	35	1-4	500	D
80502	0.25	5	55	1-4	500	D
80503	0.35	4	84	1-4	500	D
90504	0.50	3	125	1-4	500	D
80505	0.90	3	200	1-4	500	D
80506	1.3	2	300	1-4	500	D
80507	1.8	2	450	1-4	500	D
80508	2.5	2	670	1-4	500	D
80509	3.2	2	930	1-4	500	D
80510	5.0	2	1560	1-4	500	D
80511	6.0	2	2100	1-4	500	D

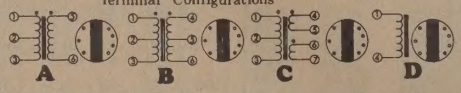
‡ For standard terminal configurations, see chart.
* Maximum product of pulse width in micro seconds by pulse amplitude in volts.

Part No.	Suggested Impedance Ranges — (ohms) Wdg. 1	Other Wdgs.	Max. Unbal. MADC	DC Resistance (ohms) Wdg. 1	Other Wdgs.	Term. Config. uration
TEC80102	2000 ct 1500 ct	4 3	3	174	.26	A
TEC80106	1000 ct 750 ct	4 3	4	78	.26	A
TEC80110	2000 ct 1500 ct	16 12	3	174	1.0	A
TEC80114	600 ct 500 ct	12 10	5	46	1.1	A
TEC80118	400 ct 300 ct	16 12	6	31	1.0	A
TEC80122	600 ct 500 ct	60/15* 50/12.5*	5	47	4.5/1.2*	C
TEC80126	500 ct	150/37.5*	5	45	11.3/2.8*	C
TEC80130	1200 ct 600 ct	600 ct 300 ct	3	108	46	B
TEC80134	600 ct	500 ct	5	48	47	B

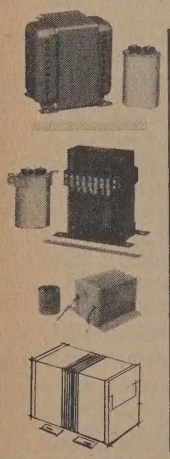
Response ±1 DB 400 to 100K Hz, Distortion: 5% at 1 MW



Terminal Configurations

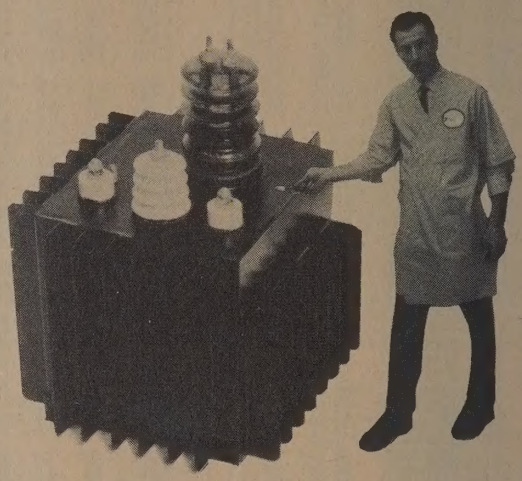


Transformer Engineers, the West's largest manufacturer of Constant Voltage Transformers, now offers a complete line of CVT's using cruciform type laminations giving better regulation, lower price and greater dependability. **TE** constant voltage transformers maintain output voltages within less than 1% with input voltage fluctuations of ±15%. **TE** can design your special requirements quickly in any step-up or step-down ratio of voltage-to-current within the desired VA rating with single or multiple secondaries.



CVT TRANSFORMERS

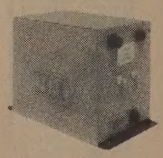
Model (*)	Input Voltage 60~	VA Output	Approx. Net Wt. lbs.	Price Users Net (**)
TEC15 (*)	95-130	15	4	15.50
TEC20 (*)	95-130	20	4.5	16.75
TEC25 (*)	95-130	25	5	17.25
TEC30 (*)	95-130	30	5	17.86
TEC35 (*)	95-130	35	5	18.30
TEC40 (*)	95-130	40	6	18.50
TEC50 (*)	95-130	50	6.5	18.70
TEC75 (*)	95-130	75	7	18.93
TEC100 (*)	95-130	100	9	19.21
TEC125 (*)	95-130	125	10	22.50
TEC150 (*)	95-130	150	12	28.50
TEC200 (*)	95-130 190-260	200	15	35.50
TEC250 (*)	95-130 190-260	250	18	42.25
TEC500 (*)	95-130 190-260	500	32	69.50
TEC1000 (*)	95-130 190-260	1000	55	89.70



TRANSFORMERS UNLIMITED has the experience and the facilities to design and build some of the very largest requirements for plate supply, impedance matching, filament, reactors, step-up and step-down transformers.

TE and **TU's** engineering staff can design any special requirements you might have for precision ratio and reference transformers: Class U high temperature transformers, inverters, DC-DC converters, pulse transformers, magnetic amplifiers, wide band transformers, box shield transformers.

TRANSFORMER ENGINEERS is QPL approved to produce transformers to MIL-T-27-C and has a complete environmental test facility to qualify even the most difficult magnetic components.



POWER SUPPLIES — look to **TE** and **TU** for your complete custom power supply requirements — call or write today for your **free** catalog outlining our complete capabilities.

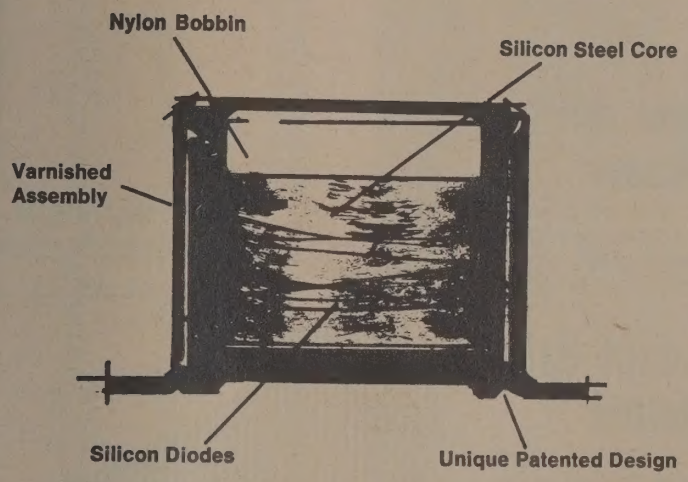
(*) Customer may choose any voltage needed and insert that value behind the VA of the part number — Example: 25 VA CVT would be ordered by TEC-2**515** for 15VDC output.

(**) User net in 25-49 quantities . . . contact your local representative or factory for larger quantity discounts and detailed mounting dimensions.

CTU Transformer Engineers • Transformers Unlimited

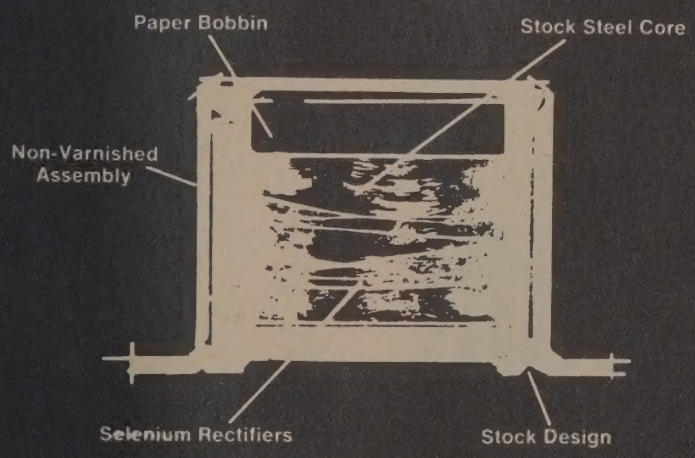
1039 E. VALLEY BLVD. • SAN GABRIEL, CALIF. • 91776 • CU 3-9071 • TWX 910-589-3382

Custom Transformers at the Speed of Stock!



Why is this 89c Dynamic transformer better than this 95c stock transformer?

In addition to the obvious advantages this superior Dynamic transformer can be made to your specifications in DAYS instead of MONTHS and — in most cases — there is NO COST for prototypes!

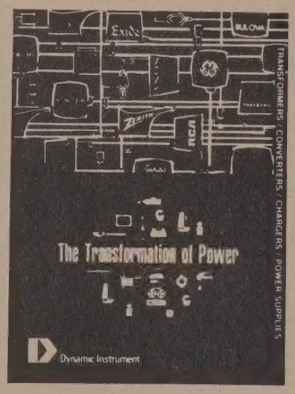


Transformers for all reasons

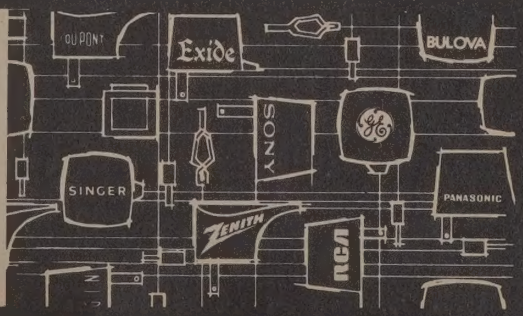
- ☐ Patented, U/L Listed
- ☐ Internal or External
- ☐ Wall-Mounted
- ☐ Fast-Charging
- ☐ Power Conversion
- ☐ Conversion/Charging
- ☐ Printed Circuit
- ☐ Sub-Miniature
- ☐ Ferro-resonant
- ☐ Multi-Input
- ☐ Multi-Output

The Transformation of Power

This unique brochure explains the many advantages and application possibilities of Dynamic's patented, U/L listed transformers, converters, chargers and power supplies. Swift reading, amply supported by illustrations, photos and schematics. To obtain your free copy send a letterhead request.



Please judge us by the companies we keep . . .



Dynamic Instrument CORP.

OEM DIVISION
115 E. Bethpage Rd., Plainview, N. Y. 11803 516 694-6000

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

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UNITED TECHNICAL PUBLICATIONS

FERROTRAN
ELECTRONICS CO., INC.

MINIATURE TRANSFORMERS

Extremely small rectifier transformers with single or duel secondary winding for electronic designers who wish to design their own solid state power supplies. 115 volt A.C. input, 55-450 cycles ratings below give D.C. outputs for rectifier circuits with condenser input.

SUBMINIATURE UNITS

Channel-frame (1⅜"x1⅛"x1"W).

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
SM-1	10	80ma	$10.00
SM-2	15	60	10.00
SM-3	20	50	10.50
SM-4	30	30	10.50
SM-5	12, 12	30	14.00
SM-6	15, 15	25	14.00
SM-7	40	25	10.50
SM-8	50	20	10.50
SM-9	60	17	11.00
SM-10	70	15	11.00

MINIATURE UNITS

Channel-frame (1⅝"Lx1⅜"Hx1⅛"W).

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
R-1	40	35ma	$ 9.50
R-2	30	50	9.50
R-3	20	75	9.00
R-4	10	160	9.00
R-5	20, 20	50	12.00
R-6	15, 15	50	12.00
R-7	10, 10	75	12.00
R-8	6, 6	100	12.00
R-9	50	30	9.50
R-10	60	27	10.00
R-11	70	22	10.00
R-12	80	20	10.00
R-13	90	18	10.00
R-14	100	18	10.50
R-15	120	15	10.50
R-16	150	15	11.00
R-17	180	10	11.00
R-18	200	10	11.00

The R Series also available in epoxy case for printed circuit boards.

INTERMEDIATE UNITS

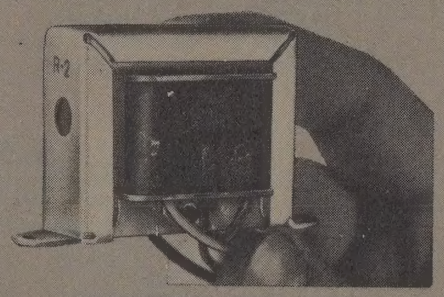
Channel-frame (2"Lx1⅝"Hx1¼"W).

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
I-1	10	300ma	$ 8.00
I-2	15	250	8.00
I-3	20	200	8.00
I-4	25	175	8.50
I-5	30	140	8.50
I-6	40	125	8.50
I-7	20, 20	125	11.00
I-8	15, 15	125	11.00
I-9	10, 10	150	11.00
I-10	50	80	9.00
I-11	75	60	9.50
I-12	100	35	9.50
I-13	150	30	10.00
I-14	180	30	10.50
I-15	200	25	10.50

SUBMINIATURE PC UNITS

Epoxy encapsulated transformers mounted on rigid epoxy forms; incorporates pins for direct soldering to printed circuit boards. (1⅝"x1¼"x1¼").

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
SM-1A	10	80ma	$12.00
SM-2A	15	60	12.00
SM-3A	20	50	12.50
SM-4A	30	30	12.50
SM-5A	12, 12	30	15.00
SM-6A	15, 15	25	15.00



R-2 TRANSFORMER (CHANNEL-FRAME)

STANDARD UNITS

Channel-frame (2¼"x2"x1⅝"W).

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
S-1	10	670ma	$ 8.50
S-2	15	500	8.50
S-3	20	300	9.00
S-4	30	225	9.00
S-5	50	125	9.50
S-6	20, 20	150	12.00
S-7	15, 15	200	12.00
S-8	10, 10	300	12.00
S-9	75	120	10.00
S-10	100	70	10.00
S-11	120	60	10.00
S-12	150	45	10.00
S-13	200	35	10.00

CM SERIES

Channel-frame (2⅝"x2 3/16"x1¾").

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
CM-1	10	1.0a	$ 9.00
CM-2	15	.75	9.00
CM-3	20	.60	9.00
CM-4	30	.40	9.00
CM-5	40	.3a	9.00
CM-6	80	.14	10.00
CM-7	100	.12	10.00
CM-8	120	.10	10.00
CM-9	150	.07	10.50
CM-10	175	.06	10.50
CM-11	200	.05	10.50

DESIGN INFORMATION

CENTER TAP — All units are center tapped. The ratings, therefore, are for a full-wave circuit. SM-7 thru 10, R-9 thru R-18, I-10 thru I-15, S-9 thru S-13, CM-6 thru CM-11, H-9 thru H-20, RT-6 thru RT-10 are not center tapped and are designed for a bridge circuit.

TEST VOLTAGE — 1000 V., D.C. between primary and secondary, and between secondary windings.

INSULATION — Nylon bobbin; insulating paper between each layer.

LEADS — Flexible leads rated for 105°C.

DUAL SECONDARIES — Transformers shown with two output units give indicated current from each tap.

All transformers listed may be wound for 220 v.a.c. input.

ALL TRANSFORMERS MAY BE WOUND WITH ELECTRO STATIC SHIELDS.

SEE SECTION 4000 FOR COMPLETE LIST OF FERROTRAN SOLID STATE POWER SUPPLIES

HIGH CURRENT UNITS

Channel-frame (3"Lx2½"Hx2"W).

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
H-1	10	1.3amp	$10.00
H-2	15	1.3	10.00
H-3	20	1.0	10.00
H-4	30	0.7	10.00
H-5	40	0.4	10.00
H-6	20, 20	0.5	12.00
H-7	15, 15	0.7	12.00
H-8	10, 10	1.0	12.00
H-9	80	.225	10.00
H-10	100	.180	10.00
H-11	120	.150	10.50
H-12	150	.130	10.50
H-13	175	.110	11.00
H-14	200	.100	11.00
H-15	225	90ma	11.00
H-16	250	80	11.50
H-17	275	70	11.50
H-18	300	65	11.50
H-19	400	50	12.00
H-20	500	40	12.00

RT SERIES

3¾" x 2⅝" x 3".

Model	Sec. D.C., Volts	Sec. D.C., Current	Price
RT-1	10	5amp	$16.00
RT-2	15	3.5	16.00
RT-3	20	2.5	16.00
RT-4	30	1.7	16.50
RT-5	40	1.3	17.00
RT-6	50	1.0	17.50
RT-7	75	.7	18.00
RT-8	100	.5	18.00
RT-9	120	.5	18.25
RT-10	150	.4	18.50
RT-11	180	.4	18.50
RT-12	200	.35	18.50

ISOLATION TRANSFORMERS

Model	Sec. Volts	Sec. Current	Price
IH	115v.	170ma	$10.00
ICM	115	100	9.50
IS	115	60	9.00
II	115	25	9.00
IR	115	14	10.00

ENCASED TRANSFORMERS

All listed transformers are available fully encapsulated in a MIL-T-27 can.

The cost of such units is an additional $11.00 for single secondary transformers and $13.00 additional for dual secondary units.

Standard connectors are of the hooked solder pin type (0.900" in dia.), mounted dead center on the stud side of the case.

Case types are as follows:

Series	Case	Size
SM	AH	1 5/16"x1 5/16"x1¼"
R	AJ	1⅝"x1⅝"x2⅜"
I	AJ	1⅝"x1⅝"x2⅜"
S	FB	2 5/16"x2 1/16"x2½"
CM	QB	2¾"x2⅜"x2 13/16"
H	QB	2¾"x2⅜"x2 13/16"
RT	JA	3 9/16"x3 1/16"x4⅞"

FERROTRAN ELECTRONICS COMPANY, INC.
683 BROADWAY ▪ NEW YORK, N.Y. 10012 ▪ PHONE 212-254-5810

See YELLOW SECTION for Local Offices, Phones

FERRODYNE . . . ADVANCED STATE OF THE ART

Highly sophisticated specialty Transformers, Inductors, and Associated Magnetic Components.

FERRODYNE products are keyed to those segments of the electronics industry that are primarily concerned with high quality, strict specifications, and advanced state of the art products.

Since 1961, the FERRODYNE CORPORATION has been an industry leader in the development of micro-miniature, low profile, and high frequency transformers and inductors for the Computer, Communications, and Electronic Instrument Industries. FERRODYNE products range from highly sophisticated ¼″ cube transformers and inductors to five (5) kilowatt components; frequencies to 50 megahertz; construction categories cover the entire range from open type to hermetically sealed; quality assurance is in accordance with Mil-Q-9858A. The FERRODYNE CORPORATION manufactures magnetic components in compliance with U.L. standards for computer and instrument manufacturers and is also Q.P.L. listed.

Contact FERRODYNE for prompt and efficient engineering assistance with your specialty transformer requirement. FERRODYNE provides quick service on special prototype units. We welcome your inquiries.

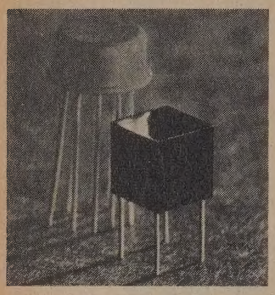
- Box Shielded Instrument Transformers
- Constant Voltage Transformers
- Hybrid Transformers
- Inverter/Converter Transformers
- Power Transformers
- Toroids
- Pulse Transformers
- Precision Scott-T Transformers
- Wide-Band Transformers
- Magnetic Amplifiers
- Saturable Reactors
- Swinging Filter Chokes

FERRODYNE MICRO-MINIATURE AND MINIATURE TRANSFORMERS AND INDUCTORS

The FMM, FMA, and FMC SERIES of transformers and inductors are micro-miniature and miniature HI-REL units especially suited for printed circuit board applications. Coils are wound on slotted bobbins that permit complete penetration of epoxy resin into the coil interior. All leads are fatigue resistant nickel alloy, gold plated to Mil-G-45204, Class 1 specification (weldable or solderable termination). Special finishing techniques are used, and every unit is stress-relieved and temperature cycled to assure the highest quality performance.

Additional Engineering data available upon request.

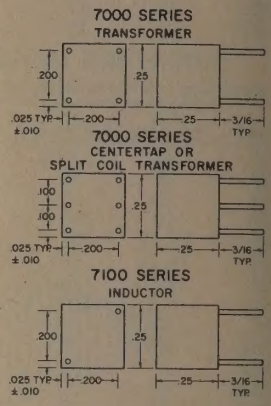
FMM SERIES ¼″ CUBE MICRO-MINIATURE TRANSFORMERS AND INDUCTORS



- Available from stock
- Size .25″ x .25″ x .25″
- Weight 1.2 grams max.
- Frequency range 400Hz to 250 KHz

Transformer Part No.	Impedence, ohms Prim.	Sec.	D.C.R. Prim.	Sec.	Power MW @ 1 KHz	DCMA @ 1 KHz	Application	User Net Price 1-9
FMM-7010	1,000 CT	1,000 CT	90	110	50	0.25	Output-Isolation	$12.80
FMM-7013	25,000 CT	1,000 CT	1130	145	25	0.25	Interstage	15.40
FMM-7020	10,000 CT	1,200 CT	1022	248	50	0.5	Driver	14.80
FMM-7021	10,000 CT	2,000 CT	1010	282	50	0.25	Driver	14.90
FMM-7029	10,000 CT	500 CT	1022	118	50	0.5	Driver	14.40
FMM-7032	500 CT	50	55	6	50	1.5	Output	11.70
FMM-7042	150 CT	12	19	1.4	50	5.0	Output	12.40
FMM-7052	1,500 CT	600	231	93	50	1.5	Output	13.60
FMM-7059	120 CT	3.2	13	0.6	50	5.0	Output	14.60
FMM-7066	10,000 CT	10,000 CT	600	746	50	0	Driver	14.40

Inductor Part No.	Inductance HY (Min.) @ 1 KHz	D.C.R. Ohms	D.C. ma @ 1 KHz	User Net Price 1-9
FMM-7101	0.08	25	4.0	$11.70
FMM-7102	0.5	223	.75	12.00
FMM-7103	1.	364	.25	12.30
FMM-7104	3.5	1495	1.0	12.60
FMM-7105	50.	1495	0	13.00



FMA SERIES MICRO-MINIATURE TRANSFORMERS AND INDUCTORS

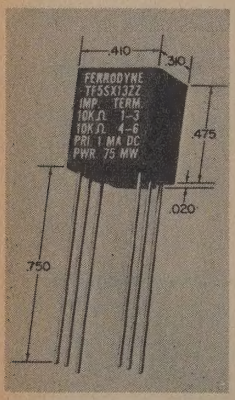
- Available from stock
- Size .475″ high x .310″ wide x .410″ long
- Weight 1/10 oz.
- Frequency range 300 HZ to 120 KHZ
- Mil-T-27C, Grade 5, Class S
- All leads separated in increments of 1/10″
- Complete circuit data on each unit
- 500 RMS test voltage

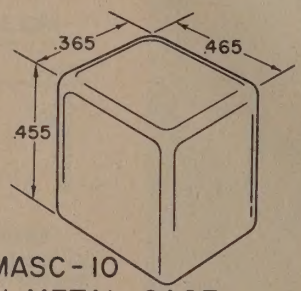
FMA-1 SERIES MICRO MINIATURE LOW PROFILE, OPEN TYPE VERSION OF FMA UNITS

- 2-4 weeks delivery
- Size .25″ high x .35″ wide x .375″ long
- Mil-T-27C, Grade 6, Class S
- No. 28 leads (Max. number of leads 6) for Printed Circuit application

FMA-2 SERIES MICRO MINIATURE LOW PROFILE, SOLID EPOXY MOLDED VERSION OF FMA UNITS

- 2-4 weeks delivery
- Size .30″ high x .40″ wide x .40″ long
- Mil-T-27C, Grade 5, Class S
- 12 Pin capacity





FMASC-10
MU-METAL CASE

Type No.	Mil Type No.	Power Level in M.W. @ 300 Hz	Application	Matching Impedance Primary	Secondary	Max. MA. DC Unbal. in Pri.	DC Resistance Primary	Secondary	Overall Turns Ratio	User Net Price 1-9
FMA 4	TF5SX16ZZ	10	Input	200,000 CT	1,000 CT	0	5300	100	14.1:1	$10.18
FMA 5	TF5SX16ZZ	25	Input	50,000 CT	1,000 CT	0	3800	75	7.1:1	9.65
FMA 6	TF5SX16ZZ	1	Input	250,000	250,000	0	3000	4000	1:1	11.55
FMA 7	TF5SX16ZZ	10	Input	200,000	1,000	0	5300	100	14.1:1	9.23
FMA 11	TF5SX13ZZ	40	Interstage	25,000/20,000	1,000/800	.5	1700	115	5:1	8.02
FMA 13	TF5SX13ZZ	40	Interstage	25,000 CT/ 20,000 CT	1,000 CT/ 800 CT	.5	1700	115	5:1	8.80
FMA 15	TF5SX13ZZ	50	Interstage	10,000 CT	1,500 CT	1	1050	300	2.57:1	8.72
FMA 20	TF5SX13ZZ	50	Driver	10,000 CT	1,200 CT	1	1050	200	2.88:1	8.46
FMA 21	TF5SX13ZZ	50	Driver	10,000 CT	2,000 CT	1	1050	330	2.24:1	8.51
FMA 22	TF5SX13ZZ	50	Driver	10,000	2,000 CT/ 500°	1	1050	146/168°	4.48:1:1	8.83
FMA 29	TF5SX13ZZ	50	Driver	10,000 CT	500 CT	1	1050	80	4.47:1	8.24
FMA 33	TF5SX17ZZ	50	Output	1,000	50	3	145	8	4.4:1	6.89
FMA 50	TF5SX17ZZ	50	Output	500 CT	600	3	67	98	1:1.1	7.39
FMA 51	TF5SX17ZZ	50	Output	900 CT	600	4	104	96	1.22:1	7.48
FMA 52	TF5SX13ZZ	50	Output	1,500 CT	600	3	168	92	1.58:1	7.74
FMA 66	TF5SX13ZZ	50	Isolation	10,000 CT	10,000 CT	1	1000	1300	1:1	8.23
FMA 67	TF5SX17ZZ	50	Isolation	600 CT	600 CT	3	72	92	1:1	7.32
FMA 68	TF5SX13ZZ	50	Isolation	10,000	10,000 CT/ 2,500°	1	1000	565/650°	2:1:1	8.63
FMA 69	TF5SX17ZZ	50	Isolation	600	600 CT/150°	3	72	40/45°	2:1:1	8.24
FMA 70	TF5SX17ZZ	50	Isolation	600	600	3	72	92	1:1	6.74
FMA 106	TF5SX20ZZ	—	Audio Choke	6 HY	—	2	1700	—	—	6.86
FMA 107	TF5SX20ZZ	—	Audio Choke	1.25 HY	—	2	180	—	—	5.80
FMA 108	TF5SX20ZZ	—	Audio Choke	3.5 HY	—	2	1100	—	—	6.03
FMA 118	TF5SX20ZZ	—	Audio Choke	.3 HY	—	4	42	—	—	5.84
FMASC10	Mu-Metal .020″ Case for 20-45 db Shielding									

* Splitwinding

FMC SERIES MINIATURE TRANSFORMERS AND INDUCTORS

- 2-4 weeks delivery
- Size .630″ x .530″ x .52″ high
- Weight 7 grams
- Frequency range 300 Hz to 50 KHz
- Mil-T-27C, Grade 5, Class S
- All leads separated in increments of 1/10″
- Complete circuit data on each unit
- 500 RMS test voltage
- Ten lead capacity

Type No.	Mil Type Number	Power Level In MW @ 300 Hz	Application	Matching Impedance or Ratio Primary	Secondary	Max. MADC Unbal. In Pri.
FMC 4	TF5SX16ZZ	30	Input	200K ct	1K ct	0
FMC 5	TF5SX16ZZ	70	Input	50K ct	1K ct	0
FMC 6	TF5SX16ZZ	1	Input	250K	250K	0
FMC 8	TF5SX16ZZ	½	Input	500K	500K	0
FMC 13	TF5SX13ZZ	100	Interstage	25K ct	1K ct	1
FMC 21	TF5SX13ZZ	150	Driver	10K ct	2K ct	2
FMC 66	TF5SX13ZZ	150	Isolation	10K ct	10K ct	2
FMC 67	TF5SX13ZZ	150	Isolation	600 ct	600 ct	6
FMC 68	TF5SX13ZZ	150	Isolation	10K split	10K split	2
FMC 104	TF5SX20ZZ	—	Choke	12 HY	1K	—
FMC 200	TF5SX03ZZ	100	Power	115V	115V	—

Electrostatic shield available on all items with some modification of design.

Ferrodyne Corporation
FERRODYNE CORPORATION
A Subsidiary of Dressen/Barnes Electronics Corporation
4240 GLENCOE AVENUE / VENICE, CA 90291 / (213) 391-5233

FCV-200 SERIES—Constant Voltage Transformers (available from stock) Low Profile / Smaller / Advanced Design

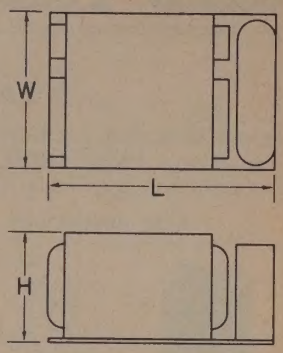
Combines both low profile advantages and standard multi-selectable output features to provide the user the optimum application advantages at competitive prices. 70% of the ampere capacity of each unit is available at either plus or minus 5VDC. The 30% balance of power available can be supplied at either plus or minus 12, 15, or 24 VDC. Primary voltage is 95-130V, 1 phase, 60 Hz. The most commonly used sizes are:

Part No.	Watt Rating	H	W	L
FCV-210	25	3⅛	3¾	4
FCV-220	75	3⅝	5	4½
FCV-230	100	3⅝	5	5
FCV-240	250	5¼	5¾	5
FCV-250	500	5¼	5¾	7⅜

Other standard voltages and ampere ratings are available.

The Ferrodyne Corporation also supplies the computer industry with large numbers of custom designed constant voltage transformers. Contact the Ferrodyne Corporation for quick, efficient and competitive engineering services and quotations regarding your constant voltage requirements.

Dressen-Barnes Electronics Corporation, the parent company of Ferrodyne Corporation, is developing a line of Constant Voltage Power Supplies. Information on this line can be obtained through Ferrodyne or by contacting Dressen-Barnes at 250 N. Vinedo Avenue, Pasadena, California 91107. Telephone: (213) 681-0643, TWX: 213-449-2556.



FIS/FPS SERIES—Box Shielded Instrument and Power Transformers

FIS Box Shielded Instrument Transformers are designed for two distinctly different application requirements. The Ferrodyne FIS Series units are designed primarily for use in the instrumentation field, and have many outstanding features generally considered difficult to meet by most competitors. Some of these features are:

- Double box shielded primary and single box shielded secondary windings result in a low winding to winding capacitance or .05PF max.
- Encased in three high permeability cans, shielding is a minimum of 90DB.
- Low microphonic construction.
- Common mode reduction will exceed 140DB.
- Low thermal construction.
- Frequency response = 5 Hz to 8 KHz @ 25 mv level.
- Insulation resistance is 10,000 Meg. ohms @ 500VDC.
- Impedance characteristics are as follows:

Typical units are:

Part No.	Primary	Secondary
FIS-1	100K ohm Ct	320K ohm
FIS-2	320K ohm Ct	320K ohm
FIS-3	100K ohm Ct	100K ohm
FIS-4	320K ohm Ct	100K ohm

Dimensions are 1-11/16" high x 1¾" wide x 1-7/16" deep.

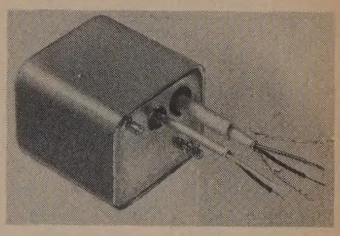
FPS—The Ferrodyne FPS Series is designed for application where a high degree of isolation is required from the noise generated in the line. Some of the outstanding features are:

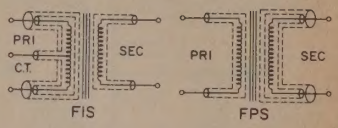
- Single box shielded primary and double box shielded secondary result in a primary to secondary winding capacitance of .03PF max.
- Common mode rejection will exceed 140DB.
- Operating frequency is 50/60 Hz.
- Insulation resistance is 10,000 Meg ohms min.
- Designed at low operating flux density with grain oriented silicon steel to reduce the magnetic flux radiation.
- Open construction with shield cable leads treated and coated with epoxy.

Typical units are:

Part No.	Prim.	Sec.	H	W	D	Lbs.
FPS-50	115V	40V @ 20MA	1⅝	1-5/16	1½	0.4
FPS-51	115V	115V @ 2MA	1⅝	1-5/16	1½	0.4
FPS-52	115V	115V @ .2A	3	2-½	2¼	2
FPS-53	115V	115V @ 1A	3¾	3-⅛	3½	6.3

The units described above are typical, but it doesn't cost any extra to have Ferrodyne design specifically for your application. Contact us for quick, efficient and competitive engineering services and quotations. Ferrodyne is one of the largest suppliers of box shielded transformers in the West. We welcome your inquiries.





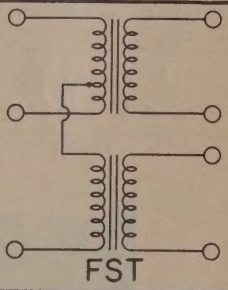
FST SERIES—Precision Scott-T Transformers

For applications from resolver to syncro; or from syncro to resolver. Mil-T-27C, grades 5 and 6, class S. Designed to meet the most stringent requirements such as:

- D.C. resistance balance to within 5%.
- Minimum phase shift down to ½ min.
- Transformation accuracy with .05%.
- Input impedance up to 1 megohm.
- Frequencies from 60 Hz to 1 KHz.

Part No.	Hz	L to L	E out	Z in	M. V. Null	Acc. Arc. in.
FST-1	60/400	78/11.8	6.4	100K min.	< 4	.03°
FST-2	400	90	6.4	200K min.	<10	.03°
FST-3	400	11.8	5	100K	< 1	.03°
FST-4	400	90	4.25	1 meg.	< 1	.03°

Contact the Ferrodyne Corporation for quick, efficient and competitive engineering services and quotations.

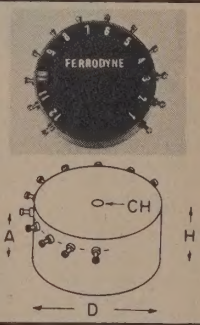


FIC SERIES—Inverter/Converter Transformers

The Ferrodyne inverter and converter toroidal transformers are ideal for use where low voltage DC power must be converted to high efficiency, high voltage DC. The Transformers are epoxy molded under vacuum to eliminate moisture and increase unit ruggedness. The FIC Series exceed Mil-T-27C, grade 5, class R specifications. Frequencies to 10 KHz. Inverter circuit information can also be supplied by Ferrodyne Engineering. For specific application please contact the factory. Units are available upon request in metal enclosures to minimize flux radiation.

Catalog No.	D.C. Input Voltage	D.C.* Output	D.C. Current Milliamps	Power Max. Watts	Case Type	Dimensions - Inches A	D	H	C.H.	Weight Lbs.	Price (1-9)
†FIC-87	12.6	5000	5	25	EM	1⅝	2⅞	2	13/64	2.00	$32.50
FIC-88	12.6	250	100	25	EM	½	1¾	11/16	11/64	.35	13.70
FIC-89	12.6	300	200	60	EM	¾	1¾	1	11/64	.35	14.35
FIC-90	12.6	325	150	50	EM	¾	1¾	1	11/64	.35	14.95
FIC-91	12.6	375	200	75	EM	¾	2	1	11/64	.50	14.20
FIC-92	12.6	450	150	70	EM	¾	2	1	11/64	.50	14.25
FIC-93	12.6	500	250	125	EM	1⅛	2¾	1⅜	3/16	.85	17.35
FIC-94	12.6	600	200	125	EM	1⅛	2¾	1⅜	3/16	1.00	14.85
FIC-95	12.6	600	350	220	EM	1⅝	2⅞	2	13/64	2.00	27.00
FIC-98	28	250	80	20	EM	13/32	1-5/16	9/16	7/64	.25	10.00
FIC-99	28	300	100	30	EM	½	1¾	11/16	11/64	.35	12.75
FIC-102	28	450	200	90	EM	¾	2	1	11/64	.50	14.50
FIC-104	28	600	200	125	EM	1⅛	2¾	1⅜	3/16	1.00	14.95

† 10-32 x ½ stud mounting.
* D.C. output is rated out of the rectifier for full wave bridge, if using full wave center reduce the output ½.



FSI SERIES—Switching Regulator Inductors

This Series is specifically designed for application in switching regulated power supplies operating at frequencies above 1KHz, constructed to meet high "Q" requirements with a minimum of R.F.I. and flux radiation. The F.S.I. Series uses cold rolled steel cases with fused tin plating. Center hold mounting is provided by through hole.

Typical Switching Regulator Inductors:

L	I D.C.	D.C.R. ohms	O.D.	Height
6½ Mhy	100 Ma	2	1⅛	½
4 Mhy	250	1.3	1⅛	½
2.5 Mhy	500	.5	1⅜	¾
1.5 Mhy	1 A	.25	1⅜	¾
1 Mhy	2.5	.12	2-1/16	1
½ Mhy	5	.05	2-1/16	1⅝

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FREED TRANSFORMER CO., INC.

STANDARD MILITARY TRANSFORMERS

The group comprises audio and power units designed to meet MIL-T-27C specifications.

The functional characteristics of these transformers were established by the Armed Service Standardization Progra
These units are supplied in standard MIL cases.

CASE DIMENSIONS

AJ CASE
Height: 2⅜"
Width: 1⅝"
Depth: 1⅝"
Mtg. Cen.: 1¾"x1¾"
Studs: 4 6-32
Cut Out: 1⅛" D

HA CASE
Height: 4¼"
Width: 3 1/16"
Depth: 2⅝"
Mtg. Cen.: 2 19/64"x1 55/64"
Studs: 4 8-32

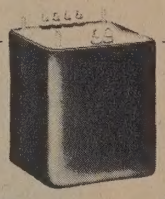
LB CASE
Height: 4½"
Width: 4 5/16"
Depth: 3 11/16"
Mtg. Cen.: 3 5/16"x2 11/16"
Studs: 4 10-32

JB CASE
Height: 3⅞"
Width: 3 9/16"
Depth: 3 1/16"
Mtg. Cen.: 2⅝"x2⅛"
Studs: 4 8-32

MB CASE
Height: 4 15/16"
Width: 4 11/16"
Depth: 4"
Mtg. Cen.: 3 11/16"x3"
Studs: 4 ¼-20

KB CASE
Height: 4 5/16"
Width: 3 15/16"
Depth: 3⅜"
Mtg. Cen.: 3"x2 7/16"
Studs: 4 10-32

NB CASE
Height: 5½"
Width: 5 1/16"
Depth: 4 5/16"
Mtg. Cen.: 4 1/16"x3 5/16"
Studs: 4 ¼-20



EB CASE
Height: 2 7/16"
Width: 1 15/16"
Depth: 1 13/16"
Mtg. Cen.: 1⅜"x1¼"
Studs: 4 6-32

FB CASE
Height: 2½"
Width: 2 5/16"
Depth: 2 1/16"
Mtg. Cen.: 1 11/16"x1 7/16"
Studs: 4 6-32

GB CASE
Height: 2 13/16"
Width: 2¾"
Depth: 2⅜"
Mtg. Cen.: 2⅛"x1¾"
Studs: 4 6-32

HB CASE
Height: 3 3/16"
Width: 3 1/16"
Depth: 2⅝"
Mtg. Cen.: 2 19/64"x1 55/64"
Studs: 4 8-32

Transformers meeting MIL-T-27C specifications Grade 1 through 6 with temperature char teristics of Class S, T, or U can be supplied on special order.
Encapsulated units using either Epoxy-Resins or Fosterite can be supplied for Grade 2 and Class U components can be supplied molded in special high temperature Freed resin.

STANDARD MILITARY AUDIO TRANSFORMERS

Frequency Response 300-10,000 C.P.S. ±2 DB

Catalog No.	Application	Type Designation	Impedance Level in Ohms Primary	Impedance Level in Ohms Secondary	Ratio	Max. Power Level DBM	Pri. D.C. Per Side in Ma	Max. D.C. unbalance	Ca
MGA 1	Transformer; interstage, single or P.P. plates to single or P.P. grid	TF4RX15AJ	10,000 C.T.	90,000 split and C.T.	1:3 overall	+15	10	10	A
MGA 2	Transformer; matching 600 ohm line to voice coil.	TF4RX16AJ	600 split	4, 8, 16	6.12:1 overall	+33	0	0	A
MGA 3	Transformer; input, 600 ohm line to single or P.P. grids.	TF4RX10AJ	600 split	135,000 C.T.	1:15	+15	0	0	A
MGA 4	Transformer; matching, 600 ohm line to 600 ohm line.	TF4RX16AJ	600 split	600 split	1:1	+15	0	0	A
MGA 5	Transformer; output, single plate 7,600 ohm, 4,800 ohm to 600 ohm line.	TF4RX13AJ	7,600 tap @ 4,800	600 split	3.56:1	+33	40	40	AJ
MGA 6	Transformer; output, single plate 7,600 ohm, 4,800 ohm to voice coil.	TF4RX13AJ	7,600 tap @ 4,800	4, 8, 16	21.8:1	+33	40	40	AJ
MGA 7	Transformer; output, single or P.P. plates to 600 ohm line.	TF4RX13AJ	15,000 C.T.	600 split	5:1	+33	10	10	AJ
MGA 8	Transformer; output, P.P. plates to 600 ohm line.	TF4RX13AJ	24,000 C.T.	600 split	6.32:1	+30	10	1	AJ
MGA 9	Transformer; output, P.P. plates to 600 ohm line.	TF4RX13AJ	60,000 C.T.	600 split	10:1	+27	10	1	AJ

STANDARD MILITARY POWER TRANSFORMERS

Primary 105/115/125V 60~

SINGLE PHASE 400 CPS, AND THREE PHASE 60 AND 400 CPS TRANSFORMERS CAN BE SUPPLIED ON SPECIAL ORDER.

Catalog No.	MIL-T-27 Type Designation	Hi Volt	D.C. Volts	D.C. Amps	Fil. No. 1	Fil. No. 2	Case
MGP 1	TF4RX03HA001	200/100/0/100 200	185	.070	5 6. 3V @ 2A	6. 3V @ 3A	HA
MGP 2	TF4RX03JB002	650 C.T.	260	.070	5 6. 3V @ 2A	6. 3V @ 4A	JB
MGP 3	TF4RX03KB006	650 C.T.	245	.150	6. 3V @ 5A	5V @ 3A	KB
MGP 4	TF4RX03LB003	800 C.T.	318	.175	5V @ 3A	6. 3V @ 8A	LB
MGP 5	TF4RX03MB004	900 C.T.	345	.250	5V @ 3A	6. 3V @ 8A	MB
MGP 6	TF4RX02KB001	700 C.T.	255	.250			KB
MGP 7	TF4RX02LB002	1100 C.T.	419	.250			LB
MGP 8	TF4RX02NB003	1600 C.T.	640	.250			NB

STANDARD MILITARY FILAMENT TRANSFORMERS

Primary 105/115/125V 60~

SINGLE PHASE 400 CPS, AND THREE PHASE 60 AND 400 CPS TRANSFORMERS CAN BE SUPPLIED ON SPECIAL ORDER.

Catalog No.	MIL-T-27 Type Designation	Secondary Volts	Secondary Current Amps	Secondary Test Volts RMS	Case
MGF 1	TF4RX01EB002	2.5	3.0	2,500	EB
MGF 2	TF4RX01GB003	2.5	10.0	2,500	GB
MGF 3	TF4RX01FB004	5.0	3.0	2,500	FB
MGF 4	TF4RX01HB005	5.0	10.0	2,500	HB
MGF 5	TF4RX01FB006	6.3	2.0	2,500	FB
MGF 6	TF4RX01GB007	6.3	5.0	2,500	GB
MGF 7	TF4RX01JB008	6.3	10.0	2,500	JB
MGF 8	TF4RX01KB009	6.3	20.0	2,500	KB
MGF 9	TF4RX01JB012	2.5	10.0	10,000	JB
MGF 10	TF4RX01KB013	5.0	10.0	10,000	KB

*Standard Military Filament and Power Transformers are also available in Grade 4.

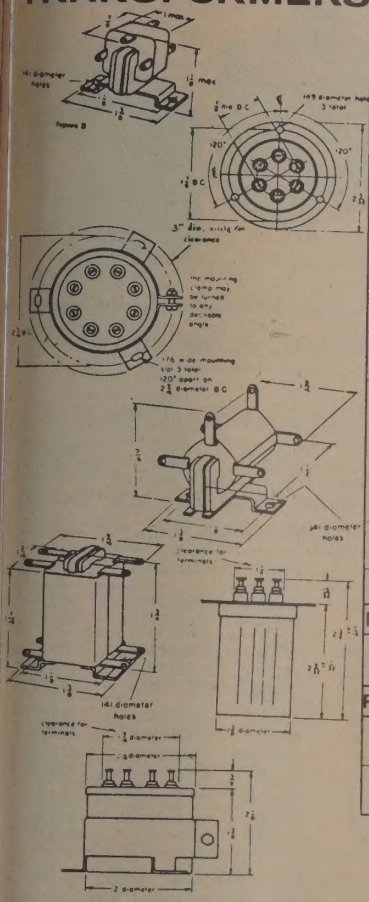
See our complete listing in Radio Electronic Master. In addition to standard items, Freed has extensive facilities for the design and production of transformers and reactors as follows:

- Power
- Audio
- Pulse
- Reference
- Toroid
- Constant Voltage
- Magnetic Amplifiers
- Ultrasonic
- Filters
- Sub-Miniature
- Control
- Molded
- Encapsulated
- High Temp
- Saturable

FREED TRANSFORMER COMPANY, INC. 1795 WEIRFIELD ST. (Ridgewood) Brooklyn, N. Y. 11227

FREED TRANSFORMER CO., INC.

PULSE TRANSFORMERS

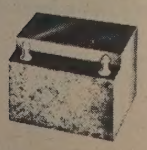


Freed No.	Radiation Laboratory No.	Westinghouse No.	Dimension Figure	GUIDANCE VALUES: Pulse Voltage (KV)	Pulse Duration (Microseconds)	Maximum Duty Ratio	Load Impedance (Ohms)	Test Voltage (60 Cycle RMS)
BLOCKING OSCILLATOR, REGENERATIVE DRIVER OR COUPLING TRANSFORMERS								
MPT-13C MPT-13M MPT-13H	132AW2 132AW2F 132AW2P	1P1 7P1 4P101	1 1 4	1.0/1.0/1.0	0.3 to 1.5	0.002	250	1000
MPT-14C MPT-14M MPT-14H	132BW2 132BW2F 132BW2P	1P2 7P2 4P102	1 1 5	0.5/0.5/0.5/0.15	0.3 to 1.5	0.002	200	1000
MPT-15C MPT-15M MPT-15H	132DW2 132DW2F 132DW2P	1P3 7P3 4P103	1 1 4	0.5/0.5/0.5	0.1 to 0.5	0.002	300	1000
MPT-16C MPT-16M MPT-16H	134BW2 134BW2F 134BW2P	1P4 7P4 4P104	3 3 5	2.5/2.5; 2.5/1.25 1.5/1.5; 1.5/0.75	1 to 2.5 1 to 5	0.002 0.002	1500 1500	1500
MPT-17C MPT-17M MPT-17H	134CW2 134CW2F 134CW2P	1P5 7P5 4P105	1 1 4	2.0/2.0/1.0 1.5/1.5/0.75	1 to 2.5 1 to 5	0.002 0.002	1200 1200	1000
MPT-18C MPT-18M	134EW2 134EW2F	1P6 7P6	2 2	2.0/2.0/1.0 1.5/1.4/0.75	0.3 to 1 0.3 to 1.5	0.002 0.002	800 800	750
MPT-19C MPT-19M MPT-19H	145CW2 145CW2F 145CW2P	1P7 7P7 4P107	1 1 4	0.5/0.5/0.5	1.0 to 5	0.002	500	1000
MPT-20C MPT-20M MPT-20H	145EW2 145EW2F 145EW2P	1P8 7P8 4P108	1 1 4	1.0/1.0/1.0	1.0 to 5	0.002	800	1000
MPT-21C MPT-21M MPT-21H	166AW2 166AW2F 166AW2P	1P9 7P9 4P109	1 1 4	1.0/0.67/0.67	1.0 to 5	0.002	800	1000
MPT-22C MPT-22M MPT-22H	176AW2 176AW2F 176AW2P	1P10 7P10 4P110	1 1 4	2.0/1.0/1.0 1.5/0.75/0.75	1 to 2.5	0.002 0.002	1000 1000	1000
MPT-23C MPT-23M MPT-23H	187AW2 187AW2F 187AW2P	1P11 7P11 4P111	1 1 4	1.0/0.5/0.5	0.5 to 2	0.002	400	1000
MPT-24C MPT-24M	224AW2 224AW2F	1P12 7P12	2 2	1.0/1.0/1.0/0.3	0.1 to 0.5	0.002	1000	750
PULSE TRIGGERING OR CURRENT TRANSFORMERS								
MPT-25C MPT-25M MPT-25H	139DW2 139DW2F 139DW2P	1P13 7P13 4P113	1 1 4		0.25 to 5	0.002		1000
PULSE OUTPUT TRANSFORMERS								
MPT-26C MPT-26M MPT-26H	148CW2 148CW2F 148CW2P	1P14 7P14 4P114	3 3 5	0.2/2.0 0.4/2.0 0.4/2.0	0.6 to 3 0.25 to 1.25 0.5 to 2.5	0.002 0.002 0.002	1600 1000 2000	1500
MPT-27C MPT-27M MPT-27H	148DW2 148DW2F 148DW2P	1P15 7P15 4P115	3 3 5	0.29/2.0 0.57/2.0 0.57/2.0	0.5 to 2.5 0.2 to 1.0 0.4 to 2.0	0.002 0.002 0.002	1200 800 1500	1500

C Indicates—varnish impregnated commercial construction.
M Indicates—encapsulated or molded construction to MIL-T-27C Grade 5 Class R.
H Indicates—hermetically sealed to MIL-T-27C Grade 4 Class R.

HERMETICALLY SEALED FILTER REACTORS

Case	Height	Depth	Width	Mtg. Centers	Studs
AJ	2⅜	1⅝	1⅝	1 3/16x1 3/16	4 6-32
EB	2⁷⁄₁₆	1¹³⁄₁₆	1¹³⁄₁₆	1 ⅜x1 ¼	4 6-32
FA	3⅛	2¹⁄₁₆	2⁵⁄₁₆	1¹¹⁄₁₆x1 7/16	4 6-32
GA	3¹³⁄₁₆	2⅜	2¾	2 ⅛x1 ¾	4 6-32
HB	3⁹⁄₁₆	3¹⁄₁₆	2⅝	2¹⁹⁄₆₄x1⁵⁵⁄₆₄	4 8-32
JA	3⁹⁄₁₆	3¹⁄₁₆	4⅞	2 ⅝x2⅛	4 8-32
JB	3⅞	3¹⁄₁₆	3⁹⁄₁₆	2 ⅝x2⅛	4 8-32
KB	4⁵⁄₁₆	3⅜	3¹³⁄₁₆	3 x2 7/16	4 10-32
LA	5⁹⁄₁₆	3¹¹⁄₁₆	4⁵⁄₁₆	3 5/16x2¹¹⁄₁₆	4 10-32
LB	4½	3¹¹⁄₁₆	4⁵⁄₁₆	3 5/16x2¹¹⁄₁₆	4 10-32
MB	4¹³⁄₁₆	4	4¹¹⁄₁₆	3¹¹⁄₁₆x3	4 ¼-20



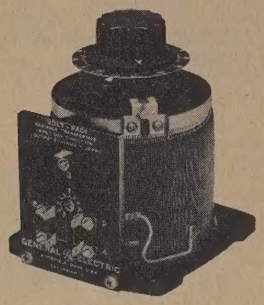
MC-10 CASE
Height: 15⁄16"
Width: 1 1/4"
Depth: 13⁄16"
Mtg. Cen.: 9⁄16" x 7⁄8"
Mtg.: 2 4-40 threaded inserts

MEET MIL-T-27C SPECIFICATIONS

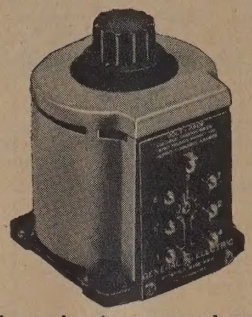
Catalog No.	MIL Type	Inductance Henry	Rat. Current DC Ma.	DC Res. Ohms	Test Volt Kilovolts	Case No.
MGC 1	TF4RX04AJ	100	10	3,500	1.	AJ
MGC 2	TF4RX04AJ	4	50	230	1.	AJ
MGC 3	TF4RX04EB	10	50	325	1.	EB
MGC 4	TF4RX04FA	20	50	475	1.5	FA
MGC 5	TF4RX04FA	30	50	650	1.5	FA
MGC 6	TF4RX04AJ	3	75	175	1.	AJ
MGC 7	TF4RX04EB	6	75	235	1.5	EB
MGC 8	TF4RX04FA	12	75	265	1.5	FA
MGC 9	TF4RX04EB	3.5	100	145	1.	EB
MGC 10	TF4RX04FA	8	100	180	1.5	FA
MGC 11	TF4RX04GA	12	100	190	2.	GA
MGC 12	TF4RX04EB	2	150	92	1.5	EB
MGC 13	TF4RX04FA	4	150	115	1.5	FA
MGC 14	TF4RX04GA	8	150	125	2.	GA
MGC 15	TF4RX04JB	11	150	120	2.5	JB
MGC 16	TF4RX04FA	2.5	200	70	1.5	FA
MGC 17	TF4RX04GA	4	200	80	2.	GA
MGC 18	TF4RX04HB	7	200	135	2.	HB
MGC 19	TF4RX04JA	10	200	125	2.5	JA
MGC 20	TF4RX04GA	2.5	300	50	2.	GA
MGC 21*	TF4RX04HB	4	300	62	2.5	HB
MGC 22	TF4RX04JB	6	300	85	2.5	JB
MGC 23*	TF4RX04KB	8	300	65	2.5	KB
MGC 24	TF4RX04LA	10	300	100	2.5	LA
MGC 25*	TF4RX04HB	2	400	37	2.5	HB
MGC 26	TF4RX04KB	6	400	60	2.5	KB
MGC 27*	TF4RX04JA	2	500	35	2.5	JA
MGC 28	TF4RX04KB	4	500	45	2.5	KB
MGC 29*	TF4RX04MB	7	500	50	2.5	MB
MGC 30*	TF4RX04LB	2	700	20	2.5	LB
MGC 31*	TF4RX04MB	1.75	1,000	12.5	2.5	MB

*Not stocked, available on short delivery.
Above units available in Grade 4.

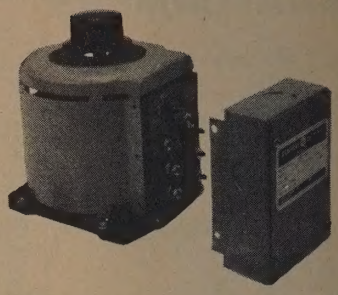
volt-pac® VARIABLE TRANSFORMERS



Manual uncased unit—exposed terminals



Manual cased unit—exposed terminals



Manual cased unit—enclosed terminals

MANUAL — SINGLE-PHASE, 50/60 HERTZ

Line Voltage Connection		No. of Cores & Frame Size	UNCASED MODELS		CASED MODELS Exposed Terminals (See below For Terminal Enclosure Kit)	
Rated Amp[1]	Max. Amp		Model Number	Suggested Net Price[2]	Model Number	Suggested Net Price[2]
120-VOLT INPUT: OUTPUT—0-120 VOLT (LINE VOLTAGE CONN.) 0-140 VOLT (OVERVOLTAGE CONN.)						
2.5[3]	3.2	1-30	9T92A1	$13.00	.....	.....
4.5	5.8	1-40	9T92A5	19.00	.....	.....
6.5[3][5]	8.0	1-50	9T92A7	22.00	9T92A7G2	$28.00
10.0	11.5	1-60	9T92A9	25.00	9T92A9G2	31.00
12.0[4][6]	14.5	1-60	9T92A10	27.00	9T92A10G2	33.00
15.0[5]	19.0	1-75	9T92Y27	45.00	9T92Y27G2	51.00
18.0[5]	21.7	1-75	9T92Y28	56.00	9T92Y28G2	62.00
30.0[5]	34.0	1-85	9T92Y37	111.00	9T92Y37G2	118.00
37.0[5]	37.0	1-85	9T92Y38	130.00	9T92Y38G2	137.00
50.0[5]	55.0	1-95	9T92Y49	162.00	9T92Y49G2	170.00
60.0	60.0	1-95	9T92Y50	245.00	9T92Y50G2	253.00
74.0[5]	74.0	2-85	9T92Y41	241.20	9T92Y41G2	253.80
100.0	110.0	2-95	9T92Y53	328.50	9T92Y53G2	342.90
120.0	120.0	2-95	9T92Y54	496.80	9T92Y54G2	511.20
150.0	165.0	3-95	9T92Y55	575.10	9T92Y55G2	596.70
180.0	180.0	3-95	9T92Y56	761.40	9T92Y56G2	783.00
240.0	240.0	4-95	9T92Y57	1042.20	9T92Y57G2	1071.00
300.0	300.0	5-95	9T92Y58	1226.70	9T92Y58G2	1262.70
360.0	360.0	6-95	9T92Y59	1536.30	9T92Y59G2	1579.50
240-VOLT INPUT: OUTPUT 0-240 VOLT (LINE VOLTAGE CONN.) 0-280 VOLT (OVERVOLTAGE CONN.) OR 120-VOLT INPUT[7], OUTPUT 0-280 VOLTS						
4.0	5.0	1-60	9T92A13	$30.00	9T92A13G2	$36.00
5.0[4]	6.8	1-60	9T92A14[8]	32.00	9T92A14G2[8]	38.00
7.0[5]	10.1	1-75	9T92Y29	45.00	9T92Y29G2	51.00
8.5[5]	11.0	1-75	9T92Y30	56.00	9T92Y30G2	62.00
12.0[4]	14.5	2-60	9T92A23	72.00	9T92A23G2[8]	82.80
14.0[5]	14.0	1-85	9T92Y39	107.00	9T92Y39G2	114.00
16.0[5]	16.0	1-85	9T92Y40	122.00	9T92Y40G2	129.00
30.0	33.0	1-95	9T92Y51	164.00	9T92Y51G2	172.00
35.0	35.0	1-95	9T92Y52	245.00	9T92Y52G2	253.00
60.0	66.0	2-95	9T92Y60	328.50	9T92Y60G2	342.90
70.0	70.0	2-95	9T92Y61	495.00	9T92Y61G2	509.40
90.0	99.0	3-95	9T92Y62	575.10	9T92Y62G2	596.70
105.0	105.0	3-95	9T92Y63	760.50	9T92Y63G2	782.10
120.0	132.0	4-95	9T92Y5021	830.70	9T92Y5021G2	859.50
140.0	140.0	4-95	9T92Y64	1044.00	9T92Y64G2	1072.80
175.0	175.0	5-95	9T92Y65	1226.70	9T92Y65G2	1262.70
210.0	210.0	6-95	9T92Y66	1536.30	9T92Y66G2	1579.50
480-VOLT INPUT: OUTPUT 0-480 VOLT (LINE VOLTAGE CONN.) 0-560 VOLT (OVERVOLTAGE CONN.) OR 240-VOLT INPUT[7], OUTPUT 0-560 VOLTS						
4.0[5]	5.0	2-60	9T92A17	$67.50	9T92A17G2	$78.30
5.0[4]	6.8	2-60	9T92A18[9]	71.10	9T92A18G2[9]	81.90
7.0[5]	10.1	2-75	9T92Y31	92.70	9T92Y31G2	103.50
8.5[5]	11.0	2-75	9T92Y32	112.50	9T92Y32G2	123.30
14.0[5]	14.0	2-85	9T92Y42	207.00	9T92Y42G2	219.60
16.0[5]	16.0	2-85	9T92Y43	238.50	9T92Y43G2	251.10
30.0	33.0	2-95	9T92Y67	313.20	9T92Y67G2	327.60
35.0	35.0	2-95	9T92Y68	486.00	9T92Y68G2	500.40
60.0	66.0	4-95	9T92Y69	819.00	9T92Y69G2	847.80
70.0	70.0	4-95	9T92Y70	1030.50	9T92Y70G2	1059.30
90.0	99.0	6-95	9T92Y71	1207.80	9T92Y71G2	1251.00
105.0	105.0	6-95	9T92Y72	1525.50	9T92Y72G2	1568.70

TERMINAL ENCLOSURE KITS

Economical modification kits convert exposed-terminal models to enclosed ones. To order determine frame size and number of cores of selected transformer, determine appropriate Terminal Kit Model Number based on frame size from table at right, and order for each transformer the same quantity of Terminal Kits as there are cores.

For Frame Size	Model No.	Sugg'd Net Price[2]
30	None Available	.....
40	None Available	.....
50	9T92A903	$1.00
60	9T92A903G2	1.00
75	9T92Y903G3	2.00
85	9T92Y903G4	4.00
95	9T92Y903G5	7.00

MANUAL — THREE-PHASE, 50/60 HERTZ

Line Voltage Connection		No. of Cores & Frame Size	UNCASED MODELS		CASED MODELS Exposed Terminals (See below For Terminal Enclosure Kit)	
Rated Amp[1]	Max. Amp		Model Number	Suggested Net Price[2]	Model Number	Suggested Net Price[2]
240-VOLT LINE TO LINE INPUT: OUTPUT—0-240 VOLT (LINE VOLTAGE CONN.), 0-280 VOLT (OVERVOLTAGE CONN.) (THREE CORE, WYE CONN.)						
2.5[3][5]	3.2	3-30	9T92A3	$53.10	.....	.....
4.5[5]	5.8	3-40	9T92A6	76.50	.....	.....
6.5[3][6]	8.0	3-50	9T92A19	78.30	9T92A19G2	$94.50
10.0[5]	11.5	3-60	9T92A21	84.60	9T92A21G2	100.80
12.0[6]	14.5	3-60	9T92A22	89.10	9T92A22G2	105.30
15.0[5]	19.0	3-75	9T92Y33	144.00	9T92Y33G2	160.20
18.0[5]	21.7	3-75	9T92Y34	175.50	9T92Y34G2	191.70
30.0[5]	34.0	3-85	9T92Y44	324.00	9T92Y44G2	342.90
37.0[5]	37.0	3-85	9T92Y45	405.00	9T92Y45G2	423.90
50.0[5]	55.0	3-95	9T92Y74	549.00	9T92Y74G2	570.60
60.0[5]	60.0	3-95	9T92Y75	738.00	9T92Y75G2	759.60
74.0[5]	74.0	6-85	9T92Y48	882.00	9T92Y48G2	919.80
100.0[5]	110.0	6-95	9T92Y78	1170.00	9T92Y78G2	1213.20
120.0[5]	120.0	6-95	9T92Y79	1514.70	9T92Y79G2	1557.90
480-VOLT LINE TO LINE INPUT: OUTPUT—0-480 VOLT (LINE VOLTAGE CONN.), 0-560 VOLT (OVERVOLTAGE CONN.) (THREE CORE, WYE CONN.) OR 240-VOLT INPUT[7], OUTPUT 0-560 VOLTS						
4.0[5]	5.0	3-60	9T92A25	$90.00	9T92A25G2	$106.20
5.0[4]	6.8	3-60	9T92A26[9]	93.60	9T92A26G2[9]	109.80
7.0[5]	10.1	3-75	9T92Y35	141.30	9T92Y35G2	157.50
8.5[5]	11.0	3-75	9T92Y36	171.00	9T92Y36G2	187.20
14.0[5]	14.0	3-85	9T92Y46	322.20	9T92Y46G2	341.10
16.0[5]	16.0	3-85	9T92Y47	382.50	9T92Y47G2	401.40
30.0[5]	33.0	3-95	9T92Y76	553.50	9T92Y76G2	575.10
35.0[5]	35.0	3-95	9T92Y77	741.60	9T92Y77G2	763.20
60.0[5]	66.0	6-95	9T92Y80	1197.00	9T92Y80G2	1240.20
70.0[5]	70.0	6-95	9T92Y81	1514.70	9T92Y81G2	1557.90
120-VOLT LINE TO LINE INPUT: OUTPUT—0-120 VOLT (LINE VOLTAGE CONN.), 0-140 VOLT (OVERVOLTAGE CONN.) (TWO CORE, OPEN DELTA CONN.)						
2.5[3]	3.2	2-30	9T92A2	$32.40	.....	.....
4.5	5.8	2-40	9T92A4	48.60	.....	.....
6.5[3][5]	8.0	2-50	9T92A11	53.10	9T92A11G2	$63.90
10.0	11.5	2-60	9T92A15	59.40	9T92A15G2	70.20
12.0[4]	14.5	2-60	9T92A23	72.00	9T92A23G2	82.80
240-VOLT LINE TO LINE INPUT: OUTPUT—0-240 VOLT (LINE VOLTAGE CONN.), 0-280 VOLT (OVERVOLTAGE CONN.) (TWO CORE, OPEN DELTA CONN).						
4.0	5.0	2-60	9T92A17	$67.50	9T92A17G2	$78.30
5.0[4]	6.8	2-60	9T92A18	71.10	9T92A18G2	81.90

(1) Also overvoltage connection amp. When overvoltage connection is used, rated current should not be exceeded. Output kva for overvoltage connection is maximum output voltage times rated current.

(2) OEM quantity prices are available on request.

(3) Output at overvoltage connection is 0.264 volts or 0-132 volts.

(4) No overvoltage protection provided.

(5) When using extended tap connections, operation is for 60 hertz only.

(6) 60 hertz only.

(7) When operated with this input voltage, rated current must be reduced when output voltage exceeds 140 percent of input voltage.

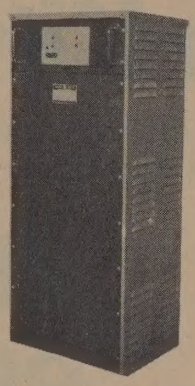
(8) For 240-volt input, 0-240-volt output, application only.

(9) For 480-volt input, 0-480-volt output application only.

volt-pac® VARIABLE TRANSFORMERS

Motor uncased unit exposed terminals

Motor cased unit enclosed terminals



MOTOR-OPERATED — SINGLE-PHASE, 50/60 HERTZ

Line Voltage Connection		No. of Cores &	UNCASED MODELS		CASED MODELS Enclosed Terminals	
Rated Amp[1]	Max. Amp	Frame Size	Model Number	Suggested Net Price[2]	Model Number	Suggested Net Price[2]
120-VOLT INPUT: OUTPUT 0-120 VOLT (LINE VOLTAGE CONN.) 0-140 VOLT (OVERVOLTAGE CONN.)						
2.5[3]	3.2	1-30	9T92A1G51	$115.20	.....	.....
4.5	5.8	1-40	9T92A5G51	120.60	.....	.....
6.5[3][5]	8.0	1-50	9T92A7G51	127.80	9T92A7G54	$135.00
10.0	11.5	1-60	9T92A9G51	130.50	9T92A9G54	137.70
12.0[4][6]	14.5	1-60	9T92A10G51	132.30	9T92A10G54	139.50
15.0[5]	19.0	1-75	9T92Y27G51	184.50	9T92Y27G54	191.70
18.0[5]	21.7	1-75	9T92Y28G51	194.40	9T92Y28G54	201.60
30.0[5]	34.0	1-85	9T92Y37G51	243.90	9T92Y37G54	253.80
37.0[5]	37.0	1-85	9T92Y38G51	261.00	9T92Y38G54	270.90
50.0	55.0	1-95	9T92Y49G51	289.80	9T92Y49G54	302.40
60.0	60.0	1-95	9T92Y50G51	364.50	9T92Y50G54	377.10
74.0[5]	74.0	2-85	9T92Y41G51	385.20	9T92Y41G54	405.00
100.0	110.0	2-95	9T92Y53G51	472.50	9T92Y53G54	497.70
120.0	120.0	2-95	9T92Y54G51	640.80	9T92Y54G54	666.00
150.0	165.0	3-95	9T92Y55G51	719.10	9T92Y55G54	756.90
180.0	180.0	3-95	9T92Y56G51	905.40	9T92Y56G54	934.20
240.0	240.0	4-95	9T92Y57G51	1186.20	9T92Y57G54	1238.40
300.0	300.0	5-95	9T92Y58G51	1370.70	9T92Y58G54	1435.50
360.0	360.0	6-95	9T92Y59G51	1680.30	9T92Y59G54	1757.70
240-VOLT INPUT: OUTPUT 0-240 VOLT (LINE VOLTAGE CONN.) 0-280 VOLT (OVERVOLTAGE CONN.) OR 120-VOLT INPUT[7], OUTPUT 0-280 VOLTS						
4.0	5.0	1-60	9T92A13G51	$135.00	9T92A13G54	$142.20
5.0[4]	6.8	1-60	9T92A14G51[8]	136.80	9T92A14G54[8]	144.00
7.0	10.1	1-75	9T92Y29G51	184.50	9T92Y29G54	191.70
8.5[5]	11.0	1-75	9T92Y30G51	194.40	9T92Y30G54	201.60
12.0[4][6]	14.5	2-60	9T92A23G51[8]	180.00	9T92A23G54[8]	194.40
14.0[5]	14.0	1-85	9T92Y39G51	240.30	9T92Y39G54	250.20
16.0[5]	16.0	1-85	9T92Y40G51	253.80	9T92Y40G54	263.70
30.0	33.0	1-95	9T92Y51G51	291.60	9T92Y51G54	304.20
35.0	35.0	1-95	9T92Y52G51	364.50	9T92Y52G54	377.10
60.0	66.0	2-95	9T92Y60G51	472.50	9T92Y60G54	497.70
70.0	70.0	2-95	9T92Y61G51	639.00	9T92Y61G54	664.20
90.0	99.0	3-95	9T92Y62G51	719.10	9T92Y62G54	756.90
105.0	105.0	3-95	9T92Y63G51	904.50	9T92Y63G54	942.30
120.0	132.0	4-95	9T92Y5021G51	974.70	9T92Y5021G54	1026.90
140.0	140.0	4-95	9T92Y64G51	1188.00	9T92Y64G54	1240.20
175.0	175.0	5-95	9T92Y65G51	1370.70	9T92Y65G54	1435.50
210.0	210.0	6-95	9T92Y66G51	1680.30	9T92Y66G54	1757.70
480-VOLT INPUT: OUTPUT 0-480 VOLT (LINE VOLTAGE CONN.) 0-560 VOLT (OVERVOLTAGE CONN.) OR 240-VOLT INPUT[7], OUTPUT 0-560 VOLTS						
4.0	5.0	2-60	9T92A17G51	$175.50	9T92A17G54	$189.90
5.0[4]	6.8	2-60	9T92A18G51[9]	179.10	9T92A18G54[9]	193.50
7.0[5]	10.1	2-75	9T92Y31G51	236.70	9T92Y31G54	251.10
8.5[5]	11.0	2-75	9T92Y32G51	256.50	9T92Y32G54	270.90
14.0[5]	14.0	2-85	9T92Y42G51	351.00	9T92Y42G54	370.80
16.0[5]	16.0	2-85	9T92Y43G51	382.50	9T92Y43G54	402.30
30.0	33.0	2-95	9T92Y67G51	457.20	9T92Y67G54	482.40
35.0	35.0	2-95	9T92Y68G51	630.00	9T92Y68G54	655.20
60.0	66.0	4-95	9T92Y69G51	963.00	9T92Y69G54	1015.20
70.0	70.0	4-95	9T92Y70G51	1174.50	9T92Y70G54	1226.70
90.0	99.0	6-95	9T92Y71G51	1351.80	9T92Y71G54	1429.20
105.0	105.0	6-95	9T92Y72G51	1669.50	9T92Y72G54	1746.90
140.0	140.0	8-95	9T92Y73G51	2297.70	9T92Y73G54	2401.20

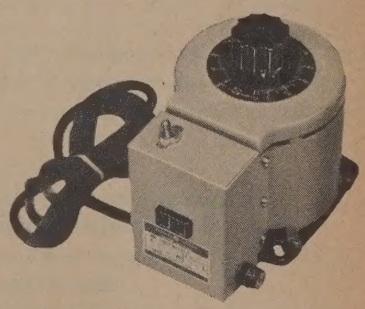
NOTE: See opposite page for footnotes.

MOTOR-OPERATED — THREE-PHASE, 50/60 HERTZ

Line Voltage Connection		No. of Cores &	UNCASED MODELS		CASED MODELS Enclosed Terminals	
Rated Amp[1]	Max. Amp	Frame Size	Model Number	Suggested Net Price[2]	Model Number	Suggested Net Price[2]
240-VOLT LINE TO LINE INPUT: OUTPUT 0-240 VOLT (LINE VOLTAGE CONN.) 0-280 VOLT (OVERVOLTAGE CONN.) (THREE CORE, WYE CONN.)						
2.5[3][5]	3.2	3-30	9T92A3G51	$156.60	.....	.....
4.5[5]	5.8	3-40	9T92A6G51	180.00	.....	.....
6.5[3][6]	8.0	3-50	9T92A19G51	186.30	9T92A19G54	$207.90
10.0	11.5	3-60	9T92A21G51	192.60	9T92A21G54	214.20
12.0[4][6]	14.5	3-60	9T92A22G51	197.10	9T92A22G54	218.70
15.0[5]	19.5	3-75	9T92Y33G51	288.00	9T92Y33G54	309.60
18.0[5]	21.7	3-75	9T92Y34G51	319.50	9T92Y34G54	341.10
30.0[5]	34.0	3-85	9T92Y44G51	468.00	9T92Y44G54	497.70
37.0[5]	37.0	3-85	9T92Y45G51	549.00	9T92Y45G54	578.70
50.0[5]	55.0	3-95	9T92Y74G51	693.00	9T92Y74G54	730.80
60.0[5]	60.0	3-95	9T92Y75G51	882.00	9T92Y75G54	919.80
74.0[5]	74.0	6-85	9T92Y48G51	1026.00	9T92Y48G54	1085.40
100.0[5]	110.0	6-95	9T92Y78G51	1314.00	9T92Y78G54	1391.40
120.0[5]	120.0	6-95	9T92Y79G51	1658.70	9T92Y79G54	1736.10
150.0[5]	165.0	9-95	9T92Y82G51	2071.80	9T92Y82G54	2188.80
180.0[5]	180.0	9-95	9T92Y83G51	2519.10	9T92Y83G54	2636.10
480-VOLT LINE TO LINE INPUT: OUTPUT 0-480 VOLT (LINE VOLTAGE CONN.) 0-560 VOLT (OVERVOLTAGE CONN.) (THREE CORE, WYE CONN.) OR 240-VOLT INPUT[7], OUTPUT 0-560 VOLTS						
4.0[5]	5.0	3-60	9T92A25G51	$198.00	9T92A25G54	$219.60
5.0[4][6]	6.8	3-60	9T92A26G51	201.60	9T92A26G54	223.20
7.0[5]	10.1	3-75	9T92Y35G51	285.30	9T92Y35G54	306.90
8.5[5]	11.0	3-75	9T92Y36G51	315.00	9T92Y36G54	336.60
14.0[5]	14.0	3-85	9T92Y46G51	466.20	9T92Y46G54	495.90
16.0[5]	16.0	3-85	9T92Y47G51	526.50	9T92Y47G54	556.20
30.0[5]	33.0	3-95	9T92Y76G51	697.50	9T92Y76G54	735.30
35.0[5]	35.0	3-95	9T92Y77G51	885.60	9T92Y77G54	923.40
60.0[5]	66.0	6-95	9T92Y80G51	1341.00	9T92Y80G54	1418.40
70.0[5]	70.0	6-95	9T92Y81G51	1658.70	9T92Y81G54	1736.10
90.0[5]	99.0	9-95	9T92Y84G51	2071.80	9T92Y84G54	2188.80
105.0[5]	105.0	9-95	9T92Y85G51	2519.10	9T92Y85G54	2636.10
120-VOLT LINE TO LINE INPUT: OUTPUT 0-120 VOLT (LINE VOLTAGE CONN.), 0-140 VOLT (OVERVOLTAGE CONN.) (TWO CORE, OPEN DELTA CONN).						
2.5[3]	3.2	2-30	9T92A2G51	$135.90	.....	.....
4.5	5.8	2-40	9T92A4G51	152.10	.....	.....
6.5[3][5]	8.0	2-50	9T92A11G51	161.10	9T92A11G54	$175.50
10.0	11.5	2-60	9T92A15G51	167.40	9T92A15G54	181.80
12.0[4][6]	14.5	2-60	9T92A23G51	180.00	9T92A23G54	194.40
240-VOLT LINE TO LINE INPUT: OUTPUT 0-240 VOLT (LINE VOLTAGE CONN.), 0-280 VOLT (OVERVOLTAGE CONN.) (TWO CORE, OPEN DELTA CONN).						
4.0	5.0	2-60	9T92A17G51	$175.50	9T92A17G54	$189.90
5.0[6]	6.8	2-60	9T92A18G51	179.10	9T92A18G54	193.50

PLUG-IN SETS

Bench or wall-mounted single-phase units for laboratory or shop source of adjustable a-c voltage. Provides output voltage of 0-117% of input voltage, but is easily reconnectible for 0-100%.



Rated Amp	Fuse Rating, Amp	Frame Size (All have 1 Core)	Model Number	Sugg'd Net Price[2]	Receptacle Configuration
50/60 HZ, 120-VOLT INPUT, 0-140 VOLT OUTPUT					
2.5[10]	3	30	9T92A90	$25.00	Fig. 1
4.5	5	40	9T92A91	31.00	Fig. 1
6.5[10][11]	6	50	9T92A86	35.00	Fig. 1
10.0	10	60	9T92A87	39.00	Fig. 1
15.0[11]	15	75	9T92Y88	64.00	Fig. 1
18.0[11]	20	75	9T92Y89	78.00	Fig. 2
50/60 HZ, 240-VOLT INPUT[12], 0-280 VOLT OUTPUT					
4.0	4	60	9T92A95	$45.00	Fig. 4
7.0[11]	8	75	9T92A96	64.00	Fig. 4
8.5[11]	10	75	9T92A97	78.00	Fig. 4

Fig. 1

Fig. 2

Fig. 3

[10] Output range 0-132 volts.
[11] 60 Hz only when connected for 0-117% line voltage output.
[12] Reconnectible for 120-volt input, with derating required.

Prices subject to change without notice.

For complete information contact nearest GE Sales Office listed on inside front cover, or write to General Electric Co., Section 998-88, Schenectady, N. Y. 12305.

GENERAL ELECTRIC

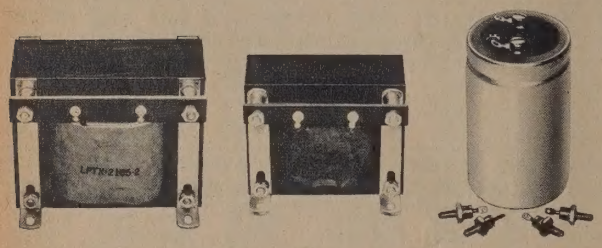
New from Lambda... Power Kits

Pre-designed power supply circuits and selected components providing four levels of regulation and ripple...over 150 circuits.

1. define parameters

- output voltage
- current
- regulation
- ripple

Everything you need for a pre-designed power supply.



Lambda power kits are comprised of components selected for a pre-designed power supply circuit so that you can build your own dc power supply.

Lambda is its own distributor for these major components:

power transformers
filter chokes
computer grade electrolytic capacitors
silicon rectifiers
regulator systems

The components vary depending upon the circuit selected, as well as the dc voltage and dc current required.

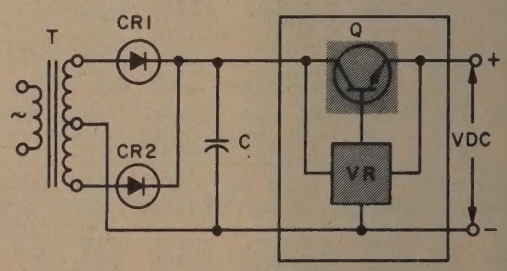
Off-the-shelf delivery for breadboard, pre-production and production models.

Lambda, with the introduction of standard power kits, leaves you free to design your circuit without having to bother with the power supply. Lambda now offers a wide selection of power supply kits to provide you with all the major components from a single source of supply. At the same time Lambda stocks these items so you get off-the-shelf delivery.

2. select power kit

All the major components you need... pre-designed to meet your specific requirements and delivered off-the-shelf from a single source of supply.

Wide selection of circuits for regulation and ripple



Lambda offers a selection of pre-designed groups of circuits from which you can select the regulation and ripple characteristics required for your application. Specifications are available from 0.01% regulation 250 μv rms ripple to 20% regulation at 2 v rms ripple.

Wide selection of output voltages and currents.

In each group of circuits Lambda offers a wide selection of voltages and currents to meet your needs . . . both single and dual outputs. Voltage ranges up to 48 vdc and current ranges up to 50 amperes dc are provided.

Simply select what you need... no calculations or design necessary.

All the circuits supplied with the Power Kits have been pre-designed, proved and tested by Lambda Engineering to assure you the same quality and performance achieved by Lambda's standard line of power supplies. Lambda transformers and chokes carry the same 5 year guarantee as Lambda power supplies. Lambda transformers and chokes are fully varnish-impregnated and built to MIL-T-27C, grade 6, specifications.

Special and multi-output transformers

ulti-output transformers and special output voltage trans-rmers are available on request.

Circuit Specifications

RIES 1000—CAPACITOR-INPUT FILTER POWER SUPPLY CIRCUITS

e regulation: 1.2% per % @ full load
ad regulation: 20% from ½ load to full load
tput voltage tolerance: ±5% @ nominal line of 115 vac
ple: 1 v rms, up to 12 vdc
2 v rms, 15 to 48 vdc
c output voltages: 5 to 48 vdc (ten ranges)
c output currents: 0.25 to 50 amps (seven ranges)
put voltages: 105-132 vac, 57-63 Hz

RIES 2000—CHOKE-INPUT FILTER POWER SUPPLY CIRCUITS

e regulation: 1% per % @ full load
ad regulation: 10% from ½ load to full load
tput voltage tolerance: ±5% @ nominal line of 115 vac
ple: 2% (rms) of dc output voltage
c output voltages: 5 to 48 vdc (ten ranges)
c output currents: 1.0 amp to 50 amps (five ranges)
put voltages: 105-132 vac, 57-63 Hz

RIES 3000—REGULATED POWER SUPPLY CIRCUITS

gulation: 0.15% + 10 mv — line or load
ple: 5 mv rms
c output voltages: 5 to ±18 vdc (four ranges)
c output currents: 0.25 to 50 amps (seven ranges)
put voltages: 105-132 vac, 57-63 Hz

RIES 4000—HIGHLY REGULATED POWER SUPPLY CIRCUITS

gulation: 0.01% + 1 mv — line or load
ple: 250 μv rms, 1 mv p-to-p
c output voltages: 5 to ±18 vdc (four ranges)
c output currents: 0.25 to 50 amps (seven ranges)
put voltages: 105-132 vac, 57-63 Hz

Power kit.
Quick reference chart. Kits presently available.

DC OUTPUT VOLTAGE	POWER KIT SERIES	DC OUTPUT CURRENT—(AMPS) 0.25	0.5	1.0	5.0	10.0	25.0	50.0
5	1000	√	√	√	√	√	√	√
	2000			√	√	√	√	√
	3000	√	√	√	√	√	√	√
	4000	√	√	√	√	√	√	√
6	1000	√	√	√	√	√	√	√
	2000			√	√	√	√	√
	3000	√	√	√	√	√	√	√
	4000	√	√	√	√	√	√	√
12	1000	√	√	√	√	√	√	√
	2000			√	√	√	√	√
15	1000	√	√	√	√	√	√	√
	2000			√	√	√	√	√
±15	1000	√	√	√	√			
	2000			√	√			
	3000	√	√	√	√			
	4000	√	√	√	√			
18	1000	√	√	√	√	√	√	
	2000			√	√	√	√	
±18	1000	√	√	√	√			
	2000			√	√			
	3000	√	√	√	√			
	4000	√	√	√	√			
24	1000		√	√	√	√	√	
	2000			√	√	√	√	
28	1000		√	√	√	√	√	
	2000			√	√	√	√	
48	1000			√	√	√		
	2000			√	√	√	√	

Here's all you do to order Lambda power kits

1. Determine the regulation and ripple requirement for the circuit you wish to supply.
2. Select one of the four series of circuits that best satisfies your needs—1000, 2000, 3000 or 4000 series.
3. Turn to the table for that series and select the power supply kit that meets your dc output voltage and current requirements. No need to design the power supply or to calculate voltage drops across components. This has already been done for you.
4. You may purchase either the entire kit, the transformer, the filter choke, or the capacitors, silicon rectifiers, and regulator.
5. Number System—The Lambda part number is an alpha-numeric designation in three parts:

Stock No. Prefix	Stock No.	Suffix
LPKT	**2311**	**—3**

The stock number prefix defines the kit or components you wish to purchase and the suffix identifies the circuit to be used within that series.

LPKT = Lambda Power Kit
LPTX = Lambda Power Transformer
LPFC = Lambda Filter Choke
LPCR = Capacitors and Rectifiers
LPCO = Capacitors, Rectifiers and Regulators

The stock number defines the circuit series (which identifies the regulation and ripple) in addition to output voltage and current. For stock numbers in the:

1000 series, see pages 4 & 5
2000 series, see pages 6 & 7
3000 series, see pages 8 & 9
4000 series, see pages 10 & 11

Capacitors and silicon rectifiers are only supplied as a unit package in series 1000, 2000 and 3000.

Capacitor, silicon rectifiers, and regulator are only supplied as a unit package in Series 4000.

Example:

If you were to order part number LPKT 2311-3, you would be ordering (from the Power Kit and Component Selection chart on Pages 6 & 7) a complete Lambda Power Kit in the 2000 series, a power supply with a choke input filter, which provides a dual + and — 18 volts dc output at 5 amps each, as shown in series 2000 circuit 3. The kit price on the chart is $138. If, on the other hand you only wanted the transformer, you would order LPTX 2311-3 at $44 or LPFC 2311-3 at $82 if you only wanted the filter chokes, etc.

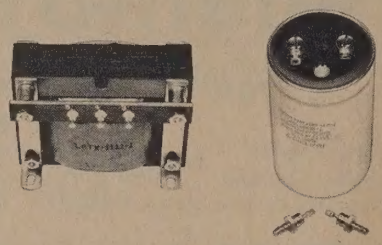
Ordering:

1. Turn to the page listing the circuit series that meets your requirement for regulation and ripple.
2. Select the voltage you need along the vertical axis of the selection chart.
3. Select the current you need along the horizontal axis of the selection chart.
4. Pick the stock number directly off the chart at the intersection of the axes.
5. You select the stock number prefix to the number depending upon whether you want the entire kit or just individual components. The price for each item is also listed in the same section of the chart. Prices for 1 to 4 units are listed in the left-hand column and prices for 5 or more units are listed in the right-hand column under each current rating.
6. Direct all transformer and other component orders directly to Lambda Electronics Corp., 515 Broad Hollow Road, Melville, L. I., New York 11746.

1000 SERIES POWER KITS

...transformers, capacitors, rectifiers and circuits.

Power Kit and component selection chart



LPKT
Lambda Power Kit

LPTX
Lambda Power Transformer

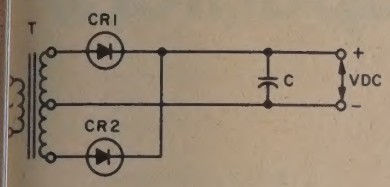
LPCR
Capacitor and Rectifiers

Regulation
line 1.2% per % at full load
load 20% from ½ load to full load
output voltage tolerance ±5% at nominal line of 115 vac
Ripple
1 v rms, up to 12 vdc
2 v rms, 15 to 48 vdc
DC output voltages
5 to 48 vdc (ten ranges)
DC output currents
0.25 to 50 amps (seven ranges)
AC input
105-132 vac, 57-63 Hz

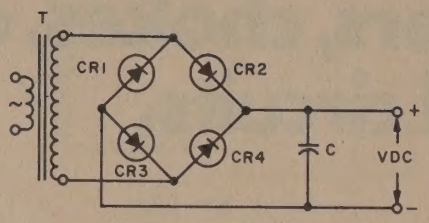
Lambda transformers and chokes are guaranteed for five years.

DC OUTPUT VOLTAGE	STOCK NUMBER PREFIX	0.25 AMP 1-4	0.25 AMP 5 & UP
		1003-1	
5 VDC	LPKT	$15.	$13.
	LPTX	12.	10.50
	LPCR	3.	2.50
		1053-1	
6 VDC	LPKT	$15.	$13.
	LPTX	12.	10.50
	LPCR	3.	2.50
		1103-1	
12 VDC	LPKT	$16.	$13.50
	LPTX	13.	11.
	LPCR	3.	2.50
		1153-2	
15 VDC	LPKT	$16.50	$14.
	LPTX	13.	11.
	LPCR	3.50	3.
		1203-3	
±15 VDC	LPKT	$20.	$17.
	LPTX	14.	12.
	LPCR	6.	5.
		1253-2	
18 VDC	LPKT	$17.	$14.50
	LPTX	13.50	11.50
	LPCR	3.50	3.
		1303-3	
±18 VDC	LPKT	$20.	$17.
	LPTX	14.	12.
	LPCR	6.	5.
24 VDC	LPKT		
	LPTX		
	LPCR		
28 VDC	LPKT		
	LPTX		
	LPCR		
48 VDC	LPKT		
	LPTX		
	LPCR		

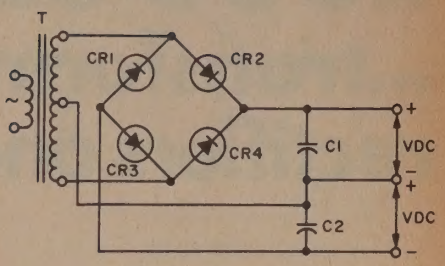
Capacitor-input filter, power supply circuits.



SERIES 1000 CIRCUIT 1



SERIES 1000 CIRCUIT 2



SERIES 1000 CIRCUIT 3

DC OUTPUT CURRENT AND STOCK NUMBERS

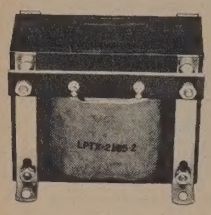
0.5 AMP		1.0 AMP		5.0 AMPS		10.0 AMPS		25.0 AMPS		50.0 AMPS	
1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP
1005-1		**1007-1**		**1011-1**		**1015-1**		**1025-1**		**1031-1**	
15.	$13.	$17.	$14.50	$30.	$25.50	$48.	$41.	$88.	$75.	$145.	$123.
12.	10.50	13.50	11.50	21.	18.	34.	29.	60.	51.	93.	79.
3.	2.50	3.50	3.	9.	7.50	14.	12.	28.	24.	52.	44.
1055-1		**1057-1**		**1061-1**		**1065-1**		**1075-1**		**1081-1**	
15.	$13.	$17.	$14.50	$30.	$25.50	$48.	$41.	$88.	$75.	$145.	$123.
12.	10.50	13.50	11.50	21.	18.	34.	29.	60.	51.	93.	79.
3.	2.50	3.50	3.	9.	7.50	14.	12.	28.	24.	52.	44.
1105-1		**1107-1**		**1111-1**		**1115-1**		**1125-1**		**1131-1**	
$16.	$13.50	$17.50	$15.	$41.	$35.	$56.	$48.	$113.	$96.	$147.	$125.
13.	11.	14.50	12.50	33.	28.	47.	40.50	94.	80.	115.	98.
3.	2.50	3.	2.50	8.	7.	9.	7.50	19.	16.	32.	27.
1155-2		**1157-2**		**1161-2**		**1165-2**		**1175-1**		**1181-1**	
$16.50	$14.	$18.	$15.	$43.	$37.	$58.	$49.	$122.	$104.	$155.	$132.
13.	11.	14.50	12.	33.	28.50	47.	39.50	99.	84.	118.	101.
3.50	3.	3.50	3.	10.	8.50	11.	9.50	23.	20.	37.	31.
1205-3		**1207-3**		**1211-3**							
$20.	$17.	$22.	$19.	$69.	$59.						
14.	12.	16.	14.	53.	45.50						
6.	5.	6.	5.	16.	13.50						
1255-2		**1257-2**		**1261-2**		**1265-2**		**1275-1**			
$17.	$14.50	$19.	$16.	$46.	$39.	$62.	$53.	$125.	$106.		
13.50	11.50	15.50	13.	36.	30.50	52.	44.50	105.	89.		
3.50	3.	3.50	3.	10.	8.50	10.	8.50	20.	17.		
1305-3		**1307-3**		**1311-3**							
$20.	$17.	$28.	$24.	$72.	$61.						
14.	12.	22.	19.	56.	47.50						
6.	5.	6.	5.	16.	13.50						
1355-2		**1357-2**		**1361-2**		**1365-2**		**1375-2**			
$18.	$15.50	$20.	$17.	$52.	$44.	$66.	$56.	$132.	$112.		
14.50	12.50	16.50	14.	42.	35.50	56.	47.50	110.	93.50		
3.50	3.	3.50	3.	10.	8.50	10.	8.50	22.	18.50		
1455-2		**1457-2**		**1461-2**		**1465-2**		**1475-2**			
$18.	$15.50	$20.	$17.	$52.	$44.	$66.	$56.	$132.	$112.		
14.50	12.50	16.50	14.	42.	35.50	56.	47.50	110.	93.50		
3.50	3.	3.50	3.	10.	8.50	10.	8.50	22.	18.50		
		1507-2		**1511-2**		**1515-2**					
		$25.	$21.	$63.	$54.	$114.	$97.				
		20.	16.50	53.	45.50	100.	85.				
		5.	4.50	10.	8.50	14.	12.				

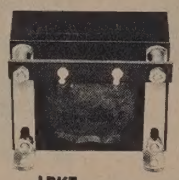
All prices F.O.B. Gouldsboro, Pa. All prices and specifications are subject to change without notice.

2000 SERIES POWER KITS

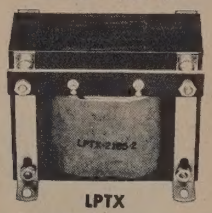
...transformers, chokes, capacitors, rectifiers and circuits.

Power Kit and component selection chart





LPKT
Lambda Power Kit



LPTX
Lambda Power Transformer

LPFC
Lambda Filter Choke

LPCR
Capacitor and Rectifiers

Regulation
line 1% per % at full load
load 10% from ½ load to full load
output voltage tolerance ±5% at nominal line of 115 vac

Ripple
2% (rms) of dc output voltage

DC output voltages
5 to 48 vdc (ten ranges)

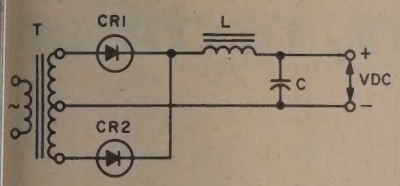
DC output currents
1.0 to 50 amps (five ranges)

AC input
105-132 vac, 57-63 Hz

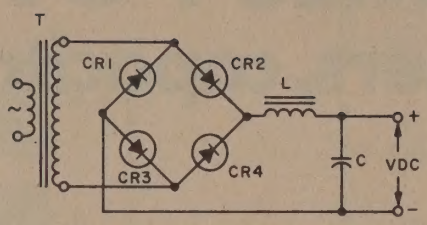
Lambda transformers and chokes are guaranteed for five years.

DC OUTPUT VOLTAGE	STOCK NUMBER PREFIX	1.0 AMP 1-4	1.0 AMP 5 & UP
		2007-1	
5 VDC	LPKT	$32.	$27.
	LPTX	12.	10.
	LPFC	17.	14.50
	LPCR	3.	2.50
		2057-1	
6 VDC	LPKT	$32.	$27.
	LPTX	12.	10.
	LPFC	17.	14.50
	LPCR	3.	2.50
		2107-1	
12 VDC	LPKT	$34.	$29.
	LPTX	13.	11.
	LPFC	18.	15.50
	LPCR	3.	2.50
		2157-2	
15 VDC	LPKT	$35.	$30.
	LPTX	13.	11.
	LPFC	18.	15.50
	LPCR	4.	3.50
		2207-3	
±15 VDC	LPKT	$57.	$48.
	LPTX	15.	13.
	LPFC	36.	30.
	LPCR	6.	5.
		2257-2	
18 VDC	LPKT	$35.	$30.
	LPTX	13.	11.
	LPFC	18.	15.50
	LPCR	4.	3.50
		2307-3	
±18 VDC	LPKT	$58.	$49.
	LPTX	16.	14.
	LPFC	36.	30.
	LPCR	6.	5.
		2357-2	
24 VDC	LPKT	$37.	$32.
	LPTX	15.	13.
	LPFC	18.	15.50
	LPCR	4.	3.50
		2457-2	
28 VDC	LPKT	$38.	$33.
	LPTX	16.	14.
	LPFC	18.	15.50
	LPCR	4.	3.50
		2507-2	
48 VDC	LPKT	$40.	$34.
	LPTX	16.50	14.
	LPFC	18.	15.50
	LPCR	5.50	4.50

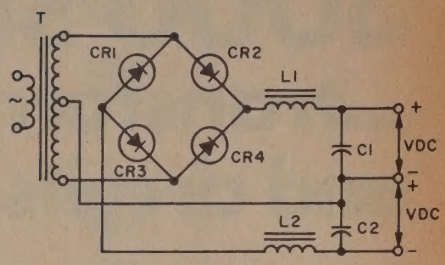
Choke-input filter, power supply circuits.



SERIES 2000 CIRCUIT 1



SERIES 2000 CIRCUIT 2



SERIES 2000 CIRCUIT 3

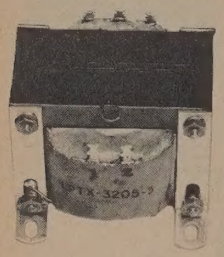
DC OUTPUT CURRENT AND STOCK NUMBERS

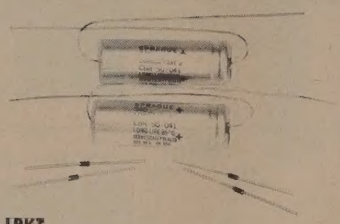
5.0 AMPS		10.0 AMPS		25.0 AMPS		50.0 AMPS	
1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP
2011-1		**2015-1**		**2025-1**		**2031-1**	
$49.	$42.	$83.	$71.	$137.	$117.	$181.	$160.
17.	14.50	27.	23.	41.	35.	57.	51.
24.	20.50	47.	40.	80.	68.	92.	82.
8.	7.	9.	8.	16.	14.	32.	27.
2061-1		**2065-1**		**2075-1**		**2081-1**	
$49.	$42.	$83.	$71.	$137.	$117.	$181.	$160.
17.	14.50	27.	23.	41.	35.	57.	51.
24.	20.50	47.	40.	80.	68.	92.	82.
8.	7.	9.	8.	16.	14.	32.	27.
2111-1		**2115-1**		**2125-1**		**2131-1**	
$53.	$45.	$96.	$82.	$149.	$127.	$205.	$173.
21.	18.	40.	34.	52.	44.	90.	76.
24.	20.	47.	40.	80.	68.	83.	70.
8.	7.	9.	8.	17.	15.	32.	27.
2161-2		**2165-2**		**2175-1**		**2181-1**	
$56.	$49.	$100.	$85.	$156.	$133.	$215.	$183.
22.	19.	38.	33.	61.	52.	96.	82.
24.	21.50	47.	40.	78.	66.	87.	74.
10.	8.50	15.	12.	17.	15.	32.	27.
2211-3							
$90.	$76.						
27.	23.						
48.	41.						
15.	12.						
2261-2		**2265-2**		**2275-1**			
$69.	$59.	$104.	$87.	$177.	$150.		
20.	17.	44.	37.	77.	65.		
41.	35.	49.	41.	78.	66.		
8.	7.	11.	9.	22.	19.		
2311-3							
$138.	$117.						
44.	37.						
82.	70.						
12.	10.						
2361-2		**2365-2**		**2375-2**			
$90.	$77.	$106.	$90.	$190.	$161.		
37.	31.	47.	40.	78.	66.		
45.	39.	48.	41.	78.	66.		
8.	7.	11.	9.	34.	29.		
2461-2		**2465-2**		**2475-2**			
$92.	$79.	$109.	$93.	$195.	$166.		
37.	31.50	47.	40.	83.	71.		
45.	39.	51.	44.	78.	66.		
10.	8.50	11.	9.	34.	29.		
2511-2		**2515-2**					
$94.	$81.	$121.	$103.				
39.	33.50	56.	48.				
45.	39.	51.	43.				
10.	8.50	14.	12.				

All prices F.O.B. Gouldsboro, Pa. All prices and specifications are subject to change without notice.

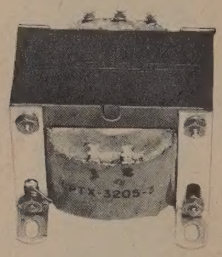
3000 SERIES POWER KITS ...transformers, capacitors, rectifiers and circuits.

Power Kit and component selection chart

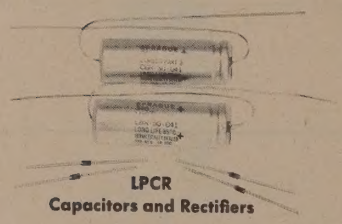




LPKT
Lambda Power Kit



LPTX
Lambda Power Transformer



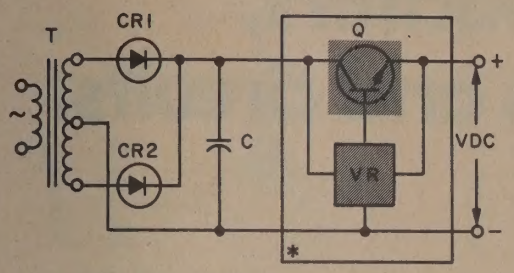
LPCR
Capacitors and Rectifiers

DC OUTPUT VOLTAGE	STOCK NUMBER PREFIX	0.25 AMP 1-4	0.25 AMP 5 & UP
		3003-1	
5 VDC	LPKT	$19.	$16.50
	LPTX	16.	14.
	LPCR	3.	2.50
		3053-1	
6 VDC	LPKT	$20.	$17.50
	LPTX	17.	15.
	LPCR	3.	2.50
		3203-3	
±15 VDC	LPKT	$29.	$25.
	LPTX	23.	20.
	LPCR	6.	5.
		3303-3	
±18 VDC	LPKT	$30.	$26.
	LPTX	24.	21.
	LPCR	6.	5.

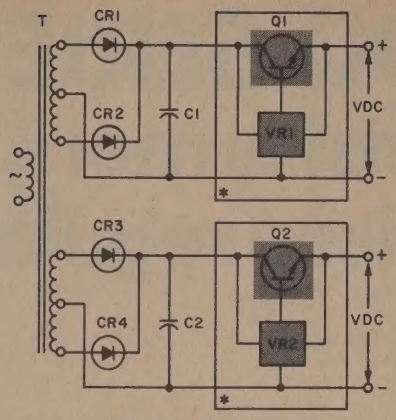
Regulation
0.15% + 10 mv, line or load
Ripple
5 mv rms
DC output voltages
5 to ±18 vdc (four ranges)
DC output currents
0.25 to 50 amps (seven ranges)
AC input
105-132 vac, 57-63 Hz
Temperature coefficient
0.03%/°C
Remote Sensing
Automatic Current Limiting

Lambda transformers and chokes are guaranteed for five years.

Regulated power supply circuits.



SERIES 3000 CIRCUIT 1



SERIES 3000 CIRCUIT 3

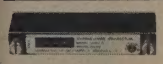
*Complete circuit diagrams are provided with kits and components. Lambda does not supply those components shown in shaded areas.

DC OUTPUT CURRENT AND STOCK NUMBERS

0.5 AMP		1.0 AMP		5.0 AMPS		10.0 AMPS		25.0 AMPS		50.0 AMPS	
1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP
3005-1		**3007-1**		**3011-1**		**3015-1**		**3025-1**		**3031-1**	
$20.	$17.50	$24.	$21.	$61.	$53.	$80.	$70.	$108.	$94.	182.	$159.
17.	15.	20.50	18.	53.	46.	70.	61.50	90.	78.	151.	132.
3.	2.50	3.50	3.	8.	7.	10.	8.50	18.	16.	31.	27.
3055-1		**3057-1**		**3061-1**		**3065-1**		**3075-1**		**3081-1**	
$21.	$18.	$25.	$22.	$60.	$52.	$81.	$71.	$109.	$95.	$185.	$162.
18.	15.50	21.50	19.	52.	45.	71.	62.50	91.	79.	154.	135.
3.	2.50	3.50	3.	8.	7.	10.	8.50	18.	16.	31.	27.
3205-3		**3207-3**		**3211-3**							
$30.	$26.	$38.	$33.	$95.	$83.						
24.	21.	31.50	27.50	78.	68.						
6.	5.	6.50	5.50	17.	15.						
3305-3		**3307-3**		**3311-3**							
$31.	$27.	$40.	$35.	$97.	$85.						
25.	22.	33.50	29.50	80.	70.						
6.	5.	6.50	5.50	17.	15.						

All prices F.O.B. Gouldsboro, Pa. All prices and specifications are subject to change without notice.

OVERVOLTAGE PROTECTOR ACCESSORIES

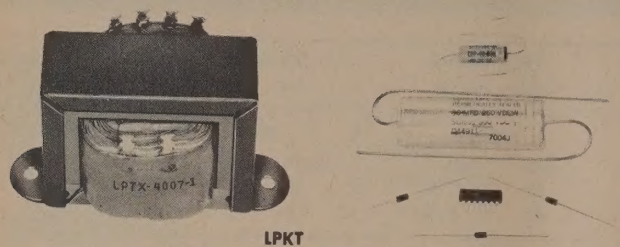


MODEL	ADJ. VOLT RANGE VDC	CURRENT RANGE	PRICE
LC-OV-10	3-24	up to 1 amp	$20
LM-OV-1	3-8	5-10 amps	30
LM-OV-2	6-20	5-10 amps	30
LM-OV-7	3-8	25-50 amps	75
LM-OV-8	6-20	25-50 amps	75

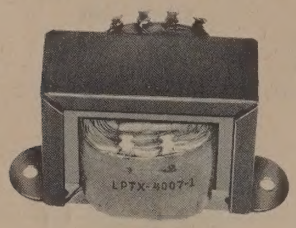
4000 SERIES POWER KITS

...transformers, capacitors, rectifiers, regulators and circuits.

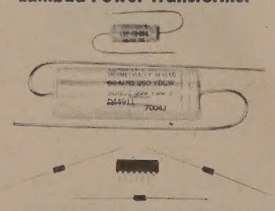
Power Kit and component selection chart



LPKT
Lambda Power Kit



LPTX
Lambda Power Transformer



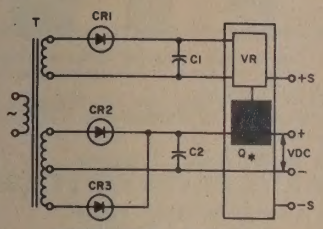
LPCO
Capacitor, Rectifiers, and Regulator

DC OUTPUT VOLTAGE	STOCK NUMBER PREFIX	0.25 AMP 1-4	0.25 AMP 5 & UP
		4003-1	
5 VDC	LPKT	$40.	$35.
	LPTX	20.	17.50
	LPCO	20.	17.50
		4053-1	
6 VDC	LPKT	$42.	$37.
	LPTX	22.	19.50
	LPCO	20.	17.50
		4203-5	
±15 VDC	LPKT	$67.	$59.
	LPTX	27.	24.
	LPCO	40.	35.
		4303-5	
±18 VDC	LPKT	$69.	$60.
	LPTX	29.	25.
	LPCO	40.	35.

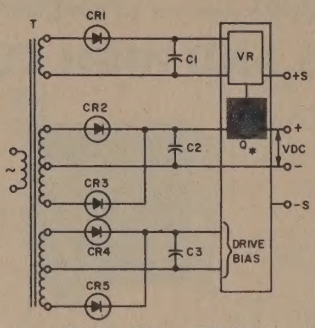
Regulation
0.01% + 1 mv, line or load
Ripple
250 μv rms, 1 mv p-to-p
DC output voltages
5 to ±18 vdc (four ranges)
DC output currents
0.25 to 50 amps (seven ranges)
AC input
105-132 vac, 57-63 Hz
Temperature coefficient
0.015% /°C
Remote sensing
Remote programing
1000 ohm/v nominal or volt/volt
Series/parallel operation
with similar single or dual units
Automatic current limiting

Lambda transformers and chokes are guaranteed for five years.

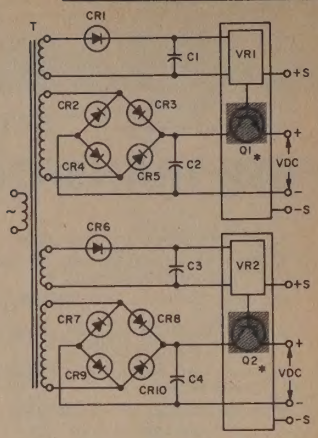
Highly regulated power supply circuits.



SERIES 4000 CIRCUIT 1



SERIES 4000 CIRCUIT 3



SERIES 4000 CIRCUIT 5

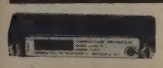
*Complete circuit diagrams are provided with kits and components. Lambda does not supply those components shown in shaded areas.

DC OUTPUT CURRENT AND STOCK NUMBERS

0.5 AMP		1.0 AMP		5.0 AMPS		10.0 AMPS		25.0 AMPS		50.0 AMPS	
1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP	1-4	5 & UP
4005-1		4007-1		4011-1		4015-1		4025-1		4031-3	
$42.	$37.	$44.	$38.50	$77.	$67.	$99.	$89.	$127.	$111.	$212.	$186.
22.	19.50	24.	21.	53.	46.	74.	67.	93.	81.	162.	142.
20.	17.50	20.	17.50	24.	21.	25.	22.	34.	30.	50.	44.
4055-1		4057-1		4061-1		4065-1		4075-1		4081-3	
$44.	$38.50	$46.	$40.	$78.	$68.	$100.	$88.	$131.	$115.	$250.	$219.
24.	21.	26.	22.50	54.	47.	75.	66.	97.	85.	170.	149.
20.	17.50	20.	17.50	24.	21.	25.	22.	34.	30.	80.	70.
4205-5		4207-5		4211-5							
$72.	$63.	$75.	$66.	$150.	$131.						
32.	28.	35.	31.	100.	87.						
40.	35.	40.	35.	50.	44.						
4305-5		4307-5		4311-5							
$75.	$66.	$80.	$70.	$155.	$136.						
35.	31.	40.	35.	105.	92.						
40.	35.	40.	35.	50.	44.						

All prices F.O.B. Gouldsboro, Pa. All prices and specifications are subject to change without notice.

OVERVOLTAGE PROTECTOR ACCESSORIES



MODEL	ADJ. VOLT RANGE VDC	CURRENT RANGE	PRICE
LC-OV-10	3-24	up to 1 amp	$20
LM-OV-1	3-8	5-10 amps	30
LM-OV-2	6-20	5-10 amps	30
LM-OV-7	3-8	25-50 amps	75
LM-OV-8	6-20	25-50 amps	75

Lambda-staffed sales and service offices

Arizona, Scottsdale
Tel. 602-945-1416

California, North Hollywood
Tel. 213-877-0041

California, Sunnyvale
Tel. 408-738-2541

D. C., Washington
Tel. 301-424-2010

Florida, Clearwater
Tel. 813-446-8376

Illinois, Schiller Park
Tel. 312-671-0182/83

Indiana, Indianapolis
Tel. 317-631-9557

Maryland, Baltimore
Tel. 301-243-0035

Massachusetts, Lexington
Tel. 617-861-8585

Minnesota, Minneapolis
Tel. 612-332-6714

New York, Melville
Tel. 516-694-4200

New York, Rochester
Tel. 716-454-6770

North Carolina, Charlotte
Tel. 704-372-7203

Ohio, Cleveland
Tel. 216-771-7447

Oklahoma
Enterprise 2-183

Pennsylvania, Norristown
Tel. 215-272-7101

Texas, Houston
Tel. 713-464-6554

Texas, Richardson
Tel. 214-231-7121

CANADA

Quebec, Pointe Claire
Tel. 514-697-6520

See YELLOW SECTION for Local Offices, Phones

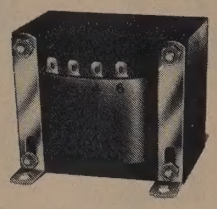
K.G.S. electronics, inc.

kgs electronics

2029 North Lincoln Avenue • Pasadena, California 91103 • Tel. (213) 798-0787

POWER TRANSFORMERS AND HIGH CURRENT CHOKES

- Available Immediately From Stock
- Secondary Voltages Between The Standard Units Available At No Additional Cost
- Primary Voltage = 115V RMS, 60 HZ (Will Operate To 400 HZ)
- Capacitance and Inductance Values Shown For E_{ripple} (P-P) ≤ 3% of E_{dc}.
- Allow Two Weeks For Non-Standard Voltage Transformers
- Nomenclature of Part Number 1000 - 56 Secondary Power Rating in VA RMS Voltage



STOCKED FOR IMMEDIATE DELIVERY

- Transformer Regulation is 5% No Load to Full Load
1. Transformers Rated For 45°C Temperature Rise. Rated For Class B Performance Per MIL-T-27B.
2. All Transformers Have Two Secondary Windings. They Can Be Connected For Parallel or Series Operation
- Bleeder Current = 10% of I_{dc}.
- V_r of Rectifiers Will Affect D.C. Output Voltage
- Choke Connections: P - Parallel * S - Series

STOCKED FOR IMMEDIATE DELIVERY

VOLTAGE AND CURRENT TABLE FOR THE DIFFERENT CIRCUIT CONFIGURATION

Power Rating Watts	Transformer Part Number	Secondary E_s Volts RMS	Secondary RMS Amps	Fig. 1 E_{dc} Volts	Fig. 1 I_{dc} Amps	Fig. 1 C_1 Farad	Fig. 2 E_{dc} Volts	Fig. 2 I_{dc} Amps	Fig. 2 C_1 UF	Fig. 3 E_{dc} Volts	Fig. 3 I_{dc} Amps	Fig. 3 L_1 Part No.*	Fig. 3 C_1 UF	Fig. 4 E_{dc} Volts	Fig. 4 I_{dc} Amps	Fig. 4 L_1 Part No.*	Fig. 4 C_1 UF
100	100-12.8	12.8	8	6.0	8.0	.300	13.0	4.0	100,000	4.0	12.0	100-8LP	60,000	9.0	6.0	100-8LS	15,000
100	100-28	28	4	16.0	4.0	.050	33.5	2.0	17, 30	11.0	6.0	100-40LP	8,000	23.0	3.0	100-40LS	2,000
100	100-36	36	3	22.0	3.0	.035	44.0	1.5	12,500	14.3	5.0	100-60LP	6,000	29.0	2.5	100-60LS	1,500
100	100-56	56	2	34.0	2.0	.020	70.0	1.0	7,500	22.0	3.3	100-160LP	2,500	44.5	1.6	100-160LS	750
250	250-12.8	12.8	20	5.8	20.0	.700	13.0	10.0	250,000	3.7	30.0	250-4LP	80,000	9.0	15.0	250-4LS	20,000
250	250-28	28	9	15.5	10.0	.150	32.5	5.0	60,000	10.5	16.0	250-16LP	25,000	22.5	8.0	250-16LS	6,000
250	250-36	36	7	21.5	8.0	.100	43.5	4.0	25,000	14.0	12.0	250-28LP	12,500	29.0	6.0	250-28LS	3,000
250	250-56	56	4.5	33.5	5.0	.030	68.0	2.5	15,000	22.0	8.0	250-60LP	6,000	44.5	4.0	250-60LS	1,500
500	500-12.8	12.8	40	5.5	42.0	1.000	12.7	21.0	400,000	3.5	68.0	500-2LP	160,000	9.0	34.0	500-2LS	40,000
500	500-28	28	18	15.0	20.0	.250	32.0	10.0	95,000	10.0	30.0	500-8LP	50,000	22.5	15.0	500-8LS	12,500
500	500-36	36	14	21.0	16.0	.150	42.0	8.0	60,000	14.0	24.0	500-16LP	36,000	28.5	12.0	500-16LS	10,000
500	500-56	56	9	33.0	10.0	.070	66.0	5.0	25,000	22.0	16.0	500-28LP	12,500	44.5	8.0	500-28LS	3,000
1000	1000-28	28	36	15.0	40.0	.500	31.0	20.0	200,000	10.0	60.0	1000-4LP	80,000	22.0	30.0	1000-4LS	20,000
1000	1000-36	36	28	20.5	32.0	.250	41.0	16.0	120,000	13.5	50.0	1000-6LP	50,000	28.0	25.0	1000-6LS	12,500
1000	1000-56	56	18	32.5	20.0	.150	65.0	10.0	50,000	21.5	34.0	1000-16LP	25,000	44.0	17.0	1000-16LS	6,000

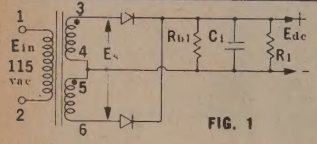


FIG. 1

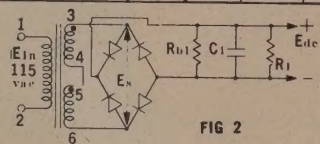


FIG 2

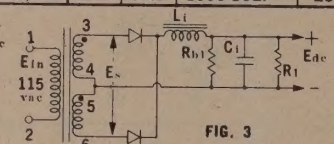


FIG. 3

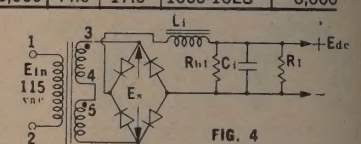
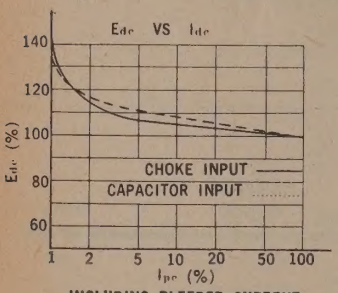
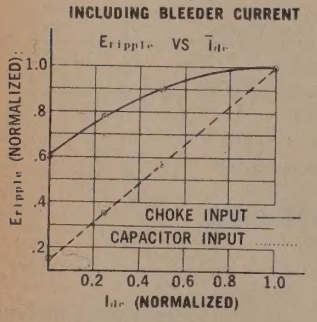


FIG. 4



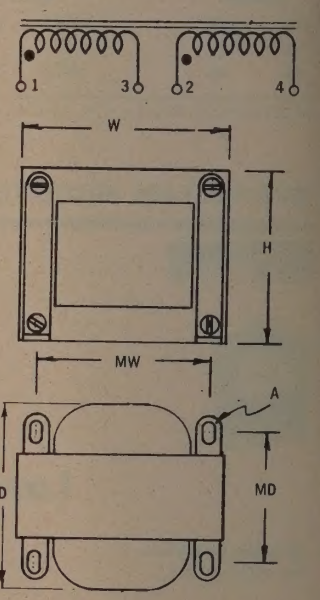
INCLUDING BLEEDER CURRENT



INDUCTANCE TABLE FOR SERIES AND PARALLEL CONNECTION

Part Number	Inductance In Series Millihenries	Current DC Amps	DC Res. Series OHM	Inductance In Parallel Millihenries	Current DC Amps	DC Res. Parallel OHM
100-8L	8	6.0	.06	2	12	.015
100-40L	40	3.0	.35	10	6	.09
100-60L	60	2.5	.56	15	5	.14
100-160L	160	1.6	1.35	40	3.3	.34
250-4L	4	15.0	.037	1	30.0	.009
250-16L	16	8.0	.146	4	16	.037
250-28L	28	6.0	.20	7	12.0	.05
250-60L	60	4.0	.50	15	8.0	.125
500-2L	2	34.0	.16	0.5	68.0	.04
500-8L	8	15.0	.05	2	30.0	.012
500-16L	16	13.0	.09	4	26.0	.022
500-28L	28	8.0	.22	7	16.0	.055
1000-4L	4	30.0	.026	1	60.0	.007
1000-6L	6	25.0	.038	1.5	50.0	.01
1000-16L	16	17.0	.10	4	34	.025

- All Chokes Rated For Class B.
- All Chokes Have Two Identical Coils. They Can Be Connected in Parallel or Series.



HOW TO ORDER

TRANSFORMERS

VA RATING 100 - 28 SECONDARY RMS VOLTAGE

CHOKES

VA RATING 100 - 8L SERIES INDUCTANCE IN MILLIHENRIES

DIMENSIONS TRANSFORMERS **MINIMUM ORDER • $25.00 — F.O.B. • PASADENA, CALIF.**

Power Rating VA	W in	H in	D in	MW in	MD in	A in	WT LB	Quantities for Unit Price 1-5	6-11	12-24	25-49	50-99	100-249
100	3⅜	2 13/16	3½	2 13/16	2 31/32	7/32x5/16	5	11.00	10.45	10.10	9.80	9.35	9.10
250	4½	3¾	3⅞	3¾	3 3/64	"	10	19.25	18.50	16.80	16.00	14.30	13.50
500	5¼	4⅜	4½	4⅜	3 5/16	9/32x1 13/32	16	25.30	24.25	23.10	22.00	20.35	19.80
1000	6⅜	5 5/16	6	5 5/16	4½	9/32x½	30	47.30	41.75	37.40	35.20	34.10	33.00
CHOKES													
100	3⅜	2 13/16	3⅛	2 13/16	2 45/64	7/32x5/16	5	10.45	9.90	9.60	9.35	9.10	8.90
250	4⅛	3 7/16	4 5/16	3 7/16	3 29/64	"	10	16.50	15.40	14.30	13.75	13.25	12.65
500	5¼	4⅜	4½	4⅜	3⅜	9/32x1 13/32	16	24.25	23.10	22.00	21.45	20.90	20.35
1000	6⅜	5 5/16	6	5 5/16	4¼	9/32x½	27	42.90	40.70	40.15	38.50	36.85	34.10

MAGNETICO, INC.

6 RICHTER COURT
East Northport, L. I., N. Y. 11731
Tel: 516 - 261-4502

STANDARD MINIATURE 400 Hz POWER TRANSFORMERS

LET MAGNETICO'S EXPERT ENGINEERING STAFF TACKLE YOUR SPECIAL REQUIREMENTS FOR:

- PRODUCTION TOROIDAL WINDING
- HI Q INDUCTORS
- INVERTER TRANSFORMERS
- DC - DC CONVERTER TRANSFORMERS
- DIGITALLY TAPPED TRANSFORMERS
- PRECISION RATIO TRANSFORMERS
- MAGNETIC AMPLIFIERS
- PRECISION REFERENCE TRANSFORMERS
- PULSE TRANSFORMERS
- WIDE BAND TRANSFORMERS

CONDENSED PERFORMANCE DATA — PRIMARY VOLTAGE 115 VRMS

ALL UNITS DESIGNED TO MEET MIL-T-27B, GRADE 4, CLASS S, LIFE EXPECTANCY X, MILITARY DESIGNATION TF4SX01YY

Catalog Number	VA Rating	Secondary Voltage (RMS)	O.D. ±1/32	Height ±1/32	Nominal Weight	Nom. Reg.	Nom.* Temp. Rise	Price
9600	2	6-300 V	1″	19/32″	1 oz/ 30 gm	18%	10°C	$19.00
9601	4	6-300 V	1″	11/16″	1.2 oz/ 35 gm	15%	12°C	19.00
9602	6	6-300 V	1″	7/8″	1.6 oz/ 45 gm	10%	18°C	19.00
9603	9	6-300 V	1″	1 1/16″	2.1 oz/ 60 gm	8%	20°C	19.00
9604	30	6-300 V	1″	1 1/2″	5.3 oz/150 gm	7%	23°C	19.00
10648	75	10-300 V	2″	1 5/16″	10 oz	±3%	30°C	40.00
10649	150	10-300 V	2 1/4″	1 9/16″	18 oz	±3%	40°C	60.00

* Approximately 3° less on 2 x 2 x 1/8″ aluminum plate

IMMEDIATE DELIVERY FOR PROTOTYPE QUANTITIES

HOW TO ORDER:

Order Magnetico Standard Units directly by using the Magnetico Part Number.

VA RATING	SECONDARY VOLTAGE	SCHEMATIC	SHIELD
Catalog Number	6.0 thru 300 (VRMS)	X — No Tap T — Center Tap	N — No Shield S — Electrostatic Shield

EXAMPLE:
To order a 115 V 400 Hz to 26 V center tapped, 6 VA power transformer with no shield. Order Magnetico Number: **9602-26-T-N.**

VA RATING	SECONDARY VOLTAGE
9602	26
SCHEMATIC	**SHIELD**
T	N

MINIATURE TOROIDAL INDUCTORS

- 5 mh to 5 H
- Unequalled Temperature Stability
- −55 to +125°C operation
- Military Designation TF5RX20ZZ
- PC Board Mounting
- Maximum Q—Minimum Size
- Available from stock
- Unit price — $9.00 - $16.00

SCOTT-T-TRANSFORMERS

***For Use in* SOLID STATE SYNCHRO SYSTEMS**

Typical 400 Hz Resolver To Synchro Converter Transformers

Part NO.	Input Voltage 2 Phase 4 Wire	Output Voltage 3 Phase 3 Wire (L-L)	Load Typical Min. Ohms (L-L)	Input Z Typical Ohms Open CKT	Accuracy Arc Minutes	Size Inches
10084	11.8	11.8	150	2K	2	1 x 2 x .65H
10085	11.8	11.8	150	2K	5	1 x 2 x .65H
10086	6.0	11.8	150	1K	2	1 x 2 x .65H
10087	6.0	11.8	150	1K	5	1 x 2 x .65H
10088	9.0	11.8	300	2K	1.5	1 3/8 x 2 3/4 x .65H
10089	9.0	11.8	300	2K	5	1 3/8 x 2 3/4 x .65H
10090	9.0	90	2500	2K	1.5	1 3/8 x 2 3/4 x 7/8H
10091	9.0	90	2500	2K	5	1 3/8 x 2 3/4 x 7/8H

Typical 400 Hz Synchro To Resolver Converter Transformers

Part No.	Input Voltage (Volts) (L-L)	Z* In (Ohms)	Z Out (Ohms)	Null (MV)	Output (RMS) Voltage (Volts)	Secd'y D.C. Res. (Ohms)	Transformation Accuracy**	Wt. (Oz.)	Size Inches
9652	11.8	100K	11	< 1	5	6	30 sec. of arc	5	2 3/4 x 1 3/8 x 7/8 H
9514	90	1Meg	11	< 1	4.25	7	30 sec. of arc	5	2 3/4 x 1 3/8 x 7/8 H
9561	11.8	10K	4	< 1	1.75	4	2 min. of arc	3	1 x 2 x 5/8 H
10472			25	< 10	6	15	5 min. of arc	0.6	3/4 x 1.5 x 3/8 H

* TYPICAL @ RATED VOLTAGE. ** DEPENDENT ON LOAD.

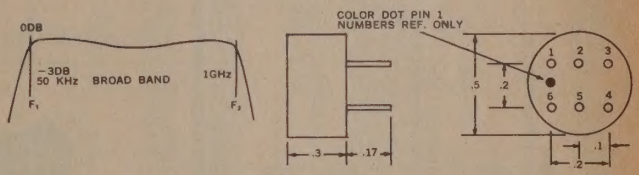
SPECIAL UNITS AVAILABLE ON REQUEST

IMP-TRANZ

WIDE BAND IMPEDANCE MATCHING TRANSFORMERS
PULSE TRANSFORMERS

FOR USE IN:

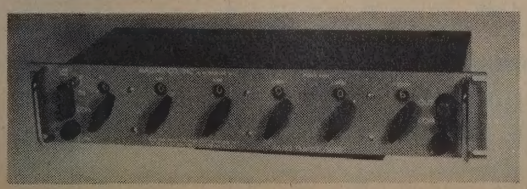
- impedance matching
- antenna matching
- balanced mixers
- input, output, and interstage coupling
- D.C. isolation
- pulse and reflectometry devices
- voltage/current, step up, step down



				PRICE
10721A B C	50 ohm/ 50 ohm 75 ohm/ 75 ohm 100 ohm/100 ohm	Unbalanced/Unbalanced		$15
10722A B C	50 ohm/ 50 ohm 75 ohm/ 75 ohm 100 ohm/100 ohm	Unbalanced/Unbalanced	Phase Reversing	15
10723A	50 ohm/ 50 ohm	Unbalanced/Balanced	Symmetrical	15
10724D E	50 ohm/200 ohm 75 ohm/300 ohm	Unbalanced/Balanced Unbalanced/Balanced	Unsymmetrical Unsymmetrical	15
10725D E	50 ohm/200 ohm 75 ohm/300 ohm	Unbalanced/Balanced Unbalanced/Balanced	Symmetrical Symmetrical	15
10726A B	50 ohm/ 50 ohm 75 ohm/ 75 ohm	Unbalanced/Unbalanced	Reversing, D.C. Isolated	15

PULSE TRANSFORMERS — SEND FOR NEW LITERATURE

MAGNETICO DIGITAL RATIO TRANSFORMERS



Model	Ratio Range	Accuracy 10V to Max Input	Frequency Range	Input Impedance	Max Input Voltage	Nom. Out. Res.	Resolution	Size	Wt	Price
M450	0.000000 to 1.111110	1 part per million at 50 to 3000 Hz	50 to to 10,000 Hz	200K @ 400 Hz	.35 x f (f in Hz) not to exceed 350V	4 ohm	Continuous	3 1/2″ H x 19″ W x 8 1/2″ D	7 3/4 lbs.	$425.00
M460	0.000000 to 1.111110	1 part per million at 30 to 400 Hz	30 to to 1,000 Hz	250K @ 60 Hz	2.5 x f (f in Hz) not to exceed 350V	8 ohm	Continuous	3 1/2″ H x 19″ W x 8 1/2″ D	9 lbs.	$500.00

See YELLOW SECTION for Local Offices, Phones

MCE MINIATURE TRANSFORMERS

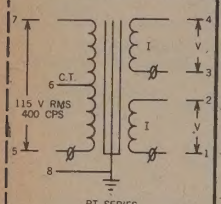
400 CYCLE • 60 CYCLE • MULTI-PURPOSE

Forwards they're for isolation and stepdown — backwards they're for converters and inverters. This built-in bi-directional capability is only one of the many values designed into MCE's miniature standard transformer line. These unique parts are listed below in our easy to find "by size" sequence. As is the case with all MCE standard lines, any component can be ordered in a variety of packaging, mounting, and termination configurations.

In addition to a wide selection of electrical specifications and packaging options, MCE standard components offer high value (quality/price). Request Catalogue for more information.

115V - 400 CYCLE RT SERIES

This RT line of miniature transformers has been designed for use in 400 cycle power supply and control applications. They are also useful for inverter and converter applications in the popular 400 cycle to 2Kc frequency range. Each part has a nominal 115 Volt RMS center-tapped primary and two equal and separate step-down secondaries. Total power ratings are from 2.4 to 215 VA. This is based upon a regulation of 10% or a temperature rise of 25°C above ambient of 25°C. Power ratings and secondary voltage ratings are for both secondaries carrying rated current. The secondary voltages given in the tables are for each separate secondary. The two secondaries may be connected in series to give twice the rated voltage (V) at rated current with a center tap available.



SIZE 25
P = 2.4 VA Reg 10%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
25RT23	1.57	.77
25RT26	3.15	.38
25RT28	5	.24
25RT29	6.3	.19
25RT30	8	.15
25RT31	10	.12
25RT32	12.6	.10
25RT33	16	.075
25RT34	20	.060
25RT35	25	.048
25RT36	32	.038
25RT37	40	.030
25RT38	50	.024
25RT39	64	.019

SIZE 37
P = 12.6 VA Reg = 10%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
37RT21	3.15	2
37RT23	5	1.26
37RT24	6.3	1
37RT25	8	.79
37RT26	10	.63
37TR27	12.6	.5
37RT28	16	.39
37RT29	20	.32
37RT30	25	.25
37RT31	32	.20
37RT32	40	.16
37RT33	50	.13
37RT34	64	.10

SIZE 50
P = 25 VA Reg = 6.3%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
50RT17	3.15	4
50RT19	5	2.5
50RT20	6.3	1.95
50RT21	8	1.56
50RT22	10	1.25
50RT23	12.6	1
50RT24	16	.78
50RT25	20	.63
50RT26	25	.5
50RT27	32	.39
50RT28	40	.31
50RT29	50	.25
50RT30	64	.20

SIZE 62
P = 50 VA Reg = 4.3%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
62RT16	5	5
26RT17	6.3	4
62RT18	8	3.1
62RT19	10	2.5
62RT20	12.6	2
62RT21	16	1.6
62RT22	20	1.25
62RT23	25	1
62RT24	32	.78
62RT25	40	.63
62RT26	50	.5
62RT27	64	.4

SIZE 75
P = 70 VA Reg = 2.4%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
75RT16	10	3.5
75RT17	12.6	2.8
75RT18	16	2.2
75RT19	20	1.75
75RT20	25	1.4
75RT21	32	1.13
75RT22	40	.88
75RT23	50	.70
75RT24	64	.55

SIZE 87
P = 120 VA Reg = 1.7%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
87RT16	20	3
87RT17	25	2.4
87RT18	32	1.9
87RT19	40	1.5
87RT20	50	1.2
87RT21	64	.95

SIZE 100
P = 215 VA Reg = 1.6%

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
100RT15	25	4.3
100RT16	32	3.5
100RT17	40	2.7
100RT18	50	2.15
100RT19	64	1.7

MINIATURE LINE

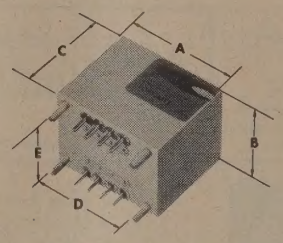
DIMENSIONS AND PACKAGING

MCE miniature standard parts are available in the 7 packages listed below. The 2 letter alpha code of the desired package must be added as a prefix to the Electrical Part Number to completely identify the part.

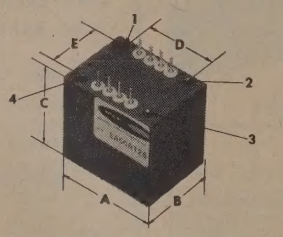
CA (Canned) Studs with terminals on same surface
CB (Canned) Inserts with terminals on same surface
CC (Canned) Studs with terminals on opposite surface
CD (Canned) Inserts with terminals on opposite surface

OA (Open) Terminals, strap bracket and hard epoxy coating
OB (Open) Flex leads, strap bracket, moisture resistant coating.

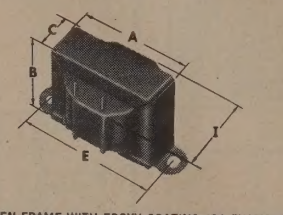
EA (Encapsulated) Terminals with thru holes at corners.



LOW PROFILE HERMETIC SEALED CAN (CA EXAMPLE)



ENCAPSULATED WITH THRU-HOLE MOUNTING (EA EXAMPLE)



OPEN FRAME WITH EPOXY COATING (OA EXAMPLE)

HERMETIC SEALED CAN—LOW PROFILE TYPE YY GRADE IV

SIZE	WT/LBS.	A	B	C	D	E
25	.16	1.25	1.25	1.00	.88	.88
37	.30	1.50	1.38	1.31	1.13	1.00
50	.52	1.88	1.50	1.56	1.50	1.13
62	.83	2.13	1.75	1.81	1.75	1.38
75	1.3	2.50	2.00	2.13	2.13	1.63
87	1.9	2.88	2.25	2.44	2.50	1.88
100	2.8	3.25	2.50	2.75	2.88	2.13

ENCAPSULATED DIMENSIONS—TYPE ZZ GRADE V

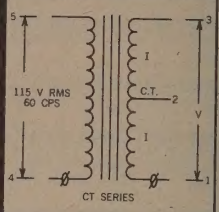
SIZE	WT/LBS	A	B	C	D	E
25	.15	1.34	1.16	.94	1.000°	.828°
37	.26	1.60	1.32	1.28	1.157°	.875°
50	.51	1.95	1.57	1.56	1.500	1.125
62	.78	2.17	1.70	1.81	1.688	1.250
75	1.3	2.57	1.95	2.12	2.000	1.438
87	2.1	2.98	2.19	2.44	2.438	1.625
100	2.8	3.33	2.42	2.81	2.688	1.750

°Thru Holes 1 and 3 Only

115V - 60 CYCLE CT SERIES

These miniature 60 cycle transformers are especially designed for small DC power supply and other control applications, where a voltage step down and/or isolation from the standard 115 volts is required at relatively low power levels. All secondary windings have center taps and are Bi-Filar wound for balanced resistance and voltage. Rated secondary current (I) is based upon regulation of 15%. Maximum secondary current (I Max.) is determined by a temperature rise of 100°C from an ambient of 25°C or the short circuit current indicated by (*). Secondary load voltage (V) is at rated current (I).

FREQ. RANGE 50-400 CPS



SIZE 25
P = 0.05 VA I Max. = 10 x I (*)

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
25CT48	100	0.0005
25CT45	50	0.001
25CT44	40	0.00125
25CT42	25	0.002
25CT41	20	0.0025
25CT39	12.6	0.004
25CT38	10	0.005
25CT36	6.3	0.008
25CT33	3.12	0.016
25CT30	1.56	0.032

SIZE 37
P = 0.35 VA I Max. = 8.1 x I (*)

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
37CT42	100	0.0035
37CT39	50	0.007
37CT38	40	0.0088
37CT36	25	0.014
37CT35	20	0.0175
37CT33	12.6	0.028
37CT32	10	0.035
37CT30	6.3	0.056
37CT27	3.12	0.112
37CT24	1.56	0.224

SIZE 50
P = 1.5 VA I Max. = 6 x I (*)

*ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
50CT38	100	0.015
50CT35	50	0.030
50CT34	40	0.038
50CT32	25	0.060
50CT31	20	0.075
50CT29	12.6	0.120
50CT28	10	0.150
50CT26	6.3	0.240
50CT23	3.12	0.480
50CT20	1.56	0.960

SIZE 62
P = 3 VA I Max. = 4.3 x I

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
62CT36	100	0.030
62CT33	50	0.060
62CT32	40	0.075
62CT30	25	0.120
62CT29	20	0.150
62CT27	12.6	0.240
62CT26	10	0.300
62CT24	6.3	0.480
62CT21	3.12	0.960
62CT18	1.56	1.920

SIZE 75
P = 6.0 VA I Max. = 3.8 x I

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
75CT33	100	0.060
75CT30	50	0.120
75CT29	40	0.150
75CT27	25	0.240
75CT26	20	0.300
75CT24	12.6	0.480
75CT23	10	0.600
75CT21	6.3	0.960
75CT18	3.12	1.92
75CT15	1.56	3.84

SIZE 87
P = 16 VA I Max. = 2.5 x I

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
87CT30	100	0.16
87CT27	50	0.32
87CT26	40	0.40
87CT24	25	0.64
87CT23	20	0.80
87CT21	12.6	1.28
87CT20	10	1.60
87CT18	6.3	2.56
87CT15	3.12	5.12

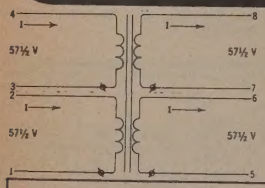
SIZE 100
P = 30 VA I Max. = 2.3 x I

ELECT. PART NO.	V-RMS VOLTS	I-RMS AMPS
100CT27	100	0.30
100CT24	50	0.60
100CT23	40	0.75
100CT21	25	1.20
100CT20	20	1.50
100CT18	12.6	2.40
100CT17	10	3.00
100CT15	6.3	4.80

OPEN FRAME DIMENSIONS

SIZE	WT/LBS.	A	B	C	E	I
25	.078	1.10	.86	.40	1.38	.98
37	.16	1.37	1.20	.57	1.84	1.09
50	.35	1.76	1.46	.70	2.00	1.37
62	.55	2.02	1.74	.84	2.39	1.46
75	.96	2.38	2.04	.96	2.81	1.73
87	1.8	2.76	2.35	1.09	3.12	2.10
100	2.3	3.15	2.68	1.23	3.56	2.23

115V 400 CYCLE/20KC MULTI-PURPOSE TRANSFORMERS - MT1 SERIES



This line of utility transformers offers the design engineer a valuable tool for proving design concepts at minimum cost. Because they are lightweight and built to Mil-Spec they can be used equally as well as final design components. Primaries and secondaries both have two 57½ Volt windings. Built for a basic 400CPS operation, they will operate effectively—and with small phase shift-up to 20KC. Specifications are at 25°C at rated voltage, 400 cycle. For suggested circuit applications, write for product bulletin MT-1.

Elect. Part No.	I MAX - RMS AMPS @ 100°C	@ 25°C	WINDING RESISTANCE — OHMS ±20% 1-2	3-4	5-6	7-8
25MT1	.021	.087	100	120	140	160
37MT1	.11	.24	19	22	25	28
50MT1	.22	.56	6.0	6.7	7.6	8.5
62MT1	.43	1.0	2.1	2.3	2.5	2.8
75MT1	.61	1.9	.89	1.0	1.1	1.2
87MT1	1.0	3.3	.36	.38	.42	.45
100MT1	1.9	4.5	.23	.24	.26	.28

ORDERING INFORMATION

1. Order by complete part number. For example: OA75CT21; CA87MT1; CD25FL26; EA62RT24.
2. Price breaks at 2, 3, 5, 10, 25, plus six more to 1000. Contact factory for 1-9 quantity price list and larger quantity quotations.

MAGNETIC CIRCUIT ELEMENTS INC
DEL MONTE RESEARCH PARK
2455A GARDEN ROAD, MONTEREY, CALIFORNIA 93940
TELEPHONE (408) 373-0456

MCE MINIATURE FILTER INDUCTORS

mce

APPLICATION FEATURES

Miniature inductors, primarily for use in DC power-supply smoothing-filter applications, are offered in two series (1) the linear FL SERIES and (2) the "swinging" NL SERIES.

The FL SERIES inductors are especially suited for requirements where the DC will be 50 to 100% of I-DC rated. They will provide the most inductance in this range.

The NL SERIES inductors are generally more suitable where the DC will vary between 10 to 100% of I-DC rated. The inductance at rated I-DC is approximately ¼ of the value at I-DC = 0.

Both SERIES are listed by size in the tables of specifications. The V, I-DC, and R are the same for similar part numbers, only the inductance values and characteristics are different.

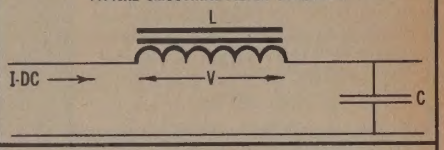
All parts are available in any of the MCE Miniature Line package options (OA, OB, EA, CA, etc.).

SIZE 25

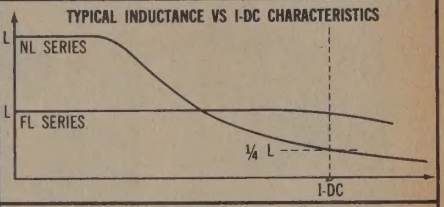
FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
25FL20	.00083	.240	2040	.09	.0017	25NL20
25FL21	.0013	.310	1620	.15	.0027	25NL21
25FL22	.0021	.385	1280	.23	.0044	25NL22
25FL23	.0033	.485	1020	.36	.0069	25NL23
25FL24	.0053	.600	808	.59	.011	25NL24
25FL25	.0083	.800	641	.91	.017	25NL25
25FL26	.013	1.00	508	1.4	.028	25NL26
25FL27	.021	1.25	403	2.2	.044	25NL27
25FL28	.033	1.55	320	3.5	.070	25NL28
25FL29	.053	1.95	253	5.4	.11	25NL29
25FL30	.083	2.45	201	8.7	.18	25NL30
25FL31	.13	3.10	159	14	.28	25NL31
25FL32	.21	3.90	126	22	.45	25NL32
25FL33	.33	4.95	100	36	.71	25NL33
25FL34	.53	6.00	80	57	1.1	25NL34
25FL35	.83	8.00	63	89	1.8	25NL35
25FL36	1.3	10.0	50	140	2.9	25NL36
25FL37	2.1	12.5	40	220	4.6	25NL37
25FL38	3.3	16	31	360	7.2	25NL38
25FL39	5.3	20	25	570	11.	25NL39

FL & NL SERIES INDUCTORS

TYPICAL SMOOTHING-FILTER SCHEMATIC



TYPICAL INDUCTANCE VS I-DC CHARACTERISTICS



SIZE 37

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
37FL18	.0010	.465	3250	.059	.0019	37NL18
37FL19	.0016	.600	2580	.092	.0031	37NL19
37FL20	.0025	.750	2040	.150	.0048	37NL20
37FL21	.0040	.900	1620	.23	.0077	37NL21
37FL22	.0063	1.15	1280	.36	.012	37NL22
37FL23	.010	1.45	1020	.59	.019	37NL23
37FL24	.016	1.85	808	.93	.031	37NL24
37FL25	.025	2.35	641	1.5	.049	37NL25
37FL26	.040	2.95	508	2.3	.078	37NL26
37FL27	.063	3.70	403	3.5	.12	37NL27
37FL28	.10	4.70	320	5.8	.20	37NL28
37FL29	.16	6.00	253	9.2	.31	37NL29
37FL30	.25	7.50	201	15	.50	37NL30
37FL31	.40	9.5	159	23	.79	37NL31
37FL32	.63	12	126	37	1.3	37NL32
37FL33	1.0	15	100	58	2.0	37NL33
37FL34	1.6	19	80	92	3.2	37NL34
37FL35	2.5	24	63	150	5.1	37NL35
37FL36	4.0	30	50	230	8	37NL36
37FL37	6.3	38	40	380	13	37NL37
37FL38	10	48	31	570	20	37NL38
37FL39	16	60	25	930	32	37NL39

SIZE 50

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
50FL17	.0021	1.00	4100	.066	.0027	50NL17
50FL18	.0033	1.25	3250	.11	.0043	50NL18
50FL19	.0052	1.55	2580	.17	.0068	50NL19
50FL20	.0083	1.95	2040	.26	.011	50NL20
50FL21	.013	2.45	1620	.41	.017	50NL21
50FL22	.021	3.10	1280	.66	.027	50NL22
50FL23	.033	3.90	1020	1.1	.043	50NL23
50FL24	.052	4.90	808	1.6	.068	50NL24
50FL25	.083	6.00	641	2.6	.11	50NL25
50FL26	.13	8.00	508	4.3	.17	50NL26
50FL27	.21	10.0	403	6.7	.28	50NL27
50FL28	.33	12.5	320	11	.44	50NL28
50FL29	.52	15.5	253	17	.70	50NL29
50FL30	.83	20.0	201	28	1.1	50NL30
50FL31	1.3	25.0	159	45	1.8	50NL31
50FL32	2.1	31.5	126	68	2.8	50NL32
50FL33	3.3	39.5	100	110	4.5	50NL33
50FL34	5.2	50	80	190	7.1	50NL34
50FL35	8.3	65	63	270	11	50NL35
50FL36	13	80	50	430	18	50NL36
50FL37	21	100	40	670	29	50NL37
50FL38	33	125	31	1100	45	50NL38
50FL39	52	160	25	1700	72	50NL39

SIZE 62

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
62FL16	.0023	1.40	5170	.059	.0035	62NL16
62FL17	.0036	1.75	4100	.093	.0056	62NL17
62FL18	.0058	2.20	3250	.14	.0087	62NL18
62FL19	.0091	2.75	2580	.22	.014	62NL19
62FL20	.015	3.50	2040	.35	.022	62NL20
62FL21	.023	4.40	1620	.56	.035	62NL21
62FL22	.036	5.50	1280	.89	.056	62NL22
62FL23	.058	7.0	1020	1.4	.088	62NL23
62FL24	.091	9.0	808	2.2	.14	62NL24
62FL25	.15	11.0	641	3.6	.22	62NL25
62FL26	.23	14.0	508	5.7	.36	62NL26
62FL27	.36	17.5	403	8.9	.57	62NL27
62FL28	.58	22.5	320	14	.9	62NL28
62FL29	.91	28.0	253	22	1.4	62NL29
62FL30	1.5	35.5	201	36	2.3	62NL30
62FL31	2.3	45	159	59	3.6	62NL31
62FL32	3.6	55	126	90	5.7	62NL32
62FL33	5.8	70	100	150	9.2	62NL33
62FL34	9.1	90	80	240	15	62NL34
62FL35	15	115	63	360	23	62NL35
62FL36	23	140	50	580	37	62NL36
62FL37	36	180	40	940	59	62NL37
62FL38	58	225	31	1500	93	62NL38
62FL39	91	285	25	2200	150	62NL39

SIZE 75

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
75FL15	.0029	2.25	6510	.066	.0041	75NL15
75FL16	.0047	2.85	5170	.10	.0064	75NL16
75FL17	.0076	3.60	4100	.16	.010	75NL17
75FL18	.012	4.55	3250	.25	.016	75NL18
75FL19	.019	5.50	2580	.39	.026	75NL19
75FL20	.030	7.0	2040	.62	.041	75NL20
75FL21	.048	9.0	1620	1.0	.065	75NL21
75FL22	.076	11.5	1280	1.5	.10	75NL22
75FL23	.12	14.5	1020	2.5	.16	75NL23
75FL24	.19	18.0	808	4.0	.26	75NL24
75FL25	.30	23.0	641	6.2	.42	75NL25
75FL26	.48	29.0	508	9.9	.66	75NL26
75FL27	.76	36.5	403	16	1.1	75NL27
75FL28	1.2	46	320	25	1.7	75NL28
75FL29	1.9	60	253	39	2.7	75NL29
75FL30	3.0	75	201	64	4.2	75NL30
75FL31	4.8	90	159	100	6.7	75NL31
75FL32	7.6	115	126	160	11	75NL32
75FL33	12	145	100	260	17	75NL33
75FL34	19	185	80	420	27	75NL34

SIZE 87

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
87FL15	.0073	5.10	6510	.12	.010	87NL15
87FL16	.012	6.40	5170	.19	.016	87NL16
87FL17	.018	8.10	4100	.30	.025	87NL17
87FL18	.029	10.2	3250	.47	.040	87NL18
87FL19	.046	12.8	2580	.74	.063	87NL19
87FL20	.073	16.2	2040	1.2	.10	87NL20
87FL21	.12	20.4	1620	1.8	.16	87NL21
87FL22	.18	25.7	1280	2.9	.26	87NL22
87FL23	.30	32.4	1020	4.6	.41	87NL23
87FL24	.47	40.5	808	7.3	.65	87NL24
87FL25	.74	51	641	12	1.0	87NL25
87FL26	1.2	64	508	19	1.7	87NL26
87FL27	1.8	81	403	30	2.6	87NL27
87FL28	3.0	102	320	47	4.2	87NL28
87FL29	4.7	128	253	74	6.5	87NL29
87FL30	7.4	162	201	120	11	87NL30
87FL31	12	204	159	190	17	87NL31
87FL32	18	257	126	300	26	87NL32
87FL33	30	324	100	480	42	87NL33

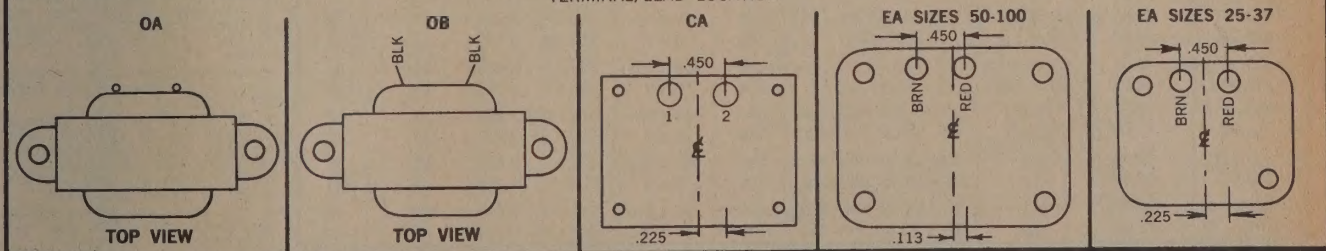
SIZE 100

FL SERIES ELEC. PART NO.	L ±25% HENRIES	V-RMS VOLTS 60 CPS	I-DC MA	R OHMS ±20%	NL SERIES L MIN. HENRIES	ELEC. PART NO.
100FL15	.012	8.80	6510	.18	.016	100NL15
100FL16	.018	11.1	5170	.29	.026	100NL16
100FL17	.029	13.9	4100	.45	.041	100NL17
100FL18	.046	17.5	3250	.71	.066	100NL18
100FL19	.074	22.0	2580	1.1	.10	100NL19
100FL20	.12	27.7	2040	1.7	.16	100NL20
100FL21	.19	35.0	1620	2.7	.26	100NL21
100FL22	.30	44.0	1280	4.3	.42	100NL22
100FL23	.47	55.5	1020	6.9	.66	100NL23
100FL24	.74	70	808	11	1.1	100NL24
100FL25	1.2	88	641	17	1.7	100NL25
100FL26	1.9	111	508	28	2.7	100NL26
100FL27	3.0	139	403	45	4.2	100NL27
100FL28	4.8	175	320	73	6.8	100NL28
100FL29	7.5	220	253	110	11	100NL29
100FL30	12	277	201	190	17	100NL30
100FL31	19	350	159	290	28	100NL31
100FL32	30	440	126	450	42	100NL32

NOTES:

1. *The inductance values given are at the corresponding V-RMS 60 CPS voltages and I-DC = 0. For test purposes, it is recommended that inductance measurements be made by impedance, or E-I method. This is preferable to bridge type instruments because of the relatively high AC voltage levels and low Q values at 60 CPS.*
2. *For canned parts (CA, etc.) with very small resistance values ($R \leq 1.0$), the total resistance at the terminals is slightly higher than the table values. If required, request this data giving complete part number.*
3. *Dielectric withstanding voltage: 500 V-RMS 60 CPS.*
4. *Insulation resistance ≧1000 megohms @ 500 V-DC.*
5. *All electrical data is @ 25 ±5°C.*
6. *For complete packaging information refer to appropriate Package Bulletins (OA, OB, EA, & CA).*
7. *Sizes 25 and 37 encapsulated parts (EA) have only 2 thru holes.*
8. *All OB type parts with part numbers ending with 15, 16, or 17 have self leads (solid) with sleeving.*
9. *Specify complete part number, e.g. OA25FL20, OB37NL18, EA50FL17.*

TERMINAL/LEAD LOCATION



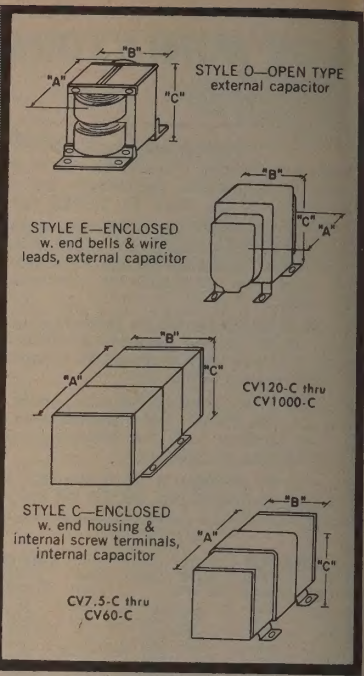
ORDERING INFORMATION

1. Order by complete part number. For example: OA75CT21; CA87MT1; CD25FL26; EA62RT24.
2. Price breaks at 2, 3, 5, 10, 25, plus six more to 1000. Contact factory for 1-9 quantity price list and larger quantity quotations.

MAGNETIC CIRCUIT ELEMENTS INC
DEL MONTE RESEARCH PARK
2455A GARDEN ROAD, MONTEREY, CALIFORNIA 93940
TELEPHONE (408) 373-0456

NEW MINIATURE TYPE MCV-1

118 or 5 V output ±1% at 0.6 VA with 95-130 V, 60 cycle input. Only 2 7/16" by 1 25/64" dia including built-in capacitor. $12.75 net. (Also made in any voltage & current combination to max of 0.6 VA @ 60 cy., 5 VA @ 400 cy.)



NTC CONSTANT VOLTAGE TRANSFORMERS

STATIC-MAGNETIC VOLTAGE REGULATING TRANSFORMERS

NORMAL HARMONIC TYPES

- Output capacity from 0.5 to 3,000 VA
- Instantaneous, continuous voltage regulation
- No tubes or manual adjustments
- Ratings made to order at low cost
- Compact, single-unit design
- Low-cost open types for component applications
- Heavy-duty, enclosed types for accessory uses
- Single or multiple secondaries

NTC constant voltage transformers maintain output voltages within one percent with input voltage fluctuations up to 15 percent. Regulation is instantaneous, continuous and completely automatic. Operating on principles of ferro-resonance, the transformers have no tubes, moving parts or separate saturable reactors.

Most important, the design of NTC constant voltage transformers enables their outputs to be made exactly to your specifications — and at decidedly low cost even in small quantities. With only a few basic lamination configurations and windings, virtually any output voltage/current combination can be obtained. *Since the transformers are designed to your specific requirements they often eliminate costly circuitry and expensive components.*

POWER SUPPLIES, too . . . Neshaminy's engineering skills are at your service for the design and quantity production of complete, regulated power supplies in any capacity and rating. Let us discuss your next requirement.

Model	Net User Price	Regulated Output Voltage	Input Voltage Range (60 cycles)	VA Output	Nominal Mounting Centers	Approx. Overall Dimensions, Inches A	B	C	Approx. Net Wt., lbs.	Style
MCV—1	$ 12.75	5 or 118	95—130	0.6	1 3/16 x 1 3/16	1 25/64 dia	x	2 7/16	6 oz	—
CV7.5—E	12.00	6.3 or 118	95—130	7.5	2 3/8 x 1 3/8	2 1/2	x 2 3/4	x 3 7/8	3	E
CV7.5—C	15.00	6.3 or 118	95—130	7.5	3 x 1 5/8	4	x 2 3/4	x 3 7/8	4	C
CV15—E	14.00	6.3 or 118	95—130	15	2 3/8 x 1 3/4	2 7/8	x 2 3/4	x 3 7/8	4	E
CV15—C	16.50	6.3 or 118	95—130	15	3 x 2	4 3/8	x 2 3/4	x 3 7/8	5	C
CV30—E	16.75	6.3 or 118	95—130	30	2 3/8 x 2 1/2	3 5/8	x 2 3/4	x 3 7/8	6	E
CV30—C	19.00	6.3 or 118	95—130	30	3 x 2 3/4	5 1/8	x 2 3/4	x 3 7/8	7	C
CV60—E	20.25	6.3 or 118	95—130	60	2 3/8 x 3 1/4	4 3/8	x 2 3/4	x 3 7/8	8	E
CV60—C	22.50	6.3 or 118	95—130	60	3 x 3 1/2	5 7/8	x 2 3/4	x 3 7/8	9	C
CV120—O	27.80	6.3 or 118	95—130	120	2 1/4 x 5 1/4	3 3/8	x 6	x 6 1/4	12	O
CV120—C	33.50	6.3 or 118	95—130	120	5 x 5	9 1/4	x 6	x 7 1/8	14	C
CV150—O	35.00	6.3 or 118	95—130	150	2 5/8 x 5 1/4	3 3/4	x 6	x 6 1/4	14	O
CV150—C	42.00	6.3 or 118	95—130	150	5 x 5	9 5/8	x 6	x 7 1/8	16	C
CV250—O	44.00	118	95—130 or 190—260	250	3 1/4 x 5 1/4	4 3/8	x 6	x 6 1/4	24	O
CV250—C	51.00	118	95—130 or 190—260	250	5 x 5	10 1/4	x 6	x 7 1/8	27	C
CV500—O	69.00	118	95—130 or 190—260	500	4 1/4 x 5 1/4	5 3/8	x 6	x 6 1/4	35	O
CV500—C	76.00	118	95—130 or 190—260	500	5 x 5	11 1/4	x 6	x 7 1/8	38	C
CV1000—O	115.00	118	95—130 or 190—260	1000	7 5/8 x 5 1/4	8 3/4	x 6	x 6 1/4	52	O
CV1000—C	126.00	118	95—130 or 190—260	1000	5 x 7 1/4	15 7/8	x 6	x 7 1/8	56	C

TYPICAL STANDARD MODELS

1% output regulation. Closer regulation to order. Output contains approx 14% total rms harmonic content. SPECIAL MODELS can be made quickly to exact requirements in any step-up or step-down ratio of voltage to current within the desired VA rating and with single or multiple secondaries, with or without centertaps. CV models also available for 50 cycles, and MCV models for 50 or 400 cycles.

NOTES

1. Cord/Receptacle kits, similar to that shown in illustration are available on all "C" style transformers of 118 VAC output rating.
2. Specify required input voltage range on CV transformers from 250 to 1000 VA.
3. To specify output voltage required (6.3 or 118 VAC) add voltage to model number (Example — 15 VA cased transformer with 118 VAC output would be model #CV15-118).
4. "C" style units have built-in capacitors. Styles "E" and "O" have external capacitors.

Send us your requirements for a prompt quotation.

NESHAMINY TRANSFORMER COMPANY

Furlong, Penna. (215) 794-7411

NTC is a division of the Neshaminy Electronic Corporation, manufacturers of JansZen Electrostatic high fidelity speaker systems and components. NTC input and power transformers are used in the high voltage bias supply of the JansZen Electrostatic.

Prices and specifications subject to change without notice

MICROTRAN CO., INC.

145 E. MINEOLA AVE.
VALLEY STREAM, N.Y. 11582
(516) 561-6050

PICO MINIATURE TRANSFORMERS — PM SERIES

PM-M (Fig. A): Epoxy molded finish; gold plated leads, 0.020" x ¾". Frequency response ±2 db, 300 Hz to 100 kHz (PM3 and PM5, to 45 kHz). Power level given for 15% max. distortion, except PM35, 20% and PM37, 25%. Size, .410" x .465" x .310" max. Wt., 0.1 oz. Mil Type TF5RX—ZZ. **PM-F (Fig. B):** Open frame, resin impregnated, 4" #30 plastic leads. Size, .250" x .375" x .406" max. Wt., .05 oz. MIL Type TF6RX—ZZ.

Microtran No.†	Impedance Primary	Impedance Secondary	Pri. DC mA*	DC Resist., Ohms Pri.	DC Resist., Ohms Sec.	Power Level, mW	MIL No.
PM3-	200K CT	1K CT	0	5300	110	10	16
PM5-	200K	1K	0	5300	110	10	16
PM7-	50K CT	1K CT	0	3300	75	10	16
PM9-	50K	1K/250‡	0	3300	75	10	16
PM11-	25K CT	1K CT	0.5	1700	110	40	12
PM13-	25K	1K/250‡	0.25	1700	110	40	12
PM15-	25K	1K	0.25	1700	110	40	12
PM17-	10K CT	10K CT	1	1000	1300	50	12
PM19-	10K CT	2K CT	1	1000	300	50	12
PM21-	10K	2K/500‡	0.5	1000	300	50	12
PM23-	10K CT	1200 CT	1	1050	280	50	12
PM25-	10K	1200/300‡	0.5	1050	280	50	12
PM27-	10K	1200	0.5	1050	280	50	12
PM29-	10K CT	500 CT	1	1050	80	50	12
PM31-	2500	2500 CT	1	250	325	50	12
PM33-	1500 CT	600	3	170	135	50	12
PM34-	600 CT	600 CT	3	72	92	50	17
PM35-	500	50	3	60	8	50	17
PM36-	500	500/125‡	3	72	85	50	17
PM37-	120 CT	3.2	10	16	0.75	50	17
PM38-	300 CT	600	7	41	98	50	17
PM39-	6 H		2	1800	—	—	20
PM40-	3.5 H		2	560	—	—	20
PM41-	.3 H		4	43	—	—	20
PM90-	Magnetic shield mu-metal slip-on can; 20 db shld.						

†Order by complete Microtran No. i.e. (PM3-M)

ULTRA-MINIATURE — UM SERIES

Frequency Response: ±2 db, 300-10K Hz. Leads supplied, 4" #27 color-coded. Power levels given for 7½% max. distortion. **UMF-F (Fig. C):** Size, ⅜" x ⅜" x 11/32". Wt., 0.08 oz. MIL Type TF6RX—ZZ (Insert MIL No. from table). **UM-M (Fig. D):** Size, ½" dia. x ½" with 1" leads. Wt., 0.14 oz. MIL Type TF5RX—ZZ.

Microtran No.†	Impedance Primary	Impedance Secondary	Unbal. Pri., DC mA	DC Resist., Ohms Pri.	DC Resist., Ohms Sec.	Level at 1 kHz mW	MIL No.
UM21-	100K	1K	0	1900	135	70	16
UM22-	20K	1K	0.5	1100	100	300	13
UM23-	20K	1200 CT	0.5	1100	110	300	13
UM24-	1K	50	3	60	10	500	17
UM25-	400	50	3	35	5	500	17
UM26-	400	11	3	35	1.5	500	17
UM27-	400 CT	11	6	35	1.5	500	17
UM28-	10 H, 0 DC; 8 H, 0.5 mA			650	—	—	20
UM29-	600 CT	600 CT	7	45	60	400	21
UM30-	1.5 H, 0 DC; .7 H, 2 mA			100	—	—	20
UM31-	10K CT	1200 CT	2	850	120	500	21
UM32-	1500 CT	600	5	135	65	500	13
UM33-	1K CT	600	6	80	65	500	17
UM34-	10K CT	600 CT	2	850	40	500	13
UM35-	15K CT	15K CT	1	930	1210	300	15
UM36-	20K CT	800 CT	0.5	1100	80	500	13
UM37-	10K	2K CT	1	850	200	500	13
UM39-	2.5K CT	600 CT	2	250	50	500	13
UM90-	Magnetic shield mu-metal slip-on can; 20 db shld. (Fig. E)						

†Order by complete Microtran No. i.e. (UM21-F)

VERI-MINIATURE TRANSFORMERS — VM SERIES

Frequency Response: ±2 db, 200-10K Hz. Leads supplied, 4" #27 color-coded. Power levels given for 7½% max. distortion. **VM-M (Fig. F).** For plug-in printed circuit applications. Cast epoxy resing provides high resistance. Size, 9/16" x 9/16" x ½". Wt., 0.25 oz. MIL Type TF5RX—ZZ (Insert MIL No. from table). **VM-FPB (Fig. G):** Plug-in tab mounted channel. Size, 17/32" x 15/32" x 7/16". Wt., 0.2 oz. MIL Type TF6RX—ZZ.

Microtran No.	Impedance Primary	Impedance Secondary	DCR Ohms Pri.	DCR Ohms Sec.	Level, mW	MIL No.
VM1-	50	600, 1.5 mA	7	90	15	21
VM2-	200K	600, 1.0 mA	3000	110	2.5	21
VM3-	25K	600, 1.0 mA	720	45	2.5	21
VM4-	200K	1200, .72 mA	3100	165	5	21
VM5-	50K	600, 1.0 mA	830	55	5	21
VM6-	100K	1200‡ .72 mA	2000	150	5	21
VM7-	500, 3.5 mA	3.4	50	0.5	15	21
VM8-	1250, 2.0 mA	3.4	135	0.5	15	21
VM9-	1250, 2.0mA	50	135	6.5	15	21
VM10-	2500, 1.5 mA	2500 CT	225	215	3	21
VM11-	20 H, 0 mA;	12 H, .5 mA	1000	—	—	21
VM12-	20K	1000, .75 mA	625	85	5	21
VM13-	20K	1000‡ .75 mA	625	85	5	21
VM14-	600‡. 7 mA	600 CT	50	65	15	17
VM15-	50K CT	50K CT	2000	2600	5	15
VM16-	500‡ 7.5 mA	250 CT	40	13	15	17
VM17-	10K CT	5K CT	400	300	5	17
VM90-	Magnetic shield mu-metal slip-on can; 20 db shld.					

‡C.T.
†Order by complete Microtran No. i.e. (VM1-M)

IMMEDIATE DELIVERY FROM STOCKING DISTRIBUTORS
SEE RADIO MASTERS FOR COMPLETE PRICE SCHEDULE

MICRO-MINIATURE TRANSFORMERS — MM-MMT SERIES

MM-M (Fig. J): Molded, for plug-in printed circuit applications. Cast epoxy resin for high resistance to extremes of ambient temperature. MIL Type TF5RX—ZZ. Size, ⅞" x 25/32" x 17/32" with 5/32" pins, .020" dia. Wt., ½ oz. **MM-H (Fig. K):** Hermetically sealed with high compression glass terminals. Gray enamel finish. MIL Type TF4RX—YY. Size, 15/16" dia. x 11/16". Wt., ¾ oz. **MM-FB (Fig. L):** Open frame with channel. Available with plug-in tab channel or without channel on special order. MIL Type TF6RX—ZZ. Size, 13/16" x 19/32" x 15/32", plus tabe. **MM-CM (Fig. M):** Contour molded on special order only; for mtg. on top of chassis. Size, ⅞" x 9/16" x 25/32". Prices on request.

Microtran No.†	Impedance Primary	Impedance Secondary	Pri. Unbal. DC mA	Oper. Level, dbm	Freq. Resp. ±2 db, Hz	MIL No.
MM1-	200/50	250K/62.5K	0	4	200-10K	10
MM2-	10K	90K	0	4	150-10K	10
MM3-	10K	200	3	20	150-10K	13
MM4-	30K	50	1	20	150-10K	13
MM5-	4.7K ohms DC Resis.		—	—	—	20
MM6-	100K	60	0.5	20	250-10K	13
MM7-	30K	1200	0.5	20	200-10K	13
MMT1-	600	600	8	22	200-15K	17
MMT3-	50K	600	0.7	20	200-15K	13
MMT4-	50K CT	600 CT	1.4	20	200-15K	13
MMT5-	50K	6	1	20	200-15K	13
MMT7-	25K	1200 CT	1	20	200-15K	13
MMT8-	50K CT	1200 CT	1.4	20	200-15K	13
MMT9-	600 CT	1200 CT	16	22	200-15K	17
MMT10-	25K	600	1	20	200-15K	13
MMT11-	4K CT	600 CT	5	28	200-15K	12
MMT12-	2K	3.4	5	28	200-15K	13
MMT13-	4K CT	3.4	5	28	200-15K	13
MMT16-	10K	1500 CT	1	20	200-15K	13
MMT17-	10K CT	200 CT	6	20	200-15K	13
MMT18-	25K CT	1200 CT	2	20	200-15K	13
MMT19-	2500	2500 CT	2	23	200-15K	13
MMT21-	4K CT	600/150 split	5	28	200-15K	13
MMT25-	7500 CT	600 CT	4	22	200-15K	13
MMT26-	600 CT	600 CT	16	22	200-15K	17
MMT27-	25K CT	600 CT	2	20	200-15K	13
MMT28-	10K CT	1500 CT	2	20	200-15K	13
MMT29-	10K CT	10K CT	2	20	200-15K	13
MMT30-	7500 CT	1200 CT	4	22	200-15K	13
MMT31-	2K CT	500 CT	10	28	200-15K	13
MMT32-	600 CT	1.2K/300 Split	16	22	200-15K	17
MMT33-	600 CT	600/150 split	16	22	200-15K	10
MMT35-	10K CT	150/37.5 split	2	20	200-15K	13

†Order by complete Microtran No. i.e. (MM1-M)

SUBMINIATURE TRANSFORMERS — SM-SMT

SM-AF (Fig. N): MIL-T-27B-AF modified case; compression sealed ceramic terminals; gray enamel finish. MIL Type TF4RX—YY. Size, ¾" x ¾" x 1⅛" max. with two 4-40NC-2 spade mtg. bolts. Wt., 1⅛ oz. **SM-H (Fig. K):** Hermetically sealed; high compression glass terminals; gray enamel finish. MIL Type TF4RX—YY. Size, 15/16" x 15/16" h. Wt., 1 oz. **SM-FB (Fig. L):** Open frame with channel. With plug-in tab mounted channel or without channel on special order. MIL Type TF6RX—ZZ. Size, 13/16" x 19/32" x ¾", plus tabs. Wt., 0.750 oz. **SM-M (Fig. O):** Molded, for plug-in PC applications. MIL Type TF5RX—ZZ. Size, 13/32" x ⅞" x ¾" max. Wt., 1½ oz. **SM-CM (Fig. M):** Contour molded on special order; prices on request.

Microtran No.†	Impedance Primary	Impedance Secondary	Pri. Unbal. DC mA	Oper. Level, dbm	Freq. Resp. ±2 db, Hz	MIL No.
SM1-	200/50	250K/62.5K	0	6	80-10K	10
SM2-	10K	90K	0	8	100-10K	10
SM3-	10K	200	3	21	150-10K	13
SM4-	30K	50	1	21	150-10K	13
SM5-	3K ohms	DC Resist.	—	—	—	20
SM6-	100K	60	0.5	21	150-10K	13
SMT1-	600	600	9	23	200-15K	17
SMT3-	50K	600	1	20	300-15K	13
SMT4-	50K CT	600 CT	2	20	200-15K	13
SMT5-	50K	6	1	20	300-15K	13
SMT7-	25K	25K	1.5	20	200-15K	13
SMT8-	50K CT	1200 CT	2	20	200-15K	13
SMT9-	600 CT	1200 CT	18	23	200-15K	17
SMT10-	25K	600	2	20	200-15K	13
SMT12-	2K	3.4	5	30	200-15K	13
SMT13-	4K CT	3.4	5	30	200-15K	13
SMT16-	10K	1500 CT	1	23	200-15K	13
SMT17-	10K CT	200 CT	6	20	200-15K	13
SMT18-	25K CT	1200 CT	3	20	200-15K	13
SMT19-	2500	2500 CT	5	26	200-15K	13
SMT26-	600 CT	600 CT	18	23	200-15K	17
SMT36-	2.5K CT	2.5K/625 split	10	26	200-15K	13

†Order by complete Microtran No. i.e. (SM1-M)

LOW LEVEL CHOPPER INPUT TRANSFORMERS

Efficiently transfer 30-500 Hz signals to instrument amplifiers. Signal level range, 0.5μV to 0.5 V. Resin impregnated. Three mu-metal, two copper shields; 90 db shielding. Size, 1⅜" dia. x 1 25/32" h. with 6-32 x ⅜" studs on 1½" ctrs. Wt., 5 oz.

CASED (FIG. H)

Microtran No.	Turn Ratio Full Pri.-Full Sec.	Turn Ratio ½ Pri.-Full Sec.	Full Pri. H*	Full Pri. Imped.*	DC Resistance Full Pri.	DC Resistance Sec.
M8025	1:7.7	1:15.4	17.5	6600	365Ω	4140Ω
M8026	1:3.2	1:6.4	60	22,500	455Ω	3500Ω
M8052	1:4.53	1:9.06	90	34,000	760Ω	5220Ω
M8053‡	1:0.5	1:1	140	53,000	920Ω	653Ω
M8112	1:0.5	1:1	450	80,000	2300Ω	1600Ω

HERMETIC (FIG. I)

M8525	1:7.7	1:15.4	17.5	6600	365Ω	4140Ω
M8526	1:3.2	1:6.4	60	22,500	455Ω	3500Ω
M8552	1:4.53	1:9.06	90	34,000	760Ω	5220Ω
M8553‡	1:0.5	1:1	140	53,000	920Ω	653Ω

*At 0.5 V, 60 Hz. ‡Secondary is center tapped.

MICROTRAN CO., INC.

145 E. MINEOLA AVE.
VALLEY STREAM, N.Y. 11582
(516) 561-6050

DC TO DC CONVERTER TRANSFORMERS — SWITCHING TYPE ▲

Select the Unit that Meets Your Power & Size Requirements	Catalog Number	Total VA Output▲	D.C. Input Volts	D.C. Output** Bridge Volts	Bridge MA	C.T. Volts	Full Wave MA	Switching Frequency Hz (approx.)	Dimensions D	W	H	Mtg. MD	Cent. MW	Type of Construction	Fig. No.	Approx. Weight Oz.
High Voltage Low Power Miniature Design	M8050	25mW	3	1000*	25μA	—	—	400	1 11/16	13/16	27/32	1 3/8	—	Open Frame	G	1.25
	M8051	25mW	3	1000*	25μA	—	—	400	1	1	1 3/8	1 1/8	—	MIL — AG	Q	2.4
	M8073	25mW	4	425-500*	50μA	—	—	50-3K†	3/8	3/8	3/8	—	—	Open Frame	C	.1
	M8074	50mW	3	535*	90μA	—	—	400	1 11/16	13/16	27/32	1 3/8	—	Open Frame	G	1.25
	M8072	190mW	2.7	480*	400μA	—	—	800	1 11/16	13/16	27/32	1 3/8	—	Open Frame	G	1.25
	M8120	190mW	28	480*	400μA	—	—	3.5K	1 11/16	13/16	27/32	1 3/8	—	Open Frame	G	1.25
High Voltage Low Profile Encapsulated	M8115	5	13.8	±250 or 500■	10	250	20	6K	1 1/4 D x 3/4 H — .140 Cl. Hole					Toroidal	V	1.1
	M8117	5	28	±250 or 500■	10	250	20	6K	1 1/4 D x 3/4 H — .140 Cl. Hole					Toroidal	V	1.1
NEW! High Frequency Encapsulated	M8132	30	13.8	± 15 or 30■	1000	15	2000	20K	1 1/4 D x 3/4 H — .140 Cl. Hole					Toroidal	V	1.1
	M8133	30	28	± 15 or 30■	1000	15	2000	20K	1 1/4 D x 3/4 H — .140 Cl. Hole					Toroidal	V	1.1
High Voltage Hermetic	M8036	40	13.6	±225 or 450■	90	225	155	800	2 5/16	2 1/16	3 1/8	1 11/16	1 7/16	MIL — FA	P	1 1/4 lbs.
Medium Power Low Profile Encapsulated	M8113	50	13.8	± 14 or 28■	1750	14	3500	2.5K	2 1/8 D x 1 1/4 H — .170 Cl. Hole					Toroidal	V	6
	M8114	50	28	± 14 or 28■	1750	14	3500	2.5K	2 1/8 D x 1 1/4 H — .170 Cl. Hole					Toroidal	V	6
	M8116	50	13.8	± 35 or 70■	700	35	1400	2.5K	2 1/8 D x 1 1/4 H — .170 Cl. Hole					Toroidal	V	6
	M8118	50	28	± 35 or 70■	700	35	1400	2.5K	2 1/8 D x 1 1/4 H — .170 Cl. Hole					Toroidal	V	6
High Voltage High Power Hermetic	M8035	125	13.6	±250 or 500■	250	250	420	800	2 3/4	2 3/8	3 13/16	2 1/8	1 3/4	MIL — GA	P	2 1/4 lbs.
	M8034	125	28	±250 or 500■	250	250	420	800	2 3/4	2 3/8	3 13/16	2 1/8	1 3/4	MIL — GA	P	2 1/4 lbs.

▲Full wave and C.T. loads may be simultaneously drawn, but for continuous duty, total V.A. output should not be exceeded. ■For positive and negative voltage supply as utilized in op-amp and similar circuitry, use secondary circuit #10. *Output when used with schematic indicated. **Based on approximately 1 volt drop per rectifier. †Frequency depends on load and bias conditions. ▲M8050, M8051, M8073, M8074 are blocking oscillator types.

400 Hz POWER SUPPLY TRANSFORMERS

(FIG. P)

For silicon rectifier circuitry and filament applicationns. Hermetically sealed. Primary, 105/115/125 V. Output voltage given for resistive or inductive loads, based on approx. 1 V drop per rectifier. MIL Type TF4RX01— (add MIL Case Type from table) per MIL-T-27.

Microtran No.	Secondary VAC	Secondary rms	Rect. Cir. VDC*	Rect. Cir. VDC†	MIL Case
M8063‡•	2.85	.045 A	1.5§	3	YY
	2.85	.045 A			
M8064‡	6.3 CT	.6 A	1.9	3.8	AH
M8075‡•	6.3 CT	.3 A	1.9	3.8	YY
M8076‡	12.6 CT	.3 A	4.7	9.4	AH
M8039	12.6	.8 A	10.5§	21§	AJ
	12.6 CT	.8 A			
M8077	12.6	2 A	10.5§	21§	FA
	12.6 CT	2 A			
M8038	12.6	2 A	16§	32§	AJ
	12.6	2 A			
	12.6	2 A			
M8018	18.5 CT	1 A	7.4	14.8	EA
M8019	18.5 CT	3 A	7.4	14.8	FA
M8065	26 CT	1.5 A	10.8	21.6	EA
M8066	26 CT	3 A	10.7	21.5	FA
M8079	26 CT	4 A	10.8	21.6	HA
M8067	30 CT	1.5 A	12.5	25	FB
M8020	35 CT	3 A	14.5	29	GA
M8068	40 CT	.2 A	17	34	AJ
M8041‡	50 CT	.25 A	21.5	43	AH
M8080	50 CT	.2 A	21.5	43	AJ
M8069‡•	60 CT	.003 A	26	52	YY
M8070‡	65 CT	.170 A	28.4	56.8	AH
M8081‡•	65 CT	.030 A	28.4	56.8	YY
M8021	70 CT	1 A	30	60	FA
M8071	80 CT	.90 A	35	70	FA

400 Hz PLUG-IN P.C. POWER TRANSFORMERS

Compact design for miniature solid state circuitry. Precision spaced molded-in terminals for power supplies, control equipment, instrument and similar applications. PC4300 Series approx. .325 Watts, P.C.4400 Series approx. 4 Watts 115 V Primary. — Dual secondaries may be connected in series or parallel for varied voltage and current requirements. FIG. U

Catalog No.	Secondary Parallel	Secondary Series	Size Inches W x D x H
PC4304	3.15V @ .1A	6.3V CT @ .05A	4 3/64 x 1 1/16 x 23/32
PC4312	12.6V @ .026A	25.2V CT @ .013A	4 3/64 x 1 1/16 x 23/32
PC4316	28V @ .012A	56V CT @ .006A	4 3/64 x 1 1/16 x 23/32
PC4320	35V @ .01A	70V CT @ .005A	4 3/64 x 1 1/16 x 23/32
PC4408	6.3V @ 0.60A	12.6V CT @ .30A	1 1/64 x 1 1/64 x 27/32
PC4412	12.6V @ 0.30A	25.2V CT @ .15A	1 1/64 x 1 1/64 x 27/32
PC4416	28V @ 0.14A	56V CT @ .07A	1 1/64 x 1 1/64 x 27/32
PC4424	40V @ 0.10A	80V CT @ .05A	1 1/64 x 1 1/64 x 27/32
PC4428	58V @ .066A	116V CT @ .033A	1 1/64 x 1 1/64 x 27/32
PC4432	115V @ .010A,	12.6V @ .150A	1 1/64 x 1 1/64 x 27/32

400 Hz ISOLATION TRANSFORMERS (FIG. P)

Electrostatic shielding. Also for use in either FW bridge or FW CT circuit. MIL Type TF4RX01—.

Microtran No.	Input Volts	Output Volts	rms Amps	VA	MIL Case
M8058†	115	115 CT	.017	2	YY
M8059	115	115 CT	.35	40	EB
M8060	115	115 CT	1.3	150	GA
M8061	115*	115 CT	2.6	300	JA
M8062	115*	115 CT	4.4	500	KA
M8082†	26	12.6 CT	.15	1.9	YY
		12.6	.15	1.9	
M8083	115	115 CT	.03	10	AJ
		12.6 CT	.25	total	
		12.6	.25		
M8084	115	115 CT	.12	14	AJ
M8085	115	115 CT	.7	80	FA

*Primary 105/115/125 V. †Fig. K.

400 Hz TOROIDAL POWER TRANSFORMERS

Ideal for applications requiring minimum size and weight. Feature epoxy molded case and printed circuit pins which can be bent for chassis mounting. Toroidal cores provide greater efficiency and low phase shift. All have 115 V primary windings and center .170" clearance hole for #8 screw. MIL Type TF5SX01ZZ. FIG. W

Microtran No.	Secondary V	Secondary mA	VA	Size, Inches O.D. x Ht.	Wt., Oz.
M8106	28 CT	320	9	1 13/32 x 1 1/8	2
M8107	28 CT	710	20	1 1/2 x 1 1/4	4
M8108	56 CT	160	9	1 13/32 x 1 1/8	2
M8109	56 CT	356	20	1 1/2 x 1 1/4	4
M8110	115 CT	78	9	1 13/32 x 1 1/8	2
M8111	115 CT	170	20	1 1/2 x 1 1/4	4

60 Hz CONTROL/POWER SUPPLY TRANSFORMERS

For low voltage, high current applications such as filament supplies, relays silicon rectifiers, etc. Output given for resistive or inductive loads, based on approx. 1v drop per rectifier. Model numbers for MIL Type TF4RX01 (Fig. P) are listed on left. Open frame model numbers are listed on right. Primary, 105/115/125V.

Microtran No.	Secondary VAC	Secondary rms A	Rectifier VDC*	Rectifier VDC‡	MIL Case	Size, Inches W. x D. x H.	Microtran No.	Fig.
M8042	6.3 CT	.6	1.9	3.8	AJ	2 3/8 x 1 3/8 x 1 1/2	M8242	X
M8043	6.3 CT	2	1.9	3.8	FB	2 9/32 x 1 5/8 x 1 13/16	M8243	X
M8086	6.3 CT	6	1.9	3.8	GA	3 11/16 x 2 1/8 x 2 1/4	M8286	X
M8087	12.6 CT	3	4.7	9.4	GA	3 11/16 x 2 1/8 x 2 1/4	M8287	X
**	12	4	9.9§	19.8§	**	4 1/8 x 3 1/8 x 3 3/4	M8247#	Y
	12	4	9.9§	19.8§				
M8044	12.6	2	10.5§	21§	JB	3 3/8 x 2 7/8 x 3 3/32	M8244	Y
	12.6 CT	2	10.5§	21§				
M8022	18.5 CT	3	7.4	14.8	JB	3 3/8 x 2 1/2 x 3/32	M8222	Y
M8088	26 CT	2.5	10.8	21.6	HA	3 x 2 3/4 x 2 3/4	M8288	Y
M8152	28 CT	.15	11.7	23.4	AJ	—	‡‡ —	—
M8045	28 CT	.6	11.7	23.4	FA	2 9/32 x 2 1/8 x 1 13/16	M8245	X
M8055	30 CT	2.5	12.5	25	JA	3 3/4 x 2 3/4 x 3 13/32	M8255	Y
M8023	35 CT	3	14.5	29	KA	4 1/8 x 3 x 3 3/4	M8223	Y
M8089	40 CT	.1	17	34	AJ	2 3/8 x 1 3/8 x 1 1/2	M8289	X
M8090	40 CT	.3	17	34	EA	2 13/16 x 1 5/8 x 1 5/8	M8290	X
M8091	40 CT	.75	17	34	GB	3 11/16 x 2 1/8 x 2 1/4	M8291	X
M8046	49 CT	2.5	21	42	LA	4 1/2 x 3 1/4 x 4 1/32	M8246	Y
M8024	70 CT	1	30	60	JA	3 3/4 x 2 3/4 x 3 13/32	M8224	Y
M8056	80 CT	.6	35	70	HA	3 x 2 5/8 x 2 3/4	M8256	Y

*Full-wave CT. ‡Full-wave bridge. **Available in open frame only.
•Fig. K. §Series. ‡‡Available in MIL case only.
#Sec. connected series, 24 V at 4 A; parallel, 12 V at 8 A.

60 Hz PLUG-IN P.C. TRANSFORMERS (FIG. U)

115V Primary

Compact design for miniature solid state circuitry. Precision spaced molded in terminals for power supplies, control equipment, instrument, and similar applications. Dual secondaries may be connected in series or parallel for varied voltage and current requirements.

Catalog No.	Secondary Parallel	Secondary Series	Dimensions W. x D. x H. x M.C.
PC6506	6.3V CT @ .250A (Single Secondary		1 25/64 x 1 13/32 x 1 11/64
PC6512	12.6V @ .120A	25.2V CT @ .060A	1 25/64 x 1 13/32 x 1 11/64
PC6524	40V @ .040A	80V CT @ .020A	1 25/64 x 1 13/32 x 1 11/64
PC6528	58V @ .026A	116V CT @ .013A	1 25/64 x 1 13/32 x 1 11/64
PC6608	6.32V @ .70A	12.6V CT @ .35A	2 3/8 x 1 1/4 x 1 25/64 x 2•
PC6616	28V @ .156A	56V CT @ .078A	2 3/8 x 1 1/4 x 1 25/64 x 2•
PC6624	40V @ .110A	80V CT @ .055A	2 3/8 x 1 1/4 x 1 25/64 x 2•
PC6628	58V @ .066A	116V CT @ .033A	2 3/8 x 1 1/4 x 1 25/64 x 2•
PC6632	115V @ .020A,	12.6 @ .150A	2 3/8 x 1 1/4 x 1 25/64 x 2•
PC6708	6.3V @ 1.2A	12.6V CT @ .60A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•
PC6712	12.6V @ .6A	25.2V CT @ .30A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•
PC6716	28V @ .27A	56V CT @ .135A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•
PC6724	40V @ .18A	80V CT @ .090A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•
PC6728	58V @ .130A	116V CT @ .065A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•
PC6732	115V @ .025A,	12.6V @ .250A	2 13/16 x 1 15/32 x 1 41/64 x 2 3/8•

•Mounting channel attached as per Fig. X.

60 Hz ISOLATION & POWER TRANSFORMERS

With center tap for use in either full wave bridge or full wave C.T. circuitry. Electrostatic shielding. Model numbers for MIL Type TF4RX01, (Fig. P) are listed on left. Open frame types are on right.

Microtran No.	Input Volts	Output Volts	rms Amps	VA	MIL Case	Size, Inches W. x D. x H.	Microtran No.	Fig.
M8094	115	115 CT	.0085	1	AH	2 1/8 x 1 1/8 x 1 3/16	M8294	X
M8095	115	115 CT	.03	3.5	EA	2 13/16 x 1 1/8 x 1 5/8	M8295	X
		12.6 CT	.25	3.15				
		12.6	.25	3.15				
M8151	115	115 CT	.13	15	FA	3 1/4 x 1 5/8 x 1 13/16	M8251	X
M8096*	115	115 CT	.35	40	GA	2 3/8 x 3 3/16 x 2 3/4	M8296	Z
M8078*	115	115 CT	.9	100	KA	3 3/4 x 3 1/4 x 3 13/32	M8278	Y

*Primary 105/115/125 V. †Fig. K.

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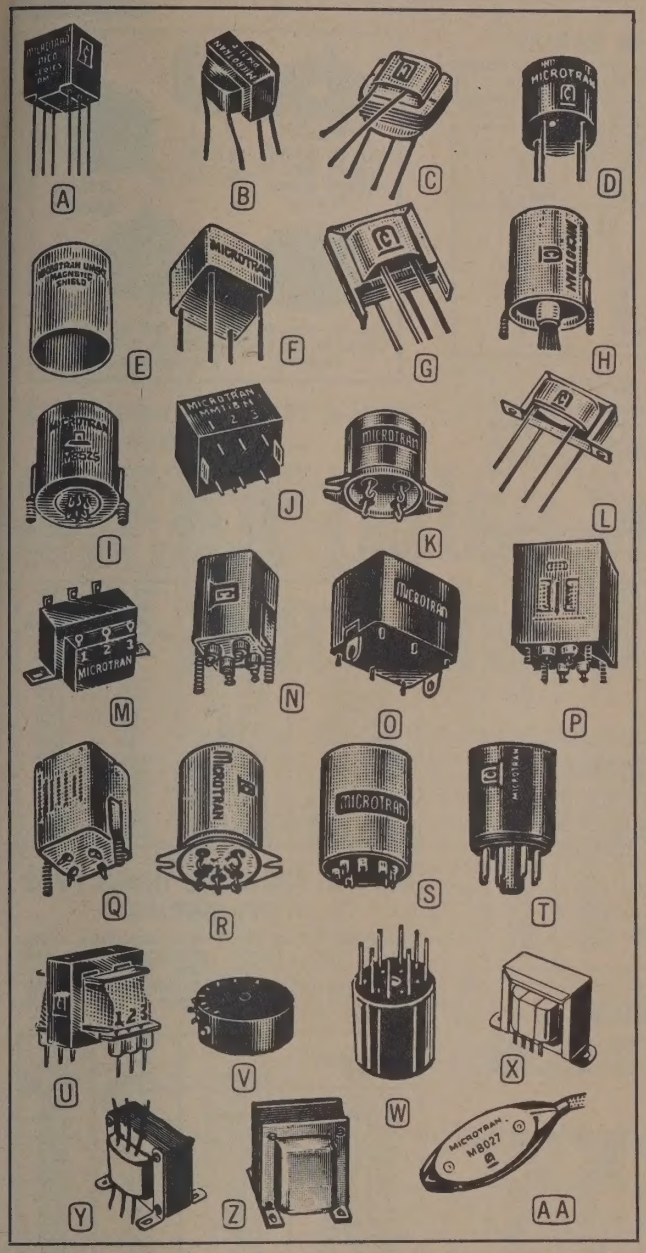

DECI-MINIATURE PC TRANSFORMERS (FIG. U)

Primary and secondary windings may be interchanged to obtain varied matching requirements such as input, interstage, output and isolation. Designed for printed circuits; frequency response: ±2 db, 200-15,000 Hz. Size, 13/16" w. x 19/32" d. x 3/4" h.

Microtran No. DCM	Impedance Primary	Impedance Secondary	Unbal. Pri. mADC	Oper. Level dbm
DCM1-PC	25K CT	1200 CT	2	18
DCM2-PC	15K CT	15K CT	3	19
DCM3-PC	15K CT	600 CT	3	19
DCM4-PC	10K CT	5000 CT	4	20
DCM5-PC	10K	2500/625 split	2	20
DCM6-PC	10K CT	1500 CT	4	20
DCM7-PC	5000 CT	80K CT	6	15
DCM8-PC	4000 CT	1200 CT	6	20
DCM9-PC	4000 CT	600 CT	6	20
DCM10-PC	4000	600/150 split	3	20
DCM11-PC	2500 CT	2500 CT	8	20
DCM12-PC	2500	2500/625 split	4	20
DCM13-PC	2500 CT	625 CT	8	20
DCM14-PC	2500 CT	200 CT	8	20
DCM18-PC	600 CT	50K CT	16	20
DCM19-PC	600	8000/2000 split	8	20
DCM20-PC	600 CT	200 CT	16	20
DCM21-PC	600 CT	600 CT	16	20
DCM22-PC	250 CT	600 CT	25	20

MINIATURE TRANSFORMERS — M & MT SERIES

M-M (Fig. O): Molded, for plug-in printed circuit use. Cast epoxy resin provides highest resistance to temperature extremes. MIL Type TF5RX—ZZ (Insert MIL No. from table). Max. Size, 1 3/32" x 7/8" x 7/8". Wt., 1 3/4 oz. **M-AG (Fig. Q):** Enclosed in modified MIL-T-27B AG case with compression sealed ceramic terminals. MIL Type TF4RX—YY. Max. Size, 1" x 1" x 1 3/8". Wt., 2 3/8 oz. **M-H (Fig. R):** Hermetically sealed with high compression glass terminals, gray enamel finish. Available on special order with .120" holes. MIL Type TF4RX—YY. Size, 15/16" dia. x 1 7/16" max. Wt., 1 1/4 oz. **M-A (Fig. S):** Aluminum case with 2-56 screws. MIL Type TF3RX—YY. Size, .875" dia. x 1 3/16". Wt., 1.25 oz. **M-FB (Fig. L):** Open frame with channel. Available with plug-in tab channel or without channel on special order. MIL Type TF6RX—ZZ. Size, 1 3/64" x 13/16" x 27/32" max., plus tabs. Wt., 1.13 oz. **M-P (Fig. T):** Octal plug-in type in sealed plastic housing. MIL Type TF6RX—ZZ. Size, 1 3/32" dia. x 1 15/32". Wt., 2 oz. **M90 Shield (Fig. E):** 25 db magnetic shield for Type M-A. Two clearance holes on 1 1/16" centers. **M-PC (Fig. U):** Open frame PC with terminals molded into bobbin to maintain accurate dimensions for PC board. MIL Type TF6RX—ZZ. Size, 7/8" x 1 1/32" x 1"; terminals 3/16" below bobbin. Wt., 1.2 oz. **M-CM (Fig. M):** Contour molded on special order only; for mtg. on top of chassis. Size, 1 5/32" x 7/8" x 7/8". Prices on request.

MINIATURE TRANSFORMERS — M SERIES

Microtran No.	Impedance Primary	Impedance Secondary	DC Pri. mA*	Level, Oper. dbm	Freq. Response ±2 db, Hz	MIL No.
M1-△	‡	50K	0	5	20-20K	10
M2-△	‡	50K CT	0	5	20-20K	10
M3-	7.5/30	50K	0	5	20-20K	10
M4-	15K	60K	0	6	20-15K	10
M5-	15K	60K	4	14	200-20K	15
M6-	15K	95K CT	0	5	20-15K	10
M7-	15K	95K CT	4	11	200-20K	15
M8-△	15K	‡	0	8	20-20K	16
M9-△	15K	‡	4	21	150-20K	13
M10-△	30K, p-p	‡	0	8	30-50K	16
M11-△	50K	‡	0	5	20-20K	16
M12-△	§	‡	0	8	20-20K	16
M13-	300#	•	—	—	6K ohms DCR	20
M14-	200	1/2 meg.	0	9	80-3K	10
M15-	10K	1 meg.	0	11	100-2500	10
M90	Magnetic shield mu-metal slip on can; 25 db shielding					

MINIATURE TRANSFORMERS — MT SERIES

MT1-	600	600	10	23	200-15K	17
MT2-△	100	10 CT/40 CT	100	27	200-15K	17
MT3-	50K	600	3	20	300-15K	13
MT5-	50K	6	3	20	300-15K	13
MT6-	100K	1200 CT	1.4	17	200-15K	13
MT7-△	25K	1200 CT	3	22	200-15K	13
MT8-	50K CT	1200 CT	3	20	300-15K	13
MT9-	600 CT	1200 CT	4	23	200-15K	17
MT10-△	25K	600	3	22	200-15K	13
MT11-	4K CT	600 CT	3	32	200-15K	13
MT12-	2K	3.4	10	32	200-15K	13
MT13-△	4K CT	3.4	3	32	200-15K	13
MT14-	400	10	50	25	200-20K	17
MT15-△	500 CT	210	30	27	300-20K	17
MT18-△	25K CT	1200 CT	6	22	200-15K	13
MT20-△	50K CT	▲	3	20	300-15K	13
MT21-△	4K CT	■	3	32	200-15K	13
MT22-△	■	1200 CT	4	23	200-15K	17
MT23-	250 CT	1000	10	30	200-15K	17
MT24-△	2500	600 CT	10	32	200-15K	13
MT25-	7500 CT	600 CT	8	32	200-15K	12
MT26-	600 CT	600 CT	20	23	200-15K	17
MT29-	1600 CT	450	15	30	200-15K	13
MT30-	250 CT	500	10	30	200-15K	17
MT33-△	■	■	20	23	200-20K	17
MT34-△	10K/2500**	2000/500**	4	20	200-20K	13
MT35-△	600	600 CT & 600 CT	0	5	40-20K	16

*Unbalanced.
‡50/250/600 CT.
§50/250 CT.
#H O DC.
**Split WDG.
•50 H at 3 mA.
▲1200/300 split.
■600/150 split.
△Not available in -PC type.

DECI-MINIATURE PC CHOKES (FIG. U)

For audio frequency, servo mechanisms, computer applications, etc. Size, 13/16" w. x 19/32" d. x 15/16" h. Open frame.

Microtran No.	Inductance, Henries At 0 mA	Inductance, Henries At Rated Current	DC Res., Ohms
DCM51-PC	10	5 at 3 mA	300
DCM52-PC	5	2 at 5 mA	155
DCM53-PC	2.5	1 at 7 mA	75

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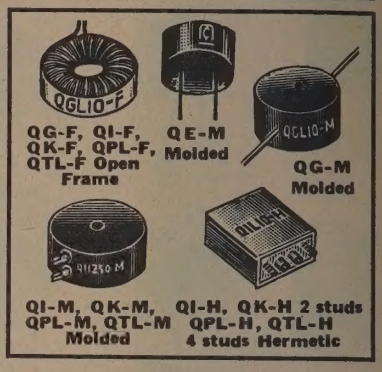
ULTRA-MINIATURE TOROIDAL INDUCTORS — QE-M SERIES

Affords new application opportunities in high density packaging. Ultra miniaturized with low height design. Exceptionally high "Q" and wide frequency range. Available on special order with ±1% inductance tolerance. Frequency range of QEL Series 1 to 300 kHz; QEM, 3 to 500 kHz. Accuracy, ±2%. Molded in epoxy resin with .020" x 2" gold-plated nickel alloy leads. Size, .450" dia. x .285".

Inductance	QEL-M SERIES Microtran No.	Typ. DC Res., Ohms	Typ. Dist. Cap., pF	QEM-M SERIES Microtran No.	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
.5 mH	—	—	—	QEM05-M	1.6	9
1 mH	QEL1-M	1.5	9	QEM1-M	2.8	10
2 mH	QEL2-M	2.7	10	QEM2-M	6.1	12
5 mH	QEL5-M	6.7	13	QEM5-M	16	15
10 mH	QEL10-M	15.6	15	QEM10-M	29	19
15 mH	QEL15-M	24	18	QEM15-M	43	21
25 mH	QEL25-M	38	22	QEM25-M	56	25
50 mH	QEL50-M	55	25	QEM50-M	127	30
100 mH	QEL100-M	125	30	—	—	—



QG-F, QI-F, QK-F, QPL-F, QTL-F Open Frame

QE-M Molded

QG-M Molded

QI-M, QK-M, QPL-M, QTL-M Molded

QI-H, QK-H 2 studs QPL-H, QTL-H 4 studs Hermetic

MICRO-MINIATURE TOROIDAL INDUCTORS — QG SERIES

Frequency range of QGL Series, to 20 kHz; QGM Series, 2 to 100 kHz. Accuracy, ±2%. **QG-F:** Open frame, microcrystalline wax dipped with 4" #28 plastic leads. Size, 5/8" dia. x 9/32". **QG-M:** Molded in high temperature epoxy resin with .020" x 2" gold plated nickel alloy leads. Leads may be bent downward for plug-in printed circuit use. Size, 7/8" dia. x 3/8". **QGH:** Hermetically sealed. Size, 11/16" dia. x 13/32". **QG-HC:** Hermetic crystal can. Special order only; prices setup charge same as QG-H Series. Size, 23/32" x 11/32" x 45/64".

QGL SERIES

Microtran No.	Inductance	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
QGL5-	5 mH	2.5	30
QGL10-	10 mH	5	33
QGL15-	15 mH	8	34
QGL30-	30 mH	17	37
QGL50-	50 mH	28	40
QGL100-	100 mH	50	42
QGL250-	250 mH	130	46
QGL500-	500 mH	290	48
QGL1000-	1.0 H	530	51
QGL1500-	1.5 H	825	53

QGM SERIES

Microtran No.	Inductance	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
QGM1-	1 mM	1.4	22
QGM5-	5 mH	6	28
QGM2-	2 mH	2.5	25
QGM10-	10 mH	12	31
QGM15-	15 mH	18	32
QGM25-	25 mH	30	35
QGM50-	50 mH	52	37
QGM100-	100 mH	115	39

SUBMINIATURE TOROIDAL INDUCTORS — QIL SERIES

Frequency range to 20 kHz; accuracy, ±2%. **QIL-M:** Molded in high temperature epoxy with silver plated turret lugs. Size, 1 3/16" dia. x 1/2". **QIL-H:** Hermetically sealed in metal case with Teflon® terminals. Size, 1 1/16" x 1/2" x 1 7/32". **QIL-F:** Open frame. Microcrystalline wax dipped with 4" #28 plastic leads. Size, 1" dia. x 13/32".

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QIL3-	3 mH	.73	36
QIL5-	5 mH	1.1	38
QIL10-	10 mH	2.1	40
QIL15-	15 mH	3.3	42
QIL25-	25 mH	5.3	45
QIL50-	50 mH	11	47
QIL100-	100 mH	22	49
QIL150-	150 mH	34	50
QIL250-	250 mH	55	53
QIL500-	500 mH	95	55
QIL1000-	1.0 H	210	57
QIL1500-	1.5 H	335	59
QIL2500-	2.5 H	550	61

MINIATURE TOROIDAL INDUCTORS — QK SERIES

Frequency range of QKL Series, to 10 kHz; QKM Series, 5 to 50 kHz. Accuracy, ±2%. **QK-F:** Open frame, microcrystalline wax dipped; 4" #28 plastic leads. Size, 1 1/4" dia. x 5/8". **QK-H:** Hermetic with Teflon terminals. Size, 1 15/32" x 25/32" x 1 47/64". **QK-M:** Molded in high temperature epoxy resin; silver plated turret lugs. Size, 1 3/8" x 3/4"; #8 clearance hole.

QKL SERIES

Microtran No.	Inductance	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
QKL5-	5 mH	.62	60
QKL10-	10 mH	1.1	66
QKL15-	15 mH	1.7	68
QKL25-	25 mH	2.8	72
QKL50-	50 mH	6	76
QKL100-	100 mH	11	81
QKL150-	150 mH	17	83
QKL250-	250 mH	28	87
QKL500-	400 mH	63	91
QKL1000-	1.0 H	110	96
QKL1500-	1.5 H	175	98
QKL2500-	2.5 H	275	103
QKL5000-	5 H	645	106
QKL10,000-	10 H	1175	112

QKM SERIES

QKM2-	2 mH	.45	52
QKM5-	5 mH	1.1	58
QKM10-	10 mH	2.5	62
QKM25-	25 mH	6.5	70
QKM50-	50 mH	11	74
QKM100-	100 mH	25	79
QKM250-	250 mH	65	87
QKM500-	500 mH	115	92
QKM1000-	1.0 H	250	97

FILTER INDUCTORS

For transistor and low voltage applications. May be connected in series or parallel for varied inductive requirements. 1500 V. test. Model numbers for MIL Type TF4RX04 (Fig. P) are listed on left. Open frame model numbers (Fig. X) are listed on right.

Microtran No.	Series Connected Induct. H	Series Connected DC Amps	Series Connected DC Res. Ohms	Parallel Connected Induct. H	Parallel Connected DC Amps	Parallel Connected DC Res. Ohms	MIL Case	Mtg. Ctrs., Inches	Microtran No.
M8098	3.5	.05	200	.875	.10	50	AH	1 3/4	M8198
M8099	1.0	.15	65	.25	.30	16	AJ	2	M8199
M8100	.5	.3	30	.125	.6	7.5	EB	2 3/8	M8200
M8101	.32	.6	16	.08	1.2	4	FB	2 3/4	M8201
M8102	.2	1.0	4	.05	2.0	1	JA	2 13/16 x 2 1/8	M8202*
M8103	.07	2.5	.84	.0175	5.0	.21	JA	3 1/8 x 2 1/2	M8203*
M8104	.022	4.0	.4	.0055	8.0	.1	JA	2 3/4 x 2 1/2	M8204*
M8105	.022	5.0	.2	.0055	10	.05	KA	3 3/4 x 2 1/2	M8205*

*Fig. Y.

HIGH-Q TOROIDAL INDUCTORS — QPL SERIES

Frequency range to 10 kHz; accuracy, ±2%. **QPL-F:** Open frame, microcrystalline wax dipped; 4" #24 leads. Size, 1 15/16" dia. x 7/8". **QPL-H:** Hermetically sealed with Teflon terminals. Size, 1 15/16" x 1 1/16" x 2 29/32". **QPL-M:** Molded in high temperature epoxy resin; silver plated turret lugs. Size, 2" dia. x 1".

Microtran No.	Inductance	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
QPL25-	25 mH	1.5	100
QPL50-	50 mH	2.5	105
QPL100-	100 mH	6	110
QPL250-	250 mH	15	115
QPL500-	500 mH	25	120
QPL1000-	1.0 H	60	125
QPL1500-	1.5 H	90	130
QPL2500-	2.5 H	150	133
QPL5000-	5.0 H	350	138
QPL7500-	7.5 H	525	140
QPL10,000-	10 H	600	142
QPL15,000-	15 H	900	146
QPL25,000-	25 H	1500	150

HIGH-Q TOROIDAL INDUCTORS — QTL SERIES

Frequency range to 15 kHz; accuracy, ±2%. **QTL-F:** Open frame, microcrystalline wax dipped; 4" #24 leads. Size, 2 7/16" dia. x 1". **QTL-H:** Hermetic, Teflon terminals. Size, 2 9/16" x 1 3/4" x 2 13/16". **QTL-M:** Molded in epoxy resin. Size, 2 7/8" dia. x 1 3/8".

Microtran No.	Inductance	Typ. DC Res., Ohms	Typ. Dist. Cap., pF
QTL25-	25 mH	0.85	127
QTL50-	50 mH	1.5	136
QTL100-	100 mH	2.8	144
QTL150-	150 mH	3.9	149
QTL250-	250 mH	7	156
QTL500-	500 mH	15	164
QTL1000-	1.0 H	27	173
QTL1500-	1.5 H	40	177
QTL2500-	2.5 H	70	184
QTL5000-	5 H	140	192
QTL10,000-	10 H	270	200
QTL15,000-	15 H	430	205
QTL25,000-	25 H	850	212
QTL50,000-	50 H	1500	221

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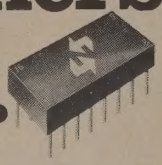
for pulse transformers[1] read the fine print.



Ness Pacific[2] is the first international electronics firm specializing in high-volume, off-shore[3] manufacturing of industrial and commercial magnetic components[4], particularly pulse transformers[5]. Our design engineering, prototype manufacturing, administrative and sales offices[6] are headquartered in Palo Alto[7] and our manufacturing facilities are located in Hong Kong[8] and Djakarta.[9] Typical products manufactured are dual in-line packaged floating switches and baluns[10] (four transformers per module). And Ness Pacific pulse transformers[11] quality is equal or better than our competition's[12] because the highest quality materials and most modern[13] production techniques are employed. To get complete information, write, call, cable, and/or TWX Jim Rogers[14] at 470 San Antonio Road, Palo Alto[7] 94306, [415] 328-7036, cable NESSIND, TWX 910 373-1177. He'll do the rest.[15]

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2. One of the Ness Industries family of companies
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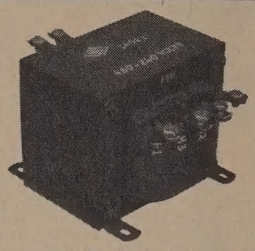
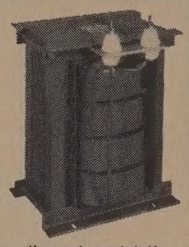
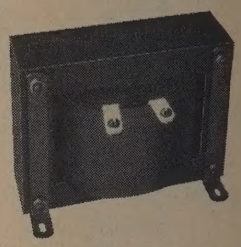


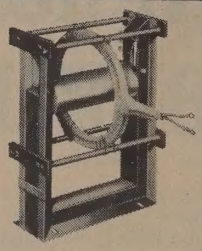
Instrument transformers, current and potential, 1-10,000 amperes, 1-50,000 volts. High accuracy, through type, bus bar, indoor and outdoor.



Plate, audio and modulation transformers in sizes from 50 VA to 100 KVA and up to 100,000 volts.

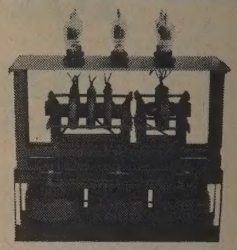


Chokes, linear and swinging. 0.1 millihenry to 10 henry.



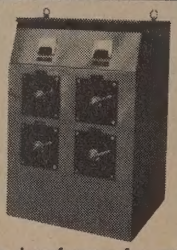
Filament transformers, single and multiple. Up to 100,000 volts, dry and oil types.

Saturable Core Reactors, from 50 VA to 500 KVA. Single and 3 phase.

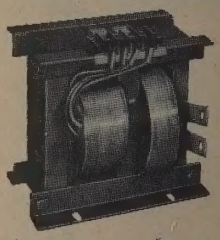


Rectifying transformers and supplies, 1, 2 or 3 phase. 1 to 3,000 amperes, up to 500 KVA.

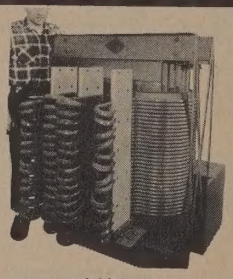
Oil filled specialty and high voltage transformers up to 300 KVA.



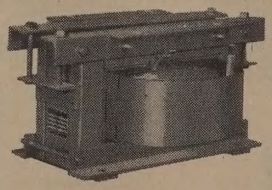
Heating transformers for resistance and induction furnaces. All types. Up to 1200 KVA.



High impedance type transformers, from 50 VA to 50 KVA and up to 10,000 volts.



High power and high current water-cooled transformers.



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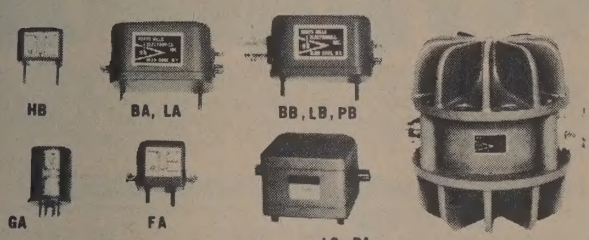


OVERALL DIMENSIONS (IN.)

Case	W	L	H	Case	W	L	H
BA	1.3	2.3	1.1	KA	4.6 Dia. x 5.5		
BB	1.3	2.6	1.1	LA	1.7	2.8	1.2
FA	0.9	1.4	1.0	LB	1.7	3.1	1.2
GA	0.9 Dia. x 1.1			LC	1.7	3.4	1.2
HB	0.S	0.9	0.7	PA	2.9	3.7	2.0
JA	0.8	1.7	0.8	PB	2.9	3.5	2.0

UNBALANCED TO BALANCED TRANSFORMERS

Balanced sides center-tapped and dc-isolated.

1 WATT SERIES

Response down to 100 kHz. Available in BA, BB, FA, GA, HB Cases.

Type No.	Impedance Unb/Bal (Ω)	Bandwidth MHz	Type No.	Impedance Unb/Bal (Ω)	Bandwidth MHz
0001	50:50	.1-125	1100	75:75	.1-100
0101	50:75	.1-125	1300	75:100	.1-100
0200	50:90	.1-125	1302	75!124	.1-100
0300	50:100	.1-100	1400	75:150	.1-100
0307	50:124	.1-100	1500	75:200	.1-100
0400	50:150	.1-100	1501	75:300	.1-100
0500	50:200	.1-100	1600	75:450	.1-60
0501	50:300	.1-100	1700	75:600	.1-60
0600	50:450	.1-65	1800	75:800	.1-30
0700	50:600	.1-65	1900	75:1200	.1-30
0800	50:800	.1-60	7700	600:600	.1-30
0900	50:1200	.1-30			

10 WATT SERIES

Push-pull output circuits. Available in FA, HB Cases.

0008	50:50	.1-30	1105	75:75	.1-30
0309	50:100	.1-30	1306	75:100	.1-30
0514	50:200	.1-30	1503	75:200	.1-30

25 WATT SERIES

0.1-30 and 30-80 MHz bands. Available in BA, BB Cases.

0106	50:75	30-80	1303	75:100	30-80
0305	50:100	30-80	1304	75:100	.1-30
0308	50:100	.1-30	1401	75:150	.1-30
0402	50:150	.1-30	1402	75:150	30-80
0403	50:150	30-80	1509	75:300	30-80
0507	50:200	30-80	1510	75:300	.1-30
0512	50:200	.1-30	1703	75:600	.1-30
0701	50:600	.1-30			

100 WATT SERIES

0.5-30 MHz band. Available in BA, BB Cases.

0105	50:75	.5-30	0506	50:300	.5-30
0304	50:100	.5-30	1403	75:150	.5-30
0404	50:150	.5-30	1505	75:300	.5-30

1 KW SERIES

Antenna matching, 2-32 MHz. Available in KA Case only.

Type No.	Impedance Unb/Bal (Ω)	Bandwidth MHz	Type No.	Impedance Unb/Bal (Ω)	Bandwidth MHz
0107	50:75	2-32	1108	75:75	2-32
0513	50:300	2-32	1511	75:300	2-32
0601	50:450	2-32	1705	75:600	2-32
0702	50:600	2-32			

VIDEO SERIES

Response down to 1 kHz. Available in LA, LB Cases.

0009	50:50	.001-25	1301	75:124	.001-20
0311	50:100	.001-20	1502	75:300	.001-15
0306	50:124	.001-20	1704	75:600	.001-10
0511	50:200	.001-15	1902	75:1200	.001-9
0517	50:300	.001-12	1903	75:1850	.001-6
1102	75:75	.001-25	2300	90:124	.001-15

EXTENDED VIDEO SERIES

Response down to 20 Hz.

1307-LB	75:110	20 Hz - 7 MHz
1309-PB	75:124	20 Hz - 10 MHz
1706-LB	75:600	20 Hz - 5 MHz

I:I ISOLATION TRANSFORMERS

For 50 and 75Ω lines. Insulated BNC connectors for unbalanced input and output. High rejection of spurious ground loop potentials.

Type No.	Impedance Unb/Unb (Ω)	Bandwidth
0005-LC	50:50	1 kHz - 20 MHz
1103-LC	75:75	1 kHz - 20 MHz
1109-PA	75:75	25 Hz - 7 MHz

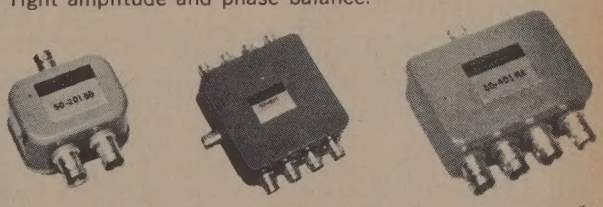
ULTRA-WIDE SERIES

Unbalanced to unbalanced transformers. BNC input and output connectors. Low VSWR. 0.1 — 400 MHz. Available in JA Case only.

0003-JA	50:50	Phase Reversing
1106-JA	75:75	Phase Reversing
0102-JA	50:75	Impedance Adapter

HYBRIDS

Power Dividers and Adders. 2, 4, and 8-Way.
50 and 75Ω ports. 0.5 to 10, 1 to 50, 50 to 250 MHz bands. Low VSWR and insertion loss, minimum of 30 dB isolation. Tight amplitude and phase balance.



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Seven basic physical types meet most industrial requirements with long, maintenance-free life. Excellent regulation at any point within rated load; free from wave-form distortion. Direct-reading 2-scale (1 per side) dial supplied; CCW also available. New space-saving low power types VT1, VT02 and VT3 have adjustable shaft independent of brush assembly, 3-way terminals, instantly replaceable brush contacts and improved heat dissipation. **Mounting:** Easily replace other brands: VT2LN, VT1, VT02 and VT3 have 3/8-32 thd. bushing; VT8 and VT20, 4-hole bolt mount; VT4, 3-hole bolt mount convertible to 4-hole with adapter plate. **Enclosed Types:** Gray hammertone-finish cases. Units with suffix **B** have exposed terminal panel and mounting base; **E**, fixed type for table or panel mounting; **F**, portable with cord, outlet socket and fuse; **G**, deluxe portable with handle, circuit breaker and switch for overvoltage selection. Final suffix: **V** indicates with voltmeter; **VA**, voltammeter; **VW**, volt/wattmeter; all come with handle except VT8NF series. **Other Options:** All types except VT2LN offer shafts, extendable from brush or base side; ganged versions have thru-shaft with same flexibility. Final suffix **C** types come with 3-cond. input and output with one grounded to case. **UL Listing:** Most single and tandem VT4, VT8 and VT20 units for 120 volt operation are U/L Listed. Consult factory.

SINGLE TRANSFORMERS

Ohmite Number	Input Volts	Max. Output Amps	Max. Output Volts	Feature or Connection	Size, Inches W. x D.♦ x H.	Net Each 1-9
UNCASED, SINGLE-PHASE 60 HERTZ*						
VT1†	120	1.0	0-120/132	Low power, space saver	2⅞ dia. x 1 13/16 d.	$10.75
VT1N	120	1.2	0-120	Same, no overvoltage	2⅞ dia. x 1 13/16 d.	10.75
VT02†	120	2.0	0-120/132	Low power, space saver	2⅞ dia. x 2 5/16 d.	10.50
VT02N	120	2.0	0-120	Same, no overvoltage	2⅞ dia. x 2 5/16 d.	10.50
VT2LN	40	5.0	0-40	High amps, low volts	2 13/16 dia. x 2⅛ d	12.75
VT3†	120	2.6	0-120/132	Low power, space saver	2⅞ dia. x 2 13/16 d	13.00
VT3N	120	3.0	0-120	Same, no overvoltage	2⅞ dia. x 2 13/16 d.	13.00
50 HERTZ*						
VT4	120	3.5	0-120/132	Basic, 3.5-amp model	4 5/32 x 4¾ x 4 13/16	15.75
VT4N	120	4.75	0-120	Same, no overvoltage	4 5/32 x 4¾ x 4 13/16	15.75
VT4LN	40	12.0	0-40	High amps, low volts	4 5/32 x 4¾ x 4 13/16	18.00
VT8	120	7.5	0-120/140	Basic, 7.5-amp model	4⅞ x 5⅝ x 5 11/16	21.00
VT8N	120	10.0	0-120	Same, no overvoltage	4⅞ x 5⅝ x 5 11/16	21.00
VT8LN	40	22.0	0-40	High amps, low volts	4⅞ x 5⅝ x 5 11/16	23.25
VT8H	240‡	3.0	0-240/480	240 V input, 120 V tap	4⅞ x 5⅝ x 5 11/16	23.25
VT8HN	240‡	4.0	0-240	Same, no overvoltage	4⅞ x 5⅝ x 5 11/16	23.25
VT20	120	20.0	0-120/140	Basic 20-amp model	7½ x 5⅝ x 8 1/16	57.00
VT20N	120	25.0	0-120	Same, no overvoltage	7½ x 5⅝ x 8 1/16	57.00
VT20H	240‡	9.0	0-240/280	240 V input, 120 V tap	7½ x 5⅝ x 8 1/16	59.00
VT20HN	240‡	11.0	0-240	Same, no overvoltage	7½ x 5⅝ x 8 1/16	59.00
CASED, SINGLE-PHASE 60 HERTZ*						
VT1E†	120	.8	0-120/132§	Fixed mounting	3⅜ x 2½ x 4¼	$17.25
VT1NE	120	1.0	0-120	Fixed mounting	3⅜ x 2½ x 4¼	17.25
VT1F†	120	1.0	0-132 #	Portable	3⅜ x 2½ x 4¼	19.75
VT1NF	120	1.2	0-120	Portable	3⅜ x 2½ x 4¼	19.75
VT02E†	120	1.4	0-120/132§	Fixed mounting	3⅜ x 2½ x 4¼	16.25
VT02NE	120	1.6	0-120	Fixed mounting	3⅜ x 2½ x 4¼	16.25
VT02F†	120	1.75	0-132 #	Portable	3⅜ x 2½ x 4¼	18.50
VT02NF	120	2.0	0-120	Portable	3⅜ x 2½ x 4¼	18.50
50 HERTZ*						
VT4E	120	2.8	0-120/140§	Fixed mounting	4½ x 4½ x 6 3/16	21.50
VT4NE	120	3.8	0-120	Fixed mounting	4½ x 4½ x 6 3/16	21.50
VT4F	120	3.5	0-140 #	Portable	4⅞ x 4½ x 6¼	23.50
VT4NF	120	4.75	0-120	Portable	4⅞ x 4½ x 6¼	23.75
VT4FC	120	3.5	0-140 #	In/out grounded VT4F	4⅞ x 4½ x 6¼	27.50
VT4NFC	120	4.75	0-120	In/out grounded VT4NF	4⅞ x 4½ x 6¼	27.50
VT8E	120	6.0	0-120/140§	Fixed mounting	5 3/16 x 5¼ x 7 3/16	27.00
VT8NE	120	8.0	0-120	Fixed mounting	5 3/16 x 5¼ x 7 3/16	27.00
VT8F	120	7.5	0-140 #	Portable	5 17/32 x 5¼ x 7⅜	29.00
VT8NF	120	10.0	0-120	Portable	5 17/32 x 5¼ x 7⅜	29.00
VT8FC	120	7.5	0-140 #	In/out grounded VT8F	5 17/32 x 5¼ x 7⅜	32.50
VT8NFC	120	10.0	0-120	In/out grounded VT8NF	5 17/32 x 5¼ x 7⅜	32.50
VT8G	120	6.0	0-120/140 •	Deluxe portable, handle	5 3/16¶ x 5¼ x 7⅜■	32.50
VT8GC	120	6.0	0-120/140 •	In/out grounded VT8G	5 3/16¶ x 5¼ x 7⅜■	36.00
VT20B	120	20.0	0-120/140	Basic case model	7⅝ x 8⅛ x 4⅞ ♦	63.00
VT20NB	120	25.0	0-120/140	No overvoltage	7⅝ x 8⅛ x 4⅞ ♦	63.00
VT20E	120	20.0	0-120/140§	Fixed mounting	7¾ x 5½ x 10 15/16	78.00
VT20NE	120	25.0	0-120	No overvoltage	7¾ x 5½ x 10 15/16	78.00
VT20FC	120	20.0	0-140	Portable	8¼ x 5½ x 11¼	87.00
VT20NFC	120	25.0	0-120	Portable	8¼ x 5½ x 11¼	87.00
VT20GC	120	20.0	0-120/140 •	In/out grounded	7¾θ x 5½ x 11¼■	100.00
VT20HB	240‡	9.0	0-240/280	Basic Case model	7⅝ x 8⅛ x 4⅞ ♦	66.00
VT20HNB	240‡	11.0	0-240	Same, no overvoltage	7⅝ x 8⅛ x 4⅞ ♦	66.00
VT20HE	240‡	9.0	0-240/280§	Fixed mounting	7¾ x 5½ x 10 15/16	80.00
VT20HNE	240‡	11.0	0-240	Same, no overvoltage	7¾ x 5½ x 10 15/16	80.00
VT20HFC	240‡	9.0	0-240/280	Portable	8¼ x 5½ x 11¼	89.00
VT20HNFC	240‡	11.0	0-240	Portable	8¼ x 5½ x 11¼	89.00
CASED WITH METERS, SINGLE-PHASE 50 HERTZ*						
VT8GCV	120	6.0	0-120/140 •	Voltmeter, grnd. conn.	7 x 5¼ x 10½ ■	$68.00
VT8GCVA	120	6.0	0-120/140 •	Volt/ammeter, grounded	7 x 5¼ x 10½ ■	102.00
VT8GCVW	120	6.0	0-120/140 •	Volt/wattmeter, grnd.	7 x 5¼ x 10½ ■	137.00
VT8NFCV	120	10.0	0-120	Voltmeter, grnd. conn.	7⅜ x 5¼ x 10½	64.00
VT8NFCVA	120	10.0	0-120	Volt/ammeter, grounded	7⅜ x 5¼ x 10½	99.00
VT8NFCVW	120	10.0	0-120	Volt/wattmeter, grnd.	7⅜ x 5¼ x 10½	133.00
VT20GCV	120	20.0	0-120/140 •	Voltmeter, grnd. conn.	8¼ x 5½ x 14 ■	144.00
VT20GCVA	120	20.0	0-120/140 •	Volt/ammeter, grounded	8¼ x 5½ x 14 ■	178.00
VT20GCVW	120	20.0	0-120/140 •	Volt/wattmeter, grnd	8¼ x 5½ x 14 ■	255.00
VT20NFCV	120	25.0	0-120	Voltmeter, grnd. conn.	8¼ x 5½ x 14 ■	130.00
VT20NFCVA	120	25.0	0-120	Volt/ammeter, grounded	8¼ x 5½ x 14 ■	164.00
VT20NFCVW	120	25.0	0-120	Volt-wattmeter, grnd.	8¼ x 5½ x 14 ■	241.00

*Minimum; max. up to 1000 cps for all models. †Use also at 50 cps if connected at no overvoltage output. ‡With 120V input tap at which the max. current output rating applies up to 120 volts, but reduces approx. 50% at max. output voltage shown. In tandem units, the use of low voltage inputs would halve the rated input and output voltages. §User wires for desired output; dial normally calibrated for overvoltage. #Factory-connected for overvoltage output; easily re-connected by user for no overvoltage. •Switch selects overvoltage or no overvoltage. ¶5¾" including handle. ■Case height only, excluding handle. ♦Depth behind panel: add 1" for knob thickness for VT8 types; ⅞", VT02 or VT4 types; 1¼" for VT20 types. θ9" including handle. ††Includes knob, dial and hardware. **Must not be connected for overvoltage. ‡ For mounting bracket, add 1¼" w. x 7/16" d.

MULTIPLE, IN-TANDEM TRANSFORMER ASSEMBLIES

Ohmite Number	Input Volts	Max. Output Amps	Max. Output Volts	Feature or Connection	Size, Inches W. x D.♦ x H.	Net Each 1-4
SINGLE-PHASE, TWO-IN-TANDEM						

Normally wired for series connection; when so connected, load cannot be grounded. Standard CW dial 240/280 volts except VT02 tandems where 240/264 V dial is supplied; on VT8H-2, 480/560 volt dial is standard. Other dials available as listed elsewhere on these pages.

60 HERTZ*						
VT1-2†	240	1.0	0-240/264	Uncased, series conn.	2⅞ x 4 7/32 x 4¼	$33.50
VT1N-2	240	1.2	0-240	Same, no overvoltage	2⅞ x 4 7/32 x 4¼	33.50
VT02-2†	240	1.75	0-240/264	Uncased, series conn.	2⅞ x 5 7/32 x 4¼	31.50
VT02N-2	240	2.0	0-240	Same, no overvoltage	2⅞ x 5 7/32 x 4¼	31.50
VT3-2†	240	2.6	0-240/264	Uncased, series conn.	2⅞ x 6 13/32 x 4¼	37.50
VT3N-2	240	3.0	0-240	Same, no overvoltage	2⅞ x 6 13/32 x 4¼	37.50
VT4-2	240	3.5	0-240/280	Uncased, series conn.	4 5/32 x 7 13/16 x 4 13/16	44.75
50 HERTZ*						
VT4N-2	240	4.75	0-240	Same, no overvoltage	4 5/32 x 7 13/16 x 4 13/16	44.75
VT8-2	240	7.5	0-240/280	Uncased, series conn.	4⅞ x 9 5/16 x 5 11/16	55.00
VT8N-2	240	10.0	0-240	Same, no overvoltage	4⅞ x 9 5/16 x 5 11/16	55.00
VT8H-2	480‡	3.0	0-480/560	480 V input VT8-2	4⅞ x 9 5/16 x 5 11/16	60.00
VT8HN-2	480‡	4.0	0-480	Same, no overvoltage	4⅞ x 9 5/16 x 5 11/16	60.00
VT20-2	240	20.0	0-240/280	Uncased, series conn.	7½‡* x 10 x 8 1/16	131.00
VT20N-2	240	25.0	0-240	Same, no overvoltage	7½‡* x 10 x 8 1/16	131.00
VT20-2B	240	20.0	0-240/280	B-cased version VT20-2	7½ x 10½ x 8 1/16	143.00
VT20N-2B	240	25.0	0-240	Same, no overvoltage	7½ x 10½ x 8 1/16	143.00
VT20H-2	480‡	9.0	0-480/560	480 V input VT20-2	7½‡* x 10 x 8 1/16	135.00
VT20HN-2	480‡	11.0	0-480	Same, no overvoltage	7½‡* x 10 x 8 1/16	135.00
THREE-PHASE, TWO-IN-TANDEM						

Supplied with 240/280 volt CW dial, except VT02 (204/264 V). Other dials available as listed elsewhere on these pages.

60 HERTZ*						
VT1-2†	120	1.0	0-120/132	Uncased, open delta con.	2⅞ x 4 7/32 x 4¼	$33.50
VT1N-2	120	1.2	0-120	Same, no overvoltage	2⅞ x 4 7/32 x 4¼	33.50
VT02-2†	120	1.75	0-120/132	Uncased, open delta con.	2⅞ x 4 7/32 x 4¼	31.50
VT02N-2	120	2.0	0-120	Same, no overvoltage	2⅞ x 4 7/32 x 4¼	31.50
VT3-2†	120	2.6	0-120/132	Uncased, open delta con.	2⅞ x 6 13/32 x 4¼	37.50
VT3N-2	120	3.0	0-120	Same, no overvoltage	2⅞ x 6 13/32 x 4¼	37.50
50 HERTZ*						
VT4-2	120	3.5	0-120/140	Uncased, open delta con.	4 5/32 x 7 13/16 x 4 13/16	44.75
VT4N-2	120	4.75	0-120	Same, no overvoltage	4 5/32 x 7 13/16 x 4 13/16	44.75
VT8-2	120	7.5	0-120/140	Uncased, open delta con.	4⅞ x 9 5/16 x 5 11/16	55.00
VT8N-2	120	10.0	0-120	Same, no overvoltage	4⅞ x 9 5/16 x 5 11/16	55.00
VT8H-2	240‡	3.0	0-240/280	240 V input VT-2	4⅞ x 9 5/16 x 5 11/16	60.00
VT8HN-2	240‡	4.0	0-240	Same, no overvoltage	4⅞ x 9 5/16 x 5 11/16	60.00
VT20-2	120	20.0	0-120/140	Uncased, open delta con.	7½‡*x10x8 1/16	131.00
VT20N-2	120	25.0	0-120	Same, no overvoltage	7½‡*x10x8 1/16	131.00
VT20-2B	120	20.0	0-120/140	B-case version VT20-2	7½ x 10½ x 8 1/16	143.00
VT20N-2B	120	25.0	0-120	Same, no overvoltage	7½ x 10½ x 8 1/16	143.00
VT20H-2	240‡	9.0	0-240/280	240 V input VT20-2	7½‡*x10x8 1/16	135.00
VT20HN-2	240‡	11.0	0-240	Same, no overvoltage	7½‡*x10x8 1/16	135.00
THREE-PHASE, THREE-IN-TANDEM						

Normally wired for Y-connection. Standard CW dial 240/280 volts except VT02 types where 240/264 V dial is supplied, and VT8H-3, where 480/560 volt dial is standard. Other dials available as listed elsewhere on these pages.

60 HERTZ*						
VT1-3	240	1.0	0-240**	Uncased, Y-connection	2⅞x6 17/32 x 4¼	$49.00
VT02-3	240	1.75	0-240**	Uncased, Y-connection	2⅞x8 1/32 x 4¼	46.00
VT3-3	240	2.6	0-240**	Uncased, Y-connection	2⅞x9 27/32 x 4¼	55.00
VT4-3†	240	3.5	0-240/280	Uncased, Y-connection	4 5/32 x 11⅞x4 13/16	64.00
VT8-3†	240	7.5	0-240/280	Uncased, Y-connection	4⅞x14 1/8x5 11/16	80.00
VT8-3E†	240	6.0	0-240/280	Uncased, Y-connection	5 3/16 x 15¾x7 3/16	97.00
VT8H-3†	480‡	3.0	0-480/560	Uncased, Y-connection	4⅞x14 1/8x5 11/16	87.00
VT20-3†	240	20.0	0-240/280	E-case version VT8-3	7½‡*x15 1/16x8 1/16	192.00
VT20N-3	240	25.0	0-240	No overvoltage VT20-3	7½‡*x15 1/16x8 1/16	192.00
VT20-3B†	240	20.0	0-240/280	B-case version VT20-3	7½x15 13/16x8 1/16	210.00
VT20N-3B	240	25.0	0-240	Same, no overvoltage	7½x15 13/16x8 1/16	210.00
VT20H-3	480‡	9.0	0-480/560	480 V input VT20-3	7½‡*x15 1/16x8 1/16	199.00
VT20HN-3	480‡	11.0	0-480	Same, no overvoltage	7½‡*x15 1/16x8 1/16	199.00

TRANSFORMER ACCESSORIES

Extra Dials, Extra Knobs for Uncased Units, Adjustable Stops, Brush Contact Assemblies, and Special Mounting Adapters are available for Ohmite Variable Transformers. See Radio Master for Complete Details.

OHMITE MFG. CO., a NORTH AMERICAN PHILIPS company • 3635 HOWARD STREET, SKOKIE, ILLINOIS 60076 • PHONE (312) 675-2600 • TWX 910-223-0805

SOLA ELECTRIC

DIVISION OF SOLA BASIC INDUSTRIES

CV Transformers

Constant-voltage Sola transformers provide a stabilized output voltage even though the input voltage varies over a considerable range. Their applications are numerous and varied. CV's are especially ideal for high-accuracy requirements such as in computers and data-processing equipment.

Another advantage in CV transformers is their ability to prolong the life of electronic components by eliminating injurious over- and under-voltages. The Sola transformer's current-limiting factor protects semiconductors and other components from excessive inrush and fault currents.

Write for catalog CV-100 for complete listings including 50 and 400 Hz models.

Sola Sinusoidal Type (CVS)

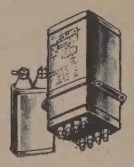
LESS THAN 3% HARMONIC CONTENT
SPECIFICATIONS • 60 CYCLE SINGLE PHASE

Voltage Rating Regulated Output	Input Range	VA	Catalog Number	Price Ind'l & Govt. Users	Approx. Ship. Wt. Lbs	Structure Code
118	95-130	30	23-13-030-2	$ 32.45	8	W
	95-130	60	23-13-060-2	38.50	10	W
	190-260X 380-520	60	23-23-060-2	42.10	10	W
	95-130X 190-260	120	23-22-112-2	49.30	14	W
	190-260X 380-520	120	23-23-112-2	52.90	14	W
	95-130X 190-260	250	23-22-125	67.30	28	W
	190-260X 380-520	250	23-23-125	72.10	29	W
	95-130X 190-260	500	23-22-150	104.60	45	W
	190-260X 380-520	500	23-26-150	111.80	46	W
	95-130X 175-235X	750	23-25-175	144.25	54	W
	190-260	1000	23-25-210	175.50	72	W
	190-260X 380-520	1000	23-26-210	175.50	72	W
	95-130X 175-235X	1500	23-25-215	234.40	128	W
	190-260	2000	23-25-220	307.75	140	W
	190-260X 380-520	2000	23-26-220	307.75	148	W
118x236	95-130X 175-235X 190-260	3000	23-25-230-3	427.95	194	W
	190-260X 380-520	3000	23-26-230	427.95	192	W
	95-130X 175-235X 190-260	5000	23-25-250	668.35	335	Y*
	190-260X 380-520	5000	23-26-250	668.35	342	Y*
	190-260X 380-520	7500	23-28-275	992.90	502	7**

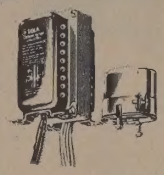
*Same as W, but duplex. **Same as W, but triplex.

AUTOMATIC, INSTANTANEOUS VOLTAGE REGULATION FOR A WIDE VARIETY OF ELECTRIC AND ELECTRONIC DEVICES

D — Drawn case; integral capacitor unit; flex leads.



S — Hermetically-sealed case; separate capacitor; solder lugs.



E—Exposed core; end bells; separate capacitor; flex leads.

W—Exposed core; end housings; screw-type terminals in outlet box.

Normal Harmonic Type (CVN)

SPECIFICATIONS • 60 CYCLE SINGLE PHASE

Voltage Rating Output Regulated	Input Range	VA	Catalog Number	Price 1-4 pcs.	Ship. Wt. (Lbs.)	Structure Code
118	95-130	15	20-10-015	$ 19.25	4	D
			20-11-015	27.95	4	S
			20-14-015	18.05	3	E
		30	20-14-030	20.45	5	E
			20-13-030-2	26.45	7	W
		60	20-13-060-2	32.45	10	W
			20-14-060	27.65	8	E
118	95-130	120	20-14-112	37.50	11	E
			20-13-112-2	43.35	12	W
236	190-260	120	20-21-112-2	43.35	13	W
118	95-130	150	20-13-115	51.70	22	W
	95-130X 190-260	250	20-22-125	63.70	25	W
	190-260X 380-520	250	20-23-125	63.70	25	W
	95-130X 190-260	500	20-22-150	99.75	36	W
	190-260X 380-520	500	20-23-150		36	W
236	190-260X 380-520	500	20-24-150		38	W
118x236	190-260X 380-520	500	20-26-150	106.95	37	W
118	95-130X 190-260	1000	20-22-210	165.90	48	W
118x236	95-130X 175-235X	2000	20-25-220	272.55	128	W
	190-260	3000	20-25-230	408.70	170	W
	190-260X	5000	20-27-250	635.90	290	W
	380-520	10000	20-26-310	1223.50	590	Y

Electronic-Power Types ±1% REGULATION FOR FILAMENT TYPE, ±3% FOR PLATE-FILAMENT TYPE

The electronic-power type of Sola transformer is designed as a component for simple assembly into many kinds of electronic equipment. The filament type (CVF) provides 6.0 or 6.3 volts of output regulated within ± 1% over line variations of ± 15%; the combination plate-and-filament type (CVE) regulates within ± 3%.

D — Drawn case; integral capacitor unit; flex leads.

E — Exposed core; end bells; separate capacitor; flex leads.

for filament service (Type CVF)

SPECIFICATIONS • 60 CYCLE SINGLE PHASE

Voltage Rating Regulated ±1% Output	Input Range	Output Capacity in Amps.	Catalog Number	Approx. Net Price Each to Industrial Users	Approx. Ship. Wt. in Lbs.	* Structure Code
6.0	95-130	2.50	20-01-015	$19.25	4	D
			20-06-015	18.05	3	E
6.3	95-130	2.38	20-02-015	19.25	4	D
			20-03-015	26.45	4	S
			20-04-015	18.05	3	E
	95-130X 190-260	5.0	20-04-030	20.45	6	E
		10.0	20-04-065	26.45	8	E
		15.0	20-04-095	31.25	11	E
		25.0	20-04-116	45.65	23	E

for plate filament service (Type CVE)

SPECIFICATIONS • 60 CYCLE SINGLE PHASE
Input range, 100-130 volts

Typical Rectifier Tube	Average D.C. Input Volts to Filter*	Filament Windings 6.3 Volts	Filament Windings 5.0 Volts	Catalog Number	Approx. Net Price Each to Industrial Users	Approx. Ship. Wt. in Lbs.	* Structure Code
5Y3	275v D.C. @ 50 M.A.	2.5 amps C.T.	2.0 amps	7104	$16.05	6	E
5Y3	385v D.C. @ 110 M.A.	3.0 amps C.T.	2.0 amps	7106	19.80	8	E
5U4	380v D.C. @ 250 M.A.	No. 1: 4.0 amps No. 2: 8.0 amps unregulated	3.0 amps	7107	37.10	19	E

*Voltage values are taken at output of 5Y3GT rectifier for No. 7104 and No. 7106 transformers and at output of 5U4GA-GB for No. 7107. Guaranteed regulation of ±3% on plate voltage output is contingent on the use of Sola-regulated 5.0μ filament supply winding for the rectifier tube.

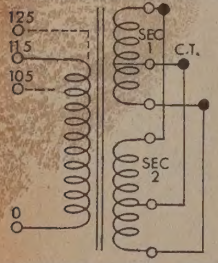
For more information on SOLA CVDC Power Supplies, see page 1211, Section 4000.

SHIPPED FROM STOCK IMMEDIATELY

HIGH & LOW CURRENT TRANSFORMERS

OPEN FRAME • EPOXY ENCAPSULATED (GRADE 5) • HERMETICALLY SEALED (GRADE 4)

SECONDARY VOLTS	Part No.	Primary Volts	SECONDARY AMPS Series	SECONDARY AMPS Parallel	OPEN FRAME OR EPOXY ENCAPSULATED* Mtg. Style	L	W	H	ML	MW	Mtg. Screw	Appr. Lbs.	HERMETICALLY SEALED IN STEEL CASE‡ L	W	H	ML	MW	Mtg. Stud
10 or 5 V C. T. Series 0 - 2.5 - 5 - 7.5 - 10 V Parallel 0 - 2.5 - 5 V @ 2 x Current	10-0.1	115	0.1	0.2	C	2	1½	1¾	1 23/32	—	#8	0.3	1⅝	1⅝	2 3/16	1 3/16	1 3/16	6-32 x ⅜
	10-0.25	115	0.25	0.5	C	2⅜	1½	2	2	—	#8	0.5	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	10-0.5	115	0.5	1.0	C	2⅜	1¾	2	2	—	#8	0.8	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	10-1	115	1	2	C	2⅞	1¾	2 5/16	2⅜	—	#8	1.0	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	10-2	115	2	4	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	10-4	115	4	8	C	3 9/16	2⅜	3 1/16	3⅛	—	#8	2.3	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	10-6	115	6	12	B	3⅜	2¾	2 13/16	2 13/16	2⅛	#8	3.3	3⅝	3	3¼	2 13/16	2⅛	8-32 x ⅜
	10-8	115	8	16	B	3⅜	3⅛	2 13/16	2 13/16	2½	#8	4.0	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	10-12	115	12	24	B	3¾	3¼	3⅛	3⅛	2½	#8	5.0	4⅛	3¾	3½	3⅛	2½	10-32 x ½
	10-25	115	25	50	B	4½	3¾	3¾	3¾	2¾	#10	8.7	4¾	5¼	4¼	3¾	4¼	10-32 x ½
	10-50	105, 115, 125	50	100	B	5¼	5½	4⅜	4⅜	3⅝	¼	17.0	5½	7	5½	4⅜	5⅞	¼-20 x ⅝
	10-100	105, 115, 125	100	200	B	6⅜	7¼	5 5/16	5 5/16	4⅜	¼	34.5	6¾	8¾	6½	5 5/16	6¼	¼-20 x ⅝
12.8 or 6.4 C. T. Series 0 - 3.2 - 6.4 - 9.6 - 12.8 V Parallel 0 - 3.2 - 6.4 V @ 2 x Current	12.8-0.1	115	0.1	0.2	C	2	1½	1¾	1 23/32	—	#8	0.3	1⅝	1⅝	2 3/16	1 3/16	1 3/16	6-32 x ⅜
	12.8-0.25	115	0.25	0.5	C	2⅜	1½	2	2	—	#8	0.5	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	12.8-0.5	115	0.5	1	C	2⅞	1⅝	2 5/16	2⅜	—	#8	0.8	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	12.8-1	115	1	2	C	2⅞	2	2 5/16	2⅜	—	#8	1.2	2 5/16	2 1/16	2½	1 11/16	1 7/16	6-32 x ⅜
	12.8-2A	115	2	4	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5	2¾	2⅝	2⅞	2⅛	1¾	6-32 x ⅜
	12.8-2	115	2	4	B	3	2½	2½	2½	2	#8	2.3	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	12.8-4	115	4	8	B	3	2⅞	2½	2½	2⅜	#8	2.8	3¼	3⅛	2⅞	2½	2⅜	8-32 x ⅜
	12.8-6	115	6	12	B	3⅜	3 1/16	2 13/16	2 13/16	2½	#8	4.0	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	12.8-8	115	8	16	B	3¾	3⅛	3⅛	3⅛	2¼	#8	4.5	4⅛	3½	3½	3⅛	2¼	10-32 x ½
	12.8-12	115	12	24	B	4⅛	3¼	3 7/16	3 7/16	2⅜	#10	6.0	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	12.8-25	115	25	50	B	5¼	4¼	4⅜	4⅜	2⅞	#10	12.5	5½	5¾	5¼	4⅜	4⅝	¼-20 x ⅝
	12.8-50	105, 115, 125	50	100	B	5¼	6	4⅜	4⅜	4⅛	¼	20.7	5½	7½	5½	4⅜	6⅜	¼-20 x ⅝
	12.8-100	105, 115, 125	100	200	B	6⅜	7¼	5 5/16	5 5/16	4⅜	¼	34.5	6¾	8¾	6½	5 5/16	6¼	6-20 x ⅝
16 or 8 V C. T. Series 0 - 4 - 8 - 12 - 16 V Parallel 0 - 4 - 8 @ 2 x Current	16-0.1	115	0.1	0.2	C	2	1⅝	1¾	1 23/32	—	#8	0.4	1⅝	1⅝	2 3/16	1 3/16	1 3/16	6-32 x ⅜
	16-0.25	115	0.25	0.5	C	2⅜	1¾	2	2	—	#8	0.7	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	16-0.5	115	0.5	1	C	2⅞	1⅝	2 5/16	2⅜	—	#8	0.8	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	16-1	115	1	2	C	2⅞	2	2 5/16	2⅜	—	#8	1.2	2 5/16	2 1/16	2½	1 11/16	1 7/16	6-32 x ⅜
	16-2	115	2	4	C	3⅛	2¼	2¾	2 13/16	—	#8	1.7	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	16-4	115	4	8	B	3⅜	2¾	2 13/16	2 13/16	2⅛	#8	3.3	3⅝	3	3¼	2 13/16	2⅛	8-32 x ⅜
	16-6	115	6	12	B	3¾	3⅛	3⅛	3⅛	2¼	#10	4.5	4⅛	3½	3½	3⅛	2¼	10-32 x ½
	16-8	115	8	16	B	3¾	3½	3⅛	3⅛	2⅝	#10	5.4	4⅛	3¾	3½	3⅛	2½	10-32 x ½
	16-12	115	12	24	B	4⅛	3⅞	3⅝	3 7/16	3	#10	7.9	4½	4½	3⅞	3 7/16	3	10-32 x ½
	16-25	115	25	50	B	4½	5⅜	4	3¾	4	#10	14.5	4¾	6½	4¼	3¾	5½	10-32 x ½
	16-50	105, 115, 125	50	100	B	6⅜	5¾	5 5/16	5 5/16	3¾	¼	26.5	6¾	6⅝	6	5 5/16	5⅛	¼-20 x ⅝
	16-100	105, 115, 125	100	200	B	7½	7½	6⅜	6¾	4⅝	¼	50.0	8	8½	7	6¾	7¼	¼-20 x ⅝
24 or 12 C.T. Series 0 - 6 - 12 - 18 - 24 V Parallel 0 - 6 - 12 V @ 2 x Current	24-0.1	115	0.1	0.2	C	2⅜	1½	2	2	—	#8	0.5	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	24-0.25	115	0.25	0.5	C	2⅞	1¾	2 5/16	2⅜	—	#8	1.0	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	24-0.5	115	0.5	1	C	2⅞	2	2 5/16	2⅜	—	#8	1.2	2 5/16	2 1/16	2½	1 11/16	1 7/16	6-32 x ⅜
	24-1A	115	1	2	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	24-1	115	1	2	B	3	2½	2½	2½	2	#8	2.3	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	24-2	115	2	4	B	3	2⅞	2½	2½	2⅜	#8	2.9	3¼	3⅛	2⅞	2½	2⅜	8-32 x ⅜
	24-4	115	4	8	B	3¾	3⅛	3⅛	3⅛	2¼	#8	4.5	4⅛	3½	3½	3⅛	2¼	10-32 x ½
	24-6	115	6	12	B	4⅛	3¼	3 7/16	3 7/16	2⅜	#10	5.8	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	24-8	115	8	16	B	4⅛	3⅞	3⅝	3 7/16	3	#10	7.9	4½	4½	3⅞	3 7/16	3	10-32 x ½
	24-12	105, 115, 125	12	24	B	4½	4½	3¾	3¾	3⅜	#10	11.0	4¾	5⅜	4¼	3¾	4⅜	10-32 x ½
	24-20	105, 115, 125	20	40	B	5¼	4¾	4⅜	4⅜	3⅜	¼	15.3	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	24-25	105, 115, 125	25	50	B	5¼	5⅝	4⅜	4⅜	4⅛	¼	19.5	5½	6½	5¼	4⅜	5⅜	¼-20 x ⅝
	24-50	105, 115, 125	50	100	B	6⅜	6¼	5 5/16	5 5/16	4⅜	¼	31.3	6¾	7½	6	5 5/16	6	¼-20 x ⅝
	24-100	115/230	100	200	B	7½	7	6⅜	6¾	4⅛	¼	43	8	8	7	6¾	6¾	¼-20 x ⅝
36 or 18 V C.T. Series 0 - 9 - 18 - 27 - 36 V Parallel 0 - 9 - 18 V @ 2 x Current	36-0.1	115	0.1	0.2	C	2⅜	1⅝	2	2	—	#8	0.5	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	36-0 25	115	0.25	0.5	C	2⅞	1⅝	2 5/16	2⅜	—	#8	0.8	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	36-0.5	115	0.5	1	C	3⅛	2	2¾	2 13/16	—	#8	1.3	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	36-1A	115	1	2	C	3 9/16	2⅜	3 1/16	3⅛	—	#8	2.3	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	36-1	115	1	2	B	3	2¾	2½	2½	2¼	#8	2.6	3¼	3⅛	2⅞	2½	2⅜	8-32 x ⅜
	36-2	115	2	4	B	3⅜	2 15/16	2 13/16	2 13/16	2⅜	#8	3.8	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	36-4	115	4	8	B	4⅛	3⅜	3 7/16	3 7/16	2⅝	#10	6.8	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	36-6	115	6	12	B	4½	3¾	3¾	3¾	2¾	#10	8.7	4¾	4¼	4¼	3¾	2⅞	10-32 x ½
	36-8	105, 115, 125	8	16	B	4½	4½	4⅛	3¾	3⅜	#10	11.0	4¾	5	4⅜	3¾	3⅜	10-32 x ½
	36-12	105, 115, 125	12	24	B	5¼	5	4⅜	4⅜	3⅜	¼	15.0	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	36-20	105, 115, 125	20	40	B	6⅜	5⅜	5 5/16	5 5/16	3⅜	¼	22.8	6¾	5¾	5¾	5 5/16	4¼	¼-20 x ⅝
	36-25	105, 115, 125	25	50	B	6⅜	5¾	5 5/16	5 5/16	3¾	¼	26.5	6¾	6⅝	6	5 5/16	5⅛	¼-20 x ⅝
	36-30	105, 115, 125	30	60	B	6⅜	6	5 5/16	5 5/16	4⅜	¼	31.5	6¾	7½	6	5 5/16	6	¼-20 x ⅝
	36-50	115/230	50	100	B	6⅜	7¼	5 5/16	5 5/16	5⅛	¼	40.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	36-100	115/230	100	200	B	7½	9	6¼	6¾	5 7/16	¼	63.5	8	10	7	6¾	8¾	¼-20 x ⅝
56 or 28 V C.T. Series 0 - 14 - 28 - 42 - 56 V Parallel 0 - 14 - 28 V @ 2 x Current	56-0.1	115	0.1	0.2	C	2⅜	1¾	2	2	—	#8	.8	1 15/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
	56-0.25	115	0.25	0.5	C	2⅞	2	2 5/16	2⅜	—	#8	1.2	2 5/16	2 1/16	2½	1 11/16	1 7/16	6-32 x ⅜
	56-0.5	115	0.5	1	C	3⅛	2¼	2¾	2 13/16	—	#8	1.7	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	56-1	115	1	2	B	3⅜	2⅞	2 13/16	2 13/16	2¼	#8	3.5	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	56-2	115	2	4	B	3¾	3¼	3⅛	3⅛	2½	#8	5.0	4⅛	3¾	3½	3⅛	2½	10-32 x ½
	56-4	115	4	8	B	4⅛	3¾	3 7/16	3 7/16	3	#10	7.7	4½	4½	3⅞	3 7/16	3	10-32 x ½
	56-6	115	6	12	B	5¼	4¼	4⅜	4⅜	2⅞	#10	12.0	5½	4¾	5	4⅜	3	¼-20 x ⅝
	56-8	105, 115, 125	8	16	B	5¼	5	4⅜	4⅜	3⅝	¼	17.0	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	56-12	105, 115, 125	12	24	B	6⅜	5¼	5 5/16	5 5/16	3⅜	¼	22.0	6¾	5¾	5¾	5 5/16	4¼	¼-20 x ⅝
	56-25	105, 115, 125	25	50	B	6⅜	7⅛	5 5/16	5 5/16	5⅛	¼	38.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	56-50	115/230	50	100	B	7½	7½	6¼	6¾	4⅞	¼	56.3	8	8½	7	6¾	7¼	¼-20 x ⅝
	56-100	115/230	100	200	B	7½	11¼	6¼	6¾	8¼	¼	95.0	8	13	7	6¾	11¾	¼-20 x ⅝

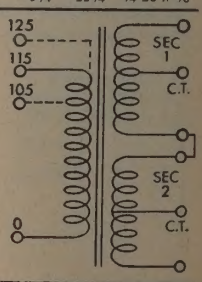


PARALLEL CONNECTED SECONDARIES

All transformers are designed conservatively for a max of 45°C rise above ambient, for use on 115V power line from 50-500 cps. Only prime raw materials are used. Units are thoroughly impregnated and baked with Signal's own high gloss black baking varnish. The transformers and chokes are rugged in construction, well-insulated, and have a consistently uniform appearance. All ratings are at full load current continuous operation.

Electrical ratings have been chosen to cover a wide range of applications. All transformers have two center-tapped secondary windings.

SERIES CONNECTED SECONDARIES



SIGNAL TRANSFORMER CO., INC
ENGINEERS • DESIGNERS • MANUFACTURERS
FACTORY: 1 JUNIUS STREET, BROOKLYN, NEW YORK 11212 — (212) 498-5111

See YELLOW SECTION for Local Offices, Phones

HIGH & LOW CURRENT TRANSFORMERS

0.1 to 200 Amps
2.5 to 300 Volts

OPEN FRAME • EPOXY ENCAPSULATED (GRADE 5) • HERMETICALLY SEALED (GRADE 4)

IDEAL FOR USE IN SINGLE OR DUAL DC POWER SUPPLIES

SECONDARY VOLTS	Part No.	Primary Volts	SECONDARY AMPS Series	SECONDARY AMPS Parallel	OPEN FRAME OR EPOXY ENCAPSULATED* Mtg. Style	L	W	H	ML	MW	Mtg. Screw	Appr. Lbs.	HERMETICALLY SEALED IN STEEL CASE‡ L	W	H	ML	MW	Mtg. Stud
68 or 34 C.T. Series 0 - 17 - 34 - 51 - 68 V, Parallel 0 - 17 - 34 V @ 2 x Current	68-0.1	115	0.1	0.2	C	2⅞	1⅝	2⅝	2⅜	—	#8	0.8	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	68-0.25	115	0.25	0.5	C	2⅞	2	2⅝	2⅜	—	#8	1.2	2 5/16	2 1/16	2½	1 11/16	1 7/16	6-32 x ⅜
	68-0.5A	115	0.5	1	C	3⅛	2¼	2¾	2 13/16	—	#8	1.7	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	68-0.5	115	0.5	1	B	3	2¾	2½	2½	2¼	#8	2.7	3¼	3⅛	2⅞	2½	2⅜	8-32 x ⅜
	68-1	115	1	2	B	3⅜	2 15/16	2 13/16	2 13/16	2⅜	#8	3.8	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	68-2	115	2	4	B	4⅛	3⅜	3 7/16	3 7/16	2⅝	#10	6.8	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	68-4	115	4	8	B	4½	4½	4⅛	3¾	3⅜	#10	11.5	4¾	5	4⅜	3¾	3⅜	10-32 x ½
	68-6	105, 115, 125	6	12	B	5¼	5	4⅜	4⅜	3⅜	¼	15.0	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	68-8	105, 115, 125	8	16	B	5¼	5½	4⅜	4⅜	3⅞	¼	19.0	5½	6	5	4⅜	3⅞	¼-20 x ⅝
	68-12	105, 115, 125	12	24	B	6⅜	5¾	5 5/16	5 5/16	3¾	¼	26.5	6¾	6⅝	6	5 5/16	5⅛	¼-20 x ⅝
	68-25	115/230	25	50	B	6⅜	7¼	5 5/16	5 5/16	5⅛	¼	39.7	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	68-50	115/230	50	100	B	7½	9	6¼	6¾	5 7/16	¼	58.5	8	10	7	6¾	8¾	¼-20 x ⅝
80 or 40 C.T. Series 0 - 20 - 40 - 60 - 80 V, Parallel 0 - 20 - 40 V @ 2 x Current	80-0.1	115	0.1	0.2	C	2⅞	1⅝	2⅝	2⅜	—	#8	0.8	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	80-0.25	115	0.25	0.5	C	3⅛	2	2¾	2 13/16	—	#8	1.3	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	80-0.5A	115	0.5	1	C	3 3/16	2⅜	3 1/16	3⅛	—	#8	2.2	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	80-0.5	115	0.5	1	B	3	2¾	2½	2½	2¼	#8	2.8	3¼	3⅛	2⅞	2½	2⅜	8-32 x ⅜
	80-1	115	1	2	B	3⅜	3 1/16	2 13/16	2 13/16	2½	#8	4.0	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	80-2	115	2	4	B	4⅛	3⅜	3 7/16	3 7/16	2⅝	#10	6.8	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	80-4	115	4	8	B	5¼	4¼	4⅜	4⅜	2⅞	¼	12.3	5½	4¾	5	4⅜	3	¼-20 x ⅝
	80-6	105, 115, 125	6	12	B	5¼	5½	4⅝	4⅜	3⅞	¼	19.0	5½	6	5	4⅜	3⅞	¼-20 x ⅝
	80-8	105, 115, 125	8	16	B	6⅜	5¼	5 5/16	5 5/16	3¼	¼	20.5	6¾	5¾	5¾	5 5/16	4¼	¼-20 x ⅝
	80-12	105, 115, 125	12	24	B	6⅜	6	5 5/16	5 5/16	4⅛	¼	29.0	6¾	6⅝	6	6 5/16	5⅛	¼-20 x ⅝
	80-25	115/230	25	50	B	7½	6½	6¼	6¾	3⅞	¼	40.3	8	7	7	6¾	6¾	¼-20 x ⅝
	80-50	115/230	50	100	B	7½	9	6¼	6¾	6½	¼	78.0	8	10	7	6¾	8¾	¼-20 x ⅝
88 or 44 C.T. Series 0 - 22 - 44 - 66 - 88 V, Parallel 0 - 22 - 44 V @ 2 x Current	88-0.1	115	0.1	0.2	C	2⅞	1¾	2⅝	2⅜	—	#8	1.0	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
	88-0.25	115	0.25	0.5	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
	88-0.5	115	0.5	1	C	3 3/16	2⅜	3 1/16	3⅛	—	#8	2.2	3¼	2¾	2⅞	2½	2	8-32 x ⅜
	88-1	115	1	2	B	3¾	3	3⅛	3⅛	2¼	#8	4.5	4⅛	3½	3½	3⅛	2¼	10-32 x ½
	88-2	115	2	4	B	4⅛	3⅜	3 7/16	3 7/16	2⅝	#10	6.8	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	88-4	115	4	8	B	5¼	4½	4⅜	4⅜	3⅛	¼	13.4	5½	4¾	5	4⅜	3	¼-20 x ⅝
	88-6	105, 115, 125	6	12	B	5¼	5½	4⅜	4⅜	3⅞	¼	19.0	5½	6	5	4⅜	3⅞	¼-20 x ⅝
	88-8	105, 115, 125	8	16	B	6⅜	5⅜	5 5/16	5 5/16	3⅜	¼	22.8	6¾	5¾	5¾	5 5/16	4¼	¼-20 x ⅝
	88-12	105, 115, 125	12	24	B	6⅜	6½	5 5/16	5 5/16	4⅝	¼	35.0	6¾	7	5¾	5 5/16	5½	¼-20 x ⅝
	88-25	115/230	25	50	B	7½	8	6¼	6¾	5⅝	¼	62.0	8	10	7	6¾	8¾	¼-20 x ⅝
	88-50	115/230	50	100	B	7½	11	6¼	6¾	8⅝	¼	100.0	8	13	7	6¾	11¾	¼-20 x ⅝
120 or 60 C.T. Series 0 - 30 - 60 - 90 - 120 V, Parallel 0 - 30 - 60 V @ 2 x Current	120-0.5	115	0.5	1.0	B	3⅜	2⅞	2 13/16	2 13/16	2¼	#8	3.2	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	120-1	115	1	2	B	3¾	3⅜	3⅛	3⅛	2¾	#8	5.8	4⅛	4	3½	3⅛	2⅞	10-32 x ½
	120-2	115	2	4	B	4½	3¾	3¾	3¾	2¾	#10	8.5	4¾	4¼	4¼	3¾	2⅞	10-32 x ½
	120-4	115	4	8	B	5¼	5½	4⅜	4⅜	3⅞	¼	17.0	5½	6	5	4⅜	3⅞	¼-20 x ⅝
	120-6	105, 115, 125	6	12	B	6⅜	6	5 5/16	5 5/16	3⅞	¼	27.0	6¾	6⅝	6	5 5/16	5⅛	¼-20 x ⅝
	120-8	105, 115, 125	8	16	B	6⅜	6½	5 5/16	5 5/16	4⅝	¼	34.0	6¾	7	5¾	5 5/16	5½	¼-20 x ⅝
	120-12	105, 115, 125	12	24	B	6⅜	7¼	5 5/16	5 5/16	5⅜	¼	42.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	120-20	105, 115, 125	20	40	B	7½	8	6¼	6¾	5⅜	¼	57.0	8	9	7	6¾	7¾	¼-20 x ⅝
160 or 80 C.T. Series 0 - 40 - 80 - 120 - 160 V, Parallel 0 - 40 - 80 V @ 2 x Current	160-0.5	115	0.5	1	B	3⅜	3 1/16	2 13/16	2 13/16	2½	#8	4.0	3⅝	3⅜	3¼	2 13/16	2⅜	8-32 x ⅜
	160-1	115	1	2	B	4⅛	3⅝	3 7/16	3 7/16	2⅝	#10	6.5	4½	3¾	3⅞	3 7/16	2⅜	10-32 x ½
	160-2	115	4	8	B	4½	4⅜	3¾	3¾	3⅜	#10	11.0	4¾	5	4⅜	3¾	3⅜	10-32 x ½
	160-4	105, 115, 125	4	8	B	6⅜	5¼	5 5/16	5 5/16	3¼	¼	21.0	6¾	5¾	5¾	5 5/16	4¼	¼-20 x ⅝
	160-8	105, 115, 125	8	16	B	6⅜	6¾	5 5/16	5 5/16	4⅞	¼	36.0	6¾	7½	6	5 5/16	6	¼-20 x ⅝
	160-12	115/230	12	24	B	7½	6½	6¼	6¾	3⅞	¼	39.8	8	8	7	6¾	6¾	¼-20 x ⅝
180 or 90 C.T. Series 0 - 45 - 90 - 135 - 180 V, Parallel 0 - 45 - 90 @ 2 x Current	180-0.5	115	0.5	1	B	3¾	3⅜	3⅛	3⅛	2¾	#8	5.8	4⅛	4	3½	3⅛	2⅜	10-32 x ½
	180-1	115	1	2	B	4⅛	3⅞	3⅝	3 7/16	3	#10	8.2	4½	4½	3⅞	3 7/16	3	10-32 x ½
	180-2	115	2	4	B	5¼	5	4⅜	4⅜	3⅝	¼	15.8	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	180-4	115	4	8	B	6⅜	5¾	5 5/16	5 5/16	3¾	¼	27.0	6¾	6⅝	6	5 5/16	5⅛	¼-20 x ⅝
	180-6	105, 115, 125	6	12	B	6⅜	7¼	5 5/16	5 5/16	5⅛	¼	37.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	180-8	105, 115, 125	8	16	B	6⅜	7¾	5 5/16	5 5/16	5⅝	¼	42.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
	180-12	105, 115, 125	12	24	B	7½	8¼	6¼	6¾	5⅝	¼	62.0	8	9	7	6¾	7¾	¼-20 x ⅝
230 or 115 C.T. Series 0-57½-115-172½-230 V, Parallel 57½ - 115 V @ 2 x Current	230-0.5	115	0.5	1	B	3¾	3⅝	3⅛	3⅛	3	#8	6.5	4⅛	4	3½	3⅛	2⅞	10-32 x ½
	230-1	115	1	2	B	4½	3¾	3¾	3¾	3	#10	9.4	4¾	4¼	4¼	3¾	2⅞	10-32 x ½
	230-2	115	2	4	B	5¼	4¾	4⅜	4⅜	3⅜	¼	14.5	5½	5½	5¼	4⅜	3½	¼-20 x ⅝
	230-4	105, 115, 125	4	8	B	6⅜	6	5 5/16	5 5/16	4⅛	¼	28.4	6¾	6⅜	6	5 5/16	5⅛	¼-20 x ⅝
	230-6	105, 115, 125	6	12	B	6⅜	7¼	5 5/16	5 5/16	5⅛	¼	38.0	6¾	8	6	5 5/16	6½	¼-20 x ⅝
300 or 150 C.T. Series 0-75-150-225-300 V, Parallel 0 - 75 - 150 V @ 2 x Current	300-0.5	115	0.5	1	B	4½	3½	3¾	3¾	2½	#10	7.0	4¾	4¼	4¼	3¾	2⅞	10-32 x ½
	300-1	115	1	2	B	5¼	4⅛	4⅜	4⅜	3	¼	12.8	5½	4¾	5	4⅜	3	¼-20 x ⅝
	300-2	115	2	4	B	5¼	5¾	4⅜	4⅜	4½	¼	21.0	5½	6¼	5	4⅜	5⅛	¼-20 x ⅝
	300-4	105, 115, 125	4	8	B	6⅜	5¾	5 5/16	5 5/16	3⅞	¼	27.5	6¾	6⅜	6	5 5/16	5⅛	¼-20 x ⅝

AVAILABLE IN 3 STYLES

FOR OPEN FRAME USE PART NUMBERS SHOWN

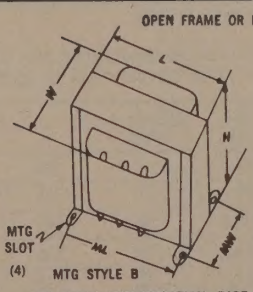
* For epoxy encapsulation add prefix "E-" to Part No., e.g., E-36-1 add 3/16 to L, W, H Dim. Grade 5.
‡ For hermetically sealed units add prefix "H-" to Part No., e.g., H-36-1. Grade 4.

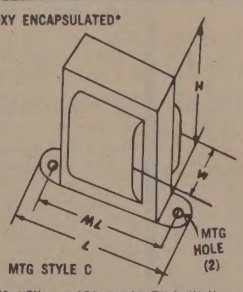
AVAILABLE IN 3 STYLES

METHOD OF DETERMINING SECONDARY CURRENT RATINGS

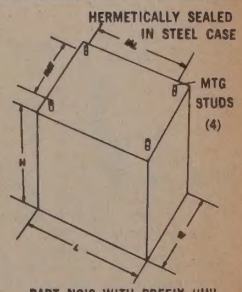
RECTIFIER TYPE	FILTER TYPE	RMS SECONDARY CURRENT
Full Wave Center-Tap	Choke Input	.7 × DC amps
Full Wave Center-Tap	Capacitor Input	1.2 × DC amps
Full Wave Bridge	Choke Input	= to DC amps
Full Wave Bridge	Capacitor Input	1.8 × DC Amps

OPEN FRAME OR EPOXY ENCAPSULATED*





HERMETICALLY SEALED IN STEEL CASE



*FOR EPOXY ENCAPSULATION, PART NO'S "E" — ADD 3/16" TO L, W, H

PART NO'S WITH PREFIX "H"

SIGNAL TRANSFORMER CO., INC

ENGINEERS • DESIGNERS • MANUFACTURERS

FACTORY: 1 JUNIUS STREET, BROOKLYN, NEW YORK 11212 — (212) 498-5111

HIGH & LOW CURRENT CHOKES 0.1 to 1000 AMPS

OPEN FRAME • EPOXY ENCAPSULATED (GRADE 5) • HERMETICALLY SEALED (GRADE 4)

Signal's line of High and Low Current Chokes is the most extensive available. It is designed to complement the selection of High and Low Current Transformers so that a set may be specified for power supplies using inductive filters.

The inductance ratings given are minimum values guaranteed at full DC current. All resistance ratings are maximum values.

Special variations or intermediate values of inductance, current, or resistance can be supplied promptly and accurately.

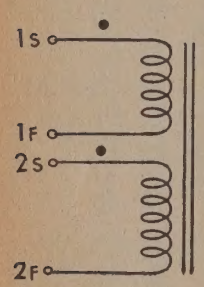
FOR MECHANICAL DIMENSIONS REFER TO TRANSFORMER OUTLINES ON PREVIOUS PAGE

PART No.	IND. (MHY)	CURR. (Amps)	RES. (Ohms)	OPEN FRAME OR EPOXY ENCAPSULATED*								HERMETICALLY SEALED IN STEEL CASE‡					
				MTG. STYLE	L	W	H	ML	MW	MTG. SCREW	APPR. LBS.	L	W	H	ML	MW	MTG. STUD
CH-0.1	1000	0.1	25	C	2	1½	1¾	1 23/32	—	#8	0.3	1⅝	1⅝	2 3/16	1 3/16	1 3/16	6-32 x ⅜
CH-0.2	800	0.2	15	C	2⅜	1⅝	2	2	—	#8	0.7	1 13/16	1 13/16	2 7/16	1⅜	1¼	6-32 x ⅜
CH-0.25	800	0.25	10.0	C	2⅞	1¾	2 5/16	2⅜	—	#8	1.0	2 1/16	2 1/16	2½	1 7/16	1 7/16	6-32 x ⅜
CH-0.5	400	0.5	4.0	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5	2¾	2⅜	2⅞	2⅛	1¾	6-32 x ⅜
CH-1	100	1	1.5	B	3	2½	2½	2½	2	#8	2.3	3¼	2¾	2⅞	2½	2	8-32 x ⅜
CH-2	70	2	0.9	B	3⅜	2¾	2⅞	2 13/16	2⅛	#8	3.2	3⅝	3	3¼	2 13/16	2⅛	8-32 x ⅜
CH-4	70	4	0.6	B	3¾	3⅛	3¼	3⅛	2½	#8	5.3	4⅛	3½	3½	3⅛	2½	8-32 x ⅜
CH-6	40	6	0.4	B	3¾	3⅝	3¼	3⅛	3	#8	6.5	4⅛	4	3½	3⅛	2⅞	8-32 x ⅜
CH-8	30	8	0.3	B	4⅛	3⅝	3½	3 7/16	3	#10	8	4½	4	3⅞	3 7/16	3	10-32 x ½
CH-12	15	12	0.1	B	5¼	4	4 7/16	4⅜	3⅛	#10	13.7	5½	4½	5	4⅜	3⅛	10-32 x ½
CH-16	15	16	.08	B	5¼	4⅝	4 7/16	4⅜	3⅝	#10	17.5	5½	5⅛	5	4⅜	3⅝	10-32 x ½
CH-20	7	20	.05	B	5¼	4	4 7/16	4⅜	3⅛	#10	13.3	5½	4¾	5	4⅜	3⅛	10-32 x ½
CH-25	5	25	.025	B	5¼	4¾	4 7/16	4⅜	3⅞	#10	17.8	5½	5⅜	5	4⅜	3⅞	¼-20 x ⅝
CH-30	4	30	.01	B	6⅜	5	5⅜	5 5/16	3⅜	¼	24.4	6¾	5¼	5⅞	5 5/16	3⅜	¼-20 x ⅝
CH-50	1.4	50	0.01	B	6⅜	5¼	5⅜	5 5/16	3¾	¼	26.7	6¾	5¼	5⅞	5 5/16	3¾	¼-20 x ⅝
CH-100	0.5	100	0.005	B	6⅜	6¼	5⅜	5 5/16	4⅛	¼	31.4	6¾	6⅝	5⅞	5 5/16	4⅛	¼-20 x ⅝
CH-200	0.3	200	0.0025	B	7½	7	6⅜	6¾	4⅛	¼	48.0	NOT AVAILABLE					
CH-250	0.3	250	0.00115	B	7½	8	6¼	6¾	5⅛	¼	56.0	NOT AVAILABLE					
CH-500	0.055	500	0.00027	B	7½	6½	6⅜	6¾	4⅛	¼	50.0	NOT AVAILABLE					
CH-1000	0.015	1,000	0.000065	B	7½	6½	6¾	6¾	4⅜	¼	70.0	NOT AVAILABLE					

AVAILABLE IN 3 STYLES FOR OPEN FRAME — USE PART NUMBERS SHOWN ABOVE

* For epoxy encapsulation add prefix "E-" to Part No., e.g., E-CH-1 add 3/16 to L, W, H W, H Dim. Grade 5.
‡ For hermetically sealed units add prefix "H" to Part No., e.g., H-CH-1, Grade 4.

DUAL CHOKES FOR LOWER INDUCTANCE APPLICATIONS

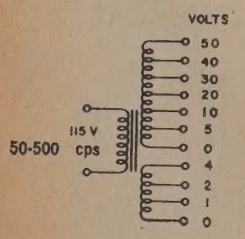


DUAL CHOKES FOR LOWER INDUCTANCE APPLICATIONS

Part No.	Series Connected Ind. (MHY)	Series Connected Curr. (Amps)	Series Connected Res. (Ohms)	Parallel Connected Ind. (MHY)	Parallel Connected Curr. (Amps)	Parallel Connected Res. (Ohms)	Mtg. Style	Dimensions L	Dimensions W	Dimensions H	Dimensions ML	Dimensions MW	Mtg. Screw	Appr. Lbs.
CL-1-2	72	1	1.4	18	2	0.35	C	2⅞	1¾	2 5/16	2⅜	—	#8	0.9
CL-2-4	40	2	0.7	10	4	0.18	C	3⅛	2⅛	2¾	2 13/16	—	#8	1.5
CL-4-8	20	4	0.3	5	8	0.075	B	3	2⅞	2½	2½	2¼	#8	3.0
CL-6-12	12	6	0.15	3	12	0.038	B	3⅜	3 1/16	2 13/16	2 13/16	2½	#8	4.0
CL-12-24	4.8	12	0.052	1.2	24	0.013	B	3⅜	3 9/16	2 13/16	2 13/16	3	#8	5.3
CL-25-50	1.2	25	0.011	0.3	50	0.003	B	3¾	3⅜	3⅛	3⅛	2¾	#8	6.0
CL-50-100	0.5	50	0.0043	0.12	100	0.0011	B	4½	3¾	3¾	3¾	2½	#8	8.0

Signal's Dual Chokes are supplied with 2 windings which may be series or parallel connected with rating shown on chart. This line is basically designed for applications requiring lower inductance values at high currents, such as low voltage, DC supplies or SCR filters.

MULTI-VOLT 1 to 54 VOLTS in 1 VOLT STEPS



"MV" LINE

MV (multi-voltage) secondaries may be series connected for any output from 1 to 54 volts, in 1 volt steps, at rated current. This is accomplished by using the small buck-boost secondary.

Part No.	Secondary Amps.	DIMENSIONS L	DIMENSIONS W	DIMENSIONS H	DIMENSIONS ML	DIMENSIONS MW	Appr. Wt.
MV-1	1	3⅜	2¾	2 13/16	2 13/16	2⅛	3.2
MV-2	2	3¾	3⅛	3⅛	3⅛	2⅜	5.0
MV-4	4	4½	3⅝	3¾	3¾	2½	7.5
MV-6	6	5¼	4	4⅜	4⅜	2⅞	12
M-12	12	5¼	6	4⅜	4⅜	4⅝	23

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See YELLOW SECTION for Local Offices, Phones

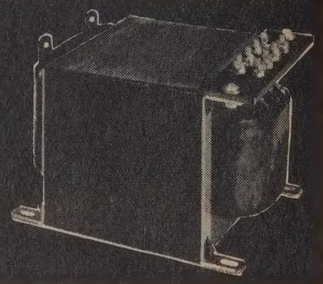
VERY HIGH CURRENT

STOCKED FOR SAME DAY SHIPMENT

TRANSFORMERS & CHOKES

250 to 1400 AMPERES

NEVER AVAILABLE BEFORE

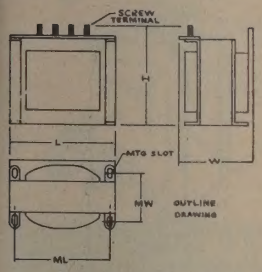


TRANSFORMERS

Part No.	Secondary Volts	Secondary Amps. Nominal (45°C rise)	Secondary Amps. Max. (100°C rise)	Dimensions L	W	H	ML	MW	Mtg. Screw	Appr. Lbs.
6-250	6	250	350	7½	5	7¼	6¾	3 9/16	¼	32
9-250	9	250	350	7½	5¾	7¼	6¾	4 5/16	¼	40
12-250	12	250	350	7½	6¼	7¼	6¾	4 13/16	¼	48
6-500	6	500	700	7½	6	7¼	6¾	4 5/16	¼	40
9-500	9	500	700	7½	7½	7¼	6¾	6 1/16	¼	60
12-500	12	500	700	7½	9	7¼	6¾	7 3/16	¼	80
3-1000	3	1000	1400	7½	6	7¼	6¾	4 5/16	¼	40
6-1000	6	1000	1400	7½	9	7¼	6¾	7 5/16	¼	80

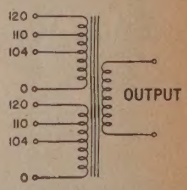
CHOKES

Part No.	Inductance (Milli-hy)	Current (Amperes)	Resis. (Ohms)	L	W	H	ML	MW	Mtg. Screw	Appr. Lbs.
CH-250	.3	250	.00115	7½	8	6¼	6¾	5⅛	¼	56
CH-500	.055	500	.00027	7½	6½	6¼	6¾	4⅛	¼	50
CH-1000	.015	1000	.000065	7½	7½	6¼	6¾	5⅛	¼	70

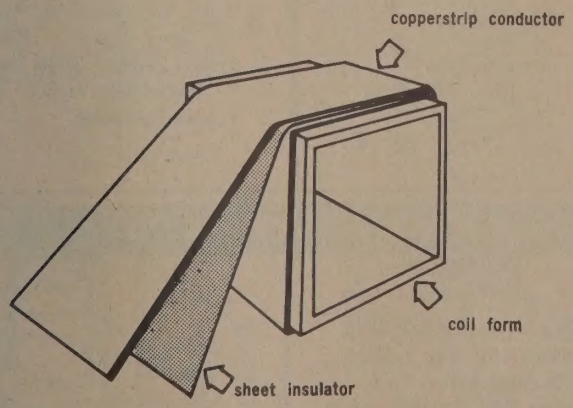


As shown on the schematic diagram dual primaries are provided. This permits parallel connection for 104, 110, or 120 volts or series connection for 208, 214, 220, 230, and 240 volts. Frequency range is 50 to 500 cps.

It is important to note that primary taps may be used to adjust the secondary voltages. Line voltages up to 125V (parallel) or 250V (series) may be used on the lowest primary tap. Nickel plated screw terminals are provided on a heavy phenolic board for easy primary connections.



WINDINGS OF HEAVY COPPER STRIP



STRIP-WOUND SECONDARIES

At the heavy current used in this line it becomes practical and desirable to use wide copper strip (as wide as the coil itself) for windings. Besides the obvious advantages of excellent winding space factor, the heat dissipation of the coil is improved. This improvement is due to the fact that the heat generated in the windings has a pure copper path to the coil ends, where it can be dissipated. In conventional windings of many turns per layer this heat flow is impeded by wire insulation and air spaces between turns. Therefore, the use of copper strip windings yields a dramatic reduction in size and weight.

GRAIN-ORIENTED STEEL CORE

These cores permit the use of higher peak flux densities for the same core loss. This results in a lower number of turns required and therefore, a smaller, more compact transformer.

CLASS F INSULATION USED THROUGHOUT

Class F insulation is rated for unlimited life at a total temperature of 155°C (ambient plus temperature rise).

Class A insulation has a maximum temperature rating of 105°C. The "nominal" current ratings given to this series are for a temperature rise of 45°C above 55°C ambient (Class A). Since Class F insulation is used it is permissible to increase these ratings by 40% (700 and 1400 amperes) without reducing the reliability of the transformer. The temperature rise will be 100°C over a 55°C ambient. The only limitation is not the transformer, but the temperature rating of surrounding components which may be affected by the additional heat radiated by the transformer.

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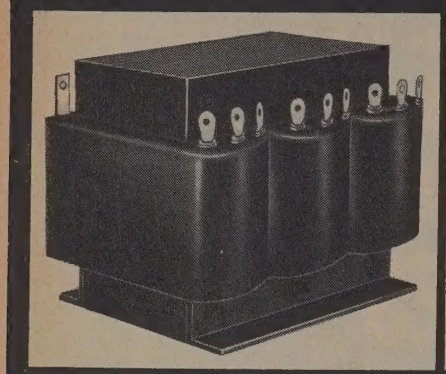
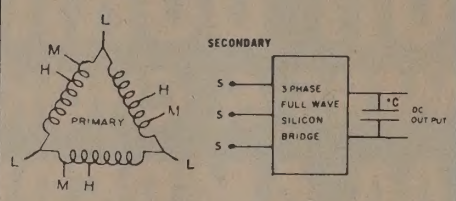
3 PHASE HIGH CURRENT RECTIFIER TRANSFORMERS

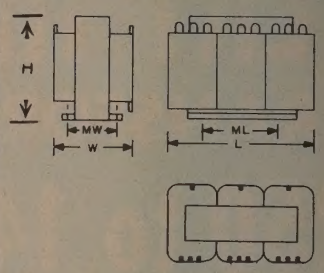


SCHEMATIC DIAGRAM



*C — Optional, no capacitor will give DC output shown at approx. 5% ripple.

MECHANICAL DIMENSIONS



DC OUTPUT VOLTAGE

PART NO.	PRI TAP "L" SUPPLY VOLTAGE 208	PRI TAP "L" SUPPLY VOLTAGE 220	PRI TAP "M" SUPPLY VOLTAGE 208	PRI TAP "M" SUPPLY VOLTAGE 220	PRI TAP "H" SUPPLY VOLTAGE 208	PRI TAP "H" SUPPLY VOLTAGE 220	DC RATED AMPS	APPROX. DIMENSIONS L	W	H	ML	MW	APX. LBS.
3PH 24-50	24	25	26	27.5	28	30	50	7¾	6	5½	4.8	4⅞	35
3PH 24-100	24	25	26	27.5	28	30	100	11½	5	8¼	7.2	4	42
3PH 24-200	24	25	26	27.5	28	30	200	11½	8⅝	8¼	7.2	6¼	90
3PH 48-30	42	44	47	50	52	55	30	7¾	6	5½	4.8	4⅞	35
3PH 48-60	42	44	47	50	52	55	60	11½	5	8¼	7.2	4	42
3PH 48-120	42	44	47	50	52	55	120	11½	8⅝	8¼	7.2	6¼	90

At higher power loads (above 2-3 KVA) it becomes inefficient to use single phase 115 or 230 volt standard lines. With this in mind, our engineering staff has developed a line of 3 phase transformers for use off 208 or 220V 3 phase power lines. These offer the significantly higher conversion efficiency and lighter power line drain of 3 phase systems. Since the principal application of these items is in high power dc power supplies, output ratings are given in dc voltage and current assuming the use of a 3 phase full wave rectifier.

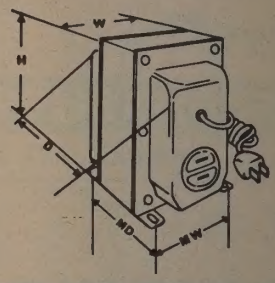
AUTO TRANSFORMERS

STEP-DOWN 230 TO 115 V
"SD" SERIES — LINE CORD & RECEPTACLE

VA Rating	Part No.	W	D	H	MW	MD	Mtg. Screw	Appr. Lbs.
100	SD-100	2⅝	2⅞	3⅛	2	1 13/16	#8	2.3
150	SD-150	2⅝	3½	3⅛	2	2 7/16	#8	3.6
250	SD-250	3⅞	3½	4⅝	3	2⅜	#8	6.2
350	SD-350	3⅞	4¼	4⅝	3	3 1/16	#8	8.3
500	SD-500	3⅞	4¾	4⅝	3	3 9/16	#8	10.5
750	SD-750	4⅝	5⅜	5⅜	3½	3¾	¼	14.5
1000	SD-1000	4⅝	5⅞	5⅜	3½	4¼	¼	18
1500	SD-1500	4⅝	6⅝	5⅜	3½	5	¼	22
2000	SD-2000	4⅝	7⅛	5⅜	3½	5½	¼	26

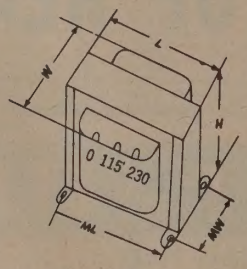
(100-2000 VA)
TYPE SD

Low Regulation • Fully encased — Black Wrinkle Finish • 45°C Temperature Rise • U/L Approved 2 prong line cord and receptacle.



STEP-UP OR DOWN 115/230 OR 230/115 V
"SDO" SERIES — OPEN FRAME • SOLDER LUGS

VA Rating	Part No.	L	W	H	ML	MW	Mtg. Screw	Appr. Lbs.
100	SDO-100	3	2½	2½	2½	2⅛	#8	2.3
150	SDO-150	3	3¼	2½	2½	2¾	#8	3.6
250	SDO-250	4½	2¾	3¾	3¾	2	#10	6.2
350	SDO-350	4½	3¾	3¾	3¾	2¾	#10	8.3
500	SDO-500	4½	4¼	3¾	3¾	3¼	#10	10.5
750	SDO-750	5¼	4½	4⅜	4⅜	3⅜	¼	14.5
1000	SDO-1000	5¼	5	4⅜	4⅜	3⅞	¼	18
1500	SDO-1500	5¼	5¾	4⅜	4⅜	4⅝	¼	22
2000	SDO-2000	5¼	6¼	4⅜	4⅜	5⅛	¼	26



TYPE SDO

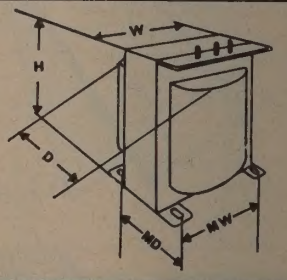
Same Electrically as Type SD. Open Frame • Black Enamel Finish • Solder Lugs • Inexpensive Version for Use in Equipment.

STEP-UP OR DOWN 115/230 OR 230/115
"HSD" SERIES
RUGGED • HEAVY DUTY • PHENOLIC TERMINAL BOARDS

VA Rating	Part No.	W	D	H	MW	MD	Mtg. Screw	Appr. Lbs.
3000	HSD-3000	7½	6	6¾	6¾	4⅛	¼	40
4000	HSD-4000	7½	6½	6¾	6¾	4⅝	¼	46
5000	HSD-5000	7½	7	6¾	6¾	5⅛	¼	52
6000	HSD-6000	7½	8	6¾	6¾	6⅛	¼	65

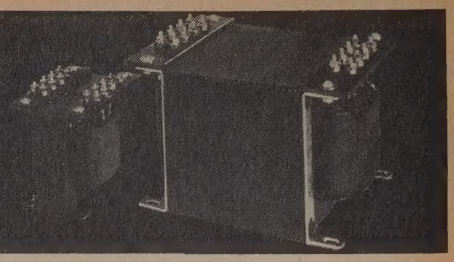
(3000-6000 VA)
TYPE HSD

Very low Regulation • 45°C Temperature Rise • Black High Gloss Enamel Fnish • Screw type terminals on phenolic board.



IGNAL TRANSFORMER CO., INC
ENGINEERS • DESIGNERS • MANUFACTURERS
FACTORY: 1 JUNIUS STREET, BROOKLYN, NEW YORK 11212 — (212) 498-5111

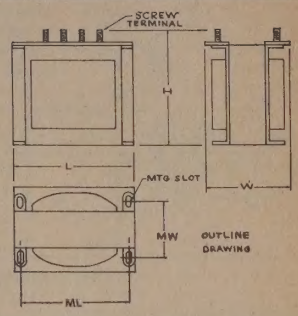
INDUSTRIAL GRADE
STEP-UP OR STEP-DOWN
POWER ISOLATION OR AUTO-TRANSFORMERS
HIGH DEGREE OF VERSATILITY OFFERS MANY POSSIBLE VOLTAGE RATINGS



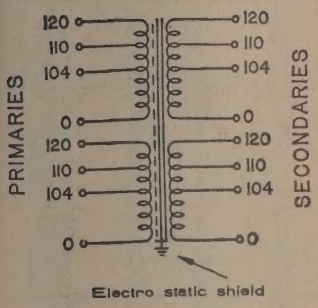
AVAILABLE FROM STOCK FOR IMMEDIATE SHIPMENT

The "DU", "SU", and "UP" lines are designed for a maximum of 55°C rise above ambient for use on standard power lines from 50 to 500 Cps. Only prime raw materials are used. Units are thoroughly impregnated and baked with Signal's own high gloss black baking varnish. The transformers are rugged in construction, well-insulated and have a consistently uniform appearance. All ratings are at full load current, continuous operation.

Heavy ¼ inch phenolic terminal boards are provided with plated brass screws and flat washers. Connections can be easily made with a nut driver. It is also simple to alter the inter-connections to change transformer ratings. **Electro static shields are provided grounded to the core.** The connection is made with a lug to ground and may be opened if an ungrounded shield is desired.



"DU SERIES" 110/220 Dual Primary To 110/220 Dual Sec. (Primary & Secondary may be reversed)

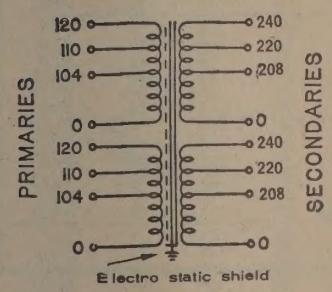


As shown on the schematic diagram the "DU" line is designed with dual primaries and secondaries. All four windings are identically rated at 0/104/110/120 volts. This permits series or parallel connections on either primary or secondary. Therefore, a nominal 110 to 110 volt, 220 to 220 volt, 110 to 220 volt, or 220 to 110 volt transformer can be set up. The winding taps permit intermediate series ratings such as 208, 214, or 230 volts.

It is also possible to make auto-transformer connections by connecting a primary group in series with a secondary group. Such nominal ratings as 440 to 220 volts or 220 to 440 volts can be set-up, in addition to the standard ratings described above. A further advantage to auto-transformer connection is the fact that the KVA rating of a particular type is **doubled.**

Part No.	KVA	Series Secondaries		Parallel Secondaries		Mechanical Dimensions					Mtg. Screw	Appr. Lbs.
		Volts	Max. Amps	Volts	Max. Amps	L (Max.)	W (Max.)	H (Max.)	ML ± 1/32	MW ± 1/16		
DU-¼	¼	0/208/220/240	1.1	0/104/110/120	2.2	5 5/16	4¼	5¼	4⅜	2½	#10	12
DU-½	½	0/208/220/240	2.3	0/104/110/120	4.6	5 5/16	5 5/16	5¼	4⅜	3⅝	#10	18
DU-1	1	0/208/220/240	4.5	0/104/110/120	9	7 9/16	6¼	7¼	6¾	4⅛	¼	33
DU-2	2	0/208/220/240	9	0/104/110/120	18	7 9/16	8¼	7¼	6¾	6	¼	56
DU-3	3	0/208/220/240	14	0/104/110/120	28	7 9/16	9¼	7¼	6¾	7	¼	70
DU-5	5	0/208/220/240	23	0/104/110/120	46	7 9/16	10¾	7¼	6¾	8½	¼	89
DU-7.5	7.5	0/208/220/240	31	0/104/110/120	62	9	9	8	7½	6½	¼	105
DU-10	10	0/208/220/240	41	0/104/110/120	83	9	12	8	7½	9	¼	150

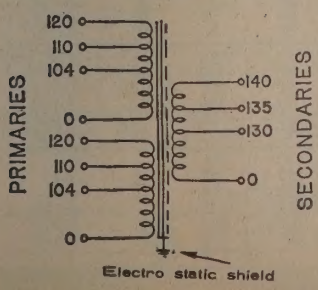
"SU SERIES" 110/220 Dual Primary to 220/440 V. Dual Sec. (Primary & Secondary may be reversed)



"SU" transformers are similar to "DU" types except that a 220/440 V secondary is provided.

Part No.	KVA	Series Secondaries		Parallel Secondaries		Mechanical Dimensions					Mtg. Screw	Appr. Lbs.
		Volts	Max. Amps	Volts	Max. Amps	L (Max.)	W (Max.)	H (Max.)	ML ±½	MW ±1/16		
SU-¼	¼	0/416/440/480	0.55	0/208/220/240	1.1	5 5/16	4¼	5¼	4⅜	2½	#10	12
SU-½	½	0/416/440/480	1.15	0/208/220/240	2.3	5 5/16	5 5/16	5¼	4⅜	3⅝	#10	18
SU-1	1	0/416/440/480	2.25	0/208/220/240	4.5	7 7/16	6¼	7¼	6¾	4⅛	¼	33
SU-2	2	0/416/440/480	4.5	0/208/220/240	9	7 7/16	8¼	7¼	6¾	6	¼	56
SU-3	3	0/416/440/480	7	0/208/220/240	14	7 7/16	9¼	7¼	6¾	7	¼	70
SU-5	5	0/416/440/480	11.5	0/208/220/240	23	7 7/16	10¾	7¼	6¾	8½	¼	89
SU-7.5	7.5	0/416/440/480	15.5	0/208/220/240	31	9	9	8	7½	6½	¼	105
SU-10	10	0/416/440/480	20.5	0/208/220/240	41	9	12	8	7½	9	¼	150

"UP SERIES" 110/220 Dual Primary To 0/130/135/140 V. Sec. (Primary & Secondary may be reversed)



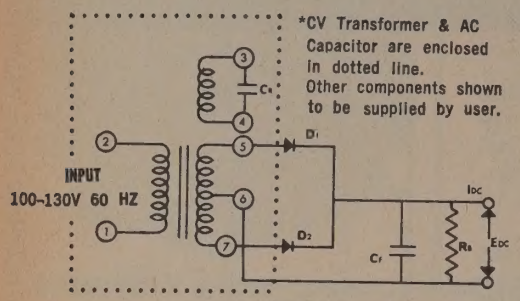
The "UP" line utilizes the same dual primary as the "DU" line. It has, however, a single secondary rated at 0/130/135/140 volts.

This type is quite useful to boost low line voltages or raise line voltages to compensate for drops in series elements. It also finds application in bridge rectifiers for DC voltage outputs of approximately 115 to 130 volts.

Part No.	KVA	Secondary Volts	Max. Secondary Amps	L (Max.)	W (Max.)	H (Max.)	ML ± 1/32	MW ± 1/16	Mtg. Screw	Appr. Lbs.
UP-2	¼	0/130/135/140	2	5 5/16	4¼	5¼	4⅜	2½	#10	12
UP-4	½	0/130/135/140	4	5 5/16	5 5/16	5¼	4⅜	3⅝	#10	18
UP-8	1	0/130/135/140	8	7 9/16	6¼	7¼	6¾	4⅛	¼	33
UP-15	2	0/130/135/140	15	7 9/16	8¼	7¼	6¾	6	¼	56
UP-25	3	0/130/135/140	25	7 9/16	9¼	7¼	6¾	7	¼	70
UP-40	5	0/130/135/140	40	7 9/16	10¾	7¼	6¾	8½	¼	89

CONSTANT VOLTAGE TRANSFORMERS

FOR USE IN DC POWER SUPPLIES (TYPE CDC)



SCHEMATIC DIAGRAM *

CDC CONSTANT VOLTAGE TRANSFORMERS

Signal's CDC Regulating Transformers are specifically manufactured for use in DC Power Supplies. They are designed and rated for use with a full wave center-tapped silicon rectifier. CDC transformers are operated in ferro-resonance and are used in conjunction with an AC **tuning capacitor** (Cr in schematic diagram), which is supplied with the transformer.

In order to construct a regulated power supply the only other parts necessary are two diodes (D_1 and D_2), an electrolytic computer grade capacitor (C_f) and a bleeder resistor (R_b). These are standard shelf items.

The specification chart lists specific outputs available and the recommended auxiliary components. Part numbers are coded in terms of DC outputs, e.g., CDC-15-2 will give an output of 15V DC at 2 amps DC.

Electrical performance is completely specified. The DC voltage is constant to ±1% over the line voltage range of 100 to 130V at 60 HZ. The nominal output is held to ±2%. Closer tolerance on nominal output (±1%) can be obtained on special order at slightly higher cost.

Load regulation is specified as the rise in dc voltage output (increase in E_{dc}) from full load to the no load, ¼ load, and ½ load points. The filter capacitor (C_f) specified should be used and will yield the values of ripple voltage shown.

A significant protection feature is the fact that the DC short circuit current is limited to a maximum of 2 times rated current (3 times in size "C-6" units). This protects the entire circuit against shorts.

OUTPUT D.C. VOLTS	DC Amps I_{dc}	Part Number	Load Regulation (Rise in DCV from FL) NL-FL	¼-FL	½-FL	Ripple Volts (RMS)	Recommended Diodes (D_1 & D_2) P.I.V.	I/Cell	Filter† Cap. (C_f) MFD.	DCWV	Bleeder‡ Resistor (R_b) Ohms	Watts	Style* & Size
5 vdc	1	CDC-5-1	2.0	1.5	0.8	0.3	50	1	4K	10	50	2	C-6
	5	CDC-5-5	1.0	0.7	0.5	0.4	50	6	20K	10	10	5	B-25
	10	CDC-5-10	1.0	0.7	0.5	0.4	50	16	30K	10	5	10	B-50
	18	CDC-5-18	1.0	0.7	0.4	0.4	50	60	80K	10	4	10	B-120
	50	CDC-5-50	0.7	0.4	0.2	0.4	50	100	200K	10	3	20	B-250
6 vdc	0.8	CDC-6-0.8	2.0	1.5	0.8	0.3	50	1	3K	10	50	2	C-6
	4.5	CDC-6-4.5	1.0	0.7	0.5	0.4	50	6	15K	10	10	5	B-25
	9.0	CDC-6-9	1.0	0.7	0.5	0.4	50	16	25K	10	6	10	B-50
	16	CDC-6-16	1.0	0.7	0.4	0.4	50	16	75K	10	5	10	B-120
	40	CDC-6-40	0.7	0.4	0.2	0.4	50	60	150K	10	3	20	B-250
	75	CDC-6-75	0.8	0.6	0.4	0.4	50	100	200K	10	1	40	B-500
12 vdc	0.4	CDC-12-0.4	3.0	2.2	1.1	0.3	100	1	2K	15	150	2	C-6
	2.2	CDC-12-2.2	1.5	1.0	0.6	0.4	100	3	8K	15	25	10	B-25
	4.5	CDC-12-4.5	1.2	0.7	0.5	0.4	100	6	15K	15	25	10	B-50
	9.0	CDC-12-9	1.0	0.7	0.4	0.4	100	16	40K	15	10	20	B-120
	20	CDC-12-20	0.8	0.5	0.3	0.3	100	40	75K	15	5	40	B-250
	38	CDC-12-38	0.9	0.7	0.4	0.4	100	60	120K	15	4	50	B-500
15 vdc	0.35	CDC-15-0.35	3.5	2.3	1.3	0.3	100	1	1.5K	20	200	2	C-6
	2.0	CDC-15-2	1.6	1.0	0.6	0.4	100	2	7K	20	50	5	B-25
	3.5	CDC-15-3.5	1.3	0.8	0.6	0.3	100	6	15K	20	25	10	B-50
	8	CDC-15-8	1.5	0.9	0.6	0.4	100	16	30K	20	15	20	B-120
	16	CDC-15-16	1.0	0.8	0.5	0.3	100	16	75K	20	10	30	B-250
	30	CDC-15-30	1.0	0.6	0.4	0.3	100	40	120K	20	5	50	B-500
18 vdc	0.32	CDC-18-0.32	3.7	2.3	1.3	0.4	100	1	1K	20	300	2	C-6
	1.8	CDC-18-1.8	2.0	1.2	0.7	0.4	100	2	7K	20	100	5	B-25
	3	CDC-18-3	1.7	1.2	0.7	0.3	100	3	12K	20	50	10	B-50
	6	CDC-18-6	1.7	0.9	0.6	0.3	100	6	30K	20	25	20	B-120
	13	CDC-18-13	1.3	1.0	0.7	0.3	100	16	50K	20	15	30	B-250
	26	CDC-18-26	1.5	0.6	0.5	0.3	100	40	120K	20	10	50	B-500
24 vdc	0.25	CDC-24-0.25	4.0	3.4	1.5	0.3	200	1	1K	25	350	2	C-6
	1.2	CDC-24-1.2	2.0	1.2	0.7	0.4	200	2	5K	25	100	10	B-25
	2.1	CDC-24-2.1	1.8	1.5	1.0	0.3	200	3	10K	25	50	20	B-50
	4.5	CDC-24-4.5	2.0	1.0	0.7	0.3	200	6	25K	25	50	20	B-120
	11	CDC-24-11	1.3	1.0	0.5	0.3	200	16	50K	25	25	30	B-250
	20	CDC-24-20	1.5	0.7	0.3	0.3	200	40	75K	25	15	50	B-500
28 vdc	0.22	CDC-28-0.22	5.6	4.0	2.3	0.3	200	1	1K	35	500	2	C-6
	1.0	CDC-28-1	2	1.5	0.6	0.3	200	1	5K	35	100	10	B-25
	2.0	CDC-28-2	2.5	1.5	1.0	0.3	200	2	10K	35	100	10	B-50
	4.0	CDC-28-4	2.0	1.2	0.8	0.3	200	6	25K	35	50	20	B-120
	9.0	CDC-28-9	1.3	1.0	0.5	0.3	200	16	50K	35	25	40	B-250
	16	CDC-28-16	1.7	0.8	0.3	0.3	200	16	75K	35	15	60	B-500
36 vdc	0.18	CDC-36-0.18	7.0	5.5	3.5	0.3	200	1	1K	50	1K	2	C-6
	0.9	CDC-36-0.9	2.0	1.4	0.8	0.3	200	1	5K	50	150	10	B-25
	1.8	CDC-36-1.8	3.0	2.0	1.3	0.3	200	2	8K	50	100	20	B-50
	3.2	CDC-36-3.2	2.5	1.4	0.7	0.3	200	3	20K	50	100	20	B-120
	6	CDC-36-6	2.0	1.5	1.0	0.3	200	16	25K	50	25	60	B-250
	12	CDC-36-12	1.8	1.0	0.7	0.3	200	16	50K	50	25	60	B-500
48 vdc	0.12	CDC-48-0.12	8.0	6.0	4.0	0.2	200	1	1K	50	1.5K	2	C-6
	0.6	CDC-48-0.6	2.5	2.0	1.0	0.3	200	1	3K	50	300	10	B-25
	1.5	CDC-48-1.5	3.0	1.5	1.0	0.3	200	2	6K	50	250	10	B-50
	2.5	CDC-48-2.5	3.0	1.5	1.0	0.2	200	2	15K	50	200	20	B-120
	5.0	CDC-48-5	2.0	1.0	0.6	0.3	200	6	15K	50	50	50	B-250
	10	CDC-48-10	2.0	1.0	0.5	0.4	200	16	25K	50	50	50	B-500
60 vdc	0.1	CDC-60-0.1	8.0	6.0	4.0	0.2	400	1	1K	75	2.5K	2	C-6
	0.5	CDC-60-0.5	3.0	2.0	1.2	0.4	400	1	2K	75	500	10	B-25
	1.2	CDC-60-1.2	4.2	3.0	2.0	0.3	400	2	5K	75	400	10	B-50
	2.0	CDC-60-2	3.5	2.0	1.0	0.3	400	2	10K	75	300	20	B-120
	4	CDC-60-4	1.5	1.2	1.0	0.4	400	6	12K	75	75	50	B-250
	8	CDC-60-8	3.0	2.0	0.6	0.4	400	16	20K	75	75	50	B-500
120 vdc	0.05	CDC-120-0.05	9.0	8.0	5.0	0.2	400	1	0.5K	150	10K	2	C-6
	0.3	CDC-120-0.3	6.0	4.0	2.5	0.3	400	1	2K	150	2K	10	B-25
	0.6	CDC-120-0.6	5.5	3.5	2.5	0.3	400	1	3K	150	1.5K	10	B-50
	1.0	CDC-120-1	5.5	3.2	2.0	0.4	400	1	4K	150	1K	20	B-120
	2	CDC-120-2	4.0	3.0	2.0	0.3	400	2	9K	150	250	60	B-250
	4	CDC-120-4	4.0	2.0	0.8	0.4	400	6	15K	150	150	100	B-500

* See mechanical dimensions on opposite page.
‡ Bleeder resistor may be eliminated if load current does not fall to zero. DC amp rating may be increased accordingly.
† May be reduced if ripple requirements are less severe.

CONSTANT VOLTAGE TRANSFORMERS

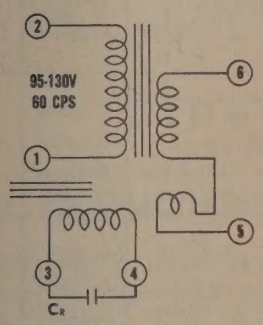
FOR USE IN AC APPLICATIONS (TYPE ACV)

Signal ACV transformers are manufactured for use with AC loads. They are simple and rugged designs and will regulate to within plus or minus 1% for input variations from 95-130V at 60 cps. If regulation of plus or minus ½% or better is desired, special units can be made to your order. ACV transformers will regulate with loads that are not unity power factor.

Full regulation is maintained at any load from about 20% to 100%. Overload current is limited to a maximum of 200% of rated current at short circuit. The 6.4 and 12.8V ratings are ideal for use with tube or lamp loads since the short circuit current rating limits the inrush current to cold filaments. Stabilization of the voltage results in longer filament life.

ACV transformers are "normal" harmonic type with approximately a square wave output.

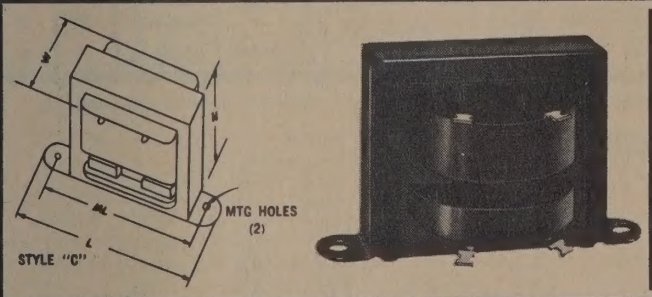
PART NO.	VOLTS AC	AMPS AC	STYLE & SIZE
25 ACV-6.4	6.4	4	B-25
25 ACV-12.8	12.8	2	B-25
25 ACV-26	26	1	B-25
25 ACV-118	118	0.25	B-25
50 ACV-6.4	6.4	8	B-50
50 ACV-12.8	12.8	4	B-50
50 ACV-26	26	2	B-50
50 ACV-118	118	0.43	B-50
120 ACV-6.4	6.4	20	B-120
120 ACV-12.8	12.8	10	B-120
120 ACV-26	26	5	B-120
120 ACV-118	118	1	B-120
250 ACV-12.8	12.8	20	B-250
250 ACV-26	26	10	B-250
250 ACV-118	118	2.2	B-250
500 ACV-118	118	4.5	B-500

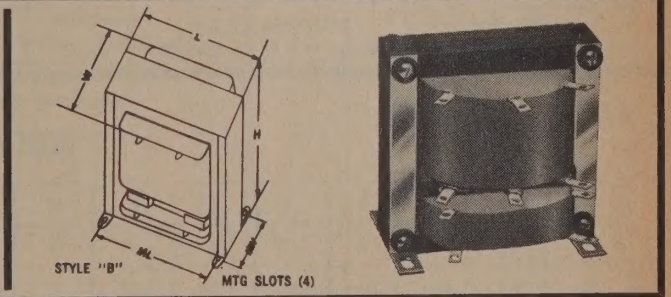


CAPACITOR WINDING SCHEMATIC DIAGRAM

MECHANICAL DIMENSIONS

STYLE & SIZE	L	W	H	ML	MW	MTG. SCREW
C-6	3¼	1⅞	1 15/16	2 13/16	—	#8
B-25	3	2⅝	3⅛	2⅝	1 15/16	#8
B-50	3	3⅝	3⅛	2⅝	2 9/16	#8
B-120	4	3⅞	4 1/16	3½	2⅜	#10
B-250	4	5¾	4 1/16	3½	3 15/16	#10
B-500	5	5¾	5 1/16	4⅜	3 15/16	#10





ADVANTAGES OF CONSTANT VOLTAGE TRANSFORMERS

REGULATION — output regulated to plus or minus 1% for line voltage variations of 95 to 130V at 60 cps.

SELF-PROTECTION — against output short circuit. Current limited to a maximum of 2 times rated current.

MECHANICALLY RUGGED — as resistant to mechanical shock as conventional power transformers.

NO MOVING PARTS — no adjustment or maintenance necessary.

SQUARE WAVE OUTPUT — ideal for use in rectifier circuits — little filtering needed.

HIGH DEGREE OF ISOLATION — between input and output circuits — both physical and electrical isolation, electro-static shields not necessary.

RESONATING CAPACITOR — supplied with transformers.

EPOXY IMPREGNATION — minimizes acoustic noise.

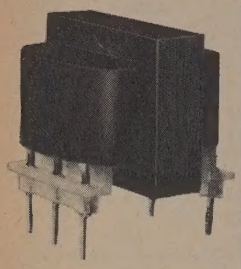
SIGNAL TRANSFORMER CO., INC
ENGINEERS • DESIGNERS • MANUFACTURERS
FACTORY: 1 JUNIUS STREET, BROOKLYN, NEW YORK 11212 — (212) 498-5111

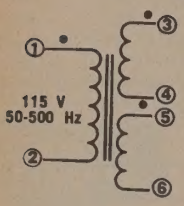
SHIPPED FROM STOCK IMMEDIATELY

MINIATURE PLUG-IN POWER TRANSFORMERS

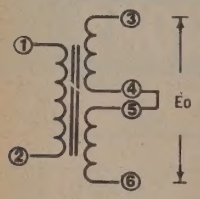
FOR PRINTED CIRCUIT APPLICATIONS

low profile • low regulation • 50-500 Hz

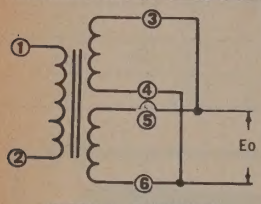




BASIC SCHEMATIC



SERIES CONNECTED



PARALLEL CONNECTED

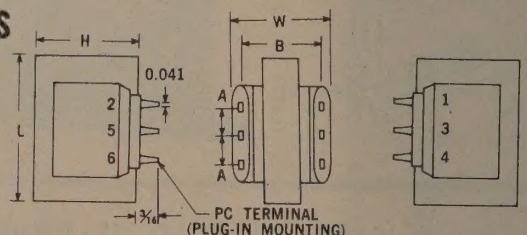
IDEAL FOR — SINGLE OR DUAL OUTPUT DC SUPPLIES — ISOLATED CONTROL CIRCUIT AND REFERENCE SUPPLIES.

SECONDARY VOLTS	Part No.	Secondary Milliamps Series	Secondary Milliamps Parallel	Size*	SECONDARY VOLTS	Part No.	Secondary Milliamps Series	Secondary Milliamps Parallel
10 V.C.T. or 5 V.	PC-10-120	120	240	37	40 V.C.T. or 20 V.	PC-40-30	30	60
SERIES 10 V.C.T.	PC-10-440	440	880	50	SERIES 40 V.C.T.	PC-40-110	110	220
PARALLEL 5 V @ 2 x CURRENT	PC-10-1000	1000	2000	62	PARALLEL 20 V @ 2 x CURRENT	PC-40-250	250	500
12.6 V.C.T. or 6.3 V.	PC-12-100	100	200	37	56 V.C.T. or 28 V.	PC-56-20	20	40
SERIES 12.6 V.C.T.	PC-12-350	350	700	50	SERIES 56 V.C.T.	PC-56-80	80	160
PARALLEL 6.3 V @ 2 x CURRENT	PC-12-800	800	1600	62	PARALLEL 28 V @ 2 x CURRENT	PC-56-180	180	360
16 V.C.T. or 8 V.	PC-16-75	75	150	37	88 V.C.T. or 44 V.	PC-88-15	15	30
SERIES 16 V.C.T.	PC-16-260	260	520	50	SERIES 88 V.C.T.	PC-88-50	50	100
PARALLEL 8 V @ 2 x CURRENT	PC-16-640	640	1280	62	PARALLEL 44 V @ 2 x CURRENT	PC-88-120	120	240
20 V.C.T. or 10 V.	PC-20-60	60	120	37	120 V.C.T. or 60 V.	PC-120-10	10	20
SERIES 20 V.C.T.	PC-20-220	220	440	50	SERIES 120 V.C.T.	PC-120-35	35	70
PARALLEL 10 V @ 2 x CURRENT	PC-20-500	500	1000	62	PARALLEL 60 V @ 2 x CURRENT	PC-120-85	85	170
24 V.C.T. or 12 V.	PC-24-50	50	100	37	180 V.C.T. or 90 V.	PC-180-6	6	12
SERIES 24 V.C.T.	PC-24-180	180	360	50	SERIES 180 V.C.T.	PC-180-24	24	48
PARALLEL 12 V @ 2 x CURRENT	PC-24-450	450	900	62	PARALLEL 90 V @ 2 x CURRENT	PC-180-55	55	110
34 V.C.T. or 17 V.	PC-34-35	35	70	37	230 V.C.T. or 115 V.	PC-230-5	5	10
SERIES 34 V.C.T.	PC-34-125	125	250	50	SERIES 230 V.C.T.	PC-230-20	20	40
PARALLEL 17 V @ 2 x CURRENT	PC-34-300	300	600	62	PARALLEL 115 V @ 2 x CURRENT	PC-230-40	40	80

*Size shown applies to both right and left hand units which are on same horizontal line.

DIMENSIONS

Size	VA	L	W	H	A	B	Oz.
37	1.2	1⅜	1⅛	1 3/16	0.312	1.00	3
50	4.4	1⅝	1¼	1⅜	0.400	1.10	5
62	10	1⅞	1 7/16	1⅝	0.400	1.30	9



MECHANICAL OUTLINE

METHOD OF DETERMINING SECONDARY CURRENT RATINGS

RECTIFIER TYPE	FILTER TYPE	RMS SECONDARY CURRENT
Full Wave Center-Tap	Choke Input	.7 X DC amps
Full Wave Center-Tap	Capacitor Input	1.2 X DC amps
Full Wave Bridge	Choke Input	= to DC amps
Full Wave Bridge	Capacitor Input	1.8 X DC amps

Signal's PC Transformers are constructed of prime raw materials using Class S insulation and nylon bobbins with PC pins molded directly in the bobbin wall. They are vacuum varnish impregnated and 100% tested for all parameters before shipment.

Primaries are rated at 115 V. 50 to 500 Hz. Dual secondaries provide two outputs, or secondaries may be series or parallel connected. This results in a wide variety of output combinations. Load regulation is limited to a maximum of 20%.

SPECIAL PC TRANSFORMERS OR CHOKES — PROMPT QUOTATIONS

SIGNAL TRANSFORMER CO., INC

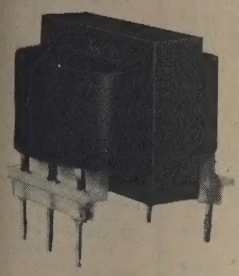
FACTORY: 1 JUNIUS ST., BROOKLYN, N. Y. 11212 • (212) 498-5111

MINIATURE PLUG-IN POWER TRANSFORMERS

FOR PRINTED CIRCUIT APPLICATIONS

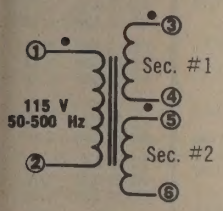
low profile • low regulation • 50-500 Hz

SHIPPED FROM STOCK IMMEDIATELY



FOR INDICATOR TUBE & I.C. APPLICATIONS

"PCN" transformers provide ideal outputs for use in indicator tube and I.C. applications. 175 or 130 V. can be used for DC supplies for "Nixies" and 6.3 or 12.6 V. can supply power for associated I.C. circuitry or supplies.



SECONDARY VOLTS	Part No.	Secondary Milliamps Sec. #1 (3-4)	Secondary Milliamps Sec. #2 (5-6)	Size *	SECONDARY VOLTS	Part No.	Secondary Milliamps Sec. #1 (3-4)	Secondary Milliamps Sec. #2 (5-6)
175 V. & 6.3 V.	PCN-37-1	4	80	37	130 V. & 6.3 V.	PCN-37-3	5.5	80
SEC. #1 (3-4) 175 V.	PCN-50-1	12	350	50	SEC. #1 (3-4) 130 V.	PCN-50-3	16	350
SEC. #2 (5.6) 6.3 V.	PCN-62-1	20	1000	62	SEC. #2 (5-6) 6.3 V.	PCN-62-3	27	1000
175 V. & 12.6 V.	PCN-37-2	4	40	37	130 V. & 12.6 V.	PCN-37-4	5.5	40
SEC. #1 (3-4) 175 V.	PCN-50-2	12	175	50	SEC. #1 (3-4) 130 V.	PCN-50-4	16	175
SEC. #2 (5-6) 12.6 V.	PCN-62-2	20	500	62	SEC. #2 (5-6) 12.6 V.	PCN-62-4	27	500

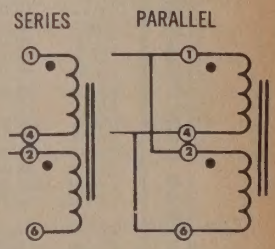
*Size shown applies to both right and left hand units which are on same horizontal line.

DUAL INDUCTORS FOR SMOOTHING & SCR SURGE LIMITING

"PCC" dual filter chokes find use in DC supply filters or as inductive elements in switching circuits. Another application is to limit current surge (di/dt) in SCR circuits. These chokes may also be used as AC reactors.

Part No.	Series Connected Ind. (MHY)	Series Connected Curr. (Amps)	Series Connected Resis. (Ohms)	Parallel Connected Ind. (MHY)	Parallel Connected Curr. (Amps)	Parallel Connected Resis (Ohms)	E-T* (Volt-Millisec)	Size
PCC-1-37	120	0.375	6.0	30	0.75	1.5	25	37
PCC-2-37	80	0.5	3.8	20	1.0	0.95	20	37
PCC-1-50	88	0.75	3.2	22	1.5	0.80	30	50
PCC-2-50	40	1.0	2.0	10	2.0	0.5	25	50
PCC-1-62	32	1.5	1.0	8	3.0	0.25	25	62
PCC-2-62	20	2.0	0.64	5	4.0	0.16	20	62

*Based on maximum flux density of 5,000 gauss. (approx. value series connection)



Note Pins 3 & 5 are Dummy Terminals

SPECIAL "PC" COMPONENTS

Signal maintains a unique department which specializes in the design and production of "PC" type transformers and chokes.

It is equipped with the most modern automated coil winding and lamination stacking machinery. Specialized production test equipment assures uniform, high quality transformers at the most economical price. This facility is being constantly improved and expanded to meet the growing demand for our designs.

The "PC" items shown here are stocked in depth at our factory for immediate delivery. However, they represent only a small fraction of our total shipments. The major portion consists of custom designs or variations for our customer's special requirements.

Please contact us for prompt quotations on any of your special requirements for "PC" or other bobbin wound components.

SPECIAL PC TRANSFORMERS OR CHOKES — PROMPT QUOTATIONS

SIGNAL TRANSFORMER CO., INC

FACTORY: 1 JUNIUS ST., BROOKLYN, N. Y. 11212 • (212) 498-5111

PRICE LIST

Part No.	User Net
10-0.1	3.74
10-0.25	3.96
10-0.5	4.13
10-1	4.57
10-2	5.72
10-4	7.15
10-6	9.24
10-8	9.90
10-12	11.55
10-25	20.02
10-50	29.15
10-100	47.30
12.8-0.1	3.74
12.8-0.25	4.02
12.8-0.5	4.40
12.8-1	4.90
12.8-2A	5.67
12.8-2	6.99
12.8-4	8.47
18.8-6	9.90
12.8-8	10.56
12.8-12	12.10
12.8-25	24.64
12.8-50	33.55
12.8-100	48.40
16-0.1	3.85
16-0.25	4.07
16-0.5	4.35
16-1	4.73
16-2	5.89
16-4	8.91
16-6	10.45
16-8	11.33
16-12	14.03
16-25	26.40
16-50	41.80
16-100	70.40
24-0.1	3.85
24-0.25	4.51
24-0.5	4.95
24-1A	5.39
24-1	6.99
24-2	8.03
24-4	10.07
24-6	12.10
24-8	16.72
24-12	19.58
24-20	24.64
24-25	33.00
24-50	48.40
24-100	77.00
36-0.1	3.96
36-0.25	4.40
36-0.5	5.01
36-1A	6.22
36-1	7.26
36-2	8.58
36-4	11.99
36-6	17.16
36-8	18.37
36-12	22.00
36-20	37.07
36-25	43.56
36-30	48.40
36-50	60.50
36-100	118.80
56-0.1	4.18
56-0.25	4.90
56-0.5	5.50
56-1	8.80
56-2	9.79
56-4	16.39
56-6	23.65
56-8	29.15
56-12	38.50
56-25	62.70
56-50	112.20
56-100	166.10
68-01	4.29
68-025	4.84
68-0.5A	5.61
68-0.5	7.43
68-1	8.69
68-2	11.00
68-4	20.68
68-6	23.65
68-8	28.38
68-12	41.80
68-25	62.70
68-50	113.30
80-01	4.40
80-0.25	5.06
80-0.5A	6.16
80-0.5	7.43
80-1	9.35
80-2	13.97
80-4	23.10
80-6	29.70
80-8	35.75
80-12	45.10
80-25	76.45
80-50	136.40
88-0.1	4.51
88-0.25	5.28
88-0.5	6.27
88-1	9.68
88-2	14.19
88-4	24.20
88-6	30.25
88-8	36.85
88-12	46.20
88-25	79.20
88-50	140.80
120-0.5	9.02
120-1	11.44
120-2	16.17
120-4	30.80
120-6	37.40
120-8	46.75
120-12	57.75
120-20	84.15
160-0.5	9.57
160-1	14.19
160-2	19.80
160-4	34.10
160-8	53.35
160-12	71.50
180-0.5	10.01
180-1	15.62
180-2	22.00
180-4	39.60
180-6	46.75
180-8	57.20
180-12	85.80
230-0.5	11.55
230-1	16.50
230-2	23.65
230-4	46.20
230-6	55.00
300-0.5	12.10
300-1	21.67
300-2	34.10
300-4	53.35
CH-0.1	2.48
CH-0.2	2.86
CH-0.25	3.30
CH-0.5	4.18
CH-1	6.27
CH-2	7.26
CH-4	9.68
CH-6	12.10
CH-8	15.40
CH-12	19.80
CH-16	22.00
CH-20	21.45
CH-25	30.25
CH-30	36.30
CH-50	41.80
CH-100	47.30
CH-200	74.80
CH-250	84.00
CH-500	101.20
CH-1000	112.20
CL-1-2	3.45
CL-2-4	4.35
CL-4-8	7.35
CL-6-12	8.40
CL-12-24	12.50
CL-25-50	14.00
CL-50-100	18.00
E-10-0.1	5.61
E-10-0.25	5.97
E-10-0.5	6.38
E-10-1	6.99
E-10-2	8.80
E-10-4	12.21
E-10-6	14.30
E-10-8	15.40
E-10-12	18.21
E-10-25	29.48
E-10-50	46.42
E-10-100	75.90
E-12.8-0.1	5.61
E-12.8-0.25	6.06
E-12.8-0.5	6.66
E-12.8-1	7.43
E-12.8-2A	8.64
E-12.8-2	10.73
E-12.8-4	13.04
E-12.8-6	15.29
E-12.8-8	16.39
E-12.8-12	18.92
E-12.8-25	38.94
E-12.8-50	53.46
E-12.8-100	77.55
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E-16.025	6.13
E-16-0.5	6.56
E-16-1	7.17
E-16-2	8.98
E-16-4	13.70
E-16-6	16.17
E-16-8	17.66
E-16-12	22.00
E-16-25	41.80
E-16-50	67.10
E-16-100	112.20
E-24-0.1	5.78
E-24-0.25	6.82
E-24-0.5	7.54
E-24-1A	8.25
E-24-1	10.75
E-24-2	12.34
E-24-4	16.28
E-24-6	18.76
E-24-8	25.96
E-24-12	30.58
E-24-20	38.50
E-24-25	51.81
E-24-50	76.45
E-24-100	122.10
E-36-0.1	5.94
E-36-0.25	6.63
E-36-0.5	7.57
E-36-1A	9.41
E-36-1	11.06
E-36-2	13.09
E-36-4	18.48
E-36-6	26.62
E-36-8	28.60
E-36-12	34.32
E-36-20	58.08
E-36-25	68.42
E-36-30	76.45
E-36-50	96.25
E-36-100	190.30
E-56-0.1	6.27
E-56-0.25	7.37
E-56-0.5	8.31
E-56-1	13.31
E-56-2	14.85
E-56-4	25.08
E-56-6	36.41
E-56-8	45.21
E-56-12	59.95
E-56-25	98.45
E-56-50	177.10
E-56-100	264.00
E-68-0.1	6.44
E-68-0.25	7.28
E-68-0.5A	8.47
E-68-0.5	11.24
E-68-1	13.20
E-68-2	16.83
E-68-4	31.68
E-68-6	36.41
E-68-8	44.00
E-68-12	65.45
E-68-25	99.00
E-68-50	181.50
E-80-0.1	6.60
E-80-0.25	7.65
E-80-0.5A	9.35
E-80-0.5	11.33
E-80-1	14.41
E-80-2	21.56
E-80-4	35.86
E-80-6	46.20
E-80-8	56.10
E-80-12	71.17
E-80-25	121.00
E-80-50	217.80
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E-88-0.25	7.95
E-88-0.5	9.52
E-88-1	14.80
E-88-2	21.89
E-88-4	37.51
E-88-6	47.08
E-88-8	57.75
E-88-12	72.93
E-88-25	125.40
E-88-50	224.40
E-120-0.5	13.53
E-120-1	17.27
E-120-2	24.64
E-120-4	47.41
E-120-6	57.86
E-120-8	72.38
E-120-12	91.30
E-120-20	134.20
E-160-0.5	14.36
E-160-1	21.45
E-160-2	30.14
E-160-4	52.47
E-160-8	83.16
E-160-12	113.30
E-180-0.5	15.02
E-180-1	23.54
E-180-2	33.44
E-180-4	61.05
E-180-6	72.38
E-180-8	89.10
E-180-12	135.30
E-230-0.5	17.33
E-230-1	25.08
E-230-2	36.30
E-230-4	71.50
E-230-6	85.25
E-300-0.5	18.15
E-300-1	33.00
E-300-2	52.80
E-300-4	83.16
E-CH-0.1	3.19
E-CH-0.2	3.74
E-CH-0.25	4.35
E-CH-0.5	5.50
E-CH-1	8.36
E-CH-2	9.68
E-CH-4	12.98
E-CH-6	16.28
E-CH-8	20.79
E-CH-12	26.95
E-CH-16	30.14
E-CH-20	29.48
E-CH-25	41.80
E-CH-30	50.27
E-CH-50	57.97
E-CH-100	66.00
E-CH-200	105.60
E-CH-500	145.20
E-CH-1000	162.80
H-10-0.1	10.84
H-10-0.25	11.55
H-10-0.5	12.05
H-10-1	13.31
H-10-2	16.78
H-10-4	21.23
H-10-6	27.72
H-10-8	29.81
H-10-12	34.87
H-10-25	60.72
H-10-50	85.58
H-10-100	146.30
H-12.8-0.1	10.84
H-12.8-0.25	11.66
H-12.8-0.5	12.82
H-12.8-1	14.30
H-12.8-2A	16.61
H-12.8-2	20.63
H-12.8-4	25.08
H-12.8-6	29.37
H-12.8-8	31.68
H-12.8-12	36.52
H-12.8-25	75.13
H-12.8-50	103.07
H-12.8-100	150.70
H-16-0.1	11.22
H-16-0.25	11.83
H-16-0.5	12.65
H-16-1	13.86
H-16-2	17.27
H-16-4	26.18
H-16-6	30.80
H-16-8	33.55
H-16-12	41.80
H-16-25	79.20
H-16-50	125.40
H-16-100	211.20
H-24-0.1	11.22
H-24-0.25	13.09
H-24-0.5	14.41
H-24-1A	15.79
H-24-1	20.57
H-24-2	23.65
H-24-4	29.92
H-24-6	36.08
H-24-8	50.27
H-24-12	58.85
H-24-20	74.14
H-24-25	99.55
H-24-50	147.40
H-24-100	235.40
H-36-0.1	11.50
H-36-0.25	12.76
H-36-0.5	14.58
H-36-1A	18.15
H-36-1	21.29
H-36-2	25.19
H-36-4	35.31
H-36-6	50.60
H-36-8	54.45
H-36-12	65.34
H-36-20	110.00
H-36-25	129.80
H-36-30	144.10
H-36-50	181.50
H-36-100	358.60
H-56-0.1	12.10
H-56-0.25	14.19
H-56-0.5	16.01
H-56-1	25.63
H-56-2	28.60
H-56-4	47.96
H-56-6	69.41
H-56-8	86.24
H-56-12	114.40
H-56-25	187.00
H-56-50	335.50
H-56-100	500.50
H-68-0.1	12.43
H-68-0.25	14.06
H-68-0.5A	16.39
H-68-0.5	21.67
H-68-1	25.30
H-68-2	32.23
H-68-4	61.05
H-68-6	70.18
H-68-8	84.70
H-68-12	124.85
H-68-25	191.40
H-68-50	347.60
H-80-0.1	12.76
H-80-0.25	14.69
H-80-0.5A	18.10
H-80-0.5	22.00
H-80-1	27.61
H-80-2	41.47
H-80-4	68.75
H-80-6	89.10
H-80-8	107.58
H-80-12	136.40
H-80-25	233.20
H-80-50	418.00
H-88-0.1	13.09
H-88-0.25	15.35
H-88-0.5	18.43
H-88-1	28.60
H-88-2	42.13
H-88-4	72.05
H-88-6	90.75
H-88-8	111.10
H-88-12	139.70
H-88-25	240.90
H-88-50	431.20
H-120-0.5	26.18
H-120-1	33.44
H-120-2	47.52
H-120-4	91.30
H-120-6	110.00
H-120-8	139.70
H-120-12	172.70
H-120-20	255.20
H-160-0.5	27.72
H-160-1	41.47
H-160-2	58.08
H-160-4	101.20
H-160-8	159.50
H-160-12	214.50
H-180-0.5	29.04
H-180-1	45.65
H-180-2	64.57
H-180-4	116.60
H-180-6	138.60
H-180-8	170.50
H-180-12	257.40
H-230-0.5	33.55
H-230-1	48.18
H-230-2	69.41
H-230-4	136.40
H-230-6	163.90
H-300-0.5	35.09
H-300-1	63.25
H-300-2	100.10
H-300-4	157.30
H-CH-0.1	7.15
H-CH-0.2	8.31
H-CH-0.25	9.63
H-CH-0.5	12.21
H-CH-1	18.37
H-CH-2	21.45
H-CH-4	28.82
H-CH-6	36.30
H-CH-8	46.42
H-CH-12	59.95
H-CH-16	66.88
H-CH-20	65.23
H-CH-25	92.18
H-CH-30	111.10
H-CH-50	128.70
H-CH-100	146.30
6-250	78.00
9-250	100.00
12-250	110.00
6-500	107.80
9-500	139.70
12-500	173.80
3-1000	114.40
6-1000	184.80
MV-1	14.85
MV-2	17.60
MV-4	23.10
MV-6	31.90
MV-12	44.00
3PH-24-50	99.00
3PH-24 100	139.70
3PH-24 200	227.70
3PH-48-30	99.00
3PH-48-60	139.70
3PH-48 120	227.70
SD-100	8.03
SD-150	9.46
SD-250	11.00
SD-350	14.30
SD-500	16.61
SD-750	21.18
SD-1000	25.30
SD-1500	29.70
SD-2000	38.50
SDO-100	5.50
SDO-150	6.60
SDO-250	8.14
SDO-350	11.55
SDO-500	13.64
SDO-750	18.15
SDO-1000	22.22
SDO-1500	25.85
SDO-2000	34.98
HSD-3000	60.50
HSD-4000	66.00
HSD-5000	75.90
HSD-6000	83.60
DU-¼	30.58
DU-½	37.95
DU-1	60.50
DU-2	82.50
DU-3	117.70
DU-5	158.40
DU-7½	203.50
DU-10	258.50
SU-¼	31.50
SU-½	39.00
SU-1	62.00
SU-2	84.00
SU-3	120.00
SU-5	160.00
SU-7.5	205.00
SU-10	260.00
UP-2	30.80
UP-4	35.75
UP-8	58.30
UP-15	84.70
UP-25	108.90
UP-40	151.80
CDC-5-1	15.60
CDC-5-5	22.10
CDC-5-10	26.10
CDC-5-18	32.70
CDC-5-50	50.00
CDC-6-0.8	15.40
CDC-6-4.5	21.89
CDC-6-9	25.85
CDC-6-16	32.45
CDC-6-40	48.84
CDC-6-75	74.80
CDC-12-0.4	15.35
CDC-12-2.2	21.78
CDC-12-4.5	25.74
CDC-12-9	32.34
CDC-12-20	48.51
CDC-12-38	74.58
CDC-15-0.35	15.29
CDC-15-2	21.67
CDC-15-3.5	25.63
CDC-15-8	32.12
CDC-15-16	48.29
CDC-15-30	74.36
CDC-18-0.32	15.24
CDC-18-1.8	21.56
CDC-18-3	25.52
CDC-18-6	32.01
CDC-18-13	48.29
CDC-18-26	74.25
CDC-24-0.25	15.18
CDC-24-1.2	21.45
CDC-24-2.1	25.41
CDC-24-4.5	31.90
CDC-24-11	48.18
CDC-24-20	74.03
CDC-28-0.22	15.13
CDC-28-1	21.34
CDC-28-2	25.30
CDC-28-4	31.79
CDC-28-9	48.07
CDC-28-16	73.92
CDC-36-0.18	15.02
CDC-36-0.9	21.23
CDC-36 1.8	25.19
CDC-36-3.2	31.68
CDC-36-6	47.85
CDC-36-12	73.70
CDC-48-0.12	14.96
CDC-48-0.6	21.12
CDC-48-1.5	25.08
CDC-48-2.5	31.57
CDC-48-5	47.74
CDC-48-10	73.48
CDC-60-0.1	14.74
CDC-60-0.5	21.34
CDC-60-1.2	24.97
CDC-60-2	31.35
CDC-60-4	47.63
CDC-60-8	73.37
CDC-120-0.5	14.74
CDC-120-0.3	20.90
CDC-120-0.6	24.86
CDC-120-1	31.24
CDC-120-2	47.52
CDC-120-4	73.15
25-ACV-6.4	22.00
25-ACV-12.8	21.78
25-ACV-26	21.45
25-ACV-118	20.90
50-ACV-6.4	25.96
50-ACV-12.8	25.52
50-ACV-26	24.97
50-ACV-118	24.42
120-ACV-6.4	32.01
120-ACV-12.8	31.79
120-ACV-26	31.46
120-ACV-118	31.02
250-ACV-12.8	48.40
250-ACV-26	47.30
250-ACV-118	46.09
500-ACV-118	74.80
PC-10-120	3.92
PC-10-440	4.11
PC-10-1000	4.34
PC-12-100	3.96
PC-12-350	4.14
PC-12-800	4.36
PC-16-75	4.00
PC-16-260	4.16
PC-16-640	4.38
PC-20-60	4.02
PC-20-220	4.18
PC-20-500	4.40
PC-24-50	4.13
PC-24-180	4.29
PC-24-450	4.51
PC-34-35	4.24
PC-34-125	4.40
PC-34-300	4.62
PC-40-30	4.29
PC-40-110	4.46
PC-40-250	4.68
PC-56-20	4.32
PC-56-80	4.48
PC-56-180	4.70
PC-88-15	4.35
PC-88-50	4.51
PC-88-120	4.73
PC-120-10	4.40
PC-120-35	4.57
PC-120-85	4.79
PC-180-6	4.46
PC-180-24	4.60
PC-180-55	4.82
PC-230-5	4.50
PC-230-20	4.62
PC-230-40	4.84
PCN-37-1	4.70
PCN-50-1	4.80
PCN-62-1	5.00
PCN-37-2	4.70
PCN-50-2	4.80
PCN-62-2	5.00
PCN-37-3	4.70
PCN-50-3	4.80
PCN-62-3	5.00
PCN-37-4	4.70
PCN-50-4	4.80
PCN-62-4	5.00
PCC-1-37	3.86
PCC-2-37	3.90
PCC-1-50	4.06
PCC-2-50	4.10
PCC-1-62	4.26
PCC-2-62	4.30

OEM DISCOUNT SCHEDULE

QTY.	DISCOUNT	QTY.	DISCOUNT
1-9	NET	50-99	33⅓%
10-24	15%	100-199	40%
25-49	25%	200 Over	QUOTE

TERMS: NET 30 DAYS ON APPROVED CREDIT
F.O.B. FACTORY, N. Y.

SIGNAL TRANSFORMER CO., INC

FACTORY: 1 JUNIUS STREET, BROOKLYN, NEW YORK 11212 — (212) 498-5111

STACO® Variable Autotransformers

120 VOLT SINGLE PHASE PANEL MOUNTING

Cased and uncased units designed for mounting on panels 1/4" thick to 5/8" thick. Most panel mounting units can also be bench mounted.

Mfr's Type No.	Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
171	*0-132	1.75	.23	$2\frac{13}{16} \times 2\frac{3}{32}$	3	10.50
241	0-120/140	2.4	.33	$3\frac{1}{4} \times 3\frac{1}{4} \times 3\frac{15}{16}$	4	17.50
251	*0-132	2.5	.33	$2\frac{13}{16} \times 2\frac{9}{16}$	3.5	11.25
371	*0-120/140	3.75	.53	$3\frac{3}{4} \times 3\frac{3}{4} \times 3\frac{1}{4}$	5	15.75
501	0-120/140	5.0	.70	$3\frac{3}{4} \times 3\frac{3}{4} \times 3\frac{5}{16}$	6	16.00
601	0-120/140	6.0	.84	$4\frac{1}{2} \times 4\frac{1}{2} \times 3\frac{15}{16}$	7	21.00
1010	0-120/140	10.0	1.4	$5\frac{5}{16} \times 5 \times 4\frac{3}{16}$	12	21.00
1010CT	0-120/140	10.0	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12	28.00
1210	**0-120	12.5	1.4	$5\frac{5}{16} \times 5 \times 4\frac{3}{16}$	12	23.00
1210CT	**0-120	12.5	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12	29.00
1510	0-120/140	15.0	2.1	$6\frac{1}{8} \times 6\frac{5}{8} \times 4\frac{3}{8}$	20	39.00
2510	0-120/140	25.00	3.5	$8\frac{3}{16} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23	57.00
2510CT	0-120/140	25.0	3.5	$9\frac{5}{8} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23	66.00
5010	0-140	50.0	7.0	$12\frac{1}{2} \times 12\frac{1}{2} \times 6\frac{1}{2}$	60	140.00
5010CT	0-140	50.0	7.0	$15\frac{5}{8} \times 14 \times 6\frac{1}{2}$	60	155.00

*60 cycle operation only at overvoltage.
**60 cycle operation only.

120 VOLT SINGLE PHASE MODELS WITH CORD & RECEPTACLE

All models housed in rugged cases include pilot light, switch fuse, line cord, plug and matching receptacle.
2 PF models are equipped with 2-wire cords, plugs and receptacles.
3PN models are equipped with 3-wire grounded cords, plugs, and receptacles.

Mfr's Type No.	Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
2PF171	**0-132	1.75	.23	$3\frac{7}{8} \times 3\frac{7}{8} \times 3\frac{1}{2}$	3.5	20.00
3PN171	**0-132	1.75	.23	$3\frac{7}{8} \times 3\frac{7}{8} \times 3\frac{1}{2}$	3.5	22.00
2PF371	*0-120/140	3.75	.53	$6\frac{1}{2} \times 6\frac{1}{8} \times 6\frac{1}{2}$	7.0	22.00
3PN371	*0-120/140	3.75	.53	$6\frac{1}{2} \times 6\frac{1}{8} \times 6\frac{1}{2}$	7.0	24.00
2PF501	0-120/140	5.0	.70	$6\frac{1}{2} \times 6\frac{1}{8} \times 6\frac{1}{2}$	9.0	24.00
3PN501	0-120/140	5.0	.70	$6\frac{1}{2} \times 6\frac{1}{8} \times 6\frac{1}{2}$	9.0	26.00
3PN601	0-140	6.0	.84	$4\frac{7}{8} \times 4\frac{3}{8} \times 6\frac{1}{2}$	11.0	33.00
2PF1010	0-120/140	10.0	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	29.00
3PN1010	0-120/140	10.0	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	33.00
2PF1210	**0-120	12.5	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	34.00
3PN1210	**0-120	13.5	1.4	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	36.00
3PN2210	0-140	22.0	2.4	$10\frac{3}{4} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23.0	79.00

*60 cycle operation only on overvoltage. **60 cycle operation only.

240 VOLT SINGLE PHASE PANEL MOUNTING

Cased and uncased units designed for mounting on panels 1/4" thick to 5/8" thick. Most panel mounting units can also be benched mounted.

Mfr's Type No.	Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
1020	0-240/280	3.5	.98	$5\frac{5}{16} \times 5 \times 4\frac{3}{16}$	12.0	24.00
1020CT	0-240/280	3.5	.98	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	32.00
1220	0-240	5.0	1.2	$5\frac{5}{16} \times 5 \times 4\frac{3}{16}$	12.0	26.00
1220CT	0-240	5.0	1.2	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	34.00
1520	0-240/280	9.5	2.7	$6\frac{1}{8} \times 6\frac{7}{8} \times 4\frac{13}{16}$	20.0	39.00
2520	0-240/280	10.0	2.8	$8\frac{3}{8} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23.0	57.00
2520CT	0-240/280	10.0	2.8	$9\frac{5}{8} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23.0	66.00
5020	0-240/280	28.0	7.8	$12\frac{1}{2} \times 12\frac{1}{2} \times 6\frac{1}{2}$	60.0	140.00
5020CT	0-240/280	28.0	7.8	$15\frac{5}{8} \times 14 \times 6\frac{1}{2}$	60.0	155.00

240 VOLT SINGLE PHASE MODELS WITH CORD & RECEPTACLE

All models housed in rugged cases include pilot light, switch, fuse, line cord, plug and matching receptacle.
2 PF models are equipped with 2-wire cords, plugs and receptacles.
3 PN models are equipped with 3-wire grounded cords, plugs, and receptacles.

Mfr's Type No.	Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
2PF1020	0-280	3.5	.98	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	33.00
3PN1020	0-280	3.5	.98	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	37.00
2PF1220	**0-240	5.0	1.2	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	38.00
3PN1220	**0-240	5.0	1.2	$6\frac{7}{8} \times 5 \times 4\frac{7}{16}$	12.0	40.00
3PN2520	0-240	10.0	2.8	$9\frac{5}{8} \times 7\frac{5}{8} \times 4\frac{1}{8}$	23.0	79.00

**60 cycle operation only.

120 VOLT VARIABLE ISOLATION TRANSFORMERS

STACO isolated variable autotransformers provide a means for smooth control of an electrically isolated AC voltage output. Uncased models offer isolated, non-isolated voltage doubler, and series connections with proper external hook-up. Cased models feature circuit breaker, switch pilot light, output voltmeter 3-wire grounded cord, plug, and matching receptacles. Cased models available in isolated connection only. Ratings shown are for isolated connections.

Mfr's Type No.	Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
J201	0-140	2.0	.28	$4\frac{1}{2} \times 4\frac{1}{2} \times 4\frac{7}{16}$	17.0	34.00
J401	0-140	4.0	.56	$6\frac{1}{8} \times 6\frac{5}{8} \times 4\frac{7}{8}$	13.0	46.00
J901	0-140	9.0	1.26	$8\frac{9}{32} \times 7\frac{3}{4} \times 5\frac{1}{8}$	25.0	65.00
EJ201V	0-140	2.0	.28	$7\frac{3}{8} \times 15\frac{7}{16} \times 5\frac{7}{8}$	13.0	79.00
EJ401V	0-140	4.0	.56	$9\frac{1}{2} \times 12\frac{15}{16} \times 6\frac{3}{8}$	26.0	89.00
EJ901V	0-140	9.0	1.26	$11\frac{1}{4} \times 14\frac{9}{16} \times 6\frac{5}{8}$	36.0	105.00

EJ201V, EJ401V, EJ901V have a 0-140 VAC and 0-120 VDC at full rated current available at isolated banana receptacles.

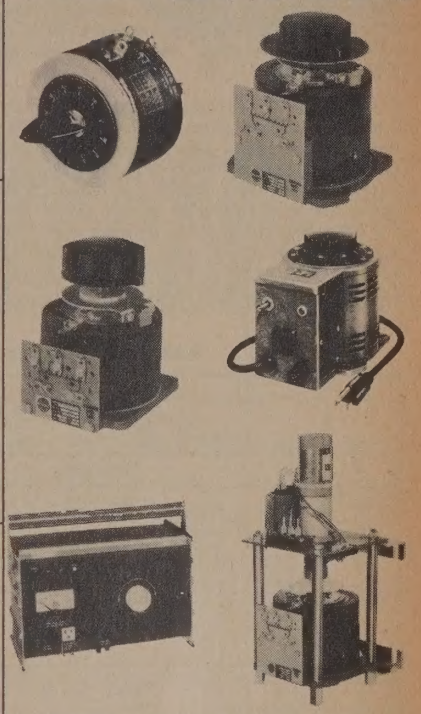
DELUXE VARIABLE AUTOTRANSFORMERS

STACO offers a selected group of variable autotransformers with new style, broad applications, and a unique combination of practical features. Suitable for use in any industrial application, classroom or laboratory. All units provide continuous voltage control over a wide range, and all are protected against short circuit. Convenient controls provide error-free operation and distortionless adjustment of AC voltage.

Mfr's Type No.	Input Volts	Output Volts	Output Amps	KVA	Size	Weight (Lbs.)	Price
E171	120	0-132	1.75	.23	$5\frac{7}{8} \times 9\frac{9}{16} \times 3\frac{5}{8}$	8.0	25.50
E371	120	0-140	3.75	.52	$7\frac{3}{8} \times 11\frac{3}{16} \times 4\frac{7}{8}$	11.0	27.00
E501	120	0-140	5.0	.7	$7\frac{3}{8} \times 11\frac{3}{16} \times 4\frac{7}{8}$	12.0	32.00
E501V	120	0-140	5.0	.7	$7\frac{3}{8} \times 15\frac{7}{16} \times 5\frac{7}{8}$	13.0	58.00
E501VA	120	0-140	5.0	.7	$11\frac{1}{4} \times 12\frac{9}{16} \times 5\frac{7}{8}$	17.0	95.00
E501VAW	120	0-140	5.0	.7	$11\frac{1}{4} \times 14\frac{9}{16} \times 5\frac{7}{8}$	18.0	156.00
E1010	120	0-140	10.0	1.4	$7\frac{3}{8} \times 11\frac{15}{16} \times 5\frac{7}{8}$	18.0	40.50
E1010V	120	0-140	10.0	1.4	$7\frac{3}{8} \times 15\frac{7}{16} \times 5\frac{7}{8}$	19.0	73.00
E1010VA	120	0-140	10.0	1.4	$11\frac{1}{4} \times 12\frac{9}{16} \times 5\frac{7}{8}$	23.0	114.00
E1010VAW	120	0-140	10.0	1.4	$11\frac{1}{4} \times 14\frac{9}{16} \times 5\frac{7}{8}$	23.0	184.00
E1210	120	0-120	12.0	1.44	$7\frac{3}{8} \times 11\frac{15}{16} \times 5\frac{7}{8}$	18.0	48.00
E1020	240	0-280	3.5	.98	$7\frac{3}{8} \times 11\frac{15}{16} \times 5\frac{7}{8}$	18.0	48.50
E1710	120	0-140	17.0	2.38	$11\frac{1}{4} \times 14\frac{9}{16} \times 5\frac{7}{8}$	31.0	84.00
E1720	240	0-280	10.0	2.8	$11\frac{1}{4} \times 14\frac{9}{16} \times 5\frac{7}{8}$	30.0	86.00

E501V, E501VA, E501VAW, E1010V, E1010VA, E1010VAW have isolated AC and DC outputs of 10% of the output current rating of the unit. Outputs are available at isolated banana receptacles.

V = Voltmeter A = Ammeter W = Wattmeter



STACO Variable Autotransformers are precision built to exacting tolerances from the finest materials available.

Staco's new improved design provides long life with negligible maintenance, high efficiency and regulation, greater power to size ratio. Staco designs permit replacement of competitive equipment or previous Staco models without modification.

Models are available in various configurations from 1.75 to 300 amperes output. Choose from panel mounted units, cord and plug types or deluxe fully enclosed portable models, with or without metering. Staco products represent 25 years experience in providing safe and dependable control of power.

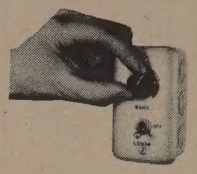
Contact your local representative for full details or write the factory for our new Product Guide.

STACO® INCORPORATED

POWERSTAT® *Variable Transformers now*

New epoxy-coated POWERKOTE Coils make the POWERSTAT line the most outstanding value in variable transformers today. *Without increase in price, size or weight,* only POWERSTAT Variable Transformers give an average of 20% higher current ratings, 10:1 greater overload capability, longer life, greater resistance to fungus, salt spray and other contaminating atmospheres. POWERKOTE Coil commutator bars are embedded in place preventing steady-state operating temperature and severe overloads from distorting the commutator.

POWERSTAT Variable Transformers are designed to deliver continuously adjustable voltage from a-c power lines. They introduce no waveform distortion and feature rugged construction, precious metal plated commutators, excellent regulation, high efficiency and conservative ratings. All manually operated types listed in the charts except the 10B-12, EN116B-EN216B and EN117B-EN217B Series are available with motor drives if desired. Motor-driven speeds are 5, 15, 30 or 60 seconds for full range travel on all except types having -4, -5, or -6 suffixes which do not offer the 5-second speed. Single types in the 116B-216B, 117B-217B, 126-226 and 136B-236B Series are also offered with 2- or 3-wire cord-plug sets. 1156D-1256D Series types are available in ratings to 244 kva.



ADJUSTABLE SPEED DRIVES

All motor-driven units in the 116B-216B, 117B-217B, 126-226, 136B-236B and 146-246 Series are available with adjustable speed drives which permit the output voltage of the transformer to be controlled over the full range of zero to maximum output voltage at speeds ranging from 5 seconds to 200 seconds. All control circuitry is solid-state and adaptable for present speed systems. The Adjustable Speed Control Potentiometer BHP65455-G1 can be remotely located from the variable transformer.

RATINGS AND SPECIFICATIONS

INPUT		OUTPUT						
			Const. Current Load		Const. Impedance Load			
Volts	Cycles	Volts	Max. Amp.	Max. KVA	Max. Amp.	Max. KVA	TYPE	Ship. Wt. Lbs.
10B-12 SERIES								
Single Phase								
120	60	0-132	1	0.13	—	—	2PF10	3½
120	50/60	0-120	2.25*	0.27	3‡	0.36	10B	2½
120	60	0-132	2.25*	0.30	—	—		
240	50/60	0-240	0.7*	0.17	0.9‡	0.22	12	2½
240	50/60	0-264	0.5**	0.13	—	—		
240	50/60	0-240	2.25*	0.54	3‡	0.72	10B-2	6
240	60	0-264	2.25*	0.59	—	—		
480	50/60	0-480	0.7*	0.34	0.9‡	0.43	12-2	6
480	50/60	0-528	0.5**	0.26	—	—		
Three Phase								
120	50/60	0-120	2.25*	0.47	3‡	0.62	10B-2	6
120	60	0-132	2.25*	0.51	—	—		
240	50/60	0-240	0.7*	0.29	0.9‡	0.37	12-2	6
240	50/60	0-264	0.5**	0.23	—	—		
240	60	0-240	2.25*	0.94	3‡	1.2	10B-3	8½
480	50/60	0-480	0.7*	0.58	0.9‡	0.75	12-3	8½
480	60	0-528	0.5**	0.46	—	—		
21-22 SERIES								
Single Phase								
120	50/60	0-120	4.5	0.54	6.5	0.78	21	6
120	50/60	0-140	4.5	0.63	—	—		
240	50/60	0-240	2.25	0.54	3.25	0.78	22	6
240	50/60	0-280	2.25	0.63	—	—		
240	50/60	0-240	4.5	1.1	6.5	1.6	21-2	13½
240	50/60	0-280	4.5	1.3	—	—		
480	50/60	0-480	2.25	1.1	3.25	1.6	22-2	13½
480	50/60	0-560	2.25	1.3	—	—		
Three Phase								
120	50/60	0-120	4.5	0.94	6.5	1.4	21-2	13½
120	50/60	0-140	4.5	1.1	—	—		
240	50/60	0-240	2.25	0.94	3.25	1.4	22-2	13½
240	50/60	0-280	2.25	1.1	—	—		
240	50/60	0-240	4.5	1.9	6.5	2.7	21-3	19
240	60	0-280	4.5	2.2	—	—		
480	50/60	0-480	2.25	1.9	3.25	2.7	22-3	19
480	60	0-560	2.25	2.2	—	—		

*Rating when mounted on metal panel. On bracket or nonmetallic panel, derate 10B Series to 1.75 amp., 12 Series to 0.5 amp.
‡Rating when mounted on metal panel. On bracket or nonmetallic panel, derate 10B Series to 2.5 amp., 12 Series to 0.75 amp.
**0.7 amp. maximum in range from 0 to line voltage when mounted on metal panel.

INPUT		OUTPUT						
			Const. Current Load		Const. Impedance Load			
Volts	Cycles	Volts	Max. Amp.	Max. KVA	Max. Amp.	Max. KVA	TYPE	Ship. Wt. Lbs.
116B-216B and 117B-217B SERIES†								
Single Phase								
120	50/60	0-120	10	1.2	13	1.6	116B	12
120	50/60	0-140	10	1.4	—	—		
120	60	0-120	12	1.4	15	1.8	117BT	12
240	50/60	0-240	3.5	0.84	5	1.2	216B	12
240	50/60	0-280	3.5	0.98	—	—		
240	60	0-240	5	1.2	7	1.7	217BT	12
240	50/60	0-240	10	2.4	13	3.1	116BT-2	24
240	50/60	0-280	10	2.8	—	—		
240	60	0-240	12	2.9	15	3.6	117BT-2	24
480	50/60	0-480	3.5	1.7	5	2.4	216BT-2	24
480	50/60	0-560	3.5	2.0	—	—		
480	60	0-480	5	2.4	7	3.4	217BT-2	24
Three Phase								
120	50/60	0-120	10	2.1	13	2.7	116BT-2	24
120	50/60	0-140	10	2.4	—	—		
120	60	0-120	12	2.5	15	3.1	117BT-2	24
240	50/60	0-240	3.5	1.5	5	2.1	216BT-2	24
240	50/60	0-280	3.5	1.7	—	—		
240	60	0-240	5	2.1	7	2.9	217BT-2	24
240	50/60	0-240	10	4.2	13	5.4	116BT-3	36
240	60	0-280	10	4.8	—	—		
240	60	0-240	12	5.0	15	6.2	117BT-3	36
480	50/60	0-480	3.5	2.9	5	4.2	216BT-3	36
480	60	0-560	3.5	3.4	—	—		
480	60	0-480	5	4.2	7	5.8	217BT-3	36
EN116B-EN216B and EN117B-EN217B SERIES								
Single Phase								
120	50/60	0-120	8	0.96	13	1.6	EN116B	15
120	50/60	0-140	8	1.1	—	—		
120	60	0-120	10	1.2	14.5	1.7	EN117B	15
240	50/60	0-240	3	0.72	4.5	1.1	EN216B	15
240	50/60	0-280	3	0.84	—	—		
240	60	0-240	4.4	1.1	5.8	1.4	EN217B	15
240	50/60	0-240	8	1.9	13	3.1	EN116B-2	28
240	50/60	0-280	8	2.2	—	—		
240	60	0-240	10	2.4	14.5	3.5	EN117B-2	28
480	50/60	0-480	3	1.4	4.5	2.2	EN216B-2	28
480	50/60	0-560	3	1.7	—	—		
480	60	0-480	4.4	2.1	5.8	2.8	EN217B-2	28
Three Phase								
120	50/60	0-120	8	1.7	13	2.7	EN116B-2	28
120	50/60	0-140	8	1.9	—	—		
120	60	0-120	10	2.1	14.5	3.0	EN117B-2	28
240	50/60	0-240	3	1.2	4.5	1.9	EN216B-2	28
240	50/60	0-280	3	1.5	—	—		
240	60	0-240	4.4	1.8	5.8	2.4	EN217B-2	28
240	50/60	0-240	8	3.3	13	5.4	EN116B-3	39
240	60	0-280	8	3.9	—	—		
240	60	0-240	10	4.2	14.5	6.0	EN117B-3	39
480	50/60	0-480	3	2.5	4.5	3.7	EN216B-3	39
480	60	0-560	3	2.9	—	—		
480	60	0-480	4.4	3.7	5.8	4.8	EN217B-3	39

†Also available with open construction. Suffix U when ordering.

THE SUPERIOR ELECTRIC COMPANY
1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

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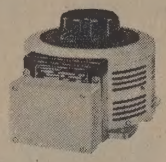
with POWERKOTE® COILS

TYPE 10B

TYPE 21

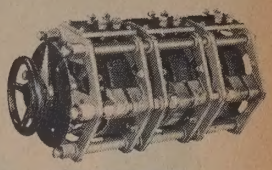
TYPE 116B



TYPE 136BT

HIGH FREQUENCY TYPES ➧

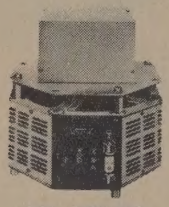
TYPE 5-1011



TYPE 2HL15UK-3Y

TYPE EN216B-2

TYPE 3PN126



TYPE 5MB1156D

Standard manually-operated types designed to meet applicable military specifications are available for 28, 120, 240 and 480 volt, 400/800 hertz single and three phase operation in ratings from 56 va to 7.3 kva; for 115 volt, 400/800 hertz single phase service with outputs of 0-28 volts, 2.5 or 8 amperes and 0-5 volts, 6 or 12 amperes; for 400/1600 hertz service as limited range variable transformers, low voltage output variable transformers or line correctors.

INPUT		OUTPUT						
			Const. Current Load		Const. Impedance Load			
Volts	Cycles	Volts	Max. Amp.	Max. KVA	Max. Amp.	Max. KVA	TYPE	Ship. Wt. Lbs.
126-226 SERIES†								
Single Phase								
120	50/60	0-120	15	1.8	20	2.4	126	17
120	50/60	0-140	15	2.1	—	—		
240	50/60	0-240	7.5	1.8	10	2.4	226	17
240	50/60	0-280	7.5	2.1	—	—		
240	50/60	0-240	15	3.6	20	4.8	126-2	32
240	50/60	0-280	15	4.2	—	—		
480	50/60	0-480	7.5	3.6	10	4.8	226-2	32
480	50/60	0-560	7.5	4.2	—	—		
Three Phase								
120	50/60	0-120	15	3.1	20	4.2	126-2	32
120	50/60	0-140	15	3.6	—	—		
240	50/60	0-240	7.5	3.1	10	4.2	226-2	32
240	50/60	0-280	7.5	3.6	—	—		
240	50/60	0-240	15	6.2	20	8.3	126-3	49
240	60	0-280	15	7.3	—	—		
480	50/60	0-480	7.5	6.2	10	8.3	226-3	49
480	60	0-560	7.5	7.3	—	—		
136B-236B SERIES†								
Single Phase								
120	50/60	0-120	22	2.6	28	3.4	136B	25
120	50/60	0-140	22	3.1	—	—		
120	50/60	0-120	44	5.3	56	6.7	136B-2§	52
120	50/60	0-140	44	6.2	—	—		
240	50/60	0-240	10	2.4	13	3.1	236B	25
240	50/60	0-280	10	2.8	—	—		
240	50/60	0-240	22	5.3	28	6.7	136B-2	52
240	50/60	0-280	22	6.2	—	—		
480	50/60	0-480	20	4.8	26	6.2	236B-2	52
480	50/60	0-560	20	5.6	—	—		
Three Phase								
120	50/60	0-120	22	4.6	28	5.8	136B-2	52
120	50/60	0-140	22	5.3	—	—		
240	50/60	0-240	10	4.2	13	5.4	236B-2	52
240	50/60	0-280	10	4.8	—	—		
240	50/60	0-240	22	9.1	28	11.6	136B-3	76
240	60	0-280	22	10.7	—	—		
480	50/60	0-480	10	8.3	13	10.8	236B-3	76
480	60	0-560	10	9.7	—	—		
146-246 SERIES†								
Single Phase								
120	50/60	0-120	30	3.6	35	4.2	146	38
120	50/60	0-140	30	4.2	—	—		
120	50/60	0-120	60	7.2	70	8.4	146-2§§	83
120	50/60	0-140	60	8.4	—	—		
240	50/60	0-240	15	3.6	19	4.6	246	38
240	50/60	0-280	15	4.2	—	—		
240	50/60	0-240	30	7.2	35	8.4	146-2	83
240	50/60	0-280	30	8.4	—	—		
480	50/60	0-480	15	7.2	19	9.1	246-2	83
480	50/60	0-560	15	8.4	—	—		

†Also available with open construction. Suffix U when ordering.
§Requires also one paralleling choke type T5000.
§§Requires also one paralleling choke type T6053.

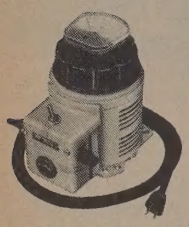
INPUT		OUTPUT						
			Const. Current Load		Const. Impedance Load			
Volts	Cycles	Volts	Max. Amps.	Max. KVA	Max. Amps.	Max. KVA	TYPE	Ship. Wt. Lbs.
146-246 SERIES† (contd.)								
Three Phase								
120	50/60	0-120	30	6.2	35	7.3	146-2	83
120	50/60	0-140	30	7.3	—	—		
240	50/60	0-240	15	6.2	19	7.9	246-2	83
240	50/60	0-280	15	7.3	—	—		
240	50/60	0-240	30	12.5	35	14.5	146-3	125
240	60	0-280	30	14.5	—	—		
480	50/60	0-480	15	12.5	19	15.8	246-3	125
480	60	0-560	15	14.5	—	—		
1156D-1256D SERIES†								
Single Phase								
120	50/60	0-120	50	6.0	55	6.6	1156D	82
120	50/60	0-140	50	7.0	—	—		
120	50/60	0-120	100	12.0	110	13.2	1156D-2P	169
120	50/60	0-140	100	14.0	—	—		
120	50/60	0-120	150	18.0	165	19.8	1156D-3P	272
120	50/60	0-140	150	21.0	—	—		
240	50/60	0-240	28	6.7	28	6.7	1256D	82
240	50/60	0-280	28	7.8	—	—		
240	50/60	0-240	50	12.0	55	13.2	1156D-2S	156
240	50/60	0-280	50	14.0	—	—		
240	50/60	0-240	56	13.4	56	13.4	1256D-2P	169
240	50/60	0-280	56	15.7	—	—		
240	50/60	0-240	84	20.2	84	20.2	1256D-3P	272
240	50/60	0-280	84	23.5	—	—		
240	50/60	0-240	100	24.0	110	26.4	1156D-4PS	361
240	50/60	0-280	100	28.0	—	—		
480	50/60	0-480	28	13.4	28	13.4	1256D-2S	156
480	50/60	0-560	28	15.7	—	—		
480	50/60	0-480	56	26.9	56	26.9	1256D-4PS	361
480	50/60	0-560	56	31.4	—	—		
Three Phase								
120	50/60	0-120	50	10.4	55	11.4	1156D-2D	155
120	50/60	0-140	50	12.1	—	—		
240	50/60	0-240	28	11.6	28	11.6	1256D-2D	155
240	50/60	0-280	28	13.6	—	—		
240	50/60	0-240	50	20.8	55	22.9	1156D-3Y	230
240	60	0-280	50	24.2	—	—		
240	50/60	0-240	100	41.6	110	45.7	1156D-6Y	507
240	50/60	0-280	100	48.5	—	—		
480	50/60	0-480	28	23.3	28	23.3	1256D-3Y	235
480	60	0-560	28	27.2	—	—		
480	50/60	0-480	56	46.6	56	46.6	1256D-6Y	507
480	60	0-560	56	54.3	—	—		

VOLTBOX® A-C POWER SUPPLY

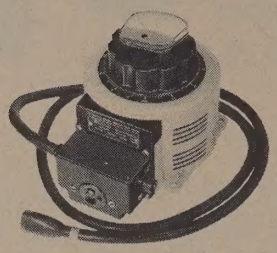
Contains POWERSTAT Variable Transformer, voltmeter, three output receptacles, two 5-WAY Binding Posts, "on-off" switch, line-load meter switch, fuse and six-foot cord-plug. Type UC1MB ratings are 120 volt, single phase 50 60 hertz input and 0-140 volt 10 ampere, 1.4 kva output.

IN SECTIONS 2100, 3500 AND 4000

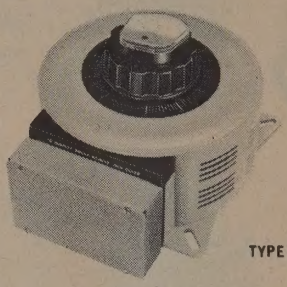
STATIONARY METERED KNOB POWERSTAT® Variable Transformers

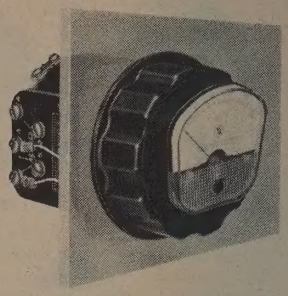


TYPE VS116B



TYPE VS3PN126





TYPE VS146T

GENERAL UTILITY MOUNTING – Single units (those listed in charts without -2 or -3 suffixes) in the 116B-216B, 117B-217B, 126-226, 136B-236B and 146-246 series are also available with knobs incorporating direct-reading voltmeters. Voltmeters remain stationary as the knob rim is turned, have an accuracy of ±3% of full scale and are insensitive to stray magnetic fields. When ordering, add VS prefix to the type number given in the charts.

BACK-OF-PANEL MOUNTING – Standard cataloged POWERSTAT Variable Transformers in the 21-22 through the 146-246 series designed or adaptable for back-of-panel mounting can be combined with Metered Knob Assemblies. Models for 120 volt service require Metered Knob Assembly VS150 having a 0-150 volt scale and units for 240 volt use require Metered Knob Assembly VS300 having a 0-300 volt scale. Existing models can be retrofitted also.

ENCLOSED LABORATORY POWERSTAT® Variable Transformers

TYPE N10B

TYPE N21

TYPE N116B

TYPE N116BK

Portable, single phase units having grounded NEMA cord-plug assembly, on-off switch, output receptacle, pilot light and fuse. The handle is integrally designed and the panel controls are recessed. A slot is provided at the rear of each unit to accept wall hanger brackets supplied with the assembly. Types N21, N116B, N116BK, N116BL and N116BLK have POWERKOTE Coils.

METERED KNOB types N116BK and N116BLK have metered knobs to conveniently measure load voltage without the necessity of providing a separate voltmeter. The knob is designed so that the voltmeter remains stationary as the knob is turned to vary the voltage, assuring accurate readings and maximum meter visibility.

INPUT		OUTPUT					
			CONSTANT CURRENT LOAD		CONSTANT IMPEDANCE LOAD		
VOLTS	HERTZ	VOLTS	MAX. AMP.	MAX. KVA	MAX. AMP.	MAX. KVA	TYPE
120	60	0-132	2.25	0.30	—	—	N10B
120	50/60	0-140	4.5	0.63	—	—	N21
120	50/60	0-140	10	1.4	—	—	N116B N116BK
120	50/60	0-120	10	1.2	13	1.6	N116BL N116BLK

FLEXIFORMER®

Packaged Transformer Primaries

TYPE TP150

When used as a source of a-c voltage, the center opening permits hand-threading the correct number of secondary winding turns to obtain the desired output voltage. When used as a current transformer, the unit winding is shuted by an ammeter which indicates the current flow in a conductor hand-threaded through the center opening. For 50/60 hertz duty.

RATINGS AS A SOURCE OF A-C VOLTAGE

TYPE	NORMAL PRIMARY VOLTS	Hertz	MAXIMUM VA	VOLTS PER SECONDARY TURN	REGULATION AT MAXIMUM OUTPUT
TP150	120	50/60	150	0.3	25%
TP1000	120	50/60	1000	0.75	10%
TP152	240	50/60	150	0.3	25%
TP1020	240	50/60	1000	0.75	10%

RATINGS AS A CURRENT TRANSFORMER

TYPE	INPUT/ OUTPUT RATIO	MAXIMUM PRIMARY AMPERES	MAXIMUM SECONDARY AMPERES	ACCURACY AT 60 Hertz
TP150	400/1	400	1.0	1%
TP1000	160/1	800	5.0	1%
TP152	800/1	400	0.5	1%
TP1020	320/1	800	2.5	1%

POWERSTAT

DC Motor Speed Controllers

Continuously adjustable speed control of d-c shunt-wound motors from a-c power lines. Full rated torque available at any speed. Instantaneous start, stop and reverse, tubeless transient-protected circuitry. Rated for 120 volt, 60 hertz single phase input. Type MSC16 for motors to 1/6 hp, type MSC33 to 1/3 hp and type MSC75 to 3/4 hp. NEMA frame 1725 rpm, dc motors in 1/6, 1/3 and 3/4 hp also available.

TYPE MSC33

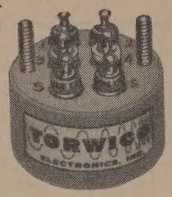
THE SUPERIOR ELECTRIC COMPANY

1000 MIDDLE STREET, BRISTOL, CONNECTICUT 06010

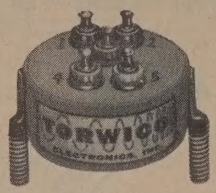
SEE OTHER SUPERIOR ELECTRIC PRODUCT IN SECTIONS 2100, 3500 AND 4000

TORWICO ELECTRONICS — LEADER IN MAGNETIC COMPONENTS

TINYMAX
Miniature 400 Cycle Power Transformers



This Case style available in 1.5 through 250 VA



This Case style available in 1.5 through 9 VA

TINYMAX
CONDENSED PERFORMANCE DATA FOR STANDARD TINYMAX 400 CYCLE POWER TRANSFORMERS

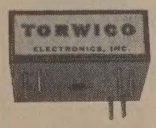
VA Rating	Secondary Voltage-VRMS* (Choose any one voltage within limits listed)	O.D. ±1/32	Height ±1/32	Nominal Weight	Nominal Regulation	Nominal Temp. Rise MIL-T-27 (with no heat sink)
1.5	6.0 to 300	1"	15/32"	0.89 oz.	20%	13°C
1.5 (with electrostatic shield)	6.0 to 300	1"	19/32"	1.1 oz.	15%	13°C
3	6.0 to 300	1"	19/32"	1.1 oz.	15%	15°C
3 (with electrostatic shield)	6.0 to 300	1"	13/16"	1.5 oz.	10%	15°C
6	6.0 to 300	1"	13/16"	1.5 oz.	10%	18°C
6 (with electrostatic shield)	6.0 to 300	1"	1 1/16"	2 oz.	8%	18°C
9	6.0 to 300	1"	1 1/16"	2 oz.	8%	23°C
9 (with electrostatic shield)	6.0 to 300	1 3/8"	1 1/8"	3.5 oz.	7%	23°C
16	6.0 to 300	1 3/8"	1 1/8"	3.5 oz.	7%	25°C
25	6.0 to 300	1 3/8"	1 3/8"	4.5 oz.	6%	36°C
50	6.0 to 300	2"	1 1/2"	10 oz.	2.5%	26°C
75	10 to 300	2"	1 3/4"	12 oz.	2.5%	32°C
100	12 to 300	2 1/4"	2"	17 oz.	2%	35°C
250	26 to 300	2 7/8"	2"	27.5 oz.	1.5%	47°C

*with primary 115V, 400 cps

TINYMAX Power Transformers are hermetically sealed in drawn steel cases and shall meet all requirements of MIL-T-27; Military Designation: TF4S01YY.

24 hour delivery for prototype quantities. Don't settle for less—Prices on these custom-engineered transformers equal those of competitive shelf items—Phone today for your comprehensive TINYMAX catalog.

TINYMAX
POWER TRANSFORMERS FOR PRINTED CIRCUIT APPLICATIONS



VA Rating	Secondary Voltage—VRMS* (Choose any one voltage within limits listed)	Dimensions ±1/32"	Nominal Weight	Nominal Regulation	Nominal Temp. Rise
1.5	6.0 to 300	1 1/16" square x 7/16" tall	0.75 oz.	20%	13°C
3	6.0 to 300	1 1/16" square x 9/16" tall	1.0 oz.	15%	15°C
6	6.0 to 300	1 1/16" square x 3/4" tall	1.25 oz.	10%	18°C
9	6.0 to 300	1 1/16" square x 1" tall	1.63 oz.	8%	23°C

*with primary 115V, 400 cps

TINYMAX Power Transformers for printed circuit applications are hermetically sealed in thermoset plastic and shall meet all requirements of MIL-T-27; Military Designation: TF5SX01ZZ.

TORWICO ELECTRONICS INC. LAKEWOOD, N.J.

TOROTEL INC

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030

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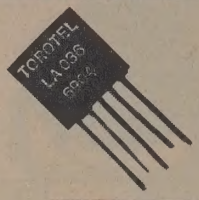
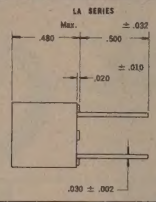
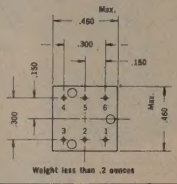
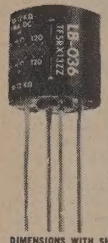
MINIATURE AUDIO TRANSFORMERS — LA & LB SERIES

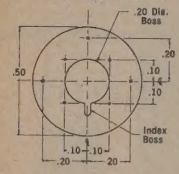


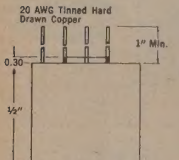






DIMENSIONS WITH SHIELD
O.D. 9/16 MAX.
H.T. 17/32 MAX.





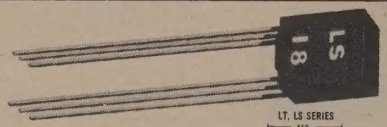
Torotel "LB" Transformers are manufactured to MIL-T-27B, Grade 5, Class S specifications. This Series of "LB" Transformers have 0.1 grid spacing for printed circuit applications and .030 mounting surface to avoid a moisture trap. Leads are made of 20AWG tinned hard drawn copper. Unitizing Dumet wire are available on special request.

DELIVERY AVAILABLE FROM STOCK

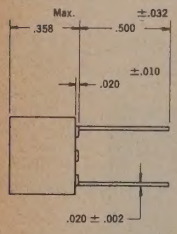
LB #	Mil Type	Application	Pri. Imp.	D.C. MA In Pri.	Sec. Imp.	Nom. Pri. Res.	MW Lev @1KC
001	TF5SX13ZZ	Interstage	20,000 30,000	.5 .5	800 1200	850	50
002	TF5SX17ZZ	Output	500 600	3 3	50 60	60	100
003	TF5SX13ZZ	Output	1000 1200	3 3	50 60	115	100
004	TF5SX17ZZ	Output	600	3	3.2	60	100
005	TF5SX13ZZ	Output	1200	2	3.2	115	100
006	TF5SX13ZZ	Output	10,000	1	3.2	790	100
007	TF5SX16ZZ	Input Other Applications	200,000 500	0 0	1000 100,000	8500 —	25
008	TF5SX20ZZ	Reactor 3.5HY @ 2MADC, 1HY @ 5MADC				630	
009	TF5SX13ZZ	Output or Driver	10,000 12,000	1 1	500CT 600CT	800	100
010	TF5SX13ZZ	Driver	10,000 12,000	1 1	1200CT 1500CT	800	100
011	TF5SX13ZZ	Driver	10,000 12,000	1 1	2000CT 2500CT	800	100
012	TF5SX17ZZ	Single or PP Output	150CT 200CT	10 10	12 16	11	500
013	TF5SX17ZZ	Single or PP Output	300CT 400CT	7 7	12 16	20	500
014	TF5SX17ZZ	Single or PP Output	600CT 800CT	5 5	12 16	43	500
015	TF5SX17ZZ	Single or PP Output	800CT 1070CT	4 4	12 16	51	500
016	TF5SX13ZZ	Single or PP Output	1000CT 1330CT	3.5 3.5	12 16	71	500
017	TF5SX13ZZ	Single or PP Output	1500CT 2000CT	3 3	12 16	108	500
018	TF5SX13ZZ	Single or PP Output	7,500CT 10,000CT	1 1	12 16	505	500
019	TF5SX17ZZ	Output to Line	3C0CT	7	600	19	500
020	TF5SX17ZZ	Output or Line to Line or Mixing	500CT	5.5	600	31	500
021	TF5SX17ZZ	Output to Line	900CT	4	600	53	500
022	TF5SX13ZZ	Output to Line	1500CT	3	600	86	500
023	TF5SX13ZZ	Interstage	20,000CT 30,000CT	.5 .5	800CT 1200CT	850	100
024	TF5SX16ZZ	Input Other Application	200,000CT 500CT	0 0	1000CT 100,000CT	8500 —	25
025	TF5SX13ZZ	Interstage	10,000CT 12,000CT	1 1	1500CT 1800CT	800	100
026	TF5SX20ZZ	Reactor 6HY @ 2MADC 1.5HY @ 5MADC				2100	
027	TF5SX20ZZ	Reactor 1.25HY @ 2MADC, .5HY@ 11MADC				100	
028	TF5SX20ZZ	Reactor .3HY @ 4MADC, .15HY @ 20MADC				31	
029	TF5SX17ZZ	Single or PP Output	120CT 150CT	10 10	3.2 4	10	500
030	TF5SX17ZZ	Single or PP Output	320CT 400CT	7 7	3.2 4	20	500

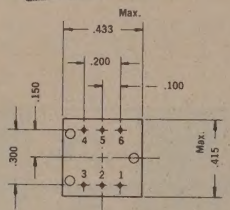
LB #	Mil Type	Application	Pri. Imp.	D.C. MA In Pri.	Sec. Imp.	Nom. Pri. Res.	MW Lev @1KC
031	TF5SX17ZZ	Single or Push Pull Output	640CT 800CT	5 5	3.2 4	43	500
032	TF5SX17ZZ	Single or PP Output	800CT 1000CT	4 4	3.2 4	51	500
033	TF5SX13ZZ	Single or PP Output	1060CT 1330CT	3.5 3.5	3.2 4	71	500
034	TF5SX13ZZ	Single or PP Output	1600CT 2000CT	3 3	3.2 4	109	500
035	TF5SX13ZZ	Single or PP Output	8000CT 10,000CT	1 1	3.2 4	505	100
036	TF5SX13ZZ	Isolation or Interstage	10,000CT 12,000CT	1 1	10,000CT 12,000CT	950	100
037	TF5SX13ZZ	Driver	10,000CT 12,000CT	1 1	1200CT 1500CT	800	100
038	TF5SX13ZZ	Driver	10,000CT 12,000CT	1 1	2000CT 2500CT	800	100
039	TF5SX13ZZ	Driver	10,000CT 12,000CT	1 1	500CT 600CT	800	100
040	TF5SX16ZZ	Input	100,000	0	1000	1700	70
041	TF5SX13ZZ	Driver	20,000	.5	1000	1000	100
042	TF5SX13ZZ	Driver	20,000	.5	1200CT	1000	100
043	TF5SX17ZZ	Output	1000	3	50	60	100
044	TF5SX17ZZ	Output	400	3	50	30	100
045	TF5SX17ZZ	Output	400	3	11	30	100
046	TF5SX17ZZ	Single or PP Output	400CT	3	11	30	500
047	TF5SX20ZZ	Reactor 10HY @0 MADC 8HY @ .5MADC				650	
048	TF5SX13ZZ	Isolation or Interstage Ratio 1:1:1	2000CT 2500CT	3 3	8000 split 10,000 split	195	100
049	TF5SX13ZZ	Interstage	10,000CT 12,000CT	1 1	2000 split 2400 split	560	100
050	TF5SX13ZZ	Interstage	20,000CT 30,000CT	.5 .5	1000 split 1500 split	800	100
051	TF5SX13ZZ	Interstage	40,000CT 50,000CT	.25 .25	400 split 500 split	1700	50
C52	TF5SX17ZZ	Interstage or Output	400CT 500CT	8 6	400 split 500 split	46	500
053	TF5SX17ZZ	Interstage	400CT 500CT	8 6	120 split 150 split	46	500
054	TF5SX17ZZ	Interstage	400CT 500CT	8 6	40 split 50 split	46	500
055	TF5SX17ZZ	Interstage	800CT 100CT	12 10	32 split 40 split	9.8	500
056	TF5SX16ZZ	Input	50,000CT	.3	1000CT	1900	50
057	TF5SX17ZZ	Output	600CT 750CT	4.5	3.2 4.0	40	500
058	TF5SX13ZZ	Output	1200CT 1500CT	3	3.2 4	100	500
500		Magnetic Shielding Case					

SUB-MINIATURE AUDIO TRANSFORMERS — LT, LS & LU SERIES

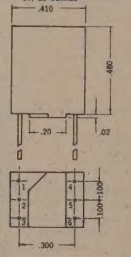


LU SERIES





LT, LS SERIES



LS, LT, and LU Series transformers have successfully passed the rigid requirements of MIL-T-27B, Class R, Grade 5.

Subminiature in size, weighting less than 0.1 ounce, these transformers have tenth inch grid spacing between terminals and are ideally suited for transistor circuit applications which utilize printed circuit board design. All three series have risers on mounting surfaces to facilitate inspection and board cleaning, and also to prevent moisture traps.

MAGNETIC SHIELDING

LS and LT Series transformers are available with magnetic shields when required. Overall dimensions of transformers with the magnetic shield added are .365 max x .465 max x .531 max.

To order transformers with shields installed add 500 to dash numbers shown in the table. For example: to order an LS-22 with shield, specify LS-522.

LS, LT or LU No.	Type	MIL-T-27A Designation	Primary Impedance	D.C. Res. Ohms	D.C. Ma. Pri.	Secondary Impedance	Max. Power MW.	Term. Layout
2	Input	TF5RX16ZZ	50000 c.t.	3800	.2	1000 c.t.	25	E
4	Interstage	TF5RX13ZZ	20000/30000	1700	.5	800/1200	40	B
5	Interstage	TF5RX13ZZ	20000/30000 c.t.	1700	.5	800/1200 c.t.	40	E
6	Interstage	TF5RX13ZZ	10000/12000 c.t.	1050	1	1500/1800 c.t.	50	E
7	Driver	TF5RX13ZZ	10000/12000 c.t.	1050	1	1200/1500 c.t.	50	E
8	Driver	TF5RX13ZZ	10000/12000 c.t.	1050	1	2000/2500 c.t.	50	E
9	Driver	TF5RX13ZZ	10000/12000 c.t.	1050	1	500/600 c.t.	50	E
10	Output	TF5RX17ZZ	500/600	60	3	50/60	50	B
11	Output	TF5RX17ZZ	1000/1200	145	3	50/60	50	B
12	Output	TF5RX17ZZ	600	70	3	3.2	50	B
13	Output	TF5RX13ZZ	1200	120	2	3.2	50	B
14	Output	TF5RX13ZZ	10000	1160	1	3.2	50	B
15	Output	TF5RX17ZZ	150/200 c.t.	18	10	12/16	50	D
16	Output	TF5RX17ZZ	300/400 c.t.	38	7	12/16	50	D
17	Output	TF5RX17ZZ	600/800 c.t.	75	4.5	12/16	50	D
18	Output	TF5RX17ZZ	1000/1330 c.t.	120	3.5	12/16	50	D
19	Output	TF5RX13ZZ	1500/2000 c.t.	180	3	12/16	50	D
20	Output	TF5RX13ZZ	7500/10000 c.t.	820	1	12/16	50	D
21	Output	TF5RX13ZZ	300 c.t.	37	7	600	50	D
22	Output	TF5RX17ZZ	500 c.t.	60	3	600	50	D
23	Output	TF5RX17ZZ	900 c.t.	100	4	600	50	D
24	Output	TF5RX17ZZ	1500 c.t.	170	3	600	50	D
25	Output	TF5RX17ZZ	120/150 c.t.	15	10	3.2/4	50	D
26	Output	TF5RX17ZZ	320/400 c.t.	40	6	3.2/4	50	D
27	Output	TF5RX17ZZ	600/750 c.t.	70	4.5	3.2/4	50	D
28	Output	TF5RX17ZZ	800/1000 c.t.	100	4	3.2/4	50	D
29	Output	TF5RX13ZZ	1200/1500 c.t.	125	3	3.2/4	50	D
30	Output	TF5RX13ZZ	1600/2000 c.t.	190	2.5	3.2/4	50	D
31	Output	TF5RX13ZZ	8000/10000 c.t.	820	1	3.2/4	50	D
32	Output	TF5RX13ZZ	10000 c.t.	1000	1	10000 c.t.	50	E
33	Driver	TF5RX13ZZ	10000/12000	1050	1	500/600 c.t.	50	C
34	Driver	TF5RX13ZZ	20000	1700	.3	1000	50	B
35	Output	TF5RX17ZZ	1000	135	3	50	50	B
36	Output	TF5RX17ZZ	400 c.t.	40	3	11	50	D
37	Driver	TF5RX13ZZ	10000/12000	1050	1	2000/2500 c.t.	50	C
38	Output	TF5RX17ZZ	600 c.t.	72	3	600 c.t.	50	E
39	Output	TF5RX13ZZ	10000	1000	1	10000 split	50	*
40	Output	TF5RX17ZZ	600	72	3	600 split	50	*
41	Input	TF5RX13ZZ	25000 c.t.	4300	0.6	1000 c.t.	30	E
42	Isolation	TF5RX17ZZ	600 c.t.	90	4	600 c.t.	30	E
101	Choke	TF5RX20ZZ	6 hy. @ 2 ma.	1700	—	—	—	A
102	Choke	TF5RX20ZZ	1.25 hy. @ 2 ma.	180	—	—	—	A
103	Choke	TF5RX20ZZ	3.5 hy. @ 2 ma.	1100	—	—	—	A
104	Choke	TF5RX20ZZ	.3 hy. @ 4 ma.	42	—	—	—	A

TOROTEL INC.

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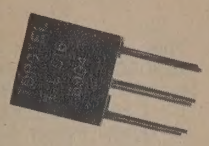
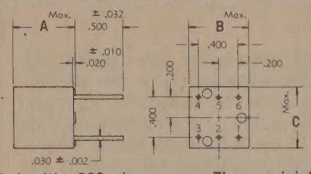
AUDIO TRANSFORMERS LL & LR SERIES





Series	A	B	C
LL	.600	.590	.590
LR	.925	.800	.710

These tiny, versatile "LL" transformers are provided with .020 risers and 0.1 grid spacing for printed circuit board applications and are manufactured to MIL-T-27, Grade 5, Class S specifications.

RESPONSE: ±1 DB 200 to 50,000 HZ
DISTORTION: 10% Max. at rated power, 200 to 50,000 HZ
WEIGHT: 0.4 OZ

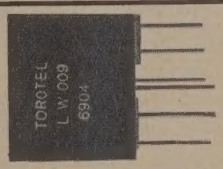
LL No.	MIL-T-27 Designation	Application	Impedance Ohms Pri	Impedance Ohms Sec.	DC Resistance Ohms Pri	DC Resistance Ohms Sec	Max. Pri DC (ma)	Max. 200 Hz Pwr* (mw)
001	TF5SX16ZZ	Input	100K-CT	1000-CT	6000	60	0	150
002	TF5SX16ZZ	Interstage	25K-CT	1000-CT	2800	120	0	150
003	TF5SX13ZZ	Interstage	10K-CT	10K-CT	1100	1200	1	150
004	TF5SX13ZZ	Driver	10K-CT	1500-CT	1100	200	1	150
005	TF5SX13ZZ	Output to Line	10K-CT	600-CT	1100	75	1	150
006	TF5SX13ZZ	Interstage	4000-CT	10K-CT	440	1200	1.5	150
007	TF5SX17ZZ	Output to Line	1000-CT	600-CT	100	60	3	150
008	TF5SX17ZZ	Output	1000-CT	4	100	0.4	3	150
009	TF5SX11ZZ	Input	600-CT	25K-CT	65	3500	4	150
010	TF5SX17ZZ	Isolation	600-CT	600-CT	65	75	4	150
011	TF5SX17ZZ	Output	600-CT	60	65	7	4	150
012	TF5SX17ZZ	Output	600-CT	4	65	0.5	4	150
013	TF5SX13ZZ	Driver	10K-CT	2000-CT	1100	240	1	150
014	TF5SX13ZZ	Driver	10K-CT	500-CT	1100	65	1	150
015	TF5SX17ZZ	Line to Line	500-CT	600-CT	55	75	4.5	150
016	TF5SX17ZZ	Output to Line	300-CT	600-CT	33	75	5.5	150

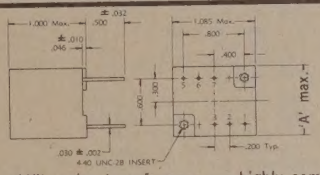
These miniaturized "LR" transformers are manufactured to MIL-T-27, Grade 5, Class S specifications and are ideally suited for a wide range of printed circuit applications.

RESPONSE: ±1 DB 200 to 20,000 HZ
DISTORTION: 10% Max. at rated power, 200 to 20,000 HZ
WEIGHT: 1.0 OZ

LR No.	MIL-T-27 Designation	Application	Impedance Ohms Pri	Impedance Ohms Sec.	DC Resistance Ohms Pri	DC Resistance Ohms Sec	Max. Pri DC (ma)	Max. 200 Hz Pwr* (mw)
001	TF5SX13ZZ	Interstage	25K-CT	1000-CT	2600	110	0.5	750
002	TF5SX13ZZ	Interstage	10K-CT	10K-CT	1000	1100	1	750
003	TR5SX13ZZ	Driver	10K-CT	1500-CT	1000	165	1	750
004	TF5SX13ZZ	Output to Line	10K-CT	600-CT	1000	70	1	750
005	TF5SX13ZZ	Output	10K-CT	4	1000	0.5	1	750
006	TF5SX13ZZ	Interstage	4000-CT	10K-CT	400	1100	1.5	750
007	TF5SX13ZZ	Output	1500-CT	15	150	2	2.5	750
008	TF5SX17ZZ	Output to Line	1000-CT	600-CT	100	70	3	750
009	TF5SX17ZZ	Output	1000-CT	4	100	0.5	3	750
010	AF5SX11ZZ	Input	600-CT	25K-CT	60	2900	4	750
011	TF5SX17ZZ	Isolation	600-CT	600-CT	60	70	4	750
012	TF5SX17ZZ	Output	600-CT	60	60	6.5	4	750
013	TF5SX17ZZ	Output	600-CT	15	60	2	4	750
014	TF5SX17ZZ	Output	600-CT	4	60	0.5	4	750
015	TF5SX17ZZ	Output to Line	250	600-CT	25	70	7	750
016	TF5SX13ZZ	Driver	10K-CT	2000-CT	1000	110	1	750
017	TF5SX13ZZ	Driver	10K-CT	500-CT	1000	110	1	750
018	TF5SX17ZZ	Line to Line	500-CT	600-CT	50	70	4.5	750
019	TF5SX17ZZ	Output to Line	300-CT	600-CT	30	70	5.5	750

AUDIO TRANSFORMERS LW & LY SERIES





Series	A
LW	.900
LY	1.125

"LW" series transformers are manufactured to MIL-T-27, Grade 5, Class S specifications. Riser areas and 0.1 grid spacing make these units ideal for printed circuit board applications.

RESPONSE: ±1 DB 100 to 10,000 HZ
DISTORTION: 1.5% Max. at 60 MW, 100 TD 10,000 HZ
WEIGHT: 2.4 OZ

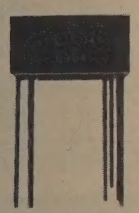
LW No.	MIL-T-27 Designation	Application	Impedance Ohms Pri	Impedance Ohms Sec.	DC Resistance Ohms Pri	DC Resistance Ohms Sec	Max. Pri DC (ma)	Max. 200 Hz Pwr* (mw)
001	TF5SX13ZZ	Interstage	10K-CT	10K-CT	800	1050	1	3.5
002	TF5SX13ZZ	Output to Line	10K-CT	600-CT	800	60	1	3.5
003	TF5SX13ZZ	Output	10K-CT	4	800	0.5	1	3.5
004	TF5SX13ZZ	Output	1500-CT	15	110	1.5	2.5	3.5
005	TF5SX17ZZ	Output to Line	1000-CT	15	75	60	3	3.5
006	TF5SX17ZZ	Output	1000-CT	4	75	0.5	3	3.5
007	TF5SX11ZZ	Input	600-CT	25K-CT	45	2700	4	2.5
008	TF5SX17ZZ	Isolation	600-CT	600-CT	45	60	4	3.5
009	TF5SX17ZZ	Output	600-CT	60	45	6.5	4	3.5
010	TF5SX17ZZ	Output	600-CT	15	45	1.5	4	3.5
011	TF5SX17ZZ	Output	600-CT	4	45	0.5	4	3.5
012	TF5SX17ZZ	Output to Line	250	600-CT	20	60	7	3.5
013	TF5SX13ZZ	Interstage	25K-CT	1000-CT	2500	85	0.5	2.5
014	TF5SX13ZZ	Driver	10K-CT	2000-CT	800	170	1	3.5
015	TF5SX13ZZ	Driver	10K-CT	500-CT	800	50	1	3.5
016	TF5SX17ZZ	Line to Line	500-CT	600-CT	50	60	4.5	3.5
017	TF5SX17ZZ	Output to Line	300-CT	600-CT	30	60	5.5	3.5
018	TF5SX13ZZ	Interstage	2500-CT	10K-Split	200	900	1.5	3.5

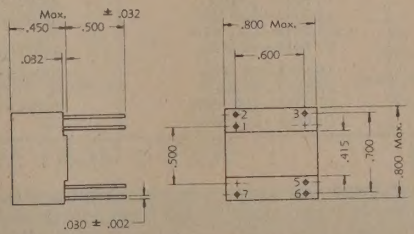
"LY" series transformers are highly compact, efficient units with power output ratings to 7.5 watts. These transformers are manufactured to MIL-T-27, Grade 5, Class S specifications.

RESPONSE: ±1 DB 60 to 10,000 HZ
DISTORTION: 1% Max. at 250 MW, 60 to 10,000 HZ
10% Max. at rated power, 200 to 10,000 HZ
WEIGHT: 2.5 OZ.

LY No.	MIL-T-27 Designation	Application	Impedance Ohms Pri	Impedance Ohms Sec.	DC Resistance Ohms Pri	DC Resistance Ohms Sec	Max. Pri DC (ma)	Max. 200 Hz Pwr* (mw)
001	TF5SX13ZZ	Interstage	10K-CT	10K-CT	700	900	1	6
002	TF5SX13ZZ	Output to Line	10K-CT	600-CT	700	55	1	6
003	TF5SX13ZZ	Output	10K-CT	4	700	0.4	1	6
004	TF5SX13ZZ	Output	1500-CT	15	100	1.5	2.5	7.5
005	TF5SX17ZZ	Output to Line	1000-CT	600-CT	65	55	3	7.5
006	TF5SX17ZZ	Output	1000-CT	4	65	0.4	3	7.5
007	TF5SX17ZZ	Isolation	600-CT	600-CT	40	55	4	7.5
008	TF5SX17ZZ	Output	600-CT	60	40	6	4	7.5
009	TF5SX17ZZ	Output	600-CT	15	40	1.5	4	7.5
010	TF5SX17ZZ	Output	600-CT	4	40	0.4	4	7.5
011	TF5SX17ZZ	Output to Line	250	600-CT	16	55	7	7.5
012	TF5SX13ZZ	Driver	10K-CT	2000-CT	700	150	1	6
013	TF5SX13ZZ	Driver	10K-CT	500-CT	700	45	1	6
014	TF5SX17ZZ	Line to Line	500-CT	600-CT	45	55	4.5	7.5
015	TF5SX17ZZ	Output to Line	300-CT	600-CT	27	55	5.5	7.5
016	TF5SX13ZZ	Interstage	2500-CT	10K-Split	170	800	1.5	7.5

AUDIO TRANSFORMERS — LJ SERIES





"LJ" Series transformers are the ultimate in compactness and their .450 HT and 0.1 grid spacing provide a most efficient .5" board spacing unit. Designed to meet MIL-T-27B, Grade 5, Class S.

RESPONSE: ±1 DB 200 to 10,000 HZ
DISTORTION: 10% Max. at rated power, 200 to 10,000 HZ
WEIGHT: 0.75 OZ

LJ No.	Application	Impedance Ohms Pri	Impedance Ohms Sec	DC Resistance Ohms Pri	DC Resistance Ohms Sec	Max. Pri DC (ma)	Max. 200 Hz Pwr* (mw)
001	Interstage	25K-CT	1000-CT	1325	53	0.5	300
002	Interstage	10K-CT	10K-CT	510	525	1	375
003	Driver	10K-CT	1500-CT	510	80	1	375
004	Output to Line	10K-CT	600-CT	510	31	1	375
005	Output	10K-CT	4	510	0.3	1	375
006	Interstage	4000-CT	10K-CT	200	525	1.5	375
007	Output	1500-CT	15	75	1	2.5	375
008	Output to Line	1000-CT	600-CT	50	31	3	375
009	Output	1000-CT	4	50	0.3	3	375
010	Input	600-CT	25K-CT	30	1500	4	300
011	Isolation	600-CT	600-CT	30	31	4	375
012	Output	600-CT	60	30	3	4	375
013	Output	600-CT	15	30	1	4	375
014	Output	600-CT	4	30	0.3	4	375
015	Output to Line	250	600-CT	13	31	7	375
016	Driver	10K-CT	2000-CT	510	106	1	375
017	Driver	10K-CT	500-CT	510	26	1	375
018	Line to Line	500-CT	600-CT	25	31	4.5	375
019	Output to Line	300-CT	600-CT	15	31	5.5	375
020	Isolation-Ratio 1:1:1	2000-CT	8K Split	100	425	2	300
021	Isolation	10K-CT	2K Split	510	106	1	300

* These power ratings are based upon lowest frequency operation. Much higher ratings are possible at higher operating frequencies.

VARI-L CO., INC.

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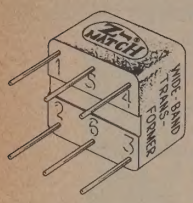
MINIATURE WIDEBAND TRANSFORMER



Used For:
Impedance Matching
Phase Detector
Wideband Interstage Coupling
Pulse Transformer
Voltage/Current Step-up or Step-down
Numerous other Applications

Time tested principles are combined with 20 years experience in the design and construction of inductive components in this series of transformers. The broad line of transformers listed below solves circuit coupling problems in today's transistorized equipment, and Z-Match transformers are standard components in many critical applications.

They have been qualified to MIL-C-15305C. Operating temperature range is —50°C to +85°C. VSWR is less than 1.3:1 and insertion loss is .5 db max. on all types. Power handling ability is 2W from the lowest frequency specified up to mid range and about 4 W over the high portion. Applicable bulletins are 567, 101 and 103.

TYPES AVAILABLE FROM STOCK

MODEL	DESCRIPTION	RANGE OF FREQUENCY RESPONSE=—1dB. max.	SCHEMATIC NUMBER	PRICE 1-9
5012.5A	50 ohm unbal./12.5 ohm unbal.	100 KHz—1 GHz	4G(N=4)	$20.80
*5025A	50 ohm unbal./25 ohm unbal.	100 KHz—200 MHz	4G(N=2)	20.80
5050A	50 ohm unbal./50 ohm unbal.	100 KHz—1 GHz	4A	12.90
*50100A	50 ohm unbal./100 ohm unbal.	100 KHz—200 MHz	4G(N=.5)	20.80
5050B	50 ohm unbal./50 ohm unbal. ph. rev.	100 KHz—1 GHz	4B(N=1)	12.90
5050C	50 ohm unbal./50 ohm bal. symmetrical	50 KHz—700 MHz	4E	15.55
5050F	50 ohm unbal./50 ohm unbal. ph. rev. DC isol.	100 KHz—500 MHz	4C	15.55
5075B	50 ohm unbal./75 ohm unbal. ph. rev.	4 MHz—300 MHz	4B(N=1.5)	20.80
50200A	50 ohm unbal./200 ohm unbal.	250 KHz—500 MHz	4F(N=4)	15.55
50200D	50 ohm unbal./200 ohm bal. unsymmetrical	250 KHz—500 MHz	4H	15.55
50200E	50 ohm unbal./200 ohm bal. symmetrical	100 KHz—1 GHz	4I	20.80
50200F	50 ohm unbal./200 ohm unbal. ph. rev. DC isol.	200 KHz—100 MHz	4D	15.55
50200K	50 ohm bal./200 ohm bal. symmetrical	250 KHz—1 GHz	4J	20.80
50450A	50 ohm unbal./450 ohm unbal.	50 KHz—50 MHz	4F(N=9)	20.80
*50200H	50 ohm unbal./200 ohm bal. symmetrical DC isol.	100 KHz—200 MHz**	4K(N=4)	20.80
*50600H	50 ohm unbal./600 ohm bal. DC isol.	100 KHz—100 MHz	4K(N=12)	20.80
7575B	75 ohm unbal./75 ohm unbal. ph. rev.	150 KHz—1 GHz	4B(N=1)	12.90
7575C	75 ohm unbal./75 ohm bal.	100 KHz—1 GHz	4E	15.55
*75124H	75 ohm unbal./124 ohm bal. DC isol.	50 KHz—25 MHz	4K(N=1.65)	20.80
75300A	75 ohm unbal./300 ohm unbal.	250 KHz—500 MHz	4F(N=4)	15.55
75300D	75 ohm unbal./300 ohm bal. unsymmetrical	250 KHz—500 MHz	4H	15.55
75300E	75 ohm unbal./300 ohm bal. symmetrical	250 KHz—900 MHz	4I	20.80
75300K	75 ohm bal./300 ohm bal. symmetrical	400 KHz—900 MHz	4J	20.80
100100B	100 ohm unbal./100 ohm unbal. ph. rev.	200 KHz—1 GHz	4B(N=1)	12.90
100100C	100 ohm unbal./100 ohm bal.	100 KHz—1 GHz	4E	15.55

*.5 watt max. types **For a 50200H model for higher frequency, see type HYB-1

For dimensions see figure 4L

LOW FREQUENCY SERIES

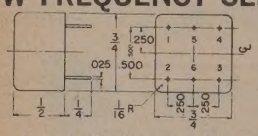


Fig. 1 LF Outline drawing

Slightly larger than the series above but usable at much lower frequencies is the LF line listed in the table directly below. These new units, which were designed at the request of our customers, utilize the proven construction techniques of the original Z-Match line and are produced with the same void-free encapsulation methods. The approximate constants as given above apply to the LF units. Applicable bulletin is 105.

LOW FREQUENCY TRANSFORMER SPECIFICATIONS

MODEL	DESCRIPTION	RANGE OF FREQUENCY RESPONSE=—1dB max.	SCHEMATIC NUMBER	PRICE 1-9
LF5012.5A	50 ohm unbal./12.5 ohm unbal.	10 KHz—100 MHz	4G(N=4)	$20.80
LF5050B	50 ohm unbal./50 ohm unbal. ph. rev.	10 KHz—100 MHz	4B(N=1)	12.90
LF5050C	50 ohm unbal./50 ohm bal. symmetrical	10 KHz—100 MHz	4E	15.55
LF5050F	50 ohm unbal./50 ohm unbal. ph. rev. DC isol.	10 KHz—100 MHz	4C	15.55
LF50200A	50 ohm unbal./200 ohm unbal.	10 KHz—100 MHz	4F(N=4)	15.55
LF50200E	50 ohm unbal./200 ohm bal. symmetrical	10 KHz—100 MHz	4I	20.80
LF50200F	50 ohm unbal./200 ohm unbal. ph. rev. DC isol.	10 KHz—50 MHz	4D	15.55
LF50450A	50 ohm unbal./450 ohm unbal.	10 KHz—25 MHz	4F(N=9)	20.80
LF50200H	50 ohm unbal./200 ohm bal. DC isol.	10 KHz—50 MHz	4K(N=4)	20.80
LF50600H	50 ohm unbal./600 ohm bal. DC isol.	10 KHz—25 MHz	4K(N=12)	20.80
LF50800H	50 ohm unbal./800 ohm bal. DC isol.	10 KHz—10 MHz	4K(N=16)	22.50
LF501800H	50 ohm unbal./1800 ohm bal. DC isol.	10 KHz—5 MHz	4K(N=36)	25.00
LF7575B	75 ohm unbal./75 ohm unbal. ph. rev.	15 KHz—100 MHz	4B(N=1)	12.90
LF7575C	75 ohm unbal./75 ohm bal.	15 KHz—100 MHz	4E	15.55
LF75124H	75 ohm unbal./124 ohm bal. DC isol.	10 KHz—10 MHz	4K(N=1.65)	20.80
LF75300A	75 ohm unbal./300 ohm unbal.	15 KHz—75 MHz	4F(N=4)	15.55
LF75300E	75 ohm unbal./300 ohm bal. symmetrical	15 KHz—75 MHz	4I	20.80
LF100100B	100 ohm unbal./100 ohm unbal. ph. rev.	10 KHz—100 MHz	4B(N=1)	12.90
LF100100C	100 ohm unbal./100 ohm bal.	10 KHz—100 MHz	4E	15.55

WIDEBAND HYBRID JUNCTION/TRANSFORMER

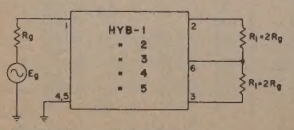


Fig. 2 Hybrid as a conventional wideband transformer

These are true center-tapped, dc isolated transformers which can be used to design or construct singly or doubly balanced mixers and phase detectors. Other applications include vectoral addition and subtraction and power division and addition. They of course also give excellent performance as conventional wide band transformers where dc isolation is necessary. All have 4:1 impedance ratio with 50 Ohms unbal. primary to 200 Ohms balanced secondary. Physical size is shown in figure 4L of the schematic section on page 3. Applicable bulletin 368 gives comprehensive circuit information.

For other Vari-L products see Sections 1800 and 3400.

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Z-MATCH

HYBRID APPLICATIONS

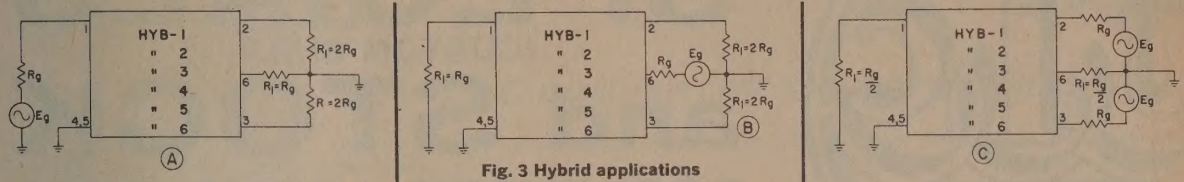


Fig. 3 Hybrid applications

3A: Signal applied at Terminal 1 appears at Terminals 2 and 3. Phase relationship 2 to 3 is 180°. Terminal 6 is isolated.

3B: Signal applied at Terminal 6 appears at Terminals 2 and 3. Phase relationship 2 to 3 is 0°. Terminal 1 is isolated.

3C: By reciprocity it can be correctly assumed from the above that the loads at Terminals 2 and 3 can be replaced by generators, and when the generators are in phase their combined outputs will appear at Terminal 6, and when they are 180° out of phase their combined outputs will appear at Terminal 1.

As illustrated, any of the six HYB transformer types may be used in the circuits in Figures 3A, 3B, and 3C.

HYBRID/TRANSFORMER SPECIFICATIONS

MODEL	USEFUL RANGE, MHz	SCHEMATIC FIGURE 4	H DIMENSION	PRICE 1-9
HYB-1	.250-500	K	19/64	$24.50
HYB-2	.250-300	K	19/64	20.80
HYB-3	.100-200	K	19/64	20.80
HYB-4	2.5 -250	K	19/64	19.00
HYB-5	3.5 -250	K	19/64	19.00
HYB-6	.002-15	K	9/16	24.50

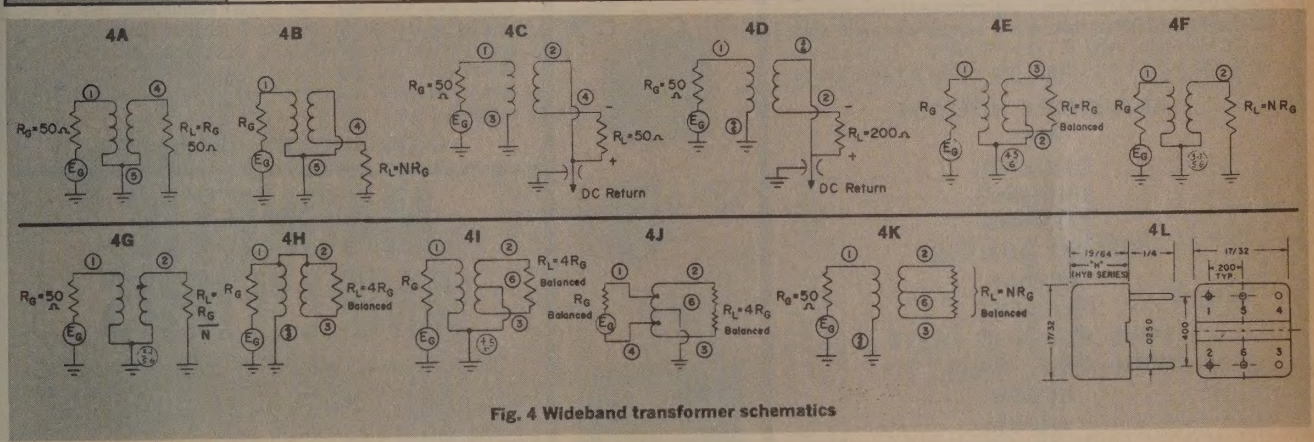
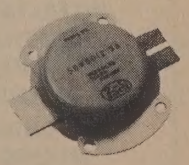
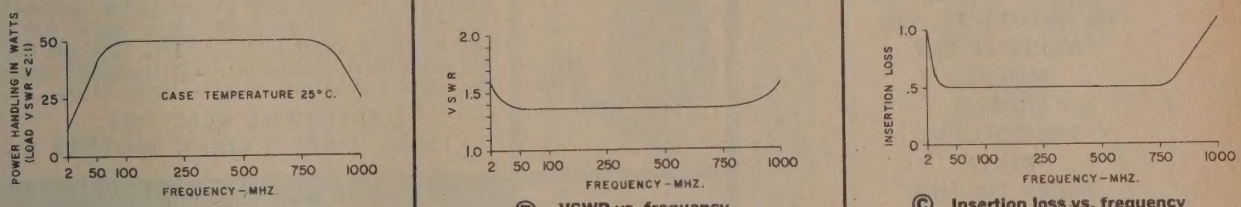


Fig. 4 Wideband transformer schematics

POWER WIDEBAND TRANSFORMER

50 Watts (up to 1KW peak for pulses) power handling ability is provided in this series of rugged microstrip-compatible wideband transformers. Operating temperature range is −55 to +125°C, derated per figure 5 linearly at ½% per °C of the 25°C value. They are reciprocal and may be used for impedance/voltage step-up or step-down. Internal conductors will handle steady-state currents up to 4 amps. Applicable bulletins are 100 and 101.





Ⓐ Power handling vs. frequency

Ⓑ VSWR vs. frequency

Ⓒ Insertion loss vs. frequency

Fig. 5

TYPES AVAILABLE FROM STOCK:

MODEL	DESCRIPTION	RANGE OF FREQUENCY RESPONSE = −1dB. max.	PRICE 1-9
50W5012.5A	50 ohm unbal./12.5 ohm unbal.	2 MHz-1 GHz	$ 90.00
50W5050C	50 ohm unbal./50 ohm bal. symmetrical	2 MHz-1 GHz	90.00
50W505A	50 ohm unbal./5 ohm unbal.	2 MHz-750 MHz	110.00
50W50200E	50 ohm unbal./200 ohm bal. symmetrical	2 MHz-1.5 GHz	110.00
50W50200A	50 ohm unbal./200 ohm unbal.	2 MHz-750 MHz	110.00

For other Vari-L products see Sections 1800 and 3400.

PIONEERS IN MINIATURIZATION

SPECIALS (CUSTOM BUILT) and STOCK

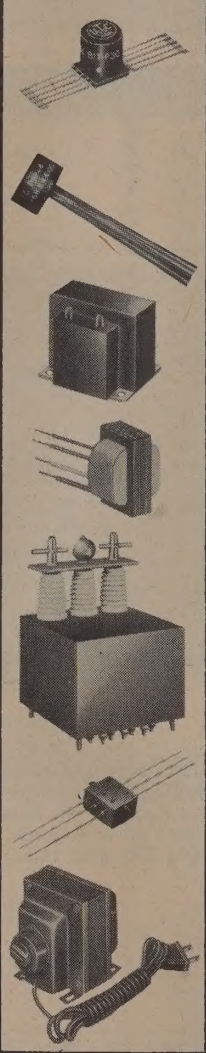
FOR EVERY APPLICATION

IMMEDIATE DELIVERY ON ALL STOCK ITEMS

TRANSFORMERS

Concerted attention, for almost forty years, to engineering, quality and reliabilty has made UTC a pioneer in the design and manufacture of iron core components. Physical constructions include metal cased, molded, encapsulated, potted, or open type units as required. Special and stock units for both transistor and tube applications are available for industrial requirements and military requirements to MIL-T-27C specifications. In addition, these units are unprecedented for ham, hi-fi, broadcast and replacement purposes. Ranges are: power transformers, milliwatts to 100 KVA; audio units, 0.1 Hz to 400 MHz . . . microwatts to 50 KW; pulse transformers, microwatts to 10 megawatts.

ADJUSTABLE VOLTAGE
BIAS
BOOSTER
BRIDGING
CHOPPER
CURRENT LIMITING
DRIVER
FILAMENT
FOUR HUNDRED HERTZ
HIGH TEMP. (Class "S")
HYBRID
INPUT
INTERSTAGE
ISOLATION
LOW CAPACITY
LOW FREQUENCY
MATCHING
MIXING
MILITARY STANDARD
MINIATURE POWER
MODULATION
MOLDED
OUTPUT
PHOTOFLASH
PLATE
PLATE TO LINE
POWER
PRECISION REFERENCE
PRINTED CIRCUIT
PULSE
SIGNAL
STEP DOWN
THREE PHASE
TRANSISTOR
TRANSISTOR INVERTER
TRANSISTOR SUPPLY



INDUCTORS

UTC's capabilities in range run from fractions of microhenries to many thousands of henries, limited only by the physical size of the unit. Almost forty years of specialization in the design and production of iron core components have resulted in UTC being a first source of supply for difficult units. Military to (MIL-T-27C) and commercial types are available in all standard UTC case configurations, plus units to your specifications. Metal cased, molded, encapsulated, open, and potted units of the highest quality and reliability are available. The largest engineering staff of its kind is supported by the most modern, fully equipped materials and test laboratories. In addition, extensive life testing and rigid quality control measures assure the advanced designing and high reliability associated with UTC products.

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MAGNETIC AMPLIFIERS

UTC has manufactured virtually thousands of special types of magamps, saturable reactors and reference transformers tailored to a variety of unique applications. Included are units both hermetically sealed to MIL-T-27C specifications, and of the commercial type. Power gains of over 400,000 are not unusual. Physical construction, including metal cased, molded, encapsulated, potted, or open type units are designed and produced to your specifications. A new stock line of magamps include compact, exceptionally stable, magnetically shielded units with an amplification of 40:1. These stock components, specifically designed for transistor application, are hermetically sealed to MIL-T-27C; one application is for control of 2 phase, 115 V., 400 Hz servo motors. Another new stock line, the "MAS" magamps operate on an input of 115 V 400 Hz with an output of ± 7.5 V DC, 1000 ohm load and have 2 isolated control inputs. These magnetic amplifiers afford a power gain of approximately 30,000.

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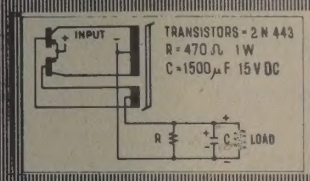
DC TO DC CONVERTER TRANSFORMERS

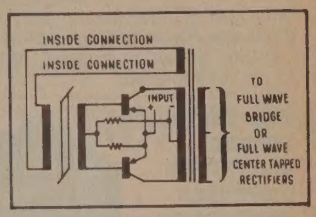
Permits conversion of low voltage direct current to high voltage for operating mobile electronic equipment.



CATALOG NO.	DC INPUT VOLTS	DC OUTPUT VOLTS	DC LOAD AMPS
DD01001	6	12	4
DD01002	9	12	4
DD01003	6	9	4

These transformers are used in an efficient circuit using minimum components as it can be seen from the circuit diagram. Transformer used with this circuit gives a safe operation within −60° C to +70° C. The circuit remains highly efficient in either full load or fractional full load operation.

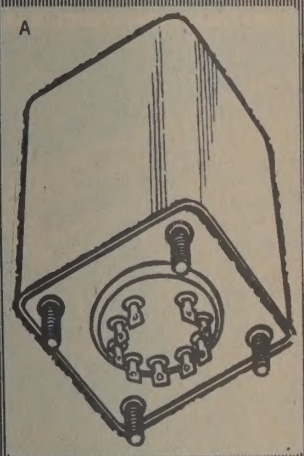
CATALOG NO.	DC INPUT VOLTS	TOTAL VA OUTPUT	TRANSISTORS	OUTPUT Bridge Volt	Bridge mA	CT Volt	CT mA	CONSTRUCTION
DD02004	28	125	Delco 2N174	500	250	250	420	GA
DD02005	12	125	Delco 2N442	500	250	250	420	GA
DD02006	12	40	Delco 2N442	450	90	225	155	FA



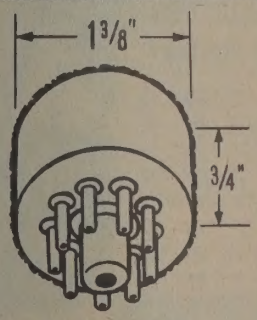
These transformers are used with relatively high load currents. With a low power saturating transformer the high power transformer can be linear so the circuit will prevent high collector current spikes. Recommended transistors are listed in the table. Feed back and starting resistor values will be supplied with every transformer.

These transformers are hermetically sealed and meet MIL-T-27B TF4RX09, electrical schematic diagram is legible on gray finished cans.

A

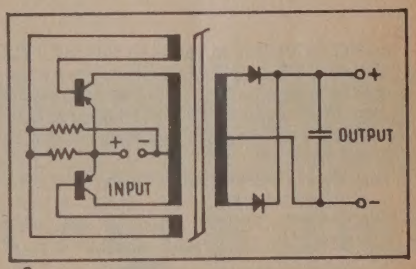


B



STANDARD 9 PIN
OCTAL PLUG IN.

CATALOG NO.	DC INPUT VOLTS	DC OUTPUT VOLTS	DC LOAD mA	TRANSISTORS	CONSTRUCTION
DD02007	6.3	250	10	2N1038	Fig. A
DD02008	6.3	200	15	2N1038	Fig. A
DD02009	6.3	150	20	2N1038	Fig. A
DD02010	6.3	120	30	2N1038	Fig. A
DD02011	6.3	250	50	2N1038	Fig. A
DD02012	6.3	200	70	2N1038	Fig. A
DD02013	6.3	150	85	2N1168	Fig. B
DD02014	6.3	120	125	2N1168	Fig. B
DD02015	12.6	250	10	2N1168	Fig. B
DD02016	12.6	200	15	2N1168	Fig. B
DD02017	12.6	150	20	2N1168	Fig. B
DD02018	12.6	120	30	2N1168	Fig. B
DD02019	12.6	250	50	2N1168	Fig. B
DD02020	12.6	200	70	2N1168	Fig. B
DD02021	12.6	150	85	2N1168	Fig. B
DD02022	12.6	120	125	2N1168	Fig. B
DD02023	28	250	10	2N174	Fig. C
DD02024	28	200	15	2N174	Fig. C
DD02025	28	150	20	2N174	Fig. C
DD02026	28	120	30	2N174	Fig. C
DD02027	28	250	50	2N174	Fig. C
DD02028	28	200	70	2N174	Fig. C
DD02029	28	150	85	2N174	Fig. C
DD02030	28	120	125	2N174	Fig. C
DD02031	6	12	500	2N1168	Fig. A
DD02032	6	24	250	2N1168	Fig. B
DD02033	12	24	250	2N1168	Fig. B
DD02034	6	12	1000	2N1168	Fig. C
DD02035	6	24	500	2N1168	Fig. C
DD02036	6	28	500	2N1168	Fig. C
DD02037	12	24	250	2N1168	Fig. C



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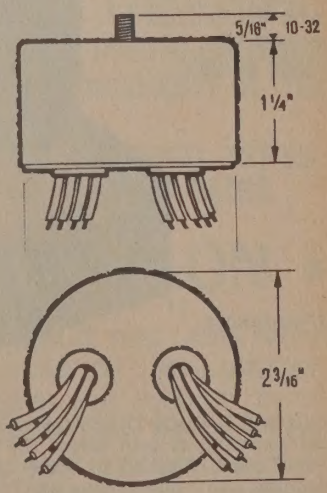
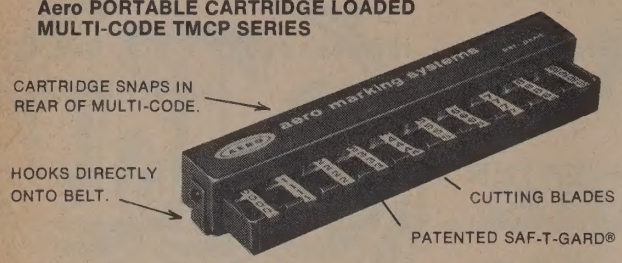


Aero PORTABLE CARTRIDGE LOADED MULTI-CODE TMCP SERIES

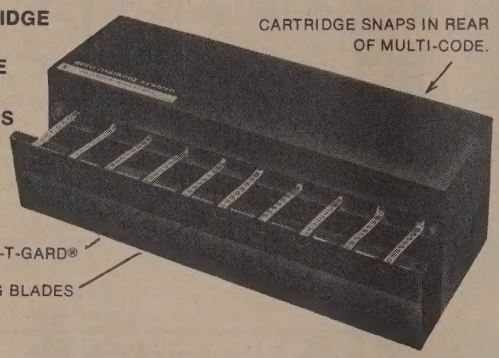


This is the NEW IMPROVED PORTABLE CARTRIDGE LOADED MULTI-CODE. The unit comes pre-packed with ten rolls of white acetate fiber tape with numbers from 0 to 9.

The unit conatins enough tape for 720 markings. The CARTRIDGE LOADED MULTI-CODE cartridges can be instantly loaded by snapping into the rear of the unit.

This tool is used exclusively by electrical contractors and plant electricians. The dispenser can be carried on the contractors pouch or clipped onto the belt, and only weighs 12 oz. fully loaded.

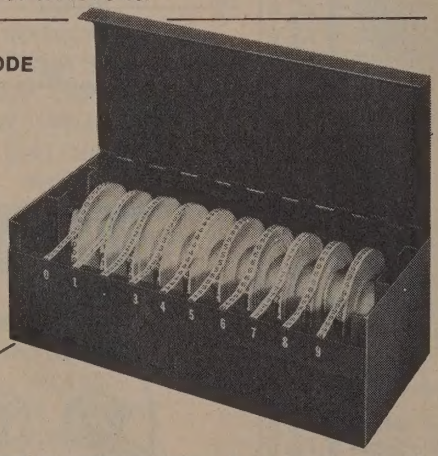
Aero CARTRIDGE LOADED MULTI-CODE DISPENSER TMCC SERIES



AERO DEVICES introduces this new CARTRIDGE LOADED MULTI-CODE DISPENSER. The very streamline design makes this bench unit extremely easy to use. All the numbers or letters are easily visible for quick identification and application. The tape cartridges snap in the rear of the unit in seconds.

This NEW CARTRIDGE LOADED MULTI-CODE can be used in AIRCRAFT, MISSILES, ELECTRONICS, MOTOR REPAIR SHOPS, FACTORY ELECTRICAL MAINTENANCE and ELECTRICAL CONTRACTORS.

Aero MULTI-CODE DISPENSER TMCD SERIES



This MULTI-CODE DISPENSER offers the easiest and fastest way to code your wires. The cabinet is constructed of heavy steel, finished in black baked coritex. The top is secured with a piano hinge which closes flush — no dust or drying of tape to worry about.

Here are some typical areas in which our wire marking system is used; AIRCRAFT and MISSILE ASSEMBLY, ELECTRONICS, MOTOR REPAIR, FACTORY ELECTRICAL MAINTENANCE, ELECTRICAL CONTRACTING, ETC.

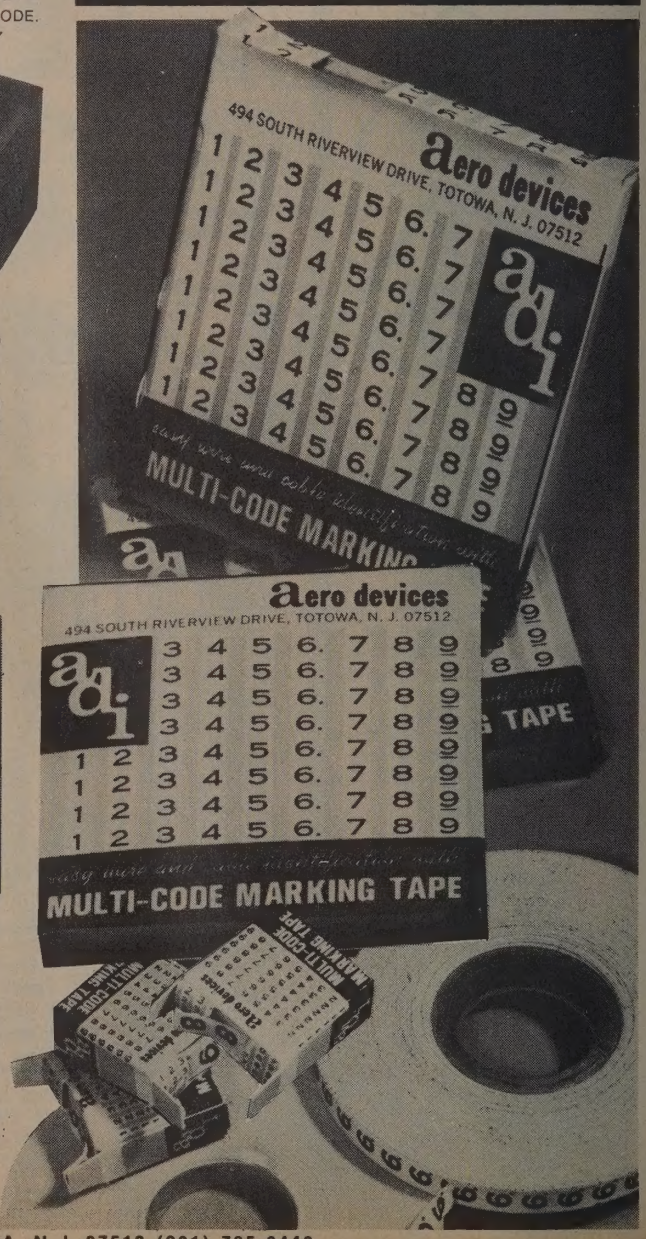
easy wire and cable identification

with **aero devices**

multi-code wire and cable identification systems

ADI multi-code marking tapes will do what you want it to do. Tapes come in letters, numbers or vivid colors for easier identification. Available with High-TAC adhesive for permanent marking or LOW-TAC adhesive for easy removal. All tapes are packaged in boxes to ensure freshness and tape longevity. Shelf life of tape is approximately 1 year.

Specify the tape you need . . . or tell us the specific job its needed for — let our research department help you.



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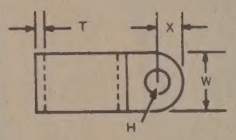
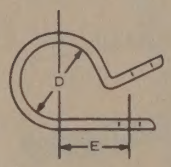
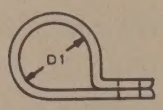
3/16 L	3/16	.172	.378	.050	3/8	13/64	7/32
1/4 L	1/4	.234	.409	.050	3/8	13/64	7/32
5/16 L	5/16	.297	.441	.050	3/8	13/64	7/32
3/8 L	3/8	.359	.471	.050	3/8	13/64	7/32
7/16 L	7/16	.422	.519	.050	3/8	13/64	7/32
1/2 L	1/2	.484	.550	.050	3/8	13/64	7/32
1/8 H	1/8	.115	.360	.060	1/2	13/64	7/32
3/16 H	3/16	.172	.423	.060	1/2	13/64	7/32
1/4 H	1/4	.234	.457	.060	1/2	13/64	7/32
5/16 H	5/16	.297	.498	.060	1/2	13/64	7/32
3/8 H	3/8	.359	.529	.060	1/2	13/64	7/32
7/16 H	7/16	.422	.560	.060	1/2	13/64	7/32
1/2 H	1/2	.484	.592	.060	1/2	13/64	7/32
9/16 H	9/16	.547	.623	.060	1/2	13/64	7/32
5/8 H	5/8	.609	.654	.060	1/2	13/64	7/32
11/16 H	11/16	.672	.752	.060	1/2	13/64	7/32
3/4 H	3/4	.734	.783	.060	1/2	13/64	7/32
13/16 H	13/16	.797	.814	.060	1/2	13/64	7/32
7/8 H	7/8	.859	.845	.060	1/2	13/64	7/32
1 H	1	.984	.908	.060	1/2	13/64	7/32
1-1/8 H	1-1/8	1.102	.970	.060	1/2	13/64	7/32
1-3/16 H	1-3/16	1.164	1.002	.060	1/2	13/64	7/32
1-1/4 H	1-1/4	1.227	1.062	.060	1/2	13/64	7/32
1-3/8 H	1-3/8	1.352	1.125	.060	1/2	13/64	7/32
1-1/2 H	1-1/2	1.477	1.187	.060	1/2	13/64	7/32







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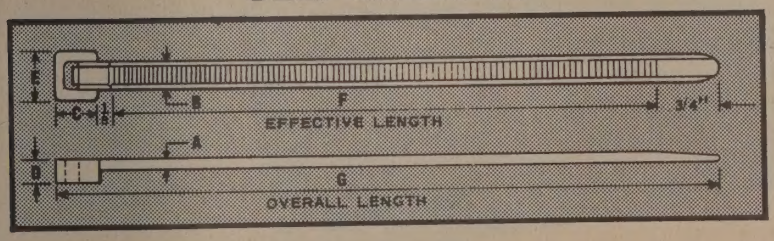

PAT. NO. REG. 3,494,505

PART NO.	Bdle. Min.	Dia. Max.	A	B	C	C	E	F	G
LT400	1/8	3/4	.050	.115	.190	.150	.225	3 3/8	4
LT675	1/8	1 3/4	.055	.190	.275	.180	.312	5 5/8	6 3/4
LT1100	1/8	3	.055	.190	.275	.180	.312	10	11
LT1400	1/8	4	.055	.190	.275	.180	.312	13	14

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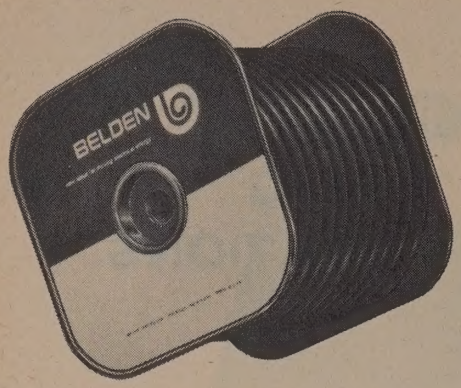

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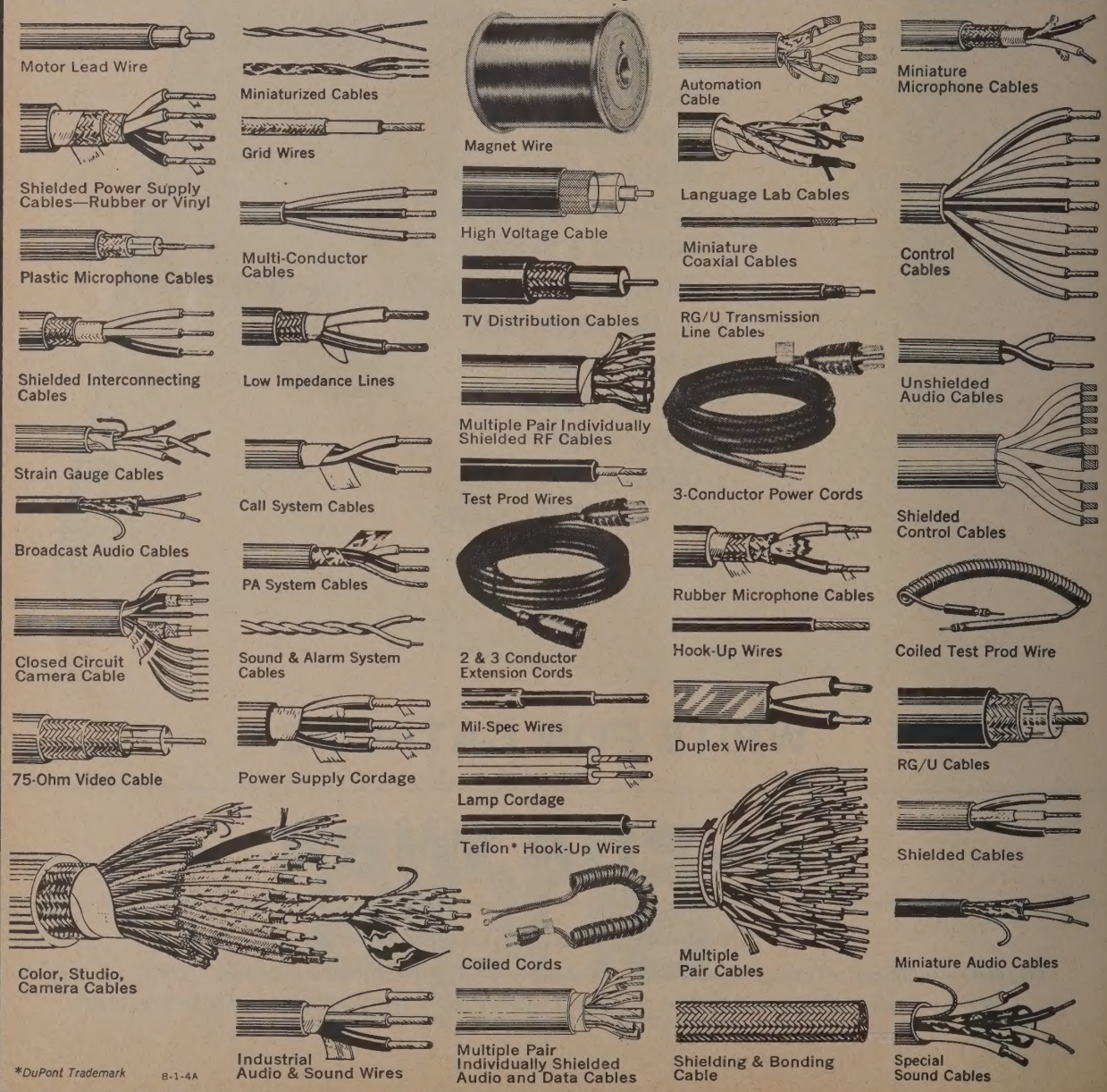

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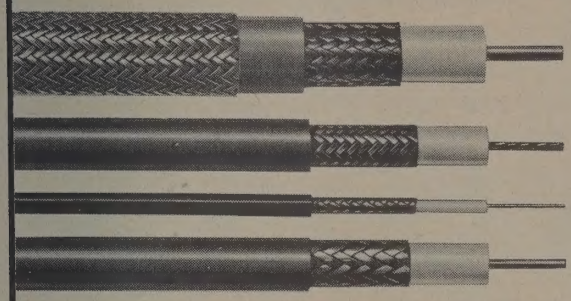
PLASTICOTE WIRE & CABLE BY CHESTER



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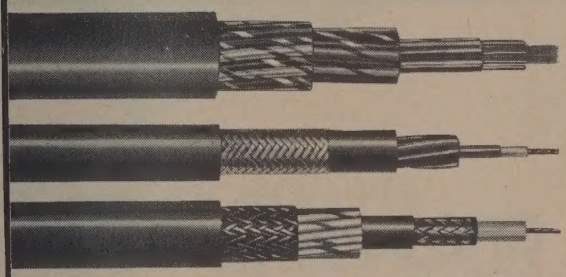

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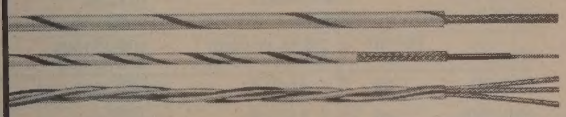
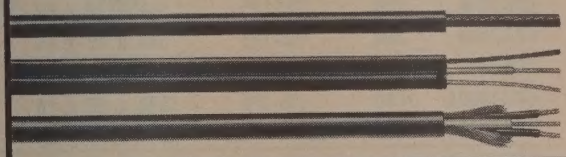
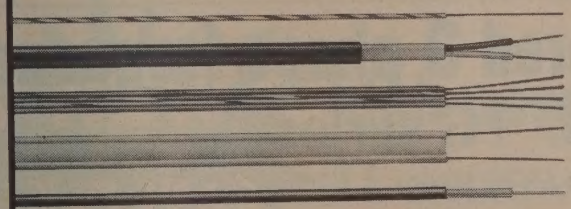


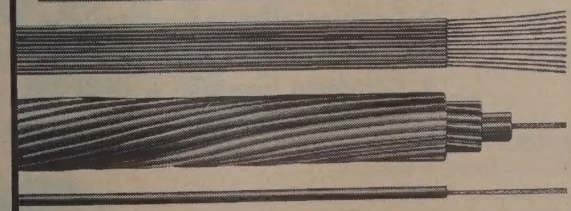
MIL-SPEC WIRE — Made in accordance with specifications MIL-W-16878 (Types B, C & D), MIL-W-76B (Types LW, MW & HW) and MIL-W-5086A for electronic systems. Available in single or multiple constructions, shielded or unshielded, with or without nylon or PVC jackets.



WIRE AND CORD FOR THE APPLIANCE INDUSTRY — U/L and CSA approved, 60°C — 80°C — 90°C — 105°C appliance wiring material — SVT, SJT, ST cord, SJTO & STO oil-resistant cord, SJT & ST oil-proof cord, SPT cord with or without individually insulated ground wire. Used for washers, dryers, refrigerating, air conditioning, vending, heating, X-ray and other electrical and electronic equipment.



RADIO AND TV CIRCUIT WIRE AND CABLE — U/L and CSA approved, 60°C — 80°C — 90°C — 105°C appliance and radio circuit wire, microphone cable, shielded and unshielded audio circuit wire, twin lead antenna wire, phonograph cable, parallel-bonded color convergence ckt. cable, braided hook-up wire, hi-anode wire, hot chassis lead, balun-coil wire, shielded constructions with spiral, braided, aluminum-Mylar tape and conductive materials; all available in Thrif-T-Bond® tinned over-coated conductors.



MISCELLANEOUS WIRE AND CABLE—Machine Tool Wire · Bus Drop Cable · Flexible Test Lead Wire · Municipal Signal Cable · Low Energy Circuit Control Cable · Station Control Cable · Inter-Office Communication and Signaling Cable · Deep-Well Submersible Water Pump Cable · Gas Tube Sign and Oil Burner Ignition Cable · Intercom Cable · Gasoline and Oil Resistant Wire · Computer Cable · Uninsulated Bus Wire · Parallel and Jacketed Cord · Braided Ground Strap, and special custom designed cable for your applications.

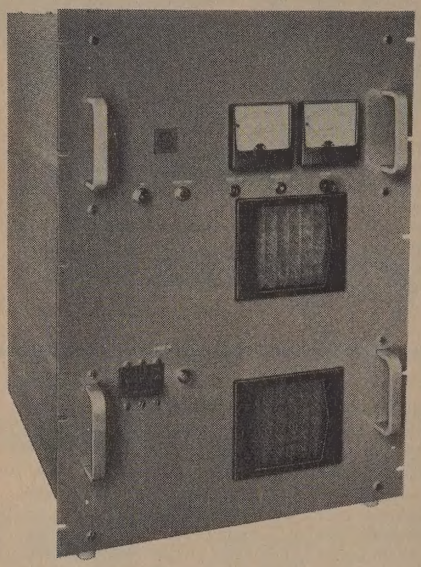
Write or phone for further information

CHESTER CABLE Operations, CHESTER, NEW YORK 10918

CITIES SERVICE COMPANY

Phone: 914—469-2141 • TWX: 914—469-9801

CML solid state frequency converters



- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 1% Voltage Regulation
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

model
CRS-2000A

LRS series
60 Hz single phase output

MODEL	OUTPUT VA	**45-65 Hz INPUT SINGLE ø VOLTS	DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
LRS-250A	250	105-125	5¼ x 19 x 15	80
LRS-500A	500	105-125	10½ x 19 x 16	100
LRS-1000A	1000	105-125	21 x 19 x 16½	220

**350-450 Hz Input also available; specify suffix -H (example: Model LRS-250A-H).

CRS series
400 Hz single phase output

MODEL	OUTPUT VA	*45-65 Hz INPUT SINGLE ø VOLTS	DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
CRS-50A	50	105-125	3½ x 19 x 14	24
CRS-100A	100	105-125	3½ x 19 x 14	26
CRS-150A	150	105-125	5¼ x 19 x 10	30
CRS-250A	250	105-125	5¼ x 19 x 15	65
CRS-500A	500	105-125	10½ x 19 x 16	88
CRS-1000A	1000	105-125	15¾ x 19 x 16	135
CRS-2000A	2000	200-240V 3ø	26¼ x 19 x 20	260

*350-450 Hz Input also available on a special basis.

NEW FOR 1970

high powered 3 phase frequency converters / TG series
1.0 KVA to 30 KVA output • 60 & 400 Hz models

- Rugged construction for marine & ground support applications
- High efficiency
- Fixed & adjustable output frequencies
- Compact, lightweight designs
- Low distortion sinewave output
- Complete overload & short circuit protection

Write or Call Collect for Complete Specifications

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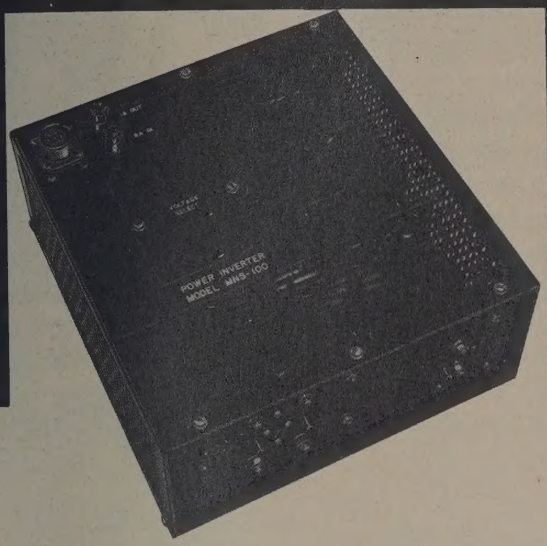
CML solid state DC to AC power inverters



- 50 to 2000 VA — Single Phase Output
- 0.5% Frequency Regulation
- 0.5% Voltage Regulation (DRS & MRS Series)
- Harmonic Distortion less than 1% at 400 Hz, less than 3% at 60 Hz
- High Efficiency Switched Mode Operation

model
MNS-100

MNS series 60 Hz

Output: 105/115/125 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Frequency Regulation:** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
MNS-50	50	5 x 11 x 11	28
MNS-100	100	5 x 11 x 11	28
MNS-500	500	8 x 14 x 14	80
MNS-1000	1000	14 x 17 x 19	162

DRS series 400 Hz

Output: 115 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Voltage & Frequency Regulation:** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
DRS-50	50	5 x 11 x 8	25
DRS-100	100	5 x 11 x 8	26
DRS-500	500	8 x 14 x 16	70
DRS-1000	1000	14 x 17 x 18	160

MRS series 60 Hz

Output: 115 Volts rms. Single Phase.
Input: 22-30 Volts D.C. **Voltage & Frequency Regulation:** 0.5%.

MODEL	OUTPUT VA	DIMENSIONS H x W x D	NET WT. LBS. (APPROX.)
MRS-500	500	12 x 14 x 14	150
MRS-1000	1000	14 x 17 x 19	175
MRS-2000	2000	17 x 17 x 22	300

NEW FOR 1970

high powered 3 phase inverters

TL series / 1.0 KVA to 30 KVA output
60 & 400 Hz models

- Rugged, lightweight construction
- Regulated voltage & frequency
- Low distortion sinewave output
- High efficiency
- Complete overload & short circuit protection
- Output unaffected by unbalanced loads

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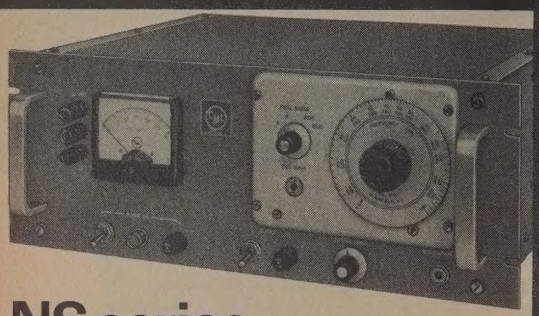
CML single phase AC power supplies

NS & NA series

- Fixed or Adjustable Output Frequencies between 45 & 6000 Hz
- Each model can be operated either as a precision AC Power Supply or as Regulated Audio Power Amplifier
- Minimum package sizes . . . 2000 VA in 14" rack height, 750 VA in 8¾" rack height
- Instantaneous Overload Protection
- Interchangeable Plug-in Oscillators Frequency Stabilities to 0.001%
- Constant Voltage Output, 0.5% regulation — response time less than 50 microseconds
- Low Distortion Sinewave Output, less than 1% 300 to 1000 Hz, less than 3% 45 to 6000 Hz
- Full Rated Output into Load Power Factors of 0.7 Lead or Lag to Unity



model
NS175-7A-V

NS series
70 VA to 350 VA

Regulated Power Amplifiers

MODEL	OUTPUT POWER VOLT-AMPERES	*DIMENSIONS H x W x D	WEIGHT (APPROX.) LBS.
NS70	70	7" x 19" x 14"	53
NS120	120	7" x 19" x 14"	57
NS175	175	7" x 19" x 14"	60
NS350	350	8¾" x 19" x 20¾"	115

*Dimensions apply to standard rack mount models. Add ¾" to height if bench adapters are included.

Standard Oscillators**

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		SUFFIX #			
Fixed	400 Hz	—4A	—4B	—4E	—4G
Fixed	800 Hz	—8A	—8B	—8E	—8G
Fixed	50 Hz	—1A	—1B	—1E	Special
Fixed	60 Hz	—2A	—2B	—2E	Order
	Selectable 50/60/400/800 Hz	—9A	—9B	X	X
Adjustable	350-450 Hz	—5A	—5B	X	X
Adjustable	45-70 Hz	—3A	—3B	X	X
Adjustable	300-2000 Hz	—6A	—6B	X	X
Adjustable	45-6000 Hz	—7A	X	X	X

Specifications:

INPUT SERVICE: 115V ±5%, 1ø, 47-65 Hz.

OUTPUT CONFIGURATION: Single phase, 2 wire floating.

OUTPUT VOLTAGE: Adjustable 0-125 volts rms by front panel gain control; full power available at 110-125 volts.

DUTY CYCLE: Continuous duty at rated output.

EXTERNAL SIGNAL: 5 volts rms required for rated output. Signal input impedance 600 ohms single ended.

METERS: Output voltmeter is furnished as standard equipment on model NS350. Voltmeter is available as accessory for models NS70, NS120 & NS175; specify suffix (—V).

TERMINATIONS: Output terminals are furnished both front and rear, five way binding posts on front and barrier strip on rear. Input power termination is rear mounted barrier strip. Signal input is via jack mounted on front panel.

CONSTRUCTION: Standard 19" rack mount construction with full dust covers. Bench adapters available as accessory; specify suffix (—C).

****AUDIO AMPLIFIER ONLY:** Each model is also available as an audio power amplifier only (without a built-in oscillator) with a full power range of 45-6000 Hz. All standard models (with or without oscillator) include an input signal jack for use with external signal source. Specify the Basic Power Supply Model and Suffix # (—JA) if oscillator is not required.

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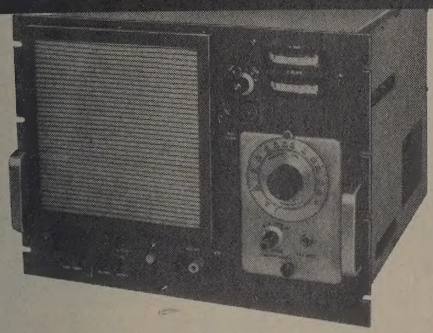
CML single phase AC power supplies



NA series
500 VA to 15 KVA

model N1000A
with SG-17A plug-in oscillator

Regulated Power Amplifiers

MODEL	OUTPUT POWER—VA	INPUT	*DIMENSIONS H	W	D	WT. APPROX. LBS.
N500A	500	115V, 1ø, 47-65 Hz	8¾	19	21	175
N750B	750	115V, 1ø, 47-65	8¾	19	21	180
N750A	750	208/230V, 3ø, 47-65	14	19	20½	260
N1000A	1,000	208/230V, 3ø, 57-65	14	19	20½	270
N1500A	1,500	208/230V, 3ø, 47-65	14	19	20½	315
N2000A	2,000	208/230V, 3ø, 47-65	14	19	20½	325
N5000A	5,000	208/230V, 3ø, 57-65	51	24	24	850
N15000A	15,000	208/230V, 3ø, 57-65	47	68	24	1600

*500VA to 2000VA units are standard rack mount models.
Add ¾" to height if bench adapters are included.
5000VA and 15000VA units are cabinet models.
Model N5000A includes casters.

Plug-in Oscillators**

	OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		MODEL #			
Fixed	400 Hz	SG-14A	SG-14B	SG-14E	SG-14G
Fixed	800 Hz	SG-18A	SG-18B	SG-18E	SG-18G
Fixed	60 Hz	SG-12A	SG-12B	SG-12E	Special
Fixed	50 Hz	SG-11A	SG-11B	SG-11E	Order
	Selectable 50/60/400/800 Hz	SG-19A	SG-19B	X	X
Adjustable	350-450 Hz	SG-15A	SG-15B	X	X
Adjustable	45-70 Hz	SG-13A	SG-13B	X	X
Adjustable	300-2,000 Hz	SG-16A	SG-16B	X	X
Adjustable	45-6,000 Hz	SG-17A	X	X	X
		EXTERNAL SIGNAL ADAPTER			
	45-6,000 Hz	Model SA-2			

**All Plug-in-Oscillators are provided with a jack for external signal drive.

Specifications:

OUTPUT CONFIGURATION: Single Phase, 2 wire floating.

OUTPUT VOLTAGE: Adjustable 0-125 Volts; full power available at output of 110-125 Volts.

DUTY CYCLE: Continuous duty at full rated output.

PROTECTIVE CIRCUITS: All models are equipped with instantaneous overload protection and front panel reset.

METERS: All standard models are furnished with front panel meters to monitor output voltage and plate currents of final amplifier tubes.

EXTERNAL SIGNAL: Signal input voltage of 5 volts rms required for full rated output. Signal input impedance 600 ohms, single ended.

OUTPUT & INPUT TERMINATIONS: Units rated at 500VA to 2000VA include output terminals on front and rear, five way binding posts on front and barrier strip on rear; input power termination is rear mounted barrier strip.

Models N5000A and N15000A have input and output terminals accessible via knockouts at cabinet rear.

CONSTRUCTION: Models rated 500VA to 2,000VA are standard 19" rack mount units with full dust covers. Bench adapters available as accessory for these models; specify suffix (—C). Side support is recommended for rack mount models. Slides available as optional accessories; specify suffix (—S). 5 KVA and 15 KVA models are furnished complete in cabinet enclosure. 5 KVA model includes casters.

NEW FOR 1970

solid state AC power supplies
ST series

- 3 models rated at 600, 1250 & 2500 VA Single Phase Output
- All models can be stacked for 2 Phase or 3 Phase Operation
- 45 to 10,000 Hz Frequency Range
- Interchangeable Plug-in Oscillators with Fixed or Adjustable Frequencies. Frequency Stabilities to 0.001%
- Selectable Output Voltage Taps
- Minimum Package Sizes
- Complete Short Circuit and Thermal Protection

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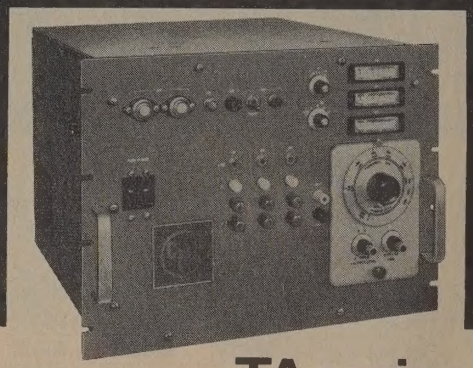
CML three phase AC power supplies

- **Minimum Package Sizes** . . . 2500 VA in 14" rack height.
- **Interchangeable Plug-in Oscillators** . . . 23 standard oscillators are available—to provide fixed or adjustable output frequencies between 45 and 6,000 Hz and stabilities to ±0.001%.
- **Instantaneous Overload Protection** . . . An overload of any one phase causes complete output shutdown, protecting 3 phase load.
- **Dual Output Voltage for △ or Y Loads** . . . Adjustable voltages 0-125 volts line-to-line as well as 0-217 volts line-to-line are presented at output terminals; output is isolated for maximum versatility.
- **Constant Voltage Output** . . . 0.5% regulation for no load to full load change.
- **Response time less than 50 microseconds.**
- **Output Voltage** unaffected by unbalanced loads.



model T2500A with SG-36B oscillator

TA series / 150 VA to 20 KVA

Three Phase Amplifiers

MODEL	3ø OUTPUT POWER—VA	INPUT	DIMENSIONS H	W	D	WT. APPROX. LBS.
T150A	150	115V, 1ø, 47-65	7	19	17	105
T300B	300	115V, 1ø, 47-65	12¼	19	20	180
T500B	500	115V, 1ø, 47-65	12¼	19	20	190
T750A	750	208/230V, 3ø, 47-65	14	19	20½	275
T1200A	1,200	208/230V, 3ø, 57-65	14	19	20½	285
T1750A	1,750	208/230V, 3ø, 47-65	14	19	20½	355
T2500A	2,500	208/230V, 3ø, 47-65	14	19	20½	365
T5000A	5,000	208/230V, 3ø, 47-65	45	24	24	950
T15000A	15,000	208/230V, 3ø, 57-65	78	35	36	1700
T20000A	20,000	208/230V, 3ø, 57-65	78	35	36	1900

Plug-in Oscillators

	3ø OUTPUT FREQUENCY	FREQUENCY STABILITY ±0.25%	±0.1%	±0.01%	±0.001%
		MODEL #			
Fixed	400 Hz	SG-34A	SG-34B	SG-34E	SG-34G
Fixed	800 Hz	SG-38A	SG-38B	SG-38E	SG-38G
Fixed	60 Hz	SG-32A	SG-32B	SG-32E	Special Order
Fixed	50 Hz	SG-31A	SG-31B	SG-31E	Special Order
Adjustable	Selectable 50/60/400/800 Hz	SG-39A	SG-39B	X	X
Adjustable	350-450 Hz	SG-35A	SG-35B	X	X
Adjustable	45-70 Hz	SG-33A	SG-33B	X	X
Adjustable	300-2,000 Hz	SG-36A	SG-36B	X	X
Adjustable	45-6,000 Hz	SG-37A	X	X	X

Specifications

OUTPUT CONFIGURATION: Three Phase, 4 wire wye, neutral floating.

OUTPUT VOLTAGE: 0-125 Volts line-to-line and 0-217 Volts line-to-line; both sets of terminals are presented at output. Full power available at output of 110-125 volts and 190-217 volts. Master gain control and phase 2 and 3 trim controls provided on front panel.

OUTPUT POWER: Rated output power for each model is shown in chart above. Maximum power per phase is ⅓ of 3ø output.

LOAD POWER FACTOR: 0.7 lead or lag to unity at rated output; wider power factor range with slight derating.

FREQUENCY RANGE: Each amplifier model is rated at full power 45-6,000 Hz except for the models T15000A and T20000A which have a 300-500 Hz full power range. The operating output frequency range is determined by the particular plug-in oscillator which is used.

HARMONIC DISTORTION: Less than 3% over the entire 45-6,000 Hz amplifier range; less than 1%, 300-1000 Hz.

HUM AND NOISE: 60 db below maximum output voltage.

OUTPUT PHASE SEPARATION: 120 ±1° for fixed frequency models as well as 350-450 Hz models. 120 ±2° for 45-70 and 300-2,000 Hz models. 120 ±3° for 45-6,000 Hz models.

CONSTRUCTION: Models rated 150VA to 2500VA are standard 19" rack mount units with full dust covers. Bench adapters available as accessories for these models; specify suffix (—C). Side support is recommended for rack mount models. Slides are available as optional accessories; specify suffix (—S). 5KVA-20KVA models are furnished complete in cabinet enclosure. 5KVA model includes casters.

Single Phase & Two Phase Output

Standard 3 phase amplifiers may be used to provide a 2 phase output at ⅔ of rated output power. Special plug-in oscillators are available with selectable 90° or 120° phase separation for 2 phase or 3 phase operation respectively.
Standard 3 phase amplifiers may be used to provide a single phase output at 57% of rated output power over an adjustable voltage range of 110-125 volts.

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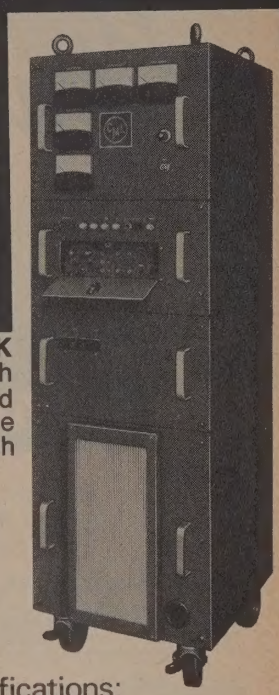
CML wide band power amplifiers for audio and ultrasonic testing

- Full power into reactive loads
- Low distortion
- ±0.5 db frequency response
- Ideal for CW and PULSED duty
- Selectable output taps for matching wide range of load impedances
- Rugged construction for marine or airborne installations

APPLICATIONS: SONAR TESTING/ VIBRATION TESTING/INDUSTRIAL PROCESS CONTROL / HIGH INTENSITY ACOUSTIC SYSTEMS/



model S5K passes through a standard submarine hatch

SPG series 1 KVA to 200 KVA

MODEL	OUTPUT POWER KVA	LOAD POWER FACTOR RANGE AT RATED KVA	STANDARD OUTPUT IMPEDANCE TAPS OHMS	DIMENSIONS* H x W x D (APPROX.) INCHES	WEIGHT (APPROX.) LBS.	TYPE OF COOLING
A1K	1KVA	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 20½	345	FORCED AIR
A2K	2	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 20½	400	
A3K	3	±0.1 to Unity	4/16/36/64/144/576	53 x 27 x 26	750	
S5K	5	±0.4 to Unity	16/64/256	62 x 17 x 17	800	
B5K	5	±0.1 to Unity	8/32/72/128/288/1152	45 x 24 x 24	850	
A10K	10	±0.1 to Unity	16/64/144/256/576/2304	47 x 68 x 24	1,700	
A20K	20	±0.3 to Unity	16/64/144/256/576	47 x 68 x 24	2,100	
VA30K	30	±0.1 to Unity	16/64/144/256/576	72 x 72 x 36	3,000	VAPOR COOLED
VA50K	50	±0.4 to Unity	16/64/144/256/576	72 x 72 x 36	4,200	
VA100K	100	±0.1 to Unity	16/64/144/256	2 sections, ea.: 90 x 72 x 57	9,400	
VA200K	200	±0.1 to Unity	16/64/144/256	3 sections, ea.: 90 x 72 x 57	14,100	

*Models A1K and A2K are standard 19" rack mount units; bench adapters available on special order. All other models are furnished complete in cabinet enclosures. Models A3K, S5K and B5K include casters.

Specifications:

FREQUENCY RESPONSE: ±0.5 db, 100-10,000 Hz; model A3K ±0.5 db 200-15,000 Hz. Other frequency ranges between 5 Hz and 100 KHz available on a custom basis.

HARMONIC DISTORTION: Less than 3% over rated frequency range; less than 1.5% midband.

HUM & NOISE: At least 60 db below rated tap voltage.

ultrasonic power amplifier model HS1K

1000 VA output from **10 KHz to 1 MHz**

NEW FOR 1970

- Full Rated Output into Load Power Factors of 0.4 Lead or Lag to Unity
- Continuous Duty Capability at Full Rated Output
- Suitable for operation with Keyed Input Signals
- Hum and Noise at least 60db below Tap Voltage
- Compact, rugged construction

solid state power amplifier model LSU1000

- Ideal for shipboard applications Compact, rugged construction.
- 1000 VA Output Continuous Duty
- 100 Hz to 20 KHz Frequency Range
- Selectable Output Voltage Taps: 90/180/270/360/540/1080 VAC
- Full Rated Output into Load Power Factors of 0.4 Lead or Lag to Unity
- Hum and Noise at least 70db below Tap Voltage
- Complete Short Circuit and Thermal Protection

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Cimco TEFLON* INSULATED HIGH TEMPERATURE WIRE, CABLE AND TUBING

Cimco manufactures both standard and custom-made wire and cable for aircraft, missiles, computers, electronic assemblies, and many other applications using TEFLON* insulated cable, tubing and hook-up wire.

Cimco

BONDING TREATMENT Surface treatment to increase bondability for use with potting compounds.

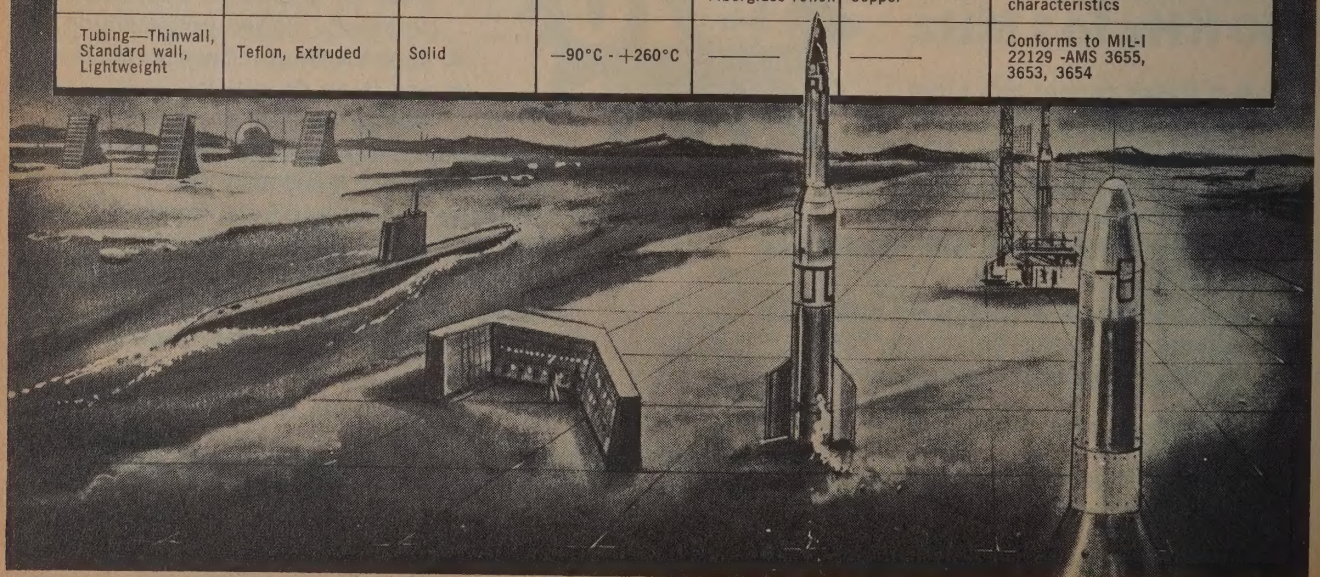
*REGISTERED DUPONT TRADEMARK

WRITE FOR CATALOG ON COMPLETE SPECIFICATIONS

wire & cable co. 250 W. CRESCENT AVE., ALLENDALE, N. J. 07401 PHONE 201-327-2522

SPECIFICATIONS

WIRE, CABLE OR TUBING	PRIMARY INSULATION	COLORS MIL-STD-104	OPERATING TEMPERATURE	JACKETS	SHIELDING	REMARKS
High Temperature Hook-up Wire	Teflon, Extruded	Solid & Striped	—90°C - +260°C	———	Nickel Plated Silver Plated or Tinned Copper	Conforms to MIL-W-16878 Types E, EE & ET or other special specifications as required.
Cables A	Teflon, Extruded Teflon Tape Wrapped	Solid & Striped	—54°C - +105°C	PVC	Silver Plated or Tinned Copper	Any combinations of conductors and shielding required.
Cables B	Teflon, Extruded Teflon Tape Wrapped	Solid & Striped	—54°C - +120°C	Nylon Braid Nylon Extruded	Silver Plated or Tinned Copper	Any combinations of conductors and shielding required.
Cables H	Teflon, Extruded Teflon Tape Wrapped	Solid & Striped	—90°C - +260°C	Fiberglass-Teflon	Silver Plated Copper	Any combinations of conductors and shielding required.
Cables C	Teflon, Extruded Teflon Tape Wrapped	Solid & Striped	—90°C - +260°C	Teflon Tape	Silver Plated Copper	Any combinations of conductors and shielding required.
Airframe Wire	Teflon Tape Plus Impregnated Glass	Solid Only	—60°C - +260°C	———	———	MIL-W-7139B
Miniature Coaxial Cable	Teflon, Extruded	Jackets Only Solid & Striped	—90°C - +260°C	Teflon Tape, Fiberglass-Teflon Nylon & PVC	Silver Plated or Tinned Copper	Conforms to MIL-C-17B
Low Capacitance Cable	Teflon Air-weave	Natural	—90°C - +260°C —90°C - +260°C —54°C - +105°C —54°C - +120°C	Teflon Tape, Fiberglass-Teflon PVC Nylon	Silver Plated or Tinned Copper	Special constructions as low as 8.0 mmf/ft.
High Voltage Cable	Teflon Tape	Solid & Striped	—90°C - +260°C	Teflon Tape, Fiberglass-Teflon	Silver Plated Copper	High voltage lead wire or cable excellent corona resistance characteristics
Tubing—Thinwall, Standard wall, Lightweight	Teflon, Extruded	Solid	—90°C - +260°C	———	———	Conforms to MIL-I 22129 -AMS 3655, 3653, 3654



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Metallurgists and Manufacturers ... Since 1901

PRECIOUS METALS

Potentiometer Wire . . . A series of precious metal alloys resistance range 29 to 550 ohms per circular mil foot. High **corrosion resistance,** assuring potentiometers of great reliability, and freedom from noise. Bare or enameled.

Platinum Wire for Resistance Thermometers . . . Platinum wire having a temperature coefficient of resistance — (when fully annealed) — at .003926 per degree C. (0-100°C.).

Alloys for Semiconductors . . . Gold Semiconductor Wire for Wedge, Ball and Ultrasonic Bonding. Sheet fabricated into discs, squares, etc. . . Gallium-Gold and Antimony-Gold for evaporation.

Bridge Wires for Electro Explosive Devices . . . Made from Noble metals, Noble metal alloys, and base metals to very fine sizes. Resistance and degree of hardness closely controlled. In MIL standards and commercial requirements.

Platinum, Platinum-Rhodium Thermocouple Wires . . . Calibrated to match the emf values given in National Bureau of Standards circular #561 of April 27, 1955. In two qualities, Standard Grade matching NBS values within limits of ±0.25% and Reference Grade ±0.1%.

Iridium, Iridium-Rhodium Thermocouple Wires . . . Temperatures as high as 2000°C. may be measured, even in an oxidizing atmosphere. Also available in strips and foil.

Taut-Band Ribbon . . . An alloy of **Nickel-Platinum** for rugged, bearing-free electrical measuring instruments.

Galvanometer Suspension Ribbon . . . Gold alloy strip for conventional construction.

PLATING SOLUTIONS

Rhodium . . . Rhodium produces a hard, thin, white and highly reflective electrodeposit, with excellent corrosion resistance. Used for wave guides, electrical contacts, other applications.

Gold Potassium Cyanide is supplied either as a **dry salt** or in **aqueous solution,** for various plating baths.

Write for comprehensive bulletins containing detailed information on each specific product.

SPECIAL WIRES

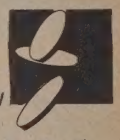
Enameled Aluminum Wire . . . Very small sizes to .0006"; for light-weight galvanometer coils and similar applications. Also available bare.

Electroplated Wire and Ribbon . . . We specialize in continuous electroplating of wire. Regularly electroplate Gold, Silver Platinum, Indium, and Tin onto base wire or ribbon, such as, Molybdenum, Nickel, Copper and Clad Wires. Gold Plating to MIL-G-45204.

Enameled Wire . . . Our enameling process consists in applying multiple coats of a baked thermosetting resin, either Class A, B or H. It is thinner than most commercial enamel coating; smooth, uniform, free from beads. Excellent for **potentiometers.**

Aluminum Alloy Bonding Wires . . . for ultrasonic bonding of new hybrid and monolithic semiconductor devices . . . Common alloys: Aluminum 1% Silicon; Aluminum 1% Magnesium; #1100 Aluminum; also pure Aluminum (99.999%). In ribbon as well as wire.

PYROFUZE® PRODUCTS



Pyrofuze . . . A bimetallic composition, the elements of which at 650°C. alloy violently and exothermically resulting in deflagration without support of oxygen. Available in a variety of physical forms, this material has found great application in the aerospace, ordnance, and electronic industries. In ignition, fire transferral, separation and current interrupting devices.

MEDWIRE PRODUCTS

Teflon-coated, Iridium-Platinum alloy wires — also Silver and Stainless Steel wires — for microelectrode probes . . . Rigid, strong, corrosion-resistant . . . Wide range of diameters . . . Send for data.

SIGMUND COHN CORP.

Affiliates: Sigmund Cohn Mfg. Co., Inc. • Pyrofuze Corp. • Medwire Corp.
121 S. Columbus Ave., Mt. Vernon, N.Y. 10553 • Phone (914) MO-4-5300

Sigmund Cohn Corp. of California, 826 Walnut Ave., Burbank, Calif. 91501

Sigmund Cohn-Pyrofuze, Inc., 5721 Brookstown Dr., Dallas, Texas 75230

Distributors in: Great Britain, France, Italy and Japan.

See YELLOW SECTION for Local Offices, Phones

COLEMAN CABLE & WIRE CO.

1900 N. FIFTH AVE., RIVER GROVE, ILL. 60171 (312) 456-4000

CUSTOM WIRE & CABLE — COPPER OR ALUMINUM CONDUCTOR

Our unique position in the wire and cable industry enables us to offer a *complete service* to our customers. Available to you, for immediate delivery from the nation's largest inventory, is virtually every conceivable type of electronic and communication wire and cable to meet an infinite variety of military, commercial and industrial needs.

In addition, our proven engineering and manufacturing capability is at your service for the production of the most exacting custom wire and cable, as well as your special wire products such as Cable Assemblies, Wiring Harnesses, Cut Leads (stripped, tinned) and Cord Sets. Staffed by experienced personnel and utilizing the industry's most modern equipment, Coleman can promptly and economically produce the wire, cable and wire products you need — no matter how large the run.

COLEMAN All-Temp

High Temperature Silicone Rubber Wire and Cable

CONSTRUCTION SPECIFICATIONS

Type TAGT/S*
Extra - temp. 600V 250°C
UL listed construction
*Teflon, Asbestos, Glass, Teflon/Silicone finish

SRML SILICONE RUBBER FLEXIBLE MOTOR LEAD WIRE

200°C (392°F) Class B
(AIEE) Intermittent Service

Catalog No.	Size	Stranding	Insulation (64ths)	Braid (Mils)	O.D.	Shipping Weight (Lbs.)
510018	18	16/.010	2	6	.130	13 lbs.
510016	16	26/.010	2	6	.140	17 lbs.
510014	14	41/.010	2	6	.158	23 lbs.
510012	12	65/.010	2	6	.180	33 lbs.
510010	10	104/.010	3	6	.240	55 lbs.
510008	8	133/.011	4	6	.317	80 lbs.
510006	6	133/.0140	4	6	.370	141 lbs.
510004	4	133/.0177	4	9	.420	205 lbs.
510002	2	133/.0223	4	9	.495	301 lbs.
510001	1	259/.0180	5	20	.570	402 lbs.
510100	1/0	259/.0202	5	20	.615	482 lbs.
510020	2/0	259/.0227	5	20	.670	598 lbs.
510030	3/0	259/.0255	5	20	.730	764 lbs.
510040	4/0	259/.0286	5	20	.800	888 lbs.

PER 1000 FEET

TYPE SF-2 600V FIXTURE & APPLIANCE WIRE 200°C (392°F)

UL Listed
N.E.C. Type SF-2 Class H

600 volt Insulation; Stranded or Solid Tinned Conductor; Silicone Rubber Insulation; Fiberglass Braid.
*Not N.E.C. Type SF-2.

510618	18	7/0152	2	9	.124	15
510616	16	7/0192	2	9	.137	20
510614	14	7/0242	2	9	.155	27
510612	12*	19/0185	2	9	.170	38
510610	10*	19/0234	3	9	.230	62

TYPE SFF-2 600V FIXTURE & APPLIANCE WIRE 150°C (302°F)

UL Listed
N.E.C. Type SFF-2

600 volt Insulation; Stranded or Solid Tinned Conductor; Silicone Rubber Insulation; Fiberglass Braid.
*Not N.E.C. Type SFF-2.

510722	22*	7/010	2	9	.114	10
510720	20*	10/010	2	9	.122	11
510718	18	16/010	2	9	.130	15
510716	16	26/010	2	9	.142	20
510714	14	41/010	2	9	.162	27
510712	12*	65/010	2	9	.184	38

*NEW BRAIDLESS MOTOR LEAD WIRE STRANDED T/C 600V

150°C (302°F)
(Thermal Stability to 200°C)

ALL-TEMP braidless motor lead wire. Combines the outstanding physical and electrical properties of silicone rubber, compounded to afford less costly but more rugged, tough, abrasion resistant insulation. Eliminating the need for a fiberglass braid.
*UL Listed.

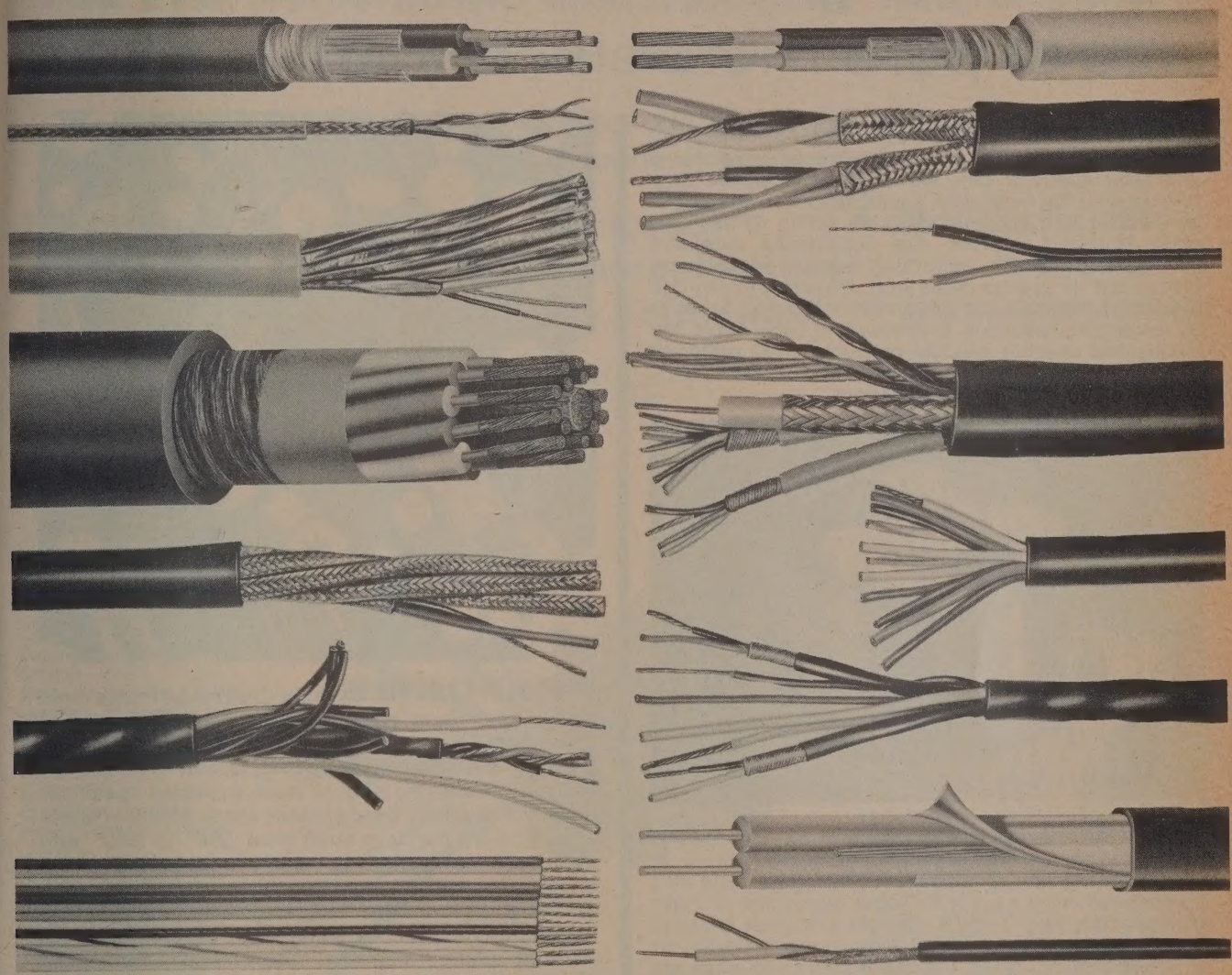
Catalog No.	Size	Stranding	Insulation (64ths)	O.D.	Shipping Weight (Lbs.)
510822	22	7/.010	2	.085	8 lbs.
510820	20	10/.010	2	.095	9 lbs.
510818	18	16/.010	2	.115	10 lbs.
510816	16	26/.010	2	.125	13 lbs.
510814	14	41/.010	2	.143	18 lbs.
510812	12	65/.010	2	.165	27 lbs.
510810	10	105/.010	3	.205	48 lbs.
510808	8	133/.010	4	.290	81 lbs.
510806	6	133/.0142	4	.345	127 lbs.
510804	4	133/.0177	4	.390	183 lbs

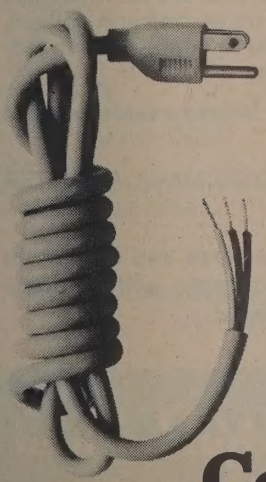
Note: Sizes not listed available upon request.
Standard Pack: 22-8AWG — 500 & 1000 ft. spools.
6 AWG & larger — 500 ft. cartons or reels.

Colors: All Solid Colors Stocked.
Terms: 2% 10th Prox.
Freight: Freight allowed on 300 lbs. or more.

See YELLOW SECTION for Local Offices, Phones

Columbia- the complete wire and cordset line.



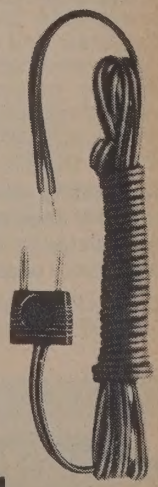


Whatever you need wire, cable and cordsets for – automated systems, instrumentation, communications, aerospace, military, or consumer projects – Columbia has the right product for you!

COLUMBIA

All top quality, it can be delivered promptly from inventories of over 100 million feet located across the country.

What's more, Columbia has a complete custom service capable of producing wire, cable, and cordsets to your exact specifications in any combination of conductors up to 2″ in diameter. For full information on the complete Columbia line, write the nearest Columbia Electronic Cables sales office: 150 Hamlet Ave., Woonsocket, R.I. 02895; 1950 Naomi Ave., Los Angeles, California 90011.

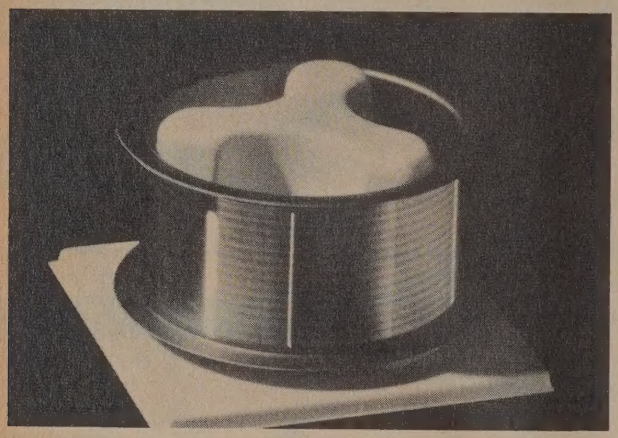


Columbia Electronic Cables

a division of AVNET, INC

CRM a single source for electronic grade preforms and fine wire of pure metals and special alloys

CRM specializes in the manufacture of precision wire and preforms for use in electronic components and semiconductor devices. In order to assure conformance to the most rigid specifications, even metals purification and alloying are done within CRM's own plant. Hundred of stock dies supplement extensive tool-making facilities, permitting fast and inexpensive fabrication of custom sizes and shapes. Appropriate physical, chemical, and performance tests are used at all stages of production to assess and certify both the quality and usability of CRM products. CRM preforms and wire are available from stock or are custom fabricated to meet all your specifications.



WIRE from CRM is available in all varieties required for electronics, semiconductors, and electrical instruments to any specification. Thus, pure Gold may be obtained in 5-9's purity for vapor deposition or lower purity for bonding. Tensile strength and other physical properties can also be varied, even to match particular wire bonding machines. Various doped Gold wires are also available. Similarly, standard and custom wire of pure metals and special alloys are produced by CRM for other semiconductor applications, resistance thermometers, potentiometers, strain gauges, galvanometers, thermocouples, and for experimental applications. All wire can be supplied with any type of enamel or plated, or bare.

Gold bonding wire • silicon-aluminum bonding wire • pure vapor deposition wire • potentiometer wire • platinum resistance thermometer wire • fuse wire • strain gauge wire • enameled wire • plated wire

CRM WIRE CAN HELP YOU MAKE A BETTER PRODUCT.

PREFORMS from CRM range from simple solder washers to precisely sized perfect spheres of high purity gold for semiconductor mounting and special frames for flatpack assembly. Quality is controlled at every processing step to meet customer specifications. For example, Gold spheres are available in either 4-9's or 5-9's purity in sizes from .008″ to .040″ with sphericity controlled to ±.001″. All spheres are checked optically to assure perfect surface finish; they are weighed to assure uniform density, and they are rolled down an inclined plane which automatically rejects all spheres which are out of round. CRM makes preforms from precious metals and alloys, Aluminum and Aluminum alloys, brazing alloys, and soft solders. Over 300 stock dies are on hand to permit custom fabrication without tooling charges.

Discs • rectangles • washers • frames • solder • braze • eutectic gold alloys

CRM PREFORMS CAN HELP YOU MAKE A BETTER PRODUCT.

Call or Write for a useful Data Book and Catalog of CRM Fine Wire and Precision Preforms, and for a quotation on your special requirements.

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See our catalog pages in this year's edition of
The Radio-Electronic MASTER

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For an Infinite Variety of Applications

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Aerial Wire
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Annunciator Wire
Audio Cable
Automotive Cable
Bare Copper Wire
Bonding Strap
Braided Copper
Broadcast Studio Cable
Bronze Wire
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Cathode Ray Tube Cable
Coaxial Cable
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Copper—Braided Tinned
Copper—Solid Tinned
Copper—Stranded Bare
Copper—Stranded Tinned
Cord—Power, Service
Cord Sets
Direct Burial Cable
Electrical Cordage
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Hi-Temp Wire
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Hook-up Wire
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Glass
Nylon
Ignition Wire
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Juke Box Speaker Cable
Lamp Cord
Lead Covered Communication Cable
Lead Sheathed Cable

Magnet Wire
Microphone Cable—Plastic
Microphone Cable—Rubber
Military Specification
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MIL-W-76B
QQ-B-575
MIL-W-583B
MIL-W-3861
MIL-C-3432B

MIL-W-5086A
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Plastic Hook-up Wire
Plastic Jacketed Cable, Shielded
Plastic Jacketed Cable, Unshielded
R.G. Coaxial Cables

Resistance Wire
Rubber Covered Cable, Shielded
Rubber Covered Cable, Unshielded
Service Cord
Shielded Cable
Shielding—Braided Copper
Shielded—Hook-up Wire
Shielded Microphone Cable
Shielded Multi-Conductor Cable
Speaker Cable, Shielded
Speaker Cable, Unshielded
Spiral Wrapped Shielded Cable
Stereo Phono Pick-up Arm Cable, Shielded
Stereo Phono Pick-up Arm Cable, Unshielded
Teflon Wire and Cables

Telephone Wire and Cables
Television Wire and Cables
T.V. Camera Cable
Test Lead Wire
Thermo-Couple
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Tinned Copper—Stranded
Transmission Line—Shielded
Transmission Line—Unshielded
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Type "SJ" Cord
Type "SJT" Cord
Type "ST" Cord
U/L Lamp Cord—Plastic
U/L Lamp Cord— Rubber
U/L Service Cord—Neoprene
U/L Service Cord—Rubber
Underground—Plastic Covered Cable
Underground—Lead Covered Cable

WRITE FOR CONSOLIDATED'S NEW CATALOG —

INFORMATION ON SPECIAL ITEMS AS WELL AS BASIC VARIETIES FROM WHICH YOU CAN SELECT DIFFERENT COMBINATIONS OF CHARACTERISTICS TO MEET YOUR EXACT REQUIREMENTS

CONSOLIDATED WIRE AND ASSOCIATED CORPORATIONS

1635 S. CLINTON ST. • CABLE ADDRESS: "CONWIRE" • CHICAGO, ILLINOIS 60616

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DABURN

DABURN ELECTRONICS & CABLE CORP.

WIRE • CABLE • TUBING • MIL/COMM • SWITCHES • ELECTRONIC HARDWARE

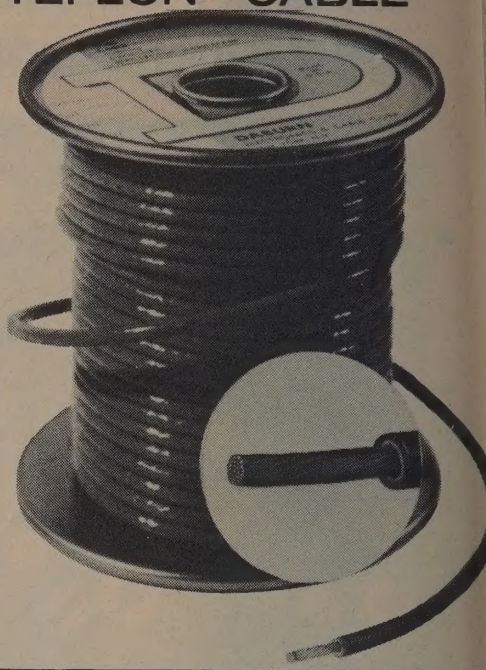
2360 HOFFMAN STREET, BRONX, N. Y. 10458, TEL. 212-295-005

NEW

HI-VOLT CORONA RESISTANT TEFLON* CABLE

Voltage Rating at Sea Level • Voltage Rating at 80,000 feet, approximately 1/3 lower

• Minimum life expectancy: 10,000 hours.

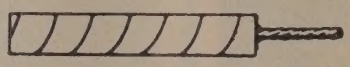


SMALL SIZE:
You do not need bulky, thick, insulation jacketing as used wtih silicone rubber and polyethylene insulations to get your hi-voltage requirements. Wire used is MIL-SPEC QQ-W-343 and MIL-W-16878D. insulation used conforms and surpasses MIL-SPEC-W-16878D

AVOID CORONA PROBLEMS:
Corona resistant Teflon construction is specifically designed to retard and prevent corona penetration.
Temperature variations from −60° to +300°C have no life effect on the corona resistant Teflon. In addition, there is no stress or crack failure under severe, adverse conditions including mechanical strain, moisture, corona or chemical conditions.

DESCRIPTION:
Single Conductor, Stranded Silver Plated Copper, Corona Resistant Teflon* Insulation.

TEMPERATURE RATING:
−90°C to +250°C.



VOLTAGE RATING:
Based on insulation thickness.

AVAILABLE COLORS:
White, Black, Red, Green, Yellow, Lt. Blue, Brown, Orange, Gray, Violet. (Also available in tracer colors)

PUT-UP: 250′, 500′, 1000′

* DUPONT

DABURN No.	AWG Size	Strand	Voltage Rating AC	Voltage Rating DC	Nom. O.D.
CRT-12-2	12	19/25	2500	10,000	.142″
CRT-12-2.5	12	19/25	3750	12,500	.152″
CRT-12-3	12	19/25	4500	15,000	.162″
CRT-12-3.5	12	19/25	5300	17,500	.172″
CRT-12-4	12	19/25	6000	20,000	.182″
CRT-12-5	12	19/25	7500	25,000	.202″
CRT-12-6.5	12	19/25	10,000	32,500	.232″
CRT-12-8	12	19/25	12,000	40,000	.262″
CRT-12-10	12	19/25	15,000	50,000	.302″
CRT-14-2	14	19/27	2500	10,000	.124″
CRT-14-2.5	14	19/27	3750	12,500	.134″
CRT-14-3	14	19/27	4500	15,000	.144″
CRT-14-3.5	14	19/27	5300	17,500	.154″
CRT-14-4	14	19/27	6000	20,000	.164″
CRT-14-5	14	19/27	7500	25,000	.184″
CRT-14-6.5	14	19/27	10,000	32,500	.214″
CRT-14-8	14	19/27	12,000	40,000	.244″
CRT-14-10	14	19/27	15,000	50,000	.284″
CRT-16-2	16	19/29	2500	10,000	.109″
CRT-16-2.5	16	19/29	3750	12,500	.119″
CRT-16-3	16	19/29	4500	15,000	.129″
CRT-16-3.5	16	19/29	5300	17,500	.139″
CRT-16-4	16	19/29	6000	20,000	.149″
CRT-16-5	16	19/29	7500	25,000	.169″
CRT-16-6.5	16	19/29	10,000	32,500	.199″
CRT-16-8	16	19/29	12,000	40,000	.229″
CRT-16-10	16	19/29	15,000	50,000	.269″
CRT-18-2	18	19/30	2500	10,000	.102″
CRT-18-2.5	18	19/30	3750	12,500	.112″
CRT-18-3	18	19/30	4500	15,000	.122″
CRT-18-3.5	18	19/30	5300	17,500	.132″
CRT-18-4	18	19/30	6000	20,000	.142″
CRT-18-5	18	19/30	7500	25,000	.162″
CRT-18-6.5	18	19/30	10,000	32,500	.192″
CRT-18-8	18	19/30	12,000	40,000	.222″
CRT-18-10	18	19/30	15,000	50,000	.272″
CRT-20-2	20	19/32	2500	10,000	.092″
CRT-20-2.5	20	19/32	3750	12,500	.102″
CRT-20-3	20	19/32	4500	15,000	.112″
CRT-20-3.5	20	19/32	5300	17,500	.122″
CRT-20-4	20	19/32	6000	20,000	.132″
CRT-20-5	20	19/32	7500	25,000	.152″
CRT-20-6.5	20	19/32	10,000	32,500	.192″
CRT-20-8	20	19/32	12,000	40,000	.212″
CRT-20-10	20	19/32	15,000	50,000	.252″
CRT-22-2	22	19/34	2500	10,000	.084″
CRT-22-2.5	22	19/34	3750	12,500	.094″
CRT-22-3	22	19/34	4500	15,000	.104″
CRT-22-3.5	22	19/34	5300	17,500	.114″
CRT-22-4	22	19/34	6000	20,000	.124″
CRT-22-5	22	19/34	7500	25,000	.144″
CRT-22-6.5	22	19/34	10,000	32,500	.174″
CRT-22-8	22	19/34	12,000	40,000	.204″
CRT-22-10	22	19/34	15,000	50,000	.244″
CRT-24-2	24	19/36	2500	10,000	.077″
CRT-24-2.5	24	19/36	2750	12,500	.087″
CRT-24-3	24	19/36	4500	15,000	.097″
CRT-24-3.5	24	19/36	5300	17,500	.107″
CRT-24-4	24	19/36	6000	20,000	.117″
CRT-24-5	24	19/36	7500	25,000	.137″
CRT-24-6.5	24	19/36	10,000	32,500	.167″
CRT-24-8	24	19/36	12,000	40,000	.197″
CRT-24-10	24	19/36	15,000	50,000	.237″
CRT-26-2	26	7/34	2500	10,000	.071″
CRT-26-2.5	26	7/34	3750	12,500	.081″
CRT-26-3	26	7/34	4500	15,000	.091″
CRT-26-3.5	26	7/34	5300	17,500	.101″
CRT-26-4	26	7/34	6000	20,000	.111″
CRT-26-5	26	7/34	7500	25,000	.131″
CRT-26-6.5	26	7/34	10,000	32,500	.161″
CRT-26-8	26	7/34	12,000	40,000	.191″
CRT-26-10	26	7/34	15,000	50,000	.231″
CRT-28-2	28	7/36	2500	10,000	.067″
CRT-28-2.5	28	7/36	3750	12,500	.077″
CRT-28-3	28	7/36	4500	15,000	.087″
CRT-28-3.5	28	7/36	5300	17,500	.097″
CRT-28-4	28	7/36	6000	20,000	.117″
CRT-28-5	28	7/36	7500	25,000	.127″
CRT-28-6.5	28	7/36	10,000	32,500	.157″
CRT-28-8	28	7/36	12,000	40,000	.187″
CRT-28-10	28	7/36	15,000	50,000	.227″

See YELLOW SECTION for Local Offices, Phones

DABURN

DABURN ELECTRONICS & CABLE CORP.

WIRE • CABLE • TUBING • MIL/COMM • SWITCHES • ELECTRONIC HARDWARE

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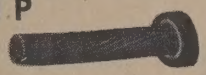
In Stock MIL • COMMERCIAL • UL CSA • INDUSTRIAL SPECIFICATIONS

WIRE CABLE AND TUBING

HOOK-UP WIRE



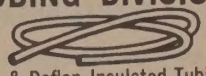
HI VOLTAGE TEFLON* WIRE

Aircraft Wire to MIL-W-5086A and MIL-C-7078A
Business Machine
High Voltage — Polyethylene — Rulan
High Voltage — Corona Resistant Teflon*
Plastic Wire to MIL-W-76B
Plastic Wire to MIL-W-16878D
Types B, C, D, E, EE, ET, F, FF, HF, HHF, K, KK
H Film & Kapton*
High Temperature
Instrumentation Hook-Up Wire
Military Wire
Shielded Lead and Hook-Up Wire
Teflon* Hook-Up Wire to MIL-16878D
Teflon* Hook-Up Wire to MIL-W-7139B
Teflon* Multi Cables
Test Lead Wire — Retractile
Thermocouple

INDUSTRIAL WIRE PRODUCTS

Bus Bar — Solid Tinned Copper to QQ-W-343 type S
Braid — Bonding Strap — Shielding — Flat Tinned Copper
Braid — Tubular Tinned Copper to QQ-B-575
Coiled Cords — Retractile Cables
Cord Sets (Special Constructions)
Control Cables
Copperweld Wire
Industrial — Audio & Sound
Magnet Wire to MIL-W-583B
Lacing Cord Tape MIL-T-713A, MIL-T-43435
Shielding & Bonding
Silicone Rubber Wire
Silicone Bronze Wire
Telephone — Burial
Test Lead Wire to MIL-W-13169
Teflon Wire
UL Wire, Cable

WIRE • CABLE TUBING DIVISION



Daflex & Daflon Insulated Tubing In Stock to UL-MIL-Industrial Specificaitons
Polyvinylchloride-PVC-Polyethylene Plastic Tubing to UL and MIL-I-631D, MIL-I-8057A, MIL-21557A
Vinyl Coated Fiberglass Tubing to MIL-I-3190B
Plastic Tubing to MIL-I-7444B, MIL-I-22076B
Fiberglass Sleeving
Teflon* Tubing to MIL-I-22129C Thin Wall, Standard Wall, Industrial, MIL-P-14078A
Shrinkable Tubing — Polyolefin, PVC, Teflon Tubing, Neoprene, MIL Specs
To MIL-I-631D, MIL-I-22129C, MIL-I-23053B
Also Wire Cable Cutting & Stripping

* DUPONT

WE MAINTAIN HUGE INVENTORIES IN DEPTH

MULTI-CONDUCTOR CABLES

Audio & Data
Audio-Intercom
Automation
Broadcast-Studio Cables
Coaxial
Cord Sets
Data-Digital
Intercom
Microphone
Low Capacity
Multi-Conductors
Phono
Retractile
Control Cables

Instrumentation
Hi-Fi & Stereo
Language Lab
Miniaturization
Power-UL
Ribbon — Flat
Shielded
Strain Gauge
Subminiature
Telephone
Teflon* Cables
Thermocouple
Speaker Extension shielded-unshielded

Wire & Cables to
MIL-C-3432C
MIL-W-16878D
MIL-W-76B
MIL-W-5086A
MIL-W-3861
MIL-C-7078A
MIL-W-7139
MIL-C-17D
MIL-W-8777B
MIL-W-13169B
MIL-W-81381
MIL-C-13777

WIRE SPECIALTIES

Your special cable requirements can be fabricated for custom cabling and short or long runs.

See our catalog pages in this year's edition of The Radio-Electronic MASTER

RETRACTILE CORDS

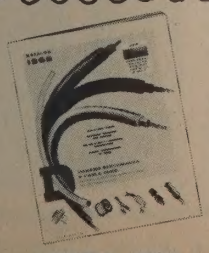
FROM 1 THRU 37 CONDUCTORS

POWER
TEST LEAD
CORD SETS
MINIATURE

COMMUNICATION Shielded — Unshielded
"SUPA" HEAVY DUTY POWER
4 YEAR RETRACTABILITY GUARANTEE FOR DURABILITY

PREPARED, PRE-CUT MULTI-CONDUCTOR
RUBBER, NEOPRENE, DANYON
UL APPROVED — CSA
SPECIAL CONSTRUCTIONS TO ORDER

ELECTRONIC COMPONENT DIV.



WRITE FOR COMPLETE CATALOG

Cable Clamps, Clips, Ties
Captive Hardware
Ceramic Insulators
Clamps
Component Clips
Feed-Thru Insulators
Insulating Harness
Heat Sinks
Insulators: Ceramic, Steatite, Beads, Nylon, Teflon*
Jacks & Plugs: Banana, Phone Tip

Nylon Screws, Nuts, Washers
Spiral Harness Wrap
Solderless Terminals
Stand Offs
Switches — Proximity
Terminal Strips, Lugs
Test Leads
Test Prods, Jacks
Transistor Heat Sinks
Transistors Retainers
UL Cord-Cables

Lacing Cord/Tapes to MIL-T-713A & MIL-T-43435 including Teflon*, Dacron & Nylon Tapes

HEAT SHRINKABLE TUBING

TO MIL-INDUSTRIAL SPECIFICATIONS MIL-I-23053 POLYOLEFIN, PVC TEFLON*, NEOPRENE* TUBING

See YELLOW SECTION for Local Offices, Phones

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

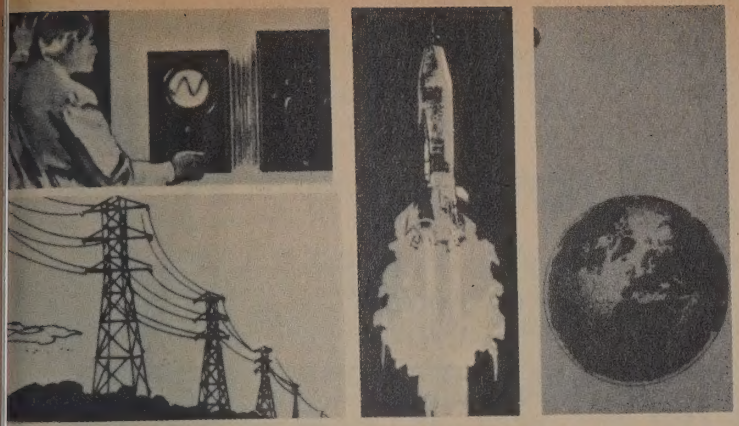
in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS



DEARBORN

WIRE, CABLE, INSULATION AND ACCESSORY PRODUCTS

ERVING THE WORLD'S LEADERS IN INDUSTRY • MILITARY • AERO SPACE • COMMUNICATIONS • ELECTRONICS

NEW KYNAR INSULATED HOOK-UP WIRE *for Wire Wrap Applications*

Especially Suited for Computer, Business Machine Usage and Other Areas Where Space is Limited

(FOR AUTOMATIC POINT TO POINT TERMINATION APPLICATIONS)

U.L. APPROVED

ENLARGED 20 TIMES

The miniaturization of computers and business machines has created special problems in the wiring of components and associated programming equipment. Essentially there is a need for wire with a tough insulation that is resistant to abrasion and cold flow. It should function at operating temperatures up to 125°C. The wire wrap type of termination requires a high conductivity low corrosive surface on the conductor. Dearborn Kynar insulated wire fulfills these needs.

SPECIFICATIONS:

The conductor is OFHC (Oxygen Free High Conductivity) Annealed Copper, Silver Plated.
The insulation is Kynar*, a Vinylidene Fluoride Plastic with unique characteristics.

KYNAR CHARACTERISTICS:

- **Mechanically Tough**
- **Flame Retardant, Self Extinguishing**
- **Excellent Resistance to Ultraviolet Light and Weathering**
- **Operating Temperature Up to 125° Continuous, Assigned U.L. Rating 105°C.**
- **Exposure to 300 Million Roentgens Does Not Change Insulation Characteristics**
- **Vivid Colors for Easy Identification**

* Pennwalt Chemicals Corp. Trademark

Dearborn P/N.	AWG Size	Insul. Thk.	Nom. O.D.	UL Style	Stock Colors Available
773001	30(1)	.005″	.0195″	1422	0, 1, 2, 3, 4, 5, 6, 8, 9
772801	28(1)	.0035″	.020″	1423	0, 1, 2, 5, 6, 9
772601	26(1)	.005″	.027″	1422	2, 4, 5, 6, 8, 9
772401	24(1)	.010″	.042″	1327	2, 4, 5, 6, 9

All supplied on specially designed large hub reels, 1,000′ minimum

Code Coloring: 0—Black • 1—Brown • 2—Red • 3—Orange • 4—Yellow • 5—Green • 6—Blue • 7—Violet • 8—Gray • 9—White

- All Kynar wire listed is supplied on 1000 ft. putups on **Large** Hub Diameter reels 8½″ O.D. and 10⅝″ Flange to eliminate curvature set in wire and to function properly in the automatic equipment used for application.
- Larger putups on the same reel can be supplied from Factory stock and additional colors are also available from Factory on special order.

HEAVY DUTY VEHICLE CABLE

MANUFACTURED IN ACCORDANCE WITH MIL-C-13486B • TYPE 1 • CLASS A

SINGLE CONDUCTOR • HEAVY DUTY • SPECIAL PURPOSE

CONSTRUCTION

Tinned Copper, Stranded Conductor, Rubber Insulating Core, Inner Glass Braid, Black Neoprene Jacket.

Ordnance Part Number, Gauge and Manufacturer's Name Stamped on Outer Jacket.

USAGE

For use on all types of military ground vehicles, such as tanks, trailers and trucks.

CHARACTERISTICS

Excellent flexibility even at low temperatures and resistance to abrasion, fluids and weather allows use in exposed situations; fungus resistant.

Dearborn P/N	Military P/N	Former Ordnance No.	Wire Size	Stranding	Nom. O.D.
551619	M-13486/1-3	7722204	16	19/29	.140″
551419	M-13486/1-5	7720853	14	19/27	.160″
551219	M-13486/1-7	7056678	12	19/25	.235″
558133	M-13486/1-9	7056677	8	133/29	.360″
556133	M-13486/1-10	7056676	6	133/27	.422″
554133	M-13486/1-11	8690175	4	133/25	.490″
552670	M-13486/1-12	7056675	2	670/30	.610″
550001	M-13486/1-14	7056674	0	1045/30	.670″

100, 500, and 1,000 Ft. Putups — Stock

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

DEARBORN

MIL SPEC MIL-W-16878D HOOKUP WIRE-TYPES B & C

Single conductor, stranded tinned copper

TYPE B
Insulation PVC .010″ wall thickness, color coded. **Temperature rating:** −55°C to +105°C. **Voltage rating:** 600 volts.

TYPE B — PREBONDED
Double tinned strands are heated which fuses the individual strands together in order to prevent fraying.. Allows easy stripping and insertion in holes in lugs, circuit boards, etc. Color coded .010″ PVC insulation to MIL-W-16878D. **Temperature rating:** −55°C to +105°C. **Voltage rating:** 600 volts.

105°C TYPE B, 600 VOLT

DEARBORN NO.	TYPE	SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
173207	B-32	32	7/40	.028	.010	0-9 & 90-98
173007	B-30	30	7/38	.032	.010	0-9 & 90-98
172807	B-28	28	7/36	.034	.010	0-9 & 90-98
172607	B-26	26	7/34	.038	.010	0-9 & 90-98
172619	B-26	26	19/38	.038	.010	0-9 & 90-98
172407	B-24	24	7/32	.044	.010	0-9 & 90-98
172419	B-24	24	19/36	.044	.010	0-9 & 90-98
172207	B-22	22	7/30	.051	.010	0-9 & 90-98
172219	B-22	22	19/34	.051	.010	0-9 & 90-98
172007	B-20	20	7/28	.058	.010	0-9 & 90-98
172019	B-20	20	19/32	.058	.010	0-9 & 90-98
171807	B-18	18	7/26	.068	.010	0-9 & 90-98
171819	B-18	18	19/30	.068	.010	0-9 & 90-98
171619	B-16	16	19/29	.077	.010	0-9 & 90-98
171419	B-14	14	19/27	.091	.010	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

105°C TYPE C, 1000 VOLT

DEARBORN NO.	TYPE	SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
202407	C-24	24	7/32	.058	.017	0-9 & 90-98
202419	C-24	24	19/36	.058	.017	0-9 & 90-98
202207	C-22	22	7/30	.065	.017	0-9 & 90-98
202219	C-22	22	19/34	.065	.017	0-9 & 90-98
202007	C-20	20	7/28	.072	.017	0-9 & 90-98
202019	C-20	20	19/32	.072	.017	0-9 & 90-98
201807	C-18	18	7/26	.082	.017	0-9 & 90-98
201819	C-18	18	19/30	.082	.017	0-9 & 90-98
201619	C-16	16	19/29	.092	.017	0-9 & 90-98
201419	C-14	14	19/27	.105	.017	0-9

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

105°C TYPE B, BONDED CONDUCTOR, 600V

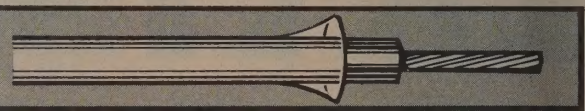
DEARBORN NO.	TYPE	SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
192407	B-24	24	7/32	.043	.010	0-9 & 90-98
192207	B-22	22	7/30	.050	.010	0-9 & 90-98
192007	B-20	20	7/28	.058	.010	0-9 & 90-98
191807	B-18	18	7/26	.068	.010	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

TYPE C
Insulation PVC .017″ wall thickness. **Temperature rating:** −55°C to +105°C. **Voltage rating:** 1000 volts.

TYPE C — NYLON
Same as above but with clear nylon jacket which increases temperature rating to +115°C.

TYPE C — SHIELD AND NYLON JACKET
Basic type C with 90% coverage braided tinned copper shield and clear nylon .005″ jacket overall.



115°C TYPE B, NYLON JACKET (.003″), 600 V.

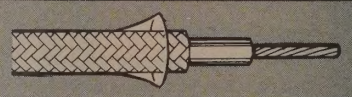
DEARBORN NO.	TYPE	SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
183207	B-32	32	7/40	.035	.010	0-9
183007	B-30	30	7/38	.039	.010	0-9
182807	B-28	28	7/36	.041	.010	0-9
182607	B-26	26	7/34	.044	.010	0-9
182619	B-26	26	19/38	.044	.010	0-9
182407	B-24	24	7/32	.050	.010	0-9
182419	B-24	24	19/36	.050	.010	0-9 & 90-98
182207	B-22	22	7/30	.057	.010	0-9 & 90-98
182219	B-22	22	19/34	.057	.010	0-9 & 90-98
182007	B-20	20	7/28	.064	.010	0-9 & 90-98
182019	B-20	20	19/32	.064	.010	0-9 & 90-98
181807	B-18	18	7/26	.074	.010	0-9 & 90-98
181819	B-18	18	19/30	.074	.010	0-9 & 90-98
181619	B-16	16	19/29	.085	.010	0-9 & 90-98
181419	B-14	14	19/27	.099	.010	0-9

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

115°C TYPE C, NYLON JACKET (.003″), 1000 V

DEARBORN NO.	TYPE	GAUGE SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
212407	C-24	24	7/32	.064	.017	0-9 & 90-98
212419	C-24	24	19/36	.064	.017	0-9 & 90-98
212207	C-22	22	7/30	.071	.017	0-9 & 90-98
212219	C-22	22	19/34	.071	.017	0-9 & 90-98
212007	C-20	20	7/28	.079	.017	0-9 & 90-98
212019	C-20	20	19/32	.079	.017	0-9 & 90-98
211807	C-18	18	7/26	.090	.017	0-9
211819	C-18	18	19/30	.090	.017	0-9
211619	C-16	16	19/29	.100	.017	0-9
211419	C-14	14	19/27	.113	.017	0-9

STOCK PUT UP: 100 FT., 1000 FT., AND BULK



115°C TYPE C, SHIELDED, NYLON JACKET, 1000 V.

DEARBORN NO.	TYPE	GAUGE SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
222407	C-24	24	7/32	.102	.017	9 Only
222207	C-22	22	7/30	.109	.017	9 Only
222007	C-20	20	7/28	.120	.017	9 Only
221819	C-18	18	19/30	.132	.017	9 Only
221619	C-16	16	19/29	.144	.017	9 Only
221419	C-14	14	19/27	.159	.017	9 Only

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

COLOR CODE ON HOOKUP WIRE: 0—Black • 1—Brown • 2—Red • 3—Orange • 4—Yellow • 5—Green • 6—Blue • 7—Violet • 8—Grey • 9—White
90—White/Black • 91—White/Brown • 92—White/Red • 93—White/Orange • 94—White/Yellow • 95—White/Green • 96—White/Blue • 97—White/Violet • 98—White/Gray

* OTHER COLORS AND STRIPE COMBINATIONS AVAILABLE UPON REQUEST

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

DEARBORN

MIL-SPEC MIL-W-16878D HOOKUP WIRE AND CABLE

MULTI-CONDUCTOR CABLES, TYPE C, FLAT RIBBON

Each conductor to MIL-W-16878D Type C. All conductors bonded together to form ribbon type cable. All conductors color coded and easily separated for ease in terminating.

MULTI-CONDUCTOR, TYPE B, NYLON, SHIELDED AND JACKETED WITH WHITE PVC JACKET

Stranded tinned copper conductors with .010 PVC insulation, color coded. .003" nylon jacket on each conductor, 90% coverage braided tinned copper shield and white PVC jacket overall.

TYPE D AND D-NYLON

Stranded tinned copper with color coded PVC insulation. Temperature rating: −55°C to +105°C (+115°C with nylon type jacket). Voltage rating: 3000 volts.

105° C TYPE D, 3000 VOLT

DEARBORN NO.	TYPE	GAUGE SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
232407	D-24	24	7/32	.082	.031	0, 2, 9
232419	D-24	24	19/36	.082	.031	0, 2, 9
232207	D-22	22	7/30	.089	.031	0, 2, 9
232219	D-22	22	19/34	.089	.031	0, 2, 9
232007	D-20	20	7/28	.097	.031	0, 2, 9
232019	D-20	20	19/32	.097	.031	0, 2, 9
231807	D-18	18	7/26	.107	.031	0, 2, 9
231819	D-18	18	19/30	.107	.031	0, 2, 9
231619	D-16	16	19/29	.116	.031	0, 2, 9
231419	D-14	14	19/27	.130	.031	0, 2, 9
231219	D-12	12	19/25	.162	.037	0, 2, 9
231037	D-10	10	37/26	.183	.037	9 Only
238133	D-8	8	133/29	.247	.040	9 Only
236133	D-6	6	133/27	.291	.040	9 Only
234133	D-4	4	133/25	.355	.045	9 Only
232665	D-2	2	665/30	.423	.045	9 Only
231817	D-1	1	817/30	.480	.050	9 Only
230001	D-0	0	1045/30	.530	.052	9 Only

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

115° C TYPE D, NYLON JACKET, 3000 VOLT

DEARBORN NO.	TYPE	GAUGE SIZE	STRANDING	NOM. O.D.	WALL THICKNESS	STOCK* COLORS
242407	D-24	24	7/32	.090	.031	0, 2, 9
242207	D-22	22	7/30	.097	.031	0, 2, 9
242007	D-20	20	7/28	.105	.031	0, 2, 9
241807	D-18	18	7/26	.115	.031	0, 2, 9
241619	D-16	16	19/29	.124	.031	0, 2, 9
241419	D-14	14	19/27	.140	.031	0, 2, 9
241219	D-12	12	19/25	.172	.037	0, 2, 9
241037	D-10	10	37/26	.195	.037	9
248133	D-8	8	133/29	.265	.040	9
246133	D-6	6	133/27	.310	.040	9

115°C TYPE D, WHITE NYLON BRAID, 3000 V.

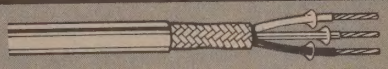
244133	D-4	4	133/25	.375	.045	9
242665	D-2	2	665/30	.447	.045	9
241817	D-1	1	817/30	.502	.050	9
240001	D-0	0	1045/30	.552	.052	9

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

105° C TYPE C, FLAT MULTI- CONDUCTOR, 1000 V.

DEARBORN NO.	NO. OF COND.	GAUGE SIZE	STRANDING	NOM. WALL	NOM. THICKNESS	NOM. WIDTH
382204	4	22	7/30	.016	.065	.260
382208	8	22	7/30	.016	.065	.520
382212	12	22	7/30	.016	.065	.780
382216	16	22	7/30	.016	.065	1.040
382220	20	22	7/30	.016	.065	1.300

STOCK PUT UP: 100 FT., 1000 FT., AND BULK



MULTI-CONDUCTOR, TYPE B, NYLON, SHIELD AND JACKET

DEARBORN NO.	NO. OF COND.	GAUGE SIZE	STRANDING	NOM. WALL	NOM. JACKET THICKNESS	NOM. O.D.
262601	1	26	7/34	.010	.010	.087
262602	2	26	7/34	.010	.014	.138
262603	3	26	7/34	.010	.014	.142
262604	4	26	7/34	.010	.016	.162
262401	1	24	19/36	.010	.010	.092
262402	2	24	19/36	.010	.016	.152
262403	3	24	19/36	.010	.016	.161
262404	4	24	19/36	.010	.017	.164
262201	1	22	19/34	.010	.010	.100
262202	2	22	19/34	.010	.016	.168
262203	3	22	19/34	.010	.017	.178
262204	4	22	19/34	.010	.019	.184
262001	1	20	19/32	.010	.010	.106
262002	2	20	19/32	.010	.019	.186
262003	3	20	19/32	.010	.019	.196
262004	4	20	19/32	.010	.021	.203
261801	1	18	19/30	.010	.012	.120
261802	2	18	19/30	.010	.021	.210
261803	3	18	19/30	.010	.022	.227
261804	4	18	19/30	.010	.023	.238
261601	1	16	19/29	.010	.016	.137
261602	2	16	19/29	.010	.023	.236
261603	3	16	19/29	.010	.023	.240
261604	4	16	19/29	.010	.025	.274

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

← FOR COLOR CODING ON HOOK-UP WIRE, SEE OPPOSITE PAGE

COLOR CODE ON MULTI-CONDUCTOR CABLES: 1—White • 2—Black • 3—Red • 4—Green • 5—Yellow • 6—Light Blue • 7—Brown • 8—Orange • 9—Gray (Slate) • 10—Violet (Purple) • 11—White/Black • 12—White/Red • 13—White/Green • 14—White/Yellow • 15—White/Blue • 16—White/Brown • 17—White/Orange • 18—White/Gray • 19—White/Violet • 20—White/Black/Red.

* OTHER COLORS AND STRIPE COMBINATIONS AVAILABLE UPON REQUEST

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

DEARBORN

TEFLON INSULATED AIRCRAFT, MISSILE AND ELECTRONIC WIRE AND CABLE

MIL-W-16878D, TYPE ET
Voltage rating: 250 volts. **Temperature rating:** −65°C to +200°C. Single conductor stranded silver plated copper, extruded TFE Teflon insulation.

MIL-W-7139B, CLASS I WIRE
Voltage rating: 600 volts. **Temperature rating:** −65°C to +200°C. Silver plated copper, insulated with layers of TFE Teflon, interspersed with layers of Teflon impregnated fiberglass. Color is white with blue tracer. Teflon impregnated fiberglass braid overall.

MIL-W-7139B, CLASS II, WIRE
Voltage rating: 600 volts. **Temperature rating:** −65°C to +260°C. Nickel coated copper, insulated with layers of TFE Teflon, interspersed with layers of Teflon impregnated fiberglass. Color is white with orange tracer. Teflon impregnated fiberglass braid overall.

- **All Teflon wire and cable listed here is resistant to acids, alkalis, oil, flame, moisture, solvents, fungus, aircraft fuels, hydraulic fluid, skydral, ethylene glycol and alcohol.**

MIL-W-16878D, TYPE ET, TEFLON

DEARBORN P/N	TYPE & CONDUCTOR AWG SIZE & STRAND.		NOM. WALL THICKNESS	NOM. O.D.	STOCK P.U. (FT.)	STOCK* COLORS
33207	ET-32	7/40	.006	.021	500 & 1000	0-9
33219	ET-32	19/44	.006	.023	500 & 1000	0-9
33007	ET-30	7/38	.006	.024	500 & 1000	0-9
33019	ET-30	19/42	.006	.024	500 & 1000	0-9
32807	ET-28	7/36	.006	.027	500 & 1000	0-9
32819	ET-28	19/40	.006	.027	500 & 1000	0-9
32607	ET-26	7/34	.006	.031	500 & 1000	0-9
32619	ET-26	19/38	.006	.031	500 & 1000	0-9
32407	ET-24	7/32	.006	.036	500 & 1000	0-9
32419	ET-24	19/36	.006	.036	500 & 1000	0-9
32207	ET-22	7/30	.006	.042	500 & 1000	0-9
32219	ET-22	19/34	.006	.042	500 & 1000	0-9
32007	ET-20	7/28	.006	.050	500 & 1000	0-9
32019	ET-20	19/32	.006	.050	500 & 1000	0-9

MIL-W-7139B, CLASS I WIRE

DEARBORN P/N	CONDUCTOR AWG SIZE & STRANDING		NOMINAL O.D. FINISHED WIRE	STOCK PUT UP (FT.)
82219	22	19/34	.087	100 & 1000
82019	20	19/32	.097	100 & 1000
81819	18	19/30	.112	100 & 1000
81619	16.	19/29	.132	100 & 1000
81419	14	19/27	.147	100 & 1000
81219	12	19/25	.167	100 & 1000
81037	10	37/26	.197	100 & 1000
88133	8	133/29	.250	100 & 1000
86133	6	133/27	.293	100 & 1000
84133	4	133/25	.350	100 & 1000
82665	2	665/30	.435	100 & 1000
81817	1	817/30	.480	100 & 1000
80001	0	1045/30	.540	100 & 1000
80002	00	1330/30	.590	100 & 1000
80003	000	1665/30	.654	100 & 1000
80004	0000	2109/30	.743	100 & 1000

MIL-W-7139B, CLASS II WIRE

DEARBORN P/N	CONDUCTOR AWG SIZE & STRANDING		NOMINAL O.D. FINISHED WIRE	STOCK PUT UP (FT.)
82219N	22	19/34	.087	100 & 1000
82019N	20	19/32	.097	100 & 1000
81819N	18	19/30	.112	100 & 1000
81619N	16	19/29	.132	100 & 1000
81419N	14	19/27	.147	100 & 1000
81219N	12	19/25	.167	100 & 1000
81037N	10	37/26	.197	100 & 1000
88133N	8	133/29	.250	100 & 1000
86133N	6	133/27	.293	100 & 1000
84133N	4	133/25	.350	100 & 1000
82665N	2	665/30	.435	100 & 1000
81817N	1	817/30	.480	100 & 1000
80001N	0	1045/30	.540	100 & 1000
80002N	00	1330/30	.590	100 & 1000
80003N	000	1665/30	.654	100 & 1000
80004N	0000	2109/30	.743	100 & 1000

COLOR CODE ON HOOKUP WIRE: 0—Black • 1—Brown • 2—Red • 3—Orange • 4—Yellow • 5—Green • 6—Blue • 7—Violet • 8—Grey • 9—White
* OTHER COLORS AND STRIPE COMBINATIONS AVAILABLE UPON REQUEST

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

DEARBORN

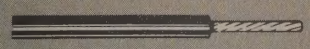
MIL-W-16878D TEFLON* HOOKUP WIRE

TYPE E, 600 VOLT
Single conductor, stranded or solid silver plated copper, extruded TFE Teflon insulation. **Voltage rating:** 600 volts. **Temperature rating:** −65°C to +200°C.

TYPE EE, 1000 VOLT
Same as Type E, except for insulation thickness and voltage rating of 1000 volts.

TYPE E, SPIRAL WRAPPED FUSED TEFLON
Same as Type E — 600 volt but with spiral wrapped fused Teflon insulation.

TYPE EE, SPIRAL WRAPPED FUSED TEFLON
Same as Type EE, but with spiral wrapped fused Teflon insulation.



TYPE E, 600 VOLT

DEARBORN NO.	TYPE & CONDUCTOR AWG SIZE & STRAND'G		NOM. WALL THICKNESS	NOM. O.D.	STOCK COLORS* 100′	1000′
13207	E-32	7/40	.010	.029	0-9	0-9
13007	E-30	7/38	.010	.032	0-9	0-9
12807	E-28	7/36	.010	.036	0-9	0-9
12619	E-26	19/38	.010	.040	0-9	0-9 & 90-98
12607	E-26	7/34	.010	.039	0-9	0-9 & 90-98
12419	E-24	19/36	.010	.045	0-9	0-9 & 90-98
12407	E-24	7/32	.010	.044	0-9	0-9 & 90-98
12219	E-22	19/34	.010	.052	0-9	0-9 & 90-98
12207	E-22	7/30	.010	.050	0-9	0-9 & 90-98
12019	E-20	19/32	.010	.060	0-9	0-9 & 90-98
12007	E-20	7/28	.010	.058	0-9	0-9 & 90-98
11819	E-18	19/30	.010	.070	0-9	0-9 & 90-98
11807	E-18	7/26	.010	.068	0-9	0-9 & 90-98
11619	E-16	19/29	.011	.077	0-9	0-9 & 90-98
11419	E-14	19/27	.011	.094	0-9	0-9 & 90-98
11219	1-12	19/25	.012	.113	0-9	0-9 & 90-98
11037	E-10	37/26	.012	.135	0-9	0-9 & 90-98
13201	E-32	1/32	.010	.029	0-9	0-9
13001	E-30	1/30	.010	.032	0-9	0-9
12801	E-28	1/28	.010	.035	0-9	0-9
12601	E-26	1/26	.010	.039	0-9	0-9 & 90-98
12401	E-24	1/24	.010	.044	0-9	0-9 & 90-98
12201	E-22	1/22	.010	.050	0-9	0-9 & 90-98
12001	E-20	1/20	.010	.058	0-9	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

**Not MIL Spec.

TYPE EE, 1000 VOLT

DEARBORN NO.	TYPE & CONDUCTOR AWG SIZE & STRAND'G		NOM. WALL THICKNESS	NOM. O.D.	STOCK COLORS* 100′	1000′
23207	EE-32	7/40	.015	.039	0-9	0-9
23007	EE-30	7/38	.015	.042	0-9	0-9
22807	EE-28	7/36	.015	.045	0-9	0-9
22607	EE-26	7/34	.015	.049	0-9	0-9 & 90-98
22619	EE-26	19/38	.015	.050	0-9	0-9 & 90-98
22407	EE-24	7/32	.015	.054	0-9	0-9 & 90-98
22419	EE-24	19/36	.015	.055	0-9	0-9 & 90-98
22207	EE-22	7/30	.015	.060	0-9	0-9 & 90-98
22219	EE-22	19/34	.015	.062	0-9	0-9 & 90-98
22007	EE-20	7/28	.015	.068	0-9	0-9 & 90-98
22019	EE-20	19/32	.015	.070	0-9	0-9 & 90-98
21819	EE-18	19/30	.015	.088	0-9	0-9 & 90-98
21619	EE-16	19/29	.016	.089	0-9	0-9 & 90-98
21419	EE-14	19/27	.017	.105	0-9	0-9 & 90-98
21219	EE-12	19/25	.017	.124	0-9	0-9 & 90-98
21037	EE-10	37/26	.017	.145	0-9	0-9 & 90-98
28133	EE-8	133/29	.020	.207	0-9	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

TYPE E, SPIRAL WRAPPED FUSED TEFLON

DEARBORN NO.	TYPE & CONDUCTOR AWG SIZE & STRAND'G		NOM. WALL THICKNESS	NOM. O.D.	STOCK COLORS* 100′	1000′
13207W	E-32	7/40	.010	.029	0-9	0-9
13007W	E-30	7/38	.010	.032	0-9	0-9
12807W	E-28	7/36	.010	.035	0-9	0-9
12619W	E-26	19/38	.010	.040	0-9	0-9 & 90-98
12607W	E-26	7/34	.010	.039	0-9	0-9 & 90-98
12419W	E-24	19/36	.010	.045	0-9	0-9 & 90-98
12407W	E-24	7/32	.010	.044	0-9	0-9 & 90-98
12219W	E-22	19/34	.010	.052	0-9	0-9 & 90-98
12207W	E-22	7/30	.010	.050	0-9	0-9 & 90-98
12019W	E-20	19/32	.010	.060	0-9	0-9 & 90-98
12007W	E-20	7/28	.010	.058	0-9	0-9 & 90-98
11819W	E-18	19/30	.010	.070	0-9	0-9 & 90-98
11807W	E-18	7/26	.010	.068	0-9	0-9 & 90-98
11619W	E-16	19/29	.011	.077	0-9	0-9 & 90-98
11419W	E-14	19/27	.011	.094	0-9	0-9 & 90-98
11219W	E-12	19/25	.012	.113	0-9	0-9 & 90-98
11037W	E-10	37/26	.012	.135	0-9	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

TYPE EE, SPIRAL WRAPPED FUSED TEFLON

DEARBORN NO.	TYPE & CONDUCTOR AWG SIZE & STRAND'G		NOM. WALL THICKNESS	NOM. O.D.	STOCK COLORS* 100′	1000′
23207W	EE-32	7/40	.015	.039	0-9	0-9
23007W	EE-30	7/38	.015	.042	0-9	0-9
22807W	EE-28	7/36	.015	.045	0-9	0-9
22607W	EE-26	7/34	.015	.049	0-9	0-9 & 90-98
22619W	EE-26	19/38	.015	.050	0-9	0-9 & 90-98
22407W	EE-24	7/32	.015	.054	0-9	0-9 & 90-98
22419W	EE-24	19/36	.015	.055	0-9	0-9 & 90-98
22207W	EE-22	7/30	.015	.060	0-9	0-9 & 90-98
22219W	EE-22	19/34	.015	.062	0-9	0-9 & 90-98
22007W	EE-20	7/28	.015	.068	0-9	0-9 & 90-98
22019W	EE-20	19/32	.015	.070	0-9	0-9 & 90-98
21819W	EE-18	19/30	.015	.088	0-9	0-9 & 90-98
21619W	EE-16	19/29	.016	.089	0-9	0-9 & 90-98
21419W	EE-14	19/27	.017	.105	0-9	0-9 & 90-98
21219W	EE-12	19/25	.017	.124	0-9	0-9 & 90-98
21037W	EE-10	37/26	.017	.145	0-9	0-9 & 90-98
28133W	EE-8	133/29	.020	.207	0-9	0-9 & 90-98

STOCK PUT UP: 100 FT., 1000 FT., AND BULK

COLOR CODE ON HOOKUP WIRE: 0—Black • 1—Brown • 2—Red • 3—Orange • 4—Yellow • 5—Green • 6—Blue • 7—Violet • 8—Grey • 9—White
90—White/Black • 91—White/Brown • 92—White/Red • 93—White/Orange • 94—White/Yellow • 95—White/Green • 96—White/Blue • 97—White/Violet • 98—White/Gray

* OTHER COLORS AND STRIPE COMBINATIONS AVAILABLE UPON REQUEST

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

MIL-W-16878D SHIELDED TEFLON* CABLES

DEARBORN

Each conductor stranded silver plated copper, Type E extruded TFE Teflon .010″ color coded insulation. Braided silver plated copper shield 90% coverage. **Voltage rating:** 600 volts. **Temperature rating:** −65°C to +200°C. Resistant to acids, alkalis, oil, flame, moisture, solvents and fungus.

*Dupont T.M.

- **NO OUTER COVERING OVER SHIELD.**
- **TEFLON IMPREGNATED BRAID OVER SHIELD**
  Braided natural or white Teflon impregnated fiberglass braid overall.
- **FEP EXTRUDED JACKET OVER SHIELD**
  Tough abrasion resistant extruded white FEP Teflon jacket overall.
- **TEFLON TAPE WRAP JACKET OVER SHIELD**
  Sintered wrapped white Teflon tape jacketed overall.

NO OUTER COVERING OVER SHIELD

DEARBORN NO.	NO. OF COND.	CONDUCTOR AWG SIZE	CONDUCTOR STRANDING	NOM O.D. AT MAX. WIDTH HIGH POINT	PUT UP (FT.)
42401	1	24	19/36	.069	100 & 1000
42402	2	24	19/36	.112	100 & 1000
42403	3	24	19/36	.120	100 & 1000
42404	4	24	19/36	.132	100 & 1000
42201	1	22	19/34	.075	100 & 1000
42202	2	22	19/34	.124	100 & 1000
42203	3	22	19/34	.132	100 & 1000
42204	4	22	19/34	.146	100 & 1000
42001	1	20	19/32	.083	100 & 1000
42002	2	20	19/32	.142	100 & 1000
42003	3	20	19/32	.153	100 & 1000
42004	4	20	19/32	.168	100 & 1000
41801	1	18	19/30	.093	100 & 1000
41802	2	18	19/30	.162	100 & 1000
41803	3	18	19/30	.172	100 & 1000
41804	4	18	19/30	.192	100 & 1000
41601	1	16	19/29	.103	100 & 1000
41602	2	16	19/29	.184	100 & 1000
41603	3	16	19/29	.200	100 & 1000
41604	4	16	19/29	.230	100 & 1000

TEFLON TAPE WRAP OVERALL

DEARBORN NO.	NO. OF COND.	CONDUCTOR AWG SIZE	CONDUCTOR STRANDING	NOM O.D. AT MAX. WIDTH HIGH POINT	PUT UP (FT.)
62401	1	24	19/36	.095	100 & 1000
62402	2	24	19/36	.140	100 & 1000
62403	3	24	19/36	.147	100 & 1000
62404	4	24	19/36	.159	100 & 1000
62201	1	22	19/34	.102	100 & 1000
62202	2	22	19/34	.154	100 & 1000
62203	3	22	19/34	.162	100 & 1000
62204	4	22	19/34	.176	100 & 1000
62001	1	20	19/32	.110	100 & 1000
62002	2	20	19/32	.170	100 & 1000
62003	3	20	19/32	.175	100 & 1000
62004	4	20	19/32	.213	100 & 1000
61801	1	18	19/30	.120	100 & 1000
61802	2	18	19/30	.190	100 & 1000
61803	3	18	19/30	.219	100 & 1000
61804	4	18	19/30	.237	100 & 1000
61601	1	16	19/29	.130	100 & 1000
61602	2	16	19/29	.230	100 & 1000
61603	3	16	19/29	.240	100 & 1000
61604	4	16	19/29	.270	100 & 1000

TEFLON IMPREGNATED BRAID OVERALL

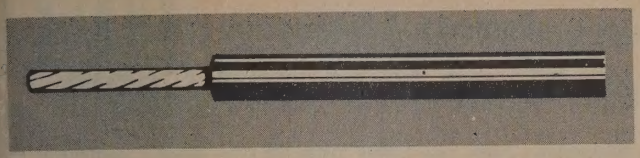
DEARBORN NO.	NO. OF COND.	CONDUCTOR AWG SIZE	CONDUCTOR STRANDING	NOM O.D. AT MAX. WIDTH HIGH POINT	PUT UP (FT.)
52401	1	24	19/36	.081	100 & 1000
52402	2	24	19/36	.126	100 & 1000
52403	3	24	19/36	.133	100 & 1000
52404	4	24	19/36	.144	100 & 1000
52201	1	22	19/34	.088	100 & 1000
52202	2	22	19/34	.137	100 & 1000
52203	3	22	19/34	.144	100 & 1000
52204	4	22	19/34	.158	100 & 1000
52001	1	20	19/32	.097	100 & 1000
52002	2	20	19/32	.154	100 & 1000
52003	3	20	19/32	.163	100 & 1000
52004	4	20	19/32	.180	100 & 1000
51801	1	18	19/30	.106	100 & 1000
51802	2	18	19/30	.174	100 & 1000
51803	3	18	19/30	.185	100 & 1000
51804	4	18	19/30	.205	100 & 1000
51601	1	16	19/29	.117	100 & 1000
51602	2	16	19/29	.196	100 & 1000
51603	3	16	19/29	.225	100 & 1000
51604	4	16	19/29	.255	100 & 1000

EXTRUDED JACKET OVER SHIELD

DEARBORN NO.	NO. OF COND.	CONDUCTOR AWG SIZE	CONDUCTOR STRANDING	NOM O.D. AT MAX. WIDTH HIGH POINT	PUT UP (FT.)
72401	1	24	19/36	.085	100 & 1000
72402	2	24	19/36	.130	100 & 1000
72403	3	24	19/36	.135	100 & 1000
72201	1	22	19/34	.091	100 & 1000
72202	2	22	19/34	.150	100 & 1000
72203	3	22	19/34	.158	100 & 1000
72001	1	20	19/32	.100	100 & 1000
72002	2	20	19/32	.168	100 & 1000
72003	3	20	19/32	.178	100 & 1000
71801	1	18	19/30	.110	100 & 1000
71802	2	18	19/30	.188	100 & 1000
71803	3	18	19/30	.207	100 & 1000
71601	1	16	19/29	.123	100 & 1000
71602	2	16	19/29	.220	100 & 1000
71603	3	16	19/29	.235	100 & 1000

COLOR CODE OF CONDUCTORS: 1st Conductor—White • 2nd Conductor—Black • 3rd Conductor—Red • 4th Conductor—Green

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774



DEARBORN

PLASTIC INSULATED HOOKUP WIRE

U.L. AND C.S.A. APPROVED

STYLE 1007, U.L. HOOK-UP WIRE

Voltage rating: 600 Volts. **Temperature rating:** −10°C to +80°C. 1/64" Polyvinylchloride insulation over stranded tinned copper.

STYLES 1335, 1336, 1337 MTW TYPE MACHINE TOOL WIRE

Voltage rating: 600 volts. **Temperature rating:** −10°C to +90°C in air; −10°C to +60°C in oil. Polyvinylchloride insulation over bare stranded copper.

STYLES 1015, 1028 U.L. HOOK-UP WIRE

Voltage rating: 600 Volts. **Temperature rating:** −10C° to +105°C. 1/32" Polyvinylchloride insulation over stranded tinned copper on Style 1015; 3/64" on Style 1028.

STYLE 1061, U.L. SEMI-RIGID BUSINESS MACHINE WIRE

Voltage rating: 300 Volts. **Temperature rating:** −10°C to +80°C. .009" Polyvinylchloride insulation over solid or stranded tinned copper.

300 VOLT, 80 C, STYLE 1007

DEARBORN NO.	SIZE AWG	STRANDING	NOM. WALL THICK.	NOM. O.D.	STANDARD PUT UP (FT.)	STOCK COLORS
402407	24	7/32	1/64	.057	500 & 1000	0-9
402207	22	7/30	1/64	.065	500 & 1000	0-9
402010	20	10/30	1/64	.071	500 & 1000	0-9
401816	18	16/30	1/64	.080	500 & 1000	0-9
401626	16	26/30	1/64	.095	500 & 1000	0-9

MACHINE TOOL WIRE, STYLE 1335

DEARBORN NO.	SIZE AWG	STRANDING	NOM. WALL THICK.	NOM. O.D.	STANDARD PUT UP (FT.)	STOCK COLORS
461816	18	16/30	1/32	.113	500 & 1000	0-9
461626	16	26/30	1/32	.125	500 & 1000	0-9
461419	14	19/27	1/32	.139	500	0-9
461219	12	19/25	1/32	.158	500	0-9
461019	10	19/.0234	1/32	.182	500	0-6, 9

MACHINE TOOL WIRE, STYLE 1336

521419	14	19/27	3/64	.165	500	0-9
521219	12	19/27	3/64	.185	500	0-9
521019	10	19/.0234	3/64	.214	500	0-6, 9
520819	8	19/.0295	3/64	.249	500	0, 2, 9

MACHINE TOOL WIRE, STYLE 1337

530819	8	19/.0295	4/64	.265	500	0, 2, 9
530619	6	19/.0372	4/64	.315	500	0 Only
530419	4	19/.0469	4/64	.365	500	0 Only
530219	2	19/.0591	4/64	.440	500	0 Only

600 VOLT, 105 C, STYLES 1015, 1028

DEARBORN NO.	SIZE AWG	STRANDING	NOM. WALL THICK.	NOM. O.D.	STANDARD PUT UP (FT.)	STOCK COLORS
412207	22	7/30	1/32	.095	500 & 1000	0-9
412207B	22	7/30	1/32	.095	500 & 1000	0-9
412007	20	10/30	1/32	.100	500 & 1000	0-9
412007B	20	10/30	1/32	.100	500 & 1000	0-9
411816	18	16/30	1/32	.110	500 & 1000	0-9
411816B	18	16/30	1/32	.110	500 & 1000	0-9
411626	16	26/30	1/32	.124	500 & 1000	0-9
411441	14	41/30	1/32	.141	500 & 1000	0-9
411265	12	65/30	1/32	.160	500 & 1000	0-9
411000	10	105/30	1/32	.194	500 & 1000	0-9
418133	8	133/29	3/64	.255	500 & 1000	0-9

(B) After part number indicates Bonded T.C.

U.L. SEMIRIGID ; STYLE 1061

DEARBORN NO.	SIZE AWG	STRANDING	NOM. WALL THICK.	NOM. O.D.	STANDARD PUT UP (FT.)	STOCK COLORS
422601	26	1/26	.009	.036	500 & 1000	0-9
422401	24	1/24	.009	.041	500 & 1000	0-9
422201	22	1/22	.009	.046	500 & 1000	0-9
422001	20	1/20	.009	.052	500 & 1000	0-9
421801	18	1/18	.009	.060	500 & 1000	0-9
422607	26	7/34	.009	.037	500 & 1000	0-9
422407	24	7/32	.009	.042	500 & 1000	0-9
422207	22	7/30	.009	.049	500 & 1000	0-9
422007	20	7/28	.009	.057	500 & 1000	0-9
422010	20	10/30	.009	.057	500 & 1000	0-9
421816	18	16/30	.009	.067	500 & 1000	0-9
421626	16	26/30	.009	.076	500 & 1000	0-9

COLOR CODE: 0—Black • 1—Brown • 2—Red • 3—Orange • 4—Yellow • 5—Green • 6—Blue • 7—Violet • 8—Grey • 9—White.

DEARBORN WIRE AND CABLE CO. 3333 W. OHIO STREET, CHICAGO, ILLINOIS 60624
ALL PHONES: AREA 312/638-6711 — TELEX DEARBORN WC-CGO-25-3774

ITT IRRAVIN™ Insulated Military and U/L Hook-up Wire and Cable

IRRAVIN, irradiation cross-linked insulation developed by ITT Wire and Cable, meets the tough requirements of today's electronic, aerospace, airframe and data processing industries. Through precisely controlled electronic bombardment a PVC compound becomes solder-iron resistant, abrasion resistant, cut-through and crush resistant IRRAVIN insulation. It has the desired characteristics of other high temperature wires with the **added** advantage of low cost, continuous long lengths, ease of handling and universal application.

IRRAVIN insulated wires can be used for internal circuit hook-up, harnesses bundles as well as being advantageously used with automatic wire wrapping machinery. For those applications, the tough IRRAVIN insulation possesses superior electrical, mechanical and thermal characteristics as compared to conventional PVC.

HEAT RESISTANCE — Withstands high ambient temperatures. Resists solder iron damage. Eliminates shrink-back, flowing and dripping of insulation.

ABRASION AND CUT-THROUGH RESISTANCE — IRRAVIN insulation has improved mechanical properties. Eliminates the need for outer jacketing. This results in superior space and weight savings advantages.

CRUSH RESISTANCE — IRRAVIN insulation has 50% more crush resistance than PVC insulation . . . 200% more than TFE insulation. This means extra reliability in wire bundles and harnesses, because ties and lacings will not cut through the insulation.

LONG LENGTHS — Long continuous lengths of IRRAVIN insulated wire are available at no extra cost . . . Fewer shipping spools, less storage space needed, and fewer automatic machine set-ups.

UNIVERSAL APPLICATIONS — IRRAVIN insulated wire conforms to military specification MIL-W-16878, types B, C and D, and is listed by Underwriters' Laboratories, Inc. for styles 1429, 1430 and 1431.

LOW COST — Saves you up to two-thirds the cost of other high temperature wire. Its universality reduces inventories especially if used with in-house striping machinery for color coding.

IRRAVIN WIRE CAN BE PRINTED, PAINTED, POTTED AND STRIPED USING CONVENTIONAL PROCESSING EQUIPMENT.

U/L STYLE 1429 80°C BUSINESS MACHINE WIRE

Description: Thin wall IRRAVIN B insulation on tinned copper or overcoated tinned copper stranded or solid conductor. Resistant to deformation and hot solder iron damage.

Application: Internal wiring of business machines, computers and maintenance of equipment.

Temperature: −55° to +80°C.

Rating: 300 Volts r.m.s.

Available: Stranded: Sizes AWG 28 through 16 in a selection of strandings. **Solid:** Sizes AWG 26 through 20.

See illustration (A) *or* (B)

U/L STYLE 1430 APPLIANCE WIRE

Description: 1/64 inch wall of IRRAVIN C insulation on tinned copper or overcoated tinned copper stranded or solid conductor. The only type 1430, 300 Volt appliance wire without a nylon jacket, yet resistant to abrasion, deformation and cut through.

Temperature: −55°C to +105°C. Can be used to 125°C for intermittent service.

Rating: 300 Volts r.m.s. for appliances 600 Volts for electronic equipment.

Available: Stranded: Sizes AWG 26 through 16 in a selection of strandings. **Solid:** Sizes AWG 24 through 16.

See illustration (A) *or* (B)

600 VOLT MIL-SPEC HOOK-UP WIRE

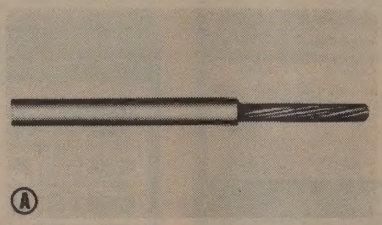
Description: Thin wall IRRAVIN B insulation on tinned copper conductor.

Certified to: MIL-W-16878 Type B.

Temperature: −55°C to +105°C. Intermittent service at higher temperatures.

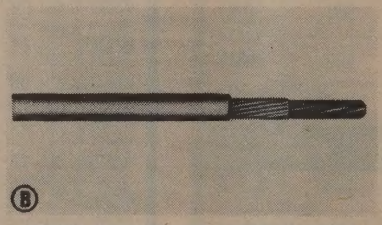
Available: 30 AWG through 14 AWG stranded.

See illustration (A)



(A)

IRRAVIN insulation over stranded tinned copper conductor



(B)

IRRAVIN insulation with overcoated tinned copper conductor

1000 VOLT MIL-SPEC HOOK-UP WIRE

Description: Medium wall IRRAVIN C insulation over tinned copper conductor. Has outstanding resistance to corona attack at high peak A.C. voltages.

Certified: MIL-W-16878 Type C.

Temperature: −55°C to +105°C. Intermittent service at higher temperatures.

Available: 26 through 12 AWG stranded.

See illustration (A)

600 & 1000 VOLT MIL-SPEC HOOK-UP WIRE WITH OVERCOATED TINNED CONDUCTOR

Description: Insulated with IRRAVIN B for 1000 Volt application with overcoated tinned copper stranded conductors. Eliminates tinning operation after stripping away insulation. Prevents wire ends from fraying.

Certified: MIL-W-16878 Types B and C.

Temperature: −55°C to +105°C. Intermittent service at higher temperatures.

Available: 24, 22, and 16 AWG stranded.

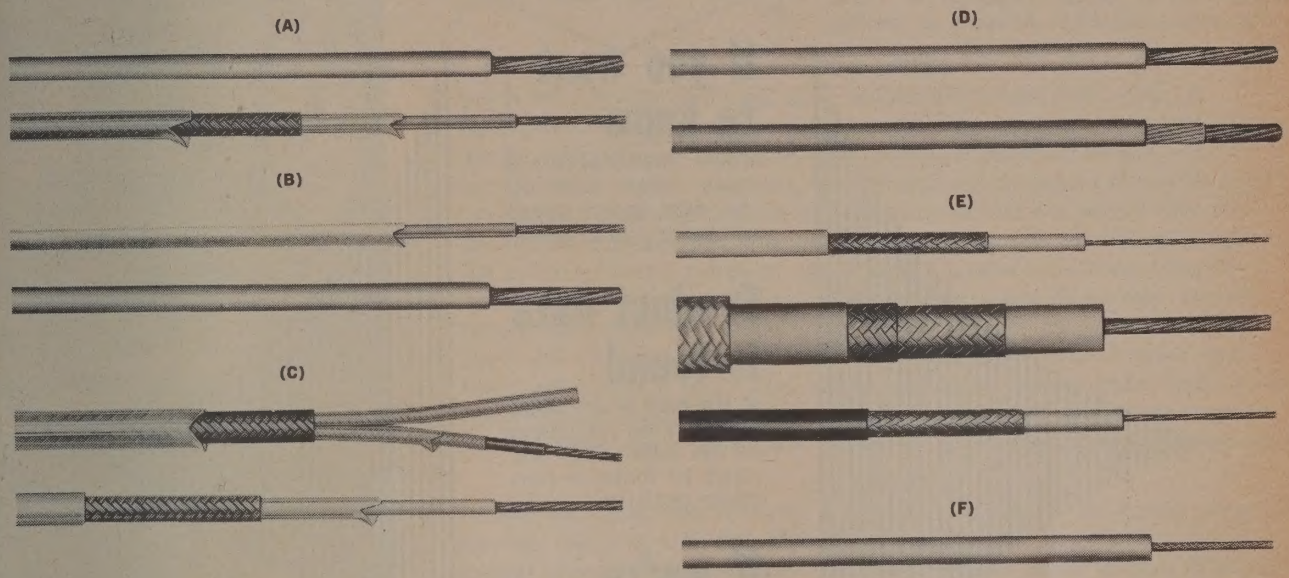
See illustration (B)

ITT SURPRENANT • DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

WRITE FOR COMPLETE CATALOG — **CLINTON, MASSACHUSETTS 01510**

ITT Electronic Wire and Cable

. . . broadest wire and cable line available
. . . over 23,000 manufactured types
. . . more QPL listings than any other manufacturer



(A) MILITARY HOOK-UP WIRE

Military specification MIL-W-16878D is universally accepted for general purpose hook-up wire. It covers performance requirements for wires insulated with polyethylene, PVC, Silicone, TFE Teflon and FEP Teflon and IRRAVIN™ insulation. ITT Wire and Cable manufactures all of these constructions as listed in MIL-W-16878D. Polyethylene and PVC insulated wires can be ordered with nylon jacketing over the insulation.

Wires can also be manufactured to the following military specifications:

MIL-W-76B	MIL-W-81044	MIL-C-27500
MIL-W-22759	MIL-C-7078	

(B) UNDERWRITERS' LABORATORIES, INC. LISTED HOOK-UP WIRE

Hook-up wire, as listed by U.L. specifications and the Canadian Standards Association, requires a heavier wall thickness for equivalent voltage rating as compared to military specifications.

ITT Wire and Cable manufactures a broad line of U.L. wires and maintains a stock of the following U.L. styles:

1007	1015	1429
1010	1061	1430
1011		1431

(C) AIR FRAME WIRE

ITT Wire and Cable is a major producer of wire for the aviation and aerospace industries. Here are a few of the military specification wires manufactured for airframe and aerospace applications.

MIL-W-81044	MIL-W-22759
MIL-W-5086 All Types	MIL-W-8777

(D) AUTOMATIC WIRE WRAP WIRES

ITT Wire and Cable offers two types of wire insulation for automatic wire wrapping of computer back-panel assemblies.

SURFLENE B—A modified fluorocarbon insulation tough enough to resist cut through but flexible enough to prevent "pop-up" problems that often occur in wires used on automatic wire wrapping machines. It has outstanding thermal and chemical characteristics, and is rated at −40°C to +135°C. Manufactured in 24 through 30 AWG sizes.

IRRAVIN B — This irradiation cross-linked polyvinyl chloride compound provides increased mechanical toughness even when applied in a thin wall of 0.0065″. It is extremely hard, slick, and crush resistant. Solder iron contact will not melt or deform this insulation. It is especially suitable for wire wrap machine applications because of low cost, stable electrical characteristics, small diameter, and longer lengths. Manufactured in 24 through 30 AWG sizes. (See IRRAVIN information)

Please contact the ITT Wire and Cable Division for specific technical assistance.

(E) COAXIAL CABLES

ITT Wire and Cable designs and manufactures coaxial cables with special alloys, solid or stranded conductors and uniquely compounded dielectric materials which possess low loss factors. There are endless varieties of conductors, dielectric materials, shieldings and jacketings available to the design engineer who requires a particular coaxial cable. RG/U tables of the ITT manufactured standard line coaxial cables are listed in catalog CP-1 available on request.

(F) SILICONE RUBBER HIGH VOLTAGE WIRE

ITT Silicone rubber insulated wire for high voltage applications has a superior resistance to high temperature and corona. Silicon rubber remains flexible at −65°C and can be subjected to 175°C temperature for short periods without detrimental effects. High voltage cables for 10-30 KV D.C. use are also offered. These cables are listed in catalog CP-3 available on request.

ITT electronic wire and cable distribution centers:
Clinton, Mass. • Atlanta, Ga. • Commerce, Calif. f.

WRITE FOR COMPLETE CATALOG — **CLINTON, MASSACHUSETTS 01510**

ITT SURPRENANT • DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

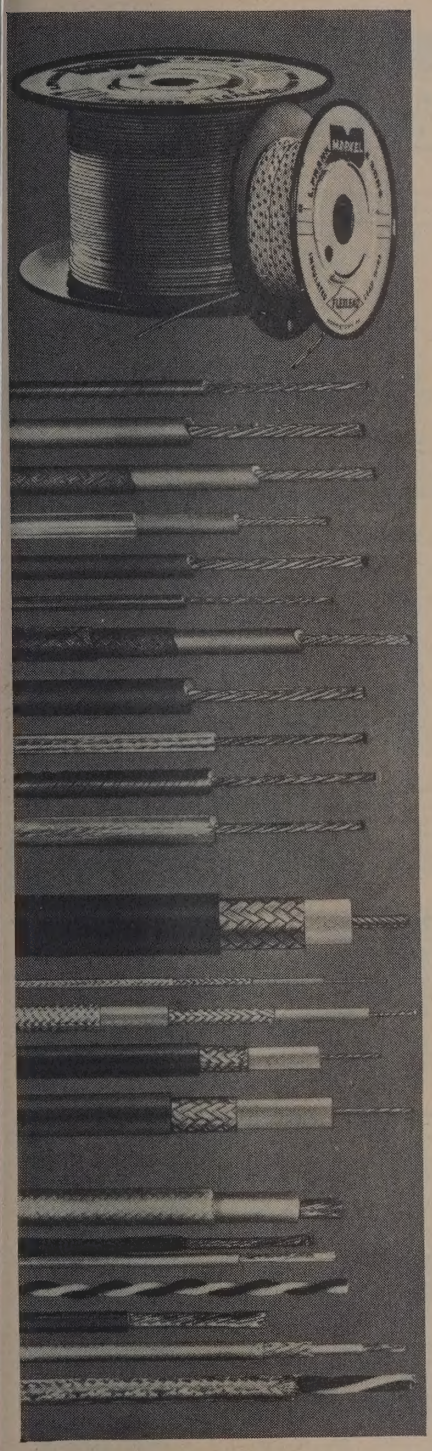
in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

MARKEL
SINCE 1922

Insulating Tubings and Sleevings-High Temperature Wire and Cable



FLEXLEAD®

High temperature Wire and Cable insulated with Teflon (TFE or FEP) or silicone rubber. You can select a numbered FLEXLEAD type listed below, or let Markel quote, to your specifications, on a custom FLEXLEAD construction.

MIL-W-16878D

Type E—600 v. Stranded silver-plated copper insulated with extruded DuPont Teflon TFE
Type E—600 v. Stranded silver-plated copper insulated with wrapped and sintered Teflon TFE tape
Type EE—1000 v. Stranded silver-plated copper conductor insulated with extruded Teflon TFE
Type EE—1000 v. Stranded silver-plated copper insulated with wrapped and sintered TFE tape
Type ET—300 v. Stranded silver-plated copper conductor insulated with extruded Teflon TFE
Type ET—300 v. Stranded silver-plated copper insulated with wrapped and sintered TFE tape
Type K—600 v. Stranded silver-plated copper conductor insulated with extruded Teflon FEP
Type KK—1000 v. Stranded silver-plated copper conductor insulated with extruded Teflon FEP
Type KT—300 v. Stranded silver-plated copper conductor insulated with extruded Teflon FEP
Type F—600 v. Stranded tin-coated copper conductor insulated with extruded silicone rubber
Type F—600 v. Same as Type F above, jacketed with silicone resin-impregnated fiberglass braid
Type FF—1000 v. Stranded tin-coated copper conductor insulated with extruded silicone rubber
Type FF—1000 v. Same as Type FF above, jacketed with silicone resin-impregnated fiberglass braid

U/L APPROVED

Extruded Teflon Wires, sizes 10-28 AWG; 80°C to 200°C ratings; 300 and 600 volt ratings: U/L Style Nos. **1164, 1180, 1198, 1199, 1212, 1213.**

Extruded Silicone Rubber Wires, various constructions, with and without fiberglass jackets; sizes 10-32 AWG; 150°C and 200°C ratings; 300 and 600 volt ratings: U/L Style Nos. **3066, 3067, 3068, 3069, 3070, 3071, 3074, 3075, 3101, 3113, 3122, 3123, 3132, 3133, 3134, 3135, 3136, 3137, 3138, 3139, 3140, 3141, 3142, 3143, 3144, 3145, 3180, SF-1, SF-2, SFF-1, SFF-2.**

Ask for data sheets, prices, and samples of these FLEXLEAD wire constructions

FLEXLEAD Coaxial Cables. Markel manufactures a complete line of both standard and special RG/U coaxial cables. In accordance with specifications, types are available with silver-plated copper, plated or unplated copper-covered steel, or bare copper center conductor; one or two braided shields; tape-wrapped Teflon shield guards; and outer jacketing of impregnated fiberglass braid or Teflon (extruded or tape-wrapped). For complete data, ask for a FLEXLEAD Coaxial Cable Specifications folder.

FLEXLEAD Special Constructions. Because wiring problems cannot always be solved with standard materials, Markel's capacity for engineering high temperature wire and cable constructions to meet particular needs has grown steadily with the demand. We can combine insulations—Teflon, silicone rubber, fiberglass, nylon-shielding, fillers, liners, and jacket materials—with single, twisted pair or multiple conductors—to provide a special cable construction for any temperature range from —90° to 260°C.

FLEXLEAD Fused Twisted Pair. This unique Teflon-insulated twisted pair construction finds wide application in computers and similar circuitry. The fusing, which will withstand predetermined pulls to separate the individual wires, keeps the wires evenly twisted for easier assembly and uniform capacitance and inductance. Ask for a test sample and prices.

FLEXLEAD MB Bondable Teflon. The Markel MB process can be factory-applied to any of the FLEXLEAD Teflon wires, extruded or tape-wrapped, and renders the surface bondable with commonly used elastomeric and epoxy-base potting and encapsulating compounds. Without affecting the color or electrical properties of the insulation, the MB treatment provides a bond with up to 150 psi pull-out strength, and a surface that is receptive to marking and printing.

1 SOURCE *for* EXCELLENCE *in Insulating Tubings and Sleevings • High Temperature Wire and Cable*

L. FRANK MARKEL & SONS

NORRISTOWN, PENNSYLVANIA 19404

Telephone: 215-272-8960 • TWX: 510-660-0190

NATIONAL WIRE & CABLE CORPORATION

136 SAN FERNANDO RD., LOS ANGELES, CALIF. 90031 • PHONE (213) 225-5611 • TWX: 910-321-4155 • FED. STOCK CODE H4-04569

U/L APPROVED WIRE

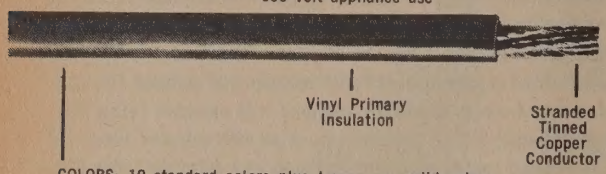
Wires approved by the Underwriters' Laboratories, Inc. for operation in an air or an oil environment. U.L. File #E35793. See Section 4 for U.L. Control Cable.

SEE PAGE 2942 FOR CSA APPROVED WIRE

U.L. TYPE 1015 105°C SERVICE**

U/L APPROVED APPLIANCE WIRING MATERIAL

1/32" vinyl insulation. U.L. rated: 2500 volts electronic use
600 volt appliance use



COLORS: 10 standard colors plus tracers on solid colors.

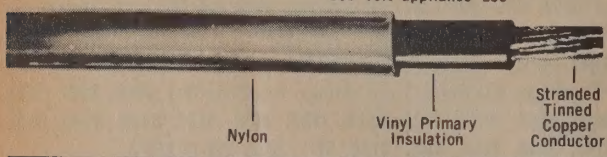
Gauge (AWG)	National Catalog Number	No. of Strands	Ga. of Strands (AWG)	Nom. Diam. of Stranded Conductor (Inches)	Nom. Fin. Wire Diam. (Inches)	Max. Resistance (dc) at 25°C Ohms/1000 Ft.	Nom. Wt. Per 1000 Ft. (Lbs.)
24†	N600-1936U	*19	36	.024	.078	26.8	4.0
22†	N600-1934U	*19	34	.030	.084	16.7	5.2
20†	N600-1932U	*19	32	.038	.092	10.5	7.3
18	N600-1930U	*19	30	.048	.102	6.57	10.0
16	N600-1929U	19	29	.057	.111	4.85	12.0
14	N600-1927U	19	27	.071	.125	3.05	17.1
12	N600-1925U	19	25	.090	.159	1.92	27.4
10	N600-4927U	49	27	.111	.178	1.24	38.6

Also approved by the Canadian Standards Assn. for use as type TR-32 radio wiring.
** Suitable for operation at +105°C in air, or up to 80°C in oil.

U.L. STYLE 1010 105°C SERVICE**

U/L APPROVED APPLIANCE WIRING MATERIAL

1/64" vinyl & nylon insulation. U.L. rated: 600 volt electronic use
300 volt appliance use



24	N300-1936N	*19	36	.024	.062	26.8	3.25
22	N300-1934N	*19	34	.030	.068	16.7	4.0
20	N300-1932N	19	32	.038	.077	10.5	6.0
18	N300-1930N	19	30	.048	.087	6.57	8.50
16	N300-1929N	19	29	.057	.097	4.85	10.75
14	N300-1927N	19	27	.071	.112	3.05	15.50

* Also available in 7 strand. † Available as Nabond 7 strand.
** Suitable for operation at +105°C in air, or up to 80°C in oil.

U.L. STYLE 1007 80°C SERVICE

U/L APPROVED APPLIANCE WIRING MATERIAL

1/64" vinyl insulation U.L. rated: 300 volt service

COLORS: 10 standard colors plus tracer on solid colors.

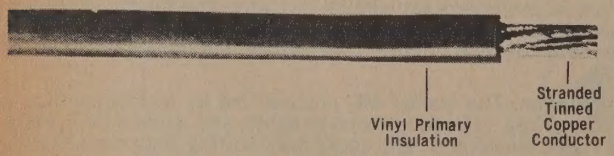
Gauge (AWG)	National Catalog Number	No. of Strands	Ga. of Strands (AWG)	Nom. Diam. of Stranded Conductor (Inches)	Nom. Fin. Wire Diam. (Inches)	Max. Resistance (dc) at 25°C Ohms/1000 Ft.	Nom. Wt. Per 1000 Ft. (Lbs.)
24†	N303-1936U	*19	36	.024	.057	26.8	2.75
22†	N303-1934U	*19	34	.030	.063	16.7	3.75
20	N303-1932U	*19	32	.038	.071	10.5	5.50
18	N303-1930U	*19	30	.048	.081	6.57	8.0
16	N303-1929U	19	29	.057	.091	4.85	10.0

Also approved by the Canadian Standards Assn. (CSA) as type TR-64 radio wiring for 90°C service.

U.L. STYLE 1061 80°C SERVICE

U/L APPROVED APPLIANCE WIRING MATERIAL

.009" semi-rigid vinyl insulation U.L. rated: 300 volt service

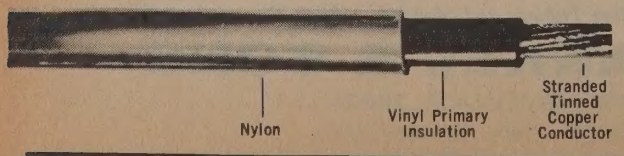


28	N304-736U	7	36	.015	.039	69.0	1.0
26	N304-734U	7	34	.019	.043	42.9	1.5
24	N304-1936U	*19	36	.024	.048	26.8	2.0
22	N304-1934U	*19	34	.030	.054	16.7	3.0
20	N304-1932U	*19	32	.038	.062	10.5	4.75
18	N304-1930U	*19	30	.048	.073	6.57	6.5
16	N304-1929	19	29	.057	.082	4.85	9.0

U.L. STYLE 1006 105°C SERVICE

U/L APPROVED APPLIANCE WIRING MATERIAL

.008 P.V.C. plus nylon. Voltage not specified



24	N305-1936N	19	36	.024	.048	26.8	2.25
22	N305-1934N	19	34	.030	.054	16.7	3.25
20	N305-1932N	19	32	.040	.062	10.5	4.75
18	N305-1930N	19	30	.050	.073	6.57	7.0
16	N305-1929N	19	29	.057	.082	4.85	9.0

* Also available in 7 strand. † Available as Nabond 7 strand.

NATIONAL WIRE & CABLE CORPORATION

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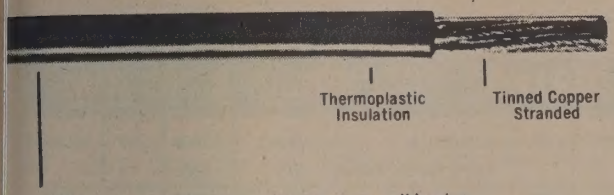
NABOND* (Continued)



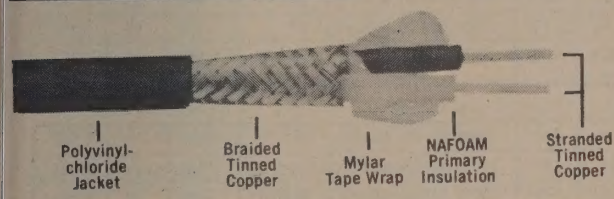
COLORS: 10 standard colors plus tracer on solid colors.

Gauge (AWG)	National Catalog Number	No. of Strands	Ga. of Strands (AWG)	Nom. Diam. of Stranded Conductor (Inches)	Nom. Fin. Wire Diam. (Inches)	Max. Resistance (dc) at 25°C Ohms/1000 Ft.	Nom. Wt. Per 1000 Ft. (Lbs.)
U.L. AWM STYLE 1061 WITH NABOND — NABOND 600 VOLT TYPE B 105°C.							
24	NB732UB	7	32	.024	.044	26.8	3.0
22	NB730UB	7	30	.030	.050	16.7	3.8
20	NB728UB	7	28	.038	.058	10.5	5.7
18	NB1930UB	19	30	.048	.068	6.57	8.0
U.L. AWM STYLE 1007 WITH NABOND — NABOND 1000 VOLT TYPE B 105°C.							
24	NC732UB	7	32	.024	.058	26.8	3.2
22	NC730UB	7	30	.030	.063	16.7	4.
20	NC728UB	7	28	.038	.072	10.5	6.
18	NC1930UB	19	30	.048	.082	6.57	8.5

* NW&C T.M.

"NAFOAM"

LOW CAPACITY INSTRUMENTATION WIRE AND CABLE PRIMARY INSULATIONS OVER STRANDED CONDUCTORS



National now offers low-capacitance instrumentation leads using NAFOAM insulation.

This foamed polyethylene insulation is extruded in any wall thickness from .015″ to .250″.

The foaming is produced by an agent which liberates nitrogen gas into the melted plastic during the hot extrusion process. The expansion of the gas forms tiny bubbles throughout the material.

These bubbles expand, then are trapped as the plastic cools on the conductor.

The finished material is a firm closed cell foam of polyethylene. Approximately ½ the volume of the foam is .002″ diam. bubbles of the nitrogen gas.

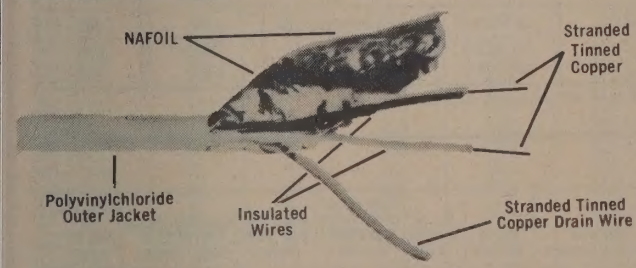
Since the normal expansion is about 100% by volume, the resulting dielectric has extremely low capacitance. (See table).

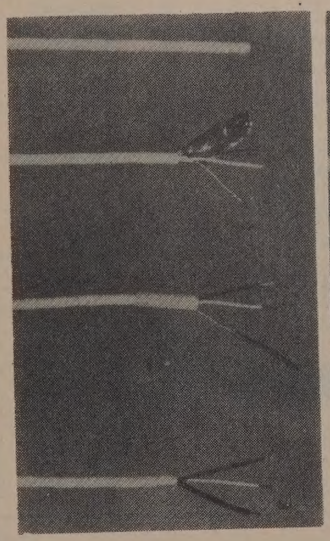
TYPICAL CHARACTERISTICS

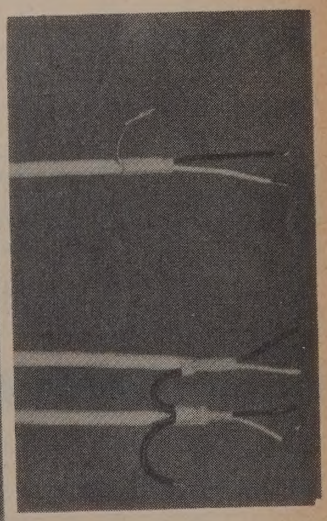
Property	NAFOAM	TEFLON®	Regular Polyethylene
Dielectric Constant	1.5	2.0	2.26
Dissipation Factor	.0004	.003	.0003
Breakdown Voltage (volts/mil)	200	600	500
Temperature Range degrees F	−80 +160	−85 +400	−80 +160
Density (gm/cc)	47	2.2	.93
Colors:	Natural & Brown	any	any

"NAFOIL"

SHIELDED WIRES AND CABLES







NAFOIL SHIELDING:

The ideal choice for low-level signal circuit and general instrumentation work.

WHAT IT IS:

NAFOIL is a laminated tape: { One tape of clear Mylar .001″ thick. One tape of aluminum foil, .00035″ thick.

The two tapes are bonded by an adhesive to form a .0015″ thick tape of high strength and excellent conductivity. Will not damage conductors. Far superior to unsupported metal foils.

HOW IT'S USED:

A — An extra conductor (bare) called the "drain" is included on the outside of the wire bundle or cable.
B — NAFOIL tape is spiral wrapped around the wire bundle and drain, with the aluminum side inward.
C — The aluminum foil contacts the "drain" at every turn, preventing inductance build-up.
D — The foil is overlapped upon itself, so the wire bundle is covered 100% (Unlike regular braided shields).

WHY IT'S BETTER:

1 — Costs less than braided shields.
2 — Shield covers 100% of bundle. Not 85-90% as in braided shields
3 — Smaller. NAFOIL adds .006″ to OD. (0.25″ for regular braid).
4 — Drain wire used to make shield connection. Fast! Simple!
5 — Flexible. Negligible stiffening of bundle.
6 — Capacitance through the shield is less. Lowest cross-talk.
7 — Mylar adds to insulation of outer jacket.

PROOF OF PERFORMANCE:

The following data taken on a 22 ga. twisted shielded pair (22 ga. drain).

PROPERTY	NAFOIL Shield	90% Braid Shield
Capacitance through the shielding. mmfd.	< .008 mmfd/ft.	< .017 mmfd/ft.
Resistance of shield	16 ohm/M ft.	6.0 ohm/M ft.
Contact resistance of foil to drain	.05 ohm/6″	——

NATIONAL WIRE & CABLE CORPORATION

136 SAN FERNANDO RD., LOS ANGELES, CALIF. 90031 · PHONE (213) 225-5611 · TWX: 910-321-4155 · FED. STOCK CODE H4-04569

NAFOAM & NAFOIL

SPECIAL SHIELDED DATA & INSTRUMENTATION CABLES

Designed for Low Level or Low Capacitance Needs
All feature extremely low dielectric leakage both in insulation and outer sheath.
Suitable for very long runs in tray or conduit (1000 ft. and up).

SINGLE CONDUCTOR SHIELDED

Part Number	AWG & Stranding	Drain AWG & Stranding	Insulation & Thickness	Jacket Thickness	Nom. O.D.	Shield % Coverage	Capacitance mmfd/ft	Working Voltage	Surge Impedance Ohms	Temp. °F
S10-516	28(7x38)	—	.086″ NAFOAM	.015″ pvc	.242″	TC Braid 90%*	12	3000	120	+180
S10-328-1	22(19x34)	—	.042″ NAFOAM	.020″ pvc	.182″	90% Braid	20.7	1000	60	+180
S10-328-2						100% NAFOIL & Braid	20.7	1000		
S10-680	22(19x34)	22(7x30)	.032″ poly	.016″ pvc	.135″	NAFOIL & Drain	30	3000	—	+180
S10-679	22(19x34)	24(7x32)	.010″ pvc .002″ nylon	.015″ pvc	.091″	100% NAFOIL & Drain	100	600	25	+221

TWO CONDUCTOR SHIELDED

Part Number	AWG & Stranding	Drain AWG & Stranding	Insulation & Thickness	Jacket Thickness	Nom. O.D.	Shield % Coverage	Capacitance mmfd/ft	Working Voltage	Surge Impedance Ohms	Temp. °F
S10-010-1	22(19x34)	—	.042″ NAFOAM	.020″ pvc	.295″	90% Braid	10.6 W-W	1000	120	+180
S10-010-2						100% NAFOIL + Braid				
S10-010-3						NAFOIL only				
S10-681	22(19x34)	22(7x30)	.025″ NAFOAM	.020″ poly	.210″	100% NAFOIL & Drain	15 W-W	600	84	+180
S10-686	22(19x34)	22 (7x30)	.018″ NAFOAM	.020″ poly	.178″	100% NAFOIL & Drain	20	600	63	+180
S10-362	22(19x34)	22(7x30)	.010″ pvc .002″ nylon	.020″ poly	.166″	100% NAFOIL & Drain	40 W-W	600	52	+221

THREE CONDUCTOR SHIELDED

Part Number	AWG & Stranding	Drain AWG & Stranding	Insulation & Thickness	Jacket Thickness	Nom. O.D.	Shield % Coverage	Capacitance mmfd/ft	Working Voltage	Surge Impedance Ohms	Temp. °F
S10-683	22(19x34)	18(19x30)	.042″ NAFOAM	.020″ pvc	.297″	100% NAFOIL & Drain	10	1000	—	+180
S10-684	22(19x34)	20(19x32)	.018″ NAFOAM	.020″ pvc	.185″	100% NAFOIL & Drain	20	600	—	+180
S10-920	22(19x34)	22(7x30)	.010″ pvc .002″ nylon	.020″ poly	.170″	100% NAFOIL & Drain	40 W-W	600	50	+221

TRIAXIAL CABLES (Low Noise)

Part Number	AWG & Stranding	Drain AWG & Stranding	Insulation & Thickness	Jacket Thickness	Nom. O.D.	Shield % Coverage	Capacitance mmfd/ft	Working Voltage	Surge Impedance Ohms	Temp. °F
S10-685	22(19x34)	—	.042″ NAFOAM	Inner: .020″ poly Outer: .020″ pvc	.253″	NAFOIL 100% + Braid Inner & Outer (Suitable for Microvolt Signals)	20 130	600	60	+180

MULTI-CONDUCTOR DATA CABLES (Specify Polyethylene sheath if used for direct burial.)

All Shielded Pr.	Part Number	No. of Subcables	Subcable Type	Sheath Thickness	Nom. O.D.	Wt./M Ft.
Low-Cost	NW-12-362	12	S10-362	.060″ pvc	.800″	320
	NW-19-362	19	S10-362	.065″ pvc	.960″	480
Low Capacity Data Cable	NW-12-010	12	S10-010-2	.125″ Neoprene	1.50″	390
Low Capacity Data Cables	NW-12-328	12	S10-328-2	.060″ pvc	.870″	270
	NW-19-328	19	S10-328-2	.070″ pvc	1.05″	420

CODE: poly (polyethylene), PVC (polyvinyl chloride). * Not preferred for microvolt signals.

CSA APPROVED WIRE

Wires approved by the Canadian Standards Association for radio or electronic use. CSA File No. LR-20482.

TYPE TR-32 RADIO WIRE RATED 90°C 600 VOLT

1/32″ vinyl insulation

Polyvinylchloride Primary Insulation

†Stranded Tinned Copper

Gauge (AWG)	National Catalog Number	† No. of Strands	Ga. of Strands (AWG)	Nom. Diam. of Stranded Conductor (Inches)	Nom. Fin. Wire Diam. (Inches)	Max. Resistance (dc) at 25°C Ohms/1000 Ft.	Nom. Wt. Per 1000 Ft. (Lbs.)
24	N307-732U†	*19	36	.024	.078	26.8	4.0
22	N307-730U†	*19	34	.030	.084	16.7	5.2
20	N307-1932U	*19	32	.038	.092	10.5	7.3
18	N307-1930U	*19	30	.048	.102	6.57	10.0
16	N307-1929U	19	29	.057	.111	4.85	12.0
14	N307-1927U	19	27	.071	.125	3.05	17.1
12	N307-1925U	19	25	.090	.159	1.92	27.4
10	N307-4927U	49	27	.111	.178	1.24	38.6

TYPE TR-64 RADIO WIRE RATED 90°C 300 VOLT

1/64″ vinyl insulation

Polyvinylchloride Primary Insulation

†Stranded Tinned Copper

Gauge (AWG)	National Catalog Number	† No. of Strands	Ga. of Strands (AWG)	Nom. Diam. of Stranded Conductor (Inches)	Nom. Fin. Wire Diam. (Inches)	Max. Resistance (dc) at 25°C Ohms/1000 Ft.	Nom. Wt. Per 1000 Ft. (Lbs.)
24	N308-732U†	*7	32	.024	.056	28.4	2.75
22	N308-730U†	*7	30	.030	.062	19.0	3.50
20	N308-1932U	*19	32	.040	.070	13.12	5.25
18	N308-1930U	*19	30	.050	.084	7.89	6.75
16	N308-1929U	19	29	.057	.092	4.97	10.0
14	N308-1927U	19	27	.071	.104	3.05	
12	N308-1925U	19	25	.090	.124	1.92	

† Also available as "Nabond" * Also available in 7 strand.

SEE CONTROL CABLE SECTION FOR WIDER SELECTION OF CABLES

NATIONAL WIRE & CABLE CORPORATION

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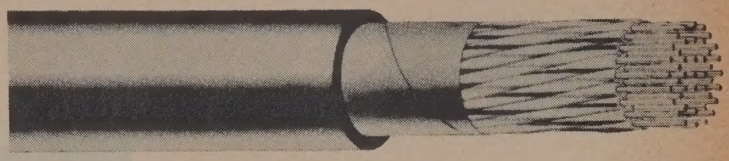

MULTIPLE CONDUCTOR CONTROL CABLES

IN STOCK
MIL-SPEC

National Wire & Cable Corporation manufactures a complete line of multiple conductor control cables. Conductors are of tinned copper strand with 1/64" vinyl primary insulation for use up to 105°C per MIL-W-16878D Type C†. Insulated for **1000** volts working voltage. Conductors are color coded using 10 standard basic colors, plus spiral tracers on white per MIL-STD. 122.

All conductors are planetary cabled and contra-helically laid with a Mylar tape serve over the cable bundle. The overall jacket is a 105° C black polyvinyl-chloride thermoplastic, meeting specification MIL-I-631 Class F, or may be Neoprene to MIL-R-6855 Class 2 Grade 60 specification. (Neoprene jackets at added cost.)*

National Multiple Conductor SHIELDED CABLES are to the same specifications as above with addition of tinned copper braided shield over cable complex with 85-90% coverage to MIL-C-7078A. STANDARD PUT-UPS: 500 ft. and 1000 ft. No-deposit reels.

*(Standard put-up for Neoprene jacketed cable is 250 ft.)

†Insulated Conductors are also UL approved under UL type 1007 AWM, and are CSA approved as type TR 64.

TECHNICAL DATA (all cables)

Insulation Breakdown Voltage:	Greater than 8000 volts AC RMS, 60 cps.
Capacitance:	Nominal capacitance from a wire to all else in the cable ranges from 40 to 65 mmfd per ft., @ 1000 cps; dependent on gauge and position.
Insulation Leakage Res.:	200. megohms/1000 ft. min. at 500 VDC from any conductor to all else in cable.
Sheath Leakage Res.:	10. megohms/1000 ft. min. at 500 VDC from overall shield through sheath to outside world.
Usable Temp. Range:	Suitable for continuous use from +105°C to −55°C.
Cold Bending Capability:	All cables are suitable for flexing to a circle diam. of approx. 6 cable diameters from +105°C to −20°C; Recommended flex diameter should be greater than 20 cable diam. for flexing at −40°C., or for continuous flexing service to −55°C, specify our neoprene sheath, in lieu of plastic sheath.

MULTI-CONDUCTOR STOCK CABLES

Conductor sizes 22, 20, 18, 16, 14 & 12 gauge. 22 AWG is 7 strand. All others 19 strand.

UNSHIELDED

PART NO.	NO. COND.	COND. AWG	JKT. THICK	CABLE O.D.	WEIGHT PER M'
NW-722 J	7	22	.040	.295	40 Lbs.
NW-1222J	12	22	.050	.390	70 Lbs.
NW-1922J	19	22	.060	.460	110 Lbs.
NW-2722J	27	22	.060	.530	160 Lbs.
NW-3722J	37	22	.060	.600	200 Lbs.
NW-4822J	48	22	.060	.670	245 Lbs.
NW-6022J	60	22	.060	.730	300 Lbs.
NW-7222J	72	22	.060	.775	360 Lbs.
NW-8822J	88	22	.060	.835	425 Lbs.
NW-10222J	102	22	.060	.880	485 Lbs.
NW-720 J	7	20	.040	.300	50 Lbs.
NW-1220J	12	20	.050	.400	105 Lbs.
NW-1920J	19	20	.060	.470	160 Lbs.
NW-2720J	27	20	.060	.560	210 Lbs.
NW-3720J	37	20	.060	.610	280 Lbs.
NW-4820J	48	20	.060	.700	360 Lbs.
NW-6020J	60	20	.060	.750	435 Lbs.
NW-7220J	72	20	.060	.840	485 Lbs.
NW-8820J	88	20	.060	.900	580 Lbs.
NW-10220J	102	20	.060	.975	670 Lbs.
NW-718 J	7	18	.040	.350	75 Lbs.
NW-1218J	12	18	.050	.460	135 Lbs.
NW-1918J	19	18	.060	.560	225 Lbs.
NW-2718J	27	18	.060	.650	300 Lbs.
NW-3718J	37	18	.060	.730	390 Lbs.
NW-4818J	48	18	.060	.820	510 Lbs.
NW-6018J	60	18	.060	.900	600 Lbs.
NW-7218J	72	18	.060	1.100	720 Lbs.
NW-716 J	7	16	.040	.370	95 Lbs.
NW-1216J	12	16	.050	.500	155 Lbs.
NW-1916J	19	16	.060	.600	230 Lbs.
NW-2716J	27	16	.060	.700	320 Lbs.
NW-3716J	37	16	.060	.785	430 Lbs.
NW-4816J	48	16	.060	.900	625 Lbs.
NW-6016J	60	16	.060	.980	750 Lbs.
NW-714 J	7	14	.050	.450	150 Lbs.
NW-1214J	12	14	.050	.560	240 Lbs.
NW-1914J	19	14	.060	.675	370 Lbs.
NW-2714J	27	14	.060	.800	515 Lbs.
NW-512 J	5	12	.050	.480	175 Lbs.
NW-712 J	7	12	.050	.525	225 Lbs.
NW-1212J	12	12	.060	.700	375 Lbs.
NW-1912J	19	12	.060	.820	560 Lbs.

OVERALL SHIELDED

PART NO.	NO. COND	COND AWG	T.C. SHIELD	JKT. THICK	CABLE O.D.	WEIGHT PER M'
NW-722 SJ	7	22	No. 36	.040	.320	55 Lbs.
NW-1222SJ	12	22	No. 34	.050	.420	90 Lbs.
NW-1922SJ	19	22	No. 34	.060	.490	145 Lbs.
NW-2722SJ	27	22	No. 34	.060	.560	200 Lbs.
NW-3722SJ	37	22	No. 34	.060	.630	245 Lbs.
NW-4822SJ	48	22	No. 34	.060	.700	300 Lbs.
NW-6022SJ	60	22	No. 34	.060	.760	355 Lbs.
NW-7222SJ	72	22	No. 34	.060	.810	425 Lbs.
NW-8822SJ	88	22	No. 34	.060	.870	500 Lbs.
NW-10222SJ	102	22	No. 34	.060	.915	560 Lbs.
NW-720 SJ	7	20	No. 34	.040	.335	68 Lbs.
NW-1220SJ	12	20	No. 34	.050	.435	125 Lbs.
NW-1920SJ	19	20	No. 34	.060	.500	195 Lbs.
NW-2720SJ	27	20	No. 34	.060	.595	250 Lbs.
NW-3720SJ	37	20	No. 34	.060	.650	325 Lbs.
NW-4820SJ	48	20	No. 34	.060	.735	415 Lbs.
NW-6020SJ	60	20	No. 34	.060	.785	500 Lbs.
NW-7220SJ	72	20	No. 34	.060	.875	555 Lbs.
NW-8820SJ	88	20	No. 34	.060	.935	660 Lbs.
NW-10220SJ	102	20	No. 34	.060	1.010	750 Lbs.
NW-718 SJ	7	18	No. 34	.040	.380	95 Lbs.
NW-1218SJ	12	18	No. 34	.050	.490	170 Lbs.
NW-1918SJ	19	18	No. 34	.060	.590	265 Lbs.
NW-2718SJ	27	18	No. 34	.060	.680	350 Lbs.
NW-3718SJ	37	18	No. 34	.060	.760	445 Lbs.
NW-4818SJ	48	18	No. 34	.060	.850	575 Lbs.
NW-6018SJ	60	18	No. 34	.060	.935	680 Lbs.
NW-7218SJ	72	18	No. 34	.060	1.135	820 Lbs.
NW-716 SJ	7	16	No. 34	.040	.400	125 Lbs.
NW-1216SJ	12	16	No. 34	.050	.535	195 Lbs.
NW-1916SJ	19	16	No. 34	.060	.635	275 Lbs.
NW-2716SJ	27	16	No. 34	.060	.735	375 Lbs.
NW-3716SJ	37	16	No. 34	.060	.820	500 Lbs.
NW-4816SJ	48	16	No. 34	.060	.935	700 Lbs.
NW-6016SJ	60	16	No. 34	.060	1.015	830 Lbs.
NW-714 SJ	7	14	No. 34	.050	.485	180 Lbs.
NW-1214SJ	12	14	No. 34	.050	.600	280 Lbs.
NW-1914SJ	19	14	No. 34	.060	.710	420 Lbs.
NW-2714SJ	27	14	No. 34	.060	.835	575 Lbs.
NW-512 SJ	5	12	No. 34	.050	.515	210 Lbs.
NW-712 SJ	7	12	No. 34	.050	.560	265 Lbs.
NW-1212SJ	12	12	No. 34	.060	.735	430 Lbs.
NW-1912SJ	19	12	No. 34	.060	.850	625 Lbs.

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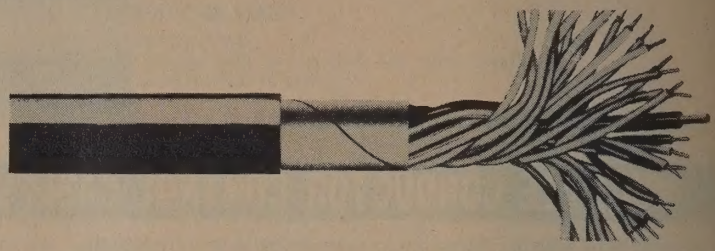

MULTIPLE PAIR SIGNAL & CONTROL CABLES

IN STOCK
MIL-SPEC

Identical to National's NW-Series Cables except offered as twisted pairs.

National Wire & Cable Corporation manufactures a complete line of multiple pair control cables. Conductors are of tinned copper strand with 1/64" vinyl primary insulation for use up to 105° C per MIL-W-16878D Type C. Insulated for **1000** volts working voltage. Conductors are color coded using 10 standard basic colors, plus spiral tracers on white per table below.

All pairs are planetary cabled and contra-helically laid with a Mylar tape serve over the cable bundle. The overall jacket is a 105°C black vinyl plastic per MIL-I-631; or may be Neoprene to MIL-R-6855 Class 2 Grade 60 specification. (Neoprene at added cost).

SHIELDED CABLES

National Multiple Conductor SHIELDED CABLES are to the same specifications as above with addition of tinned copper braided shield over cable complex with 85-90% coverage to MIL-C-7078A. STANDARD PUT-UPS: 500 ft. and 1000 ft. No-deposit reels.

TECHNICAL DATA (all cables)

Insulation Breakdown Voltage:	Greater than 8,000 volts AC RMS, 60 cps.
Capacitance:	Nominal capacitance wire to wire for a pair ranges from 27. to 40. mmfd/ft. Capacitance from both wires tied together measured to all else in common ranges from 35. to 60. mmfd/ft. dependent on gauge and position. Overall shield has negligible effect on W-W capacitance.
Insulation Leakage Res.:	200. megohms/1000 ft. min. at 500 VDC from any conductor to all else in cable.
Sheath Leakage Res.:	10. megohms/1000 ft. min. at 500 VDC from overall shield through sheath to outside world.
Usable Temp. Range:	Suitable for continuous use from +105°C to −55°C.
Cold Bending Capability:	All cables are suitable for flexing to a circle diam. of approx. 6 cable diameters from +105°C to −20°C; Recommended flex diameter should be greater than 20 cable diam. for flexing at −40°C., or for continuous flexing service to −55°C, specify our neoprene sheath, in lieu of plastic sheath.

MULTIPLE PAIR STOCK CABLES

UNSHIELDED OVERALL

PART NO.	NO. OF PAIRS	COND. GA.	JKT. THICK	O.D.	WEIGHT
NWP-722 J	7	22	.045	.470	90 Lbs.
NWP-1222J	12	22	.050	.600	150 Lbs.
NWP-1922J	19	22	.050	.700	200 Lbs.
NWP-2722J	27	22	.055	.830	280 Lbs.
NWP-3722J	37	22	.060	.960	370 Lbs.
NWP-4822J	48	22	.060	1.080	470 Lbs.
NWP-6022J	60	22	.060	1.200	560 Lbs.
NWP-720 J	7	20	.050	.520	120 Lbs.
NWP-1220J	12	20	.050	.660	200 Lbs.
NWP-1920J	19	20	.050	.800	290 Lbs.
NWP-2720J	27	20	.060	.960	420 Lbs.
NWP-3720J	37	20	.060	1.100	500 Lbs.
NWP-4820J	48	20	.060	1.240	620 Lbs.
NWP-6020J	60	20	.060	1.380	750 Lbs.
NWP-718 J	7	18	.050	.580	150 Lbs.
NWP-1218J	12	18	.050	.740	290 Lbs.
NWP-1918J	19	18	.060	.920	400 Lbs.
NWP-2718J	27	18	.060	1.080	560 Lbs.
NWP-3718J	37	18	.060	1.240	750 Lbs.
NWP-4818J	48	18	.060	1.400	900 Lbs.
NWP-716 J	7	16	.050	.640	180 Lbs.
NWP-1216J	12	16	.060	.840	300 Lbs.
NWP-1916J	19	16	.060	1.020	430 Lbs.
NWP-2716J	27	16	.060	1.200	720 Lbs.
NWP-3716J	37	16	.060	1.380	1000 Lbs.

MULTIPLE PAIR STOCK CABLES

OVERALL SHIELDED

PART NO.	NO. OF PAIRS	COND. GA.	JKT. THICK	O.D.	WEIGHT
NWP-722 SJ	7	22	.045	.495	135 Lbs.
NWP-1222SJ	12	22	.050	.630	206 Lbs.
NWP-1922SJ	19	22	.050	.730	260 Lbs
NWP-2722SJ	27	22	.055	.860	358 Lbs
NWP-3722SJ	37	22	.060	.990	460 Lbs.
NWP-4822SJ	48	22	.060	1.110	570 Lbs.
NWP-6022SJ	60	22	.060	1.230	675 Lbs.
NWP-720 SJ	7	20	.050	.550	170 Lbs.
NWP-1220SJ	12	20	.050	.690	260 Lbs.
NWP-1920SJ	19	20	.050	.830	355 Lbs.
NWP-2720SJ	27	20	.060	.990	510 Lbs
NWP-3720SJ	37	20	.060	1.130	603 Lbs.
NWP-4820SJ	48	20	.060	1.270	735 Lbs.
NWP-6020SJ	60	20	.060	1.410	880 Lbs.
NWP-718 SJ	7	18	.050	.610	205 Lbs.
NWP-1218SJ	12	18	.050	.770	360 Lbs.
NWP-1918SJ	19	18	.060	.950	487 Lbs.
NWP-2718SJ	27	18	.060	1.110	660 Lbs.
NWP-3718SJ	37	18	.060	1.270	865 Lbs
NWP-4818SJ	48	18	.060	1.430	1030 Lbs.
NWP-716 SJ	7	16	.050	.670	240 Lbs.
NWP-1216SJ	12	16	.060	.870	377 Lbs.
NWP-1916SJ	19	16	.060	1.050	520 Lbs.
NWP-2716SJ	27	16	.060	1.230	830 Lbs.
NWP-3716SJ	37	16	.060	1.410	1330 Lbs.

COLOR CODING USED ON TWISTED PAIRS

PR #	PAIR COLORS	PR #	PAIR COLORS	PR #	PAIR COLORS	PR #	PAIR COLORS	PR #	PAIR COLORS	PR #	PAIR COLORS
1.	WHITE WITH BLACK	11.	BLACK WITH RED	21.	BROWN WITH GREEN	31.	ORANGE WITH YELLOW	41.	GREEN WITH VIOLET	51.	WHT/BLK WITH GREEN
2.	WHITE WITH BROWN	12.	BLACK WITH ORANGE	22.	BROWN WITH BLUE	32.	ORANGE WITH GREEN	42.	GREEN WITH GRAY	52.	WHT/BLK WITH BLUE
3.	WHITE WITH RED	13.	BLACK WITH YELLOW	23.	BROWN WITH VIOLET	33.	ORANGE WITH BLUE	43.	BLUE WITH VIOLET	53.	WHT/BLK WITH VIOLET
4.	WHITE WITH ORANGE	14.	BLACK WITH GREEN	24.	BROWN WITH GRAY	34.	ORANGE WITH VIOLET	44.	BLUE WITH GREY	54.	WHT/BLK WITH GRAY
5.	WHITE WITH YELLOW	15.	BLACK WITH BLUE	25.	RED WITH ORANGE	35.	ORANGE WITH GRAY	45.	VIOLET WITH GRAY	55.	WHT/BRN WITH BLACK
6.	WHITE WITH GREEN	16.	BLACK WITH VIOLET	26.	RED WITH YELLOW	36.	YELLOW WITH GREEN	46.	WHT/BLK WITH BLACK	56.	WHT/BRN WITH BROWN
7.	WHITE WITH BLUE	17.	BLACK WITH GRAY	27.	RED WITH GREEN	37.	YELLOW WITH BLUE	47.	WHT/BLK WITH BROWN	57.	WHT/BRN WITH RED
8.	WHITE WITH VIOLET	18.	BROWN WITH RED	28.	RED WITH BLUE	38.	YELLOW WITH VIOLET	48.	WHT/BLK WITH RED	58.	WHT/BRN WITH ORANGE
9.	WHITE WITH GRAY	19.	BROWN WITH ORANGE	29.	RED WITH VIOLET	39.	YELLOW WITH GRAY	49.	WHT/BLK WITH ORANGE	59.	WHT/BRN WITH YELLOW
10.	BLACK WITH BROWN	20.	BROWN WITH YELLOW	30.	RED WITH GRAY	40.	GREEN WITH BLUE	50.	WHT/BLK WITH YELLOW	60.	WHT/BRN WITH GREEN

NATIONAL WIRE & CABLE CORPORATION

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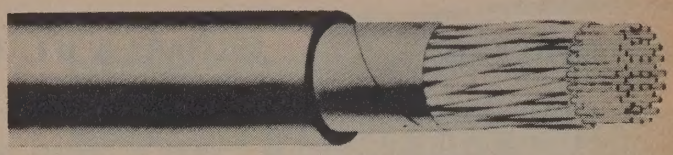

MINIATURE SIGNAL & CONTROL CABLES

IN STOCK
U.L. APPROVED COMPUTER GRADE

National Wire & Cable Corp. manufactures a complete line of MINIATURE low voltage signal and control cable. Available as cabled pairs or cabled singles, with optional overall shield. Conductors are stranded tinned copper with .010" wall of vinyl primary insulation for use up to 105°C. per MIL-W-16878 Type B. Insulated for **600 volts** working voltage. (Also meets U.L. AWM Type 1061; 300 volt, 80°C.) All are coded using 10 standard colors plus stripes on white per MIL-STD-681.

All conductors are planetary cabled and contra-helically laid for optimum flexibility, with a Mylar tape barrier under shields. Shielded cables have a tinned copper braid overall, of 85–90% coverage per MIL-C-7078; and braid angles below 40° for easy pushback.

The outer jacket is black abrasion-resistant 105°C. vinyl meeting MIL-I-631 Type F. All materials are self-extinguishing and fungus resistant. All items are U.L. APPROVED STYLE 2343 COMPUTER CABLE; rated 300 volt, 80°C. (Higher temp. ratings apply for any non-U.L. service.)

Standard Putups: 500 & 1000 ft. No-deposit reels.

*Denotes U.L. Style 2344.

TECHNICAL DATA (all cables)

Insulation Breakdown Voltage:	Greater than 5000 volts AC RMS, 60 cps.
Capacitance:	Nominal capacitance from a wire to all else in a cable ranges from 45. to 70. pf/ft at 1. kc, depending on gauge and position.
Insulation Leakage:	200. megohms/1000 ft. min. @ 500. VDC from any conductor to all else in cable.
Sheath Leakage:	10. megohms/1000 ft. min. @ 500 VDC from shield or conductor group through sheath to ground.
Temperature Range:	Suitable for continuous use from −40°C. to +105°C. (U.L. Service limited to +80°C.)
Bending Characteristics:	All cables are suitable for flexing to a circle diameter of 6. cable diameters from +105°C. to −20°C. Recommended flex diameter should be greater than 20 cable diameters for flexing at −40°C.

MULTI-CONDUCTOR STOCK CABLES SINGLES

Cond: 22, 24 are 7 strand; 20 AWG is 19 strand

UNSHIELDED CABLES

PART NO.	NO. COND.	COND. AWG	COND. O.D.	JKT. WALL	CABLE O.D.	WEIGHT LB/M'
NX-524 J	5	24	.045	.062	.220	32 Lbs.
NX-724 J	7	24	.045	.062	.250	40 Lbs.
NX-1224J	12	24	.045	.062	.300	53 Lbs.
NX-1524J	15	24	.045	.062	.330	65 Lbs.
NX-1924J	19	24	.045	.062	.340	73 Lbs.
NX-2724J	27	24	.045	.062	.390	85 Lbs.
NX-3724J	37	24	.045	.062	.420	120 Lbs.
NX-4824J	48	24	.045	.062	.470	142 Lbs.
NX-6024J	60	24	.045	.062	.510	170 Lbs.
NX-522 J	5	22	.050	.062	.200	40 Lbs.
NX-722 J	7	22	.050	.062	.270	48 Lbs.
NX-1222J	12	22	.050	.062	.330	72 Lbs.
NX-1522J	15	22	.050	.062	.350	85 Lbs.
NX-1922J	19	22	.050	.062	370	96 Lbs.
NX-2722J	27	22	.050	.062	.430	130 Lbs.
NX-3722J	37	22	.050	.062	.480	163 Lbs.
NX-4822J	48	22	.050	.062	.530	210 Lbs.
NX-6022J	60	22	.050	.062	.570	255 Lbs.
NX-520 J	5	20	.057	.062	.275	49 Lbs.
NX-720 J	7	20	.057	.062	.290	59 Lbs.
NX-1220J	12	20	.057	.062	.360	90 Lbs.
NX-1520J	15	20	.057	.062	.390	110 Lbs.
NX-1920J	19	20	.057	.062	.410	128 Lbs.
NX-2720J	27	20	.057	.062	.490	166 Lbs.
NX-3720J	37	20	.057	.062	.520	220 Lbs.
NX-4820J	48	20	.057	.062	.580	275 Lbs.
NX-6020J	60	20	.057	.062	.640	335 Lbs.

OVERALL SHIELDED CABLES

PART NO.	NO. COND.	COND. AWG	COND. O.D.	JKT. WALL	SHLD. AWG	CABLE O.D.	WEIGHT LB/M'
NX-524 SJ	5	24	.045	.062	36	.245	44 Lbs.
NX-724 SJ	7	24	.045	.062	36	.275	55 Lbs.
NX-1224SJ	12	24	.045	.062	36	.325	68 Lbs.
NX-1524SJ	15	24	.045	.062	36	.350	80 Lbs.
NX-1924SJ	19	24	.045	.062	36	.365	88 Lbs.
NX-2724SJ	27	24	.045	.062	36	.415	102 Lbs.
NX-3724SJ	37	24	.045	.062	36	.445	140 Lbs.
NX-4824SJ	48	24	.045	.062	36	.495	172 Lbs.
NX-6024SJ	60	24	.045	.062	36	.535	205 Lbs.
NX-522 SJ	5	22	.050	.062	36	.285	50 Lbs.
NX-722 SJ	7	22	.050	.062	36	.295	58 Lbs.
NX-1222SJ	12	22	.050	.062	36	.355	87 Lbs.
NX-1522SJ	15	22	.050	.062	36	.380	101 Lbs.
NX-1922SJ	19	22	.050	.062	36	.395	111 Lbs.
NX-2722SJ	27	22	.050	.062	36	.455	150 Lbs.
NX-3722SJ	37	22	.050	.062	34	.510	193 Lbs.
NX-4822SJ	48	22	.050	.062	34	.560	245 Lbs.
NX-6022SJ	60	22	.050	.062	34	.600	295 Lbs.
NX-520 SJ	5	20	.057	.062	36	.300	59 Lbs.
NX-720 SJ	7	20	.057	.062	36	.315	69 Lbs.
NX-1220SJ	12	20	.057	.062	36	.385	105 Lbs.
NX-1520SJ	15	20	.057	.062	36	.415	137 Lbs.
NX-1920SJ	19	20	.057	.062	36	.435	158 Lbs.
NX-2720SJ	27	20	.057	.062	36	.515	196 Lbs.
NX-3720SJ	37	20	.057	.062	34	.550	255 Lbs.
NX-4820SJ	48	20	.057	.062	34	.610	320 Lbs.
NX-6020SJ	60	20	.057	.062	34	.670	385 Lbs.

MULTI-CONDUCTOR STOCK CABLED PAIRS

UNSHIELDED CABLES

PART NO.	NO. PAIRS	COND. AWG	COND. O.D.	JKT. WALL	CABLE O.D.	WEIGHT LB/M'
NXP-524 J	5	24	.045	.062	.330	52 Lbs.
NXP-724 J	7	24	.045	.062	.350	60 Lbs.
NXP-1224J	12	24	.045	.062	.435	90 Lbs.
NXP-1524J	15	24	.045	.062	.485	110 Lbs.
NXP-1924J	19	24	.045	.062	.505	126 Lbs.
NXP-2724J	27	24	.045	.062	.590	167 Lbs.
NXP-3724J	37	24	.045	.062	.660	216 Lbs.
NXP-4824J	48	24	.045	.062	.745	270 Lbs.
NXP-6024J	60	24	.045	.062	.815	325 Lbs.
NXP-522 J	5	22	.050	.062	.365	56 Lbs.
NXP-722 J	7	22	.050	.062	.390	82 Lbs.
NXP-1222J	12	22	.050	.062	.470	120 Lbs.
NXP-1522J	15	22	.050	.062	.545	145 Lbs.
NXP-1922J	19	22	.050	.062	.550	170 Lbs.
NXP-2722J	27	22	.050	.062	.670	230 Lbs.
NXP-3722J	37	22	.050	.062	.750	300 Lbs.
NXP-4822J*	48	22	.050	.080	.850	375 Lbs.
NXP-6022J*	60	22	.050	.080	.930	460 Lbs.
NXP-520 J	5	20	.057	.062	.395	82 Lbs.
NXP-720 J	7	20	.057	.062	.440	108 Lbs.
NXP-1220J	12	20	.057	.062	.540	163 Lbs.
NXP-1520J	15	20	.057	.062	.600	196 Lbs.
NXP-1920J	19	20	.057	.062	.630	235 Lbs.
NXP-2720J	27	20	.057	.062	.745	320 Lbs.
NXP-3720J	37	20	.057	.062	.820	420 Lbs.
NXP-4820J	48	20	.057	.080	.950	530 Lbs.
NXP-6020J	60	20	.057	.080	1.040	650 Lbs.

OVERALL SHIELDED CABLES

PART NO.	NO. PAIRS	COND. AWG	COND. O.D.	JKT. WALL	T.C. SHIELD	CABLE O.D.	WEIGHT LB/M'
NXP-524 SJ	5	24	.045	.062	No. 36	.355	67 Lbs.
NXP-724 SJ	7	24	.045	.062	No. 36	.375	75 Lbs.
NXP-1224SJ	12	24	.045	.062	No. 36	.460	115 Lbs.
NXP-1524SJ	15	24	.045	.062	No. 36	.510	140 Lbs.
NXP-1924SJ	19	24	.045	.062	No. 36	.530	161 Lbs.
NXP-2724SJ	27	24	.045	.062	No. 34	.620	211 Lbs.
NXP-3724SJ	37	24	.045	.062	No. 34	.690	266 Lbs.
NXP-4824SJ	48	24	.045	.062	No. 34	.775	330 Lbs.
NXP-6024SJ*	60	24	.045	.062	No. 34	.845	390 Lbs.
NXP-522 SJ	5	22	.050	.062	No. 36	.390	77 Lbs.
NXP-722 SJ	7	22	.050	.062	No. 36	.415	100 Lbs.
NXP-1222SJ	12	22	.050	.062	No. 36	.495	150 Lbs.
NXP-1522SJ	15	22	.050	.062	No. 34	.575	185 Lbs.
NXP-1922SJ	19	22	.050	.062	No. 34	.580	210 Lbs.
NXP-2722SJ	27	22	.050	.062	No. 34	.600	280 Lbs.
NXP-3722SJ	37	22	.050	.062	No. 34	.780	357 Lbs.
NXP-4822SJ*	48	22	.050	.080	No. 34	.880	445 Lbs.
NXP-6022SJ*	60	22	.050	.080	No. 34	.960	535 Lbs.
NXP-520 SJ	5	20	.057	.062	No. 36	.420	102 Lbs.
NXP-720 SJ	7	20	.057	.062	No. 36	.465	123 Lbs.
NXP-1220SJ	12	20	.057	.062	No. 34	.570	203 Lbs.
NXP-1520SJ	15	20	.057	.062	No. 34	.630	241 Lbs.
NXP-1920SJ	19	20	.057	.062	No. 34	.660	280 Lbs.
NXP-2720SJ	27	20	.057	.062	No. 34	.775	380 Lbs.
NXP-3720SJ*	37	20	.057	.080	No. 34	.850	490 Lbs.
NXP-4820SJ*	48	20	.057	.080	No. 34	.980	605 Lbs.
NXP-6020SJ*	60	20	.057	.080	No. 34	1.070	735 Lbs.

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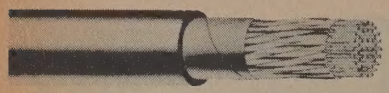


MILITARY & U.L. GRADE RFI SHIELDED PAIR CABLES

MEETS U.L. STYLE 2343 OR 2344 FOR COMPUTER USE.

SHIELDED PAIR CABLES

SIGNAL & CONTROL CABLES

National Wire & Cable Corp., manufactures a complete line of flexible multi-pair cables in which each pair is individually twisted, shielded and plastic-jacketed.

Provides a minimum of crosstalk between signal channels, plus complete isolation between shields. Excellent for analog signals. All jackets moisture-proof. Suitable for use in duct, conduit, aerial or burial installations.

Conductors are stranded tinned copper with .010″ vinyl primary insulation, plus .004″ nylon insulation over the vinyl per MIL-W-16878 Type B. Insulation for 600 volts working rating at 105°C. Color coded: White and black (all conductors are 19 strand.)

Shielding is tinned copper braid with 90% minimum coverage per MIL-C-7078, and shield angle below 40 degrees for easy push-back.

Jackets over shields are extruded 105°C white polyvinyl chloride plastic per MIL-I-631, Class F; Color coded with stripes per MIL-STD-681, starting with 9.

All pairs are planetary cabled and contra-helically laid with a mylar tape serve over the cable bundle. The overall sheath is abrasion-resistant black 105°C vinyl thermoplastic per MIL-I-631, Class F.

Optional overall shielding of cabled bundle is 90% minimum coverage of tinned copper braid applied per MIL-C-7078 over the tape serve under sheath.

STANDARD PUT-UPS: 500 & 1000 FT. ON NO-DEPOSIT REELS.

TECHNICAL DATA

Insulation Breakdown Voltage: Greater than 5000 volts RMS, 60 hz.

Capacitance: (mmfd/ft.)

AWG	Wire-Wire	Wire-Shield
22	37	64
20	44	77
16	55	96

Insulation Leakage Resistance: 200 Megohms/1000 ft. min. at 500 VDC from any conductor to all else in cable.

Sheath Leakage Resistance: 10 Megohms/1000 ft. min. at 500 VDC from overall shield through sheath to saline bath at 25°C.

Usable Temperature Range: Suitable for continuous use from +105°C to −55°C when stationary. Flexing service: +105°C to −25°C.

Cold Bending Capability: All cables are suitable for bending to a circle diameter of 8 cable diameters from +105°C to −20°C. Recommended flex diameter should be greater than 20 cable diameters at −40°C.

Crosstalk: Common-mode, adjacent pairs: Worst case, −50 db @ 1 mhz; falling to −100 db below 100 khz. (Ref. MIL-C-23437 for test method.) For 100 ft. test length.

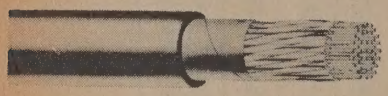
STANDARD CONSTRUCTIONS

WITHOUT OVERALL SHIELD

Part No.	No. Pairs	Cond. AWG	Jacket Thick.	Cable O.D.	Weight Per M′
NTP-722J	7	22	.062	.625	260 Lbs.
NTP-1222J	12	22	.070	.820	435 Lbs.
NTP-1922J	19	22	.080	.980	660 Lbs.
NTP-2722J	27	22	.080	1.115	910 Lbs.
NTP-3722J	37	22	.085	1.130	1,200 Lbs.
NTP-4822J	48	22	.090	1.520	1,570 Lbs.
NTP-720J	7	20	.070	.685	300 Lbs.
NTP-1220J	12	20	.080	.890	500 Lbs.
NTP-1920J	19	20	.080	1.065	755 Lbs.
NTP-2720J	27	20	.085	1.270	1,055 Lbs.
NTP-3720J	37	20	.090	1.445	1,400 Lbs.
NTP-716J	7	16	.075	.845	430 Lbs.
NTP-1216J	12	16	.080	1.105	700 Lbs.
NTP-1916J	19	16	.085	1.325	1,075 Lbs.

WITH OVERALL SHIELD

Part No.	No. Pairs	Cond. AWG	Jacket Thick.	Cable O.D.	Weight Per M′
NTP-722SJ	7	22	.062	.650	310 Lbs.
NTP-1222SJ	12	22	.070	.845	500 Lbs.
NTP-1922SJ	19	22	.075	1.005	700 Lbs.
NTP-2722SJ	27	22	.080	1.120	1,000 Lbs.
NTP-3722SJ	37	22	.085	1.355	1,290 Lbs.
NTP-4822SJ	48	22	.090	1.545	1,700 Lbs.
NTP-720SJ	7	20	.070	.710	355 Lbs.
NTP-1220SJ	12	20	.080	.920	570 Lbs.
NTP-1920SJ	19	20	.080	1.090	840 Lbs.
NTP-2720SJ	27	20	.085	1.295	1,155 Lbs.
NTP-3720SJ	37	20	.090	1.470	1,500 Lbs.
NTP-716SJ	7	16	.080	.870	500 Lbs.
NTP-1216SJ	12	16	.080	1.130	795 Lbs.
NTP-1916SJ	19	16	.085	1.350	1,185 Lbs.



MIL-SPEC FOR ROUGH USAGE & EXTREME ENVIRONMENTS

TEFLON®-INSULATED CABLES

SIGNAL & CONTROL CABLES

National Wire & Cable Corp., manfactures a standard line of TEFLON®-INSULATED multi-conductor signal and control cables designed for extreme environments and rough usage.

Construction is widely used in aerospace and industrial applications requiring a near-ultimate in cable physical and electrical performance plus high reliability.

Conductors are stranded silver-plated copper, insulated with .010″ of extruded TFE Teflon®; rated at 600 volts working from −65°C to +260°C per MIL-W-16878 Type E. Conductors are color coded using 10 standard colors plus spiral stripes on white per MIL-STD-681. (All conductors are 19 strand.)

All conductors are planetary cabled and contro-helically laid for optimum flexibility, with a Mylar tape wrap over the cabled bundle. The outer sheath is abrasion-resistant black Neoprene per MIL-S-6855, Class 2, Grade 60.

Optional overall shield is a 90% coverage tinned copper braid over the tape wrap per MIL-C-7078.

STANDARD PUT-UPS: 250 FT. LENGTHS ON NO-DEPOSIT REELS.

® Trademark, E. I. Dupont Co.

TECHNICAL DATA

Insulation Breakdown Voltage: Greater than 4000 volts RMS, 60 hz.

Capacitance: Nominal capacitance from a wire to all else in cable ranges from 25 to 45 mmfd/ft. dependent on gauge and position in cable bundle.

Insulation Leakage Resistance: 5000 Megohms per 1000 ft.; minimum from any wire to all else in cable.

Sheath Leakage Resistance: 20 Megohms/ft. minimum; from shield through sheath to saline bath after 24 hr. at 25°C.

Usable Temperature Range: Suitable for continuous use from −55°C to +75°C in flexing service or stored.

Cold Bending Capability: All cables are suitable for bending to a circle diameter as small as 4 times their diameter from −55°C to +75°C. Continuous flexing to less than 6 times diameter is not recommended below −40°C.

General Performance: All materials are self-extinguishing after exposure to flame. Non-nutrient to fungus. Highly resistant to ozone, oils, mild acids and bases, high humidity.

STANDARD CONSTRUCTIONS

Part No.	No. Cond.	Cond. AWG	Jacket Thick.	Cable O.D.	Weight Per M′
NZ-720J	7	20	.062	.300	70 Lbs.
NZ-1220J	12	20	.062	.365	100 Lbs.
NZ-1920J	19	20	.078	.445	145 Lbs.
NZ-2720J	27	20	.078	.505	210 Lbs.
NZ-3720J	37	20	.093	.590	260 Lbs.
NZ-4820J	48	20	.093	.650	330 Lbs.
NZ-6020J	60	20	.093	.705	400 Lbs.
NZ-716J	7	16	.062	.355	95 Lbs.
NZ-1216J	12	16	.078	.470	160 Lbs.
NZ-1916J	19	16	.078	.540	235 Lbs.
NZ-2716J	27	16	.093	.655	325 Lbs.
NZ-3716J	37	16	.093	.720	435 Lbs.
NZ-4816J	48	16	.093	.805	545 Lbs.

Part No.	No. Cond.	Cond. AWG	Jacket Thick.	Cable O.D.	Weight Per M′
NZ-720SJ	7	20	.062	.325	80 Lbs.
NZ-1220SJ	12	20	.062	.400	115 Lbs.
NZ-1920SJ	19	20	.078	.470	165 Lbs.
NZ-2720SJ	27	20	.078	.535	240 Lbs.
NZ-3720SJ	37	20	.093	.616	300 Lbs.
NZ-4820SJ	48	20	.093	.675	370 Lbs.
NZ-6020SJ	60	20	.093	.730	450 Lbs.
NZ-716SJ	7	16	.062	.380	110 Lbs.
NZ-1216SJ	12	16	.078	.495	190 Lbs.
NZ-1916SJ	19	16	.078	.565	270 Lbs.
NZ-2716SJ	27	16	.093	.680	370 Lbs.
NZ-3716SJ	37	16	.093	.745	485 Lbs.
NZ-4816SJ	48	16	.093	.830	605 Lbs.

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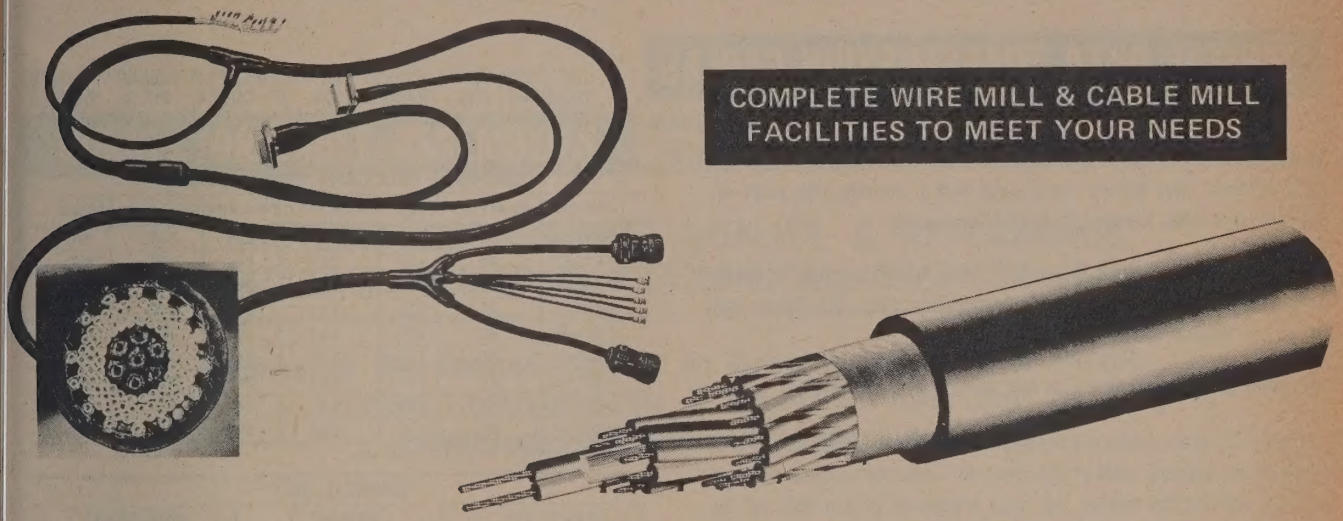


COMPLETE WIRE MILL & CABLE MILL FACILITIES TO MEET YOUR NEEDS

CUSTOM-MADE CABLE TO YOUR OWN SPECIFICATIONS....

IS AVAILABLE PROMPTLY — AND AT LOWER COST THAN YOU MAY SUPPOSE . . .

BECAUSE NATIONAL HAS:

1- **The organization & experience** to handle short-runs or rush schedules with consistent quality.

2- **All types of mill machinery** for fabricating cable and all intermediate operations.

3- **An enormous wire inventory** to draw from for material for your cable. (over 100 million feet in stock)

4- **Technical consultants** to aid you in properly specifying your cable needs and construction.

Mr. DESIGNER: May we suggest:

A. **Request a copy of our complete Master Catalog. Write to us on your company letterhead, or phone us directly in Los Angeles with your request**
Then . . .

B. Check our catalog section and the instrumentation cable section for any of our standard stock cables which may meet your needs.

C. Review our cable designer's check list in the "Technical Information" section of the Master Catalog. Note any topics on which you may need information or recommendations.

D. Call National Wire & Cable Corp. (213 - 225-5611) and discuss your needs with our Technical Consultants. They speak your language and will have the answers you need.

E. Our Consultants will assist you in design, obtain cost and delivery information, and provide formal quotations and drawings, and assist with sales and procurement liaison.

F. Send us your prints for your custom cables for review and quotation. Where necessary, National Wire and Cable will provide engineering at no cost to fit your needs.

TRY OUR SERVICE, AND SEE!

NATIONAL WIRE & CABLE CORPORATION IS UNIQUE AMONG THE LEADING MANUFACTURERS OF CONTROL AND INSTRUMENTATION CABLE FOR THE ELECTRONIC AND AEROSPACE INDUSTRY. UNIQUE, DUE TO OUR HUGE WIRE INVENTORY — OVER 100 MILLION FEET IN STOCK — WHICH ALLOWS VERY RAPID DELIVERY OF CABLE, AND EXCELLENT SERVICE TO OUR WIRE CUSTOMERS.

COMPLETE FACILITIES FOR FABRICATING ALL CONSTRUCTIONS.

COPPER CONDUCTOR FABRICATION
CONDUCTOR INSULATION EXTRUSION
INSULATION CODING & STRIPING
ELECTRICAL SHIELDING

TWISTING & SUBCABLE FABRICATION
PLANETARY CABLE FABRICATION
CABLE SHEATH EXTRUSION
CABLE ASSEMBLY FABRICATION

NATIONAL WIRE & CABLE CORPORATION

136 SAN FERNANDO RD., LOS ANGELES, CALIF. 90031 • PHONE (213) 225-5611 • TWX: 910-321-4155 • FED. STOCK CODE H4-04569

DIGITAL DATA TRANSMISSION CABLES

Manufactured by our affiliate, Dynatronic Cable Engineering Corp.

THE D-200 SERIES CABLES ARE MULTIPLE-PAIR FLEXIBLE CABLES DESIGNED FOR TRANSMISSION OF DIGITAL PULSE SIGNALS BETWEEN A COMPUTER AND ITS PERIPHERAL EQUIPMENT.

These cables are specifically designed for use with TTL, ECL, DTL or RTL logic systems. They feature signal pairs with a uniform high surge impedance, low delay, low capacitance and attenuation.

The cables may be directly driven by I.C.'s in either balanced or single-ended systems. The compact cable dimensions allow convenient connector installation and tight installation bends.

All cables have an overall shield and black vinyl outer sheath.

The D-200 series cables are designed to be used in either balanced or single-ended systems without the need for individual shields on each pair. By omitting the shields, the surge impedance is kept high yet the cable size is small. The cable geometry, pair and layer lay lengths, rotation directions, and the insulation materials and sizes have been carefully designed for low cross-talk and exact surge impedance.

All cable lengths are factory-tested for surge impedance accuracy using time-domain reflectometry techniques; and are certified to meet the impedance tolerances specified.

STANDARD DATA CABLE CONSTRUCTIONS

Part No.	No. of Pairs	Z_0	Delay ns/ft.	Cond. AWG	Cable Diam.	Sheath
D-200-15	15	110.	1.61	24	.500	PVC
D-200-20	20	110.	1.61	24	.550	PVC
D-200-24	24	110.	1.61	24	.680	PVC
D-200-27	27	110.	1.61	24	.690	PVC
D-200-30	30	110.	1.61	24	.710	PVC
D-200-33	33	110.	1.61	24	.750	PVC
D-200-42	42	110.	1.61	24	.850	PVC
D-200-48	48	110.	1.61	24	.890	PVC
D-200-50	50	110.	1.61	24	.910	PVC

All items available in 50 ft. multiples.

TECHNICAL DATA

Characteristic	Balanced**	Single-Ended*
Surge Impedance	110 ohms ±5%	78 ohms ±4%
Capacitance	14 pf/ft.	21 pf/ft.
Signal Delay	1.61 ns/ft.	1.61 ns/ft.
DC Resistance/100 ft.	5.6 ohms loop	2.8 ohms
Insulation Breakdown	6 KV min. DC	6 KV min. DC
Insulation Resistance	> 1000 megohms/M′	> 1000 megohms/M′
Temperature Range	−20°C up to +80°C	
Min. Bend Radius	6 x cable diameter	

* One conductor of each pair tied to common. ** Both driven, one inverted.

DESIGN FEATURES OF THE D-200 SERIES DIGITAL DATA CABLE

Unlike conventional flexible cable construction, the primary features offered by the D-200 series data cable are the high and accurately-controlled characteristic impedance of every pair, regardless of its position in the cable;† and special geometry chosen to reduce crosstalk.†

ADVANTAGES:

1—Less crosstalk and noise from mismatched loads, due to proper matching.

2—Uniform light loading on drivers allows direct I.C. drive, accurate prediction of current demands from power supply, and driver power dissipation.

3—Proper load match reduces re-reflection and inversion noise where driver end is not matched to line (typical of TTL).

4—Special geometry and pair construction provides exceptionally close capacitance balance between pair wires, reducing differential crosstalk.†

USAGE:

We recommend use of **balanced drive** and **differential-input line receivers** for lowest crosstalk and best pulse-reproduction, utilizing the 110 ohm balanced impedance of the pairs. With such a system, TTL and MECL speeds have been used on D-200 cable at 1 mc data rates over 1000 ft.

Where the system is single-ended drive and receive, all pairs exhibit the 78 ohm impedance. Since these line receivers cannot discriminate between noise and the desired signal, crosstalk limits the cable distance over which transmission is reliable. Typical runs for DTL having 50 ns risetimes are 200 ft. Where risetimes can be slowed to longer than 100 ns, run lengths are practical to 500 ft. Without differential line reception, runs over 500 ft. are not recommended for D-200 cable due to external noise aspects. The **D-210** series cable is recommended for high-noise or long-run application (utilizing individual shields).

† Patent pending

Although use of balanced drive and differential line reception will avoid most noise problems, there are some installations where the expected external noise is unknown but assumed to be very great. Here, the use of data cables having individually-shielded pairs may be considered as conservative engineering practice. The assurance of a lower received noise may justify the increased size, cost and risetime.

For these high-noise long-run applications, Dynatronic Cable Engineering Corp. has developed the D-210 series data cables. Electrical performance is essentially the same as the D-200 series cables, which use only an overall shield. An overall tinned-copper shield braid may be specified on either series by the suffix -RF on the part number. Standard D-200 shield is aluminum-mylar foil.

STANDARD DATA CABLE CONSTRUCTIONS

D-210 Series Cables			Individually-shielded Data Pairs			
Part No.	No. of Pairs	Z_0	Delay ns/ft.	Cond. AWG	Cable Diam.	Sheath
D-210-12	12	110.	1.61	24	.980	PVC
D-210-15	15	110.	1.61	24	1.06	PVC
D-210-20	20	110.	1.61	24	1.20	PVC
D-210-30	30	110.	1.61	24	1.42	PVC
D-210-40	40	110.	1.61	24	1.69	PVC
D-210-48	48	110.	1.61	24	1.76	PVC

TECHNICAL DATA

Characteristic	Balanced**	Single-Ended*
Surge Impedance	110 ohms ±5%	63 ohms ±4%
Capacitance	14 pf/ft.	23.5 pf/ft.
Signal Delay	1.61 ns/ft.	1.61 ns/ft.
DC Resistance/100 ft.	5.6 ohms loop	2.8 ohms
Insulation Breakdown	6 KV min. DC	6 KV min. DC
Insulation Resistance	> 1000 megohms/M′	> 1000 megohms/M′
Temperature Range	−20°C up to +80°C	
Min. Bend Radius	9 x cable diameter	

** Both driven, one inverted. * One conductor of each pair tied to common.

National Cable Molding Corp., Division of:

NATIONAL WIRE & CABLE CORPORATION

136 SAN FERNANDO RD., LOS ANGELES, CALIF. 90031 • PHONE (213) 225-5611 • TWX: 910-321-4155 • FED. STOCK CODE H4-04569

CONNECTOR/CABLE ASSEMBLIES INTEGRAL-MOLDED

HIGHEST PROFESSIONAL QUALITY & APPEARANCE
DURABLE, RELIABLE, ECONOMICAL, READY-TO-USE.

Connectors Are Created Directly on Cable by Injection of Plastic Around Contacts, Cable & Hardware; Using Our Proprietary High-Production Techniques.

WIDELY USED IN:

- ELECTRO-MEDICAL EQUIPMENT
- INDUSTRIAL CONTROLS
- COMPUTER CABLING
- INSTRUMENTATION
- COMMUNICATIONS EQUIPMENT
- AUDIO & HI-FI EQUIPMENT

WE ARE A COMPLETE SOURCE:

MANUFACTURING: Since we manufacture all wire, cable, contacts, hardware, molding and tooling within our own facilities, we can ensure consistent quality and dependable delivery. Complete wire & cable mill plus injection-molding plant.

STANDARD ITEMS: We have many standard cables and molded connector styles; all available without tooling or setup expense.

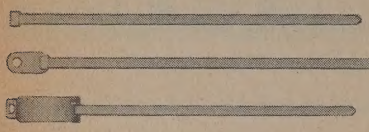
ENGINEERING: Complete engineering and design services to assist you. Cables and molded connectors custom-designed to your requirements. Extra-flexible and low-capacitance construction are our specialty.

CALL OR WRITE FOR INFORMATION & PRICES

WE SPECIALIZE IN HI-SPEED INJECTION-MOLDING OF CONNECTORS DIRECTLY ONTO CABLES.

PANDUIT® wiring components

STA-STRAP® CABLE TIES AND CLAMPS



SST — Cable Ties

SSC — Clamps

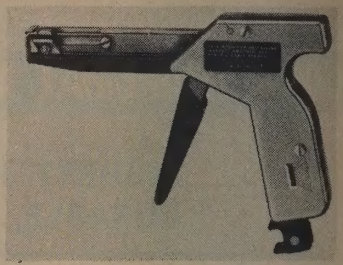
SSM — Markers

**** Part Number System:**

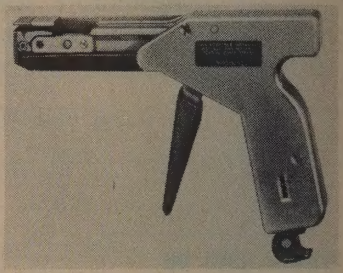
SST 2 S-M 6

Type / Size / Cross-Section Size / Pkg. Size / Color

Hand Operated Installation Tools



GS2B — Manual $19.00 ea. net. Installs Miniature, Intermediate and Standard Cable Ties.



GS4H — Manual $40.00 ea. net. Heavy Duty — installs Standard and Heavy Cable Ties.

STANDARD PKG. OF 100 (C)

**Part Number	Max. Bundle Dia.	Approx. Shpg. Wt. Lbs./1000	Price Per 100	
			Base Price 100-400	500
SST1M-C	3/4"	1	$1.74	$1.39
SST1.5M-C	1 1/4"	1.2	2.08	1.67
SST1.5I-C	1 1/4"	1.5	2.26	1.81
SST2S-C	1 3/4"	2.6	2.78	2.22
SST3I-C	3"	2.6	5.21	4.17
SST3S-C	3"	3.5	6.08	4.86
SST4S-C	4"	4.5	6.94	5.56
SST4H-C	4"	12	10.94	8.75
SST8H-C	8"	24	22.50	18.00
SSC2S-C	1 3/4"	3.2	4.90	3.90
SSC4S-C	4"	5.5	10.80	8.60
SSC4H-C	4"	14	17.00	13.60
SSM2S-C	1 3/4"	3.3	8.60	6.80
SSM4S-C	4"	6	14.10	11.20

Total quantity per item, shipment and order determines price.
Colors: Standard Color — Natural Nylon White.
Other Colors — 10% additional price.

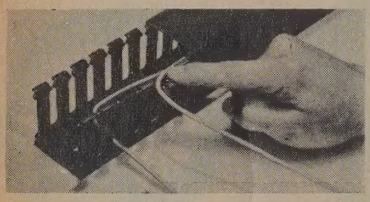
BULK PACKAGING*

These items available in bulk packaging quantities only as designated.

**Part Number	Price Per M (1000)		
	1M-24.5M	25M-49.5M	50M
SST1M-M	$11.10	$10.55	$10.00
SST1.5M-M	13.35	12.65	12.00
SST1.5I-M	14.45	13.70	13.00
SST2S-M	17.80	16.85	16.00
SST3I-M	33.35	31.60	30.00
SST3S-M	38.90	36.85	35.00
SST4S-M	44.45	42.10	40.00
SST4H-D	70.00	66.30	63.00
SST8H-D	140.00	136.00	126.00
SSC2S-M	30.00	28.50	27.00
SSC4S-M	66.00	62.70	59.40
SSC4H-D	111.80	106.20	100.75
SSM2S-D	55.00	52.25	49.50
SSM4S-D	87.50	83.15	78.25

*Bulk packaging quantities indicated by letter suffix in part no. D = 500; M = 1000.
Order by Number of Pieces Required.

PANDUCT® PLASTIC WIRING DUCT



Type E — Open Slot

PART NUMBER SYSTEM

Channel Only

Example: E 1.5 x 2 LG 6

Type / 1.5" Wide / 2" High / Light Gray / 6' Long

Cover Only

Example: C 1.5 LG 6

Cover / 1.5" Wide / Light Gray / 6' Long

Color Code:
Dark Gray (DG);
Light Gray (LG);
White (WH).

PANDUCT® CHANNEL ONLY

Nominal Width x Height (Inches)	Approx. Shpg. Wt. Per 100'	Price/Foot		
		Under 200 ft.	200 to 1999 ft.	2000 to 4999 ft.
.5x.5	11 lbs.	$0.43	$0.34	$0.31
.5x.62	12 lbs.	.45	.36	.34
.5x1	16 lbs.	.49	.39	.37
.5x1.25	16 lbs.	.56	.44	.40
.5x1.75	16 lbs.	.58	.47	.44
.75x.75	14 lbs.	.48	.38	.36
.75x1	16 lbs.	.49	.39	.37
.75x1.5	19 lbs.	.58	.46	.43
.75x2	23 lbs.	.71	.57	.52
1x1	16 lbs.	.49	.40	.37
1x1.5	18 lbs.	.65	.53	.49
1x2	21 lbs.	.69	.55	.51
1x3	31 lbs.	.88	.71	.65
1.5x1.5	20 lbs.	.69	.56	.50
1.5x2	20 lbs.	.75	.60	.55
1.5x3	30 lbs.	.95	.76	.70
1.5x4	40 lbs.	1.21	.97	.89
2x1	18 lbs.	.68	.55	.49
2x2	23 lbs.	.76	.61	.56
2x3	36 lbs.	.98	.78	.72
2x4	48 lbs.	1.26	1.01	.93
2.5x3	41 lbs.	1.04	.83	.77
3x1	20 lbs.	.82	.65	.61
3x2	33 lbs.	.89	.71	.65
3x3	43 lbs.	1.07	.85	.78
3x4	53 lbs.	1.32	1.06	.97
4x1.5	33 lbs.	.94	.75	.70
4x2	38 lbs.	.96	.77	.71
4x3	48 lbs.	1.14	.92	.84
4x4	58 lbs.	1.42	1.13	1.04

CORRESPONDING COVER ONLY

Nominal Width (Inches)	Approx. Shpg. Wt./100'	Price/Foot		
		Under 200 ft.	200 to 1999 ft.	2000 to 4999 ft.
.5	4 lbs.	$0.10	$0.08	$0.07
.75	6 lbs.	.11	.09	.08
1	9 lbs.	.14	.11	.10
1.5	10 lbs.	.16	.13	.12
2	12 lbs.	.20	.16	.14
2.5	14 lbs.	.24	.20	.17
3	17 lbs.	.28	.23	.21
4	22 lbs.	.36	.28	.26

Order by Total No. of Ft. Req'd. (must be multiple of length per part). Standard Mounting Holes: No Charge — Supplied Only if Specified — See Duct Catalog for Dimensions.
NOTE: Standard Length: 6 ft. Standard Color: Light Gray. White and Dark Gray available.
NOTE: Total length of all sizes of duct and cover, ordered for shipment at one time to one location, determines price columns.
NOTE: Type "S" has solid walls and no wire slots or openings.

Delivery: F.O.B. Tinley Park, Ill. Minimum Billing: $25.00 net, each customer-designated shipment. Terms: Cash Discount 2%, 10th prox. FREIGHT ALLOWED via Panduit routing on domestic shipments of $300.00 or more net billing. All prices subject to change without notice.

PANDUIT CORP.
17301 Ridgeland Ave., Tinley Park, Ill. 60477 • Phone: 312 — 532-1800 • TELEX 25-4560

Synkote®

SYMBOL OF THE FINEST AND NEWEST DEPENDABLE WIRE AND CABLE. SEND FOR LATEST CATALOGUE

Coaxial Cable, Hook-up Wire, Shipboard Cable, Silicone Rubber Wire and Cable, Custom-engineered Multi-Conductor Cable. For prices, samples and technical data, contact your nearest Plastoid representative. (See list in manufacturers' section).

PLASTOID CORPORATION | Plants: HAMBURG, NEW JERSEY — FRANKLIN, NEW JERSEY
Offices: LONG ISLAND CITY, N. Y.

AA-SIGNAL & CONTROL CABLE
(Thermoplastic Insulation & Jacket)

COAXIAL CABLES
Spec JAN-C-17A & MIL-C-17C
Including Low-Temperature, Non-Contaminating Jackets
Double Shielded & Jacketed Coaxial Cable
Foam Polyethylene Insulated Community TV Coaxial Cables

SPECIAL PURPOSE CABLES
Meteorological Survey Cable
Underwater Sound Equipment Cable
Geophysical Cable
Fire Control Wire & Cable
Electronic Computer Wire & Cable
Inside Telephone Cable
Special Design High Frequency Cable

Thermostat Cable 2-7 conductors (Twisted & Thermoplastic Jacketed)
Microphone Cables
Sound & Intercommunication Wire & Cable
Rotor Antenna Cable

TEFLON INSULATED WIRE & CABLE
MIL-W-16878D TYPES "E" & "EE", "ET", "K", "KK", "KT"
Multi-conductor Cables
Teflon Coaxial Cables
MIL-W-7139B

RADIO AND ELECTRONIC HOOK-UP WIRE
MIL-W-76B (types MW, LW, HW)
MIL-W-16878D (types B, C, D, J) with and without Nylon jackets. All types can be supplied with braided, shielded and jacketed outer coverings or combinations thereof.

Underwriters Laboratory — 80°; 90°; 105° PVC insulation, nominal walls of .008; .015; .031; .047 & with braided outer or extruded nylon jacket

AIRCRAFT WIRE & CABLE
MIL-W-5086A MIL-W-5274A
MIL-C-7078A MIL-W-7072A
MIL-W-8777B

NAVY SHIPBOARD CABLE
MIL-C-915A & MIL-C-2194D

ELECTRICAL SHIPBOARD CABLE
AIEE-45

REA TELEPHONE CABLE
SPEC PE-14, PE-15, PE-17, PE-27, PE-28

MULTI PAIR RURAL DISTRIBUTION WIRE TRAFFIC CONTROL CABLES
(Specs IMSA 19 & 20)

POWER CONTROL CABLES
(Specs IPCEA & IMSA)
(Thermoplastic Insulation & Jacket)

AIRPORT LIGHTING CABLE
COMMUNITY TV COAXIAL CABLE
(Wire Shield, Flat Ribbon Shield, Corrugated Copper Tape Shield, Aluminum Sheath.)

SILICONE RUBBER INSULATED WIRE & CABLE
MIL-W-16878D types "F", "FF", "FFW"
MIL-W-8777B
Underwriters Laboratory type SF-1, SF-2, SFF-1, SFF-2
High temperature, high voltage hook-up wire
Motor lead wire

HOOK-UP & AIRCRAFT WIRE

MIL-W-1687D, MIL-W-7139A, MIL-W-7139B (Extruded Teflon*)

MIL-W-7139B

Manufactured to conform to Dept. of Defense requirements.
600 Volts Temperature Rating +200°C & +260°C.
Class 1—Silver Coated Copper Conductor for +200°C Operation.
Class 2—Nickel Coated Copper Conductor for +260°C Operation.
*DuPont Trade Mark

SILICONE WIRE & CABLE

EXTRUDED SILICONE RUBBER

Outstanding performance, under difficult operating conditions rapidly expand applications for these constructions.

ADVANTAGES

1. Electrical properties remain constant from −130°F to +500°F.
2. Remains flexible even after long exposure to temperatures from −130°F to +500°F.
3. Resists ozone and corona.
4. Can be soldered without melting or destroying insulation.
5. Non-Flammable.
6. High Dielectric strength (450 to 550 volts/mil)
7. High Insulation resistance (1000 to 20,000 megohms-/1000 ft.)
8. Low dissipation factor (.001-.02)
9. Low Dielectric Constant (2.98-3.6)
10. Low water absorption (1 to 2%)
11. High Tensile Strength (750 to 1500 PSI)
12. High Elongation (100-550%)

The most prominent silicone rubber insulated wires and cables are detailed by the following specifications:

MIL-W-8777B — IGNITION WIRE
MIL-W-16878D (F, FF, FFW) — APPLIANCE WIRE
MIL-C-3162A (SF-1, SF-2, SFF-1, SFF-2.)
MIL-C-8817 (ASG) — MOTOR LEAD WIRE

GLASS BRAID — SILICONE RUBBER — TINNED COPPER

MOTOR LEAD WIRE

(600 Volts Class "H" +200°C)

Lead wire failures can be practically eliminated with the use of silicone rubber insulations. In many instances the equipment can be baked with lead wire in place.

MIL-W-8777B (ASG)

Dated 1 August 1960—Superseding MIL-W-8778A—10 July 1956. Voltage Rating 600 Volts. Temperature Rating −55°C +150°C.
Construction Details:
(a) Conductor—Concentric stranded or rope—lay stranded silver copper conductors as required by specification. (b) Primary Insulation—Silicone Rubber. (c) Protective Cover—Fiberglas Braid impregnated with heat-resistant lacquer. (d) Outer Protective Coating—1. Polyester Jacket, impregnated with heat resistant lacquer. 2. Extruded FEP Jacket. (e) Print—Outer surface printed as required by specification.

Per Military Standards—
MS 25471 (ASG) Polyester Jacket Impregnated with High Temperature Finisher MS 27110 (USAF) Extruded Clear FEP Jacket.

HIGH TEMPERATURE — HIGH VOLTAGE HOOK-UP WIRE

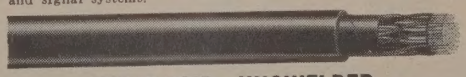
Class "H" Insulation for −65°C to +200°C Max.
Silicone Rubber and extruded Teflon* 100 (FEP).

Description:
a. Conductor — Copper stranded, silver plated — 40 microinches min.
b. Primary Insulation — High strength silicone rubber.
c. Jacket — Teflon* (Perfluorocarbon resin 100) extruded.
For operation between −65°C and +175°C at 2000 Volts RMS (sea-level).

TYPES SF-1, SF-2, SFF-1, SFF-2
For appliances where high temperature wiring is mandatory.
*DuPONT TRADE MARK

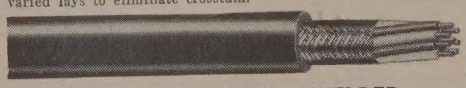
MULTI-CONDUCTOR, UNSHIELDED, JACKETED CABLES

These cables can be supplied in various AWG sizes, insulation types, number of conductors and jacket types. Used for unbalanced intercom systems, low voltage control systems, public address systems, electronic computers, indoor and outdoor sound and signal systems.



MULTI-PAIR, UNSHIELDED, JACKETED CABLES

This cable type can be supplied in a variety of sizes, insulations and jackets to meet individual needs and requirements. For use in balanced intercom systems, annunciators, telephones, nurses call systems, control circuits, electronic computers, multiple speaker, signal and alarm systems. Pairs twisted with varied lays to eliminate crosstalk.



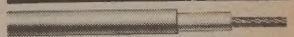
MULTI-CONDUCTOR, SHIELDED JACKETED CABLES

Cables of this type are used for indoor and outdoor public address and sound systems, installations in schools, hospitals, and institutions, recording studios, transmitters, paging and call systems, and wherever required to prevent interference pickup. Can be supplied in various AWG sizes, insulation types, braided, spiral wrapped or foil wrapped shields and PVC or Polyethylene jackets.

MULTI-PAIR, SHIELDED JACKETED CABLES

These cables are designed to provide maximum performance in eliminating interference and crosstalk in public address and sound systems, broadcast studios and indoor and outdoor telephone and intercom systems. Can be supplied in various AWG sizes, Insulations, shield types and jackets.

AIRCRAFT WIRE



MIL-W-5086A — Type 1

(Dated June 18, 1957 Superseding MIL-W-5086 — Nov. 30, 1950.)
600 Volts Temp. Rat. −55°C +105°C
Synkote insulated electrical aircraft wire manufactured to conform to Military Specification MIL-W-5086-A

1. Construction Details:
   (a) Concentric stranded tinned copper conductor
   (b) Synthetic resin insula. (105°C)
   (c) Extruded clear nylon jacket
2. This construction available with tinned copper shield and/or with extruded nylon jacket over shield. Identified as Type 1 or Type 2 per specification MIL-C-7078A.
3. Standard Color: White.
4. May be furnished in multiple conductor combinations—color coded as required.

MIL-W-5086A — Type 2

(Dated June 18, 1957 Superseding MIL-W-5086 — Nov. 30, 1950.)
600 Volts Temp. Rat. −55°C +105°C

1. Construction Details:
   (a) Concentric stranded or rope-lay stranded tinned copper conductors as required by specification
   (b) Synthetic resin insula. (105°C)
   (c) Glass braid — saturated.
   (d) Extruded clear nylon jacket sizes AN-22 thru AN-12; braided nylon, impregnated with nylon lacquer sizes AN-10 thru AN-4/0.
2. This construction available with tinned copper shield in all sizes. Also with extruded nylon jacket over shield in sizes AN-22 thru AN-12 per specification MIL-C-7078A — Type 1 or 2.
3. Standard Color: White.
4. May be furnished in multiple conductor combinations—color coded as required.

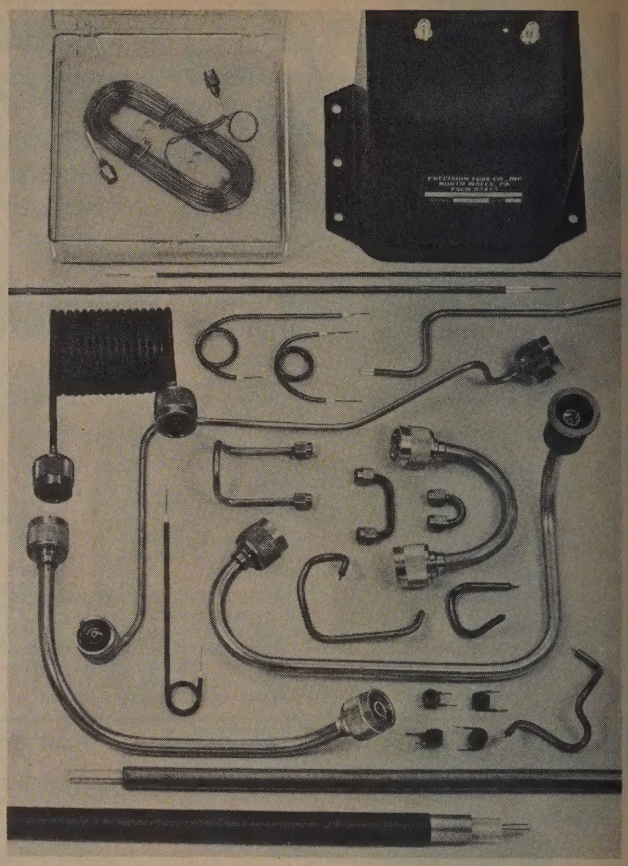
MIL-W-5086A — Type 3

(Dated June 18, 1957 Superseding MIL-W-5086 — Nov. 30, 1950.)
600 Volts Temp. Rat. −55°C +105°C

1. Construction Details:
   (a) Concentric stranded or rope-lay stranded tinned copper conductors as required by specification
   (b) Synthetic resin insula. (105°C)
   (c) Glass braid — saturated.
   (d) Secondary synthetic resin insulation.
   (e) Extruded clear nylon Jacket sizes AN-22 thru AN-12; braided nylon, impregnated with nylon lacquer sizes AN-10 thru AN-4/0.
2. This construction available with tinned copper shield in all sizes. Also with extruded nylon jacket over shield in sizes AN-22 thru AN-12 per specification MIL-C-7078A — Type 1 or 2.
3. Standard Color: White.
4. May be furnished in multiple conductor combinations—color coded as required.

PRECISION TUBE COAXITUBE

Semi-Rigid Coaxial Cable



To meet the demand for fast delivery of 50-ohm semi-rigid coaxial cables, Precision now stocks the most commonly used types, listed below, for immediate off-the-shelf shipment. Fifty-foot coils of these constructions can be shipped within two working days; cut straight lengths, to your specification, take only a little longer. All of these standard cables employ dielectric of solid polytetrafluoroethylene, with seamless copper or aluminum outer conductors. All exhibit nominal electrical characteristics as follows: $Z_0 = 50$ ohms; propagation velocity = 69.5%; and capacitance = 29.3 pf/ft.

In addition to these standard cables, Precision manufactures more than 40 special Coaxitube constructions with impedances ranging from 12 to 125 ohms, and outer diameters from .020 to .500 inches. Custom outer finishes, including plating on aluminum and plastic jacketing, are available to order. Precision's Pre-Fab Department can provide complete cable assemblies, coaxial delay lines, and other custom Coaxitube constructions to your exact specifications, including testing where required. Call or write for prompt attention and quotations.

Standard sizes in 50-foot coils for immediate delivery!

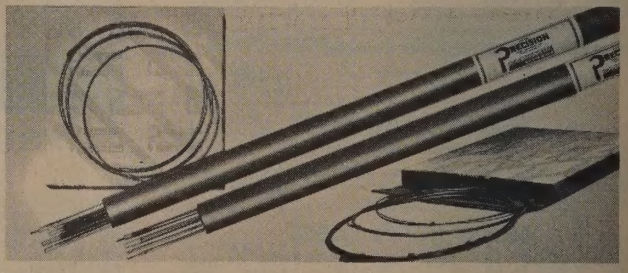
Part Number	O.D.	Outer Conductor Material & Finish	Safe Bend Radius
MA50056	.056 ± .002	Copper	.125
AA50085	.085 ± .001	Copper	.125
BA50085	.085 ± .001	Copper	.125
BC50085	.085 ± .001	Silvered Copper	.125
AA50141	.141 ± .001	Copper	.125
AC50141	.141 ± .001	Silvered Copper	.125
AD50141	.141 ± .001	Cadmium Plated Copper	.125
AE50141	.141 ± .001	Tinned Copper	.125
CA50215	.215 ± .003	Copper	.375
CH50215	.215 ± .003	Aluminum	.375
BA50250	.250 ± .002	Copper	.375
NA50325	.325 ± .005	Copper	.500
NH50325	.325 ± .005	Aluminum	.500

NOTES: (1) All dimensions are in inches. (2) Silverplating on outer conductor is Type II, Grade B, QQ-J-365, .0003 inch minimum thick. (3) Tinplating on outer conductor is Type I, MIL-T-10727, .001 to .00025 inch thick. (4) Cadmium plating on outer conductor is Class 2, Type I, QQ-P-416.

For breadboarding or prototype production, small quantities of Coaxitube Cable are available in these four Coax-i-kits, priced at $20 each, FOB destination, with next-day shipment. Select the kits which fit your needs, then call in your order.

Kit	Contents	Ship Via
A	One 10-foot coil each of MA50056, DA50085 and CA50141	1st Class Mail
B	Two 4-foot straight lengths each of CA50215 and NA50325	Parcel Post
C	One 10-foot coil each of BA50085 and AA50141	1st Class Mail
D	Two 4-foot straight lengths each of CH50215 and NH50325	Parcel Post

DA50085 and CA50141 are identical to BA50085 and AA50141, respectively, except for OD tolerance of ± .003 inches and a greater impedance tolerance.



PRECISION TUBE COMPANY, INC.
NORTH WALES, PA. 19454
Phone—215-699-5801 • Telex—84-6439 • TWX—510-661-8427

We will gladly send additional data, samples and prices. Call, write or wire for prompt action.

48 PAGE CATALOG ALL TYPES OF WIRE, CABLE & CORD

SWC

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Government Military Specifications . . . Commercial Specifications or Approved Manufacturers Specifications.

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- Most Military Specifications
- High Temperature Wire & Cable
- Telemetering Supervisory Control Cable
- Complex Instrument Cable
- Telephone & Inter-Communicating Cable
- Electrical & Electronic Instrument Wire
- Coaxial Cables
- Thermocouple Wire
- Multiple Pair Control Cable
- Microphone Cable
- Computer Cable
- Many more

SEND FOR COMPLETE CATALOG

Write Dept. E-1

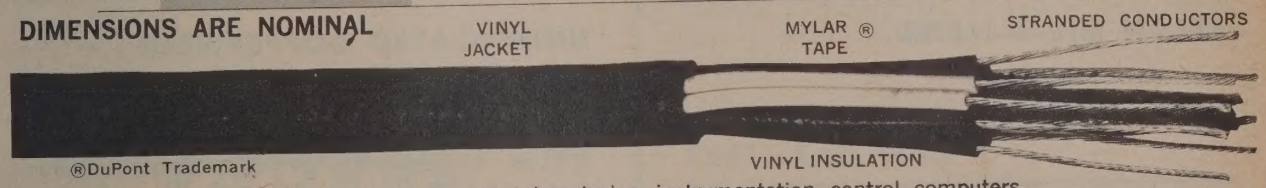
"Below is an abbreviated sample heading of page 40 of our catalog. Each page is 8½" x 11" and contains a complete range of sizes, all specifications and other pertinent information for its specific type of wire, cable or cord.

24-Year History Ability To Deliver Complete Line of Wire, Cable & Cord Stocks or we will custom your design

INSTRUMENTATION CONTROL CABLE

	24 AWG CONDUCTORS			22 AWG CONDUCTORS			20 AWG CONDUCTORS			18 AWG CONDUCTORS		
No. Cond.	Catalog Number	Jacket Thick.	Cable O.D.	Catalog Number	Jacket Thick.	Cable O.D.	Catalog Number	Jacket Thick.	Cable O.D.	Catalog Number	Jacket Thick.	Cable O.D.
25	5016	.030	.329	5116	.030	.365	5216	.035	.423	5316	.040	.493
30	5017	.030	.347	5117	.035	.396	5217	.040	.457	5317	.045	.531
35	5018	.035	.383	5118	.035	.425	5218	.045	.501	5318	.050	.581

DIMENSIONS ARE NOMINAL



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interconnecting cables for electronic equipment, telemetering, instrumentation, control, computers.

stranded, tinned copper per Type "B" to MIL-W-16878D .010 nominal wall Vinyl per MIL-W-16878D. 600 volts.

NUMBERED consecutively in black on white insulation at approximately 1 inch intervals. Jacket: black flexible Vinyl

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SAXTON PRODUCTS INC. is a Complete Source for all Types of Industrial, Commercial and Military Wire and Cable. Listed here are only a few of the Product Groups which Saxton regularly carries in Stock. Many more Stock types are available and countless types can be made to order.

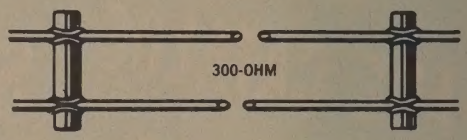
SMALL OR LARGE QUANTITIES PROMPTLY HANDLED

COAXIAL CABLE

COMMERCIAL TYPES AND MIL TYPES

SAXTON CAN supply all types of RG/U Cable. This includes 50 ohm, 75 ohm and 93 ohm with solid polyethylene dielectric and foam polyethylene dielectric for general purpose, television and military application.

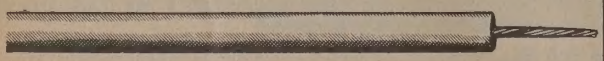
OPEN WIRE TRANSMISSION LINE



SAXTON SUPPLIES all types of low loss air dielectric open wire transmission line made with copperweld wire or solid copper wire. 300 ohm, 450 ohm, 475 ohm transmission lines are available with 7/16" spacing, 1" spacing, and 2" spacing using 12 gauge, 14 gauge, 16 gauge and 18 gauge conductors.

HIGH VOLTAGE WIRE

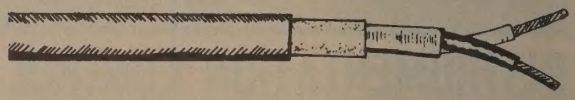
FLAME-RETARDANT RULAN INSULATION



SAXTON MANUFACTURES all types of High Voltage Wire including shielded and unshielded types with 18 and 20 gauge conductors.

MIL SPEC SPECIAL CABLES

MIL-C-3432 **QQ-W-343**
MIL-C-5756 **MIL-W-5086A**
MIL-C-915A **MIL-C-10392B**
MIL-C-17



SAXTON OFFERS all types of MIL Spec Special Cable in all gauges and number of conductors.

TEFLON MIL-W-16878D

SAXTON OFFERS a complete selection of Teflon Wire made to military specifications. This includes gauges from 14 through 30 with Type E, Type EE.

UNINSULATED COPPERWELD

40% COPPERWELD CONDUCTOR NON-STRETCH HARD-DRAWN

SAXTON HAS uninsulated copperweld wire in all gauges from No. 6 to No. 18.

Saxton PRODUCTS, INC.

215 N. ROUTE 303, CONGERS, N. Y. 10920

MULTI-CONDUCTOR JACKETED CABLE

SAXTON MANUFACTURES all types of multi-conductor cable. Both solid and stranded conductors are available in 18, 20 and 22 gauge. Stock items include cables of from two conductors through 12 conductors.

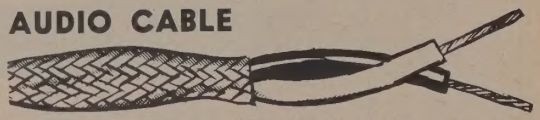
MULTI-CONDUCTOR SHIELDED JACKETED CABLE

SAXTON CAN supply 1, 2, 3, or 4 conductor cable with solid or stranded conductors from 16 gauge thru 24 gauge with either a spiral wrapped shield aluminum foil or a braided shield.

UNSHIELDED AUDIO CABLE

SAXTON OFFERS multi-conductor unshielded unjacketed Audio Cable with solid or stranded conductors from 16 gauge thru 22 gauge.

AUDIO CABLE

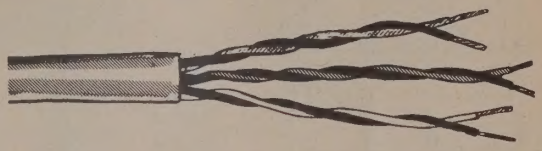


SAXTON MANUFACTURES all types of Audio Cable with solid conductors or stranded conductors running from 12 thru 22 gauge. The selection includes 2 conductor shielded, 3 conductor wherein 2 conductors are shielded and one is not and four conductor wherein two conductors are shielded and two are not.

MICROPHONE CABLE

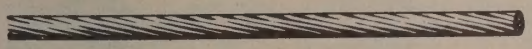
SAXTON MANUFACTURES all types of low capacity microphone cable. Gauges run from 20 through 26 with 1 through 6 conductors. The choice of shields include braided, spiral wrap and aluminum foil.

INTERCOM CABLE



SAXTON PROVIDES all types of Intercom Cable from 1 pair through 51 pairs with 22 gauge solid or stranded conductors.

UNINSULATED TINNED COPPER



SAXTON SUPPLIES solid and stranded uninsulated tinned bare copper wire in all gauges from 12 through 20.

PLASTIC HOOK-UP WIRE

SAXTON MANUFACTURES all types of Plastic Hook-Up Wire with either solid or stranded conductors from 14 gauge to 22 gauge.

SHIELDED PLASTIC HOOK-UP WIRE

SAXTON MANUFACTURES all types of Shielded Plastic Hook-Up Wire with either solid or stranded conductors from 14 gauge to 22 gauge.

TEST LEAD WIRE

SAXTON PROVIDES all types of Test Lead Wire with 18 gauge and 20 gauge conductors in voltage breakdown ratings from 5,000 volts to 22,000 volts.

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Tensolite HIGH TEMPERATURE WIRE & CABLE

SUMMARY OF STANDARD MIL SPECIFICATION COMPONENT WIRES

Specification	Type	AWG	Nom. Wall. Thick.	Conductor	Insulation	Temp. Rating°C	Rating, Vrms	Usage & Former Spec. No.
MIL-W-16878	ET (/6A)	32-20	.006	SPC/NPC	Teflon®-TFE	200/260	250	Miniature Wall Hook-Up
	E (/4A)	32-10	.010	SPC/NPC	Teflon-TFE	200/260	600	Hook-Up
	EE (/5A)	32-8	.015	SPC/NPC	Teflon-TFE	200/260	1000	Heavy Wall Hook-Up
	KT (/13)	32-20	.006	TPC/SPC	Teflon-FEP	135/200	250	Miniature Wall Hook-Up
	K (/11)	32-10	.010	TPC/SPC	Teflon-FEP	135/200	600	Hook-Up
	KK (/12B)	32-4/0	.015	TPC/SPC	Teflon-FEP	135/200	1000	Heavy Wall Hook-Up
MIL-W-22759	22759/1	22-4/0	.025-.065	SPC	TFE/Glass Tape & Braid	200	600	Airframe, Heavy Wall Mil-W-7139, Cl.1
	22759/2	22-4/0	.025-.065	NPC	TFE/Glass Tape & Braid	260	600	Airframe, Heavy Wall Mil-W-7139, Cl.2
	22759/3	22-2/0	.020-.055	NPC	TFE/Glass-TFE	260	600	Airframe, Medium Wall
	22759/4	22-2/0	.021-.060	SPC	TFE/Glass + FEP	200	600	Airframe, Medium Wall MS-90294
	22759/5	24-4	.025-.044	SPC	Mineral Filled Extruded TFE	200	600	Airframe, Heavy Wall MS-17411
	22759/6	24-4	.025-.044	NPC	Mineral Filled Extruded TFE	260	600	Airframe, Heavy Wall MS-17412
	22759/7	24-4	.018-.034	SPC	Mineral Filled Extruded TFE	200	600	Airframe, Medium Wall MS-18000
	22759/8	24-4	.018-.034	NPC	Mineral Filled Extruded TFE	260	600	Airframe, Medium Wall MS-18001
	22759/9	28-8	.014-.017	SPC	Extruded TFE	200	1000	Heavy Wall Hook-Up MS-18113
	22759/10	28-8	.014-.017	NPC	Extruded TFE	260	1000	Heavy Wall Hook-Up MS-18114
	22759/11	28-16	.009	SPC	Extruded TFE	200	600	Hook-Up MS-21985
	22759/12	28-16	.009	NPC	Extruded TFE	260	600	Hook-Up MS-21986
	22759/13	24-1/0	.010-.017	TPC	FEP/KYNART™	135	600	Airframe Medium Wall
MIL-W-81381	/1	26-10	.007	SPC	**Kapton®	200	600	Lightweight Hook-Up
	/2	26-10	.007	NPC	Kapton	200	600	Lightweight Hook-Up
	/3	26-2	.012-.016	SPC	Kapton	200	600	Airframe or Hook-Up
	/4	26-2	.012-.016	NPC	Kapton	200	600	Airframe or Hook-Up
	/5	26-20	.007	SP Alloy	Kapton	200	600	Lightweight Hook-Up
	/6	26-20	.007	NP Alloy	Kapton	200	600	Lightweight Hook-Up

TPC — Tin Plated Copper SPC — Silver Plated Copper NPC — Nickel Plated Copper ®Dupont **Polyimide/FEP Type F Film

Above component wires available in shielded & jacketed multiconductor cables. Typical cable specs are: MIL-C-7078 & MIL-C-27500™ PENNWALT

UL APPROVED HIGH TEMPERATURE APPLIANCE AND EQUIPMENT WIRE

Material	Nominal Wall	UL Style No.
TFE	.0055	1371
	.010	1212
	.010	1213
	1/64	1164
	1/64	1180
	.020 To .045	1198
		1199
TFE or FEP	Coaxial Cable	1354
FEP/Nylon	.006/.003	1292
FEP	.010	1226
	.010	1227
	1/64	1332
	.0055 To .020	1371
	1/64	1333
	1/32	1330
	1/32	1331

Material	Nominal Wall	UL Style No.
Mylar	.004	5073†
	.007	5074†
	.010	5075†
Kynar	.004	1423
	.005	1422
	.006	1426
	.010	1327
	.010	1351
Polysulfone	.004	1425
	.005	1424
	.006	1432
	.007	1433
Kapton	.004	1470†
	.0055	1450
High Voltage TV Wire	.038	3239

†Pending UL Approval.

RG/U TFE DIELECTRIC COAXIAL CABLE

PER — MIL-C-17D

Miniature Max. OD .075" - .155"	Medium Max. OD .175" - .335"	Heavy Max. OD .420" - .525"
178B/U*	140/U	87A/U*
179B/U*	141A/U*	116/U
180B/U*	142B/U*	119/U
187A/U*	143A/U	120/U
188A/U*	302/U	144/U
195A/U*	303/U*	165/U
196A/U*	304/U	166/U
316/U*		225/U
		227/U

*Off-the-shelf Delivery.

CSA Approvals available in 150, 300 & 600 volt rating, TFE insulated.

OTHER HIGH TEMPERATURE WIRE AND CABLE PRODUCTS FOR INDUSTRIAL AND COMMERCIAL USAGE

1. Thermoplastic Wire & Cable Bulletin 109A	Insulations & Jackets — PVC Nylon, Kynar Polyurethane, FEP, Polysulfone, etc.
2. Ultra-Thin Hook-Up Wire Bulletin 112	100 Vrms Type UT wire, sizes 36 through 26 in solid conductors, and 28 through 36 in stranded conductors. Wall thickness from .0015" to .004".
3. Instrumentation and Control Cables	Fluorocarbon, polyimide or high temperature thermoplastic insulated multi-conductor cables for instrumentation, signal, and control cable applications.
4. Heater Cables	TFE and Polyimide insulated resistance alloy conductors. Ratings to 500°F.
5. Power Cables	600 and 1000 Vrms ratings in sizes AWG 22 through 4/0.
6. Transmission Lines	Flat laminated or extruded constructions, including tri-line cables.
7. Parallel Wrapped PVC and TFE Insulations	Increased flexibility for phonograph tone arms and hearing aids. High dielectric strength for TV and radio wiring.
8. Computer Wire Bulletin 110	Wide variety of insulation and conductors for use in automatic wiring equipment. TFE, FEP, Kynar, Mylar, Polyimide overcoated Kapton, etc.
9. Tufflite™ Polyimide Insulated Wires Bulletin 108B	Medium and heavy wall constructions to MIL-W-81381. Thin wall, .0045", construction also available.
10. Ribbon Cables Bulletin 102A	Bonded and woven high temperature Teflon, Kapton, and thermoplastic components.
11. Teflon Tape Bulletin 101	Extruded, unsintered tape in widths from 3" to 12", and lengths of 180, 360 and 540 yards.
12. Teflon-Liquid H Bulletin 113	For airframe and computer back panel use where cut-through resistance is required.

For more complete data and technical assistance, contact the Tensolite man in your area, or call us directly.

March 1970

Tensolite

Division of Carlisle Corporation
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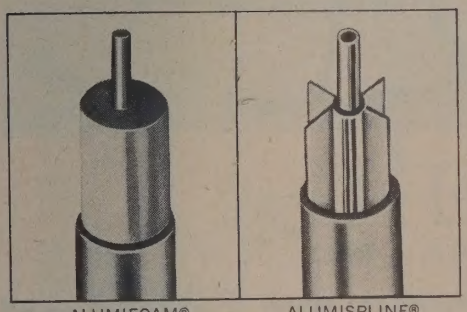
(914) 631-2300 • TWX 710-567-1202

Times interconnection products solve a broad spectrum of transmission problems

Solid metal tube sheathed coaxial cable



ALUMIFOAM® ALUMISPLINE®

What ordinary flexible coaxial cable won't do . . . Times semiflexible will! Here are 7 reasons why: More isolation—at least 80 db more than ordinary coaxial cable. Uniformity average—VSWR 1.1 or less. Stability—10 times better. Lower loss—30% less. Pulse reflection—less than 1%. Less distortion.

Available in three standard versions:

ALUMIFOAM®—Foam polyethylene dielectric where pressurizing isn't practical.

ALUMISPLINE®—Air dielectric where pressurizing is practical. Superior because the dielectric is uniformly extruded directly on the center conductor, guaranteeing lowest attenuation, VSWR, and good nanosecond pulse response.

ALUMISOL®—Solid dielectric

All semiflexibles are available for high temperature applications.

Write or phone for technical data.

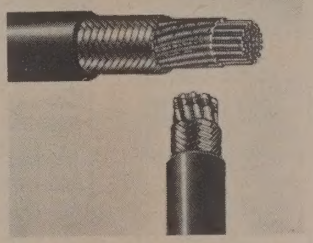
Coaxial cable

RG/U. Over 50 Teflon insulated—and over 125 polyethylene insulated—to MIL-C-17. Over 120 types available from stock. T-Line—Improved RG cable equivalents—specially designed, improved characteristic cable equivalent to RG cables.

Miniaturized low capacitance, low attenuation cables; shielded, low capacitance twisted pairs. Special: Custom engineered coaxial cable is a Times specialty.

Write or phone for technical data.

Multi-conductor cable



High and medium temperature cables with up to 198 conductors have been designed and manufactured by TIMES to over 9000 customer and military specifications.

Write or phone for technical data.

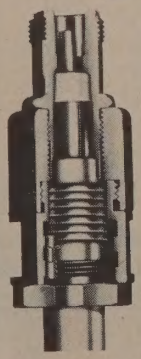
Cable assemblies

Times' custom engineering service is qualified to design cable assemblies for the most critical applications, using any combinations of wire and connector constructions. We can take over the complete systems capability from layout to complete construction of cable assembly, which often results in lower engineering, shipping and installation costs.

Write or phone for technical data.

New TIMATCH® connector with COILGRIP® CLAMP

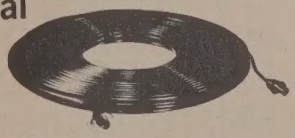
- Ready for instant termination
- Re-usable
- Fits most metal tube sheathed coaxial cable
- Has the exclusive CoilGrip Cable Clamp



A major advance in the connector field that virtually makes all other connectors obsolete. Makes it a simple one-step operation to attach connector to semiflex cable without any further connector assembly. Unpack the connector and it's ready for instant use.

Write or phone for technical data.

Coaxial delay lines



Usually the most critical cable components of an interconnection system. Though VSWR, attenuation, or pulse distortion are important, the electrical length or time delay is the most significant factor. Times gives the most serious consideration to the error tolerances assigned to the delay lines, as tight tolerances can significantly affect costs. We are in an excellent position to guarantee precision quality because we use coaxial cable and connectors that we ourselves manufacture in the construction of these delay lines.

Write or phone for technical data.

TIMES WIRE & CABLE

DIVISION OF THE INTERNATIONAL SILVER CO.

Wallingford, Conn.

TRANSMISSION SYSTEM DESIGN AND ENGINEERING • STANDARD & SPECIAL COAXIAL CABLE • MULTICONDUCTOR CABLE • COMPLETE CABLE ASSEMBLIES • TEFLON* HOOK-UP WIRE

*A DU PONT TRADEMARK

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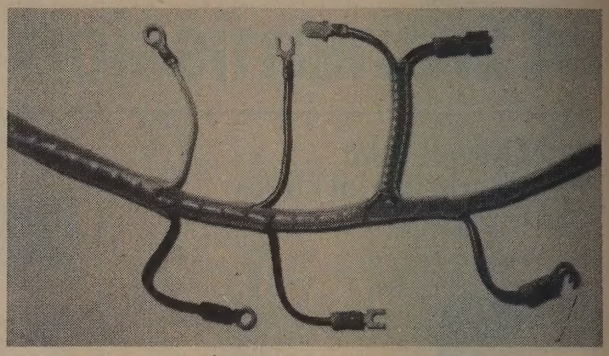
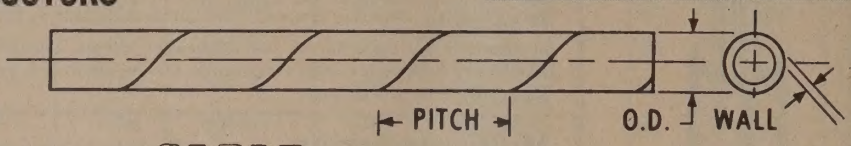
Transcon MANUFACTURING CO.

BOX 20825 • DALLAS, TEXAS 75220 • (214) 357-8301

CABLE-rap®

SPIRAL WRAPPING FOR FLEXIBLE HARNESSES, CABLES, GROUPS OF LEADS OR CONDUCTORS





POLYETHYLENE (Natural) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-0001	1/8″	.125	.031	1/4	.5″	100′
500-0002	3/16″	.187	.031	1/4	1.5″	100′
500-0003	1/4″	.250	.031	3/8	2.0″	100′
500-0004	1/4″	.250	.040	3/8	2.0″	100′
500-0006	3/8″	.375	.062	7/16	3.0″	100′
500-0007	1/2″	.500	.062	9/16	4.0″	100′
500-0008	5/8″	.625	.062	5/8	5.0″	100′
500-0009	3/4″	.750	.062	7/8	6.0″	100′
500-0012	1″	1.000	.083	7/8	8.0″	100′

Conforms to: Grade C Fed. Spec. L.P. 390 MIL-I-631D MIL-P-26692

OUTDOOR POLYETHYLENE (Black) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-1001	1/8″	.125	.031	1/4	.5″	100′
500-1002	3/16″	.187	.031	1/4	1.5″	100′
500-1003	1/4″	.250	.031	3/8	2.0″	100′
500-1004	1/4″	.250	.040	3/8	2.0″	100′
500-1006	3/8″	.375	.062	7/16	3.0″	100′
500-1007	1/2″	.500	.062	9/16	4.0″	100′
500-1008	5/8″	.625	.062	5/8	5.0″	100′
500-1009	3/4″	.750	.062	7/8	6.0″	100′
500-1012	1″	1.000	.083	7/8	8.0″	100′

Conforms to: Grade C Fed. Spec. L.P. 390 MIL-I-631D MIL-P-26692

NYLON (Natural) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-2001	1/8″	.125	.016	1/4	.5″	100′
500-2002	3/16″	.187	.016	1/4	1.0″	100′
500-2003	1/4″	.250	.031	3/8	2.0″	100′
500-2004	3/8″	.375	.031	7/16	3.0″	100′
500-2005	1/2″	.500	.031	9/16	4.0″	100′
500-2006	5/8″	.625	.031	5/8	5.0″	100′
500-2007	3/4″	.750	.040	7/8	6.0″	100′
500-2008	7/8″	.875	.040	7/8	7.0″	100′
500-2009	1″	1.000	.040	1	8.0″	100′

Conforms to: MIL-M-22096

OUTDOOR NYLON (Black) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-3001	1/8″	.125	.016	1/4	.5″	100′
500-3002	3/16″	.187	.016	1/4	1.0″	100′
500-3003	1/4″	.250	.031	3/8	2.0″	100′
500-3004	3/8″	.375	.031	7/16	3.0″	100′
500-3005	1/2″	.500	.031	9/16	4.0″	100′
500-3006	5/8″	.625	.031	5/8	5.0″	100′
500-3007	3/4″	.750	.040	7/8	6.0″	100′
500-3008	7/8″	.875	.040	7/8	7.0″	100′
500-3009	1″	1.000	.040	1	8.0″	100′

Conforms to: MIL-M-22096

RULAN (Flame Retardant Polyethylene) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-4001	1/8″	.125	.030	1/4	.5″	100′
500-4002	1/4″	.250	.062	3/8	2.0″	100′
500-4003	3/8″	.375	.062	7/16	3.0″	100′
500-4004	1/2″	.500	.062	9/16	4.0″	100′

TEFLON* (Natural) CABLE-rap®

Part Number	Nom. Size	O.D.	Wall	Pitch	Max. Bundle	Std. Package
500-5001	1/8″	.125	.030	1/4	.5″	100′
500-5002	3/16″	.187	.030	1/4	1.0″	100′
500-5003	1/4″	.250	.030	3/8	2.0″	100′
500-5004	3/8″	.375	.030	7/16	2.5″	100′
500-5005	1/2″	.500	.030	9/16	3.0″	100′
500-5006	5/8″	.625	.030	5/8	3.5″	100′
500-5007	3/4″	.750	.040	7/8	4.0″	100′
500-5008	7/8″	.875	.045	7/8	5.0″	100′
500-5009	1″	1.000	.045	1	6.0″	100′

Conforms to: MIL-I-22129B AMS 3651B, 3653 *TEFLON—duPont Trademark

OTHER LENGTHS AVAILABLE UPON REQUEST

Transcon ENGINEERED HARDWARE IS THE STANDARD OF INDUSTRY

TEFLON* TFE EXTRUDED TUBING

THIN WALL TEFLON* TUBING AMS-3655

Part No.	AWG	I.D.	Wall
550-0001	30	.012	.009
550-0002	28	.015	.009
550-0003	26	.018	.009
550-0004	24	.022	.009
550-0005	23	.026	.009
550-0006	22	.027	.009
550-0007	21	.032	.012
550-0008	20	.034	.012
550-0009	19	.038	.012
550-0010	18	.042	.012
550-0011	17	.047	.012
550-0012	16	.053	.012
550-0013	15	.059	.012
550-0014	14	.066	.012
550-0015	13	.076	.012
550-0016	12	.085	.012
550-0017	11	.095	.012
550-0018	10	.106	.012
550-0019	9	.118	.015
550-0020	1/8"	.125	.015
550-0021	8	.133	.015
550-0022	7	.148	.015
550-0023	6	.166	.015
550-0024	5	.188	.015
550-0025	4	.208	.015
550-0026	3	.234	.015
550-0027	1/4"	.250	.015
550-0028	2	.263	.015
550-0029	1	.294	.015
550-0030	5/16"	.312	.015
550-0031	0	.330	.015

STANDARD WALL TEFLON* TUBING MIL-I-22129 AMS-3653

Part No.	AWG	I.D.	Wall
550-1001	30	.012	.010
550-1002	28	.015	.010
550-1003	26	.018	.010
550-1004	24	.022	.012
550-1005	23	.026	.012
550-1006	22	.027	.012
550-1007	21	.032	.014
550-1008	20	.034	.016
550-1009	19	.038	.016
550-1010	18	.042	.016
550-1011	17	.047	.016
550-1012	16	.053	.016
550-1013	15	.059	.016
550-1014	14	.066	.016
550-1015	13	.076	.016
550-1016	12	.085	.016
550-1017	11	.095	.016
550-1018	10	.106	.016
550-1019	9	.118	.020
550-1020	1/8"	.125	.020
550-1021	8	.133	.020
550-1022	7	.148	.020
550-1023	6	.166	.020
550-1024	5	.188	.020
550-1025	4	.208	.020
550-1026	3	.234	.020
550-1027	1/4"	.250	.020
550-1028	2	.263	.020
550-1029	1	.294	.020
550-1030	5/16"	.312	.020
550-1031	0	.330	.020

LIGHTWEIGHT TEFLON* TUBING AMS-3654

Part No.	AWG	I.D.	Wall
550-2001	30	.012	.006
550-2002	28	.015	.006
550-2003	26	.018	.006
550-2004	24	.022	.006
550-2005	23	.026	.006
550-2006	22	.027	.006
550-2007	21	.032	.006
550-2008	20	.034	.006
550-2009	19	.038	.006
550-2010	18	.042	.006
550-2011	17	.047	.006
550-2012	16	.053	.006
550-2013	15	.059	.006
550-2014	14	.066	.008
550-2015	13	.076	.008
550-2016	12	.085	.008
550-2017	11	.095	.008
550-2018	10	.106	.008
550-2019	9	.118	.008
550-2020	1/8"	.125	.008
550-2021	8	.133	.008
550-2022	7	.148	.008
550-2023	6	.166	.010
550-2024	5	.186	.010
550-2025	4	.208	.010
550-2026	3	.234	.010
550-2027	1/4"	.250	.010
550-2028	2	.263	.010
550-2029	1	.294	.010
550-2030	5/16"	.312	.012
550-2031	0	.330	.012

FRACTIONAL INDUSTRIAL TEFLON* TUBING

PART NO.	I.D.	O.D.	WALL
550-3001	1/8"	.185	.030
550-3002	3/16"	.248	.030
550-3003	1/4"	.310	.030
550-3004	5/16"	.372	.030
550-3005	3/8"	.435	.030
550-3006	7/16"	.498	.030
550-3007	1/2"	.560	.030
550-3008	9/16"	.622	.030
550-3009	5/8"	.685	.030
550-3010	11/16"	.747	.030
550-3011	3/4"	.830	.040
550-3012	7/8"	.965	.045
550-3013	1"	1.090	.045
550-3014	1-1/8"	1.215	.045
550-3015	1-1/4"	1.340	.045
550-3016	1-1/2"	1.600	.050

Notes:

1. Standard Color—Natural, but any of 10 solid colors can be supplied.
2. Supplied in 100′ coils or spools. Specify if longer or shorter spools are required.
3. Industry standard tolerances apply to diameter and wall thickness unless otherwise specified.
4. Certificate of compliance to MIL-I-22129C furnished upon request.
5. Quotation for special services, such as bundable treatment or etching, furnished promptly upon request.

VINYL (PVC) TUBING NON-TOXIC CLEAR VINYL TUBING • GENERAL PURPOSE

Non-Toxic Flexible Clear Vinyl Tubing is chemical resistant, odorless, tasteless. Formulated with compounds that have been approved by the U. S. Food & Drug Administration. Used for food and beverage tubing, laboratory tubing and medical tubing.

General Purpose Clear Vinyl Tubing is tough, flexible, long-lasting. Used for water lines, refrigerating tubing, chemical and industrial applications.

Non-Toxic Part No.	Gen. Purpose Part No.	I.D.	O.D.	Wall
512-4001	512-4101	.120	.170	.025
512-4002	512-4102	1/8	1/4	1/16
512-4003	512-4103	3/16	5/16	1/16
512-4004	512-4104	3/16	3/8	3/32
512-4005	512-4105	3/16	7/16	1/8
512-4006	512-4106	1/4	3/8	1/16
512-4007	512-4107	1/4	7/16	3/32
512-4008	512-4108	1/4	1/2	1/8
512-4009	512-4109	5/16	7/16	1/16
512-4010	512-4110	5/16	1/2	3/32
512-4011	512-4111	5/16	9/16	1/8
512-4012	512-4112	3/8	1/2	1/16
512-4013	512-4113	3/8	9/16	3/32

Non-Toxic Part No.	Gen. Purpose Part No.	I.D.	O.D.	Wall
512-4014	512-4114	3/8	5/8	1/8
512-4015	512-4115	7/16	9/16	1/16
512-4016	512-4116	7/16	5/8	3/32
512-4017	512-4117	7/16	11/16	1/8
512-4018	512-4118	1/2	5/8	1/16
512-4019	512-4119	1/2	11/16	3/32
512-4020	512-4120	1/2	3/4	1/8
512-4021	512-4121	1/2	13/16	5/32
512-4022	512-4122	9/16	3/4	3/32
512-4023	512-4123	9/16	13/16	1/8
512-4024	512-4124	9/16	7/8	5/32
512-4025	512-4125	5/8	13/16	3/32
512-4026	512-4126	5/8	7/8	1/8

Non-Toxic Part No.	Gen. Purpose Part No.	I.D.	O.D.	Wall
512-4027	512-4127	11/16	15/16	1/8
512-4028	512-4128	11/16	1"	5/32
512-4029	512-4129	3/4	1"	1/8
512-4030	512-4130	3/4	1-1/16	5/32
512-4031	512-4131	3/4	1-1/4	1/4
512-4032	512-4132	7/8	1-1/8	1/8
512-4033	512-4133	7/8	1-3/16	5/32
512-4034	512-4134	1"	1-1/4	1/8
512-4035	512-4135	1"	1-3/8	3/16
512-4036	512-4136	1"	1-1/2	1/4
512-4037	512-4137	1-1/4	1-1/2	1/8
512-4038	512-4138	1-1/4	1-3/4	1/4

STANDARD LENGTH IS 100′ COILS—OTHER LENGTHS AVAILABLE UPON REQUEST

Transcon MANUFACTURING CO. BOX 20825 • DALLAS, TEXAS 75220 • (214) 357-8301

VINYL (PVC) TUBING (Continued)

Our high temperature vinyl tubing is a high heat resistant vinyl sleeving, which is particularly applicable for electric motor insulation, transformer leads, and other applications where high dielectric strength with outstanding resistance to heat and oils are required.

Our low temperature vinyl tubing is specification vinyl insulation sleeving embodying outstanding characteristics: Low temperature flexibility, excellent flame resistance, complete fungus and corrosion resistance. Composed of the new colorless transparent materials.

Our Extra High Temperature Vinyl Tubing was developed especially for electrical applications which require tubing flexibility, cut-through resistance and dielectric strength after prolonged immersion in oil, varnish or asphaltic pitch. In some instances of extreme use +105°C should be considered as operating maximum.

Our UL-105° Sleeving is a high heat resistant vinyl material which is most suitable for electric motor insulation, transformer leads or other applications where high dielectric strength with outstanding resistance to heat and oils is required. It incorporates excellent flame resistance.

	LOW TEMP. MIL-I-7444 +80°C [+176°F] −65°C [− 85°F]		HIGH TEMPERATURE MIL-I-631 +105°C [+221°F] −20°C [−4°F]			EXTRA HIGH TEMP. 125°C +125°C [+257°F] −40°C [−40°F]		U.L. 105°C +105°C [+221°F] −20°C [−4°F]						
Size A.W.G. or I.D. (Inches)	Clear Part No.	Black Part No.	White Part No.	Clear Part No.	Black Part No.	Clear Part No.	Black Part No.	Clear Part No.	Black Part No.	Nom. I.D.	Nom. Wall	Spool or Coil	Standard Length in Feet	Size A.W.G. or I.D. (Inches)
24	512-0001	512-0101	512-0901	512-1001	512-1201	512-0601	512-0701	512-1301	512-1401	.022	.012	S	1000	24
22	512-0002	512-0102	512-0902	512-1002	512-1202	512-0602	512-0702	512-1302	512-1402	.027	.012	S	1000	22
20	512-0003	512-0103	512-0903	512-1003	512-1203	512-0603	512-0703	512-1303	512-1403	.034	.016	S	1000	20
19	512-0004	512-0104	512-0904	512-1004	512-1204	512-0604	512-0704	512-1304	512-1404	.038	.016	S	1000	19
18	512-0005	512-0105	512-0905	512-1005	512-1205	512-0605	512-0705	512-1305	512-1405	.042	.016	S	1000	18
17	512-0006	512-0106	512-0906	512-1006	512-1206	512-0606	512-0706	512-1306	512-1406	.047	.016	S	1000	17
16	512-0007	512-0107	512-0907	512-1007	512-1207	512-0607	512-0707	512-1307	512-1407	.053	.016	S	1000	16
15	512-0008	512-0108	512-0908	512-1008	512-1208	512-0608	512-0708	512-1308	512-1408	.059	.016	S	1000	15
14	512-0009	512-0109	512-0909	512-1009	512-1209	512-0609	512-0709	512-1309	512-1409	.066	.016	S	500	14
13	512-0010	512-0110	512-0910	512-1010	512-1210	512-0610	512-0710	512-1310	512-1410	.076	.016	S	500	13
12	512-0011	512-0111	512-0911	512-1011	512-1211	512-0611	512-0711	512-1311	512-1411	.085	.016	S	500	12
11	512-0012	512-0112	512-0912	512-1012	512-1212	512-0612	512-0712	512-1312	512-1412	.095	.016	S	500	11
10	512-0013	512-0113	512-0913	512-1013	512-1213	512-0613	512-0713	512-1313	512-1413	.106	.016	S	500	10
9	512-0014	512-0114	512-0914	512-1014	512-1214	512-0614	512-0714	512-1314	512-1414	.118	.020	S	500	9
1/8″	512-0015	512-0115	512-0915	512-1015	512-1215	512-0615	512-0715	512-1315	512-1415	.125	.020	S	500	1/8″
8	512-0016	512-0116	512-0916	512-1016	512-1216	512-0616	512-0716	512-1316	512-1416	.133	.020	S	500	8
7	512-0017	512-0117	512-0917	512-1017	512-1217	512-0617	512-0717	512-1317	512-1417	.148	.020	S	500	7
6	512-0018	512-0118	512-0918	512-1018	512-1218	512-0618	512-0718	512-1318	512-1418	.166	.020	S	500	6
5	512-0019	512-0119	512-0919	512-1019	512-1219	512-0619	512-0719	512-1319	512-1419	.186	.020	S	250	5
4	512-0020	512-0120	512-0920	512-1020	512-1220	512-0620	512-0720	512-1320	512-1420	.208	.020	C	250	4
3	512-0021	512-0121	512-0921	512-1021	512-1221	512-0621	512-0721	512-1321	512-1421	.234	.020	C	250	3
1/4″	512-0022	512-0122	512-0922	512-1022	512-1222	512-0622	512-0722	512-1322	512-1422	.250	.020	C	200	1/4″
2	512-0023	512-0123	512-0923	512-1023	512-1223	512-0623	512-0723	512-1323	512-1423	.263	.020	C	200	2
1	512-0024	512-0124	512-0924	512-1024	512-1224	512-0624	512-0724	512-1324	512-1424	.294	.020	C	200	1
0	512-0025	512-0125	512-0925	512-1025	512-1225	512-0625	512-0725	512-1325	512-1425	.330	.020	C	200	0
5/16″	512-0026	512-0126	512-0926	512-1026	512-1226	512-0626	512-0726	512-1326	512-1426	.313	.025	C	200	5/16″
3/8″	512-0027	512-0127	512-0927	512-1027	512-1227	512-0627	512-0727	512-1327	512-1427	.375	.025	C	200	3/8″
7/16″	512-0028	512-0128	512-0928	512-1028	512-1228	512-0628	512-0728	512-1328	512-1428	.438	.025	C	100	7/16″
1/2″	512-0029	512-0129	512-0929	512-1029	512-1229	512-0629	512-0729	512-1329	512-1429	.500	.025	C	100	1/2″
9/16″	512-0030	512-0130	512-0930	512-1030	512-1230	512-0630	512-0730	512-1330	512-1430	.562	.030	C	100	9/16″
5/8″	512-0031	512-0131	512-0931	512-1031	512-1231	512-0631	512-0731	512-1331	512-1431	.625	.030	C	100	5/8″
3/4″	512-0032	512-0132	512-0932	512-1032	512-1232	512-0632	512-0732	512-1332	512-1432	.750	.035	C	50	3/4″
7/8″	512-0033	512-0133	512-0933	512-1033	512-1233	512-0633	512-0733	512-1333	512-1433	.875	.035	C	50	7/8″
1	512-0034	512-0134	512-0934	512-1034	512-1234	512-0634	512-0734	512-1334	512-1434	1.000	.035	C	50	1
1-1/16″	512-0035	512-0135	512-0935	512-1035	512-1235	512-0635	512-0735	512-1335	512-1435	1.062	.035	C	50	1-1/16″
1-1/8″	512-0036	512-0136	512-0936	512-1036	512-1236	512-0636	512-0736	512-1336	512-1436	1.125	.040	C	50	1-1/8″
1-1/4″	512-0037	512-0137	512-0937	512-1037	512-1237	512-0637	512-0737	512-1337	512-1437	1.250	.040	C	50	1-1/4″
1-3/8″	512-0038	512-0138	512-0938	512-1038	512-1238	512-0638	512-0738	512-1338	512-1438	1.375	.040	C	50	1-3/8″
1-1/2″	512-0039	512-0139	512-0939	512-1039	512-1239	512-0639	512-0739	512-1339	512-1439	1.500	.045	C	50	1-1/2″
1-3/4″	512-0040	512-0140	512-0940	512-1040	512-1240	512-0640	512-0740	512-1340	512-1440	1.750	.055	C	50	1-3/4″
2	512-0041	512-0141	512-0941	512-1041	512-1241	512-0641	512-0741	512-1341	512-1441	2.000	.060	C	50	2″
2-1/4″	512-0042	512-0142	512-0942	512-1042	512-1242	512-0642	512-0742	512-1342	512-1442	2.250	.065	C	50	2-1/4″
2-1/2″	512-0043	512-0143	512-0943	512-1043	512-1243	512-0643	512-0743	512-1343	512-1443	2.500	.070	C	50	2-1/2″

OTHER COLORS AND LENGTHS AVAILABLE UPON REQUEST

Transcon ENGINEERED HARDWARE IS THE STANDARD OF INDUSTRY

SHRINKABLE TUBING

IRRADIATED POLYOLEFIN SHRINKABLE TUBING RATIO: 2 x 1 (50% SHRINK)

Black Part No.	Clear Part No.	Red Part No.	Yellow Part No.	Blue Part No.	White Part No.	Expanded Inside Diameter Minimum (Inches)		Recovered Inside Diameter Maximum (Inches)	Nominal Wall Thickness After Shrinking (Inches)
514-0101	514-0001	514-0201	514-0301	514-0401	514-0501	3/64	.046	.023	.016
514-0102	514-0002	514-0202	514-0302	514-0402	514-0502	1/16	.063	.031	.017
514-0103	514-0003	514-0203	514-0303	514-0403	514-0503	3/32	.093	.046	.020
514-0104	514-0004	514-0204	514-0304	514-0404	514-0504	1/8	.125	.062	.020
514-0105	514-0005	514-0205	514-0305	514-0405	514-0505	3/16	.187	.093	.020
514-0106	514-0006	514-0206	514-0306	514-0406	514-0506	1/4	.250	.125	.025
514-0107	514-0007	514-0207	514-0307	514-0407	514-0507	3/8	.375	.187	.025
514-0108	514-0008	514-0208	514-0308	514-0408	514-0508	1/2	.500	.250	.025
514-0109	514-0009	514-0209	514-0309	514-0409	514-0509	3/4	.750	.375	.030
514-0110	514-0010	514-0210	514-0310	514-0410	514-0510	1	1.000	.500	.035
514-0111	514-0011	514-0211	514-0311	514-0411	514-0511	1-1/2	1.500	.750	.040
514-5112	514-0012	514-0212	514-0312	514-0412	514-0512	2	3.000	1.000	.045
514-0113	514-0013	514-0213	514-0313	514-0413	514-0513	3	3.000	1.500	.050
514-0114	514-0014	514-0214	514-0314	514-0414	514-0514	4	4.000	2.000	.055

SPECIFICATION (SHRUNK): MIL-I-23053 (135°C)—STANDARD LENGTH: 100 FT. (25 FOUR FT. LENGTHS)

VINYL SHRINKABLE TUBING RATIO: 2 x 1 (50% SHRINK)

Clear Part No.	Black Part No.	Red Part No.	White Part No.	Expanded Inside Diameter Minimum (Inches)		Recov. Inside Diam. Max. (Inches)	Nom. Wall Thick. After Shrinking (In.)
512-1903	512-1803	512-1753	512-1703	1/8	.125	.063	.025
512-1904	512-1804	512-1754	512-1704	3/16	.187	.093	.025
512-1905	512-1805	512-1755	512-1705	1/4	.250	.125	.025
512-1906	512-1806	512-1756	512-1706	3/8	.375	.187	.030
512-1907	512-1807	512-1757	512-1707	1/2	.500	.250	.035
512-1908	512-1808	512-1758	512-1708	3/4	.750	.375	.040
512-1909	512-1809	512-1759	512-1709	1	1.000	.500	.045

SPECIFICATIONS (Shrunk): MIL-I-631D UL 105°C

TEFLON* HEAT SHRINKABLE TUBING THIN WALL 2 x 1 (50% SHRINK)

Natural Part No.	Ordered As A.W.G. Size	Expanded Inside Diam. Minimum (Inches)	Recovered Inside Diam. Maximum (Inches	Nominal Wall Thickness After Shrinking Wall	±Tolerance
550-0501	30	.034	.015	.009	±.002
550-0502	28	.038	.018	.009	±.002
550-0503	26	.046	.022	.009	±.002
550-0504	24	.050	.027	.010	±.002
550-0505	22	.055	.032	.010	±.002
550-0506	20	.060	.039	.012	±.003
550-0508	18	.076	.049	.012	±.003
550-0510	16	.093	.061	.012	±.003
550-0512	14	.120	.072	.012	±.003
550-0514	12	.150	.089	.012	±.003
550-0516	10	.191	.112	.012	±.003
550-0518	8	.240	.141	.015	±.004
550-0520	6	.302	.178	.015	±.004
550-0522	4	.370	.224	.015	±.004
550-0524	2	.430	.278	.015	±.004
550-0526	0	.470	.347	.015	±.004

EXPANDED FROM: AMS 3655 MIL-I-23053B/12

*TEFLON—DuPont Trademark

TEFLON* HEAT SHRINKABLE TUBING STANDARD WALL 2 x 1 (50% SHRINK)

Natural Part No.	Ordered As A.W.G. Size	Expanded Inside Diam. Minimum (Inches)	Recovered Inside Diam. Maximum (Inches)	Nominal Wall Thickness After Shrinking Wall	±Tolerance
550-1504	24	.045	.027	.012	±.002
550-1505	22	.050	.032	.012	±.002
550-1506	20	.055	.039	.016	±.003
550-1507	19	.060	.043	.016	±.003
550-1508	18	.065	.049	.016	±.003
550-1509	17	.080	.054	.016	±.003
550-1510	16	.090	.061	.016	±.003
550-1511	15	.110	.067	.016	±.003
550-1512	14	.120	.072	.016	±.003
550-1513	13	.130	.080	.016	±.003
550-1514	12	.140	.089	.016	±.003
550-1515	11	.160	.102	.016	±.003
550-1516	10	.180	.112	.016	±.003
550-1517	9	.200	.124	.020	±.004
550-1518	8	.230	.141	.020	±.004
550-1519	7	.240	.158	.020	±.004
550-1520	6	.290	.178	.020	±.004
550-1521	5	.310	.198	.020	±.004
550-1522	4	.370	.224	.020	±.004
550-1523	3	.390	.249	.020	±.004
550-1524	2	.430	.278	.020	±.004
550-1525	1	.450	.311	.020	±.004
550-1526	0	.470	.347	.020	±.004

EXPANDED FROM: AMS 3653 MIL-I-22129 MIL-I-23053B/12

TEFLON* HEAT SHRINKABLE TUBING FRACTIONAL INDUSTRIAL 4 x 1 (SHRINK RATIO)

Natural Part No.	Expanded Inside Diameter Minimum (Inches)		Recovered Inside Diam. Maximum (Inches)	Nominal Wall Thickness After Shrinking Wall	±Tolerance
550-3501	5/64	.078	.025	.009	±.002
550-3502	1/8	.125	.037	.010	±.002
550-3503	1/4	.250	.063	.012	±.003
550-3504	3/8	.375	.096	.012	±.003
550-3505	1/2	.500	.144	.015	±.004
550-3506	5/8	.625	.178	.015	±.004
550-3507	3/4	.750	.224	.015	±.004
550-3508	1	1.000	.278	.015	±.004
550-3509	1-1/4	1.250	.347	.015	±.004

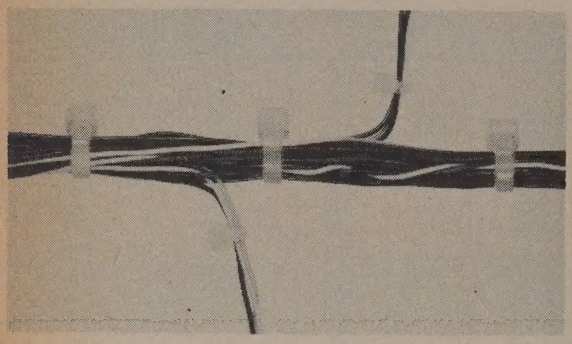
STANDARD PACKAGE IS 100 FEET EXCEPT 1" & 1¼" ARE 25 FEET MIL-I-23053B/12

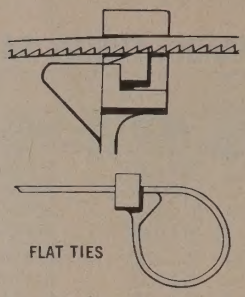
STANDARD PACKAGE IS 100'—OTHER LENGTHS AVAILABLE UPON REQUEST
Colors to MIL-STD-104 Also Available

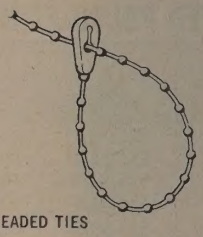
Transcon MANUFACTURING CO. BOX 20825 • DALLAS, TEXAS 75220 • (214) 357-8301

CABLE & WIRE TIES

"TUF-TIES"®







Use standard pistol-type tool or simply wrap the tie around the cable, slip tail through the head, and pull tight. Snip off excess tail.

FLAT "TUF-TIES"® (CABLE TIES)

PART NO.	MIL. SPEC.*	COLOR	LENGTH	WIDTH	BUNDLE DIA. (Max.)	MATERIAL
700-3501	MS-18034-4	Natural	4.00″	.110″	1.00″	Nylon
700-3502	MS-17821-4	Black	4.00″	.110″	1.00″	Nylon
700-3401	MS-18034-1	Natural	6.75″	.188″	1.75″	Nylon
700-3402	MS-17821-1	Black	6.75″	.188″	1.75″	Nylon
700-3421	MS-18034-2	Natural	14.00″	.188″	4.00″	Nylon
700-3422	MS-17821-2	Black	14.00″	.188″	4.00″	Nylon

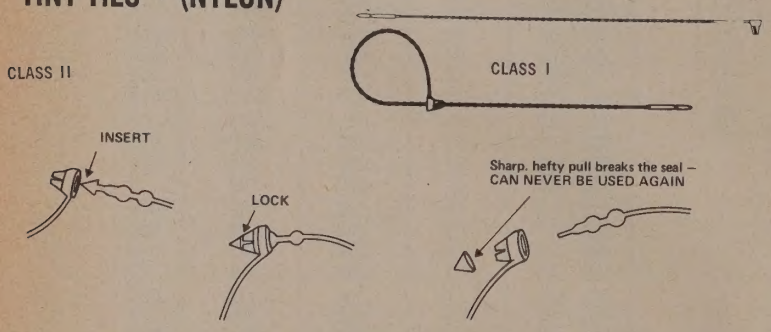
*Meets or exceeds military specifications.

Patent No. 3,484,905

BEADED "TUF-TIES"® (WIRE TIES)

PART NO.	COLOR	LENGTH	BUNDLE DIA.	MATERIAL
700-0001	Red	5.0″	1.5″	Polypropylene
700-0002	Yellow	5.0″	1.5″	Polypropylene
700-0003	Blue	5.0″	1.5″	Polypropylene
700-0004	Natural	5.0″	1.5″	Polypropylene
700-0020	Red	10.5″	3.0″	Polypropylene
700-0021	Yellow	10.5″	3.0″	Polypropylene
700-0022	Blue	10.5″	3.0″	Polypropylene
700-0023	Natural	10.5″	3.0″	Polypropylene
700-1001	Natural	5.0″	1.5″	Nylon
700-1002	Natural	10.5″	3.0″	Nylon

"TINY-TIES"® (NYLON)



NYLON ADJUSTABLE—Class I

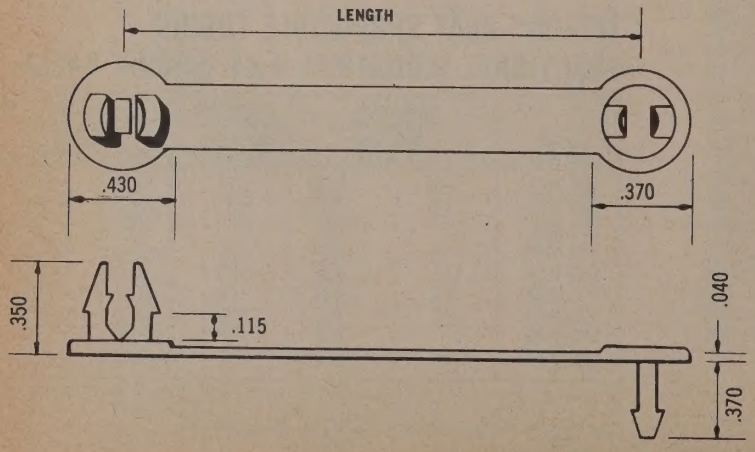
PART NUMBER	COLOR	LENGTH
700-3661	Natural	5″
700-3662	Black	5″

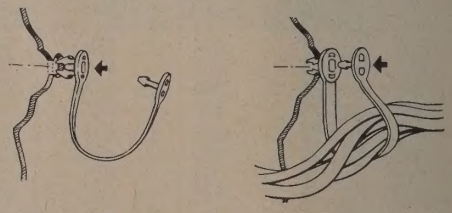
NYLON FIXED—Class II

PART NUMBER	COLOR	LENGTH
700-3601	Natural	3″
700-3602	Black	3″
700-3621	Natural	5″
700-3622	Black	5″
700-3641	Natural	8″
700-3642	Black	8″

AVAILABLE IN ALL STANDARD COLORS

NYLON CABLE HANGERS





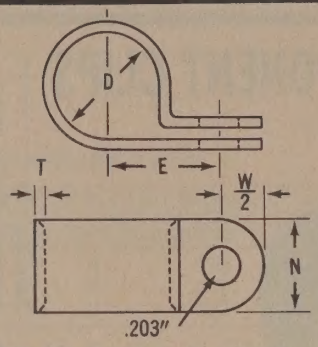
Plugs into a .250″ hole in material up to .100″ thick. Wire bundle or tubing hangs secure in loop formed.

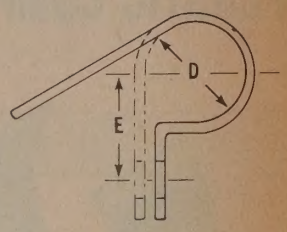
PART NUMBER		COLOR	Length	Wire Bundle or Tube Size
Nylon	Polypropylene			
720-0001	720-0101	Natural	1.75″	3/8″
720-0002	—	Black	1.75″	3/8″
720-0003	720-0121	Natural	2.75″	5/8″
720-0004	—	Black	2.75″	5/8″
720-0005	—	Natural	4.00″	1″
720-0006	—	Black	4.00″	1″

OTHER COLORS AVAILABLE ON REQUEST

Transcon ENGINEERED HARDWARE IS THE STANDARD OF INDUSTRY

CABLE CLAMPS





NYLON CABLE CLAMPS—3/8" WIDE

Part No.		Dimensions		
Natural	Black	"D"	"E"	"T"
710-0001	710-0501	1/8	.360	.050
710-0002	710-0502	3/15	.391	.050
710-0003	710-0503	1/4	.423	.050
710-0004	710-0504	5/16	.454	.050
710-0005	710-0505	3/8	.485	.050
710-0006	710-0506	7/16	.516	.050
710-0007	710-0507	1/2	.548	.050

NYLON CABLE CLAMPS—5/8" WIDE

Part No.		Dimensions		
Natural	Black	"D"	"E"	"T"
710-0212	710-0712	1-1/2	1.163	.063

NYLON CABLE CLAMPS—1/2" WIDE

Part No.		Dimensions		
Natural	Black	"D"	"E"	"T"
710-0102	710-0602	1/8	.360	.060
710-0103	710-0603	3/16	.391	.060
710-0104	710-0604	1/4	.423	.060
710-0105	710-0605	5/16	.454	.060
710-0106	710-0606	3/8	.485	.060
710-0107	710-0607	7/16	.516	.060
710-0108	710-0608	1/2	.548	.060
710-0109	710-0609	9/16	.579	.060
710-0110	710-0610	5/8	.610	.060
710-0111	710-0611	11/16	.641	.060
710-0112	710-0612	3/4	.673	.060
710-0113	710-0613	7/8	.735	.060
710-0114	710-0614	1	.798	.060
710-0115	710-0615	1-1/8	.880	.060
710-0116	710-0616	1-3/16	.912	.060
710-0117	710-0617	1-1/4	.943	.060
710-0119	710-0619	1-3/8	1.068	.060
710-0121	710-0621	1-1/2	1.163	.060

POLYPROPYLENE CABLE CLAMPS—1/2" WIDE

STANDARD COLOR IS "MILKY WHITE" (NATURAL)

Part No.	Dimensions		
	"D"	"E"	"T"
710-3001	1/8	.360	.060
710-3002	3/16	.391	.060
710-3003	1/4	.423	.060
710-3004	5/16	.454	.060
710-3005	3/8	.485	.060
710-3006	7/16	.516	.060
710-3007	1/2	.548	.060
710-3008	9/16	.579	.060
710-3009	5/8	.610	.060
710-3010	11/16	.641	.060
710-3011	3/4	.673	.060
710-3013	7/8	.735	.060
710-3014	1	.798	.060
710-3015	1-1/8	.880	.060
710-3016	1-3/16	.912	.060
710-3017	1-1/4	.943	.060
710-3018	1-3/8	1.068	.060
710-3019	1-1/2	1.163	.060

ETHOCEL CABLE CLAMPS—1/2" WIDE

STANDARD COLOR IS AMBER.

Part No.	Dimensions		
	"D"	"E"	"T"
710-4001	1/8	.360	.060
710-4002	3/16	.391	.060
710-4003	1/4	.423	.060
710-4004	5/16	.454	.060
710-4005	3/8	.485	.060
710-4006	7/16	.516	.060
710-4007	1/2	.548	.060
710-4008	9/16	.579	.060
710-4010	5/8	.610	.060
710-4011	11/16	.641	.060
710-4012	3/4	.673	.060
710-4013	7/8	.735	.060
710-4014	1	.798	.060
710-4015	1-1/8	.880	.060
710-4016	1-3/16	.912	.060
710-4017	1-1/4	.943	.060
710-4019	1-3/8	1.068	.060
710-4021	1-1/2	1.163	.060

ALL ITEMS CAN BE SUPPLIED IN COLORS AND OTHER PACKAGING OR DIFFERENT MOUNTING HOLE SIZE, PRICES FOR SPECIALS ON REQUEST.

Nylon Cable Clamps are stronger than most other cable clamp material. They resist acids better and have a higher operating temperature, +135°C (+275°F). Basically conforms to MIL-P-17091A* and amendment 2, MIL-P-17091B*, MIL-M-20693A type 1*, NAS-1397, MS-39014*, MIL-P-20693.

*Conforms to dimensional requirements and materials specifications.

Polypropylene Clamps are stronger and stand higher temperatures than Ethocel and at a lower price.

Ethocel clamps have satisfied unlimited fastening problems throughout the electrical/electronic industry. It is light weight, yet very durable with excellent shock resisting properties in a temperature range from 185°F to −40°F.

USED IN:
Television and Radio
Business Machines
Industrial Machines
Electrical and Electronics
Aircraft
Home Appliances
Vending Machines

USED FOR:
Durability
Electrical Properties
Strength
Corrosion Resistance
Economy
Moisture Resistance
Abrasion Resistance
Resilience
Lightness of Weight
Single Wires
Group Wires
Pipe
Tubing

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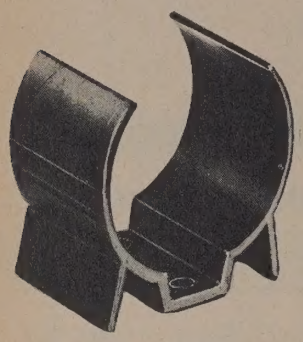
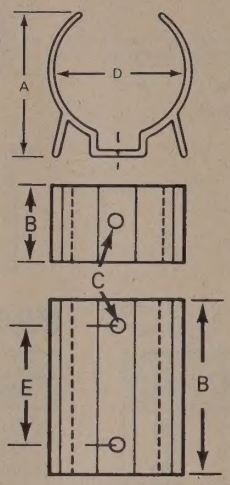
PLASTIC COMPONENT CLIPS

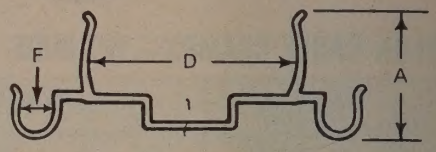




TRANSCON Plastic Component Clips are a convenient and economical means for fastening a wide variety of electrical and electronic components, accessories and parts. They are designed for fast, easy insertion, hold firmly and yet are easily removed. Typical applications are capacitors, resistors, lamps, batteries and fuses.

The clips are made of strong, rigid vinyl with insulating properties having high di-electric strength.

The floor of the clip is punched with one or two holes for screws or other fastening devices.



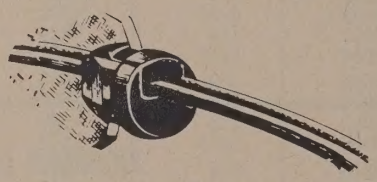
PART No. 721-0015

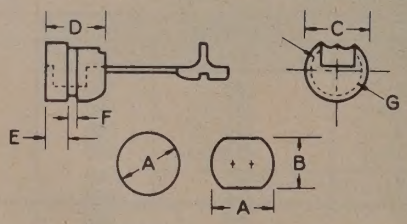
DIMENSIONS (Inches)

PART NO.	D DIA. OF PART TO BE HELD	HEIGHT A	LENGTH B	DIA. OF HOLE C	BETWEEN HOLES E	F DIA. OF PART TO BE HELD
721-0001	1/4	11/32	1/2	3/32		
721-0002	5/16	15/32	1/2	3/32		
721-0003	3/8	1/2	1/2	3/32		
721-0004	7/16	1/2	1/2	3/32		
721-0005	1/2	5/8	1/2	3/32		
721-0006	9/16	5/8	1/2	3/32		
721-0007	5/8	5/8	1/2	3/32		
721-0008	11/16	3/4	1/2	5/32		
721-0009	3/4	7/8	1/2	5/32		
721-0010	7/8	1	1/2	5/32		
721-0011	1	1-1/4	1/2	5/32		
721-0012	1-3/8	1-15/32	1-1/8	5/32	3/4	
721-0013	1	1-1/4	1-1/8	5/32	3/4	
721-0014	1-3/8	1-15/32	1-1/8	5/32		
721-0015	1-15/32 x 17/32	1	1-19/32	5/32	3/4	17/64

U.S. Pat. No. 2,541,828

STRAIN RELIEF BUSHINGS





These bushings will cut your production cost because there is no need to knot or tie your cords to avoid strain on connections! They are quickly and easily installed with specially designed pincers or even with ordinary pliers.

Once installed they lock the cords to the chassis panel in a vice-like grip and are locked there until deliberately removed for servicing or trouble shooting.

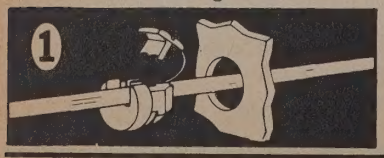
TRANSCON Bushings on an appliance are a symbol of highest quality.

SPECIAL PINCERS FOR SPEEDIER INSTALLATION ARE AVAILABLE.

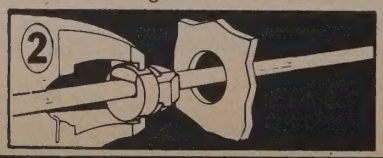
PART NO.		WIRE ACCOMMODATED	APPROX. WIRE SIZE	Mounting Holes		C	D	E	F
BLACK	WHITE			A	B				
722-0001	722-0002	SPT-1	.110x.210	.437	.395	.470	.405	.160	.062
722-0003	722-0004	SP #16/2 SPT-2 #18/2	.150x.280 .160x.300	.515	.465	.570	.500	.171	.100
*722-0005	*722-0006	SPT-3 #18/2 #18/3 #16/2 #16/3	.190x.350 to .200x.430	.730	.560	.775	.680	.275	.125
722-0007	722-0008	SV #18/2 SVT-2 #18/3	.250 .265	.515	.465	.560	.430	.165	.105
722-0009	722-0010	SJ #18/2 SJT #18/3 #16/2 SJO #16/3	.300 .330 .325 .325	.656 .687	.570	.730	.680	.275	.115

*Use Style "B" Mounting Hole Only

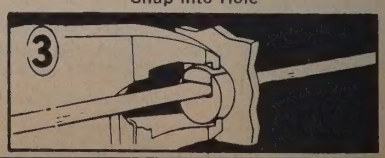
Place Bushing on Cord



Press Together with Pincers



Snap into Hole



Transcon ENGINEERED HARDWARE IS THE STANDARD OF INDUSTRY

LACING TAPE AND CORD

NYLON (POLYAMIDE) TWINE (CORD) TO MEET MIL-T-713C (Supersedes MIL-T-713A)

PART NUMBER								
Natural	Black	Type	Class	Tensile Strength	Finish	Nominal Diameter (Inches)	Yards per Pound	Standard Put-up
730-0101	730-0001	P Waxed	1	70 Lbs.	B	.039	550	1 Lb. Spool
730-0102	730-0002	P Waxed	2	48 Lbs.	B	.029	750	1 Lb. Spool
730-0103	730-0003	P Waxed	3	32 Lbs.	B	.025	1100	1 Lb. Spool

NYLON (POLYAMIDE) FLAT BRAIDED TAPE TO MEET MIL-T-43435

PART NUMBER								
Natural	Black	Type	Size	Tensile Strength	Finish	Nominal Width (Inches)	Nominal Thickness (Inches)	Standard Put-up
730-0105	730-0005	I	1	135 Lbs.	B	.225	.114	250 Yd. Spool
730-0106	730-0006	I	2	80 Lbs.	B	.125	.012	250 Yd. Spool
730-0107	730-0007	I	3	50 Lbs.	B	.090	.012	500 Yd. Spool
730-0108	730-0008	I	4	25 Lbs.	B	.062	.012	500 Yd. Spool
730-0109	730-0009	I	5	15 Lbs.	B	.050	.012	500 Yd. Spool

DACRON (POLYESTER) FLAT BRAIDED TAPE TO MEET MIL-T-43435

PART NUMBER								
Natural	Black	Type	Size	Tensile Strength	Finish	Nominal Width (Inches)	Nominal Thickness (Inches)	Standard Put-up
730-0115	730-0015	II	1	135 Lbs.	B	.225	.014	250 Yd. Spool
730-0114	730-0014	II	2	80 Lbs.	B	.125	.012	250 Yd. Spool
730-0111	730-0011	II	3	50 Lbs.	B	.090	.012	500 Yd. Spool
730-0112	730-0012	II	4	25 Lbs.	B	.062	.012	500 Yd. Spool
730-0113	730-0013	II	5	15 Lbs.	B	.050	.012	500 Yd. Spool

TEFLON* (TETRAFLUOROCARBON) FLAT BRAIDED TAPE TO MEET MIL-T-43435

PART NUMBER								
Brown		Type	Size	Tensile Strength	Finish	Nominal Width (Inches)	Nominal Thickness (Inches)	Standard Put-up
730-0222		III	2	30 Lbs.	B	.120	.011	250 Yd. Spool
730-0224		III	4	15 Lbs.	B	.065	.011	250 Yd. Spool
730-0227		III	2	30 Lbs.	B	.120	.011	50 Yd. Spool
730-0229		III	4	15 Lbs.	B	.065	.011	50 Yd. Spool

GLASS & TEFLON* FLAT BRAIDED TAPE FIBER GLASS, TEFLON* COATED (FOR 550°F.) TO MEET MIL-T-43435

PART NUMBER								
White		Type	Size	Tensile Strength	Finish	Nominal Width (Inches)	Nominal Thickness (Inches)	tandard Put-up
730-0261		IV	1	200 Lbs.	D	.225	.016	250 Yd. Spool
730-0262		IV	2	100 Lbs.	D	.125	.016	250 Yd. Spool
730-0263		IV	3	75 Lbs.	D	.090	.016	500 Yd. Spool
730-0264		IV	4	70 Lbs.	D	.062	.016	500 Yd. Spool
730-0265		IV	5	60 Lbs.	D	.050	.016	500 Yd. Spool
730-0266		IV	1	200 Lbs.	D	.225	.016	100 Yd. Spool
730-0267		IV	2	100 Lbs.	D	.125	.016	100 Yd. Spool
730-0268		IV	3	75 Lbs.	D	.090	.016	100 Yd. Spool
730-0269		IV	4	70 Lbs.	D	.062	.016	100 Yd. Spool
730-0270		IV	5	60 Lbs.	D	.050	.016	100 Yd. Spool

*TEFLON—DuPont Trademark

MIL-T-713C SPECIFICATIONS

TYPE

N, Waxed — Vegetable Fiber
P, Unwaxed — Polyamide (Nylon)
P, Waxed — Polyamide (Nylon)
SAR — Saponified Acetate

CLASS

1 — 70 Pound Breaking Strength
2 — 48 Pound Breaking Strength
3 — 32 Pound Breaking Strength

MIL-T-43435 SPECIFICATIONS

TYPE

I — Polyamide (Nylon)
II — Polyester
III — Tetrafluorocarbon
IV — Glass
V — Polyamide (Nylon), Heat Resistant

FINISH

A — Natural
B — Wax Impregnated
C — Synthetic Rubber Including Elastomer Coating
D — Tetrafluorocarbon Coating
E — Vinyl Chloride or Vinyl Chloride — Acetate Copolymer Coating
F — Silicone Resin Impregnated

OTHER TYPES AND SIZES ARE AVAILABLE.

See YELLOW SECTION for Local Offices, Phones

MicroCoax

Close-Tolerance Miniature Solid-Jacketed Coaxial Cables

Uses of close-tolerance MicroCoax cables include:

- Microwave transmission and delay lines
- Totally shielded connections (mixers, klystrons, stripline)
- High-speed computer leads
- Audio crosstalk suppression
- Low-noise amplifier isolation

Advantages:

- Low loss
- Essentially total RF shielding
- Easily soldered, stripped and connected
- Close tolerance, resulting in a high degree of uniformity and reliability, both mechanically and electrically
- Comprehensive mechanical and electrical test data available

Specifications and Technical Data—10, 25, 50, 70, and 93 Ohm MicroCoax Cables

CABLE TYPE	Impedance, ohms	Outside Diam. ±.001"	Jacket Material	Dielectric Diam. ±.001"	Dielectric Material	Center Cond. AWG (in.)	Center Cond. Material	Capacitance pF/ft.	Max. Temp. °C	Min. Bend Radius (in.)	Typical Attenuation db/100 ft. .5 GHz	1.0 GHz	5.0 GHz	10.0 GHz	Weight (Pounds/100 ft.)
UT-8	50	.008	Copper	.004	TFE	.002	C	29.3	85	1/16	154	222	550	810	<0.1
UT-13	50	.013	Copper	.010	FEP	.0025	SPCW	29.3	85	1/16	105	152	381	592	<0.1
UT-20	50	.023	Copper	.017	FEP	#37(.0045)	SPCW	29.3	85	1/16	50	76	—	—	.10
UT-34	50	.034	Cooper	.028	TFE	#32(.008)	SPCW	29.3	100	1/8	28	44	100	—	.13
UT-47	50	.047	Copper	.037	TFE	#29(.0113)	SPCW	29.3	150	1/8	26	36	87	130	.53
UT-701	50	.070	Copper	.059	TFE	#25(.0179)	SPC	29.3	150	1/8	14.7	19.9	45.5	66.2	.75
UT-85	50	.0865	Copper	.0658	TFE	#24(.0201)	SPCW	29.3	150	1/8	12.0	17.0	42.0	62.0	1.4
UT-85C	50	.0865	Copper	.0658	TFE	#24(.0201)	SPC	29.3	150	1/8	12.0	17.0	42.0	62.0	1.4
UT-85FC	50	.0865	Copper	.0658	FEP	#24(.0201)	SPCW	29.3	150	1/8	17	26	55	90	1.4
UT-141	48.8	.141	Copper	.116	TFE	#19(.0359)	SPCW	29.5	200	1/4	5.8	8.8	24.5	38	3.2
UT-141A	50	.141	Copper	.1185	TFE	#19(.0359)	SPCW	29.3	200	1/4	5.8	8.8	24.5	38	3.2
UT-141B	50	.141	Copper	.1185	TFE	#19(.0359)	BeCu	29.3	200	1/4	6.0	9.1	26.3	41.0	3.2
UT-141C	50	.141	Copper	.1185	TFE	#19(.0359)	SPC	29.3	200	1/4	5.8	8.8	24.5	38	3.2
UT-141L	50	.141	Copper	.1185	TFE	#19(.0359)	T	29.3	200	1/4	45.0	65.0	154.0	250.0	3.2
UT-141P	50	.141	Copper	.1185	IP	#19(.0359)	C	29.3	200	1/4	6.0	9.1	26.3	41.0	3.1
UT-141FC	50	.141	Copper	.1185	FEP	#19(.0359)	SPC	29.3	200	1/4	8.0	12.0	30.0	47.5	3.2
UT-250A	50	.250	Copper	.210	TFE	#14(.064)	SPC	29.3	200	3/8	3.7	5.8	16.2	25.0	10.0
UT-10	10	.043	Copper	.036	TFE	#21(.0285)	C	146.5	100	1/4	—	—	—	—	—
UT-25	25	.034	Copper	.024	TFE	#28(.0126)	SPCW	58.5	100	1/8	—	—	—	—	—
UT-70	70	.085	Copper	.056	TFE	#29(.0113)	SPCW	19.3	175	1/4	13.0	19.0	42.0	63.0	1.4
UT-851	93	.085	Copper	.073	TFE	#32(.008)	SPCW	15.5	150	1/4	15.0	21.5	51.0	76.0	1.4
UT-93	93	.130	Copper	.1055	TFE	#29(.0113)	SPCW	15.5	175	1/4	9.6	14.0	34.0	50.0	2.6
UT-20-SS	50	.020	304SS	.015	FEP	#37(.0045)	SPCW	29.3	150	1/8	—	—	—	—	.10
UT-85-SS	50	.0865	304SS	.0658	TFE	#24(.0201)	SPCW	29.3	200	1/4	26.5	39.0	95.0	—	1.2
UT-141-SS	50	.141	304SS	.119	TFE	#19(.0359)	SPCW	29.3	250	1/2	17.0	25.0	57.0	84.0	3.1
UT-141-SSC	50	.141	304SS	.119	TFE	#19(.0359)	SPC	29.3	250	1/2	17.0	25.0	57.0	84.0	3.1
UT-141AL	50	.141	Aluminum	.119	TFE	#19(.0359)	SPCW	29.3	200	1/4	6.8	10.0	29.7	45.0	1.9
UT-250AL	50	.250	Aluminum	.214	TFE	#14(.064)	SPC	29.3	200	3/8	5.0	7.5	20.0	34.0	6.4
UT-325	50	.325	Copper	.285	TFE	#7X(.0312)	SPC	29.3	200	1/2	3.6	5.5	14.3	22.0	15.0
UT-852	75	.085	Copper	.067	TFE	#29(.0113)	SPCW	19.3	150	1/8	13.0	19.0	42.0	63.0	1.4

NOTES: SPCW = Silver Plated Copperweld Wire, SPC = Silver Plated Copper Wire, C = Copper Wire, T = Tophet(1) C Wire, BeCu = Beryllium Copper Wire, 304SS = Stainless Steel, Type 304, TFE = Teflon TFE Resin, FEP = Teflon(2) FEP Resin, IP = Irradiated Polyethylene. (1) = Trade Name W. B. Driver, (2) = Trade Name E. I. Du Pont.

CONDUCTOR MATERIALS

Alloys or Pure Aluminum, Copper, Beryllium Copper, Iron, Nickel, Gold, Silver, Columbium (Niobium), Stainless Steel.

DIELECTRICS

ORGANICS: Teflon (TFE and FEP), KEL-F, PVC, RTV, Polystyrene, Polyethylene.

INORGANICS: Titanite, Alumina, Magnesium Oxide, Beryllium Oxide.

CABLE ASSEMBLIES

Fabricated from any of the standard MicroCoax cables, these assemblies are fully tested for VSWR and attenuation characteristics. A large stock of connectors assures the engineer rapid delivery of either straight or formed units. Comprehensive VSWR and attenuation test data is also available on request.

CUSTOM DELAY LINES

The fabrication of any of the MicroCoax cables listed in the above table into delay elements is one of our specialties. Obtaining the best combination of attenuation, size, shape, cost and weight can be best accomplished by discussing your delay requirements with our engineering staff.

STANDARD DELAY LINES

Stock delivery of delay elements is available for prototype or production requirements. Cable sizes include UT-250, UT-141-A, UT-85, UT-34 and UT-20. Delay values of 5, 10, 25, 50 and 100 nanoseconds allow the cascading of these elements to obtain specific delay and attenuation characteristics.

703R

UNIFORM TUBES, INC.
Collegeville, Pa. 19426
PHONE: (215) 489-7293 ■ TWX: 510-660-6107 ■ TELEX: 84-6428

VICTOR WIRE & CABLE CORP.

3601 HOLDREGE AVENUE, LOS ANGELES, CALIFORNIA 90016

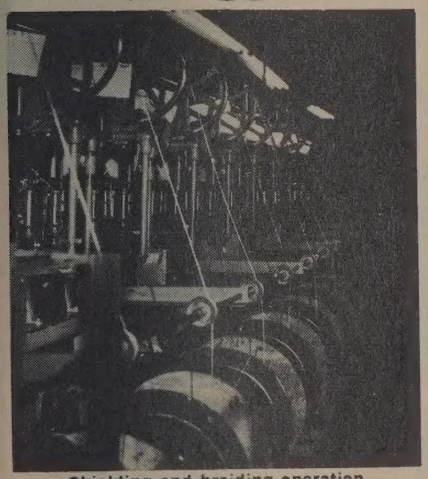
(213) 870-9933 • TWX 910-340-6754

Manufacturer

NOTE:

The only "QPL" listed manufacturer of polyethylene, PVC and Teflon coaxial cable on the west coast to RG/U call-outs. Latest revision MIL-C-17.

(Approved in-plant test facility)

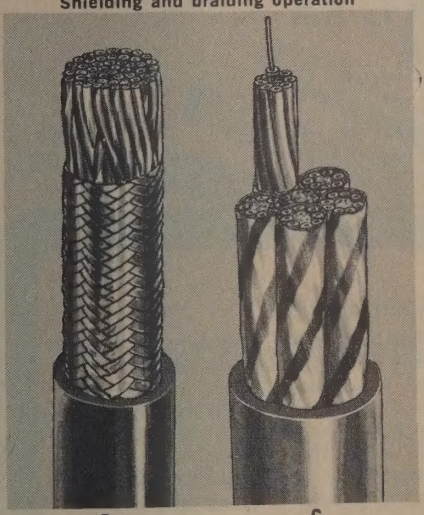


Shielding and braiding operation

Large warehouse stock of all type military specification wire and cable, commercial power cords and cable, multi-conductor cables, high voltage motor lead — UL style. Electronic wire and cable.

Hookup —

- TEFLON
- VINYL
- NYLON
- AIRCRAFT
- MINIATURE TEFLON COAXIAL CABLE
- REGULAR & COMMERCIAL COAXIAL CABLE
- SERVICE & POWER CABLES
- TINNED COPPER BRAID - TUBULAR & FLAT
- SILVER PLATED COPPER BRAID - TUBULAR & FLAT
- ELECTRONIC CONTROL CABLE
- STAINLESS STEEL BRAID - TUBULAR & FLAT
- UL STYLE WIRE & CABLE
- AUDIO CABLES
- COMPUTER CABLE
- INSTRUMENTATION & SOUND CABLES
- BUSINESS MACHINE
- VIDEO
- CAMERA CABLES
- CUSTOM CABLES

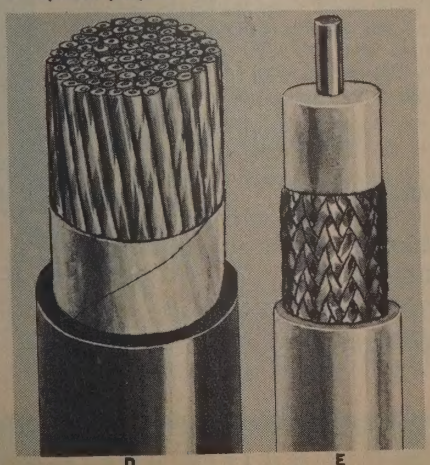


B C

B. Communication cable
C. Special purpose and camera cable

We Build and Manufacture all Types of Wire and Cable:

- PVC
- POLYETHYLENE
- NYLON
- POLYPROPELENE
- POLYURETHANE
- IMPREGNATED GLASS BRAIDS
- NYLON BRAID
- DACRON & COTTON BRAIDS
- CELLULAR FOAMED POLYETHYLENE
- RUBBER
- NEOPRENE
- COPPER SHIELDS
- ALUMINUM FOIL SHIELD
- STAINLESS STEEL SHIELD
- CONDUCTIVE VINYL SHIELD



D E

D. Multi conductor control cable
E. Coaxial cable

Our Specialty:
Special Designed and Engineered Cable Special Coaxial Cable to Customer Prints and Engineered Designs.

Small and Large Quantities.

Factory Facility Inspections Invited.

JACKETING WITH DUR-X-THANE®, POLYETHYLENE, PVC OR BLOWN NEOPRENE

ARMORING

TEXTILE BRAIDING

METHODS DESIGNED FOR BETTER QUALITY AND BETTER SERVICE

An important feature in maintaining the quality of our products is our ability to design and construct the tools necessary to do the job. We guarantee continuous performance of equipment & continuity of production.

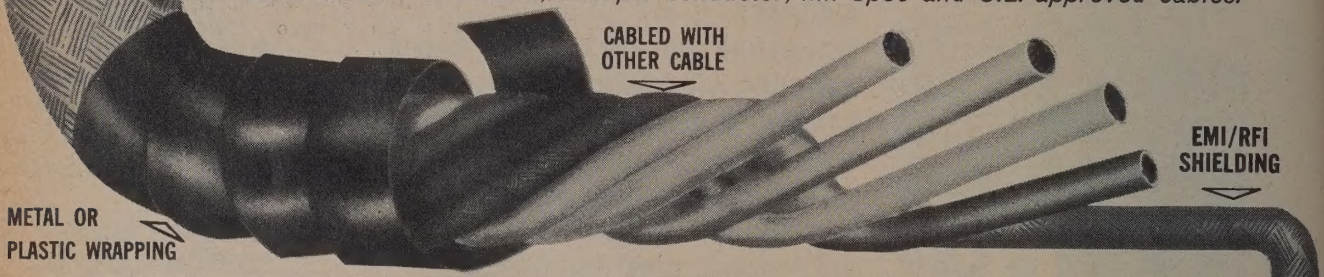
The exacting specifications of Whitmor's space-age customers require a stringent quality assurance program. Our Q.C. meets Mil-Q-9858 & Mil-I-45208 with modifications required by customers. The same quality consciousness is applied to commercial work. We guarantee trouble free cable and wire!

Whitmor has what it takes to build cables for tough jobs!

20,000 square feet housing modern, high speed equipment makes it possible to fill orders on a 24 hour basis, if required.

WHITMOR WIRE AND CABLE CORPORATION

Manufacturers of custom, multiple conductor, Mil-Spec and U.L. approved cables.



UNSHIELDED							SHIELDED**			
MULTI-CONDUCTOR STOCK CABLES / All wire 19 strand					DUR-X-THANE®		STOCK		DUR-X-THANE®	
PART NO.	COND. AWG	NO. COND.	JKT. THICK.	CABLE O.D.	JKT. THICK.	CABLE O.D.	JKT. THICK.	CABLE O.D.	JKT. THICK.	CABLE O.D.
W-227*	22	7	.040	.280	.030	.260	.040	.305	.030	.285
W-2212*	22	12	.050	.380	.030	.340	.050	.405	.030	.365
W-2219*	22	19	.060	.450	.040	.410	.060	.475	.040	.435
W-2227*	22	27	.060	.530	.040	.490	.060	.555	.040	.515
W-2237*	22	37	.060	.580	.040	.540	.060	.605	.040	.565
W-2248*	22	48	.060	.660	.050	.640	.060	.685	.050	.665
W-2261*	22	61	.060	.710	.050	.690	.060	.735	.050	.715
W-2272*	22	72	.060	.775	.060	.775	.060	.800	.060	.800
W-207*	20	7	.040	.300	.030	.280	.040	.325	.030	.305
W-2012*	20	12	.050	.400	.030	.360	.050	.425	.030	.385
W-2019*	20	19	.060	.475	.040	.435	.060	.500	.040	.460
W-2027*	20	27	.060	.560	.040	.520	.060	.585	.040	.545
W-2037*	20	37	.060	.610	.040	.570	.050	.640	.040	.595
W-2048*	20	48	.060	.700	.050	.680	.060	.725	.050	.705
W-2061*	20	61	.060	.750	.060	.750	.060	.775	.060	.775
W-2072*	20	72	.060	.840	.060	.840	.060	.865	.060	.865
W-187*	18	7	.040	.335	.030	.315	.040	.360	.030	.340
W-1812*	18	12	.050	.450	.040	.430	.050	.475	.040	.455
W-1819*	18	19	.060	.550	.040	.510	.060	.575	.040	.535
W-1827*	18	27	.060	.650	.050	.630	.060	.675	.050	.655
W-1837*	18	37	.060	.720	.050	.700	.060	.745	.050	.725
W-1848*	18	48	.060	.820	.060	.820	.060	.845	.060	.845
W-1861*	18	61	.060	.890	.060	.890	.060	.915	.060	.915
W-1872*	18	72	.060	.995	.060	.995	.060	1.020	.060	1.020
W-167*	16	7	.040	.370	.030	.350	.040	.395	.030	.375
W-1612*	16	12	.050	.500	.040	.480	.050	.525	.040	.505
W-1619*	16	19	.060	.600	.040	.560	.060	.625	.040	.585
W-1627*	16	27	.060	.685	.050	.665	.060	.710	.050	.590
W-1637*	16	37	.060	.755	.060	.755	.060	.780	.060	.780
W-1648*	16	48	.060	.865	.060	.865	.060	.890	.060	.890
W-1661*	16	61	.060	.935	.060	.935	.060	.960	.060	.960
W-147*	14	7	.050	.420	.040	.400	.050	.445	.040	.425
W-1412*	14	12	.050	.550	.040	.530	.050	.575	.040	.555
W-1419*	14	19	.060	.645	.050	.625	.060	.670	.050	.650
W-1427*	14	27	.060	.775	.060	.775	.060	.800	.060	.800
W-125*	12	5	.050	.445	.040	.400	.050	.470	.040	.425
W-127*	12	7	.050	.480	.040	.460	.050	.505	.040	.485
W-1212*	12	12	.060	.650	.050	.650	.060	.675	.050	.675
W-1219*	12	19	.060	.820	.060	.820	.060	.845	.060	.845

*Designate jacketing desired as follows: V=vinyl X=Dur-X-thane P=polyethylene N=neoprene · Mil-S-6855 · Class 2 · Grade 60
EXAMPLE: W-1827P=Cable w/27 conductors, 18 gauge wire, w/polyethylene jacketing. **Add "S" to PART NO. for Shielded cable.
Other constructions available on request using 1/32" PVC insulation (3000 V, Military Type D); (600 V, Style 1015 U.L. Commercial)

TECHNICAL DATA

Whitmor Wire and Cable Corporation manufactures a complete line of multiple conductor control cables. All conductors are Type C per MIL-W-16878, insulated for 1000 V and 105° C. Conductors are color coded per MIL-STD 681. All conductors are planetary cabled and contra-helically laid with Mylar tape over the cable bundle.

® Dur-X-thane is Whitmor's Registered T.M. for extruded Polyurethane.

SHIELDED CABLES: Same specifications as above with additions of tinned copper braided shield over cable complex with 85%-95% coverage to MIL-C-7078A, cables shipped on non-returnable reels.

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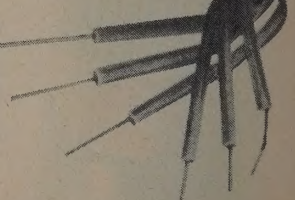

WHITMOR WIRE AND CABLE CORPORATION

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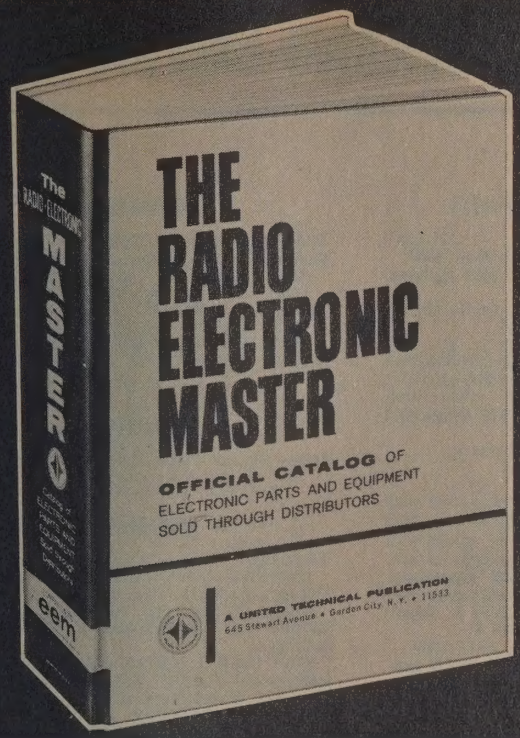

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James W. Clary Co., 1713 2nd Ave. So.
Electronic Supplies, Inc., 2900 Bessemer Rd.
Decatur—Mock Distrib. Co., Inc., 902 Bank St.
Gadsden—Southeastern Radio, 304 So. 4th St.
Huntsville—Electronic Wholesalers Inc., 2310 Bob Wallace Ave. S.W.
Mock Electronics, 2310 Memorial Pkwy., So.
Radio Electric Service Co. of Baltimore, 825B Wheeler Ave.
Mobile—
Nelson Radio & Supply, 1541 S. Beltline Hwy.
Montgomery—
Southeastern Radio, 635 E. Jefferson St.
Selma—Southeastern Radio Parts Co., 729 Jefferson Davis Ave.
Sheffield—Mock Radio & Electronics, Inc., 107 No. Montgomery Ave.

ALASKA

Anchorage—Yukon Radio Supply, 3222 Commercial Drive
Fairbanks—Yukon Radio Supply, 1112 Cushman

ARIZONA

Phoenix—Dalis Electr. Supply, 917 N. 7th St.
Parts Electr. of Ariz., 1310 No. 7th St.
Sterling Electrs. Corp., 1930 N. 22nd Ave.
Tucson—Inland Electronic, 715 E. Broadway
Yuma—Yuma Electronics Supply, 149 Main St.

ARKANSAS

Blytheville—Bluff City Dist. Co., 113 S. Division
El Dorado—Industrial Electr., 413 W. Main St.
Lavender Electronics, 522 West Main St.
Fort Smith—Carlton-Bates Co., 302 No. 6th St.
Wise Radio & TV Supply, 1001 Towson Ave.
Jonesboro—Bluff City Dist. 324 W. Huntington
Little Rock—Carlton-Bates Co., 1210 E. 6th St.
Lavender Electronics, Inc., 1122 Center
Southern Electronics, 1419 Main St.
Pine Bluff—Carlton-Bates Co., 1510 State St.
Springdale—Springdale Radio, 710 N. Thompson
Texarkana—Lavender Electrs., 520 E. 4th St.

CALIFORNIA

Bakersfield—Lafayette Radio, 2039 N. Baker
Canoga Park—Sandy's Electr., 21305 Saticoy St.
Fresno—Jack C. Arbuckle Co., 2349 Kern St.
Inland Electr., Suppliers, 461 N. Fresno St.
Goleta—Milo of California, 5857 Hollister Ave.
Hollywood—
Hollywood Radio & Electronics, 5250 Hollywood Blvd.
Yale Radio Electric Co., 6616 Sunset Blvd.
Huntington Park—
Martin Distributing, 2509 E. Florence Ave.
Lancaster—Electronics Distr., 44539 10th St. W.
Long Beach—Scott Radio Supply, 266 Alamitos
Los Angeles—Calif. Electrs, 1911 Armacost Ave.
Radio Products Sales, 1501 So. Hill St.
Mt. View—Brill Electrs., 1065 Terra Bella Ave.
Dunlap Electrs., 2025 Old Middlefield Way
Elmar Electronics, 2288 Charleston Rd.
Terminal-Hudson Electrs., 880 Maude Ave.
Oakland—Brill Electronics, 610 E. 10th St.
Dunlap Electronics, 100 Hegenberger Loop
Oxnard—Milo of California, 921 S. Oxnard Blvd.
Palo Alto—Zack Electronics, 654 High St.
Pasadena—Milo of Cal., 1759 E. Colorado Blvd.
Riverside—Electronic Supply, 2486 3rd St.
Sacramento—Dunlap Electronics, 1800 18th St.
Sacramento Electronic Supply, 1219 S. St.
San Diego—Milo of California, 2060 India St.
Shanks & Wright, 2045 Kettner Blvd.
Western Radio, 1415 India St.
San Francisco—
Zack Electronics, 1444 Market St.
San Jose—Quement Electrs., 1000 S. Bascom
San Mateo—San Mateo Electrs., 16 W. 42 Ave.
Sunnyvale—Sunnyvale Electrs., 548 S. Murphy

CANADA

Calgary, Alberta—
Smalley's Radio, Ltd., 1105 7th Ave., S.W.
Halifax, N. S.—Amphion Electrs., 2411 Agricola
Moncton, N. B.—
Amphion Elec., P.O. Box 2246, Postal Sta. A
Montreal, Quebec—
Cesco Electrs., 4050 Jean Talon St. W.
Electronic Wholesalers, 1935 Church Ave.
Quebec, Quebec—Crobel, Ltd., 225 Rue Lee
Toronto, Ont.—
Electro-Sonic Industrial Sales, 543 Yonge St.
Vancouver, B. C.—
Canadian Electrs., Ltd., 971 Richards St.

COLORADO

Colorado Springs—
L. B. Walker Radio Co., 9 E. Vermijo
Denver—Electronic Parts Co., 1277 Broadway
Kierulff Electronics, 10890 E. 47th Ave.
Newark-Denver Electr. Supply, 2170 S. Grape
L. B. Walker Radio Co., 300 Bryant St.
Durango—L. B. Walker Radio Co., 2817 Main
Grand Junction—L. B. Walker Radio Co., 537 N. 1st
Greeley—L. B. Walker Radio Co., 1525 8th Ave.
Pueblo—L. B. Walker Radio Co., 100 N. Victoria

CONNECTICUT

Bridgeport—Westconn Electrs., 195 Colorado
Hartford—Eastco, 95 Leggett St.
New London—Aikins Electr. Supplies, 531 Broad
Stamford—Westchester Electrs., 181 Stillwater
Waterbury—Bond Radio Electrs., 439 W. Main

DELAWARE

Wilmington—First State Electrs., 805 E. 13th
Radio Electric Service Co. of Pa., 3601 N. Market St.

DISTRICT OF COLUMBIA

Collins Bros. Electrs., 4946 Marlboro Pike

FLORIDA

Hollywood—Electronic Whlsrs., 4035 N. 29th
Orlando—Electronic Whlsrs., 345 N. Graham
Hammond Electrcs., 911 W. Central Ave.
Panama City—Central Electr., 316 Luverne Ave.
Tampa—Leader Electr. Distributors, Inc., 3411 South Dale Mabry Hhwy.
Thurow Electronics, 121 S. Ashley Dr.
Winter Park—
Radio Electric Serv. Co. of Balto., P.O. Box 577

GEORGIA

Albany—Southeastern Radio, 206 S. Monroe St.
Athens—
Southeastern Radio Parts Co., 393 Finley
Atlanta—Ack Radio Supply Co. of Ga., 554 Deering Rd. N.W.
Jackson Electronics Co., 1135 Chattahoochee Ave., N.W.
Southeastern Radio Parts Co., 430 W. Peachtree St., N.W.
Specialty Distributing, 763 Juniper St., N.E.
World Electrcs., 293 Peachtree St., N.E.
Augusta—Dixie Radio Supply, 1234 Gordon Park
Dalton—Curle Electronics, 710 N. Hamilton Ave.
Gainesville—
Southeastern Radio Parts Co., 412 Oak St.
Hapeville—
Southeastern Radio Parts Co., 565 N. Central
La Grange—
Southeastern Radio Parts Co., 206 Ridley
Macon—Southeastern Radio Parts Co., 866 2nd
Rome—
Southeastern Radio Parts Co., 248 N. 5th
Savannah—
Southeastern Radio Parts Co., 545 E. York

HAWAII

Hilo—Radio-Television Corp., 28 Pookela St.
Honolulu—Electrical Equipt. Co., 656 Queen
Honolulu Electronics, 819 Keeaumoku St.
Industrial Electronic, Inc., 646 Queen St.
Precision Radio, Ltd., 1160 S. King St.
Radio-Television Corp. Ltd., 432 Keawe St.
Radio Wholesale & Supply, 610 Ward Ave.
Kahului, Maui—Electrical Equipt., 319 Ano St.

IDAHO

Boise—Kimball Electrs., 418 N. Orchard

ILLINOIS

Champaign—
Spracklen's Electr. Parts, 905 So. Neil St.
Chicago—Electronic Distrib., 4900 N. Elston
Newark Electrs., 500 No. Pulaski Rd.
Danville—Bud Electr. Supply, 22 N. Jackson St.
Decatur—
Klaus Radio & Electric, 370 E. Cerro Gordo
Jacksonville—Baptist Electronic Supply Co., 419 S. Mauvaisterre St.
La Salle—Klaus Radio & Electric, 1055 First
Oak Park—Melvin Electrs., 541 W. Madison St.
Palatine—Ohmtronics, Inc., 649 Vermont Ave.
Peoria—Klaus Radio & Electric Co., 8400 Pioneer Industrial Park
Quincy—Klaus Radio & Electric, 1101 S. B'dway

INDIANA

Anderson—Electronic Supply of Anderson, 23rd and Columbus
Seybert's Radio Supply Inc., 1331 Main St.
Evansville—Ohio Valley Sound, 20 E. Sycamore
Ft. Wayne—Ft. Wayne Electrs., 3606 E. Maumee
Indianapolis—Graham Electrs., Suplly, Inc. 133 S. Pennsylvania St.
Graham Electronics, 6101 N. Keystone
Ra-Dis-Co., Inc., 814 N. Senate Ave.
Lafayette—
Lafayette Radio Electrs., 408 North St.
Michigan City—Tri-State Electrical Supply, 212 E. Michigan St.
Muncie—Muncie Electronics, 222 No. Madison
Vincennes—Ohio Valley Sound, Ninth & Main

IOWA

Burlington—Union Supply Co. Inc., 231 S. 3rd
Cedar Rapids—Deeco, Inc., 2500 16th Ave. S.W.
Davenport—Klaus Radio & Electric, 322 E. 4th
T. C. R. Distributors, 1205 E. River Dr.
Mid-State Distributing Co., 1201 Grand Ave.
Radio Trade Supply Co., 1017 High St.
Mason City—Waters Electrs., 516 So. Delaware

KANSAS

Coffeyville—Norman Electr. Supply, 121 W. 7th
Great Bend—Radio Supply Co., 1910 Tenth
Hutchinson—Acme Radio Supply, 313 No. Main
Manhattan—Acme Radio Supply, 318 Thurston
Salina—Radio Supply Co., Inc., 1809 S. B'dway
Topeka—Acme Radio Supply, 135 Kansas Ave.
Interstate Electronic, 2500 S. Kansas
Wichita—Interstate Electronic Supply, 230 Ida
Radio Supply Co., Inc., 115 Laura

KENTUCKY

Bowling Green—
Randolph, Hale & Meredith, Inc., 98 State
Hopkinsville—Randolph & Hale, 729 East 4th
Lexington—Radio-Electronic Euipment Co., Inc., 480 Skain Ave.
Louisville—P. I. Burks Co., 842 S. Seventh St.
Peerless Electr. Equpt., 1815 S. Seventh St.
Owensboro—Ohio Valley Sound, 600 W. 3rd St.

Contact Your Local Distributor For The 1970 Radio-Electronic MASTER

LOUISIANA

Alexandria—Ralph's, 601 N. 3rd St.
Baton Rouge—Ralph's, 1732 Plank Rd.
Southern Radio Supply Co., 2610 Scenic Hwy.
Gretna—EPCOR, 723 Franklin St.
Houma—Sterling Electrs., 252 Magnolia St.
Lafayette—Ralph's, 3004 Cameron St.
Lake Charles—Ralph's, 911 4th Ave.
Monroe—C. & O. Electrs., 201 So. Stanley Ave.
Morgan City—Ralph's, 715 Brashear St.
New Iberia—Ralph's, 1903 E. Main St.
New Orleans—Columbia Radio & Sup., 3940 3rd
EPCOR, 3308 Orleans Ave.
Radio Parts, Inc., 1112 Magazine St.
Southern Radio Supply, 1909 Tulane Ave.
Sterling Electrs., 537 S. Claiborne Ave.
Shreveport—
Industrial Elecr. Supply, 2422 Southern Ave.
Interstate Electric Co. of Shreveport, Inc., 1419 Culpepper St.
Koelemay Electronics, 2530 Linwood Ave.

MAINE

Auburn—Radio Supply Co., Inc., 26 Cross St.
Bangor—Radio Supply Co., Inc., 83 Farm Rd.
Portland—Commercial Distributors, 50 Diamond

MARYLAND

Aberdeen—Harco Electrs., Carsins Run, Rte. 22
Baltimore—A.S.I. Electr., Meadows Ind. Park—Whitehead & White Stone Rds.
Electronic Wholesalers, 3200 Wilkens Ave.
General Radio Electrs., 2314 E. Joppa Rd.
Kann-Ellert Electrs., 2050 Rockrose Ave.
Radio Elec. Serv. Co. of Baltimore, 1026 Cromwell Bridge Rd.
Radio Electric Service Co. of Pa., Whitehead & White Stone Rds., Meadows Ind. Park
A. R. Spartana Co., Inc., 239 No. Gay St.
Bethesda—Empire Electr. Sup., 4907 Rugby Ave.
Cumberland—
Allegheny Electrs., 1100 E. Oldtown Rd.
Gaithersburg—Electronic Wholesalers, Inc., 16021 Industrial Dr.
Hagerstown—Allegheny Electrs., 1301 Potomac
Stoddard Supply Co., 354 S. Cannon Ave.
Hyattsville—
Milgray/Washington, 5405 Lafayette Pl.
Rockville—Capitol Radio Wholesalers, Inc., 12272 Wilkins Ave.
Pioneer-Standard Washington, 1037 Taft St.
Silver Spring—Radio Electric Serv. Co. of Balto., 1316 Fenwick Lane

MASSACHUSETTS

Boston—
DeMambro Electrs., 1095 Commonwealth Ave.
Sager Electrical Supply Co., 172 High St.
Burlington—
Milgray/New England, 79 Terrace Hall Ave.
Cambridge—Harvey/R & D Electrs., 71 Pearl
Fitchburg—Radio Maintenance Supply Co., 1334 Water St.
Lawrence—Milo of New England, 3 Wolcott Ave.
Newton—Cramer Electronics Inc., 320 Needham St.
No. Wilbraham—Industrial Components Corp., 2551 Boston Road
Springfield—Del Padre Supply of Springfield, 999 Worthington St.
Watertown—
Q. P. L. Electr. Distrs., 75 N. Beacon St.
West Springfield—Eastco, 284 Bliss St.
Westwood—Eastco, 26 Dartmouth St., Westwood Industrial Park
Worcester—Radio Maintenance Supply Co., Inc., 80 Thomas St.

MICHIGAN

Detroit—Rissi Electr. Supply, 14405 Wyoming
Grand Rapids—
Radio Electr. Supply, 505 Jefferson Ave. S.E.
Jackson—Fulton Radio Supply, 1208 Greenwood
Kalamazoo—Radio Electr. Supply, 822 Mills St.
Lansing—Fulton Radio Supply, 2707 Alpha

MICHIGAN (cont'd.)

Marquette—
NWR Electrs. Corp., 1010 W. Washington
Traverse City—Radio Electr. Sup., 715 Beitner

MINNESOTA

Duluth—Northwest Radio, 123 E. 1st St.
Edina—Lew Bonn Co., 7275 Bush Lake Rd.
Minneapolis—Electronic Center, 107 3rd Ave. N
St. Paul—Electronic Center, 312 W. University

MISSISSIPPI

Columbus—Bluff City Dist. Co., 116 So. 22nd
Greenville—Bluff City Dist., 349 Hwy. #1 So.
Hattiesburg—Swan Electrs., 506 Bouie St.
Jackson—Swan Electrs., 342 N. Gallatin St.
Pascagoula—May Electr. Sup., 605-9 Ingalls
Tupelo—Bluff City Dist., 707 Robert E. Lee Dr.

MISSOURI

Joplin—Norman Electronic Supply, 402 Wall
Kansas City—Burstein-Applebee, 3199 Mercier
Manhattan Radio Equip., 7110 McGee St.
Norman Electr. Supply Co., 3814 Main
Radiolab, Inc., 3814 Main
St. Joseph—Acme Radio Supply, 820 So. 10th
St. Louis—Ebinger Electrs., 2501 So. Jefferson
Radonics-Electrs., 4445 Gustine Ave.
Van Sickle Radio-Electrs., 1915-17 Washington
Springfield—
Norman Electr. Supply, 952 E. Trafficway
Reed Radio & Supply, 805 Boonville Ave.
University City—Olive Industrial Electrs., Inc., 6662 Olive Blvd.

NEBRASKA

Lincoln—Leuck Radio Supply, 1024 "L" St.
Scott Electr. Supply, 4040 Adams St.
North Platte—Scott Electr. Sup., 516 N. Poplar
Omaha—J-B Distributing Co., 1616 Cass St.
Radio Equipment Co., 625 N. 18th St.

NEVADA

Las Vegas—Electronic Supply Co., 1112 South Casino Center Blvd.
Industrial Electronics, 300 W. Utah
Reno—EDCO, 720 Tahoe St.

NEW HAMPSHIRE

Manchester—RSL Distrs., 670 Chestnut St.

NEW JERSEY

Camden—General Radio Supply, 600 Penn St.
Radio Electric Service Co. of Pa., 211 Market St.
Clifton—Harvey Radio Co., 375 Allwood Road
Eatontown—Atkinson & Smith, 17 Lewis St.
Hackensack—NIDISCO Hackensack, 55 State St.
Jersey City—NIDISCO Jersey City, 713 Newark
Passaic—NIDISCO Passaic, 294 Passaic St.
Phillipsburg—Carl B. Williams, 465 So. Main
Ridgefield—NIDISCO Cliffside Pk., 484 Bergen
Springfield—Federated Electr., 155 U.S. Rte. 22
Trenton—NIDISCO Trenton, 985 Princeton
Union City—NIDISCO, 2812 Kennedy Blvd.

NEW MEXICO

Albuquerque—
Sterling Electronics, 1712 Lomas Blvd., N.E.
Walker Radio Co., 102 Granite Ave. N.W.
Roswell—R & R Electr. Supply, 605 E. Second

NEW YORK

Albany—E. E. Taylor Co., 465 Central Ave.
Batavia—Radio Equipment Corp., 5 Center St.

NEW YORK (cont'd.)

Binghamton—
Harvey/Federal Electrs. Inc., Vestal Parkway
Stack Indl. Electrs. Inc., 45 Washington St.
Brooklyn—Laco Indus. Electrs., 4924—4th Ave.
Buffalo—Genesee Radio & Parts, 2550 Delaware
Radio Equipment Corp., 196 Vulcan St.
Radio Equipment Corp., 3240 Sheridan Drive
Summit Distributors, Inc., 916 Main St.
Cheektowaga—Radio Equipt., 1532 Walden Ave.
Commack—Componitron Corp., 67 Harned Rd.
Elmsford—Melville Radio Corp., 1 Nepperhan
Farmingdale—Harrison Radio Co., 20 Smith St.
Flushing—Allen Electronics, Inc., 41-42 Main
Jamaica—Harrison Radio Co., 139-20 Hillside
Lafayette Radio Electrs., 165-08 Liberty Ave.
Norman Radio Distrs., 94-29 Merrick Blvd.
Long Island City—H. L. Dalis, 35-35 24th St.
Lynbrook—Peerless Radio Corp., 19 Wilbur St.
Mt. Vernon—QAR Industrial Electr. Sales Inc., 621 So. Columbus Ave.
New York—Blan Electrs. Corp., 52 Warren St.
Center Industr. Electrs., 15-17 E. 16th St.
Harrison Radio Co., 8 Barclay St.
Harvey Radio Co., 2 West 45th St.
Midway Industrial Electrs., 15 W. 45th St.
Midway Radio & Television, 58 W. 45th St.
Milgray/New York, 160 Varick St.
Milo Electronics Corp., 325 Hudson St.
Terminal-Hudson Electrs., 236 W. 17th St.
Terminal Radio Intern'l, Ltd., 3 W. 61st St.
Newburgh—Chief Electronics, 248 Washington
Niagara Falls—Radio Equipt. Corp., 1720 Pierce
Olean—Radio Equipt Corp., 1615 West State
Poughkeepsie—Chief Electrs., 14 N. Bridge St.
Richmond Hill—
Anchor Electronic Dist., 116-01 101st Ave.
Rochester—Goldcrest Electrs., 482 St. Paul St.
Masline Electrs., 511 Clinton Ave., South
Rochester Radio Supply, 140 W. Main St.
Syracuse—Morris Electronics of Syracuse, Inc., 1153 W. Fayette St.
Westbury—Adelphi Electrs., Jericho Turnpike
White Plains—Westchester Electronics, Inc., 610 Mamaroneck Ave.
Woodbury—Harvey Radio, 60 Crossways Pk. W.

NORTH CAROLINA

Asheville—Freck Radio & Supply Co., Inc., 38-40 Biltmore Ave.
Freck Radio & Supply, 1074 Patton
Charlotte—Dixie Radio Supply, 2220 So. Tryon
World Electronics, 1415 South Tryon
Durham—Southeastern Radio Sup., 401 Foster
Womack Electronics, 509 Ramseur St.
Fayetteville—Southeastern Radio Supply 325 Rowan St.
Gastonia—Dixie Radio Supply, 507 W. Airline
Greensboro—Southeastern Radio Supply 445 English St.
Hickory—Freck Radio & Sup., 1012 Hgwy. 64-70
Southeastern Radio Sup., 907 2nd Ave., N.W.
Jacksonville—
Southeastern Radio Sup., 1009 Lejeune Blvd.
Kinston—Southeastern Radio Supply 1005 E. Highland Ave.
Raleigh—Southeastern Radio Supply 414 Hillsborough St.
Salisbury—Southeastern Radio Supply 316 N. Depot St.
Shelby—Freck Radio & Sup., 402 W. Dixon Blvd.
Wilmington—Southeastern Radio Supply 520 N. Third St.
Wilson—Southeastern Radio Supply 321 S. Goldsboro St.
Winston-Salem—Electronic Whlsrs., 938 Burke
Southeastern Radio Supply, 200 S. Marshall St.

OHIO

Akron—Akron Electr. Sup., 107 S. Arlington St.
Sun Radio Co., 110 E. Market St.
Ashland—Servex Electr. Distr., 62 E. Main St.
Ashtabula—Sim's Electr. Sup., 5001 West Ave.
Barberton—
Akron Electr. Supply, 108 15th St., N.W.
Canton—Canton Electr., 126 12th St., N.W.
Cincinnati—
Mytronic Co,, 1843 N. Reading Rd (Reading)
United Radio, Summit Rd. & Reinhold Dr.

(Continued on next page)

Contact Your Local Distributor For The 1970 Radio-Electronic MASTER

OHIO (cont'd.)

Cleveland—Milgray/Cleveland, 1821 E. 40th St.
Pioneer-Standard Electronics, Inc.
5403 Prospect Ave.
Winteradio Electr. Sup., 1468 W. 25th St.
Columbus—SREPCO Electronics, 1045 Ridge St.
Whitehead Radio Co., 124 No. Grant Ave.
Dayton—SREPCO Electronics, 314 Leo St.
Stotts-Friedman Co., 108-112 N. Jefferson
Delaware—Servex Electr. Distr., 175 E. Winter
Hamilton—SREPCO Electrs., 4854 Factory Dr.
Lorain—Pioneer-Standard Electrs., 3847 Pearl
Mansfield—Servex Electr. Distr.,
775 Springmill Road
Marion—Servex Electr. Distr., 224 N. Prospect St.
Middletown—SREPCO Electrs., 2104 Brentwood
Mt. Vernon—Servex Electr. Distr., 516 S. Main St.
Newark—SREPCO Electronics, 138 Union St.
Parma—Winteradio Electr. Sup., 5373 Ridge Rd.
Piqua—SREPCO Electronics, R.R. #66
Sandusky—Pioneer-Standard Electrs., 317 Perry
Servex Electr. Distr., 534 Columbus
So. Euclid—
Winteradio Electr. Supply, 4432 Mayfield Rd.
Springfield—
Standard Radio-Springfield, 1300 St. Paris Rd.
Tiffin—Servex Electr. Distrib., 215 Jefferson
Warren—REM Electrs. Sup., 264 W. Market St.
Wooster—
Servex Electr. Distrib., 230 N. Buckeye St.

OKLAHOMA

Ada—Trice Wholesale Electrs., 231 N. Francis
Ardmore—Trice Wholesale Electrs., 709 Grand
Bartlesville—Cummins Electronic Supply Inc.
700 E. Frank Phillips Blvd.
Enid—Trice Wholesale Electrs., 223 E. Randolph
Lawton—Trice Wholesale Electrs., 30 "E" St.
McAlester—
McAlester Radio & TV Supply, 407 N. Main
Trice Wholesale Electronics, 529 No. Main
Muskogee—
Trice Wholesale Electronics, 211 Callahan
Oklahoma City—
Miller-Jackson Co., Inc., 121 E. California
Radio, Inc., 903 North Hudson
Trice Wholesale Electrs., 4701 N. Stiles
Trice Wholesale Electronics, 800 No. Hudson
Okmulgee—
Trice Wholesale Electronics, 120 N. Oklahoma
Ponca City—
Trice Wholesale Electrcs., 607 No. First St.
Tulsa—Radio, Inc., 1000 South Main St.
Trice Wholesale Electronics, 730 So. Utica

OREGON

Eugene—Central Distributors, 1035 Conger
Klamath Falls—RF Supply Co., 509 Commercial
Medford—Central Distributors, 605 N. Fir St.
Verl G. Walker Co., 205 W. Jackson St.
Portland—
Central Distributors, 955 N.E. Union Ave.
Lou Johnson Co., Inc., 2720 N.W. 29th Ave.
United Radio Supply, Inc., 123 N.E. 7th Ave.

PENNSYLVANIA

Allentown—A. A. Peters, Inc., 404 Union Blvd.
Radio Electric Service Co. of Lehigh Valley,
Inc., 425 Hanover Ave.
Altoona—Allegheny Electrcs., 1720-22 Union
Braddock—M. Leff Radio Parts, 225 Braddock
Carlisle—Cumberland Electrs., 810 No. Hanover
Drexel Hill—Kass Electronics Distributors,
2502 Township Line Rd.
Easton—Radio Elec. Serv. Co., 1700 Northampton
Erie—J. V. Duncombe Electr., 721 Parade St.
Mace Electronics, 2631 W. 8th St.
Greensburg—M. Leff Radio Parts, 401 S. Main
Harrisburg—Cumberland Electrs., 1345 So. 12th
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CHASE-SHAWMUT CO., 374 Merrimac St., Newburyport, Mass., 01950, Tel: 617-462-6662; Sls. Mgr: H.E. Pike....FSC No. 71424
CHASE & SONS, INC., 19 Highland Ave., Randolph, Mass., 02368, Tel: 617-963-2600; Sls. Mgr: L.P. Graham
CHASEBESTOS - insulation - Chase & Sons, Inc.
CHASEFLEX - insulation - Chase & Sons, Inc.
CHASEKOTE - tape - Chase & Sons, Inc.
CHASEMAT - insulation - Chase & Sons, Inc.
CHASSIS-TRAK, INC., 525 S. Webster Ave., Indianapolis, Ind., 46219, Tel: 317-359-5407; Sls. Mgr: L.M. Vaughn....FSC No. 06666
CHATHAM CONTROLS CORP., 33 River Rd., Chatham, N.J., 07928, Tel: 201-635-8892; Sls. Mgr: D.C. Perst....FSC No. 04814
CHATILLON JOHN & SONS, 83-30 Kew Gardens Rd., Kew Gardens, N.Y., 11415, Tel: 212-847-5000; Sls. Mgr: B. Wagner ....FSC No. 11710
CHECK-LINE - tension meters, tachometers - Electromatic Equip. Co.
CHECK-LITE - pilot light push button - Adalet Mfg. Co.
CHECKMASTER - refrigeration products - Mueller Brass Co.
CHECKMAT - cash register locks - Recora Co., Inc.
CHEER LITES - decorative lamp - Aerolux Light Co. Inc.
CHEK-IT - continuity checker - Workman Elctrn. Prods., Inc.
CHEM-GARD - flex-plug valves - Vanton Pump & Equip. Corp.
CHEM-GARD - strainers - Vanton Pump & Equip. Corp.
CHEM-GARD - centrifugal plastic pumps - Vanton Pump & Equip. Corp.
CHEM-GARD - gauge-gards - Vanton Pump & Equip. Corp.
CHEM-GARD - pump and filter systems - Vanton Pump & Equip. Corp.
CHEM-O-SEAL - can end sealing compound - Chemical Prods. Corp.
CHEM-O-SOL - p.v.c. dispersion-coating, gasketing - Chemical Prods. Corp.
CHEM-O-THANE - two-part polyurethane elastomer - Chemical Prods. Corp.
CHEMALLOY ELCTRNS. CORP., 7947 John Towers Ave., Gillespie Airport, Santee, Cal., 92071, Tel: 714-448-5715; Sls. Mgr: S. Freedman....FSC No. 05936
CHEMALYZER - analyzer - Milton Roy Co.
CHEMCOR - chemically strengthened glasses - Corning Glass Works
CHEMCUT CORP., 500 Science Pk., State College, Pa., 16801, Tel: 814-238-0514
CHEMELEC PRODS., INC., 8 Fellowship Rd., Cherry Hill, N.J., 08034, Tel: 609-424-1470; Pres: F.O. Dutton....FSC No. 73680
CHEMENGRAVE - photoetching - Miller Dial
CHEMETRON CORP., Aero Sys., 11 Penn St., El Segundo, Cal., 90245, Tel: 714-772-1421; Sls. Mgr: J.A. McBride....FSC No. 02217
CHEMFLOUR - products made of teflon - Chemplast, Inc.
CHEMFLUOR - prods. of TFE (teflon/halon) fluorocarbons - Chemplast, Inc.
CHEMGRIP - epoxy cement TFE bondable - Chemplast, Inc.
CHEMICAL & AEROSPACE PRODS., INC., 231 E. Lomita, Wilmington, Calif., 90744, Tel: 213-775-2581; Sls. Mgr: M. Borks
CHEMICAL COMMERCE, 123 Sussex Ave., Newark, N.J., 07103, Tel: 201-621-9652; Owner: R. Handel
CHEMICAL MICRO MILLING CO, Box 770, Camden, N.J., 08101
CHEMICAL PRODS. CORP., King Philip Rd., E. Providence, R.I., 02914, Tel: 401-434-1770, TWX: 401-438-2607; Pres: W.I. McGowan
CHEMINAX - coaxial cables - Raychem Corp.
CHEMLOY - bearing mat'l - Crane Packing Co.
CHEMOXIDE III - conversion coating for aluminum surfaces - Colonial Alloys Co.
CHEMPLAST, INC., 031-150 Dey Rd., Wayne, N.J., 07470, Tel: 201-696-4700, TWX: 710-988-5834; V.P. Sls: M. Powell, Jr.
CHEMPUTER - circular chemical computer - Coleman Instrs.
CHEMTRON - reed relays - Self-Organizing Sys., Inc.
CHEMTRONICS, INC., 1260 Ralph Ave., Brooklyn, N.Y., 11236, Tel: 212-NA-9-1300; Sls. Mgr: R.A. Cone
CHEMWARE - lab. ware TFE (teflon/halon) - Chemplast, Inc.
CHERRY - rivets - Cherry Rivet Div.

CHERRY ELECTRICAL PRODS. CORP., 1650 Old Deerfield Rd., Highland Pk., Ill., 60035, Tel: 312-831-2100; Sls. Mgr: D.W. Grady ....FSC No. 01963 .....Pgs. 2019-2022

Ala	Huntsville, Powertronics, Inc., Box 3384	205-852-6347
Cal	Palo Alto, Abbott Engrg. Co., 2450 El Camino Real	415-327-0830
Cal	Torrance, O'Donnell Assoc., Inc., 18053 Crenshaw Blvd.	213-323-9243
Colo	Broomfield, Arrowhead Sls. Corp., RR 1, Box 335	303-222-6462
Conn	Meriden, Electro-Prods. Sls. Co., 150 S. Broad St.	203-235-4040
Fla	Sarasota, Powertronics, Inc., Box 5702	813-924-5061
Ind	Ft. Wayne, Menze Sls., 6010 Lower Huntington Rd.	219-747-5616
Kans	Prairie Village, Thro Ind'l. Sls. Co., 2110 W. 75th St.	913-362-2533
Mass	Waltham, Electro-Prods. Sls. Co., Box 121	617-899-1570
Mich	Birmingham, McPhail Corp., 1100 N. Woodward	313-646-9976
Mich	Westland, Miltimore Sls., 34142 Fountain Dr.	313-261-8117
Minn	St. Paul, Cahill Assoc., 3000 Hudson Rd.	612-739-8445
Mo	St. Louis, Wells-White Co., 7607 Page Blvd.	314-726-2511
NJ	Ft. Lee, S. Justin Assocs., 1580 Lemoine Ave.	201-947-4371
NJ	Pitman, Colrud Co., 601 Ardmore Ave.	609-589-5866
NM	Albuquerque, Crown Engrg., 2125 San Mateo, N.E.	505-265-1020
NY	Rochester, W. Andres Sls., 39 Saginaw Dr.	716-244-2445
NC	Raleigh, Powertronics, 2454 Medway Dr.	919-834-6947
NC	Thomasville, Powertronics, Inc., Box 403	919-476-4257
Tex	Dallas, W. Reese Assoc., Box 24410	214-638-6575
Tex	Houston, W. Reese Assocs., Box 26247	713-621-3134
Utah	Salt Lake City, Arrowhead Sls. Corp., 49 W. Malvern	801-487-3444
Va	Lynchburg, Powertronics, 5633 White Oak Dr.	703-239-6085
Wash	Seattle, J. J. Backer Co., 221 W. Galer	206-283-6470
Wisc	Milwaukee, D. Herrick Co., 220 Sussex St.	414-691-2770
FOR:	Can., Oakville, Ont., H. Daymond Sls., Ltd., 262 Kerr St.	416-844-6721

CHERRY LOCK - rivets - Cherry Rivet Div.
CHERRY RIVET DIV., Townsend Co., P.O. Box 2157, Santa Ana, Calif., 92707, Tel: 714-545-5511, TWX: 910-595-1500; Sls. Mgr: D.J. Sauser....FSC No. 11815
CHESAPEAKE INSTR. CORP., Shadyside, Md., 20867, Tel: 301-867-2151; Mktg. Mgr: G.M. Larkin....FSC No. 00794

CHESTER CABLE CO., See Cities Service Co.
CHICAGO AERIAL IND., INC., See Bourns/CAI, Inc.
CHICAGO CONDENSER CORP., 3255 W. Armitage Ave., Chicago, Ill., 60647, Tel: 312-227-7070; Sls. Mgr: P. Philips....FSC No. 71436

CHICAGO DYNAMIC INDS., INC., Precision Prods. Div., 1725 W. Diversey Blvd., Chicago, Ill., 60614, Tel: 312-935-4600; Sls. Mgr: J.M. Early .....Pg. 2018

Cal	Burbank, Weightman & Assocs., 1226 W. Olive Ave.	213-VI-9-2435
Cal	Menlo Pk., Weightman & Assocs., 120 Santa Margarita	415-325-2885
Conn	Waterbury, Coakley, Boyd & Abbett, Inc., 6 Gaywood Dr.	203-756-8766
Fla	Orlando, W.R. Lehmann, Box 1224	305-422-9848
Ill	Chicago, Sumer, Inc., 5969 N. Elston Ave.	312-774-8989
Ill	Rolling Meadows, Sumer, Inc., 5105 Tollview Dr.	312-392-7370
Ind	Ft. Wayne, Sumer, Inc., 1430 Dividend Dr.	
La	New Orleans, Glidden Engrg. & Equip. Co., 319 Citrus Rd.	504-737-0642
Md	Timonium, J. Billis Sls. Co., 110 Gorsuch Rd.	301-CL-2-0779
Mass	Needham, Coakley, Boyd & Abbett, Inc., 141 Highland Ave.	DE 2-4800
Mich	Southfield, S. Sterling Co., 21250 10-1/2 Mile Rd.	313-357-3700
Minn	Minneapolis, M. Foster Co., 228 S. Cedar Lake Rd.	612-374-2612
NJ	Cherry Hill, J. Billis Sls. Co., 14 Galway La.	609-HA-8-3651
NJ	Wayne, S.A.M. Assocs., Inc., 18 Tilghman Dr.	201-684-7682
NY	Albany, Compar-Albany, 6 Highland Ave.	518-489-4777
NY	Jamaica, S.A.M. Assocs., Inc., 150-08 87th Ave.	212-OL-8-8881
NC	Greensboro, L & D, Inc., Box 7243	919-292-3201
Ohio	Cleveland, S. Sterling Co., 5827 Mayfield Rd.	216-HI-2-8080
Tex	Dallas, Glidden Engrg. & Equip. Co., 8609 N.W. Plaza Dr.	214-EM-3-6539
Tex	Houston, Glidden Engr. & Equip. Co., 7728 Long Pt. Rd.	713-681-1415
Tex	Houston, Glidden Engrg. & Equip. Co., 3802 Winchester	713-CA-4-6471
Wash	Seattle, R. Johnston Co., 1011 N.E. 69th St.	206-514-5170
Wash	Seattle, R. Merritt Co., 1320 Prospect St.	
EXP:	N.Y., Westbury, Minthorne Int'l. Co., 2200 Shames Dr.	212-895-3120
EXP:	NY, Woodside, Minthorne Int'l. Co., Inc., 64-14 Woodside Ave.	899-8888
FOR:	Can., Montreal, Quebec, Electrodesign, Ltd., 9124 St. Lawrence Blvd.	514-389-5914

CHICAGO LOCK CO., 4275 W. Belmont Ave., Chicago, Ill., 60641, Tel: 312-282-7177; Sls. Mgr: E.L. Lovelace .....Pg. 2023

NY	New Rochelle, 271 North Ave.	914-636-1311

CHICAGO MINIATURE LAMP WORKS, 4433 N. Ravenswood Ave., Chicago, Ill., 60640, Tel: 312-784-1020, TWX: 910-221-5445; Dir. of Mktg: A. Velasquez .....Pg. 1497

Ala	Huntsville, Cartwright & Bean, Inc., Box 5266	205-852-7670
Ariz	Phoenix, Howe & Howe Sls., Inc., 4109 N. 18th St.	602-264-7971
Cal	No. Hollywood, Chicago Miniature Lamp Co., 10213 Riverside Dr.	213-877-0158
Cal	San Francisco, Chicago Miniature Lamp Co., 115 New Montgomery St.	415-391-1098
Colo	Denver, Nelson Co., Inc., 1294 S. Bannock St.	303-733-5528
Conn	New Haven, Gerber Sls. Co., Inc., 29 Whalley Ave.	203-777-6279
Fla	No. Miami Bch., Cartwright & Bean, Inc., 20100 N.E. 25th Ct.	305-945-2962
Fla	Orlando, Cartwright & Bean, Inc., 601 N. Fern Creek Ave.	305-425-8284
Ga	Atlanta, Cartwright & Bean, Inc., 3223 Cains Hill Pl., N.W.	404-237-2273
Ill	Chicago, Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave.	312-784-1020
Ind	Ft. Wayne, B. F. Homsher Co., 418 E. Berry	219-432-1164
Iowa	Atlantic, Koenig-Myers Assocs., Inc., 300 Linn St.	712-243-5188
Kans	Shawnee Mission, Koenig-Myers Assocs., Inc., 5500 Buena Vista Dr.	913-432-8300

La Metairie, Cartwright & Bean, Inc., Box 73336 504-887-5225
Md Baltimore, Kaufholz Assocs., Box 6232 301-488-6561
Mass Waltham, Gerber Sls. Co., Inc., 176 Second Ave. 617-891-8040
Mich Dearborn, Villani-Pitcher, Inc., 20233 Ann Arbor Trail 313-271-4600
Minn Minneapolis, Wenco Sls., Inc., 7728 Morgan Ave., S. 612-866-3639
Mo Maryland Hgts., Koenig-Myers Assocs., Inc., 2721 Beloit Dr. 314-739-1655
NM Albuquerque, Nelson Co., Inc., Box 1884 505-299-0433
NY DeWitt, F. W. Taylor Co., Inc., 4455 E. Genesee St. 315-446-0422
NY Port Washington, TMA, Inc., Box 735 516-767-2432
NC Charlotte, Cartwright & Bean, Inc., 625 Harwyn Dr. 704-333-6457
Ohio New Bremen, T. Shelby & Co., 17 S. Walnut St. 419-629-6511
Pa Newtown Sq., Kaufholz Assocs., 6 St. Albans Ave. 215-356-5000
Tenn Memphis, Cartwright & Bean, Inc., 560 S. Cooper St. 901-276-4442
Tex Dallas, Techno Assocs., 2324 Shore Crest Dr. 214-357-9213
Utah Salt Lake City, Nelson Co., Inc., Box 1871 801-484-4504
Wash Seattle, J. J. Backer Co., 221 W. Galer St. 206-285-1300
EXP: Ill., Chicago, E. D. Magnus & Assoc., Inc., 5715 N. Lincoln Ave. 312-334-1503

CHICAGO RIVET & MACH. CO., 950 S. 25 Ave., Bellwood, Ill., 60104, Tel: 312-LI-4-5100, TWX: 312-547-7316; Sls. Mgr: W.O. Shineflug

CHICAGO SWITCH, INC., 2035 W. Wabansia Ave., Chicago, Ill., 60647, Tel: 312-489-5500; Sls. Mgr: M. Podgorski .....Pg. 2024
Ariz Phoenix, Southwest Engrg., Inc., 8341 N. 7th St. 602-944-1521
Cal Santa Clara, Ruby Sls. Corp., Box 487 408-243-1694
Cal Venice, Coplan Assocs., 4206A Glencoe Ave. 213-397-2166
Conn Guilford, Brookdale/Richter Engrg., Inc., 14 Hazel Rd. 617-244-6969
Fla Indian Rocks Bch., Tech-Rep. Assocs., Inc., Box 425 813-595-2834
Fla Melbourne, Tech-Rep. Assocs., Inc., Box 2095 305-723-9140
Ga Jonesboro, Tech-Rep. Assocs., Inc., Box 955 404-753-0111
Ind Indianapolis, Tech. Reps., Inc., 4000 Meadows Dr. 317-546-4967
Mass Newton Upper Falls, Brookdale/Richter Engrg., Inc., 1214 Chestnut St. 617-244-6969
Mich Southfield, J.L. Montgomery, Inc., 19400 W. Ten Mile Rd. 313-358-2616
Minn Minneapolis, Wenco Sls., Inc., 7728 Morgan Ave., S. 612-866-2101
NJ Riverton, Given Assocs., Box 183 609-829-7249
NJ Union City, Bressler Assocs., Inc., 4808 Bergenline Ave. 201-864-9577
NY New York, Bressler Assocs., Inc. 212-695-3727
NY Rochester, W.A. Franklin Sls. Corp., 179 Hillary 716-889-4849
NY Syracuse, W.A. Franklin Sls. Corp., 2 Standish Terr. 315-446-1120
NY Whitesboro, W.A. Franklin Sls. Corp., 42 Glenridge Rd. 315-736-5460
Ohio Dayton, A. H. Baier Co. & Assoc., 3300 S. Dixie Dr. 513-298-9897
Ohio Willoughby, A. H. Baier Co. & Assoc., 4399 Industrial Pkwy. 216-946-6080
Ore Beaverton, N. R. Schultz Co., Box 156 503-646-1345
Wash Bellevue, N. R. Schultz Co., 305-112th Ave., N.E. 206-GL-4-5224
FOR: Can., Scarborough, Ont., D. Randall, Ltd., 1710 Midland Ave. 416-751-7911

CHICOPEE MFG. CO., Cornelia, Ga., 30531, Tel: 404-778-2281, TWX: 404-778-4450; Gen'l. Mgr: W.J. Shortt

CHINALAK - varnishes - Dolph, John C. Co.
CHIP BLOCK - subminiature semiconductor packaging - ASC Microelectronics
CHO-BOND - conductive adhesives and caulks - Chomerics, Inc.
CHO-FOAM - emi/rfi shielding foam - Chomerics, Inc.
CHO-SEAL - emi/rfi shielding material - Chomerics, Inc.
CHO-SHRINK - conductive heat-shrinkable tubing - Chomerics, Inc.
CHO-SIL - emi/rfi shielding material - Chomerics, Inc.
CHO-WELT - emi/rfi strip gasket - Chomerics, Inc.

CHOMERICS, INC., 77 Dragon Ct., Woburn, Mass., 01801, Tel: 617-648-8650, TWX: 710-348-0446

CHP - ac torque motors - Hobbs Mfg. Co.

CHRISTEL CO., 20649 Londelius St., Canoga Pk., Cal., 91306, Tel: 213-346-8036; Sls. Mgr: W.B. Miller

CHRISTIAN PRECISION MFG. CO., INC., 12th & Federal Sts., Camden, N.J., 08102, Tel: 609-WO-3-3289; V.P. Sls: N. Weiner

CHRISTIE ELECTRIC CORP., 3404 A W. 67th St., Los Angeles, Cal., 90060, Tel: 213-750-1151, TWX: 910-321-3867; Sls. Mgr: F. Benjamin ....FSC No. 02294 .....Pgs. 1006,1007
Ala Huntsville, Ridge Instr. Co., 7220 Governors Dr., W. 205-837-1761
Ariz Phoenix, R.A. Mayes Co., 4747 N. 16th St. 602-279-5243
Cal Diablo, Thomas Assocs., Box 684 415-837-8411
Cal Los Angeles, Halbar Assocs., 3261 W. 4th St. 213-387-8283
Colo Denver, R.A. Mayes Co., Box 10486 303-466-6311
Fla Orlando, Ridge Instr. Co., 2227 Seely Dr. 305-293-4711
Ga Atlanta, Ridge Instr. Co., 3094 McCully Dr., N.E. 404-939-1554
Haw Honolulu, Victor Kim Elctrns., 623-25 South St. 507-132
Ill Chicago, K.W. Meyers Co., 7256 W. Touhy Ave. 312-774-6440
Ind Indianapolis, K.W. Meyers Co., 3512 Rockville Rd. 317-243-6681
Iowa Cedar Rapids, Engrg. Svcs. Co., 1026 Third Ave., S.E. 319-366-1591
Kans Prairie Village, Engrg. Svcs. Co., 7924-A State Line 913-649-4000
Md Silver Spring, L.G. White & Co., 1110 Fidler La. 301-585-3141
Mass Lexington, W.M. Hague Co., 10 Muzzey St. 617-862-5700
Mich Farmington, Carter, McCormic & Pierce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
Mo St. Louis, Engrg. Svcs. Co., 6717 Vernon Ave. 314-726-2233
NJ Ridgewood, Instr. Sls. Co., Box 403 201-445-5210
NM Albuquerque, R.A. Mayes Co., 8016 Zuni Rd., S.E. 505-265-7989
NY Clarence, Rep. Tech., Inc., Box 156 716-684-6250
NY Syracuse, Rep. Tech., Inc., Box 98 315-454-0761
NY Vestal, Rep. Tech., Inc., 1905 Vestal Rd. 607-785-5979
NC Winston-Salem, L.G. White & Co., Box 2356 919-725-3612
Ohio Cleveland, Carter, McCormic & Pierce, Inc., 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Pierce, Inc., Box 1472 513-278-5873
Pa Narberth, L.G. White-Keystone Co., 100 Essex Ave. 215-664-6505
Pa Pittsburgh, Carter, McCormic & Pierce, Inc., 201 Penn Ctr. Blvd. 412-824-3760
Tenn Oak Ridge, Ridge Instr. Co., 140 E. Division Rd. 615-483-1311
Tex Richardson, C. Tinch Sls. Co., First Bank & Trust Bldg. 214-231-1322
Va Arlington, Gans-Fryling, Inc., 2030 - 16th St., N. 703-527-3262
Wash Bellevue, A. Smith Co., 405 - 166 S.E. 206-746-6770
Wisc Milwaukee, K. W. Meyers Co., 4359 S. Howell Ave. 414-482-1313
EXP: Cal., Los Angeles, Trans-World Trade, 11973 San Vicente Blvd. 213-472-0444

CHROMAFIX - television synchronization-color - Tracor, Inc.
CHROMALOX - electric heaters - Wiegand, Edwin L. Co.
CHROMATO-VUE - portable u-v darkroom - Ultra-Violet Prods., Inc.
CHROMEL - thermocouple and electrical resistance alloys - Hoskins Mfg. Co.
CHROMETEX - for nickel activation agents - Mac Dermid, Inc.
CHROMICOAT - coating - Oakite Prods., Inc.

CHRONETICS, INC., 500 Nuber Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-4400, TWX: 710-560-0014; Sls. Mgr: T. Berg ....FSC No. 15072 .....Pg. 629
Ala Huntsville, Brennan Assocs., Box 1074 205-536-7425
Ariz Phoenix, Barnhill Assocs., 537 E. Osborn Rd. 602-263-1250
Cal Hawthorne, Chronetics, Inc., 13724 Prairie Ave. 213-675-0331
Cal Inglewood, Meas. Assocs., 219 W. Manchester Blvd. 213-671-7651
Cal Sunnyvale, Meas. Assocs., 789 E. El Camino Real 408-739-7785
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Conn Hamden, J & J Assocs., 965 Dixwell Ave. 203-624-7800
Fla Clearwater, Brennan Assocs., Inc., Box 5006 813-446-5006
Fla Orlando, Brennan Assocs., Box 13026 305-425-8161
Ill Chicago, L.F. Green & Assocs., 5218 W. Diversey Ave. 312-286-6824
Ind Indianapolis, L.F. Green & Assocs., 1111 E. 54th St. 317-253-2087
Md Silver Spring, Q.E.D. Elctrns., Inc., 880 Bonifant St. 301-JU-8-8134
Mass Burlington, J & J Assocs., 12 Cambridge St. 617-899-0160
Minn Minneapolis, L.F. Green & Assocs., 6225 University Ave. 612-781-1611
NJ Camden, Q.E.D. Elctrns., Inc., 2916 Federal St. 215-WA-5-8711
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY Mt. Vernon, Q.E.D. Elctrns., Inc., 500 Nuber Ave. 914-664-0080
Tex Houston, Barnhill Assocs., 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Assocs., 312 N. Central Expwy. 214-231-2573
Utah Salt Lake City, Barnhill Assocs., 2459 S. Main St. 801-487-1327
Wash Seattle, H. Levinson Co., 1211 E. Denny Way 206-EA-3-5100
Wisc Waukesha, L.F. Green & Assoc., 830 Plateau 414-786-2180

CHRONISTOR - elapsed time indicators - Bergen Labs., Inc.

CHRONO-LOG CORP., 2583 W. Chester Pike, Broomall, Pa., 19008, Tel: 215-EL-6-6771; Sls. Mgr: A. Frellich....FSC No. 11963 Pg. 548
Ala Huntsville, Reynolds & Assoc., 904 Bob Wallace Ave., S.W. 205-536-1941
Ariz Phoenix, R.A. Mayes Co., 4747 N. 16th St. 602-279-5243
Cal Los Angeles, Thorson Co., 6824 Melrose Ave. 213-WE-7-0790
Cal Palo Alto, Thorson Co., 2443 Ash St. 415-DA-1-2414
Cal San Diego, Thorson Co., 444 Olive St. 714-CY-8-8385
Cal Tustin, Thorson Co., 17461 Irvine Blvd. 714-544-5121
Colo Denver, R. A. Mayes Co., Box 10486 303-466-6311
Fla Eau Gallie, Reynolds & Assocs., Box 1043 305-727-3205
Fla Ft. Lauderdale, Reynolds & Assocs., 161 S.W. 75th St. 305-581-6611
Fla Orlando, Reynolds & Assocs., Box 8877 305-424-3836
Ga Atlanta, Reynolds & Assoc., 175 W. Wieuca Rd. 404-252-5360
Ill Chicago, Berndt Assocs., Inc., 6200 N. Hiawatha Ave. 312-283-0713
Ind Ft. Wayne, Berndt Assocs., Inc., 605 Ft. Wayne Bank Bldg. 219-743-1844
Mass Needham, Wild & Assocs., 570 Hillside Ave. 617-HI-4-2366
Mich Ypsilanti, Ohio Instr. Co., 8928 Nottingham Dr. 313-484-0585
Minn St. Paul, De Beck Assoc., 2119 Grand Ave. 612-690-1557
NJ E. Brunswick, J. J. Wild, Inc., Box 152 201-238-0055
NM Albuquerque, R.A. Mayes Co., 8016 Zuni Rd. 505-265-7989
NY Hastings on Hudson, Wild & Assocs., Box 266 914-963-3803
NY Jericho, J. J. Wild, Inc., 400 Jericho Tpke. 516-WA-1-7100
Ohio Worthington, Ohio Instr. Co., 505 Whitney Ave. 313-484-0585
Pa Southampton, Wild & Assocs., 80 Second St. Pike 215-EL-7-6645
Tex Richardson, R. A. Mayes Co., Box 1021 214-235-3043
Va Arlington, H.J. Heffernan Co., 1123 N. Irving St. 703-JA-2-6666
Wash Seattle, Thorson Co., 909 N.E. 43rd St. 206-ME-2-0710
FOR: Can., Don Mills, Ont., York Instrs., 1262 Don Mills Rd. 416-445-1255

CHRONO-LOK - modems & keyers - Western Telematic, Inc.
CHRONO-SPRAY DE-FROST-IT - time control - Paragon Elec. Co., Inc.
CHRONODYNE - resonator - Armec Corp.

CHU ASSOCS., INC., P.O. Box 387, Whitcomb Ave., Littleton, Mass., 01460, Tel: 617-456-3282; Sls. Mgr: I.M. Faigen

CICOIL CORP., 9324 Topanga Canyon Blvd., Chatsworth, Cal., 91311, Tel: 213-882-2021, TWX: 910-494-1921; Sls. Mgr: W. Kish

CIMASTRA DIV., Cincinnati Milling Machine Co., 4760 Marburg Ave., Cincinnati, Ohio, 45209, Tel: 513-731-2121; Sls. Mgr: R.L. Voyles

CIMCO WIRE & CABLE CO., 250 W. Crescent Ave., Allendale, N.J., 07401, Tel: 201-DA-7-2522; Pres: W.J. Indoe .....Pg. 2920
Cal Hawthorne, Falmat, Inc., 13666 Hawthorne Blvd.
Fla Orlando, E.C.A. Assocs., 2213 Merritt Pk. Dr.
Ill Chicago, Kennedy Engrg., 6713 N. Oliphant Ave.
Mass Weston, F.C. Talbot Co., Box 366
Mich Birmingham, Component/Insulation Corp., 610 N. Woodward Ave.
Minn St. Paul, E. Hoffman Co., 180 N. Snelling Ave.
NJ Haddonfield, Keefe Elctrn. Sls. Co., 15 S. Haddon Ave.
NJ Montclair, E.B. Hinck, Box 201 201-716-2625
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Minn Minneapolis, R.W. Marshall Co., 6106 Excelsior Blvd. 612-929-0457
Mo Hazelwood, Poly-Onics, Inc., 47 Village Sq. Shopping Ctr. 314-837-0597
NJ Cherry Hill, CTS Corp., Box 322 609-424-1207
NJ Metuchen, B.G. Beck, 375 Plainfield Rd. 201-LI-8-0610
NM Albuquerque, Elctrn. Comp. Sls., Inc., 3119 Graceland, N.E. 505-243-8378
NY Jamica, S-J Sls. Assocs., Inc., 148-05 Archer Ave. 212-AX-1-3232
NY Rhinebeck, CTS Corp., Box 386 914-876-6717
NC Skyland, CTS of Asheville, Inc., Mills Gap Rd. 704-684-6451
Ohio Cincinnati, Baehr, Greenleaf & Assocs., 9505 Montgomery Rd. 891-3827
Ohio Cleveland, Baehr, Greenleaf & Assocs., 14700 Detroit Ave. 216-221-9030
Ohio Xenia, Baehr, Greenleaf & Assocs., 3350 Maplewood Dr. 513-426-5485
Ore Portland, R. Legg Co., Box 25327 503-292-8824
Pa Pittsburgh, Covert & Newman, 300 Mt. Lebanon Blvd.
Tex Addison, Parvin Sls. Co., Box 307 214-363-6822
Utah Salt Lake City, Elctrn. Comp. Sls., Inc., Box 2066 801-262-3700

CTS CORP, 905 N. West Blvd., Elkhart, Ind., 46514, Tel: 219-293-7511, TWX: 810-294-2256; Sls. Mgr: R.A. Stackhouse Pgs. 1600,2014,2700,2796,2797

Ala Huntsville, Holcombe Sls. Agency, Inc., Box 1343 205-881-6708
Ariz Phoenix, Hecht, Henschen & Assoc., Inc., 2435 E. University Dr. 602-275-4411
Cal Burlingame, J. Logan & Assocs., 801-D Mahler Road 415-697-6100
Cal S. Pasadena, CTS Electronics, Inc., 1010 Sycamore Ave. 213-254-9141
Cal San Diego, A.D. Electronics, 7969 Engineer Road 714-278-9260
Colo Denver, Elctrn. Comps. Sls., Inc., Box 22011 303-771-6200
Conn North Haven, CompRep Assocs., Inc., 22 Broadway 203-239-9762
Fla Lauderhill, Orbe, Inc., 4431 N. W. 13th Ct. 305-584-4749
Fla Orlando, Orbe, Inc., 1221 N. Orange Ave. 305-425-9004
Fla St. Petersburg, Orbe, Inc., 4110 Central Ave. 813-894-0687
Ill Sandwich, CTS Knights, Inc., 101 E. Church St. 815-786-8411
Ind Elkhart, CTS Corp., 905 N. West Blvd. 219-293-7511
Ind Ft. Wayne, Tri-State Mktg., Inc., 3220 Broadway 219-465-3567
Kans Leawood, Poly-Onics, Inc., 4434 W. 90th Terr. 913-648-4173
Mass Needham, CompRep Assocs., Inc., 1116 Great Plain Ave. 617-444-2484
Mich Southfield, J. L. Montgomery, Inc., 19400 W. Ten Mile Rd. 313-358-2616
Minn Minneapolis, R.W. Marshall Co., 6106 Excelsior Blvd. 612-929-0457
Mo Hazelwood, Poly-Onics, Inc., 47 Village Sq. Shopping Ctr. 314-837-0597
NJ Cherry Hill, CTS Corporation, Box 322 609-424-1207
NM Albuquerque, Elctrn. Comp. Sls., 1811 Carlisle, N.E. 505-256-9831
NY Jamaica, S-J Sls. Assocs., Inc., 148-05 Archer Ave. 212-291-3232
NY Rhineback, CTS Corporation, Box 386 914-876-6717
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
NC Skyland, CTS of Asheville, Mills Gap Road 704-684-6451
Ohio Cincinnati, Baehr, Greenleaf & Assoc., 9505 Montgomery Rd. 513-891-3827
Ohio Cincinnati, Tri-State Mktg., Inc., 1717 Section Rd. 513-631-5060
Ohio Cleveland, Baehr, Greenleaf & Assoc., 14700 Detroit Ave. 216-221-9030
Ohio Cleveland, Tri-State Mktg., Inc., 25000 Euclid Ave. 216-731-9207
Ohio Columbus, Baehr, Greenleaf & Assoc., Box 5722 614-486-4046
Ohio Xenia, Baehr, Greenleaf & Assoc., 3350 Maplewood Dr. 513-426-5485
Ore Portland, Richard Legg Co., Box 25327 503-292-8824
Pa Pittsburgh, Covert & Newman Co., 300 Mt. Lebanon Blvd. 412-563-0303
Tex Addison, Parvin Sales Co., Box 307 214-239-9148
Utah Salt Lake City, Elctrn. Comp. Sls., 445 E. 2nd, S. 801-355-5327
FOR: Can., Streetsville, Ont., CTS Of Can., Ltd., 80 Thomas St. 416-826-1141

CTS ELCTRNS., INC., 1010 Sycamore Ave., S. Pasadena, Calif., 91030, Tel: 213-254-9141, TWX: 910-321-4060; Sls. Mgr: J.F. Bell ....FSC No. 11237 .....Pgs. 2014,2796,2797

Ala Huntsville, Holcombe Sls. Agency, Box 1343 205-881-6708
Ariz Phoenix, Hecht, Henschen & Assoc., Box 21166 602-275-4411
Cal Burlingame, J. Logan & Assocs., 801 Mahler Rd. 415-697-6100
Cal San Diego, AD Elctrns., 7969 Engineer Rd. 714-278-9260
Colo Denver, Elctrn. Comp. Sls., Box 22011 303-771-6200
Conn North Haven, CompRep Assocs., Inc., 14 Bowling Green Ave. 203-239-9762
Fla Lauderhill, Orbe, Inc., 4431 N.W. 13th Ct. 305-584-4749
Fla Orlando, Orbe, Inc., 1221 N. Orange Ave. 305-425-9004
Fal St. Petersburg, Orbe, Inc., 4110 Central Ave. 813-894-0687
Kans Leawood, Poly-Onics, 4434 W. 90th Terr. 913-648-4173
Mass Needham, CompRep Assocs., Inc., 1116 Gr. Plain Ave. 617-444-2484
Mich Southfield, J. L. Montgomery, Inc., 24001 Southfield Rd. 313-358-2616
Minn Minneapolis, R.W. Marshall Co., 6106 Excelsior Blvd. 612-929-0457
Mo Hazelwood, Poly-Onics, Inc., 47 Vill. Sq. Shop. Ctr. 314-837-0597
NJ Cherry Hill, CTS Corp., Box 322 609-424-1207
NM Albuquerque, Elctrn. Comp. Sls., 1811 Carlisle, N.E. 505-256-9831
NY Jamaica, S-J Sales Assocs., Inc., 148-05 Archer Ave. 212-291-3232
NY Rhinebeck, CTS Corp., Box 386 914-876-6717
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
Ohio Cleveland, Baehr, Greenleaf & Assoc., 14700 Detroit Ave. 216-221-9030
Ohio Upper Arlington, Baehr, Greenleaf & Assoc., Box 5722 614-486-4046
Ohio Xenia, Baehr, Greenleaf & Assoc., 3350 Maplewood Dr. 513-426-5485
Ore Portland, R. Legg Co., Box 25327 503-292-8824
Pa Pittsburgh, Covert & Newman Co., 300 Mt. Lebanon Blvd. 412-563-0303
Tex Addison, Parvin Sls. Co., Addison Rd. 214-239-8886
Utah Salt Lake City, Elctrn. Comp. Sls.

CTS KNIGHTS, INC., 400 Reimann St., Sandwich, Illinois, 60548, Tel: 815-786-8411, TWX: 910-642-0860; Sls. Mgr: M.E. Hinkle ....FSC No. 75378 .....Pg. 1431

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Cal S. Pasadena, CTS Electronics, Inc., 1010 Sycamore Ave. 213-254-9141
Cal San Diego, A.D. Electronics, 7969 Engineer Rd. 714-278-9260
Colo Denver, Elcom Sales, Inc., Box 22011 303-771-6200
Conn Glastonbury, C.K. Barton Assoc., 343 New London Tpke. 203-633-9417
Conn No. Haven, Comp. Rep. Assoc., Inc., 22 Broadway 203-239-9762
Fla Ft. Lauderdale, 4150 S.W. 23rd St. 305-584-0650
FLa Lauderhill, Orbe, Inc., 4431 N.W. 13th St. 305-584-4749
Fla Orlando, Orbe, Inc., 1221 N. Orange Ave. 305-425-9004
Fla St. Petersburg, Orbe, Inc., 4110 Central Ave. 813-894-0687
Ga Marietta, NBS, Inc., 893 Church St., N.W. 404-422-6067
Ill Sandwich, CTS Knights, Inc., 101 E. Church St. 815-786-8411
Ind Elkhart, CTS Corp., 905 N. West Blvd. 219-293-7511
Kans Leawood, Poly-Onics, Inc., 4434 W. 90th Terr. 913-648-4173
Mass Needham, Comp. Rep. Assoc., Inc., 1116 Great Plain Ave. 617-444-2484
Mich Southfield, J.L. Montgomery, Inc., 19400 W. Ten Mile Rd. 313-358-2616
Minn Minneapolis, J. Lee Co., 4241 Toledo Ave., S. 612-920-1525
Mo Hazelwood, Poly-Onics, Inc., 47 Village Sq. Shopping Ctr. 314-837-0597
Mo Raytown, R.R. Burton Sls. Co., 9915 E. 63rd St. 816-358-5370
Mo St. Louis, R.R. Burton Sls. Co., 10414 Oak Ave. 314-429-7327
NJ Cherry Hill, CTS Corp., Box 322 609-424-1207
NJ Springfield, F.F. Sylvester Assoc., Box 207 201-376-3324
NM Albuquerque, Elcom Sales Inc., 209 San Pablo S.E. 505-256-3663
NM Albuquerque, Elctrn. Comp. Sls., Inc., 1811 Carlisle, N.E. 505-256-9831
NY Great Neck, F.F. Sylvester Assoc., 260 Northern Blvd. 212-539-6011
NY Rhinebeck, CTS Corporation, Box 386 914-876-6717
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
NC Skyland, CTS of Asheville, Mills Gap Rd. 704-684-6451
Ohio Cincinnati, Sheridan Assoc., Inc., 10 Knollcrest Dr. 513-761-5432
Ohio Cleveland, Sheridan Assoc., Inc., Box 8226 216-237-9145
Ohio Dayton, Sheridan Assoc., Inc., Box 37, Riverdale Sta. 513-277-8911
Ore Portland, R. Legg Co., Inc., 4475 S.W. Scholls Ferry Rd. 503-292-8824
Pa Pittsburgh, Sheridan Assoc., Inc., 201 Penn Ctr. Blvd. 412-243-6655
Tex Addison, Parvin Sales, Box 307 214-239-9148
Utah Salt Lake City, Elctrn. Comps. Sls., Inc., 445 E. 2nd, S. 801-355-5327
EXP: Ill, Sandwich, CTS Knights, Inc.
FOR: Can., Streetsville, Ont., CTS Canada, Ltd., 80 Thomas St. 416-TA-6-1141

CTS MICRO ELCTRNS., INC., Box 1278, Lafayette, Ind., 47902, Tel: 317-463-2565, TWX: 810-342-1880 .....Pgs. 1600,2700,2796

CU-SIL - high temperature p.c.b. - Conductorlab, Inc.
CUAL-AID - inhibitor - Teledyne Penn-Union Elec.
CUBIC CORP., 9233 Balboa Ave., San Diego, Cal., 92123, Tel: 714-277-6780, TWX: 714-279-0267; Mktg. Mgr: T. Grady ....FSC No. 94987
CUBOND - copper brazing paste - Glidden-Durkee Div.
CUE-SWITCH - conbination switch and rear-projection readout - Industrial Elctrn. Engrs., Inc.
CUFLEX - semi-rigid cable - Phelps Dodge Comm. Co.
CULVER STEARNS MFG. CO., Sub. Roanwell Corp., 354 Franklin St., Worcester, Mass., 01604, Tel: 617-753-6304; Sls. Mgr: F. H. Malboeuf....FSC No. 72390
CUNIP - copper-nickel-phospherous alloy - Handy & Harman

CUNNINGHAM CORP., Sub. Gleason Works, 10 Carriage St., Honeoye Falls, N.Y., 14472, Tel: 716-624-2000, TWX: 510-254-4202; Sls. Mgr: R.T. Means....FSC No. 71775 .....Pgs. 2030,2031

Ala Huntsville, Gentry Assocs., 2109 W. Clinton Ave. 205-534-9771
Ariz Phoenix, T. L. Snitzer Co., 15 N. 40th Pl. 602-273-1673
Cal Del Mar, T. L. Snitzer Co., 1150 Camino del Mar 714-454-2191
Cal Los Angeles, T. L. Snitzer Co., 9005 Exposition Blvd. 213-836-6170
Cal Cupertino, T. L. Snitzer Co., 10320 Saratoga-Sunnyvale 408-257-8333
Colo Denver, J.F. Hurlbut Co., 1295 S. Bannock St. 303-744-1451
Conn Hamden, Instr. Consits., Inc., 2381 Whitney Ave. 203-248-4174
Fla Orlando, Gentry Assocs., Inc., 550 N. Bumby Ave. 305-841-7740
Ga Atlanta, Gentry Assocs., Inc., Box 13513, Sta. K 404-233-3816
Ill Chicago, Scientific Sls. Corp., 7132 N. Harlem Ave. 312-775-7594
Ind Indianapolis, Scientific Sls. Corp., 5555 N. Tacoma Ave. 317-253-4606
Md Bethesda, Bartlett Assocs., Inc., 4405 East-West Hwy. 301-656-3061
Mass Waban, Instrument Consits., Inc., Box 25 617-969-9881
Mich Southfield, S. Sterling Co., 21250 10 1/2 Mile Rd. 313-357-3700
Minn Minneapolis, Scientific Sls. Corp., 5100 Edina Ind'l. Blvd. 612-941-2215
Mo St. Louis, Scientific Sls. Corp., 1760 S. Brentwood Blvd. 314-968-1133
NM Albuquerque, C. Schmidt Sls., 9611 Acoma Rd., S.E. 505-298-2415
NY Endicott, Tech-Mark, Inc., Professional Bldg. 607-748-7473
NY Fairport, Tech-Mark, Inc., 19 Valley Brook Dr. 716-377-5531
NY New Hartford, Tech-Mark, Inc., Box 296 315-732-1602
NY White Plains, Bartlett Assocs., Inc., 470 Mamaroneck Ave. 914-949-6476
NC Burlington, Gentry Assocs., Inc., 116 E. O'Neal Ave. 919-227-2581

Ohio Cleveland, S. Sterling Co., 5827 Mayfield Rd. 216-442-8080
Ohio Dayton, S. Sterling Co., 2673 Culver Ave. 513-298-7573
Pa Pittsburgh, S. Sterling Co., 2 Parkway Ctr. 412-922-5720
Pa Wayne, Bartlett Assocs., Inc., 130 W. Lancaster Ave. 215-688-7325
Tex Houston, Scientific Sls. Corp., 6400 Westpark Dr. 713-781-2711
Tex Richardson, Scientific Sls. Co., 777 S. Central Expwy. 214-231-6541
Utah Granger, J.F. Hurlbut Co., 3817 W. 3280 S. 801-299-4321
Wash Seattle, Paratech, Box 5427 206-784-6447
FOR: Can., Toronto, Ont., Simtec Inds., Ltd., Box 38, Sta. "O" 416-425-6118
FOR: Can., Montreal, Que., Simtec Inds., Ltd., 3400 Metropolitan Blvd., E. 514-728-4527

CUPAC - silicon rectifier - Semtech Corp.
CUPOSIT - metal deposition chemicals - Shipley Co., Inc.
CUPROX - analytical reagent - Coleman Instrs.
CURRISTORS - current sensing resistor - General Resistance
CURTAIN OF LIGHT - power press guard - Electronic Control Corp.

CURTIS DEV. & MFG. CO., 3278 N. 33rd St., Milwaukee, Wisc., 53216, Tel: 414-445-1817, TWX: 910-262-3125; Sls. Mgr: R.A. Larsen Pg. 2438

Cal Inglewood, V & L Assocs., 3412 W. Century Blvd. 213-671-7688
Cal Los Altos, Ewing-Foley, Inc., 900 N. San Antonio Rd. 415-941-4525
Colo Denver, Nelson Co., Inc., 1294 S. Bannock 303-733-5528
Fla Orlando, Buchanan & Abrams Assoc., Inc., 1512 E. Concord Ave. 305-423-8995
Haw Honolulu, Dougherty Enterprises, 1164 Waimanu St.
Ill, Downers Grove, Richmar Elctrn. Comps., 915 Burlington Ave. 312-968-0118
Ill Moline, J. Otis & Assocs., 3526 28th Ave. 309-762-3276
Ind Ft. Wayne, Val-Skol Sls., Inc., 2005 Franklin Ave. 219-742-9122
Ind Indianapolis, Val-Skol Sls., Inc., 3556 Luewan Dr. 317-926-5063
Md Lutherville-Timonium, Naudain Assocs., Box One 301-252-5378
Mass Boston, Elec. Apparatus Co., Inc., 1200 Soldiers Field Rd. 617-782-7440
Mich Detroit, Hilltronics, Inc., 13720 Puritan Ave. 313-342-3242
Minn St. Paul, Mesa Co., 1821 University Ave. 612-645-8676
Mo Kansas City, E.J. McCaffrey, 505 Delaware 816-842-4640
NY Great Neck, Cooper-Simon & Co., Inc., 38 Middle Neck Rd. 516-487-1142
NY Red Hook, Ossmann Comp. Sls. Corp., 77 Kelly Rd. 914-758-6464
NY Rochester, Ossmann Comp. Sls. Corp., 39 Saginaw Dr. 716-442-3290
NY Syracuse, Ossmann Comp. Sls. Corp., 132 Pickard Bldg. 315-454-4477
NY Vestal, Ossmann Comp. Sls. Corp., 1901 Vestal Pkwy., E. 607-785-9949
NC Winston-Salem, L. G. White & Co., Inc., Box 2356 919-725-3612
Ohio Cleveland Hgts., Val-Skol Sls., Inc., 12417 Cedar Rd. 216-462-2822
Ohio Cincinnati, Val-Skol Sls., Inc., 10515 Margate Terr. 513-563-6790
Ohio Columbus, Val-Skol Sls., Inc., Box 13088 614-878-7212
Okla Tulsa, T. J. Ray Co., Box 45191 918-627-1515
Pa Philadelphia, Naudain Assocs., 1023 Suburban Sta. Bldg. 215-564-3194
Pa Pittsburgh, R.F. Clark Co., 10517 Lindberg Ave. 412-242-9500
Tex Dallas, R. F. Kimball Co., 5531 Dyer St. 214-363-5431
Wash Seattle, C. B. Parsons & Co., 5319 Fourth Ave., S. 206-762-7373
Wisc Milwaukee, Curtis Dev. & Mfg. Co., 3266 N. 33rd St. 414-445-1817
FOR: Can., Willowdale, Ont., A. C. Simmonds & Sons, Ltd., 285 Yorkland Blvd. 416-491-1010

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CURTIS INSTRS., INC., 200 Kisco Ave., Mt. Kisco, N.Y., 10549, Tel: 914-666-2971, TWX: 710-571-2163; Sls. Mgr: E.M. Marwell ....FSC No. 18583 ....Pg. 638

Cal Los Altos, Richards Assocs., 900 N. San Antonio Rd. 415-941-3226
Cal Los Angeles, Cairns Engrg. Sls. Co., 6151 W. Century Blvd. 213-670-1700
Colo Littleton, 1449 W. Littleton Blvd., 303-798-4573 ury Blvd.
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
Md Silver Spring, Aeron Assocs., 1110 Fidler La. 301-588-4047
Mass Brookline, Harman Assocs., 251 Harvard St. 617-232-6687
Minn Minneapolis, E.C. Elctrn. Sls., 10108 Abbott Ave., S. 218-888-0102
Mo Kansas City, Kay Sls. Co., 2600 Grand 816-221-2733
NM Albuquerque, Aztec Enterprises, 3202 Candelaria Rd., N.E. 505-345-3441
NY Greenvale, B. D. Aaron, Inc. 516-621-0630
NY Syracuse, Rep. Tech., Inc., Pickard Bldg. 315-454-0761
Pa Media, W. Reeves Assocs., Inc., 2973 N. Providence Rd. 215-LO-6-6709
Tex Dallas, Techno Assocs., 2324 Shore Crest Rd. 214-FL-7-9213
Wash Seattle, J.J. Backer Co., 221 W. Galer 206-285-1300
Wisc Waukesha, Midwest Elctrn. Sls., 1317 Garfield Ave. 414-542-5129

CURTISS-WRIGHT CORP., Electronics Div., 35 Market St., E. Paterson, N.J., 07407, Tel: 201-777-2900....FSC No. 94197
CURVAC - fittings & connectors - Ultek Div.
CURVE-BACK - bar clamps and terminal lugs - Teledyne Penn-Union Elec.
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CUSHMAN ELCTRNS., INC., 166 San Lazaro Ave., Sunnyvale, Calif., 94086, Tel: 408-739-6760; Sls. Mgr: H.D. Anderson
CUSIL - brazing alloys - Western Gold & Platinum Co.
CUSTOM - converters and dynamotors - Carter Motor Co.
CUSTOM COIL CO., Box 2624, Zanesville, Ohio, 43701, Tel: 614-452-6973; Sls. Mgr: D. Young
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CUSTOM MATERIALS, INC., Alpha Ind'l. Pk., Chelmsford, Mass., 01824, Tel: 617-729-5020, TWX: 617-256-6686; Sls. Mgr. J.E. Leard
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CUTLER-HAMMER, INC., 4201 North 27th St., Milwaukee, Wisc., 53201, Tel: 414-442-7800, TWX: 414-273-4327; Sls. Mgr: W.G. Cudlip ....FSC No. 15605 ....Pg. 2029

Ala Birmingham, Cutler-Hammer, Inc., 15 Office Pk. Cir. 205-871-1166
Ala Mobile, Cutler-Hammer, Inc., Three Office Pk. 205-438-9815
Ariz Phoenix, Cutler-Hammer, Inc., 341 E. Camelback Rd. 602-264-1184
Ark Little Rock, Cutler-Hammer, Inc., 414 Pulaski St. 501-375-8355
Cal Belmont, Cutler-Hammer, Inc., 490 El Camino Real 415-591-7361
Cal Fresno, Cutler-Hammer, Inc., 2720 E. Hammond Ave. 209-268-3301
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Cal Oakland, Cutler-Hammer, Inc., 3014 Lakeshore Ave. 415-451-9600
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Cal San Diego, Cutler-Hammer, Inc., 3737 5th Ave. 714-298-5432
Colo Denver, Cutler-Hammer, Inc., 2650 W. 2nd Ave., #4 303-934-5408
Conn Fairfield, Cutler-Hammer, Inc., 1700 Post Rd. 203-255-1561
Conn Wethersfield, Cutler-Hammer, Inc., 500 Silas Deane Hwy. 203-563-0104
Fla Jacksonville, Cutler-Hammer, Inc., 6957 Lillian Rd. 904-725-2845
Fla Tampa, Cutler-Hammer, Inc., 2909 Bay to Bay Blvd. 813-839-5493
Fla Winter Pk., Cutler-Hammer, Inc., 1320-B Palmetto Ave. 305-647-7508
Ga Doraville, Cutler-Hammer, Inc., 3001 McCall Dr. 404-451-2331
Ill Peoria, Cutler-Hammer, Inc., 2508 N. Sheridan Rd. 309-685-4031
Ill Rockford, Cutler-Hammer, Inc., 4040 Charles St. 815-398-6585
Ill Wilmette, Cutler-Hammer, Inc., 3201 Old Glenview Rd. 312-273-4150
Ind Indianapolis, Cutler-Hammer, Inc., 2511 E. 46th St. 317-546-4096
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Ind So. Bend, Cutler-Hammer, Inc., 435 S. Ironwood Dr. 219-288-0601
Iowa Davenport, Cutler-Hammer, Inc., 220 Main St. 319-323-8057
Kans Mission, Cutler-Hammer, Inc., 5845 Horton 913-236-6313
Kans Wichita, Cutler-Hammer, Inc., 1015 E. 2nd St. 316-363-5216
La Baton Rouge, Cutler-Hammer, Inc., 1821 Wooddale Ct. 504-921-2890
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La Shreveport, Cutler-Hammer, Inc., 2210 Line Ave. 318-425-1504
Md Rockville, Cutler-Hammer, Inc., 12216 Parklawn Dr. 301-946-1450
Md Towson, Cutler-Hammer, Inc., 320 Hillen Rd. 301-825-6041
Mass Brighton, Cutler-Hammer, Inc., 415 Western Ave. 617-254-6210
Mich Bridgeport, Cutler-Hammer, Inc., 6213 Dixie Hwy. 517-755-0417
Mich Grand Rapids, Cutler-Hammer, Inc., 733 Alger St., S.E. 616-243-0152
Mich Lansing, Cutler-Hammer, Inc., 2915 S. Logan St. 517-393-5424
Mich Southfield, Cutler-Hammer, Inc., 24315 Northwestern Hwy. 313-444-8700
Minn Minneapolis, Cutler-Hammer, Inc., 4510 W. 77th St. 612-927-8453
Mo St. Louis, Cutler-Hammer, Inc., 8118 Page Blvd. 314-429-7711
Neb Omaha, Cutler-Hammer, Inc., 6936 Maple St. 402-553-6553
NH Dover, Cutler-Hammer, Inc., 4 Tanglewood Dr. 603-742-1687
NJ Union, Cutler-Hammer, Inc., 370 Chestnut St. 201-687-4433
NM Albuquerque, Cutler-Hammer, Inc., 1405 "D" San Mateo Blvd., N.E. 505-268-7190
NY Buffalo, Cutler-Hammer, Inc., 3871 Harlem Rd. 716-836-4444
NY E. Syracuse, Cutler-Hammer, Inc., 3 Adler Dr. 315-437-7201
NY Latham, Cutler-Hammer, Inc., 678 Troy-Schenectady Rd. 518-785-6144
NY Melville, Cutler-Hammer, Inc., Walt Whitman Rd. 516-692-7499
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NY Rochester, Cutler-Hammer, Inc., 39 Saginaw Dr. 716-271-5460
NC Charlotte, Cutler-Hammer, Inc., 4200 Park Rd. 704-523-3056
NC Greensboro, Cutler-Hammer, Inc., 1902 Lindew St. 919-272-4567
Ohio Cleveland, Cutler-Hammer, Inc., 1461 W. 117th St. 216-221-0100
Ohio Columbus, Cutler-Hammer, Inc., 1580 King Ave. 614-486-2935
Ohio Dayton, Cutler-Hammer, Inc., 3101 S. Kettering Blvd. 513-293-2117
Ohio Forest Pk., Cutler-Hammer, Inc., 11322 Southland Rd. 513-825-5252
Ohio Youngstown, Cutler-Hammer, Inc., 5609 Market St. 216-788-8751
Okla Oklahoma City, Cutler-Hammer, Inc., 4501 N. Classen Blvd. 405-848-4804
Okla Tulsa, Cutler-Hammer, Inc., 8102 E. 46th St. 918-627-3312
Ore Portland, Cutler-Hammer, Inc., 6415 S.W. Canyon Ct. 503-292-0757
Pa Allentown, Cutler-Hammer, Inc., 34 S. St. Elmo St. 215-439-0585
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Pg. 1369

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ELCTRN. COILS, INC., Box 1665, 33 Lyman St., Springfield, Mass., 01101, Tel: 413-736-6339; Pres: R.E. Lawson

ELECTRONIC COMM., INC., Sub. NCR, 1501 72nd St., N., St. Petersburg, Fla., 33733, Tel: 813-347-1121, TWX: 810-863-0377; Sls. Mgr: C. N. Lusty....FSC No. 00724

ELCTRN. COMPONENTS CORP., Box 157, Addison, Ill., 60101, Tel: 312-543-7720 E.A. Joyner

ELCTRN. COMPS. DIV., United Aircraft, Trevose, Pa., 19047, Tel: 215-355-5000, TWX: 510-667-1717; Sls. Mgr: J.E. Hearl, Jr. Pg. 1977

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Cal Los Angeles, Halbar Assocs., 3261 W. Fourth St. 213-321-4561
Cal Orange, United Aircraft Corp., 128 E. Katella Ave. 714-639-4030
Cal San Mateo, Halbar Assocs., 3 W. 37th Ave. 415-349-4700
Fla Largo, Atlantic Comp. Corp., 1331 Harbor Lake Dr. 813-584-8257
Fla Plantation Isles, Atlantic Comp. Corp., 5840 S.W. 16th St. 305-587-2767
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Mass Winchester, Blake Assocs., 7 Lowell Ave. 617-729-7890
Mich Birmingham, J.C. Hofstetter Co., 700 Maple E. 313-642-0590
Minn St. Paul, Northport Engrg., Inc., 2027 Grand Ave. 612-698-3841
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NM Albuquerque, Telemetry Sls. Corp., 810 Charleston, N.E. 505-255-9192
NY Fayetteville, Graydon-Sherman, Inc., Davis Bldg. 315-637-9861
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Ohio Dayton, A. Nace Co., Inc., Box 93, Riverdale Sta. 513-277-8215
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Pa Pittsburgh, A. Nace Co., Inc., 1725 Washington Rd. 412-561-3544
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Wash Seattle, J.B. Jolly, 413 Maritime Bldg. 206-624-2152
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NY Port Washington, P. D. Aaron Assocs., Box 511 516-767-2600
NC Raleigh, Powertronic Assocs., 2454 Medway Dr. 919-834-6947
NC Thomasville, Powertronic Assocs., Box 403 919-476-4257
Ohio Cleveland, Baehr, Greenleaf & Assocs., 14700 Detroit Ave. 216-221-9030
Pa Ft. Washington, Mesa, Inc., Box 15 215-643-1002
Pa Pittsburgh, Covert & Newman Co., 300 Mt. Lebanon Blvd. 412-563-0303
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Tex Houston, Parvin Sls., 5700 Savoy La. 713-782-0218
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Minn St. Paul, R.G. Ragon, Inc., 1136 W. Larpenteur Ave. 612-488-0201
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Tex Houston, Roux & Assocs., 950 W. 41st St. 713-686-6527
Tex Richardson, Roux & Assocs., Box 281 214-231-5560
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Fla Ft. Lauderdale, Nine Assocs., 3440 N.E. 12th Ave. 305-566-8409
Ill Chicago, Data Elctrns. Co., Inc., 5505 N. Menard Ave. 312-774-1452
Ind Indianapolis, Data Elctrns. Co., Inc., Box 50084 317-547-2329
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Mass Acton, Applied Meas., Inc., Box 316 617-646-7250
Mich Ferndale, Tiby Co., 380 Hilton Rd. 313-547-3550
Minn Minneapolis, Data Elctrns. Co., Inc., 8633 Harrison Cir. 612-881-6386
Mo Hazelwood, Impala, Inc., 47 Village Sq. Shopping Ctr. 314-837-3100
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Ohio Cleveland, Tiby Co., 2245 Warrensville Ctr. Rd. 216-371-5335
Ohio Dayton, Tiby Co., 1960 N. Main 513-277-3822
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EXP: Pa., Philadelphia, B.K. Serfer Co., Box 7616
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Ga Tucker, Troy Harbison, 1885 D Fellowship 404-938-9849
Ill Chicago, Rozner Sls. Co., 4720 N. Central Ave. 312-283-0022
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Mass Lexington, Contact Sls., Inc., 594 Marrett Rd. 617-861-8544
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Minn St. Paul, Cahill Assocs., 3000 Hudson Rd. 612-739-8445
Mo Hazelwood, Penzner-Mankus Assocs., 400 Brookes La. 314-731-4334
NY Valley Cottage, LRC Assocs., Box 114 212-298-8964
NY Syracuse, Carlen Reps., 3650 James St. 315-437-2921
Ohio Aurora, EMA, Inc., Box 275 216-247-4488
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Pa Bristol, Be-Mar Assocs., Inc., 445 Mill St. 215-785-3256
Tex Dallas, Dunbar Assocs., Inc., Box 30511 214-239-7151
Wash Seattle, C. L. Reeve Mktg., Box 7087 206-542-5889
EXP: N.Y., Yonkers, Elctrn. Devices, N.Y., 21 Gray Oaks Ave. 914-965-4400

ELECTRONIC DEVICES, INC., Box 78, N. Ridgeville, Ohio, 44035, Tel: 216-777-3867; Sls. Mgr: G. Diehl....FSC No. 08520

ELECTRONIC ENCLOSURES, INC., Box 90978, El Segundo, Cal., 90009, Tel: 213-679-0181; Sls. Mgr: J. Gordon....FSC No. 09097 Pg. 2148

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NJ Pennsauken, Elctrn. Enclosures, Inc., 7825 Airport Hwy. 609-665-6810

ELCTRN. ENGRG. CO. CAL., Elctrn. Prods. Div., 1441 E. Chestnut Ave., Santa Ana, Cal., 92702, Tel: 714-547-5651, TWX: 910-595-1547; Sls. Mgr: B. Fordiani ....Pg. 2040

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Mass Waltham, EECO, 181 West St. 617-899-6360
NJ Hightstown, EECO, Box 1002 609-448-8118
NJ Ho-Ho-Kus, EECO, Box 335, 50 Franklin Tpke. 201-444-3220
NY Rochester, EECO, Box 7492 716-621-2410

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EXP: N.Y., Westbury, Minthorne Int'l., 2200 Shames Dr. 516-334-3303
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Colo Littleton, Action Sls., 6367 S. Gallup 303-794-0447
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Fla Miami Beach, Geartner Assocs., Inc., 350 Lincoln Rd. 305-531-0200
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La New Orleans, G.V. Peck Co., Box 8087 504-282-1553
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Mass Framingham Ctr., J. Moore Co., Box 43 617-877-1077
Mich Oak Pk., Willard Spenser Co., 21,500 Greenfield Rd. 313-398-8005
Minn Minneapolis, P.L. Coppini Sls. Co., 2907 E. Franklin Ave. 816-842-1760
NJ Edison, MEG Elctrn. Sls., 55 National Rd. 201-287-2855
NY Manlius, Arthur L. Perkins Co., Inc., Kinloch Plaza 315-682-5005
Okla Tulsa, G.V. Peck Co., 729 W. 5th St. 918-585-5853
Tex Dallas, G.V. Peck Co., 210 Casa Linda Plaza 214-328-3511

Tex Houston, G.V. Peck Co., 5757 Bellaire Blvd. 713-664-1435
Wash Mercer Island, J.H. Andersen Assoc., Box 637 206-232-0484

ELECTRONIC HOMES CO., 200 Claremont Ave., New York, N.Y., 10027, Tel: 212-MO-2-1129; Sls. Mgr: George T. Saddler

ELECTRONIC IDEAS, INC., Reading Sta., Wyncote, Pa., 19095, Tel: 215-TU-6-4770; Sls. Mgr: B. Cole....FSC No. 19407

ELCTRN. INSTR. & SPECIALTY CORP., 71 Cross St., Winchester, Mass., 01890, Tel: 617-729-1202; Sls. Mgr: R.A. Painter Pg. 1761

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Cal San Jose, Grosken, Inc., 330 Phelan Ave. 408-293-3108
Conn Madison, A & M Elctrn. Reps., Inc., Ailene Dr. 203-245-1031
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Mass Needham, A & M Elctrn. Reps., Inc., Box 73 617-444-8170
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NY Syracuse, Midstate Resch., Inc., 327 Wellesley Rd. 315-478-8314
NY Westbury, RSP Assocs., Box 696 516-333-4693
NC Charlotte, B. Jackson, 4632 Randolph Rd. 704-366-6678
Ohio Cleveland, Electro-Com, 8761 Snow Rd. 216-886-2404
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Pa Lansdowne, W.F. Satterthwaite & Co., 237 N. Lansdowne Ave. 215-623-5100
Tex Houston, Texas Special Elctrn. Comps., 7024 Mapleridge 713-666-5871

ELECTRONIC MACH. PARTS, INC., 128-11 18th Ave., College Point, N.Y., 11356, Tel: 212-IN-1-8850; Pres: W.T. McAdam

ELECTRONIC MEAS., 2 Crescent Pl., Oceanport, N.J., 07757, Tel: 201-229-8800; Sls. Mgr: R.H. Schlote .....Pgs. 1042-1044

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Ariz Scottsdale, Dorton Enterprises, Inc., Box 16127 602-263-0414
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Fla Orlando, Lee Assocs., Inc., 200 E. Marks St. 305-241-4445
Ill La Grange, Bard Assocs., Inc., La Grange Ind'l. Pk. 312-354-0660
Ind Indianapolis, Bard Assocs., Inc., 4000 Meadows Dr. 317-547-3113
Md Rockville, Lee Assocs., Inc., 230 N. Washington St. 301-424-9460
Mass Lynnfield, New England Mktg. Assoc., 55 Salem St. 617-245-9530
Mich Orchard Lake, Sidnell & Co., 6051 Pinecroft 313-851-3518
Minn Minneapolis, Bard Assocs., Inc., 4640 W. 77th St. 612-922-8233
Mo Crestwood, Bard Assoc., 50 Crestwood Exec. Ctr. 314-849-0080
NM Albuquerque, P.L.S. Assocs., 4200 B. Silver Ave., N.E. 505-255-2330
NY Buffalo, R.W. Mitscher Co., Inc., 496 Ellicott Sq. Bldg. 716-854-2518
NC Winston-Salem, Lee Assocs., Inc., Box 906 919-724-2406
Ohio Dayton, R.G. Sidnell & Co., Inc., 3300 S. Dixie Dr. 513-293-1194
Ohio Mentor, Sidnell & Co., 4 Meadow Lawn Dr. 216-942-3304
Tex Dallas, Industrial Equip. Co., 4914 Greenville Ave. 214-368-8087
Tex Houston, Industrial Equip. Co., Box 9567 713-928-3463
Wash Seattle, R. Johnston Co., Inc., 1011 N.E. 69th St. 206-524-5170
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ELECTRONIC MEAS. CORP., 625 Broadway, New York, N.Y., 10012, Tel: 212-GR-5-0610; Sls. Mgr: M. Lieblich....FSC No. 08596

ELECTRONIC MEMORIES, 12621 Chadron Blvd., Hawthorne, Cal., 90252, Tel: 213-772-5201, TWX: 910-325-6213; Sls. Mgr: M.E. Lamph

ELECTRONIC MODULES CORP., Box 141, Timonium, Md., 21093, Tel: 301-666-3300, TWX: 710-862-2638; Sls. Mgr: R. Vogel

ELCTRN. MOLDING CORP., 44 Church St., Pawtucket, R.I., 02860, Tel: 401-726-2100; Sls. Mgr: I. Dulude....FSC No. 17117 Pg. 2443

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Md Greenbelt, Jadelectronics Assoc., Box 119 301-474-8161
Mass Norwood, Perron Assocs., 159 Morse St. 617-762-8114
Minn Minneapolis, Countryman Assocs., 1821 University Ave. 612-645-9151
NH Dover, Perron Assocs., 1 Elm St. 603-742-2321
Pa Philadelphia, Jadelectronics Assoc., 4338 N. Third St. 215-455-3355
Tex Dallas, Texport Co., 2411 Farrington St. 214-631-6270

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Mass Waltham, Newton Assocs., 225 Crescent St. 617-891-1230
NJ Madison, A.L. Livera & Assocs., Inc., James Bldg. 201-377-3220
NY Roslyn Hgts., A.L. Livera & Assocs., Inc., 275 Warner Ave. 516-484-1276
Ohio No. Olmsted, J. Cutts Sls. Co., 24039 Ambour Dr. 216-777-0992

ELCTRN. RESCH. ASSOCS., INC., 67 Sand Park Rd., Cedar Grove, N.J., 07009, Tel: 201-239-3000, TWX: 710-994-5789 ....FSC No. 96762 .....Pgs. 1038-1041

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Cal Palo Alto, Tech-Ser, Inc., 800 San Antonia Rd. 415-326-6400
Cal San Diego, Tech-Ser, Inc., Box 10544 714-222-1121
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Fla Ft. Lauderdale, Reynolds & Assoc., Inc., 161 S.W. 75th Ave. 305-581-6611
Fla Orlando, Reynolds & Assoc., Inc., Box 8877 305-843-6440
Fla Melbourne, Reynolds & Assoc., Inc., Box 1043 305-727-3205
Ga Atlanta, Reynolds & Assoc., Inc., 175 W. Wieuca Rd., N.E. 404-252-5360
Ill Chicago, Magnuson Assoc., 5639 W. Fullerton Ave. 312-622-6322
Kans Mission, Tech. Sls. Assoc., Inc., 5827 Outlook 913-831-2888
Md Baltimore, Stemler Assoc., Inc., 6707 Whitestone Rd. 301-944-8262
Mass Burlington, J & J Assocs., Inc., 12 Cambridge St. 617-272-2606
Mich Farmington, W. R. Hummon Assoc., Inc., Box 501 313-474-0661
Minn St. Paul, Magnuson Assoc., 1246 W. 7th St. 612-227-8495
Mo St. Louis, Tech. Sls. Assoc., Inc., 34 N. Brentwood Blvd. 314-725-5361
NJ Cherry Hill, Stemler Assoc., Inc., Box 287 609-966-3477
NY Great Neck, E.R.A., Inc., 330 Great Neck Rd. 516-482-9320
NY Fayetteville, M. P. Andrews Co., 319 Mott Rd. 315-637-3144
NC Charlotte, Electro-Rep Assoc., 128 W. 30th St. 704-333-0451
Ohio Cincinnati, G & H Sls. Co., 10599 Chester Rd. 513-771-8231
Ohio Columbus, G & H Sls. Co., Box 27280 614-231-4433
Ohio Novelty, G & H Sls. Co., 13690 Fox Hill Dr. 216-247-4446
Okla Oklahoma City, Ammon & Champion Co., Box 12274 405-948-2222
Okla Tulsa, Ammon & Champion Co., Box 4682 918-627-7670
Pa Paoli, Stemler Assoc., Inc., Box 711 215-644-3477
Tex Dallas, Ammon & Champion Co., Box 35263 214-357-8441
Tex El Paso, Kelly Enterprises, 5432 Vancouver St. 915-751-3843
Tex Houston, Ammon & Champion Co., Box 35552 713-729-1233
Va Alexandria, Stemler Assoc., Inc., 306 N. Washington St. 703-548-7818

ELECTRONIC RESEARCH CO., A Textron Co., 10000 W. 75th St., Overland Pk., Kans., 66204, Tel: 913-631-6700, TWX: 910-749-6477; Sls. Mgr: H.M. Danzig....FSC No. 13571 .....Pgs. 1436,1437

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Ala Huntsville, 20th Century Mktg., Inc., 2603 Artie St., S.W. 205-536-1596
Cal Newport Bch., Hi-Rel Mktg., 4242 Campus Dr. 714-545-4849
Cal Menlo Pk., J. S. Heaton Co., Box 2087 415-369-4671
Cal Van Nuys, Shepard Comp., 16152 Covello St. 213-787-4610
Colo Denver, Engrg. Resch. Assocs., Inc., 231 Detroit St. 303-377-8306
Colo Englewood, Cummings & Assocs., Box 1112 303-789-3449
Conn New Canaan, Stan Pierce, Inc., 115 Bald Hill Rd. 203-966-4630
Fla Clearwater, Dyne-A-Mark Corp., 1665 Magnolia Dr. 813-446-2991
Fla Fern Pk., Dyne-A-Mark Corp., Box 128 305-831-5100
Fla Orlando, Lee Assocs., Inc., 200 E. Marks St. 305-241-4445
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GUARDIAN ELEC. MFG. CO., 1550 W. Carroll Ave., Chicago, Ill., 60607, Tel: 312-243-1100, TWX: 910-221-5073; Sls. Mgr: G.G. Rowell Pg. 1777

Ala Birmingham, Tech. Mktg., Inc., Box 5971 205-871-5431
Cal Culver City, Guardian Elec. Mfg. Co. of Cal., Inc., 5755 Camille Ave. 213-870-4642
Cal Palo Alto, O'Donnell Assocs., 1955 B El Camino Real 415-327-9260
Cal Torrance, O'Donnell Assocs., 18053 Crenshaw Blvd. 213-323-9243
Colo Denver, D. E. Bond Assocs., 5505 E. Evans Ave. 303-756-1234
Fla Hallandale, Tech. Mktg., Inc., Box 127 305-563-8585
Fla Orlando, Tech. Mktg., Inc., 1511 E. Robinson 305-843-2500
Fla St. Petersburg, Tech. Mktg., Inc., Box 13196 813-862-5536
Ga Marietta, Tech. Mktg., Inc., Box 1152 404-435-0079
Haw Honolulu, G. Piety Factors, Inc., 160 Mokauea St. 837-185
Ill Chicago, Guardian Elec. Mfg. Co., 1550 W. Carroll Ave. 312-243-1100
Ind Ft. Wayne, B. F. Homsher Co., 418 E. Berry St. 219-432-1164
Ind Ft. Wayne, Needler Sls. Co., Sta. C, Box 2407 219-447-2123
Ind Indianapolis, Needler Sls. Co., Mapleton Sta., Box 88153 317-255-8056
Kans Prairie Village, Thunderbird Tech. Sls. & Svcs., Inc., 4014 A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svcs., Inc., 7707 E. Osie 316-684-3941
Md Baltimore, McCourt Co., inc., 28 W. Pennsylvania Ave. 301-823-3455
Mass W. Concord, Sls. Engrg. Co., Baker Ave. 617-369-3943
Mich Westland, Miltimore Sls., 34142 Fountain Blvd. 313-261-8117
Minn Minneapolis, F.A. Nitti, 324 S. 4th St. 612-339-5878
Mo St. Louis, Thunderbird Tech. Sls. & Svcs., Inc., Box 12849 314-542-6488
NY Binghamton, Elcom Sls., Box 134, Southview Sta. 607-723-9270
NY Massapequa, J. F. Coughlin Assocs., Box 281 516-799-7743
NY Rochester, Elcom Sls., Box 9112 716-385-1400
NY Whitesboro, Elcom Sls., Box 38 315-732-6445
NC Greensboro, Tech. Mktg., Inc., Box 6664 919-274-2570
Ohio Miamisburg, W.C. Schmidt, Box 105 513-298-4451
Ohio Richmond Hgts., W. Rowell, Jr., Box 43062 216-247-6011
Pa Delmont, T.F. Laslo & Assocs., 411 Manor Rd. 412-468-5045
Pa Doylestown, Tech. Oriented Elec. Sls., Box 530 215-348-5333
Tex Dallas, W. Reese Assocs., 3131 Stemmons Frwy. 214-638-6575
Tex Houston, W. Reese Assocs., 2400 W. Loop, S. 713-NA-1-3134
Wash Seattle, R. K. Squibb, Inc., 655 N.E. Northlake Pl. 206-632-2450
Wisc Milwaukee, F.N. Nitti, 2340 W. Wells St. 414-933-1975

GUBELMAN CHART DIV., Nashua Corp., 100 E. Kinney St., Newark, N.J., 07105, Tel: 201-589-5970; Sls. Mgr: C. James Smolinske

GUDE-DIAL CORD AND CHAMPION-DIAL CORD - dial cord - Gudebrod Bros. Silk Co., Inc.

GUDE-GLASS - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDE-NYLACE - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDE-Q - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDE-SPACE - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDE-TIES - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDEBROD BROS. SILK CO., INC., Elctrms. & Exp. Div., 225 W 34th St., New York, N.Y., 10001, Tel: 212-LA-4-5858; Gen'l. Mgr: J. Bacsak

GUDELACE - lacing tape - Gudebrod Bros. Silk Co., Inc.

GUDEMAN DIV., Gulton Inds., Inc., 340 W. Huron St., Chicago, Ill., 60610, Tel: 312-337-7400, TWX: 910-221-3863; Sls. Mgr: P.J. LoVecchio....FSC No. 72928 .....Pgs. 2237-2256

Cal Alhambra, M.W. Riedel Co., 2715 W. Valley Blvd. 213-283-7694
Cal San Carlos, Capacitor Sls., Inc., 815 Cherry St. 415-593-8201
Cal San Carlos, Melchior Assocs., Inc., 820-B Cherry St. 415-591-7383
Colo Denver, Todd Assocs., 1393 S. Inca St. 303-777-4381
Fla Oviedo, Conley & Assocs., Box 668 305-365-3283
Ga Atlanta, B. Brown Assocs., 3354 Lansbury Village Dr., N.E. 404-939-7075
Ill Oak Pk., Wasson-Gallagher Co., 1024 North Blvd. 312-CO-1-7517
Ind Indianapolis, Tech. Reps. Co., 4000 Meadows Dr. 317-546-4967
Iowa Cedar Rapids, J.R. Sls. Engrg. Co., 3550 Cottage Grove Ave., S.E. 319-365-5259
Md Bethesda, W. Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Mass Bedford, Underwood Sls. Corp., 32 Shawsheen Plaza 617-275-0780
Mich Grand Rapids, Elko Sls. Corp., 3119 Midland Dr., S.E. 616-949-1451
Mich Grosse Point Woods, Elko Sls. Corp., 970 N. Oxford 313-884-7893
Minn St. Paul, Cullen & Assocs., 1595 Selby Ave. 612-646-7371
Mo Kansas City, R.R. Burton Sls. Co., 1016 Baltimore Ave. 816-471-2850
NJ Fanwood, King & Assocs., Box 267 201-561-5464
NY Liverpool, George Corp., 215 Fairmont 315-457-1188
NY New York, E. Glass Assocs., 250 W. 57th St. 212-JU-6-8440
NY Rochester, J.L. Semple Assocs., 21 Edgewater La. 716-342-1413
NC Winston-Salem, C. Dula Assocs., Inc., Box 5316, 3389 Nottingham Rd. 919-723-4205
Ohio Cincinnati, Components, Inc., 11820 Knollsprings 513-721-2997
Ohio Cleveland, Components, Inc., 7461 N. Linden La. 216-842-2737
Ohio Dayton, R.G. Siff & Assocs., Inc., 22 Oxford St. 513-CR-8-4779
Tex Dallas, Techno Assocs., 2324 Shore Crest Dr., Box 20544 214-357-9213
Wash Seattle, Elctm. Sls. Corp., 5600 California Ave., S. 206-932-0330
FOR: Can., Montreal, Que., S.C. Hooker, Ltd., 144 Ronald Dr. 514-488-9114

GUIDE INDS., INC., 11855 Wicks St., Sun Valley, Calif., 91352, Tel: 213-767-2610, TWX: 910-498-2707; Pres: E. Ryskowski ....FSC No. 17480

GUIDE-LINED - metallic tubing - Republic Steel Corp

GUIDE-O-MATIC SYSTEM - guidance system - Barrett Elctrms. Corp.

GUILDLINE INSTRS., INC., 1997 Palmer Ave., Larchmont, N.Y., 10538, Tel: 914-834-8100, TWX: 610-561-1681; Sls. Mgr: E. Nemeroff

GULF AEROSPACE CORP., 5440 Alder, Houston, Texas, 77036, Tel: 713-666-4884; Sls. Mgr: G.L. Dawson....FSC No. 17475

GULPER - sorption pumps - Hughes Aircraft Co

GULTON INDS., INC., Costa Mesa Facility, 1644 Whittier Ave., Costa Mesa, Calif., 92626, Tel: 714-642-2400, TWX: 714-642-1346; Sls. Mgr: J. Prebicin....FSC No. 95564

GULTON INDS., INC., Data Systems Div., 15000 Central, E., Albuquerque, N.M., 87112, Tel: 505-299-7601, TWX: 910-989-1669; Sls. Mgr: K. A. Davenport

GULTON INDS., INC., Engr. Magnetics Div., 13041 Cerise Ave., Hawthorne, Calif., 90250, Tel: 213-679-0111, TWX: 910-325-6208; Sls. Mgr: M. Eisen....FSC No. 06509

GULTON INDS., INC., Controls & Instrumentation Grp., 1644 Whittier Ave., Costa Mesa, Cal., 92627

GULTON INDS., INC., Instr. Div-West, 1644 Whittier Ave, Costa Mesa, Cal., 92627, Tel: 714-642-2400, TWX: 910-596-1352; Sls. Mgr: J.C. Prebicin

GULTON INDS., INC., Microceramics Div., Metuchen, N.J., 08840, Tel: 201-548-2800, TWX: 710-998-0592; Sls. Mgr: G. Wolter Pgs. 1578,1579,2109,2234-2236

Cal Los Altos, Parsons Co., 1 First St. 415-941-4745
Ariz Phoenix, Hecht-Henschen & Assoc., Box 21166 602-275-4411
Cal Alhambra, M.W. Riedel Co., 2215 W. Valley Blvd.
Cal Los Angeles, Elcom Sls. Co., 3600 Motor Ave. 213-870-4707
Cal Los Angeles, M.A. Stolaroff Co., Inc., 4622 N. Salusen Ave. 213-295-7781
Cal Palo Alto, M.W. Riedel & Co., 944 E. Charleston Rd. 415-969-9861
Cal San Carlos, Melchoir Assoc., 820 B Cherry 415-591-7383
Cal San Mateo, J. Pyle Co., 1611 Borel Pl. 415-349-1266
Colo Denver, Todd Assocs., 1393 S. Inca St. 303-777-4381
Colo Engelwood, Thorson Co., 300 E. Hampden Ave. 303-789-1841
Fla Oviedo, Conley & Assocs., Box 668 305-365-3283
Fla Tampa, F.C. Nickerson, 4513 S. Cameron Ave. 813-833-4321
Ga Decatur, F.C. Nickerson, Box 33185 404-377-1575
Ga Tucker, B. Brown Co., Box 407 404-939-7075
Ill Oak Pk., Wasson-Gallagher, 1024 North Blvd. 312-CO-1-7517
Ind Indianapolis, Technical Rep. Co., Inc., 4000 Meadows Dr. 317-546-4967
Ind Mishawaka, C. Given, 921 E. 3rd St. 219-255-6439
Iowa Cedar Rapids, J.R. Sls. Engrg., 3550 Cottage Grove Ave. 319-365-5259
Md Bethesda, W. Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Md Towson, McCourt Co., 610 Washington Ave. 301-657-9312
Mass Bedford, Underwood Sls., 32 Shawsheen Plaza 617-275-0780
Mass Needham Hgts., Tesco, Inc., Box 201 617-275-0780
Mass Newton, QRC Co., 134 Upland Rd. 617-332-9600
Mich Grand Rapids, Elko Sls. Co., 3119 Midland Dr. 616-949-1451
Mich Pleasant Ridge, Martenson Co., 46 Ridge Rd. 313-543-3633
Minn St. Paul, E. Melius & Assocs., Inc., 3758 N. Dunlap St. 612-488-7293
Minn St. Paul, H.A. Cullen & Assocs., 1595 Selby Ave. 612-646-7371
Minn St. Paul, Wagner Comp. Consits., 452 S. Snelling Ave. 612-698-0331
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Mo Overland Pk., Tech. Mktg. Assoc., 2050 Woodson Rd. 314-427-3600
NM Albuquerque, R. Reeder, 15000 Central Ave. 505-299-7601
NJ Fanwood, King Assocs., Box 267 201-561-5464

NY New York, E. Glass Assocs., 250 W. 57th St. 212-JU-6-8440
NY Rochester, J.L. Semple, 21 Edgewater La. 716-342-1413
NY Rochester, Reed Elctrns., 2815 Monroe Ave. 716-473-2767
NC Charlotte, F.C. Nickerson, 4332 University Ave. 704-525-2682
NC Winston-Salem, Dula Assocs., 1402 E. Morehead St. 919-723-4205
Ohio Cincinnati, A.C. Wahl & Assocs., Inc., Box 15220 513-821-3270
Ohio Cleveland, Comps., Inc., 7461 N. Linden La. 216-842-2737
Ohio Dayton, R.G. Siff & Assocs., 22 Oxford Ave. 216-942-0601
Ohio Wickliffe, W.J. Brauer & Assoc., 29029 Euclid Ave. 216-942-0601
Pa Ardmore, W. K. Metz, Box 309 215-649-3966
Tex Dallas, Allied Comps., Box 38009 214-DI-8-6660
Tex Dallas, Techno Assocs., Box 20544 214-FL-7-9213
Wash Seattle, Elctm Sls. Corp., 5600 California St., S.W. 206-932-0330

GURLEY, W. & L. E., A TELEDYNE CO., See Teledyne Gurley

GUY-GRIP - dead-end antenna fitting - Preformed Line Prods. Co.

GWILLIAM CO., 342 Furman St., Brooklyn, N.Y., 11201, Tel: 212-MA-4-2644; Sls. Mgr: J.V. Cinque....FSC No. 26635

GYRATHERM - hot plate & stirrer - Will Scientific, Inc.

GYREX - centrifuge - Goerz Optical Co., Inc.

GYRO-FLUX GATE - remote indicating compass sys. - Bendix Aerospace-Elctms. Co.

GYROFIN - ship stabilization - Sperry Marine Sys. Div.

GYROPILOT - auto. ship steering - Sperry Marine Sys. Div.

GYROPOISE - turntable - Stanton Magnetics, Inc.

GYROTRONICS, INC., 3500 Sunset Ave., Asbury Park, N.J., 07712, Tel: 201-988-0408; Gen'l. Mgr: C. Coppola

H.C. BONE BLACK - solid carburizer - Houghton, E.F. & Co.

H-B INSTR. CO., American & Bristol Sts., Philadelphia, Pa., 19140, Tel: 215-DA-9-9125; Sls. Mgr: C.G. Roveran....FSC No. 26659

H & H TOROIDAL WINDING CO., 26215 Tungsten Rd., Euclid, Ohio, 44132, Tel: 216-261-7700; Sls. Mgr: K.H. Hoffmann .....Pg. 2341
Mass Acton, Neeco, 700 Main St. 617-263-7566
Mich Detroit, Sheridan Assocs., 25625 Southfield 313-358-3333
Mich Grand Rapids, Sheridan Assocs., 2637 Golfridge 616-949-8110
Mo St. Louis, Sheridan Assocs., 100 S. Hwy. 140 314-837-5200
Ohio Cincinnati, Sheridan Assocs., 10 Knollcrest 513-761-5432
Ohio Cleveland, Sheridan Assocs., 7800 Wall St. 216-524-8120
Ohio Dayton, Sheridan Assocs., 5045 N. Main 513-277-8911
Pa Pittsburgh, Sheridan Assocs., 1601 Penn Ave. 412-243-6655

H-P-M DIV., Koehring Co., Marion Rd., Mt. Gilead, Ohio, 43338, Tel: 419-946-0222; Sls. Mgr: T.G. Bishop....FSC No. 29975

H & S WIRE CUTTING SVC., INC., 42 East 12th St., New York, N.Y., 10003, Tel: 212-OR-4-2966; Sls. Mgr: A. Mignone

H-ZONE - high temperature wire - Cerro Wire & Cable Co.

H/I - scientific instruments - Hacker Instrs., Inc.

HACKER INSTRS., INC., Box 646, W. Caldwell, N.J., 07006, Tel: 201-226-8450

HADLOCK & TEMTE, INC., 3332 W. Franklin Blvd., Chicago, Ill., 60624, Tel: 312-SA-2-4200; Sls. Mgr: P.R. Klingsporn

HADRON INC., 800 Shames Dr., Westbury, N.Y., 11590, Tel: 516-334-4402; Mktg. Mgr: P.G. Schoening

HAFSTROM TECH. PRODS., INC., 4616 Santa Fe St., San Diego, Calif., 92109; Tel: 714-274-8822, TWX: 714-277-3194; Sls. Mgr: J.R. Hafstrom

HAKE PRODS., INC., 6152 Wasigo Dr., Cincinnati, Ohio, 45230, Tel: 513-231-4650; Sls. Mgr: E.C. Hake

HAL PAK - hall generator - Bell, F.W., Inc.

HALEDY ELCTRNS. CO., 99 Wall St., New York, N.Y., 10005, Tel: 212-WH-3-3140; Sls. Mgr: S. Gold

HALF MILE HAILER - electronic megaphone - Chamberlain Mfg. Corp.

HALF PINT - relay - Hi-G, Inc.

HALLIKAINEN INSTRS., 750 National Ct., Richmond, Calif., 94804, Tel: 415-233-2010; Sls. Mgr: T.T. Clark

HALLMARK STANDARDS, INC., 257 Washington St., Mt. Vernon, N.Y., 10551, Tel: 914-664-4288, TWX: 710-566-1104; Sls. Mgr: M. Steinberg....FSC No. 23125

HALLOWELL - shop equip & shelving - Columbia-Hallowell

HALLTIPLIER - electric power transducers, power instrumentation, etc. - Scientific Columbus, Inc.

HALLTRON - hall effect devices - Ohio Semitronics, Inc.

HALM INSTR. CO., INC., Glen Head Rd., Glen Head, N.Y., 11545, Tel: 516-OR-6-6700; Gen'l. Sls. Mgr: D. Schanck

HALMAR ELCTRNS., INC., 1544 W. Mound St., Columbus, Ohio, 43223, Tel: 614-276-0134; Sls. Mgr: D.W. Yauch

HALSEY - x-ray prods. - U.S. Radium Corp.

HALTATA - test equip-environmental-servo - Muirhead, Inc.

HAM KITS, Box 175, Cranford, N.J., 07016, Tel: 201-BR-6-8161; Sls. Mgr: J. Higgins

HAMAMATSU CORP., 80 Pine St., New York, N.Y., 10005, Tel: 212-483-0524; Sls. Mgr: Mr. Alba .....Pgs. 2134,2135

HAMAMATSU TV CO., LTD., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan, Tel: 0534-34-3311; Sls. Mgr: M. Fujita Pgs. 2134,2135
NY New York, Hamamatsu Corp., 80 Pine St. 212-483-0525

HAMICOTE - mold releasing coating - Miller, Harry Corp.

HAMIDRAW - drawing compound - Miller, Harry Corp.

HAMILTON ALEXANDER INSTITUTE, 235 E. 42nd St., New York, N.Y., 10017, Tel: 212-OX-7-6868; Sls. Mgr: J. Sparks

HAMILTON INDUSTRIES, P.O. Box 504, Winter Haven, Fla., 33880, Tel: 813-293-1058; Sls. Mgr: W.H. Hamilton, Jr.

HAMILTON STANDARD, Div. United Aircraft Corp., Windsor Locks, Conn., 06096, Tel: 203-623-1621, TWX: 710-420-0584; Sls. Mgr: D.P. McLelland

HAMILTON WATCH CO., Metals & Instrs. Group, Lancaster, Pa., 17604, Tel: 717-394-7161, TWX: 717-560-4440; Mktg. Mgr: D.P. Folsom

HAMITERGE - ultrasonic cleaner - Miller, Harry Corp.

HAMLIN ELCTRNS., INC., 3879 N. 28th Ave., Phoenix, Ariz., 85017 Pg. 1778
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Colo Denver, Elctrn. Comps. Sls., Box 22011 303-771-6200
Conn Berlin, White Sls. Co., Box 122 203-224-0423
Fla Lutz, S. K. Wallace Assoc., Inc., Box 67 813-949-1817
Fla Miami, S.K. Wallace Assocs., Inc., 3115 N.W. 81st Terr. 305-691-1654
Ga Atlanta, S. K. Wallace Assoc., Inc., Box 42258 404-753-8463
Ill Chicago, Lincoln, Hodges & Assoc., 5875 N. Lincoln Ave. 312-561-8440
Iowa Marion, Thomas & Modrcin Assoc., 890 17th Ave. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc., Box 189 913-432-2131
Mass Needham, White Sls. Co., 20 Chestnut St. 617-444-3676
Mich Dearborn, Villani-Pitcher, Inc., 20233 Ann Arbor Trail 313-271-4600
Minn Minneapolis, R-J Sls. & Engrg., 7100 S. France Ave. 612-922-1425
Mo Hazelwood, Thomas & Modrcin Assoc., Box 545 314-838-6446
NM Albuquerque, Elctrn. Comps. Sls., 1811 Carlisle, N.E. 505-256-9831
NY Hyde Pk., R. P. Kennedy Co., Greentree Dr., N. 914-471-4430
NY Manhasset, Win-Cor Elctrn. Sls. Corp., 75 Plandome Rd. 516-627-9474
NY Rochester, R. P. Kennedy Co., 39 Saginaw Dr. 716-271-6322
NC Kernersville, S. K. Wallace Assoc., Inc., Box 526 919-993-3993
NC Matthews, S. K. Wallace Assoc., Inc., Box 215 704-847-9262
Ohio Cincinnati, G & H Sls., 10599 Chester Rd. 513-771-8231
Ohio Columbus, G & H Sls., Box 27280 612-231-4433
Ohio Novelty, G & H Sls., 13690 Fox Hill Dr. 216-247-4446
Pa Erie, NEBco, 1564 W. 42nd St. 814-868-2111
Pa Monroeville, NEBco Assoc., 1974 Gregory Ave. 412-824-2111
Tenn Memphis, S. K. Wallace Assoc., Inc., 5960 Brierdale Cove 901-682-2281
Tex Dallas, Allied Comps., Inc., Box 38009 214-348-6660
Tex Houston, Allied Comps., Inc., 6400 Westpark Dr. 713-782-5406
Utah Salt Lake City, Elctrn. Comps. Sls., 445 E. 2nd, S. 801-355-5327
Wash Seattle, Testco Sls., Inc., Boeing Field, Rm. 219 206-762-8220
Wisc Waukesha, Lincoln, Hodges & Assoc., 217 Wisconsin Ave. 414-542-3087

HAMLIN, INC., 670 Lake St., Lake Mills, Wisc., 53551, Tel: 414-648-2361, TWX: 910-260-3740; V.P. Mktg: R.T. Armantrout ....FSC No. 12617 .....Pg. 2047
Cal Los Angeles, C. Holmes Co., 107 North Ave. 213-256-2255
Cal Palo Alto, Testco Sls., Inc., 941 Charleston Rd. 415-326-5320
Colo Denver, Elctrn. Comp. Sls., Box 22011 303-771-6200
Conn Berlin, White Sls. Co., Box 122 203-224-0423
Fla Lutz, S.K. Wallace Assoc., Box 67 813-949-1817
Fla Miami, S.K. Wallace Assoc., 3115 N.W 81st Terr. 305-691-1654
Ga Atlanta, S.K. Wallace Assoc., Box 42258 404-753-8463
Ill Chicago, Lincoln, Hodges Assoc., 5875 N. Lincoln Ave. 312-561-8440
Iowa Marion, Thomas & Modrcin Assoc., 890 17th Ave. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin, Box 189 913-432-2131
Mass Needham, White Sls. Co., 20 Chestnut St. 617-444-3676
Mich Dearborn, Villani-Pitcher, Inc., 20233 Ann Arbor Trail 313-271-4600
Minn Minneapolis, R J Sls. & Engrg., 7100 S. France Ave. 612-922-1425
Mo Hazelwood, Thomas & Modrcin, Box 545 314-838-6446
NM Albuquerque, Elctrn. Comp. Sls., 1811 Carlisle, N.E. 505-256-9831
NY Hyde Pk., R.P. Kennedy Co., Greentree Dr., N. 914-471-4430
NY Manhasset, Win-Cor Elctrn. Sls. Corp., 75 Plandome Rd. 516-627-9474
NY Rochester, R.P. Kennedy Co., Inc., 39 Saginaw Dr. 716-271-6322
NC Kernersville, S.K. Wallace Assoc., Box 526 919-993-3993
NC Matthews, S.K. Wallace Assoc., Box 215 704-847-9262
Ohio Novelty, G & H Sls., 13690 Fox Hill Dr. 216-338-1122
Ohio Cincinnati, G & H Sls., 10599 Chester Rd. 513-771-8231
Ohio Columbus, G & H Sls., Box 27280 614-231-4433
Pa Erie, NEBco Assoc., 1564 W. 42nd St. 814-868-2111
Pa Lansdowne, W.F. Satterthwaite, Box 191 215-623-5100
Pa Monroeville, Nebco Assocs., 1974 Gregory Ave. 412-824-2111
Tenn Memphis, S.K. Wallace Assoc., 5960 Brierdale Cove 901-682-2281
Tex Dallas, Allied Comp., Inc., Box 38009 214-348-6660
Tex Houston, Allied Comp., Inc., 6400 W. Park 713-782-5406
Utah Salt Lake City, Elctrn. Comp. Sls., 445 E. 2nd, S. 801-355-5327
Wash Seattle, Testco Sls., Inc., Boeing Field, Rm. 114 206-762-8220
Wisc Waukesha, Lincoln, Hodges & Assoc., 217 Wisconsin Ave. 414-542-3087

HAMMARLUND MFG. CO., Sub. Elctm. Assistance Corp., 73-88 Hammarlund Dr., Mars Hill, N.C., 28754, Tel: 704-689-5411, TWX: 510-935-3553....FSC No. 73035

HAMMEL, RIGLANDER & CO., INC., 435 Hudson St., Village Sta., New York, N.Y., 10014, Tel: 212-989-7950; Sls. Mgr: E.J. Renz

HAMMERBITS - masonry drills - Tilden Tool Mfg. Co., Inc.

HAMMOND MFG. CO., LTD., 394 Edinburgh Rd., N., Guelph, Ont., Can., Tel: 519-822-2960; Sls. Mgr: G.L. Poulter

HANDI-PAC - insulating tape - Brady, W.H. Co.

HANDY & HARMAN, 850 Third Ave., New York, N.Y., 10022, Tel: 212-752-3400, TWX: 212-867-4894; Sls. Mgr: R.E. Burke

HANDY FLUX - brazing fluxes - Handy & Harman

HANDY TOTES - tote bins - Corrugated Paper Prods., Inc.

HANDY-BINS - parts bins - Corrugated Paper Prods., Inc.

HANDY-WRAP - wire wrapping tools - Ostby & Barton Co.

HANDYLAB - prepacked devices - Motorola Semiconductor Prods., Inc.

HANSCOM, H.F. CO., INC., 225 Chapman St., Providence, R.I., 02905, Tel: 401-941-1456; Sls. Mgr: H.F. Hanscom

HANSEN MFG. CO., INC., P.O. Box 23, Princeton, Ind., 47570, Tel: 812-385-3415; Sls. Mgr: A.F. Bridger

HAPCO, Box 1205, Boulder, Colo., 80302, Tel: 303-447-0441; Sls. Mgr: B. Stark

HARCO LABS., INC., 186 Cedar St., Branford, Conn., 06405, Tel: 203-488-8371; Sls. Mgr: M.A. Porto

HARDER, DONALD C. CO., INC., 2580 "K" St., San Diego, Calif., 92102, Tel: 714-239-8021; Sls. Mgr: L.L. LaZelle....FSC No. 99153

HARDMAN INC., Belleville, N.J., 07109, Tel: 201-751-3000; Sls. Mgr: R.E. O'Neill

HARDWICK HINDLE PRODUCTS - resistors & rheostats - LTV Electrosystems, Inc.

HARMON LICHTENSTEIN & CO., 26 Broadway, New York, N.Y., 10004; Sls. Mgr: R.B. Harmon

HARMONIC DRIVE - power & motion transmission - USM Corp.

HAROSYN - brushless synchros - Harowe Servo Controls, Inc.

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HOMELITE, Div. Textron Inc., Riverdale Ave., Port Chester, N.Y., 10573, Tel: 914-WE-9-3400, TWX: 914-937-4030; V.P. Sales & Sls. Mgr: R.S. Kennedy....FSC No. 29201

HOMOSIL - fused quartz - Amersil, Inc.

HONEY BEE - audio-video recording motor - Hurst Mfg. Corp.

HONEYCOMBE - dehumidifiers, industrial - Cargocaire Engrg. Corp.

HONEYWELL, INC., Aerospace & Def. Grp., 2701 Fourth Ave., S., Minneapolis, Minn., 55408; Tel: 612-332-5222, TWX: 612-321-1036; V.P. Mktg: R.J. Condon....FSC No. 94580

HONEYWELL, INC., Apparatus Controls Div., 2701 Fourth Ave., S., Minneapolis, Minn., 55408, Tel: 612-332-5222; Sls. Mgr: R.L. Fillmore

HONEYWELL, INC., Commercial Div., 2701 Fourth Ave., S., Minneapolis, Minn., 55408, Tel: 612-332-5222; Pres: S.F. Keating

HONEYWELL, INC., Computer Control Div., Electropac Oper., Peterborough, N.H., 03458, Tel: 603-924-3821, TWX: 710-364-1866; Mgr: T. Arnsten

HONEYWELL, INC., Elctrn. Data Processing Div., 60 Walnut St., Wellesley Hills, Mass., 02181, Tel: 617-235-7450; V.P. Mktg: R.P. Henderson

HONEYWELL, Industrial Div., 1100 Virginia Dr., Ft. Washington, Pa., 19034, Tel: 215-643-1300, TWX: 510-661-0328; Sls. Mgr: R.J. Corbin....FSC No. 08987

HONEYWELL, Micro Switch Div., 11 W. Spring St., Freeport, Ill., 61032, Tel: 815-232-1122, TWX: 910-642-0922; Sls. Mgr: E.N. Hughes ....FSC No. 91929

HONEYWELL, INC., Wabash Comm. Factory, 200 Bond St., Wabash, Ind., 46992, Tel: 219-563-2161, TWX: 810-290-2725; Sls. Mgr: W.G. McLaughlin ....Pg. 2152

Ala	Huntsville, Beacon Elctrns., 3322 S. Memorial Pkwy.	205-881-5031
Cal	Mountain View, REPEX, Inc., Box 807	415-969-9200
Colo	Denver, E. W. Johnson Co., 10130 W. Asbury Ave.	303-985-4810
Fla	Ft. Lauderdale, Beacon Elctrns., 651 N.E. 45th St.	305-564-4298
Fla	Maitland, Beacon Elctrns., Box 1278	305-647-3498
Ga	Atlanta, Beacon Elctrns., 2285 Peachtree Rd.	404-351-3654
Ill	Elmhurst, Scott Assocs., 663 Fairview Ave.	312-279-5681
Ind	Ft. Wayne, R.O. Whitesell & Assoc., 3426 Taylor St.	219-432-5591
Ind	Indianapolis, R.O. Whitesell & Assoc., 6691 E. Washington St.	317-359-9283
Ky	Louisville, R.O. Whitesell & Assoc., 3620 Lexington Rd.	502-893-7303
Mass	Burlington, Schaal Assocs., Four A St.	617-862-3578
Mich	Southfield, R.O. Whitesell & Assoc., 25100 Evergreen Rd.	313-358-2020
Mich	St. Joseph, R.O. Whitesell & Assoc., Rm. 214, Shepard-Benning Bldg.	616-983-7337
Minn	Minneapolis, Pilot Sls. & Engrg., 7007 Walker St.	612-925-2464
Ohio	Cincinnati, R.O. Whitesell & Assoc., 1172 Galbraith	513-521-2290
Ohio	Cleveland, R.O. Whitesell & Assoc., 21139 Lorain Ave.	216-333-2585
Ohio	Dayton, R.O. Whitesell & Assoc., 4133 S. Dixie Ave.	513-298-9546
Pa	Pittsburgh, R.O. Whitesell & Assocs., 201 Penn Ctr. Blvd.	412-242-0100
Tex	Dallas, Blair Engrg., 10034 Monroe St.	214-352-8411
Tex	Houston, Blair Engrg., 6420 Hillcroft	713-772-0677

HONEYWELL, INC., Photographic Prods. Div., 5501 S. Broadway, Littleton, Colo., 80120; V.P. & Gen'l. Mgr: R.L. Pennock, Jr.

HONEYWELL, INC., Residential Div., 2701 Fourth Ave., S., Minneapolis, Minn., 55408, Tel: 612-332-5222; V.P. & Gen'l. Mgr: T.A. Reed

HONEYWELL, Test Instrs. Div., Box 5227, Denver, Colo., 80217, Tel: 303-771-4700; Sls. Mgr: W.T. Lisenby....FSC No. 05714 Pg. 691

Ala	Huntsville, 2003 Byrd Spring Rd., S.W.	205-881-2711
Cal	Los Angeles, 6620 Telegraph Rd.	213-724-3500
Cal	San Diego, 1515 Morena Blvd.	715-276-4162
Cal	Sunnyvale, 910 Thompson Pl.	408-732-0120
Colo	Englewood, 7825 E. Prentice Ave.	303-771-2340
Conn	Hartford, 885 Wethersfield Ave.	203-525-3163
Fla	Orlando, 1000 Woodcock Rd.	305-841-1570
Ga	Atlanta, 500 Plaster Ave., N.E.	404-875-9561
Ill	Chicago, 2015 175th St.	312-474-9300
Ill	Chicago, 7350 N. Lincoln Ave.	312-674-9770
Ind	Indianapolis, 5739 Professional Cir.	317-243-0831
Md	Lutherville, 1306 Bellona Ave.	301-828-0900
Mass	Boston, 1230 Soldiers Field Rd.	617-787-5300
Mich	Southfield, 17515 W. Nine Mile Rd.	313-352-1900
Minn	Minneapolis, 415 E. 27th St.	612-339-8551
Mo	St. Louis, 2146 Hampton Ave.	314-647-6100
NJ	Westfield, 574 Springfield Ave.	201-233-9200
NM	Albuquerque, 3301 Carlisle Blvd., N.E.	505-345-1656
NY	Long Island City, 24-30 Skillman Ave.	212-392-4300
NY	Rochester, 100 Metro Pk.	716-461-1600
NC	Greensboro, 1216 Perry St.	919-292-1556
Ohio	Cleveland, 1001 E. 55th St.	216-881-0300
Ohio	Dayton, 2314 Stanley Ave.	513-461-4480
Pa	Bala Cynwyd, One Decker Sq.	215-835-2500
Pa	Pittsburgh, Bee St. at Greentree Rd.	412-922-4422
Tex	Dallas, 6000 N. Central Expwy.	214-363-5441
Tex	El Paso, 7350 Gateway, E.	915-591-1447
Tex	Houston, 1730 Nasa Blvd.	713-488-0534
Tex	San Antonio, 111 E. Rhapsody	512-344-2351
Va	McLean, 1766 Old Meadow Rd.	703-893-4660
Va	Norfolk, 1516 Harmon St.	703-583-2611
Wash	Mercer Island, 9555 S.E. 36th	206-232-5030

HOOK SWITCH - lever switches - Switchcraft, Inc.

HOOK-A-ROUND - current transformers - Annis, R.B. Co.

HOOK-N-PUSH - component mounting boards - Electraid, Inc.

HOPE ELCTRNS., Box 773, Clifton, N.J., 07013, Tel: 201-777-3522; Sls Mgr: R. Mossige

HOPKINS ENGRG. CO., 12900 Foothill Blvd., San Fernando, Cal., 91342, Tel: 910-496-1531, TWX: 213-361-8691; Mktg. Mgr: D.A. Knox ....FSC No. 02777 ....Pg. 1573

Ala	Huntsville, Young & Lawrence Assoc., Inc., 2907 Governors Dr., S.W.	205-539-6575
Ariz	Scottsdale, Runyon Co., 6825 E. Thomas	602-947-5711
Cal	Menlo Pk., Frauman Assocs., 1010 Doyle	415-322-8461
Colo	Denver, Daniels-Padgett Assoc., 2785 N. Speer Blvd.	303-433-7181
Conn	Glastonbury, C.K. Barton Assoc., Inc., 343 New London Tpke.	203-633-9417
DC	Washington, Andco Sls-Engr., Inc., 1931 Kennedy Dr.	703-893-8474
Fla	Ft. Lauderdale, Young & Lawrence Assocs., Inc., 415 E. Broward Blvd.	305-563-6717
Fla	St. Petersburg, Young & Lawrence Assoc., Inc., 300 31st St., N.	813-894-0026
Fla	Winter Pk., Young & Lawrence Assoc., Inc., 601 N. New York Ave.	305-647-6929
Ill	Chicago, Engineered Sls. Co., 4738 N. Harlem Ave.	312-867-8434
Iowa	Marion, Thomas-Modrcin Assoc., Inc., 890 17th Ave.	319-377-6261
Kans	Shawnee Mission, Thomas Modrcin Assoc., Inc., 5450 Buena Vista Dr.	913-432-2131
Mass	Auburndale, C.K. Barton Assoc., Inc., Box 51	617-332-2021
Minn	St. Paul, H. Cullen & Assoc., 1595 Selby Ave.	612-646-7371
Mo	Hazelwood, Thomas-Modrcin Assoc., Inc., 47 Village Sq.	314-838-6446
NY	Huntington, Andrews Andrews, Inc., 425 New York Ave.	516-692-8686
NY	Syracuse, Midstate Resch. Sls., Inc., 327 Wellesley Rd.	315-478-8314
NC	Bethania, Candor Co., Bethania	919-924-1480
Ohio	Brecksville, A. Nace Co., Box 156	216-526-4323
Ohio	Dayton, A. Nace Co., Box 93, Forest Pk. Br.	513-277-8215
Ohio	Galion, A. Nace Co., Rte. 3	419-468-7641
Pa	Philadelphia, Andco Sls-Engr., Inc., 18 W. Chelten Ave.	215-438-7900
Pa	Pittsburgh, A. Nace Co., 1725 Washington Rd.	412-561-3544
Tex	Dallas, Stevens Sls., 9990 Monroe Dr.	214-350-2476
Wash	Bellevue, Farwest Agencies, 12410 S.E. 32nd St.	206-747-1515
FOR:	Can., Montreal 383, Que., Ben Manis Assoc., 2690 Pitfield Blvd.	514-336-4500

HOPLINE - fiber glass liner for foundry usage - Zurn Inds.

HOPPER STAKER - swaging machines - Cambridge Thermionic Corp

HOREX ELCTRNS., INC., 1729 21st St., Santa Monica, Calif., 90404, Tel: 213-451-0211; Sls. Mgr: J. Schwarzer

HORIZON LINE - voltmeters & ammeters - General Elec. Co.

HORLICK, WILLIAM I. CO., INC., 266 Summer St., Boston, Mass., 02210, Tel: 617-426-2480; Sls. Mgr: R.C. Horlick....FSC No. 96574

HORNET - miniature soldering iron - Hexacon Elec. Co.

HOSKINS MFG. CO., 4445 Lawton Ave., Detroit, Mich., 48208, Tel: 313-895-2860, TWX: 313-222-5490

HOSPIX - rental tv sets - Sylvania Elec. Prods., Inc.

HOT LINOBATE - linobate composition - Crystal Technology Inc.

HOT ROD - electric furnace heating elements - Norton Co.

HOT SHOT - dry batteries - Union Carbide Corp.

HOT TIP - soldering accessory - Air-O-Tronics Prods., Inc.

HOT-SHOT, SOLDER-ETTE - soldering iron - Fedtro, Inc.

HOTIP - thermal wire strippers, resistance soldering tools - Contact, Inc.

HOTPACK CORP., 5148 Cottman Ave., Philadelphia, Pa., 19135, Tel: 215-333-1700, TWX: 710-670-1964....FSC No. 19880

HOTVAC - vacuum furnace - Vacuum Inds., Inc.

HOTWATT, INC., 128 Maple St., Danvers, Mass., 01923, Tel: 617-777-0070; Sls. Mgr: R.S. Lee

HOUGHTO-BLACK - steel blackener - Houghton, E.F. & Co.

HOUGHTO-CLEAN - soluble - Houghton, E.F. & Co.

HOUGHTO-DRAW - compounds - Houghton, E.F. & Co.

HOUGHTO-GRIND - grinding fluid - Houghton, E.F. & Co.

HOUGHTO-QUENCH - quenching oil - Houghton, E.F. & Co.

HOUGHTO-SAFE - fire-resistant fluids - Houghton, E.F. & Co.

HOUGHTO-SIZE - warp size compounds - Houghton, E.F. & Co.

HOUGHTO-SOLV - sludge solvent - Houghton, E.F. & Co.

HOUGHTO-WAX - warp wax - Houghton, E.F. & Co.

HOUGHTON, E.F. & CO., 303 W. Lehigh Ave., Philadelphia, Pa., 19133, Tel: 215-RE-9-7100; V.P. Sls: C.R. Schmitt

HOUPOID - extreme pressure oils - Houghton, E.F. & Co.

HOUSTON INSTR., Div. Bausch & Lomb, 4950 Terminal Ave., Bellaire, Tex., 77401, Tel: 713-667-7403, TWX: 910-881-5782; Sls. Mgr: L.C. Bower ....Pg. 848

Ala	Huntsville, J.L. Highsmith & Co., 18 Holiday Off. Ctr.	205-881-3294
Ariz	Tempe, Tri-City Elctrns., Inc., 3300 S. Mill Ave.	602-966-5321
Cal	Long Bch., Product Data Co., 3760 Orange Ave.	213-595-1777
Cal	Los Altos, Dayton Assocs., Inc., Box 1215	415-948-3871
Colo	Englewood, Aztec Enterprises, 1449 W. Littleton Blvd.	303-798-4573
Conn	So. Norwalk, J.M. Lancaster Co., 26 Oak Hill Ave.	203-866-9705
Fla	Orlando, J.L. Highsmith & Co., 2543 Industrial Blvd.	305-293-5202
Ill	LaGrange, Bard Assocs., Inc., LaGrange Ind'l. Pk.	312-354-0660
Ind	Indianapolis, Bard Assocs., Inc., 4000 Meadows Dr.	317-547-3113
Kans	Lenexa, Bard Assocs., Inc., 13100 W. 95th St.	913-888-2673
Ky	Louisville, Ridgway East, Inc., 3807 Bishop La.	502-968-1250
Mass	Framingham, J.M. Lancaster Co., 147 Concord St.	617-873-8893
Minn	Minneapolis, Bard Assocs., Inc., 4640 W. 77th St.	612-922-8233
Mo	Crestwood, Bard Assocs., Inc., 50 Crestwood Exec. Ctr.	314-849-0080
NJ	E. Brunswick, J. J. Wild, Inc., Box 152	201-238-0055
NJ	Englewood, Scientific Devices-E., 95 Cedar La.	201-871-3916
NM	Albuquerque, Aztec Enterprises, 3202 Candelaria Rd., N.E.	505-345-3441
NY	Fayetteville, Doolittle Elctrn., Inc., Box 97	315-637-3222
NY	Hastings on Hudson, J. J. Wild, Inc., Box 266	914-963-3803
NY	Jericho, J. J. Wild, Inc., 400 Jericho Tpke.	516-921-7100
Ohio	Columbus, Ridgway East, Inc., Box 13184	614-235-0818
Ohio	Loveland, Ridgway East, Inc., 1185 Cosmos Dr., Box 68	513-683-4350
Ohio	No. Olmsted, Ridgway East, Inc., 23821 Lorain Rd.	216-777-6600
Pa	King of Prussia, S & S Assocs., Boro Line Rd.	215-265-3450
Pa	Southampton, J. J. Wild, Inc., 80 Second St. Pike	215-357-6645
Tex	Houston, Data Engrg. Corp., 2120 S. Post Oak	713-622-2820
Tex	Richardson, Data Engrg. Corp., 777 S. Central Expwy.	214-231-4846
Tex	San Antonio, Data Engrg. Corp., 4438 Centerview Dr.	512-732-7176
Va	Annadale, Nine Assocs., Box 328	703-256-9105
Va	Richmond, J.L. Highsmith & Co., 5003 Brook Rd.	703-266-2060
Wash	Seattle, R.S. Drake, 6133 Maynard Ave., S.	206-763-2755
Wisc	Hales Corners, Arthur Engrg. Sls. Co., 10720 W. Scharles Ave.	414-425-5919
FOR:	Can., Ottawa 3, Ont., Datagraphics, 1300 Carling Ave.	613-722-8736

HOUSTON SCIENTIFIC INDS., INC., 3925 Dacoma Rd., Sec. E, Houston, Tex., 77018, Tel: 713-681-6631; Sls. Mgr: G.J. Giacchino, Jr.

HOWARD INDS., Div. MSL Inds., Inc., 2420 16th St., Racine, Wisc., 53403, Tel: 414-632-2731, TWX: 910-271-2387; Sls. Mgr: W.L. Crawford ....Pg. 1673

Cal	Encino, Howard Inds., 18075 Ventura Blvd.	213-881-4842
Fla	Ft. Lauderdale, Dewey Sls. Co., 320 S.W. 75th Terr.	305-587-9454
Ill	Chicago, Howard Inds.	312-992-2218
Minn	Minneapolis, Howard Inds., Div. of MSL Inds., Inc., 7710 Computer Ave.	612-920-5890
Mo	Festus, Howard Inds., Box 232	314-436-1570
NJ	Red Bank, Tech. Sls. Co., 157 Broad St.	201-741-3556
Ohio	Dayton, Howard Inds., Div. of MSL Inds., Inc., 5335 Far Hills Ave.	513-434-9822
Tex	Houston, Mr. Lindley King, 15236 E. Ritter Cir.	713-723-9256

HOWE RICHARDSON SCALE CO., 680 Van Houten Ave., Clifton, N.J., 07015, Tel: 201-GR-1-3400; Sls. Mgr: J. Giner

HOWELL INSTRS., INC., 3479 W. Vickery Blvd., Ft. Worth, Tex., 76107, Tel: 817-ED-6-7411; V.P. Sls: L.H. Becker....FSC No. 98869

HOWIE CORP., Noble & Jackson Sts., Norristown, Pa., 19401, Tel: 215-279-8190; Pres: K. Howie

HOWMET CORP., Alloy Div., Roy St., Dover, N.J., 07801, Tel: 201-361-2310, TWX: 710-987-7976; Sls. Mgr: C.C. Butzer

HOYT ELEC. INSTR. WORKS, INC., Burton-Rogers Co., Sls. Div., 556 Trapelo Rd., Belmont, Mass., 02178, Tel: 617-489-1520; Sls. Mgr: W. Burton....FSC No. 74542 ..... Pgs. 712,713

Cal Hollywood, Duncan Engrg. Sls., 1800 N. Highland Ave. 213-462-5880
Colo Denver, J. Dolliver, 1441 Humboldt St. 303-FR-7-4740
Ill Chicago, R.M. Krueger Co., Inc., 5755 W. Irving Pk. Rd. 312-AV-2-8444
Ind Ft. Wayne, Val-Skol Sls., Inc., 2005 Franklin Ave. 219-742-9122
Ind Indianapolis, Val-Skol Sls., 3556 Luewan Dr. 317-926-5063
Mass Scituate, G.E. Morton Co., 161 Summer St. 617-545-0155
Minn Minneapolis, R.J. Siedare Assoc., 4724 42nd Ave., N. 612-533-2294
Mo Kansas City, K-M Sls. Co., 17th & Main St. 816-GR-1-1355
NJ W. Caldwell, Peterson-Rudnick Assoc., Box 822 201-CA-6-4363
NY Elmhurst, Peterson-Rudnick Assoc., 97-20 57th Ave. 212-271-6042
NY Syracuse, Carlen Reps., 3650 James St. 315-437-2921
Ohio Cincinnati, Val-Skol Sls., 10515 Margate Terr. 513-563-6790
Ohio Columbus, Val-Skol Sls., Box 13088 614-291-4123
Tex Dallas, Stevens Sls., Box 34493 214-350-2476
Wash Belleville, E. Bowden Co., 12927 N.E. 26th Pl. 206-VA-2-5608

HOZ-FAS-NER - hose clamp - Reliance Div.

HPL JERSEY CO., Div of HPL Inds., Inc., 1087 Globe Ave., Mountainside, N.J., 07092, Tel: 201-233-3100; Sls. Mgr: J. Yasenka

HR - tools and equipment - Hammel, Riglander & Co., Inc.

HRB-SINGER, INC., Science Park, Box 60, State College, Pa., 16801, Tel: 814-238-4311, TWX: 510-691-2610; Mktg. Mgr: F.J. Soriero

HSK - high voltage rectifier stack - Semikron Int'l., Inc.

HT-1000 - co2 economizer - Hafstrom Tech. Prods., Inc.

HUBLOC - antenna structure - Andrew Corp.

HUDSOL - magnet wire; polyurethane - Hudson Wire Co

HUDSON CORP., Box 867, Manchester, N.H., 03105, Tel: 603-669-8570; Sls. Mgr: M. Walker

HUDSON LAMP CO., 542 Elm St., Kearny, N.J., 07032, Tel: 201-997-1850; Sls. Mgr: P. Rust ..... Pg. 1514

Ariz Tuscon, D.V. Hamilton Co., Box 50526 602-624-2391
Cal Los Altos, W.W. Posey Co., 175 S. San Antonio Rd. 415-948-7771
Cal Los Angeles, Rep. Assocs., 1645 S. La Cienega Blvd. 213-274-8485
Ill Palatine, R.L. Hanna Co., Box 202 312-358-3940
Ind Angola, Southern Sls. Co., 105 Lakeshore Dr. 219-665-3961
Ky Louisville, Southern Sls. Co., 212 Republic Bldg. 502-583-6902
Mass Needham, Coakley, Boyd & Abbett Co., Box 248 617-444-5470
Mich Detroit, R.O. Whitesell & Assoc., 25100 Evergreen 313-358-2020
Mich St. Joseph, R. O. Whitesell & Assoc., Shepard & Bennings Bldg. 616-983-7337
Minn Minneapolis, J. Lee Co., 4241 Toledo Ave., S. 612-920-1525
Mo Clayton, L.R. Harry & Assocs., 7603 Forsyth 314-872-3183
Mo Grandview, L.R. Harry & Assocs., Box 288 816-763-3634
NY Liverpool, Megatone, Inc., 202 Woods-Path Rd. 315-652-8723
Ohio Chargrin Falls, E.H. Alexander, Box 68 216-247-4133
Ohio Cincinnati, Luebbe Sls., 2649 Erie Ave. 513-871-4211
Pa Glenside, Shelmar Elctrns. Corp., Box 254 215-885-0800
Pa Pittsburgh, R.O. Whitesell & Assoc., 201 Penn Ctr. Bldg. 412-242-0100
Tenn Madison, Dixie Elctm. Assoc., Box 200 615-895-5666
Tex Dallas, J. Yount & Co., Box 17270 214-EX-1-4125
Wash Bellevue, Farwest Agencies, Box 805 206-747-3845
Wisc Milwaukee, F.C. Du Bois, 2364 N. 117th St. 414-774-3100

HUDSON WIRE CO, 62 Water St, Ossining, N Y, 10562, Tel: 914-941-8500; Sls. Mgr: R.W. Cashman

HUGHES AIRCRAFT CO, Aerospace Grp., Centinela Ave & Teale St, Culver City, Cal., 90230, Tel: 213-391-0711, TWX: 213-871-5210

HUGHES AIRCRAFT CO., Connecting Devices, Box H, Newport Beach, Cal., 92663, Tel: 714-548-0671, TWX: 714-642-1353; Mktg. Mgr: E.V. Valehrach....FSC No. 73293 ..... Pg. 2453

Cal Newport Beach, W. E. S. T., Inc., 3825 Birch St. 714-540-9040
Colo Denver, Williams Assocs., 4971 Jackson St. 303-388-4391
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Rd. 312-392-7370
Kans Wichita, Thunderbird Tech. Sls. & Svcs., Inc., 7707 E. Osie 316-684-3941
Md Towson, Kraft Elctrns. Sls., Inc., 510 Woodbine Ave. 301-828-5828
Mass Bedford, Underwood Sls. Corp., Box 375 617-275-0780
Minn Minneapolis, R.J. Siedare Assocs., 4724 42nd Ave., N. 609-429-4938
NJ Haddonfield, T.M. Mills Co., 13 B Tanner St. 609-429-1005
NJ Riverdale, Adamo Sls., Box 29 201-839-4463
NY Syracuse, C.W. Floring & H.R. Murray, Inc., DeWitt Box 11 315-446-5555
Ohio Cincinnati, Luebbe Sls. Co., 2649 Erie Ave. 513-871-4211
Tex Irving, Space Elctrns. Corp., Box 705, Irving Bank Towers 214-631-0905
Wash Redmond, Hughes Aircraft Co., Connecting Devices, Box 487 206-855-5911

HUGHES AIRCRAFT CO., Electron Dynamics Div., 3100 W. Lomita Blvd., Torrance, Calif., 90509, Tel: 213-534-2121, TWX: 910-347-6238; Mktg. Mgr: J.H. Johnson

HUGHES AIRCRAFT CO., Frequency Control Devices, 500 Superior Ave., Newport Bch., Cal., 92663, Tel: 714-548-0671, TWX: 714-642-1353; Sls. Mgr: F.H. Weisel, Jr....FSC No. 73293 Pg. 1449

Ala Birmingham, F.C. Nickerson Co., 1148 Cheyenne Blvd. 205-853-3181
Cal Sunnyvale, M & M Elctrns., Inc., 505 W. Olive St. 408-738-0100
Colo Littleton, Simpson Assocs., Inc., 2552 Ridge Rd. 303-798-8439
Conn No. Haven, Forsberg Sls., 22 Broadway 203-239-5111
DC Washington, Hughes Aircraft Co., 1875 Connecticut Ave., N.W. 202-234-9300
Fla Tampa, F. C. Nickerson Co., Inc., 4513 S. Cameron Ave. 813-833-4321
Ga Decatur, F. C. Nickerson Co., Inc., 1240 Clairmont Ave. 404-377-1575
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Rd. 312-259-4947
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun St. 219-744-4331
Kans Overland Pk., Tech. Reps., Inc., 9009 W. 95th St. 913-381-5852
Md Baltimore, Doss Elctrns., Inc., 6660 Security Blvd. 301-944-1900
Mass Brockton, Frosberg Sls., 646 Summer St. 617-522-6300
Mich Orchard Lake, R. G. Sidnell Co., Inc., 6051 Pinecroft Dr. 313-851-3518
Minn Minneapolis, Sumer, Inc., 4660 W. 77th St. 612-920-8414
Mo Florissant, Tech. Reps., Inc., 525 St. Francois St. 314-838-9100
NM Albuquerque, Data Handling Co., 209 San Pablo, S.E. 505-268-4364
NY Glen Oaks, V.P.I. Assocs., 70-60 260th St. 212-343-4667
NY Great Neck, V.P.I. Assocs., 300 Northern Blvd. 516-482-8387
NY Liverpool, M.D. Inds., Inc., 202 Woods Path Rd. 315-652-8273
NC Kinston, F.C. Nickerson Co., Inc., 1001 Parrott Ave. 919-527-4911
Ohio Dayton, R.G. Sidnell Co., Inc., 3300 S. Dixie Dr. 513-293-1194
Pa Philadelphia, V.P.I. Assocs., Box 12510 215-474-3200
Tex Irving, Space Elctrns., Inc., Irving Bank Tower 214-631-0905

HUGHES AIRCRAFT CO, Ground Sys. Grp., 1901 Malvern St, Fullerton, Cal., 92634, Tel: 714-871-3232, TWX: 910-592-1246

HUGHES AIRCRAFT CO., Hybrid Microelectronic Circuits, 500 Superior Ave., Newport Bch., Cal., 92663, Tel: 714-548-0671, TWX: 714-642-1353; Sls. Mgr: D. Mortensen....FSC No. 73293

HUGHES AIRCRAFT CO., Ind'l. Sys. Div., Box 92904, Los Angeles, Cal., 90009, Tel: 213-670-9040, TWX: 910-328-6109

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Cal Los Altos, Westec Elctrns., Inc., 110 First St. 415-948-8880
Cal Los Angeles, Galaxie Sls. Int'l., 1930 Wilshire Blvd. 213-483-0910
Conn Danbury, RJC Assoc., Lakeview Dr., Cedar Hgts. 203-237-0357

Fla Ft. Lauderdale, Young & Lawrence Assocs., 415 E. Broward Blvd. 305-563-6717
Fla Winter Pk., Young & Lawrence Assocs., 601 N. New York Ave. 305-647-6929
Ill Hinsdale, J.D. Allyn Co., 419 S. Bruner 312-325-0495
Iowa Des Moines, KSW Assocs., 3831 43rd St.
Md Pikesville, A. Wetterhahn Co., Box 5929 301-484-6376
Mass Waltham, R.J.C. Assocs., 600 Main St. 617-899-5858
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. Dr. 313-477-7700
Mo Kansas City, KSW Assocs., 7546 Troost 816-363-5651
Mo St. Louis, KSW Assocs., 2319 Hampton Ave.
NJ Oaklyn, A. Wetterhahn Co., 201 Cuthbert Blvd. 609-858-3003
NY Fayetteville, R. P. Kennedy Co., Box 56 315-637-9531
NY Hyde Pk., R. P. Kennedy Co., Green Tree Dr. 914-229-2269
NY Brooklyn, Eastern Elctrn. Sls. Co., 1 Montana Pl. 212-763-5180
NY Rochester, R. P. Kennedy Co., 39 Saginaw Dr. 716-271-6322
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster St. 513-278-5873
Okla Tulsa, G. V. Peck Co., Box 15671 918-LU-5-5853
Ore Portland, J. V. Belusko Co., 2355 N.W. Quimby St. 503-222-4279
Pa Erie, NEBco Assocs., 1564 W. 42nd St. 814-868-2111
Pa Monroeville, NEBco Assocs., Inc., 1974 Gregory Ave. 412-824-2111
Tex Dallas, G. V. Peck Co., 210 Casa Linda Plaza 214-DA-8-3511
Tex Houston, G. V. Peck Co., 5757 Bellaire Blvd. 713-MO-4-1435
EXP: N.Y., New York, Terminal Radio Int'l. Ltd., 3 W. 61st St. 212-CI-6-2133

KURMELEC - relays - Kurman Instrs. Corp.
KURMINST - relays - Kurman Instrs. Corp.
KURZ-KASCH, INC., 1421 S. Broadway, Dayton, Ohio, 45401, Tel: 513-223-8161; Pres: R.L. Davidson....FSC No. 75376
KURZ & ROOT CO., INC., 1000 N. Meade St., Appleton, Wisc., 54911, Tel: 414-739-9441, TWX: 910-272-1169; Sls. Mgr: W.E. Meyer
KWIK CHANGE - miscellaneous - Switchcraft, Inc.
KWIK-CHEK - Hamilton Watch Co.
KWIK-KALL - inter-comm sys - Loge Elctrns.
KWIK-WAY - water applied decal - Meyercord Co.
KWIKMOLD - mold making latex - Adhesive Prods. Corp.
KWIKON - insulating sleeve for quick disconnect terminals - H & S Wire Cutting Svc., Inc.
KWIKSET POWDERED METAL PRODS., Kwikset Div-Emhart Corp., 516 E. Santa Ana St., Anaheim, Calif., 92803, Tel: 714-535-8111; Sls. Mgr: J. Mikitka
KWIKY-DOTS - overlapping masking discs - By-Buk Co.
KYBE CORP., 132 Calvary St., Waltham, Mass., 02154, Tel: 617-899-0012; Sls. Mgr: P. Garland
KYNAR 500 - protective coating - Pennwalt Corp.
KYREAD - magnetic tape developer - Kyros Corp.
KYROS CORP., Box 406, Madison, Wisc., 53701, Tel: 608-238-3587; Sls. Mgr: E. Cox
L & L MFG. CO., 166 Conchester Rd., Twin Oaks, Pa., 19016, Tel: 215-HU-5-6334; Sls. Mgr: S. Lewicki
L & R - all ultrasonic cleaning machines & mechanical cleaning machines, chemicals - L & R Mfg. Co.
L & R MFG. CO., 577 Elm St., Kearny, N.J., 07032, Tel: 201-991-5330; Sls. Mgr: S.L. Goldfarb
L.S.D. - leadless space-saving device - KMC Semiconductor Corp.
LA PERLE - watch & clock oils - Hammel, Riglander & Co., Inc.
LA SCALA - loudspeaker sys. - Klipsch & Assocs., Inc.
LA-CO - fluxes and sealing compounds - Lake Chemical Co.
LAB-LINE - transformers - James Elctrns., Inc.
LAB-LINE INSTRS., INC., Lab-Line Plaza, Melrose Park, Ill., 60160, Tel: 312-345-7400
LAB-ON-WHEELS - instrument carriers - Waber Elctrns., Inc.

LAB-TRONICS DIV., Rowe Inds., Inc., 6225 Benore Rd., Toledo, Ohio, 43612, Tel: 419-729-3951, TWX: 810-442-1734; Sls. Mgr: R.D. Willis....FSC No. 93490 ..... Pgs. 2530,2531
Cal Los Angeles, W.S. Harmon Co., 6118 Venice Blvd. 213-937-1460
Ill Chicago, Rowe Inds., Inc., 1317 Fargo Ave.
Mass Wakefield, Rowe Inds., Inc., Box 452 617-246-0415
Mo Kansas City, KSW, 7546 Troost Ave. 816-363-5651
Mo St. Louis, Tri "J" Power, 11540 Adie Rd. 314-872-8824
Nev Las Vegas, Communique Consits., 3671 Rosecrest Cir., N. 702-735-8579
NJ Maple Shade, Rowe Inds., Inc., 6D Ivy Ct., Maplewood Apt. 609-667-8433
NY Kingston, Rowe Inds., Inc., Box 728 914-331-3755
NC Winston-Salem, Dula Assocs., 3389 Nottingham Rd. 919-723-4205
Ohio Cleveland, Richardson & Champ, 3691 Lee Rd. 216-991-2885
Ohio Toledo, B. Loy, 2701 Northwood 419-475-8302
Ohio Toledo, Rowe Inds., Inc., 6225 Benore Rd. 419-729-3951
Tex Dallas, Berry Co., Box 20461 214-528-0461
L.A.B. CORP., Div. Redford Corp., 981 Onondaga St., Skaneateles, N.Y., 13152, Tel: 315-OV-5-5781; Sls. Mgr: J.T. Hubbard ....FSC No. 34532

LAB/SERVO - teaching aid - Knapton Assocs., Inc.
LABCONCO CORP., 8811 Prospect, Kansas City, Mo., 64132, Tel: 816-363-1355; Sls. Mgr: G.D. McFarland
LABELON CORP., 10 Chapin St., Canandaigua, N.Y., 14424, Tel: 315-394-6220; Sls. Mgr: R.O. Dill
LABSTROBE - stroboscope - Berkshire Labs.
LABTRANS - pulse transformers - Berkshire Labs.
LACKON PROCESS - marking - Sun Dial & Panel Corp.
LAD ELECTRO-SYS., INC., 7 Commercial St., Hicksville, N.Y., 11801, Tel: 516-822-1420; Exec. V.P: S.F. Delligatti
LAKE - solenoid valves - Laketown Mfg. Corp.
LAKE - intercommunicating equipment - Lake Mfg. Co.
LAKE CHEMICAL CO., 250 N. Washtenaw Ave., Chicago, Ill., 60612, Tel: 312-826-1700; V.P. Sls: C. Kleiman
LAKE MFG. CO., 909 King St., Oakland, Calif., 94606, Tel: 415-534-5086; Sls. Mgr: W.E. Howe
LAKETOWN MFG. CORP., Box 27A RFD 1, Waconia, Minn., 55387, Tel: 612-442-4045; Sls. Mgr: N.S. Field....FSC No. 17324

LA MARCHE MFG. CO., 102 Bradrock Dr., Des Plaines, Ill., 60018, Tel: 312-299-1188 ..... Pgs. 1122,1123
Ala Birmingham, Hollen Crim, Box 58033 205-871-4084
Alas Anchorage, J.P. Bagoy, Box 1005 277-0911
Ariz Phoenix, B. Hartley, Box 4381 602-258-2552
Ark El Dorado, Louis Byrne, 632 Champagnalie Rd. 501-UN-3-9435
Cal El Cerrito, Bob Saletta, 10567 San Pablo Ave. 415-527-0557
Cal Encino, Richard J. Meyers, 16024 Ventura Blvd. 213-981-6552
Colo Denver, Jim Raney, 4068 E. Iliff Ave. 303-757-7623
Fla Juniper, J.L. Marsh, Box 865 305-746-4911
Ga Atlanta, H.P. Whitehead, Box 28662 404-252-5977
Ga Atlanta, Jack Reid, 4271 Garmon Rd., N.W. 404-CE-7-9385
Ill Skokie, William Conrardy, 4821 Main St. 312-679-1424
Ind Indianapolis, K. Reinhardt, 1407 N. Illinois St. 317-631-4136
Md Annapolis, Philip J. Martini, 778 Fairview Ave. 301-267-7462
Mass Dover, Edgar Hubert, Box 21 617-235-6815
Mass Melrose, Walter Doggett, 159 Warwick Rd. 617-665-7404
Mich Detroit, Randy Smith, 18038 Mack Ave. 313-886-3930
Mich Grand Rapids, John M. Perry, 2339 Oakwood Dr., S.E. 616-949-0271
Mo Kansas City, Charles V. Dunn, 11 E. Gregory Blvd. 816-HI-4-6212
Mo Kirkwood, H.B. Zeppenfeld, Box 3763 314-822-2333
Neb Omaha, Joseph Greshake, 5064 Arcadia Ave. 402-457-5211
NJ Collingswood, Jack Wright, 15 Maple La. 609-858-4887
NM Albuquerque, Ralph Black, 1025 Hermosa, S.E. 505-265-0144
NY Buffalo, William Stamp, 127 S. Long St. 716-634-2240
NY Uniondale, L.I., Arthur F. Crowe, 783 Henry St. 516-485-2622
NC Raleigh, Mike Constantino, 2317 McMullan Cir. 919-828-8669
Ohio Columbus, Arthur N. Ulrich, 1565 Alum Creek Dr. 614-253-2706
Ohio Olmsted Falls, A. Wolfe, Box 9334 216-235-5779
Ohio W. Carrollton, P. Navin, Box 221 513-434-2662
Ohio Willoughby, Bob Ehret, Box 488 216-946-2033
Okla Tulsa, Ray Riddle, Box 7573 918-RI-3-9851
Ore Portland, B. Haynes, 401 S.E. 50th Ave. 503-236-2744
Tex Dallas, David E. Cooper, 4914 Greenville Ave. 214-368-5881
Tex Houston, Edmond F. Meyer, 6831 Navigation 713-WA-8-3463
WVa Scott Depot, Larry Morris, Box 103 304-755-4401
Wisc Milwaukee, Edward A. Dickinson, 3612 N. Green Bay Ave. 414-264-1080
FOR: Can., Scarborough, Ont., Mr. Bert Preston, Box 102, Sta. A 293-8716 A.C. 416
FOR: Can., Vancouver 9, B.C., Simson Maxwell Co., Ltd., 1380 W. 6th Ave. 736-5431

LAMBDA ELCTRNS. CORP., 515 Broad Hollow Rd., Melville, N.Y., 11746, Tel: 516-694-4200, TWX: 510-224-6484; Sls. Mgr: J. Albers Pgs. 1125-1154,2862-2871
Ariz Scottsdale, 7102 E. Oak St. #12 602-945-1416
Cal No. Hollywood, 13425 Wyandotte St. 213-877-0041
Cal Sunnyvale, 575 N. Mathilda Ave. 408-738-2541
Conn Guilford, 71 Highwood Dr., RFD #2
Fla Clearwater, 301 Pierce St. 813-446-8376
Ill Hanover Pk., 7775 Huntington Cir., S.
Ill Schiller Pk., 4849 N. Scott St. 312-671-0182
Ind Indianapolis, 7401 N. Central Ave. 317-631-9557
Md Ellicott City, 2909 Ramblewood Rd. 301-424-2010
Md Ellicott City, 11 Belleview Dr. 301-424-2010
Mass Lexington, 49 Waltham St. 617-861-8585
Mass Natick, 3 Lakeview Gardens
Minn Minnetonka, Box 1073 612-332-6714
NJ Lincroft, 66 Leedsville Dr.
NY Beacon, 6 Crossway Rd.
NY Liverpool, 4 Gull Path 716-454-6770
NY Massapequa Pk., Box 82
NY Spring Valley, 1 Craftwood Dr.
NC Charlotte, 2918 Hampton Ave. 704-372-7203
Ohio Avon Lake, 203 Duff 216-777-9232
Pa Warminster, 1093 Little La. 215-272-7101
Tex Houston, 1823 Maux 713-464-6554
Tex Richardson, 777 S. Central Expwy. 214-231-7121
EXP: N.Y., Melville, 515 Broad Hollow Rd. 516-694-4200
LAMINAIR, INC., 13226 Figueroa, Los Angeles, Calif., 90061, Tel: 213-321-0545; Sls. Mgr: B. Weiner
LAMINATED FABRICATORS, 1145 San Mateo Ave., San Bruno, Calif., 94066, Tel: 415-583-5092; Sls. Mgr: H.L. Jacobs
LAMINATED SHIM CO., INC., 48 Union St., Glenbrook, Conn., 06906, Tel: 203-325-2631, TWX: 203-327-1184; V.P. & Gen'l. Sls. Mgr: M.E. Errico....FSC No. 75495
LAMINEX - multilayer p.c. - Advanced Circuitry Div.
LAMINOL - laminates - American Nickeloid Co.
LAMITEX - laminated plastics - Franklin Fibre-Lamitex Corp.
LAMP LIGHTER - converter/battery charger 12n. dc - Permavolt Transformers, Inc.
LAMP-JAX - phone jacks - Switchcraft, Inc.
LAMP-JAX - phone jacks - Switchcraft, Inc.
LAMPKIN LABS., INC., Perico Rd., Bradenton, Fla., 33505, Tel: 813-746-4175; Sls. Mgr: D.A. Boyers

LAMPS, INC., 19220 S. Normandie Ave., Torrance, Cal., 90502, Tel: 213-323-7578 ..... Pgs. 1522,1523
Cal Los Altos, Shannon Assocs., One First St. 415-941-2217
Cal Del Mar, McKim Enterprises, 1812 Santa Fe 714-755-2641
Colo Littleton, R-G Enterprises, 7272 S. Lincoln Way 303-794-6164
Conn Farmington, Ray Perron & Co., Inc., 10 Briarwood Rd. 203-673-4825
Conn Old Greenwich, Hoffman Engrg. Corp., Box 300 203-637-1719
Conn Trumbull, R. Perron & Co., Inc., 36 Louis St. 203-268-9631
Fla Indian Rock Bch., Tech-Rep. Assocs., Inc., Box 425 813-595-2834
Fla Melbourne, Tech-Rep. Assocs., Inc., Box 2095 305-723-9140
Ga Jonesboro, Tech-Rep. Assocs., Inc., Box 955 404-753-0111
Ill Chicago, Engineered Sls. Co., 4738 N. Harlem Ave. 312-867-8434
Kans Wichita, Aviation Tech. Reps., 227 Ida 316-265-4633
Md Baltimore, Callas Elctrns., 6409 Frederick Ave. 301-744-7711
Mass Norwood, R. Perron & Co., Inc., 159 Morse 617-762-8114
Mich Southfield, G. & H. Sls. Co., 24001 Southfield Rd. 313-358-1910
Minn Minneapolis, G. E. Arneson & Co., 4900 Viking Dr. 612-920-2086
NH Dover, R. Perron & Co., Inc., One Elm St. 603-742-2321
Ohio Cincinnati, G. & H. Sls. Co., 10599 Chester Rd. 513-771-8231
Ohio Columbus, G. & H. Sls. Co., Box 27280 614-231-4433
Ohio Novelty, G. & H. Sls. Co., 14959 Hillbrook 216-247-4446
Ore Beaverton, Arneson Assocs., 4175 S.W. Cedar Hill 503-646-3416
Pa Wayne, Emlen-Peterson Co., 34 West Ave. 215-687-3535
Tex Dallas, Scott Tech. Sls., Box 30324 214-352-7698
Wash Seattle, Arneson Assocs., 5950 6th Ave., S. 206-762-7664
EXP: Cal., Gardena, 17000 S. Western Ave. 213-323-7578
LAMSON & SESSIONS CO., 5000 Tiedeman Rd., Cleveland, Ohio, 44144, Tel: 216-267-5000; Sls. Mgr: D.J. Brown
LANCASTER GLASS CORP., 220-226 W. Main St., Lancaster, Ohio, 43130, Tel: 614-653-0311; Sls. Mgr: B.C. Greenlee
LANCE ANTENNA CORP., 13001 Bradley Ave., Sylmar, Calif., 91342, Tel: 213-367-5941; Sls. Mgr: J. Updyke
LANCE INDS., P.O. Box 4156, Sylmar, Calif., 91342, Tel: 213-367-1811; Sls. Mgr: J. Updyke
LANCELOK - terminals - Amp Inc.
LANCER - adj. freq. ac drives - Allis Louis Co.
LANCER - adj. freq. ac drive - Allis, Louis Co.
LANCER ELCTRNS. CORP., 1416 W. Main St., Norristown, Pa., 19401, Tel: 215-277-4410; Sls. Mgr: C.E. Anstey
LANDAUER, R.S., JR. & CO., Science Rd., Glenwood Science Park, Glenwood, Ill., 60425, Tel: 312-755-7000; Dir. of Sls: A. J. Kawaters

LANDIS & GYR, INC., 4 Westchester Plaza, Elmsford, N.Y., 10523, Tel: 914-592-4400, TWX: 710-567-1219; Sls. Mgr: E. Geide Pg. 1390
Ala Huntsville, Craft Assocs. Co., Box 1053 205-837-0221
Cal Los Altos, Recht Assocs., 900 N. San Antonio Rd. 415-941-0336
Cal Los Angeles, P.F. Wiley Co., 1632 Silverlake Blvd. 213-NO-3-8028
Colo Aurora, Bishop Enterprises, Inc., 126 Del Mar Cir., Ste. C 303-364-7361
Conn W. Hartford, Instr. Dynamics, Inc., 345 N. Main St. 203-233-5503
Fla Maitland, Craft Assocs. Co., Box 986 305-645-2242
Ga Atlanta, Craft Assocs. Co., Box 11716 404-237-2282
Haw Honolulu, Berkley Engrg. & Equip. Co., Box 3856
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Dr. 312-392-7370
Ill Edwardsville, Sumer, Inc., Box 241 618-656-2586
Ind Ft. Wayne, Sumer, Inc., 1430 Dividend Dr. 219-484-9588

Md Timonium, Billis Sls. Co., 110 Gorsuch St. 301-CL-2-0779
Mass Wakefield, Instr. Dynamics, Inc., Wakefield Ind'l. Pk. 617-245-5100
Mich Detroit, L.H. Dickelman Co., 13331 Puritan Ave. 313-273-0806
Minn Minneapolis, Sumer, Inc., 4660 W. 77th St. 612-920-8414
NJ Cherry Hill, Billis Sls. Co., 14 Galway La. 609-HA-8-3651
NY Lake Grove, W. H. Goudy Assoc., Box 15 516-585-0033
NY Syracuse, Naylor Elec. Co., 1718 Erie Blvd., E. 315-GR-2-9183
Ohio Cincinnati, J.H. Doerner Co., Inc., 4125 Hamilton Ave. 513-MU-1-7624
Ohio Cleveland, L.H. Dickelman Co., 28829 Chagrin Blvd. 216-831-1039
SC Greenville, Bond Transmission & Controls, 1214 Laurens Rd. 803-242-4570
Tex Dallas, Southland Engr. & Sls., Inc., 1040 W. Mockingbird La. 214-638-6264
Tex Houston, Southland Engrg. & Sls., Inc., 5810 Schumacher La. 713-782-4575
Utah Salt Lake City, Bishop Enterprises, Inc., 2520 S. State St. 801-487-2551
Wash Mercer Island, J. H. Andersen Assoc., Box 637 206-232-0484

LANDSVERK ELECTROMETER CO., 641 Sonora Ave., Glendale, Cal., 91201, Tel: 213-245-9281; Sls. Mgr: R.L. Morris

LANE INDS., Elctrns. Div., 7254 Atoll Ave. N., North Hollywood, Calif., 91605, Tel: 213-877-7828; Sls. Mgr: F. Christian

LANGEVIN, Div. Sci. Inds., Inc., 1801 E. Carnegie Ave., Santa Ana, Calif., 92705, Tel: 714-546-8830; Sls. Mgr: M.R. Headrick ....FSC No. 11135

LANOLUBRIC - wool lubricant - Houghton, E.F. & Co.

LANSDALE MICROELECTRONICS, INC., Colmar, Pa., 18915, Tel: 215-822-0155, TWX: 510-661-4932; Sls. Mgr: J. Dale

LANSDALE TRANSISTOR & ELCTRNS., INC., Advance La. & Rte. 309, Colmar, Pa., 18915, Tel: 215-855-9002, TWX: 510-661-4932; Sls. Mgr: L. Gana ..... Pg. 1918

Cal Los Angeles, L.J.G. Inds., 1720 Pontius Ave. 213-472-8902
Cal Palo Alto, L.J.G. Inds., 201 Town & Country Village 415-327-8272
Ill Chicago, Brock & Cushman, Inc., 6261 W. Grand Ave. 312-CO-1-6313
La Metairie, M. White Engrg., 247 Phosphor Ave. 504-833-3731
Mass Needham, Comp. Rep. Assocs., Inc., 1116 Great Plain Ave. 710-325-6907
Minn St. Paul, Countryman, Wagner & Behnen Co., 1821 University Ave. 612-645-9151
NJ Rivervale, LBS Assocs., 615 John St. 201-391-9400
Ohio Springfield, H. Stobbs, 2279 Seminole Dr. 513-255-4023
Tex Dallas, Mfrs. Mktg. Svc., 10303 Carry Back Cir. 214-357-6893
Tex El Paso, McNicol, Inc., 811 N. Estrella 915-LO-5-8282
Wash Seattle, B. Hirsh Co., 4013 Leary Way 206-783-3423
FOR: Can., Montreal, Que., Elpro Elctrn. Sls., Ltd., Box 35, Youville Sta. 514-381-8331
FOR: Can., Oakville, Ont., W. Barron, Box 127 416-845-2224

LANSING, JAMES B. SOUND, INC., 3249 Casitas Ave., Los Angeles, Calif., 90039, Tel: 213-665-4101, TWX: 910-321-4317; Mktg. Dir: B. Rigney, Jr.....FSC No. 90555

LA POINTE INDS., INC., 155 W. Main St., Rockville, Conn., 06066, Tel: 203-875-3351, TWX: 710-435-1663; Pres: J.H. Stillbach ....FSC No. 36621

LAPIX - hot top insulator - Houghton, E.F. & Co.

LAPP INSULATOR DIV., INTERPACE CORP., Radio Specialties, 350 Sumner St., LeRoy, N.Y., 14482, Tel: 716-967-6221, TWX: 716-967-2511; Sls. Mgr: Sumner P. Lapp....FSC No. 75539

LARK ELCTRNS., INC., 45 Walker St., New York, N.Y., 10013, Tel: 212-925-9060; Sls. Mgr: J. Cole

LA ROSE, W.T. & ASSOCS., INC., P.O. Box F, Lansingburg Sta., Troy, N.Y., 12182, Tel: 518-237-6500; Sls. Mgr: J.F. Trembley

LARSEN IMPORTING CO., 140 Nassau St., New York, N.Y., 10038, Tel: 212-233-2490; Sls. Mgr: A. Gordon

LARSON AERO DEV., Box 135, Concord, Calif., 94522, Tel: 415-228-7870; Pres: M.D. Larson

LARSON CHARLES O. CO., P.O. Box "E", Sterling, Ill., 61081, Tel: 815-625-0503; Sls. Pres: C. O. Larson

LARSON INSTR. CO., INC., Greenbush Rd., Orangeburg, N.Y., 10962, Tel: 914-359-3800; Pres: G.E. Larson ..... Pg. 734

Cal Los Angeles, L-Tronix Assocs., 1617 W. Colorado Blvd. 213-256-2224
Cal Inglewood, Meas. Assocs., 219 W. Manchester Blvd. 213-671-7651
Ill Chicago, Megatek, Inc., 1915 N. Harlem Ave. 312-889-1277
Kans Leawood, Vasen Sls. Co., 8005 Ensley La. 816-842-1760
Mo St. Louis, G. Fixman Engrg. Co., 8160 Stanford Ave. 314-725-5219
NY Roslyn Hgts., H.D.E. Assocs., 300 Edwards St. 516-484-4010
NY Syracuse, Tesco Assocs., 2002 Teall Ave. 315-463-4566
Ohio Dublin, L. K. Schaefer Co., Box 356 614-889-1224
Pa Ingomar, R. W. Moulton Assocs., Box 331 412-366-3333
Pa Willow Grove, Techparts, 81 Old York Rd. 215-657-0100
SC Santee, JLH Electro Dynamics, Inc., Box 131 803-897-2670
Tex Dallas, IBL Engrg. & Sls., 219 Preston Royal Ctr. 214-363-2921

LASER SENTRY - intrusion detection sys. - Laser Sys. Corp.

LASER SYS. CORP., 313 N. First St., Ann Arbor, Mich., 48103, Tel: 313-761-7150; Sls. Mgr: D.L. Linn

LASER TECHNOLOGY, INC., 10624 Ventura Blvd., N. Hollywood, Calif., 91604, Tel: 213-763-7091; Sls. Mgr: H B McLaughlin

LASERMETRICS, INC., 19 Legion Pl., Rochelle Park, N.J., 07662, Tel: 201-843-5780; Sls. Mgr: R. Goldstein

LASERTRON - laser plasma tube - University Labs.

LASTEC - wire saws, wire, polishing machines, sieve shakers - Laser Technology, Inc.

LATICRETE - coatings, anti-static & conductive - Uniroyal, Inc.

LATRONICS CORP., Box 469, Latrobe, Pa., 15650, Tel: 412-539-1626; Sls. Mgr: J.F. Murray

LATTIN RADIO LABS., 1431 Sweeney, Box 44, Owensboro, Ky., 42301, Tel: 502-683-2868; Pres: W.J. Lattin....FSC No. 98843

LA VEZZI MACHINE WORKS, INC., 4635 W. Lake St., Chicago, Ill., 60644, Tel: 312-378-1636; Sls. Mgr: W. Baird....FSC No. 87230

LEA-RONAL, INC., 272 Buffalo Ave., Freeport, N.Y., 11520, Tel: 516-868-8800; Sls. Mgr: M. Nadel

LEACH CORP., 1499 Huntington Dr., So. Pasadena, Cal., 91030, TWX: 213-449-1253....FSC No. 35344 Pgs. 1812-1815

Ala Huntsville, Craft Assoc. Co., Box 1053 205-837-0221
Cal Downey, Leach, 8221 E. Third 213-923-0826
Cal San Mateo, Halbar, 188A W. 36th Ave. 415-349-4700
Colo Denver, Brown Tech., 130 S. Yarrow St. 303-237-4032
Fla Maitland, Craft Assoc. Co., Box 986 305-645-2242
Ga Atlanta, A.C. Craft, 3151 Maple Dr., N.E. 404-237-2282
Ill Northfield, Torkelson, 540 W. Frontage 312-446-9085
Md Timonium, Billis Sls., 110 Gorsuch Rd. 301-252-0779
Mass Lexington, Circuit Sls., 1 Militia Dr. 617-861-0567
Minn Minneapolis, Torkelson, 4820 W 77 St. 612-920-1046
Mo Ferguson, Leach, Box 10938 314-524-2880
NJ Cherry Hill, Billis Sls., 14 Galway La. 609-428-3651
NJ Ft. Lee, Leach, 2500 Lemoine Ave. 201-461-6550
Ohio Dayton, Leach Corp., 5335 Far Hills Ave. 513-434-8151
Tex Dallas, Leach, 2433 W. Northwest Hwy. 214-352-9731
Va Alexandria, Leach, 6000 Stevenson Ave. 703-751-9416
Wash Seattle, Leach, Boeing Field 206-767-3660
FOR: Can., Mon., Brian, 2445 Duncan Rd. 514-735-1671

LEACH CORP., Controls Div., 717 N. Coney Ave., Los Angeles, Cal., 91702, Tel: 213-334-8211; Sls. Mgr: B. Dody....FSC No. 96261

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M-TRON INDS., INC., Box 630, 100 Douglas St., Yankton, S.D., 57078, Tel: 605-665-9321, TWX: 910-668-3603; Sls. Mgr: L. Tally Pg. 1470
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Cal Los Angeles, R. A. Strassner Co., Box 39756 213-666-4040
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Fla St. Petersburg, Tech-Rep. Assocs., Box 425, Indian Rocks Bch. 813-595-2834
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Tex Richardson, Whiteside Sls., Box 814 214-231-9771

M-1 MICROMUX - carrier sys. - Electronic Comm., Inc.
M-35 - microfilm lamps - Quartz Radiation Corp.
MABUCHI - fractional h.p. d.c. motors - Aristo-Craft Distinctive Miniatures
MAC DERMID, INC., 526 Huntingdon Ave., Waterbury, Conn., 06720, Tel: 203-754-6161; Pres: H. Leever
MAC PANEL CO., Programming Prods. Div., Box 5027, High Pt., N.C., 27262, Tel: 919-882-8138, TWX: 919-883-4923; Sls. Mgr: J.L. Craycroft....FSC No. 16654
MAC 16 - multi application computer - Lockheed Elctrns. Co.
MAC-16 - digital computer - Lockheed Elctrns. Co.

MACARR, INC., 166 National Rd., Edison, N.J., 08817, Tel: 201-287-2810....FSC No. 00062 .....Pg. 1155
Ala Huntsville, Russell Assocs., Inc., 2516 N. Memorial Pkwy. 205-539-7211
Cal Pasadena, Russell Assoc., Inc., 3951 E. Huntington Dr. 213-795-9521
Fla Winter Pk., Russell Assocs., Inc., 211 W. Fairbanks Ave. 305-MI-7-2251
Ga Atlanta, Russell Assocs., Inc., 6427 Roswell Rd. 404-255-8422
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Mich Detroit, Russell Assoc., Inc., 24634 Five Mile Rd.
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MACHLETT LABS., INC., Sub. Raytheon Co., 1063 Hope St., Stamford, Conn., 06907
MACK ELEC. DEVICES, INC., 32 Glenside Ave., Wyncote, Pa., 19095, Tel: 215-884-8123; Sls. Mgr: N.K. McKinney
MACK RELAYS - mercury relays - Mack Elec. Devices, Inc.
MACKAY-MARG - tonometer - Biotronics, Inc.
MACKAY, A.D., INC., 198 Broadway, New York, N.Y., 10038, Tel: 212-BA-7-8532; Sls. Mgr: P.H. Nisley
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MADATRON CORP., 110 Rte. 10, Whippany, N.J., 07981
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MAG-CON ENGRG. CO., 85 Richardson St., S.E., St. Paul, Minn., 55112, Tel: 612-633-8820; Sls. Mgr: M. Lorge
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MAGAVERTER - voltage to frequency converter - Pioneer Magnetics, Inc.
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MAGIC CIRCLE - A.R.F. Products, Inc.
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Ala	Huntsville, BJR Resch. & Mfg., 9202 Navios Dr.	205-881-3569
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Colo	Wheat Ridge, Waugaman Assocs., 4643 Wadsworth	303-423-1020
Conn	Farmington, R. Perron & Co., Inc., 10 Briarwood Rd.	203-673-4825
Conn	Trumbull, R. Perron & Co., Inc., 36 Louis St.	203-268-9631
Fla	No. Miami, Mark Elctrn. Sls., Box 291	305-947-5080
Ga	Tucker, BJR Resch. & Mfg., Box 372	404-436-5160
Ill	Chicago, Ellinger Sls. Corp., 6580 Northwest Hwy.	312-763-1570
Iowa	Clarion, Ellinger Sls. Corp., 309 Fourth Ave., S.E.	515-532-3218
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Mich	Royal Oak, Satullo Co., 4514 N. Woodward Ave.	313-549-3910
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NY	Lockport, Simberkoff Sls., Inc., 35 Niagara St.	716-434-4426
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Tex	Addison, Parvin Sls. Co., Box 307	214-239-9148
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MAGNET WIRE, INC., 25 Walker St., New York, N.Y., 10013, Tel: 212-226-0900; Sls. Mgr: J. Wasserman
MAGNETEC CORP., 7751 Densmore Ave., Van Nuys, Calif., 91406, Tel: 213-787-5131; Sls. Mgr: J.W. Hawkins....FSC No. 13860
MAGNETIC ANALYSIS CORP., 535 South 4th Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-9450; Sls. Mgr: V.L. Spoley

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Ill	Addison, E.R. Lauer & Assocs., 19 W. 380 Lake St.	312-543-4344
Mass	Brookline, Technology Prods. Grp., 233 Harvard Ave.	617-731-0858
NY	Bedford, Addem-1, Cedar Hill Rd.	914-273-3820
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Pa	Ambler, Wyncote Instr. Co., 365 E. Butler Ave.	215-643-2440
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Ill	Oak Pk., H.G. Pretat, Inc., 6905 W. North Ave.	312-848-0787
Kans	Mission, Inland Assocs., 6047 Howe Dr.	913-362-2366
Mass	Feeding Hills, Magnetics, Inc., 884 North St.	
Minn	Minneapolis, F. Peterson Co., Box 16224, Elmwood Br.	612-927-4453
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NY	Rochester, Fowler-Beach Corp., 3700 East Ave.	716-586-0468
Ohio	Dayton, R.G. Sidnell & Co., Inc., 3300 S. Dixie Dr.	513-293-1194
Pa	Doylestown, Magnetics, Inc., 33 Sunnyside Dr.	215-794-7312
Tex	Richardson, Texelec, Inc., 2500 Little Creek Dr.	214-235-3821

MAGNETICS, Ind'l. Control Div., Sandy Lake, Pa., 16145, Tel: 412-376-7515; Div. Mgr: L.N. Martin

MAGNETICS SYS. & INSTRS. Div., Div. O.S. Walker Co., Inc., Rockdale St., Worcester, Mass., 01606, Tel: 617-853-3232; Mgr: P.J. Ottowitz .....Pg. 807

Cal	Inglewood, C. Fowler Co., 9911 Inglewood Ave.	213-678-5211
Cal	Menlo Pk., C. Fowler Co., 845 Oak Grove Ave.	415-322-5374
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Fla	Sanford, Pulcir, Inc., Box 1692	305-644-2511
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Minn Minneapolis, R.J. Inc., 7100 S. France Ave. 612-922-1425
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MOFFATT PRODS., INC., 727 Winnetka Ave., N., Minneapolis, Minn., 55427

MOHAWK DATA SCIENCE CORP., Franklin Elctrns. Div., Third & Allendale Rds., King of Prussia, Pa., 19406, Tel: 215-265-7700, TWX: 510-660-2194; Sls: W. Wiand

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FOR: Can., Don Mills, Ont., York Instrs., 1262 Don Mills Rd. 416-445-1255

NOVACOR - catv amplifiers - C-COR Elctrns., Inc.
NOVAERTER - frequency changers/inverters - Nova Electric Mfg. Co.
NOVAGLAS - nomex-glass fabric - Natvar Corp.
NOVATRON - high energy flash tubes - Xenon Corp.

NOVATRONICS, INC., Box 878, Pompano Beach, Fla., 33061, Tel: 305-942-5200; Sls. Mgr: J. Cianciarulo....FSC No. 97953

NOX-RUST - rust preventives - Daubert Chem. Co.

NRA, INC., 12 Nevada Dr., New Hyde Park, N.Y., 11040, Tel: 516-352-8800; Sls. Mgr: A. Davis

NRC - vacuum equipment - Norton Co.
NU BLAC - ceramic products - Star Porcelain Co.
NU GLU - cement - Carter's Ink Co.
NU-WAY - terminals - Marshall, John Assocs., Inc.
NUCARB - solid carburizers - Houghton, E.F. & Co.
NUCLEAR AND NUBLACK - varnishes - Sterling
NUCLEAR TRIODE - position sensitive detector - Nuclear Diodes, Inc.

NUCLEAR-CHICAGO, 2000 Nuclear Dr., Des Plaines, Ill., 60018, Tel: 312-827-4456; V.P: D.W. Scudder

NUCLEAR CORP. AMERICA, Nuclear Div., 2 Richwood Pl., Denville, N.J., 07834, Tel: 201-627-4200, TWX: 710-987-8487; Sls. Mgr: D. Pessolano....FSC No. 06442 .....Pgs. 1172-1175
Cal Los Angeles, Cairns Eng. Sls. Corp., 6151 W. Century Blvd. 213-670-1700
Mass Lynfield, New England Mktg., 55 Salem St.
NJ Ridgewood, Hansen Assocs., Box 339 201-652-7055

NUCLEAR DATA, INC., 100 W. Golf Rd., Palatine, Ill., 60067, Tel: 312-529-4600; V.P. Sls: C.J. Long, Jr.

NUCLEAR DIODES, INC., P.O. Box 135, Prairie View, Ill., 60069, Tel: 312-634-3870, TWX: 72-6407; Sls. Mgr: J.W. Orth

NUCLEAR EQUIP. CHEM. CORP., 165 Marine St., Farmingdale, N.Y., 11735, Tel: 516-CH-9-8454; Sls. Mgr: E. Backstrom

NUCLEAR MEAS. CORP., 2460 N. Arlington Ave., Indianapolis, Ind., 46218, Tel: 317-546-2415; Sls. Mgr: L.G. Vaughn

NUCLEAR PRODS. CO., Box 1178, El Monte, Calif., 91734, Tel: 213-283-2603; Sls. Mgr: R.M. Evleth....FSC No. 07818

NUCLEAR RESCH. CORP., Street Rd. & Second St. Pike, Southampton, Pa., 18966, Tel: 215-357-5015; Sls. Mgr: D.S. Pollock....FSC No. 96696

NUCLEAR SUPPLIES DIV., Box 312, Encino, Calif., 91316, Tel: 213-985-6190; Sls. Mgr: M.R. Solomon

NUCLEAR SYS., INC., 406 S. Yale St., Box 98, Garland, Tex., 75040, Tel: 214-276-0543; Mgr: R. Marlow....FSC No. 24670

NUCLEONIC PRODS. CO., INC., 6660 Variel Ave., Canoga Pk, Cal., 91303, Tel: 213-887-1010, TWX: 910-494-1954; Sls. Mgr: H.K. Cooper....FSC No. 1188

NUCLIDE CORP., AGV Div., 916 Main St., N. Acton, Mass., 01720, Tel: 617-263-2936; Gen'l. Mgr: D.J. Marshall

NUCOM - loudspeakers - Micro-Magna Elctrns.
NUCOR - power components - Nuclear Corp. America
NUDEEA - anti-static cleaner - Miller, Harry Corp.
NUGGET - blower - Rotron, Inc.
NULOK - coax connector - Cinch-Nu Line
NUMERICAL INDEXER - numerical control - Summit Engrg. Corp.

NURAD, INC., 2165 Druid Pk. Dr., Baltimore, Md., 21211, Tel: 301-462-1700; Sls. Mgr: H. Rutstein

NURL LOC - press-in sockets - Elctrn. Molding Corp.
NURL LOC - press-in test jacks - Elctrn. Molding Corp.
NURL LOC - press-in terminals - Elctrn. Molding Corp.
NURSECOM - hospital comm. sys. - Executone, Inc.
NURSETALK - nursing home comm. sys. - Executone, Inc.

NUS CORP., Underwater & Elctrn. Sys. Div., P.O. Box 248, Paramus, N.J., 07652, Tel: 201-265-2400; Sls. Mgr: E.M. Zacharias ....FSC No. 25214

NUTMEG SCREW MACH. PRODS., Box 1470, Waterbury, Conn., 06720, Tel: 203-879-1496; Sls. Mgr: T.J. Iorio

NUTRONICS MFG. CO., 1703 Peoria Rd., Springfield, Ill., 62702, Tel: 217-544-9821; Pres: A. Darran

NUTSERT - insert fasteners - Avdel, Inc.

NVF CO, Maryland Ave. & Beech St., Wilmington, Del., 19899, Tel: 302-239-5281; Sls. Mgr: G. Levan....FSC No. 43021

NWL, INC., Box 455, Trenton, N.J., 08603, Tel: 609-882-2500; Sls. Mgr: C.B. Toole....FSC No. 82858 .....Pg. 2882
Tex Dallas, Titan Reps., Inc., 6434 Maple Ave. 214-357-8266

NY-GLASS PLASTICS, 7314 E. Madison St., Paramount, Calif., 90723, Tel: 213-636-1035; Sls. Mgr: A. Willis....FSC No. 11783

NYCO - coils & transformers - New York Coil Co.

NYE, WILLIAM F., INC., P.O. Box G-927, New Bedford, Mass., 02742, Tel: 617-992-1327; Sls. Mgr: G.B. Mock

NYLAFLOW - nylon reinforced hose - Polymer Corp.
NYLAFLOW - nylon pressure tubing - Polymer Corp.
NYLAKRIMP - nylon insulated terminal - ETC, Inc.
NYLASINT - sintered nylon parts - Polymer Corp.
NYLATCH - panel fastener - Hartwell Corp.
NYLATINT - nylon dye - Polymer Corp.
NYLATRON - nylon stock shapes - Polymer Corp.
NYLATRON - nylon molding compounds - Polymer Corp.
NYLAWELD - nylon to nylon adhesive - Polymer Corp.
NYLOBOND - connectors - Amp Inc.
NYLOCLIP - nylon cable hangers - Burndy Corp.

NYLOGRIP PRODS. CO., 281 Winter, Waltham, Mass., 02154, Tel: 617-891-8100; Sls. Mgr: N.R. Houghton

NYLOK - self-locking fastener - Nylok Co. Div.

NYLOK CO. DIV., USM Corp., 611 Industrial Ave., Paramus, N.J., 07652, Tel: 201-261-9400, TWX: 201-262-2243; Sls. Mgr: R.W. Rundle....FSC No. 02615

NYLON-ZIP - slide fasteners - Waldes Kohinoor, Inc.
NYLOTUBE - thinwall tubing and insulation - Nyltite Corp. America
NYLOX - adhesive composition for nylon, etc. - Hardman Inc.
NYLOY - rod ends with ball bearings - MPB Corp.

NYLTITE CORP. AMERICA, 3451 S. Clinton Ave., S. Plainfield, N.J., 07080, Tel: 201-561-1300; Sls. Mgr: C. Gould

NYPOLY - magnet wire; polyurethane-nylon - Hudson Wire Co
NYSOL - polyurethane insulated magnet wire - REA Magnet Wire Co., Inc.
NYSTAGMOTRAC - optical stimulator - Beckman Instrs., Inc.
NYT-CAP - ceramic capacitor - Nytronics, Inc.
NYT-CHIP - ceramic capacitor - Nytronics, Inc.
NYTRAN - miniature transformer - Nytronics, Inc.
NYTRIM - variable resistor - Nytronics, Inc.

NYTRONICS, INC., Custom Comps. Grp., Third Ave., Alpha, N.J., 08865, Tel: 201-454-1143, TWX: 510-235-2918; Grp. V.P: J. Potash....FSC No. 43543

NYTRONICS, INC., Capacitor Div., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 710-995-4589; Dir. Mktg: F. Meshowski .....Pg. 2274
Ariz Phoenix, Barnhill Assocs., 4900 E. Indian School Rd. 602-959-2115
Cal Los Angeles, Clemick-Neenan & Assoc., 654 N. Sepulveda Blvd. 213-476-1272
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Fla Pompano Bch., Dyne-A-Mark Corp., 1010 E. Atlantic Blvd. 305-942-5870
Ill Chicago, Croydon Elctrns., Inc., 1915 N. Harlem Ave. 312-237-4343
Ind Ft. Wayne, Croydon Elctrns., Inc., 618 E. State St. 219-484-9622
Kans Prairie Village, Thunderbird Tech. Sls. & Svc., 4014-A W. 95th St. 913-642-7220
Md Bethesda, Warren Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Minn St. Paul, Wagner Comp. Consits., 542 S. Snelling Ave. 612-698-0331
Mo Hazelwood, Thunderbird Tech. Sls. & Svcs., Inc., 400 Brookes Dr. 314-731-4343
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY Rochester, W.A. Franklin Sls. Co., 179 Hillary Dr. 716-889-4849
NY Syracuse, W.A. Franklin Sls. Co., 2 Standish Terr. 315-446-1120
Ohio Cincinnati, S.A.R.G.E., Inc., 4201 Victory Pkwy. 513-751-1313
Okla Tulsa, H.J. Daly Co., 5836 S. 70th East Ave. 918-627-4159
Utah Salt Lake City, Barnhill Assocs., 2459 S. Main 801-487-1327
Wash Seattle, Elctrn. Sls. Corp., 21 Michigan St. 206-767-3160

NYTRONICS, INC., Electro-Mec Instr. Corp., 183 Commercial St., Watertown, Conn., 06795, Tel: 203-274-5431, TWX: 710-478-0387; Sls. Mgr: T. Brys....FSC No. 97235

NYTRONICS, INC., Essex Elctrns. Div., Standard Comps. Grp., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 810-665-2182; Dir. Mktg: F. Meshowski....FSC No. 72259 Pgs. 2344,2584
Ariz Phoenix, Barnhill Assocs., 4900 E. Indian School Rd. 602-959-2115
Cal Gardena, Santa Monica Bell Elec., 306 E. Alondra Blvd. 213-321-5802
Cal Menlo Pk., Bell Elctrns. Corp., 1070 O'Brien Dr. 415-323-9431
Cal San Diego, Bell Elctrns. Corp., 8072 Engineer Rd. 714-278-4350
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Fla Pompano Bch., Dyne-A-Mark Corp., 1010 E. Atlantic Blvd. 305-942-5870
Ill Chicago, Croydon Elctrns., Inc., 1915 N. Harlem Ave. 312-237-4343
Ind Ft. Wayne, Croydon Elctrns., Inc., 618 E. State St. 219-484-9622
Kans Prairie Village, Thunderbird Tech. Sls. & Svc., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svc., 7707 E. Osie 316-684-3941
Md Bethesda, W. Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Mass Bedford, F.R. Lesser, 20 Haydon La. 617-275-7558
Mich Birmingham, H.C. Heym Assoc., 1688 Buckingham Rd. 313-644-9166
Minn Minneapolis, M. Foster Co., Inc., 228 S. Cedar Lake Rd. 612-374-2612
Mo St. Louis, Thunderbird Tech. Sls. & Svcs., Inc., Box 6156 314-838-6688
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan Ave. 201-947-6767
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY Buffalo, Telesco Assocs., 395 Cleveland Dr. 716-834-1026
NY Vestal, Telesco Assoc., Inc., 609 Harvard St. 607-729-6339
Ohio Cincinnati, S.A.R.G.E., Inc., 4201 Victory Pkwy. 513-751-1313
Okla Tulsa, H. J. Daly Co., 5836 S. 70th E. Ave. 918-627-4159
Pa Ambler, Humes-Quinlan Sls., Inc., 242 E. Butler Ave. 215-646-7250
Tex Dallas, Southwest Elec. Inds., 621 Meadows Bldg. 214-363-1671
Tex Houston, Southwest Elec. Inds., 1405 S. Post Oak Rd. 713-621-3760
Utah Salt Lake City, Barnhill Assocs., 2459 S. Main 801-487-1327
Wash Bellevue, Farwest Elec., 12410 S.E. 32nd St. 206-747-1515
EXP: N.Y., New York, National Atlantic Corp., 50 E. 42nd St. 212-697-2584

NYTRONICS, INC., Precision Resistor Div., Industrial Rd., Kutztown, Pa, 19530, Tel: 215-683-7307; Grp. V.P: R. Hallock ....FSC No. 98141 .....Pg. 2735
Ariz Phoenix, Barnhill Assocs., 4900 E. Indian School Rd. 602-959-2115
Cal Menlo Pk., Bell Elctrns. Corp., 1070 O'Brien Dr. 415-323-9431
Cal No. Hollywood, Crown Elctrns., Box 4741 213-877-3550
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Ill Chicago, Croydon Elctrns., Inc., 1915 N. Harlem Ave. 312-237-4343
Ind Ft. Wayne, Croydon Elctrns., Inc., 618 E. State St. 219-484-9622
Kans Merriam, Mid America Mktg., 10019 W. 55th St. 913-432-8678
Md Bethesda, W. Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Mass Bedford, F.R. Lesser, 20 Haydon La. 617-275-7558
Mich Birmingham, H.C. Heym Assoc., 1688 Buckingham Rd. 313-644-9166
Minn Minneapolis, M. Foster Co., Inc., 228 S. Cedar Lake Rd. 612-374-2612
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY New York, Sprung/Nussbaum, Inc., 254 W. 31st St. 212-565-1820
NY Rochester, Telesco Assoc., Inc., 3254 Winton Rd., S. 716-275-9200
NY Vestal, Telesco Assoc., Inc., 609 Harvard St. 607-729-6339
Ohio Cincinnati, S.A.R.G.E., Inc., 4201 Victory Pkwy. 513-751-1313
Okla Tulsa, H. J. Daly Co., 5836 S. 70th E. Ave. 918-627-4159
Pa Media, W. Reeves Assoc., Inc., 2973 N. Providence Rd. 215-566-6709
Tex Dallas, Southwest Elec. Inds., 621 Meadows Bldg. 214-363-1671
Tex Houston, Southwest Elec. Inds., 1405 S. Post Oak Rd. 713-621-3760
Utah Salt Lake City, Barnhill Assocs., 2459 S. Main 801-487-1327
Wash Bellevue, Bell Farwest Elec., 12410 S.E. 32nd St. 206-747-1515
EXP: N.Y., New York, Nat'l. Atlantic Corp., 50 E. 42nd St. 212-697-2584

NYZIN - nickel-zinc battery - Yardney Elec. Corp.

O & S RESEARCH, INC., 1912 Bannard St., Riverton, N.J., 08077, Tel: 609-829-2800, TWX: 609-829-2836; Pres: E.R. Sanders ....FSC No. 04716

O CORD - type sto-sjto cord - Plastic Wire & Cable Corp.

O M I - resistors - Omtronics Mfg., Inc.

O-PAC - power packs - Opad Elec. Co., Inc.

O-PF - transistors - Motorola Semiconductor Prods., Inc.

O-30 - cemented oxide mat'l. and prods. - General Elec. Co.

OAK MFG. CO., Div. Oak Electro/Netics Corp., Dept. EL, Crystal Lake Ave., Crystal Lake, Ill., 60014, Tel: 815-459-5000, TWX: 910-634-3353; Sls. Mgr: P.M. Hassett....FSC No. 76854 Pgs. 2074,2075
Ariz Phoenix, Shefler-Kahn Co., 2017 N. 7th St. 602-258-7893
Cal Inglewood, J. Kent, 5005 W. Century Blvd. 213-678-4108
Cal Los Altos, P. Wheaton, 960 N. San Antonio Rd. 415-941-1237
Colo Denver, I.W. Strong & Assocs., 635 Canosa Ct. 303-292-6900
Fla Ft. Lauderdale, D. Green, 1040 Bayview Dr. 305-563-2681
La Metairie, J.F. McKinney Sls. Co., 2012 Condon Ave. 504-887-1723
Md Baltimore, J.W. Sheffer, 4609 Old Frederick Rd. 301-CE-3-0606
Mass Andover, R. Kolarik, 30 Park St. 617-475-9390
Mich Stevensville, K. Yerama, 420 Lake Shore Dr. 616-925-5112
Minn Minneapolis, L. F. Murphy & Assocs., Inc., 730 Chicago Ave. 612-333-4511
Mo St. Louis, J.P. Carlson, 2316 Putter La. 314-CH-1-4351
NJ Haddonfield, Gray-Williams Assocs., 8 E. Mt. Vernon Ave. 609-429-5300
NJ Mountainside, H. G. Richter, Inc., 608 Sherwood Pkwy. 201-AD-3-4615
NM Albuquerque, Shefler-Kahn Co., 408 San Mateo Blvd., N.E. 505-265-7077
NY Fayetteville, H. G. Richter, Inc., Box 251 315-637-6713
NY New York, H. G. Richter, Inc. 212-WO-2-5820
NY Rochester, E. J. Schomburg Co., 1850 Clover St. 716-244-0920
NC Charlotte, O.W. Jones, 4615 H Coronado Dr. 704-537-2587
Ohio Cincinnati, L. Grabinger, 8613 Winton Rd. 513-521-5689
Ohio Dayton, P. C. McDaniel, 3020 California Ave. 513-298-5752
Okla Tulsa, J.F. McKinney Sls. Co., Box 3958 918-622-2967
Ore Portland, B. Bartos, 2035 S.W. 58th Ave. 503-292-0878
Tex Bellaire, J.F. McKinney Sls. Co., Box 1026 713-665-3653
Tex Dallas, J.F. McKinney Sls. Co., 1303 Chemical St. 214-631-9450
EXP: Ill., Crystal Lake, Oak Electro/Netics Corp. 815-459-5000

OAKITE - cleaning compound - Oakite Prods., Inc.

OAKITE DRYCID - powdered acid compound - Oakite Prods., Inc.

OAKITE PRODS., INC., 50 Valley Rd., Berkeley Hgts., N.J., 07922, Tel: 201-464-6900; Sls. Mgr: F.J. McNally

OAKOMETER - solution testing instrument - Oakite Prods., Inc.

OAKTRON INDS., INC., Monroe, Wisc., 53566, Tel: 608-325-2121; Sls. Mgr: C.E. Matthews

OAL ASSOCS., INC., 155 Sullivan La., Westbury, N.Y., 11590, Tel: 516-742-0278; Sls. Mgr: O. Lohkemper

O'BRIEN, D. G., INC., 15 Mercer Rd., Natick, Mass., 01760, Tel: 617-655-4700, TWX: 710-380-0643; Sls. Mgr: C.A. Fuller

OBRISCO ELECTRONICS, INC., 110 Valley Rd., Wilmington, Del., 19804, Tel: 302-658-4136; Sls. Mgr: H.O. Boryshko ....FSC No. 16864

OBSERVER - cctv cameras - Blonder-Tongue Labs., Inc.

OCT-O-LET - multiple outlets - Fedtro, Inc.

OCTAGON - cleaners & solvents - Octagon Process, Inc.

OCTAGON PROCESS, INC., 35 Archer St., Edgewater, N.J., 07020, Tel: 201-945-9400; Sls. Mgr: C. Maas

OCTAPLATE - electrolessplating chemicals - Octagon Process, Inc.

OCTASTRIP - stripping compounds - Octagon Process, Inc.

OCTATRON - voltage turnable oscillator - Alpha Inds., Inc.

OCULAR REFLECTOSCOPE - eye measuring device - Automation Inds., Inc.

ODEC COMPUTER SYS., INC., 871 Waterman Ave., E. Providence, R.I., 02914, Tel: 401-438-0220

ODETICS, INC., 1845 S. Manchester, Anaheim, Cal., 92802, Tel: 714-530-6050, TWX: 910-594-1461; Sls. Mgr: J. Muench

OECO CORP., 712 S.E. Hawthorne Blvd., Portland, Ore., 97214, Tel: 503-232-0161, TWX: 910-464-6146; Gen'l. Mgr: S.A. Meek ....FSC No. 95266

O E M PRODS., Litton Automated Business Sys., 600 Washington Ave., Carlstadt, N.J., 07072, Tel: 201-935-2200

OFFSCAT - offset parabolic reflectors - RF Systems, Inc.

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Box 59, Ogallala, Neb., 69153, Tel: 308-284-4093, TWX: 910-620-0322; Sls. Mgr: H.L. Harrington

OGDEN TECHNOLOGY LABS., INC., 1536 E. Valencia Dr., Fullerton, Cal., 92634, Tel: 213-289-4425, TWX: 213-288-3123; Sls. Mgr: C.D. Richmond

OGDEN TECHNOLOGY LABS., INC., 100 Smith St., Farmingdale, N.Y., 11736, Tel: 516-694-8616; Sls. Mgr: A. Davis

O'HARA METAL PRODS. CO., 540 Brannan St., San Francisco, Calif., 94107, Tel: 415-989-5390; Sls. Mgr: C.V. O'Hara

OHIO - carbon brushes - Ohio Carbon Co.

OHIO CARBON CO., 12508 Berea Rd., Cleveland, Ohio, 44111, Tel: 216-CL-2-6100; Sls. Mgr: D.I. Stoffel....FSC No. 76868

OHIO SEMITRONICS, INC., 1205 Chesapeake Ave., Columbus, Ohio, 43212, Tel: 614-486-9561; Sls. Mgr: J.R. Gillard ....FSC No. 12066 .....Pgs. 761,2123
Ala Huntsville, M. D. Anderson, Box 1466 205-536-8484
Ariz Tempe, Windsor Dynamics, Inc., 3300 S. Mill Ave. 602-967-3222
Cal Sherman Oaks, Windsor Dynamics, Inc., Box 5500 213-789-2421
Conn Meriden, Abott-Allison Co., Box 467 203-237-9232
Fla Clearwater, Brennan Assocs., Inc., Box 5006 813-446-5006
Ill Lombard, Quadtron Assocs., Box 306 312-627-6800
Mo St. Louis, R. D. Sebright Co., 7120 W. Florissant 314-261-0055
Ohio Cleveland, Control Design Assoc., 7333 Fair Oaks 216-439-2299

OHIO STEEL TUBE DIV., Copperweld Steel Co., Shelby, Ohio, 44875, Tel: 419-347-2424, TWX: 810-490-2480; Sls. Mgr: J.E. Horner

OHIOHM - carbon composition resistors - Ohio Carbon Co.

OHMART CORP., 4241 Allendorf Dr., Cincinnati, Ohio, 45209, Tel: 513-272-0131

OHMITE MFG. CO., 3635 W. Howard St., Skokie, Ill., 60076, Tel: 312-675-2600, TWX: 910-223-0805; Sls. Mgr: F. Maiale ....FSC No. 44655 ..... Pgs. 1833,2736,2817,2884
Alas Anchorage, H. J. Lang & Assocs., 1406 47th Ave. 279-5741
Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-AL-8-7893
Cal Hollywood, Ohmite Mfg. Co., 6115 Selma Ave. 213-466-3434
Cal Palo Alto, Ohmite Mfg. Co., 999 Commercial St. 415-321-6953
Colo Denver, I.W. Strong & Assoc., Inc., 635 Canosa Ct. 303-292-6900
DC Washington, S.K. Macdonald, Inc., 3308 14th St., N.W. 202-265-3938
Fla Lutz, S.K. Wallace Assocs., Inc., Box 67 813-949-1817
Ga Atlanta, A. Brown Assocs., 1771 Tully Cir. 404-636-9446
Ill Skokie, Ohmite Mfg. Co., 3601 Howard St. 312-OR-5-2600
Iowa Des Moines, T. L. Dowell, Inc., 4127 27th St. 515-255-6580
Kans Overland Pk., T. L. Dowell, Inc., 7208 W. 80th St. 910-749-6481
La Metairie, Cartwright & Bean, 7010 Magnolia Ct. 504-887-5525
Md Baltimore, S.K. MacDonald, Inc., 5500 Harford Rd. 301-254-3380
Mass Burlington, Ohmite Mfg. Co., 99 Cambridge St. 617-272-6060
Mich Birmingham, Ohmite Mfg. Co., 725 S. Adams St. 313-642-6040
Minn Minneapolis, F.B. Hill Co., 7317 Cahill Rd. 612-941-5270
Mo St. Louis, T. L. Dowell, Inc., 4753 Titan Ct. 314-892-2859
NJ Hackensack, Ohmite Mfg. Co., 40 Zabriskie St. 201-488-3690
NY Rochester, Ohmite Mfg. Co., 3700 East Ave. 716-DU-1-1890
NC Charlotte, Cartwright & Bean, 625 Harwyn Dr. 704-537-7965
Ohio Cleveland, Ohmite Mfg. Co., 25000 Euclid Ave. 216-261-6000
Ore Salem, M.K. Widdekind Co., 3292 Sunnyview, N.E. 503-363-6445
Pa Philadelphia, S.K. MacDonald, Inc., 1531 Spruce St. KI 5-1205
Pa Pittsburgh, S.K. MacDonald, Inc., 7805 McKnight Rd. 412-366-2643
Pa York, S.K. Macdonald, Inc., 4000 Wilshire Dr. 717-755-6578
Tenn Memphis, Cartwright & Bean, Box 4760, Crosstown Sta. 901-276-4442
Tex Dallas, B. Wylds Co., 3505 Turtle Creek La. 214-522-0120
Tex Houston, B. Wylds Co., 8385 Westview Dr. 713-468-3264
Wash Seattle, M.K. Widdekind Co., 815 W. Ewing St. 206-284-8020

OHMITRAN - transformers - Ohmite Mfg. Co.

OHMITROL - power controls - Ohmite Mfg. Co.

OHMSPUN LOADS - resistance load - States Co.

OHR-TRONICS, Sub. Mohawk Data Sciences Corp., Box 406, King of Prussia, Pa., 19406, Tel: 215-265-7700, TWX: 510-660-2194

OIL FOIL - felt oil seals - GAF Corp.

OILON PV 80 - acetal combined with lubricant - Cadilac Plastics & Chems.

OILOSTATIC - oil pressure pipe type cable transmission systems - Okonite Co.

OITDAG - graphite in petroleum oil - Acheson Colloids Co.

OKAY - leather belting - Houghton, E.F. & Co.

OKEMCO - heavy duty tank cleaner - Oakite Prods., Inc.

OKI ELCTRNS. AMERICA, INC., 500 S.E. 24th St., Ft. Lauderdale, Fla., 33316, Tel: 305-523-7202, TWX: 510-955-9837; Pres: G.A.S. Roberts

OKLAHOMA AEROTRONICS, INC., 632 Pennsylvania Ave., Hartshorne, Okla., 74547, Tel: 918-297-2566; Sls. Mgr: C. Oberst ....FSC No. 22887

OKOCLAD - aluminum sheathed wiring systems - Okonite Co.

OKOCORD - portable cord and flexible cable - Okonite Co.

OKOFLEX - instrument control tubing - Okonite Co.

OKOGUARD - high-voltage cable - Okonite Co.

OKOLATEX - latex insulation - Okonite Co.

OKOLENE - (polyethylene) insulated wire - Okonite Co.

OKOLITE - high-voltage cable, wire and tape - Okonite Co.

OKOLITE 90 - oil base insulated cable - Okonite Co.

OKOMETAL - fatigue-resistant alloyed lead sheaths - Okonite Co.

OKONITE - wire, cable, tape, rubber & cement splice roller - Okonite Co.

OKONITE CO., Wire & Cable Div., Box 340, Ramsey, N.J., 07446, Tel: 201-327-0368; V.P. & Gen'l. Sls. Mgr: J. Hoss

OKOPRENE - cable & wire protective coverings - Okonite Co.

OKOSEAL - chemical resistant cable and wire - Okonite Co.

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PRESS-I-CELL - pressure indicator - Fischer & Porter Co.
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Pa Jenkintown, Stein Instr. Corp., 413 Johnson St. 215-885-2370
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RIVERBANK LABS., Dept. Engrg., Box 110, Geneva, Ill., 60134, Tel: 312-232-2207
RIVERTONE - record accesories - American Phono-Ton, Inc.
RIXON ELCTRNS., INC., 2120 Industrial Pkwy., Silver Spring, Md., 20904, Tel: 301-622-2121, TWX: 301-622-2292; Sls. Mgr: J. White ....FSC No. 00433

R L C ELCTRNS., INC., 83 Radio Cir., Mt. Kisco, N.Y., 10549, Tel: 914-241-1334; Sls. Mgr: M. Rosenzweig....FSC No. 12598 Pgs. 906,907
Ala Huntsville, Reynolds & Assocs., Inc., 904 Bob Wallace Ave. 205-536-1941
Cal Mountain View, IFM-North, 2269 E. Middlefield Rd. 415-961-2828
Cal No. Hollywood, Crown Elctrns., 5657 Lankershim Blvd. 213-877-3550
Cal Orange, Smith & Assocs., Central Tower 714-541-2629
Fla Eau Gallie, Reynolds & Assocs., Inc., Box 1043 305-727-3205
Fla Ft. Lauderdale, Reynolds & Assocs., Inc., 161 S.W. 75th Ave. 305-581-6611
Fla Orlando, Reynolds & Assocs., Inc., Box 8877 305-424-3836
Ga Atlanta, Reynolds & Assocs., Inc., 175 W. Wieuca Rd., N.E. 404-252-5360
Ill Des Plaines, Marsland Assocs., Inc., 1000 Executive Way 312-298-2620
Ind Indianapolis, Marsland Assocs., Inc., 3734 Carrollton Ave. 317-924-3568
Mass Cochituate, Micronic Assocs., Box 162 617-653-8229
Mass Waltham, Microwave Consits. Corp., 195 West St. 617-899-4400
Minn Minneapolis, Marsland Assocs., Inc., 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland Assocs., Inc., 100 St. Francois 314-831-0015
NJ Trenton, Fleming & Levergood Assoc., 16 Florister Dr. 609-587-7797
Va Fairfax, Schibley Assocs., Inc., 10604 Warwick Ave. 703-591-3008

RMS ELECTRONICS, INC., 50 Antin Pl., Bronx, N.Y., 10462, Tel: 212-TY-2-6700; Sls. Mgr: A.A. Fink
RMS ENGINEERING, INC., 486 14th St., N.W., Atlanta, Ga., 30318, Tel: 404-873-5257; Sls. Mgr: N. Morgan....FSC No. 18016

RO ASSOCS., INC., 3705 Haven Ave., Menlo Pk., Cal., 94025, Tel: 415-322-5321, TWX: 910-378-5929; Sls. Mgr: R.H. Okada ....FSC No. 24230 ..... Pgs. 1206-1209,1396
Ala Huntsville, Lee Assocs., Inc., Box 1506 205-539-0761
Cal San Diego, RDP Instrs., Inc., Box 10449 714-224-3521
Cal Downey, RDP Instrs., Inc., 11565-B Paramont Blvd. 213-923-1515
Fla Orlando, Lee Assocs., Inc., 200 E. Marks St. 305-241-4445
Ga Chamblee, Lee Assocs., Inc., Box 80666 404-261-0493
Ill Chicago, Lightner Assoc., Inc., 6322 N. Milwaukee Ave. 312-775-5300
Md Ellicott City, Gans-Fryling, Inc., 9516 Michaels Way 314-423-7200
Mass Needham Hgts., Techmar Inc., 19 Brooks Rd. 617-444-8130
Mo St. Louis, Ozark Elctrn. Mktg., Inc., 2573 Woodson Rd. 314-423-7200
NJ So. Hackensack, Engrd. Prods., Inc., 290 Huyler St. 201-488-4040
NC Winston-Salem, Lee Assocs., Inc., 955 Burke St. 919-724-2406
Ohio Cleveland, Data-Tron, 7016 Euclid Ave. 216-391-8421
Tex Dallas, Compar Southwest, 8609 N.W. Plaza Blvd. 214-363-1526
Tex Houston, Compar Southwest, 5757 Bellaire Blvd. 713-667-3420
Va Arlington, Gans-Fryling, Inc., 2030 16th St., N. 703-527-3262
Wash Bellevue, A. Smith Co., 405 166 Southeast St. 206-746-6770
FOR: Can., Toronto, Ont., B.H. McGregor, Box 156, Sta. "H" 416-699-5521

RO-TRAN - power control unit - Inland Motor Corp. of Va.
ROAD RATER - pavement strength tester - Wyle Labs.
ROANWELL CORP., 180 Varick St., New York, N.Y., 10014, Tel: 212-989-1090, TWX: 710-581-6555; Sls. Mgr: H.W. Clark
ROBBINS & MYERS, INC., 1345 Lagonda Ave., Springfield, Ohio, 45501, Tel: 513-323-6461, TWX: 513-324-5961; Sls. Mgr: N.L. Morgan

ROBERTSHAW CONTROLS CO., Acro Div., I-71 S. at Stringtown Rd., Box 449, Columbus, Ohio, 43216, Tel: 614-875-2351, TWX: 810-335-2560; Dir. Mktg: A.D. Unetic....FSC No. 80311 Pgs. 2082,2083
Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-258-7893
Cal Inglewood, V & L Assocs., 3412 W. Century Blvd. 213-671-7688
Conn Newington, Box 11276 203-527-4241
Fla Ft. Lauderdale, W.C. Smith, 2000 N.E. 26th Dr. 305-564-1477
Ill Elk Grove Village, Robertshaw Controls Co., 190 Gordon St. 312-569-2200
Mo Maryland Hgts., Robertshaw Controls Co., 11645 Adie Rd. 314-432-1260
NJ Martinsville, Van Nest Dr. 201-469-2090
NJ Paramus, Robertshaw Controls Co., 600 Industrial Ave. 201-265-6670
Ohio Cleveland, 8200 E. Pleasant Valley Rd. 216-524-4821
Wash Seattle, C.B. Parsons, 5319 Fourth Ave., S. 206-762-7373

ROBERTSHAW CONTROLS CO., Aeronautical & Instr. Div., Santa Ana Frwy at Euclid Ave., Anaheim, Calif., 92803, Tel: 714-535-8151, TWX: 714-776-1790; Mktg. Dir: E. Mullen ....FSC No. 00543

ROBERTSON INSTR. CO., 1760 W. First St., Azusa, Calif., 91702, Tel: 213-334-3101; Pres: H.L. Robertson

ROBICON CORP., Plum Ind'l. Pk., Pittsburgh, Pa, 15239, Tel: 412-327-7000; Sls. Mgr: N. Altman

ROBINS DATA DEVICES, INC., Sub. of Robins Inds. Corp., 15-58 127th St, Flushing, N Y, 11356, Tel: 212-445-7200; Sls. Mgr: D. Hubbinett

ROBINSON-HALPERN CO., 5 Union Hill Rd., W. Conshohocken, Pa., 19428, Tel: 215-825-1300, TWX: 510-660-8416; Sls. Mgr: M.R. Garber....FSC No. 12400

ROBINSON-NUGENT, INC., 800 E. 8th St., New Albany, Ind., 47150, Tel: 812-945-0211, TWX: 810-355-2912 .....Pgs. 2526,2527

Cal	Arcadia, A.M. Wood Co., Box 1-A	213-283-1201
Cal	Redwood City, Logan Sls. Co., 463 Brewster Ave.	415-369-6726
Conn	Hamden, J. F. Kerrigan & Co., Box 5385	203-288-2200
Fla	Oviedo, Conley-May Assocs., Inc., Box 668	305-365-3283
Fla	Pompano Beach, Conley-May Assocs., Inc., 721 S.E. 6th Terr.	943-8284
Ill	Chicago, Electro-Comp. Sls., Inc., 5129 W. Devon Ave.	312-763-3636
Ind	So. Whitley, Warner, Kesler, & Assoc., Box 338	219-723-5353
Mass	Clinton, F.J. Coleman & Co., Box 241	617-894-1855
Minn	Minneapolis, R. W. Marshall Co., 6106 Excelsior Blvd.	612-929-0457
Mo	Kansas City, K & M Sls. Co., Ste. 500, Davidson Bldg.	816-471-1355
NY	Huntington, C. R. Mayer Co., Box 152	516-921-7876
NY	Rochester, J. P. Scanlon Co., 51 Bloomfield Pl.	716-473-7553
Ore	Portland, J. Belusko Co., 2355 N.W. Quimby St.	503-222-4279
Pa	Narberth, S. A. Jeffries, Inc., 105 Forrest Ave.	215-664-8500
Tex	Irving, Space Elctrns. Corp., Ste. 409, Irving Bank Towers	214-631-0905
FOR:	Can., Ottawa, Ont., E.G. Lomas, Ltd., 227 Laurier Ave., W.	613-232-7106

ROBINTECH, INC., 3310 Vanowen St., Burbank, Calif., 91504, Tel: 213-849-7181, TWX: 910-498-2217; Sls. Mgr: D.J. Louro ....FSC No. 26624

ROBINTECH, INC., Electro Mechanical Div., Commerce Rd., Vestal, N.Y., 13850, Tel: 607-798-5011, TWX: 510-252-0189

ROBISON ELCTRNS., INC., 2134 W. Rosecrans Ave., Gardena, Cal., 90249, Tel: 213-321-0080....FSC No. 19080

ROBLACK - blackening processes - Hull, R.O. & Co., Inc.

ROBOT - cameras, recorders, lenses, filters, programmer/timer - Heitz, Karl, Inc.

ROBOT - x-ray cameras, reader-projector, remote controls digital counter - Heitz, Karl, Inc.

ROBOT INDS., INC., 7041 Orchard, Dearborn, Mich., 48126, Tel: 313-TI-6-2623; Sls. Mgr: F.J. Osuch

ROBOT MONITOR - water quality data acquistion system - Schneider Instr. Co.

ROBOTEC - current limit monitor - Power Designs, Inc.

ROBOTESTER - tester - Spedcor Elctrns., Inc.

ROBOTESTER - test equip., automatic checkout - Spedcor Elctrns., Inc.

ROBOTRON CORP., 21300 West 8 Mile Rd., Detroit, Mich., 48219, Tel: 313-444-1444; Sls. Mgr: R. Lachner....FSC No. 01519

ROCHE, PAUL C. CO., INC., 11 Park Pl., New York, N.Y., 10007, Tel: 212-227-8288; Sls. Mgr: R. Humphrey

ROCHELTEX - cyanide copper plating additive - Mac Dermid, Inc.

ROCHESTER INSTR. SYS., INC., 275 N. Union St., Rochester, N.Y., 14605, Tel: 716-325-5120

ROCKBESTOS - wire and cable - Cerro Corp.

ROCKETTE - rocker operated switches - Cutler-Hammer, Inc.

ROCKLAND INSULATED WIRE & CABLE CO., INC., 87 Broadway, Haverstraw, N.Y., 10927, Tel: 914-429-3103; Sls. Mgr: E. Kigler ....FSC No. 12111

ROCKLAND SYS. CORP., Rockland Labs. Div., 131 Erie St., E., Blauvelt, N.Y., 10913 .....Pg. 1587

Ala	Huntsville, Lee Assocs., Inc., #5R Traylor Island	205-539-0761
Ariz	Phoenix, O'Halloran Assocs., 4747 N. 16th St.	602-277-3223
Cal	No. Hollywood, O'Halloran Assocs., 10700 Ventura Blvd.	213-877-0173
Cal	Palo Alto, O'Halloran Assocs., 3921 E. Bayshore Dr.	415-326-1493
Cal	San Diego, O'Halloran Assocs., 3270 Midway Dr.	714-224-2824
Colo	Boulder, A.L.S. Elctrns.	303-447-2436
Conn	Hamden, J & J Assocs., Inc., 953 Dixwell Ave.	203-624-7800
Fla	Orlando, Lee Assocs., Inc., 200 E. Marks St.	305-241-4445
Ill	Des Plaines, Marsland Assocs., Inc., 100 Executive Way	312-298-2620
Ind	Indianapolis, Marsland Assocs., Inc., 3734 Carrolton Ave.	317-924-3568
Md	Rockville, Eastronics, Inc., 14616 Southlawn La.	301-762-8445
Mass	Burlington, J & J Assocs., Inc., 12 Cambridge St.	617-272-2606
Mich	Detroit, Electro Sls. Assocs., 10745 Marang Dr.	313-886-2280
Minn	Minneapolis, Marsland Assocs., Inc., 231 N. Edgewood Ave.	612-545-4481
Mo	Florissant, Marsland Assocs., Inc., Box 567	314-831-0015
Nev	Las Vegas, O'Halloran Assocs.	Enterprise 1-5084
NJ	Redbank, Eastern Instr., Inc.	201-842-4242
NM	Albuquerque, A.L.S. Elctrns., Box 11626	505-268-9600
NY	Great Neck, Eastern Instr., Inc., 300 Northern Blvd.	516-466-9505
NY	Syracuse, Lingren Assocs., Inc., 605 Palmer Dr.	315-458-3113
NC	Winston-Salem, Lee Assocs., Inc., 855 Burke St.	919-724-2406
Ohio	Cleveland, Electro Sls. Assocs., 851 E. 222 St.	216-261-5440
Ohio	Dayton, Electro Sls. Assocs., 2621 Mardon Dr.	513-426-5551
Ore	Portland, Instr. Specialists, Inc., 7832 S.W. 35th St.	503-246-3341
Pa	Philadelphia, Eastern Instr., Inc., 613 Cheltenham Ave.	215-927-7777
Pa	Pittsburgh, Electro Sls. Assocs., 201 Penn Ctr. Blvd.	412-371-9449
Tex	Beaumont, Roux & Assocs., 8655 Newfield La.	713-622-7448
Tex	Richardson, Roux & Assocs., Box 281	214-231-5560
Utah	Salt Lake City, A.L.S. Elctrns.	801-363-2921
Wash	Seattle, Instr. Specialists, Inc., 5950 Sixth Ave., S.	206-767-4260
EXP:	N.Y., New York, Ancrona Corp., 65 E. 55 St.	212-688-6285
EXP:	N.Y., New York, Lindor Int'l. Corp., 10 E. 40 St.	212-MU-5-6740
EXP:	N.Y., New York, Multiparts Corp., 52 Wall St.	212-WH-4-4370
FOR:	Can., Montreal 354, Que., Electrodesign, Ltd., 9124 St. Lawrence Blvd.	514-389-5914
FOR:	Can., Ottawa, Ont., Electrodesign, Ltd., 880 Glascow Crescent	613-745-0541
FOR:	Can., Toronto 19, Ont., Electrodesign, Ltd., 3433 Bathurst St.	416-787-0991
FOR:	Can., Vancouver, B.C., Canadian Dynamics, Ltd., 8264 St. George St.	604-325-6014

ROCKWELL ENGRG. CO., 2125 E. 45th St., Indianapolis, Ind., 46205, Tel: 317-251-9453; Pres: H.R. Rockwell....FSC No. 94008

ROCKZONE - power cables - Cerro Wire & Cable Co.

RODALE MFG. CO., INC., Emmaus, Pa., 18049, Tel: 215-965-9071; Sls. Mgr: W. Bannon

RODALE ELCTRNS., INC., 603 Chestnut St., Garden City, N.Y., 11530, Tel: 516-CH-8-5050; Exec. V.P: J.P. Lester....FSC No. 16111

RODAN - decoder/drivers, b.c.d. counters - Inter-Market, Inc.

RODE, INC., 5 Green St., Woburn, Mass., 01801, Tel: 617-933-3580; Sls. Mgr: H. Doiron....FSC No. 02737

RODELCO, 356A Commack Rd., Deer Park, N.Y., 11729, Tel: 516-643-5110; Sls. Mgr: J. Rodgers

RODIP - chromate conversion coatings - Hull, R.O. & Co., Inc.

ROE - capacitors - Priester, H.E. Corp.

ROGAN BROS., INC., 8031 N. Monticello Ave., Skokie, Ill., 60076, Tel: 312-OR-5-1233; Sls. Mgr: E. Rogan II .....Pg. 1532

Cal	Palo Alto, O'Donnell Assocs., Inc., 1955 'B' El Camino Real	415-327-9260
Cal	Torrance, O'Donnell Assocs., Inc., 18053 Crenshaw Blvd.	213-323-9243
Colo	Arvada, Arrowhead Sls. Corp., 6460 Brentwood Ave.	303-798-0319
Conn	W. Hartford, F. Kosowicz, 2 Madsen Rd.	203-233-7883
Ill	Chicago, J.U. Willman, 6034 N. Cicero Ave.	312-286-1614
Ill	Skokie, Rogan Bros., Inc., 8019 N. Monticello	312-675-1234
Mich	Southfield, J.L. Montgomery, Inc., 19400 W. Ten Mile Rd.	313-358-2616
Minn	Minneapolis, R.W. Marshall Co., 6106 Excelsior Blvd.	612-929-0457
NJ	Pitman, Colrud Co., 601 Ardmore Ave.	609-589-5866
NJ	Rutherford, Lydon Sls. Co., Box 64	201-939-6290
NY	New York, Lydon Sls. Co., 500 Madison Ave.	201-939-6290
Ohio	Medina, J.C. Hofstetter Co., 5168 Valley View Dr.	216-241-4880
Tex	Dallas, B. McClung Co., 2245 Valwood Pkwy.	214-241-3655
Utah	Salt Lake City, Arrowhead Sls. Corp., 49 W. Malvern	801-487-3444
Va	Lynchburg, Royelec Elctrn. Rep., Box 254	703-846-7117
Wash	Bellevue, Ruggles Tech. Sls., 10717 N.E. 4th St.	206-455-2778
EXP:	Chicago, Carrington Stone, 205 W. Wacker Dr.	312-726-7725

ROGARD - rust and tarnish preventives - Hull, R.O. & Co., Inc.

ROGERS ANTI-STATIC CHEMS., INC., 22 W. Madison, Chicago, Ill., 60602; Pres: S.J. Rogers

ROGERS CORP., Rogers, Conn., 06263, Tel: 203-774-9605, TWX: 710-448-0094; Sls. Mgr: W.A. Hayes, Jr.

ROGLEAM - nickel brightener - Hull, R.O. & Co., Inc.

ROHCO - general line - Hull, R.O. & Co., Inc.

ROHCO 20XL AND SUPER XL - cadmium brighteners - Hull, R.O. & Co., Inc.

ROHDE & SCHWARZ SLS. CO. (U.S.A.), INC., 111 Lexington Ave., Passaic, N.J., 07055, Tel: 201-773-8010; Sls. Mgr: R. Feldt

ROHN MFG. CO., 6718 W. Plank Rd., Peoria, Ill., 61601, Tel: 309-697-4400, TWX: 309-697-1488; Sls. Mgr: R.A. Kleine ....FSC No. 18580

ROKLEEN - cleaners - Hull, R.O. & Co., Inc.

ROL-A-CHART DIV., Wm. A. Steward Co., Somerset, Cal., 95684, Tel: 916-622-2437; Sls. Mgr: L. Walton

ROL-PAK - rings, retaining - Waldes Kohinoor, Inc.

ROLA DIV., Muter Co., 21010 Miles Pkwy., Cleveland, Ohio, 44128, Tel: 216-475-9200; Sls. Mgr: W.N. Chapman

ROLATAPE, INC., 1301 Olympic Blvd., Santa Monica, Cal., 90404, Tel: 213-394-8296; Sls. Mgr: P.W. Evans

ROLL-A-FLEX - laboratory furniture - Blickman, S., Inc.

ROLL-A-MAZE - air filter - North American Rockwell Corp.

ROLL-AER - air filter - Cambridge Filter Corp.

ROLL-FLO - air filter - Cambridge Filter Corp.

ROLLER BEARING CO. AMERICA, Sullivan Way, W. Trenton, N.J., 08628, Tel: 609-882-7400; Sls. Mgr: S. Beimfohr

ROLLPIN - self-locking spring pins - Elastic Stop Nut Div.

ROLTITE - x-ray clips - Upson Tools, Inc.

ROLY-POLY - replacement round speakers - Era Acoustics

ROLY-POLY - round wafer-thin replacement speakers - Magitran Co.

ROLY-POLY - round plastic speaker - Elctrn. Resch. Assocs., Inc.

ROMAC ELCTRNS., INC., 48-01 25th Ave., Long Island City, N.Y., 11103, Tel: 212-721-2222; Pres: M. Bloomberg

ROMAN BRONZE - naval brass - Revere Copper & Brass, Inc.

ROMAR PLASTICS, INC., 1311 E. Main St., St. Charles, Ill., 60174, Tel: 312-584-6571; Sls. Mgr: C.W. Peterson

ROMELCO - densitometer - Fotomatic Corp.

RONDEC SFRR II - micro min. screen machine - Podgor, Joseph E. Co., Inc.

RONSON METALS CORP., 55 Manufacturers Pl., Newark, N.J., 07105, Tel: 201-624-1380; Pres: Louis V. Aronson II

ROPER WHITNEY, INC., 2833 Huffman Blvd., Rockford, Ill., 61101, Tel: 815-962-3011; Sls. Mgr: G. Plumb

ROPHOS - phosphating processes - Hull, R.O. & Co., Inc.

ROPLATE - nickel plating process - Hull, R.O. & Co., Inc.

ROPREPP - rust and scale removers - Hull, R.O. & Co., Inc.

ROSAN, INC., 2901 W. Coast Hwy., Newport Beach, Calif., 92663, Tel: 714-548-5533, TWX: 714-642-1342; Sls. Mgr: Gen'l. T.F. Riley USMC (Ret.)

ROSCO - screwdrivers & hand tools - Rosenberg Bros. & Co.

ROSEMOUNT ENGRG. CO., Box 35129, Minneapolis, Minn., 55435, Tel: 612-941-5560, TWX: 910-576-3103; Mktg. Mgr: D.M. Sullivan ....FSC No. 04274

ROSEMOUNT PLUG-IN, INC., Comp. Sls., 1416 Lebanon Rd., Nashville, Tenn., 37210, Tel: 615-244-1330, TWX: 810-371-1699; Sls. Mgr: P. Kelso .....Pg. 1205

Ala	Huntsville, Craft Assocs., Box 1053	205-837-0221
Cal	Chatsworth, Rosemount Engrg. Co., 9549 DeSoto Ave.	213-341-3944
Cal	Downey, Rosemount Engrg. Co., 8542 E. Florence Ave.	213-773-7413
Cal	San Diego, Rosemount Engrg. Co., 4508 Mission Bay Dr.	714-274-4703
Cal	San Francisco, Rosemount Engrg. Co., 960 Palisade Ave.	415-327-1420
Conn	Norwalk, J.M. Lancaster Co., 26 Oak Hill	203-866-9705
DC	Washington, Brogger Assocs., 1025 Connecticut	202-298-7735
Fla	Maitland, Craft Assocs., Box 986	305-645-2242
Ga	Atlanta, Craft Assocs., Box 11716	404-237-2282
Ill	Berkeley, Lesman Instrs., 5642 St. Charles	312-267-9128
Mass	Framingham, J.M. Lancaster Co., 147 Concord	617-TR-3-8893
Minn	Minneapolis, ARJAY Sls., 6121 Excelsior Blvd.	612-925-1833
Mo	St. Ann, Rosemount Engrg. Co., 500 N.W. Plaza	314-739-2707
NJ	Englewood Cliffs, Rosemount Engrg. Co., 600 Palisade Ave.	201-568-6366
NY	Williamsville, Alpha Co., Box 282	716-854-4121
NC	Charlotte, Rosemount Engrg. Co., Box 17375	704-364-1700
Ohio	Dayton, RDP Assocs., 5877 Huberville	513-CL-3-6175
Pa	Newtown Sq., Rosemount Engrg. Co., 3415 W. Chester	215-353-3344
Tex	Dallas, Holland Engr. Co., Box 28655	214-BR-1-1527
Tex	Houston, Rosemount Engrg. Co., 3810 Westheimer	713-621-7850
Wash	Seattle, Rosemount Engrg. Co., 13240 N.E. 20th St.	206-747-4900
FOR:	Can., Montreal, Que., Willer Engr., 1179 Decarie	514-747-9316
FOR:	Can., Toronto, Ont., Willer Engr., 1800 Avenue Rd.	416-783-3373

ROSEMOUNT PLUG-IN, INC., Instrumentation Sales, 4900 West 78th St., Minneapolis, Minn., 55435, Tel: 612-292-4136; Sls. Mgr: L. Martin

ROSENBERG BROS. & CO., 100 Landing Ave., Smithtown, N.Y., 11787, Tel: 516-AN-5-2200; Sls. Mgr: R. Rosenberg

ROSENTHAL CHINA CORP., Tech. Ceramic Div., 411 E. 76th St., New York, N.Y., 10021, Tel: 212-249-1400; Sls. Mgr: E.B. Wiest
ROSHEENE - bright dips - Hull, R.O. & Co., Inc.
ROSITE R, GCD & TA - inorganic cold molded compounds - Rostone Corp.
ROSITE 2050 - phenolic, mineral filled, cold molded - Rostone Corp.
ROSITE 2150 - melamine, cold molded, arc quenching - Rostone Corp.
ROSITE 3250 - glass reinforced polyester, non-tracking - Rostone Corp.
ROSITE 3450 - glass reinf. polyester, corrosion resistant - Rostone Corp.

ROSS ENGRG. CORP., 11915 Shadybrook, Saratoga, Cal., 95070, Tel: 408-253-1572; Pres: H.C. Ross .....Pg. 1852
ROSS ENGRG. DIV., Midland-Ross Corp., Box 751, New Brunswick, N.J., 08903, Tel: 201-249-1040; Gen'l. Sls. Mgr: R.J. Yunghahn
ROSS FINE LINE - depth recorders - Ross Labs., Inc.
ROSS LABS., INC., 3138 Fairview Ave., E., Seattle, Wash., 98102, Tel: 206-EA-4-3950; Sls. Mgr: H. Pollack
ROSS, MILTON CO., 511 Second St. Pike, Southampton, Pa., 18966, Tel: 215-355-0200, TWX: 510-667-1702; Sls. Mgr: R.J. Lyons ....FSC No. 07047
ROSTONE CORP., 2451 S. Concord Rd., Lafayette, Ind., 47902, Tel: 317-474-2421; Sls. Mgr: J.R. Jamison
ROSTRIP - metal strippers and paint strippers - Hull, R.O. & Co., Inc.
ROTA-CRIMP - crimping tools - Amp Inc.
ROTARY CO., INC., 1746 Dale Rd., Buffalo, N.Y., 14225, Tel: 716-894-4425; Dir. Mktg: B.E. Wysocki....FSC No. 79735
ROTASWITCH - incremental shaft encoder - Disc Instrs., Inc.

ROTATING COMPS., Div. Instr. Sys. Corp., 1560 Fifth Ave., Bay Shore, N.Y., 11706, Tel: 516-MO-6-8500, TWX: 516-666-7047; Sls. Mgr: G.F. Bruning....FSC No. 02598 ..... Pgs. 1685-1687,2648,2649
Cal Encino, King-Way Assocs., 17100 Ventura Blvd. 213-788-4124
Cal Santa Clara, Nova-Tronix, 1659 Scott Blvd. 408-243-0530
Conn Milford, Todino Engrg. Sls., Inc., Box 402 203-TR-4-6643
Fla Winter Pk., Spartak, Inc., 1320 Minnesota Ave. 305-644-3023
Ill Chicago, E. Schmeichel Co., 5968 W. Chicago Ave. 312-ES-8-2070
Md Towson, J.H. Elctrn. Sls. Co., Box 6844 301-VA-5-4440
Mass Needham Hgts., Todino Engrg. Sls. Co., Box 201 617-HI-4-7925
Minn St. Louis, Aerotronics, Box 10236, Lambert St. 314-739-3947
Mo St. Paul, Wagner Comp. Consit., 542 S. Snelling Ave. 612-698-0331
NY Huntington, Andrews & Andrews, Inc., 140 E. Main St. 516-692-8686
NY Skaneateles, Henkel Co., Box 132 315-685-6945
Ohio Yellow Springs, Motors, Inc., 155 Allen St. 513-878-7319
Pa Philadelphia, Loman Co., 261 S. 22nd St. 215-732-8888
Wash Seattle, Marbell Assoc., 1016 First Ave., S. 206-622-7975
EXP: N.Y., New York, Milano Brothers, 250 W. 57th St. 212-CI-6-3210
ROTAVAC - vacuum seal - Vacuum Inds., Inc.
ROTEX - label makers and embossing tapes - Chartpak Rotex
ROTO-CAM - mechanical disc clutches - Formsprag Co.
ROTO-MARK - production wire marking machine - Aero Devices, Inc.
ROTO-NETIC - stepping motor - Heinemann Elec. Co.
ROTO-SEMBLY - assembly sta. - Lewis G. B. Co
ROTO-TELLITE - lighted pushbutton switches - Master Specialties Co.
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NY Newburgh, San Fern. Elec., Box 70 212-254-7292
Tex Dallas, Ruby Sls. Co., Box 9894 214-827-6630
Wash Seattle, B. Hirsh Co., 4013 Leary Way, N.W. 206-783-3423
EXP: Conn., Stamford, Dage Corp., 757 Main St. 203-324-3123
FOR: N.Y., Ogdensburg, Whittaker Elctrns., Ltd., Ogdensburg Bridge Bldg.
FOR: Can., Ottawa, Ont., Whittaker Elctrns., Ltd., 42 Howden Ave. 613-224-1221
FOR: Can., Roxboro, Que., Whittaker Elctrns., Ltd., Box 216 514-683-3621
FOR: Can., Weston, Ont., Whittaker Elctrns., Ltd., 1885 Wilson Ave. 416-247-7454

SANDAC 200 - programmable communications processor - Sanders Assocs, Inc.

SANDERS ASSOCS. INC., Daniel Webster Hwy., S., Nashua, N.H., 03060, Tel: 603-885-6660, TWX: 710-228-1894; Sls. Mgr: J. Melrose....FSC No. 94117

SANDERS ASSOCS, INC., Data and Display Dept, Daniel Webster Hwy., S., Nashua, N.H., 03060, Tel: 603-885-5827, TWX: 710-228-1896; Sls. Mgr: T. Burgess....FSC No. 94117

SANDERS ASSOCS., INC., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H., 03060, Tel: 603-885-6340, TWX: 710-228-1896; Sls. Mgr: J. Griffin....FSC No. 94117

SANDERS ASSOCS., Electro Sciences Div., 8700 Main St., Buffalo, N.Y., 14221, Tel: 716-634-6950, TWX: 710-523-1862; Sls. Mgr: W. Hobden....FSC No. 94117

SANDERS ASSOCS., EMC Dept., 95 Canal St., Nashua, N.H., 03060, Tel: 603-885-6362; Sls. Mgr: H. Schwartz

SANDERS ASSOCS., INC., Flexprint Div., Grenier Field, Manchester, N.H., 03103, Tel: 603-669-4615, TWX: 710-220-1845; Sls. Mgr: N. Kingston....FSC No. 94117

SANDERS ASSOCS., INC., Flexprint Prod. Div., Grenier Field, Manchester, N.H., 03103

SANDERS ASSOC., Geospace Elctrns. Div., 1 Fairchild Ave., Plainview, N.Y., 11803, Tel: 516-938-8300, TWX: 510-221-1850; Sls. Mgr: J. Spallone....FSC No. 94117

SANDERS ASSOCS., INC., Instr. Div., Grenier Field, Manchester, N.H., 03103, Tel: 603-669-4615, TWX: 710-220-1845; Sls. Mgr: G. Lathrop....FSC No. 94117

SANDERS ASSOCS., INC., Int'l. Ground Sys. Div., 11101 Sunset Hills Rd., Reston, Va., 22070, Tel: 703-471-1550, TWX: 710-883-0696; Sls. Mgr: J. Mayman....FSC No. 94117

SANDERS ASSOCS., INC., Microwave Div., Ledge St., Nashua, N.H., 03060, Tel: 603-885-2445, TWX: 710-228-1887; Sls. Mgr: P. Johnson....FSC No. 94117

SANDERS ASSOCS., INC., Mithras Div., 710 Concord Ave., Cambridge, Mass., 02138, Tel: 617-868-2000, TWX: 710-228-1887; Sls. Mgr: J. Stone....FSC No. 94117

SANDERS ASSOCS., INC., Ocean Sys. Div., Daniel Webster Hwy., So. Nashua, N.H., 03060, Tel: 603-885-2596, TWX: 710-228-6954; Sls. Mgr: R. Crisp....FSC No. 94117

SANDERS NUCLEAR CORP, 95 Canal St, Nashua, N H, 03060, Tel: 603-885-2230, TWX: 710-228-1894; Sls. Mgr: N. Van Dine ....FSC No. 94117

SANDS, LEO G. & ASSOCS., INC., 250 Park Ave., New York, N.Y., 10017, Tel: 212-697-0235; Sls. Mgr: R.F. Burns

SANGAMO ELEC. CO., Capacitor Div., Box 128, Pickens, S.C., 29671, Tel: 803-878-6311, TWX: 810-397-2496; Sls. Mgr: W.C. Bakes ....FSC No. 00853 ..... Pg. 2280

Ariz Scottsdale, El-Kap Sls. Co., 7155 E. Thomas Rd. 602-946-2457
Cal Santa Monica, El-Kap Sls. Co., 2808 Santa Monica Blvd. 213-451-9881
Cal Sunnyvale, Sangamo Elec. Co., 155 San Lazaro Ave. 408-739-0500
Fla Dunedin, J. J. Smith & Assocs., Inc., Box 627 813-733-0032
Fla Eau Gallie, J. J. Smith & Assocs., Inc., Box 1506 305-254-4206
Fla Miami, J. J. Smith & Assocs., Inc., Box 537 305-374-6784
Haw Honolulu, Pacific Factors, Inc., 1204 Waimanu St. 808-533-7135
Ill Palatine, Sangamo Elec. Co., 111 S. Northwest Hwy. 312-359-6080
Mass Braintree, Sangamo Elec. Co., 817 Washington St. 617-848-0532
Mich Detroit, D.E. Poulin Co., 17222 E. Warren Ave. 313-886-4990
Mich Kentwood, D. E. Poulin Co., 1635 Pembroke Dr., S.E. 616-452-7408
Minn Minneapolis, S. Clothier Co., 7400 Lyndale, S. 612-869-3231
Mo Kansas City, Harris-Hanson Co., 7916 Paseo St. 816-444-9494
Mo St. Louis, Harris-Hanson Co., 2814 S. Brentwood Blvd. 314-962-0111
NJ Cherry Hill, Sangamo Elec. Co., 1103 N. Kings Hwy. 609-667-4848
NY DeWitt, Sangamo Elec. Co., Box 6 315-446-2299
NY Elmont, F.E. Schmitt Co., 311 Meacham Ave. 516-437-8150
Ohio Columbus, Sangamo Elec. Co., 1646 W. Lane Ave. 614-486-1508
Ore Portland, C.K. Shanks & Assocs., Box 25375 503-292-5656
SC Pickens, Sangamo Elec. Co., Box 128 803-878-6311
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd. 214-357-4601
Tex Houston, R.E. Nesbitt Co., 4208 Mt. Vernon 713-528-3811
FOR: Can., Port Credit, Ont., D. R. Beattie, Ltd., 2104 Clarkson 416-822-4414

SANITAIRE - air purification fixtures - Atlantic Ultraviolet Corp.

SANKYO SEIKI MFG. CO., LTD., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan, Tel: 591-8371; Sls. Mgr: T. Iijima Pg. 1689

NY New York, American Sankyo Corp., 95 Madison Ave. 212-LE-2-8020

SANS-A-FUSE - circuit breaker - Workman Elctrn. Prods., Inc.

SANTA BARBARA RESCH. CTR., 75 Coromar Dr, Goleta, Calif., 93017

SANTA FE MFG. CO., 2343 Jerome Ave., Bronx, N.Y., 10468, Tel: 212-LU-4-8900; Sls. Mgr: V.J. Sarrica....FSC No. 99845

SANWA - multitesters - Sanwa Corp. America

SANWA CORP. AMERICA, 2500 Woodbridge Ave., Edison, N.J., 08817, Tel: 201-985-7800, TWX: 844-472; Sls. Mgr: J.J. Brown

SAPHIRITE - blast nozzles - Diamonite Prods. Mfg. Co.

SARA SCIENTIFIC CO., P.O. Box 321, San Francisco, Calif., 94101, Tel: 415-421-3172; Sls. Mgr: S. Fishman

SARA 7 - detergent - Sara Scientific Co.

SARA-SONIC - ultrasonic cleaners - Sara Scientific Co.

SARGENT WELCH SCI. CO., Vacuum Prods. Div., 7300 N. Linder Ave., Skokie, Ill., 60076, Tel: 312-677-0600; Sls. Mgr: N.C. Brunner.

SARKES TARZIAN, INC., Semiconductor Div., 415 N. College Ave., Bloomington, Ind., 47402, Tel: 812-332-1435, TWX: 810-351-1384; Sls. Mgr: F. Lucas....FSC No. 84970

SARTRON, INC., 114 N. Main St., Newberg, Ore., 97132, Tel: 503-538-3191, TWX: 503-531-7030; Sls. Mgr: J.W. Johnson

SASCO - Pryor Marking Prods.

SATELLITE - thin film tooling - Vacuum/Atmospheres Co.

SATURN PUMP - t.f.e. pumps - Fluorocarbon Co.

SATUROL - solvent detergent - Oakite Prods., Inc.

SAUCER - fan - Rotron, Inc.

SAUEREISEN CEMENTS CO., 160 Gamma Dr., Pittsburgh, Pa., 15238, Tel: 412-781-2323; Sls. Mgr: G.W. Read

SAVANT ENGRG. INC., 825 N. Second St., St. Charles, Mo., 63301, Tel: 314-724-5991; Sls. Mgr: J Schroy

SAWCAT - circular saws - Black & Decker Mfg. Co., The

SAWYER INDS., INC., 5445 Peck Rd., Arcadia, Cal., 91006, Tel: 213-442-5981, TWX: 910-587-3534; Gen'l Mgr: J.J. Marino ....FSC No. 16098 ..... Pg. 1690

Cal Arcadia, Transco Motor Mfg., Inc., 5445 Peck Rd. 213-442-5981
Cal Lafayette, Persons & Assocs., 32 Diablo Rd. 415-283-3760
NJ Teaneck, Budd-Tronics, Inc., 71 Grayson Pl. 201-837-1660
NY Centereach, Transco Prods., Inc., Box 175 516-698-1055
Ohio Middletown, Transco Prods., Inc., Box 129 513-423-0332
Pa Newtown, Transco Prods., Inc., Box 255 215-968-2911
Tex Ft. Worth, Carey-Wolf Co., Box 12425 817-738-1702

SAWYER RESCH. PRODS., INC., 35400 Lakeland Blvd., Eastlake, Ohio, 44094, Tel: 216-942-8747; V.P. Sls: D.P. Larsen

SAXTON PRODS., INC., 215 N. Rte. 303, Congers, N.Y., 10920, Tel: 914-268-6848; Sls. Mgr: A. Lassers ..... Pgs. 2954,2955

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Cal Oakland, Sinclair Elctrns., 1085 Clarendon Crescent 415-451-3428
Conn Hartford, J. Colavecchio, 122 Grant 203-522-0596
Ill Chicago, D. Abo, 4100 Marine Dr. 312-262-1718
NM Albuquerque, L. Davis, 3211 Silver Ave., S.E.
Minn So. St. Paul, G. Johnson, 115 Highland Ave.
Ore Lake Oswego, McMillan Elec., 16679 S.W. Maple Cir.
Pa Philadelphia, L. Feinstein, 2035 Beyer Ave. 215-OR-7-6497
Tex Garland, K. Treuter, 1221 W. Miller Rd. 214-278-4355
Utah Bountiful, P. E. Anderson, 131 N. 5th, W.

SBE - cb & amatuer radio equip. - Linear Sys., Inc.

SC ELCTRNS., INC., New Brighton, St. Paul, Minn., 55112, Tel: 612-633-3131; Sls. Mgr: H.B. Christian, Jr.

SCAICO - tempswitch - Wavetronics Inds., Inc.

SCAICO DIV., 211 Warren St., W. Pittston, Pa., 18643; Pres: H.M. Real ....FSC No. 00906

SCALA RADIO CORP., 1970 Republic Ave., San Leandro, Cal., 94577, Tel: 351-3792; Sls. Mgr: B. Zucconi

SCAM INSTR. CORP., 7401 N. Hamlin Ave., Skokie, Ill., 60076, Tel: 312-675-2500, TWX: 910-223-3606; Sls. Mgr: G.P. Mitchell ....FSC No. 04585

SCAN-LINE - minature instrumentation - Fischer & Porter Co.

SCANAFAX - recording paper - International Scanatron Sys. Corp.

SCANBE - p.c. card packaging - Scanbe Mfg. Corp.

SCANBE MFG. CORP., 3445 Fletcher Ave., El Monte, Cal., 91731, Tel: 213-579-2300, TWX: 910-587-3437; Sls. Mgr: J. Rose ....FSC No. 18677 ..... Pgs. 2156,2157

Ariz Scottsdale, Vinson Assocs., 44 E. Indian School Rd. 602-947-7371
Cal Menlo Pk., McKnight Co., Box 36 415-325-2844
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Colo Littleton, Vinson Assocs., 6610 S. Broadway 303-798-4516
Ill Chicago, J.C. Angel Co., 2743 W. Peterson Ave. 312-878-0653
Kans Mission, Inland Assocs., 6047 Howe Dr.
Mass Wellesley, R.P. Mahan Co., 572 Washington St. 617-237-1040
Mich Detroit, J. M. Thorpe Co., 640 Hidden La. 313-884-4360
Minn St. Paul, H. Cullen & Assocs., 1595 Selby Ave. 612-646-7372
Ohio Akron, A. Natalino Assoc., 209 Harmony Hills 216-666-1447
Pa Newton Square, Kaufholz Assoc., Box 227 215-356-5000
Tex Dallas, Techno Assocs., 2324 Shorecrest Dr. 214-357-9213
Wash Seattle, Associated Ind., 3711 S. Hudson St. 206-723-5600

SCANFAR - radar - Hughes Aircraft Co

SCANIVALVE, INC., Box 20005, San Diego, Calif., 92120, Tel: 714-283-0010; Sls. Mgr: J.C. Pemberton

SCANOMARK - digital encoders - Leupold & Stevens, Inc.

SCENADAPTER - oscilloscope adapter - Optical Elctrns., Inc.

SCENOSCOPE - three dimensional oscilloscope - Optical Elctrns., Inc.

SCHADOW - push button switches - International Electro Exchange Corp.

SCHAUER MFG. CORP., 4516 Alpine Ave., Cincinnati, Ohio, 45242, Tel: 513-791-3030; Sls. Mgr: S.E. Wright ..... Pg. 1921

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Cal Orange, F. Huddleston Assocs., 44 Plaza Sq. 714-639-1941
Conn Meriden, H. Lavin Assocs., Inc., Box 921 237-5527
Fla Orlando, F. Fausett & Co., Inc., 711 N. Magnolia Ave.
Ga Smyrna, F. Fausett & Co., Inc., Box 278 404-436-5169
Ill Chicago, Ellinger Sls. Corp., 6580 N. Northwest Hwy. 312-763-1570
Iowa Clarion, D. Sharp, 309 Fourth Ave., S.E.
Mass Needham, H. Lavin Assocs., Inc., 52 Pickering St. 444-3446
Mich Detroit, Rathsburg Assocs., Inc., 16621 E. Warren Ave. 313-882-1717
Mo St. Louis, E. Rea, 4969 Bancroft 352-2027
NY Buffalo, J. M. Glass Assocs., 220 Delaware 716-856-9272
NY Woodside, D.F. Tobias & Co., Inc., 49-01 31st Ave. 212-726-4551
Ohio Cleveland, J.O. Olsen Co., 16201 Shaker Blvd. 752-5444
Pa Elkins Pk., K.B. Erdman Co., 7906 Montgomery Ave. 224-1833
Pa Pittsburgh, E.A. Snefsky, 104 Elatan Dr. 179-2550
Pa Pittsburgh, R.A. Stone, 1843 Maydell St. 241-8391
SC Greenwood, D. Hawthorne, Stony Pt. Hwy. 753-3104
Tex Dallas, J.Y. Schoonmaker Co., Inc., 2995 Ladybird La. 214-357-8481
Va Salem, F. Fausett & Co., Inc., 1338 Pulaski St. 303-424-0701
Wash Seattle, D. Miller Sls. Co., Inc., 2319 N. 45th St. 206-632-7070

SCHENCK TREBEL CORP, 120 Finn Ct., Farmingdale, N. Y., 11735, Tel: 516-694-7965; Sls. Mgr: N Vetsch

SCHENECTADY CHEMS., INC., P.O. Box 1046, Schenectady, N.Y., 12301, Tel: 518-346-8711; Sls. Mgr: A.C. Sheals

SCHERMA, F.A. MFG. CO., INC., 424 Broome St., New York, N.Y., 10013, Tel: 212-WA-5-2077; Sls. Mgr: M. Scherma....FSC No. 05612

SCHINDLERS, 195 Greenfield Ave., Los Angeles, Calif., 90049, Tel: 213-GR-2-0146

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SCHJELDAHL, G.T. CO., Elec. Prods. Div., Box 170, Northfield, Minn., 55057, Tel: 507-645-5633, TWX: 910-565-2180; Mktg. Mgr: E.S. Lyman

SCHMIDT - tension meters - Electromatic Equip. Co.

SCHNEIDER INSTR. CO., 8115 Camargo Rd., Madeira, Cincinnati, Ohio, 45243, Tel: 513-561-6803

SCHOEFFEL INSTR. CORP., 24 Booker St, Westwood, N.J., 07675, Tel: 201-664-7263; Sls. Mgr: W. Sweet

SCHONSTEDT INSTR. CO., 1775 Wiehle Ave., Reston, Va., 22070, Tel: 703-471-1050; Sls. Mgr: T.W. Bennett....FSC No. 02169

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Cal Redwood City, Warren-Hickey Sls. Co., 175 Fifth Ave. 415-368-3849
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Colo Denver, Walter Engrg. Assocs., 880 Bonnie Brae Blvd. 303-777-5585
Conn Meriden, P. R. Sturgeon Co., Inc., 99 Colony St. 203-237-1112
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Mo St. Louis, M.E. Bettis Co., 9103 Bessemer 314-429-2099
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NJ Trenton, F. Kriegner Sls. Co., 1602 Pennington Rd. 609-882-6330
NY Glen Cove, S. Glassman Assocs., 28 Prestwick Terr. 516-676-1039
NY Sodus, A.E. DeCew Agency, Inc., 27 State St. 315-483-3261
NC Charlotte, Electro-Rep. Assocs., 128 W. 30th St. 704-333-0451
Ohio Dayton, R.P. Calhoun & Assocs., 40 Southmoor Cir. 513-299-4144
Pa Narberth, L.G. White-Keystone, Inc., 100 N. Essex 215-664-6505
Tex Houston, Unidyne, Inc., 5700 Savoy La. 713-782-0218

FOR: Can., Montreal, Que., Deskin Sls. Corp., 1565 Louvain St., W. 514-384-1420
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SCHUTTER MICROWAVE, Div. Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y., 11757, Tel: 516-888-5200....FSC No. 71313

SCHWEITZER, PETER J. DIV., Kimberly Clark Corp., Lee, Mass., 01238, Tel: 413-243-1000, TWX: 413-243-2121; Sls. Mgr: R. Plaut, Jr.

SCI SYS., INC., 8620 S. Memorial Pkwy., Huntsville, Ala., 35802, Tel: 205-881-1611, TWX: 510-579-2234....FSC No. 17981

SCIAKY BROS., INC., 4915 West 67th St., Chicago, Ill., 60638, Tel: 312-PO-7-5600, TWX: 910-224-3809; Sls. Mgr: W. Farrell ....FSC No. 53610

SCIENCE FAIR - circuitry - Waber Elctrns., Inc.

SCIENTIFIC-ATLANTA, INC., Box 13654, Atlanta, Ga., 30324, Tel: 404-938-2930, TWX: 810-766-4912; Sls. Mgr: H. Crispin ....FSC No. 10110 ....Pg. 2158

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Md Bladensburg, 5801 Annapolis Rd. 301-779-1515
NJ Edison, Rte. 27, Parsonage Rd. 201-549-0515
Wash Seattle, Showalter-Judd, Inc., 1806 S. Bush Pl. 206-324-7911
FOR: Can., Montreal, Que., Radionics, Ltd., 8230 Mayrand St. 514-739-5517

(Optima-Enclosures Reps.)
Ala Huntsville, Gentry Assocs., Inc., 2109 W. Clinton Ave. 205-536-5306
Ariz Phoenix, Hytronic Meas., Inc., 1017 N. Third St. 602-253-6104
Cal Long Bch., Sci-Atlanta, Inc., 4300 Long Beach Blvd. 213-428-7515
Cal Los Altos, Scientific-Atlanta, Inc., 960 N. San Antonio Rd. 415-941-1616
Cal Pasadena, Scientific-Atlanta, Inc., 1000 E. Walnut St. 213-681-0278
Colo Denver, Hytronic Meas., Inc., 4940 E. 39th Ave. 303-388-4081
Fla Orlando, Gentry Assocs., Inc., 550 N. Bumby Ave. 305-841-7740
Ga Atlanta, Gentry Assocs., Inc., Box 13513 404-233-3816
Ill Rosemont, Cozzens & Cudahy, Inc., 9501 W. Devon Ave. 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, Inc., 647 Mulford Ct. 317-244-2456
Md Bladensburg, Scientific-Atlanta, Inc., 5801 Annapolis Rd. 301-779-1515
Mass Lexington, Zieco, Inc., 18 Muzzey St. 617-861-8300
Mich Royal Oak, Cozzens & Cudahy, Inc., 127 Edmund St. 313-585-5159
Minn Minneapolis, Cozzens & Cudahy, Inc., 7710 Computer Ave. 612-920-1022
Mo Edmundson, Cozzens & Cudahy, Inc., 10534 Natural Bridge Rd. 314-423-1234
NJ Edison, Scientific-Atlanta, Inc., Rte. 27, Parsonage Rd. 201-549-0515
NM Albuquerque, Hytronic Meas., Inc., 205 San Pablo, S.E. 505-268-3941
NC Burlington, Gentry Assocs., Inc., 116 E. O'Neal Ave. 919-227-2581
Ohio Medina, Cozzens & Cudahy, Inc., 735 S. Court St. 216-725-5660
Ore Hillsboro, Showalter-Judd, Inc., 1445 N.E. Arrington 503-648-6372
Tex Ft. Worth, Carey-Wolf, Zerbe Co., 3327 Winthrop Ave. 817-738-1702
Tex Houston, Carey-Wolf, Zerbe Co., Box 60338 713-643-2114
Utah Salt Lake City, Hytronic Meas., Inc., 2022 S. Main 801-466-4924

SCIENTIFIC COLUMBUS, INC., 1035C W. Third Ave., Columbus, Ohio, 43212, Tel: 614-291-4681; Sls. Mgr: W. Traetow Pgs. 2124,2125

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Ariz Phoenix, B.F.A., Inc., 4710 N. 16th St. 602-264-6536
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Cal San Francisco, G.E. Honn Co., 171 King St. 415-781-7352
Colo Denver, C. Beabout Co., 666 Sherman St. 303-244-3151
DC Washington, Hildenbrand Co., Box 1060 703-280-2330
Fla Orlando, Mekco Assocs., Inc., 3165 McCrory Rd. 305-841-2215
Ill Chicago, Murphy & Dickey, 10001 Derby La. 312-344-5660
Ind Indianapolis, Electro Engrg. Sls., 6909 E. 32nd St. 317-546-4053
Iowa Des Moines, H.E. Ferris Co., 4005 Plainview Dr. 515-255-5008
La New Orleans, Mid-South Sls. Co., Box 13625 504-822-3030
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Mich Detroit, G. R. Peters Assocs., Box 1042 313-564-6325
Mich Marquette, NWR Elctrns., 1010 W. Washington St. 906-226-7578
Minn Minneapolis, Electrical Jobbers Equip., Inc., 1120 Glenwood Ave. 612-377-7904
Minn Virginia, NWR Elctrns., Box 118 218-741-5080
Mo Kansas City, C. B. Fall Co., 11301 Bennington St. 816-SO-1-6545
Mo St. Louis, C. B. Fall Co., 317 N. 11th St. 314-CH-1-2433
NJ Union, Esterline Angus, 2005 U.S. Rte. 22 201-687-4416
NM Albuquerque, B.F.A., Inc., 1238 Ortiz, S.E. 505-268-4387
NY Buffalo, R. F. Lamb Co., Inc., 1865 Kenmore Ave. 716-874-4900
NY Fairport, World Automation, Inc., 1157 Fairport Rd. 718-586-5980
NY Kingston, R. F. Lamb Co., Inc., Box 661 914-338-8833
NY Syracuse, R. F. Lamb Co., Inc., Box 28 315-454-2469
NC Charlotte, R. W. Chapman & Co., Box 4430 704-375-4495
NC Raleigh, R. W. Chapman & Co., Box 10503 919-828-3604
Ohio Cincinnati, Beedle Equip. Co., Box 36061 513-793-0140
Ohio Cleveland, Waldrip Blankenburg & Co., 7650 Chippewa Rd. 216-526-1100
Ore Portland, Shaffer & Nelson, Inc., 1001 S.E. Water Ave. 503-BE-4-7437
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Pa Pittsburgh, Gilson Engrg. Sls., 978 Perry Hwy.
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Tenn Knoxville, W. Massey Co., Box 10102 615-577-9553
Tex Dallas, P. Kreager Co., 9230 Cliffmere Dr. 214-348-3521
Tex Houston, E. Smith Sls. Co., 7007 Gulf Frwy. 713-649-5756
Utah Salt Lake City, Shaffer & Nelson, Inc., 805 W. 2500 S. 801-484-3382
Wash Seattle, Shaffer & Nelson, Inc., 314 N.E. 72nd St. 206-LA-3-0664
Wash Spokane, Shaffer & Nelson, Inc., Box 3343 509-FA-7-9528
Wisc Milwaukee, T. R. Bicker Assocs., Box 7245 414-453-3772
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FOR: Can., Vancouver, B.C., Ahearn & Soper, Ltd., 1234 Marine Dr. 604-988-6822

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TURCON - tfe material - Shamban, W.S. & Co.
TURN-TYTE - elec. wiring devices - Rodale Mfg. Co., Inc.
TURNER MICROPHONE CO., 909 17th St., N.E., Cedar Rapids, Iowa, 52402, Tel: 319-365-0421; Sls. Mgr: T.H. Moss
TURNGUATE - rotary switches - Subminiature Instrs. Corp.
TURNLOK - lighting connectors - Pass & Seymour, Inc.
TUSEAL - solvent pump - Baron-Blakeslee, Inc.
TUTORETTE - record players - Audiotronics Corp.
TV LIFE-SAVER - surge protector - Wuerth Prods. Corp.
TVEHICLE - tv stands - Sylvania Elec. Prods., Inc.
TWEEZER-WELD - welding equipment - Federal Tool Engrg. Co., Inc.
TWENTY/TWENTY - epoxy adhesive - Allaco Prods.
TWIN CITY METALSEAL, INC., 825 11th Ave. S.E., Minneapolis, Minn., 55414, Tel: 612-331-1700; Gen'l. Mgr: H.G. Knight
TWIN HI-D JAX - phone jacks - Switchcraft, Inc.
TWIN LIGHT - circuit indicator light - Sylvania Elec. Prods., Inc.
TWIN LOCK INC., 13115 Washington Blvd., Los Angeles, Cal., 90066, Tel: 213-397-7745; Sls. Mgr: L.M. Ford
TWIN-COM - intercom - Bogen Div.
TWIN-JAX - phone jacks - Switchcraft, Inc.
TWIN-LIFE - filters - AMBAC Inds., Inc.
TWIN-PHONE - phone system - Bogen Div.
TWIN-PLUG - phone plugs - Switchcraft, Inc.
TWIN-WARP - plain wire cloth - AMBAC Inds., Inc.
TWINCONE - conical fiberglass stripping wheels - Carpenter Mfg. Co., Inc.
TWINPOT - potentiometer - Bourns, Inc.
TWINS - multiple device transistors - Motorola Semiconductor Prods., Inc.
TWINSLEEVE TUNER - matching network - Alford Mfg. Co.
TWINTRON - A F reasonator - HB Engrg. Corp.
TWIST-LITE - lightedd pushbutton switches - Master Specialties Co.
TWIST-LOK - electrolytic capacitor - Sprague Elec. Co.
TWISTON - hole saws - Black & Decker Mfg. Co., The
TWO-WAY - locknut - MacLean-Fogg Lock Nut Co.
2 D SUBMINIATURE - "d" subminiature with double density 22 ga. contacts in the std. mil-c-24308 shell - Matrix Science Corp.
2 PLUS 2 - selective calling encoders & decoders - Bramco Controls Div.
20/20 - custom panel instrument line - Westinghouse Elec. Corp.
241-D - potting & encapsulating - Allaco Prods.
260 - multi-testers - Simpson Elec. Co.
TWYSTRON - microwave amplifier - Varian Assocs.
TY-FAST - cable ties - Burndy Corp.
TY-FAST - cable ties - Tyton Corp.
TY-HUKKI - classifier - Tyler, W.S. Co.
TY-LEVEL - screening machine - Tyler, W.S. Co.
TY-NEE TUMBLER - small abrasive tumbler - Aubin, A.E. Co.
TY-RAP - cable ties and clamps - Thomas & Betts Co.
TY-ROCK - screening machine - Tyler, W.S. Co.
TY-ROCKET - screening machine - Tyler, W.S. Co.
TY-SIFTER - sifting machine - Tyler, W.S. Co.
TY-SPEED - screening machine - Tyler, W.S. Co.
TYCO BYTREX DIV., INC., 223 Crescent St., Waltham, Mass., 02154, Tel: 617-899-5600, TWX: 710-324-6988; Sls. Mgr: M. Green ....FSC No. 06880
TYCO INSTR. DIV., 16 Hickory Dr, Waltham, Mass., 02154, Tel: 617-891-4700; Sls. Mgr: R.W. Kendrick
TYGON - polyvinyl chloride tubing - Blum, Julius & Co., Inc.
TYLAN CORP., 4203 Spencer St., Torrance, Calif., 90503, Tel: 213-370-3521, TWX: 910-344-6420; Sls. Mgr: C.F. Drexel ....FSC No. 14260
TYLER, W.S. CO., 8200 Tyler Blvd., Mentor, Ohio, 44060
TYMETER - clocks, computers - Pennwood Numechron Co.
TYPE - proton precession magnetometer - GeoMetrics
TYPE C - solvent applied decal - Meyercord Co.
TYPE G - cement applied decal - Meyercord Co.
TYPHOON AIR CONDITIONING CO., 505 Carroll St., Brooklyn, N.Y., 11215, Tel: 212-UL-8-0800; V.P. Sls: E.G. Seergy
TYPIT - technical symbols - Mechanical Enterprises
TYPOTRON - direct view storage tube - Hughes Aircraft Co.
TYPROJECTOR - teletype projector - Bolt Beranek & Newman, Inc.
TYTEX - batteries - Exide Power Sys. Div.
TYTON CABLE BINDING SYSTEMS - Ideal-Hellermann Can., Ltd.
TYTON CORP., 3330 W. Cameron Ave., Milwaukee, Wisc., 53209
U-D-F - unidirectional flow inductors - Ajax Magnethermic Corp.
U-SET - scissors, shears, snips, wire cutters - Compton, W.H. Shear Co.
U-TILE-MU - shielding tiles - Amuneal Mfg. Corp.
U/V FLAME SAFEGUARD - interlock systems & controls - Edison, Thomas A. Inds.
UBER GRAFIC INSTRS., Box 4, Palo Alto, Calif., 94302, Tel: 415-327-4732; Sls. Mgr: D. Kroener
UBIQUITOUS - spectrum analyzer - Federal Sci. Corp.
'UCAR' - metal & ceramic coatings - Union Carbide Corp
UID ELCTRNS. CORP., 4105 Pembroke Rd., Hollywood, Fla., 33021, Tel: 305-981-1211; Mgr: M. Cohen
UINIPULSER - single decade counter - Durant Digital Instrs.
ULANO PRODS. CO. INC., 210 East 86 St., New York, N.Y., 10028, Tel: 212-628-7960; Sls. Mgr: Marian Ulano Prince
ULTDELAY - solid state industrial time delay relays - Plessey Airborne Corp.
ULTDELAY ECONOMIN/ - solid state industrial time delay relays - Plessey Airborne Corp.
ULTDELAYMIN/ - solid state industrial time delay relays - Plessey Airborne Corp.
ULTEK DIV., Perkin-Elmer Corp., Box 10920, Palo Alto, Calif., 94303, Tel: 415-321-4117, TWX: 910-379-6442; Sls. Mgr: R.H. Yarbrough ....FSC No. 14937
ULTIMETER - meter-relay - API Instrs. Co.
ULTIPOR - filter medium - Pall Corp.
ULTRA AUDIO PRODS., Box 921, Beverly Hills, Calif., 90213, Tel: 213-CR-6-2726; Pres: O. Berliner
ULTRA CARBON CORP., Box 747, Bay City, Mich., 48706, Tel: 517-893-4575; Sls. Mgr: R. Baney
ULTRA D - hi fi speaker sys. - University Sound
ULTRA SONIC INDS., 800 Albany Ave., Lindenhurst, N.Y., 11757, Tel: 516-884-2700; Sls. Mgr: C. Saginario
ULTRA-CLEAN - ultrasonic cleaner - Commander Labs., Inc.
ULTRA-FIDELITY ENCLOSURES - loud speaker enclosures - Karlson Resch. & Mfg. Div.
ULTRA-FLEX - flat flexable cable - Lane Inds.
ULTRA-MITE - connectors - Amphenol Ind'l. Div.

ULTRA-SPEED - etchants for production of printed circuits - Hunt, Philip A. Chemical Corp.
ULTRA-TAL - contacts - Amphenol Ind'l. Div.
ULTRA-TEMP - high temperature adhesive - Aremco Prods., Inc.
ULTRA-VIOLET PRODS., INC., 5114 Walnut Grove Ave., San Gabriel, Cal., 91778, Tel: 213-283-7701; Sls. Mgr: P.B. Warren
ULTRA/CLEAN - laminar flow clean room equipment - Edcraft Inds., Inc.
ULTRACELL - fast responding cell less than 1 use - Sensor Technology, Inc.
ULTRAFLEX - adjustable speed drives - Cutler-Hammer, Inc.
ULTRALAP - lapping and polishing medium - Pfizer Minerals
ULTRALARM - over temperature alarm - Plessey Airborne Corp.
ULTRAMAT - for tubing and pipe testers - Republic Steel Corp
ULTRAMONITOR - solid state multipoint indicator - Plessey Airborne Corp.
ULTRASCAN - moving ticker display - Sylvania Elec. Prods., Inc.
ULTRASIL - fused quartz - Amersil, Inc.

ULTRASONIC DEVICES, Div. Kenyon Elctrns., Inc., 1057 Summit Ave., Jersey City, N.J., 07307, Tel: 201-656-1100, TWX: 710-730-5365; Sls. Mgr: P. Martin .....Pg. 1316
NY New York 212-964-2016
ULTRASONIC DISTANCE METER - water depth gage - Automation Inds., Inc.
ULTRASONIC MACH. CO., 266 West Ave., Long Branch, N.J., 07740; Pres: E. Kuboosh
ULTRAVERTER - uhf lo vhf converter - Blonder-Tongue Labs., Inc.
ULTRAVOX - portable p.a. system - American Geloso Elctrns., Inc.
ULTRELAY - solid state monitor controller - Plessey Airborne Corp.
ULTRONIX, INC., 461 N. 22nd St., Grand Junction, Colo., 81501, Tel: 303-242-0810, TWX: 910-929-6965; Sls. Mgr: J. Brandfas ....FSC No. 05347
ULVAC CORP., Int'l. Div., 1, 1-chome, Kyobashi, Chuo-ku, Tokyo 104, Japan, Tel: 03-535-6381; Sls. Mgr: Mr. Mizoguchi
ULVAUTO-6 - fully automated h.v. coater - ULVAC Corp.
ULVION PUMP - sputter ion pump - ULVAC Corp.
UNDERWOOD ELEC. & MFG. CO., INC., 148 South 8 Ave., Maywood, Ill., 60153, Tel: 312-MU-1-2970; Sls. Mgr: R.G. Futterer
UNDERWRITERS SAFETY DEVICE CO., 4332 N. Kedzie Ave., Chicago, Ill., 60618, Tel: 312-583-4080; Sls. Mgr: H.R. Ege
UNECAP - electrolytic capacitors - United Elctrn. Mfg. Corp.
UNELCO - capacitors - Underwood Elec. & Mfg. Co., Inc.
UNEX LABS., INC., 321 Newbury St., Hathorne, Mass., 01937, Tel: 617-774-3300; Gen'l. Mgr: J.O. Woodbridge
UNGAR, Div. Eldon Inds., Inc., 233 E. Manville St, Compton, Calif., 90220, Tel: 213-774-5950; Pres: W.L. Nehrenz

UNHOLTZ-DICKIE CORP., 3000 Whitney Ave., Hamden, Conn., 06518, Tel: 203-288-3358; Pres: J.A. Dickie....FSC No. 15580 Pgs. 804,805
Ala Huntsville, W.A. Brown & Assoc., Inc., 1314 Buford St., N.W. 205-539-6884
Cal Redondo Beach, Unholtz-Dickie Corp., 1926 S. Pacific Coast Hwy. 213-378-9418
Conn Hamden, W.W. Jarowey Co., Box 6164 203-288-3010
Fla Ft. Lauderdale, W.A. Brown & Assoc., Inc., 3039 N.E. 32nd Ave. 305-564-8000
Fla Orlando, W.A. Brown & Assoc., Inc., 222 Weber Ave. 305-425-5505
Ill La Grange, Bard Assocs., Inc., Shawmut at Beach Ave. 312-354-0660
Ind Indianapolis, Bard Assocs., Inc., 4000 Meadows Dr. 317-547-3113
Kans Wichita, Aero-Hill Sls., 1635 Garland 316-AM-7-7167
Mass Westboro, W. Jarowey Co., Box 142 617-899-3449
Mich Farmington, Anderson Elctrns., Inc., 30785 Grand River Ave. 313-476-9161
Minn Minneapolis, Bard Assocs., Inc., 4640 W. 77th St. 612-866-1700
NM Albuquerque, Elctrn. Enterprises, 5206 Constitution Ave., N.E. 505-256-3561
NM Las Cruces, Elctrn. Enterprises, Box 116 505-524-0126
NY Hyde Pk., J.G. Paulson, Green Tree Dr., N. 914-229-2269
NY No. Merrick, Space-Tronics, Inc., 1705 Merrick Ave. 516-TN-8-1800
NY Rochester, R.P. Kennedy Co., Inc., 39 Saginaw Dr. 716-271-6322
NC Winston-Salem, W.A. Brown & Assoc., Inc., 1108 Burke St. 919-725-5384
Tex Dallas, Wright Ind'l. Prods. Co., 5619 Dyer St. 214-361-7108
Va Alexandria, W.A. Brown & Assoc., Inc., 325 First St. 703-836-1800

UNI BLITZ - electrical photog. shutters - Velmex, Inc.
UNI LEX - electromagnetic actuators - Velmex, Inc.
UNI SLIDE - mechinical slide assemblies - Velmex, Inc.
UNI-BUS - bus duct - Cutler-Hammer, Inc.
UNI-CORE - acid filled core solder - Alpha Metals, Inc.
UNI-CURVE - thermistors - Fenwal Elctrns., Inc.
UNI-DRILL - single spindle drill - Excellon Inds.
UNI-JUST - flying, write/read head - Bryant Computer Prods.
UNI-PAC - receptacle - Methode Elctrns., Inc.
UNI-SON (R) - sonic energy cleaners - Bendix Corp.
UNI-TORQUE - locknut - MacLean-Fogg Lock Nut Co.
UNI-TRAN SEMICONDUCTOR CORP., 1 Charles St., W. Orange, N.J., 07050, Tel: 201-731-9531; Sls. Mgr: R. Cox
UNI-VIT - transducer support equip. - Kaman Nuclear, Div.

UNIBLOC - plastic package (transistors) - Motorola Semiconductor Prods., Inc.
UNIBRAZE CORP, 455 Knollwood Rd, White Plains, N.Y., 10603, Tel: 914-428-3441; Sls. Mgr: G. Brucks
UNICARD - pc breadboard card - A P Inc.
UNICERAM - fixed ceramic capacitors - JFD Elctrns. Corp/Sub. Riker-Maxson Corp.

UNICO, INC., 2635 Golf Ave., Racine, Wisc., 53404, Tel: 414-632-2703; Sls. Mgr: M.E. Grant .....Pg. 600
UNICOAT - insulation coating - Bacon Inds., Inc.
UNICON 690 - laser mass memory system - Precision Instr. Co.
UNICORE 9 - memory sys., core, single card - Cambridge Memories, Inc.
UNICOTE CORP., 15121 Charlevoix Ave., Grosse Pointe Pk., Mich., 48230, Tel: 313-823-0888
UNIDAPT - frequency sensors - Crydom Controls Div. Int'l. Rectifier
UNIDEC - digital (single decade) counter - ENM Company, Inc.
UNIDEX - rotary switches - Oak Mfg. Co.
UNIDYNE - microphone - Shure Bros., Inc.

UNIFORM TUBES, INC., Collegeville, Pa., 19426, Tel: 215-489-7293, TWX: 510-660-6107; Sls. Mgr: R.L. Buffington .....Pg. 2966
Cal Los Altos, Marketek, Inc., One First St. 415-941-0882
Colo Denver, Crump Co., 1971 W. 12th Ave. 303-534-5183
Conn Meriden, J. Anderson, 166 Converse Ave. 203-269-1812
Fla Ft. Lauderdale, Hanson Assocs., 611 N.W. 73rd Terr. 305-524-4331
Fla Melbourne, Hanson Assocs., Inc., Box 26 305-727-7474
Ga Roswell, E. Rushin Co., Box 486 404-993-6498
Ill Schiller Pk., 4849 Scott St. 312-671-2717
Ind Indianapolis, Thomas & Sukup, Inc., 2060 E. 54th St. 317-251-4574
Kans Mission, Fusion, Inc., 5827 Outlook Ave. 913-262-1121
Mass Seekonk, J. Murphy, 30 Sunset Dr. 617-SO-1-7153
Mich Dearborn, Villani-Pitcher, Inc., 20233 Ann Arbor Trail 313-271-4600
Mass Newburyport, J.W. Murphy Assocs., 5 Eagle St. 617-465-0304
Minn Hopkins, Applied Sls. Engrg. Co., 12401 Minnetonka Blvd. 612-935-3491
Mo Afton, Fusion, Inc., 142 Flamingo Rd. 314-843-1459
NJ Wallington, 54 Resevoir Rd. 201-777-8131
NY Bklyn., F. Scott, 82 79th St. 212-836-8719
NY Fairport, L. Bagley, 88 Nettlecreek Rd. 716-377-2059
NC Charlotte, McLean Sls. Co., 3505 Schoolhouse La. 704-366-2675
NC Raleigh, McLean Sls. Co., 1916 Colewood Dr. 919-832-1654
Ohio Cleveland, R.A. Reich Co., 21010 Ctr. Ridge Rd. 216-331-0541
Ore Portland, C.K. Shanks & Assocs., 3176 S.W. 87th Ave. 503-292-5656
Va Waynesboro, McLean Sls. Co., Box 250 703-942-8678
EXP: N.Y., New York, Ad. Auriema, Inc., 85 N. Broad St.
EXP: Pa., Reading, J.J. Mahler, Box 457
UNILAY-21 - stranded conductor, bare or plated - Hudson Wire Co
UNILINE - sound columns - University Sound
UNILUX II-4 - liquid scintillation counter - Nuclear-Chicago
UNIMAC - eddy current inspection equip. - Magnetic Analysis Corp.

UNIMAX SWITCH CORP., Riker-Maxson Sub., Ives Rd., Wallingford, Conn., 06492, Tel: 203-269-8701, TWX: 710-476-1397; V.P. Mktg: A.J. Schweitzer....FSC No. 80207 .....Pg. 2093
Ala Huntsville, Rep., Inc., 6100 S. Memorial Pkwy. 205-881-9270
Ariz Phoenix, Hytronic Meas., Inc., 1017 N. 3rd St. 602-253-6104
Cal Los Altos, Ewing-Foley, Inc., 900 N. San Antonio Rd. 415-941-4525
Cal Los Angeles, M.A. Stolaroff Co., 4622 W. Slauson Ave. 213-295-7781
Colo Denver, Hytronic Meas., Inc., 4940 E. 39th Ave. 303-388-4081
Conn Bloomfield, Zaslow Sls., 6 Newberry Rd. 203-242-7781
Fla Oviedo, Conley & Assoc., Inc., W. Broadway 305-365-3283
Fla Oviedo, Conley-May Assocs., Inc., W. Broadway 305-365-3283
Fla Pompano Bch., Conley & Assocs., Inc., 1010 E. Atlantic Blvd. 305-943-8284
Fla Satellite Bch., Conley & Assocs., Inc., 465 Park Ave. 305-262-2054
Ga Atlanta, Rep., Inc., 1483 Monroe Dr., N.E. 404-876-1591
Ill Chicago, Wasson-Gallagher 312-261-7517
Ill Oak Pk., Wasson-Gallagher, 1024 North Blvd. 312-383-6572
Ind Marion, O.H. Bromberg & Assocs., Inc., 1723 Overlook Dr. 317-664-5384
Iowa W. Des Moines, J. D. Irvine & Assocs., 1900 Prospect 515-279-2206
Ky Louisville, O. H. Bromberg & Assoc., Inc., 10306 Hartley Dr. 502-245-8916
Md Silver Spring, L.G. White & Co., Inc., 1100 Fidler La. 301-585-3141
Mass Lowell, Zaslow Sls. Co., Inc., 339 Middlesex St. 617-458-8452
Mass Northboro, Zaslow Sls. Co., Inc., 371 Howard St. 617-393-8150
Mich Detroit, Skip Greiner Assoc., 15318 Mack Ave. 313-882-7570
Minn Minneapolis, Jos-Co. Sls. Engrg., 4520 Gilford Dr. 612-927-5858
Mo St. Louis, Hill & Co., 915 Buder Bldg. 314-621-1818
NM Albuquerque, Hytronic Meas., Inc., 205 San Pablo, S.E. 505-268-3941
NY Oceanside, Technical Liaison Corp., 3095 Lawson Blvd. 516-764-9003
NY Sodus, A.E. DeCew Agency, Inc., 27 State St. 315-483-4061
NC Winston-Salem, L.G. White & Co., Inc., 1020 Brooktown Ave. 919-725-3612
Ohio Cincinnati, O.H. Bromberg & Assocs., Inc., 561 Reading Rd. 513-381-5728
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Okla Tulsa, Southland Engrg. & Sls., Inc., 6740 S. 66th East Ave. 918-622-4846
Pa Narberth, L.G. White & Co., Inc., 100 Essex Ave. 215-664-6505
Tenn Memphis, Ransom Sls. Co., 4230 Hwy. 51 S. 901-332-0036
Tex Dallas, Southland Engrg. & Sls., 1040 W. Mockingbird La. 214-638-6264
Tex Houston, Southland Engrg. & Sls., 5810 Schumacher La. 713-782-4575
Utah Salt Lake City, Hytronic Meas., Inc., 2022 S. Main St. 801-466-4924
Wash Mercer Island, J. H. Andersen Assocs., Box 637 206-232-0484
FOR: Can., Burlington, Ont., Motion Control Dev., Ltd., 1254 Plains Rd. 416-637-9369
UNIMETRICS, INC., 23 W. Mall, Plainview, N.Y., 11803, Tel: 516-694-9171; Pres: M. Shapiro
UNIMORPH - piezoelectric transducer - Gould, Inc.
UNION CARBIDE CORP., Carbon Prods. Div., 270 Park Ave., New York, N.Y., 10017
UNION CARBIDE CORP., Chemicals & Plastics, 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-4641
UNION CARBIDE CORP., Consumer Prods. Div., 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-2345; Mgr: R.J. Price ....FSC No. 61637

UNION CARBIDE CORP., Mat'ls. Sys. Div., Comps. Dept., Box 5928, Greenville, S.C., 29606, Tel: 803-963-7421, TWX: 810-287-2536 Pgs. 2312-2315
Ala Huntsville, Powertronic Assocs., Box 3384 205-539-0876
Ariz Scottsdale, Carter Assocs., Inc., 201 W. First St. 602-947-4355
Cal Mountain View, 2680 Bayshore Frontage Rd. 415-969-9390
Cal San Diego, Black & Strong, 444 Olive St. 714-298-4711
Cal Whittier, 701 E. Whittier Blvd. 213-698-8077
Colo Denver, Lindberg Co., 2654 S. Krameria St. 303-757-6489
Fla Orlando, Compar of Fla., Inc., Box 13109 305-855-3964
Fla Pompano Beach, Compar of Fla., Inc., 2350 N.E. 29th Pl. 305-943-5529
Ill Chicago, D. Dolin Sls. Co., 3525 W. Peterson Ave. 312-588-3738
Ill Chicago, 120 S. Riverside Plaza 312-822-7024
Ind Indianapolis, L.M. Devoe Co., 4010 Washington Blvd. 317-283-1395
Md Lutherville, Daniel & Co., Box 124 301-825-3330
Mass Needham Hgts., 300 First Ave. 617-444-5400
Mich Detroit, R.C. Merchant Co., 18411 W. McNichols Rd. 313-535-6000
Minn Minneapolis, S. Clothier Co., 7400 Lyndale Ave., S. 612-869-3231
Mo St. Louis, Harris-Hanson Co., 2814 S. Brentwood Blvd. 314-647-4350
NJ Wayne, 1341 Hamburg Tpke. 201-696-2710
NM Albuquerque, Barnhill Assocs., 6101 Anderson St., S.E. 505-265-7766
NY Syracuse, I.A. Hotze Co., Inc., 112 DeWitt St. 315-479-6641
NC Raleigh, Powertronic Assocs., 2454 Medway Dr. 919-834-6947
NC Thomasville, Powertronic Assocs., Box 403 919-476-4257
Ohio Cincinnati, Baehr, Greenleaf & Assocs., Inc., 9505 Montgomery Rd. 513-891-3826
Ohio Cleveland, 11901 Madison Ave. 216-221-0600
Okla Oklahoma City, Ammon & Champion Co., Box 12274 405-942-8222
Ore Beaverton, Ameson Assocs., 200 N.E. Canyon Rd. 503-646-3416
Pa Glenside, Daniel & Co., 231 S. Easton Rd. 215-TU-7-0550
SC Greenville, Box 5928 803-963-7421
Tex Dallas, Ammon & Champion Co., Box 35263 214-357-8441
Wash Seattle, Ameson Assocs., 5950 Sixth St. 206-762-7664
UNION CARBIDE CORP, Mat'ls. Sys. Div., Crystal Prods. Dept., 8888 Balboa Ave., San Diego, Calif., 92123
UNION CARBIDE CORP, Materials Sys. Div., Coatings Serv., 1500 Polco St., Indianapolis, Ind., 46224, Tel: 317-241-2311; Sls. Mgr: T.C. McGeary
UNION INSULATING CO., Box B, Parkersburg, W. Va., 26101, Tel: 304-422-4571; Sls. Mgr: T.E. Graham III
UNION SWITCH & SIGNAL, See WABCO, Aerospace Dept.

UNION ULTRA-SONICS CORP., 576 Lawrence St., Lowell, Mass., 01852, Tel: 617-458-0066, TWX: 617-458-6396; Sls. Mgr: R.C. Gosselin

UNIPAGE - vhf/fm pager - Unimetrics, Inc.

UNIPAK - horizontal epitaxial reactor - Hugle Inds.

UNIPLEX - single point suspension - Varo Inertial Prods., Inc.

UNIPLEX - microphone - Shure Bros., Inc.

UNIPLY - power sources - Power Designs, Inc.

UNIPOLE - antenna - Andrew Corp.

UNIPULSER - single decade electromechanical counter - Durant Mfg. Co.

UNIQUE WIRE WEAVING CO., INC., 759 Ramsey Ave., Hillside, N.J., 07205, Tel: 201-688-4600; Sls. Mgr: R.D. Purdy

UNIQUICK - screw driver - Shakeproof Div.

UNIRING - sheath connectors - Burndy Corp.

UNIROYAL, INC., 1230 Ave. of Americas, New York, N.Y., 10020, Tel: 212-CI-7-5000

UNISEAL - for microphones - Electro-Voice, Inc.

UNISEAL - self-sealing fasteners - ABSCOA Inds.

UNISEC - optical angle reading device - Teledyne Gurley

UNISET - epoxy compounds - Amicon Corp.

UNISET - select or switch - Durant Digital Instrs.

UNISET - selector switch - Durant Mfg. Co.

UNISORB - machine mounts - Felters Co.

UNISPHERE - microphone - Shure Bros., Inc.

UNISWITCH - push button switches - Switchcraft, Inc.

UNISYSTEM - electron count/control sys. - Durant Mfg. Co.

UNISYSTEM - electro-mechanical counter - Durant Digital Instrs.

UNIT AMPLIFIER - modular solid state amplifier - Avantek, Inc.

UNIT PROCESS ASSEMBLIES, 53-15 37th Ave., Woodside, N.Y., 11377, Tel: 212-899-9090; Sls. Mgr: S.S. Como

UNITED AIRCRAFT CORP., Norden Div., Helen St., Norwalk, Conn., 06856

UNITED AMERICAN METALS DIV., Anchor Alloys, Inc., 970 Meeker Ave., Brooklyn, N.Y., 11222, Tel: 212-ST-2-7090; Sls. Mgr: D. McCann

UNITED CONTROL CORP., Sub. Sundstrand Corp., Redmond, Wash., 98052, Tel: 206-885-3711, TWX: 910-449-2860; V.P. Gen'l. Mgr: A.H. Rooks....FSC No. 97896

UNITED DETECTOR TECHNOLOGY, 1732 21st St., Santa Monica, Cal., 90404, Tel: 213-393-3785 Ext. 11; Sls. Mgr: P.H. Davis
Pg. 1706

Ala Huntsville, Beacon Elctrn. Assocs., 3322 S. Memorial Pkwy. 205-881-5031
Conn Stamford, Northeast Assocs., 516 Pepper Ridge Rd. 203-329-0012
Fla Ft. Lauderdale, Beacon Elctrn. Assocs., 651 N.E. 45th St. 305-564-4298
Fla Maitland, Beacon Elctrn. Assocs., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn. Assocs., 2285 Peachtree Rd., N.E. 404-351-3654
Ill Chicago, Brooks Engrg. Co., 227 E. Walton Pl. 312-944-1227
Md Rockville, Spectroscopy Sys., Box 1067 301-949-8261
Mass Marblehead, Northeast Assocs., Box 31 617-595-1000
NY Hauppauge, Barnett Assocs., Inc., 40 Aberdeen Rd. 516-724-0202
Minn Stillwater, Brooks Engrg. Co., Box 60 612-439-7222
NY New York, E.C. Smith & Assocs., 60 E. Forty-second St. 212-682-6890
SC Santee, Beacon Elctrns. Assocs., Box 31 803-897-2670

UNITED ELEC. CONTROLS CO., 85A School St., Watertown, Mass., 02172, Tel: 617-WA-6-1000, TWX: 617-092-2445; Sls. Mgr: A.W. Reis, Jr.....FSC No. 88234

UNITED ELCTRN. MFG. CORP., 542 39th St., Union City, N.J., 07087, Tel: 201-UN-5-4452; Pres: C.M. Wolf

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Ill Peoria, 915 N. Adams St. 309-673-0754
Ill Rockford, 2121 15th St. 815-398-3591
Ind Evansville, 403 S. Third Ave., Box 545 812-425-7146
Ind Ft. Wayne, 727 S. Clinton St. 219-742-0221
Ind Hammond, 6355 Indianapolis Blvd. 219-844-9400
Ind Indianapolis, 1560 Stadium Dr. 317-632-3301
Ind So. Bend, 2015 Western Ave. 219-287-1051
Iowa Cedar Rapids, 210 Dows Bldg. 319-366-0781
Iowa Davenport, 1531 W. River Dr., Box 3868 319-323-2761
Iowa Des Moines, 101 12th St. 515-283-2081
Kans Wichita, Box 967 316-591-3411
Ky Louisville, 1941 Bishop La. 502-459-5440
La Baton Rouge, 440 3rd St., Box 2883 504-348-5759
La New Orleans, Box 19657 504-486-6141
La Shreveport, Box 1661 318-425-2435
Me Augusta, 9 Bowman St. 207-623-4571
Md Baltimore, Instrument Specialties, Inc., 3100 Washington Blvd. 301-644-0200
Md Towson, 1055 Taylor Ave. 301-828-5400
Mass Boston, Prudential Tower Bldg. 617-542-0600
Mass Springfield, Box 1611 413-734-4936
Mass Worcester, 3 Rockdale St. 617-853-2680
Mich Detroit, 5757 Trumbull Ave. 313-872-7010
Mich Grand Rapids, 281 Leonard, N.W. 616-459-4664
Mich Jackson, 715 W. Michigan Ave., Box 746 517-787-3630
Mich Saginaw, 4855 State St. 517-793-5100
Minn Duluth, 330 S. First Ave., E. 218-727-1541
Minn Minneapolis, 3501 S. Highway 100 612-927-6551
Miss Jackson, Box 2168 601-354-2373
Mo Kansas City, 1215 W. 12th St. 816-421-7122
Mo St. Louis, 411 N. 7th Ave. 314-421-6911
Mont Butte, 949 S. Montana St. 406-792-2301
Neb Omaha, 117 N. 13th St. 402-345-8700
NJ E. Orange, 67 Evergreen Pl. 201-465-0222
NM Albuquerque, 5301 Central Ave., N.E. 505-265-6647
NY Albany, 17 Warehouse Row 518-459-1820
NY Buffalo, 700 Ellicott Sq. 716-854-3966
NY New York, 200 Park Ave. 212-692-3211
NY Olean, 309 Exchange Nat'l. Bank Bldg. 716-372-0040
NY Rochester, 711 Exchange St. 716-232-4380
NY Syracuse, 4030 New Court Rd. 315-463-9581
NY Vestal, Box 148 607-729-2258
NY Watertown, 32 The Arcade 315-788-2071
NC Charlotte, 2001 W. Morehead St. 704-377-3471
NC Greensboro, 1020 E. Wendover Ave. 919-273-5551
NC Raleigh, Box 10386 919-834-4375
Ohio Akron, 158 E. Voris St. 216-376-2171
Ohio Cincinnati, 7710 Reading Rd. 513-475-7400
Ohio Cleveland, 55 Public Sq. 216-579-2121
Ohio Cleveland, Weschler Elec. Corp., 4250 W. 130th St. 216-251-4609
Ohio Columbus, 940 Williams Ave. 614-294-5261
Ohio Dayton, 1306 Farr Dr. 513-461-3720
Ohio Toledo, 245 Summit St. 419-248-6681
Ohio Youngstown, 246 W. Wood St. 216-744-8911
Okla Oklahoma City, 120 N. Robinson St. 405-528-2911
Okla Tulsa, 915 Enterprise Bldg. 918-583-3191
Ore Eugene, 1345 Olive St. 503-342-3083
Ore Medford, Box 1487 503-773-1845
Ore Portland, Box 12265 503-224-4200
Pa Allentown, Box 59 215-432-6841
Pa Bala Cynwyd, One Decker Sq. 215-878-1300
Pa Erie, 1107 Hess Ave. 814-452-4867
Pa Johnstown, 107 Station St. 814-288-1559
Pa Pittsburgh, Box 1017 412-255-3800
Pa Wilkes Barre, 267 N. Pennsylvania Ave. 717-825-7337
Pa Williamsport, 202 Basin St. 717-322-6183
SC Columbia, 1710 Gervais St. 803-256-1511
SC Greenville, 292 Pleasantburg Bldg. 803-232-5695
Tenn Chattanooga, 305 Provident Bldg. 615-267-4361
Tenn Kingsport, 433 E. Center St. 615-247-5167
Tenn Knoxville, 808 Campbell Ave., S.E. 615-522-8101
Tenn Memphis, 1520 First Nat'l. Bank Bldg. 901-526-8546
Tenn Nashville, 110-21st Ave., S. 615-242-3505
Tex Amarillo, 301 Polk St. 806-372-3259
Tex Beaumont, 1103 Beaumont Savings Bldg. 713-838-6333
Tex Corpus Christi, Corpus Christi State Nat'l. Bldg. 512-883-9236
Tex Dallas, 8400 John W. Carpenter Frwy. 214-631-2811
Tex El Paso, Southwest Ctr., 300 E. Main St., Ste. 536 915-542-1744
Tex Houston, 507 Dallas Ave. 713-224-7791
Tex Houston, D. H. Dashiell Co., 6161 Washington Ave. 713-869-4878
Tex Lubbock, Box 6399 806-792-2811
Tex Odessa, 300 N. Jackson St. 915-337-1822
Tex San Antonio, 201 N. St. Mary's St. 512-223-9181
Utah Salt Lake City, 1680 S. Redwood Rd. 801-486-8751
Va Richmond, 4000 W. Broad St. 703-649-9061
Va Roanoke, Box 2547 703-342-8925
Wash Seattle, 19 W. Harrison 206-623-7001
Wash Spokane, Box 2987 509-535-3521
WVa Bluefield, 704 Bland St. 304-325-7215
WVa Charleston, 1204 Kanawha Blvd., E. 304-346-9606
WVa Fairmont, 10th & Beitline 304-363-0400
WVa Huntington, 1029 7th Ave. 304-529-7146
WVa Wheeling, Box 431 304-232-4100
Wisc Appleton, 315 W. Wisconsin Ave. 414-739-2313
Wisc Madison, Box 3099 608-257-4517
Wisc Milwaukee, Box 1207 414-276-1800

WESTINGHOUSE ELEC. CORP., Semiconductor Div., Youngwood, Pa., 15697, Tel: 412-WA-5-7272, TWX: 412-679-2783; Sls. Mgr: D.J. Morrison

WESTINGHOUSE ELEC. CORP., Specialty Elctrns. Div., 7800 Susquehanna St., Pittsburgh, Pa., 15221, Tel: 412-256-5175; Sls. Mgr: J.F. Barnyak

WESTINGHOUSE ELEC. CORP., Specialty Metals Div., R.D. #2, Box 45, Blairsville, Pa., 15717, Tel: 412-459-9400

WESTINGHOUSE ELEC. CORP., Specialty Transformer Div., Box 231, Greenville, Pa., 16125, Tel: 412-981-1611; Sls. Mgr: J. Basista, Jr.

WESTINGHOUSE ELEC. INT'L. CO., 200 Park Ave., New York, N.Y., 10017, Tel: 212-692-3211; Pres: J. de Cubas

WESTLAKE PLASTICS CO., 133 W. Lenni Rd., Lenni, Pa., 19052, Tel: 215-GL-9-1000; Sls. Mgr: W.F. Noonan, Jr.

WESTMORELAND PLASTICS CO., 135 Gertrude St., Latrobe, Pa., 15650, Tel: 412-539-1612; Sls. Mgr: E.R. Hatfield

WESTON COMPS. DIV., Weston-Archbald, Archbald, Pa., 18403, Tel: 717-876-1500, TWX: 717-770-2928; Sls. Mgr: F.J. Butteri ....FSC No. 94271 ....Pgs. 2832,2833

Ala Huntsville, Rep., Inc., 8100 S. Memorial Pkwy. 205-881-9270
Ariz Scottsdale, Vinson Assocs., Inc., 503 N. Brown Ave. 602-947-7371
Cal Monterey Pk., Weston Instrs., Inc., 736 Monterey Pass Rd. 213-268-9271
Cal Redwood City, Held & Mollard, Inc., 1494 Oddstad Dr. 415-369-4871
Colo Littleton, Vinson Assocs., Inc., Box 1068 303-798-4516
Fla Orlando, Scott & Assocs., 1010 Executive Ctr. Dr. 305-841-4840
Ga Atlanta, Rep., Inc., 1483 Monroe Dr. 404-876-1591
Ill Oakbrook, Whitmore Assocs., Inc., 1301 W. 22nd St. 312-325-4727
Md Silver Spring, QED Elctrns., Inc., 880 Bonifant St. 301-588-8134
Mass Lexington, Weston Instrs., Inc., 17 Hartwell Ave. 617-861-8950
Mich Farmington, Weston Instrs., Inc., 23629 Liberty St. 313-477-5686
Minn St. Paul, R.G. Ragon, Inc., 1136 W. Larpenteur Ave. 612-488-6634
Mo Kansas City, R.R. Burton Sls. Co., 7546 Troost Ave. 816-JA-3-7865
Mo St. Louis, R.R. Burton Sls. Co., 10414 Oak Ave. 314-429-7327
NJ Camden, QED Elctrns., Inc., 2916 Federal St. 215-925-8711
NM Albuquerque, Vinson Assocs., Inc., 2329 Wisconsin, N.E. 505-298-7442
NY Mt. Vernon, QED Elctrns., Inc., 500 Nuber Ave. 914-968-2200
NC Charlotte, J.L. Highsmith & Co., 3733 Monroe Rd. 704-333-7743
Ohio Dayton, Weston Instrs., Inc., 3300 S. Dixie Dr. 513-298-7511
Pa Archbald, Weston Comp. Div. 717-876-1500
Tex Dallas, Kemp Engrg. Co., 2618 Manana Dr. 214-FL-7-6663
Wash Seattle, Weston Instrs., Inc., 314 First Ave., W. 206-282-3388

WESTON HYDRAULICS, DIV., Borg-Warner Corp., 7500 Tyrone Ave., Van Nuys, Calif., 91409, Tel: 213-781-4000, TWX: 910-495-1726; Sls. Mgr: D.G. Sherman....FSC No. 79294

WESTON INSTRUMENTS, DIV., Weston Instruments Inc., 614 Frelinghuysen Ave., Newark, N.J., 07114

WESTON INSTRS., INC., Weston-Lexington Div., 17 Hartwell Ave., Lexington, Mass., 02173, Tel: 617-861-9000, TWX: 710-326-0596; Sls. Mgr: R.H. Leeman....FSC No. 11842

WESTON-MAGNETICS, 14617 Keswick Ave., Van Nuys, Calif., 91405, Tel: 213-782-1974; Sls. Mgr: W.D. Stone....FSC No. 05934

WESTON-TRANSICOIL, Weston Comps. Div., Worcester, Pa., 19490, Tel: 215-277-1300, TWX: 510-660-0132; Dir. Mktg: E.F. Hall ....FSC No. 82686 ....Pg. 1998

Ariz Scottsdale, Runyon Co., 6825 E. Thomas 602-947-5711
Cal Arcadia, Stark Instr. Sls., 2125 Louise Ave. 213-445-3756
Cal Los Altos, Richards Assocs., 900 San Antonio Rd. 415-941-3226
Cal Monterey Pk., Weston-Transicoil, 736 Monterey Pass Rd. 213-268-0161
Colo Denver, Peterson Co., 4949 Colorado Blvd. 303-333-5434
Fla Orlando, Dost Assocs., Box 17057 305-295-4440
Kans Shawnee Mission, Florence & Meyer, 7301 Mission Rd. 913-722-5210
Kans Wichita, Florence & Meyer, 2900 Woodland 316-838-7226
Md Timonium, Barnhill & Assocs., 1931 Greenspring Dr. 301-252-5610
Mass Waltham, Newton Assocs., 225 Crescent St. 617-891-1230
Mo St. Louis, Florence & Meyer, 8650A Airport Rd. 314-521-6800
NJ Cherry Hill, J.C. Miller, 801 Pennsylvania Ave. 609-429-7668
NJ Cherry Hill, Monteiro Assocs., 95 W. Gate Dr. 215-265-0634
NJ E. Orange, Masin-Esco, 263 Central Ave. 201-674-6505
NJ Pt. Pleasant, F.C. Helies, 800 South St. 201-899-0298
NY Liverpool, T. J. Shanahan, 239 Buckley Rd. 315-652-7010
Ohio Dayton, A.H. Baier Co., 3300 S. Dixie Dr. 513-298-9897
Ohio Willoughby, A.H. Baier Co., 4399 Industrial Pkwy. 216-946-6080
Pa Worcester, Weston-Transicoil, Trooper Rd. 215-277-1300
Tex Dallas, J. Tennison, 15535 El Estado 214-231-9811
Utah Salt Lake City, Peterson Co., 521 W. Fourth, N. 801-355-7464
Wash Bellevue, Western Tech. Sls., Inc., 10843 N. 8th St. 206-454-3906

WESTWOOD - tools - Waldes Kohinoor, Inc.

WHARFEDALE, DIV., British Inds. Co., Westbury, N.Y., 11590, Tel: 516-ED-4-7450; Sls. Mgr: L.J. Epstein....FSC No. 08279

WHARTON UNITOOLS, 8-10 Lake St., Moosup, Conn., 06354, Tel: 203-LO-4-2254; Sls. Mgr: R.H. Rich

WHEELABRATOR CORP., Wheelabrator Div., 1478 S. Byrkit St., Mishawaka, Ind., 46544, Tel: 219-255-2141; V.P. Sales: L.J. Kohlmeyer

WHEELER LABS., INC., Box 561, Smithtown, N.Y., 11787, Tel: 516-AN-5-3810; Pres: H.L. Bachman....FSC No. 13073

WHEELOCK SIGNALS, INC., 273 Branchport Ave., Long Branch, N.J., 07740, Tel: 201-222-6880, TWX: 201-222-7091; Sls. Mgr: C.C. Applegate ....Pg. 1863

Ariz Scottsdale, Portis & Assoc., 132 E. Stetson 602-947-4379
Cal Palo Alto, Wheelock Signals, Inc., 230 W. 40th Ave. 415-967-4938
Cal Pasadena, H. Vickroy, Box 2724 213-836-3388
Cal San Mateo, T. Ryan, 230 W. 40th Ave. 415-573-8655
Colo Denver, Engrg. Resch. Assoc., 231 Detroit St. 303-377-8306
Conn Wethersfield, Com/Pak, Box 37 203-563-4784
Fla Orlando, Gra-Mar, Inc., 3113 Lawton Rd. 305-841-2330
Ill Chicago, J. Lane, 1420 W. Farwell 312-764-1648
Mass Needham, Com/Pak, 14 Oak St. 617-HI-4-1259
Mass Roslindale, J. Shepard, 142 Fawndale Rd. 617-327-4158
Minn Mound, MacNamara Assocs., Box 38 612-472-4919
NJ Cherry Hill, L. Cleary, 403 Preston Rd. 609-667-6055
NJ Montclair, D. Ferguson, Box 560 201-222-6880
NJ Newark, B. Dean, Inc., 220 Elmwood Ave.

NY Ithaca, B. Dean, Inc., 714 W. Clinton 607-AR-2-2187
NY Queens Village, F.T. Battista Co., 223-46 Hempstead Ave. 212-479-3550
Ohio Dayton, Midwest Mktg. Assocs., 137 Lakeview 513-433-2511
Tex Dallas, Ruby Sls. Corp., Box 9894 214-827-6630
FOR: Can., Port Credit, Ont., Leonard Elec., 1008 Rangeview Rd. 416-274-3454

WHIRLCLAD - fluidized bed coating system - Polymer Corp.
WHIRLPOOL MIXERS - chemical agitators - Standard Elec. Mfg. Co.
WHIRLWIND - wire brushes - Black & Decker Mfg. Co., The
WHISPER - fan - Rotron, Inc.
WHISTLER ELCTRNS., INC., 8613 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-349-7100; Sls. Mgr: J.A. Willey....FSC No. 18617

WHIT - screen press - Etchomatic, Inc.
WHITAKER CABLE CORP., 1301 Burlington St., N. Kansas City, Mo., 64116, Tel: 816-471-4640; Sls. Dir: C.J. Owen
WHITE DOT - pumice cleaner - Etchomatic, Inc.
WHITE ELECTROMAGNETICS, INC., 656 Lofstrand La., Rockville, Md., 20850, Tel: 301-424-2900; Sls. Mgr: D.R.J. White
WHITE INSTRS., INC., Box 698, Austin, Tex., 78767, Tel: 512-892-0752; Sls. Mgr: W. Robertson....FSC No. 03945
WHITEWATER ELCTRNS., INC., 136 W. Main St., Whitewater, Wisc., 53190, Tel: 414-473-5700, TWX: 910-260-3830; V.P. Sales: R. Grenn
WHITMAN CORP., 1725 Powers St., Cincinnati, Ohio, 45223, Tel: 513-541-3223; Sls. Mgr: S. Erhardt

WHITMOR WIRE & CABLE CORP., 13161 Sherman Way, Unit B, No. Hollywood, Cal., 91605, Tel: 213-764-6296, TWX: 910-499-2159; Sls. Mgr: J.J. Serago....FSC No. 15851 .....Pg. 2068

WHITSO, INC, 9330 Byron St., Schiller Park, Ill., 60176, Tel: 312-678-5200, TWX: 312-678-2672; Genl. Sls. Mgr: A. Paloian ....FSC No. 92825
WHITTAKER CORP., 9229 Sunset Blvd., Los Angeles, Calif., 90069, Tel: 213-274-0771, TWX: 213-273-4192
WHIZ-LOCK - locknut - MacLean-Fogg Lock Nut Co.
WIDE WINDOW - laminations - Thomas & Skinner, Inc.
WIDE-VUE - panel meters - Simpson Elec. Co.
WIDEBETA - radioactivity detection sys. - Beckman Instrs., Inc.
WIDGET - welder - Silver, G.H. & Assocs., Inc.
WIDNEY-DORLEC - aluminum constructional system - Bridges Frank Assocs., Inc.
WIEGAND, EDWIN L. CO., Div. Emerson Elec. Co., 7705 Thomas Blvd., Pittsburgh, Pa., 15208, Tel: 412-242-6400, TWX: 710-664-4449; Sls. Mgr: S. Campanella....FSC No. 65586
WILBRAZ - brazing alloys - Wilkinson Co.
WILCO - all products - Engelhard Minerals & Chemicals Corp.
WILCO CORP., 4030 W. Tenth St., Indianapolis, Ind., 46222, Tel: 317-244-2516
WILCOLOY E - copper spring material - Engelhard Minerals & Chemicals Corp.
WILCOX, 1400 Chestnut, Kansas City, Mo., 64127
WILCOX PRODS. CO., Sub. Thermotech Inds., Inc., 1202 S. Fifth St., Hopkins, Minn., 55343, Tel: 612-938-7671; Sls. Mgr: E. Ostergard

WILD ONE - amplifier - Wilder Engrg. Prods.

WILD ROVER CORP., Herbert Ave., Closter, N.J., 07624, Tel: 201-768-8436; Sls. Mgr: G.W. Mills .....Pg. 2094

Ariz Phoenix, Luscombe Engrg. Co., 222 W. Osborne Rd. 602-274-1542
Cal Pasadena, Luscombe Engrg. Co., 610 S. Arroyo Pkwy. 213-684-2000
Cal San Mateo, Luscombe Engrg. Co., 220 E. Third Ave. 415-342-7057
Conn Hamden, Compar New England, 2531 Whitney Ave. 203-288-9276
Mass Newton Highlands, Compar New England, 88 Needham St. 617-969-7140
NY Hyde Pk., R. P. Kennedy Co., Inc., Green Tree Dr., N. 914-229-2269
NY Rochester, R. P. Kennedy Co., Inc., 39 Saginaw Dr. 716-271-6322

WILDER ENGRG. PRODS., 715 Kedzie, Chicago, Ill., 60612, Tel: 312-826-6161
WILDER MFG. CO., INC., Mechanic St. & Erie R.R., Port Jervis, N.Y., 12771, Tel: 914-856-5188
WILKENS, ALWIN FR., INC., Rte. 22, Pawling, N.Y., 12564, Tel: 914-855-5510; Pres: A.Fr. Wilkens
WILKINSON CO., 31011 Agoura Rd., Westlake Village, Cal., 91360, Tel: 213-889-0050; Sls. Mgr: R.L. Haynes
WILL SCIENTIFIC, INC., 39 Russell St., Rochester, N.Y., 14603, Tel: 716-271-8200; Sls. Mgr: S.J. Feier
WILLAB - furniture - Will Scientific, Inc.
WILLIAMS - high purity iron oxides - Pfizer Minerals
WILLIAMS J.H. & CO., United Greenfield Div. TRW, Inc., 400 Vulcan St., Buffalo, N.Y., 14207, Tel: 716-875-3200, TWX: 710-522-1747; Sls. Mgr: W. Woodbury
WILLIAMSON CORP., 1152 Main St., W. Concord, Mass., 01781, Tel: 617-369-9607; Sls. Mgr: C.R. Clarke
WILMAD GLASS CO., INC., Buena, N.J., 08310, Tel: 609-697-3000; Sls. Mgr: A. Pyne

WILMINGTON CONTROLS DIV., Ledex Inc., 111 S. Nelson Rd., Wilmington, Ohio, 45177, Tel: 513-382-0987, TWX: 810-455-2781; Sls. Mgr: T. Ristoff....FSC No. 81840 .....Pgs. 2061-2064

Ariz Phoenix, Barnhill Five, Inc., 537 E. Osborn Rd. 602-263-1250
Cal Palo Alto, Testco, 941 Charleston Rd. 415-326-5320
Cal Los Angeles, C. E. Holmes Co., 1047 North Ave. 64 213-256-2255
Colo Denver, Barnhill Five, Inc., 1170 S. Sheridan Blvd. 303-934-5505
Fla Clearwater, W.B. Wimberly Co., 532 S. Ft. Harrison Ave. 813-446-7072
Fla Orlando, W.B. Wimberly Co., 500 S. Osceola 305-425-3083
Ill Lombard, Strain Sls. Co., 1028 Cherry La. 312-627-7696
Mass Lexington, K.C. Stevens & Co., 442 Marrett Rd. 617-862-1812
Mich Lathrup Village, R.C. Nordstrom & Co., Box 32 313-444-4417
Minn Minnetonka, T. H. Ayre Assocs., Inc., 5509 Eden Prairie Rd. 612-935-2191
NJ Nutley, Falk-Baker Assocs., 382 Franklin Ave. 201-661-2430
NM Albuquerque, Barnhill Five, Inc., 827 Pennsylvania, N.E. 505-265-7766
NY Liverpool, L. Garner, Box 56 315-652-7911
NC Raleigh, A.B. Andrews Co., Box 2627 919-833-5565
Ohio Dayton, Dynel Co., Box 7, Centerville Br. 513-434-6467
Pa Philadelphia, V.S. Malta, Box 4007 215-836-5122
Wash Seattle, Testco, Boeing Field, Rm. 219 206-762-8220

WILTRON CO., 930 E. Meadow Dr., Palo Alto, Calif., 94303, Tel: 415-321-7428; Sls. Mgr: W.E. Jarvis....FSC No. 20944
WINATIC CORP., 409 Commerce Rd., Vestal, N.Y., 13850, Tel: 607-729-6318; Sls. Mgr: B. Howe

WINCHESTER ELCTRNS. DIV., Litton Inds., Main & Hillside Aves., Oakville, Conn., 06779, Tel: 203-274-8891, TWX: 710-478-3394; Mktg. Mgr: P. Robichaud....FSC No. 10118 .....Pgs. 2554,2555

Ariz Phoenix, Shefler-Kahn, Box 1587 602-258-7893
Cal San Diego, Litton Inds., 8797 Balboa Ave. 714-279-4051
Cal Sunnyvale, Litton Inds., 1001 W. Maude Ave. 408-738-2222
Cal Van Nuys, Litton Inds., 13536 Saticoy St. 213-782-0660
Fla Coral Springs, Litton Inds., Box 8817 305-587-4483
Ill Chicago, Litton Inds., 6835 W. Higgins Rd. 312-775-6697
Mass Waltham, Litton Inds., 395 Totten Pond Rd. 617-899-2207
Minn Minneapolis, Litton Inds., 2500 39th Ave., N.E. 612-788-9474
NJ Englewood Cliffs, Litton Inds., 616 Palisade Ave. 201-567-6800
NY New York, Litton Inds. 212-524-4727
Ohio Dayton, Litton Inds., 5899 Huberville Ave. 513-252-1441
Pa Ft. Washington, Litton Inds., 1260 Virginia Dr., Ft. Washington Ind'l. Pk. 215-643-2100
Tex Dallas, BESCO, 1715 Matagorda Dr. 214-376-1929
Wash Bellevue, H. S. Thorpe, Box 1117 206-GL-4-0667
FOR: Can., Montreal, Que., S. C. Hooker Can., Ltd., 144 Ronald Dr. 514-487-5151
FOR: Can., Toronto, Ont., S. C. Hooker Can., Ltd., 761 Jane St. 416-767-7725

WINCHESTER RELAYS - Reed Relays - Elctrn. Instr. & Specialty Corp.
WINCO - a.c. generator - Dyna Technology Inc.
WINCO - generators motors dynamotors - Dyna Technology, Inc.
WINDJAMMER - vacuum-blower system - Ametek/Lamb Elec.
WINEGARD CO., 3000 Kirkwood St., Burlington, Iowa, 52601, Tel: 319-753-0121, TWX: 319-390-1811; Sls. Mgr: J.S. Ridge
WINPOWER MFG CO., 1207 First Ave., E., Newton, Iowa, 50208, Tel: 515-792-1301; Dir. Mktg: Roy Brewer....FSC No. 66127
WINSLOW TELE-TRONICS, INC., 607 Industrial Way, W., Eatontown, N.J., 07724, Tel: 201-542-7000, TWX: 710-722-6682; Sls. Mgr: H.W. West....FSC No. 66150
WINTERBURN MFG. CO., Box 386, Putnam, Conn., 06260, Tel: 203-928-6551; Sls Mgr: R. W. Randall
WINTRISS CONTROLS, Div. Tyco Labs., Inc., 20 Vandam St., New York, N.Y., 10013, Tel: 212-CH-2-0105; Sls. Mgr: B. Wels
WINTRON CO., INC., 9759 Rush St., S. El Monte, Calif., 91733, Tel: 213-283-6951....FSC No. 11603
WINZELER MFG. & TOOL CO., 7355 W. Wilson Ave., Chicago, Ill., 60656, Tel: 312-867-7971; Sls. Mgr: J.H. Winzeler, Jr. ....FSC No. 09109
WIRE CLOTH ENTERPRISES, INC., 130-132 Gamma Dr., R.I.D.C. Ind'l. Pk., Pittsburgh, Pa., 15238, Tel: 412-781-1390; Sls. Mgr: R.C. Kyle
WIRE-DIAL - terminal attaching machines - Kent Corp.
WIRE-WRAP - machines and tools - Gardner-Denver Co.
WIRECENTER - semi-automatic wiring machine - Hughes Aircraft Co.
WIRECRAFT PRODS., INC., Rte. 9, W. Brookfield, Mass., 01585, Tel: 617-867-3155; Sls. Mgr: R. Arsenault....FSC No. 24868

WIREMOLD CO., Hartford, Conn., 06110, Tel: 203-233-6251; Sls. Mgr: W.E. Parks....FSC No. 78725 .....Pgs. 2556,2557

Ala Birmingham, H.G. Hanson, 9820 Redcliff Rd. 205-836-8474
Ark Little Rock, J. Greene, 2312 Cantrell Rd. 501-376-6626
Cal Los Angeles, Vernon Airey-Thompson Co., 3653 Sierra Pine St. 213-264-1533
Cal San Francisco, F.W. Gray, 2450 17th St. 415-626-2219
Colo Denver, R.B. Schumann, 634 Gilpin St. 303-534-1058
Conn Farmington, E.W. Selnau, 23 Tanglewood Rd. 203-673-4979
DC Washington, T.J. Pugh, 5501 22nd Ave. 202-296-3669
Fla Tampa, J.D. Whetsell, Box 16066 813-988-5860
Ga Decatur, R.L. Pace, 5169 Covington Rd. 404-BU-4-3354
Ill Chicago, A.J. Massey, 20 N. Wacker Dr. 312-ST-2-7850
Md Bel Air, A.B. French, 26 Lake Dr. 301-825-1305
Mass Boston, R.T. Bennett, 10 High St. 617-HA-6-5693
Mich Detroit, M.F. Frazier Co., 17610 W. McNichols Rd. 313-KE-5-0840
Minn Minneapolis, H.G. Schendel, 3746 Cedar Ave., S. 612-PA-2-2226
Mo Kansas City, V.A. Meier, 5335 N. Jackson 816-452-9076
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An alphabetical listing of 2,000 independent sales representatives selling the types of products listed in **eem** — with their branch offices. Includes address, telephone and TWX numbers for main offices.

GEOGRAPHICAL SECTION — Page 3225

Main office listings arranged alphabetically within each state and city, with phone and TWX numbers. Listings also include:

- Branch office addresses, phone and TWX numbers. Branch offices are also listed geographically with a cross-reference to the main office listing for complete information.
- Manufacturers represented.
- Types of accounts served.
- Facilities and services.
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This is the most complete list available of independent sales representatives selling electronic equipment, components and materials.

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Almac/Stroum Elctrns., 5811—6th Ave. S., Seattle, Wash., (206) 763-2300. TWX: 910-444-2067. Branch Office: Portland, Oregon.
Anderson, J. E. M. Co., 5231 Humboldt Ave. S., Minneapolis, Minn., (612) 823-6459.
Aeroconomy Agency, 1079 Lexington Ave., Schenectady, N.Y., (518) 372-8426.
Aertronic Assoc., Inc., 5899 Huberville Ave., Dayton, Ohio, (513) 253-8144. Branch Office: Northfield, Ohio.
Agress, M. C., P.E., 891 Fulton St., Valley Stream, N.Y., (516) 825-8955.
Airep Elctrns., 6300 N. Central Exp., Dallas, Texas, (214) 363-5291. Branch Office: Houston, Texas.
Allen, D. Co., 7969 Engineer Rd., San Diego, Cal., (714) 278-9250.
Allied Components, Inc., 10464 E. Northwest Hwy., Dallas, Texas, (214) 348-6660. TWX: 910-861-4925. Branch Office: Houston, Texas.
Allgood Assocs., 1621 Centinella Ave., Inglewood, Calif., (213) 776-5820. TWX: 910-328-6195. Branch Offices: Mountain View, Calif.; San Diego, Calif.
Allied Enterprises Inc., Box 30104, Cleveland, Ohio, (216) 234-3838.
Allied Northwest Machine Tool Corp., 3525 S.E. 17th, Portland, Ore., (503) 659-2329.
Almac/Stroum Elctrns., 5811—6th Ave. S., Seattle, Wash., (206) 763-2300. TWX: 910-444-2067. Branch Office: Portland, Ore.
American Technical Sales Co., 1460 S. Sherbourne Dr., Los Angeles, Calif., (213) 659-3791.
Andco Sales-Engrg. Inc., 18 W. Chelten Ave., Philadelphia, Pa., (215) GE 8-7900. Branch Office: Washington, D.C.
Anderson Elctrns., Inc., 30785 Grand River Ave., Farmington, Mich., (313) 476-9161.
Anderson, J. B. Co., Inc., 8 E. Long St., Columbus, Ohio, (614) 221-6385. Branch Office: Berea, Ohio.
Andrews & Andrews, Inc., 140 E. Main St., Huntington, N.Y., (516) 692-8686. Branch Office: Englewood, N.J.
Andrews, A. B. & Co., Box 2627, Raleigh, N.C., (919) 833-5565.
Andrews, M. P., Inc., 319 Mott Rd., Fayetteville, N.Y., (315) 637-3144. TWX: 710-545-0242.
Angel, Jay C. & Co., 2743 W. Peterson, Chicago, Ill., (312) 878-0653. TWX: 910-221-5688.
Anger Assocs., Inc., 13126 Michigan Ave., Dearborn, Mich., (313) 584-9853. Branch Offices: Chicago, Ill.; Columbus, Ohio.
Angus, Inc., Pleasant Valley Ave., Moorestown, N.J., (609) 235-1900. TWX: 710-897-0829. Branch Office: Beltsville, Md.
Ansell Engrg Co., 816 Thayer Ave., Silver Spring, Md., (301) 588-4222.
Appell, L. W., Co., Inc., 11 Warren St., New York, N.Y., (212) WO 4-4255.
Applied Science Assocs., 1 Turtle Creek Village, Dallas, Texas (214) 526-8316. TWX: 214-899-905. Branch Office: Houston, Texas.
ARA Elctrn. Inc., 501 Edge Hill Rd., Glenside, Pa., (215) TU 7-5250. Branch Office: Bethesda, Md.
Arbeiter Co., 7297 Olive Blvd., St. Louis, Mo., (314) 727-0016.
ARCO Engrg. Co., 1000 16th St., N.W., Washington, D.C., (202) 393-5991. Branch Office: Collingswood, N.J.
Arenstrup, F. G. Co., 250 Hudson Rd., Sudbury, Mass., (617) 443-2992.
Arneson Assoc., Inc., 5950 6th Ave. S., Seattle, Wash., (206) 762-7664. Branch Office: Beaverton, Ore.
Arnold Assocs. Inc., 2 Ryers Ave., Cheltenham, Pa., (215) 742-0600.
ARVA, Inc., 1320 Prospect St., Seattle, Wash., (206) 622-0177. TWX: 910-444-2022. Branch Offices: Anchorage, Alaska; Portland, Ore.
ASC Sales Co., 12140 So. Atlantic Ave., Lynwood, Calif., (213) 537-1856.
Ash, W. J. & Assoc., 4110 Templar Rd., Toledo, Ohio, (419) 241-1141.
Ashby, G. L. Assocs. Inc., 4130 Linden Ave., Dayton, Ohio, (513) 252-5627.
Associated Agents, Box 11444, Greensboro, N.C., (919) 292-6508.
Atkind, I., 821 Burman Ave., Trotwood, Ohio, (513) 837-4750.
Audio Sound Sales Co., 2535 N. Ashland, Chicago, Ill., (312) 528-8422.
Aurich, F. W. & Co., 3601 Gilman Ave. W., Seattle, Wash., (206) 284-5561. TWX: 910-444-1333.
Automatic General Elctrn. Sales, Inc., 6550-E Troost Ave., Kansas City, Mo., (816) 333-8206.
Automation Engrg. Co., Inc., 12740 N. River Rd, 43W., Mequon, Wis., (414) 242-1520.
Automation Sales, Inc., Box 448, Huntington, N.Y., (516) 692-6207.
Avionics Liaison, Inc., 6770 Perimeter Rd., South, Seattle, Wash., (206) RO 7-3870. TWX: 910-444-2013.
Aymond Co., Inc., 4340 No. Central Expy., Dallas, Texas (214) 827-8043. Branch Office: Bellaire, Texas.
Aztec Enterprises, Inc., 3202 Candelaria Rd. NE, Albuquerque, N.M., (505) 345-3441. Branch Offices: Phoenix, Ariz.; Littleton, Colo.

For Additional Information See Geographical Listing, Page 3225

B

B. & A. Assocs., 237 Lancaster Ave., Devon, Pa., (215) MU 8-5173.
B & W Assocs., B St., Burlington, Mass., (617) 275-9177.
Bach Sales Corp., 78 Wellington Rd., Garden City, N.Y., (212) 687-1240. Branch Office: New York, N.Y.
Bach-Stewart Assoc., 947 Old York Rd., Abington, Pa., (215) 927-1200.
Bach, P. Electric, 1233 N. W. 12th Ave., Portland, Ore., (503) 227-2173. Branch Offices: Bellevue, Wash.; Spokane, Wash.
Backer, J. J. Co., 221 W. Galer, Seattle, Wash., (206) 285-1300. TWX: 910-444-1646.
Baehr-Greenleaf & Assocs. Inc., 14700 Detroit Ave., Cleveland, Ohio (216) 221-9030. Branch Offices: Cincinnati, Ohio; Columbus, Ohio; Xenia, Ohio.
Bahr Sales Co., 91 Woodsley Rd., Longmeadow, Mass., (413) 567-3488.
Baier, A. H. Co. & Assocs., 4399 Industrial Pkwy., Willoughby, Ohio, (216) 946-6080. Branch Office: Dayton, Ohio.
Balhorn & Welch, Inc., 1925 N. Harlem Ave., Chicago, Ill., (312) 889-5011. TWX: 910-221-5368. Branch Office: Cedar Rapids, Iowa.
Ballagh & Thrall, Inc., 1010 Schaff Bldg., Philadelphia, Pa., (215) 564-4020.
Ballou, Inc., 51 N. Broad St., Ridgewood, N.J., (201) 444-6990.
Banks, R. A. Sales Corp., 1029 Corporation Way, Palo Alto, Cal.
Bard Assocs. Inc., La Grange Industrial Park, La Grange, Ill., (312) 354-0660. TWX: 910-683-1894. Branch Offices: Indianapolis, Ind.; Lenexa, Kansas; Minneapolis, Minn.; Crestwood, Mo.
Barnhill & Assocs. Inc., 1932 Greenspring Dr., Timonium, Md., (301) 252-5610. Branch Office: Lynchburg, Va.
Barnhill Assoc., 1170 So. Sheridan Blvd., Denver, Colo., (505) 265-7766, (303) 934-5505. TWX: 910-931-2685. Branch Offices: Phoenix, Ariz.; Albuquerque, N.M.; Houston, Texas; Richardson, Texas; Salt Lake City, Utah.
Barnes, A. Co., 740 S. Sherman St., Richardson, Texas, (214) 235-4541. TWX: 910-867-4710. Branch Offices: Austin, Texas; Houston, Texas; San Antonio, Texas.
Barron, W. J. Co., 1406 South Grand Ave., Los Angeles, Calif., (213) 748-6191.
Bartlett Assocs. Inc., 130 W. Lancaster Ave., Wayne, Pa., (215) 688-7325. TWX: 510-668-2995. Branch Offices: Bethesda, Md.; White Plains, N.Y.
Barstow & Doran, Inc., 1406-08 S. Grand Ave., Los Angeles, Calif., (213) RI 9-0438.
Barton, C. K. Assocs. Inc., 343 New London Tpke., Glastonbury, Conn., (203) 633-9417. Branch Office: Auburndale, Mass.
Bassett & Moore, Inc., 12045 Magnolia Blvd., No. Hollywood, Calif., (213) 877-7129.
Bassin Technical Sales Co., 52 Fayette Rd., Scarsdale, N.Y., (914) SC 3-3334.
Batha, H. J. Co., 310 So. Dorchester Ave., Wheaton, Ill., (312) 668-4740.
Baxter, A. H., Box 267, Philmont, Va., (703) 338-6002.
BCS Assocs. Inc., 940 N. Ferncreek Ave., Orlando, Fla., (305) 843-1510. TWX: 810-850-0185. Branch Offices: Huntsville, Ala.; Greensboro, N.C.
Bear, N. Corp., 3435 Streetsboro Rd., Richfield, Ohio, (216) 659-3331. TWX: 810-427-9100. Branch Office: Dayton, Ohio.
Beedle Equipt. Co., 6900 Silverton Ave., Cincinnati, Ohio, (513) 793-0140.
Beemer Engrg. Co., Ft. Washington, Pa., (215) MI 6-8440. TWX: 510-661-1654. Branch Offices: Severna Pk., Md.; Springfield, N.J.; Buffalo, N.Y.; Fayetteville, N.Y.; Charlotte, N.C.
Beil & Whitaker, Inc., 3623 Jacksonwald Ave., Reading, Pa., (215) 779-2610. Branch Offices: Camp Hill, Penna.; Harrisburg, Penna.
Belchamber & French, 308 Playa Blvd., LaSelva Beach, Calif., (408) 688-3281.
Belfer, W., 387 6th St., San Francisco, Calif., (415) 781-0392.
Bell, J. W., 601 S. Vermont Ave., Los Angeles, Calif., (213) 388-7104.
Bennewitz Assoc., Inc., 9720 Candelaria NE, Albuquerque, N.M., (505) 298-6775. TWX: 910-989-0610. Branch Offices: Scottsdale, Ariz.; Denver, Colo.
Benson Engrg. Co., 9884 Monroe Dr., Dallas, Texas, (214) 352-7541. Branch Offices: Shawnee Mission, Kan.; Wichita, Kan.
Berg, S., Inc., Box 4500, Pittsburg, Pa., (412) 923-1911.
Berliant Assocs., 39 St. Mary Pl., Freeport, N.Y., (516) TN 8-9106. Branch Office: Baldwin, N.Y.
Berman, J. Co., Inc., 8295 S. LaCienga Blvd., Inglewood, Calif., (213) 678-1281. TWX: 910-328-6184. Branch Offices: Phoenix, Ariz.; San Diego, Calif.
Bermann, M. Sales, 8631 E. Prairie Rd., Skokie, Ill.
Berndt Assocs., Inc., 6200 N. Hiawatha Ave., Chicago, Ill., (312) 283-0713. TWX: 910-221-2515. Branch Offices: Indianapolis, Ind.; St. Louis Park, Minn.
Berthold Sales Co., 4411 Maple Ave., Dallas, Texas, (214) 526-8329.
Bettan, M. Sales Inc., 77-15 164th St., Flushing, N.Y., (212) 657-6659.
Bettis, M. E. Co., Box 598, Shawnee Mission, Kan., (913) 362-0772. Branch Offices: Wichita, Kan.; St. Louis, Mo.
BFA, 1309 So. Inca, Denver, Colo., (303) 744-3301. Branch Offices: Scottsdale, Ariz.; Euless, Tex.; Friendswood, Tex.; Albuquerque, N.M.; Las Cruces, N.M.
Bialek, S. Assocs., Inc., 29-28 41st Ave., Long Island City, N.Y., (212) 786-5562.
Bidwell, Reder, Ross and Fetting, 17525 So. Broadway, Gardena, Calif., (213) 770-0300.
Bieberich, W. W. Inc., 801 Leesburg Rd., Fort Wayne, Ind., (219) 432-2537.
Bittan Assocs., Inc., 381 Sunrise Hwy., Lynbrook, N.Y., (516) 593-3833. TWX: 510-225-8429.
Biztek Co. Inc., 10639 Riverside Dr., Toluca Lake, Calif., (213) 766-4890. Branch Offices: Scottsdale, Ariz.; San Francisco, Calif.
Black & Strong, Inc., 1728 So. La Cienega, Los Angeles, Calif., (213) 870-9191. TWX: 910-340-6369. Branch Office: San Diego, Calif.
Blaker, S. C. Co., Box 129, Northfield, Ill., (312) 446-8777. Branch Offices: Ft. Wayne, Ind.; Minneapolis, Minn.
Blind & Assocs., Inc., 1060 E. 86th St., Indianapolis, Ind., (317) 846-5441.
Boeing, J. E. Co., Inc., 18 Muzzey St., Lexington, Mass., (617) 862-2500. Branch Office: Branford, Conn.
Bohlig, C. E. Co., Box 16095, Minneapolis, Minn., (612) 922-7011.
Bohman, G. F. Assocs., Inc., 6990 Lake Ellenor Dr., Orlando, Fla., (305) 855-0274. TWX: 810-850-0198. Branch Office: Palm Beach Gardens, Fla.
Bollinger & Bradford, Box 8088, Pittsburgh, Pa., (412) 561-2340.
Bonn Assocs., Inc., 266 Lake Ave., Metuchen, N.J., (201) 549-9573. Branch Offices: Cherry Hill, N.J.; Stony Brook, N.Y.
Booth, C. & Assoc., Inc., 1921 N. Harlem, Chicago, Ill., (312) 237-7910.
Bordewieck Engrg. Sales Co., 221 Grove St., Braintree, Mass., (617) 843-0845.
Boyce, W., 12 Civic Center Dr., E. Brunswick, N.J., (201) 254-3831. Branch Office: Pompano Beach, Fla.
Braddock Assoc., Box 305, Haddonfield, N.J., (609) 429-0087.
Bradley Assocs. Corp., 9 Dash Pl., Bronx, N.Y., (212) 549-8500.
Brandt, E. W. Co., Box 538, San Rafael, Calif., (415) 454-0840.
Branom Instr. Co., 2137 Second Ave., Seattle, Wash., (206) 622-7320. Branch Offices: Portland, Ore.; Vancouver, Can.
Branum Sales Co., Box 516, Lake Zurich, Ill., (312) 438-2356.
Branum Sales, Inc., Box J, Richardson, Texas, (214) 231-6148.
Brauer, W. J. & Assocs. Inc., Box 305, Wickliffe, Ohio, (216) 943-0601. Branch Offices: Vandalia, Ohio; Pittsburgh, Pa.
Braun, W. M. & Assocs., Inc., 316 E. Silver Spring Dr., Milwaukee, Wisc., (414) 332-1040.
Brennan Assoc. Inc., Box 5006, Clearwater, Fla., (813) 446-5006. TWX: 810-866-0431.
Brennan Assocs., Inc., 208 Carlson Blvd., Bellevue, Wash., (206) 454-9332. TWX: 206-742-0834.
Bressler Assocs., Inc., 4808 Bergenline Ave., Union City, N.J., (201) 864-9577.
Bresson, Jerry, Assoc., 107 Forrest Ave., Narberth, Pa., (215) TE 9-6770. Branch Office: Elkridge, Md.
Breuer, R. E. Co., Inc., 1 Barstow Rd., Great Neck, N.Y., (516) 466-3030. TWX: 510-223-0886.
Brice Co., 5000 Terminal St., Box 730, Bellaire, Texas, (713) 666-0788. TELEX: 76-2347. Branch Offices: Tulsa, Okla.; Dallas, Texas (projected).
Bridgman, F. King, Jr., 283 Dover Center Rd., Bay Village, Ohio, (216) 752-0225.
Brimberg Assocs., Inc., 814 Thayer Ave., Silver Spring, Md., (301) 588-7790. TWX: 710-825-9625.
British Aircraft Corp. (U.S.A.), Inc., Intratec Div., 399 Jefferson Davis Hghwy., Arlington, Va., (713) 684-640.
Brinkley-Pallatz Co., Box 487, Kendall Sta., Miami, S.W., Fla., (305) 238-0864. Branch Office: St. Petersburg, Fla.
Brogan Assocs., Inc., 80 Urban Ave., Westbury, N.Y., (516) 333-6683. TWX: 510-222-4555. Branch Offices: Bloomfield, Conn.; Waltham, Mass.; Totowa, N.J.; Rochester, N.Y.; Rye, N.Y.; Syracuse, N.Y.; Conshohocken, Pa.
Broger Instr. Sls. Co., Inc., 223 Crescent St., Waltham, Mass., (617) 891-8045. Branch Office: Fairfield, Conn.
Brothers & Conneen Assoc., 6302 Lincoln Ave., Baltimore, Md., (301) 764-7189. Branch Office: Newtown Square, Pa.
Brouillette, W. G. & Assoc., Inc., 9855 Roosevelt Rd., Westchester, Ill., (312) 345-6500.
Brown & Morrison, Box 4307, Charlotte, N.C., (704) 333-0774.
Brown-Frederick & Assocs., Inc., 88 Penna. Ave., Oreland, Pa., (215) TU 7-1325.
Booth, C. & Assoc., Inc., 1921 N. Harlem, Chicago, Ill., (312) 237-7910.
Brown, Howard R. Sls. Co., 3400 Indian Rd. S.E., Cedar Rapids, Iowa, (319) 366-0635.
Brown, Irv. Co., Inc., 401 Kingston Ave., Brooklyn, N.Y., (212) 493-1379.
Brown, Jack, Elctrns. Sales Reps. Inc., 207 Rosedale Rd., Yonkers, N.Y., (914) 779-7330. Branch Offices: Bklyn, N.Y.; Liverpool, N.Y.; Rochester, N.Y.; Whitestone, N.Y.
Brown, K. O. & Co., Box 20845, Dallas, Texas, (214) 357-3996. Branch Office: Raleigh, N.C.
Brown, W. A. Components, Inc., Box 513, Orlando, Fla., (305) 425-5505. TWX: 810-850-0146. Branch Offices: Huntsville, Ala.; Ft. Lauderdale, Fla.; Winston Salem, N.C.; Alexandria, Va.
Brown, W. A. Instr., Inc., Orlando, Fla., (305) 425-5505. TWX: 810-850-0146. Branch Offices: Huntsville, Ala.; Ft. Lauderdale, Fla.; Ft. Walton Beach, Fla.; Tucker, Ga.; Winston-Salem, N.C.; Alexandria, Va.
Bruno, L. D., Co., Box 2044, Kettering Branch, Dayton, Ohio, (513) 434-1847.
Brust, Charles K., Box 182, Mt. Clemens, Mich., (313) 463-7386. Branch Office: Warren, Mich.
Bryer-Associates, Box 35841, Dallas, Texas, (214) 351-4350.
Buchanan & Abrams Assocs. Inc., Box 6026, Orlando, Fla., (305) 423-8995.
Budd-Tronics Inc., 71 Grayson Pl., Teaneck, N.J., (201) 837-1660.
Buerger Co., Inc., 33 Limekiln Pike, Glenside, Pa., (215) 887-5030, 224-2442. Branch Offices: East Meadow, N.Y.; Pittsburgh, Pa.
Burcaw Company & Assocs., 18236 W. McNichols Rd., Detroit, Mich., (313) 533-7700.
Burgin-Kreh Assocs., Inc., Box 9787, Towson, Md., (301) 661-1120. TWX: 710-862-0878. Branch Office: Lynchburg, Va.
Burgin-Kreh Florida, Inc., Box 1799, Pompano Beach, Fla., (305) 942-0774. TWX: 510-955-9854. Branch Office: Clearwater, Fla.
Burke, E. F. Inc., 5010 Mayfield, Cleveland, Ohio, (216) 382-3646.
Burlingame Assocs., Ltd., 510 S. Fulton Ave., Mount Vernon, N.Y., (914) 664-7530. TWX: 710-562-0150. Branch Offices: Rockville, Md.; Waltham, Mass.; Syracuse, N.Y.; Bala Cynwyd, Penna.
Buse Sales Co., 214 N. 2nd St., St. Charles, Mo., (314) 739-1613. TWX: 910-760-1720.

C

C & F Sales Co., 5451 Oakland St., Philadelphia, Pa., (215) 288-9406.
Cady, J. F., 1485 Bayshore Blvd., San Francisco, Calif., (415) 467-8656.
Cain & Co., 522 S. Sepulveda Blvd., Los Angeles, Calif., (213) 476-2251. Branch Offices: San Diego, Cal.; Los Altos, Cal.; Dallas, Tex.; Mt. Prospect, Ill.; Minneapolis, Minn.; Reynoldsburg, Ohio; Hyattsville, Md.; Union, N.J.; Liverpool, N.Y.; Melrose, Mass.; Ft. Lauderdale, Fla.
Callahan-Ferguson Co., 107 Greenhedge Dr., Camillus, N.Y., (315) 488-5518. Branch Office: Manlius, N.Y.
Camber, M., 1700 York Ave., New York, N.Y., (212) 369-4222.
Campbell & George Co., 840 Mahler Rd., Burlingame, Calif., (415) 697-2965.
Campion Sales Co., Box 396, Addison, Texas, (214) 239-9196.
Campisano, Frank J. & Assocs., Box 11043, Cincinnati, Ohio, (513) 662-1616. TWX: 810-461-2578. Branch Offices: Indianapolis, Ind.; Cleveland, Ohio.
Canadian Dynamics Ltd., 8264 St. George St., Vancouver, B.C., Can., (604) 325-3201. Branch Office: Calgary, Alberta, Can.
Candor Co., Inc., Bethania, North Carolina, (919) 924-1480.
Cane Technical Sls., Inc., 555 E. Boston Post Rd., Mamaroneck, N.Y., (914) 698-4411. TWX: 710-566-1113.
Capell, Richard, Co., P.O. Box 723, Tarzana, Calif., (213) 987-2233.
Carbone Assocs., P.O. Box 181, Little Falls, N.J., (201) 256-9191.
Cardinal Assocs., Inc., 16024 Ventura Blvd., Encino, Calif., (213) 788-4540. TWX: 910-495-1717.
Carduner Sls. Co., Jericho Tnpk., Westbury, N.Y., (516) 333-8170. TWX: 510-222-6356.
Carlson Elctrn. Sls. Co., 7448 N. Harlem Ave., Chicago, Ill., (312) 774-4812. TWX: 910-221-5017. Branch Offices: St. Louis, Mo.; Minneapolis, Minn.
Carrier & Gable Inc., One Northland Plaza, 20755 Greenfield Rd., Southfield, Mich., (313) 444-8980.
Carse, Thos., Sls. Co., Inc., P.O. Box 71, Latham, N.Y., (518) 785-5844.
Carter Elctrns., Inc., 4919 W. 63rd St., Chicago, Ill., (312) 585-5485. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; Milwaukee, Wisc.
Carter, McCormic & Peirce, Inc., 23995 Freeway Park Dr., Farmington, Mich., (313) 477-7700. TWX: 810-242-2986. Branch Offices: Dayton, Ohio; Cleveland, Ohio; Pittsburgh, Pa.
Carter, Jack, Assoc., 11200 Chandler Blvd., North Hollywood, Calif., (213) 980-3450.
Cartwright & Bean, Inc., 560 S. Cooper St., Memphis, Tenn., (901) 276-4442. Branch Offices: Huntsville, Ala.; N. Miami Beach, Fla.; Orlando, Fla.; Ormand Beach, Fla.; Atlanta, Ga.; Metairie, La.; Charlotte, N.C.; Raleigh, N.C.
Cascade Chapter of E.R.A., 5403 Rainier Ave. So., Seattle, Wash., (206) 723-5150.
Cathey, R. E., Co., 200 Garrison St., Denver, Colo., (303) 238-1506.
CDB Enterprises, Inc., 675 W. Jericho Turnpike, Huntington, N.Y., (516) 692-5200. Branch Office: Camden, N.J.
CDH Assocs., 18075 Ventura Blvd., Encino, Calif., (213) 345-1644.
Central Assoc., Inc., 44 N. Dean St., Englewood, N.J., (201) 568-0808. Branch Office: Plainview, N.Y.
Central Elctrns. Sales Co., 19217 Fairport, Detroit, Mich., (313) 526-5841. Branch Office: Tipton, Ind.
Central Equipt. Co., Inc., 80 E. Jackson, Chicago, Ill., (312) 427-5401.
Cerf, A., & Co., 512 Bloomfield Ave., Caldwell, N.J., (201) 226-2263. Branch Offices: Ellicott City, Md.; Hillsdale, N.J.; Yonkers, N.Y.; Willow Grove, Pa.
Chamberlin, H. A., Civil Air Term., Bedford, Mass., (617) 274-0044.
Chapman, C. & Co., 301 E. 10th Ave., Hialeah, Fla.
Champion, E. T., & Assocs., 4828 Main St., Skokie, Ill., (212) 676-3960.
Champlin, D. Co., Inc., 12347 Lake City Way N.E., Seattle, Wash., (206) 362-0401.
Chapman, R. W. Co., Box 4430, Charlotte, N.C., (704) 375-4495. TELEX: 575-285. Branch Offices: Raleigh, N.C.; Greenville, S.C.

Chase, T. S., Mfg. Rep., 2903 Montfichet Ln., Winter Park, Fla., (305) 671-5954.
Church, L. F., Co., 655 Folsom, San Francisco, Calif., (415) 781-1897.
Churchill, F. W., 50 Upland Way, Haddonfield, N.J., (609) 429-7871.
Clagett Engrg. Sales Co., 420 Ellis Ave., Rockford, Ill., (815) 965-4555.
Clancy, J. & Co., Inc., P.O. Box 269, Angola, Ind., (219) 665-2561.
Clare Elctrns., 24431 Oak Hill Dr., Cleveland, Ohio.
Clarfield-Stollmack Assocs., 175 Westwood Ave., Westwood, N.J., (201) 666-8989. TWX: 710-990-7509.
Clark Sales Co., 3570 Warrensville Center Rd., Cleveland, Ohio, (216) 991-2000. TWX: 810-427-2640. Branch Office: Chagrin Falls, Ohio.
Clark, R. F., Co., 10517 Lindberg Ave., Pittsburgh, Pa., (412) 242-9500.
Cleland & Co., 1609 Westwood Blvd., Los Angeles, Calif., (213) 477-0551. TWX: 910-342-6883. Branch Office: Los Altos, Calif.
Clerg-Telmoss, Inc., P.O. Box X-80, Ferndale, Mich., (313) 398-2206. Branch Office: Dearborn Hgts., Mich.
Closs, T. H. Co., 8202 White Manor Dr., Lutherville, Md., (301) 825-4445.
Coakley, Boyd & Abbett, Inc., Box 248, 1424 Highland Ave., Needham, Mass., (617) 444-5470. Branch Office: Waterbury, Conn.
Cohn & Shane, Inc., 1323 Venice Blvd., Los Angeles, Calif., (213) 388-9374. Branch Offices: Phoenix, Ariz.; San Francisco, Calif.
Col-lins-Co, Inc., Box 13189, Orlando, Fla., (305) 423-7615. TWX: 810-850-0134. Branch Offices: Huntsville, Ala.; Marietta, Ga.; Winston-Salem, N.C.
Cole, G. McL. Co., 6514 W. Higgins Rd., Chicago, Ill., (312) 774-3535. TWX: 910-221-2929. Branch Office: Madison, Wisc.
Collins-Carlson-Hemp, LectroReps, Inc., P.O. Box 10719, Kansas City, Mo., (816) 453-3203. Branch Offices: East St. Louis, Ill.; Des Moines, Iowa.
Collins Co., 11227 Drummond Dr., Dallas, Texas, (214) 279-5218. Branch Office: New Orleans, La.
Colucci, R. A. Co., 230 Mineola Blvd., Mineola, N.Y., (516) 746-0397.
Compar Albany, Inc., 6 Highland Ave., Albany, N.Y., (518) 489-7408. TWX: 710-441-8224. Branch Offices: Endwell, N.Y.; Fairport, N.Y.; Liverpool, N.Y.
Compar Chesapeake Inc., 7 Church Lane, Baltimore, Md., (301) 484-5400. TWX: 710-862-0860.
Compar Corp., Elctrn. Comp. Div., 828 Airport Blvd., Burlingame, Calif., (415) 347-9501. TWX: 910-374-2841. Branch Offices: Huntsville, Ala.; Scottsdale, Ariz.; Burbank, Calif.; San Diego, Calif.; Englewood, Colo.; Hamden, Conn.; Addison, Ill.; Baltimore, Md.; Newton Highlands, Mass.; Southfield, Mich.; Minneapolis, Minn.; St. Louis, Mo.; Haddonfield, N.J.; Albuquerque, N.M.; Clifton, N.J.; Albany, N.Y.; Liverpool, N.Y.; Fairport, N.Y.; Endwell, N.Y.; Winston-Salem, N.C.; Fairborn, Ohio; Fairview Park, Ohio; Dallas, Texas; Houston, Texas; Salt Lake City, Utah; Kirkland, Wash.
Compar New England, 88 Needham St., Newton Highlands, Mass., (617) 969-7140. Branch Office: Hamden, Conn.
Compar Ohio, Box 4791, Fairview Park, Ohio, (216) 333-4120. Branch Office: Fairborn, Ohio.
Compar Southwest, 8609 N.W. Plaza Dr., Dallas, Texas, (214) 363-1526. TWX: 910-861-4249. Branch Office: Houston, Texas.
Compar Twin Cities, Box 16095, Minneapolis, Minn., (612) 922-7011.
Component/Insulation Corp., 14235 Detroit Ave., Cleveland, Ohio, (216) 521-3570. Branch Office: Birmingham, Mich.
Components for Elctrns. Inc., 60 Midvale Rd., Mountain Lakes, N.J., (201) 334-2921. TWX: 710-987-8395.
Components for Industry, 416 Franklin St., Fayetteville, N.Y., (315) 637-9601. Branch Office: Lancaster, N.Y.
Components Inc., 7461 N. Linden La., Cleveland, Ohio, (216) 842-2737. TWX: 810-427-9151. Branch Office: Cincinnati, Ohio.
Component Marketers, Inc., 151 Valley Rd., Montclair, N.J., (201) 746-6717. (212) WO 2-3318. Branch Office: Teaneck, N.J.
Components Sales California, Inc., 11484 Oxnard St., No. Hollywood, Calif., (213) 980-3400. TWX: 910-499-2174. Branch Offices: Palo Alto, Calif.; San Diego, Calif.
Components Sls. Corp., 221 E. Hartsdale Ave., Hartsdale, N.Y., (914) 725-1050. Branch Office: Lexington, Mass.
Comptronics, 3220—16th Ave. W., Seattle, Wash., (206) AT 4-4842. TWX: 910-444-1638.
Comtel Components, 315 Laura Dr., Addison, Ill., (312) 543-7350. TWX: 910-651-4950. Branch Offices: Indianapolis, Ind.; Southfield, Mich.; St. Louis, Mo.; Cleveland, Ohio; Dayton, Ohio.
Comtronic Assocs., 370 Old Country Rd., Garden City, N.Y., (516) 741-8966. TWX: 510-222-7276.
Connors, Inc., 424-S Federal Blvd., Denver, Colo., (303) 934-5829
Conover, L. C., Assocs., Chester Springs, Penna., (215) 827-7261.
Conrow Co., 3300 Wyoming, Kansas City, Mo.
Control Equipment Co., 265 Cross Road Sq., Salt Lake City, Utah, (801) 487-7741.
Control Equipment Co., Inc., 3166 Maple Dr., N.E., Atlanta, Ga., (404) 237-1688. TELEX: 542-579. Branch Offices: Birmingham, Ala.; Huntsville, Ala.; Daytona Beach, Fla.; Savannah, Ga.
Controlcraft Corp., 213 Main St., W. Chicago, Ill., (312) 653-4010.
Cook X-Ray Co., Box 10105, Tampa, Fla., (813) 839-5561.
Cooper Clement Assoc., 835 Glenside Ave., Wyncote, Pa., (215) 548-5450.
Cooper, H. D. Co., 7634 N. Eastlake, Chicago, Ill., (326) 274-5566.
Cooper, R. J., Sales, 2928 Sandyford Ave., Philadelphia, Pa., (215) 624-5486.
Cordray, W. H. Sls. Co., One Radnor Sta., Radnor, Pa., (215) TR 8-3737.
Costello, Little & Co., 8737 Venice Blvd., Los Angeles, Calif., (213) 870-5951. Branch Office: Palo Alto, Calif.
Countryman Assocs. Co., 1821 University Ave., Suite 424 North, St. Paul, Minn., (612) 645-9151. TWX: 910-563-3564.
Convert & Newman Co., 310A, 300 Mount Lebanon Blvd., Pittsburgh, Pa., (412) 563-0303.
Cozzens & Cudahy, Inc., 9501 W. Devon Ave., Rosemont, Ill., (312) 825-1144. TWX: 910-253-1820.
Crane & Egert Corp., 146 Meacham Ave., Elmont, N.Y., (516) 488-2100. TWX: 510-223-0417.
Crescent Sls. Co., Inc., 4830 McKnight Rd., Pittsburgh, Pa., (412) 364-3700.
Crest Assocs., Inc., 7001 N. Clark St., Chicago, Ill., (312) 274-2640.
Crockett Engrg. Co., Box 47287, Dallas, Texas, (214) 637-6120.
Crockett Sls. Co., 2204 Griffin, Dallas, Texas, (214) 748-8209. Branch Offices: New Orleans, La.; Houston, Texas.
Crowe, L. M. Co., 130 W. Wieuca Rd., N.E., Atlanta, Ga., (404) 255-2700.
C S C Associates, 3855 Ellenridge Lane, Toledo, Ohio, (419) 478-0325.
Cuesta, J. E. & Co., Inc., Valley Forge, Pa., (215) 265-5800. TWX: 510-660-1484. Branch Offices: Wilmington, Del.; Greenbelt, Md.
Cullen, H. A. & Assocs., 1595 Selby, St. Paul, Minn., 646-7371. TWX: 910-576-2740.
Cummings & Assocs., 4772 So. Kalamath St., Box 1112, Englewood, Colo., (303) 789-3449.
Curtin, R. V., Co., 82 Curve St., Needham, Mass., (617) 444-4198.

D

D & O Engrg. Co., Inc., Box 1800, Wichita, Kansas, (316) 264-7358. TWX: 910-741-6916. Branch Office: Arlington, Texas.
D & O Products Co., Box 11203, Wichita, Kansas, (316) 264-8351.
Dage Corporation, 757 Main St., Stamford, Conn., (203) 324-3123. TWX: 710-474-2490.
Dal-Tech Devices Inc., 366 No. Broadway, Jericho, N.Y., (516) 433-7448.
Damon/Engel Inc., 123 Prospect St., Box 705, Ridgewood, N.J., (201) 444-1400. TWX: 710-988-5603. Branch Offices: Commack, N.Y.; Hatboro, Pa.
Dannemiller-Smith, Inc., 10050 Monroe Dr., Dallas, Tex., (214) 357-8247. Branch Office: Houston, Tex.
Darbury Corp., 437 Cherry St., W. Newton, Mass., (617) 244-2053. TWX: 710-325-6758.
Darger Co., 211 S. 2nd West, Salt Lake City, Utah, (801) 355-2873.
Data Elctrns. Co., Inc., 5505 North Menard Ave., Chicago, Ill., (312) 774-1452. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; Milwaukee, Wisc.
Data Engrg. Corp., 777 S. Central Expwy., Richardson, Texas, (214) 231-4846. TWX: 910-867-4739. Branch Offices: Tulsa, Okla.; Houston, Texas; San Antonio, Texas.
Data Mktg. Assocs., Inc., 3925C Dacoma St., Houston, Texas, (713) 686-9627. TWX: 910-881-2569. Branch Office: Richardson, Texas.
Data-Rep Associates, Inc., 40 W. Main St., Rockaway, N.J., (201) 625-2233. Branch Offices: Huntington Station, N.Y.; Norristown, Pa.
Datech Assocs. Inc., 815 Washington St., Newtonville, Mass., (617) 527-5394. TWX: 710-335-6767. Branch Office: New Haven, Conn.
Daugherty, F. A. Co., 6025 Mayfield Rd., Cleveland, Ohio, (216) 449-1122. Branch Office: McMurray, Pa.
Davidson Assocs., Inc., 2920 Nebraska, Santa Monica, Calif., (213) 829-1731. TWX: 910-343-6869.
Davies, R. Associates, 10 Old Post Office Rd., Silver Spring, Md., (301) 587-3910. TWX: 710-825-0420.
DB Assocs., Inc., 3307 Erie Blvd. East, Dewitt (Syracuse), N.Y., (315) 446-0220.
Dean, Bob, Inc., 714 W. Clinton, Ithaca, N.Y., (607) 272-2187. TWX: 510-255-5876.
DeBeck Assocs., Inc., 2119 Grand Ave., St. Paul, Minn., (612) 690-1557.
Deco Engrg. Prods., Inc., 1112 Locust St., Des Moines, Iowa, (515) 288-5721. Branch Offices: Cedar Rapids, Iowa; Davenport, Iowa; Omaha, Neb.
Decew, A. E. Agency, Inc., Box F, Sodus, N.Y., (315) 483-3261. Branch Office: Sodus, N.Y.
Deere Elctrns., Inc., 20440 Town Center Lane—Ste. D., Cupertino, Calif., (408) 257-3040. TWX: 910-338-0253.
Delaney, H. R. Sls., 78 Sweetbriar Dr., Clark, N.J., (201) 382-7643.
Delta Sls. Inc., 1407 N. Illinois St., Indianapolis, Ind., (317) 631-4136.
Denco-Data Engrg. Co., 304 W. Johnson Hwy., Norristown, Pa., (215) 272-1444. TWX: 510-660-0713. Branch Office: Silver Spring, Md.
Denning Assocs., Box 491, Wakefield, Mass., (617) 245-4986. Branch Office: East Orange, N.J.
Denny, H. M. Co., 3410-16th West, Seattle, Wash., (206) 282-7200. Western Union: GDM-Seattle.
Deskin, A. Sales Corp., 1565 Louvain St. N., Montreal, Que., Can., (514) 384-1420. TWX: 610-421-3793. Branch Offices: Vancouver, B.C., Can.; Toronto, Ont., Can.
Detwiler, L. K., 443 Broad St., Newark, N.J., (201) 621-9080, (212) 962-6342.
Deunk, R. K. & Assoc. Inc., Box 196, Brecksville, Ohio, (216) 526-4317. TWX: 810-427-9160.
DeVoe, L. M. Co., 665 E. 61st St., Indianapolis, Ind., (317) 257-1227. TWX: 810-241-3284.
DeVos-Prinz Sls. Corp., 1819 E. Kenilworth, Milwaukee, Wisc., (414) 272-0356.
Dewar & Assocs., 6361 First Ave. So., Seattle, Wash., (206) 763-2233.
DiBiasi, J., Assoc., Inc., 14 Vanderventer Ave., Port Washington, N.Y., (516) 767-0470-1-2.
Dickelman, L. H. Co., 13331 Puritan St., Detroit, Mich., (313) 273-0806. Branch Office: Cleveland, Ohio.
Dickinson, E. A. & Assoc., Inc., 3612 North Green Bay, Milwaukee, Wis.
Diethert, R., Co., Inc., 2030 W. Montrose Ave., Chicago, Ill., (312) 561-7627. TWX: 910-221-2916. Branch Offices: Indianapolis, Ind.; Gastonia, N.C.; Waukesha, Wisc.
Dietrich, L., Co., 90 Clairton Rd., Pittsburgh, Pa., (412) 892-2992. Branch Offices: Cleveland, Ohio; Dayton, Ohio; Detroit, Mich.
Dittman & Greer Inc., Randolph Rd. at Coe Ave., Middletown, Conn., (203) 346-9606. TELEX: 9-9293.
D. J. M. Electronic Sls., Inc., 5356 N. Milwaukee Ave., Chicago, Ill., (312) 774-1212.
Dolfuss, C. H., Jr. & Co., 2108 Payne Ave., Cleveland, Ohio, (216) 771-1270. Branch Office: Dayton, Ohio.
Dorado Electronics Inc., 13615 Victory Blvd., Van Nuys, Calif., (213) 787-4125, 873-4124. TWX: 910-495-1803. Branch Office: San Diego, Calif.
Doss Elctrns., Inc., 6660 Security Blvd., Baltimore, Md., (301) 944-1900. TWX: 710-862-9162. Branch Office: Vienna, Va.
Dougherty, J. A., Sls. Co., 320 Hillen Rd., Towson, Md., (301) 823-0431. TWX: 710-232-1808.
Dowell, T. L., Inc., 7208 W. 80th., Overland Park, Kans., (913) 649-6069. TWX: 910-749-6481. Branch Offices: Des Moines, Iowa; St. Louis, Mo.
Dowers, A. A. Co., 15152 Golden W. Circle, Westminster, Calif., (213) 596-4485. TWX: 910-596-1807. Branch Offices: Phoenix, Ariz.; San Carlos, Calif.
Doyle, W. J. Co., 7426 N. Western Ave., Chicago, Ill., (312) 274-6685.
Drake, R. S., Assocs., Inc., 6133 Maynard Ave. S., Seattle, Wash., (206) 763-2755. TWX: 910-444-2030.
Drew, B. & Assocs., 5201-29th Ave. N., St. Petersburg, Fla., (813) 342-7322.
Drew, W., Co., 611 Main St., Riverton, N.J., (609) 829-4800.
Drummond, J. B. Co., 3021 S. Broadway, Englewood, Colo., (303) 789-2281. TELEX: 045-620.
Duckett, G., Sls. Co., Box 29067, Atlanta, Ga., (404) 451-3529. Branch Offices: Huntsville, Ala.; Winter Park, Fla.; Greensboro, N.C.
Dudek, R. C. & Co., Inc., 10546 W. Pico Blvd., Los Angeles, Calif., (213) 836-0335. TWX: 910-340-6435.
Dyna Rep Co., Suite 200, 5265 Port Royal Rd., Springfield, Va., (703) 321-8630. TWX: 710-833-0693.
Dynamic Assocs., LeasaMetric, Inc., 822 Airport Blvd., Burlingame, Calif., (415) 344-2521. TWX: 910-374-2364. Branch Offices: Los Angeles, Calif.; San Diego, Calif.
Dynamic Sls. Co., Box 834, Red Bank, N.J., (201) 747-5353.
DynaSales Co., Box 6757, Los Angeles, Calif., (213) 268-1175.

E

E-A, Inc., 1406 Shoemaker Rd., Baltimore, Md., (301) 825-2385. TWX: 710-232-1825. Branch Offices: Delaware; Washington, D.C.; New Jersey; Pennsylvania; Virginia.
E-K-P Associates, Inc., Lafayette Towers, 2040 Lehigh St., Easton, Pa., (215) 258-6477. Branch Offices: Baltimore, Md.; Doylestown, Pa.
E-P-R Inc., 281 Vera Rd., Bristol, Conn., (203) 584-2202. Branch Office: Concord, Mass.
Earl Assocs., 1638 Kona St., Honolulu, Hawaii, (808) 949-6953.
East Coast Liaison, Inc., Box 243, Lutherville, Md., (301) 252-1288.
Eastern Components, Inc., 1349 W. Cheltenham Ave., Philadelphia, Pa., (215) 927-6262. Branch Office: Landover Hills, Md.
Eastern Electronic Sls. Co., 1 Montana Place, Brooklyn, N.Y., (212) 763-5180. Branch Office: Sharon, Mass.
Eastronics, 14616 Southlawn Lane, Rockville, Md., (301) 762-8445. TELEX: 89-456.
Earl & Brown Co. Inc., 2047 14th Ave. W., Seattle, Wash., (206) 284-1121. Branch Office: Portland, Ore.
Eastern Instrumentation, Inc., 613 Cheltenham Ave., Philadelphia, Pa. Branch Offices: Baltimore, Md.; Washington, D.C.; Great Neck, N.Y.; Passaic, N.J.; Red Bank, N.J.; Richmond, Va.
Eckersley, J. W. Co., 3150 S. W. Hamilton St., Portland, Ore., (503) 246-3183.
ECCO Supply Inc., Box 210, Broomall, Pa., (215) 356-9217. TELEX: 834-596.
Edcom, Inc., 815 Washington St., Newtonville, Mass., (617) 969-9710. TWX: 710-335-6767. Branch Office: New Haven, Conn.
Edstrom, J. E., 407 S.W. 11th Ave., Box 66221, Portland, Ore., (503) 227-5311.

Edwards & Christopher, Box 544, Livingston, N.J., (201) 992-3311.
E. E. Enterprises, Inc., 5901 Noble Ave., Van Nuys, Calif., (213) 787-5360. TWX: 910-495-1759.
E. E. Specialists, Inc., Box 956, Acton, Mass., (617) 259-9200. Branch Office: Springdale, Conn.
Egbert Eng., 801 Welch Rd., Palo Alto, Calif., (415) 326-1387.
Egert, S. S. Co., Inc., 146 Meacham Ave., Elmont, N.Y., (516) 488-2255. TWX: 510-223-0417.
Eicher-Richards Co., 2727 N.E. Blakeley St., Seattle, Wash., (206) 523-7888.
Elbar Electronics Corp., Box 660, Schenectady, N.Y., (518) 372-5841.
Elcom, Inc., 130 S. Easton Rd., Glenside, Pa., (215) 885-1325. TWX: 510-665-0269.
Electric Component Sls., 6524 Walker St., Minneapolis, Minn., (612) 929-4494.
Electric Motor Specialists, Box 517, Westminster, Calif., (213) 564-7372.
Electric Sls. Corp., 9 E. 22nd St., Minneapolis, Minn., (612) 335-7734. TWX: 910-576-2755.
Electrical Apparatus Co., Inc., 1200 Soldiers Field Rd., Boston, Mass., (617) 782-7440.
Electrical Components, Inc., 355 Crider Ave., Moorestown, N.J., (609) 235-3012.
Electro-Comp Sls., Inc., 5129 W. Devon Ave., Chicago, Ill., (312) RO 3-3636. TWX: 910-221-5674.
Electro-Mation Assocs., 1137 Cole City, Birmingham, Mich., (313) 564-6517.
Electro-Mechanical Insts., Inc., 1388 E. Walnut St., Pasadena, Calif., (213) 681-2748.
Electro-Plast, Inc., 2 Radnor Station Bldg., Radnor, Pa., (215) 688-5581. Branch Office: York, Pa.
Electro Sls. Assocs., 851 E. 222 St., Cleveland, Ohio, (216) 261-5440. Branch Offices: Dayton, Ohio; Detroit, Mich.; Pittsburgh, Pa.
Electronic Components & Servcs., 611 Trapello Rd., Waltham, Mass., (617) 894-6921.
Electronic Controls & Devices Inc., 1016 Black Horse Pike, Glendora, N.J., (609) 939-2200.
Electronic Engineering Assocs. Ltd., P.O. Box 997, San Carlos, Calif., (415) 593-2189. TWX: 910-376-4406.
Electronic Fasteners Co., 10 Center Place, Yonkers, N.Y.
Electronic Mfgs. Consultants Inc., Box 503, Colorado Springs, Colo., (303) 636-5131. Branch Offices: Phoenix, Ariz.; Salt Lake City, Utah.
Electronic Reps. Assn., 600 S. Michigan Ave., Chicago, Ill., (312) 427-0100.
Electronic Time Corp., Box 2173, Honolulu, Hawaii, (808) 531-0484. Cable: "SURFBOARD" HONOLULU
Electronics Mktg. Assocs., Box 5199, San Mateo, Calif., (415) 341-6666.
Electronic Mktg. Assocs., Div. Inmark, Inc., 11501 Huff Ct., Kensington, Md., (301) 881-5300. TWX: 710-825-9645. Branch Office: King of Prussia, Pa.
Elliott, C. P. Co., 661 Delaware St., Denver, Colo., (303) 255-2844.
Elliot, G., Inc., 13615 Victory Blvd., Van Nuys, Calif., (213) 873-6862, 781-8454.
Elsner-Rambo Co., 2526 Hyperion Ave., Los Angeles, Calif., (213) 664-2928. TWX: 910-321-4257.
Ellis, D., Co., 123 N. Marengo, Pasadena, Calif., (213) 681-9108.
EMEC Inc., Box 217, Hicksville, N.Y., (516) 931-3700.
Emlen-Peterson Co., 34 West Ave., Wayne, Pa., (215) 687-3535.
Engel, G. C. & Assoc., 210 South Broad St., Ridgwood, N.J., (201) 444-0662.
Engelbretson, W., Co., 906 Ottawa Ave., St. Paul, Minn., (612) 222-2338.
Engleman, A., Co., Box 12091, Memphis, Tenn., (901) 275-3680.
Engineered Sls. Co., Inc., 4738 N. Harlem, Chicago, Ill., (312) 867-8434. TWX: 910-221-0223.
Engineering Assocs. Inc., Box 11069, Fort Worth, Texas, (817) 923-8257. Branch Office: Houston, Texas.
Engineering Sls. Assocs., Box 544, Scottsdale, Ariz., (602) 945-5781.
Engineering Services Co., 6717 Vernon Ave., St. Louis, Mo., (314) 726-2233. Branch Offices: Cedar Rapids, Iowa; Prairie Village, Kans.
Engle, K. D. Co., Inc., 3621 W. Devon Ave., Chicago, Ill., (312) 539-1820. TWX: 910-221-5351. Branch Office: Indianapolis, Ind.
Entis Assocs., 11 Babcock St., Brookline, Mass.
Equipment Sls. Co., Inc., Box 5396, Hamden, Conn., (203) 248-5581. Branch Offices: Bedford, Mass.; Cooperstown, N.Y.
Erickson Prods., Inc., Box 507, Avondale Estates, Ga., (404) 289-9413.
E.R.A. Inc., 330 Great Neck Rd., Great Neck, N.Y., (516) HU 2-9320. TWX: 510-223-0836.
Erde-Haviland Assocs., Inc., 333 Hempstead Ave., Malverne, N.Y., (516) 599-6500.
Erdman, K. B. Co., Inc., 7906 Montgomery Ave., Philadelphia, Pa., (215) CA 4-1833.
Erlanger Sls. Co., Inc., 4217 W. Jefferson Blvd., Los Angeles, Calif., (213) 731-2238.
Ernest, R. D., Assocs. Inc., 12818 Puritan Ave., Detroit, Mich., UN 1-7311.
Eschner & Keranen, Inc., 20 North Wacker Dr., Chicago, Ill., (312) 236-1533. TWX: 910-221-4245.
Estersohn Assocs., Inc., 541 Davisville Rd., Willow Grove, Pa., (215) 657-1414.
Ewing-Foley, Inc., Box 1107, 900 N. San Antonio Rd., Los Altos, Calif., (415) 941-4525. TELEX: 34-8336.

F

F. & F. Assocs., 461 Old Country Rd., Westbury, L.I., N.Y., (516) 334-1160. Branch Office: Woodcliff Lake, N.J.
F-M Electronic Assocs., 206 Bewley Rd., Havertown, Pa., (215) HI 6-1961-1962. Branch Office: Kensington, Md.
Fact-Tronics, Inc., Box 745, Casselberry, Fla., (305) 838-5607.
Fairbanks, H. J., Co., Box 124, Wynnewood, Pa.
Falck, F. W., Co., Box 1733, La Jolla, Calif., 233-3341.
Falk-Baker Assocs., 382 Franklin Ave., Nutley, N.J., (201) 661-2430. TWX: 710-989-1476.
Farris, R. W., Co., Inc., 1715 Baltimore, Kansas City, Mo., (816) 421-1751. Branch Office: Maryland Heights (St. Louis), Mo.
Fausett, F. & Co., Box 278, Smyrna, Ga., (404) 436-5169. Branch Offices: Orlando, Fla.; Salem, Va.; Greenwood, S.C.
Flora, J. M., Inc., 165 W. Liberty, Plymouth, Mich., (313) 453-4296.
Featherstone Sls. Co., Box 726, Sunnyvale, Calif., (408) 734-2663.
Federal Stampings, Inc., 13630 Saticoy St., Van Nuys, Calif., (213) 873-7610.
Fedotin, Lionel S., 3680 Dorset Dr., Dayton, Ohio, (513) 275-9345.
Feinberg, J. L. Assoc. Inc., 33 Shirley Lane, New London, Conn., (203) 442-2514. Branch Office: Bridgeport, Conn.
Feldman, H., Co., Box 66367, Los Angeles, Calif., (213) 870-5973.
Fenole, J. E., Co., Inc., Box 908, Goleta, Calif., (805) 964-5811. Branch Office: Sherman Oaks, Calif.
Ferguson, T., Sls. Co., Inc., Box 3893, Rochester, N.Y., (716) 482-7757. Branch Offices: Albany, N.Y.; Syracuse, N.Y.
Ferris, F. R. Co., Inc., Box 42067, Los Angeles, Calif., (213) 254-6161. Branch Office: San Mateo, Calif.
Fetty/Schoenduve Inc., 7407 Melrose Ave., Los Angeles, Calif., (213) 651-4050. TWX: 910-321-2385. Branch Office: Palo Alto, Calif.
Fieldtec, Inc., 4242 Campus Dr., Newport Beach, Calif., (213) 860-4000. Branch Offices: Scottsdale, Ariz.; Santa Clara, Calif.
Fieldtec of Arizona, 7155 E. Thomas Rd., Scottsdale, Ariz., (602) 947-7761.
Finnicum, J. L. & Assoc., 1495 Warren Rd., Cleveland, Ohio, (216) 226-7076. TWX: 810-421-8424.
Fisher, S., Sls. Corp., 161 Cedar Lane, Teaneck, N.J., (201) 836-6661.
Fishman Assocs., 2060 E. 54th St., Indianapolis, Ind., (317) 251-2401.
Fistell, H., Mfg. Rep., 1812 South Halsted St., Chicago, Ill., CA 6-6114.
Fitz, L. R., Co., 1801 S. Washington Ave., Park Ridge, Ill., (312) 631-5488.
Fitzsimmons Assocs., Inc., 412 H. Ashland Ave., Park Ridge, Ill., 825-3161.
Fixman, G., Engrg. Co., 8160 Stanford Ave., St. Louis, Mo., (314) 725-5219
Florence & Meyer, Inc., 7301 Mission Rd., Shawnee Mission, Kans., (913) 722-5210. TWX: 910-743-6865. Branch Offices: Wichita, Kans.; Berkeley, Mo.
Floring, C. W., & H. R. Murray, Inc., Box 11, DeWitt, N.Y., (315) 446-5555. Branch Office: Rochester, N.Y.
Foley, A. A., Assocs., Box 155, Moorestown, N.J., (609) 663-4545.
Forsberg Sls., 646 Summer St., Brockton, Mass., (617) 522-6300. Branch Office: North Haven, Conn.
Foley, E. J., & Assoc., 441 North Winfield Scott Plaza, Scottsdale, Ariz., (602) 945-2665. TWX: 910-950-1180.
Foster, M., Co., Inc., 228 South Cedar Lake Rd., Minneapolis, Minn., (612) 374-2612. TWX: 910-576-2746.
Franklin, R. E., Co., 3007 So. Post Oak Rd., Houston, Texas, (713) 621-5861.
Franklin, W. A., Sls. Corp., 2 Standish Terr., Syracuse, N.Y., (315) 446-1120. TWX: 710-541-0433. Branch Offices: Rochester, N.Y.; Whitesboro, N.Y.
Frederick & Meily Corp., 252 E. Pontiac St., Fort Wayne, Ind., (219) 744-0641, 745-2461.
Freed, L., & Co., Box 417, Larchmont, N.Y., (914) 834-6510-6511.
Freeman, L. C., & Assoc., 484 Bloomfield Ave., Montclair, N.J., (201) 746-5200.
Friedman-Smith Elctrn. Sls. Inc., 519 S. 5th Ave., Mt. Vernon, N.Y., (914) 664-4866.
Friedman Assocs., Inc., 110 Halsted St., E. Orange, N.J., (201) 673-2500. Branch Office: Garden City, N.J.
Fryco, Box 460, 403 N. Old Scottsdale Rd., Scottsdale, Ariz., (602) 945-3281. TWX: 910-950-0086.
Furman, C. M., Co., Box 4208, Charlotte, N.C.

G

G & H Sls. Co., 10599 Chester Rd., Cincinnati, Ohio, (513) 771-8231. TWX: 513-482-9112. Branch Offices: Southfield, Mich.; Columbus, Ohio; Novelty, Ohio.
Gallagher Co., 15 Ritchie Ave., Cincinnati, Ohio, (513) 761-1288.
Gans-Fryling, Inc., 2030 16th St. No., Arlington, Virginia, (703) 527-3262. Branch Office: Ellicott City, Md.
Gardner & Meredith, Inc., Box 4837-519 Cherokee Blvd., Chattanooga, Tenn., (615) 267-4971. Branch Offices: Birmingham, Ala.; Greensboro, N.C.; Knoxville, Tenn.
Gardner, Robert M., Co., 26940 Lyndon St., Detroit, Mich., (313) KE 1-1658.
Gaskins, T., 1005 S. Aurora Ave., Wheaton, Ill., (312) MO 8-3438.
Gassner & Clark Co., 6644 N. Western Ave., Chicago, Ill., (312) 764-6121. TWX: 910-221-0107.
Gates, F. Y., Co., Inc., 2631 Texas, N.E., Albuquerque, N.M., (505) 298-1875. Branch Offices: Scottsdale, Ariz.; Denver, Colo.; Salt Lake City, Utah.
Gawler-Knoop Company, 14 Beaufort Ave., Roseland, N.J., (201) 226-4545, (212) 344-2997. Branch Offices: Silver Spring, Md.; Richboro, Pa.
Geartner Assocs., Inc., 350 Lincoln Rd., Miami Beach, Fla., (305) 531-0200. Branch Offices: Clearwater, Fla.; Orlando, Fla.
Gee Assocs., Inc., 14474 Dickens St., Sherman Oaks, Calif., (213) 788-5961, 872-1068.
Geist Assocs., Inc., 26 Duffy Place, San Rafael, Calif., (415) 454-5131.
Gentry Assocs., Inc., 550 N. Bumby Ave., Orlando, Fla., (305) 841-7740. TWX: 810-850-0136. Branch Offices: Huntsville, Ala.; Atlanta, Ga.; Burlington, N.C.
Gerber Sls. Co., Inc., 176 Second Ave., Waltham, Mass., (617) 891-8040. TWX: 710-324-1937. Branch Offices: New Haven, Conn.; E. Longmeadow, Mass.
Gianaras Sls., 7051 W. Wilson Ave., Chicago, Ill., (312) 774-4600. TWX: 910-221-5223.
Ginsbury, S., Ltd., 425 Park Ave. South, New York, N.Y., (212) 689-5212. Branch Office: Munich, W. Germany.
Gibb, C. R., Co., 1311 W. 25th St., Minneapolis, Minn., (612) 377-1200.
Gibson Engrg. Co. Inc., 90 Broadway, Norwood, Mass., (617) 769-3600. TELEX: 92-4446.
Gilbert Sls. Assoc., 70 Glenwood Rd., Ridgewood, N.J., (201) 444-2604.
Gillett, G. M. & Assocs., Box 99035, Seattle, Wash., (206) 284-3344.
Gilway Sls. Co., Box 584, Newburyport, Mass., (617) 465-7568.
Gislason Sls., Inc., 617 Case Bldg., Rochester, N.Y., (716) 454-4741. TWX: 510-253-2932.
Glass, E., Assoc., 250 W. 57th St., New York, N.Y., (212) 586-8440.
Glassman, S., Assoc. Inc., 28 Prestwick Terr., Glen Cove, N.Y., (516) 676-1039. Branch Office: Nutley, N.J.
Glenn Assocs., Inc., 172 Simpson St., N.W., Atlanta, Ga., (404) 522-4906.
Glenn, J. J., & Co., 4300 S. Tripp Ave., Chicago, Ill., (312) 847-6400. TWX: 910-221-5419.
Glidden Engrg. & Equipt. Co., 8609 Northwest Plaza Dr., Dallas, Texas, (214) 363-6539. Branch Offices: New Orleans, La.; Houston, Texas.
Golbus, B. J. Assocs., 6251 W. Touhy Ave., Chicago, Ill., (312) 774-3999.
Golten, J., Co., Inc., 4319 W. Irving Park Rd., Chicago, Ill., (312) 725-7870.
Goode, J. E., Sls. Co., 325 W. Huron, Chicago, Ill., (312) 642-2022.
Goode, J. J. Assoc., 44 Ledgewood Rd., Weston, Mass., (617) 235-3900.
Goodman, G., Co., 1800 N. Charles St., Baltimore, Md., (301) 837-3210. Branch Office: Richmond, Va.
Goory Sls. Co., 19555 Henry Rd., Cleveland, Ohio, (216) 331-2055.
Goudy, W. H., Assocs., Box 15, Lake Grove, N.Y., (516) 585-0033.
Graham, W., Assoc., 610 Latham Drive, Wynnewood, Pa., (215) 649-3027, 9822.
Gramer & Co., 110 W. Camelback Rd., Phoenix, Ariz., (602) 279-1231. TWX: 910-951-1407.
Grant Sls. Co., 1415 S. Second St., Minneapolis, Minn., (612) 332-6955.
Gray & Reed Assocs., Inc., 9 Dunford St., Huntington Sta., N.Y., (516) GE 3-3333. Branch Office: Westfield, N.J.
Gray, H., Assoc. Inc., 20 Foster St., Bergenfield, N.J., (201) 384-3643, (212) 279-3766. TWX: 710-991-9772.
Grayden & Flemmer, Inc., Hamilton Rd., Hopkins, Minn., (612) 941-1120. TWX: 910-576-2861.
Graydon-Sherman, Inc., 230 Madison Ave., Morristown, N.J., (201) 538-9246. TWX: 710-986-7458. Branch Offices: Great Neck, N.Y.; Syracuse, N.Y.; Philadelphia, Pa.
Green, J. A., Co., 7118 Envoy Court, Dallas, Texas, (214) 631-7450. Branch Offices: Tulsa, Okla.; Houston, Texas.
Green, L. F., & Assocs., 5218 W. Diversey Ave., Chicago, Ill., (312) 286-6824. TWX: 910-221-5301. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; Waukesha, Wisc.
Greenberg, J., & Assocs., 100 N. Village Ave., Rockville Centre, L.I., N.Y., (516) 678-3668.
Gregory, G., Assoc., 7 Erie Dr., Natick, Mass., (617) 235-9070. Branch Office: Cheshire, Conn.
Griffin-Campbell, Inc., 25 Skippack Pike, Ambler, Pa., (215) 646-7535.
Grimm, Siegel Assocs., Inc., 246 Clifton Ave., Clifton, N.J., (201) 773-5010.
Gross, H. R., & Co., Box 4607, Clearwater, Fla., (813) 446-6649.
Grossman Sls. Co. Inc., 339 Auburn St., Auburndale, Mass., (617) 527-7753.
Grossman, H., Assocs., 519 S. Fifth Ave., Mount Vernon, N.Y.
Guenther, J. B., Inc., 5121 McKinney, Dallas, Texas, (214) 528-6286. Branch Office: Houston, Texas.

H

H K Sales, Inc., Box 2087, Menlo Park, Calif., (415) 369-6244.
The Haber-Ramp Corp., 2315 Broadway, New York, N.Y., (212) 799-4040.
Haight, F. H., Co., 3212 Eastlake Ave. East, Seattle, Wash., (206) 322-1818.
Halinton, H., Engrg. Assocs., Inc., 6646 N. Loron, Chicago, Ill., (312) 763-2131.
Hammond Assocs., 34 Lincoln Ave., Greenwich, Conn., (203) 661-9410.
Hanna, R. L., Co., Box 202, Palatine, Ill., (312) 358-3940.
Hanner, J. C., Box 510, Raleigh, N. C., (919) 834-8443.
Hansen Assocs. Inc., 215 Brookside Ave., Ho-Ho-Kus, N.J., (201) 652-7055, (212) 947-0379.
Harmon, W. S., Co., 6118 Venice Blvd., Los Angeles, Calif., (213) 937-1460. TWX: 213-937-3438.
Harris & Aldrich Sls., Inc., 320 Northern Blvd., Great Neck, N.Y., (516) 466-4122.
Harris-Hanson Co., 2814 S. Brentwood Blvd., St. Louis, Mo., (316) 962-0111. TWX: 910-760-1650. Branch Office: Kansas City, Mo.

Harris, B., Co., 3440 Overland Ave., Los Angeles, Calif., (213) 870-9231. TWX: 910-340-6758. Branch Offices: Phoenix, Ariz.; Palo Alto, Calif.; Bellevue, Wash.

Harris, S. A., Co., 945 Great Plain Ave., Needham, Mass., (617) 444-4780.
Harriss, L. H., Co., 204 E. Hillsdale Blvd., San Mateo, Calif., (415) 341-2909.
Hart, F. H., 114 Pond St., Nahart, Mass., (617) 581-0381.
The Hartwick-Van Auker Co., Box 1204, Berkley, Mich., (313) 549-1160.
Hasse & Assocs., Inc., Box 22707, Minneapolis, Minn., (612) 588-0551.
Hatch, E. B., Co., Inc., 6 Eastman Pl., Melrose, Mass., (617) 665-0055.
Hathaway, G. M., Elctrns. Inc., 7-11 Mystic St., Arlington, Mass., (617) 646-1380. Branch Office: Canaan, Conn.
Hayden, P., Assoc., P.O. Box 90668, East Point, Ga., (404) 766-0261. TELEX: 54-2661. Branch Offices: Huntsville, Ala.; Lake Park, Fla.; Greensboro, N.C.
Hecht, Henschen & Assocs., Inc., 2435 E. University Dr., Phoenix, Ariz., (602) 275-4411. TWX: 910-951-0635. Branch Office: Palo Alto, Calif.
Heim & Smolen, Inc., 18455 Burbank Blvd., Tarzana, Calif., (213) 881-4667. TWX: 910-493-1254. Branch Office: San Jose, Calif.
Heimann Co., Inc., 5603 Lyndale Ave. So., Minneapolis, Minn., (612) 861-6051. Branch Office: Fort Dodge, Iowa.
Held & Mollard, Inc., 1494 Oddstad Dr., Redwood City, Calif., (415) 369-4871. TWX: 910-378-5927.
Heller-Freedman Assoc., Box 391, Ardmore, Pa., (215) 649-3679. Branch Office: Timonium, Md.
Heffernan, H. J. Co., 1123 N. Irving St., Arlington, Va., (703) 522-6666.
Henberger, J. C., Co., 3661 Voltaire St., San Diego, Calif., (714) 223-7114.
Hendrickson, W. A., Co., 766 Country Way, No. Scituate, Mass., (617) 545-0652.
Henriks, R. E., & Assocs., 4900 Sanita Anita Ave., El Monte, Calif., (213) 442-1820.
Henry, B., Assocs., Box 6097, Charlotte, N.C., (704) 375-8958. TWX: 810-621-0516. Branch Office: Winston-Salem, N.C.
Henry Co., Box 18166, Wichita, Kans., (316) 684-1241. Branch Office: Dallas, Texas.
Herrick, G. L., Co., 845 Canterbury, Cleveland, Ohio, (216) 871-8855. Branch Office: Cincinnati, Ohio.
Herrmann, C., Assoc., Box 1179, Palo Alto, Calif., (415) 322-4561. Branch Office: Pasadena, Calif.
Hersey, J. T., 2120 Greenwood Drive S.E., Cedar Rapids, Iowa, (319) 362-2031.
Hevner, D. S., Co., 1528 Spring Mill Rd., Gladwyne, Pa., (215) 525-9727, 525-9695.
Heyda, B., Co., 3830 Rustic Pl., St. Paul, Minn., (612) 484-8531.

Highsmith, J. L., & Co., Box 9367, Charlotte, N.C., (704) 333-7743, 7744, 7745. Branch Offices: Huntsville, Ala.; Orlando, Fla.; Richmond, Va.

Hilderbrand, R. H., Co., Fairview Village, Box 166, Montgomery County, Pa., (215) 247-6225. TWX: 510-660-0985.
Hile, W. K., Co., Inc., Box 1015, Matthews, N.C., (704) 847-9125. TELEX: 572-435. Branch Office: Richmond, Va.
Hill & Company, 915 Buder Bldg., St. Louis, Mo., (314) 621-1818. TELEX: 044-7300.
Hill, F. B., Co., 7317 Cahill Rd., Minneapolis, Minn., (612) 941-5270. TWX: 910-576-2924.
Hill-Gray Assocs., Inc., Box 32, Hinsdale, Ill., (312) 375-4810. TWX: 910-651-4157.
Hilliard Assocs., Inc., Box 186, Abington, Pa., (215) 884-6100.
Hilltronics Inc., 13720 Puritan Ave., Detroit, Mich., (313) 342-3242. TWX: 810-243-4069.
Hiltebrant Greenleaf Co., 20412 Center Ridge Rd., Cleveland, Ohio, (216) 333-5480. Branch Office: Cincinnati, Ohio.
Hirsh, B., Co., 4013 Leary Way, N.W., Seattle, Wash., (206) 783-3423.
Hitchcock, E. R., & Assoc., 1629-K St. N.W., Washington, D.C., (202) 296-6899.
HMR, Inc., 9 E. 22nd St., Minneapolis, Minn., (612) 335-7734. TWX: 910-576-2755.
Hoemig Sls. Co., 3405 Butler Ct., Fort Wayne, Ind., (219) 483-6913.
Hoffman, C., Assocs., Inc., 777 So. Central Expwy., Richardson, Texas., (214) 235-3600. TWX: 910-867-4727.
Holdsworth & Co., Inc., Box 298, Newtown Sq., Pa., (215) EL 6-8550. TWX: 510-662-9028.
Holmes, C. E., Co., 107 North Ave., Los Angeles, Calif., (213) 256-2255. TWX: 910-321-3937.

Holmes, E. G., & Assoc., 4185 Clairmont Rd., Chamblee, Ga., (404) 451-6161. Branch Offices: Huntsville, Ala.; Orlando, Fla.; Greensoboro, N.C.

Homsher, B. F., Co., 418 E. Berry St., Fort Wayne, Ind., (219) 432-1164, 743-5371.
Honkamp Sls. Co., 11120 W. Ruby Ave., Milwaukee, Wisc., (414) 463-2530.
Honn, George E., Co., Inc., 566 Folsom St., San Francisco, Calif., (415) 781-7352. TELEX: 3-4788.
Hooker, S. C., Inc., Box 352, Winchester, Mass., (617) 729-5482. TWX: 710-348-1067. Branch Office: West Hartford, Conn.
Hopkins, R. S., Co., 15016 Venture, Sherman Oaks, Calif., (213) 788-5501.
Houser Assoc., Inc., 188 Water St., Perth Amboy, N.J., (201) 442-3159.
Hoyt Sales Corp., 440 Barell Ave., Carlstadt, N.J., (201) 935-0044.
HRC Assocs., 390 Plandome Rd., Manhasset, N.Y., (516) 627-4644.
Hubert, A., Assocs., 9025 Hawthorne Ave., Surfside, Fla.
Huddleston, F., Assocs., Inc., 44 Plaza Sq., Orange, Calif., (714) 639-1941. TWX: 910-593-1347.
Hughes, K. E., Co., Inc., 2175 Lemoine Ave., Fort Lee, N.J., (201) 944-1600.
Hughes, R. E., Co., 5229 Del Ray Dr., Dallas, Texas, (214) 358-1511.
Hughes, R. S., Co., Inc., 5301 E. Sheila St., Los Angeles, Calif., (213) 268-2501. Branch Offices: Berkeley, Calif.; Mountain View, Calif.; Orange, Calif.; San Diego, Calif.; Seattle, Wash.
Hull, R. O., & Company, Inc., Box 02098, Cleveland, Ohio, (216) 651-7300. Branch Offices: Los Angeles, Calif.; Toronto, Ont., Can.; Littleton, Colo.; Stratford, Conn.; Chicago, Ill.; Hazel Park, Mich.; St. Louis, Mo.; Dayton, Ohio; Greenville, S. Car.; Dallas, Tex.
Hundley Co., Inc., 3282 Fletcher Dr., Los Angeles, Calif., (213) 255-7111. Branch Office: San Francisco, Calif.
Hunt Assocs. Inc., Box 398, Cherry Hill, N.J., (609) 428-6666. Branch Office: Towson, Md.
Huntoon, V. J., Assocs. Inc., 908 Belmont Ave., Springfield, Mass., (413) 788-8516. Branch Office: Newton, Mass.
Hurlbut, J. F., Co., 1295 South Bannock, Denver, Colo., (303) 744-1451. Branch Office: Granger, Utah.
Hutmacher, R. R., Assocs., 6668 Northwest H'wy., Chicago, Ill., (312) 631-3248. TWX: 910-221-5561.
Hytronic Measurements, Inc., 4940 E. 39th Ave., Denver, Colo., (303) 388-4081. TWX: 910-931-2597. Branch Offices: Phoenix, Ariz.; Albuquerque, N.M.; Salt Lake City, Utah.

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IBL Engrg. & Sls., Inc., 219 Preston Royal Center, Suite 6, Dallas, Texas, (214) 363-2921. Branch Offices: Houston, Texas; Austin, Texas; New Orleans, La.; Tulsa, Okla.; Shawnee Mission, Kans.; Albuquerque, N.M.
I F M — North, 2269 Old Middlefield Way, Mountain View, Calif.
IFM—South, 3455 Cahuenga Blvd., Hollywood, Calif., (213) 469-1641. Branch Offices: Mountain View, Calif.; San Diego, Calif.
Impact Sls. Co., Inc., 223 Crescent St., Waltham, Mass., (617) 893-2850. TWX: 710-324-6655. Branch Office: Hamden, Conn.
Industron Assocs., Inc., 300 Northern Blvd., Great Neck, N.Y., (516) HU 7-2620.
Inland Assocs., 6047 Howe Dr., Mission, Kans., (913) 362-2366. Branch Office: Creve Coeur, Mo.
Instrument Assocs., Inc., 30 Park Ave., Arlington, Mass., (617) 648-2922. TWX: 710-389-0460. Branch Office: Hartford, Conn.
Instrument Consultants, Inc., Microwave Div., Box 25, Waban, Mass., (617) 969-3372. TWX: 710-335-6682. Branch Office: Hamden, Conn.
Instrument Consultants, Inc., Box 25, Waban, Mass., (617) 969-9881. TWX: 710-335-6682. Branch Office: Hamden, Conn.
Instrument Dynamics Inc., Wakefield Ind. Pk., Wakefield, Mass., (617) 245-5100. TWX: 710-348-0428. Branch Office: West Hartford, Conn.
Instrument Lab., 1323 W. 130th St., Gardena, Calif., (312) 770-0650, 327-3279. Branch Office: Palo Alto, Calif.
Instrument Representatives, Inc., 1046 Massachusetts Ave., Arlington, Mass., (617) 646-1034. TWX: 710-389-0151. Branch Office: Glastonbury, Conn.
Instrument Specialists, Inc., 1109 So. Central Ave., Glendale, Calif., (213) 245-9404. TWX: 910-497-2086. Branch Offices: San Diego, Calif.; Santa Clara, Calif.; Portland, Ore.; Seattle, Wash.
Instrumentation Sls. Co., Box 403, Ridgewood, N.J., (201) 445-5210, (212) 695-4269. TWX: 710-988-5609.
Instrumentation Sys., Inc., 3481 Office Park Dr., Dayton, Ohio, (513) 293-8095. Branch Office: Cleveland, Ohio.
Interdom, 1320 E. Wakeham Ave., Santa Ana, Calif., (714) 835-5104.
Intermountain Assocs., 1930 Fourteenth St., Boulder, Colo., (303) 449-1473.
Interstate Mktg. Assoc., 22030 Ventura Blvd., Woodland Hills, Calif., (213) 883-7606. TWX: 910-494-1239.
I T M Assocs., Box 385, Sudbury, Mass., (617) 443-8414.

J

J & J Assocs., Inc., 12 Cambridge St., Burlington, Mass., (617) 272-2606. TWX: 710-324-6356. Branch Office: Hamden, Conn.
Jackson Electronic Sls. Corp., 71 Valley St., So. Orange, N.J., (201) 763-7900. TELEX: 138-335.
Jackson, R. W., Co., Inc., Box 2668, Buffalo, N.Y., (716) 839-0200. Branch Office: Fayetteville, N.Y.
Jacobs, M. F., Co., 4147 N. Newhall St., Milwaukee, Wisc., (414) 962-7070.
Jacobs, M. S., & Assoc., 810 Nobletown Rd., Pittsburgh, Pa., (412) 923-2090. Branch Offices: Charlestown, W. Va.; Cleveland, Ohio; Batavia, N.Y.
JADElectronics Assocs., Inc., Box 5735, Philadelphia, Pa., (215) 455-3355. Branch Office: Greenbelt, Md.
Janse, E. A., Assocs., Inc., 892 Worcester St., Wellesley, Mass., (617) 235-1623.
Jappe, H. C., Co., 137 Water St., Wakefield, Mass., (617) 245-9359.
The Jay Co., Inc., 2914 Annandale Rd., Falls Church, Va., (703) 534-7800.
Jeffries, S. A., Inc., 105 Forrest Ave., Narberth, Pa., (215) 664-8500, 839-4344. Branch Offices: Washington, D.C.; Baltimore, Md.; Pittsburgh, Pa.
Jensen Instr. Co., 1919 Beverly Blvd., Los Angeles, Calif. Branch Office: San Francisco, Calif.
Jewett Co., 13111 Ventura Blvd., North Hollywood, Calif., (213) 789-8193, 872-1895. TWX: 910-499-2196.
J. H. Elctrn. Sls. Co., Box 6844, Towson, Md., (301) 825-4440. TWX: 710-232-1816. Branch Office: Poughkeepsie, N.Y.
Jobe & Co., Inc., 2857 Greenmount Ave., Baltimore, Md., (301) 235-3502. Branch Office: Richmond, Va.
Johnson Assoc., Inc., 471 Washington St., Wellesley Hills, Mass., (617) 235-3977. Branch Office: Branford, Conn.
Johnson Elctrns., Inc., Box 7, Casselberry, Fla., (305) 838-2111.
Johnson, H. C., Agencies, Inc., 111 Mt. Hope Ave., Rochester, N.Y., (716) 232-2688. Branch Office: Ballston Lake, N.Y.; Fayetteville, N.Y.; Williamsville, N.Y.; Pittsburgh, Pa.
Johnson, P., Co., Box 8162, Chattanooga, Tenn.
Johnston, R., Co., Inc., 1011 Northeast 69th, Seattle, Wash., (206) 524-5170. TWX: 910-444-2258.
Jones, D. K., & Assocs., 2100 N. Charles St., Baltimore, Md., (301) 752-0577.
Jones, W. M., Co., Box 5490, Towson, Md., (310) 823-5721-5722-5791. TWX: 710-232-1838. Branch Offices: Orlando, Fla.; Atlanta, Ga.; Maple Shade, N.J.; Woodbridge, Va.
Jubell Assoc., 23760 Miles Ave., Cleveland, Ohio, (216) 662-2884. Branch Office: Dayton, Ohio.

K

K & M Sls. Co., 1627 Main St., Kansas City, Mo., (816) 471-1355.
KaDell Sls. Assocs., Inc., 6134 Milwaukee Ave., Chicago, Ill., (312) 774-6815.
Kaelber & Mack Inc., 75 Plandome Rd.—Box 796, Manhasset, L.I., N.Y. Branch Office: Wakefield, Mass.
Kagan, H., Assocs., 18 Tilghman Dr., Wayne, N.J., (201) 684-7682. Branch Office: Jamaica, N.Y.
Kahgan Sls. Corp., 556 Peninsula Blvd., Hempstead, N.Y., (516) 538-2300.
Kahsar, F. E., Sls., Inc., 5229 Glenway Ave., Cincinnati, Ohio, (513) 471-9011. Branch Office: Hudson, Ohio.
Kantenberger Co., 1900 Chamber of Commerce Bldg., Houston, Texas, (713) 223-3637. Branch Office: Dallas, Texas.
Kasrel, J., Sls. Agency, 7341 South Kingston Ave., Chicago, Ill., (312) 955-5246.
Kathrinus—Kelly—Boswell & Co., 2427 Brentwood Blvd., St. Louis, Mo., (314) 962-5627. Branch Office: Shawnee Mission, Kans.

Kaub, H., & Co., 4970 Jackson St., Denver, Colo.
Kaufholz Assocs., Box 227, Newtown Sq., Pa., (215) 346-5000. Branch Office: Baltimore, Md.
Kay Sales Co., Box 647, Gardner, Kans., (913) 884-8900.
Keene Sls. Co., 156 Borad St., Lynn, Mass., (617) 595-1001.
Kelburn Engrg. Co., 6545 N. Olmstead, Chicago, Ill., (312) 775-5722. Branch Offices: Indianapolis, Ind.; New Berlin, Wisc.
Keller Ind. Prods., Inc., 70 Mt. Hope Ave., Rochester, N.Y., (716) 546-4313. Branch Offices: Buffalo, N.Y.; Syracuse, N.Y.
Keller, L. W., & Assocs., Inc., 1680 Newbridge Rd., No. Bellmore, N.Y., (516) 785-2826. Branch Offices: Edision, N.J.; New York City, N.Y.
Kelley Enterprises, 336 E. Fourth St., Loveland, Colo. Branch Office: El Paso, Texas
Kemp Engrg. Co., Inc., 2618 Manana Dr., Dallas, Texas, (214) 357-6663. TWX: 910-861-4031. Branch Offices: Huntsville, Ala.; St. Louis, Mo.; Houston, Texas.
Kemp Instrs., Inc., 4306 Governors Dr., W., Huntsville, Ala., (205) 837-4304.
Kennedy Engrg., Inc., 6713 N. Oliphant Ave., Chicago, Ill., (312) 631-8283.
Kennedy, R. P., Co., Inc., 39 Saginaw Dr., Rochester, N.Y., (716) 271-6322. Branch Office: Hyde Park, N.Y.
Key Representation, Box 523, Wilmington, Calif., (213) 549-1770. Branch Office: Los Altos, Calif.
Keyco Assocs., Inc., Box 357, Farmington, Conn. Branch Office: Needham, Mass.
Kilfoil, J. F., Co., Box 42164, Cincinnati, Ohio, (513) 791-6150. Branch Office: Fort Wayne, Ind.
Kilroy J., Corp., Box 365, Chagrin Falls, Ohio, (216) 247-8997.
King Engrg. Co., 15720 Ventura Blvd., Encino, Calif., (213) 981-0161. Branch Offices: Phoenix, Ariz.; La Jolla, Calif.; San Francisco, Calif.
Kirkeby & Assocs., Inc., 821—2nd Ave. N., Minneapolis, Minn., (612) 377-3239.
Kirsch Sls. Co., 107 Wabash Ave., LaFontaine, Ind., (317) 981-2801.
Kirsh, P. L., Assoc., 223 Windemere Rd., Rochester, N.Y., (716) 288-0705.
Kitchen & Kutchin, Inc., 17 Waltham St., Lexington, Mass., (617) 862-8230. TWX: 710-326-0597. Branch Office: North Haven, Conn.
Kittleson Co., 416 N. La Brea Ave., Los Angeles, Calif., (213) 933-7371. Branch Office: Mountain View, Calif.
Kleker, Jerome H., Co., 177 Sunset Ave., Glen Ellyn, Ill., (312) 469-2297.
Klicpera, M. F., Box 2668, Houston, Texas, (713) 747-3868. Branch Offices: New Orleans, La.; Tulsa, Okla.; Dallas, Texas.
K L S Assocs., 387 Passaic Ave., Fairfield, N.J., (201) 227-2900. Branch Office: New York, N.Y.
Knight, W. B., Co., Inc., Box 400, Inglewood, Calif., (213) 678-4711. TWX: 910-328-6116. Branch Office: Phoenix, Ariz.
Knoblock & Associates, Inc., Box 67, Elk Grove Village, Ill., (312) 593-5940. TWX: 910-222-1604.
Koch Engrg. & Sls. Co., Inc., 126 Meadows Bldg., Dallas, Texas, (214) 369-5136.
Koenig-Myers Assoc., Inc., 5500 Buena Vista Dr., Box 374, Shawnee Mission, Knas., (913) 432-8300. Branch Offices: Atlantic, Iowa; Maryland Hghts, Mo.
Koessler Sls. Co. Inc., 2101 W. Burbank, Burbank, Calif., (213) 849-5716. Branch Office: Phoenix, Ariz.
Koether-Cox Co., 1325 So. Inca St., Denver, Colo., (303) 733-5561.
Kosowicz, F., 2 Madsen Rd., West Hartford, Conn., (203) 233-7883.
Kraft Elctrn. Sls. Inc., 510 Woodbine Ave., Towson, Md., (301) 828-5838.
Kriegner Sls. Co. Inc., 1602 Pennington Rd., Trenton, N.J., (609) 882-6330.
Krotozyner, J. M., 420 Market St., San Francisco, Calif., (415) 982-4636.
Krueger, R. M., Co., Inc., 5755 W. Irving Pk. Rd., Chicago, Ill., (312) 282-8444.
Kruse, R. C., Assocs., Box 1225, Canoga Park, Calif., (213) 341-3020.
KSE, Inc., Box 35184, 2710 Manor Way, Dallas, Texas, (214) 352-8431.
KSW Assocs., 7546 Troost Ave., Kansas City, Mo., (816) 363-5651. Branch Offices: Des Moines, Iowa; Kansas City, Mo.; St. Louis, Mo.
Kubrick, D., Co., 456 So. Franklin St., Hempstead, L.I., N.Y., (516) IV 3-7230, 4276.

L

L & M Assoc., 511 Victor St., Saddle Brook, N.J., (201) 843-8700. Branch Offices: Brentwood, N.Y.; Andalusia, Pa.
L & M Sls., 2404 S. Redwood Dr., Box 6255, Anaheim, Calif., (714) 774-0492.
L-C-A Sales, Inc., 76 Main St., Tuckahoe, N.Y., (914) WO 1-4700. Branch Offices: Ardmore, Pa.; Annandale, Va.
L-Tec, Inc., 5808 W. Higgins Rd., Chicago, Ill., (312) 286-1500. TWX: 910-221-1370.
Labronics, Inc., 130 Pickard Bldg., Syracuse, N.Y., (315) 454-9314. Branch Offices: Endicott, N.Y.; Jonesville, N.Y.; North Tonawanda, N.Y.
Laidlaw Co., The, 2563 E. 55th Pl., Indianapolis, Indiana, (317) 253-4436.
Laird Equipt. Co., 1029 Twining Rd., Dresher, Pa., (215) 884-8198.
Lake, H. G., Co., 1521 N. Main St., Dayton, Ohio, (513) 277-8181. Branch Office: Cincinnati, Ohio.
Lamb, R. F., Co., Inc., 1865 Kenmore Ave., Kenmore, N.Y., (716) 874-4900. TWX: 710-522-1808. Branch Offices: Kingston, N.Y.; Rochester, N.Y.; Syracuse, N.Y.
Lancer Assocs., 16 Adams St., Burlington, Mass., (617) 272-6445.
Lancer-Kneeland, Inc., 359 Main St., Haverhill, Mass., (617) 373-1313. Branch Office: Hamden, Conn.
Landa, E., Co., 1607 Pontius Ave., Los Angeles, Calif., (213) 879-0770. TWX: 910-342-6343. Branch Offices: Los Altos, Calif.; San Diego, Calif.
Landes, Zachary & Peterson, 2137 Mills Ave., El Paso, Texas (915) 533-9060. Branch Office: Albuquerque, N.M.
Landis Assocs., 5222 Venice, Los Angeles, Calif., (213) 933-8187. TWX: 910-321-4106.
Landis, C., Sls. Co., 34-28 80th St., Jackson Heights, N.Y., (212) 458-7900.
Lanphear, W. R., Co., Inc., 4031 Stoneway N., Seattle, Wash., (206) 633-4900.
Lanzendorf, O. G., Co., 513 Cumberland Ave., Syracuse, N.Y., (315) 472-4195.
Larsen Assocs., 10855 W. Potter Rd., Wauwatosa, Wisc., (414) 258-0529.
Laub Engrg., Box 8—456 Frontage Rd., Northfield, Ill., (312) 446-4166.
Laub, N. J., Co., 3749 W. Broadway, Minneapolis, Minn., (612) 588-4663.
Lavin, H., Assocs., Inc., Box 921, Meriden, Conn., (203) 237-5527. Branch Office: Needham, Mass.
Lawrence Sls. Co., Box 1038, Richardson, Texas, (214) 235-5504. TWX: 910-867-4715.
Lawson, R., Assocs., Box 206, Wenonah, N.J., (609) 468-5115.
Lazor, J., Assocs., Inc., 39 Saginaw Dr., Rochester, N.Y., (716) 473-8336. Branch Office: Manlius, N.Y.
Leban, A. D., Assocs., 218 Lloyd Lane, Philadelphia, Pa., (215) 642-9047.
Ledbetter Assocs., Box 528—16618 Ventura Blvd., Encino, Calif., (213) 789-8115. TWX: 213-783-3345.
Lee Assoc., Inc., 200 E. Marks, Orlando, Fla., (305) 241-4445. Branch Offices: Huntsville, Ala.; Chamblee, Ga.; Rockville, Mo.; Winston-Salem, N. Car.
Lee, Ltd., Bethania, North Carolina, (919) 924-8245. Branch Offices: Huntsville, Ala.; Orlando, Fla.
Lee, J., Co., 4241 South Toledo Ave., Minneapolis, Minn., (612) 920-1525.
Leemark Engineers, Inc., Box 6175, Leawood, Kansas, (913) 648-0124.
Leff Sls. Assocs., 5900 Westfield Ave., Pennsauken, N.J., (609) 663-4025. Branch Offices: Towson, Md.; Somerville, N.J.
Legg, R., Co., Box 25327, 4475 S.W. Scholls Ferry Rd., Portland, Ore., (503) 292-8824. TWX: 910-464-1510. Branch Office: Oakland, Calif.
Lehmann, W. R., Co., Inc., Box 20275, Orlando, Fla., (305) 841-4901. TWX: 810-850-0162. Branch Office: Lighthouse Point, Fla.
Lesker, K. J., Co., 5635 Horning Rd., Pittsburgh, Pa., (412) 653-0800. Toll free—800-245-2580.
Lesser, F. R., Box 241, Bedford, Mass.
Levinson, H., Co., 1211 E. Denny Way, Seattle, Wash., (206) 323-5100. TWX: 910-444-2154.
Levison Sls. Co., Inc., Box 242, 66 West Merrick Rd., Valley Stream, N.Y., (516) 561-9696.
Lewis, D., Assocs., 21650 Cloud Way, Hayward, Calif., (415) 785-9650. TELEX: 336-470. Branch Office: Alhambra, Calif.
Lewis, H., Co., 1013 Penn Tower, 1801 J. F. Kennedy Blvd., Phila., Pa., (215) 567-5020, 567-2068. Branch Office: Willow Grove, Pa.
Lieberman, H., Sls. Co., Box 66216, Houston, Texas, (713) 526-3431. Branch Offices: Baton Rouge, La.; Denton, Texas.
Lienau Assocs., Inc., 8537 Second Ave., Silver Spring, Md., (301) 588-1970. Branch Offices: Washington, D.C.; New Britain, Pa.; Philadelphia, Pa.
Lightner Assocs. Inc., 6322 No. Milwaukee Ave., Chicago, Ill., (312) 774-1500. TWX: 910-221-0999.
Lightstone Corp., Pickard Bldg., E. Molloy Rd., Syracuse, N.Y., (315) 454-3209.
Lincoln, Hodges & Assocs., 5875 N. Lincoln Ave., Chicago, Ill., (312) 561-8440. Branch Office: Wawkesha, Wisc.
Lindberg Co., 2654 South Krameria St., Denver, Colo., (303) 757-6489. TWX: 910-931-2579. Branch Office: Albuquerque, N.M.
Linz, D. S., 238 Shelmire St., Philadelphia, Pa., (215) 379-0734.
Linz, W. M., Assoc., Inc., 4001 W. Devon Ave., Chicago, Ill., (312) 685-6060.
Little, S., Co., Box 308, East Point, Ga., (404) 761-5353.
Littrell Western Sls., Inc., 3121 E. Twelfth St., Los Angeles, Calif., (213) 261-0164. Branch Office: San Francisco, Calif.
Lo Dan Inc., 1077 Industrial Rd., San Carlos, Calif., (415) 592-4600. TWX: 910-376-4902.
Loeb, E. R., Sls. Co., 6201 N. Lake Dr.—Box 3643, Milwaukee, Wisc., (414) 964-2155.
Lobdell Sls. Co., Candlewood Lake Rd., Brookfield, Conn., (203) 775-2253.
Logan & Logan Co., Box 4, Redwood City, Calif., (415) 365-1303.
Logan Sls. Co., 463 Brewster Ave., Redwood City, Calif., (415) 369-6726. TWX: 910-378-5928.
Logan, J., & Assocs., 801 Mahler Rd., Burlingame, Calif., (415) 697-6100. TWX: 910-375-3382.
Lohmann, R. S., Co., 19326 W. McNichols, Detroit, Mich., (313) 535-6144.
Long & Assocs., Inc., 505 Middlefield Rd., Redwood City, Calif., (415) 369-3324. TWX: 910-378-5429. Branch Office: Burlingame, Calif.
Lowell-Kangas & Assoc., Inc., Box 4116, Overland Park, Kans., (913) 888-3200. TWX: 910-749-6493. Branch Office: St. Louis, Mo.
Lowery, L. D., Inc., 2801 W. Chester Pike, Broomall, Pa., (215) EL 6-5300. Branch Offices: Hyattsville, Md.; Harrisburg, Pa.
LSM Assocs., Orchard Park, Phelps, N.Y., (315) 548-4891. Branch Offices: De Ruyter, N.Y.; Hamburg, N.Y.
Lucas, C. H., Sls. Co., 2303 Mountain Lake Rd.—Box 24632, Dallas, Texas, (214) 339-3533.
Luce, R. P., & Co., Inc., 30 Locust Ave., Berkeley Hghts., N.J., (201) 464-6440. TWX: 710-984-7965. Branch Offices: Baltimore, Md.; New Hyde Park, N.Y.; Philadelphia, Pa.
Lund & Co., Box 35566—2616 Manor Way, Dallas, Texas, (214) 358-4335. Branch Office: Houston, Texas.
Lund, M., Assocs., 2828 Mary St., Falls Church, Va., (703) 560-8400.
Luscombe Engrg. Co., 610 S. Arroyo Pkwy., Pasadena, Calif., (213) 684-2000. TWX: 910-588-3285. Branch Offices: Phoenix, Ariz.; San Mateo, Calif.
Lynch, T., Co., Electronic Mfg. Rep., 1125 Singingwood Dr., Arcadia, Calif., (213) 355-1753, 684-1392.
Lynch-Gentry Assocs., Inc., Box 13248, St. Petersburg, Fla., (813) 347-5131. Branch Office: Ft. Lauderdale, Fla.
Lynn & Brooks, 3055 Wilshire Blvd., Los Angeles, Calif., (213) 382-2255. Branch Offices: San Francisco, Calif.; Portland, Ore.

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M & S Assocs., Inc., Box 185, Haddonfield, N.J., (609) 429-7055, (215) BA 9-7575. Branch Office: Sellersville, Pa.
MacDonald, S. K., Inc., 1531 Spruce St., Philadelphia, Pa., (301) 254-3380. Branch Office: Baltimore, Md.
MacDonald, B. C., & Co., 1265 Research Blvd., St. Louis, Mo., (314) 993-2833. Branch Offices: Little Rock, Ark.; Kansas City, Kans.; Wichita, Kans.
Macdonald, S. K., Inc., 1531 Spruce St., Philadelphia, Pa., (215) KI 5-1205. Branch Offices: Washington, D.C.; Baltimore, Md.; Pittsburgh, Pa.
Magnuson Assoc., 5639 W. Fullerton Ave., Chicago, Ill., (312) 622-6322. TWX: 910-221-5239. Branch Office: St. Paul, Minn.
Maguire, J. A., & Co., 726 Cooper St., Camden, N.J., (609) 966-3118, (215) 627-1670. TWX: 710-891-7081. Branch Offices: Baltimore, Md.; Winston-Salem, N. Car.; Plainfield, N.J.
Mahan, R. P., Co., Inc., 572 Washington St., Wellesley, Mass., (617) 237-1040. Branch Office: Watertown, Conn.
Maher, F., Sls. Co., 175 Brookside Rd., Newington, Conn., (203) 247-7474. Branch Office: Bridgewater, Mass.
Malta, V. S., Co., Box 4007, Philadelphia, Pa., (215) 836-5122.
Mandell, H., Co., Box 24, Revere, Mass., (617) 289-3787. Branch Office: Manchester, Conn.
Manufacturers Sls. Co., Box 20005, Greensboro, N.C., (919) 274-2474.
Manufacturing Assocs., 1738 Colorado Ave., Santa Monica, Calif., (213) 479-8884.
Marchand-Fara, 15 Alden St., Cranford, N.J., (201) 272-5510. Branch Office: Manhasset, N.Y.
Mark Electronic Sls. Co., Box 291, No. Miami, Fla., (305) 947-5080.
Marketek, Inc., One First St., Los Altos, Calif., (415) 941-0882. TWX: 910-370-7969.
Markman Co., 4142 Lankershim Blvd., No. Hollywood, Calif., (213) 877-3368.
Marktron, Inc., 651 Lofstrand Lane, Rockville, Md., (301) 762-6210. TWX: 710-828-0089. Branch Office: Towson, Md.
Marlow Associates, Inc., 4486 Mayfield Rd., Cleveland, Ohio, (216) 381-4500.
Mars Sales Tronics, 4405 S. Clinton Ave., S. Plainfield, N.J., (201) 561-3233.
Marsey Sls. Inc., 206 Park Ave., Rochester, N.Y., (716) 442-9700.
Marsh, J. W., Co., 4216 W. Jefferson Blvd., Los Angeles, Calif.
Marshall Co., G. S., 9674 Telstar Ave., El Monte, Calif., (213) 686-1500. TWX: 910-587-1565. Branch Offices: Dallas, Texas; Sunnyvale, Calif.; Farmingdale, N.Y.; San Diego, Calif.; Phoenix, Ariz.
Marshall, R. W., Co., Inc., 6106 Excelsior Blvd., Minneapolis, Minn., (612) 929-0457.
Marshank Sls. Co., 7422 Melrose Ave., Los Angeles, Calif., (213) 938-2591. TWX: 213-937-2789.
Marsland Assocs., Inc., 1000 Executive Way, Des Plaines, Ill., (312) 775-1309. TWX: 910-233-4002. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; Florissant, Mo.
Martigs Inc., 5741 N. E. Glisan St., Portland, Ore., (503) 232-1949.
Martin Elec. Co., 118 Valley Rd., Ardmore, Pa., (215) 649-6332.
Martin-Rettger, Inc., 11955 Shaker Blvd., Cleveland, Ohio, (216) 781-8787.
Martin, R., Assocs., Inc., Box 19291, Houston, Texas, (713) 468-3877. TWX: 910-881-3630. Branch Office: Dallas, Texas.
Masin-Esco, Inc., 333 Jackson Ave., Syosset, N.Y., (516) 364-0210. Branch Office: E. Orange, N.J.
Massey Assocs., Inc., 1 Thomas Circle N.W., Washington, D.C., (202) 628-1023.
Massey Assocs,. Inc., 6215 Greenbelt Rd., College Park, Md., (301) 345-3345.
Massey Assocs., Inc., 1325 W. Chester Pike, Havertown, Pa., (215) 789-2320, 528-6384. Branch Offices: Jupiter, Fla.; St. Petersburg, Fla.
Mates, 5508 Hobart St., Pittsburgh, Pa., (412) 421-8998.
Mauer Co., Inc., 3308 Noyes St., Evanston, Ill., (312) 869-1644.

Mauldin Co., The, 437 California Ave., Palo Alto, Calif., (415) 326-5291. Branch Office: Portland, Ore.
Mayer, The C. R., Co., Inc., Box 152, Huntington, N.Y., (516) 921-7876.
Maynard-Gunn Sls. Co., 158 Express, Dallas, Texas, (214) 742-2384. Branch Office: San Antonio, Texas.
Maytnier, D. M., Corp., 2510 Grosse Point Rd., Evanston, Ill., (312) 475-4334.
McBride, J. J., Sls., Inc., 6054 Touhy, Chicago, Ill., (312) 775-1080.
McCorvey, V. A., Co., 2187 Briarcliff Rd. N.E., Atlanta, Ga., (404) 636-2502.
McCoy, J., Inc., Box 20, Cherry Hill, N.J., (609) 428-3444, (215) WA 2-7333.
McDavitt Sls. Corp., Box 308, Drexel Hill, Pa., (215) 544-2588.
McDonald Sls. Co., Box 9148, Ft. Wayne, Ind., (219) 747-3650. Branch Office: Indianapolis, Ind.
McDonough, J., Assoc., Inc., 4541 Main St., Buffalo, N.Y., (716) 839-3467.
McFadden Sls., Inc., 150 E. Broad St., Columbus, Ohio, (614) 221-3363. TWX: 810-482-1623. Branch Offices: Fort Wayne, Ind.; Indianapolis, Ind.; Cincinnati, Ohio; Cleveland, Ohio.
McKay Assocs., 60 Park Pl., Newark, N.J., (201) 642-3930.
McKinney, J. F., Sls. Co., 1303 Chemical—Box 10451, Dallas, Texas, (214) 631-9450. TWX: 910-861-4232. Branch Offices: Metairie, La.; Tulsa, Okla.; Bellaire, Texas.
McKnight, G R Co., Inc., Box 36, 115 Spruce Ave., Menlo Park, Calif., (415) 325-2844. TWX: 910-373-1172.
McMillan Electronics, 16679 S.W. Maple Circle, Lake Oswego, Ore., (503) 636-6257.
McSweeney, F. J., & Assocs., 2555 E. 55th Pl., Indianapolis, Ind., (317) 255-3777.
McTaggart, L. J., Assocs., 2451 Wehrle Dr., Buffalo, N.Y., (716) 634-2030. Branch Office: Grand Island, N.Y.
Measurement Equipt. Co., 599 North Ave., Wakefield, Mass., (617) 245-4870. TWX: 710-348-6717. Branch Office: East Hartford, Conn.
Measurement Technology Inc., 295 Northern Blvd., Great Neck, N.Y., (516) 482-3500. TWX: 510-223-0846.
Mech-Elec Sls. Co., Inc., 16 South Main, Medford, N.J., (609) 654-8209.
Melchior Assocs., Inc., 820B Cherry, San Carlos, Calif., (415) 591-7383. TWX: 910-376-4404.
Melius, E. & Associates, Inc., 3758 Dunlap St. No., St. Paul, Minn., (612) 484-8541. TWX: 910-563-3672.
Melvin Sls. Co., 113 El Camino Real, Millbrae, Calif., (415) 697-6922. TWX: 910-375-3832.
Memac Sls. Co., Inc., 4740 N. Austin Ave., Chicago, Ill., (312) 545-1033. TWX: 910-221-5567.
Merchant, R. C., & Co., Inc., 18411 W. McNichols Rd., Detroit, Mich., (313) 535-6000. Branch Offices: Grand Rapids, Mich.; St. Joseph, Mich.
Merican, J. C., 546 Anchor Dr., Joppa, Md., (301) 679-6969.
Merritt, J. W., & Co., 2525 Knollwood Dr., Indianapolis, Ind., (317) 291-9674.
Merritt, Ron Co., 1320 Prospect St., Seattle, Wash., (206) 682-7337. TWX: 910-555-1212. Branch Office: Portland, Ore.
Metro Tech. Sls. Corp., 333 North Broadway, Jericho, N.Y., (516) 935-3330. TWX: 510-221-1829. Branch Office: Harrington Park, N.J.
Metrorep, Inc., Box 782, Freehold, N.J., (201) 462-1221. Branch Offices: Washington, D.C.; N.Y.C., N.Y.
Meussdorffer, R., & Assoc., 13441 Ventura, Sherman Oaks, Calif., (213) 788-0771.
Meyer Material, 5101 E. 65th, Indianapolis, Ind., (317) 253-6407.
Meyers, R., Assocs., 529 Shoemaker Rd., Philadelphia, Pa., (215) 224-1663.
Meyer, Ross & Fleming, 113 Tenth St., San Francisco, Calif., (415) 431-0652.
Meyers, K. W., Co., 7256 W. Touhy Ave., Chicago, Ill., (312) 774-6440. TWX: 910-221-5288. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; Milwaukee, Wisc.
Michaelson, B. L., Co., 1053 Arlington Dr—Box 217, Xenia, Ohio, (513) 372-5496. Branch Offices: Cleveland, Ohio; Pittsburgh, Pa.
Mid-Eastern Assocs., Inc., 1759 Country Club Dr., Cherry Hill, N.J.
Midland Elect. Co., 2125 Superior Ave., Cleveland, Ohio, (216) 861-3200.
Mid-Lantic Chapter, Electr. Representatives Assoc., 315 Harrison Ave., Glenside, Pa., (215) 884-0139.
Mid State Distributing Co., Inc., 1201 Grand Ave., Des Moines, Iowa, 288-7231. Branch Offices: Ames, Iowa; Carroll, Iowa; Cedar Rapids, Iowa; Creston, Iowa; Iowa City, Iowa; Marshalltown, Iowa; Mason City, Iowa; Ottumwa, Iowa; Spencer, Iowa; Kirksville, Mo.
Midstate Research, Inc., 327 Wellesley Rd., Syracuse, N.Y., (315) 478-8314.
Midwest Elctrn. Sls., 5707 W. Division St., Chicago, Ill., (312) 626-0030. TWX: 910-221-5247. Branch Offices: Indianapolis, Ind.; Cedar Rapids, Iowa; Waukesha, Wisc.
Midwest Microwave, 6200 N. Hiawatha Ave., Chicago, Ill., (312) 283-4900. TWX: 910-221-2515. Branch Offices: Indianapolis, Ind.; St. Louis Pk., Minn.
Midwest Sls. Co., 3219 West 117th St., Cleveland, Ohio, (216) 941-2700.
Milbank Mfg. Co., 1111 Virginia, Kansas City, Mo., (816) 421-0219. TWX: 42-6277. Branch Offices: Eldorado, Ark.; Kokomo, Ind.
Millar Elctrns., Inc., 3110 Maple Dr. N.E.—Box 12137—Northside Sta., Atlanta, Ga., (404) 261-6160. 261-6161. Branch Office: Raleigh, N. Car.
Miller & Dietz Co., 101 W. Main St., Moorestown, N.J., (609) 234-1050.
Miller & Miller, Box 36, Grosse Ile, Mich., (313) 386-0900, 676-2724.
Miller, B., Box 72, Little Neck, N.Y., (212) BA 9-5769.
Miller, E. G., Co., Inc., Box 929, Henderson, Texas, (214) 657-5049.
Miller, Gilbert E., Assoc. Ltd., Box 95, Jericho, L.I., N.Y., (212) 586-4780. Branch Office: Stamford, Conn.
Miller, Hank, Sls. Co., 4087 Meadowbrook, Cleveland, Ohio, (216) 321-3900. Branch Offices: Madison, Ohio; Sabina, Ohio.
Miller, J., Co., 1 Continental Ave., Forest Hills, N.Y., (212) 263-4446.
Mills, W. S., 2 Wilburtha Rd., Trenton, N.J., (609) 882-4111.
Milsk, R., Co., 19375 James Couzens Hwy., Detroit, Mich., (313) 342-6660. Desk FAX-KRS. Branch Offices: Indianapolis, Ind.; Louisville, Ky.; Grand Rapids, Mich.
Minthorne Intl. Co., Inc., 2200 Shames Dr., Westbury, N.Y., (516) 334-3303.
Minthorne, R. M., Co., 6565 S.W. Macadam Ave., Portland, Ore., (503) 246-4556.
Mitchell, C. H., Co., 18531 Ventura Blvd., Tarzana, Calif., (213) 881-2626.
Mitscher, R. W., Co., Inc., 496 Ellicott Sq. Bldg., Buffalo, N.Y., (716) 854-2517. TWX: 710-522-1225. Branch Offices: Camillus, N.Y.; Fayetteville, N.Y.; Virginia Beach, Va.; Pittsford, N.Y.; Raleigh, N. Car.; Nashville, Tenn.
Moch, G. M., Co., 595 Broad Ave., Ridgefield, N.J., (201) 945-0080, (212) 279-6758.
Montgomery Bros., Inc., 1831 Bayshore, Burlingame, Calif., (415) 697-6500. TELEX: 34-0183. Branch Offices: Phoenix, Ariz.; Los Angeles, Calif.; San Diego, Calif.; Portland, Ore.; Salt Lake City, Utah; Seattle, Wash.
Moore Sls. Co., 401 Margaret W., Detroit, Mich. (313) 883-0218.
Moore, H. A., Sls. Co., Box 7245, Phoenix, Ariz., (602) 274-0060.
Montague Assocs., 404 Jerusalem Rd., Cohasset, Mass.
Morath, H. J., 325 Bankers Tr. Bldg., Indianapolis, Ind., (317) 635-4082.
Morgan, C. T., Co., 500 Maple St., Danvers, Mass., (617) 774-3216. Branch Office: Waterville, Me.
Morhan Exporting Corp., 458 Broadway, New York, N.Y., (212) 925-1257.
Morris-Cunningham & Assoc., Inc., 720 E. 65th St., Indianapolis, Ind., (317) 255-2458. Branch Office: Fort Wayne, Ind.
Morse Assocs., 1721 Chestnut St., San Francisco, Calif., (415) 567-6871.
Morse, I., Sls., 150 Broadway, New York, N.Y., (212) 267-2913.
Morton, G. E., Co., 161 Summer St., Scituate, Mass., (617) 545-0155.
Motors, Inc., Box 274, Yellow Springs, Ohio. Branch Office: Cleveland, Ohio.
Moulthrop, F. W., & Assocs., 1530 E. 12th St., Oakland, Calif., (415) 261-7676. TWX: 910-366-7206.
Mount, W., Co., 4924 St. Elmo Ave., Bethesda, Md., (301) 657-9312. TWX: 710-824-0090. Branch Office: Jenkintown, Pa.
Mulvin & Co., Inc., 3843 E. Colorado Blvd., Pasadena, Calif., (213) 681-4591.
Mureen, R. W., Co., 5523 Dyer St., Dallas, Texas, (214) 369-7561. Branch Office: Houstin, Texas.
Murphy & Cota, 500 Plasamour Dr. N.E., Atlanta, Ga., (404) 875-2525. Branch Offices: Huntsville, Ala.; Orlando, Fla.; Greensboro, N. Car.; Winston-Salem, N. Car.
Murphy & Dickey, 10001 Derby Lane, Westchester, Ill., (312) 344-5660.
Murphy, L. F., & Assoc., Inc., 730 Chicago S., Minneapolis, Minn., (612) 333-4511. TWX: 910-576-3417.
Murray, The, Co., 25 W. Northfield Rd., Livingston, N.J., (201) 992-0520. Branch Office: Bucks County, Pa.
Murray Director Assocs., 115-62 237 St., Elmont, N.Y., (516) 285-6823.
Mustico, J., Co., Box 624—312 Bewley Rd., Havertown, Pa., (215) HI 6-1961. Branch Office: Kensington, Md.
Myers, R. E., & Son, Inc., 9191 W. Florissant, St. Louis, Mo., (314) 521-5253.

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Naco Elctrns. Corp., Box 248, North Syracuse, N.Y., (315) 699-2651. TWX: 710-541-0439. Branch Offices: Binghamton, N.Y.; Buffalo, N.Y.; Poughkeepsie, N.Y.; Rochester, N.Y.; Schenectady, N.Y.; Utica, N.Y.
Naeco Assocs., Inc., Suite #1002, 1925 N. Lynn St., Arlington, Va., (703) 524-4551. TWX: 710-955-9843. Branch Offices: Bonita, Calif.; Dayton, Ohio; Pierrefonds, Montreal, Canada.
Natalino, A., Assocs., 209 Harmony Hills, Akron, Ohio, (216) 725-6087. TWX: 810-437-2477. Branch Offices: Dayton, Ohio; Pittsburgh, Pa.
National Sls. Dev. Co., 676 Stratford Rd., Baldwin, N.Y., (516) BA 3-0038.
Naudain Assocs., 1032 Suburban Sta. Bldg., Philadelphia, Pa., (215) LO 4-3194. Branch Office: Lutherville-Timonium, Md.
Near, Inc., 99 Highland Ave., Somerville, Mass., (617) 776-2262.
Needler Sls. Co., Station C—Box 2407, Fort Wayne, Ind., (219) 447-2123. Branch Office: Ind'p'lis, Ind.
Neff, J. R., 5349 Hedgerow Dr., Indianapolis, Ind., (317) 546-5824.
Nelson & Son Inc., 4005 West 65th St., Minneapolis, Minn., (612) 920-3414.
Nelson Co., Inc., 1294 So. Bannock, Denver, Colo., (303) 733-5528. Branch Offices: Albuquerque, N.M.; Salt Lake City, Utah.
Nelson, W. K., Co., 2322 Chestnut Ave. W., Minneapolis, Minn., (612) 374-1970.
Nesbitt, R. E., Co., 2930 Merrell Rd.—Box 21816, Dallas, Texas, (214) 357-4601. Branch Office: Houston, Texas.
New England Component Sls., Box 656, Newton Lower Falls, Mass., (617) 969-9523.
New England Elctrn. Sls. Corp., 515 Washington St., Canton, Mass., (617) 828-4835.
Newhope, The, Corp., 6 East 39th St., New York, N.Y., (212) 532-7372.
Newson, C. H., & Assocs., Inc., 711 Bethlehem Pike, Philadelphia, Pa., (215) 248-3377. Branch Office: Towson, Md.
Nickerson, F. C., Co., Inc., Box 33185, Decatur, Ga., (404) 377-1575. Branch Offices: Birmingham, Ala.; Winter Haven, Fla.; Kinston, N.C.
NLR Assocs., 31 Round Top Rd., Warren, N.J., (201) 647-3390.
Nolan, J. J., & Associates, 314 W. Sparks St., Philadelphia, Pa., (215) 924-1595.
Nordstrom, R. C., & Co., Box 32, Lathrup Village, Mich.
Norman, H. C., Sls. Co., Box 5185, Station B, Greenville, S.C., (803) 244-6254.
Normell Assocs., 10 Day St., Newton, Mass., (617) 969-5478.
Northeast Engrg., Inc., 3013 Dixwell Ave., Hamden, Conn., (203) 248-4481. Branch Offices: Danvers, Mass.; Manhasset, N.Y.
Northern States Sls. Co., 1109 West 78½ St., Minneapolis, Minn., (612) 866-3468.
Northport Engrg., Inc., 2027 Grand Ave., St. Paul, Minn., (612) 698-3841. TWX: 910-563-3674.
Northwest Sls. & Engrg. Svc., Terminal Sls. Bldg., Seattle, Wash., (206) 622-3860. Branch Office: San Francisco, Calif.
Norton, J., 60 Midvale Rd., Mt. Lakes, N.J., (201) 334-2921. TWX: 710-987-8395.
Norvell Assocs., Inc., 10210 Monroe Dr., Dallas, Texas, (214) 357-6451. TWX: 910-861-4512. Branch Office: Houston, Texas.
N.P.N. Assocs., Inc., 522 E. Putnam Ave., Greenwich, Conn., (203) 869-4955-6.
Numar Corp., 242 W. 30th St., New York, N.Y., (212) LA 4-4411.
Nurches, P., Co., 2396 E. Foothill Blvd., Pasadena, Calif., 796-5844. Branch Office: Palo Alto, Calif.

O

O'Donnell Assocs. Inc., 18053 Creshaw, Torrance, Calif., (213) 323-9243. TWX: 910-346-6732. Branch Office: Palo Alto, Calif.
OEM Sls. Co., Box 68, Birmingham, Mich., (313) 647-1172.
O.E.M. Sls. Co., Inc., Box 55232, Indianapolis, Ind., (317) 545-1267. Branch Office: Florissant, Mo.
O'Halloran Assocs., 10700 Ventura Blvd., North Hollywood, Calif. Branch Offices: Palo Alto, Calif., San Diego, Calif.
O'Hara, B., 4952 Wynnefield Ave., Philadelphia, Pa., (215) 473-3654.
Ohio Associates, Box 728, Lima, Ohio, (419) 646-3495.
Ohio Instr. Co., The, 505 Whitney Ave., Worthington, Ohio, (614) 885-0743. Branch Office: Ypsilanti, Mich.
Olander, R., & Co., Box 1485, 540 Hollywood Way, Burbank, Calif., (213) 843-5200. TWX: 910-498-2720. Branch Offices: Santa Clara, Calif.; Bellevue, Wash.
Olsen, J. O., Co., 16201 Shaker Blvd., Cleveland, Ohio, (216) 752-5444. Branch Offices: Cincinnati, Ohio; Pittsburgh, Pa.
Onyx, W. M., Co., 101 Pickwick Rd., DeWitt, N.Y., (315) 446-7930. Branch Offices: Mattydale, N.Y.; Syracuse, N.Y.
Orbe, Inc., 1221 N. Orange Ave., Orlando, Fla., (305) 425-9004. Branch Offices: Lauderhill, Fla.; St. Petersburg, Fla.
Orbe, Inc., 4110 Central Ave., St. Petersburg, Fla., (813) 894-0687. TWX: 810-863-0370. Branch Offices: Lauderhill, Fla.; Orlando, Fla.
Ormsby, Scott, Sls. Co., 7121 Catina St., New Orleans, La., (504) 282-2097.
Ossmann Component Sls. Corp., 39 Saginaw Dr., Rochester, N.Y., (716) 442-3290. TWX: 510-253-7685. Branch Offices: Red Hook, N.Y.; Syracuse, N.Y.; Vestal, N.Y.
Ossmann Instr., Inc., 6666 Old Collamer Rd., E. Syracuse, N.Y., (315) 437-6666. TWX: 710-541-1523. Branch Offices: Rochester, N.Y.; Vestal, N.Y.; Wappingers Falls, N.Y.
Oszman, E. W., 932 W. Montana Ave., St. Paul, Minn., (612) 488-1811.

P

Pacent Engrg. Corp., 300 Northern Blvd., Great Neck, N.Y., (516) 482-4678.
Packard Assocs., Inc., Box 20825, Dallas, Texas, (214) 357-5713.
Pan-Tech Engrg. Co., Box 22491—3815 Richmond, Houston, Texas, (713) 623-0640. Branch Offices: Baton Rouge, La.; Arlington, Texas.
Par-Nell Sls. Co., Box 374, 115 E. Maple Ave., Langhorne, Pa., (215) 757-7644. Branch Office: Reisterstown, Md.
Paragon Sls. Co., 111 S. 22nd St., Philadelphia, Pa., (215) 563-7060.
Paratech, 2208 N.W. Market St., Seattle, Wash., (206) 783-3900. TWX: 910-444-2002.
Parkins & Bretz Co., 500 V. F. W. Bldg., Kansas City, Mo., (816) 931-6824. TWX: 4-2561. Branch Office: Tulsa, Okla.
Parsons, C. B., & Co., 5319 4th Ave., S., Seattle, Wash., (206) 762-7373. FAX: FQD
Paston-Hunter Co., Inc., 2002 Teall Ave., Syracuse, N.Y., (315) 437-2992.
Patterson, W. S., Co., Inc., 5604 N. Western Ave., Chicago, Ill., (312) 271-3774. TWX: 910-221-3029.
Pattis, The B., Co., 4761 W. Touhy Ave., Lincolnwood, Ill.
P D C Corp., The Benson East, Jenkintown, Pa., (215) TU 7-9610.
Pearson, M., & Co., 1860 So. Acoma, Denver, Colo., (303) 744-2323. TWX: 910-931-0494. Branch Office: Salt Lake City, Utah.
Pearson, R. T., Sls. Inc., 1125 Old York Rd., Abington, Pa., (215) 887-0186.
Peck, The G. V., Co., Box 18627, 210 Casa Linda Plaza—Suite 44, Dallas, Texas, (214) 328-3511. TWX: 910-861-4148. Branch Offices: Tulsa, Okla.; Houston, Texas.
Peddlers Unlimited, 641 N. Minnesota Ave., Glendora, Calif., (213) 963-5868.
Peninsula Assocs., 415 Clyde Ave., Suite B., Mountain View, Calif., (415) 961-8663.
Penn-Del Instr. Sls., Inc., 709 Bethlehem Pike, Chestnut Hill, Pa., (215) CH 7-9600.
Penwarden Assocs., 14547 Titus, Van Nuys, Calif., (213) 782-4920. TWX: 910-495-1729.
Periph-A-Tronics, P.O. Box 339, Ridgewood, N.J., (201) 447-4766.
Perkins, A. L., Co., Kinlock Plaza, Manlius, N.Y., (315) 682-5005. Branch Office: Williamson, N.Y.
Perron, R., & Co., Inc., 159 Morse St., Norwood, Mass., (617) 762-8114. TWX: 710-336-6347. Branch Offices: Farmington, Conn.; Trumbull, Conn.; Dover, N.H.
Perry Assocs., Inc., R.D. #2 Rosewood La., Cumberland, R.I., (401) 333-5054, (617) 891-7658.
Peters-de Laet, Inc., 1606 Rollins Rd., Burlingame, Calif., (415) 697-1800. Branch Offices: Hawthorne, Calif.; Sacramento, Calif.; Denver, Colo.; Eugene, Ore.; Portland, Ore.; Seattle, Wash.; Spokane, Wash.
Peters, R. W., Co., 630 E. 222, Cleveland, Ohio, (216) 261-2330.
Peters, W. J., Co., 850 Elm Grove Rd., Elm Grove, Wisc.,
Peterson-Rudnick Assocs., Box 822, West Caldwell, N.J., (201) 226-4363. Branch Office: Corona, N.Y.
Peterson, F., Co., 4501 Minnetonka Blvd., Minneapolis, Minn., (612) 927-4453. TWX: 910-576-2835.
Petitt, G., Co., Inc., 349 Ashland Ave., River Forest, Ill., (312) 369-8940, 261-0342. Branch Offices: East Peoria, Ill.; Brookfield, Wisc.
Pettigrew, R. S., & Co., Inc., 10 N. Main St., West Hartford, Conn., (203) 233-8533. Branch Office: West Newton, Mass.
Pfeiffer, W. E., 615 Stutsmen St., Council Bluffs, Iowa, (712) 322-8280. Branch Office: Council Bluffs, Iowa.
Phillips, H. W., Co., 3651 Cold Springs Lane, Atlanta, Ga., (404) 451-5762.
Phister Equipt. Co., Inc., 922 Federal Reserve Bank Bldg., Cincinnati, Ohio, (516) 421-3850.
Piedmont Equip. Co. Inc., Box 10037—401 W. 32nd St., Charlotte, N.C., (704) 334-6823.
Pierce, S., Inc., 24 Linden St., Norwood, Mass., (617) 762-3164. Branch Office: New Canaan, Conn.
Pinkney & Assocs., Inc., 957 Winnetka Ave. No., Minneapolis, Minn., (612) 544-3628. TELEX: 29-0101.
Piper Assocs. Inc., 10 Haven St., Dover, Mass., (617) 449-1144. Branch Offices: Framingham, Mass.; Plymouth, Mass.
Pivan Engrg. Co., 3535 West Peterson Ave., Chicago, Ill.
P. J. Engrg. Sls. Co., Inc., 360 No. Reacon St., Boston, Mass., (617) 783-0510. TELEX: 94-6232.
Plageman, L. C., 3334 Meyer Pl., Cincinnati, Ohio, (513) 481-4260.
Plasencia, J., Inc., 521 Fifth Ave., New York, N.Y., (212) 867-8084.
PLS Assocs., Inc., 7895 E. Prentice Ave., Englewood, Colo., (303) 771-0140. Branch Offices: Phoenix, Ariz.; Albuquerque, N.M.
Podolny, J. H., Co., 5912 Penn Ave., Pittsburgh, Pa., (412) 441-0800.
Polach & Bensinger, Inc., 231 E. Millbrae Ave., Millbrae, Calif., (415) 697-2525.
Polich, A. L., Inc., 5940 S.W. Hood, Portland, Ore., (503) 246-5451. Branch Office: Seattle, Wash.
Poly-Onics, Inc., 4434 W. 90 Terr., Leawood, Kans., (913) 648-4173. TWX: 910-749-6479. Branch Office: Hazelwood, Mo.
Porter Co., 17000 Ventura Blvd., Encino, Calif., (213) 788-2350. TELEX: 64-1434.
Positive Consultants Inc., 2255 Arby Court, Box 453, Bellmore, N.Y., (516) 221-2262.
Potter, N., Assocs., 191 Shotwell Rd., Woodstock, N.Y., (914) 679-6074.
Power Equipt. Co., 1630 State St., Box 787, Bettendorf, Iowa, (319) 355-5623.
Premmco/PH, 3351-59th St., Long Beach, Calif., (213) 636-9205. Branch Office: Alameda, Calif.
Printz, W., Co., Inc., 81 Urban Ave., Westbury, N.Y., (516) 334-7770.
Pro Mktg. Corp., 451 E. 58th Ave., Denver, Colo., (303) 266-2571.
Pugh, C. L., Assocs., Inc., 2144 Riverside Dr., Columbus, Ohio, (614) 486-9678. Branch Offices: Berea, Ohio; Pittsburgh, Pa.
Puleo Electronics Inc., 39 Hutcheson Pl., Lynbrook, N.Y., (516) 599-4875. TWX: 510-225-8440.
Purdy, W. J., Co., 770 Airport Blvd., Burlingame, Calif., (415) 347-7701. TWX: 910-247-2353. Branch Office: Littleton, Colo.
Purinton, R., Inc., 28 Park St., Andover, Mass., (617) 475-7055. TWX: 710-347-0338.
Putnam, L. B., Co., 7111 Larsh Dr., Denver, Colo., (303) 825-5066. Branch Office: Salt Lake City, Utah.
Pyle, J., Co., 1611 Borel Pl.—Suite #4, San Mateo, Calif., (415) 349-1266. TWX: 910-374-2354.

Q

Q.E.D. Electronics, Inc., 500 Nuber Ave., Mount Vernon, N.Y., (914) 664-0080. TWX: 710-560-0014. Branch Offices: Silver Spring, Md.; Camden, N.J.
QRC Company, Inc., 134 Upland Rd., Waban, Mass., (617) 332-9600.
Quadtron Assoc. Inc., Box 306, Lombard, Ill., (312) 627-6800.

R

Radco Company, 614 First Union Natl. Bk. Bldg., Winston-Salem, N.C., (919) 722-9671.
Ragon, R. G., Inc., 1136 W. Larpenteur Ave., St. Paul, Minn., (612) 488-0201. TWX: 910-563-3736.
Randall, K., Co., 250 Haddon Ave., Box 100, Collingswood, N.J., (609) 854-3323. Branch Office: West Chester, Pa.
Ranson, Wallace & Co., Inc., 116½ E. 4th St., Charlotte, N.C., (704) 334-4244.
Rathsburg Assocs., Inc., 16621 E. Warren Ave., Detroit, Mich., (313) 882-1717.
Raymarg, Box 515, Santa Clara, Calif., (408) 248-5199.
RDP Instruments, Inc., 999 Commercial St., Palo Alto, Calif., (415) 328-6666. Branch Office: Downey, Calif.
Reagan, J. A., Co., Inc., 6 Highland Ave., Albany, N.Y., (518) 489-4777. TWX: 710-441-8224. Branch Offices: Binghampton, N.Y.; New Hartford, N.Y.; Newburgh, N.Y.; Rochester, N.Y.
Recht Assocs., 900 N. San Antonio Rd., Los Altos, Calif., (415) 941-0336. TWX: 910-370-7454.
Reese Engrg. Sls. Co., Box 600, Paoli, Pa., (215) 644-8717.
Reeves, W., Assocs., Inc., 2973 N. Providence Rd., Media, Pa., (215) 566-6709.
Reichold Assocs., 1655 House St., Belmont, Mich., (616) 866-0626.
Reid Assocs., Inc., 526 Merchants Nat'l. Bank Bldg., Cedar Rapids, Iowa, (319) 362-6302.
Reid, R. L., & Co., 248 W. Pamela Rd., Arcadia, Calif., (213) 681-0711.
Reid, R. L., & Co., 707 E. 106th St., Indianapolis, Ind., (317) 846-2511. Branch Office: Arcadia, Calif.
Reid, R. T. Assocs., Inc., 175 Cedar La., Teaneck, N.J., (201) 692-0200.
Reiss, R. S., Assoc., 70 Jessie Drive, West Haven, Conn., (203) 933-8542. Branch Office: Sharon, Mass.
Reizes, H. N., 1473 Sylvia Lane, East Meadow, L.I., N.Y.
Rep Assocs., 1645 So. LaCienega Blvd., Los Angeles, Calif., (213) 274-8485.
Rep Tec Inc., Pickard Bldg., 5858 E. Molloy Road, Syracuse, N.Y., (315) 454-0761. Branch Offices: Clarence, N.Y.; Vestal, N.Y.
Repex Inc., Box 807, 2015 Latham St., Mountain View, Calif., (415) 969-9200. TWX: 910-379-6477. Branch Offices: Costa Mesa, Calif.; Bellevue, Wash.
Representatives, The, Corp., 52 Main St., Topsfield, Mass., (617) 426-0541. Branch Office: Bethany, Conn.
Retzloff, W. R., Co., Box 1786, San Antonio, Texas, (512) 533-7839.
Reynolds & Assocs. Inc., Box 1043—822 E. Strawbridge Ave., Melbourne, Fla., (305) 727-3205. TWX: 510-959-6003. Branch Offices: Huntsville, Ala.; Ft. Lauderdale, Fla.; Orlando, Fla.; Atlanta, Ga.; Graham, N.C.
R F Assocs., Inc., 1621 Pontius Ave., Los Angeles, Calif., (213) 478-1586. TWX: 910-342-6884. Branch Office: Palo Alto, Calif.
RF Specialists, 118 W. Higgins Rd., Park Ridge, Ill., (312) 698-2044.
Ribble, C. H., Co., Inc., 31 Di Carolis Ct., Hackensack, N.J., (201) 342-2602.
Richards Assocs., 900 San Antonio—Suite L, Los Altos, Calif., (415) 941-3226.
Richardt, J. W., Co., Rt. 46—Box 154, Great Meadows, N.J., (201) 637-4107. Branch Offices: Pine Brook, N.J.; Whippany, N.J.
Richter, H. G., Inc., 608 Sherwood Pkwy., Mountainside, N.J., (201) AD 3-4615. TWX: 710-997-9581. Branch Office: Fayetteville, N.J.
Rider, W. N., Co., 6211 Denton, Dallas, Texas, (214) 357-2246.
Ridley Assocs., Box 370, Williams Bay, Wisc., (414) 245-5543.
Riedel, M. W., & Co., 2215 W. Valley, Alhambra, Calif., (213) 283-7694. TWX: 910-589-3375. Branch Offices: El Cajon, Calif.; Mountain View, Calif.
Riggs, C. E., Inc., 422 Northwest 8th, Portland, Ore., (503) 226-3286. Branch Office: Seattle, Wash.
Riley & Petchell Sls., Inc., 16515 Schoolcraft Ave., Detroit, Mich., (313) 838-9100. Branch Office: Buchanan, Mich.
Ringer, R. L., Co., Box 114, Glen Rock, N.J., (201) 444-1434.
Ripley, R., & Assocs., 11040 Goodrich Circle, Box 20-447, Minneapolis, Minn., (612) 881-8282.
Rissi Sls. Co., 11936 E. Washington Blvd., Whittier, Calif., (213) 945-2341.
RIVCO, Box 338, King of Prussia, Pa.
RJC Assocs., 26 Morningside Dr., Cortland, N.Y., (607) 753-3909.
R. L. Assocs., Box 2255, Sepulveda, Calif., (714) 782-7826.
R. L. Assocs., 14401 Gilmore St., Van Nuys, Calif., (213) 782-7826. TWX: 910-495-1733.
Roberts Assocs., 1624 Souvenir Dr., Clearwater, Fla., (813) 447-3712.
Roberts, E. V., & Assocs., Inc., 9601 W. Jefferson Blvd., Culver City, Calif., (213) 870-9561. TWX: 910-340-6363. TELEX: 67-4103. Branch Offices: Palo Alto, Calif.; San Diego, Calif.
Robertson, E. B., Inc., 1339 Plowman Ave., Dallas, Texas, (214) 942-8486. TWX: 861-4357. Branch Office: Houton, Texas.
Robinson, C. A., Co., Inc., 5010 Mayfield Rd., Cleveland, Ohio, (216) 381-9049. Branch Office: Dayton, Ohio.
Robinson, R. H., Co., Box 368, Coventry, Conn., (203) 742-7323. Branch Office: Norwood, Mass.
Roburn Agencies, Inc., 349 W 14th St., N.Y., N.Y., (212) 989-5939.
Rockford Controls Co., 21 W. 181 Hill Ave., Glen Ellyn, Ill., (312) 469-6016.
Rockford Controls Ohio, Inc., 2077 Embury Park Rd., Dayton, Ohio, (513) 278-7362. TWX: 810-459-1983. Branch Offices: Cleveland, Ohio; Columbus, Ohio; Pittsburgh, Pa.
Roes, H. A., & Co., 1509 Gold Terr., Deltona, Fla., (305) 574-2564.
Rogell Assocs., Inc., Box 797, Norwalk, Conn., (203) 853-4141.
Root, G. S., & Co., 809 Wainwright Dr., Pittsburgh, Pa., (412) 561-4125.
Ropek-Cahill, Inc., 5439 W. Division St., Chicago, Ill., (312) 287-7292. TWX: 910-221-5219.
Rosen, G., & Assoc., Inc., 9501 Wadsworth Dr., Bethesda, Md., (301) 365-5113.
Rosen, G., Co., Inc., 563 Worcester Rd., Natick, Mass., (617) 655-2211. TWX: 710-386-6983. Branch Office: Stratford, Conn.
Ross, David H., Co., 1095 Industrial Rd., San Carlos, Calif., (415) 591-4411. TWX: 910-376-4392.
Roth, M., Sls. Co., 678 South Green Rd., Cleveland, Ohio, (216) 382-9090.
Rothenheber & Wurts, Inc., 53 Cricket Ave., Ardmore, Pa., (215) MI 2-6911. Branch Office: Rockville, Md.
Roussey, R. F., & Assocs., Inc., 6101 N. Sheridan Rd. East, Chicago, Ill., (312) 764-1374.
Rowland, E. W., Assocs., 132 Nassau St., New York, N.Y., (212) 965-7188.
Royelec Electronic Rep., Box 254, 605 Krise Bldg., Lynchburg, Va., (703) 846-7117.
Rudisill, J., Assoc., Inc., 1225 Harding Pl., Box 4245, Charlotte, N.C., (704) 377-6901.
Runyon Co., Inc., Box 1567, 6825 E. Thomas, Scottsdale, Ariz., (602) 947-5711. TWX: 910-950-1290.
Rush, C. B., & Assocs., 1830 W. Olympic Blvd., Los Angeles, Calif., 388-7111.
Rushin, E., Co., Box 486, Roswell, Ga., (404) 993-6498.
Russell Assoc. Inc., 165 Orinoco Dr., Brightwaters, N.Y., (516) MO 6-6500. TWX: 510-227-6141. Branch Offices: Bel Air, Md.; Atlanta, Ga.; Huntsville, Ala.; Winter Park, Fla.; Greenhills, Cincinnati, Ohio; Detroit, Mich.; McHenry, Ill.; Pasadena, Calif.; Seattle, Wash.; Buffalo, N.Y.; Waltham, Mass.; Fair Haven, N.J.; Dallas, Tex.
Rutt, W., Inc., 475 White Plains Rd., Eastchester, N.Y., (914) 779-4100.
Ryaby Assocs., 38 Wall St., Passaic, N.J., (201) 773-6359. Branch Office: Lavallette, N.J.
Ryan Assocs., 60 Roger Dr., Port Washington, N.Y., (516) 767-7958. Branch Office: Elizabeth, N.J.
Ryerson, J. D., Assoc. Inc., Box 8369, Rochester, N.Y., (716) 442-1900. Branch Offices: Albany, N.Y.; Syracuse, N.Y.; Williamsville, N.Y.
Rywel Sls. Inc., The Lincoln Bldg., Syosset, N.Y., (516) 364-0888.

S

S-J Sales Assocs. Inc., 148-05 Archer Ave., Jamaica, N.Y., (212) 291-3232. TWX: 710-582-2635.
Saffro & Assocs., 3736 Dempster St., Skokie, Ill., (312) 588-0905. Branch Office: Oak Creek, Wisc.
Saffler, P., Assoc., Inc., 157 W. 57th St., New York, N.Y., (212) 247-3855. TWX: 710-581-5887. Branch Office: Rochester, N.Y.
Sales Engrg. Co., Baker Ave., West Concord, Mass., (617) 369-3943.
Sales, G. F., Co., 4750 N. Milwaukee Ave., Chicago, Ill., (312) 545-5562. TWX: 312-265-1496.
Salsbury Assocs., Inc., 331 W. John St., Hicksville, L.I., N.Y., (516) 938-1080. TWX: 510-221-1887.
S.A.M. Assocs. Inc., 150-08 87th Ave., Jamaica, N.Y., (212) 658-8881. Branch Office: Wayne, N.J.
Sandman Elec. Co., Inc., 660 Parker St., Boston, Mass., (617) 442-7600.
Sanford, L. C., Assocs., 1994 Kansas Ave. N.E., St. Petersburg, Fla., (813) 526-5403.
Satterthwaite, W. F., & Co., Box 191, Lansdowne, Pa., (215) 623-5100.

Satullo Co., The, 4514 N. Woodward, Royal Oak, Mich., (313) 549-3910. Branch Offices: Cleveland, Ohio; Dayton, Ohio.
SBM Assocs., Inc., 45-15 Culver Rd., Rochester, N.Y., (716) 266-1400. TWX: 510-253-6145. Branch Offices: Union, N.J.; Plainview, N.Y.; Pleasantville, N.Y.; Syracuse, N.Y.
Scanlon, P. J., Co., Inc., 724 So. Sherman St., P.O. Box 70, Richardson, Texas, (214) 231-4661. TWX: 910-867-4713. Branch Office7: Houston, Texas.
Scanlon, R. B., Co., 10 Halliwell Dr., Stamford, Conn., (203) 325-2718.
Schaal Assocs. Inc., Four A St., Burlington, Mass., (617) 272-7940. TWX: 710-332-0246.
Scheffler, C., Co., 1133 Navajo Trail, Indianapolis, Ind., (317) 253-6337.
Schibley Assocs., Inc., 10604 Warwick Ave., Fairfax, Va., (703) 591-3008. Branch Office: Baltimore, Md.
Schultz, D. A., Co., 801 Southeast 8th St., Minneapolis, Minn., (612) 339-7701.
Scientific Devices S.E. Inc., 707 East Colonial Drive, Orlando, Fla., (305) 424-7932. Branch Offices: Huntsville, Ala.; Ft. Lauderdale, Fla.; Bethania, N. Car.
Scientific Devices—Southwest, Inc., 312 N. Central Expwy, Suite 212, Richardson, Texas, (214) 231-8106. TWX: 910-867-4740. Branch Offices: Phoenix, Ariz.; Denver, Colo.; Albuquerque, N.M.; Houston, Texas.
Schlemmer Assocs., 1172 W. Galbraith Rd., Cincinnati, Ohio, (513) 522-8340.
Schmeichel, E., Co., 5968 W. Chicago Ave., Chicago, Ill., (312) 378-2070.
Schmidt & Assocs., 1419 Deveraux Dr., Dayton, Ohio, (513) 293-6652.
Schmidt, C. H., Co., 16405 W. Eight Mile Rd., Detroit, Mich.
Schmitt, F. E., Co., Inc., 311 Meacham Ave., Elmont, N.Y., (516) 437-8150.
Schmitz Bros., Inc., 82 St. Paul St., Rochester, N.Y., (716) 546-7628.
Schoeffler, F., Assocs., 8755 E. Buena Terra Way, Scottsdale, Ariz., (602) 949-8572.
Schomburg, E. J., Co., Box 8465, Rochester, N.Y., (716) 244-0920.
Schoonmaker, J. Y., Co., Inc., Box 20840, 2995 Ladybird Ln., Dallas, Texas, (214) 357-8481. Branch Offices: Magnolia, Ark.; San Antonio, Texas.
Schroeder & Loomis, Inc., 714 E. 65th St., Indianapolis, Ind., (317) 251-7920.
Schroeder Sls. Co., 2084 Noble Rd., Cleveland, Ohio, (216) 268-3636.
Schuft, The H. J., Co., Inc., 815 Washington St., Newtonville, Mass., (617) 527-5304. TWX: 710-335-6767. Branch Office: New Haven, Conn.
Schultz, N. R., Co., Box 159 Belleview, Wash., (206) 454-0300. Branch Office: Beaverton, Ore.
Schulz, E. A., Co., 721 Sherwood Dr., Indianapolis, Ind., (317) 255-1993.
Scientific Sls. Corp., 7132 N. Harlem Ave., Chicago, Ill., (312) 775-7594. Branch Offices: Indianapolis, Ind.; Minneapolis, Minn.; St. Louis, Mo.
Scientific Systems Sls. Corp., 376 Great Neck Rd., Great Neck, N.Y., (516) 466-0053. Branch Office: Washington, D.C.
Scott, G. G., Co., 6 W. Stuart Dr., Glen Cove, N.Y., (516) 676-2088.
Scott, Michael, Co., Inc., 20 Walnut St., Wellesley Hills, Mass., (617) 235-0102. TWX: 710-383-7526.
Seatronics Inc., 5616 4th Ave., So., Seattle, Wash., (206) 767-4330.
Seay, H. H., Co., 1350 Crestwood Ave., Columbus, Ohio, (614) 235-0265.
Sebright, R. D., & Co., 7120 W. Florissant, St. Louis, Mo., (314) 261-0055.
Segel, C., Co., Box 106, Newtonville, Mass., (617) 969-6900. Branch Office: Hartford, Conn.
Sel-Tronics Inc., 721 Ellsworth Dr., Silver Spring, Md., (301) 589-3391.
Sencor, Inc., 2222 Glendale St., Phila., Pa., (215) FI 2-0223. Branch Office: Albertson, N.Y.
Shannon Assocs., One First St., Los Altos, Calif., (415) 941-2217.
Sharp, The F. R., Co., Inc., 14904 Euclid Ave., Cleveland, Ohio, (216) 249-7000. Branch Offices: Cincinnati, Ohio; Dayton, Ohio; Ligonier, Penna.
Shaw, S. A., Inc., 30 New Bridge Rd., Bergenfield, N.J., (201) 384-5400.
Sheffer, J. W., Co., 4609 Old Frederick Rd., Baltimore, Md., (301) 233-0606.
Shelby, T., & Co., 17 S. Walnut, New Bremen, Ohio, (419) 629-6511.
Shelmar Elctrns. Corp., Box 254, Glenside, Pa., (215) 885-0800.
Shelps, G. A., Co., #2 Roberts Block, Box 254, Glenside, Pa., (215) 885-0800.
Shephard Components, 16152 Covello St., Van Nuys, Calif., (213) 787-4610. TWX: 910-495-1741.
Sherertz-Henderson Co., 5707 W. Lake St., Chicago, Ill., (312) CO 1-1032.
Sheridan Assocs., Inc., Box 37646, Cincinnati, Ohio, (513) 761-5432. Branch Offices: Lathrup Village, Mich.; Grand Rapids, Mich.; St. Louis, Mo.; Cleveland, Ohio; Dayton, Ohio; Pittsburgh, Pa.
Shields, W. D., Co., Box 9093, Pittsburgh, Pa., (412) 471-6946.
Shiell, T. J., Assocs., Box 504, Menlo Park, Calif., (415) 323-6404.
Shprentz, H., Co., 126 Deertrack Lane, Irvington, N.Y., (914) 591-7970.
Siclari, V., 655 Atlantic Rd., North Palm Beach, Fla., (305) 848-8000. Branch Office: Brooklyn, N.Y.
Sidnell, R. G., & Co., Inc., 3300 S. Dixie Dr., Dayton, Ohio, (513) 293-1194. Branch Offices: Orchard Lake, Mich.; Mentor, Ohio.
Siff, R. G., & Assoc., Inc., 22 Oxford Ave.—Sta. B., Dayton, Ohio. Branch Office: Sarasota, Fla.
Silvers, M. M. & Assocs., 4403 Sheridan Rd., Chicago, Ill.
Simberkoff Sls., Inc., 71 Valley St., So. Orange, N.J., (201) 763-7900. TWX: 710-999-5517. Branch Offices: Kenmore, N.Y.; Kingston, N.Y.; Lockport, N.Y.; Phila., Pa.; Arlington, Va.
Sinai-Johnson, Inc., 817 Douglas Ave., Box 5218, Redwood City, Calif., (415) 365-6263. TWX: 910-378-5427.
Sinclair Elctrn. Assocs., 1085 Clarendon Crescent, Oakland, Calif., (415) 451-1835.
Sir Sls. Inc., Box 335, 35 Powerhouse Rd., Roslyn Heights, N.Y.
Slater, R. R., Co., 713 Terminal Sales Bldg., Seattle, Wash., (206) 622-3860. Branch Office: San Francisco, Calif.
Slubin, L., & Co., 2305 Fairmount Ave., Philadelphia, Pa., (215) 236-2072.
Smith, A., Co., 405 166th S.E., Bellevue, Wash., (206) 746-6770.
Smith, D., & Assoc., Inc., 32 South River St., Box 1364, Aurora, Ill., (312) 896-0828.
Smith, E. E., Assoc. Inc., 7 South Main St., W. Hartford, Conn., (203) 236-3521.
Smith, G. W., Co., Box 265, Tucker, Ga., (404) 938-8335.
Smith, H. M., & Assoc., 1341 Old County Rd., Belmont, Calif., (415) 591-8961.
Smith, H. F., 259 W. 14th St., Room 1515, New York, N.Y., (212) CH 2-2398.
Smith, J. J., & Assocs., Inc., Box 1506, Melbourne, Fla., (305) 254-4206. Branch Offices: Dunedin, Fla.; Miami, Fla.
Smith, M. K., Inc., 1605 Chatham Ave., Charlotte, N.C., (704) 372-1026. Branch Offices: Ft. Lauderdale, Fla.; Birmingham, Ala.; Chamblee, Ga.; Marietta, Ga.
Smith, R., Co., 59 Verndale St., Brookline, Mass., (617) 277-0017. Branch Office: West Hartford, Conn.
Smith, The, Co., Box 85, South Orange, N.J., (201) 763-1770.
Snitzer, T. L., Co., 9005 Exposition Blvd., Los Angeles, Calif., (213) 836-6170. TWX: 910-340-6170. Branch Offices: Phoenix, Ariz.; Cupertino, Calif.; Del Mar, Calif.
Snyder Sls. Co., 102 South Washington St., Box 243, Hingdale, Ill., (312) 323-9191.
Snyder, L. G., Co., 1418 North Highland Ave., Hollywood, Calif., (213) 469-6278.
Sodaro Co., 3753 South Robertson Blvd., Culver City, Calif., (213) 838-5272.
Somers, J. F., Co., 527 So. Main St., Geneva, N.Y., (315) 789-7938.
Sonkin, D., Assocs., Inc., 10 Fiske Place, Mt. Vernon, N.Y., (914) 668-9809.
Southern Intl. Sls. Corp., Box 1896, San Juan, Puerto Rico, (809) 722-0863. Telex: 365384.
Southern Sls. Co., 105 Lakeshore Dr., Angola, Ind., (219) 665-3961. Branch Offices: Indianapolis, Ind.; Louisville, Ky.
Southland Engrg. & Sls. Inc., 5810 Schumacher La., Houston, Texas, (713) 782-4575. Branch Office: Dallas, Texas.
Southwest Elctrn. Inds., Inc., 621 Meadows Bldg., Dallas, Texas, (214) 363-1671. Branch Offices: Tulsa, Okla.; Houston, Texas.
Space Age Sls. Co., Box 35625, Dallas, Texas, (214) 357-5713.
Space Engrg., 491 No. Los Robles Ave., Pasadena, Calif., (213) 681-4421, 449-3456.
Spacetronics Co., 4515 Prentice St., Dallas, Texas, (214) 368-1215.
Spellman, F., Co., 1295 Northern Blvd., Manhasset, N.Y., (516) MA 7-3399.
Spencer, C. H., & Co., Box 1054, Salt Lake City, Utah, (801) 486-1081.
Spenser, W., Co., 21500 Greenfield Rd., Oak Park, Mich., (313) 398-8005. Branch Office: Windsor, Ontario, Canada.
Spivey-LeBoeuf Assocs., Box 12321, 7547 Wilmerdean, Houston, Texas, (713) 649-1221. Branch Office: Richardson, Texas.
Sproch Sales Inc., 3520 W. Broward Blvd., Ft. Lauderdale, Fla., (305) 587-3792. Branch Office: Winter Park, Fla.
Sprung-Nussbaum Inc., 120 Sylvan Ave., Englewood Cliffs, N.J., (201) 947-6767. TWX: 710-991-9645.
Squibb, R. K., Inc., 655 N.E. Northlake Pl., Seattle, Wash., (206) 632-2450. FAX GNS.
Stacks, J., Co., Inc., 1312 W. T. Waggoner Bldg., Fort Worth, Texas, (817) 332-5044.
Staff, R. A., Co., 19684 Center Ridge Rd., Cleveland, Ohio, (216) 331-5100. Branch Offices: Syracuse, N.Y.; Cincinnati, Ohio; Oregon, Ohio.
Stang Sls. Corp., 271 Columbus Ave., Tuckahoe, N.Y., (914) 779-6868.
Shapiro, S., Assocs., 1467 Sylvia Lane, East Meadow, N.Y., (516) 483-4185.
Steffen, D., & Assoc., Inc., 904 East 222 St., Cleveland, Ohio. Branch Office: Dayton, Ohio.
Stein Instrumentation Corp., 413 Johnson St., Jenkintown, Pa., (215) 885-2370.
Stemm, R. E., Inc., 17W480 Lake St., Addison, Ill., (312) 279-2440. Branch Office: Minneapolis, Minn.
STEPCO Inc., Box 9836, El Paso, Texas, 772-5274.
Sterling, S., Co., 5827 Mayfield Rd., Cleveland, Ohio. Branch Offices: Addison, Ill.; Southfield, Mich.; St. Louis, Mo.; Dayton, Ohio; Pittsburgh, Pa.
Stevens Engrg., 5306 W. Lawrence Ave., Chicago, Ill., (312) 725-4400.
Stevens, D., & Co., 1610 South Bonnie Brae St., Los Angeles, Calif., (213) 747-9221. Branch Office: Burlingame, Calif.
Stevens, L. C., & Co., Inc., Box 24, 442 Marrett Rd., Lexington, Mass.
Stickel-McAllister, 4357 Melrose, Los Angeles, Calif., (213) 665-6621.
Still, Palmer & Associates, 9415 Old Bonhomme Rd., St. Louis, Mo., (314) 993-2077.
Stinson Assocs., 227 Haverford Ave., Narberth, Pa., (215) 664-5511.
Stobbart, A. J., Drexline Apts. #302, 4980 State Rd., Drexel Hill, Pa., (215) 259-3881.
Stolaroff, M. A., Co., 4622 W. Slauson Ave., Los Angeles, Calif., (213) 295-7781. TWX: 910-321-3884.
Stone, Carrington, Engrs., 205 W. Wacker Dr.—Rd. 2020, Chicago, Ill., (312) RA 6-7725.
Stone, J., & Assoc., 330 Second St., Los Altos, Calif., (415) 948-4563. TWX: 910-370-7953.
Stone, J. L., 110 Terrace Circle, Dewitt, N.Y., (315) 446-5127.
Stone, R. R., & Assoc., Inc., Box 47, Mentor, Ohio, (216) 946-6766. Branch Office: Dayton, Ohio.
Stout, H., Assocs., 200 Third St., Los Altos, Calif., (415) 948-3265. FAX: FDC.
Stranco Prods., 1534 W. Van Buren St., Chicago, Ill., (312) 738-1580. TWX: 910-221-3830. Branch Office: Spotswood, N.J.
Strassner, E. E., Co., 3121 Los Feliz Blvd., Los Angeles, Calif.
Strassner, R. A., Co., Inc., 3003 Glendale Blvd., Los Angeles, Calif., (213) 666-4040. TWX: 910-321-3990. Branch Offices: Phoenix, Ariz.; Los Altos, Calif.
Stratton, C. H., 7720-A Stenton Ave., Philadelphia, Pa.
Strever Co., Inc., Box 325, Montrose, Calif., (213) 245-8803. TELEX: 674219.
Striker, J. E., Co., 1319 Howard Ave., Burlingame, Calif., (415) 342-1425.
Strother & Assoc., Inc., 6050 Brown Rd., St. Louis, Mo., (314) 521-5100. TWX: 910-760-1629.
Sturdy, R. H., Co., Inc., 204 Worcester St., Wellesley Hills, Mass., (617) 235-2330. TWX: 710-383-6519. Branch Office: Hamden, Conn.
Sturgeon, P. R., Co., Inc., 1330 Boylston St., Chestnut Hill, Mass., (617) 235-8462. Branch Office: Meriden, Conn.
Sunday—O'Brien, 15 Potter St., Haddonfield, N.J., (609) 429-4013.
Surratt Mfg. Sales Agency, 231 Cedar St., Jackson, Tenn., (901) 422-3623.
Swedgal, M., 258 Broadway, New York, N.Y., (212) WO 2-5485.
Swenson, E. V., & Assocs., 1112 Talbott Tower, Dayton, Ohio, (513) 223-4279.
Swinke, W. F., & Assocs., 3014 Colfax St., Evanston, Ill., (312) 248-4343.
Sykes, V. J., Assocs., Inc., 13333 N. Central Exprwy., (214) 235-5280.
Sylvester, F. F., Assocs., 649 Morris Ave.—Box 207, Springfield, N.J., (201) 376-3324. TWX: 710-983-4439. Branch Office: Great Neck, N.Y.
Symon Assocs., 663 Fifth Ave., New York, N.Y., (212) 757-3638.
Systems Engrg. Assocs., 5505 N. Menard Ave., Chicago, Ill., (312) 774-1452.

T

T A Instrs., Inc., Box 14125, Orlando, Fla., (305) 843-3030. Branch Offices: Huntsville, Ala.; Spartanburg, S.C.
Tak Instrs. Assocs., Box 226, Palisades Park, N.J., (201) 944-3337.
Talbe Co., Inc., 19 Sylvan Ave., Englewood Cliffs, N.J., (201) 947-5038. Branch Offices: Stamford, Conn.; Dayton, Ohio.
Talbot Assocs., Inc., 11 Cleveland Pl., Springfield, N.J., (201) 376-9570.
Talcomp Co., Inc., 19 Sylvan Ave., Englewood Cliffs, N.J., (201) 947-5038. Branch Offices: Stamford, Conn.; Dayton, Ohio.
Tate Engrg. Inc., 601 W. West St., Baltimore, Md., (301) 539-0787. Branch Offices: Bladensburg, Md.; Hagerstown, Md.; Salisbury, Md.; Roanoke, Va.; Richmond, Va.
Tauber, W., Co., 151 Fayette Blvd., Syracuse, N.Y., (315) 446-7094.
TAW Elctrns., 12925 Riverside Dr., Box 5757, Sherman Oaks, Calif., (213) 784-2765. Branch Offices: La Puente, Calif.; Santee, Calif.; Sherman Oaks, Calif.
Taylor, F. W., Co., Inc., 4455 E. Genesee St., Dewitt, N.Y., (315) 446-0422. Branch Office: Rochester, N.Y.
Taylor, D. A., Inc., 2019 Hudson Ave., Rochester, N.Y., (716) 342-8881.
Taylor, J. F., Sls. Co., 5229 Glenway Ave., Cincinnati, Ohio, (513) 471-5750.
Taylor, M. F., Co. Inc., P.O. Box 111, Silver Spring, Md., (301) 589-4002. Branch Offices: Birmingham, Ala.; Casselberry, Fla.; Winter Haven, Fla.; Baltimore, Md.; Charlotte, N.C.; Marlton, N.J.; Camp Hill, Pa.; Philadelphia, Pa.; Pittsburgh, Pa.
Teamwork Inc., 2646 Andjon Dr., Dallas, Texas, (214) 352-7747.
Tech-Rep Assoc. Inc., Box 2095, Melbourne, Fla., (305) 723-9140. Branch Offices: Indian Rocks Beach, Fla.; Ft. Lauderdale, Fla.; Jonesboro, Ga.
Tech-Ser, Inc., 2435 North Naomi St., Box 3255, Burbank, Calif., (213) 846-9631. TWX: 910-498-2709. Branch Offices: Palo Alto, Calif.; San Diego, Calif.; Dallas, Texas.
Tec Sls., 9906 Chicago Ave. So., Minneapolis, Minn., (612) 884-1180.
Tech Mktg. Assocs., Inc., 355 W. Olive Ave., Sunnyvale, Calif., (408) 736-3687. TWX: 910-339-9227.
Technical Assoc., Inc., Box 388, Fairborn, Ohio, (513) 878-2484. Branch Office: Rocky River, Ohio.
Technical Assocs. Inc., Box 14044, Orlando, Fla., (305) 843-3030. Branch Offices: Huntsville, Ala.; Spartanburg, S. Car.
Technical Enterprises, 181 West St., Waltham, Mass., (617) 891-5300.
Technical Instruments, Inc., 122 West St., Wilmington, Mass., (617) 944-3930. Branch Office: Bridgeport, Conn.
Technical Mktg., Inc., 1511 E. Robinson, Orlando, Fla., (305) 843-2500. TWX: 810-850-0161. Branch Offices: Birmingham, Ala.; Hallandale, Fla.; St. Petersburg, Fla.; Marietta, Ga.; Greensboro, N. Car.
Technical Sls. Assocs., 1485 Bayshore Blvd., San Francisco, Calif., (415) 467-1434.
Technical Sls. Co., Inc., 4619 W. Marginal Way S.W., Seattle, Wash., (206) 523-4063.
Technicraft Co., 7028 Ridge Ave., Philadelphia, Pa., (215) IV 3-4700.
TechniSales Co., 3820 E. Colorado Blvd., Pasadena, Calif., (213) 792-5111.
Techno Assocs., 2324 Shorecrest Dr., Dallas, Texas, (214) 357-9213.
Tek-Rep, Inc., 12000 Old Georgetown Rd., Rockville, Md., (301) 762-7777.

Tek-Sel, Inc., 440 No. Midland Ave., Saddle Brook, N.J.
Temco Inc., 118 So. Rogers St., Bloomington, Ind., (812) 332-3377.
Teplitz, H., & Co., Inc., 3718 Salem Ave., Dayton, Ohio, (513) 277-6531. Branch Offices: Cleveland, Ohio; Detroit, Mich.
TESCO Associates, 2002 Teall Ave., Syracuse, N.Y., (315) 463-4566.
TESSCO, Towson Engrg. Sales Svc. Co., Inc., 1931 Greenspring Dr., Lutherville-Timonium, Md., (301) 252-5610. Branch Offices: Adelphi, Md.; Lynchburg, Va.
Test Equip. Sls. Co., 4447 N. Bodine St., Philadelphia, Pa., (215) 329-1822.
Texas Avionics Company, 4515 Prentice St., Dallas, Texas, (214) 368-3566.
Texas Sls. Representatives Co., 2422 Tangley, Houston, Texas, (713) 523-1675.
Texport, Co., The, 2411 Farrington, Dallas, Texas, (214) 631-6270. TWX: 910-861-4507. Branch Offices: Metairie, La.; Houston, Texas; Memphis, Tenn.
Thal-Mor Assoc., Inc., 3232 Encrete Lane, Dayton, Ohio, (513) 298-9939. TELEX: 28-8234.
Thomas & Modrcin Assocs., Inc., Box 189, 5460 Buena Vista Drive, Shawnee Mission, Kans., (913) 432-2131. Branch Offices: Marion, Iowa; Hazelwood, Mo.
Thomas & Sukup, Inc., 2060 E. 54th St., Indianapolis, Ind., (317) 251-4574. TWX: 317-635-8075.
Thomas, C. W., Inc., 134 Tyson Ave., Glenside, Pa., (215) CA 4-5676.
Thompson, J. F., Co., 322 Riverside Dr., Ormond Beach, Fla., (904) 677-2298. Branch Office: Jensen Beach, Fla.
Thorpe, J. M., Co., 640 Hidden Lane, Detroit, Mich., (313) 884-4360.
3 DBM Inc., 5388 Sterling Center Dr., Westlake Village, Calif., (213) 889-2300. TWX: 910-494-1957. Branch Office: Santa Ana, Calif.
Thorson, The, Co., 6824 Melrose Ave., Los Angeles, Calif., (213) 937-0790. TWX: 910-321-4024. Branch Offices: Phoenix, Ariz.; Palo Alto, Calif.; Tustin, Calif.; San Diego, Calif.; Denver, Colo.; Albuquerque, N.M.; Dallas, Texas; Houston, Texas; Seattle, Wash.
Thro Industrial Sls. Co., Box 7244, Kansas City, Mo., (913) 362-2533.
TIBY Co., 2245 Warrensville Center Rd., Cleveland, Ohio, (216) 371-5335. Branch Offices: Dayton, Ohio; Ferndale, Mich.
Tim-Co Sls., 16024 Sherman Way, Van Nuys, Calif., (213) 781-7370.
Titan Reps, Inc., 6434 Maple Bldg., Dallas, Texas, (214) 357-8266.
Tobias & Co., Inc., 49-01 31st Ave., Long Island City, N.Y., (212) 726-4551.
Todino Engrg. Sls. Inc., 50 Kearney Rd.—P.O. Box 201, Needham Hgts, Mass., (617) 444-7925. TWX: 710-325-0126. Branch Office: Milford, Conn.
Tollaksen, G. K., Inc., 610 Main St., Racine, Wisc., (414) 632-2345. Branch Office: Madison, Wisc.
Tollefson, B. H., Assoc., Inc., 110 Allen Creek Rd., Rochester, N.Y., (716) 271-4141. Branch Offices: Alexander, N.Y.; East Syracuse, N.Y.; W. Winfield, N.Y.
Tools For Electronics, Box 173, Waltham, Mass., (617) 894-7080.
Toneline Mfg. Co., 1812 South Halsted, Chicago, Ill.
Townsend Tech. Sls., Box 265, Saratoga, Calif., (408) 252-3478. TWX: 910-338-0240.
Tower Sls. Engrg. Co., 633 Marginal Rd., Paramus, N.J., (201) 265-2878.
Travco Assocs., Inc., 142 Mineola Ave., Roslyn Hghts., N.Y., (516) 621-3223.
Trier, J. S. & Assoc., 2906 Fairchild Apron, Torrance Municipal Airport, Torrance, Calif., (213) 326-1385.
Trinkle Sls. Inc., 500 N. Kings Hwy., Cherry Hill, N.J., (609) 667-3500. TWX: 710-892-0749.
TRITEK, INC., 165A Bedford St., Burlington, Mass., (617) 272-4550. TWX: 710-332-7564.
Truex Assocs., Inc., 3165 McCrory Pl., Orlando, Fla., (305) 841-8931.
TUCUL Engrg. Co., 6402 Crenshaw Blvd., Los Angeles, Calif., (213) 750-0338. TELEX: 67-3309.
Tudor, J. A., & Assoc., Inc., 2605 Western Ave., Seattle, Wash., (206) 682-7444. TWX: 32-209. Branch Offices: Eugene, Ore.; Portland, Ore.; Spokane, Wash.
Twist, J. G., Co., 5222 W. Diversey Ave., Chicago, Ill., (312) 777-2250. TWX: 910-221-1313. Branch Office: Waukesha, Wisc.
Tylinski, F., Co., Inc., 338 Northern Blvd., Great Neck, N.Y., (516) 466-9070.

U

U S Recording Co., 1347 South Capitol St., Washington, D.C., (202) 543-2705.

V

Val-Skol Sls., Inc., 10515 Margate Terr., Cincinnati, Ohio, (513) 563-6790. Branch Offices: Indianapolis, Ind.; Fort Wayne, Ind.; Cleveland Hts., Ohio; Columbus, Ohio.
Varrelman-Gorman Co., Box 206, Livingston, N.J., (201) 992-2505. Branch Offices: Pompano Beach, Fla.; Liverpool, N.Y.
Venn, R. W., Co., Route 2, Box 660, Lake Villa, Ill., (312) 395-5353.
Vereb, S. J., & Assoc., Box 4424, Cleveland, Ohio, (216) 271-2066.
Verter Sls. Co., 2352 E. 66th St., Brooklyn, N.Y., (212) 444-3880.
Vidal Elctrns. Co., 11411 N. Central Expsy., Suite 123, Dallas, Texas, (214) 369-6404.
Vignola, C. A., Assoc. Inc., 2611 Schellridge Rd., Box 569, Jefferson City, Mo., (314) 635-1023. Branch Offices: Kansas City, Mo.; St. Louis, Mo.; Bellevue, Neb.
Villani-Pitcher, Inc., 20233 Ann Arbor Trail, Dearborn, Mich.
Vogt, M., 2817 Bamlet Rd., Royal Oak, Mich., (313) 549-3355.
VPI Assocs., Inc., 13001 Mistletoe Rd., Laurel, Md., (301) 792-7631. TWX: 710-863-2569. Branch Offices: Byfield, Mass.; Great Neck, N.Y.; Phila., Pa.
Vrbik, J., Co., Three-50th St. N.E., Cedar Rapids, Iowa, (319) 377-8244. FAX #FFQ.

W

Wadsworth Mfg. Assoc., Inc., 183 Buckley Rd., Liverpool, N.Y. Branch Offices: Atherton, Calif.; Pacific Palisades, Calif.; Oak Park, Ill.; Williamsville, N.Y.; Richardson, Texas.
Wagner, D., Assoc., Box 485, Altadena, Calif., (213) 681-4060.
Wahl, A. C., & Assocs., Inc., Box 15220, Cincinnati, Ohio, (513) 821-3270. Branch Offices: Evansville, Ind.; Indianapolis, Ind.; Columbus, Ohio; Dayton, Ohio.
Waldman Assocs., 1094 West Evelyn Ave., Sunnyvale, Calif., (408) 245-2500.
Waldrip, Blankenburg & Co., 7650 Chippewa Rd., Brecksville, Ohio, (216) 526-1100.
Wallace, S. K., Assoc., Inc., Box 67, Lutz, Fla., (813) 949-1817. Branch Offices: Miami, Fla.; Tampa, Fla.; Atlanta, Ga.; Kernersville, N.C.; Matthews, N.C.; Memphis, Tenn.
Walsh, J. V., & Assocs., Box 59, Teaneck, N.J., (201) 836-5700.
Walter Assocs. Inc., Box AN, Los Altos, Calif., (415) 941-3141. TWX: 910-370-7458.
Warburg, E., Co., Inc., 1207 E. 8th St., Los Angeles, Calif., (213) 627-1126.
Ward/Davis Assocs., 770 S. Arroyo Pky., Pasadena, Calif., (213) 684-2840. Branch Offices: Palo Alto, Calif.; San Diego, Calif.
Ward Engrg. Co., Inc., 2727 Phyllis St., Jacksonville, Fla., (904) 388-7656. Branch Offices: Ft. Lauderdale, Fla.; Orlando, Fla.
Ware, J. A., & Assoc., 1400 N. 32nd St., Phoenix, Ariz., (602) 273-7309. Branch Office: San Diego, Calif.
Warner, A. J., Co., 4927 34th Ave. So., Minneapolis, Minn., (612) 729-7371.
Warren-Hickey Sls. Co., 175 Fifth Ave., Redwood City, Calif., (415) 368-3849.
Wasson-Gallagher, Suite 104, 1024 N. Boulevard, Oak Park, Ill., (312) CO 1-7517. TWX: 910-228-3321.
Web Elctrn. Assocs., 18039 Crenshaw Blvd., Torrance, Calif., (213) 323-8676.
Weber, D. G., Co., 1226 S.E. 7th Ave., Portland, Ore., (503) 234-7671, 234-0686. Branch Offices: Seattle, Wash.; Spokane, Wash.
Weber, J. L., Agency, 8150 Westfield Blvd., Indianapolis, Ind., (317) 255-4117.
Weber, J., Assocs., Inc., 2700 Henry Hudson Pkwy., Bronx, N.Y., (212) 546-8306.
Weightman & Assoc., 1226 W. Olive, Burbank, Calif., (213) 849-7711. FAX R.T.K. Branch Office: Menlo Park, Calif.
Weinberg, M., Assocs., 1919 Waverly Rd., Laverock, Pa., (215) 885-1918, LI 9-1122.
Weinreich, G., & Assocs., 11554 E. Northwest Hwy., Dallas, Texas, (214) 321-2800.
Weiss, W. W., & Assocs., 1780 Broadway, New York, N.Y., (212) 246-4778.
Weller Elctrn. Sls., Inc., Box 212, Worthington, Ohio, (614) 885-7819.
Wells, W. C., Co., 6055 N. E. Glisan, Portland, Ore., (503) 235-2437.
Wenco Sls., Inc., 7728 Morgan Ave., S., Minneapolis, Minn., (612) 866-3639.
Wes-K Assocs., 5917 Noble Ave., Van Nuys, Calif., (213) 989-3070. TWX: 910-495-1770.
Wesrep Corp., 369 S. Robertson Blvd., Beverly Hills, Calif., (213) 655-9784.
West, J., 6747 N. Octavia Ave., Chicago, Ill., (312) 763-3500.
Westaironics, Inc., 1800 N. Highland Ave., Hollywood, Calif., (213) 466-6201. TWX: 910-321-4226.
Western Electro-Mech., 300 Broadway, Oakland, Calif., (415) 452-1936.
Westrep, 9519 Telegraph Rd., Pico Rivera, Calif., (213) 949-2551. TWX: 910-586-1363.
Wesrep Corp., 339 S. Robertson Blvd., Beverly Hills, Calif., (213) 655-9784. FAX—RDG.
Wetterhahn, A., Co., Inc., 201 W. Cuthbert Blvd., Oaklyn, N.J., (609) 858-3003. TWX: 710-892-0762. Branch Office: Pikesville, Md.
Wheeler, R. J., Griggs-Midway Bldg., St. Paul, Minn., (612) 644-9557.
Whelan, The, Corp., 2600 Far Hills Ave., Dayton, Ohio, (513) 298-9997. TWX: 810-459-1639. Branch Offices: Cleveland, Ohio; Pittsburgh, Pa.
Whitcomb Assocs., 730 Deepdene Rd., Baltimore, Md., (301) 889-1245. Branch Office: Washington, D.C.
White Sls. Co., Inc., 20 Chestnut St., Needham, Mass., (617) 444-3676. Branch Office: Berlin, Conn.
White, B., & Co., Inc., 7 Church Lane, Baltimore, Md., (301) 484-5400. TWX: 710-862-0860.
White, H. J., Co., Inc., 302 W. Marlton Pk., Cherry Hill, N.J., (609) 428-2304-5. Branch Office: Towson, Md.
White-Keystone, L. G., Inc., 100 Essex Ave., Narberth, Pa., (215) MO 4-6505, TE 9-3445.
White, L. G., & Co., Inc., 1110 Fidler La.—Suite 1216, Silver Spring, Md., (301) 585-3141. TWX: 710-825-9635. Branch Office: Winston-Salem, N.C.
Whitehead, J. F., Co., Box 177, Guilford, Conn., (203) 453-3855.
Whitesell, R. O. & Assocs., 6691 E. Washington St., Indianapolis, Ind., (317) 359-5374. Branch Offices: Ft. Wayne, Ind.; Louisville, Ky.; Benton Harbor, Mich.; Southfield, Mich.; Cincinnati, Ohio; Cleveland, Ohio; Dayton, Ohio; Pittsburgh, Pa.
Whitmore Assocs., Inc., 1301 West 22nd St., Oakbrook, Ill., (312) 325-4727. Branch Office: Minneapolis, Minn.
Whitney, M. E., Assocs., Inc., 1400 N. Uhle St., Arlington, Va., (703) 524-5642.
Widdekind, M. K., Co., Inc., 815 W. Ewing, Seattle, Wash., (206) 284-8020. TELEX: 32-0154. Branch Office: Salem, Ore.
Wieler & Co., Box 708, Downey, Calif., (213) 861-9223, 773-5982. Branch Offices: La Jolla, Calif.; Sunnyvale, Calif.
Wild, J. J., Inc., 400 Jericho Tpke., Jericho, N.Y., (516) WE 5-6600. Branch Offices: Laurel, Md.; Needham, Mass.; East Brunswick, N.J.; Hastings-on-Hudson, N.Y.; Jericho, N.Y.; Southampton, Pa.
Wiley, P. F., Co., 1632 Silverlake Blvd., Los Angeles, Calif.
Wilkinson, R. L., Inc., 707 Stevenson Lane, Towson, Md., (301) 377-7800. Branch Office: Glenside, Pa.
Wilks, E. L., Co., Box 34466, Dallas, Texas, (214) 242-5321.
Willgold Elctrn. Sls. Corp., 100 N. Village Ave., Rockville Centre, N.Y., (516) 764-4022. TWX: 510-225-7501.
Williams-Assocs., Inc., 4971 Jackson St., Denver, Colo., (303) 388-4391. TWX: 303-292-2349. Branch Offices: Phoenix, Ariz.; Albuquerque, N.M.
Williams, B. M., 1933 S. Broadway, Los Angeles, Calif., (213) 749-0355.
Williams, H. R., Assocs., Inc., Box 344, Ridgewood, N.J., (201) 444-5392. Branch Office: Westdale, Fla.
Willoughby-Fowler Co., Box 486, 110 N. McKinney, Suite 204, Richardson, Texas, (214) 235-3664.
Wimberly, W. Ben, Co., 532 S. Fort Harrison, Clearwater, Fla., (813) 446-7072. Branch Office: Orlando, Fla.
Windsor Dynamics Inc., Box 5500, Sherman Oaks, Calif., (213) 989-3631. Branch Office: Woodside, Calif.
Winfield Elctrn. Sls. Co., 1875 N.E. 149 St., North Miami, Fla., (305) 751-5566. TWX: 810-848-8772. Branch Office: Atlanta, Ga.
Winslow Design & Sls. Co., 206 North Clay Ave.—Rm. 201, St. Louis, Mo., (314) 965-5880. Branch Office: Kansas City, Mo.
WKM Assocs., Inc., 16141 Puritas Ave., Cleveland, Ohio, (216) 267-0445. TWX: 810-421-8453. Branch Offices: Detroit, Mich.; Dayton, Ohio; Pittsburgh, Pa.
Wolff, A. L., Co., 2485 Huntington Dr., San Marino, Calif., (213) 783-9149.
Wood, A. M., Co., Box 1-A, Arcadia, Calif., (213) 283-1201, 287-0449. TWX: 910-589-3368.
Woods, A. A., & Assocs., Inc., 5511½ Montrose Ave., Chicago, Ill., (312) 283-7400. TWX: 910-221-2579.
Woodit, H. P., Assoc., Box 475, East Orange, N.J., (201) 673-7959.
Woods, G. E., Assocs., Inc., 2415 South Manchester Ave., Anaheim, Calif., (714) 633-9370. Branch Offices: Phoenix, Ariz.; Los Altos, Calif.; San Diego, Calif.
Woolf, I. W., Assocs., 104 S. Central Ave.—P.O. Box 366, Valley Stream, N.Y., (516) 561-0122.
Wright, The, Co., Inc., Box 128, Gaithersburg, Md., (301) 948-5588. Branch Offices: Washington, D.C.; Bethesda, Md.
Wright Engrg., 180 E. California Blvd., Pasadena, Calif., (213) 681-2651. TWX: 910-588-3753. Branch Office: Los Altos, Calif.

Y

Yarbrough Sls. Co., 5808 Monterey Rd., Los Angeles, Calif.
Yarussi, F. P., Co., 312 Rockfield Rd., Pittsburgh, Pa., (412) 221-4676.
Young, F., Assocs., Inc., 555 Winton Rd., N., Rochester, N.Y., (716) 482-1555.
Yount, J., Co., Box 17270—1431 Pleasant Dr., Dallas, Texas, (214) 391-4125.

Z

Zak & Assocs., Inc., 230 S. Bemiston, St. Louis, Mo., (314) 727-8559.
Zaslow Sls. Co., Inc., 6 Newberry Rd., Bloomfield, Conn., (203) 242-7781. Branch Offices: Milford, Conn.; Lowell, Mass.; Northboro, Mass.
Zimmer Sls., Box 329, Shawnee Mission, Kansas, (913) 262-8951. Branch Office: Evanston, Ill.
Zimmerman, W. E., Co., 16603 Ventura Blvd., Encino, Calif., (213) 986-3400.
Zimmerman, W. H., Inc., 112 DeWitt St., Syracuse, N.Y., (315) 474-4889. TWX: 710-541-1572. Branch Office: Rochester, N.Y.
Zlowe, L., Co., Inc., 200 Ashford Ave., Dobbs Ferry, N.Y., (212) 687-7282.

DIRECTORY OF SALES REPRESENTATIVES

GEOGRAPHICAL SECTION (For alphabetical listing see pages 3215-3224)

Main office listings arranged alphabetically within each state and city, with phone and TWX numbers. Listings also include:

- Branch office addresses, phone and TWX numbers. Branch offices are also listed geographically with a cross-reference to the main office listing for complete information.
- Manufacturers represented.
- Types of accounts served.
- Facilities and services.
- Numbers of salesmen. (Parentheses indicate number of salesmen who are engineers.)

This is the most complete list available of independent sales representatives selling electronic equipment, components and materials.

GEOGRAPHICAL SECTION

ALABAMA

Birmingham

CONTROL EQUIPMENT CO., INC. (See Atlanta, Ga.)
GARDNER & MEREDITH, INC. (See Chattanooga, Tenn.)
NICKERSON, F. C. CO., INC. (See Decatur, Ga.)
SMITH, M. K. INC. (See Charlotte, N.C.)
TAYLOR M. F. CO. INC. (See Silver Springs, Md.)
TECHNICAL MKTG. INC. (See Orlando, Fla.)

Huntsville

BCS ASSOCS., INC. (See Orlando, Fla.)
BROWN, W. A. COMPONENTS, INC. (See Orlando, Fla.)
BROWN, W. A. INSTRS., INC. (See Orlando, Fla.)
CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)
COL-LINS CO., INC. (See Orlando, Fla.)
COMPAR CORP. (See Burlingame, Calif.)
CONTROL EQUIPMENT CO. (See Atlanta, Ga.)
DUCKETT, G. SALES CO. (See Atlanta, Ga.)
GENTRY ASSOCS., INC. (See Orlando, Fla.)
HAYDEN, P. ASSOC. (See East Point, Ga.)
HIGHSMITH, J. L. & CO. (See Charlotte, N.C.)
HOLMES, E. G. & ASSOC. (See Chamblee, Ga.)
KEMP ENGRG. CO., INC. (See Dallas, Tex.)
KEMP INSTRS. INC., 4306 Governors Dr., W., Suite N, (205) 837-4804.
Factories: Allen, R. C.; Astrosystems; AVCO Elctrns.; B & F Instrs.; Borg-Warner Controls; Data Memory; Dynisco/A Microdot; Edcliff Instrs.; Flow Technology; General Resistance; Hughes Aircraft Co.; MetroPhysics; Teledyne Telemetry; Tenvac; Thermal Sys.; Weston Instrs. **Services:** Sales Rep Office
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
LEE, LTD. (See N. C.)
LEE ASSOC., INC. (See Orlando, Fla.)
MURPHY & COTA (See Atlanta, Ga.)
REYNOLDS & ASSOCS. INC. (See Melbourne, Fla.)
RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)
SCIENTIFIC DEVICES S. E. INC. (See Orlando, Fla.)
TECHNICAL ASSOC. INC. (See Orlando, Fla.)

ALASKA

Anchorage

ARVA, INC. (See Seattle, Wash.)

ARIZONA

Phoenix

AZTEC ENTERPRISES, INC. (Alburqueue, N.M.)
BARNHILL ASSOCS. (See Denver, Colo.)
BERMAN, J. CO., INC. (Inglewood, Calif.)
COHN & SHANE, INC. (See Los Angeles, Calif.)
DOWERS, A. A. CO. (See Westminster, Calif.)
ELECTRONIC MFRS' CONSULTANTS INC. (See Colorado Springs, Colo.)
GRAMER & CO., 110 W. Camelback Rd., (602) 279-1231. TWX: 910-951-1407.
Factories: Ackerman Engravers; Acton Labs.; Amco Engrg.; Angstrohm Precision; Bowmar Instr.; Calif. Injection Molding; Dexter Corp.; Electro-Winders; Industrial Elctrn. Engrg.; N/P Co.; National Beryllia; O & S Research; Sanders Assoc.; Shaw Insulator; Stacoswitch-Staco; Technology Instr.; U.S. Terminals.
Selling To: ★ I. **Salesmen:** 3 (eng 2)
Services: Mail

(See Advertisement Page 3226)

HARRIS, B. CO. (See Los Angeles, Calif.)
HECHT, HENSCHEN & ASSOCS., INC., 2435 E. University Dr., (602) 275-4411. TWX: 910-951-0635.
Branch: 3997 E. Bayshore Rd.; Palo Alto, Calif., (415) 969-3131.
Factories: Croname; CTS; Dentronics; Die-Mate; Fluorocarbon; Fotofabrication; Golden State Castings; Gulton Inds.; Haley Inds.; Hermetite Ametek/Hitemp Wires; Industrial Tectonics; Jessop Steel; Hobbs Div. of Stewart Warner; Jupiter Engrg.; Kidco, Inc.; Kiemotive Corp.; Mahler Engrg.; Marvel Elec.; Micro Tech; Positronic Inds.; Printed Circuits Inc.; Reisner Metals; Seastrom Mfg. Co.; Thermal Systems; TRW Capacitor; TRW Semiconductor; Tube Processing Corp.; Wyman-Gordon Co.; Mayvill Gear; J. T. Kelly & Sons.
Selling To: ★ I. **Salesmen:** 4 (eng 4)
HYTRONIC MEASTS., INC. (See Denver, Colo.)
IFM—SOUTH (See Hollywood, Calif.)
KING ENGRG. CO. (See Encino, Calif.)
KNIGHT, W. B. CO., INC. (See Inglewood, Calif.)
KOESSLER SLS. CO. INC. (See Burbank, Calif.)
LUSCOMBE ENGRG. CO. (See Pasadena, Calif.)
MARSHALL, G. S., CO. (See El Monte, Calif.)
MONTGOMERY BROS., INC. (See Burlingame, Calif.)
MOORE, H. A. SLS. CO., Box 7245, (602) 274-0060.
Factories: Chamois Mfg.; Jackson Electrical Inst.; E. F. Johnson; Littelfuse; Lowell Mfg.; Marden Elctrns.; Mercury Elctrns.; J. W. Miller; Pomona Elctrns.; Sprague Prods. **Services:** Warehouse
Selling To: ★ A,I,D. **Salesmen:** 1
PLS ASSOCS. INC. (See Englewood, Colo.)
SCIENTIFIC DEVICES-SOUTHWEST, INC. (See Richardson, Tex.)
SNITZER, T. L. Co. (See Los Angeles, Calif.)
STRASSNER, R. A. CO., INC. (See Los Angeles, Calif.)
THORSON, CO. (See Los Angeles, Calif.)
WARE, J. A. & ASSOC., 1400 N. 32nd St., (602) 273-7309.
Factories: Anaconda Sealtite; Course Hinds.; Edwin F. Guth; Century Lighting; Edwards Co.; Hunter Div. of Robbin & Myers; Hunt Elctrns.; Moldcast Mfg.; Par Mfg.; Prescolite Mfg. **Selling To:** ★ D. **Salesmen:** 4 (eng 2)
WILLIAMS ASSOCS., INC. (See Denver, Colo.)
WOODS G. E. ASSOCS. INC. (See Anaheim, Calif.)

Scottsdale

AR/TEC, INC., Box 727, (602) 947-6304. TWX: 910-950-1294.
Factories: Circuit Board Drilling Service; Collins Radio; Electro-Cube; Electro-Mech Comp.; Excellon Inds.; Harowe Servo Controls; Kelvin Resistor; Kleer-Vu. Inds.; Macronetics; L. F. Markel & Sons; National Wire & Cable; Price Elec. Co.; Symbolic Displays; Texas Instrs.; Thermalloy; Transformer Engrs.; Wells Elctrns.
Selling To: ★ I. **Salesmen:** 2
Services: Repair.
BENNWITZ ASSOC. INC. (See Albuquerque, N.M.)
RUNYON CO. INC., Box 1567, 6825 E. Thomas, (602) 947-5711. TWX: 910-950-1290.
Factories: Advance Circuits; Barry Controls; Dynamic Instrs.; Electra/Midland; Glasseal Prods.; Glenair; Glentronics; Hopkins Engrg.; Isofilm Intl.; M H & W Intl.; National Connector; Penntube Plastics; S R Engrg.; Scott Elctrns.; Skydyne; Stop Components; Voltronics; Wabash Magnetics; Weston-Transicoil.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
Services: Warehouse
SCHOEFFLER, F. ASSOCS., 8755 E. Buena Terra Way, (602) 949-8572.
Factories: Cicoil; Elctrn. Specialties; Microtran; Singer-General Precision.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)
BFA (See Denver, Colo.)
BIZTEK CO., INC. (See Toluca Lake, Calif.)
COMPAR CORP. (See Burlingame, Calif.)
ENGINEERING SLS. ASSOCS., Box 544, (602) 945-5781.
Factories: Associated Research; Associated Testing Associated Testing Labs.; BTU Engrg.; C & K Components; Essex Wire; Gordos Corp.; Intel Corp.; Magnecraft Elec.; United Aircraft. **Salesman:** 1 (eng 1)
Selling To: ★ D,I,M. **Services:** Repair, Warehouse
FIELDTEC, INC. (See Newport Beach, Calif.)
FOLEY, E. J. & ASSOC., 441 North Winfield Scott Plaza, (602) 945-2665. TWX: 910-950-1180.
Factories: Advance Stamping; J. B. Cooper & Sons; Deringer Metallurgical; Eltee; Indium; K-Tech; Micro-Etch Prods.; Mitronics; Newcomb Spring; Technical Comps. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

M. W. RIEDEL & CO.
MANUFACTURERS REPRESENTATIVES
ELECTRONICS COMPONENTS
A COMPLETE ELECTRONIC MARKETING ORGANIZATION SERVING CALIFORNIA AND ARIZONA
TECHNICAL SALES STAFF
STOCKING FACILITIES
PREMIUM PRODUCTS
Cables, Capacitors, Coatings, Connectors, Delay Lines, P.C. Boards, Potentiometers, Readouts, Relays, Resistors, Switches, Thermistors, Transformers
M. W. RIEDEL & CO.
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TWX 910-589-3375 • Phone (213) 283-7694
BRANCH OFFICES
CALIFORNIA
1626 Pepper Drive, El Cajon, California 92021
Telephone: (714) 442-5664
2015 Latham Street, Mountain View, California 94040
Telephone: (415) 961-0565

FRYCO, Box 460, 403 N. Old Scottsdale Rd., (602) 945-3281. TWX: 910-950-0086.
Factories: American Technical Ceramics; Americon Corp.; Amlabs; Ammon Instrs.; C & M Wire; Gardiner Solder; Insaco; KMC; Rotron; Southern Gage; Tepro.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

GATES, F. Y. CO., INC. (See Albuquerque, N.M.)

ARKANSAS

Eldorado

MILBANK MFG. CO. (See Kansas City, Mo.)

Little Rock

MacDONALD, B. C. & CO. (See St. Louis, Mo.)

Magnoliz

SCHOONMAKER, J. Y. CO., INC. (See Dallas, Tex.)

CALIFORNIA

Alameda

PREMMCO/PH (See Long Beach, Calif.)

Alhambra

LEWIS, D. ASSOCS. (See Hayward, Calif.)

RIEDEL, M. W. & CO., 2215 W. Valley, (213) 283-7694. TWX: 910-589-3375.
Branches: 1626 Pepper Dr., El Cajon, Calif., (714) 442-5664; 2015 Latham St., Mountain View, Calif., (415) 961-0565.
Factories: Abex Inds.; American Components; Aztec Elctrns.; Columbia Tech.; Fairchild Controls; E.I.P., Inc.; Gudeman; Guiton Inds.; International Electro Exchange; Microfab; Phelps Dodge Communications; Positronic Inds.; R.C.L. Elctrns.; Sanders Assocs.; Shelly Assocs.; Singer; T.C. Prods.; Voak Engrg. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 9 (eng 4)

(See Advertisement This Page)

Altadena

WAGNER, D. ASSOC., Box 485, (213) 681-4060.
Factories: Ajax Condenser; Artted; Clad Rex Div.; Connector Corp.; Crystek; Elcom Sys.; Elctrn. Applications; Flight Sys.; Greenray Inds.; Intermares; Jaidinger Mfg.; Marvel Elec.; Metric Engrg.; Neshaminy Transformer; Oaktron Inds.; Oven Inds.; Plastic Ware; Stampede.
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 2)

Anaheim

L & M Sls., 2404 S. Redwood Dr., Box 6255, (714) 774-0492.
Factories: Cable Tech; D-Cemco; Elctrn. Instr. & Specialty; Glenair; Milton Ross; National Beryllia; Optomechanisms; Protolab; Rowe Inds.; Zippertubing.
Selling To: ★ I,A,D,M. **Salesmen:** 3 (eng 1)
Services: Direct Mail

WOODS, G. E. ASSOCS. INC., 2415 South Manchester Ave., (714) 633-9370.
Branches: 1182 Los Altos Ave., Los Altos, Calif., (415) 941-3343; Box 11308, San Diego, Calif., (714) 279-7120; 1400 North 32nd St., Phoenix, Ariz., (602) 273-0605.
Factories: American Optical; Bourns; Crest Ultrasonics; Dexon; P. Dosier Assocs.; Gale Sys.; Henes Mfg.; Hughes Vacuum Tube Prods.; Micronetics; Plat Engrg.; Protonic Inds.; Sonobond; Synergistic Prods.; Tekform Prods.; Workplace Sys. **Salesmen:** 7
Selling To: ★ Electronic & Aerospace

Arcadia

LYNCH, T. CO., ELECTRONIC MFG. REP., 1125 Singingwood Dr., (213) 355-1753, 684-1392.
Factories: C T S Knights; Dictation Prod.; Electra Corp.; Erie Technological Prod.; Gentec Inc.; I E Mfg.; Oneida Electronic Mfg.; Pageant; Rola Div., Muter; Telephone Dynamics; Tennessee Paper & Box.
Selling To: ★ D. **Services:** Warehouse **Salesman:** 1

REID, R. L. & CO. (See Indianapolis, Ind.)

WOOD, A. M. CO., Box 1-A, (213) 283-1201, 287-0449. TWX: 910-589-3368.
Factories: E-Z-Hook Test Prods.; Langevin Div.; Robinson-Nugent; Syntronic Instr.; Westport Dev & Mfg.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)

Atherton

WADSWORTH MFG. ASSOC. INC. (See Liverpool, N.Y.)

Belmont

SMITH, H. M. & ASSOC., 1341 Old County Rd., (415) 591-8961.
Factories: Alina; Bausch & Lomb; Boeckler Inst., Brown & Sharpe; Collins; Dazor; Fowler; R. T. Gilman; Hamilton Watch; Helios; Johannson, C. E.; Kennedy, Luxo; Mahr; Mitotoyo; Moderntool; National Borescope; Neise; Noblewest; Olympus Microscopes; Pratt & Whitney; Rahn Granite; Rex durometers; Scherr-Tumico; Shore Inst.; Swift; Troyke; Van Keuren.
Selling To: ★ A,I,D,M. **Salesmen:** 4 (eng 1)
Services: Repair, Warehouse, Gaging consultation.

Berkeley

HUGHES, R. S. CO., INC. (See Los Angeles, Calif.)

Beverly Hills

WESREP CORP., 369 S. Robertson Blvd., (213) 655-9784.
Factories: Dia Prods.; National Laminating Mfg.; Saveresen Cements. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

Bonita

NAECO ASSOCS., INC. (See Arlington, Va.)

Burbank

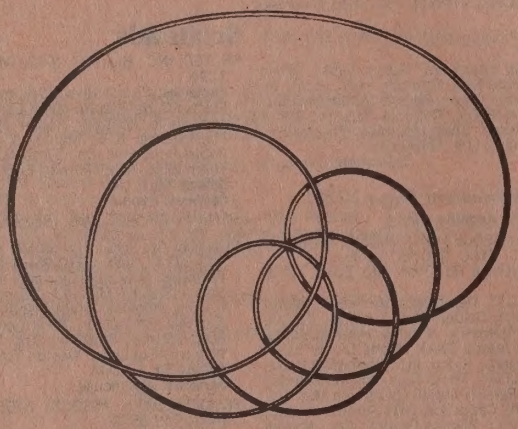
COMPAR CORP. (See Burlingame, Calif.)

KOESSLER SLS. CO. INC., 2010 W. Burbank, (213) 849-5716.
Branch: 4614 North Seventh St., Phoenix, Ariz., (602) 264-4031.
Factories: Audio Accessories; Audio Devices; R. T. Bozak Mfg.; Elpa Marketing Inds.; McIntosh Audio; McIntosh Labs.; Thomas M. Morris Assocs.; Panacoustics; Picker-Briggs; Telex Comm. Div.; Worner Elctrn. Devices.
Selling To: ★ A,I,D,M. **Salesmen:** 5 (eng 1)
Services: Warehouse

(See Advertisement Page 3227)

OLANDER, R. & CO., Box 1485, 540 Hollywood Way, (213) 843-5200. TWX: 910-498-2720.
Branches: 1400 Coleman Ave., Santa Clara, Calif., (408) 247-1788; 2110 92nd N.E., Bellevue, Wash., (206) 454-3061.
Factories: Ad-Yu Elctrns.; Ampex; Andrea Radio; Bell Furniture; CGS Scientific; Emerson Elec.; Ferranti Elec.; Ferranti-Packard; Greibach Instrs.; Hallmark Data Sys.; Listening Environment Engrs.; Newell Inds.; NJE; Pickering; Sparton Southwest; United Audio Prods.
Selling To: ★ A,I,D,M. **Salesmen:** 15 (eng 6)
Services: Repair, Warehouse, Display Room, Demo Van.

TECH-SER, INC., 2435 North Naomi St., Box 3255, (213) 846-9631. TWX: 910-498-2709.
Branches: 800 San Antonio Rd., Palo Alto, Calif., (415) 326-6400. TWX: 910;373-1762; 3760 Midway Dr., Box 10544, San Diego, Calif., (714) 222-1121; 10210 Monroe Dr., Dallas, Tex., (214) 358-2504.
Factories: Amptek; Basic Ceramics; J. G. Biddle; Chemical & Aerospace Prod.; Electronic Research Assoc.; Globe Electrical Mfg.; Helix Research Assoc.; Lorlin Inds.; NH Research; Redcor Instrumentation; Rohde & Schwarz Sls.; Sandefur Engrg.; Tech-Stok; Trio-Tech; United Mineral & Chem.; Unitek/Weldmatic Divn.; Costron Inds.; Wakefield Engrg.; Zeltex.
Selling To: ★ I,M. **Salesmen:** 10 (eng 9)
Services: Repair, Warehouse, Modification Capability.

There is no end

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Service is our only product — and has been for over 20 years.
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Our 21st year of service in Arizona
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WEIGHTMAN & ASSOC., 1226 W. Olive, (213) 849-7711. FAX: R.T.K.
Branch: 120 Santa Margarita, Menlo Park, Calif., (415) 325-2885.
Factories: Borg-Warner Thermoelectrics; Chicago Dynamic; Industrial Reproductions; Johanson Mfg.; Precision Sys.; Stevens-Arnold; TEC; Technical Devices; USM. **Services:** Warehouse, Demo Lab.
Selling To: ★ I,M. **Salesmen:** 9 (eng 9)

(See Advertisement This Page)

Burlingame

CAMPBELL & GEORGE CO., 840 Mahler Rd., (415) 697-2965.
Factories: Eagle Signal; Heinemann Electric; Lexington Standard; Sola Elec. **Services:** Repair, Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 4 (eng 3)

COMPAR CORP. ELCTRN. COMPS. DIV., 828 Airport Blvd., (415) 347-9501. TWX: 910-374-2841.
Branches: 904 Bob Wallace Ave., Huntsville, Ala., (205) 539-8476; 84 W. First St., Scottsdale, Ariz., (602) 947-4336. TWX: 910-950-1293; 820 Airport Blvd., Burlingame, Calif., (415) 347-5411. TWX: 910-374-2366; Box 7018, Burbank, Calif., (213) 843-1772. TWX: 910-498-2203; Box 11218, San Diego, Calif., (714) 279-9280; 300 E. Hampden Ave., Englewood, Colo., (303) 781-0912. TWX: 910-933-0175; 2531 Whitney Ave., Hamden, Conn., (203) 288-9276. TWX: 203-772-0439; 315 Laura Ave., Addison, Ill., (312) 543-8833. TWX: 910-651-4950; 7 Church La., Baltimore, Md., (301) 484-5400. TWX: 710-862-0860; 88 Needham St., Newton Heights, Mass., (617) 969-7140. TWX: 710-335-1686; 21250 Civic Center Dr., Southfield, Mich., (313) 357-5369. TWX: 810-232-4936; Box 16095, Minneapolis, Minn., (612) 922-7011; 11734 Lackland Ind. Dr., St. Louis, Mo., (314) 542-3399; 15 Potter St., Haddonfield, N.J., (609) 429-1526. TWX: 710-896-0679; 2129 San Mateo Blvd. NE, Albuquerque, N.M., (505) 265-1020 TWX: 910-989-1659; 404 Clifton Ave., Clifton, N.J., (201) 473-2660; 6 Highland Ave., Albany, N.Y., (518) 489-7408. TWX: 710-441-8224; 33-7 Garnock Ct., Hollyrood Pk., Liverpool, N.Y., (315) 471-3356; 42 Winding Brook Dr., Fairport, N.Y., (716) 271-2230; Box 135, Endwell, N.Y., (607) 723-8743; 1106 Burke St., Winston-Salem, N.C., (919) 723-1002. TWX: 910-931-3101; Box 338, Fairborn, Ohio, (513) 878-2631; Box 4791, Fairview Park, Ohio, (216) 333-4120; 8609 Northwest Plaza Dr., Dallas, Tex., (214) 363-1526. TWX: 910-861-4249; 5757 Bellaire Blvd., Houston, Tex., (713) 667-3420. TWX: 910-881-3784; Box 15006, Salt Lake City, Utah, (801) 364-1163; 12610 N. E. 104th St., Kirkland, Wash., (206) 822-4191. TWX: 910-449-2863.
Factories: A. P. Inc.; Bendix Connectors; Denes Co.; Deutsch Relay; Electo Materials; Hecon; Nanatron; Paktron; Powercube; Power Tech.; Qualidyne; Signetics; Solid State Prods.; Unitrode. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 60 (eng most)

DYNAMICS ASSOCS./LEASAMETRIC, INC., 822 Airport Blvd., (415) 344-2521. TWX: 910-374-2364.
Branches: 836 E. Washington St., San Diego, Calif., (714) 291-1391; 2500 S. La Cienega Blvd., Los Angeles, Calif., (213) 837-0123.
Factories: Ampex; Atlantic Technology; Computer Labs; Datatron; Esterline Angus; Leasametric; Monsanto; Newport Labs; Optimation; Power Designs; Sangamo; Statham; Wiltron. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 8 (eng 6)

LOGAN, J. & ASSOCS., 801 Mahler Rd., (415) 697-6100. TWX: 910-375-3382.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 2)
Services: Direct Mail.
Factories: American Radionic; APM-Hexseal; Central Transformer; Consolidated Wire; C T S Corp.; C T S - Knights; Gowanda Elctrns.; Dynamics; Griffith Plastic Prods.; T R W; Transitron Elctrn.; Methode Elctrns.; Phaostron; Sterling Instr.

LONG & ASSOCS., INC. (See Redwood City, Calif.)

MONTGOMERY BROS., INC., 1831 Bayshore, (415) 697-6500. TELEX: 34-0183.
Branches: 4800 District Blvd., Los Angeles, Calif., (213) 589-6321. TELEX: 67-4981; 911 Western Ave., Seattle, Wash., (206) 624-7297. TELEX: 32-296; 935 N.W. 19th Ave., Portland, Ore., (503) 223-4713. TELEX: 36-587; Box 6079, Salt Lake City, Utah, (801) 484-8871; 3530 Addison St., San Diego, Calif., (714) 224-4513; P.O. Box 7234, Phoenix, Ariz., (602) 277-9819.
Factories: Bendix Filter Div.; Carborundum; Commercial Filters Div.; Cryodry; Elma Engrg.; Harrop Precision Furance; Gruenberg Elec.; Kanthal; Lanly; Norbatrol Elctrns.; Pacific Chromalox; Pickands Mather; Rockwell Measurement & Control Div.; Sta-Warm Elec.; Vokes Filter Div.; Weco Div.; E. L. Wiegand.
Selling To: ★ I,D,M. **Salesmen:** 35 (eng 7)
Services: Warehouse.

PETERS-DE LAET, INC., 1606 Rollins Rd., (415) 697-1800.
Branches: 13845 S. Hawthorne Blvd., Hawthorne, Calif., (213) 772-4226; 5937 N. Greeley Ave., Portland, Ore., (503) 285-7703; Hilton Office Bldg., Denver, Colo., (303) 364-0071; 910 15th, Sacramento, Calif., (916) 443-3603; 1703 Nagle Pl., Seattle, Wash., (206) 322-2215; 11 So. Jefferson, Spokane, Wash., (509) 624-0137; 1639 Jefferson, Eugene, Ore., (503) 342-6111.
Factories: Ardel; BIC; Budwig Mfg.; Electrovert; ETC; Marson Fasteners; Molex; Three M Co.; Virginia Panel.
Selling To: ★ I,M. **Salesmen:** 20 (eng 1)
Services: Warehouse.

PRUDY, W. J., CO., 770 Airport Blvd., (415) 347-7701. TWX: 910-247-2353.
Branch: 1449 W. Littleton, Littleton, Colo., (303) 794-4283. TELEX: 45-801.
Factories: ACDC Elctrns.; Allied Control; Amperex Elctrns.; Ashland Elec. Prods.; Astatic; Dearborn Elctrns.; Eldema; Eldre Components; Ferroxcube; Hybrid Elctrns.; Interswitch; Jewell Electrical Instr.; Kurz-Kasch; Littelfuse; Mostek; Newcomb Audio Prods.; Pamotor; Pirgo Elctrns.; Quam-Nichols; Simpson Elec.; Spectrol Elctrns.; Sprague Elec.; Waldom Elctrns.; Wen Prods.
Selling To: ★ A,I,D,M. **Salesmen:** 15 (eng 5)
Services: Warehouse

STEVENS, D. & CO. (See Los Angeles, Calif.)

STRIKER, J. E. CO., 1319 Howard Ave., (415) 342-1425.
Factories: California Etching; Circuit Structures Lab.; Clark Crystal; D-Cemco; Eastron; Elcom Sys.; Flight Sys.; Greenray Inds.; Metric Engrg.; Oven Inds.; RFL Inds.; Sierra Sys.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)

Canoga Park

R. C. KRUSE ASSOCS., Box 1225, (213) 341-3020.
Factories: Electronic Applications; Hammarlund Mfg.; Inter-Technical Group; Joseph Pollak; Maxi-Switch Co.; Printact Relay Div.; Staffall, Inc.; Dorann Co.; Underwriters Safety Device Co.; Argonaut Associates, Inc.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

Costa Mesa

REPEX INC. (See Mountain View, Calif.)

Culver City

ALDERSON, W. CO. INC., 8548 Washington Blvd., Box 206, (213) UP 0-9286.
Factories: Argos Prods.; Calif. Chassis; Darome; Federal Sign & Signal; W. A. Holmin; Jensen Mfg. Div.; Muter Co.; Perma-Power; Chambron; Turner Co.; Manhattan Elec. Cable. **Services:** Warehouse
Selling To: ★ I,A,D. **Salesmen:** 4

ROBERTS, E. V. & ASSOCS., INC., 9601 W. Jefferson Blvd., (213) 870-9561. TWX: 910-340-6363; TELEX 67-4103.
Branches: 800 San Antonio Rd., Palo Alto, Calif., (415) 324-1671. TELEX: 34-8480; 4379—30th St., San Diego, Calif., (714) 282-7691. TELEX: 69-5071.
Factories: Allen Avionics; Churchill; Clairex Elctrns.; Electric Indicator; Electrical Inds.; Engonics Engrg.; Glentronics; Hafstrom Tech. Prods.; Instrument Specialties; Mitchell Rand Mfg.; Rotamec; Rustrak Instr. Div.; Tapecon. **Serivces:** Repair, Warehouse, Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 14 (eng 12)

SODARO CO., 3753 South Robertson Blvd., (213) 838-5272.
Factories: Balco Capacitors; Data Research; DIGIAC; Dynographic Elctrn.; Electrospace; Instrument Research; New London Instr.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)

Cupertino

DEERE ELCTRNS. INC., 20440 Town Center Lane—Ste D, (408) 257-3040. TWX: 910-338-0253.

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Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

SNITZER T. L. CO. (See Los Angeles, Calif.)

Del Mar

SNITZER, T. L. CO. (See Los Angeles, Calif.)

Downey

RDP INSTRS. INC. (See Palo Alto, Calif.)

WIELER & CO., Box 708, (213) 861-9223, 773-5982.
Branches: 405 So. Sunnyvale Ave., Sunnyvale, Calif., (408) 736-6098; 2260 Calle Frescota, La Jolla, Calif., (714) 459-7712.
Factories: Acopian; American Elctrn. Labs.; Behlman Engrg.; Cabtron; Dytronics; GPS; Measurement Control Devices; Monitor Sys.; Product Designs; Reo Data Prods.; Specific Prods.; Test Technology; Time Sys.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse

El Cajon

RIEDEL, M. W. & CO. (See Alhambra, Calif.)

El Monte

HENRIKS, R. E. & ASSOCS., 4900 Sanita Anita Ave., (213) 442-1820.
Factories: Coining; South Bay Technology; Taft-Peirce Mfg.; Thermionic Prods.; R. G. Thomas.
Selling To: ★ M. **Salesman:** 1 (eng 1)

MARSHALL CO., G. S., 9674 Telstar Ave., (213) 686-1500. TWX: 910-587-1565.
Branches: 2607Andjon St., Dallas, Tex., (214) 358-0161. TWX: 910;861-4934; 732 North Pastoria St., Sunnyvale, Calif., (408) 732-1100. TWX: 910-339-9275; 195 P Central Ave., Farmingdale, N.Y., (516) 293-4141. TWX: 510-224-6486; 7990 Engineer Rd., San Diego, Calif., (714) 278-6350; 4747 N. 16th St., Phoenix, Ariz., (602) 277-7451. TWX: 910-951-4239.
Factories: Barnes; Beckman Helipot; Deutsch; Dickson; Fairchild Semiconductor; General Elec.; JFD; Marco-Oak; MidTeX; RCA; Signetics; National Semiconductor.
Selling To: ★ I,M. **Salesmen:** 22
Services: Warehouse, Distributors

Encino

CARDINAL ASSOCS., INC., 16024 Ventura Blvd., (213) 788-4540. TWX: 910-495-1717.
Factories: American Time Prods.; Control Circuits; Eastern Air Devices; Elctrn. Modules Corp.; Hamlin Elctrns.; Hybrid Systems; Magnedyne; Natel Engrg.; Quantum Devices; Super Mfg. & Instr.
Selling To: ★ I,M. **Salesmen:** 5 (eng 4)

CDH ASSOCS., 18075 Ventura Blvd., (213) 345-1644.
Factories: Acton Labs.; Optical Elctrns.; Barden Co.; Eemco Div.; Kinetic Technology. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

KING ENGRG. CO., 15720 Ventura Blvd.-Ste. 608, (213) 981-0161.
Branches: 2260 Calle Frescota, La Jolla, Calif., (714) 459-7444; San Francisco, Calif., (415) 349-6285; 5045 N. 12th St., Phoenix, Ariz., (602) 266-3485.
Factories: Adar Assocs.; Bose; Computer Corp.; Dresser Sys.; Dynamic Sys. Elctrns.; Electronic Assocs.; Federal Scientific.
Selling To: ★ I,M. **Salesmen:** 6 (eng 6)

LEDBETTER ASSOCS., Box 528, 16618 Ventura Blvd., (213) 789-8115. TWX: 213-783-3345.
Factories: Atmar Engraving; Dynamics Controls; Luminator; Struthers-Dunn; W & L. E. Gurley.
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

PORTER CO., 17000 Ventura Blvd., (213) 788-2350. TELEX: 65-1434.
Factories: American Standard; APM Hexseal; Fifth Dimension; Heinemann Elec.; Transtector Sys.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

(See Advertisement Page 3227)

ZIMMERMAN, W. E. CO., 16603 Ventura Blvd., (213) 986-3400.
Factories: Electronic Cooling Devices; ESCA Div.; General RF Fittings; Torsion Balance. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Gardena

BIDWELL, REDER, ROSS & FETTING, 17525 So. Broadway, (213) 770-0300.
Factories: Duotone; Intl. Rectifier; Judson Res.; J. W. Miller; Minneapolis Speaker Co.; University Sound; Wall Mfg. **Services:** Warehouse
Selling To: ★ A,I,D. **Salesmen:** 4 (eng 1)

INSTRUMENT LAB., 1323 W. 130th St., (312) 770-0650, 327-3279.
Branch: 644 Emerson St., Palo Alto, Calif., (415) 328-1040.
Factories: Biddle J. E.; Conax; Consolidated Controls; Dynalco; Electro-Mechano; L. H. Marshall; Slaughter; West Instr. Div. **Services:** Repair, Warehouse
Selling To: ★ D,I,M. **Salesmen:** 10 (eng 2)

Glendale

INSTRUMENT SPECIALISTS, INC., 1109 So. Central Ave., (213) 245-9404. TWX: 910-497-2086.
Branches: 10459 "A" Roselle St., San Diego, Calif., (714) 453-1833. TWX: 910-337-1273; 2359 De La Cruz Blvd., Santa Clara, Calif., (408) 244-1505. TWX: 910-338-0121; 5950 Sixth Ave. So., Seattle, Wash., (206) 767-4260. TWX: 910-444-1636; 7832 Southwest 35th Ave., Portland, Ore., (503) 246-3341.
Factories: Burr-Brown Research; Cintra/Physics Intl.; Cipher Data Prods.; Computer Signal Processors; Daconics; Data Royal; Daymarc; J. Fluke Mfg.; Foto-Mem; GRI Computer; North Atlantic Inds.; Peripheral Sys. Div.; San-Del; Teradyne, Inc.; Varian/Graphics & Data Sys. **Services:** Repair
Selling To: ★ A,I,M. **Salesmen:** 27 (eng 20)

Glendora

PEDDLERS UNLIMITED, 641 N. Minnesota Ave., (213) 963-5868.
Factories: American Circuit Board; Semiconductor Components; Wanlass Elec. Mil. Prods. Div.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)
Services: Sales

Goleta

FENOLE, J. E. CO., INC., Box 908, (805) 964-5811.
Branch: Sherman Oaks, Calif., (213) 783-1582.
Factories: AGM Prods.; Astro-Geo-Marine; Skyway Magnetics. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

Hawthorne

PETERS-DE LAET, INC. (See Burlingame, Calif.)

Hayward

LEWIS, D. ASSOCS., 21650 Cloud Way, (415) 785-9650.
Branch: 420 Date Ave., Alhambra, Calif., (213) 289-6251. TELEX: 67-3689.
Factories: Alcoa Aluminum; Automation Mach.; Chicago Rivet & Machine; Commercial Cam & Machine; Eberhard Mfg.; Groov-Pin; La Deau Mfg.; Ohio Nut & Bolt; Ramset; Southco; Speed Feed Sys.; J. J. Tourek Mfg.; Waterbury Pressed Metal; Black & Webster.
Selling To: ★ I. **Salesmen:** 6 (eng 2)
Services: Warehouse

Hollywood

IFM—SOUTH, 3455 Cahuenga Blvd., (213) 469-1641.
Branches: 2269 Old Middlefield Way, Mountain View, Calif., (415) 961-2828; Phoenix, Airz., EN 1252; San Diego, Calif., ZE 2-2010.
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Selling To: ★ I. **Salesmen:** 5 (eng 5)

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Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

WESTAIRONICS, INC., 1800 N. Highland Ave., (213) 466-6201. TWX: 910-321-4226.
Factories: Crystalonics; Harowe Servo Controls; Hugh H. Eby; Industrial Devices; J. B. Elctrn. Transformers; Knox Elctrns.; Price Elec.; Sanders Assocs.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)

Inglewood

ALLGOOD ASSOCS., 1621 Centinella Ave., (213) 776-5820. TWX: 910-328-6195.
Branches: 2680 Bayshore Frontage Rd., Mountain View, Calif., (415) 961-9686; 3731 6th Ave., San Diego, Calif., (714) 298-7735.
Factories: Bishop Graphics; Brand Rex; Fairchild Microwave & Optoelectronics; Intradyne Sys.; Jerrold Elctrns.; Radar Relay; SCM-Melabs.
Selling To: ★ I,M. **Salesmen:** 7 (eng 6)

BERMAN, J. CO., INC., 8295 S. LaCienga Blvd., (213) 678-1281. TWX: 910-328-6184.
Branches: 2101 W. Shangri La Rd., Phoenix, Ariz., (602) 944-3361; Box 10197, San Diego, Calif., (714) 583-6457.
Factories: Allied Control; Amperex Elctrn.; British Inds.; Bud Radio; Clarostat; Dialight; Elco; Harman-Kardon; JBT Instrs.; Koss Elctrns.; Littelfuse; Phalo Corp.; Raytheon Co.; Shure Bros.; Shurite; Spectrum Contls.; Systron-Donner; Triplett Electrical Instr.
Selling To: ★ A,I,D,M. **Salesmen:** 15
Services: Warehouse

(See Advertisement Page 3228)

KNIGHT, W. B. CO., INC., Box 400, (213) 678-4711. TWX: 910-328-6116.
Branch: Box 11394, Phoenix, Ariz., (602) 264-3578.
Factories: Allen-Bradley; All Star Prods.; Ammon Instr.; Components; Essex Int'l.; Genisco Technology; General Inds.; McCoy Elctrns.; H. W. Sams & Co.; Wakefield Engrg. **Selling To:** ★ I,D,M. **Salesmen:** 10 (eng 6)

La Jolla

FALCK, F. W. CO., Box 1733, 233-3341.
Factories: D-Cemco; Electro Connective Sys.; Harbour Inds.; ITT-Jennings; Key Inds.; Spatron Inc.; Newman Co. **Selling To:** ★ I,D,M. **Salesman:** 1 (eng 1)

KING ENGRG. CO. (See Encino, Calif.)

WIELER & CO. (See Downey, Calif.)

La Puente

TAW ELCTRNS. (See Sherman Oaks, Calif.)

LeSelva Beach

BELCHAMBER & FRENCH, 308 Playa Blvd., (408) 688-3281.
Factories: C. Cordover & Co.; Fidelitone, Inc.; Oelrich Publ.; Pomona Elctrn.; Premax Prod.; Standard Components; Swing-O-Lite; Tech Spray; Tele-Jac Co.
Selling To: ★ D. **Salesmen:** 2 (eng 2)

Long Beach

PREMMCO/PH, 3351-59th St., (213) 636-9205.
Branch: 2406 Lincoln Ave., Alameda, Calif., (415) 523-9495.
Factories: Bivar; Heli-Coil; James Elctrns.; Micro-Measurements; Pemco; Photolastic; Stanford Applied Engrg.; Systems Enclosures; USM; Vishay Instrs.; Zippertubing. **Selling To:** ★ I,M. **Salesmen:** 7 (eng 3)

Los Altos

CAIN & CO. (See Los Angeles, Calif.)

CLELAND & CO. (See Los Angeles, Calif.)

EWING-FOLEY INC., Box 1107, 900 N. San Antonio Rd., (415) 941-4525. TELEX: 34-8336.
Factories: Aladdin Elctrns.; Carter Motor; C & K Components; Curtis Dev. & Mfg.; Genisco Technology; Hunter Tools; Oaktron Inds.; Panduit Corp.; M. H. Rhodes; Standard-Grigsby; Unimax Switch; Valpey-Fisher.
Selling To: ★ I,D. **Salesmen:** 4
Services: Representatives.

LANDA, E. CO. (See Los Angeles. Calif.)

MARKETEK, INC., One First St., (415) 941-0882. TWX: 910-370-7969.
Factories: Arrow Gear; Barbour-Stockwell Instr.; Federal Stampings; Glassco Instr.; Scott Aviation; Uniform Tubes. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

RECHT ASSOCS., 900 N. San Antonio Rd., (415) 941-0336. TWX: 910-370-7454.
Factories: Aero Research Instr.; Amelco Semiconductor; Filtron; Gulton Inds.; IMC Magnetics; IRC Div.; Landis & Gyr; Monrovia Instr.; Potter & Brumfield; Semikron Int'l.; UTC Div.; Wakefield Engrg.
Selling To: ★ I. **Salesmen:** 5 (eng 5)

(See Advertisement This Page)

RICHARDS ASSOCS., 900 San Antonio—Suite L., (415) 941-3226.
Factories: Curtis Instr.; HyCal Engrg.; Piezotronics; Powertec; Transducers; Weston-Transicoil.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

SHANNON ASSOCS., One First St., (415) 941-2217.
Factories: Digitran; Lamps; Oak Electronetics; Lear Siegler; Whittaker-Counter Prods.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

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Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

STOUT, H. ASSOC., 200 Third St., (415) 948-3265.
Factories: Acrodyne Inds.; Alpha Inds.; Applied Technology; Computer Devices Corp.; Constanta; Daico Inds.; Electrotec; W. H. Ferwalt; Microwave Semiconductor; Summit Engrg.; Xtalonix Prods.
Selling To: ★ I. **Salesman:** 1 (eng 1)

STRASSNER R. A., CO., INC. (See Los Angeles, Calif.)

WALTER ASSOCS. INC., Box AN, (415) 941-3141. TWX: 910-370-7458.
Factories: Ace Engrg.; Danex Corp.; Micro-Tel.; Nelco Microwave; Omni-Spectra; Rodda Co.; Waltronic; Zeta Labs. **Services:** Repair, Warehouse, Direct Mail
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

WOODS, G. E. ASSOCS. INC. (See Anaheim, Calif.)

WRIGHT ENGRG. (See Pasadena, Calif.)

Los Angeles

AMERICAN TECHNICAL SALES CO., 1460 S. Sherbourne Dr., (213) 659-3791.
Factories: B. H. Inds.; California Elctrn. Mfg.; Control Technology; Gates Elctrn.; General Electro-Mechanical Inertial Motors; Info-Lite Div.; Meltronics; Measure-Matic Elctrns.; Post Elctrn. Prod.; Power Inc.
Selling To: ★ A,I,M. **Salesman:** 1 (eng 1)

BARRON, W. J. CO., 1406 South Grand Ave., (213) 748-6191.
Factories: Electro Lighting Sys.; Film Capacitors; Gladding-Keystone; LTV Electrosystems; Memcor/Components. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesman:** 1

BARSTOW & DORAN, INC., 1406-08 S. Grand Ave., (213) RI 9-0438.
Factories: Aerotron, Inc.; Dict-O-Tape; Electro Lighting; Gold Line Connectors; James Elctrns.; Kepro Circuit Sys.; Midland Int'l.; Mosley Elctrns.; Pioneer Elctrns.; Quincy Prods.; Swing-O-Lite; Terado Corp.
Selling To: ★ A,I,D. **Salesmen:** 4
Services: Warehouse

BELL, J. W., 601 S. Vermont Ave., (213) 388-7104.
Factories: Newage Inds.; Numberall Stamp & Tool; Portland Co.; Sonicor Instr.; Testone Elctrns.; Wetter Numbering Machine.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)

BLACK & STRONG, INC., 1728 So. La Cienega, (213) 870-9191. TWX: 910-340-6369.
Branch: 7961 Engineer Rd., San Diego, Calif., (714) 279-6363. TWX: 910-335-1529.
Factories: Amco Engrg.; American Micro-Sys.; Ceremetek; Electra/Midland; Intech; Marshall Capacitors; NCI; Potter & Brumfield; Silicon General; Stackpole Carbon.
Selling To: ★ I,D,M. **Salesmen:** 11 (eng 11)
Services: Warehouse

(See Advertisement Page 3229)

CAIN & CO., 522 S. Sepulveda Blvd., (213) 476-2251.
Branches: 7854 Compass Lake Dr., San Diego, Calif., (714) 461-1033; 175 S. San Antonio Rd., Los Altos, Calif., (415) 948-6533; 8609 Northwest Plaza Dr., Dallas, Tex., (214) 369-2897; 401 E. Prospect Ave., Mt. Prospect, Ill., (312) 253-3578; 4450 Minnetonka Blvd., Minneapolis, Minn., (612) 920-7572; 1467 Graham Rd., Reynoldsburg, Ohio, (614) 861-2119; 7515 Annapolis Rd., Hyattsville, Md., (301) 459-6400; 420 Chestnut St., Union, N.J., (201) 687-7077; 330 First St., Liverpool, N.Y., (315) 457-4871; 45 Essex St., Melrose, Mass., (617) 665-8600; 4015 S. W. 1st St., Ft. Lauderdale, Fla., (305) 587-3849.
Factories: Alto Scientific; Accra-Point Arrays; Avtel; Bucode Inc.; California Microwave; Computer Microtechnology; Daconics; Dicom Inds.; Engineered Data Peripherals; General Atronics; Hyletronics Corp.; Monitor Displays; Peripheral Dynamics; Physical Elctrns. Labs.; Raytheon Computer; RHG Elctrns. Lab.; Rolm Corp.; Solitron/Microwave; Standard Memories; Teledyne Microwave; Thomson CSF.
Selling To: ★ I,M. **Salesmen:** 35 (eng 35)

CLELAND & CO., 1609 Westwood Blvd., (213) 477-0551. TWX: 910-342-6883.
Branch: Box 58, Los Altos, Calif., (415) 948-9349.
Factories: Aviel Elctrns.; Poly-Physics; Sivers Lab.; Stoddart Electro-Sys.; Wilmar Prods. **Selling To:** ★ I,M.
Services: Warehouse **Salesmen:** 3 (eng 3)

COHN & SHANE, INC., 1323 Venice Blvd., (213) 388-9374.
Branches: San Francisco, Calif.; Phoenix, Ariz.
Factories: Murphy Inds.; Portable Div.; Upland Tool; FleetTool; Realflex Prods.; Star-A Elec.
Selling To: ★ D. **Services:** Warehouse **Salesmen:** 14

COSTELLO, LITTLE & CO., 8737 Venice Blvd., (213) 870-5951.
Branch: 575 Middlefield Rd., Palo Alto, Calif., (415) 321-3745.
Factories: American Regitel; Cambridge Memories, Inc.; Decitek, Inc.; Delta Data Sys.; Digital Devices Div. Tyco; GDI Inc.; Mac Panel Co.; Magnafile Inc.; Optical Memory Sys.; Tel-Tech Corp.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

DUDEK, R. C. & CO., INC., 10546 W. Pico Blvd., (213) 836-0335. TWX: 910-340-6435.
Factories: Gries Reproducer; Molly Co.; Penn Engrg. & Mfg.; Positive Connector; Zagora Gear Prods.
Selling To: ★ I. **Salesmen:** 5 (eng 2)
Services: Warehouse

DYNAMIC ASSOC. LEASAMETRIC, INC. (See Burlingame, Calif.)

DYNASALES CO., Box 6757, (213) 268-1175.
Factories: Alpha Automation; I C Metrics; Mastech; Co-Ord Switch Div.; Milli-Switch; MCG Elctrns.; Servo Development; Vero Elctrns. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)

(See Advertisement This Page)

Elsner-Rambo Co., 2526 Hyperion Ave., (213) 664-2928, TWX: 910-321-4257.
Factories: Bliley Electric; Branson Corp.; Comar Electric; Lundey Assocs.; Sealtron Corp.; Tech Labs.; United Elctrns.; Waters Mfg. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

ERLANGER SLS. CO. INC., 4217 W. Jefferson Blvd., (213) 731-2238. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 3

FELDMAN, H. CO., Box 66367, (213) 870-5973.
Factories: Barker Prods.; Enterprise Dev.; Hamilton-Hall; Lectrotech Inc.; Weller Elec. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2

FERRIS, F. R. CO. INC., Box 42067—6726 N. Figueroa St., (213) 254-6161.
Branch: Box 3097, San Mateo, Calif., (415) 349-3855.
Factories: Berkley & Co.; Shop Vac Corp.; Universal Mtr. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 6 (eng 2)

FETTY/SCHOENDUVE INC., 7407 Melrose Ave., (213) 651-4050. TWX: 910-321-2385.
Branch: 253 Town & Country Village, Palo Alto, Calif., (415) 321-7041. TWX: 910-373-1189.
Factories: Acromag; Burns Engrg.; Clevite/Piezoelectric Div.; Clevite/Brush Instr. Div.; Electronic Specialty; Energy Conversion Sys.; Haydon Switch & Instr.; Industrial Electronetics; Metra Instr.; Philco-Ford; Pickering & Co.; Rayonic; Structural Technology; Torr Labs.; Vectron Labs.; Victory Engrg.
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 8)

HARMON, W. S. CO., 6118 Venice Blvd., (213) 937-1460. TWX: 213-937-3438.
Factories: Advance Ross Elctrns.; Air-O-Tronics Prod.; Anchor Plastics; Carter Precision Elec.; Gavitt Wire & Cable Div.; General Elec.; Grigsby-Barton; Hobson Bros.; Rowe Inds.; Mel-Rain; Millen, James Mfg.; Resistors; Rockwood Mfg.; Ty-Car Mfg.; Waterbury Pressed Metal.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

HARRIS, B. CO., 3440 Overland Ave., (213) 870-9231 TWX: 910-340-6758.
Branches: 644 Emerson St., Palo Alto, Calif., (415) 328-3082; 816 102nd N.E., Bellevue, Wash., (206) 454-0995; Box 14707, Phoenix, Ariz., (602) 272-0571.
Factories: Aut ac. Inc.; Electroweave; Lynn Elctrns.;

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Micro Cable; Plastoid Corp.; Rockland Insulated Wire & Cable Co.; Spargo Wire Co.; Standard Wire Co.; Standard Wire & Cable Co. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 15 (eng 3)

HOLMES, C. E. CO., 107 North Ave., (213) 256-2255. TWX: 910-321-3937.
Factories: Ceram; Colorado Crystal; Elec-Trol; Electro-Mechanical Inst.; Hamlin; Philips Elmet; Sensitron; Syntron; WABCO; Wilmington Controls Div.
Selling To: ★ I,D. **Salesmen:** 5 (eng 2)
Services: Repair, Warehouse

HUGHES, R. S. CO., INC., 5301 E. Sheila St., (213) 268-2501.
Branches: 3606 Midway Dr., San Diego, Calif., (714) 224-2431; 346 N. State College Ave., Orange, Calif., (714) 639-4444; 620 National Ave., Mountain View, Calif., (415) 961-3700; 2818 Eighth St., Berkeley, Calif., (415) 841-0522; 6520 6th Ave. S., Seattle, Wash., (206) 767-4463.
Factories: Carmer Inds.; Crown Industrial Prods.; Devcon; DuPont; Electronized Chemicals; Formica; General Elec. Silicone; W. L. Gore & Assocs.; Halocarbon Prods.; A. L. Hyde; Jaco Mfg.; Loctite; Norton Tape; Permacel; Penntube Plastics; Saunders; Sperex; Trimflex; Vogt Mfg. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 6 (eng 5)

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

HUNDLEY CO. INC., 3282 Fletcher Dr., (213) 255-7111. TELEX: 67-3297.
Branch: 754 Natoma St., San Francisco, Calif., (415) 552-3414.
Factories: Ebert Elctrns.; Electronics Corp.; Gemco Electric Mfg.; Gulf & Western; Healy Ruff; Lexington Standard. **Services:** Repair, Warehouse
Selling To: ★ I,D. **Salesmen:** 6 (eng 4)

JENSEN INSTR. CO., 1919 Beverly Blvd.
Branch: 429 Bryant St., San Francisco, Calif., (415) EX 2-1472.
Factories: Dieterich Standard; Lumenite Elctrn.; Moeller Instr.; Scam Instr.
Selling To: ★ I. **Salesmen:** 7

KITTLESON CO., 416 N. La Brea Ave., (213) 933-7371.
Branch: 2680 Bayshore Frontage Rd., Mountain View, Calif., (415) 326-7410.
Factories: Control Sys.; Eastron; Electronic Navigation Inds.; ELM Sys.; S. Himmelstein; Ovitron; Machine Control Sys.; Renco; Saturn Elctrn.; Simkron Int'l.; Spencer-Kennedy Labs.; Tyco Instrument Div.; Wade Co. Div.; Warnecke Electron Tubes.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

LANDA, E. CO., 1607 Pontius Ave., (213) 879-0770. TWX: 910-342-6343.
Branches: One First St., Los Altos, Calif., (415) 948-0788. TWX: 910-370-7457; 3850 Clairemont Dr., San Diego, Calif., (714) 274-7242.
Factories: Arvin Frequency Devices; Automatic Metal Prods.; Babcock Relays; Capitol Switch; Columbia Components; Dressen-Barnes; Fenwal Elctrns.; Magnetic Shield Div.; Microsonics; National Connector; Pyrofilm Resistor; Robintech; Ultronix; UOP Instr.
Selling To: ★ I,D. **Salesmen:** 7 (eng 7)
Services: Warehouse

(See Advertisement Page 3230)

LANDIS ASSOCS., 5222 Venice, (213) 933-8187. TWX: 910-321-4106.
Factory: Cal-State Elctrns. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)

LITTRALL WESTERN SLS., INC., 3121 E. Twelfth St., (213) 261-0164.
Branch: 100 Produce St., San Francisco, Calif., (415) 583-5572.
Factories: Harry Davies Molding; Dahlstrom Mfg.; Dek; Diebel Mfg.; Metalcraft; Nylomatic; Tapeswitch; S. S. White Ind. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 5 (eng 1)

LYNN & BROOKS, 3055 Wilshire Blvd., (213) 382-2255.
Branches: 1485 Bayshore Blvd., San Francisco, Calif., (415) 467-3100; 320 S. W. Stark St., Portland, Ore., (503) 224-4991.
Factories: Gott Mfg.; Union Insulating.
Selling To: ★ I,D. **Salesmen:** 7
Services: Warehouse

MARSH, J. W. CO., 4216 W. Jefferson Blvd.
Factories: Audio Book Co.; Alliance Mfg.; Heppner Mfg.; Merit Coil & Transformer; V-M Corp.
Selling To: ★ I,A,D. **Salesmen:** 3
Services: Warehouse

MARSHANK SLS. CO., 7422 Melrose Ave., (213) 938-2591. TWX: 213-937-2789.
Factories: A.K.G.; Automatic Radio; Bauer Elctrns.; Bogen Communications Div.; Calcon Mfg. Co.; D. Clark Co.; Concertone; Crown Int'l.; Elite Elctrns.; G.R.I. Computer; Metal Works; Peploe; Recoton; Rye Inds.; Trusonic.
Selling To: ★ A,D. **Salesmen:** 3 (eng 1)
Services: Warehouse

MONTGOMERY BROS., INC. (See Burlingame, Calif.)

REP ASSOCS., 1645 So. LaCienega Blvd., (213) 274-8485.
Factories: American-Zettler; Chassis-Trak; Dow-Key; Electro-Mech Components; Hudson Lamp; Kilovac; R F Interonics; Signalite; Vent-Rak.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

(See Advertisement Page 3230)

R F ASSOCS. INC., 1621 Pontius Ave., (213) 478-1586. TWX: 910-342-6884.
Branch: 800 San Antonio Rd., Palo Alto, Calif., (415) 327-5531. TWX: 910-373-1223.
Factories: Advanced Microwave Labs.; Alford Mfg.; Energy Sys.; General Microwave; Keltec; Lorch Elctrns.; Microphase; Nelson Ross Elctrns.; Optimax; Prodelin; Solitran Microwave; Texscan; Trak Microwave.
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 8)
Services: Warehouse, Company Aircraft

RUSH, C. B. & ASSOCS., 1830 W. Olympic Blvd., 388-7111.
Factories: Armel Elctrns.; Cambridge Scientific; Commercial Plastics; General Control.
Selling To: ★ A,I,D,M. **Salesmen:** 4 (eng 3)

SNITZER, T. L. CO., 9005 Exposition Blvd., (213) 836-6170. TWX: 910-340-6170.
Branches: 1150 Camino Del Mar, Del Mar, Calif., (714) 454-2191; 10320 Saratoga-Sunnyvale Rd., Cupertino, Calif., (408) 257-8333. TWX: 910-338-0212; 15 N. 40th Pl., Phoenix, Ariz., (602) 273-1673.
Factories: Alpha Data; Century Elctrns. & Instrs.; Cimron Div.; Cunningham; Eldorado Electrodata; Elgar; Guildline Instrs.; Hallmark Standards; Ingersoll Prods.; McLean Engrg. Labs.; PRD Elctrns.; Polarad Elctrn. Instrs.; Precision Magnetics; Sierra Elctrn. Operation; Singer. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 11 (eng 11)

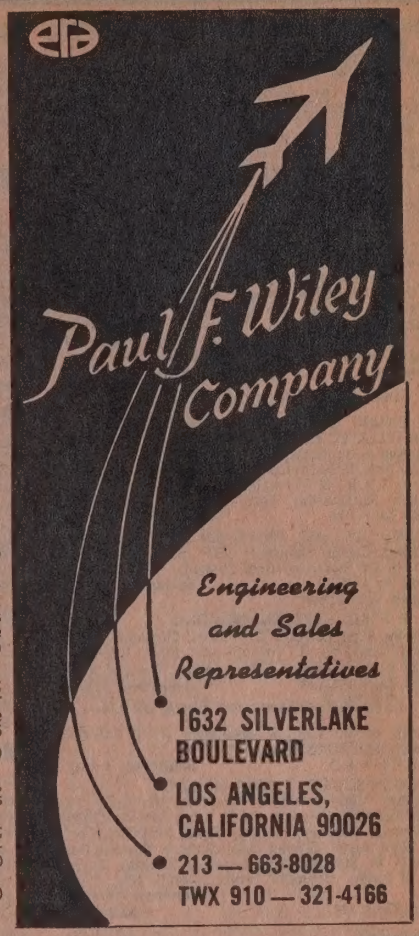
STEVENS, D. & CO., 1610 South Bonnie Brae St., (213) 747-9221.
Branch: 833 Mahler Rd., Burlingame, Calif., (415) 697-3022.
Factories: Clauss Cutlery; Clemson Bros.; Devcon; Hexacon Elec.; Niagara Cutter; Precision Steel Warehouse; Pulmosan Safety Equipt.; Utica Tool.
Selling To: ★ D. **Salesmen:** 6 (eng 1)
Services: Warehouse

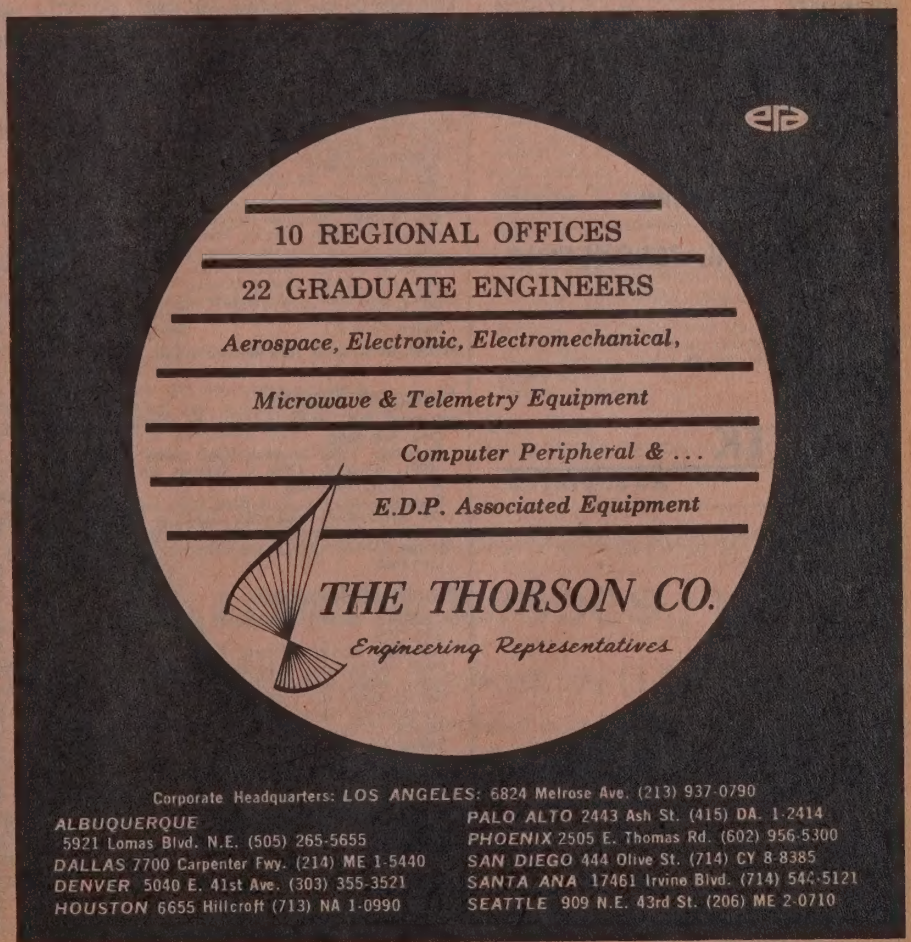
STICKEL-McALLISTER, 4357 Melrose, (213) 665-6621.
Selling To: ★ A,I,D,M. **Salesmen:** 4 (eng 1)
Services: Repair, Warehouse

STOLAROFF, M. A. CO., 4622 W. Slauson Ave., (213) 295-7781. TWX: 910-321-3884.
Factories: Berkleonics; Custom Elctrns.; Electronic Devices; G-V Controls; General Resistance; Gulton Inds.; Isofilm Int'l.; Sage Elctrns.; Specialty Connector; Texas Instrs.; Unimax Switch. **Services:** Factory service
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 3)

STRASSNER, E. E. CO., 3121 Los Feliz Blvd.
Factories: Components; Fisher Berkley; Koiled Kords; Kulka Elec.; H. A. Smith; Miconics Ind.; Staco; Soundolier Tel-Co. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 5

STRASSNER, R. A. CO., INC., 3003 Glendale Blvd., (213) 666-4040. TWX: 910-321-3990.
Branches: 885 N. San Antonio Rd., Los Altos, Calif., (415) 948-3334. TWX: 910-370-7954; 55 E. Thomas Rd., Phoenix, Ariz., (602) 277-3921.
Factories: Airflow; Astrodyne; Electronic Hardware; Ideal Precision Meter; M-Tron Inds.; Matrix Sys.; National Union Elec.; Plastic Capacitors; Sealectro; UID Elctrns.; Zenith Transformer.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 2)
Services: Warehouse, Direct Mail





THORSON, THE, CO., 6824 Melrose Ave., (213) 937-0790. TWX: 910-321-4024.
Branches: 5921 Lomas Blvd. N.E., Albuquerque, N.M., (505) 265-5655. TWX: 910-989-1174; 7700 Carpenter Frwy., Dallas, Tex., (214) 631-5440. TWX: 910-861-4423; 5040 East Forty-first Ave., Denver, Colo., (303) 355-3521. TWX: 910-931-0429; 6655 Hillcroft, Houston, Tex., (713) 771-3504. TWX: 910-881-3707; 2443 Ash St., Palo Alto, Calif., (415) 321-2414. TWX: 910-373-1226; 2505 E. Thomas Rd., Phoenix, Ariz., (602) 956-5300. TWX: 910-951-0653; 444 Olive St., San Diego, Calif., (714) 298-8385. TWX: 910-335-2011; 17461 Irvine Blvd., Tustin, Calif., (714) 544-5121. TWX: 910-595-1541; 909 Northeast Forty-third St., Seattle, Wash., (206) 632-0710. TWX: 910-444-2187.
Factories: Astrocom, Inc.; Autronics; Avantek; Chronolog; Cognitronics; Computer Access Sys.; Conic; Control Data; Datanetics; Datapac; Diablo Information Sys.; Genisco Technology; GRI Computer; Holex; Inland Motor; Mechanics for Elctrns.; Microwave Elctrns.; Omnitec; Sage Labs.; Sequential Information Sys.; Servo Dev.; Wang Computer Prods.; Zerox Data Sys.
Selling To: ★ I. **Salesmen:** 23 (eng 23)

(See Advertisement Page 3231)

TUCUL ENGRG. CO., 6402 Crenshaw Blvd., (213) 750-0338. TELEX: 67-3309.
Factories: Automation Prods. Mfg.; Chadwick-Helmuth; HH Controls; ISSC (Industrial Solid State Controls); JMR Elctrns.; L.A.B.; M.T.I. Instrs. Div.; Poly-Optics; Presin; Practical Automation; Tenor; Thermosen; Truco.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

WARBURG, E. CO., INC., 1207 E. 8th St., (213) 627-1126.
Factories: Cutter Hammer; JBT Instr.; Funal Elec.; Ward Lenart; Reliance Trinel Control.
Selling To: ★ M,D. **Salesmen:** 3 (eng 2)
Services: Warehouse

WILEY, P. F. CO., 1632 Silverlake Blvd.
Factories: Augat; Electro-Miniatures; Elmwood Sensors; General Reed Div.; ITT Gremar; Int'l. Instr.; Interswitch; Landis & Gyr; Pamotor; Sigma Instrs.; Switchcraft.
Selling To: ★ A,D,I,M. **Salesmen:** 6 (eng 4)

(See Advertisement Page 3231)

WILLIAMS, B. M., 1933 S. Broadway, (213) 749-0355.
Factory: UNREADABLE.
Selling To: ★ A,D. **Salesmen:** 3 (eng 2)

YARBROUGH SLS. CO., 5808 Monterey Rd.
Factories: Algo/Hamilton; Amerline; Amnueal Mfg.; Bead Chain Mfg.; Fusite; K.C.D. Mfg.; Kenyon Elctrns.; Lee Spring; Magnuson Engrg.; Pekay; Pellfacs; Sexton Can; Sightmaster; Silimet Inds.; Sphere; Stevens Paper Mills; D. M. Steward Mfg.; Superior Steatite; Thermal Wire of Amer.; Universal Prods.; Zierick Mfg.; Zophar Mills. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2

Lynwood

ASC SALES CO., 12140 So. Atlantic Ave., (213) 537-1856.
Factories: Delru Co.; Ebco Assocs.; Isotronics; National Moldite; Penn Keystone; Printex Corp.; E. H. Titchener.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

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McKNIGHT, G R CO., INC., Box 36, 115 Spruce Ave., (415) 325-2844. TWX: 910-373-1172.
Factories: Ammon; Branson; Colorado Crystal; Computer Components; ESC Elctrns.; Fenwal Elctrns.; Fenwal; Fifth Dimension; GM Nameplate; Grant Slides; Janco; JB Elctrn.; Licon; Midwec; Omega Elec.; QCI; Raven Elctrns.; Scanbe; Standard Controls; TEC.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)
Services: Warehouse, Representative

H K SALES, INC., Box 2087, 3723 Haven Ave., (415) 369-6244.
Factories: Benjamin Elctrn. Sound; Marantz; Sony/Superscope; Stanton Magnetics. **Services:** Warehouse
Selling To: ★ A. **Salesmen:** 4

SHIELL, T. J. ASSOCS., Box 504, (415) 323-6404.
Factories: Alessi Inds.; Century Automation; Moser Jewel; Post Elctrn. Prods.; Precision Prods. & Controls; Precision Equipt.; Signatone; Siks Mfg.; Staver; Venus Scientific.

WEIGHTMAN & ASSOC. (See Burbank, Calif.)

Millbrae

MELVIN SLS. CO., 113 El Camino Real, (415) 697-6922. TWX: 910-375-3832.
Factories: Airborn; Hathaway Components; Premier Microwave; R. F. Interonics; Ward Leonard Elec.; Stettner-Trush. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 1)

POLACH & BENSINGER, INC., 231 E. Millbrae Ave., (415) 697-2525.
Factories: Datak; Essex Int'l.; Fairchild Camera & Instr.; J. Millen Mfg.; Triplett. **Services:** Direct Mail
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

Montrose

STREVER CO. INC., Box 325, (213) 245-8803. TELEX: 67-4219.
Factories: Domtar Chemicals; Ex-Cell-O; Greenback Inds.; Powder Alloys; Teledyne.
Selling To: ★ I,D,M. **Salesmen:** 3
Services: Warehouse, Sales Office

Mountain View

ALLGOOD ASSOCS. (See Inglewood, Calif.)

HUGHES, R. S. CO., INC. (See Los Angeles, Calif.)

I F M - NORTH, 2269 Old Middlefield Way.
Factories: Associated Testing Labs.; Beta Instr.; Hyperion Inds.; Instrument Prods. 3M; Melcor Elctrns.; Ragen Precision; RFL Industries; Shepard-Vogue; TMC Sys.; Waveline. **Services:** Repair; Warehouse
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)

IFM-SOUTH (See Hollywood, Calif.)

KITTLESON CO. (See Mountain View, Calif.)

PENINSULA ASSOCS., 415 Clyde Ave., Suite B, (415) 961-8663.
Factories: Disco Abrasive Prods.; Geoscience Instrs.; K D J - Electronetics; West Coast Research.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

REPEX INC., Box 807, 2015 Latham St., (415) 969-9200. TWX: 910-379-6477.
Branches: 1790 Pitcairn, Costa Mesa, Calif., (714) 540-4832; 10717 N.W. 4th St., Bellevue, Wash., (206) 455-2778.
Factories: Advanced Peripherals; Airflyte Elctrns.; Artisan Elctrns.; Computer Devices; Dynamic Instr.; Dynamics Research; Electric Thermometers; Electronic Devices; General Monitors; Honeywell Commercial Div.; Industrial Devices; Japanese Prods.; Loyola Inds.; Maxwell Labs.; Printed Motors; Quality Transformers; A. O. Smith; Spellman High Voltage Elctrns.; Transducer Sys.; G. Ulanet; Vidcor. **Services:** Warehouse
Selling To: ★ D,I. **Salesmen:** 7 (eng 6)

RIEDEL, M. W. & CO. (See Alhambra, Calif.)

Newport Beach

FIELDTEC INC., 4242 Campus Dr., (213) 860-4000. (714) 540-4000.
Branches: 1400 Coleman Ave., Santa Clara, Calif., (408) 243-4600; 7155 E. Thomas Rd., Scottsdale, Ariz., (602) 947-7762.
Factories: Aero Vac; R. D. Brew & Co.; Cryolab; ENVIRCO; Evaporation Apparatus; Genarco; High Vacuum Equipt.; Harris Mfg.; Hotpack; Harris Mfg.; Particle Technology; T-M Vacuum Prods.; Thunder Scientific; Vacuum Instr. **Services:** Repair

North Hollywood

BASSETT & MOORE, INC., 12045 Magnolia Blvd., (213) 877-7129.
Factories: Acoustron Elctrn.; Amperex; Antenna Specialists; Astatic Corp.; Atlas Sound; Auricord Corp.; Bussmann Mfg.; Controlonics; Cornell-Dubilier Elctrn.; Gertsch Dept; IRC; Linear Sys.; Lowell Mfg.; Standard Components; United Technical Publications; Utah Elctrns. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 3

CARTER, J. ASSOC., 11200 Chandler Blvd., (213) 980-3450.
Factories: Electrovert; Electro Voice; Fairchild; International Wire; JFD; JFD-MATV; McMartin; Mercury Jackson; Murdock; Oaktron; Tandberg; Triad. **Salesmen:** 4
Selling To: ★ A,D,I. **Services:** Repair, Warehouse

COMPONENTS SALES CALIFORNIA, INC., 11484 Oxnard St., (213) 980-3400. TWX: 910-499-2174.
Branches: 12696 Pacato Circle N., San Diego, Calif., (714) 291-5799. TWX: 910-499-2174; Palo Alto, Calif., (415) 326-5317. TWX: 910-499-2174.
Factories: Computer Instr.; Digitronics; Instrumentation Technology; Invac Corp.; Iota Engrg.; Millitest Corp.; Precision Mechanisms; Prestoseal Mfg.; Science Accessories. **Selling To:** ★ I,M. **Salesmen:** 3 (eng 3)

JEWETT CO., 13111 Ventura Blvd., (213) 789-8193, 872-1895. TWX: 910-499-2196.
Factories: Abrams Instr.; Bendix; Damon; Hastings-Raydist; International Scientific; Olektron; Roanwell.
Selling To: ★ I. **Salesmen:** 3 (eng 3)

MARKMAN CO., 4142 Lankershim Blvd., (213) 877-3368.
Factories: BSR-McDonald; Denon; Dynaco; Fanon Elctrns.; GBC; Grado; I.E.C./Mullard; Magitran; Motorola-Hep; NT•T Sls.; Playtape; Ranger/Tenna/Merlin; Rotron; H.H. Scott; Walco. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 5 (eng. 2)

O'HALLORAN ASSOCS., 10700 Ventura Blvd.
Branches: 3921 East Bayshore Dr., Palo Alto, Calif.; 3760 Midway Dr., San Diego, Calif.
Factories: AMF: Beckman Instrs. EID; Boonton Elctrns.; Electronic Ventures; Gencom Div.; Hughes Aircraft; Hybrid Sys.; Marubenilida; Narda Microwave; Philips Elctrn. Instr.; Products for Research; Rental Elctrns.; R F Comm.; SAICOR; Scott Elctrns. Labs.; Wanlass Elec.
Selling To: ★ I,M. **Salesmen:** 9 (eng 9)
Services: Repair, Warehouse, Conference Facility

Oakland

LEGG, R. CO. (See Portland, Ore.)

MOULTHROP, F. W. & ASSOCS., 1530 E. 12th St., (415) 261-7676. TWX: 910-366-7206.
Factories: Alpha Wire; Bendix Microwave Devices Div.; Bussmann Mfg.; Dialight; Elco; Elctra/Midland; Electrovert; J-B-T/Shurite; Magnecraft Elec.; Marshall Inds.; National Capacitor; Solitron Devices; Wyco Metals.
Selling To: ★ I,D. **Salesmen:** 4

SINCLAIR ELCTRN. ASSOCS., 1085 Clarendon Crescent, (415) 451-1835.
Factories: Epsilon Code Records; Gold Line Connector; Hammarlund Mfg.; Jackson Electrical Instr.; Kirk Elctrns. Div.; Lykes Elctrns.; Marden Elctrns.; Mercury Elctrns.; Mosley Elctrns.; Saxton Prods.; Sonar Radio; Tristao Tower; Vokar Prods.; Ward Prods. **Salesmen:** 1
Selling To: ★ D. **Services:** Warehouse

WESTERN ELECTRO-MACH., 300 Broadway, (415) 452-1936. **Services:** Repair
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

Orange

HUDDLESTON, F. ASSOCS. INC., 44 Plaza Square, (714) 639-1941. TWX: 910-593-1347.
Factories: Caton Inds.; Chemelec Prods.; Cir-Kit; Grayhill; Grayhill Moltronics; Omntronics Mfg.; Schauer Mfg.; Torotel. **Selling To:** ★ I,D,M. **Salesmen:** 3

HUGHES, R. S. CO., INC. (See Los Angeles, Calif.)

Pacific Palisades

WADSWORTH MFG. ASSOC. INC. (See Liverpool, N.Y.)

Palo Alto

ADTEK ASSOCS., 201 Town & Country Village, (415) 323-5414.
Factories: Allen Avionics; Ballastran Corp.; Mark Prods.; Rayseel. **Services:** Application Engineering
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

(See Advertisement This Page)

BANKS, R. A. SALES CORP., 1029 Corporation Way.
Factories: ACS Inds.; Barnes Corp.; Jonathan Mfg.; Lerco Div.; Sealtron Corp.; Semcor Div.; Sloan Co.; Staco Switch; Varo; Vero Elctrns.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 2)

COMPONENTS SLS. CALIFORNIA, INC. (See No. Hollywood, Calif.)

COSTELLO, LITTLE & CO. (See Los Angeles, Calif.)

EGBERT ENG., 801 Welch Rd.-Suite 214, (415) 326-1387.
Factories: Astro-Science; Electro Development; Monitor Systems; Monitor Displays; Tavis Corp.
Selling To: ★ M. **Salesman:** 1 (eng 1)

HARRIS, B. CO. (See Los Angeles, Calif.)

HECHT, HENSCHEN AND ASSOCS., INC. (See Phoenix, Ariz.)

HERRMANN, C. ASSOC., Box 1179, (415) 322-4561.
Branch: 1245 E. Walnut St., Pasadena, Calif., (213) 861-5111.
Factories: Advanced Technology — Sys.; Bell & Howell; CHA Inds.; Cooke Vacuum Prods.; Leybold-Heraeus.
Selling To: ★ I. **Salesmen:** 3 (eng 3)
Services: Repair, Warehouse, Display Room

INSTRUMENT LAB. (See Gardena, Calif.)

MAULDIN CO., 437 California Ave., (415) 326-5291.
Branch: P.O. Box 02031, Portland, Ore., (503) 654-0495.
Factories: Alpha Data; Ametik; Aragon Assocs.; Astro-Metrix; Coast Coil; Digital Prods.; Electronic Specialty; Exact Elctrns.; Faratron; Greibach; Industrial Technology Medistor Instr.; RMS: Sterling Transformer; Time Sys.
Selling To: ★ A,I,M. **Salesmen:** 5 (eng 4)
Services: Repair

NURCHES, P. CO. (See Pasadena, Calif.)

O'DONNELL ASSOCS. INC. (See Torrance, Calif.)

O'HALLORAN ASSOC. (See N. Hollywood, Calif.)

RDP INSTRUMENTS, INC., 999 Commercial St., (415) 328-6666.
Branch: 11565-B Paramount Blvd., Downey, Calif., (213) 923-1515.

Factories: Behlman Div. of Calif. Instr.; California Instr.; Centilab; Compace Communications: Control Equipt.; Dranetz Engrg. Labs.; Intronics; Itron; Kevlin Mfg.; Miracle-Hill Elctrns.; B. L. Packer; Phoenix Data; RO Assoc.; Rowan-Elctrn. Meas.; Semiconductor Circuits; Wayne Kerr. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

RETTY/SCHOENDUVE INC. (See Los Angeles, Calif.)

R F ASSOCS., INC. (See Los Angeles, Calif.)

ROBERTS, E. V. & ASSOCS., INC. (See Culver City, Calif.)

TECH-SER, INC. (See Burbank, Calif.)

THORSON CO. (See Los Angeles, Calif.)

WARD/DAVIS ASSOC. (See Pasadena, Calif.)

Pasadena

A-F SALES ENGRG., INC., 1000 E. Walnut St., (213) 681-5631. TWX: 910-588-3761.
Factories: Airtron Div.; Bailey Instr.; Beta Instr.; Coherent Optics; Coherent Radiation Labs.; Control Products; Electro Fiberoptics; ILC, Inc.; Infodex; Lancaster Glass; Maxwell Labs.; Optron; Quan-Tech Div.; Thomas Elctrns.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

ELECTRO-MECHANICAL INSTS., INC., 1388 E. Walnut St., (213) 681-2748.
Factories: Dynamic Instr.; Northfield Precision Instrmt.; Sperry Rand Corp.; Wilmore Elctrns.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

ELLIS, D. CO., 123 N. Marengo, (213) 681-9108.
Factories: Alco Elctrn. Prods.; Alcoswitch; Doran Mfg.; Illinois Capacitor Sls.; Meson Elctrns. Co.; Semi-Elements; World Magnetics. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

HERRMANN, C. ASSOC. (See Palo Alto, Calif.)

LUSCOMBE ENGRG. CO., 610 S. Arroyo Pkwy., (213) 684-2000. TWX: 910-588-3285.
Branches: 330 E. Third Ave., San Mateo, Calif., (415) 342-7057. TWX: 910-374-2866; 222 W. Osborn Rd., Phoenix, Ariz., (602) 274-1542.
Factories: American Aerospace Controls; Analogic; Industrial Test Equipt.; Modutec; NPL; RFL Inds.; Static Prods.; Technipower; Trump Ross. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 12

MULVIN & CO. INC., 3843 E. Colorado Blvd., (213) 681-4591.
Factories: Aerotronic; Kurz Kasch; Newko Elctrns.; Mansol Ceramics; Merel; Spec Plastics; Textool Prods.; Metalized Ceramic. **Services:** Warehouse, Sales Office
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

NURCHES, P. CO., 2396 E. Foothill Blvd., (213) 796-5844.
Branch: 999 Commercial St., Palo Alto, Calif., DA 6-7842.
Factories: F. W. Bell; Buckeye Stamping; Coto-Coil; Gordos; Pomona Elctrns.; Spar Elctrns.; Vernitron Corp.; Western Elctrn. Prods.
Selling To: ★ I,M,D. **Salesmen:** 5 (eng 5)

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

SPACE ENGRG., 491 No. Los Robles Ave., (213) 681-4421. TWX: 213-449-3456.
Factories: Condor Inds.; Eagle Signal; Eastern Rotocraft; Fredericks. **Services:** Application Engineering
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

TECHNISALES CO., 3820 E. Colorado Blvd., (213) 792-5111.
Factories: Discon; Electro-Craft; Electro Prods. Labs.; Machinery Electrification.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

WARD/DAVIS ASSOCS., 770 S. Arroyo Pky., (213) 684-2840.
Branches: 3941 E. Bayshore, Palo Alto, Calif., (415) 968-7116; 3442 Hancock St., San Diego, Calif., (714) 297-4619.
Factories: Anadex; Beckman Instrs.; Dana Labs.; Data Meas.; Data Memory; EMC: Empire; Gertsch; Gulton Inds.; Kennedy; Midwestern Instrs.; Panoramic; Raytheon; Sangamo Elec.; Singer Co.; SRI; Valtec; Wavetek.
Selling To: ★ I,M. **Salesmen:** 18 (eng 18)
Services: Repair, Warehouse

WRIGHT ENGRG., 180 E. California Blvd., (213) 681-2651. TWX: 910-588-3753.
Branch: 175 S. San Antonio Rd., Los Altos, Calif., (415) 941-4405.
Factories: Anzac Elctrns.; Atlantic Microwave; Cutler-Hammer; Data Instrs.; Diamond Antenna & Microwave; Digilin Digital Instrs.; Electro/Data; Electronic Dev.; Eppley Lab.; London; Microwave Prods. Group; Sage Labs.; Semi/Dyne Elctrns. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

Pico Rivera

WESTREP, 9519 Telegraph Rd., (213) 949-2551. TWX: 910-586-1363.
Factories: Daven; Electronic Specialty; Electro Switch; Film Microelectronics; Korry; Tansitor; Times Wire & Cable; Solid State Scientific.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 3)

Redwood City

HELD & MOLLARD, INC., 1494 Oddstad Dr., (415) 369-4871. TWX: 910-378-5927.
Factories: Acopian; Clary; Control Data; Isofilm Int'l.; Raytek; Sartron; Sessions Ind. Timing Div.; Struthers-Dunn; Tech Labs.; Vamistor; Weston Comp. Div.; Weston Instruments. **Services:** Repair, Warehouse
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)

LOGAN & LOGAN CO., Box 4, (415) 365-1303.
Factories: D. M. Semiconductor; Lektrostat; Major Elctrns.; S & A Elctrns.
Selling To: ★ D. **Salesman:** 1

LOGAN SLS. CO., 463 Brewster Ave., (415) 369-6926. TWX: 910-378-5928.
Factories: Antenna Specialists; California Chassis; Centralab; Centralab Semiconductor; Components; Electra; Electro Prods. Labs.; Finney; Gertsch; E. F. Johnson; J. W. Miller; Pennsylvania Elctrns. Tech; Paktron Div.; Richey Elctrns.; Robinson-Nugent Elctrns.; Rohn Mfg.; Triad Distributor Div.; U T P.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

LONG & ASSOCS. INC., 505 Middlefield Rd., (415) 369-3324. TWX: 910-378-5429.
Branch: 1210 Canterbury Dr., Burlingame, Calif., (415) 342-3324.
Factories: Automation Dev.; Barber-Colman; CEA; Delevan Elctrns.; Electro-Craft; General Time; Holtzer-Cabot; Horizons Int'l.; Hurst Mfg.; Portescap; Trompeter Elctrns.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Warehouse; Demo Room; Printing Plant; Projection Eqpt.; Conference Rooms.

(See Advertisement This Page)

SINAI-JOHNSON, INC., 817 Douglas Ave., Box 5218, (415) 365-6263. TWX: 910-378-5427.
Factories: Automatic Radio; AMD-Claricon; B & K Mfg. Co.; Blonder Tongue Labs.; Bomar Crystal Co.; Broadmoor Inds.; BSR McDonald; Elctrn. Publishing; Enterprise Dev.; Harman Kardon; Int'l. Wire & Cable; Jensen Mfg.; Lance Antenna; Loral Distb. Prods.; Magnetic Tape; Merit Coil & Trans.; Micro-ohm; Pickering & Co.; Precision Apparatus Div.; Rek-O-Cut Div.; Terado; Turner; Weller Elec.; Workman Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 2)

WARREN-HICKEY SLS. CO., 175 Fifth Ave., (415) 368-3849.
Factories: Accuride Div.; Barry Controls; Beede Electrical Instr.; Birtcher; Chicago Condenser; Continental-Wirt Elctrns.; Electro-Mechanisms; Kulka Electric; Precision Timer; Schrack Electrical Sls.; H. H. Smith; Sorensen Elctrns.; Zenith Transformer. **Services:** Warehouse
Selling To: ★ D,I,M. **Salesmen:** 4 (eng 3)

Sacramento

PETERS-DE LAET, INC. (See Burlingame, Calif.)

San Carlos

BUCCHIA, R. D., 1077 Industrial Rd., (415) 592-4600. TWX: 910-376-4902.
Factories: Alco Elctrns. Prods.; Ceram; Chomerics; Electro Adapter; Icore Electro-Plastics; Keystone Elctrns.; Kings Elctrns.; Nytronics; Pam-Pro Plastics; Sanders Assocs.; Seven Assocs.; Sonotone; Sterling Connection Sys.; Viking Inds.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

DOWERS, A. A. CO. (See Westminster, Calif.)

ELECTRONIC ENGINEERING ASSOCS. LTD., P. O. Box 997, (415) 593-2189. TWX: 910-376-4406.
Factories: A.P.I. Instrs.; Hafstrom Technical Prods.; Imtra Corp.; Millivac Instrs.; Natel Engrg.; Schaevitz Engrg.; Texas Instrs.; Thermosen, Inc.; Trans-sonics, Inc.; Todd Prods.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

MELCHIOR ASSOCS. INC., 820B Cherry, (415) 591-7383. TWX: 910-376-4404.
Factories: Gudeman; Hansen Mfg.; Hevi-Duty Elec.; Hutson; NVF; Stackpole Carbon; Syntron; Thomas & Skinner; Vishay Resistor Prod. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

ROSS, D. H. CO., 1095 Industrial Rd., (415) 591-4411. TWX: 910-376-4392. **Services:** Warehouse
Selling To: ★ I,D,A,M. **Salesmen:** 9 (eng 4)

San Diego

ALLEN, D. CO., 7969 Engineer Rd., (714) 278-9250.
Factories: Fresco; IMB Elctrns.; Janco; Kelvin Assoc.; Vanguard/Wyle.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

ALLGOOD ASSOCS. (See Inglewood, Calif.)

BERMAN, J. CO., INC. (See Inglewood, Calif.)

BLACK & STRONG, INC. (See Los Angeles, Calif.)

CAIN & CO. (See Los Angeles, Calif.)

COMPAR CORP. (See Burlingame, Calif.)

COMPONENTS SLS. CALIF. (See No. Hollywood, Calif.)

DORADO ELCTRNS. INC. (See Van Nuys, Calif.)

DYNAMIC ASSOC. LEASAMETRIC, INC. (See Burlingame, Calif.)

HENBERGER, J. C. CO., 3661 Voltaire St., (714) 223-7114.
Factories: Aero Mechanisms; Agastat; Automatic Signal; J. E. Bauer; Buchanan Electrical Prods.; Browning Mfg.; Cobehn; Electro Dynamics; Gray; Pfaff & Kendall; Philadelphia Gear; Sargent-Sowell; Solar; Stimsonite; Veeder Root, Inc.; VePed Traffic Controls.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
Services: Warehouse

HUGHES, R. S. CO., INC. (See Los Angeles, Calif.)

IFM-SOUTH (See Hollywood, Calif.)

INSTRUMENT SPECIALISTS, INC. (See Glendale, Calif.)

LANDA, E. CO. (See Los Angeles, Calif.)

MARSHALL, G. S. CO. (See El Monte, Calif.)

MONTGOMERY BROS., INC. (See Burlingame, Calif.)

O'HALLORAN ASSOC. (See North Hollywood, Calif.)

ROBERTS, E. V. & ASSOCS. INC. (See Culver City, Calif.)

TECH-SER, INC. (See Burbank, Calif.)

THORSON CO. (See Los Angeles, Calif.)

WARD/DAVIS ASSOC. (See Pasadena, Calif.)

WOODS G. E. ASSOCS. INC. (See Anaheim, Calif.)

San Francisco

BELFER, WILLIAM, 387 6th St., (415) 781-0392.
Selling To: ★ A,D. **Salesmen:** 2 (eng 1)
Services: Warehouse

BIZTEK CO., INC. (See Toluca Lake, Calif.)

CADY, J. F., 1485 Bayshore Blvd., (415) 467-8656.
Factories: Bodine Elec.; Stearns Elec.
Selling To: ★ A,I. **Salesmen:** 2 (eng 2)

CHURCH, L. F. CO., 655 Folsom, (415) 781-1897.
Factories: De Bothezat Fans; Ward Leonard Elec.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)
Services: Warehouse

COHN & SHANE, INC. (See Los Angeles, Calif.)

HONN, G. E. CO. INC., 566 Folsom St., (415) 781-7352. TELEX: 3-4788.
Factories: Adalet Mfg.; Beta; Lightalarms Elec.; Nife; J. Remke; Scientific Columbus; States Co.
Selling To: ★ D,I. **Salesmen:** 5 (eng 2)
Services: Warehouse

HUNDLEY CO., INC. (See Los Angeles, Calif.)

JENSEN INSTR. CO. (See Los Angeles, Calif.)

KING ENGRG. CO. (See Encino, Calif.)

KROTOZYNER, J. M., 420 Market St., (415) 982-4636.
Factories: Autotron; Carbon Engrg.; Linemaster Switch.
Selling To: ★ I,D,M. **Salesman:** 1

LITTRELL WESTERN SLS. INC. (See Los Angeles, Calif.)

LYNN & BROOKS (See Los Angeles, Calif.)

MEYER, ROSS & FLEMING, 113 Tenth St., (415) 431-0652.
Factories: Acoustone; Andrea Radio; Argos Prods.; Astrocom/Marlux; Audio Devices; Calcon Mfg.; David Clark; Electro Voice; Fanon Elctrns.; Grommes-Precision Elctrns.; Hi-Lo Mfg. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 1)

MORSE ASSOCS., 1721 Chestnut St., (415) 567-6871.
Factories: Agac-Derritron; Chadwick-Helmuth; Conn. Environmental R & D; D. A. C.; Denton Vacuum; Discon; EMR-Hatboro Div.; Inreco; Truco; U. S. Dynamics.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

NORTHWEST SLS. & ENGRG. SVC. (See Seattle, Wash.)

SLATER R. R. CO. (See Seattle, Wash.)

TECHNICAL SLS. ASSOCS., 1485 Bayshore Blvd., (415) 467-1434.
Factories: AKG Headphones; Chemtronics; Columbia Elctrn. Cables; Fasco Inds.; Fourjay Inds.; Lectrotech; Oxford Speaker; Perma Power; Texas Crystals.
Selling To: ★ A,D. **Salesmen:** 2
Services: Warehouse

San Jose

HEIM & SMOLEN, INC. (See Tarzana, Calif.)

LONG & ASSOCS., INC.

Engrg. Reps — Redwood City (S.F.), Calif.

• 4 Sales Engrs — Extensive, saturation customer services.

• Limited Lines, Insts: Envtls • Elecx. Systems

Compts: MIL-Com'l Mtrs • Video Patching/Matrices • Pwr. Sup.

• Display Rms • 4000 Engr. Mail. List • Strong, Field Tech. Mktg.

415 369-3324 **The Go-Go Boys!** TWX: 910 378-5429

San Marino

WOLFF, A. L. CO., 2485 Huntington Dr., (213) 783-9149.
Factories: Physiological Training; Ward Assocs.; Wolff Inds. **Selling To:** ★ I.

San Mateo

ELECTRONICS MKTG. ASSOCS., Box 5199, (415) 341-6666.
Factories: Amertest; Baver; Bell Furniture; Bogen; Daburn; Grado Labs; Gri-Com; Industrial Devices; J.B.L. Sound; Javelin Elect.; Recoton; Robins; Superex; Toujay Multi-Cube. **Selling To:** ★ A,D. **Salesmen:** 2

FERRIS, F. R. CO., INC. (See Los Angeles, Calif.)

HARRISS, L. H. CO., 204 E. Hillsdale Blvd., (415) 341-2909.
Factories: Antronic; Bell P. A. Prods.; Cornish Wire; Metal Works; NT•T Sls.; Seco Elctrns.; Semitronics; Utah Elctrns. **Services:** Warehouse
Selling To: ★ D. **Salesmen:** 2 (eng 1)

LUSCOMBE ENGRG. CO. (See Pasadena, Calif.)

PYLE, J. CO., 1611 Borel Pl.-Suite #4, (415) 349-1266. TWX: 910-374-2354.
Factories: Control Data; Cermetek; Duncan Elctrns.; Elctrn. Arrays; General Resistance; Sage Elctrns.; Silicon General; Warnecke Electron Tubes.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Mailing.

San Rafael

BRANDT, E. W. CO., Box 538, (415) 454-0840.
Factories: Delwyn; Dynaco; Sansui; Telefunken.
Selling To: ★ A. **Salesman:** 1
Services: Warehouse

GREIST ASSOCS. INC., 26 Duffy Place, (415) 454-5131.
Factories: Penta-Kilovac; View. **Services:** Warehouse
Selling To: ★ A,I. **Salesmen:** 3 (eng 2)

Santa Ana

INTERDOM, 1320 E. Wakeham Ave., (714) 835-5104.
Factories: Associated Research; Fil-Magic; Frazier; Scientific Audio Equi.; Sherwood Elctrn. Labs.; Thermolyne.
Selling To: ★ A,I,D,M. **Salesmen:** 3
Services: Repair, Warehouse

3 DBM INC. (See Westlake Village, Calif.)

Santa Clara

FIELDTEC, INC. (See Newport Beach, Calif.)

INSTRUMENT SPECIALISTS, INC. (See Glendale, Calif.)

OLANDER, R. & CO. (See Burbank, Calif.)

RAYMARG, Box 515, (408) 248-5199.
Factories: Alac; Bulova Watch; Controlonics; Larsen Elctrns.; Northeast Scientific; Radio Specialty Mfg.; Techform Labs. **Services:** Direct Mail
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Santa Monica

DAVIDSON ASSOCS., INC., 2920 Nebraska, (213) 829-1731. TWX: 910-343-6869.
Factories: Automation Dev.; Betatronics; Control Data; Globe Inds.; Magtrol, Inc.; H. K. Porter Co.; Power Instrs.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

(See Advertisement This Page)

MANUFACTURING ASSOCS., 1738 Colorado Ave., (213) 479-8884.
Factories: Applied Engrg. Prods.; EMC Technology; Gabriel Elctrns.; Horton-Angell; Meca Elctrns.; Omega Labs.; Progress Elctrns. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

Santee

TAW ELECTRNS. (See Sherman Oaks, Calif.)

Saratoga

TOWNSEND TECH. SLS., Box 265, (408) 252-3478. TWX: 910-338-0240.
Factories: EMC Tech.; Engelmann Microwave; Mills Resistor; Printact Relay Div.; S. H. Couch Div.; Spectrum Microwave; TEK Wave; Washburn Div.
Selling To: ★ I,M. **Salesmen:** 2
Services: Distributor

Sepulveda

R. L. ASSOCS., Box 2255, (714) 782-7826.
Factories: Airborn; Control Switch Div.; W. Kidde CPD; Photo Chemical Prods.; Richey Elctrns.; Utah Elctrns.; Victor Elctrns. **Selling To:** ★ I,D,M.

Sherman Oaks

FENOLE, J. E. CO., INC. (See Goleta, Calif.)

GEE ASSOCS., INC., 14474 Dickens St., (213) 788-5961, 872-1068.
Factories: Bonzer; Dorsett Elctrns.; Elcor; Fairchild Controls. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

HOPKINS, R. S. CO., 15016 Venture, (213) 788-5501.
Factories: Carter Motor; Dole Valve; Essex Engrg.; General Inds.; H-B Instr.; Hansen Mfg.; Protective Controls; Schrack Electrical Sls.; TruHeat.
Selling To: ★ I. **Salesman:** 1 (eng 1)

MEUSSDORFFER, R. & ASSOC., 13441 Ventura, (213) 788-0771. FAX QVF TDVY Sherman Oaks.
Factories: Barber-Colman Co.; Dayton Superior Prods.; Durakool, Inc.; Electro Mel Inds.; Hermaseal; Zero-Max.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Repair

TAW ELECTRONICS, 12925 Riverside Dr., Box 5757, (213) 784-2765.
Branches: 10,000 Buena Vista, Santee, Calif.; 16880 Wing Lane, La Puente, Calif.
Selling To: ★ I,D. **Salesmen:** 2
Services: Warehouse

WINDSOR DYNAMICS INC., Box 5500, (213) 989-3631.
Branch: 195 Greer Rd., Woodside, Calif., (415) 854-4870.
Factories: Beam Tube; Elgenco; Fork Standards; Frequency Elctrns.; Kepco; Kilovolt; Lockheed Elctrns.; Logimetrics; Ohio Semitronics; TRG. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 6 (eng 6)

Sunnyvale

FEATHERSTONE SLS. CO., Box 726, (408) 734-2663.
Factories: Commander Elctrns.; Components Specialities; Hamilton-Hall; Makado Elctrns.; M. A. Miller Mfg.; Picker-Briggs; Royal Radio; Spemco; Trusonic Audio; Unimetrics. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 2

MARSHALL, G. S. CO. (See El Monte, Calif.)

TECH MKTG. ASSOCS., INC., 355 W. Olive Ave., (408) 736-3687. TWX: 910-339-9227.
Factories: Base Ten Sys.; Borg-Warner Controls; Conic; Dacom; Data-Control Sys.; IED Div.; Microdyne; RdF; RdF West. **Selling To:** ★ M. **Salesmen:** 2 (eng 2)

WALDMAN ASSOCS., 1094 West Evelyn Ave., (408) 245-2500.
Factories: Anaren Microwave; Arvin Frequency Devices; E & M Labs.; Frequency Sources; GHZ Devices; Microsonics; Microwave Energy; Nurad.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

WIELER & CO. (See Downey, Calif.)

Tarzana

CAPELL, RICHARD, CO., P.O. Box 723, (213) 987-2233.
Factories: Caddock Elctrns.; Component Research; Digilog Elctrns.; Guide Inds.; Hamby Corp.; Mu-Electro Ceramics; Quest Elctrns.; Torwico Elctrns.; United Prods.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

HEIM & SMOLEN, INC., 18455 Burbank Blvd., (213) 881-4667. TWX: 910-493-1254.
Branch: 5418 Ora St., San Jose, Calif., (408) 252-7358.
Factories: Imetra; National Beryllia; Oberg Mfg.; Philco-Ford; Secon Metals; Sibley; Steel Inds.; Stewart Stamping; Vitta. **Selling To:** ★ I. **Salesmen:** 4 (eng 4)

MITCHELL, C. H. CO., 18531 Ventura Blvd., (213) 881-2626.
Factories: David Riemer; Mura; Petersen Radio; Telvac Instr. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

Toluca Lake

BIZTEK CO. INC., 10639 Riverside Dr., (213) 766-4890.
Branches: Box 321, San Francisco, Calif., (415) 421-3172; 7155 E. Thomas Rd., Scottsdale, Ariz., (602) 945-5781.
Factories: Datak Corp.; General Sensors; Glenmarc Mfg.; Hi-Grade Alloy; Methode Dev.; Solomon, W. B. & Assocs.
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)
Services: Warehouse, Direct Mail

Torrance

O'DONNELL ASSOCS. INC., 18053 Crenshaw, (213) 323-9243. TWX: 910-346-6732.
Branch: 1955 "B" El Camino Real, Palo Alto, Calif., (415) 327-9260.
Factories: Carborundum; Cherry Electrical Prod.; Dynage; Guardian Electrical Mfg.; HEI; Ledex; New England Instr.; Piezo Crystal; Rogan Bros.; Self-Organizing Sys.; Welch Relay.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)

TRIER, J. S. & ASSOC., 2906 Fairchild Apron, Torrance Municipal Airport, (213) 326-1885.
Factory: International Dynamics. **Salesmen:** 3 (eng 2)
Selling To: ★ I. **Services:** Repair, Warehouse

WEB ELCTRN. ASSOCS., 18039 Crenshaw Blvd., (213) 323-8676.
Factories: Coilform; Graphic Elctrns.; Phipps Precision Prods.; Quality Transformers; Wilco.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Tustin

THORSON CO. (See Los Angeles, Calif.)

Van Nuys

E. E. ENTERPRISES, INC., 5901 Noble Ave., (213) 787-5360. TWX: 910-495-1759.
Factories: Autotronics Inc.; Dynamics Rsch; Eldre Components; Hillburn Relay; Kappa Networks; Maurey Instr.; Planet Instr.; Randtronics; Tachtronic Instrs.

(See Advertisement This Page)

ELLIOT, G. INC., 13615 Victory Blvd., (213) 873-6862, 781-8454.
Factories: Applied Elctrns.; General Staple; Parabam Inc.; Piasecki Aircraft; Scionics Corp.; S-I Elctrns.; Texas Instrs.; Raytheon Co. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

DORADO ELECTRONICS INC., 13615 Victory Blvd., (213) 787-4125, 873-4124. TWX: 910-495-1803.
Branch: 6692 Bonnie View Dr., San Diego, Calif., (714) 234-2034, 466-3740.
Factories: Airtron; Atlee Corp.; Barnes Corp.; Dorado-Cal Corp.; Fairchild Controls; General Instr.; Intersil Inc.; Power Physics; Remval Comp.; Sealor Inc.; Superior Circuits; Tel Labs Inc.; Vitramon Inc.; Wesco Elec.
Selling To: ★ A,I,D,M. **Salesmen:** 5 (eng 5)
Services: Direct Mail

E. E. Enterprises, Inc.

Electronic Manufacturers Representatives

WESTERN SPECIALISTS IN TECHNICAL PRODUCT REPRESENTATION

5901 NOBLE AVE., VAN NUYS, CALIFORNIA
787-5360
TWX 910-495-1759

SALES AND ENGINEERING REPRESENTATIVES FOR SOUTHERN CALIFORNIA

DAVIDSON ASSOCIATES INC.

SOUTHERN CALIFORNIA SALES ENGINEERS

If you have a design problem involving electro-mechanical devices, our staff of graduate engineers can assist you. We have 23 years experience in the application and sales of electrical equipment. Motors and other servo system electro-mechanical components, are our specialty.

ELECTRO-MECHANICAL COMPONENTS AND SYSTEMS

- Actuators
- Angle Indicators
- Blowers
- Brakes
- Clutches
- Cooling Equipment
- Dynamometers
- Fans
- Gearmotors
- Meter Relays
- Motors
- Motor Speed Controls
- Positioning Devices
- Pots, Motorized
- Power Supplies
- Pumps
- Rate Generators
- Recorder Drives
- Relays
- Servo Motors
- Servo Systems
- Stepper Motors
- Stroboscopes
- Tachometers
- Timers
- Torque Meters
- Variable Speed Drives

2920 NEBRASKA AVE., SANTA MONICA, CALIFORNIA (213) 829-1731

FEDERAL STAMPINGS, INC., 13630 Saticoy St., (213) 873-7610.
Selling To: ★ A,M. **Salesmen:** 3 (eng 2)

PENWARDEN ASSOCS., 14547 Titus, (213) 782-4920. TWX: 910-495-1729.
Factories: Curtis Development; Drake Mfg.; Foster Transformer; Globe-Union; Hurst Mfg.; McGill Mfg.; Nucleonic Prods.; Precision Elctrn.; Sigma Instr.; Standard Grisby.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)

R. L. ASSOCS., 14401 Gilmore St., (213) 782-7826. TWX: 910-495-1733.
Factories: Air Born; Control Switch Div.; Croven; Ovenaire; Piezo Technology; Richey Elctrns.; Victor Elec. Wire & Cable; Voltronics; Utah Elctrns.
Selling To: ★ I,M. **Salesmen:** 5 (eng 4)

SHEPHARD COMPONENTS, 16152 Covello St., (213) 787-4610. TWX: 910-495-1741.
Factories: Amperex Elctrn.; Better Coil & Transformer; Bourns Pacific Magnetics; Continental-Wirt Elctrns.; Elctrn. Research; Flair Elctrns.; Deutsch Ind. Relays; Lenox Fugle Elctrns.; National Tel Tronics; Sensitron Semiconductor; Sprague Elec. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

TIM-CO SLS., 16024 Sherman Way, (213) 781-7370.
Factories: Electronic Transistors; Sterling Transformer.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)
Services: Warehouse

WES-K ASSOCS., 5917 Noble Ave., (213) 989-3070. TWX: 910-495-1770.
Factories: Hybridyne; Kelvin; Mid-Continent Lab.; Vamistor; Western Gold & Platinum.
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 3)

Westlake Village

3 DBM INC., 5388 Sterling Center Dr., (213) 889-2300. TWX: 910-494-1957.
Branch: 2216 No. SpurgeonAve., Santa Ana, Calif., (714) 542-1966.
Factories: Applied Research; Cober Elctrns.; E & M Labs.; Frequency Sources; GHz Devices; LDV Electro Science Inds.; Int'l. Microwave; Microtech; Microwave Energy; OKI Elctrns.; Spectrum Tech.; Vitramon Microwave. **Services:** Warehouse
Selling To: ★ M. **Salesmen:** 3 (eng 2)

Westminster

DOWERS, A. A. CO., 15152 Golden W. Circle, (213) 596-4485. TWX: 910-596-1807.
Branches: 1710 Industrial Rd., San Carlos, Calif., (415) 592-4600. TWX: 910-376-4902; 311 E. Indian School Rd., Phoenix, Ariz., (602) 266-7252.
Factories: Kelscot Inds.; Kings Elctrns.; Marathon Battery; Nickel-Cadmium Elctrns. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 4)

ELECTRIC MOTOR SPECIALISTS, Box 517, (213) 564-7372.
Factories: Dynacool Mfg.; Jakel Motors; Scot Inc.; Motor Specialty. **Selling To:** ★ I,D. **Salesmen:** 3 (eng 2)

Whittier

RISSI SLS. CO., 11936 E. Washington Blvd., (213) 945-2341.
Factories: Aerovox; Barker & Williamson; Daburn Elctrns. & Cable; Gowanda Elctrns.; Pomona Elctrns.; Premier Metal Prods.; Tab Books.
Selling To: ★ D. **Salesmen:** 3 (eng 1)

Wilmington

KEY REPRESENTATION, Box 523, (213) 549-1770.
Selling To: ★ I,M,Medical **Salesmen:** 3 (eng 3)
Services: Warehouse

Woodland Hills

INTERSTATE MKTG. ASSOC., 22030 Ventura Blvd., (213) 883-7606. TWX: 910-494-1239.
Factories: Airco-Speer; Bulova Elctrns.; ESC Elctrns. Corp.; Hi-G Inc.; LRC Inc.; Silicon Transistor; STM Corp.; Transitron Elctrns.; Vari-L Co. **Services:** Repair
Selling To: ★ A,D,I,M. **Salesmen:** 6 (eng 6)

Woodside

WINDSOR DYNAMICS INC. (See Sherman Oaks, Calif.)

COLORADO

Boulder

INTERMOUNTAIN ASSOCS., 1930 Fourteenth St., (303) 449-1473.
Factories: Aircom; Bel Fuse; Bivar; Carborundum; Chemical Fabrics; Circuit Materials; Comtel; Connector Div.-Control Data; Electronic Modules; Magnetic Core; Methode Dev.; Singer; Southern Elctrns.; Universal Laminates. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

Colorado Springs

ELECTRONIC MFGS. CONSULTANTS INC., Box 503, (303) 636-5131.
Branches: 15 N. 40th Pl., Phoenix, Ariz., (602) 273-7376; 1728 S. 790 West, Salt Lake City, Utah, (801) 485-1441.
Factories: Admiral Controls; Anixter Murray; Electric Soldering Iron; Formulabs, Inc.; N.J. Semi-Conductor; Power Components; Precision Thermometer & Instr.; Printact Div., Executone Corp.; Tingstol Co.; Vigor Tool Div. **Selling To:** ★ I,D. **Salesmen:** 3 (eng 1)

Denver

BARNHILL ASSOCS., 1170 So. Sheridan Blvd., (505) 265-7766, (303) 934-5505. TWX: 910-931-2685.
Branches: Houston, Tex., (713) 621-0040; Richardson, Tex., (214) AD 1-2573; 827 Pennsylvania N.E., Albuquerque, N.M., (505) 265-7766; 537 E. Osborn Rd., Phoenix, Ariz., (602) 263-1250; 2459 S. Main, Salt Lake City, Utah, (801) 487-1327.
Factories: Anaren Microwave; Applied Magnetics; Bendix; Beckman Instrs.; Hi-G Inc.; Ingersoll Prods.; Intech; Ledex; Litton Prods.; Monitor Prods.; Nytronics; Siliconix; Tansistor Elctrns.; Uid Electrns.; Auto-Control Labs.; B L H Elctrns.; Beckman Instrs.; B & K Instrs.; Chronetics; Data Royal; John Fluke Mfg.; Microlab/FXR; Neff Instr.; Optimation; Raytheon; Spectra-Physics.
Selling To: ★ A,I,D,M. **Salesmen:** 43 (eng 23)
Services: Sales Office

BENNEWITZ ASSOC., INC. (See Albuquerque, N.M.)

BFA, 1309 So. Inca, (303) 744-3301.
Branches: 1238 Ortiz, S.E., Albuquerque, N.M., (505) 268-4387; Box 1237, Las Cruces, N.M., (505) 523-0601; 503 N. Brown Ave., Scottsdale, Ariz., (602) 946-4215; Box 50, Friendswood, Tex., (713) 482-7563; 708 W. Euless Blvd., Euless, Tex., (817) 267-1505.
Factories: American Std.; Aero Research Instr.; Analogic Co.; Astrodata, Inc.; Babcock Elctrns.; Bolt, Beranek & Newman, Inc.; Cimron Div.; Coleman Engrg.; Esterline Angus; Incre-Data Corp.; Interdata; Precision Instr.; SRC Div.; Tally Corp.; Tracor; Trygon/Trymetrics; Wavetek. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 11 (eng 5)

CATHEY, R. E. CO., 200 Garrison St., (303) 238-1506.
Factories: Eidson, Thos. A.; Grayhill; Sensor Precision Ind. **Services:** Repair
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

CONNORS, INC., 424 S Federal Blvd., (303) 934-5829.
Factories: Aerovox; Astatic; IRC Inc.; Int'l. Rectifier; Finney; Norcon; Raytheon; Seco; Thordarson-Meissner; Waldom; Weller; Xcelite. **Services:** Warehouse
Selling To: ★ D. **Salesmen:** 3

ELLIOTT, C. P. CO., 661 Delaware St., (303) 255-2844.
Factories: Automatic Switch; W. L. Jenkins; Sterling Electric Motors.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

GATES, R. Y. CO., INC. (See Albuquerque, N.M.)

HURLBUT, J. F. CO., 1295 S. Bannock, (303) 744-1451.
Branch: 3817 W. 3280 St. S., Granger, Utah, (801) 299-4321.
Factories: Alcoknob; Allen Avionicx; American Zettler; Bell & Howell; Boonton Elctrns.; Cunningham Corp.; Elron Elctrn. Inds.; Fairchild Controls; G-V Controls; Gowanda Elctrns.; Intertechnique; Kepco; Kevex; M.I.A.L., Inc.; Quan-Tech Labs.; Spiras Sys.; Varo; Y-Lab.
Selling To: ★ D,I,M. **Salesmen:** 3 (eng 2)
Services: Repair, Warehouse

HYTRONIC MEASUREMENTS, INC., 4940 E. 39th Ave., (303) 388-4081. TWX: 910-931-2597.
Branches: 205 San Pablo S.E., Albuquerque, N.M., (505) 268-3941; 1017 North Third St., Phoenix, Ariz., (602) 253-6104. TWX: 910-951-1362; 2022 South Main St., Salt Lake City, Utah, (801) 466-4924.
Factories: Aerovox; Airborne Instrs. Lab.; Alco Elctrn. Prods.; Ampex; A.P.I. Instrs.; Cipher Data Prods.; Dana Labs.; EG & G; Elctrn. Engrg.; Elgar; ITT Surprenant; Kings Elctrns.; Marconi Instrs.; Minco Prods.; Optima Enclosures; Phelps Dodge Elctrn. Prods.; Philbrick/Nexus Research; Power Designs; Rentronix; Unimax Switch. **Selling To:** ★ I,D,M. **Salesmen:** 10 (eng 8)
Services: Repair, Warehouse, Stock & Distribution

KAUB, H., & CO., 4970 Jackson St.
Factories: Colt Inds.; Dynascan Corp.; Euclid Elec. & Mfg.; Ikor; Machinery Electrification; Marathon Elec. Mfg.; Reuland Elec.; Seco Elctrns.; Westinghouse Elec.; Zero Max. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

KOETHER-COX CO., 1325 So. Inca St., (303) 733-5561.
Selling To: ★ I,A,D,M. **Salesmen:** 2
Services: Warehouse

LINDBERG CO., 2654 South Krameria St., (303) 757-6489. TWX: 910-931-2579.
Branch: 3621 Headingly N.E., Albuquerque, N.M., (505) 345-2489.
Factories: Cushman Elctrns.; Electro-Voice; Hy-Gain Elctrns.; IMC Magnetics; National Connector; Panduit; Regency Elctrns.; Spectrol Elctrns.; STM; Thermalloy; Ward-Leonard Elec.; Wollensak-3M.
Selling To: ★ A,I,D,M. **Salesmen:** 5 (eng 3)

NELSON CO. INC., 1294 So. Bannock, (303) 733-5528.
Branches: Box 1871, Salt Lake City, Utah.; Box 1884, Albuquerque, N.M.

PEARSON, M. & CO., 1860 So. Acoma, (303) 744-2323. TWX: 910-931-0494.
Branch: 288 Canyon Rd., Salt Lake City, Utah., (801) 364-7524.
Factories: Amperex Elctrn.; N. A. Philips; Vanguard Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 1)

PETERS-DE LAET, INC. (See Burlingame, Calif.)

PRO MKTG. CORP., 451 E. 58th Ave., (303) 266-2571.
Factories: Cordomatic Reels; Consolidated Merchandsng.
Selling To: ★ I,D. **Salesmen:** 4

PUTNAM, L. B. CO., 7111 Larsh Dr., (303) 825-5066.
Branch: 3695 Lois La., Salt Lake City, Utah.
Factory: Mueller Electric.
Selling To: ★ I,D. **Salesmen:** 2

SCIENTIFIC DEVICES-SOUTHWEST, INC. (See Richardson, Tex.)

THORSON CO. (See Los Angeles, Calif.)

WILLIAMS-ASSOCS. INC., 4971 Jackson St., (303) 388-4391. TWX: 303-292-3249.
Branches: 2250 N. Sixteenth St., Phoenix, Ariz., (602) 254-6085. TWX: 602-255-0483; 420 Washington St. S.E., Albuquerque, N.M., (505) 255-1638. TWX: 910-989-0622.
Factories: Amco Engrg.; Burr-Brown Research; Cohu Elctrns.; Cramer Div.; Dale Elctrns.; Dynasciences; Globe Inds.; Hastings-Raydist; RFL Inds.; Rustrak Instrs.; Signalite; Signetics; Singer; Technical Wire Prods.; Varian Assocs. **Services:** Repair, Warehouse
Selling To: ★ I,D,M. **Salesmen:** 10 (eng 6)

Englewood

COMPAR CORP. (See Burlingame, Calif.)

CUMMINGS & ASSOCS., 4772 So. Kalamath St., Box 1112, (303) 789-3449.
Factories: American Sankyo; Arnold Magnetics; E-T-A Prods.; Elctrn. Research; Electro Switch; Howard Inds.; Hudson Lamp; Insulectro; Telvac Instr.; Triwec Trans.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

DRUMMOND, J. B. CO., 3021 S. Broadway, (303) 789-2281. TELEX: 045-620.
Selling To: ★ I,D. **Salesmen:** 4 (eng 2)

PLS ASSOCIATES, INC., 7895 E. Prentice Ave., (303) 771-0140.
Branches: 4200 B Silver Ave., Albuquerque, N.M., (505) 255-2330; 901 W. McDowell Rd., Phoenix, Ariz., (602) 258-0067.
Factories: Aero Vac; Avtel; Beehive Electrotech; Control Logic; Data Gen.; Daytronic; Digi-Data; Elctrn. Meas.; Keltec; Kilovolt; Kistler Instr.; Lebow Assocs.; McLean Engrg. Labs.; Micro-Power; Microdot; Microphase; Microwave/Sys.; Optimax; Pacific Meas.; PRD Elctrns.; Redcor; Texas Instrs.; Weston Instrs.; Wilstron.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

Littleton

AZTEC ENTERPRISES, INC. (See Albuquerque, N.M.)

HULL, R. O. & CO. INC. (See Cleveland, Ohio)

PURDY, W. J. CO. (See Burlingame, Calif.)

Loveland

KELLEY ENTERPRISES, 336 E. Fourth St.
Branch: 5432 Vancouver St., El Paso, Tex., (915) 751-3843. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 2)

CONNECTICUT

Berlin

WHITE SLS. CO., INC. (See Needham, Mass.)

Bethany

REPRESENTATIVES CORP. (See Topsfield, Mass.)

Bloomfield

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

ZASLOW SLS. CO., INC., 6 Newberry Rd., (203) 242-7781.
Branches: 49 Clark St., Milford, Conn., (203) 878-1094. 339 Middlesex St., Lowell, Mass., (617) 458-8452; 371 Howard St., Northboro. Mass., (617) 393-8150.
Factories: Artisan Elctrns.; Electro-Therm; Franke Gear Works; Harowe Servo Controls; Helical Prods.; Humphrey; Ingraham; Langevin Div.; Leecraft Mfg.; Madatron; Maurey Instr.; Molon Motor & Coil; Power Control; Standard Instr.; Unimax Switch Div.; Western Gear. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)

Branford

BOEING, J. E. CO., INC. (See Lexington, Mass.)

JOHNSON ASSOC., INC. (See Wellesley Hills, Mass.)

Bridgeport

FEINBERG, J. L. ASSOC. INC. (See New London, Conn.)

TECHNICAL INSTR., INC. (See Wilmington, Mass.)

Bristol

E-P-R INC., 281 Vera Rd., (203) 584-2202.
Branch: 1113 Lexington Rd., Concord, Mass., (617) 259-8429.
Factories: American Process Equipt.; Dynage, Inc.; EL Instrs.; Enviro-Temp Inc.; General Dynamics Elctrns. Div.; Ingenuics, Inc.; Ling Elctrns.; Sippican.
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)
Services: Warehouse, Engineering Assistance

Brookfield

LOBDELL SLS. CO., Candlewood Lake Rd., (203) 775-2253. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 2 (eng 1)

Canaan

HATHAWAY, G. M. ELCTRNS. INC. (See Arlington, Mass.)

Cheshire

GREGORY, G. ASSOC. (See Natick, Mass.)

Coventry

ROBINSON, R. H. CO., Box 368, (203) 742-7323.
Branch: 1420 Providence Hgwy., Norwood, Mass., (203) 762-3511.
Factories: American Monarch Div.; Brand-Rex Div.; Bundy Elctrns.; Electro Circuits; JPM; Quinn Berry Div.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

East Hartford

MEASUREMENT EQUIP. CO. (See Wakefield, Mass.)

Fairfield

BROGER INSTR. SLS. CO., INC. (See Waltham, Mass.)

Farmington

KEYCO ASSOCS., INC., Box 357.
Branch: Box 97, Needham, Mass., (617) 449-2600.
Factories: All Craft Metals; Emtec; Flight Sys.; Gridcraft; H. H. Hilton; Mandex Mfg.; National Semiconductors; Paktron Div.; Protective Controls; RFL Inds.; Zeva Elec.
Selling To: ★ I,M. **Salesmen:** 2

PERRON, R. & CO. (See Norwood, Mass.)

Glastonbury

BARTON, C. K. ASSOCS. INC., 343 New London Tpke., (203) 633-9417.
Branch: 442 Lexington St., Auburndale, Mass., (617) 332-2021.
Factories: Branson Corp.; Braun Tool & Instr.; Carter Mfg.; Columbus Elec.; Fidelitone Rubber; Hopkins Engrg.; Janco Corp.; Jones Motrola Corp.; Marco-Oak, Ind.; Panduit. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

INSTRUMENT REPRES., INC. (See Arlington, Mass.)

Greenwich

HAMMOND ASSOCS., 34 Lincoln Ave., (203) 661-9410.
Factory: Reed Switch Dev.
Selling To: ★ I. **Salesman:** 1

N.P.N. ASSOCS., INC., 522 E. Putnan Ave., (203) 869-4955-6.
Factories: Aurcord; Develco; Elec-Trol; Gauss Electrophysics; Saki Magnetics.
Selling To: ★ I,A,M. **Salesmen:** 2 (eng 2)

Guilford

WHITEHEAD, J. F. CO., Box 177, (203) 453-3855.
Factories: E & M Industries; Ilanthol.
Selling To: ★ I. **Salesmen:** 2

Hamden

COMPAR CORP. (See Burlingame, Calif.)

COMPAR NEW ENGLAND (See Newton Highlands, Mass.)

EQUIPMENT SLS. CO., INC., Box 5396, (203) 248-5581.
Branches: Bedford, Mass., (617) 275-7730; Cooperstown, N.Y., (607) 547-8968.
Factories: Apollo Lasers; Astro-Science; Avo Elctrns. Div.; Bendix Scott Testers; Chadwick-Helmuth Co.; Cole Instr.; Data Graphics; Diamond Power Specialty; Intermed; Kahn & Co.; Marshall Reserarch & Dev.; MB Elctrns.; Multi Circuits; Optron Corp; Oregon Tech. Prods.; Powell Pressed Steel Co.; 3M Co.; Schaevitz Engrg.; Spectrolab; Team Corp.; Tenney Engrg.; Vogue Instr.
Selling To: ★ I,M. **Salesmen:** 7 (eng 6)

(See Advertisement This Page)

IMPACT SLS. CO., INC. (See Waltham, Mass.)

INSTRUMENT CONSULTANTS, INC. (See Waban, Mass.)

J & J ASSOCS. INC. (See Burlington, Mass.)

LANCER-KNEELAND, INC. (See Haverhill, Mass.)

NORTHEAST ENGRG. INC., 3013 Dixwell Ave., (203) 248-4481.
Branches: 5 Elm St., Danvers, Mass., (617) 774-3010; 124 Trumbull Rd., Manhasset, N.Y., (516) 365-9633.
Factories: Aircraft Porous Media; Environmental Control Sys.; Fischer & Porter Co.; Genisco Technology; Glassco Instr.; Mectron Inds.; Real Time Geophysics; Spectral Dynamics; Structural Dynamics Res.; Technology/Versatronics; Tescom Corp.
Selling To: ★ M. **Salesmen:** 7 (eng 7)
Services: Engrg. Assistance

STURDY, R. H., CO., INC. (See Wellesley Hills, Mass.)

Hartford

SEGEL, C. CO. (See Newtonville, Mass.)

INSTRUMENT ASSOC. INC. (See Arlington, Mass.)

Manchester

MANDELL, H. CO. (See Revere, Mass.)

Meriden

ABBOTT-ALLISON CO. INC., Box 467, (203) 237-9232.
Branch: Box 96, N. Andover, Mass., (617) 245-0250.
Factories: AM&F; M F Elctrns.; Magnetic Shield Div.; Skan-a-Matic; Spedcor; Technipower; Transducer Controls. **Services:** Mail Lists
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

LAVIN, H. ASSOCS., INC., Box 921, (203) 237-5527.
Branch: 52 Pickering St., Needham, Mass., (617) 444-3446.
Factories: ASM; Ashland; Diamonite; ETA; G-L; Gulton Mallory; Plastic Capacitors; Premier; RMC; Schauer; Sloan; Specialty Connector; Spectrum Control.
Selling To: ★ I. **Salesmen:** 6 (eng 5)

(See Advertisement Page 3237)

STURGEON, P. R. CO., INC. (See Chestnut Hill, Mass.)

Middletown

DITTMAN & GREER INC., Randolph Rd. at Coe Ave., (203) 346-9606. TELEX: 9-9293.
Factories: Cornwell Electric Co.; Electric Heater Co.; Emerson Electric; Gruenberg Electric; Oven Sys.; Sprague Electric Co.; Sta Warm Electric.
Selling To: ★ I,D. **Salesmen:** 11 (eng 4)
Services: Repair, Warehouse

Milford

TODINO ENGRG. SLS. INC. (See Needham Hgts, Mass.)

ZASLOW SLS. CO., INC. (See Bloomfield, Conn.)

New Canaan

PIERCE, S. INC. (See Norwood, Mass.)

New Haven

ADDELCO CORP. (See Needham, Mass.)

DATECH ASSOC. INC. (See Newtonville, Mass.)

EDCOM, INC. (See Newtonville, Mass.)

GERBER SLS. CO., INC. (See Waltham, Mass.)

SCHUFT, H. J. CO., INC. (See Newtonville, Mass.)

New London

FEINBERG, J. L. ASSOC. INC., 33 Shirley Lane, (203) 442-2514.
Branch: 113 Temple St., Bridgeport, Conn., (203) 377-1749.
Factories: Control Corp.; Panelgraphic Corp.; Tower Mfg.; Truco; Victor Elect. W & C. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Newington

MAHER, F. SLS. CO., 175 Brookside Rd., (203) 247-7474.
Branch: 450 Plymouth St., Bridgewater, Mass.
Factories: Dexter Chemical; Audio Designs; Deltex.
Selling To: ★ D. **Salesmen:** 2 (eng 1)
Services: Warehouse

North Haven

FORSBERG SLS. (See Brokcton, Mass.)

KITCHEN & KUTCHIN, INC., (See Lexington, Mass.)

Norwalk

ROGELL ASSOCS., INC., Box 797, (203) 853-4141.
Factories: Bendix-Mosaic Fabrications Div.; Encore Elctrns.; Millis Research.
Selling To: ★ I. **Salesman:** 1 (eng 1)

Springdale

E. E. SPECIALISTS, INC. (See Acton, Mass.)

Stamford

DAGE CORPORATION, 757 Main St., (203) 324-3123. TWX: 710-474-2490.
Factories: Acrodyne Inds.; Allied Control; Autotronics Inc.; Barnes Corp.; Baytron Co.; Bissett-Berman; Bliley Electric; Crystalonics Inc.; Dielectric Comm.; Digital Devices; Electronautics; Engelmann Microwave; Intronics; LRC Elctrns.; Merrimac Resh. & Dev.; Microtech; Microwave Dev. Labs.; Microwave Prods. Group; New England Instr.; Omega Labs.; Omtronics Mfg.; Pyrofilm Resistor; Quantatron; Ray Proof; San Fernando Elec. Mfg.; Sangamo Elec.; Stanwyck Winding; Tachtronic Instrs.; Trans-Tech Inc.; Ultronix, Inc.; Wavecome, Inc.

MILLER, G. E. ASSOC. LTD. (See Jericho, N.Y.)

SCANLON, R. B. CO., 10 Halliwell Dr., (203) 325-2718.
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

TALBE, INC. (See Englewood Cliffs, N.J.)

TALCOMP CO., INC. (See Englewood Cliffs, N.J.)

Stratford

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

ROSEN, G. CO., INC. (See Natick, Mass.)

Trumbull

PERRON, R. & CO., INC. (See Norwood, Mass.)

Wallingford

ADAMS-McGREGOR INC. (See Lincoln, R.I.)

Waterbury

COAKLEY, BOYD & ABBETT, INC. (See Needham, Mass.)

Watertown

MAHAN, R. P. CO., INC. (See Wellesley, Mass.)

West Hartford

HOOKER, S. C., INC. (See Winchester, Mass.)

INSTRUMENT DYNAMICS INC. (See Wakefield, Mass.)

KOSOWICZ, F., 2 Madsen Rd., (203) 233-7883.
Factories: Aero-Guardian Controls; M. H. Rhodes; Rogan Bros. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 1)

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PETTIGREW, R. S. & CO., INC., 10 N. Main St., (203) 233-8533.
Branch: 950 Watertown St., West Newton, Mass., (617) 969-5770.
Factories: Associated Ceramics & Technology; Clevepak; El-Met Parts; Fair-Rite; Furane Plastics; Hamilton-Precision Metals Div.; Isotemp; Malco Mfg.; Mideast Aluminum Inds.; Norplex Div.-U.O.P.; Quality Components; Troy Tool; United Mineral & Chemical.
Selling To: ★ I. **Salesmen:** 6

SMITH, E. E. ASSOC. INC., 7 South Main St., (203) 236-3521.
Factory: Dynasonics Corp. **Services:** Consultation
Selling To: ★ I (Direct to factories) **Salesmen:** 2

SMITH, R. CO. (See Brookline, Mass.)

West Haven

REISS, R. S. ASSOC., 70 Jessie Drive, (203) 933-8542.
Branch: 199 E. Foxboro St., Sharon, Mass., (617) 784-3439.
Factories: Crystek; Elpa Mktg.; Game Inds.; JBL Sound; Kepro Circuit Sys.; Leader Instr.; Mellotone; Monarch Elec.; Pomona Elec.; RMS Elec.; Sennheiser Elec.
Selling To: ★ A,I,D. **Salesmen:** 2 (eng 1)

DELAWARE

Wilmington

CUESTA, J. E. & CO., INC. (See Valley Forge, Penna.)

DISTRICT OF COLUMBIA

Washington

ANDCO SALES-ENG., INC. (See Philadelphia, Pa.)

ARCO ENGRG. CO., 1000 16th St., N.W., (202) 393-5991.
Branch: Box 239, Collingswood, N.J.
Factories: Chicago Condensor; Electro Mechanisms; Gladding-Keystone; Remvac Components; Tech Labs.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

E-A, INC. (See Baltimore, Md.)

EASTERN INSTR., INC. (See Philadelphia, Pa.)

HITCHCOCK, E. R. & ASSOC., 1629-K St. N.W., (202) 296-6899.
Factories: Churchill; New England Trawler Equipt.; Phillips-Foscue; Scott Paper Co. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

JEFFRIES, S. A. INC. (See Narberth, Pa.)

LIENAU ASSOCS., INC. (See Silver Spring, Md.)

MacDONALD, S. K. INC. (See Philadelphia, Pa.)

MASSEY ASSOCS., INC., 1 Thomas Circle NW., (202) 628-1023. Selling To: ★ A,D,I,M. **Salesmen:** 3

METROREP, INC. (See Freehold, N.J.)

SCIENTIFIC SYSTEMS SLS. CORP. (See Great Neck, N.Y.)

U S RECORDING CO., 1347 S. Capitol St., (202) 543-2705.
Factories: Ampex; Altec-Lansing; Bogen Comm. Div.; Conrac; J. W. Davis Co.; Electro-Voice; Gately; Langevin; Sennheiser; Telex; Uher; University.
Selling To: ★ A,M. **Salesmen:** 4 (eng 2)

WHITCOMB ASSOC. (See Baltimore, Md.)

WRIGHT THE CO., INC. (See Gaithersburg, Md.)

FLORIDA

Casselberry

FACT-TRONICS, INC., Box 745, (305) 838-5607.
Factories: Astrosystems; General Resistance; N-H Research; Trio Labs. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

JOHNSON ELCTRNS., INC., Box 7, (305) 838-2111.
Selling To: ★ A. **Services:** Repair **Salesmen:** 10

TAYLOR, M. F. CO. INC. (See Silver Springs, Md.)

Clearwater

BRENNAN ASSOC. INC., Box 5006, (813) 446-5006. TWX: 810-866-0431.
Factories: Audio Suttle; Custom Materials; Digital Apparatus; KMC Semiconductor; Metcom; Microlab/FXR; Nuclear; Polarad; Prodelin; Rayproof; Servo; Trymetrics.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

BURGIN-KREH FLORIDA, INC. (See Pompano Beach, Fla.)

GEARTNER ASSOCS., INC. (See Miami Beach, Fla.)

GROSS, H. R. & CO., Box 4607, (813) 446-6649.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)
Services: Repair, Warehouse, Direct Mail

ROBERTS ASSOCS., 1624 Souvenir Dr., (813) 447-3712.
Factories: Holtzer-Cabot; Insco; Lobee Pump & Mach.; Rite-Size Corrugated Mach.; Teltron.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

WIMBERLY, W. B. CO., 532 S. Fort Harrison, (813) 446-7072.
Branch: 500 S. Osceola, Orlando, Fla., (305) 425-3083.
Factories: Adams & Westlake; Conrad-Missimers; Electric Indicator; Electro-Mechanisms; Dearborn Elctrns.; General Semiconductor; Grant Pulley & Hardware; Hafstrom Technical Prods.; Ledex; Licon Div.; Stow Labs; Technical Devices; Vishay Resistor Prods.; Wakefield Engrg. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

(See Advertisement This Page)

Daytona Beach

CONTROL EQUIPMENT CO., INC. (See Atlanta, Ga.)

Deltona

ROSS, H. A. & CO., 1509 Gold Terrace, (305) 574-2564.
Selling To: ★ A,I,D. **Salesman:** 1

Dunedin

SMITH J. J. & ASSOCS., INC. (See Melbourne, Fla.)

Eau Gallie

REYNOLDS & ASSOCS. INC., Box 1043, 822 E. Strawbridge Ave., (305) 727-3205. TWX: 510-959-6003.
Branches: 175 W. Wieuca Rd., N.E., Atlanta, Ga., (404) 252-5360; 161 S.W. 7th Ave., Ft. Lauderdale, Fla., (305) 581-6611; Box 212, Graham, N.C., (919) 275-3725; Box 8877, Orlando, Fla., (305) 843-6440; 904 Bob Wallace Ave., Huntsville, Ala., (205) 536-1941.
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

Ft. Lauderdale

CAIN & CO. (See Los Angeles, Calif.)

BROWN, W. A. COMPONENTS, INC. (See Orlando, Fla.)

BROWN, W. A. INSTRS., INC. (See Orlando, Fla.)

LYNCH-GENTRY ASSOCS. INC. (See St. Petersburg, Fla.)

REYNOLDS & ASSOCS. INC. (See Melbourne, Fla.)

SCIENTIFIC DEVICES S.E. INC. (See Orlando, Fla.)

SMITH, M. K. INC. (See Charlotte, N.C.)

SPROCH SALES INC., 3520 W. Broward Blvd., (305) 587-3792.
Branch: P.O. Box #850, Winter Park, Fla., (305) 671-4906.
Factories: Autotron Inc.; Boker Mfg.; Crystek; Electro Voice Inc.; Electroweave Inc.; Int'l. Elctrns. Corp.; Int'l. Wire & Cable Co.; NT•T Sales Co.; Sencore Inc.; TA Mfg. Corp.; Tape Athon Corp.; Waters Mfg.
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)
Services: Direct Mailing

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WARD ENG. CO., INC. (See Jacksonville, Fla.)

Ft. Walton Beach

BROWN, W. A. INSTRS. INC. (See Orlando, Fla.)

Hallandale

TECHNICAL MKTG., INC. (See Orlando, Fla.)

Hialeah

CHAPMAN, C. & CO., 301 E. 10th Ave.
Factory: Carol Cable. **Selling To:** ★ D

Indian Rocks Beach

TECH-REP ASSOC. INC. (See Melbourne, Fla.)

Jacksonville

WARD ENGRG. CO., INC., 2727 Phyllis St., (904) 388-7656.
Branches: 7040 Lake Ellenor Dr., Orlando, Fla., (305) 851-0725; 1718 N.E. 28th Dr., Ft. Lauderdale, Fla., (305) 564-4883.
Factories: Chas F. Warrick; Clark Control; Eagle Signal; Elwell Park Elec.; Federal Sign & Signal; Gemco Elec.; H. D. Elec.; H. H. Sticht; Knopp; Sangamo Elec.; Standard Elec. Time; Superior Elec.; Western Elec. Mech.
Selling To: ★ I,D. **Salesmen:** 3
Services: Repair, Warehouse

Jupiter

MASSEY ASSOCS., INC. (See Havertown, Pa.)

Lake Park

HAYDEN, P. ASSOC. (See East Point, Ga.)

Lauderhill

ORBE, INC. (See Orlando, Fla.)
ORBE, INC. (See St. Petersburg, Fla.)

Lighthouse Point

LEHMANN, W. R. CO., INC. (See Orlando, Fla.)

Lutz

WALLACE, S. K. ASSOC., INC., Box 67, (813) 949-1817.
Branches: 11010 Carrollwood Dr., Tampa, Fla.; Box 42258, Atlanta, Ga.; Box 215, Matthews, N.C.; Box 526, Kernersville, N.C.; 3115 N.W. 81st Terr., Miami, Fla.; 5960 Brierdale Cove, Memphis, Tenn.
Factories: Aerorox; Beauschaine; Consolidated Wire; Hollingsworth; James Elctrn.; Lowell Mfg.; Ohmite Mfg.; Talk-A-Phone. **Selling To:** ★ A,I,D,M. **Salesmen:** 6

Melbourne

SMITH, J. J. & ASSOCS., INC., Box 1506, (305) 254-4206.
Branches: Box 573, Biscayne Annex, Miami, Fla., (305) 374-6784; Box 627, Dunedin, Fla., (813) 733-0032.
Factories: Computer Instr.; Bussco Eng.; Elco; J.F.D. Elctrns.; Electro-Adapter; Sangamo Elec.; Star-Tronics; Ward Leonard Elec.; Angstrohm Precision.
Selling To: ★ I. **Salesmen:** 3
Services: Direct Mail

TECH-REP ASSOC. INC., Box 2095, (305) 723-9140.
Branches: Box 425, Indian Rocks Beach,Fla., (813) 595-2834; Box 24143, Ft. Lauderdale, Fla., (305) 566-3241; Box 955, Jonesboro, Ga., (404) 753-0111.
Factories: Baltimore Transformer; Chicago Supply; Chicago Switch; Diehl Div.; Fairchild Controls; Harowe Servo Controls; ITT/Jennings; Los Angeles Miniature Prods.; M-Tron Ind.; M M Elctrn. Enclosures; Monitor Prods.; Phaostron Instrs.; Radcon; R F Interonics; Scheidl Mfg.; Shelly Assoc.; Standard Wire & Cable; Stewart-Warner Microcircuits; Vernitron Signal Data Conversion.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Warehouse, Direct Mail

Miami Beach

GEARTNER ASSOCS., INC., 350 Lincoln Rd., (305) 531-0200.
Branches: 1221 Lee Rd., Orlando, Fla., (305) 299-1000. TWX: 810-850-0158; 1848 Hunt Lane, Clearwater, Fla., (813) 531-4113.
Factories: Allied Controls; Conductorlab; Eldema; Electrical Inds.; Grayhill Inc.; Grayhill Moldtronics; IMC Magnetics; Indiana General; Memcor; Microtran; Potter Co.; Sealectro; Thermal Wire. **Salesmen:** 8 (eng 3)
Selling To: ★ A,I,D,M. **Services:** Warehouse, Direct Mail

Miami

BRINKLEY-PALLATZ, Box 487, Kendall Sta., (305) 238-0864.
Branch: 4501 4th St. N., St. Petersburg, Fla., (813) 526-1014.
Factories: Bartlett Mfg.; Beckman Instrs.; Cardwell Condenser; Elctrn. Transformer; Greibach Instrs.; Sprague Elec.; Vactronic Labs. **Services:** Repair
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

SMITH J. J. & ASSOCS., INC. (See Melbourne, Fla.)
WALLACE S. K. ASSOC., INC. (See Lutz, Fla.)

N. Miami Beach

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

MARK ELCTRONIC SLS. CO., Box 291, (305) 947-5080.
Factories: Connolly & Co.; Dakota Engrg.; Delta Coils; Elctrn. Crystal; Magnecraft Elec.; Omtronics Mfg.; Plastic Capacitors; Telcor Elctrns.
Selling To: ★ I,M,D. **Salesmen:** 2 (eng 1)

WINFIELD ELCTRN. SLS. CO., 1875 N.E. 149 St., (305) 751-5566. TWX: 810-848-8772.
Branch: 2991D No. David Hills Rd., N.E., Atlanta, Ga., (404) 636-3023.
Factories: D. Clark; Columbia Wire; Dual; Fanon; Fisher; Norelco, Oaktron Ind.; Pickering; Raytheon; Sprague; Thordarson-Meissner. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 4 (eng 2)

North Palm Beach

SICLARI, V., 655 Atlantic Rd., (305) 848-8000.
Branch: 949 51st St., Brooklyn, N.Y., (212) GE 6-4567.
Selling To: ★ I,Medical **Salesmen:** 1 (eng 1)
Services: Repair, Sales-Mkging Consultant

Orlando

ADAMS & ASSOCS., INC. (See Greensboro, N.C.)

BCS ASSOCS., INC., 940 N. Ferncreek Ave., (305) 843-1510. TWX: 810-850-0185.
Branches: 3322 S. Memorial Pky., Huntsville, Ala., (205) 881-6220. TWX: 810-726-2109; 1039 E. Wendover Ave., Greensboro, N.C., (919) 273-1918. TWX: 510-925-1173.
Factories: BLH Elctrns.; Beckman Instrs.; Burr-Brown Research; Cohu Elctrns.; Daymarc; E-H Resh. Labs.; J. Fluke Mfg.; Guidline Instrs.; N. Atlantic Inds.; Optimation; Philco-Ford; R F Communications; Raytheon Co.; Sangamo Elec.; Spectral Dynamics Corp.; United Systems Corp.; Varian Assocs.; Weinschel Engrg.
Selling To: ★ I,M. **Salesmen:** 12 (eng 11)
Services: Repair, Warehouse, Calibration

BOHMAN, G. F. ASSOCS. INC., 6990 Lake Ellenor Dr., (305) 855-0274. TWX: 810-850-0198.
Branch: 10249 N. Military Trail, Palm Beach Gardens, Fla., (305) 842-7188.
Factories: Cambridge Thermionic; Eldre Components; ESC Elctrns.; Kemet; Optron Inc.; Piezo Crystal; Rotron; Silicon Transistor; Viking Inds.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

BROWN, W. A. COMPONENTS, INC., Box 513, (305) 425-5505. TWX: 810-850-0146.
Branches: 1314 Buford St., Huntsville, Ala., (205) 539-6884. TWX: 810-726-2114; 3039 N. E. 32nd Ave., Ft. Lauderdale, Fla., (305) 565-3885; 1108 Burke St., Winston Salem, N.C., (919) 725-5385; 325 First St., Alexandria, Va., (703) 836-1800. TWX: 710-832-9813.
Factories: Applied Microwave Lab.; Haydon, A. W.; Birtcher Corp.; Bethlehem Corp.; Control Data Corp.; Dee Elec.; Delta Design; G-L Inds.; Litton Inds.; Pace, Inc.; Phelps Dodge Elctrn. Prods.; Price Elec.; Rustrak Instrs.; Sandefur Eng.; Sippican Corp.; Unholtz Dickie; Vitramon, Inc. **Services:** Repair, Warehouse
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 8)

BROWN, W. INSTRS. INC., Box 513, (305) 425-5505. TWX: 810-850-0146.
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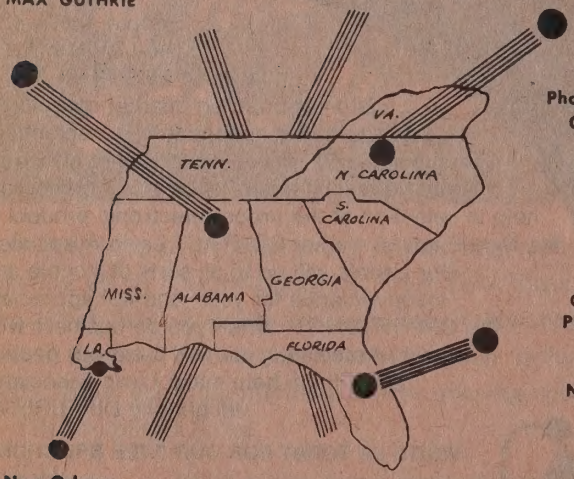

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Factories: Bolt Beranek & Newman; Brush Instrs.; Data General; Digi-Data; Digitronics; Emcor; Ferrocube; McLean Engrg.; Microdot; Monsanto Elctrn. Instrs.; Neff Instr.; Philbrick/Nexus Resh.; Sangamo Elec.; Trygon Elctrns.; Wavetek. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 13 (eng 13)

BUCHANAN & ABRAMS ASSOCS. INC., Box 6026, (305) 423-8995. **Selling To:** ★ I,D,M. **Salesmen:** 2 (eng 1)

CARTWRIGHT & BEAN INC. (See Memphis, Tenn.)

COL-LINS-CO, INC., Box 13189, (305) 423-7615. TWX: 810-850-0134.
Branches: Box 4246, Huntsville, Ala., (205) 539-1771; 200 Carrington Way, Marietta, Ga., (404) 422-8327; Box 5597, Winston-Salem, N.C., (919) 765-3650.
Factories: Aero Resh. Instr.; Applied Magnetics; J. G. Biddle Co.; Comar Elec.; Cramer Div.; Datacraft; EDO Western; EECO; Elctrn. Arrays; Federal Scientific; Fenwal Elctrns.; Hickok Elec. Instr.; Krohn-Hite; Memory Technology; Metal Prods.; NJE; Stanford Applied Engrg.; Whittaker/Dyansciences ISD.
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)
Services: Repair, Warehouse

(See Advertisement Page 3238)

FAUSETT, F. & CO. (See Smyrna, Ga.)

GENTRY ASSOCS., INC., 550 N. Bumby Ave., (305) 841-7740. TWX: 810-850-0136.
Branches: 2109 W. Clinton Ave., Huntsville, Ala., (205) 534-9771; 116 E. O'Neal Ave., Burlington, N.C., (919) 227-2581; Box 13513, Atlanta, Ga., (404) 233-3816.
Factories: Acopian; Alford Mfg.; Alfred Elctrns.; Ballantine Operation; Cintra; Cunningham; Data Technology; DuMont Oscilloscope Labs.; General Microwave; Granger Assocs.; Instruments for Industry; Keltec; Melabs; Omni Spectra; Remex Elctrns.; Scientific-Atlanta; Stoddart Electro Sys.; Telonic Instrs. & Engrg.; TRG/Control Data Corp.; Watkins-Johnson Co. & CEI Div.
Selling To: ★ I,M. **Salesmen:** 8 (eng 7)

GEARTNER ASSOCS., INC. (See Miami Beach, Fla.)

HIGHSMITH, J. L. & CO. (See Charlotte, N.C.)

HOLMES, E. G. & ASSOC. (See Chamblee, Ga.)

JONES, W. M. CO. (See Towson, Md.)

LEE ASSOC., INC., 200 E. Marks, (305) 241-4445.
Branches: 827 Wheeler Ave., Huntsville, Ala., (205) 539-0761; 955 Burke St., Winston-Salem, N.C., (919) 725-2406; 230 N. Washington St., Rockville, Md., (301) 424-9460; Box 80666, Chamblee, Ga., (404) 457-7117.
Factories: Applied Digital Data Sys.; B&K Instrs.; Clary; Digital Information Devices; Dynasciences; Hipotronics; Marconi Instrs.; Midwestern Instrs.; Precision Standards; Rowan-Elctrn. Meas.; Ruska Instrs.; Saicor; Sigma Instrs.; Texas Instrs.; Tri-Data; Viatran.
Selling To: ★ A,I,M. **Salesmen:** 8 (eng 8)
Services: Repair, Warehouse, Limited Stock

LEE, LTD. (See N. C.)

LENMANN, W. R. CO., INC., Box 20275, (305) 841-4901. TWX: 810-850-0162.
Branch: Box 5010, Lighthouse Point, Fla., (305) 941-2150.
Factories: Cermetek; Chicago Dynamic Inds.; Collins Radio; International Instrs.; MicroDot; Resistance Prods.; Sigma Instrs.; Syntron; Thermal Sys.; TEC.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)

MURPHY & COTA (See Atlanta, Ga.)

ORBE, INC. (See St. Petersburg, Fla.)

REYNOLDS & ASSOCS. INC. (See Melbourne, Fla.)

SCIENTIFIC DEVICES S.E. INC., 707 E. Colonial Dr., (305) 424-7932.
Branches: 703 Watts Drive S.E., Huntsville, Ala., (205) 536-1969; 540 N.E. 7th Ave., Ft. Lauderdale, Fla., (305) 565-7029; Box 1, Bethania, N.C., (919) 924-4392.
Factories: Alpha Scientific; Automation Dynamics; Analog Devices; Amptek; Cabtron; Computor Prods. Div.; Data-Pulse Div.; Data Prods. Div.; Glentronics; Kruse-Storke; Measurements Div.; MFE; Microwave Div.; Millivac Instrs.; Newport Labs; Statham Instrs.; Summit Engrg.; South Field Elctrns.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

T A INSTRS. INC., Box 14125, (305) 843-3030.
Branches: Box 1983, Spartanburg, S. C., (805) 585-3864; Box 4088, Huntsville, Ala., (205) 881-8494.
Factories: Anaren Microwave; Data-Control; Datum; Dynamic Sys. Elctrns.; Elctrn. Assocs.; Foto-Mem; General Oceanology; Keithley Instrs.; Medistor Instr.; Peripheral Equipt.; Princeton Applied Research; Syner-Data; SYS Assocs.; Todd Prods.; United Telecontrol Elctrns.; Wyle Computer Prods.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

TECHNICAL ASSOCS. INC., Box 14044, (305) 843-3030.
Branches: Box 5583, Spartanburg, S.C., (803) 585-3864; Box 4088, Huntsville, Ala., (205) 881-8494.
Factories: A. D. Data Sys.; Atron; Ferranti-Packard; General Laser; Information Data Sys.; Vogue/Shepard.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

TECHNICAL MKTG., INC., 1511 E. Robinson, (305) 843-2500. TWX: 810-850-0161.
Branches: Box 127, Hallandale, Fla., (305) 563-8585; Box 13196, St. Petersburg, Fla., (813) 862-3836; Box 1152, Marietta, Ga., (404) 435-0079; Box 5971, Birmingham, Ala., (205) 871-5431; Box 6664, Greensboro, N.C., (919) 274-2570
Factories: Circuit Technology; E D P; Essex; Guardian Elec.; Kent; Micro Devices; Milwaukee Transformer; Singer General Precision; Skydyne; Stackpole Carbon; Transitron Elctrns.; WacLine.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

TRUEX ASSOCS. INC., 3165 McCrory Pl., (305) 841-8931.
Factories: Atomichron, Div.; B & F Instrs.; Bemco; Computer Communications; Davidson Optronics; Deltron; Diamond Antenna & Microwave; EMR-Hatboro; Energy Sys. Div.; Frequency Elctrns.; Micro Instr.; Micromega Div.; Preston Scientific; Structural Tech.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)
Services: Direct Mail

(See Advertisement Page 3238)

WARD ENG. CO. INC. (See Jacksonville, Fla.)

WIMBERLY W. B. CO. (See Clearwater, Fla.)

Ormand Beach

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

THOMPSON, J. F. CO., 322 Riverside Dr., (904) 677-2298.
Branch: No. Indian River Dr., Jensen Beach, Fla., (305) 287-0198.
Factories: Antennacraft; Calcon Mfg.; California Chassis; Game Inds.; McMartin Inds.; Oxford Speaker; Philmore Mfg.; Motorola Semiconductors Prod.; Probins Inds.; Superex Elctrns.; Ward Prods. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 2

Palm Beach Gardens

BOHMAN, G. F. ASSOCS., INC. (See Orlando, Fla.)

Pompano Beach

BOYCE, W. (See E. Brunswick, N.J.)

BURGIN-KREH FLORIDA, INC., Box 1799, (305) 942-0774. TWX: 510-955-9854.
Branch: Box 5146, Clearwater, Fla., (813) 531-8801.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
Services: Direct Mail

VARRELMAN-GORMAN CO. (See Livingston, N.J.)

Sarasota

SIFF, R. G. & ASSOCS., INC. (See Dayton, Ohio)

St. Petersburg

BRINKLEY-PALLATZ CO. (See Miami, S.W., Fla.)

DREW, B. & ASSOCS., 5201-29th Ave. N., (813) 342-7322.
Factories: Dormeyer Appliances; Webcor Tape Recorder.
Selling To: ★ A,D,I. **Salesmen:** 2
Services: Warehouse

LYNCH-GENTRY ASSOCS. INC., Box 13248, (813) 347-5131.
Branch: 6340 NE 20th Terr., Ft. Lauderdale, Fla., (305) 896-4601.
Factories: Beckman Inst.; Georator; T.M.C. Sys.; D. Randall; Sub of W. Kidde. **Selling To:** ★ I,M.

MASSEY ASSOCS., INC. (See Havertown, Pa.)

ORBE, INC., 4110 Central Ave., (813) 894-0687. TWX: 810-863-0370.
Branches: 1221 N. Orange Ave., Orlando, Fla., (305) 426-9004; 4431 N.W. 13th Ct., Lauderhill, Fla., (305) 584-4749.
Factories: Abex Inds.; Components; CTS; Designatronics, Inc.; Duncan Elctrns.; Edcliff Instrs.; Power Physics; Semtech; Sensor Technology; Sentry Mfg.; Standard Precision, Inc.; U.S. Capacitor; Vernitron.
Selling To: ★ A,I,D,M. **Salesmen:** 3

SANFORD, L. C. ASSOCS., 1994 Kansas Ave. N.E., (813) 526-5403. **Selling To:** ★ I,A,D,M. **Salesman:** 1 (eng 1)

TECHNICAL MKTG., INC. (See Orlando, Fla.)

Surfside

HUBERT, A. ASSOCS., 9025 Hawthorne Ave.
Factory: J. Tall Enterprise. **Selling To:** ★ A.

Tampa

COOK X-RAY CO., Box 10105, (813) 839-5561.
Factories: Ed Baldwin & Assocs.; Diapulse Corp.; Dunleee; Eureka X-Ray Tube; H. G. Fischer & Co.; Halsey X-Ray Prods.; S & S X-Ray Prods., Wolf X-Ray Corp.
Selling To: ★ D. **Salesmen:** 3 (eng 1)
Services: Repair, Warehouse

WALLACE S. K. ASSOC., INC. (See Lutz, Fla.)

Weirsdale

WILLIAMS H. R. ASSOC., INC. (See Ridgewood, N.J.)

Winter Haven

NICKERSON, F. C. CO., INC. (See Decatur, Ga.)

TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

Winter Park

CHASE, T. S., Mfg. Rep., 2903 Montfichet Ln., (305) 671-5954.
Factories: New Homes Engraving Machine; Ocala Saw & Tool. **Selling To:** ★ I,M. **Salesmen:** 2

DUCKETT, G. SALES CO. (See Atlanta, Ga.)

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

SPROCH SLS. INC. (See Ft. Lauderdale, Fla.)

GEORGIA

Atlanta

ALLEN, R. W., Box 7142 Station "C", (404) 233-2361.
Selling To: ★ I,M,D. **Salesman:** 1 (eng 1)
Services: Sales and Engrg.

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

CONTROL EQUIPMENT CO., INC., 3166 Maple Dr., N.E., (404) 237-1688. TELEX: 542-579.
Branches: Box 6044, Birmingham, Ala., (205) 879-8211; Box 1857, Daytona Beach, Fla., (904) 252-7086; Box 4358, Huntsville, Ala.; Box 3887, Savannah, Ga.
Factories: ITT Barton; Transmation, Inc.; Beta Corp.; A. H. Emery Co.; Robertshaw-Ind. Instrs.; Dezurik Corp.; Research Controls; Conax Corp.; Meletron Corp.; Crescent; Johns-Manville.
Selling To: ★ I,D. **Salesmen:** 9 (eng 3)

CROWE, L. M. CO., 130 W. Wieuca Rd., N.E., (404) 255-2700.
Factories: Davis Instrs. Div.; Diamond Elctrns.; T. A. Edison; Leopold-Stevens; J. E. Lonergan; Lundell; Mangetrol Inc.; Metritape Inc.; Maure Inds.; Nash & Harrison; Ohmart Corp.; Raytheon-Ultrasonic Div.; West Instrs. **Selling To:** ★ I. **Salesmen:** 4

DUCKETT, G. SLS. CO., Box 29067, (404) 451-3529.
Branches: Box 22002, Greensboro, N.C., (919) 273-4617; Box 503, Huntsville, Ala., (205) 837-6026; Box 59, Winter Park, Fla., (305) 424-3466.
Factories: Bristol Co.; Chester Cable; Del Elctrns.; Duncan Elctrns.; ELFAB; Int'l. Rectifier; Jewell Elec. Instrs.; JFD Elctrn.; Licon Div. ITW, Inc.; Mallory Controls; Primec; Specialty Connector; Standard Controls; Syncro Capacitor; Thermalloy Co.; Torr Labs.; Zaring Inds.
Selling To: ★ A,I,D,M. **Salesmen:** 5

GENTRY ASSOCS., INC. (See Orlando, Fla.)

GLENN ASSOCS., INC., 172 Simpson St., N.W., (404) 522-4906.
Factory: Pyle-National. **Services:** Sales
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

JONES, W. M. CO. (See Towson, Md.)

McCORVEY, V. A. CO., 2187 Briarcliff Rd. N.E., (404) 636-2502.
Factories: Control Data; Diamonite Prod. Mfg.; Lectrotech; Pomona Elctrns.; Raytheon; Rodale Mfg.; Sloan; Waters Mfg. **Selling To:** ★ I,D,M. **Salesmen:** 3 (eng 2)

MILLAR ELCTRNS., INC., 3110 Maple Dr., (404) 261-6160, 261-6161.
Branch: Box 17173, Raleigh, N.C., (919) 787-9564.
Factories: Alpha Wire; Amperex Elctrn.; Clarostat Mfg.; J-B-T Instrs.; E. F. Johnson; J. W. Miller; Multicore Sls.; Shure Bros.; Sola Elec.; Staco; Triangle Connector; Trimm; Triplett; United Transformer; Weckesser; Wood Elec. **Selling To:** ★ A,D,I,M. **Salesmen:** 8 (eng 1)

MURPHY & COTA, 500 Plasamour Dr., N.E., (404) 875-2525.
Branches: Box 6365, Greensboro, N.C., (919) 288-1923; 904 Bob Wallace Ave. SW., Huntsville, Ala., (205) 539-8476; 712 W. Vassar St., Orlando, Fla., (305) 424-2407; 1106 Burke St., Winston-Salem, N.C., (919) 723-1001. TWX: 510-931-3101. **Factory:** Electronic Components.
Selling To: ★ A,I,D,M. **Salesmen:** 8 (eng 3)

PHILLIPS, H. W. CO., 3651 Cold Springs La., (404) 451-5762.
Factories: Bowman Leisure; Calvert Elctrns.; Crest Inds.; Tele Matic. **Selling To:** ★ A,I,D. **Salesmen:** 2

REYNOLDS & ASSOCS. INC. (See Melbourne, Fla.)

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

WALLACE S. K. ASSOC. INC. (See Lutz, Fla.)

WINFIELD ELCTRN. SLS. CO. (See North Miami, Fla.)

Avondale Estates

ERICKSON PRODS., INC., Box 507, (404) 289-9413.
Factories: Arrow Molded Plastics; Capsonic Group; Diemakers; Fox Mfg.; Harvey Spring & Mfg.; Kurz-Kasch; Kwikset Powdered Metal Prods.; Omark Inds.; PMF Inds.; Saber; Staver.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

Chamblee

HOLMES, E. G. & ASSOC., 4185 Clairmont Rd., (404) 451-6161.
Branches: 430 W. Friendly Ave., Greensboro, N.C., (919) 275-0897; 316½ S. Bumby St., Orlando, Fla., (305) 241-2128; 4862 Governors Drive W., Huntsville, Ala., (205) 837-6900.
Factories: Barnes Engrg.; Biomationa; Cipher Data Prods.; Computer Peripherals; Data Royal; Eldorado Electrodata; EMC; Fairchild Microwave Prods.; Hughes Electron; Leybold Heraeus; LSI; Mechtronics Nuclear; Micro Power; Narda Microwave; Nuclear Equipt. Nuclear Equipt.; Redcor; Systron Donner; Typagraph.
Selling To: ★ I,M. **Salesmen:** 6 (eng 5)
Services: Warehouse

LEE ASSOC., INC. (See Orlando, Fla.)

SMITH, M. K. INC. (See Charlotte, N.C.)

Decatur

ADAMS & ASSCOS., INC. (See Greensboro, N.C.)

NICKERSON, F. C. CO., INC., Box 33185, 1240 Clairmont Ave., (404) 377-1575.
Branches: 100 So. Lake Florence Dr., Winter Haven, Fla., (813) 293-0377; Box 9679, Birmingham, Ala., (205) 853-2852; 1001 Parrott Ave., Kinston, N.C., (919) 527-4911.
Factories: Adams Elctrns.; Autotronics; Daburn Elctrns. & Cable; Dyonics; Film Capacitors; Gardiner Solder; Hoagland Instr.; Hughes Aircraft; Littelfuse; Microtran; Midwest Audio; Milwaukee Resistor; Oxford Speaker; Printact; Sage Elctrn.; Schrack Electrical Sls.; WABCO's Signal Comm. Div.; Wall Mfg.; Xcelite.
Selling To: ★ I,D,M. **Salesmen:** 4
Services: Direct Mail

East Point

HAYDEN, P. ASSOC., P.O. Box 90668, (404) 766-0261. TELEX: 54-2661.
Branches: 2006 Crestridge Rd., Greensboro, N.C., (919) 292-2342; 819 Chambers Dr., Huntsville, Ala., (205) 536-3962; 932 Jasmine Dr., Lake Park, Fla., (305) 848-3095.
Factories: Benjamin Elctrn. Sound; Cartapes; Conn. Telephone & Elec.; C. Cordover & Co.; Curtis Elec. Lighting; Duotone; Dynaco; Ell Int'l.; Fedtro; Gramer Halldorson Elctrns.; Hi-Tron Semiconductor; Kalimar; Kits Inds.; Leader Inst.; Magnetic Tape; Monarch Elctrns. Int'l.; Penn Resistor; Vaco Prods.
Selling To: ★ A,D,I. **Salesmen:** 5
Services: Warehouse

LITTLE, S. CO., Box 308, (404) 761-5353.
Selling To: ★ A,D. **Salesmen:** 2 (eng 2)

Jonesboro

TECH-REP ASSOC. INC. (See Melbourne, Fla.)

Marietta

COL-LINS CO. INC. (See Orlando, Fla.)

SMITH, M. K. INC. (See Charlotte, N.C.)

TECHNICAL MKTG. INC. (See Orlando, Fla.)

Roswell

RUSHIN, E. CO., Box 486, (404) 993-6498.
Factories: American Time Prods. Div.; Anderson Power Prods.; Auto-Valve; Bergen Wire Rope; Brand-Rex Div.; NSK; Uniform Tubes.
Selling To: ★ I,M,D. **Salesmen:** 2 (eng 1)

Savannah

CONTROL EQUIPMENT CO., INC. (See Atlanta, Ga.)

Smyrna

FAUSETT, F. & CO., Box 278, (404) 436-5169.
Branches: 711 N. Magnolia Ave., Orlando, Fla., (305) 424-0701; 1338 Pulaski St., Salem, Va.; Greenwood, S.C.
Factories: Atlee Corp.; Capitol Mach. & Switch; Carter Motor; Equipto Enclosure Sys.; Freed Transformer Hy-Gain Elctrns.; Petersen Radio; Secon Wire Div.; Technipower; Vector Engrg.; Vemaline Prods.; Wesco Electrical. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 3)

Tucker

BROWN, W. A. INSTRS., INC. (See Orlando, Fla.)

SMITH, G. W. CO., Box 265, (404) 938-8335.
Factories: Bellofram; Green Ball Bearing; Miether Machine Works; Roberts Mfg. **Services:** Warehouse
Selling To: ★ D,I,M. **Salesmen:** 2 (eng 1)

HAWAII

Honolulu

EARL ASSOCS., 1638 Kona St., (808) 949-6953. Cable address: EARLASSOC.
Factories: Amphenol Corp.; Astatic Corp.; Aztec Sound; Antronic Corp.; CBS Soundcraft; Consolidated Wire; Harman Kardon; Jerrold Elctrns.; Lear Jet Stereo; Kits Inds.; Kahn Research Lab. Inv.; Mallory Distributor Prod.; Midland Int'l.; Norske Organ; Pickering & Co.; Positive Connector; Perma Power; Pax, Ltd.; Radio Specialty Mfg.; Rahn Chemical; SC Elctrns.; Sharpe Headphones; Simpson Electric; H. H. Smith; Sorensen Power Supplies; Stancor Elctrns.; Technical Appliance; Tenatronics Ltd.; Worner Elctrn. Devices; University Sound. **Services:** Limited Warehouse
Selling To: ★ A,D,I,M. **Salesman:** 1

ELECTRONIC TIME CORP., Box 2173, (808) 531-0484. Cable Address: "SURFBOARD" HONOLULU
Factories: Betz Instrs.; Bulova Watch; Ferranti-Packard Elec.; Griffith Marine Engrg.; Jonkers Corp.; C. Plath & Co.; Universal-Interloc; Veeder-Root Co.
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 3)
Services: Repair, Warehouse

ILLINOIS

Addison

COMPAR CORP. (See Burlingame, Calif.)

COMTEL COMPONENTS, 315 Laura Dr., (312) 543-7350. TWX: 910-651-4950.
Branches: 5827 Mayfield Rd., Cleveland, Ohio, (216) 442-8080; 21250 Civic Center Dr., Southfield, Mich., (313) 357-3700. TWX: 810-224-4936; 2673 Culver Ave., Dayton, Ohio, (513) 298-7573; 11734 Lackland Ind. Dr., St. Louis, Mo., (314) 542-3636; 5027 N. Kenmore, Indianapolis, Ind.
Factories: Intersil; Micro Networks; Omni Spectra; Indit; CDI; IEE; Markite; Plastoid Connectors; Philhrick/Nexas. **Selling To:** ★ A,I,M. **Salesmen:** 7 (eng 7)

STEMM, R. E. INC., 17W480 Lake St., (312) 279-2440.
Branch: 2713 Lyndale Ave. So., Minneapolis, Minn., (612) 822-8404.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse, In-house facilities for seminars and workshops. Marketing and promotional aids by staff consultant.

STERLING, S. CO. (See Cleveland, Ohio)

Aurora

SMITH, D. & ASSOC., INC., 32 South River St., Box 1364, (312) 896-0828.
Factories: Amperex Elect.; Bio-Medical Elect.; Empire Scientific; Graphic Controls T.P.&I.; Permafilter; Solid Controls; Testone Electrostatics; Tri-Tronics.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)
Services: Warehouse

Chicago

ANGEL, J. C. & CO., 2743 W. Peterson, (312) 878-0653. TWX: 910-221-5688.
Factories: ADC Prods.; Cambridge Thermionic; Chemical Micro Milling; Dahlstrom Mfg.; Electric Terminal; Hughes Aircraft; Omega Electric Div.; Physical Sciences; Quality Name Plate; Scanbe Mfg.; Technical-Wire Prods. **Services:** Direct Mail
Selling To: ★ I,D. **Salesmen:** 5 (eng 2)

(See Advertisement This Page)

ANGER ASSOCS., INC. (See Dearborn, Mich.)

AUDIO SOUND SALES CO., 2535 N. Ashland, (312) 528-8422.
Factories: American Semi.; Elctrn. Imports Ltd.; General Oceanology; Helios Semi.; Helix Research Assoc.; Hybrid Sys.; National Beryllia; Parko Elctrns.; Pollak & Skan, Inc.; Renco Corp.; Reo-Data Prods.; Rodney Hunt Co.; Tavis Engrg.; Test Technology; Tech Electric Pnael; United Mineral & Chem.; Zenrad Controls.
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 3)
Services: Warehouse

BALHORN & WELCH, INC., 1925 N. Harlem Ave., (312) 889-5011. TWX: 910-221-5368.
Branch: Box 1521, Cedar Rapids, Iowa, (319) 363-9970.
Factories: Elesco Inds.; Encoder Div.; Maurey Instr.; Nytronics, Inc.; Potter & Brumfield; Raonwell Corp.; Times Wire & Cable Co.; Transitron Elctrns.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 7)
Services: Engineering

BERNDT ASSOCS., INC., 6200 N. Hiawatha Ave., (312) 283-0713. TWX: 910-221-2515.
Branches: 1443 N. Edmondson Ave., Indianapolis, Ind., (317) 359-3747; 2852 Brunswick, St. Louis Park, Minn., (612) 929-7045.
Factories: American Computer; Addington Labs.; IMC Magnetics; Shallcross; Sylvania; Thermalloy.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)
Services: Engineering

BOOTH, C. & ASSOC., INC., 1921 N. Harlem, (312) 237-7910.
Factories: Brockway Pressed Metals; Elctrn. Circuit Assocs.; Infinetics; Phelps Dodge Comm.; Poly Cable; South Bay Cable; Thermatics, Inc.
Selling To: ★ I,M. **Salesmen:** 2

CARLSON ELCTRN. SLS. CO., 7448 N. Harlem Ave., (312) 774-4812. TWX: 910-221-5017.
Branches: 453 N. Lindbergh Rd., St. Louis, Mo., (314) 991-0262; 2500 39th Ave. N.E., Minneapolis, Minn., (612) 788-4111. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 5)

CARRINGTON STONE ENGRS., 205 N. Wacker Dr., (312) RA 6-7725.
Factories: Atlantic India Rubber Export Dept.; Autotron Export; Carter Motor; Chester Cable; Cinch Exp.; Electro Prods. Power Supply; H. B. Jones; Robertson Transformer; Rogan Bros.
Selling To: ★ A,D,I,M. **Services:** Warehouse, Export

CARTER ELCTRNS., INC., 4919 W. 63rd St., (312) 585-5485.
Branches: 6333 Hollister Dr., Indianapolis, Ind.; 2401 W. 66th St., Minneapolis, Minn.; 6600 W. Capitol Dr., Milwaukee, Wisc.
Factories: Alfred; Ampex; Analogic; Astrodata; Bell, F.W.; Beehive; Birtcher; Computer Peripherals; Data General; Datapulse; DuMont; Eldorado Electrodata; Electroglas; ENI; ESI; Kennedy; Neff; NJE; SAICOR; Sykes Datatronics; Wavetek; Wiltron. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 9 (eng 9)

CENTRAL EQUIPT. CO. INC., 80 E. Jackson, (312) 427-5401.
Factories: Hycon Mfg.; North American Elec. Lamp; Reliance Time Controls; Safety Electrical Equipt.; Trans Lite; Trico Fuse Mfg.
Selling To: ★ I,D,Railroad **Salesmen:** 4 (eng 4)

COLE, G. McL., CO., 6514 W. Higgins Rd., (312) 774-3535. TWX: 910-221-2929.
Branch: 150 S. Marquette, Madison, Wis., (608) 244-1623.
Factories: Antennacraft; Argos Prods.; Continental-Wirt Elctrns.; Drake Mfg.; Engler Instr.; Erie Ceramic Arts; Hallicrafters; HEI Inc.; Kalimar; Loral Distributor Prods.; Molecu Wire; Morhan National Sls.; George Risk Inds.; Sarkes Tarzian; Ungar Div.; Universal Circuits.
Selling To: ★ A,D,I. **Salesmen:** 7 (eng 2)

COOPER, H. D. CO., 7634 N. Eastlake, (326) 274-5566.
Selling To: ★ I.

CREST ASSOCS., INC., 7001 N. Clark St., (312) 274-2640.
Factories: Data Device; Elctrn. Controls; France Mfg.; Joslyn Elctrn. Sys.; Modutec, Inc.; Rayten, Inc.; Technipower, Inc.; Toro Engineered Prods.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

D. J. M. ELECTRONIC SLS., INC., 5356 N. Milwaukee Ave., (312) 774-1212.
Factories: Ammon Instrs.; Conant Labs.; Conductor Lab.; Dale Elctrns.; Electro Mech Comp.; Industrial Engravers; National Radio; Wood Electric.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

DATA ELCTRNS. CO., INC., 5505 North Menard Ave., (312) 774-1452.
Branches: 8633 Hartison Circle, Minneapolis, Minn., (612) 881-3579; Box 50084, Indianapolis, Ind., (317) 547-2329; Box 979, Milwaukee, Wisc., (414) 645-1550.
Factories: Analog Devices; Cipher Data Prods.; Data Graphics; DataMate Computer Sys.; Datascan; Dentronics; Digital Information Storage; Digitron; Elgar; Icon; RF Communications; Trio Labs.; Transducers, Inc.; Ultronics Sys. **Services:** Repair, Leasing
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

DIETHERT, R. CO. INC., 2030 W. Montrose Ave., (312) 561-7627. TWX: 910-221-2916.
Branches: 217-Wisconsin, Waukesha, Wisc., (414) 547-6575; 903 East 2nd St., Gastonia, N.C., (704) 864-9757; 5420 N. College, Indianapolis, Ind., (317) 255-6169.
Factories: Bardon Rubber; Electronized Chemicals; Instrument Specialties; JBL Corp.; Judd Wire; Maynard Plastics; Neff-Perkins; Northwest Plastics; Sealectro Corp.; J. H. Winn.
Selling To: ★ I. **Salesmen:** 9 (eng 5)

DOYLE, W. J. CO., 7426 N. Western Ave., (312) 274-6685.
Factories: BASF Sys.; Buckeye Stamping; Rye Inds.; Tenna Corp.; Thurow Elctrns.; Utah Elctrns.
Selling To: ★ A,D,I.

EDWARD SCHMEICHEL CO., 5968 W. Chicago Ave., (312) 378-2070.
Factories: ASM Switch; Bartlett-Emery Meters; Bel-Tronics; Blackhawk Networks; Collins Radio Component Prods.; Dolinko & Wilkens; Elpac; Hillburn Relay; Kalmus & Assocs.; Northern Engrg. Labs.; Rotating Components; United Elctrns.; Power Components; Tri-Ex Tower. **Selling To:** ★ I,M. **Salesmen:** 3 (eng 2)

ELECTRO-COMP SLS., INC., 5129 W. Devon Ave., (312) RO 3-3636. TWX: 910-221-5674.
Factories: Aladdin Elctrns.; Cimastra Div.; Haddon Tool & Mfg.; Hamilton Prec. Metals Div.; National Beryllia; Robinson-Nugent; Saxonburg Ceramics; 3M.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Mfg. Representatives

ELECTRONIC REPS. ASSN., 600 S. Michigan Ave., (312) 427-0100 **Selling To:** ★ A,D,I,M.

ENGINEERED SLS. CO., INC., 4738 N. Harlem, (312) 867-8434. TWX: 910-221-0223.
Factories: Ceram Corp.; Diehl Div. Singer; Eagle Signal; Helical Prods.; Hi-G, Inc.; Jonathan Mfg.; LAMPS, Inc.; Merrimack Magnetics; Mossman Co.; Sloan Co.; Tec Magnetics; Technical Accessories.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

EAGLE, K. D. CO., INC., 3621 W. Devon Ave., (312) 539-1820. TWX: 910-221-5351.
Branch: 5072 E. 10th St., Indianapolis, Ind., (317) 356-3001. **Selling To:** ★ I. **Salesmen:** 5 (eng 1)

ESCHNER & KERANEN, INC., 20 North Wacker Dr., (312) 236-1533. TWX: 910-221-4245.
Factories: Aerovox; Automatic Winding; C & M Corp.; Exmet Corp.; Gasket Stamping & Mfg.; Gettig Engrg. & Mfg.; Mettalized Prods.; Ohio Carbon; Technical Fluorocarbons Engrg.; Trimflex.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

FISTELL, H. MFG. REP., 1812 S. Halsted St., CA 6-6114.
Factories: Cappella Wood Prods.; Lowenthal Mfg.; Toneline Mfg. **Selling To:** ★ D.

FITZ, L. R. CO., 1801 S. Washington Ave., (312) 631-5488.
Factories: Delavan Mfg.; G. K. Heller Corp.; Inventron; Raytek, Inc.; Welco Inds. **Salesmen:** 3 (eng 2)
Selling To: ★ I,D. **Services:** Repair, Warehouse

GASKINS, T., 1005 S. Aurora Ave., (312) MO 8-3438.
Factories: Int'l. Technology; Micro Elctrns.
Selling To: ★ I. **Salesman:** 1 (eng 1)

GASSNER & CLARK CO., 6644 N. Western Ave., (312) 764-6121. TWX: 910-221-0107.
Factories: Dickson Elctrns.; Dow Key; Fairchild DuMont Labs Elec.; High Vacuum Elctrns.; Int'l. Inst.; Joy Mfg.; RCL Elctrns.; Rotron Mfg.; Spectrol Elctrns.; Spectrum Control; Torotel; Viking Ind.; Vitramon; Voltronics.
Selling To: ★ D,I,M. **Salesmen:** 7 (eng 6)

(See Advertisement This Page)

GIANARAS SLS., 7051 W. Wilson Ave., (312) 774-4600. TWX: 910-221-5223.
Factories: Bourns/Euphonics; Davis Elec.; General Instr.; Miconics Inds.; Osford Speaker; Transformer Mfg.
Selling To: ★ I. **Salesmen:** 4 (eng 1)
Services: Sales

GLENN, J. J. & CO., 4300 S. Tripp Ave., (312) 847-6400. TWX: 910-221-5419.
Factories: Acme Chemicals & Insulation; Astro Chemicals; Atkins & Pearce Mfg.; Atlas Asbestos; Bishop Mfg.; Connecticut Hard Rubber; Furane Plastics; General Elec.; Hullhorst Tools; Huse Liberty Mica; Kanartex Coatings; Lenni Prods.; L. F. Markel & Sons; Mutual Inds.; New England Mica; Phelps Dodge Magnet Wire; Potter & Rayfield; Power Brush Inds.; Schenectady Chemicals; Southern Weaving; H. I. Thompson Fiberglass; Toledo Commutator; Westline Prods. **Services:** Warehouse
Selling To: ★ A,I. **Salesmen:** 8

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GOLBUS, B. J. ASSOCS., 6251 W. Touhy Ave., (312) 774-3999.
Factories: Alpha Wire; Aracon; Russell Inds.; Semitronics.
Selling To: ★ I.

GOLTEN, J. CO., INC., 4319 W. Irving Park Rd., (312) 725-7870.
Factories: Astatic; Autotrol; Brevel Prods.; Electrical Inds.; Electrical Plastics; Industrial Mica; Motron Elec. Mfg.; National Ceramic; National Moldite; Penntube Plastics; Rodale Mfg.; Tensolite Insulated Wire.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

GOODE, J. E. SLS. CO., 325 W. Huron, (312) 642-2022.
Factories: ARO Inds.; C-F Networks; Eastern States Sls.; Espey Mfg. & Elctrns.; M-Tron Inds.; Saratoga Inds.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

GREEN, L. F. & ASSOCS., 5218 W. Diversey Ave., (312) 286-6824. TWX: 910-221-5301.
Branches: 6225 University Ave. N.E., Minneapolis, Minn., (612) 781-1611; 1111 East 54th St., Indianapolis, Ind., (317) 253-2087; 830 Plateau, Waukesha, Wisc., (414) 786-2180.
Factories: Ail Microwave Instrs.; Burr-Brown Research; Century Elctrns. & Instrs.; CML, Inc.; Data Technology; Digitronics; Hickok Electrical Instrs.; Millivac Instrs.; Nelson-Ross Elctrns.; Power Designs; Rohde & Schwarz Sls.; Telex Comm. Div. **Services:** Mailings
Selling To: ★ A,D,I,M. **Salesmen:** 8 (eng 6)

(See Advertisement Page 3241)

HALINTON, H., 6646 N. Loron, (312) 763-2131.
Factories: ESICO; Globe Plastics; Hypol; Martrionics.
Selling To: ★ I. **Salesmen:** 2 (eng 1)
Services: Warehouse, Billing

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

HUTMACHER, R. R. ASSOCS., 6668 Northwest H'wy., (312) 631-3248. TWX: 910-221-5561.
Factories: Bogen Comm.; Calcon Mfg.; Hammarlund Mfg.; Jerrold Elctrns.; Oxford Speaker; Rectilinear Research; Robins Inds.; Shure Bros.; Soundolier; Shintron; TRWE-Distributor Prods.; Tandberg; Telephone Dynamics. **Selling To:** ★ A,I,D. **Salesmen:** 5 (eng 3)

KaDELL SLS. ASSOCS., INC., 6134 Milwaukee Ave., (312) 774-6815.
Factories: Alco Elctrns.; Custom Cords & Cable; Mura; Pac Elctrns.; Ramsgate. **Salesmen:** 3 (eng 3)
Selling To: ★ I,D,M. **Services:** Repair, Warehouse

KASREL, J. SLS. AGENCY, 7341 South Kingston Ave., (312) 955-5246.
Factories: Bennett Mfg.; Champion Paint; Collis; Schaefer Brush Mfg.; Spartan Saw Works. **Salesman:** 1
Selling To: ★ D. **Services:** Warehouse

KELBURN ENGRG. CO., 6545 N. Olmsted, (312) 775-5722.
Branch Offices: Box 40251, Indianapolis, Ind., (317) 846-5574; 13330 W. Sunny View Dr., New Berlin, Wis., (414) 786-5630.
Factories: Burling Instr.; Eagle Signal Div.; Electro-Mechano; Robinson-Halpern; C. F. Warrick.
Selling To: ★ I. **Salesmen:** 10 (eng 10)
Services: Repair, Warehouse

KENNEDY ENGRG., INC., 6713 N. Oliphant Ave., (312) 631-8283.
Factories: Actimonatt; Arnold Eng.; Barnes; Cimco; Coilform; Dolph; Gorman; Optimized Devices; Plastimatic; Ross; Tapecon; Voltube. **Services:** Engineering
Selling To: ★ I. **Salesmen:** 2 (eng 2)

MAGNUSON ASSOC., 5639 W. Fullerton Ave., (312) 622-6322. TWX: 910-221-5239.
Branch: 1246 West Seventh St., St. Paul, Minn., (612) 227-8495. TWX: 910-563-3554.
Factories: Beckman Instrs.; Bristol; Down Corning; T. A. Edison Inds.; ERA Transpac; Industrial Elctrn. Engrg.; Int'l. Elctrn. Research; Master Specialties.
Selling To: ★ I,M. **Salesmen:** 9 (eng 4)
Services: Warehouse

McBRIDE, J. J. SLS. INC., 6054 Touhy, (312) 775-1080.
Factories: Academy Electron Tube; Bauer Elctrns.; CBC Inds.; D M Semiconductor; Forbes & Wagner; Fotofabrications; Hunter Tools; Manhattan Electric Cable; Don McGohan; Orrtronics; S & A Elctrns.; Rockwood Mfg.; Herman H. Smith; Stever; Unimetrics.
Selling To: ★ A,D,I,M. **Salesmen:** 3

KRUEGER, R. M. CO., INC., 5755 W. Irving Park Rd., (312) 282-8444.
Factories: Augat; Burton-Rogers; Chassis-Trak; Metex; Pace; Technical Devices; Vent-Rak.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

L-TEC INC., 5808 W. Higgins Rd., (312) 286-1500. TWX: 910-221-1370.
Factories: Aavid Engr.; Clairex Elctrns.; Grigsby-Barton; Hutson Inds.; ITT Gremar; Masterite Inds.; Resistors, Inc.; Tansitor Elctrns.; Victory Engrg. Corp.
Selling To: ★ I. **Salesmen:** 4 (eng 4)
Services: Warehouse

LAUB ENGRG., 456 Frontage Rd., Box 8, (312) 446-4166.
Factories: Aerotherm; Amer. Optical; EG&G Prods. Div.; Eppley Labs.; Integrated Circ. Meas.; Keux; Measurement Control Devices; Medistor Instr.; Russell Labs.; Universal Ad-Yu Elctrns.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

LIGHTNER ASSOCS. INC., 6322 No. Milwaukee Ave., (312) 774-1500. TWX: 910-221-0999.
Factories: James Elctrns.; Marco Oak Inds.; Mial USA; National Semiconductor; Penn Tran; Power Physics; Semcor Div. Components; VID Elctrns.
Selling To: ★ I,D. **Salesmen:** 6 (eng 6)

LINCOLN, HODGES & ASSOCS., 5875 N. Lincoln Ave., (312) 561-8440.
Branch: 217 Wisconsin Ave., Wankesha, Wisc., (414) 542-3087.
Factories: Burgess Switch; Dimco-Gray; Elec-Trol; Electro-Cube; Hamlin; Hamlin Elctrns.; Joseph Pollak; Kessler-Ellis Prods.; TEC.
Selling To: ★ I. **Salesmen:** 4

LINZ, W. M. ASSOC., INC., 4001 W. Devon Ave., (312) 685-6060.
Factories: Astrocom/Marlux; Electro-Voice; Elctrn. Chemical; Hy Gain; JFD Elctrns.; Lloyd's Elctrns.; Perma Power; Pomona Elctrns.; Turret Elctrns.; Ward Prods.; Wen Prods. **Selling To:** ★ A,D,I. **Salesmen:** 4

MEMAC SLS. CO., INC., 4740 N. Austin Ave., (312) 545-1033. TWX: 910-221-5567.
Factories: ASC Microelectronics; Battery; Bel Fuse; Berkshire Elec. Cable; Components; Electro Connective Sys.; Hathaway Components; Int'l. Electro Exchange; NPC Elctrns.; Welch Relay; Wilbrecht Elctrns.
Selling To: ★ A,I,D,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

MEYERS, K. W., CO., 7256 W. Touhy Ave., (312) 774-6440. TWX: 910-221-5288.
Branches: 4359 S. Howell Ave., Milwaukee, Wisc., (414) 482-1313; 4725 Excelsior Blvd., Minneapolis, Minn., (612) 920-7080; 3512 Rockville Rd., Indianapolis, Ind., (317) 243-6681.
Factories: J. G. Biddle; Boonton Elctrns.; Christie Elec.; Digitec/United Sys.; Eurveh/Charles; Leasemetric; Marconi Instr.; Monsanto; Power/Mate; Quan-Tech Labs.; Universal Voltronics. **Services:** Repair
Selling To: ★ I. **Salesmen:** 6 (eng 6)

MIDWEST ELCTRN. SLS., 5707 W. Division St., (312) 626-0030. TWX: 910-221-5247.
Branches: 2042 Franklin Ave. N.E., Cedar Rapids, Iowa, (319) 362-4410; 5462 E. 40th St., Indianapolis, Ind., (317) 547-3259; 1317 Garfield Ave., Waukesha, Wisc., (414) 542-5129.
Factories: Associated Testing Labs.; C.M.C., Computer Measurements Corp.; Curtis Instrs.; Easy Elctrns.; Electrovert; E.T.A. Prods.; Fenwal Elctrns.; Kepco; Measurements; H. H. Scott; Wall Mfg.; Western Reserve.
Selling To: ★ I,D. **Salesmen:** 5 (eng 5)
Services: Repair, Warehouse

MIDWEST MICROWAVE, 6200 N. Hiawatha Ave., (312) 283-4900. TWX: 910-221-2515.
Branches: 1443 N. Edmondson Ave., Indianapolis, Ind., (317) 359-3747; 2852 Brunswick, St. Louis Pk., Minn., (612) 929-7045.
Factories: American Computer; EIP; Federal Scientific; Microwave Energy; Sylvania; Tracor; Weston.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)
Services: Engineering

PATTERSON, W. S. CO., INC., 5604 Western Ave., (312) 271-3774. TWX: 910-221-3029.
Factories: Auricord; Collins & Hyde; Eldema; General Inst.; Goldline Connector; Heyboer Transformers; Planet Mfg.; Utah Elctrns. **Services:** Limited Warehouse
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 1)

PIVAN ENGRG. CO., 3535 West Peterson Ave.,
Factories: BLH; Beckman EID; Cintra; Dana; Digilin; Lebow; Midwestern Instrs.; Pacific Measurements; Precision Instrs.; Simulators; Sorensen; Spiras Sys.; Tally; Topaz; Varian Aerograph Div.; Vidar.

ROPEK-CAHILL, INC., 5439 W. Division St., (312) 287-7292. TWX: 910-221-5219.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

ROUSSEY, R. F. & ASSOCS., INC., 6101 N. Sheridan Rd. East 28B, (312) 764-1374.
Factories: Contract Mfrs. Assoc's.; ESS; Raypar.
Selling To: ★ I. **Salesman:** 1
Services: We will make your product—complete.

SALES, G. F. CO., 4750 N. Milwaukee Ave., (312) 545-5562. TWX: 312-265-1496.
Factories: Bead Chain Mfg.; General Mfg.; Lundey Assocs.; Wilco.
Selling To: ★ I. **Salesman:** 1 (eng 1)

SCIENTIFIC SLS. CORP., 7132 N. Harlem Ave., (312) 775-7594.
Branches: 5555 N. Tacoma Ave., Indianapolis, Ind., (317) 253-4606; 5100 Edina Industrial Blvd., Minneapolis, Minn., (612) 941-2215; 1760 S. Brentwood Blvd., St. Louis, Mo., (314) 968-1133.
Factories: Bucode; Cambridge Memories; Cunningham; Datawest; Digitran; Dynamics Research;Dynasciences; Ferranti-Packard; General Designs; Information Data Sciences; International Data Sciences; MicroSonics; Narda Microwave; E. Munsell; Sangamo Elec.; Sierra Electromes; Transducer Sys.; Watkins Johnson.
Selling To: ★ I,M. **Salesmen:** 6 (eng 6)
Services: Repair

SHERERTZ-HENDERSON CO., 5707 W. Lake St., CO 1-1032.
Factories: Ametek/Testing Equipt. Sys.; Consolidated Controls; Glesco Elctrns.; Scientific Sys.; Techsonics.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

SILVERS, M. M. & ASSOCS., 4403 Sheridan Rd.
Factories: Armacost Prods.; Kleer-Vision Mfg.; Ohio Mfg.; Sunray Lighting.
Selling To: ★ D. **Salesmen:** 3 (eng 1)

STEVENS ENGRG., 5306 W. Lawrence Ave., (312) 725-4400.
Factories: Aarkles Switch; Bendix; ENM; McMillan Mfg.; Merkle Korff Gear; Norwalk Therostat.
Selling To: ★ I. **Salesmen:** 5 (eng 4)
Services: Warehouse

STRANCO PRODS., 1534 W. Van Buren St., (312) 738-1580. TWX: 910-221-3830.
Branch: 15 Gover Ct., Spotswood, N.J., (215) 884-9946.
Selling To: ★ I,D.

SYSTEMS ENGRG. ASSOCS., 5505 N. Menard Ave., (312) 774-1452.
Factories: Analog Devices Inc.; Atec Inc.; Cal Inst.; Cimron Div.; Computer Comm.; Elctyn Assoc.; Flo-Tron; S. Himmelstein; Ind. Electronetics Corpl; Info Inst.; Matrix Corp.; Micro Test; Peripheral Equip.; Remex

Phones: 312 COlumbus 1-7517
312 EUclid 3-6572
TWX: 910-228-3321

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(For alphabetical listing see page 3215)

Elctrn.; R.F. Comm.; Robins Data Devices; Sangamo Elec.; Shepard Labs.; Techni-Rite Elctrn.; Theta Inst.; Todd Prod.; Transducers Inc.
Selling To: ★ I,M. **Salesmen:** 10 (eng 10)

TONELINE MFG. CO., 1812 South Halsted.
Factories: Toneline Mfg.; Elctrn. Stroke Light; Lowenthal Mfg. **Salesman:** 1
Selling To: ★ D,Wholesale Music

TWIST, J. G. CO., 5222 W. Diversey Ave., (312) 777-2250. TWX: 910-221-1313.
Branch: 540 Catskill Rd., Waukesha, Wisc., (414) 786-6330.
Factories: Cermetek; Controls; Custom Components; Daven; I.R.C.; Michigan Magnetics; Quam-Nichols; Signalite; Syncro Cap.; TRW; Gulton Inds.; Victor Wire & Cable. **Selling To:** ★ A,I,D,M. **Salesmen:** 9 (eng 3)

WEST, J., 6747 N. Octavia Ave., (312) 763-3500.
Factories: Hy-GainElctrns.; James Elctrns.; Regency Elctrns.; Shepherd Inds.
Selling To: ★ D. **Salesmen:** 2

WHITMORE ASSOCS., INC., 1301 West 22nd St., (312) 325-4727.
Branch: 7710 Computer Ave., Minneapolis, Minn., (612) 926-2855.
Factories: Advance Circuits; Dynamic Instrs.; Elctrn. Resh.; Isofilm Int'l.; Plastoid; Price Elec.; Marathon Batteries; Weston Instrs.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

WOODS, A. A. & ASSOCS., INC., 5511½ Montrose Ave., (312) 283-7400. TWX: 910-221-2579.
Factories: Stockpole Carbon; Stockpole Components.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 5)

Des Plaines

MARSLAND ASSOCS. INC., 1000 Executive Way, (312) 775-1309. TWX: 910-233-4002.
Branches: 3734 Carrollton Ave., Indianapolis, Ind., (317) 924-3568; 231 North Edgewood Ave., Minneapolis, Minn., (612) 545-4481; Box 567, Florissant, Mo., (314) 831-0015.
Factories: Chadwick-Helmuth; Cobehn; Columbia Research Lab.; Data Control Sys.; Datametrics; Ectron; Emcor-Borg Warner; Hy-Cal Engrg.; Krohn-Hite; Ling Elctrns.; Monterey Research Labs.; Raytheon Computer; RFL Inds.; RLC Elctrns.; Sandefur Engrg.; Team Corp.; Tenney Engrg.; Test Equip.; Time Sys.; Trygon Elctrns.; Wayne, G.; Wayne Kerr.; Zeltex. **Services:** Warehouse
Selling To: ★ A,I,M. **Salesmen:** 8 (eng 8)

East Peoria

PETITT, G. CO., INC. (See River Forest, Ill.)

East St. Louis

COLLINS-CARLSON-HEMP (See Kansas City, Mo.)

Elk Grove Village

KNOBLOCK & ASSOCS., INC., Box 67, (312) 593-5940. TWX: 910-222-1604.
Factories: American Zettler; Chester Cable; Culbertson Prods.; Keystone Carbon; Stevens-Arnold; D. M. Steward Mfg.; York Capacitor.
Selling To: ★ I,D. **Salesmen:** 2

Evanston

MAUER CO., INC., 3308 Noyes St., (312) 869-1644.
Factories: Ithaco; Julies Research Labs.; Lear Siegler; Mid-Eastern Industries; Penn Airborne Inst.; Standard Controls; Statham Instrs.; Summit Engrg.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)
Services: Repair, Engineering

MAYTNIER, D. M. CORP., 2510 Grosse Point Rd., (312) 475-4334.
Factories: Harry Davies Molding; Hotwatt; Nordex; Still-Man Mfg.; Trilometer; Vacuum Die Casting.
Selling To: ★ I. **Salesmen:** 5 (eng 2)

SWINKE, W. F. & ASSOCS., 3014 Colfax St., (312) 248-4343.
Factories: Aero Space Precision Inds.; Automation Prods.; Erie Frequency Controls; Foster Transformer; Micro-Ohm Corp.; Milwaukee Resistor; Minerva Mfg.; Moorlee Mfg.; Radio Wire Mfg. **Selling To:** ★ I,M **Salesmen:** 2 (eng 2)

ZIMMER SLS. (See Shawnee Mission, Kans.)

Glen Ellyn

JEROME H. KLEKER CO., 177 Sunset Ave., (312) 469-2297.
Factories: Frazier; Lowell Mfg.; MetalWorks; Microtran; Newcomb Audio Prods.
Selling To: ★ A,I,D. **Salesmen:** 2 (eng 1)

ROCKFORD CONTROLS CO., 21 W. 181 Hill Ave., (312) 469-6016.
Factories: Alco Elctrn. Prods.; Automatic Timing & Controls; Electroswitch; Gordos; Reed Devices; Struthers-Dunn. **Services:** Repair, Warehouse
Selling To: ★ I,D. **Salesmen:** 5 (eng 3)

Hinsdale

HILL-GRAY ASSOCS., INC., 2 Salt Creek La.—Box 32, (312) 375-4810. TWX: 910-651-4157.
Factories: APM-Hexseal; Bliley Elec.; B.R.O.I. Inc.; Caton Ind.; Chemelec Prod.; Dialight; Electrovert; Grayhill; Grayhill Moldtronics; Industrial Timer; Interswitch; Leecraft Mfg.; Magnuson Engrg.; Pacific Ind. Controls; Pamotor; Permanet Magnet; Sealtron; Seastrom Mfg.; Waber Elctrns. **Services:** Sales facility
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 2)

SNYDER SLS. CO., 102 South Washington St., Box 243, (312) 323-9191.
Factories: Beckwith Elec.; Continental Wire & Cable.
Selling To: ★ I. **Salesmen:** 2

La Grange

BARD ASSOCS. INC., La Grange Industrial Park, (312) 354-0660. TWX: 910-683-1894.
Branches: 4640 W. 77th St., Minneapolis, Minn., (612) 922-8233; 4000 Meadows Dr., Indianapolis, Ind., (317) 547-3113; 50 Crestwood Executive Ctr., Crestwood, Mo., (314) 849-0080; 13100 W. 95th St., Lenexa, Kans., (913) 888-2673.
Factories: B&K Instrs.; Cohu Elctrns.; Computer Displays; Computer Equipt.; Datatron; Electronic Measurements; Genisco; LHB Corp.; Micro Instr.; Princeton Applied Resh.; Rental Elctrns.; Sangamo Elec.; Signetics Corp.; Singer; Spectral Dynamics; Thermotron; Unholtz-Dickie. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 10 (eng 10)

Lake Villa

VENN, R. W. CO., Route 2, Box 660, (312) 395-5353.
Factories: Adams & Assocs.; Air Control; Affiliated Mfgrs.; Apollo Lasers; Electro Materials; P. Elmet Engrg. Tech. Prods.; Gaiser Tool; Tekform; Watkins-Johnson; Wentworth Labs.; West Bond.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Repair, Warehouse

Lake Zurich

BRANUM SALES CO., Box 516, (312) 438-2356.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Lincolnwood

PATTIS, THE B. CO., 4761 W. Touhy Ave.

Lombard

QUADTRON ASSOC. INC., Box 306, (312) 627-6800.
Factories: ICS; Loyola Inds.; Mack Electric Devices; Ohio Semitronics; Pickering & Co.; Spectra-Strip.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)
Services: Direct Mail

McHenry

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

Mt. Prospect

CAIN & CO. (See Los Angeles, Calif.)

Northfield

BLAKER, S. C. CO., Box 129, (312) 446-8777.
Branches: Box 2515, Ft. Wayne, Ind., (219) 432-0897; 3516 E. 50th St., Minneapolis, Minn., (612) 722-6771.
Factories: Bean Rubber; Bradley Semiconductor; Extrudapak Engrg.; Forest Electric; Kidco, Inc.; Protolab, Inc.; Repley Co.; Robinson Components Div.; Transene Co.; Valor Elctrns.; Valor Instrs.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Oak Park

WADSWORTH MFG. ASSOC. INC. (See Liverpool, N.Y.)

WASSON-GALLAGHER, Suite 104, 1024 N. Boulevard, (312) CO 1-7517. TWX: 910-228-3321.
Factories: American Monarch; Control Data; Electro Mechanisms; Gudeman Div.; Gulton Inds.; Ingraham Inds.; Mohawk Wire & Cable; Sage Elctrns.; Specialty Connectors; Transitron Elec.; Unimax Switch; Vernitron Elec. **Selling To:** ★ I. **Salesmen:** 3

(See Advertisement Page 3242)

Palatine

HANNA, R. L. CO., Box 202, (312) 358-3940.
Factories: Adcraft Decals; Dry Screen Process; General Semiconductor; General Sensors; Gudebrod Bros. Silk; Hudson Lamp; Magnusonic Devices.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

Park Ridge

FITZSIMMONS ASSOCS., INC., 412 N. Ashland Ave., 825-3161. **Factories:** Audio Book Co.; VM Corp.
Selling To: ★ A,D. **Salesmen:** 3

RF SPECIALISTS, 118 W. Higgins Rd., (312) 698-2044.
Factories: Aranzac Elctrns.; Airflyte Elctrns.; E & M Labs.; Electro-Impulse; Fairchild-Microwave; Hughes-Electron Dynamics; Microlab/FXR; Prodelin; Unitrode/Microwave Div.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

River Forest

PETITT, G. CO., INC., 349 Ashland Ave., (312) 369-8940, 261-0342.
Branches: Avondale Dr., East Peoria, Ill., (309) 699-3301; 13845 Capitol Dr., Brookfield, Wisc., (414) 781-7596.
Factories: Atlas Sound; Blonder Tongue Labs.; British Inds.; Bud Radio; Capitol Mach. & Switch; J.B.T. Instrs.; Stancor Transformers; Triplett; Turner.
Selling To: ★ A,I,D. **Salesmen:** 7
Services: Repair, Warehouse

(See Advertisement Page 3242)

Rockford

CLAGETT ENGRG. SALES CO., 420 Ellis Ave., (815) 965-4555.
Factories: American Louver; Chelsea Fan & Blower; Hevi-Duty Elec.; Kinney Electrical Mfg.; Solar Light Mfg.; Zenith Controls. **Selling To:** ★ I,D. **Salesman:** 1 (eng 1)

Rosemont

COZZENS & CUDAHY, INC., 9501 W. Devon Ave., (312) 825-1144. TWX: 910-253-1820.
Branches: 735 S. Court St., Medina, Ohio, (216) 725-5660; 127 Edmund St., Royal Oak, Mich., (313) 585-5159; 21 Beachway Dr., Indianapolis, Ind., (317) 244-2456; 7710 Computer Ave., Minneapolis, Minn., (612) 921-1022; 10534 Natural Bridge Rd., St. Louis, Mo., (314) 423-1234.
Factories: Bright Inds.; Care Elctrns.; Computer Signal Processors; Continental Leasing; Data Royal; Daymarc Corp.; Delta Data Sys.; E-H Resh. Labs.; Elctrn. Arrays; J. Fluke Mfg.; Krohn-Hite; Kruse-Storke Elctrns.; Marquette Elctrsn.; Microwave Elctrns.; Monsanto/Elctrn. Special Prods.; Newell Inds.; Optima/Scientific-Atlanta; Physio Controls; Redcor Corp.; Rockland Labs.; Silicon General; SRC/Crescent Technology; Standard Memories; Synergistics, Inc.; Teradyne; Weinschel Engrg.

Skokie

BERMANN, M. SALES, 8631 E. Prairie Rd.
Selling To: ★ D. **Salesman:** 1

CHAMPION, E. T. & ASSOCS., 4828 Main, (312) 676-3960.
Factories: Gold-Line Connector; Leader Instr.; Milwaukee Resistor Mfg.; Oneida Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 8

SAFFRO & ASSOCS., 3736 Dempster St., (312) 588-0905.
Branch: 6312 S. 27th St., Oak Creek, Wis., (414) 761-2120.
Factories: Beede Elect. Inst.; Control Knobs; General Instr.; Guildline Instr.; Hallmark Standards; Staco; Sterling Mfg.; United Mineral & Chem. **Salesmen:** 5 (eng 3)
Selling To: ★ A,I,D,M. **Services:** Warehouse

W. Chicago

CONTROLCRAFT CORP., 213 Main St., (312) 653-4010.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Repair

Westchester

BROUILLETTE, W. G. & ASSOC., INC., 9855 Roosevelt Rd., (312) 345-6500.
Factories: Bradford Components; Cleveland Elctrns.; Hoagland Instr.; Magnetic Shield; Olympic Controls; PCA Elctrns.; Victoreen Instr.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

MURPHY & DICKEY, 10001 Derby Lane, (312) 344-5660.
Factories: R. B. Annis; Atkins Tech.; Columbia Elec. Mfg.; Norcross; Permutit; Radiation; H. H. Sticht; Vapor.
Selling To: ★ I. **Salesmen:** 3 (eng 3)

Wheaton

BATHA, H. J. CO., 310 So. Dorchester Ave., (312) 668-4740.
Factories: Carlton Mfg.; S. H. Couch; ESB; Mica Corp.; Positive Connector; Selectrons Ltd.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)
Services: Warehouse

INDIANA

Angola

CLANCY, J. & CO., INC., P.O. Box 269, (219) 665-2561.
Factories: American Geloso Elec.; Aeeger, Inc.; Livingston Audio Prods.; Pickwick Int'l.; Raytheon; Specialty Sounds; Trutone Elctrns.
Selling To: ★ D. **Salesmen:** 2

SOUTHERN SLS. CO., 105 Lakeshore Dr., (219) 665-3961.
Branches: 1111 East 54 St., Indianapolis, Ind., (317) 253-3359; 212 Republic Bldg., Louisville, Ky., (502) 583-6902.
Factories: Argo Prods.; Bud Radio; Continental Wirt Elctrns.; Dialight; Hudson Lamp; Kent; Leecraft Mfg.; Sage Elctrns.; Sonotone; Staco; Standard Grigsby; Syracuse Elctrns. **Services:** Warehouse, Mailing List
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 2)

Bloomington

TEMCO INC., 118 So. Rogers St., (812) 332-3377.
Factories: Breyer Molding; Kurz Kasch; Leyse Alum.; Madison Kipp; Mid West Cortland; TRW Inc. ECD; York Tape & Label.
Selling To: ★ I. **Salesmen:** 3 (eng 1)

Evansville

WAHL A. C. & ASSOCS. INC. (See Cincinnati, Ohio)

Fort Wayne

BIEBERICH, W. W. INC., 801 Leesburg Rd., (219) 432-2537.
Factories: Ceramics Int'l.; Delevan Elctrns.; Deltrol Controls.; Drake Mfg.; Intersil; Isotronics; J.B.T. Instrs.; Milwaukee Resistor; Plastic Capacitors; Shurite Meters; Triplett Corp.; Triwec Transformer; WABCO Aerospace Prods. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 1)

(See Advertisement Page 3244)

BLAKER, S. C. CO. (See Northfield, Ill.)

FREDERICK & MEILY CORP., 252 E. Pontiac St., (219) 744-0641, 745-2461.
Factories: American Zettler; El-Rad Mfg.; Electri-Cord; Hamilton-Hall; Mid-West Transformer & Coil; Malco Mfg.; Mandex Mfg.; Nax Prods.; F. H. Paul & Stein Bros.; Sarkes Tarzian; Tingstol. **Services:** Direct Mail
Selling To: ★ I. **Salesmen:** 3

HOEMIG SLS. CO., 3405 Butler Court, (219) 483-6913.

Factories: Arvin Frequency Devices; Illinois Tool Works; Pic Design; Taurus; Tech Labs.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

HOMSHER, B. F. CO., 418 E. Berry St., (219) 432-1164, 743-5371.
Factories: Chemtronics; Chicago Miniature Lamp Works; Clarostat Mfg.; Electric Soldering Iron; Guardian Elec. Mfg.; Kulka Elec.; Morhan Nat'l. Sls.; NT•T Sls.; Precision Metal Prods.; Triad Distributor Div.; Utah Elctrns.
Selling To: ★ A,D,I,M. **Salesmen:** 2

KILFOIL, J. F. CO. (See Cincinnati, Ohio)

McDONALD SLS. CO., Box 9148, (219) 747-3650.
Branch: Box 55311, Indianapolis, Ind., (317) 257-1010.
Factories: Amco Eng.; Bodnar Prods.; Curtis Instr.; Dynamic Instr.; Gibbs Mfg.; Harowe Servo; Phelps Dodge Elctrns. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

MORRIS-CUNNINGHAM & ASSOC., INC. (See Indianapolis, Ind.)

NEEDLER SLS. CO., Sta. C, Box 2407, (219) 447-2123.
Branch: Mapleton Sta., Box 88153, Indianapolis, Ind., (317) 255-8056.
Factories: Bartlett Mfg.; Clarostat Mfg.; General Instr.; Guardian Elec. Mfg.; Ren Elctrns.; Skottie Elctrns.
Selling To: ★ I,M. **Salesmen:** 3

VAL-SKOL SLS. INC. (See Cincinnati, Ohio)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

Indianapolis

BARD ASSOCS. INC. (See La Grange, Ill.)

BERNDT ASSOCS. INC. (See Chicago, Ill.)

BLIND & ASSOCS., INC., 1060 E. 86th St., (317) 846-5441.
Factories: Automatic Radio; British Inds.; Carpenter Mfg. Co.; Conrac Corp.; Comco Supply; Cosmo Plastics; Epic Resins; Franklin Fibre Lamitex; G. Stevens Mfg.; Lion Research; Sennheiser Elctrn.; Stanton Magnetics.
Selling To: ★ A,D,I,M. **Salesmen:** 3
Services: Direct Mail

CAMPISANO, F. J. & ASSOC. (See Cincinnati, Ohio)

CARTER ELCTRNS. INC. (See Chicago, Ill.)

COMTEL COMPONENTS (See Addison, Ill.)

COZZENS & CUDAHY, INC. (See Rosemont, Ill.)

DATA ELCTRNS. CO., INC. (See Chicago, Ill.)

DELTA SLS. INC., 1407 N. Illinois St., (317) 631-4136.
Selling To: ★ A,D,I,M. **Salesmen:** 3
Services: Warehouse

DeVOE, L. M. CO., 665 E. 61st St., (317) 257-1227. TWX: 810-341-3284.
Factories: Adams Elctrns.; Amphenol Elctrns.; Centralab Elctrns.; Gardiner Metals; Littelfuse Inc.; RCL Elctrns.; Sigma Inst.; Union Carbide Elctrns.; Weller Elec.; Zero Mfg. **Selling To:** ★ I,D,M. **Salesmen:** 7 (eng 4)

DIETHERT, R. CO. INC. (See Chicago, Ill.)

ENGLE, K. D. CO., IND. (See Chicago, Ill.)

FISHMAN ASSOCS., 2060 E. 54th St., (317) 251-2401.
Factories: Norelco; Murdock; Precision Elctrns.; Tenatronics. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 2 (eng 1)

GREEN, L. F. & ASSOCS. (See Chicago, Ill.)

KELBURN ENGRG. CO. (See Chicago, Ill.)

LAIDLAW CO., THE, 2563 E. 55th Pl., (317) 253-4436.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

MARSLAND ASSOCS., INC. (See Des Plaines, Ill.)

McDONALD SALES CO. (See Ft. Wayne, Ind.)

McSWEENEY, F. J. & ASSOCS., 2555 E. 55th Pl., (317) 255-3777.
Factories: Ampex; Columbia Elect. Cables; Emico; Mosley Elctrns.; Oelrich Publications; Soundolier; Ungar; University Sound. **Selling To:** ★ A,I,D. **Salesman:** 1

MERRITT, J. W. & CO., 2525 Knollwood Dr., (317) 291-9674. **Selling To:** ★ A,D,I. **Salesmen:** 2

MEYER MATERIAL, 5101 E. 65th, (317) 253-6407.
Selling To: ★ A,D,I,M.

MEYERS, K. W. CO. (See Chicago, Ill.)

MIDWEST ELCTRNS. SLS. (See Chicago, Ill.)

MIDWEST MICROWAVE (See Chicago, Ill.)

MILSK, R. CO. (See Detroit, Mich.)

MORATH, H. J., 325 Bankers Tr. Bldg., (317) 635-4082.
Factories: Air-Vac Engrg.; Photomation; Wintriss Controls.
Selling To: ★ I.

MORRIS-CUNNINGHAM & ASSOC., INC., 720 E. 65th St., (317) 255-2458.
Branch: 4425 Maple Terrace Pkwy., Fort Wayne, Ind., (219) 485-3612.
Factories: Automatic Mfg. Div.; Better Coil & Transformer; International Importers; Jensen Mfg. Div.; J. W. Sickles Div.; P. Smith Div.; Turner.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

NEEDLER SLS. CO. (See Fort Wayne, Ind.)

NEFF, J. R., 5349 Hedgerow Dr., (317) 546-5824.
Selling To: ★ I,M. **Salesman:** 1

O.E.M. SLS. CO., INC., Box 55232, (317) 545-1267.
Branch: Box 252, Florissant, Mo., (314) 838-6600.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

REID, R. L. & CO., 707 E. 106th St., (317) 846-2511.
Branch: 248 W. Pamela Rd., Arcadia, Calif., (213) 681-0711.
Factories: Cin-tran; Quality Components; Power Components; Radio Television Prods.; Ratel, Inc.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

SCHEFFLER, C., CO., 1133 Navajo Trail, (317) 253-6337.
Factories: Antronic; Certron; Duotone; Dynaco; Fasco Inds.; Gamber-Johnson; Hudson Lamp; Industrial Devices; Int'l. Elctrns.; Loral Distributor Prods.; Mura; Philmore Mfg.; Rectilinear Research; Roberts Elctrns.; S & A Elctrns.; Sansui Elctrns.
Selling To: ★ A,D. **Salesman:** 1

SCHULZ, E. A. CO., 721 Sherwood Dr., (317) 255-1993.
Factories: Astatic; Robins Inds.; Sherwood Elctrn. Labs.; Workman Elctrn. Prods.
Selling To: ★ A,I,D. **Salesmen:** 2

SCHROEDER & LOOMIS, INC., 714 E. 65th St., (317) 251-7920.
Factories: Aladdin Elctrns.; Consolidated Merchandising; Cu Tronics; Diodes; Electra; Genisco; IRC; Leonard Elec.; Millen, James Mfg.; United Mineral & Chemical.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 1)

SCIENTIFIC SLS. CORP. (See Chicago, Ill.)

SOUTHERN SLS. CO. (See Angola, Ind.)

THOMAS & SUKUP, INC., 2060 E. 54th St., (317) 251-4574; TWX: 317-635-8075.
Factories: Alpha Wire; Amperex Elctrn.; Chassis-Trak/Vent-Rak; Ferroxcube; Simpson Elec.; Switchcraft; Uniform Tubes. **Services:** Warehouse, Direct Mail
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 3)

VAL-SKOL SLS. INC. (See Cincinnati, Ohio)

WAHL A. C. & ASSOCS. INC. (See Cincinnati, Ohio)

WEBER, J. L. AGENCY, 8150 Westfield Blvd., (317) 255-4117. **Selling To:** ★ I. **Salesman:** 1 (eng 1)

WHITESELL, R. O. & ASSOCS., 6691 E. Washington St., (317) 359-5374.
Branches: Central Bldg., Ft. Wayne, Ind., (219) 432-5591; 3620 Lexington Rd., Louisville, Ky., (502) 893-7303; 303 Fidelity Bldg., Benton Harbor, Mich., (616) 927-2041; 25100 Evergreen Rd., Southfield, Mich., (313) 358-2020; 1172 W. Galbraith, Cincinnati, Ohio, (513) 521-2290; 21139 Lorain Ave., Cleveland, Ohio, (216) 333-2585; 4133 So. Dixie Ave., Dayton, Ohio, (513) 298-9546; 201 Penn Center Blvd., Pittsburgh, Pa., (412) 242-0100.
Selling To: ★ I,M. **Salesmen:** 18 (eng 16)

(See Advertisement This Page)

Kokoms

MILBANK MFG. CO. (See Kansas City, Mo.)

LaFontaine

KIRSCH SLS. CO., 107 Wabash Ave., (317) 981-2801.
Factories: Co-Tronics; Courtesy Circuits; Capsonic Group; F-Dyne Elctrns.; LTV Electrosystems; Wilco.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

Tipton

CENTRAL ELCTRNS. SALES CO. (See Detroit, Mich.)

IOWA

Ames

MID STATE DISTG. CO., INC. (See Des Moines, Iowa)

Atlantic

KOENIG-MYERS ASSOC., INC. (See Shawnee Mission, Kans.)

Bettendorf

POWER EQUIP. CO., 1630 State St., Box 787, (319) 355-5623.
Factories: Doerr Elec.; Dumore; Dynamatic Div.; Electro-Hydraulic; Machinery Electrification; Ohio Gear.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Carroll

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

Cedar Rapids

BALHORN & WELCH, INC. (See Chicago, Ill.)

BROWN, H. R. SLS. CO., 3400 Indian Rd. S.E., (319) 366-0635.
Factories: Anderson Labs.; Clevite/Gould Piezoelectric; Disitran; Kilovac; Keystone Carbon; Mepco; Monolithic Dielectric; Philips Elctrns. Ind.; Piconics, Inc.; SR Engrg.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

DECO ENGRG. PRODS., INC. (See Des Moines, Iowa)

ENGINEERING SVCS. CO. (See St. Louis, Mo.)

HERSEY, J. T., 2120 Greenwood Drive S.E., (319) 362-2031.
Factories: American Coil Spring; Atlantic India Rubber Wks.; Braward Rivet; Kendale Inds.; McLean Fogg Lock Nut; W. L. Molding.
Selling To: ★ I. **Salesman:** 1

VRBIK, J. CO., Three-50th St. N.E., (319) 377-8244.
Factories: American Magnetics; Bliley Elec.; Centralab Div.; Daven; Electro Assemblies; EMF; E. F. Johnson; Norplex Plastics; North American Wire & Cable; Spectrol Elctrns. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2

(See Advertisement Page 3245)

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

MIDWEST ELCTRN. SLS. (See Chicago, Ill.)

REID ASSOCS. INC., 526 Merchants Nat'l. Bank Bldg., (319) 362-6302.
Factories: Airpax Elctrns.; Alpha Inds.; Elctrn. Devices; Grayhill; Indiana Gen.; Marshall Inds.; Modutec; Reon Resistor; Struthers-Dunn; Vanguard Elctrns.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Council Bluffs

PFEIFFER, W. E., 615 Stutsman St., (712) 322-8280.
Branch: 1001 So. 6th St., Council Bluffs, Iowa, (712) 322-8280.
Factories: Bender Elctrns.; Digital Prods.; Electro-Mec Instrs. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 4

PFEIFFER, W. E. (See Council Bluffs, Iowa)

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Des Moines

COLLINS-CARLSON-HEMP (See Kansas City, Mo.)

DECO ENGRG. PRODS., INC., 1112 Lucust St., (515) 288-5721.
Branches: 517 Main St., Davenport, Iowa, (319) 324-6123; Omaha, Neb., (402) 341-4836; 350-16th St. S.E., Cedar Rapids, Iowa, (319) 364-2952.
Factories: Allen-Bradley; Barber-Colman; Dongan Elec. Mfg.; Elctrns. Corp. of America; Electro-Devices; Faraday, Inc.; Hays Corp.; Magnetrol, Inc.; Radiation, Inc.; Royal Elec. Mfg. **Services:** Repair, Warehouse
Selling To: ★ I,D. **Salesmen:** 7 (eng 5)

DOWELL, T. L. INC. (See Overland Park, Ks.)

KSW ASSOCS. (See Kansas City, Mo.)

MID STATE DISTRIBUTING CO., INC., 1201 Grand Ave., 288-7231.
Branches: 511-So 3rd St., Ames, Iowa, (515) 232-2104; 216 W 5th St., Carroll, Iowa, (712) 792-2177; Cedar Rapids, Iowa, (319) 365-9411; 904 No. Sumner, Creston, Iowa, (515) 782-5718; 620 So. Madison, Iowa City, Iowa, (319) 337-3726; 311½ South Center, Marshalltown, Iowa, (515) 752-0513; 18 7th St. S.E., Mason City, Iowa, (515) 423-8012; 429 W 2nd St., Ottumwa, Iowa, (515) 682-5407; 518 3rd Ave. E., Spencer, Iowa, (712) 262-4083; 515 No. Main, Kirksville, Mo., (816) 665-5625.
Factories: Amperex; Amphonel; Astatic; Beauchaine; Belden; Bud Radio; Burgess; Bussman; Centralab; Channel Master; Chicago Miniature; Hy Gain; Game; General Cement; IR; IRC; Jensen Mfg.; Kursh-Kash; Kulka; Littelfuse; Midland; Miller; Minnesota Mining; Lowell; Potter Brumfield; National; Ohmite; Raytheon; Recoton; Rohn; Howard Sams; Sencore; Shure; Sprague; Switchcraft; Sylvania; Thordarson; Ungar; Weller.
Selling To: ★ A,D,I. **Salesmen:** 15
Services: Warehouse

Fort Dodge

HEIMANN CO., INC. (See Minneapolis, Minn.)

Iowa City

MID STATE DISTG. CO., INC. (See Des Moines, Iowa)

Marion

THOMAS & MODRCIN ASSOC. INC. (See Shawnee Mission, Kans.)

Marshalltown

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

Mason City

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

Ottumwa

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

Spencer

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

KANSAS

Gardner

KAY SLS. CO., Box 647, (913) 884-8900.
Factories: Curtis Instrs.; M.I.A.L. Inc.; Rayonic; Quality Transformers; Vemaline Prods.
Selling To: ★ I,M. **Salesmen:** 2

Leawood

LEEMARK ENGRG., INC., Box 6175, (913) 648-0124.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

POLY-ONICS, INC., 4434 W. 90 Terr., (913) 648-4173. TWX: 910-749-6479.
Branch: 47 Village Sq., Hazelwood, Mo., (314) 837-0597. TWX: 910-760-1708.
Factories: Alfred Elctrns.; Avantek; CTS; Data Gen.; Elctrn. Assocs.; Industrial Elctrn. Engrg.; Instruments for Industry; McLean Engrg. Labs.; Narda Microwave; Peripheral Equip.; Princeton Applied Research; Staco; Systron Donner; Wavetek.
Selling To: ★ I,M,D. **Salesmen:** 4 (eng 2)

Lenexa

BARD ASSOCS. INC. (See La Grange, Ill.)

Mission

INLAND ASSOCS., 6047 Howe Dr., (913) 362-2366.
Branch: 453 North Lindbergh, Creve Coeur, Mo., (314) 993-0301.
Factories: Automatic Metal Prods.; Bel Fuse; Bivar; Chemical Fabrics; Circuit Materials; Damon Elctrns.; Elctrn. Modules; Hurst Mfg.; Magnetic Core; Magnetics; National Wire & Cable; Singer; Southern Elctrns.; Thermotech Coil Forms; Universal Laminates; Wall Mfg.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

Overland Park

DOWELL, T. L. INC., 7208 W. 80th—Room 204, (913) 649-6069. TWX: 910-749-6481.
Branches: 4753 Titan Ct., St. Louis, Mo., (314) 892-2859; 4127 27th St., Des Moines, Iowa, (515) 255-6580.
Factories: Alliance Mfg.; Augat, Inc.; Cicoil Corp.; Bourns-Euphonics; Electro-Voice; J.B.T. Instrs.; Littelfuse Inc.; Mason Elec.; Ohmite Mfg.; Quam-Nichols Co.; H. W. Sams Co.; Switchcraft, Inc.; Triad; Triplett; Vaco Prods.; Wagner Elec.
Selling To: ★ A,D,I,M. **Salesmen:** 5

(See Advertisement This Page)

LOWELL-KANGAS & ASSOC., INC., Box 4116, (913) 888-3200. TWX: 910-749-6493.
Branch: Box 12526 Creve Coeur Sta., St. Louis, Mo., (314) HE 4-4560. **Services:** Direct Mail
Selling To: ★ A,D,I. **Salesmen:** 4

Prairie Village

ENGINEERING SERVICES CO. (See St. Louis, Mo.)

Shawnee Mission

BENSON ENGRG. CO. (See Dallas, Tex.)

BETTIS, M. E. CO., Box 598, (913) 362-0772.
Branches: 423 No. Fountain, Wichita, Kans., (316) MU 5-7441; 9103 Bessemer, St. Louis, Mo., (314) HA 9-2099. **Selling To:** ★ I,D. **Salesmen:** 4 (eng 4)

FLORENCE & MEYER, INC., 7301 Mission Rd., (913) 722-5210. TWX: 910-743-6865.
Branches: 8650A Airport Rd., Berkeley, Mo., (314) 521-6800. TWX: 910-760-1625; 2900 Woodland, Wichita, Kans., (316) 838-7226.
Factories: American Zettler; Bourns; Compac Engrg.; Computer Circuitry; Dickson Elctrns.; Nat'l. Semiconductor; Staco; Torotel; Weston-Transicoil; Viking Inds.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

IBL ENGRG. & SLS., INC. (See Dallas, Tex.)

KATHRINUS-KELLY-BOSWELL & CO. (See St. Louis, Mo.)

KOENIG-MYERS ASSOC., Box 374, (913) 432-8300.
Branches: 2721 Beloit Dr., Maryland Hghts., Mo., (314) 739-1655, 428-0300; 307 Linn St., Atlantic, Iowa, (712) 243-3342.
Factories: Accurate Spring Mfg.; AKG Microphones; Atlas Sound; Barker Prods.; Bell P/A Prods.; Chicago Miniature Lamp Works; Columbus Elec. Mfg.; Drake Mfg. Co.; Heeger; Mosley Elctrns.; Regency Elctrns.; Shepherd Inds. Inc.; Talk-A-Phone; Wilco.
Selling To: ★ A,D,I. **Salesmen:** 4 (eng 1)

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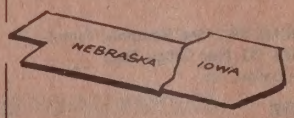

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Branches: 47 Village Sq., Box 545, Hazelwood, Mo., (314) 838-6446; 890 17th Ave., Marion, Iowa, (319) 377-6261.
Factories: Beede Electrical Instrs.; Cambridge Thermionic; Equipto Elctrns.; Essex Wire; Fenwal Elctrns.; Ferroxcube; Hamlin; Hammarlund Mfg.; Industrial Timer; Line Elec.; Magnetic Metals; Memcor Components; Metex; Panduit; Rotron Mfg.; Stancor; Western Microwave Labs.
Selling To: ★ D,I,M. **Salesmen:** 6 (eng 6)

(See Advertisement Page 3245)

ZIMMER SLS., Box 329, (913) 262-8951.
Branch: 1616 Forest Pl., Evanston, Ill., (312) 869-6464.
Factory: McIntosh Lab.
Selling To: ★ A. **Salesman:** 1

Wichita

BENSON ENGRG. CO. (See Dallas, Tex.)

BETTIS, M. E. CO. (See Shawnee Mission, Kan.)

D & O ENGRG. CO., INC., Box 1800, (316) 264-7358. TWX: 910-741-6916.
Branch: Suite 106, 604 Avenue H East, Arlington, Texas, (817) 261-9511. TWX: 910-891-5133.
Factories: Electrofilm, Inc.; Gorn Corp.; James, Pond & Clark; Kemp Inds.; Nash Controls; Schultz Tool & Mfg.; Simmonds Precision Prods.; Teledyne Inc.; WacLine, Inc.
Selling To: ★ M. **Salesmen:** 4 (eng 3)

D & O PRODUCTS CO., Box 11203, (316) 264-8351.
Factories: Circle Seal Corp.; Denison Div. of Abex Corp.; Moog, Inc.; Pall Corp.; Parker-Hannifin Corp.; Zefex Div. of Kellogg-American. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 1)

FLORENCE & MEYER, INC. (See Shawnee Mission, Kan.)

HENRY CO., Box 18166, (316) 684-1241. TLX: 417-436.
Branch: Box 8767, Dallas, Tex., RI 7-3207.
Factory: Marblette.
Selling To: ★ I,M. **Services:** Warehouse

MacDONALD, B. C. & CO. (See St. Louis, Mo.)

Louisville

MILSK, R. CO. (See Detroit, Mich.)

SOUTHERN SLS. CO. (See Angola, Ind.)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

LOUISIANA

Baton Rouge

LIEBERMAN, H. SLS. CO. (See Houston, Tex.)

PAN-TECH ENGRG. CO. (See Houston, Tex.)

Metairie

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

McKINNEY, J. F. SLS. CO. (See Dallas, Tex.)

TEXPORT CO. (See Dallas, Tex.)

New Orleans

COLLINS CO. (See Dallas, Tex.)

CROCKETT SALES CO. (See Dallas, Tex.)

GLIDDEN ENGRG. & EQUIPT. CO. (See Dallas, Tex.)

IBL ENGRG. & SLS. INC. (See Dallas, Tex.)

KLICPERA, M. F. (See Houston, Tex.)

SCOTT ORMSBY SLS. CO., 7121 Catina St., (504) 282-2097.
Factories: E-Z-Way Prods.; Glidelite; Granger Assocs.; Irish Tape; Johnson Elctrns.; Premax Prods.; Sonar Radio; Tape-Athon; Texas Crystals; Turner; Utah Elctrns.; Waber Elctrns. **Services:** Limited Warehouse, Direct Mail
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)

MARYLAND

Adelphi

TESSCO (See Lutherville-Timonium, Md.)

Baltimore

A B & T SALES CORP. (See Olney, Md.)

BERNARD WHITE & CO. INC., 7 Church Lane, (301) 484-5400. TWX: 710-862-0860.
Factories: Azimuth Elctrns.; Deutsch Ind. Prods.; Fenwal Elctrns.; Filtron; Freed Transformer; Interdyne; Philco-Ford.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

BROTHERS & CONNEEN ASSOC., 6302 Lincoln Ave., (301) 764-7189.
Branch: 12 S. Newtown St. Rd., Newtown Square, Pa., (215) 353-2241.
Factories: Amperex Elctrns.; Bogen Comm.; Electro-Voice; Memcor Components; Telex Comm.
Selling To: ★ A,D,I. **Salesmen:** 6

COMPAR CHESAPEAKE INC., 7 Church Lane, (301) 484-5400. TWX: 710-862-0860.
Factories: A P, Inc.; Bendix Corp.; Coron Corp.; Denes Co.; Deutsch Relay Div.; Electro Materials Corp.; Electronized Chem.; Hecon Corp.; Nanotron; Paktron; Powercube; Qualidyne Corp.; Signetics Corp.; Solid State Prods.; Unitrode Corp.; Power Tech.
Selling To: ★ D,I,M. **Salesmen:** 2 (eng 2)

DOSS ELCTRNS. INC., 6660 Security Blvd., (301) 944-1900. TWX: 710-862-9162.
Branch: 1638 Irvin St., Vienna, Va., (703) 938-0061.
Factories: Acopian Corp.; Aertech Inds.; Amlabs; Angstrohm Precision; ARRA, Inc.; Components, Inc.; Hughes Aircraft; J F D Elctrns.; Maxwell Labs.; Ward Leonard. **Services:** Direct Mail
Selling To: ★ D,I,M. **Salesmen:** 4 (eng 3)

E-A, INC., 1406 Sheomaker Rd., (301) 825-2385. TWX: 710-232-1825.
Branches: Washington, D.C., (202) 783-7319; Philadelphia, Pa.; ENTERprise 6229; New Jersey; Delaware;
Factories: Ace Shielded Prods.; Alford Mfg.; American Sys.; Avantek, Inc.; B. F. Goodrich; Hitachi-Marubenilida; LDV Electro Science; Measurement Technology; Micro-Tel Corp.; Microwave Sys.; Pacific Radionics; Raven Elctrns.; Radiation Sys.; Ryka Scientific; Structural Technology. **Selling To:** ★ I,M. **Salesmen:** 3 (eng 3)

E-K-P ASSOCS., INC. (See Easton, Pa.)

EASTERN INSTR., INC. (See Philadelphia, Pa.)

GOODMAN, G. CO., 1800 N. Charles St., (301) 837-3210.
Branch: 220 E. Belt Blvd., Richmond, Va.
Factories: Badger-Meter; Burling Inst.; General Monitors; ITT-Barton; Robertson Mfg.; Sybron.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

JEFFRIES, S. A. INC. (See Narberth, Pa.)

JOBE & CO., INC., 2857 Greenmount Ave., (301) 235-3502.
Branch: 2508 Grenoble Rd., Richmond, Va., (703) 282-6508.
Factories: Alnor; ARCO; Ash Div.; Automatic Timing & Controls; Ball Mfg.; Buell Engrg.; A. W. Cash; CEECO; CEA; Childers; Cla-Val; Conoflow; Dean Prods.; W. C. Dillon; Dravo; Economy Pump; Electro-Devices; A H. Emery; Farris Eng.; Flex-Val; Fuller; Garden City Fan & Blower; K-S Eng.; C. M. Kemp Mfg.; O.C. Keckley; King Instr.; LaFavorite Rubber Mfg.; Marsh Instr.; Magnatrol Valve; Marshalltown Mfg.; Northern Blower Div.; Norwalk; Reotemp Instr.; Sutorbilt; Victor Controls Div.; Weksler Instrs.; Worcester Valve; Yarway.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)
Services: Warehouse, Sales

JONES, D. K. & ASSOCS., 2100 N. Charles St., (301) 752-0577.
Factories: Allen Avionics; Carpenter Mfg.; Components; Dormeyer Inds.; James Elctrns.; Hollis Engrg.; Magnetic Shield Div.; Midtex/Aemco Div.; Macdonald & Co.; Saxonbury Ceramics. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 3 (eng 2)

KAUFHOLZ ASSOCS. (See Newtown Sq., Pa.)

LUCE, R. P. & CO., INC. (See Berkeley Hghts., N.J.)

MacDONALD, S. K. INC. (See Philadelphia, Pa.)

MAGUIRE, J. A. & CO. (See Camden, N.J.)

SCHIBLEY ASSOCS., INC. (See Fairfax, Va.)

SHEFFER, J. W. CO., 4609 Old Frederick Rd., (301) 233-0606.
Factories: McCoy Elctrns.; Oak Mfg. **Selling To:** ★ I,M.

TATE ENGRG. INC., 601 W. West St., (301) 539-0787.
Branches: 4404 Baltimore Ave., Bladensburg, Md., (202) 737-0318; 116 Antietam St., Hagerstown, Md., (301) 739-9400; 827 Riverside Rd., Salisbury, Md., (301) 749-4168; 920 Jefferson St., Roanoke, Va., (703) 343-4033; 2512 Waco St., Richmond, Va., (703) 288-6023.
Factories: Armstrong Pumps; Automatic Switch; J. Bean; Boston Gear; Chempump; Cleaver Brooks; Cochrane; Commercial Filters; Dresser; Duro; Eaton, Yale & Towne; Flexonics; Galigher; Goodyear Tire & Rubber; Graco; Hills McCanna; Hoover Bearings; E. B. Kaiser; Link-Belt; Mission Valve & Pump; Norma-Hoffman Bearings; M. Roy; Rockwell; SKF Inds.; U. S. Gauge; Westinghouse; Worthington.
Selling To: ★ I. **Services:** Repair, Warehouse

TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

WHITCOMB ASSOCS., 730 Deepdene Rd., (301) 889-1245.
Branch: Washington, D.C., (202) 737-0763.
Factories: Argonaut; Bailey; Baird-Atomic; Centronics; Exotic Materials; General Oceanology; Monroe Elctrns.; Northeast Scientific; Radio Frequency; Technipower; Transducer Tech.
Selling To: ★ I,M,Research **Salesmen:** 2 (eng 2)

Bel Air

RUSSELL ASSOC., INC. (See Brightwaters, N.Y.)

Beltsville

ANGUS, INC. (See Moorestown, N.J.)

Bethesda

ARA ELCTRNS., INC. (See Glenside, Pa.)

BARTLETT ASSOCS., INC. (See Wayne, Pa.)

ROSEN, G. & ASSOC., INC., 9501 Wadsworth Dr., (301) 365-5113.
Factories: Astrocom/Marlux; Barzilay; Channel Mktg.; Chassis-Trak; Elektra Amplidyne Resh.; Langevin; J. B. Lansing Sound; Nikko Elec.; Qatron; Sennheiser Elctrn. Stanton Magnetics; Vent-Rak. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 2

MOUNT, W. CO., 4924 St. Elmo Ave., (301) 657-9312. TWX: 710-824-0090.
Branch: 700-6 Fox Pavilion, Jenkintown, Pa.
Factories: Babcock Elctrns.; Electro-Mechanisms; Gulton Inds.; Hughes Aircraft; Lansdale Microelectronics; Marco-Oak; Microdot; Shallcross Mfg.; Standard Elctrns.; Suckle Mfg.; Texas Instrs.; Thermalloy; Thermatics; Wire Supply. **Services:** Warehouse, Sales Office
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 3)

WRIGHT THE CO., INC. (See Gaithersburg, Md.)

Bladensburg

TATE ENGRG. INC., 601 W. West St., (301) 539-0787.

College Park

MASSEY ASSOCS., INC., 6215 Greenbelt Rd., (301) 345-3345.
Factories: J.B.T. Instrs.; Radcon; Syntronic Instrs.; Triplett. **Services:** Sales only
Selling To: ★ I,D,M. **Salesmen:** 2

Elkridge

BRESSON, J. ASSOC. (See Narberth, Pa.)

Ellicott City

CERF, A. & CO. (See Caldwell, N.J.)

GANS-FRYLING, INC. (See Arlington, Va.)

Gaithersburg

WRIGHT CO. INC., Box 128, (301) 948-5588.
Branches: 1629 K St. N.W., Washington, D.C., (202) 296-0979; 4977 Battery La., Bethesda, Md., (301) 656-1482.
Factories: American Computer Tech.; American Power Devices; Atmar Engraving; B & F Instrs.; Cable Tech; Computer Resources; Conductorlab; Denelcor; Diversified Elctrns.; Elpac RF/Microwave; Int'l. Data Science; Isotronics; E. F. Johnson; Lek Trol; Marstan Elctrns.; MMI Instrs.; New Prod. Engrg.; Radiant Lamp; Tavis; Tech. Accessories; Time Research Labs.; Vanguard Elctrn. Tools. **Services:** Repair, Warehouse
Selling To: ★ D,I,M. **Salesmen:** 4 (eng 4)

Greenbelt

CUESTA, J. E. & CO., INC. (See Valley Forge, Pa.)

JAD ELCTRNS. ASSOCS. INC. (See Philadelphia, Pa.)

Hagerstown

TATE ENGRG. INC. (See Baltimore, Md.)

Hyattsville

CAIN & CO. (See Los Angeles, Calif.)

LOWERY, L. D. INC. (See Broomall, Pa.)

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MERICAN, J. C., 546 Anchor Dr., (301) 679-6969.
Factories: Audiovox; Dicto-o-Tape; Eby; Philmore; Pioneer; Rame; Ra-imer-Tru-Tone; Telephone Dynamics. York. **Selling To:** ★ A,D. **Salesmen:** 2

Kensington

ELECTRONIC MKTG. ASSOCS., Div. Inmark, Inc., 11501 Huff Ct., (301) 881-5300. TWX: 710-825-9645.
Branch: 210 Goddard Blvd., King of Prussia, Pa., (215) 265-1600. TWX: 510-660-3130.
Factories: Alfred Elctrns.; Cintra; Computer Meas.; Control Logic; Digilin, Inc.; EIP, Inc.; J. Fluke Mfg.; Kennedy Co.; Narda Microwave; Philbrick/Nexus Rsch.; Reaction Instrs.; Rentronix; Singer Instrumentation; Spiras Sys.; Typagraph Corp.; Varian Aerograph; Vogue Instrs. **Services:** Repair, Warehouse
Selling To: ★ A,I,M. **Salesmen:** 16 (eng 16)

F-M ELCTRN. ASSOCS. (See Havertown, Pa.)

MUSTICO, J. CO. (See Havertown, Pa.)

Landover Hills

EASTERN COMPONENTS, INC. (See Philadelphia, Pa.)

Laurel

VPI ASSOCS., INC., 13001 Mistletoe Rd., (301) 792-7631. TWX: 710-863-2569.
Branches: Box 12510, Philadelphia, Pa., (215) 474-3200; 300 Northern Blvd., Great Neck, N.Y., (516) 482-8387. TWX: 510-223-0819; Box 467, Byfield, Mass., (617) 465-7555.
Factories: Computer Energy; Control Elctrns.; Hughes Aircraft; Keltec; Micro-Dynamics; Microlab/FXR; Prodelin; Transco Prods.; Unitrode; Venus Scientific; Western Microwave Labs.
Selling To: ★ I,D,M. **Salesmen:** 11 (eng 11)

WILD, J. J., INC. (See Jericho, N.Y.)

Lutherville

CLOSS, T. H. CO., 8202 White Manor Dr., (301) 825-4445.
Factories: Bristol Co.; Computer Instr.; Control Data; Custom Comp. Switches; H. H. Sticht Co.; Trent, Inc.; Western Electro Mechanical; Parker Instr.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

EAST COAST LIAISON, INC. (also known as PHIL KNOX & CO.), Box 243, (301) 252-1288.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)
Services: Direct Mail.

Lutherville-Timonium

NAUDAIN ASSOC. (See Philadelphia, Pa.)

TESSCO, Towson Engrg. Sls. Svc. Co., 1931 Greenspring Dr., (301) 252-5610.
Branches: 1720 Merrimack Dr., Adelphi, Md., (301) HE 4-8801; 2713 Greenhill Lane, Lynchburg, Va., (703) 384-2062.
Selling To: ★ D. **Salesmen:** 4 (eng 2)

Olney

A B & T SALES CORP., 3311 Olney-Sandy Spring Rd., (301) 924-4976.
Branches: 8921 Turton Dr., Philadelphia, Pa., (215) HO 4-8921; 1352 Walker Ave., Baltimore, Md., (301) 323-8184.
Factories: Acoustone; Dynaco; Gamber-Johnson; Gel-oso; Harman-Kardon; Irish Tape; Riemer; Tape-Athon; Wen. **Services:** Direct Mail
Selling To: ★ A,D. **Salesmen:** 3 (eng 1)

Pikesville

WETTERHAHN A. CO., INC. (See Oaklyn, N.J.)

Reisterstown

PUR-NELL SLS. CO. (See Langhorne, Pa.)

Rockville

BURLINGAME ASSOCS., LTD. (See Mount Vernon, N.Y.)

EASTRONICS, 14616 Southlawn Lane, (301) 762-8445. TELEX: 89-456.
Factories: Computer Equipt.; Dressen-Barnes Elctrns.; Dynamic Sys. Elctrns.; Eldorado ElectroData; Rockland Labs.; Spatial Data Sys.; Vega Elctrns.; Wyle Computer Prods. **Selling To:** ★ A,I,M. **Salesmen:** 3 (eng 2)

MARKTRON, INC., 651 Lofstrand La., (301) 762-6210. TWX: 710-828-0089.
Branch: 202 W. Pennsylvania Ave., Towson, Md., (301) 825-8222. TWX: 710-232-1850.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

ROTHENHEBER & WURTS, INC. (See Ardmore, Pa.)

TEK-REP, INC., 12000 Old Georgetown Rd., (301) 762-7777.
Factories: Bourns; Computer Prods.; Digital Instrs.; Incor; Kistler Instr.; Midwestern Instrs.; Sonex; United Control. **Selling To:** ★ I,D,M. **Salesmen:** 3 (eng 3)

Salisbury

TATE ENGRG. INC. (See Baltimore, Md.)

Silver Spring

ANSELL ENGRG. CO., 816 Thayer Ave., (301) 588-4222.
Factories: American Zettler; Cabtron Corp.; Essex Int'l.; Littelfuse, Inc.; Stanford Applied Engrg.; TRV Connector.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

BRIMBERG ASSOCS., INC., 814 Thayer Ave., (301) 588-7790. TWX: 710-825-9625.
Factories: Americon; AVCO Elctrns.; Datapulse; Enclosure; Ferrotec; Guildline Instrs.; Hallmark Standards;

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Selling To: ★ I,M. **Salesmen:** 8 (eng 5)
Services: Repair

DAVIES, R. ASSOCIATES, 10 Old Post Office Rd., (301) 587-3910. TWX: 710-825-0420.
Factories: Analogic; Applied Dynamics; Basic Computing Arts; Biomation; Computer Displays; Computer Operations; Data Action Corp.; Datum; Delta Data Sys.; Diablo Sys.; Digi-Data; Digital Storage Information; Discom, Inc.; Eldorado Electro Data; G.R.I. Computer; Leasametric; Jacobi Sys.; Multidata, Inc.; North Atlantic Inds.; Novation; Synergistics; Sys. Assocs.; Transcom.
Selling To: ★ I,M. **Salesmen:** 10 (eng 10)
Services: Repair, Warehouse

DENCO-DATA ENGRG. CO. (See Norristown, Pa.)

GAWLER-KNOOP CO. (See Roseland, N.J.)

LIENAU ASSOCS., INC., 8537 Second Ave., (301) 588-1970.
Branches: 160 Pueblo Rd., New Britain, Pa., (215) 345-1691; 15034 Carter Ave., Philadelphia, Pa., (215) HO 4-8148; 5121 Westridge Rd., Washington, D.C., (301) OL 4-2333.
Factories: D. Clark; Eico; Int'l. Rectifier; Multicore Solder; Oaktron; Robins; Soundolier; Stancor. **Salesmen:** 7
Selling To: ★ A,D,I. **Services:** Warehouse

Q.E.D. ELCTRNS., INC. (See Mt. Vernon, N.Y.)

SEL-TRONICS INC., 721 Ellsworth Dr., (301) 589-3391.
Factories: ACDC Elctrns.; J. G. Biddle; Boonton Elctrns.; Control Equip.; Data Measurements; Data Memory; Digital Gen.; Faul/Coradi; Hyperion Inds.; Intermed; Interstate Elctrns.; Magnasync/Moviola; New London Instr.; Northern Precision Labs.; Quan-Tech Labs.; Spectra Instrs.; Technical Comm.; Trompeter Elctrns.
Selling To: ★ I,M. **Salesmen:** 5 (eng 3)
Services: Minor Repair

TAYLOR, M. F. CO. INC., P. O. Box 11, (301) 589-4002.
Branches: 9500 Buckhorn Rd., Baltimore, Md., (301) 668-9054; 294 Ridgeway Plaza, Philadelphia, Pa., (215) 676-5332; 2009 Market St., Camp Hill, Pa., (717) 761-3299; Box 23, Marlton, N.J., (215) 622-0383; 201 Penn Center Blvd., Pittsburgh, Pa., (412) 823-8400; 1224 Dresden Dr. W., Charlotte, N.C., (704) 537-4878; 2328 3rd Way N.E., Birmingham, Ala., (205) 853-3673; Box 458, Casselberry, Fla., (305) 838-0821; 940 Lake Elbert Dr., Winter Haven, Fla., (813) 294-2941.
Factories: Jensen Mfg. Div.; Kurz-Kasch; Loral Distributor Prods.; Mercury Elctrns.; Newcomb Audio Prods.; North American Phillips; Pickering & Co.; H. H. Smith; Turner; Ungar; Vega Elctrns.; Vidaire Elctrn. Mfg.
Selling To: ★ A,D,I,M. **Salesmen:** 11 (eng 1)
Services: Warehouse

WHITE, L. G. & CO., INC., 1110 Fidler La., Suite 1216, (301) 585-3141. TWX: 710-825-9635.
Branch: 1014 Brookstown Rd., Winston-Salem, N.C., (919) 725-3612. TWX: 710-825-9635.
Factories: Amco Engrg.; Astrosystems; Birtcher; Christie Elec.; Deltron; Digitron; Digitronics; G-V Controls; Instrument Displays; Science Accessories; Tri-Data; Unimax Switch Div. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 7)

Timonium

BARNHILL & ASSOCS., INC., 1932 Greenspring Dr., (301) 252-5610.
Branch: 2713 Greenhill La., Lynchburg, Va., (703) 384-2062. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 3)

(See Advertisement Page 3247)

HELLER-FREEDMAN ASSOC. (See Ardmore, Pa.)

Towson

BURGIN-KREH ASSOCS., INC., Box 9787, (301) 661-1120. TWX: 710-862-0878.
Branch: 2600 Memorial Ave., Lynchburg, Va., (703) 845-5600. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

DOUGHERTY, J. A. SLS. CO., 320 Hillen Rd., (301) 823-0431. TWX: 710-232-1808.
Factories: American Micro-Sys.; Cermetek, Inc.; Delevan Elctrns.; Eastron Corp.; Kings Elctrns.; Stewart-Warner Microcircuits; Vishay Intertechnology.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

HUNT ASSOCS., INC. (See Cherry Hill, N.J.)

J. H. ELCTRN. SLS. CO., Box 6844, (301) 825-4440. TWX: 710-232-1816.
Branch: Box 123, Poughkeepsie, N.Y., (914) TR 6-4936.
Factories: Dickson Elctrns.; Hugh H. Eby; Lockheed Elctrns.; Metcom; Omtronics Mfg.; Price Elec.; Rayseel; Scott Elctrns.; Siliconix; Times Wire & Cable.
Selling To: ★ I. **Salesmen:** 3

JONES, W. M. CO., Box 5490, 1107 Echo Ct. N., (310) 823-5721-5722-5791. TWX: 710-232-1838.
Branches: 2317 South St., Orlando, Fla., (305) 464-6298; Atlanta, Ga., (404) 261-8275; 332 Forklanding Rd., Maple Shade, N.J., (305) 565-9226; 104 3rd St., Woodbridge, Va., (703) 494-6701.
Factories: Ackerman Engravers; Arnold Magnetics; Computer Components; Comtel Corp.; Custom Components; Diccom Elctrns.; Dynamic Gear; Int'l. Elctrn. Res.; Spar Elctrns.; Technical Nameplate; Teproof Florida; Torsion Balance. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 4)

KRAFT ELCTRN. SLS., INC., 510 Woodbine Ave., (301) 828-5838.
Factories: AMETEK/Hitemp Wires; Display Devices; Icore Electro-Plastics; Hughes Aircraft; Practical Automation; Presin; Sunbank Elctrns.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

LEFF SLS. ASSOCS. (See Pennsauken, N.J.)

MARKTRON, INC. (See Rockville, Md.)

NEWSON, C. H. & ASSOCS., INC. (See Philadelphia, Pa.)

WILKINSON, R. L. INC., 707 Stevenson La., (301) 377-7800.
Branch: Box 215, Glenside, Pa., (215) 424-8400.
Factories: Coto-Coil; Dale Elctrns.; Globe/tron; Rocker Inds.; Truco. **Selling To:** ★ I,D,M. **Salesmen:** 3 (eng 1)

(See Advertisement This Page)

MAINE

Waterville

MORGAN, C. T. CO. (See Danvers, Mass.)

MASSACHUSETTS

Acton

E. E. SPECIALISTS, INC., Box 956, (617) 259-9200.
Branch: Box 4119, Springdale, Conn., (203) 327-3275.
Factories: AGAC-Derritron; Assembly Specialists; Associated Testing Labs.; Boyden Elctrns.; Dimensional Sys.; Hughes Aircraft; M. P. Odell; Ragen Precision; Universal Ad-Yu. **Services:** Radio advertising
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

Arlington

HATHAWAY, G. M. ELCTRNS. INC., 7-11 Mystic St., (617) 646-1380.
Branch: Ducillo Bldg., Canaan, Conn., (203) 824-7215.
Factories: Artted; Berkshire Transformer; Bradley Semi-Conductor; Dependable Printed Circuits; Electrical Inds.; Fairchild Controls; C. T. Gamble Inds.; General Atronics; Hurst Mfg.; Int. Electronic Research; Midwest Sintered Prod.; Nu-Devices; Parelco Operation; Phaostran Inst. & Elctrn.; Potter Brumfield; Tensolite Insulated Wire; Tepro.
Selling To: ★ D,I,M. **Salesmen:** 9

INSTRUMENT ASSOCS. INC., 30 Park Ave., (617) 648-2922. TWX: 710-389-0460.
Branch: 234 Murphy Rd., Hartford, Conn., (203) 525-9367.
Factories: American Elctrn. Labs.; Anadex Instrs.; Astrodata/Comcor; Bio-Medical Elctrns.; Computer Corp.; Cintra Physics. Int'l.; Computer Peripherals; Dana Labs.; Data Devices; Data Meas.; Digital Information Devices; Electro-Optics Assocs.; Electromed; Foto-Mem; A. W. Haydon; Incre-Data; Intermec; Korad/Union Carbide; Physio-Control; Precision Instrs.; Princo; Quinton Instrs.; Sorensen Operation; Space Labs; Spiras Sys./UMC; Syner-Data; Tally; Topaz; Typagraph;Valtec; Varian Electrographics; Vogue-Shepard Div.
Selling To: ★ A,I,M. **Salesmen:** 14 (eng 14)
Services: Repair, Calibration, RFI Testing

INSTRUMENT REPRESENTATIVES, INC., 1046 Mass. Ave., (617) 646-1034. TWX: 710-389-0151.
Branch: 156 Hebron Ave., Glastonbury, Conn., (203) 633-0777.
Factories: Computer Measurements; Datawest; Digilin; Edwin Inds.; Exact Elctrns.; J. Fluke Mfg.; Kinelogic; Microtest; Midwestern Instr./Telex; North Atlantic Inds.; Panasonic Equip.; R F Comm.; Varian Aerograph.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse

Andover

PURINTON, R. INC., 28 Park St., (617) 475-7055. TWX: 710-347-0338.
Factories: Amphenol; North Elec.; Oak; Texas Instrs.
Selling To: ★ I,D. **Salesmen:** 5 (eng 2)
Services: Warehouse

Auburndale

BARTON, C. K. ASSOCS., INC. (See Glastonbury, Conn.)

GROSSMAN SLS. CO. INC., 339 Auburn St., (617) 527-7753.
Factories: Barker Prods.; Certron; Concord Elctrns.; Elctrn. Publishing; Grado Lab.; Ideal Radio; Lee Chairs; Livingston Audio; Playtape; Rockford Furn.; N. N. Scott Stereos; Soundtech.
Selling To: ★ A,D. **Salesmen:** 3 (eng 1)

Bedford

CHAMBERLIN, H. A., Civil Air Term., (617) 274-0044.
Factories: Antenna Specialists; CTS Knights; Hunter Tools; Kris Inc.; Pace Comm.; Standard Comm.; Universal Mfg. **Selling To:** ★ D. **Salesmen:** 3

EQUIPMENT SLS. CO., INC. (See Hamden, Conn.)

LESSER, F. R., Box 241.
Factories: Electro-Optic; Elctrn. Inds.

Boston

ELECTRICAL APPARATUS CO., INC., 1200 Soldiers Field Rd., (617) 782-7440.
Factories: Curtis Development & Mfg.; General Control Co.; Heinemann Electric; MeasureMatics; Norbatrol; Precision Prods. & Controls; Scanning Devices; Transtector; Struthers-Dunn.
Selling To: ★ A,D,I,M. **Salesmen:** 7

P. J. ENGRG. SLS. CO., INC., 360 No. Beacon St., (617) 783-0510. TELEX: 94-6232.
Factories: Ceramaseal; Delevan Elctrns.; Epic; Pyrofilm.
Selling To: ★ I,M. **Salesmen:** 5 (eng 2)
Services: Warehouse, Direct Mail

SANDMAN ELEC. CO., INC., 660 Parker St., (617) 442-7600.
Factories: Brook Motor; Crocker-Wheeler Elec. Motor Div.; Fairbanks-Morse Elec. Motor & Generator Div.; G & N Engrg.; Rapid Transformer.
Selling To: ★ I,D. **Salesmen:** 4 (eng 2)
Services: Repair, Warehouse

Braintree

BORDEWIECK ENGRG. SALES CO., 221 Grove St., (617) 843-0845.
Factories: Acromag Inc.; Central Transformer; Clairex Elctrns.; Georator Corp.; Imtra Corp.; Life Instr. Co.; Magtrol; Marathon Spec. Prods.; PCA Elctrns.; Pickering & Co.; Tapeswitch Corp.; Taylor Elec.; Vectrol; Waveforms Div.; Yellow Springs Instr.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 4)
Services: Repair, Warehouse

Bridgewater

MAHER, F. SLS. CO. (See Newington, Conn.)

Brockton

FORSBERG SLS., 646 Summer St., (617) 522-6300.
Branch: 22 Broadway, North Haven, Conn., (203) 239-5111.
Factories: Aero Research Instrs.; Bendix; Chester Cable; Hughes Aircraft; I.T.T. Jennings; Liverpool; Mutron; Robintech; Viking Inds. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 5

Brookline

ENTIS ASSOCS., 11 Babcock St.

SMITH, R. CO., 59 Verndale St., (617) 277-0017.
Branch: 188 Brewster Rd., West Hartford, Conn., (203) 523-0512.
Factories: Amplivox; Andrea; Acoustone; Conn. Tele.; Kenwood Elctrns.; Nordmende; Perma Power; Orr-tronics; University Sound. **Services:** Direct Mail
Selling To: ★ A,D. **Salesmen:** 3

Burlington

B & W ASSOCS., B St., (617) 275-9177.
Factories: Automatic Metal Prods.; Times Wire & Cable.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)
Services: Repair, Warehouse

J & J ASSOCS., INC., 12 Cambridge St., (617) 272-2606. TWX: 710-324-6356.
Branch: 953 Dixwell Ave., Hamden, Conn., (203) 624-7800.
Factories: Automation Dynamics; Beehive Electrotech; Braincon; Chronetics; Computer Labs.; Elctrn. Research Assocs.; Enclosure; Datametrics; Datel; I/O Sys.; Ken-

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nedy; Microdyne Instrs.; Natel Engrg.; Raytheon Computer; Rockland Labs.; Testex; United Telecontrol Elctrns.; Wavetek. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 6 (eng 6)

LANCER ASSOCS., 16 Adams St., (617) 272-6445.
Factories: Granger Assocs.; Merrimac Resh. & Dev.; Micro-Dynamics; Microwave Dev. Lab.; Prodelin; Watkins-Johnson; Weinschel Engrg.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

SCHAAL ASSOCS. INC., Four A St., (617) 272-7940. TWX: 710-332-0246.
Factories: Barry Controls; Chemplast Prods.; Fairchild Hiller; Honeywell Cabinet Div.; Jonathan Mfg.; Raychem; Rayclad Tubes. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 12 (eng 5)

TRITEK, INC., 165A Bedford St., (617) 272-4550. TWX: 710-332-7564.
Factories: Avantek; Del Elctrns.; Formcraft Tool; Hitachi Ltd.; Narda Microwave; Precision Tube; Teledyne Microwave; Relcom; Ryka Scientific; Teledyne Relays; Trans-Tech. **Selling To:** ★ I,M,D. **Salesmen:** 8 (eng 6)

Byfield

VPI ASSOC., INC. (See Laurel, Md.)

Canton

NEW ENGLAND ELCTRN. SLS. CORP., 515 Washington St., (617) 828-4835.
Factories: ACI; Automation Components; Bunker-Ramo; EAI Components Div.; Faratron; Joslyn Elctrns.; Merit Coil & Transformers; Modutec; Omtronics; RPC; Sensitron Semiconductor; Triridge.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

Chestnut Hill

STURGEON, P. R. CO., INC., 1330 Boylston St., (617) 235-8462.
Branch: 99 Colony St., Meriden, Conn.
Factories: Bliley Elec.; H. Davies Molding; Eldema Div.; Interswitch; Jewell Electrical Instrs.; E. F. Johnson; Midwec; Pamotor; Simpson Elec.; Wanlass Elec.
Selling To: ★ A,D,I,M. **Salesmen:** 6 (eng 4)
Services: Warehouse

Cohasset

MONTAGUE ASSOCS., 404 Jerusalem Rd.
Factories: California Chassis; CBC Inds.; Hy-Gain Elctrns.; Regency Elctrns.; Rye Inds.; Shepherd Inds.
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)

Concord

E-P-R INC. (See Bristol, Conn.)

Danvers

MORGAN, C. T. CO., 500 Maple St., (617) 774-3216.
Branch: Ridge Rd., Waterville, Me., (207) 873-4972.
Factories: Athena Controls; Atkins Tech.; Conax; Delcon; Met-L-Chek; Nuclear Chicago; Numec Instrs.; Particle Data; Raytek; Sperry Controls; C. W. Stevens; Texas Nuclear Div. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 4 (eng 4)

NORTHEAST ENGRG., INC. (See Hamden, Conn.)

Dover

PIPER ASSOCS. INC., 10 Haven St., (617) 449-1144.
Branches: 20 Winslow St., Plymouth, Mass., (617) 746-6522; 42 Juniper La., Framingham, Mass., (617) 877-4519.
Factories: Audio Dynamics; AKG; Atlas Sound; AVID (PM&E); Canon; David Clark; Data Packaging; Infonics; Langevin; Nexus; Pelco Sls.; Soundolier; Vega Elctrns.; Video Components; Western Magnetics.
Selling To: ★ A,D,I. **Salesmen:** 3

E. Longmeadow

GERBER SLS. CO., INC. (See Waltham, Mass.)

Framingham

PIPER ASSOCS. INC. (See Dover, Mass.)

Haverhill

LANCER-KNEELAND INC., 359 Main St., (617) 373-1313.
Branch: Box 4104, Hamden, Conn., (203) 288-4177.
Factories: Airborn Inc.; Electro Fibreoptics; Electro Mechanisms; Masden; National Metalizing; Optron; Phelps Dodge Comm.; Reliance Controls; Technology Instr.; Telemicro.
Selling To: ★ A,D,I,M. **Salesmen:** 2 (eng 2)

Lexington

BOEING, J. E. CO., INC., 18 Muzzey St., (617) 862-2500.
Branch: 225 Montowese St., Branford, Conn., (203) 488-8301.
Factories: Ansley; Defiance Circuit; Electra/Midland; Electric Indicator Co.; Hi-G, Inc.; Skydyne; Tansitor Elctrns.; Vitramon.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 3)

COMPONENTS SLS. CORP. (See Hartsdale, N.Y.)

KITCHEN & KUTCHIN, INC., 17 Waltham St., (617) 862-8230. TWX: 710-326-0597.
Branch: 22 Broadway, North Haven, Conn., (203) 239-0212.
Factories: Airflyte Elctrns.; Amelco Semiconductor; Ammon Instrs.;Babcock Relays; Bulova Watch; Fabri-Tek; Industrial Elctrn. Engrg.; Korry Mfg.; Marshall Inds.; Nytronics; RCL Elctrns.; Solid State Prods.; Spectrol Elctrns.; Varo; Vernitron.
Salesmen: 7 (eng 6)

STEVENS, L. C. & CO. INC., Box 24, 442 Marrett Rd.
Factories: ACS Inds.; Bramco Controls Div.; Cyclotronics; Ledek; Miniclutch; Nation Union Elec.; Walden Elctrns.; Wilmington Controls Div.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

Longmeadow

BAHR SALES CO., 91 Woodsley Rd., (413) 567-3488.
Factories: Airco Speer Elctrns.; Gavitt Wire & Cable Co.; Seastrom Mfg.; Trivec Transformer; Wirecraft Prods.
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 1)

Lowell

ZASLOW SLS.°CO., INC. (See Bloomfield, Conn.)

Lynn

KEENE SLS. CO., 156 Broad St., (617) 595-1001.
Factories: Autronic; Audio Magnetics; Bomar Crystal; Eby Sls.; Electra; Fairchild Sound Equip.; Gibbs Special Prods.; Jersey Specialty; Lectrotech; Loral Distributor Prods.; McMartin Inds.; Midland Int'l.; Mueller Elec.; Oaktron Inds.; Racon; Recoton; South River Metal Prods.; Tech Spray. **Selling To:** ★ A,I,D,M.**Salesmen:** 3 (eng 1)

Melrose

CAIN & CO. (See Los Angeles, Calif.)

HATCH, E. B. CO., INC., 6 Eastman Pl., (617) 665-0055.
Factories: Kester Solder; Luma Elec. Equipt.
Selling To: ★ I,D. **Salesmen:** 3 (eng 2)

Nahart

HART, F. H., 114 Pond St., (617) 581-0381.
Factories: Precision Elec.; Shurclose Seal; Varflex Sls.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Natick

GREGORY, G. ASSOC., 7 Erie Dr., (617) 235-9070.
Branch: Cheshire, Conn., (203) 272-5040.
Factories: A.I.L.; Alto Scientific; Behlman Engrg.; Boonton Elctrns.; Energy Sys.; Holt Instr. Labs.; Monsanto Elctrn. Instrs.; Neico Microwave; Plarad Elctrns.
Selling To: ★ I,M. **Salesmen:** 6 (eng 4)
Services: Direct Mail

ROSEN, G. CO. INC., 563 Worcester Rd., (617) 655-2211. TWX: 710-386-6983.
Branch: 194 Plymouth St., Stratford, Conn., (203) 375-5456. TWX: 710-386-6983.
Factories: American Optical; Hugh H. Eby; Elctrn. Specialty; Fairchild Microwave & Optoelectronics Div.; General Instr.; ILC; ITT Gremar; ITT Surprenant; San Fernando Elec.; Technical Wire Prods.; Torwico Elctrns.
Selling To: ★ A,I,D. **Salesmen:** 5 (eng 4)
Services: Warehouse

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Needham

ADDELCO CORP., 56 Pickering St., (617) 444-4754. TWX: 617-444-1931.
Branch Office: New Haven, Conn.
Factories: Accutronics, Inc.; American Elctrn. Labs.; Bar-Ray Prods.; C-COR Elctrns.; Clary Corp.; Cohu Elctrns.; Coleman Engrg.; Daytronic; Industrial Test Equip.; Kistler Instr.; Lebow Assocs.; Optimized Devices; Sage Labs.; Seifert X-Ray; Servo Corp.; Time Sys.; United Control-Transucer Div.; Varian/EMI-Gencom Div.
Selling To: ★ A,I,M,Telonic Inds. **Salesmen:** 6 (eng 5)
Services: Repair, Warehouse, Registered Professional Engineers

COAKLEY, BOYD & ABBETT, INC., Box 248, 1424 Highland Ave., (617) 444-5470.
Branch: 6 Gaywood Dr., Waterbury, Conn., (203) 756-8766.
Factories: Chassis-Trak-Vent Rak; Chicago Dynamic Inds.; Columbia Cable; Connector Corp.; Electro Prods. Labs.; Gichner Mobile Sys.; Hudson Lamp; Kulka-Smith Elctrns.; Price Electric; Staco, Inc.; Stanwyck Winding; Turner Microphones; Weller Electric.
Selling To: ★ A,I,D,M. **Salesmen:** 7

CURTIN, R. V. CO., 82 Curve St., (617) 444-4198.
Factories: A. J. Supply Co.; Workplace Sys.
Selling To: ★ I,M. **Salesman:** 1

LAVIN, H. ASSOCS., INC. (See Meriden, Conn.)

HARRIS, S. A. CO., 945 Great Plain Ave., (617) 444-4780.
Factories: Centralab; Maximus Sound; Rotex; H. W. Sams; Shure Brothers; Thordarson-Meissner; Unear Solderme Tools. **Services:** Warehouse, Direct Mail
Selling To: ★ A,I,D. **Salesmen:** 4 (eng 2)

KEYCO ASSOCS., INC. (See Farmington, Conn.)

WHITE SLS. CO., INC., 20 Chestnut St., (617) 444-3676.
Branch: Box 122, Berlin, Conn., (203) 224-0423.
Factories: Adams & Westlake; Autotron; Barber-Colman; Hamlin; Hamlin Elctrns.; Inter-Market; Line Elec.; Reed Switch Dev.; Resistors; Simmons Fastener.
Selling To: ★ I,D. **Salesmen:** 3 (eng 3)

(See Advertisement Page 3249)

WILD, J. J., INC. (See Jericho, N.Y.)

Needham Heights

TODINO ENGRG. SLS. INC., 50 Kearney Rd., P.O. Box 201, (617) 444-7925. TWX: 710-325-0126.
Branch: 132 New Haven Ave., Box 402, Milford, Conn., (203) 874-6643.
Factories: Cal-R; Electro Connective Sys.; Electro-Mech Components; Elpac; General Instr.; Gulton Inds.; G-V Controls; Kelvin Assocs.; Marubeni-Iida; Remvac Components; Rola Div.; Rotating Components; Sage Elctrns.; Spectrum Tech.; Vero Elctrns.
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 3)

Newburyport

GILWAY SLS. CO., Box 584, (617) 465-7568.
Factories: Aerospace Knob; Electro Vision Inds.; General Sensors; Kessler Ellis; Sierra Sys.; Sun Dial & Panel Stake Fastener; Western Indicator.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)
Services: Warehouse

Newton

HUNTOON, V. J. ASSOCS. INC. (See Springfield, Mass.)

NORMELL ASSOCS., 10 Day St., (617) 969-5478.
Factories: Diceon Elctrns.; Inter Technical Group; Monolithic Dielectrics; NPC Elctrns.; Technitrol; Thermosen.
Selling To: ★ I. **Salesman:** 1
Services: Warehouse

Newton Highlands

COMPAR NEW ENGLAND, 88 Needham St., (617) 969-7140.
Branch: 2531 Whitney Ave., Hamden, Conn., (203) 288-9276. TWX: 710-465-1540.
Factories: Computer Circuits Corp.; Coron Corp.; Del Elctrns.; Denes; Electro Materials; Frequency Elctrns.; Hatahway Instrs.; Hecon Corp.; Helipot Div.; Hudson Corp.; Judd Wire Div.; Kilovac Div.; Paktron Div.; Power Physics; Powertech; Signetics; Unitrode; Wild Rover.
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)
Services: Warehouse

Newton Lower Falls

NEW ENGLAND COMPONENT SLS., Box 656, (617) 969-9523.
Factories: Consolidated Distributors; JAN Hardware Mfg.; Printact Relay Div.; Scientific Components; Tekna Prods.; United Mineral & Chemical.
Selling To: ★ I,D. **Salesmen:** 2

Newtonville

DATECH ASSOCS. INC., 815 Washington St., (617) 527-5394. TWX: 710-335-6767.
Branch: 965 Dixwell Ave., New Haven, Conn., (203) 865-1365.
Factories: A. D. Data Sys.; Alpha Data; Century Elctrns.; Precision Magnetics; Signetics Corp.
Selling To: ★ I,M,Computer Peripheral
Services: Repair, Warehouse **Salesmen:** 5 (eng 5)

EDCOM, INC., 815 Washington St., (617) 969-9710. TWX: 710-335-6767.
Branch: 965 Dixwell Ave., New Haven, Conn., (203) 426-5460.
Factories: Aetna Mfg.; Caton Inds.; Computer Designs; Electrovert, Inc.; Equipto Enclosures; Postronics; Technibilt; Texas Crystals; Voltron Prods.
Selling To: ★ I,M,D **Salesmen:** 5 (eng 5)
Services: Repair, Warehouse

SCHUFT, THE H. J. CO., INC., 815 Washington St., (617) 527-5304. TWX: 710-335-6767.
Branch: 965 Dixwell Ave., New Haven, Conn., (203) 865-1365.
Factories: Beckman Instrs.; Data Technology; Elgar; Itron; Pacific Measurements; Power Designs; Scientific Measurement Sys.; Singer; Rohde & Schwarz Sls.; Statham Instrs. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

SEGEL, C. CO., Box 106, (617) 969-6900.
Branch: Hartford, Conn.
Factories: Dialight; Littelfuse; Microtran.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)
Services: Warehouse

N. Andover

ABBOTT-ALLISON CO. INC. (See Meriden, Conn.)

No. Scituate

HENDRICKSON, W. A. CO., 766 Country Way, (617) 545-0652.
Factories: Blonder-Tongue Labs.; Calcon Mfg.; Fideltone; JAMES Elctrncs.; Mercury Elctrns.; J. W. Miller; Rawn; ROHN Mfg.; TRW; Turret Elctrns.; UXL (Telematic).
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)
Services: Warehouse, Mailing.

Northboro

ZASLOW SLS. CO., INC. (See Bloomfield, Conn.)

Norwood

GIBSON ENGRG. CO. INC., 90 Broadway, (617) 769-3600. TELEX: 92-4446.
Factories: Dolan Jenner Inds.; Eagle Signal; Monnier Bros.; Numatics; Numatrol; Rustrak Instr. Div.; SP Mfg.; West Instr.; Zefex. **Salesmen:** 10 (eng 8)
Selling To: ★ I. **Services:** Repair, Warehouse

PERRON, R. & CO. INC., 159 Morse St., (617) 762-8114. TWX: 710-336-6347.
Branches: 1 Elm St., Dover, N.H., (603) 742-2321; 36 Louis St., Trumbull, Conn., (203) 268-9631; 10 Briarwood Rd., Farmington, Conn., (203) 673-4825.
Factories: Beede; Dormeyer; Hipotronics; Hi-Tek; Industrial Condenser; Kepco; Lamps; Magnecraft; Measurements; Shelly Assocs.; Siliconix Inc.; Vernitron.
Selling To: ★ I,M,D. **Salesmen:** 9 (eng 9)

PIERCE, S. INC., 24 Linden St., (617) 762-3164.
Branch: 115 Bald Hill Rd., New Canaan, Conn.
Factories: Augat; Elctrn. Concepts; Elctrn. Research; Envirco; James Elctrns.; Kidco; K.M.C. Semiconductors; McGraw Edison; D. P. Mossman; Syntronic Instr.; Thomas Elctrns. **Selling To:** ★ I,A,D,M. **Salesmen:** 4

ROBINSON, R. H. CO. (See Coventry, Conn.)

Plymouth

PIPER ASSOCS. INC. (See Dover, Mass.)

(For alphabetical listing see page 3215)

Revere

MANDELL, H. CO., Box 24, (617) 289-3787.
Branch: Box 509, Manchester, Conn., (203) 646-4442.
Factories: Dilectron; General Coil Prods.; Heppner Mfg.; Inglot Elctrns.; Mel-Rain; Nat'l. Tel-Tronics; Power Components; Temple Inds.; U.I.D. Elctrns.; Wilco; Woodward-Schumacher.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

Scituate

ADAMS-McGREGOR INC. (See Lincoln, R.I.)

MORTON, G. E. CO., 161 Summer St., (617) 545-0155.
Factories: Comdel; Continental Semiconductor; GMP Assocs.; Kimberly, James; Hoyt Elec. Instrs.; S&O Metal Fabricators; TDC. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

Sharon

ADCOUR, One Summer St., (617) 784-3996.
Factories: Electrotec; Moxness Prods.; Nife, Inc.; Ohio Carbon; Rae Motor; Synchro-Start Prods.; Syracuse Elctrns.; Wilmington Fibre Specialty.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)
Services: Warehouse

EASTERN ELCTRN. SALES CO. (See Brooklyn, N.Y.)

REISS, R. S. ASSOC. (See West Haven, Conn.)

Somerville

NEAR, INC., 99 Highland Ave., (617) 776-2262.
Factories: Amatom Elect. Hdwe.; Cleveland Elctrns.; Davis Elec.; Glasseal Prods.; Grigsby-Barton; Quality Transformer; Morban Sls.; Milli-Switch.
Selling To: ★ I,D. **Salesmen:** 2

Springfield

HUNTOON, V. J. ASSOCS. INC., 908 Belmont Ave., (413) 788-8516.
Branch: 272 Centre St., Newton, Mass., (617) 244-5871. TWX: 710-335-0619.
Factories: ADC Prods.; Dexon; Fluoroware; General Semiconductor Inds.; Int'l. Scientific; Magnusonic Devices; Micro Networks; F. W. Sickles Div.; Sturdilite Prods.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)
Services: Mailing

Sudbury

ARENSTRUP, F. G. CO., 250 Hudson Rd., (617) 443-2992.
Factories: Ceramic Metal Sys.; Crystal Engrg. Co.; Debcin Co.; General Stamping; Indium Corp.; Nesor Alloy.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 1)

I T M ASSOCS., Box 385, (617) 443-8414.
Factories: Computer Prods.; General Data Comm.; Modular Devices; R. F. Amplifier; R.F. Comm.; Spatial Data Sys. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Topsfield

REPRESENTATIVES CORP., 52 Main St., (617) 426-0541.
Branch: Carrington Rd., Bethany, Conn., (203) 393-0024.
Factories: Amphenol Switch Div.; Ark-Les Switch; Hoagland Instrs.; Latronics; Stemco Controls Div.; TDC Div.; Underwriters Safety Devices.
Selling To: ★ I. **Salesmen:** 4 (eng 2)

Waban

INSTRUMENT CONSULTANTS, INC., Box 25, (617) 969-9881. TWX: 710-335-6682.
Branch: 2381 Whitney Ave., Hamden, Conn., (203) 288-5246.
Factories: B & K Instrs.; Biomation; California Instrs.; Compucord; Computer Terminals; Consolidated Kinetics; Cunningham; Gralex Inds.; Julie Research Labs.; Krohn-Hite; Leasametric; Matric Sys.; Power/Mate; Precision Standards; Sangamo Elec.; Signal Analysis; Singer Instrumentation; Suttle; Wyle Sys.; Zeltex.
Selling To: ★ A,I,M. **Salesmen:** 6 (eng 5)
Services: Repair

(See Advertisement This Page)

INSTRUMENT CONSULTANTS, INC., Microwave Div., Box 25, (617) 969-3372. TWX: 710-335-6682.
Branch: 2381 Whitney Ave., Hamden, Conn., (203) 288-5246.
Factories: Electro Data; Elctrn. Navigation Inds.; Engelmann Microwave; G-L Microwave; Leasametric; Microdot; Micro Power; Singer Instrumentation; Texscan.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)
Services: Repair

QRC COMPANY, INC., 134 Upland Rd., (617) 332-9600.
Factories: Bel Fuse; Garrett Wire & Cable; Johnson Elec. Coil; C. R. Snelgrove; Standard Elctrns.
Selling To: ★ I. **Salesman:** 1

Wakefield

DENNING ASSOCS., Box 491, (617) 245-4986.
Branch: Box 475, East Orange, N.J., (201) 673-7959.
Factories: Carstedt Research; Infinetics, Inc.; Magnetic Core; Permanent Magnet.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

INSTRUMENT DYNAMICS INC., Wakefield Ind. Pk., (617) 245-5100. TWX: 710-348-0428.
Branch: 345 North Main St., West Hartford, Conn., (203) 233-5503.
Factories: Amco Engrg.; Automated Measurements; Bolt, Beranek & Newman; Digital Apparatus; Digital Information Storage; E-H Research Labs.; GPS; Landis & Gyr; Micro Instr.; Preston Scientific; Remex Elctrns.; Tri-Data; Trygon Elctrns.; Trymetrics; Barnes Engrg.; Pemco.
Selling To: ★ I,M. **Salesmen:** 7 (eng 7)
Services: Repair

JAPPE, H. C. CO., 137 Water St., (617) 245-9359.
Branch: Dale Elctrns.; Reeves Hoffman Div.; Thomas & Skinner. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 2 (eng 1)

MEASUREMENT EQUIP., 599 North Ave., (617) 245-4870. TWX: 710-348-6717.
Branch: Box 8192, East Hartford, Conn., (203) 528-8192.
Factories: Acopian; Burr-Brown Research; Cabtron; CM², Inc.; Dynasciences, Sub. Whittaker; InterOcean Sys.; Microwave Prods. Group; Printed Motors; Sage Labs.; Tecnetics; Theta Instr.; Westamp.
Selling To: ★ I,M. **Salesmen:** 5 (eng 3)

Waltham

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

BROGER INSTR. SLS. CO., INC., 223 Crescent St., (617) 891-8045.
Branch: RD #1, Fairfield, Conn., (203) 255-4133.
Factories: HyCal Engrg.; Ithaco, Inc.; Lockheed Elctrns.; MetroPhysics; Setra, Inc. **Salesmen:** 3 (eng 2)
Selling To: ★ I,M. **Services:** Repair, Warehouse

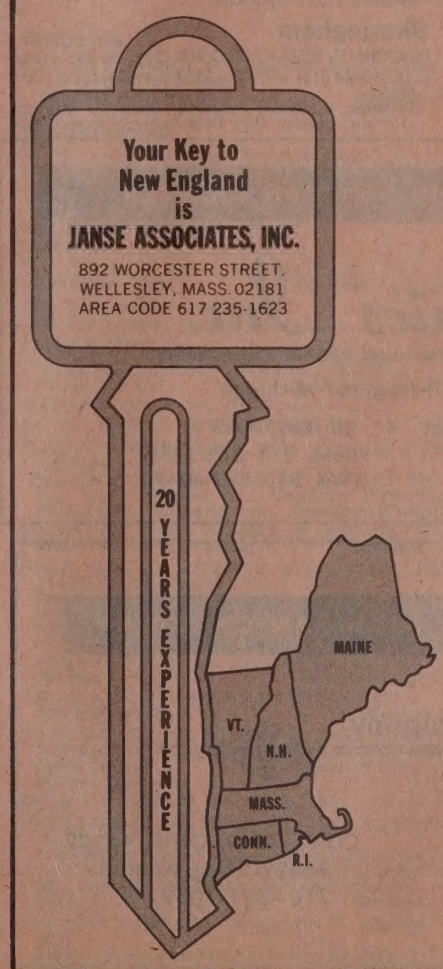
BURLINGAME ASSOCS., LTD. (See Mt. Vernon, N.Y.)

ELECTRONIC COMPONENTS & SERVCS., 611 Trapello Rd., (617) 894-6921.
Factories: Baird-Atomic; F W Bell; Buckeye Stamping; Dytronics Co.; Mack Elec.; Mastech Corp.; Nanmac Corp.; Telmar Corp.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
Services: Repair, Warehouse, Calibration

GERBER SLS. CO., INC., 176 Second Ave., (617) 891-8040. TWX: 710-324-1937.
Branches: 29 Whalley Ave., New Haven, Conn., (203) 777-6279; 44 Baldwin St., E. Longmeadow, Mass., (413) 525-3059.
Factories: Aerovox; Alco; Alpha Wire; Amperex Elctrn.; Chicago Miniature Lamp Works; Duncan Elctrns.; IMC Magnetics; Millen Mfg.; Sarkes Tarzian; Standard-Grigsby; United Transformer. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 9 (eng 9)

(See Advertisement Page 3250)

IMPACT SLS. CO., INC., 223 Crescent St., (617) 893-2850. TWX: 710-324-6655.
Branch: 60 Connolly Pkwy., Hamden, Conn., (203) 248-9368.
Factories: Circuit Technology; Deutsch-Relay Div.; Digitran; Microsemiconductor; Stewart Warner; Symbolic Displays; Transitron; Ultronix; Union Carbide; Valpey-Fisher; Victory Engr.; Waters Mfg.; Welwyn Int'l.
Selling To: ★ A,D,I,M. **Salesmen:** 6 (eng 5)
Services: Warehouse, Limited Line Distributor



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RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

TECHNICAL ENTERPRISES, 181 West St., (617) 891-5300.
Factories: Atec; Austron; Frequency Control; Sierra Elec. Div.; Tracor. **Services:** Repair
Selling To: ★ A,I,M. **Salesman:** 1 (eng 1)

TOOLS FOR ELECTRONICS, Box 173, (617) 894-7080.
Factories: Colbert Inds.; Edsyn; Menda Scientific; Mini-Line; P.P.P. Mfg. **Services:** Repair, Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)

Wanefield

KAELBER & MACK INC. (See Manhasset, N.Y.)

Wellesley

JANSE, E. A. ASSOCS., 892 Worcester St., (617) 235-1623.
Factories: American Elctrns.; Arco Elctrns.; Dynacool Mfg.; Magnetic Radiation Labs.
Selling To: ★ M. **Salesmen:** 3 (eng 1)
(See Advertisement Page 3251)

JOHNSON ASSOC., INC., 471 Washington St., (617) 235-3977.
Branch: 121 Thimble Islands Rd., Branford, Conn., (617) 235-3977.
Factories: Barker & Williamson; Chicago Etching; Colorado Hickok; Empire Scientific; Hallicrafters; Hickok Electrical Instr.; Milwaukee Resistor; New-Tronics; Pearce-Simpson; Sherwood Elctrn. Labs.; Superex Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 4 (eng 3)

MAHAN, R. P. CO., INC., 572 Washington St., (617) 232-1040.
Branch: Hopkins Rd., Watertown, Conn.
Factories: Abrams Instr.; Autronics Engrg. Div.; Borg Warner Thermoelectrics; Custom Components; Erdle Perforating; Holex; L. F. Markel; Milton Ross; Mosaic Fabrications; Polyphase Instr.; Precision Castings; Scanbe Mfg.; Standard Connector; Three-Dimensional Circuits; Western Elctrns. Prods.
Selling To: ★ I,M. **Salesmen:** 6 (eng 4)

STURDY, R. H. CO., INC., 204 Worcester St., (617) 235-2330. TWX: 710-383-6519.
Branch: Box 5385, Hamden, Conn., (203) 288-2200.
Factories: Analogic; Collins Radio; Dynamics Research; Mid-Eastern; Monitor Prods.; Pacific Assemblers; Sanders Assocs.; Transistron Special Prods.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)
Services: Direct Mail

SCOTT, M. CO., INC., 20 Walnut St., (617) 235-0102. TWX: 710-383-7526.
Factories: British Inds.; Electro-Voice; Erie Technological Prods.; Essex Int'l.; Grayhill; Grayhill Moldtronics; Int'l. Rectifier; Kings Elctrns.; Lenox-Fugle Elctrns.; Ripley; Telex Comm.
Selling To: ★ A,D,I. **Salesmen:** 7 (eng 3)

West Concord

SALES ENGRG. CO., Baker Ave., (617) 369-3943.
Factories: Bristol; DAO Elctrns.; Elctrn. Control; Guardian Elec.; HEI; Mosa; Molex; Muirhead; Precision Metal Prods.; Richmond; Sealectro; Sibley; Transitron; Wakefield; Welch-Allyn. **Services:** Direct Mail
Selling To: ★ I,D. **Salesmen:** 8 (eng 6)

West Newton

DARBURY CORP., 437 Cherry St., (617) 244-2053. TWX: 710-325-6758.
Factory: Litton. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 2)

PETTIGREW, R. S. & CO., INC. (See West Hartford, Conn.)

Weston

GOODE, J. J. ASSOC., 44 Ledgewood Rd., (617) 235-3900.
Factories: Alberox; Lektrol; Torotel.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Wilmington

TECHNICAL INSTRUMENTS, INC., 122 West St., (617) 944-3930.
Branch: 595 Broad St., Bridgeport, Conn., (203) 368-4582.
Factories: Advanced Technology & Sys.; Blackstone Ultrasonics; Eubanks Engrg.; Hadron; Henes Mfg.; Incor; Ingersoll Prods. Div.; McLean Engrg. Labs.; Methode Elctrns.; Metra Instrs.; Optic-Aire Sys.; Sandefur Engrg.; Southfield Elctrns.; Trio-Tech; Weldmatic Div.; Wanlass Elec.; Watkins-Johnson **Services:** Repair
Selling To: ★ A,I,M. **Salesmen:** 6 (eng 3)

Winchester

HOOKER, S. C. INC., 2 Winchester Pl., Box 352, (617) 729-5482. TWX: 710-348-1067.
Branch: Box 369, West Hartford, Conn., (203) 233-8000.
Factories: Bulova Watch; Caddock Elctrns.; Minerva Elctrn. Inds.; Premier Microwave; Stackpole Carbon; Stackpole Comp.; Tapecon; Voltronics.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)

MICHIGAN

Benton Harbor

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

Berkley

HARTWICK-VAN AUKER CO., Box 1204, (313) 549-1160.
Factories: Shelly Assocs.; Solitron Devices.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)
Services: Repair, Warehouse

Birmingham

COMPONENT/INSULATION CORP. (See Cleveland, Ohio)

ELECTRO-MATION ASSOCS., 1137 Cole City, (313) 564-6517.
Factories: Associated Research; Computer Measurement Co.; Delavan Mfg.; Delta Sonics; Electro Prods. Labs.; Electron-Machine; Icon Corp.; Jordan Controls; Nuclear-Chicago; Veeder-Root. **Salesmen:** 4 (eng 4)
Selling To: ★ I,D,M. **Services:** Repair, Warehouse

OEM SLS. CO., Box 68, (313) 647-1172.
Factories: American Enka; J. C. Dolph; Electrolock; H. Hubbell; Multi-Flex Seals; Vitta.
Selling To: ★ A,I,M. **Salesman:** 1

Buchanan

RILEY & PETCHELL SLS., INC. (See Detroit, Mich.)

Dearborn

ANGER ASSOCS., INC., 13126 Michigan Ave., (313) 584-9853.
Branches: 5329 R. N. High St., Columbus, Ohio, (614) 885-2909; 10926 S. Western Ave., Chicago, Ill., (312) 233-2214.
Factories: Agar-Derritron; Alpha-Scientific; Bethlehem Corp.; Coleman Elx.; Cryogenic Res.; Delcon Div.; Edwin Inds.; Goddard Valve; Harris Mfg.; Hi Vacuum Eqpt.; Ideal Aerosmith; Kinetic Sys.; L.A.B.; Plasmtoyne Div.; Spatial Data Sys.; TRW Instrs. Div.; Uson Corp.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

VILLANI-PITCHER, 20233 Ann Arbor Trail.
Factories: Bourns; Cambion; Chicago Min. Lamp Works; Hamlin; Licon Div.; Pic Design; Zero Mfg.
Selling To: ★ D,I,M. **Salesmen:** 3 (eng 2)

Dearborn Heights

CLERG-TELMOSS, INC. (See Ferndale, Mich.)

Detroit

BURCAW COMPANY & ASSOCS., 18236 W. McNichols Rd., (313) 533-7700.
Factories: Acoustone Fabrics; Audio Devices; Beede Electrical Instr.; Bell P/A Prods.; CTS Knights; Chamois Elctrn. Mfg.; Dale Elctrns.; Hammarlund Mfg.; Hunter Tool Div.; Int'l. Wire & Cable; Javelin Elctrns.; Jerrold Elctrns.; Lowell Mfg.; Oxford Transducer; Sightmaster.
Selling To: ★ A,I,D. **Salesmen:** 4

CENTRAL ELCTRNS. SALES CO., 19217 Fairport, (313) 526-5841.
Branch: P.O. Box 265, Tipton, Ind., (317) 675-4821.
Selling To: ★ A,D,Comm. **Salesmen:** 3

DICKELMAN, L. H. CO., 13331 Puritan St., (313) 273-0806.
Branch: 28829 Chagrin Blvd., Cleveland, Ohio, (216) 831-1039.
Factories: Allied Cont.; Carlyle Johnson Mach.; Farmer Elec. Prods.; Gordos Corp.; Helwig Carbon Prods.; Lanids & Gyr; Lee Spring; Rustrack Inst.
Selling To: ★ I,D. **Salesmen:** 4 (eng 2)
Services: Warehouse
(See Advertisement This Page)

DIETRICH, L. CO. (See Pittsburgh, Pa.)

ELECTRO SLS. ASSOC. (See Cleveland, Ohio)

GARDNER, R. M. CO., 26940 Lyndon St., (313) KE 1-1658.
Factories: Continental Wire & Cable; Kulka Elec.; Mercury Elctrns.; Plastic Applicators Div.; Tork Time Cntrls.
Selling To: ★ I,D,M. **Salesman:** 1

LOHMANN, R. S. CO., 19326 W. McNichols, (313) 535-6144.
Factories: Opti-Gage; Sensitron; Skottie Elctrns.; Vishay Resistor Prods.; Wilmad Glass Co. **Selling To:** ★ I,D,M.

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

TEPLITZ H. & CO., INC. (See Dayton, Ohio)

THORPE, J. M. CO., 640 Hidden Lane, (313) 884-4360.
Factories: Amperex Elctrn.; Bud Radio; Digital Data Sys.; Dynage; Eldre Components; Electro Lighting Sys.; Hudson Lamp; Memcor Div.; Miracle-Hill Elctrns.; Remvac Components; Scanbe Mfg.; Triad Div.; Utrad Corp.; Wall Mfg.
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

ERNEST, R. D. ASSOCS. INC., 12818 Puritan Ave., UN 1-7311.
Factories: Betatronics; Buss-Eagle Signal; Dolan-Jenner; Edon Industrial Prods.; D. P. Mossman; Photomation.
Selling To: ★ I. **Salesmen:** 5 (eng 3)
Services: Repair

HILLTRONICS INC., 13720 Puritan Ave., (313) 342-3242. TWX: 810-243-4069.
Factories: Amerace-Esna; Augat; Basler Elec.; Clairex Elctrns.; Clarostat Mfg.; Curtis Dev. & Mfg.; E-T-A Prods.; Eldema Div.; Electro Switch; Fenwal Elctrns.; Mueller Elec.; Ripley; Syntron; United Mineral & Chemical.
Selling To: ★ I,M,D. **Salesmen:** 4 (eng 4)
(See Advertisement This Page)

MERCHANT, R. C. & CO., INC., 18411 W. McNichols Rd., (313) 535-6000.
Branches: 505 Pleasant St., St. Joseph, Mich., (616) 983-7378; 58 Market St. S.W., Grand Rapids, Mich., (616) 451-8818.
Factories: Allied Control; Centralab; Dialight; Kemet Department-Union Carbide; Pamotor; Phalo; Sola Elec.; Simpson Elec.; Switchcraft; Stancor Prods.; Electro-Craft; Jewell Electrical Instrs.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 5)

MILSK, R. CO., 19375 James Couzens Hwy., (313) 342-6660. DESK FAX-KRS.
Branches: 200 North Division Ave., Grand Rapids, Mich., (616) 451-0615-6; 2511 East 46th St., Indianapolis, Ind., (317) 546-5468; 212 Republic Bldg., Louisville, Ky., (502) 585-4880.
Factories: Aerovox; Astatic; Atlas Sound Div.; Fisher Radio; JFD Elctrns.; Mellotone; Motorola HEP; Panasonic UTR-CCTV; Pickering & Co.; Quam-Nichols; Regency Elctrns.; S-C Elctrns.; Howard W. Sams & Co.; Talk-A-Phone; Shepherd Inds.; Soundolier; Ungar Elec. Tools.
Selling To: ★ A,I,D. **Salesmen:** 12 (eng 2)
Services: Warehouse

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MOORE SLS. CO., 401 Margaret W., (313) 883-0218.
Factories: Elmo Elctrns.; Dynamic Mktg.; Greylock Elctrns.; Int'l. Elctrns. Sls.; Micro-Com Elctrns.; Parker Metal Goods; Vokar Prods.
Selling To: ★ A,D. **Salesmen:** 2

RATHSBURG ASSOCS., INC., 16621 E. Warren Ave., (313) 882-1717.
Factories: Amcor; Cornell-Dubilier Elctrns.; Cyclotronics; NPC Elctrns. Div.; Printed Circuits; Schauer Mfg.; Triboro Elec.; U.I.D. Elctrns.; Avid.
Selling To: ★ I,D. **Salesmen:** 4 (eng 3)

RILEY & PETCHELL SLS., INC., 16515 Schoolcraft Ave., (313) 838-9100.
Branch: 401 Chippewa St., Buchanan, Mich., (616) 695-6356.
Factories: Barker Prods.; Bauer Elctrns.; Bogen Communications Div.; Brightco Elctrn.; Calcon Mfg.; Dynaco; Electro-Voice; Fleetwood Elctrns.; Gamber-Johnson; Krylon; Lektrostat; Metal Works; Mosley Elctrns.; S & A Elctrns.; Telex Communications; Ten-Tec; U. S. Recording. **Services:** Direct Mail
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 1)

SCHMIDT, C. H. CO., 16405 W. Eight Mile Rd.
Factories: American Radionic; Ardmore Prods.; Barclay.
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 1)

WKM ASSOCS. INC. (See Cleveland, Ohio)

Farmington

ANDERSON ELCTRNS., INC., 30785 Grand River Ave., (313) 476-9161.
Factories: Aerotherm Corp.; Bytrex; Cipher Data Prods.; Data Device; Datascan; Doric Scientific; Eldorado Electrodata; Elgar Corp.; Flo-Tron, Inc.; General Resistance; Schaevitz Engrg.; Systems Data; Tenney Engrg.; Trygon/Trymetrics; Unholtz-Dickie Corp.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

CARTER, McCORMIC & PEIRCE, INC., 23995 Freeway Park Dr., (313) 477-7700. TWX: 810-242-2986.
Branches: 5423 Webster St., Dayton, Ohio, (513) 278-5873. TWX: 810-459-1613; 21380 Lorain Rd., Cleveland, Ohio, (216) 333-5650; 201 Penn Center Blvd., Pittsburgh, Pa., (412) 824-3760.
Factories: Anadex Instrs.; Bourns; Controls Co. America; Exact Elctrns.; Grant Pulley & Hardware; Howell Instrs.; Kistler Instr.; MTS Systems; Precision Instr.; Remex Elctrns.; Signal Analysis Inds.
Selling To: ★ I,M. **Salesmen:** 10 (eng 10)
Services: Repair, Warehouse

Ferndale

CLERG-TELMOSS, INC., P.O. Box X-80, (313) 398-2206.
Branch: 5100 Clippert, Dearborn Hgts., Mich., (313) 561-6698.
Factories: Calif. Auto Radio; Gibbs Special Prods.; Hallicrafters; Comm. Inds.; Burnby, Inc.
Selling To: ★ A,D. **Salesmen:** 2
Services: Repair, Warehouse

TIBY CO. (See Cleveland, Ohio)

Grand Rapids

MERCHANT, R. C. & CO., INC. (See Detroit, Mich.)

MILSK, R. CO. (See Detroit, Mich.)

REICHOLD ASSOCS., 1655 House St., (616) 866-0626.
Factories: Douglas Randahl; Filtron; Milwaukee Transformer; Pho-Tronics.
Selling To: ★ I,M. **Salesmen:** 2

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

Grosse Ile

MILLER-& MILLER, Box 36, (313) 386-0900, 676-2724.
Factories: Bodine Elec.; Hilliard; Uppco.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

Hazel Park

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

Lathrup Village

NORDSTROM, R. C. & CO., Box 32.
Factories: Bramco Controls Div.; Buckeye Stamping; Comar Elec.; Ledex; Paktron Div.; Precision Metal Prods.; Resistance Prods.; Resistors; Spectrol Elctrns.; Texas Instrs.; Vernitron; Wilmington Controls Div.
Selling To: ★ D,I,M. **Salesmen:** 3 (eng 3)

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

Mt. Clemens

BRUST, CHARLES K., Box 182, (313) 463-7386.
Branch: 26516 Wagner St., Warren, Mich., (313) 755-2723.
Factories: American Bosch Div.-Ambac Corp.; Benton Corp.; Berner Inc.; Lexington Inds.; RJ Stampings; Space Inds.; Technical Sys. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesemen:** 3 (eng 3)

Oak Park

SPENSER, W. CO., 21500 Greenfield Rd., (313) 398-8005.
Branch: 3238 Curry Ave., Windsor, Ontario, (519) 969-1332.
Factories: Elctrn. Hardware; Grand Transformers; Grayline; Industrial Devices; Metallics.
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 4)

Orchard Lake

SIDNELL R. G. & CO., INC. (See Dayton, Ohio)

Plymouth

FLORA, J. M. INC., 165 W. Liberty, (313) 453-4296.
Factories: Amplivox; Automatic Radio; Barzilay; Certron; Concord; Garrard; JBL; Multicore; Royal Radio; H. H. Scott; Sennheizer Headphones; Shure; Sonar; Stackpole; TEAC; Wharfedale.
Selling To: ★ A,D,I. **Salesmen:** 6 (eng 2)
Services: Warehouse, Direct Mail

Royal Oak

COZZENS & CUDAHY, INC. (See Rosemont, Ill.)

SATULLO CO., THE, 4514 N. Woodward, (313) 549-3910.
Branches: 16801 Euclid Ave., Cleveland, Ohio, (216) 486-2800; 2801 Far Hills Ave., Dayton, Ohio, (513) 293-7061.
Factories: J. G. Biddle; Elctrn. Modules; Englemann Microwave; Equipto Elctrns.; Green Instr.; Integrated Controls; Kepco; The London; Magnecraft Elec.; Midwestern Instrs.; Monsanto; Pyrofilm; Skydyne; Telescience; Topaz. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 6 (eng 5)

VOGT, M., 2817 Bamlet Rd., (313) 549-3355.
Factories: Chassis-Trak; Gotham Audio; Gauss Electrophysics; Fairchild Sound Equip.; Poxylube; Scully Recording Instrs.; Metrotech; Vent-Rak.
Selling To: ★ A,D,I. **Salesman:** 1 (eng 1)
Services: Warehouse

St. Joseph

MERCHANT, R. C. & CO., INC. (See Detroit, Mich.)

Southfield

CARRIER & GABLE INC., One Northland Plza., 20755 Greenfield Rd., (313) 444-8980.
Factories: Aerovox; Rotron.
Selling To: ★ I. **Salesman:** 1 (eng 1)

COMPAR CORP. (See Burlingame, Calif.)

COMTEL COMPONENTS (See Addison, Ill.)

G & H SLS. CO. (See Cincinnati, Ohio)

STERLING, S. CO. (See Cleveland, Ohio)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

Vosilanti

OHIO INSTR. CO. (See Worthington, Ohio)

Warren

BRUST, CHARLES K. (See Mt. Clemens, Mich.)

MINNESOTA

Hopkins

GRAYDEN & FLEMMER, INC., Hamilton Rd., (612) 941-1120. TWX: 910-576-2861.
Selling To: ★ I,D,M. **Salesmen:** 4

Minneapolis

AARON, I. & ASSOCS. (See Milwaukee, Wisc.)

ANDERSON, J. E. M. CO., 5231 Humboldt Ave. S., (612) 823-6459. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 2 (eng 1)

BARD ASSOCS., INC. (See La Grange, Ill.)

BLAKER, S. C. CO. (See Northfield, Ill.)

BOHLIG, C. E. CO., Box 16095, (612) 922-7011.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

CAIN & CO. (See Los Angeles, Calif.)

CARLSON ELCTRNS. CO. (See Chicago, Ill.)

CARTER ELCTRNS. INC. (See Chicago, Ill.)

COMPAR TWIN CITIES, Box 16095, (612) 922-7011.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

COZZENS & CUDAHY, INC. (See Rosemont, Ill.)

DATA ELCTRNS. CO. INC., (See Chicago, Ill.)

ELECTRIC COMPONENT SLS., 6524 Walker St., (612) 929-4494.
Factories: Controls Div.; EG&G Inc.; ECC Corp.; Elec. Wire Prods.; Grayline Inc.; Monolithic Dielectrics; Panduit Corp. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 2)

ELECTRIC SLS. CORP., 9 E. 22nd St., (612) 335-7734. TWX: 910-576-2755. **Selling To:** ★ I. **Salesman:** 1

FOSTER, M. CO. INC., 228 South Cedar Lake Rd., (612) 374-2612. TWX: 910-576-2746.
Factories: Astatic; Augat, Inc.; Bourns, Inc.; Chicago Dynamic Inds.; Intersil; Jewell Instrs.; Kurz-Kasch, Inc.; Littelfuse, Inc.; Nytronics, Inc.; Pamotor, Inc.; Phalo Corp.; Quam-Nichols; Simpson Elec.; Switchcraft, Inc.; Vactec; Weckesser; Wood Elec. **Selling To:** ★ A,D,I,M.
Services: Warehouse **Salesmen:** 8 (eng 2)

GIBB, C. R. CO., 1311 W. 25th St., (612) 377-1200.
Selling To: ★ A,D,I. **Salesmen:** 4

GRANT SLS. CO., 1415 S. Second St., (612) 332-6955.
Factories: Controls Co. of America; Ronk Electrical Inds.
Selling To: ★ I. **Salesman:** 1 (eng 1)
Services: Warehouse

GREEN, L. F. & ASSOCS. (See Chicago, Ill.)

HASSE & ASSOCS., INC., 3825 York Ave. North, Box 22707, (612) 588-0551.
Factories: Ace Shielded Prods.; Andersen Labs.; Chassis-Trak; Electro Circuits; MM Elctrn. Enclosures; Omtronics Mfg.; Sealectro; U.S. Comps.; Vent-Rak; Vitramon.
Selling To: ★ I,D. **Salesmen:** 3

HEIMANN CO., INC., 5603 Lyndale Ave. So., (612) 861-6051.
Branch: 236 Seventh Ave. No., Fort Dodge, Iowa, (515) 576-2374.
Factories: Audio Devices; Birtcher; Clairex Elctrns.; Cornish Wire; Data Device; Great Valley Inds.; Guildline; Hallmark Standards; JBT; JFD; Life Instr.; Lundey Assocs.; Nat'l. Transformer; Nat'l. Tel-Tronics; Rustrak; Triplett Electrical Instr.; Vernitron-Beauchaine; Weston-Lexington; Weston & Stack. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 7 (eng 2)

HILL, F. B. CO., 7317 Cahill Rd., (612) 941-5270. TWX: 910-576-2924. **Selling To:** ★ D,I. **Salesmen:** 3 (eng 1)

HMR, INC., 9 E. 22nd St., (612) 335-7734. TWX: 910-576-2755. Selling To: ★ A,I,D,M. **Salesmen:** 6 (eng 5)

KIRKEBY & ASSOCS. INC., 821-2nd Ave. N., (612) 377-3239. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

LAUB, N. J. CO., 3749 W. Broadway, (612) 588-4663.
Factories: Antenna Specialists; Carl Cordover; Controlonics; Hickok; Linear Sys.; Petersen Radio; Stancor.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)
Services: Repair, Warehouse

LEE, J. CO., 4241 South Toledo Ave., (612) 920-1525.
Factories: CTS Knights; Data Instrs. Div.; Gefco Mfg.; Hudson Lamp; Luxo Lamp; Transtector Sys.; Wald Sound.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 1)
Services: Warehouse

MARSHALL, R. W. CO., INC., 6106 Excelsior Blvd., (612) 929-0457.
Factory: Electronic Components & Controls.
Selling To: ★ A,I,D,M. **Salesmen:** 3 (eng 2)

MARSLAND ASSOCS., INC. (See Des Plaines, Ill.)

MEYERS, K. W. CO. (See Chicago, Ill.)

MURPHY, L. F. & ASSOC., INC., 730 Chicago S., (612) 333-4511. TWX: 910-576-3417.
Selling To: ★ I. **Salesmen:** 4

NELSON & SON INC., 4005 West 65th St., (612) 920-3414.
Factories: Groov-Pin; M. H. Rhodes; TRW.
Selling To: ★ I. **Salesman:** 1 (eng 1)

NELSON, W. K. CO., 2322 Chestnut Ave. W., (612) 374-1970.
Factories: Bendix; Farrand Controls; IKL; Metritape Controls; Ohmart. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 4 (eng 2)

NORTHERN STATES SLS. CO., 1109 West 78½ St., (612) 866-3468.
Factories: Aeronautical Elec.; Finney; Philmore Mfg.; Pomona Elctrns.; Shure Bros.; Talk-A-Phone.
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 1)
Services: Repair, Warehouse

PINKNEY & ASSOCS., INC., 957 Winnetka Ave. No., (612) 544-3628. TELEX: 29-0101.
Factories: Automated Environmental Sys.; Dresser Sys.; Electrical Protection; Esterline Corp.; Pyrometer Instr.; Setra Sys.; Vishay Resistor Prods. **Services:** Repair
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

PETERSON, F. CO., 4501 Minnetonka Blvd., (612) 927-4453. TWX: 910-576-2835.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

RIPLEY, R. & ASSOCS., 11040 Goodrich Circle, (612) 881-8282.
Factories: Acoustone; Cornell-Dubilier; Columbia Wire; Eico; El-Rad; Lyn-Tron; Robins Ind.; Standard Radio; Unger Elec. Tools.
Selling To: ★ A,D,I,M. **Salesmen:** 2

SCHULTZ, D. A. CO., 801 Southeast 8th St., (612) 339-7701. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 5 (eng 2)

SCIENTIFIC SLS. CORP. (See Chicago, Ill.)

STEMM, R. E. INC. (See Addison, Ill.)

TEC SLS., 9906 Chicago Ave. So., (612) 884-1180.
Factories: All-tronics; Artisan Elctrns.; Universal Elctrns.; Zenrad Controls.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

WARNER, A. J. CO., 4927 34th Ave. So., (612) 729-7371.
Factories: Buckeye Stamping; Carter Motor; Clarostat Mfg.; G. K. Heller; Nicollet Transformer; Potter & Brumfield; Soundolier.
Selling To: ★ A,I,D. **Salesmen:** 4

WENCO SLS., INC., 7728 Morgan Ave., S., (612) 866-3639.
Factories: Beede Meters; Chicago Min. Lamp; ETA Prods.; Gordos; IMC Magnetics; Licon; Presin; Thermalloy.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

WHITMORE ASSOCS. INC. (See Chicago, Ill.)

St. Louis Park

BERNDT ASSOCS., INC. (See Chicago, Ill.)

MIDWEST MICROWAVE (See Chicago, Ill.)

St. Paul

CULLEN, H. A. & ASSOCS., 1595 Selby, (612) 646-7371. TWX: 910-576-2740.
Factories: Acme Elec.; Acton Labs.; Admiral Controls; Bowmar; General Sensors; Gudeman; Gulton Inds.; Hopkins Engrg.; J.P.M. Co.; Memcor; Morganite; Scanbe; Tansitor; Technology Instr.; Torotel.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

COUNTRYMAN ASSOCS. CO., 1821 University Ave., (612) 645-9151. TWX: 910-563-3564.
Factories: Alco Elctrn. Prods.; Bussco Engrg.; Capco, Inc.; Elco Corp.; Elctrn. Specialties; Elctrn. Molding; Electrovert, Inc.; Genisco Technology; Indiana General; Infinetics, Inc.; Jefferson Wire & Cable; Liberty Controls; Michigan Magnetics; Morrison Prods.; Park Nameplate; Repac Div.; Systems Enclosures. **Selling To:** ★ I,D,M.
Services: Warehouse, Direct Mail **Salesmen:** 4 (eng 2)

DeBECK ASSOCS., INC., 2119 Grand Ave., (612) 690-1557.
Factories: Accutronics, Inc.; Advanced Space Age Prods.; Astroscience Corp.; Chronolog Corp.; Craig Sys.; Digital Devices; Dynalex, Inc.; Kato Engrg.; Information Displays. **Selling To:** ★ I. **Salesman:** 1 (eng 1)

ENGELBRETSON, W. CO., 906 Ottawa Ave., (612) 222-2338. **Services:** Warehouse, Direct Mail
Selling To: ★ A,D,I. **Salesman:** 1 (eng 1)

HEYDA, B. CO., 3830 Rustic Pl., (612) 484-8531.
Factories: Accuride Div.; Anco Engrg.; Barnes; Control Switch Div.; Filters & Capacitors; Hillburn Relay; MacPanel; Technical Wire Prods.
Selling To: ★ I,D. **Salesman:** 1

MAGNUSON ASSOC. (See Chicago, Ill.)

MELIUS, E. & ASSOCIATES, INC., 3758 Dunlap St. No., (612) 484-8541. TWX: 910-563-3672.
Selling To: ★ I. **Salesmen:** 2 (eng 1)
Services: Direct Mail, Warehouse

NORTHPORT ENGRG., INC., 2027 Grand Ave., (612) 698-3841. TWX: 910-563-3674.
Factories: B. Colman; Chemical Micro Milling; Display Devices; FMC Corp.; Grayhill; Grayhill Moldtronics; Microdot. **Services:** Direct Mail, Warehouse
Selling To: ★ I. **Salesmen:** 4 (eng 3)

OSZMAN, E. W., 932 W. Montana Ave., (612) 488-1811.
Factories: Jersey Specialty; Tri-Ex Tower; Workman Elctrn. Prods. **Selling To:** ★ A,D. **Salesman:** 1

RAGON, R. G. INC., 1136 W. Larpenteur Ave., (612) 488-0201. TWX: 910-563-3736. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 6 (eng 5)

WHEELER, R. J., Griggs-Midway Bldg., (612) 644-9557.
Factories: Hotpack; Kewaunee Scientific Equip.
Selling To: ★ I. **Salesmen:** 2

MISSOURI

Berkeley

FLORENCE & MEYER, INC. (See Shawnee Mission, Kan.)

Crestwood

BARD ASSOCS. INC. (See La Grange, Ill.)

Creve Coeur

INLAND ASSOCS. (See Mission, Kansas)

Florissant

MARSLAND ASSOCS. INC. (See Des Plaines, Ill.)

O.E.M. SALES CO., INC. (See Indianapolis, Ind.)

Hazelwood

POLU-ONICS, INC. (See Leawood, Kans.)

R. W. FARRIS CO., INC.

1715 Baltimore Avenue
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P.O. Box 1428
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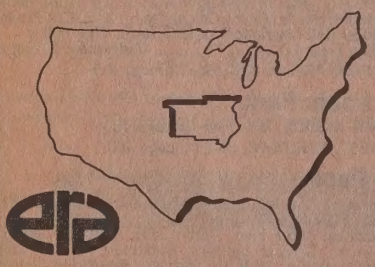
432-3780 A.C. 314



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VIGNOLA, C. A. ASSOC. INC., 2611 Schellridge Rd., Box 569, (314) 635-1023.
Branches: 10371 Sannois, St. Louis, Mo., (314) 542-4991; 9807 Drury, Kansas City, Mo., (816) 763-3578; 1508 Bellevue Blvd., Bellevue, Neb., (402) 734-1134.
Factories: Altec Lansing; Barzilay; Benjamin Elctrn.; Craig; Fidelitone; G. R. T.; Koss Elctrns.; Motorola Semiconductors; Newcastle Fabrics; Nikko Elec.; Perma-Power; Pickering & Co.; Robins; Sherwood; TEAC.
Selling To: ★ A,D,I. **Salesmen:** 4
Services: Warehouse

Kansas City

AUTOMATIC GENERAL ELCTRN. SALES, INC., 6550-E Troost Ave., (816) 333-8206.
Factories: Aladdin Elctrns.; American Radionic Co.; Davis Elec. Co.; A. W. Haydon Co.; Risdon Mfg.
Selling To: ★ I. **Services:** Mfg. Rep. **Salesmen:** 3 (eng 1)

COLLINS-CARLSON-HEMP, LECTROREPS, INC., P.O. Box 10719, (816) 453-3203.
Branches: 6 Bank Square, East St. Louis, Ill., (618) 397-2398; 4121 75th St., Des Moines, Iowa, (515) 276-6387. **Selling To:** ★ A,D. **Salesmen:** 4

CONROW CO., 3300 Wyoming.
Factories: Bliss-Eagle Signal; Chelsea Fan & Blower; Emerson Elec.; Elctrns. Corp. of America; Loyola Inds.; Oven Sys. **Selling To:** ★ I,D. **Salesmen:** 3 (eng 2)

FARRIS, R. W. CO., INC., 1715 Baltimore, (816) 421-1751.
Branch: 115 Progress Pkwy., Maryland Heights, Mo., (314) 432-3780.
Factories: Ava Machine & Elctrns.; Barker Williamson; BASF Sys.; Basic Ceramics; Bowman Leisure Inds.; Bud Radio; Calvert Elctrns.; Elco Corp.; Eldema; Harbour Inds.; H & K Prods.; Hunter Tools; Leader Elctrns.; Lewis Spring; Midland Int'l.; J. W. Miller; Phaostron Instr. & Elec.; Remvac Components Inc.; Rohn Mfg.; Ryan Sound; Sealectro Corp.; Specialty Sound; Standard Controls; Sunbank Elctrns.; Telematic; Turnpike Elctrns.; Whiting Screw Machine Prods.
Selling To: ★ A,I,D,M. **Salesmen:** 8

(See Advertisement This Page)

HARRIS-HANSON CO. (See St. Louis, Mo.)

K & M SLS. CO., 1627 Main St., (816) 471-1355.
Selling To: ★ A,D,I,M. **Salesmen:** 3
Services: Warehouse, Direct Mail

KSW ASSOCS., 7546 Troost Ave., (816) 363-5651.
Branches: 2319 Hampton Ave., St. Louis, Mo., (314) 781-6111; 3831 43rd St., Des Moines, Iowa, (515) 279-9235. **Services:** Limited Warehouse, Mailing
Selling To: ★ I,D. **Salesmen:** 4 (eng 3)

MacDONALD, B. C. & CO. (See St. Louis, Mo.)

MILBANK MFG. CO., 1111 Virginia, (816) 421-0219. TWX: 42-6277.
Branches: 1400 Haven St., Kokomo, Ind., (317) 612-5694, TWX: 27-2102; Box 278, Eldorado, Ark., (501) UN 2-6601. **Salesmen:** 4 (eng 1)

PARKINS & BRETZ CO., 500 V.F.W. Bldg., (816) 931-6824. TWX: 4-2561. **Branch:** Box 7741, Tulsa, Okla.
Factories: Circle F Inds.; Excel Wire & Cable; Electri-Flex; Midland-Ross; Steelduct Conduit Prods.; Southwire. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 4

THRO INDUSTRIAL SLS. CO., Box 7244, (913) 362-2533.
Factories: Armstrong Prods.; Brevel Prods.; Cherry Electrical Prods.; Fasco Inds., Inc.; Truheat.

VIGNOLA C. A. ASSOC. INC. (See Jefferson City, Mo.)

WINSLOW DESIGN & SLS. CO. (See St. Louis, Mo.)

Kirksville

MID STATE DISTRG. CO., INC. (See Des Moines, Iowa)

Maryland Heights

FARRIS, R. W. CO., INC. (See Kansas City, Mo.)

KOENIG-MYERS ASSOC., INC. (See Shawnee Mission, Kans.)

Rockville

LEE ASSOC., INC. (See Orlando, Fla.)

St. Charles

BUSE SALES CO., 214 N. 2nd St., (314) 739-1613. TWX: 910-760-1720.
Factories: Tensolite; Hi-G; Torwico; Digitran; Lockheed; Matric; Star-Tronics. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3

St. Louis

ARBEITER CO., 7297 Olive Blvd., (314) 727-0016.
Factories: Cornish Wire; Holub Inds.; Plymouth Rubber; Sta-Tite Mfg.; Southwire Co.; Steelduct Co.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)
Services: Warehouse

BETTIS, M. E. CO. (See Shawnee Mission, Kans.)

CARLSON ELCTRNS. CO. (See Chicago, Ill.)

COMPAR CORP. (See Burlingame, Calif.)

COMTEL COMPONENTS (See Addision, Ill.)

COZZENS & CUDAHY, INC. (See Rosemont, Ill.)

DOWELL, T. L. INC. (See Overland Park, Kans.)

ENGINEERING SERVICES CO., 6717 Vernon Ave., (314) 726-2233.
Branches: 7924-A State Line, Prairie Village, Kans., (913) 649-4000; 1026 Third Ave. S.E., Cedar Rapids, Iowa (319) 366-1591. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 5 (eng 3)

FIXMAN, G. ENGRG. CO., 8160 Stanford Ave., (314) 725-5219. **Branch:** Kansas City, Wichita.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

HARRIS-HANSON CO., 2814 S. Brentwood Blvd., (316) 962-0111. TWX: 910-760-1650.
Branch: 7916 Paseo, Kansas City, Mo., (413) 816-444-9494. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

HILL & CO., 915 Buder Bldg., (314) 621-1818. Telex: 044-7300.
Factories: Continental-Wirt Elctrns.; Elmwood Sensors; Heinemann Elec.; Midtex Inc.; Maxson Elctrns.; Torin.
Selling To: ★ I. **Salesmen:** 2

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

KATHRINUS-KELLY-BOSWELL & CO., 2427 Brentwood Blvd., (314) 962-5627.
Branch: 5460 Buena Vista, Shawnee Mission, Kans., (913) 432-0000.
Factories: American Elec. Heater; Chester Cable; Dazor Mfg.; Eby Sls.; Electro-Voice; I R C Div.; Jewell Electrical Instrs.; Keil Engrg. Prod.; Kepco Labs.; Photoswitch; H. W. Sams; Simpson Elec.; Sprague Prod.
Selling To: ★ A,D,I. **Salesmen:** 6 (eng 3)
Services: Repair, Warehouse

KEMP ENGRG. CO., INC. (See Dallas, Tex.)

KSW ASSOCS. (See Kansas City, Mo.)

LOWELL-KANSAS & ASSOC., INC. (See Overland Park, Kans.)

MacDONALD, B. C. & CO., 1265 Research Blvd., (314) 993-2833.
Branches: 510 Southwest Blvd., Kansas City, Kan., (913) 236-7434; 1402 W. Douglas, Wichita, Kans., (316) 267-9978; 507 E. Markham, Little Rock, Ark., (501) 376-6331.
Factories: Brush Instr.; Clevite; Federal Prods.; Heli Coil.
Selling To: ★ I,M. **Salesmen:** 9
Services: Repair, Warehouse

MEYERS, R. E. & SON, INC., 9191 W. Florissant, (314) 521-5253.
Factories: Circle F Inds.; Hi-Scale Prods.; Illinois Conduit Fittings; Minerallac Elec.; Precision Multiple Controls; Radix Wire; M. H. Rhodes.
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

SCIENTIFIC SLS. CORP. (See Chicago, Ill.)

SEBRIGHT, R. D. & CO., 7120 W. Florissant, (314) 261-0055.
Factories: Acromag; Del Elctrns.; Burns Engrg.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

STERLING, S. CO. (See Cleveland, Ohio)

STILL, PALMER & ASSOCS., 9415 Old Bonhomme Rd., (314) 993-2077.
Factories: Molex Prods.; Presmet; Saint Clair Die Casting; Stampings.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

STROTHER & ASSOC., INC., 6050 Brown Rd., (314) 521-5100. TWX: 910-760-1629.
Factories: APCO; AVICA; Hydraulic Research & Mfg.; Kaynar; Olympic Screw & Rivet; Stroco Inc.; Tec-Seal.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

VIGNOLA C. A. ASSOC. INC. (See Jefferson City, Mo.)

WINSLOW DESIGN & SLS. CO., 206 North Clay Ave., Rm. 201, (314) 965-5880.
Branch: 1217 Linwood Blvd., Kansas City, Mo., (816) 561-6565.
Factory: National Acme. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2

ZAK & ASSOCS., INC., 230 S. Bemiston, (314) 727-8559.
Factories: Genisco Technology; Frequency Elctrns.; Teledyne. **Services:** Repair, Warehouse
Selling To: ★ D,I,M. **Salesmen:** 5 (eng 4)

NEBRASKA

Bellevue

VIGNOLA C. A. ASSOC. INC. (See Jefferson City, Mo.)

Omaha

DECO ENGRG. PRODS., INC. (See Des Moines, Iowa)

NEW HAMPSHIRE

Dover

PERRON, R. & CO., INC. (See Norwood, Mass.)

NEW JERSEY

Bergenfield

GRAY, H. ASSOC. INC., 20 Foster St., (201) 384-3643, (212) 279-3766. TWX: 710-991-9772.
Factories: ASM Corp.; Airco Speer Elctrn. Comp.; Elctrn. Concepts; Electrovert; General Semiconductor; Interswitch; Jan Hardware; Marco Oak Northern Engrg. Labs.; Pamotor; Solid Power; Specialty Connector; Technical Elctrn. Distributors; Thermal Sys.; Victory Engrg.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)
Services: Warehouse, Mailing

(See Advertisement Page 3255)

SHAW, S. A. CO., INC., 30 New Bridge Rd., (201) 384-5400.
Factories: Alliance Mfg.; Burns & Towne; Maestro; Quality Components; Varcotronics. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 2)

Berkeley Heights

LUCE, R. P. & CO., INC., 30 Locust Ave., (201) 464-6440. TWX: 710-984-7965.
Branches: 1300 Jericho Tnpke., New Hyde Park, N.Y., (516) 437-4550. TWX: 710-984-7965; 8717 Patton Rd., Philadelphia, Pa., (215) 864-8365. TWX: 710-984-7965; 19 E. 21st St., Baltimore, Md., (301) 752-8200. TWX: 710-984-7965.
Factories: Aeroflex Labs.; Airflyte Elctrns.; Autotronics; Bendix; Birtcher; Electro-mechanisms; Helical Prods.; Kintec; Landis & Gyr; NSK; PCA Elctrns.; Taylor Devices; Zero Mfg.; Zero Honeycomb Structures Div.
Selling To: ★ ★ I,D,M. **Salesmen:** 7 (eng 5)
Services: Warehouse

Caldwell

CERF, A. & CO., 512 Bloomfield Ave., (201) 226-2263.
Branches: 9501 Mellonbrook Rd., Ellicott City, Md., (301) 730-5493; 27 Arcadia Way, Hillsdale, N.J., (201) 391-2039; 19 Fern Ave., Willow Grove, Pa., (215) 657-0282; 16 Burbank St., Yonkers, N.Y., (914) 337-2559.
Factories: Bussman Mfg.; Crown; Enterprise Dev.; ERA Magitran Co.; Bourns-Euphonics; Lowell Mfg.; Midland Int'l.; New-Tronics; Superior Insulated Wire; Terado Co.; Transcriber Co.; Weller Elec. Corp.
Selling To: ★ A,D. **Salesmen:** 5
Services: Newsletter and Mail

Camden

CDB ENTERPRISES, INC. (See Huntington, N.Y.)

MAGUIRE, J. A. & CO., 726 Cooper St., (609) 966-3118, (215) 627-1670. TWX: 710-891-7081.
Branches: 5716 York Rd., Baltimore, Md., (201) 433-2613. TWX: 301-323-3580; 440 West End Blvd., Winston-Salem, N.C., (919) 723-5980; 705 Park Ave., Plainfield, N.J., (201) 754-6400.
Factories: American Enka; American Monarch; Davis & Hamphill; ETC; Elctrn. Specialty; Elmwood Sensors; Engineered Wire & Cable; Lectro Print; Metal Etching; Siemens America.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

(See Adv. This Page, 3246, 3257, 3267)

Q.E.D. ELCTRNS., INC. (See Mt. Vernon, N.Y.)

Carlstadt

HOYT SALES CORP., 440 Barell Ave., (201) 935-0044.
Factories: Pure Carbon; Bando "V" Belt; Peer Bearing; Imperial Metals; Phoenix Brushholder; D. B. Flower Mfg.
Selling To: ★ I,D. **Salesmen:** 4 (eng 2)
Services: Warehouse

Cherry Hill

BONN ASSOCS., INC. (See Metuchen, N.J.)

HUNT ASSOCS., INC., Box 398, (609) 428-6666.
Branch: Box 9812, Towson, Md., (301) 828-4408.
Factories: Alpha Metals; Argus Engrg.; Hexacon Elec.; Lear Siegler. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 3 (eng 2)

McCOY, J., INC., Box 20, (609) 428-3444, (215) WA 2-7333.
Factories: Airpax Elctrns.; Potter & Brumfield; Thermalloy. **Selling To:** ★ I,A,D,M. **Salesmen:** 2 (eng 2)

MID-EASTERN ASSOCS., INC., 1759 Country Club Dr.
Factories: Bargale Inds.; Continental Conn.; Filtron; G & G Elctrns.; Jaco Elctrns.; Semiconductor Concepts.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)
Services: Direct Mail

TRINKLE SLS. INC., 500 N. Kings Hwy., (609) 667-3500. TWX: 710-892-0749.
Factories: Bud Radio; Electrovert; Jewell Elect. Inst.; Nortronics; Perma Power; Quan-Nichols; Raytheon; Sprague Prods.; Switchcraft; Thordarson-Meissner.
Selling To: ★ A,D,I,M. **Salesmen:** 8 (eng 5)
Services: Warehouse, Direct Mail

WHITE, H. J. CO., INC., 302 W. Marlton Pk., (609) 428-2304-5.
Branch: 320 Hillen Rd., Towson, Md., (301) 828-6373.
Factories: American Radionic; Elctrn. Research; E S C Corp.; Ideal Precision Meter; Tansitor Elctrns.
Selling To: ★ I. **Salesmen:** 4 (eng 1)

Clark

DELANEY, H. R. SLS., 78 Sweetbriar Dr., Apt. 6, (201) 382-7643.
Factories: Core-Tronics, Inc.; Fair-rite Prods.; Ferronics, Inc.; General Magnetic; Mag Machine; TAV Elctrn. Prods.; U. S. Magnet & Alloy.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Clifton

GRIMM, SIEGEL ASSOCS., INC., 246 Clifton Ave., (201) 773-5010.
Factories: American Mach. & Foundry; Bristol Motors; G-V Controls; Micro Devices; Struthers-Dunn.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

Collingswood

ARCO ENGR. CO. (See Washington, D.C.)

RANDALL, K. CO., 250 Haddon Ave., Box 100, (609) 854-3323.
Branch: N. Dutton Mill Rd., RD #3, West Chester, Pa., (609) 854-3323.
Factories: Ammon Instrs.; Churchill; Dexon; Glentronics; Hammarlund Mfg.; High Energy; Multi-Flex Seals; Tel Labs.
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 2)

Cranford

MARCHAND-FARA, 15 Alden St., (201) 272-5510.
Branch: 1295 Northern Blvd., Manhasset, N.Y., (516) MA 7-1151.

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Factories: CEA; Delevan Elctrns.; Electro-Mechano; Elctrn. Crystals; G & G Elctrns.; Holtzer Cabot; Judson Bigelow; J W Microelctrns.; Midwec; Phipps Precision Prods.; Redington Counters; Electro/General; R.M.S. Motor; Syracuse Elctrns. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

E. Brunswick

BOYCE, W., 12 Civic Center Dr., (201) 254-3831.
Branch: 305 Pompano Beach Blvd., Pompano Beach, Fla., (305) 943-6484.
Factory: Elctrns. Comp.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

WILD J. J., INC. (See Jericho, N.Y.)

East Orange

DENNING ASSOCS. (See Wakefield, Mass.)

FRIEDMAN ASSOCS., INC., 110 Halsted St., (201) 673-2500.
Branch: Garden City, N.Y., (516) 746-5199.
Factories: American Elctrn. Labs.; Associated Research; Bausch & Lomb; Bytrex Div., Tyco; EMI/Varian; Holt Instr. Labs.; Hughes; Micro Instrs.; Microdot; Pacific Photometrics; Photo Research.
Selling To: ★ I,M. **Salesmen:** 6 (eng 6)
Services: Repair, Calibration

(See Advertisement Page 3255)

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MASIN-ESCO, INC. (See Syosset, N.Y.)

WOODIT, H. P., ASSOC., Box 475, (201) 673-7959.
Factories: Carstedt Research; Force; Kyocera Int'l.; Permanent Magnet; Timeco.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Edison

KELLER, L. W. & ASSOCS., INC. (See No. Bellmore, N.Y.)

Elizabeth

RYAN ASSOC. (See Port Washington, N.Y.)

Englewood

ANDREWS & ANDREWS, INC. (See Huntington, N.Y.)

CENTRAL ASSOC., INC., 44 N. Dean St., (201) 568-0808.
Branch: 11 Commercial St., Plainview, N.Y., (516) 433-0808.
Factories: Advanced Technology & Sys.; Alfred Elctrns.; W.M.A. Andersen & Assocs.; Electrochrome; E & M Labs.; ERC/Textron-Temperature Prods.; Herley Inds.; Jerrold Elctrns.; Miteq, Inc.; Structural Technology; Vector Engrg. **Services:** Repair
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 4)

Englewood Cliffs

SPRUNG-NUSSBAUM INC., 120 Sylvan Ave., (201) 947-6767. TWX: 710-991-9645.
Factories: Alcon Metal Prods.; Bradford Inds.; Cable Tech; Diodes; Eldema Div.; Electra/Midland; Modutec; Nytronics; Radial Controls; Stackpole; Wilson-Hurd Mfg. **Selling To:** ★ A,D,I,M. **Salesmen:** 4 (eng 4)

TALBE CO., INC., 19 Sylvan Ave., (201) 947-5038.
Branches: 5899 Huberville Ave., Dayton, Ohio, (513) 253-5351; 38 Barmore Drive, W., Stamford, Conn., (203) 322-6570.
Factories: Compace Comm.; Pho-Tronics; Poly-Scientific; Teller Inds.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 6)

TALCOMP CO., INC., 19 Sylvan Ave., (201) 947-5038.
Branches: 5899 Huberville Ave., Dayton, Ohio, (513) 253-5351; 38 Barmore Dr. W., Stamford, Conn., (203) 322-6570.
Factories: Amuneal Mfg.; Triad; Triad Distributor; Utrad.
Selling To: ★ I,D. **Salesmen:** 6 (eng 6)

Fair Haven

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

Fairfield

K L S ASSOCS., 387 Passaic Ave., (201) 227-2900.
Branch: New York, N.Y., (212) 233-4849.
Factories: Arvin Sys.; Calif. Sys. Components; Computer Labs.; Datatron; Delta Design; Electro Rents; Federal Tool Engrg.; Non Linear Sys.; Sangamo; Shepard Labs.; Stellar Metrics. **Services:** Repair
Selling To: ★ A,I,M. **Salesmen:** 4 (eng 3)

Fayetteville

RICHTER, H. G. INC. (See Mountainside, N.J.)

Fort Lee

HUGHES, K. E. CO., INC., 2175 Lemoine Ave., (201) 944-1600.
Factories: Beehive Electrotech; Computer Equip.; Computer Inds.; Digitron; Elasco-Eastern; Emcor-Borg Warner; McLean Engrg. Labs.; Raytheon Computer; Systems Instrs. Research; Taurus; Vero Elctrns.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

Freehold

METROREP, INC., Box 782, (201) 462-1221.
Branches: New York, N.Y., (212) 964-2000; Washington, D.C., ENTERPRISE 1-3223.
Factories: Eastman Sound Mfg.; Crown Int.l.; Stanford Int'l. **Services:** Repair
Selling To: ★ A,D,I,M. **Salesman:** 1 (eng 1)

Glen Rock

RINGER, R. L. CO., Box 114, (201) 444-1434.
Factories: Chassis-Trak; Components; Green Instr.; NIFE: Poxylube; Vent-Rak.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Glendora

ELECTRONIC CONTROLS & DEVICES INC., 1016 Black Horse Pike, (609) 939-2200.
Factories: Amerace; Aquatronics Inc.; Elctrns.; Fairchild Controls; Loyola Inds.; Taber Instr.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)
Services: Repair, Warehouse

Great Meadows

RICHARDT, J. W. CO., Rt. 46, Box 154, (201) 637-4107.
Branches: Rt. 46, Box 357, Pinebrook, N.J., (201) 637-4108; Box 267, Whippany, N.J., (201) 637-4108.
Factories: Cincinnati Fan; National Wire & Cable; Perfect Gear; 3 M Corp., Magnetic Div.
Selling To: ★ I. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse, Laboratory

Hackensack

RIBBLE, C. H. CO., INC., 31 Di Carolis Ct., (201) 342-2602.
Factories: Anderson Power Prods.; Delavan Mfg.; Dohrmann Instr.; Eagle Signal; Fast Heat Element Mfg.; Gemco Elec.; General Electric; Heatube Dept. Bersted Mfg., Div. McGraw Edison. **Services:** Repair
Selling To: ★ I. **Salesmen:** 7 (eng 7)

Haddonfield

BRADDOCK ASSOC., Box 305, (609) 429-0087.
Factories: Austin-Craft; Device Seals; Gold Line Connector; Graphic Elctrns.; Herb Kreckman; Illinois Broaching; Milwaukee Resistor; Nanasi Co.; National Radio; Olektron Corp.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

CHURCHILL, F. W., 50 Upland Way, (609) 429-7871.
Factories: Cramer Coil; Hamilton-Hall Resistor; Kalmus & Assocs.; Rola Div.
Selling To: ★ I. **Salesman:** 1

COMPAR CORP. (See Burlingame, Calif.)

M & S ASSOCS., INC., Box 185, (609) 429-7055, (215) BA 9-7575.
Branch: Box 267, Sellersville, Pa., (215) BA 9-7575.
Factories: Astrocom Elctrns.; Elctrns. of Clearfield; Electro-Voice; Florida Comm. & Elctrns.; Goldsman; Gulton Inds.; MM Elctrn. Enclosures; TDX; Torr Labs.
Selling To: ★ I,M. **Salesmen:** 7 (eng 3)
Services: Stocking Reps.

SUNDAY-O'BRIEN, 15 Potter St., (609) 429-4013.
Factories: Atlantic Semiconductor; Components; Interdyne; Lehighton Elctrns.; Semcor Div. of C.I.; Spectrol Elctrns.; STM; Wabco; Wakefield Engineering.
Selling To: ★ I,D,M. **Salesmen:** 2

Harrington Park

METRO TECH. SLS. CORP. (See Jericho, N.Y.)

Hillsdale

CERF, A. & CO. (See Caldwell, N.J.)

Ho-Ho-Kus

HANSEN ASSOCS. INC., 215 Brookside Ave., (201) 652-7055, (212) 947-0379.
Factories: Atec, Inc.; Calif. Electro-Scientific; Datawest; Doric Scientific; Dynamics Instrumentation; NH Research; Nova Elec. Mfg.; Nuclear; Tyco Instr. Div.; Vernitron; Virginia Panel; Zeltec. **Salesmen:** 5 (eng 4)
Selling To: ★ I,M. **Services:** Repair, Stocking Rep.

(See Advertisement This Page)

Lavallette

RYABY ASSOC. (See Passaic, N.J.)

Little Falls

CARBONE ASSOCS., P.O. Box 181, (201) 256-9191.
Factories: Elctrn. Applications; KCB Ind.; London Chemical; Miller Diel. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

Livingston

EDWARDS & CHRISTOPHER, Box 544, (201) 992-3311.
Factories: Automation Inc.; Candy Mfg.; General Elec.; Hird Brown; Systems Design. **Salesmen:** 2 (eng 2)
Selling To: ★ I,D. **Services:** Repair, Warehouse

MURRAY, THE, CO., 25 W. Northfield Rd., (201) 992-0520.
Branch: Box 253, Newtown, Bucks County, Pa., (215) 958-2497.
Factories: Circutek Dano Elec.; Gordos; Heller Inds.; Malco Mfg.; Mohawk Mfg.; Vernitron Electrical Components.
Salesmen: 3 (eng 3)

VARRELMAN-GORMAN CO., Box 206, (201) 992-2505.
Branches: Box 387, Liverpool, N.Y., (315) 458-4774; Box 50, Pompano Beach, Fla., (305) 941-5544.
Factories: Airtron; American Elctrns.; Atlantic Coast Elctrns.; Bendix; Capitol Mach. & Switch; Collectron; Dormeyer Inds.; Electralab Div./Tyco Labs.; North American Printed Circuit Div.; Quantum Devices; Stampings; Thermax Wire; Transitron Elctrns.; Welch Relay.
Selling To: ★ I,M. **Salesmen:** 6 (eng 5)

Maple Shade

JONES, W. M. CO. (See Towson, Md.)

Marlton

TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

Medford

MECH-ELEC SLS. CO., INC., 16 South Main, (609) 654-8209.
Factories: Amrum Metals; Anchor Plastics; Audio Sears; General Inds.; IXL Mfg.; Moldex; Rogate Inds.; Wells Plastics; Seal-A-Matic; Secon Metals.
Selling To: ★ A,I. **Salesmen:** 3 (eng 2)

COMPONENT MARKETERS, INC.
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Murdock — Headphones
Datak — Instant Lettering
Nortronics Co., Inc. — Magnetic Recording Heads (Digital and Audio)
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BONN ASSOCS., INC., 266 Lake Ave., (201) 549-9573.
Branches: Box 700, Stony Brook, N.Y., (516) 427-4328; 6 Highgate Ct., Cherry Hill, N.J., (609) 795-0600.
Factories: American Elctrn. Labs.; Cicoil Corp.; Communications Elctrns.; Conrad; Electro-Mechanisms; Energy-Sys.; George Ulanet; Gulton Inds.; Hyperion Inds.; Johanson Mfg.; Lear-Siegler; Microwave Control; Monterey Resh. Lab.; pcb piezotronics; RMS Engrg.; Sirco Controls; Spectral Dynamics; Titan Transformer; VIZ Mfg.; VP Co. **Selling To:** ★ I,A,M. **Salesmen:** 6 (eng 6)

(See Advertisement Page 3256)

Montclair

COMPONENT MARKETERS, INC., 151 Valley Rd., (201) 746-6717, (212) WO 2-3318.
Branch: 571 Sunderland Rd., Teaneck, N.J., (201) TE 6-9595.
Factories: Barker Prods.; B.S.R. Ltd.; Datak; Jerrold; Murdock; Nortronics Co.; Pax Ltd.; Rockford Spec. Furniture; H. H. Scott; Telvac Instrs. **Salesmen:** 5
Selling To: ★ A,D,I. **Services:** Warehouse

FREEMAN, L. C. & ASSOCS., 484 Bloomfield Ave., (201) 746-5200.
Factories: Bendix-Dage; Seven Assocs.
Selling To: ★ A,D,I,M. **Services:** Warehouse
Salesmen: 3 (eng 2)

Moorestown

ANGUS, INC., Pleasant Valley Ave., (609) 235-1900. TWX: 710-897-0829.
Branch: 10759 Tucker St., Beltsville, Md., (301) 345-7050.
Factories: Amelco-Teledyne; Burndy Corp.; Crystalonics-Teledyne; Helipot-Beckman; C.P. Clare; Kemet; Phelps-Dodge Micon; Microtran; Motorola Semi. Prods.; Hecon Corp.; Westinghouse Semi. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 7 (eng 3)

ELECTRICAL COMPONENTS, INC., 355 Crider Ave., (609) 235-3012.
Factories: ElectroMagnetic Prods.; Hamilton Precision Metals; Perfection Mica; Spague Elec.; Westinghouse Elec. **Services:** Sales Reps.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

FOLEY, A. A. ASSOCS., Box 155, (609) 663-4545.
Factories: Cox & Co.; Demco Generators; DeVale; E-T-A Prod.; Eastron; Resistors, Inc.; Rohn Mfg.; SBD Sys.; Utica Elctrns. **Selling To:** ★ I,D,M. **Salesmen:** 2 (eng 1)

MILLER & DIETZ CO., 101 W. Main St., (609) 234-1050.
Factories: Bin-Dicator; R. B. Denison; Ebbert Engrg.; Fast Heat Element; Gemco Elec.; Industrial Solid State Controls; Joy Mfg.; Photomation; Tenor.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)

Morristown

GRAYDON-SHERMAN, INC., 230 Madison Ave., (201) 538-9246. TWX: 710-986-7458.
Branches: Syracuse, N.Y., (315) 637-9861. TWX: 710-541-0241; Great Neck, N.Y., (516) 487-9696. TWX: 710-986-7458; Philadelphia, Pa., (215) 664-7316. TWX: 710-986-7458.
Factories: Applied Magnetics; Computer Microtechnology; KMC Semiconductor; Omni Spectra Inc.; Power Mate; Universal Voltronics; Waveline.
Selling To: ★ I,D,M. **Salesmen:** 10 (eng 10)
Services: Warehouse

Mountain Lakes

COMPONENTS FOR ELCTRNS. INC., 60 Midvale Rd., (201) 334-2921. TWX: 710-987-8395.
Factories: Carter Precision Elec.; Grant Pulley & Hardware; Grigsby-Barton; Methode Elctrns.; Methode Mfg.; Standard Grigsby; Stantron.
Selling To: ★ A,I,M. **Salesmen:** 4 (eng 2)

NORTON, J., 60 Midvale Rd., (201) 334-2921. TWX: 710-987-8395.
Factories: Carter Precision Elec.; Grant Pulley & Hardware; Grigsby-Barton; Methode Elctrns.; Methode Mfg.; Standard Grigsby; Wyco Metal Prods.
Selling To: ★ A,I,M. **Salesmen:** 4 (eng 2)

Mountainside

RICHTER, H. G. INC., 608 Sherwood Pkwy., (201) AD 3-4615. TWX: 710-997-9581.
Branch: Fayetteville, N.J., (315) NE 7-6713.
Factories: Fabri-Tek; Hart-Advance Div.; JPM; Oak Mfg.; Panelgraphic; Paktron Div.
Selling To: ★ I,D. **Salesmen:** 6 (eng 4)

Nutley

GLASSMAN, S. ASSOC. INC. (See Glen Cove, N.Y.)

FALK-BAKER ASSOCS., 382 Franklin Ave., (201) 661-2430. TWX: 710-989-1476.
Factories: Bestcraft Prods.; Ledex, Inc.; Mepco, Inc.; Mial, USA.; Semicon, Inc.; Whitewater Elctrns.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

Newark

DETWILER, L. K., 443 Broad St., (201) 621-9080. TWX: 212-962-6342.
Factories: Brandywine Fibre Prods.; Case Bros.; Keene; Harvey Hubbell; Rhopac, Inc.; Stone Ind'l.; Wisconsin Porcelain. **Selling To:** ★ I,D. **Salesmen:** 4 (eng 1)

McKAY ASSOCS., 60 Park Pl., (201) 642-3930.
Factories: Consolidated Controls; Electro Devices; Hampden Engrg.; Kelek; Pathon Mfg.; States.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)

Oaklyn

WETTERHAHN, A. CO., INC., 201 W. Cuthbert Blvd., (609) 858-3003. TWX: 710-892-0762.
Branch: Box 5929, Pikesville, Md., (301) 484-6376.
Factories: Automation Components; C & M; Continental Wirt Elctrns.; Electri-Cord Mfg.; Elctrn. Plastics; Gardiner Solder; Kurman Instr.; Magnetic Core; Oxford Elec.; Permonite Mfg.; Printed Circuits; Rayonics; Tresco Scientific Devices. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

Palisades Park

TAK INSTR. ASSOCS., Box 226, (201) 944-3337.
Factory: Resalab. **Services:** Repair
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Paramus

TOWER SLS. ENGRG. CO., 633 Marginal Rd., (201) 265-2878. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 1)

Passaic

EASTERN INSTR., INC. (See Philadelphia, Pa.)

RYABY ASSOCS., 38 Wall St., (201) 773-6359.
Branch: 2 West Cove Way, Ocean Beach, Lavallette, N.J., (201) 793-3183.
Factories: Lyon; Micromeritics Instr.; Norcross; Tacussel Elctrns. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 3 (eng 2)

Pennsauken

LEFF SLS. ASSOCS., 5900 Westfield Ave., (609) 663-4025.
Branches: 408 York Rd., Towson, Md., (301) 823-0774; Box 110, Somerville, N.J., (201) 534-4041.
Factories: Astrodyne; Borg Warner; Electromechanical Instr.; General Control; Midway Mfg.; National Circuits; Nucleonic Prods.; Plastic Capacitors; Premier Metal Prods. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 3)

Perth Amboy

HOUSER ASSOC., INC., 188 Water St., (201) 442-3159.
Factories: Specialized Elctrn. Instrs.; Spectrum Labs.; Corbin-Farnsworth. **Selling To:** ★ I. **Salesmen:** 2
Services: Repair, Mgmt. Consulting, Credit & Collections.

Pine Brook

RICHARDT, J. W. CO. (See Great Meadows, N.J.)

Plainfield

MAGUIRE, J. A. & CO. (See Camden, N.J.)

Red Bank

DYNAMIC SLS. CO., Box 834, (201) 747-5353.
Factories: Canoga Elctrns.; Ground Data; Teledyne Telemetry. **Services:** Mail Service
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

EASTERN INSTR., INC. (See Philadelphia, Pa.)

Ridgefield

MOCH, G. M. CO., 595 Broad Ave., (201) 945-0080. (212) 279-6758.
Factories: Elmwood Sensors; ITT Gremar; LRC Elctrns.; Omega Elec.; Reeves-Hoffman Div.; Thermolab Corp.; United Mineral & Chemical. **Salesmen:** 4 (eng 3)
Selling To: ★ I,D,M. **Services:** Warehouse, Direct Mail

Ridgewood

BALLOU, INC., 51 N. Broad St., (201) 444-6990.
Factories: Cole Instr.; Heinemann Elec.; JMR Elctrns.; Precision Switch; Power Conversion Prods.; Rundel Comps.; Semitron; Vectrol Inc.; Voltron Prods.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

DAMON/ENGEL INC., 123 Prospect St., Box 705, (201) 444-1400. TWX: 710-988-5603.
Branches: 8 Melrose La., Commack, N.Y., (212) 732-0001; Box 425, Hatboro, Pa., (215) 922-3270.
Factories: Applied Microwave Lab.; Astro-Metrix; Incor, Inc.; Kruse-Storke Elctrns.; Microwave/Sys.; Midwestern Instr./Telex; Philips Elctrn. Instrs.; Tau-Tron, Inc.; Wanlass Instrs.; Waveline, Inc.; Weinschel Engrg.; Weston-Lexington. **Selling To:** ★ I,M. **Salesmen:** 5 (eng 5)

ENGEL, G. C. & ASSOC., 210 South Broad St., (201) 444-0662. **Services:** Repair
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

GILBERT SLS. ASSOC., 70 Glenwood Rd., (201) 444-2604.
Factories: Elctrn. Coils; Glasseal Prods.; Universal Prods. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 1)

INSTRUMENTATION SLS. CO., Box 403, (201) 445-5210, (212) 695-4269. TWX: 710-988-5609.
Factories: American Astrionics; Analogic; Christie Elec.; Digital Information Storage; Information Control; Int'l. Data Sciences; Logitek; Precision Magnetics; Synergistics; Technipower; Micropac Inds.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

(See Advertisement Page 3258)

PERIPH-A-TRONICS, P.O. Box 339, (201) 447-4766.
Factories: Bendix; Advanced Prods.; Applied Digital Data Sys.; Delta Data Sys.; Computer Access. Sys.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

WILLIAMS, H. R. ASSOCS., INC., Box 344, (201) 444-5392.
Branch: Box 247, Weirsdale, Fla., (904) 821-2239.
Selling To: ★ I. **Services:** Warehouse **Salesmen:** 4

Riverton

DREW, W. CO., 611 Main St., (609) 829-4800.
Factories: Contract Svcs.; Maire Plastics; Meese Elctrns.
Selling To: ★ I. **Salesmen:** 2 (eng 2)
Services: Warehouse

Rockaway

DATA-REP ASSOCS., INC., 40 W. Main St., (201) 625-2233.
Branches: Box 164, Huntington Sta., N.Y., (516) 423-7677; Box 349, Norristown, Pa., (215) 279-5810.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Repair

(See Advertisement This Page)

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GAWLER-KNOOP CO., 14 Beaufort Ave., (201) 226-4545, (212) 344-2997.
Branches: 10 Old Post Office Rd., Silver Spring, Md., (301) 589-4406; Box 414, Richboro, Pa., (215) WA 5-7550.
Factories: BBN/Data Eqpt. Div.; Beckman Cedar Grove Operation; Century Elctrns.; Electro Mechanics; Emerson Elec.; Instrs. for Industry; McGraw Edison; B. L. Packer; Pemco; Rockland Labs.; Singer/Ballantine Operation; Texas Instrs.; Watkins-Johnson.
Selling To: ★ I,M. **Salesmen:** 8 (eng 8)
Services: Repair

(See Advertisement Page 3259)

Saddle Brook

L & M ASSOC., 511 Victor St., (201) 843-8700.
Branches: 965A Bristol Pike, Andalusia, Pa., (215) 639-3100, 632-0600; 7 Mayflower Ct., Brentwood, N.Y., (516) 231-8363.
Factories: Alford Mfg.; Baird-Atomic; J. G. Biddle; Data Meas.; E & L Instrs.; Henes Mfg.; Hughes Aircraft; Logic Elctrns.; Marconi Instrs.; Optic Aire Sys.; Protronic Inds.; Quan-Tech Labs.; Trompeter Elctrns.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse

TEK-SEL, INC., 440 No. Midland Ave.
Factories: Chadwick-Helmuth; Conic; Daytronic; Kistler Instr.; Lebow Assocs.; Ling Elctrns. Div.; Robinson-Halpern; Team; United Control.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Somerville

LEFF SALES ASSOCS. (See Pennsauken, N.J.)

South Orange

JACKSON ELECTRONIC SLS. CORP., 71 Valley St., (201) 763-7900. TELEX: 138-335.
Factories: Crystek; V-M-P Inc.; Weltron Co.
Selling To: ★ A,I,D,M. **Salesmen:** 19 (eng 9)

SIMBERKOFF SLS., INC., 71 Valley St., (201) 763-7900. TWX: 710-999-5517. TELEX: 138-335.
Branches: 35 Niagara St., Lockport, N.Y., (716) 434-4426; 284 Edgewood Ave., Kenmore, N.Y., (716) 834-8119; DeWitt Mill Rd., RD #5, Box 237, Kingston, N.Y., (914) 331-4920; 1021 Levick St., Phila., Pa., (215) 743-2512; 420W Arlington Towers, Arlington, Va.
Factories: Aerovox; Goe Eng.; Jensen Mfg.; Kulka Elec.; Magnecraft Elec.; Penn-Tran; Phalo; Precision Timer; H. W. Sams & Co.; Sarkes-Tarzian; Shure Bros.; SNC Mfg.
Selling To: ★ A,I,D,M. **Salesmen:** 19 (eng 9)

SMITH, THE, Box 85, (201) 763-1770.
Factories: Anderson & Sons; Beier-Chanoux; Bentley-Harris; Computer Crafts; Destalo; Per; Robicon; Truline Bearing. **Selling To:** ★ I. **Salesmen:** 3 (eng 2)

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TWX: 710 - 988-5609

S. Plainfield

MARS SALES TRONICS, 4405 S. Clinton Ave., (201) 561-3233.
Factories: Alpha Wire; Audiophonics; American Plasticraft; Keystone Elctrns.; Elctrn. Hardware; Star-A Elec.; Superior Resistor; Trans-Tek Mfg.; Xexex Inds.
Selling To: ★ A,D,I. **Salesmen:** 4 (eng 3)
Services: Advertising

Spotswood

STRANCO PRODS. INC. (See Chicago, Ill.)

Springfield

SYLVESTER, F. F. ASSOCS., 649 Morris Ave., Box 207, (201) 376-3324. TWX: 710-983-4439.
Branch: 260 Northern Blvd., Great Neck, N.Y., (516) 487-6447.
Factories: CTS Knights; Fusite; Icore Electro-Plastics; Phoenix Transformer; Plastic Capacitors; Rotron; Texas Instrs.; Townsend Inds.; Ultronix; Waters Mfg.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)

TALBOT ASSOCS., INC., 11 Cleveland Pl., (201) 376-9570.
Factories: Badger Alloys; Beemer Engrg.; Callen Mfg.; Certified Casting & Engrg.; Delta Microwave; Eaton, Yale, & Towne; Hamilton Allied; Hitchiner Mfg.; Interstate Drop Forge; Piad Precision Casting; Progress Foundries; Shell Cast; Swedish Crucible Steel.
Selling To: ★ I. **Salesmen:** 8 (eng 8)

Teaneck

ABBOTT-GORDON ASSOCS., (See Seaford, N.Y.)

BUDD-TRONICS INC., 71 Grayson Pl., (201) 837-1660.
Factories: Beta Instr. Corp.; Pollak, J.; Sawyer Inds.; Thomas Elctrns.; Unique Mfg.; Warnecke Mfg.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

COMPONENT MARKETERS, INC. (See Montclair, N.J.)

FISHER, S. SLS. CORP., 161 Cedar Lane, (201) 836-6661.
Factories: Jersey Specialty; Loral Dist. Prods.; Motorola (Hep); Mosley; Raytheon; Superex; Utah.
Selling To: ★ A,D.

REID, R. T. ASSOCS., INC., 175 Cedar La., (201) 692-0200.
Factories: Babcock Elctrns. Corp.; Barnes Corp.; Carbone Corp.; General Instr.; Kertron, Inc.; Marshall Inds.; Power Physics; REPAC Div. Republic Corp.; Statham Instrs.; Vanguard Electrns.; Varadyne, Inc.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 5)

WALSH, J. V. & ASSOCS., Box 59, (201) 836-5700.
Factories: Columbia Scientific; Garlet; Gichner Mobile Sys.; Insaco. **Selling To:** ★ A,D,I,M. **Salesmen:** 2 (eng 1)

Totowa

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

Trenton

KRIEGNER SLS. CO. INC., 1602 Pennington Rd., (609) 882-6330.
Factories: Hardman; Heinemann Elec.; Monitor Controller. **Selling To:** ★ I,D,M. **Salesmen:** 3 (eng 2)

MILLS, W. S., 2 Wilburtha Rd., (609) 882-4111.
Factories: Diamonite Prods. Mfg.; D. M. Steward Mfg.
Selling To: ★ I,M.

Union

CAIN & CO. (See Los Angeles, Calif.)

SBM ASSOCS., INC. (See Rochester, N.Y.)

BRESSLER ASSOCS., INC., 4808 Bergenline Ave., (201) 864-9577.
Factories: James Elctrns.; Littelfuse; Magnetic Shield; Metex Corp.; Novatronics; Syntronic Instrs.; Vishay Resistor Prods. **Services:** Mailing
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

Warren

NLR ASSOCS., 31 Round Top Rd., (201) 647-3390.
Factory: Maplewood Elctrns. **Services:** Repair
Selling To: ★ A,I,M. **Salesmen:** 4 (eng 4)

Wayne

KAGAN, H. ASSOCS., 18 Tilghman Dr., (201) 684-7682.
Branch: 150-08 87th Ave., Jamaica, N.Y., (212) OL 8-8881.
Factories: ALA Inds.; Electro Windings & Components; Hampden Mfg.; Melray Mfg.; Modern Die & Machine.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

S. A. M. ASSOCS. INC. (See Jamaica, N.Y.)

Wenonah

LAWSON, R. ASSOCS., Box 206, (609) 468-5115.
Factories: Eastern Air Devices; Electro-Flex Heat; Northern Precision Labs.; Vibrac.
Selling To: ★ I,D,M. **Salesman:** 1

West Caldwell

PETERSON-RUDNICK ASSOCS., Box 822, (201) 226-4363.
Branch: 97-20 57th Ave., Corona, N.Y., (212) 271-6042.
Factories: Bartlett Mfg.; Ecco Elctrn. Comp.; Hoyt Electrical Inst. Works; Marvel Elec.; Precision Resistor; Sampson; E. Stanwyck Coil; Vanguard Relay; Warwick Prod. **Selling To:** ★ I,D. **Salesmen:** 3 (eng 1)

(See Advertisement This Page)

Westfield

GRAY & REED ASSOCS., INC. (See Huntington Sta., N.Y.)

Westwood

CLARFIELD-STOLLMACK ASSOCS., 175 Westwood Ave., (201) 666-8989. TWX: 710-990-7509.
Factories: Dearborn Elctrns.; Enercon; IMC Magnetics; Maurey Instr.; McCoy Elctrns.; Resistance Prods.; Transformer Elctrns. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

Whippany

RICHARDT, J. W. CO. (See Great Meadows, N.J.)

Woodcliff Lake

F. & F. ASSOCS. (See Westbury, L.I., N.Y.)

NEW MEXICO

Albuquerque

AZTEC ENTERPRISES, INC., 3202 Candelaria Rd. NE., (505) 345-3441.
Branches: 1449 W. Littleton Blvd., Littleton, Colo., (303) 798-4573; 15 N. 40th Pl., Phoenix, Ariz., (602) 267-8103.
Factories: Curtis Instrs.; Data Technology; Ectron; Eldorado Electrodata; Hipotronics; Houston Instr.; Keithley Instrs.; Krohn-Hite; Kulite Semiconductor Prods.; Lear Siegler; Modutec; Rental Elctrns.; Technipower.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Direct Mail

BARNHILL ASSOCS. (See Denver, Colo.)

BENNEWITZ ASSOC., INC., 9720 Candelaria NE., (505) 298-6775. TWX: 910-989-0610.
Branches: 2801 E. Colfax Ave., Denver, Colo., (303) 399-1132. TWX: 910-931-2665; 532 N. Brown Ave., Scottsdale, Ariz., (602) 947-7379. TWX: 910-950-0082.
Factories: Astrosys.; Barnes Engrg.; Basler Elec.; Chester Cable; DataMate Computer Sys.; JFD Elctrns.; Narda Microwavel; Polarad Elctrns.; Prodelin; Pulse Engrg.; Pyrofilm Corp.; Singer; Teledyne Relays; Time Sys.; Trompeter Elctrns.; Watkins-Johnson; Zeta Labs.
Selling To: ★ I,M. **Salesmen:** 5 (eng 5)

BFA (See Denver, Colo.)

COMPAR CORP. (See Burlingame, Calif.)

GATES, F. Y. CO., INC., 2631 Texas N.E., (505) 298-1875.
Branches: 700 E. Louisiana Ave., Denver, Colo., (303) 722-4674; 102 E. 1st Ave., Scottsdale, Ariz., (602) 947-2991; 455 E. 4th St., Salt Lake City, Utah, (801) 359-1101.
Factories: Computer Conversions; DuMont Electron Tubes; Electro-Metrics Corp.; Energy Conversion Sys.; Frequency Engrg. Lab.; Hughes Aircraft; Instruments for Industry; McIntosh Lab.; Measurements Div.; Medistor Instrs.; Monsanto Elctrns.; Princeton Applied Research; Scientific Instrs.; Technibilt; Valer Elctrns.; Venus Scientific; Wyle Computer Prod. Div.; Zero Mfg.; Dranetz Engrg.; U.S. Sys.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 4)

HYTRONIC MEAS., INC. (See Denver, Colo.)

IBL ENGRG & SLS., INC. (See Dallas, Tex.)

LANDES, ZACHARY & PETERSON (See El Paso, Tex.)

LINDBERG CO. (See Denver, Colo.)

NELSON CO., INC. (See Denver, Colo.)

PLS ASSOCS., INC. (See Englewood, Colo.)

SCIENTIFIC DEVICES-SOUTHWEST, INC. (See Richardson, Tex.)

THORSON CO. (See Los Angeles, Calif.)

WILLIAMS ASSOC., INC. (See Denver, Colo.)

Las Cruces

BFA (See Denver, Colo.)

NEW YORK

Albany

COMPAR ALBANY, INC., 6 Highland Ave., (518) 489-7408. TWX: 710-441-8224.
Branches: Box 135, Endwell, N.Y., (607) 723-8743; 42 Winding Brooke Dr., Fairport, N.Y., (716) 271-2230; 33-7 Garnock Ct., Liverpool, N.Y., (315) 471-3356.
Factories: Chicago Dynamics; Circuit Technology; Compar; Coron; Daystrom/Weston; Del Elctrns.; Denes; Electronized Chemical; John Fluke; Kappa Networks; Powercube; Qualidyne; TEC, Inc.; Unitrode.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Repair, Warehouse

FERGUSON, T. SLS. CO., INC. (See Rochester, N.Y.)

REAGAN, J. A. CO., INC., 6 Highland Ave., (518) 489-4777. TWX: 710-441-8224.
Branches: 52B Crestmont Rd., Binghamton, N.Y., (607) 723-9661; 41 Woodbury Rd., New Hartford, N.Y., (315) 732-3775; RD3 Meadow Hill Rd., P.O. Box 2547, Newburgh, N.Y., (914) 561-4510; 891 Monroe Ave., Rochester, N.Y., (716) 473-2115.
Factories: Burr Brown; Clary; Computer Power; Del Elctrns.; Dynasciences; Instruments for Industry; Ingersoll Prods. Div.; Itron Corp.; LeasaMetrics; McLean Engrg.; Monterey Research; Signetics Meas. Data; Tautron; Telonics; Trygon-Trymetrics. **Selling To:** ★ I,M.
Salesmen: 5 (eng 5) **Services:** Repair, Warehouse

RYERSON, J. D. ASSOC. INC. (See Rochester, N.Y.)

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TOLLEFSON B. H. ASSOC., INC. (See Rochester, N.Y.)

Baldwin
BERLIANT ASSOCS. (See Freeport, N.Y.)

NATIONAL SLS. DEV. CO., 676 Stratford Rd., (516) BA 3-0038.
Factory: Binary Elctrns. **Services:** Repair
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)

Ballston Lake
JOHNSON, H. C. AGENCIES, INC. (See Rochester, N.Y.)

Batavia
JACOBS, M. S. & ASSOC. (See Pittsburgh, Pa.)

Bellmore
POSITIVE CONSULTANTS INC., 2255 Arby Court, Box 453, 2255 Arby Court, (516) 221-2262.
Factories: Athcon Prods.; Beryllium Mfg.; Biotex; Concept Inds.; Connectors; Gramercy Mach.; Graphic Prods.; Marks Machinery; Norel Elctrns.; Ray Diasley; Semi Dyne Elctrns.; Universal Ultrasonics.
Selling To: ★ I,M. **Salesmen:** 6 (eng 2)

Binghamton
NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)
REAGAN, J. A. CO., INC. (See Albany, N.Y.)

Brentwood
L & M ASSOC. (See Saddle Brook, N.J.)

Brightwaters
RUSSELL ASSOC. INC., 165 Orinoco Dr., (516) MO 6-6500. TWX: 510-227-6141.
Branches: 102 N. Main St., Bel Air, Md., (301) 838-9292, (301) 879-9180. 6427 Roswell Rd., Atlanta, Ga., (404) 255-8422. TWX: 810-751-8132. 2516 N. Memorial Pkwy., Huntsville, Ala., (205) 539-7211. 211 W. Fairbanks, Ave., Winter Park, Fla., (305) MI 7-2251; 4 Eswin St., Greenhills, Cincinnati, Ohio, (513) 825-0930. TWX: 810-465-8339; 24634 Five Mile Rd., Detroit, Mich., (313) KE 2-5770; 1303 North Richmond Rd., McHenry, Ill., (815) 385-4220. TWX: 910-642-3760; 3951 E. Huntington Dr., Pasadena, Calif., (213) 795-9521, 681-9374. TWX: 910-588-3782; 6361 First Ave. S., Seattle, Wash., (206) RO 2-1213. TWX: 910-444-1682; 6789 Main St., Buffalo, N.Y., (716) 634-3377; 69 Hickory Dr., Waltham, Mass., (617) 891-4570; 569 River Rd., Fair Haven, N.J., (201) 747-0600; 8616 Northwest Plaza., Dallas, Tex., (214) 369-3173.
Factories: Abrams Instr.; Aeroflash Signal; American Elctrns.; Carco Elctrns.; Conn. Div.; Electroforming Div.; Elctrn. Resources; Electro-Miniatures; General Dynamics; Gorn; Indiana; Macarr; Markite; Mason Elec.; Masterite Inds.; Nash Controls; Varo.
Selling To: ★ I,M. **Salesmen:** 26 (eng 26)

Bronx
BRADLEY ASSOCS. CORP., 9 Dash Pl., (212) 549-8500.
Factories: Dytro Corp.; Inland Motors.
Selling To: ★ I. **Salesman:** 1 (eng 1)

WEBER, J. ASSOCS. INC., 2700 Henry Hudson Pkwy., (212) 546-8306.
Factories: Keprow Circuit Sys.; Keystone Elctrns.; Middletown Mfg.; Pomona Elctrns.
Selling To: ★ I,D,M. **Salesmen:** 3

Brooklyn
BROWN, I. CO. INC., 401 Kingston Ave., (212) 493-1379.
Factories: Atlas Sound; Cleveland Elctrns.; Federal Sign & Signal; Holmin, W. A. Corp.; Ideal Wire Prods.; Javelin CCTV; Mellotone; Orrtronics; Tenatronics; Workman Elctrn. Prods. **Selling To:** ★ A,D,Commercial Sound **Salesmen:** 3

BROWN, J. ELCTRNS. SLS. REPS. INC. (See Yonkers, N.Y.)

EASTERN ELCTRN. SLS. CO., 1 Montana Pl., (212) 763-5180.
Branch: One Summer St., Sharon, Mass., (617) 784-3996.
Factories: Industrial Solid State Controls; Jones Motorola; Kurman Instrs.; Pennsylvania Elctrns. Technology; Photomation Inc.; Positive Connector; SEG Elctrns.; Stow Labs. **Services:** Repair, Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 3)

SICLARI, V. (See N. Palm Beach, Fla.)

VERTER SLS. CO., 2352 E. 66th St., (212) 444-3880.
Factories: B.E.C.; CamCraft Automatics; Globe Plastics; Javex; Stanford Miller; Newcastle Fabrics; Opti-Gage; Pioneer Components; Profile Elctrns.; TAB; Texas Crystals. **Services:** Limited Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 2 (eng 1)

Buffalo
JACKSON, R. W. CO., INC., 4446 Main St., (716) 839-0200.
Branch: P.O. Box 295, Fayetteville, N.Y., (315) 637-3851.
Factories: Aeronautical Elec.; Airco Speer Elctrn. Components; American Elec. Cable; Franklin Fibre Lamitex; Precision Elctrn. Components; UOP Instrs. Div.; U. S. Components. **Selling To:** ★ I,M,D. **Salesmen:** 2 (eng 1)

KELLER IND. PRODS., INC. (See Rochester, N.Y.)

McDONOUGH, J. ASSOC. INC., 4541 Main St., (716) 839-3467.
Factories: Circuits; General Instr.; Standard Grigsby.
Selling To: ★ I. **Salesmen:** 3 (eng 1)

McTAGGART, L. J. ASSOCS., 2451 Wehrle Dr., (716) 634-2030.
Branch: 3783 W. River Pkwy., Grand Island, N.Y.
Factories: AMD Elctrns.; Bowman Leisure Inds.; Chemtronics; Cornell-Dubilier; Electra; Mellotone; Newcomb Audio Prods.; Sencore; Sinclair Radio Labs.; Utah Elctrns.
Selling To: ★ A,D. **Salesmen:** 2

MITSCHER, R. W. CO., INC., 496 Ellicott Sq. Bldg., (716) 854-2517. TWX: 710-522-1225.
Branches: 3573 Howlett Hill Rd., Camillus, N.Y., (315) 679-6451; 51 Ely Dr., Fayetteville, N.Y., (315) 446-4540; 3100 Basin Ct., Virginia Beach, Va., (703) 464-0500; 22 Latchmere Ct., Pittsford, N.Y., (716) 381-9115; Box 10541, Raleigh, N.C., (919) 828-0575.
Factories: Amelco Semiconductor; Bliley Elec.; Carter Motor; Comar Elec.; Eldema; Hickok Elect. Int'l Rectifier; E F Johnson; Littelfuse; Molon Motor & Coil; Par Inds.; Stackpole; Stancor Elctrn.; Tepro Elec.; Thermatics.
Selling To: ★ A,I,D,M. **Salesmen:** 14 (eng 9)

NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

Camillus
CALLAHAN-FERGUSON CO., 107 Greenhedge Dr., (315) 488-5518.
Branch: 117 Fayette St., Manlius, N.Y., (315) 682-9301.
Selling To: ★ A,D. **Salesmen:** 2
Services: Warehouse

MITSCHER, R. W. CO., INC. (See Buffalo, N.Y.)

Clarence
REP TEC INC. (See Syracuse, N.Y.)

Clifton
COMPAR CORP. (See Burlingame, Calif.)

Commack
DAMON/ENGEL INC. (See Ridgewood, N.J.)

Cooperstown
EQUIPMENT SLS. CO., INC. (See Hamden, Conn.)

Corona
PETERSON-RUDNICK ASSOCS. (See West Caldwell, N.J.)

Cortland
RJC ASSOCS., 26 Morningside Dr., (607) 753-3909.
Factories: AIL Div. of Cutler-Hammer; Beckman Instrs.; Dynage; Gibbs Mfg.; Micro Instr.; Optical Elctrns.; Rohde & Schwarz; Struthers Elctrns. **Services:** Direct Mail
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

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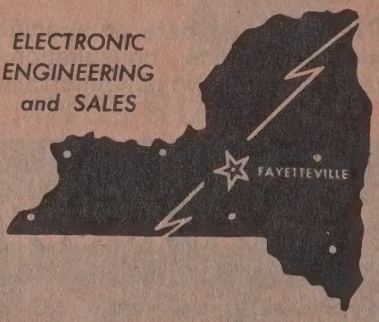

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FLORING, C. W. & H. R. MURRAY, INC., Box 11, 6585 Kinne Rd., (315) 446-5555.
Branch: 113 Gilbert Dr., Rochester, N.Y., (716) HU 8-2293. **Selling To:** ★ I,D. **Salesmen:** 5 (eng 3)

ONYX, W. M. CO., 101 Pickwick Rd., (315) 446-7930.
Branches: 2312 Grant Blvd., Syracuse, N.Y., (315) 479-651; Box 4, Mattydale, N.Y., (315) 479-6561.
Factories: J. H. Ambrose; Johnson Elec. Coil; Mandex Mfg.; C. Sjoberg & Son; T A Mfg.
Selling To: ★ A,I,M. **Salesman:** 1 (eng 1)

STONE, J. L., 110 Terrace Circle, (315) 446-5127.
Factories: Adell; Duall Plastics; Phoenix Gage; Staffall; Westco; WRH. **Selling To:** ★ I,M. **Salesman:** 1

TAYLOR, E. W. CO. INC., 4455 E. Genesee St., (315) 446-0422.
Branch: Rochester, N.Y., (716) 473-2404.
Factories: A C S Inds.; Chicago Miniature Lamp Works; Electro-Mechanical Instr.; Hollingsowrth Solderless Terminal; Kulka Elec.; Metermod Instr.; Riester & Thesmacher; Skydyne; Switchcraft; Triplett Electrical Instr. **Selling To:** ★ I,D. **Salesmen:** 4 (eng 2)

Dobbs Ferry

ZLOWE, L. CO., INC., 200 Ashford Ave., (212) 687-7282.
Factories: Andrea TV; Dyna Co.; Rectilinear Research; Vytec. **Selling To:** ★ A,D. **Salesmen:** 2 (eng 1)

East Meadow

BUERGER CO., INC. (See Glenside, Pa.)

REIZES, H., 1473 Sylvia Lane.
Factories: Audio Fair; Elctrns. Ind. Exch.; Newcomb Audio Prod.; Wharfdale.
Selling To: ★ A,D. **Salesmen:** 2

SHAPRIO, S. ASSOCS., 1467 Sylvia La., (516) 483-4185.
Factories: Piher Int.; Universal Scientific.
Selling To: ★ A,I. **Salesmen:** 2 (eng 2)
Services: Warehouse

East Syracuse

TOLLEFSON, B. H. ASSOC., INC. (See Rochester, N.Y.)

OSSMANN INSTRS. INC., 6666 Old Collamer Rd., (315) 437-6666. TWX: 710-541-1523.
Branches: 2425 Clover St., Rochester, N.Y., (716) 271-4565; 122 E. Main St., Wappingers Falls, N.Y., (914) 297-7777; 1901 Vestal Pkwy. E., Vestal, N.Y., (607) 785-9947. TWX: 510-252-1987.
Factories: Anadex; BLH Elctrns.; Communication Elctrns.; Dana Labs.; Data Control; Daymarc; Digilin; Electro Prods. Labs.; Elctrn. Assocs.; Ferroxcube; Industrial; Microphase; Microwave; Midwestern Instrs.; Narda Microwave; Pacific Meas.; Peripheral Equip.; Power Designs; Prodelin; Relcom; Romex Elctrns.; Robinson Halpern; Rustrak; Semi/Dyne; Teradyne; Watkins Johnson; Wiltron; Zeta Labs.
Selling To: ★ I. **Salesmen:** 9 (eng 9)

Eastchester

RUTT, W. INC., 475 White Plains Rd., (914) 779-4100.
Factories: Sprague Elec.; Sprague Prods.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)

Elmont

CRANE & EGERT CORP., 146 Meacham Ave., (516) 488-2100. TWX: 510-223-0417.
Factories: Carborundum Co.; Computer Measurements Daymarc Corp.; Digilin Inc.; Elctrn. Arrays; Krohn-Hite Corp.; Newell Inds.; Philbrick/Nexus Resh.; Rentronix, Inc.; Teradyne, Inc.; Trio-Tech Inc.; United Controls Magnetics Div.; Wakefield Engrg.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 6)
Services: Repair, Warehouse, Stocking Distributor

(See Advertisement Page 3260)

EGERT, S. S. CO. INC., 146 Meacham Ave., (516) 488-2255. TWX: 510-223-0417.
Factories: Carborundum Co.; Continental-Wirt; Dielectric Sys.; Oxford Speaker. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 4 (eng 3)

MURRAY DIRECTOR ASSOCS., 115-62 237 St., (516) 285-6823.
Factories: Arcolectric Switch; Polaris Inds.; Space-Guard; Telematic Inds.; United Elctrn. Mfg.; U.X.L.; Vari Prods. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 2)

SCHMITT, F. E. CO., INC., 311 Meacham Ave., (516) 437-8150.
Factories: Bliley Elec.; Continental-Wirt; Essex Int'l.; Hurst Mfg.; E. F. Johnson; Sangamo Elec.; Shure Bros.; Rayonic Tubes. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 6 (eng 2)

Endicott

ADVANCED COMPONENTS CORP. (See North Syracuse, N.Y.)

LABRONICS, INC. (See Syracuse, N.Y.)

Endwell

COMPAR ALBANY, INC. (See Albany, N.Y.)

COMPAR CORP. (See Burlingame, Calif.)

Fairport

COMPAR ALBANY, INC. (See Albany, N.Y.)

COMPAR CORP. (See Burlingame, Calif.)

Farmingdale

MARSHALL, G. S. CO. (See El Monte, Calif.)

Fayetteville

ANDREWS, M. P. INC., 319 Mott Rd., (315) 637-3144. TWX: 710-545-0242.
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 3)
Services: Direct Mail

(See Advertisement Page 3260)

COMPONENTS FOR INDUSTRY, 416 Franklin St., (315) 637-9601.
Branch: 22 Biscayne Dr., Lancaster, N.Y., (716) 684-6336.
Factories: Accuride; Ampex; Avco; CuTronics; Digitron; Instrulab; JFD; Marshall R & D; MB Elctrns.; Optron; Rotary Co.; Sensotec; Sanders Assoc.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

JACKSON, R. W. CO., INC. (See Buffalo, N.Y.)

JOHNSON, H. C. AGENCIES, INC. (See Rochester, N.Y.)

MITSCHER, R. W. CO., INC. (See Buffalo, N.Y.)

Flushing

BETTAN, M. SALES INC., 77-15 164th St., (212) 657-6659.
Factories: JFD Elctrns.; Linear Sys.; Monarch Elctrns.; Robins Inds.; Telex Comm.; TRIEX Tower; University Sound. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 4

Forest Hills

MILLER, J. CO., 1 Continental Ave., (212) 263-4446.
Factories: Farmer Elec. Prods.; PMF Elctrns.; Synchro-Start Prods. **Services:** Warehouse, Direct Mail
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Freeport

BERLIANT ASSOCS., 39 St. Mary Pl., (516) TN 8-9106.
Branch: 1024 Garden Pl., Baldwin, N.Y., (516) TN 8-9106.
Factories: Component Specialties; Computrain; Dow-Corning; Ed-Berl Prods. **Salesmen:** 4 (eng 1)
Selling To: ★ A,D,I. **Services:** Warehouse, Repair

Garden City

BACH SALES CORP., 78 Wellington Rd., (212) 687-1240.
Branch: 1 E. 42 St., New York, N.Y., (212) 687-1240.
Factories: Epicure Prods.; Koss Elctrns.; Revox Corp.; Sinclair Audionics. **Services:** Warehouse
Selling To: ★ A. **Salesman:** 1 (eng 1)

COMTRONIC ASSOCS., 370 Old Country Rd., (516) 741-8966. TWX: 510-222-7276.
Factories: Bulova Watch Co.; Components; Electro Cube; Globe Inds.; Potter & Brumfield; RCL Elctrns.; United Transformer **Selling To:** ★ A,D,I,M. **Salesmen:** 8 (eng 7)

FRIEDMAN ASSOCS. INC. (See E. Orange, N.J.)

Geneva

SOMERS, J. F. CO., 527 So. Main St., (315) 789-7938.
Factories: Audiosears; New Haven Wire & Cable; Plastic Wire & Cable. **Selling To:** ★ A,I,D. **Salesman:** 1 (eng 1)

Glen Cove

GLASSMAN, S. ASSOC. INC., 28 Prestwick Terr., (516) 676-1039.
Branch: 326 Hillside Ave., Nutley, N.J., (201) 667-0563.
Factories: Audio Accessories; Current; Edal Inds.; General Reed.; Polyphase Instr.; Schrack Electrical Sls.; A.T.Wall. **Selling To:** ★ A,D,I,M. **Salesmen:** 3 (eng 2)

SCOTT, G. G. CO., 6 W. Stuart Dr., (516) 676-2088.
Factories: Douglas-Stemac; Emporium Specialties; Rayseel; Tau Elctrns. Prods.; Willington Name Plates.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Grand Island

McTAGGART, L. J. ASSOCS. (See Buffalo, N.Y.)

Great Neck

BREUER, R. E. CO., INC., 1 Barstow Rd., (516) 466-3030. TWX: 510-223-0886.
Factories: Able Displays; Advance Ross Elctrns.; Aeronautical Elec.; Columbia Elctrns.; Croname Inc.; Diemolding Corp.; Electrical Windings; Hubbard Inds.; Int'l. Electro Exchange; New-Berg Leather Prods.; Quam-Nichols; Syncro Capacitor; Telefunken Sls.
Selling To: ★ A,I. **Salesmen:** 5

E.R.A. INC., 330 Great Neck Rd., (516) HU 2-9320. TWX: 510-223-0836.
Factories: A.D.C. Prods.; Barry Controls; Cambridge Thermionic; Churchill Corp.; Dexon Inc.; Display Devices; Eastern Reproduction; E.R.A. Transpac; Industrial Elctrns.; Microwave Assocs.; Shallcross Corp.; U.S. Capacitor; Wakefield Engrg.
Selling To: ★ I,D,M. **Salesmen:** 10 (eng 8)

EASTERN INSTR., INC. (See Philadelphia, Pa.)

GRAYDON-SHERMAN, INC. (See Morristown, N.J.)

HARRIS & ALDRICH SLS., INC., 320 Northern Blvd., (516) 466-4122.
Factories: Baker Mfg.; C. Cordover; EBY Sls.; Electro-Mechanical Instr.; Master Appliance; Philmore Mfg.; Premier Metal Prods.; Waber Elctrns.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)

INDUSTRON ASSOCS. INC., 300 Northern Blvd., (516) HU 7-2620.
Factories: Carver; Chemflex; Control Data; Digital Data Sys.; Industrial Test Equip.; Test Equip.; 3M Co.; Transval Elctrns.; Universal Elctrns.; UREI; Y-Labs.
Selling To: ★ I,M.

MEASUREMENT TECHNOLOGY INC., 295 Northern Blvd., (516) 482-3500. TWX: 510-223-0846.
Factories: Brush Instrs.; Cimron; Cipher Data Prods.; Data Device; Datacraft; Datametrics; Digital Apparatus;

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Selling To: ★ A,I,D,M. **Salesmen:** 5 (eng 4)

(See Advertisement This Page)

PACENT ENGRG. CORP., 300 Northern Blvd., (516) 482-4678.
Factories: American Rotors; Ammon Instrs.; Ballastran; Lamination Specialties; Olsen Magnetic; Pellfacs; Tepro; Viking Wire. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 2)

SCIENTIFIC SYSTEMS SLS. VRP., 376 Great Neck Rd., (516) 466-0053.
Branch: 7705 Georgia Av. N.W., Washington, D.C., (202) 726-4161.
Factories: Alpha Scientific Labs.; Astro Inds.; Cintra; Cooke Vacuum Prods.; Cryogenic Assoc.; Infrared Inds.; Korad; LeCroy Research Sys.; Mech Tronics Nuclear; Northern Scientific; Optics Technology; Princeton Gamma Tech; Tem-Pres.
Selling To: ★ I,M. **Salesmen:** 6 (eng 2)

SYLVESTER F. F. ASSOCS. (See Springfield, N.J.)

TYLINSKI, F. CO. INC., 338 Northern Blvd., (516) 466-9070.
Factories: Astro Circuits; Chemelec Prods.; Douglas Randall; Electro Switch; Fork Standards; Grayhill; National Radio; Ripley Co.; C. R. Snelgrove; Tech Tran; Weller Elec.; Wood Elec.
Selling To: ★ I,D. **Salesmen:** 4 (eng 3)

VPI ASSOC., INC. (See Laurel, Md.)

Greenvale

AARON, B. D. & CO. INC., 55 Northern Blvd., (516) 621-0630.
Factories: Avien; Cermetek; Conductron; Curtis Instrs.; Deltron; E G G; Intradyne Sys.; General Microwave; Sawyer Assocs.; Texscan.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Hamburg

LSM ASSOCS. (See Phelps, N.Y.)

Hartsdale

COMPONENTS SLS. CORP., 221 E. Hartsdale Ave., (914) 725-1050.
Branch: 789 Massachusetts Ave., Lexington, Mass., (617) 862-1633.
Factories: Advanced Space Age Prods.; Computer Accessories; Custom Computer Sys.; Datran Corp.; Digitronics; Dressen Barnes Elctrns.; Houston Scientific Inds.; Power Instrs.; Precision Mechanisms; Science Accessories; Tasker Inds.; Transducer Technology; Sensor Corp. **Selling To:** ★ I,M. **Salesmen:** 5 (eng 5)

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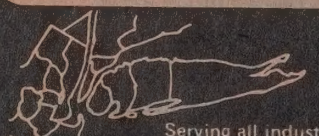

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KAHGAN SLS. CORP., 556 Peninsula Blvd., (516) 538-2300.
Factories: Amperex Elctrns.; Bel Fuse; Bulova; Computer Diode; Ferroxcube; Grand Transformer; Sensitron.
Selling To: ★ A,D,I,M. **Salesmen:** 6 (eng 6)
Services: Warehouse

KUBRICK, D. CO., 456 So. Franklin St., (516) IV 3-7230, 3-4276.
Factories: Adler Mfg.; Intratec; Patson; Polaris; S & A.
Selling To: ★ A,I,D. **Salesmen:** 3 (eng 3)

Hicksville

EMEC INC., Box 217, (516) 931-3700.
Factories: Air-Vac; Applied Microwave Lab.; Applied Research; ARRA Inc.; Astro Elctrns.; Auricord; Barker & Williamson; Computer Conv.; Control Elctrns.; DeVale, Inc.; FAM Engrg.; Hades Mfg. Co.; Herley Inds.; Hydrospace Elctrns. & Instr.; LAD Elctro-Sys.; MCG Elctrns.; MercTronic Instrs.; Microwave Magnetics; Nanosecond Sys.; Nelson-Ross Elctrns.; Optimax; Ostronics Inc.; Premier Metal Prods.; Radair Inc.; Ramcor Inc.; Roblex Inds.; Sonar Radio Corp.; Spacekom Inc.; Sun-Lite Electro; ISC/Telephonics; Teledata Inc.; Topper Mfg.; Towner Sys.; Trio Labs.; Unico Controls; UNIGEN; Western Elctrn. Prods.
Selling To: ★ I,M. **Services:** Repair

SALSBURY ASSOCS. INC., 331 W. John St., (516) 938-1080. TWX: 510-221-1887.
Factories: Americon; Applied Research; Control Equip.; Ferrotec; Intech; Int'l. Components; Micro-Power; Microwave Dev. Labs.; Spectrum Technology; Vari-L.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Direct Mail.

Huntington

ANDREWS & ANDREWS, INC., 140 E. Main St., (516) 692-8686.
Branch: 44 N. Dean St., Englewood, N.J., (209) 699-8800.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)
Services: Warehouse

AUTOMATION SALES, INC., Box 448, (516) 692-6207.
Factories: Automated Computer Entry Sys.; Automated Production; Chuxco Inc.; Controlamation; Elctrn. Tab Services; J. C. Assocs.; M.I.S. Centers; Microwave Integrated Circuits; Tek-Com.
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

CDB ENTERPRISES, INC., 675 W. Jericho Turnpike, (516) 692-5200.
Branch: 26 Haddon Ave., Camden, N.J., (609) WO 3-9164.
Factories: Antekna; Diamond Antenna & Microwave Corp.; Fairchild Microwave & Optoelectronics; G-L Microwave; B. F. Goodrich; Graylex Inds.; Lad Elctrns.; Metcom; Micro-Tel; Mini-Circuits Labs.; Nytek Elctrns.; Premier Microwave; TRG, Inc.; Trylon; Denelcor; Graylex Ind.; Hydro Prods.; Martek Instrs.; Ocean Research Equip.; Varadyne Instr.; Fenwal Elctrns.; Electronic & Oceanographic. **Selling To:** ★ I,D,M. **Salesmen:** 5 (eng 5)

(See Advertisement Page 3261)

MAYER, C. R. THE, CO., INC., Box 152, (516) 921-7876.
Factories: Atomicitron; FKS Communications; Freqeuncy Elctrns.; Mid-Eastern Inds.; Robinson-Nugent; Thermalloy; Transitron.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

Huntington Station

DATA-REP ASSOCS., INC. (See Rockaway, N.J.)

GRAY & REED ASSOCS., INC., 9 Dunford St., (516) GE 3-3333.
Branch: 626 Hillcrest Ave., Westfield, N.J., (201) 233-6116.
Factories: Addington Labs.; Aertech Inds.; Eastern Microwave; EIP Labs; EMC Technology; Hitachi Millimeter; Keltec Florida; Lark Engrg.; Microwave Semiconductor; M.O. Valve; Narda Microwave; Penninsula Microwave Labs.; RFD Inc.; Werlatone Engrg.; Wiltron; Yigtek. **Selling To:** ★ I,M. **Salesmen:** 4 (eng 4)

Hyde Park

KENNEDY, R. P. CO., INC. (See Rochester, N.Y.)

Irvington

SHPRENTZ, H. CO., 126 Deertrack Lane, (914) 591-7970.
Factories: Ablestik Adhesive; Thomas B. Moore.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Ithaca

BOB DEAN INC., 714 W. Clinton, (607) 272-2187. TWX: 510-255-5876.
Factories: American Technical Ceramics; Captor Corp.; Components Inc.; Coors Porcelain; Grayhill Inc.; Intersil; Isofilm Int'l.; Mepco Inc.; New England Instr.; Stow Labs.; United Transformer; Varo Semi; Wheelock Signals.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)
Services: Warehouse

Jackson Heights

LANDIS, C. SLS. CO., 34-28 80th St., (212) 458-7900.
Factories: British Aircraft; Seco Elctrns.; Universal Mfg.; Vernitron Electrical Components.
Selling To: ★ I,D. **Salesmen:** 1

Jamaica

KAGAN, H. ASSOCS. (See Wayne, N.J.)

S.A.M. ASSOCS. INC., 150-08 87th Ave., (212) 658-8881.
Branch: 18 Tilghman Dr., Wayne, N.J., (201) 684-7682.
Factories: Applied Design; Chicago Dynamic Inds.; Goldsman Inc.; Milwaukee Transformer; Printact Relay.
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 2)

S-J SALES ASSOCS. INC., 148-05 Archer Ave., (212) 291-3232. TWX: 710-582-2635.
Factories: CTS; H.H. Eby; Quality Trans.; Solitron Devices; Stewart Warner Microcircuits; STM; VID Elctrns.; Wabco Relays. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 8 (eng 6)

Jericho

DAL-TECH DEVICES INC., 366 No. Broadway, (516) 433-7448.
Factories: Anzac Elctrns.; Applied Technology; Atlantic Microwave; ESCA; Filmohm; General RF Fittings; Electrotec; Lundy RFI Filter Div.; Melabs; Solitron Microwave Semiconductors; Solitron RF Transistors; Plaxial Cable; Royal Microwave.
Selling To: ★ I,M,D. **Salesmen:** 3 (eng 2)
Services: Warehouse, Distributor

MILLER, G. E. ASSOC. LTD., Box 95, (212) 586-4780.
Branch: 28 Knollwood Ave., Stamford, Conn., (203) 329-9174.
Factories: AIWF Wireless Microphones; Bell & Howell Magnetic Tape; Mortronics; Picker-Briggs; Pioneer Elctrns.; Tandberg; Tapeathon; Trutone Elctrns.
Selling To: ★ A,D,I. **Salesmen:** 3

WILD, J. J. INC., 400 Jericho Tpke., (516) WE 5-6600.
Branches: 400 Jericho Tnpke., Jericho, N.Y., (516) 921-7100; 80 Second St. Pike, Southampton, Pa., (215) 357-6645; 570 Hillside Ave., Needham, Mass., (617) 444-2366; Box 266, Hastings-on-Hudson, N.Y., (914) 963-3803; Box 152, East Brunswick, N.J., (201) 238-0055; 380 Main St., Laurel, Md., (301) 776-7670.
Factories: American Regitel; Bliley Elec.; Cambridge Memories; Chrono-Log; Cognitronics; Concord Control; Decitek; Digital Devices Div.; GDI; Houston Instr.; Information Data Sys.; Information Tech.; Mac Panel; Microdyne; Optical Memory Sys.; Seggos Inds.; Ultronic Sys.; Wang Computer Prods.
Salesmen: 8 (eng 8)

METRO TECH. SLS. CORP., 333 North Broadway, (516) 935-3330. TWX: 510-221-1829.
Branch: 39 Bluefield Ave., Harrington Park, N.J., (201) 768-8495.
Factories: Astrodyne; Balco Capacitors; Computer Instrs.; CuTronics; E-Tronics; Inter-Market; Int'l. Elctrns.; Marstan Resistors; Nucleonic Prods.; Shelly Assocs.; Verntron. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 3)

Jonesville

LABRONICS, INC. (See Syracuse, N.Y.)

Kenmore

LAMB, R. F. CO., INC., 1865 Kenmore Ave., (716) 874-4900. TWX: 710-522-1808.
Branches: 63 Norcrest Dr., Rochester, N.Y., (716) 544-5580; E. Molloy Rd., Syracuse, N.Y., (315) 454-2469; Box 661, Uptown St., Kingston, N.Y., (914) 338-8833.
Factories: Agastat Div.; Beckman Instr.; Delta Design; EG & G; Esterline Angus Instr.; Fenwal; Guildline Instr.; Holtzer-Cabot; Ircon; Potter Brumfield.
Selling To: ★ I,D. **Salesmen:** 9 (eng 8)
Services: Repair, Warehouse

SIMBERKOFF SLS., INC. (See So. Orange, N.J.)

Kingston

LAMB, R. F. CO., INC. (See Kenmore, N.Y.)

SIMBERKOFF SLS., INC. (See So. Orange, N.J.)

Lake Grove

GOUDY, W. H. ASSOCS., Box 15, (516) 585-0033.
Factories: Forbes & Wagner; Landis & Gyr; Monolithic Dielectrics; Transene.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Lancaster

COMPONENTS FOR INDUSTRY (See Fayetteville, N.Y.)

Larchmont

FREED, L. & CO., Box 417, (914) 834-6510, 834-6511.
Factories: Gavitt Wire & Cable; Quincy Speaker; Sterling Mfg.; W. Tell Woodcrafters; Wirecraft Prods.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Latham

CARSE, THOS. SLS. CO., INC., P.O. Box 71, (518) 785-5844.
Factories: Delavan Mfg.; Hurst Mfg.; Partlow Corp.; Potter & Brumfield; States Co.; Sticht, H. H. CO.; Vap-Air Div.; Western Electro-Mechanical; Williamson Corp.
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

Little Neck

MILLER, B., Box 72, Little Neck, N.Y., (212) BA 9-5769.
Selling To: ★ I.

Liverpool

CAIN & CO. (See Los Angeles, Calif.)

COMPAR ALBANY, INC. (See Albany, N.Y.)

COMPAR CORP. (See Burlingame, Calif.)

J. BROWN ELCTRNS. SLS. REPS. INC. (See Yonkers, N.Y.)

VARRELMAN-GORMAN CO. (See Livingston, N.J.)

WADSWORTH MFG. ASSOC., INC., 183 Buckley Rd.
Branches: 12 Jamstead Ct., Williamsville, N.Y., (716) 634-8650; 1429 N. Halem Ave., Oak Park, Ill., (312) 848-2560; 201 South Dorothy Dr., Richardson, Tex., (214) 231-1805; 15920 Temecula St., Pacific Palisades, Calif., (213) GL 4-4313; H. Duane Wadsworth, 71 Parker Ave., Atherton, Calif., (415) 321-3619.

Factories: Beckwith Carbon; Carler Prods.; Ceramic Magnetics; Ceramaseal; Continental Device; Diamonite Prods. Mfg.; Metal Cutting; Monolith; Multi-Circuits; National Ceramic Co.; Quality Components; Star Photofabrication; D. M. Steward Mfg.; Truck-Lite; Warren Components; Western Scientific Apparatus.
Selling To: ★ I. **Salesmen:** 9 (eng 5)
Services: Warehouse

Lockport

SIMBERKOFF SLS. INC. (See So. Orange, N.J.)

Long Island City

BIALEK, S. ASSOCS., INC., 29-28 41st Ave., (212) 786-5562.
Factories: Anderson Elctrns.; Columbia Wire Prods.; Rola; Rtron Corp.; Standard Condenser; Winatic Corp.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 1)

TOBIAS & CO., INC., 49-01 31st Ave., (212) 726-4551.
Factories: Empro Mfg.; J-B-T Instrs.; Pomona Elctrns.; Schauer Mfg.; Shurite Meters; Triplett; Vamistor.
Selling To: ★ A,D,I,M. **Salesmen:** 4
Services: Repair, Warehouse

Lynbrook

BITTAN ASSOCS., INC., 381 Sunrise Hwy., (516) 593-3833. TWX: 510-225-8429.
Factories: Alco Elctrn. Prods.; Bramco Controls Div.; Electroid Corp.; Instrument Displays; Keystone Carbon; Rye Inds.; Spectrol Elctrns.; Tel Labs, Inc.; Ungar Div.; Vitramon; Welwyn Int'l.
Selling To: ★ A,D,I,M. **Salesmen:** 8

PULEO ELCTRNS. INC., 39 Hutcheson Pl., (516) 599-4875. TWX: 510-225-8440.
Factories: Cushman Elctrns.; Secode Elctrns.; Quindox Elctrns. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 2 (eng 1)

Malverne

ERDE-HAVILAND ASSOCS., INC., 333 Hempstead Ave., (516) 599-6500.
Factories: GBC CCTV Corp.; Satchell Carlson; H. Wilson.
Selling To: ★ A,D,I,M. **Salesmen:** 2
Services: Warehouse, Repair

Mamaroneck

CANE TECHNICAL SLS., INC., 555 E. Boston Post Rd., (914) 698-4411. TWX: 710-566-1113.
Factories: Astrocom Corp.; American Time Prods.; F. W. Bell; Bourns; Columbia Research Labs.; Control Data; Data Action; Datanetics; Ideal Precision Meter Corp.; Varisystems Corp. **Salesmen:** 4 (eng 4)
Selling To: ★ I,M. **Services:** Warehouse, Mailing Lists

Manhasset

SPELLMAN, F. CO., 1295 Northern Blvd., (516) MA 7-3399.
Selling To: ★ A,I,D,M. **Salesmen:** 2 (eng 1)

HRC ASSOCS., 390 Plandome Rd., (516) 627-4644.
Factories: Dynage; Elec-Trol; Korry Mfg.; McGraw-Edison; Nu-Devices; Thos. & Betts Co.
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 3)

KAELBER & MACK INC., 75 Plandome Rd., Box 796.
Branch: 37 Hillcrest Rd., Wakefield, Mass., (617) 245-9359.
Factories: Amer. Elec. Heater; Dale Elctrns.; De Wire Fabricating; Industry Devices; Thermal Eldc. & Wire; Thermotech Ind.; Thomas & Skinner.
Selling To: ★ I,D. **Salesmen:** 5 (eng 3)

MARCHAND-FARA (See Cranford, N.J.)

NORTHEAST ENGRG., INC. (See Hamden, Conn.)

Manlius

CALLAHN-FERGUSON CO. (See Camillus, N.Y.)

J. LAZOR ASSOCS., INC. (See Rochester, N.Y.)

PERKINS, A. L. CO., Kinlock Plaza, (315) 682-5005.
Branch: 256 Congdon Rd., Williamson, N.Y., (716) 544-8581.
Factories: Dialight; Ideal Precision Meter; Leecraft Mfg.; Microtran; Precision Connector Dic-Transistron; Republic Elctrns./MUCON; Wesco Electrical
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)
Services: Warehouse

Mattydale

ONYX, W. M. CO. (See DeWitt, N.Y.)

Mineola

COLUCCI, R. A. CO., 230 Mineola Blvd., (516) 746-0397.
Factories: Penntube Plastics; Potter Co.; Spectron Glass & Elctrns. **Selling To:** ★ I,D,M. **Salesmen:** 2 (eng 1)

Mount Vernon

BURLINGAME ASSOCS., LTD., 510 S. Fulton Ave., (914) 664-7530. TWX: 710-562-0150.
Branches: 1749 Rockville Pike, Rockville, Md., (301) 881-5525. TWX: 710-828-0874; 1 Belmont Ave., Bala Cynwyd, Penna., (215) 835-2080. TWX: 510-662-5685; E. Molloy Rd., Syracuse, N.Y., (315) 454-2408. TWX: 710-541-0445; 7 Wellington St., Waltham, Mass., (617) 894-1955. TWX: 710-324-0687.
Factories: Beckman Instrs.; Bright Ind.; Control Sys. Research; Data Dynamics; Data Memory; Data Sys., Div.; Dixson; Data Royal; General Microwave; Japanese Prods.; Listening, Inc.; Lorch Elctrns.; Lorch/Adret; Multimetrics Inc.; NJE Corp.; Sub. Condec Corp.; Ray Proof Corp.; Scientific Leasing Svcs.
Selling To: ★ I,M. **Salesmen:** 20 (eng 20)
Services: Repair, Sales/calibration

FRIEDMAN-SMITH ELCTRNS. SLS. INC., 519 S. 5th Ave., (914) 664-4866.
Factories: APM-Hexseal; ASC Microelectronics; Digilog Elctrns.; ETC Inc.; TEC, Inc.; Teledyne Relays; Torsion Balance; Truco; Whitso.
Selling To: ★ I,D. **Salesmen:** 4 (eng 4)

(See Advertisement Page 3261)

GROSSMAN, H. ASSOCS., 519 S. Fifth Ave.
Factories: HGA/Transtech; Picot; Transtech; Zolomatics.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)
Services: Repair, Warehouse

Q.E.D. ELECTRONICS, INC., 500 Nuber Ave., (914) 664-0080. TWX: 710-560-0014.
Branches: 2916 Federal St., Camden, N.J., (215) 925-8711. TWX: 710-891-7070; 880 Bonifant St., Silver Spring, Md., (301) 588-8134. TWX: 710-825-0073.
Factories: Beckman Instrs.; Burr-Brown Research; Chronetics; Dynamics Research; Equipto Elctrns.; General Resistance; Hallmark Standards; Isofilm Int'l.; Millivac Instrs.; Power Designs; Printed Motors; Signetics; Weston Instrs.
Selling To: ★ I,M. **Salesmen:** 13 (eng 13)

(See Advertisement This Page)

SONKIN, D. ASSOCS., INC., 10 Fiske Pl., (914) 668-9809.
Factories: Augat, Inc.; C & K Components; Dixson; Electro-Mechanical Instr.; Griffith Plastic Prods.; Hi-Tek; Litton-Data Sys. Div.; Merrimack Magnetics; Premier Metal Prods. **Services:** Mailing
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

(See Advertisement Page 3264)

New Hartford

REAGAN, J. A. CO., INC. (See Albany, N.Y.)

New Hyde Park

LUCE, R. P. & CO., INC. (See Berkeley Hghts., N.Y.)

New York

APPELL, L. W. CO., INC., 11 Warren St., (212) WO 4-4255.
Factories: Columbian Vise & Mfg.; Ennis Mfg.; Kedman Co.; Slaymaker Lock; Ungar Div.; Xcelite.
Selling To: ★ D. **Salesmen:** 4

BACH SALES CORP. (See Garden City, N.Y.)

CAMBER, M., 1700 York Ave., (212) 369-4222.
Factories: General Instr.; Nytronics; Merit Coil & Transf.; Varian Devices. **Selling To:** ★ A,D,I,M. **Salesmen:** 2

GINSBURY, S. LTD., 425 Park Ave. South, (212) 689-5212.
Branch: Zanglweg 20, Munich, W. Germany.
Factories: Arnold Engrg.; C-Cor Elctrns.; Clairex; Dynamic Research; Electro Prods. Labs.; General Microwave; Kelvin; Lavoie Labs. Div.; McCoy Elctrns.; Measurements; Methode Mfg.; Quan-Tech Labs.; Radio Research; Solar Sys.; Specific Prods.; Syntronic Instrs.; Technitrol; Thomas Elctrns.; Vari-L Co.; Venus Scientific; Waveline. **Selling To:** ★ I. **Salesmen:** 4

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GLASS, E. ASSOC., 250 W. 57th St., (212) 586-8440.
Factories: American Components; Gudeman; Gulton Inds.; Microtran; National Capacitor; Sloan; Sage Elctrns.; Sherrold Crystals; Tyco Labs.
Selling To: ★ A,I,M. **Salesmen:** 5 (eng 5)

HABER-RAMP CORP., THE, 2315 Broadway, (212) 799-4040.
Factories: Avid Corp.; Eastern Air Devices; Electro Vision Inds.; Gould Instrs. Divs.; Norden; Planet Instrs.
Selling To: ★ I,D. **Salesmen:** 3 (eng 3)

K L S ASSOCS. (See Fairfield, N.J.)

KELLER, L. W. & ASSOCS., INC. (See No. Bellmore, N.Y.)

METROREP, INC. (See Freehold, N.J.)

MORHAN EXPORTING CORP., 458 Broadway, (212) 925-1257.
Factories: Ava Elctrn. & Mach.; Ampex Stereo; B & K Mfg.; Bowman Leisure Inds.; Commander; Freed Transformer; Grommes/Precision Elctrns.; Irish Tape; Mortone Magnetics; NT•T Sls.; Precision Apparatus; H. H. Smith; Supreme Publications; Recordex; Tech Spray; Terado; Trusonic Audio; Tung-Sol Elec.; Utah Elctrns.; Walco Elctrns. **Services:** Warehouse, Sales
Selling To: ★ A,D,I,M. **Salesmen:** 20

MORSE, I. SLS., 150 Broadway, (212) 267-2913.
Factories: Electro-Mel Inds.; Engrg. & Elctrn. Devices; Imtra; Hunter Tools; M. & M. Metal Prods.; Philmore Mfg.; Renco Elctrns. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

NEWHOPE CORP., 6 East 39th St., (212) 532-7372.
Factories: Centralab Distributor Div.; Duotone; Krylon; North American Philips; Vidaire Elctrns.
Selling To: ★ A,D. **Salesmen:** 4 (eng 1)

NUMAR CORP., 242 W. 30th St., (212) LA 4-4411.
Factory: Minionics. **Services:** Repair, Warehouse
Selling To: ★ A,I,M. **Salesmen:** 12 (eng 8)

PLASENCIA, J. INC., 521 Fifth Ave., (212) 867-8084.
Factories: Alliance Mfg.; F. W. Bell; Dytronics; Miratel Div.; Semper Seal; Sinclair Radio Labs.; Superior Continental; Technical Appliance.
Selling To: ★ I,D,M. **Salesmen:** 50 (eng 50)

ROBURN AGENCIES, INC., 349 W 14th St., (212) 989-5939.
Factories: Argos Prods.; Astatic; ATR Elctrns.; Becker Elctrns.; Bevin-Wilcox Line; Chemtronics; Continental-Wirt Elctrns.; Daburn Elctrns. & Cable; Dialight; Dialtron; Dynavox; Eico Elctrn. Instr.; Fanon-Masco; Hudson Lamps; Jersey Specialty; E. F. Johnson; Leecraft Mfg.; Mellotone; Memcor/Tru-Ohm/Hardwick Hindle; Metra Elctrns.; J. W. Miller; New-Tronics; Oxford Elec.; Parker Metal Goods; Petersen Radio; RBM Controls; RMS Elctrns.; H. W. Sams; Semitronics; Stancor; Tenna Mfg.; University Sound. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 35 (eng 20)

ROWLAND, E. W. ASSOCS., 132 Nassau St., (212) 964-7188
Factories: B/W Controller; Madison Elec. Prods.; Precision Prods. & Controls.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

SAFTLER, P. ASSOC., INC., 157 W. 57th St., (212) 247-3855. TWX: 710-581-5887.
Branch: 2450 West Side Dr., Rochester, N.Y., (716) 594-9683.
Factories: All Star Prod.; Buckeye Stamping; J. Fluke Mfg.; General Ind.; Lion Cords; McGregor Elctrn. Ind.; Molex Prod.; Power Components; Richco Plastic; Sightmaster; Solar Mount. **Services:** ★ I.

SMITH, H. F., 259 W. 14th St., Room 1515, (212) CH 2-2398
Factories: Drake Mfg.; Katolight; Trimm.
Selling To: ★ A,D,I,M. **Salesmen:** 2 (eng 1)

SWEDGAL, M., 258 Broadway, (212) WO 2-5485.
Factory: Jackson Bros. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 4)

SYMON ASSOCS., 663 Fifth Ave., (212) 757-3638.
Factories: Brooklyn Screw Mach. Prods.; Resistors; Tele-Craft Elctrns. **Selling To:** ★ I. **Salesmen:** 2 (eng 2)

WEISS, W. W. & ASSOCS., 1780 Broadway, (212) 246-5778.
Factories: Fuji Elec.; Hayns Elctrns.; Ka Elctrns.
Selling To: ★ I. **Salesmen:** 5 (eng 3)
Services: Repair

Newburgh

REAGAN, J. A. CO., INC. (See Albany, N.Y.)

North Bellmore

KELLER, L. W. & ASSOCS., INC., 1680 Newbridge Rd., (516) 785-2826.
Branches: 32A Woodedge Ave., Edison, N.J., (516) 785-2826; 111 3rd Ave., N.Y.C., N.Y., (516) 785-2826.
Factories: Arista Enterprises; Columbia Elctrn. Cable; Component Specialties; Finney; I.E.C.; Maximus Sound; NT•T; Sencore; Tech Spray; Telephone Dynamics.
Selling To: ★ A,D. **Services:** Warehouse
Salesmen: 4

North Syracuse

ADVANCED COMPONENTS CORP., INC., Box 248, (315) 699-2671. TWX: 710-541-0439.
Branches: Box B, Utica, N.Y., (317) 736-9195; Box 645, Endicott, N.Y., (607) 785-3191; Box 142, Rochester, N.Y., (716) TU 9-1429.
Factories: Dickson Elctrns.; Discon; Nat'l. Semiconductor; Redcor; Semicon; Signalite; Triad/Utrad; U.S. Capacitor; Weldmatic/Unitek; Zeltek.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)
Services: Repair, Warehouse

NACO ELCTRNS. CORP., Box 248, (315) 699-2651. TWX: 710-541-0439.
Branches: 74 Park Ave., Rochester, N.Y., (716) 244-4720; 2631 Edgewood Rd., Utica, N.Y., (315) 732-1801; 1032 Merlin Dr., Schenectady, N.Y., (518) 785-3750; Poughkeepsie, N.Y., (914) 462-2730; Binghamton, N.Y., (607) 724-8288; Buffalo, N.Y., (716) 836-5108.
Factories: AMCO; Ballantine; Cimron; Cipher; CMC; Dumont; E&M Labs.; Kepco; MEC; PEL; Polarad; SAGE; Tri Data; Tyco; Wavetek; Weinschel.
Selling To: ★ I,M. **Salesmen:** 6 (eng 5)
Services: Repair, Warehouse

LABRONICS, INC. (See Syracuse, N.Y.)

Phelps

LSM ASSOCS., Orchard Park, (315) 548-4891.
Branches: 54 Puritan Pl., Hamburg, N.Y., (716) 649-8380; 218 E. Lake Rd., De Ruyter, N.Y., (315) 662-3296.
Factories: Blonder Tongue Labs.; Centralab; Perma Power; Russell Inds.; Waldom Elctrns.; J W Miller; Robins Inds.; Pickering & Co.; South River Metal; Telex Comm.; Soundolier; Motorola "HEP" Line.
Selling To: ★ A,D. **Salesmen:** 3

Pittsford

MITSCHER, R. W. CO., IND. (See Buffalo, N.Y.)

Plainview

CENTRAL ASSOC., INC. (See Englewood, N.J.)

SBM ASSOCS., INC. (See Rochester, N.Y.)

Pleasantville

SBM ASSOCS., INC. (See Rochester, N.Y.)

Port Washington

AARON, P. D. ASSOCIATES, Box 511, (516) 767-2600. TWX: 510-223-0810.
Factories: Automatic Metal Prods.; Berkshire Elec. Cable; Calvert Elctrn. Int'l.; Heyboer Transformers; Isotronics; Precision Elctrn. Comp.; Tingstol Co.; U.S. Capacitor. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 5 (eng 1)

DiBLASI, J. ASSOC., INC., 14 Vanderventer Ave., (516) 767-0470-1-2.
Factories: Airpax Elctrns.; James Millen Mfg.; Northern States Screw; Singer-Diehl; Three Dimensional Circuits.
Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 2)

RYAN ASSOCS., 60 Rogers Dr., (516) 767-7958.
Branch: Box 444, Elizabeth, N.J.
Factories: Panduit; Synvo; Hammond Mfg.; M H & W Int'l.; Esson Elctrns.; Orbit; Walbern Devices.
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 2)

Poughkeepsie

J. H. ELCTRN. SLS. CO. (See Towson, Md.)

NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)

Red Hook

OSSMANN COMPONENT SLS. CORP. (See Rochester, N.Y.)

Rochester

ADVANCED COMPONENTS CORP. (See No. Syracuse, N.Y.)

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

BROWN, J. ELCTRNS. SLS. REPS. INC. (See Yonkers, N.Y.)

FERGUSON, T. SLS. CO., INC., Box 3893, (716) 482-7757.
Branches: Box 126, Syracuse, N.Y., (315) 446-3330; Box 5146, Albany, N.Y., (518) 869-0405.
Factories: Agastat; Autotron; Dumore Corp.; Electro Craft; Electro Switch; Fuse Indicator Corp.; Icore Inds.; Kanthal Corp.; Midwest Circuits; Rotamel; Wabco Relays.
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)
Services: Warehouse

FLORING, C. W. & MURRAY, H. R., INC. (See Dewitt, N.Y.)

FRANKLIN, W. A. SLS. CORP. (See Syracuse, N.Y.)

GISLASON SLS., INC., 617 Case Bldg., (716) 454-4741. TWX: 510-253-2932.

JOHNSON, H. C. AGENCIES, INC., 111 Mt. Hope Ave., (716) 232-2688.
Branches: 8 Los Robles St., Williamsville, N.Y., (716) 632-7880; Box 215, Fayetteville, N.Y., (315) 637-9383; RD #3, Ballston Lake, N.Y., (518) 9303; 636 Moreland Dr., Pittsburgh, Pa., (412) 923-2877.
Selling To: ★ I,M. **Salesmen:** 6 (eng 4)
Services: Warehouse

KELLER IND. PRODS., INC., 70 Mt. Hope Ave., (716) 546-4313. TELEX: 95-8207.
Branches: 126 Pearl St., Buffalo, N.Y., (716) 852-7212; 3650 James St., Syracuse, N.Y., (315) 437-9195.
Factories: Bowles Fluidics; Carylyle Johnson Machine; Continental Hydraulics; Custom Components Switches; Delta Power Hydraulics; Fairchild Hiller; Fluorocarbon; Lear Siegler; The Marquette Metal Prods.; Parker Hannifin; Westinghouse Elec. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 3 (eng 2)

KENNEDY, R. P. CO., INC., 39 Saginaw Dr., (716) 271-6322.
Branch: Green Tree Dr. N., Hyde Park, N.Y., (914) 229-2269.
Factories: Aladdin/Magnetics Div.; Airflyte Elctrns.; Datatron; Filtron; Fenwal Elctrns.; Ferroxcube; Hamlin; Los Angeles Miniature Lamps; Modutec; Precision Metal; Shelly Assocs.; Technipower; Unholtz-Dickie; Whittaker, ISD. **Selling To:** ★ I. **Salesmen:** 3 (eng 2)

KIRSH, P. L. ASSOC., 223 Windemere Rd., (716) 288-0705.
Factories: Ametok; Hitemp Wires; Greenfield Elctrns.; Ottawa Rubber; Tuttle Elec. Prods.
Selling To: ★ I. **Salesman:** 1 (eng 1)

LAMB, R. F. CO., INC. (See Kenmore, N.Y.)

LAZOR, J. ASSOCS., INC., 39 Saginaw Dr., (716) 473-8336.
Branch: Stoneledge Lane, Manlius, N.Y., (315) 682-9700.
Factories: Bendix; Carborundum; Syntron; Tensolite.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)
Services: Warehouse

MARSEY SLS. INC., 206 Park Ave., (716) 442-9700.
Factories: Alpha Wire; Bud Radio; Empire Scientific; Hammarlund Mfg.; Kurz-Kasch; Loral Distributor Prods.; Merit Coil & Transformer; Turner.
Selling To: ★ A,I,D. **Salesmen:** 3 (eng 1)
Services: Limited Warehouse

NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)

OSSMANN COMPONENT SLS. CORP., 39 Saginaw Dr., (716) 442-3290. TWX: 510-253-7685.
Branches: 132 Pickard Bldg., Syracuse, N.Y., (315) 454-4477. TWX: 710-541-1522; 1911 Vestal Pkway. E., Vestal, N.Y., (607) 785-9949. TWX: 510-252-1987; 77 Kelly Rd., Red Hook, N.Y., (914) 297-7773.
Factories: Avantek; Babcock Relays; Beede Electrical Instr.; Curtis Dev. & Mfg.; Deltron; Fairchild Controls; Frequency Elctrns.; Helipot Div.; Industrial Elctrn. Engrgs.; Microlab/FXR; Pyrofilm Resistor; TEL Labs.; Sibley Co.; Vemaline Prods.; Western Microwave Labs. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 8 (eng 4)

OSSMANN INSTRS., INC. (See E. Syracuse, N.Y.)

REAGAN, J. A., CO., INC. (See Albany, N.Y.)

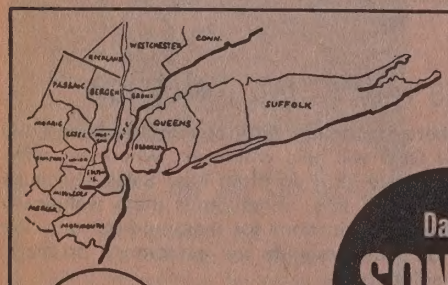
RYERSON, J. D. ASSOC. INC., Box 8369, (716) 442-1900.
Branches: Box 1400, Syracuse, N.Y., (315) 656-7419; Box 124, Williamsville, N.Y., (716) 634-4500; Box 537, Albany, N.Y., (518) 869-3806.
Factories: Cal-Power; Cermetek; Data Instrs. Div.; Daytronic; Dynamic System Elctrns.; Gertsch Div.; Merrimac Research & Dev.; Microwave Circuits; Multa Circuits; N H Research; Nuclear; Radix Elctrns.; Xenon. **Selling To:** ★ A,I,M. **Salesmen:** 5 (eng 5)

SAFTLER, P. ASSOC., INC. (See New York, N.Y.)

SBM ASSOCS., INC., 45-15 Culver Rd., (716) 266-1400. TWX: 510-253-6145.
Branches: 1519-A Stuyvesant Ave., Union, N.J., (201) 687-8737. TWX: 710-985-4720; 28 Hobby St., Pleasantville, N.Y., (914) RO 9-1811. TWX: 710-572-2193; 528 Old Country Rd., Plainview, N.Y., (516) 433-1421; 5858 E. Molloy Rd., Syracuse, N.Y., (315) 454-9377.
Factories: Automated Measurements Corp.; Automation Dynamics; B & F Instr.; Birtcher; Boonton Elctrns.; CINTRA; E-H Research Labs.; Eldorado Electrodata; J. Fluke Mfg.; Incre-Data; Kennedy; Optimation; Neff Instr.; Raytheon; RF Communications; Spiras Sys.; Tally; Typagraph; Valtec; Varian Aerograph Div.; Varian Electrographics Div. **Services:** Repair
Selling To: ★ I,D,M. **Salesmen:** 12 (eng 12)

SCHMITZ BROS., INC., 82 St. Paul St., (716) 546-7628.
Factories: Atlas Asbestos; Bentley-Harris Mfg.; J. C. Dolph; Keene; Superior Carbon Prods., Inc.
Selling To: ★ I. **Salesmen:** 4

SCHOMBURG, E. J. CO., Box 8464, (716) 244-0920.
Factories: Columbus Elec. Mfg.; Morganite; Oak Mfg.; Planet Mfg.; Zaring Inds. **Salesman:** 1
Selling To: ★ I,M. **Services:** Warehouse, Stocking



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TAYLOR, D. A. INC., 2019 Hudson Ave., (716) 342-8881.
Factories: Cooke Engrg.; Product Designs; Sicho Instrs.; Tyton. **Selling To:** ★ I,D. **Salesmen:** 2 (eng 2)

TAYLOR F. W. CO. INC. (See Dewitt, N.Y.)

TOLLEFSON, B. H. ASSOC., INC., 110 Allen Creek Rd., (716) 271-4141.
Branches: Box 247, Alexander, N.Y., (716) 591-1219; Box 142, W. Winfield, N.Y., (315) 822-5647; Box 147, East Syracuse, N.Y., (315) 463-4507.
Factories: Ashland Elec.; Chester Cable; Drake Mfg.; Harbour Inds.; Kent; LRC Elctrns.; Merkle-Korff Gear; Spectrum Control; Vernitron Elec. Comp.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 2)

YOUNG, F., ASSOCS. INC., 555 Winton Rd., N., (716) 482-1555.
Factories: Circuit-Wise; Data Numerics; H. H. Eby; Electro Connective Sys.; Singer GPL Lab.; Microsonics Div.; Precision Elctrns.; Reed Switch Dev.; Shallcross Mfg. Div.; Solid State Scientific; Systems Enclosures.
Selling To: ★ I. **Salesmen:** 3 (eng 2)

ZIMMERMAN W. H., INC. (See Syracuse, N.Y.)

Rockville Centre

GREENBERG, J. & ASSOCS., 100 N. Village Ave., (516) 678-3668.
Factories: Altec-Lansing; Automatic Radio; Fedtro; Regency; Shepherd. **Services:** Warehous
Selling To: ★ A,D. **Salesmen:** 3 (eng 1)

WILLGOLD ELCTRN. SLS. CORP., 100 N. Village Ave., (516) 764-4022. TWX: 510-225-7501.
Factories: Bud Radio; Chomerics; Comar Elec.; Control Data Connector; Electro-Sonics; Glenair; Hermetic Seal; Premak Prods.; Rodale Mfg.; Tresco, Anaydin; Turner; Underwriters Safety Device.
Selling To: ★ A,D,I,M. **Salesmen:** 5

Roslyn Heights

SIR SLS. INC., Box 335, 35 Powerhouse Rd.
Factories: Antsco; Amer. Geloso; Audiovox; Dict-O-Tape; Dyn Elctrns.; Easy-up; Fasco Inds.; Game Inds.; LMB; Ledy Lamp; On-Guard; Quick Mount; Unelco; Verital; Wald Sound.
Selling To: ★ A,D. **Salesmen:** 4

TRAVCO ASSOCS., INC., 142 Mineola Ave., (516) 621-3223.
Factories: Alpha Data; Inertial Motors; Int'l. Scientific; Magtrol; Radix Telemetry; Tele-Dynamics; Virginia Elctrns.; Western Magnetics. **Services:** Direct Mail
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Rye

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

Scarsdale

BASSIN TECHNICAL SLS. CO., 52 Fayette Rd., (914) SC 3-3334.
Factories: Compac Engrg.; Electro-Mech Comp.; Elctrn. Assocs. Inc.; Kessler-Ellis Counters; Transformer Engrs.; Valor. **Services:** Warehouse, Direct Mail
Selling To: ★ I,D,M.

Schenectady

AEROCONOMY AGENCY, 1079 Lexington Ave., (518) 372-8426.
Factories: BEC Inc.; Oil Center Research; J. P. Smith.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

ELBAR ELCTRNS. CORP., Box 660, 433 Liberty St., (518) 372-5841.
Factories: American Comp.; ASM Corp.; Beau Motors; Bivar, Inc.; Compton Inds.; Denes Co., Inc.; Eastron Corp.; El Instrs.; Electrol; Flair Elctrns.; Lenox Fugle Elctrns.; Nutron Elctrns.; Renco Corp.; RF Amplifier; G. Risk Inds.; Sensor Technology; Walbern evices.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)

NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)

Seaford

ABBOTT-GORDON ASSOCS., 3939 Wicks Ave., (516) 781-5256.
Branch: 628 W. Englewood Ave., Teaneck, N.J., (201) TE 6-3876.
Factories: Cramer Coil Co.; Gentronics Inc.; Intermares Ltd.; N.P.C. Elctrns.; Skottie Elctrns.
Selling To: ★ I,D. **Salesmen:** 3

Sodus

DECEW, A. E. AGENCY, INC. (See Sodus, N.Y.)

DECEW, A. E. AGENCY, INC., Box F, (315) 483-3261.
Branch: 27 State St., Sodus, N.Y., (315) 483-4061.
Factories: Astrosystems, Inc.; Chemac, Inc.; Conrac; Corson Elctrns.; Detroit Coil; Dimensional Sys.; Elctrn. Controls; Harrel, Inc.; Hipotronics, Inc.; Northern Precision Labs.; Raymond Engrg.; Schrack Electrical Sls.; Unimax Switch; Velonex.
Selling To: ★ I,M. **Salesmen:** 5 (eng 3)
Services: Repair, Warehouse, Manufacture Control Panels Under AED Distributors Div.

Stony Brook

BONN ASSOCS., INC. (See Metuchen, N.J.)

Syosset

MASIN-ESCO, INC., 333 Jackson Ave., (516) 364-0210.
Branch: 263 Central Ave., East Orange, N.J.
Factories: Artisan Elctrns.; Bundy Elctrns.; Columbia Components; Computer Instrs.; Electro Fab; Elctrn. Closures; Elctrn. Specialty; Metal Works; Pickering & Co.; Radiation Sys.; Sessions; Solid State Scientific; Switchcraft. **Selling To:** ★ A,D,I,M. **Salesmen:** 6 (eng 5)

RYWEL SLS. INC., The Lincoln Bldg., (516) 364-0888.
Factories: Advanced Elctrns.; H. Davies Molding.
Selling To: ★ I,A,D,M. **Salesmen:** 2 (eng 1)
Services: Sampling

(See Advertisement This Page)

Syracuse

BROGAN ASSOCS., INC. (See Westbury, N.Y.)

BURLINGAME ASSOCS., LTD. (See Mt. Vernon, N.Y.)

FERGUSON, T. SLS. CO., INC. (See Rochester, N.Y.)

FRANKLIN, W. A. SLS. CORP., 2 Standish Terr., (315) 446-1120. TWX: 710-541-0433.
Branches: 42 Glenridge Rd., Whitesboro, N.Y., (315) 736-5460; 179 Hillary Dr., Rochester, N.Y., (716) 889-4849.
Factories: Bridgeport Insulated Wire; Continental-Wirt Elctrns.; General Instr.; Industrial Elctrn. Hardware; Nucleonic Prods.; Raytheon Co.; Scientific Comp.; Victor Electric Wire & Cable.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

(See Advertisement Page 3266)

GRAYDON-SHERMAN, INC. (See Morristown, N.J.)

KELLER IND. PRODS., INC. (See Rochester, N.Y.)

LABRONICS, INC., 130 Pickard Bldg., (315) 454-9314.
Branches: 3568 Moyer Rd., North Tonawanda, N.Y., (716) 695-1001; 306 Mersereau Ave., Endicott, N.Y., (607) 748-0509; 3 Eastwood La., Jonesville, N.Y., (518) 372-6649.
Factories: Alfred Elctrns.; Analog Devices; Atec; F. W. Bell; Bolt Beranek & Newman; Brush Instrs.; Calif. Instrs.; Equipto Elctrns.; Gulton Inds.; Julie Research Labs.; Keltec; Mechanical Technology; Microdot; Microwave/Sys.; North Atlantic Inds.; Rental Elctrns.; Tesxcan; SAICOR. **Selling To:** ★ I,M. **Salesmen:** 5 (eng 5)

LAMB, R. F. CO., INC. (See Kenmore, N.Y.)

LANZENDORF, O. G. CO., 513 Cumberland Ave., (315) 472-4195.
Factories: Amacoil Mach.; Bendix; Carlton Design Mfg.; Dexon; Electric Soldering Iron; Eraser; Hampden Mfg.; Magnetic Core; Wybar Elctrns. Div.
Selling To: ★ I,M. **Salesman:** 1

LIGHTSTONE CORP., Pickard Bldg., E. Molloy Rd., (315) 454-3209.
Factories: Acrodyne Inds.; Addington Labs.; American Elctrn. Labs.; Ampar; Anzac Elctrns.; Applied Research; Electrn. Impulse Labs.; Electro Magnetic Technology; Hyperion Inds.; Microwave Semiconductor; Nanofast; Practical Automation; Presin.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

MIDSTATE RESEARCH, INC., 327 Wellesley Rd., (315) 478-8314.
Factories: Augat; Cantford Mfg.; D-Cemco Circuit Structures; Dyonics; Group 128; Hopkins Eng.; Jos. Cooper & Sons.; Universal Scientific.
Selling To: ★ I,D. **Salesmen:** 2

ONYX, W. M., CO. (See DeWitt, N.Y.)

OSSMANN COMPONENT SLS. CORP. (See Rochester, N.Y.)

PASTON-HUNTER CO., INC., 2002 Teall Ave., (315) 437-2992.
Factories: Amperex Elctrn.; Astatic; Atlas Sound; Harman-Kardon; Jerrold Elctrns.; Krylon; N. A. Philips; Sprague Prods.; Turret Elctrns. **Salesmen:** 2 (eng 1)
Selling To: ★ A,D,I. **Services:** Warehouse

REP TEC INC., Pickard Bldg., 5858 E. Molloy Rd., (315) 454-0761.
Branches: Box 156, Clarence, N.Y., (716) 684-6250. 1905 Vestal Rd., Vestal, N.Y., (607) 748-2700.
Factories: APM Hexsea; Basic Ceramics; Bulova Watch; Christie Elec.; Curtis Instrs.; Elctrn. Specialty; Harowe Servo Controls; Robintech; Sterling Instr.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

RYERSON, J. D. ASSOC. INC. (See Rochester, N.Y.)

SBM ASSOCS., INC. (See Rochester, N.Y.)

STAFF, R. A. CO. (See Cleveland, Ohio)

TAUBER, W. CO., 151 Fayette Blvd., (315) 446-7094.
Factories: BASF Sys.; Consolidated Wire & Assoc.; Injectorall Elctrns.; Jayell Mfg.; Leader Instrs.; Midland Int'l.; Swing-O-Lite; Talk-A-Phone; Waber Elctrns.
Selling To: ★ A,I,D. **Services:** Warehouse **Salesmen:** 2

TESCO ASSOCS., 2002 Teall Ave., (315) 463-4566.
Factories: ARRA; C-Cor Elctrns.; Cushman Elctrns.; DICO; Larson Instr.; Philips Electrn. Instrs.; Servo; Statham Instrs. **Services:** Repair, Direct Mail
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

ZIMMERMAN, W. H. INC., 112 DeWitt St., (315) 474-4889. TWX: 710-541-1572.
Branch: 3100 Monroe Ave., Rochester, N.Y., (716) 586-4450.
Factories: Gamar Electromatic; Globe-Union; Hamilton-Hall Resistor; Neshaminy Transformer; Platronics-Seals; RCL Elctrns.; Secon Metals; Victoreen Instr. Div.; Welch Allyn. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

Tuckahoe

L-C-A SLS., INC., 76 Main St., (914) WO 1-4700.
Branches: 32 Rittenhouse Pl., Ardmore, Pa., (215) GR 7-2725; 3505 Epsilon Pl., Annandale, Va., (703) 560-9485.
Factories: BASF; Blonder-Tongue Labs.; Electrohome; Hudson Lamp; Int'l. Wire & Cable; McGohan; Oxford Transucer; Sherwood Elctrn. Labs.; Spectra-Strip; Talk-A-Phone. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 8 (eng 2)

(See Advertisement Page 3266)

STANG SLS. CORP., 271 Columbus Ave., (914) 779-6868.
Factories: Bogen Communications; Dual Changer; Dejon Antennas; EICO Elctrn. Instr.; Grado Cartridges; J. B. Lansing Sound; Lee Musical Chair; Recoton.
Selling To: ★ A. **Salesmen:** 4 (eng 1)

Utica

ADVANCED COMPONENTS CORP., INC. (See North Syracuse, N.Y.)

NACO ELCTRNS. CORP. (See North Syracuse, N.Y.)

Valley Stream

AGRESS, M. C., P.E., 891 Fulton St., (516) 825-8955.
Factories: Electric Tachometer; Endicott Coil; Impectron; Mikro Connector; N.E. Transformer.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

LEVISON SLS. CO., INC., Box 242, 66 West Merrick Rd., (516) 561-9696.
Factories: Alberox; American Elec. Cable; Beede Electrical Instr.; Chicago Dial; Multi-Flex Seals; Staco; Staver; Vogue Instr.
Selling To: ★ I,D. **Salesmen:** 4 (eng 2)

WOOLF, I. W. ASSOCS., 104 S. Central Ave., P.O. Box 366, (516) 561-0122.
Factories: Berkshire Pre-recorded Tapes; Stereo Tape; V-M Corp. **Selling To:** ★ D. **Salesmen:** 3

Vestal

OSSMANN COMPONENT SLS. CORP. (See Rochester, N.Y.)

OSSMANN INSTRS., INC. (See E. Syracuse, N.Y.)

REP TEC INC. (See Syracuse, N.Y.)

Wappingers Falls

OSSMANN INSTRS., INC. (See E. Syracuse, N.Y.)

Westbury

BROGAN ASSOCS., INC., 80 Urban Ave., (516) 333-6683. TWX: 510-222-4555.
Branches: 22 Purchase St., Rye, N.Y., (914) 967-2612; 780 N. Riverview Dr., Totowa, N.J., (201) 256-0174; 107 W. Ridge Pike, Conshohocken, Pa., (215) 825-0510; 69 Hickory Dr., Waltham, Mass., (617) 894-3250. TWX: 710-324-0192; 474 Thurston Rd., Rochester, N.Y., (716) 328-2350; 202 Arterial Rd., Syracuse, N.Y., (315) 437-2988; 112 Cottage Grove Rd., Bloomfield, Conn., (203) 242-0701.
Factories: Computer Management; Data Automation; Data Communication Sys.; Data Computing; Data General; Datatrol; Dynalex; Infotec; Litton Encoder Div.; Magnetic Recording Sys.; Novation, Inc.; Peripheral Data Machines; Perspective; Rolm Corp.; Sugarman Labs.; Sykes-Datatronics; Synergistics; Time Share Peripherals.
Selling To: ★ I. **Salesmen:** 14 (eng 14)

CARDUNER SLS. CO., Jericho Tnpk., (516) 333-8170. TWX: 510-222-6356.
Factories: Audio Devices; British Inds.; Electro-Voice; TRW. **Selling To:** ★ A,D. **Salesmen:** 5 (eng 2)

F. & F. ASSOCS., 461 Old Country Rd., (516) 334-1160.
Branch: 58 Arcadia Rd., Woodcliff Lake, N.J., (201) 778-6767.

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ROBERT E SARGENT
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TWX — 710-541-0433

Branch Office in ROCHESTER, N. Y.
Branch Office in UTICA, N. Y.

Factories: Amco Engrg.; Bertan Assocs.; C-Cor Elctrns.; Elcom Sys.; Microwave Prods. Group; Sage Labs.; Semi/Dyne Elctrns.; Telonic Inds.; Todd Prods.; Vectron Labs.; Zeta Labs. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

MINTHORNE INT'L. CO., INC., 2200 Shames Dr., (516) 334-3303.
Factories: Allied Control; Alltronics; Antenna Specialists; Ballistic Control; Beaver Labs.; Brach Mfg.; Chicago Dynamics; Brach H. Diets; Dolinko & Willkens; Elctrn. Transistor; EPCO; Federal Elctrns.; Glaxy Elctrns.; Gold Line; C. S. Gordon; Hallett Mfg.; Hamilton-Hall; Hansen Mfg.; Hartford Battery; Hartman Marine; Haydon Tubes; Hol-Gar Div.; Hurst Mfg.; Int'l. Graphite & Electrode; Jeffers Elctrns.; JFD Elctrns.; K-R Tubes; Keystone; Keystone Carbon Co.; Kemtron Elctrns.; Lampkin Labs.; Lewis & Kaufman; Marshall Elctrns.; Metrotek Elctrns.; Mosley Antennas; National Union Elctrns.; On Guard; Pageant Needles; Pennwood Numechron; Perry Briggs; Philmore Elctrns.; Quick-Mount; RF Interonics, Inc.; Radiation Material; Radio Condenser; Regency Elctrns.; Resistance Prods.; S-B Mfg.; Saxton Wire & Cable; Semicon; Severance Tool Ind.; Sheppard Ind.; Spark-O-Matic; Speer Carbon; Steri-Dri Elctrns.; Telephone Components; T. C. Thompson; Tri-Ex Towers; U.S. Semcor; Weiler; Zeus Generators. **Services:** Export
Selling To: ★ A,D,I,M. **Salesmen:** 68 (eng 22)

PRINTZ, W. CO. INC., 81 Urban Ave., (516) 334-7770.
Factories: Ames Precision Mach. Works; Clark Instr.; W. C. Dillon & Co.; Gruenberg Elec.; K. H. Huppert; G. Kock & Sons; Soiltest; Sturtevant Tools; Waage Elec.
Selling To: ★ I,M. **Salesmen:** 4

White Plains
BARTLETT ASSOCS., INC. (See Wayne, Pa.)

Whitesboro
FRANKLIN, W. A. SLS. CORP. (See Syracuse, N.Y.)

Whitestone
BROWN, J. ELCTRNS. SLS. REPS. INC. (See Yonkers, N.Y.)

Williamson
PERKINS, A. L. CO. (See Manlius, N.Y.)

Williamsville
JOHNSON, H. C. AGENCIES, INC. (See Rochester, N.Y.)
RYERSON, J. D. ASSOC. INC. (See Rochester, N.Y.)
WADSWORTH MFG. ASSOC. INC. (See Liverpool, N.Y.)

W. Winfield
TOLLEFSON B. H. ASSOC. INC. (See Rochester, N.Y.)

Woodstock
POTTER, N. ASSOCS., 191 Shotwell Rd., (914) 679-6074.
Selling To: ★ A,I,M. **Salesmen:** 12 (eng 3)
Services: Education

Yonkers
ADELMAN-PINZ SALES CORP., 570 Yonkers Ave., (914) 427-4747.
Factories: Acoustone; Audio Originals; Elctrn. Publishing; Jensen Mfg.; Lenk Mfg.; Pickering & Co.; Scientific Audio Elctrns.; Soundolier; Standard Radio.
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)
Services: Warehouse, Direct Mailing

BROWN, J. ELCTRNS., 207 Rosedale Rd., (914) 779-7330.
Branches: 166-65-20th Ave., Whitestone, N.Y., (212) 428-2715; 217 Neck Rd., Bklyn, N.Y., (212) 645-1075; 157 Rawlinson Rd., Rochester, N.Y., (716) 266-2728; 107 Riverine Rd., Liverpool, N.Y., (315) 652-7244.
Factories: AVA Elctrns.; Bomar Crystals; Columbia Elcrrn. Cable; EICO; Game Elctrns.; Gibbs Mfg.; Gramer Halldorson; Industrial Devices; Int'l. Elctrns.; IRL Div.; Lenox-Fugle; Oaktron Inds.; H. H. Smith.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 1)

CERF, A. & CO. (See Caldwell, N.J.)

ELECTRONIC FASTENERS CO., 10 Center Place.
Factories: Atlantic Spring Pin; Southern Screw.
Salesman: 1 (eng 1)

NORTH CAROLINA

Bethania
CANDOR CO. INC., (919) 924-1480.
Factories: Anderson Power Prods.; Armstrong Prods.; Barber-Colman; Cambion, Components; Electra/Midland; Hartzell Elctrns.; Hi-G; Hopkins Engrg.; Kearfott-General Precision; Magnetic Metals; Microlab/FXR; National Connector; Poly-Scientific/Litton; Reeves-Hoffman; Stewart-Warner Microcircuits; U.S. Components; Vitramon. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)

LEE, LTD., (919) 924-8245.
Branches: 3202 Tradewinds Trail, Orlando, Fla., (305) 424-7932; 703 Watts Dr., Huntsville, Ala., (205) 536-1969.
Factories: Allen Jones Elctrns.; Brad Thompson Inds.; Deltron; Penn Engrg. & Mfg.; Spyraflo; Vacuum Atmospheres; Wells Elctrns.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

SCIENTIFIC DEVICES S.E. INC. (See Orlando, Fla.)

Burlington
GENTRY ASSOCS., INC. (See Orlando, Fla.)

Charlotte
BROWN & MORRISON, Box 4307, (704) 333-0774.
Factories: ATC Timers; ETC; Barksdale; Hynes; Kinney.
Selling To: ★ I. **Salesmen:** 5 (eng 5)

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

CHAPMAN, R. W. CO., Box 4430, (704) 375-4495. TELEX: 575-285.
Branches: Box 10503, Raleigh, N.C., (919) 828-3604; 209 East Stone Ave., Greenville, S.C., (803) 233-0053.
Selling To: ★ I,D. **Salesmen:** 9 (eng 6)

FURMAN, C. M. CO., Box 4208.
Factories: Emglo Mfg.; Fairmount Tools; King Electrical; Teledyne.

HENRY, B. ASSOCS., 1043 Providence Rd., Box 6097, (704) 375-8958. TWX: 810-621-0515.
Branch: 1020 Brookstown Rd., Winston-Salem, N.C., (919) 723-3069.
Factories: Americon Corp.; Elec-Trol; Grant Pulley & Hardware; IMC Magnetics; Precision Connector Div.; Signalite; E. H. Titchener; Vari-L Co.; Waterbury Co.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

HIGHSMITH, J. L. & CO., 3733 Monroe Rd., Box 9367, (704) 333-7743, 7744, 7745.
Branches: 3322 South Memorial Pkwy., Huntsville, Ala., (205) 881-3294; 2543 Industrial Blvd., Box 7835, Orlando, Fla., (305) 293-5202; 5003 Brook Rd., Box 9225, Richmond, Va., (703) 266-2060.
Factories: Ace Engrg. & Mach.; Boonton Elctrns.; Clevite/Piezoelectric Div.; Control Equip. Corp.; EG&G Labs.; Elgar Corp.; Globe Inds.; Grayhill; Houston Instr. Div.; Kepco; Leasametric; Miracle-Hill Elctrns.; Singer Co.; Time Sys.; Topaz; Ward Leonard Elec.
Selling To: ★ I,M,D. **Salesmen:** 7 (eng 7)
Services: Repair

PIEDMONT EQUIP. CO. INC., Box 10037-401 W. 32nd St., (704) 334-6823.
Factories: Alcoa Alum; Apex Mach. & Tool; Arrow Safety Device; Auto City Prods.; Burruss Land & Lumber; Calgar; Cargotrol Prods.; Carol Cable; Celus Fasteners; Cleveland Hardware & Forging; Cole-Hersee; Commercial Vehicle Parts; Consolidated Metal Prods.; Continental Rubber Works; Continental Screw; Cooper Industrial Prods.; Covert Mfg.; Deco Prods.; Detroit Hinge Mfg.; Eberhard Mfg.; Equipto; Evans Prods.; Extruded Alloys; Flexible Southern; Freedman Seating; Grayarc; H. L. Hanson; Inland Rubber Mfg.; Interlake Steel; Jarrow Prods.; Johns-Manville; Junkunc Bros.; Kason Hardware; Koneta Rubber; Lewisohn Sls.; Lincoln Engrg.; Load-Hoder; Load Stop Mfg.; Logan; Metalcraft Mfg.; Metal Service; Miami Screw; National Metal Fabricators; Parrish Pressed Steel; Parker Harnifin; Parr Paint & Sealants; Permacel; Peterson Mfg.; Plastics Prods.; Plumley Rubber; Power Brake; Power Tool Service; Presstite Prods.; Quinco; Radiator Specialty; Reynolds Alum. Supply; Saxton Mfg.; Service Prods.; Signal Stat; Sioux Tools, Inc.; Southco, Inc.; Southern Fabricating; Standard Kell Mfg.; Tar-Hell Container; 3-M; Todco Door Div.; U.S. Plywood; U.S. Tool & Mfg.; Universal Screw; Val-Nick Prods.; Vital Prods.; Wilton; York Corrugating. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 3

RANSON, WALLACE & CO., INC., 116½ E. 4th St., (704) 334-4244.
Factories: J. G. Biddle; Conax; Dynalco; Esterline Angus Instrs.; General Transducer; Montedoro; Quindar Elctrns.; Weston Instrs. **Selling To:** ★ I,D,M. **Salesmen:** 2 (eng 2)

RUDISILL, J. ASSOC., INC., 1225 Harding Pl., Box 4245, (704) 377-6901.
Factories: Acopian; ASM; Associated Research; Ceramaseal; Columbus Elec. Mfg.; Dale Elctrns.; E.I.L. Instrs. Div.; Nylok Fastener Div.; Struthers-Dunn; TRS Div. **Selling To:** ★ A,I,D,M. **Salesmen:** 4 (eng 2)

SMITH, M. K. INC., 1605 Chatham Ave., (704) 372-1026.
Branches: 64 Isle of Venice, Ft. Lauderdale, Fla., (305) 522-1187; 5375 New Peachtree Rd., Chamblee, Ga., (404) 475;1931; 3258 Caheba Heights Rd., Birmingham, Ala., (205) 967-3080; 110 Robins Rd., R.F.D. 3, Marietta, Ga., (404) 427-6361.
Factories: Dynascan; Electro-Voice; Remvac Components; Rye Inds.; Sprague Prods.; Vanguard Elctrn. Tools; Waber Elctrns. **Services:** Warehouse
Selling To: ★ A,I,D. **Salesmen:** 7

TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

Gastonia
DIETHERT, R. CO., INC. (See Chicago, Ill.)

Greensboro
ADAMS & ASSOCS., INC., Box 9256, (919) 272-6838.
Branches: Box 877, Decatur, Ga., (404) 288-4799; 3112 Maloney Rd., Knoxville, Tenn., (615) 577-4241; Box 2171, Orlando, Fla., (305) 424-9491.
Factories: Blonder-Tongue Labs.; EBY Sales; Int'l. Rectifier; Int'l. Wire & Cable; Javelin Elctrns.; KRACO Prods.; Midland Int'l.; Perma-Power Div.; Planet Sales; Premier Metal Prods.; Utah Elctrns.
Selling To: ★ A,D. **Salesmen:** 5

ASSOCIATED AGENTS, Box 11444, (919) 292-6508.
Factories: Auto Weigh; Columbia Eng'r. Serv.; Dolan-Jenner Inds.; Electric Tachometer; Goring-Kerr; Moisture Register; Strandberg Eng'r Labs.; Tensitron; Textile Elctrns.; Trumeter. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 3 (eng 3)

BCS ASSOCS., INC. (See Orlando, Fla.)

DUCKETT, G. SALES CO. (See Atlanta, Ga.)

GARDNER & MEREDITH, INC. (See Chattanooga, Tenn.)

HAYDEN, P. ASSOC. (See East Point, Ga.)

HOLMES, E. G. & ASSOC. (See Chamblee, Ga.)

MANUFACTURERS SLS. CO., Box 20005, (919) 274-2474.
Factories: Holmberg; Patton-MacGuyer; Rowe Inds.
Selling To: ★ I. **Salesmen:** 4 (eng 2)

MURPHY & COTA (See Atlanta, Ga.)

TECHNICAL MKTG. INC. (See Orlando, Fla.)

Kinston
NICKERSON, F. C. CO., INC. (See Decatur, Ga.)

Graham
REYNOLDS & ASSOCS. INC. (See Melbourne, Fla.)

Kernersville
WALLACE S. K. ASSOC., INC. (See Lutz, Fla.)

Matthews
HILE, W. K. CO., INC., Box 1015, (704) 847-9125. TELEX: 572-435.
Branch: Box 4643, Richmond, Va., (703) 649-1221.
Factories: Acromag; Farmer Elec. Prods.; Fenwal; Gibson Elec.; Hotwatt; Loyola Inds.; Raytek; Visicon.
Selling To: ★ I,D,M. **Services:** Repair, Warehouse
Salesmen: 6 (eng 6)

WALLACE S. K. ASSOC., INC. (See Lutz, Fla.)

Raleigh
ANDREWS, A. B. & CO., Box 2627, (919) 833-5565.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)
Factories: Bramco; Chatham Elctrns.; Collins & Hyde; Florida Transformer; Grigsby-Barton; Ledex; Mial; National Tel-Tronics; Rockwood Mfg.; Sinclair Radio Labs.; Stettner-Trush; D. M. Steward Mfg.; Tedford Crystal Labs.; Wagner Elec.; Wilmington Controls.

BROWN, K. O. & CO. (See Dallas, Tex.)

CARTWRIGHT & BEAN, INC. (See Memphis, Tenn.)

CHAPMAN, R. W. CO. (See Charlotte, N.C.)

HANNER, J. C., Box 510, (919) 834-8443.
Selling To: ★ I. **Services:** Repair, Warehouse
Salesmen: 3 (eng 3)

MILLAR ELCTRNS., INC. (See Atlanta, Ga.)

MITSCHER, R. W. CO., INC. (See Buffalo, N.Y.)

Winston-Salem
BROWN, W. A. COMPONENTS, INC. (See Orlando, Fla.)

BROWN, W. A. INSTRS., INC. (See Orlando, Fla.)

COL-LINS CO., INC. (See Orlando, Fla.)

COMPAR CORP. (See Burlingame, Calif.)

HENRY, B. ASSOCS. (See Charlotte, N.C.)

LEE ASSOC., INC. (See Orlando, Fla.)

MAGUIRE, J. A. & CO. (See Camden, N.J.)

MURPHY & COTA (See Atlanta, Ga.)

WHITE L. G. & CO., INC. (See Silver Springs, Md.)

RADCO CO., 614 First Union Natl. Bk. Bldg., (919) 722-9671.
Factories: Associated Testing Labs.; Baird Atomic; CML; Control Logic; Jerrold Elctrns.; Nanofast; Quantech Labs.; PRD Elctrns.; Weston Instrs.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

OHIO

Akron
NATALINO, A. ASSOCS., 209 Harmony Hills, (216) 725-6087. TWX: 810-437-2477.
Branches: 333 W. 1st St., Dayton, Ohio, (513) 223-5002; 530 Sixth Ave., Pittsburgh, Pa., (412) 281-8283.
Factories: Aeronautical Elec.; Bulova Watch; Central Transformer; CO-ORD Switch; Gridcraft Inc.; Metal Etching Corp.; Microsemi. Corp.; RCL Elctrns.; Scanbe Mfg.; Specialty Connector; Tansitor Elctrns.; Technical Wire Prods. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

Bay Village
BRIDGMAN, F. KING, JR., 283 Dover Center Rd., (216) 752-0225.

Berea
ANDERSON, B. CO. (See Columbus, Ohio)

PUGH, C. L. ASSOC. INC. (See Columbus, Ohio)

Brecksville
DEUNK, R. K. & ASSOC. INC., 10005 Chippewa Rd., (216) 526-4317. TWX: 810-427-9160.
Factories: Ammon Instrs.; Barber-Colman; Bow Solder Prods.; Mica Corp.; Moorlee Mfg. **Services:** Direct Mail
Selling To: ★ I. **Salesmen:** 2 (eng 1)

WALDRIP, BLANKENBURG & CO., 7650 Chippewa Rd., (216) 526-1100.
Factories: Atkins Tech.; W. C. Dillon; Esterline-Angus Div.; Royson Engrg.; Scientific Columbus Div.
Selling To: ★ I. **Salesmen:** 6 (eng 6)

Chagrin Falls
CLARK SALES CO. (See Cleveland, Ohio)

KILROY J. CORP., Box 365, (216) 247-8997.
Factories: Acromag; Amer. Std.; Hurst Mfg.; Inland Control; Inland Motor; Jordan Controls; Magtrol; Presin Co.; Syracuse Elctrn.; United Elec. Controls.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

(See Advertisement Page 3268)

Cincinnati
BAEHR-GREENLEAF & ASSOCS., INC. (See Cleveland, O.)

BEEDLE EQUIPT. CO., 6900 Silverton Ave., (513) 793-0140.
Factories: Adams & Westlake; Alnor Instr.; R. B. Denison; Esterline Angus Instrs.; Magnetics, Inc.; Scientific Columbus; H. H. Sticht; Struthers-Dunn; Vulcan Elec.; Weksler Instrs.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

CAMPISANO, F. J. & ASSOCS., Box 11043, (513) 662-1616. TWX: 810-461-2578.
Branches: 3453 Nolen Dr., Indianapolis, Ind., (317) 291-4066; 7790 Ann Arbor Dr., Cleveland, Ohio, (216) 845-0440.
Factories: Aerovox; Alliance Mfg.; Acton Labs.; Cermetek; Chicago Magnet Wire; Del Elctrns.; Fair-Rite Prods.; Fairchild Controls; Gettig Engr. & Mfg.; Haydon Switch & Instr.; Kalmus & Assocs.; Remvac Comp.; Rola Co.; Rotron. **Services:** Direct Mail
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 2)

COMPONENTS INC. (See Cleveland, Ohio)

G & H SLS. CO., 10599 Chester Rd., (513) 771-8231. TWX: 513-482-9112.
Branches: 14959 Hillbrook Cir., Novelty, Ohio, (216) 247-4446; 24001 Southfield Rd., Southfield, Mich., (313) 358-1910; Box 27280, Columbus, Ohio, (614) 231-4433.
Factories: Babcock Relays; Electra/Midland; General Instr.; Hamlin.
Selling To: ★ I,D,M. **Salesmen:** 8 (eng 8)

GALLAGHER CO., 15 Ritchie Ave., (513) 761-1288.
Factories: Ametek/Hitemp Wires; Bentley-Harris Mfg.; Electro-Connective Sys.; Gems Co.; Kings Elctrns.; Mohawk Wire & Cable; Vigor Tool.
Selling To: ★ A,I,M. **Salesmen:** 4 (eng 3)
Services: Limited Warehouse

HERRICK, G. L. CO. (See Cleveland, Ohio)

HILTEBRANT GREENLEAF CO. (See Cleveland, Ohio)

KAHSAR, F. E. SLS., INC., 5229 Glenway Ave., (513) 471-9011.
Branch: 47 West Case Dr., Hudson, Ohio, (216) 655-6808.
Factories: A & A Wire Spring; Alco Elctrn. Prod.; Crofoot Gear; Engvis; Karmen Rubber; Lyn-Tron; Midtex Inc.; National Circuits; PCM Inc.; Parsons Screw Prod.; Plastic Ware; Russell Gasket; Triad Distributor Div.; Utrad.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)

KILFOIL, J. F. CO., 9415 Montgomery Rd., Box 42164, (513) 791-6150.
Branch: 5225 New Haven Ave., Fort Wayne, Ind., (219) 749-0113.
Factories: Airco/Speer Elctrn. Components; American Semi-Conductor; Andover Inds.; Buffalo Molded Plastics; Cincinnati Milling Mach.; Colorado Crystal; Fuze-On.
Selling To: ★ I,D,M. **Salesmen:** 3

LAKE, H. G. CO. (See Dayton, Ohio)

J. A. Maguire and Co.

ELECTRONIC COMPONENTS AND MATERIALS

REPRESENTING:
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Brand-Rex Div., American Enka Corp.
Davis & Hemphill, Inc.
ETC Incorporated
Electronic Specialty Co.
Elmwood Sensors, Inc.
Engineered Wire & Cable, Inc.
Lectro-Print, Inc.
The Metal Etching Corp.
Mic-Lin Company
Siemens Corporation

SERVING:
Delaware
District of Columbia
Maryland
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PLAINFIELD, N. J. 07060 • 705 Park Ave. • Phone: 201-754-6400
PENNSAUKEN, N. J. 08110 • 4608-10 Westfield Ave. • Phones: 609-665-5136 215-627-1670

OLSEN, J. O. CO. (See Cleveland, Ohio)

PHISTER EQUIPT. CO. INC., 922 Federal Reserve Bank Bldg., (513) 421-3850.
Factories: Bergen Wire Rope; Zippertubing.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

PLAGEMAN, L. C., 3334 Meyer Pl., (513) 481-4260.
Selling To: ★ I,D,M. **Salesmen:** 4

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

SCHLEMMER ASSOCS., 1172 W. Galbraith Rd., (513) 522-8340.
Factories: Atkins Tech.; Fast Heat Element Mfg.; Frost Elctrns.; W. L. Gore & Assoc.; Ircon; Moore Instrumentation; Reotemp Instr.; Ruska Instr.; Western Elctrns. Prods.; West Instr. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)

SHARP, F. R. CO., INC. (See Cleveland, Ohio)

SHERIDAN ASSOCS. INC., Box 37646, (513) 761-5432.
Branches: Box 3997, Jennings Sta., St. Louis, Mo., (314) 524-4800; Box 4457, Cleveland, Ohio, (216) 524-8120; Box 423, Dayton, Ohio, (513) 277-8911; Box 128, Lathrup Village, Mich., (313) 358-3333; Box 6312, Grand Rapids, Mich., (616) 949-8110; 1601 Penn, Pittsburgh, Pa., (412) 243-6655.
Factories: American Precision Inds.; Bendix/Mosaic Fabrications Div.; Bristol Co.; Burr-Brown Resh. Corp.; Chemical Micro Milling; Components Corp.; Computer Communications; Conn. Technical Corp.; CTS Knights; Data Computing; Dasa Corp.; Elco Corp.; Elctrn. Expeditors; Elec. Indicator Co.; Fabri-Tek; H & H Toroidal; Helipot Div., Beckman Instruments; IERC; Int'l. Instrs. Div.; Kearfott; Merrimac Resh. & Dev.; NJE; Photo Magnetic; Pulse Engrg.; RJ Communication Prods.; Rotamec; Sigma Instrs.; Tally. **Selling To:** ★ I,M.

STAFF, R. A. CO. (See Cleveland, Ohio)

TAYLOR, J. F. SLS. CO., 5229 Glenway Ave., (513) 471-5750.
Factories: Cleveland Vibrator; DeBothezat Fans; Jetstream Sys.; Liberty Inds.; National Air Vibrator; Whittaker Instrs.; Young Machinery.
Selling To: ★ M,D,I. **Salesmen:** 2 (eng 2)
Services: Stocking, Distrib., NAVCO Vibrators

VAL-SKOL SLS., INC., 10515 Margate Terr., (513) 563-6790.
Branches: 12417 Cedar Rd., Cleveland Hts., Ohio, (216) 462-2822; Box 13088, Columbus, Ohio, (614) 291-4123; 2005 Franklin Ave., Fort Wayne, Ind., (219) 742-9122; 3556 Luewan Dr., Indianapolis, Ind., (317) 926-5063.
Factories: APM-Hexseal; Curtis Dev. & Mfg.; Dart Engrg.; Hoyt Electrical Instr. Works; Industrial Timer; Leeder Inds.; Panduit.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 2)

(See Advertisement Page 3269)

WAHL, A. C. & ASSOCS., INC., Box 15220, (513) 821-3270.
Branches: 2122 Mershon Ave., Dayton, Ohio, (513) 252-0961; 1153 Trentwood Rd., Columbus, Ohio, (614) 486-7719; 1416 N. Boeke Rd., Evansville, Ind., (812) 476-9771; 510 N. Sadlier, Indianapolis, Ind., (317) 353-2921.
Factories: Datascan; Gulton Inds.; Polyphase Instr.; RMC Div.; Shallco; Shallcraft Mfg.
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

Cleveland

ALLIED ENTERPRISES INC., Box 30104, (216) 234-3838.
Factories: Elmwood Sensors; Hotwatt; Micro Devices; Norwalk Thermostat; Still-Man Mfg.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

BAEHR-GREENLEAF & ASSOCS., INC., 14700 Detroit Ave., (216) 221-9030.
Branches: 9505 Montgomery Rd., Cincinnati, Ohio, (513) 891-3826; Box 5722, Columbus, Ohio, (614) 486-4046; Maplewood Dr., Xenia, Ohio, (513) 426-5485.
Factories: Acme Elec.; C P Clare; CTS; Clare Electro-Seal; Clare-Pendar; Cutler Controls; Elco; Holyoke Wire & Cable; JRC Div.; Robinson-Halpern; Simpson Elec.; Ungar Div.; Union Carbide.
Selling To: ★ D,M. **Salesmen:** 7 (eng 7)

BURKE, E. F. INC., 5010 Mayfield, (216) 382-3646.
Factories: Alnor Instr.; B-Line Div.; Corning Glass; Harper Elec. Furnace; Royal Elec. Mfg.; U. S. Safety Trolley.
Selling To: ★ I,D. **Salesmen:** 2 (eng 1)

CAMPISANO, F. J. & ASSOC. (See Cincinnati, Ohio)

CARTER, McCORMIC & PEIRCE, INC. (See Farmington, Mich.)

CLARE ELCTRNS., 24431 Oak Hill Dr.
Factories: Metrotech; Seastrom Mfg.
Selling To: ★ I. **Salesmen:** 2

CLARK SALES CO., 3570 Warrensville Center Rd., (216) 991-2000. TWX: 810-427-2640.
Branch: 16830 Park Circle Dr., Chagrin Falls, Ohio, (216) 543-9848.
Factories: Accurate Elctrns.; Brand-Rex Div.; Mohawk Mfg.; Circuitwise; Comtec. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 2 (eng 1)

COMPONENT/INSULATION CORP., 14235 Detroit Ave., (216) 521-3570.
Branches: 610 No. Woodward Ave., Birmingham, Mich., (313) 644-0087.
Selling To: ★ A,I,D,M. **Salesmen:** 4 (eng 2)

COMPONENTS INC., 7461 N. Linden La., (216) 842-2737. TWX: 810-427-9151.
Branch: 11820 Knollsprings, Cinncinati, Ohio, (513) 721-2997.
Factories: Birtcher Corp.; Chassis-Trak; Collins & Hyde; Davis Elec.; Defiance Circuit Corp.; Dow-Key Co.; Hugh H. Eby Co.; Electrofilm; Gulton Inds.; Harbour Inds.; Hi G, Inc.; Janco Corp.; Malco Mfg. Co.; Mandex Mfg. Co.; Merrimack Magnetics; Omtronics Mfg.; Power Components; Panelgraphic; Quan-Tech Labs.; Reon Resistor; Rotron; Texas Instrs.; Tec Magnetics; Vent-Rak; Wacline; Western Gear.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

COMTEL COMPONENTS (See Addison, Ill.)

DAUGHERTY, F. A. CO., 6025 Mayfield Rd., (216) 449-1122.
Branch: 112 Oakwood Rd., McMurray, Pa., (412) 941-6473.
Factories: Atlas Sound; Automatic Radio; Fisher Radio; New Tronics; Regency Elctrns.; United Audio Prods.; Utah Elctrns. Div. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 6

DICKELMAN, L. H. CO. (See Detroit, Mich.)

DIETRICH, L. CO. (See Pittsburgh, Pa.)

DOLFUSS, C. H., JR. & CO., 2108 Payne Ave., (216) 771-1270.
Branch: 1700 Needmore Rd., Suite 305, Dayton, Ohio, (513) 275-4831.
Factories: Aerovox Corp.; Bussman Mfg. Div.; Datak Corp.; Essex Engrg.; J B T Instrs.; Networks Elctrns.; Muter Co.; Shurite Meters; Solid State Scientific; Triplett Electrical Instr.
Selling To: ★ I,M,D. **Salesmen:** 4 (eng 1)

ELECTRO SLS. ASSOCS., 851 E. 222 St., (216) 261-5440.
Branches: Overlook Br., Dayton, Ohio, (513) 426-5551; 10745 Morang Dr., Detroit, Mich., (313) 886-2280; 201 Penn Center Blvd., Pittsburgh, Pa., (412) 371-9449.
Factories: Adage, Inc.; Analog Devices; Applied Digital Data Sys.; Atlantic Technology; B&K Instrs.; Biomation; Century Detroit; Columbia Research Labs.; Data Control Sys.; Digital Information Devices; Digitron Corp.; Dranetz Engrg. Labs.; Dresser Sys.; Dynacontrol Div.; Elctrn. Assocs.; Itron Corp.; Kaman Nuclear; Krohn-Hite; Leasametric Inc.; Memory Technology; N-H Research; Natel Elctrn. Ind.; Spectral Dynamics; Taber Instr.; Tyco Instr.; Vogue Instr.; Wayne-George.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

FINNICUM, J. L. & ASSOC., 1495 Warren Rd., (216) 226-7076. TWX: 810-421-8424.
Factories: H. F. Cox; R. B. Denison Inc.; Dolam-Jenner Inds.; Eagle Signal; Rundtu Comp.
Selling To: ★ I,D. **Salesmen:** 5 (eng 5)

GOORY SLS. CO., 19555 Henry Rd., (216) 331-2055.
Factories: Drake Mfg.; Hudson Wire; Miller Dial & Nameplate; Rae Co.; Vulcan Elec.
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

HERRICK, G. L. CO., 845 Canterbury, (216) 871-8855.
Branch: 2209 Losantiville Rd., Cincinnati, Ohio, (513) 351-4441.
Factories: ATM Plastics; Continental Wirt Elctrns.; Ind. Elctrn. Hardware; Jenny; Mold Rite Plastics; Positive Terminal & Connector; Ting Stol; Victor Elec. Wire & Cable. **Selling To:** ★ I. **Salesmen:** 3

HILTEBRANT GREENLEAF CO., 20412 Center Ridge Rd., (216) 333-5480.
Branch: 4315 Simca La., Cincinnati, Ohio, (513) 661-0969.
Factories: Cole Hersee; Comar Elec.; Electro Switch; E.A.P. Div. Gen'l. Cable; Grote Mfg.; Koro; Phillips Prods.; Plastic Enterprises; Tower Mfg.; Underwriters Safety Device.
Selling To: ★ I. **Salesmen:** 5 (eng 5)

HULL, R. O. & CO., INC., 3203 W. 71st St., Box 02098, (216) 651-7300.
Branches: 1340 East 6th St., Los Angeles, Calif., (213) 623-9261; 66 Fordhouse Blvd., Toronto, Ontario, Canada, (416) 255-6959; 5524 Alder Ave., Littleton, Colo., (303) 798-1677; 110 Old South Ave., Stratford, Conn., (203) 378-7339; 6135 W. 65 St., Chicago, Ill., (312) 458-8430; 66 East 10 Mile Rd., Hazel Park, Mich., (313) 564-5940; 4530 Manchester Ave., St. Louis, Mo., (314) 531-9009; 2280 East River Rd., Dayton, Ohio, (513) 293-6829; 511-15 Rhett St., Greenville, S.C., (803) 233-3904; 1333 Crampton St., Dallas, Tex., (214) 631-6630.
Selling To: ★ I,D. **Salesmen:** 26
Services: Warehouse, Manufacturing

INSTRUMENTATION SYS. INC. (See Dayton, Ohio)

JACOBS, M. S. & ASSOC. (See Pittsburgh, Pa.)

JUBELL ASSOC., 23760 Miles Ave., (216) 662-2884.
Branch: 2503 South Dixie Dr., Dayton, Ohio, (513) 299-4321.
Factories: Elec-Tron; Miller Elec.; Protective Controls; Revcor; M. H. Rhodes; Uppco.
Selling To: ★ I. **Salesmen:** 3 (eng 3)

MARLOW ASSOCS., INC., 4486 Mayfield Rd., (216) 381-4500.
Factories: Alpha Wire; Bud Radio; Russell Inds.; Staco Syracuse Elctrns.; Waldom Elctrns.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)

MARTIN-RETTGER, INC., 11955 Shaker Blvd., (216) 791-8787.
Factories: B.E.C.; Foster Transformer; Greibach Instrs. Div.; Mackworth Rees; Magnetics; Meaker; Semikron Int'l.; States; H. H. Sticht.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

MICHAELSON, B. L. CO. (See Xenia, Ohio)

MIDLAND ELECT. CO., 2125 Superior Ave., (216) 861-3200.
Selling To: ★ I. **Salesmen:** 12 (eng 3)
Services: Warehouse

MIDWEST SLS. CO., 3219 West 117th St., (216) 941-2700.
Selling To: ★ I,D,M.

MILLER, H. SLS. CO., 4087 Meadowbrook, (216) 321-3900.
Branches: Rte. 1, Zimmerman Rd., Sabina, Ohio, (513) 453-2240; 1602 Ridge, Madison, Ohio, (216) 428-2540.
Factories: Acoustone; Astrocom-Marlux; Electro-Voice; Game Ind.; H. Y. Gain; J.F.D.; Lectrotech; Monarch; Recoton; Workman. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 3

MOTORS INC. (See Yellow Springs, Ohio)

OLSEN, J. O. CO., 16201 Shaker Blvd., (216) 752-5444.
Branches: 5539 Stokeswood Ct., Cincinnati, Ohio, (513) 922-2176; 12127 Marwood Lane, Cincinnati, Ohio, (513) 771-6667; 104 Elatan Dr., Pittsburgh, Pa., (412) 279-2550; 1843 Maydell sSt., Pittsburgh, Pa., (412) 341-8391.
Factories: Amatom Elctrn. Hardware; Borden Chemical; Consolidated Wire & Assoc.; Dixson; E-T-A Prods.; High Energy; Johnson Elec. Coil; PIC Design; Schauer Mfg.; Trompeter Elctrns.; Lowell Mfg.; Microtran; S & A Elctrns.; Temple Sound Equip.; Waber Elctrns.; Xcelite.
Selling To: ★ A,I,D,M. **Salesmen:** 7 (eng 3)

PETERS, R. W. CO., 630 E. 222, (216) 261-2330.
Factories: Antronic; Empire Scientific; Ambassador Elctrns.; Gamber Johnson; Keystone Elctrns.; Int'l. Elctrn. Sls.; Quietrole; Rheem/Roberts Elctrns.; Sennheiser Elctrsn.; Sherwood Elctrn. Labs.; Ward Prods.
Selling To: ★ A,D,I. **Salesmen:** 2
Services: Warehouse, Direct Mail

ROCKFORD CONTROLS OHIO, INC. (See Dayton, Ohio)

ROBINSON, C. A. CO., INC., 5010 Mayfield Rd., (216) 381-9049.
Branch: 11 West Monument Bldg., Dayton, Ohio, (513) 222-0832.
Factories: ADC Prods.; Autotron; Berk-Tek; Delevan Elctrns.; A. W. Haydon; Keystone; Price Elec.; Quality Name Plate; Sessions.
Selling To: ★ I,M. **Salesmen:** 4 (eng 1)

ROTH, M. SLS. CO., 678 South Green Rd., (216) 382-9090.
Factories: Astatic; B & K Mfg.; Centralab/Globe Union; Diceon Elctrns.; Pennsylvania Elctrns. Technology; Phaostron Instr. & Elec.; Premier Metal Works; Raytheon; Sloan; Telex/Communications Div.; Weller Elec.; Temple Inds.; Thordarson-Meissner.
Selling To: ★ I,D. **Salesmen:** 5 (eng 2)
Services: Samples

SATULLO CO. (See Royal Oak, Mich.)

SCHROEDER SLS. CO., 2184 Noble Rd., (216) 268-3636.
Factories: Altec Lansing Div.; Auricord Div.; BSR; Benjamin Elctrn. Sound; Grado Labs.; Int'l. Electro Exchange; Koss Elctrns.; Langevin; Listening Environment Engrs.; McIntosh Lab.; Nortronics; Picker Briggs; TEAC; Vega Elctrns. **Services:** Repair, Warehouse
Selling To: ★ A,I. **Salesmen:** 3

SHARP, F. R. CO., INC., 14904 Euclid Ave., (216) 249-7000.
Branches: 1720 Section Rd., Cincinnati, Ohio, (513) 351-5091; 2801 Far Hills Ave., Dayton, Ohio, (513) 298-0011; Barron Rd., Ligonier, Penna., (412) 238-2748.
Factories: Conrad-Missimer; Elec. Tachometer; Electro Gen'l.; Electro Prods.; Vector Engrg.
Selling To: ★ I. **Salesmen:** 6 (eng 4)
Services: Direct Mail, Warehouse

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

STAFF, R. A. CO., 19684 Center Ridge Rd., (216) 331-5100.
Branches: Oregon, Ohio, (419) 698-1026; Cincinnati, Ohio, (513) 241-1421; Syracuse, N.Y., (315) 422-0194.

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Factories: Acme Chemicals & Insulation; Bentley-Harris Mfg.; Bridgeport Insulated Wire; Ceramic Prods.; Electro Insulation; Fibre Materials; Insul-Tab; Milwaukee Resistor; Molecu Wire; Anixter-Murray Co.; Mystik Tape; Plymouth Rubber; Superior Steatite & Ceramic; Stever-Locke Specialties; Taconic Plastics; Westinghouse Industrial Plastics. **Selling To:** ★ I. **Salesmen:** 6

STEFFEN, D. & ASSOC., INC., 904 East 222 St.
Branch: 1201 Hempstead Rd., Dayton, Ohio, (513) 293-3145,46.
Factories: Cicoil Corp.; Continental Device; Deltrol Controls; Glenair, Inc.; Logic Dynamics; Maurey Instr.; Microdot, Inc.; Midwec Corp.; North Elec.; Sensitron; Sarkes Tarzian; Standard Controls; STM Corp.; Tensolite Corp.; Varadyne, Inc. **Salesmen:** 4 (eng 1)

STERLING, S. CO., 5827 Mayfield Rd.
Branches: 2 Parkway Ctr., Pittsburgh, Pa.; 2673 Culver Ave., Dayton, Ohio; 11734 Lackland Industrial Dr., St. Louis, Mo.; 315 Laura Ave., Addison, Ill.; 21250 Civic Center Dr., Southfield, Mich., (313) 357-3700.
Factories: All American; Alfred Elctrns.; Ampex; Beckman Instrs.; BLH Elctrns.; Century Elctrns.; Cohu Elctrns.; Cunningham; Consulting Services; Dana Labs.; Data Memory; Daytronic; Delta Design; Detroit Testing Lab.; DI/AN Controls; Digitronics; Emcor; Empire/EMC; Flow; Ind. Electronetics; Kennedy; Lebow Assocs.; Ling Elctrns.; Microdot; Microwave/Sys.; Omni-Spectra; Panoramic Dept.; PCB Piezotronics; Philbrick/Nexus Research Labs.; Power Instrs.; PRD Elctrns.; Reaction Instrs.; Rental Elctrns.; Remtech; Sensotec; Singer; Sorensen Div.; SSCO Standards Labs.; Team; Stow Labs.; Systron-Donner; Texas Instrs.; Time/Data; Tinsley; Transducer Tech.; United Sys.; United Telecontrol Elctrns.; Watkins-Johnson; Wayne Kerr; Zeta Labs.
Selling To: ★ I,M. **Salesmen:** 17 (eng 10)
Services: Repair, Warehouse

TEPLITZ H. & CO., INC. (See Dayton, Ohio)

TIBY CO., 2245 Warrensville Center Rd., (216) 371-5335.
Branches: 1960 North Main, Dayton, Ohio, (513) 277-3822; 380 Hilton Rd., Ferndale, Mich., (313) 547-3550.
Factories: Airborne Instrs. Labs.; Bay Labs.; Consolidated Ohmic Devices; Control Data; Develco; Frequency Elctrns.; Measurements; Naniloa; Nelson-Ross Elctrns.; Pacific Photometric Instrs.; Setra Sys.; Viatran.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

VEREB, S. J. & ASSOC., Box 4424, (216) 271-2066.
Factories: Adams & Westlake; BW Controller; Electro Devices. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 2 (eng 2)

WHELAN CORP. THE (See Dayton, Ohio)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

WKM ASSOCS., INC., 16141 Puritas Ave., (216) 267-0445. TWX: 810-421-8453.
Branches: 5335 Far Hills Ave., Dayton, Ohio, (513) 434-7500. TWX: 810-459-1687; 1474 E. Outer Dr., Detroit, Mich., (313) 892-2500. TWX: 810-243-4110; 90 Clairton Blvd., Pittsburgh, Pa., (412) 892-2953. TWX: 710-667-4858.
Factories: Amco Engrg.; Analogic; Astrodata; Beckman Instrs. Div.; F. W. Bell; CGS Scientific; Deltron; Dumont Oscilloscope Labs.; J. Fluke Mfg.; Genisco Tech.; Princeton Applied Rsch.; Rentronix Div. of Inmark; Sangamo Elec.; Tally; Varian Aerograph; Vidar; Wavetek; Zeltex.
Selling To: ★ I,M. **Salesmen:** 11 (eng 11)
Services: Coordination

Cleveland Heights

VAL-SKOL SLS. INC. (See Cincinnati, Ohio)

Columbus

ANDERSON, J. B. CO., INC., 8 E. Long St., (614) 221-6385.
Branch: 108 Beach St., Berea, Ohio, (216) 234-8731.
Factories: Dynamic Gear; Lowell Corp.; Torqua Transmission Div. **Selling To:** ★ I. **Salesmen:** 3

ANGER ASSOCS., INC. (See Dearborn, Mich.)

BAEHR-GREENLEAF & ASSOCS., INC. (See Cleveland, Ohio)

G & H SLS. CO. (See Cincinnati, Ohio)

ROCKFORD CONTROLS OHIO, INC. (See Dayton, Ohio)

McFADDEN SLS., INC., 150 E. Broad St., (614) 221-3363. TWX: 810-482-1623.
Factories: Bliley Elec.; Bogen Comm.; Components; E. F. Johnson; Lenz Elec.; Sealectro; U. S. Capacitor.
Selling To: ★ A,I,D,M. **Salesmen:** 8

PUGH, C. L. ASSOCS., INC., 2144 Riverside Dr., (614) 486-9678.
Branches: 143 Milton St., Berea, Ohio, (216) 243-2717; 512 Crestline Dr., Pittsburgh, Pa., (412) 531-2731.
Selling To: ★ A,D. **Salesmen:** 5

SEAY, H. H. CO., 1350 Crestwood Ave., (614) 235-0265.
Factorus: AMECO; American Tape Duplicators; Audiovox; Buckeye Stamping; Chicago Condenser; Electrical Windings; Elctrn. Chem.; Fairchild Recording Equip.; Fourjay Inds.; Gonset; Hamilton Hall; Heeger; Kits Inds.; Leader Instrs.; M. A. Miller Mfg.; Mueller Elec.; NT•T Sls.; Parker Metal Goods; Rodale Mfg.; Rye Inds.; 'M. Swedgal; Thurow Elctrns.; Universal Woodcrafters; Vidaire Elctrns. Mfg.
Selling To: ★ A,D,I. **Salesmen:** 2

VAL-SKOL SLS. INC. (See Cincinnati, Ohio)

WAHL A. C. & ASSOCS. INC. (See Cincinnati, Ohio)

Dayton

AERTRONIC ASSOC., INC., 5899 Huberville Ave., (513) 253-8144.
Branch: Box 387, Northfield, Ohio, (216) 467-8011.
Factories: Air Control; Atomergic Chemetals Co.; Beam Tube Corp.; Cryogenic Technology; Delphi Inds.; Economatics; Flight Resh., Inc.; Goddard Valve Corp.; Hughes Aircraft; Lundy Elctrns. & Sys.; Microwave Elctrns.; Moore & Hanks; Optronics Int'l.; Precision Power Inds.; Research Assistants; Scientific Sys.; SEDCO Sys.; Vacuum/Atmospheres. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

ASHBY, G. L. ASSOCS., INC., 4130 Linden Ave., Room 155, (513) 252-5627.
Factories: Applied Magnetics; Aztec Elctrns.; Coleman Engrg.; Conrad-Missimer; Hadion Inc.; Infrared Inds.; Lorch; Sierra Div. Philco; Warnecke Electron Tubes.
Selling To: ★ I,M. **Salesmen:** 4

BAIER, H. CO. & ASSOCS. (See Willoughby, Ohio)

BEAR, N. CORP. (See Richfield, Ohio)

BRUNO, L. D. CO., Box 2044, Kettering Branch, (513) 434-1847. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 1)

CARTER, McCORMIC & PEIRCE, INC. (See Farmington, Mich.)

COMTEL COMPONENTS (See Addison, Ill.)

DIETRICH, L. CO. (See Pittsburgh, Pa.)

DOLFUSS, C. H. JR. & CO. (See Cleveland, Ohio)

ELECTRO SLS. ASSOCS. (See Cleveland, Ohio)

FEDOTIN, L. S., 3680 Dorset Dr., (513) 275-9345.
Factories: American Trans-Coil; Elctrn. Transistors; Jan Hardware; Magnecraft Elec.; Philadelphia Scientific Controls. **Selling To:** ★ M. **Salesman:** 1

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

INSTRUMENTATION SYS., INC., 3481 Office Park Dr., Dayton, Ohio, (513) 293-8095.
Branch: 21877 Euclid Ave., Cleveland, Ohio, (216) 486-0782.
Factories: Calif. Instrs.; Cipher Data Prods.; Digital Information Storage; Doric Scientific; Dynamics Instrumentation; Eldorado Electrodata; Electro Scientific Ind.; Intermed; Matrix; Synergistics; Thermo-Sys.; Trans-Sonics; Wanlass Elec.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

JUBELL ASSOC. (See Cleveland, Ohio)

LAKE, H. G. CO., 1521 N. Main St., (513) 277-8181.
Branch: 8486 Concord, Cincinnati, Ohio, (513) 891-0313.
Factories: Auburn Plastics; Bellofram; Chicago Gasket; Diamonite Prods. Mfg.; Deerfield Mfg.; Elastomeric Prods.; Latronics; Melray Mfg.; P-K Tool & Mfg.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

NAECO ASSOCS., INC. (See Arlington, Va.)

NATALINO, A. ASSOCS. (See Akron, Ohio)

ROBINSON, C. A. CO., INC. (See Cleveland, Ohio)

ROCKFORD CONTROLS OHIO, INC., 2077 Embury Park Rd., (513) 278-7362. TWX: 810-459-1983.
Branches: 26100 Brush Ave., Cleveland, Ohio, (216) 531-4841; 3550 Laketon Rd., Pittsburgh, Pa., (412) 731-4600; Box 6523, Columbus, Ohio, (614) 231-5890.
Factories: Duncan Elctrns.; Fifth Dimension; General Magnetic; Gordos; Harowe Servo Controls; H. H. Hilton;

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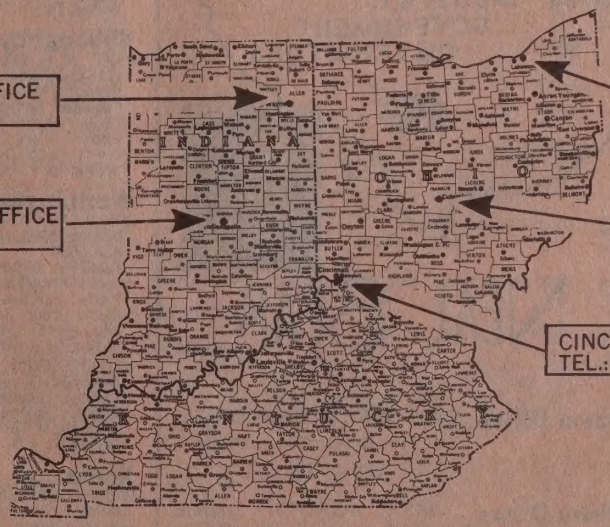

Licon Div.; Paktron Div.; Reed Devices; Struthers-Dunn; Tepro; Tri-Tronics.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 5)

SATULLO CO. (See Royal Oak, Mich.)

SCHMIDT & ASSOCS., 1419 Deveraux Dr., (513) 293-6652.
Factories: Aerovox; J-B-T Instrs.
Selling To: ★ D,M. **Salesman:** 1 (eng 1)

SHARP, F. R. CO., INC. (See Cleveland, Ohio)

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

SIDNEL, R. G. & CO., INC., 3300 S. Dixie Dr., (513) 293-1194.
Branches: 4 Meadowlawn Dr., Mentor, Ohio, (216) 942-3304; 6051 Pinecroft Dr., Orchard Lake, Mich., (313) 851-3518.
Factories: ACDC Elctrns.; Carborundum; Electro-Science Labs.; Hughes Aircraft; Hughes Aircraft VTP; Ind. Reproductions; Magnetics; Presco; Protronic Inds.; Rowan Inds. **Selling To:** ★ I,M,D. **Salesmen:** 4 (eng 4)

SIFF, R. G. & ASSOC., INC., 22 Oxford Ave., Sta. B.
Branch: Ship Shop, 7 Marina Plaza, Sarasota, Fla., (813) 959-5141.
Factories: Ace Elctrns. Assocs.; Bradley Semiconductor; Centralab Elctrn. Div.; Centralab Semiconductor; Emerson & Cuming; Gudeman Div.; Gulton Inds.; Hammarlund Mfg.; ILC Labs.; Joy Mfg.; Microtran Transformer; Sage Elctrns.; Tra Dyne.
Selling To: ★ M. **Salesmen:** 2 (eng 2)

STEFFEN, D. & ASSOC., INC. (See Cleveland, Ohio)

STERLING, S. CO. (See Cleveland, Ohio)

STONE, R. R. & ASSOC., INC. (See Mentor, Ohio)

SWENSON, E. V. & ASSOCS., 1112 Talbott Tower, (513) 223-4279.
Factories: Assembly-Overland; Avien; Baus Optics; Brown Engrg.; Conair; Data Meas.; Data Metrics Div.; Digital Instrs.; Dynatech; Malwin Elctrns.; Valcor Engrg.; United Dynacom; Amptek; Cooke Engrg.
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

TALBE, INC. (See Englewood Cliffs, N.J.)

TALCOMP CO., INC. (See Englewood Cliffs, N.J.)

TEPLITZ, H. & CO., INC., 3718 Salem Ave., (513) 277-6531.
Branches: 3945 Meadowbrook Blvd., Cleveland, Ohio, (216) 371-2044; 26847 Grand River Ave., Detroit, Mich., (313) 537-9058.
Factories: American Optical; Broomer Research; Calif. Elctrn. Mfg.; Data Instrs. Div.; Dytro; EG&G; Electro-Mechanisms; Film Microelectronics; Microwave Assocs.; Polarad Elctrn. Instrs.; Power Designs; Torotel; Waters Mfg.; Wiltron. **Services:** Direct Mail
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

THAL-MOR ASSOC., INC., 3232 Encrete La., (513) 298-9939. TELEX: 28-8234.
Factories: Consolidated Controls; Eagle Signal Div.; Gemco Elec.; Minarik Elec. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 4 (eng 1)

TIBY CO. (See Cleveland, Ohio)

WAHL A. C. & ASSOC. INC. (See Cincinnati, Ohio)

WHELAN, CORP., 2600 Far Hills Ave., (513) 298-9997. TWX: 810-459-1639.
Branches: 21877 Euclid Ave., Cleveland, Ohio, (216) 692-1266; Pittsburgh, Pa., (412) 361-1020.
Factories: Aero Research Instr.; Axel Elctrns.; Farmer Elec.; Inland Controls; Intronics; ITT Jennings; Korry Mfg.; Magnetic Windings; Microsonics; Milton Ross; Solitron Devices; United Elec. Controls.
Selling To: ★ I,M. **Salesmen:** 4 (eng 2)
Services: Warehouse

WHITESELL, R O & ASSOCS., (See Indianapolis, Ind.)

WKM ASSOCS. INC. (See Cleveland, Ohio)

Fairborn

COMPAR CORP. (See Burlingham, Calif.)

COMPAR OHIO (See Fairview Park, Ohio)

TECHNICAL ASSOC., INC., Box 388, (513) 878-2484.
Branch: 19500 Center Ridge Rd., Rocky River, Ohio, (216) 333-0035.
Factories: Airflyte Elctrns.; Ansley; Dynalco; Endicott Coil; G-V Controls; Helical Prods.; Von Weise Gear.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

Fairview Park

COMPAR OHIO, Box 4791, (216) 333-4120.
Branch: Box 388, Fairborn, Ohio, (513) 878-2631.
Factories: Industrial Condenser; Vectron; Magnetico; Glow-Lite Corp.; Hudson Corp.; Coron Corp.; Staco Switch; Electronized Chemicals Corp.; Delco Wire & Cable. **Selling To:** ★ I,M. **Salesmen:** 4 (eng 4)

Hudson

KAHSAR, F. E. SLS., INC. (See Cincinnati, Ohio)

Lima

OHIO ASSOCS., Box 728, (419) 646-3495.
Factories: Cushcraft; Epsilon Code Records; E.Z. Etch; Gam Antennas; Heights Towers; Kreckman Antennas; Omega T. Sys.; Pace Communications; Pausan Mars; Village-Twig Co. **Services:** Warehouse
Selling To: ★ D. **Salesmen:** 3 (eng 1)

Madison

MILLER, H. SALES CO. (See Cleveland, Ohio)

Medina

COZZENS & CUDAHY, INC. (See Rosemont, Ill.)

Mentor

SIDNELL R. G. & CO., INC. (See Dayton, Ohio)

STONE, R. R. & ASSOC., INC., Box 47, (216) 946-6766.
Branch: 1000 Cox Plaza, 3131 South Dayton Dr., Dayton, Ohio, (513) 293-3994.
Factories: Continental Wire & Cable; Couch Ordnance; Gehan Elec.; Meriden Molded Plastics; Shaw Insulator.
Selling To: ★ I,M. **Salesman:** 1

New Bremen

SHELBY, T. & CO. INC., 17 S. Walnut, (419) 629-6511.
Factories: Alliance Mfg.; Bell P/A Prods.; Chicago Miniature Lamp Works; Endeco; Loral Dist. Prods.; J. W. Miller; Mosley Elctrns.; Motorola Semiconductors; Oxford Transducer; Petersen Radio. **Salesmen:** 3
Selling To: ★ I,D. **Services:** Warehouse

Northfield

AERTRONIC ASSOC. (See Dayton, Ohio)

Novelty

G & H SLS. CO. (See Cincinnati, Ohio)

Oregon

STAFF R. A. CO. (See Cleveland, Ohio)

Reynoldsburg

CAIN & CO. (See Los Angeles, Calif.)

Richfield

BEAR, N. CORP., 3435 Streetsboro Rd., (216) 659-3331. TWX: 810-427-9100.
Branch: 1563 E. Dorothy La., Dayton, Ohio, (513) 299-3566. TWX: 810-459-1848.
Factories: Antenna Specialists; Argos Prods.; Bourns, Inc.; Eldema Div.; Holtzer-Cabot; Interswitch; Kulka; Littelfuse; National Semiconductor; New Prod. Engrg.; Pamotor; Parker Instr.; H. H. Smith; Switchcraft; Viking; Zero Mfg. **Selling To:** ★ A,I,D,M. **Salesmen:** 9 (eng 5)

(See Advertisement This Page)

Rocky River

TECHNICAL ASSOC. INC. (See Fairborn, Ohio)

Sabina

MILLER, H. SLS. CO. (See Cleveland, Ohio)

Toledo

ASH, W. J. & ASSOC., 4110 Templar Rd., (419) 241-1141.
Factories: W. F. Curlee Mfg.; Gemco Elec.; Heinemann Elec.; Hendrix Wire & Cable; T.J. Cope; Lapp Insulator; Preformed Line Prods. Co.; Zinsco.
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

CSC ASSOCS., 3855 Ellenridge Lan., (419) 478-0325.
Factories: Electra Corp.; Fasco Ind.; Hudson Lamp.
Selling To: ★ D. **Salesmen:** 2

Trotwood

ATKIND, I., 821 Burman Ave., (513) 837-4750.
Factory: Freed Transformer.
Selling To: ★ M. **Salesmen:** 2 (eng 1)

Vandalia

BRAUER, W. J. ASSOCS. INC. (See Wickliffe, Ohio)

Wickliffe

BRAUER, W. J. & ASSOCS., INC., Box 305, (216) 943-0601.
Branches: Box 35, Vandalia, Ohio, (513) 898-1224; Box 8466, Pittsburgh, Pa., (412) 921-3213.
Factories: Artisan Elctrns.; Beede Electrical Instr.; Berkshire Elec. Cable; Diodes, Inc.; Electrical Utilities; Electro Windings & Components; Penn Resistor; Resistors; Sage Elctrns.; Tru-Connector; U.S. Components.
Selling To: ★ I. **Salesmen:** 3 **Services:** Mailings

Willoughby

BAIER, A. H. CO. & ASSOCS., 4399 Industrial Pkwy., (216) 946-6080.
Branch: 3300 S. Dixie Dr., Dayton, Ohio, (513) 298-9897.
Factories: Basler Elec.; Data Technology; Electro-Craft; Fenwal Elctrns.; Ferranti-Packard; Grayhill; Stanford Applied Engrg.; Vishay Intertechnology; WABCO; Weston-Transicoil Div. **Services:** Warehouse
Selling To: ★ A,I,D,M. **Salesmen:** 6 (eng 3)

Worthington

OHIO INSTR. CO., THE, 505 Whitney Ave., (614) 885-0743.
Branch: 8928 Nottingham Dr., Ypsilanti, Mich., (313) 484-0585.
Factories: Birtcher; Chrono-Log; Fisher-Akin; Marconi Instrs.; Mova Elec. Mfg.; Philips Elctrn. Instrs.; Red-Data Prods.; Sanders Div.; Schlumberger; Inger; Solariron Elctrn. Group; Spar Elctrns.; Stable Dynamics; Technibilt; Xetex Elctrns. **Services:** Display Van
Selling To: ★ I,M,Schools **Salesmen:** 2 (eng 2)

WELLER ELCTRN. SLS., INC., Box 212, (614) 885-7819.
Factories: Blonder-Tongue; Gilbert Engrg.; Industrial Devices; Johnson Elctrns.; Metal Works; Precision Elctrns.; Raytheon; SC Elctrns.; Siema Inds.; South River Metal; Turner.
Selling To: ★ D. **Salesmen:** 3 (eng 1)

Xenia

BAEHR-GREENLEAF & ASSOCS., INC. (See Cleveland, Ohio)

MICHAELSON, B. L. CO., 1053 Arlington Dr., Box 217, (513) 372-5496.
Branches: 3617 Lee Rd., Cleveland, Ohio, (216) 921-8850; 4 West Manilla Ave., Pittsburgh, Pa., (412) 922-2420.

DAVE LOCKE

JOHN LIEDTKE

BOB SCHREGARDUS

PAT KING

BOB GILBERT

ART MARINELLI

RON STETLER

WARREN ROSE

NEAL BEAR

NEAL BEAR CORP.

Northern Office 3435 STREETSBORO RD., RICHFIELD, OH., 44286 (216) 659-3331

Southern Office 1563 E. DOROTHY LANE, DAYTON, OH., 45429 (513) 299-3566

Factories: Aotek-Fritzsching; AUDN; Delavan Mfg.; Dolan-Jenner Inds.; The Electron Machine; Goring Kerr; Graphic Controls; Invac; Inventron Inds.; Williamson; KDI Poly-Technic.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)

Yellow Springs
MOTORS INC., Box 274.
Branch: 19500 Center Ridge Rd., Cleveland, Ohio.
Factories: T. A. Edison; Electro Counter & Motor; Rae Motors; Rotating Components.
Selling To: ★ I. **Salesmen:** 4 (eng 4)

OKLAHOMA

Tulsa
BRICE CO. (See Bellaire, Tex.)
DATA ENGRG. CORP. (See Richardson, Tex.)
GREEN, J. A. CO. (See Dallas, Tex.)
IBL ENGRG. & SLS. INC. (See Dallas, Tex.)
KLICPERA, M. F. (See Houston, Tex.)
McKINNEY, J. F. SLS. CO. (See Dallas, Tex.)
PARKINS & BRETZ CO. (See Kansas City, Mo.)
PECK, G. V. CO. (See Dallas, Tex.)
SOUTHWEST ELCTRN. INDS., INC. (See Dallas, Tex.)

OREGON

Beaverton
ARNESON ASSOCS., INC. (See Seattle, Wash.)
SCHULTZ, N. R. CO. (See Belleview, Wash.)

Lake Oswego
McMILLAN ELCTRNS., 16679 S.W. Maple Circle, (503) 636-6257.
Factories: American Elctrn. Lab.; Certron; Continental Semi-Conductors; Crown Int'l.; Datak; Magitran; Trutone Elctrns.; Saxton Prods.
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)

Eugene
PETERS-DE LAET, INC. (See Burlingame, Calif.)
TUDOR J. A. & ASSOC. INC. (See Seattle, Wash.)

Portland
ALLIED NORTHWEST MACHINE TOOL CORP., 3525 S.E. 17th, (503) 659-2329.
Factories: A&O; Besley Prods.; Brown & Sharpe; Cogsdill; Conrac; Elox; Fellows; Hammond Machinery; Jones & Lamson; Manchester; Niagara; Pennoyer Dodge; Sheldon; Sig-Syn N/C; Waterbury Farrel; W.F. Wells; N.A. Woodworth. **Selling To:** ★ I. **Salesmen:** 3
ALMAC/STROUM ELCTRNS. (See Seattle, Wash.)
ARVA, INC. (See Seattle, Wash.)
BACH, P. ELECTRIC, 1233 N. W. 12th Ave., (503) 227-2173.
Branches: Box 631, Bellevue, Wash., (206) 454-8694; Box 96, Spokane, Wash., (509) 924-8544.
Factory: Kulka Elec.
Selling To: ★ I,D. **Salesmen:** 3 (eng 1)
BRANOM INSTR. CO. (See Seattle, Wash.)
EARL & BROWN CO. INC. (See Seattle, Wash.)
ECKERSLEY, J. W. CO., 3150 S. W. Hamilton St., (503) 246-3183.
Factories: Alliance Mfg.; American Electrical Heater; Caringella Elctrns.; Cleveland Elctrns.; S. H. Couch Div.; ESB, Inc.; Gold Line Co.; Heeger, Inc.; Ingraphics Ltd.; Int'l. Wire & Cable; Mura Corp.; Pearce-Simpson, Inc.; Positive Connector; Thoro-Test Div.; Trimm, Inc.; Vantage Prods. **Selling To:** ★ I,D. **Salesman:** 1
EDSTROM, J. E., 407 S.W. 11th Ave., (503) 227-5311.
Factories: Bahnson Co.; Cole Dynamics; Digitron; Eastron; Philadelphia Scientific Glass; PMF Elctrns.; Semiconductor Circuits.
Selling To: ★ I. **Salesman:** 1 (eng 1)
INSTRUMENT SPECIALISTS, INC. (See Glendale, Calif.)
LEGG, R. CO., Box 25327, 4475 S.W. Scholls Ferry Rd., (503) 292-8824. TWX: 910-464-1510.
Branch: 33 Sequoyah View Dr., Oakland, Calif., (415) 569-8822.
Factories: Cal-R; Carol Cable; Columbus Elec.; CTS; CTS Knights; New Prods. Engrg.; Siemens America; Tansitor Elctrns.; Wabash Magnetics.
Selling To: ★ I,M. **Salesmen: 4 (eng 2)**
LYNN & BROOKS (See Los Angeles, Calif.)
MARTIGS INC., 5741 N. E. Glisan St., (503) 232-1949.
Factories: Automated Environmental Sys.; Deltron; Fischer & Porter; Frost Elctrns.; In-Val; Research Controls. **Services:** Repair, Warehouse
Selling To: ★ I,D. **Salesmen:** 5 (eng 2)
MAULDIN CO. (See Palo Alto, Calif.)
MERRITT, R. CO. (See Seattle, Wash.)
MINTHORNE, R. M. CO., 6565 S.W. Macadam Ave., (503) 246-4556.
Factories: Akro Mils; Arkay Prods. Mfg.; C. Cordover; Dutrex/Dumont Inds.; Eby Sls.; Electra; Jersey Specialty; Kits Inds.; Leader Instr.; Monarch Elctrns. Int'l.; Newcastle Fabrics; Robins Inds.; Superex Elctrns.; Tab Books; Televac. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 2
MONTGOMERY BROS., INC. (See Burlingame, Calif.)
PETERS-DE LAET, INC. (See Burlingame, Calif.)
POLICH, A. L. INC., 5940 S.W. Hood, (503) 246-5451.
Branch: 2636 Thorndyke W., Seattle, Wash., AT 3-7100.
Factories: A.O. Smith; Gould; Mektron; Ratelco.
Selling To: ★ I. **Salesmen:** 5 (eng 4)
Services: Warehouse
RIGGS, C. E. INC., 422 Northwest 8th, (503) 226-3286.
Branch: 314 2nd Ave. S., Seattle, Wash., (206) MA 3-5707.
Factories: Amacoil Machinery; Gardiner Solder; Frank Markel & Son; Niemand; Sterling Div.; Wilcox Prods.
Selling To: ★ I,D. **Salesmen:** 6
Services: Warehouse
TUDOR J. A. & ASSOC., INC. (See Seattle, Wash.)
WEBER, D. G. CO., 1226 S.E. 7th Ave., (503) 234-0686, 234-7671.
Branches: 403 Maritime Bldg., Seattle, Wash., (206) 623-5990; 303 W. 15th Ave., Spokane, Wash., (509) 624-3908.
Factories: Acoustron; Air-Vac Engrg.; Astatic; Delevan Elctrns.; Electrical Inds.; Erdco Engrg.; James Elctrns.; Kurz-Kasch; Lectrotech; Merit Coil & Transformer; Raytheon; Sprague Prods.; Trusonic; Utah Elctrns.
Selling To: ★ A,D,I. **Salesmen:** 4 (eng 2)
Services: Warehouse
WELLS, W. C. CO., 6055 N. E. Glisan, (503) 235-2437.
Factories: Linemaster Switch; Midwest Elec. Prods.; National Heme. **Services:** Limited Warehouse
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

PENNSYLVANIA

Abington
BACH-STEWART ASSOC., 947 Old York Rd., (215) 927-1200.
Factories: A.D. Data Sys.; Atlantic Tech.; Bielski Memory Sys.; Biomation/Data Lab.; Computer Prods.; Doric Scientific; Edwin Inds.; Elgar Corp.; Fairchild Control; Holt Instr. Labs.; Melabs; Optical Elctrns.; MIL Assocs.; Racal Comm.; Rohde & Schwarz Sales; Saicor; Spencer-Kennedy Labs. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
HILLIARD ASSOCS., INC., Box 186, (215) 884-6100.
Selling To: ★ I,D. **Salesmen:** 4 (eng 1)
Services: Warehouse
PEARSON, R. T. SLS. INC., 1125 Old York Rd., (215) 887-0186.
Factories: Arrow Mfg.; Auricord Mfg.; Gates Albert; Iseli; Liverpool Inds.; Mel-Rain; J. L. Petz; Tower Mfg.; Tyler Sls.; Victor Elec. Wire & Cable; Waterbury.
Selling To: ★ I. **Salesmen:** 3 (eng 2)

Ambler
GRIFFIN-CAMPBELL, INC., 25 Skippack Pike, (215) 646-7535.
Factories: Axel Elctrns.; Carlisle Corp.; N. American Printed Circuit Div.; NCI, Inc.; Price Elec.; Transitron Elctrn. **Selling To:** ★ I,D,M. **Salesmen:** 3 (eng 2)

Andalusia
L & M ASSOC. (See Saddle Brook, N.J.)

Ardmore
HELLER-FREEDMAN ASSOC., Box 391, (215) 649-3679.
Branch: Box 293, Timonium, Md., (301) 252-4780.
Factories: ACS Inds.; Applied Engrg. Prods.; Cosmo Plastics; Defiance Circuit; Endicott Coil; Gordos; Heldor Assocs.; Hi-G; Inter-Technical Group; Merrimack Magnetics; Sensitron; Tec-Magnetics; Thorn Radio Valves & Tubes. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 2)
L C A SALES, INC. (See Tuckahoe, N.Y.)
MARTIN ELEC. CO., 118 Valley Rd., (215) 649-6332.
Factories: Acopian Technical; Bunker-Ramo; Del Elctrns.; Penntube Plastics; Severna Div.; Varflex; WL Molding. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)
ROTHENHEBER & WURTS, INC., 53 Cricket Ave., (215) MI 2-6911.
Branch: 14211 Chesterfield Rd., Rockville, Md., (301) 929-3388.
Factories: Dearborn Elctrns.; General Semiconductor; Grand Transformers; Hotwatt; Pennsylvania Elctrns. Technology; Power Control; Quality Components; Republic Elctrns.; Skinner Precision Inds.; Stemco Controls; Syracuse Elctrns.; Thermal Circuits.
Selling To: ★ I. **Salesmen:** 3 (eng 2)

Bala Cynwyd
BURLINGAME ASSOCS., LTD. (See Mt. Vernon, N.Y.)

Broomall
ECCO SUPPLY INC., Box 210, (215) 356-9217. TELEX: 834-596.
Factories: Ashcroft Dresser IVI; Continental Disc.; Duro Inst.; Fram Corp.; Garlock Inc.; Hildebrandt Engr.; ITT General Controls; Magnatrol Valve; Magnetrol Div.; Marsh Inst.; Penberthy Div.; Tylok Int'l.; Valve Engrgs. Div.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 2)
Services: Repair, Warehouse
LOWERY, L. D. INC., 2801 W. Chester Pike, (215) EL 6-5300.
Branches: 6200 Annapolis Rd., Hyattsville, Md., (301) 773-4977; 1501 Allison St., Harrisburg, Pa., (717) CE 3-0917.
Factories: Corning Elctrn. Prods.; Dialight; Elctrn. Specialty; A. W. Haydon; Kulka Elec.; Leecraft Mfg.; Micropac Inds.; Pamotor; Phalo; United Transformer; Wood Elec. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 10 (eng 3)

Camp Hill
BEIL & WHITAKER, INC. (See Reading, Pa.)
TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

Cheltenham
ARNOLD ASSOCS. INC., 2 Ryers Ave., (215) 742-0600.
Factories: Carborundum Elctrns.; Microtran; R. F. Interonics; Voltronics. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

Chester Springs
CONOVER, L. C. ASSOCS., (215) 827-7261.
Factories: Economy Cable Grip Co.; Glowtex Lighting; Hope Electrical Prods.; B. Jadow & Sons.; Knopp Inc.; Lidseen of North Carolina; Lutron Elctrns.; Rapid Elec. Transformer. **Selling To:** ★ D. **alesmen:** 3

Chestnut Hill
PENN-DEL INSTR. SLS., INC., 709 Bethlehem Pike, (215) CH 7-9600.
Factories: Austron; Delavan Mfg.; Electron Mach.; Fetterolf; Hankison; W. A. Kates; Moore Inds.; Ohmart; Power Engrg. & Equipt.; Raytheon; Simmonds Precision; Veeder-Root. **Services:** Sales
Selling To: ★ I. **Salesmen:** 4 (eng 3)

Conshohocken
BROGAN ASSOCS., INC. (See Westbury, N.Y.)

Devon
B. & A. ASSOCS., 237 Lancaster Ave., (215) MU 8-5173.
Factories: Acromag; Barnes Corp.; Beede Electrical Instr.; Dormeyer Inds.; Inertial Motors; Macrosonics Int'l.; Precision Specialties; Trott Elctrns.; Vishay Resistor Prods. **Selling To:** ★ I,M. **Salesmen:** 4 (eng 3)

Doylestown
E-K-P ASSOCS., INC. (See Easton, Pa.)

Dresher
LAIRD EQUIP. CO., 1029 Twining Rd., (215) 884-8198.
Factories: Cadillac Stamp; Electromark; Franklin Mfg.; Hermes Plastics; Kwikmark; New Hermes Engraving Mach. **Services:** Warehouse, Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 1)

Drexel Hill
McDAVITT SLS. CORP., Box 308, (215) 544-2588.
Factories: Anderson Power Prods.; Barber Colman.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)
STOBBART, A. J., 4980 State Rd., (215) 259-3881.
Selling To: ★ I,D. **Salesman:** 1 (eng 1)

Easton
E-K-P ASSOCS., INC., Lafayette Towers, 2040 Lehigh St., (215) 258-6477.
Branches: 1626 Forest Park Ave., Baltimore, Md., (301) 747-3170; 344 W. Court St., Doylestown, Pa., (215) 345-1495.
Factories: Columbia Elctrn. Cables; E/V Game Inds.; Finney Co.; Mercury Elctrns.; Premier Metal Prods.; South River Metal Prods.; Utah Elctrns.; Waldom Elctrns.; Workman Elctrn. Prods.; Xcelite.
Selling To: ★ A,D,I. **Salesmen:** 3

Fairview Village
ACROMATIX ASSOCS., INC., Box 271, 3118 Germantown Pike, (215) 279-0377.
Factories: Atec, Inc.; Birtcher Corp.; Chadwick-Helmuth; CML, Inc.; Colorado Video; Marconi Instrs.; Matrix Corp.; North Atlantic Inds.; Optimation; Resalab, Inc.; Weiser/Robodyne. **Services:** Repair
Selling To: ★ A,I,M. **Salesmen:** 3 (eng 3)

Fort Washington
BEEMER ENGRG. CO., (215) MI 6-8440. TWX: 510-661-1654.
Branches: Cleveland Pl., Springfield, N.J., (201) 376-8338; 67 Oakgrove Dr., Buffalo, N.Y., (716) 632-4363; 108 Dawley Rd., Fayetteville, N.Y., (315) 446-5197; Box 916, Severna Park, Md., (301) 647-1840; 2201 Park Rd., Charlotte, N.C., (704) 332-2129.
Factories: Chrysler Corp.; Dixon; Halogen Insulator & Seal; Haskel Engrg. & Supply; Lear-Siegler; Marion Bronze; Plastic & Rubber Prods.; Tec Seal Corp.; United Aircraft Prods. **Services:** Warehouse
Selling To: ★ I. **Salesmen:** 15 (eng 4)

Gladwyne
HEVNER, D. S. CO., 1528 Spring Mill Rd., (215) 525-9727, 525-9695.
Factories: Ajax Hardware; Cleveland Elctrns.; Cord Sets; Dixie Wire; Eastern Machine; Louvre-Lux; Perfection Electrical Prods.; Sandee Mfg.

Glenside
ARA ELCTRNS. INC., 501 Edge Hill Rd., (215) TU 7-5250.
Branch: 7805 Old Georgetown Rd., Bethesda, Md., (301) 657-2585. **Services:** Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
BUERGER CO., INC., 33 Limekiln Pike, (215) 887-5030, 224-2442.
Branches: 1359 Oak Lane, East Meadow, N.Y., (516) IV 5-6228; 2961 Liberty Ave., Pittsburgh, Pa., (412) 276-3122.
Factories: Baron-Blakeslee Inc.; Chemcut Corp.; Colight, Inc.; Consul-Mutoh; Eastman Kodak; H & M Machinery; Heller Tool Div.; Hydra-Electric; Infra-Red Sys.; Ramyr Mfg.; Robertson Photo-Mechanix; United Scientific. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 4 (eng 2)

ELCOM, INC., 130 S. Easton Rd., (215) 885-1325. TWX: 510-665-0269.
Factories: Cal-R Inc.; Centralab Semiconductor; Defiance Circuit; Frequency Elctrns.; Intersil Inc.; Republic Corp.; Silicon Transistor.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

MID-LANTIC CHAPTER ELECTR. REPRESENTATIVES ASSOC., 315 Harrison Ave., (215) 884-0139.

(See Advertisement page 3273)

SHELMAR ELCTRNS. CORP., Box 254, (215) 885-0800.
Factories: American Thermostat; Anixter-Murray; Ark-Les Switch; Kanthal; Radix Wire.
Selling To: ★ I. **Salesmen:** 2

SHELPS, G. A. CO., 2 Roberts Block, (215) 885-0800.
Factories: American Thermostat; Ark-Les Switch; Hudson Lamp; Kanthal; Radix Wire. **Salesmen:** 2
Selling To: ★ I. **Services:** Warehouse

THOMAS, C. W. INC., 134 Tyson Ave., (215) CA 4-5676.
Factories: Jenny Inds.; Welkesser.
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 1)
Services: Warehouse

WILKINSON R. L., INC. (See Towson, Md.)

Harrisburg

BEIL & WHITAKER, INC. (See Reading, Pa.)

LOWERY, L. D. INC. (See Broomall, Pa.)

Hatboro

DAMON/ENGEL INC. (See Ridgewood, N.J.)

Havertown

F-M ELCTRN. ASSOCS., 206 Bewley Rd., (215) HI 6-1961-1962.
Branch: 3519 Raymoor Rd., Kensington, Md., (301) 949-1747.
Factories: Ava Elctrn. & Mach.; Datak Corp.; Duotone Co.; Gavin Instrs.; Gibbs Special Prods.; James Elctrns.; Resistor Wholesalers; Rye Sound Corp.; Trimm, Inc.
Salesmen: 2

MASSEY ASSOCS., INC., 1325 W. Chester Pike, (215) 789-2320, 528-6384.
Branches: 801 79th St. S., St. Petersburg, Fla., (813) 347-6183; Box 877, Jupiter, Fla., (305) 746-4591.
Factories: J-B-T Instrs.; Logic Dynamics; Metex; Omni Spectra; Panelgraphic; Precision Tube; Sanders Assocs.; Shurite Meters; Syntronic Instrs.; Triplett; Vamistor.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 3)

MUSTICO, J. CO., Box 624, 312 Bewley Rd., (215) HI 6-1961.
Branch: 3519 Raymor Rd., Kensington, Md., (301) 949-4149.
Factories: Aerotherm; B&F Instrs.; Badger Meter; Dynisco Div. Microdot; Electro-Gen'l.; Neff Instrs.; RdF; Robinson-Halpern.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

STEIN INSTRUMENTATION CORP., 413 Johnson St., (215) 885-2370.
Factories: Dentronics; Natel Engrg.; Pioneer Magnetics; PPM; Preston Scientific; Renco; Setra Sys.; Thermal Sys.; Viatran. **Services:** Repair, Warehouse, Direct Mail
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

King of Prussia

ELECTRONIC MKTG. ASSOCS. (See Kensington, Md.)

RIVCO, Box 338.
Factories: Advanced Research Digital; Control Equipment; Computer Labs.; Computer Signal Processors; GPS; Information Control; Metal Works; Memory Technology; North Elec. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

Langhorne

PAR-NELL SLS. CO., Box 374, 115 E. Maple Ave., (215) 757-7644.
Branch: 69 Main St., Reisterstown, Md., (301) 833-6444.
Factories: Bomar Crystal; Kepro Prods.; J. W. Miller; M. A. Miller Mfg.; Mosley Elctrns.; RMS Elctrns.; Sonar Radio; TRWE Distributor Prods.; Wall Mfg.
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 1)
Services: Warehouse

Lansdowne

SATTERTHWAITE, W. F. & CO., Box 191, (215) 623-5100.
Factories: Aeroflex Labs.; American Technical Ceramics; Chicago Etching; Diamonite Prods. Mfg.; Eagle Signal Div.; Elctrn. Instr. & Specialty; Halex; Hamlin; Integrated Circuit Elctrns.; Johanson Mfg.; Piconics; Precision Circuits.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

Laverock

WEINBERG, M. ASSOCS., 1919 Waverly Rd., (215) 885-1918, LI 9-1122.
Factories: Bogen Communications; Coleman Cable & Wire; Fourjay Inds.; GRI-Comm.; Lee Elec.; Kimco Tape Accessories; Midland Int'l.; Optical Controls.
Selling To: ★ A,I,D. **Salesmen:** 2 (eng 1)

Ligonier

SHARP, F. R. CO. INC. (See Cleveland, Ohio)

McMurray

DAUGHERTY, F. A. CO. (See Cleveland, Ohio)

Media

W. REEVES ASSOCS. INC., 2973 N. Providence Rd., (215) 566-6709.
Factories: Aero Mechanism; All-tronics; Clairex Elctrns.; Control Data; Curtis Instrs.; General Reed; Kessler-Ellis Prods.; Nytronics; Tapeswitch; Thermo-lab.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

Montgomery County

HILDERBRAND, R. H. CO., Fairview Village, Box 166, (215) 247-6225, 277-3333. TWX: 510-660-0985.
Factories: A & M Instr.; Airco Speer Elctrn. Comp.; ARCO Elctrns.; Cincinnati Milling & Grinding Mach.; Coilcraft, Inc.; Precision Elctrn. Comp.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

Narberth

BRESSON, JERRY, ASSOC., 107 Forrest Ave., (215) TE 9-6770.
Branch: 5600 Main St., Elkridge, Md., (301) 796-5220.
Factories: Centralab; General Instr.; Electra/Midland; Phastron Instr. & Elctrns.; Solitron Devices Inc.
Selling To: ★ I. **Salesmen:** 7 (eng 4)
Services: Direct Mail

JEFFRIES, S. A. INC., 105 Forrest Ave., (215) 664-8500, 839-4344.
Branches: 530 Sixth Ave., Pittsburgh, Pa., 391-1100; 500 Overcrest Rd., Baltimore, Md.; 529 14th St. N.W., Washington, D.C., 737-2295.
Factories: American Magnetics; All States Plastic Mfg.; Cole Instr.; Elctrn. Chemical; Elmag; Littelfuse; National Controls; Robinson-Nugent; Rodale Mfg.; Sealectro; Seastrom Mfg.; United Mineral & Chemical; Whitso.
Selling To: ★ I,D. **Salesmen:** 5 (eng 3)
Services: Warehouse

STINSON ASSOCS., 227 Haverford Ave., (215) 664-5511.
Factories: Antenna Specialists; Barker Prods.; Cornell Dubilier; CTS Knights; Motorola; Murdock; CBS Soundcraft; Walco Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 1)

WHITE-KEYSTONE, L. G. INC., 100 Essex Ave., (215) MO 4-6505, TE 9-3445.
Factories: Amco Engrg.; Birtcher; Christie Elec.; Deltron; Digitron; Digitronics; Enercon; G-V Controls; Instrument Displays; New Product Engrg.; Raymond Controls; Schrack Electrical Sls.; Tasker Inds.; Unimax Switch; Vector Engrg.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

New Britain

LIENAU ASSOCS., INC. (See Silver Spring, Md.)

Newtown, Bucks County

MURRAY CO. (See Livingston, N.J.)

Newtown Square

BROTHERS & CONNEEN ASSOC. (See Baltimore, Md.)

HOLDSWORTH & CO., INC., Box 298, (215) EL 6-8550. TWX: 510-662-9028.
Factories: Joslyn Elctrn. Sys.; Modutec; Monitor Sys.; Rustrak Instr. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

KAUFHOLZ ASSOCS., Box 227, (215) 356-5000.
Branch: Box 6232, Baltimore, Md.
Factories: Chicago Miniature Lamp Works; Drake Mfg.; Illinois Tool Works; Janco; North Elec.; Ramsey Controls; Scanbe Mfg.; Technical Wire Prods.
Selling To: ★ I,D. **Salesmen:** 4 (eng 3)
Services: Warehouse, Direct Mail

Norristown

DATA-REP ASSOCS., INC. (See Rockaway, N.J.)

DENCO-DATA ENGRG. CO., 304 W. Johnson Hwy., (215) 272-1444. TWX: 510-660-0713.
Branch: 10 Old Post Office Rd., Silver Spring, Md., (301) 587-3910.
Factories: Analogic Corp.; Computer Displays; Computer Operations; Delta Data Sys.; Diablo Sys.; Digital Information Storage; GRI Computer; Hycomp Inc.; Intech Inc.; Microsonics Inc.; Standard Memories.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Repair, Warehouse, Software Services

Oreland

BROWN-FREDERICK & ASSOCS., INC., 88 Penna Ave., (215) TU 7-1325.
Factories: Gowanda Elctrns.; Semicon; Stackpole Carbon.
Selling To: ★ I,D. **Salesmen:** 2 (eng 2)

Paoli

REESE ENGRG. SLS. CO., Box 600, (215) 644-8717.
Factories: Caig Labs.; Capsonic Group; Control Corp.; Contronautics; Knox Elctrns.; OAL Assocs.; R-K Elec.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

Philadelphia

A B & T SALES CORP. (See Olney, Md.)

ANDCO SLS-ENGRG., INC., 18 W. Chelten Ave., (215) GE 8-7900.
Branch: 6900 Wisconsin Ave., Washington, D.C., (301) 654-6065.
654-6065. **Selling To:** ★ I,M. **Salesmen:** 2 (eng 2)

BALLAGH & THRALL, INC., 1010 Schaff Bldg., (215) 564-4020.
Factories: Brand-Rex Div.; Latronics Corp.; Magnetic Metals; Penn Engrg. & Mfg.; Struthers-Dunn.
Selling To: ★ I,D. **Salesmen:** 18 (eng 2)

C & F SALES CO., 5451 Oakland St., (215) 288-9406.
Factories: Alco Elctrn. Prods.; All En Avionics; American Power Devices; Artisan Elctrns.; S & E I Mfg. Co.; Singer-Controls Co.; Vitramon.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

COOPER, R. J. SLS., 2928 Sandyford Ave., (215) 624-5486.
Factories: Adams Elctrns.; American Plasticraft; American Screw; Dirksen Screw Prods.; National Tel-Tronics; Underwood Elec. & Mfg. **Selling To:** ★ I,M.

E-A INC. (See Baltimore, Md.)

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EASTERN COMPONENTS, INC., 1349 W. Cheltenham Ave., (215) 927-6262.
Branch: 6200 Annapolis Rd., Landover Hills, Md., (301) 322-1412.
Factories: Bulova Elctrns.; Computer Diode; Ferroxcube Corp.; Staco Inc.; Voltron Prods.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 4)
Services: Stocking Fac.

EASTERN INSTRUMENTATION, INC., 613 Cheltenham Ave.
Branches: 300 Northern Blvd., Great Neck, N.Y., (516) 466-9505; Passaic, N.J., (201) 661-2000; Red Bank, N.J., (201) 842-4242; 1002 Ingleside Ave., Baltimore, Md., (301) 744-3675; 2600 Virginia Ave., Washington, D.C., (212) 333-8880; Ross Building, Richmond, Va., (703) 644-6622.
Factories: Cober Elctrns.; Kepco, Inc.; Microphase Corp.; Monsanto Elctrn. Instr.; Polarad Elctrns.; PRD Elctrns.; Servo; Sylvania Elctrn. Sys.; Watkins-Johnson; Wavetek, Inc.
Selling To: ★ I,M. **Salesmen:** 19 (eng 19)

ERDMAN, K. B. CO., INC., 7906 Montgomery Ave., (215) CA 4-1833.
Factories: Albany Prods.; Cambridge Thermionic; Illinois Lock; Midwest Circuits; PIC Design; Schauer Mfg.
Selling To: ★ I,D. **Salesmen:** 4
Services: Warehouse, Direct Mail

(See Advertisement Page 3272)

GRAYDON-SHERMAN, INC. (See Morristown, N.J.)

JADELECTRONICS ASSOCS., INC., Box 5735, (215) 455-3355.
Branch: Box 115, Greenbelt, Md., (301) 474-8161.
Factories: Amatom Elctrn. Hardware; Capco; Consolidated Ceramics; Elec-Trol; Electro-Science Labs.; Elec. Indicator; Elctrn. Molding; EMC Technology; Spectrum Microwave; Torotel.
Selling To: ★ I,D,M. **Salesmen:** 3

LEBAN, A. D. ASSOCS., 218 Lloyd Lane, (215) 642-9047.
Factories: Loral Dist. Prods.; RMS Elctrns.; Tube Mfg.
Selling To: ★ D. **Salesman:** 1

LEWIS, H. CO., 1013 Penn Tower, 1801 J. F. Kennedy Blvd., (215) 567-5020.
Branch: 210 Red Barn Rd., Willow Grove, Pa., (215) 659-0704.
Factories: Arista Enterprises; Audiophonics; Consolidated Wire; Carl Cordover; Fedtro; Hamilton-Hall; Hi-Tron; I.E.C./Mullard Tubes; Injectorall; Nat'l. Tel-Tronics; Pace-Nova Tech; Resisco; Swing-O-Lite; Tab Books; Tri-Dec Computer Lab.; Waber Elctrns.; Wald Sound.
Selling To: ★ A,D,I. **Services:** Warehouse **Salesmen:** 2

LIENAU ASSOCS., INC. (See Silver Spring, Md.)

LINZ, D. S., 238 Shelmire St., (215) 379-0734.
Factories: Barker & Williamson; Cornish Wire; Hammarlund Mfg.; Hy Gain Elctrns.; Keystone Elctrns.; Metra Elctrns.; Mura Elctrns.; Pomona Elctrns.; Semitronics; Ward Prods. **Services:** Warehouse
Selling To: ★ D,I,M. **Salesman:** 1 (eng 1)

LUCE, R. P. & CO., INC. (See Berkeley Hghts., N.J.)

MACDONALD, S. K. INC., 1531 Spruce, (215) KI 5-1205.
Branches: 3308 14th St., N.W., Wash., D.C., (202) 265-3938; 5500 Harford Rd., Baltimore, Md., (301) 254-3380; 7805 McKnight Rd., Pittsburgh, Pa., (412) 366-2643.
Factories: Consolidated Distributors; Eldema; Gramer-Halldorson Elctrns.; Ohmite Mfg.; Premax Prods.; Shure Bros.; Simpson Elec.; H. H. Smith.
Selling To: ★ A,D,I,M. **Salesmen:** 11 (eng 6)

(See Advertisement Page 3274)

MALTA, V. S. CO., Box 4007, (215) 836-5122.
Selling To: ★ A,D,I,M. **Salesmen:** 2 (eng 2)

MEYERS, R. ASSOCS., 529 Shoemaker Rd., (215) 224-1663.
Factories: Boonton Elctrns.; Continental Device; Delta Design; Eckel Inds.; Elctrns. for Meas.; Krohn-Hite; Mechanical Technology; Newport Labs.; Spacerays; Spectra Instrs. **Services:** Warehouse
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

NAUDAIN ASSOCS., 1032 Suburban Sta. Bldg., (215) LO 4-3194.
Branch: Lutherville-Timonium, Md., Box 1, (301) 252-5378.
Factories: Curtis Dev. & Mfg.; Grayhill; Grayhill Moldtronics; Industrial Timer; Jan Hardware; Panduit; Sanders Flexprint; Specialty Connector; Transtector Sys.; Weller Industrial Prods.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)

NEWSON, C. H. & ASSOCS., INC., 711 Bethlehem Pike, (215) 248-3377.
Branch: 16 Skidmore Ct., Towson, Md., (301) 825-0001.
Factories: American Micro-Sys.; Dearborn Glass; Kent; L. Frank Markel & Sons; Reeves-Hoffman; Sealectro; Stewart Warner Microcircuits; U. S. Components; Waters Mfg. **Selling To:** ★ I,D. **Salesmen:** 4 (eng 4)

NOLAN, J. J. & ASSOCS., 314 W. Sparks St., (215) 92-1595.
Factories: Electrical Windings; Javex Elctrns.; Mellotone Fabrics; Meltex Fabrics; Mohawk Wire & Cable.
Selling To: ★ A,D,I. **Salesmen:** 2 (eng 1)

O'HARA, B., 4952 Wynnefield Ave., (215) 473-3654.
Factories: Audio Dynamics; R.T. Bozak Mfg.; Koss Elctrns. **Selling To:** ★ A,D. **Salesman:** 1

PARAGON SLS. CO., 111 S. 22nd St., (215) 563-7060.
Factories: Amperex Elctrn.; Astatic; Bradford Components; General Coil Prods.; Ilsco; Lenox-Fugle Elctrns.; Mullard; Raeco; Spectrum Control; Universal Circuits.
Selling To: ★ I. **Salesmen:** 3 (eng 3)

SENCOR, INC., 2222 Glendale St., (215) FI 2-0223.
Branch: 79 Albertson Ave., Albertson, N.Y., (516) 747-1273.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

SIMBERKOFF SLS., INC. (See So. Orange, N.J.)

MID-LANTIC CHAPTER

ELECTRONIC REPRESENTATIVES ASSOCIATION

A B and T Sales Corp.
A R A Electronics, Inc.
Andco Sales Engineering, Inc.
Atlantic Technical Sales
H. S. Bancroft Corporation
J. N. Barrett Associates, Inc.
Jerry Bresson Associates
Brothers & Conneen Associates
Brown-Frederichs & Associates, Inc.
Howard C. Buerger Co., Inc.
Floyd W. Churchill Co.
W. Henry Cordray Sales Company
J. E. Cuesta & Co., Inc.
Danco Corporation
Eastern Components, Inc.
Emesco Associates
Emlen-Peterson Company
Kenneth B. Erdman Co., Inc.
FM Electronic Associates
H. J. Fairbanks Company
Andrew A. Foley Associates
Martin Friedman Associates, Inc.
Gray-Williams Associates
JADElectronics Associates, Inc.
Samuel A. Jeffries, Inc.
Kaufholz Associates
Jules Kornberger
L.C.A. Sales, Inc.
Letronix
Herman Lewis Co.
Samuel K. Macdonald, Inc.
J. A. Maguire & Co.
Victor S. Malta Co.
Martin Electric Company
William D. McCuin & Associates
William K. Metz
Robert Meyers Associates
Mid-Eastern Associates, Inc.
Naudain Associates
C. H. Newson & Associates, Inc.
Paragon Sales Co.
Precision Electronics, Inc.
Quality Components Company
D. G. Quinlan Co.
Ken Randall Company
Reese Engineering Sales Company
Rivco
Gene Rosen & Associates, Inc.
Rothenheber & Wurts, Inc.
Sher & Taub Sales, Inc.
Stitzer Associates, Inc.
Morris F. Taylor Company, Inc.
Trinkle Sales, Inc.
A. Wetterhahn Co., Inc.
L. G. White-Keystone, Inc.

GEORGE G. SCARBOROUGH, Executive Secretary
315 Harrison Avenue, Glenside, Pa. 19038 **Area (215) 884-0139**

SLUBIN, L. & CO., 2305 Fairmount Ave., (215) 236-2072.
Factories: Bergen Labs.; Elctrn. Specialty; Ferrotec; Kenyon Elctrns.; Microwave Dev. Labs.; Parametric Inds.; Tech-Tran. **Salesmen:** 3

STRATTON, C. H., 7720-A Stenton Ave.
Factory: Simmons Fastener. **Selling To:** ★ I.

TAYLOR M. F. CO. INC. (See Silver Springs, Md.)

TECHNICRAFT CO., 7028 Ridge Ave., (215) IV 3-4700.
Factories: Barbour Stockwell Instrs.; Couch Ordnance Div.; De-Tec-Tronic; General Automatic; Lake Shore Elec.; Madison Labs.; Sigma-Netics; Torq Engineered Prods.; Virginia Elctrns. **Salesmen:** 2 (eng 1)
Selling To: ★ I,M. **Services:** Repair, Warehouse, Direct Mail

TEST EQUIP. SLS. CO., 4447 N. Bodine St., (215) 329-1822.
Factories: Aero Research Instr. Dept.; Conrad-Missimers; Dynasciences Instr. Sys. Div.; Technology/Versatronics.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)

VPI ASSOC., INC. (See Laurel, Md.)

Pittsburgh

BERG, S., INC., Box 4500, (412) 923-1911.
Factories: Barksdale Valves; Barnes Drill; Circle Seal Prods.; G. W. Dahl Co.; Sprague Eng.; Victor Controls.
Selling To: ★ I. **Salesmen:** 3 (eng 3)

BOLLINGER & BRADFORD, Box 8088, (412) 561-2340.
Factories: Ampex Corp.; Associated Resh.; Atkins Technical; Dynasciences Corp.; Electro Prods. Labs.; Electron Machine; Esterline-Angus Instr.; Greibach Instr.; Royson Engrg.; Veeder-Root.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

BRAUER, W. J. & ASSOCS. INC. (See Wickliffe, Ohio)

BUERGER CO., INC. (See Glenside, Pa.)

CARTER, McCORMIC & PEIRCE, INC. (See Farmington, Mich.)

CLARK, R. F. CO., 10517 Lindberg Ave., (412) 242-9500.
Factories: Adams & Westlake; Bramco Div.; Control Sys.; Curtis Dev. & Mfg.; Datascan; R.B. Denison; Foster Transformer; Industrial Elec. Engrs.; Industrial Timer; Robertshaw Controls; Spectrol Elctrns.; Stearns Elec.; H. H. Sticht; Strothers-Dunn; Texas Instrs.; Trent Inc.; Weksler Instr.
Selling To: ★ I,D. **Salesmen:** 5 (eng 5)

COVERT & NEWMAN CO., 310A, 300 Mount Lebanon Blvd., (412) 563-0303.
Factories: Components; Cornell-Dubilier; CTS Corp.; Electro Switch; Essex Wire; Grayhill; Hunter Inds.; Ledex; Precision Resistor; Precision Timer; TRW.
Selling To: ★ I,D. **Salesmen:** 2

CRESCENT SLS. CO., INC., 4830 McKnight Rd., (412) 364-3700.
Factories: Circle F Inds.; Chase-Shawmut; Electrical Prods. Div.; Jefferson Elec.; Porcelain Prods.; Republic Steel. **Services:** Warehouse
Selling To: ★ I,D. **Salesmen:** 6 (eng 1)

DIETRICH, L. CO., 90 Clairton Rd., (412) 892-2992.
Branches: 316 Marion Bldg., 1276 W. 3rd St., Cleveland, Ohio, (216) 781-1855; 333 West 1st St., Dayton, Ohio, (513) 223-6042; 600 Michigan Bldg., Detroit, Mich., (313) 961-4540.
Factories: Elctrn. Comp.; Environmental Test Equip.; Instrumentation Digital Sys. **Salesmen:** 5 (eng 5)
Selling To: ★ D,I,M. **Services:** Repair, Warehouse

ELECTRO SLS. ASSOCS. (See Cleveland, Ohio)

JACOBS, M. S. & ASSOC., 810 Nobletown Rd., (412) 923-2080.
Branches: Box 523, Charlestown, W. Va.; 6900 Granger Rd., Cleveland, Ohio, (216) 524-3000; 1 School St., Batavia, N.Y., (716) 344-0102.
Factories: Associated Controls & Equip.; A. W. Cash; Davis Instrs.; Demco; Ellison; Fairchild Hiller; I.T.T. Barton; Mission; Telmar; Vibra Screw.
Selling To: ★ I. **Salesmen:** 20 (eng 20)
Services: Warehouse

JEFFRIES, S. A., INC. (See Narberth, Pa.)

JOHNSON, H. C. AGENCIES, INC. (See Rochester, N.Y.)

LESKER, K. J. CO., 5635 Horning Rd., (412) 653-0800. Toll Free: 800-245-2580.
Factories: Beckman Instrs.; Bio-Cal Instrs.; CHA Inds.; Extranuclear Labs.; Forma Scientific; K-Square; Kenics; Laboratory Data Control; MKS Instrs.; Newport; Sloan Instrs.; Spacelabs; Thermo-Lab Instrs.; Union Carbide; Vacudyne; Welch Scientific. **Salesmen:** 10 (eng 10)
Selling To: ★ I,M. **Services:** Repair, Warehouse

MacDONALD, S. K., INC. (See Philadelphia, Pa.)

MATES, H., 5508 Hobart St., (412) 421-8998.
Factories: America Phono-Ton; B.E.C. Inc.; CBC Inds.; Chemtronics; Dictation Prods.; Livingston Audio Prods.; Telephone Dynamics; United Elctrns.; Veritas.
Selling To: ★ A,D.

MICHAELSON, B. L., CO. (See Xenia, Ohio)

NATALINA, A. ASSOCS. (See Akron, Ohio)

OLSEN, J. O. CO. (See Cleveland, Ohio)

PODOLNY, J. H. CO., 5912 Penn Ave., (412) 441-0800.
Factories: American Geloso Elctrns.; American Stylus; Barzilay; BRITISH Inds.; Commonwealth Inds.; Drake Mfg. Elctrn. Publishing; Hallicrafters; Harman-Kardon; Mura; Murdock; Peerless Electrical Prods.; Robins Inds.; Tab Books; TEAC; Waters Conley.
Selling To: ★ A,D,I. **Salesmen:** 4

PUGH, C. L. ASSOC., INC. (See Columbus, Ohio)

ROCKFORD CONTROLS OHIO, INC. (See Dayton, Ohio)

ROOT, G. S. & CO., 809 Wainwright Dr., (412) 561-4125.
Selling To: ★ I,D. **Salesmen:** 2

SHERIDAN ASSOC. INC. (See Cincinnati, Ohio)

SHIELDS, W. D. CO., Box 9093, (412) 471-6946.
Selling To: ★ I,D. **Salesmen:** 3 (eng 3)
Services: Repair, Mfg.

STERLING, S. CO. (See Cleveland, Ohio)

TAYLOR, M. F. CO. INC. (See Silver Springs, Md.)

WHELAN CORP. THE (See Dayton, Ohio)

WHITESELL, R O & ASSOCS. (See Indianapolis, Ind.)

WKM ASSOCS., INC. (See Cleveland, Ohio)

YARUSSI, F. P. CO., 312 Rockfield Rd., (412) 221-4676.
Factories: Bogen Comm. DIC/LSI; Crystech; Electra; Hudson Lamp; Koss Elctrns.; Mercury Elctrns.; O'Sullivan Inds.; Quam-Nichols; Telefunken Sls.
Selling To: ★ A,D,I. **Salesman:** 1 (eng 1)
Services: Warehouse, Direct Mail

Radnor

CORDRAY, W. H., SLS. CO., One Radnor Sta., (215) TR 8-3737. **Selling To:** ★ I,M. **Salesmen:** 3

ELECTRO-PLAST, INC., 2 Radnor Station Bldg., (215) 688-5581.
Branch: 1247 Wiltshire Dr., Brockie, York, Pa., (717) 854-5441.
Factories: Alto Dev.; C/P Corp.; Gibson Elec.; Haveg Inds.; Industrial Blast Coil; Precision Laminates; Wiggins Plastics; Wood Plastics.
Selling To: ★ I. **Salesmen:** 3 (eng 2)

Reading

BEIL & WHITAKER, INC., 3623 Jacksonwald Ave., (215) 779-2610.
Branches: 5610 Akron Dr., Harrisburg, Pa., (717) 652-0184; 849 W. Foxcroft Dr., Camp Hill, Pa., (717) 233-1254.
Factories: Acopian Technical; Alpha Wire; Amperex Elctrns.; Clarostat Mfg.; Electrovert, Inc.; Intercon Corp.; JFD Elctrns.; Littelfuse; Potter & Brumfield.
Selling To: ★ I,D,M. **Salesmen:** 4
Services: Warehouse

(See Advertisement This Page)

Richboro

GAWLER-KNOOP CO. (See Roseland, N.J.)

Sellersville

M & S ASSOCS., INC. (See Haddonfield, N.J.)

Southampton

WILD, J. J., INC. (See Jericho, N.Y.)

Valley Forge

CUESTA, J. E. & CO., INC., (215) 265-5800. Phila. Line, (215) 242-0150. TWX: 510-660-1484.
Branches: 8501 Glendale Rd., Greenbelt, Md., (301) 552-1200; 1212 Washington St., Wilmington, Del., (302) 656-7728.
Factories: Arvin Frequency Devices; Bytrex Div. Tyco Labs.; Columbia Research Labs.; Datacraft Corp.; Datametrics Div.; Ferranti Elec.; Ingersoll Prods. Div.; Lear Siegler; Ling Elctrns.; Mid Eastern Inds.; Optron Corp.; Quadri-Core Corp.; Raytheon Computer; R.C.A. Magnetic Prods.; Sangamo Elec.; Spectral Dynamics; Test Equip. **Services:** Repair, Warehouse
Selling To: ★ I,M. **Salesmen:** 9 (eng 8)

Wayne

BARTLETT ASSOCS., INC., 130 W. Lancaster Ave., (215) 688-7325. TWX: 510-668-2995.
Branches: 470 Mamaroneck Ave., White Plains, N.Y., (914) 949-6476. TWX: 710-568-1335; 4405 East-West Hghwy., Bethesda, Md., (301) 656-3061. TWX: 710-824-0093.
Factories: AAI Corp.; Associated Resh.; Cohu Elctrns.; Coleman Engrg.; Compucord; Cunningham; Data Disc; Edwin Inds.; High Vacuum Equipt.; Inter-Computer Elctrns.; Sangamo Elec.; Sierra Elctrn.; Systems Instrs.; Teledyne Telemetry; Topaz.
Selling To: ★ I,M. **Salesmen:** 12 (eng 12)

EMLEN-PETERSON CO., 34 West Ave., (215) 687-3535.
Factories: Aerospace Knob; Diamond Power Specialty; LAMPS, Inc.; Magnuson Engineers; Remex Elctrns. Div.; Shelly Assocs.; Stake Fastener; Western Indicator.
Selling To: ★ I,M. **Salesmen:** 2

West Chester

RANDALL, K. CO. (See Collingswood, N.J.)

Willow Grove

CERF, A. & CO. (See Caldwell, N.J.)

ESTERSOHN ASSOCS. INC., 541 Davisville Rd., (215) 657-1414.
Factories: Grado; Morantz; Superscope; United Audio.
Selling To: ★ A,D. **Salesmen:** 8

LEWIS, H. CO. (See Philadelphia, Pa.)

Wyncote

COOPER CLEMENT ASSOC., 835 Glenside Ave., (215) 548-5450.
Factories: Electro Assemblies; Grigsby Barton; Scot.
Selling To: ★ I. **Salesman:** 1 (eng 1)

Wynnewood

FAIRBANKS, H. J. CO., Box 124, 420 Chichester.
Factories: Accurate Elctrns.; Avon Gear & Eng.; GM Nameplate; H. J. Elctrn. Seal; Nassau Corp.; National

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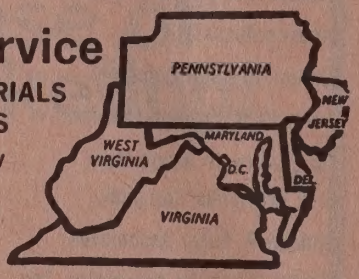

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Wire & Cable; Pioneer Corp.
Selling To: ★ I,M. **Salesman:** 1

GRAHAM, W. ASSOC., 610 Latham Dr., (215) 649-3027, 9822.
Factories: Adler Mfg.; Mercury Record; PAX Ltd.; Sansui Elctrns.; TDK Elctrns.
Selling To: ★ A,D. **Salesmen:** 2

York

ELECTRO-PLAST, INC. (See Radnor, Pa.)

RHODE ISLAND

Cumberland

PERRY ASSOCS., INC., R.D. #2, Rosewood La., (401) 333-5054, (617) 891-7658.
Factories: Singer-General Precision; Singer-Education Sys.; Cooke Engrg.; Webster Elec.; Dusal Instr.
Selling To: ★ A,I,M. **Salesmen:** 1 (eng 1)

Lincoln

ADAMS McGREGOR INC., 66 Lakeview Rd., (401) 726-1300.
Branches: Box 353, Wallingford, Conn., (203) 269-5816; Box A, Scituate, Mass., (617) 545-2213.
Factories: Datak Corp.; Gold Line Connectors; JBT Instr.; Kurz-Kash; Linears Sys.; Mosley Elctrn.; Parsons Mfg.; Shurite Meters; Side Band Engrs.; Sorenson Mfg.; Tri-Ex Tower; Triplett; Waber Elctrn.; Wall Brand Soldering Equip. **Selling To:** ★ I,D. **Salesmen:** 3

SOUTH CAROLINA

Greenville

CHAPMAN, R. W. CO. (See Charlotte, N.C.)

HULL, R. O. & CO., INC. (See Cleveland, Ohio)

NORMAN, H. C. SLS. CO., Box 5185, Sta. B., (803) 244-6254.
Factories: EICO Elctrn. Instr.; Mosley Elctrns.; Robins Inds.; Sonar Radio; Soundolier.
Selling To: ★ A,D. **Salesman:** 1

FAUSETT, F. & CO. (See Smyrna, Ga.)

Spartanburg

T A INSTR. INC. (See Orlando, Fla.)

TECHNICAL ASSOC. INC. (See Orlando, Fla.)

TENNESSEE

Chattanooga

GARDNER & MEREDITH, INC., Box 4837, 519 Cherokee Blvd., (615) 267-4971.
Branches: Greensboro, N.C.; Birmingham, Ala.; Knoxville, Tenn.
Factories: Chicago Rivet & Machine; Kester Solder.
Selling To: ★ I,D. **Salesmen:** 4 (eng 4)
Services: Warehouse

JOHNSON, J. P. CO., Box 8162, 3535 Dell Trail.
Factories: American Process Equip.; Com-Trol; Pyrotronics; Rawn. **Selling To:** ★ I,D. **Salesman:** 1 (eng 1)

Jackson

SURRATT, S. MFRS. SLS. AGENCY, 231 Cedar St., (901) 422-3623.
Factory: Telefunken Sls. **Services:** Warehouse
Selling To: ★ A,D. **Salesmen:** 3

Knoxville

ADAMS & ASSOCS., INC. (See Greensboro, N.C.)

GARDNER & MEREDITH, INC. (See Chattanooga, Tenn.)

Memphis

CARTWRIGHT & BEAN, INC., 560 S. Cooper St., (901) 276-4442.
Branches: Box 5266, Huntsville, Ala., (205) 852-7670; 20100 NE 25th Ct., N. Miami Beach, Fla., (305) 945-2962; 601 N. Fern Creek Ave., Orlando, Fla., (305) 425-8284; 779 John Anderson Dr., Ormand Beach, Fla., (904) 677-3480; 3223 Cain's Hill Pl. N.W., Atlanta, Ga., (404) 237-2273; Box 7336, Metairie, La., (504) 887-5225; 625 Harwyn Dr., Charlotte, N.C., (704) 537-7965; 1016 Belfast Dr., Raleigh, N.C., (919) 832-7128.
Factories: Bud Radio; Centrlab Elctrn.; Chicago Miniature Lamp Works; Dialight Corp.; Mueller Elec.; Ohmite Mfg.; Phalo Corp.; Potter & Brumfield; Radio Elctrn. Master; Simpson Elec.; Switchcraft; TRW Elctrn.
Selling To: ★ A,D,I,M. **Salesmen:** 14
Services: Warehouse

ENGELMAN, A. CO., Box 12091, (901) 275-3680.
Factories: iE Mfg.; Jensen Mfg.; Littelfuse; Midland Int'l.; Transcon; Wen Prods.; Xcelite. **Salesman:** 1 (eng 1)
Selling To: ★ A,D,I. **Services:** Direct Mail

TEXPORT CO. (See Dallas, Tex.)

WALLACE, S. K. ASSOC., INC. (See Lutz, Fla.)

Nashville

MITSCHER, R. W. CO., INC. (See Buffalo, N.Y.)

TEXAS

Addison

CAMPION SLS. CO., Box 396, (214) 239-9196.
Selling To: ★ A,D,I. **Salesmen:** 3

Arlington

D & O ENGRG. CO., INC. (See Wichita, Kansas)

PAN-TECH ENGRG. CO. (See Houston, Tex.)

Austin

BARNES, A. CO. (See Richardson, Tex.)

IBL ENGRG. & SLS., INC. (See Dallas, Tex.)

Bellaire

AYMOND CO., INC. (See Dallas, Tex.)

BRICE CO., 5000 Terminal St., Box 730, (713) 666-1788. TELEX: 76-2347.
Branches: Box 15743, Tulsa, Okla., (918) 627-7866; Dallas, Tex.
Factories: Adirondack; AMCO; Electro Switch; Farmer Photo & Proximity Control; Hamilton Watch; Marshalltown Gauges & Thermometers; Staco.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Warehouse

McKINNEY, J. F. SLS. CO. (See Dallas, Tex.)

Dallas

AIREP ELCTRNS., 6300 N. Central Expr., (214) 363-5291.
Branch: 4901 Richmond Ave., Houston, Tex., (713) 621-0955.
Factories: Aertech Inds.; Antekna; Boonton Elctrns.; Dytronics; Holt Instr. Labs.; Hughes Electron Dynamics; Illumination Inds.; Jerrold Elctrns.; Kepco; Pacific Measurements. **Services:** Company Airplane
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

ALLIED COMPONENTS, INC., 10464 E. Northwest Hwy., (214) 348-6660. TWX: 910-861-4925.
Branch: 288-6400 Westpark Dr., Houston, Tex., (713) 782-5406. TWX: 910-881-3741.
Factories: Bourns; Chemical Micro Milling; Digitran; Elec-Trol; Elctrn. Specialty; Filtron; Gulton Inds.; Hamlin; Ind. Gen.; Joy Mfg.; Magnetic Metals; Moog Inc.; Olympic Prod.; Penntube Plastics; Vactec; Viking Ind.
Selling To: ★ D,M. **Salesmen:** 8 (eng 4)

APPLIED SCIENCE ASSOCS., 1 Turtle Creek Village, (214) 526-8316. TWX: 214-899-905.
Branch: 6218 Westheimer, Houston, Tex., (713) 781-1441.
Factories: Century Elctrns.; Dynasciences; Film Microelctrns.; Honeywell; Power Designs; Preston Scientific.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)
Services: Warehouse

AYMOND CO., INC., 4340 No. Central Expy., (214) 827-8043.
Branch: Box 1064, Bellaire, Tex., (713) 464-9446.
Factories: Babcock Relay; Breeze-Ill.; Brush Instr.; Dale Elctrns.; Equipto Elctrns.; Globe Inds.; Hartzell Elctrns.; Janco Corp.; Marshall Inds.; Microdot; Phalo Corp.; Symbolic Displays; United Transformer.
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 3)

BENSON ENGRG. CO., 9884 Monroe Dr., (214) 352-7541.
Branches: 6900 West 80th St., Shawnee Mission, Kan., (913) 648-2843; 519 So. Broadway, Wichita, Kan., (316) 262-6971.
Factories: Bound Brook Bearing; C.E.M.; Delta Spring; Dixon Corp.; Hartford Precision Prods.; Hartford Universal; Kaydon Bearing Div.; Marlin Rockwell Co.; Roller Bearing Co.; Scully-Jones-Bendix; J. J. Tourek Mfg.; Waldes Kohinoor.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 6)

BERTHOLD SLS. CO., 4411 Maple Ave., (214) 526-8329.
Factories: C. Cordover & Co.; Gavin Instrs.; HowAll Prods.; Jayell Mfg.; Leader Instrs.; Loral Dist. Prods.; NT•T Sls.; Perma-Power; Tenatronics, Ltd.
Selling To: ★ A,D. **Salesmen:** 2
Services: Warehouse

BRICE CO. (See Bellaire, Tex.)

BROWN, K. O. & CO., Box 20845, (214) 357-3996.
Branch: 310 North Hills Office Mall, Raleigh, N.C., (919) 782-0198.
Factories: American Elctrns.; Avon Gear & Eng.; Caton Inds.; MacPanel Co.; Markite Corp.; Textool Prods.; Vibrac Corp. **Services:** Salesmen, Dirtect Mail
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)

BRYER-ASSOCIATED, Box 35841, (214) 351-4350.
Factories: Electron Machine; Grayloc; Hallikainen Instrs.; Hankison Corp.; Hoffman Filtration; Red Valve Co.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)
Services: Direct Mail

CAIN & CO. (See Los Angeles, Calif.)

COLLINS CO., 11227 Drummond Dr., (214) 279-5218.
Branch: 4334 Stemway, New Orleans, La., (504) 866-7549.
Factories: Audio Dynamics; Cush Craft Antennas; Irish Recording Tape; Kirk Elctrns.; Manhattan Elec. Cable; C. H. Mitchell; Polaris Ind.; Pax/Ltd.
Selling To: ★ A,D. **Salesmen:** 2

COMPAR CORP. (See Burlingame, Calif.)

COMPAR SOUTHWEST, 8609 N.W. Plaza Dr., (214) 363-1526. TWX: 910-861-4249.
Branch: 5757 Bellaire Dr., Houston, Tex., (713) 667-3420. TWX: 910-881-3784.
Factories: AP Inc.; Chase-Foster; Coron Corp.; Del Elctrns.; Denes Co.; Electri Materials; Electronized Chem.; ETC, Inc.; Hybridyne; Kollsman Motor Corp.; Nanotran; Qualidyne Corp.; R O Assocs.; Unitrode; Solid State Prods.; Compar Corp.
Selling To: ★ I,M. **Salesmen:** 3 (eng 2)

CROCKETT ENGRG. CO., Box 47287, (214) 637-6120.
Factories: Affiliated Mfg.; Beckman Instrs.; Birtcher Corp.; Coherent Radiation Labs.; Delta Design; Eldorado Electrodata Corp.; Field Emission Corp.; Hollis Engrg.; Hugle Inds.; Micro Instr.; Philips Elctrn. Instrs.; Watkins-Johnson; Wells Elctrns. **Salesmen:** 3 (eng 3)
Selling To: ★ I,M. **Services:** Repair, Warehouse

(See Advertisement This Page)

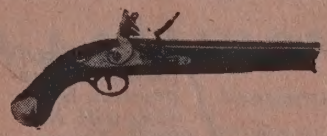
CROCKETT SLS. CO., 2204 Griffin, (214) 748-8209.
Branches: 2920 Weslayan, Houston, Tex., (713) 622-5420; Box 24237, New Orleans, La., (504) 288-2517.
Selling To: ★ A,D. **Services:** Warehouse **Salesmen:** 4

DANNEMILLER-SMITH, INC., 10050 Monroe Dr., (214) 357-8247.
Branch: 5760 Rice Ave., Houyon, Tex., (713) 668-4461.
Factories: Alford Mfg.; American Regitel; Cabtron Corp.; Cipher Data Prods.; Fairchild Controls; Rentronix; Robins Data Devices; Science Accessories; Spiras Sys.; Systems Dev.; Texscan Corp.; Todd Prods.; Trymetrics; Varian Assoc. **Selling To:** ★ I,M. **Salesmen:** 4 (eng 1)
Services: Repair, Warehouse, Demonstration Room

GEORGE WEINREICH & ASSOCS., 11554 E. Northwest Hwy., (214) 321-2800.
Factories: Aladdin Elctrns.; Amacoil Mach.; American Elctrn. Labs.; Autotronics; Bartlett Mfg.; Bruce Inds.; Clare-Electroseal; CP Elctrns.; Die-Mate; Dresser Sys.; Edal Inds.; Elctrn. Soldering Iron; Elctrn. Research; Film Capacitors; Isotemp Research; Life Instr.; Lundell Controls; Multi-Flex Seals; Pickering & Co.; Reeves-Hoffman Div.; Solder Removal.
Selling To: ★ I. **Salesmen:** 2 (eng 1)

GLIDDEN ENGRG. & EQUIP. CO., 8609 Northwest Plaza Dr., Suite 218, (214) 363-6539.
Branches: 7728 Long Point Rd., Houston, Tex., (713) 681-1415; Box 10442, New Orleans, La., (504) 835-6204
Factories: Amprobe Instr.; Chicago Dynamic Inds.; Electro Mech Comp.; E N M; Fifth Dimension; Heinemann Elec.; I C S Inc.; Liberty Controls; Monitor Controller; Transtector Sys.
Selling To: ★ I,M,D. **Salesmen:** 4 (eng 1)

GREEN, J. A., 7118 Envoy Ct., (214) 631-7450.
Branches: 3400 Montrose Blvd., Houston, Tex., (713) 526-2959; Box 3209, Tulsa, Okla., (918) RI 2-4657.
Factories: Borg-Warner Thermoelectrics; Emcor-Ingersoll Prods. Div.; Flight Sys.; Gavitt Wire & Cable; Greenray Inds.; Clark Crystal; Metric Engrg.; Oven Inds.; Hughes Aircraft; Kilovolt Corp.; McLean Engrg. Labs.;



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Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 4)
Services: Repair

GUENTHER, J. B. INC., 5121 McKinney, Suite #103, (214) 528-6286.
Branch: Box 55525, Houston, Tex., (713) 468-0232.
Factories: Alco Elctrn. Prods.; Augat; Cimastra; Fusite; C. T. Gamble Inds.; Hurst Mfg.; Int'l. Instrs.; Litton Inds.; Parelco; Potter & Brumfield; Reed Devices; Sarkes Tarzian; Signalite; Viking Inds.
Selling To: ★ I,M,D. **Salesmen:** 6
(See Advertisement This Page)

HENRY CO. (See Wichita, Tex.)

HUGHES, R. E. CO., 5229 Del Ray Dr., (214) 358-1511.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 3)
Services: Leasing of Equiptment

HULL, R. O. & CO. INC. (See Cleveland, Ohio)

IBL ENGRG. & SLS., INC., 219 Preston Royal Center, Suite 6, (214) 363-2921.
Branches: 3403 Audubon #4, Houston, Tex., (713) 523-8360; 1903 W. 34th St., Austin, Tex., (512) 452-2064; 1472 Calhoun St., New Orleans, La., (504) 895-4793; 5149 E. 31st St., Tulsa, Okla., (918) 938-6305; 6630 Dearborn Dr., Shawnee Mission, Kan., (913) 292-1374; 429 Buena Ventura Pl. N.E., Albuquerque, N.M., (505) 298-2575.
Factories: Advanced Space Age Prods.; American Cystoscope Markers; Diamond Tool Engrg.; Digitron; Digitronics; Elctrn. Dev.; Greibach Instrs.; Industrial Instr.; Instr. Displays; Larson Instr.; LaVoie Labs.; Lear Siegler; Liberty Inds.; Scovill Mfg. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 11 (eng 11)

KANTENBERGER CO. (See Houston, Tex.)

KEMP ENGRG. CO., INC., 2618 Manana Dr., (214) 357-6663. TWX: 910-861-4031.
Branches: 6001 Gulf Freeway, Houston, Tex., (713) 928-5426. TWX: 910-881-3698; 10702 Manchester Rd., St. Louis, Mo., (314) 968-0300; 4306 Governors Dr., Huntsville, Ala., (205) 837-4304.
Factories: Aerometrics; R. C. Allen; Astrosystems; B & F Instrs.; Borg-Warner Controls; Bytrex; Cintra; Edcliff Instrs.; Gen'l. Resistance; Hughes Aircraft; IthaCo.; Kronos; Microdyne; Rustrak Instr. Div.; Stellarmetrics; Systron-Donner; Techni-Rite Elctrns.; Teledyne Telemetry; United Control Magnetic Div.; Weston Instrs.
Selling To: ★ I,D,M. **Salesmen:** 11 (eng 11)
Services: Manufacturers' Rep.

KLICEPRA, M. F. (See Houston, Tex.)

KOCH ENGRG. & SLS. CO., INC., 126 Meadows Bldg., (214) 369-5136.
Factories: Ansley East; Ansley West; Bristol Motors; Columbia Tech.; GEN'L. Inds.; Marvel Elec.; Miller Dial & Nameplate; Orbit Instrs.; Precision Rack; Thermatics.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

KSE, INC., Box 35184, 2710 Manor Way, (214) 352-8431.
Factories: Associated Ceramics; Co-Tronics; Electro-Flex Heat; Fabrico Mfg.; Fabrite Metals; General Plastics; Mafab; G. Morrell; Moxness Prods.; Navan Prods.; Porth Plastics; Precise; Seal Bag* Trimflex; Wilshire Foam Prods.; Wylie & Green. **Services:** R & D-Fabrication
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

LUCAS, C. H. SLS. CO., 2303 Mountain Lake Rd., Box 24632, (214) 339-3533. **Services:** Warehouse
Selling To: ★ A, **Salesmen:** 2 (eng 1)

LUND & CO., Box 35566, 2616 Manor Way, (214) 358-4335.
Branch: 3827 Richmond Ave., Houston, Tex., (713) 623-4191. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 6

MARSHALL, G. S. CO., (See El Monte, Calif.)

MAYNARD-GUNN SLS. CO., 158 Express, (214) 742-2384. TWX: 75207.
Branch: 155 Cromwell Dr., San Antonio, Tex., (512) 733-7427, 733-7765.
Factories: Antenna Specialist; Amertest Prods.; Fanon Elctrns. Ind.; In'l. Elctrn. Sls. JFD Elctrns.; Koss Elctrns.; Kris; J. B. Lansing Sound; Mellotone; J. W. Miller; Phalo; Robins Inds.; Rotron Mfg.; Terado. **Salesmen:** 4 (eng 1)
Selling To: ★ A,D,I. **Services:** Warehouse

McKINNEY, J. F. SLS. CO., 1303 Chemical, Box 10451, (214) 631-9450. TWX: 910-861-4232.
Branches: Box 1026, Bellaire, Tex., (713) 665-3653; 2012 Condon St., Metairie, La., (504) 887-1723; Box 3958, Tulsa, Okla., (918) 622-2967.
Factories: American Electrical Heater; Bendix Microwave Devices; British Inds.; Fabri-Tek Circuits; General Instr. Capacitor Div.; Hart/Advance; Kent Mfg.; Kulka Elec.; Mark Prods.; Methode Elctrns.; Metcom; Oak Mfg.; H. H. Smith; Scientific Components; Thordarson Meissner. **Services:** Warehouse
Selling To: ★ A,D,I,M. **Salesmen:** 8 (eng 8)

MUREEN, R. W. CO., 5523 Dyer St., (214) 369-7561.
Branch: Box 7205, Houston, Tex., (713) 861-1277.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

NESBITT, R. E. CO., 2930 Merrell Rd., Box 20816, (214) 357-4601.
Branch: Box 66831, Houston, Tex., (713) 528-3811.
Factories: Centralab; Chester Cable; Cimco Wire & Cable; Clare-Pendar; C. P. Clare; Cramer iv.; Daven Div.; El dema; Milwaukee Resistor; Sangamo Elec.; Sola Elec.; Stancor Elctrns.; Technical Devices.
Selling To: ★ I,D,M. **Salesmen:** 6 (eng 2)

NORVELL ASSOCS., INC., 10210 Monroe Dr., (214) 357-6451. TWX: 910-861-4512.
Branch: 6440 Hillcroft Ave., Houston, Tex., (713) 774-2568.
Factories: Advanced Memory Sys.; Burr-Brown Research; Calif. Microwave; Helipot Div., Beckman Instr.; Industrial Elctrn. Engrgrs.; Int'l. Scientific; Intersil; Torotel; Madatron; Trio Labs.; Vitramon.
Selling To: ★ I,M. **Salesmen:** 7 (eng 5)
Services: Warehouse

PACKARD ASSOCS., INC., Box 20825, (214) 357-5713.
Factories: Beede Electrical Instr.; Harbour Inds.; H. Jones Elctrns.; Mandex Mfg.; Pacific Transformer; Plastic Capacitors; Tingstol. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

PECK, G. V., Box 18627, 210 Casa Linda Plaza, Suite 44, (214) 328-3511. TWX: 910-861-4148.
Branches: Box 15671, Tulsa, Okla., (918) 585-5853; 5757 Bellaire Blvd., Houston, Tex., (713) 664-1435. TWX: 910-881-5534.
Factories: Amatom Elctrn. Hardware; ASM; Astrodyne; Custom Components; Digital Instrs.; Electralab; Elctrn. Hardware; Electrovert; Int'l. Electro Exchange; Ircon Western; Johanson Mfg.; Kurman Instrs.; Kurz-Kasch; P. R. Mallory & Co.; Maynard Plastics; Mel-Rain; Premier Metal; Radio Materials; Sealectro; Solar Sys.; Staver.
Selling To: ★ I,D,M. **Salesmen:** 9 (eng 2)

RIDER, W. N. CO., 6211 Denton, (214) 357-2246.
Factories: Delron Fastener Div.; Humphrey; Laminated Shim; Yardney Elec.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)

ROBERTSON, E. B. INC., 1339 Plowman Ave., (214) 942-8486. TWX: 861-4357.
Branch: 4101 San Jacinto, Houston, Tex., (713) 529-3797. TWX: 571-1079.
Selling To: ★ I,D. **Salesmen:** 4 (eng 1)
Services: Direct Mail, Warehouse

RUSSELL ASSOC. INC. (See Brightwaters, N.Y.)

SCHOONMAKER, J. Y. CO., INC., Box 20840, 2995 Ladybird Ln., (214) 357-8481.
Branches: Box 5540, San Antonio, Tex., (512) 342-0251; Box 247, Magnolia, Ark., (501) 234-3778.
Factories: A.C.S. Inds.; Associated Research; Astatic; Birnbach; Clarostat Mfg.; Cornell-Dubilier Elctrns.; Electro-Craft; Interswitch; Jewell Electrical Instrs.; McGraw Edison; Michigan Magnetics; Muter; Pamotor; M. H. Rhodes; Schauer Mfg.; Simpson Elec.; Soundcraft Div.; Telex-Communication Div.; US Trading & Prod.; United Technical Publications.
Selling To: ★ A,D,I,M. **Salesmen:** 7 (eng 2)
Services: Warehouse

SOUTHLAND ENGRG. & SLS. INC. (See Houston, Tex.)

SOUTHWEST ELCTRN. INDS. INC., 621 Meadows Bldg., (214) 363-1671.
Branches: 1405 S. Post Oak Rd., Houston, Tex., (713) 621-3760; 2015-C So. Lakewood, Tulsa, Okla., (918) 835-2481. **Services:** Mail List
Selling To: ★ I,D,M. **Salesmen:** 5
(See Advertisement This Page)

SPACE AGE SLS. CO., Box 35625, (214) 357-5713.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)
Services: Warehouse

SPACETRONICS CO., 4515 Prentice St., (214) 368-1215.
Factories: Americon; Applied Microwave Lab.; G-L Microwave; Olektron; Micromanipulator; Ramsey Labs.; Waveline; Introl. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

SYKES, V. J. ASSOCS., INC., 13333 N. Central Expswy., (214) 235-5280.
Factories: Airmaster Div.; Alpha Components; Castall Research Labs.; Chomerics; Ericsson Centrum; Gould; Locus; Marathon Battery; Masterite Inds.; Monroe Elctrns.; Navcor; Tobe Deutschmann Labs.; Singer; Voltron Prods.; Wood Elec.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 3)

TEAMWORK INC., 2646 Andjon Dr., (214) 352-7747.
Factories: Automark; Blackstone Ultrasonics; Ewald Instrs.; Eyelet Tool; Rejafix Marking; Spectra Instrs.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)
Services: Repair, Warehouse

TECH-SER, INC. (See Burbank, Calif.)

TECHNO ASSOCS., 2324 Shorecrest Dr., (214) 357-9213.
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 3)
Services: Warehouse

TEXAS AVIONICS COMPANY, 4515 Prentice St., (214) 368-3566.
Factories: Addington Labs.; Applied Research; BF Goodrich Sponge Prods.; EIP; EMC Tech.; Microwave Semiconductor; Sage Labs.; Telonic Engrg.; Telonic Instrs.; Vari-L; Vishay Resistor Prods. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)

TEXPORT CO., THE, 2411 Farrington, (214) 631-6270. TWX: 910-861-4507.
Branches: 8811 Gaylord, Houston, Tex., (713) 464-2828; 5118 Park Ave., Memphis, Tenn., (901) 683-0880; 3220 North Trumbull, Metairie, La., (504) 885-0558.
Factories: Airtron; Alpha Wire; Arnold Magnetics; Axel Elctrns.; Cedar Engrg.; Dialight; Elctrn. Molding; Int'l. Rectifier; Kelvin; Monitor Prods. **Salesmen:** 7
Selling To: ★ A,D,I,M. **Services:** Warehouse

THORSON CO. (See Los Angeles, Calif.)

TITAN REPS, INC., 6434 Maple Bldg., (214) 357-8266.
Factories: Firing Circuits; Furnas Elec.; ITT Jennings; Marathon Special Prods.; Mullard; Norhelfer Winding Labs; Power Semiconductors; U.O.P. Norplex.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)
Services: Warehouse

VIDAL ELCTRNS. CO., 11411 N. Central Expswy., Suite 123, (214) 369-6404.
Factories: Aritech; B. L. Packer; Digital Data Sys.; Lark Engrg.; Narda Microwave; Polarad Elctrn. Instrs.; RFD; Rohde & Schwarz Sls.; Saki Magnetics; Semi/Dyne Elctrns.; Specific Prods.; TRG; Unitrode.
Selling To: ★ A,I,M. **Salesmen:** 2 (eng 2)
Services: Warehouse, Direct Mail

WILKS, E. L. CO., Box 34466, (214) 242-5321.
Factories: Argos Prods.; Conant; Consolidated Wire; Hamilton Elctrns.; Hudson Lamp; Johnson SCA; Kaar Elctrns.; Oelrich Publications; Premax; Quam; Sterling Mfg.; Tape-Athon; Transcriber; Turner; Ward.
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 1)
Services: Warehouse

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YOUNT, J. CO., Box 17270, 1431 Pleasant Dr., (214) 391-4125.
Factories: Electro-Voice; Hudson Lamp; Lowell Mfg.; Millen Mfg.; Solar Textiles. **Services:** Warehouse
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Denton

LIEBERMAN, H. SLS. CO. (See Houston, Tex.)

El Paso

KELLEY ENTERPRISES (See Loveland, Colo.)

LANDES, ZACHARY & PETERSON, 2137 Mills Ave., (915) 533-9060.
Branch: 4800 Pan American Hwy. N.E., Albuquerque, N.M., (505) 345-2405.
Factories: Erico Prods.; Unistrut. **Salesmen:** 2 (eng 2)
Selling To: ★ I,D. **Services:** Warehouse

STEPCO INC., Box 9836, (915) 772-5274.
Factories: Automatic Switch; Automatic Timing & Controls; S. Moore; RFL Inds. **Services:** Mfgs. Reps
Selling To: ★ I,M,D. **Salesmen:** 3 (eng 1)

Euless

BFA (See Denver, Colo.)

Fort Worth

ENGINEERING ASSOCS. INC., 2912 Stanley, Box 11069, (817) 923-8257.
Branch: Box 1277, Houston, Tex., (713) 774-3739.
Factories: Dixie Wire; FASCO Inds.; Insulating Fabricators; Perfection Electrical Prods.
Selling To: ★ I,D. **Salesmen:** 3 (eng 3)

STACKS, J. CO. INC., 1312 W. T. Waggoner Bldg., (817) 332-5044.
Factories: Balcrank Div.; Century Drill & Tool; Gojer; K-D Mfg.; Laitner Brush; Lamson & Sessions; Minerals & Chemicals; Minerals & Chemicals Div.; Mishawaka; Neapco Prods.; Perfect Equipment; Utica Tool.
Selling To: ★ D. **Salesmen:** 5

Friendswood

BFA (See Denver, Colo.)

Henderson

MILLER, E. G. CO. INC., Box 929, (214) 657-5049.
Factories: Decker; E.F. Assocs.; Elcor; Gen'l. Oceanographic; Harrel; Erik A. Lindgren & Assocs.; Macrosonics Int'l.; Medi-Comp Research & Dev.; Powertronic Equip.; Scientific Sys.; Systems Instrs. Research; t.r.m. Sys.; Waymire Instrs. **Services:** Lab.
Selling To: ★ I,M. **Salesmen:** 1 (eng 1)

Houston

AIREP ELCTRNS. (See Dallas, Tex.)

ALLIED COMPONENTS INC. (See Dallas, Tex.)

APPLIED SCIENCE ASSOCS. (See Dallas, Tex.)

BARNES, A. CO. (See Richardson, Tex.)

BARNHILL ASSOCS. (See Denver, Colo.)

COMPAR CORP. (See Burlingame, Calif.)

COMPAR SOUTHWEST (See Dallas, Tex.)

CROCKETT SALES CO. (See Dallas, Tex.)

DANNEMILLER-SMITH INC. (See Dallas, Tex.)

DATA ENGR. CORP. (See Richardson, Tex.)

DATA MRKTG. ASSOCS., INC., 3925C Dacoma St., (713) 686-9627. TWX: 910-881-2569.
Branch: 805B So. Sherman, Richardson, Tex., (214) 231-1406. TWX: 910-867-4709.
Factories: Anadex Instrs.; Control Logic; Dana Labs.; Digilin Inc.; Elctrn. Arrays; Elgar Corp.; Ferroxcube Corp.; Julie Research Labs.; Memory Technology; Remex Elctrns.; Rental Elctrns.; Signetics Corp.; Sykes Datatronics; Sylvania Electric Prod.; Zehntel, Inc.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

ENGINEERING ASSOCS. INC. (See Fort Worth, Tex.)

FRANKLIN, R. E. CO., 3007 So. Post Oak Rd., (713) 621-5861.

GLIDDEN ENGRG. & EQUIP. CO. (See Dallas, Tex.)

GREEN, J. A. CO. (See Dallas, Tex.)

GUENTHER, J. B. INC. (See Dallas, Tex.)

IBL ENGRG. & SLS., INC. (See Dallas, Tex.)

KANTENBERGER CO., 1900 Chamber of Commerce Bldg., (713) 223-3637.
Branch: 711 Reverchon Dr., Dallas, Tex., (214) 941-4724.
Factory: Control Data.
Selling To: ★ I. **Salesmen:** 2 (eng 2)

KEMP ENGRG. CO., INC. (See Dallas, Tex.)

KLICPERA, M. F., Box 2668, (713) 747-3868.
Branches: 1201 Castle, Box 4117, Dallas, Tex., (214) 742-2515- 1554 No. Marion, Tulsa, Okla., (918) 939-5956; P.O. Box 8217, Gentilly Sta., New Orleans, La., (504) 282-2897.
Factories: Carter Motors; Continental Wirt Elctrns.; E.T.A. Prod.; Int'l. Prod.; Petersen Radio; Talk-A-Phone; Wen Prods. **Services:** Warehouse, Direct Mail
Selling To: ★ I,D. **Salesmen:** 3 (eng 2)

LIEBERMAN, H. SLS. V., Box 66216, (713) 526-3431.
Branches: 2907 Longfellow Ln., Denton, Tex., (817) 387-1210; 1766 Bellrose Dr., Baton Rouge, La., (504) 924-3947.
Factories: Aerovox; American Geloso; Benjamin Elctrn. Sound; Chemtronics; Component Specialties; Dearborn Wire & Cable; Hickok Electrical Instr.; TAB Books; RMS Elctrns. **Services:** Warehouse
Selling To: ★ A,D,I. **Salesmen:** 5 (eng 2)

LUND & CO. (See Dallas, Tex.)

MARTIN, R. ASSOCS., INC., Box 19291, (713) 468-3877. TWX: 910-881-3630.
Branch: Box 64513, Dallas, Tex., (214) 358-3704.
Factories: ACDC Elctrns.; American Zettler; Chassis Trak/Vent Rak; Frequency Elctrns.; Guildline Instrs.; Hipotronics; Krohn-Hite; Magnedyne; Signal Analysis Inds.; Stoddart Electro Sys.; Topaz; Transducers; Tyco Instr. Div. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)

MUREEN, R. W. CO. (See Dallas, Tex.)

NESBITT, R. E. CO. (See Dallas, Tex.)

NORVELL ASSOCS., INC. (See Dallas, Tex.)

PAN-TECH ENGRG. CO., Box 22491, 3815 Richmond, (713) 623-0640.
Branches: 600 Ave. H. E., Arlington, Tex., (817) 261-4111; Box 1783, Baton Rouge, La., (304) 344-2791.
Factories: Computer Instr.; Ohmart; Solidstate Controls; Texas Instrs.; Transmation; Viatran.
Selling To: ★ I. **Salesmen:** 6 (eng 6)
Services: Repair

PECK, G. V. CO. (See Dallas, Tex.)

ROBERTSON, E. B. INC. (See Dallas, Tex.)

SCANLON, P. J. CO., INC. (See Richardson, Tex.)

SCIENTIFIC DEVICES-SOUTHWEST, INC. (See Richardson, Tex.)

SOUTHLAND ENGRG. & SLS. INC., 5810 Schumacher La., (713) 782-4575.
Branch: 1040 West Mockingbird, Dallas, Tex., (214) 638-6264.
Factories: Adams & Westlake; Autotron; Ammon Instr.; Deutsch Ind. Prods.; Maxi-Switch; Sodeco; Underwriters Safety Devices; Unimax. **Salesmen:** 3 (eng 3)
Selling To: ★ I,D. **Services:** Warehouse

SOUTHWEST ELCTRN. INDS., INC. (See Dallas, Tex.)

SPIVEY-LeBOEUF ASSOCS., Box 12321, 7547 Wilmerdean, (713) 649-1221.
Branch: 716 Nottingham, Richardson, Tex.
Factories: Columbia Elctrns. Cables; Blonder-Tongue Labs.; Eby Sls.; Horman-Kardon; Recoton; Utah Elctrns.
Selling To: ★ D. **Salesmen:** 4

TEXAS SLS. REPRESENTATIVES CO., 2422 Tangley, (713) 523-1675.
Factories: American Elctrn. Labs.; Channel-Way Inds.
Selling To: ★ A,D. **Salesmen:** 2

TEXPORT CO. INC. (See Dallas, Tex.)

THORSON CO. (See Los Angeles, Calif.)

Richardson

BARNHILL ASSOCS. (See Denver, Colo.)

BARNES, A. CO., 740 S. Sherman St., (214) 235-4541. TWX: 910-867-4710.
Branches: 3230 Mercer, Houston, Tex., (713) 622-3620. TWX: 910-881-2624; Box 9748, Austin, Tex., (512) 454-4371; San Antonio, Tex., (512) 828-1323.
Factories: American Micro-Sys.; Barnes Engrg.; Burroughs; Cermetek; Cohu Elctrns.; Data Disc.; Datatron; Omnitec Corp.; Sangamo Elec.; Shepard Labs Div.; Singer; Technibilt Corp.; Textex; Trompeter Elctrns.; United Telecontrol Elctrns. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 9 (eng 1)

BRANUM SALES, INC., Box J, (214) 231-6148.
Factories: Avanti R & D; James Elctrns.; Mura Corp.; Rawn Co.; Sonar Radio; Standard Kollsman Inds.; Switchcraft; Triad Transformer; U.S. Capacitor.
Selling To: ★ A,D,I. **Salesmen:** 3 (eng 1)
Services: Warehouse, Direct Mailing

DATA ENGRG. CORP., 777 S. Central Expwy., (214) 231-4846. TWX: 910-867-4739.
Branches: 2120 S. Post Oak Rd., Houston, Tex., (713) 622-2820, TWX: 910-881-3668; 4438 Centerview Dr. #115, San Antonio, Tex., (512) 732-7176, 4580 E. 50th St., Tulsa, Okla., (918) 622-3753.
Factories: Analog Devices; Computer Displays; Data General; Digi-Data; Fabri-Tek; Houston Instr.; Information Data Sys.; Non-Linear Sys.; PRD Elctrns.; Rolm Corp.; Tally Corp.; Trygon Elctrns.
Selling To: ★ I,M. **Salesmen:** 8 (eng 8)
Services: Repair, Warehouse, Training Laboratory

DATA MKTG. ASSOC. INC. (See Houston, Tex.)

HOFFMAN, C. ASSOCS., INC., 777 So. Central Expressway, (214) 235-3600. TWX: 910-867-4727.
Factories: Angstrohm Precision; Arco Elctrns.; Datapac; Electro/Data; Electro Impulse; Hathaway Instrs.; National Connector; G. Risk Inds.; Skottie Elctrns.; Valpey-Fisher; Syscon, Int'l.; Ward Leonard Elec.; A. T. Wall.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)
Services: Warehouse

LAWRENCE SLS. CO., Box 1038, (214) 235-5504. TWX: 910-867-4715.
Factories: Automatic Metal Prods.; Dynamic Gear; Microwave Prods.; Precision Tube; Struthers Elctrns.
Selling To: ★ I,D,M. **Salesman:** 1 (eng 1)
Services: Warehouse

SCANLON, P. J. CO., INC., 724 So. Sherman St., Box 70, (214) 231-4661. TWX: 910-867-4713.
Branch: 7115 Bayou Forest, Houston, Tex., (713) 466-6889.
Factories: Alpha Metals; Celco; Coors Porcelain; Delevan Elctrns.; Esna/Agastat; Electrovert; Hexacon Elec.; Metex Elctrns.; Sandefur Engrg.; Sigma Instrs.; Statham Instrs.; Thomas Elctrns.; Westinghouse Ind. Equip.
Selling To: ★ I,D,M. **Salesmen:** 9 (eng 6)
Services: Repair, Warehouse

(See Advertisement This Page)

SCIENTIFIC DEVICES-SOUTHWEST, INC., 312 N. Central Expwy., Suite 212, (214) 231-8106. TWX: 910-867-4740.
Branches: 4300 Silver, S.E., Albuquerque, N.M., (505) 268-6729; 2765 S. Colorado Blvd., Denver, Colo., (303) 758-1888; 3827 Richmond Ave., Houston, Tex., (713) 623-4250; 3920 E. Indian School Rd., Phoenix, Ariz., (602) 955-4740.
Factories: Microwave Div.; Dumont Oscilloscope Labs.; Fairchild Electro-Metrics; Electro Rents; Instrs. for Inds.; Telex/Midwestern Instrs.; NJE; Logimetrics; Systron Donner; Alpha Div.; Datapulse Div.; Kruse Div.; Instrument Div.; Microwave Div.
Selling To: ★ A,D,I,M. **Salesmen:** 8 (eng 3)
Services: Repair, Warehouse, Invoicing, TWX, Dir. Mail

SPIVEY-LEBOEUF ASSOCS. (See Houston, Tex.)

WADSWORTH MFG. ASSOC., INC. (See Liverpool, N.Y.)

WILLOUGHBY-FOWLER, 110 N. McKinney, Suite 204, Box 486, (214) 235-3664.
Factories: Calcon Mfg.; Electra; Ico/Rally; Japanese Prods.; Jensen Mfg. Div.; Pak-Tronics; Sigma Inds.; Telvac Instr. **Selling To:** ★ A,D,I. **Salesmen:** 2

San Antonio

BARNES, A. CO. (See Richardson, Tex.)

DATA ENGR. CORP. (See Richardson, Tex.)

MAYNARD-GUNN (See Dallas, Tex.)

RETZLOFF, W. R. CO., Box 1786, (512) 533-7839.
Factories: Kepra Circuit Sys.; Quick Mount Mfg.; Vaco Prods. **Selling To:** ★ I,D,M.

SCHOONMAKER, J. Y. CO., INC. (See Dallas, Tex.)

UTAH

Granger

HURIBUT, J. F. CO. (See Denver, Colo.)

Salt Lake City

BARNHILL ASSOCS. (See Denver, Colo.)

CONTROL EQUIPMENT CO., 265 Cross Rd. Sq., (801) 487-7741.
Factories: Alnor Instr.; Automatic Switch; Automatic Timing & Controls; Conoflow Corp.; Eclipse Fuel Engrg.; Hankison Corp.; Hays Corp.; Magnetrol; Ohmart Corp.; Partlow Corp.; Precision Prods. & Controls; Schutte & Koerting Co. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)

COMPAR CORP. (See Burlingame, Calif.)

DARGER CO., 211 S. 2nd West, (801) 355-2873.
Factories: Amprobe Instr.; Cox & Co.; Polyken Div.; Swivelier Co.; Wakefield Lighting Div.; Zinsco Electrical Prods. **Selling To:** ★ D. **Salesman:** 1 (eng 1)

ELECTRONIC MFRS.' CONSULTANTS INC. (See Colorado Springs, Colo.)

GATES, F. Y. CO., INC. (See Albuquerque, N.M.)

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PEARSON, M. & CO. (See Denver, Colo.)
PUTNAM, L. B. CO. (See Denver, Colo.)
SPENCER, C. H. & CO., Box 1054, (801) 486-1081.
Factories: AMF-Cuno Div.; Bin-Dicator; Cochrane Div.; Cone-Drive Gears Div.; Copes-Vulcan Div.; Grinnell; Helicoid Gage Div.; Lilie-Hoffmann Cooling Towers; Pennwalt; H. K. Porter; Ruggles-Klingemann Mfg.; Snap-Tite; Stephens-Adamson Mfg.; Subox Coatings Div.; Trabon Lubricating Sys.; United Conveyor; Universal Oil Prods. Div.; Weatherhead Co.; Wilkerson Corp.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)
Services: Warehouse

VIRGINIA

Alexandria
BROWN, W. A. COMPONENTS, INC. (See Orlando, Fla.)
BROWN, W. A. INSTRS., INC. (See Orlando, Fla.)

Annandale
L C A SALES, INC. (See Tuckahoe, N.Y.)

Arlington
BRITISH AIRCRAFT CORP. (U.S.A.) INC., Intratec Div., 399 Jefferson Davis Hghwy., (713) 684-6401.
Factories: Astaron-Bird Ltd.; Astmoor Ind. Estate; S.D.C. Elctrns. Ltd. **Selling To:** ★ I,D,M. **Services:** Warehouse
GANS-FRYLING, INC., 2030 16th St. No., (703) 527-3262.
Branch: 9516 Michaels Way, Ellicott City, Md., (301) 837-6311.
Factories: American Aerospace Controls; Bryant Computer Prods.; Chalco Engrg.; CML; Dranetz Engrg. Labs.; Mechanics for Elctrns.; Metra Instrs.; Monterey Research Lab.; PCB Piezotronics; Phoenix Data; RO Assocs.; Signal Analysis Inds.; Signal Research; Valtec; Veldnex.
Selling To: ★ I,M. **Salesmen:** 4 (eng 3)
Services: Repair
HEFFERNAN, H. J. CO., 1123 N. Irving St., (703) 522-6666.
Factories: Adar Assocs.; Allied Sys.; Applications Consultants; Bendix Advanced Prod. Div.; Chrono-Log; Cooke Engrg.; Datel; Elctrn. Arrays; Ferranti Elec.; Heidelex; I E R Corp.; Intech; Inter-Computer Elctrns.; Kenlab Assocs.; Microdyne Instrs.; Mnemotek; Roytron/Litton; Western Magnetics, Inc.
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)
NAECO ASSOCS., INC., Suite #1002, 1925 N. Lynn St., (703) 524-4551. TWX: 710-955-9843.
Branches: 1563 East Dorothy La., Dayton, Ohio, (513) 298-1062; 3736 Alta Loma Dr., Bonita, Calif., (714) 420-5161; 20874 Govin Blvd., Pierrefonds, Montreal, Canada, (514) 626-2688.
Factories: Canadian Marconi; Kaar Elctrns.; Leigh Instrs.; Alto Instrs.; Alto Scientific; Cartesian; Conrad Missimer; Secode; RFL; General Electrodynamics; Galaxy Elctrns.; Leigh Sys.; Aviation Elec.; Integrated Sys.; Static Prods.; Decibel Prods.
Selling To: ★ I,M. **Salesmen:** 20 (eng 15)
SIMBERKOFF SLS. INC. (See Orange, N.J.)
WHITNEY, M. E. ASSOCS., INC., 1400 N. Uhle St., (703) 524-5642.
Factories: Ameray Corp.; Concord Control, Inc.; Filtron Co.; Roanwell Corp.
Selling To: ★ I,M. **Salesman:** 1 (eng 1)

Charlestown
JACOBS, M. S. & ASSOC. (See Pittsburgh, Pa.)

Fairfax
SCHIBLEY ASSOCS., INC., 10604 Warwick Ave., (703) 591-3008.
Branch: Baltimore, Md., (301) 837-4371.
Factories: Applied Research; Basic Ceramics; Bendix; Eastern Microwave; Frequency Sources; Hugle Inds.; Hyletronics; Industrial Reproductions; Precision Tube; Relcom; RLC Elctrns.; United Aircraft; Zeltex.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse, Mass Mailing Facilities

Falls Church
JAY CO., INC., 2914 Annandale Rd., (703) 534-7800.
Factories: ACCRA-Point Arrays; Addington Labs.; Edal Inds.; Electroweave; Infodex; Microwave Prods. Group; Monolithic Dielectrics; Sage Labs.; Solid State Scientific; Universal Voltronics; Vectron Labs.; Zeta Labs.
Selling To: ★ I,D,M. **Salesmen:** 4 (eng 4)
Services: Repair, Warehouse, Direct Mail
LUND, M. ASSOCS., 2828 Mary St., (703) 560-8400.
Factories: American Standard; Barnant; Burnett Elctrns.; Lab.; ETA Prods.; HLS; Liberty Inds.; Phillips Prods.; Photomation; Redington Counters; Saki Magnetics; Service Filtration; Service Recorder; Taber Instr.; Testing Machines; Trio Fuze Mfg. **Salesmen:** 2 (eng 2)
Selling To: ★ I,D,M. **Services:** Repair, Warehouse

Lynchburg
BARNHILL & ASSOCS. INC. (See Timonium, Md.)
BURGIN-KREH ASSOCS., INC. (See Towson, Md.)
ROYELEC ELECTRONIC REP., Box 254, 605 Krise Bldg., (703) 846-7117.
Factories: Ark-Les Switch; Dahlstrom Mfg.; Insulating Fabricators; Lundey Assocs.; Rogan; Von Weise Gear.
Selling To: ★ A,I,M. **Salesman:** 1 (eng 1)
Services: Warehouse
TESSCO (See Lutherville-Timonium, Md.)

Philmont
BAXTER, A. H., Box 267, (703) 338-6002.
Factories: Aitkan Prods.; A.L.R. Inc.; American Rectifiers Corp.; Crilheat, Inc.; Cellutron Prods.; Luminator.
Selling To: ★ I,D. **Salesman:** 1

Richmond
EASTERN INSTR., INC. (See Philadelphia, Pa.)
GOODMAN, G. CO. (See Baltimore, Md.)
HIGHSMITH, J. L. & CO. (See Charlotte, N.C.)
HILE, W. K. CO., INC. (See Matthews, N.C.)
JOBE & CO. INC. (See Baltimore, Md.)
TATE ENGRG. INC. (See Baltimore, Md.)

Roanoke
TATE ENGRG. INC. (See Baltimore, Md.)

Salem
FAUSETT, F. & CO. (See Smyrna, Ga.)

Springfield
DYNA REP CO., Suite 200, 5265 Port Royal Rd., (703) 321-8630. TWX: 710-833-0693.
Factories: Airborne Instr. Labs.; Cimron Div.; Communications Assoc.; Control Sys. Research; Hughes; International Microwave; Lear Siegler; Melabs, SCM; Powertec; Raytheon Computer; RFL Inds.; Sonoma; Waveline.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
Services: Repair

Vienna
DOSS ELCTRNS., INC. (See Baltimore, Md.)

Virginia Beach
MITSCHER, R. W. CO., INC. (See Buffalo, N.Y.)

Woodbridge
JONES, W. M. CO. (See Towson, Md.)

WASHINGTON

Bellevue
BACH ELECTRIC (See Portland, Ore.)
BRENNAN ASSOCS., INC., 208 Carlson Bldg., (206) 454-9332. TWX: 216-742-0834.
Factories: American Optical; Argonaut Assoc.; Aztec Elctrn.; Calif. Inst.; Data Gen'l.; Digi Data; Dumont OSC Labs.; Dynisco; Eldorado Electrodata; General Resh.; N.J.E.; Non Linear Sys.; Preston Scientific; Total Sys. Tech. **Services:** Repair, Sales
Salesmen: 2 (eng 2)

HARRIS, B. CO. (See Los Angeles, Calif.)
OLANDER, R. & CO. (See Burbank, Calif.)
REPEX INC. (See Mountain View, Calif.)
SCHULTZ, N. R. CO., Box 159, (206) 454-0300.
Branch: Box 156, Beaverton, Ore., (503) 646-1345.
Selling To: ★ I,M,D. **Salesmen:** 2 (eng 2)
SMITH, A. CO., 405 166th S.E., (206) 746-6770.
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

Kirkland
COMPAR CORP. (See Burlingame, Calif.)

Seattle
ACE ASSOCS., 137 S.W. 153rd St., (206) CH 4-9391.
Factories: All-Tronics, Inc.; CCA Elctrns.; QRK Elctrns.; Rek-O-Cut; Standard Elctrns.
Selling To: ★ I,A,D,M. **Salesmen:** 2 (eng 1)
ALMAC/STROUM ELCTRNS., 5811-6th Ave. S., (206) 763-2300. TWX: 910-444-2067.
Branch: 8888 S. W. Canyon Rd., Portland, Ore., (503) 292-3534. TWX: 910-464-6105.
Factories: Beckman Instr.-Helipot Div.; Clarostat Mfg.; Deltrol Controls; Dialight Corp.; Elco Corp.; Leecroft Mfg.; Litton Inds.-Useco Div.; RCL Elctrns.; Texas Instrs.; Zero Mfg. **Services:** Warehouse
Selling To: ★ I,M. **Salesmen:** 11 (eng 6)
ALMAC/STROUM ELCTRNS., 5811-6th Ave. S.
Branch: 8888 S.W. Canyon Rd., Portland, Ore., (503) 292-3534.
Factories: Beckman Instr.; Clarostat Mfg.; Deltrol Controls; Dialight Corp.; Elco Corp.; Leecraft Mfg.; Litton Inds.; RCL Elctrns.; Texas Instrs.; Zero Mfg.
Selling To: ★ I,M. **Salesmen:** 10 (eng 8)
Services: Warehouse
ARNESON ASSOCS. INC., 5950 6th Ave. S., (206) 762-7664.
Branch: 4175 S.W.Cedar Hills Blvd., Beaverton, Ore., (503) 646-3416.
Factories: American Micro Sys.; Babcock Relays; Capco; Condenser Prods.; Dale Elctrns.; Digitran; Dupree Mfg.; Fenwal Elctrns.; Intech; Intersil; Kemet Div.; Lamps, Inc.; Lemosa, Inc.; NPC Elctrns.; Startron; Solitron Devices; Solitron Microwave; Stewart-Warner Microcircuits.
Selling To: ★ I,M. **Salesmen:** 3 (eng 1)
Services: Technical Assistance
ARVA, INC., 1320 Prospect St., (206) 622-0177. TWX: 910-444-2022.
Branches: 2035 S.W. 58th Ave., Portland, Ore., (503) 292-8762; Box 759, Anchorage, Alaska, (907) 272-5231.
Factories: AMCO Engrg. Co.; Ballantine Oper. Div.; Calif. Instr.; Computer Measurements; Daytronic Corp.; Guildline Instrs.; Microdot Instr.; Philbrick/Nexus Resh.; Philco-Ford Corp.; Polarad Elctrn. Instrs. Precision Instr.; Raytheon Co.; Rustrak Instr. Co.
Selling To: ★ I,M. **Salesmen:** 5 (eng 3)
Services: Repair, Warehouse, Direct Mail
AURICH, F. W. & CO., 3601 Gilman Ave. W., (206) 284-5561. TWX: 910-444-1333.
Factories: Bead Chain Mfg.; Bronson Hinge; Eberhard Mfg.; Groov Pin; National Rivet Mfg.; Southco Inc.
Selling To: ★ I,D,M. **Salesmen:** 7 (eng 5)
Services: Warehouse
AVIONICS LIAISON, INC., 6770 Perimeter Rd., South; (206) RO 7-3870. TWX: 910-444-2013.
Factories: Adtech, Inc.; Analog Devices, Inc.; Borg-Warner Controls; Cedar Div.; EMP Elctrns.; Krohn-Hite; North Hills Elctrns.; Princeton Applied Research; Signetics Corp.; Valor Instrs.
Selling To: ★ I,M. **Salesmen:** 3 (eng 3)
BACKER, J. J., 221 W. Galer, (206) 285-1300. TWX: 910-444-1646.
Selling To: ★ A,I,D,M. **Services:** Warehouse, Direct Mail
Salesmen: 7
BRANOM INSTR. CO., 2137 Second Ave., (206) 622-7320.
Branches: 6019 N.E. Union Ave., Portland, Ore., (503) 285-5205; 1037 W. Broadway, Vancouver, Can., (604) 736-7794.
Factories: Brooks Instr.; Eagle Singla; Ebert Elctrns.; Hays Corp.; Ideal Aerosmith; Jamesbury; Marsh Instr.; Mercoid Corp.; Rochester Instr. Sys.; Taylor Instr. Co.; West Instr.; Weston Instr.; Yarway Corp.
Selling To: ★ I,D,M. **Salesmen:** 9 (eng 2)
Services: Repair, Warehouse
CASCADE CHAPTER OF E.R.A., 5403 Rainier Ave. So., (206) 723-5150.
CHAMPLIN, D. CO., INC., 12347 Lake City Way N.E., (206) 362-0401.
Factories: Audio Originals; Barker Prods.; Benjamin Elctrn. Sound; Dynaco; J. B. Lansing Sound; Mellotone; Nikko Elec. Corp. of America; Nova-Tech Elctrns.; Sunn Musical Equipt.; Tedford Crystal Labs.
Selling To: ★ A,I,D. **Salesmen:** 2 (eng 1)
Services: Warehouse
COMPTRONICS, 3220—16th Ave. W., (206) AT 4-4842. TWX: 910-444-1638.
Factories: API Instrs.; Accuride; Data-Control Sys.; Datum Inc.; Field Emission; L. R. Graham & Co.; Holt Instr.; Lab.; Microdyne; Molecu-Wire; Philips Elctrn. Instrs.; Plasmetex Inds.; Shepard Labs.; Sprague Elec.; Vamistor Corp. **Services:** Repair
Selling To: ★ I,M. **Salesmen:** 2 (eng 2)
DENNY, H. M. CO., 3410-16th West, (206) 282-7200.
Factories: Acme Elec.; A. O. Smith; General Equipt. & Mfg.; B & B Electromatic; Inventron Inds.; Fullman Mfg.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)
Services: Warehouse
DEWAR & ASSOCS., 6361 First Ave. So., (206) 763-2233.
Factories: AIL; Anadex Instrs.; Baird Atomic; CEA; Dalmo Victor; Douglas Microwave; Edgerton, Germeshausen & Grier; Elgar Corp.; Flight Sys.; Gen'l. Atronics; Instrs. for Inds.; London Co.; Kilovolt Corp.; Macrosonics Int'l.; Redford Corp.; Texscan Corp.; Universal

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Services: Direct Mail

DRAKE, R. S. ASSOCS., INC., 6133 Maynard Ave. S., (206) 763-2755. TWX: 910-444-2030.
Factories: Astrodata; C-Cor Elctrns.; Clary Corp.; Compucord, Inc.; Dana Labs.; Data Measurements; Dynasciences Div.; Elctrn. Arrays; Houston Instr. Div.; Infotec; Intermed; Micro Instr.; Novation, Inc.; Peripheral Equip. Corp.; Remex Elctrns.; Rentronix; Sangamo Elec. Co.; Singer; Vu Data, Inc.; Watkins Johnson; Wavetek; Weinschel Engrg.
Selling To: ★ I,M. **Salesmen:** 4 (eng 4)

EARL & BROWN CO. INC., 2047 14th Ave. W., (206) 284-1121.
Branch: 2041 S.W. 58th, Portland, Ore., (503) 292-9145.
Factories: Alco Elctrns.; Antenna Specialists; Bud Radio; Harman Kardon; J.B.L. Sound; Jerrolo Elctrns.; Langevin Inc.; P. R. Mallory; J. W. Miller; Nortronics; Phalo Corp.; S-C Elctrns.; Simpson Elec.; H. H. Smith; Stancor; University Sound. **Services:** Direct Mail
Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 2)

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Selling To: ★ A,D,I,M. **Salesmen:** 3 (eng 1)

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Selling To: ★ A,D,I,M. **Services:** Warehouse

LANPHEAR, W. R. CO., INC., 4031 Stoneway N., (206) 633-4900.
Factories: British Inds.; C/P Corp.; Dixson; Electro-Voice; Federal Sign & Signal; Garrard; Hallett; Motorola Semiconductor Prods.; Multicore Sls.; Pickering & Co.; Tenna; Unimetrics; Workman Elctrn. Prods.
Selling To: ★ A,D,I,M. **Salesmen:** 4 (eng 1)
Services: Warehouse

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Selling To: ★ D,I,M. **Salesmen:** 3 (eng 3)
Services: Warehouse

MERRITT, RON CO., 1320 Prospect St., (206) 682-7337. TWX: 910-555-1212.
Branch: 2035 S.W. 58th, Portland, Ore., (503) 292-8762.
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Selling To: ★ A,D,I. **Salesmen:** 4 (eng 2)
Services: Repair, Warehouse, Direct Mail

(See Advertisement Page 3278)

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NORTHWEST SLS. & ENGRG. SVC., Terminal Sls. Bldg., (206) 622-3860.
Branch: 420 Market St., San Francisco, Calif., (415) 392-9154.
Factories: Arvin Frequency Devices; Isotemp Research; Life Instr.; Lundey Assocs.; Nylok Div.; Printact Div.
Selling To: ★ I,D. **Salesmen:** 3 (eng 3)

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Selling To: ★ I,D,M. **Salesmen:** 4 (eng 3)
Services: Warehouse

PARSONS, C. B. & CO., 5319 4th Ave., S., (206) 762-7373.
Factories: Autron; Cole Instr.; Curtis Dev. & Mfg.; Detroit Coil; Electro Switch; G-V Controls; Industrial Timer; ITT General Controls; Midtex; Kessler-Ellis Prods.; Robertshaw Controls. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 2 (eng 1)

PETERS-DE LAET, INC. (See Burlingame, Calif.)

POLICH, A. L. INC. (See Portland, Ore.)

RIGGS, C. E., INC. (See Portland, Ore.)

RUSSELL ASSOC. INC. (See Brightwaters, N.J.)

SEATRONICS INC., 5616 4th Ave., So., (206) 767-4330.
Factories: Agastat Div.; American Standard Aero Resh.; Barber-Colman; Beckman Instrs.; BLH Elctrns.; DDC Div.; Fenwal; General Cable; General Elec.; B. F. Goodrich; Grayhill; Gulton Inds.; Icon; Lectromagnetics; Panduit; Philamon; Taft Electrosystems; TEC; Telonic Inds.; Times Wire & Cable; Victoreen Instr.; Ward Leonard Elec.; Wilmar Elctrns. **Services:** Warehouse
Selling To: ★ I,D,M. **Salesmen:** 5 (eng 5)

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Selling To: ★ I,D. **Salesmen:** 3 (eng 3)

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Factories: Anixter-Murray; Collins & Hyde; Fidelitone; Gavin Instrs.; Guardian Elec. Mfg.; Keystone Elctrns.; Kings Elctrns.; Mercury Elctrns.; Petersen Radio; Pomona Elctrns.; Sensitron Components; Sonotone Batteries; Stacoswitch; Superior Resistor.
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 1)
Services: Direct Mail

TECHNICAL SLS. CO. INC., 4619 W. Marginal Way S.W., (206) 523-4063. **Services:** Warehouse, Direct Mail
Selling To: ★ I,D,M. **Salesmen:** 3 (eng 2)

THORSON CO. (See Los Angeles, Calif.)

TUDOR, J. A. & ASSOC., INC., 2605 Western Ave., (206) 682-7444. TWX: 32-209.
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Factories: Allen-Bradley Co.; Automatic Timing & Controls; Beta Corp.; Crydom Controls; Fairbanks Morse & Co.; Glenn-Pacific; Healy-Ruff; Insul-8-Corp.; King Knight Co.; Monolithics Dielectrics.; Reuland Elec.; Sprague Elec.; Telemotive Div. **Selling To:** ★ I,D
Services: Mfg. Rep. **Salesmen:** 12 (eng 8)

WEBER D. G. CO. (See Portland, Ore.)

WIDDEKIND, M. K. CO. INC., 815 W. Ewing, (206) 284-8020. TELEX: 32-0154.
Branch: 3292 Sunnyview Ave. N.E., Salem, Ore., (503) 363-6445.
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Selling To: ★ A,D,I,M. **Salesmen:** 5 (eng 4)
Services: Warehouse

Spokane

BACH ELECTRIC (See Portland, Ore.)

PETERS-DE LAET, INC. (See Burlingame, Calif.)

TUDOR, J. A. & ASSOC. INC. (See Seattle, Wash.)

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Mequon

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Factories: Automatic Timing & Controls; Gen'l. Equipt. & Mfg.; Airmatic Valve; Electro Products Lab.; Delavan Mfg. **Services:** Repair, Warehouse
Selling To: ★ I. **Salesmen:** 7 (eng 3)

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Services: Warehouse

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Selling To: ★ I,D. **Services:** Warehouse, Direct Mail

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Selling To: ★ A,D. **Salesman:** 1
Services: Repair, Warehouse

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New Berlin

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Wauwatosa

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Selling To: ★ I,M. **Salesmen:** 7
Services: Warehouse

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Services: Repair, Warehouse

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Selling To: ★ I,D,M. **Salesmen:** 2 (eng 2)

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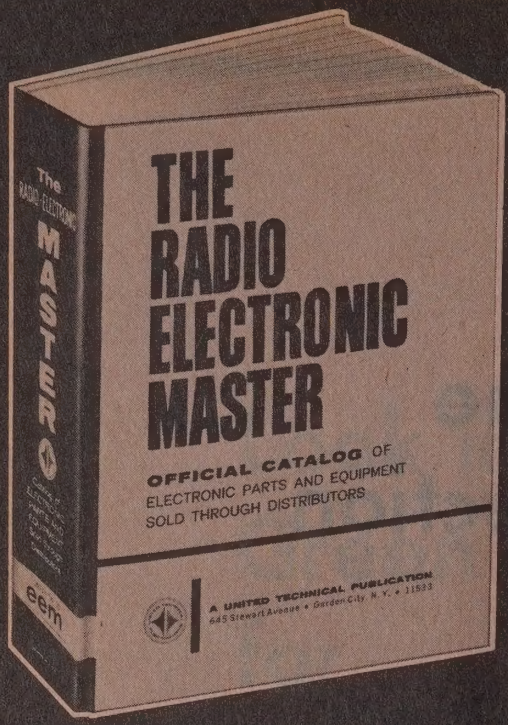

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Huntsville—Electronic Wholesalers Inc., 2310 Bob Wallace Ave. S.W.
Mock Electronics, 2310 Memorial Pkwy., So.
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Mobile—
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Montgomery—
Southeastern Radio, 635 E. Jefferson St.
Selma—Southeastern Radio Parts Co., 729 Jefferson Davis Ave.
Sheffield—Mock Radio & Electronics, Inc., 107 No. Montgomery Ave.

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Lancaster—Electronics Distr., 44539 10th St. W.
Long Beach—Scott Radio Supply, 266 Alamitos
Los Angeles—Calif. Electrs, 1911 Armacost Ave.
Radio Products Sales, 1501 So. Hill St.
Mt. View—Brill Electrs., 1065 Terra Bella Ave.
Dunlap Electrs., 2025 Old Middlefield Way
Elmar Electronics, 2288 Charleston Rd.
Terminal-Hudson Electrs., 880 Maude Ave.
Oakland—Brill Electronics, 610 E. 10th St.
Dunlap Electronics, 100 Hegenberger Loop
Oxnard—Milo of California, 921 S. Oxnard Blvd.
Palo Alto—Zack Electronics, 654 High St.
Pasadena—Milo of Cal., 1759 E. Colorado Blvd.
Riverside—Electronic Supply, 2486 3rd St.
Sacramento—Dunlap Electronics, 1800 18th St.
Sacramento Electronic Supply, 1219 S. St.
San Diego—Milo of California, 2060 India St.
Shanks & Wright, 2045 Kettner Blvd.
Western Radio, 1415 India St.
San Francisco—
Zack Electronics, 1444 Market St.
San Jose—Quement Electrs., 1000 S. Bascom
San Mateo—San Mateo Electrs., 16 W. 42 Ave.
Sunnyvale—Sunnyvale Electrs., 548 S. Murphy

CANADA

Calgary, Alberta—
Smalley's Radio, Ltd., 1105 7th Ave., S.W.
Halifax, N. S.—Amphion Electrs., 2411 Agricola
Moncton, N. B.—
Amphion Elec., P.O. Box 2246, Postal Sta. A
Montreal, Quebec—
Cesco Electrs., 4050 Jean Talon St. W.
Electronic Wholesalers, 1935 Church Ave.
Quebec, Quebec—Crobel, Ltd., 225 Rue Lee
Toronto, Ont.—
Electro-Sonic Industrial Sales, 543 Yonge St.
Vancouver, B. C.—
Canadian Electrs., Ltd., 971 Richards St.

COLORADO

Colorado Springs—
L. B. Walker Radio Co., 9 E. Vermijo
Denver—Electronic Parts Co., 1277 Broadway
Kierulff Electronics, 10890 E. 47th Ave.
Newark-Denver Electr. Supply, 2170 S. Grape
L. B. Walker Radio Co., 300 Bryant St.
Durango—L. B. Walker Radio Co., 2817 Main
Grand Junction—L. B. Walker Radio Co., 537 N. 1st
Greeley—L. B. Walker Radio Co., 1525 8th Ave.
Pueblo—L. B. Walker Radio Co., 100 N. Victoria

CONNECTICUT

Bridgeport—Westconn Electrs., 195 Colorado
Hartford—Eastco, 95 Leggett St.
New London—Aikins Electr. Supplies, 531 Broad
Stamford—Westchester Electrs., 181 Stillwater
Waterbury—Bond Radio Electrs., 439 W. Main

DELAWARE

Wilmington—First State Electrs., 805 E. 13th
Radio Electric Service Co. of Pa., 3601 N. Market St.

DISTRICT OF COLUMBIA

Collins Bros. Electrs., 4946 Marlboro Pike

FLORIDA

Hollywood—Electronic Whlsrs., 4035 N. 29th
Orlando—Electronic Whlsrs., 345 N. Graham
Hammond Electrcs., 911 W. Central Ave.
Panama City—Central Electr., 316 Luverne Ave.
Tampa—Leader Electr. Distributors, Inc., 3411 South Dale Mabry Hhwy.
Thurow Electronics, 121 S. Ashley Dr.
Winter Park—
Radio Electric Serv. Co. of Balto., P.O. Box 577

GEORGIA

Albany—Southeastern Radio, 206 S. Monroe St.
Athens—
Southeastern Radio Parts Co., 393 Finley
Atlanta—Ack Radio Supply Co. of Ga., 554 Deering Rd. N.W.
Jackson Electronics Co., 1135 Chattahoochee Ave., N.W.
Southeastern Radio Parts Co., 430 W. Peachtree St., N.W.
Specialty Distributing, 763 Juniper St., N.E.
World Electrcs., 293 Peachtree St., N.E.
Augusta—Dixie Radio Supply, 1234 Gordon Park
Dalton—Curle Electronics, 710 N. Hamilton Ave.
Gainesville—
Southeastern Radio Parts Co., 412 Oak St.
Hapeville—
Southeastern Radio Parts Co., 565 N. Central
La Grange—
Southeastern Radio Parts Co., 206 Ridley
Macon—Southeastern Radio Parts Co., 866 2nd
Rome—
Southeastern Radio Parts Co., 248 N. 5th
Savannah—
Southeastern Radio Parts Co., 545 E. York

HAWAII

Hilo—Radio-Television Corp., 28 Pookela St.
Honolulu—Electrical Equipt. Co., 656 Queen
Honolulu Electronics, 819 Keeaumoku St.
Industrial Electronic, Inc., 646 Queen St.
Precision Radio, Ltd., 1160 S. King St.
Radio-Television Corp. Ltd., 432 Keawe St.
Radio Wholesale & Supply, 610 Ward Ave.
Kahului, Maui—Electrical Equipt., 319 Ano St.

IDAHO

Boise—Kimball Electrs., 418 N. Orchard

ILLINOIS

Champaign—
Sprackien's Electr. Parts, 905 So. Neil St.
Chicago—Electronic Distrib., 4900 N. Elston
Newark Electrs., 500 No. Pulaski Rd.
Danville—Bud Electr. Supply, 22 N. Jackson St.
Decatur—
Klaus Radio & Electric, 370 E. Cerro Gordo
Jacksonville—Baptist Electronic Supply Co., 419 S. Mauvaisterre St.
La Salle—Klaus Radio & Electric, 1055 First
Oak Park—Melvin Electrs., 541 W. Madison St.
Palatine—Ohmtronics, Inc., 649 Vermont Ave.
Peoria—Klaus Radio & Electric Co., 8400 Pioneer Industrial Park
Quincy—Klaus Radio & Electric, 1101 S. B'dway

INDIANA

Anderson—Electronic Supply of Anderson, 23rd and Columbus
Seybert's Radio Supply Inc., 1331 Main St.
Evansville—Ohio Valley Sound, 20 E. Sycamore
Ft. Wayne—Ft. Wayne Electrs., 3606 E. Maumee
Indianapolis—Graham Electrs., Supply, Inc. 133 S. Pennsylvania St.
Graham Electronics, 6101 N. Keystone
Ra-Dis-Co., Inc., 814 N. Senate Ave.
Lafayette—
Lafayette Radio Electrs., 408 North St.
Michigan City—Tri-State Electrical Supply, 212 E. Michigan St.
Muncie—Muncie Electronics, 222 No. Madison
Vincennes—Ohio Valley Sound, Ninth & Main

IOWA

Burlington—Union Supply Co. Inc., 231 S. 3rd
Cedar Rapids—Deeco, Inc., 2500 16th Ave. S.W.
Davenport—Klaus Radio & Electric, 322 E. 4th
T. C. R. Distributors, 1205 E. River Dr.
Mid-State Distributing Co., 1201 Grand Ave.
Radio Trade Supply Co., 1017 High St.
Mason City—Waters Electrs., 516 So. Delaware

KANSAS

Coffeyville—Norman Electr. Supply, 121 W. 7th
Great Bend—Radio Supply Co., 1910 Tenth
Hutchinson—Acme Radio Supply, 313 No. Main
Manhattan—Acme Radio Supply, 318 Thurston
Salina—Radio Supply Co., Inc., 1809 S. B'dway
Topeka—Acme Radio Supply, 135 Kansas Ave.
Interstate Electronic, 2500 S. Kansas
Wichita—Interstate Electronic Supply, 230 Ida
Radio Supply Co., Inc., 115 Laura

KENTUCKY

Bowling Green—
Randolph, Hale & Meredith, Inc., 98 State
Hopkinsville—Randolph & Hale, 729 East 4th
Lexington—Radio-Electronic Euipment Co., Inc., 480 Skain Ave.
Louisville—P. I. Burks Co., 842 S. Seventh St.
Peerless Electr. Equpt., 1815 S. Seventh St.
Owensboro—Ohio Valley Sound, 600 W. 3rd St.

Contact Your Local Distributor For The 1970 Radio-Electronic MASTER

LOUISIANA

Alexandria—Ralph's, 601 N. 3rd St.
Baton Rouge—Ralph's, 1732 Plank Rd.
Southern Radio Supply Co., 2610 Scenic Hwy.
Gretna—EPCOR, 723 Franklin St.
Houma—Sterling Electrs., 252 Magnolia St.
Lafayette—Ralph's, 3004 Cameron St.
Lake Charles—Ralph's, 911 4th Ave.
Monroe—C. & O. Electrs., 201 So. Stanley Ave.
Morgan City—Ralph's, 715 Brashear St.
New Iberia—Ralph's, 1903 E. Main St.
New Orleans—Columbia Radio & Sup., 3940 3rd
EPCOR, 3308 Orleans Ave.
Radio Parts, Inc., 1112 Magazine St.
Southern Radio Supply, 1909 Tulane Ave.
Sterling Electrs., 537 S. Claiborne Ave.
Shreveport—
Industrial Elecr. Supply, 2422 Southern Ave.
Interstate Electric Co. of Shreveport, Inc., 1419 Culpepper St.
Koelemay Electronics, 2530 Linwood Ave.

MAINE

Auburn—Radio Supply Co., Inc., 26 Cross St.
Bangor—Radio Supply Co., Inc., 83 Farm Rd.
Portland—Commercial Distributors, 50 Diamond

MARYLAND

Aberdeen—Harco Electrs., Carsins Run, Rte. 22
Baltimore—A.S.I. Electr., Meadows Ind. Park—Whitehead & White Stone Rds.
Electronic Wholesalers, 3200 Wilkens Ave.
General Radio Electrs., 2314 E. Joppa Rd.
Kann-Ellert Electrs., 2050 Rockrose Ave.
Radio Elec. Serv. Co. of Baltimore, 1026 Cromwell Bridge Rd.
Radio Electric Service Co. of Pa., Whitehead & White Stone Rds., Meadows Ind. Park
A. R. Spartana Co., Inc., 239 No. Gay St.
Bethesda—Empire Electr. Sup., 4907 Rugby Ave.
Cumberland—
Allegheny Electrs., 1100 E. Oldtown Rd.
Gaithersburg—Electronic Wholesalers, Inc., 16021 Industrial Dr.
Hagerstown—Allegheny Electrs., 1301 Potomac
Stoddard Supply Co., 354 S. Cannon Ave.
Hyattsville—
Milgray/Washington, 5405 Lafayette Pl.
Rockville—Capitol Radio Wholesalers, Inc., 12272 Wilkins Ave.
Pioneer-Standard Washington, 1037 Taft St.
Silver Spring—Radio Electric Serv. Co. of Balto., 1316 Fenwick Lane

MASSACHUSETTS

Boston—
DeMambro Electrs., 1095 Commonwealth Ave.
Sager Electrical Supply Co., 172 High St.
Burlington—
Milgray/New England, 79 Terrace Hall Ave.
Cambridge—Harvey/R & D Electrs., 71 Pearl
Fitchburg—Radio Maintenance Supply Co., 1334 Water St.
Lawrence—Milo of New England, 3 Wolcott Ave.
Newton—Cramer Electronics Inc., 320 Needham St.
No. Wilbraham—Industrial Components Corp., 2551 Boston Road
Springfield—Del Padre Supply of Springfield, 999 Worthington St.
Watertown—
Q. P. L. Electr. Distrs., 75 N. Beacon St.
West Springfield—Eastco, 284 Bliss St.
Westwood—Eastco, 26 Dartmouth St., Westwood Industrial Park
Worcester—Radio Maintenance Supply Co., Inc., 80 Thomas St.

MICHIGAN

Detroit—Rissi Electr. Supply, 14405 Wyoming
Grand Rapids—
Radio Electr. Supply, 505 Jefferson Ave. S.E.
Jackson—Fulton Radio Supply, 1208 Greenwood
Kalamazoo—Radio Electr. Supply, 822 Mills St.
Lansing—Fulton Radio Supply, 2707 Alpha

MICHIGAN (cont'd.)

Marquette—
NWR Electrs. Corp., 1010 W. Washington
Traverse City—Radio Electr. Sup., 715 Beitner

MINNESOTA

Duluth—Northwest Radio, 123 E. 1st St.
Edina—Lew Bonn Co., 7275 Bush Lake Rd.
Minneapolis—Electronic Center, 107 3rd Ave. N
St. Paul—Electronic Center, 312 W. University

MISSISSIPPI

Columbus—Bluff City Dist. Co., 116 So. 22nd
Greenville—Bluff City Dist., 349 Hwy. #1 So.
Hattiesburg—Swan Electrs., 506 Boule St.
Jackson—Swan Electrs., 342 N. Gallatin St.
Pascagoula—May Electr. Sup., 605-9 Ingalls
Tupelo—Bluff City Dist., 707 Robert E. Lee Dr.

MISSOURI

Joplin—Norman Electronic Supply, 402 Wall
Kansas City—Burstein-Applebee, 3199 Mercier
Manhattan Radio Equip., 7110 McGee St.
Norman Electr. Supply Co., 3814 Main
Radiolab, Inc., 3814 Main
St. Joseph—Acme Radio Supply, 820 So. 10th
St. Louis—Ebinger Electrs., 2501 So. Jefferson
Radonics-Electrs., 4445 Gustine Ave.
Van Sickle Radio-Electrs., 1915-17 Washington
Springfield—
Norman Electr. Supply, 952 E. Trafficway
Reed Radio & Supply, 805 Boonville Ave.
University City—Olive Industrial Electrs., Inc., 6662 Olive Blvd.

NEBRASKA

Lincoln—Leuck Radio Supply, 1024 "L" St.
Scott Electr. Supply, 4040 Adams St.
North Platte—Scott Electr. Sup., 516 N. Poplar
Omaha—J-B Distributing Co., 1616 Cass St.
Radio Equipment Co., 625 N. 18th St.

NEVADA

Las Vegas—Electronic Supply Co., 1112 South Casino Center Blvd.
Industrial Electronics, 300 W. Utah
Reno—EDCO, 720 Tahoe St.

NEW HAMPSHIRE

Manchester—RSL Distrs., 670 Chestnut St.

NEW JERSEY

Camden—General Radio Supply, 600 Penn St.
Radio Electric Service Co. of Pa., 211 Market St.
Clifton—Harvey Radio Co., 375 Allwood Road
Eatontown—Atkinson & Smith, 17 Lewis St.
Hackensack—NIDISCO Hackensack, 55 State St.
Jersey City—NIDISCO Jersey City, 713 Newark
Passaic—NIDISCO Passaic, 294 Passaic St.
Phillipsburg—Carl B. Williams, 465 So. Main
Ridgefield—NIDISCO Cliffside Pk., 484 Bergen
Springfield—Federated Electr., 155 U.S. Rte. 22
Trenton—NIDISCO Trenton, 985 Princeton
Union City—NIDISCO, 2812 Kennedy Blvd.

NEW MEXICO

Albuquerque—
Sterling Electronics, 1712 Lomas Blvd., N.E.
Walker Radio Co., 102 Granite Ave. N.W.
Roswell—R & R Electr. Supply, 605 E. Second

NEW YORK

Albany—E. E. Taylor Co., 465 Central Ave.
Batavia—Radio Equipment Corp., 5 Center St.

NEW YORK (cont'd.)

Binghamton—
Harvey/Federal Electrs. Inc., Vestal Parkway
Stack Indl. Electrs. Inc., 45 Washington St.
Brooklyn—Laco Indus. Electrs., 4924—4th Ave.
Buffalo—Genesee Radio & Parts, 2550 Delaware
Radio Equipment Corp., 196 Vulcan St.
Radio Equipment Corp., 3240 Sheridan Drive
Summit Distributors, Inc., 916 Main St.
Cheektowaga—Radio Equipt., 1532 Walden Ave.
Commack—Componitron Corp., 67 Harned Rd.
Elmsford—Melville Radio Corp., 1 Nepperhan
Farmingdale—Harrison Radio Co., 20 Smith St.
Flushing—Allen Electronics, Inc., 41-42 Main
Jamaica—Harrison Radio Co., 139-20 Hillside
Lafayette Radio Electrs., 165-08 Liberty Ave.
Norman Radio Distrs., 94-29 Merrick Blvd.
Long Island City—H. L. Dalis, 35-35 24th St.
Lynbrook—Peerless Radio Corp., 19 Wilbur St.
Mt. Vernon—QAR Industrial Electr. Sales Inc., 621 So. Columbus Ave.
New York—Blan Electrs. Corp., 52 Warren St.
Center Industr. Electrs., 15-17 E. 16th St.
Harrison Radio Co., 8 Barclay St.
Harvey Radio Co., 2 West 45th St.
Midway Industrial Electrs., 15 W. 45th St.
Midway Radio & Television, 58 W. 45th St.
Milgray/New York, 160 Varick St.
Milo Electronics Corp., 325 Hudson St.
Terminal-Hudson Electrs., 236 W. 17th St.
Terminal Radio Intern'l, Ltd., 3 W. 61st St.
Newburgh—Chief Electronics, 248 Washington
Niagara Falls—Radio Equipt. Corp., 1720 Pierce
Olean—Radio Equipt Corp., 1615 West State
Poughkeepsie—Chief Electrs., 14 N. Bridge St.
Richmond Hill—
Anchor Electronic Dist., 116-01 101st Ave.
Rochester—Goldcrest Electrs., 482 St. Paul St.
Masline Electrs., 511 Clinton Ave., South
Rochester Radio Supply, 140 W. Main St.
Syracuse—Morris Electronics of Syracuse, Inc., 1153 W. Fayette St.
Westbury—Adelphi Electrs., Jericho Turnpike
White Plains—Westchester Electronics, Inc., 610 Mamaroneck Ave.
Woodbury—Harvey Radio, 60 Crossways Pk. W.

NORTH CAROLINA

Asheville—Freck Radio & Supply Co., Inc., 38-40 Biltmore Ave.
Freck Radio & Supply, 1074 Patton
Charlotte—Dixie Radio Supply, 2220 So. Tryon
World Electronics, 1415 South Tryon
Durham—Southeastern Radio Sup., 401 Foster
Womack Electronics, 509 Ramseur St.
Fayetteville—Southeastern Radio Supply 325 Rowan St.
Gastonia—Dixie Radio Supply, 507 W. Airline
Greensboro—Southeastern Radio Supply 445 English St.
Hickory—Freck Radio & Sup., 1012 Hgwy. 64-70
Southeastern Radio Sup., 907 2nd Ave., N.W.
Jacksonville—
Southeastern Radio Sup., 1009 Lejeune Blvd.
Kinston—Southeastern Radio Supply 1005 E. Highland Ave.
Raleigh—Southeastern Radio Supply 414 Hillsborough St.
Salisbury—Southeastern Radio Supply 316 N. Depot St.
Shelby—Freck Radio & Sup., 402 W. Dixon Blvd.
Wilmington—Southeastern Radio Supply 520 N. Third St.
Wilson—Southeastern Radio Supply 321 S. Goldsboro St.
Winston-Salem—Electronic Whlsrs., 938 Burke
Southeastern Radio Supply, 200 S. Marshall St.

OHIO

Akron—Akron Electr. Sup., 107 S. Arlington St.
Sun Radio Co., 110 E. Market St.
Ashland—Servex Electr. Distr., 62 E. Main St.
Ashtabula—Sim's Electr. Sup., 5001 West Ave.
Barberton—
Akron Electr. Supply, 108 15th St., N.W.
Canton—Canton Electr., 126 12th St., N.W.
Cincinnati—
Mytronic Co,, 1843 N. Reading Rd (Reading)
United Radio, Summit Rd. & Reinhold Dr.

(Continued on next page)

Contact Your Local Distributor For The 1970 Radio-Electronic MASTER

OHIO (cont'd.)

Cleveland—Milgray/Cleveland, 1821 E. 40th St.
Pioneer-Standard Electronics, Inc.
5403 Prospect Ave.
Winteradio Electr. Sup., 1468 W. 25th St.
Columbus—SREPCO Electronics, 1045 Ridge St.
Whitehead Radio Co., 124 No. Grant Ave.
Dayton—SREPCO Electronics, 314 Leo St.
Stotts-Friedman Co., 108-112 N. Jefferson
Delaware—Servex Electr Distr., 175 E. Winter
Hamilton—SREPCO Electrs., 4854 Factory Dr.
Lorain—Pioneer-Standard Electrs., 3847 Pearl
Mansfield—Servex Electr. Distr.,
775 Springmill Road
Marion—Servex Electr. Distr., 224 N. Prospect St.
Middletown—SREPCO Electrs., 2104 Brentwood
Mt. Vernon—Servex Electr. Distr., 516 S. Main St.
Newark—SREPCO Electronics, 138 Union St.
Parma—Winteradio Electr. Sup., 5373 Ridge Rd.
Piqua—SREPCO Electronic, R.R. #66
Sandusky—Pioneer-Standard Electrs., 317 Perry
Servex Electr. Distr., 534 Columbus
So. Euclid—
Winteradio Electr. Suppl. 4432 Mayfield Rd.
Springfield—
Standard Radio-Springfield 1300 St. Paris Rd.
Tiffin—Servex Electr. Distr., 215 Jefferson
Warren—REM Electrs. Sup., 54 W. Market St.
Wooster—
Servex Electr. Distr., 23 N. Buckeye St.

OKLAHOMA

Ada—Trice Wholesale Electr, 231 N. Francis
Ardmore—Trice Wholesale Electrs., 709 Grand
Bartlesville—Cummins Electric Supply Inc.
700 E. Frank Phillips Blvd.
Enid—Trice Wholesale Electrs 223 E. Randolph
Lawton—Trice Wholesale Electrs., 30 "E" St.
McAlester—
McAlester Radio & TV Supply, 407 N. Main
Trice Wholesale Electronics 529 No. Main
Muskogee—
Trice Wholesale Electronics 211 Callahan
Oklahoma City—
Miller-Jackson Co., Inc., 11 E. California
Radio, Inc., 903 North Hudson
Trice Wholesale Electrs., 471 N. Stiles
Trice Wholesale Electronics, 00 No. Hudson
Okmulgee—
Trice Wholesale Electronics, 1 N. Oklahoma
Ponca City—
Trice Wholesale Electrs., 60 No. First St.
Tulsa—Radio, Inc., 1000 South Main St.
Trice Wholesale Electronics, 30 So. Utica

OREGON

Eugene—Central Distributors, 103 Conger
Klamath Falls—RF Supply Co., 50 Commercial
Medford—Central Distributors, 60 N. Fir St.
Verl G. Walker Co., 205 W. Jackson St.
Portland—
Central Distributors, 955 N.E. Union Ave.
Lou Johnson Co., Inc., 2720 N.E. 29th Ave.
United Radio Supply, Inc, 123 N.E. 7th Ave.

PENNSYLVANIA

Allentown—A. A. Peters, Inc. 404 Union Blvd.
Radio Electric Service Co. of Lehigh Valley, Inc., 425 Hanover Ave.
Altoona—Allegheny Electrs., 1720-22 Union
Braddock—M. Leff Radio Parts, 225 Braddock
Carlisle—Cumberland Electrs. 810 No. Hanover
Drexel Hill—Kass Electronic Distributors,
2502 Township Line Rd.
Easton—Radio Elec. Serv. Co., 700 Northampton
Erie—J. V. Duncombe Electr. 721 Parade St.
Mace Electronics, 2631 W. 8th St.
Greensburg—M. Leff Radio Parts, 401 S. Main
Harrisburg—Cumberland Electr., 1345 So. 12th
Johnstown—Allegheny Electrs. 46 Valley Pike
Lancaster—
George D. Barbey Co., 618-620 Columbia Ave.
Lebanon—
George D. Barbey Co., 821 Cantin Rd.

PENNSYLVANIA (cont'd.)

Philadelphia—A. C. Radio Supply Co.,
1539 W. Passyunk Ave.
Milgray/Delaware Valley, 2532 No. Broad St.
Phila. Electronics, Inc., 1225 Vine St.
Radio Electric Service Co. of Pa., 7th & Arch Sts.
Radio Electric Service Co. of Pa. 5930 Market St.
Radio Electric Service Co. of Pa.
6587 Roosevelt Blvd.
Simco Electrs., Inc., 3907-11 N. Broad St.
Pittsburgh—Cameradio Co., 2801 Liberty Ave.
Pottstown—George D. Barbey Co., 157 N. York
Pottsville—Moyer Electronic Supply Co., Inc.,
330 E. Norwegian St.
Reading—George D. Barbey Co., 333 N. 4th St.
Electronic & TV Distrs., Inc., 201 So. 4th St.
Scranton—
Consolidated Distrib. Co., 1148-1150 Capouse
State College—University Electrs., 258 E. Beaver
Upper Darby—
Radio Electric Service Co. of Pa.,
7911 W. Chester Pike
Willow Grove—
Radio Electric Service Co. of Pa., 29 York Rd.

RHODE ISLAND

Providence—
William Dandreta & Co., 28 Wolcott St.
Warwick—Eastco, 100 Pioneer Ave.
W. H. Edwards, Inc., 55 Electronic Drive

SOUTH CAROLINA

Anderson—Dixie Radio Supply, 1206 S. Murray
Charleston—Radio Laboratories, 475 E. Bay St.
Columbia—Dixie Radio Supply, 1900 Barnwell
Southeastern Radio Parts Co., 1606 Gregg
Florence—Dixie Radio Supply, 531 Palmetto
Greenville—Dixie Radio Supply, 500 Pendleton
Sawyer Electronics Corp., 1210 Poinsett Hwy.
Greenwood—Dixie Radio Supply, 116 Circular St.
Spartanburg—Dixie Radio Sup., 208 E. St. John
Sumter—Dixie Radio Supply, 25 Guignard Dr.

TENNESSEE

Bristol—Clark Radio Supply, 1130 W. State
Chattanooga—Curle Electrs., 439 Broad St.
Harpe Electronic Distributors, 1845 Central
Clarksville—Randolph Hale & Matthews Inc.,
25 Crossland Ave.
Columbia—Randolph & Williams, 208 W. 4th St.
Cookeville—Randolph & Parks, 2nd & Oak Sts.
Jackson—Lavender Electrs., 249 East Deadrick
Johnson City—
Freck Radio & Supply, 1611 W. Market St.
L & S Electronics, 501 So. Roan St.
Kingsport—Radio Elec. Sup., 961 E. Sullivan
Memphis—Bluff City Distributing, 234 East St.
Lavender Electronics, 180 S. Cooper
Nashville—Electra Distrib. Co., 1914 West End
Randolph & Rice, 1213 McGavock St.
Union City—Bluff City Dist. Co., 306 S. Second

TEXAS

Abilene—R & R Electr. Supply, 1441 Butternut
Amarillo—Nunn Electric Supply, 119 Polk St.
R & R Electronic Supply 920 West 7th
Trice Wholesale Electronics, 1014 W. Sixth
Austin—Trice Wholesale Electrs., 405 E. 43rd
Borger—Trice Wholesale Electrs., 500 W. 3rd
Beaumont—Ralph's, 1293 Broadway
Dallas—Crabtree's Electronics, 2608 Ross Ave.
Crabtree's Electronics, 254 W. Carpenter Freeway
Crabtree's Electronics, 11430 N. Central Expressway
Crabtree's Electronics, 3510 Marvin D. Love Freeway
R & R Electr., Supply Co., 2103 Irving Blvd.
Trice Wholesale Electrnics, 2914 Commerce
Wilkinson Bros. Co., 2406 Ross Ave.
Denison—Denison Radio Sup., 310 W. Woodard
El Paso—Midland Specialty, 2235 Wyoming Ave.
Nunn Electric Supply, 2137 Mills Ave.
R & R Electronic Supply, 2631 E. Yandell

TEXAS (cont'd.)

Fort Worth—Swieco, Inc., 1518 E. Lancaster
Trice Wholesale Electronics, 104 South Main
Greenville—Lavender Electrs., 2311 Washington
Houston—Electrotex Corp., 2300 Richmond
Geophysical Supply Co., 1500 Crawford St.
Lenert Company, 1420 Hutchins
Sterling Electrs., 4201 Southwest Freeway
Trice Wholesale Electronics, 1318 Polk Ave.
Killeen—Trice Wholesale Electrs., 709 N. 8th
Laredo—Guarantee Radio Sup., 1314 Iturbide
Lubbock—Nunn Elec. Supply, 1817 4th St.
R & R Electronic Supply, 1607 Ave. G
Trice Wholesale Electronics, 1812 Ave. "Q"
Midland—R & R Electr. Sup., 30 Industrial Loop
Trice Wholesale Electrs., 1907 W. Industrial
Odessa—
Midland Specialty Co., 2101 Andrews Hwy.
R & R Electronic Supply, 300 East 23rd
Pampa—Trice Wholesale Electrs. 400 S. Russell
Paris—Lavender Electronics, 250 South Main
San Angelo—Gunter Wholesale, 606 S. Irving
San Antonio—
Electrotex Corp., 910 W. Laurel
Radio & Television Parts, 1828 N. St. Mary's
Sterling Electronics, 4600 San Pedro
Trice Wholesale Elecrs., 1301 South Presa
Sherman—Lavender Electrs., 308 East Houston
Trice Wholesale Electronics, 326 W. Lamar
Temple—Trice Wholesale Electrs., 217 No. Main
Texarkana—Lavender Electrs., 520 E. Fourth
McCullough Electr. Sup., 1222 Main St.
Tyler—Cole Electronic Sup., 335 S. Bonner
East Texas Electrs., 119 So. Glenwood
Lavender Electronics, 503 East Oakwood
Victoria—Lavender Electrs., 1005 No. Williams
Wichita Falls—R & R Electr. Sup., 1911 9th St.
Trice Wholesale Electrs., 1502 11th St.

UTAH

Provo—Central Utah Electrs., 735 So. State St.
Salt Lake City—Kimball Electrs., 350 Pierpont

VIRGINIA

Alexandria—Certified Electrs., 1313 Powhatan
Danville—
Southeastern Radio Sup., 215 Craghead St.
Norfolk—Avec Electronics, 711 Granby St.
Cain Electronics Co., 1530 Ingleside Rd.
Priest Electronics, Inc., 6431 Tidewater Dr.
Radio Parts Distributing Co.,
5652 E. Virginia Beach Blvd.
World Electronics, Inc., 2440 Ingleside Rd.
Portsmouth—Distributors, Inc., 710 County St.
Richmond—Avec Electrs., 2002 Staples Mill Rd.
Meridian Electronics Inc., 1001 W. Broad St.
Roanoke—Avec Electronics, 2009 Williamson Rd.
H. C. Baker Sales Co., 19 Franklin Rd. S.W.
Southeastern Radio Supply Co., Inc.,
1330 Courtland Rd., N.E.

WASHINGTON

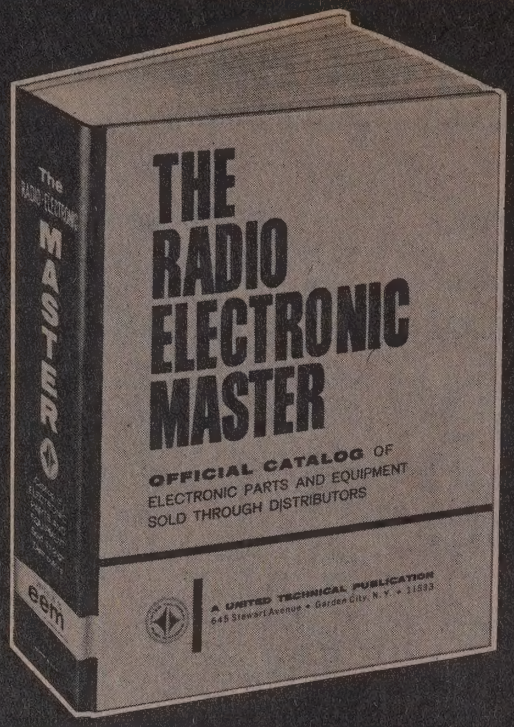
Olympia—J W Electronics, 2921 Pacific Ave.
Seattle—Pacific Electrs. Sales, 1209 First Ave.
Western Electrs., Co., 717 Dexter Ave. N
Westlake Electr. Sup., 415 Westlake Ave. N
Spokane—
Columbia Electric, E. 3420 Ferry Ave.
Northwest Electrs., East 730 First Ave.
Tacoma—C & G Electrs. Co., 2502 Jefferson
Wible Electronics, 3723 So. Lawrence
Yakima—Lay & Nord, 511 South 3rd

WEST VIRGINIA

Charleston—Mountain Electrs., 708 Bigley Ave.

WISCONSIN

Fond du Lac—
Wisconsin Electr. Sup., 223 N. Seymour St.
Green Bay—Northern Radio & Telev., 1585 Main
Milwaukee—
Marsh Radio Supply, 6047 W. Beloit Rd.
Radio Parts Co. Inc., 1314 N. 7th St.
Sheboygan—Nitze's, 1129 North 8th St.



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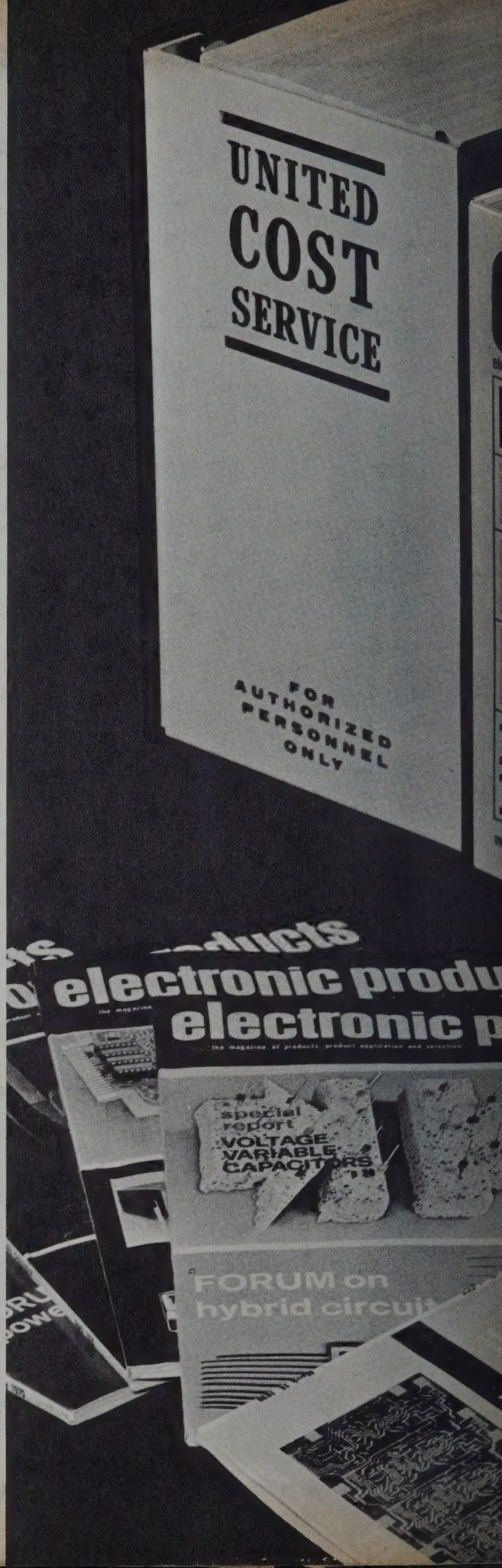

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